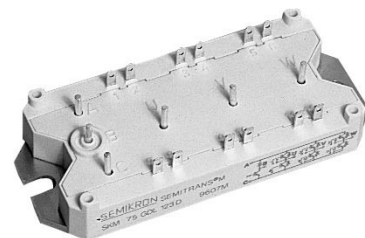


Absolute Maximum Ratings		Values	Units
Symbol	Conditions ¹⁾		
V_{CES}		1200	V
V_{CGR}	$R_{GE} = 20 \text{ k}\Omega$	1200	V
I_C	$T_{case} = 25/80 \text{ }^\circ\text{C}$	75 / 50	A
I_{CM}	$T_{case} = 25/80 \text{ }^\circ\text{C}; t_p = 1 \text{ ms}$	150 / 100	A
V_{GES}		± 20	V
P_{tot}	per IGBT, $T_{case} = 25 \text{ }^\circ\text{C}$	390	W
$T_j, (T_{stg})$		$-40 \dots +150 (125)$	$^\circ\text{C}$
V_{isol}	AC, 1 min.	2 500	V
humidity	DIN 40 040	Class F	
climate	DIN IEC 68 T.1	40/125/56	
Inverse Diode			
$I_F = -I_C$	$T_{case} = 25/80 \text{ }^\circ\text{C}$	75 / 50	A
$I_{FM} = -I_{CM}$	$T_{case} = 25/80 \text{ }^\circ\text{C}; t_p = 1 \text{ ms}$	150 / 100	A
I_{FSM}	$t_p = 10 \text{ ms}; \sin.; T_j = 150 \text{ }^\circ\text{C}$	550	A
I_t^2	$t_p = 10 \text{ ms}; T_j = 150 \text{ }^\circ\text{C}$	1500	A^2s

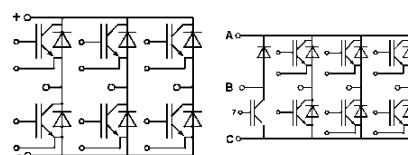
Characteristics		min.	typ.	max.	Units
Symbol	Conditions ¹⁾				
$V_{(BR)CES}$	$V_{GE} = 0, I_C = 1 \text{ mA}$	$\geq V_{CES}$	—	—	V
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 2 \text{ mA}$	4,5	5,5	6,5	V
I_{CES}	$V_{GE} = 0 \quad \left\{ \begin{array}{l} T_j = 25 \text{ }^\circ\text{C} \\ T_j = 125 \text{ }^\circ\text{C} \end{array} \right.$	—	0,8	1	mA
	$V_{CE} = V_{CES}$	—	3,5	—	mA
I_{GES}	$V_{GE} = 20 \text{ V}, V_{CE} = 0$	—	—	200	nA
V_{CEsat}	$I_C = 50 \text{ A} \quad \left\{ \begin{array}{l} V_{GE} = 15 \text{ V}; \\ T_j = 25 (125) \text{ }^\circ\text{C} \end{array} \right.$	—	2,5(3,1)	3(3,7)	V
V_{CEsat}	$I_C = 75 \text{ A} \quad \left\{ \begin{array}{l} V_{GE} = 15 \text{ V}; \\ T_j = 25 (125) \text{ }^\circ\text{C} \end{array} \right.$	—	3(3,8)	—	V
g_{fs}	$V_{CE} = 20 \text{ V}, I_C = 50 \text{ A}$	23	40	—	S
C_{CHC}	per IGBT	—	—	300	pF
C_{ies}	$\left\{ \begin{array}{l} V_{GE} = 0 \\ V_{CE} = 25 \text{ V} \end{array} \right.$	—	3300	4300	pF
C_{oes}	$\left\{ \begin{array}{l} V_{GE} = 0 \\ V_{CE} = 25 \text{ V} \end{array} \right.$	—	500	600	pF
C_{res}	$f = 1 \text{ MHz}$	—	220	300	pF
L_{CE}		—	—	60	nH
$t_{d(on)}$	$\left\{ \begin{array}{l} V_{CC} = 600 \text{ V} \\ V_{GE} = +15 \text{ V} / -15 \text{ V}^{3)} \end{array} \right.$	—	44	100	ns
t_r		—	56	100	ns
$t_{d(off)}$	$\left\{ \begin{array}{l} I_C = 50 \text{ A, ind. load} \\ R_{Gon} = R_{Goff} = 22 \text{ } \Omega \end{array} \right.$	—	380	500	ns
t_f		—	70	100	ns
$E_{on}^{5)}$	$T_j = 125 \text{ }^\circ\text{C}$	—	8	—	mWs
$E_{off}^{5)}$		—	5	—	mWs
Inverse Diode ⁸⁾					
$V_F = V_{EC}$	$I_F = 50 \text{ A} \quad \left\{ \begin{array}{l} V_{GE} = 0 \text{ V}; \\ T_j = 25 (125) \text{ }^\circ\text{C} \end{array} \right.$	—	2,0(1,8)	2,5	V
$V_F = V_{EC}$	$I_F = 75 \text{ A} \quad \left\{ \begin{array}{l} V_{GE} = 0 \text{ V}; \\ T_j = 25 (125) \text{ }^\circ\text{C} \end{array} \right.$	—	2,3(2,1)	—	V
V_{TO}	$T_j = 125 \text{ }^\circ\text{C}$	—	1,1	1,2	V
r_T	$T_j = 125 \text{ }^\circ\text{C}$	—	18	22	m Ω
I_{RRM}	$I_F = 50 \text{ A}; T_j = 25 (125) \text{ }^\circ\text{C}^{2)}$	—	23(35)	—	A
Q_{rr}	$I_F = 50 \text{ A}; T_j = 25 (125) \text{ }^\circ\text{C}^{2)}$	—	2,3(7)	—	μC
Thermal Characteristics					
R_{thjc}	per IGBT	—	—	0,32	$^\circ\text{C/W}$
R_{thjc}	per diode	—	—	0,6	$^\circ\text{C/W}$
R_{thch}	per module	—	—	0,05	$^\circ\text{C/W}$

SEMITRANS® M IGBT Modules

SKM 75 GD 123 D *)**
SKM 75 GD 123 D L *)
SKM 75 GDL 123 D **)



Sevenpack **



Sixpack: GD GDL

Features

- MOS input (voltage controlled)
- N channel, homogeneous Si
- Low inductance case
- Very low tail current with low temperature dependence
- High short circuit capability, self limiting to $6 \cdot I_{cnom}$
- Latch-up free
- Fast & soft inverse CAL diodes⁸⁾
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (9 mm) and creepage distances (13 mm).

Typical Applications

- Switched mode power supplies
- DC servo and robot drives
- Three phase inverters for AC motor speed control
- Switching (not for linear use)

¹⁾ $T_{case} = 25 \text{ }^\circ\text{C}$, unless otherwise specified

²⁾ $I_F = -I_C, V_R = 600 \text{ V}, -di_F/dt = 800 \text{ A}/\mu\text{s}, V_{GE} = 0 \text{ V}$

³⁾ Use $V_{GEoff} = -5 \dots -15 \text{ V}$

⁵⁾ See fig. 2 + 3; $R_{Goff} = 22 \text{ } \Omega$

⁸⁾ CAL = Controlled Axial Lifetime Technology.

***) Main terminals = 2 mm dia. outline → B6 - 68**

****) SEVENPACK Case D73**

*****) Sixpack, with FASTON main terminals, picture → B6 - 69 Cases and mech. data → B6-104**

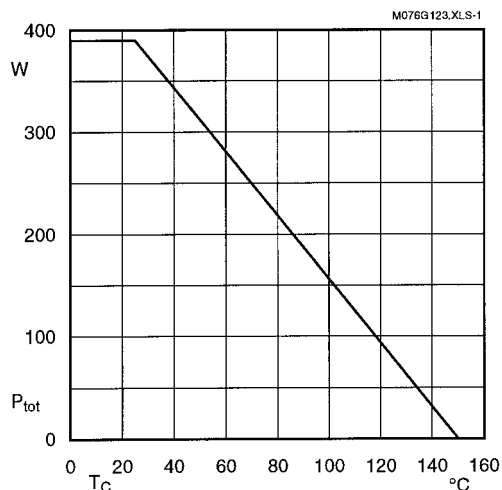


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

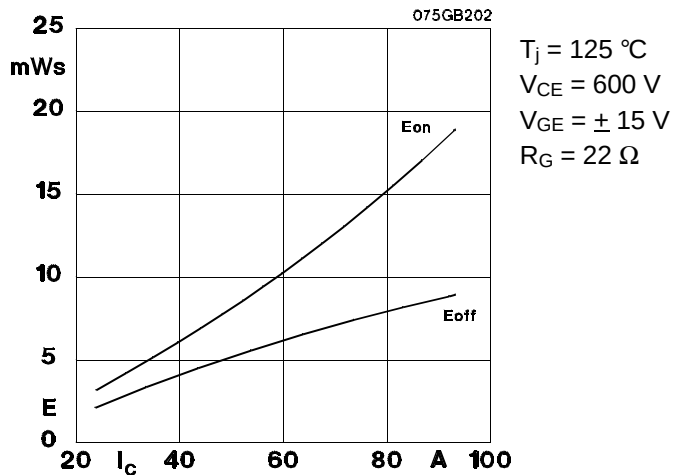


Fig. 2 Turn-on /off energy = $f(I_C)$

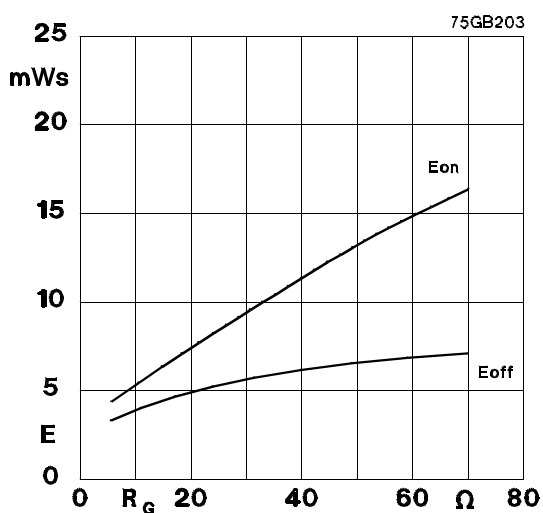


Fig. 3 Turn-on /off energy = $f(R_G)$

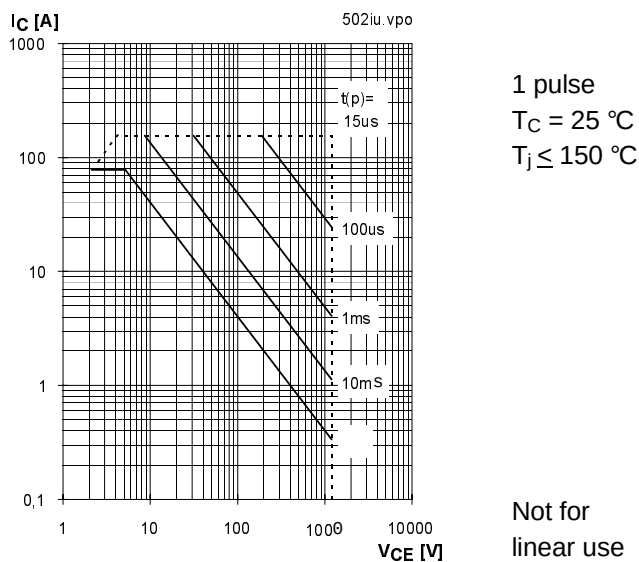


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

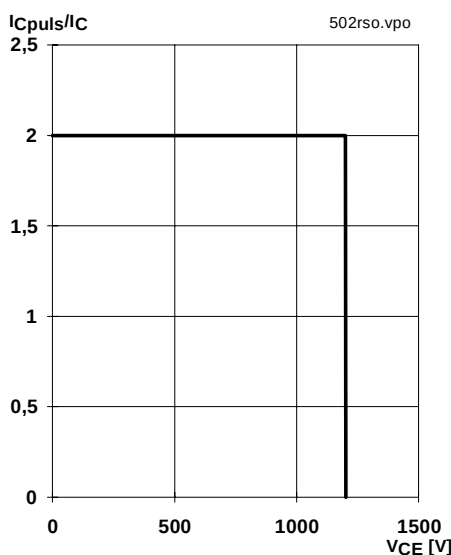


Fig. 5 Turn-off safe operating area (RBSOA)

$T_j \leq 150$ °C
 $V_{GE} = 15$ V
 $R_{Goff} = 22$ Ω
 $I_C = 50$ A

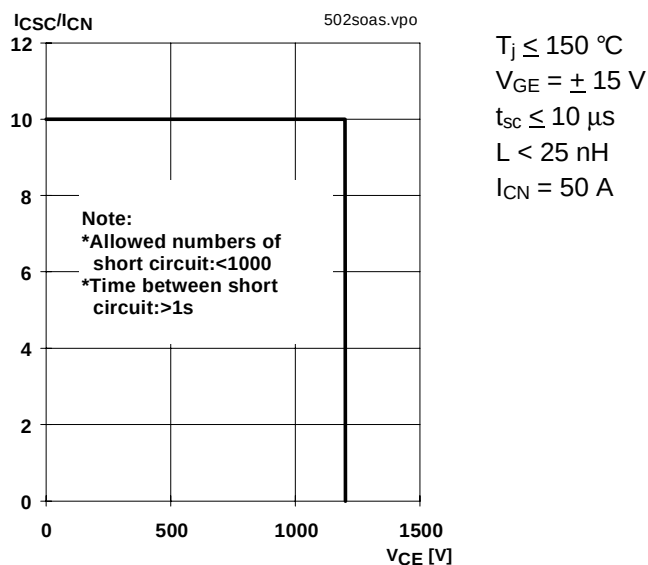


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

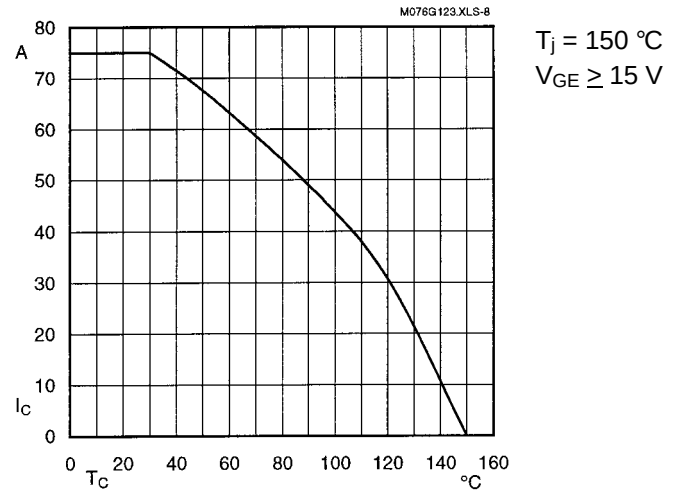


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

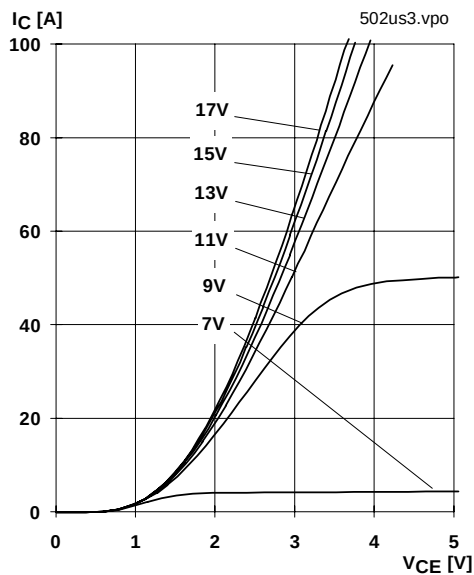


Fig. 9 Typ. output characteristic, $t_p = 80 \mu s$; $25^\circ C$

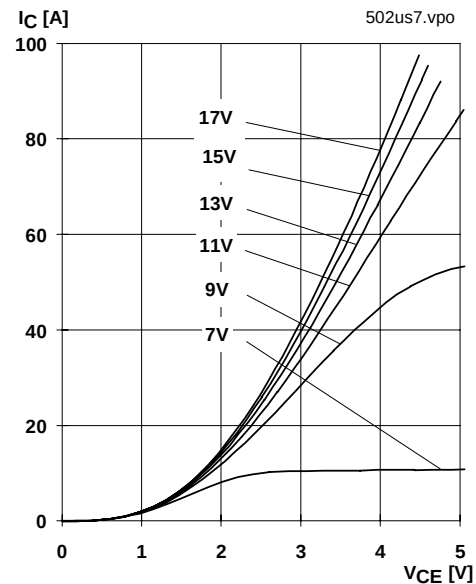


Fig. 10 Typ. output characteristic, $t_p = 80 \mu s$; $125^\circ C$

$$P_{cond(t)} = V_{CEsat(t)} \cdot I_{C(t)}$$

$$V_{CEsat(t)} = V_{CE(TO)(T_j)} + r_{CE(T_j)} \cdot I_{C(t)}$$

$$V_{CE(TO)(T_j)} \leq 1,5 + 0,002 (T_j - 25) [V]$$

$$\text{typ.: } r_{CE(T_j)} = 0,020 + 0,00008 (T_j - 25) [\Omega]$$

$$\text{max.: } r_{CE(T_j)} = 0,030 + 0,00010 (T_j - 25) [\Omega]$$

$$\text{valid for } V_{GE} = +15 \pm 2_{-1} [V]; I_C \geq 0,3 I_{Cnom}$$

Fig. 11 Saturation characteristic (IGBT)
Calculation elements and equations

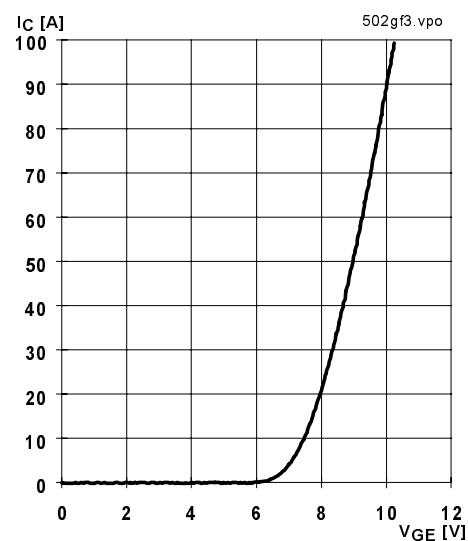


Fig. 12 Typ. transfer characteristic, $t_p = 80 \mu s$; $V_{CE} = 20 V$

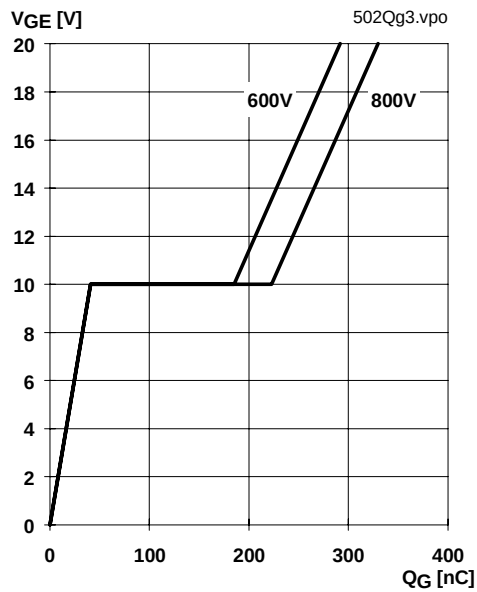


Fig. 13 Typ. gate charge characteristic

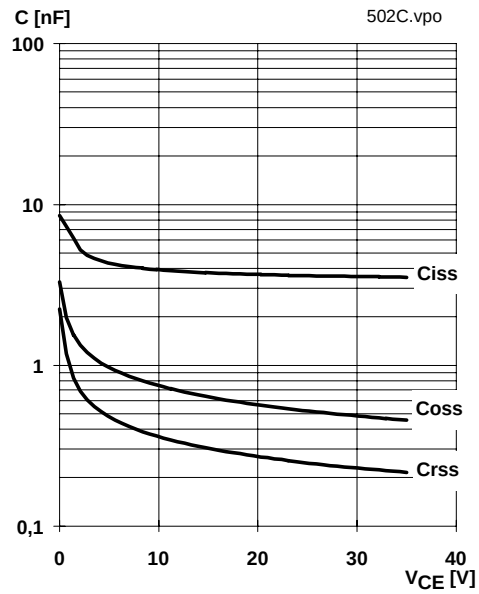


Fig. 14 Typ. capacitances vs. V_{CE}

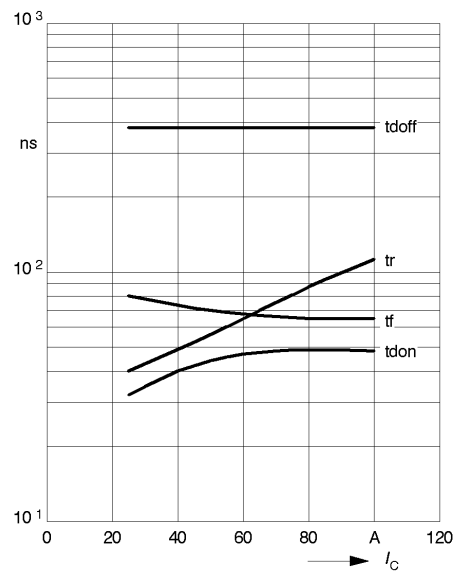


Fig. 15 Typ. switching times vs. I_C

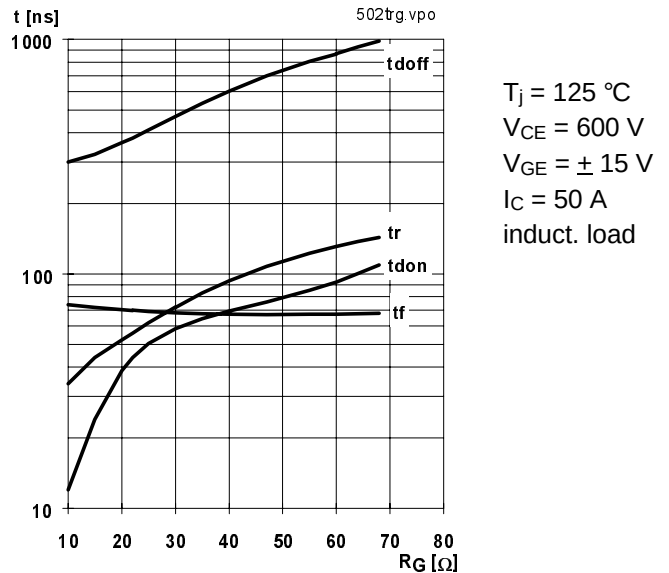


Fig. 16 Typ. switching times vs. gate resistor R_G

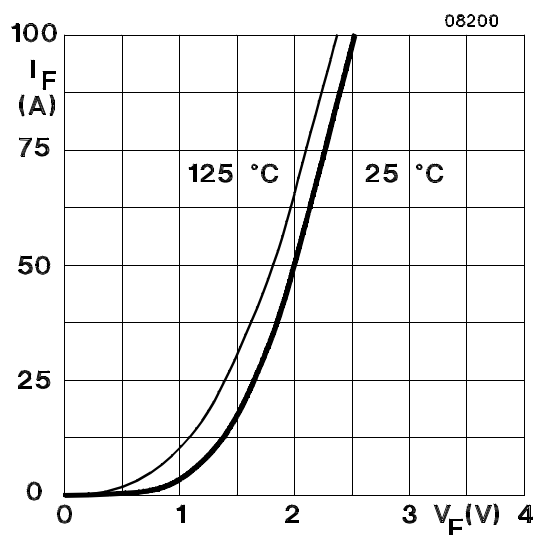


Fig. 17 Typ. CAL diode forward characteristic

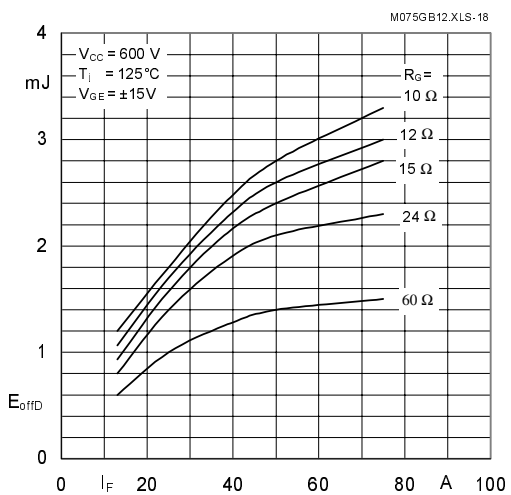


Fig. 18 Diode turn-off energy dissipation per pulse

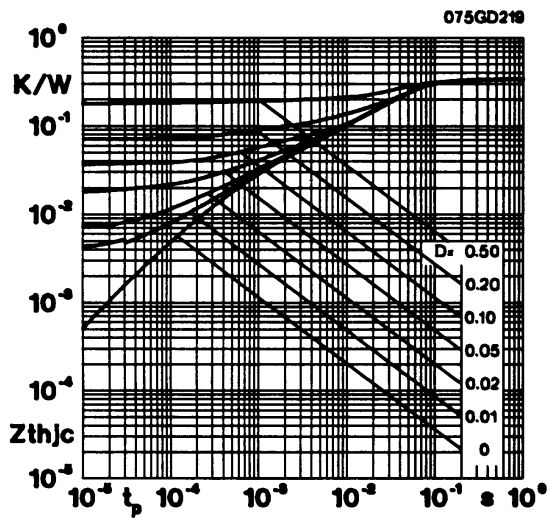


Fig. 19 Transient thermal impedance of IGBT
 $Z_{thjc} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

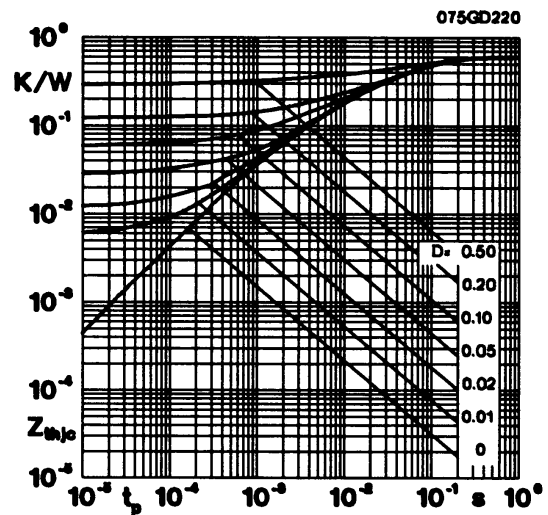


Fig. 20 Transient thermal impedance of
 inverse CAL diodes $Z_{thjc} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

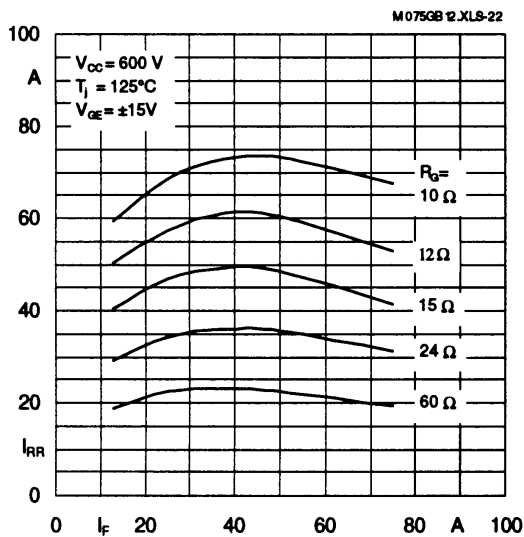


Fig. 22 Typ. CAL diode peak reverse recovery
 current $I_{RR} = f(I_F)$

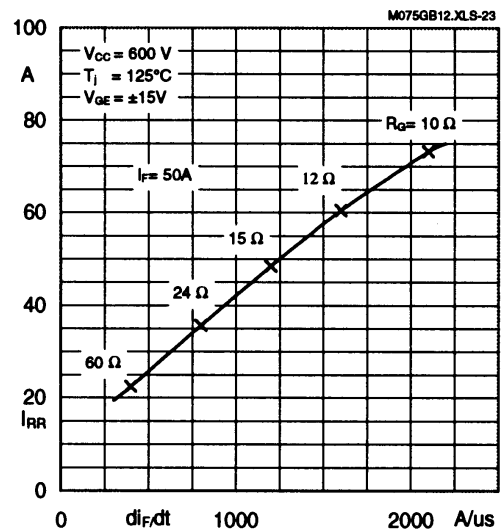


Fig. 23 Typ. CAL diode peak reverse recovery current
 $I_{RR} = f(di_F/dt)$

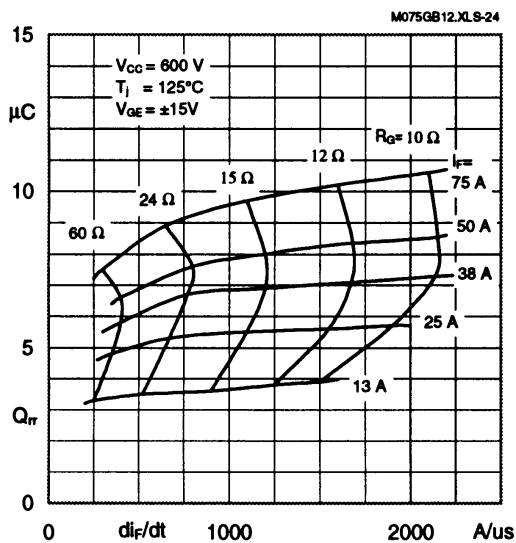


Fig. 24 Typ. CAL Diode recovered charge $Q_{rr} = f(di_F/dt)$

This is an electrostatic discharge sensitive device (ESD). Please observe the international standard IEC 747-1, Chapter IX.
Two devices are supplied in one SEMIBOX A.
Larger packing units (10 and 20 pieces) are used if suitable.
SEMIBOX → C - 1.