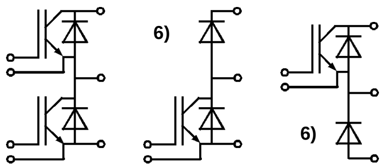
SEMIKRON

SEMITRANS® M Superfast NPT-IGBT Modules

SKM 75 GB 063 D
SKM 75 GAR 063 D 6)
SKM 75 GAL 063 D 6)

SEMITRANS 2



Absolute Maximum Ratings Symbol	Conditions 1)	Values		Units
V_{CES}		600		V
V_{CGR}	R_{GE} = 20 kΩ	600		V
I_C	T_{case} = 25/75 °C	100 / 75		A
I_{CM}	T_{case} = 25/75 °C; t_p = 1 ms	200 / 150		A
V_{GES}		± 20		V
P_{tot}	per IGBT, T_{case} = 25 °C	350		W
T_j, (T_{stg})		–40 ... +(125) 150		°C
V_{isol}	AC, 1 min.	2500		V
humidity	DIN 40040	Class F		
climate	DIN IEC 68 T.1	40/125/56		
Inverse Diode			FWD 6)	
$I_F = –I_C$	T_{case} = 25/80 °C	75 / 50	100 / 75	A
$I_{FM} = –I_{CM}$	T_{case} = 25/80 °C; t_p = 1 ms	200 / 150	260 / 180	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	440	720	A
I^2t	t_p = 10 ms; T_j = 150 °C	970	2600	A^2s

Characteristics Symbol	Conditions 1)	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 2 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	$V_{GE} = V_{CE}$, I_C = 1 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, $V_{CE} = V_{CES}$; T_j = 25 °C	–	0,1	2,3	mA
	V_{GE} = 0, $V_{CE} = V_{CES}$; T_j = 125 °C	–	3	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	150	nA
V_{CEsat}	I_C = 50 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	1,8(2,0)	–	V
V_{CEsat}	I_C = 75 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	2,1(2,4)	2,5(2,8)	V
g_{fs}	V_{CE} = 20 V, I_C = 75 A	25	–	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	4200	–	pF
C_{oes}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	500	–	pF
C_{res}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	300	–	pF
L_{CE}		–	–	30	nH
$t_{d(on)}$	V_{CC} = 300 V; V_{GE} = –15 V / +15 V 3); I_C = 75 A, ind. load; $R_{Gon} = R_{Goff}$ = 15 Ω; T_j = 125 °C	–	60	–	ns
t_r		–	50	–	ns
$t_{d(off)}$		–	350	–	ns
t_f		–	35	–	ns
E_{on}		–	3	–	mWs
E_{off}		–	2,5	–	mWs
Inverse Diode 8)					
$V_F = V_{EC}$	I_F = 50 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	1,45(1,35)	1,7	V
	I_F = 75 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	1,55(1,55)	1,9	V
V_{TO}	T_j = 125 °C	–	–	0,9	V
r_t	T_j = 125 °C	–	10	15	mΩ
I_{RRM}	I_F = 75 A; T_j = 125 °C 2)	–	30	–	A
Q_{rr}	I_F = 75 A; T_j = 125 °C 2)	–	3,7	–	µC
FWD of types “GAL”, “GAR” 8) 6)					
$V_F = V_{EC}$	I_F = 75 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	1,45(1,3)	1,7	V
	I_F = 100 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	1,55(1,55)	1,9	V
V_{TO}	T_j = 125 °C	–	–	0,9	V
r_t	T_j = 125 °C	–	8	11	mΩ
I_{RRM}	I_F = 100 A; T_j = 125 °C	–	44	–	A
Q_{rr}	I_F = 100 A; T_j = 125 °C	–	6,0	–	µC
Thermal characteristics					
R_{thjc}	per IGBT	–	–	0,35	°C/W
R_{thjc}	per diode	–	–	1,0	°C/W
R_{thch}	per module	–	–	0,05	°C/W

6) The free-wheeling diode of the GAL and GAR types have the data of the inverse diodes of SKM 100 GB 063 D

Features

- N channel, homogeneous Silicon structure (NPT- Non punch-through IGBT)
- Low tail current with low temperature dependence
- High short circuit capability, self limiting if term. G is clamped to E
- Pos. temp.-coeff. of V_{CEsat}
- 50 % less turn off losses 9)
- 30 % less short circuit current 9)
- Very low C_{ies}, C_{oes}, C_{res} 9)
- Latch-up free
- Fast & soft inverse CAL diodes 8)
- Isolated copper baseplate using DCB Direct Copper Bonding Technology without hard mould
- Large clearance (10 mm) and creepage distances (20 mm)

Typical Applications

- Switching (not for linear use)
- Switched mode power supplies
- UPS
- Three phase inverters for servo / AC motor speed control
- Pulse frequencies also > 10 kHz

1) T_{case} = 25 °C, unless otherwise specified
2) I_F = – I_C, V_R = 300 V, $–di_F/dt$ = 800 A/µs, V_{GE} = 0 V
3) Use V_{GEoff} = –5... –15 V
8) CAL = Controlled Axial Lifetime Technology
9) Compared to PT-IGBT

Cases and mech. data → B 6 – 20

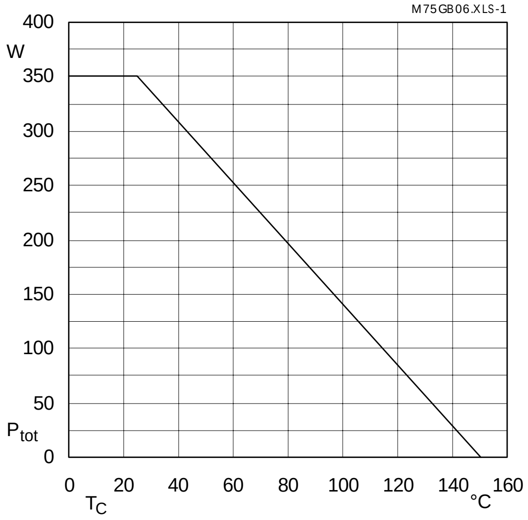


Fig. 1 Rated power dissipation P_{tot} = f (T_C)

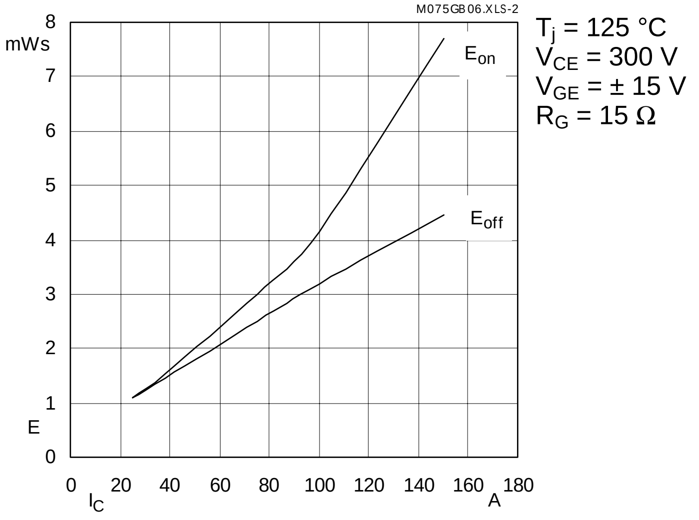


Fig. 2 Turn-on /-off energy = f (I_C)

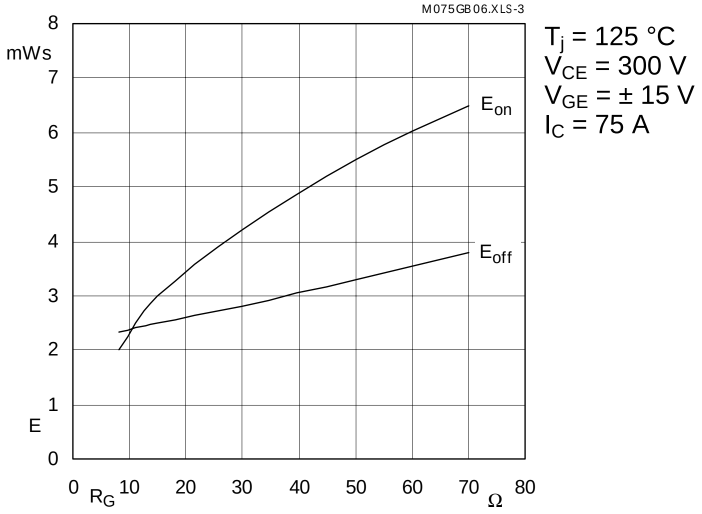


Fig. 3 Turn-on /-off energy = f (R_G)

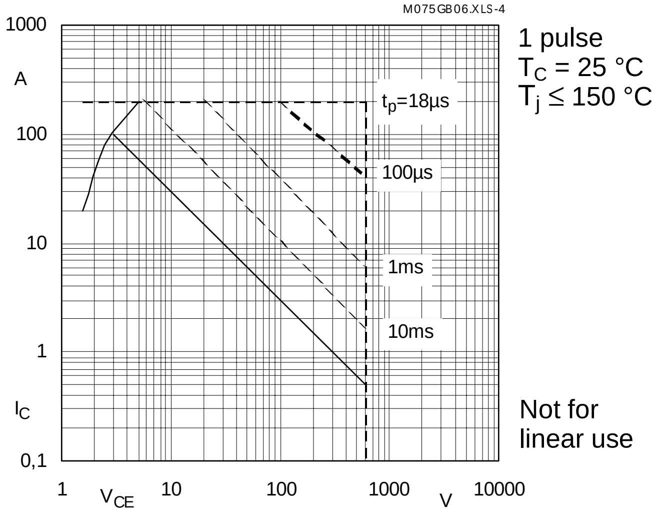


Fig. 4 Maximum safe operating area (SOA) I_C = f (V_{CE})

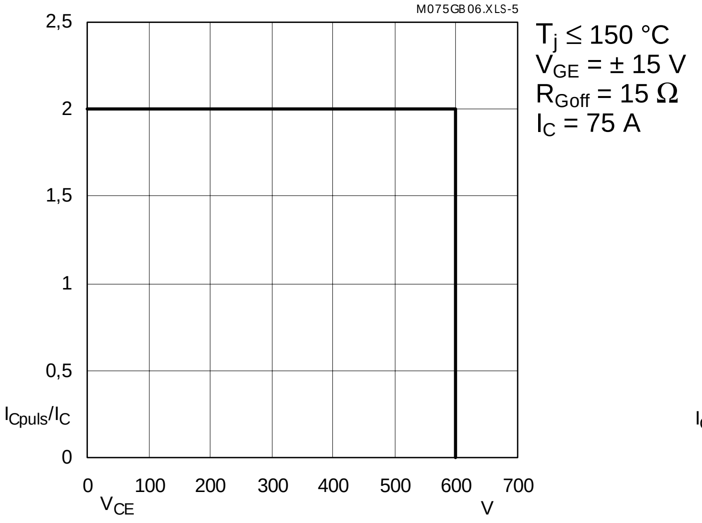


Fig. 5 Turn-off safe operating area (RBSOA)

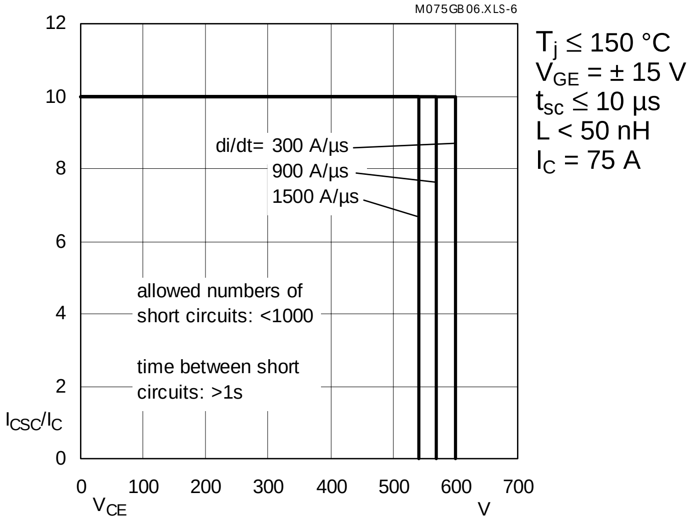


Fig. 6 Safe operating area at short circuit I_C = f (V_{CE})

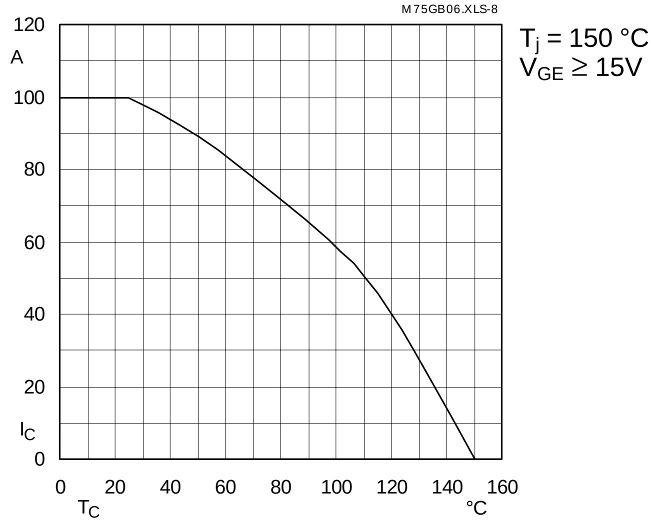


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

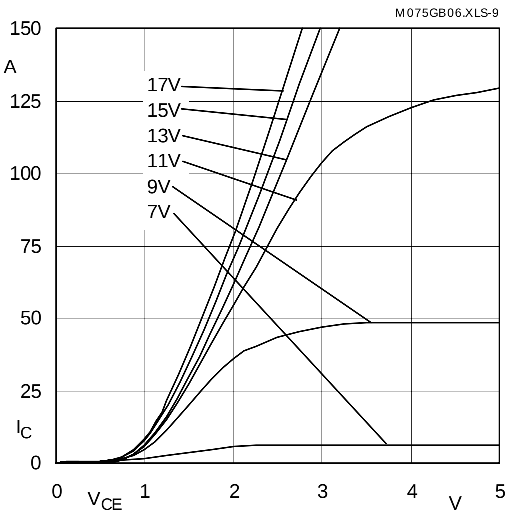


Fig. 9 Typ. output characteristic, t_p = 250 µs; T_j = 25 °C

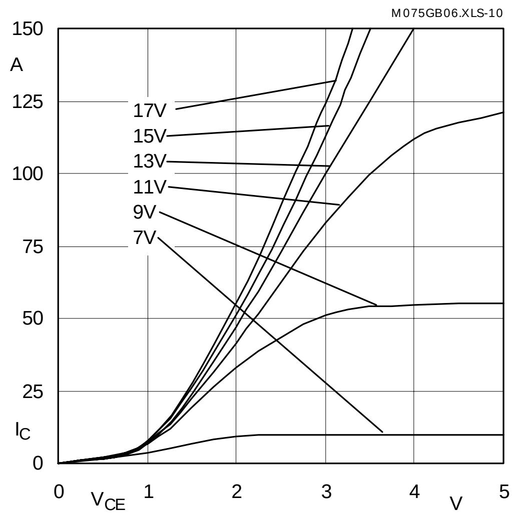


Fig. 10 Typ. output characteristic, t_p = 250 µs; T_j = 125 °C

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

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

$V_{CE(TO)(Tj)} \leq 1{,}2 - 0{,}001\ (T_j - 25)$ [V]

typ.: $r_{CE(Tj)} = 0{,}0120 + 0{,}000053\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}0173 + 0{,}000053\ (T_j - 25)$ [Ω]

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

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

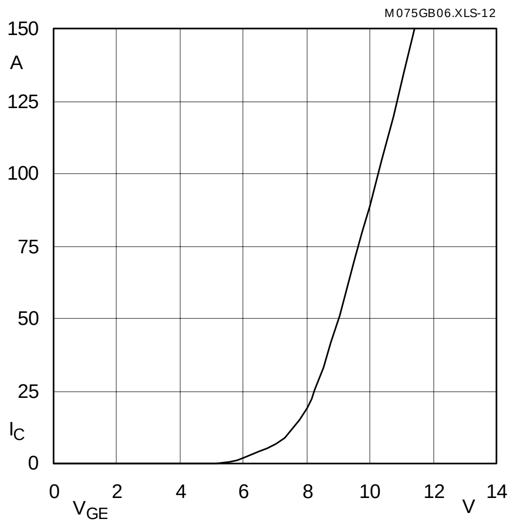


Fig. 12 Typ. transfer characteristic, t_p = 250 µs; V_{CE} = 20 V

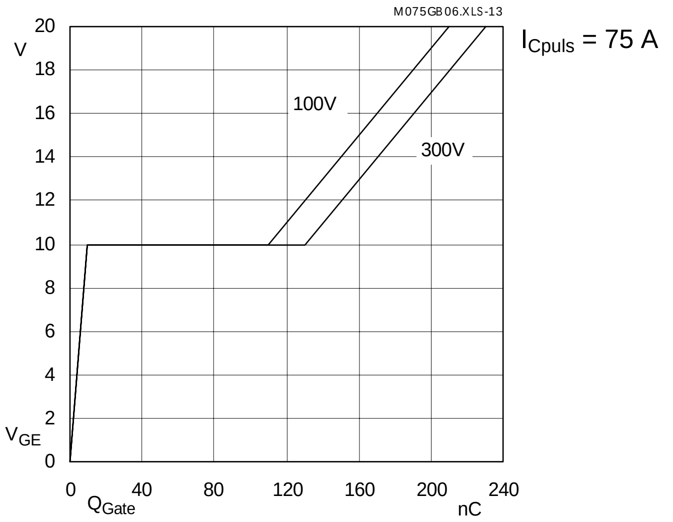


Fig. 13 Typ. gate charge characteristic

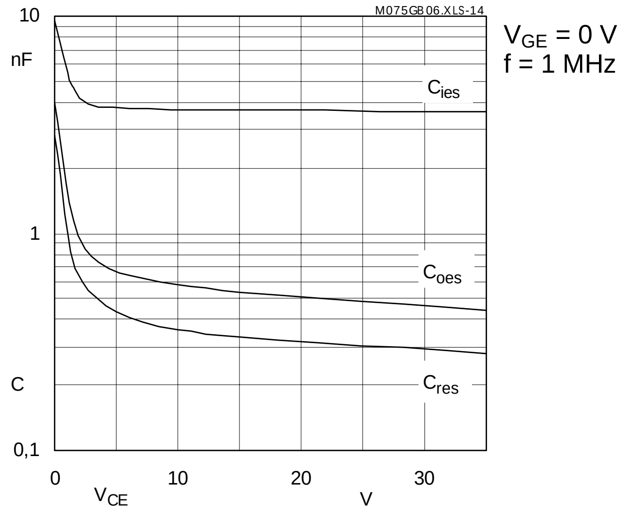


Fig. 14 Typ. capacitances vs. V_{CE}

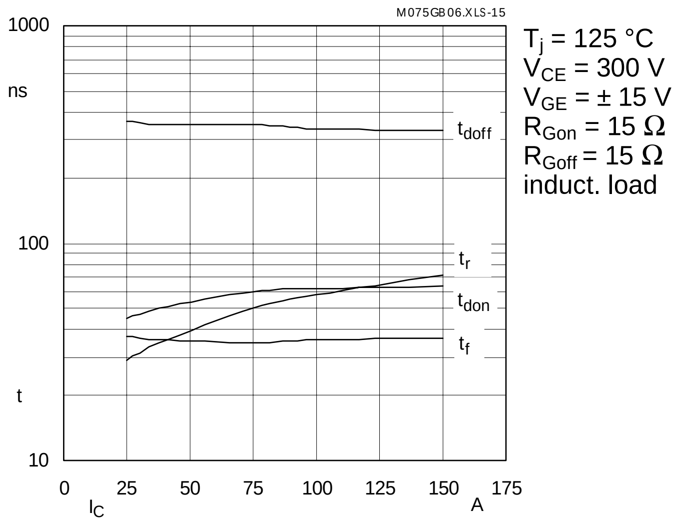


Fig. 15 Typ. switching times vs. I_C

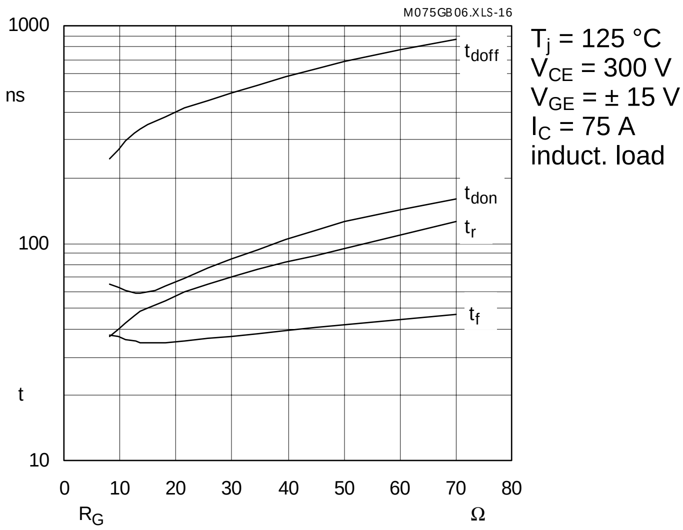


Fig. 16 Typ. switching times vs. gate resistor R_G

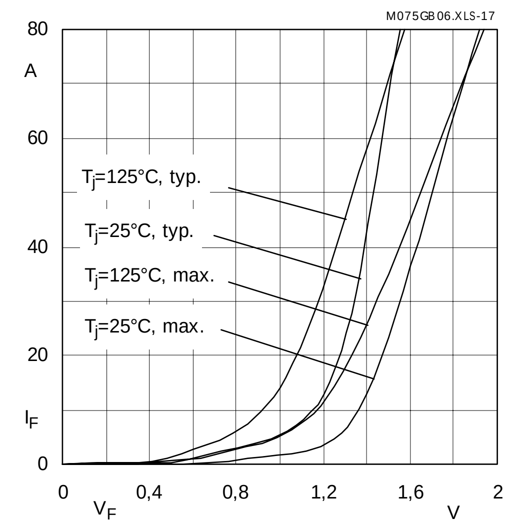


Fig. 17 Typ. CAL diode forward characteristic

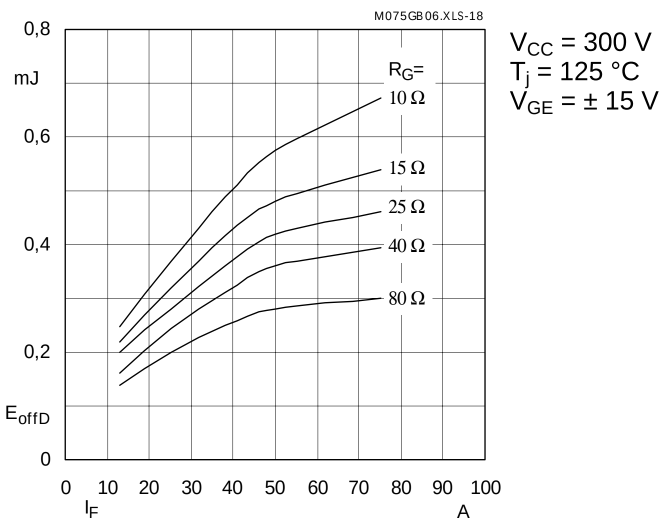


Fig. 18 Diode turn-off energy dissipation per pulse

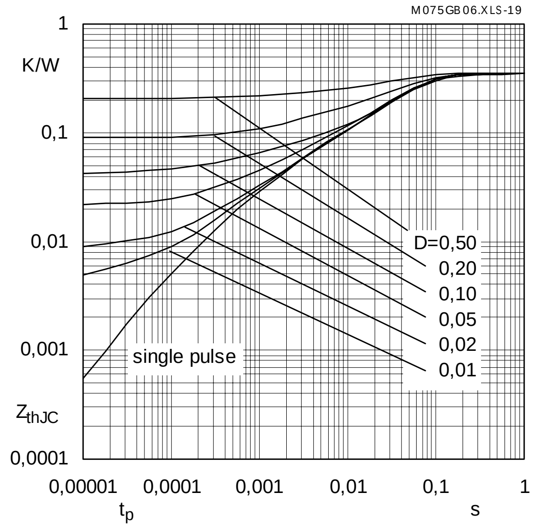


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

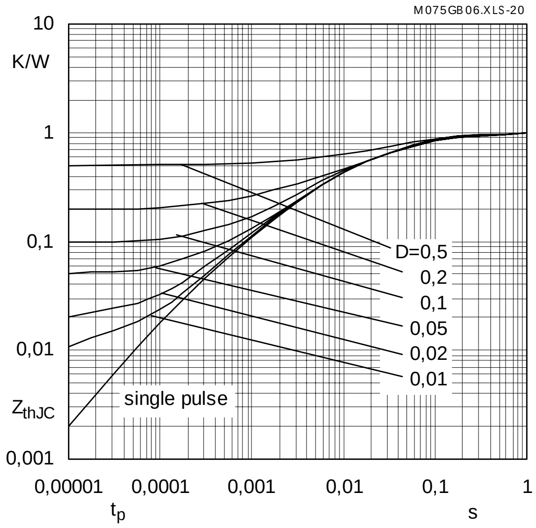
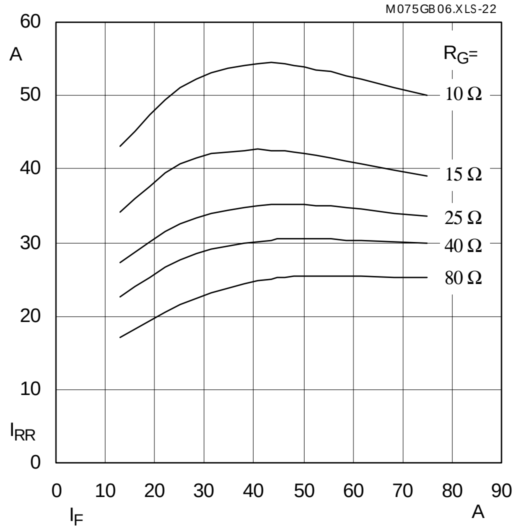
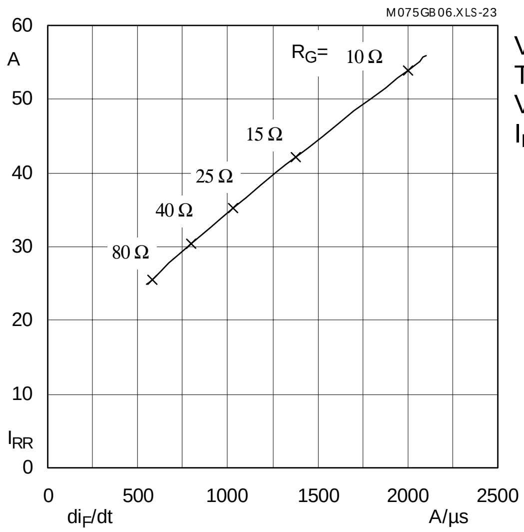


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$



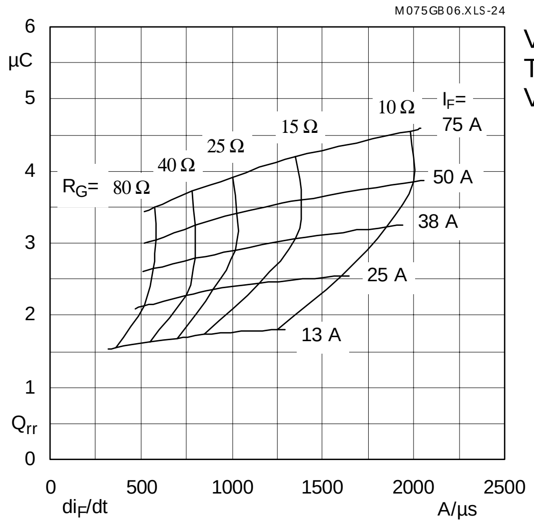
V_{CC} = 300 V
T_j = 125 °C
V_{GE} = ± 15 V

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



V_{CC} = 300 V
T_j = 125 °C
V_{GE} = ± 15 V
I_F = 50 A

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



V_{CC} = 300 V
T_j = 125 °C
V_{GE} = ± 15 V

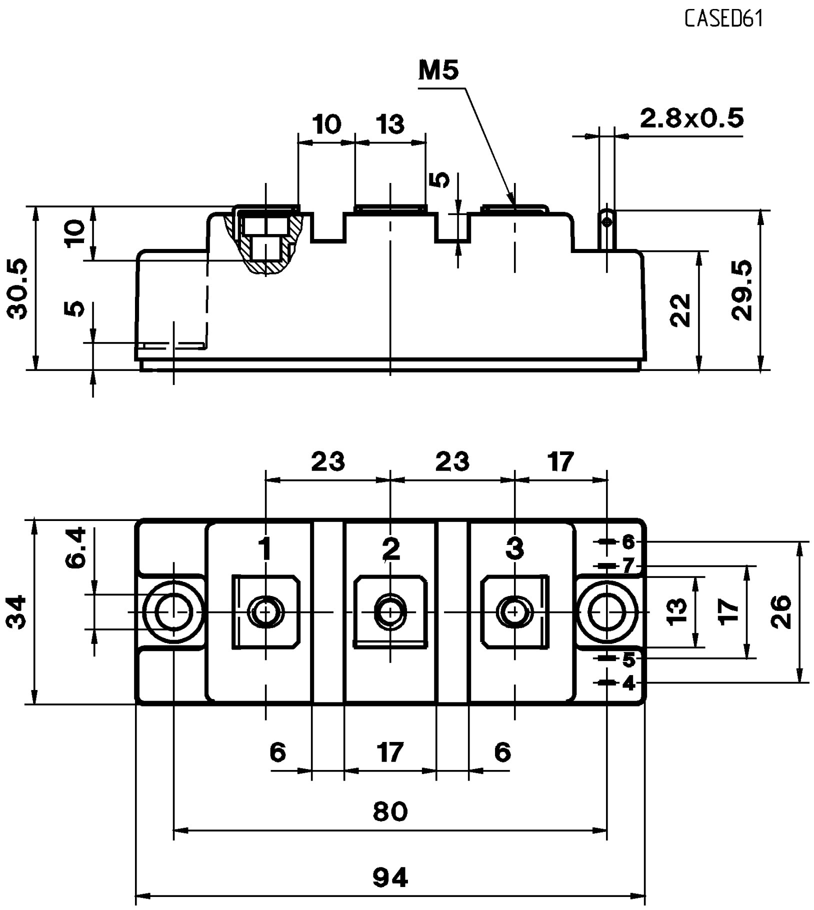
Fig. 24 Typ. CAL diode recovered charge

SEMITRANS 2

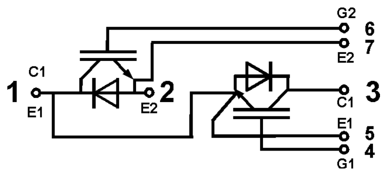
Case D 61

UL Recognized

File no. E 63 532



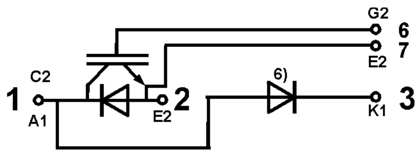
SKM 75 GB 063 D



Dimensions in mm

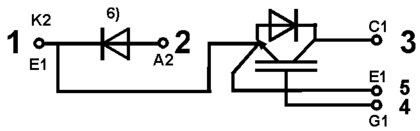
SKM 75 GAL 063 D

Case D 62 (→ D 61)



SKM 75 GAR 063 D

Case D 63 (→ D 61)



Case outline and circuit diagrams

Mechanical Data					
Symbol	**Conditions**	**Values**			**Units**
		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/s²
w		–	–	160	g

6) Freewheeling diode → B 6 – 15, remark 6.

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 packing units of 20 or 42 pieces are used if suitable

Accessories → B 6 – 4

SEMIBOX → C - 1.

