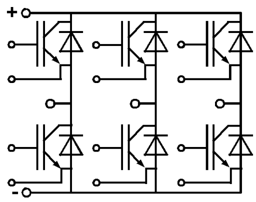
SEMITRANS® Sixpack
Superfast IGBT Modules

SKM 100 GD 063 DL *)

Absolute Maximum Ratings Symbol	Conditions [1]	Values	Units
V_{CES}		600	V
V_{CGR}	R_{GE} = 20 kΩ	600	V
I_C	T_{case} = 25/70 °C	130 / 100	A
I_{CM}	T_{case} = 25/70 °C; t_p = 1 ms	150 / 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.	2500	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	100 / 75	A
$I_{FM} = –I_{CM}$	T_{case} = 25/80 °C; t_p = 1 ms	260 / 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 = 3 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	–	0,2	3	mA
	V_{GE} = 0, $V_{CE} = V_{CES}$; T_j = 125 °C	–	5	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	200	nA
V_{CEsat}	I_C = 75 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	1,8(2,0)	–	V
V_{CEsat}	I_C = 100 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 = 100 A	30	–	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz	–	5600	–	pF
C_{oes}		–	600	–	pF
C_{res}		–	400	–	pF
L_{CE}		–	–	60	nH
$t_{d(on)}$	V_{CC} = 300 V; V_{GE} = –15 V / +15 V [3]; I_C = 100 A, ind. load; $R_{Gon} = R_{Goff}$ = 10 Ω; T_j = 125 °C	–	50	–	ns
t_r		–	40	–	ns
$t_{d(off)}$		–	300	–	ns
t_f		–	35	–	ns
E_{on}		–	4	–	mWs
E_{off}		–	3	–	mWs
Inverse Diode [8]					
$V_F = V_{EC}$	I_F = 75 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	1,45(1,35)	1,7	V
$V_F = V_{EC}$	I_F = 100A; 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 [2]	–	44	–	A
Q_{rr}	I_F = 100 A; T_j = 125 °C [2]	–	6,0	–	µC
Thermal characteristics					
R_{thjc}	per IGBT	–	–	0,27	°C/W
R_{thjc}	per diode	–	–	0,6	°C/W
R_{thch}	per module	–	–	0,05	°C/W

Sixpack



GD

Features

- MOS input (voltage controlled)
- N channel, homogeneous Si-structure (NPT-IGBT)
- High short circuit capability, self limiting to 6 * I_{cnom}
- Fast & soft invese CAL diodes [8]
- Isolated copper baseplate using DCB Direct Copper Bonding Technology without hard mould
- Large clearance (9 mm) and creepage distances (13 mm)

Typical Applications

- Switched mode power supplies
- Three phase inverters for AC motor speed control
- Pulse frequencies also above 10 kHz

[1] T_{case} = 25 °C, unless otherwise specified
[2] $I_F = – I_C$, V_R = 300 V, $–di_F/dt$ = 1000 A/µs, V_{GE} = 0 V
[3] Use V_{GEoff} = –5... –15 V
[8] CAL = Controlled Axial Lifetime Technology.

Cases and mech. data → B 6 – 32 Sixpack
***) Main terminals round 2 mm dia**

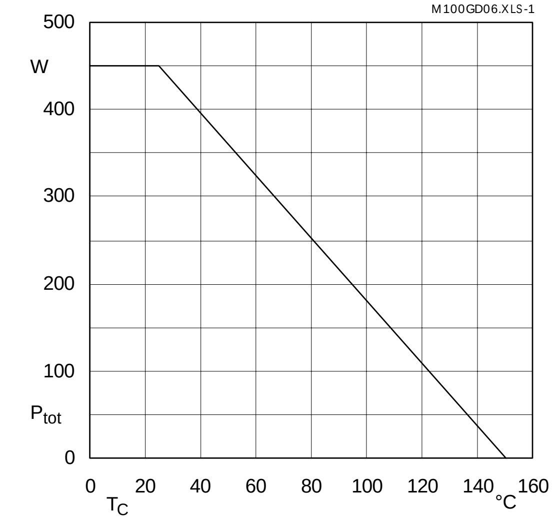


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

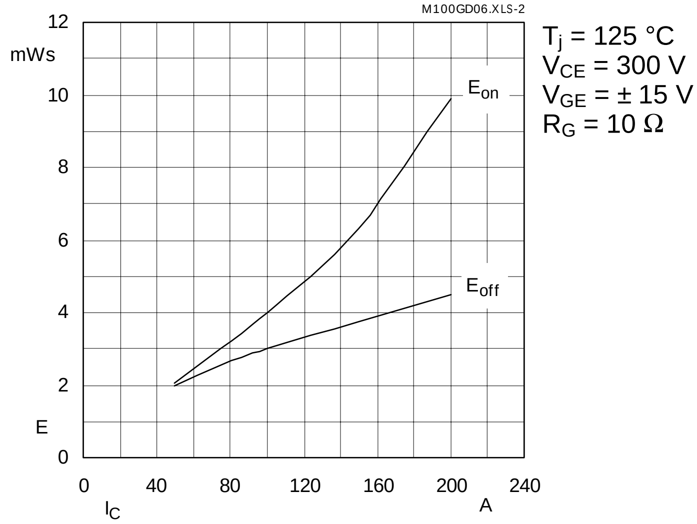


Fig. 2 Turn-on /-off energy = $f(I_C)$

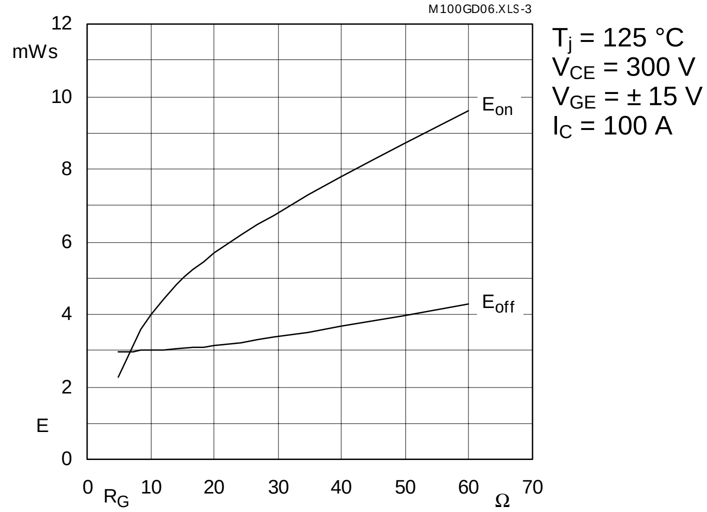


Fig. 3 Turn-on /-off energy = $f(R_G)$

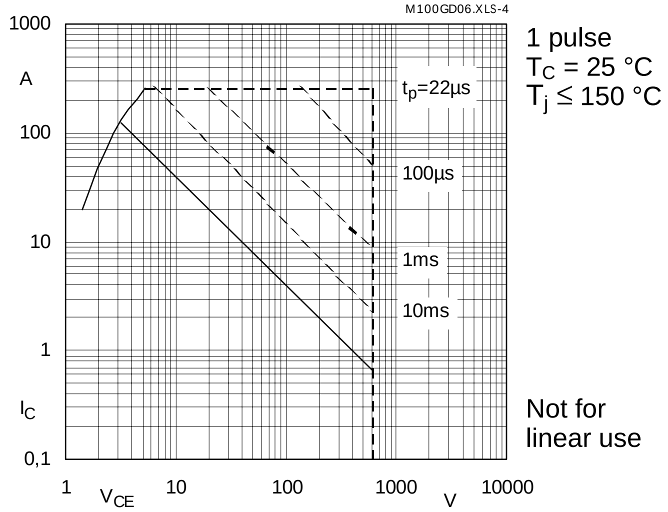


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

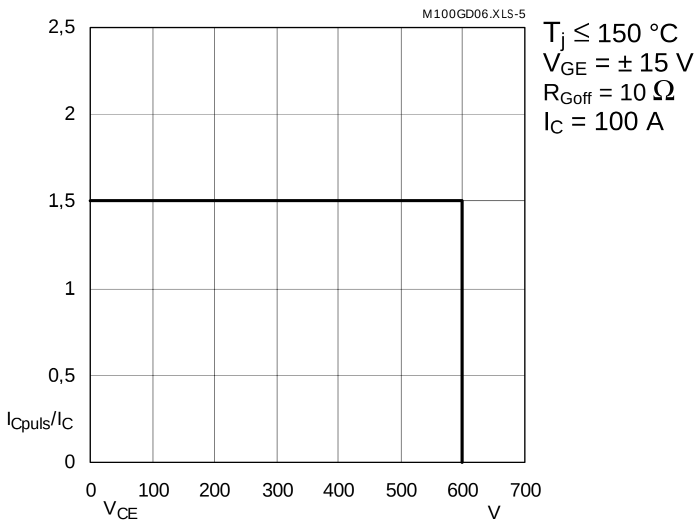


Fig. 5 Turn-off safe operating area (RBSOA)

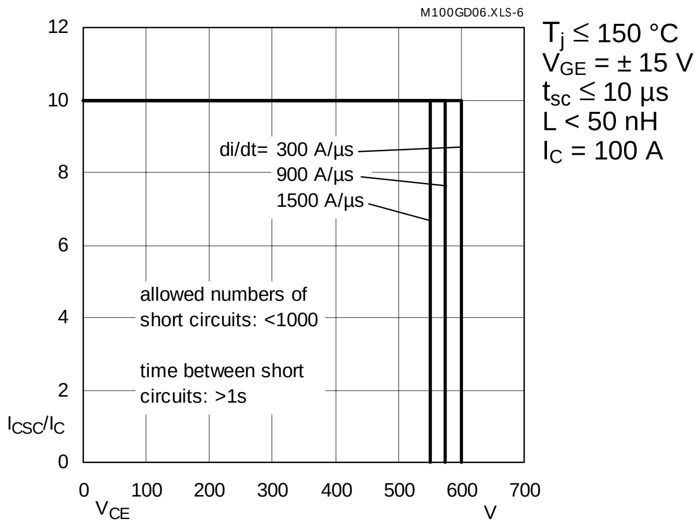


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

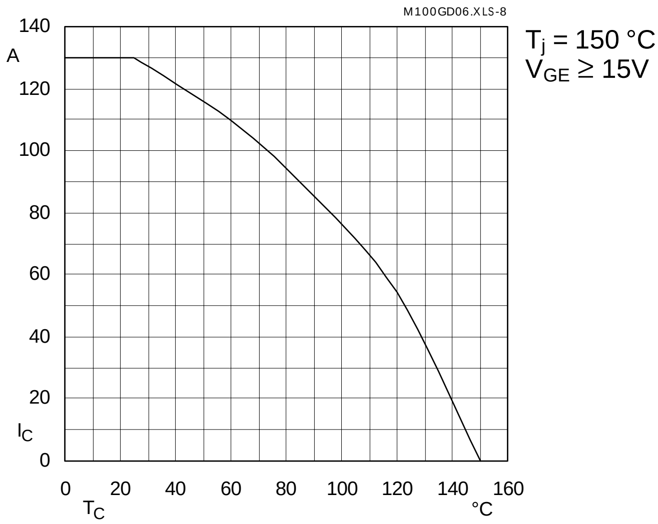


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

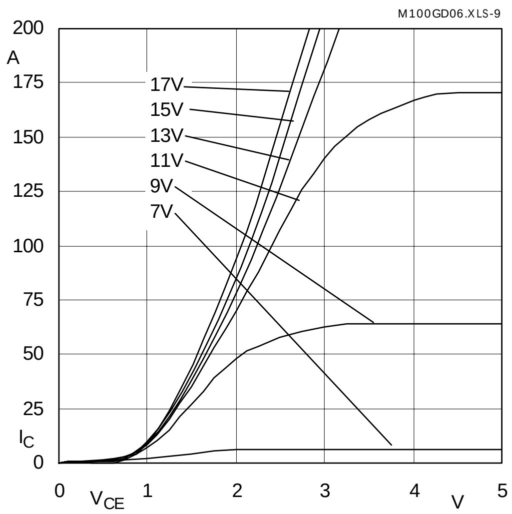


Fig. 9 Typ. output characteristic, t_p = 250 µs; T_j = 25 °C

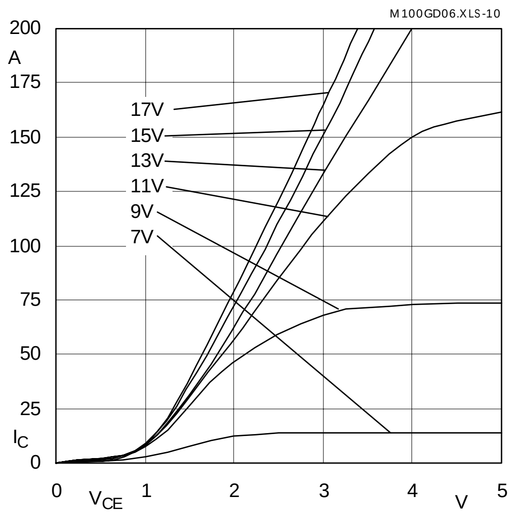


Fig. 10 Typ. output characteristic, t_p = 250 µs; T_j = 125 °C

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

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

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

typ.: $r_{CE(Tj)} = 0{,}0090 + 0{,}00004\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}013 + 0{,}00004\ (T_j - 25)$ [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

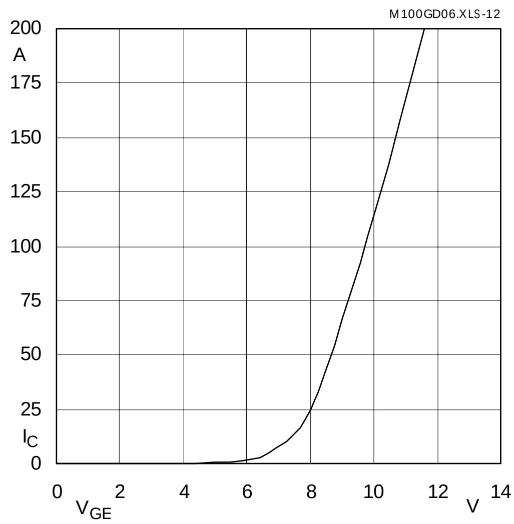


Fig. 12 Typ. transfer characteristic, t_p = 250 µs; V_{CE} = 20 V

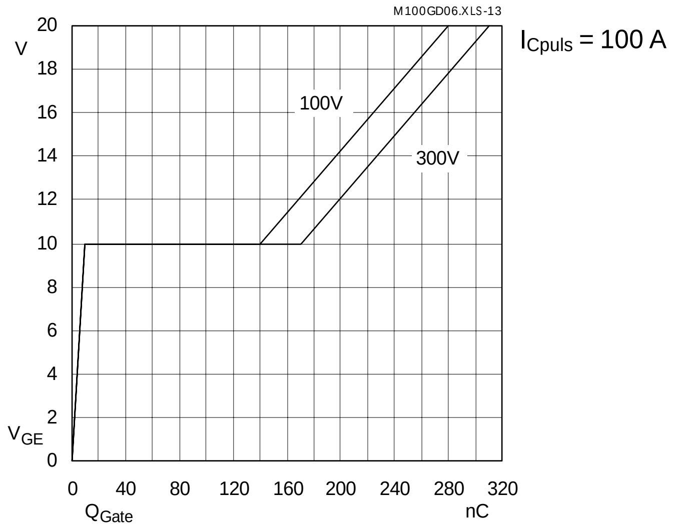


Fig. 13 Typ. gate charge characteristic

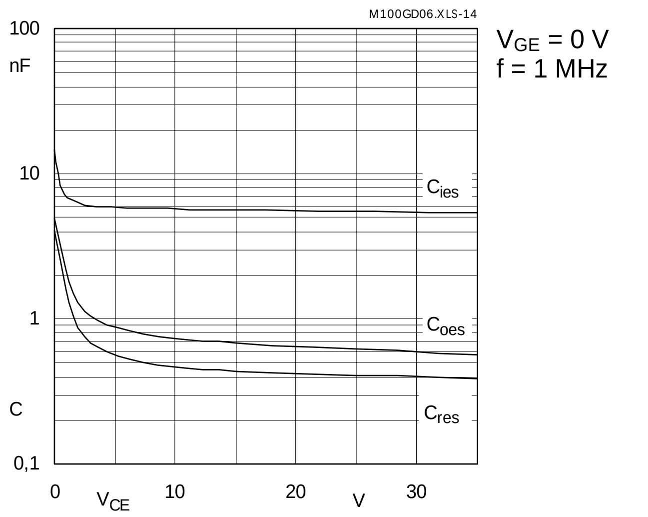


Fig. 14 Typ. capacitances vs.V_{CE}

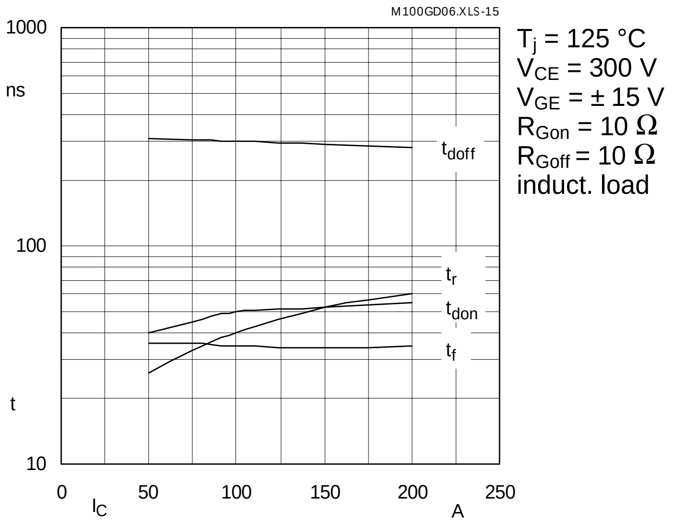


Fig. 15 Typ. switching times vs. I_C

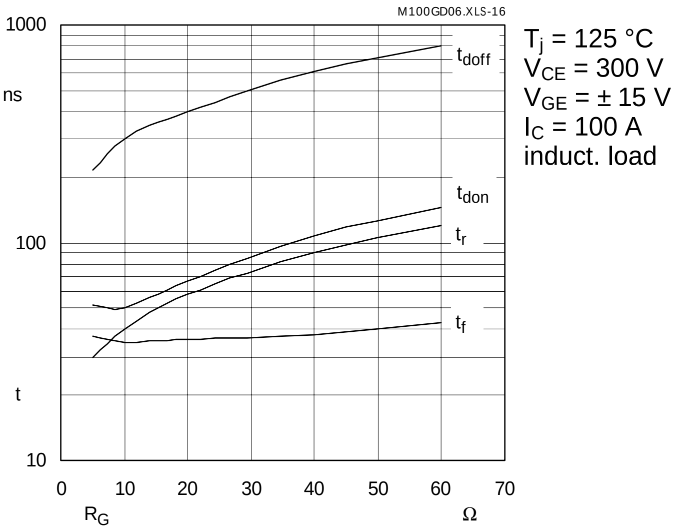


Fig. 16 Typ. switching times vs. gate resistor R_G

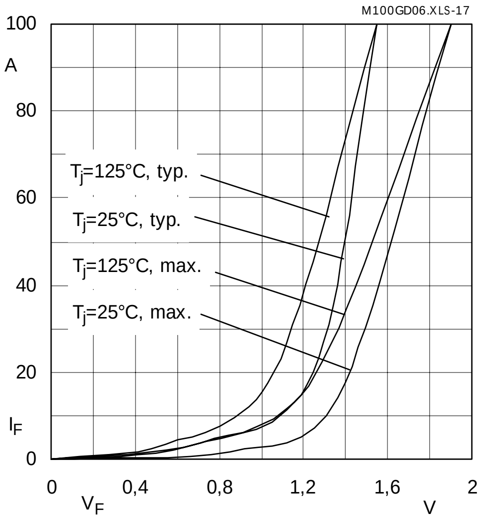


Fig. 17 Typ. CAL diode forward characteristic

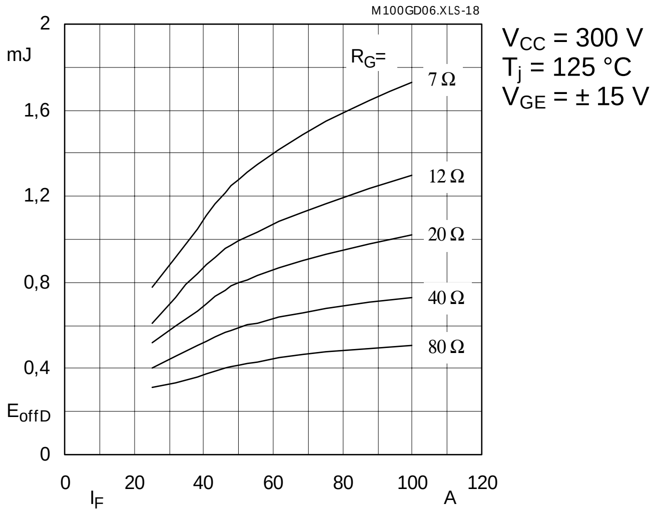


Fig. 18 Diode turn-off energy dissipation per pulse

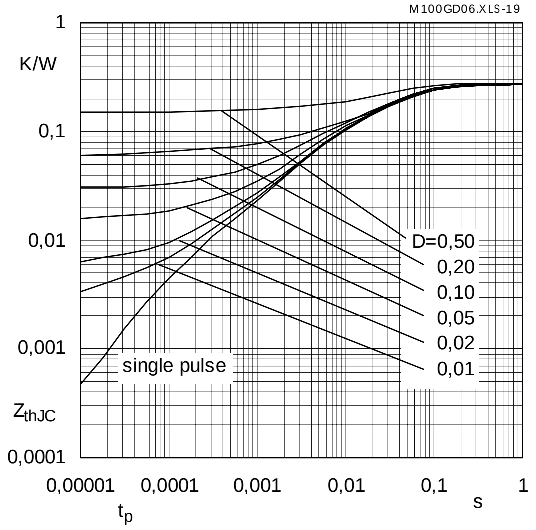


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

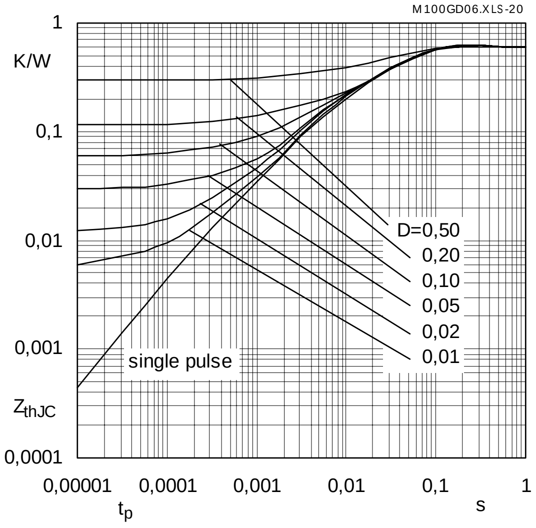


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

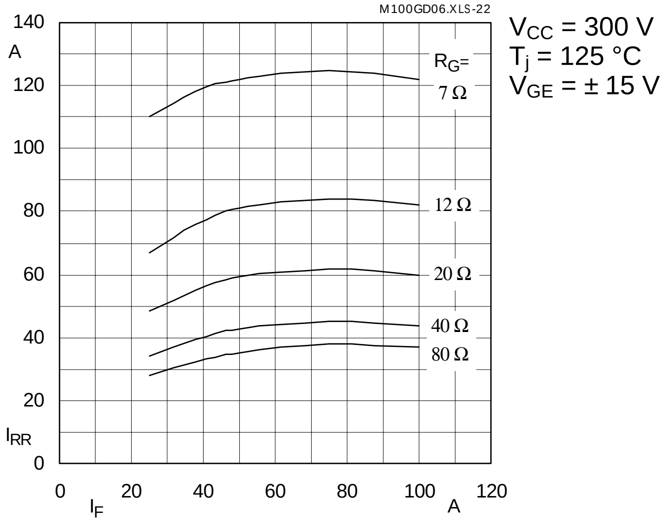


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

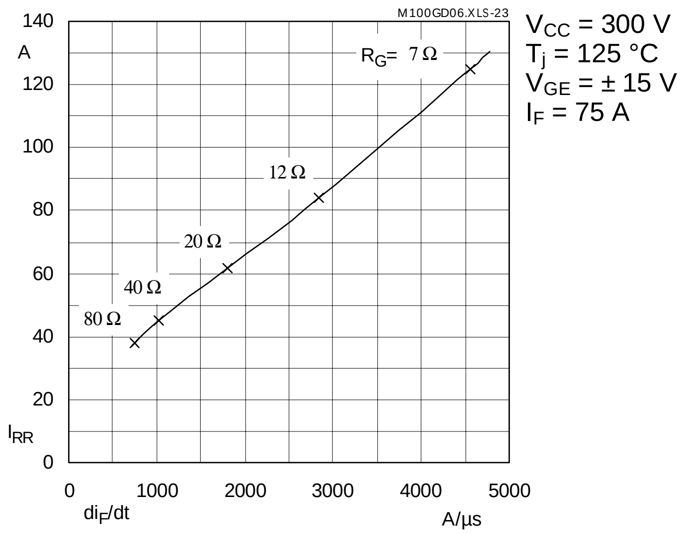


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di/dt)$

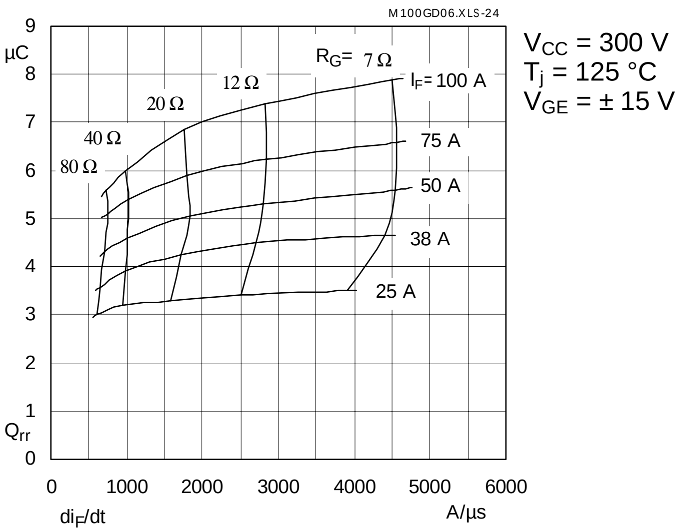


Fig. 24 Typ. CAL diode recovered charge

SKM 100 GD 063 D...

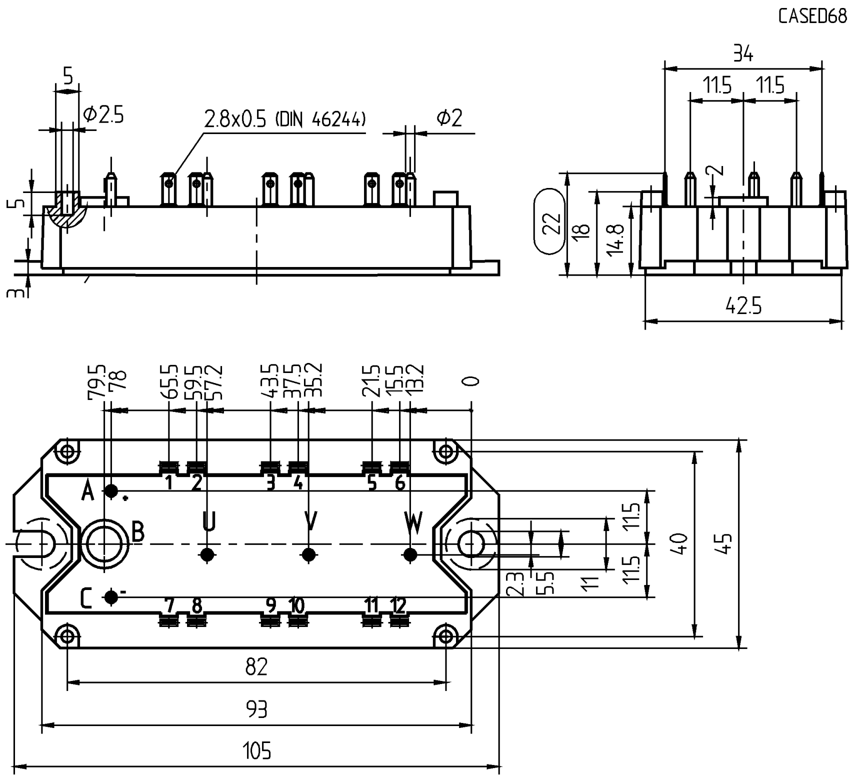
SEMITRANS® Sixpack

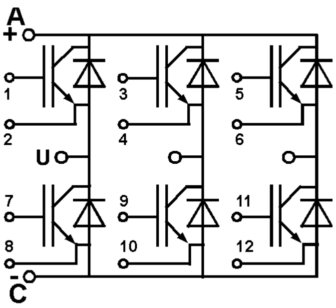
Case D 68

UL Recognized

File no. E 63 532

SKM 100 GD 063 DL





Dimensions in mm

Case outline and circuit diagram

Mechanical Data						
Symbol	**Conditions**		**Values**			**Units**
			min.	**typ.**	**max.**	
M_1	to heatsink, SI Units	(M5)	4	–	5	Nm
	to heatsink, US Units		35	–	44	lb.in.
a			–	–	5x9,81	m/s^2
w			–	–	175	g

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

Two devices are supplied in one SEMIBOX A.
Larger packing units (for 10 and 20 pieces) are used if suitable SEMIBOX → C - 1.

