

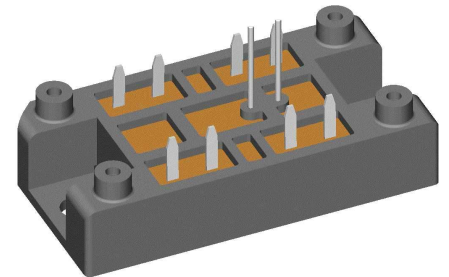
Standard Rectifier Module

| 3~ Rectifier | Brake Chopper |
|---------------------------|-------------------------------|
| $V_{RRM} = 1200\text{ V}$ | $V_{CES} = 1200\text{ V}$ |
| $I_{DAV} = 75\text{ A}$ | $I_{C25} = 58\text{ A}$ |
| $I_{FSM} = 600\text{ A}$ | $V_{CE(sat)} = 1.85\text{ V}$ |


3~ Rectifier Bridge + Brake Unit + NTC

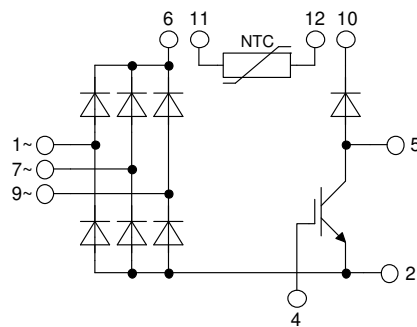
Part number

VUB72-12NOXT



Backside: isolated

 E72873



Features / Advantages:

- Package with DCB ceramic base plate
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current
- NTC

Applications:

- 3~ Rectifier with brake unit for drive inverters

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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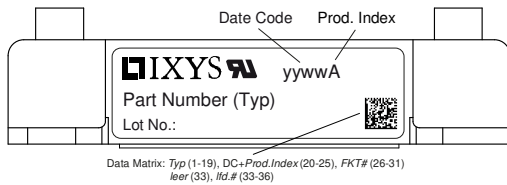
| Rectifier | | | | Ratings | | | |
|------------|--|--|---|-----------------------------|------|------|-------------------|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| V_{RSM} | max. non-repetitive reverse blocking voltage | | | | | 1300 | V |
| V_{RRM} | max. repetitive reverse blocking voltage | | | | | 1200 | V |
| I_R | reverse current | $V_R = 1200$ V | $T_{VJ} = 25^\circ\text{C}$ | | | 40 | μA |
| | | $V_R = 1200$ V | $T_{VJ} = 150^\circ\text{C}$ | | | 1.5 | mA |
| V_F | forward voltage drop | $I_F = 25$ A | $T_{VJ} = 25^\circ\text{C}$ | | | 1.10 | V |
| | | $I_F = 75$ A | | | | 1.38 | V |
| | | $I_F = 25$ A | $T_{VJ} = 125^\circ\text{C}$ | | | 1.01 | V |
| | | $I_F = 75$ A | | | | 1.37 | V |
| I_{DAV} | bridge output current | $T_C = 110^\circ\text{C}$ rectangular | $T_{VJ} = 150^\circ\text{C}$ $d = \frac{1}{3}$ | | | 75 | A |
| V_{F0} | threshold voltage | } for power loss calculation only | | | | 0.79 | V |
| r_F | slope resistance | | | | | 7.7 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | | 1.1 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | | 0.3 | | K/W |
| P_{tot} | total power dissipation | | | $T_C = 25^\circ\text{C}$ | | 110 | W |
| I_{FSM} | max. forward surge current | $t = 10$ ms; (50 Hz), sine | $T_{VJ} = 45^\circ\text{C}$ | | | 600 | A |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 650 | A |
| | | $t = 10$ ms; (50 Hz), sine | $T_{VJ} = 150^\circ\text{C}$ | | | 510 | A |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 550 | A |
| I^2t | value for fusing | $t = 10$ ms; (50 Hz), sine | $T_{VJ} = 45^\circ\text{C}$ | | | 1.80 | kA ² s |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 1.76 | kA ² s |
| | | $t = 10$ ms; (50 Hz), sine | $T_{VJ} = 150^\circ\text{C}$ | | | 1.30 | kA ² s |
| | | $t = 8,3$ ms; (60 Hz), sine | $V_R = 0$ V | | | 1.26 | kA ² s |
| C_J | junction capacitance | $V_R = 400$ V; $f = 1$ MHz | | $T_{VJ} = 25^\circ\text{C}$ | | 19 | pF |



| Brake IGBT | | | | Ratings | | | |
|---------------|--------------------------------------|--|--------------------------------|---------|----------|---------------|--|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit | |
| V_{CES} | collector emitter voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1200 | V | |
| V_{GES} | max. DC gate voltage | | | | ± 20 | V | |
| V_{GEM} | max. transient gate emitter voltage | | | | ± 30 | V | |
| I_{C25} | collector current | $T_C = 25^{\circ}\text{C}$ | | | 58 | 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 | $I_C = 35\text{ A}; V_{GE} = 15\text{ V}$ | | 1.85 | 2.15 | V | |
| | | | | 2.15 | | V | |
| $V_{GE(th)}$ | gate emitter threshold voltage | $I_C = 2\text{ mA}; V_{GE} = V_{CE}$ | 5.4 | 5.9 | 6.5 | V | |
| I_{CES} | collector emitter leakage current | $V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$ | | | 0.1 | mA | |
| | | | | 0.1 | | mA | |
| I_{GES} | gate emitter leakage current | $V_{GE} = \pm 20\text{ V}$ | | | 500 | nA | |
| $Q_{G(on)}$ | total gate charge | $V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 35\text{ A}$ | | 110 | | 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 | $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$ | $T_{VJ} = 125^{\circ}\text{C}$ | | | | |
| I_{CM} | | $V_{CEK} = 1200\text{ V}$ | | | 105 | A | |
| SCSOA | short circuit safe operating area | $V_{CEK} = 1200\text{ V}$ | | | | | |
| t_{SC} | short circuit duration | $V_{CE} = 900\text{ V}; V_{GE} = \pm 15$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 10 | μs | |
| I_{SC} | short circuit current | $R_G = 27\ \Omega$; non-repetitive | | 140 | | A | |
| R_{thJC} | thermal resistance junction to case | | | | 0.65 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.25 | | K/W | |
| Brake Diode | | | | | | | |
| V_{RRM} | max. repetitive reverse voltage | | $T_{VJ} = 25^{\circ}\text{C}$ | | 1200 | V | |
| I_{F25} | forward current | | $T_C = 25^{\circ}\text{C}$ | | 31 | A | |
| I_{F80} | | | $T_C = 80^{\circ}\text{C}$ | | 21 | A | |
| V_F | forward voltage | $I_F = 25\text{ A}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 2.97 | V | |
| | | | $T_{VJ} = 125^{\circ}\text{C}$ | 2.43 | | V | |
| I_R | reverse current | $V_R = V_{RRM}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 0.1 | mA | |
| | | | $T_{VJ} = 125^{\circ}\text{C}$ | | 0.5 | mA | |
| Q_{rr} | reverse recovery charge | $V_R = 600\text{ V}$ $-di_f/dt = 400\text{ A}/\mu\text{s}$ $I_F = 25\text{ A}; V_{GE} = 0\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 1.2 | μC | |
| I_{RM} | max. reverse recovery current | | | | 18 | A | |
| t_{rr} | reverse recovery time | | | | 130 | ns | |
| R_{thJC} | thermal resistance junction to case | | | | 1.6 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.55 | | K/W | |



| 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; $I_{ISOL} \leq 1$ mA | 3600 | | | V | |
| | | t = 1 minute | 3000 | | | V | |



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | VUB72-12NOXT | VUB72-12NOXT | Blister | 24 | 515901 |

| Similar Part | Package | Voltage class |
|--------------|-----------|---------------|
| VUB72-16NOXT | V1-A-Pack | 1600 |

Temperature Sensor NTC

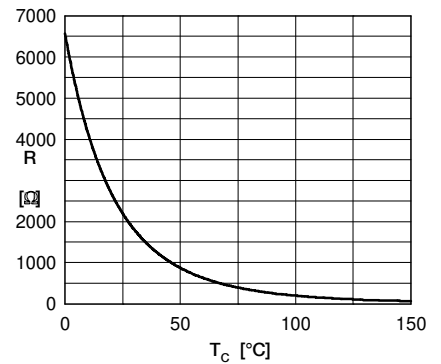
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
|-------------|-------------------------|---------------------|------|------|------|------|
| R_{25} | resistance | $T_{VJ} = 25^\circ$ | 2.13 | 2.2 | 2.27 | kΩ |
| $B_{25/50}$ | temperature coefficient | | | 3560 | | K |

Equivalent Circuits for Simulation

* on die level

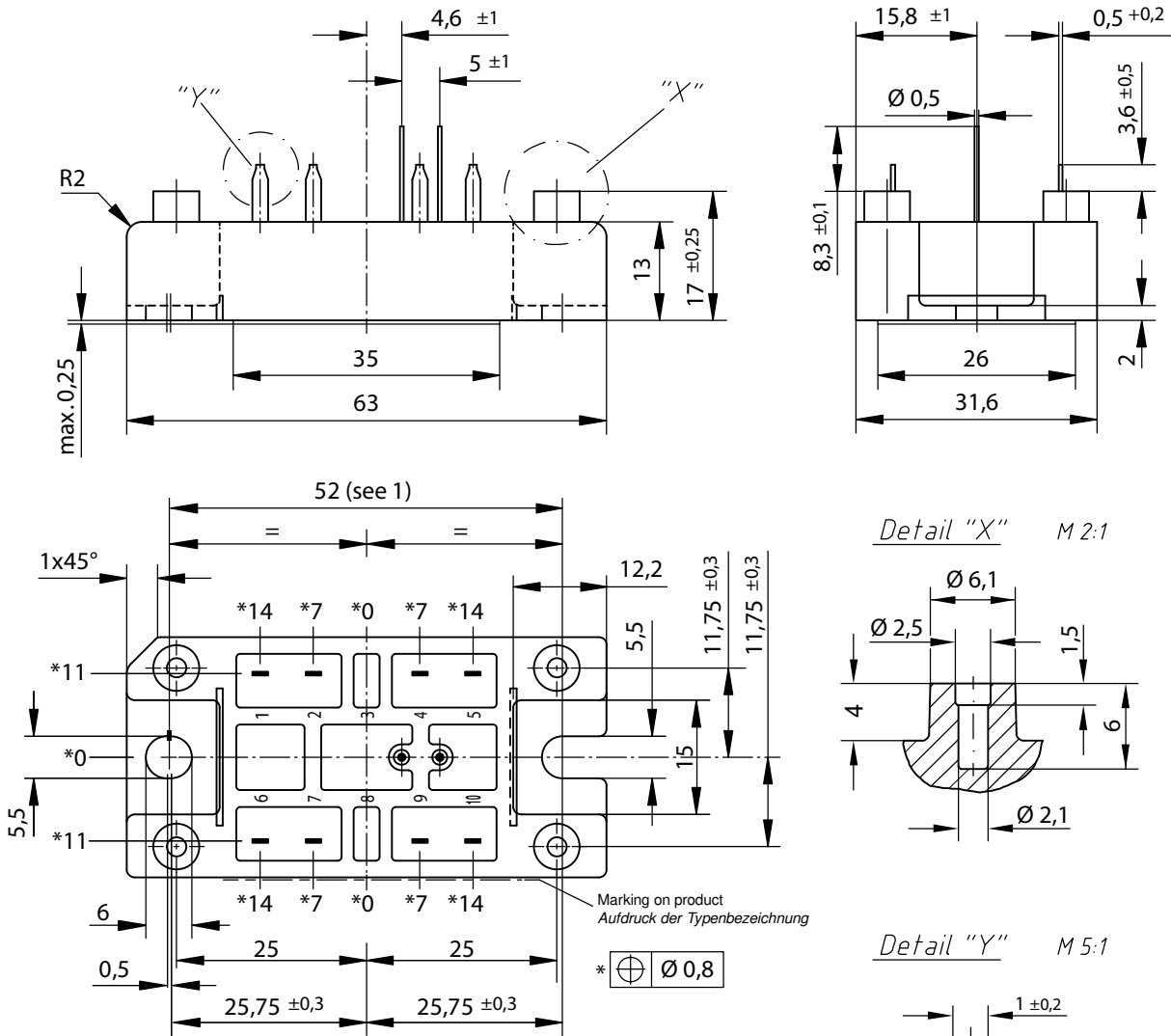
$T_{VJ} = 150^\circ\text{C}$

| | | Rectifier | Brake IGBT | Brake Diode | |
|-------|--------------------|-----------|------------|-------------|----|
| V_0 | threshold voltage | 0.79 | 1.1 | 1.16 | V |
| R_0 | slope resistance * | 6.5 | 40 | 43 | mΩ |



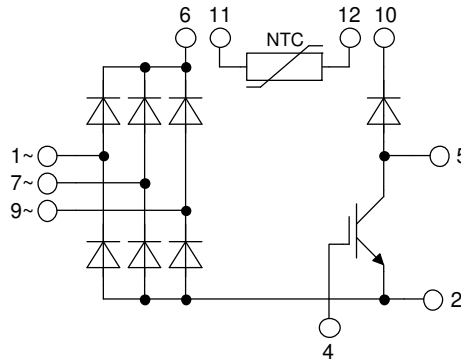


Outlines V1-A-Pack



Remarks / Bemerkungen:

1. Nominal distance mounting screws on heat sink: 52 mm / Nennabstand Befestigungsschrauben auf Kühlkörper: 52 mm
2. General tolerance / Allgmeintoleranz: DIN ISO 2768 - T1-c
3. Surface treatment of pins: tin plated (Sn) in hot dip / Oberflächenbehandlung der Pins: verzinkt (Sn) im Tauchbad
4. **Detail X:**
EJOT PT® self-tapping screws (dimension K25) to be recommended for mounting on PCB
selbstschneidende Schraube (Größe K25) empfohlen für die PCB-Montage
Take care on the maximum screw length according to board thickness and the maximum hole depth of 6 mm⁻¹
Bei der Wahl der Schraubenlänge die PCB-Dicke und die maximale Lochtiefe von 6mm beachten
Recommended mounting torque: 1.5 Nm / Empfohlenes Drehmoment: 1.5 Nm





Rectifier

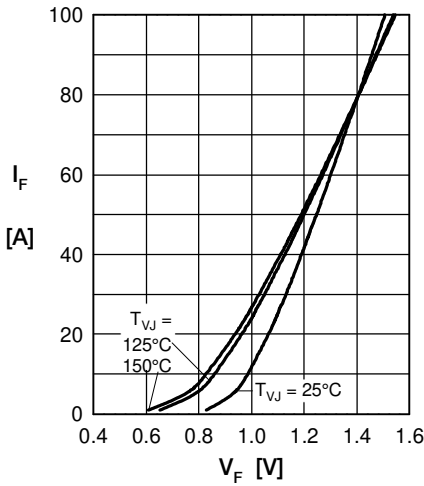


Fig. 1 Forward current vs. voltage drop per diode

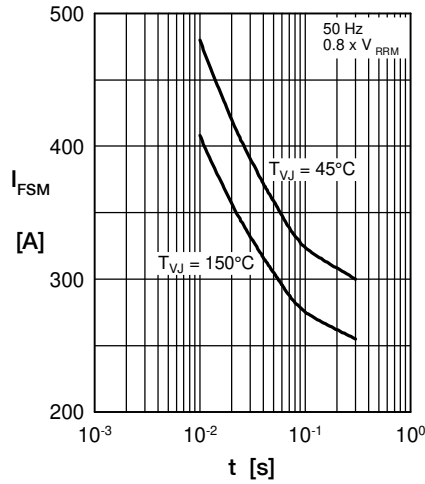


Fig. 2 Surge overload current vs. time per diode

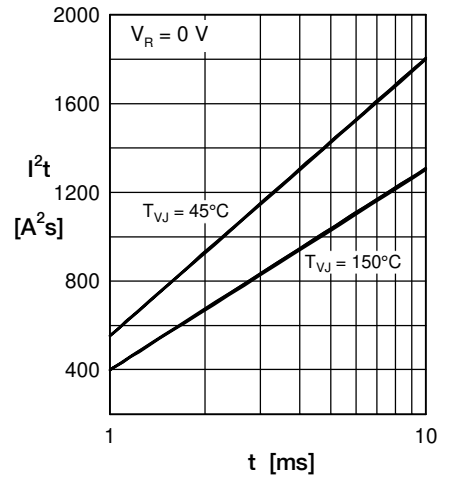


Fig. 3 I^2t vs. time per diode

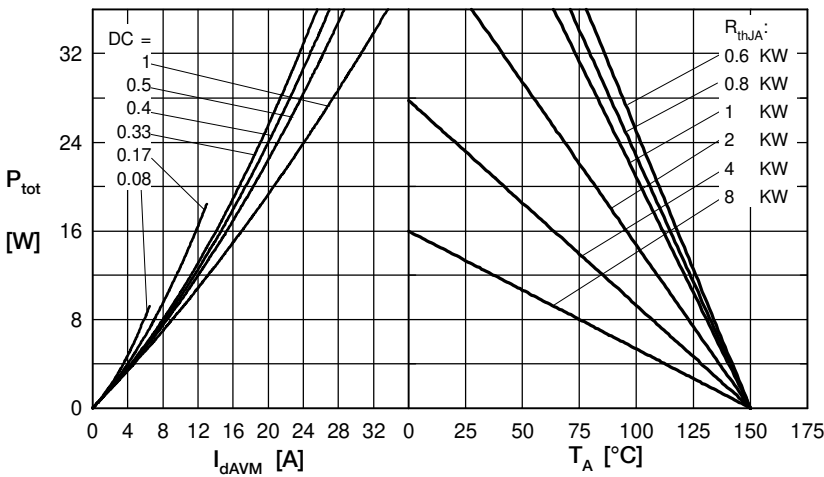


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

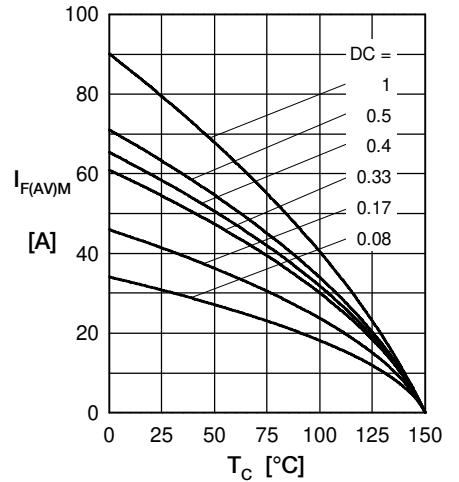


Fig. 5 Max. forward current vs. case temperature per diode

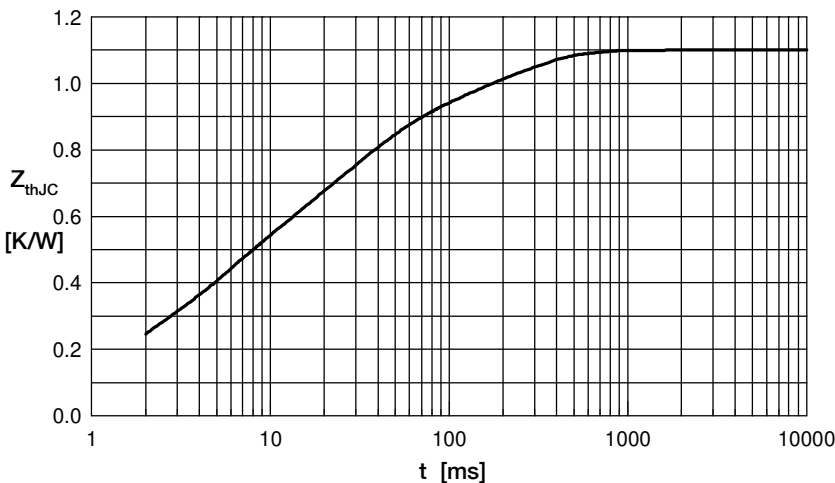


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

| i | R_{th} (K/W) | t_i (s) |
|---|----------------|-----------|
| 1 | 0.0607 | 0.0004 |
| 2 | 0.1230 | 0.00256 |
| 3 | 0.2305 | 0.0045 |
| 4 | 0.4230 | 0.0242 |
| 5 | 0.2628 | 0.1800 |

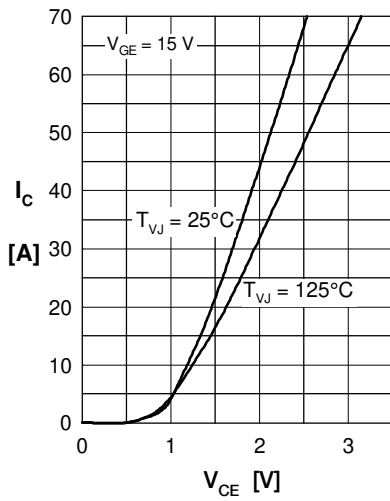
Brake IGBT


Fig. 1 Typ. output characteristics

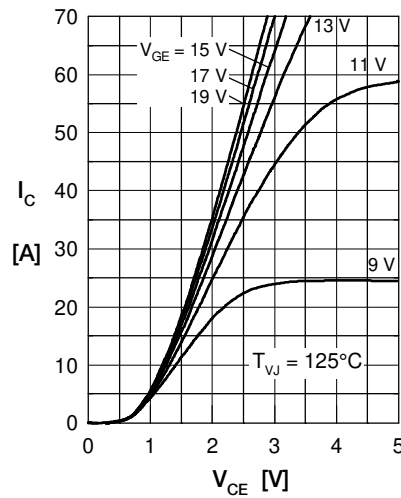


Fig. 2 Typ. output characteristics

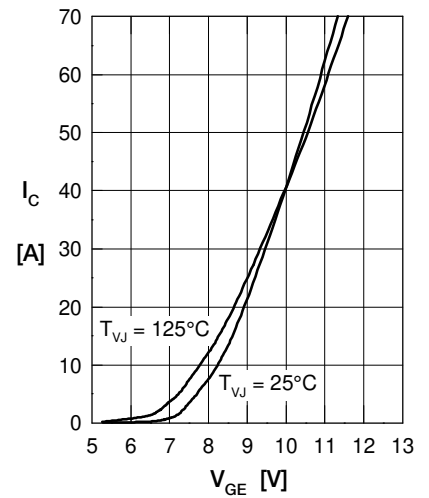


Fig. 3 Typ. transfer characteristics

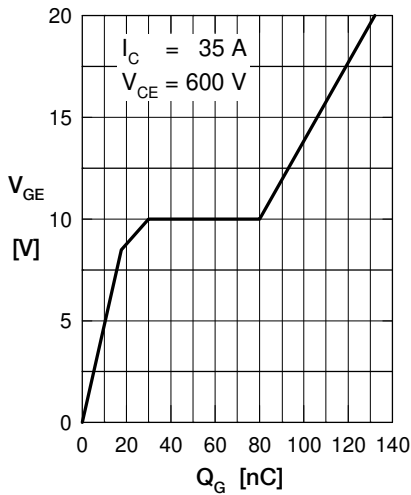


Fig. 4 Typ. turn-on gate charge

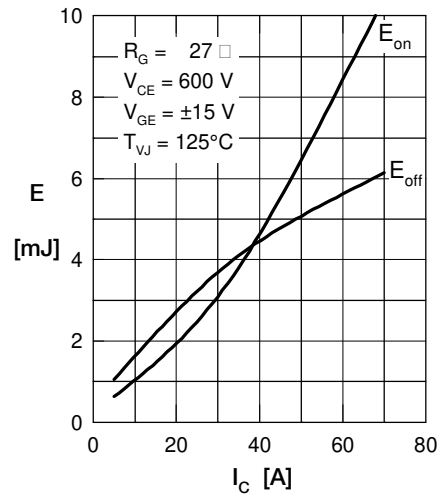


Fig. 5 Typ. switching energy versus collector current

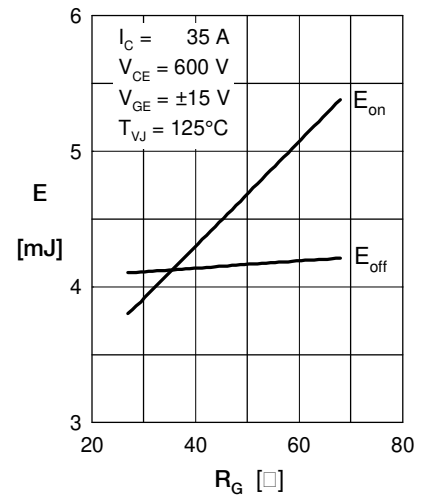


Fig. 6 Typ. switching energy versus gate resistance

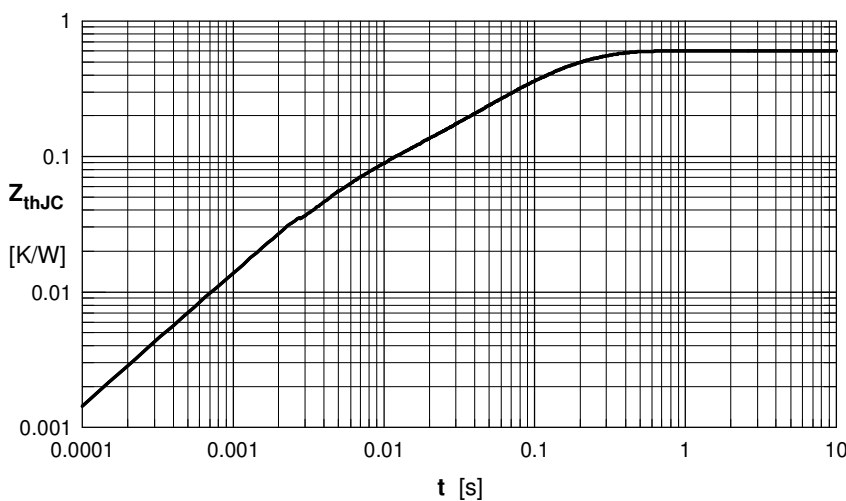


Fig. 7 Typ. transient thermal impedance

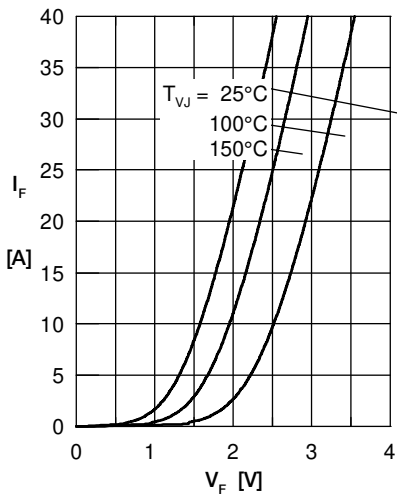
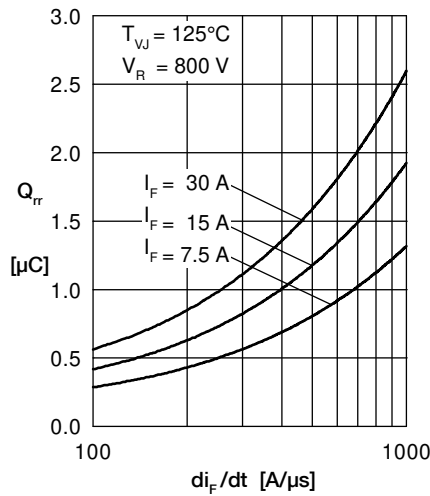
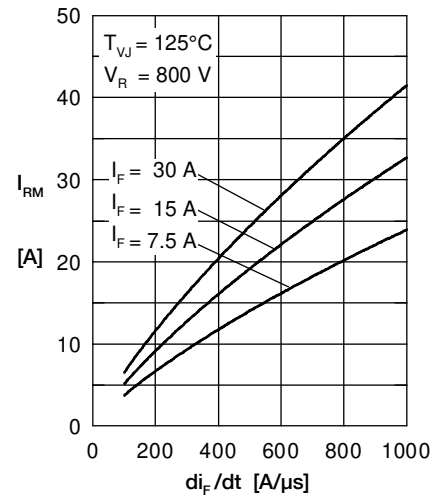
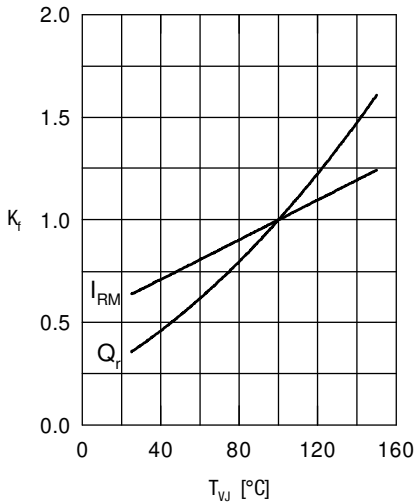
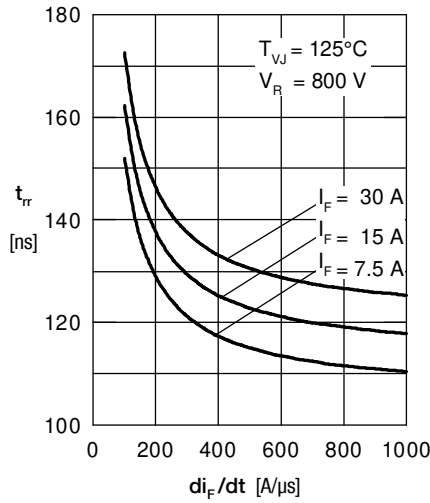
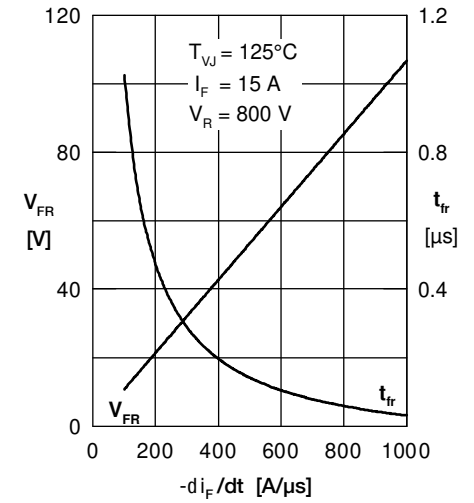
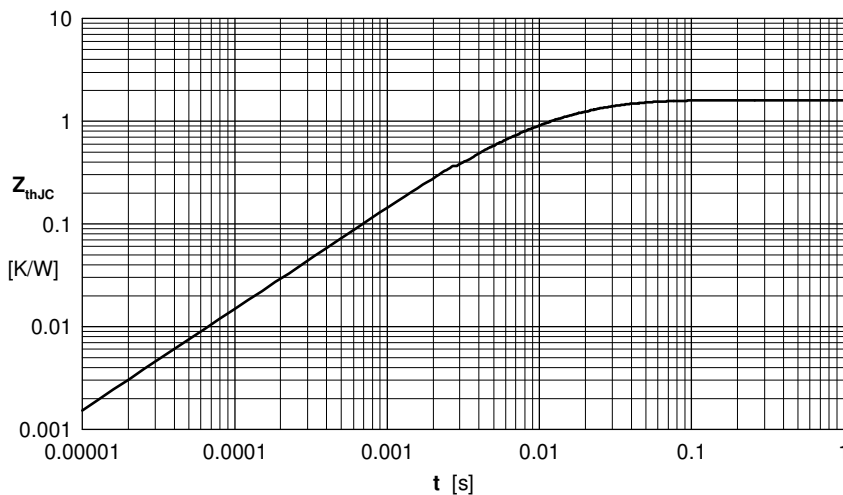
Brake Diode

 Fig. 1 Forward current I_F versus V_F

 Fig. 2 Typ. reverse recov. charge Q_{rr} versus di_F/dt

 Fig. 3 Typ. peak reverse current I_{RM} versus di_F/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. peak forward voltage V_{FR} and t_{fr} versus di_F/dt


Fig. 7 Transient thermal impedance junction to case

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