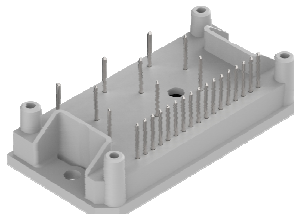
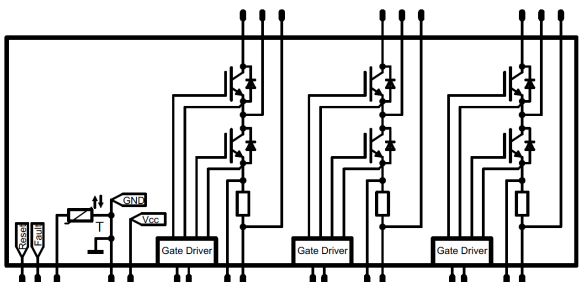




| <i>flow</i> IPM 1B (CI)   | 1200 V / 15 A  |
|---|--|
| <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Features</b></p> <p>Power</p> <ul style="list-style-type: none"> <li>3 Phase Inverter</li> <li>Open Emitter or Emitter Shunt</li> </ul> <p>Gate Driver</p> <ul style="list-style-type: none"> <li>Booststrap circuit</li> <li>Overcurrent protection</li> <li>Undervoltage lockout</li> </ul> <p>NTC</p> <ul style="list-style-type: none"> <li>Temperature sensor</li> </ul> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Target applications</b></p> <ul style="list-style-type: none"> <li>Industrial motor drive</li> <li>Embedded Drive (fan, pump, compressor, etc.)</li> </ul> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Types</b></p> <ul style="list-style-type: none"> <li>20-1B12IPA015SC-L579F09</li> </ul> </div> | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><i>flow</i> 1B 17mm housing</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Schematic</b></p>  </div> |

## Maximum Ratings

$T_j=25^{\circ}\text{C}$ , unless otherwise specified

| Parameter                         | Symbol     | Condition                                      | Value    | Unit               |
|-----------------------------------|------------|--|----------|--------------------|
| <b>Inverter Switch</b>            |            |  |          |                    |
| Collector-emitter voltage         | $V_{CES}$  |  | 1200     | V                  |
| Collector current                 | $I_C$      | $T_j = T_{jmax}$<br>$T_s = 80^{\circ}\text{C}$ | 13       | A                  |
| Repetitive peak collector current | $I_{CRM}$  | $t_p$ limited by $T_{jmax}$                    | 45       | A                  |
| Total power dissipation           | $P_{tot}$  | $T_j = T_{jmax}$<br>$T_s = 80^{\circ}\text{C}$ | 27       | W                  |
| Gate-emitter voltage              | $V_{GES}$  |  | $\pm 20$ | V                  |
| Short circuit ratings             | $t_{SC}$   | $T_j \leq 150^{\circ}\text{C}$                 | 10       | $\mu\text{s}$      |
|                                   | $V_{CC}$   | $V_{GE} = 15\text{V}$                          | 800      | V                  |
| Maximum Junction Temperature      | $T_{jmax}$ |  | 175      | $^{\circ}\text{C}$ |



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 target datasheet

| Parameter                           | Symbol     | Conditions                            | Value | Unit             |
|-------------------------------------|------------|---------------------------------------|-------|------------------|
| <b>Inverter Diode</b>               |            |                                       |       |                  |
| Peak Repetitive Reverse Voltage     | $V_{RRM}$  |                                       | 1200  | V                |
| Continuous (direct) forward current | $I_F$      | $T_j=T_{jmax}$ $T_h=80^\circ\text{C}$ | 14    | A                |
| Repetitive peak forward current     | $I_{FRM}$  |                                       | 30    | A                |
| Total power dissipation             | $P_{tot}$  | $T_j=T_{jmax}$ $T_h=80^\circ\text{C}$ | 24    | W                |
| Maximum Junction Temperature        | $T_{jmax}$ |                                       | 175   | $^\circ\text{C}$ |

| Parameter            | Symbol     | Conditions  | Value                     | Unit             |
|----------------------|------------|---|---------------------------|------------------|
| <b>Gate driver</b>   |            |   |                           |                  |
| Supply voltage       | $V_{CC}$   |   | 24                        | V                |
| Logic input voltage  | $V_{in}$   | U-HIN, U-LIN, V-HIN, V-LIN, W-HIN, W-LIN FAULT, RESET | $-0,5 \dots V_{CC} + 0,5$ | V                |
| Junction Temperature | $T_{jmax}$ |   | 125                       | $^\circ\text{C}$ |

| Parameter             | Symbol    | Conditions             | Value | Unit |
|-----------------------|-----------|------------------------|-------|------|
| <b>Inverter Shunt</b> |           |                        |       |      |
| Max DC current        | $I_{MAX}$ |                        | tbd   | A    |
| Power dissipation     | $P_{tot}$ | $T_c=70^\circ\text{C}$ | tbd   | W    |

| Parameter                      | Symbol    | Conditions | Value                        | Unit             |
|--------------------------------|-----------|------------|------------------------------|------------------|
| <b>Module Properties</b>       |           |            |                              |                  |
| <b>Thermal Properties</b>      |           |            |                              |                  |
| Storage temperature            | $T_{stg}$ |            | $-40 \dots +125$             | $^\circ\text{C}$ |
| Operation Junction Temperature | $T_{jop}$ |            | $-40 \dots +(T_{jmax} - 25)$ | $^\circ\text{C}$ |

| <b>Isolation Properties</b> |            |            |          |          |    |
|-----------------------------|------------|------------|----------|----------|----|
| Isolation voltage           | $V_{isol}$ | DC voltage | $t_p=2s$ | 4000     | V  |
| Creepage distance           |            |            |          | min 12,7 | mm |
| Clearance                   |            |            |          | min 12,7 | mm |
| Comparative Tracking Index  | CTI        |            |          | >200     |    |



## Characteristic Values

### Inverter Switch

| Parameter                            | Symbol       | Conditions      |              |           |            |                  | Value |      |      | Unit |
|--------------------------------------|--------------|-----------------|--------------|-----------|------------|------------------|-------|------|------|------|
|                                      |              | $V_{GE}$ [V]    | $V_{CE}$ [V] | $I_C$ [A] | $T_j$ [°C] | Min              | Typ   | Max  |      |      |
| <b>Static</b>                        |              |                 |              |           |            |                  |       |      |      |      |
| Gate-emitter threshold voltage       | $V_{GE(th)}$ | $V_{GE}=V_{CE}$ |              |           | 0,0005     | 25<br>125        | 5,3   | 5,8  | 6,3  | V    |
| Collector-emitter saturation voltage | $V_{CEsat}$  |                 | 15           |           | 15         | 25<br>125<br>150 | 1,58  | 1,89 | 2,07 | V    |
| Collector-emitter cut-off current    | $I_{CES}$    |                 | 0            | 1200      |            | 25<br>125        |       |      | 2    | μA   |
| Gate-emitter leakage current         | $I_{GES}$    |                 | 20           | 0         |            | 25<br>125        |       |      | 120  | nA   |
| Internal gate resistance             | $r_g$        |                 |              |           |            |                  |       | none |      | Ω    |
| Input capacitance                    | $C_{ies}$    | f=1 MHz         | 0            | 25        | 25         |                  |       | 890  |      | pF   |
| Reverse transfer capacitance         | $C_{res}$    |                 |              |           |            |                  |       | 30   |      |      |

### Thermal

|                                     |               |  |  |  |  |  |  |  |      |  |     |
|-------------------------------------|---------------|--|--|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | phase-change material<br>$\lambda=3,4W/mK$ |  |  |  |  |  |  | 3,50 |  | K/W |
|-------------------------------------|---------------|--|--|--|--|--|--|--|------|--|-----|

### Inverter Diode

| Parameter               | Symbol | Conditions |           |            |     |                  | Value |      |      | Unit |
|-------------------------|--------|------------|-----------|------------|-----|------------------|-------|------|------|------|
|                         |        | $V_r$ [V]  | $I_F$ [A] | $T_j$ [°C] | Min | Typ              | Max   |      |      |      |
| <b>Static</b>           |        |            |           |            |     |                  |       |      |      |      |
| Forward voltage         | $V_F$  |            |           |            | 15  | 25<br>125<br>150 |       | 1,80 | 2,05 | V    |
| Reverse leakage current | $I_r$  |            |           | 1200       |     | 25<br>150        |       |      | 3,5  | μA   |

### Thermal

|                                     |               |  |  |  |  |  |  |  |      |  |     |
|-------------------------------------|---------------|--|--|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | phase-change material<br>$\lambda=3,4W/mK$ |  |  |  |  |  |  | 3,95 |  | K/W |
|-------------------------------------|---------------|--|--|--|--|--|--|--|------|--|-----|



### Gate driver

| Parameter | Symbol | Conditions | Value |     |     | Unit |
|-----------|--------|------------|-------|-----|-----|------|
|           |        |            | Min   | Typ | Max |      |

#### Static

|  |                    |  |      |      |      |         |
|--|--------------------|--|------|------|------|---------|
| Recommended supply voltage               | $V_{CC}$           |  | 13,5 | 15   | 20   | V       |
| Power on reset trip voltage              | $V_{POR}$          |  | 4,0  | 5,5  | 7,5  | V       |
| Internal current limit                   | $I_{MAX}$          |  | 13,3 | 16,7 | 20   | A       |
| Quiescent supply current                 | $I_q$              |  |      | 3    | 4,5  | mA      |
| Logic "1" input threshold voltage        | $V_{inH}$          | U-HIN, U-LIN, V-HIN,<br>V-LIN, W-HIN, W-LIN,<br>RESET                      | 2,2  | 3    | 4    | V       |
| Logic "0" input threshold voltage        | $V_{inL}$          |  | 0,6  | 1,5  | 2,1  | V       |
| Logic "1" input current                  | $I_{inH}$          | $V_{in}=5V$  | 0,6  | 1    | 1,4  | mA      |
| Logic "0" input current                  | $I_{inL}$          | $V_{in}=0V$  | 0    | 0    | 0,01 | mA      |
| Input signal filter time                 | $t_{Filt}$         | U-HIN, U-LIN, V-HIN,<br>V-LIN, W-HIN,<br>W-LIN, FAULT(in),<br>RESET(pulse) | 80   | 200  | 500  | ns      |
| Logic "1" FAULT output*                  | $V_{outFAULTH}$    |  |      |      | 0,95 | V       |
| Logic "1" FAULT input threshold voltage* | $V_{inFAULTH}$     |  | 0,6  | 1,5  | 2,1  | V       |
| Logic "0" FAULT input threshold voltage* | $V_{inFAULTL}$     |  | 2,2  | 3    | 4    | V       |
| Under voltage reset voltage              | $V_{UVreset}$      |  | 10   | 10,8 | 11,6 | V       |
| Under voltage trip voltage               | $V_{UVtrip}$       |  | 10,5 | 11,3 | 12,1 | V       |
| Under voltage hysteresis voltage         | $V_{UVhysteresis}$ |  | 0,2  | 0,5  | 0,8  | V       |
| Under voltage filter time                | $t_{UVfilt}$       |  | 4    | 8    | 16   | $\mu s$ |
| Internal dead time                       | $t_{UVfit}$        | Delay matching, high side turn-on and low side turn off                    | -100 | 80   | 300  | ns      |
| Internal dead time                       | $t_{UVfit}$        | Delay matching, low side turn-on and high side turn off                    | -20  | 180  | 400  | ns      |

\*FAULT pin is inverse logic with open drain output  
 for more information see Mitsubishi's M81738FP preliminary (Jan 2012) datasheet

### Inverter Shunt

| Parameter | Symbol | Conditions | Value |     |     | Unit |
|-----------|--------|------------|-------|-----|-----|------|
|           |        |            | Min   | Typ | Max |      |

#### Static

|            |     |  |  |  |    |    |           |
|------------|-----|--|--|--|----|----|-----------|
| Resistance | $R$ |  |  |  | 25 | 30 | $m\Omega$ |
|------------|-----|--|--|--|----|----|-----------|



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**20-1B12IPA015SC-L579F09**  
**20-PB12IPA015SC-L579F09Y**  
 target datasheet

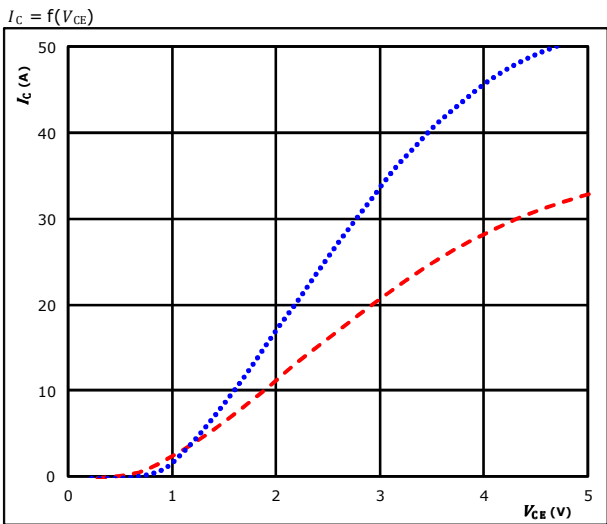
## Thermistor

| Parameter                  | Symbol         | Conditions   |              |           |            | Value |      |     | Unit |
|----------------------------|----------------|--------------|--------------|-----------|------------|-------|------|-----|------|
|                            |                | $V_{GE}$ [V] | $V_{CE}$ [V] | $I_C$ [A] | $T_j$ [°C] | Min   | Typ  | Max |      |
| Rated resistance           | R              |              |              |           | 25         |       | 22   |     | kΩ   |
| Deviation of R100          | $\Delta_{R/R}$ | R100=1486 Ω  |              |           | 100        | -12   |      | +12 | %    |
| Power dissipation          | P              |              |              |           | 25         |       | 200  |     | mW   |
| Power dissipation constant |                |              |              |           | 25         |       | 2    |     | mW/K |
| B-value                    | $B_{(25/50)}$  | Tol. ±3%     |              |           | 25         |       | 3950 |     | K    |
| B-value                    | $B_{(25/100)}$ | Tol. ±3%     |              |           | 25         |       | 3998 |     | K    |
| Vincotech NTC Reference    |                |              |              |           |            |       |      | B   |      |



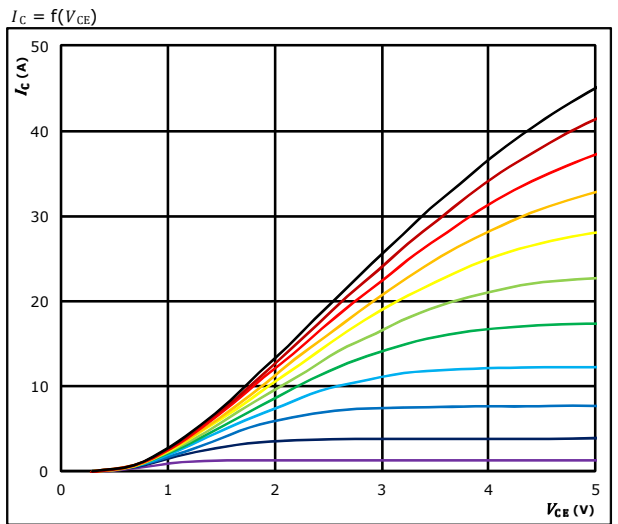
## Inverter Switch Characteristics

Typical output characteristics IGBT



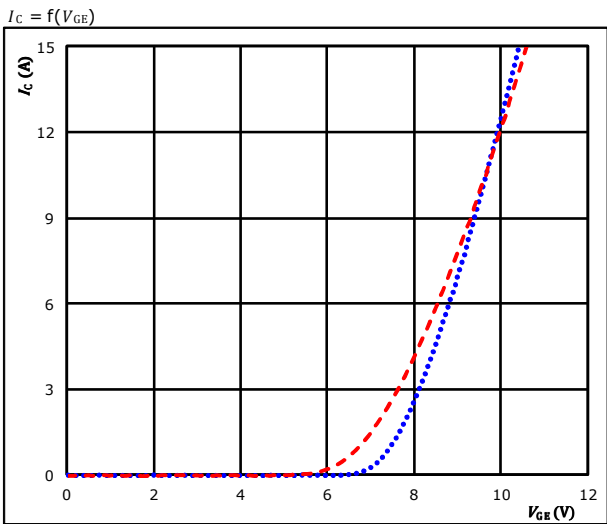
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)

Typical output characteristics IGBT



$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

Typical transfer characteristics IGBT

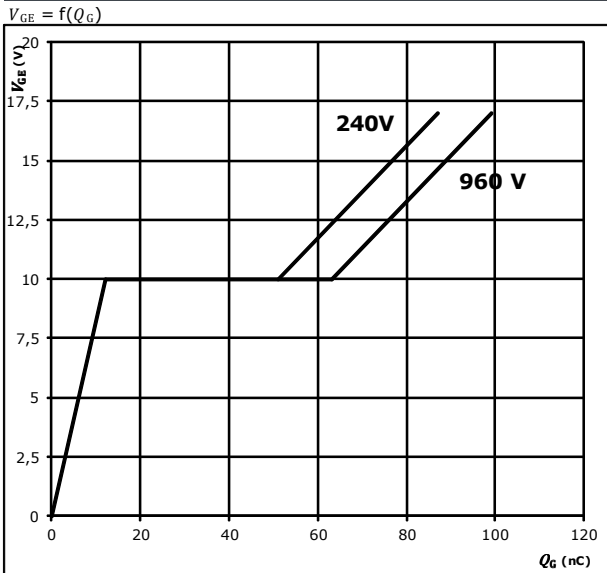


$t_p = 100 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)



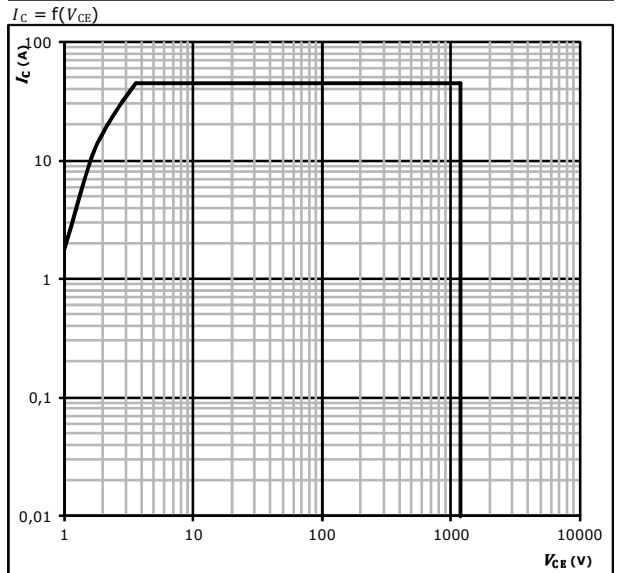
## Inverter Switch Characteristics

**Gate voltage vs Gate charge** IGBT



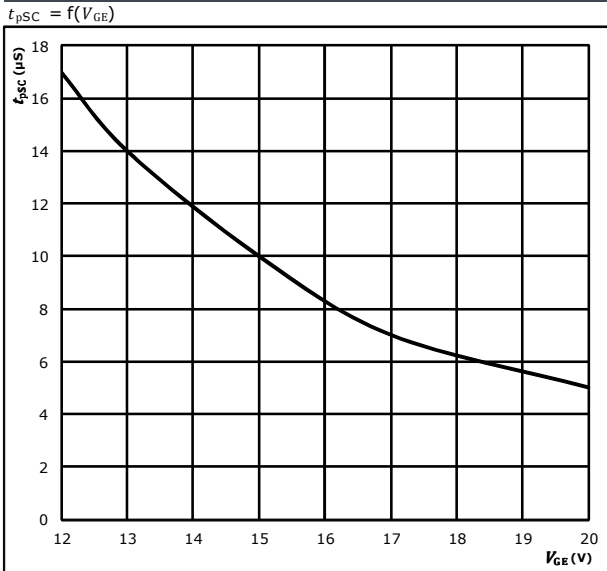
**At**  
 $I_C = 15$  A

**Safe operating area** IGBT



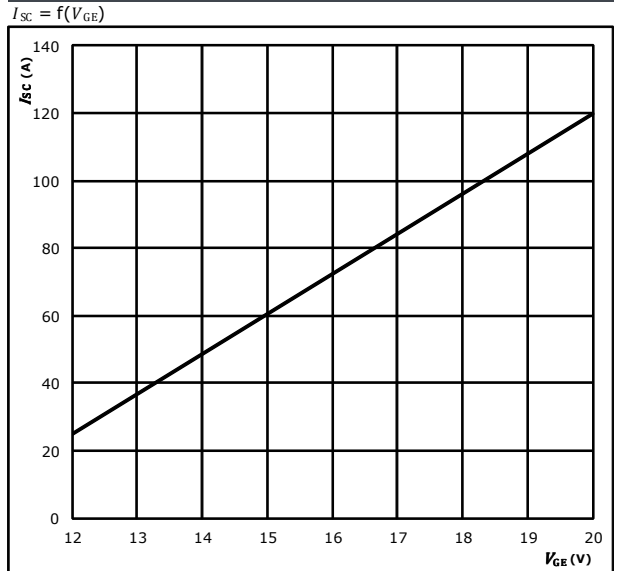
**At**  
 $D =$  single pulse  
 $T_h = 80$  °C  
 $V_{GE} = \pm 15$  V  
 $T_j = T_{jmax}$  °C

**Short circuit duration as a function of  $V_{GE}$**  IGBT



**At**  
 $V_{CE} = 1200$  V  
 $T_j \leq 175$  °C

**Typical short circuit current as a function of  $V_{GE}$**  IGBT

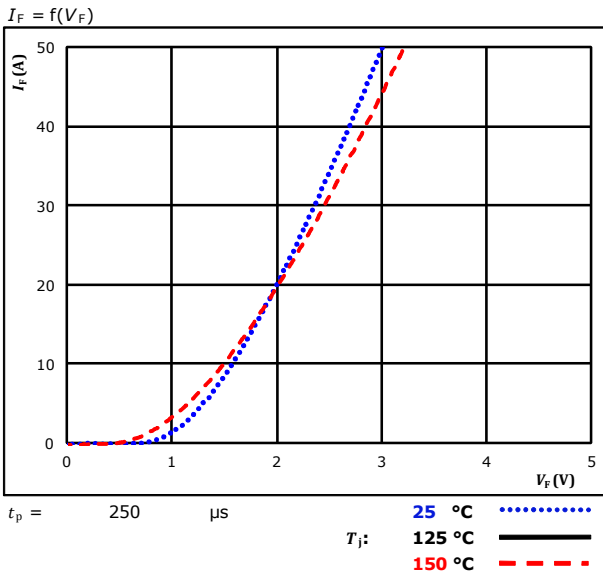


**At**  
 $V_{CE} \leq 1200$  V  
 $T_j \leq 175$  °C



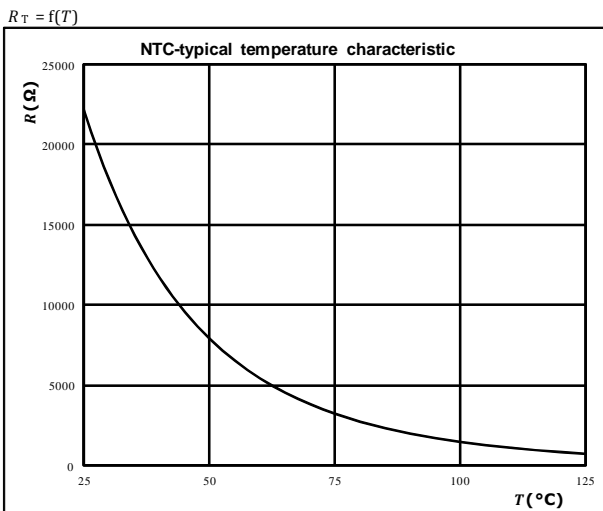
## Inverter Diode Characteristics

Typical forward characteristics FWD



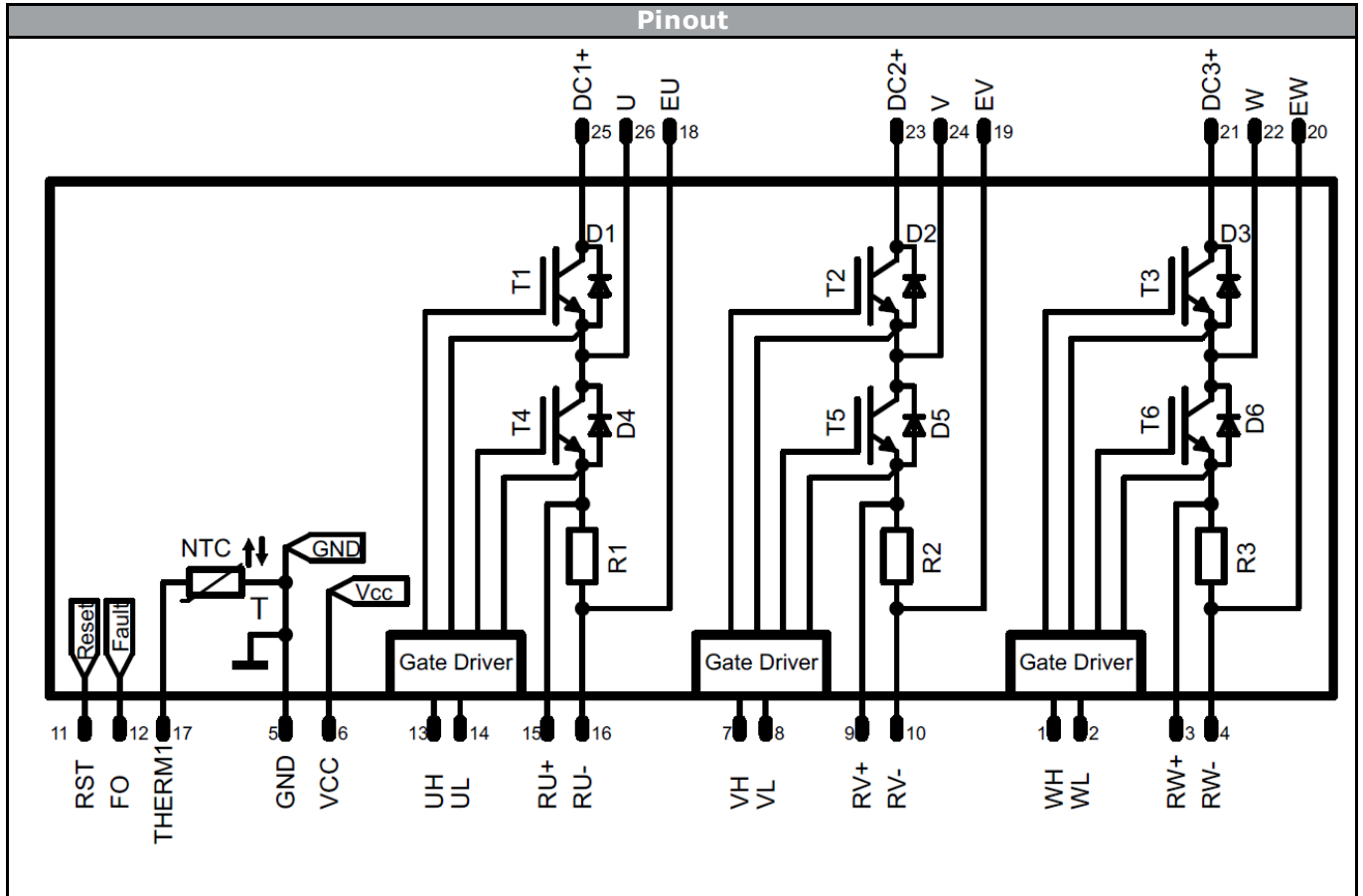
## Thermistor Characteristics

Thermistor typical temperature characteristic  
Typical NTC characteristic  
as a function of temperature









| <b>Identification</b> |           |         |         |                 |         |
|-----------------------|-----------|---------|---------|-----------------|---------|
| ID                    | Component | Voltage | Current | Function        | Comment |
| T1,T2,T3,T4,T5,T6     | IGBT      | 1200 V  | 15 A    | Inverter Switch |         |
| D1,D2,D3,D4,D5,D6     | FWD       | 1200 V  | 15 A    | Inverter Diode  |         |
| R1,R2,R3              | Resistor  | -       | -       | Inverter Shunt  |         |
| NTC                   | NTC       | -       | -       | Thermistor      |         |



| Packaging instruction             |     |      |          |
|-----------------------------------|-----|------|----------|
| Standard packaging quantity (SPQ) | 100 | >SPQ | Standard |
|                                   |     | <SPQ | Sample   |

| Handling instruction   |
|--|
| Handling instructions for <i>flow</i> 1B packages see vincotech.com website. |

| Package data  |
|---|
| Package data for <i>flow</i> 1B packages see vincotech.com website. |

| Document No.:                 | Date:        | Modification: | Pages |
|-------------------------------|--------------|---------------|-------|
| 20-1B12IPA015SC-L579F09-T1-14 | 12 Aug. 2015 |               |       |

| Product status definition |                        |  |
|---------------------------|------------------------|--|
| Datasheet Status          | Product Status         | Definition   |
| Target                    | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff. |

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