## *flow* PIM 0 3rd Gen — 1200V / 4A



### Features

- flow0 2 clip-in housing in 12 and 17mm height
- Trench Fieldstop IGBT's 4 technology
- Optional w/o BRC

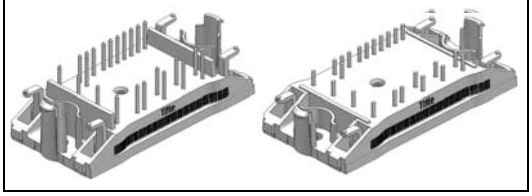
### Target Applications

- Industrial Drives
- Embedded Generation

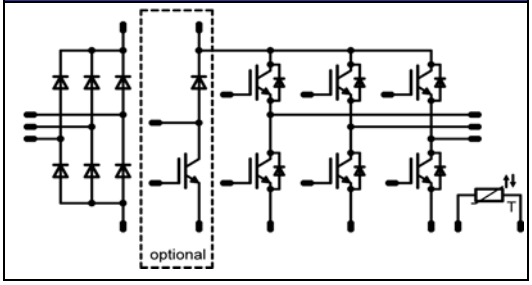
### Types

- V23990-P848-A49-PM 17mm height
- V23990-P848-A48-PM 12mm height
- V23990-P848-C49-PM 17mm height; w/o BRC
- V23990-P848-C48-PM 12mm height; w/o BRC

### *flow* 0 housing



### Schematic




## Maximum Ratings

Tj=25°C, unless otherwise specified

| Parameter | Symbol | Condition | | | Value | Unit |
|---|---|---|---|---|---|---|
| **Input Rectifier Diode** | | | | | | |
| Repetitive peak reverse voltage | $V_{RRM}$ | | $I_R$=0.05mA | $T_j$=25°C | 1600 | V |
| Forward current per diode | $I_{FAV}$ | DC current | | $T_h$=80°C<br>$T_c$=80°C | 28 | A |
| Surge forward current | $I_{FSM}$ | $t_p$=10ms | 180°sine | $T_j$=$T_j$max | 220 | A |
| I2t-value | $I^2t$ | | | | 200 | A2s |
| Power dissipation per Diode | $P_{tot}$ | $T_j$=$T_j$max | | $T_h$=80°C<br>$T_c$=80°C | 33 | W |
| Maximum Junction Temperature | $T_j$max | | | | 150 | °C |

# Maximum Ratings

Tj=25°C, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|---|---|---|---|
| **Transistor Inverter** | | | | |
| Collector-emitter voltage | $V_{CE}$ | $T_j$=25°C | 1200 | V |
| DC collector current | $I_C$ | $T_j$=$T_j$max; $T_h$=80°C; $T_c$=80°C | tbd | A |
| Repetitive peak collector current | $I_{Cpuls}$ | tp limited by $T_j$max | 12 | A |
| Power dissipation per IGBT | $P_{tot}$ | $T_j$=$T_j$max; $T_h$=80°C; $T_c$=80°C | | W |
| Gate-emitter peak voltage | $V_{GE}$ | | ±20 | V |
| Short circuit ratings* | $t_{SC}$<br>$V_{CC}$ | $T_j$=150°C $V_{GE}$=15V | 10<br>800 | us<br>V |
| Maximum Junction Temperature | $T_j$max | | 175 | °C |

* It is recommended to not exceed 1000 short circuit situations in the lifetime of the module and to allow at least 1s between short circuits

| Diode Inverter | | | | |
|---|---|---|---|---|
| Peak Repetitive Reverse Voltage | $V_{RRM}$ | $T_j$=25°C | 1200 | V |
| DC forward current | $I_F$ | $T_j$=$T_j$max; $T_h$=80°C; $T_c$=80°C | 16 | A |
| Repetitive peak forward current | $I_{FRM}$ | tp limited by $T_j$max | 20 | A |
| Power dissipation per Diode | $P_{tot}$ | $T_j$=$T_j$max; $T_h$=80°C; $T_c$=80°C | 36 | W |
| Maximum Junction Temperature | $T_j$max | | 175 | °C |

# Maximum Ratings

Tj=25°C, unless otherwise specified

| Parameter | Symbol | Condition | | Value | Unit |
|---|---|---|---|---|---|
| **Transistor BRC** | | | | | |
| Collector-emitter voltage | $V_{CE}$ | | $T_j$=25°C | 1200 | V |
| DC collector current | $I_C$ | $T_j$=$T_j$max | $T_h$=80°C<br>$T_c$=80°C | 8 | A |
| Repetitive peak collector current | $I_{cpuls}$ | tp limited by $T_j$max | $T_h$=80°C | 12 | A |
| Power dissipation per IGBT | $P_{tot}$ | $T_j$=$T_j$max | $T_h$=80°C<br>$T_c$=80°C | 32 | W |
| Gate-emitter peak voltage | $V_{GE}$ | | | ±20 | V |
| Short circuit ratings* | $t_{SC}$<br>$V_{CC}$ | $T_j$=150°C $V_{GE}$=15V | | 10<br>800 | ms<br>V |
| Maximum Junction Temperature | $T_j$max | | | 175 | °C |

* It is recommended to not exceed 1000 short circuit situations in the lifetime of the module and to allow at least 1s between short circuits

| **Diode BRC** | | | | | |
|---|---|---|---|---|---|
| Peak Repetitive Reverse Voltage | $V_{RRM}$ | | $T_j$=25°C | 1200 | V |
| DC forward current | $I_F$ | $T_j$=$T_j$max | $T_h$=80°C<br>$T_c$=80°C | 7 | A |
| Repetitive peak forward current | $I_{FRM}$ | tp limited by $T_j$max | $T_h$=80°C | 8 | A |
| Power dissipation per Diode | $P_{tot}$ | $T_j$=$T_j$max | $T_h$=80°C<br>$T_c$=80°C | 18 | W |
| Maximum Junction Temperature | $T_j$max | | | 150 | °C |

| **Thermal properties** | | | | |
|---|---|---|---|---|
| Storage temperature | $T_{stg}$ | | -40…+125 | °C |
| Operation junction temperature | $T_{jop}$ | | -40…Tjmax-25°C | °C |

| **Insulation properties** | | | | |
|---|---|---|---|---|
| Insulation voltage | $V_{is}$ | t=1min | 4000 | Vdc |
| Creepage distance | | | min 12,7 | mm |
| Clearance | | | min 12,7 | mm |

## Characteristic Values



| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{GE}$(V) or $V_{GS}$(V) | $V_r$(V) or $V_{CE}$(V) or $V_{DS}$(V) | $I_C$(A) or $I_F$(A) or $I_D$(A) | T(°C) | Min | Typ | Max | |
| • flow0 2 clip-in housing in 12 and 17mm height | | | | | | | | | | |
| **Input Rectifier Diode** | | | | | | | | | | |
| Forward voltage | $V_F$ | | | | 30 | Tj=25°C<br>Tj=125°C | | 1,22<br>1,19 | 1,9 | V |
| Threshold voltage (for power loss calc. only) | $V_{to}$ | | | | | Tj=25°C<br>Tj=125°C | | 0,93<br>0,81 | 0,83 | V |
| Slope resistance (for power loss calc. only) | $r_t$ | | | | | Tj=25°C<br>Tj=125°C | | 0,01<br>0,01 | 0,02 | Ohm |
| Reverse current | $I_r$ | | | 1500 | | Tj=25°C<br>Tj=125°C | | | 0,01 | mA |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 0,61 W/mK | | | | | | 2,16 | | K/W |
| Thermal resistance chip to case per chip | $R_{thJC}$ | | | | | | | | | |
| **Transistor Inverter** | | | | | | | | | | |
| Gate emitter threshold voltage | $V_{GE(th)}$ | VCE=VGE | | | 0,00015 | Tj=25°C<br>Tj=125°C | 5 | 5,8 | 6,5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 15 | | 4 | Tj=25°C<br>Tj=125°C | 1,6 | 1,85 | 2,1 | V |
| Collector-emitter cut-off current incl. Diode | $I_{CES}$ | | 0 | 1200 | | Tj=25°C<br>Tj=125°C | | | 0,0005 | mA |
| Gate-emitter leakage current | $I_{GES}$ | | 20 | 0 | | Tj=25°C<br>Tj=125°C | | | 120 | nA |
| Integrated Gate resistor | $R_{gint}$ | | | | | | | none | | Ohm |
| Turn-on delay time | $t_{d(on)}$ | | | | | | | tbd | | ns |
| Rise time | $t_r$ | | | | | | | tbd | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | | | | tbd | | ns |
| Fall time | $t_f$ | | | | | | | tbd | | ns |
| Turn-on energy loss per pulse | $E_{on}$ | | | | | | | | | mWs |
| Turn-off energy loss per pulse | $E_{off}$ | | | | | | | | | mWs |
| Input capacitance | $C_{ies}$ | f=1MHz | 0 | 25 | | Tj=25°C | | 0,25 | | nF |
| Output capacitance | $C_{oss}$ | | | | | | | 0,025 | | nF |
| Reverse transfer capacitance | $C_{rss}$ | | | | | | | 0,015 | | nF |
| Gate charge | $Q_{Gate}$ | | ±15 | | | Tj=25°C | | tbd | | nC |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 0,61 W/mK | | | | | | tbd | | K/W |
| Thermal resistance chip to case per chip | $R_{thJC}$ | | | | | | | | | K/W |
| **Diode Inverter** | | | | | | | | | | |
| Diode forward voltage | $V_F$ | | | | 10 | Tj=25°C<br>Tj=125°C | 1,35 | 1,84<br>1,82 | 2,2 | V |
| Reverse leakage current | $I_{rm}$ | | | | | Tj=25°C<br>Tj=125°C | | | 2,7 | mA |
| Peak reverse recovery current | $I_{RRM}$ | Rgon=32Ohm | ±15 | 600 | 10 | Tj=25°C<br>Tj=125°C | | 9,88 | | A |
| Reverse recovery time | $t_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 382 | | ns |
| Reverse recovered charge | $Q_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 1,57 | | mC |
| Peak rate of fall of recovery current | di(rec)max /dt | | | | | | | 69 | | A/ms |
| Reverse recovered energy | Erec | | | | | Tj=25°C<br>Tj=125°C | | 0,64 | | mWs |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um λ = 0,61 W/mK | | | | | | 2,68 | | K/W |
| Thermal resistance chip to case per chip | $R_{thJC}$ | | | | | | | | | K/W |

## Characteristic Values



| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{GE}$(V) or $V_{GS}$(V) | $V_r$(V) or $V_{CE}$(V) or $V_{DS}$(V) | $I_C$(A) or $I_F$(A) or $I_D$(A) | T(°C) | Min | Typ | Max | |
| • flow0 2 clip-in housing in 12 and 17mm height | | | | | | | | | | |
| **Transistor BRC** | | | | | | | | | | |
| Gate emitter threshold voltage | $V_{GE(th)}$ | VCE=VGE | | | 0.15m | Tj=25°C<br>Tj=150°C | 5 | 5,8 | 6,5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 15 | | 4 | Tj=25°C<br>Tj=125°C | | 1,96<br>2,17 | 2,2 | V |
| Collector-emitter cut-off | $I_{CES}$ | | 0 | 1200 | | Tj=25°C<br>Tj=125°C | | | 0,05 | mA |
| Gate-emitter leakage current | $I_{GES}$ | | 20 | 0 | | Tj=25°C<br>Tj=150°C | | | 200 | nA |
| Integrated Gate resistor | $R_{gint}$ | | | | | | | none | | Ohm |
| Turn-on delay time | $t_{d(on)}$ | Rgon=64Ohm<br>Rgoff=64Ohm | ±15 | 600 | 4 | Tj=25°C<br>Tj=150°C | | 90 | | ns |
| Rise time | $t_r$ | | | | | Tj=25°C<br>Tj=150°C | | 24 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | | Tj=25°C<br>Tj=150°C | | 226 | | ns |
| Fall time | $t_f$ | | | | | Tj=25°C<br>Tj=150°C | | 99 | | ns |
| Turn-on energy loss per pulse | $E_{on}$ | | | | | Tj=25°C<br>Tj=150°C | | 0,34 | | mWs |
| Turn-off energy loss per pulse | $E_{off}$ | | | | | Tj=25°C<br>Tj=150°C | | 0,3 | | mWs |
| Input capacitance | $C_{ies}$ | f=1MHz | 0 | 25 | | Tj=25°C | | 0,25 | | nF |
| Output capacitance | $C_{oss}$ | | | | | | | 0,025 | | nF |
| Reverse transfer capacitance | $C_{rss}$ | | | | | | | 0,015 | | nF |
| Gate charge | $Q_{Gate}$ | | ±15 | 600 | 4 | Tj=25°C | | | | nC |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um<br>λ = 0,61 W/mK | | | | | | 2,93 | | K/W |
| Thermal resistance chip to case per chip | $R_{thJC}$ | | | | | | | | | K/W |
| **Diode BRC** | | | | | | | | | | |
| Diode forward voltage | $V_F$ | | | | 4 | Tj=25°C<br>Tj=125°C | 1 | 1,91<br>1,84 | 2,35 | V |
| Reverse leakage current | $I_r$ | | | | | Tj=25°C<br>Tj=125°C | | | 250 | mA |
| Peak reverse recovery current | $I_{RRM}$ | Rgon=32Ohm | ±15 | 600 | 4 | Tj=25°C<br>Tj=125°C | | 4,65 | | A |
| Reverse recovery time | $t_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 446 | | ns |
| Reverse recovered charge | $Q_{rr}$ | | | | | Tj=25°C<br>Tj=125°C | | 0,76 | | mC |
| Peak rate of fall of recovery current | di(rec)max /dt | | | | | Tj=25°C<br>Tj=125°C | | 40 | | A/ms |
| Reverse recovery energy | $E_{rec}$ | | | | | Tj=25°C<br>Tj=125°C | | 0,32 | | mWs |
| Thermal resistance chip to heatsink per chip | $R_{thJH}$ | Thermal grease thickness≤50um<br>λ = 0,61 W/mK | | | | | | 3,98 | | K/W |
| Thermal resistance chip to case per chip | $R_{thJC}$ | | | | | | | | | K/W |
| **Thermistor** | | | | | | | | | | |
| Rated resistance | $R_{25}$ | Tol. ±5% | | | | Tj=25°C | 20,9 | 22 | 23,1 | kOhm |
| Deviation of R100 | $D_{R/R}$ | R100=1503Ohm | | | | Tc=100°C | | 2,9 | | %/K |
| Power dissipation given Epcos-Typ | P | | | | | Tj=25°C | | 210 | | mW |
| B-value | $B_{(25/100)}$ | Tol. ±3% | | | | Tj=25°C | | 3980 | | K |

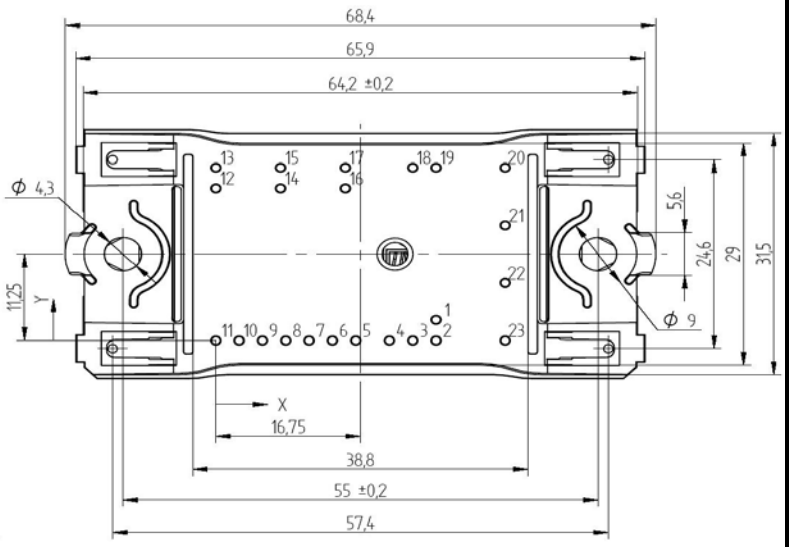
# Package Outline and Pinout



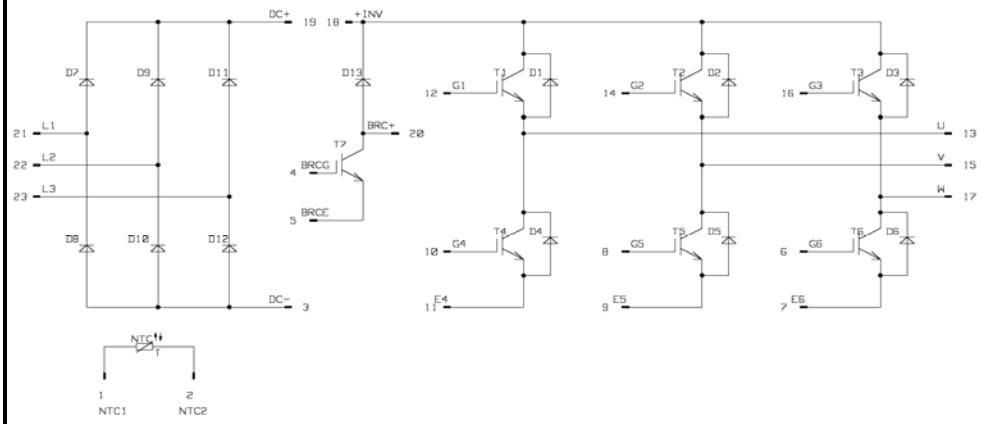
## Outline

| Pin table | | |
|---|---|---|
| Pin | X | Y |
| 1 | 25,5 | 2,7 |
| 2 | 25,5 | 0 |
| 3 | 22,8 | 0 |
| 4 | 20,1 | 0 |
| 5 | 16,2 | 0 |
| 6 | 13,5 | 0 |
| 7 | 10,8 | 0 |
| 8 | 8,1 | 0 |
| 9 | 5,4 | 0 |
| 10 | 2,7 | 0 |
| 11 | 0 | 0 |
| 12 | 0 | 19,8 |
| 13 | 0 | 22,5 |
| 14 | 7,5 | 19,8 |
| 15 | 7,5 | 22,5 |
| 16 | 15 | 19,8 |
| 17 | 15 | 22,5 |
| 18 | 22,8 | 22,5 |
| 19 | 25,5 | 22,5 |
| 20 | 33,5 | 22,5 |
| 21 | 33,5 | 15 |
| 22 | 33,5 | 7,5 |
| 23 | 33,5 | 0 |

g in 12 and 17mm height




## Pinout




This drawing contains the maximum configuration.
Depending upon types, some components may be left. See in part list.

- flow0 2 clip-in housing in 12 and 17mm height

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| Datasheet Status | Product Status | Definition |
|---|---|---|
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