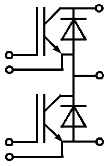
Absolute Maximum Ratings **Symbol**	**Conditions** [1]	**Values**	**Units**
V_{CES}		1200	V
V_{CGR}	$R_{GE} = 20\ k\Omega$	1200	V
I_C	$T_{case} = 25/75\ °C$	100 / 75	A
I_{CM}	$T_{case} = 25/75\ °C$; $t_p = 1$ ms	200 / 150	A
V_{GES}		± 20	V
P_{tot}	per IGBT, $T_{case} = 25\ °C$	450	W
T_j, (T_{stg})		–40 ... + 150 (125)	°C
V_{isol}	AC, 1 min.	2 500 [7]	V
humidity	DIN 40040	Class F	
climate	DIN IEC 68 T.1	40/125/56	
Inverse Diode			
$I_F = -I_C$	$T_{case} = 25/80\ °C$	75 / 50	A
$I_{FM} = -I_{CM}$	$T_{case} = 25/80\ °C$; $t_p = 1$ ms	200 / 150	A
I_{FSM}	$t_p = 10$ ms; sin.; $T_j = 150\ °C$	550	A
I^2t	$t_p = 10$ ms; $T_j = 150\ °C$	1500	A^2s

Characteristics **Symbol**	**Conditions** [1]	**min.**	**typ.**	**max.**	**Units**
$V_{(BR)CES}$	$V_{GE} = 0$, $I_C = 4$ mA	$\geq V_{CES}$	–	–	V
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 2$ mA	4,5	5,5	6,5	V
I_{CES}	$V_{GE} = 0$ } $T_j = 25\ °C$	–	0,8	1	mA
	$V_{CE} = V_{CES}$ } $T_j = 125\ °C$	–	3,5	–	mA
I_{GES}	$V_{GE} = 20$ V, $V_{CE} = 0$	–	–	200	nA
V_{CEsat}	$I_C = 50$ A { $V_{GE} = 15$ V;	–	2,1(2,4)	2,45(2,85)	V
V_{CEsat}	$I_C = 75$ A { $T_j = 25$ (125) °C	–	2,5(3,0)	–	V
g_{fs}	$V_{CE} = 20$ V, $I_C = 50$ A	23	40	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	$V_{GE} = 0$	–	3,3	4,3	nF
C_{oes}	$V_{CE} = 25$ V	–	500	600	pF
C_{res}	f = 1 MHz	–	220	300	pF
L_{CE}		–	–	30	nH
$t_{d(on)}$	$V_{CC} = 600$ V	–	60	100	ns
t_r	$V_{GE} = -15$ V / +15 V [3]	–	55	100	ns
$t_{d(off)}$	$I_C = 50$ A, ind. load	–	420	500	ns
t_f	$R_{Gon} = R_{Goff} = 22\ \Omega$	–	50	100	ns
E_{on} [5]	$T_j = 125\ °C$	–	8	–	mWs
E_{off} [5]		–	6	–	mWs
Inverse Diode [8]					
$V_F = V_{EC}$	$I_F = 50$ A { $V_{GE} = 0$ V;	–	2,0(1,8)	2,5	V
$V_F = V_{EC}$	$I_F = 75$ A { $T_j = 25$ (125) °C	–	2,25 (2,1)	–	V
V_{TO}	$T_j = 125\ °C$	–	1,1	1,2	V
r_t	$T_j = 125\ °C$	–	–	22	mΩ
I_{RRM}	$I_F = 50$ A; $T_j = 125\ °C$ [2]	–	39	–	A
Q_{rr}	$I_F = 50$ A; $T_j = 125\ °C$ [2]	–	7	–	µC
Thermal characteristics					
R_{thjc}	per IGBT	–	–	0,27	°C/W
R_{thjc}	per diode	–	–	0,60	°C/W
R_{thch}	per module	–	–	0,05	°C/W

SEMITRANS® M
Low Loss IGBT Modules

SKM 75 GB 124 D

SEMITRANS 2



GB

Features

- MOS input (voltage controlled)
- N channel, homogeneous Silicon structure (NPT- Non punch-through IGBT)
- Low loss high density chips
- 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 – 97

- 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; $R_{Goff} = 22\ \Omega$

[7] $V_{isol} = 4000\ V_{rms}$ on request

[8] CAL = Controlled Axial Lifetime Technology

Cases and mech. data → B 6 – 98

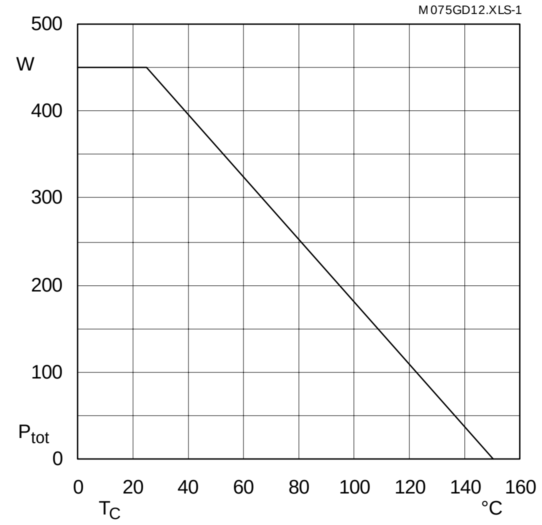
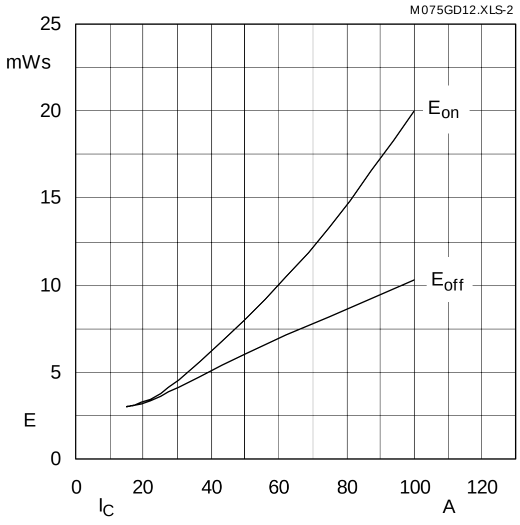
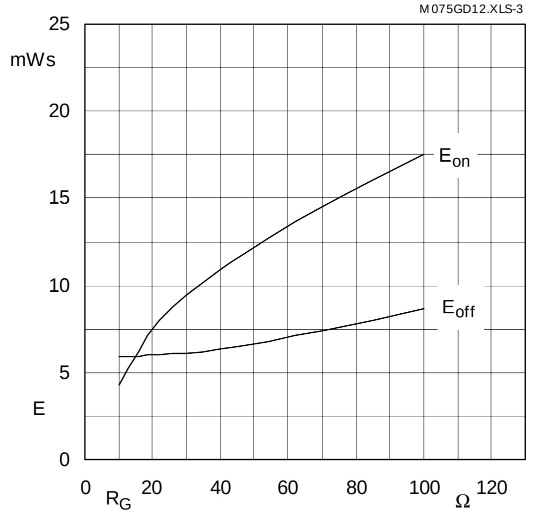


Fig. 1 Rated power dissipation P_{tot} = f (T_C)



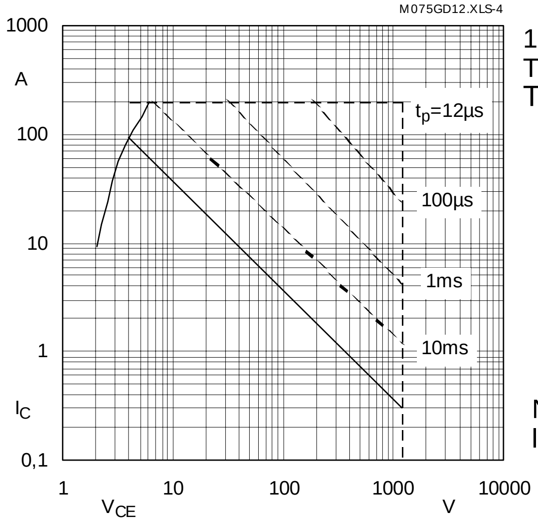
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_G = 22 Ω

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C =50 A

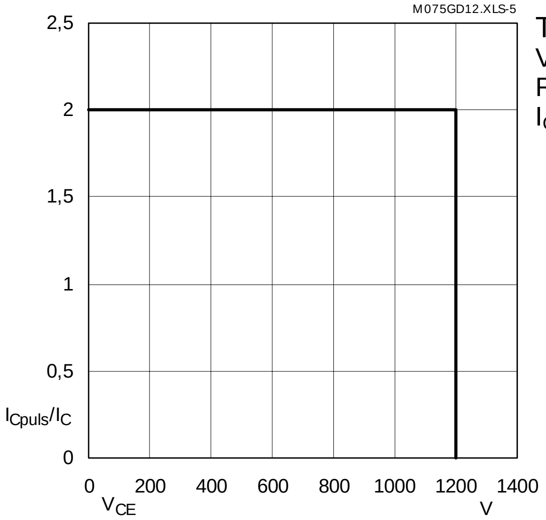
Fig. 3 Turn-on /-off energy = f (R_G)



1 pulse
T_C = 25 °C
T_j ≤ 150 °C

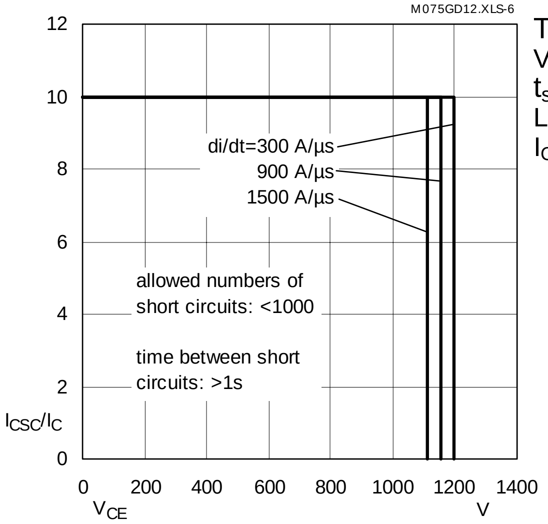
Not for
linear use

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



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

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



T_j ≤ 150 °C
V_{GE} = ± 15 V
t_{sc} ≤ 10 µs
L < 25 nH
I_{CN} = 50 A

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

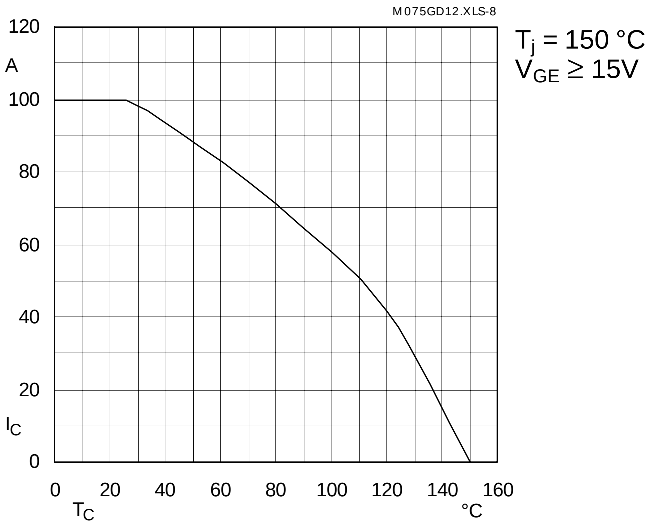


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

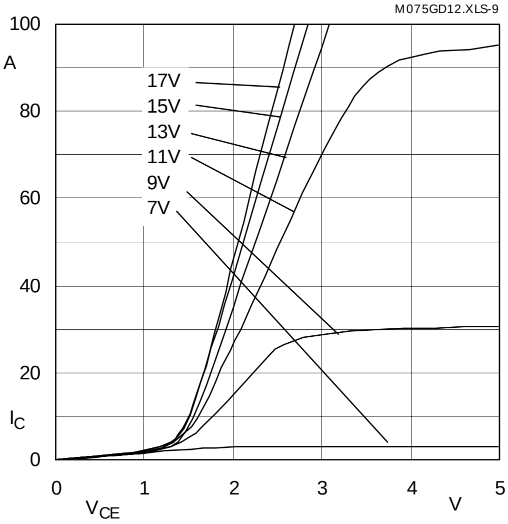


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

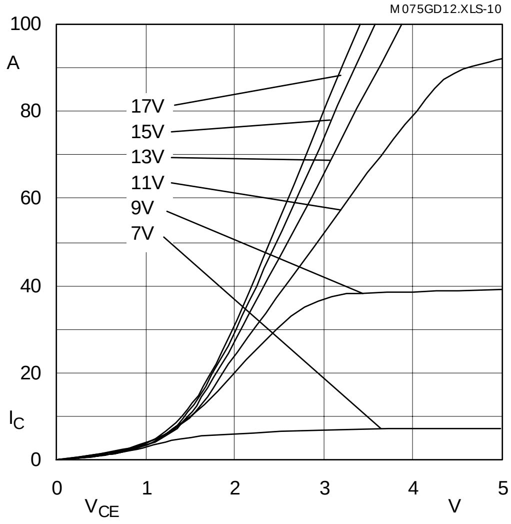


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

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

typ.: $r_{CE(Tj)} = 0{,}016 + 0{,}00005\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}023 + 0{,}00007\ (T_j - 25)$ [Ω]

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

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

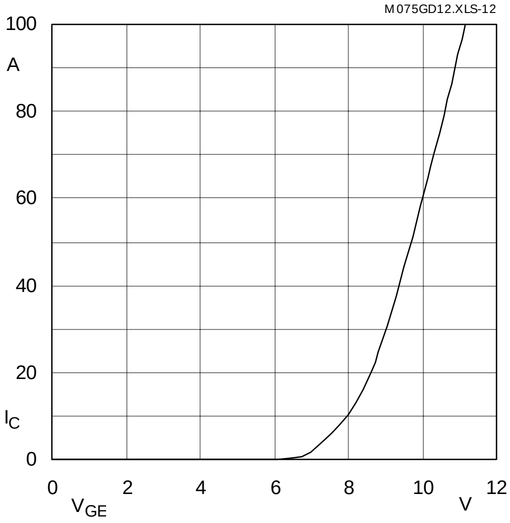
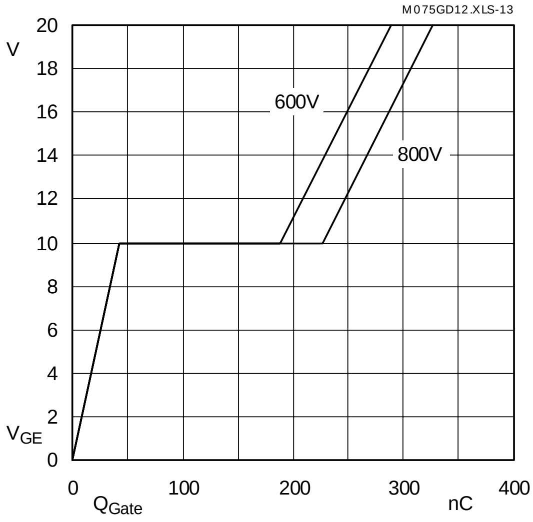
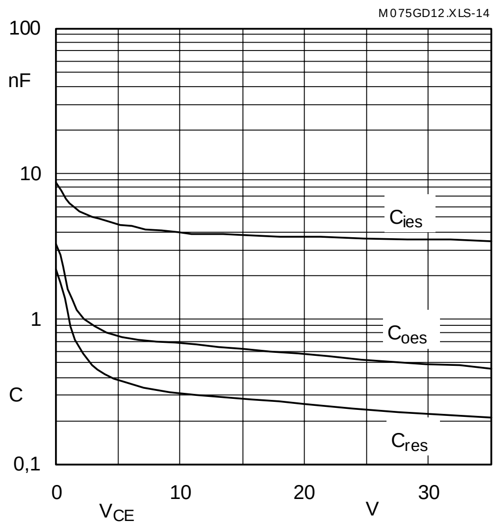


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V



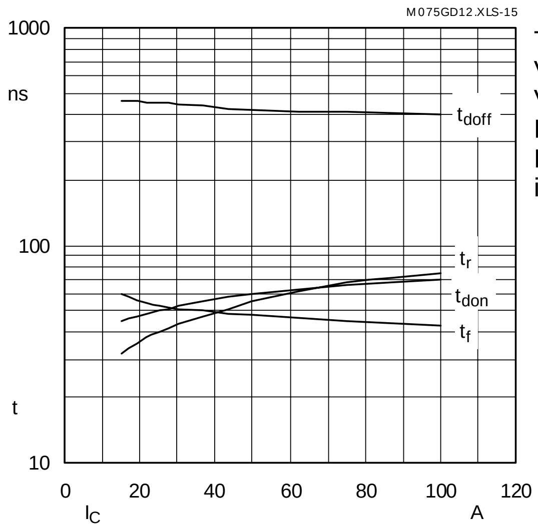
I_{Cpuls} = 50 A

Fig. 13 Typ. gate charge characteristic



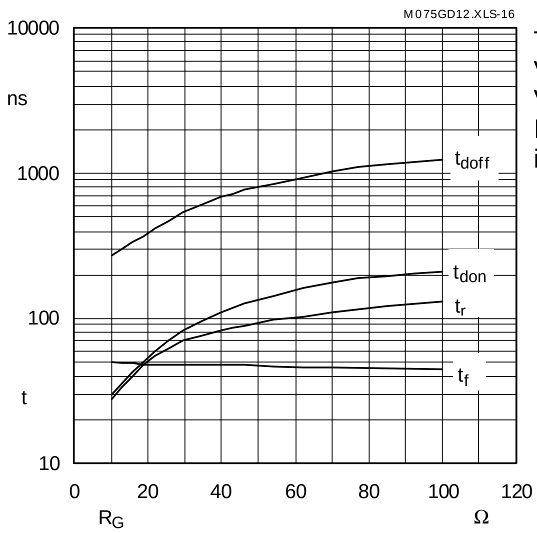
V_{GE} = 0 V
f = 1 MHz

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_{Gon} = 22 Ω
R_{Goff} = 22 Ω
induct. load

Fig. 15 Typ. switching times vs. I_C



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C = 50 A
induct. load

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

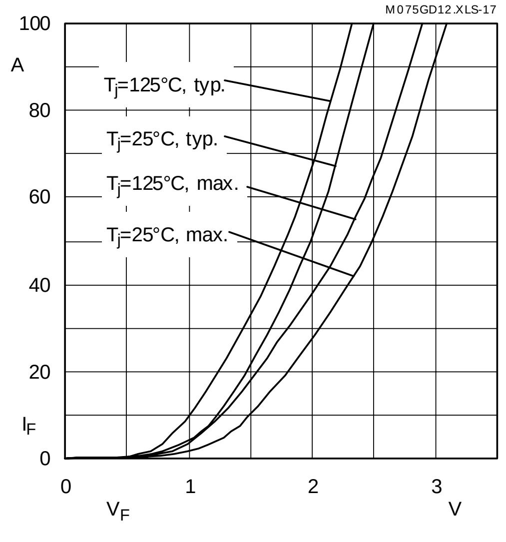
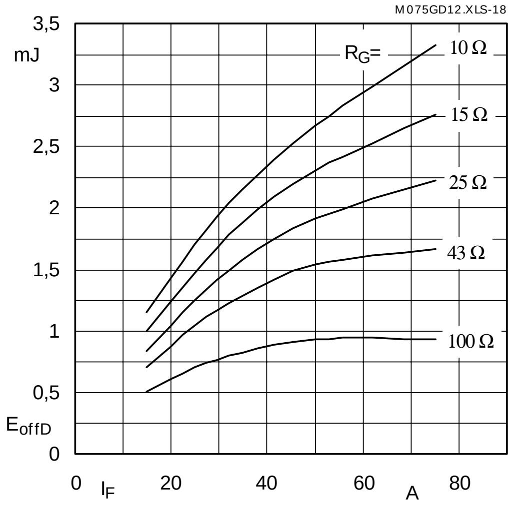


Fig. 17 Typ. CAL diode forward characteristic



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

Fig. 18 Diode turn-off energy dissipation per pulse

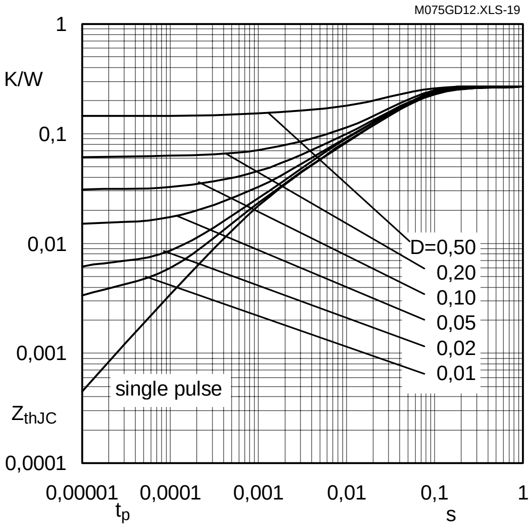


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

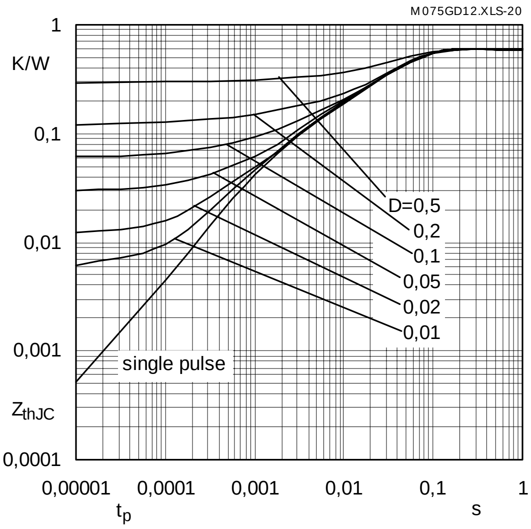
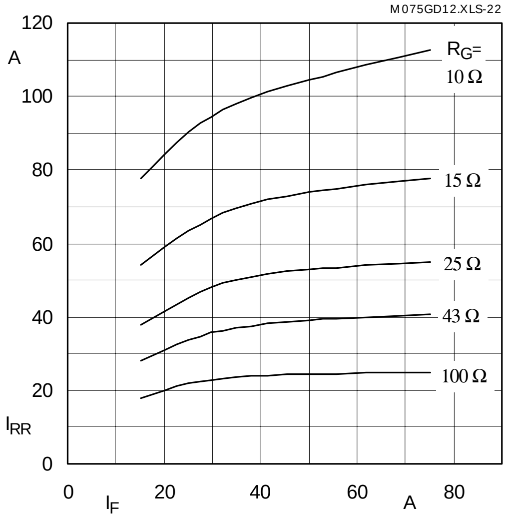
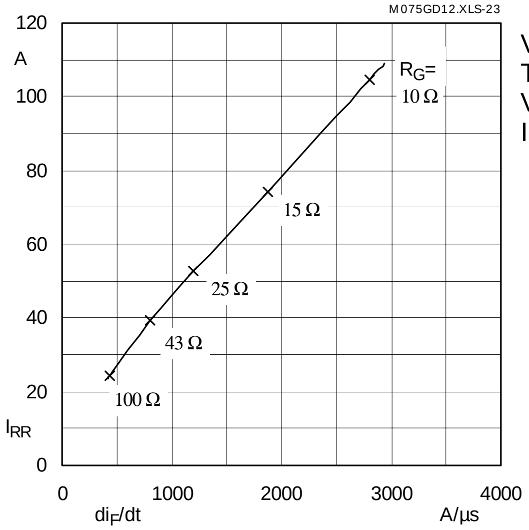


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$



$V_{CC} = 600$ V
$T_j = 125$ °C
$V_{GE} = \pm 15$ V

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

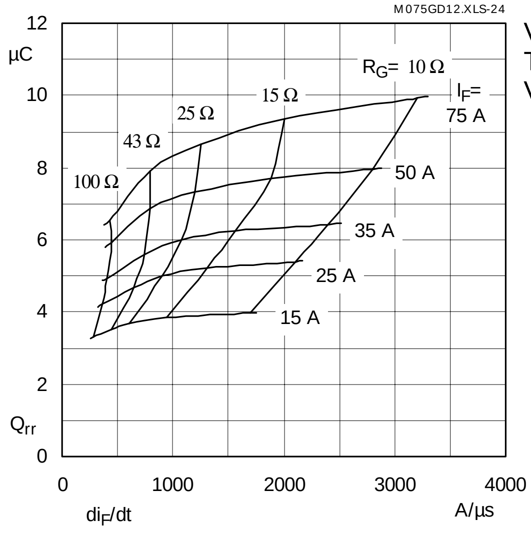


$V_{CC} = 600$ V
$T_j = 125$ °C
$V_{GE} = \pm 15$ V
$I_F = 50$ A

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



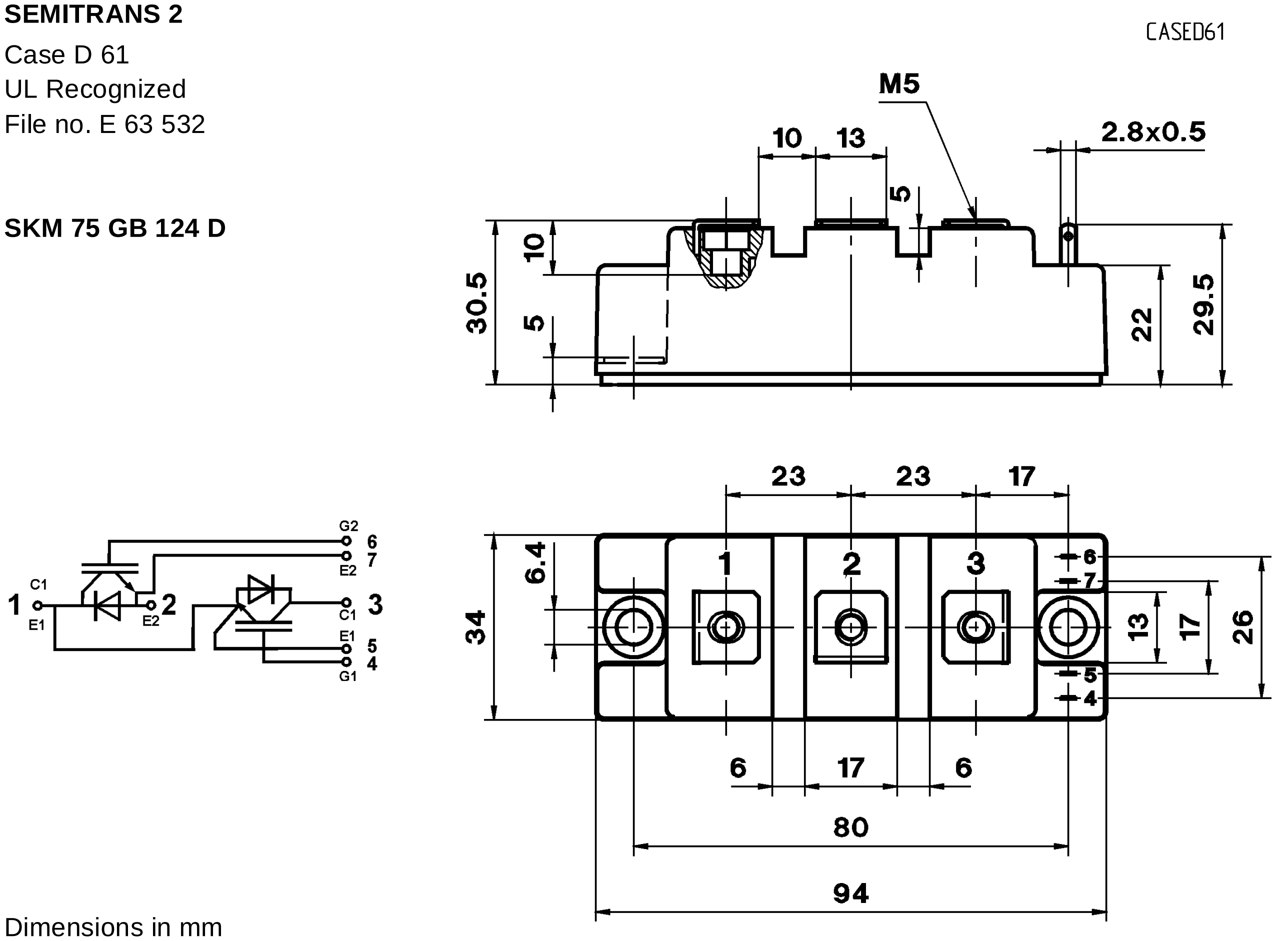
$V_{CC} = 600$ V
$T_j = 125$ °C
$V_{GE} = \pm 15$ V

Fig. 24 Typ. CAL diode recovered charge

SEMITRANS 2

Case D 61
UL Recognized
File no. E 63 532

SKM 75 GB 124 D



Dimensions in mm

Case outline and circuit diagram

Mechanical Data **Symbol**	 **Conditions**		**Values** **min.**	 **typ.**	 **max.**	**Units**
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.