



Dummy Components
Solder Practice Kits
Qualification PCBs
Tools & Supplies



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adhesives, coatings, sealants & equipment
for your manufacturing and technology applications

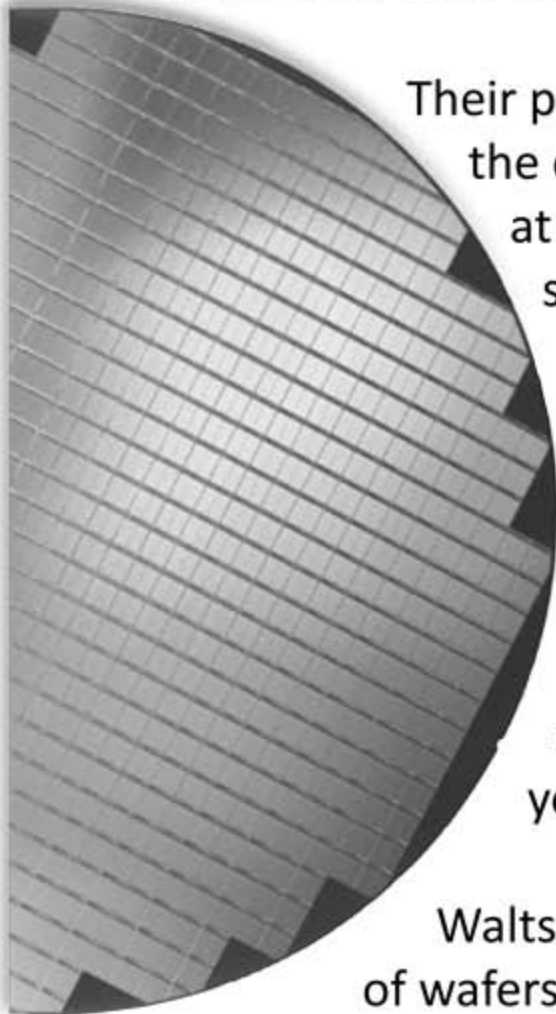
t 01865 842842

e info@intertronics.co.uk

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Advanced Test Wafers

Waltz Co., Ltd. brings together state-of-the-art technology and extensive knowledge that they have cultivated over the years and is constantly opening up the next-generation electronic assembly and mounting technology with the semiconductors of tomorrow.



Their products are used as the de-facto standard of the component mounting industry worldwide and at the most advanced research and development sites.

Experienced electronic designers worldwide not only use Waltz standard products but also their custom products that exactly meet the customer needs. At Waltz they have experienced designers that can also custom make TEG (Test Element Groups) to better suit your needs.

Waltz supports a wide variety of thin processing of wafers, film formation, sputtering, deposition, back grinding, dicing, bump forming, assemblies and various analyses are all available.

Waltz Co., Ltd. Superior-quality products and services. Made in Japan!



Distributor of mechanical IC samples (dummy components), test boards, kits and SMD production tools and equipment.

Frequently Asked Questions

What are dummy components?*

Dummy components are the exact mechanical equivalent of functional electronic components.

Why use dummy components?

Dummies save money. In cases where only mechanical characteristics are required, dummy components can be used instead of live functioning components. Since there is no expensive die inside the package, the cost for performing mechanical testing is significantly lower.

Who is Practical Components?

Practical Components is a team of dedicated electronic industry professionals offering value pricing, on-time delivery, and superior service to our customers. The Practical Components team is ready to provide project assistance in the areas of technical component knowledge, drawings, component land patterns, and PCB practice kits.

What is a PCB Practice Kit?

A PCB Practice Kit contains both the PC practice board and the necessary dummy components so customers can conduct assembly process evaluation without using high-cost, live components and functional PC boards. Kits are available in a single pack for employee hand soldering training or packaged for production equipment evaluation. Both X, Y Theta data and Gerber data are available without charge.

What other products are offered by Practical Components?

In addition to dummy components, Practical carries solder training aids, tools and related equipment, IPC products and designs custom printed circuit boards. Your sales representative can supply technical information and pricing on all our products.

Who uses dummy components?

Companies that are involved with electronic component assembly, testing, evaluation and employee training.

Contact Practical Components

If you have any additional questions concerning Practical Components, our products or policies, please contact us.

Practical Components, Inc.
10762 Noel Street
Los Alamitos, CA 90720 USA
Tel: 1-714-252-0010
Fax: 1-714-252-0026
E-mail: klaphen@practicalcomponents.com
Web Site: www.PracticalComponents.com
www.TrustPCI.com

Main E-mail..... Info@TrustPCI.com
Sales..... Russell Kido / rkido@TrustPCI.com
Sales Kym Bell / kbell@TrustPCI.com
Sales..... Lisa Laphen / llaphen@TrustPCI.com
Technical Support..... techsupport@TrustPCI.com
Purchasing/Distributors..... Deanne Guzman / dguzman@TrustPCI.com
President..... Kevin Laphen / klaphen@TrustPCI.com

* Disclaimer: Dummy components are only to be used for evaluation and testing purposes. Practical Components is not responsible for product that is used as a "live" package using live die assembly. Dummy samples are not to be used for 1st reliability testing.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

How To Place Your Order

Our sales staff is ready to serve you from 8:00 A.M. to 5 P.M. Pacific Standard Time, Monday through Friday. Our fax lines are open 24 hours every day.

Fax and E-mail orders received after normal business hours are processed the next business day. Please include your telephone and fax numbers so we can confirm your order.

Our website www.TrustPCI.com is always available and is loaded with valuable information about our products including detailed component drawings, daisy-chain patterns, white papers, photos and data sheets. The site has many products such as hand solder training kits available for purchase online.

Bill / Remit to:

Practical Components, Inc.
PO Box 1037
Los Alamitos, CA 90720-1037 USA

Ship to:

Practical Components, Inc.
10762 Noel Street
Los Alamitos, CA 90720 USA

Tel: 1-714-252-0010
Fax: 1-714-252-0026
E-mail: klaphen@practicalcomponents.com
Web Site: www.TrustPCI.com

F.O.B. is Los Alamitos, CA USA

Terms and Conditions

Out Of Stock Items: Items not available for immediate shipment will be shipped as they become available. Items not available at the end of 90 days will be cancelled. The number of back-ordered days may be extended beyond 90 days with customer approval.

Return Policy: Returns must be made promptly and accompanied by a return authorization number. Please contact a customer service representative to obtain a return authorization number. All returns must be made within 30 days of date of invoice and accompanied by return authorization number.

- Return freight charges must be prepaid.
- C.O.D. returns cannot be accepted.
- Return merchandise in original packaging and in resalable condition.
- Please note that items returned due to customer error may be subject to a restocking charge of 25%.
- Non-catalog items are not returnable.

Catalog Listings: Not all products listed in this catalog are maintained in stock, and all product specifications for each product are current as of the date of publication. Product listings, specifications and prices for each product are subject to change without notice.

Product Liability: Practical Components' sole obligation for products that prove to be defective within 10 days of purchase will be replaced or refunded. Practical Components gives no warranty either expressed or implied and specifically disclaims all other warranties, including warranties for merchantability and fitness.

In no event shall Practical Components' liability exceed the buyer's purchase price nor shall Practical Components be liable for any indirect or consequential damages.

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Non-Catalog Items: Merchandise not listed in our catalog, if available from our suppliers, may be subject to minimum order quantities and/or special handling charges. Shipment is made as quickly as deliveries are received from our suppliers. Special order products are sold on a non-returnable basis.

Quotations: All items are subject to prior sale. A quote is valid for 30 days.

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Handling Charge: A \$10.00 handling charge applies to all orders less than \$50.00.

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Tray Charge: A \$8.00 tray charge is added if customer orders less than a full tray quantity.

Special Requirements: Please include specific instructions if you require special packing, marking, shipping, routing or insurance.

*All prices are in USD (\$).

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CSPnl (RDL) Wafer



Practical Components introduces new CSPnl (RDL) dummy wafers from Amkor. The CSPnl Bump on Redistribution (RDL) option adds a plated copper redistribution layer to route I/O pads to JEDEC/ EIAJ standard pitches, avoiding the need to redesign legacy parts for CSP applications. Nickel-based or copper UBM is offered, along with polyimide or PBO repassivation. CSPnl with RDL utilizes industry-standard surface mount assembly and reflow techniques, and does not require underfill.

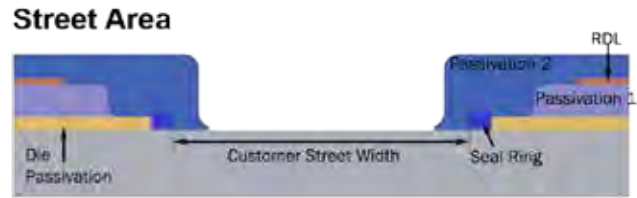
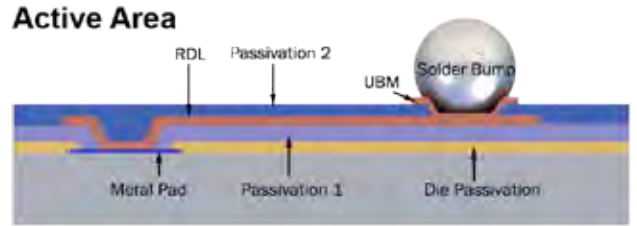
This 8 inch wafer can be provided diced into individual die or as an uncut wafer. The wafer can be provided with SAC405 bumps.

Pad pitch is 400um (0.4mm). Wafer thickness is 725um, with back grinding available to 200um.

Pads on this wafer are daisy chained and can be cut to any sized request. Packaging is tape and reel bumps down for cut die or cut and in the ring. Uncut 8inch wafers are shipped in plastic wafer packs. There is a lot of flexibility with this type of component.

In addition to the wafer Practical Components can also provide a test board (substrate) on request.

Please call our technical representatives at 714-252-0010 for additional information.

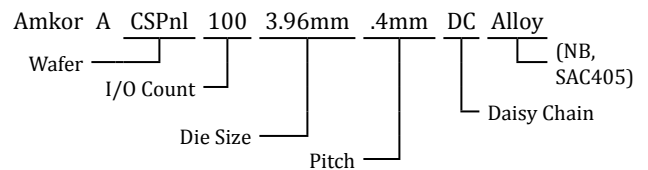


Part Description	I/O Count	Die Size	Pitch	Matrix	Projected Die Yield	Alloy
A-CSPnl4-0.76mm-.4mm-DC	4	0.76	.4mm	2x2	40,000	SAC405, No Solder Ball
A-CSPnl16-1.56mm-.4mm-DC	16	1.56	.4mm	4x4	10,000	SAC405, No Solder Ball
A-CSPnl36-2.36mm-.4mm-DC	36	2.36	.4mm	6x6	4,500	SAC405, No Solder Ball
A-CSPnl64-3.16mm-.4mm-DC	64	3.16	.4mm	8x8	2,500	SAC405, No Solder Ball
A-CSPnl100-3.96mm-.4mm-DC	100	3.96	.4mm	10x10	1,500	SAC405, No Solder Ball
A-CSPnl144-4.76mm-.4mm-DC	144	4.76	.4mm	12x12	1,000	SAC405, No Solder Ball
A-CSPnl196-5.56mm-.4mm-DC	196	5.56	.4mm	14x14	500	SAC405, No Solder Ball

Notes

- Trace material: Copper
- Trace thickness: 3um
- Trace width: 100um
- Bump pad shape: Circular / Square
- Bump pad size: 225/290um
- Tape and Reel: Width = 8mm Pitch = 4mm
- 0.3mm & 0.5mm Pitch packages are available. Please call for more information.

Part Description System



- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "NB" to end of part number for No Solder Balls.
- Add "SAC405" to end of part number for Lead-Free.
- Add "W" to end of part number for Uncut Wafer.



Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.



Practical Components is offering Amkor's embedded copper posts/pad on a eWLP (embedded Wafer Level Package) 8 inch wafer. eWLP wafers have copper posts that are embedded into the die. Size of the posts is 8um to 10um. Pitch between the copper posts is 400um (0.4mm).

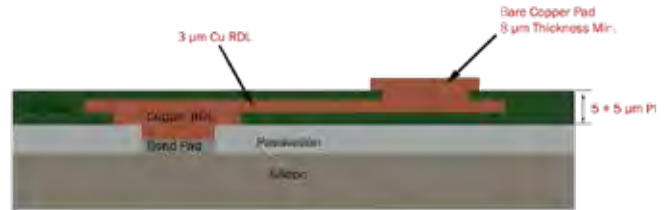
Wafer thickness is 725um and can be back grinded to 200um.

These wafers can be supplied by uncut wafer or cut die, packaged on tape and reel with pads down. Copper pillar dummy test wafers provide an excellent opportunity to investigate the effectiveness of the flip chip die attach process.

Practical Components technical staff can provide additional information on the new Amkor eWLP test wafers. In addition to the wafers and die, Practical can supply test vehicles for the eWLP test die.

Each die is daisy chained and customer can have the wafer cut to match a required die size.

Call for more information: (714) 252-0010

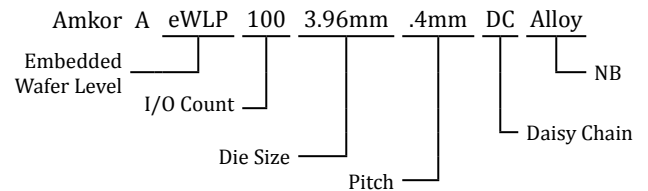


Part Description	I/O Count	Die Size	Pitch	Matrix	Projected Die Yield	Alloy
A-eWLP4-0.76mm-.4mm-DC	4	0.76	.4mm	2x2	40,000	No Solder Ball
A-eWLP16-1.56mm-.4mm-DC	16	1.56	.4mm	4x4	10,000	No Solder Ball
A-eWLP36-2.36mm-.4mm-DC	36	2.36	.4mm	6x6	4,500	No Solder Ball
A-eWLP64-3.16mm-.4mm-DC	64	3.16	.4mm	8x8	2,500	No Solder Ball
A-eWLP100-3.96mm-.4mm-DC	100	3.96	.4mm	10x10	1,500	No Solder Ball
A-eWLP144-4.76mm-.4mm-DC	144	4.76	.4mm	12x12	1,000	No Solder Ball
A-eWLP196-5.56mm-.4mm-DC	196	5.56	.4mm	14x14	500	No Solder Ball

Notes

- Ball Place or Electroplated: Electroplated
- Bump On Pad or redistribution Layer: Redistribution Layer
- Bump Material: Cu bump
- Bump Height: 10 um
- Bump pitch: 400 um
- Bump Shear Strength: >2 g/mil²
- Plating Area 30: 5948 mm²
10: 10804 mm²
- Tape and Reel: Width =8mm Pitch = 4mm
- 0.3mm & 0.5mm Pitch packages are available. Please call for more information.

Part Description System



- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "NB" to end of part number for No Solder Balls.
- Add "W" to end of part number for Uncut Wafer.

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WLP

Wafer Chip Size Package



WLP uses interconnection technology to effectively utilize the chip area by making it possible to form electrodes over the entire chip surface. This eliminates the need for the wire bonding space required by previous wiring methods. Also, electrodes are formed using copper posts for a simple structure.

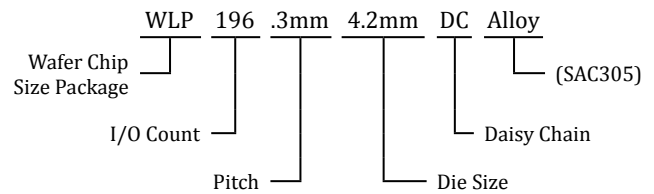
All of this means that the area of the finished package is exactly the same compact size as the original chip. It also simplifies mounting and contributes to easier high-density mounting. WLP is the perfect choice for packaging chips used in portable telephones, digital cameras, and other applications where mounting space is severely restricted.

Part Description	I/O Count	Pitch	Body Size	Matrix	Alloy
.3mm Pitch					
WLP100-.3mm-3mm-DC	100	.3mm	3mm	10x10	96.5%Sn/3.0%Ag/0.5%Cu
WLP144-.3mm-3.6mm-DC	144	.3mm	3.6mm	12x12	96.5%Sn/3.0%Ag/0.5%Cu
WLP196-.3mm-4.2mm-DC	196	.3mm	4.2mm	14x14	96.5%Sn/3.0%Ag/0.5%Cu
WLP256-.3mm-4.8mm-DC	256	.3mm	4.8mm	16x16	96.5%Sn/3.0%Ag/0.5%Cu
WLP264-.3mm-6mm-DC	264	.3mm	6mm	17x17	96.5%Sn/3.0%Ag/0.5%Cu
WLP400-.3mm-6mm-DC	400	.3mm	6mm	20x20	96.5%Sn/3.0%Ag/0.5%Cu
WLP676-.3mm-7.8mm-DC	676	.3mm	7.8mm	26x26	96.5%Sn/3.0%Ag/0.5%Cu
WLP900-.3mm-9mm-DC	900	.3mm	9mm	30x30	96.5%Sn/3.0%Ag/0.5%Cu
WLP1600-.3mm-12mm-DC	1600	.3mm	12mm	40x40	96.5%Sn/3.0%Ag/0.5%Cu
.4mm Pitch					
WLP100-.4mm-4mm-DC	100	.4mm	4mm	10x10	96.5%Sn/3.0%Ag/0.5%Cu
WLP144-.4mm-4.8mm-DC	144	.4mm	4.8mm	12x12	96.5%Sn/3.0%Ag/0.5%Cu
WLP144-.4mm-6mm-DC	144	.4mm	6mm	13x13/4-Row	96.5%Sn/3.0%Ag/0.5%Cu
WLP196-.4mm-5.6mm-DC	196	.4mm	5.6mm	14x14	96.5%Sn/3.0%Ag/0.5%Cu
WLP256-.4mm-6.4mm-DC	256	.4mm	6.4mm	16x16	96.5%Sn/3.0%Ag/0.5%Cu
WLP400-.4mm-8mm-DC	400	.4mm	8mm	20x20	96.5%Sn/3.0%Ag/0.5%Cu
WLP676-.4mm-10.4mm-DC	676	.4mm	10.4mm	26x26	96.5%Sn/3.0%Ag/0.5%Cu
WLP900-.4mm-12mm-DC	900	.4mm	12mm	30x30	96.5%Sn/3.0%Ag/0.5%Cu
.5mm Pitch					
WLP100-.5mm-5mm-DC	100	.5mm	5mm	10x10	96.5%Sn/3.0%Ag/0.5%Cu
WLP144-.5mm-6mm-DC	144	.5mm	6mm	12x12	96.5%Sn/3.0%Ag/0.5%Cu
WLP196-.5mm-7mm-DC	196	.5mm	7mm	14x14	96.5%Sn/3.0%Ag/0.5%Cu
WLP256-.5mm-8mm-DC	256	.5mm	8mm	16x16	96.5%Sn/3.0%Ag/0.5%Cu
WLP400-.5mm-10mm-DC	400	.5mm	10mm	20x20	96.5%Sn/3.0%Ag/0.5%Cu
WLP676-.5mm-13mm-DC	676	.5mm	13mm	26x26	96.5%Sn/3.0%Ag/0.5%Cu
WLP900-.5mm-15mm-DC	900	.5mm	15mm	30x30	96.5%Sn/3.0%Ag/0.5%Cu

Notes

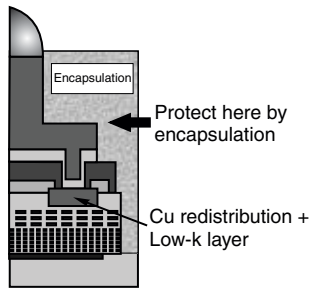
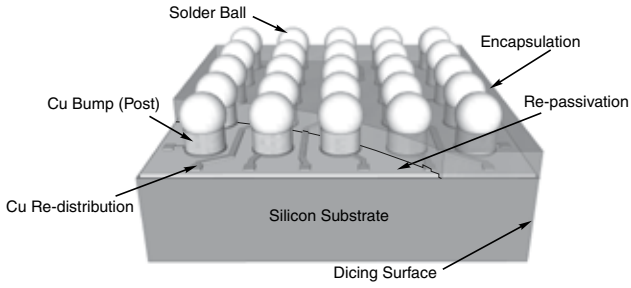
- Ultra thin type, Ultra miniature, Lightweight
- High current capacity and good heat radiation
- Stress buffer structure
- High reliability of WLP as semiconductor package makes KGD issues cleared.
- Cu-to-Cu wiring structure
- Include inductors of high Q value
- Possibility of SMT assembly
- Coplanarity (5 to 10 μm)
- Available diced and left in ring or in trays.

Part Description System

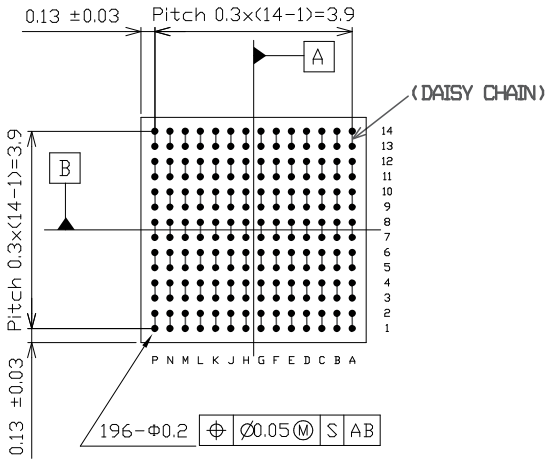


- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC305" to end of part number for Lead-Free.

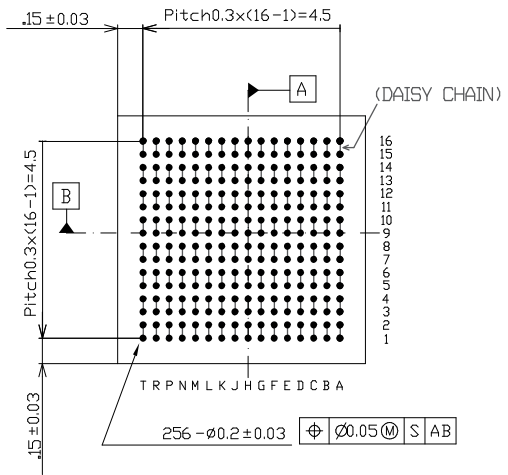
WLP Wafer Chip Size Package



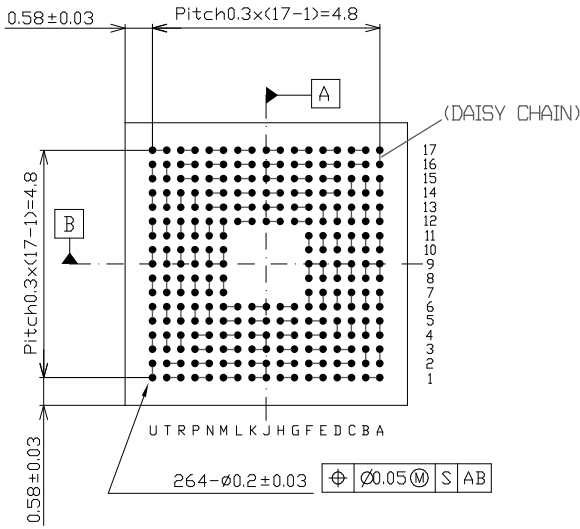
WLP196-.3mm-4.2mm (14x14 Matrix)



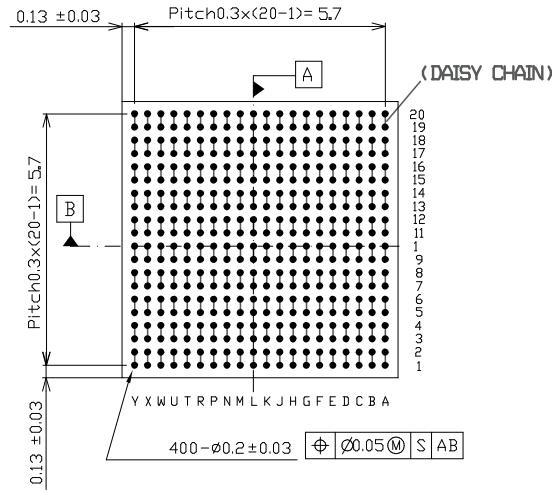
WLP256-.3mm-4.8mm (16x16 Matrix)



WLP264-.3mm-6mm (17x17 Matrix)



WLP400-.3mm-6mm (20x20 Matrix)



Flip Chips



Flip Chip describes the method of electrically connecting the die to the package carrier. The package carrier, either substrates or leadframe, then provides the connection from the die to the exterior of the package. The interconnection between die and carrier in flip chip packaging is made through a conductive bump that is placed directly on the die surface. The bumped die is then flipped over and placed face down, with the bumps connecting to the carrier. After the die is solderable, underfill is applied between the die and the substrates, around the solder bumps. The underfill is designed to contract the stress in the solder joints caused by the difference in thermal expansion between the silicon die and carrier.

Pac Tech offers a complete set of additional wafer level and backend services including: saw, dice, redistribution, repassivation, backside laser mark, backside coating, test die, and assembly. In addition, Pac Tech has the latest in metrology and analytical equipment to help in the development and production processes, including: x-ray, shear, AOI, ICP, AA, probing, high speed ball pull, chemical analysis, etc...

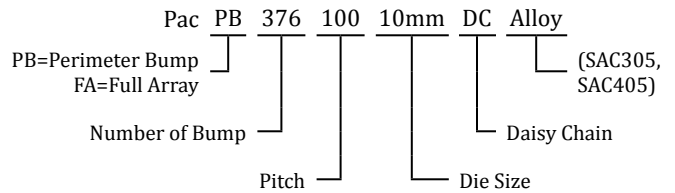
Flip Chips

Part Description	Die Size	No. of Bumps	Bump Pitch	Bump Height	UBM Diameter	Passivation Via	Uncut Wafer	Tray
Pac2.3-FA572-200/400-10mm-DC	10x10mm 394x394mils	572	200µm/400µm 7.88 / 15.76mil	75µm	90µm	80µm	6" Wafer (132 Die)	36 per Tray
Pac2.5-PB376-100-10mm-DC	10x10mm 394x394mils	376	100µm 3.94mils	53µm	37µm	27µm	6" Wafer (120 Die)	36 per Tray

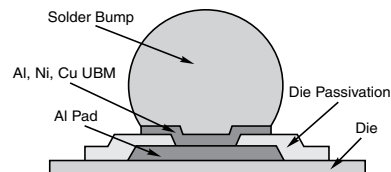
Notes

- Die count represents expected yield per wafer.
- All die is packaged in waffle pack trays unless otherwise specified.
- The potential multiple is the number of die repeats on the wafer. With the wafer orientated flat down, a right hand coordinate system applies.
- Die size is from scribe line to center-to-center. Scribe width is 0.05mm Passivated. Each bump is electrically connected to one other bump and isolated form all others to facilitate electrical test.
- Bump pitch is defined as center-to-center distance between passivation openings.
- Bump height is defined as silicon surface to the top of the bump.
- Bump diameter is defined as the maximum diameter.
- UBM = Under Bump Metallurgy
- Unbumped wafers are available upon special request.
- Metal Composition is 5µm Ni, .05µm Au
- Die are packaged in Waffle Packs
- All Flip Chips are available Lead-Free with (SAC305) 96.5%Sn/3.0%Ag/0.5%Cu or (SAC405) 95.5%Sn/4.0%Ag/0.5%Cu alloys.

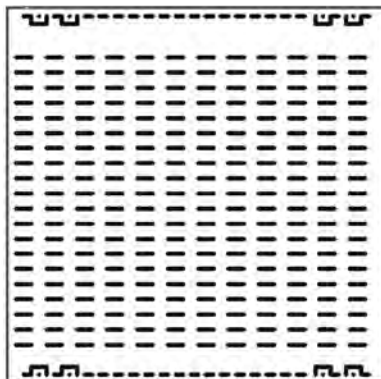
Part Description System



- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "EUT" to end of part number for Eutectic.
- Add "SAC305" to end of part number for Lead-Free.
- Add "W" to end of part number for Uncut Wafer.
- Add "UB" to end of part number for unbumped wafer/die.



Pac2.3-FA572-200/400-10mm



Die size: 10x10mm (394mils sq)
Pitch: 200µm/400µm (7.88/15.76mil)



For kit see page 9.

Pac2.5-PB376-100-10mm

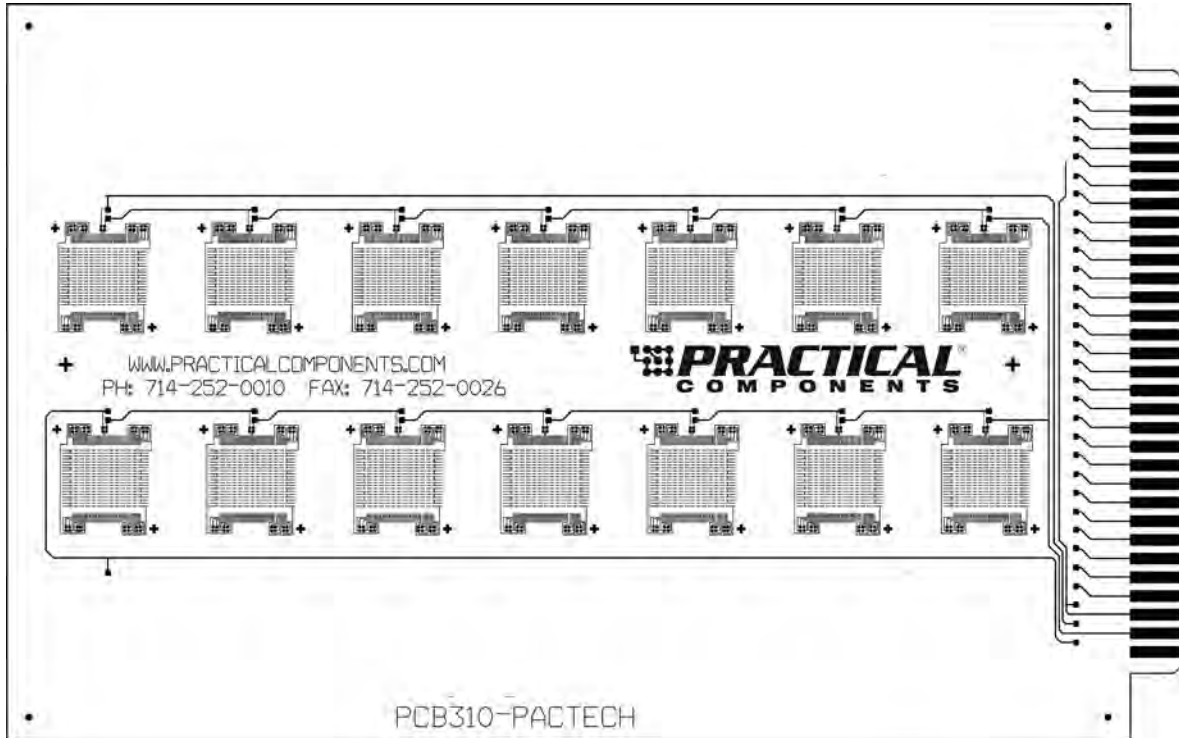


Die size: 10x10mm (394mils sq)
Pitch: 100µm (3.94mil)

Pac Tech Flip Chip Test and Evaluation Kit and Board

The Pac Tech Flip Chip Test & Evaluation board is for placement and daisy chain continuity testing after assembly. Substrate has 14 mounting sites for 10 x 10mm Flip Chips. With an increasing number of I/O's on Integrated Circuits and accompanying requirements for high performance, flip chip type components are a compelling

technology for potential users. Pac Tech test die are combined with test boards to provide customers with the ability to test a variety of specs and processes. The components and test board are daisy-chained for continuity. The PCB310 Pac Tech Board is single sided with 14 pads to accommodate 2 rows of 7 Pac2.3-572-200/400-10mm die each.



Notes

- Board size is 6.3" x 3.95", 2 layers, .062" thick.
- Board material is IS410-High Temp 180Tg.
- Standard board finish OSP Entek CU-A-HT.
- Gerber and X,Y Theta data included at no charge.
- See page 8 for available solder ball alloys.

Order Notes

- Order Number: 12299 PCB310-PacTech (board only)
- Order Number: 12312 Pac2.3-FA572-200/400-10mm-DC-305 (Rows 2 and 3)

About Lead-Free Flip Chips

Flip Chips are used in evaluating assembly techniques, board continuity, temperature cycle life test evaluation, underfill processes and other generic needs to be given to the appropriate flux, underfill, temperature profile, and pad finish for the assembly. Lead-Free Flip Chips address the need for environmentally conscious assemblies as well as Alpha particle tolerant packaging.

CVBGA

Very Thin ChipArray® BGA



ChipArray® (CVBGA) package offering by Amkor have a .3mm and .4mm pitch. In addition to the standard core ChipArray® package (CABGA and CTBGA), Amkor offers thinner mold cap thickness of 1.0mm max. By utilizing a thin core laminate, much denser routing can be achieved, thereby enabling more I/O's in a given footprint.

Due to their small size and I/O density Amkor's ChipArray® product family is an excellent choice for new devices requiring a small footprint and low mounted height.

The .3mm and .4mm CVBGA packages have become popular choices for electronic assembly. They are identical to the live package without the expensive IC die inside. The dummy versions are made of the same materials on the same manufacturing lines and have the same size, thermal and soldering properties as the live equivalent without the cost of a live die.



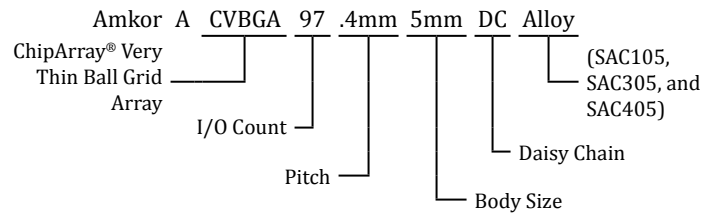
CVBGA Very Thin ChipArray® BGA

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
.3mm Pitch							
A-CVBGA368-.3mm-8mm	368	.3mm	8mm	23x23	Perimeter	260	SAC105 only
.4mm Pitch							
A-CVBGA97-.4mm-5mm	97	.4mm	5mm	10x10	Full Array	360	SAC105, SAC305, or SAC405
A-CVBGA360-.4mm-10mm	360	.4mm	10mm	23x23	Perimeter	168/250	SAC105, SAC305, or SAC405
A-CVBGA432-.4mm-13mm	432	.4mm	13mm	31x31	Perimeter	160	SAC105, SAC305, or SAC405

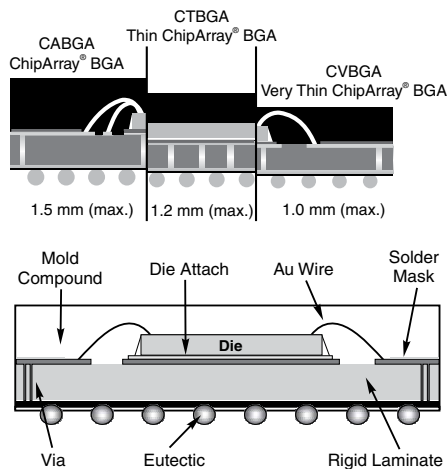
Notes

- Parts are packaged in JEDEC trays.
- All components are daisy-chained.
- Moisture sensitivity is JEDEC level 3.
- Daisy-chained connections are connections between I/O (input/output) of the component
- Lead-free parts are available with 95.5%Sn/4.0%Ag/0.5%Cu (SAC405) or 96.5%Sn/3.0%Ag/0.5%Cu (SAC305) alloy.
- Eutectic 63/37 SnPb Solder ball material is available.

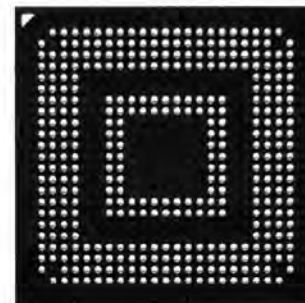
Part Description System



- Add "TR" to end of part number for Parts on Tape and Reel.
- Add "SAC105" or "SAC305" or "SAC405" to end of .4mm pitch part number for Lead-free.



.3mm Package



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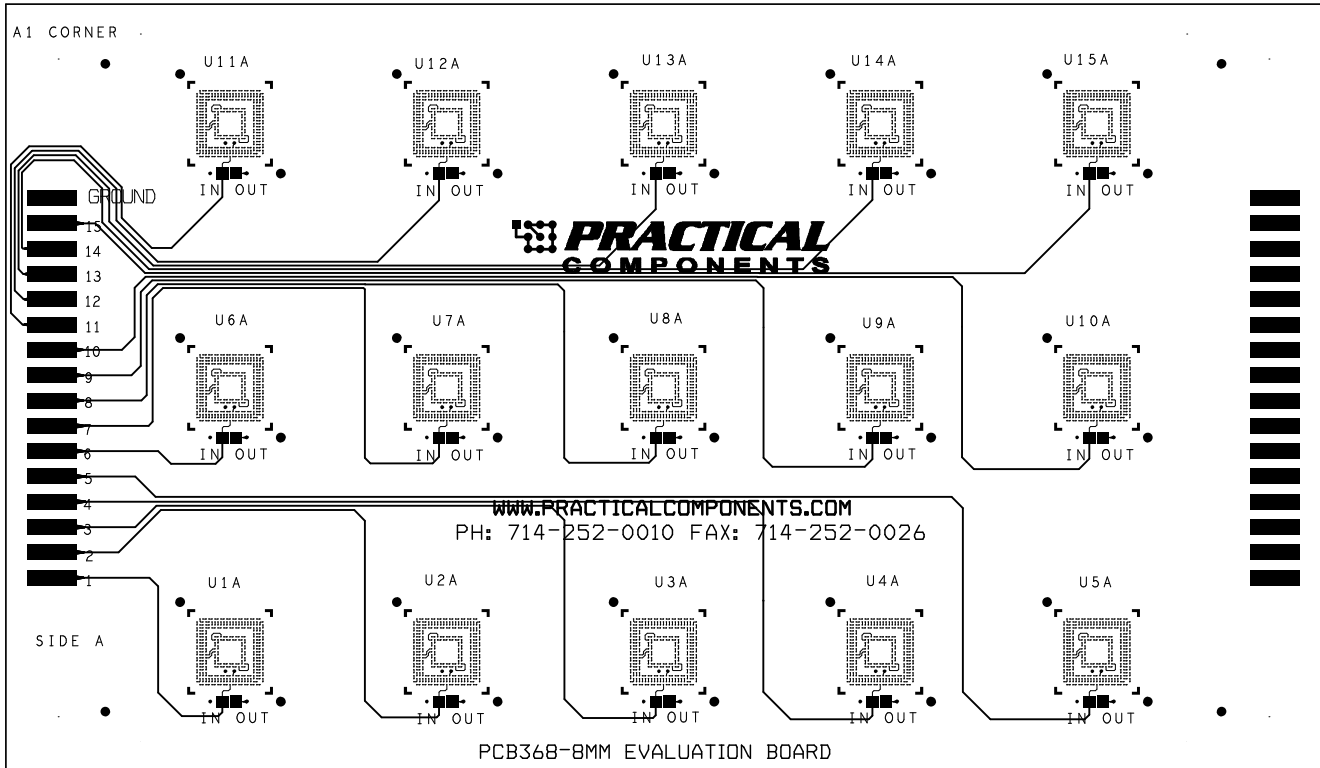
For kits see pages 11, 97, 108, & 113.

PCB368- .3 mm Pitch CVBGA Evaluation and Qualification Test Board

The PCB368-8 Evaluation Board is a test vehicle for the .3mm pitch CVBGA component.

Solder practice test vehicle PCB boards and kits are used for machine setup, evaluation, qualification, workflow analysis, prototyping, testing, and solder profiling.

For this component we have added a PCB368-8 mm Evaluation Board that is ideal for testing, evaluating and qualifying this fine-pitch technology. With Practical Components test boards and the necessary dummy components, customers can conduct assembly process evaluation without using high-cost, live components and functional PC boards. Kits are available packaged for production equipment evaluation.



Notes

- Both X, Y Theta data and Gerber data are available without charge.
- Board Size: 77 x 132mm
- 1mm thick
- 4 layers
- 15 pads for the CVBGA368 package
- Offered with OSP, ImAg & ENIG finishes

CTBGA

ChipArray® Thin Core Ball Grid Array

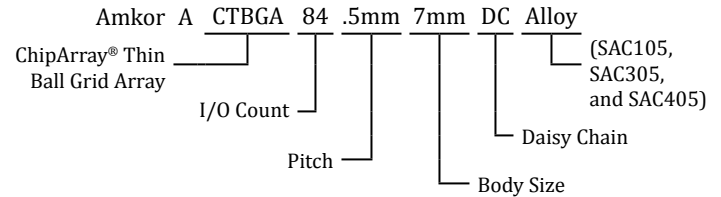


Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
.5mm Pitch							
A-CTBGA84-.5mm-6mm	84	.5mm	6mm	10x10	Perimeter	608	SAC105, SAC305, or SAC405
A-CTBGA84-.5mm-7mm	84	.5mm	7mm	12x12	Perimeter	476	SAC105, SAC305, or SAC405
A-CTBGA108-.5mm-7mm	108	.5mm	7mm	12x12	Perimeter	476	SAC105, SAC305, or SAC405
A-CTBGA132-.5mm-8mm	132	.5mm	8mm	14x14	Perimeter	360	SAC105, SAC305, or SAC405
A-CTBGA228-.5mm-12mm	228	.5mm	12mm	22x22	Perimeter	189	SAC105, SAC305, or SAC405
.8mm Pitch							
A-CTBGA64-.8mm-7mm	64	.8mm	7mm	8x8	Full Array	476	SAC105, SAC305, or SAC405
A-CTBGA100-.8mm-10mm	100	.8mm	10mm	10x10	Full Array	184/250	SAC105, SAC305, or SAC405
A-CTBGA208-.8mm-15mm	208	.8mm	15mm	17x17	Perimeter	126	SAC105, SAC305, or SAC405

Notes

- Parts are packaged in JEDEC trays
- All components are daisy-chained.
- <0.12mm (5 mil) coplanarity.
- BT (Bismaleimide-Triazine) substrates or equivalent.
- Package thickness is 1.2mm max for 0.8mm and 1.0mm pitch packages.
- Package thickness is 1.1mm max for 0.5mm pitch packages.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with (SAC405) 95.5% Sn/ 4.0% Ag/0.5% Cu alloy or 96.5%Sn/3.0%Ag/0.5%Cu alloy (SAC305) or (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu is also available.
- CABGA, CVBGA and CTBGA parts are available without solder balls, which makes the package LGA. See page 16.

Part Description System



- Add "TR" to end of part description for Tape and Reel
- Add "SAC405" or "SAC105" or "SAC305" to end of part description for Lead-Free.



For kit see page 113.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

ChipArray® (CABGA) packages are offered in laminate format and are available as Ball Grid Array. The near chip size standard outlines offer fixed body sizes and ball counts. Established SMT mounting processes and techniques are compatible with ChipArray®. The package size and design provides ideal RF operation (low inductance) for high speed applications requiring small footprints.

ChipArray® Ball Grid Array

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
.8mm Pitch							
A-CABGA36-.8mm-6mm	36	.8mm	6mm	6x6	Full Array	608	SAC105, SAC305, or SAC405
A-CABGA100-.8mm-10mm	100	.8mm	10mm	10x10	Full Array	184/250	SAC105, SAC305, or SAC405
A-CABGA144-.8mm-12mm	144	.8mm	12mm	13x13	Perimeter	189	SAC105, SAC305, or SAC405
A-CABGA160-.8mm-12mm	160	.8mm	12mm	14x14	Perimeter	189	SAC105, SAC305, or SAC405
A-CABGA176-.8mm-13mm	176	.8mm	13mm	15x15	Perimeter	160	SAC105, SAC305, or SAC405
A-CABGA192-.8mm-14mm	192	.8mm	14mm	16x16	Perimeter	119	SAC105, SAC305, or SAC405
A-CABGA208-.8mm-15mm	208	.8mm	15mm	17x17	Perimeter	126	SAC105, SAC305, or SAC405
A-CABGA288-.8mm-19mm	288	.8mm	19mm	22x22	Perimeter	84	SAC105, SAC305, or SAC405
1.0mm Pitch							
A-CABGA100-1.0mm-11mm	100	1.0mm	11mm	10x10	Full Array	168	SAC105, SAC305, or SAC405
A-CABGA144-1.0mm-13mm	144	1.0mm	13mm	12x12	Full Array	160	SAC105, SAC305, or SAC405
A-CABGA196-1.0mm-15mm	196	1.0mm	15mm	14x14	Full Array	126	SAC105, SAC305, or SAC405
A-CABGA256-1.0mm-17mm	256	1.0mm	17mm	16x16	Full Array	90	SAC105, SAC305, or SAC405

Notes

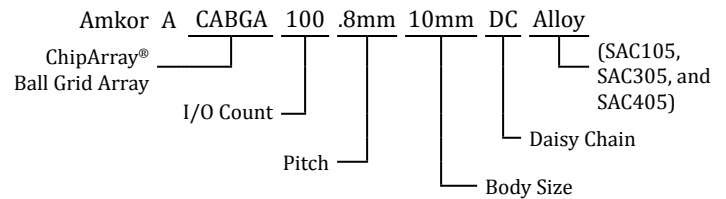
- Parts are packaged in JEDEC trays
- All components are daisy-chained.
- <0.12mm (5 mil) coplanarity.
- BT (Bismaleimide-Triazine) substrates or equivalent.
- Package thickness is 1.5mm max for 0.8mm and 1.0mm pitch packages.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with (SAC405) 95.5% Sn/ 4.0% Ag/ 0.5% Cu alloy or 96.5%Sn/3.0%Ag/0.5%Cu alloy (SAC305) or (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu is also available.
- CABGA, CVBGA and CTBGA parts are available without solder balls, which makes the package LGA. See page 16.



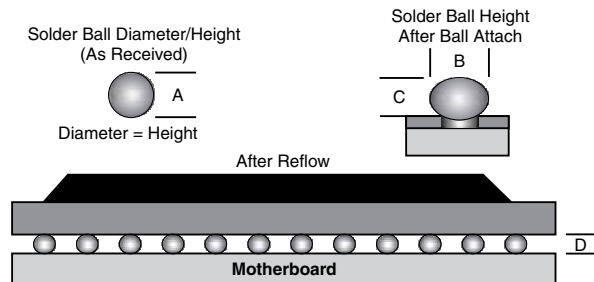
For kits see pages 93, 94, 98, 100, 108, 113 & 116.



Part Description System



- Add "TR" to end of part description for Tape and Reel
- Add "SAC405", "SAC105" or "SAC305" to end of part description for Lead-Free.



Package Pitch	A	B	C	D
1.00/0.80mm	0.46mm	0.48mm (± 0.05mm)	0.36mm (± 0.05mm)	0.30mm (± 0.05mm)

Note: Typical motherboard non-solder mask defined pad:

- 0.80 pitch = 0.30
- 1.00 pitch = 0.38

PBGA

Plastic Ball Grid Array



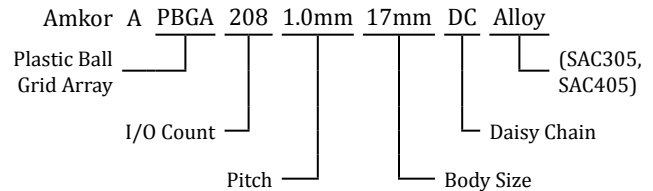
Amkor Plastic Ball Grid Arrays (PBGA) incorporate advanced assembly processes and designs for low cost, high performance applications. PBGAs are designed for low inductance, improved thermal operation and enhanced SMT ability.

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
1.0mm Pitch							
A-PBGA208-1.0mm-17mm	208	1.0mm	17mm	16x16	Perimeter	90	SAC305 or SAC405
A-PBGA256-1.0mm-17mm	256	1.0mm	17mm	16x16	Full Array	90	SAC305 or SAC405
A-PBGA288-1.0mm-23mm	288	1.0mm	23mm	22x22	Perimeter	60	SAC305 or SAC405
A-PBGA289-1.0mm-19mm	289	1.0mm	19mm	17x17	Full Array	84	SAC305 or SAC405
A-PBGA324-1.0mm-19mm	324	1.0mm	19mm	18x18	Full Array	84	SAC305 or SAC405
A-PBGA324-1.0mm-23mm	324	1.0mm	23mm	22x22	Perimeter	60	SAC305 or SAC405
A-PBGA484-1.0mm-27mm	484	1.0mm	27mm	26x26	Perimeter	40	SAC305 or SAC405
A-PBGA516-1.0mm-31mm	516	1.0mm	31mm	30x30	Perimeter	27	SAC305 or SAC405
A-PBGA580-1.0mm-35mm	580	1.0mm	35mm	34x34	Perimeter	24	SAC305 or SAC405
A-PBGA676-1.0mm-27mm	676	1.0mm	27mm	26x26	Full Array	40	SAC305 or SAC405
A-PBGA680-1.0mm-35mm	680	1.0mm	35mm	34x34	Perimeter	24	SAC305 or SAC405
A-PBGA928-1.0mm-40mm	928	1.0mm	40mm	39x39	Perimeter	21	SAC305 or SAC405
A-PBGA1156-1.0mm-35mm	1156	1.0mm	35mm	34x34	Full Array	24	SAC305 or SAC405
1.27mm Pitch							
A-PBGA208-1.27-23mm	208	1.27mm	23mm	17x17	Perimeter	60	SAC305 or SAC405
A-PBGA256-1.27mm-27mm	256	1.27mm	27mm	20x20	Perimeter	40	SAC305 or SAC405
A-PBGA272-1.27mm-27mm	272	1.27mm	27mm	20x20	Perimeter	40	SAC305 or SAC405
A-PBGA329-1.27mm-31mm	329	1.27mm	31mm	23x23	Perimeter	27	SAC305 or SAC405
A-PBGA388-1.27mm-35mm	388	1.27mm	35mm	26x26	Perimeter	24	SAC305 or SAC405

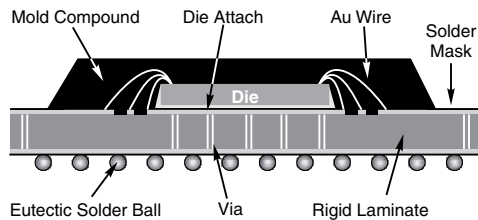
Notes

- Parts are packaged in JEDEC trays.
- Moisture sensitivity is JEDEC level 3.
- JEDEC MS-034 standard outlines.
- All components are daisy-chained.
- Daisy-chained connections are connections between I/O (input/output) of the component.
- Lead-free parts are available with 95.5%Sn/4.0%Ag/0.5%Cu (SAC405) or 96.5%Sn/3.0%Ag/0.5%Cu (SAC305) alloy.
- Solder ball material is available with Eutectic 63/37 SnPb.
- PBGAs are not available without solder balls.
- BGA packages should be baked at 125°C for 24 hours prior to assembly to prevent delamination during the assembly process.

Part Description System



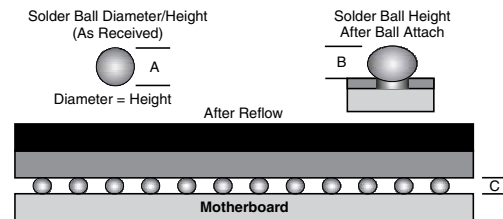
- Add "TR" to end of part number for Tape and Reel.
- Add "SAC405" or "SAC305" to end of part number for Lead-Free.



Note: Drawing not to scale.



For kits see pages 92, 98, 105, 106, 108, 111, 113, 115, 116 & 117.



Note: Drawing not to scale.

Package	Pitch	Solder Ball Diameter (A)	Solder Ball Land On Package and Board	Solder Ball Height on Package (B)	Solder Joint Height After SMT* (C)
⁽¹⁾ PBGA	1.00	0.50	0.45	0.40	0.32
⁽²⁾ PBGA	1.00	0.63	0.45	0.55	0.48
PBGA	1.27	0.76	0.63	0.60	0.52
PBGA	1.50	0.76	0.63	0.60	0.52

Units = mm

*Assumptions: 5 mils Solder Paste

Solder Mask Defined Pad

(1) Applies to 13, 15 and 17mm packages.

(2) Applies to 23, 27, 31, 35mm, and 40.0mm packages.

Practical does not guarantee the chain of custody for moisture sensitivity. This is due to the factory making consolidated shipments and customers quantity being met (breaking full tray quantities).

SuperBGA® (SBGA) package is a very low profile, high-power BGA. The IC is directly attached to an integrated copper heatsink. Since the IC and the I/O are on the same side, signal vias are eliminated.

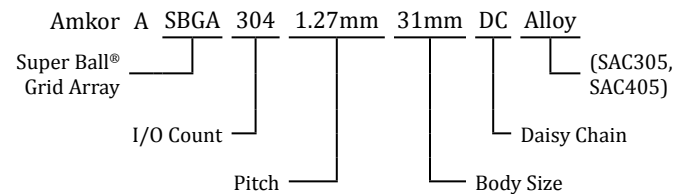
SBGA SuperBGA® 1.27mm Pitch

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
A-SBGA304-1.27mm-31mm	304	1.27mm	31mm	23x23	Perimeter	27	SAC305 or SAC405
A-SBGA560-1.27mm-42.5mm	560	1.27mm	42.5mm	33x33	Perimeter	12	SAC305 or SAC405
A-SBGA600-1.27mm-45mm	600	1.27mm	45mm	35x35	Perimeter	12	SAC305 or SAC405

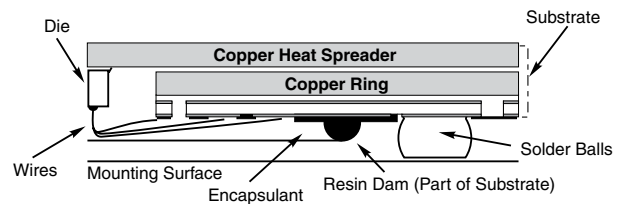
Notes

- Parts are packaged in JEDEC trays.
- Moisture resistant (JEDEC level 3)
- JEDEC MO-192 standard outlines
- All components are daisy-chained
- Lead-free parts are available with (SAC405) 95.5% Sn/4.0% Ag/0.5% Cu alloy or (SAC305) 96.5% Sn/3.0% Ag/0.5% Cu alloy
- Solder ball material is available with Eutectic 63/37 SnPb
- SBGAs are not available without solder balls.
- BGA packages should be baked at 125°C for 24 hours prior to assembly to prevent delamination during assembly process.
- Parts can be baked and dry-packed.
- Superior thermal performance.
- Light weight
- Low profile (1.4mm mounted)
- Enhanced electrical performance > 1 GHz

Part Description System



- Add "SAC405" or "SAC305" to end of part number for Lead-Free.

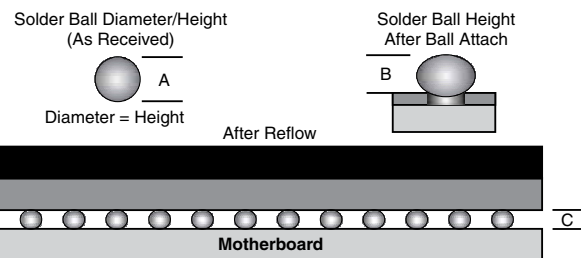


Note: Drawing not to scale.



Looking for Lead-Free?

This symbol indicates that lead-free parts are available!



Package	Pitch	A	B	C
SBGA	1.27	.76	.62	.52

All units in mm.

Assumptions: 5 mils solder paste. Solder mask defined pad.

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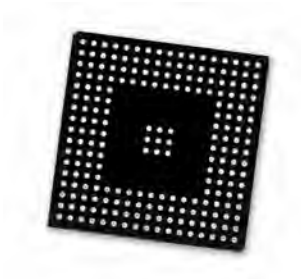
LGA

Land Grid Array



Amkor laminate ChipArray® packages are available without solder balls upon special order. Packages available without solder balls include CABGA, CTBGA and CVBGA. The same standard daisy-chained substrate would be used based on open tooling.

LGA is another term used for parts without solder balls. The same BOM (bill of material) is used when parts are assembled. LGA parts are used to reduce package height, drop test performance in handheld applications, solder ball attach practice, socket insertion, P&P evaluation, reflow profiling, enhance thermal cycle reliability and other purposes.



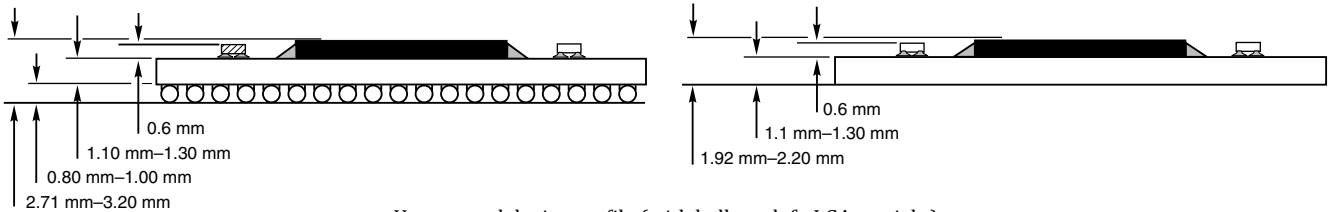
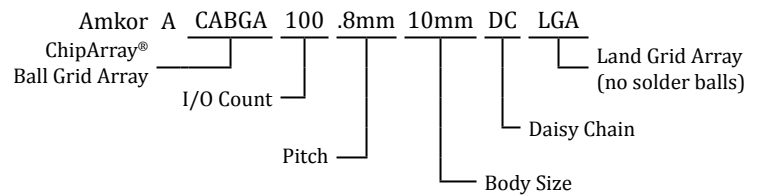
LGA solder interconnect is formed solely by solder paste applied at board assembly because there are no solder balls attached to the LGA. This results in a lower stand-off height of approximately 0.06mm to 0.10mm, depending on solder paste volume and PCB geometry. Laminate substrate is solder mask defined. Standard ball pad finish is NiAu.

Application notes available for supporting technical data.

Notes

- Body sizes range from 5mm ~ 17mm.
- Available pitches are .4mm, .5mm, .8mm and 1.0mm.
- Parts packaged in trays (standard).
- Parts available on Tape and Reel upon special request.

Part Description System (example when ordering)



Unmounted device profile (with balls on left, LGA on right)

After three years of development, Amkor has introduced the next generation PoP solution. This new technology is called Through Mold Via (TMV®). The new TMV® technology is used to create interconnect vias through the mold cap, it also provides a more stable bottom package that enables the use of thinner substrates with a larger die to package ratio. TMV® enabled POP can support single, stacked die for wirebond and FC designs.

TMV® technology enables next generation PoPs by:

- Removing bottlenecks for fine pitch memory interfaces
- Enhancing warpage control and bottom package thickness reduction
- Increasing die to package size ratios
- Supporting wirebond, flip chip, stacked die and passive integration
- Improving board level solder joint life



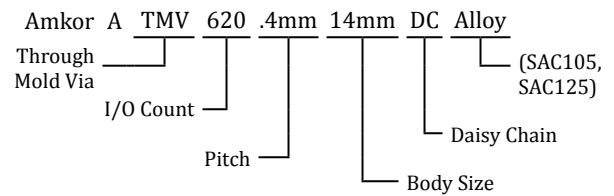
TMV® PoP—Mating Top and Bottom Daisy Chain Samples

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
14mm Body Size							
A-PoP200-.5mm-14mm	200 (top)	.5mm	14mm	27x27	Perimeter	119	SAC105
A-TMV620-.4mm-14mm	620 (bottom)	.4mm	14mm	33x33	Perimeter	119	SAC125

Notes

- Fine pitch 0.4mm bottom package footprints.
- Stacked package heights of 1.2mm nominal (see Stack Up table on following pages).
- Package configurations compliant with JEDEC standards.
- Moisture Resistance Testing is JEDEC Level 3 @ 260 °C.
- Temp Cycle -55/+125 °C, 1000 cycles.
- HAST 130 °C, 85% RH, 96 hours.
- Temp/Humidity 85 °C/85%RH/1000 hours.
- High Temp Storage 150 °C, 1000 hours.
- Board level Thermal Cycle -40/+125 °C, 1000 cycles.
- Parts packaged in JEDEC matrix trays.
- PoPs are only available Pb-free (not Tin-Lead). Available alloys are: (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu Top Package and (SAC125Ni) 98.2%Sn/1.2%Ag/0.5%Cu/0.05%Ni bottom package.
- It is recommended that parts be pre-baked at 125 °C for 48 hrs before using parts regarding moisture concern.
- PoP's are not available without solder balls.

Part Description System (example when ordering)



- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC105" or "SAC125" to end of part number for Lead-Free.

Ball Diameter

I/O Count	Ball Diameter
200	0.33mm
620	0.30mm

See drawings on the following pages (18–20) for additional technical data. Color coded version available on our website: www.TrustPCI.com

Please Note

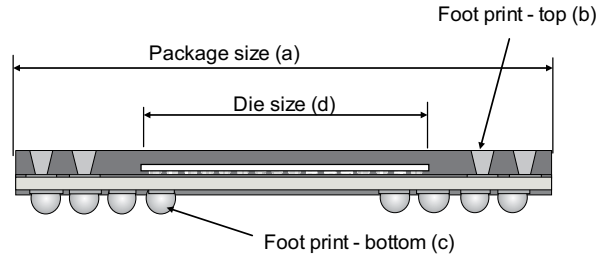
- Amkor supporting data is available on our website for: Board Level Reliability (BLR), PoP application notes, PoP Stencil & Stacking paper for SMT Conditions.
- IMAPS and SMTA White Paper Articles for additional supporting data available on our website: www.TrustPCI.com.

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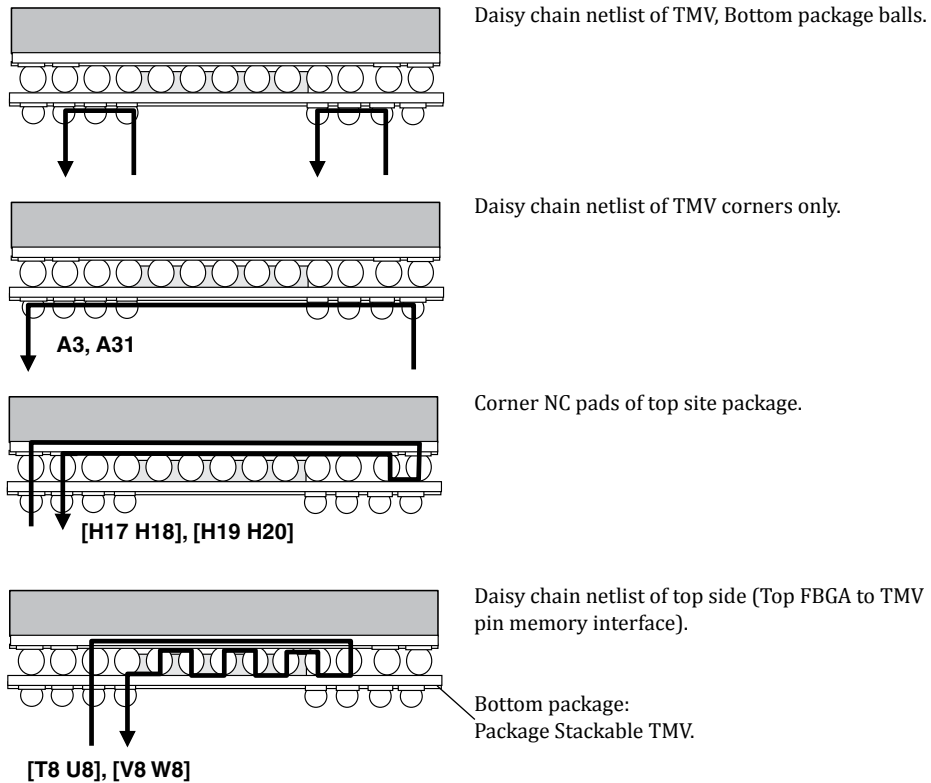
For kit see page 21.

14mm 620 TMV Bottom Package Design Dimensions



Body (a)	Foot Print-top (b)	Foot Print-bottom (c)	Die (d)
14 x 14mm	0.50 pitch, 200 ball 27 matrix, 2 row	0.4 pitch, 620 BGA 33 matrix, 4 + 2 row	7.6 x 7.6mm

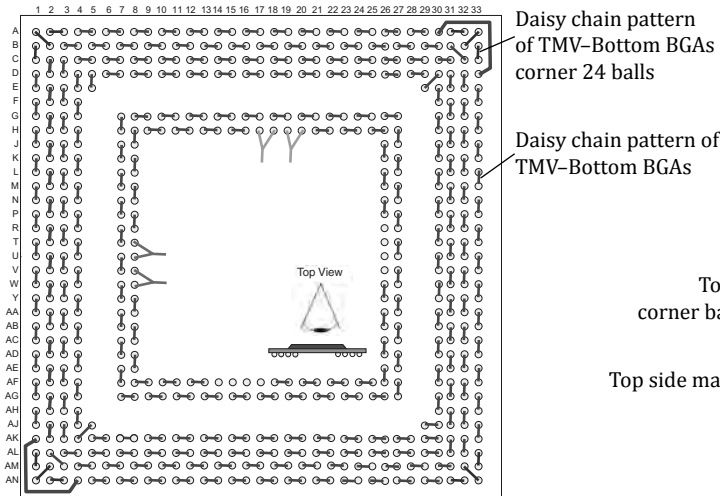
Daisy Chain 4 Net Design



** Color diagram of DC Net design available on our website.*

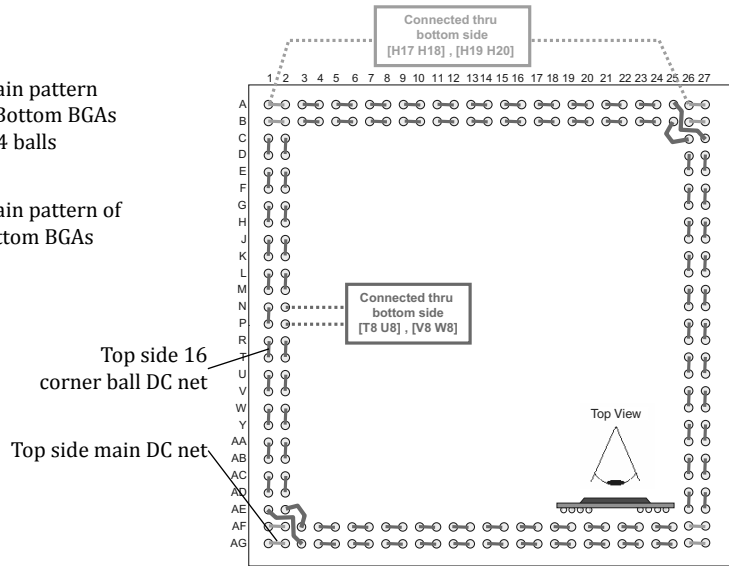
TMV 620 (Bottom Package) Bottom Side Daisy Chain Nets

Bottom side of bottom package
(top view through package)
14x14mm, 0.4 mm TMV620, 33x33 ball matrix.

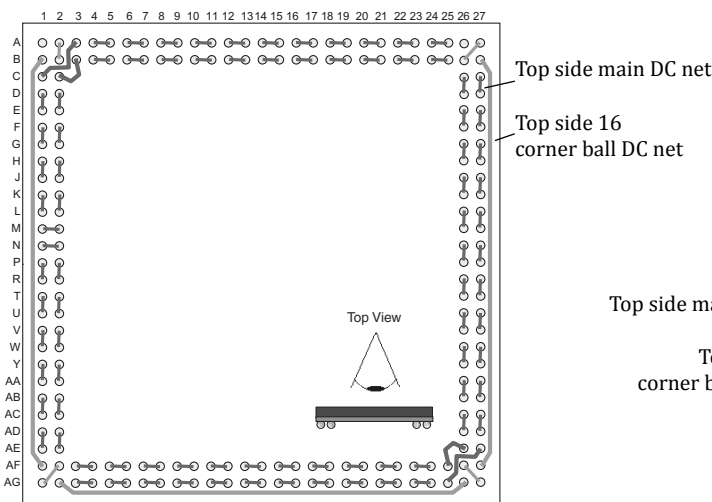


TMV 620 (Bottom Package) Top Side Daisy Chain Nets

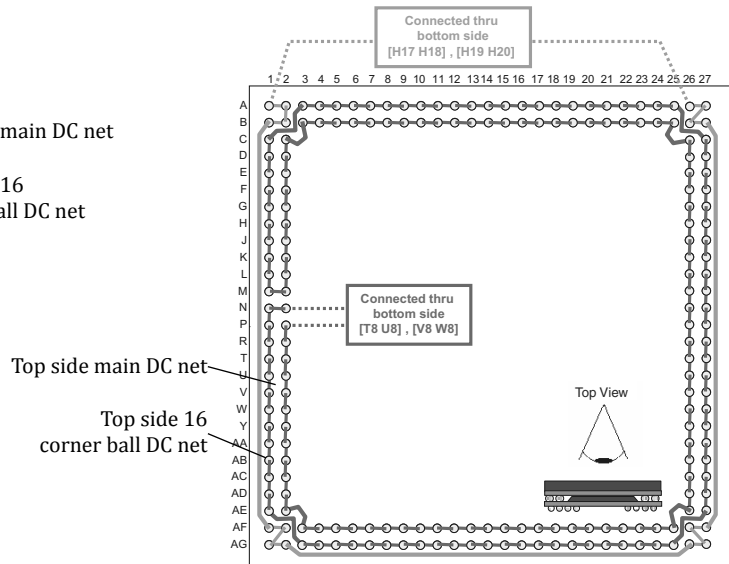
Top side of bottom package
(top view through package)
14x14mm, 0.5 mm PoP200, 27x27 ball matrix.



200 PoP (Top Package ONLY) Daisy Chain Netlist

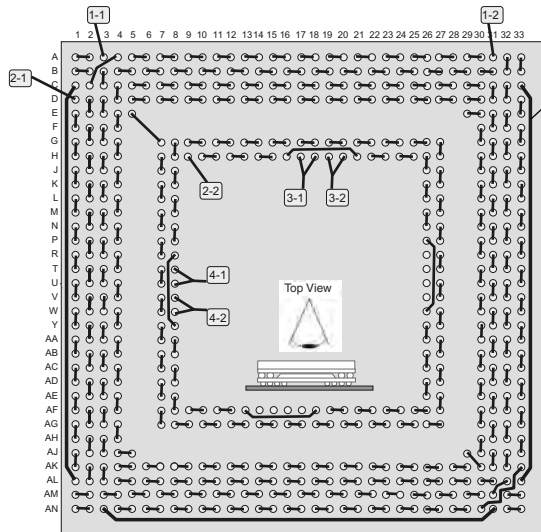


Top PoP + TMV Daisy Chain Netlist



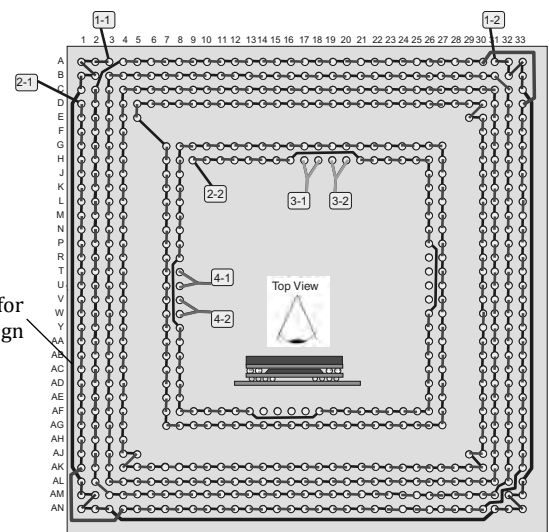
** Color diagram of DC Net design available on our website.*

Test Board PWB Netlist Pattern for BLR Testing



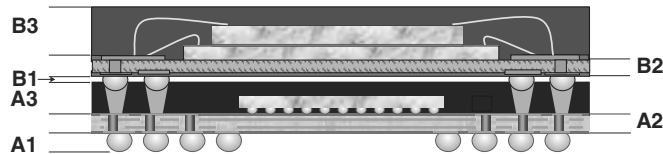
PWB Pattern for Test Board design

Stacked view of 4 DC Nets for BLR testing



PWB Pattern for Test Board design

TMV[®] PoP Overall Stack Up Table



100µm core, 350µm mode cap (Laminate)					
Symbol	Unit	Min	Nom	Max	Tolerance
A1 (Ball, 0.4 pitch)	mm	0.100	0.150	0.200	0.05
A2 (4L laminate)	mm	0.260	0.300	0.340	0.04
A3 (Mold cap)	mm	0.230	0.350	0.380	0.03
Total Bottom Pkg Height	mm	0.729	0.800	0.871	
B1 (package stand-off)	mm	0.370	0.400	0.430	0.03
B2 Subs	mm	0.100	0.130	0.160	0.03
B3 Mold	mm	0.380	0.400	0.420	0.02
B2 + B3	mm	0.494	0.530	0.566	
Overall PoP Stack Height	mm	1.301	1.380	1.459	

* Color diagram of DC Net design available on our website.



TMV® 14mm Board & Kit Drop Test Lead Free Kit

PCB250 14mm TMV Drop Test Board

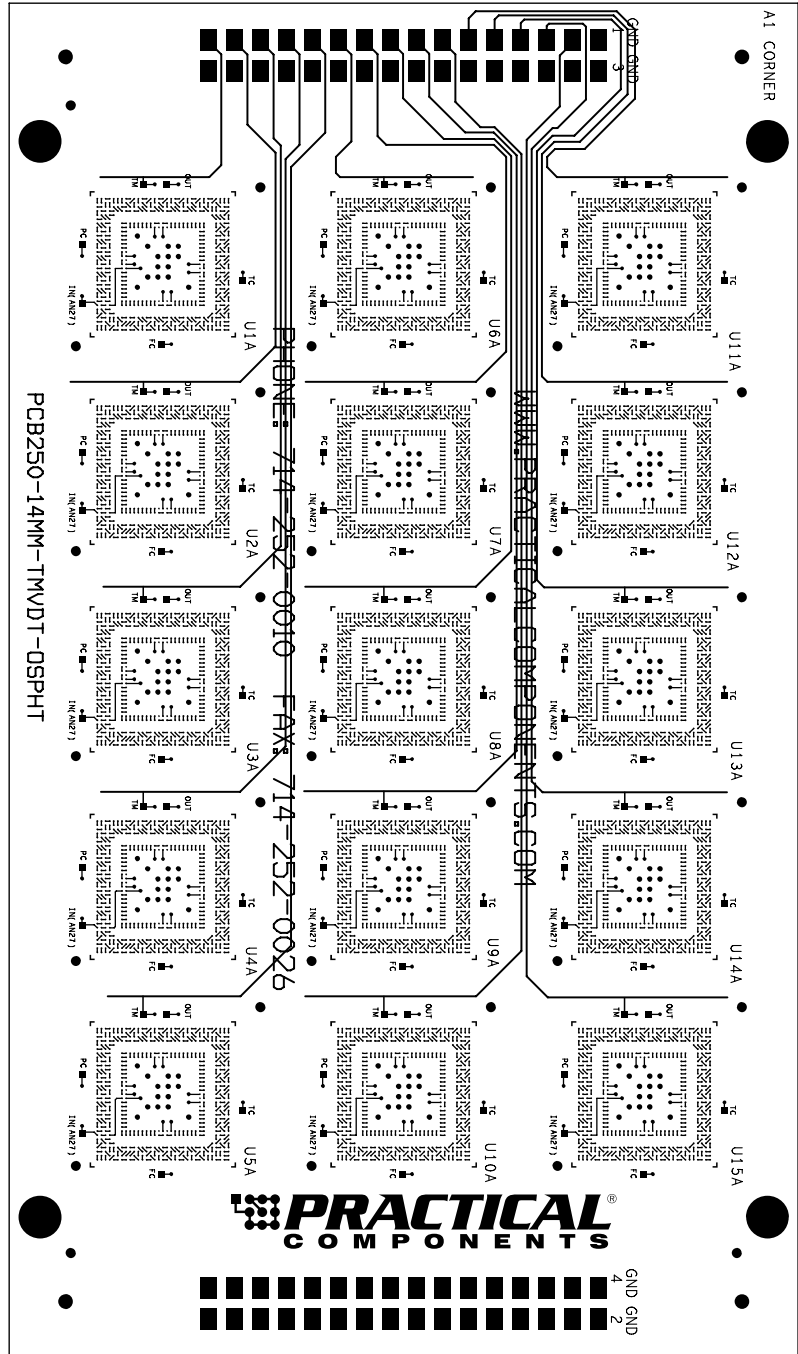
Practical Components new TMV® 14MM test board and kit is a basic drop test board designed for the new Amkor TMV® (Through Mold Via) components.

This test eight layer board is a 3x5 array with 15 components placements per board. The board is 132mm x 77mm in size, and 1.0mm thick. The standard surface finish is OSP. Our test vehicle is designed for the new TMV® 620 solder ball .4mm pitch bottom component and the PoP 200 solder ball .5mm top component. Both top and bottom components have a daisy chain pattern through the substrate of the part.

A daisy chain pattern also runs through the test board. The design allows for daisy chain 3 net design. Meaning both top and bottom components as well as the board can be tested individually or as a group. This kit allows the end user to test the integrity of their process applications for TMV® components.

Notes

- Board size is 132 x 77mm, 8 layers, .039" thick, no microvias.
- Board material is IS-410 High Temp. 180Tg.
- Standard board finish is OSP Entek CU-106A-HT.
- 15 daisy-chain pad placements for 14x14 620 TMV® component.
- Immersion Silver board finish is available upon special request. MOQ may apply.
- Gerber and X,Y Theta data included at no charge.



Ordering Information

- Order Number: 15110 (*board only*)
- Order Number: 31557 A-PoP200-.5-14mm-DC-105 (*top component only*)
- Order Number: 31558 A-TMV620-.4-14mm-DC-125 (*bottom component only*)

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

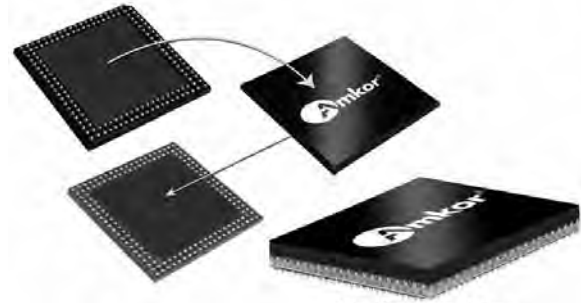
PoP

Package on Package



Amkor is offering daisy chain samples of their award winning bottom Package Stackable Very Thin Fine Pitch BGA (PSvfbGA) and their top PoP optimized for Package on Package (PoP) requirements. PoP has become the solution of choice for an increasing number of mobile consumer applications for 3D integration of logic and memory devices.

Amkor's PSvfbGA is a high density fine pitch BGA package supporting logic or ASIC devices including base band, application and image processors. PoP stacking allows the OEM greater device, supplier and time to market flexibility by sourcing the bottom and top devices from their preferred logic and memory suppliers and then stacking the devices in the PWB surface mount assembly flow. A wide range of leading wireless and mobile integrated device manufacturers are relying on Amkor's technical and industry leadership in PoP.



Stacked Package

PoP Package on Package—Mating Top and Bottom Daisy Chain Samples

Part Description	I/O Count	Pitch	Body Size	Ball Matrix	Ball Alignment	Quantity per Tray	Available Lead Free Alloy
12mm Body Size							
A-PoP128-.65mm-12mm	128 (top)	.65mm	12mm	18x18	Perimeter	152	SAC105, SAC305 or SAC405
A-MPoP128-.65mm-12mm	128 (middle)	.65mm	12mm	18x18	Perimeter	152	SAC105
A-PSvfbGA305-.5mm-12mm	305 (bottom)	.65mm (top) - .5mm (bottom)	12mm	23x23	Perimeter	152	SAC125, SAC305 or SAC405
14mm Body Size							
A-PoP152-.65mm-14mm	152 (top)	.65mm	14mm	21x21	Perimeter	119	SAC105, SAC305 or SAC405
A-PSvfbGA353-.5mm-14mm	353 (bottom)	.65mm (top) - .5mm (bottom)	14mm	26x26	Perimeter	119	SAC125, SAC305 or SAC405

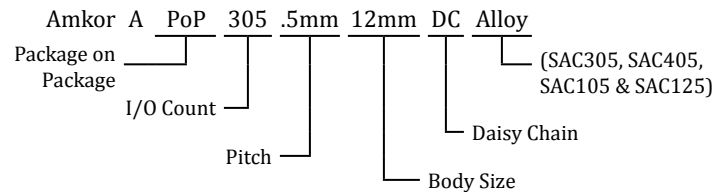
Notes

- Fine pitch 0.5mm bottom package footprints
- Stacked package heights of 1.2mm to 1.6mm available in a variety of configurations (see Stack Up table on following pages)
- Wafer thinning / handling < 100 μm
- Consistent product performance and reliability
- Package configurations compliant with JEDEC standards
- Moisture Resistance Testing is JEDEC Level 3 @ 260 °C
- Temp Cycle -55/+125 °C, 1000 cycles
- HAST 130 °C, 85% RH, 96 hours
- Temp/Humidity 85 °C/85%RH/1000 hours
- High Temp Storage 150 °C, 1000 hours
- Board level Thermal Cycle -40/+125 °C, 1000 cycles
- Parts packaged in JEDEC matrix trays
- PoPs are only available Pb-free (not Tin-Lead). Available alloys are: SAC305, SAC405, SAC105 and SAC125Ni*.
- *SAC125Ni (98.25%Sn/1.2%Ag/0.5%Cu/0.05%Ni) is only available for bottom packages.
- It is recommended that parts be pre-baked at 125 °C for 48 hrs before using parts regarding moisture concern.
- PoPs are not available without solder balls.

See drawings on the following pages (23–34) for additional technical data. Color coded version available on our website: www.TrustPCI.com

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

Part Description System



- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC305", "SAC405", "SAC105" or "SAC125" to end of part number for Lead-Free.

Ball Diameter

I/O Count	Ball Diameter
128	0.45mm
152	0.45mm
305	0.30mm
353	0.30mm

Please Note

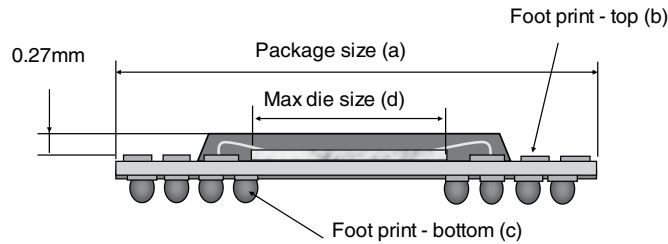
- Amkor supporting data is available on our website for: Board Level Reliability (BLR), PoP application notes, PoP Stencil & Stacking paper for SMT Conditions.
- IMAPS and SMTA White Paper Articles for additional supporting data available on our website: www.TrustPCI.com.



For kits see pages 31 & 35.

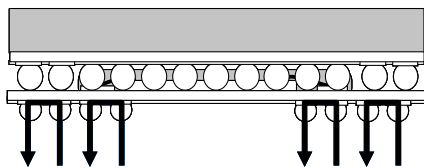
Package on Package (PoP)
 12x12mm, 0.65mm to pitch
 Stacked Daisy Chain

12mm 305 PSvfBGA Bottom Package Design Dimensions

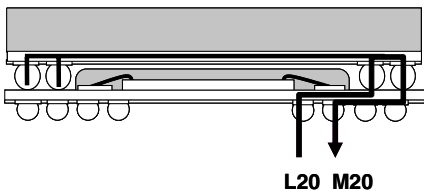


Body (a)	Foot Print-top (b)	Foot Print-bottom (c)	Die (d)	Bond Fingers Available
12 x 12mm	0.65 pitch, 128 ball 18 matrix, 2 row	0.5 pitch, 292 I/Os 23 matrix, 4 row + 12 NC + A1 ball 305 BGA	7.0 mm	332

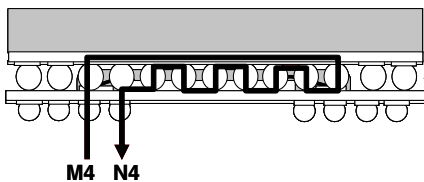
PoP Daisy Chain 3 Net Design



Daisy chain netlist of PSvfBGA, Bottom package balls.



Daisy chain netlist of top side (Top PoP to PSvfBGA 12 corner balls reserved for NC or additional supplies as memory combinations may require).



Daisy chain netlist of top side (Top PoP to PSvfBGA 116 pin memory interface).

Bottom package called: Package Stackable very thin fine pitch BGA (PSvfBGA).

** Color diagram of DC Net design available on our website.*

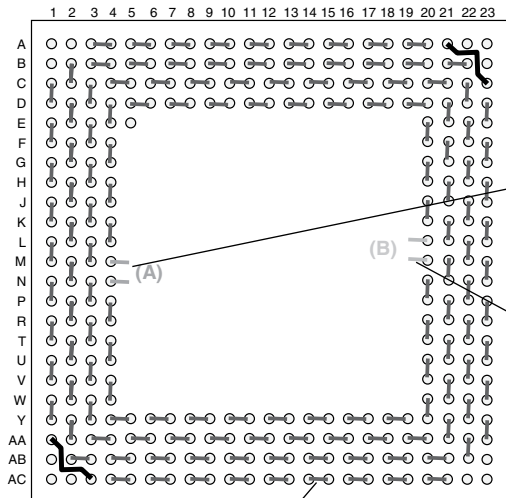
Package on Package (PoP)

12x12mm Stacked Daisy Chain



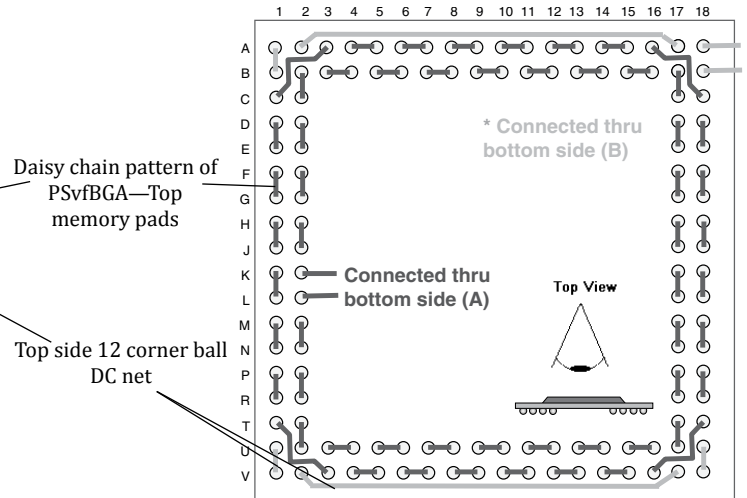
PSvfBGA 305 (Bottom Package) Daisy Chain Nets

Bottom side of bottom package
(top view through package) 12x12mm,
0.5 mm PSvfBGA305, 23x23 ball matrix

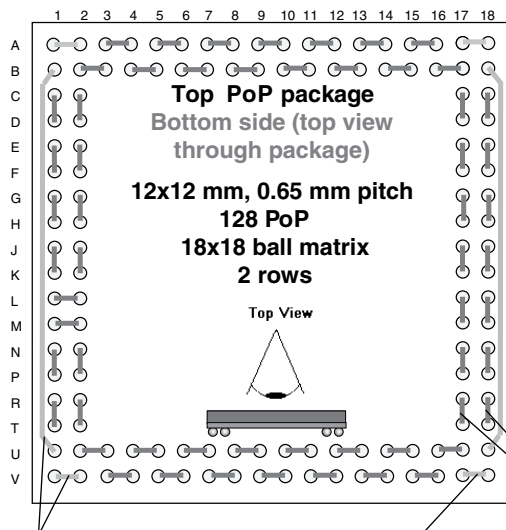


Daisy chain pattern of PSvfBGA -Bottom BGAs

Top side of bottom package
Top package interface (top view) 0.65 mm pitch,
128 pads, 18x18 ball matrix

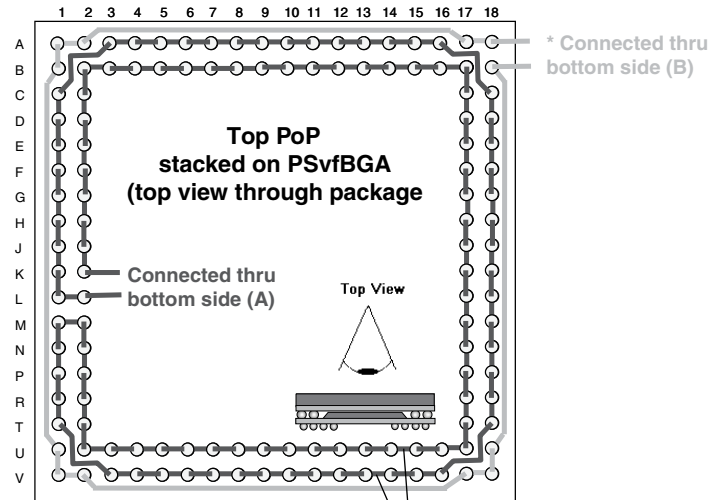


128 PoP (Top Package) Daisy Chain Netlist



Daisy chain pattern for 12 corner balls
(typically reserved as NC for applications with
no underfill, or option to add additional I/O or
memory supplies as required for high density
combinations)

PoP + PSvfBGA Daisy Chain Netlist

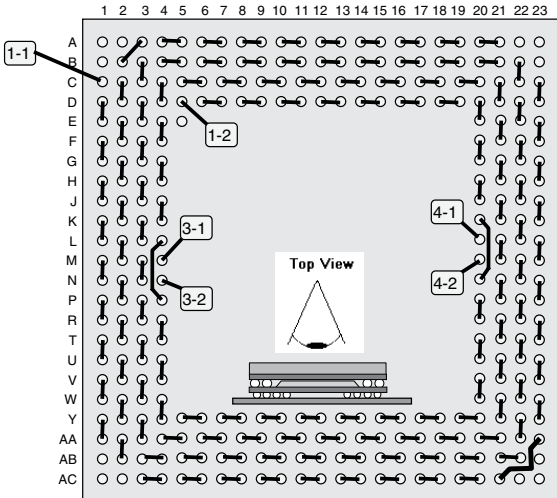


Daisy chain pattern of Top package
for 116I/O memory interface

Daisy chain netlist of
Top PoP and PSvfBGA.

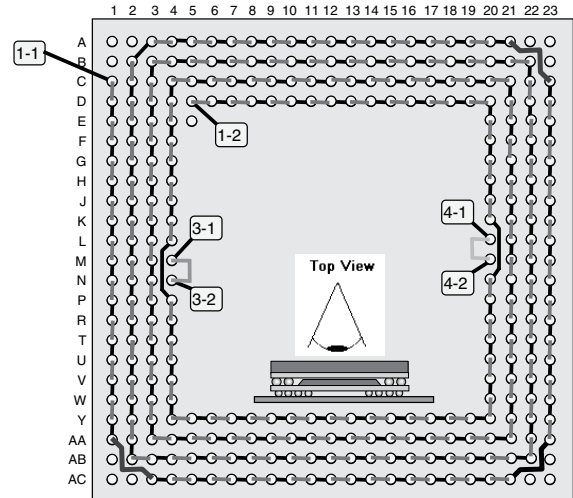
* Color diagram of DC Net design available on our website.

PWB Netlist
Pattern for BLR Testing



Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

Stacked view of 3 DC Nets
for BLR testing



Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

PoP Overall Stack Up Example



PoP +PSvfBGA				
Symbol	Unit	Min	Max	Nom
A1 (Ball, 0.5 pitch)	mm	0.150	0.250	0.200
A2 (4L laminate)	mm	0.260	0.340	0.300
B1 (Ball, 0.65 pitch)	mm	0.270	0.330	0.300
B2 (2L laminate)	mm	0.180	0.240	0.210
B3 (Mold cap)	mm	0.420	0.480	0.450
Overall Pkg Height	mm	1.378	1.542	1.460

B2 and B3 may vary depending on top memory PoP (MCP) design rules.
Overall Stack up to be finalized based on top PoP rules.

** Color diagram of DC Net design available on our website.*

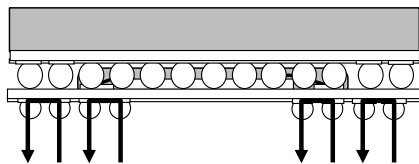
Package on Package (PoP)

12x12mm – 3 Package Stacking

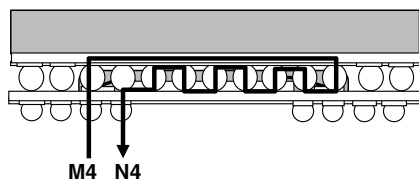
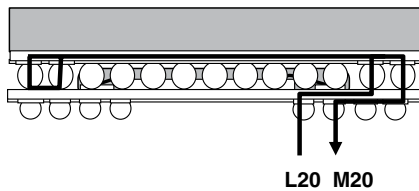


Package on Package (PoP)
 12x12mm, 0.65mm to pitch
 Stacked Daisy Chain—3 Package Stacking

PoP Daisy Chain 3 Net Design—2 Package Stack



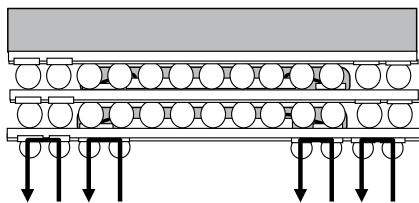
Daisy Chain netlist of PSvfBGA, Bottom package balls



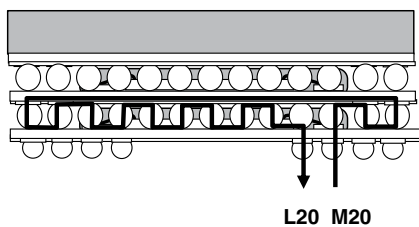
Daisy chain netlist of top side (Top FBGA to PSvfBGA 116 pin memory interface)

Bottom package called:
 Package Stackable very thin fine pitch BGA (PSvfBGA)

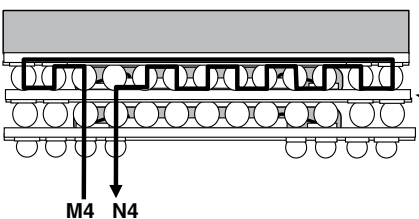
PoP Daisy Chain 3 Net Design—3 Package Stack



Daisy Chain netlist of PSvfBGA, Bottom package balls



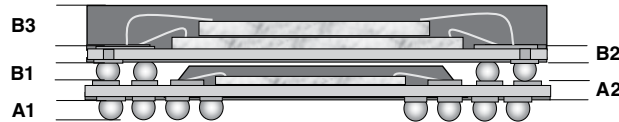
Daisy chain netlist of middle/bottom side (middle of PSvfBGA to bottom of PSvfBGA 128 balls)



Daisy chain netlist of middle/top side (FBGA to middle PSvfBGA 128 balls)

Bottom/middle package called:
 Package Stackable very thin fine pitch BGA (PSvfBGA)

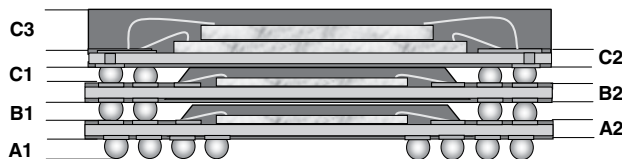
PoP Overall Stack Up—2 Package Stack



Symbol	Unit	Min	Nom	Max
A1 (Ball, 0.5 pitch)	mm	0.180	0.230	0.280
A2 (4L laminate)	mm	0.260	0.300	0.340
B1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
B2 (2L laminate)	mm	0.180	0.210	0.240
B3 (Mold cap)	mm	0.420	0.450	0.480
Overall Pkg Height	mm	1.408	1.490	1.572

Assumed standard DC substrate
Thinner stack up feasible in future build

PoP Overall Stack Up—3 Package Stack



Symbol	Unit	Min	Nom	Max
A1 (Ball, 0.5 pitch)	mm	0.180	0.230	0.280
A2 (4L laminate)	mm	0.260	0.300	0.340
B1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
B2 (2L laminate)	mm	0.180	0.210	0.240
C1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
C2 (2L laminate)	mm	0.180	0.210	0.240
C3 (Mold cap)	mm	0.420	0.450	0.480
Overall Pkg Height	mm	1.907	2.000	2.093

Assumed standard DC substrate
Thinner stack up feasible in future build

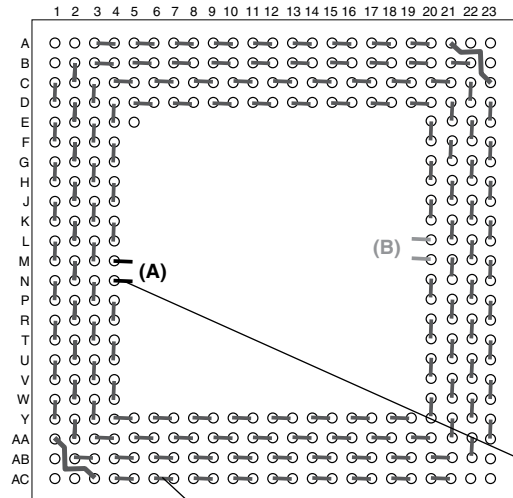
Package on Package (PoP)

12x12mm – 3 Package Stacking



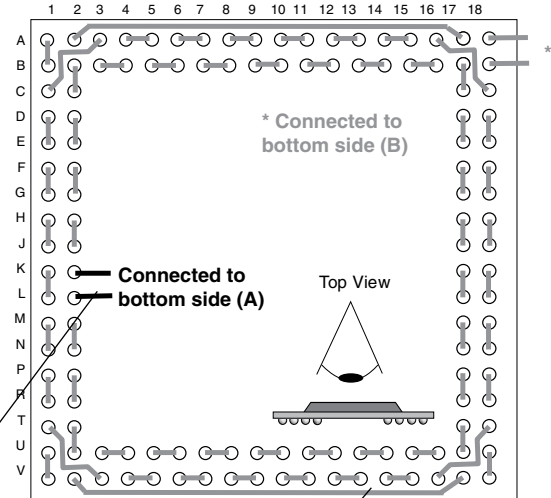
PSvFBGA 305 (Bottom Package) Daisy Chain Nets

Bottom side of bottom package (top view through package)
12x12mm, 0.65 mm PSvFBGA305, 23x23 ball matrix



Daisy chain pattern of PSvFBGA—Bottom BGAs

Top side of bottom package
Top/Middle package interface (top view)
0.65mm pitch, 128 pads, 18x18 ball matrix

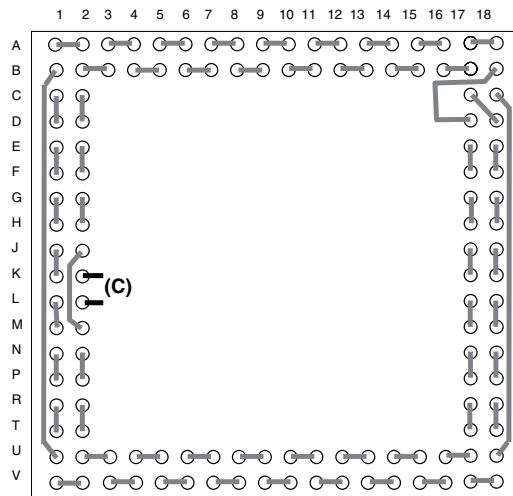


Daisy chain pattern of PSvFBGA—Top memory pads

Top side 12 corner ball DC net

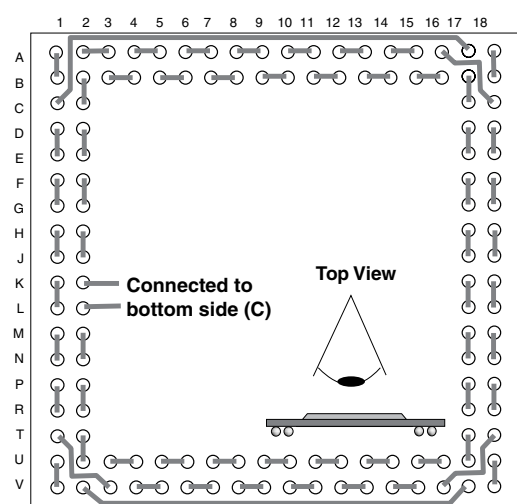
PSvFBGA 128 (Middle Package) Daisy Chain Nets

Bottom side of middle package (top view through package)
12x12mm, 0.65 mm PSvFBGA128, 18x18 ball matrix

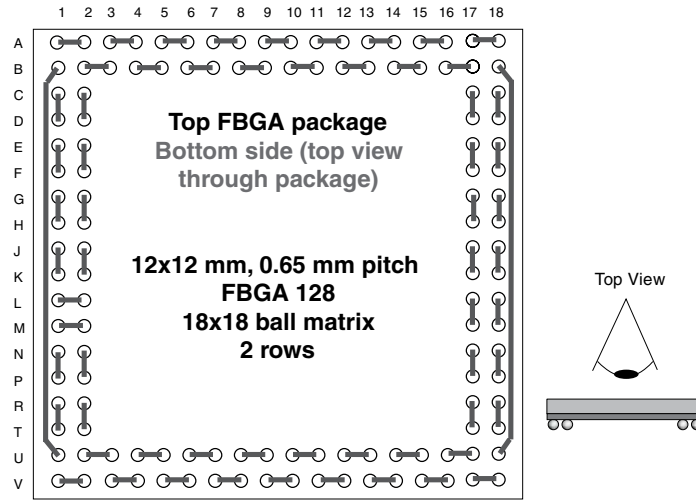


Each pad on the top side is connected to the corresponding pad on the bottom side through a via.

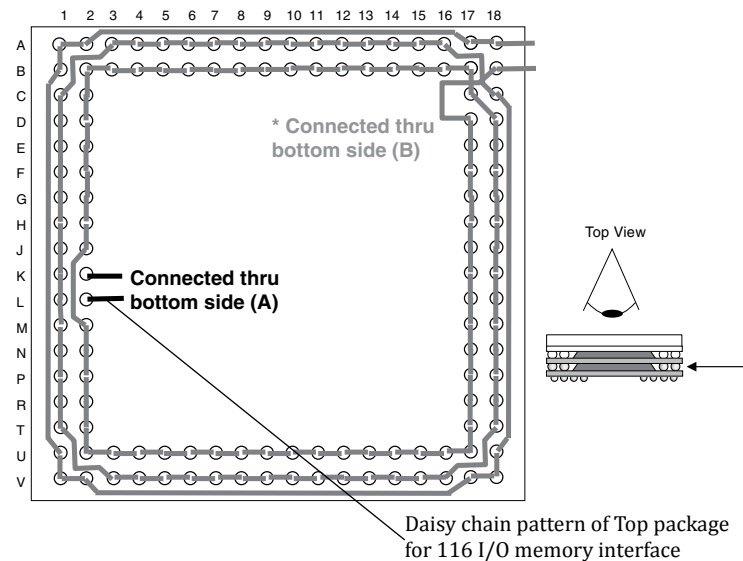
Top side of middle package
Top package interface (top view)
0.65mm pitch, 128 pads, 18x18 ball matrix



FBGA 128 (Top Package) Daisy Chain Netlist



Middle-to-Bottom Package Connection after 3 PKG Stack

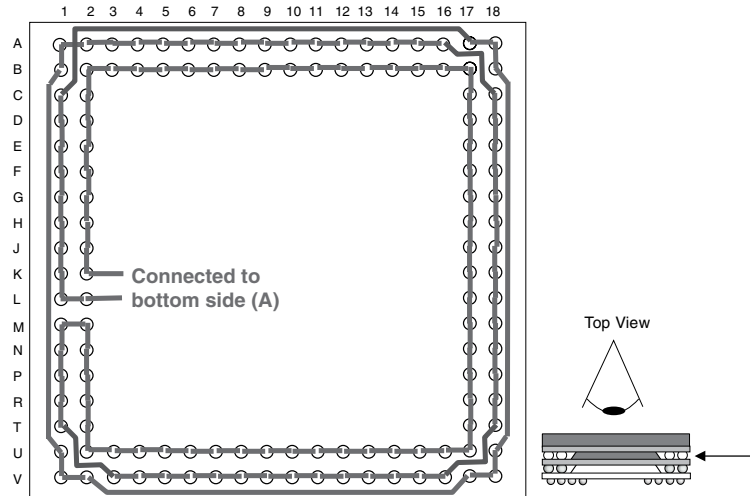


Package on Package (PoP)

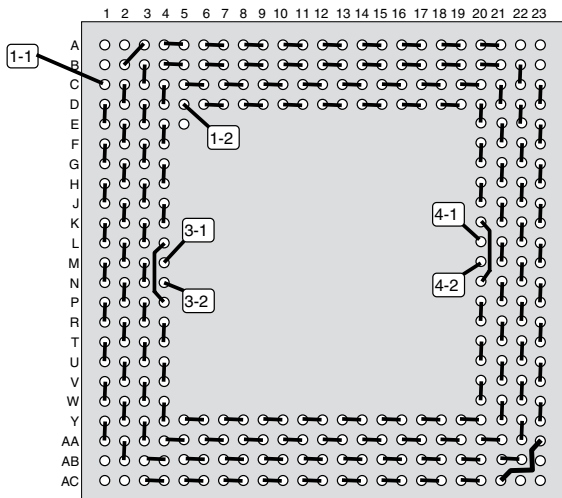
12x12mm – 3 Package Stacking



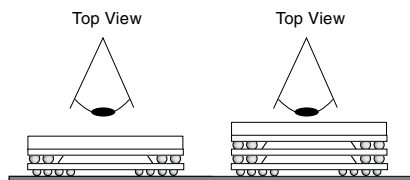
Top-to-Middle Package Connection after 3 PKG Stack



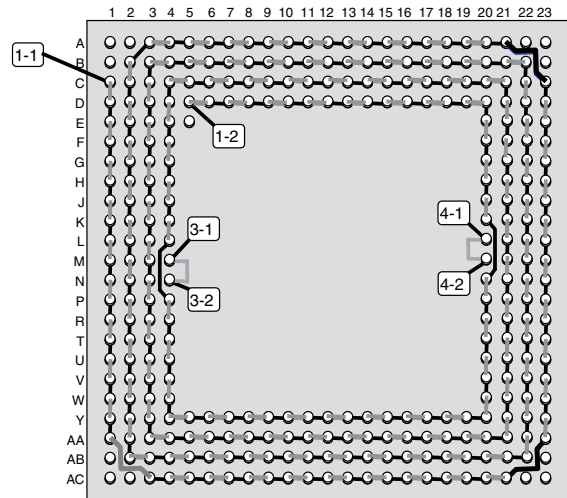
PWB Netlist Pattern for BLR Testing



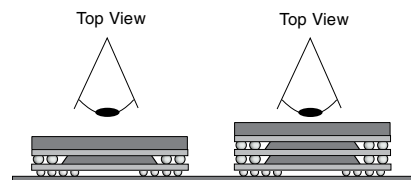
PWB Pattern
 In: 1-1, 3-1, 4-1
 Common: 1-2, 3-2, 4-2



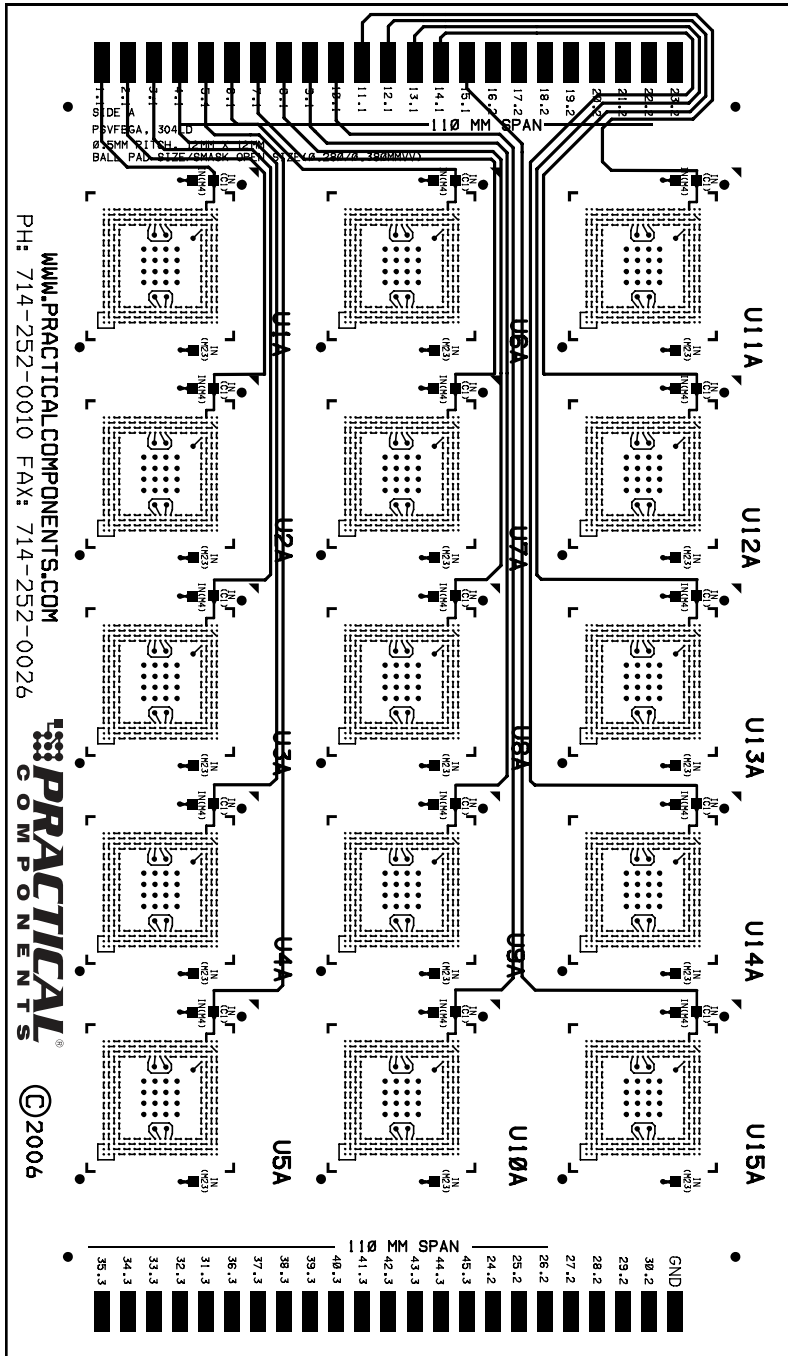
Stacked View of 3 DC Nets for BLR Testing



PWB Pattern
 In: 1-1, 3-1, 4-1
 Common: 1-2, 3-2, 4-2



PCB200 12mm Board



This PoP 12mm Board and Kit is designed as test vehicle for the new Amkor (PSvFBGA) 12x12 305 PoP package. PoP packages from Amkor focus on high density logic devices.

PoP packages are designed for products such as cell phones, digital cameras and other mobile applications benefiting from the combination of stacked packages and small footprint technology. This test board enables the end user to test their process applications on the top and bottom PoP components.

With daisy-chain patterns in both packages and the PCB200 Board, customers are able to check for continuity to guarantee the integrity of their process.

Notes

- Board size is 132 x 77mm, 8-layers, .039" thick, no microvias.
- Board material is IS-410 High Temp 180Tg.
- Standard board finish OSP Entek CU-106A-HT.
- Immersion Silver finish is also available upon special request. MOQ may apply.
- 15 daisy-chain pad placements for 12x12 305 PoP component.
- Gerber and X,Y Theta data included at no charge.
- See page 22 for available solder ball alloy's for PoP components. SAC305, SAC405, SAC105 and SAC125Ni is available.



Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

Order Notes

- Order Number: 19577 PCB200 12mm (board only)
- Order Number: 31288 A-PoP128-.65mm-12mm-DC-SAC105 (top component only)
- Order Number: 31289 A-PSvFBGA305-.5mm-12mm-DC-SAC125Ni (bottom component only)

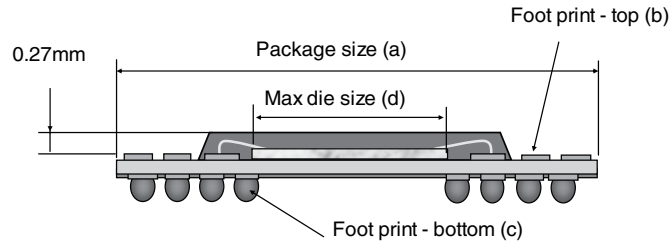
Package on Package (PoP)

14x14mm Stacked Daisy Chain



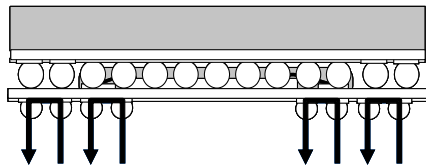
Package on Package (POP)
 14x14mm
 Stacked Daisy Chain

14mm 353 PSvfBGA Bottom Package Design Dimensions

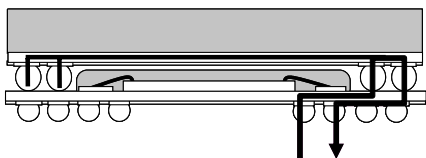


Body (a)	Foot Print-top (b)	Foot Print-bottom (c)	Die (d)	Bond Fingers Available
14 x14 mm	0.65 pitch, 152 ball 21 matrix, 2 row	0.5 pitch, 340 I/Os 26 matrix, 4 row + 12 NC + A1 ball 353 BGA	8.9 mm	328 to 396

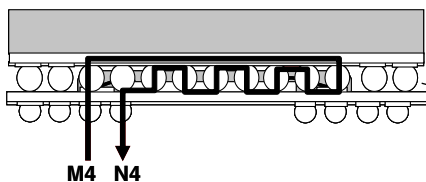
PoP Daisy Chain 3 Net Design



Daisy chain netlist of PSvfBGA, Bottom package balls



Daisy chain netlist of top side (Top PoP to PSvfBGA 12 corner balls reserved for NC or additional supplies as memory combinations may require).



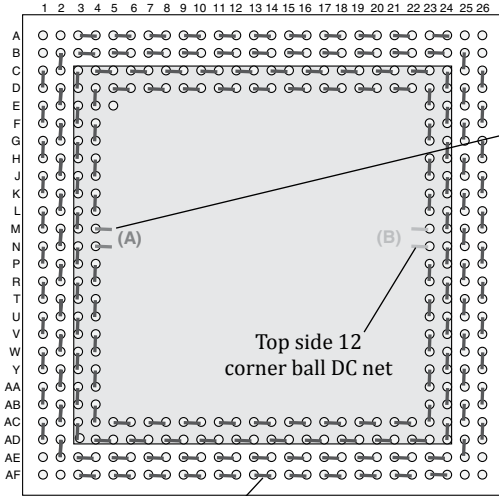
Daisy chain netlist of top side (Top PoP to PSvfBGA 140 pin memory interface)

Bottom package called: Package Stackable very thin fine pitch BGA (PSvfBGA)

** Color diagram of DC Net design available on our website.*

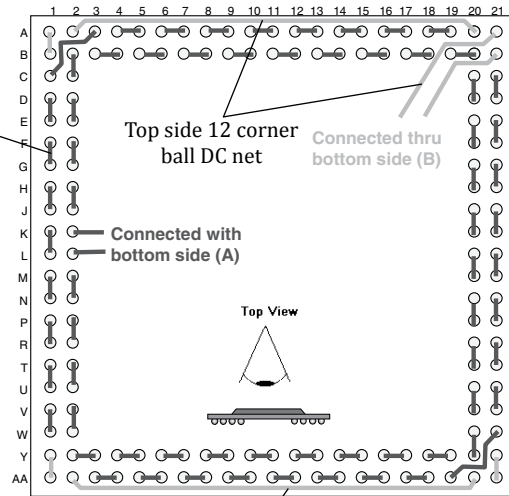
PSvfBGA 353 (Bottom Package) Daisy Chain Nets

Bottom side (top view through package)
14x14mm, 0.5 mm PSvfBGA353, 26x26 ball matrix



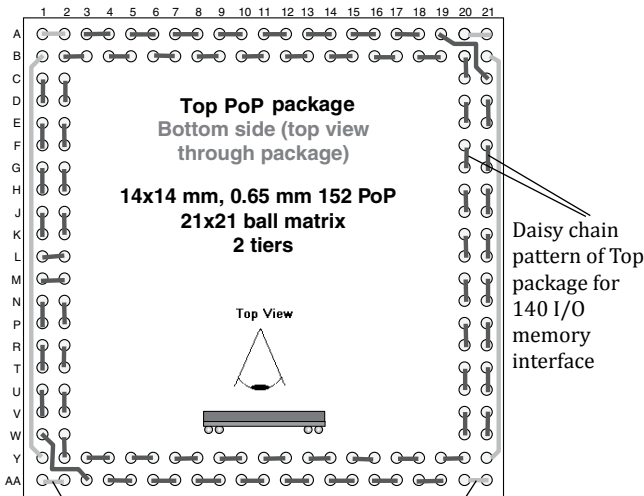
Daisy chain pattern of PSvfBGA—Bottom BGAs

Top side—Top package interface (top view) 0.65 mm pitch, 152 pads, 21x21 ball matrix



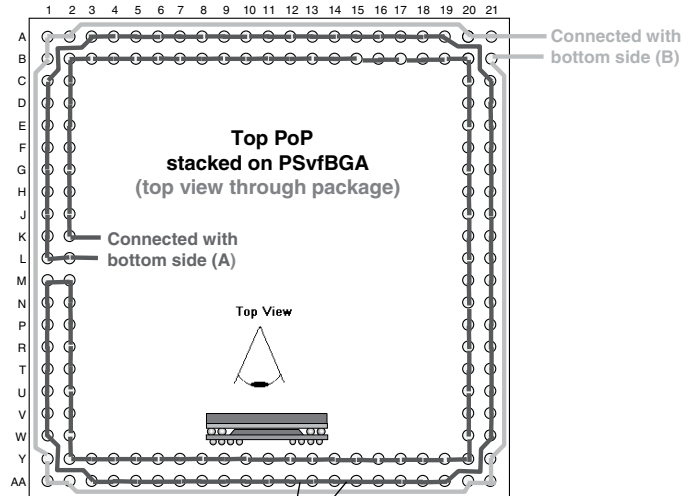
Top side 12 corner ball DC net

152 PoP (Top Package) Daisy Chain Netlist



Daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations).

Top PoP + PSvfBGA Daisy Chain Netlist



Daisy chain netlist of Top FBGA and PSvfBGA

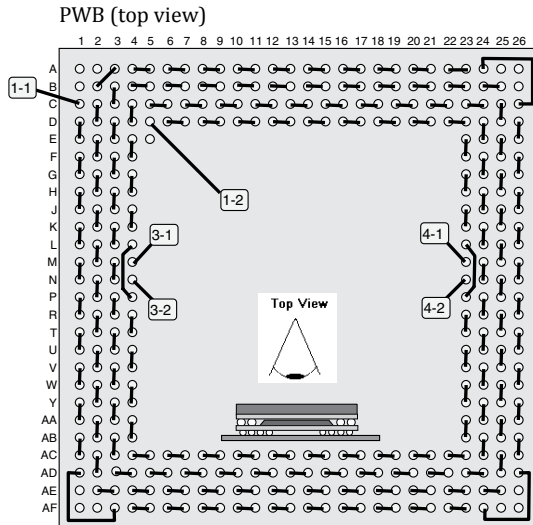
** Color diagram of DC Net design available on our website.*

Package on Package (PoP)

14x14mm Stacked Daisy Chain

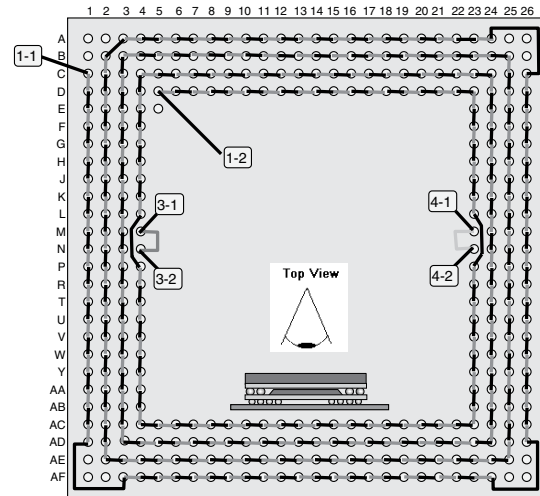


PWB Netlist Pattern
for BLR Testing



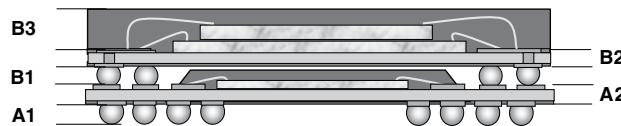
Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

Stacked View of 3 DC Nets
For BLR Testing



Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

PoP Overall Stack Up Example

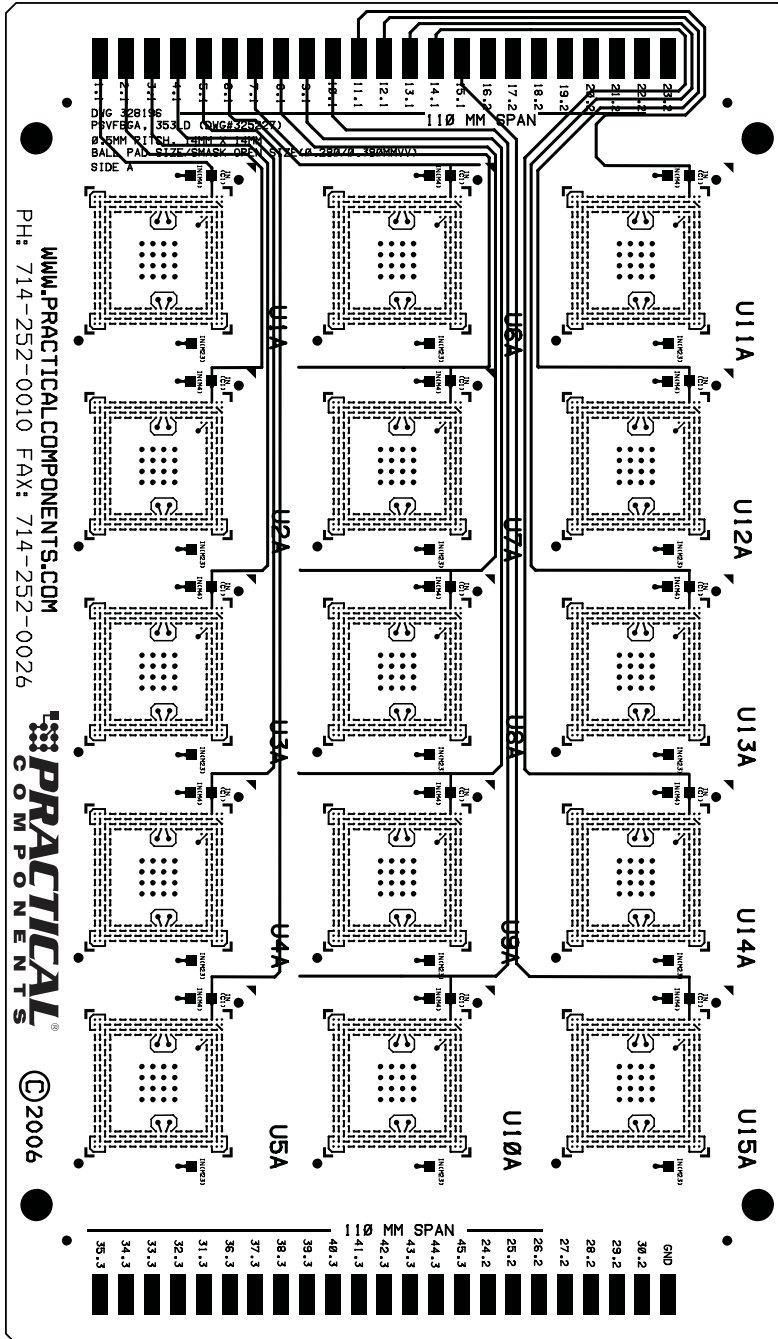


PoP + PSvfBGA				
Symbol	Unit	Min	Max	Nom
A1 (Ball, 0.5 pitch)	mm	0.150	0.250	0.200
A2 (4L laminate)	mm	0.260	0.340	0.300
B1 (Ball, 0.65 pitch)	mm	0.270	0.330	0.300
B2 (2L laminate)	mm	0.180	0.240	0.210
B3 (Mold cap)	mm	0.420	0.480	0.450
Overall Package Height	mm	1.378	1.542	1.460

B2 and B3 may vary depending on top memory PoP (MCP) design rules.
Overall Stack up to be finalized based on top PoP rules.

** Color diagram of DC Net design available on our website.*

PCB200 14mm Board



This PoP 14mm Board and Kit is designed as test vehicle for the new Amkor (PSvfBGA) 14x14 305 PoP package. PoP packages from Amkor focus on high density logic devices.

PoP packages are designed for products such as cell phones, digital cameras and other mobile applications benefiting from the combination of stacked packages and small footprint technology. This test board enables the end user to test their process applications on the top and bottom PoP components.

With daisy-chain patterns in both packages and the PCB200 Board, customers are able to check for continuity to guarantee the integrity of their process.

Notes

- Board size is 132 x 77mm, 8-layers, .039" thick, no microvias.
- Board material is IS-410 High Temp 180Tg.
- Standard board finish OSP Entek CU-106A-HT.
- 15 daisy-chain pad placements for 14x14 353 PSvfPGA component.
- Immersion Silver finish is also available upon special request. MOQ may apply.
- Gerber and X,Y Theta data included at no charge.
- See page 22 for available solder ball alloy's for PoP components. SAC305, SAC405, SAC105 and SAC125Ni is available.



Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

Ordering Information

- Order Number: 12953 PCB200-14mm-OSPHT (board only)
- Order Number: 31290 A-PoP152-.65mm-14mm-DC-LF-SAC105 (top component only)
- Order Number: 31291 A-PSvfBGA353-.5mm-14mm-DC-LF-SAC125Ni (bottom component only)

OmQFN

Open-molded Quad Flat Pack No Leads

From prototype to production volumes, these pre-molded QFN packages, created by Quik-Pak, provide a high quality, fast solution for your assembly needs.

The pre-molded packages come in a variety of sizes. They are available from 3x3mm to 12x12mm body size with lead pitch sizes ranging from .8mm to .4mm. Covers or lids are also available for air cavity applications.



OmQFN Open-molded Quad Flat Pack No Leads Package

Part Description	Lead Count	Body Size	Pitch
.4mm Pitch			
QPQFN28-4mm-.4mm	28	4mm	.4mm
QPQFN48-6mm-.4mm	48	6mm	.4mm
QPQFN88-10mm-.4mm	88	10mm	.4mm
QPQFN100-12mm-.4mm	100	12mm	.4mm
.5mm Pitch			
QPQFN12-3mm-.5mm	12	3mm	.5mm
QPQFN16-3mm-.5mm	16	3mm	.5mm
QPQFN20-4mm-.5mm	20	4mm	.5mm
QPQFN24-4mm-.5mm	24	4mm	.5mm
QPQFN28-5mm-.5mm	28	5mm	.5mm
QPQFN32-5mm-.5mm	32	5mm	.5mm
QPQFN40-6mm-.5mm	40	6mm	.5mm
QPQFN44-7mm-.5mm	44	7mm	.5mm
QPQFN48-7mm-.5mm	48	7mm	.5mm
QPQFN56-8mm-.5mm	56	8mm	.5mm
QPQFN64-9mm-.5mm	64	9mm	.5mm
QPQFN72-10mm-.5mm	72	10mm	.5mm
QPQFN80-12mm-.5mm	80	12mm	.5mm
.65mm Pitch			
A-MLF8-3mm-.65mm	8	3mm	.65mm
QPQFN12-3mm-.65mm	12	3mm	.65mm
QPQFN16-4mm-.65mm	16	4mm	.65mm
QPQFN20-5mm-.65mm	20	5mm	.65mm
QPQFN24-5mm-.65mm	24	5mm	.65mm
QPQFN28-6mm-.65mm	28	6mm	.65mm
QPQFN32-7mm-.65mm	32	7mm	.65mm

Notes

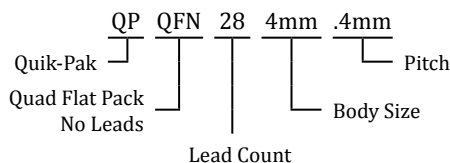
- Larger die paddle area.
- Supports larger die and ground bonds per given body size.
- RoHS and REACH compliant “green” molding compound.
- Gold plated.
- Superior bondability.
- Custom body sizes and lead counts available.
- Components can be encapsulated or lids are available.
- 40Au/80Ni Plated

Assembly Solutions Include the following:

- Wafer Dicing
- Wire Bonding
- Custom Packaging
- Backgrinding
- Complete Assembly



Part Description System





Amkor's MicroLeadFrame® Package (MLF®) is a near CSP plastic encapsulated package with a copper leadframe substrate. This package uses perimeter lands on the bottom of the package to provide



MLF® MicroLeadFrame®

electrical contact to the PWB. The package also offers Amkor's ExposedPad™ technology as a thermal enhancement by having the die attach paddle exposed on the bottom of the package surface to provide an efficient heat path when soldered directly to the PWB.

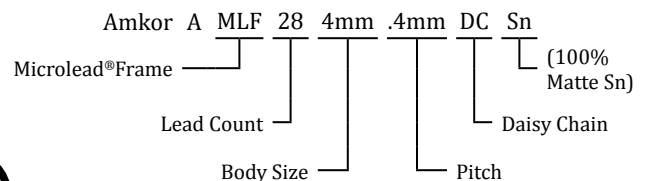
MLF - MicroLeadFrame®

Part Description	Lead Count	Body Size	Pitch	Quantity Per Tube
.4mm Pitch				
A-MLF28-4mm-.4mm	28	4mm	.4mm	75
A-MLF48-6mm-.4mm	48	6mm	.4mm	50
A-MLF88-10mm-.4mm	88	10mm	.4mm	30
A-MLF100-12mm-.4mm	100	12mm	.4mm	25
.5mm Pitch				
A-MLF12-3mm-.5mm	12	3mm	.5mm	100
A-MLF16-3mm-.5mm	16	3mm	.5mm	100
A-MLF20-4mm-.5mm	20	4mm	.5mm	75
A-MLF24-4mm-.5mm	24	4mm	.5mm	75
A-MLF28-5mm-.5mm	28	5mm	.5mm	60
A-MLF32-5mm-.5mm	32	5mm	.5mm	60
A-MLF36-6mm-.5mm	36	6mm	.5mm	50
A-MLF40-6mm-.5mm	40	6mm	.5mm	50
A-MLF44-7mm-.5mm	44	7mm	.5mm	43
A-MLF48-7mm-.5mm	48	7mm	.5mm	43
A-MLF52-8mm-.5mm	52	8mm	.5mm	37
A-MLF56-8mm-.5mm	56	8mm	.5mm	37
A-MLF64-9mm-.5mm	64	9mm	.5mm	33
A-MLF68-10mm-.5mm	68	10mm	.5mm	30
A-MLF72-10mm-.5mm	72	10mm	.5mm	30
.65mm Pitch				
A-MLF8-3mm-.65mm	8	3mm	.65mm	100
A-MLF16-4mm-.65mm	16	4mm	.65mm	75
A-MLF20-5mm-.65mm	20	5mm	.65mm	60
A-MLF32-7mm-.65mm	32	7mm	.65mm	43
A-MLF44-9mm-.65mm	44	9mm	.65mm	33
.8mm Pitch				
A-MLF16-5mm-.8mm	16	5mm	.8mm	60
A-MLF28-7mm-.8mm	28	7mm	.8mm	43

Notes

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finish available is 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Small size (50% space reduction as compared with TSSOP).
- MLF® package is a near CSP plastic encapsulated package with a copper leadframe substrate.
- MLF® is also known as QFN, MCC or MLP.
- 0.6mm to 1.5mm maximum height
- Body sizes ranging from 3 x 3mm to 12 x 12mm.
- Pin counts and body sizes change on an ongoing basis. Please call for updated listing of available packages.

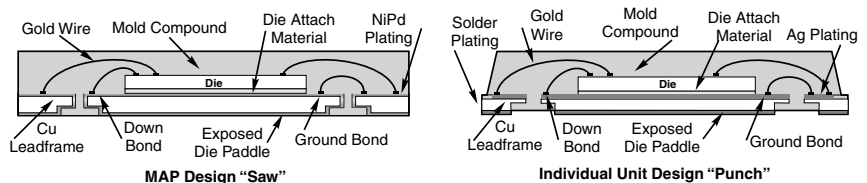
Part Description System



- Add "TR" to end of part number for Parts on Tape and Reel.
- Add "T" to end of part number for Parts in Trays.



Cross-Sections MLF®



For kits see pages 93, 100, 105, 106, 107, 108, 111 & 116.

Dual Row MLF®



Amkor's new Dual Row MLF® (MicroLeadFrame®) package with 2 rows of lands is a cost effective, high performance solution for devices requiring up to 164 I/O. Typical applications include hard disk drives, USB controllers, and Wireless LAN. The small size and weight, along with excellent thermal and electrical performance, make the MLF® package an ideal choice for handheld portable applications such as cell phones and PDAs or any other application where size, weight and package performance are required issues.

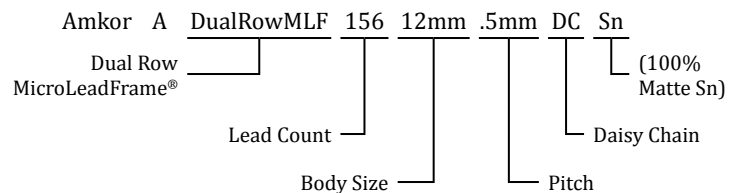


Part Description	Lead Count	Body Size	Pitch	Quantity Per Tube
.5mm Pitch				
A-DualRowMLF156-12mm-.5mm	156	12mm	.5mm	25

Notes

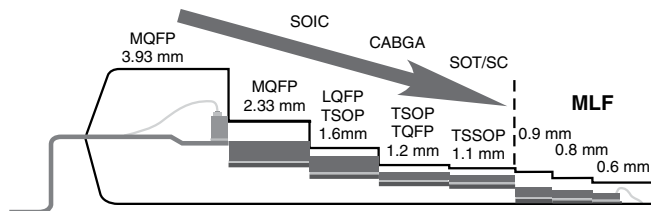
- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finish available is 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Small size (reduce package footprint by 50% or more and improved RF performance) and weight.
- Process flow is same as standard "punch" MLF®.
- Dual row MLF® offers enhanced thermal capability.
- SnPb parts no longer available.

Part Description System



- Add "TR" to end of part number for Tape and Reel.
- Add "T" to end of part number for parts in Trays.

Package Height Comparison



For kits see pages 108 & 111.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

Thin Quad Flat Pack (TQFP) packages provide the same benefit of the metric QFP package, but are thinner (body thickness of 1.0mm) and have a standard lead-frame footprint (2.0mm lead footprint). TQFPs are helping to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 176. Body sizes range from 5 x 5mm to 20 x 20mm. Copper lead-frames are used for the TQFP package.



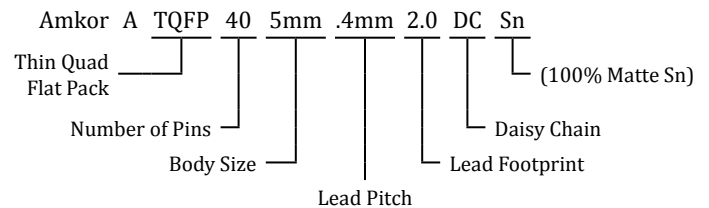
TQFP Thin Quad Flat Pack 1.0mm Thick

Part Description	Number of Pins	Body Size	Lead Pitch	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
.4mm Pitch							
A-TQFP40-5mm-.4mm-2.0	40	5mm sq	.4mm	360	16mm	12mm	1,000
A-TQFP64-7mm-.4mm-2.0	64	7mm sq	.4mm	250	16mm	12mm	1,000
A-TQFP120-14mm-.4mm-2.0	120	14mm sq	.4mm	90	32mm	24mm	750
A-TQFP128-14mm-.4mm-2.0	128	14mm sq	.4mm	90	32mm	24mm	750
A-TQFP176-20mm-.4mm-2.0	176	20mm sq	.4mm	60	44mm	24mm	500
.5mm Pitch							
A-TQFP32-5mm-.5mm-2.0	32	5mm sq	.5mm	360	16mm	12mm	1,000
A-TQFP48-7mm-.5mm-2.0	48	7mm sq	.5mm	250	16mm	12mm	1,000
A-TQFP64-10mm-.5mm-2.0	64	10mm sq	.5mm	160	24mm	16mm	1,000
A-TQFP80-12mm-.5mm-2.0	80	12mm sq	.5mm	119	24mm	24mm	1,000
A-TQFP100-14mm-.5mm-2.0	100	14mm sq	.5mm	90	32mm	24mm	750
A-TQFP128-20mm-.5mm-2.0	128	20mm sq	.5mm	60	44mm	24mm	500
A-TQFP144-20mm-.5mm-2.0	144	20mm sq	.5mm	60	44mm	24mm	500
.65mm Pitch							
A-TQFP80-14mm-.65mm-2.0	80	14mm sq	.65mm	90	32mm	24mm	750
.8mm Pitch							
A-TQFP32-7mm-.8mm-2.0	32	7mm sq	.8mm	250	16mm	12mm	1,000
A-TQFP44-10mm-.8mm-2.0	44	10mm sq	.8mm	160	24mm	16mm	1,000
A-TQFP52-10mm-.8mm-2.0	52	10mm sq	.8mm	160	24mm	16mm	1,000
A-TQFP64-14mm-.8mm-2.0	64	14mm sq	.8mm	90	32mm	24mm	750

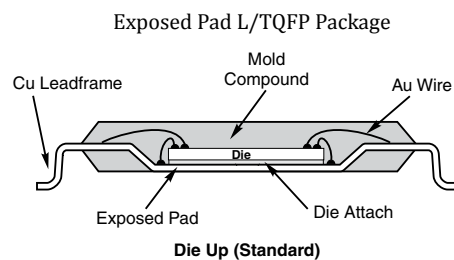
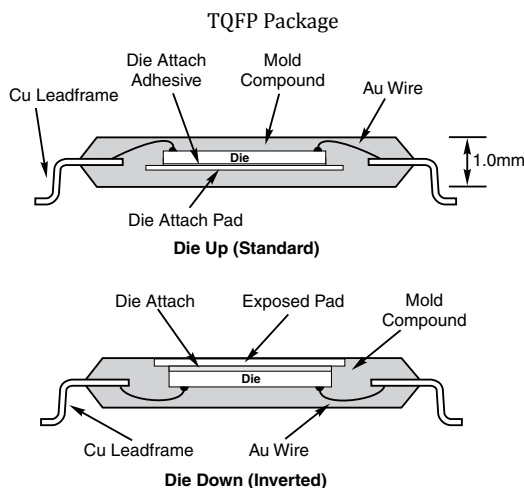
Notes

- All TQFP are standard in trays.
- Parts available on Tape and Reel.
- TQFP have body thickness of 1.0mm.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- SnPb parts no longer available.

Part Description System



- Add "TR" to end of part number for Tape and Reel.
- Add "SN" to end of part number for Lead-Free parts.



LQFP

Low Profile Quad Flat Pack



Low Profile Quad Flat Pack (LQFP) packages provide the same benefit of the metric QFP packages, but are thinner (body thickness of 1.4mm) and have a standard lead-frame footprint (2.0mm lead footprint).

LQFPs help to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 256. Body sizes range from 7 x 7mm to 28 x 28mm. Copper lead-frames are used for the LQFP package.

Daisy-Chain Parts Available!



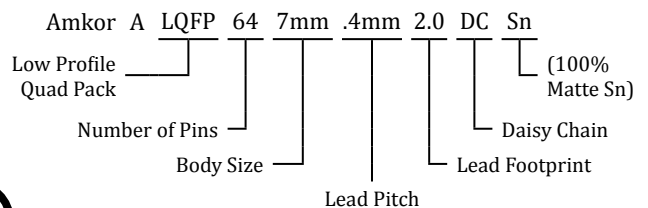
LQFP Low Profile Quad Flat Pack 1.4mm Thick

Part Description	Number of Pins	Body Size	Lead Pitch	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
.4mm Pitch							
A-LQFP64-7mm-.4mm-2.0	64	17mm sq	.4mm	250	16mm	12mm	1,000
A-LQFP120-14mm-.4mm-2.0	120	14mm sq	.4mm	90	32mm	24mm	750
A-LQFP128-14mm-.4mm-2.0	128	14mm sq	.4mm	90	32mm	24mm	750
A-LQFP176-20mm-.4mm-2.0	176	20mm sq	.4mm	60	44mm	24mm	500
A-LQFP216-24mm-.4mm-2.0	216	24mm sq	.4mm	40	44mm	32mm	500
A-LQFP256-28mm-.4mm-2.0	256	28mm sq	.4mm	36	44mm	40mm	500
.5mm Pitch							
A-LQFP48-7mm-.5mm-2.0	48	7mm sq	.5mm	250	16mm	12mm	1,000
A-LQFP64-10mm-.5mm-2.0	64	10mm sq	.5mm	160	24mm	24mm	1,000
A-LQFP100-14mm-.5mm-2.0	100	14mm sq	.5mm	90	32mm	24mm	750
A-LQFP128-14x20-.5mm-2.0	128	14x20mm	.5mm	72	44mm	32mm	500
A-LQFP128-20mm-.5mm-2.0	128	20mm sq	.5mm	60	44mm	24mm	500
A-LQFP144-20mm-.5mm-2.0	144	20mm sq	.5mm	60	44mm	24mm	750
A-LQFP160-24mm-.5mm-2.0	160	24mm sq	.5mm	40	44mm	32mm	500
A-LQFP176-24mm-.5mm-2.0	176	24mm sq	.5mm	40	44mm	32mm	500
A-LQFP208-28mm-.5mm-2.0	208	28mm sq	.5mm	36	44mm	40mm	500
.65mm Pitch							
A-LQFP52-10mm-.65mm-2.0	52	10mm sq	.65mm	160	24mm	24mm	1,000
A-LQFP80-14mm-.65mm-2.0	80	14mm sq	.65mm	90	32mm	24mm	750
A-LQFP100-14x20-.65mm-2.0	100	14x20mm	.65mm	72	44mm	32mm	500
.8mm Pitch							
A-LQFP32-7mm-.8mm-2.0	32	7mm sq	.8mm	250	16mm	12mm	1,000
A-LQFP44-10mm-.8mm-2.0	44	10mm sq	.8mm	160	24mm	24mm	1,000
A-LQFP64-14mm-.8mm-2.0	64	14mm sq	.8mm	90	32mm	24mm	750

Notes

- All LQFPs are standard in trays.
- Parts available on Tape and Reel.
- LQFPs have a body thickness of 1.4mm.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- SnPb parts no longer available.

Part Description System



- Add "TR" to end of part number for Tape and Reel.
- Add "SN" to end of part number for Lead Free parts.



For kits see pages 100, 101, 105, 108, 111, 116 & 117.



For drawings, please visit our web site at www.TrustPCI.com.

Quad Flat Pack (QFP) components have four sides with leads extending from the component body on all four sides. QFP components come packaged in trays or on tape and reel to protect the component leads that can be easily damaged. An important

measurement for QFPs is coplanarity. When the first lead from the component is placed on the PCB coplanarity is established. Coplanarity ensures the last lead can be placed on the board. The standard for QFP coplanarity is ± 4 mils.

QFP Quad Flat Pack

Part Description	Number of Pins	Body Size	Body Thickness	Lead Pitch	Footprint	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
.4mm Pitch									
A-QFP256-28mm-.4mm-2.6	256	28mm sq	3.37mm	.4mm	2.6mm	24	44	40	200
.5mm Pitch									
A-QFP64-10mm-.5mm-3.2	64	10mm sq	2.0mm	.5mm	3.2mm	96	24	24	500
A-QFP64-10mm-.5mm-3.9	64	10mm sq	2.0mm	.5mm	3.9mm	96	24	24	500
A-QFP100-14mm-.5mm-3.2	100	14mm sq	2.0/2.67mm	.5mm	3.2mm	84	32	24	350
A-QFP100-14mm-.5mm-3.9	100	14mm sq	2.67mm	.5mm	3.9mm	84	32	24	350
A-QFP128-14x20mm-.5mm-3.2	128	14x20mm	2.71mm	.5mm	3.2mm	66	44	32	200
A-QFP128-14x20mm-.5mm-3.2	128	14x20mm	2.71mm	.5mm	3.9mm	66	44	32	200
A-QFP208-28mm-.5mm-2.6	208	28mm sq	3.37mm	.5mm	2.6mm	24	44	40	200
A-QFP208-28mm-.5mm-3.2	208	28mm sq	3.37mm	.5mm	3.2mm	24	44	40	200
A-QFP240-32mm-.5mm-2.6	240	32mm sq	3.4mm	.5mm	2.6mm	24	56	44	250
.65mm Pitch									
A-QFP52-10mm-.65mm-3.2	52	10mm sq	2.0mm	.65mm	3.2mm	96	24	24	500
A-QFP52-10mm-.65mm-3.9	52	10mm sq	2.0mm	.65mm	3.9mm	96	24	24	500
A-QFP80-14mm-.65mm-3.2	80	14mm sq	2.0/2.67mm	.65mm	3.2mm	84	32	24	350
A-QFP80-14mm-.65mm-3.9	80	14mm sq	2.67mm	.65mm	3.9mm	84	32	24	350
A-QFP100-14x20mm-.65mm-3.2	100	14x20mm	2.71mm	.65mm	3.2mm	66	44	32	200
A-QFP100-14x20mm-.65mm-3.9	100	14x20mm	2.71mm	.65mm	3.9mm	66	44	32	200
A-QFP144-28mm-.65mm-3.2	144	28mm sq	3.37mm	.65mm	3.2mm	24	44	40	200
A-QFP144-28mm-.65mm-3.9	144	28mm sq	3.37mm	.65mm	3.9mm	24	44	40	200
A-QFP160-28mm-.65mm-2.6	160	28mm sq	3.37mm	.65mm	2.6mm	24	44	40	200
A-QFP160-28mm-.65mm-3.2	160	28mm sq	3.37mm	.65mm	3.2mm	24	44	40	200
A-QFP160-28mm-.65mm-3.9	160	28mm sq	3.37mm	.65mm	3.9mm	24	44	40	200
.8mm Pitch									
A-QFP44-10mm-.8mm-3.2	44	10mm sq	2.0mm	.8mm	3.2mm	96	24	24	500
A-QFP44-10mm-.8mm-3.9	44	10mm sq	2.0mm	.8mm	3.9mm	96	24	24	500
A-QFP64-14mm-.8mm-3.2	64	14mm sq	2.0/2.67mm	.8mm	3.2mm	84	32	24	350
A-QFP64-14mm-.8mm-3.9	64	14mm sq	2.67mm	.8mm	3.9mm	84	32	24	350
A-QFP80-14x20mm-.8mm-3.2	80	14x20mm	2.71mm	.8mm	3.2mm	66	44	32	200
A-QFP80-14x20mm-.8mm-3.9	80	14x20mm	2.71mm	.8mm	3.9mm	66	44	32	200
A-QFP120-28mm-.8mm-2.6	120	28mm sq	3.37mm	.8mm	2.6mm	24	44	40	200
A-QFP120-28mm-.8mm-3.2	120	28mm sq	3.37mm	.8mm	3.2mm	24	44	40	200
A-QFP128-28mm-.8mm-2.6	128	28mm sq	3.37mm	.8mm	2.6mm	24	44	40	200
A-QFP128-28mm-.8mm-3.2	128	28mm sq	3.37mm	.8mm	3.2mm	24	44	40	200
1.00mm Pitch									
A-QFP52-14mm-1.0mm-3.2	52	14mm sq	2.0/2.67mm	1.00mm	3.2mm	84	32	24	350
A-QFP52-14mm-1.0mm-3.9	52	14mm sq	2.67mm	1.00mm	3.9mm	84	32	24	350
A-QFP64-14x20-1.0mm-3.2	64	14x20mm	2.71mm	1.00mm	3.2mm	66	44	32	200
A-QFP64-14x20-1.0mm-3.9	64	14x20mm	2.71mm	1.00mm	3.9mm	66	44	32	200

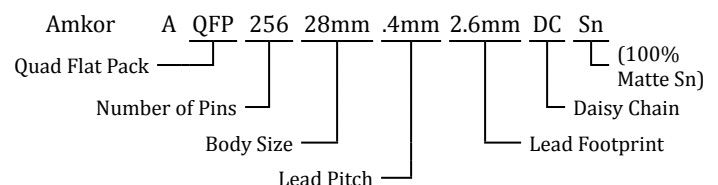
Notes

- All QFPs are standard in JEDEC trays.
- Tray quantities may vary.
- Parts available on Tape and Reel.
- Lead-free parts are available with 100% Matte Sn finish.



For kits see pages 93, 97, 98
105, 116 & 117.

Part Description System



- Add "TR" to end of part number for Tape and Reel.

CQFP

Ceramic Quad Flat Pack

CQFPs are hermetic packages consisting of true pieces of dry pressed ceramic surrounding a uniformed leadframe with tie bar attached. Lead counts for this package range from 14 to 304, with lead pitch ranging from 15.7mil to 50mils. Package leads are gold or Kovar finish

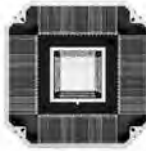
and can be solder-coated by special request. Lids are optional for CQFPs, which are sealed over the package cavity at temperatures from 400° to 460° C.

CQFP Ceramic Quad Flat Pack

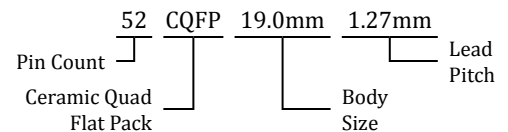
Part Description	Number of Pins	Body Size (mm)	Body Size (inch)	Pitch
52CQFP-19.0mm-1.27mm	52	19.0mm sq	.750" sq	1.27mm
68CQFP-24.1mm-1.27mm	68	24.1mm sq	.950" sq	1.27mm
84CQFP-16.5mm-.65mm	84	16.5mm sq	.650" sq	.65mm
100CQFP-19.0mm-.65mm	100	19.0mm sq	.750" sq	.65mm
132CQFP-24.1mm-.65mm	132	24.1mm sq	.950" sq	.65mm
172CQFP-29.2mm-.65mm	172	29.2mm sq	1.150" sq	.65mm
196CQFP-32.0mm-.50mm	196	32.0mm sq	1.260" sq	.65mm

Notes

- CQFPs are available with or without combo lid.
- Pins are flat (sandwiched) with tie bar.
- Parts are packaged in non-JEDEC trays.
- Parts available with a daisy-chain configuration upon request.
- Due to the custom nature of the package, body size and dimensions can change without notice.



Part Description System



LCC

Leadless Ceramic Carrier

This surface mount package consists of a ceramic base that has metalized castellations/pads on the sides and bottom of the package. LCC packages have pads on all four sides of the package. Lids for LCCs

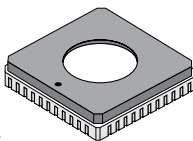
can be either metal or ceramic. Lids are attached after die attach. This allows for a hermetically sealed environment for the die.

LCC Leadless Ceramic Carrier

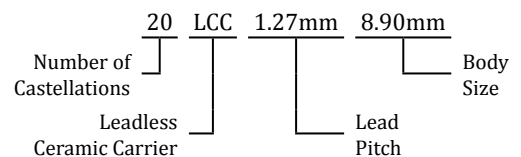
Part Description	Number of Castellations	Body Size (mm)	Body Size (inch)	Pitch
16LCC-1.27mm-7.36x8.96mm	16	7.36x8.96mm	.350"x.285"	1.27mm
20LCC-1.27mm-8.90mm	20	8.90mm sq	.350" sq	1.27mm
28LCC-1.27mm-11.5mm	28	11.50mm sq	.450" sq	1.27mm
40LCC-1.0mm-10.1mm	40	10.10mm sq	.400" sq	1.0mm
44LCC-1.27mm-16.5mm	44	16.50mm sq	.650"sq	1.27mm
68LCC-1.27mm-24.11mm	68	24.11mm sq	.950" sq	1.27mm

Notes

- LCCs are available with or without combo lid.
- Gold castellations are standard, but can be solder-tinned with 100% Sn or SnPb alloy.
- Parts are packaged in non-JEDEC trays.
- Parts available with a daisy-chain configuration upon request.
- Due to the custom nature of the package, body size and dimensions can change without notice.



Part Description System

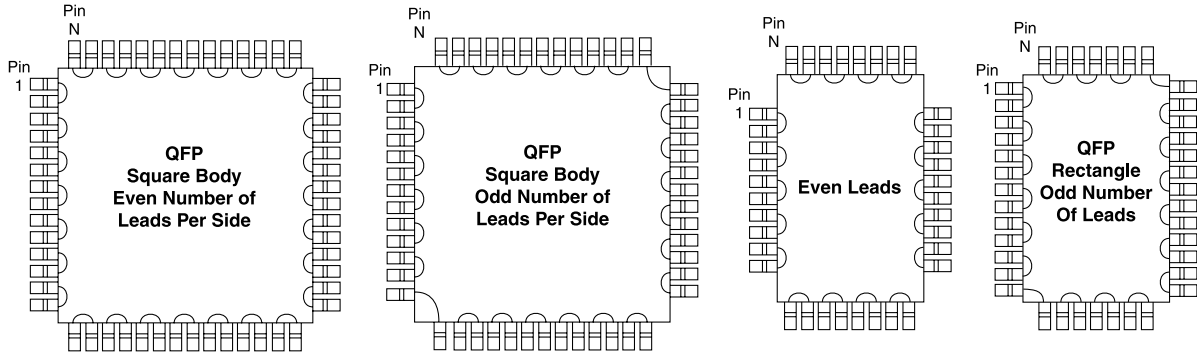


For kits see page 92 & 106.

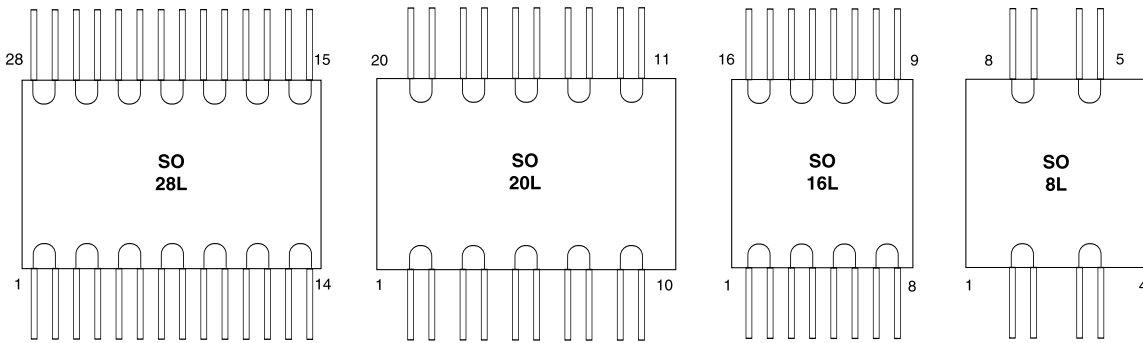
The standard daisy chain pattern for non-BGA IC's is Even. Example of daisy-chain "even" pattern for leadframe packages. Pin 1-2, 3-4, 5-6, 7-8, etc. Continuity testing requires dummy components to contain

daisy-chain connections. There is no standard daisy-chain pattern for Ball Grid Array Packages.

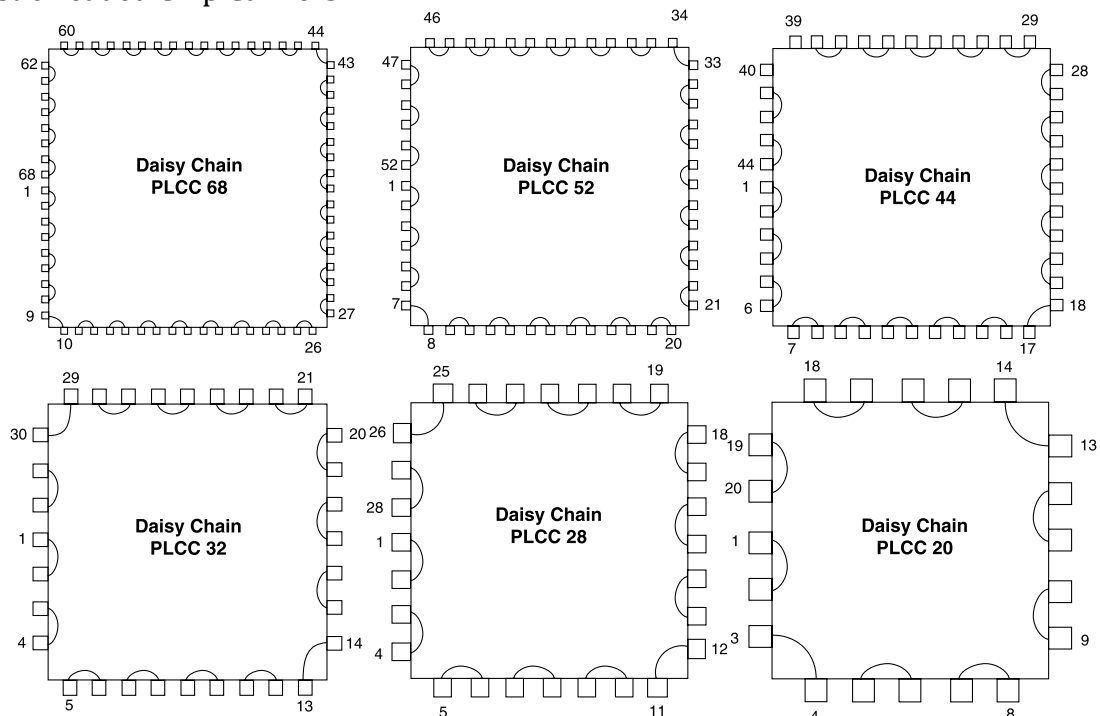
QFP Quad Flat Packs



SOIC Small Outline Integrated Circuits



PLCC Plastic Leaded Chip Carriers



PLCC

Plastic Leaded Chip Carrier

Plastic Leaded Chip Carriers (PLCC) are four-sided "J" Leaded Plastic body packages. Lead counts range from 20 to 84. PLCC packages can be square or rectangle. Body sizes range from .35" to 1.15". PLCCs are

JEDEC standard compliant. The PLCC "J" Lead configuration requires less board space versus equivalent gull leaded components.

PLCC Plastic Leaded Chip Carrier

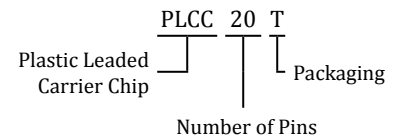
Part Description	Lead Count	Body Size	Quantity Per Tube	Tape Width	Tape Pitch	Quantity Per Reel
PLCC20T	20	8.8mm	46	16mm	12mm	1,000
PLCC28T	28	11.4mm	38	24mm	16mm	750
PLCC32T	32	11.4x13mm	30	24mm	16mm	750
PLCC44T	44	16.5mm	27	32mm	24mm	450/500
PLCC68T	68	24.1mm	18	44mm	32mm	230/250
PLCC84T	84	29.2mm	15	44mm	36mm	250

Notes

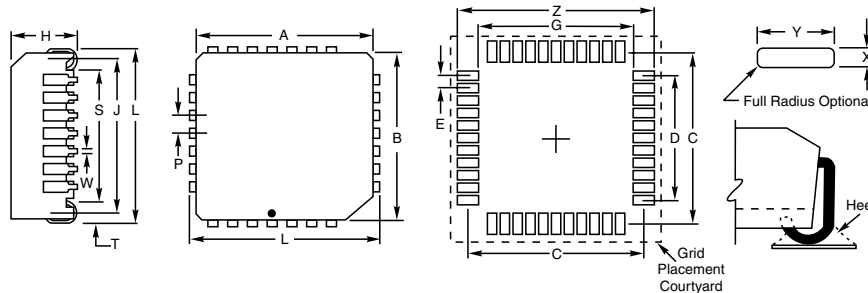
- All PLCCs have "J" leads.
- Standard lead pitch is 1.27mm (50 mils).
- PLCCs are to JEDEC standards.
- Tube quantity may vary.
- Parts available on Tape and Reel.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- Daisy-Chained and Lead-Free parts available.



Part Description System



- Packaging: T=Tubes, TR=Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.



PLCC Component Dimensions

Component Identifier	L (mm)		S (mm)		W (mm)		T (mm)		A (mm)		B (mm)		J (mm)	H (mm)	P (mm)
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Ref	Max	Basic
PLCC-20	9.78	10.03	5.78	6.53	0.33	0.53	1.50	2.00	8.89	9.04	8.89	9.04	7.87	4.57	1.27
PLCC-28	12.32	12.57	8.32	9.07	0.33	0.53	1.50	2.00	11.43	11.58	11.43	11.58	10.41	4.57	1.27
PLCC-44	17.40	17.65	13.40	14.15	0.33	0.53	1.50	2.00	16.51	16.66	16.51	16.66	15.49	4.57	1.27
PLCC-68	25.02	25.27	21.02	21.77	0.33	0.53	1.50	2.00	24.13	24.33	24.13	24.33	23.11	5.08	1.27
PLCC-84	30.10	30.35	26.10	26.85	0.33	0.53	1.50	2.00	29.21	29.41	29.21	29.41	28.19	5.08	1.27

PLCC Land Patterns

Component Identifier	Z (mm)	G (mm)	X (mm)	Y (mm) Ref	C (mm) Ref	D (mm) Ref	E (mm) Ref	Placement Grid (No. of Elements)
PLCC-20	10.80	6.40	0.60	2.20	8.60	5.08	1.27	24 x 24
PLCC-28	13.40	9.00	0.60	2.20	11.20	7.62	1.27	30 x 30
PLCC-44	18.40	14.00	0.60	2.20	16.20	12.70	1.27	40 x 40
PLCC-68	26.00	21.60	0.60	2.20	23.80	20.32	1.27	54 x 54
PLCC-84	31.20	26.80	0.60	2.20	29.00	25.40	1.27	66 x 66



For kits see pages 93, 97, 98, 100, 101, 106, 108 & 117.

Small Outline Integrated Circuit

Small Outline Package (SOIC) body size was compressed and the lead pitch tightened to obtain a smaller version SOIC. This yields an IC package that is a significant reduction in the size (compared to

standard package). All IC assembly processes remain the same as with our standard SOICs.

SOIC Small Outline Integrated Circuit

Part Description	Number of Pins	Body Size	Quantity Per Tube	Tape Width	Tape Pitch	Quantity Per Reel
SO8GT-3.8mm	8	3.8mm	100	12mm	8mm	2,500
SO14GT-3.8mm	14	3.8mm	50	16mm	8mm	2,500
SO16GT-3.8mm	16	3.8mm	48	16mm	8mm	2,500
SO16GT-7.6mm	16	7.6mm	46	16mm	12mm	1,000
SO20GT-7.6mm	20	7.6mm	38	24mm	12mm	1,000
SO24GT-7.6mm	24	7.6mm	31	16mm	12mm	1,000
SO28GT-7.6mm	28	7.6mm	25	24mm	12mm	1,000

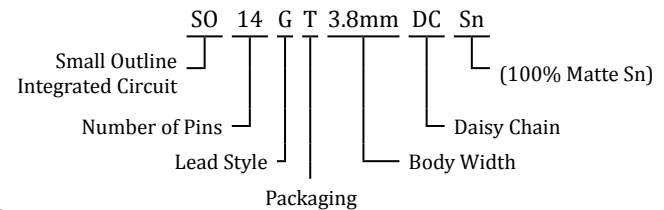
Notes

- Standard lead pitch is 1.27mm.
- Tube quantity may vary.
- Parts available on Tape and Reel.
- Lead-free parts are available with 100% Matte Sn finish.

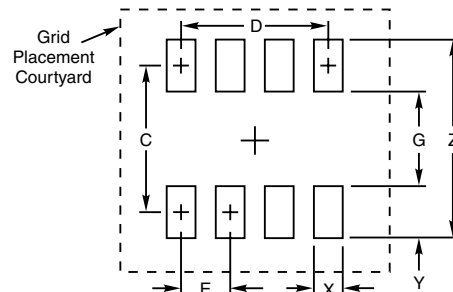
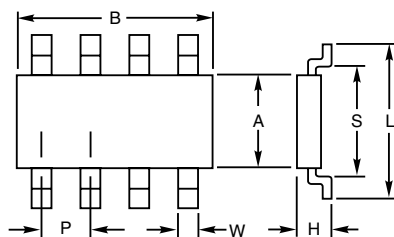


For kits see pages 93, 94, 97, 98, 99, 100, 101, 105, 116 & 117.

Part Description



- Lead Style: G=Gull Wing.
- Packaging: T=Tubes, TR=Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.



SOIC Component Dimensions

Component Identifier	JEDEC Number	L (mm)		S (mm)		W (mm)		T (mm)		A (mm)		B (mm)		H (mm)		P (mm)
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Basic
SO8	MS-012 AA	5.80	6.30	3.26	4.55	0.33	0.51	0.40	1.27	3.80	4.00	4.80	5.00	1.35	1.75	1.27
SO14	MS-012 AB	5.80	6.30	3.26	4.55	0.33	0.51	0.40	1.27	3.80	4.00	8.55	8.75	1.35	1.75	1.27
SO16	MS-012 AC	5.80	6.30	3.26	4.55	0.33	0.51	0.40	1.27	3.80	4.00	9.80	10.00	1.35	1.75	1.27
SO16-7.6mm	MS-013 AA	10.00	10.65	7.46	8.85	0.33	0.51	0.40	1.27	7.40	7.60	10.10	10.50	2.35	2.65	1.27
SO20-7.6mm	MS-013 AC	10.00	10.65	7.46	8.85	0.33	0.51	0.40	1.27	7.40	7.60	12.60	13.00	2.35	2.65	1.27
SO28-7.6mm	MO-119 AB	10.29	10.64	8.21	9.01	0.36	0.51	0.53	1.04	7.40	7.60	18.08	18.39	2.34	2.64	1.27

SOIC Land Pattern Dimensions

Component Identifier	Z (mm)	G (mm)	X (mm)	Y (mm) Ref	C (mm) Ref	D (mm) Ref	E (mm) Ref	Placement Grid (No. of Grid Elements)
SO8	7.40	3.00	0.60	2.20	5.20	3.81	1.27	12 x 16
SO14	7.40	3.00	0.60	2.20	5.20	7.62	1.27	20 x 16
SO16	7.40	3.00	0.60	2.20	5.20	8.89	1.27	22 x 16
SO16-7.6mm	11.40	7.00	0.60	2.20	9.20	8.89	1.27	22 x 22
SO20-7.6mm	11.40	7.00	0.60	2.20	9.20	11.43	1.27	28 x 24
SO28-7.6mm	11.40	7.00	0.60	2.20	9.20	16.51	1.27	38 x 24

TSOP

Thin Small Outline Package



Thin Small Outline Packages (TSOP) are thin body size components; thickness is 1.0mm. TSOP packages have four sides and are rectangular. Type I TSOPs have the leads protruding from the width portion of the package. Lead counts range from 28 to 48. Package body size ranges from 8x11.8mm to 12x20mm.



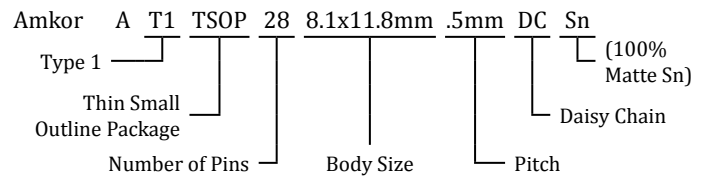
TSOP Thin Small Outline Package – Type I

Part Description	Number of Pins	Body Size	Lead Pitch	Quantity Per Tray	Tape Width	Tape Pitch	Quantity Per Reel
A-T1-TSOP28-8.1x11.8mm-.55mm	28	8.1x11.8mm	.55mm	234	24mm	12mm	1,000
A-T1-TSOP32-8x11.8mm-.5mm	32	8x11.8mm	.5mm	234	24mm	12mm	1,000
A-T1-TSOP32-8x18.4mm-.5mm	32	8x18.4mm	.5mm	156	32mm	12/16mm	1,000
A-T1-TSOP48-12x18.4mm-.5mm	48	12x18.4mm	.5mm	96	32mm	16mm	1,000

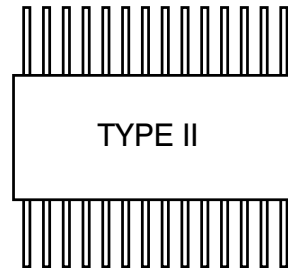
Notes

- Standard packaging is in JEDEC trays.
- Body dimensions are measured by body length and width.
- Type I means that pins extend from the narrow end (the width) of the body.
- Parts available on Tape and Reel.
- Type II means that pins extend from the wide end (the length) of the body. Type II TSOP are becoming obsolete. Practical has some stock. Please call for availability.

Part Description System



- Add "TR" to end of part number for Tape and Reel.



TSOP Thin Small Outline Package – Type II

Type II TSOP are becoming obsolete. Practical has some stock. Please call for availability.



The Thin Shrink Small Outline Package (TSSOP) offers smaller body sizes, smaller lead pitches and package thickness (0.9mm thick) than standard SOIC packages. Body widths are 3.0mm, 4.4mm and 6.1mm. Lead counts range from 8 to 80. This package conforms to JEDEC package outlines.



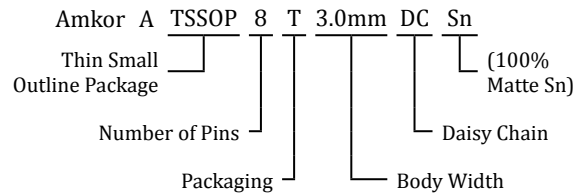
TSSOP Thin Shrink Small Outline Package

Part Description	Number of Pins	Body Size	Lead Pitch	Quantity Per Tube	Tape Width	Tape Pitch	Quantity Per Reel
A-TSSOP8T-3.0mm	8	3.0mm	.65mm	98	12mm	8mm	2,500
A-TSSOP8T-4.4mm	8	4.4mm	.65mm	100	12/16mm	8mm	1,000/2,500
A-TSSOP10T-3.0mm	10	3.0mm	.5mm	98	12mm	8mm	2,500
A-TSSOP14T-4.4mm	14	4.4mm	.65mm	96	12/16mm	8mm	1,000/2,500
A-TSSOP16T-4.4mm	16	4.4mm	.65mm	96	12/16mm	8mm	1,000/2,500
A-TSSOP20T-4.4mm	20	4.4mm	.65mm	74	16mm	8/12mm	1,000/2,500
A-TSSOP24T-4.4mm	24	4.4mm	.65mm	62	16mm	8/12mm	1,000/2,500
A-TSSOP28T-4.4mm	28	4.4mm	.65mm	50	16mm	8/12mm	1,000
A-TSSOP44T-4.4mm	44	4.4mm	.5mm	42	24mm	12mm	1,000
A-TSSOP48T-6.1mm	48	6.1mm	.5mm	39	24mm	12mm	1,000
A-TSSOP56T-4.4mm	56	4.4mm	.4mm	42	24mm	12mm	1,000
A-TSSOP56T-6.1mm	56	6.1mm	.5mm	35	24mm	12mm	1,000
A-TSSOP80T-6.1mm	80	6.1mm	.4mm	28	N/A	N/A	N/A

Notes

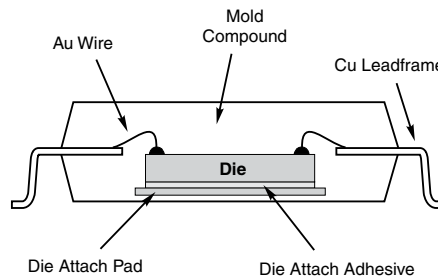
- Tube quantity may vary.
- Parts available on Tape and Reel.
- 0.9mm body thickness for 4.4 and 6.1mm body widths.
- 0.85mm body thickness for 3.0mm body width.
- JEDEC package outline is standard.
- High conductivity copper leadframes.
- Very low-stress mold compound.
- Lead-free available with 100% Matte Sn alloy.

Part Description System



- Packaging: "T" = Tubes, "TR" = Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.

TSSOP Package



For kit see page 97.

SSOP

Shrink Small Outline Package



The Shrink Small Outline Package (SSOP) body size is compressed and the lead pitch is tightened to obtain a small version of the standard SOIC packages. Lead counts range from 8 to 64. Body sizes are 209 and 300 mils. The SSOP package is JEDEC and EIAJ compliant. The package leads are solder plated.

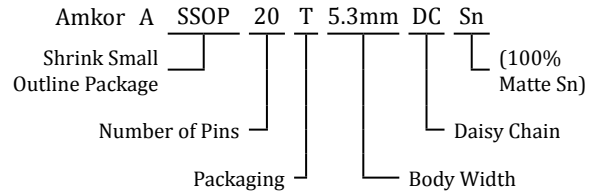
SSOP Shrink Small Outline Package

Part Description	Number of Pins	Body Size	Lead Pitch	Quantity Per Tube	Tape Width	Tape Pitch	Quantity Per Reel
A-SSOP14T-5.3mm	14	5.3mm	.65mm	100	16mm	12mm	1,000
A-SSOP16T-5.3mm	16	5.3mm	.65mm	80	16mm	12mm	1,000
A-SSOP20T-5.3mm	20	5.3mm	.65mm	62	16mm	12mm	1,000
A-SSOP24T-5.3mm	24	5.3mm	.65mm	66	16mm	12mm	1,000
A-SSOP28T-5.3mm	28	5.3mm	.65mm	47	16/24mm	12mm	1,000
A-SSOP36T-7.6mm	36	7.6mm	.8mm	31	24mm	12mm	1,000
A-SSOP48T-7.6mm	48	7.6mm	.635mm	30	32mm	12mm/16mm	1,000
A-SSOP56T-7.6mm	56	7.6mm	.635mm	26	32mm	12mm/16mm	500

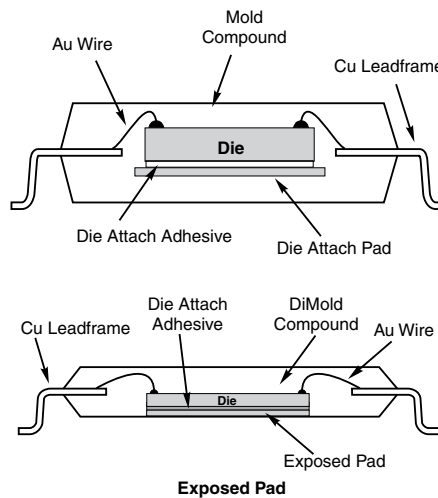
Notes

- Tube quantity may vary.
- Parts available on Tape and Reel.
- 209 and 300 mil body widths.
- JEDEC and EIAJ package outline standard compliance.
- High-conductivity copper leadframes.
- Moisture sensitivity is JEDEC level 3.
- Lead-free available with 100% Matte Sn alloy.

Part Description System



- Packaging: "T" = Tubes, "TR" = Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.



Note: Drawings not to scale.



For kits see pages 105, 108 & 117.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

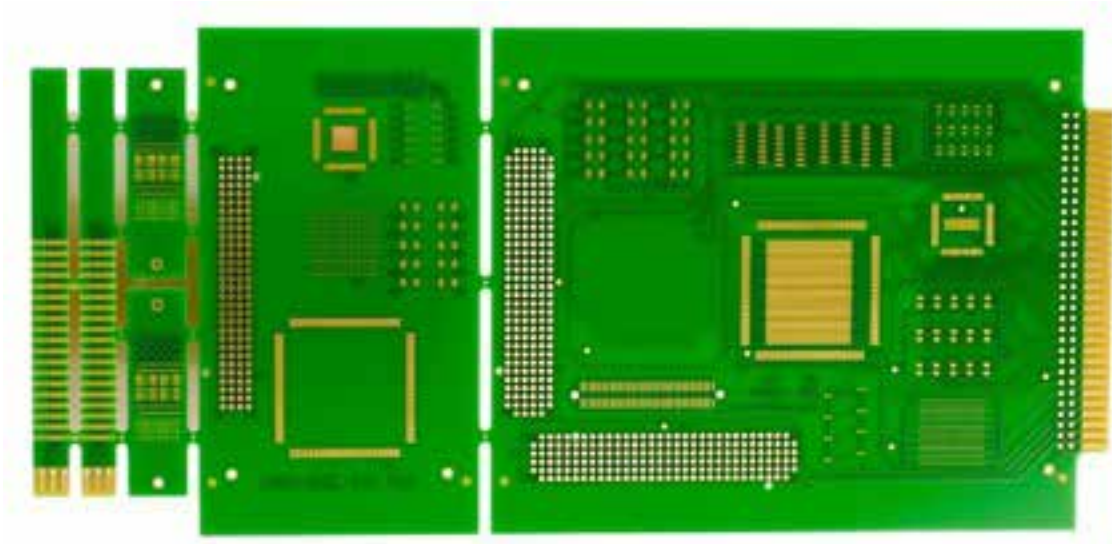


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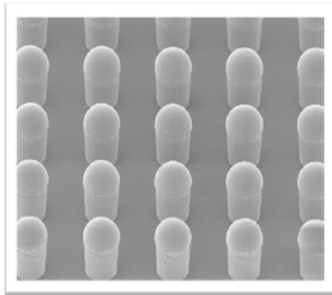
*For kits see pages 84, 85, 86,
87, 88, 89, 90, & 91.*

Advanced Wafer Packages

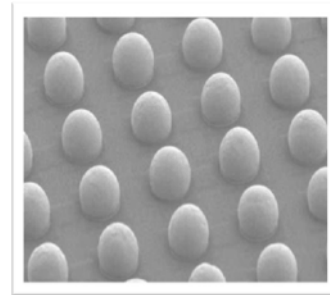
TEG Wafers and Test Elements

Practical Components is the exclusive distributor of Walts Co., LTD In the U.S.A. Walts provides next-generation assembly technology for semiconductors with leading-edge technologies. As the de facto standard, Walts products are used in research and development sites worldwide.

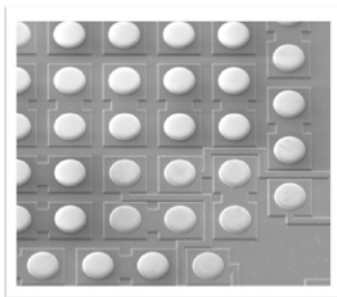
Their well experienced designers can also custom-make TEG (Test Element Groups) to better suit your needs. A wide variety of film sputtering and deposition, back grinding, dicing, bump forming, assembling and analysis are available.



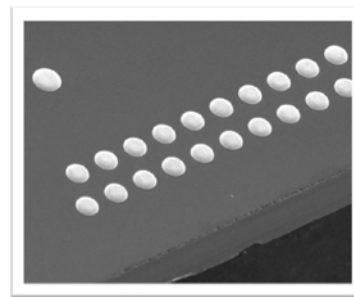
Cu Pillar Bump



Solder Bump



Electroless Plating Bump














TSV

Wafer Specifications

Wafer Size	\varnothing 4inch ~ \varnothing 12inch
Wafer Thickness	min. 10 μ m
Bump Materials	Solder Bump (High Lead, Lead Free, Eutectic) Gold Bump (Plate, Stud) Copper Bump (Plate, Pillar, Stud)
Minimum Pitch	Full Area: min. 40 μ m Peripheral: min. 20 μ m min. 20 μ m (Gold Plate)
Deposition	SiN, PBO, Polyimide, Back Side Metallization etc.

Advanced Wafer Package Line Up

Material Product	Page	Au		Solder		Cu				Ni		Electroless Ni/Au
		Plate	Stud	Plate	Mount	—	+SnAg	+Ni+SnAg	+NiAu	—	+SnAg	
												
MB50	52	●	●	●	—	●	●	●	●	●	●	—
MB60	52	●	●	●	—	●	●	●	●	●	●	—
MB80	53	●	●	●	—	●	●	●	●	●	●	—
MB130	54	●	●	●	—	●	●	●	●	●	●	●
CC40	55	●	—	●	—	●	●	●	●	●	●	—
IP40	56	—	—	—	—	●	●	●	●	●	●	●
IP40A	56	—	—	—	—	●	●	—	—	—	—	●
CC80	57	●	●	●	—	●	●	●	●	●	●	—
IP80	58	—	—	—	—	●	●	●	●	●	●	●
CC80TSV	59	—	—	—	—	—	●	●	—	—	—	●/■
CC80Mark II	59	●	●	●	—	●	●	●	●	●	●	—
FC150	60	—	—	●	●	●	●	●	●	●	●	●
FC150LC	61	—	—	—	—	●	●	—	—	—	—	—
FC150SC	61	—	—	●	●	●	●	●	●	●	●	●
FC200	62	—	—	●	●	●	●	●	●	●	●	●
FC200SC	63	—	—	●	●	●	●	●	●	●	●	●
FBW	64	—	—	—	—	●	●	●	—	—	—	—
WLP	65	—	—	—	●	—	—	—	—	—	—	—
Free Cut Size	65	—	—	—	●	—	—	—	—	—	—	—
ME	66	—	—	—	—	●	—	—	—	—	—	—
STAC	67	●	●	●	—	●	●	●	●	●	●	—
STAC150FA	67	—	—	—	—	●	●	●	●	●	●	—
STAC300FA	67	—	—	—	—	●	●	●	●	●	●	—
PWB	68	—	—	—	—	—	—	—	—	—	—	—
HPW	68	●	●	●	—	●	●	●	●	●	●	—
HPW150FA	69	—	—	—	—	●	●	●	●	●	●	—
HPW300FA	69	—	—	—	—	●	●	●	●	●	●	—
HPWTSV	69	—	—	—	—	—	●	—	—	—	—	■
LCD30	70	●	—	●	—	●	●	●	●	●	●	●

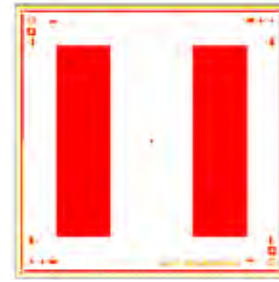
● Top Side

■ Bottom Side

MB50-0101JY

Specifications	TYPE-A	TYPE-B	TYPE-C(Glass)
Wafer Size	8 inch	8 inch	8 inch(Glass wafer)
Wafer Thickness	725±25µm	725±25µm	700±70µm
Chip Size	7.3mm ■	7.3mm ■	7.3mm ■
Pad Pitch	50µm	50µm	50µm
Function	Daisy Chain	Daisy Chain	—
Pad config	Peripheral	Peripheral	Peripheral
Electrode	Au-Stud Bump Wire Bonding	Cu-Pillar Au-Plated Solder Plated Ni on Cu-Pillar	Cu-Pillar
Pad Size	48µm ■	48µm ■	—
Bump Size	—	Cu, Au:30µm ■ Cu:φ25µm ●	Cu:30µm ■ Cu:φ25µm ●
Bump Height	—	any	any
Passivation Opening	40µm ■	φ15µm ●	—
Scribe Width	120µm	120µm	—
Number of Pad	544 pads/chip	544 pads/chip	—
Number of Chip	478 chips/wafer	478 chips/wafer	478 chips/wafer

● Top Side ■ Bottom Side



Chip Structure

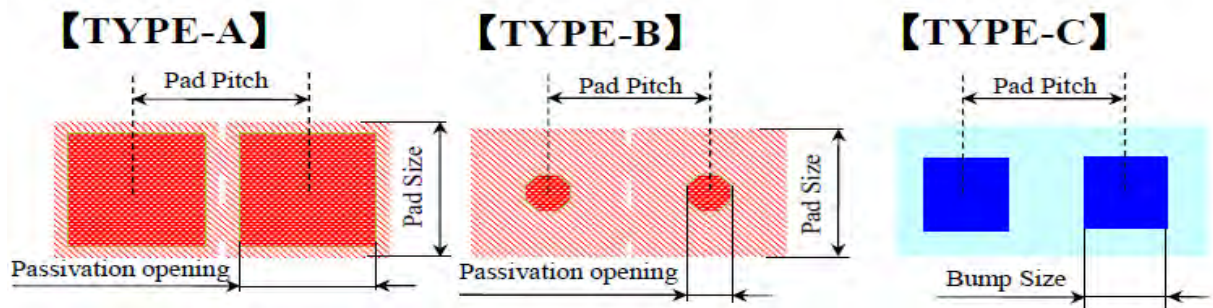
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

*HDP: High Density Plasma



For kit see page 71.



MB60-0101JY

Specifications	
Wafer Size	8 inch
Wafer Thickness	725±25µm
Chip Size	7.3mm ■
Pad pitch	60µm
Function	Daisy Chain
Pad config	Peripheral
Electrode	Au-stud Bump Wire Bonding Au Plating Cu pillar
Pad Size	56µm ■
Passivation opening	50µm ■
Scribe width	120µm
Number of Pad	448 pads/chip
Number of Chip	478 chips/wafer

■ Bottom Side

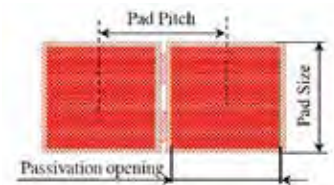


Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

*HDP: High Density Plasma



MB80-STG0101JY

Specifications	TYPE-A	TYPE-B
Wafer Size	8 inch	8 inch
Wafer Thickness	725±25µm	725±25µm
Chip Size	7.3mm ■	7.3mm ■
Pad pitch	80µm staggered	80µm staggered
Function	Daisy Chain	Daisy Chain
Pad config	Peripheral	Peripheral
Electrode	Wire Bonding	Cu pillar
Pad Size	76µm ■	76µm ■
Bump Size	-	38µm ■
Passivation opening	70µm ■	70µm ■
Scribe width	120µm	120µm
Number of Pad	648 pads/chip 82pads×4(Outer line) 80pads×4(Inner line)	648 pads/chip 82pads×4(Outer line) 80pads×4(Inner line)
Number of Chip	478 chips/wafer	478 chips/wafer

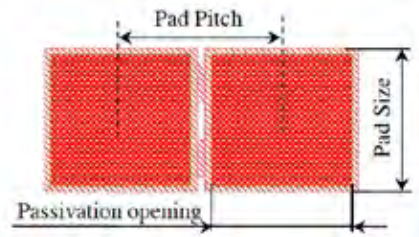
■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
- Metal layer: Ti / TiN / Al-0.5%Cu / TiN
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasm



AS8R

Specifications	
Wafer Size	8 inch
Wafer Thickness	725±25µm
Chip Size	3.5mm ■
Pad pitch	120µm
Function	Daisy Chain
Pad config	Peripheral
Electrode	Wire Bonding Stud Bump
Pad Size	115µm×125µm
Passivation opening	95µm×100µm
Scribe width	120µm
Number of Pad	96 pads (Outer line) 88 pads (Inner line)
Number of Chip	2266 chips/wafer

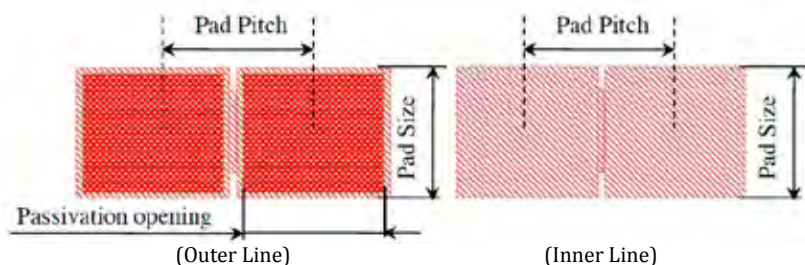
■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
- Metal layer: Ti / TiN / Al-0.5%Cu / TiN
- Passivation Layer: P-TEOS* / P-SiN

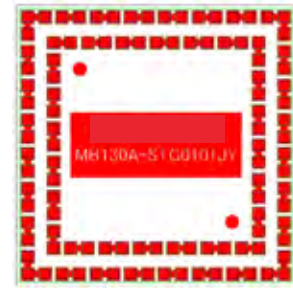
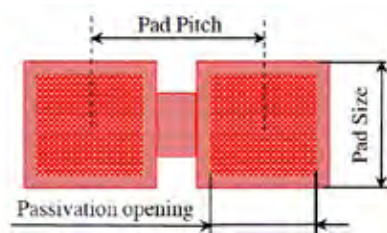
*TEOS: Tetraethoxysilane



MB130-STG0101JY & MB130A-STG0101JY

Specifications	MB130 (Type-A)	MB130 (TYPE-B)	MB130A
Wafer Size	6 inch	6 inch	8 inch
Wafer Thickness	550±25µm	550±25µm	725±25µm
Chip Size	2.13mm ■	2.13mm ■	2.13mm ■
Pad pitch	130µm	130µm	130µm
Metal Thickness	0.8µm	0.8µm	1µm or 2µm or 3µm
Function	Daisy Chain	Daisy Chain	Daisy Chain
Pad config	Peripheral	Peripheral	Peripheral
Electrode	Wire Bonding Au Stud Bump	Cu Pillar Bump	Wire Bonding Au Stud Bump
Pad Size	100µm ■	100µm ■	100µm ■
Passivation opening	80µm ■	80µm ■	80µm ■
Polyimide opening	80µm ■	80µm ■	90µm ■
Bump Size	-	70µm ■	-
Scribe width	50µm	50µm	60µm
Number of Pad	108 pads/chip 15pads×4 (Outer line) 12pads×4 (Inner line)	108 pads/chip 15pads×4 (Outer line) 12pads×4 (Inner line)	108 pads/chip 15pads×4 (Outer line) 12pads×4 (Inner line)
Number of Chip	3300 chips/wafer	3300 chips/wafer	6060 chips/wafer

■ Bottom Side



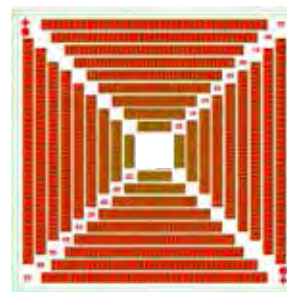
Chip Structure

- MB130
 - Base Layer: P-TEOS*
 - Metal layer: TiW / Al-1.0%Si-0.5%Cu
 - Passivation Layer: P-TEOS* / P-SiN (option) Polyimide
 - MB130A
 - Base Layer: P-TEOS*
 - Metal layer: Ti / TiN / Al-1.0%Si-0.5%Cu
 - Passivation Layer: P-TEOS* / P-SiN (option) Polyimide
- *TEOS: Tetraethoxysilane

MB6020-0102JY

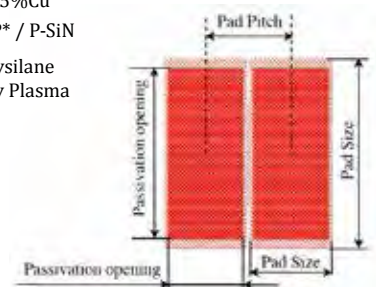
Specifications			
Wafer Size	8 inch		
Wafer Thickness	725±25µm		
Chip Size	3.0mm ■		
Pad Pitch	60/55/50/45/40/35/30/25/20		
Metal Thickness	0.6µm or 0.8µm		
Function	Daisy Chain		
Pad Config	Peripheral		
Electrode	Wire Bonding		
Pad Size	(57×110µm) (42×110µm) (27×110µm)	(52×110µm) (37×110µm) (22×110µm)	(47×110µm) (32×110µm) (17×110µm)
Passivation Opening	(53×100µm) (38×100µm) (23×100µm)	(48×100µm) (33×100µm) (18×100µm)	(43×100µm) (28×100µm) (13×100µm)
Scribe Width	100µm		
Number of Pad	(40×4) (38×4) (30×4)	(40×4) (36×4) (26×4)	(38×4) (34×4) (18×4)
Number of Chip	3016 chips/wafer		

■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
 - Metal layer: TiN / Al-0.5%Cu
 - Passivation Layer: HDP* / P-SiN
- *TEOS: Tetraethoxysilane
*HDP: High Density Plasma



Specifications	
Wafer Size	8 inch
Wafer Thickness	725±25um
Chip Size	7.3mm ■
Pad Pitch	40µm pitch Full area + Staggered (Model I) 40µm pitch Staggered (Model II)
Function	Daisy Chain
Pad Config	Full Area (Model I) Peripheral (Model II)
Electrode	Cu pillar
Pad Size	32µm ■
Passivation Opening	7µm ●
Scribe Width	120µm
Number of Chip	478 chips/wafer

● Top Side ■ Bottom Side



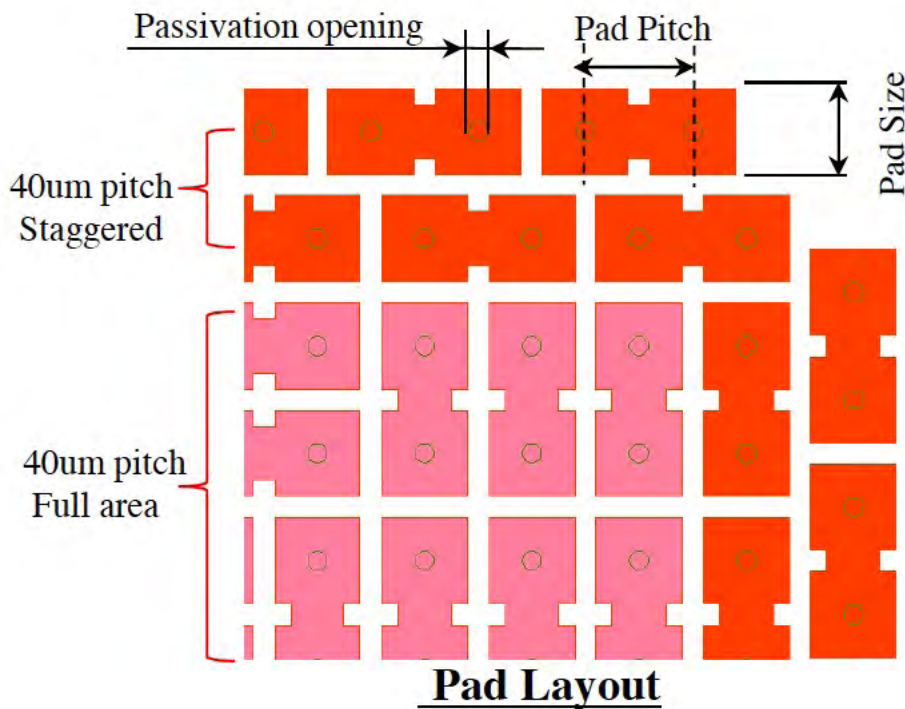
Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN

*TEOS: Tetraethoxysilane

*HDP: High Density Plasma

Bump Layout	Bump Size	Number of Bumps
Model I	φ22um	29576
Model II	φ22um	1352



【Bump Layout】



STANDARD (Model I)

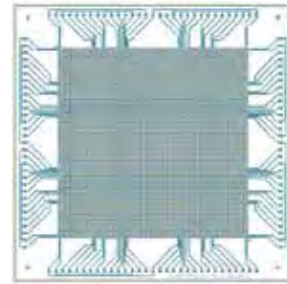


STANDARD (Model II)

IP40-0101JY & IP40A-0101JY

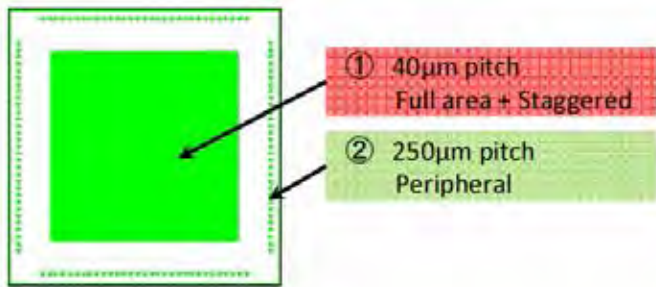
Specifications	IP40(Model I)	IP40A(Model I)	IP40(Model II)
Wafer Size	8 inch	12 inch	8 inch
Wafer Thickness	725±25um	775±25um	725±25um
Chip Size	10.0mm	10.0mm	10.0mm
Pad Pitch	① 40µm pitch Full Area + Staggered ② 250µm pitch Peripheral		① 40µm pitch Staggered ② 250µm pitch Peripheral
Function	Daisy Chain / Bump Short Check / Vernier Breakdown Voltage Check between the Bumps		
Pad Config	Full Area		Peripheral
Pad Size	① 32 µm ■ ② 110 µm ■		
Passivation Opening	① 20 µm ● ② 100 µm ■		
Scribe Width	100µm		
Number of Pad	①29576 pads ②124 pads		①1352 pads ②124 pads
Number of Chip	228 chips/wafer	616 chips/wafer	228 chips/wafer
Surface Spec of Round	Electroless Ni/Au plating		

● Top Side ■ Bottom Side

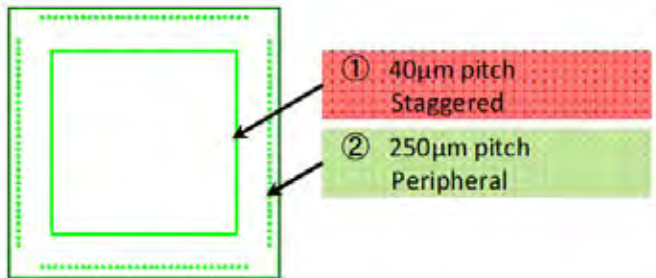


Chip Structure

- IP40
 - Base Layer: P-TEOS*
 - Metal layer: TiN / Al-0.5%Cu
 - Passivation Layer: HDP* / P-SiN
 - IP40A
 - Base Layer: P-TEOS*
 - Metal layer: TiN / Al-0.5%Cu
 - Passivation Layer: P-SiO / P-SiN
- *TEOS: Tetraethoxysilane
*HDP: High Density Plasma



STANDARD (Model I)

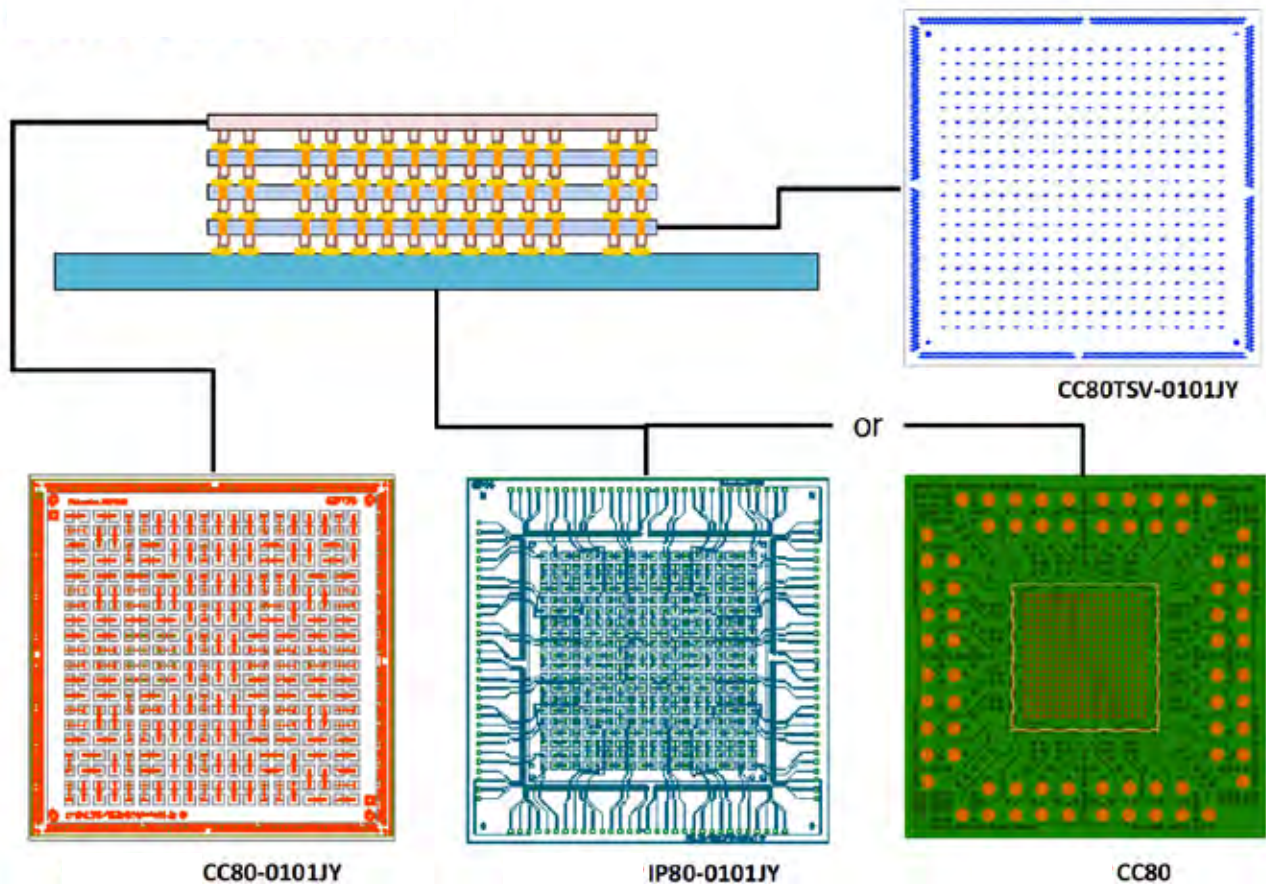


STANDARD (Model II)



Electroless Ni/Au Plating

Concept of CC80 Series

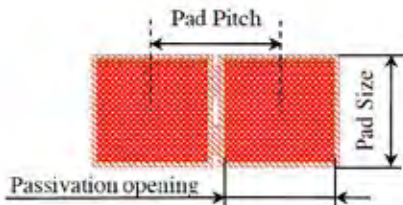


CC80-0101JY

Specifications

Wafer Size	8 inch
Wafer Thickness	725±25µm
Chip Size	7.3mm ■
Pad pitch	80µm staggered (Peripheral) 300µm Full area (Center core)
Function	Daisy Chain
Pad config	Peripheral
Electrode	Au-stud Bump Wire Bonding Au Plating Cu pillar
Pad Size	58µm ■
Passivation opening	48µm ■
Scribe width	120µm
Number of Chip	478 chips/wafer

■ Bottom Side



Chip Structure:

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

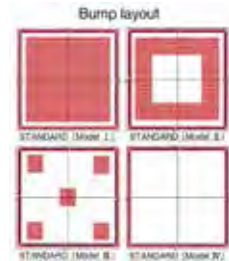
*HDP: High Density Plasma

Model	Bump Size	Number of Bumps
Model I	□ 38µm or Ø42µm	1048 *Peripheral (648) / Full Area (400)
Model II	□ 38µm	904 *Peripheral (648) / Full Area (256)
Model III	□ 38µm	728 *Peripheral (648) / Full Area (80)
Model IV	□ 38µm	648 *Peripheral (648) / Full Area (0)

※ Model IV Compatible to WALT-TEG MB80-STG0101JY



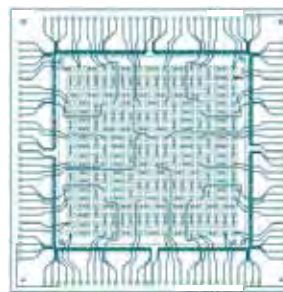
For kit see page 71.



IP80-0101JY

Specifications

Wafer Size	8 inch
Wafer Thickness	725±25µm
Chip Size	10.0mm
Pad pitch	① 80µm Staggered (Inner pad) ② 300µm Full area (Center core) ③ 250µm Peripheral (Outer pad)
Function	Daisy Chain
Pad config	Peripheral and Full Area
Pad Size	① 58 µm ② 58 µm ③ 110 µm
Passivation opening	① 48 µm ② 48 µm ③ 100 µm
Scribe width	100µm
Number of Pad	① 648 ② 400 ③ 124
Number of Chip	228 chips/wafer
Surface Spec of Electrode	Electroless Ni/Au plating, Al-Si(0.5%)

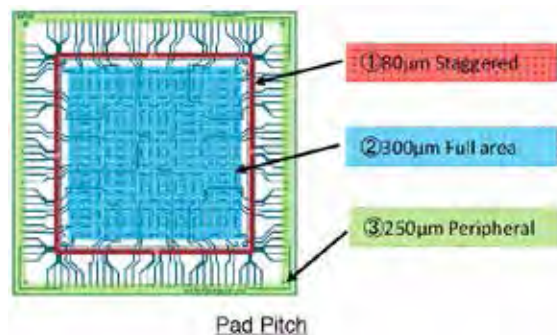


Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

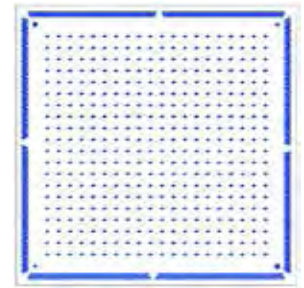
*HDP: High Density Plasma



CC80TSV-0101JY

Specifications	CC80TSV-1		CC80TSV-2	
Wafer Size	8 inch		8 inch	
Wafer Thickness	100μm		100μm	
Chip Size	7.3mm ■		7.3mm ■	
Pad pitch	80μm staggered (Peripheral) 300μm Full area (Center core)		80μm staggered (Peripheral) 300μm Full area (Center core)	
TOP Side	Electrode	Electroless Ni/Au plating	Electrode	Cu + SnAg
	Bump Size	Φ48μm (Option: φ42μm)	Bump Size	38μm ■ (Option: φ42μm)
	Bump Height	8 ~ 12μm	Bump Height	Cu20μm + SnAg15μm
BOTTOM Side	Electrode	Electroless Ni/Au plating	Electrode	Electroless Ni/Au plating
	Bump Size	Φ48μm (Option: φ42μm)	Bump Size	Φ48μm (Option: φ42μm)
	Bump Height	8 ~ 12μm	Bump Height	8 ~ 12μm
Scribe width	120μm		120μm	

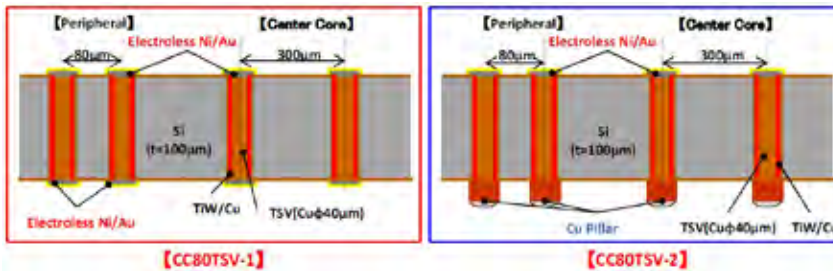
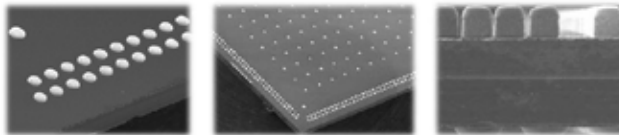
■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-Si

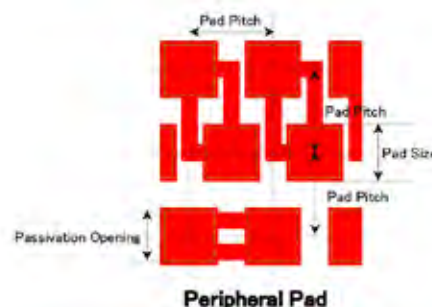
*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



CC80 MarkII-0101JY (STD)

Specifications	STD	
Wafer Size	8 inch (Notch)	
Wafer Thickness	725±25μm	
Chip Size	12.0mm ■	
Function	Daisy Chain & Migration	
Pad Pitch	Peripheral	80μm Three Rows Staggered
	Center core	200μm Full Area
Electrode	Cu Pillar	
Pad Size	54μm ■	
Bump Size	φ31μm	
Passivation opening	48μm ■	
Scribe width	120μm	
Number of Bump/Pad	Peripheral	1660 bumps / 1660 pads
	Center core	2916 bumps / 2916 pads
Number of Chip	177 chips/wafer	

■ Bottom Side

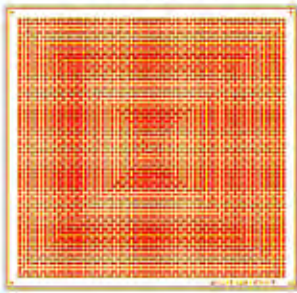


FC150JY

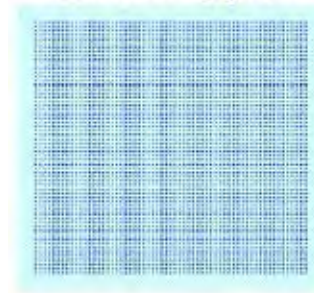
Specifications	Si		Glass	
	A	B	A	B
TYPE				
Wafer Thickness	725±25µm	725±25µm	700±70µm	700±70µm
Wafer Size	8 inch	8 inch	8 inch	8 inch
Chip Size	10.0mm ■	10.0mm ■	10.0mm ■	10.0mm ■
Bump pitch	150µm	150µm	150µm	150µm
Function	Daisy Chain	Daisy Chain	—	—
Pad config	Area	Area	Area	Area
Electrode	Ball Mounted Solder Bump	Cu Pillar	Ball Mounted Solder Bump	Cu Pillar
Pad Size	100µm ■	100µm ■	—	—
Passivation opening	φ40µm ●	φ40µm ●	—	—
Polyimide opening	φ60µm ●	φ60µm ●	—	—
UBM Size	φ80µm ●	φ75µm ●	φ80µm ●	φ75µm ●
Bump Size	φ85µm ●	φ75µm ●	φ85µm ●	φ75µm ●
Scribe width	100µm	100µm	—	—
Number of Pad	3721pads/chip(61×61)	3721pads/chip(61×61)	—	—
Number of Chip	208 chips/wafer	208 chips/wafer	208 chips/wafer	208 chips/wafer

● Top Side ■ Bottom Side

【Si-type】



【Glass-type】

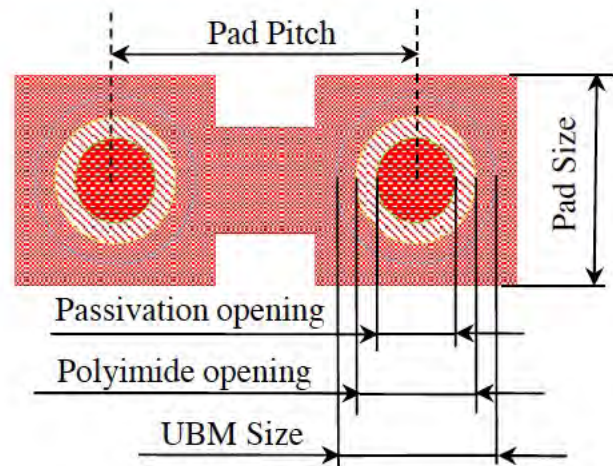
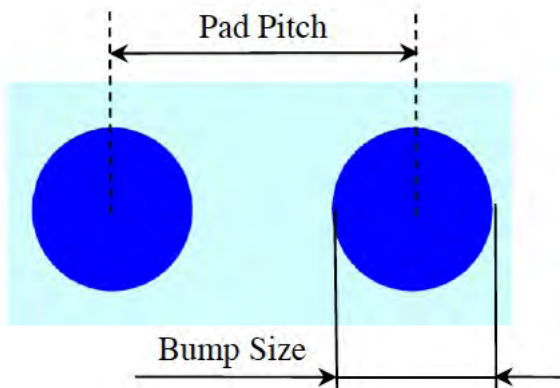


Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

*HDP: High Density Plasma

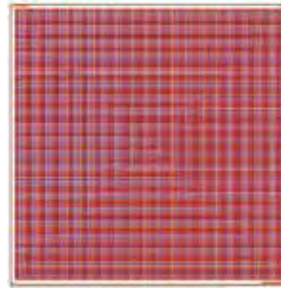


For kit see page 71.

FC150LC-0101JY

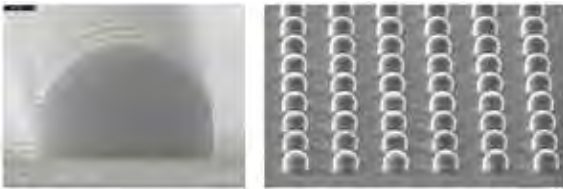
Specifications

Wafer size	φ300mm
Wafer Thickness	775±25μm
Chip size	25mm * 25 mm (Scribe center to center)
Pad (bump)pitch	150μm
Function	Daisy Chain
Electrode	Cu pillar (Cu30μm+SnAg15μm)
Bump size	φ75μm
Passivation opening	40μm (octagon)
Polyimide opening	φ40μm
Scribe line width	100μm
Number of pad	25,921 pads (161×161 Matrix)



Chip Structure

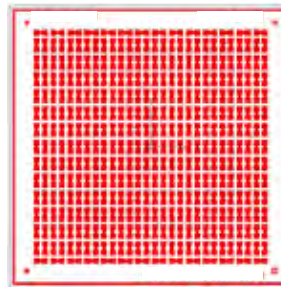
- Base Layer: P-SiO
- Metal layer: TiN / Al-Si
- Passivation Layer: P-SiO / P-SiN (option) Polyimide



FC150SCJY

TYPE	A	B
Wafer Thickness	725±25μm	725±25μm
Wafer Size	8 inch	8 inch
Chip Size	5.02mm ■	5.02mm ■
Bump pitch	150μm	150μm
Function	Daisy Chain	Daisy Chain
Pad config	Area	Area
Electrode	Ball Mounted Solder Bump	Cu Pillar
Pad Size	100μm ■	100μm ■
Passivation opening	φ40μm ●	φ40μm ●
Polyimide opening	φ60μm ●	φ60μm ●
UBM Size	φ80μm ●	φ75μm ●
Bump Size	φ85μm ●	φ75μm ●
Bump height	any	any
Scribe width	100μm	100μm
Number of Pad	784 pads/chip (28×28)784	pads/chip (28×28)
Number of Chip	832 chips/wafer	832 chips/wafer

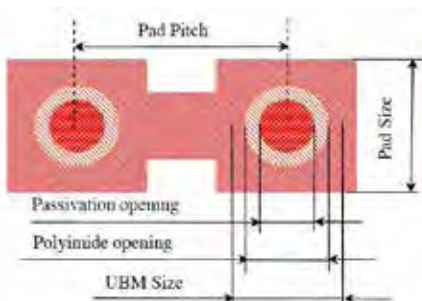
● Top Side ■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

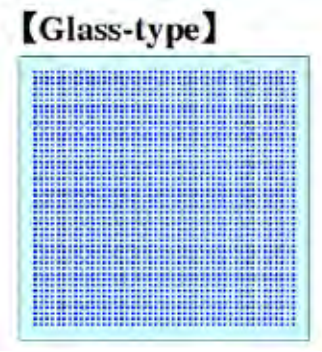
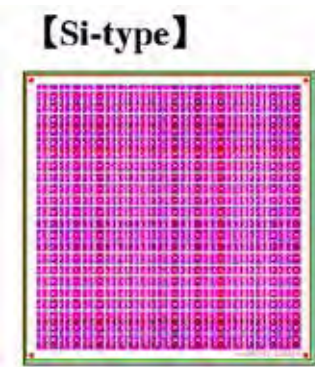
*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



FC200JY

Specifications	Si		Glass	
	A	B	A	B
TYPE	A	B	A	B
Wafer Size	8 inch	8 inch	8 inch	8 inch
Wafer Thickness	725±25µm	725±25µm	700±70µm	700±70µm
Chip Size	10.0mm ■	10.0mm ■	10.0mm ■	10.0mm ■
Bump pitch	200µm	200µm	200µm	200µm
Function	Daisy Chain	Daisy Chain	—	—
Pad config	Area	Area	Area	Area
Electrode	Ball Mounted Solder Bump	Cu Pillar	Ball Mounted Solder Bump	Cu Pillar
Pad Size	100µm ■	100µm ■	—	—
Passivation opening	φ60µm ●	φ60µm ●	—	—
Polyimide opening	φ80µm ●	φ80µm ●	—	—
UBM Size	φ100µm ●	φ90µm ●	φ100µm ●	φ90µm ●
Bump Size	φ100µm ●	φ90µm ●	φ100µm ●	φ90µm ●
Scribe width	100µm	100µm	—	—
Number of Pad	2116 pads/chip (46×46)	2116 pads/chip (46×46)	—	—
Number of Chip	228 chips/wafer	228 chips/wafer	228 chips/wafer	228 chips/wafer

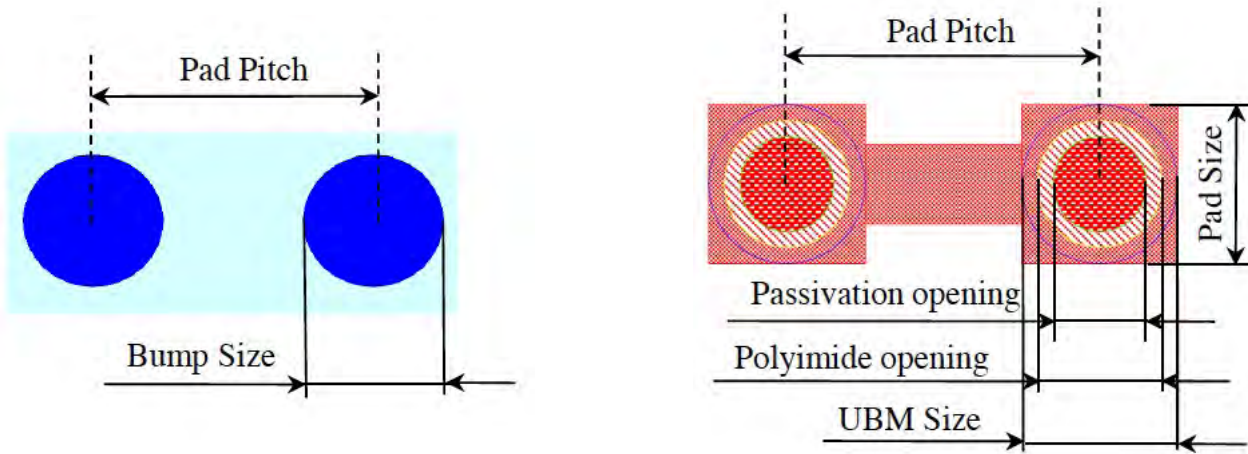
● Top Side ■ Bottom Side



Chip Structure

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) NSG* / Polyimide

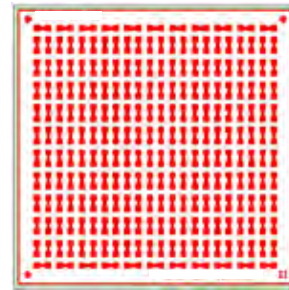
*TEOS: Tetraethoxysilane
 *HDP: High Density Plasma
 *NSG: Non-doped Silicate Glass



For kit see page 71.

Specifications	Si	
<i>TYPE</i>	<i>A</i>	<i>B</i>
Wafer Size	8 inch	8 inch
Wafer Thickness	725±25µm	725±25µm
Chip Size	5.02mm ■	5.02mm ■
Bump pitch	200µm	200µm
Function	Daisy Chain	Daisy Chain
Pad config	Area	Area
Electrode	Ball Mounted Solder Bump	Cu Pillar
Pad Size	100µm ■	100µm ■
Passivation opening	φ60µm ●	φ60µm ●
Polyimide opening	φ80µm ●	φ80µm ●
UBM Size	φ100µm ●	φ90µm ●
Bump Size	φ100µm ●	φ90µm ●
Scribe width	100µm	100µm
Number of Pad	484 pads/chip (22×22)	484 pads/chip (22×22)
Number of Chip	832 chips/wafer	832 chips/wafer

● Top Side ■ Bottom Side

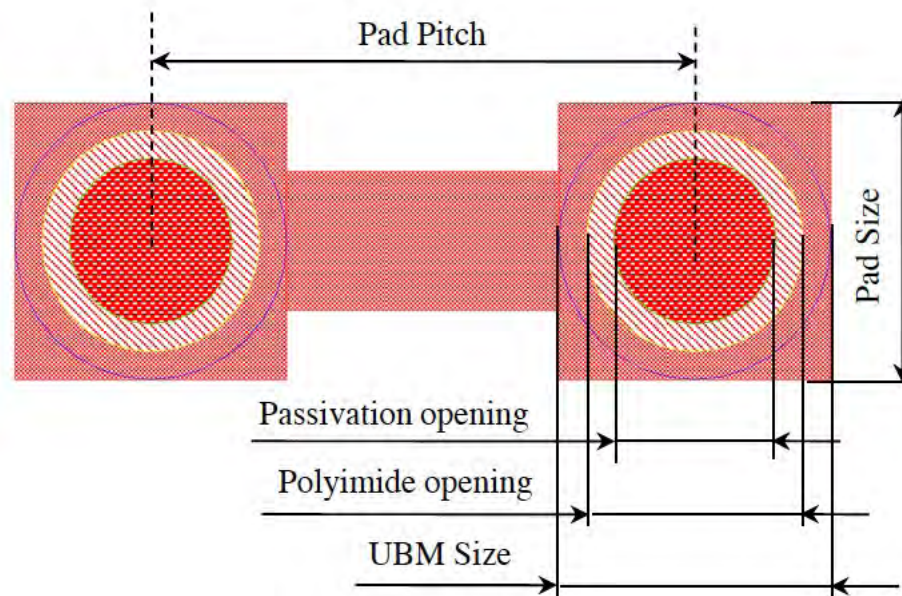


Chip Structure

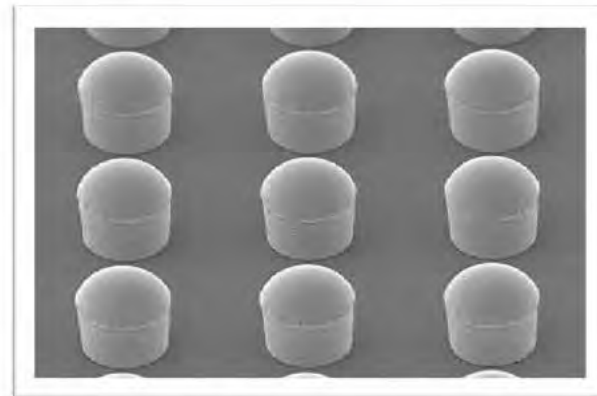
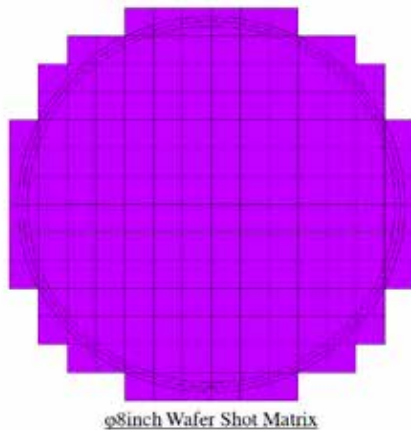
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane

*HDP: High Density Plasma



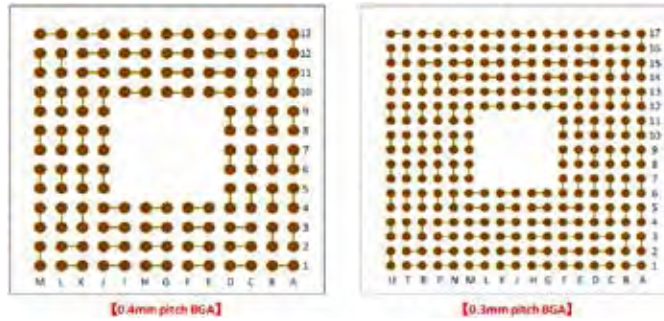
Full Bump Wafer *Dicing Size is Free*



Cu Pillar Bump TEG

Specifications	FBW200-0001JY	FBW150-0001JY	FBW130-0001JY	FBW100-0001JY	FBW80-0001JY
Wafer Size	8 inch	8 inch	8 inch	8 inch	8 inch
Wafer Thickness	725±25µm	725±25µm	725±25µm	725±25µm	725±25µm
Bump Pitch	200µm	150µm	130µm	100µm	80µm
Function	—	—	—	—	—
Electrode	Cu Pillar	Cu Pillar	Cu Pillar	Cu Pillar	Cu Pillar
Bump Size	φ90µm	φ75µm	φ65µm	φ50µm	φ40µm
Bump Height	Max.60µm	Max.60µm	Max.60µm	Max.60µm	Max.50µm

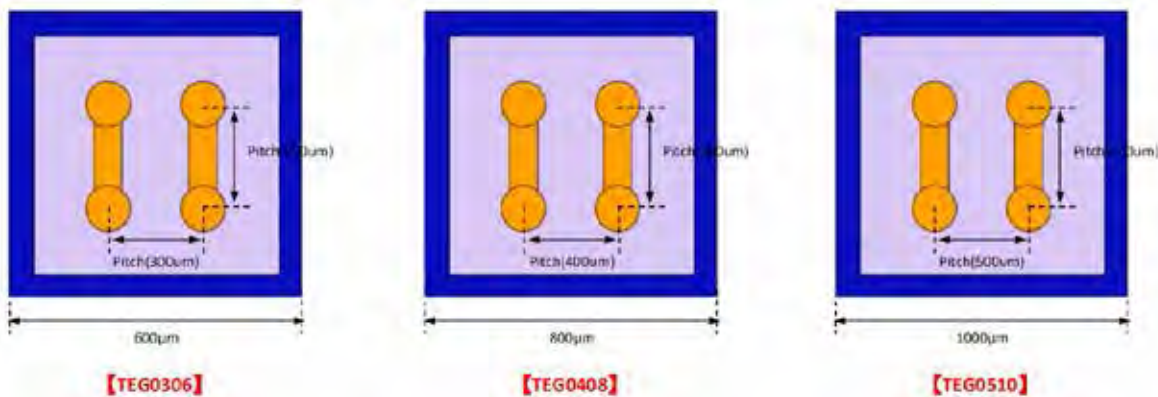
WLP TEG (0.4mm pitch & 0.3mm pitch)



WLP TEG	0.4mm pitch BGA	0.3mm pitch BGA
Wafer Size	8 inch	8 inch
Wafer Thickness	400±20µm	400±20µm
Chip Size	6.0mm ■	6.0mm ■
BGA pitch	400µm	300µm
Function	Daisy Chain	Daisy Chain
Electrode	Ball Mounted Solder Bump	Ball Mounted Solder Bump
Pad Size	(φ227µm)	(φ177µm)
Line width	25µm	20µm
Number of Pin	144 pins/chip	264 pins/chip
Number of Chip	712 chips/wafer	712 chips/wafer

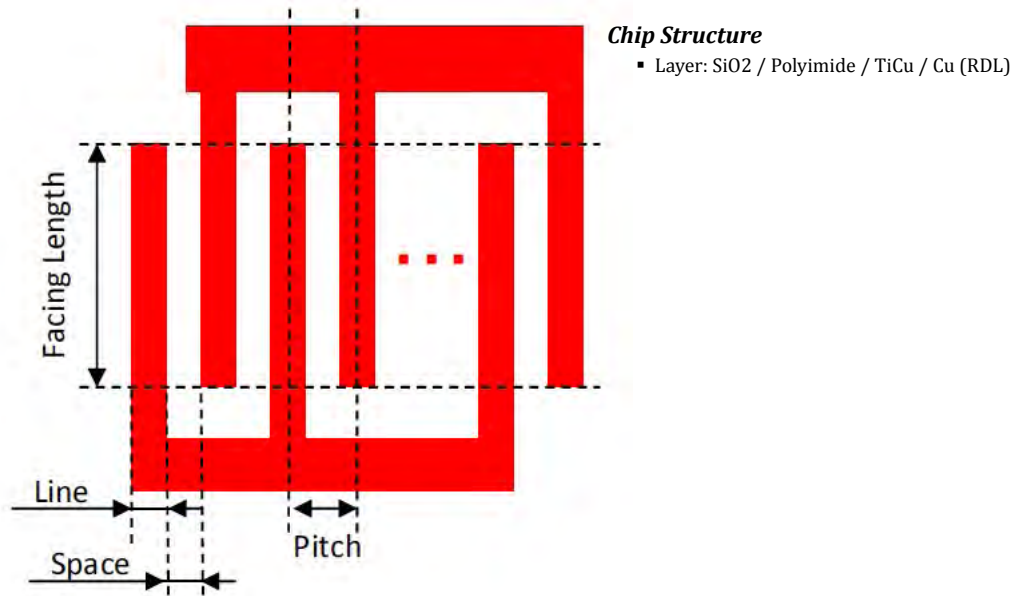
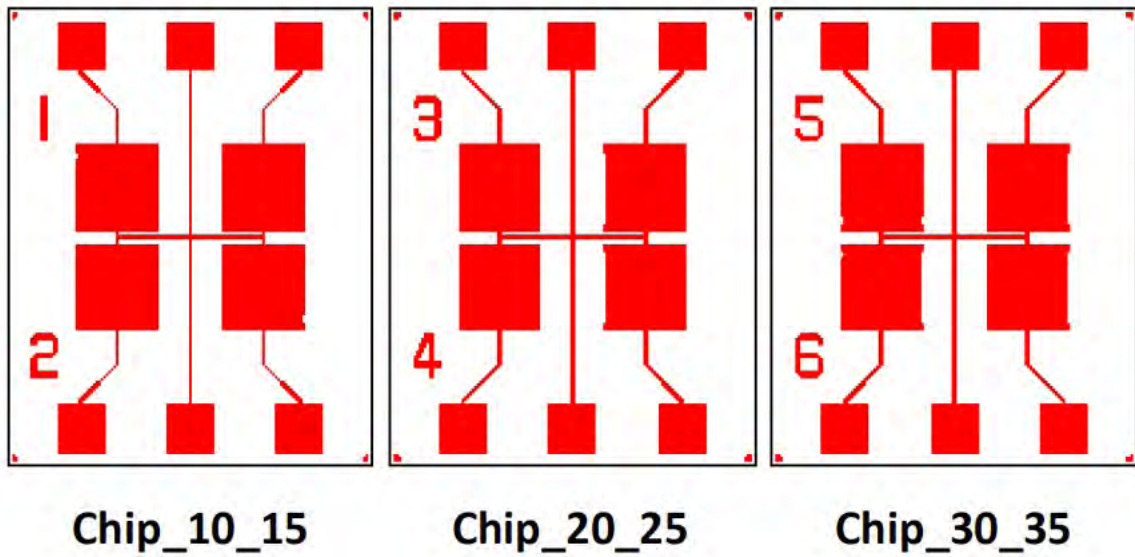
■ Bottom Side

WLP TEG (Free Size Cut TEG: TEG0306, TEG0408, TEG0510)



Free Size Cut TEG	TEG0306	TEG0408	TEG0510
Wafer Size	8 inch	8 inch	8 inch
Wafer Thickness	400µm(or more)	400µm(or more)	400µm(or more)
Cut Size (Scribe Line Included)	Min 600µm×600µm	800µm×800µm	1000µm×1000µm
Pad Pitch	300µm	400µm	500µm
Function	Daisy Chain	Daisy Chain	Daisy Chain
Electrode	Ball Mounted Solder Bump	Ball Mounted Solder Bump	Ball Mounted Solder Bump
Post Size	175µm	200µm	250µm
Number of Chip	79,257 chips/wafer	44,161 chips/wafer	28,212 chips/wafer

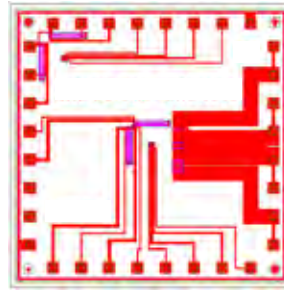
ME0102JY (for Migration Test)



Specifications

Wafer Size	12 inch					
Chip Size	20mm×25mm					
Chip Name	Chip_10_15	Chip_20_25	Chip_30_35			
Metal Height	5.5μm					
Facing Length	3mm					
Line/Space	15μm/10μm	15μm/15μm	15μm/20μm	15μm/25μm	15μm/30μm	15μm/35μm
Pitch	25μm	30μm	35μm	40μm	45μm	50μm
Number of Chip	34 chips/wafer	40 chips/wafer	34 chips/wafer			

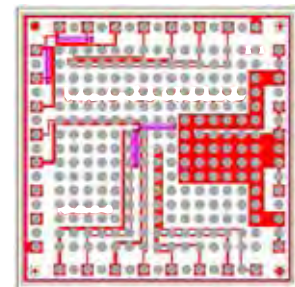
Specifications	
Wafer Size	6inch(OrientationFlat)
Wafer Thickness	550±25µm
Chip Size	3.0mm ■
Pad Pitch	300µm
Function	Stress Analysis by Piezoresistance Thermal Analysis by Diode Heat Generation by Resistance
Electrode	Al pad Cu Pillar Bump Solder Bump Au Bump
Pad Size	120µm ■
Passivation Opening	70µm (Octagon)
Polyimide Opening	φ90µm
Scribe Line Width	80µm
Number of Pad	32pads
<Option>	Back Side Metallization



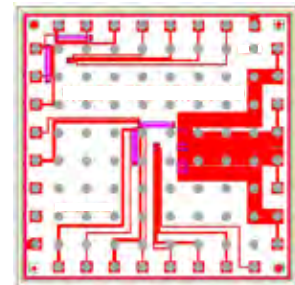
■ Bottom Side

STACTEG-150FA-0101JY & STACTEG-300FA-0101JY

Specifications	STACTEG-150FA	STACTEG-300FA
Base Wafer	STAC-0101JY	STAC-0101JY
Electrode	Ni + SnAg Bump	Cu Pillar Bump
Bump Pitch	150µm	300µm
Bump Size	φ110µm	φ110µm
Bump Height	Ni5µm+SnAg75µm	Cu50µm+SnAg10µm
Passivation Opening	70µm (Octagon)	70µm (Octagon)
Polyimide Opening	φ90µm	φ90µm
Number of Pad	32 pads	32 pads
Number of Bump	32 bumps + 253 Dummy bumps	32 bumps + 64 Dummy bumps
<Option>	Back Side Metallization	Back Side Metallization



[STACTEG-150FA]

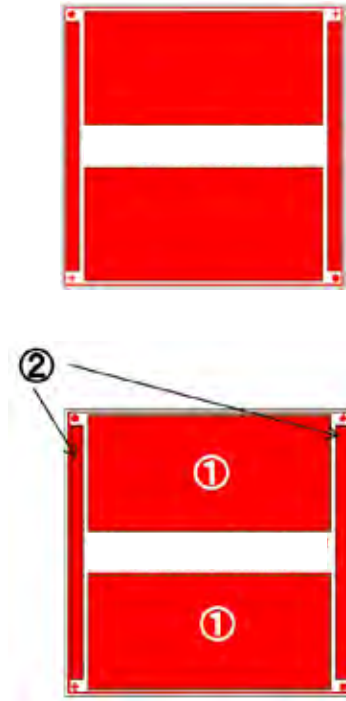


[STACTEG-300FA]

PWB0101JY

Specifications	TYPE-A	TYPE-B
Wafer Size	6 inch	6 inch
Wafer Thickness	625±25µm	625±25µm
Chip Size	6.0mm ■	6.0mm ■
Metal Thickness	Al-Si 3µm	Al-Si 4.5µm
Function	BondabilityCheck	BondabilityCheck
Pad config	Plane	Plane
Pad Size	① 5060µm × 2420µm	① 5060µm × 2420µm
	② 270µm 5300µm	② 270µm × 5300µm
Passivation opening	① 5040µm × 2400µm	① 5040µm × 400µm
	② 250µm × 5280µm	② 250µm × 5280µm
Scribe width	100µm	100µm

■ Bottom Side



HPW-0101JY

Specifications	
Wafer Size	8inch (Notch)
Wafer Thickness	725±25µm
Chip Size	3.0mm ■
Pad Pitch	300µm
Function	Thermal Analysis by Diode Heat Generation by Resistance
Electrode	Al pad
	Cu Pillar Bump
	Solder Bump
	Au Bump
Pad Size	120µm ■
Passivation Opening	70µm (Octagon)
Polyimide Opening	φ90µm
Scribe Line Width	80µm
Number of Pad	32pads
Maximum Output	Max. 14.5W/Chip
<Option>	Back Side Metallization

■ Bottom Side



Chip Structure

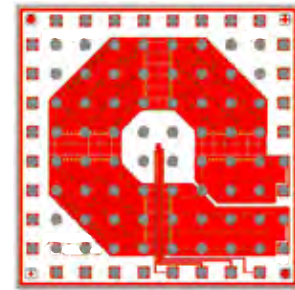
- Base Layer: SiO₂
- Metal layer: Al-1.0%Si
- Passivation Layer: P-SiN

HPWTEG-150FA-0101JY & HPWTEG-300FA-0101JY

Specifications	HPWTEG-150FA	HPWTEG-300FA
Base Wafer	HPW-0101JY	HPW-0101JY
Electrode	Ni + SnAg Bump	Cu Pillar Bump
Bump Pitch	150 μ m	300 μ m
Bump Size	ϕ 110 μ m	ϕ 110 μ m
Bump Height	Ni5 μ m+SnAg75 μ m	Cu50 μ m+SnAg10 μ m
Passivation Opening	70 μ m (Octagon)	70 μ m (Octagon)
Polyimide Opening	ϕ 90 μ m	ϕ 90 μ m
Number of Pad	32 pads	32 pads
Number of Bump	32 bumps + 253 Dummy bumps	32 bumps + 64 Dummy bumps
<Option>	Back Side Metallization	Back Side Metallization



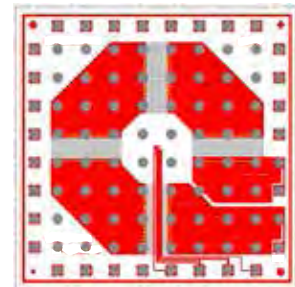
【HPWTEG-150FA】



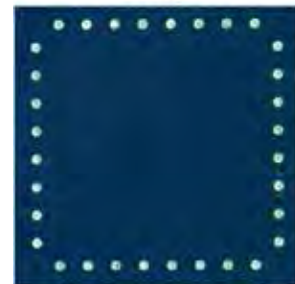
【HPWTEG-300FA】

HPWTSV-0101JY

Specifications		
Base Wafer	HPW-0101JY (SiN)	
Wafer Thickness	100 μ m	
Top Side	Electrode	Cu Pillar Bump
	Number of Bump	32 bumps + 64 Dummy bumps
	Bump Size	ϕ 100 μ m
	Bump Pitch	300 μ m
	Bump Height	Cu50 μ m+SnAg10 μ m
TSV	Top Coat Layer	Passivation (P-SiN)
	Via Size	ϕ 90 μ m
	Electrode	Electroless Ni/Au plating
	Number of Bump	32 bumps
	Bump Size	ϕ 100 μ m
BottomSide	Bump Pitch	300 μ m
	Bump Height	8 μ m
	Top Coat Layer	P-TEOS



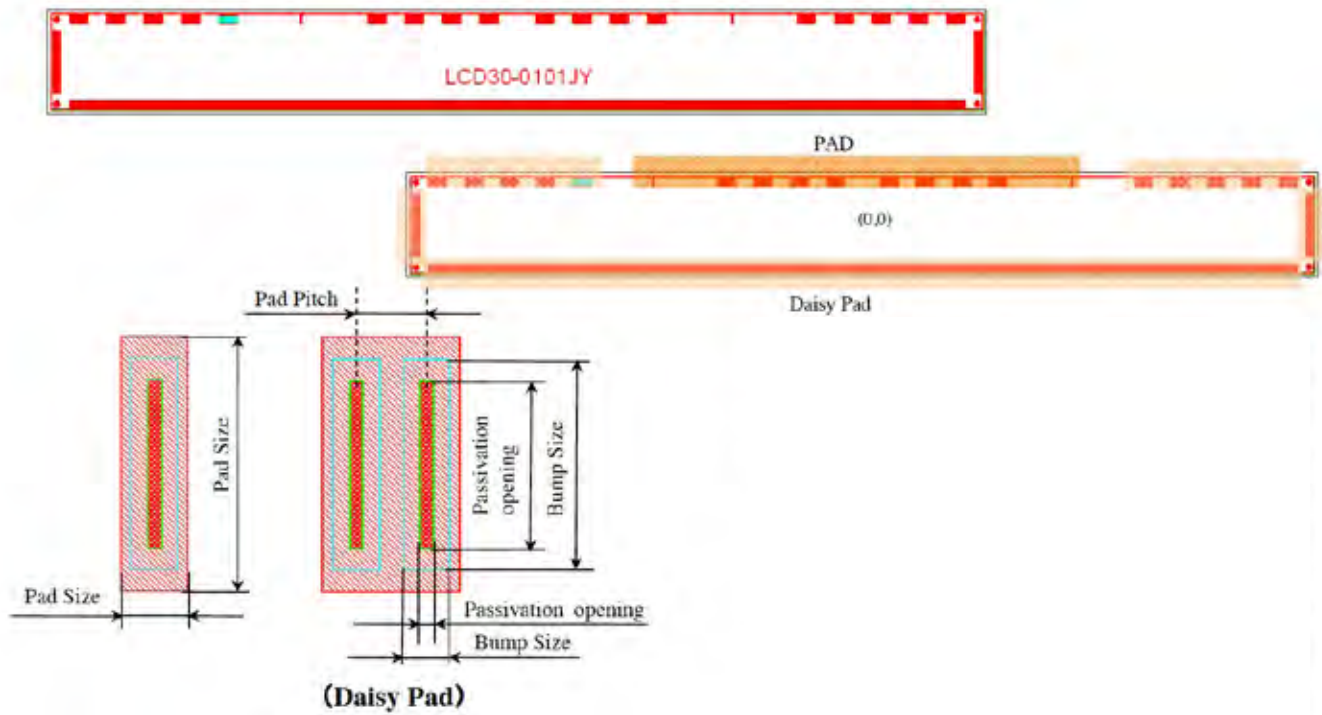
Top Side



Bottom Side



LCD30-0101JY



Specifications

Wafer Size	6 inch
Chip Size	15.1mm×1.6mm
Pad pitch	30μm
Function	Daisy Chain
Pad config	Peripheral
Bump material(process)	Gold(plating) , Cu
Pad Size	28μm×120μm
Passivation opening	6μm×80μm
UBM Size	20μm×100μm
Bump Size	20μm×100μm
Scribe width	100μm
Number of Pad	726 pad/chip
Number of Chip	530 chip/wafer

Chip Structure

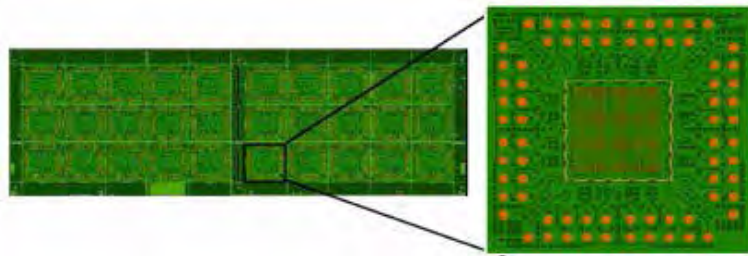
- Base Layer: P-TEOS*
- Metal layer: TiW/ Al-1.0%Si-0.5%Cu
- Passivation Layer: P-TEOS* / P-SiN

*TEOS: Tetraethoxysilane

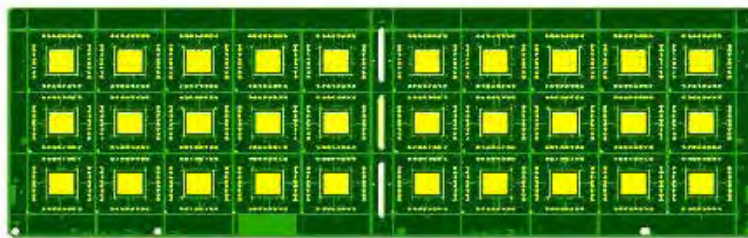
Advanced Wafer Technology Substrates

Part Description	W-Kit-MB50-0102	W-Kit-CC80-0104	W-Kit-FC150P-10	W-Kit-FC200P-10
Specifications			1x1	1x1
Structure	1-2-1 Build Up Substrate	1-2-1 Build Up Substrate	Rigid Substrate (both)	Rigid Substrate (both)
Layer Structure	Layer 1 Signal Layer (no via) Layer 2 ~ Layer 4 Mesh	Layer 1,2 Signal Layer (Via) Layer 3, 4 Mesh		
Outline	17.0mm x 17.0mm x (0.96mmt)	187.5mm x 64.0mm x (0.36mmt)	30.0mm x 30.0mm x (0.96mmt)	30.0mm x 30.0mm x (0.86mmt)
Core Material	Core: E-679FGR Build Layer: ABF-GX13	Core: E-679FGBS Build Layer: ABF-GX92	Core: E-679FGR Build Layer: ABF-GX92	Core: E-679FGR
Solder Resist Material	PSR4000 AUS-703	PSR4000 AUS-703	PSR4000 AUS-703	PSR4000 AUS-703
Function	Daisy Chain	Daisy Chain	Daisy Chain	Daisy Chain
Land Size			Φ0.12μm	Φ0.14μm
Lead Min L/S	20μm/30μm	32μm/48μm		
Number of Lead	536 lead	Peripheral: 648 lead Full Area: 400 leads	3,721 (61x61)	2,116 (46x46)
Pad Dimensions	Φ0.8μm (SR opening: Φ0.65μm)	Φ0.75μm (SR opening: Φ0.67μm)	SR opening: Φ0.80μm	SR opening: Φ0.95μm
Number of Pads	32 Pads	72 Pads	24 Pads	24 Pads
Daisy Chain			Center Area 16x15 Matrix Corner Area 15x15 four Matrix	Center Area 12x12 Matrix Corner Area 12x11 four Matrix
Surface Spec of Electrode	Electroless Ni/Au plating	Cu Cu+OSP Electroless Ni/Au plating	Electroless Ni/Au plating Cu+OSP (Option Solder Coat) Cu	Electroless Ni/Au plating Cu+OSP (Option Solder Coat) Cu

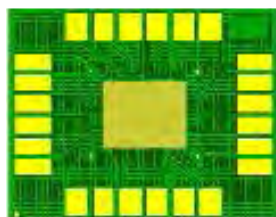
** Call Practical for custom and option kit substrate options



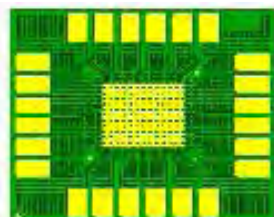
CC80 [Map]



MAP_NCR 2Block in a Sheet (3x5x2Block)



FC150 1x1



FC200 1x1

CTReels

Empty Carrier Tape Reels

When only the physical characteristics of the tape matter, we offer empty carrier tape reels in a variety of widths and pitches. Empty carrier tape reels are plastic embossed or paper carrier tape with sealed cover tape to simulate running parts without the cost and mess during feeder applications. CTReels are a cost saving alternative compared to actual parts on tape.

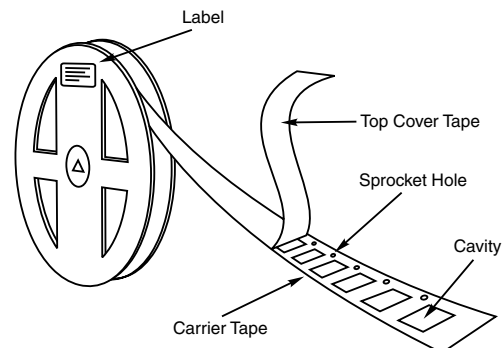
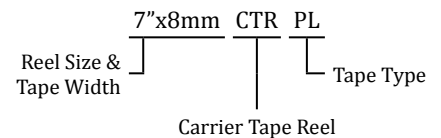
Empty Carrier Tape Reels

Part Description	Reel Size	Tape Width	Tape Pitch	Standard Pocket	Pockets Per Reel	Tape Type
7"x8mm-CTR-PA	7"	8mm	2mm	0402SMR	10,000	Paper
			4mm	0805SMR	5,000	Paper
7"x8mm-CTR-PL	7"	8mm	2mm	0402SMR	10,000	Plastic
			4mm	0805SMR	5,000	Plastic
7"x12mm-CTR-PL	7"	12mm	8mm	1812SMC	1,000	Paper
7"x16mm-CTR-PL	7"	16mm	12mm	SO16-7.6mm	500	Plastic
13"x8mm-CTR-PA	13"	8mm	4mm	0805SMR	10,000	Paper
13"x8mm-CTR-PL	13"	8mm	4mm	0805SMR	10,000	Plastic
13"x12mm-CTR-PL	13mm	12mm	8mm	SO8-3.8mm	2,500	Plastic
			12mm	SO14-3.8mm	2,500	Plastic
13"x16mm-CTR-PL	13"	16mm	12mm	SO16-7.6mm	1,000	Plastic
			12mm	SO20-7.6mm	1,000	Plastic
			16mm	PLCC28	750	Plastic
			20mm	LQFP-12mm	750	Plastic
			24mm	PBGA-13mm	500	Plastic
13"x32mm-CTR-PL	13"	32mm	12mm	T1-TSOP32	1,000	Plastic
			16mm	T1-TSOP32	1,000	Plastic
			24mm	PLCC44	750	Plastic
			16mm	T11-TSOP54	500	Plastic
			20mm	TBA	1,000	Plastic
13"x44mm-CTR-PL	13"	44mm	24mm	LQFP-20mm	750	Plastic
			32mm	PBGA-23mm	250	Plastic
			36mm	TBA	250	Plastic
			40mm	TBA	200	Plastic
			40mm	PBGA-35mm	250	Plastic
13"x56mm-CTR-PL	13"	56mm	44mm	QFP-32mm	250	Plastic
			44mm	TBA	300	Plastic
13"x72mm-CTR-PL	13"	72mm	24mm	TBA	300	Plastic

Notes

- Taped to EIA 481 standards.
- Plastic (PL) carrier tape is standard. Paper (PA) carrier tape is special order.
- Reels come standard with Heat Seal Cover Tape.
- PSA available upon request (pressure sensitive adhesive).
- 10-100g peel back pressure for 8mm carrier tapes.
- 10-130g peel back pressure for 12-56mm carrier tapes.
- 10-150g peel back pressure for 72mm carrier tapes.
- Additional pocket types available upon request.
- Additional widths and pitches may be available, call for details.

Part Description System



Tape and Reel Specifications

Part Description	Tape Width	Tape Pitch	Reel Size	Qty Per Reel
01005SMR-PA	8mm	2mm	7"	20,000
0201SMR-PA	8mm	2mm	7"	15,000
0402SMR-PA	8mm	2mm	7"	10,000
0603SMR-PA	8mm	4mm	7"	5,000
0805SMR-PA	8mm	4mm	7"	5,000
1206SMR-PA	8mm	4mm	7"	5,000
1210SMR-PA	8mm	4mm	7"	5,000
0201SMC-PA	8mm	2mm	7"	15,000
0402SMC-PA	8mm	2mm	7"	10,000
0603SMC-PA	8mm	4mm	7"	4,000
0805SMC-PA	8mm	4mm	7"	4,000
1206SMC-PA	8mm	4mm	7"	4,000
0805SMC-PL	8mm	4mm	7"	4,000
1206SMC-PL	8mm	4mm	7"	3,000
1210SMC-PL	8mm	4mm	7"	3,000
1812SMC-PL	12mm	8mm	7"	1,000
1825SMC-PL	12mm	8mm	7"	1,000
3mm-SME-PL	12mm	8mm	13"	2,000
4mm-SME-PL	12mm	8mm	13"	2000
5mm-SME-PL	12mm	12mm	13"	1,000
6.3mm-SME-PL	16mm	12mm	13"	1,000
8mm-SME-PL	16mm	12mm	13"	1,000
10mm-SME-PL	24mm	16mm	13"	500
18mm-SME-PL	44mm	32mm	13"	125
3216SMTA-PL	8mm	4mm	7"	2,000
3528SMTA-PL	8mm	4mm	7"	2,000
6032SMTA-PL	12mm	8mm	7"	500
7343SMTA-PL	12mm	8mm	7"	500
SC90-TR (supermini)	8mm	4mm	7"	3,000
SOT323-TR	8mm	4mm	7"	3,000
SOT353-TR	8mm	4mm	7"	3,000
SOT363-TR	8mm	4mm	7"	3,000
SOT23-TR	8mm	4mm	7"	3,000
SOT25-TR	8mm	4mm	7"	3,000
SOT26-TR	8mm	4mm	7"	3,000
SOT143-TR	8mm	4mm	7"	3,000
SOT89-TR	12mm	8mm	7"	1,000
SOT223-TR	12mm	8mm	7"	1,000
DPAK-TR	16mm	8mm	13"	2,500
D2PAK-TR	24mm	12mm	13"	800/1,000
SO8GTR-3.8mm	12mm	8mm	13"	2,500
SO14GTR-3.8mm	16mm	8mm	13"	2,500
SO16GTR-3.8mm	16mm	8mm	13"	2,500
SO16GTR-7.6mm	16mm	12mm	13"	1,000
SO20GTR-7.6mm	24mm	12mm	13"	1,000
SO28GTR-7.6mm	24mm	12mm	13"	1,000
SO28JTR-7.6mm	24mm	12mm	13"	1,000
SSOP14TR-5.3mm	16mm	12mm	13"	1,000
SSOP16TR-5.3mm	16mm	12mm	13"	1,000
SSOP20TR-5.3mm	16mm	12mm	13"	1,000
SSOP24TR-5.3mm	16mm	12mm	13"	1,000
SSOP28TR-5.3mm	16/24mm	12mm	13"	1,000
SSOP48TR-7.6mm	32mm	12/16mm	13"	1,000
SSOP56TR-7.6mm	32mm	12/16mm	13"	500

Part Description	Tape Width	Tape Pitch	Reel Size	Qty Per Reel
TSSOP8TR-3.0mm	12mm	8mm	13"	2,500
TSSOP8TR-4.4mm	12/16mm	8mm	13"	1,000/2,500
TSSOP10TR-3.0mm	12mm	8mm	13"	2,500
TSSOP14TR-4.4mm	12/16mm	8mm	13"	1,000/2,500
TSSOP16TR-4.4mm	12/16mm	8mm	13"	1,000/2,500
TSSOP20TR-4.4mm	16mm	8/12mm	13"	1,000/2,500
TSSOP24TR-4.4mm	16mm	8/12mm	13"	1,000/2,500
TSSOP28TR-4.4mm	16mm	8/12mm	13"	1,000
TSSOP32TR-6.1mm	24mm	12mm	13"	1,000
TSSOP44TR-4.4mm	24mm	12mm	13"	1,000
TSSOP48TR-6.1mm	24mm	12mm	13"	1,000
TSSOP56TR-4.4mm	24mm	12mm	13"	1,000
TSSOP56TR-6.1mm	24mm	12mm	13"	1,000
T1-TSOP28-8.1x11.8mm-.55mm	24mm	12mm	13"	1,000
T1-TSOP32-8x18.4mm-.5mm	32mm	12/16mm	13"	1,000
T1-TSOP48-12x18.4mm-.5mm	32mm	16mm	13"	1,000
T11-TSOP32-10.16x20.95mm-1.27mm	32mm	16mm	13"	1,000
T11-TSOP54-10.16x22.22mm-.8mm	44mm	16mm	13"	1,000
PLCC20TR	16mm	12mm	13"	1,000
PLCC28TR	24mm	16mm	13"	750
PLCC32TR	24mm	16mm	13"	750
PLCC44TR	32mm	24mm	13"	450
PLCC68TR	44mm	32mm	13"	230/250
PLCC84TR	44mm	36mm	13"	250
QFP-10mm sq.	24mm	24mm	13"	500
QFP-14mm sq.	32mm	24mm	13"	350
QFP-14x20mm	44mm	32mm	13"	500
QFP-28mm sq.	44mm	40mm	13"	200
QFP-32mm sq.	56mm	44mm	13"	200
LQFP/TQFP- 5mm sq.	16mm	12mm	13"	1,000
LQFP/TQFP- 7mm sq.	16mm	12mm	13"	1,000
LQFP/TQFP- 10mm sq.	24mm	16/24mm	13"	1,000
LQFP/TQFP- 12mm sq.	24mm	20/24mm	13"	1,000
LQFP/TQFP- 14mm sq.	32mm	24mm	13"	750
LQFP/TQFP- 14x20mm	44mm	32mm	13"	500
LQFP/TQFP- 20mm sq.	44mm	24mm	13"	500
LQFP/TQFP- 24mm sq.	44mm	32mm	13"	500
PBGA-13mm sq.	24mm	24mm	13"	500
PBGA-15mm sq.	24mm	24mm	13"	500
PBGA-17mm sq.	24mm	24mm	13"	500
PBGA-23mm sq.	44mm	32mm	13"	250
PBGA-27mm sq.	44mm	32mm	13"	250
PBGA-35mm sq.	56mm	40mm	13"	250
CTBGA/CABGA-5mm sq.	12mm	8mm	13"	1,000
CTBGA/CABGA-6mm sq.	16mm	8mm	13"	1,000
CTBGA/CABGA-7mm sq.	16mm	12mm	13"	1,000
CTBGA/CABGA-8mm sq.	16mm	12mm	13"	1,000
CTBGA/CABGA-9mm sq.	16mm	12mm	13"	1,000
CTBGA/CABGA-10mm sq.	24mm	12mm	13"	1,000
CTBGA/CABGA-11mm sq.	24mm	16mm	13"	1,000
CTBGA/CABGA-12mm sq.	24mm	16mm	13"	1,000
CTBGA/CABGA-14mm sq.	24mm	24mm	13"	500
CTBGA/CABGA-17mm sq.	24mm	24mm	13"	500

PDIP

Plastic Dual In-Line Package

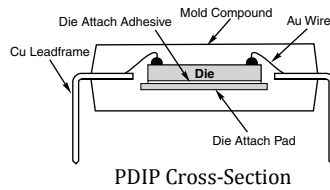
Plastic Dual In-Line Packages (PDIP) are long-established industry standard through-hole packages.

PDIP Plastic Dual In-Line Package

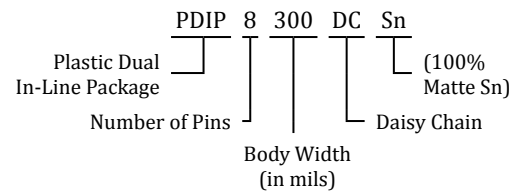
Part Description	Number of Pins	Body Size (L)	Body Size (W)	Quantity Per Tube
PDIP8-300	8	.360"	.300"	50
PDIP14-300	14	.750"	.300"	25
PDIP16-300	16	.750"	.300"	25
PDIP18-300	18	.900"	.300"	21
PDIP20-300	20	1.030"	.300"	18
PDIP24-300	24	1.250"	.300"	15

Notes

- High conductivity copper leadframe.
- JEDEC standard compliant.
- Parts packaged in anti-static 20" tubes.
- Pitch is 100 mils.
- Lead-free available with 100% Sn Matte alloy.
- Eutectic solder plating finish is 85% Sn/15% Pb.
- Daisy chained parts available.



Part Description System



For kits see pages 97, 99, 100, 101, 106, 108, 116 & 117.



Through-Hole Glass Diodes

Axial Leaded Through-hole Glass Diode package has been in use for over 50 years in the electronics industry. The body of these parts are glass and the package is hermetically sealed. The "DO" prefix is a JEDEC designation for through-hole diodes. The 34 and 35 references

case size. These type of components are packaged on ammo pack or bulk. In most cases, these parts are sold as training aids to teach new operators how to solder.

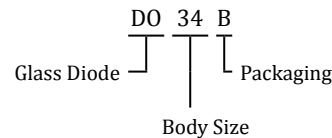
Axial Leaded Through-Hole Glass Diode

Part Description	References (JEDEC)	(EIAJ)	Case Size (Inch)	Case Size (mm)	Lead Diameter
DO-34	DO-34		0.0629"x0.1197"	1.6x3.04mm	.55mm
DO-35	DO-35	SC-40	0.0728"x0.1673"	1.85x4.25mm	.56mm

Notes

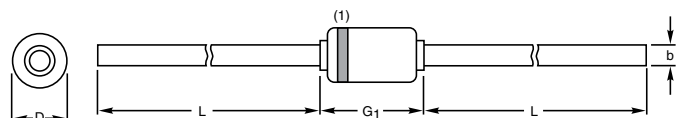
- Part is hermetically sealed glass package.
- Axial leaded (2 leads).
- Parts are packaged Ammo pack (5K per reel) or bulk.
- Lead-free available with 100% Sn alloy.

Part Description System



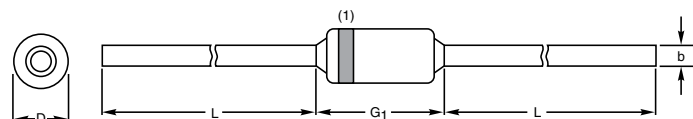
DO-34

Unit	b Max	D Max	G1Max	L Min
mm	0.55	1.6	3.04	25.4



DO-35

Unit	b Max	D Max	G1Max	L Min
mm	0.56	1.85	4.25	25.4



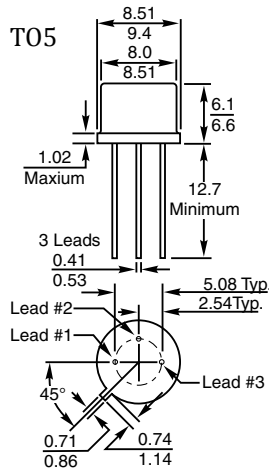
TO type components are through-hole transistors. These are basic electronic components developed in the last forty years. There are many additional types of TO components not listed. TO components

come packaged in tubes, bulk, and tape and reel. Not all components types are available in all packaging styles. Please call for availability. Parts are available lead-free with Sn finish.

Through-Hole Transistors

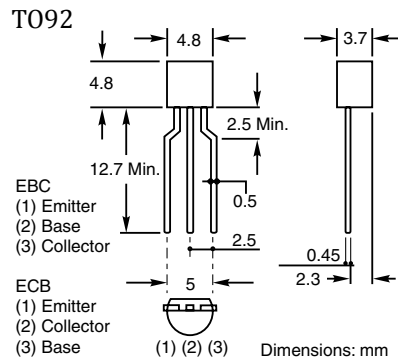
Part Description	Number of Pins	Case Material
TO5-3-B	3	Metal
TO18-3-B	3	Metal

Part Description	Number of Pins	Case Material
TO92-3-B	3	Plastic
TO220-3-B	3	Plastic



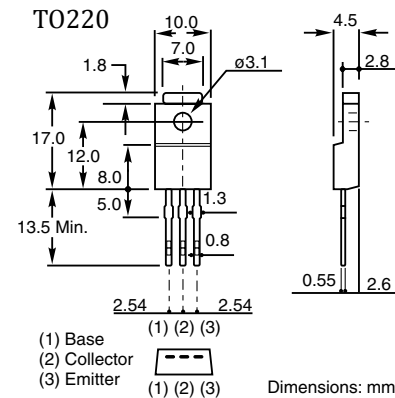
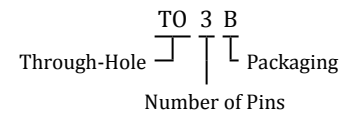
Lead Codes	Pin
1	2 3
SCR C G A	
Transistor E B C	
TRIAC MT1 G MT2	

Dimensions: mm



For kits see pages 98, 99, 100, 101, 116 & 117.

Part Description System



Axial Leaded Resistors

Axial Leaded Resistors are through-hole mounted components.

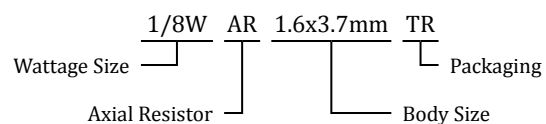
Axial Leaded Resistors

Part Description	Type	Dimensions L (mm)	Dimensions C (mm)	Dimensions D (mm)	Dimensions I (mm)	Dimensions d (mm)
1/8W-AR-1.6x3.7mm	CF 1/8	3.00 ± 0.1	3.5 Max	1.70 ± 0.2	28.0 ± 3.0	0.45 ± 0.05
1/4W-AR-2.3x6.5mm	CF 1/4	6.35 ± 0.5	7.1 Max	2.30 ± 0.3	28.0 ± 3.0	0.60 ± 0.05
1/2W-AR-3.5x9.5mm	CF 1/2	8.51 ± 0.5	9.52 Max	3.00 ± 0.3	28.0 ± 3.0	0.60 ± 0.05

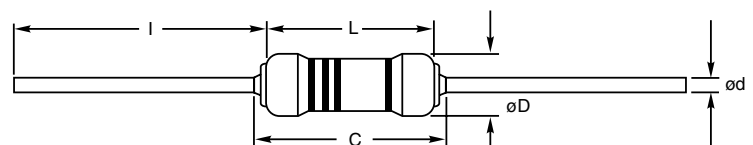
Notes

- Parts are conformal coated resistors—carbon film type.
- Parts are available in bulk, tape and reel or ammo pack.
- Lead-Free and Zero-Ohm value parts available

Part Description System



For kits see pages 98, 99, 100, 101, 116 & 117.



SMT

Lead-Free Surface Mount Transistors

SOT package is a rectangular surface mount transistor diode with three or more gull-wing leads. The leads are on the two length sides of the package. SOT packages are JEDEC compliant. Popular sizes are the SOT23, DPAK, SOT223 and SOT89.

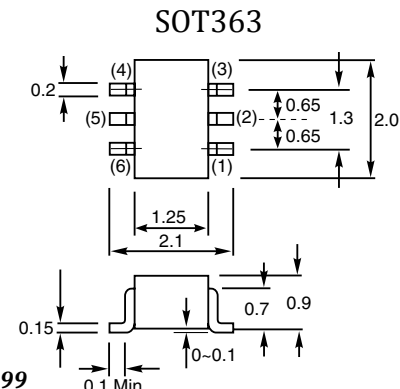
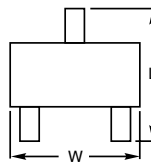
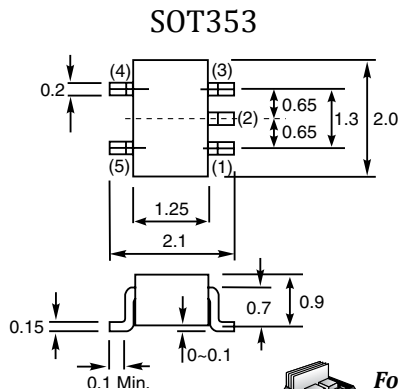
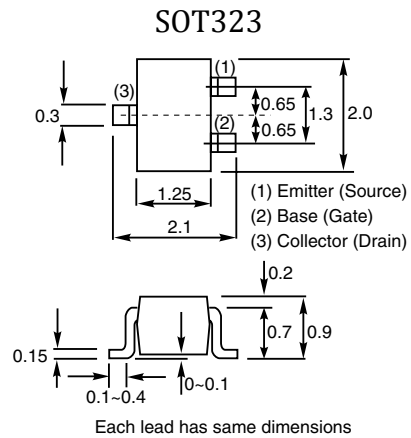
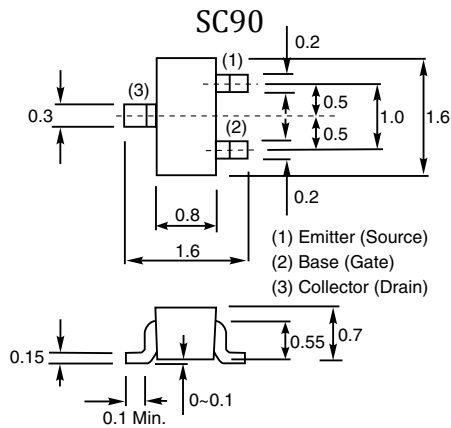
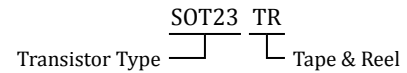
SMT Surface Mount Transistors

Part Description	Number of Pins	Body Size (W)	Body Size (L)	SC Device	Tape Width	Tape Pitch	Quantity Per Reel
SC90-TR-Sn	3	1.6mm	1.6mm	SC-75A	8mm	4mm	3,000
SOT323-TR-Sn	3	2.0mm	2.1mm	SC-70	8mm	4mm	3,000
SOT353-TR-Sn	5	2.0mm	2.1mm	SC-88A / SOT325	8mm	4mm	3,000
SOT363-TR-Sn	6	2.0mm	2.1mm	SC-88 / SOT326	8mm	4mm	3,000
SOT23-TR-Sn	3	2.9mm	2.4mm	TO-236AB	8mm	4mm	3,000
SOT25-TR-Sn	5	2.9mm	2.8mm	SC-74A	8mm	4mm	3,000
SOT26-TR-Sn	6	2.9mm	2.8mm	SC-74	8mm	4mm	3,000
SOT143-TR-Sn	4	2.9mm	2.5mm	TO-253AA	8mm	4mm	3,000
SOT89-TR-Sn	3	4.5mm	4.0mm	SC-62 / TO-243AA	12mm	8mm	1,000
SOT223-TR-Sn	3	6.5mm	7.0mm	SC-73 / TO-261AA	12mm	8mm	1,000
DPAK-TR-Sn		6.5mm	9.5mm	AC-63 / TO-252-AA	16mm	8mm	2,500
D2PAK-TR-Sn		10.0mm	15.0mm	TO-263AB	24mm	12mm	800/1,000

Notes

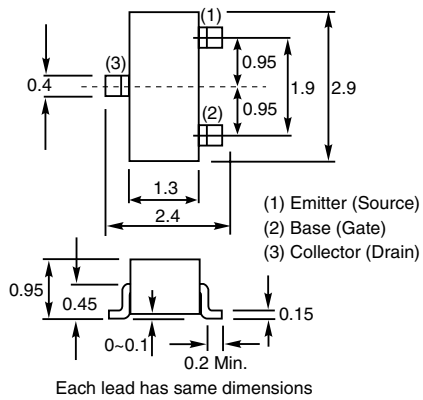
- Carrier pack is plastic for surface mount transistors.
- Tape type is plastic.
- Parts only available on Tape and Reel.
- Tin-Lead solder plating available upon request based on availability.
- Lead-free available with 100% Sn alloy.

Part Description System

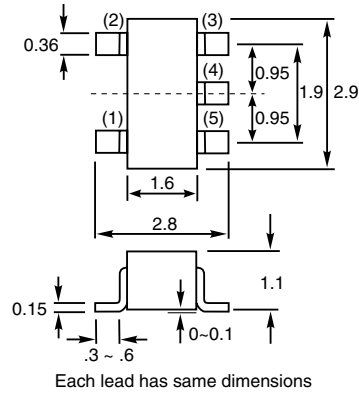


For kits see pages 93, 97, 98, 99
100, 101, 105, 116 & 118.

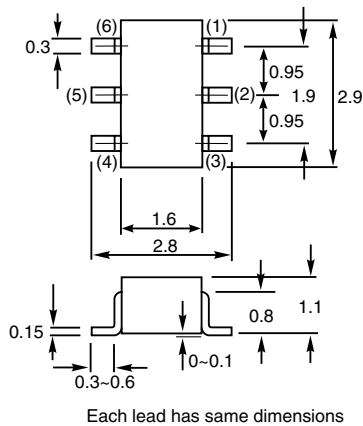
SOT23



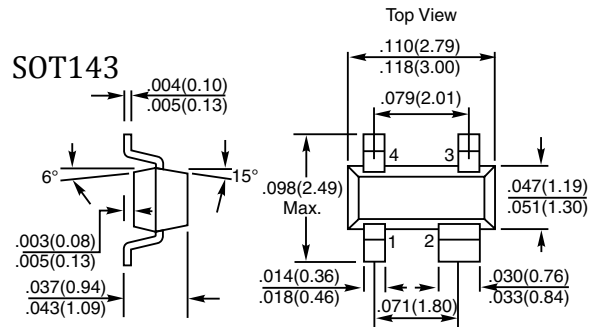
SOT25



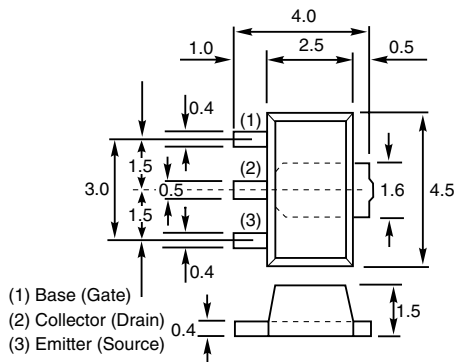
SOT26



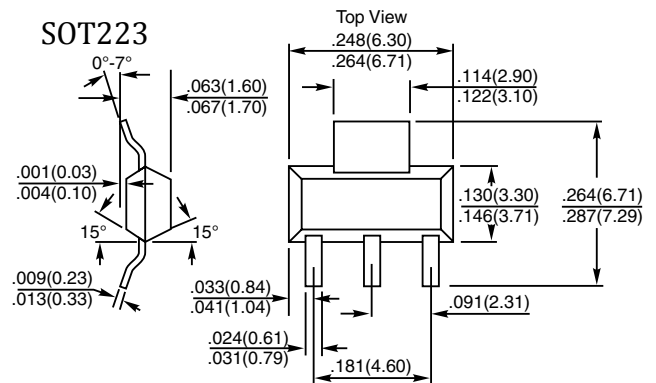
SOT143



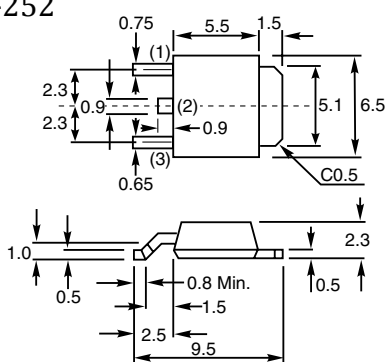
SOT89



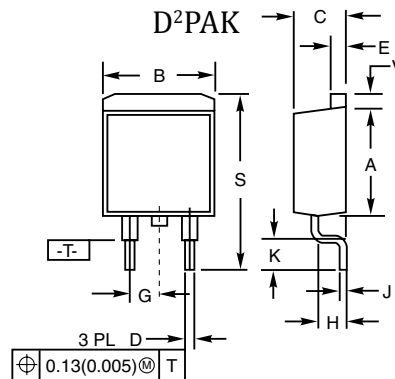
SOT223



DPAK TO-252



D²PAK



Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

Notes

- (1) Dimensioning and tolerancing per ANSI Y14.5M, 1982.
- (2) Controlling Dimension: inch.

SMR

Lead-Free Surface Mount Resistors

Surface Mount Resistors (SMR) are best suited for commercial industrial and automotive applications. Chip Resistors are suitable for a wide range of solder processes, and are ideal for high-speed electronic assembly equipment. Chip Resistor body size range from 01005 to 1210. Seven-inch reels are standard, but eleven

and thirteen-inch reels are available upon special request. Paper carrier tape is standard for Chip Resistors. In addition, Zero-Ohm Chip Resistors have a copper wire internally. This creates a short condition. Zero-Ohm Chip Resistors can be used to check for continuity after soldering.

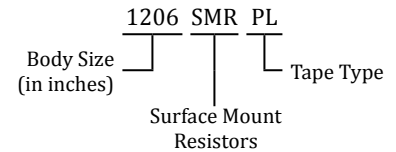
SMR Surface Mount Resistors—Lead-Free

Part Description	Body Size (inch)	Body Size (mm)	Metric	Tape Width	Tape Pitch	Quantity Per Reel
01005SMR-PA-Sn	.01"x.005"	0.4x0.2mm	0402	8mm	2mm	20,000
0201SMR-PA-Sn	.02"x.01"	0.6x0.3mm	0603	8mm	2mm	15,000
0402SMR-PA-Sn	.04"x.02"	1.0x0.5mm	1005	8mm	2mm	10,000
0603SMR-PA-Sn	.06"x.03"	1.6x0.8mm	1608	8mm	4mm	5,000
0805SMR-PA-Sn	.08"x.05"	2.0x1.27mm	2012	8mm	4mm	5,000
1206SMR-PA-Sn	.12"x.06"	3.2x1.6mm	3216	8mm	4mm	5,000
1210SMR-PA-Sn	.12"x.10"	3.2x2.6mm	3225	8mm	4mm	4,000

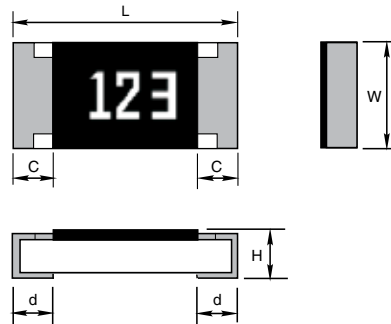
Notes

- Surface mount resistors come packaged on paper carrier tape and 7" reels (larger quantities are available upon request).
- Plastic carrier tape is non-standard for surface mount resistors.
- The numeric section of the part number refers to the physical body size (in inches) of the component. For example: Part number 0402SMR-PA has a body size of .04" length by .02" width.
- Chip resistor arrays are available (call for availability).
- Resistors are now only available standard lead-free with 100% Sn over Ni.

Part Description System



- Tape Type: "PA" = Paper Tape, "PL" = Plastic Tape.



SMR Component Dimensions

Metric	Inch	L	W	H	c	d	* Unit weight/pc.
0402	01005	0.4 +/- 0.02	0.2 +/- 0.02	0.12 +/- 0.02	0.1 +/- 0.03	0.1 +/- 0.03	—
0603	0201	0.6 +/- 0.03	0.3 +/- 0.03	0.23 +/- 0.03	0.1 +/- 0.05	0.15 +/- 0.05	0.16mg
1005	0402	1.0 +/- 0.05	0.5 +/- 0.05	0.35 +/- .05	0.2 +/- 0.1	0.25 + 0.05 - 0.10	0.6mg
1608	0603	1.6 +/- 0.1	0.8 + 0.15 - 0.05	0.45 +/- 0.10	0.3 +/- 0.1	0.3 +/- 0.1	2mg
2012	0805	2.0 +/- 0.1	1.25 +/- 0.10	0.55 +/- 0.10	0.4 +/- 0.2	0.4 +/- 0.2	5mg
3216	1206	3.2 +/- 0.15	1.6 +/- 0.15	0.55 +/- 0.10	0.5 +/- 0.25	0.5 +/- 0.25	9mg
3225	1210	3.2 +/- 0.15	2.5 +/- 0.15	0.55 +/- 0.15	0.5 +/- 0.25	0.5 +/- 0.25	16mg

Unit: mm *Values for reference



For kits see pages 93, 97, 98, 100, 101, 105, 108, 109, 116, 117 & 118.

Lead-Free Surface Mount Ceramic Capacitors

Surface Mount Multilayer Ceramic (SMC) capacitors come in case sizes ranging from 01005 to 2225. The most popular case sizes are listed in the table below. Parts on tape and reel are available on paper tape

or plastic tape. Larger size reels are available upon special request. Practical Components has lead-free PCB test boards available for the 01005 through 1206 case sizes.

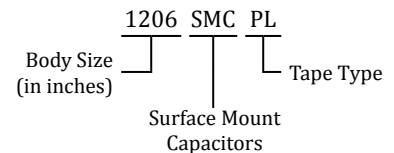
SMC Surface Mount Ceramic Capacitors

Part Description	Body Size (inch)	Body Size (mm)	Tape Width	Tape Pitch	Quantity Per Reel
01005SMC-PA-Sn	.01"x.005"	0.4x0.2mm	8mm	2mm	20,000
0201SMC-PA-Sn	.02"x.01"	0.6x0.3mm	8mm	2mm	15,000
0402SMC-PA-Sn	.04"x.02"	1.0x0.5mm	8mm	2mm	10,000
0603SMC-PA-Sn	.06"x.03"	1.6x0.8mm	8mm	4mm	4,000
0805SMC-PA-Sn	.08"x.05"	2.0x1.27mm	8mm	4mm	4,000
1206SMC-PA-Sn	.12"x.06"	3.2x1.6mm	8mm	4mm	4,000
1210SMC-PA-Sn	.12"x.10"	3.2x2.6mm	8mm	4mm	4,000
1812SMC-PL-Sn	.18"x.12"	4.5x3.2mm	12mm	8mm	1,000/1,100
1825SMC-PL-Sn	.18"x.25"	4.5x6.4mm	12mm	8mm	1,000/1,100

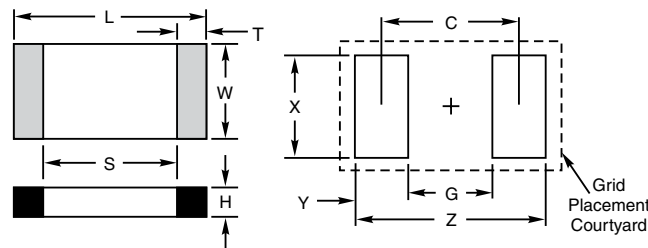
Notes

- Surface mount capacitors come on standard 7" reels (larger quantity reels are available upon request).
- Plastic carrier tape is non-standard for some carrier sizes.
- The numeric section of the part number refers to the physical body size (in inches) of the component. For example: Part number 0805SMC-PL has a body size of .08" length by .05" width.
- Chip capacitor arrays are available. Call for details.
- Capacitors are now only available standard lead-free with 100% Sn over Ni. SnPb is available upon request based on availability.

Part Description System



- Tape Type: PA = Paper Tape, PL = Plastic Tape



For kits see pages 94, 100, 101 & 118.

SMC Component Dimensions

Component Dimensions (mm) (in)	L (mm)		S (mm)		W (mm)		T (mm)		H (mm)
	Min	Max	Min	Max	Min	Max	Min	Max	Max
0603 (0201)	0.57	0.63	—	—	0.27	0.33	—	—	0.33
1005 (0402)	0.90	1.10	0.30	0.65	0.40	0.60	0.10	0.30	0.60
1608 (0603)	1.45	1.75	0.45	0.97	0.65	0.95	0.20	0.50	0.85
2012 (0805)	1.80	2.20	0.30	1.11	1.05	1.45	0.25	0.75	1.10
3216 (1206)	3.00	3.40	1.50	2.31	1.40	1.80	0.25	0.75	1.35
3225 (1210)	3.00	3.40	1.50	2.31	2.30	2.70	0.25	0.75	1.35
4532 (1812)	4.20	4.80	2.30	3.46	3.00	3.40	0.25	0.95	1.35

SMC Land Pattern Dimensions

Component Identifier (mm) (in)	Z (mm)	G (mm)	X (mm)	Y (mm) Ref	C (mm) Ref	Placement Grid (No. of Grid Elements)
0603 (0201)	0.72	0.26	0.32	0.23	0.49	—
1005 (0402)	2.20	0.40	0.70	0.90	1.40	2 x 6
1608 (0603)	2.80	0.60	1.00	1.10	1.70	4 x 6
2012 (0805)	3.20	0.60	1.50	1.30	1.90	4 x 8
3216 (1206)	4.40	1.20	1.80	1.60	2.80	4 x 10
3225 (1210)	4.40	1.20	2.70	1.60	2.80	6 x 10
4532 (1812)	5.80	2.00	3.40	1.60	3.90	8 x 12



Practical is pleased to offer NEW Ceramic Chip Pad components on tape and reel to help verify the contrasts of vision systems for pick and place machine evaluation. These Ceramic slugs are white ceramic with 90 degree laser cut edges in addition there are no terminations on either side of the components. Dimensions for each chip are 2.0mm x2.0mm x0.5mm. Chip material is Ceramic Rubalit 708 dry pressed. In addition to machine vision evaluation, these ceramic pads are idea for CPK testing amd increasing yield alignment.



Please call your knowledgeable Practical Components technical sales representative for further information.

MELF Resistors Metal Electrode Leadless Face

Metal Electrode Leadless Face (MELF) Resistors are round or cylindrical in shape. They are available in embossed plastic tape on 7" reels. The terminals on MELF resistors are force-fitted steel caps with Sn plated termination. Parts are also available in Zero-Ohm value. Land pattern sizes for MELF resistors are the same as SMD chip resistor.

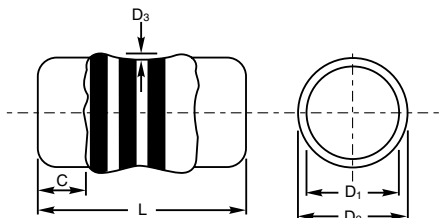
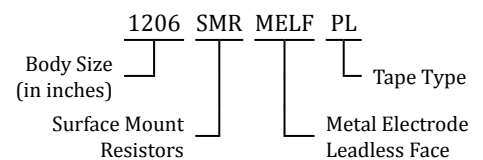
MELF Metal Electrode Leadless Face Component Resistors

Part Description	Body Size (inch)	Body Size (mm)	Tape Width	Tape Pitch	Quantity Per Reel
0805SMR-MELF-PL-Sn	.08"x.05"	2.0x1.27mm	8mm	4mm	3,000
1206SMR-MELF-PL-Sn	.12"x.06"	3.0x1.5mm	8mm	4mm	2,000
1406SMR-MELF-PL-Sn	.14"x.06"	3.56x1.5mm	8mm	4mm	3,000
2309SMR-MELF-PL-Sn	.23"x.09"	5.84x2.29mm	12mm	4mm	1,500

Notes

- MELF is the acronym for Metal Electrode Leadless Face.
- 90/10 solder plated end caps.
- Suitable for reflow and wave soldering.
- Meets or exceeds EIAJ-8009, EIA-PDP-100.
- Tape type is plastic.

Part Description System



Size Code Dimensions

Case Size	L	C Min	D ₁	D ₂ Max	D ₃ Max
0805	2.0±0.1 (0.079±0.004)	0.3 (0.012)	1.25±0.05 (0.049±0.002)	1.35 (0.053)	0.07 (0.003)
1406	3.5±0.2 (0.138±0.008)	0.5 (0.02)	1.45±0.10 (0.057±0.004)	1.55 (0.061)	0.10 (0.004)
1206	3.2±0.2 (0.126±0.008)		1.55±0.15 (0.061±0.006)	1.75 (0.069)	0.10 (0.004)
2309	5.9±0.2 (0.232±0.008)		2.2±0.10 (0.087±0.004)	2.40 (0.094)	0.15 (0.006)

Unit: mm (Inch)

Surface Mount Electrolytic Capacitors

Surface Mount Electrolytic (SME) capacitors are measured according to the diameter of the can mounted on top of the terminations. Sizes range from 3mm to 24mm in diameter. The most popular

sizes are listed below. Please call if different sizes are needed. These components come packaged on plastic embossed carrier tape. Standard reel sizes are 15".

SME Surface Mount Electrolytic Capacitors

Part Description	Body Size	Tape Width	Tape Pitch	Quantity Per Reel
3mm-SME-PL-Sn	3mm	12mm	8mm	2,000
4mm-SME-PL-Sn	4mm	12mm	8mm	2,000
5mm-SME-PL-Sn	5mm	12mm	12mm	1,000
6.3mm-SME-PL-Sn	6.3mm	16mm	12mm	1,000
8mm-SME-PL-Sn	8mm	16mm	12mm	1,000
10mm-SME-PL-Sn	10mm	24mm	16mm	500
18mm-SME-PL-Sn	18mm	44mm	32mm	125

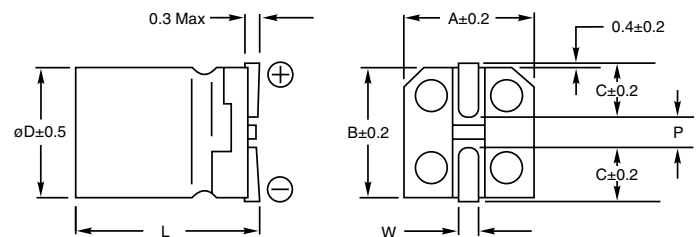
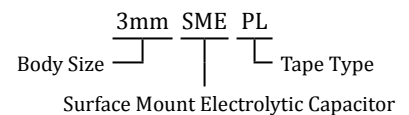
Notes

- Surface mount electrolytic capacitors come standard on 15" reels.
- Components are measured by the diameter of the electrolytic can.
- Lead-free available with 100% Sn.

øD	L	A	B	C	W	P
4	5.3±0.2	4.3	4.3	2.0	0.5±0.8	1.0
5	5.3±0.2	5.3	5.3	2.3	0.5±0.8	1.5
6.3	5.3±0.2	6.6	6.6	2.7	0.5±0.8	2.0
8	6.3±0.3	8.4	8.4	3.4	0.5±0.8	2.3
8	10±0.5	8.4	8.4	3.0	0.7±1.1	3.1
10	10±0.5	10.4	10.4	3.3	0.7±1.1	4.7
18	16.5	19.0	21.0	6.5	1.2±0.3	6.7

Unit: mm

Part Description System



MELF Diodes

Metal Electrode Face Components

Metal Electrode Face Components (MELF) have metallized terminals at each end of a cylindrical body. MELF components are designed to fit the same footprints as flat components i.e., 0805 (.08" x .05") and the 0603 (.06" x .03"). MELF packages are available on plastic tape and reel.

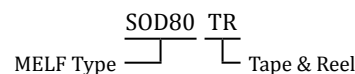
MELF Metal Electrode Face Component Diodes

Part Description	Also Known As	Body Size (mm)	Tape Width	Tape Pitch	Quantity Per Reel
SOD80-TR-Sn	LL-34 or DO-213AA	1.4x3.4mm	8mm	4mm	10,000
SM1-TR-Sn	DO-213AB	2.6x5.0mm	12mm	4mm	5,000

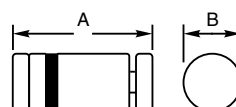
Notes

- MELF Diodes are cylindrical glass or plastic packages with Sn termination for lead-free.

Part Description System



Package	SOD80 (LL34)	SM1 (LL41)
Dimension A	3.4mm	5.0mm
Dimension B	1.5mm	2.8mm



Surface Mount Molded Tantalum Capacitors (SMTA) are polarized capacitors with solderable terminations. Surface Mount Tantalum packages are identified by case size i.e.: A, B, C and D. These case sizes stand for metric footprints of length and width. For example:
 A = 3.2 x 1.6mm; B = 3.5 x 2.8mm; C = 6.0 x 3.2mm; D = 7.3 x 4.3mm.

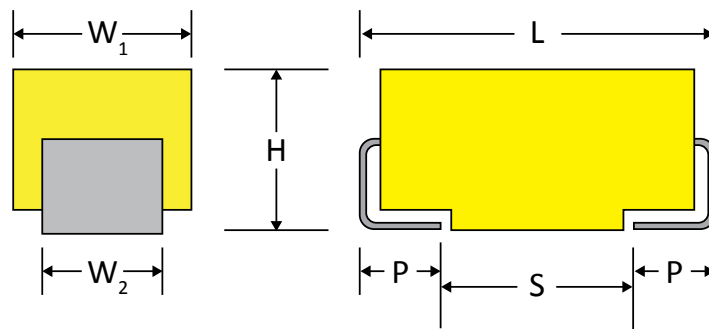
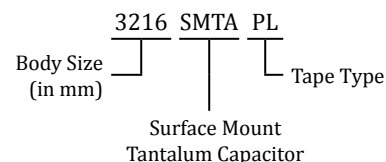
SMTA Surface Mount Tantalum Capacitors

Part Description	Body Size	Case Size	Tape Width	Tape Pitch	Quantity Per Reel
1608SMTA-PL-Sn	1.6x.85mm	R (smaller than A Case)	8mm	4mm	500
3216SMTA-PL-Sn	3.2x1.6mm	A	8mm	4mm	2,000
3528SMTA-PL-Sn	3.5x2.8mm	B	8mm	4mm	2,000
6032SMTA-PL-Sn	6.0x3.2mm	C	12mm	8mm	500/750
7343SMTA-PL-Sn	7.3x4.3mm	D	12mm	8mm	500/750

Notes

- Components are molded, surface mount tantalums.
- Conformal coated tantalums are available.
- Please call for availability of mil-spec surface mount tantalums.
- Standard reel size is 7" (larger sizes are available upon request).
- All tantalum capacitors are on plastic carrier tape.
- Tantalums are now available as standard lead-free with 100% Sn finish.
- SnPb is available upon request based on availability.

Part Description System



Case Size	Case Size	L ±0.2(±0.008)	W1 ±0.2(±0.008)	H ±0.2(±0.008)	W2 ±0.1(±0.004)	P ±0.3(±0.012)	S Min.
A	3216-18	3.2 (.126)	1.6 (.063)	1.6 (.063)	1.2 (.047)	0.8 (.031)	1.10 (0.043)
B	3528-21	3.5 (.138)	2.8 (.110)	1.9 (.075)	2.2 (.087)	.08 (.031)	1.40 (0.055)
C	6032-28	6.0 (.236)	3.2 (.126)	2.6 (.102)	2.2 (.087)	1.3 (.051)	2.90 (0.114)
D	7343-31	7.3 (.287)	4.3 (.169)	2.9 (.114)	2.4 (.094)	1.3 (.051)	4.40 (0.173)



115-1322 Epoxy Kit

This kit contains 10 packages of clear, low viscosity, superior strength epoxy, precisely measured out into two-compartment plastic packages so it's easy to use and there's no measuring.

Once cured, this epoxy makes an effective electrical insulator with good high temperature mechanical and impact resistance properties. The epoxy can be used to fill in holes, gaps, burns or to inject into delaminated locations. The kit also contains mixing sticks, mixing cups and foam swabs.



Applications

- Base Board Repair, Epoxy Method
- Base Board Repair, Edge Transplant Method
- Coating Replacement, Solder Mask
- RoHS Compliant

201-3140 Plated Hole Repair Kit

Here are all the tools and materials you'll need to repair damaged plated through holes in circuit boards.

The kit includes a variety of eyelet sizes, carbide ball mills for drilling, and setting tools to form the eyelets conforming to IPC guidelines. Eyelets are made of pure copper electroplated with solder. Eyelet tooling is hardened steel.

Application Notes

- Plated Hole Repair, No Inner Layer Connection
- Plated Hole Repair, Double Wall Method
- Plated Hole Repair, Inner Layer Connection
- RoHS Compliant



201-2100 Professional Repair Kit

The Professional Repair Kit is the most complete and most versatile circuit board repair kit you'll find anywhere. It's the total package.

The kit includes dry film, epoxy-backed circuit frames, and unique replacement circuits that do not use messy liquid epoxy. Includes eyelets and setting tools for plated through hole repair, Circuit Tracks to repair damaged circuits, epoxy and color agents for solder mask or base board repairs, and a comprehensive manual all packaged in a convenient carrying case.

If you need to repair damaged circuit boards, the all-in-one Professional Kit is what you need.

Applications

- Surface Mount Pad Repair
- BGA Pad Repair
- Land Repair
- Edge Contact Repair
- Conductor Repair
- Plated Hole Repair
- Base Board Repair, Epoxy Method
- Base Board Repair, Edge Transplant Method
- Coating Replacement
- RoHS Compliant



Professional Repair Kit is packaged in an ESD safe carry case

Kit Identifier

Component Part Numbers / Kit Numbers

Kit Part Description	PC000	PC003	PC007	PC008	PC009	PC011	SABER	PC012	PC013	PC014	PC015	PC016-J-STD-F	PC031	WTK-1	PC049	PC052	PC200-12mm	PC200-14mm	PC250-14mm-TMV-DT	PC209	SIR
Component Part Description																					
01005SMR-PL-0	•			•			•													•	
0201SMR-PL																				•	
0201SMR-PL-0	•			•									•		•						•
0402SMC-PL										•						•					
0402SMR-PL-0	•			•			•			•			•		•						•
0603SMC-PL										•	•					•					
0603SMR-PL-0	•	•		•	•		•			•			•		•						•
0805SMC-PL											•					•					
0805SMR-PL-0		•		•	•		•					•	•		•						•
1/2-W-AR-3.5x9.5mm-TR					•				•												
1/4-W-AR-2.3x6.5mm-TR					•				•		•	•	•		•						
1206SMC-PA												•				•					
1206SMR-Melf																					
1206SMR-PA-0		•		•	•		•				•	•	•		•						•
1210SMR-PA-0							•						•								
6032SMTA-PL					•																
68LCC																					•
A-CABGA36-.8mm-6mm-DC					•						•		•								
A-CABGA256-1.0-17mm-ISO																•					
A-CVBGA97-.4mm-5mm-DC																					•
A-CABGA196-1.0-15mm-DC							•														•
A-CVBGA360-.4mm-10mm-DC							•														•
A-CVBGA432-.4mm-13mm-DC							•														
A-CTBGA84-.5mm-7mm-DC							•														
A-CTBGA228-.5mm-12mm-DC							•														
A-DualRowMLF156-12mm-.5mm-DC			•																		•
A-MLF8-3mm-.65mm-DC			•																		
A-MLF16-5mm-.8mm-DC			•								•										•
A-MLF20-5mm-.65mm-DC			•																		
A-MLF28-7mm-.8mm-DC			•																		
A-MLF32-7mm-.65mm-DC			•																		•
A-MLF44-7mm-.5mm-DC			•																		
A-MLF48-7mm-.5mm-DC													•								•
A-MLF68-10mm-.5mm-DC			•	•																	
A-PBGA1156-1.0mm-35mm-DC								•													
A-PBGA208-1.0mm-17mm-DC								•													•
A-PBGA208-1.27mm-23mm-DC								•					•								
A-PBGA256-1.0mm-17mm-DC			•	•									•		•						•
A-PBGA256-1.27mm-27mm-DC					•			•													
A-PBGA272-1.27mm-27mm-DC								•													
A-PBGA288-1.0mm-23mm-DC								•													
A-PBGA304-1.27mm-31mm-DC								•													
A-PBGA324-1.0mm-23mm-DC								•													
A-PBGA329-1.27mm-31mm-DC								•													
A-PBGA388-1.27mm-35mm-DC				•				•													•
A-PBGA484-1.0mm-27mm-DC								•													
A-PBGA676-1.0mm-27mm-DC							•	•													
A-PBGA680-1.0mm-35mm-DC							•	•													
A-PoP128-.65mm-12mm-DC-LF																	•				

Kit Identifier

Component Part Numbers / Kit Numbers

Kit Part Description	PC000	PC003	PC007	PC008	PC009	PC011	SABER	PC012	PC013	PC014	PC015	PC016-I-STD-F	PC031	WTK-1	PC049	PC052	PC200-12mm	PC200-14mm	PC250-14mm-TMV-DT	PC2009	SIR
Component Part Description																					
A-PoP152-.65mm-14mm-DC-LF																					
A-PSVfBGA305-.5-12mm-DC-LF																					
A-PSVfBGA353-.5-14mm-DC-LF																					
A-TMVPoP200-.5mm-14mm-DC-LF																					
A-TMVPSVfBGA620-.4mm-14mm-DC-LF																					
A-T1-TSOP32-8x20mm-.5mm																					
A-TSSOP20T-4.4mm																					
Axial Electrolytic, 5x11																					
CK05																					
Conn-SMT																					
Conn-TH-Horizontal																					
Conn-TH-Vertical																					
DIP14																					
DIP16																					
DIP20-DC																					
DO35																					
DPAK(TO252)																					
LQFP100-14mm-.5mm-2.0mm																					
LQFP120-14mm-.4mm-2.0																					
LQFP160-24mm																					
LQFP176-24mm-.5mm-2.0mm																					
LQFP44-10mm-.8mm-2.0																					
LQFP64-7mm-.4mm-2.0																					
LQFP144-20mm-.5mm-2.0																					
Mono Capacitor - .200" lead space																					
PLCC20																					
PLCC28																					
PLCC44																					
PLCC68																					
PLCC68-DC																					
QFP100-14x20mm-.65mm-3.2mm																					
QFP100-14x20mm-.65mm-3.9mm-DC																					
QFP160-28mm-.65mm																					
QFP208-28mm-.5mm-2.6mm																					
QFP208-28mm-.5mm-2.6mm-DC																					
QFP256-28mm-.4mm-2.6mm-DC																					
QFP64-14mm-.8mm-3.9mm																					
QFP44-10mm-.8mm-3.2mm																					
QFP44-10mm-.8mm-3.9mm																					
QFP48-12mm-.8mm-3.3mm																					
QFP52-10mm-.65mm-3.9mm																					
SO8-3.8mm																					
SO14-3.8mm																					
SO16-3.8mm																					
SO16-5.6mm																					
SO16-7.6mm-DC																					
SO18G-7.6mm																					
SO20-7.6mm																					
SO44G-13.3mm																					

Kit Identifier

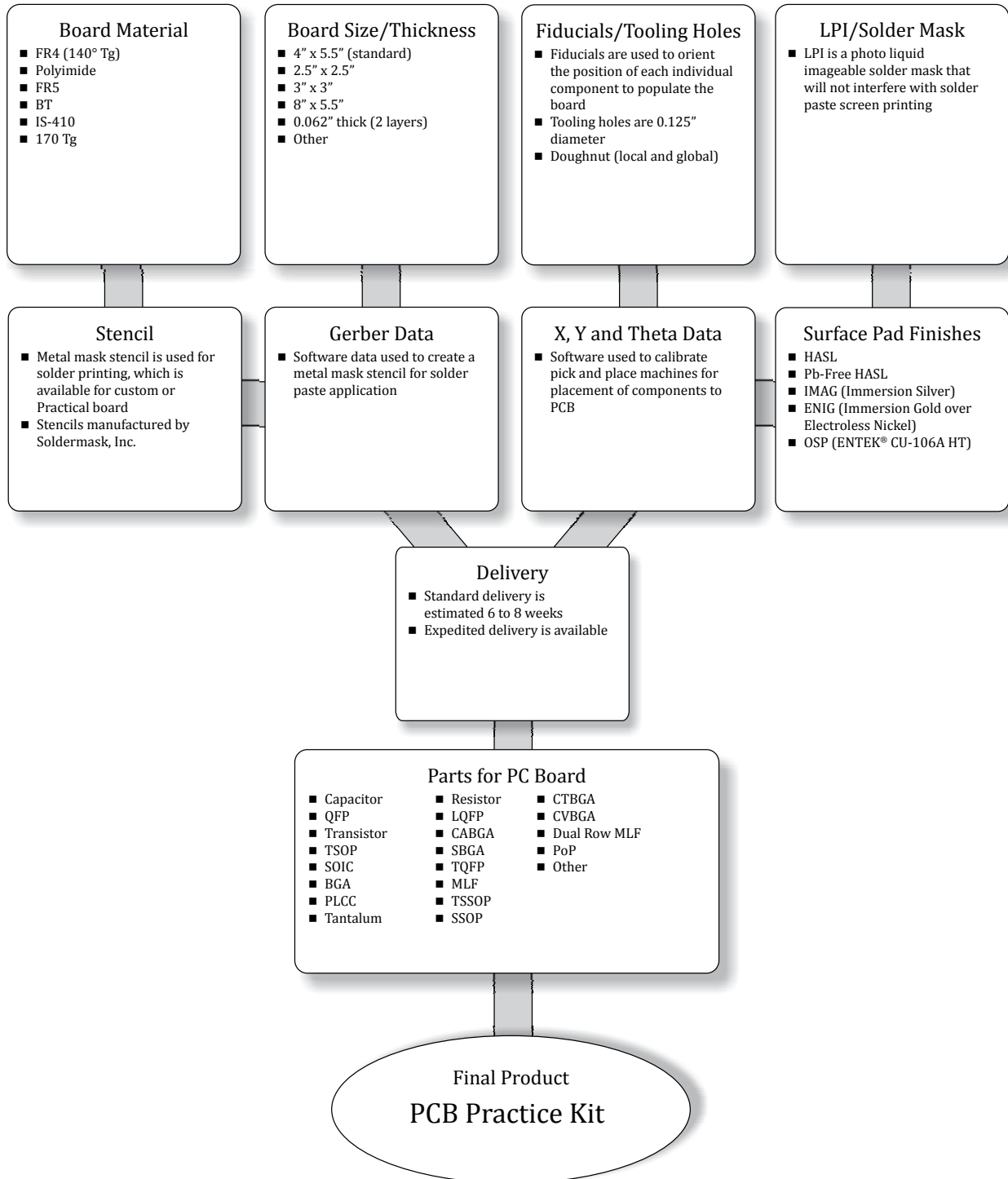
Component Part Numbers / Kit Numbers

Kit Part Description	PC000	PC003	PC007	PC008	PC009	PC011	SABER	PC012	PC013	PC014	PC015	PC016-J-STD-F	PC031	WTK-1	PC049	PC052	PC200-12mm	PC200-14mm	PC250-14mm-TMV-DT	PC209	SIR
Component Part Description																					
SOD80					•						•	•	•								
SOT143-TR		•		•							•	•	•								
SOT23-TR		•		•	•		•				•	•	•								
Spacer, CK05					•				•		•	•									
SSOP14T-5.3mm									•		•	•									•
SSOP16-3.8mm																•					
SSOP20T-5.3mm-DC															•						
SSOP20T-3.9mm				•																	•
SSOP28T-3.9mm																					•
SSOP8T-5.3mm																					
Sticky Tape (double sided)										•											
T05					•				•		•	•	•		•						
T11-TSOP54-10.16X22.22mm-.8mm			•																		
T11-TSOP44-10.16X18.42mm-.8mm			•																		
Terminal Holder Board, TB1															•						
Terminal, Bifurcated									•		•	•	•		•						
Terminal, Gold Cup									•		•	•	•		•						
Terminal, Hook									•		•	•	•		•						
Terminal, Pierced									•		•	•	•		•						
Terminal, Turret									•		•	•	•		•						
TO18									•		•	•	•								
TO5/18 Spacer					•				•		•	•									
TQFP80-12mm-.5mm																•					
Wire, 20 guage									•		•	•	•		•						
Wire, 22 guage									•		•	•	•		•						
Wire, 26 guage									•		•	•	•		•						

Custom PC Practice Boards and Kits

Design Custom PC Practice Boards Or Complete Kits To Meet Your Specific Requirements.

Practical Components will help you design custom practice PC boards or complete kits. Use the building blocks below to create your board and start saving time and money using dummy parts and a PCB practice kit. Please contact your service representative for more information. Practical PC boards are non-solder mask defined.

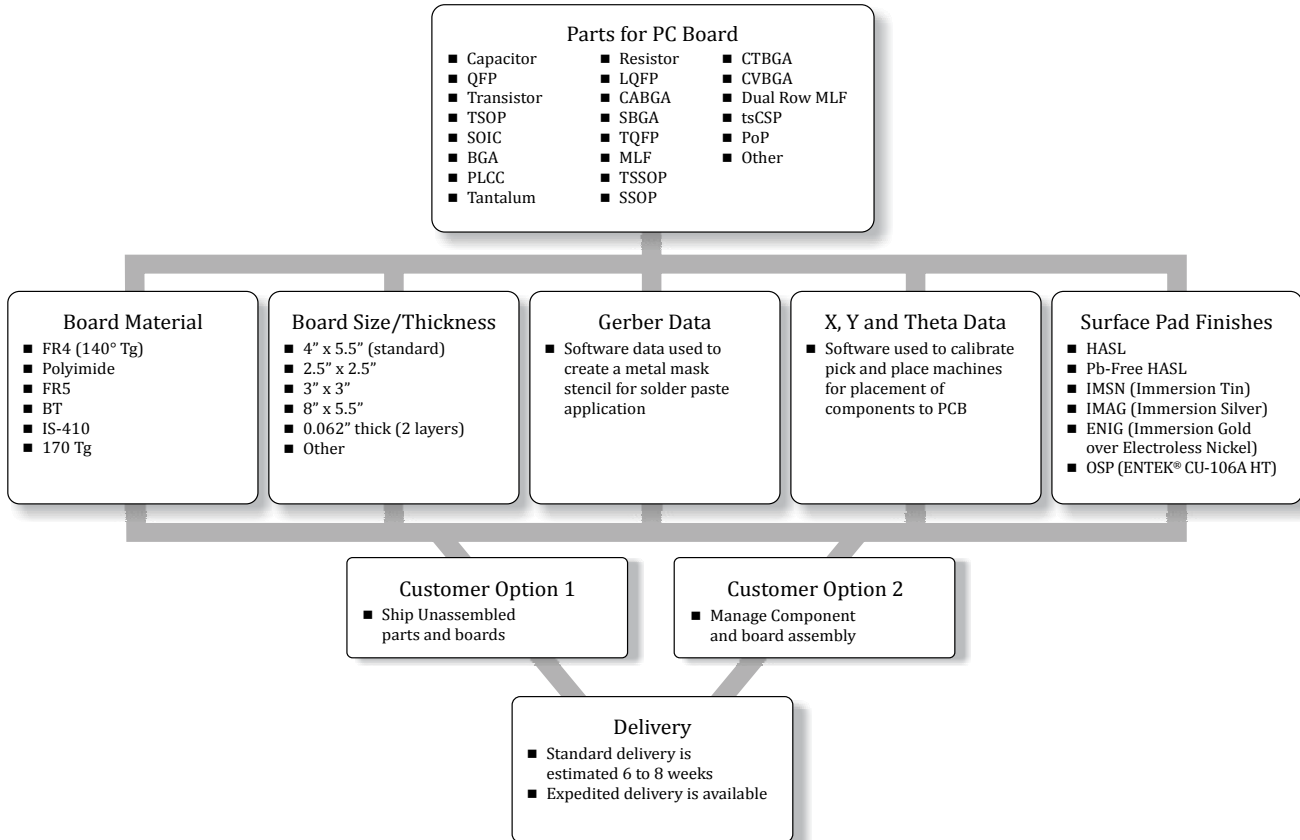


Conformal Coating Process Flow Chart

Dummy Components And PCB Test Boards For Cleanliness And Conformal Coating Process Testing

Practical Components provides products and services for the testing and evaluation of Conformal Coating materials on assembled PCB test boards. Conformal coating has provided many benefits to high

and reliability industries as well as commercial off the shelf products being used in extreme environments. Changes in technology have caused conformal coating to become more prevalent in different industries like telecommunications, automotive, and other hand held devices. All these products have benefited from the use of coatings for environmental protection and product enhancements.



Practical Components products can be effective in the following areas:

- Is conformal coating necessary?
- Clean or no clean
- SIR testing
- Coating process options
- Coating reliability
- Coating material evaluation
- Correct design for costing application
- Masking options
- Inspection and quality control of coating
- Repair and rework of PCB assemblies

The products and services provided by Practical Components in support of the evaluation items listed above are:

- Dummy Components including IC, Passives, transistors, connections or special items as requested
- Test PCB dummy boards, made to any size, thickness, material, or special requirements as requested
- Assembly of dummy components to the test PCB boards
- Design of the PCB board to customer's exact specifications
- Management of the procurement process and supply chain

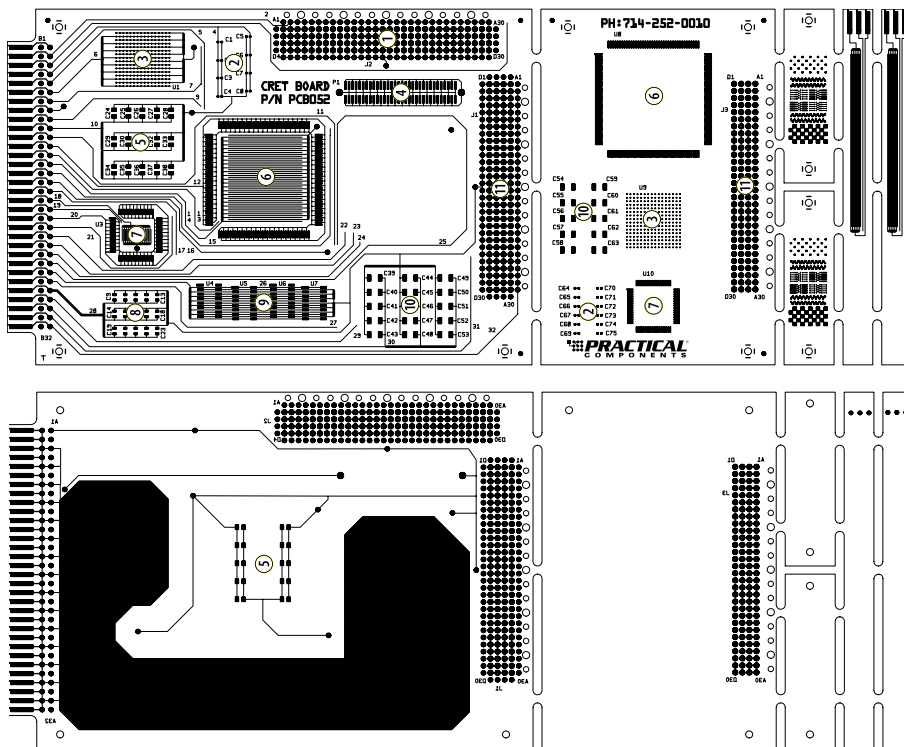
All Practical Components products are fully guaranteed. Our products are made to the exact equivalent of live components, without the internal live die or electrically functioning board. This significantly lowers the cost of the components and test boards. Practical Components can be one stop shop from board design and layout to completed assemblies ready for coating. You can be focused on the coating not the logistical chain of acquiring testing assemblies.

Test Boards for Cleanliness and Conformal Coating

Practical Components offers the following PCB Test boards for printed wiring assemblies materials for process qualification evaluations.

Practical Components Test Coupon Board Availability		Cu	HASL	ImAg	ENIG
PCB052/Rev B	CRET board	X	X	X	X
PCB-B-24	Standard Test Board	X	X	X	X
PCB-B-25A	Standard Test Board	X	X	X	X
PCB-B-36	Standard Test Assembly	X	X	X	X
PCB-SIR	Test Board	X	X	X	X
PCB-Saber	Evaluation Test Board	X	X	X	X
PCB015	Rework Test Board		X		X

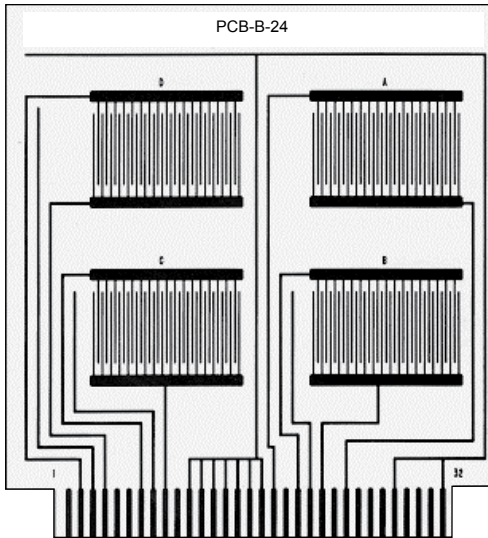
PCB052 CRET Board



The Practical Components B-52 CRET (Cleanliness & Residue Evaluation Test) board is designed to help determine the ionic cleanliness of a customer's manufacturing process. The test board follows guidelines associated with the IPC-B-52 Test Vehicle. There are several different ways to measure residues and their effects on electrical performances, the two most common in the industry are ionic cleanliness testing, for determination of ionic residues, and surface insulation resistance (SIR) testing, for the evaluation of electrochemical failures in humid environments.

Of the various methods for determination of ionic residues, the method of choice is ion chromatography, which determines both the type of ionic residue and the amount of the residue. The IPC method for ion chromatography is IPC-TM-650, method 2.3.28. For SIR testing, the most modern test method, involving frequent or continuous monitoring, is IPC-TM-650, method 2.6.3.7. Consequently, a test vehicle was needed which could be used for both ion chromatography and surface insulation resistance testing, but which was more representative of mainstream manufacturing materials and process.

Test Boards for Cleanliness and Conformal Coating

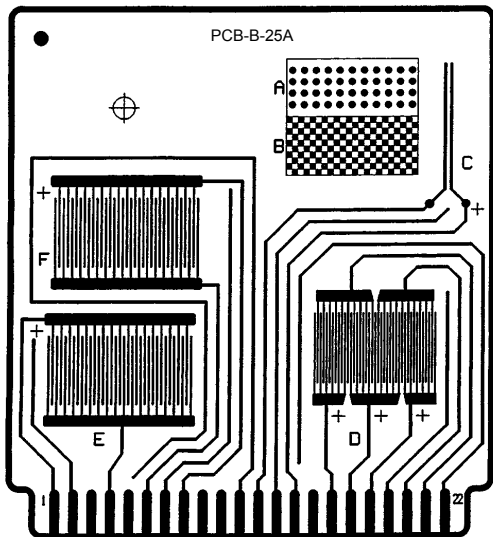


PCB-B-24 Standard Test Board

The PCB-B-24 standard test board is compliant with the IPC Phase 3 cleaning and cleanliness test program. It was designed to be a vehicle for examining the interactions between laminate, surface metalizations, and fluxes. It is the primary qualification vehicle for ANSI J-STD-004, which is the IPC specification on fluxes.

The four comb patterns are identical and have 16 mil lines and 20 mil space. These values were chosen both for ease of stencil printing solder paste, and the board can be wave soldered with minimal chance of solder bridging.

The PCB-B-24 test board is an excellent vehicle for narrowing down fluxes or solder material, or testing material interaction.

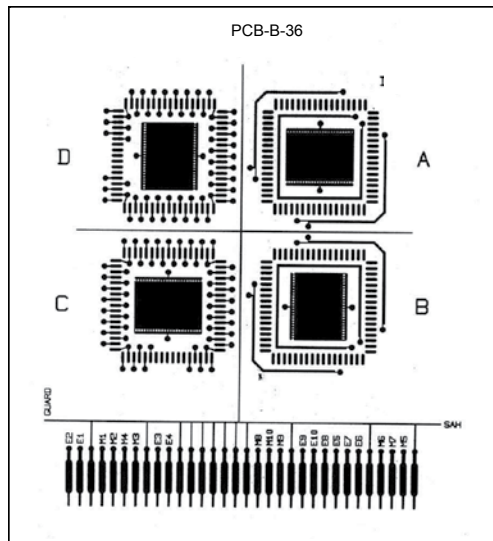


PCB-B-25A Standard Test Board

The PCB-B-25A test board meets the current guidelines for solder Masks (IPC-SM-804C) and conformal coatings (IPC-CC-830A).

The board is normally 0.062" FR-4. The board is simple print-and-etch. The surface is bare copper for materials qualification, but could be any Surface finish required.

The PCB-B-25A is used to evaluate interactions between solder masks, solder paste, and fluxes.

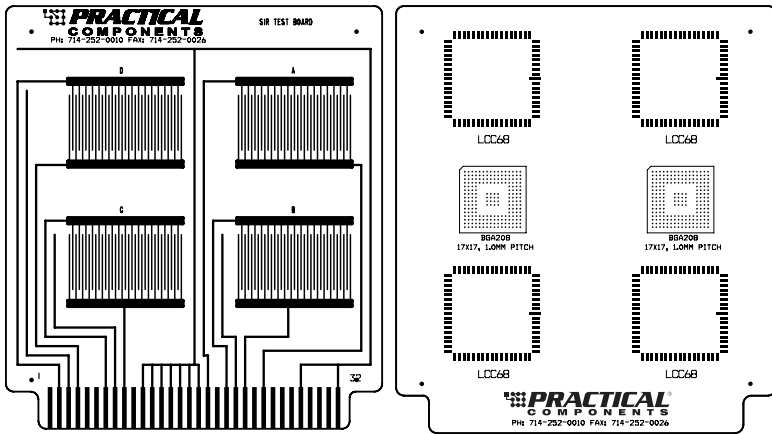


PCB-B-36 Standard Test Assembly

The PCB-B-36 standard test board was designed for the IPC cleaning cleanliness test program, Phase 1. It was designed for examining the ability of a cleaning solvent to remove flux residues, and to examine the effects of entrapped residues under low standoff components. The PCB-B-36 test board can be used as a process qualification vehicle for the J-STD-001. This board has 10 SIR test patterns. Two patterns #2 and #4 are mounting pads in quadrants C and D. The pad spacing is 25 mils for patterns #2 and #4. The contact fingers of the board are normally gold plated for compatibility with edge card connectors. The remaining metallization is normally bare copper, or any surface finish. In most cases, four leadless ceramic chip carriers (LCCs) are mounted on the board, one in each quadrant.

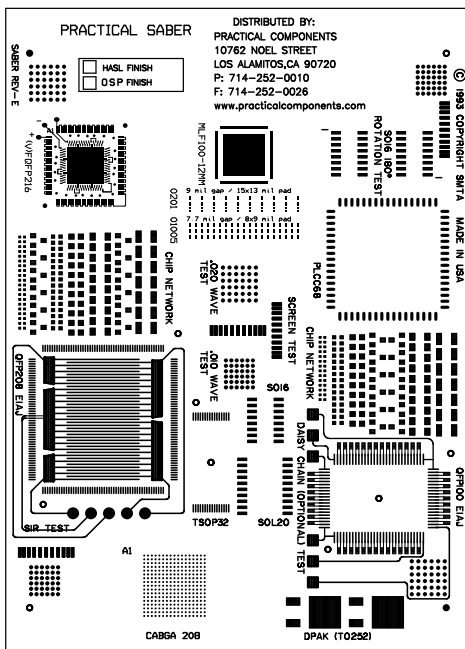
This test vehicle is designed to test combinations of conformal coatings, fluxes, solder paste and their interactions with each other. Testing cleaning residue under low stand off components is a benefit of the PCB-B-36 test board.

Test Boards for Cleanliness and Conformal Coating



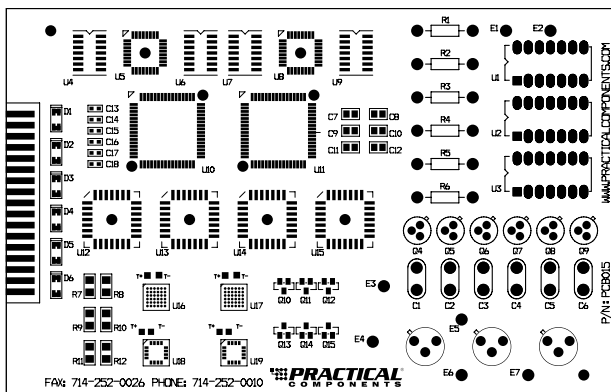
Practical Components SIR Test Board

The Practical Components SIR board is a double sided board to characterize fluxes by determining the degradation of electrical insulation resistance of rigid printed wiring board specimens after exposure to the specified flux. The board contains pads for LCC68 and A-PBGA208-1.0mm-17mm components. Boards and kits are available in Tin-Lead or Lead-Free.



Practical Components Saber Board

The SABER evaluation board can be used to evaluate pick and place equipment, reflow process, component, cleanliness and solder paste screening. The SABER board also has honeycomb patterns for SIR testing. Board finishes include ImAg, ENIG and Pb-Free HASL. Standard board material is IS-410.



Practical Components PC015 Assembled Test Board

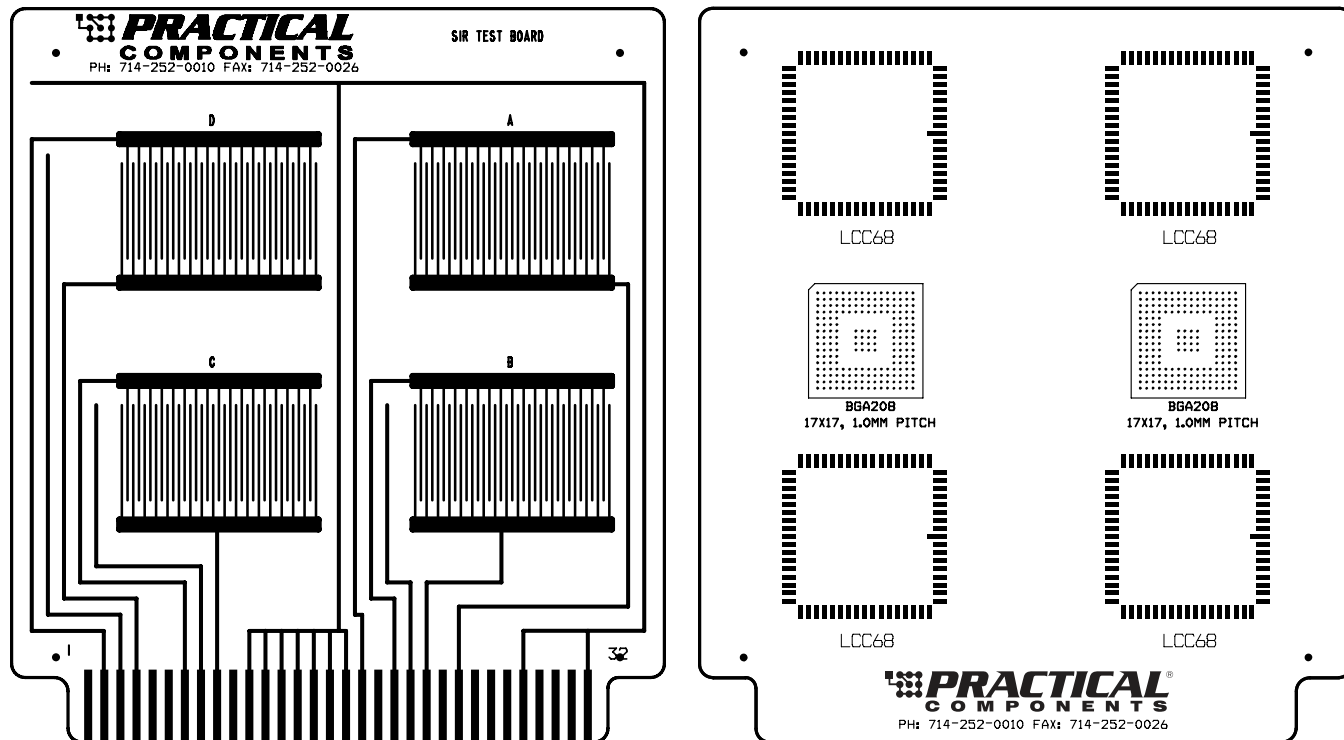
Available Pre-Assembled, this board is the ideal vehicle for Off the shelf Conformal Coating testing. Pre-Populated with a variety of component types, from LQFPs and CABGAs, DIPs down to 0603 chips this board offers a real-world conformal coating testing surface and gives standardized and repeatable results. The PC015 is available in Tin-Lead or Lead-Free versions. The PC015 and components can also be delivered unassembled or partially assembled, example: only the surface mount components mounted on the board. Practical Components also specializes in designing PCB test boards made to size, thickness, material or specified requirements as requested. Practical can also manage the procurement process and supply chain, including assembly and application of materials. Practical's PC015 Rework Kit conforms to IPC 7711/7721 standards or reworking.

SIR Test Board and Kit

REVISED [Rev. A]

The Practical SIR board is double sided board to characterize fluxes by determining the degradation of electrical insulation resistance of rigid printed wiring board specimens after exposure to the specified flux. This test is carried out at height humidity and heat conditions. The board contains pads for LCC68 and A-PBGA208-1.0mm-17mm components. Kit is available Tin-Lead or Lead-Free.

SIR Test Board



SIR Kits

Part Description	Quantity Per 1 Kit	Quantity Per 5 Kits	Quantity Per 10 Kits
68LCC-1.27mm-24.1mm	4	20	40
A-PBGA208-1.0mm-17mm-DC	2	10	20
Kit Order Number: (Tin-Lead)	SIR-0-01	SIR-0-05	SIR-0-10
Kit Order Number:(Lead-Free)	SIR-0-01-LF	SIR-0-05-LF	SIR-0-10-LF

Notes

- Gerber and X, Y Theta data included at no charge.
- PBGA is available Lead-Free with SAC305 or SAC405 solder ball alloy's. LCC is only available with Au castellations which is standard.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper and HASL.



SMTA Saber Evaluation Board and Kit

REVISED [Rev. E]

The SMTA Saber Evaluation Kit.

Practical Components is licensed by SMTA to distribute the Saber Evaluation PC Board. The Saber Board includes land patterns for a wide variety of JEDEC and EIAJ components.

The Saber Board is used to evaluate:

- P&P equipment
- Reflow process
- Component placement accuracy
- Cleanliness
- Speed and accuracy of component placement
- Solder paste screening

Notes

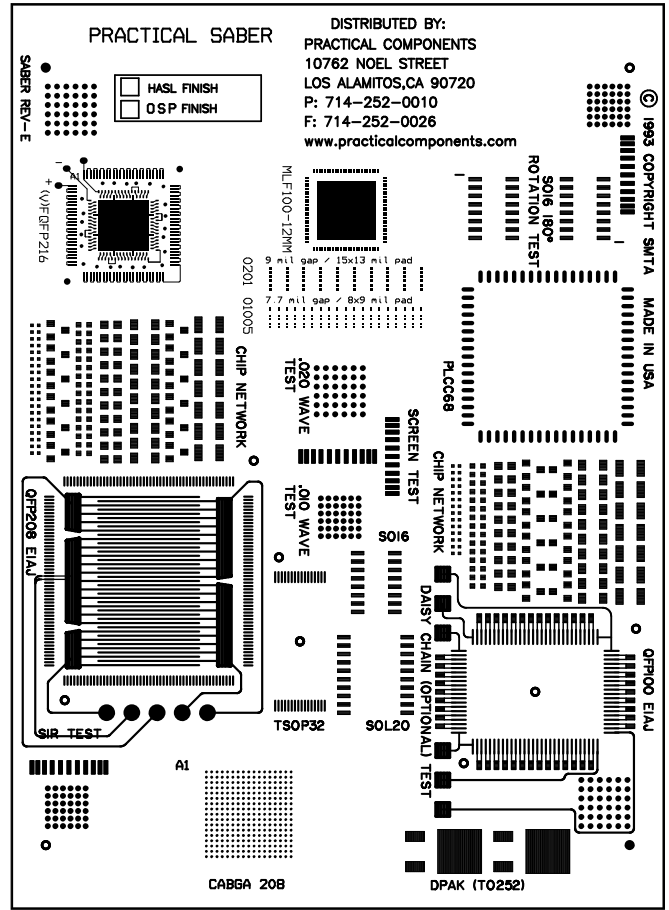
- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Lead-free parts are available.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL.



Available as a



SMTA Saber Evaluation PC Board



Double Sided (top view)
Board size: 3.875" x 5.375", .062" thick.

SMTA Saber Board Kits

Part Description	Quantity Per 1 Kit	Quantity Per 24 Kit	Quantity Per 48 Kits	Quantity Per 96 Kits
PCB-Saber	1	24	48	96
01005SMR-Sn	57	1,368	2,736	2,736
0201SMR-Sn	30	720	1,440	2,880
0402SMR-Sn	34	1,000	1,632	4,000
0603SMR-Sn	31	1,000	1,488	3,000
0805SMR-Sn	21	500	1,008	2,000
1206SMR-Sn	20	500	960	2,000
1210SMR-Sn	14	500	672	2,000
SOT23-Sn	24	1,000	1,152	3,000
A-CABGA208-.8mm-15mm-DC-305	1	24	48	96
DPAK(TO252)-Sn	2	48	96	200
SO16GT-3.8mm-Sn	3	100	144	288
SO20GT-7.6mm-Sn	1	24	48	96
A-MLF100-12mm-.4mm-DC-Sn	1	24	48	96
PLCC68-Sn	1	24	48	96
T1-TSOP32-8x18.4mm-.5mm-Sn	1	24	48	96
QFP208-28mm-.5mm-2.6mm-Sn	1	24	48	96
QFP100-140x20mm-.65mm-3.9-DC-Sn	1	24	48	96
Kit Order Number: (Tin-Lead)	SMTA-Saber-1	SMTA-Saber-24	SMTA-Saber-48	SMTA-Saber-96
Kit Order Number: (Lead-Free)	SMTA-Saber-1-LF	SMTA-Saber-24-LF	SMTA-Saber-48-LF	SMTA-Saber-96-LF

B-52 CRET Rev B

Cleanliness & Residue Evaluation Test Kits



The Practical Components B-52 CRET (Cleanliness & Residue Evaluation Test) Kit is designed to help determine the ionic cleanliness of a customer's manufacturing process. The test boards and components follow guidelines associated with the IPC-B-52 Test Vehicle.

There are several different ways to measure residues and their effects on electrical performances, the two most common in the industry are ionic cleanliness testing, for determination of ionic residues, and surface insulation resistance (SIR) testing, for the evaluation of electrochemical failures in humid environments.

Of the various methods for determination of ionic residues, the method of choice is ion chromatography, which determines both the type of ionic residue and the amount of the residue. The IPC method for ion chromatography is IPC-TM-650,

method 2.3.28. For SIR testing, the most modern test method, involving frequent of continuous monitoring, is IPC-TM-650, method 2.6.3.7. Consequently, a test vehicle was needed which could be used for both ion chromatography and surface insulation resistance testing, but which was more representative of mainstream manufacturing materials and processes. The IPC-B-52 Test Vehicle was the result.

The Practical B-52 CRET test vehicle is divided into four primary segments:

1. The main SIR test board
2. The Ion Chromatography (IC) test coupon
3. The solder mask adhesion coupons
4. The SIR mini-coupons

On the Rev. B the copper designators have been moved out. The Rev. B board width has

increased and the manufacturing rails have been removed. The non-plated holes were revised to accommodate the alignment pins of the connectors, in addition the diameter of through holes were reduced for better solder ability of the through hole connectors. The ground plane was changed from solid copper to copper mesh.

These changes should have a positive effect both on assembly and evaluation results. Items to note are the B-52 Rev. B is available with just the SIR coupon.

Information regarding this option is available by calling Practical Components at 714-252-0010. In addition, it is recommended that customers use test boards from their current or potential board supplier. Test boards can also be customized to the customers specific needs.

B-52 CRET Rev B Kit

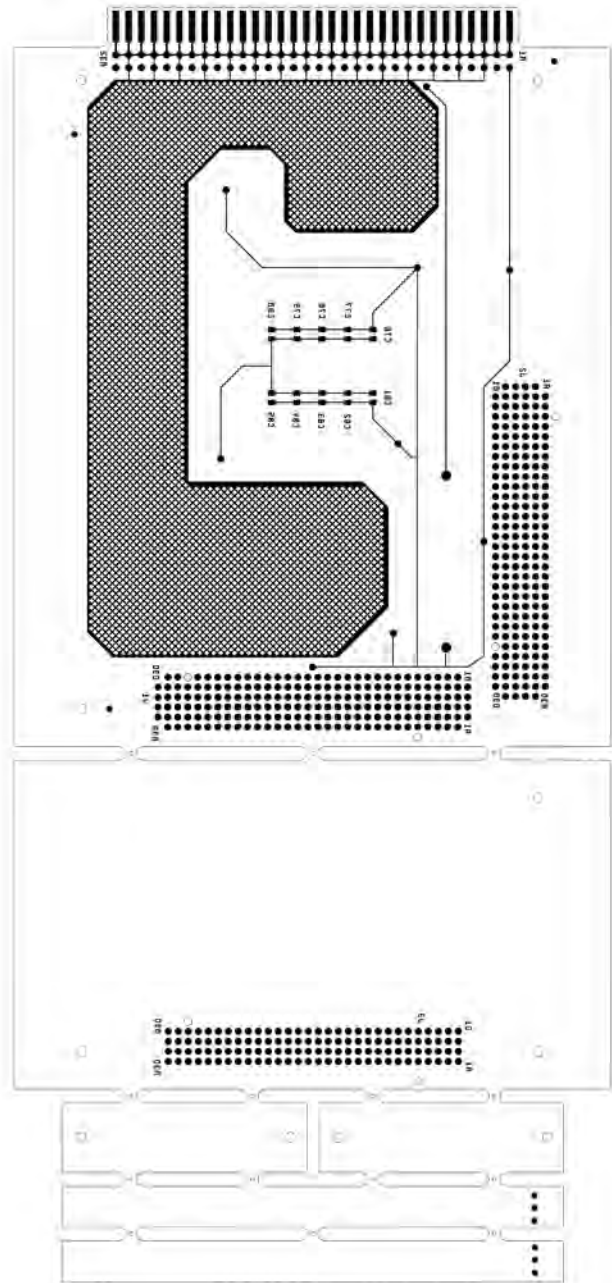
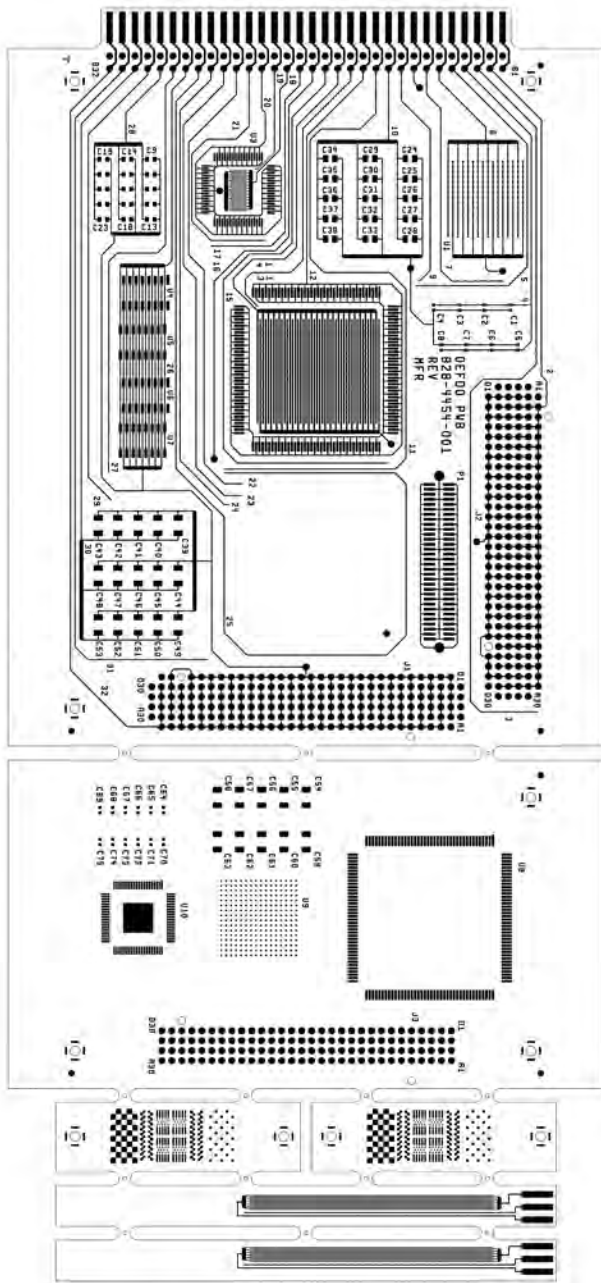
Figure ID	Location	Part Description	Quantity Per Board
3	U1, U9	A-CABGA256-1.0mm-17mm-ISO	2
6	U2, U8	A-QFP160-28mm-.65mm-ISO	2
7	U3, U10	A-TQFP80-12mm-.5mm-ISO	2
9	U4-U7	A-SO16GT-3.8mm-ISO	4
2	C1-C8, C64-C75	0402SMC-10.0pf	20
8	C9-C23	0603SMC-10.0pf	15
5	C24-C38, C76-C85	0805SMC-10.0pf	25
10	C39-C63	1206SMC-10.0pf	25
11	J1, J2, J3	Conn-TH-Ver-4x24-AMP	3
4	P1	Conn-SMT-2x16-Molex	1

Lead-Free Part Number List

Part Number	Part Description
19959	A-CABGA256-1.0mm-17mm-ISO-SAC305
19960	A-QFP160-28mm-.65mm-2.6mm-ISO-Sn
19961	A-TQFP80-12mm-.5mm-2.0mm-ISO-Sn
19962	A-SO16GT-3.8mm-ISO-Sn
20009	0402SMC-10.0pf-Sn
20010	0603SMC-10.0pf-Sn
20011	0805SMC-10.0pf-Sn
20012	1206SMC-10.0pf-Sn
19943	Conn-TH-Ver-4x24-AMP
19944	Conn-SMT-2x16-Molex

Tin-Lead Part Number List

Part Number	Part Description
19967	A-CABGA256-1.0mm-17mm-ISO
19968	A-QFP160-28mm-.65mm-2.6mm-ISO
19969	A-TQFP80-12mm-.5mm-2.0mm-ISO
19970	A-SO16GT-3.8mm-ISO
20005	0402SMC-10.0pf
20006	0603SMC-10.0pf
20007	0805SMC-10.0pf
20008	1206SMC-10.0pf
19943	Conn-TH-Ver-4x24-AMP
19944	Conn-SMT-2x16-Molex



Board size: 4.7" x 10.04", .062" thick.

Notes

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL

Ordering Information

- Board Order Number: PCB052-RevB

Single Pack Hand Solder Kit

Page Matrix

The kits listed below are for Hand Assembly. Each kit is prepackaged as an individual kit. Each component is bagged and labeled for identification. The test board is also individually bagged. Both kit and test board are put in a cardboard box that identifies the kit contents. Kits can be customized to meet specific needs. Please call regarding availability of Lead-Free single pack soldering kits.

Reference List for Single Pack Kits

Part Number Tin-Lead / Lead-Free	Kit Part Description	Description	IPC Reference	Page Number
10680 / 12086	PC003	Hand Solder Kit, 2.5" square		97
NA / 19314	PC007T-0-01	MLF Hand Assembly Kit		110
NA / 19463	PC007K-0-01	MLF / Fine Pitch SMT (top and bottom)		110
19266 / 16561	PC009	Mixed Technology Kit		98
11019 / 11021	PC011-0-01	Fine Pitch BGA Kit (0.4, 0.5, 1.0mm)		113
15848 / 19742	PC012-0-01	Global BGA Test Kit (1.0mm and 1.27mm pitch)		114
15923 / 19462	PC012T-0-01	Global BGA Test Kit (topside only, 1.0mm pitch)		114
15924 / 19991	PC012B-0-01	Global BGA Test Kit (bottomside only, 1.27mm pitch)		114
15212 / 16792	PC013-K	Through Hole Kit (with wires and terminals)		99
15213 / 16791	PC013-BTK	Through-Hole Kit (no wires or terminals)		99
15214 / 19409	PC013-RWTK-1	Recertification Kit (with wires and terminals)		99
15215 / 19308	PC013-RK	Recertification Kit (no wires or terminals)		99
15226 / 15227	PC015-0-01-STD	Rework Kit (unassembled)	7711/7721	100
11450 / 11444	PC015-0-01-RWK	Rework Kit (assembled)	7711/7721	100
18063 / 18064	PC016-J-STD	Mixed Tech Kit	J-Std-001 Rev F	101
15220 / 15224	WTK-1	Wires and Terminals (with or without holder)		102



Looking for Lead-Free?

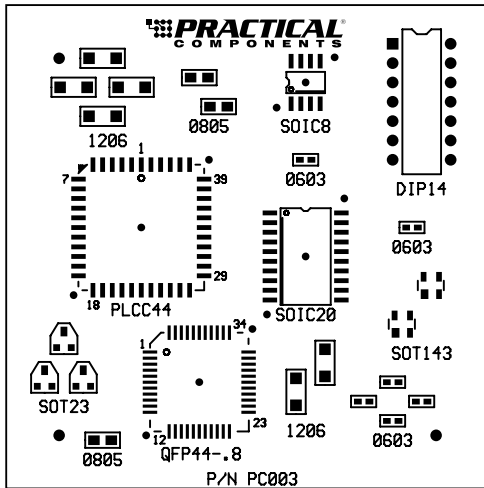
This symbol indicates that lead-free parts are available!

(Pb) Tin-Lead and Lead-Free Kits are available

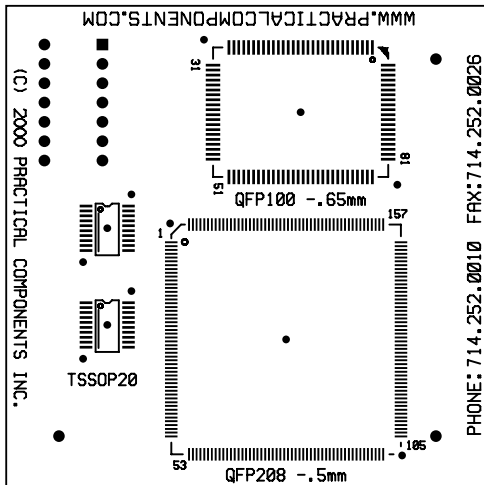
The PC003 hand solder practice kit is a low cost, effective kit for training and testing employees. This double-sided board has pads for 13 different components: One through-hole Dip14 and twelve surface-mount components. Each item is individually bagged and tagged for easy identification. Kits consist of PLCCs, SOICs, TSSOPs, SOTs, Passives, and QFPs with 0.5mm and 0.65mm pitch. This low cost kit is ideal for classroom training and practice. IPC-A-610 Rev D compliant. Kit is available with Tin-Lead or Lead-Free components.



PCB003 Solder Practice Board



Top View



Bottom View

Board size: 2.5" x 2.5", .062" thick.

PC003 Solder Practice Board Kit (Tin-Lead and Lead-Free components available)

Part Description	Quantity Per Kit
PCB003 Board (customer to specify finish)	1
QFP208-28mm-.5mm-2.6mm	1
QFP44-10mm-.8mm-3.2mm	1
QFP100-14x20mm-.65mm-3.2mm	1
PLCC44	1
SO8GT-3.8mm	1
SO20GT-7.6mm	1
SOT23	3
SOT143	2
TSSOP20-4.4mm	2
0603SMR	6
0805SMR	3
1206SMR	6
DIP14T	1
Kit Order Number: (Tin-Lead)	PC003
Kit Order Number: (Lead-Free)	PC003-LF

Notes

- Gerber Data and X, Y Theta Data are available at no charge.
- Lead-Free parts are available with Sn finish.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL



Ordering Information

- Order Number: PCB003 Rev B (Board Only)

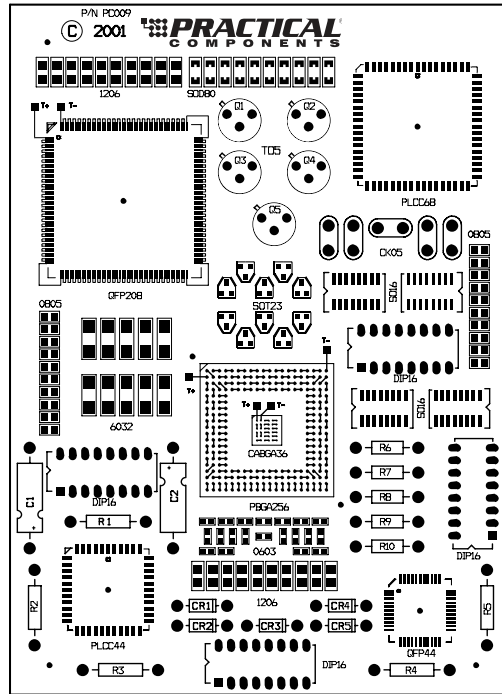
Mixed Technology Board and Kit



The PC009 Mixed Technology kit has surface mount components and through-hole components. This kit's primary use is for hand soldering but is also available as machine run upon special request. Tin-Lead and Lead-Free components available. Through-hole components are

placed in close proximity to surface mount components to represent real soldering situations. Components are individually bagged and identified for component recognition.

PCB009 Mixed Technology Board



Board size: 4" x 5.5", .062" thick.

PC009 Mixed Technology Kits

Part Description	Quantity per 1 Kit	Quantity per 5 Kit	Quantity per 10 Kit	Quantity per 20 Kit
PCB009 Board	1	5	10	20
SMD Components				
A-PBGA256-1.27-27mm-DC **	1	5	10	20
A-CABGA36-.8mm-6mm-DC **	1	5	10	20
QFP208-28mm-.5mm-2.6mm-DC	1	5	10	20
QFP44-10MM-.8MM-3.2	1	5	10	20
SOT23-TR	10	50	100	200
PLCC44	1	5	10	20
PLCC68	1	5	10	20
SOD80-TR	10	50	100	200
SO16GT-3.8mm	4	20	40	80
6032SMTA	10	100	200	400
0603SMR-TR	20	100	200	400
0805SMR-TR	20	100	200	400
1206SMR-TR	20	100	200	400
Through-Hole Components				
DPIP16T	4	20	40	80
1/4 Watt Axial Resistors	5	25	50	100
1/2 Watt Axial Resistors	5	25	50	100
CK05 (with Spacers)	5	25	50	100
TO5 (with Spacers)	5	25	50	100
5x11 Axial Electrolytic	2	10	20	2
DO34 or DO35	5	25	50	5
Kit Order Number: (Tin-Lead)	PC001-0-01	PC001-0-05	PC001-0-10	PC001-0-20
Kit Order Number: (Lead-Free)	PC009-0-01-LF	PC009-0-05-LF	PC009-0-10-LF	PC009-0-20-LF

Available as a



Notes

- **BGA/CABGA Packages are not included in kit. Either BGA or CABGA can be added to kit upon request.
- Mix and match components and quantities to create a custom kit.
- Gerber Data and X, Y Theta Data are available at no charge.
- Not all parts are available lead-free.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

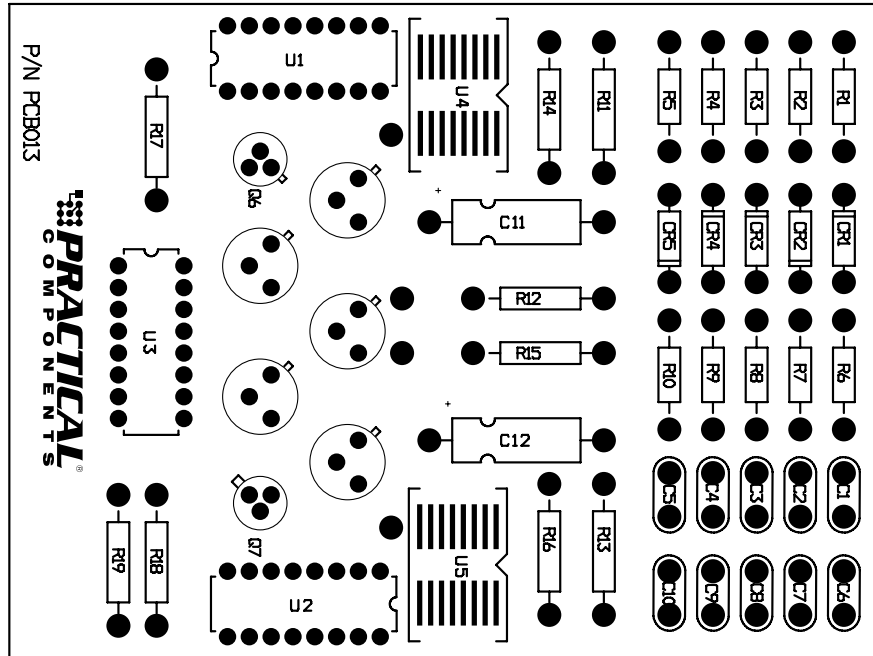
Through-Hole Solder Training Kits

Choose from four different variations of the PC013 kit

The PC013 hand solder practice kit is an effective way to evaluate or train employees and students. This versatile board comes with a variety of through-hole components and each kit is conveniently boxed and the components are individually bagged and

labeled for easy identification. It is available in several different options to meet each company's requirements. Kits come standard with an SO16 resistor network, but can be upgraded to a Flat Pack 16. This kit is ideal for classroom settings.

PCB013 Board



Board size: 4" x 3", .062" thick.

Basic Through-Hole Kit

Part Description	Quantity Per Kit
PCB013	2
DO35	10
AE-5x12	4
CK05	20
CK05 Spacer	20
1/2-W-AR	18
1/4-W-AR	20
DIP16	6
TO5	10
TO18	4
TO5/18 Spacer	14
SO16GT-3.8mm	4
Order Number: (Lead-Free)	PC013-BTK-LF
Order Number: (Tin-Lead)	PC013-BTK

Recertification Kit

Part Description	Quantity Per Kit
PCB013	1
DO35	2
AE-5x12	1
CK05	6
CK05 Spacer	6
1/4-W-AR	5
1/2-W-AR	3
DIP16	2
TO5	2
TO18	2
TO5/18 Spacer	4
SO16GT-3.8mm	1
Order Number: (Tin-Lead)	PC013-RK
Order Number: (Lead-Free)	PC013-RK-LF

Notes

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

Available as a

Single Pack Kit



Complete Through-Hole Kit

Part Description	Quantity Per Kit
PCB013	2
Turret Terminal	15
Bifurcated Terminal	15
Hook Terminal	15
Pierced Terminal	15
Cup Terminal	15
DO35	10
AE-5x12	4
CK05	20
CK05 Spacer	20
1/4-W-AR	20
1/2-W-AR	18
DIP16	6
TO5	10
TO18	4
TO5/18 Spacer	14
SO16GT-3.8mm	4
20 Gauge Wire	3'
22 Gauge Wire	3'
26 Gauge Wire	3'
Order Number: (Tin-Lead)	PC013-K
Order Number: (Lead-Free)	PC013-K-LF

Recertification Kit With Wires And Terminals

Part Description	Quantity Per Kit
PCB013	1
Turret Terminal	5
Bifurcated Terminal	5
Hook Terminal	5
Pierced Terminal	5
Cup Terminal	5
DO35	2
AE-5x12	1
CK05	6
CK05 Spacer	6
1/4-W-AR	5
1/2-W-AR	3
DIP16	2
TO5	2
TO18	2
TO5/18 Spacer	4
SO16GT-3.8mm	1
20 Gauge Wire	3'
26 Gauge Wire	3'
Order Number: (Tin-Lead)	PC013-RWTK-1
Order Number: (Lead-Free)	PC013-RWTK-1-LF

PC015 Rework Kit Conforms to IPC 7711/7721 Standards for reworking.

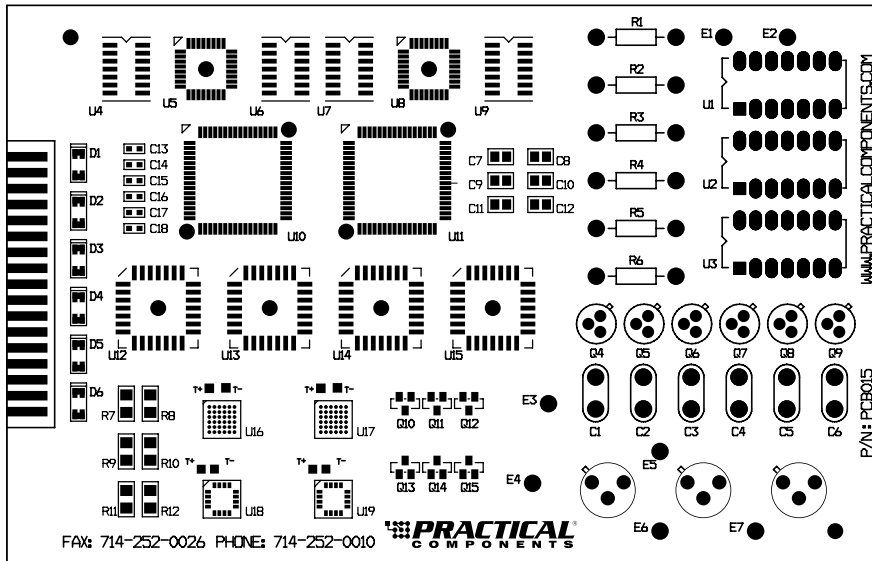
The PC015 Kit is ideal for rework training or evaluating current rework procedures. This kit contains 2 fully populated boards and replacement components to enable removing and replacing 1/2 of the components. Reworked solder joints can then be visually compared to original solder joints (on components not reworked) on the same

board. Kit includes 2 boards which allows one to be used practice and one to be used for evaluation. This kit conforms to the IPC 7711 and 7721 standards for reworking. It contains a wide range of components from Through-Hole to Chip Scale. Each kit is conveniently boxed with the replacement components individually bagged and labeled

for easy identification. Forget looking for scrap boards for training purposes. Tin-Lead and Lead-Free components available.

This kit is perfect for classroom settings and can also be ordered unassembled as a standard hand solder.

PCB015 Board



Board size: 5.5" x 3.5", .062" thick.



PC015 Rework Kit Assembled

Part Description	Quantity Per Kit
PCB015-Assembled	2
LQFP100-14mm-.5mm-2.0	2
LQFP44-10mm-.8mm-2.0	2
PLCC28T	4
SOT23	6
0603SMC	6
0805SMC	6
1206SMR	6
SOD80	6
SO14GT-3.8mm	4
1/4-W-AR	6
CK05 (with Spacers)	6
DIP14	3
TO5 (with Spacers)	3
TO18 (with Spacers)	6
*MLF16-5mm-.8mm	2
*A-CABGA36-.8mm-6mm-DC	2
Kit Order Number: (Tin-Lead)	PC015-01
Kit Order Number:(Lead-Free)	PC015-01-LF


PC015 For Hand Assembly Kit

Part Description	Quantity Per Kit
PCB015-Standard	1
LQFP100-14mm-.5mm-2.0	2
LQFP44-10mm-.8mm-2.0	2
PLCC28	4
SOT23	6
0603SMC	6
0805SMC	6
1206SMR	6
SOD80	6
SO14GT-3.8mm	4
1/4-W-AR	6
CK05 (with Spacers)	6
DIP14	3
TO5 (with Spacers)	3
TO18 (with Spacers)	6
*MLF16-5mm-.8mm-DC	2
*A-CABGA36-.8mm-6mm-DC	2
Kit Order Number: (Tin-Lead)	PC015-0-01-Std
Kit Order Number:(Lead-Free)	PC015-0-01-Std-LF

Notes

- *MLF16/CABGA36 Packages are not included in kit. Either package can be added upon request.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

IPC Compliant Hand Soldering Kit

 Tin-Lead and Lead-Free Kits Available

PCB-J-STD Board Soldering Kit Conforms to J-STD-001F Specifications

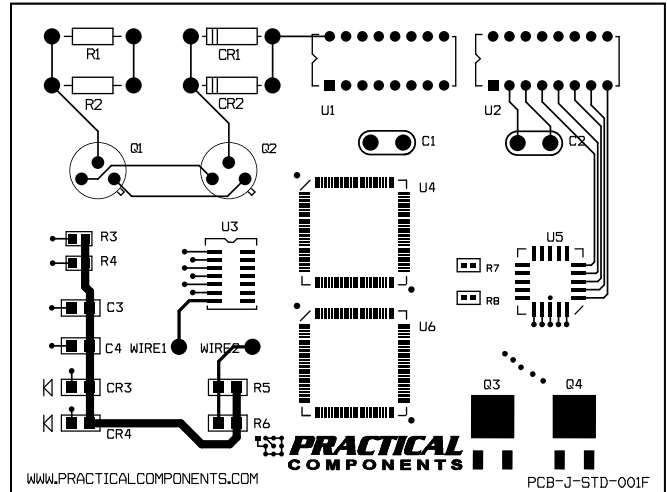
The PC016 Mixed Technology Kit is an effective and economical way to train and evaluate students and employees. This kit contains a variety of standard Surface Mount and Through-Hole components with traces to simulate real world situations. Each kit comes individually boxed with all components bagged and labeled for easy identification. Conforms to IPC J-STD-001F standard for soldering. In stock and ready to ship, this kit is perfect for classroom settings.

Available as a

Single Pack Kit

IPC Compliant

PCB-J-STD-F Board



Board size: 4" x 3", .062" thick.

PC016-J-STD-F Hand Soldering Kit

Part Description	Quantity per Kit
PCB-J-STD-F-HASL	2
A-LQFP100-14mm-.5mm-2.0	4
PDIP16T	4
SO14GT-3.8mm	2
CK05	4
CK SPACER	4
Turret Terminal	4
Hook Terminal	4
Pierced Terminal	4
Bifurcated Terminal	4
Gold Cup Terminal	4
DO35	4
SOD80	4
TO5-3-B	4
TO5/TO18 SPACER	4
1206SMC	4
0805SMR	4
1206SMR	4
0402SMR	4
1/4-W-AR	4
PLCC20T	2
DPAK	4
26 Gauge Wire Brown	3'
22 Gauge Wire Grey	3'
20 Gauge Wire Red	3'
Kit Order Number:	PC016-J-STD-F

PC016-J-STD-F Lead Free Hand Soldering Kit

Part Description	Quantity per Kit
PCB-J-STD-F-ENIG	2
A-LQFP100-14mm-.5mm-2.0-Sn	4
PDIP16T-Sn	4
SO14GT-3.8mm-Sn	2
CK05-LF	4
CK SPACER	4
Turret Terminal	4
Hook Terminal	4
Pierced Terminal	4
Bifurcated Terminal	4
Gold Cup Terminal	4
DO35-LF	4
SOD80-Sn	4
TO5-3-B-Sn	4
TO5/TO18 SPACER	4
1206SMC-Sn	4
0805SMR-Sn	4
1206SMR-Sn	4
0402SMR-Sn	4
1/4-W-AR-LF	4
PLCC20T-Sn	2
DPAK-LF	4
26 Gauge Wire Brown	3'
22 Gauge Wire Grey	3'
20 Gauge Wire Red	3'
Kit Order Number:	PC016-J-STD-F-LF

Notes

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

J-STD-001F is world-recognized as the sole industry-consensus standard covering soldering materials and processes. This revision now includes support for lead free manufacturing, in addition to easier to understand criteria for materials, methods and verification for producing quality soldered interconnections and assemblies.

Terminal and Wire Kit

The WTK-1 Kit includes everything needed to train and practice your wire soldering skills. This kit contains three different gauges of wire and five styles of terminals representative of what is available in the marketplace. Our kit also comes standard with a Terminal Holder. This reusable tool safely holds terminals during wiring and soldering operations. Terminals will fit snug in holes of the TB01 when the holder is new. The holes are intentionally slightly undersized to all for expansion with use. Each kit comes individually packaged with all components bagged and tagged for easy identification. Perfect for classroom settings.

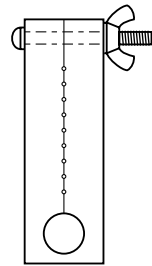
WTK-1 Kit

Part Description	Quantity Per Kit	Order Number
TB01 — Terminal Holder	1	11229
Turret Terminal	5	11228
Bifurcated Terminal	5	11224
Hook Terminal	5	11227
Pierced Terminal	5	11226
Cup Terminal	5	11301
22 Gauge Wire	3'	16163
20 Gauge Wire	3'	16164
26 Gauge Wire	3'	16162

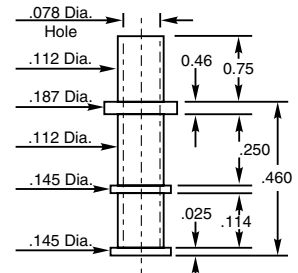
Notes

- Kit is available without terminal holder.

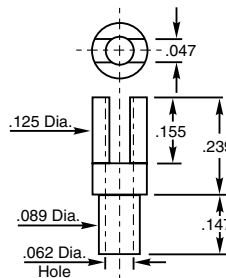
Available as a



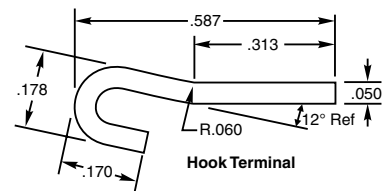
TB-01 Terminal Holder



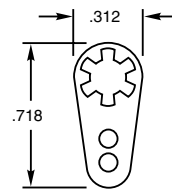
Turret Terminal



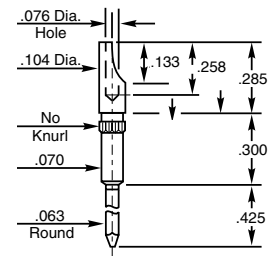
Bifurcated Terminal



Hook Terminal



Pierced Terminal



Gold Cup Terminal

Measurements are in inches.

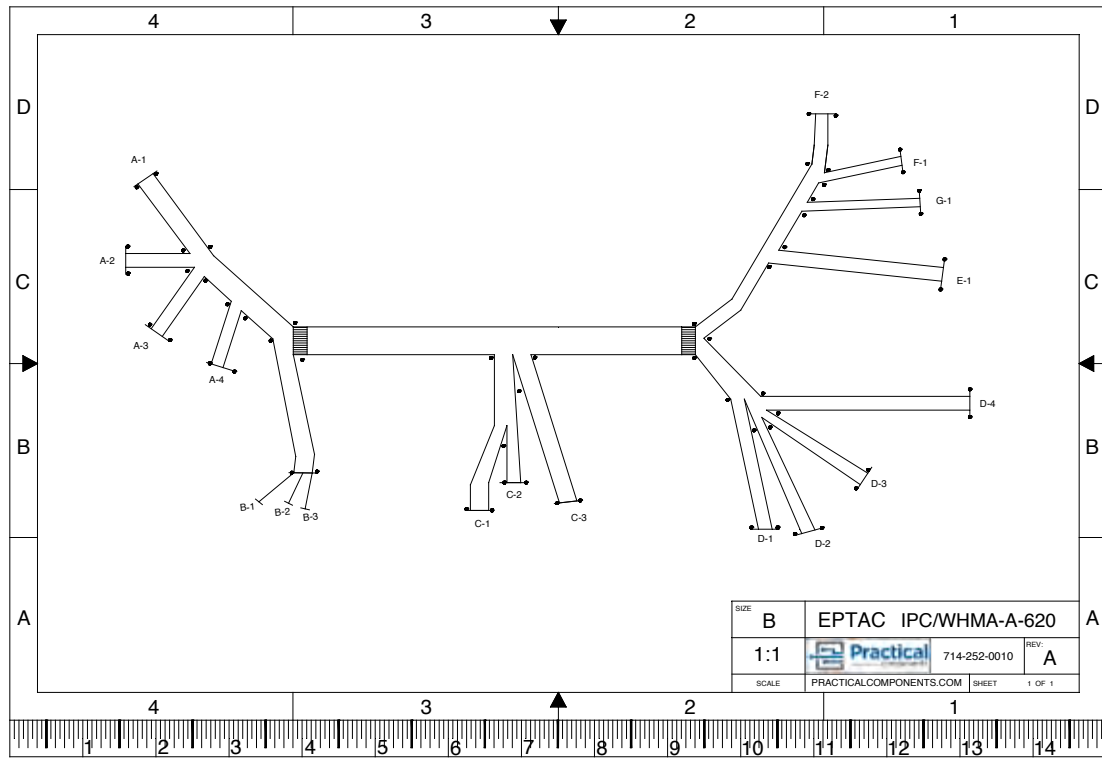
IPC/WHMA-A620 Wire Harness Kit

IPC/WHMA Compliant

The New A620 kit from Practical Components is designed to help companies meet industry standards for cable and wire harness assembly criteria. It helps teach the visual, electrical and mechanical

quality acceptability requirements for cable, wire and harness assemblies. You will also learn to identify target, acceptable, process indicator and defect conditions.

A620 Wire Harness Kit



Board Size: 15 3/8" x 11" x 1 3/4" thick.

A620 Parts Only

The A620 kit enable hands on training in the following areas of wire harness assembly:

- Cable and wire dimensioning, tolerances and preparation
- Crimp Terminations
- Insulation displacement connections
- Soldered terminations
- Splices
- Connectorization
- Marking and labeling
- Co-axial and ribbon cable assembly
- Wire bundle securing
- Installation
- Wire wrap (solderless)
- Testing of wire harness assemblies

The A620 kit comes with the recommended materials to become proficient with the IPC/WHMA-A-620 standard. Each kit is individually packaged with all items labeled. Call for recommended tools.

Lab/Manuel sold separately. Not included with kit.

Part Description	Quantity Per Kit
Gold Cup Terminal	2
Turret Terminal	2
Bifurcated Terminal	2
Pierced Terminal	2
Hook Terminal	2
RV18-16L Isulated Ring	4
R18-6L Ring	4
Butt Splice	2
Machine Pin	3
Pin Contact	2
Pin Connector	2
2 AMP Connector	2
RJ45 Plug	2
Cable Tie	6
Stain Clip	2
18AWG Coaxial Cable	6'
22AWG Stranded	4'
23AWG Coaxial Cable	2'
24AWG Cat5E Stranded	4'
28AWG Ribbon Cable	1'
Lacing Cord	1 yrd

Solder Practice Board and Kits

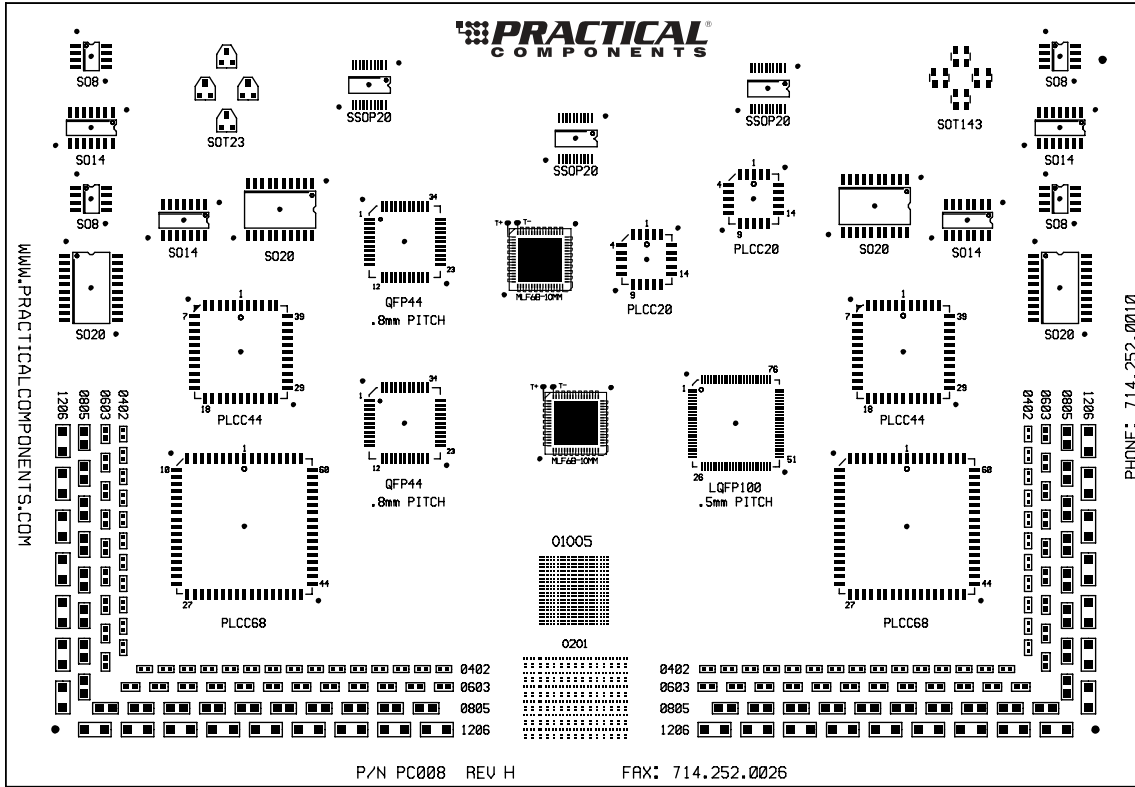


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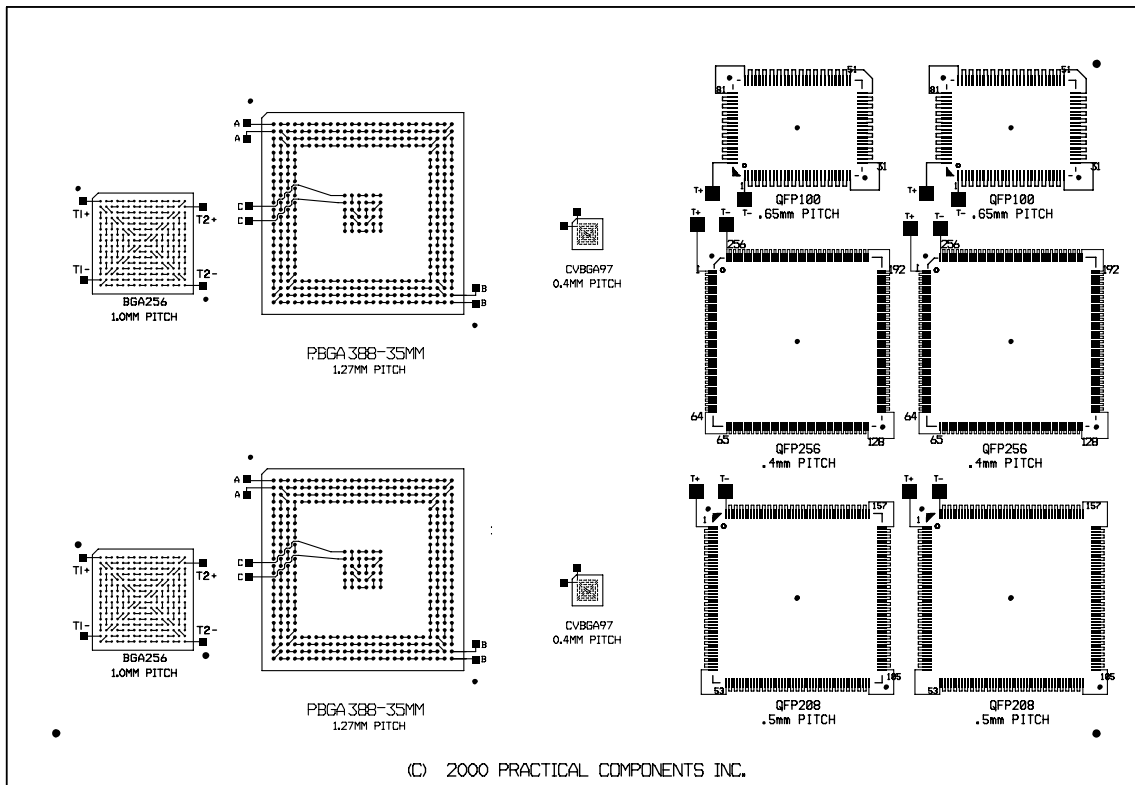
A universal PCB to meet all your needs.

Rework practice, solder training and evaluation, and for testing and calibration of pick-and-place machines.

PCB008 Solder Practice Board



Top view



Bottom view

Board size:
8" x 5.5", .062" thick.

Choose from the kits below or create your own custom configuration.

Lead-Free Components List (included in a complete kit)

Part Description	Quantity Per Board
MLF68-10mm-.5mm-DC-Sn	2
PBGA256-1.0mm-17mm-DC-LF	2
CVBGA97-.4mm-5mm-DC-LF	2
PBGA388-1.27mm-35mm-DC-LF	2
QFP44-10mm-.8mm-3.9mm-Sn	2
QFP100-14x20mm-.65mm-3.9mm-DC-Sn	2
QFP208-28mm-.5mm-2.6mm-DC-Sn	2
QFP256-28mm-.4mm-2.6mm-DC-Sn	2
LQFP100-14mm-.5mm-2.0mm-Sn	1
PLCC20-Sn	2
PLCC44-Sn	2
PLCC68-Sn	2
SO8-3.8mm-Sn	4
SO14-3.8mm-Sn	4
SO20-7.6mm-Sn	4
SSOP20-5.3mm	3
01005SMR-Sn	200
SOT23-TR-Sn	4
SOT143-TR-Sn	4
0201SMR-Sn	180
0402SMR-Sn	52
0603SMR-Sn	42
0805SMR-Sn	36
1206SMR-Sn	32
PCB008 Board (customer to specify finish)	1

Tin-Lead Components List (included in a complete kit)

Part Description	Quantity Per Board
MLF68-10mm-.5mm-DC	2
PBGA256-1.0mm-17mm-DC	2
CVBGA97.4mm-5mm-DC	2
PBGA388-1.27mm-35mm-DC	2
QFP44-10mm-.8mm-3.9mm	2
QFP100-14x20mm-.65mm-3.9mm-DC	2
QFP208-28mm-.5mm-2.6mm-DC	2
QFP256-28mm-.4mm-2.6mm-DC	2
LQFP100-14mm-.5mm-2.0mm	1
PLCC20	2
PLCC44	2
PLCC68	2
SO8-3.8mm	4
SO14-3.8mm	4
SO20-7.6mm	4
SSOP20-5.3mm	3
01005SMR	200
SOT23-TR	4
SOT143-TR	4
0201SMR	180
0402SMR	52
0603SMR	42
0805SMR	36
1206SMR	32
PCB008 Board-HASL finish	1

Notes

- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Kit is available with Lead-Free components (for Tin-Lead and Lead-Free kits). Substitutions may occur depending on availability of lead-free finishes and alloys.
- PBGAs are available with SAC305 or SAC405 Lead-Free alloys.
- CVBGA is available with SAC105, SAC305 or SAC405 Lead-Free alloys.
- Add "LF" to end of Kit Order Number when ordering Lead-Free kits.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL.

Ordering Information

- Order Number: PCB008 Rev H (Board Only)



Foresite Umpire Test Board



This vehicle is best used to look at process qualifications for the primary and secondary steps. Wave Solder, SMT, Cleaning, and then the secondary steps of temporary solder mask, rework flux, and rework cleaning. It also works well to look at interactions of solder mask with fluxes and/or solder pastes, or materials characterization tests in general. This board is a good selection if you are trying to do correlations between different specifications, e.g. IPC and Bellcore. The two B-24 comb patterns allow you to do SIR for both Bellcore and J-STD-004. Pattern D can be used to correlate to existing B-25 data, or for Bellcore electromigration testing. The military Y pattern can be used for many military qualification tests. Then a direct comparison between the military Y pattern and the C3 localized test system can be made.

The Umpire test board is a current qualification vehicle for processes (IPC-ANSI-J-STD-001) and conformal coatings (IPC-CC-830A).

Advantages

- A good vehicle to use for full process evaluations
- Easy to manufacture and therefore inexpensive
- Has all the common patterns used for SIR and electromigration resistance testing plus the component SIR patterns such as the 80 pin TQFP, 256 BGA.
- Can correlate to B-24, B-25A and B36 test boards.
- Is recognized as a valid test vehicle for Bellcore testing (both TR-78 & GR-79)
- Relatively easy to wire and test
- Can do adhesion testing and dielectric strength tests
- Good vehicle for solder mask interactions and effects

Disadvantages

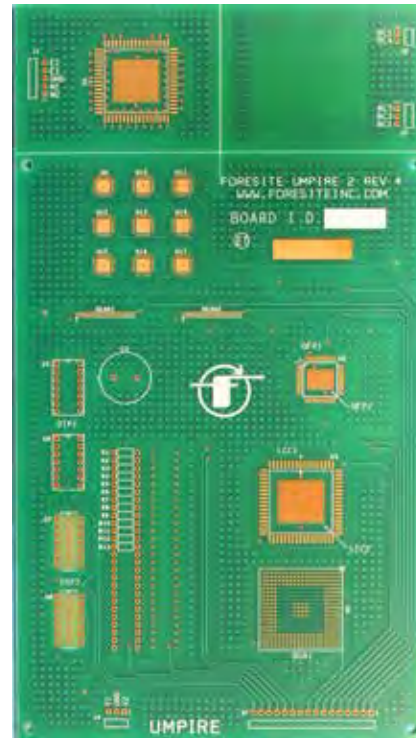
- None

PC051 Umpire Kit

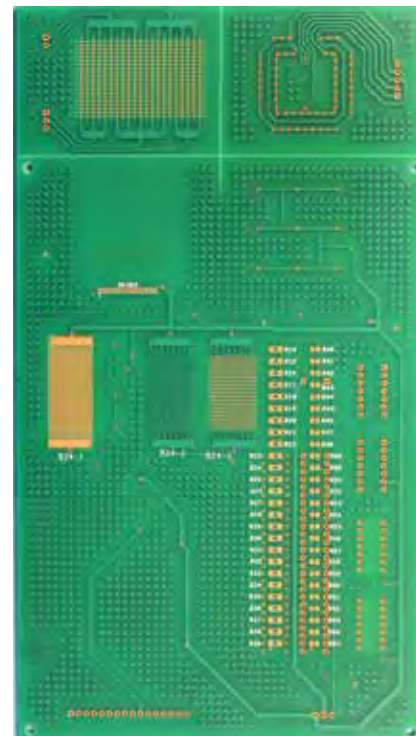
Part Description	Quantity per Kit
PCB051-Foresite	1
PDIP14-Socket	40
68LCC-1.27mm-24.11mm-TR	20
WM2723-ND-TR	10
S1221E-16-ND-TR	10
A-TQFP80-12mm-.5mm-2.0-TR	10
A-PBGA256-1.27mm-27mm-DC-TR	10
A-MLF40-6mm-.5mm	90
Kit Order Number: (Tin-Lead)	PC051-10
Kit Order Number: (Lead-Free)	PC051-10-LF

Notes

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.



Top View



Bottom View

Board size: 5.2" x 9.4", .062" thick.

Practical Components continues to offer high technology solder paste evaluation kits. The Jabil Solder paste evaluation test board and components is the most recent example.

This kit can be used to evaluate new solder paste and its performance for stencil printing and reflow characteristics. The kit can also be used to evaluate the compatibility with wave and rework chemistries. Other uses include ICT probability, comparison studies with different types of solder pastes, as well as internal development and evaluation.

The Jabil Solder Paste Evaluation Test Board is a good test design to evaluate solder paste. The bottom side of the test board has three 0.5mm pitch CTBGA84 patterns and three 0.4mm pitch CVBGA360 patterns which are used for solder paste volume measurements. The test board also has two bridging test patterns used to measure bridging after print. The pitch of pads of one pattern ranges from 8 to 20 mils.

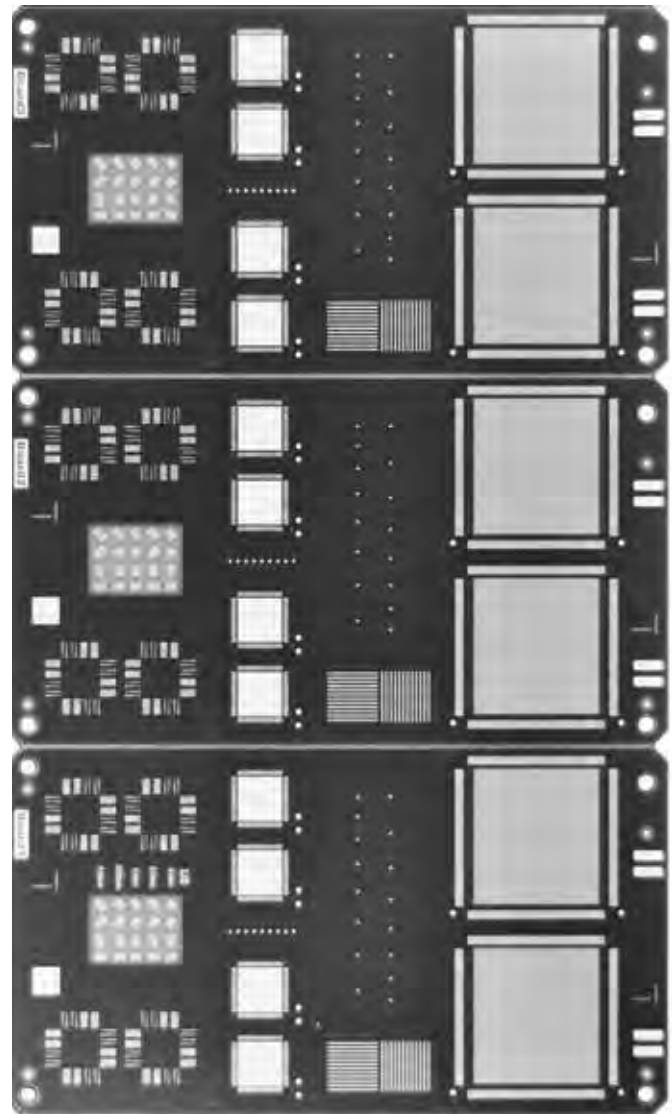
The test board includes patterns for evaluation of bridging, wetting, solder balling, voiding and graping. The wetting pattern includes 12 vertical and 12 horizontal lines. The solder balling pattern includes 16 overprinted pads of 20 mil diameter and the graping pattern includes 4 columns of 6 pads.

Patterns for testing include:

- Bridging patterns
- Wetting/spread testing
- Solder balling pull back pattern
- Graphic pattern
- Solder paste volume
- Solder paste bridging
- Voiding Testing

Notes

- 1 board as the 3-up panel (1 Array = 3 Cards)
- MLF come standard on Tape and Reel but can be ordered in tubes upon special request.
- 2 stencils per kit = 1 Top / 1 Bottom. 29" x 29"
- Customer to specify stencil thickness: 1.5" or 0.5"



Ordering Information

Jabil SP Evaluation Kit #1

- Order Number: 12853
- (50) Jabil Test Boards
- (360) A-MLF68-10mm-.5mm-DC-Sn-TR
- (2) Jabil Test Board Stencils

Jabil SP Evaluation Kit #2

- Order Number: 12853
- (100) Jabil Test Boards
- (360) A-MLF68-10mm-.5mm-DC-Sn-TR

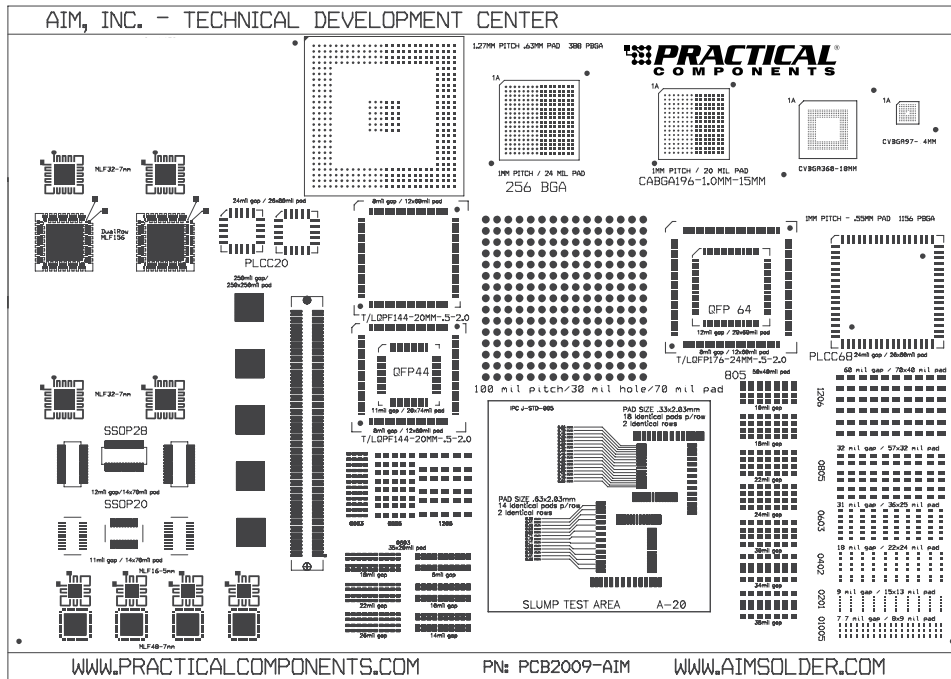
The following BGA are not included in the kit:

- Either BGA can be added to kit upon request.
- Order number: 32210 A-CVBGA360-.4mm-10mm-DC-LF-305
- Order number: 31407 A-CTBGA84-.5mm-6mm-DC-LF-305

AIM Print Test Board and Kit



PCB2009 AIM Print Test Board



Board size: 8.5" x 6", .062" thick.

PC2009 AIM Test Kit

The AIM print test board was designed to include many printing challenges which are commonly encountered on manufacturers assemblies. BGA pads have circular and square pad design to test paste release. AIM has included the standard IPC slump test pattern in order to further challenge the properties of any product tested thereon. This print pattern is more real life and more accurate to predict slump since individual pads are used instead of one pad that is common in the "thermometer" method. There is a number on the board indicating the distances between pads so a hard number can be used for paste evaluations.

Common pad sizes were incorporated into the layout including 1206, 0805 and 0603 rectangular pads for discrete components. These pads have varying distance between them so the user can determine solder beading of paste. Four 250 x 250mil pads are available to be utilized with various aperture styles in order to allow for wetting tests. There are also several fine pitch QFP pads designed to check for the propensity of any given product to cause bridging and to confirm the existence of torn prints, peaking (dog ears), or bridging.

Notes

- Digitized gerber files provided by Aegis Software included at no charge.
- Kit available with Tin/Lead and Pb-free components.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

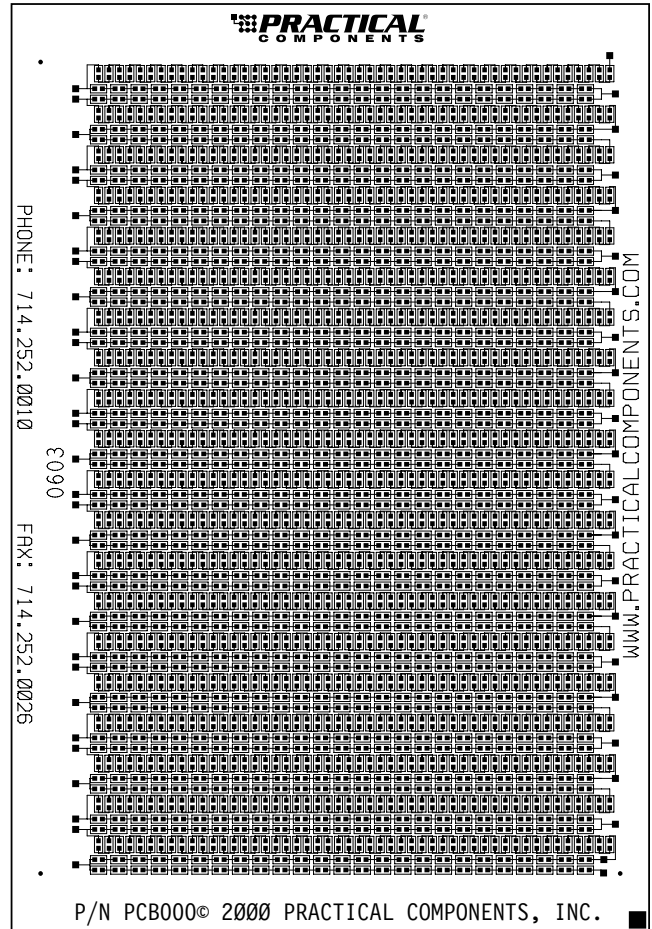
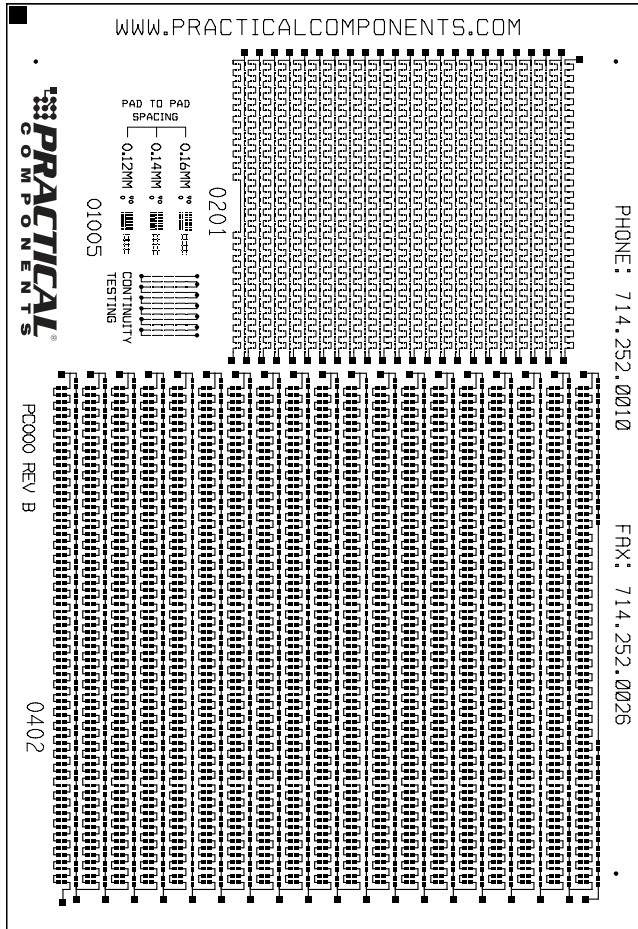


Part Description	Quantity Per 25 Kits
A-T/LQFP144-20mm-.5mm-2.0	50
A-PBGA388-1.27mm-35mm-DC	25
A-PLCC20T	50
A-PBGA256-1.0mm-17mm-DC	25
A-CABGA196-1.0mm-15mm-DC	25
A-QFP44-10mm-.8mm-3.2mm	25
A-QFP64-14mm-.8mm-3.2mm	25
A-LQFP176-24mm-.5mm-2.0mm	25
A-PLCC68T	25
A-SSOP28T-3.9mm	75
A-SSOP20T-3.9mm	75
0603SMR	5000
0805SMR	5000
1206SMR	1300
0402SMR	775
0201SMR	775
01005SMR	1425
PDIP14	350
A-MLF48-7mm-.5mm-DC	100
A-MLF32-7mm-.65mm-DC	100
A-MLF16-5mm-.8mm-DC	100
A-DualRowMLF156-12mm-.5mm-DC	50
A-CVBGA97-.4mm-5mm-DC	25
A-CVBGA360-.4mm-10mm-DC	25
PCB2009	25
Kit Order Number:	PC2009-0-25

The PCB000 test board has land patterns for 01005, 0201, 0402, and 0603 Zero Ohm Lead-Free SMD Resistors. Each component pad is connected in series (daisy-chained) to the next pad. When zero ohm value resistors are placed on the pad, the result is a line of continuity. This test board can be used for placement accuracy evaluation with

any type of component matching the physical size of the pads. Each component type has 2,000 pads, except for 01005 pad size which has 165 pads for Pick-n-Placement purposes only with four different pad spacing. There are also 48 pads for 01005 to test for continuity.

PCB000 Zero-Ohm Test Board



Board size: 8" x 5.5", .062" thick.

SMD Resistors with Zero-Ohm value, and SMD Capacitors can be used on this test board. Customers can mix and match components and quantities to create a custom kit. Please contact your Practical Components sales representative for details.

PC000 SMD Lead-Free Zero-Ohm Resistor Kits

Part Description	Quantity Per 10 Kits	Quantity Per 25 Kits	Quantity Per 50 Kits
*01005SMR-PA-0-Sn	2,000	4,300	8,500
0201SMR-PA-0-Sn	20,000	50,000	100,000
0402SMR-PA-0-Sn	20,000	50,000	100,000
0603SMR-PA-0-Sn	20,000	50,000	100,000
PCB000-Zero Ohm Board	10	25	50
Kit Order Number (Lead-Free):	PC000-0-10-LF	PC000-0-25-LF	PC000-0-50-LF

Notes

- * 01005SMR-PA-0-Sn part is not included in kit. Can be added to kit-build upon request for additional price.
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL



MLF® Test Board and Kits

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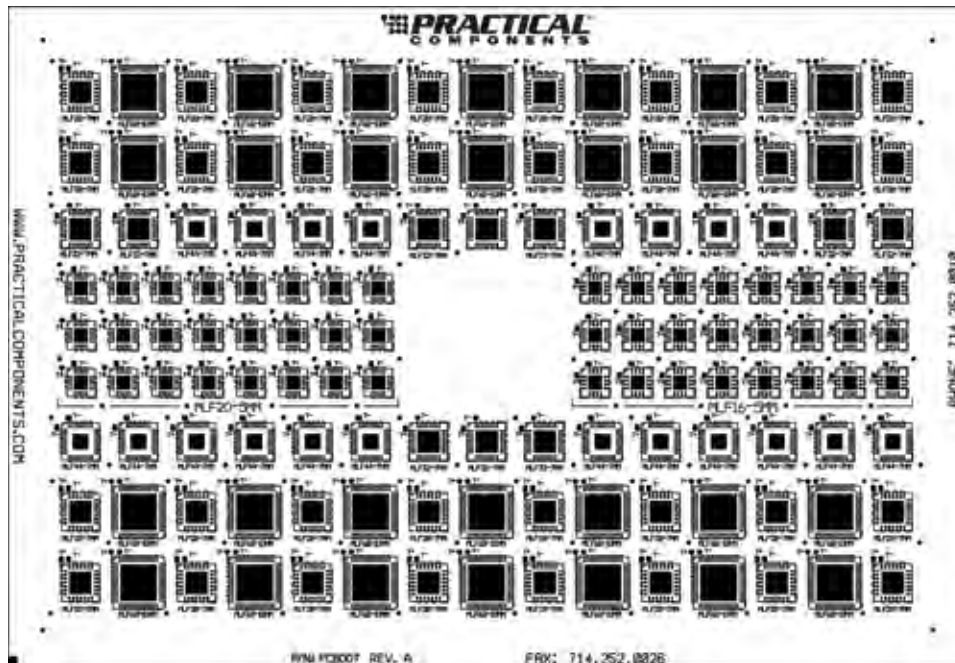
This new PCB007 *MicroLeadFrame*® (MLF®) Test Board is two test boards in one. The top side of the board consists of daisy-chained MLF® pads. Amkor's new MLF® packages are a near CSP plastic encapsulated package with a copper leadframe substrate. MLF® packages have perimeter pads on the bottom of the package. Thermal enhancement is provided by Amkor's ExposedPad™ technology.

The test board front side has land patterns for MLF® package sizes in varying I/O counts. Lead pitches of these include 0.5mm, 0.65mm and 0.8mm. The MLF® side of the PCB007 board is designed to help customers become more familiar with the placement and process characteristics of MLF® packages. The wide assortment of pad sizes and pitches provide a comprehensive overview of MLF® packages.

Daisy-chain patterns on the PCB007 board complement the patterns on the components, allowing continuity to be tested (except for TSOP's and T/LQFP120).

The bottom side of the PCB007 Test Board provides a variety of SMD component types. The bottom of the board has T/LQFP component with 0.4mm pitch, pads for the PBGA256 component with a 1.00mm pitch and two TSOP Type II components with 0.8mm pitch. Board also has new DualRowMLF156 component with 0.5mm pitch. Standard board finish for the PCB007 is Immersion Silver. Other finishes are available upon request. Standard board thickness is 0.062". Customers always have the option of mixing and matching components to suit their requirements.

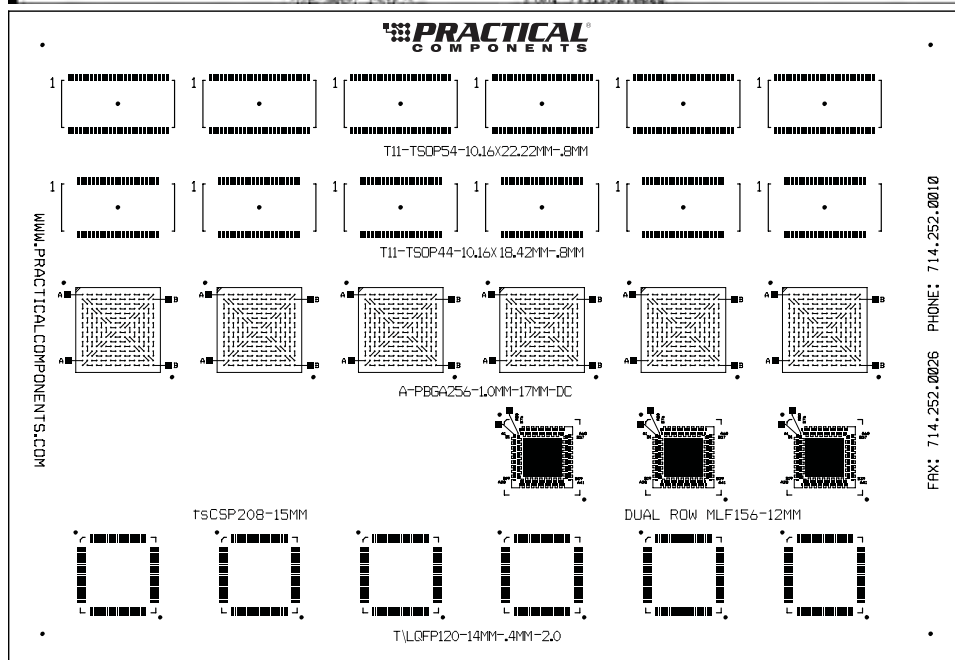
PCB007 MLF Test Board



Available as a

Single Pack Kit

Top view



Software and Data Files Included With All Kits!

Bottom view

Board size: 8" x 5.5", .062" thick.

MLF® Test Board and Kits

PC007 MLF® Kits

Part Description	Quantity Per 1 Kit	Quantity Per 10 Kits	Quantity Per 25 Kits	Quantity Per 50 Kits
Kit Order Number (Top and Bottom):	PC007K-0-01	PC007K-0-10	PC007K-0-25	PC007K-0-50
A-MLF16-5mm-.8mm-DC	24	240	600	1,200
A-MLF20-5mm-.65mm-DC	24	240	600	1,200
A-MLF28-7mm-.8mm-DC	32	320	800	1,600
A-MLF32-7mm-.65mm-DC	10	100	250	500
A-MLF44-7mm-.5mm-DC	20	200	250	1,000
A-MLF68-10mm-.5mm-DC	28	280	700	1,400
A-T/LQFP120-14mm-.4mm-2.0	6	60	150	300
A-DualRowMLF156-12mm-.5mm-DC	3	30	75	150
PBGA256-1.0mm-17mm-DC	6	60	150	300
T11-TSOP44-10.16x18.42mm-.8mm	6	60	150	300
T11-TSOP54-10.16x22.22mm-.8mm	6	60	150	300
PCB007 Test Board	1	10	25	50

Part Description	Quantity Per 1 Kit	Quantity Per 10 Kits	Quantity Per 25 Kits	Quantity Per 50 Kits
Kit Order Number (Bottom Only):	PC007B-0-01	PC007B-0-10	PC007B-0-25	PC007B-0-50
A-T/LQFP120-14mm-.4mm-2.0	6	60	150	300
A-DualRowMLF156-12mm-.5mm-DC	3	30	75	150
PBGA256-1.0mm-17mm-DC	6	60	150	300
T11-TSOP44-10.16x18.42mm-.8mm	6	60	150	300
T11-TSOP54-10.16x22.22mm-.8mm	6	60	150	300
PCB007 Test Board	1	10	25	50

Part Description	Quantity Per 1 Kit	Quantity Per 10 Kits	Quantity Per 25 Kits	Quantity Per 50 Kits
Kit Order Number (Top Only):	PC007T-0-01	PC007T-0-10	PC007T-0-25	PC007T-0-50
A-MLF16-5mm-.8mm-DC	24	240	600	1,200
A-MLF20-5mm-.65mm-DC	24	240	600	1,200
A-MLF28-7mm-.8mm-DC	32	320	800	1,600
A-MLF32-7mm-.65mm-DC	10	100	250	500
A-MLF44-7mm-.5mm-DC	20	200	250	1,000
A-MLF68-10mm-.5mm-DC	28	280	700	1,400
PCB007 Test Board	1	10	25	50

Notes

- Kit quantities are subject to change.
- Mix and match components and quantities to create a custom kit. Please contact your sales representative for details.
- Components supplied in kits (except for TSOP's and T/LQFP120) have pairs of leads shorted together in a daisy-chain pattern that result in a line of continuity when combined with the shorted pairs of pads on the board. Continuity test pads on the board allow the end user to verify electrical connections at solder joints and to identify electrical opens.
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGA is available with SAC305 or SAC405 Lead-Free solder ball alloy's.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL.

Lead-Free Part Description List

Part Description

A-MLF16-5mm-.8mm-DC-Sn
A-MLF20-5mm-.65mm-DC-Sn
A-MLF28-7mm-.8mm-DC-Sn
A-MLF32-7mm-.65mm-DC-Sn
A-MLF44-7mm-.5mm-DC-Sn
A-MLF68-10mm-.5mm-DC-Sn
A-DualRowMLF156-12mm-.5mm-DC-Sn
A-T/LQFP120-14mm-.4mm-2.0-Sn
PBGA256-1.0mm-17mm-DC-SAC305
T11-TSOP44-10.16x18.42mm-.8mm-Sn
T11-TSOP54-10.16x22.22mm-.8mm-Sn



BGA Variable Pitch and Array Board

Mix and match components to configure your custom kit.

Practical Components is now offering a "one-of-a-kind" BGA Variable Pitch and Array PC Board. Each board contains matrices for the most popular ball pitches found on BGAs and CSPs. The use of full matrices allows maximum flexibility for placing parts with full, staggered, or

perimeter configurations. Each board has a mixture of even and odd matrices to enable placement, using automatic equipment, of the highest ball counts available.

PCB005 Variable Pitch and Array Board

● VARIABLE PITCH & ARRAY **PRACTICAL COMPONENTS** ●

PHONE: 714.252.0010 FAX: 714.252.0026

KLAPHEN@PRACTICALCOMPONENTS.COM

● P/N PC005 ©1999 PRACTICAL COMPONENTS, INC. ●

Top View

● VARIABLE PITCH & ARRAY **PRACTICAL COMPONENTS** ●

PHONE: 714.252.0010 FAX: 714.252.0026

WWW.PRACTICALCOMPONENTS.COM

PC005

Bottom View

Board size: 8.33" x 5.83", .062" thick.

Notes

- Kits can be configured to the customer's requirements.
- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Pad dimensions:
 - 1.0mm pitch = 24 mil pad diameter
 - 1.27mm pitch = 28-30 mil pad diameter
 - 1.5mm = 28-30 mil pad diameter
 - 0.5mm = 11 mil pad diameter
 - 0.8mm = 18-19 mil pad diameter
 - 0.75mm = 18 mil pad diameter
- Board finishes available are: Immersion Silver, ENIG, OSP and HASL

Ordering Information

- Order Number: PCB005 (Board Only)

Available as a



Please call your Practical Components' sales representative to identify components available for the PCB005 Test Board.

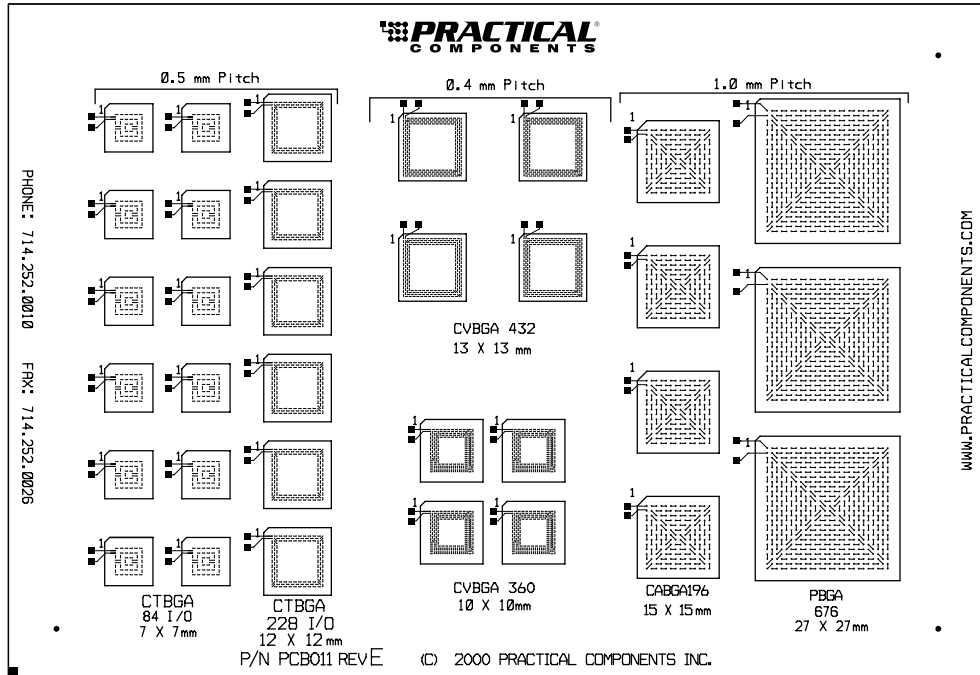
REVISED [Rev. E]

Tin-Lead and Lead-Free Available

The PC011 BGA Kit contains Amkor daisy-chained fine pitch BGAs. The daisy-chain PCB011 test board contains patterns for the 0.4mm pitch, 0.5mm pitch and 1.0mm pitch CSP/BGA components. Amkor BGA type components on the board are the CTBGAs, CVBGAs and

PBGAs. The PCB011 test board is double sided. This test board is designed to help the end user become familiar with smaller BGA sizes and pitches. Components come in standard JEDEC trays. Kit component quantities are for one side of the board only.

PCB011 BGA Fine Pitch Board



Board size: 8" x 5.5", .062" thick.

PC011 BGA Kits

Part Description	Quantity Per 1 kit	Quantity Per 10 kits	Quantity Per 25 kits
A-CTBGA84-.5mm-7mm-DC-SAC305	12	120	300
A-CTBGA228-.5mm-12mm-DC-SAC305	6	60	150
A-CVBGA360-.4mm-10mm-DC-SAC305	4	40	100
A-CVBGA432-.4mm-13mm-DC-SAC305	4	40	100
A-CABGA196-1.0mm-15mm-DC-SAC305	4	40	100
A-PBGA676-1.0mm-27mm-DC-SAC305	3	30	75
PCB011-RevE	1	10	25
Kit Order Number: (Tin-Lead)	PC011-0-01	PC011-0-10	PC011-0-25
Kit Order Number: (Lead-Free)	PC011-0-01-LF	PC011-0-10-LF	PC011-0-25-LF



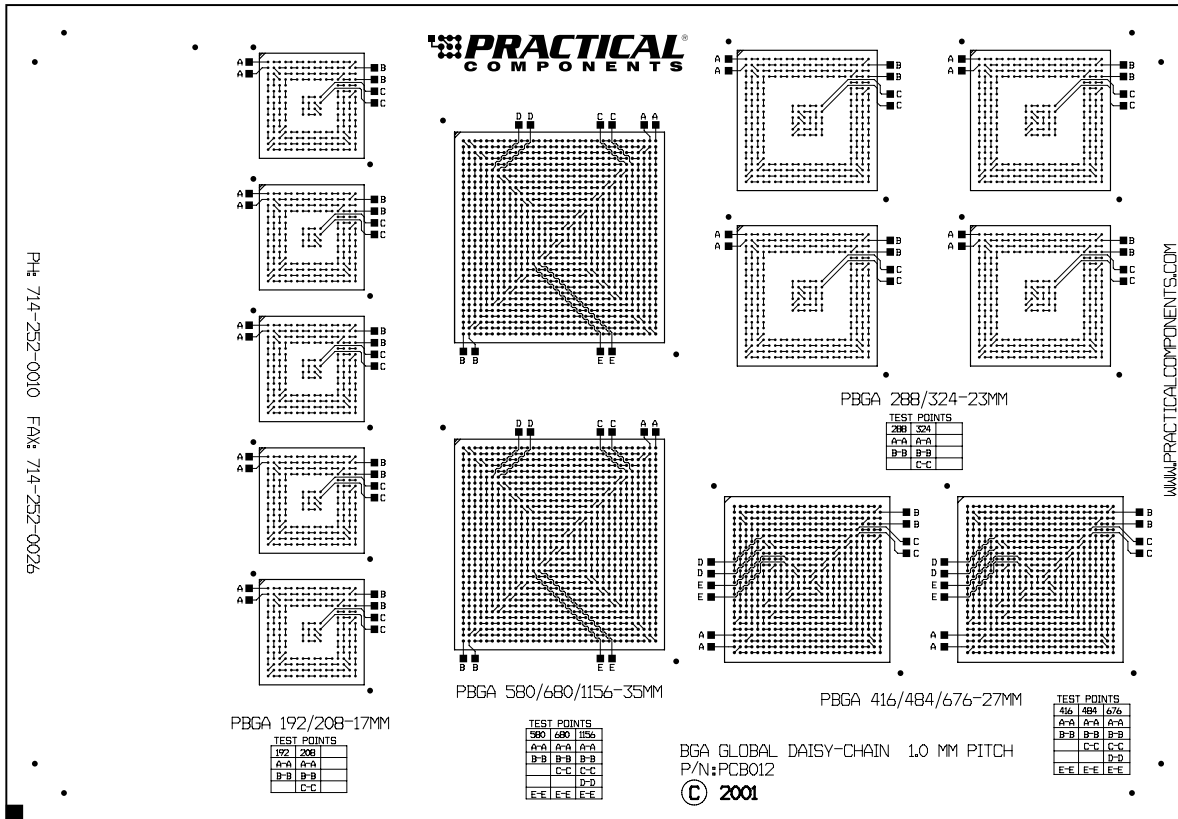
Notes

- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGAs are available with SAC305 or SAC405 solder ball alloys. CVBGA and CTBGA are available with SAC305, SAC405 or SAC105 solder ball alloys.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL

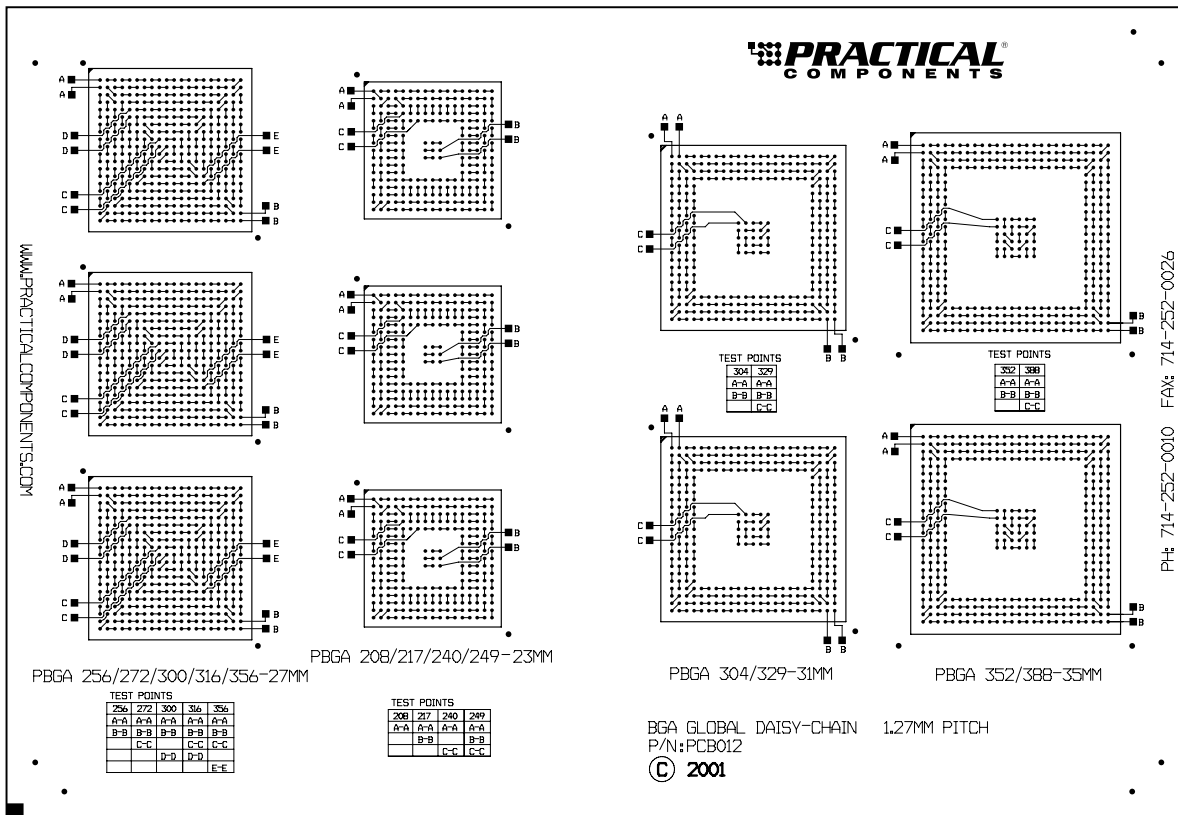
Order numbers for individual items

Part Description	Order Number
A-CTBGA84-.5mm-7mm-DC-SAC305	31317
A-CTBGA228-.5mm-12mm-DC-SAC305	31329
A-CVBGA360-.4mm-10mm-DC-SAC305	32210
A-CVBGA432-.4mm-13mm-DC-SAC305	31439
A-CABGA196-1.0mm-15mm-DC-SAC305	31503
A-PBGA676-1.0mm-27mm-DC-SAC305	31019
PCB011-RevE	TBD

PCB012 BGA Global Daisy-Chain Test Board



Top view



Bottom view

Board size:
8" x 5.5", .062" thick.



BGA Global Daisy-Chain Test Kit

Tin-Lead and Lead-Free Available!

The New PCB012 Global Daisy-Chain test board has 25 different BGA land patterns. Board pads accommodate BGA components ranging from 17mm square to 35mm square. The PCB012 test board has 1.00mm and 1.27mm pitch pads. BGA components placed on this test board range from 208 to 1,156 balls. Daisy-chain patterns on the PCB012 board compliment the patterns on the components, allowing continuity to be tested. Each pad on the board has multiple daisy-

chain patterns. These multiple daisy-chained pads allow different ball-count PBGA components to be placed on the same pad. Each pattern has test points to check for continuity. There are ball-count to test-point legends on the board. The board is double-sided with different pad sizes on the top and bottom. Customers can mix and match components to suit their requirements.

PC012 BGA Global Daisy-Chain Test Kit

1.0mm Pitch—Top Side						
Part Number	Part Description		Quantity Per 1 Kit	Quantity Per 5 Kit	Quantity Per 10 Kit	Quantity Per 25 Kit
30542	A-PBGA208-1.0mm-17mm-DC	5 Pads	5	25	50	125
31358	A-PBGA208-1.0mm-17mm-DC-LF-305	Per Board				
30362	A-PBGA324-1.0mm-23mm-DC	4 Pads	4	20	40	20
31359	A-PBGA324-1.0mm-23mm-DC-LF-305					
30513	A-PBGA288-1.0mm-23mm-DC	2 Pads	2	10	20	50
31352	A-PBGA288-1.0mm-23mm-DC-LF-305					
31083	A-PBGA676-1.0mm-27mm-DC	2 Pads	2	10	20	50
31019	A-PBGA676-1.0mm-27mm-DC-LF-305					
30604	A-PBGA484-1.0mm-27mm-DC	2 Pads	2	10	20	50
31312	A-PBGA484-1.0mm-27mm-DC-LF-305					
31123	A-PBGA1156-1.0mm-35mm-DC	2 Pads	2	10	20	50
31306	A-PBGA1156-1.0mm-35-DC-LF-305					
30343	A-PBGA680-1.0mm-35mm-DC	2 Pads	2	10	20	50
31345	A-PBGA680-1.0mm-35mm-DC-LF-305					

1.27mm Pitch—Bottom Side						
Part Number	Part Description		Quantity Per 1 Kit	Quantity Per 5 Kit	Quantity Per 10 Kit	Quantity Per 25 Kit
30543	A-PBGA208-1.27mm-23mm-DC	3 Pads	3	15	30	75
31432	A-PBGA208-1.27mm-23mm-DC-LF-305	Per Board				
30047	A-PBGA256-1.27mm-27mm-DC	3 Pads	3	15	30	75
31020	A-PBGA256-1.27mm-27mm-DC-LF-305					
30372	A-PBGA272-1.27mm-27mm-DC	2 Pads	2	10	20	50
31309	A-PBGA272-1.27mm-27mm-DC-LF-305					
30645	A-PBGA304-1.27mm-31mm-DC	2 Pads	2	10	20	50
30832	A-PBGA304-1.27mm-31mm-DC-LF-305					
30644	A-PBGA329-1.27mm-31mm-DC	2 Pads	2	10	20	50
31476	A-PBGA329-1.27mm-31mm-DC-LF-305					
30065	A-PBGA388-1.27mm-35mm-DC	2 Pads	2	10	20	50
31310	A-PBGA388-1.27mm-35mm-DC-LF-305					

Notes

- Kit quantities are subject to change.
- Mix and match components and quantities to create a custom kit. Please contact your sales representative for details.
- Board is double sided (top side for 1.0mm pitch packages / bottom side for 1.27mm pitch package)
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGA available as SAC405 but SAC305 is the preferred Alloy.
- Board finishes available are:
Immersion Silver, ENIG, Bare Copper, OSP and HASL.

	Description
Top	PC012T-0-01
Top Lead Free	PC012T-0-01-LF
Bottom	PC012B-0-01
Bottom Lead Free	PC012B-0-01-LF
Complete	PC012K-0-01
Complete Lead Free	PC012K-0-01-LF

Process Capability Validation Kit



Cookson Electronics

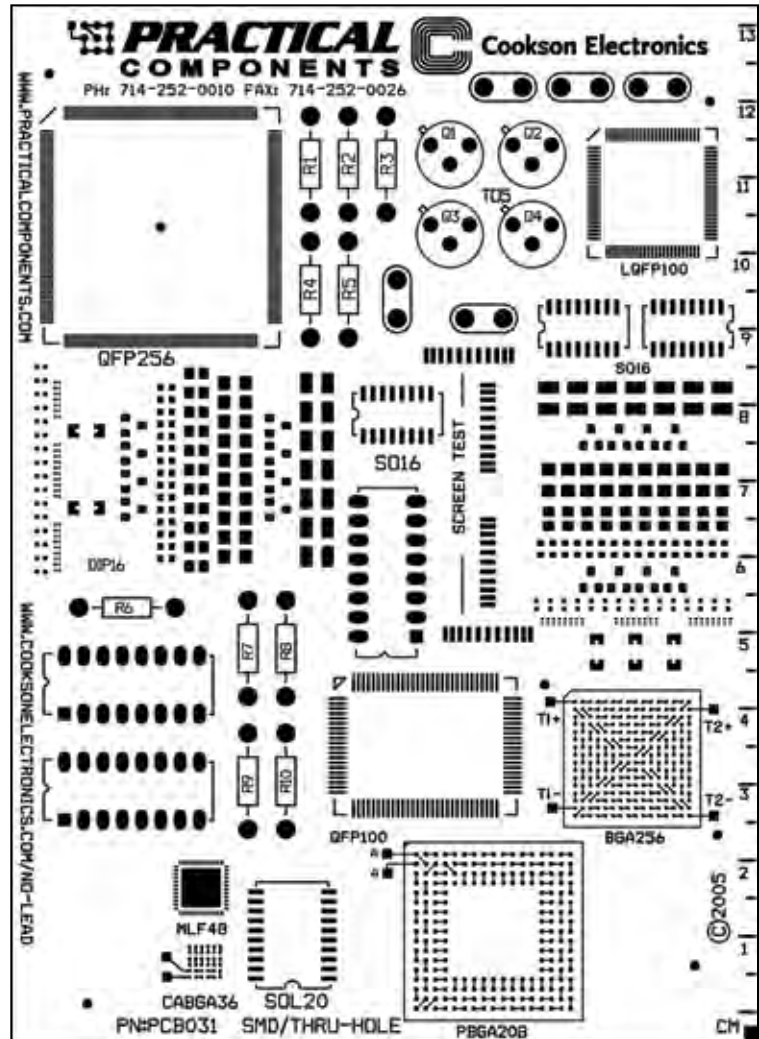
Practical Components and Cookson Electronics are teaming up to offer a new Lead-Free Process Capability Validation Program. This program consists of lead-free components and test boards from Practical Components, with Cookson Electronics' analytical evaluation and process capability validation services to the IPC and J-STD requirements.

PC031 Cookson Lead-Free Capability Validation Kit

Part Description	Quantity Per 25 Kits
PCB031	25
0201SMR-Sn	1,250
0402SMR-Sn	1,000
0603SMR-Sn	1,000
0805SMR-Sn	1,000
1206SMR-Sn	1,000
1210SMR-Sn	400
SOT23-Sn	400
.200" Radial Mono Cap	125
SO16GT-3.8mm-Sn	75
SO20GT-7.6mm-Sn	25
PDIP16T-Sn	75
1/4-W-AR-Sn	250
TO-5-Sn	100
QFP256-28mm-.4mm-Sn	25
QFP100-14x20mm-.65mm-Sn	25
A-PBGA256-1.0mm-17mm-SAC305	25
A-PBGA208-1.27mm-23mm-SAC305	25
A-LQFP100-14mm-.5mm-Sn	25
SOD80-Sn	125
A-CABGA36-6mm-.8mm-SAC305	25
A-MLF48-7mm-.5mm-Sn	25
Kit Order Number:	PC031-0-25

Notes

- Gerber Data and X,Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.
- Stencils are sold separately. Sizes as follows:
 - 20" x 20" size, 5mil thick.
 - 29" x 29" size, 5mil thick.



Board size: 3.875" x 5.375", .062" thick.

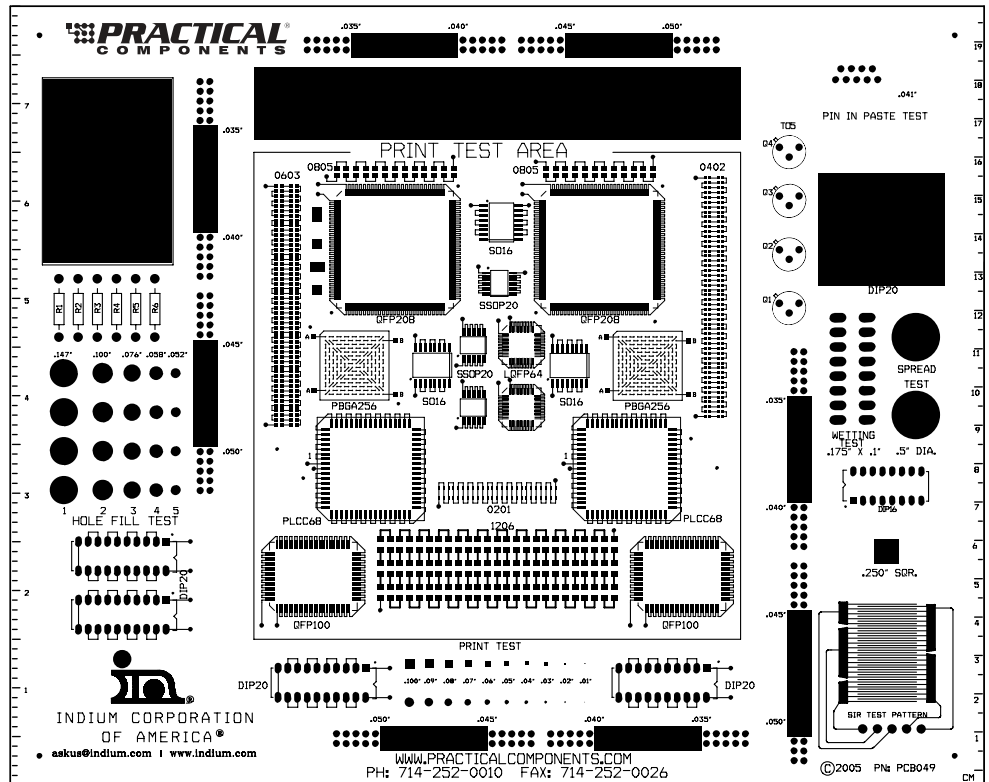


Indium Corporation SMT/PTH Mixed Technology Pb-Free Kit Practical Components and Indium Corporation are introducing a new Lead-Free SMT/Through-hole Mixed Technology test board and kit.

PCB049 Board

The PCB049 Board can be used to evaluate the following conditions:

- Solder paste wetting and spread.
- Solder paste slump performance.
- Solder perform Pin-in-Paste performance.
- Wave flux hole fill performance.
- P&P equipment and placement accuracy.
- Reflow process capabilities.
- Effectiveness of cleaning processes.
- Surface Insulation resistance (SIR).
- Surface finish interaction factors.
- Pb-Free Underfill performance.



Board size: 12" x 8", .062" thick.

PC049 Indium Lead-Free Kit

Part Description	Quantity Per 25 Kits
A-PBGA256-1.0mm-17mm-DC-LF	50
LQFP64-7mm-.4mm-2.0-DC-Sn	50
A-QFP208-28mm-.5mm-2.6-DC-Sn	50
A-QFP100-14x20mm-.65-3.9-DC-Sn	50
A-SSOP20T-5.3mm-DC-Sn	75
A-SO16GT-7.6mm-DC-Sn	75
A-PLCC68T-DC-Sn	50
0201SMR-PA-0-Sn	1,250
0402SMR-PA-0-Sn	3,125
0603SMR-PA-0-Sn	3,125
1206SMR-PA-0-Sn	2,085
A-PDIP20T-7.6mm-DC-Sn	150
A-DIP16T-7.6mm-Sn	25
0805SMR-PA-0-Sn	1,050
1/4W-AR-Sn	175
TO5-Sn	100
Kit Order Number:	PC049-0-25-LF

Notes

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.
- For details on evaluation techniques and material performance requirements, contact Indium Corporation technical support at 1-800-4-INDIUM.
- For complete information this kit or other Lead-Free solutions please contact your Practical Components representative at 1-714-252-0010.



IPC 9850 Attribute Defect Rate Kit

IPC 9850 Kit

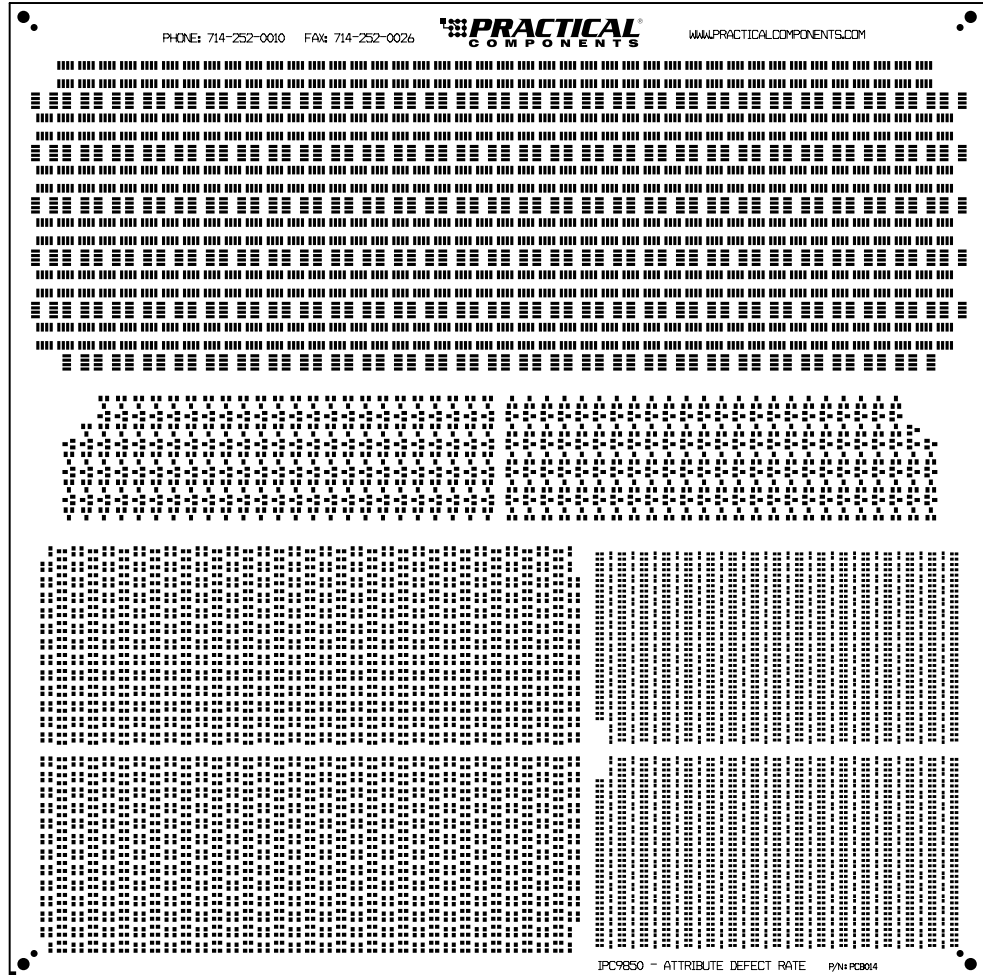
Attribute Defect Rate Kit checks out pick and place machines.

IPC-9850 includes test methods for determining various SMT placement equipment attributes, including repeatability, accuracy and attribute defects. Each of these tests requires specific material and this new test board and kit from Practical Components provides the solution for conducting the attribute rate defect testing. The applicable section from IPC-9850 is 4.1, where attribute defects are defined as components placed upside down, tombstoned, on side, missing or extra part, damaged lead(s), damaged part(s), completely off land, or wrong polarity. Testing requires the placement of 88,000 components on 20 boards to attain reasonably accurate test results. Practical Components 9850 Kit will provide you with enough components and boards to meet this guideline. While IPC-9850 requires the placement of components on sticky tape (included), these boards can also be printed with solder paste and reflowed.

Each board contains the lands (multiple orientations) for 4,400 components (440 SOT23s, 440 SO8s, 880 0603SMCs, 880 0603 SMRs, 880 0402SMCs and 880 0402SMRs). Test material is available from Practical as single boards or complete kits with all the necessary dummy components. On request, this board comes with demonstration versions of CircuitCAM and CheckPoint manufacturing software, ready-to-run CircuitCAM Project Files (CPFs) and Gerber and X, Y Theta data at no extra charge.



PCB014 Board



PC014 Kit (IPC 9850)

Board size: 11" x 11", .062" thick.

Part Description	Quantity Per 10 Kits	Quantity Per 25 Kits
SOT23-TR	6,000	15,000
SO8GTR-3.8mm	5,000	12,500
0402SMC-PL	10,000	50,000
0402SMR-PL	10,000	50,000
0603SMC-PL	12,000	50,000
0603SMR-PL	10,000	50,000
Sticky Tape	2 Rolls	3 Rolls
PCB014	10	25
Kit Order Number:	PC014-0-10	PC014-0-25

Notes

- Gerber Data and X, Y Theta Data are available, if required, at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Only board finish available is HASL.

Rapidly prepare off-line machine programs and color-coded assembly documentation from CAD or Gerber data.

Practical Components' goal is to provide value to our customers by saving time when setting up board test runs. Our partnership with Aegis Industrial Software provides our customers digitized data files for use with Practical's complete line of PCB test boards. Using Aegis' CircuitCAM™ software, customers save an enormous amount of time when setting up both manual stations and automated equipment.

Customer support for installation and use of CircuitCAM™ and CheckPoint is provided directly by Aegis. Please call your Practical sales representative to request additional information.

Aegis Software is a leading provider of innovative software solutions to improve speed, control, and visibility throughout manufacturing operations. The company's FactoryLogix software is the first system designed to support all types of discrete manufacturing. From PCB assembly, to complex box-builds, large system integrations and even high-speed consumer goods processing; this adaptive, multi-market solution redefines the very concept of MES.

Aegis' integrated suite of software modules manage the entire manufacturing information environment: from product launch, to material logistics, through manufacturing execution, to operations analytics and real-time dashboard systems. This holistic solution yields unprecedented product, process, and materials traceability as well as the data fulfillment and visibility manufacturers need for competitive improvement.

With a customer base of more than 1,200 corporations across the electronics, medical, automotive, military and aerospace industries; 36 manufacturing equipment supplier partnerships, and over a decade of independent customer satisfaction awards, Aegis delivers a unique level of capability, value, and time-to-value for its manufacturing customers.

Founded in 1997 by two manufacturing engineers looking to address a noticeable gap in the manufacturing information chain, the company's mission is to provide "software for manufacturing, created by manufacturing engineers." The Aegis corporate culture and philosophy demand honesty in the sales and promotion process, honoring of customer commitments, software value, and respect for the customer's investment.

Aegis Software is headquartered in a state-of-the-art development and training facility in Philadelphia PA. Aegis has international sales and support offices in Germany, UK, China, Singapore, and Japan, and is partnered with 36 manufacturing equipment suppliers.

www.aiscorp.com

CircuitCAM is an integral component to Aegis' Factory Logix system, a scalable suite of NPI and MES Solutions. Other integrated manufacturing tools include:

- CheckPoint—BOM Importing and Revision Control
- Web-based Paperless Documentation
- Web-based Work In Process (WIP) Tracking
- Web-based Quality Data Collection and Analysis
- Web-based Line Monitoring and Supervisory Dashboard
- Web-based Materials Setup Verification and Control
- Aegis DataMiner—Ad hoc data analysis, charting & reporting



Virtual Factory Modeling

Create a graphical routing of your plant's assets and the processes performed at each step. Each point in this routing is associated to a user-defined documentation layout (template) and to a machine programming interface gateway. Model your entire discrete assembly process flow, from prep, assembly, inspection, test, and final assembly; out through packout and shipping.

Total and Simplified CAD Support

Import board location data from CAD, Gerber, scanned boards, and from select machine sources. Import for any CAD type takes a single click. Knowledge of CAD formats is not required.

Visual Documentation

Expedite documentation development for both circuit board and mechanical assemblies with drawing templates, automatic color coding, cropping, annotation, OLE, clipboard, and multimedia. CircuitCAM is the fastest tool to provide operators with the documents they need to do their jobs effectively.

Machine Programming

CircuitCAM supports virtually all process, assembly, and inspection systems. Through an industry leading network of over 25 machine OEM partnerships, AEGIS offers comprehensive and user-friendly off-line programming for all types of SMT and through-hole insertion equipment.

All Practical Components kits come with:

- Demonstration versions of CircuitCAM and Checkpoint
- Ready-to-run CircuitCAM Project Files (CPFs)
- BOM, Gerber, GenCAD, and XY Centroid Files
- Assembly Documentation Samples and Templates
- Installation Instructions and User Manuals

For assistance with the installation and use of CircuitCAM and Checkpoint, please contact an Aegis sales representative at:

Aegis Industrial Software
www.aiscorp.com
sales@aiscorp.com
(215) 773-3571 (phone)
(215) 773-3572 (fax)



International Distributors

Australia / New Zealand

OnBoard Solutions Pty Ltd
2 Salisbury Street
Botany NSW 2019
Sydney, Australia
Tel: +61 (0)2 9695 1030
Fax: +61 (0)2 9695 1944
Contact: Peter Ruefli
E-mail: info@onboardsolutions.com
Website: www.onboardsolutions.com.au

Brazil

New Horizon Comercial Ltda.
Rua Norma Pieruccini Giannotti, 327 - Barra Funda
Sao Paulo, SP 01137-010
Brazil
Tel: +55 11 31868181
Fax: +55 11 31868182
Contact: Maria Fernanda
E-mail: esd@newhorizon.com.br

China

Kasion Automation Limited
Website: www.kasion.com
E-mail: sales@kasion.com

Hong Kong Office

Suite 2602-2603, 26/F,
New Tech Plaza, No. 34 Tai Yau Street,
San Po Kong, Kowloon, Hong Kong
Tel: (852) 2515 1268
Fax: (852) 2515 1175

Kunshan Office

Suite 201, Building 2, Mao Xuan Industrial Park,
No. 639-1 North Changjiang Road,
Kunshan, Jiangsu 215300, P.R.C.
Tel: (86) 512-3682 7433
Fax: (86) 512-3683 8423

Shenzhen Office

Suite 618, Bldg.202, Che Kung Miao Ind. Area,
Futian District, Shenzhen 518040, P.R.C.
Tel: (86) 755-8389 7068
Fax: (86) 755-8389-8028

Tianjin Office

Suite 2-705, Zhuoyue Building,
Bawei Road, Hedong District,
Tianjin, 300171, P.R.C.
Tel: (86) 22-6628 8541
Fax: (86) 22-6628 8541

Eastern Europe

(Covering countries i.e. Latvia, Lithuania, Estonia, Belarus, Moldavia, Czech Republic, Slovakia, Poland and Russia)
Production Solutions Sp. z.o.o.
ul. Marka Hlaski 18
05-410 Jozefow

Poland

Tel: +48 22 353-6324
Fax: +48 22 353-9024
Contact: Robert Jaworski
E-mail: czes@psinter.com
Website: www.psinter.com

Finland

Prodi Oy
Valakkatie 2
00780 Helsinki
Finland
Tel: +358 207 439439
E-mail: prodi@prodi.fi
Contact: Lauri Lehtinen
Website: www.prodi.fi

France / Tunisia / Algeria / Morocco

Teknis France
11, Av Des Marronniers
BP 85
78152 Le Chesnay Cedex
France
Tel: +33 1 3923 8400
Fax: +33 1 3963 3421
E-mail: p.guillaume@teknis-france.com
Contact: Philippe Guillaume
Website: www.teknisfrance.com

Germany

AAT Aston
Konradstrasse 7
90429 Nuernberg
Germany
Tel: +49 9 11 3266-0
Fax: +49 9 11 32 66 299
E-mail: dana.girstl@aston.de
Contact: Dana Girstl
Website: www.aston.de

India

Practical Components Marketing Services
51 Bukit Batok Crescent
#06-18 Unity Centre
Singapore 658077
Tel: +65 65335669
Fax: +65 63162116
E-mail: davidpraccomps@singnet.com.sg
E-mail: david.koh@practicalcomponents.com.sg
Contact: David Koh

Ireland

Production Equipment Ltd.
Riverside Commercial Estate
Galway
Ireland
Tel: 00353 91 745100
Fax: 00353 91 751299
E-mail: sgavin@productionequipment.ie
Contact: Sean Gavin
Website: www.productionequipment.ie

Israel

Nortec International
23 Atir Yeda St.
Kfar Saba
4464318
Israel
Tel: +972 9 7691700
Fax: +972 9 7486270
E-mail: kobi@nortec.co.il
Contact: Kobi Shterenberg
Website: www.nortec.co.il

Italy

Ramos
Via Camillo de Nardis 49
80127 Napoli
Italy
Tel: +39 081 5609081
Fax: +39 081 5609416
E-mail: mmoscati@iol.it
Contact: Michele Moscati
Website: www.amoscati.it

Japan

Nissho Musen Co., Ltd.
2-13-1 SOTOKANDA
Chiyoda Ku, Tokyo
101-0021 Japan
Tel: +81 3 3255 6692
Fax: +81 3 3255 6602
E-mail: aoki@nmk.co.jp
Contact: Mr. Aoki
Website: www.nmk.co.jp

Korea

T.S.S.C.
3-4, Jangmi-ro 148 beon-gil,
Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-856 Korea
Tel: 82-10-3345-8410
Fax: 031-786-4090
E-mail: cima1020@hanmail.com
Contact: Jae-Hee (John) Lee
Website: www.tsk.kr.com

Netherlands / Belgium / Luxembourg

PrintTec b.v.
De Aaldor 32
4191 PC Geldermalsen
Netherlands
Tel: +31 (0) 345-745911
Fax: +31 (0) 345-745910
E-mail: info@printtec.nl
Contact: Robert Joosten
Website: www.printtec.nl

Portugal

Teknis Portugal
Rua Eng. Duarte Pacheco, No66
Appartado 644
2461-901 Alcobaca
Portugal
Tel/Fax: +351 262598383
Mobile: +351 967126579
E-mail: mc.boukhobza@teknisfrance.com
Contact: Marie Christine Boukhobza
Website: www.teknisfrance.com

Russia

DiPaul
23, Pr. Popova Street
St. Petersburg, 197376 Russia
Tel: +7 812 325 1478
Fax: +7 812 702 1269
Contact: Andrey Lukin
E-mail: olgazonova@dipaul.ru
Contact: Grigory Rubtsov - sales
E-mail: lukin@dipaul.ru
Website: www.dipaul.ru

Singapore / Malaysia / Indonesia

Practical Components Marketing Services
51 Bukit Batok Crescent
#06-18 Unity Centre
Singapore 658077
Tel: +65 65335669
Fax: +65 63162116
E-mail: davidpraccomps@singnet.com.sg
E-mail: david.koh@practicalcomponents.com.sg
Contact: David Koh

Spain

ESTANFLUX S.A.
c/Gomis 1
08023 Barcelona - Spain
Office phone : +34 93 351 6151
Tech. service phone : +34 93 408 5323
Fax : +34 93 352 38 45
Email: jose.mas@estanflux.com
Website: http://www.estanflux.es

Sweden/ Denmark/ Norway

DESAB Elektroniksystem AB
Haradsvagen 29
14143 Huddinge
Sweden
Tel: +46 8711 7000
Fax: +46 8711 7010
E-mail: mr@desab.se
Contact: Mikael Roste
Website: www.desab.se

Switzerland

Sibalco AG
Birmannsgasse 8
CH-4055 Basel
Switzerland
Tel: +41 612 641010
Fax: +41 612 641015
E-mail: k.luedin@sibalco.ch
Contact: Karin Lüdin
Website: www.sibalco.ch

United Kingdom

Intertronics
Unit 17, Station Field
Industrial Estate
Kidlington, Oxfordshire
OX5 1JD, England
Tel: +44 1865 842 842
Fax: +44 1865 842 172
E-mail: info@intertronics.co.uk
Contact: John Heap
Website: www.intertronics.co.uk

United Arab Emirates

Neuro Technology Middle East Pze
A2, Dubai Airport Free Zone
PO Box 54534, Dubai,
UAE
Tel: +971 4 299 5949
Fax: +971 4 2995948
Email: latha@neurotechnology.ae
Contact: Latha
Website: www.neurotechnology.ae

PRACTICAL TOOLS, INC.



USA

10762 Noel St.
Los Alamitos, CA 90720-2548
Phone: 714-252-1192
Fax: 714-252-0026
avilligan@BuyPT.com

Costa Rica

Calle 22, Ave. 3 y 5 #351
San Jose Costa Rica
Office Phone (506) 2223-0371
Office Fax (506) 2258-5234
pmarin@aseprocr.com



PO Box 1037
10762 Noel Street
Los Alamitos, CA 90720 U.S.A.

TEL 1-714-252-0010
FAX 1-714-252-0026

info@trustpci.com
www.practicalcomponents.com
Trustpci.com



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