

Absolute Maximum Ratings		Values	Units
Symbol	Conditions ¹⁾		
V _{CES}		1200	V
V _{CGR}	R _{GE} = 20 kΩ	1200	V
I _C	T _{case} = 25/60 °C	90 / 75	A
I _{CM}	T _{case} = 25/60 °C; t _p = 1 ms	180 / 150	A
V _{GES}		± 20	V
P _{tot}	per IGBT, T _{case} = 25 °C	390	W
T _J , (T _{stg})		−40 ... +150 (125)	°C
V _{isol}	AC, 1 min.	2500	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	75 / 50	A
I _{FM} = −I _{CM}	T _{case} = 25/80 °C; t _p = 1 ms	180 / 150	A
I _{FSM}	t _p = 10 ms; sin.; T _J = 150 °C	550	A
I ² t	t _p = 10 ms; T _J = 150 °C	1500	A ² s

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 = 1 mA	4,5	5,5	6,5	V
I _{CES}	V _{GE} = 0 } T _J = 25 °C	—	0,8	1	mA
	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;	—	2,1(2,4)	2,45(2,85)	V
V _{CESat}	I _C = 75 A { T _J = 25 (125) °C }	—	2,5(3,0)	—	V
g _{fs}	V _{CE} = 20 V, I _C = 50 A	25	—	—	S
C _{CHC}	per IGBT	—	—	300	pF
C _{ies}	} V _{GE} = 0 V _{CE} = 25 V f = 1 MHz	—	3800	4200	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	—	60	—	ns
t _r		—	55	—	ns
t _{d(off)}		—	420	—	ns
t _f		—	50	—	ns
E _{on}		—	8	—	mWs
E _{off}		—	6	—	mWs
Inverse Diode ⁸⁾					
V _F = V _{EC}	I _F = 50 A { V _{GE} = 0 V; I _F = 75 A { T _J = 25 (125) °C }	—	2,0(1,8)	2,5	V
V _F = V _{EC}		—	2,3(2,1)	—	V
V _{TO}	T _J = 125 °C	—	1,1	1,2	V
r _t	T _J = 125 °C	—	—	22	mΩ
I _{RRM}	I _F = 50 A; T _J = 125 °C ²⁾	—	39	—	A
Q _{rr}	I _F = 50 A; T _J = 125 °C ²⁾	—	7	—	μC
Thermal Characteristics					
R _{thjc}	per IGBT	—	—	0,32	°C/W
R _{thjc}	per diode	—	—	0,6	°C/W
R _{thch}	per module	—	—	0,05	°C/W

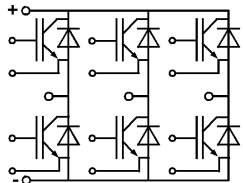
SEMITRANS® M

Low Loss IGBT Modules

SKM 75 GD 124 D



Sixpack



GD

Features

- MOS input (voltage controlled)
- N channel, homogeneous Silicon structure (NPT- Non punch-through IGBT)
- Low loss high density chip
- Low tail current
- 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 without hard mould
- Large clearance (9 mm) and creepage distances (13 mm)

Typical Applications

- Switched mode power supplies
- Three phase inverters for AC motor speed control

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

⁸⁾ CAL = Controlled Axial Lifetime Technology

Case and mech. data → B 6 – 110

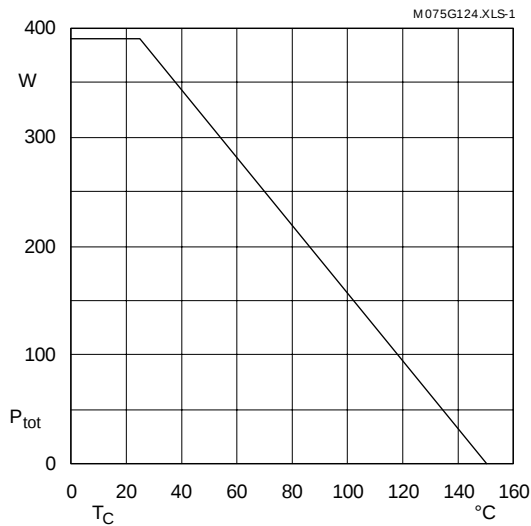


Fig. 1 Rated power dissipation $P_{tot} = f(T_C)$

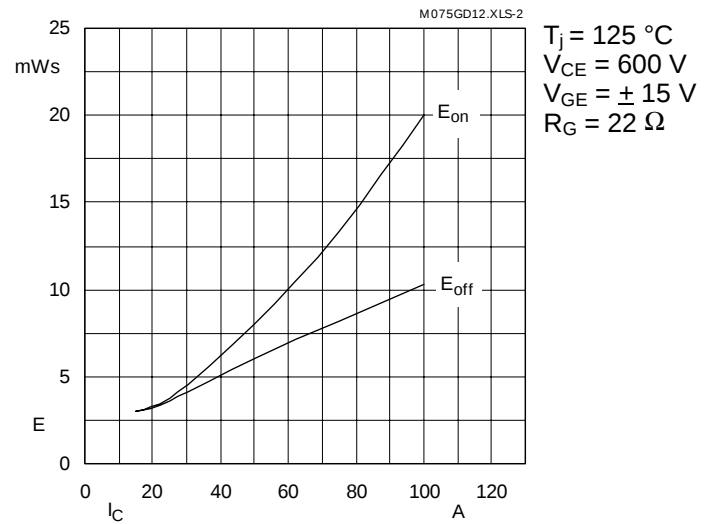


Fig. 2 Turn-on /-off energy $= f(I_C)$

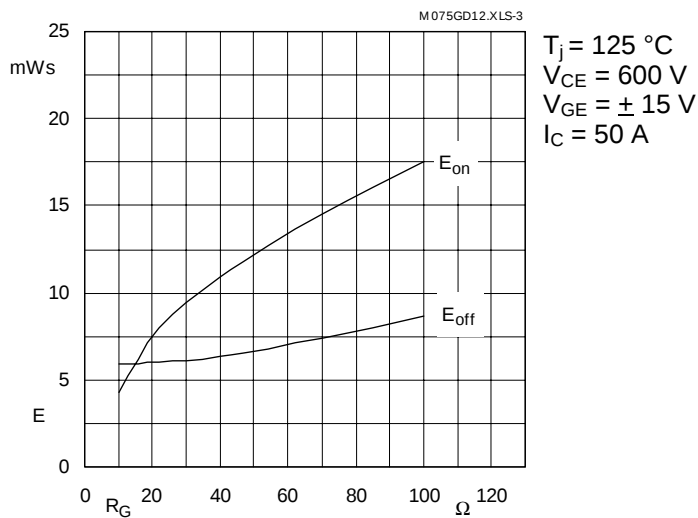


Fig. 3 Turn-on /-off energy $= f(R_G)$

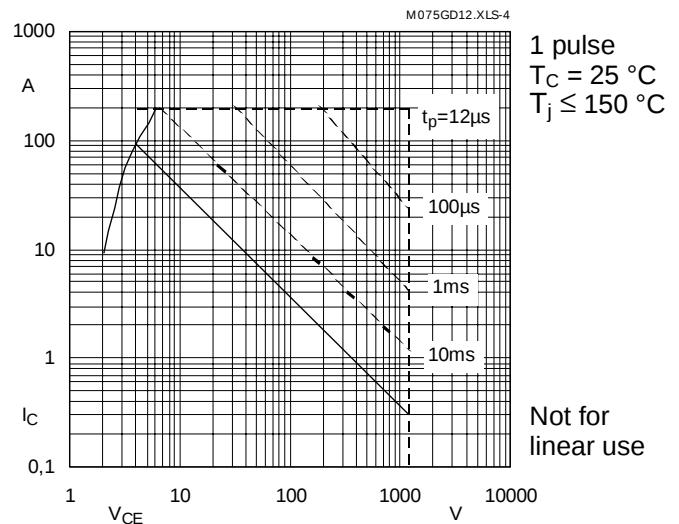


Fig. 4 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

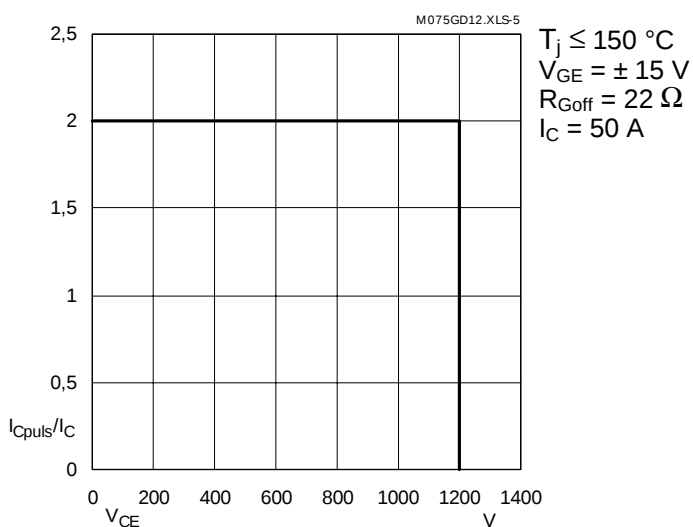


Fig. 5 Turn-off safe operating area (RBSOA)

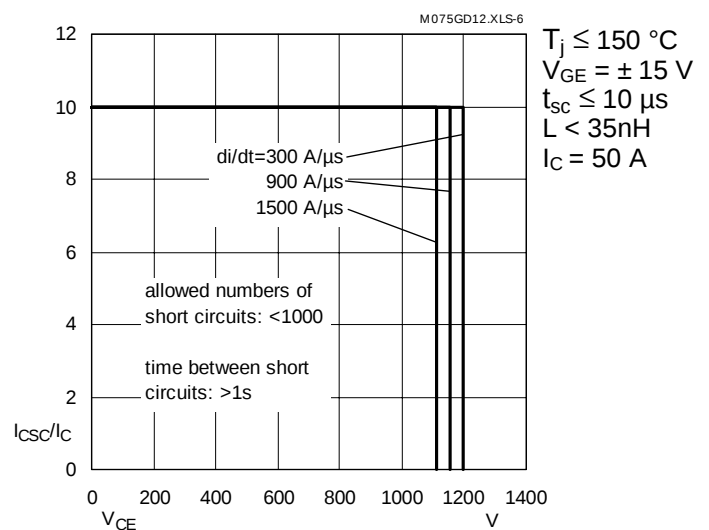


Fig. 6 Safe operating area at short circuit $I_C = f(V_{CE})$

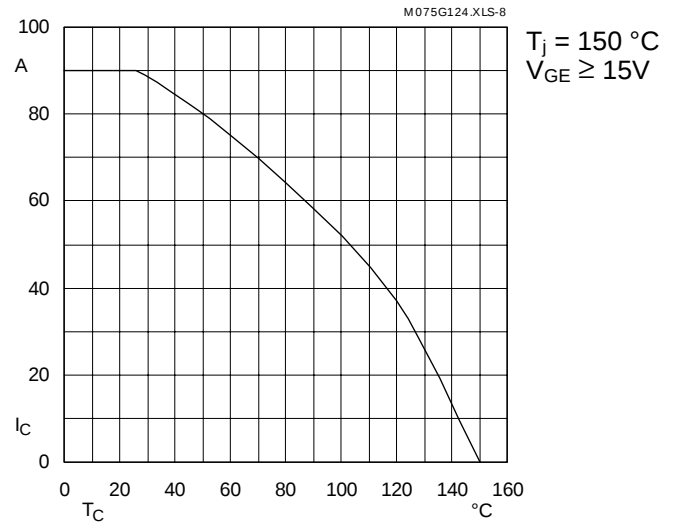


Fig. 8 Rated current vs. temperature $I_C = f(T_C)$

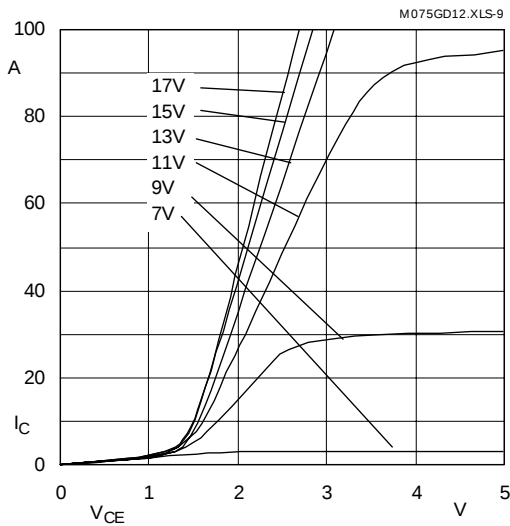


Fig. 9 Typ. output characteristic, $t_p = 80$ μs; 25 °C

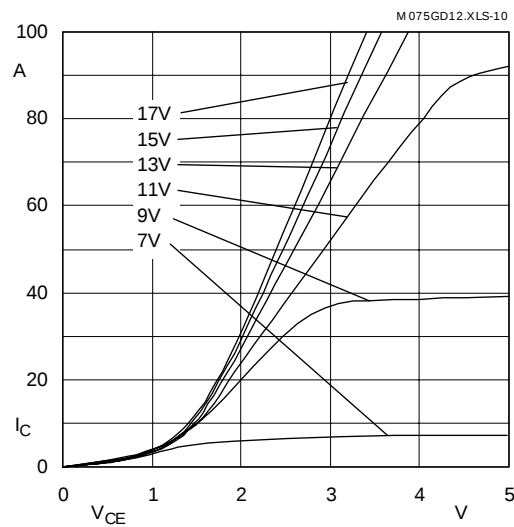


Fig. 10 Typ. output characteristic, $t_p = 80$ μs; 125 °C

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

$$V_{CEsat(t)} = V_{CE(TO)(T_j)} + r_{CE(T_j)} \cdot I_C(t)$$

$$V_{CE(TO)(T_j)} \leq 1,30 + 0,0005 (T_j - 25) [V]$$

$$\text{typ.: } r_{CE(T_j)} = 0,018 + 0,00005 (T_j - 25) [\Omega]$$

$$\text{max.: } r_{CE(T_j)} = 0,025 + 0,00005 (T_j - 25) [\Omega]$$

$$\text{valid for } V_{GE} = +15 \pm 2 [V]; I_C \geq 0,3 I_{Cn}$$

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

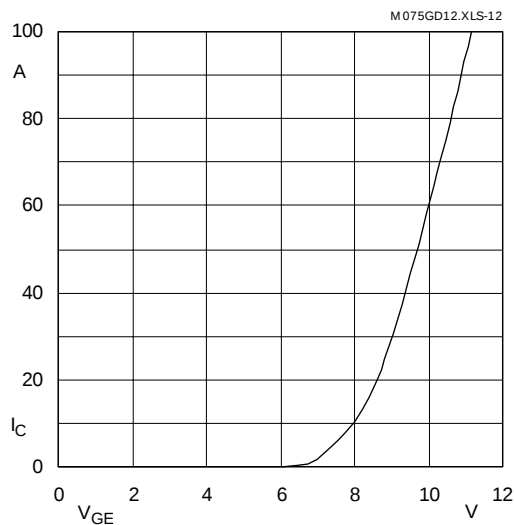
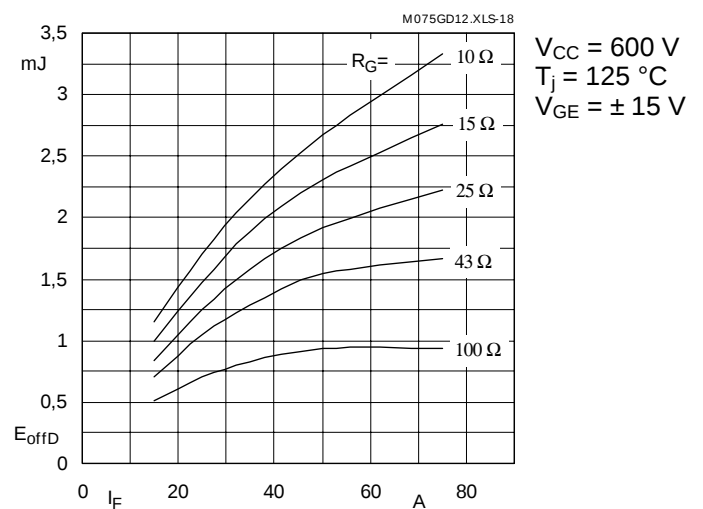
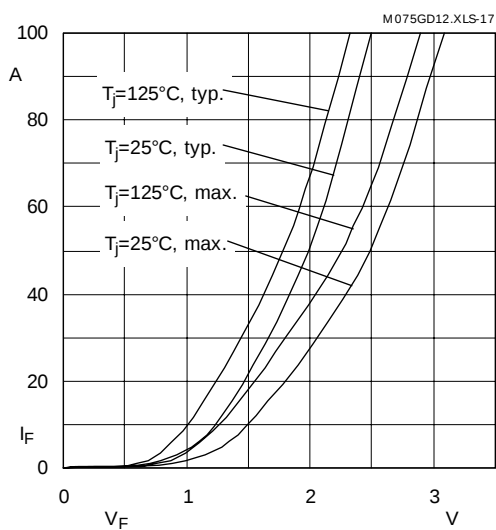
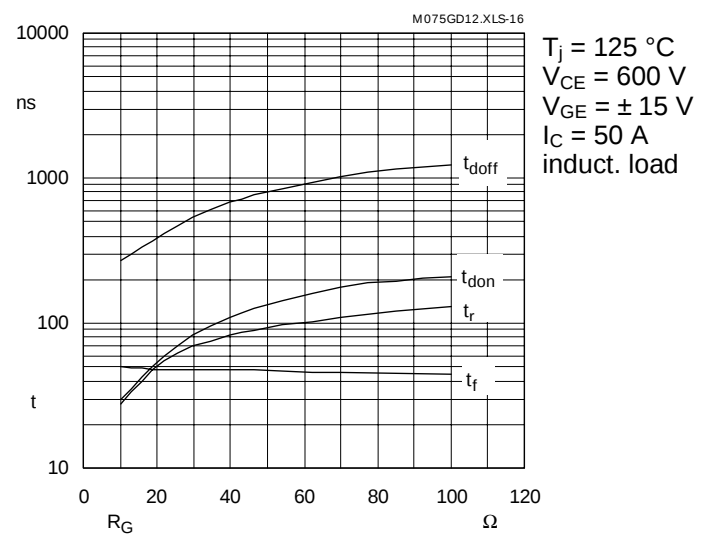
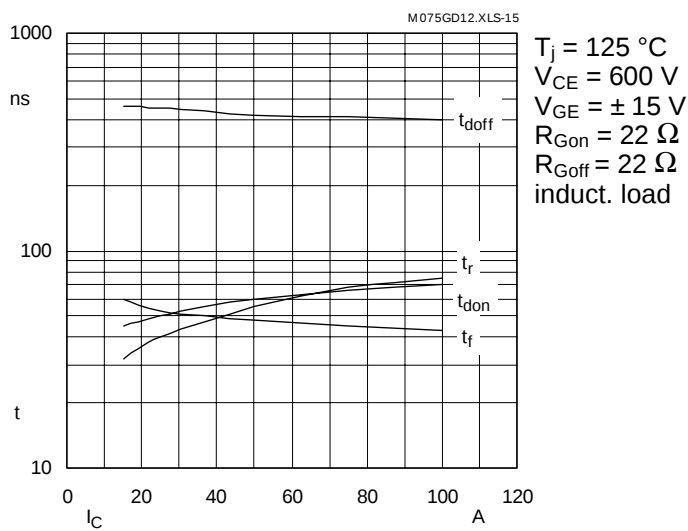
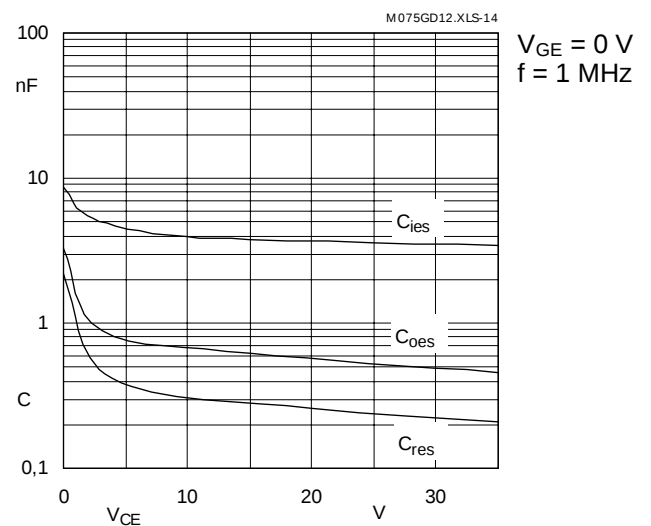
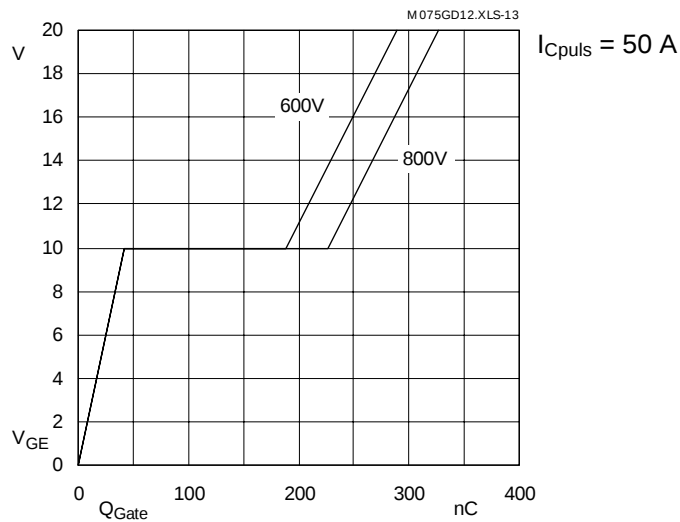


Fig. 12 Typ. transfer characteristic, $t_p = 80$ μs; $V_{CE} = 20$ V



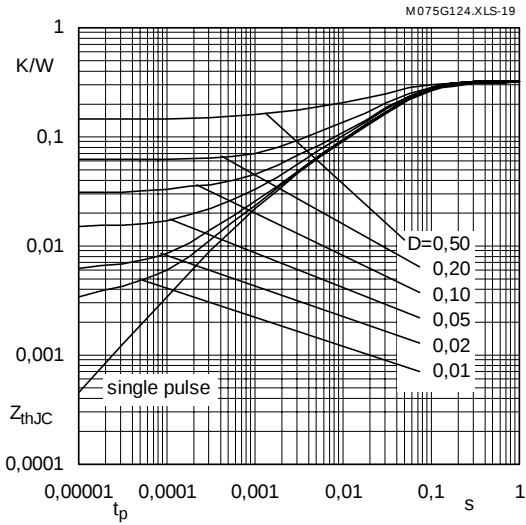


Fig. 19 Transient thermal impedance of IGBT
 $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

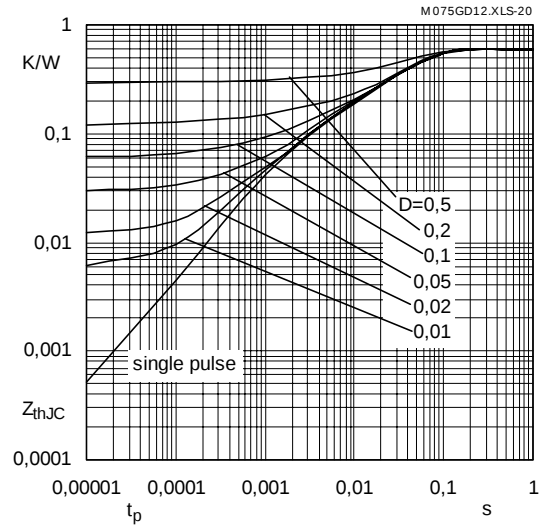


Fig. 20 Transient thermal impedance of inverse CAL diodes
 $Z_{thJC} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

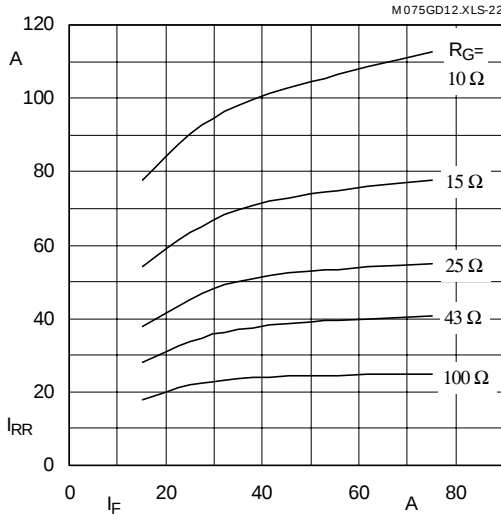


Fig. 22 Typ. CAL diode peak reverse recovery current $I_{RR} = f(I_F; R_G)$

$V_{CC} = 600 \text{ V}$
 $T_j = 125 \text{ °C}$
 $V_{GE} = \pm 15 \text{ V}$

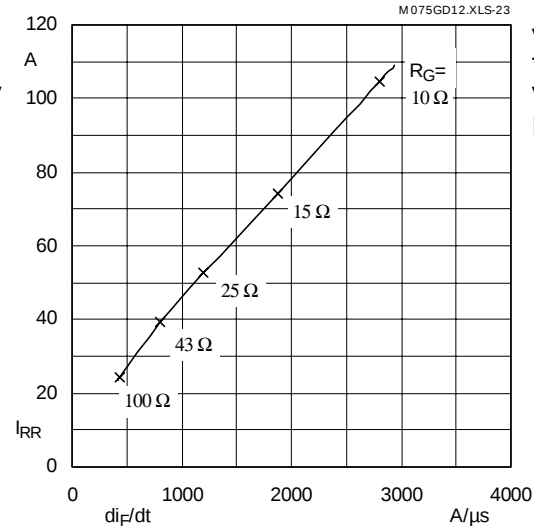


Fig. 23 Typ. CAL diode peak reverse recovery current $I_{RR} = f(di/dt)$

$V_{CC} = 600 \text{ V}$
 $T_j = 125 \text{ °C}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_F = 50 \text{ A}$

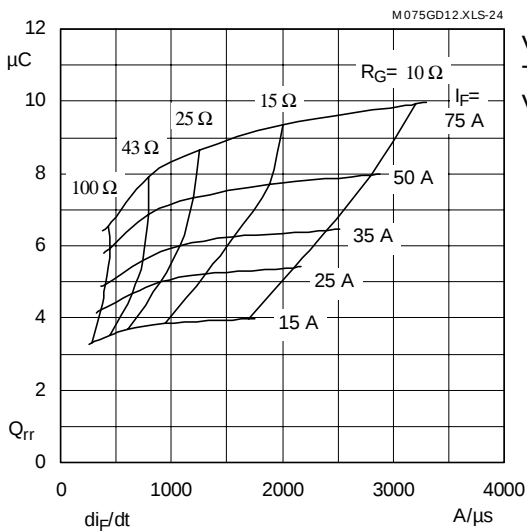
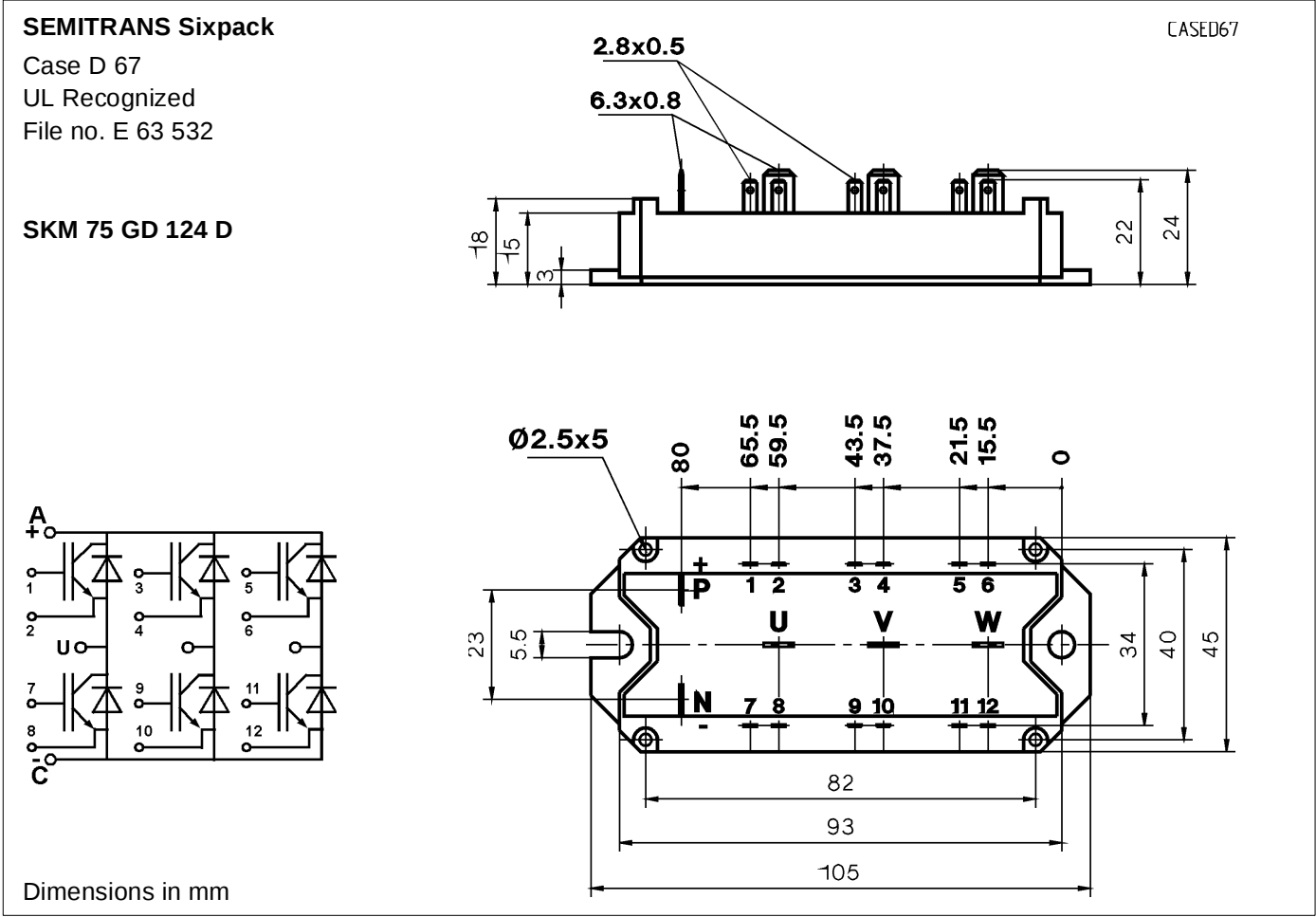


Fig. 24 Typ. CAL diode recovered charge

$V_{CC} = 600 \text{ V}$
 $T_j = 125 \text{ °C}$
 $V_{GE} = \pm 15 \text{ V}$



Case outline and circuit diagram

Mechanical Data		Values			Units
Symbol	Conditions	min.	typ.	max.	
M ₁	to heatsink, SI Units	4	—	5	Nm
a	to heatsink, US Units	35	—	44	lb.in.
w		—	—	5x9,81	m/s ²
		—	—	175	g

This is an electrostatic discharge sensitive device (ESDS). 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.