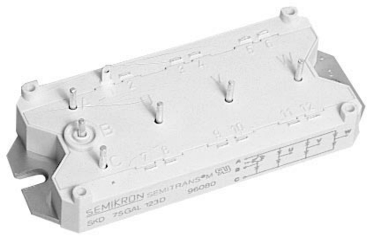
Absolute Maximum Ratings		**Values**			
Symbol	**Conditions** [1]				**Units**
V_{CES}		1200			V
V_{CGR}	R_{GE} = 20 kΩ	1200			V
I_C	T_{case} = 25/80 °C	40 / 25			A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	70 / 50			A
V_{GES}		± 20			V
P_{tot}	per IGBT/D1/D8,T_{case}=25°C	200 / 50 / 125			W
T_j, (T_{stg})		– 40 . . .+150 (125)			°C
V_{isol}	AC, 1 min.	2 500			V
humidity	DIN 40 040	Class F			
climate	DIN IEC 68 T.1	40/125/56			
Diodes [9]		D1-6	D7	D8	
I_F	T_{case} = 80 °C	9)	15	30	A
I_{FM}= – I_{CM}	T_{case} = 80 °C; t_p = 1 ms		30	50	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	350	200	350	A
I^2t	t_p = 10 ms; T_j = 150 °C	600	200	600	A^2s

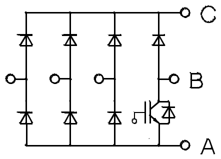
Characteristics					
Symbol	**Conditions** [1]	**min.**	**typ.**	**max.**	**Units**
$V_{(BR)CES}$	V_{GE} = 0, I_C = 0,8 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0 T_j = 25 °C	–	0,1	1	mA
	V_{CE} = V_{CES} T_j = 125 °C	–	3	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	200	nA
V_{CEsat}	I_C = 25 A V_{GE} = 15 V;	–	2,5(3,1)	3(3,7)	V
V_{CEsat}	I_C = 40 A T_j = 25 (125) °C	–	3,1(3,9)	–	V
g_{fs}	V_{CE} = 20 V, I_C = 25 A		20	–	S
C_{CHC}	per IGBT	–	–	300	pF
C_{ies}	V_{GE} = 0	–	1600	2100	pF
C_{oes}	V_{CE} = 25 V	–	250	300	pF
C_{res}	f = 1 MHz	–	110	150	pF
$t_{d(on)}$	V_{CC} = 600 V	–	70	–	ns
t_r	V_{GE} = + 15 V / - 15 V [3]	–	55	–	ns
$t_{d(off)}$	I_C = 25 A, ind. load	–	400	–	ns
t_f	R_{Gon} = R_{Goff} = 40 Ω	–	40	–	ns
E_{on} [5]	T_j = 125 °C	–	3,8	–	mWs
E_{off} [5]		–	2,3	–	mWs
Inverse Diode D7 [8]					
V_F = V_{EC}	I_F = 15 A V_{GE} = 0 V;	–	2,0(1,8)	2,5	V
V_F = V_{EC}	I_F = 25 A T_j = 25 (125) °C	–	2,3(2,1)	–	V
V_{TO}	T_j = 125 °C	–	–	1,2	V
r_T	T_j = 125 °C	–	45	70	mΩ
I_{RRM}	I_F = 15 A; T_j = 25 (125) °C [2]	–	12(16)	–	A
Q_{rr}	I_F = 15 A; T_j = 25 (125) °C [2]	–	1(2,7)	–	µC
FWD D8 Diode [8]					
V_F = V_{EC}	I_F = 25 A V_{GE} = 0 V;	–	2,0(1,8)	2,5	V
V_F = V_{EC}	I_F = 40 A T_j = 25 (125) °C	–	2,3(2,1)	–	V
V_{TO}	T_j = 125 °C	–	1,1	1,2	V
r_T	T_j = 125 °C	–	25	44	mΩ
I_{RRM}	I_F = 25 A; T_j = 25 (125) °C [2]	–	19(25)	–	A
Q_{rr}	I_F = 25 A; T_j = 25 (125) °C [2]	–	1,5(4,5)	–	µC
Thermal Characteristics					
R_{thjc}	per IGBT / diode D1...6 [9]	–	–	0,6 / 2,5	°C/W
R_{thjc}	per diode D7 / D8	–	–	1,5 / 1,0	°C/W
R_{thch}	per module / diode; IGBT	–	–	0,05/ 0,4	°C/W

SEMITRANS® M
IGBT Modules
SKD 40 GAL 123 D
Input bridge B6U with brake chopper



7D-Pack = 7 Diodes Pack

GSIGDGAL



SKD 40 GAL

Features

- Round main terminals (2 mm∅)
- Easy drilling of PCB
- Input diodes glass passivated
- 1400 V PIV, good for 500 V_{AC}
- High I^2t rating (inrush current)
- IGBT is latch-up free, homogeneous NPT silicon-structure
- High short circuit capability, self limiting to 6 * I_{cnom}
- Fast & soft CAL diodes[8]
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (9 mm) and creepage distances (13 mm).

Typical Applications:

Input rectifier bridge (B6U) with brake chopper for PWM inverter drives using SEMITRANS SKM 40GD123D

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[1] T_{case} = 25 °C, unless otherwise specified

[2] I_F = – I_C, V_R = 600 V, – di_F/dt = 500 A/µs, V_{GE} = 0 V

[3] Use V_{GEoff} = -5 ... -15 V

[5] See fig. 2 + 3; R_{Goff} = 40 Ω

[8] CAL = Controlled Axial Lifetime Technology.

[9] **Data D1 - D6, case and mech. data → page B6 - 224**

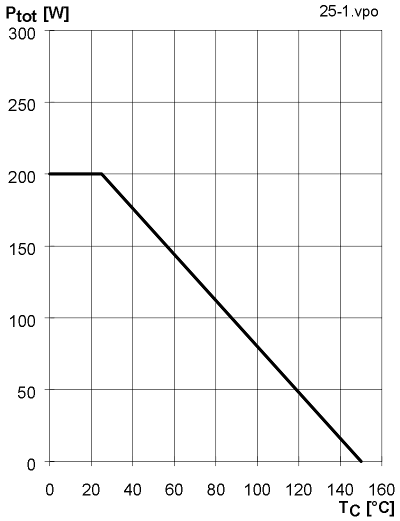
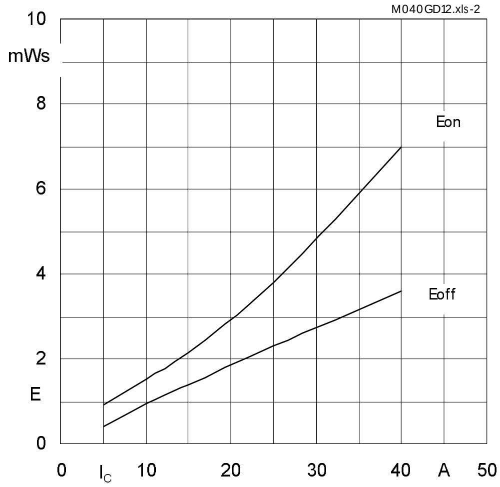
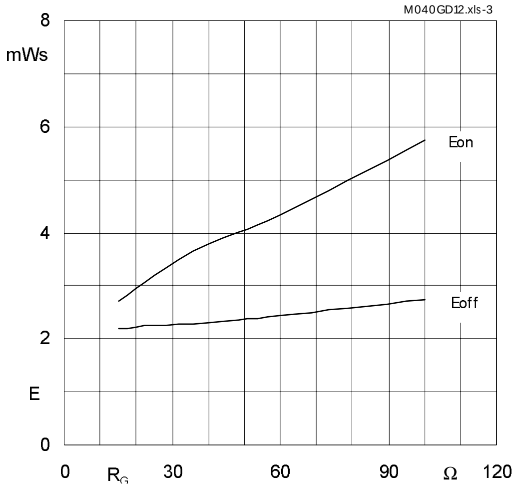


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$



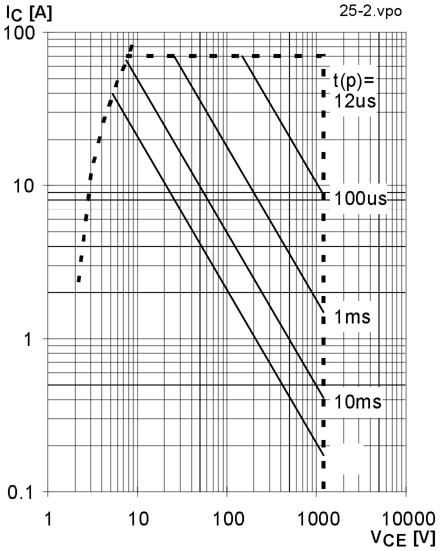
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_G = 40 Ω

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



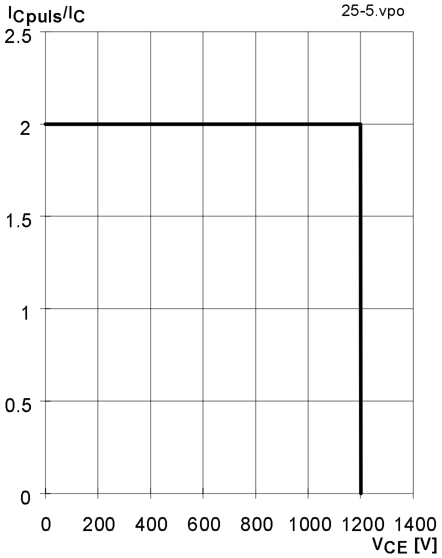
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C = 25 A

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



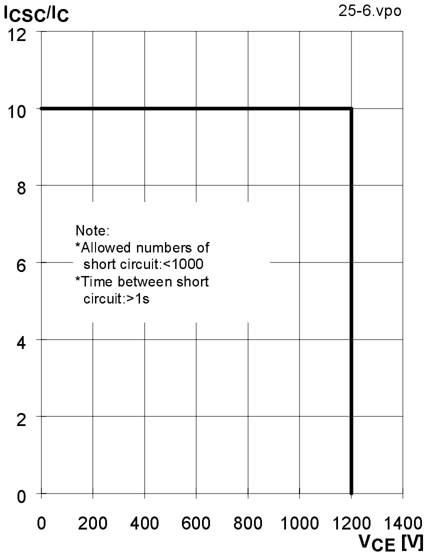
1 pulse
T_C = 25 °C
T_j ≤ 150 °C

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



T_j ≤ 150 °C
V_{GE} = ± 15 V
R_{Goff} = 40 Ω
I_C = 25 A

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



T_j ≤ 150 °C
V_{GE} = ± 15 V
t_{sc} ≤ 10 µs
L < 50 nH
I_C = 25 A

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

T_j = 150 °C
$V_{GE} \geq 15$ V

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

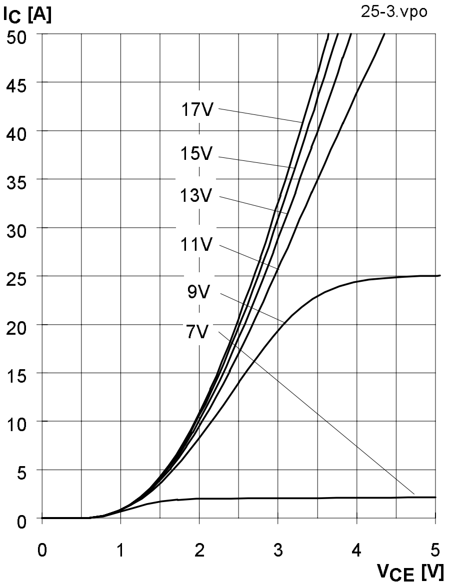


Fig. 9 Typ. output characteristic, $t_p = 80\ \mu s$; 25 °C

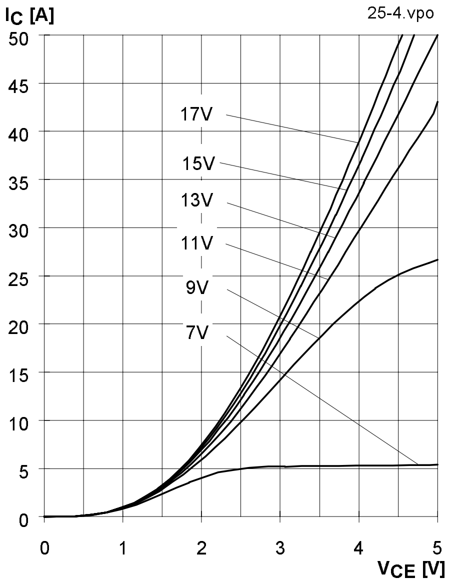


Fig. 10 Typ. output characteristic, $t_p = 80\ \mu s$; 125 °C

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

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

$V_{CE(TO)(Tj)} \leq 1{,}5 + 0{,}002\ (T_j - 25)$ [V]

typ.: $r_{CE(Tj)} = 0{,}040 + 0{,}00016\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}060 + 0{,}00020\ (T_j - 25)$ [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

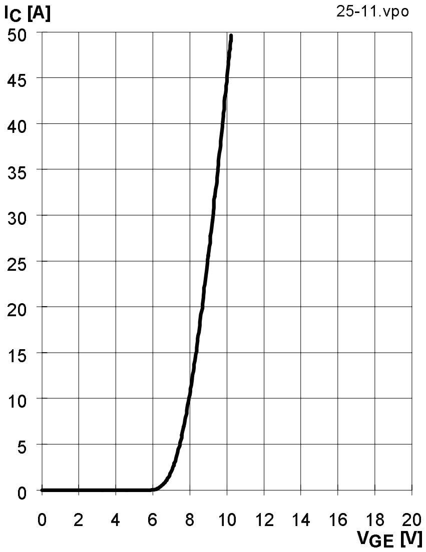
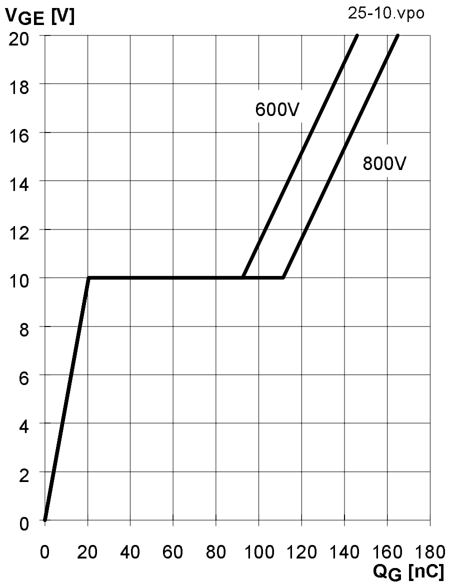
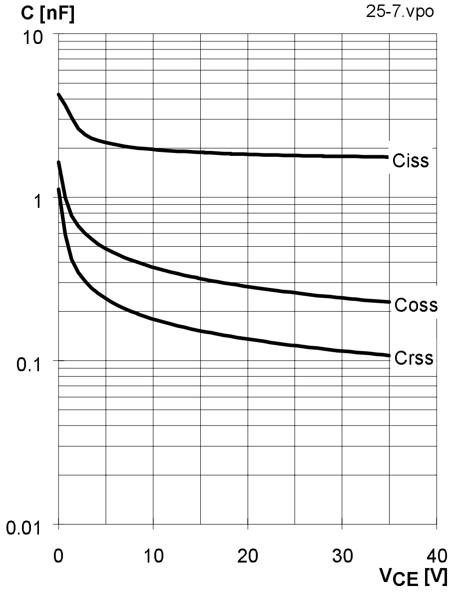


Fig. 12 Typ. transfer characteristic, $t_p = 80\ \mu s$; V_{CE} = 20 V



I_{Cpuls} = 25 A

Fig. 13 Typ. gate charge characteristic

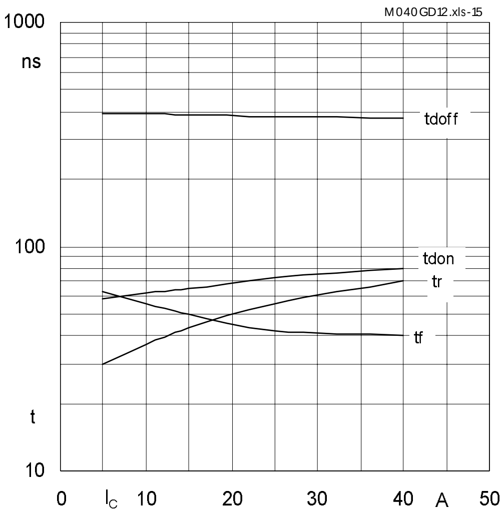


V_{GE} = 0 V
f = 1 MHZ

C_{ies}

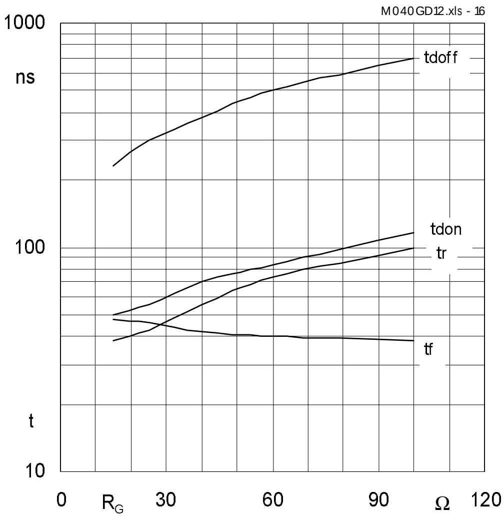
C_{oes}
C_{res}

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_{Gon} = 40 Ω
R_{Goff} = 40 Ω
induct. load

Fig. 15 Typ. switching times vs. I_C



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C = 25 A
induct. load

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

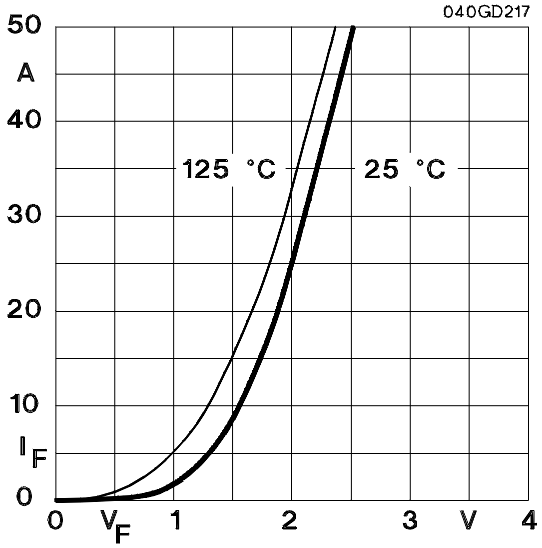


Fig. 17 Typ. CAL diode D8 forward characteristic

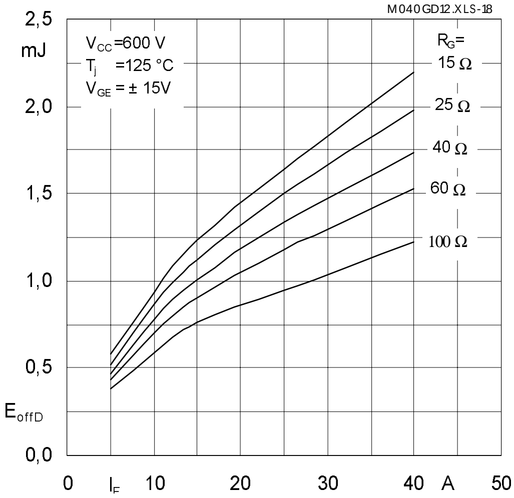


Fig. 18 Diode turn-off energy dissipation per pulse

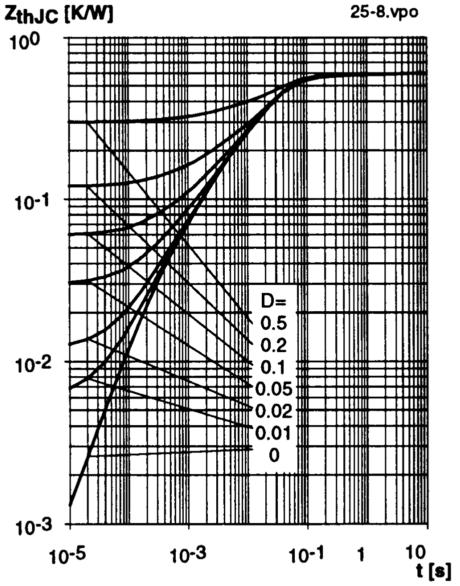


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

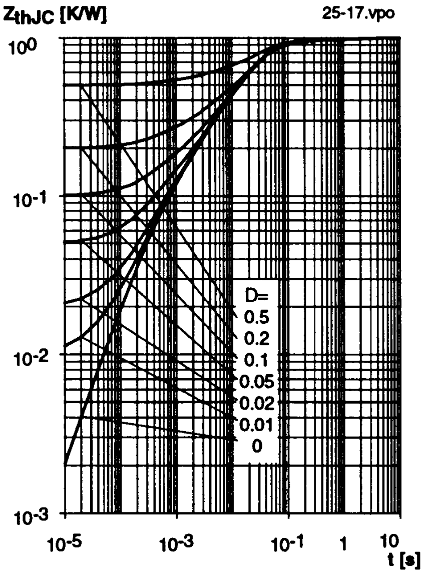


Fig. 20 Transient thermal impedance of inverse CAL diodes D8 $Z_{thJC} = f(t_p)$; $D=t_p/t_c=t_p \cdot f$

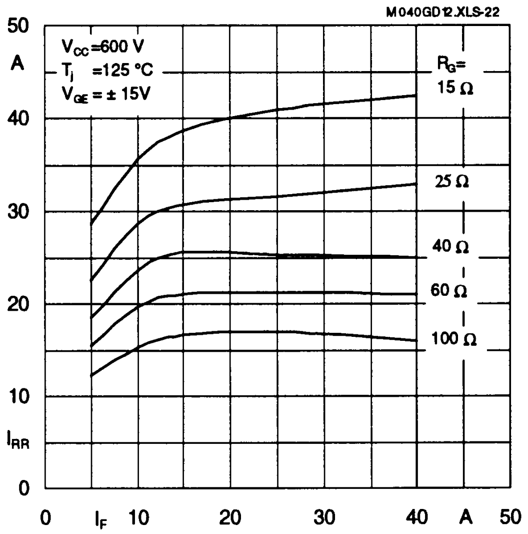


Fig. 22 Typ. CAL diode peak D8 reverse recovery current I_{RR}=f(I_F;R_G)

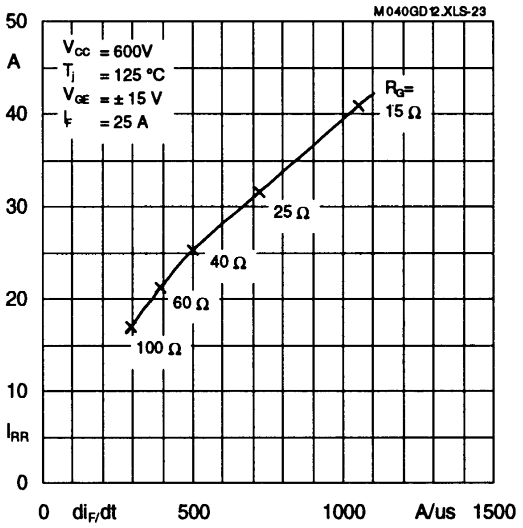


Fig. 23 Typ. CAL diode D8 peak reverse recovery current I_{RR} = f(di/dt)

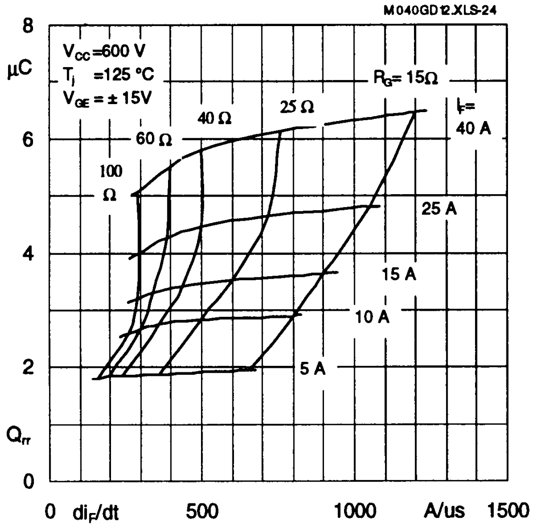


Fig. 24 Typ. CAL diode D8 recovered charge

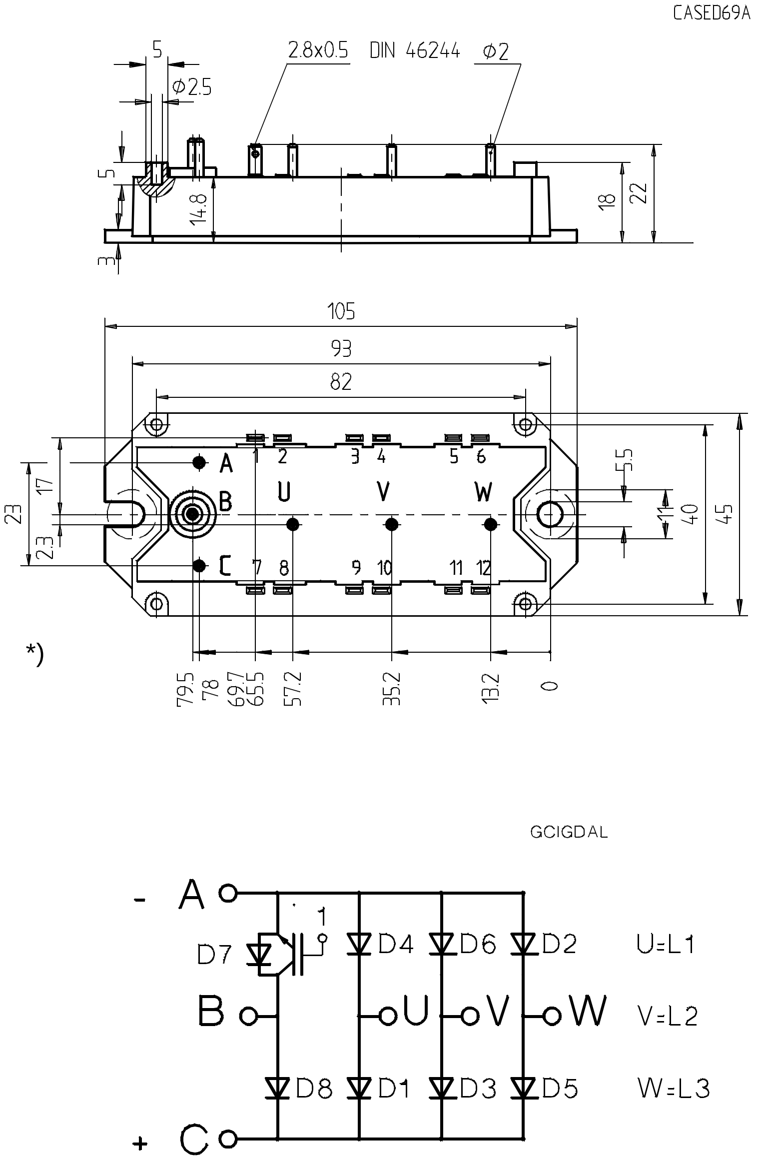
SEMITRANS

7D-pack

Case D 69 A

UL recognition

File E63 532



*) Plastic collar around pin B for UL creepage distance of > 12,7 mm.

Dimensions in mm

Fig. 21 Case outline and circuit diagram

Characteristics Symbol	Conditions [1]	Values min.	typ.	max.	Units
Input	Bridge Rectifier D1...D6				
V_{RRM}		1400	–	–	V
I_D	T_{case} = 80 °C;	–	–	70	A
V_F	T_{vj} = 25 °C; I_F = 40 A	–	–	1,45	V
V_{TO}	T_{vj} = 150 °C	–	–	0,8	V
r_T	T_{vj} = 150 °C	–	–	15	mΩ
I_{FAV}	T_{case} = 80 °C (D1...D6)	–	–	25	A
R_{thjc}	D1...D6			2,5	K/W
Mechanical Data					
M1	to heatsink, SI Units (M5)	4	–	5	Nm
	to heatsink, US Units	35	–	44	lb.in.
a		–	–	5x9,81	m/s^2
w		–	–	175	g

This is an electrostatic discharge sensitive device (ESD).
Please observe the international standard IEC 747-1, Chapter IX.

Two devices are supplied in one SEMIBOX A without mounting hardware.
Larger Packing units (≥ 10) are used if suitable.
SEMIBOX → C - 1.