

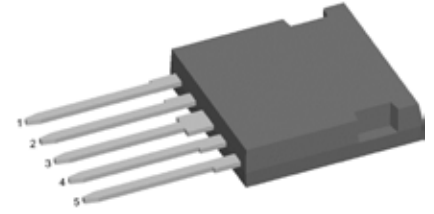
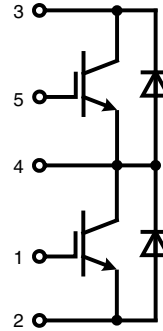
## IGBT phaseleg

in ISOPLUS i4-PAC™

$$I_{C25} = 30 \text{ A}$$

$$V_{CES} = 600 \text{ V}$$

$$V_{CE(sat) \text{ typ.}} = 1.9 \text{ V}$$



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>(SCSOA)                                  | $V_{CE} = V_{CES}$ ; $V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$<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 <sub>VJ</sub> = 25°C, unless otherwise specified) |                                                                                                                                                      |                       |               |      |     |  |
|                                                      |                                                                                                                                                      | min.                  | typ.          | max. |     |  |
| $V_{CE(sat)}$                                        | $I_C = 20\text{ A}$ ; $V_{GE} = 15\text{ V}$                                                                                                         |                       |               |      |     |  |
|                                                      | $T_{VJ} = 25^{\circ}\text{C}$                                                                                                                        |                       | 1.9           | 2.4  | V   |  |
|                                                      | $T_{VJ} = 125^{\circ}\text{C}$                                                                                                                       |                       | 2.2           |      | V   |  |
| $V_{GE(th)}$                                         | $I_C = 0.5\text{ mA}$ ; $V_{GE} = V_{CE}$                                                                                                            | 4.5                   |               | 6.5  | V   |  |
| $I_{CES}$                                            | $V_{CE} = V_{CES}$ ; $V_{GE} = 0\text{ V}$                                                                                                           |                       |               | 0.6  | mA  |  |
|                                                      | $T_{VJ} = 25^{\circ}\text{C}$                                                                                                                        |                       | 0.6           |      | mA  |  |
|                                                      | $T_{VJ} = 125^{\circ}\text{C}$                                                                                                                       |                       |               |      |     |  |
| $I_{GES}$                                            | $V_{CE} = 0\text{ V}$ ; $V_{GE} = \pm 20\text{ V}$                                                                                                   |                       |               | 200  | nA  |  |
| $t_{d(on)}$                                          | 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            |      | ns  |  |
| $t_r$                                                |                                                                                                                                                      |                       | 55            |      | ns  |  |
| $t_{d(off)}$                                         |                                                                                                                                                      |                       | 200           |      | ns  |  |
| $t_f$                                                |                                                                                                                                                      |                       | 30            |      | ns  |  |
| $E_{on}$                                             |                                                                                                                                                      |                       | 0.75          |      | mJ  |  |
| $E_{off}$                                            |                                                                                                                                                      |                       | 0.6           |      | mJ  |  |
| $C_{ies}$                                            | $V_{CE} = 25\text{ V}$ ; $V_{GE} = 0\text{ V}$ ; $f = 1\text{ MHz}$                                                                                  |                       | 1.1           |      | nF  |  |
| $Q_{Gon}$                                            | $V_{CE} = 300\text{ V}$ ; $V_{GE} = 15\text{ V}$ ; $I_C = 20\text{ A}$                                                                               |                       | 65            |      | nC  |  |
| $R_{thJC}$                                           | with heatsink compound                                                                                                                               |                       |               | 1.25 | K/W |  |
| $R_{thJH}$                                           |                                                                                                                                                      |                       | 2.5           |      | 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 |

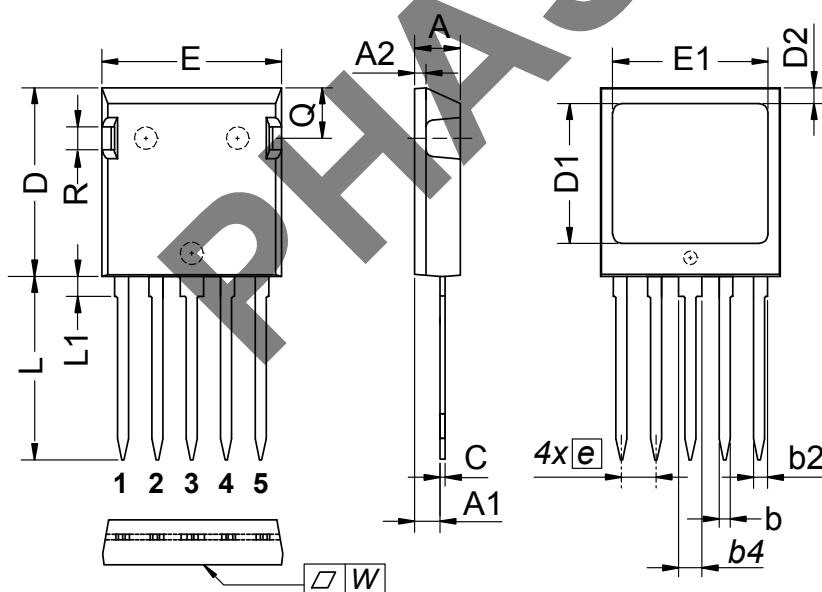
| Symbol     | Conditions                                                                                              | Characteristic Values |      |      |
|------------|---------------------------------------------------------------------------------------------------------|-----------------------|------|------|
|            |                                                                                                         | min.                  | typ. | max. |
| $V_F$      | $I_F = 20\text{ A}$                                                                                     |                       | 2.3  | 2.7  |
|            | $T_{VJ} = 25^{\circ}\text{C}$                                                                           |                       |      | 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    |

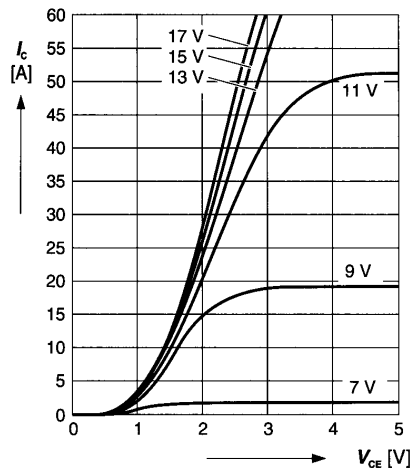


| DIM. | MILLIMETER |       | INCHES   |       |
|------|------------|-------|----------|-------|
|      | MIN        | MAX   | MIN      | MAX   |
| A    | 4.83       | 5.21  | 0.190    | 0.205 |
| A1   | 2.59       | 3.00  | 0.102    | 0.118 |
| A2   | 1.17       | 2.16  | 0.046    | 0.085 |
| b    | 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

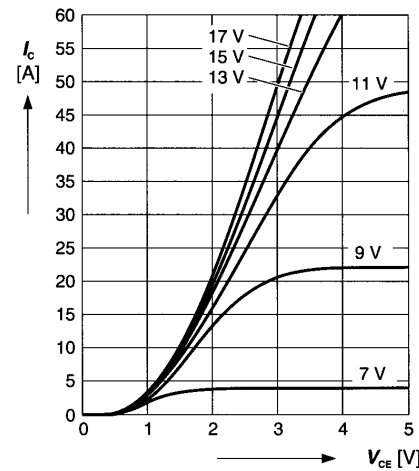
### Typ. output characteristics

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

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


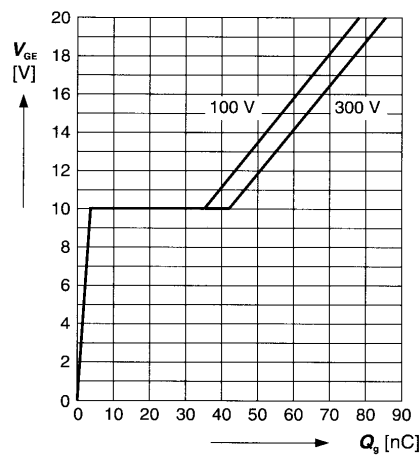
### Typ. output characteristics

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

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


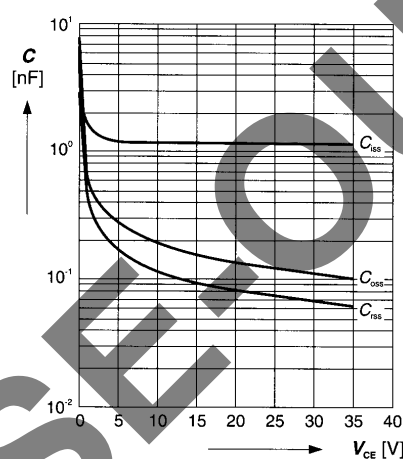
### Typ. gate charge

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

parameter:  $I_{C,puls} = 20 A$ 


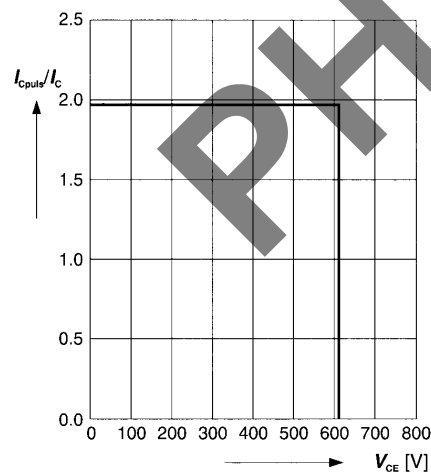
### Typ. capacitances

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

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


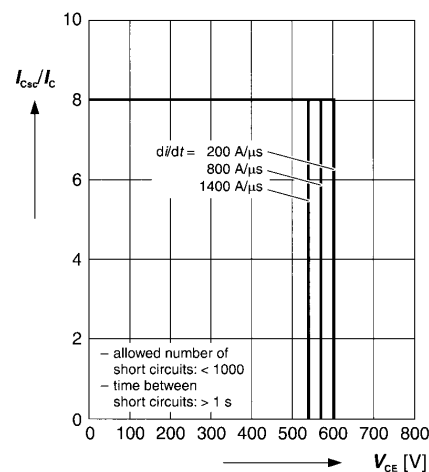
### Reverse biased safe operating area

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

parameter:  $V_{GE} = 15 V$ 


### Short circuit safe operating area

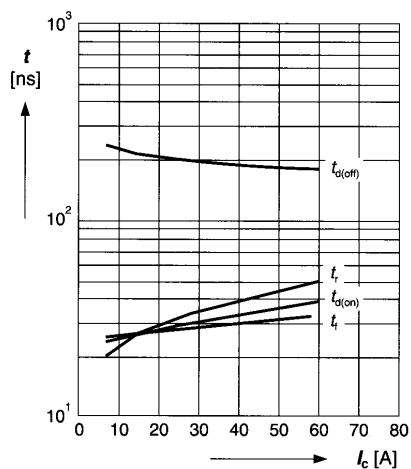
$$I_{C,sc} = f(V_{CE}), T_j = 150^\circ C$$

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


### Typ. switching time

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

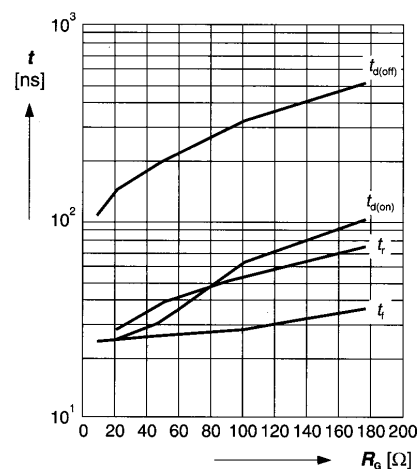
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 33\ \Omega$



### Typ. switching time

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

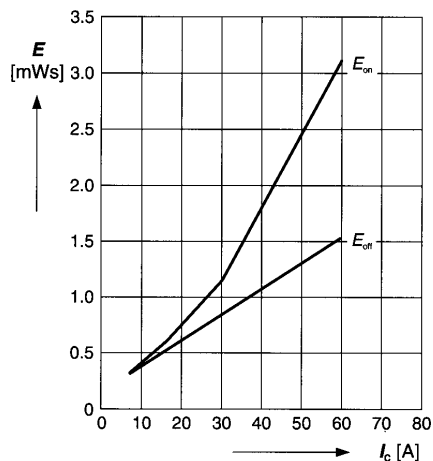
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 30\text{ A}$



### Typ. switching losses

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

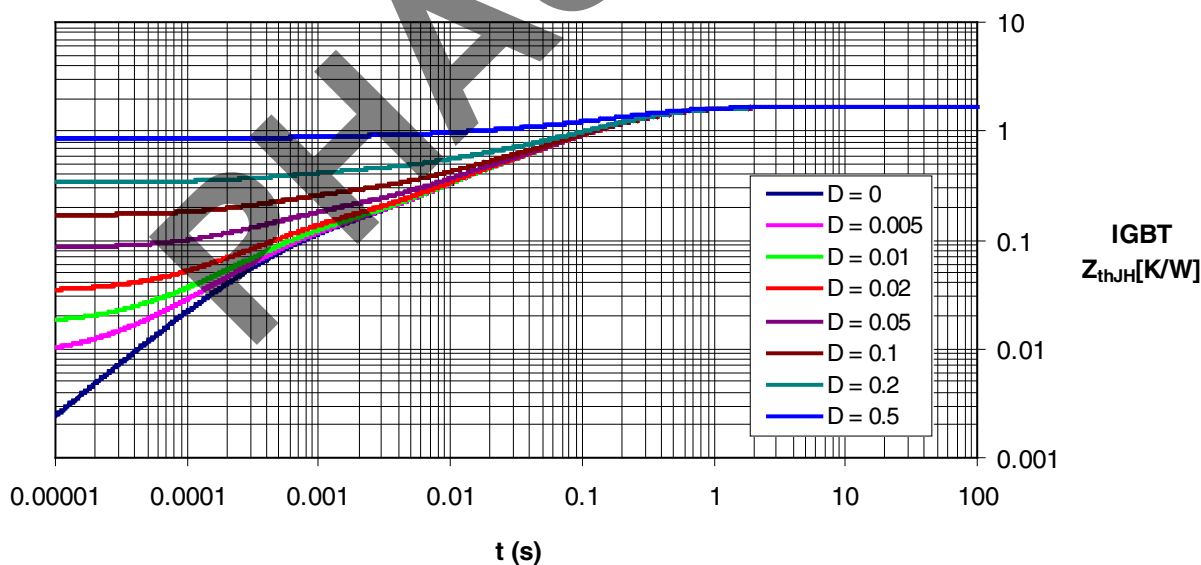
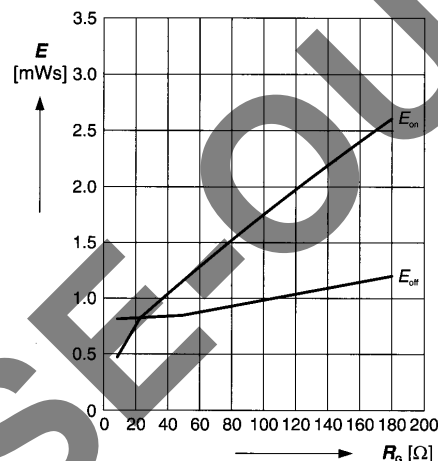
parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 33\ \Omega$



### Typ. switching losses

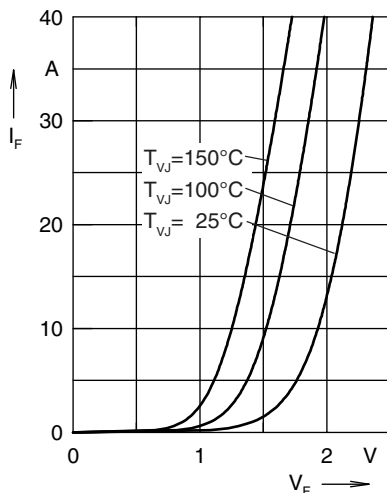
$E = f(R_G)$ , inductive load,  $T_J = 125^\circ\text{C}$

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

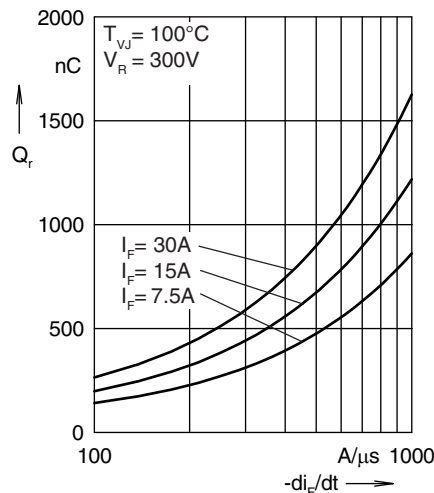


IGBT  
 $Z_{thJH}[\text{K/W}]$

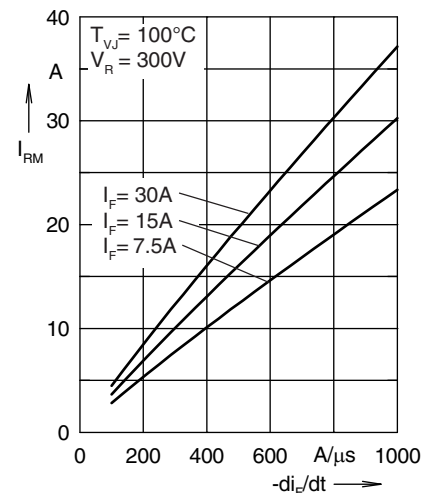
## Diode



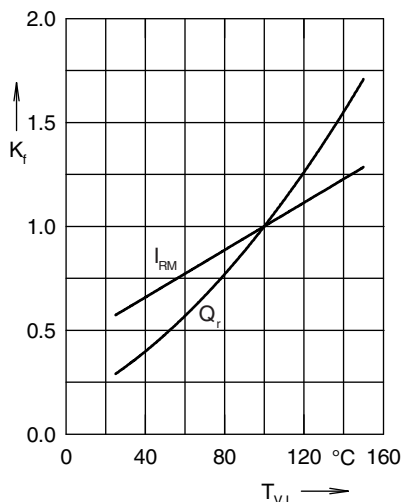
Forward current  $I_F$  versus  $V_F$



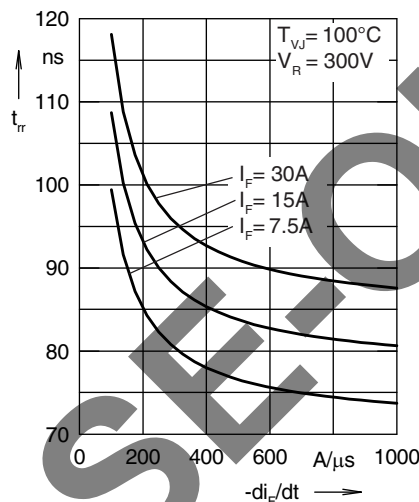
Reverse recovery charge  $Q_r$  versus  $-di_F/dt$



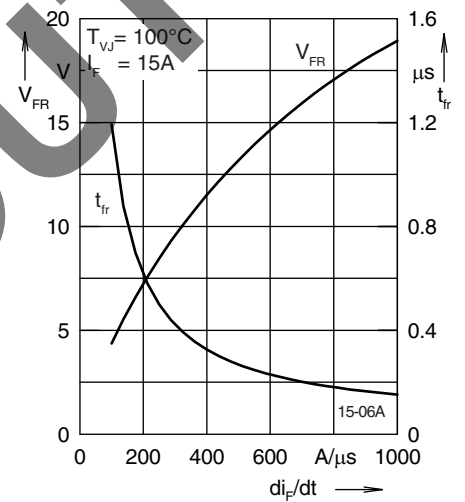
Peak reverse current  $I_{RM}$  versus  $-di_F/dt$



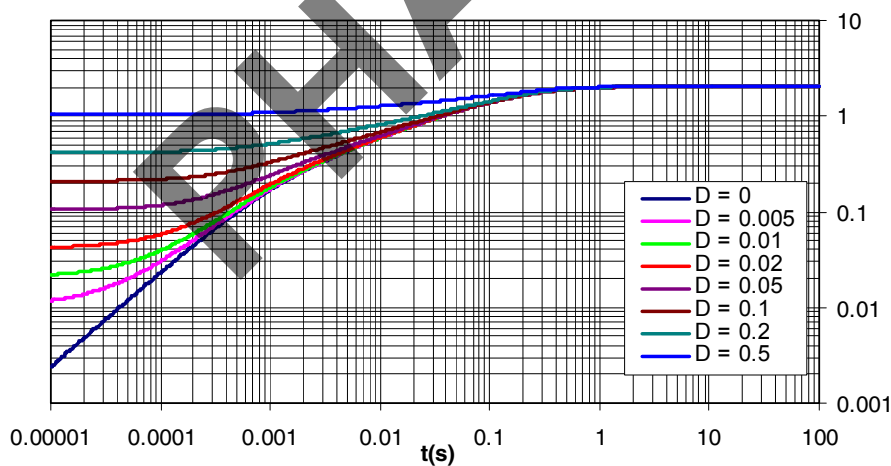
Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$



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

FRED  
 $Z_{thJH}$  [K/W]