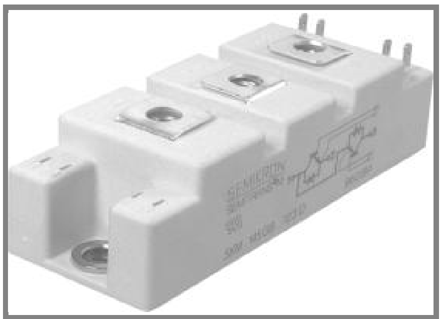
SKM 145GB123D



SEMITRANS™ 2

IGBT Modules

SKM 145GB123D

SKM 145GAL123D

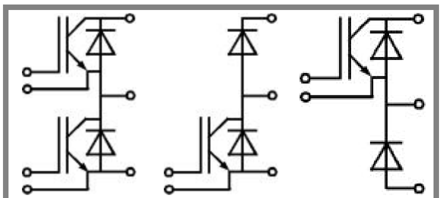
SKM 145GAR123D

Features

- MOS input (voltage controlled)
- N channel, Homogeneous Si
- Low inductance case
- Very low tail current with low temperature dependence
- High short circuit capability, self limiting to 6 x I_{cnom}
- Latch-up free
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DCB Direct Copper Bonding
- Large clearance (10 mm) and creepage distances (20 mm)

Typical Applications

- Switching (not for linear use)



GB GAL GAR

Absolute Maximum Ratings		T_c = 25 °C, unless otherwise specified	
Symbol	**Conditions**	**Values**	**Units**
IGBT			
V_{CES}		1200	V
I_C	T_c = 25 (80) °C	145 (110)	A
I_{CRM}	T_c = 25 (80) °C, t_p = 1 ms	290 (220)	A
V_{GES}		± 20	V
T_{vj}, (T_{stg})	$T_{OPERATION} \leq T_{stg}$	- 40 ... + 150 (125)	°C
V_{isol}	AC, 1 min.	2500	V
Inverse diode			
I_F	T_c = 25 (80) °C	130 (90)	A
I_{FRM}	T_c = 25 (80) °C, t_p = 1 ms	300 (220)	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	1100	A
Freewheeling diode			
I_F	T_c = 25 (80) °C	170 (115)	A
I_{FRM}	T_c = 25 (80) °C, t_p = 1 ms	300 (220)	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	1450	A

Characteristics			T_c = 25 °C, unless otherwise specified		
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Units**
IGBT					
$V_{GE(th)}$	$V_{GE} = V_{CE}$, I_C = 4 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, $V_{CE} = V_{CES}$, T_j = 25 (125) °C		0,1	0,3	mA
$V_{CE(TO)}$	T_j = 25 (125) °C		1,4 (1,6)	1,6 (1,8)	V
r_{CE}	V_{GE} = 15 V, T_j = 25 (125) °C		11 (15)	14 (19)	mΩ
$V_{CE(sat)}$	I_C = 100 A, V_{GE} = 15 V, chip level		2,5 (3,1)	3 (3,7)	V
C_{ies}	under following conditions		6,5	8,5	nF
C_{oes}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz		1	1,5	nF
C_{res}			0,5	0,6	nF
L_{CE}				30	nH
$R_{CC'+EE'}$	res., terminal-chip T_c= 25 (125) °C		0,75 (1)		mΩ
$t_{d(on)}$	V_{CC} = 600 V, I_C = 100 A		160	320	ns
t_r	$R_{Gon} = R_{Goff}$ = 6,8 Ω, T_j = 125 °C		80	160	ns
$t_{d(off)}$	V_{GE} = ± 15 V		400	520	ns
t_f			70	100	ns
E_{on} (E_{off})			16 (12)		mJ
Inverse diode					
$V_F = V_{EC}$	I_F = 100 A; V_{GE} = 0 V; T_j = 25 (125) °C		2 (1,8)	2,5	V
$V_{(TO)}$	T_j = 125 () °C			1,2	V
r_T	T_j = 125 () °C		8	11	mΩ
I_{RRM}	I_F = 100 A; T_j = 25 (125) °C		35 (50)		A
Q_{rr}	di/dt = 1000 A/µs		5 (14)		µC
E_{rr}	V_{GE} = V				mJ
FWD					
$V_F = V_{EC}$	I_F = 100 A; V_{GE} = 0 V, T_j = 25 (125) °C		1,9 (1,7)	2,4	V
$V_{(TO)}$	T_j = 125 () °C			1,2	V
r_T	T_j = 125 () °C			7	mΩ
I_{RRM}	I_F = 100 A; T_j = 25 ( ) °C		40 (65)		A
Q_{rr}	di/dt = A/µs		5 (15)		µC
E_{rr}	V_{GE} = V				mJ
Thermal characteristics					
$R_{th(j-c)}$	per IGBT			0,15	K/W
$R_{th(j-c)D}$	per Inverse Diode			0,36	K/W
$R_{th(j-c)FD}$	per FWD			0,3	K/W
$R_{th(c-s)}$	per module			0,05	K/W
Mechanical data					
M_s	to heatsink M6	3		5	Nm
M_t	to terminals M5	2,5		5	Nm
w				160	g

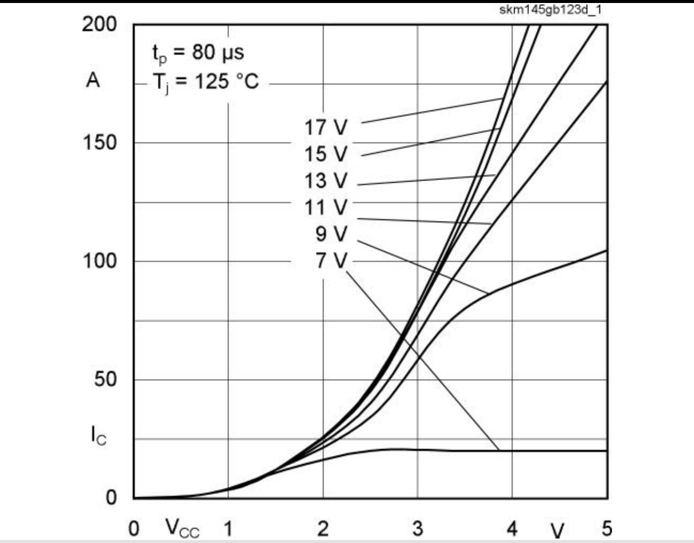


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

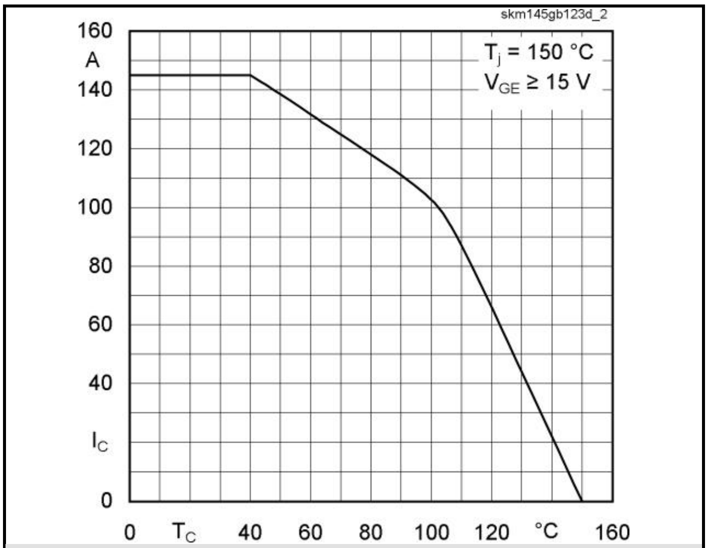


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

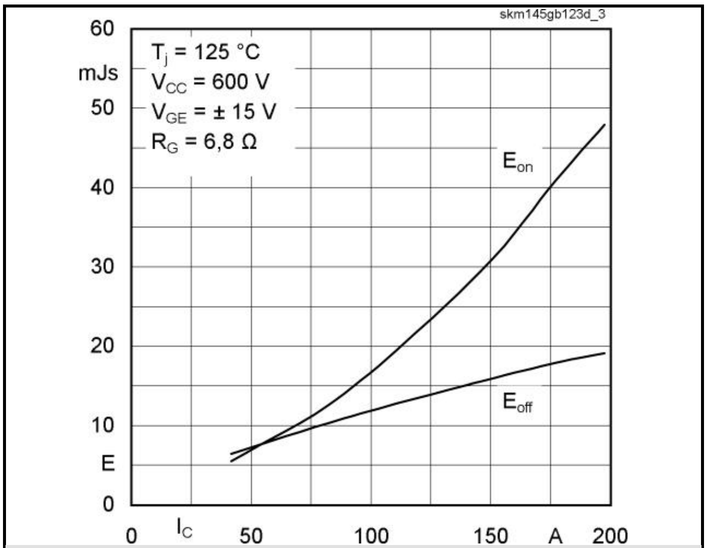


Fig. 3 Typ. turn-on /-off energy = f (I_C)

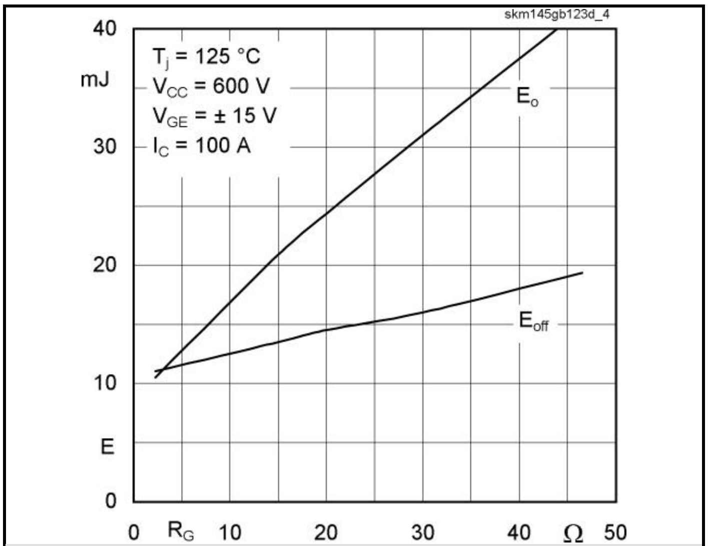


Fig. 4 Typ. turn-on /-off energy = f (R_G)

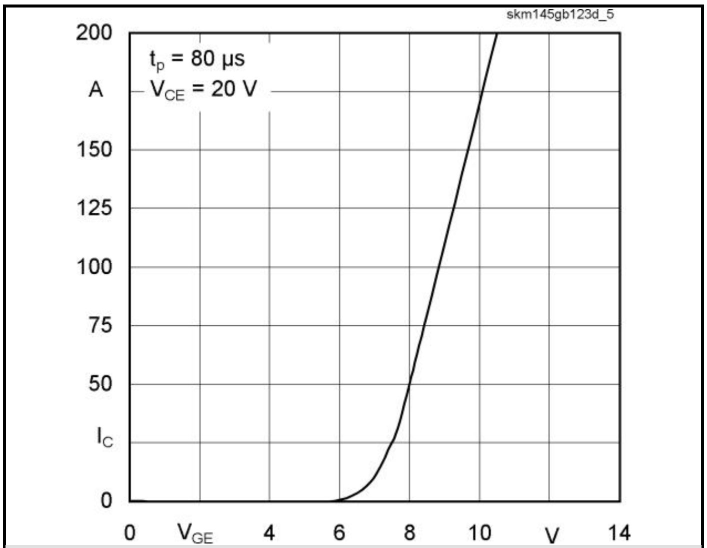


Fig. 5 Typ. transfer characteristic

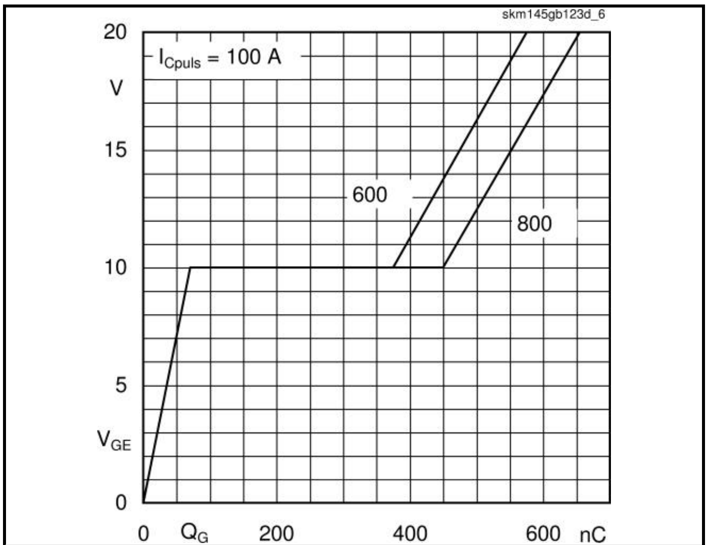


Fig. 6 Typ. gate charge characteristic

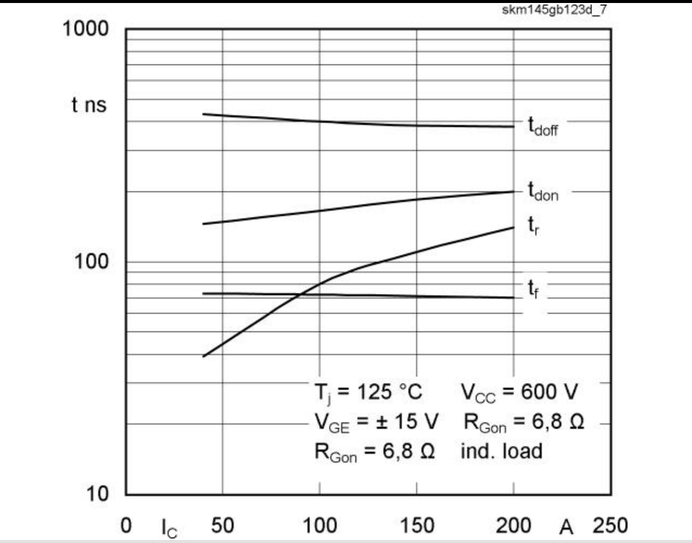


Fig. 7 Typ. switching times vs. I_C

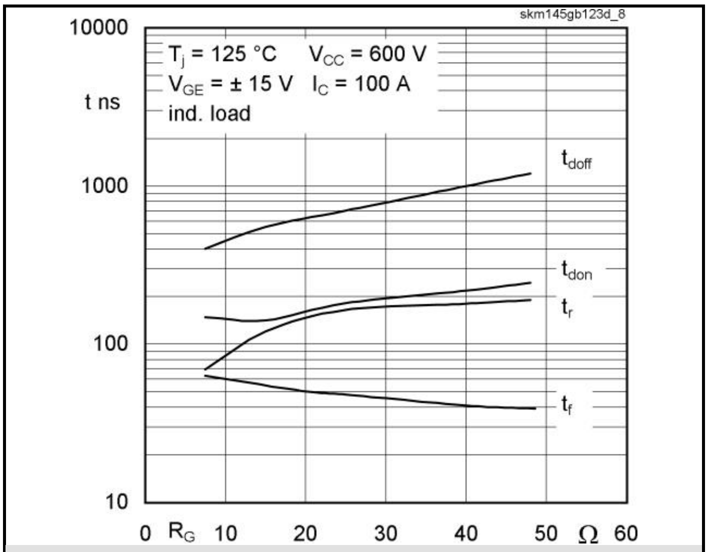


Fig. 8 Typ. switching times vs. gate resistor R_G

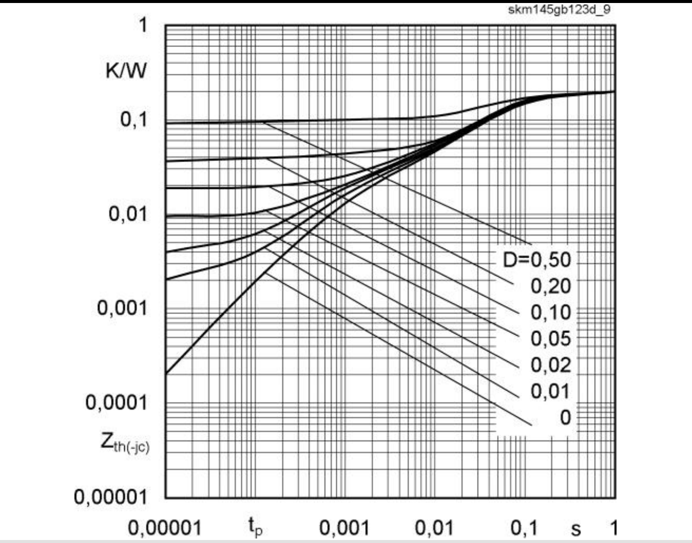


Fig. 9 Transient thermal impedance of IGBT

$Z_{thp(j-c)} = f(t_p)$; $D = t_p/t_c = t_p*f$

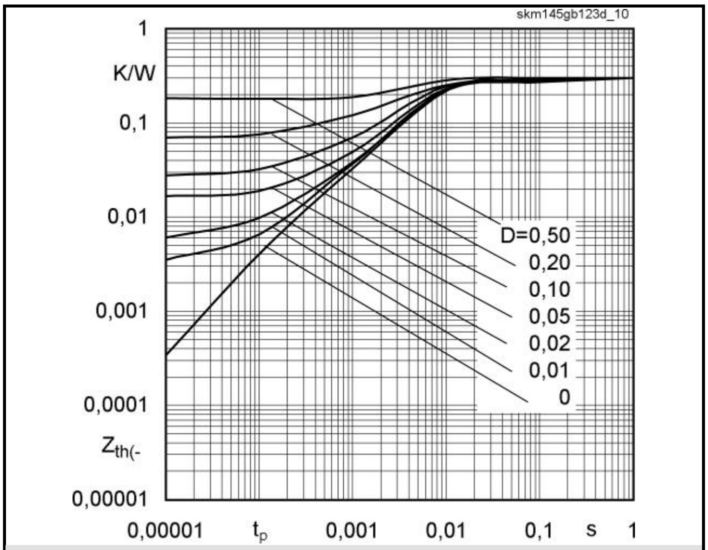


Fig. 10 Transient thermal impedance of FWD

$Z_{thp(j-c)} = f(t_p)$; $D = t_p/t_c = t_p*f$

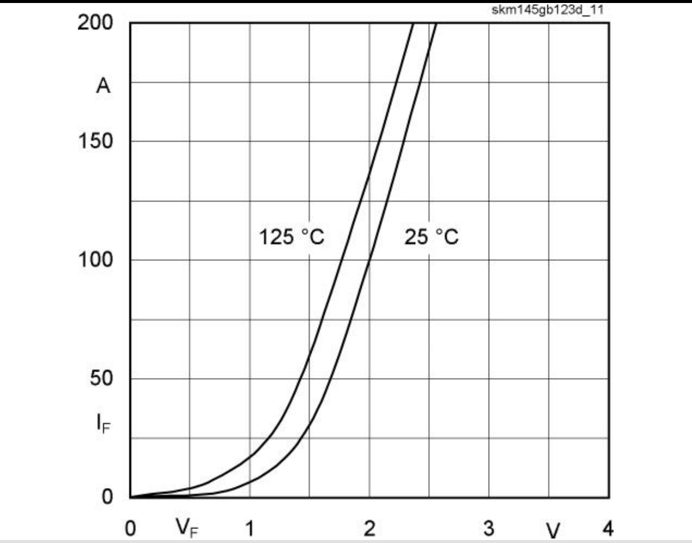


Fig. 11 CAL diode forward characteristic

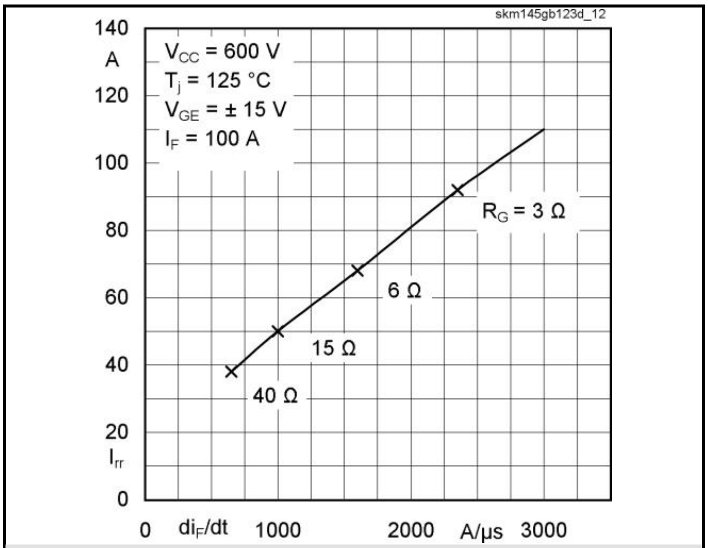


Fig. 12 Typ. CAL diode peak reverse recovery current

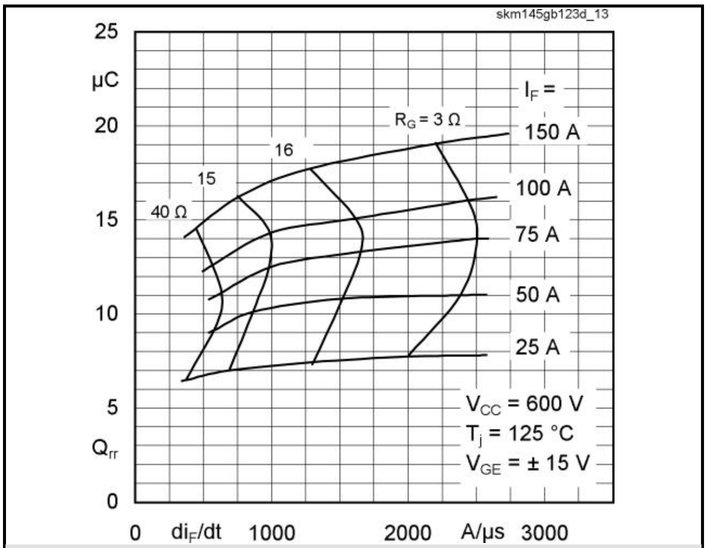
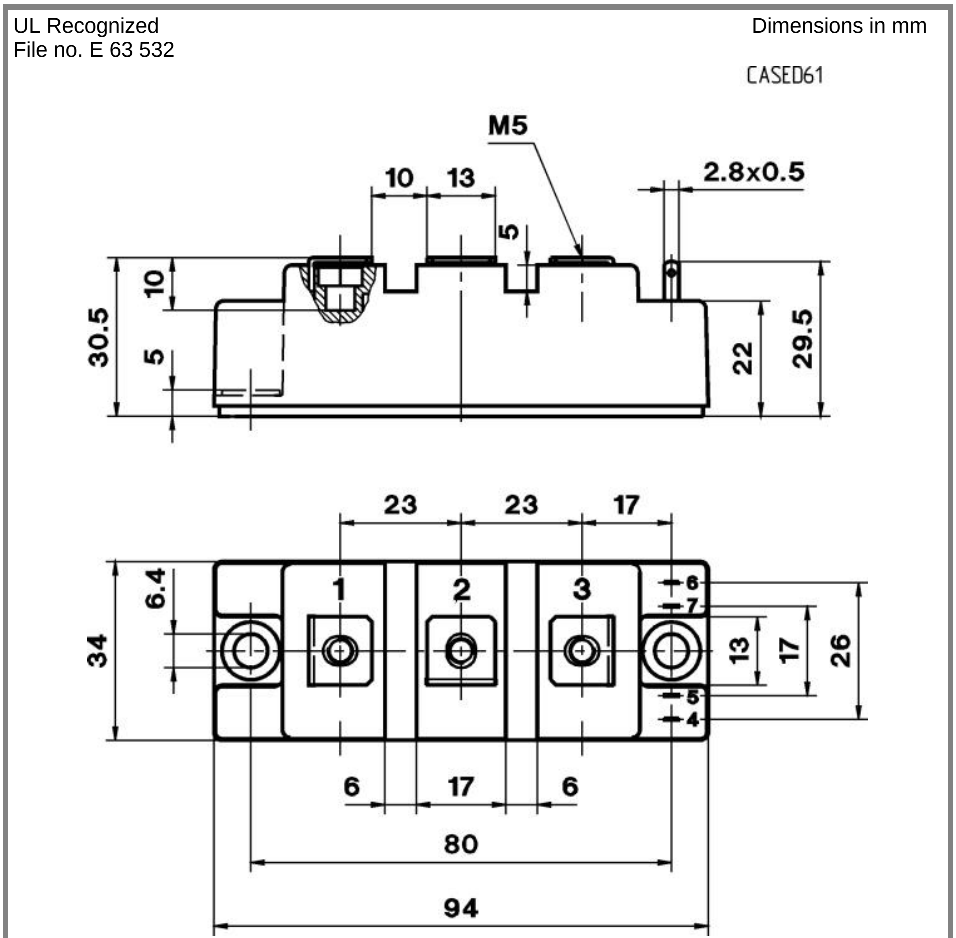
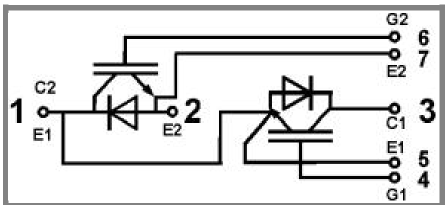


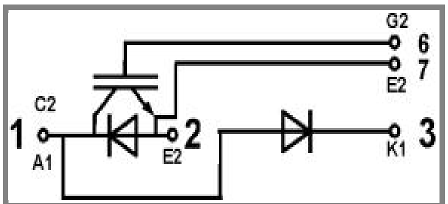
Fig. 13 Typ. CAL diode recovered charge



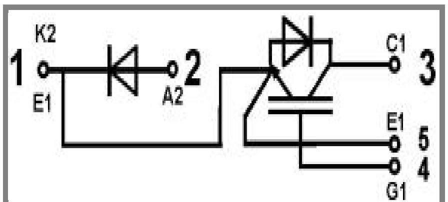
Case D 61



GB Case D 61



GAL Case D 62 (➞ D 61)



GAR Case D 63 (➞ D 61)

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.