

Absolute Maximum Ratings		Values	Units
Symbol	Conditions <sup>1)</sup>		
V <sub>CES</sub>		1200	V
V <sub>CGR</sub>	R <sub>GE</sub> = 20 kΩ	1200	V
I <sub>C</sub>	T <sub>case</sub> = 25/80 °C	100 / 80	A
I <sub>CM</sub>	T <sub>case</sub> = 25/80 °C; t <sub>p</sub> = 1 ms	200 / 160	A
V <sub>GES</sub>		± 20	V
P <sub>tot</sub>	per IGBT, T <sub>case</sub> = 25 °C	690	W
T <sub>j</sub> , (T <sub>stg</sub> )		-40 ... + 150 (125)	°C
V <sub>isol</sub>	AC, 1 min.	2500	V
humidity	IEC 60721-3-3	class 3K7/IE32	
climate	IEC 68 T.1	40/125/56	
Inverse Diode			
I <sub>F</sub> = -I <sub>C</sub>	T <sub>case</sub> = 25/80 °C	95 / 65	A
I <sub>FM</sub> = -I <sub>CM</sub>	T <sub>case</sub> = 25/80 °C; t <sub>p</sub> = 1 ms	200 / 160	A
I <sub>FSM</sub>	t <sub>p</sub> = 10 ms; sin.; T <sub>j</sub> = 150 °C	720	A
I <sup>2</sup> t	t <sub>p</sub> = 10 ms; T <sub>j</sub> = 150 °C	2600	A <sup>2</sup> s

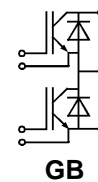
Characteristics		min.	typ.	max.	Units
Symbol	Conditions <sup>1)</sup>				
V <sub>(BR)CES</sub>	V <sub>GE</sub> = 0, I <sub>C</sub> = 4 mA	≥ V <sub>CES</sub>			V
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 2 mA	4,5	5,5	6,5	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 } T <sub>j</sub> = 25 °C		0,1	1,5	mA
	V <sub>CE</sub> = V <sub>CES</sub> } T <sub>j</sub> = 125 °C		6		mA
I <sub>GES</sub>	V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0			300	nA
V <sub>CESat</sub>	I <sub>C</sub> = 75 A } V <sub>GE</sub> = 15 V; } T <sub>j</sub> = 25 °C		3,3	3,65	V
V <sub>CESat</sub>	I <sub>C</sub> = 100 A } T <sub>j</sub> = 25 °C		3,8		V
g <sub>fs</sub>	V <sub>CE</sub> = 20 V, I <sub>C</sub> = 75 A	31			S
C <sub>CHC</sub>	per IGBT			350	pF
C <sub>ies</sub>	V <sub>GE</sub> = 0		5	6,6	nF
C <sub>oes</sub>	V <sub>CE</sub> = 25 V		720	900	pF
C <sub>res</sub>	f = 1 MHz		380	500	pF
L <sub>CE</sub>				25	nH
t <sub>d(on)</sub>	V <sub>CC</sub> = 600 V		80		ns
t <sub>r</sub>	V <sub>GE</sub> = -15 V / +15 V <sup>3)</sup>		40		ns
t <sub>d(off)</sub>	I <sub>C</sub> = 75 A, ind. load		360		ns
t <sub>f</sub>	R <sub>Gon</sub> = R <sub>Goff</sub> = 8 Ω		20		ns
E <sub>on</sub>	T <sub>j</sub> = 125 °C		9		mWs
E <sub>off</sub>			3,5		mWs
Inverse Diode <sup>8)</sup>					
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 75 A } V <sub>GE</sub> = 0 V; } T <sub>j</sub> = 25 (125) °C		2,0(1,8)	2,5	V
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 100 A } T <sub>j</sub> = 25 (125) °C		2,25(2,05)		V
V <sub>TO</sub>	T <sub>j</sub> = 125 °C			1,2	V
r <sub>t</sub>	T <sub>j</sub> = 125 °C		12	15	mΩ
I <sub>RRM</sub>	I <sub>F</sub> = 75 A; T <sub>j</sub> = 25 (125) °C <sup>2)</sup>		27(40)		A
Q <sub>rr</sub>	I <sub>F</sub> = 75 A; T <sub>j</sub> = 25 (125) °C <sup>2)</sup>		3(10)		μC
Thermal characteristics					
R <sub>thjc</sub>	per IGBT			0,18	°C/W
R <sub>thjc</sub>	per diode			0,50	°C/W
R <sub>thch</sub>	per module			0,05	°C/W

## SEMITRANS® M Ultra Fast IGBT Modules

### SKM 100 GB 125 DN



SEMITRANS 2N (low inductance)



### Features

- N channel, homogeneous Si
- Low inductance case
- **Short tail** current with low temperature dependence
- High short circuit capability, self limiting to 6 \* I<sub>cnom</sub>
- Fast & soft inverse CAL diodes <sup>8)</sup>
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (10 mm) and creepage distances (20 mm)

### Typical Applications

- Switched mode power supplies at f<sub>sw</sub> > 20 kHz
- Resonant inverters up to 100 kHz
- Inductive heating
- Electronic welders at f<sub>sw</sub> > 20 kHz

<sup>1)</sup> T<sub>case</sub> = 25 °C, unless otherwise specified

<sup>2)</sup> I<sub>F</sub> = -I<sub>C</sub>, V<sub>R</sub> = 600 V, -di<sub>F</sub>/dt = 800 A/μs, V<sub>GE</sub> = 0 V

<sup>3)</sup> Use V<sub>GEoff</sub> = -5... -15 V

<sup>8)</sup> CAL = Controlled Axial Lifetime Technology

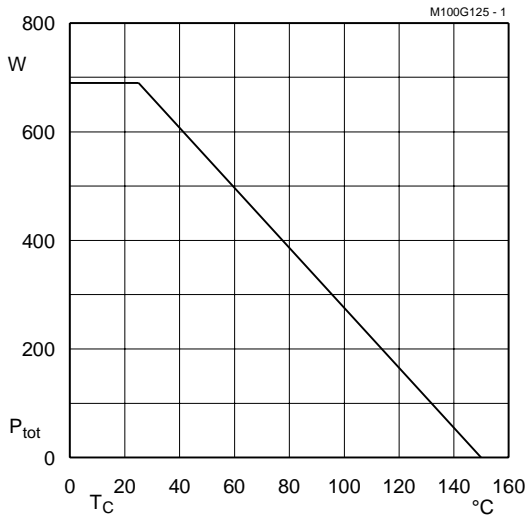


Fig. 1 Rated power dissipation  $P_{tot} = f(T_C)$

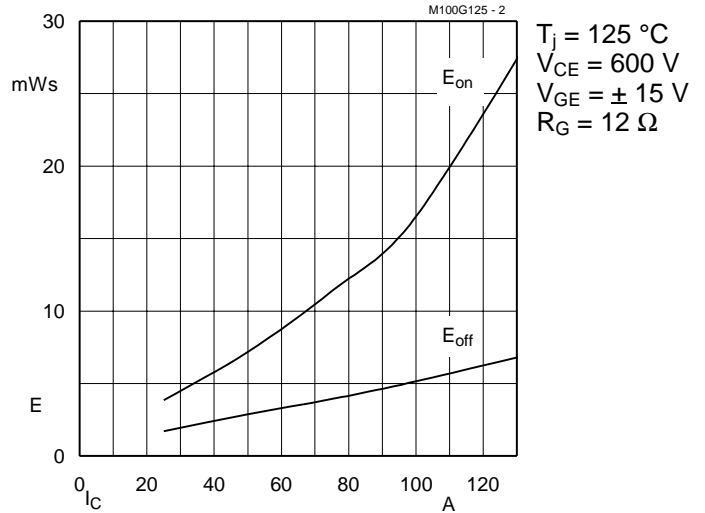


Fig. 2 Turn-on /-off energy  $E = f(I_C)$

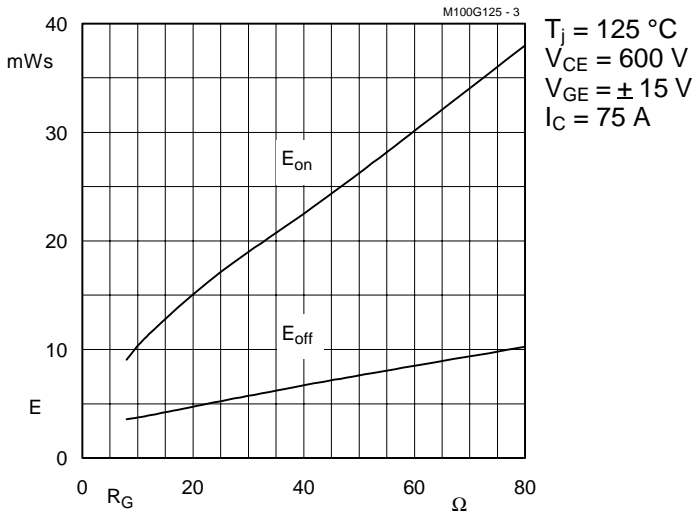


Fig. 3 Turn-on /-off energy  $E = f(R_G)$

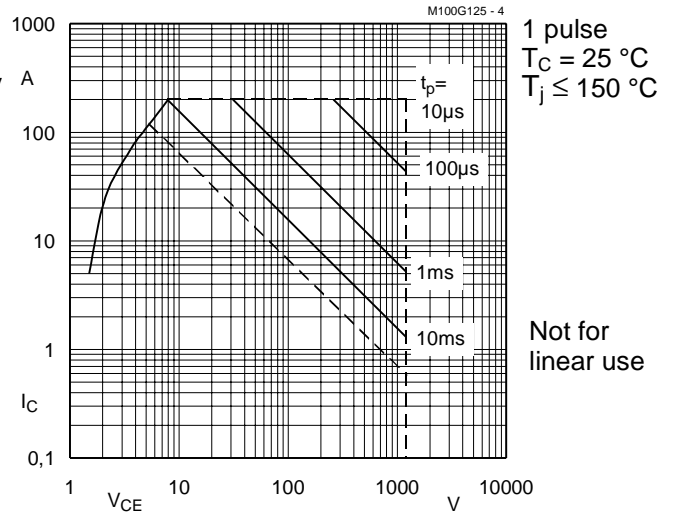


Fig. 4 Maximum safe operating area (SOA)  $I_C = f(V_{CE})$

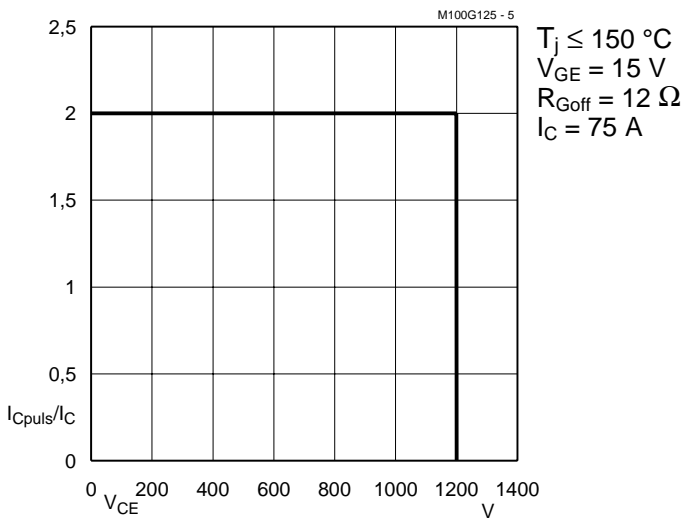


Fig. 5 Turn-off safe operating area (RBSOA)

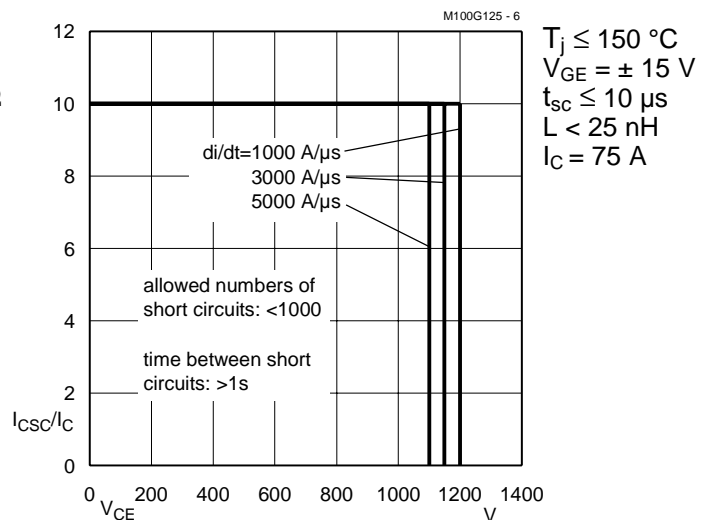


Fig. 6 Safe operating area at short circuit  $I_C = f(V_{CE})$

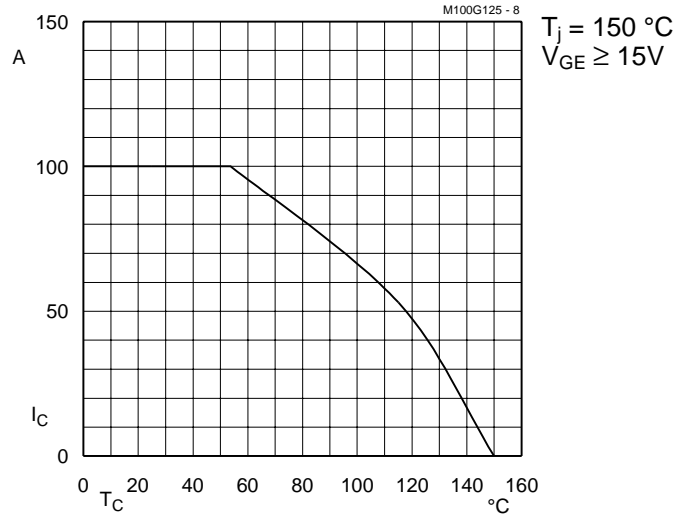


Fig. 8 Rated current vs. temperature  $I_C = f(T_C)$

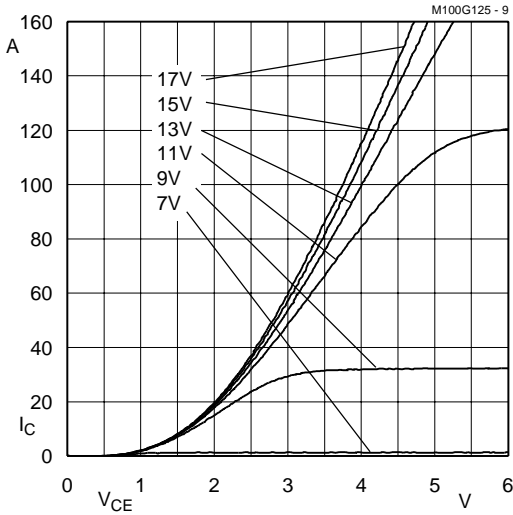


Fig. 9 Typ. output characteristic,  $t_p = 80\text{ }\mu\text{s}$ ;  $25\text{ }^\circ\text{C}$

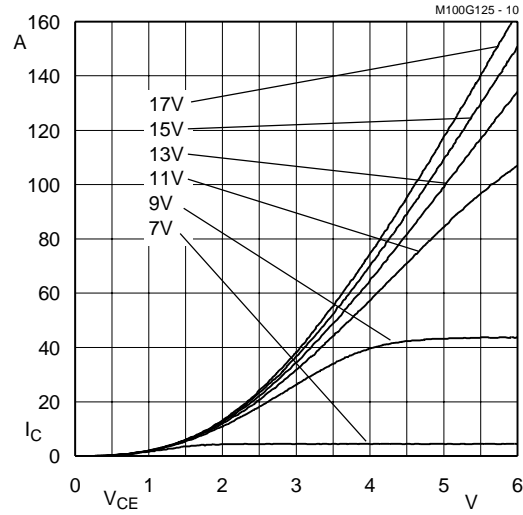


Fig. 10 Typ. output characteristic,  $t_p = 80\text{ }\mu\text{s}$ ;  $125\text{ }^\circ\text{C}$

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

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

$$V_{\text{CE(TO)(Tj)}} \leq 1,4 + 0,003 (T_j - 25) \text{ [V]}$$

$$\text{typ.: } r_{\text{CE(Tj)}} = 0,0253 + 0,000067 (T_j - 25) \text{ } [\Omega]$$

$$\text{max.: } r_{\text{CE(Tj)}} = 0,0307 + 0,00004 (T_j - 25) \text{ } [\Omega]$$

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

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

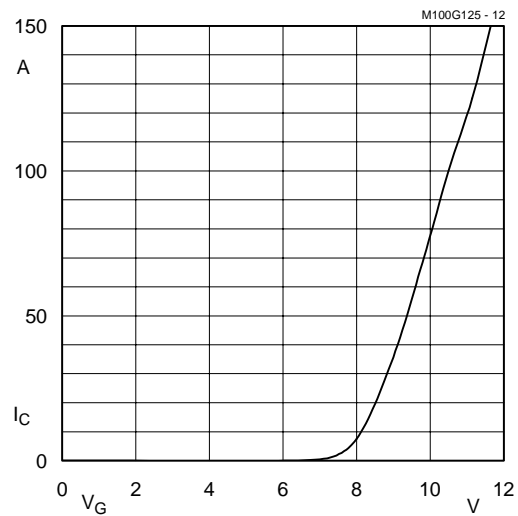


Fig. 12 Typ. transfer characteristic,  $t_p = 80\text{ }\mu\text{s}$ ;  $V_{\text{CE}} = 20\text{ V}$

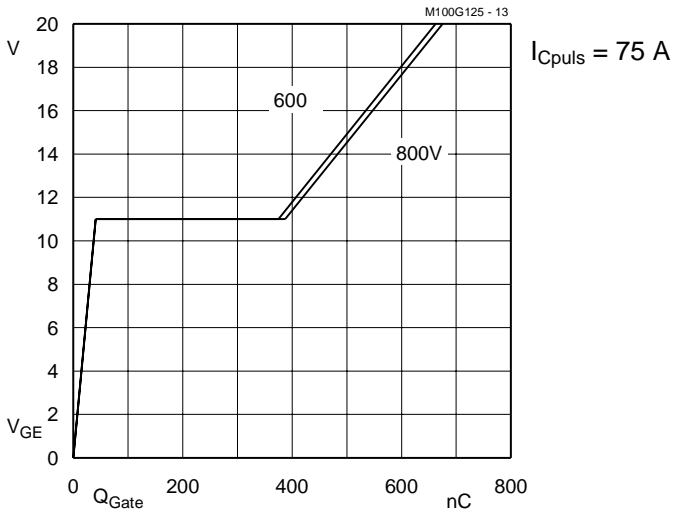


Fig. 13 Typ. gate charge characteristic

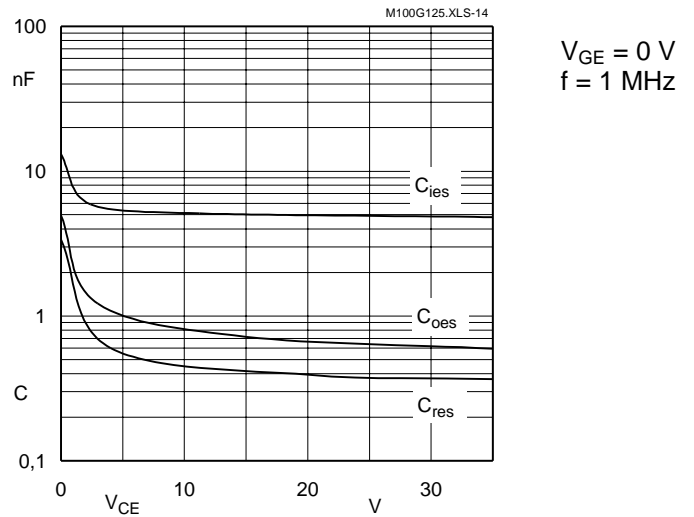


Fig. 14 Typ. capacitances vs.  $V_{CE}$

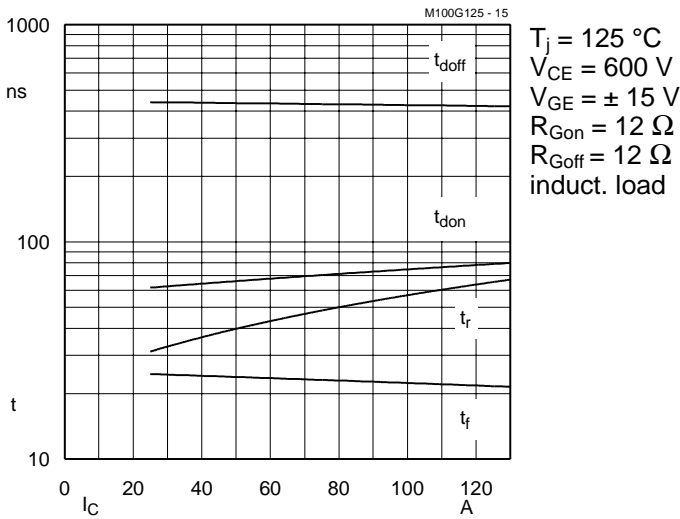


Fig. 15 Typ. switching times vs.  $I_C$

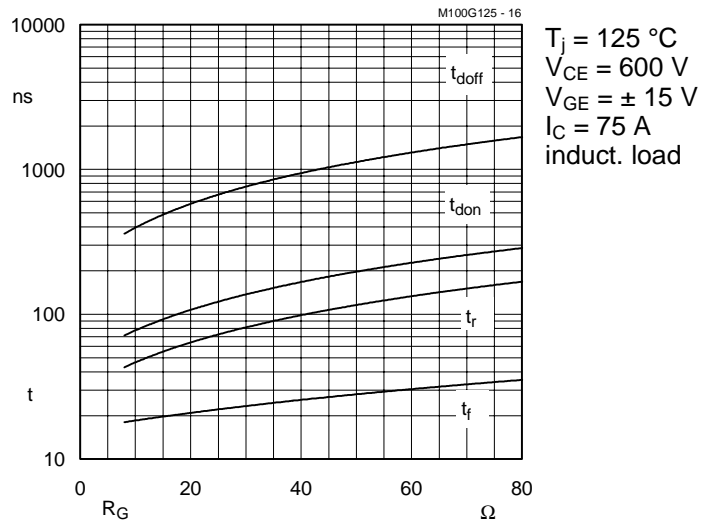


Fig. 16 Typ. switching times vs. gate resistor  $R_G$

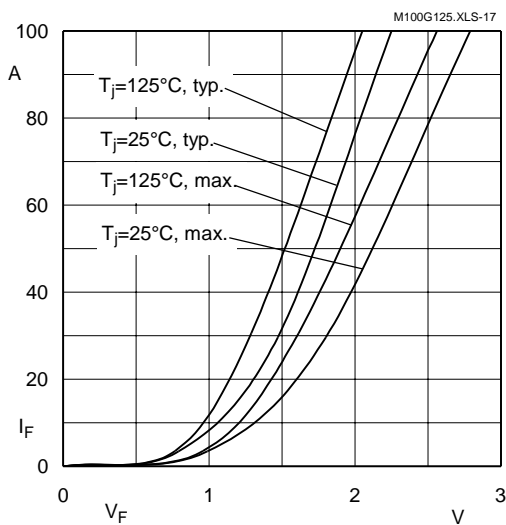


Fig. 17 Typ. CAL diode forward characteristic

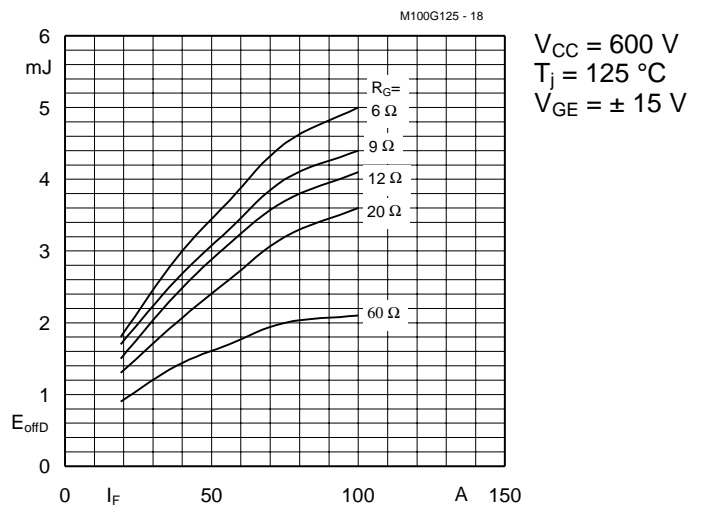


Fig. 18 Diode turn-off energy dissipation per pulse

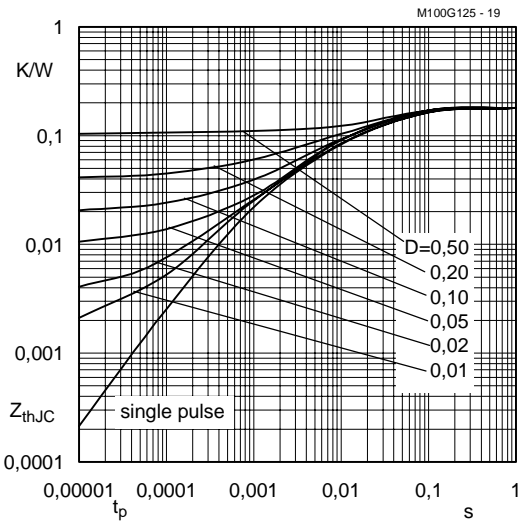


Fig. 19 Transient thermal impedance of IGBT  
 $Z_{thJC} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$

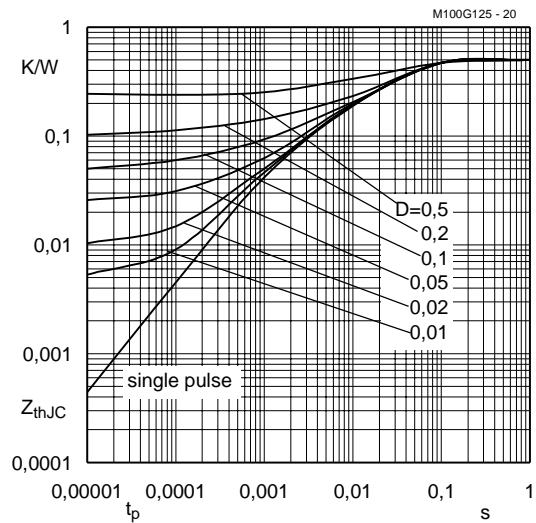
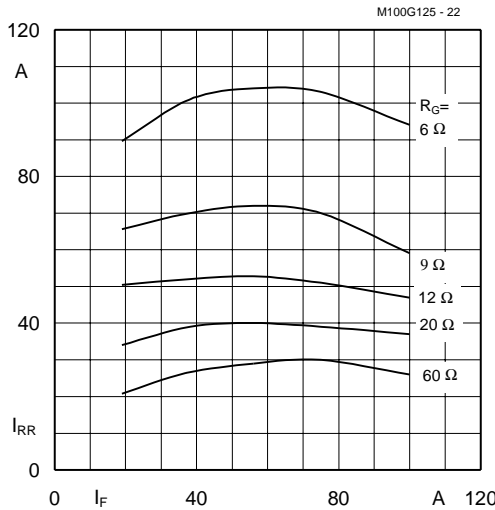
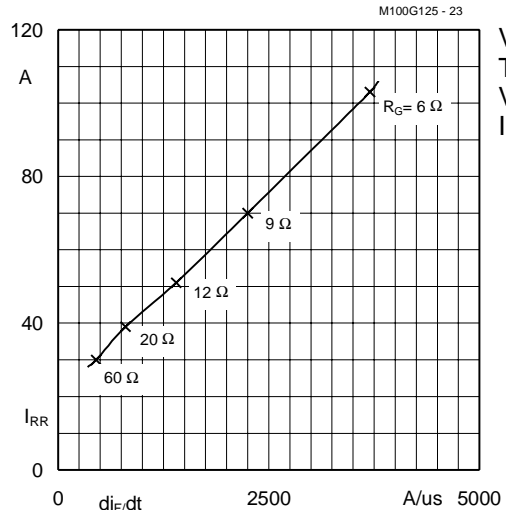


Fig. 20 Transient thermal impedance of inverse CAL diodes  
 $Z_{thJC} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$



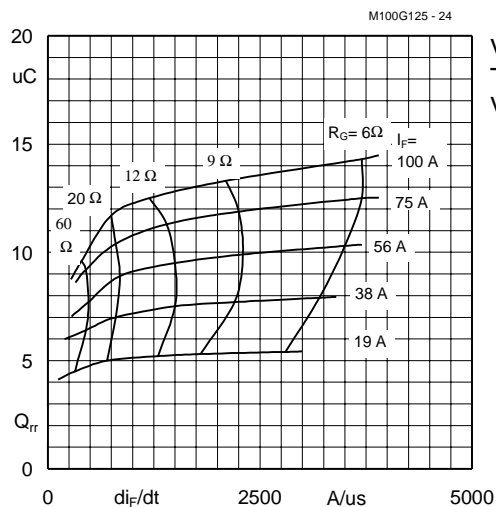
$V_{CC} = 600\text{ V}$   
 $T_j = 125\text{ }^\circ\text{C}$   
 $V_{GE} = \pm 15\text{ V}$

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



$V_{CC} = 600\text{ V}$   
 $T_j = 125\text{ }^\circ\text{C}$   
 $V_{GE} = \pm 15\text{ V}$   
 $I_F = 75\text{ A}$

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



$V_{CC} = 600\text{ V}$   
 $T_j = 125\text{ }^\circ\text{C}$   
 $V_{GE} = \pm 15\text{ V}$

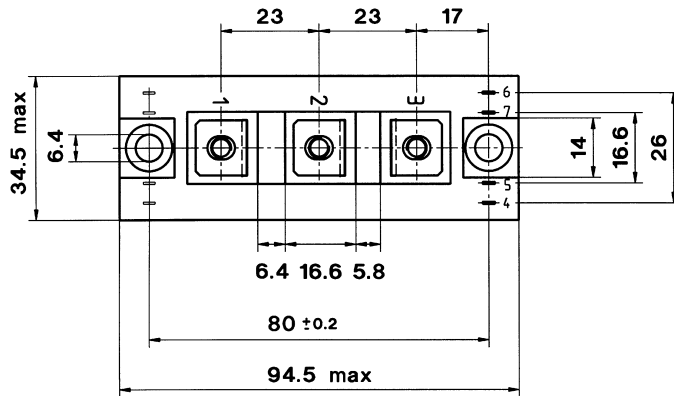
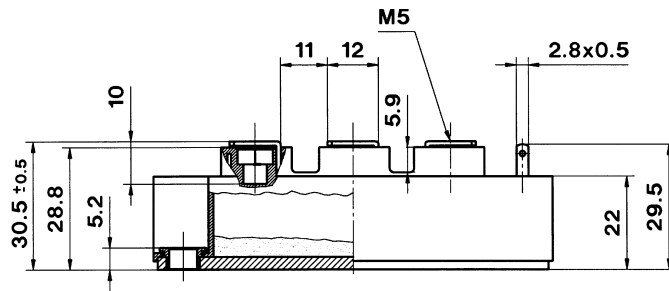
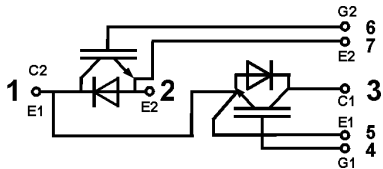
Fig. 24 Typ. CAL diode recovered charge  $Q_{rr} = f(di/dt)$

**SEMITRANS 2N (low inductance)**

Case D 93  
 UL Recognized  
 File no. E 63 532

CASED93

**SKM 100 GB 125 DN**



Dimensions in mm

Case outline and circuit diagram

Mechanical Data			Values			Units
Symbol	Conditions		min.	typ.	max.	
M <sub>1</sub>	to heatsink, SI Units to heatsink, US Units	(M6)	3	—	5	Nm lb.in.
M <sub>2</sub>	for terminals, SI Units for terminals, US Units	(M5)	2,5	—	5	Nm lb.in.
a			—	—	5x9,81	m/s <sup>2</sup>
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 and 42 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.