SEMIKRON

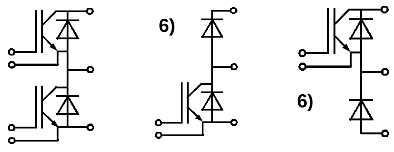
Absolute Maximum Ratings		Values	
Symbol	**Conditions** [1]		**Units**
V_{CES}		600	V
V_{CGR}	R_{GE} = 20 kΩ	600	V
I_C	T_{case} = 25/80 °C	250 / 190	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	500 / 380	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	960	W
T_j, (T_{stg})		–40 ... +150 (125)	°C
V_{isol}	AC, 1 min.	2 500	V
humidity	IEC 60721-3-3	class 3K7/IE32	
climate	IEC 68 T.1	40/125/56	
Inverse Diode and FWD of type "GAL,GAR"[6) 8)]			
$I_F = -I_C$	T_{case} = 25/80 °C	200 / 140	A
$I_{FM} = -I_{CM}$	T_{case} = 25/80 °C; t_p = 1 ms	500 / 380	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	1 400	A
I^2t	t_p = 10 ms; T_j = 150 °C	9800	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 = 4 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, T_j = 25 °C	–	0,2	–	mA
	$V_{CE} = V_{CES}$, T_j = 125 °C	–	7	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	0,3	µA
V_{CEsat}	I_C = 200 A, V_{GE} = 15 V;	–	2,1(2,4)	2,5(2,8)	V
	T_j = 25 (125) °C	–	–	–	V
g_{fs}	V_{CE} = 20 V, I_C = 200 A	40	–	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0	–	11,2	–	nF
C_{oes}	V_{CE} = 25 V	–	1250	–	pF
C_{res}	f = 1 MHz	–	750	–	pF
L_{CE}	(terminal 2 - 3)	–	–	25	nH
$t_{d(on)}$	V_{CC} = 300 V	–	120	–	ns
t_r	V_{GE} = +15 V / –15 V[3]	–	85	–	ns
$t_{d(off)}$	I_C = 200 A, ind. load	–	460	–	ns
t_f	$R_{Gon} = R_{Goff}$ = 8 Ω	–	50	–	ns
E_{on}	T_j = 125 °C	–	11,5	–	mWs
E_{off}		–	7,5	–	mWs
Inverse Diode and FWD of type "GAL,GAR"[6) 8)]					
$V_F = V_{EC}$	I_F = 150 A, V_{GE} = 0 V;	–	1,45(1,35)	1,7	V
$V_F = V_{EC}$	I_F = 200 A, 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	–	4	5,5	mΩ
I_{RRM}	I_F = 200 A; T_j = 125 °C[2]	–	75	–	A
Q_{rr}	I_F = 200 A; T_j = 125 °C[2]	–	13	–	µC
Thermal characteristics					
R_{thjc}	per IGBT	–	–	0,13	°C/W
R_{thjc}	per diode	–	–	0,3	°C/W
R_{thch}	per module	–	–	0,05	°C/W

SEMITRANS® M Superfast NPT-IGBT Modules

SKM 195 GB 063 DN
SKM 195 GAL 063 DN [6)]
SKM 195 GAR 063 DN [6)]

SEMITRANS 2N (low inductance)



Features

- N channel, homogeneous Silicon structure (NPT-Non-Punch-through IGBT)
- Low tail current with low temperature dependence
- High short circuit capability, self limiting
- Pos. temp. coeff. of V_{CEsat}
- Low inductance case
- Fast & soft inverse CAL diodes [8)]
- Without hard mould
- Large clearance (10 mm) and creepage distances (20 mm)

Typical Applications

- Switching (not for linear use)
- Switched mode power supplies
- AC inverter drives
- UPS uninterruptable power supplies

1) T_{case} = 25 °C, unless otherwise specified
2) $I_F = -I_C$, V_R = 300 V, $-di_F/dt$ = 1500 A/µs, V_{GE} = 0 V
3) Use V_{GEoff} = – 5 ... – 15 V
4) For switch-off of 2 * I_{CN} = 400 A use R_{goff} ≥ 12 Ω. For switch-off of short circuit use R_{goff} ≥ 25 Ω.
6) The free-wheeling diodes of the GAL type have the data of the inverse diodes.
8) CAL = Controlled Axial Lifetime Technology

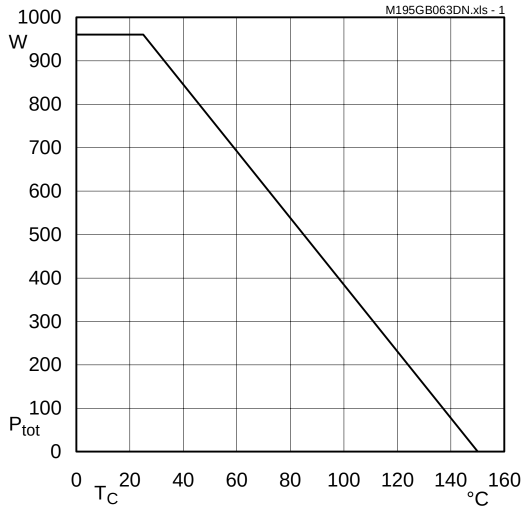


Fig. 1 Rated power dissipation P_{tot} = f (T_C)

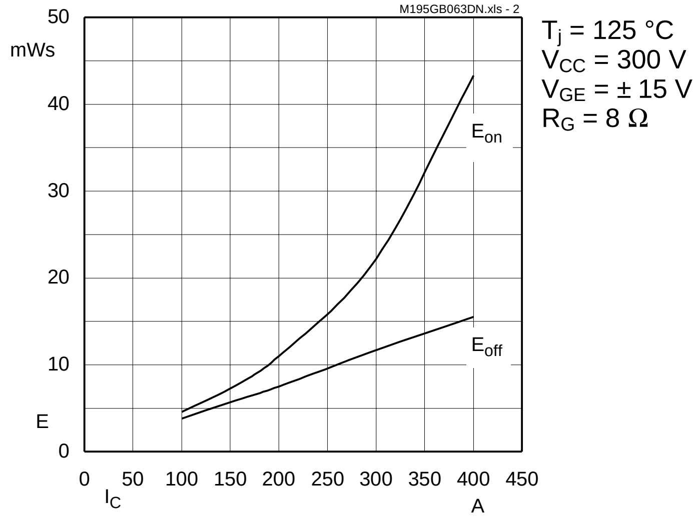


Fig. 2 Turn-on /-off energy = f (I_C)

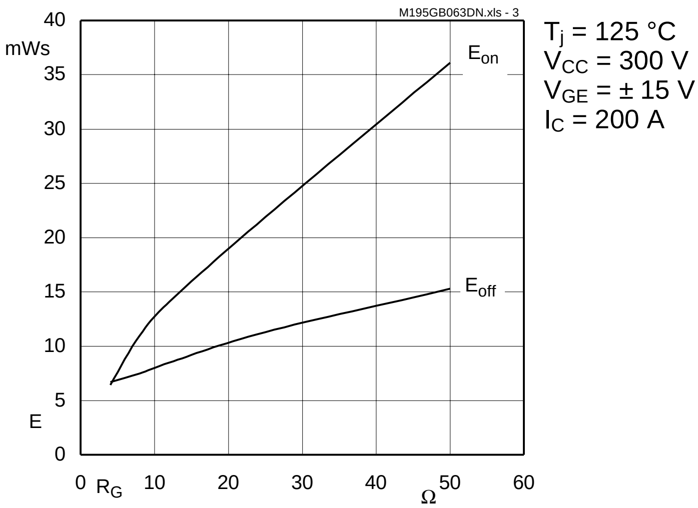


Fig. 3 Turn-on /-off energy = f (R_G)

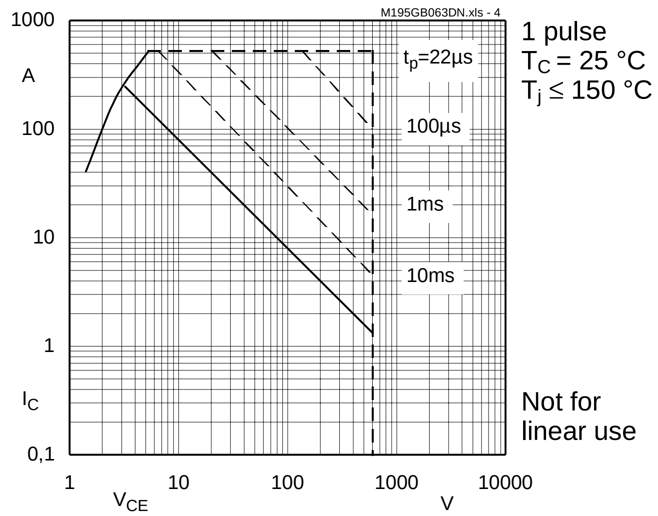


Fig. 4 Maximum safe operating area (SOA) I_C = f (V_{CE})

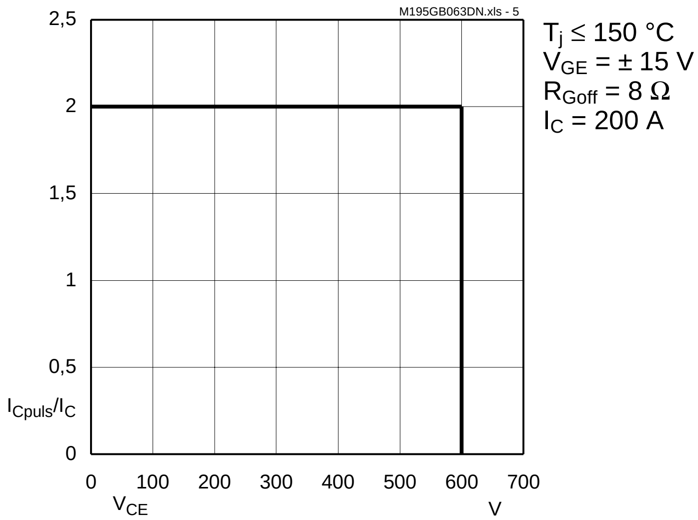


Fig. 5 Turn-off safe operating area (RBSOA)

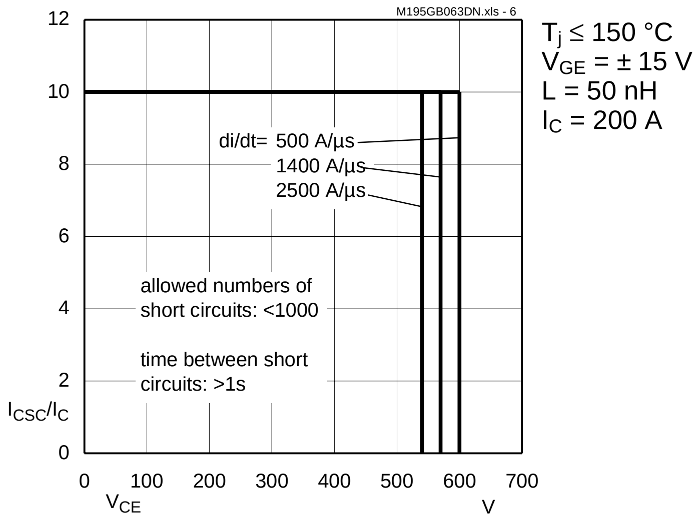


Fig. 6 Safe operating area at short circuit I_C = f (V_{CE})

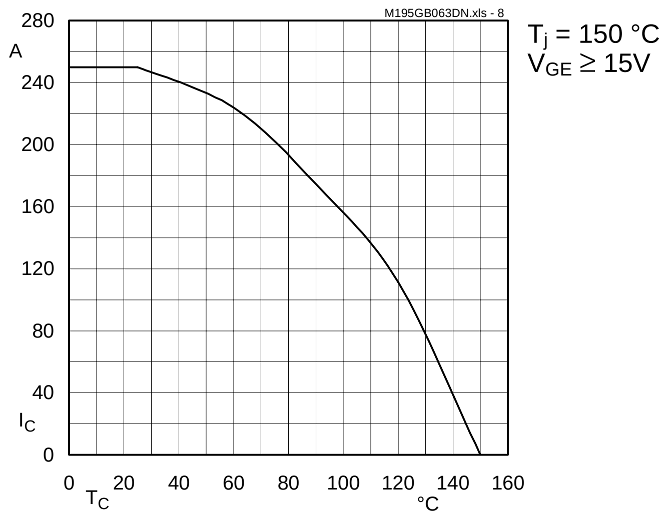


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

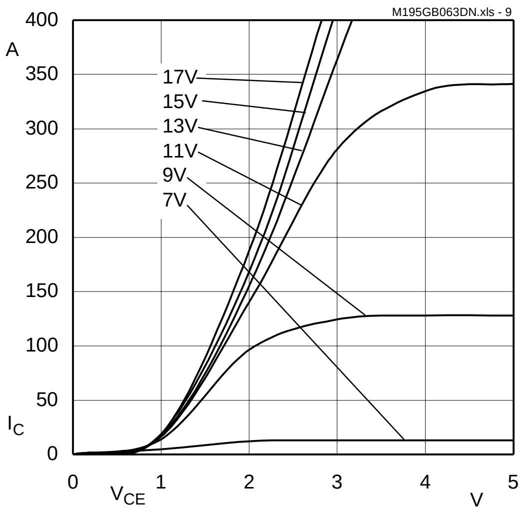


Fig. 9 Typ. output characteristic, t_p = 250 µs; T_j = 25 °C

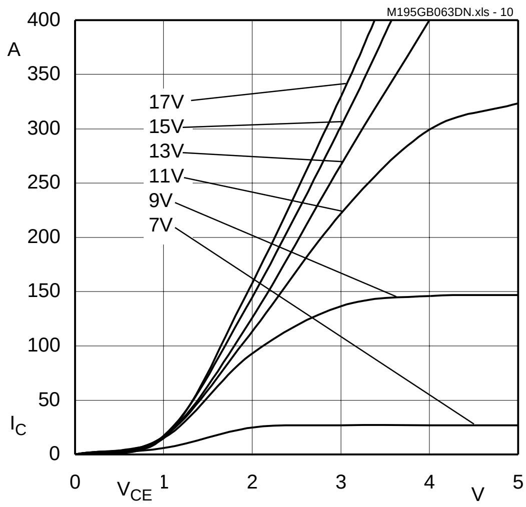


Fig. 10 Typ. output characteristic, t_p = 250 µs; T_j = 125 °C

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

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

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

typ.: $r_{CE(Tj)} = 0{,}0045 + 0{,}00002\,(T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}0065 + 0{,}00002\,(T_j - 25)$ [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

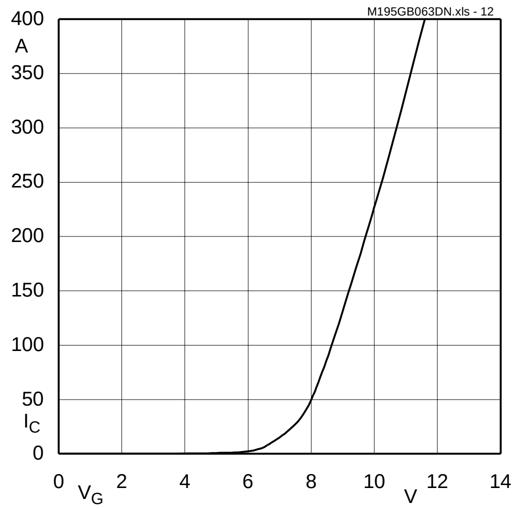
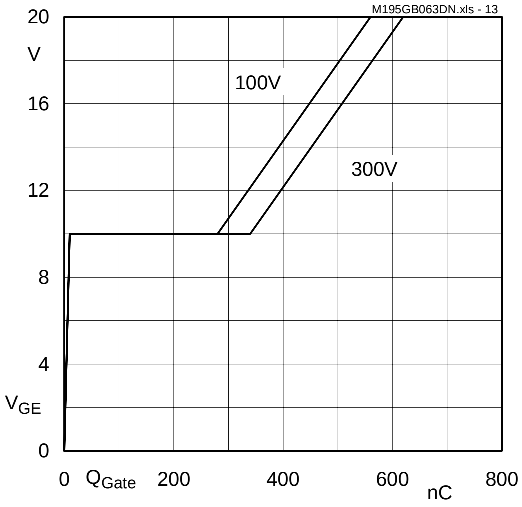
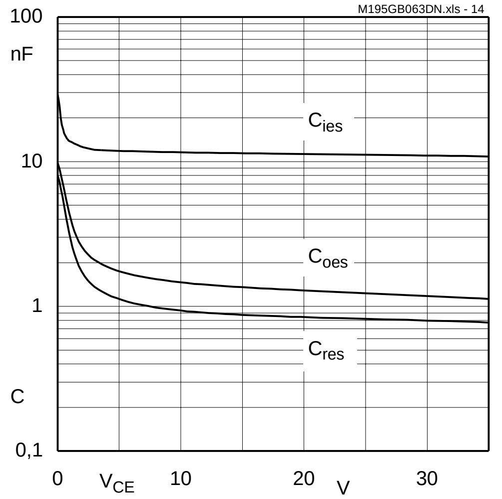


Fig. 12 Typ. transfer characteristic, t_p = 250 µs; V_{CE} = 20 V



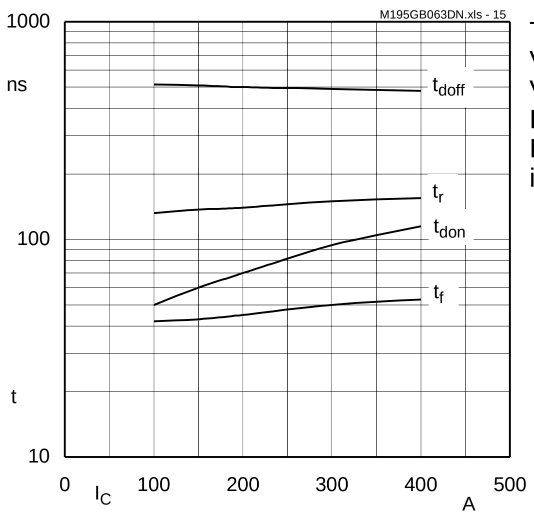
I_{Cpuls} = 200 A

Fig. 13 Typ. gate charge characteristic



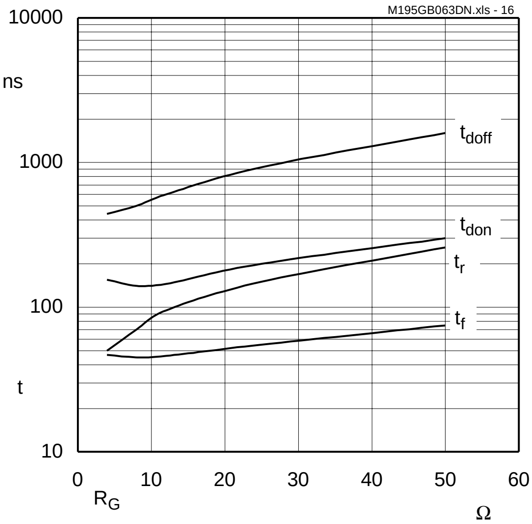
V_{GE} = 0 V
f = 1 MHz

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



T_j = 125 °C
V_{CC} = 300 V
V_{GE} = ± 15 V
R_{Gon} = 8 Ω
R_{Goff} = 8 Ω
ind. load

Fig. 15 Typ. switching times vs. I_C



T_j = 125 °C
V_{CC} = 300 V
V_{GE} = ± 15 V
I_C = 200 A
ind. load

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

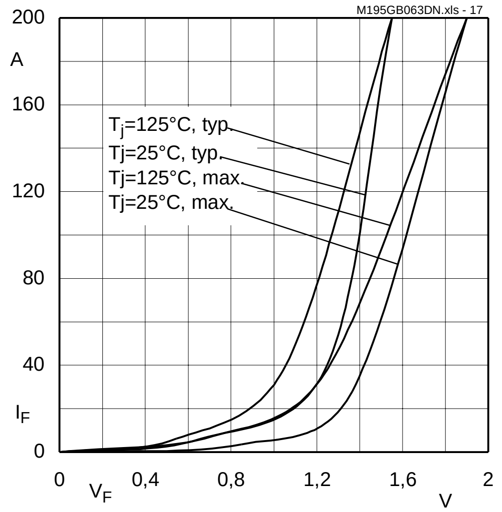
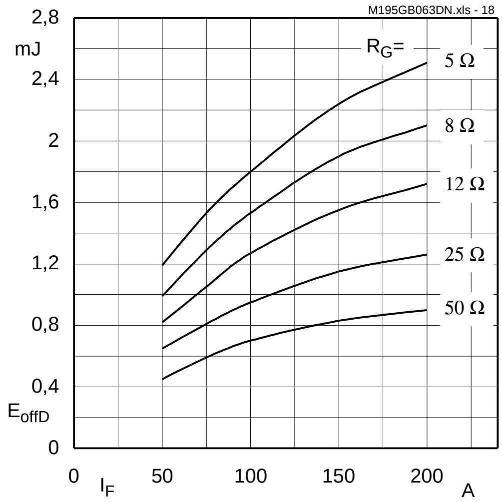


Fig. 17 Typ. CAL diode forward characteristic



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

Fig. 18 Diode turn-off energy dissipation per pulse

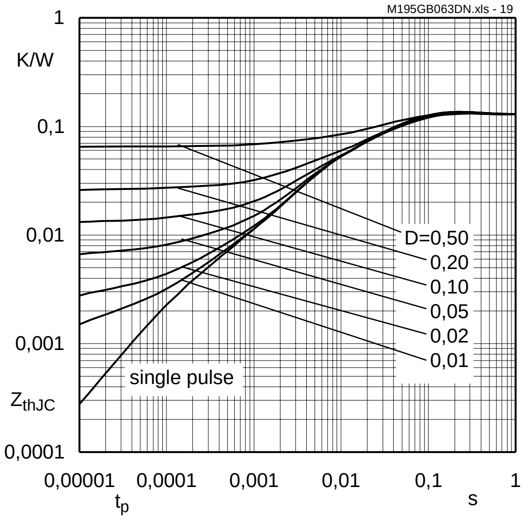


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

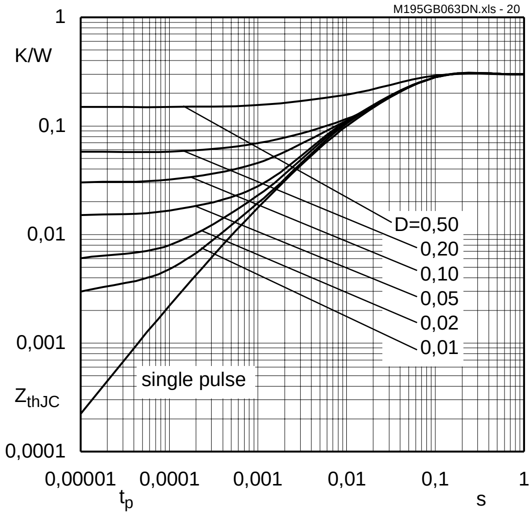


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

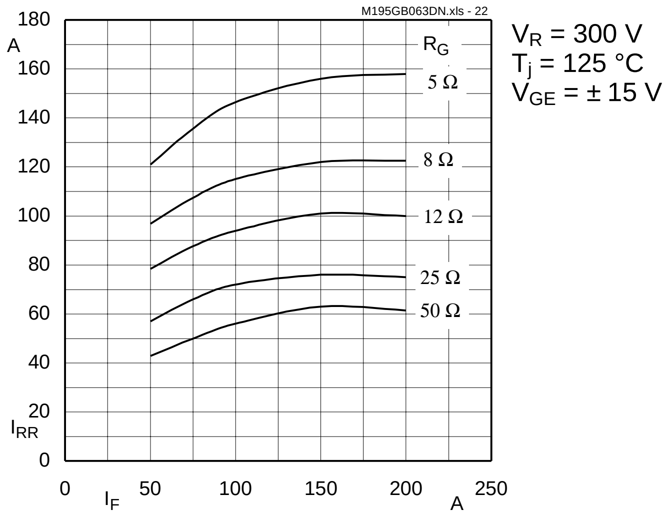


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

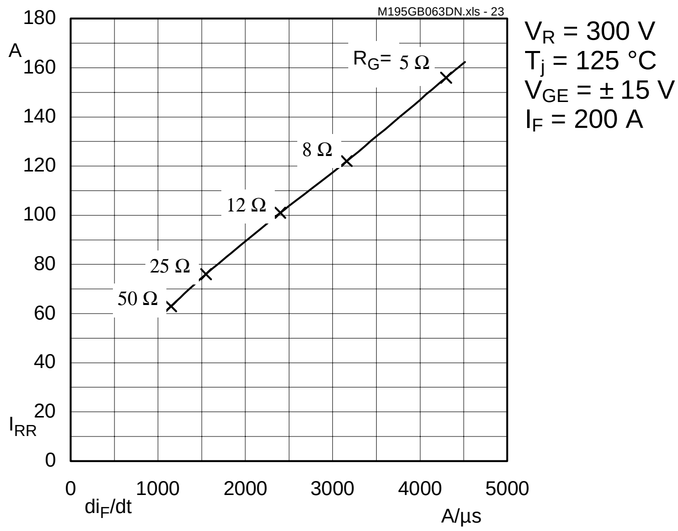


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di/dt)$

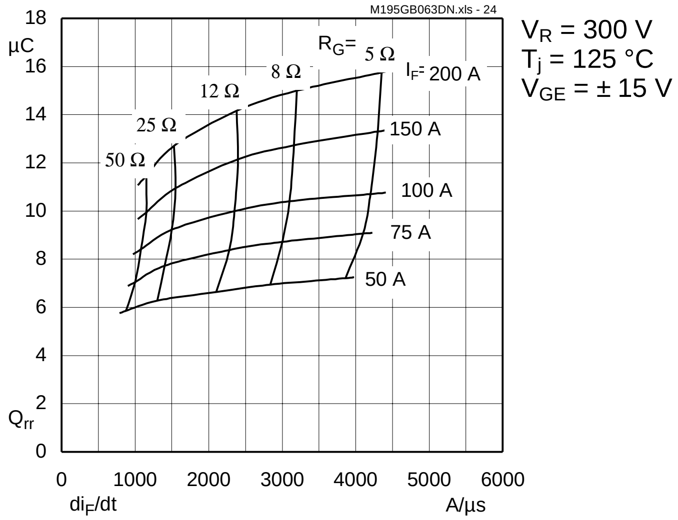
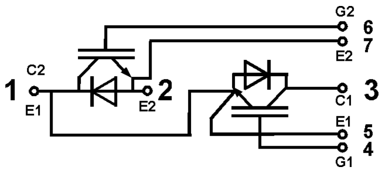
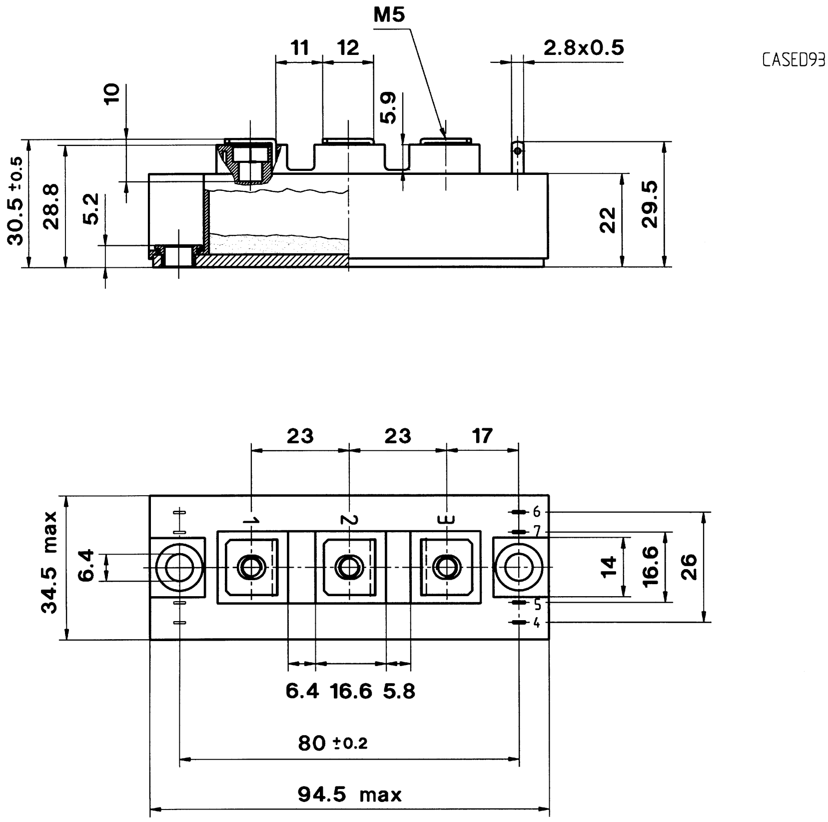


Fig. 24 Typ. CAL diode recovered charge

SEMITRANS 2N (low inductance)
Case D 93
UL Recognized
File no. E 63 532

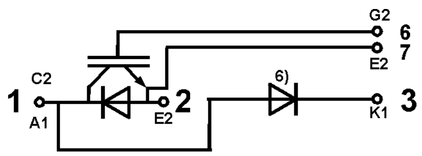
SKM 195 GB 063 DN



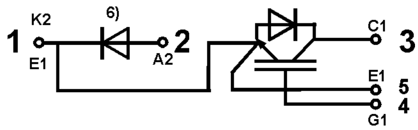


Dimensions in mm

SKM 195 GAL 063 DN
Case D 94 (→ D 93)



SKM 195 GAR 063 DN
Case D 95 (→ D 93)



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/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 pieces are used if suitable

