

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 50 A. (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 3-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 3-ounce solder pads to the surrounding laminate. This provides for the optimum gap between the SurfMate and the PCB  $0.0042" \pm 0.0004"$  (0,106 mm  $\pm 0,010$  mm), 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  $0.0042" (0,106 \text{ mm}) \pm 10\%$ . This can be achieved by using a 3-ounce copper surface layer. With this height, a minimum solder paste thickness of  $0.006"$  should be used. Thicker stencils of between  $0.008"$  (0,203 mm) and  $0.012"$  (0,305 mm) are preferred.

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

**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  $361^\circ\text{F} (183^\circ\text{C})$  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 5 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                                                                                                                                                                                                                                                                                |                |                   |        |        |                   |        |        |                       |        |        |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------|--------|--------|-------------------|--------|--------|-----------------------|--------|--------|-----------|
|                                                                                                                                                                                                                                                                                                                |                | Full Brick (Maxi) |        |        | Half Brick (Mini) |        |        | Quarter Brick (Micro) |        |        | Pin Style |
| Board Thickness                                                                                                                                                                                                                                                                                                | Mounting Style | Input             | Output | 5 Sets | Input             | Output | 5 Sets | Input                 | Output | 5 Sets |           |
| All                                                                                                                                                                                                                                                                                                            | Surface mount  | 22100             | 22101  | 16017  | 22100             | 22102  | 16021  | 22103                 | 22104  | 16025  | S, F      |
| <div> <div>1. </div> <div>2. </div> <div>3. </div> </div> |                |                   |        |        |                   |        |        |                       |        |        |           |

| Parameter                                                           | Specification Value                                                                                                                                                                                                                                                                                                                                                                                   | Reference                                                                                       |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Compatibility</b>                                                | F                                                                                                                                                                                                                                                                                                                                                                                                     | Short RoHS pins                                                                                 |
| Module pin style                                                    | S                                                                                                                                                                                                                                                                                                                                                                                                     | Short ModuMate pins                                                                             |
| <b>Mechanical</b>                                                   |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                 |
| Contact normal force                                                | 100 grams EOL min.                                                                                                                                                                                                                                                                                                                                                                                    | GR-1217-CORE, R5-23                                                                             |
| Number of mating cycles                                             | 5 max. <sup>(Note4)</sup>                                                                                                                                                                                                                                                                                                                                                                             | Exception to GR-1217-CORE which specifies 25 mating cycle                                       |
| Module engagement force                                             | 32 lbs per connector set max.                                                                                                                                                                                                                                                                                                                                                                         | GR-1217-CORE, R5-31,32                                                                          |
| Module disengagement force                                          | 32 lbs per connector set max.                                                                                                                                                                                                                                                                                                                                                                         | GR-1217-CORE, R5-31,32                                                                          |
| <b>Electrical</b>                                                   |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                 |
| Current rating                                                      | 50 A Maxi <sup>(Note1)</sup> , Mini; 25 A Micro<br>(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<br>0.080" (2,03 mm) dia socket (LLCR)  | 400 μΩ max.                                                                                                                                                                                                                                                                                                                                                                                           | GR-1217-CORE, 6.2.1                                                                             |
| Low level contact resistance<br>0.150" (3,81 mm) dia socket (LLCR)  | 300 μΩ max.                                                                                                                                                                                                                                                                                                                                                                                           | GR-1217-CORE, 6.2.1                                                                             |
| Low level contact resistance<br>0.180" (4,57 mm) dia sockets (LLCR) | 200 μΩ 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>(Note2)</sup><br>EIA-364-70A <sup>(Note3)</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

(Note1) For 80 A operation with Maxi, contact Applications Engineering.

(Note2) GR-1217-CORE issue 1, November 1995 Generic requirements for separable electrical connectors used in telecommunications hardware. A module of NEBSFR, FR-2063

(Note3) ANSI/EIA-364 American National Standards Institute / Electronic Industries Association (Electronic Components, Assemblies & Materials Association)

(Note4) The module and socket must be replaced after 5 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 (70 Cu, 30 Zn)                                                                                                                                     |
| Plating                        | 100 μ in. min. Cu, followed by 50 to 100 μ in. min. low stress sulfamate-based electrolytic nickel, followed by 20 μ in. min. soft gold                                |
| <b>Sockets</b>                 |                                                                                                                                                                        |
| Material                       | Brush Wellman Alloy #25 C17200 deep draw quality or equiv. 0.010" thick                                                                                                |
| Plating                        | Woods nickel strike followed by 50 μ in. min. low stress sulfamate-based electrolytic nickel, followed by 20 μ in. min. hard gold, followed by 10 μ in. min. soft gold |

Table 15–2 — Material properties of SurfMate components

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                                             |
| Individual part numbers |       |       |       |                                                                                 |
| Input                   | 22100 | 22100 | 22103 | Sold only in multiples of 35 Maxi, Mini, or 40 Micro.<br>Shipped in JEDEC trays |
| Output                  | 22101 | 22102 | 22104 |                                                                                 |

Table 15–3 — SurfMates: Part numbering and packaging

## Module Exchange Tool

Used in facilitating the proper extraction of modules from InMate or SurfMate sockets.

**Removal without using the Exchange Tool may cause damage to the sockets.**

**Description****Part Number**

Maxi Exchange Tool

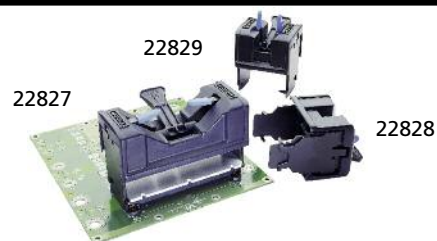
22827

Mini Exchange Tool

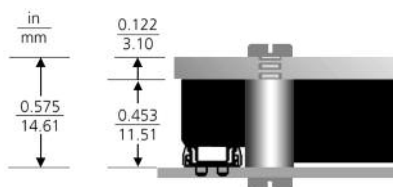
22828

Micro Exchange Tool

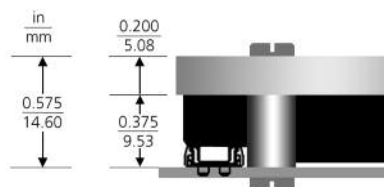
22829



## 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 |
|------------------------|--------------|---------------|
| Slotted Baseplate      |              |               |
| Through-hole           | 20178        | 20188         |
| Threaded               | 20179        | 20189         |
| Through-hole Baseplate |              |               |
| Through-hole           | 20176        | 20186         |
| Threaded               | 20177        | 20187         |
| No heat sink           | 20184        | 20186         |
| Threaded Baseplate     |              |               |
| 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     |
|-----------------|------------------|------------------------|--------------------|------------------------|--------------------|------------------------|
| Nom. (Min/Max)  | Mounting Style   | 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.