back
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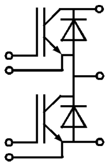
SEMITRANS® M
Low Loss IGBT Modules

SKM 100 GB 124 D

Absolute Maximum Ratings Symbol	Conditions 1)	Values	Units
V_{CES}		1200	V
V_{CGR}	R_{GE} = 20 kΩ	1200	V
I_C	T_{case} = 25/85 °C	150 / 100	A
I_{CM}	T_{case} = 25/85 °C; t_p = 1 ms	300 / 200	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	700	W
T_j, (T_{stg})		–40 ... + 150 (125)	°C
V_{isol}	AC, 1 min.	2 500	V
humidity	DIN 40040	Class F	
climate	DIN 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	300 / 200	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 } T_j = 25 °C	–	0,1	1,5	mA
	$V_{CE} = V_{CES}$ } 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;	–	2,1(2,4)	2,45(2,85)	V
V_{CEsat}	I_C = 100 A { T_j = 25 (125) °C	–	2,5(3,0)	–	V
g_{fs}	V_{CE} = 20 V, I_C = 75 A	31	–	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0	–	5	6,6	nF
C_{oes}	V_{CE} = 25 V	–	720	900	pF
C_{res}	f = 1 MHz	–	380	500	pF
L_{CE}		–	–	30	nH
$t_{d(on)}$	V_{CC} = 600 V	–	80	–	ns
t_r	V_{GE} = –15 V / +15 V 3)	–	45	–	ns
$t_{d(off)}$	I_C = 75 A, ind. load	–	430	–	ns
t_f	$R_{Gon} = R_{Goff}$ = 10 Ω	–	55	–	ns
E_{on} 5)	T_j = 125 °C	–	11	–	mWs
E_{off} 5)		–	9	–	mWs
Inverse Diode 8)					
$V_F = V_{EC}$	I_F = 75 A { V_{GE} = 0 V;	–	2,0(1,8)	2,5	V
$V_F = V_{EC}$	I_F = 100 A { T_j = 25 (125) °C	–	2,25(2,05)	–	V
V_{TO}	T_j = 125 °C	–	1,1	1,2	V
r_t	T_j = 125 °C	–	–	15	mΩ
I_{RRM}	I_F = 75 A; T_j = 125 °C 2)	–	42	–	A
Q_{rr}	I_F = 75 A; T_j = 125 °C 2)	–	9,1	–	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 2



GB

Features

- MOS input (voltage controlled)
- N channel, homogeneous Silicon structure (NPT- Non punch-through IGBT)
- Low loss high density chip
- Low tail current
- 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 Technology without hard mould
- Large clearance (10 mm) and creepage distances (20 mm)

Typical Applications:

→ **B 6 – 121**

- Switching (not for linear use)

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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

5) See fig. 2 + 3; R_{Goff} = 10 Ω

8) CAL = Controlled Axial Lifetime Technology

Cases and mech. data

→ **B 6 – 122**

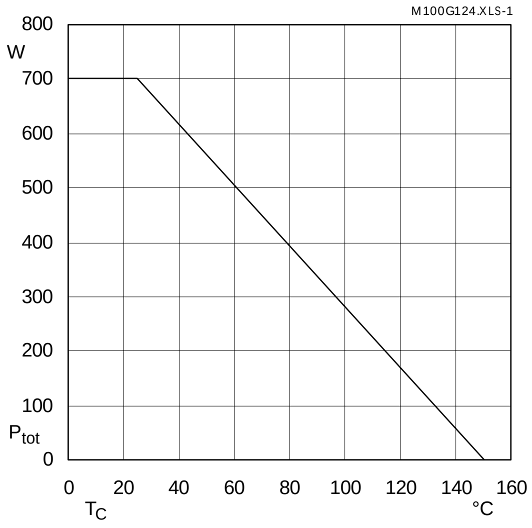
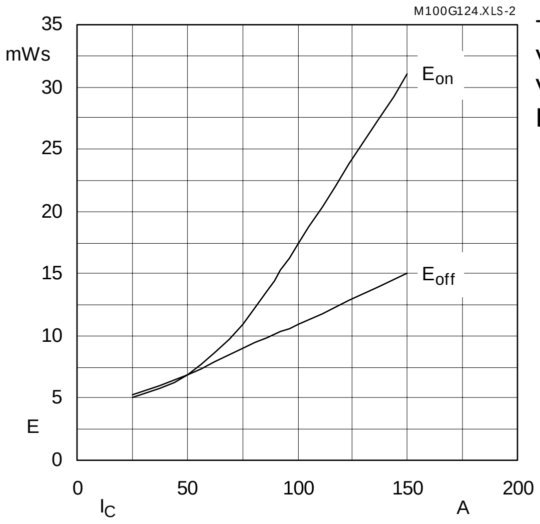
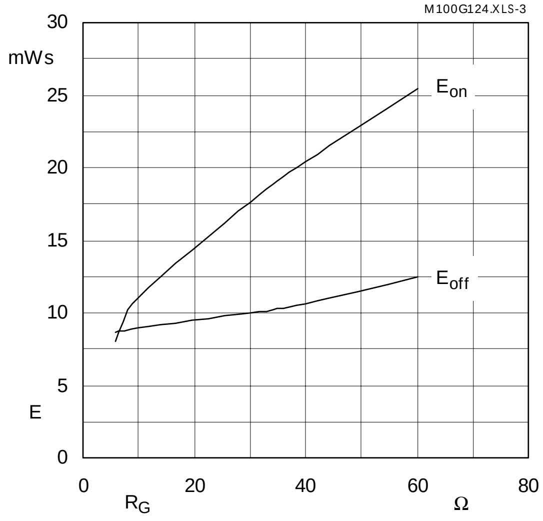


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$



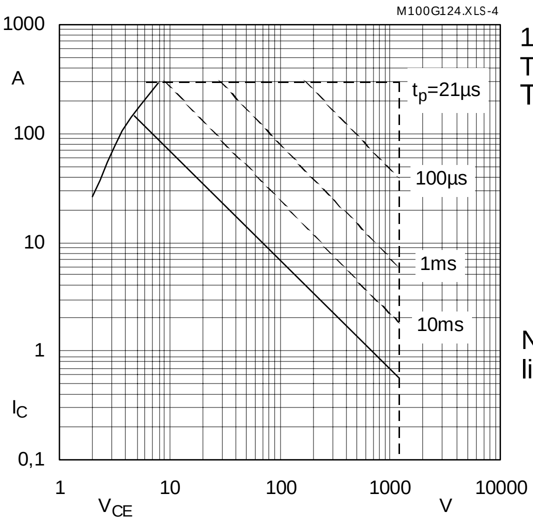
$T_j = 125$ °C
$V_{CE} = 600$ V
$V_{GE} = \pm 15$ V
$R_G = 10\ \Omega$

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



$T_j = 125$ °C
$V_{CE} = 600$ V
$V_{GE} = \pm 15$ V
$I_C = 75$ A

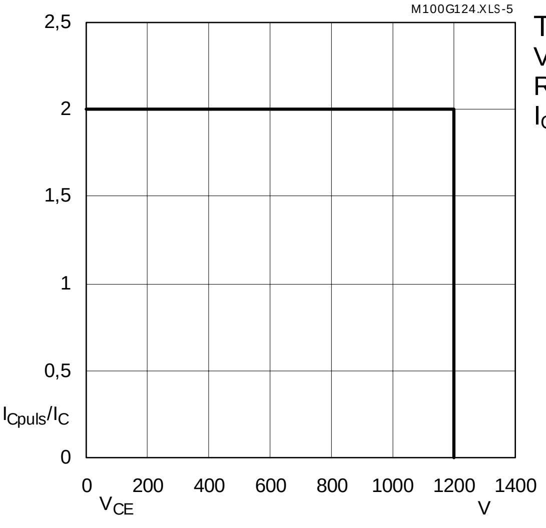
Fig. 3 Turn-on /-off energy = f (R_G)



1 pulse
$T_C = 25$ °C
$T_j \leq 150$ °C

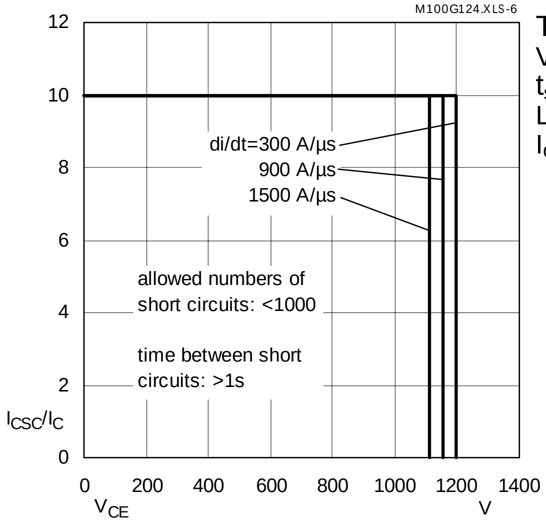
Not for linear use

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



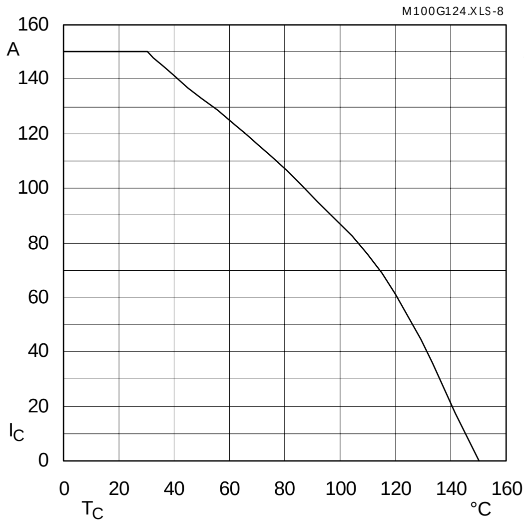
$T_j \leq 150$ °C
$V_{GE} = 15$ V
$R_{Goff} = 10\ \Omega$
$I_C = 75$ A

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



$T_j \leq 150$ °C
$V_{GE} = \pm 15$ V
$t_{sc} \leq 10$ µs
L < 25 nH
$I_C = 75$ A

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



T_j = 150 °C
$V_{GE} \geq 15V$

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

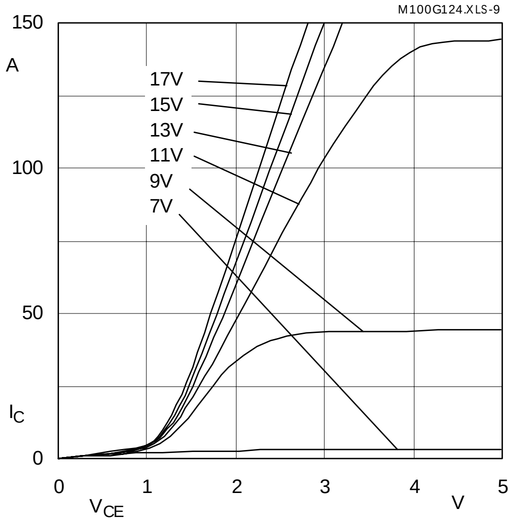


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

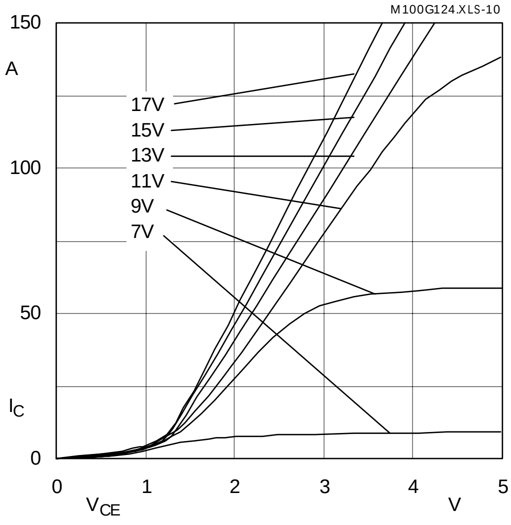


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

$V_{CE(TO)(Tj)} \leq 1{,}3 + 0{,}0005\ (T_j - 25)$ [V]

typ.: $r_{CE(Tj)} = 0{,}0107 + 0{,}000033\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}0153 + 0{,}000047\ (T_j - 25)$ [Ω]

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

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

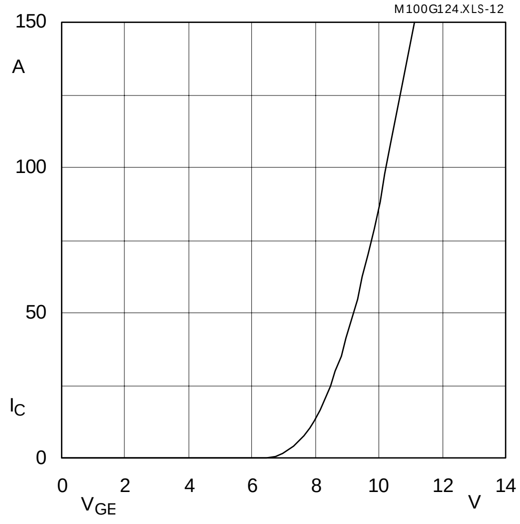


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V

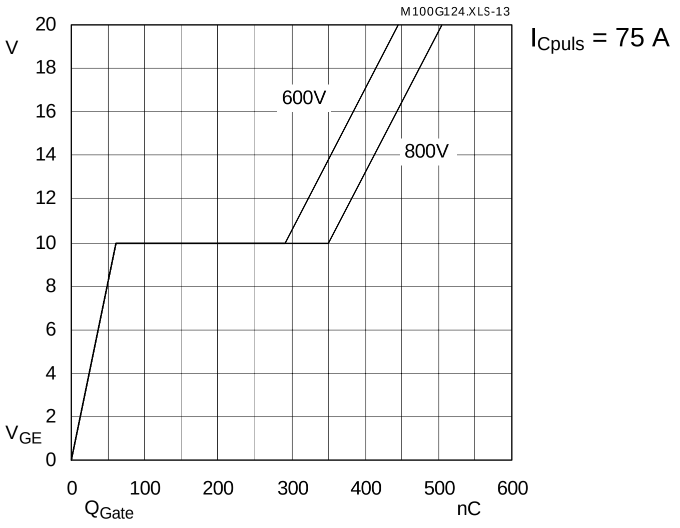


Fig. 13 Typ. gate charge characteristic

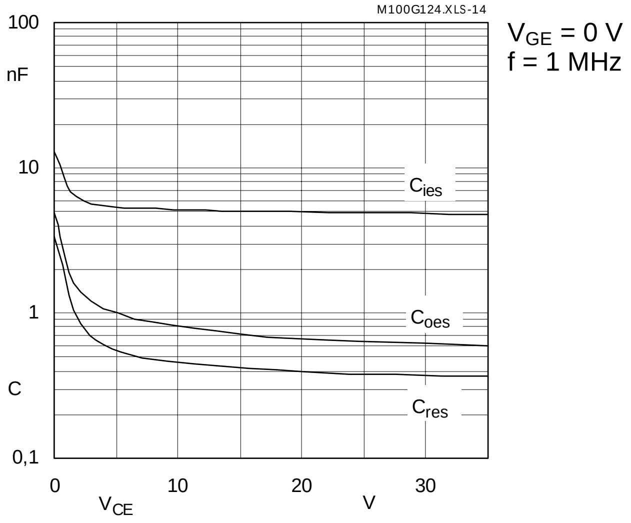


Fig. 14 Typ. capacitances vs.V_{CE}

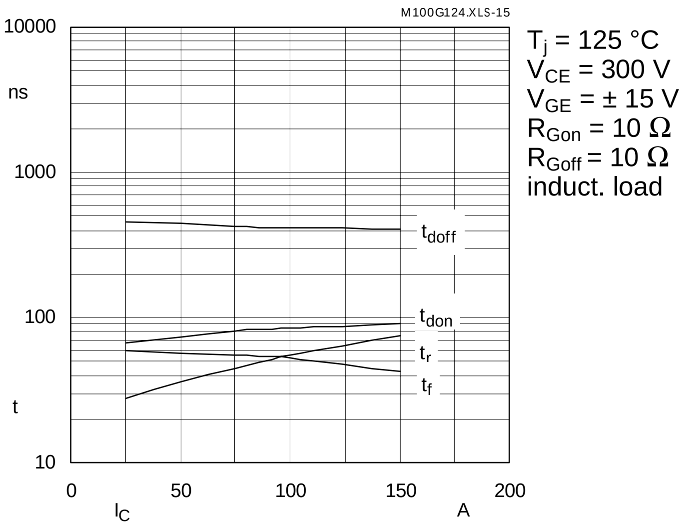


Fig. 15 Typ. switching times vs. I_C

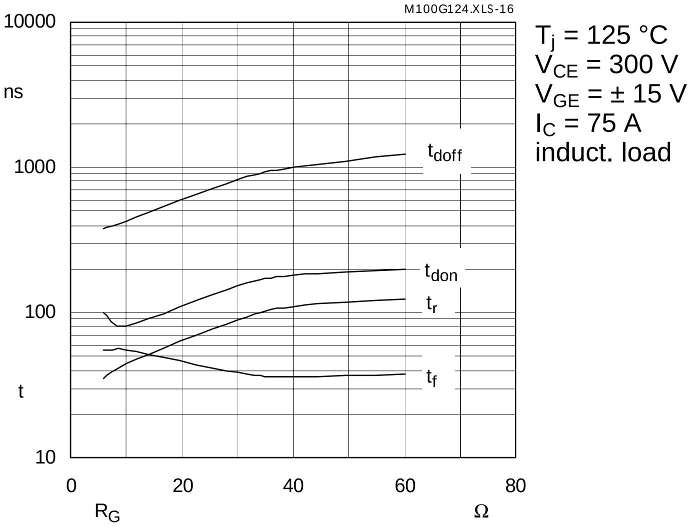


Fig. 16 Typ. switching times vs. gate resistor R_G

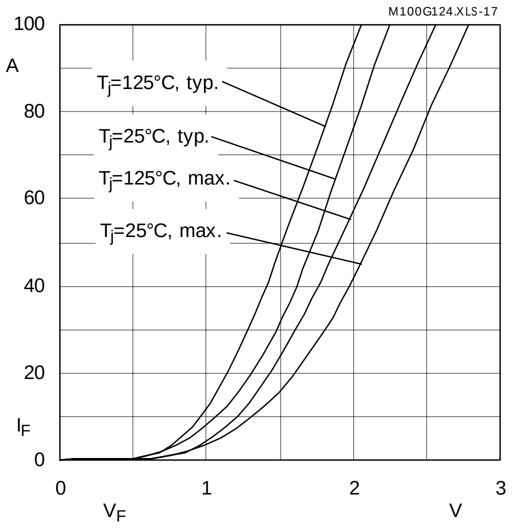


Fig. 17 Typ. CAL diode forward characteristic

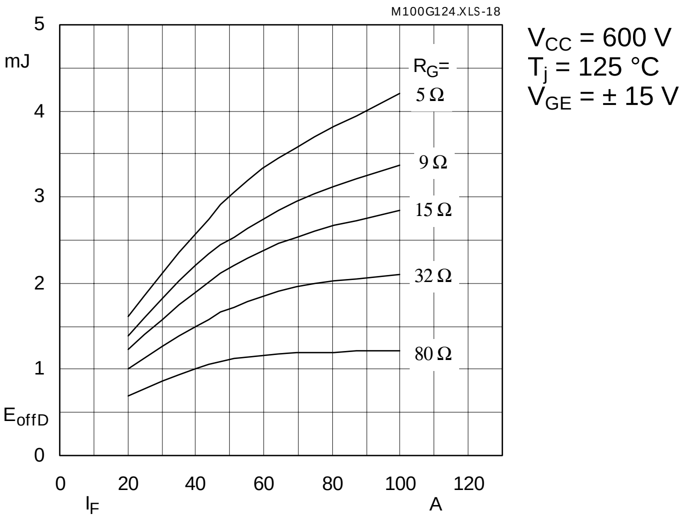


Fig. 18 Diode turn-off energy dissipation per pulse

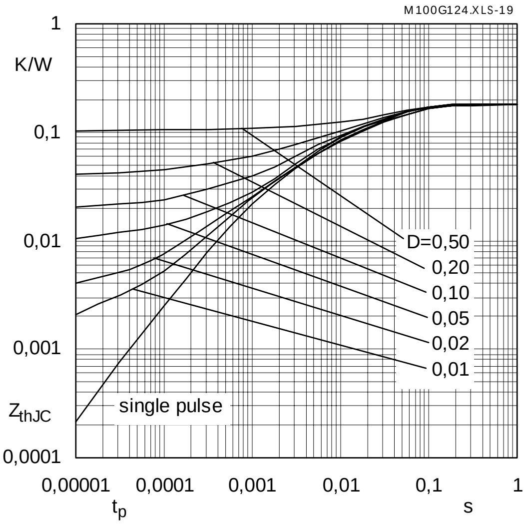


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f\,(t_p)$; $D = t_p / t_c = t_p \cdot f$

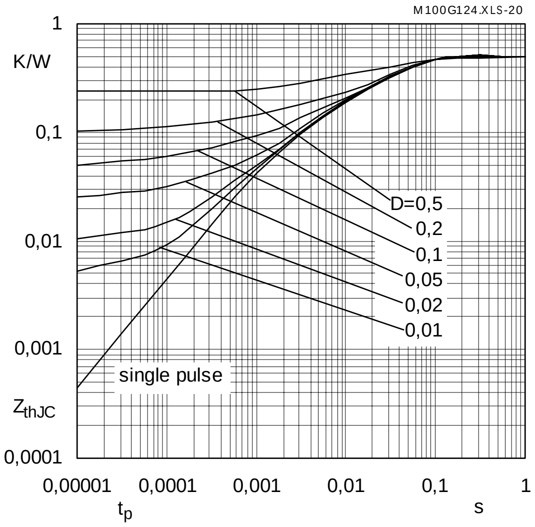
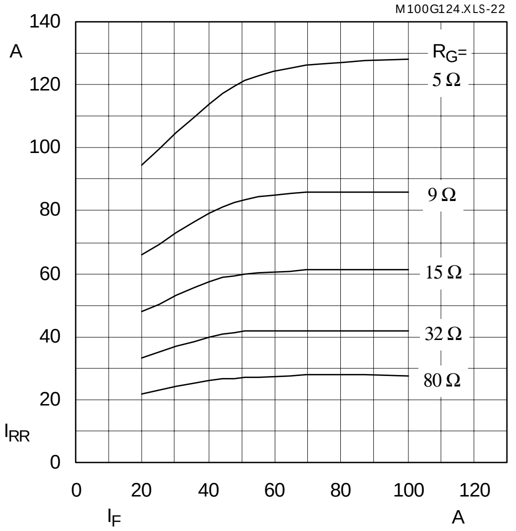
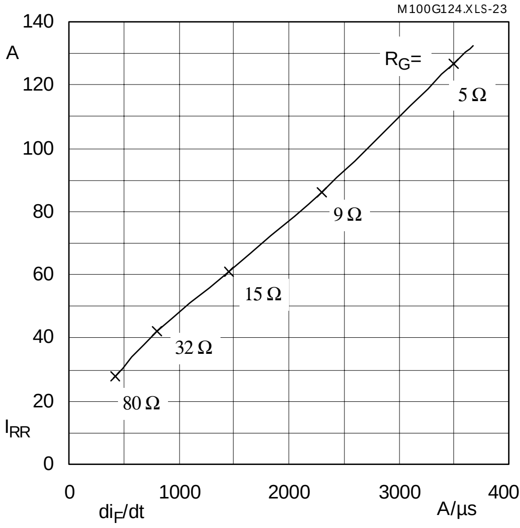


Fig. 20 Transient thermal impedance of inverse CAL diodes



V_{CC} = 600 V
T_j = 125 °C
V_{GE} = ± 15 V

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

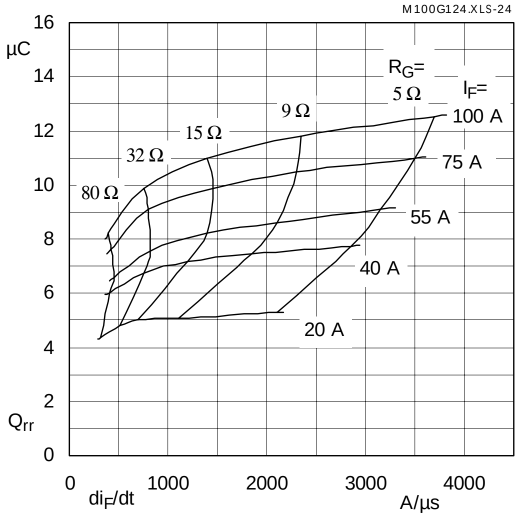


V_{CC} = 600 V
T_j = 125 °C
V_{GE} = ± 15 V
I_F = 75 A

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

Typical Applications include

Switched mode power supplies
DC servo and robot drives
Inverters
DC choppers
AC motor speed control
UPS Uninterruptable power supplies
General power switching applications



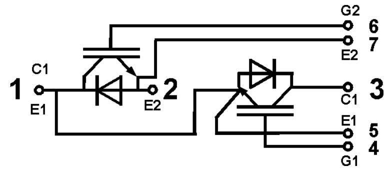
V_{CC} = 600 V
T_j = 125 °C
V_{GE} = ± 15 V

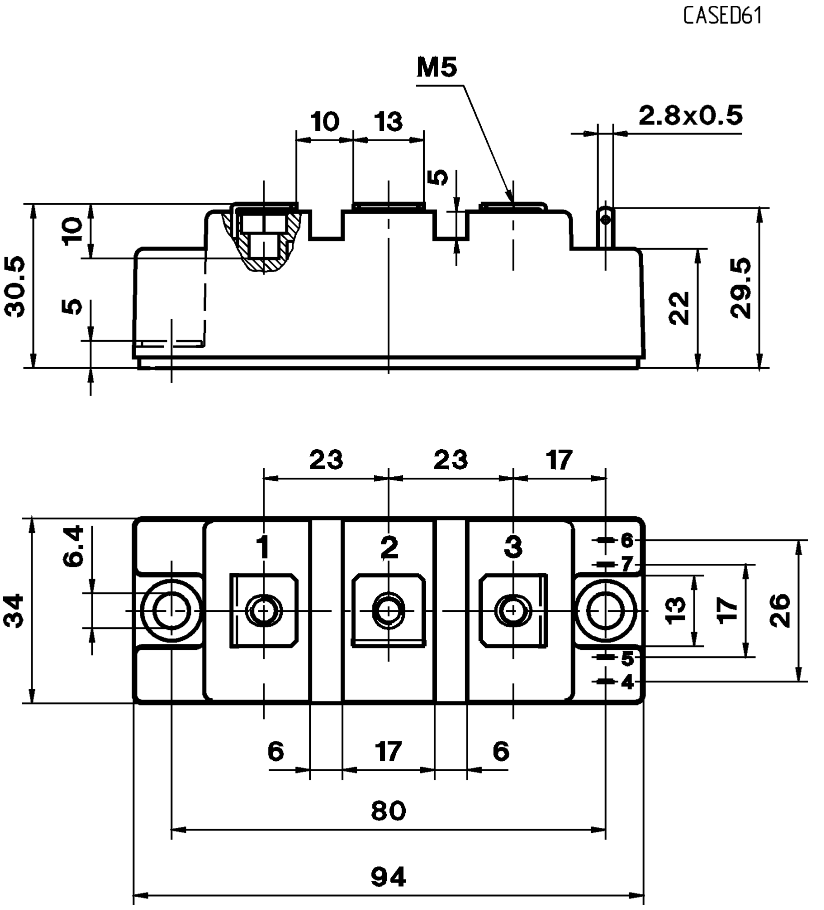
Fig. 24 Typ. CAL diode recovered charge

SEMITRANS 2

Case D 61
UL Recognized
File no. E 63 532

SKM 100 GB 124 D





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 or 42 pieces are used if suitable

Accessories → B 6 – 4

SEMIBOX → C – 1.