Application Note AN-79

Wave Soldering Guidelines for InSOP and HSOP Packages

Note: these guidelines apply to InSOP packages WITHOUT bottom exposed pads (such as InSOP-24D). InSOP packages WITH bottom exposed pads (such as InSOP-24B, InSOP-24C) must be board mounted using IR/convection reflow.

Solder Pad Layout Design Recommendations for Wave Soldering with InSOP Packages

Power Integrations recommends the use of IR/convection reflow for surface-mount attach of the InSOP and HSOP packages. However, both packages were designed with wave soldering in-mind in case IR/convection reflow is not available or not preferred. Both InSOP and HSOP have ≥0.75 mm lead pitch and narrow leads (0.25 – 0.35 mm) to allow adequate spacing between leads, and can be successfully attached when using wave soldering equipment with state-of-the-art features that prevent solder bridging. However, for older or less sophisticated wave soldering equipment, special PCB/footprint layout considerations are recommended in this document.

Maximum Spacing Between Solder Pads

The spacing between the solder pads should be as large as possible to deter solder bridging, but care must also be taken to ensure that the selected pad layout and wave-soldering process results in good quality solder fillets on all sides of the lead "foot". The InSOP solder pad can be designed as narrow as 0.30 mm in width, allowing up to 0.45 mm of pad-to-pad spacing, and the HSOP as narrow as 0.40 mm with 0.40 mm spacing. Table 1 compares package and solder pad layout dimensions to other well-known wave solderable packages.

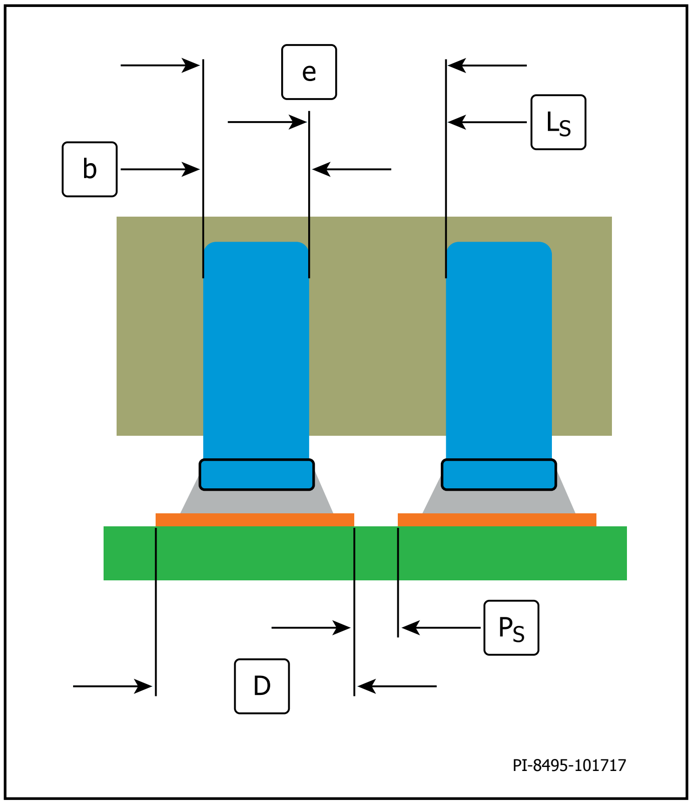

Figure 1. Solder Pad Spacing.

Layout Dimensions for Common and Finer-Pitch Wave-Solderable Leaded Packages

All Dimmensions (mm)	Lead Pitch (e)	Lead Width (b)	Lead Metal-to-Metal Spacing (L_S)	Recommended Solder Pad Width for Wave Soldering (D)	Solder Pad Metal-to-Metal Spacing (P_S)
InSOP-24	0.75	0.25	0.50	0.30 - 0.35	0.40 - 0.45
HSOP-28	0.80	0.35	0.45	0.40	0.40
SSOP-36	0.80	0.36	0.44	0.40	0.40
TQFP-32	0.80	0.35	0.45	0.40	0.40
Standard SOIC	1.27	0.40	0.87	0.60	0.67

Table 1. Layout Dimensions for Common & Finer-Pitch Wave-Solderable Leaded Packages.

Solder Thieves and Orientation Through The Wave

The well-known method of designing "solder thieves" on the PCB layout has been shown to be effective in providing good wave soldering results for the InSOP and HSOP packages. The general concept is shown in Figure 2, and includes large pads at the end of each row of fine-pitch solder pads combined with proper orientation of the layout through the wave. The large pads, called "solder thieves", act to draw excess solder, ensuring clean/bridge-free solder joints along the entire row of solder pads.

Utilizing solder thieves with both InSOP and HSOP packages requires a couple special considerations due to unique features on both packages. For InSOP, depending on the flexibility for laying out the PCB and the orientation of the package, it may be possible to save some board space by combining the solder thief pad with the wide solder pad required for the wide "batwing lead" of the InSOP. The orientation of the package through the wave MUST be with the leads perpendicular to the PCB travel direction, so the two layout options for InSOP are shown in Figure 3.

For HSOP, the leads are symmetrically designed, so there is only one option for the solder thief design. Figure 4 shows the recommended wave soldering footprint.

Thief-Pad Design is Dependent on PCB Travel Directions

Exact size, location and shape of the solder thief pads may need to be modified compared to what is shown in this document depending on the type of solder wave system utilized. However, if the general principles described here are applied, the InSOP and HSOP packages can very successfully be used with a wave soldering process.

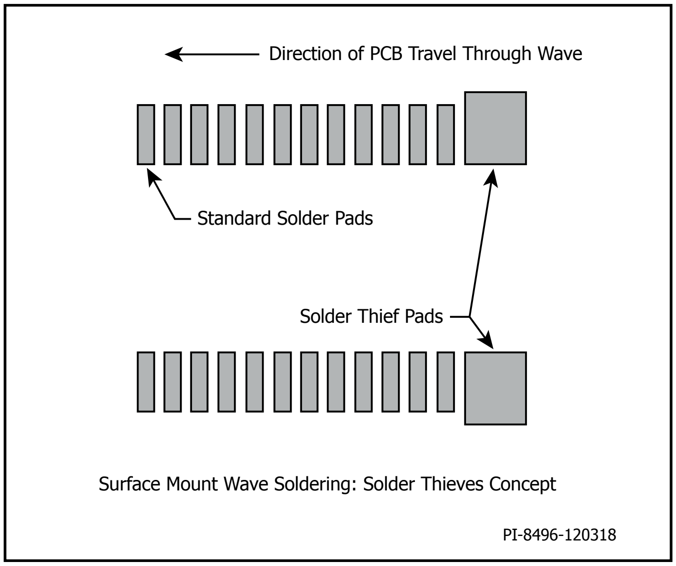

Figure 2. Solder Thieves Concept.

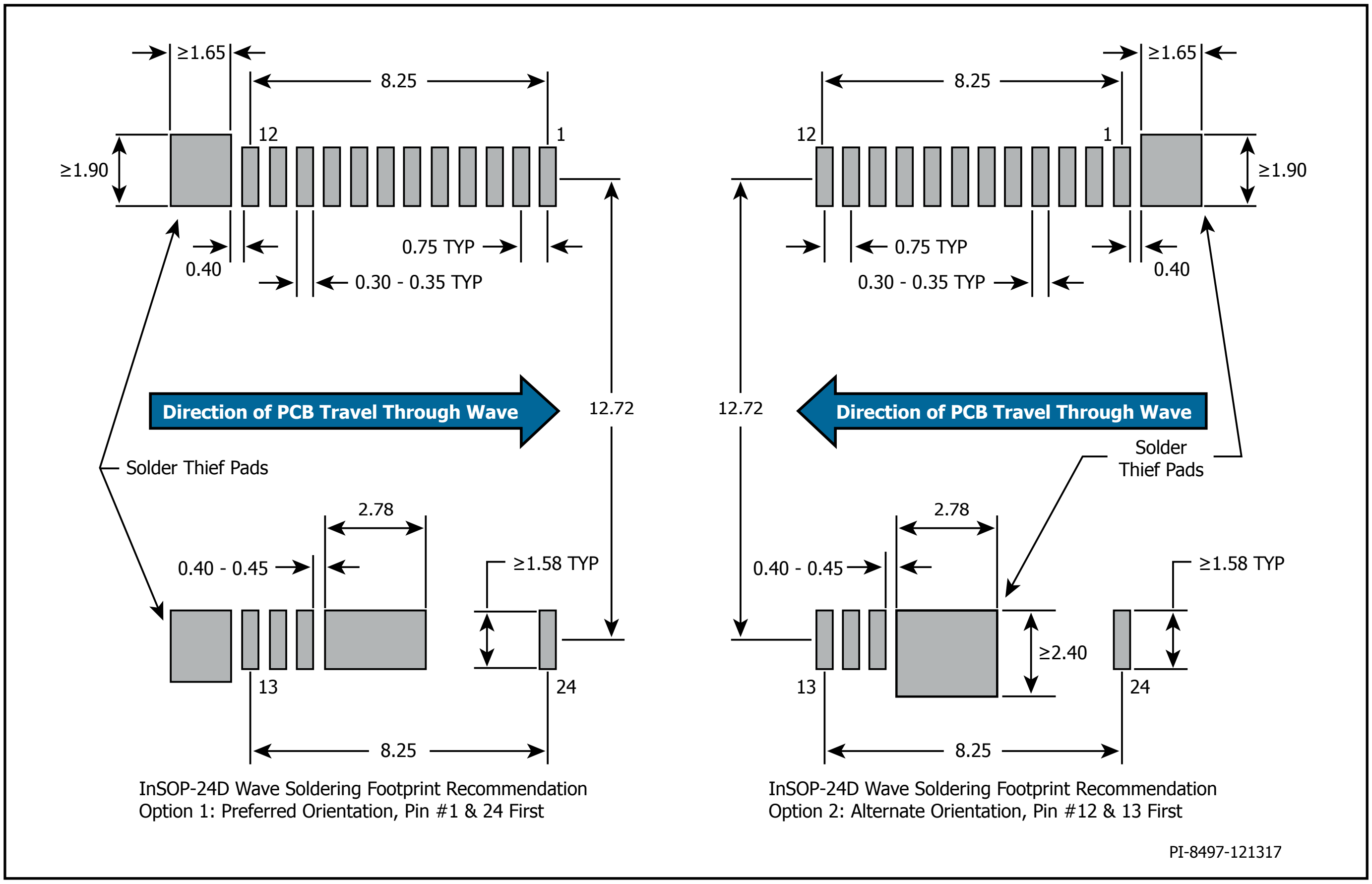

Figure 3. InSOP Wave Soldering Footprint Recommendations – Preferred and Alternate Orientations.

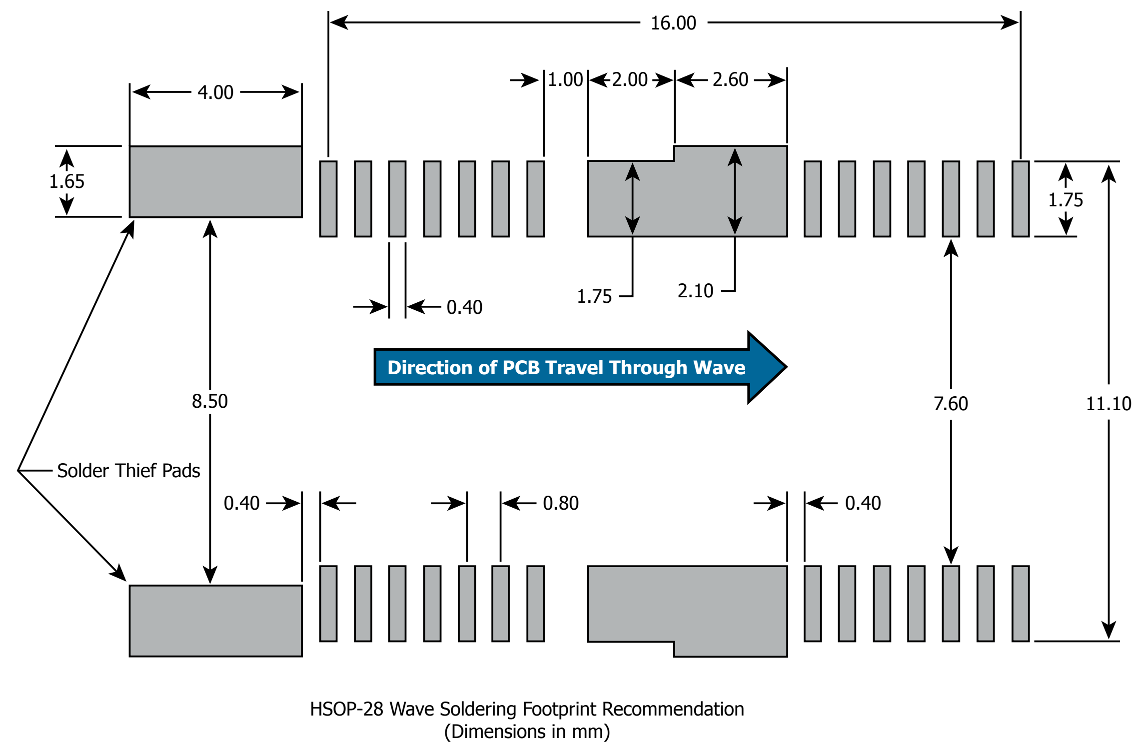

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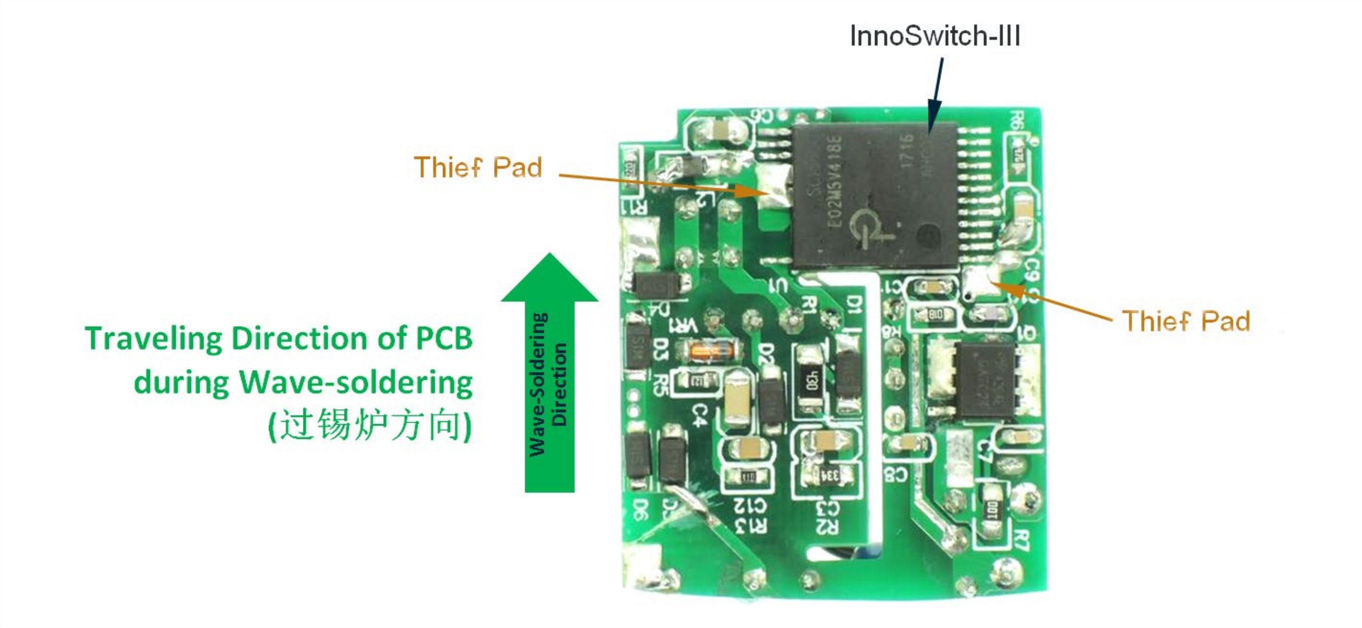
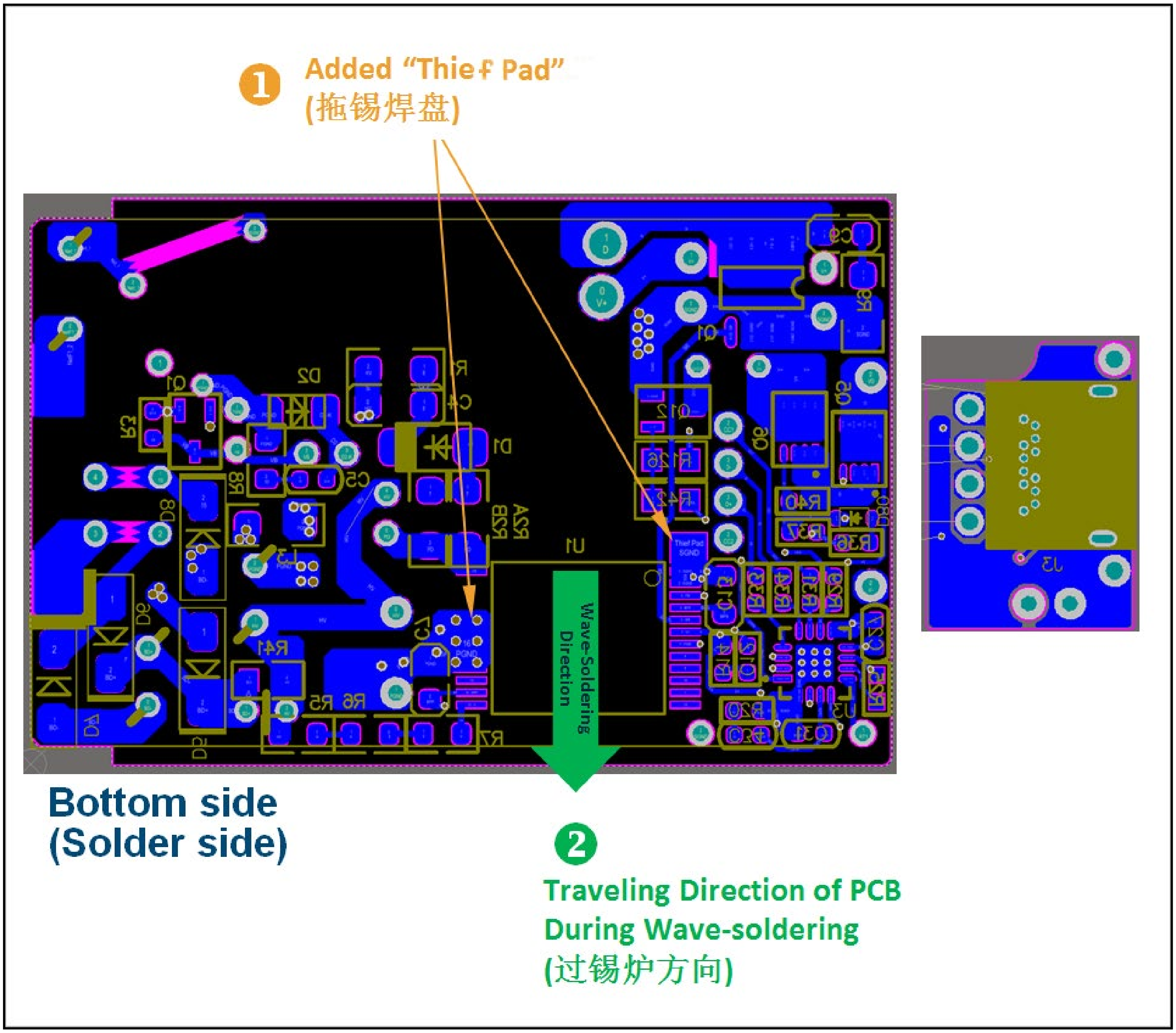
Figure 4. HSOP Wave Soldering Footprint Recommendation.

InSOP Design Examples

A. 10 W, 5 V / 2 A Design



B. 27 W USB-PD Design

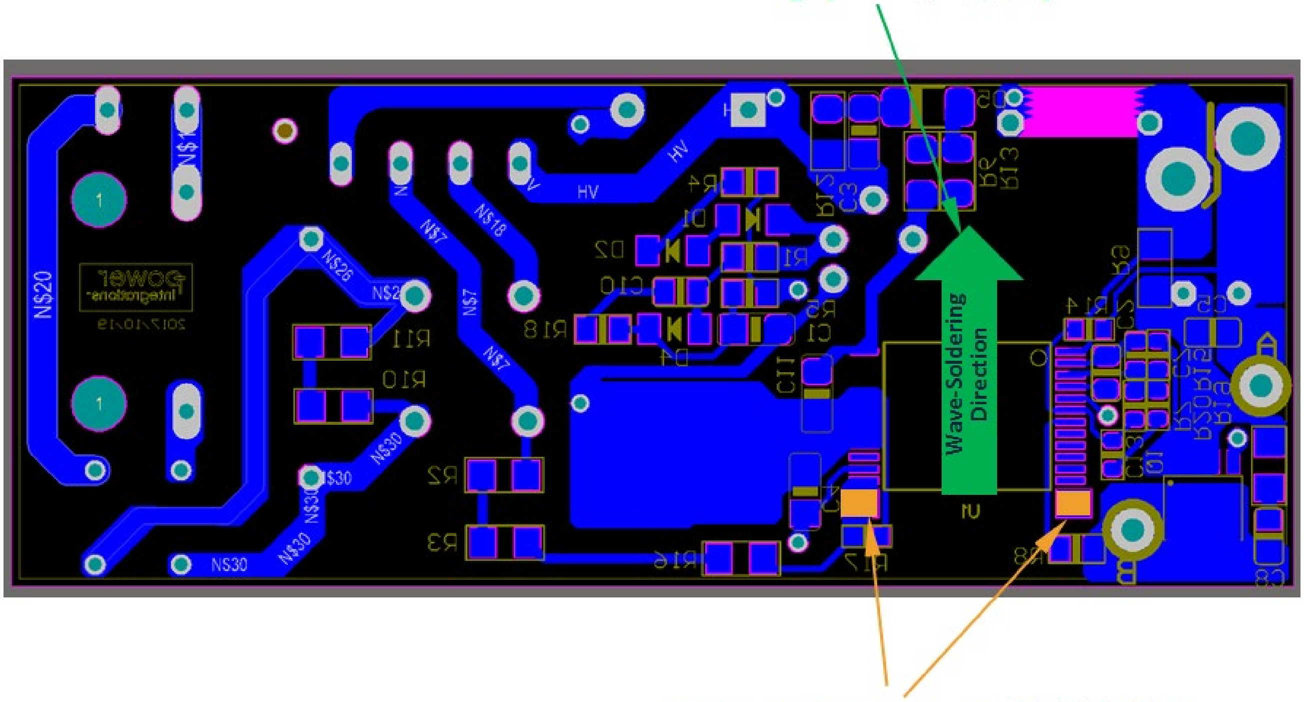


① Added “Thief Pad” (拖锡焊盘)

Bottom side (Solder side)

② Traveling Direction of PCB During Wave-soldering (过锡炉方向)

C. 45 W, Single 19 V / 2.37 A Design



Traveling Direction of PCB During Wave-soldering. (过锡炉方向)

Added "Thief Pad" (拖锡焊盘)

Notes

Revision	Notes	Date
A	Initial release.	12/18
B	Minor text changes and new Figure 4 added.	03/19

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Power Integrations Worldwide Sales Support Locations

World Headquarters
5245 Hellyer Avenue
San Jose, CA 95138, USA
Main: +1-408-414-9200
Customer Service:
Worldwide: +1-65-635-64480
Americas: +1-408-414-9621
e-mail: usasales@power.com

China (Shanghai)
Rm 2410, Charity Plaza, No. 88
North Caoxi Road
Shanghai, PRC 200030
Phone: +86-21-6354-6323
e-mail: chinasales@power.com

China (Shenzhen)
17/F, Hivac Building, No. 2, Keji Nan
8th Road, Nanshan District,
Shenzhen, China, 518057
Phone: +86-755-8672-8689
e-mail: chinasales@power.com

Germany (AC-DC/LED Sales)
Einsteinring 24
85609 Dornach/Aschheim
Germany
Tel: +49-89-5527-39100
e-mail: eurosales@power.com

Germany (Gate Driver Sales)
HellwegForum 1
59469 Ense
Germany
Tel: +49-2938-64-39990
e-mail: igbt-driver.sales@power.com

India
#1, 14th Main Road
Vasanthanagar
Bangalore-560052 India
Phone: +91-80-4113-8020
e-mail: indiasales@power.com

Italy
Via Milanese 20, 3rd. Fl.
20099 Sesto San Giovanni (MI) Italy
Phone: +39-024-550-8701
e-mail: eurosales@power.com

Japan
Yusen Shin-Yokohama 1-chome Bldg.
1-7-9, Shin-Yokohama, Kohoku-ku
Yokohama-shi,
Kanagawa 222-0033 Japan
Phone: +81-45-471-1021
e-mail: japansales@power.com

Korea
RM 602, 6FL
Korea City Air Terminal B/D, 159-6
Samsung-Dong, Kangnam-Gu,
Seoul, 135-728, Korea
Phone: +82-2-2016-6610
e-mail: koreasales@power.com

Singapore
51 Newton Road
#19-01/05 Goldhill Plaza
Singapore, 308900
Phone: +65-6358-2160
e-mail: singaporesales@power.com

Taiwan
5F, No. 318, Nei Hu Rd., Sec. 1
Nei Hu Dist.
Taipei 11493, Taiwan R.O.C.
Phone: +886-2-2659-4570
e-mail: taiwansales@power.com

UK
Building 5, Suite 21
The Westbrook Centre
Milton Road
Cambridge
CB4 1YG
Phone: +44 (0) 7823-557484
e-mail: eurosales@power.com