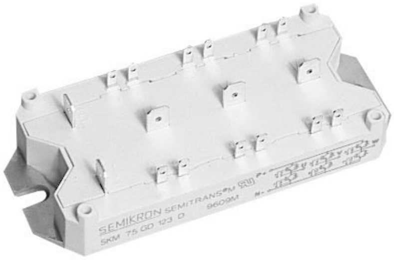
SEMIKRON

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	25 / 15	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	50 / 30	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	145	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	
Inverse Diode			
I_F= – I_C	T_{case} = 25/80 °C	25 / 15	A
I_{FM}= – I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	50 / 30	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	200	A
I^2t	t_p = 10 ms; T_j = 150 °C	200	A^2s

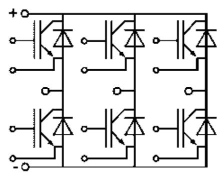
Characteristics Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)GES}$	V_{GE} = 0, I_C = 0,5 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 25 °C	–	0,3	0,5	mA
	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 125 °C	–	1,8	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	150	nA
V_{CEsat}	I_C = 15 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	2,5(3,1)	3(3,7)	V
V_{CEsat}	I_C = 22 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	3(3,7)	–	V
g_{fs}	V_{CE} = 20 V, I_C = 15 A	–	12	–	S
C_{CHC}	per IGBT	–	–	300	pF
C_{ies}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	1000	–	pF
C_{oes}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	150	–	pF
C_{res}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	70	–	pF
L_{CE}		–	–	60	nH
$t_{d(on)}$	V_{CC} = 600 V; V_{GE} = + 15 V / - 15 V[3]; I_C = 15 A, ind. load; R_{Gon} = R_{Goff} = 52 Ω; T_j = 125 °C	–	40	–	ns
t_r		–	35	–	ns
$t_{d(off)}$		–	350	–	ns
t_f		–	70	–	ns
E_{on} [5]		–	2	–	mWs
E_{off} [5]		–	1,4	–	mWs
Inverse Diode [8]					
V_F = V_{EC}	I_F = 15 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	2,0(1,8)	2,5	V
V_F = V_{EC}	I_F = 25 A; V_{GE} = 0 V; 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	–	45	70	mΩ
I_{RR}	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
Thermal Characteristics					
R_{thjc}	per IGBT	–	–	0,86	°C/W
R_{thjc}	per diode [8]	–	–	1,5	°C/W
R_{thch}	per module	–	–	0,05	°C/W

SEMITRANS® M
IGBT Modules

SKM 22 GD 123 D
SKM 22 GD 123 D L*)



Sixpack



GD

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 * I_{cnom}
- Latch-up free
- Fast & soft inverse CAL diodes[8]
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (9 mm) and creepage distances (13 mm).

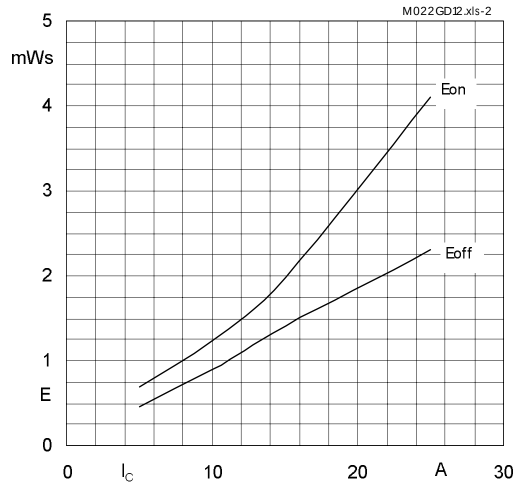
Typical Applications

- Switched mode power supplies
- Three phase inverters for AC motor speed control
- General power switching applications
- Pulse frequencies also above 15 kHz

1) T_{case} = 25 °C, unless otherwise specified
2) I_F = – I_C, V_R = 600 V, – di_F/dt = 400 A/µs, V_{GE} = 0 V
3) Use: V_{GEoff} = -5 ... -15 V
5) See fig. 2 + 3; R_{Goff} = 52 Ω
8) CAL = Controlled Axial Lifetime Technology.

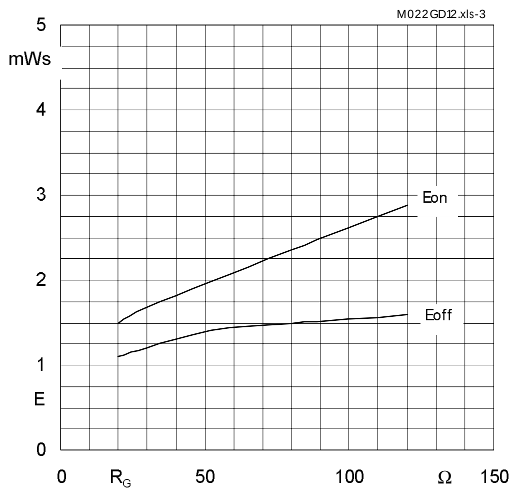
***) Main terminals = 2 mm dia.**
Cases and mech. data → B6 - 68 Sixpack

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



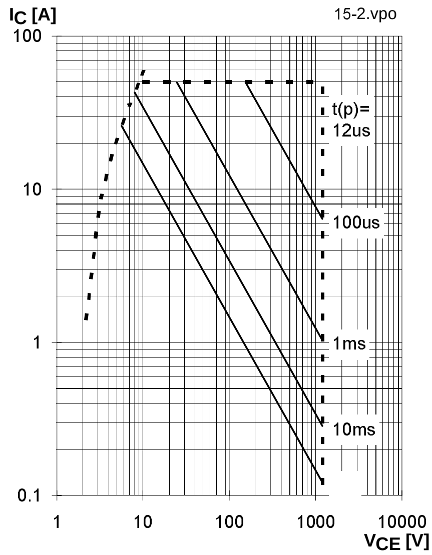
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_G = 52 Ω

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



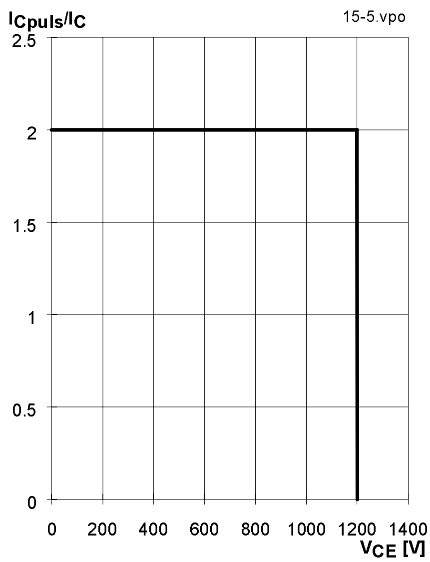
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C = 15 A

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



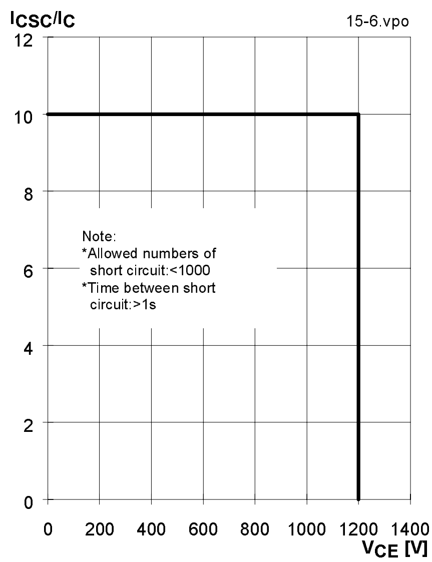
1 pulse
T_C = 25 °C
T_j ≤ 150 °C

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



T_j ≤ 150 °C
V_{GE} = ± 15 V
R_{Goff} = 52 Ω
I_C = 15 A

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



T_j ≤ 150 °C
V_{GE} = ± 15 V
t_{sc} ≤ 10 ms
L < 25 nH
I_{CN} = 15 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 $I_C = f(T_C)$

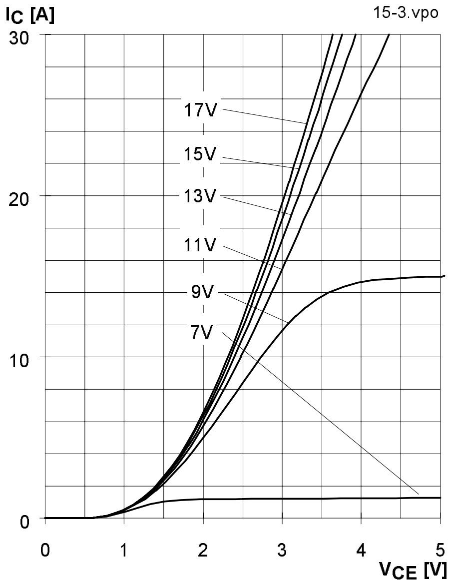


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

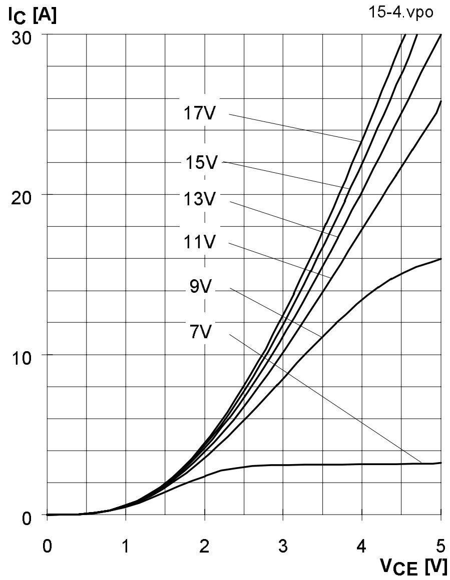


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

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

typ.: $r_{CE(Tj)} = 0{,}067 + 0{,}00027\ (T_j - 25)$ [Ω]

max.: $r_{CE(Tj)} = 0{,}100 + 0{,}00033\ (T_j - 25)$ [Ω]

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

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

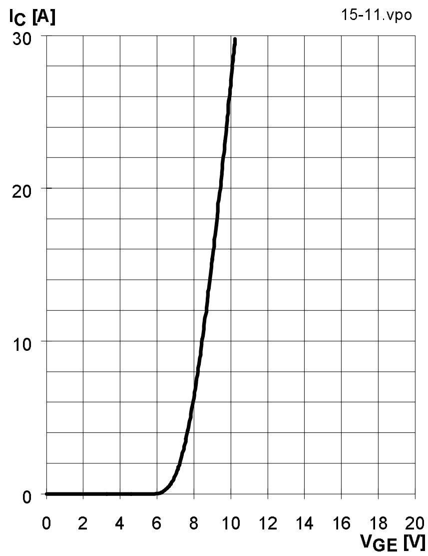
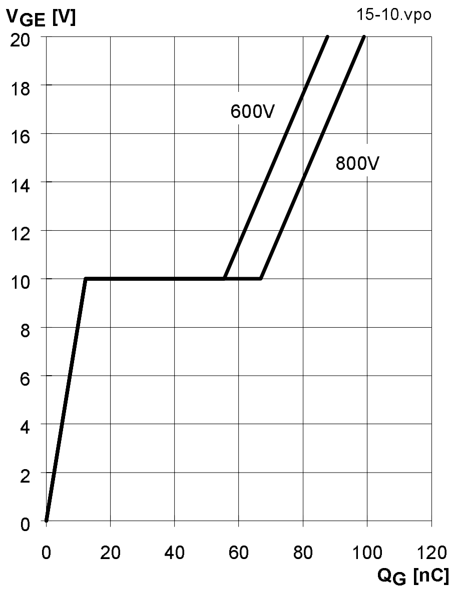
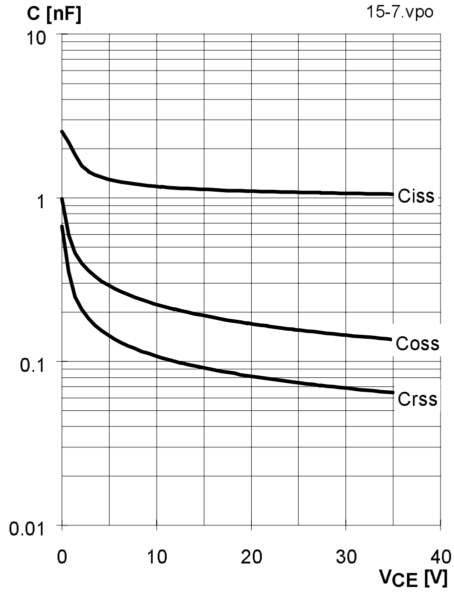


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V



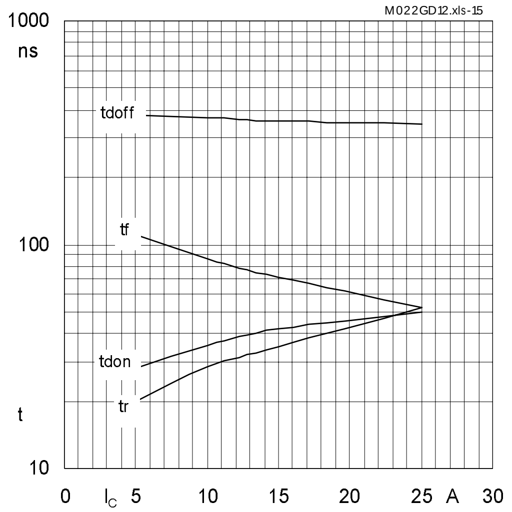
I_{Cpuls} = 15 A

Fig. 13 Typ. gate charge characteristic



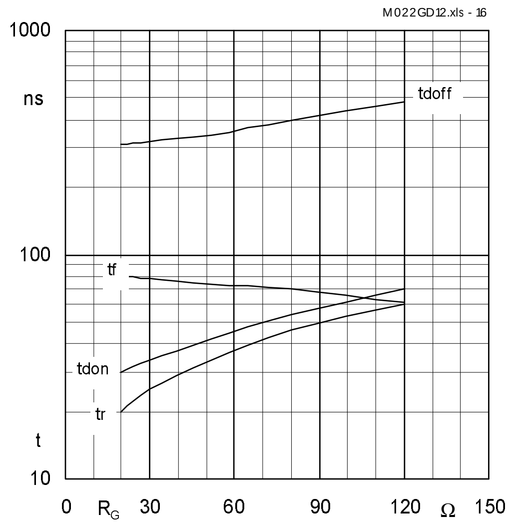
V_{GE} = 0 V
f = 1 MHZ

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_{Gon} = 52 Ω
R_{Goff} = 52 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 = 15 A
induct. load

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

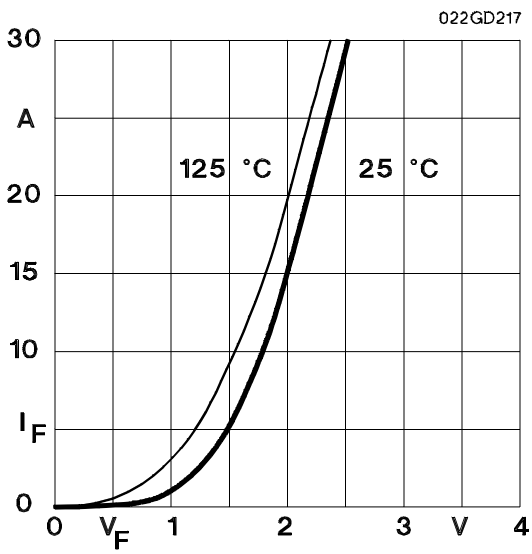


Fig. 17 Typ. CAL diode forward characteristic

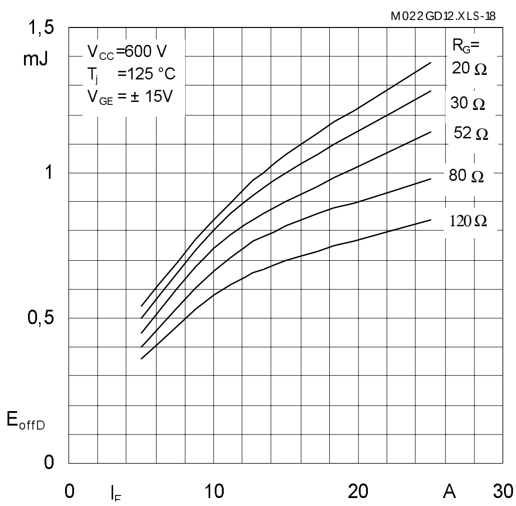


Fig. 18 Diode turn-off energy dissipation per pulse

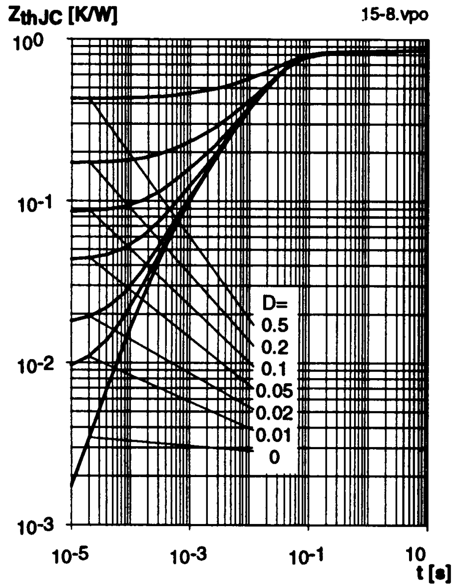


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

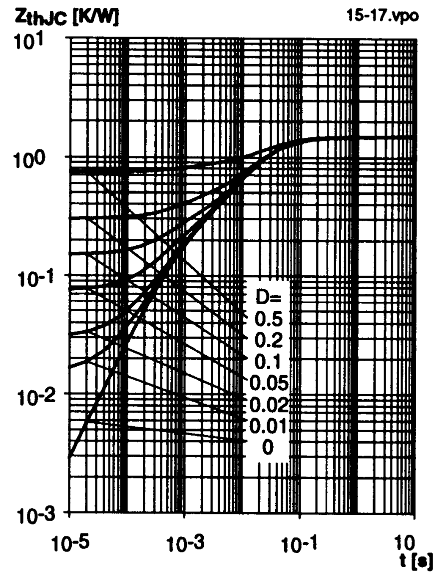


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

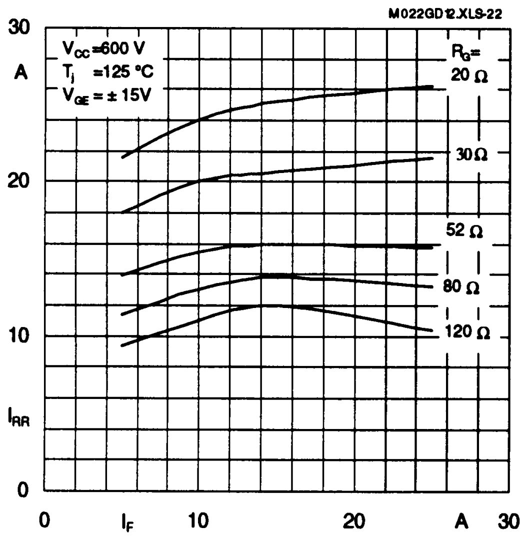


Fig. 22 CAL diode peak reverse recovery current $I_R = f(I_F; R_G)$

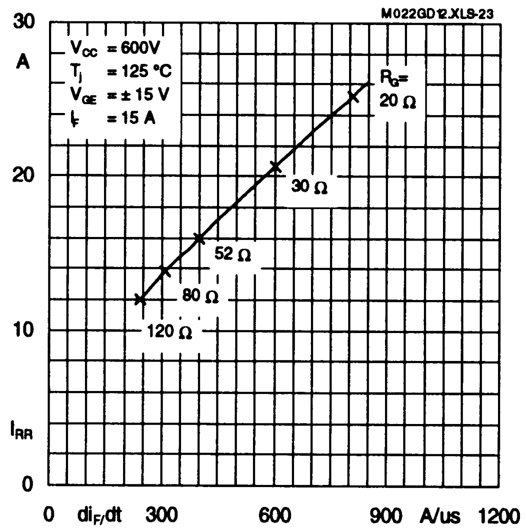


Fig. 23 CAL diode peak reverse recovery current $I_{RR} = (di/dt)$

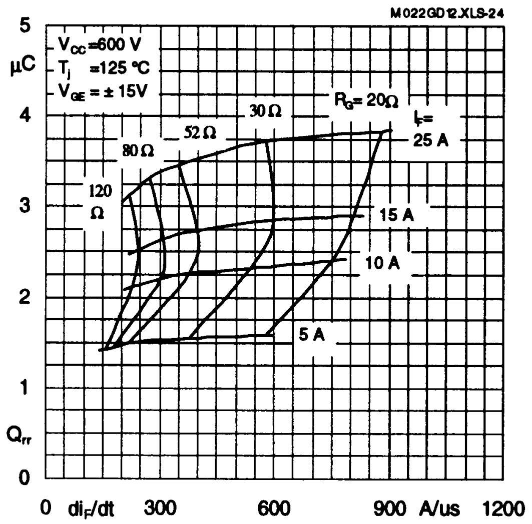


Fig. 24 CAL diode recovered charge $Q_{rr} = f(di/dt)$

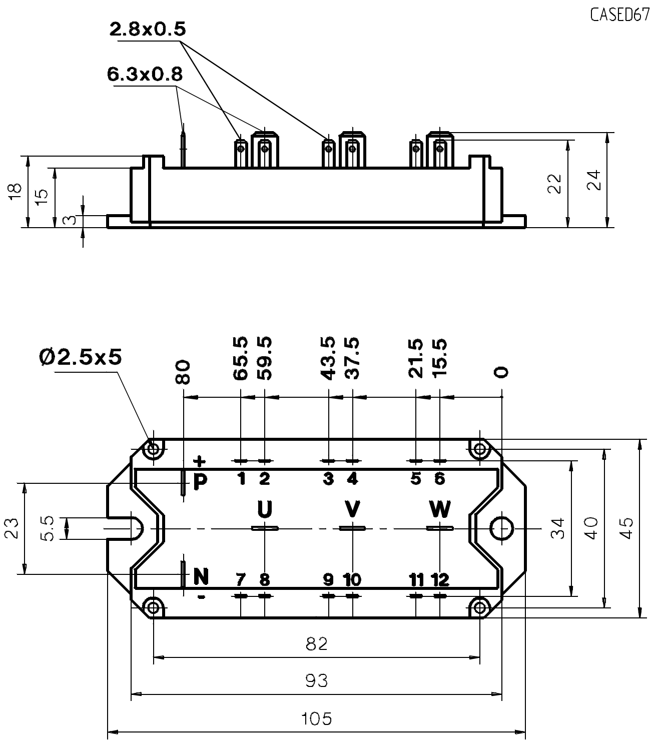
SEMITRANS Sixpack

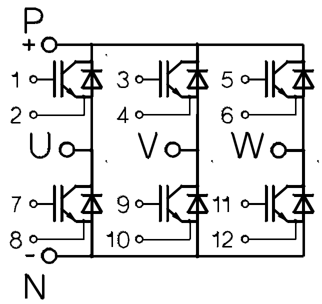
Case D 67

UL Recognized

File no. E 63 532

SKM 22 GD 123 D





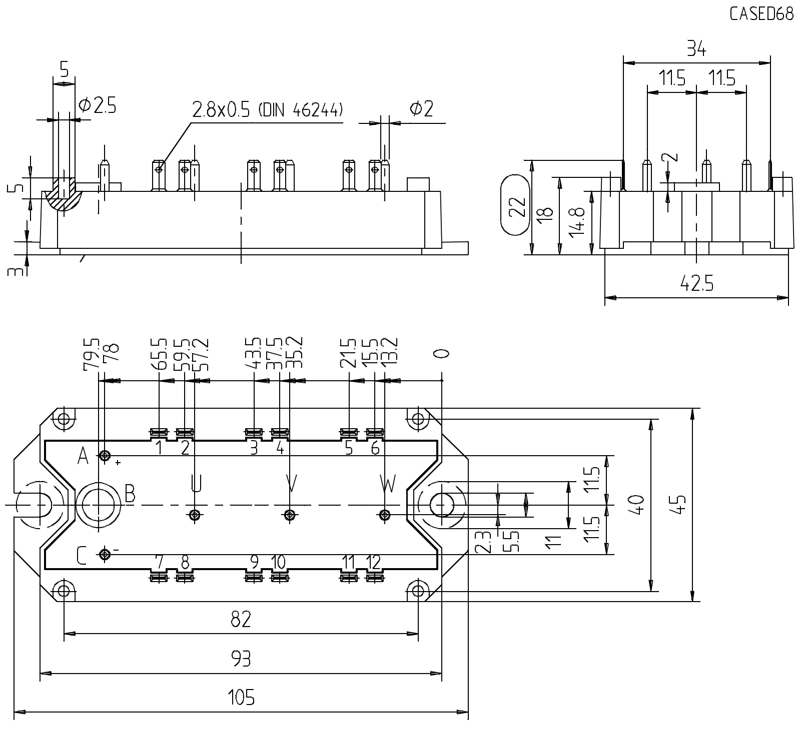
SEMITRANS Sixpack

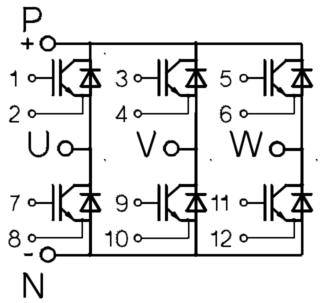
Case D 68

UL Recognized

Special version on request

SKM 22 GD 123 DL
SKM 40 GD 123 DL
SKM 75 GD 123 DL





Dimensions in mm

Case outlines and circuit diagrams

Mechanical Data

Symbol	Conditions		Values min.	typ.	max.	Units
M_1	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.
Larger packing units (10 and 20 pieces) are used if suitable.
SEMIBOX → C - 1.

