SEMIKRON

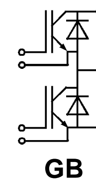
Absolute Maximum Ratings		Values	
Symbol	Conditions [1]		Units
V_{CES}		1200	V
V_{CGR}	R_{GE} = 20 kΩ	1200	V
I_C	T_{case} = 25/80 °C	100 / 80	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	200 / 160	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	690	W
T_j, (T_{stg})		–40 ... + 150 (125)	°C
V_{isol}	AC, 1 min.	2500	V
humidity	IEC 60721-3-3	class 3K7/IE32	
climate	IEC 68 T.1	40/125/56	
Inverse Diode			
$I_F = -I_C$	T_{case} = 25/80 °C	95 / 65	A
$I_{FM} = -I_{CM}$	T_{case} = 25/80 °C; t_p = 1 ms	200 / 160	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	720	A
I^2t	t_p = 10 ms; T_j = 150 °C	2600	A^2s

Characteristics					
Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 4 mA	≥ V_{CES}			V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 25 °C		0,1	1,5	mA
	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 125 °C		6		mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0			300	nA
V_{CEsat}	I_C = 75 A; V_{GE} = 15 V; T_j = 25 °C		3,3	3,65	V
V_{CEsat}	I_C = 100 A; V_{GE} = 15 V; T_j = 25 °C		3,8		V
g_{fs}	V_{CE} = 20 V, I_C = 75 A	31			S
C_{CHC}	per IGBT			350	pF
C_{ies}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz		5	6,6	nF
C_{oes}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz		720	900	pF
C_{res}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz		380	500	pF
L_{CE}				25	nH
$t_{d(on)}$	V_{CC} = 600 V; V_{GE} = –15 V / +15 V [3]; I_C = 75 A, ind. load; R_{Gon} = R_{Goff} = 8 Ω; T_j = 125 °C		80		ns
t_r			40		ns
$t_{d(off)}$			360		ns
t_f			20		ns
E_{on}			9		mWs
E_{off}			3,5		mWs
Inverse Diode [8]					
$V_F = V_{EC}$	I_F = 75 A; V_{GE} = 0 V; T_j = 25 (125) °C		2,0(1,8)	2,5	V
$V_F = V_{EC}$	I_F = 100 A; V_{GE} = 0 V; T_j = 25 (125) °C		2,25(2,05)		V
V_{TO}	T_j = 125 °C			1,2	V
r_t	T_j = 125 °C		12	15	mΩ
I_{RRM}	I_F = 75 A; T_j = 25 (125) °C [2]		27(40)		A
Q_{rr}	I_F = 75 A; T_j = 25 (125) °C [2]		3(10)		µC
Thermal characteristics					
R_{thjc}	per IGBT			0,18	°C/W
R_{thjc}	per diode			0,50	°C/W
R_{thch}	per module			0,05	°C/W

SEMITRANS® M
Ultra Fast IGBT Modules

SKM 100 GB 125 DN

SEMITRANS 2N (low inductance)



GB

Features

- N channel, homogeneous Si
- Low inductance case
- **Short tail** current with low temperature dependence
- High short circuit capability, self limiting to 6 * I_{cnom}
- Fast & soft inverse CAL diodes [8]
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (10 mm) and creepage distances (20 mm)

Typical Applications

- Switched mode power supplies at f_{sw} > 20 kHz
- Resonant inverters up to 100 kHz
- Inductive heating
- Electronic welders at f_{sw} > 20 kHz

[1] T_{case} = 25 °C, unless otherwise specified
[2] $I_F = -I_C$, V_R = 600 V, $-di_F/dt$ = 800 A/µs, V_{GE} = 0 V
[3] Use V_{GEoff} = –5... –15 V
[8] CAL = Controlled Axial Lifetime Technology

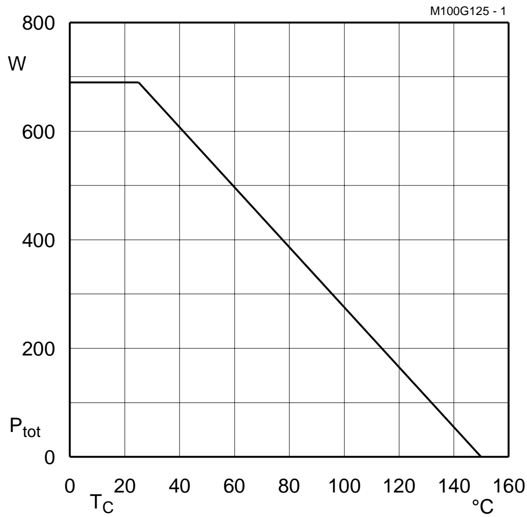


Fig. 1 Rated power dissipation P_{tot} = f (T_C)

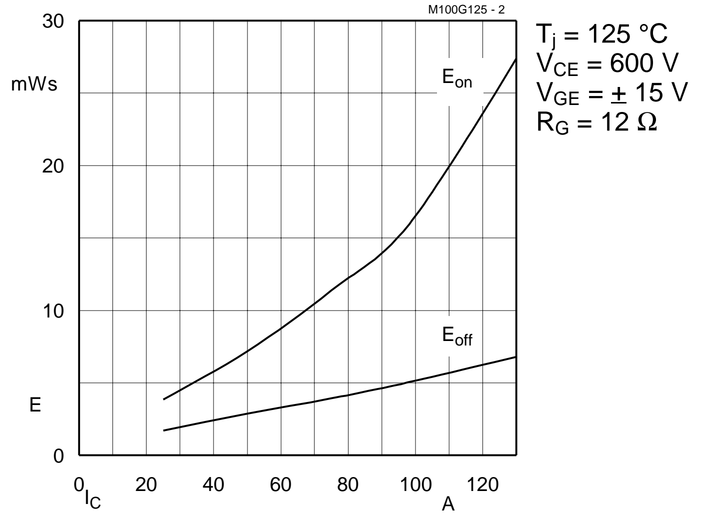


Fig. 2 Turn-on /-off energy = f (I_C)

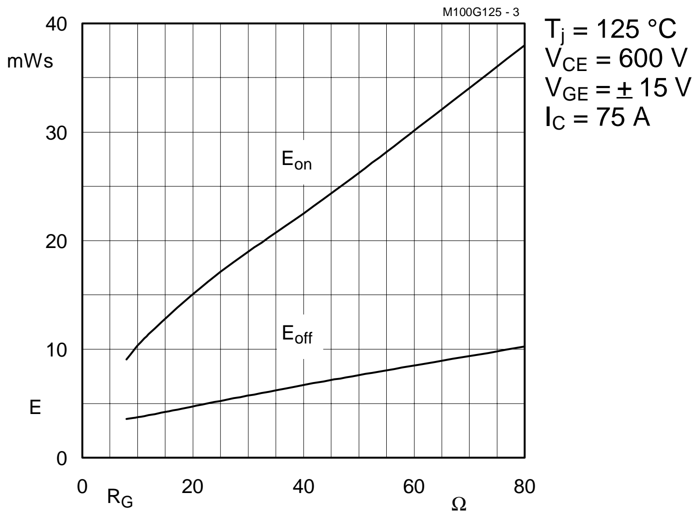


Fig. 3 Turn-on /-off energy = f (R_G)

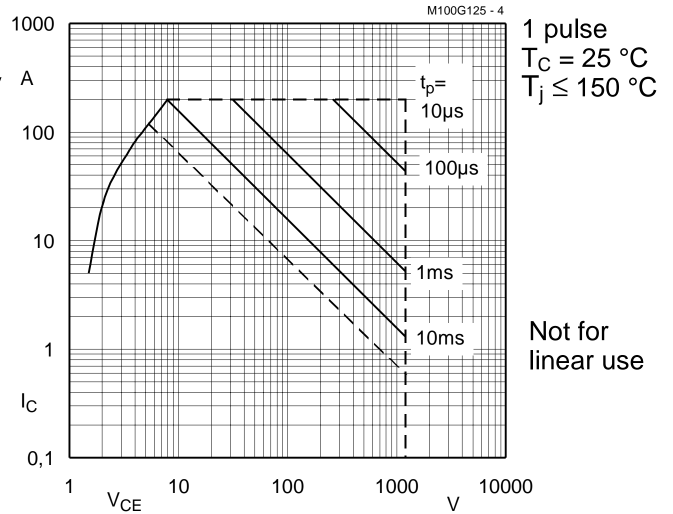


Fig. 4 Maximum safe operating area (SOA) I_C = f (V_{CE})

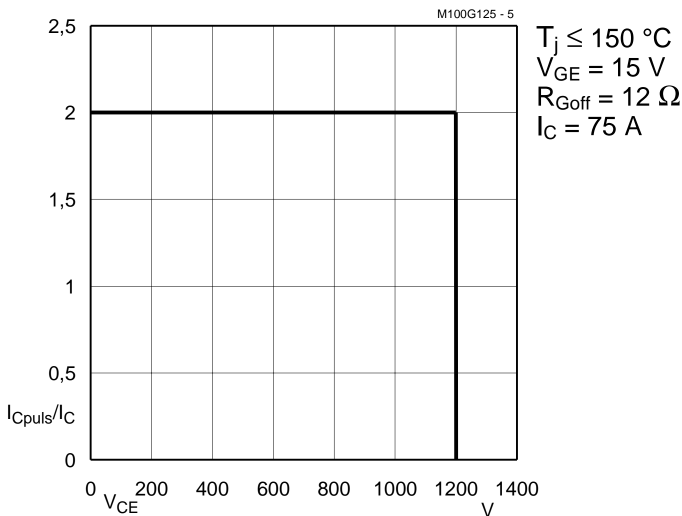


Fig. 5 Turn-off safe operating area (RBSOA)

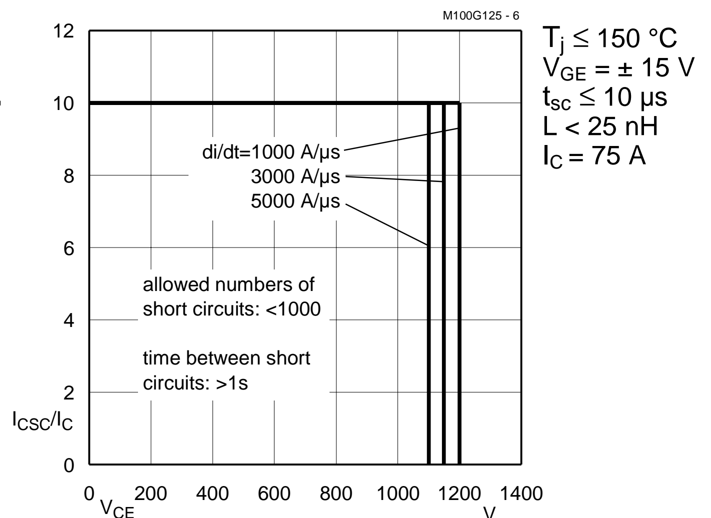


Fig. 6 Safe operating area at short circuit I_C = f (V_{CE})

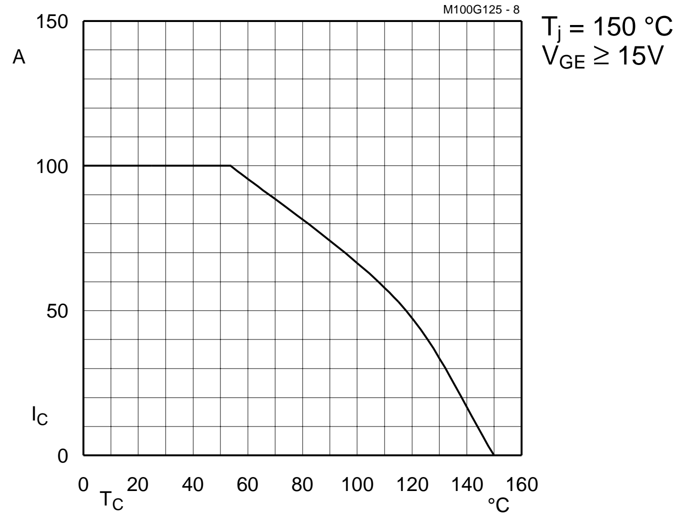


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

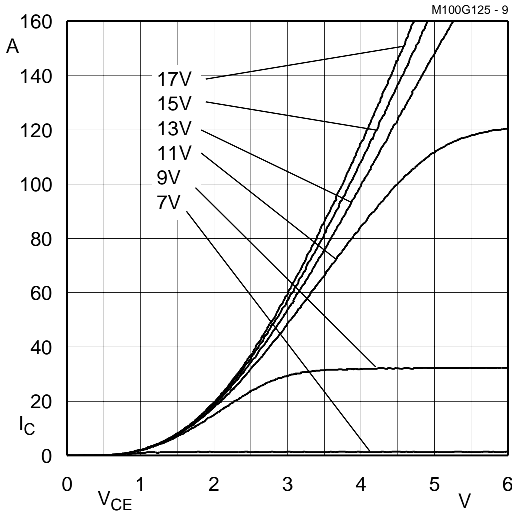


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

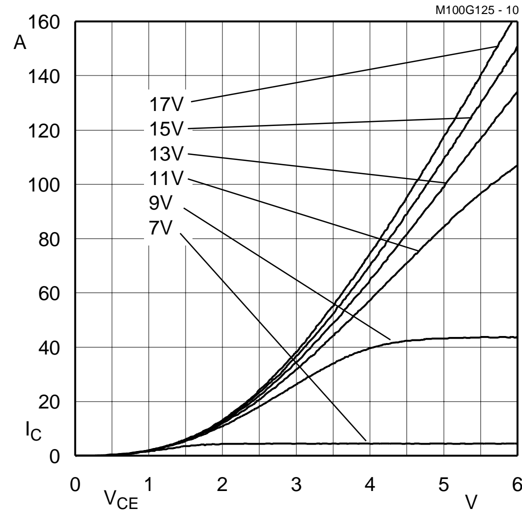


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

$V_{CE(TO)(Tj)} \leq 1{,}4 + 0{,}003\ (T_j - 25)$ [V]

typ.: $r_{CE(Tj)} = 0{,}0253 + 0{,}000067\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}0307 + 0{,}00004\ (T_j - 25)$ [Ω]

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

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

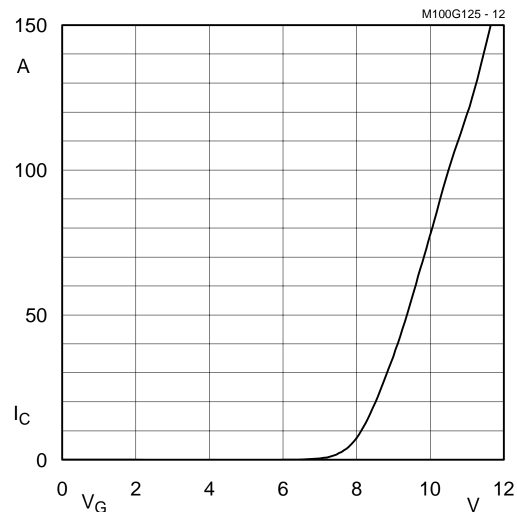


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V

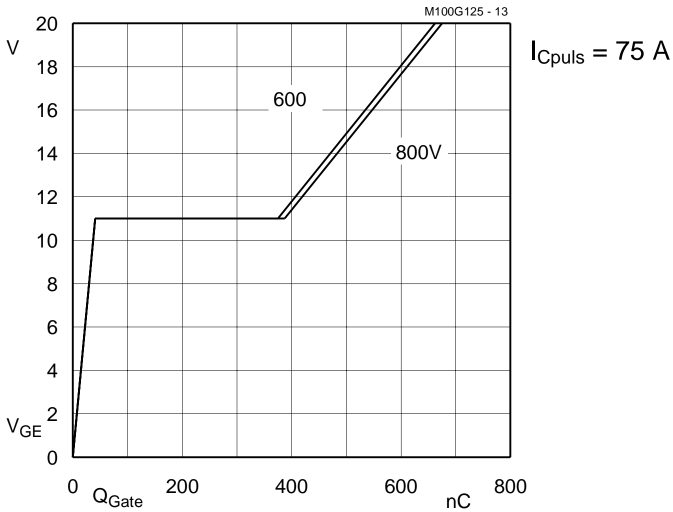


Fig. 13 Typ. gate charge characteristic

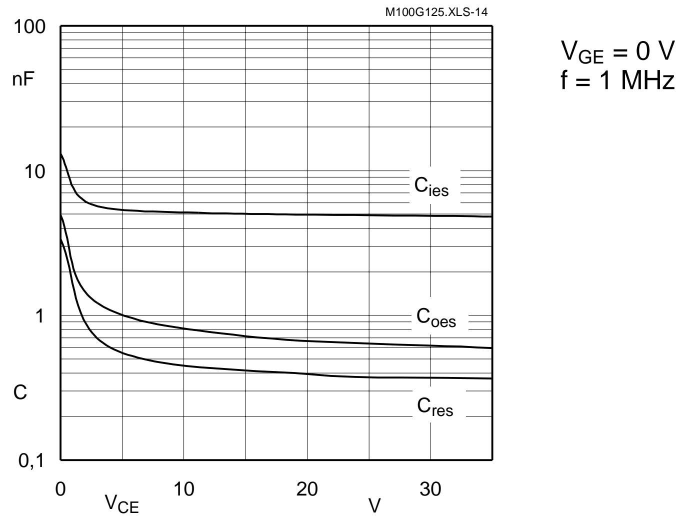


Fig. 14 Typ. capacitances vs. V_{CE}

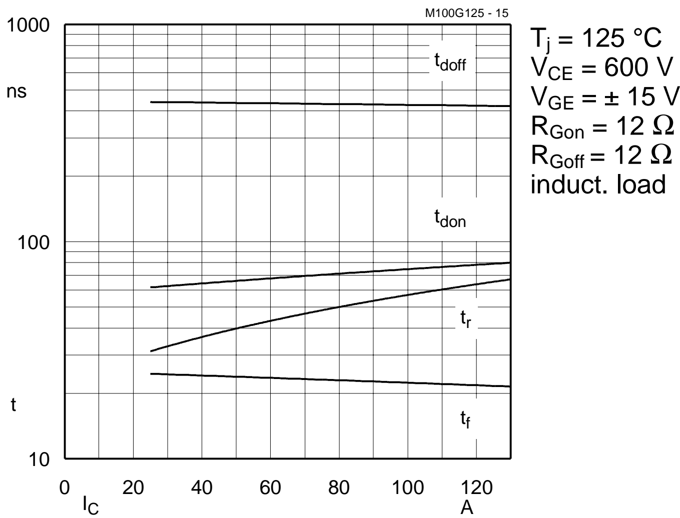


Fig. 15 Typ. switching times vs. I_C

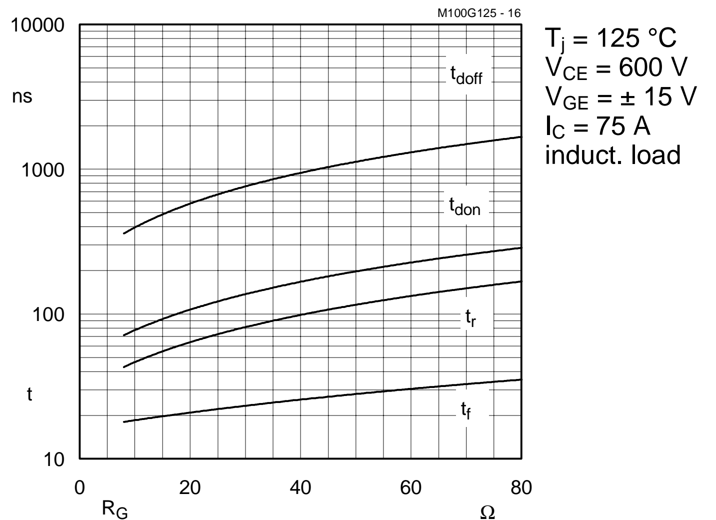


Fig. 16 Typ. switching times vs. gate resistor R_G

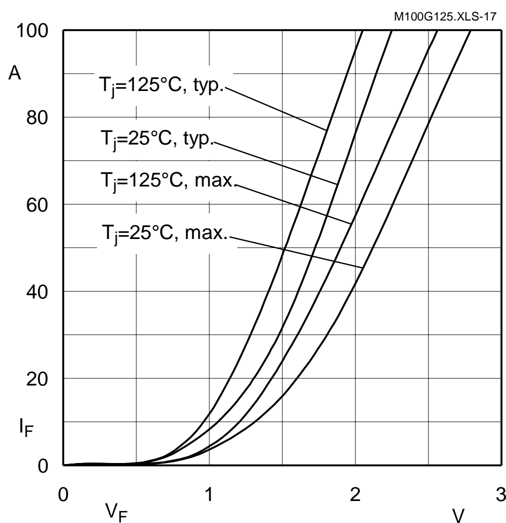


Fig. 17 Typ. CAL diode forward characteristic

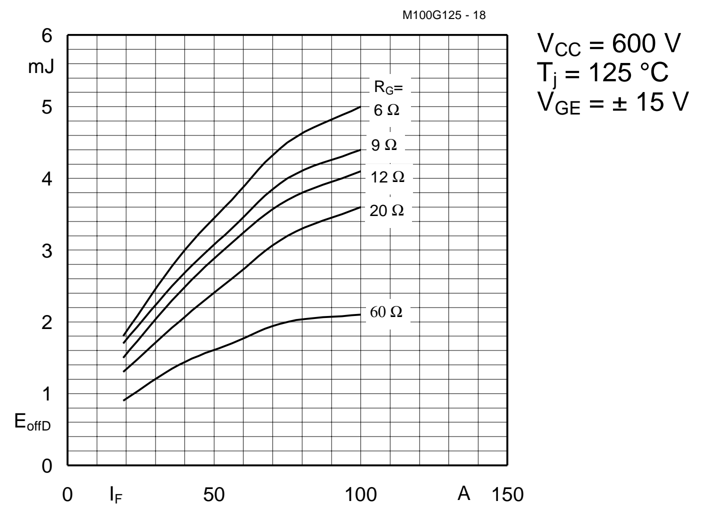


Fig. 18 Diode turn-off energy dissipation per pulse

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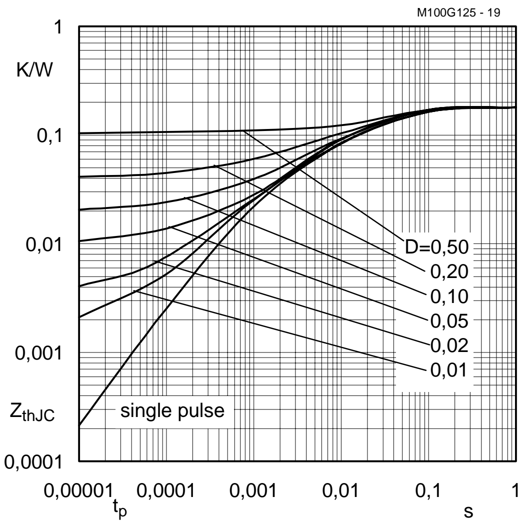

Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

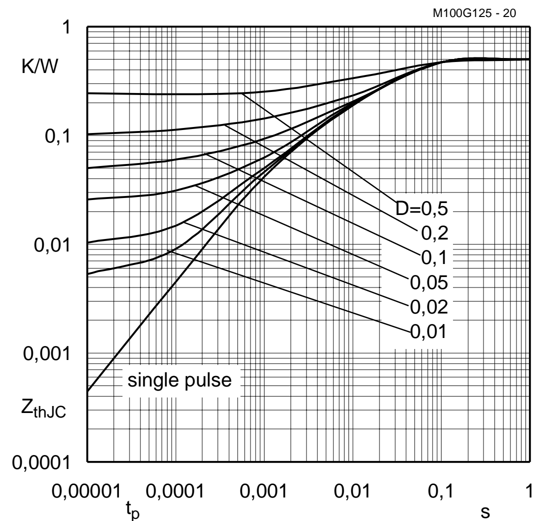

Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thjc} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

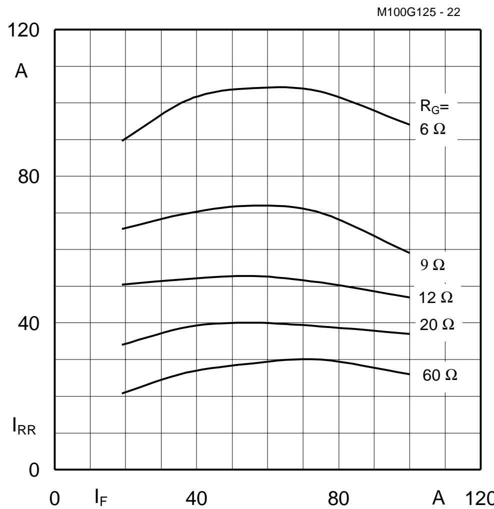

Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

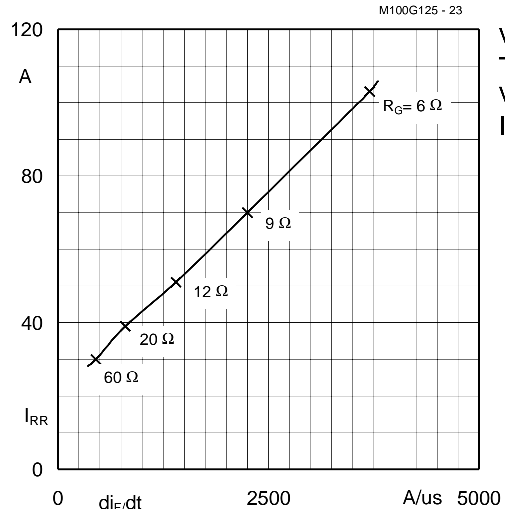

Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di/dt)$

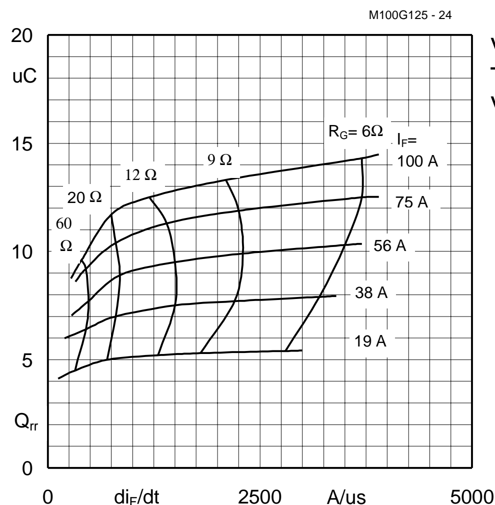

Fig. 24 Typ. CAL diode recovered charge $Q_{rr} = f(di/dt)$

SEMITRANS 2N (low inductance)

Case D 93
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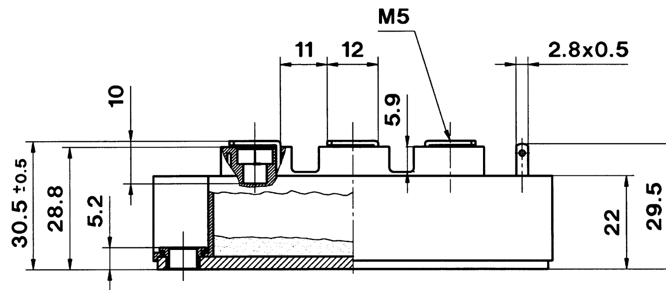
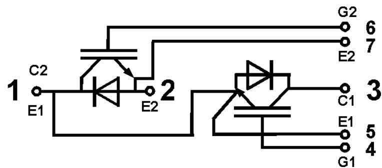
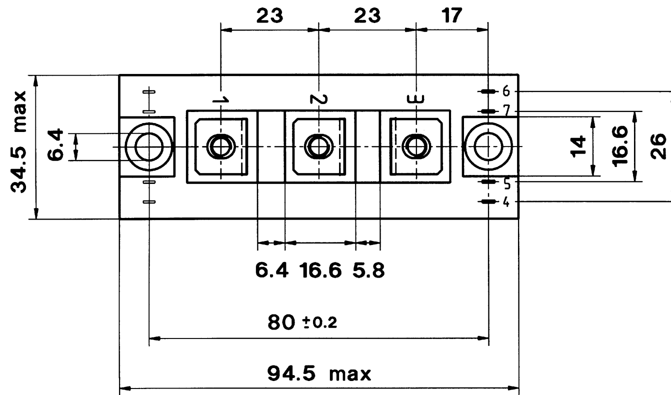
File no. E 63 532

SKM 100 GB 125 DN







Dimensions in mm

Case outline and circuit diagram

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/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 packing units of 20 and 42 pieces are used if suitable

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.