

SurfMate is a surface-mount connector system for use with pin-compatible Maxi, Mini, Micro Family converters and input / front-end modules. For the first time, circuit-board designers and assemblers have the ability to surface mount high-density DC-DC converters having current ratings up to 50A. (Table 15.1)

SurfMate utilizes a pair of surface-mounted headers that contain sockets to accept the input and output pins of the module. (Table 15.2) The SurfMate header assembly is compatible with any thickness PC board, does not increase the module mounting height above the board, and is available for all three standard module size: Maxi, Mini and Micro (full, half and quarter bricks).

SurfMates are available packaged in standard recyclable JEDEC-style trays for use with automated pick-and-place equipment and are compatible with standard reflow solder operations. After reflow, the modules are simply inserted into the SurfMates. Any secondary soldering operation used for through-hole sockets or pins can now be entirely eliminated – reducing manufacturing time and eliminating dual processes.

This unique interconnect scheme combines the inherent flexibility of component power designs with the manufacturing efficiency of surface-mount assembly.

#### Printed Circuit Board Design and Solder Guidelines for the SurfMate Socketing System

Recommended PCB layout drawings for SurfMates are provided on the Vicor website. All unspecified PCB dimensional tolerances comply with ANSI/IPC-D-300 for Class “B” boards. DXF versions of the PCB outlines are available in the Accessories section of the Vicor website.

**Recommended PCB Construction:** The SurfMate system is capable of very high current-carrying capacity. We therefore recommend a multilayer PCB with three-ounce copper and internal power and ground planes. Consult the drawings for the recommended size and quantity of via holes for carrying current to the internal planes.

**Solder Mask and Pad:** Two solder mask keep-out areas are recommended. The larger area encompasses the complete pad area at either end. It ensures the proper height of the three-ounce solder pads to the surrounding laminate. This provides for the optimum gap between the SurfMate and the PCB 0.0042in  $\pm$ 0.0004in [0,106mm  $\pm$ 0,010mm], minimizing the solder paste thickness required for quality solder joints. Without this solder mask keep-out area, the gap may widen, (see “Flush-Mounted Pads”), requiring thicker solder paste to fill the larger gap.

The smaller solder mask keep-out areas are circular and are located on each pad, for the solder joint between the PCB and the SurfMate. The remainder of the pad has a covering of solder mask. The solder paste is dispensed in a rectangular area covering the soldering area and part of the solder mask area. During soldering, the paste will migrate away from the solder mask area to the soldering area, providing ample volume for quality solder joints.

Each pad features a non-plated through hole in the center of the pad to provide a venting function. It is normal for the solder joint to have a slight void centered on this through hole.

**Solder Paste:** Solder paste thickness requirements will vary depending on whether the board pads are flush or elevated from the laminate.

**Elevated Pads (preferred):** The ideal height for elevated pads is 0.0042in [ 0,106 mm]  $\pm$ 10%. This can be achieved by using a three-ounce copper surface layer. With this height, a minimum solder paste thickness of 0.006in should be used. Thicker stencils of between 0.008in [0,203mm] and 0.012in [0,305mm] are preferred.

**Flush-Mounted Pads:** For boards with flush-mounted pads a minimum of 0.010in [0,254mm] solder paste should be used. Preferred thickness is between 0.012in [0,305mm] and 0.016in [0,406mm].




**Placement:** SurfMate locating pins will engage in the corresponding PCB holes with a light push of the SurfMate into the solder paste. The SurfMate should not be taped or adhered in place. The surface tension of the solder during reflow will center the SurfMate parts on the PCB, resulting in accurate positioning.

**Equipment and Solder:** Soldering of SurfMates should be done using either an infrared or convection oven reflow process. Solder type Sn63Pb37, or equivalent, with a eutectic temperature of 361°F [183°C] should be used. Higher temperature solder is not recommended.

**Standoffs:** Mounting standoffs are required for SurfMate applications. The location for standoff holes is shown on the PCB layout. A selection chart of recommended standoff kits is provided in this section.

**Module Pins:** SurfMates must be used with modules with the “S” or “F” pin style.

**Module Insertion / Extraction:** Sockets and modules are rated for up to five insertions and extractions before requiring replacement. When installing a module, lightly place it into position so that all pins are properly aligned over each socket. Then apply even pressure by uniformly tightening each of the mounting screws through the mounting slots on the baseplate into the pcb mounted standoffs. For module removal, Vicor highly recommends the use of our Module Exchange Tool in order to ensure that the sockets are not damaged during the module removal process. Removing the module at an angle should be avoided as this can damage the sockets.

SurfMate: Surface-Mount Sockets											
Board Thickness	Mounting Style	Full Brick (Maxi)			Half Brick (Mini)			Quarter Brick (Micro)			Pin Style
		Input	Output	Five Sets	Input	Output	Five Sets	Input	Output	Five Sets	
All	Surface Mount	22100	22101	16017	22100	22102	16021	22103	22104	16025	S, F
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>1.</p>  </div> <div style="text-align: center;"> <p>2.</p>  </div> <div style="text-align: center;"> <p>3.</p>  </div> </div>											

Parameter	Specification Value	Reference
<b>Compatibility</b>		
Module Pin Style	F	Short RoHS pins
	S	Short ModuMate pins
<b>Mechanical</b>		
Contact Normal Force	100g EOL min	GR-1217-CORE, R5-23
Number of Mating Cycles	5 max <sup>[d]</sup>	Exception to GR-1217-CORE which specifies 25 mating cycle
Module Engagement Force	32lbs per connector set max	GR-1217-CORE, R5-31,32
Module Disengagement Force	32lbs per connector set max	GR-1217-CORE, R5-31,32
<b>Electrical</b>		
Current Rating	50A Maxi <sup>[a]</sup> , Mini; 25A Micro (Based on 248°F [120°C] max socket temp & 86°F [30°C] max temperature rise of contact)	Gold plating standards and accepted industry standards such as IICIT, EIA, Bellcore guidelines
Low-Level Contact Resistance 0.080in [2,03mm] dia socket (LLCR)	400μΩ max	GR-1217-CORE, 6.2.1
Low-Level Contact Resistance 0.150in [3,81mm] dia socket (LLCR)	300μΩ max	GR-1217-CORE, 6.2.1
Low-Level Contact Resistance 0.180in [4,57mm] dia sockets (LLCR)	200μΩ max	GR-1217-CORE, 6.2.1
<b>Thermal</b>		
Max Socket Temperature	248°F [120°C] max	Max continuous-use temperature for gold plating
Temperature Rise	86°F [30°C] max	GR-1217-CORE <sup>[b]</sup> EIA-364-70A <sup>[c]</sup>
<b>Environmental</b>		
Shock and Vibration	SurfMate products are tested in random vibration environments to best simulate the broad spectrum of frequencies and amplitudes that may be encountered in typical applications. Actual system resonant frequencies will depend on PCB construction and mounting details. For critical or unusual shock and vibration environments, the performance of the system should be independently verified.	

**Table 15.1** — SurfMate specifications and materials

<sup>[a]</sup> For 80A operation with Maxi, contact Applications Engineering.

<sup>[b]</sup> GR-1217-CORE issue 1, November 1995 Generic requirements for separable electrical connectors used in telecommunications hardware. A module of NEBSFR, FR-2063

<sup>[c]</sup> ANSI/EIA-364 American National Standards Institute / Electronic Industries Association (Electronic Components, Assemblies & Materials Association)

<sup>[d]</sup> The module and socket must be replaced after five mating cycles.

Materials	Ratings
<b>Headers</b>	
Material: Vectra E150i LCP	Liquid Crystal Polymer
Flammability	UL94 V-0/5VA
Thermal Stability (short term)	500°F [260°C]
Thermal Stability (long term)	392°F [200°C]
<b>Solder Cap</b>	
Material	260 cartridge brass (70Cu, 30Zn)
Plating	100µin min Cu, followed by 50 – 100µin min low stress sulfamate-based electrolytic nickel, followed by 20µin min soft gold
<b>Sockets</b>	
Material	Brush Wellman Alloy #25 C17200 deep draw quality or equiv. 0.010in thick
Plating	Woods nickel strike followed by 50µin min low stress sulfamate-based electrolytic nickel, followed by 20µin min hard gold, followed by 10µin min soft gold

**Table 15.2** — SurfMate specifications and materials

**SurfMates**



**Figure 15.1** — SurfMates; five-pair sets

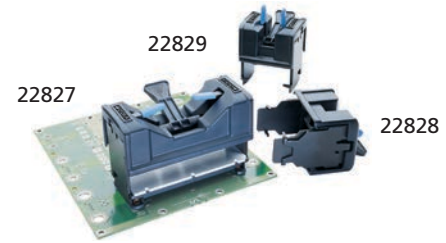


**Figure 15.2** — SurfMates; individual part numbers

Package	Maxi	Mini	Micro	Notes
Five-Pair Sets	16017	16021	16025	Inputs and outputs for five modules
<b>Individual Part Numbers</b>				
Input	22100	22100	22103	Sold only in multiples of 35 Maxi, Mini or 40 Micro Shipped in JEDEC trays
Output	22101	22102	22104	

**Table 15.2** — SurfMate specifications and materials

Module Exchange Tool	
Used in facilitating the proper extraction of modules from InMate or SurfMate sockets. <b>Removal without using the Exchange Tool may cause damage to the sockets.</b>	
Description	Part Number
Maxi Exchange Tool	22827
Mini Exchange Tool	22828
Micro Exchange Tool	22829



Standoff Kits for SurfMate Mounted Modules

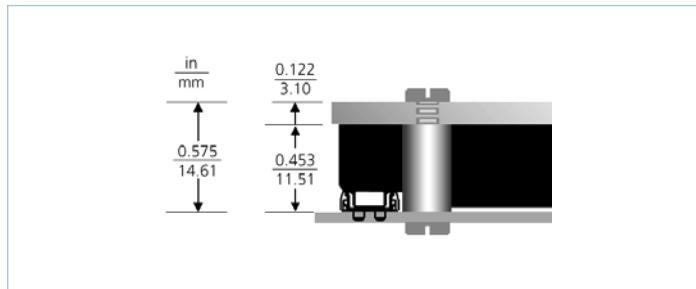


Figure 15.3 — Slotted baseplate; height above board with standoff

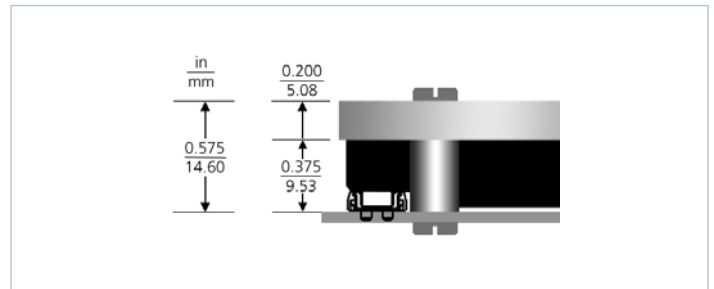


Figure 15.4 — Through-hole or threaded baseplate; height above board with standoff

Heat Sinks	Module Kit #	100 Piece Kit
<b>Slotted Baseplate</b>		
Through Hole	20178	20188
Threaded	20179	20189
<b>Through-Hole Baseplate</b>		
Through Hole	20176	20186
Threaded	20177	20187
No Heat Sink	20184	20186
<b>Threaded Baseplate</b>		
Through Hole	20176	20186
Threaded	N/A	N/A
No Heat Sink	20184	20186

Table 15.4 — Standoff kits for SurfMate mounted modules; part numbering and packaging; module kits contain enough standoffs and screws for one module. 100 piece kits contain standoffs only.

Standoff Kits for SurfMate-Mounted Modules						
Board Thickness	Mounting Options	Slotted Baseplate		Through-Hole Baseplate		Threaded Baseplate
		Through-Hole Heat Sink	Threaded Heat Sink	Through-Hole Heat Sink	Threaded Heat Sink	Through-Hole Heat Sink
All	Surface Mount	Kit-20178	Kit-20179	Kit-20176	Kit-20177	Kit-20176
		Bag-20188	Bag-20189	Bag-20186	Bag-20187	Bag-20186

Kits include six (6) standoffs and screws. Mini and Micro modules require a minimum of four (4) standoffs. Bags of one hundred (100) do not include screws; #4-40 thread hardware required.