



SEMITRANS®4

Fast IGBT4 Modules

SKM600GA12T4

Features

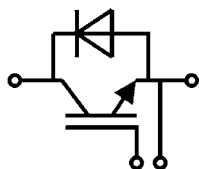
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_{Cnom}
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)

Typical Applications

- AC inverter drives
- UPS
- Electronic welders at fsw up to 20 kHz

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max, recomm.
 $T_{op} = -40 \dots +150^\circ\text{C}$, product rel. results valid for $T_j = 150^\circ$



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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	916	A
		$T_c = 80^\circ\text{C}$	704	A
I_{Cnom}			600	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		1800	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	707	A
		$T_c = 80^\circ\text{C}$	529	A
I_{Fnom}			600	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		1800	A
I_{FSM}	$t_p = 10\text{ ms}$, $\sin 180^\circ$, $T_j = 25^\circ\text{C}$		3240	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$			500	A
T_{stg}			-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	$I_C = 600\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.8	2.05		V
		$T_j = 150^\circ\text{C}$	2.2	2.4		V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9		V
		$T_j = 150^\circ\text{C}$	0.7	0.8		V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	1.7	1.9		$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	2.5	2.7		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 24\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3		mA
		$T_j = 150^\circ\text{C}$				mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	37.2			nF
C_{oes}		$f = 1\text{ MHz}$	2.32			nF
C_{res}		$f = 1\text{ MHz}$	2.04			nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		3400			nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.3			Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	177			ns
t_r	$I_C = 600\text{ A}$ $V_{GE} = \pm 15\text{ V}$	$T_j = 150^\circ\text{C}$	90			ns
E_{on}	$R_{Gon} = 2\ \Omega$		74			mJ
$t_{d(off)}$	$R_{Goff} = 2\ \Omega$		600			ns
t_f	$di/dt_{on} = 6000\text{ A}/\mu\text{s}$		100			ns
E_{off}	$di/dt_{off} = 5200\text{ A}/\mu\text{s}$		63			mJ
$R_{th(j-c)}$	per IGBT			0.049		K/W



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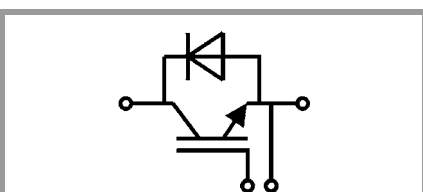
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- AC inverter drives
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 600 \text{ A}$ $V_{GE} = 0 \text{ V}$ chip	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		1.4	1.6	m Ω
		$T_j = 150^\circ\text{C}$		1.9	2.1	m Ω
I_{RRM}	$I_F = 600 \text{ A}$	$T_j = 150^\circ\text{C}$		420		A
Q_{rr}	$di/dt_{off} = 5500 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		92		μC
E_{rr}	$V_{GE} = \pm 15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		38		mJ
$R_{th(j-c)}$	per diode				0.086	K/W
Module						
L_{CE}				15	20	nH
$R_{CC'+EE'}$	terminal-chip	$T_c = 25^\circ\text{C}$		0.18		m Ω
		$T_c = 125^\circ\text{C}$		0.22		m Ω
$R_{th(c-s)}$	per module			0.02	0.038	K/W
M_s	to heat sink M6			3	5	Nm
M_t		to terminals M6, M4		2.5	5	Nm
						Nm
w					330	g



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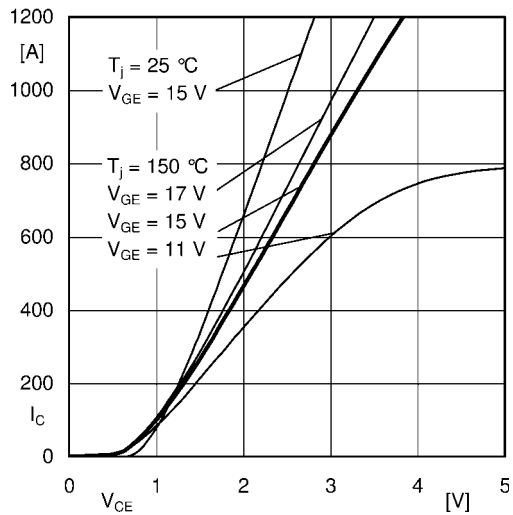


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

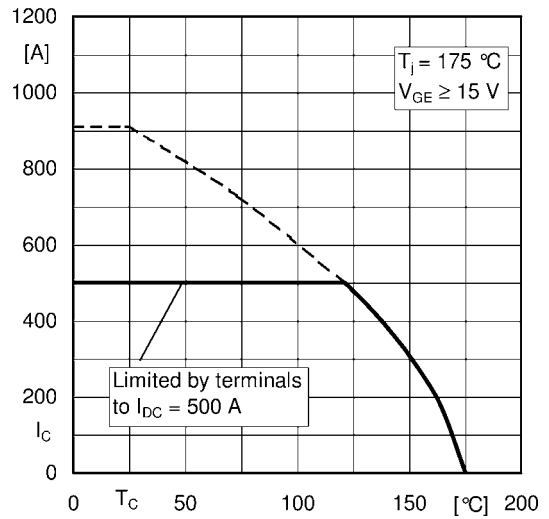


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

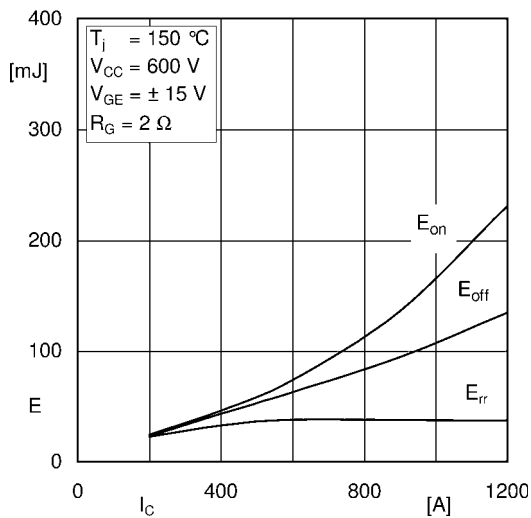


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

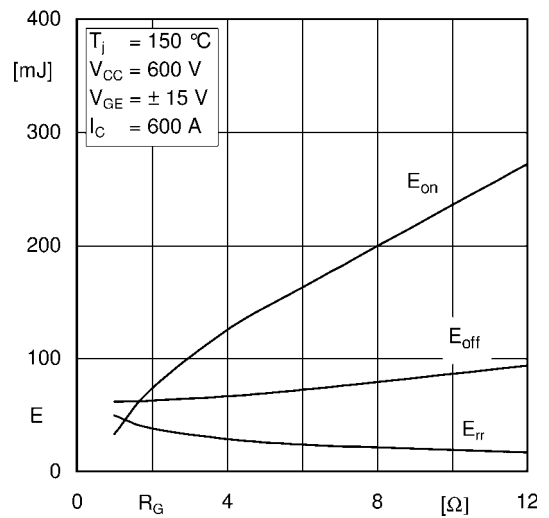


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

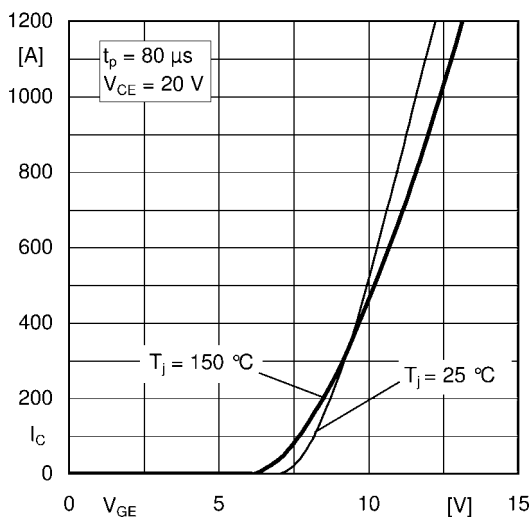


Fig. 5: Typ. transfer characteristic

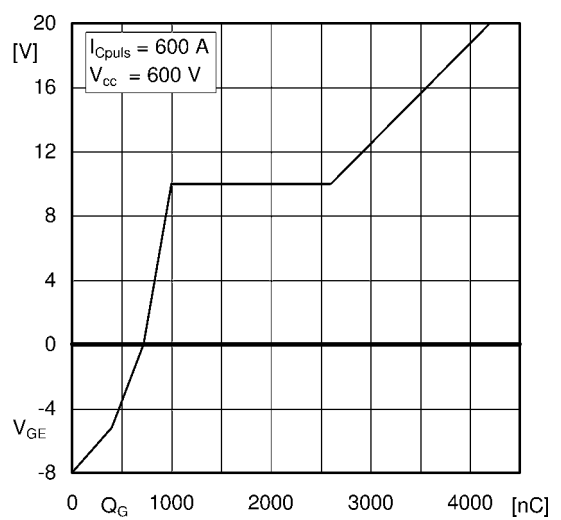
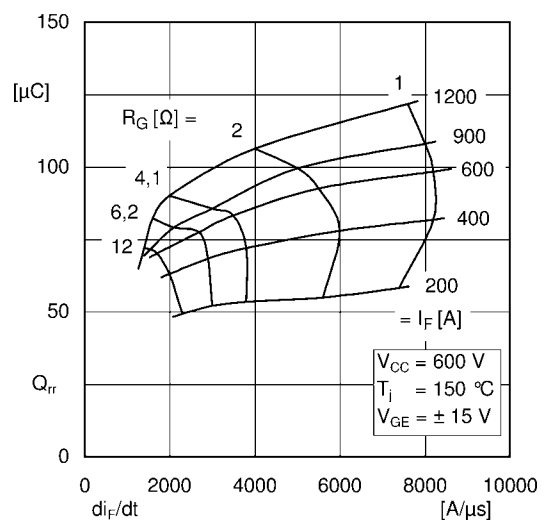
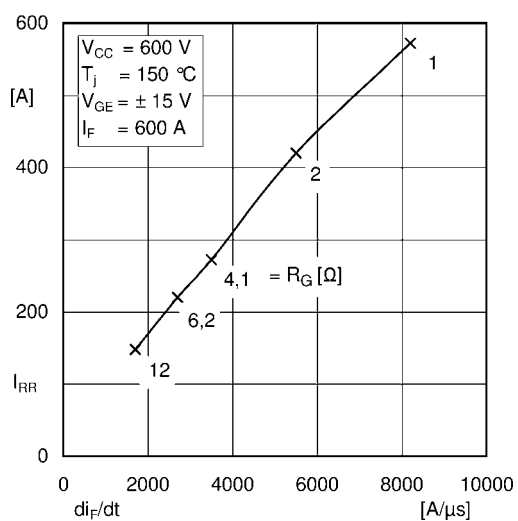
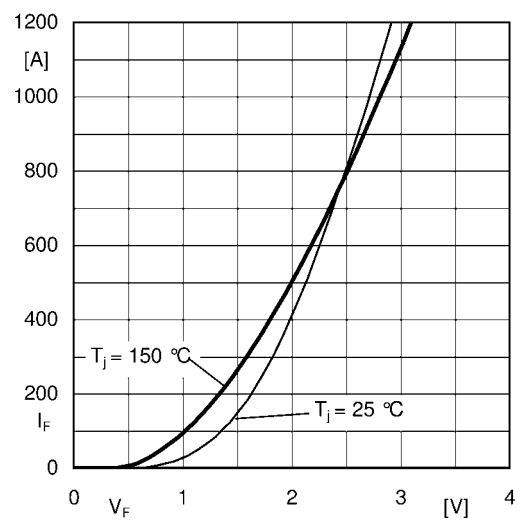
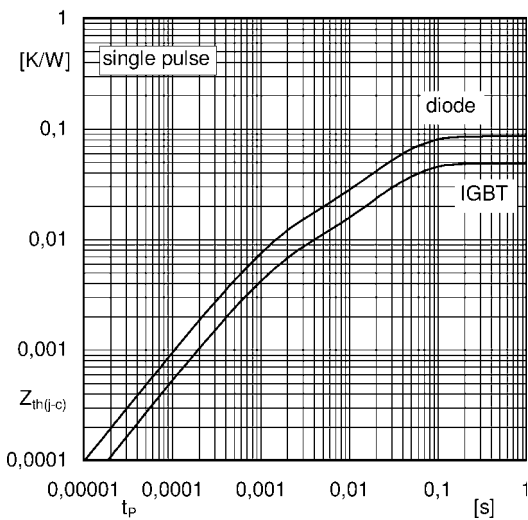
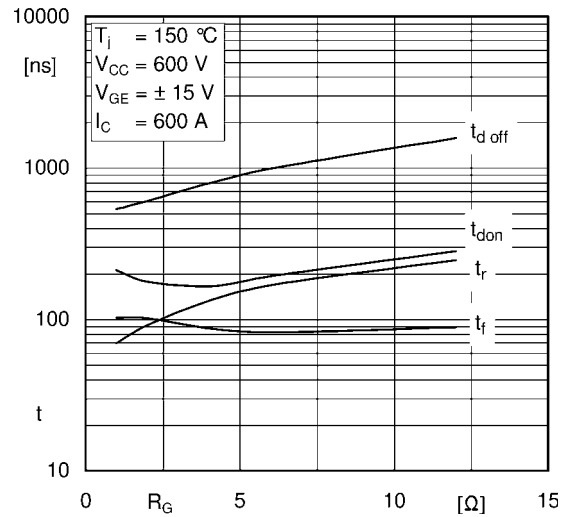
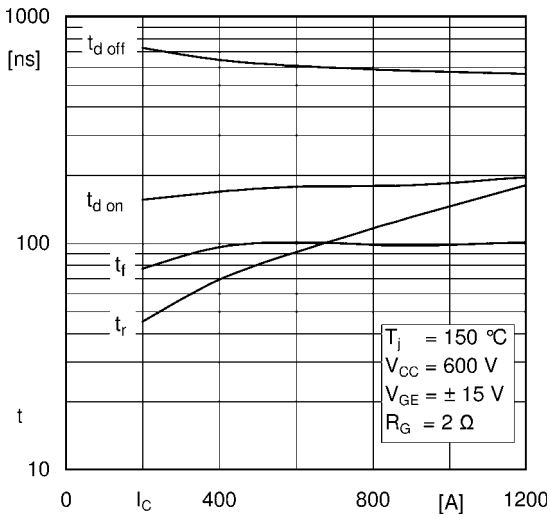
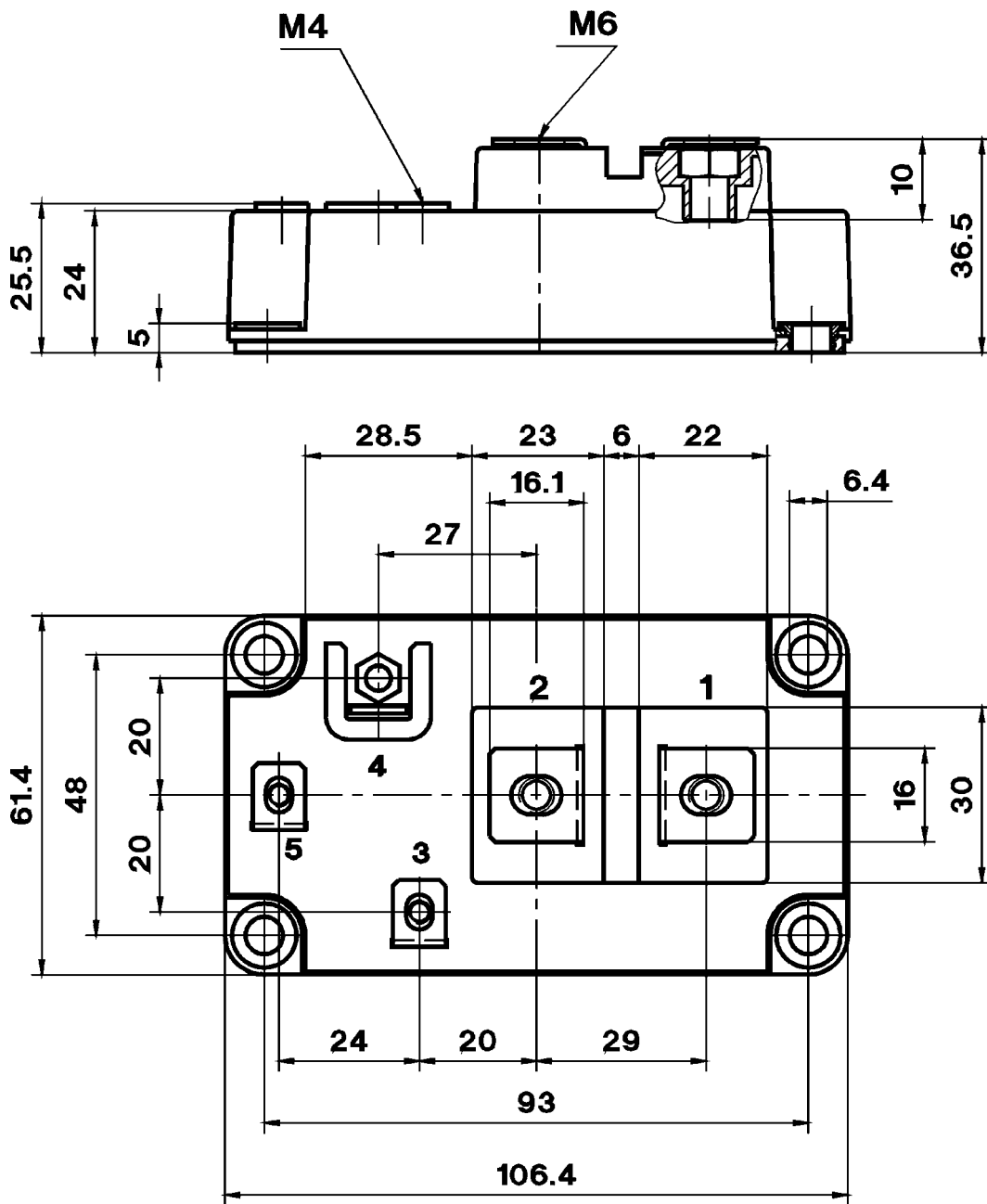
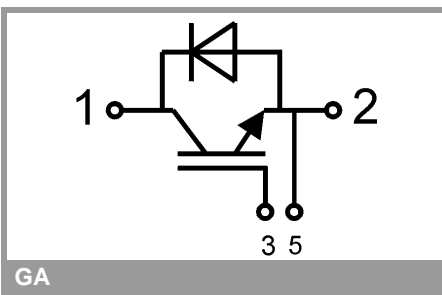


Fig. 6: Typ. gate charge characteristic





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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.