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	75 / 50	A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	144 / 100	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	350	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	55/150/56	
Inverse Diode			
I_F= – I_C	T_{case} = 25/80 °C	75 / 50	A
I_{FM}= – I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	150 / 100	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	550	A
I^2t	t_p = 10 ms; T_j = 150 °C	1500	A^2s

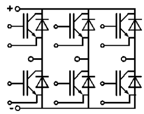
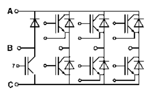
Characteristics

Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 1 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 25 °C	–	0,8	1	mA
	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 125 °C	–	3,5	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	200	nA
V_{CEsat}	I_C = 50 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	2,5(3,1)	3(3,7)	V
V_{CEsat}	I_C = 75 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	3(3,8)	–	V
g_{fs}	V_{CE} = 20 V, I_C = 25 A	23	40	–	S
C_{CHC}	per IGBT	–	–	300	pF
C_{ies}	V_{GE} = 0, V_{CE} = 25 V, f = 1 MHz	–	3300	4300	pF
C_{oes}		–	500	600	pF
C_{res}		–	220	300	pF
L_{CE}		–	–	60	nH
$t_{d(on)}$	V_{CC} = 600 V; V_{GE} = + 15 V / - 15 V [3]; I_C = 50 A, ind. load; R_{Gon} = R_{Goff} = 22 Ω; T_j = 125 °C	–	44	100	ns
t_r		–	56	100	ns
$t_{d(off)}$		–	380	500	ns
t_f		–	70	100	ns
E_{on} [5]		–	8	–	mWs
E_{off} [5]		–	5	–	mWs
Inverse Diode [8]					
V_F = V_{EC}	I_F = 50 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	2,0(1,8)	2,5	V
V_F = V_{EC}	I_F = 75 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	–	18	22	mΩ
I_{RRM}	I_F = 50 A; T_j = 25 (125) °C [2]	–	23(35)	–	A
Q_{rr}	I_F = 50 A; T_j = 25 (125) °C [2]	–	2,3(7)	–	µC
Thermal Characteristics					
R_{thjc}	per IGBT	–	–	0,35	°C/W
R_{thjc}	per diode	–	–	0,6	°C/W
R_{thch}	per module	–	–	0,05	°C/W

SEMITRANS® M IGBT Modules

SKM 75 GD 123 D ***)
SKM 75 GD 123 D L *)
SKM 75 GDL 123 D **)

Sevenpack **

Sixpack: GD GDL

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
- DC servo and robot drives
- Three phase inverters for AC motor speed control
- Switching (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
5) See fig. 2 + 3; R_{Goff} = 22 Ω
8) CAL = Controlled Axial Lifetime Technology.

***) Main terminals = 2 mm dia. outline → B6 - 10**
****) SEVENPACK Case D73**
*****) Sixpack, with FASTON main terminals, picture → B6 - 11**
Cases and mech. data → B6 - 34

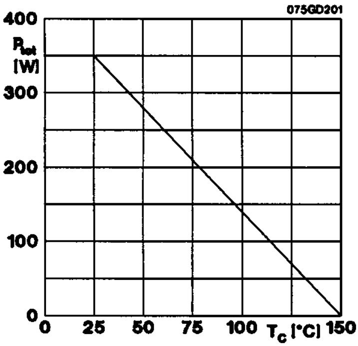
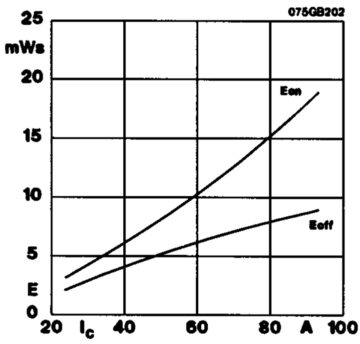
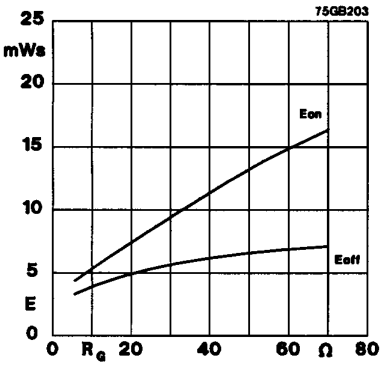


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$



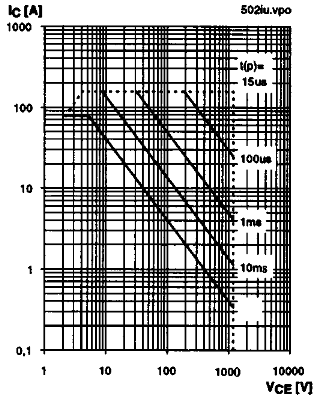
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_G = 22 Ω

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
I_C = 50 A

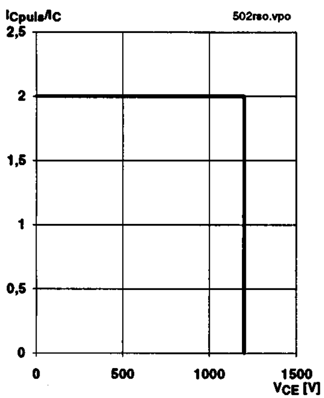
Fig. 3 Turn-on /-off energy = f (R_G)



1 pulse
T_C = 25 °C
$T_j \leq$ 150 °C

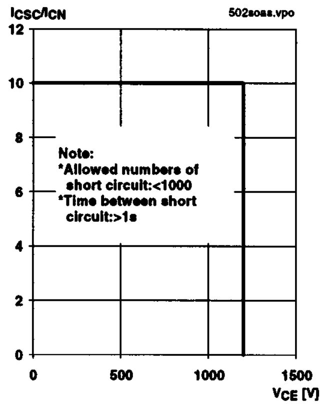
Not for linear use

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



$T_j \leq$ 150 °C
V_{GE} = 15 V
$R_{g(off)}$ = 22 Ω
I_C = 50 A

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



$T_j \leq$ 150 °C
V_{GE} = ± 15 V
$t_{sc} \leq$ 10 µs
L < 25 nH
I_{CN} = 50 A

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

Fig. 7 Short circuit current vs. turn-on gate voltage

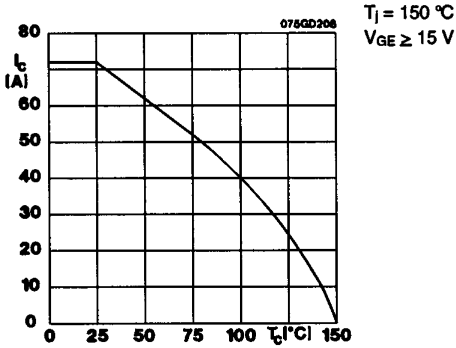


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

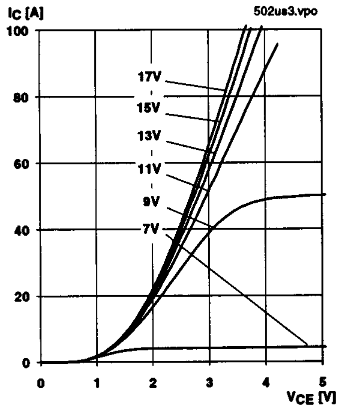


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

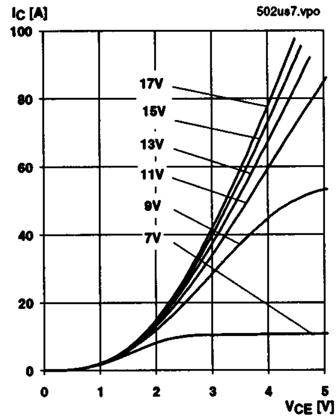


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

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

$r_{CE(Tj)} = 0{,}020 + 0{,}00008\ (T_j - 25)$ [Ω]

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

Fig. 11 Typ. saturation characteristic (IGBT)
Calculation elements and equations

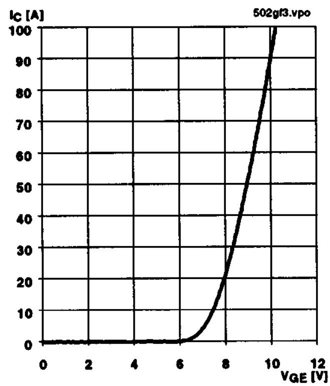
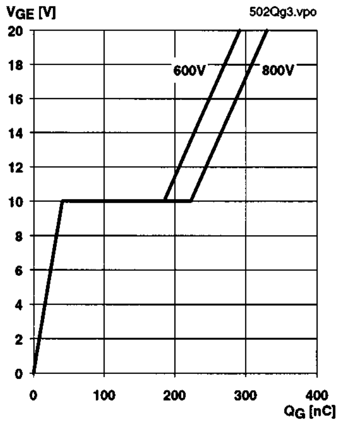
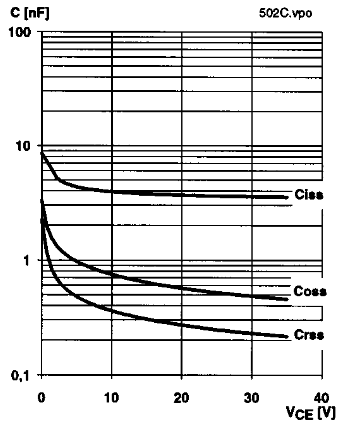


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V



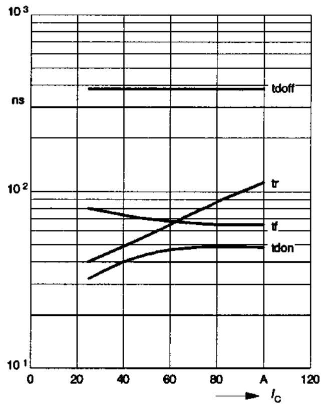
I_{Cpuls} = 50 A

Fig. 13 Typ. gate charge characteristic



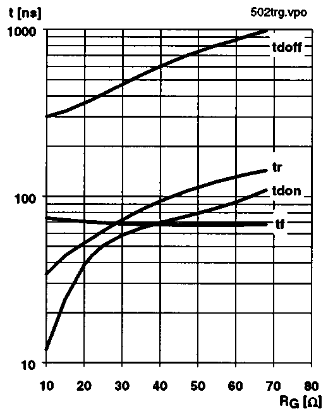
V_{GE} = 0 V
f = 1 MHZ

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



T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_{gon} = 22 Ω
R_{goff} = 22 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 = 50 A
induct. load

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

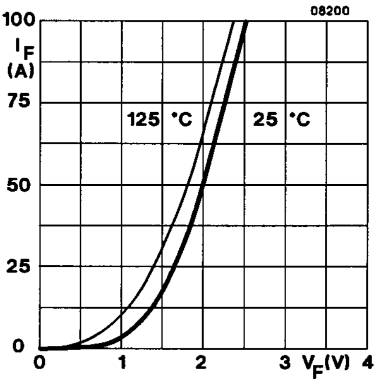


Fig. 17 Typ. CAL diode forward characteristic

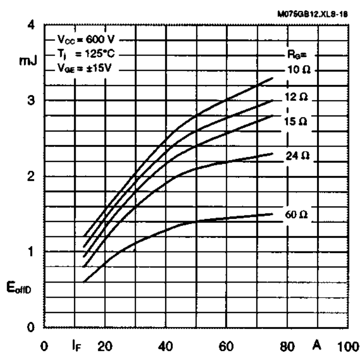


Fig. 18 Diode turn-off energy dissipation per pulse

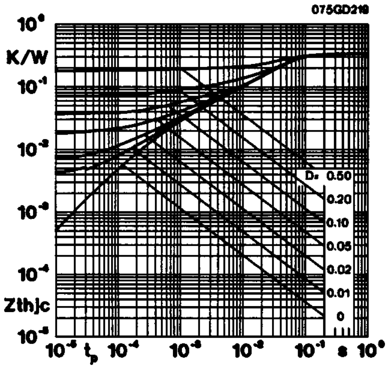


Fig. 19 Transient thermal impedance of IGBT $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

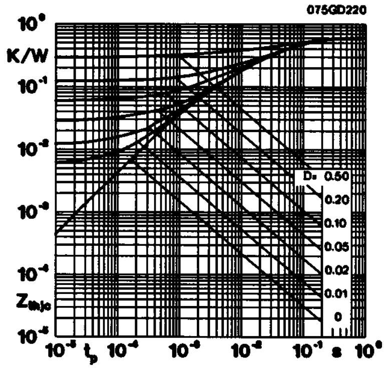


Fig. 20 Transient thermal impedance of inverse CAL diodes $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

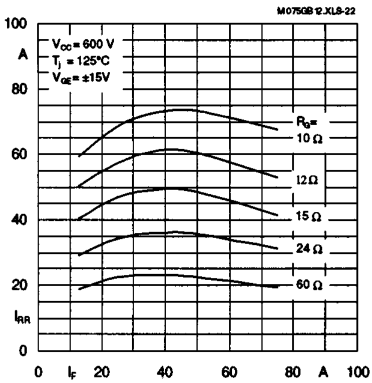


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F)$

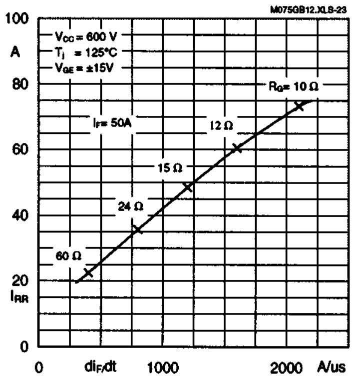


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di_F/dt)$

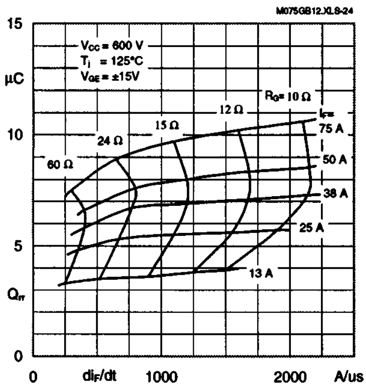


Fig. 24 Typ. CAL Diode recovered charge $Q_{rr} = f(di_F/dt)$

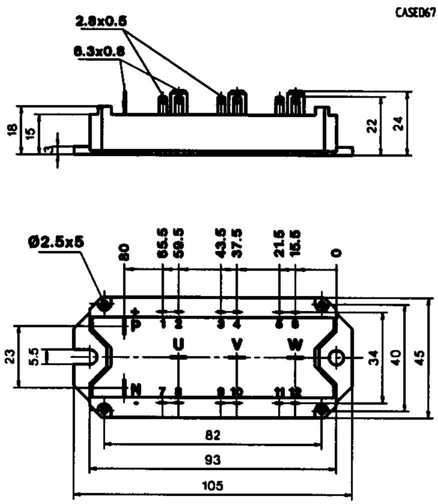
SEMITRANS Sixpack

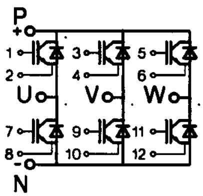
Case D 67

UL Recognized

File no. E 63 532

SKM 75 GD 123 D





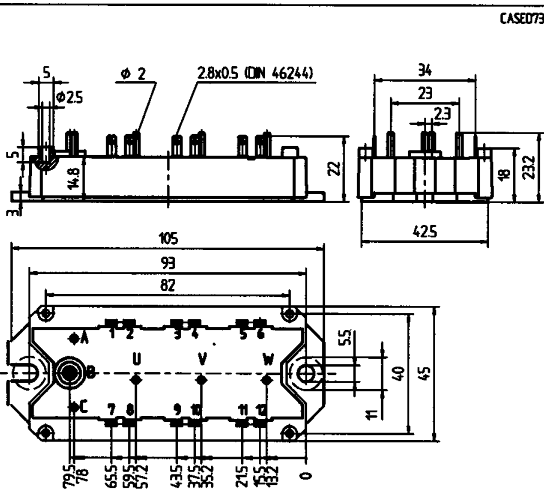
SEMITRANS Sevenpack

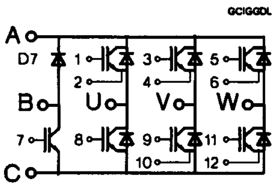
Case D 73

UL Recognized

File no. E 63 532

SKM 75 GDL 123 D





Dimensions in mm

Remark: The pin height of 23,2 mm will be changed into 24,5 ± 0,2 mm during 1996

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		–	–	190	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→ page C - 1.