

# XPT IGBT phaseleg

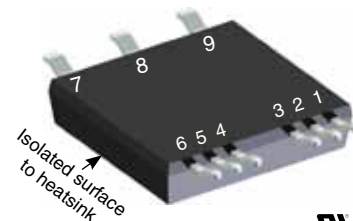
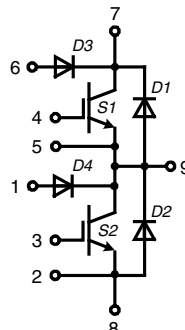
## ISOPLUS™

### Surface Mount Power Device

$$I_{C25} = 32 \text{ A}$$

$$V_{CES} = 1200 \text{ V}$$

$$V_{CE(sat) \text{ typ}} = 1.8 \text{ V}$$



E72873

**IGBTs S1, S2**

| Symbol              | Conditions   | Maximum Ratings |               |
|---------------------|--|-----------------|---------------|
| $V_{CES}$           | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$  | 1200            | V             |
| $V_{GES}$           |  | $\pm 20$        | V             |
| $I_{C25}$           | $T_C = 25^{\circ}\text{C}$   | 32              | A             |
| $I_{C80}$           | $T_C = 80^{\circ}\text{C}$   | 23              | A             |
| $I_{CM}$            | $V_{GE} = 15 \text{ V}; R_G = 56 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>RBSOA, clamped inductive load; $L = 100 \mu\text{H}$ | 45              | A             |
| $V_{CEK}$           |  | $V_{CES}$       |               |
| $t_{SC}$<br>(SCSOA) | $V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 56 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>none repetitive          | 10              | $\mu\text{s}$ |
| $P_{tot}$           | $T_C = 25^{\circ}\text{C}$   | 130             | W             |

| Symbol | Conditions | Characteristic Values |  |  |  |
|--------|------------|-----------------------|--|--|--|
|--------|------------|-----------------------|--|--|--|

 ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)

|  |  | min.  | typ.                                  | max. |                                  |     |
|--|--|---|---------------------------------------|------|----------------------------------|-----|
| $V_{CE(sat)}$  | $I_C = 15 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                     |   | 1.8<br>2.1                            | 2.1  | V<br>V                           |     |
| $V_{GE(th)}$   | $I_C = 0.6 \text{ mA}; V_{GE} = V_{CE}$  | 5.4   |                                       | 6.5  | V                                |     |
| $I_{CES}$  | $V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$  |   | 250                                   | 125  | $\mu\text{A}$<br>$\mu\text{A}$   |     |
| $I_{GES}$  | $V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$  |   |                                       | 500  | nA                               |     |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$<br>$E_{(rec)off}$ | Inductive load; $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 600 \text{ V}; I_C = 15 \text{ A}$<br>$V_{GE} = \pm 15 \text{ V}; R_G = 56 \Omega$ |   | 70<br>40<br>250<br>100<br>1.55<br>1.7 |      | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |     |
| $C_{ies}$  |  | $V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$    |                                       | tbd  |                                  | pF  |
| $Q_{Gon}$  |  | $V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 15 \text{ A}$ |                                       | 48   |                                  | nC  |
| $R_{thJC}$   |  |   |                                       |      | 1.0                              | K/W |
| $R_{thJH}$   |  | with heatsink compound (IXYS test setup)                            |                                       | 1.35 | 1.7                              | K/W |

**Features**

- **XPT IGBT**
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- **Sonic™ diode**
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- **$V_{CE(sat)}$  detection diode**
  - integrated into package
  - very fast diode
- **Package**
  - isolated back surface
  - low coupling capacity between pins and heatsink
  - PCB space saving
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability

**Applications**

- **Phaseleg**
  - buck-boost chopper
- **Full bridge**
  - power supplies
  - induction heating
  - four quadrant DC drives
  - controlled rectifier
- **Three phase bridge**
  - AC drives
  - controlled rectifier

**Diodes D1, D2**

| Symbol  | Conditions   | Maximum Ratings       |      |      |     |
|---|--|-----------------------|------|------|-----|
| $I_{F25}$   | $T_C = 25^\circ\text{C}$   | 27                    | A    |      |     |
| $I_{F80}$   | $T_C = 80^\circ\text{C}$   | 18                    | A    |      |     |
| Symbol  | Conditions   | Characteristic Values |      |      |     |
| ( $T_{VJ} = 25^\circ\text{C}$ , unless otherwise specified) |  |                       |      |      |     |
|   |  | min.                  | typ. | max. |     |
| $V_F$   | $I_F = 20\text{ A}$  |                       | 2.0  | 2.3  | V   |
|   |  |                       | 2.0  |      | V   |
| $I_{RM}$  | $I_F = 20\text{ A}; R_G = 56\ \Omega; T_{VJ} = 125^\circ\text{C}$<br>$V_R = 600\text{ V}; V_{GE} = -15\text{ V}$ |                       | 20   |      | A   |
| $t_{rr}$  |  |                       | 350  |      | ns  |
| $E_{rec}$   |  |                       | tdb  |      | mJ  |
| $R_{thJC}$  | per diode  |                       |      | 1.35 | K/W |
| $R_{thJH}$  | with heatsink compound (IXYS test setup)   |                       | 1.75 | 2.2  | K/W |

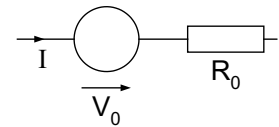
**Diodes D3, D4**

| Symbol  | Conditions  | Maximum Ratings       |      |      |               |
|---|---|-----------------------|------|------|---------------|
| $V_R$   | $T_C = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 1200                  | V    |      |               |
| Symbol  | Conditions  | Characteristic Values |      |      |               |
| ( $T_{VJ} = 25^\circ\text{C}$ , unless otherwise specified) |   |                       |      |      |               |
|   |   | min.                  | typ. | max. |               |
| $V_F$   | $I_F = 1\text{ A}$  |                       | 1.7  | 2.2  | V             |
|   |   |                       | 1.5  |      | V             |
| $I_R$   | $V_R = 1200\text{ V}$   |                       |      | 2    | $\mu\text{A}$ |
|   |   |                       | 30   |      | $\mu\text{A}$ |
| $I_{RM}$  | $I_F = 1\text{ A}; di_F/dt = -100\text{ A}/\mu\text{s}; T_{VJ} = 25^\circ\text{C}$<br>$V_R = 100\text{ V}; V_{GE} = 0\text{ V}$ |                       | 2.3  |      | A             |
| $t_{rr}$  |   |                       | 40   |      | ns            |

**Component**

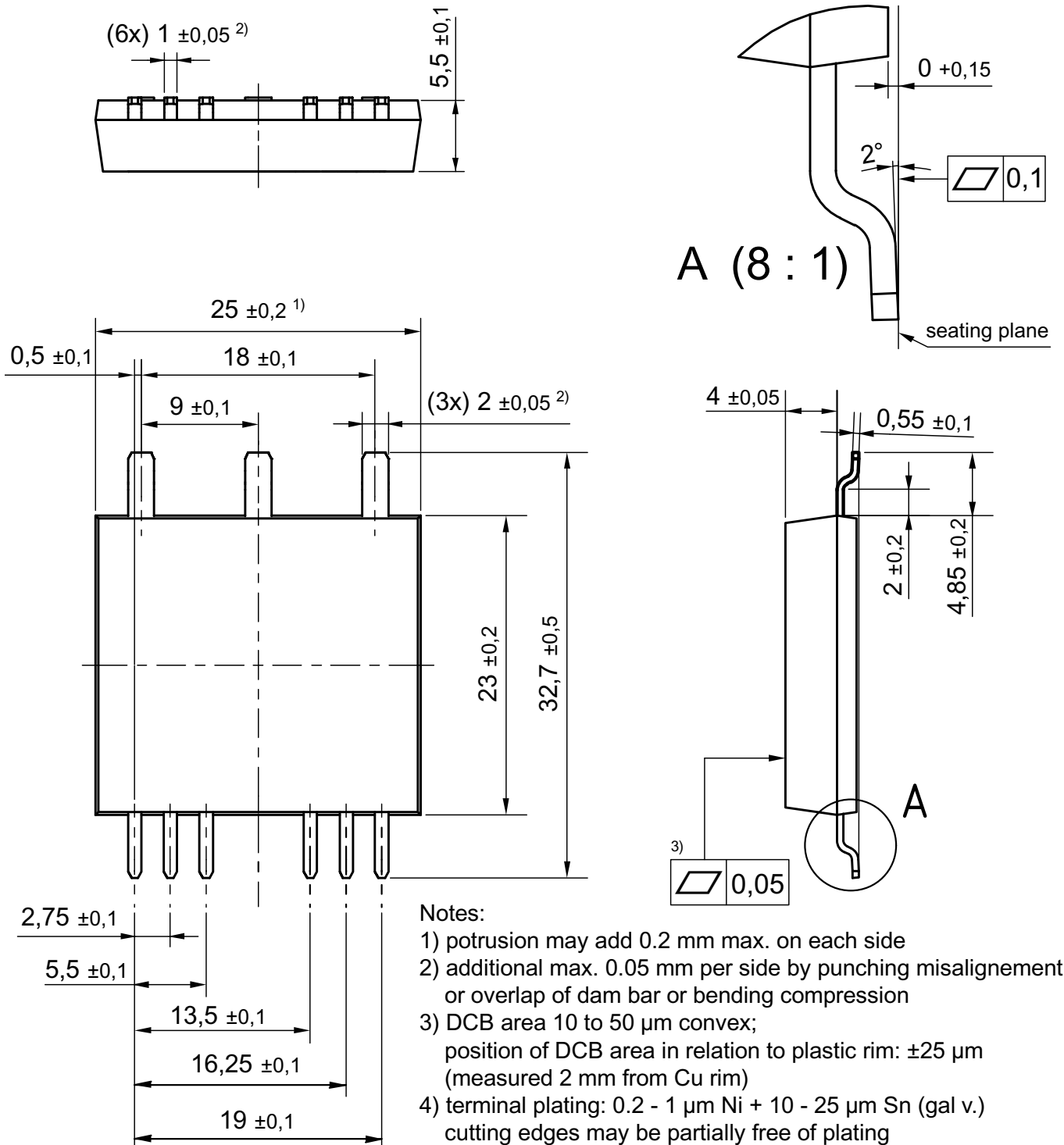
| Symbol        | Conditions  | Maximum Ratings       |                  |      |    |
|---------------|---|-----------------------|------------------|------|----|
| $T_{VJ}$      |   | -55...+150            | $^\circ\text{C}$ |      |    |
| $T_{stg}$     |   | -55...+125            | $^\circ\text{C}$ |      |    |
| $V_{ISOL}$    | $I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$              | 2500                  | V~               |      |    |
| $F_C$         | mounting force  | 40 ... 130            | N                |      |    |
| Symbol        | Conditions  | Characteristic Values |                  |      |    |
|               |   | min.                  | typ.             | max. |    |
| $C_P$         | coupling capacity between shorted pins and backside metal |                       | 90               |      | pF |
| $d_S, d_A$    | pin - pin   | 1.65                  |                  |      | mm |
| $d_S, d_A$    | pin - backside metal                                      | 4                     |                  |      | mm |
| <b>CTI</b>    |   | 400                   |                  |      |    |
| <b>Weight</b> |   |                       | 8                |      | g  |

| Ordering | Ordering Name    | Marking on Product | Delivering Mode | Base Qty | Ordering Code |
|----------|------------------|--------------------|-----------------|----------|---------------|
| Standard | IXA20PG1200DHGLB | IXA20PG1200DHGLB   | Tape&Reel       | 200      | tdb           |

**Equivalent Circuits for Simulation**
**Conduction**

 IGBTs (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 S1, S2  $V_0 = 1.1\text{ V}; R_0 = 90\text{ m}\Omega$ 

 Diodes (typ. at  $T_J = 125^\circ\text{C}$ )  
 D1, D2  $V_0 = 1.3\text{ V}; R_0 = 41\text{ m}\Omega$

Dimensions in mm (1 mm = 0.0394")



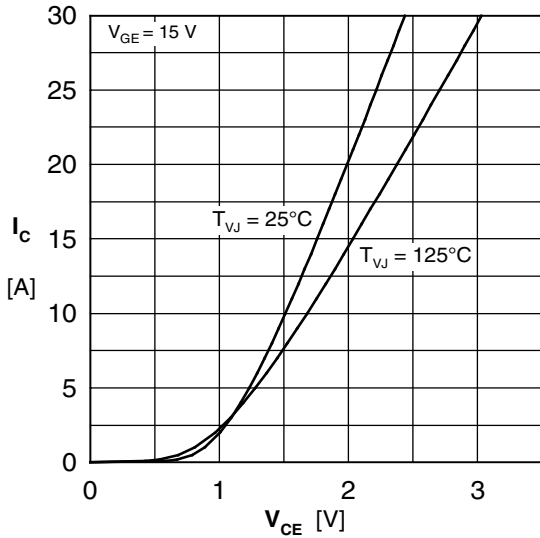


Fig. 1 Typ. output characteristics

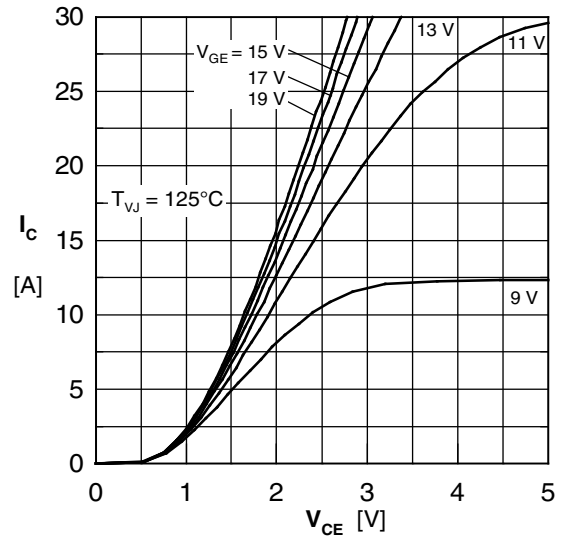


Fig. 2 Typ. output characteristics

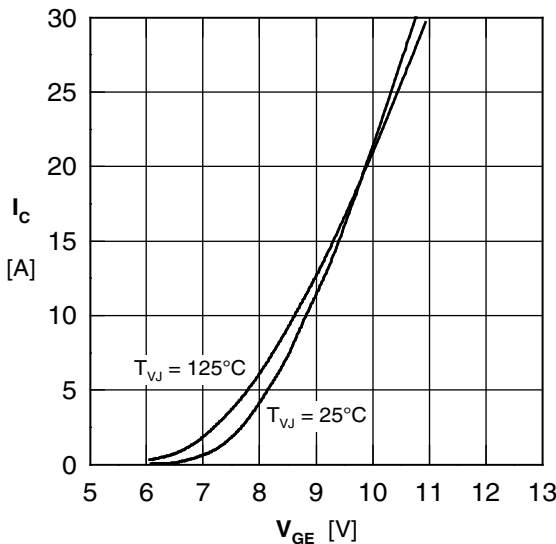


Fig. 3 Typ. transfer characteristics

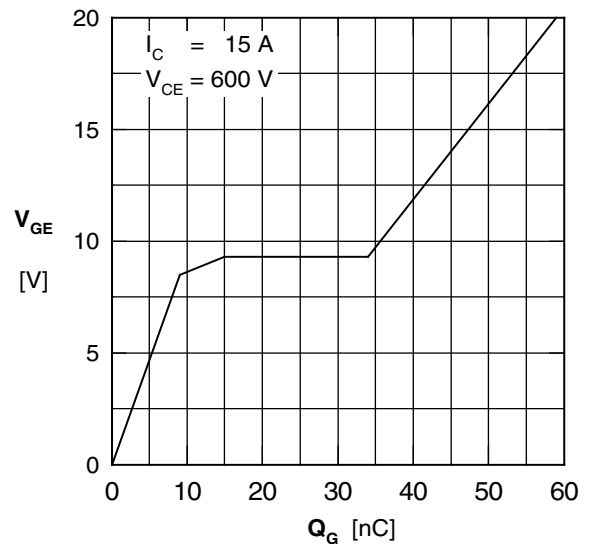


Fig. 4 Typ. turn-on gate charge

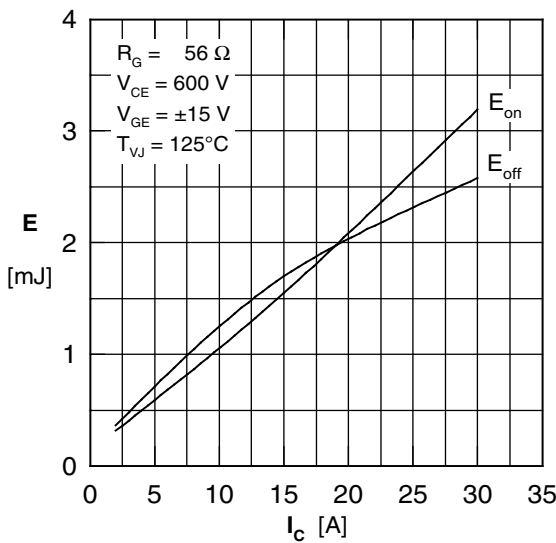


Fig. 5 Typ. switching energy vs. collector current

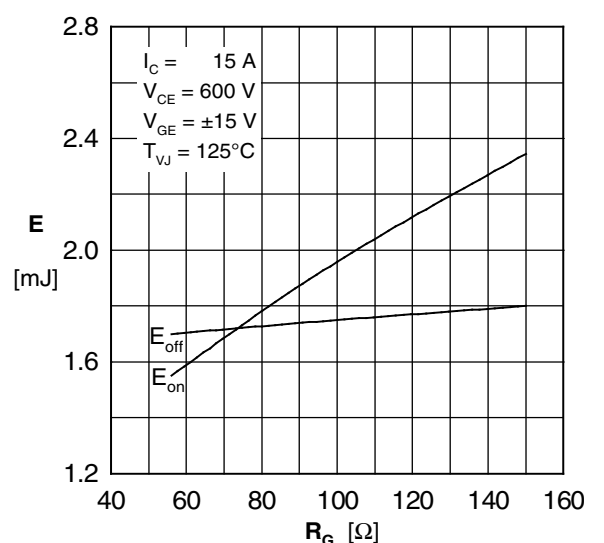


Fig. 6 Typ. switching energy vs. gate resistance

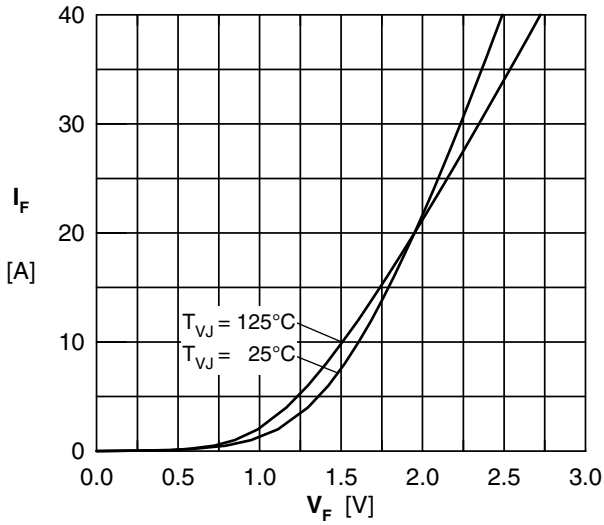


Fig. 7 Typ. Forward current versus  $V_F$

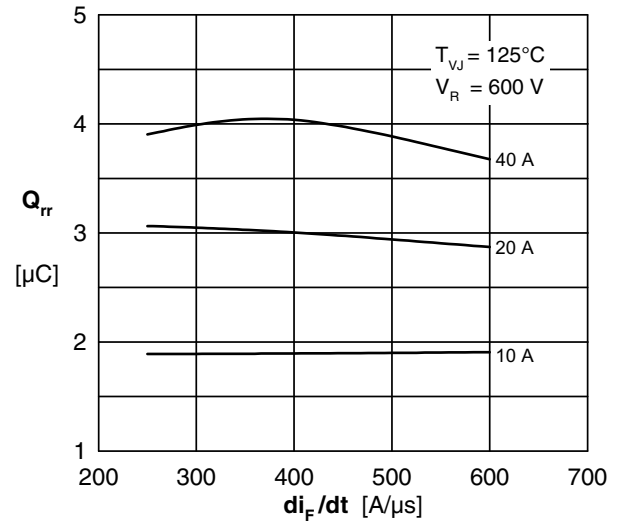


Fig. 8 Typ. reverse recov.charge  $Q_{rr}$  vs.  $di/dt$

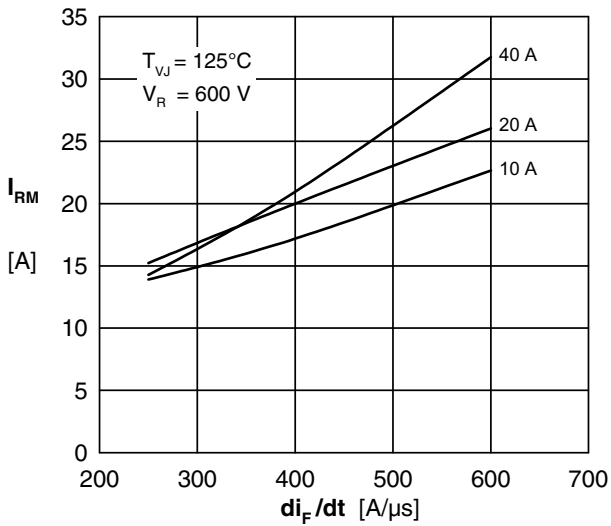


Fig. 9 Typ. peak reverse current  $I_{RM}$  vs.  $di/dt$

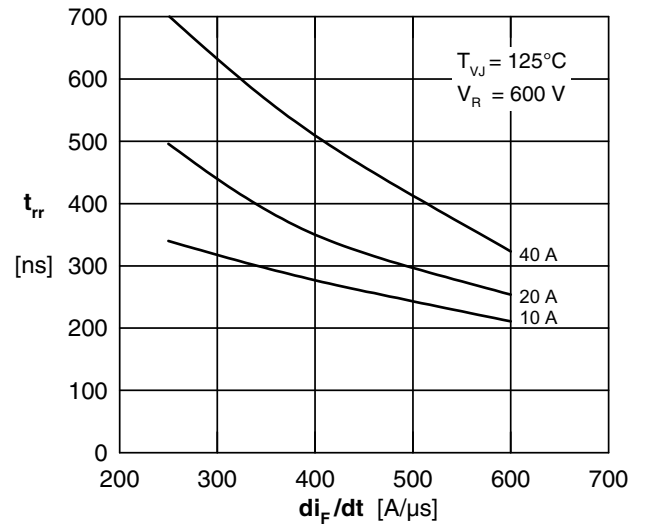


Fig. 10 Typ. recovery time  $t_{rr}$  versus  $di/dt$

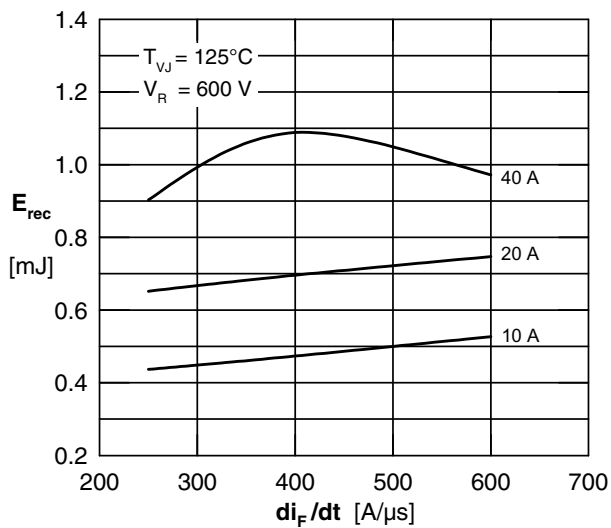


Fig. 11 Typ. recovery energy  $E_{rec}$  versus  $di/dt$

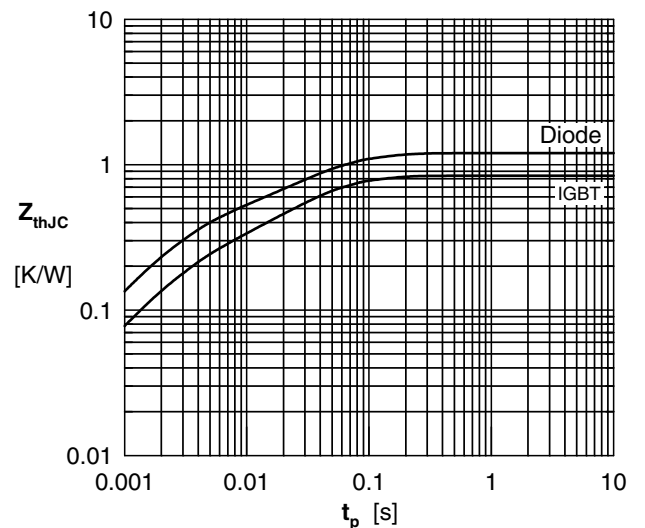


Fig. 12 Typ. transient thermal impedance