SEMIKRON

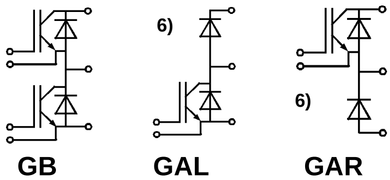
Absolute Maximum Ratings Symbol	Conditions [1]	Values	Units
V_{CES}		600	V
V_{CGR}	R_{GE} = 20 kΩ	600	V
I_C	T_{case} = 25/80 °C	250 / 190	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	500 / 380	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	960	W
T_j, (T_{stg})		–40 ... +150 (125)	°C
V_{isol}	AC, 1 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, $V_{CE} = V_{CES}$; T_j = 25 °C	–	0,2	–	mA
	V_{GE} = 0, $V_{CE} = V_{CES}$; 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; T_j = 25 (125) °C	–	2,1(2,4)	2,5(2,8)	V
		–	–	–	V
g_{fs}	V_{CE} = 20 V, I_C = 200 A	40	–	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	11,2	–	nF
C_{oes}		–	1250	–	pF
C_{res}		–	750	–	pF
L_{CE}	(terminal 2 - 3)	–	–	25	nH
$t_{d(on)}$	V_{CC} = 300 V; V_{GE} = +15 V / –15 V[3]; I_C = 200 A, ind. load; $R_{Gon} = R_{Goff}$ = 8 Ω; T_j = 125 °C	–	120	–	ns
t_r		–	85	–	ns
$t_{d(off)}$		–	460	–	ns
t_f		–	50	–	ns
E_{on}		–	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; T_j = 25 (125) °C	–	1,45(1,35)	1,7	V
$V_F = V_{EC}$	I_F = 200 A; 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	–	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

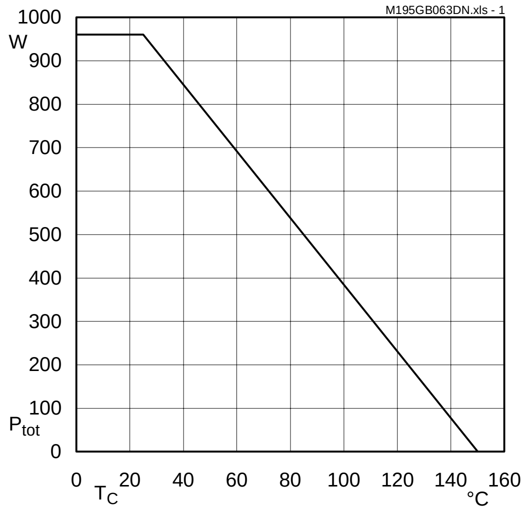


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

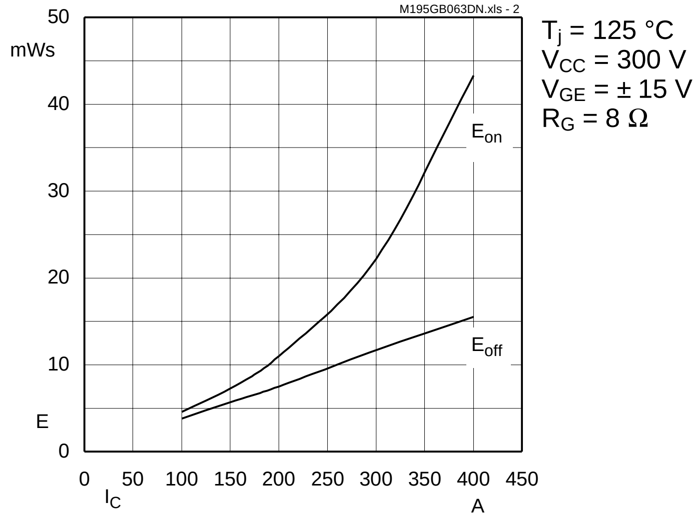


Fig. 2 Turn-on /-off energy = $f(I_C)$

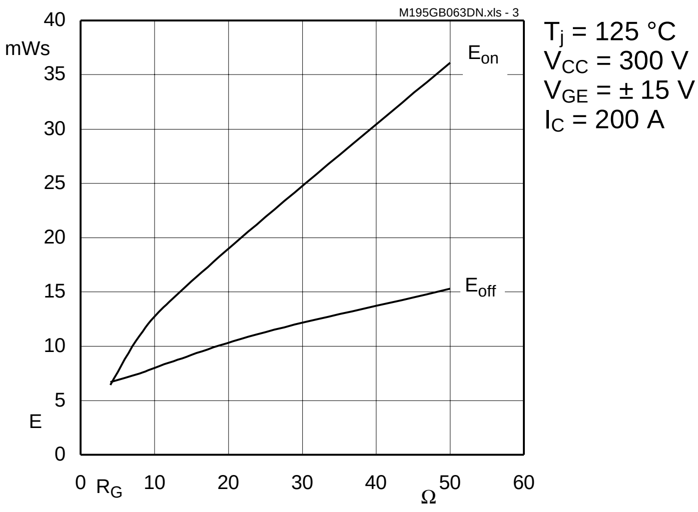


Fig. 3 Turn-on /-off energy = $f(R_G)$

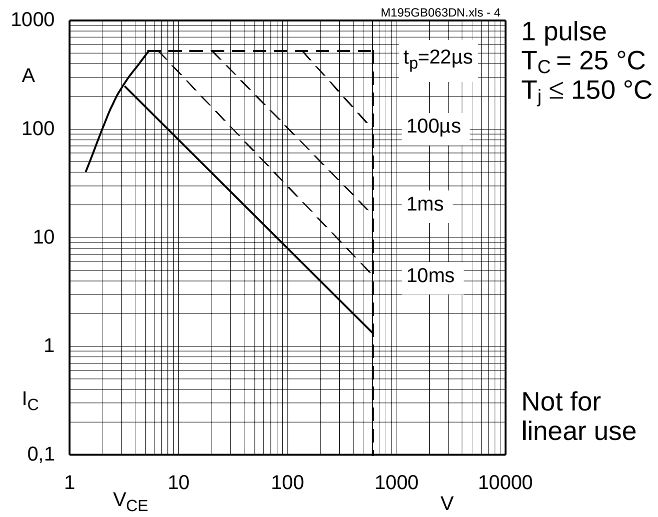


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

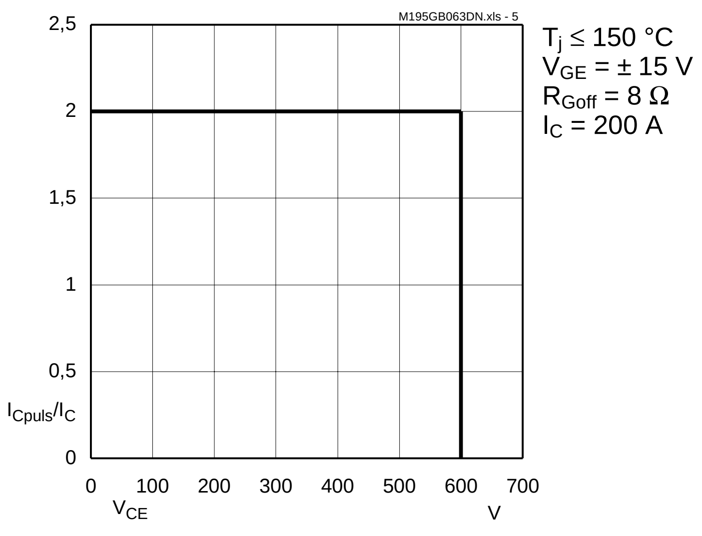


Fig. 5 Turn-off safe operating area (RBSOA)

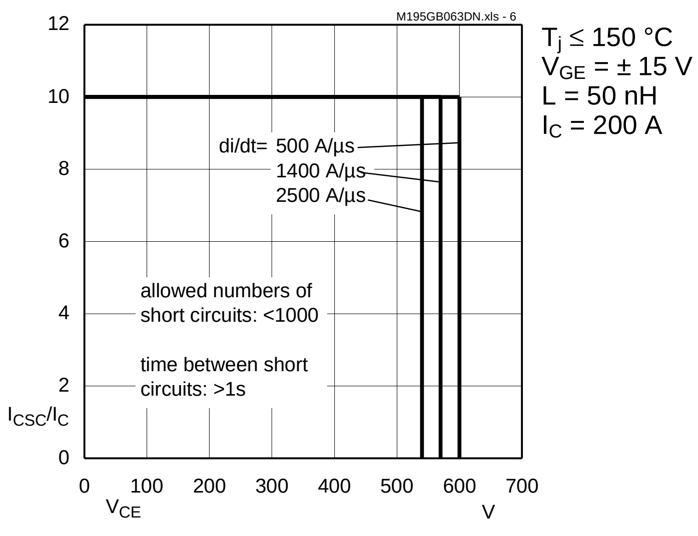


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

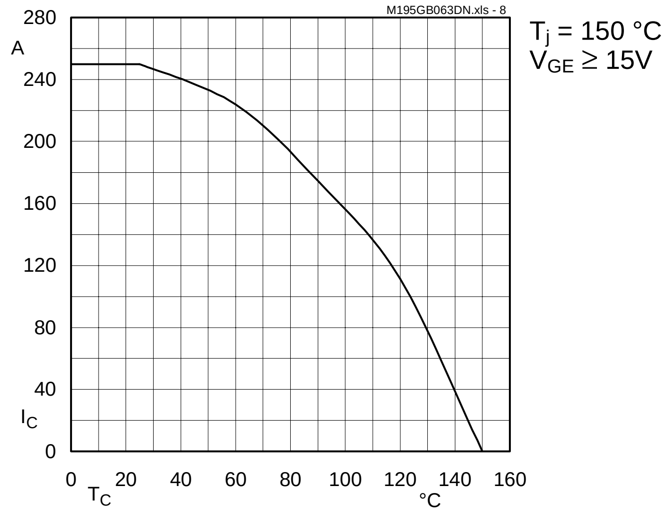


Fig. 8 Rated current vs. temperature $I_C = f\ (T_C)$

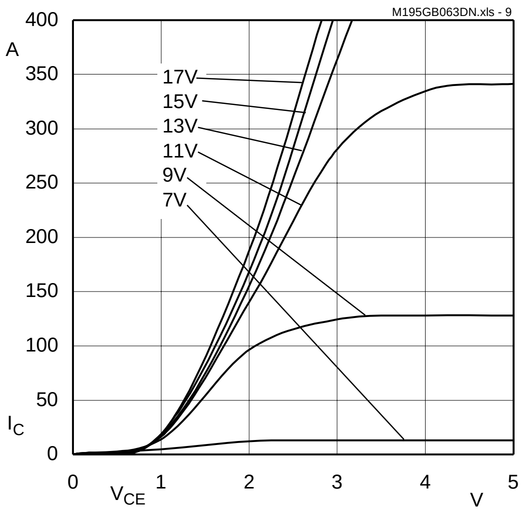


Fig. 9 Typ. output characteristic, t_p = 250 µs; T_j = 25 °C

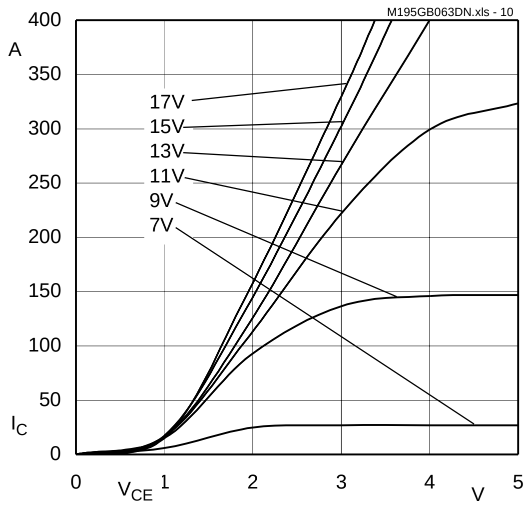


Fig. 10 Typ. output characteristic, t_p = 250 µs; T_j = 125 °C

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

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

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

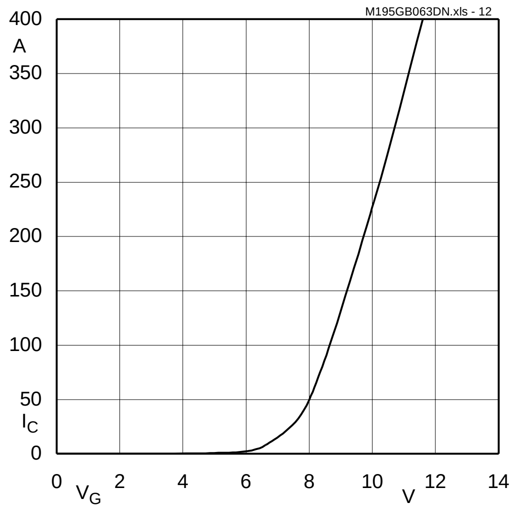


Fig. 12 Typ. transfer characteristic, t_p = 250 µs; V_{CE} = 20 V

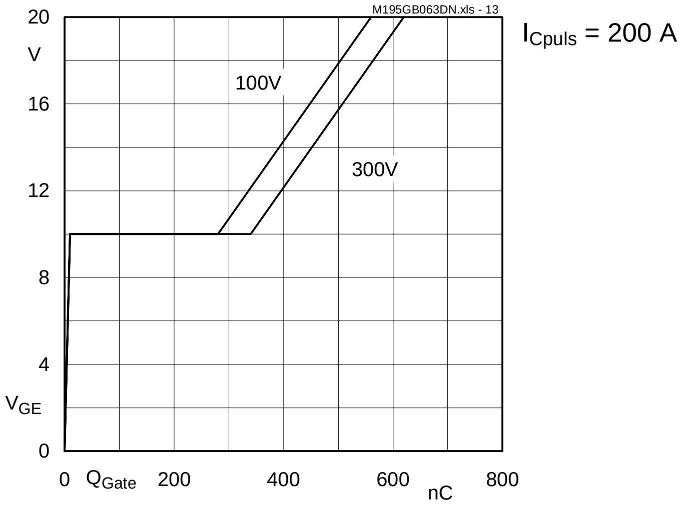


Fig. 13 Typ. gate charge characteristic

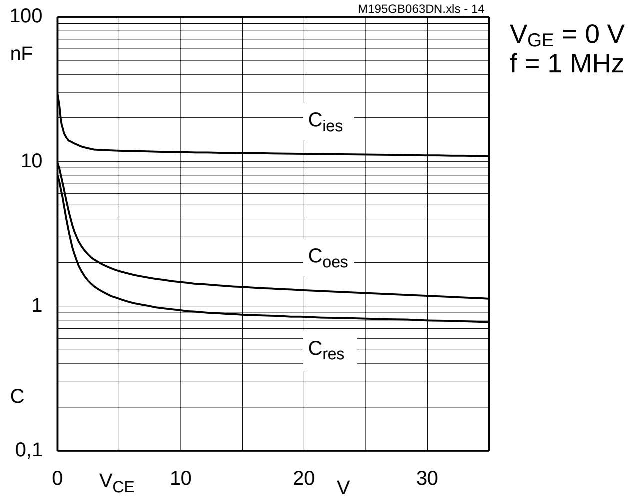


Fig. 14 Typ. capacitances vs.V_{CE}

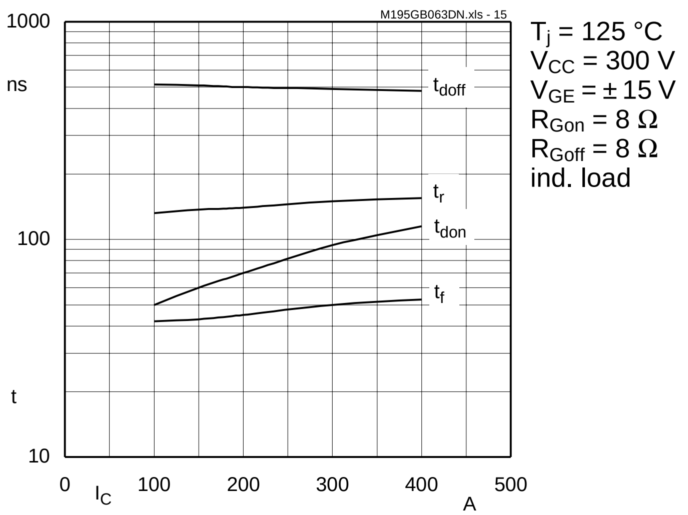


Fig. 15 Typ. switching times vs. I_C

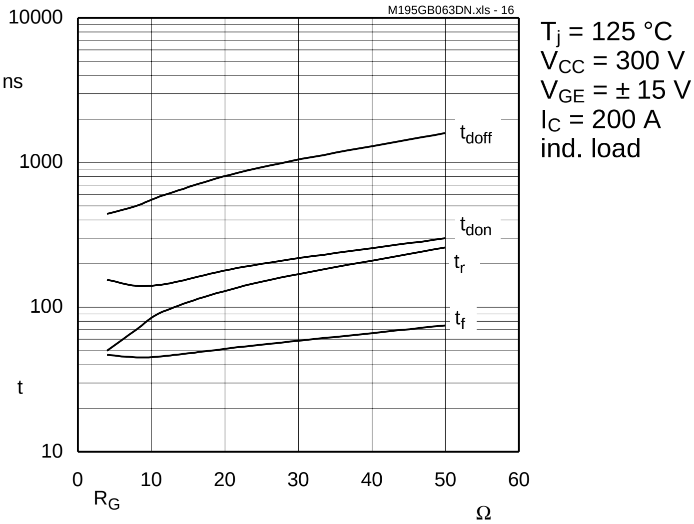


Fig. 16 Typ. switching times vs. gate resistor R_G

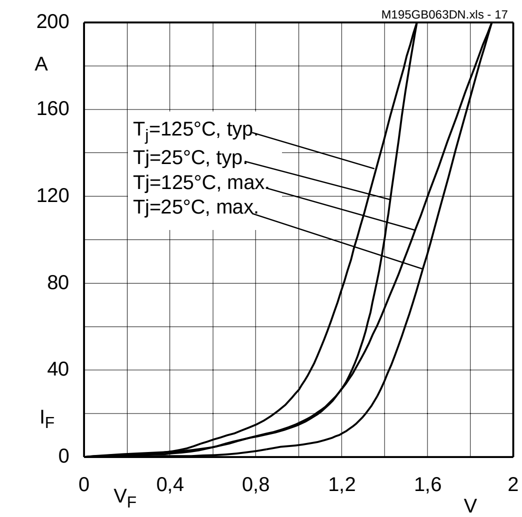


Fig. 17 Typ. CAL diode forward characteristic

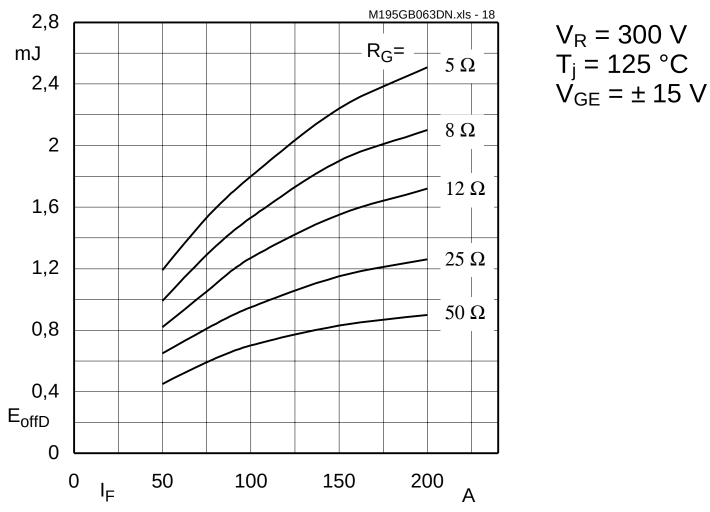


Fig. 18 Diode turn-off energy dissipation per pulse

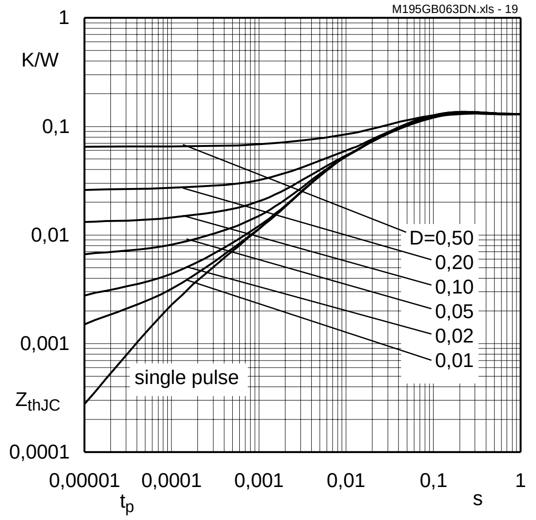


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

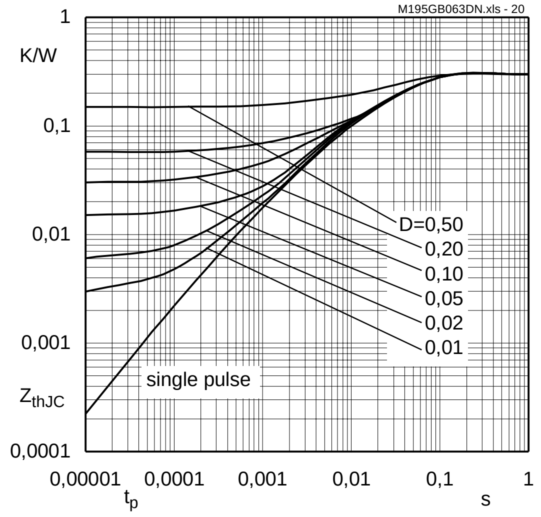


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

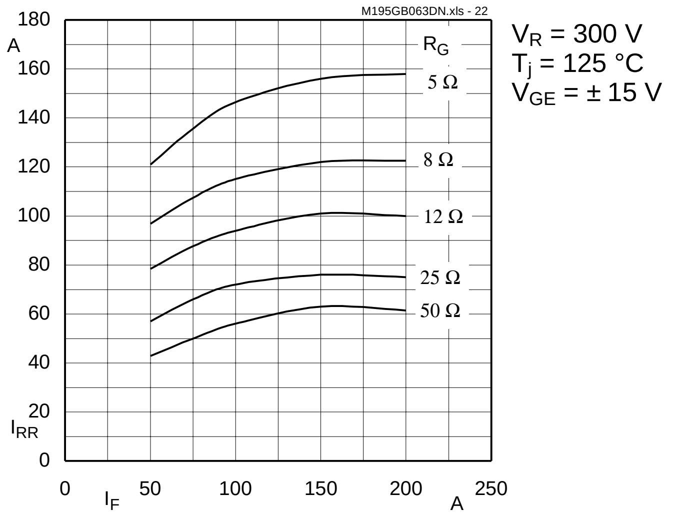


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

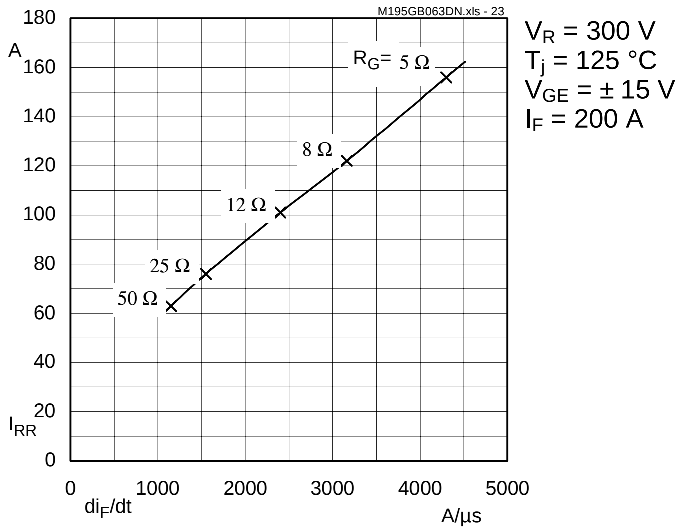


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di/dt)$

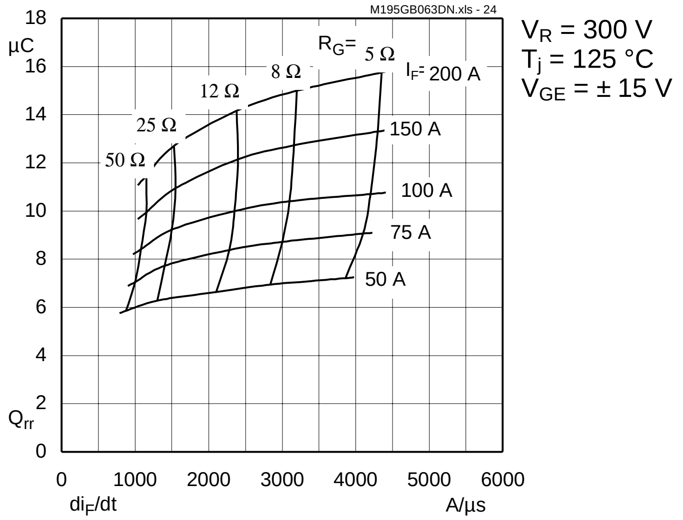
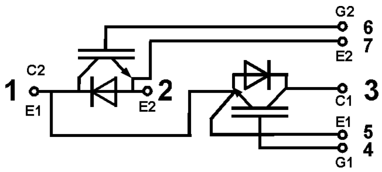


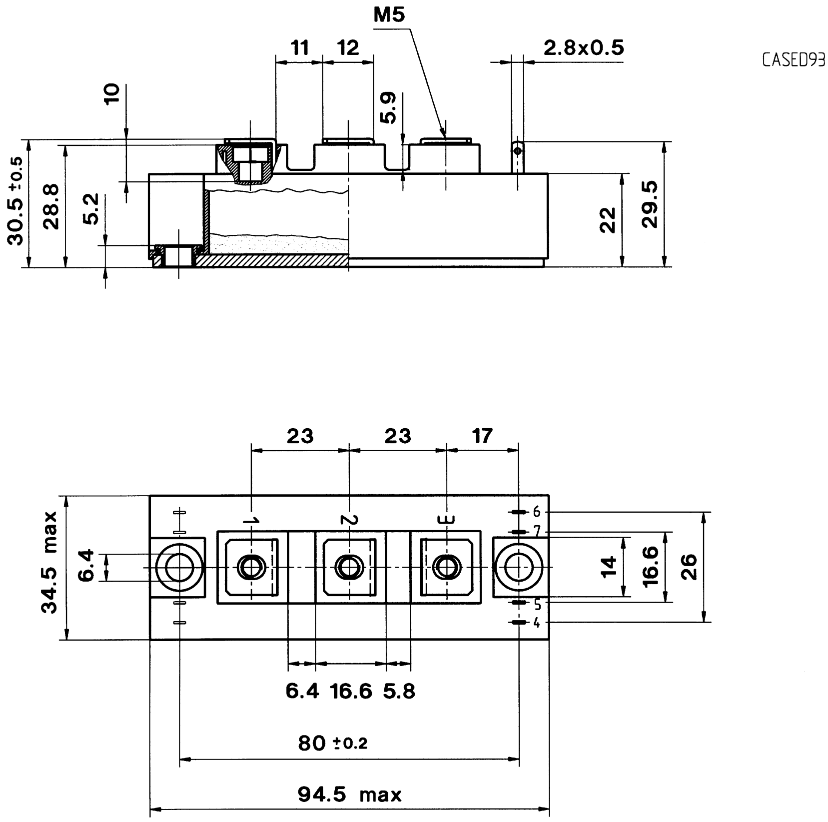
Fig. 24 Typ. CAL diode recovered charge

SEMITRANS 2N (low inductance)

Case D 93
UL Recognized
File no. E 63 532

SKM 195 GB 063 DN

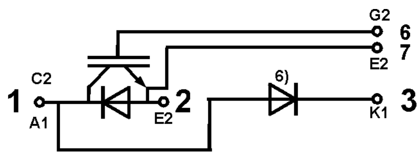




Dimensions in mm

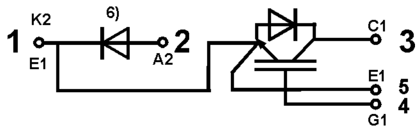
SKM 195 GAL 063 DN

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

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

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