

SKM 400 GA 128 D

Absolute Maximum Ratings		$T_{case} = 25\text{ °C}$, unless otherwise specified	
Symbol	Conditions	Values	Units
IGBT			
V_{CES}		1200	V
I_C	$T_{case} = 25\text{ (80) °C}$	530 (380)	A
I_{CRM}	$T_{case} = 25\text{ (80) °C}$, $t_p = 1\text{ ms}$	1060 (760)	A
V_{GES}		± 20	V
T_{vj} , (T_{stg})	$T_{OPERATION} \leq T_{stg}$	$-40 \dots +150\text{ (125)}$	°C
V_{isol}	AC, 1 min.	4000	V
Inverse Diode			
$I_{FAV} = -I_C$	$T_{case} = 25\text{ (80) °C}$	390 (260)	A
I_{FRM}	$T_{case} = 25\text{ (80) °C}$, $t_p < 1\text{ ms}$	1060 (760)	A
I_{FSM}	$t_p = 10\text{ ms}$; sin.; $T_j = 150\text{ °C}$	2900	A
Freewheeling Diode			
$I_{FAV} = -I_C$	$T_{case} = 25\text{ (80) °C}$		A
I_{FRM}	$T_{case} = 25\text{ (80) °C}$, $t_p < 1\text{ ms}$		A
I_{FSM}	$t_p = 10\text{ ms}$; sin.; $T_j = 150\text{ °C}$		A

Characteristics $T_{case} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified					
Symbol	Conditions	min.	typ.	max.	Units
IGBT					
$V_{GE(TO)}$	$V_{GE} = V_{CE}$, $I_C = 12\text{ mA}$	4,5	5,5	6,45	V
I_{CES}	$V_{GE} = 0$, $V_{CE} = V_{CES}$, $T_j = 25\text{ (125) }^{\circ}\text{C}$			tbd	mA
$V_{CE(TO)}$	$T_j = 25\text{ (125) }^{\circ}\text{C}$		1,0 (0,9)	1,15	V
r_{CE}	$V_{GE} = 15\text{ V}$, $T_j = 25\text{ (125) }^{\circ}\text{C}$		3,3 (4,7)	4,2(tbd)	mΩ
$V_{CE(sat)}$	$I_C = 300\text{ A}$, $V_{GE} = 15\text{ V}$, chip level		2,0 (2,3)	2,4	V
C_{ies}	$V_{GE} = 0$, $V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$		26		nF
C_{oes}			3		nF
C_{res}			3		nF
L_{CE}				20	nH
$R_{CC'+EE'}$	resistance, terminal-chip $25\text{ (125) }^{\circ}\text{C}$		0,18(0,22)		mΩ
$t_{d(on)}$	under following conditions: $V_{CC} = 600\text{ V}$, $I_C = 300\text{ A}$, $R_{Gon} = R_{Goff} = 5\text{ }\Omega$, $T_j = 125\text{ }^{\circ}\text{C}$, $V_{GE} \pm 15\text{ V}$		120		ns
t_r			70		ns
$t_{d(off)}$			800		ns
t_f			75		ns
$E_{on} (E_{off})$			31(33)		mJ
Inverse Diode under following conditions:					
$V_F = V_{EC}$	$I_F = 300\text{ A}$; $V_{GE} = 0\text{ V}$; $T_j = 25\text{ (125) }^{\circ}\text{C}$		2,0 (1,8)	2,5	V
$V_{T(TO)}$	$T_j = 25\text{ (125) }^{\circ}\text{C}$		1,1 (tbd)	1,2	V
r_T	$T_j = 25\text{ (125) }^{\circ}\text{C}$		3 (tbd)	4,3(tbd)	mΩ
I_{RRM}	$I_F = 300\text{ A}$; $T_j = 125\text{ }^{\circ}\text{C}$		345		A
Q_{rr}	$di/dt = 5200\text{ A}/\mu\text{s}$		48		μC
E_{rr}	$V_{GE} = 0\text{ V}$		19		mJ
FWD under following conditions:					
$V_F = V_{EC}$	$I_F = A$; $V_{GE} = 0\text{ V}$; $T_j = 25\text{ (125) }^{\circ}\text{C}$				V
V_{TO}	$T_j = 25\text{ (125) }^{\circ}\text{C}$				V
r_T	$T_j = 25\text{ (125) }^{\circ}\text{C}$				mΩ
I_{RRM}	$I_F = A$; $T_j = 125\text{ }^{\circ}\text{C}$				A
Q_{rr}	$V_{GE} = 0\text{ V}$				μC
E_{rr}					mJ
Thermal Characteristics					
$R_{th(j-c)}$	per IGBT			0,055	K/W
$R_{th(j-c)D}$	per Inverse Diode			0,125	K/W
$R_{th(j-c)FD}$	per FWD				K/W
$R_{th(c-s)}$	per module			0,038	K/W
Mechanical Data					
M_s	to heatsink (M6)	3		5	Nm
M_t	for terminals (M5)	2,5		5	Nm
w				330	g

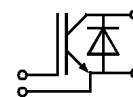
SEMITRANS™ M SPT IGBT Module

SKM 400 GA 128 D

Preliminary Data



SEMITRANS 4



GA

Features

- Homogeneous Si
- SPT = Soft-Punch-Through technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

Typical Applications

- AC inverter drives
- UPS
- Electronic welders at $f_{sw} > 20\text{ kHz}$

$$I_{DC} \leq 500\text{ A for } T_{Terminal} = 100\text{ °C}$$

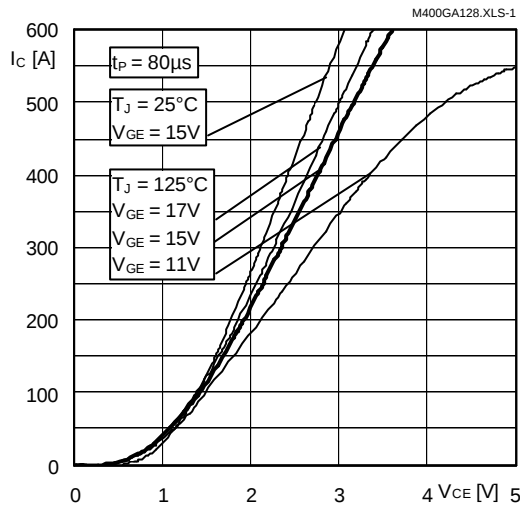


Fig. 1 Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

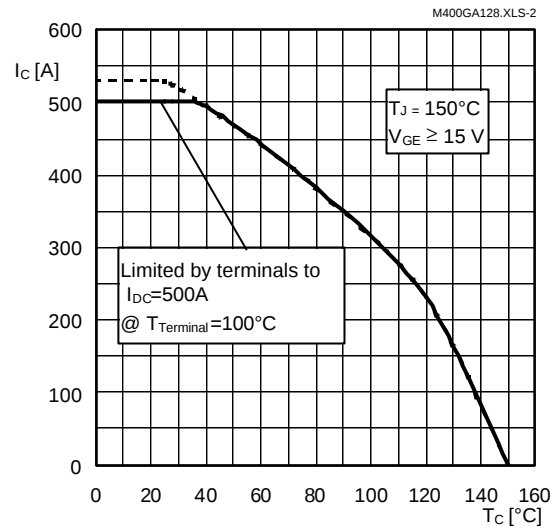


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

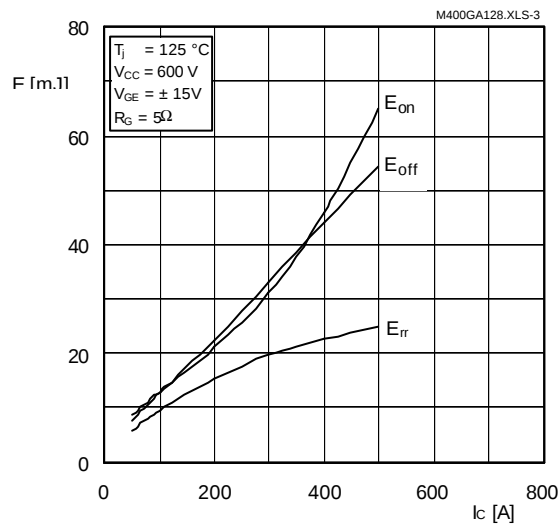


Fig. 3 Typ. turn-on /-off energy = $f(I_C)$

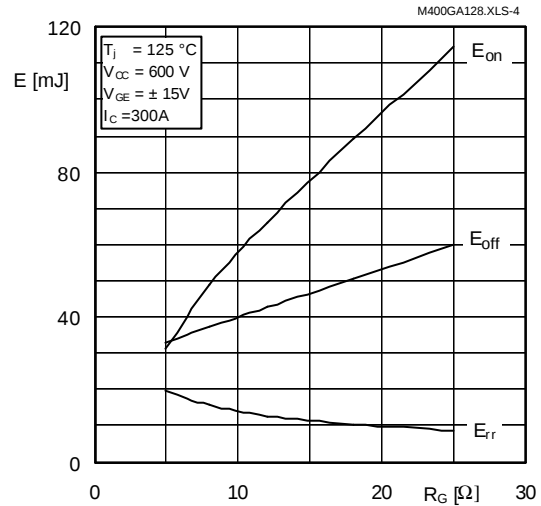


Fig. 4 Typ. turn-on /-off energy = $f(R_G)$

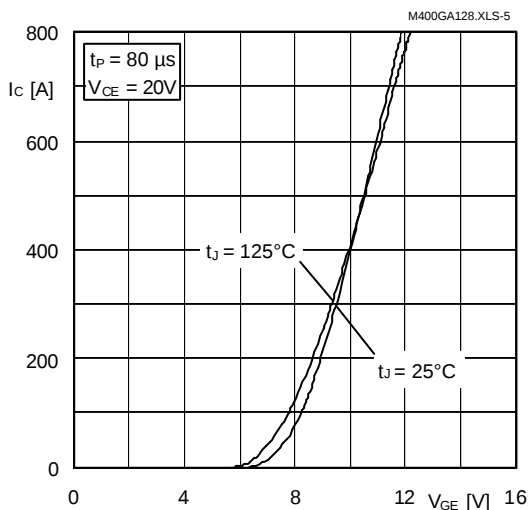


Fig. 5 Typ. transfer characteristic

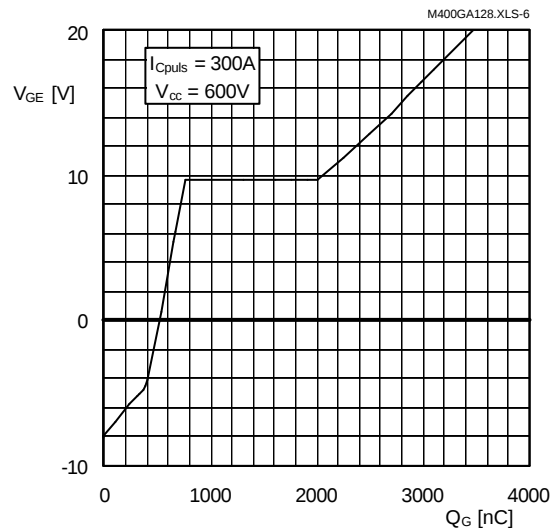


Fig. 6 Typ. gate charge characteristic

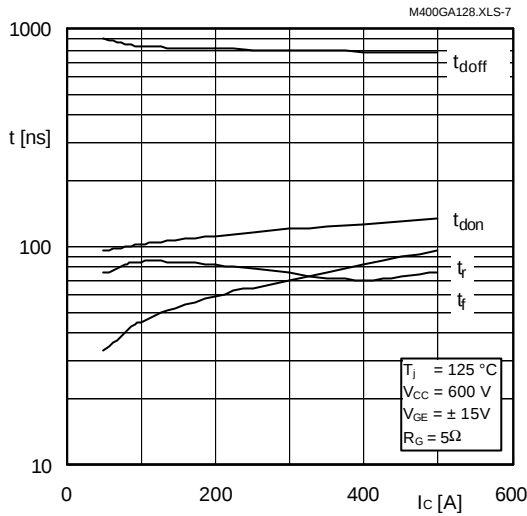


Fig. 7 Typ. switching times vs. I_C

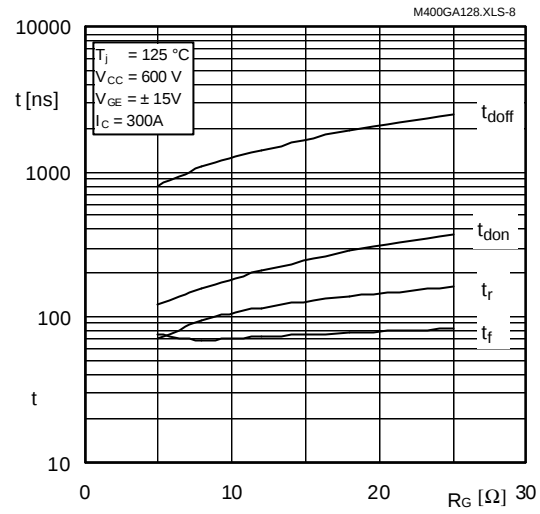


Fig. 8 Typ. switching times vs. gate resistor R_G

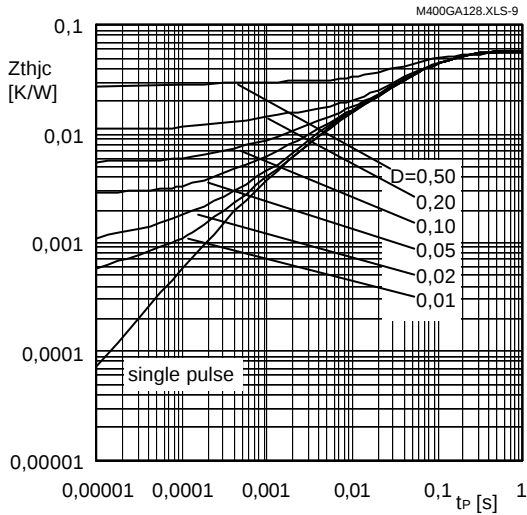


Fig. 9 Transient thermal impedance of IGBT $Z_{thp(j-c)} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

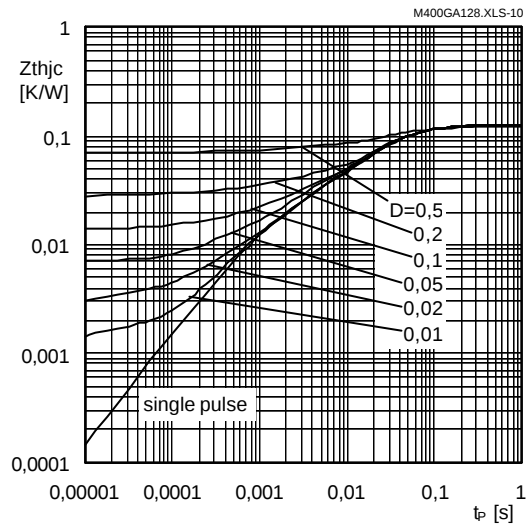


Fig. 10 Transient thermal impedance of FWD $Z_{thp(j-c)D} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

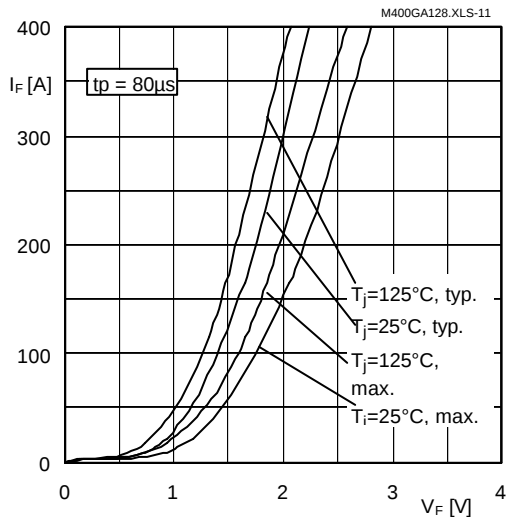


Fig. 11 CAL diode forward characteristic

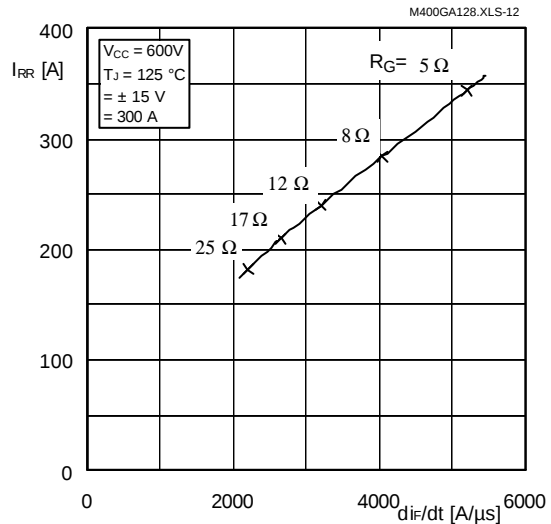
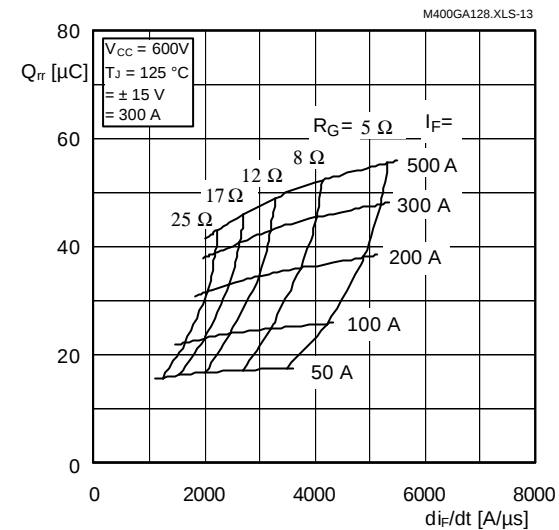


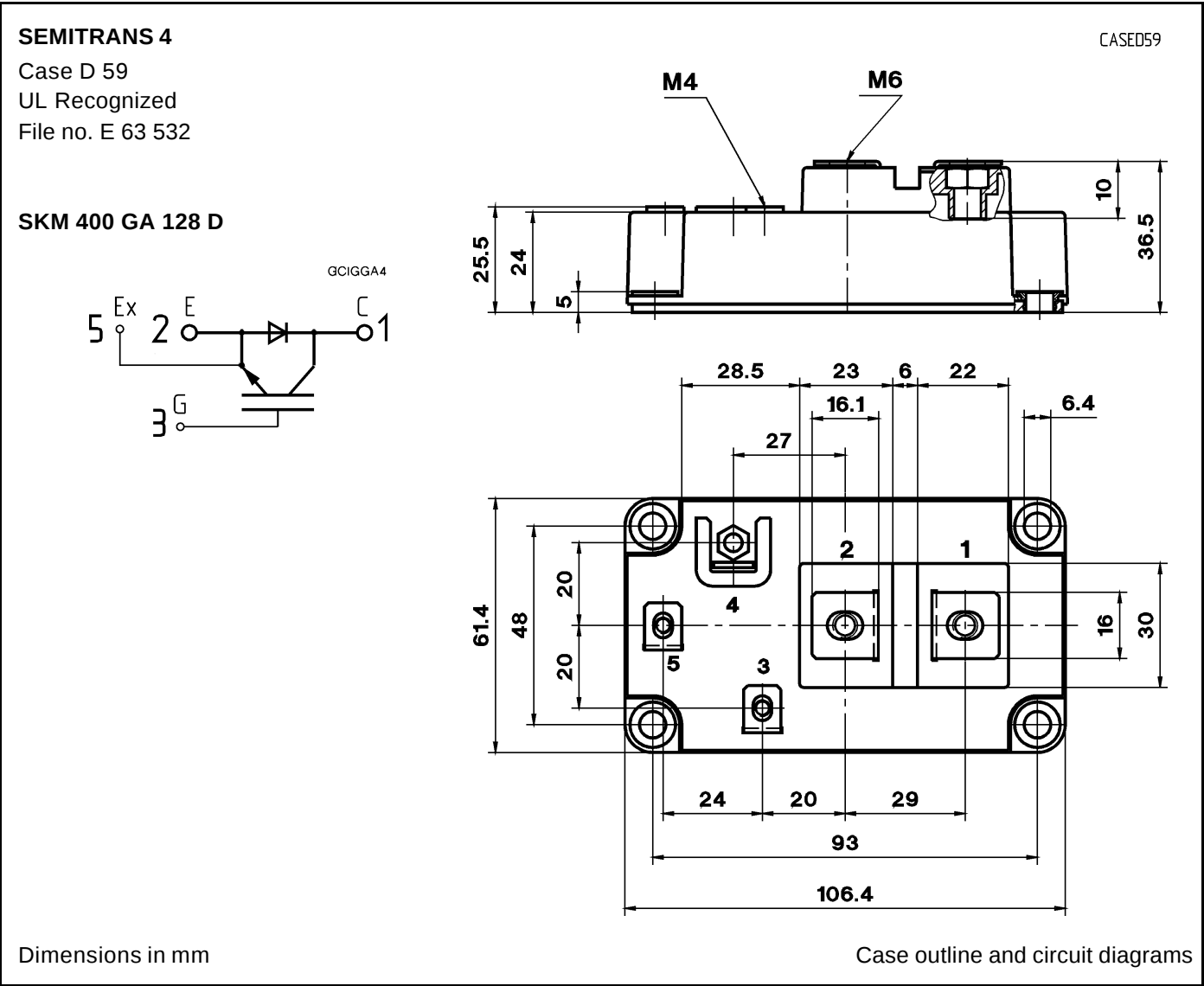
Fig. 12 Typ. CAL diode peak reverse recovery current



This is an electrostatic discharge sensitive device (ESDS).
Please observe the international standard IEC 60747-1, Chapter IX.

Packing Unit	3 pcs	SEMIBOX B
Mounting Kit	10 pcs	Ident-No. 33321100

Fig. 13 Typ. CAL diode recovered charge



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