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# XPT IGBT Module

$V_{CES}$ = 2x 650V
$I_{C25}$ = 75A
$V_{CE(sat)}$ = 1.6V

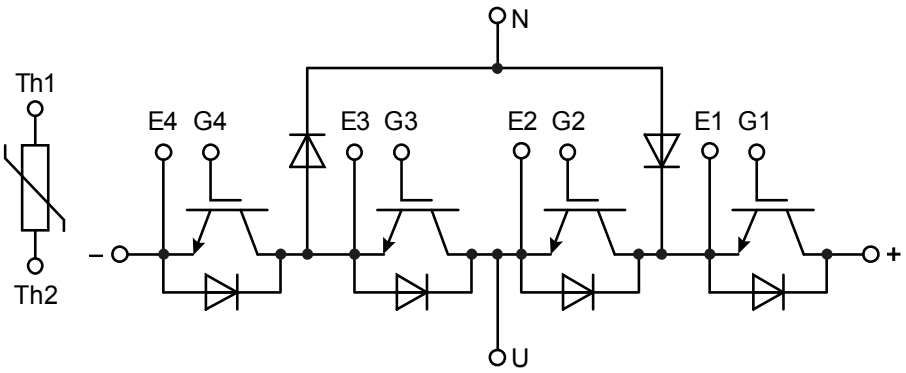
## Phase leg with Multi Level

**Part number**

MIXA50PM650TMI

Backside: isolated

E72873




**Features / Advantages:**

- High level of integration
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 3x Ic
- Thin wafer technology combined with the XPT design results in a competitive low VCE(sat)
- Temperature sense included
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

**Applications:**

- AC motro control
- AC servo and robot drives
- UPS
- Solar Inverter

**Package:** MiniPack2B

- Isolation Voltage: 3600V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling
- Assembly clips available
  - IXKU 5-505 screw clamp
  - IXRB 5-506 click clamp

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| IGBT | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $V_{CES}$ | *collector emitter voltage* | | $T_{VJ}$ = 25°C | | | 650 | V |
| $V_{GES}$ | *max. DC gate voltage* | | | | | ±20 | V |
| $V_{GEM}$ | *max. transient collector gate voltage* | | | | | ±30 | V |
| $I_{C25}$ | *collector current* | | $T_C$ = 25°C | | | 75 | A |
| $I_{C80}$ | | | $T_C$ = 80°C | | | 50 | A |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 188 | W |
| $V_{CE(sat)}$ | *collector emitter saturation voltage* | $I_C$ = 50 A; $V_{GE}$ = 15 V | $T_{VJ}$ = 25°C | | 1.6 | 1.8 | V |
| | | | $T_{VJ}$ = 125°C | | 1.9 | | V |
| $V_{GE(th)}$ | *gate emitter threshold voltage* | $I_C$ = 0.8 mA; $V_{GE}$ = $V_{CE}$ | $T_{VJ}$ = 25°C | 4 | 4.8 | 5.5 | V |
| $I_{CES}$ | *collector emitter leakage current* | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V | $T_{VJ}$ = 25°C | | | 0.1 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.1 | | mA |
| $I_{GES}$ | *gate emitter leakage current* | $V_{GE}$ = ±20 V | | | | 500 | nA |
| $Q_{G(on)}$ | *total gate charge* | $V_{CE}$ = 300 V; $V_{GE}$ = 15 V; $I_C$ = 50 A | | | 70 | | nC |
| $t_{d(on)}$ | *turn-on delay time* | | | | 70 | | ns |
| $t_r$ | *current rise time* | | | | 50 | | ns |
| $t_{d(off)}$ | *turn-off delay time* | inductive load | $T_{VJ}$ = 125°C | | 100 | | ns |
| $t_f$ | *current fall time* | $V_{CE}$ = 300 V; $I_C$ = 50 A | | | 40 | | ns |
| $E_{on}$ | *turn-on energy per pulse* | $V_{GE}$ = ±15 V; $R_G$ = 15 Ω | | | 1.2 | | mJ |
| $E_{off}$ | *turn-off energy per pulse* | | | | 1.7 | | mJ |
| RBSOA | *reverse bias safe operating area* | $V_{GE}$ = ±15 V; $R_G$ = 15 Ω | $T_{VJ}$ = 125°C | | | | |
| $I_{CM}$ | | $V_{CEmax}$ = 650 V | | | | 100 | A |
| SCSOA | *short circuit safe operating area* | $V_{CEmax}$ = 650 V | | | | | |
| $t_{SC}$ | *short circuit duration* | $V_{CE}$ = 360 V; $V_{GE}$ = ±15 V | $T_{VJ}$ = 125°C | | | 10 | µs |
| $I_{SC}$ | *short circuit current* | $R_G$ = 15 Ω; non-repetitive | | | 200 | | A |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.8 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.27 | | K/W |

| Diode | | | | | | | |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | *max. repetitive reverse voltage* | | $T_{VJ}$ = 25°C | | | 650 | V |
| $I_{F25}$ | *forward current* | | $T_C$ = 25°C | | | 55 | A |
| $I_{F80}$ | | | $T_C$ = 80°C | | | 40 | A |
| $V_F$ | *forward voltage* | $I_F$ = 50 A | $T_{VJ}$ = 25°C | | | 2.00 | V |
| | | | $T_{VJ}$ = 125°C | | 1.80 | | V |
| $I_R$ | *reverse current* | $V_R$ = $V_{RRM}$ | $T_{VJ}$ = 25°C | | | 0.1 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.5 | | mA |
| $Q_{rr}$ | *reverse recovery charge* | | | | 4.5 | | µC |
| $I_{RM}$ | *max. reverse recovery current* | $V_R$ = 300 V | | | 45 | | A |
| $t_{rr}$ | *reverse recovery time* | $-di_F/dt$ = 900 A/µs | $T_{VJ}$ = 125°C | | 150 | | ns |
| $E_{rec}$ | *reverse recovery energy* | $I_F$ = 50 A; $V_{GE}$ = 0 V | | | 1 | | mJ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 1.2 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.4 | | K/W |

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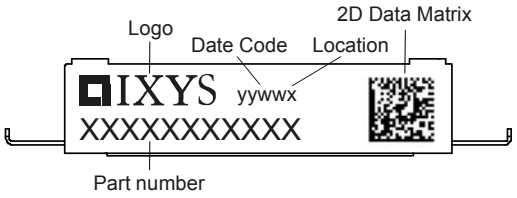
| Package MiniPack2B | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $I_{RMS}$ | *RMS current* | per terminal | | | | | A |
| $T_{stg}$ | *storage temperature* | | | -40 | | 125 | °C |
| $T_{VJ}$ | *virtual junction temperature* | | | -40 | | 150 | °C |
| Weight | | | | | 39 | | g |
| $M_D$ | *mounting torque* | | | 2 | | 2.2 | Nm |
| $V_{ISOL}$ | *isolation voltage* | t = 1 second | 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA | 3600 | | | V |
| | | t = 1 minute | | 3000 | | | V |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | *terminal to terminal* | 6.3 | 5.0 | | | mm |
| $d_{Spb/Apb}$ | | *terminal to backside* | 11.5 | 10.0 | | | mm |
| $R_{pin-chip}$ | *resistance pin to chip* | $V = V_{CEsat} + 2 \cdot R \cdot I_C$ resp. $V = V_F + 2 \cdot R \cdot I_F$ | | | 6 | | mΩ |



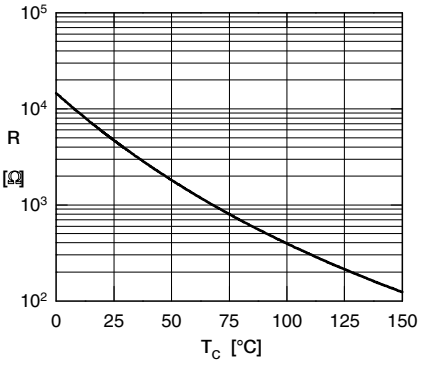

**Part number**

M = Module
I = IGBT
X = XPT IGBT
A = Gen 1 / std
50 = Current Rating [A]
PM = Phase leg with Multi Level
650 = Reverse Voltage [V]
T = Thermistor \ Temperature sensor
MI = MiniPack2B

| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | MIXA50PM650TMI | MIXA50PM650TMI | Box | 20 | 512023 |

## Temperature Sensor NTC

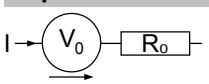
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| $R_{25}$ | *resistance* | $T_{VJ}$ = 25° | 4.75 | 5 | 5.25 | kΩ |
| $B_{25/50}$ | *temperature coefficient* | | | 3375 | | K |




Typ. NTC resistance vs. temperature

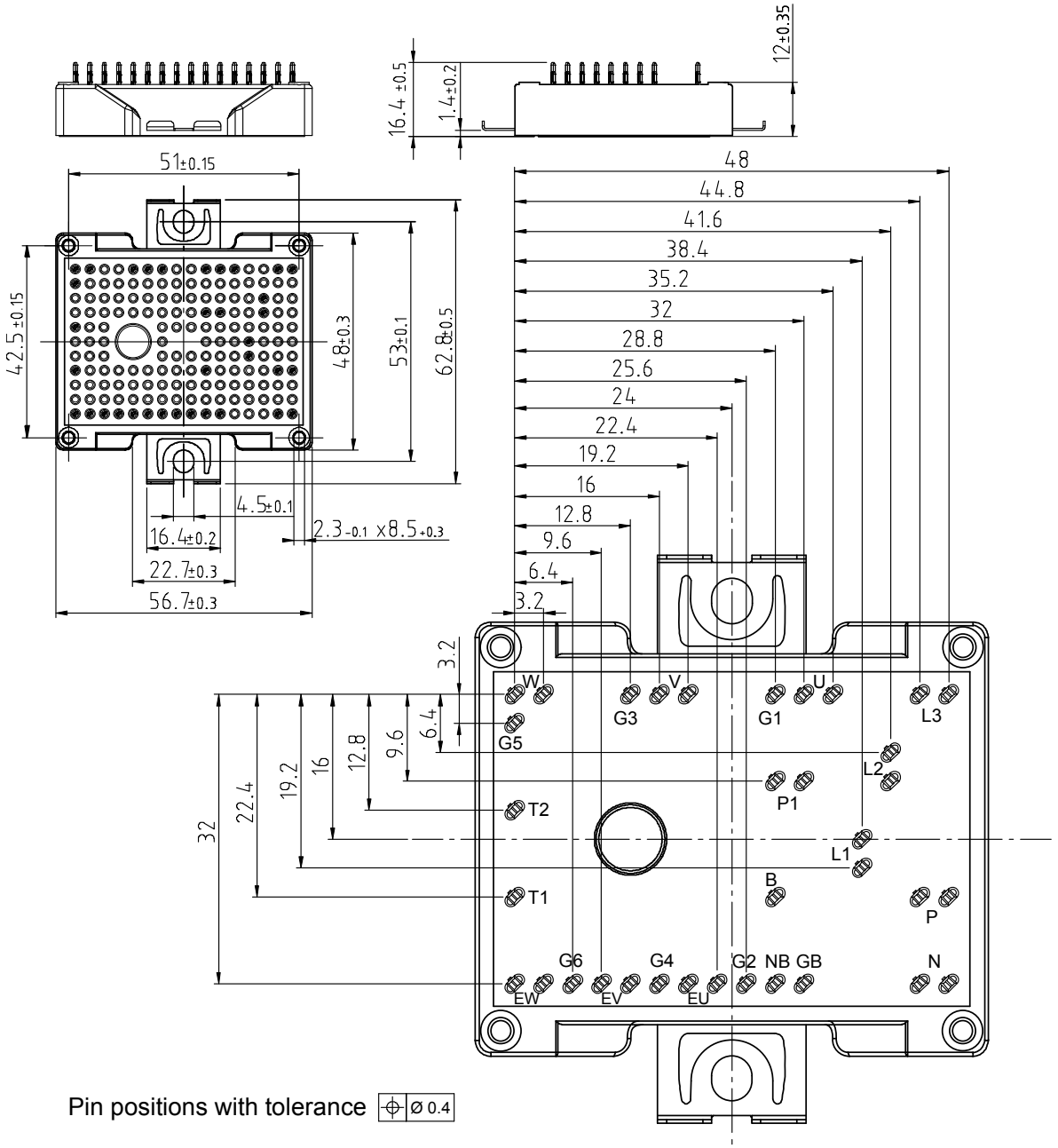
## Equivalent Circuits for Simulation

** on die level* $T_{VJ}$ = 150°C




| | | IGBT | Diode | |
|---|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 1.1 | 1.2 | V |
| $R_{0\,max}$ | *slope resistance ** | 21 | 18 | mΩ |

## Outlines MiniPack2B




Pin positions with tolerance ⌖ Ø 0.4