

# XPT IGBT

tentative

$$V_{CES} = 1200V$$

$$I_{C25} = 32A$$

$$V_{CE(sat)} = 1.8V$$

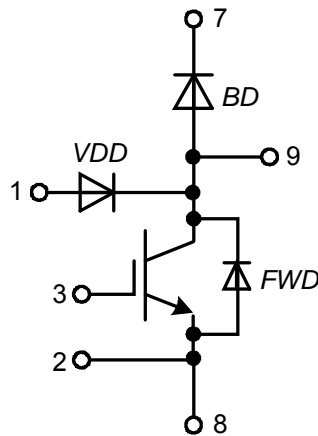
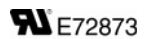
ISOPLUS™ Surface Mount Power Device  
 Boost Topology  
 XPT IGBT

Part number

**IXA20RG1200DHGLB**



Backside: isolated



### Features / Advantages:

- 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
  - low temperature dependency of reverse recovery
- Vcesat detection diode (VDD)
  - integrated into package
  - very fast diode

### Applications:

- AC drives
  - brake chopper
- PFC
  - boost chopper
- Switched reluctance drives

### Package: SMPD

- Industry convenient outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling
- Isolation Voltage: 3000 V~

| Free Wheeling Diode FWD |  |  |                         | Ratings |      |            |   |
|-------------------------|--|--|-------------------------|---------|------|------------|---|
| Symbol                  | Definition                                   | Conditions                                   | min.                    | typ.    | max. | Unit       |   |
| $V_{RSM}$               | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}C$                       |                         |         | 1200 | V          |   |
| $V_{RRM}$               | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}C$                       |                         |         | 1200 | V          |   |
| $I_R$                   | reverse current, drain current               | $V_R = 1200 V$                               | $T_{VJ} = 25^{\circ}C$  |         | 25   | $\mu A$    |   |
|                         |  | $V_R = 1200 V$                               | $T_{VJ} = 125^{\circ}C$ |         | 0.4  | mA         |   |
| $V_F$                   | forward voltage drop                         | $I_F = 20 A$                                 | $T_{VJ} = 25^{\circ}C$  |         | 2.20 | V          |   |
|                         |  |  | $T_{VJ} = 125^{\circ}C$ |         | 2.20 | V          |   |
|                         |  | $I_F = 40 A$                                 | $T_{VJ} = 25^{\circ}C$  |         |      |            | V |
|                         |  |  | $T_{VJ} = 125^{\circ}C$ |         |      |            | V |
| $I_{FAV}$               | average forward current                      | $T_C = 80^{\circ}C$<br>rectangular $d = 0.5$ | $T_{VJ} = 150^{\circ}C$ |         | 18   | A          |   |
| $V_{FO}$                | threshold voltage                            | } for power loss calculation only            | $T_{VJ} = 150^{\circ}C$ |         | 1.29 | V          |   |
| $r_F$                   | slope resistance                             |  |                         |         | 41   | m $\Omega$ |   |
| $R_{thJC}$              | thermal resistance junction to case          |  |                         |         | 1.35 | K/W        |   |
| $R_{thCH}$              | thermal resistance case to heatsink          |  |                         | 0.40    |      | K/W        |   |
| $P_{tot}$               | total power dissipation                      |  | $T_C = 25^{\circ}C$     |         | 93   | W          |   |
| $I_{FSM}$               | max. forward surge current                   | $t = 10 ms; (50 Hz), sine; V_R = 0 V$        | $T_{VJ} = 45^{\circ}C$  |         | 150  | A          |   |
| $C_J$                   | junction capacitance                         | $V_R = 400 V f = 1 MHz$                      | $T_{VJ} = 25^{\circ}C$  |         | 10   | pF         |   |

| VCEsat Detection Diode VDD |  |  |                         | Ratings |      |            |  |
|----------------------------|--|--|-------------------------|---------|------|------------|--|
| Symbol                     | Definition                               | Conditions   | min.                    | typ.    | max. | Unit       |  |
| $V_{RRM}$                  | max. repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}C$                               |                         |         | 1200 | V          |  |
| $I_R$                      | reverse current, drain current           | $V_{R/D} = 1200 V$                                   | $T_{VJ} = 25^{\circ}C$  |         | 2    | $\mu A$    |  |
|                            |  | $V_{R/D} = 1200 V$                                   | $T_{VJ} = 125^{\circ}C$ |         | 0.03 | mA         |  |
| $V_F$                      | forward voltage drop                     | $I_F = 1 A$  | $T_{VJ} = 25^{\circ}C$  |         | 2.20 | V          |  |
|                            |  |  | $T_{VJ} = 125^{\circ}C$ |         | 1.80 | V          |  |
| $V_{FO}$                   | threshold voltage                        | } for power loss calculation only                    | $T_{VJ} = 150^{\circ}C$ |         | 1.30 | V          |  |
| $r_F$                      | slope resistance                         |  |                         |         | 390  | m $\Omega$ |  |
| $C_J$                      | junction capacitance                     | $V_R = 400 V; f = 1 MHz$                             | $T_{VJ} = 25^{\circ}C$  |         | tbd  | pF         |  |
| $I_{RM}$                   | max. reverse recovery current            | } $V_R = 100 V; I_F = 1 A$<br>$-di/dt = 100 A/\mu s$ | $T_{VJ} = 25^{\circ}C$  |         | 2.3  | A          |  |
| $t_{rr}$                   | reverse recovery time                    |  | $T_{VJ} = 125^{\circ}C$ |         | tbd  | A          |  |
|                            |  |  | $T_{VJ} = 25^{\circ}C$  |         | 40   | ns         |  |
|                            |  |  | $T_{VJ} = 125^{\circ}C$ |         | tbd  | ns         |  |

| Boost 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                  |  |                                |         | $\pm 20$ | V             |  |
| $V_{GEM}$             | max. transient collector gate voltage |  |                                |         | $\pm 30$ | V             |  |
| $I_{C25}$             | collector current                     | $T_C = 25^{\circ}\text{C}$   |                                |         | 32       | A             |  |
| $I_{C80}$             |                                       | $T_C = 80^{\circ}\text{C}$   |                                |         | 23       | A             |  |
| $P_{tot}$             | total power dissipation               | $T_C = 25^{\circ}\text{C}$   |                                |         | 125      | W             |  |
| $V_{CE(sat)}$         | collector emitter saturation voltage  | $I_C = 15\text{ A}; V_{GE} = 15\text{ V}$  |                                | 1.8     | 2.1      | V             |  |
|                       |                                       |  |                                | 2       |          | V             |  |
| $V_{GE(th)}$          | gate emitter threshold voltage        | $I_C = 0.6\text{ mA}; V_{CE} = V_{CE}$   | 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                     | $V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 15\text{ A}$   |                                | 48      |          | nC            |  |
| $t_{d(on)}$           | turn-on delay time                    | inductive load<br>$V_{CE} = 600\text{ V}; I_C = 15\text{ A}$<br>$V_{GE} = \pm 15\text{ V}; R_G = 56\ \Omega$ | $T_{VJ} = 125^{\circ}\text{C}$ |         | 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              |  |                                |         | 1.55     | mJ            |  |
| $E_{off}$             | turn-off energy per pulse             |  |                                |         | 1.7      | mJ            |  |
| <b>RBSOA</b>          | reverse bias safe operating area      | $V_{GE} = \pm 15\text{ V}; R_G = 56\ \Omega$   | $T_{VJ} = 125^{\circ}\text{C}$ |         |          |               |  |
| $I_{CM}$              |                                       | $V_{CEmax} = 1200\text{ V}$  |                                |         | 45       | A             |  |
| <b>SCSOA</b>          | short circuit safe operating area     | $V_{CEmax} = 1200\text{ V}$  | $T_{VJ} = 125^{\circ}\text{C}$ |         |          |               |  |
| $t_{sc}$              | short circuit duration                | $V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V}$  |                                |         | 10       | $\mu\text{s}$ |  |
| $I_{sc}$              | short circuit current                 | $R_G = 56\ \Omega; \text{non-repetitive}$  |                                |         | 60       | A             |  |
| $R_{thJC}$            | thermal resistance junction to case   |  |                                |         | 1        | K/W           |  |
| $R_{thCH}$            | thermal resistance case to heatsink   |  |                                | 0.30    |          | K/W           |  |
| <b>Boost Diode BD</b> |                                       |  |                                |         |          |               |  |
| $V_{RRM}$             | max. repetitive reverse voltage       |  |                                |         | 1200     | V             |  |
| $I_{F25}$             | forward current                       |  | $T_C = 25^{\circ}\text{C}$     |         | 27       | A             |  |
| $I_{F80}$             |                                       |  | $T_C = 80^{\circ}\text{C}$     |         | 18       | A             |  |
| $V_F$                 | forward voltage                       | $I_F = 20\text{ A}$  | $T_{VJ} = 25^{\circ}\text{C}$  |         | 2.20     | V             |  |
|                       |                                       |  | $T_{VJ} = 125^{\circ}\text{C}$ | 1.90    |          | V             |  |
| $I_R$                 | reverse current                       | $V_R = V_{RRM}$  | $T_{VJ} = 25^{\circ}\text{C}$  |         | 0.03     | mA            |  |
|                       |                                       |  | $T_{VJ} = 125^{\circ}\text{C}$ | 0.12    |          | mA            |  |
| $Q_{rr}$              | reverse recovery charge               | $V_R = 600\text{ V}$<br>$-di_F/dt = 400\text{ A}/\mu\text{s}$<br>$I_F = 20\text{ A}; V_{GE} = 0\text{ V}$    | $T_{VJ} = 125^{\circ}\text{C}$ |         | 3        | $\mu\text{C}$ |  |
| $I_{RM}$              | max. reverse recovery current         |  |                                |         | 20       | A             |  |
| $t_{rr}$              | reverse recovery time                 |  |                                |         | 350      | ns            |  |
| $E_{rec}$             | reverse recovery energy               |  |                                |         | 0.7      | mJ            |  |
| $R_{thJC}$            | thermal resistance junction to case   |  |                                |         | 1.35     | K/W           |  |
| $R_{thCH}$            | thermal resistance case to heatsink   |  |                                | 0.4     |          | K/W           |  |

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| Package SMPD  |  | Ratings              |      |      |      |      |
|---------------|--|----------------------|------|------|------|------|
| Symbol        | Definition   | Conditions           | min. | typ. | max. | Unit |
| $I_{RMS}$     | RMS current  | per terminal         |      |      | 100  | A    |
| $T_{stg}$     | storage temperature  |                      | -55  |      | 150  | °C   |
| $T_{vj}$      | virtual junction temperature                                 |                      | -55  |      | 150  | °C   |
| <b>Weight</b> |  |                      |      | 8.5  |      | g    |
| $F_C$         | mounting force with clip                                     |                      | 40   |      | 130  | N    |
| $V_{ISOL}$    | isolation voltage  | t = 1 second         | 3000 |      |      | V    |
|               |  | t = 1 minute         | 2500 |      |      | V    |
| $d_{Spp/App}$ | creepage distance on surface   striking distance through air | terminal to terminal | 1.6  |      |      | mm   |
|               |  | terminal to backside | 4.0  |      |      | mm   |



### Part number

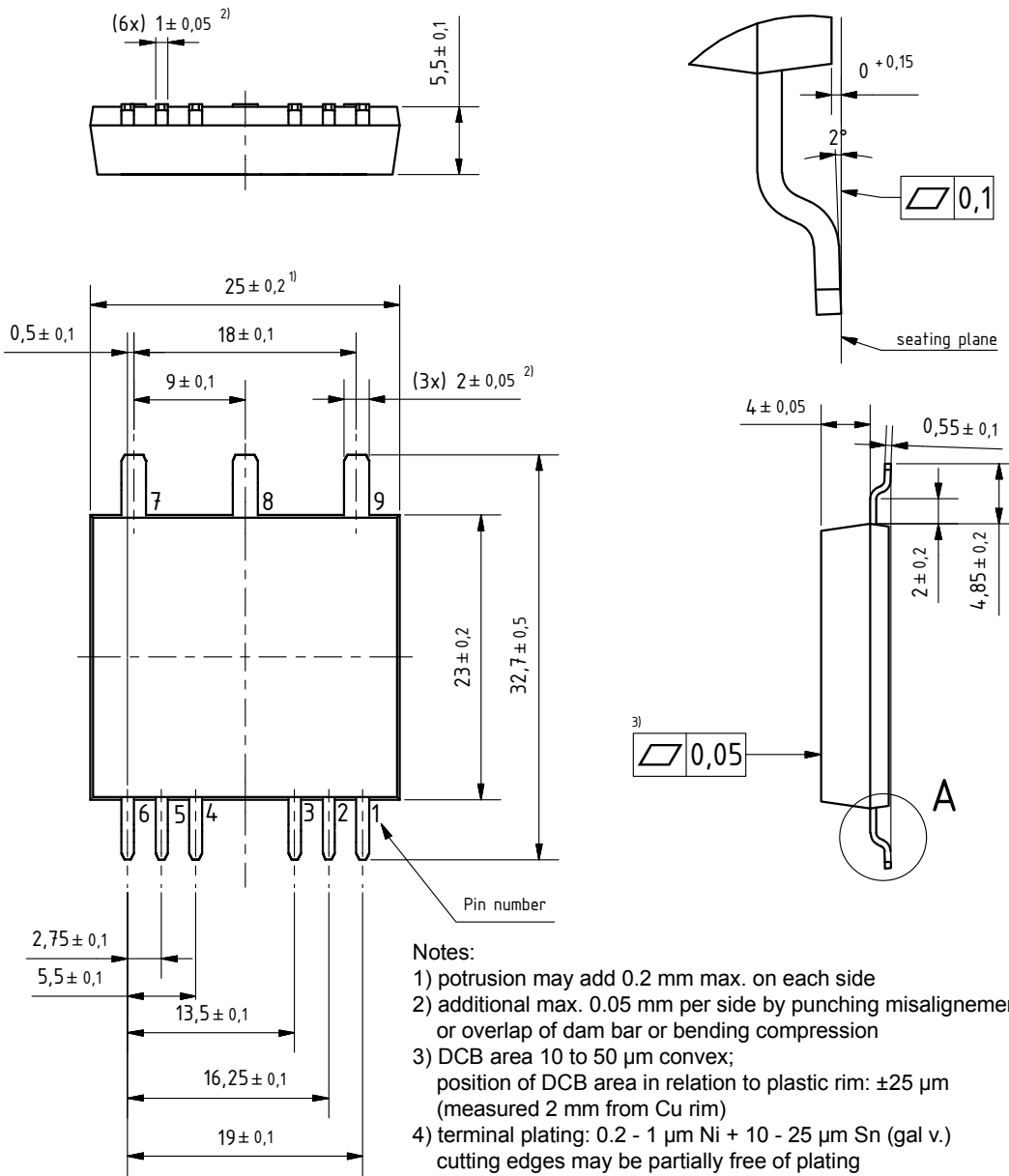
- I = IGBT
- X = XPT IGBT
- A = Gen 1 / std
- 20 = Current Rating [A]
- RG = boost configuration
- 1200 = Reverse Voltage [V]
- D = IGBT
- H = XPT IGBT
- G = Gen 1 / std
- LB = SMPD-B

| Ordering    | Part Number          | Marking on Product | Delivery Mode | Quantity | Code No. |
|-------------|----------------------|--------------------|---------------|----------|----------|
| Standard    | IXA20RG1200DHGLB     | IXA20RG1200DHGLB   | Blister       | 45       | 512349   |
| Alternative | IXA20RG1200DHGLB-TRR | IXA20RG1200DHGLB   | Tape & Reel   | 200      | 512370   |

| Similar Part     | Package | Voltage class |
|------------------|---------|---------------|
| IXA30RG1200DHGLB | SMPD-B  | 1200          |
| IXA40RG1200DHGLB | SMPD-B  | 1200          |

## Outlines SMPD

A ( 8 : 1 )



## Boost IGBT

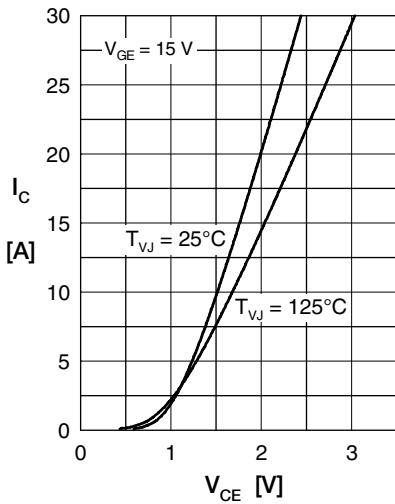


Fig. 1 Typ. output characteristics

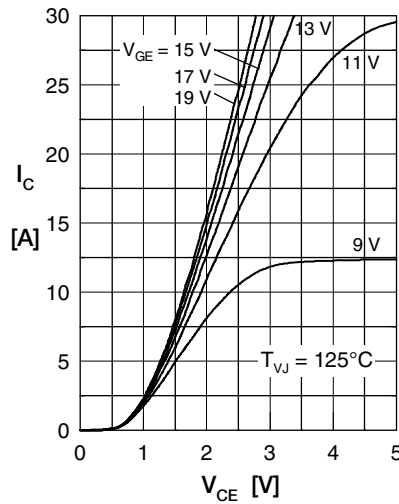


Fig. 2 Typ. output characteristics



Fig. 3 Typ. transfer characteristics



Fig. 4 Typ. turn-on gate charge

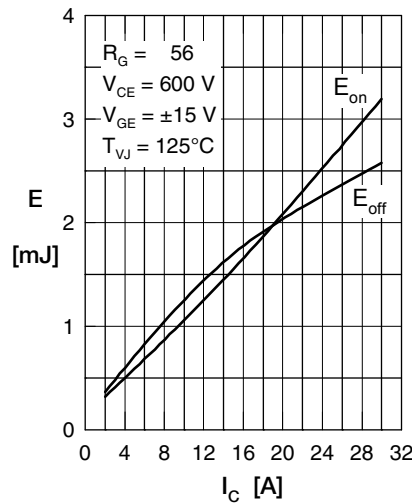


Fig. 5 Typ. switching energy versus collector current

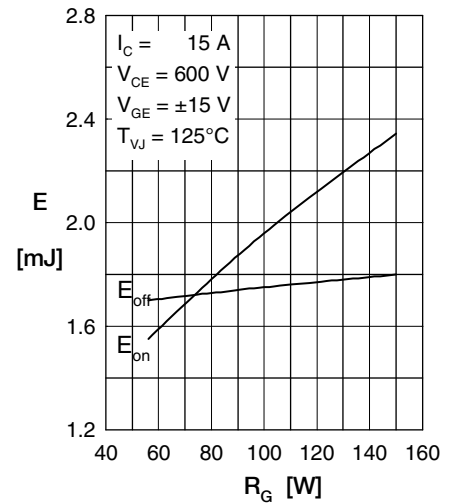


Fig. 6 Typ. switching energy versus gate resistance



Fig. 7 Typ. transient thermal impedance junction to case

## Boost Diode BD

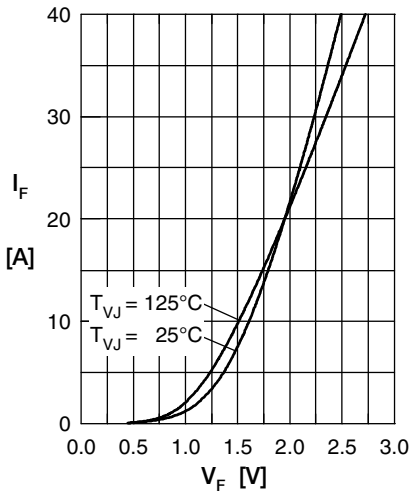


Fig. 1 Typ. Forward current versus  $V_F$

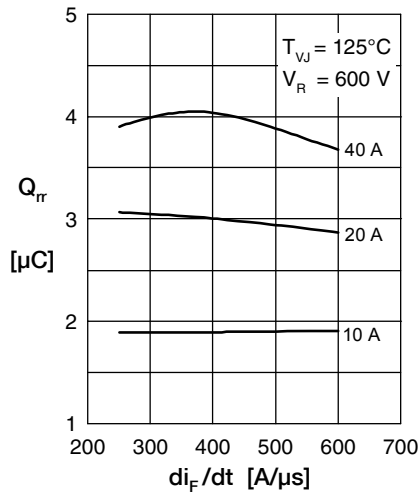


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $di_F/dt$

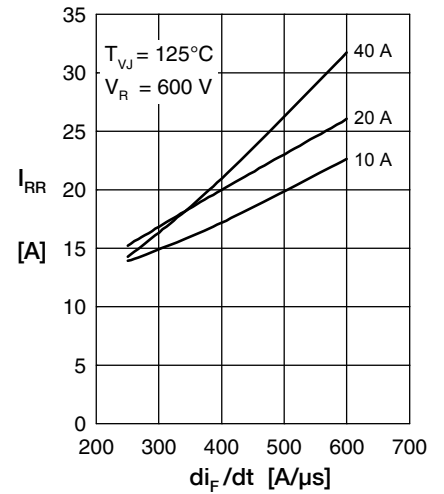


Fig. 3 Typ. peak reverse current  $I_{RRM}$  versus  $di_F/dt$

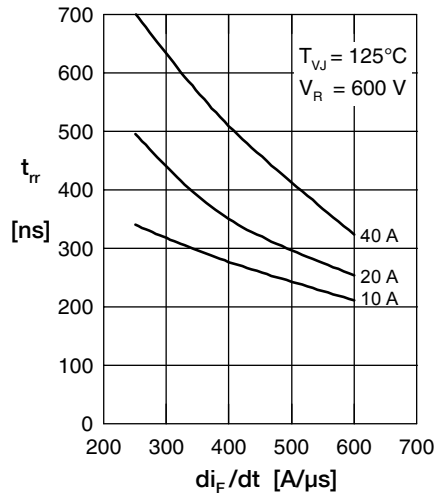


Fig. 4 Dynamic parameters  $Q_{rr}$ ,  $I_{RRM}$  versus  $di/dt$

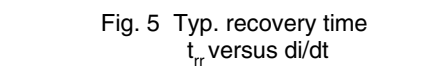


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $di/dt$

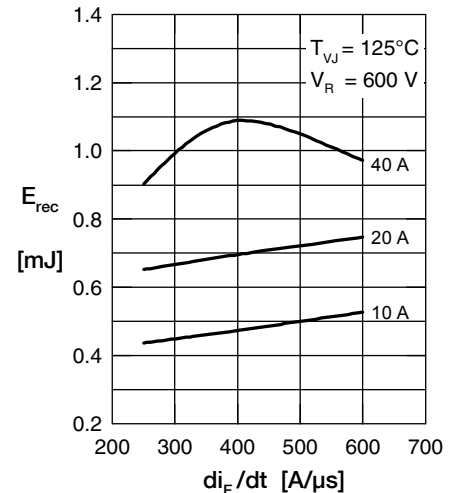


Fig. 6 Typ. recovery energy  $E_{rec}$  versus  $di/dt$

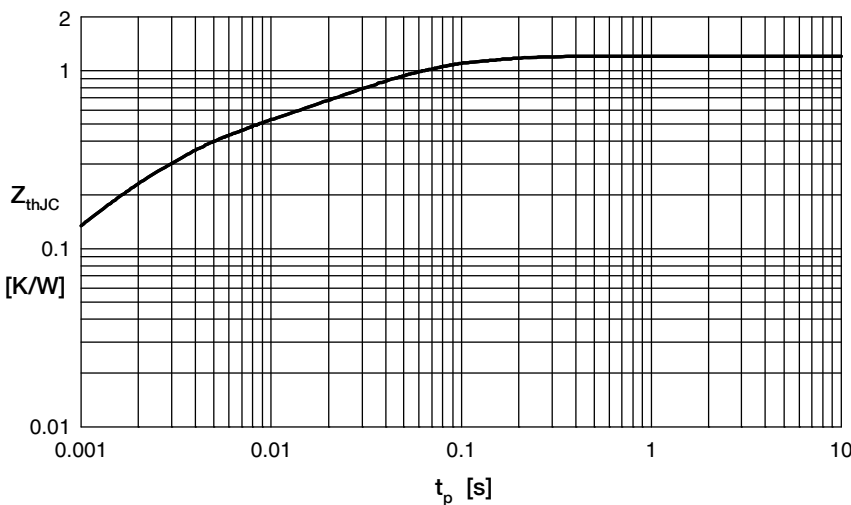


Fig. 7 Typ. transient thermal impedance junction to case



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