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preliminary

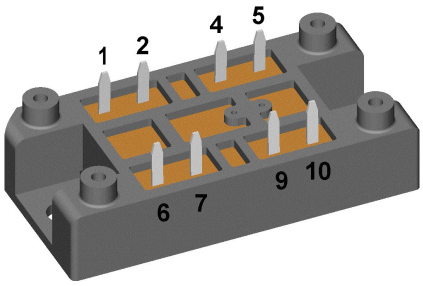
# XPT IGBT Module

$V_{CES}$ = 1200 V
$I_{C25}$ = 220 A
$V_{CE(sat)}$ = 1,8 V

## Boost Chopper

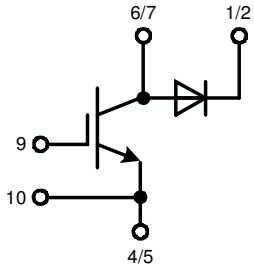
**Part number**

**MIXA150R1200VA**




Backside: isolated

E72873




**Features / Advantages:**

- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- 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)
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

**Applications:**

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

**Package:** V1-A-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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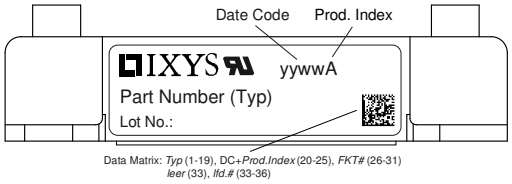
| IGBT | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| $V_{CES}$ | *collector emitter voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $V_{GES}$ | *max. DC gate voltage* | | | | | ±20 | V |
| $V_{GEM}$ | *max. transient gate emitter voltage* | | | | | ±30 | V |
| $I_{C25}$ | *collector current* | | $T_C$ = 25°C | | | 220 | A |
| $I_{C80}$ | | | $T_C$ = 80°C | | | 150 | A |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 695 | W |
| $V_{CE(sat)}$ | *collector emitter saturation voltage* | $I_C$ = 150 A; $V_{GE}$ = 15 V | $T_{VJ}$ = 25°C | | 1,8 | 2,1 | V |
| | | | $T_{VJ}$ = 125°C | | 2,1 | | V |
| $V_{GE(th)}$ | *gate emitter threshold voltage* | $I_C$ = 6 mA; $V_{GE}$ = $V_{CE}$ | $T_{VJ}$ = 25°C | 5,4 | 5,9 | 6,5 | V |
| $I_{CES}$ | *collector emitter leakage current* | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V | $T_{VJ}$ = 25°C | | | 0,5 | mA |
| | | | $T_{VJ}$ = 125°C | | 1 | | mA |
| $I_{GES}$ | *gate emitter leakage current* | $V_{GE}$ = ±20 V | | | | 500 | nA |
| $Q_{G(on)}$ | *total gate charge* | $V_{CE}$ = 600 V; $V_{GE}$ = 15 V; $I_C$ = 150 A | | | 470 | | nC |
| $t_{d(on)}$ | *turn-on delay time* | | | | 70 | | ns |
| $t_r$ | *current rise time* | | | | 40 | | ns |
| $t_{d(off)}$ | *turn-off delay time* | inductive load | $T_{VJ}$ = 125°C | | 250 | | ns |
| $t_f$ | *current fall time* | $V_{CE}$ = 600 V; $I_C$ = 150 A | | | 100 | | ns |
| $E_{on}$ | *turn-on energy per pulse* | $V_{GE}$ = ±15 V; $R_G$ = 4,7 Ω | | | 14 | | mJ |
| $E_{off}$ | *turn-off energy per pulse* | | | | 16 | | mJ |
| **RBSOA** | *reverse bias safe operating area* | $V_{GE}$ = ±15 V; $R_G$ = 4,7 Ω | $T_{VJ}$ = 125°C | | | | |
| $I_{CM}$ | | $V_{CEma}$ = 1200 V | | | | 450 | A |
| **SCSOA** | *short circuit safe operating area* | $V_{CEma}$ = 1200 V | | | | | |
| $t_{SC}$ | *short circuit duration* | $V_{CE}$ = 900 V; $V_{GE}$ = ±15 V | $T_{VJ}$ = 125°C | | | 10 | µs |
| $I_{SC}$ | *short circuit current* | $R_G$ = 4,7 Ω; non-repetitive | | | 600 | | A |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0,18 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0,20 | | K/W |

| Diode | | | | | | | |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | *max. repetitive reverse voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $I_{F25}$ | *forward current* | | $T_C$ = 25°C | | | 190 | A |
| $I_{F80}$ | | | $T_C$ = 80°C | | | 130 | A |
| $V_F$ | *forward voltage* | $I_F$ = 150 A | $T_{VJ}$ = 25°C | | | 2,20 | V |
| | | | $T_{VJ}$ = 125°C | | 1,95 | | V |
| $I_R$ | *reverse current* | $V_R$ = $V_{RRM}$ | $T_{VJ}$ = 25°C | | | 0,3 | mA |
| | | | $T_{VJ}$ = 125°C | | 0,8 | | mA |
| $Q_{rr}$ | *reverse recovery charge* | $V_R$ = 600 V | | | 20 | | µC |
| $I_{RM}$ | *max. reverse recovery current* | -$di_F$/dt = 2500 A/µs | $T_{VJ}$ = 125°C | | 175 | | A |
| $t_{rr}$ | *reverse recovery time* | $I_F$ = 150 A; $V_{GE}$ = 0 V | | | 350 | | ns |
| $E_{rec}$ | *reverse recovery energy* | | | | 10 | | mJ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0,28 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0,20 | | K/W |

preliminary

| Package V1-A-Pack | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | **Definition** | **Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| $I_{RMS}$ | *RMS current* | per terminal | | | | 100 | A |
| $T_{VJ}$ | *virtual junction temperature* | | | -40 | | 150 | °C |
| $T_{op}$ | *operation temperature* | | | -40 | | 125 | °C |
| $T_{stg}$ | *storage temperature* | | | -40 | | 125 | °C |
| **Weight** | | | | | 37 | | g |
| $M_D$ | *mounting torque* | | | 2 | | 2,5 | Nm |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | | *terminal to terminal* | 6,0 | | | mm |
| $d_{Spb/Apb}$ | | | *terminal to backside* | 12,0 | | | mm |
| $V_{ISOL}$ | *isolation voltage* | t = 1 second | 50/60 Hz, RMS; $I_{ISOL}$ ≤ 1 mA | 3600 | | | V |
| | | t = 1 minute | | 3000 | | | V |

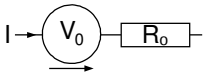



**Part description**

M = Module
I = IGBT
X = XPT IGBT
A = Gen 1 / std
150 = Current Rating [A]
R = Boost Chopper
1200 = Reverse Voltage [V]
VA = V1-A-Pack

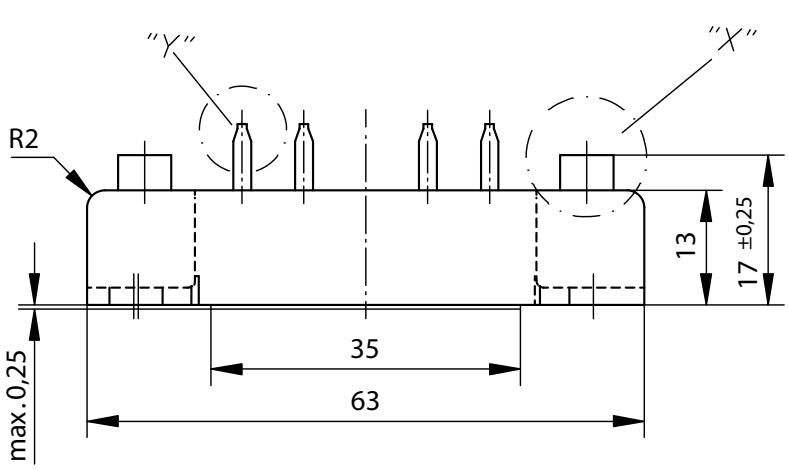
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | MIXA150R1200VA | MIXA150R1200VA | Blister | 24 | 511595 |

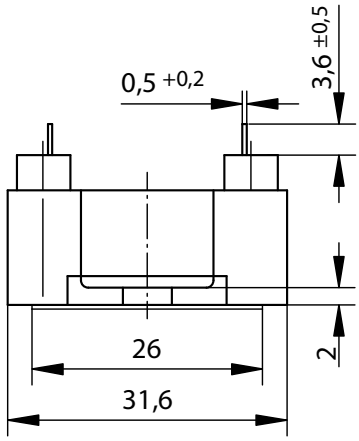
**Equivalent Circuits for Simulation** ** on die level* $T_{VJ}$ = 150 °C

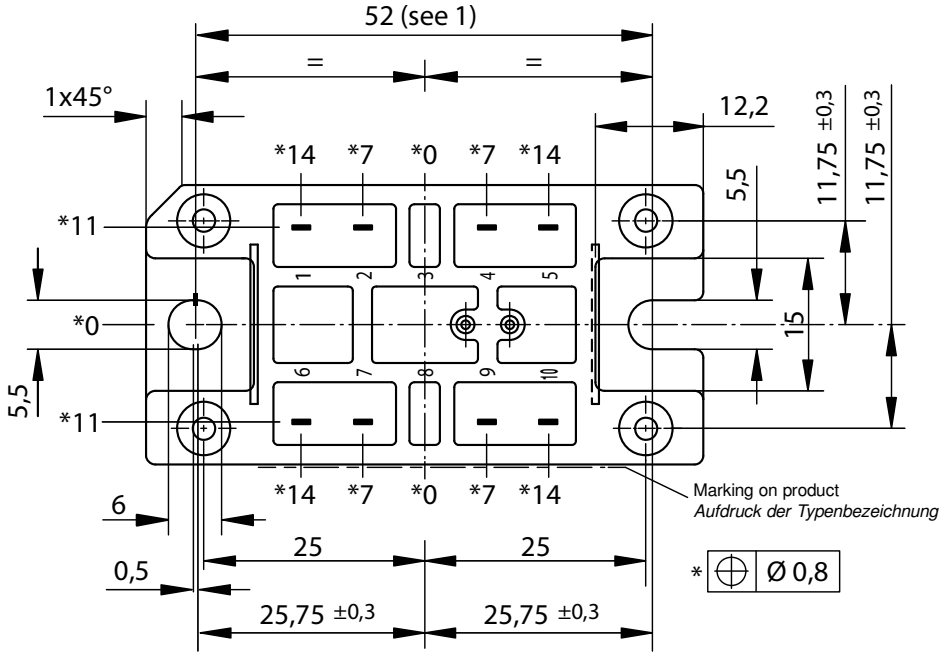



| | | IGBT | Diode | |
|---|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 1,1 | 1,25 | V |
| $R_{0\,max}$ | *slope resistance ** | 9,2 | 5,7 | mΩ |

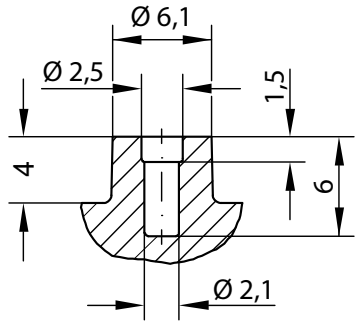
## Outlines V1-A-Pack



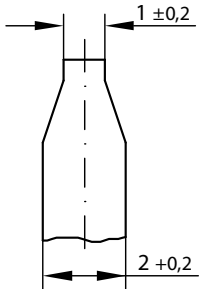




Detail "X" M 2:1

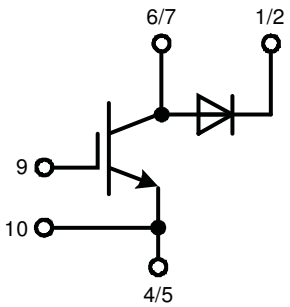



Detail "Y" M 5:1




**Remarks** / ***Bemerkungen:***

1. Nominal distance mounting screws on heat sink: 52 mm / *Nennabstand Befestigungsschrauben auf Kühlkörper: 52 mm*
2. General tolerance / *Allgemeintoleranz*: DIN ISO 2768 -T1-c
3. Surface treatment of pins: tin plated (Sn) in hot dip / *Oberflächenbehandlung der Pins: verzinnt (Sn) im Tauchbad*



## IGBT

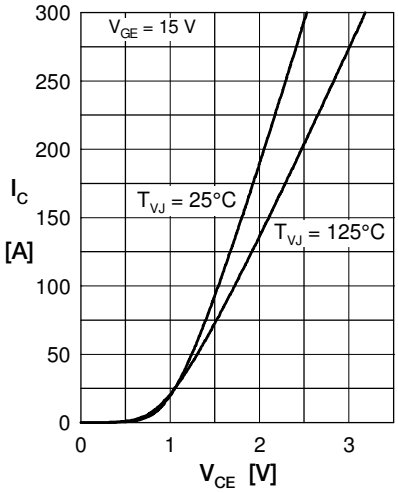



Fig. 1 Typ. output characteristics

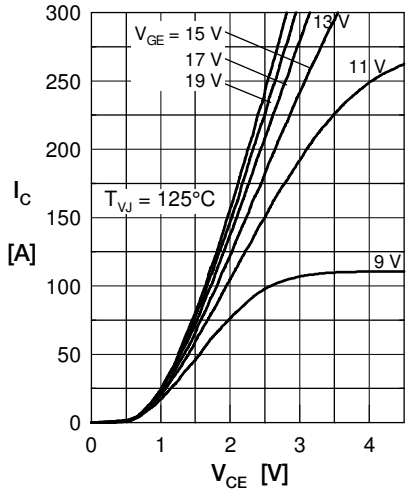



Fig. 2 Typ. output characteristics

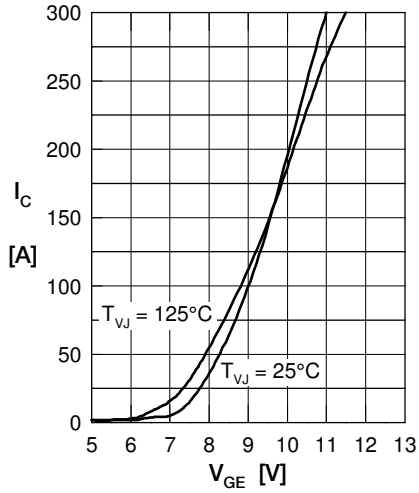



Fig. 3 Typ. tranfer characteristics

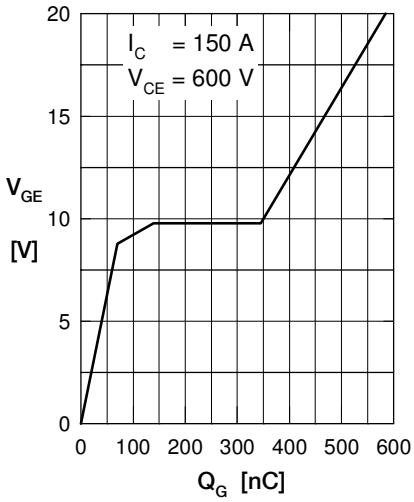



Fig. 4 Typ. turn-on gate charge

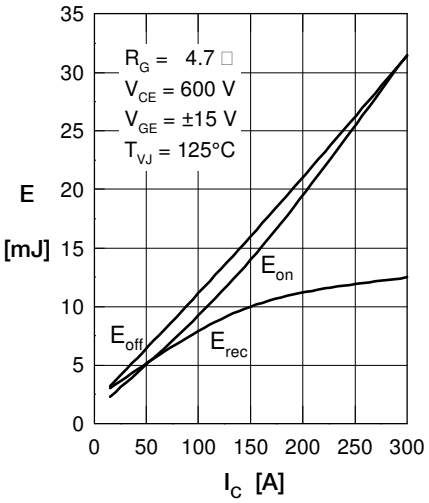



Fig. 5 Typ. switching energy versus collector current

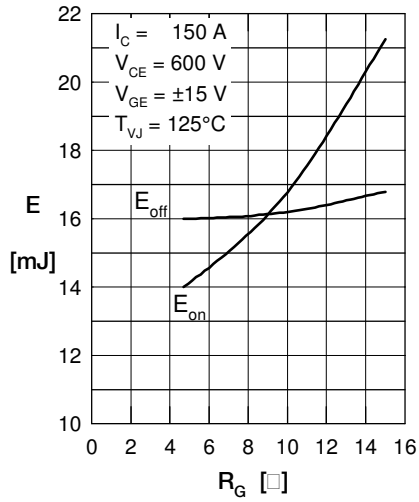



Fig. 6 Typ. switching energy versus gate resistance

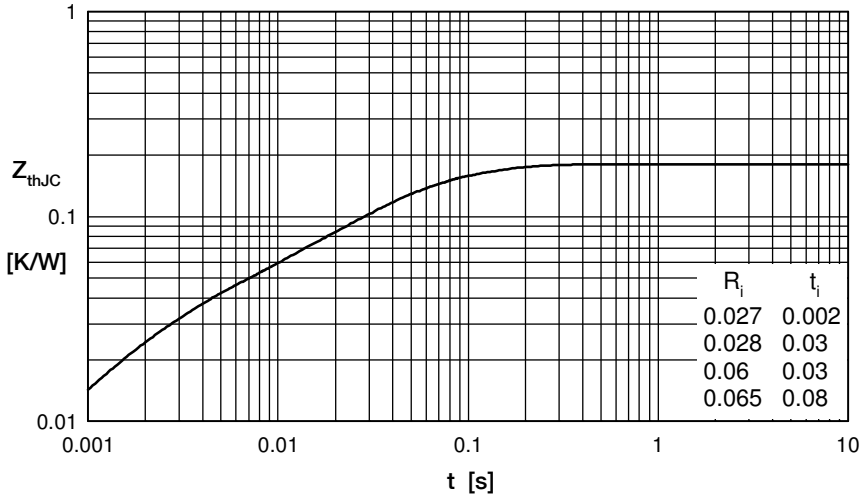



Fig. 7 Typ. transient thermal impedance

## Diode

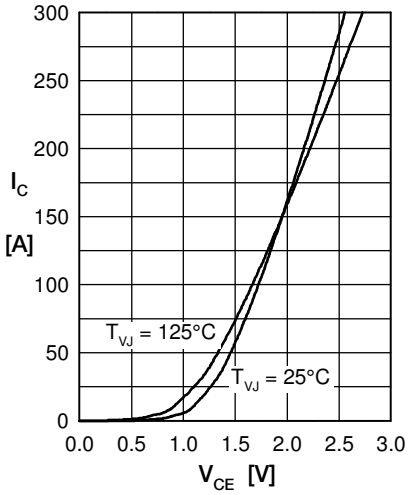



Fig. 1 Typ. Forward current versus $V_F$

Fig. 2 Typ. reverse recovery charge $Q_{rr}$ versus di/dt

Fig. 3 Typ. peak reverse current $I_{RM}$ versus di/dt

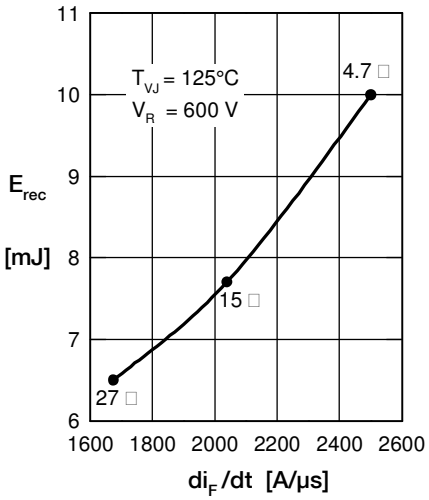



Fig. 4 Dynamic parameters $Q_r$, $I_{RM}$ versus $T_{VJ}$

Fig. 5 Typ. recovery time $t_{rr}$ versus $-di_F/dt$

Fig. 6 Typ. recovery energy $E_{rec}$ versus -di/dt

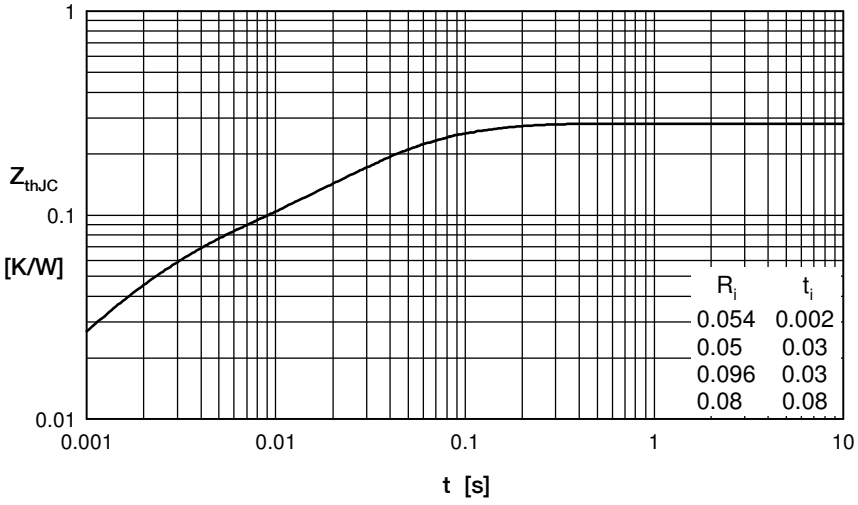



Fig. 7 Transient thermal impedance junction to case