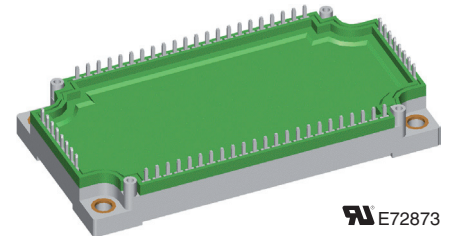


Converter - Brake - Inverter Module XPT IGBT

| Three Phase Rectifier | Brake Chopper | Three Phase Inverter |
|----------------------------|-------------------------------|-------------------------------|
| $V_{RRM} = 1600 \text{ V}$ | $V_{CES} = 1200 \text{ V}$ | $V_{CES} = 1200 \text{ V}$ |
| $I_{DAVM} = 265 \text{ A}$ | $I_{C25} = 60 \text{ A}$ | $I_{C25} = 120 \text{ A}$ |
| $I_{FSM} = 1100 \text{ A}$ | $V_{CE(sat)} = 1.8 \text{ V}$ | $V_{CE(sat)} = 1.8 \text{ V}$ |

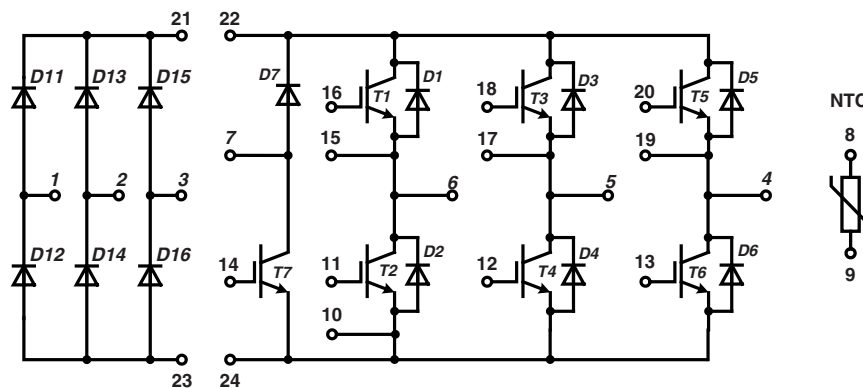
Part name (Marking on product)

MIXA80WB1200TEH



E72873

Pin configuration see outlines.



Features:

- 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
 - square RBSOA @ 3x I_C
 - low EMI
- Thin wafer technology combined with the XPT design results in a competitive low $V_{CE(sat)}$
- SONIC™ diode
 - fast and soft reverse recovery
 - low operating forward voltage

Application:

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies

Package:

- "E3-Pack" standard outline
- Insulated copper base plate
- Soldering pins for PCB mounting
- Temperature sense included

Terms & Conditions of usage

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact the sales office, which is responsible for you. Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you. Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

- to perform joint risk and quality assessments;
- the conclusion of quality agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

IXYS reserves the right to change limits, test conditions and dimensions.

20160518e

Output Inverter T1 - T6

| Symbol | Definitions | Conditions | Ratings | | | Unit | |
|---------------|---------------------------------------|--|---|-------------|----------|---------------|---|
| | | | min. | typ. | max. | | |
| V_{CES} | collector emitter voltage | | $T_{VJ} = 25^{\circ}\text{C}$ | | 1200 | V | |
| V_{GES} | max. DC gate voltage | continuous | | | ± 20 | V | |
| V_{GEM} | max. transient collector gate voltage | transient | | | ± 30 | V | |
| I_{C25} | collector current | | $T_C = 25^{\circ}\text{C}$ | | 120 | A | |
| I_{C80} | | | $T_C = 80^{\circ}\text{C}$ | | 84 | A | |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}\text{C}$ | | 390 | W | |
| $V_{CE(sat)}$ | collector emitter saturation voltage | $I_C = 77\text{ A}; V_{GE} = 15\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 1.8 2.1 | 2.1 | V V | |
| $V_{GE(th)}$ | gate emitter threshold voltage | $I_C = 3\text{ mA}; V_{GE} = V_{CE}$ | $T_{VJ} = 25^{\circ}\text{C}$ | 5.4 | 6.0 | 6.5 | V |
| I_{CES} | collector emitter leakage current | $V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 0.03 0.6 | 0.2 | mA mA | |
| I_{GES} | gate emitter leakage current | $V_{GE} = \pm 20\text{ V}$ | | | 500 | nA | |
| $Q_{G(on)}$ | total gate charge | $V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 75\text{ A}$ | | | 230 | nC | |
| $t_{d(on)}$ | turn-on delay time | inductive load $V_{CE} = 600\text{ V}; I_C = 75\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega$ | $T_{VJ} = 125^{\circ}\text{C}$ | 70 | | ns | |
| t_r | current rise time | | | 40 | | ns | |
| $t_{d(off)}$ | turn-off delay time | | | 250 | | ns | |
| t_f | current fall time | | | 100 | | ns | |
| E_{on} | turn-on energy per pulse | | | 6.8 | | mJ | |
| E_{off} | turn-off energy per pulse | | | 8.3 | | mJ | |
| RBSOA | reverse bias safe operating area | $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega;$ | $T_{VJ} = 125^{\circ}\text{C}$ $V_{CEK} = 1200\text{ V}$ | | 225 | A | |
| SCSOA | short circuit safe operating area | | $T_{VJ} = 125^{\circ}\text{C}$ | | 10 | μs | |
| t_{SC} | short circuit duration | $V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V};$ | | | | | |
| I_{SC} | short circuit current | $R_G = 10\ \Omega;$ non-repetitive | | 300 | | A | |
| R_{thJC} | thermal resistance junction to case | (per IGBT) | | | 0.32 | K/W | |

Output Inverter D1 - D6

| Symbol | Definitions | Conditions | Ratings | | | Unit |
|------------|-------------------------------------|---|---|--------------|------|---------------|
| | | | min. | typ. | max. | |
| V_{RRM} | max. repetitive reverse voltage | | $T_{VJ} = 25^{\circ}\text{C}$ | | 1200 | V |
| I_{F25} | forward current | | $T_C = 25^{\circ}\text{C}$ | | 135 | A |
| I_{F80} | | | $T_C = 80^{\circ}\text{C}$ | | 90 | A |
| V_F | forward voltage | $I_F = 100\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 1.95 1.95 | 2.2 | V V |
| Q_{rr} | reverse recovery charge | $V_R = 600\text{ V}$ $di_F/dt = -1600\text{ A}/\mu\text{s}$ $I_F = 100\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$ | 12.5 | | μC |
| I_{RM} | max. reverse recovery current | | | 100 | | A |
| t_{rr} | reverse recovery time | | | 350 | | ns |
| E_{rec} | reverse recovery energy | | | 4 | | mJ |
| R_{thJC} | thermal resistance junction to case | (per diode) | | | 0.4 | K/W |

 $T_C = 25^{\circ}\text{C}$ unless otherwise stated

Brake T7

| Symbol | Definitions | Conditions | Ratings | | | Unit | |
|---------------|---------------------------------------|--|---|-------------|----------|---------------|---|
| | | | min. | typ. | max. | | |
| V_{CES} | collector emitter voltage | | $T_{VJ} = 25^{\circ}\text{C}$ | | 1200 | V | |
| V_{GES} | max. DC gate voltage | continuous | | | ± 20 | V | |
| V_{GEM} | max. transient collector gate voltage | transient | | | ± 30 | V | |
| I_{C25} | collector current | | $T_C = 25^{\circ}\text{C}$ | | 60 | A | |
| I_{C80} | | | $T_C = 80^{\circ}\text{C}$ | | 40 | A | |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}\text{C}$ | | 195 | W | |
| $V_{CE(sat)}$ | collector emitter saturation voltage | $I_C = 35\text{ A}; V_{GE} = 15\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 1.8 2.1 | 2.1 | V V | |
| $V_{GE(th)}$ | gate emitter threshold voltage | $I_C = 1.5\text{ mA}; V_{GE} = V_{CE}$ | $T_{VJ} = 25^{\circ}\text{C}$ | 5.4 | 6.0 | 6.5 | V |
| I_{CES} | collector emitter leakage current | $V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 0.01 0.1 | 0.1 | mA mA | |
| I_{GES} | gate emitter leakage current | $V_{GE} = \pm 20\text{ V}$ | | | 500 | nA | |
| $Q_{G(on)}$ | total gate charge | $V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 35\text{ A}$ | | | 107 | nC | |
| $t_{d(on)}$ | turn-on delay time | inductive load $V_{CE} = 600\text{ V}; I_C = 35\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$ | $T_{VJ} = 125^{\circ}\text{C}$ | 70 | | ns | |
| t_r | current rise time | | | 40 | | ns | |
| $t_{d(off)}$ | turn-off delay time | | | 250 | | ns | |
| t_f | current fall time | | | 100 | | ns | |
| E_{on} | turn-on energy per pulse | | | 3.8 | | mJ | |
| E_{off} | turn-off energy per pulse | | | 4.1 | | mJ | |
| RBSOA | reverse bias safe operating area | $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega;$ | $T_{VJ} = 125^{\circ}\text{C}$ $V_{CEK} = 1200\text{ V}$ | | 105 | A | |
| SCSOA | short circuit safe operating area | | $T_{VJ} = 125^{\circ}\text{C}$ | | 10 | μs | |
| t_{SC} | short circuit duration | $V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V};$ | | | 140 | A | |
| I_{SC} | short circuit current | $R_G = 27\ \Omega;$ non-repetitive | | | | | |
| R_{thJC} | thermal resistance junction to case | | | | 0.64 | K/W | |

Brake Chopper D7

| Symbol | Definitions | Conditions | Ratings | | | Unit |
|------------|-------------------------------------|--|---|--------------|------|---------------|
| | | | min. | typ. | max. | |
| V_{RRM} | max. repetitive reverse voltage | | $T_{VJ} = 25^{\circ}\text{C}$ | | 1200 | V |
| I_{F25} | forward current | | $T_C = 25^{\circ}\text{C}$ | | 44 | A |
| I_{F80} | | | $T_C = 80^{\circ}\text{C}$ | | 29 | A |
| V_F | forward voltage | $I_F = 30\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 1.95 1.95 | 2.2 | V V |
| I_R | reverse current | $V_R = V_{RRM}$ | $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$ | 0.01 0.15 | 0.1 | mA mA |
| Q_{rr} | reverse recovery charge | $V_R = 600\text{ V}$ $di_F/dt = 600\text{ A}/\mu\text{s}$ $I_F = 30\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$ | 3.5 | | μC |
| I_{RM} | max. reverse recovery current | | | 30 | | A |
| t_{rr} | reverse recovery time | | | 350 | | ns |
| E_{rec} | reverse recovery energy | | | 0.9 | | mJ |
| R_{thJC} | thermal resistance junction to case | | | | 1.2 | K/W |

 $T_C = 25^{\circ}\text{C}$ unless otherwise stated

Input Rectifier Bridge D11 - D16

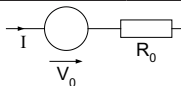
| Symbol | Definitions | Conditions | Ratings | | | Unit |
|------------|-------------------------------------|-------------------------|---------|------|------|------------------|
| | | | min. | typ. | max. | |
| V_{RRM} | max. repetitive reverse voltage | | | | 1600 | V |
| I_{FAV} | average forward current | sine 180° | | | 94 | A |
| I_{DAVM} | max. average DC output current | rect.; $d = 1/3$ | | | 265 | A |
| I_{FSM} | max. forward surge current | $t = 10$ ms; sine 50 Hz | | | 1100 | A |
| I^2t | I^2t value for fusing | $t = 10$ ms; sine 50 Hz | | | 6000 | A ² s |
| P_{tot} | total power dissipation | | | | 4700 | A ² s |
| V_F | forward voltage | $I_F = 150$ A | | | 250 | W |
| I_R | reverse current | $V_R = V_{RRM}$ | | 1.3 | 1.6 | V |
| R_{thJC} | thermal resistance junction to case | (per diode) | | 1.3 | | V |
| | | | | 0.05 | 0.1 | mA |
| | | | | 2.0 | | mA |
| | | | | | 0.5 | K/W |

Temperature Sensor NTC

| Symbol | Definitions | Conditions | Ratings | | | Unit |
|-------------|-------------|------------|---------|------|------|------------|
| | | | min. | typ. | max. | |
| R_{25} | resistance | | | | 5.0 | k Ω |
| $B_{25/50}$ | | | 4.75 | 5.0 | 5.25 | K |

Module

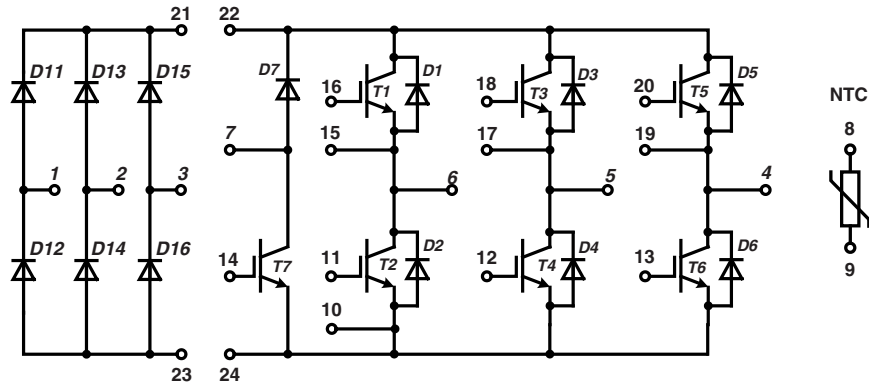
| Symbol | Definitions | Conditions | Ratings | | | Unit |
|----------------|-------------------------------------|--------------------------------|---------|------|------|------------|
| | | | min. | typ. | max. | |
| T_{VJ} | operating temperature | | -40 | | 125 | °C |
| T_{VJM} | max. virtual junction temperature | | | | 150 | °C |
| T_{stg} | storage temperature | | -40 | | 125 | °C |
| V_{ISOL} | isolation voltage | $I_{ISOL} \leq 1$ mA; 50/60 Hz | | | 3000 | V~ |
| CTI | comparative tracking index | | | | 200 | |
| M_d | mounting torque (M5) | | 3 | | 6 | Nm |
| d_S | creep distance on surface | | 6 | | | mm |
| d_A | strike distance through air | | 6 | | | mm |
| $R_{pin-chip}$ | resistance pin to chip | | | 5 | | m Ω |
| R_{thCH} | thermal resistance case to heatsink | with heatsink compound | | 0.01 | | K/W |
| Weight | | | | 300 | | g |

Equivalent Circuits for Simulation


| Symbol | Definitions | Conditions | Ratings | | | Unit |
|--------|---------------------|------------|---------|------|------|------------|
| | | | min. | typ. | max. | |
| V_0 | rectifier diode | D8 - D13 | | | 0.87 | V |
| R_0 | | | | | 2.7 | m Ω |
| V_0 | IGBT | T1 - T6 | | | 1.1 | V |
| R_0 | | | | | 17.9 | m Ω |
| V_0 | free wheeling diode | D1 - D6 | | | 1.09 | V |
| R_0 | | | | | 9.1 | m Ω |
| V_0 | IGBT | T7 | | | 1.1 | V |
| R_0 | | | | | 40 | m Ω |
| V_0 | free wheeling diode | D7 | | | 1.2 | V |
| R_0 | | | | | 27.0 | m Ω |

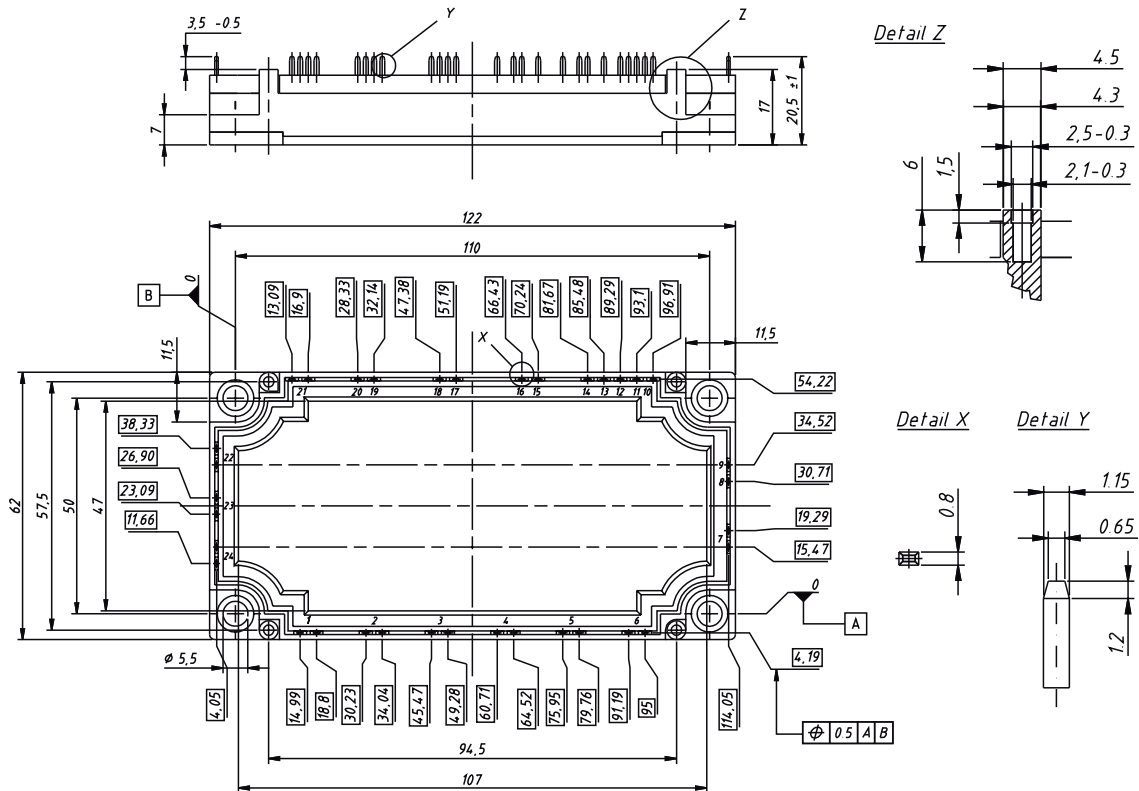
 $T_C = 25^\circ\text{C}$ unless otherwise stated

Circuit Diagram

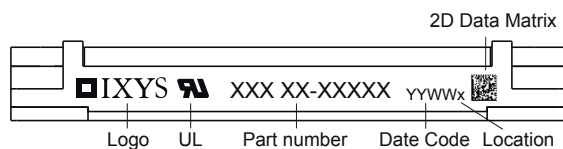


Outline Drawing

Dimensions in mm (1 mm = 0.0394")



Product Marking



Part number

- M = Module
- I = IGBT
- XA = XPT standard
- 80 = Current Rating [A]
- WB = 6-Pack + 3~ Rectifier Bridge & Brake Unit
- 1200 = Reverse Voltage [V]
- T = NTC
- EH = E3-Pack

| Ordering | Part Name | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|----------|------------------|--------------------|-----------------|----------|---------------|
| Standard | MIXA80WB1200 TEH | MIXA80WB1200TEH | Box | 5 | 509112 |

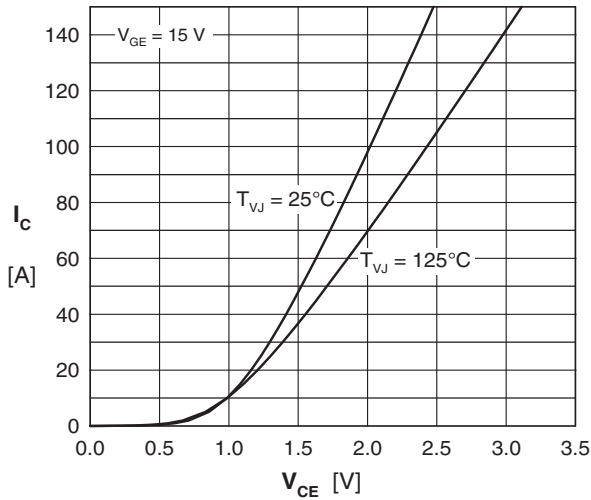
Inverter T1 - T6


Fig. 1 Typ. output characteristics

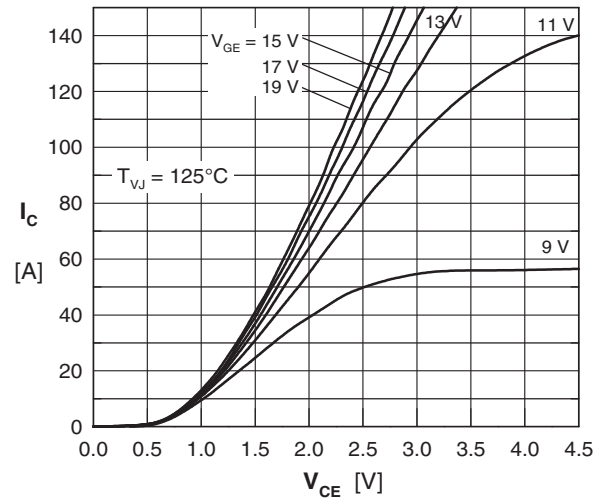


Fig. 2 Typ. output characteristics

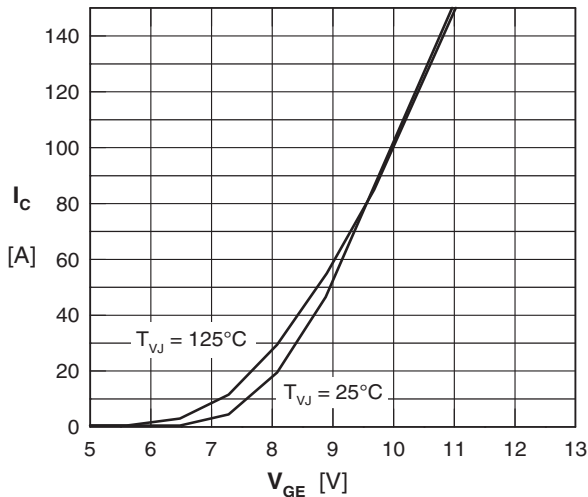


Fig. 3 Typ. transfer characteristics

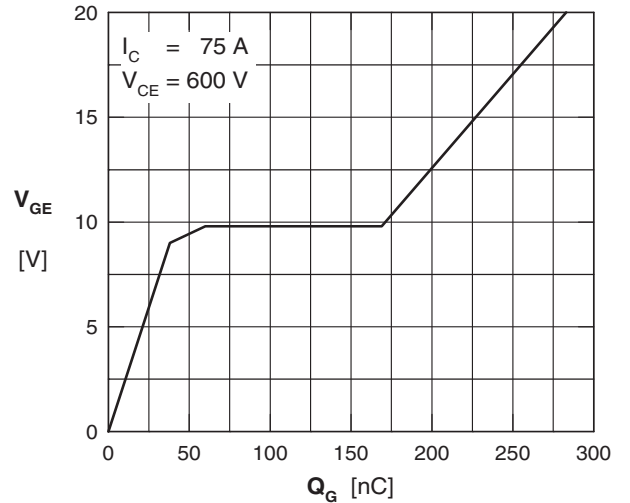


Fig. 4 Typ. turn-on gate charge

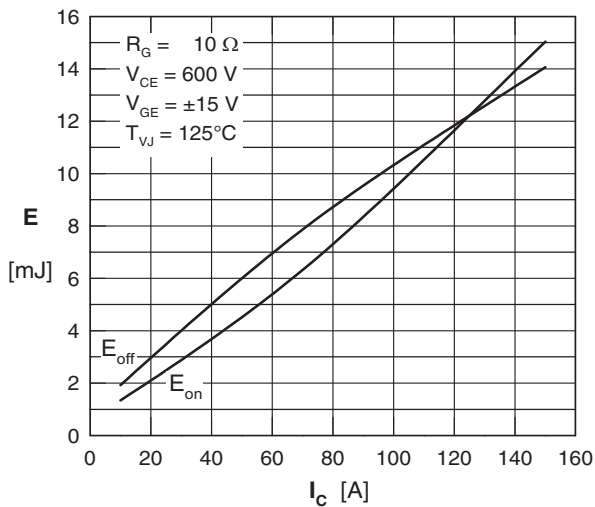


Fig. 5 Typ. switching energy vs. collector current

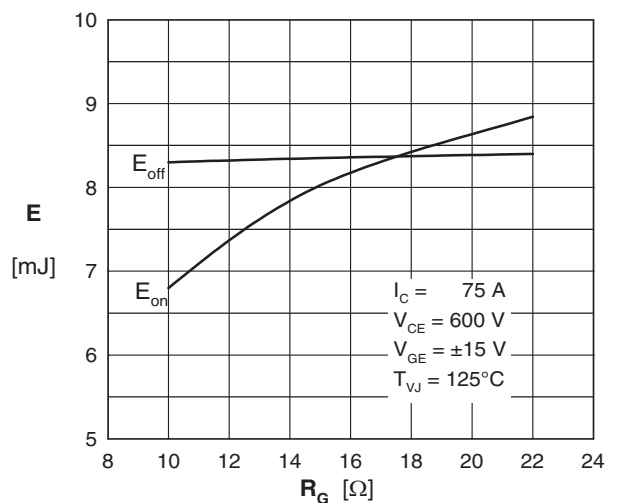


Fig. 6 Typ. switching energy vs. gate resistance

Inverter D1 - D6

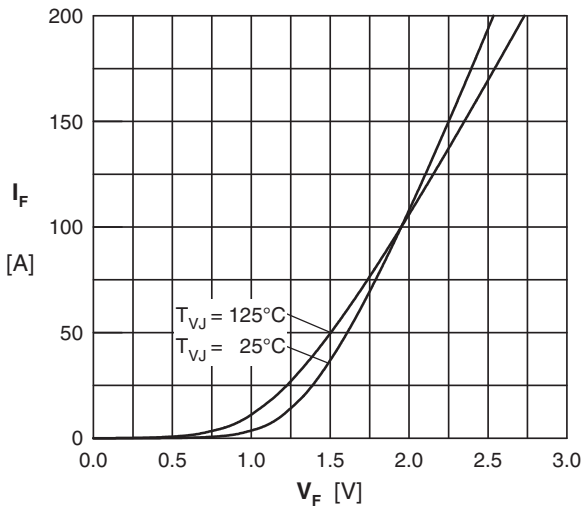


Fig. 7 Typ. Forward current versus V_F

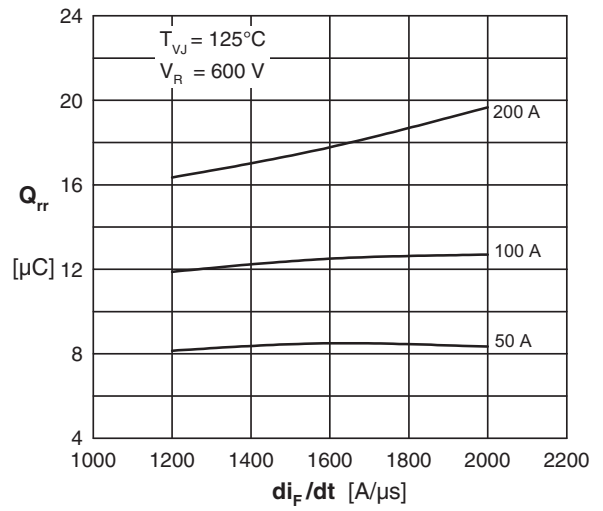


Fig. 8 Typ. reverse recov.charge Q_{rr} vs. di/dt

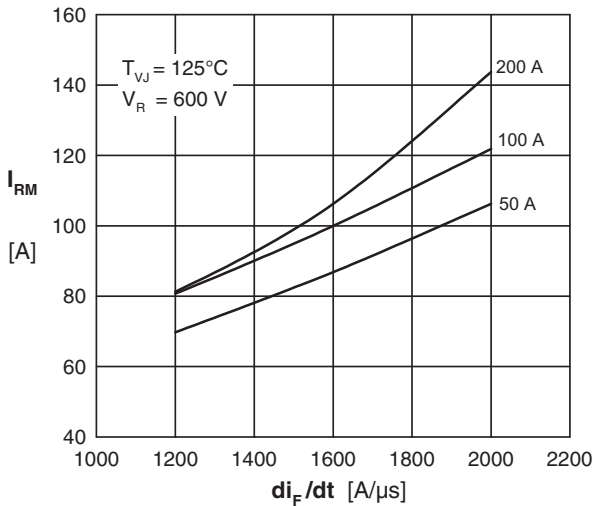


Fig. 9 Typ. peak reverse current I_{RM} vs. di/dt

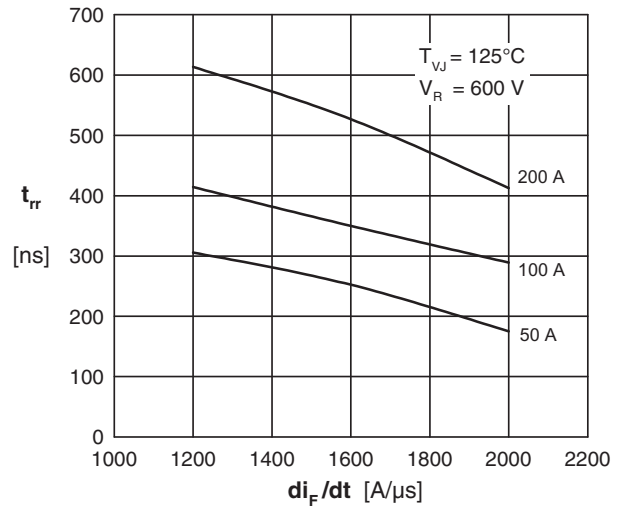


Fig. 10 Typ. recovery time t_{rr} versus di/dt

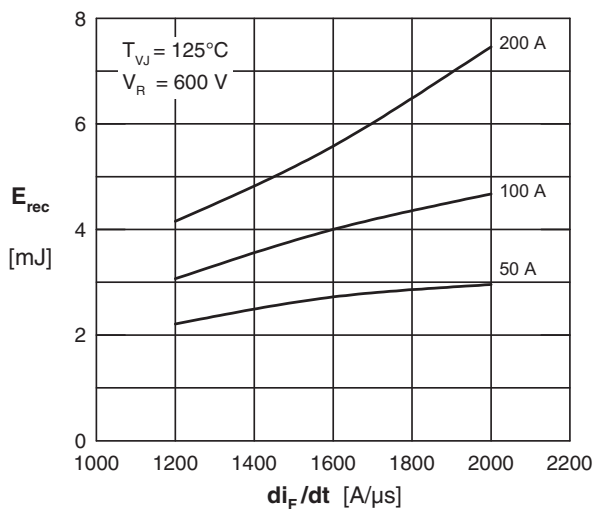


Fig. 11 Typ. recovery energy E_{rec} versus di/dt

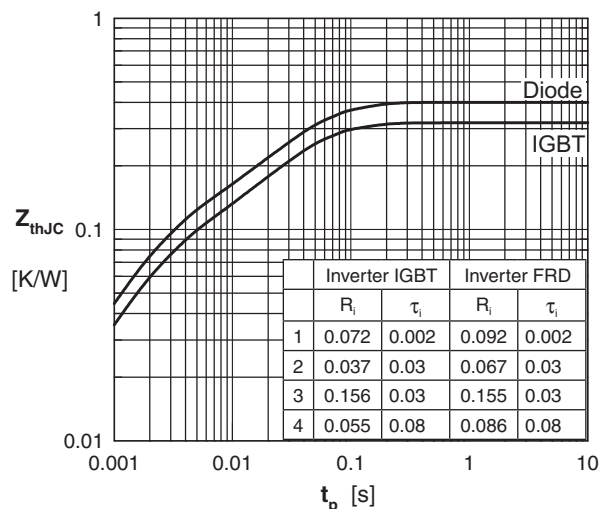


Fig. 12 Typ. transient thermal impedance

Brake T7 & D7

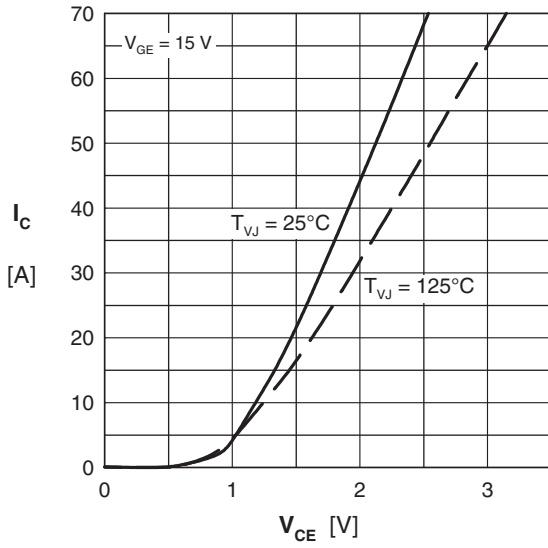


Fig. 13 Typ. output characteristics

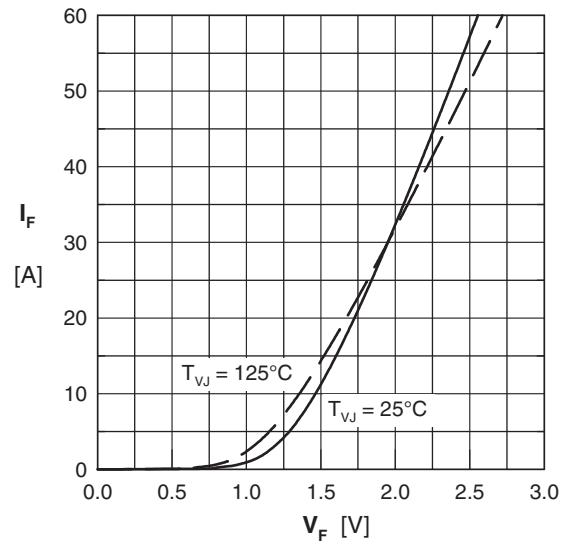


Fig. 14 Typ. forward characteristics

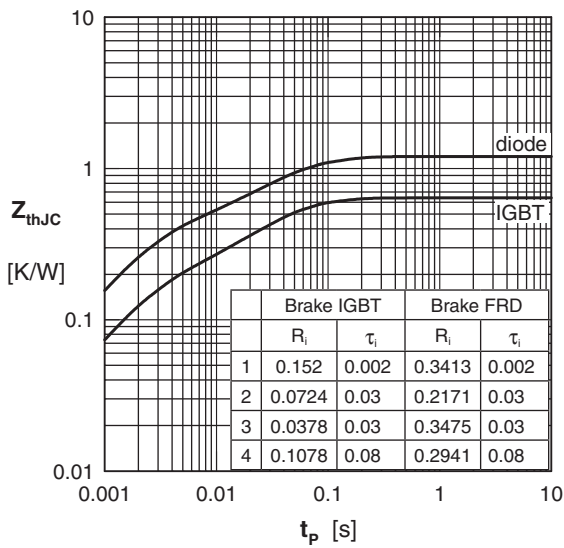


Fig. 15 Typ. transient thermal impedance

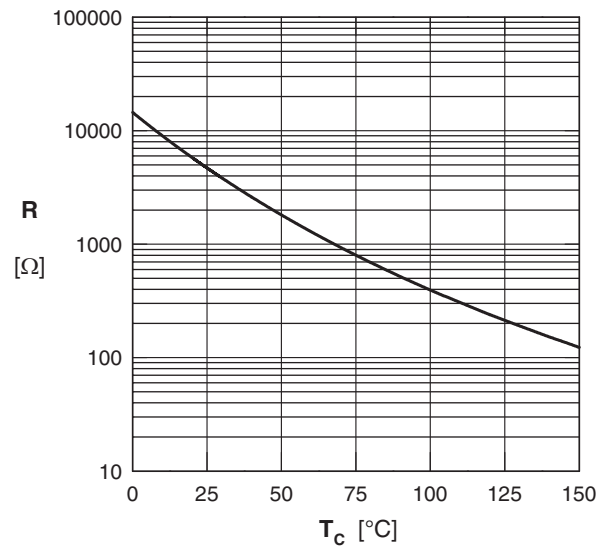


Fig. 16 Typ. NTC resistance vs. temperature

Rectifier D11 - D16

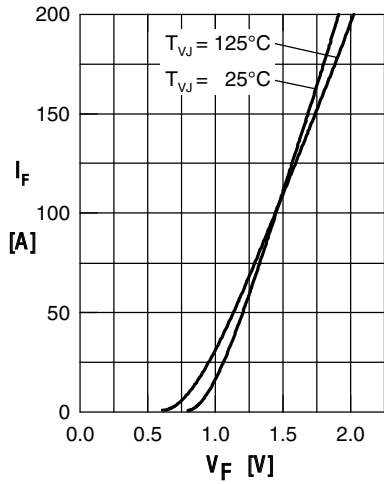


Fig. 1 Forward current vs. voltage drop per diode

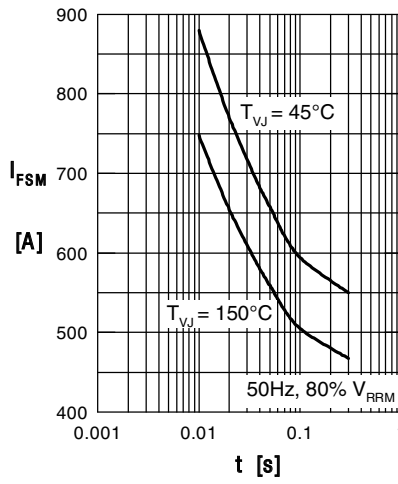


Fig. 2 Surge overload current vs. time per diode

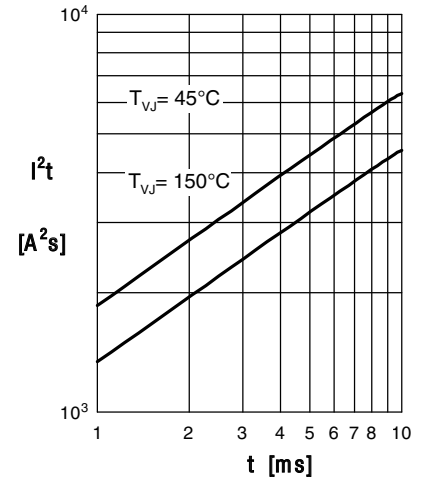


Fig. 3 I^2t vs. time per diode

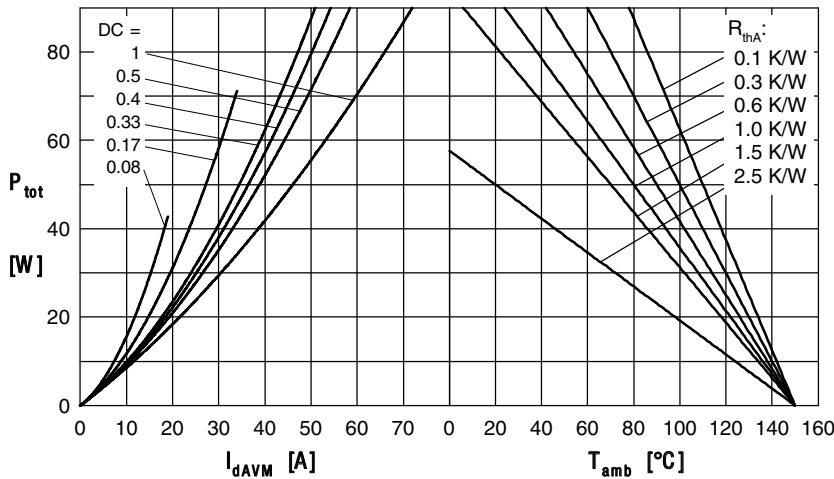


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

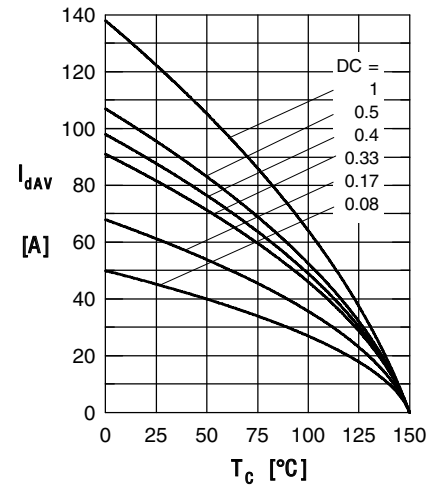


Fig. 5 Max. forward current vs. case temperature per diode

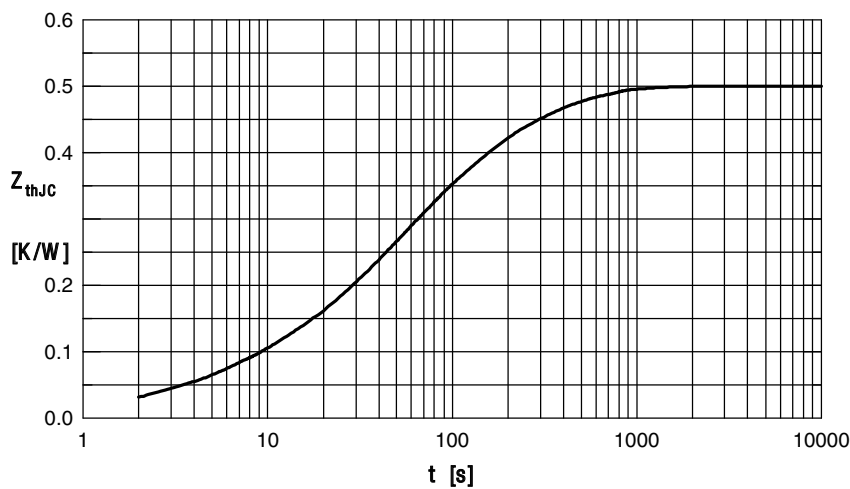


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

| i | R_{th} (K/W) | t_i (s) |
|---|----------------|-----------|
| 1 | 0.040 | 0.004 |
| 2 | 0.003 | 0.010 |
| 3 | 0.140 | 0.030 |
| 4 | 0.120 | 0.300 |
| 5 | 0.197 | 0.080 |