SEMIPONT®, Bridge Rectifiers and AC controller

Features

- Various cases and configurations with diode and thyristor rectifiers, rectifier/brake chopper or AC controller
- Compact plastic packages with screw, fast-on or PCB-mountable lead terminals
- High blocking voltages up to 1800 V, high surge currents: high ruggedness for hard industrial applications
- High isolation voltage
- Large, isolated baseplate (except some Miniature rectifier and SEMIPONT® 5/6)
- Some types of miniature rectifiers available with avalanche characteristics
- Hard or soft moulded
- UL recognized types available, e. g. File E 63532 for SEMIPONT® 5/6
- SEMIPONT® 5/6: Bridge Rectifiers for PCB assembly with thermal pressure contact, base plate free for low thermal impedance, soft moulded
- Integrated temperature sensor in SEMIPONT® 6
- Terminals of leadable bridges are available for wave soldering to PCB
- Fast rectifier bridges including CAL-diodes

For rectifier brigdes and AC controller in **SEMITOP®** technology see chapter SEMITOP®. For low power bridge rectifiers for consumer and less rugged applications see in chapter Low Power Rectifier.

Principal configurations and cases

Uncontrolled Bridges

Case Connectors Footprint dimensions	Diode bridge 1 ~	Diode bridge 3 ~	Avalanche char. avail. (some types)
Miniature bridge rectifier, inline, wired	x		x
Miniature rectifier with screw connectors	x		x
Square bridge 28,5x 28,5mm², wired	x		
Square bridge, fast-on connectors	x	x	
Rectangular bridge, PCB leadable connectors, 63,5x 29,5mm²		x	
Rectangular bridge, fast-on, 80x29mm²		x	
Square bridge, screw conn., 55x55mm²	x	x	
Square bridge, screw conn., 71x71mm²	x	x	
SEMIPONT 1, fast- on, 63x32mm²		x	
SEMIPONT 2, screw conn., 65x48mm²	x	x	
SEMIPONT 3, screw conn., 57x42 mm²	x	x	
SEMIPONT 4, screw conn., 94x54 mm²		x	
SEMIPONT 5, PCB leadable, 81x45,6mm²		x	
SEMIPONT 7, screw conn., 94x54mm²		x	

Controllable Bridges, Bridges with Brake Chopper, AC Controller

Case Connectors Footprint dimensions	controllable bridge 1 ~	controllable bridge 3 ~	3 ~ diodes with brake chopper	AC controller 3 ~
Square Bridge, screw conn., 71x 71mm²	x			
SEMIPONT 1, fast-on, 63x 32mm²	x			

Case Connectors Footprint dimensions	con-trollable bridge 1 ~	con-trollable bridge 3 ~	3 ~ dio-des with brake chopper	AC control-ler 3 ~
SEMIPONT 2, screw conn., 65x 48mm^2	x	x		
SEMIPONT 5, PCB leadable, 81x 45,6mm^2		x		x
SEMIPONT 6, PCB leadable, 100x 44,6mm^2			x	
SEMIPONT 7, screw conn., 94x 54mm^2		x		x

Type Designation Systems

Ambient rated miniature bridge rectifiers with pins for PCB

❶ ❷ ❸ ❹ ❺ ❻ ❼

SK B B 40 C 1000 L5B

❶ SEMIKRON component

❷ Bridge rectifier, single phase

❸ Two-pulse bridge circuit

❹ Recommended max. AC input voltage (V_{rms})

❺ Max. capacitive load current specified in datasheet

❻ Direct output current (freely suspended) (mA)

❼ pin out configuration

Ambient rated miniature bridge rectifiers with screw terminals

❶ ❷ ❸ ❹ / ❺ _ ❻

SK B B 250 / 220 _ 4

❶ SEMIKRON component

❷ Bridge rectifier (single phase)

❸ Two-pulse bridge circuit

❹ Recommended max. AC input voltage (V_{rms})

❺ Direct output voltage (R/L load) (V)

❻ Direct output current (freely suspended) (A)

SKB a B... Avalanche types

Case rated power input bridge rectifiers SEMIPONT®

❶ ❷❸ ❹ / ❺ _ ❻

SK DH 116 / 12 _ L100

❶ SEMIKRON component

❷ Circuit

B: Single-phase bridge

C: Single-phase bridge with freewheeling diode

D: Three-phase bridge

U: Three-phase AC controller W3C

❸ Functional circuit elements

D: Diode bridge

H: Half-controlled diode/thyristor bridge, common cathode

T: Fully controlled thyristor circuit

❹ Direct output current (I_D [A]), but SEMIPONT® 5 and 6: (I_D/10 [A])

then last digit is SEMIPONT® case size ("5"; or "6")

❺ Voltage class (V_{DRM}, V_{RRM} / 100 [V])

❻ Special options:

L: including IGBT brake or PFC chopper

_xx Type current of the IGBT I_C [A]

Captions of the Figures

Fig. 1 For ambient rated devices: Maximum rated direct output current I_D against ambient temperature T_a for resistive (R) and capacitive (C) loads

Fig. 2 For ambient rated devices: Typical power dissipation P_v against direct output current I_D for resistive (R) and capacitive (C) loads

Fig. 3

Left: For case rated devices: Typical power dissipation P_V against maximum direct current I_D for resistive (R) and capacitive (C) loads

Right: For case rated devices: case temperature T_c against ambient temperature T_a for various cooling conditions

I: Freely suspended or mounted on an insulator

M: Mounted on a painted metal sheet 250 x 250 x 1 mm^3

P ... : Mounted on heatsink P ...

P ... F: Mounted on heatsink P ... with forced air cooling.

For a particular power dissipation P_v on the left hand scale the corresponding case temperature T_c is given by the right hand scale. Recommended current: $I_N = 0,8\ I_D$

Fig. 4

Left: For case rated thyristor devices: Total power dissipation P_{VTOT} of the bridge rectifier against direct output current I_D for various conduction angles of the current through each thyristor (typical values)

Right: For case rated thyristor devices: Case temperature T_c against ambient temperature T_a for various thermal resistances $R_{th(c-a)}$ case to ambient of the heatsinks (including contact thermal resistances $R_{th(c-s)}$ case to heatsink. For a particular power dissipation on the left vertical scale the corresponding case temperature is given by the right scale

Fig. 5 For case rated power rectifiers: Ratio of the permissible overload current $I_{T(OV)}$ under fault conditions to the surge on-state current I_{TSM} (or I_{FSM}) for 10 ms (50 Hz) against duration t of the overload (time t = 1 to 1000 ms). Parameter: Peak value of the reverse voltage applied between the on-state current pulses

Fig. 6 Rated overload characteristic vs. time: Maximum direct output current I_D for short time overload against duration of overload after operating the bridge at I_N = 0,8 I_D for times t = 0,1 s to 10 min.

Fig. 7 For avalanche diode devices: Rated reverse power dissipation. Allowable non-repetitive peak reverse power dissipation P_{RSM} of the avalanche diode types against duration of reverse voltage surge time t = 1 µs to 0,1 s, during operation at I_N = 0,8 I_D or I_{NCL} = 0,8 I_{DCL}

Fig. 8 For thyristor devices: Typical recovered charge Q_{rr} against rate of decrease of on-state current $-di_F/dt$ at maximum virtual junction temperature. Parameter: on-state current before turn-off

Fig. 9 Forward characteristics of a diode arm. Typical values

Fig. 10 On-state characteristics of a thyristor arm. Typical values

Fig. 11 Gate characteristic of a thyristor device: Gate voltage V_G against gate current I_G showing the region of possible (BMZ) and certain (BSZ) triggering for various virtual junction temperatures T_{vj}. The current and voltage of the triggering pulse must lie in the region of certain triggering (BSZ), but the peak pulse power P_G must not exceed that given for the pulse length tp used.The curve 20 V; 20 Ω is the output characteristic of an adequate trigger equipment

Fig. 12 Transient thermal impedance junction to case $Z_{(th)j-c}$ of a single thyristor (diode) against the time t elapsed after a step change in power dissipation. (For computing intermittend loads)

Technical Explanations

For the caption of all ratings und parameters please refer to chapters SEMIPACK® and DISCRETE THYRISTORS AND DIODES or (for brake chopper IGBTs) the chapter SEMITRANS™. Below are only the most important definitions for bridge rectifiers.

a) Absolute maximum ratings

Non-repetitive peak reverse voltage V_{RSM}

Maximum allowable peak value of single transient reverse voltages.

Repetitive peak off-state and reverse voltages V_{DRM} and V_{RRM}

Maximum allowable peak value of repetitive transient off-state and reverse voltages.

Avalanche breakdown voltage $V_{(BR)}$

This value is given for avalanche types only (indicated in the type number by the letter "a"). At this value of reverse voltage the reverse current starts to increase rapidly. Reverse voltage peaks of short duration (< 10 µs) may exceed the avalanche voltage without causing damage, but if these peaks are of long duration or are repetitive, care must be taken that over-dissipation does not occur (see Fig.7 of those datasheets).

Recommended alternating input voltage V_{VRMS}

This is the sinusoidal r.m.s. input voltage which may be used with due allowance made for voltage transients. An efficient transient suppressing network may still be required if the voltage transients are of excessive amplitude, duration or power.

Maximum value of reservoir capacitor C_{max}, and minimum value of surge limiting resistor R_{min} with capacitive loads

The values of the surge limiting resistor and the reservoir capacitor are limited by two requirements:

a) when the current first is switched on, the amplitude and duration of the initial charging current should not over-load the rectifier, and

b) the continuous current rating with a capacitive load I_{DCL} should not be exceeded. This is determined by the form factor, which is dependent upon R_{min}, C_{max} and the load impedance. Taking account of the above conditions, the maximum value of reservoir capacitor is given by the following equation:

$C_{max} = 10^7 * I_D / f * V_D$

where

C_{max}: capacitance of the reservoir capacitor in µF

I_D: direct output current in A

V_D: direct voltage across the capacitor in V

f: operating frequency in Hz.

The value for R_{min} given in the datasheets includes the resistances of all components in the charging circuit of the reservoir capacitor. If a transformer is used which has an AC resistance of its windings R_{min}, then no additional surge limiting resistor is required. In other cases the winding resistance may be deducted from R_{min} to arrive at the value of resistance which should be used.

$R_{min} = V_{VRMS} / 1{,}6 * I_{FSM}$

where

R_{min}: minimum value of surge limiting resistance in Ω

V_{VRMS}: open circuit alternating r.m.s. voltage in V

I_{FSM}: surge current rating of the bridge at maximum junction temperature in A

Permissible overload current $I_{(OV)}$

The diagrams fig. 5 resp. fig. 6 (for small ambient rated devices) of the datasheet show the ratio of the highest permissible overload current $I_{(OV)}$ to the maximum steady-state output current I_D or I_{DCL}, resp., of the bridge rectifier freely suspended or mounted on an insulator (cooling mode "isolated"), against the duty cycle ED.

Maximum direct output current I_D, I_{DCL}

I_D is the maximum direct output current of the complete rectifier bridge for the heatsink types and cooling conditions stated, with no margins allowed for overloads. I_{DCL} is the I_D with capacitive load. See also fig. 1 (for ambient rated devices) and fig. 3 (for case rated devices). In practical cases one should use only 80 % of these values (called the "recommended direct output current I_N , I_{NCL}"), so that short term overloads and small degradations in cooling conditions will not result in any damage.

Single cycle surge forward current I_{FSM}

Maximum peak value of a single half sinewave current surge of 10 ms duration which will not cause damage. 5 ms after this surge the reverse voltage may be allowed to rise to 2/3 of V_{RRM}.

i^2t value

This is the value of i^2t, which should not be exceeded by any fuse used to protect against damage due to short circuits. The i^2t rating of the fuse over the specified time interval should be less than the specified value of i^2t of the rectifier.

Temperatures T_{vj}; T_{stg}; T_{sold}

T_{vjm}: maximum junction temperature, this may be exceeded only in case of a fault (I_{FSM})

T_{stg}: minimum and maximum storage temperature without applied voltage = max. operating temperature of the case

T_{sold}: maximum soldering temperature for the terminals during solder process. See assembly instructions.

Isolation breakdown withstand voltage V_{isol}

Max. RMS or DC value between the isolated terminals and the baseplate, applied between the high potential terminals, all connected with each other, and the ground potential of the baseplate for a specified time at the final test procedure of the device. See chapter SEMIPACK, clause "Isolation".

b) Characteristic values

of the functional circuit elements included in the rectifier device, please refer to the relevant chapter as follows:

For diode terms:
V_F; $V_{(TO)}$, r_T; $R_{th(j-c)}$; I_{RRM}; Q_{rr}; E_{off}; $R_{th(j-s)}$ refer to chapter Diodes

For thyristor terms:
V_T; $V_{T(TO)}$; r_T ; $R_{th(j-c)}$; I_{GD}; V_{GT}; I_{GT}; I_H ; I_L; $(dv/dt)_{cr}$; $(di/dt)_{cr}$ refer to chapter Thyristors

For IGBT-terms:
V_{CES}; V_{GES}; I_C ; I_{CM} ; V_{CEsat}; $t_{d(on)}$; t_r; $t_{d(off)}$; t_f; E_{on}+E_{off}; C_{ies}; $R_{th(j-c)}$ refer to chapter SEMITRANS™ IGBT- modules

Thermal resistance $R_{th(j-a)}$; $R_{th(j-c)}$; $R_{th(c-s)}$

$R_{th(j-a)}$: thermal resistance junction to ambient air is specified for ambient rated devices for PCB mounting

$R_{th(j-c)}$: thermal resistance junction to case and

$R_{th(c-s)}$: thermal contact resistance case to heatsink are specified for case rated devices, for mounting on a heatsink.The main heat flow is through the base plate of the bridge rectifier, if the bridge rectifier is built for mounting on a heatsink. One must take careful note of the mounting instructions, see down below clause "assembly instructions".

Temperature sensor R_{TS}

SEMIPONT® 6 includes a temperature sensor as protective device, the resistance of which is specified for 25 °C and for another high temperature (100 °C).

Application Notes

ESD protection

IGBT circuit (only in SEMIPONT® 6) modules are sensitive to electrostatic charges. All SEMIPONT® 6 modules are ESD protected in the shipment box with an ESD cover. During the modules handling and assembly, use conductive grounded wristlet and a conductive grounded working place.

Isolation testing

The isolation breakdown withstand voltage V_{isol} between the live parts and the baseplate (resp. DBC substrate of SEMIPONT® 5 and 6) of each SEMIKRON rectifier module is tested during the 100 % final routine test according to the datasheet specifications. For details on relevant international standards about the specifications of isolation withstand voltage V_{isol} also for equipment (as IEC, EN; DIN, VDE, UL) see chapter SEMIPACK®/Application notes.

Selection of voltage class

The table below shows the recommended selection voltage class V_{RRM} to the nominal input line voltage V_{VN} (examples).

nom. AC-line voltage L-L	recommended voltage class
V_{VN} / V	V_{RRM}, [V_{DRM}] / V
60	200
125	**400**
250	**800**
380	1200
400	**1400**
440	1400
460	1600
500	**1600**
575	1800

Transient voltage suppression

Where only low-energy transients may occur, the snubber network recommended in the individual data sheets is sufficient. Alternatively, a varistor may be used in place of the RC network. For avalanche types with such transients no suppression network may be necessary. Where high-energy transients are to be expected, more efficient suppression networks should be used for both normal and avalanche types. It is recommended that the suppression network be connected across the d.c. terminals. Please note however that in the case of the controllable rectifiers the protective network must be fitted across each thyristor or the AC terminals in order that the suppression be effective when the thyristors are in the off-state. Where transients may occur on the DC side of the circuit, an additional suppression network is necessary.

Over-current and short circuit protection

Against damage by a short circuit appropriate semiconductor fuses should be applied between input terminals and mains.The i^2t value of the fuses should be lower than the i^2t value stated for the device.

Thermal protection

For ambient rated plastic encapsulated bridge rectifiers which are mounted by fixing bolts but which have no metal case or metal base plate, the thermal resistance $R_{th(j-a)}$ between the silicon chips and the ambient air is specified. It is valid for the device mounted onto an insulator, where heat dissipation via the connecting leads plays an important role. For this reason heavy leads should be used. Mounting this type of rectifiers on a metal plate results in only a very small reduction of the thermal resistance. With bridge rectifiers for PCB mounting the quoted thermal resistances $R_{th(j-a)}$ are valid for the rectifier seated tightly on to a PCB having tinned tracks 2 to 3 mm wide. Bridge rectifiers with long connecting wires can be spaced 5 to 10 mm away from the PCB. This method of mounting will reduce the thermal resistance by 10 % or 15 % respectively due to the air cooling of the wires. Large area, tin plated PCB tracks can reduce the thermal resistance by 25 % to 30 %. In this case the rectifier must be seated directly on to the PCB. If the bridge rectifier is freely suspended by its leads from solder or screw terminals, a reduction of up to 20 % in thermal resistance can be expected. For case rated bridge rectifiers with metal base plate see also chapter SEMIPACK®.

In SEMIPONT® 6 a temperature sensor is included. This sensor has R_{TS} = 1000 Ω at 25 °C and 1670 Ω at 100 °C. If a specified value (for instance 100 °C) is overp assed, a signal should be formed to either set a warning or reduce power or switch the equipment off. For the value of measuring current SEMIKRON recommends 1 mA, the maximum values are 10 mA at 25 °C and 1 mA at 125 °C.

Assembly instructions for ambient rated devices for PCB mounting

Bridge rectifiers supplied with solder leads, resp. pins, should be soldered at iron or bath temperatures of 245 ± 5 °C. The maximum allowable temperature is 255 °C f or 5 s. Please take note of the interrelationship between mounting method and heat transfer given in the clause "thermal protection" further below. For more soldering details see also chapter Low Power Rectifiers.

Assembly instructions for case rated devices

In order to guarantee good thermal contact and to keep the thermal contact resistance values specified in the data sheets the contact area of the heatsink must be clean and free from particles. The unevenness remaining after grinding those areas must be less than 20 µm, the roughness less than 10 µm. The heatsinks used for devices with metal base plate devices must have a flat mounting surface. The metal base or the mounting surface of the case must be slightly coated with a heat conducting thermal compound paste, e.g. Wacker-Chemie P12. It is recommended to use a rubber roller, recommended thickness 30 to 80 µm. A gauged manual torque spanner should be used, not an electric or compressed air tool. Flat and spring washers should always be used. Heatsinks must be mounted so, that their cooling fins are in line with the flow of cooling air. If possible mount the unit near the air inlet so that the air is not preheated. When the device is mounted on a chassis ensure that the chassis area is at least 250 x 250 mm. If other items contribute to the heating of the chassis, it will need to be of greater area. In all cases check that the case temperature will never exceed that given in the rating diagram, see fig. 1, resp. fig. 3 (case rated devices). When devices are mounted on insulators, care must be taken again that the maximum allowable case temperature $T_c = T_{stgmax}$ is not exceeded. The insulator must be able to withstand this maximum case temperature and, if this is not so, then the devices must be suspended on heat insulating distance washers.

The table below shows the recommended mounting hardware for some case rated rectifier bridges, for which SEMIKRON offers mounting hardware kits.

contents	SEMIPONT® 2 for 8 thyristor bridges	SEMIPONT® 2 for 8 diode bridges
SEMIKRON-Ident-No.	33701500	32759000
Baseplate screws	16 pcs. M5x16 Z4-1 DIN 7985-8.8	16 pcs. M5x16 Z4-1 DIN 7985-8.8
Terminal screws	40 pcs. M5x8 Z4-1 DIN 7985-4.8	40 pcs. M5x8 Z4-1 DIN 7985-4.8
Washers	included on combi-screw	included on combi-screw
Crincle washers	included on combi-screw	included on combi-screw
gate plugs	48 pcs. B2,8-1 for plug 2,8 x 0,8 mm	-
plug f. aux. cathode	48 pcs. 2,8 x 0,8 inside 5,1mm 32409700	-
insulating plug caps	48 pcs. 1-fold 32769500	-

contents	SEMIPONT 3 for 8 diode bridges	SEMIPONT 4 for 4 diode bridges
SEMIKRON-Ident-No.	33404200	33404300
Baseplate screws	16 pcs. M5x16 Z4-1 DIN 7984-8.8	8 pcs. M6x20 Z4-1 DIN 7985-8.8
Terminal screws	40 pcs. M5x12 Z4-1 DIN 7985-4.8	20 pcs. M6x12 Z4-1 DIN 7985-4.8
Washers	included on combi-screw	included on combi-screw
Crincle washers	included on combi-screw	included on combi-screw

contents	SKB 33, SKB/D 50 for 6 bridges
SEMIKRON-Ident-No.	33404400
Baseplate screws	12 pcs. M4x8 Z4-1 DIN 7985-4.8
Terminal screws	30 pcs. M5x10 Z4-1 DIN 7985-4.8
Washers	included on combi-screw
Crincle washers	included on combi-screw
gate plugs	12 pcs. 13,5x4 for plug 1,3mm

Recommended: posidrive screws M...x... DIN 7985-...(Z4-1) (with captive crincle washers and washers) are also available from Muenchner Schraubenhandel, Dresselhaus KG., D-91126 Schwabach, Germany, Phone +49-9122-0072-40; fax +49-9122-9972-13; E-mail: kraus@dresselhaus.de homepage: www.dresselhaus.de

Special assembly instructions for SEMIPONT® 5 & 6

Heat sink specification

- The mounting area on the heatsink must be clean and free from grease and particles
- Finger prints or discolorations on the bottom side do not affect the thermal behaviour

The mechanical specifications for the heatsink are:

- Flatness: 50 µm per 100 mm
- Roughness R_Z : 6,3 µm
- Machined without overlaps

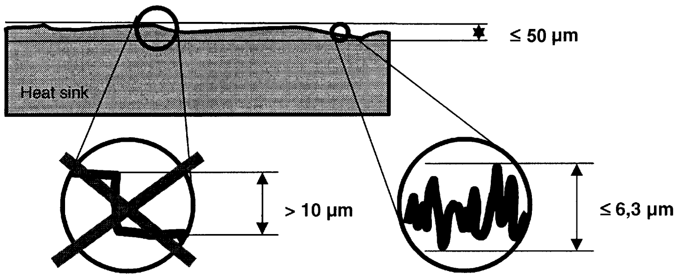


Fig. 1 Heat sink surface specification

Application of thermal grease

In order to avoid air gaps at the interface between the module and the heat sink a thermal grease must be applied. The function of the grease is to flow according to the shape of the interface, allowing a metal-to-metal contact where it is possible, and filling the remaining gaps. Recommended thermal grease material is Wacker-Chemie P 12.

SEMIKRON recommends to use an hard rubber roller or a screen print for an even distribution of the grease.

The thickness of the applied grease layer should be:

Module	Thermal Grease (Wacker P12) Thickness
SEMIPONT® 5	50 - 55 µm
SEMIPONT® 6	50 - 55 µm

The thickness of the applied grease can be checked by a measuring gauge (e.g. Company ELCOMETER Instruments GmbH, Himmlingstr. 18, 73434 Aalen, Tel. +49-7366-919283: Sechseck-Kamm 5 - 150 µm).

Assembly on heatsink

After applying the recommended thickness of thermal grease on the heatsink, tighten the screws applying first a 0,5 Nm torque to each one, in order to lean the module against the heatsink, and then tighten each screw with the corresponding mounting torque:

Module	Mounting Torque	Screw	Washer
SEMIPONT® 5	2,5 Nm +0/-10%	DIN 912-M-4x20	DIN 6798 Form A + DIN 125
SEMIPONT® 6	3 Nm +15/-15%	DIN 912-M-4x20	DIN 6798 Form A + DIN 125

SEMIKRON recommends:

- To use a torque wrench with automatic control;
- To tighten the screws only once. After the mounting do not re-tighten the screws to the nominal mounting torque value. Due to relaxation of the housing and flow of thermal paste, the loosening torque is lower than the mounting torque. However the construction of the housing, the washers and the adhesion of the thermal paste still ensure sufficient thermal coupling of the module to the heatsink.
- Do not exceed the mounting torque because a further increase of the maximum mounting torque will not improve the thermal contact but could only damage the module.

Connections SEMIPONT® 5 & 6 - PCB

The PCB has to be placed on the plastic posts present in each corner on the top of the SEMIPONT 5&6 modules (fig. 2).

The module could be additionally fixed to the PCB by means of UNI EN ISO 7049 M2,9 self tapping screws.

The maximum penetration depth must not exceed 6 mm. The minimum penetration depth has to be 4 mm.

In order to avoid mechanical stress to the solder pins, the PCB has to be additionally supported (e.g. using spacers).

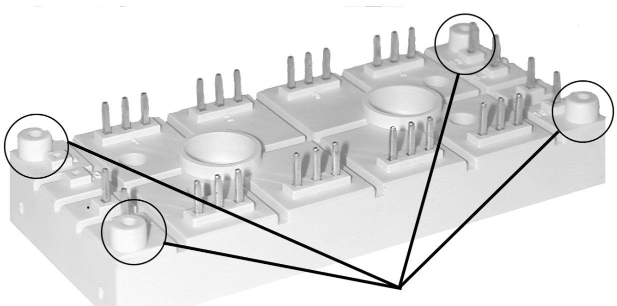


Fig. 2 Mounting post details

The suggested hole diameter for the soldering signal and power pins in the PCB is 2mm.

Soldering on PCB

SEMIPONT® 5 & 6 modules could be soldered to the PCB using the most common soldering process:

- Hand iron
- Wave soldering process
- Selective soldering

Independent of the soldering process used to solder SEMIPONT® 5 & 6 modules to the PCB, SEMIKRON recommends a thorough evaluation of the solder joints to ensure an optimal connection between power module and the PCB.

The time required to create a robust connection depend on several parameters:

a) PCB thickness: When increasing the PCB thickness, the heat dissipation capability of the PCB itself will be the higher, and thus it will require a longer soldering time.

b) Copper wire area: Pins require large copper wire to minimize resistive power losses during the current flowing. Since copper has a good heat transmission coefficient, the size of these copper wires directly affects the soldering time necessary to heat the PCB pad.

c) Hand iron power: power, tip size and working temperature of the hand iron affect the soldering time. These parameters have to be adjusted in order to keep the maximum temperature within the specified limit.

SEMIKRON recommends that the soldering joints should be thoroughly checked to ensure a high quality soldering joint. If necessary, different parameters should be adjusted in order to optimise the process.

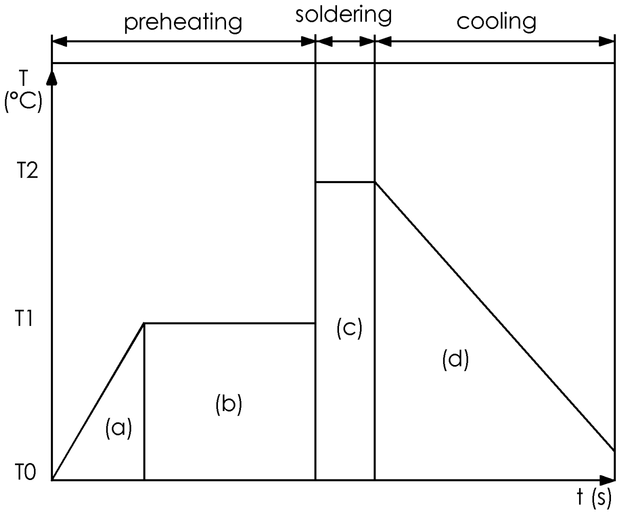
Hand Soldering

SEMIKRON recommends to not exceed the maximum temperature of 260 °C for a soldering time of 10 se conds.

Wave Soldering Profile

SEMIKRON recommends:

- Do not exceed the maximum wave soldering profile of figure 3
- The maximum preheating temperature has to be kept under or equal to the maximum storage temperature (125 °C)
- Do not exceed the maximum preheating time of 100 seconds
- During the soldering phase, do not exceed the maximum soldering time of 10 seconds at the maximum temperature of 260 °C.



(a) Zone: T0 = room temperature
T1 = Preheating temperature (typ. 50°C - 95°C, max 125°C)
(b) Zone: T1 = Preheating temperature
0s < t < 100s max
(c) Zone: T2= Soldering temperature (typ. 200°C - 230°C; max 260°C)
t = 10s max
(d) Zone: typical air cooling

Fig. 3 Wave soldering profile