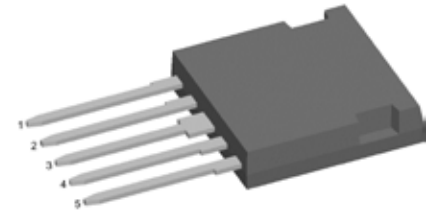
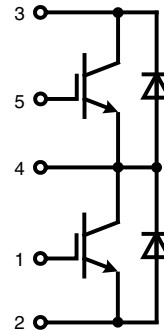


# IGBT phaseleg

in ISOPLUS i4-PAC™

$$\begin{aligned} I_{C25} &= 30 \text{ A} \\ V_{CES} &= 600 \text{ V} \\ V_{CE(sat) \text{ typ.}} &= 1.9 \text{ V} \end{aligned}$$



**IXYS** E72873

| IGBT                                                                   |                                                                                                                                                      |                                                                        |                                      |      |                                                                                        |                              |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------|------|----------------------------------------------------------------------------------------|------------------------------|
| Symbol                                                                 | Conditions                                                                                                                                           | Maximum Ratings                                                        |                                      |      |                                                                                        |                              |
| $V_{CES}$                                                              | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                                                                               | 600                                                                    | $V$                                  |      |                                                                                        |                              |
| $V_{GES}$                                                              |                                                                                                                                                      | $\pm 20$                                                               | $V$                                  |      |                                                                                        |                              |
| $I_{C25}$                                                              | $T_C = 25^{\circ}\text{C}$                                                                                                                           | 30                                                                     | $A$                                  |      |                                                                                        |                              |
| $I_{C90}$                                                              | $T_C = 90^{\circ}\text{C}$                                                                                                                           | 18                                                                     | $A$                                  |      |                                                                                        |                              |
| $I_{CM}$                                                               | $V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$                                                                     | 40                                                                     | $A$                                  |      |                                                                                        |                              |
| $V_{CEK}$                                                              | <b>RBSOA</b> Clamped inductive load; $L = 100\ \mu\text{H}$                                                                                          | $V_{CES}$                                                              |                                      |      |                                                                                        |                              |
| $t_{SC}$<br><b>(SCSOA)</b>                                             | $V_{CE} = V_{CES}$ ; $V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$<br>$T_{VJ} = 125^{\circ}\text{C}$ ; non-repetitive                              | 10                                                                     | $\mu\text{s}$                        |      |                                                                                        |                              |
| $P_{tot}$                                                              | $T_C = 25^{\circ}\text{C}$                                                                                                                           | 100                                                                    | $W$                                  |      |                                                                                        |                              |
| Symbol                                                                 | Conditions                                                                                                                                           | Characteristic Values                                                  |                                      |      |                                                                                        |                              |
| $(T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)           |                                                                                                                                                      |                                                                        |                                      |      |                                                                                        |                              |
|                                                                        |                                                                                                                                                      | min.                                                                   | typ.                                 | max. |                                                                                        |                              |
| $V_{CE(sat)}$                                                          | $I_C = 20\text{ A}$ ; $V_{GE} = 15\text{ V}$<br>$T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                      |                                                                        | 1.9<br>2.2                           | 2.4  | $V$<br>$V$                                                                             |                              |
| $V_{GE(th)}$                                                           | $I_C = 0.5\text{ mA}$ ; $V_{GE} = V_{CE}$                                                                                                            | 4.5                                                                    |                                      | 6.5  | $V$                                                                                    |                              |
| $I_{CES}$                                                              | $V_{CE} = V_{CES}$ ; $V_{GE} = 0\text{ V}$<br>$T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                        |                                                                        | 0.6                                  | 0.6  | $\text{mA}$<br>$\text{mA}$                                                             |                              |
| $I_{GES}$                                                              | $V_{CE} = 0\text{ V}$ ; $V_{GE} = \pm 20\text{ V}$                                                                                                   |                                                                        |                                      | 200  | $\text{nA}$                                                                            |                              |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | Inductive load<br>$V_{CE} = 300\text{ V}$ ; $I_C = 20\text{ A}$<br>$V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$<br>$T_{VJ} = 125^{\circ}\text{C}$ |                                                                        | 50<br>55<br>200<br>30<br>0.75<br>0.6 |      | $\text{ns}$<br>$\text{ns}$<br>$\text{ns}$<br>$\text{ns}$<br>$\text{mJ}$<br>$\text{mJ}$ |                              |
| $C_{ies}$                                                              |                                                                                                                                                      | $V_{CE} = 25\text{ V}$ ; $V_{GE} = 0\text{ V}$ ; $f = 1\text{ MHz}$    |                                      | 1.1  |                                                                                        | $\text{nF}$                  |
| $Q_{Gon}$                                                              |                                                                                                                                                      | $V_{CE} = 300\text{ V}$ ; $V_{GE} = 15\text{ V}$ ; $I_C = 20\text{ A}$ |                                      | 65   |                                                                                        | $\text{nC}$                  |
| $R_{thJC}$<br>$R_{thJH}$                                               |                                                                                                                                                      | with heatsink compound                                                 |                                      | 2.5  | 1.25                                                                                   | $\text{K/W}$<br>$\text{K/W}$ |

## Features

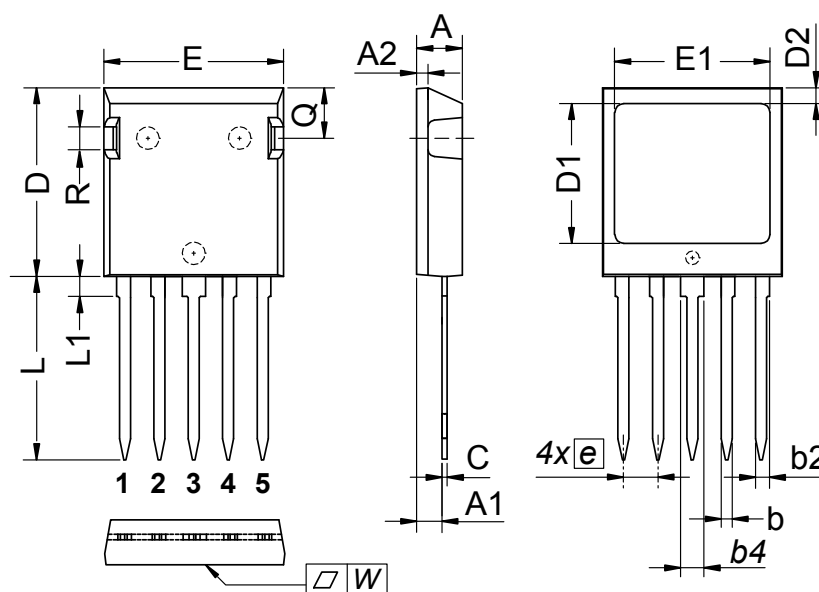
- NPT IGBT technology
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
- HiPerFRED™ diode
  - optimized fast and soft reverse recovery
  - low operating forward voltage
  - low leakage current
- ISOPLUS i4-PAC™ package
  - isolated back surface
  - low coupling capacity between pins and heatsink
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability
  - industry standard outline
  - UL registered E 72873

## Applications

- single phaseleg
  - buck-boost chopper
- H bridge
  - power supplies
  - induction heating
  - four quadrant DC drives
  - controlled rectifier
- three phase bridge
  - AC drives
  - controlled rectifier

| Diode      |                                                                                                         |                       |      |      |     |
|------------|---------------------------------------------------------------------------------------------------------|-----------------------|------|------|-----|
| Symbol     | Conditions                                                                                              | Maximum Ratings       |      |      |     |
| $V_{RRM}$  | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                                  | 600                   |      |      | V   |
| $I_{F25}$  | $T_C = 25^{\circ}\text{C}$                                                                              | 30                    |      |      | A   |
| $I_{F90}$  | $T_C = 90^{\circ}\text{C}$                                                                              | 15                    |      |      | A   |
| Symbol     | Conditions                                                                                              | Characteristic Values |      |      |     |
|            |                                                                                                         | min.                  | typ. | max. |     |
| $V_F$      | $I_F = 20\text{ A}$                                                                                     |                       | 2.3  | 2.7  | V   |
|            | $T_{VJ} = 125^{\circ}\text{C}$                                                                          |                       | 1.6  |      | V   |
| $I_{RM}$   | $I_F = 15\text{ A}; di_F/dt = -400\text{ A}/\mu\text{s};$<br>$V_R = 300\text{ V}; V_{GE} = 0\text{ V};$ |                       | 7    |      | A   |
| $t_{rr}$   |                                                                                                         |                       | 50   |      | ns  |
| $R_{thJC}$ | (per diode)                                                                                             |                       |      | 2.3  | K/W |
| $R_{thJH}$ | with heatsink compound                                                                                  |                       | 4.6  |      | K/W |

| Component  |                                                                     |                       |      |      |                    |
|------------|---------------------------------------------------------------------|-----------------------|------|------|--------------------|
| Symbol     | Conditions                                                          | Maximum Ratings       |      |      |                    |
| $T_{VJ}$   | operating                                                           | -55...+150            |      |      | $^{\circ}\text{C}$ |
| $T_{stg}$  |                                                                     | -55...+125            |      |      | $^{\circ}\text{C}$ |
| $V_{ISOL}$ | $I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}; t = 1\text{ s}$        | 2500                  |      |      | V~                 |
| $F_C$      | Mounting force with clip                                            | 20...120              |      |      | Nm                 |
| Symbol     | Conditions                                                          | Characteristic Values |      |      |                    |
|            |                                                                     | min.                  | typ. | max. |                    |
| $C_P$      | coupling capacity between shorted pins and mounting tab in the case |                       | 40   |      | pF                 |
| $d_S, d_A$ | pin - pin                                                           | 1.7                   |      |      | mm                 |
| $d_S, d_A$ | pin - backside metal                                                | 5.5                   |      |      | mm                 |
| Weight     |                                                                     |                       | 6    |      | g                  |



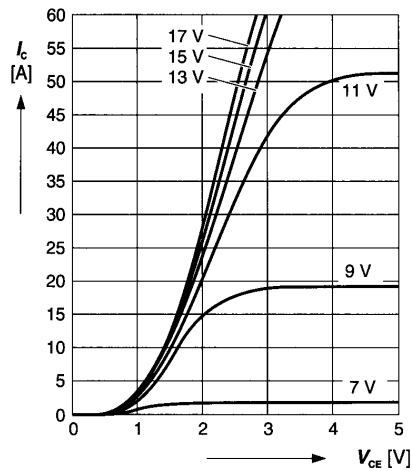
| DIM. | MILLIMETER |       | INCHES   |       |
|------|------------|-------|----------|-------|
|      | MIN        | MAX   | MIN      | MAX   |
| A    | 4.83       | 5.21  | 0.190    | 0.205 |
| A1   | 2.59       | 3.00  | 0.102    | 0.118 |
| A2   | 1.17       | 2.16  | 0.046    | 0.085 |
| b    | 1.14       | 1.40  | 0.045    | 0.055 |
| b2   | 1.47       | 1.73  | 0.058    | 0.068 |
| b4   | 2.54       | 2.79  | 0.100    | 0.110 |
| C    | 0.51       | 0.74  | 0.020    | 0.029 |
| D    | 20.80      | 21.34 | 0.819    | 0.840 |
| D1   | 14.99      | 15.75 | 0.590    | 0.620 |
| D2   | 1.65       | 2.03  | 0.065    | 0.080 |
| E    | 19.56      | 20.29 | 0.770    | 0.799 |
| E1   | 16.76      | 17.53 | 0.660    | 0.690 |
| e    | 3.81 BSC   |       | 0.15 BSC |       |
| L    | 19.81      | 21.34 | 0.780    | 0.840 |
| L1   | 2.11       | 2.59  | 0.083    | 0.102 |
| Q    | 5.33       | 6.20  | 0.210    | 0.244 |
| R    | 2.54       | 4.57  | 0.100    | 0.180 |
| W    | —          | 0.10  | —        | 0.004 |

Die konvexe Form des Substrates ist typ. < 0.05 mm über der Kunststoffoberfläche der Bauteilunterseite  
The convex bow of substrate is typ. < 0.05 mm over plastic surface level of device bottom side

### Typ. output characteristics

$$I_C = f(V_{CE})$$

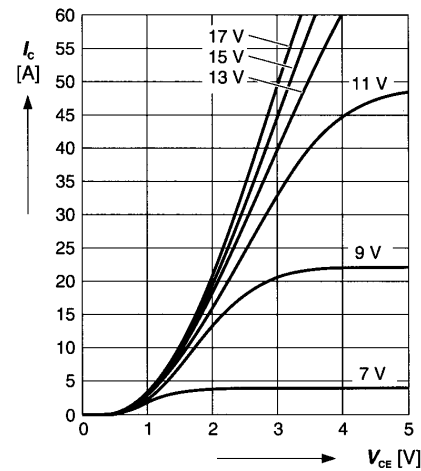
parameter:  $t_p = 250 \mu s$ ;  $T_j = 25^\circ C$



### Typ. output characteristics

$$I_C = f(V_{CE})$$

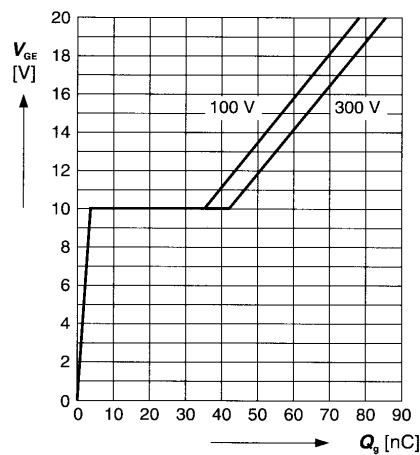
parameter:  $t_p = 250 \mu s$ ;  $T_j = 125^\circ C$



### Typ. gate charge

$$V_{GE} = f(Q_g)$$

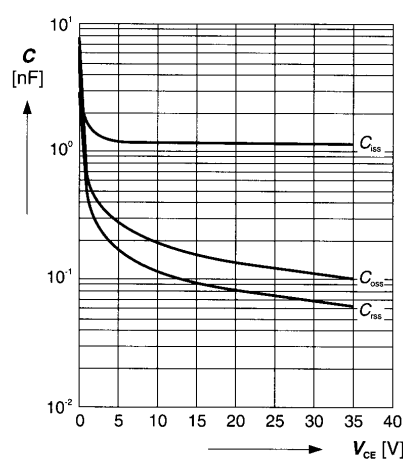
parameter:  $I_{C\text{ puls}} = 20 A$



### Typ. capacitances

$$C = f(V_{CE})$$

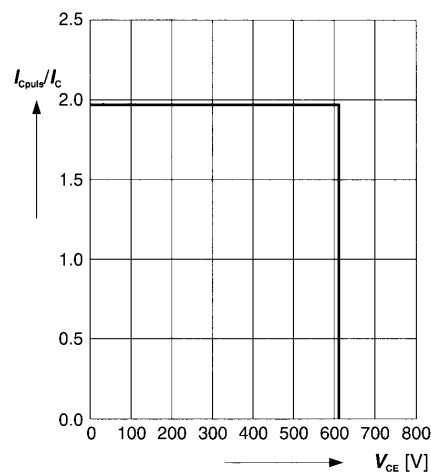
parameter:  $V_{GE} = 0 V$ ;  $f = 1 MHz$



### Reverse biased safe operating area

$$I_{C\text{ puls}} = f(V_{CE}), T_j = 150^\circ C$$

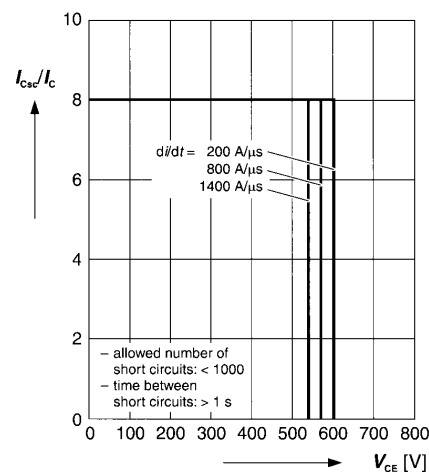
parameter:  $V_{GE} = 15 V$



### Short circuit safe operating area

$$I_{Csc} = f(V_{CE}), T_j = 150^\circ C$$

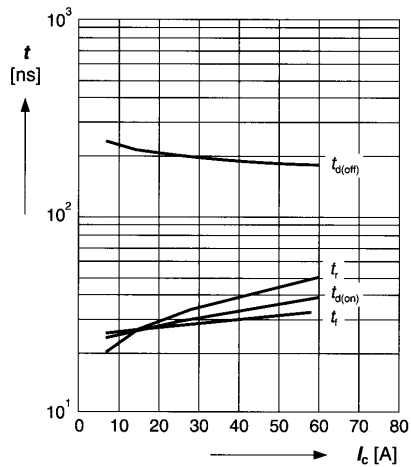
parameter:  $V_{GE} = \pm 15 V$ ;  $t_{sc} \leq 10 \mu s$ ;  $L < 50 nH$



## Typ. switching time

$t = f(I_C)$ , inductive load,  $T_J = 125^\circ\text{C}$

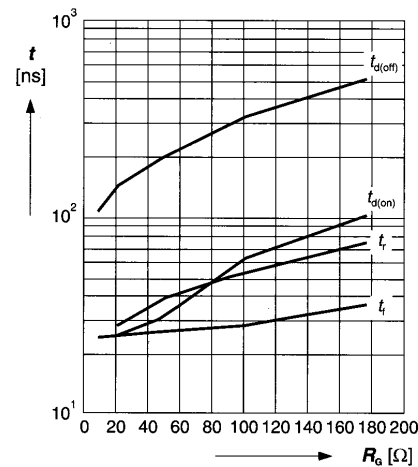
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 33\ \Omega$



## Typ. switching time

$t = f(R_G)$ , inductive load,  $T_J = 125^\circ\text{C}$

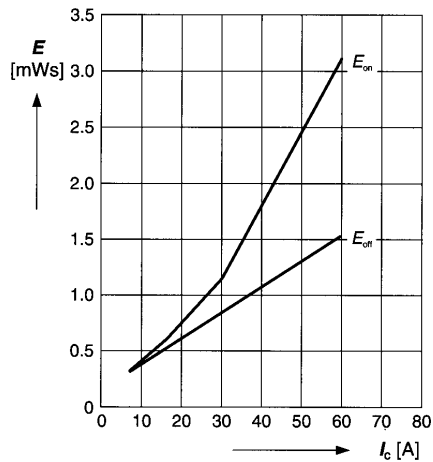
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 30\text{ A}$



## Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_J = 125^\circ\text{C}$

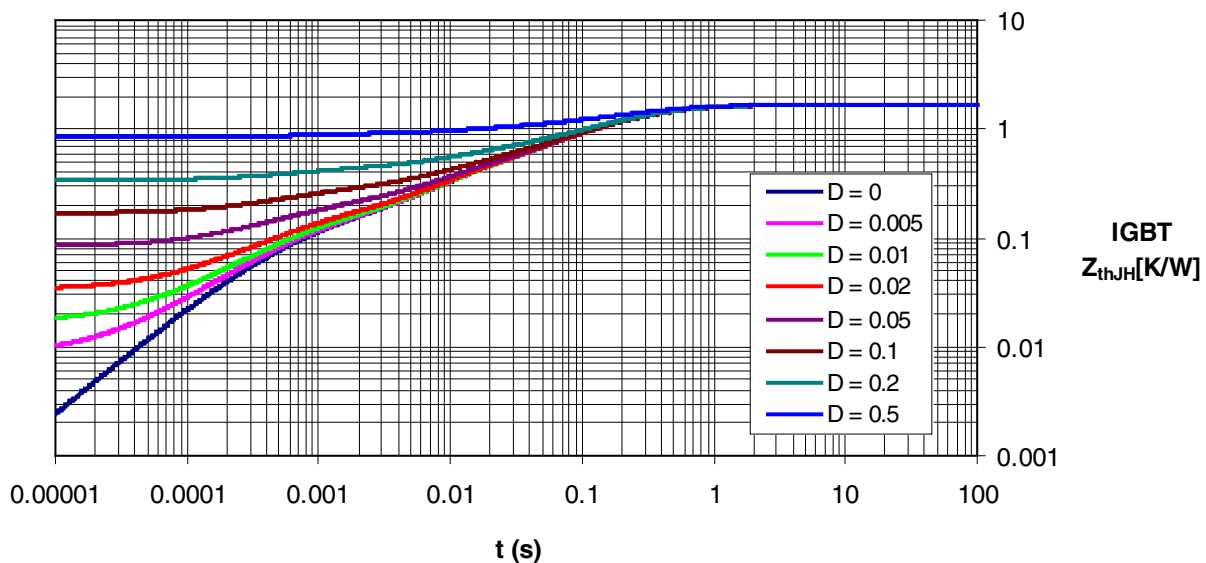
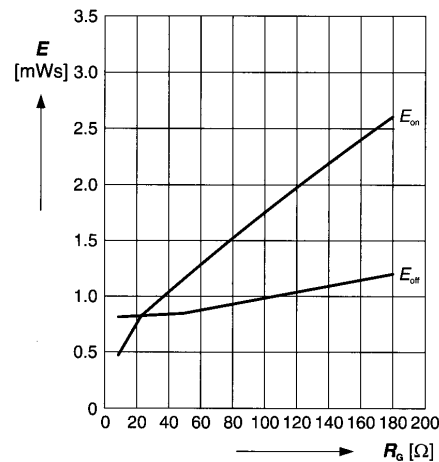
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 33\ \Omega$



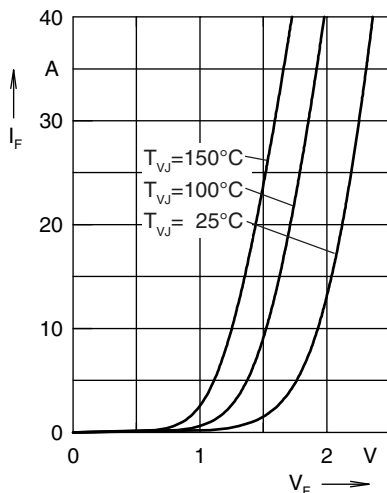
## Typ. switching losses

$E = f(R_G)$ , inductive load,  $T_J = 125^\circ\text{C}$

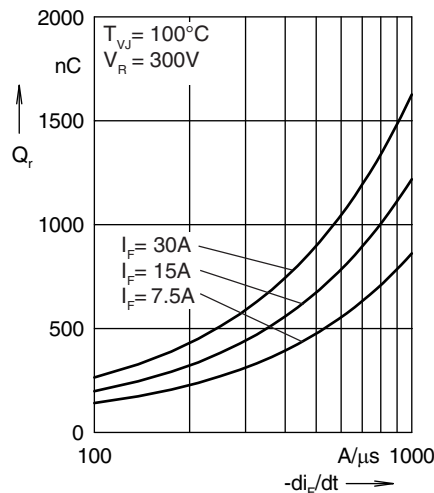
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 30\text{ A}$



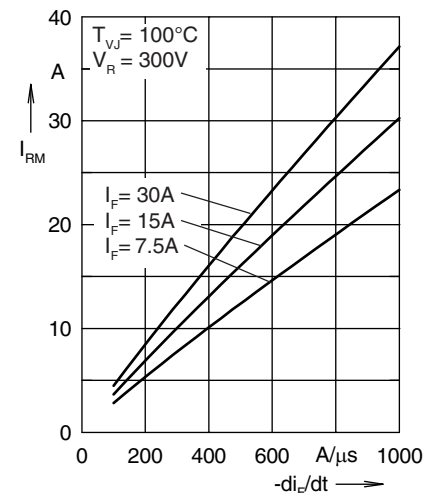
## Diode



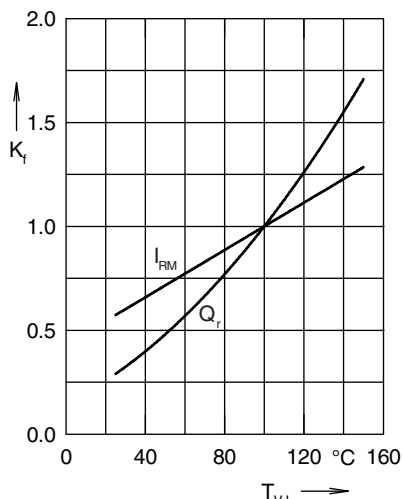
Forward current  $I_F$  versus  $V_F$



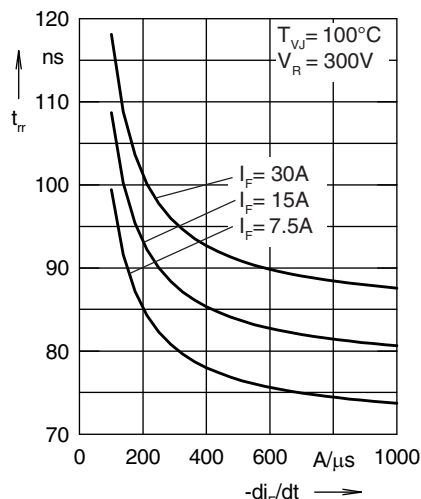
Reverse recovery charge  $Q_r$  versus  $-di_F/dt$



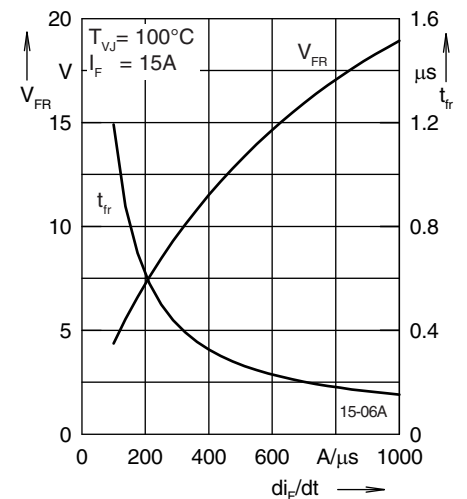
Peak reverse current  $I_{RM}$  versus  $-di_F/dt$



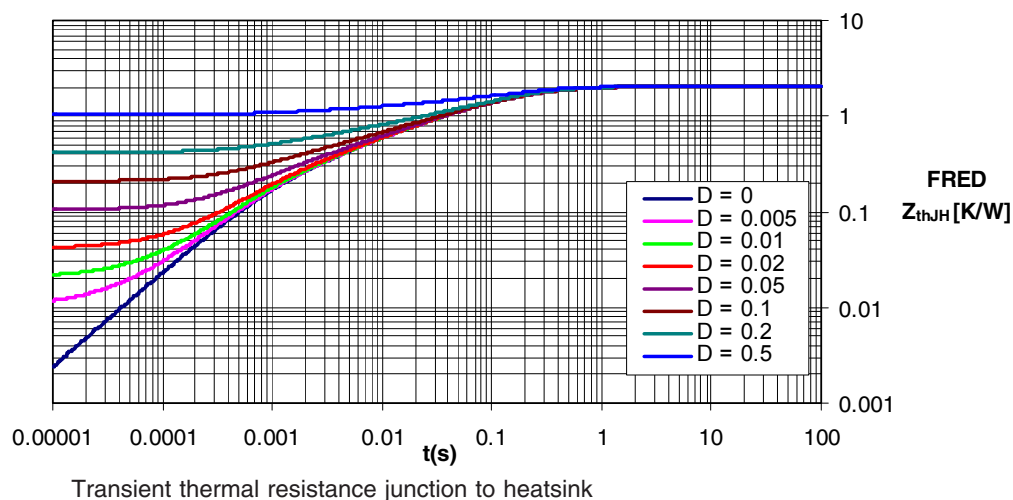
Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$



Recovery time  $t_{rr}$  versus  $-di_F/dt$



Peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$



Transient thermal resistance junction to heatsink