

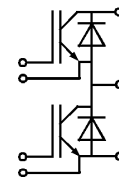
Absolute Maximum Ratings		Values	Units
Symbol	Conditions ¹⁾		
V _{CES}		1700	V
V _{CGR}	R _{GE} = 20 kΩ	1700	V
I _C	T _{case} = 25/80 °C	75 / 50	A
I _{CM}	T _{case} = 25/80 °C; t _p = 1 ms	144 / 100	A
V _{GES}		± 20	V
P _{tot}	per IGBT, T _{case} = 25 °C	500	W
T _j , (T _{stg})		- 40 ... +150 (125)	°C
V _{isol}	AC, 1 min.	4000	V
humidity	DIN 40 040	Class F	
climate	DIN IEC 68 T.1	40/125/56	
Inverse Diode ⁸⁾			
I _F = - I _C	T _{case} = 25/80 °C	60 / 40	A
I _{FM} = - I _{CM}	T _{case} = 25/80 °C; t _p = 1 ms	144 / 100	A
I _{FSM}	t _p = 10 ms; sin.; T _j = 150 °C	550	A
I _t ²	t _p = 10 ms; T _j = 150 °C	1500	A ² s

Characteristics		min.	typ.	max.	Units
Symbol	Conditions ¹⁾				
V _{(BR)CES}	V _{GE} = 0, I _C = 1 mA	≥ V _{CES}	—	—	V
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 4 mA	4,8	5,5	6,2	V
I _{CES}	V _{GE} = 0 } T _j = 25 °C	—	0,05	1	mA
	V _{CE} = V _{CES} } T _j = 125 °C	—	6	10	mA
I _{GES}	V _{GE} = 20 V, V _{CE} = 0	—	—	320	nA
V _{CEsat}	I _C = 50 A } V _{GE} = 15 V; }	—	3,4(4,2)	3,9(5)	V
V _{CEsat}	I _C = 75 A } T _j = 25 (125) °C }	—	3,8(5,5)	—	V
g _{fs}	V _{CE} = 20 V, I _C = 50 A	18	—	—	S
C _{CHC}	per IGBT	—	—	200	pF
C _{ies}	V _{GE} = 0	—	8	—	nF
C _{oes}	V _{CE} = 25 V	—	0,64	—	nF
C _{res}	f = 1 MHz	—	0,25	—	nF
L _{CE}		—	—	30	nH
t _{d(on)}	V _{CC} = 1200 V	—	40	—	ns
t _r	V _{GE} = + 15 V / - 15 V ³⁾	—	35	—	ns
t _{d(off)}	I _C = 50 A, ind. load	—	400	600	ns
t _f	R _{Gon} = R _{Goff} = 12 Ω	—	58	—	ns
E _{on}	T _j = 125 °C	—	18	—	mWs
E _{off}		—	13	—	mWs
Inverse Diode ⁸⁾					
V _F = V _{EC}	I _F = 50 A } V _{GE} = 0 V; }	—	2,2(2,0)	2,7(2,4)	V
V _F = V _{EC}	I _F = 75 A } T _j = 25 (125) °C }	—	2,45(2,25)	—	V
V _{TO}	T _j = 125 °C	—	1,30	1,5	V
r _T	T _j = 125 °C	—	12	18	mΩ
I _{RR}	I _F = 50 A; T _j = 25 (125) °C ²⁾	—	30(43)	—	A
Q _{rr}	I _F = 50 A; T _j = 25 (125) °C ²⁾	—	7(15)	—	μC
Thermal Characteristics					
R _{thjc}	per IGBT	—	—	0,25	°C/W
R _{thjc}	per diode D	—	—	0,75	°C/W
R _{thch}	per module	—	—	0,05	°C/W

SEMITRANS® M IGBT Modules SKM 75 GB 173 D



SEMITRANS 2



GB

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 * I_{Cnom}
- Latch-up free
- Fast & soft inverse CAL diodes ⁸⁾
- Isolated copper baseplate using DCB Direct Copper Bonding
- Large clearance (10 mm) and creepage distances (20 mm).

Typical Applications:

- AC inverter drives on mains 575 - 750 V_{AC}
- DC bus voltage 750 - 1200 V_{DC}
- Public transport (auxiliary syst.)
- Switching (not for linear use)

¹⁾ T_{case} = 25 °C, unless otherwise specified

²⁾ I_F = - I_C, V_R = 1200 V, - di_F/dt = 800 A/μs, V_{GE} = 0 V

³⁾ Use V_{GEoff} = -5 ... -15 V

⁸⁾ CAL = Controlled Axial Lifetime Technology.

Cases and mech. data → B6-238

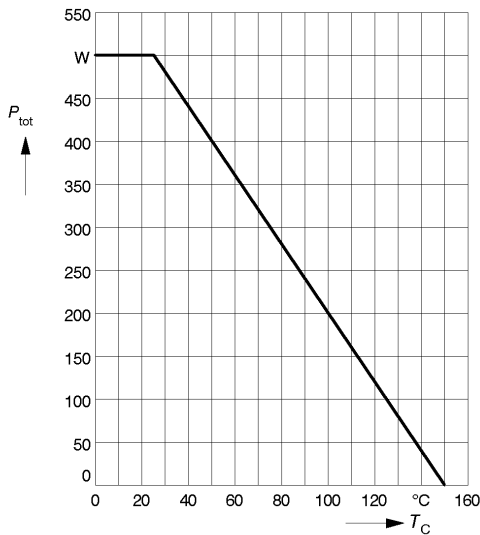


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

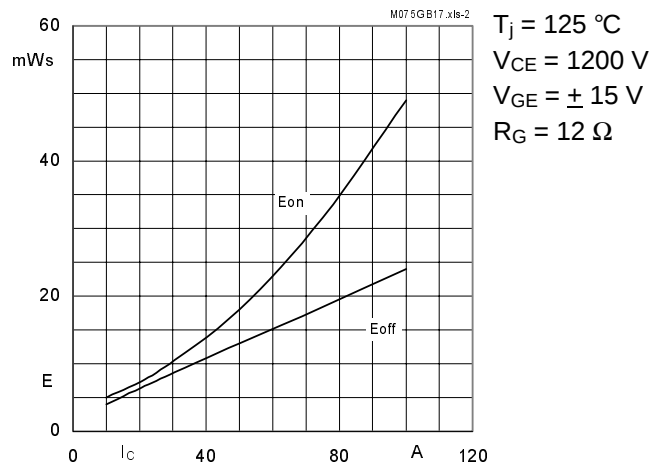


Fig. 2 Turn-on /off energy = $f(I_C)$

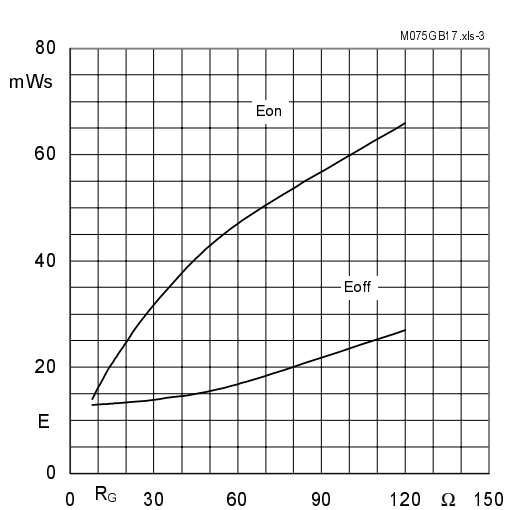


Fig. 3 Turn-on /off energy = $f(R_G)$

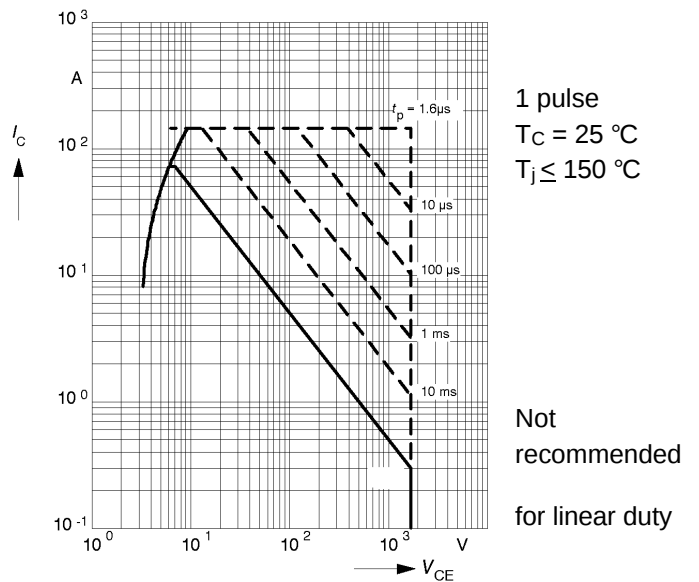


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

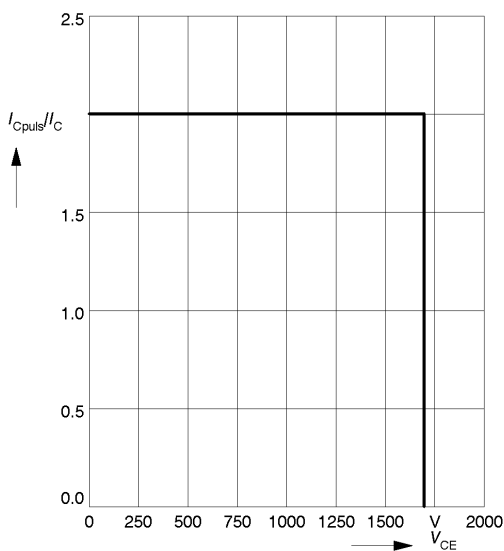


Fig. 5 Turn-off safe operating area (RBSOA)

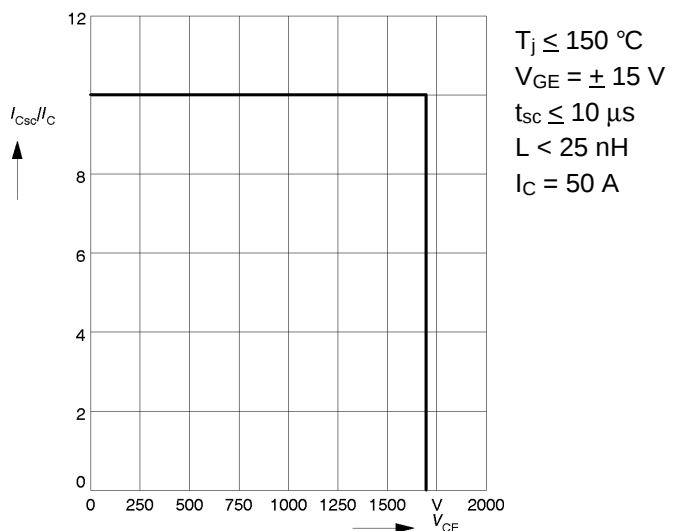


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

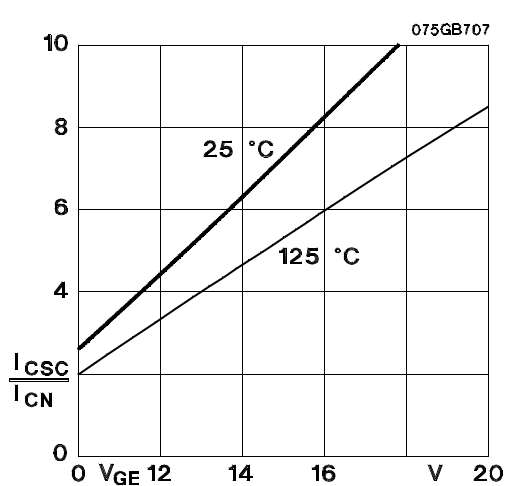


Fig. 7 Short circuit current vs. turn-on gate voltage

$V_C = 1200 \text{ V}$
 $I_C = I_{Cnom}$
 $R_G = 12 \Omega$
 $L_{ext} \leq 50 \text{ nH}$
 self-limiting

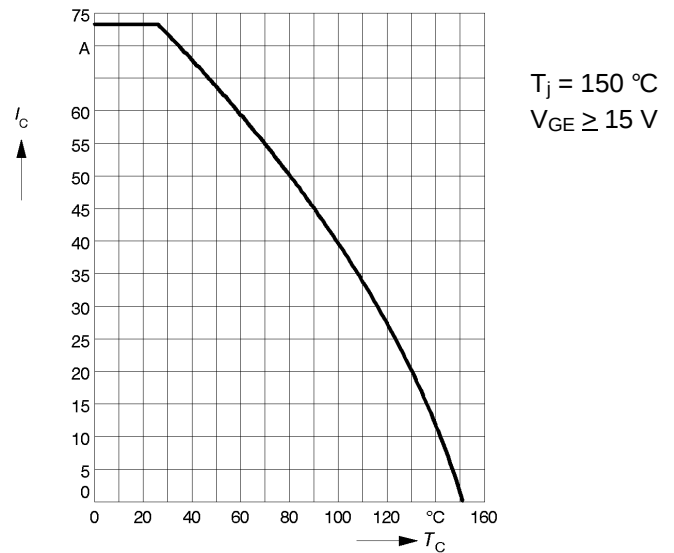


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

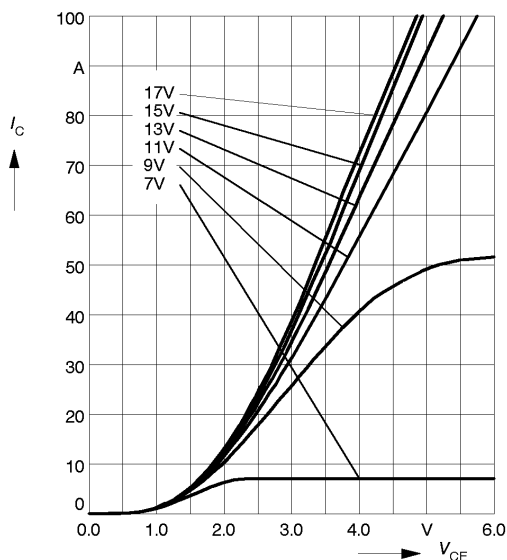


Fig. 9 Typ. output characteristic, $t_p = 80 \mu\text{s}$; $25 \text{ }^\circ\text{C}$

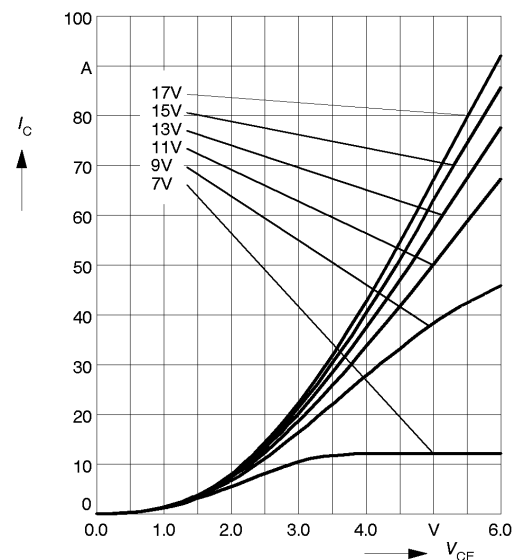


Fig. 10 Typ. output characteristic, $t_p = 80 \mu\text{s}$; $125 \text{ }^\circ\text{C}$

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

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

$$V_{CE(TO)(T_j)} \leq 1,9 + 0,003 (T_j - 25) [\text{V}]$$

$$r_{CE(T_j)} = 0,034 + 0,00010 (T_j - 25) [\Omega]$$

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

Fig. 11 Typ. saturation characteristic (IGBT)
 Calculation elements and equations

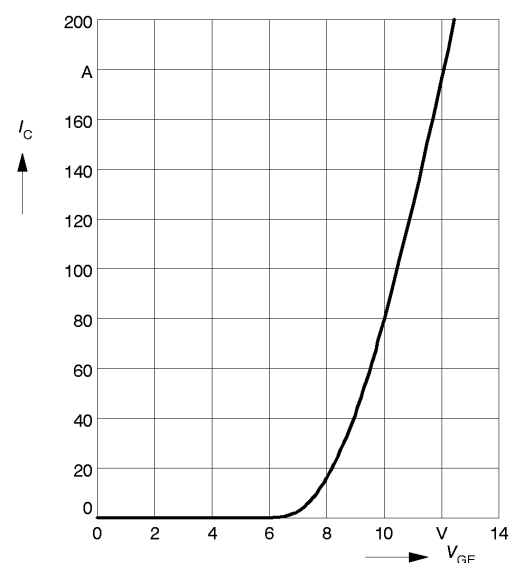


Fig. 12 Typ. transfer characteristic, $t_p = 80 \mu\text{s}$; $V_{CE} = 20 \text{ V}$

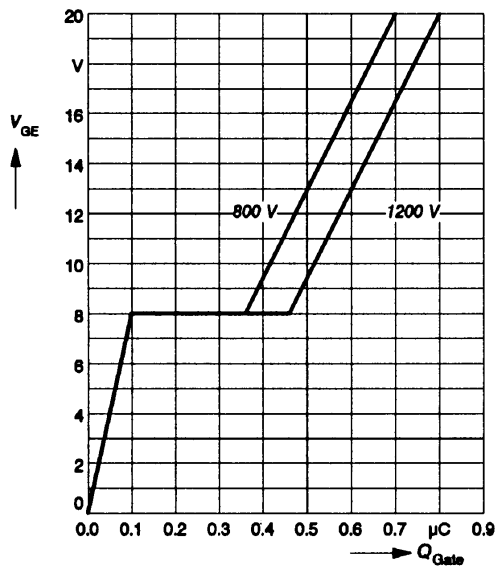


Fig. 13 Typ. gate charge characteristic

$I_{Cpuls} = 50 \text{ A}$

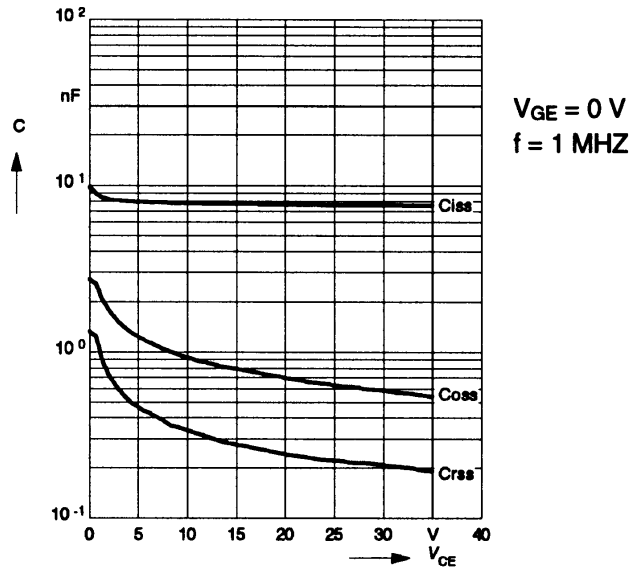


Fig. 14 Typ. capacitances vs. V_{CE}

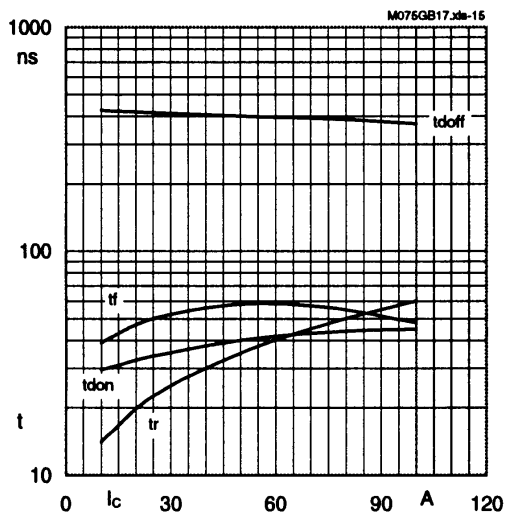


Fig. 15 Typ. switching times vs. I_C

$T_J = 125 \text{ }^{\circ}\text{C}$
 $V_{CE} = 1200 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{Gon} = 12 \text{ } \Omega$
 $R_{Goff} = 12 \text{ } \Omega$
 ind. load

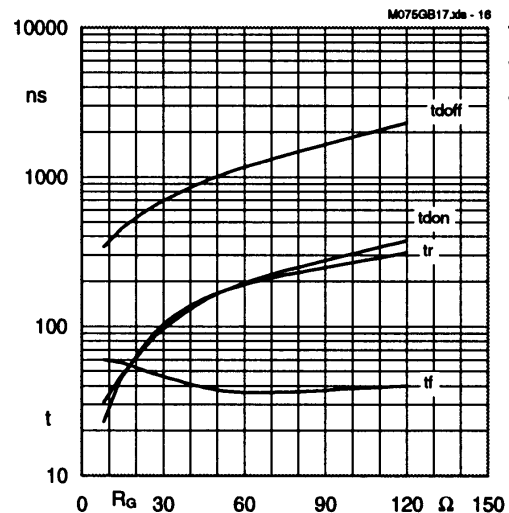


Fig. 16 Typ. switching times vs. R_G

$T_J = 125 \text{ }^{\circ}\text{C}$
 $V_{CE} = 1200 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$
 ind. load

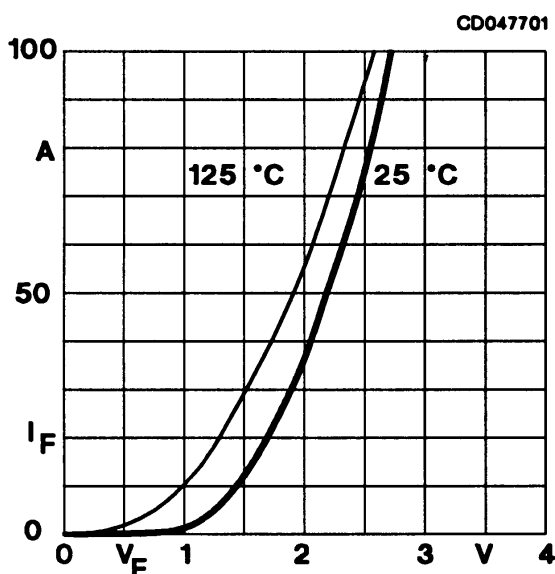


Fig. 17 Typ. CAL diode forward characteristic

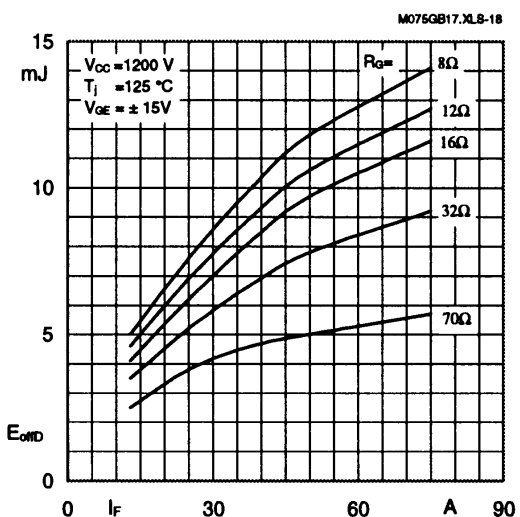


Fig. 18 Typ. Diode turn-off energy dissipation per pulse

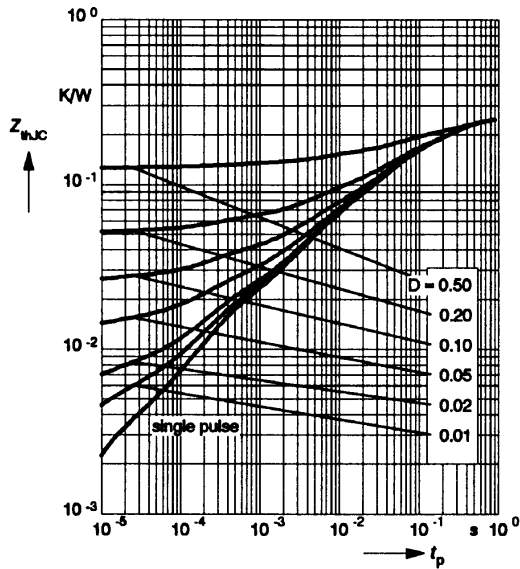


Fig. 19 Transient thermal impedance of IGBT: $Z_{thjc} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

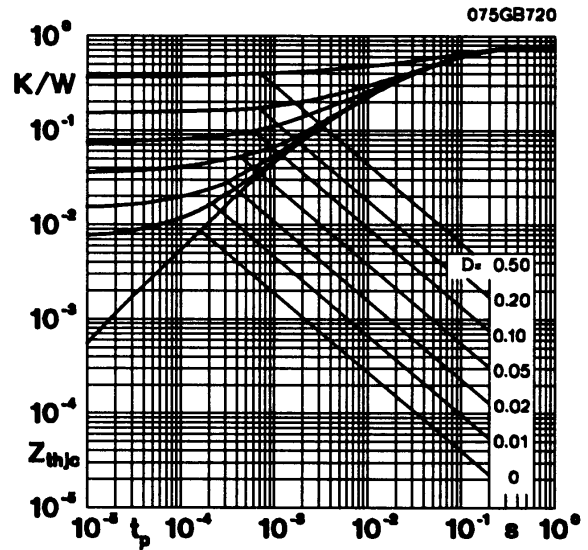


Fig. 20 Transient thermal impedance of inverse diode: $Z_{thjcD} = f(t_p)$

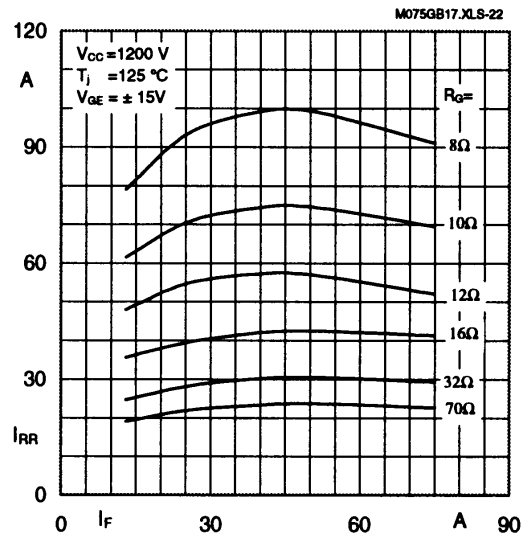


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

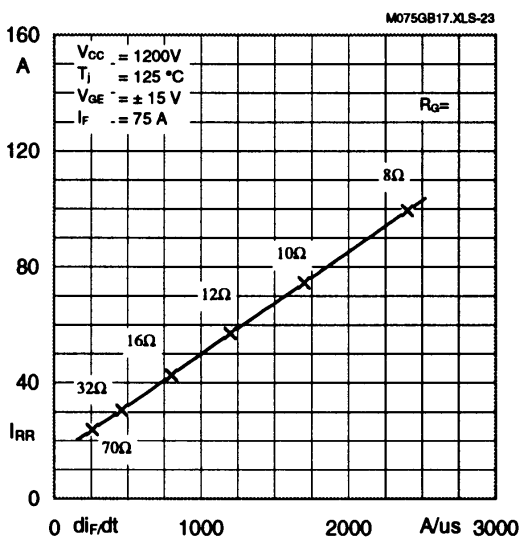


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di_F/dt)$

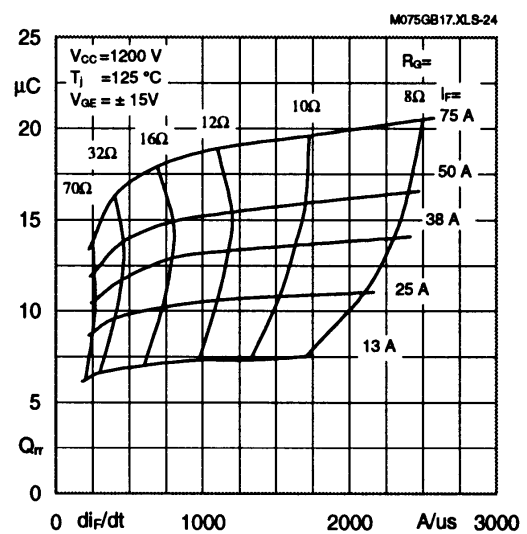


Fig. 24 Typ. CAL diode recovered charge Q_{rr}

SEMITRANS 2

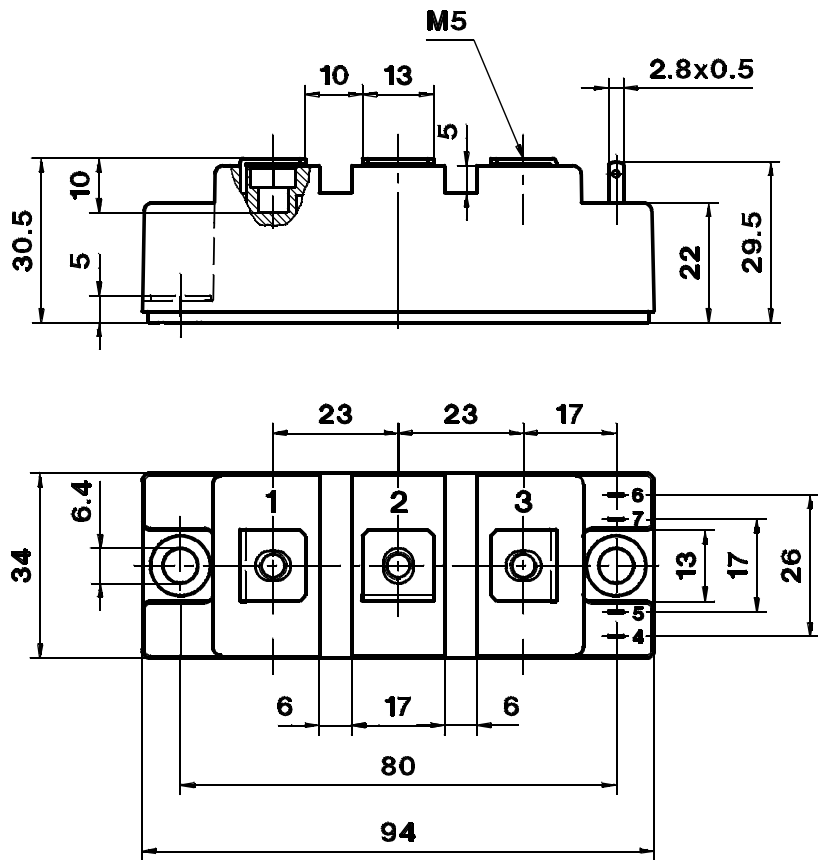
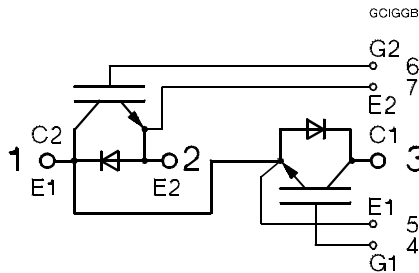
Case D 61

UL Recognized

File no. E 63 532

SKM 75 GB 173 D

CASED61



Dimensions in mm

Case outline and circuit diagrams

Mechanical Data			Values			Units
Symbol	Conditions		min.	typ.	max.	
M ₁	to heatsink, SI Units	(M6)	3	—	5	Nm
	to heatsink, US Units		27	—	44	lb.in.
M ₂	for terminals, SI Units	(M5)	2,5	—	5	Nm
	for terminals US Units		22	—	44	lb.in.
a			—	—	5x9,81	m/s ²
w			—	—	160	g

This is an electrostatic discharge sensitive device (ESDS). Please observe the international standard IEC 747-1, Chapter IX.

Eight devices are supplied in one SEMIBOX A without mounting hardware, which can be ordered separately under Ident No. 33321100 (for 10 SEMITRANS 2) Larger packaging units of 20 or 42 pieces are used if suitable
Accessories → B 6 - 4.
SEMIBOX → C - 1.