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 / 45			A
I_{CM}	T_{case} = 25/80 °C; t_p = 1 ms	140 / 90			A
V_{GES}		± 20			V
P_{tot}	per IGBT/D1/D8, T_{case}=25 °C	350 / 125 / 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	55/150/56			
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	60	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	600	200	350	A
I^2t	t_p = 10 ms; T_j = 150 °C	1800	200	600	A^2s

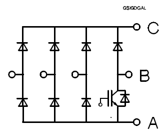
Characteristics Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 1 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0; V_{CE} = V_{CES}; T_j = 25 °C	–	0,8	1	mA
	V_{GE} = 0; V_{CE} = V_{CES}; T_j = 125 °C	–	3,5	–	mA
I_{GES}	V_{GE} = 20 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		40	–	S
C_{CHC}	per IGBT	–	–	350	pF
C_{ies}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz	–	3300	4300	pF
C_{oes}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz	–	500	650	pF
C_{res}	V_{GE} = 0; V_{CE} = 25 V; f = 1 MHz	–	220	300	pF
$t_{d(on)}$	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}		–	8	–	mWs
E_{off}		–	5	–	mWs
Inverse Diode D7[8] of brake chopper					
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_{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 of "GAL" brake chopper [8]					
V_F = V_{EC}	I_F = 25 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	2,0 (1,8)	2,5	V
V_F = V_{EC}	I_F = 40 A; V_{GE} = 0 V; 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	–	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]	–	–	0,35 / 1,0	°C/W
R_{thjc}	per diode D7 / D8	–	–	1,5 / 1,0	°C/W
R_{thch}	per module	–	–	0,05	°C/W

SEMITRANS® M
IGBT Modules

SKD 75 GAL 123 D
Input bridge B6U with brake chopper

Preliminary Data

7D-Pack = 7 Diodes Pack



SKD 75 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 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 75GD123D

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

8) CAL = Controlled Axial Lifetime Technology.

9) **Data D1 - D6, case and mech. data → B6 - 130**

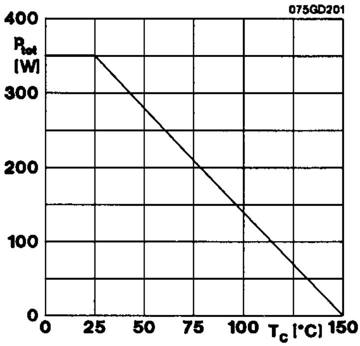
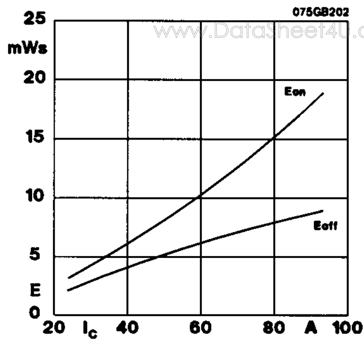
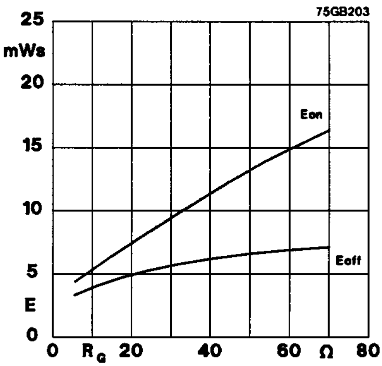


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$



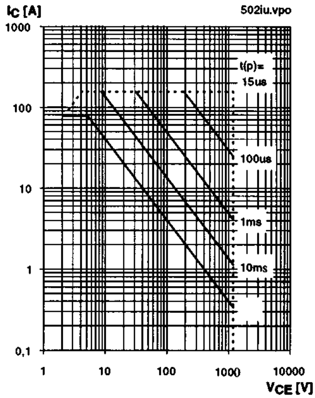
T_j = 125 °C
V_{CE} = 600 V
V_{GE} = ± 15 V
R_G = 22 Ω

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

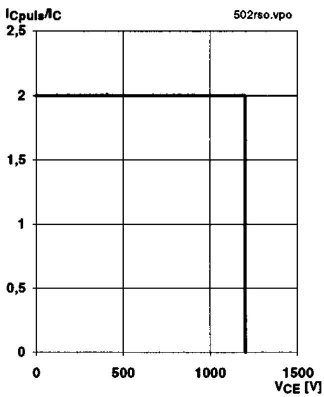
Fig. 3 Turn-on /-off energy = f (R_G)



1 pulse
T_C = 25 °C
T_j ≤ 150 °C

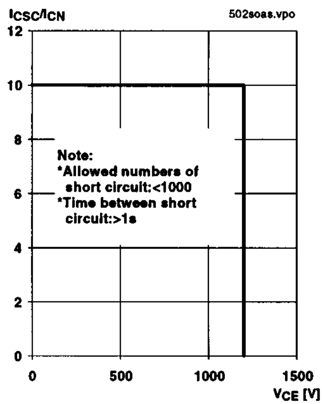
Not for linear use

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



T_j ≤ 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 ≤ 150 °C
V_{GE} = ± 15 V
t_{sc} ≤ 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

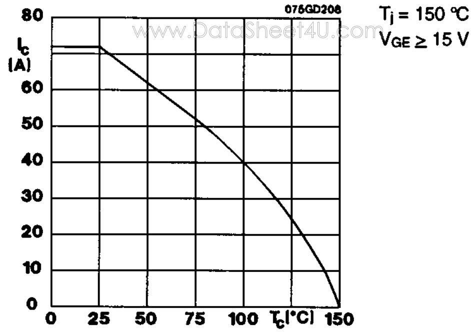


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

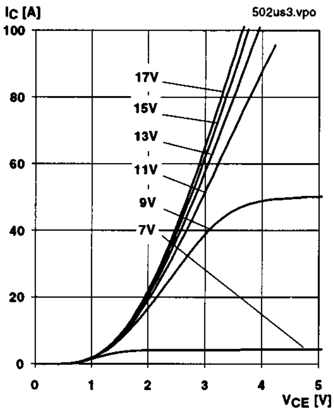


Fig. 9 Typ. output characteristic, t_p = 80 µs; 25 °C

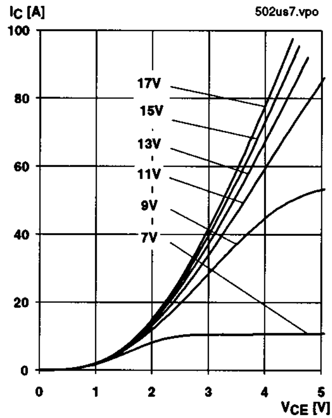


Fig. 10 Typ. output characteristic, t_p = 80 µs; 125 °C

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

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

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

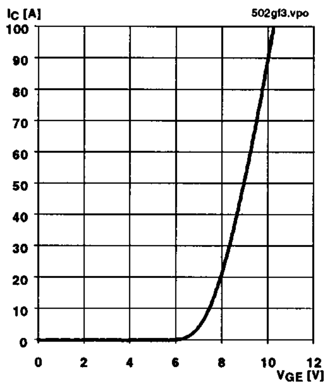
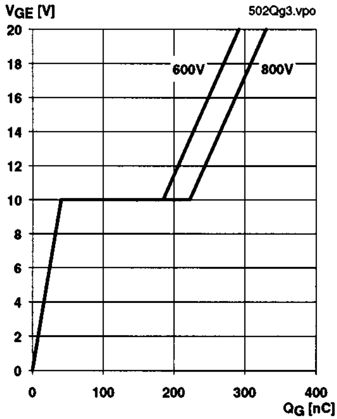
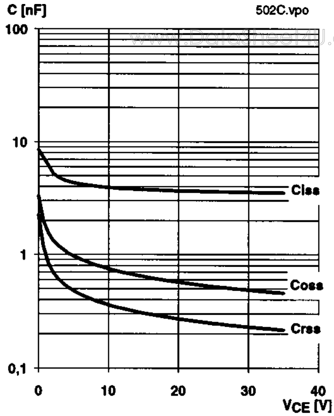


Fig. 12 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V



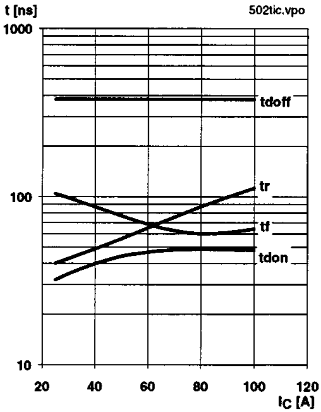
I_{Cpuls} = 50 A

Fig. 13 Typ. gate charge characteristic



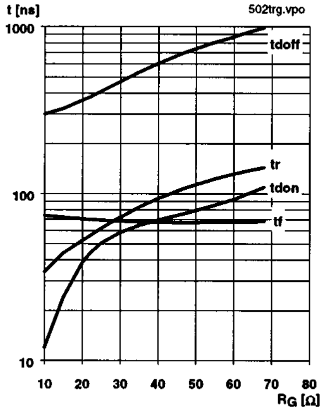
V_{GE} = 0 V
f = 1 MHZ

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

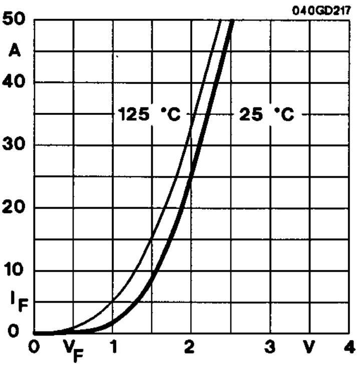


Fig. 17 Typ. CAL diode forward characteristic

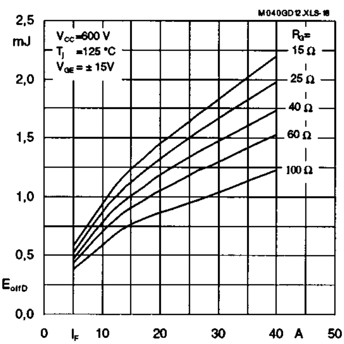


Fig. 18 Diode D8 turn-off energy dissipation per pulse

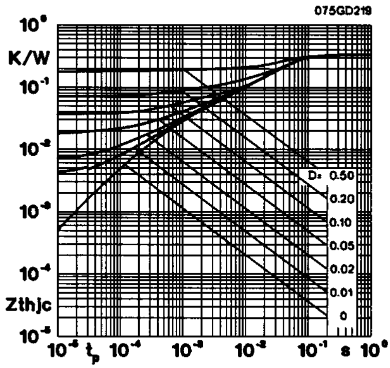


Fig. 19 Transient thermal impedance of IGBT
$Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

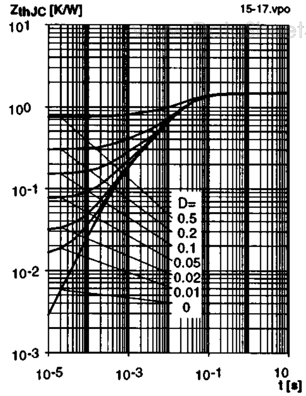


Fig. 20 Transient thermal impedance of inverse CAL diodes D7

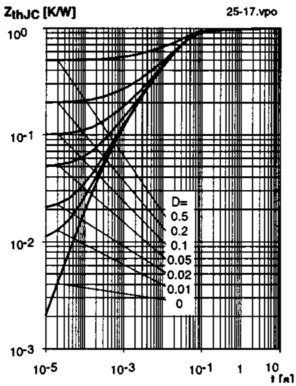


Fig. 21 Transient thermal impedance Z_{thjc} of freewheeling diode D8 and D1-D6

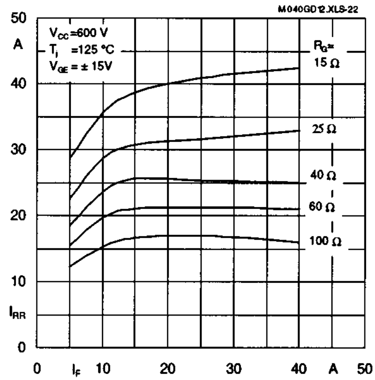


Fig. 22 Typ. CAL diode (D8) peak reverse recovery current ($I_{RR} = f(I_F; R_G)$)

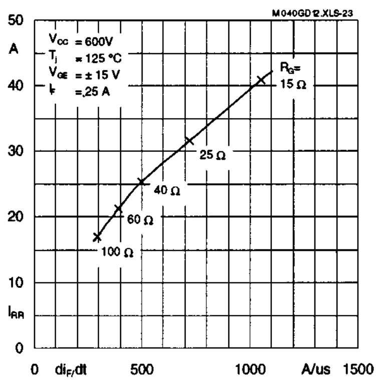


Fig. 23 Typ. CAL diode (D8) reverse recovery current $I_{RR} = f(di_F/dt)$

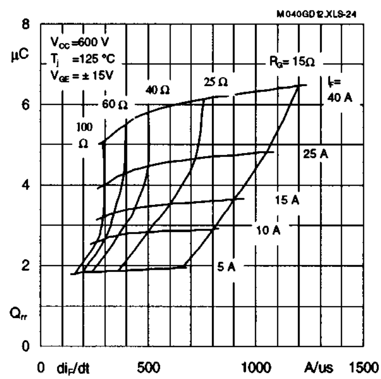
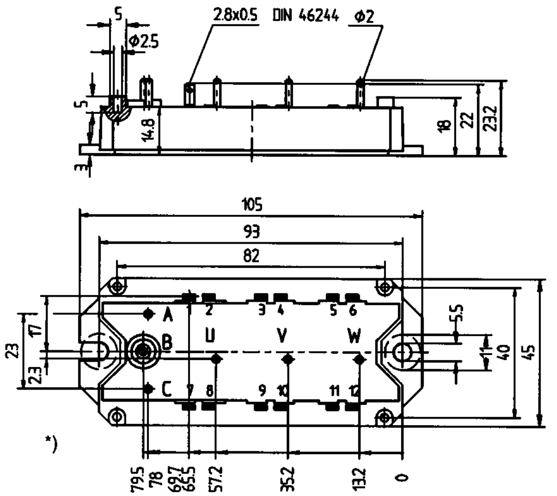


Fig. 24 Typ. CAL diode (D8) recovered charge $Q_{rr} = f(di/dt)$

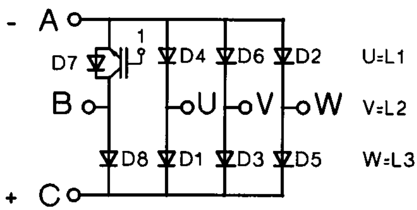
SEMITRANS
Sixpack modified
Case D 69 A
UL recognition
File E63 532
applied for



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

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

GCIGDAL



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;	–	–	100	A
V_F	T_{vj} = 25 °C; I_F = 75 A	–	–	1,45	V
V_{TO}	T_{vj} = 150 °C	–	–	0,8	V
r_T	T_{vj} = 150 °C	–	–	8,5	mΩ
R_{thjc}	D1...D6			1,0	K/W
T_{solder}	> 5 s max. 15 sec. (transfer)	–	180	250	°C
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		–	–	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.