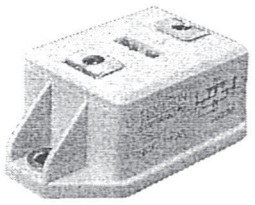
SEMIKRON

Absolute Maximum Ratings Symbol	Conditions [1]	Values	Units
V_{CES}		1200	V
V_{CGR}	R_{GE} = 20 kΩ	1200	V
I_C	T_{case} = 25/80 °C [4]	200 / 150	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms [4]	400 / 300	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	1140	W
T_j, (T_{stg})		–40 ... +150 (125)	°C
V_{isol}	AC, 1 min.	2500	V
humidity	DIN 40 040	Class F	
climate	DIN IEC 68 T.1	40/125/56	
$I_F = -I_C$	T_{case} = 25/80 °C		A
$I_{FM} = -I_{CM}$	T_{case} = 25/80 °C; t_p = 1 ms		A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C		A
I^2t	t_p = 10 ms; T_j = 150 °C		A^2s

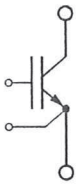
Characteristics Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 0,8 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 6 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, T_j = 25 °C	–	0,1	1	mA
	V_{CE} = V_{CES}, T_j = 125 °C	–	3	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	200	nA
V_{CEsat}	I_C = 150 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	2,7(3,3)	3,0(3,9)	V
V_{CEsat}	I_C = 200 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	2,8(3,5)	–	V
g_{fs}	V_{CE} = 20 V, I_C = 150 A	–	120	–	S
C_{CHC}	per IGBT	–	–	300	pF
C_{ies}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	10	13	nF
C_{oes}		–	1,5	2	nF
C_{res}		–	0,7	1	nF
L_{CE}		–	–	30	nH
$t_{d(on)}$	V_{CC} = 600 V	–	70	–	ns
t_r	V_{GE} = –15 V / +15 V [3]	–	55	–	ns
$t_{d(off)}$	I_C = 150 A, ind. load	–	400	–	ns
t_f	R_{Gon} = R_{Goff} = 5,6 Ω	–	40	–	ns
E_{on}	T_j = 125 °C	–	24	–	mWs
E_{off}		–	15	–	mWs
Thermal characteristics					
R_{thjc}	per IGBT	–	–	0,11	°C/W
R_{thjc}	per diode	–	–		°C/W
R_{thch}	per module	–	–	0,05	°C/W
Mechanical Data					
M1	to heatsink, SI Units	4	–	5	Nm
	to heatsink, US Units	35	–	44	lb.in.
M2	for terminals, SI Units	2,5	–	3,5	Nm
	for terminals, US Units	22	–	24	lb.in.
a				5x9,81	m/s^2
w				130	g

SEMITRANS® M
IGBT Modules

SKM 152 GA 123



SINGLE SEMITRANS M1



GA

Features

- MOS input (voltage controlled)
- N-channel, homogeneous Silicon structure (NPT-Non punch through IGBT)
- Very low tail current with low temperature dependence
- High short circuit capability, self limiting to 6 * I_{cnom} using active gate clamping
- Latch-up free
- without inverse diode
- with hardmould:
  code No. < 98000 (w = 150 g)
  without hardmould:
  code No. > 98000 (w = 130 g)
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (9 mm) and creepage distances (13 mm)

Typical Applications

- Switched mode power supplies
- Brake chopper module in AC motor speed control
- Pulse frequencies also above 15 kHz
- Not for linear use

[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
[4] Max. current at 25 °C is limited by internal connections

Case → page 5

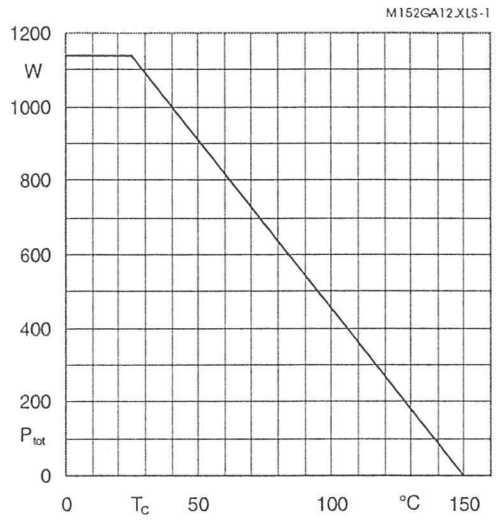


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

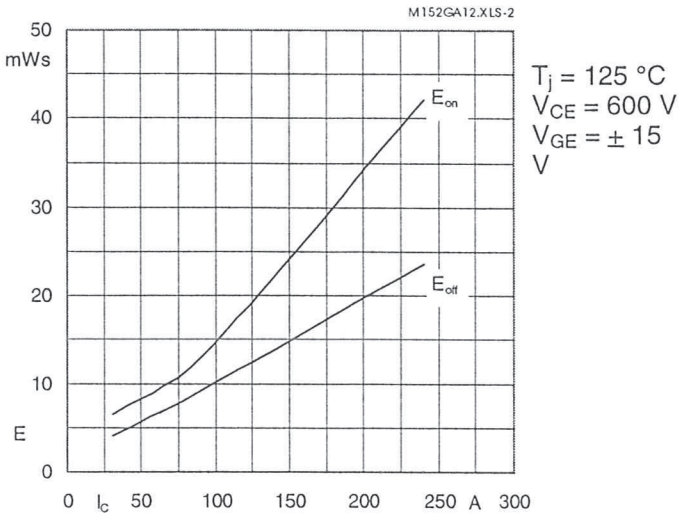


Fig. 2 Turn-on /-off energy = f (I_C)

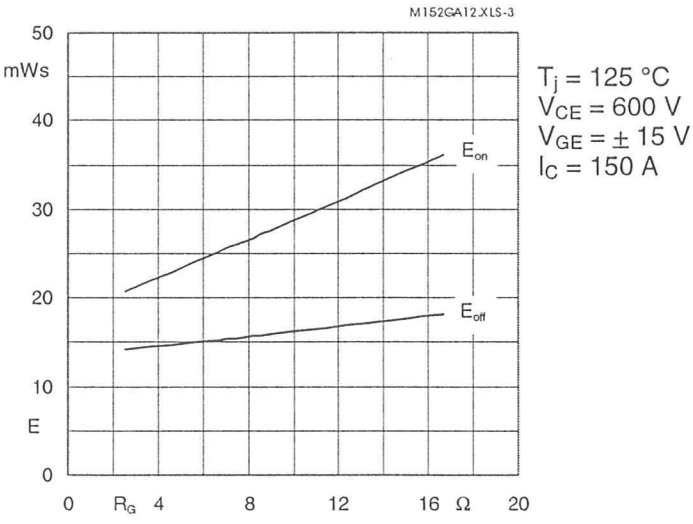


Fig. 3 Turn-on /-off energy = f (R_G)

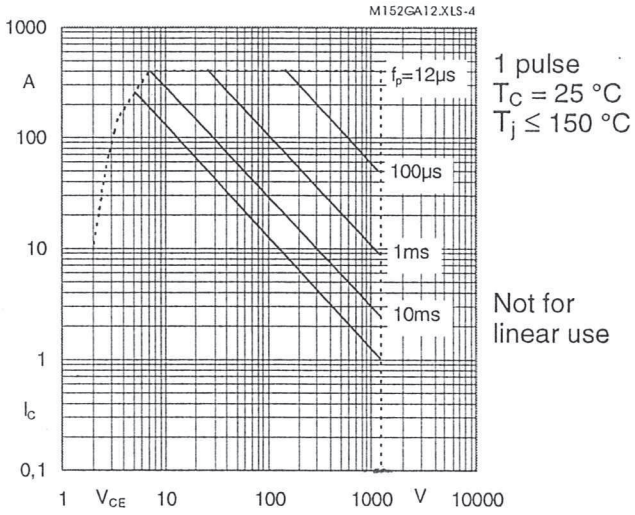


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

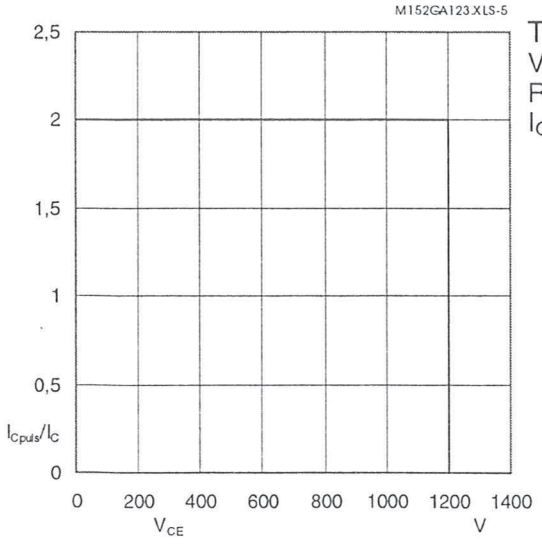


Fig. 5 Turn-off safe operating area (RBSOA)

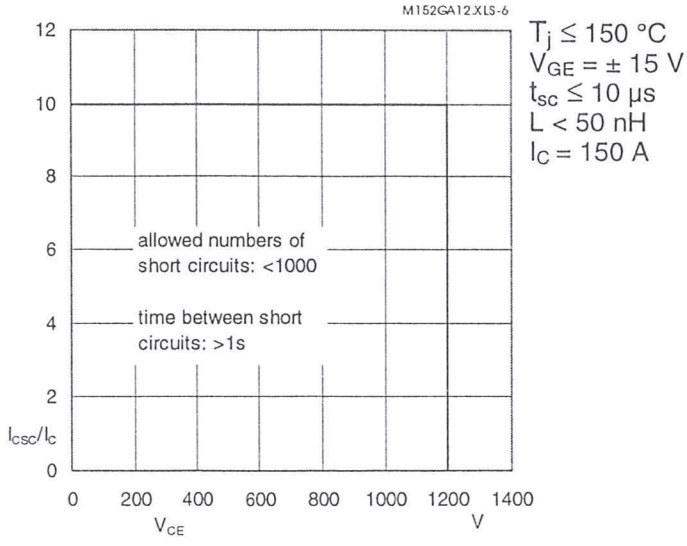


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

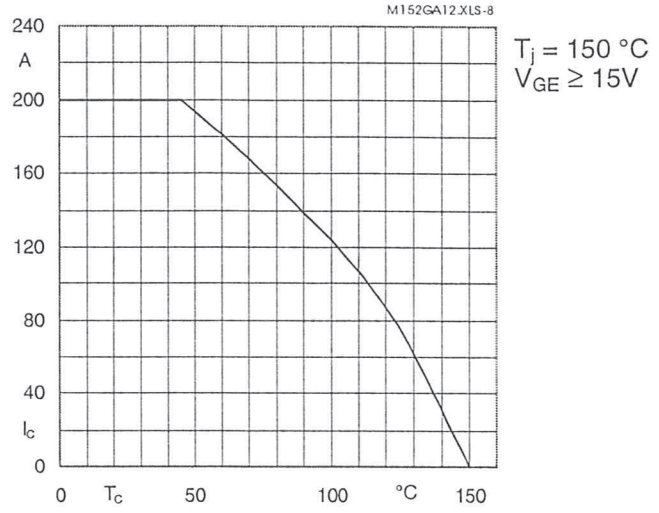


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

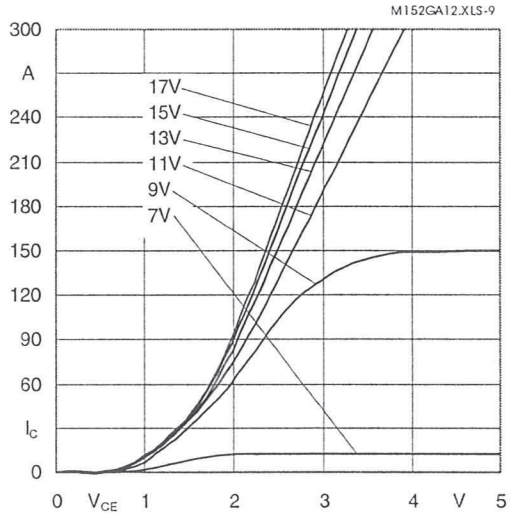


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

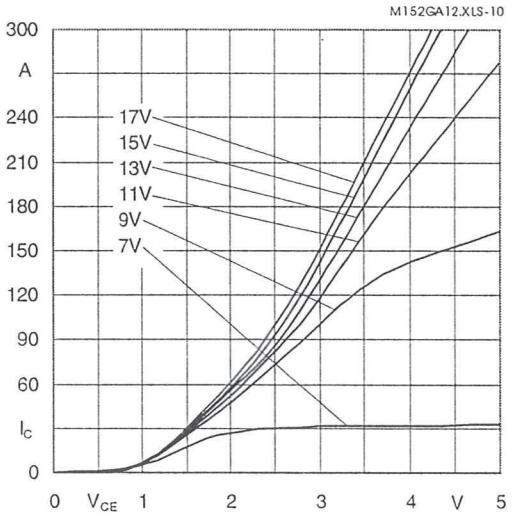


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

$V_{CE(TO)(Tj)} = 1{,}46 + 0{,}003\ (T_j - 25)$ [V]

typ.: $r_{CE(Tj)} = 0{,}006 + 0{,}00003\ (T_j - 25)$ [Ω]

max: $r_{CE(Tj)} \leq 0{,}010 + 0{,}00004\ (T_j - 25)$ [Ω]

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

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

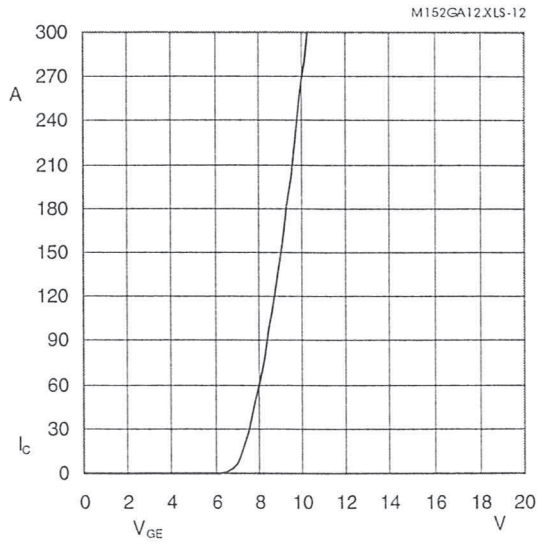


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V

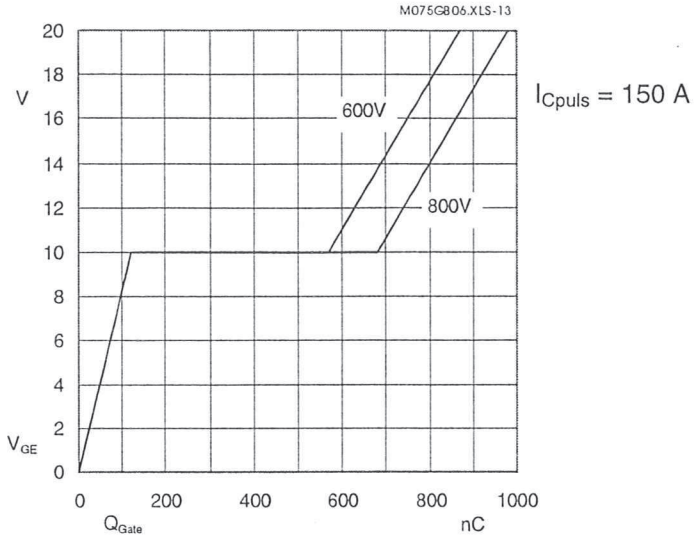


Fig. 13 Typ. gate charge characteristic

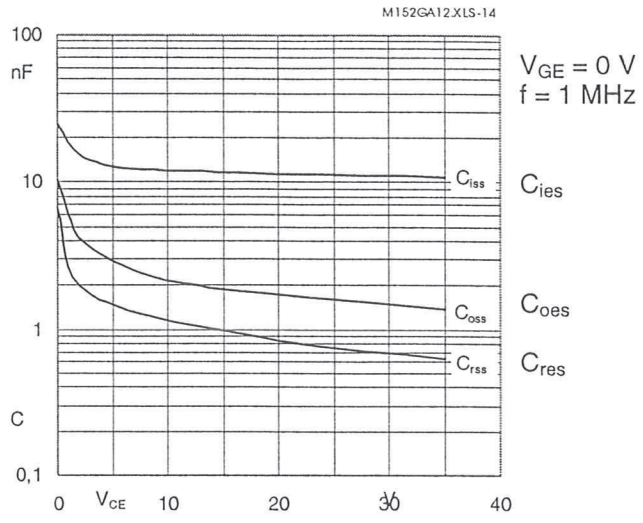


Fig. 14 Typ. capacitances vs. V_{CE}

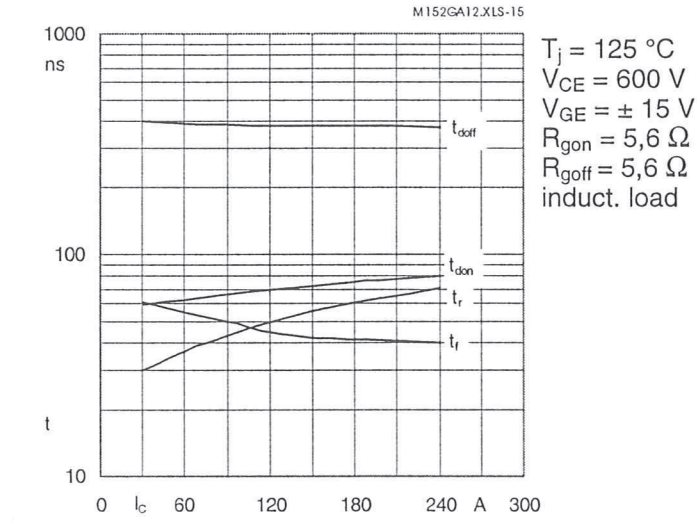


Fig. 15 Typ. switching times vs. I_C

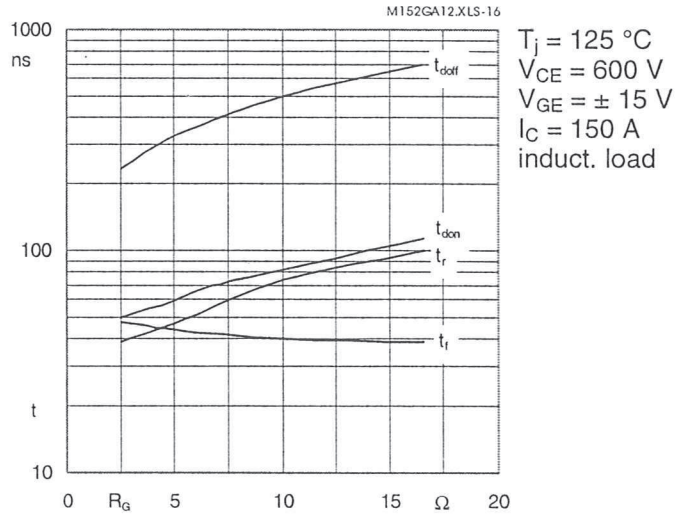


Fig. 16 Typ. switching times vs. gate resistor R_G

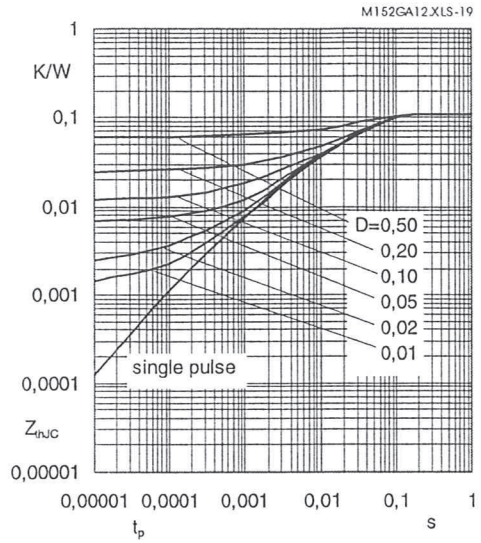
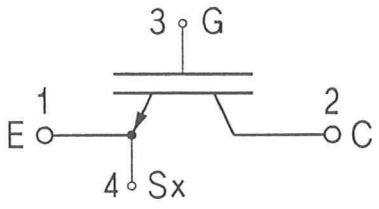
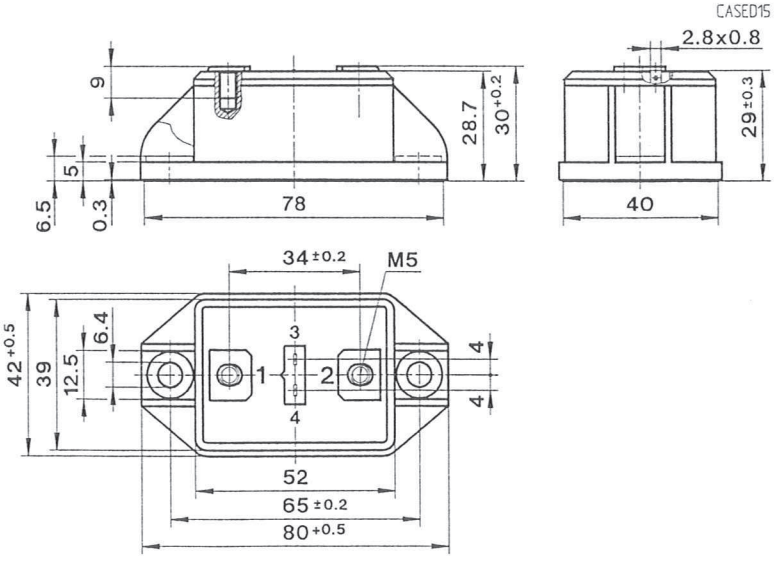


Fig. 19 Transient thermal impedance

SEMITRANS M1

Case D 15





Dimensions in mm