SKiM609GAL12E4

SKiM® 93

Trench IGBT Modules

SKiM609GAL12E4

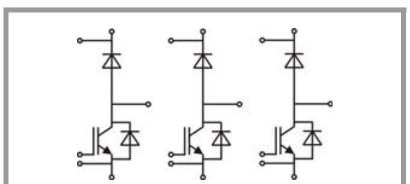
Target Data

Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Isolated by Al_2O_3 DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology forthermal contacts and electricalcontacts
- High short circuit capability, self limiting to 6 x I_C
- Integrated temperature sensor

Typical Applications

- Automotive inverter
- High reliability AC inverter wind
- High reliability AC inverter drives



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Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT				
V_{CES}			1200	V
I_C	T_j = 175 °C	T_s = 25 °C	748	A
		T_s = 70 °C	608	A
I_{Cnom}			600	A
I_{CRM}	$I_{CRM} = 3xI_{Cnom}$		1800	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_s = 25 °C	139	A
		T_s = 70 °C	110	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 3xI_{Fnom}$		450	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		900	A
T_j			-40 ... 175	°C
Freewheeling diode				
I_F	T_j = 175 °C	T_s = 25 °C	1397	A
		T_s = 70 °C	1107	A
I_{Fnom}			1350	A
I_{FRM}	$I_{FRM} = 3xI_{Fnom}$		4050	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		6480	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			700	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
IGBT						
$V_{CE(sat)}$	I_C = 600 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	V
V_{CE0}		T_j = 25 °C		0.8	0.9	V
		T_j = 150 °C		0.7	0.8	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		1.8	2.0	mΩ
		T_j = 150 °C		2.6	2.8	mΩ
$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C = 24 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1200 V	T_j = 25 °C		0.1	0.3	mA
						mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		35.2		nF
C_{oes}		f = 1 MHz		2.32		nF
C_{res}		f = 1 MHz		1.88		nF
Q_G	V_{GE} = - 8 V...+ 15 V			3400		nC
R_{Gint}	T_j = 25 °C			1.3		Ω

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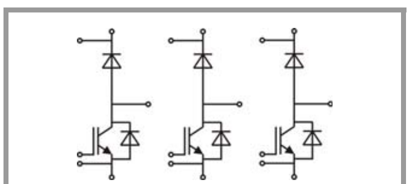

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$t_{d(on)}$	V_{CC} = 600 V	T_j = 150 °C		150		ns
t_r	I_C = 600 A	T_j = 150 °C		121		ns
E_{on}	V_{GE} = 15 V $R_{G\ on}$ = 4.1 Ω	T_j = 150 °C		136		mJ
$t_{d(off)}$	$R_{G\ off}$ = 4.1 Ω	T_j = 150 °C		808		ns
t_f	di/dt_{on} = 5000 A/µs	T_j = 150 °C		100		ns
E_{off}	di/dt_{off} = 4400 A/µs	T_j = 150 °C		83		mJ
$R_{th(j-s)}$	per IGBT				0.068	K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 150 A	T_j = 25 °C		2.1	2.5	V
	V_{GE} = 0 V chip	T_j = 150 °C		2.1	2.4	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		5.6	6.4	mΩ
		T_j = 150 °C		7.8	8.5	mΩ
I_{RRM}	I_F = 150 A	T_j = 150 °C		153		A
Q_{rr}	di/dt_{off} = 3300 A/µs V_{GE} = -15 V	T_j = 150 °C		15		µC
E_{rr}	V_{CC} = 600 V	T_j = 150 °C		9		mJ
$R_{th(j-s)}$	per diode				0.501	K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 600 A	T_j = 25 °C		1.7	1.9	V
	V_{GE} = 0 V chip	T_j = 150 °C		1.4	1.7	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		0.6	0.7	mΩ
		T_j = 150 °C		0.9	0.9	mΩ
I_{RRM}	I_F = 600 A	T_j = 150 °C		510		A
Q_{rr}	di/dt_{off} = 5300 A/µs V_{GE} = -15 V	T_j = 150 °C		123		µC
E_{rr}	V_{CC} = 600 V	T_j = 150 °C		39		mJ
$R_{th(j-s)}$					0.048	K/W
Module						
L_{CE}				10	15	nH
$R_{CC'+EE'}$	terminal-chip	T_s = 25 °C		0.3		mΩ
		T_s = 125 °C		0.5		mΩ
M_s	to heat sink (M4)		2.5		4	Nm
M_t		to terminals (M6)	3		5	Nm
						Nm
w					1100	g
Temperatur Sensor						
R_{100}	T_{Sensor} = 100 °C (R_{25} = 5 kΩ)			339		Ω
$B_{100/125}$	$R_{(T)} = R_{100} exp[B_{100/125}(1/T-1/373)]$; T[K];			4096		K

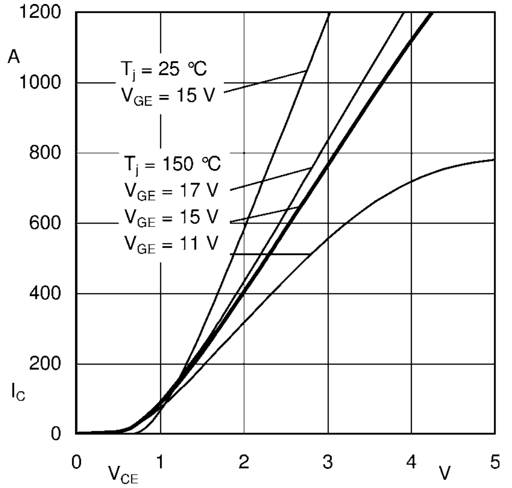


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

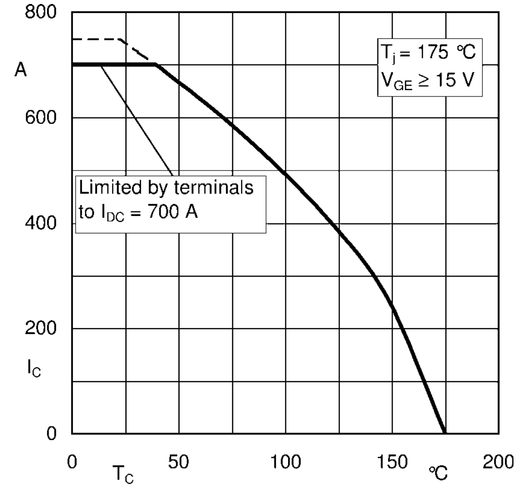


Fig. 2: Rated current vs. temperature I_C = f (T_C)

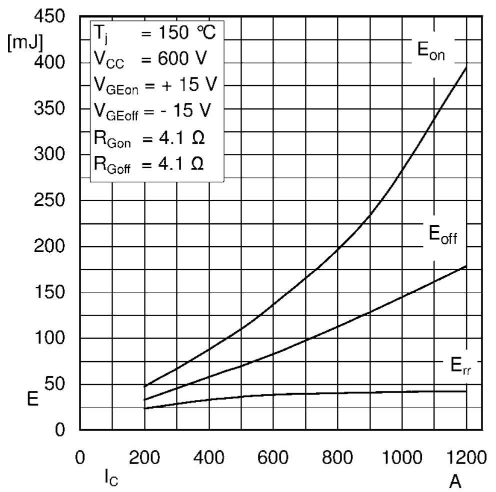


Fig. 3: Typ. turn-on /-off energy = f (I_C)

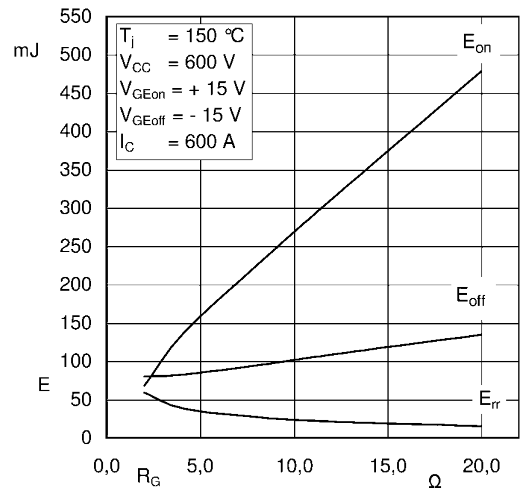


Fig. 4: Typ. turn-on /-off energy = f (R_G)

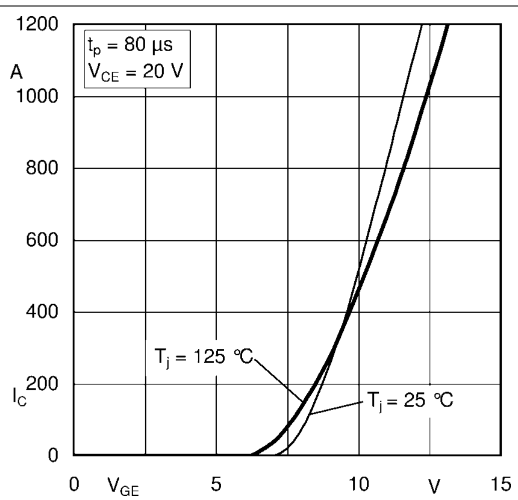


Fig. 5: Typ. transfer characteristic

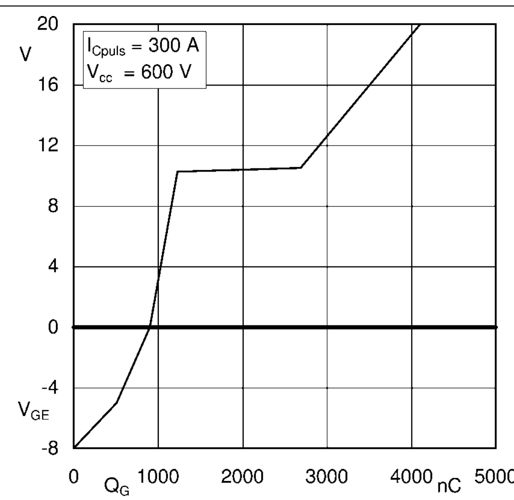


Fig. 6: Typ. gate charge characteristic

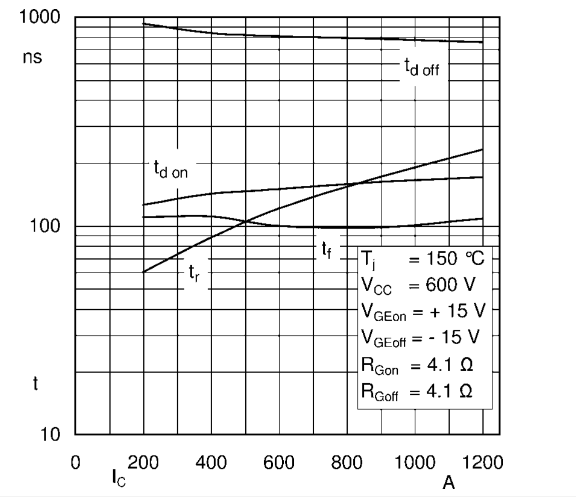


Fig. 7: Typ. switching times vs. I_C

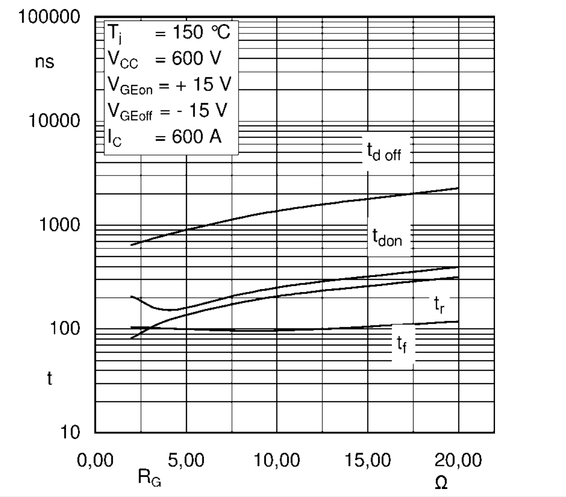


Fig. 8: Typ. switching times vs. gate resistor R_G

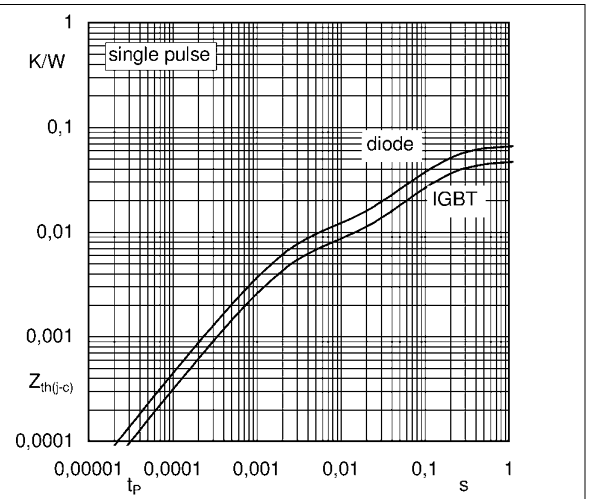


Fig. 9: Typ. transient thermal impedance

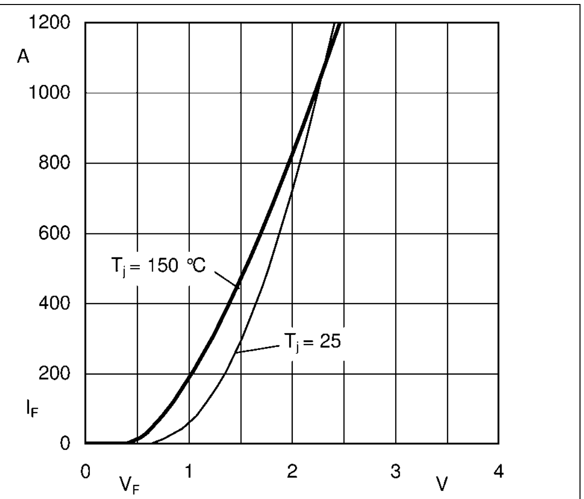


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

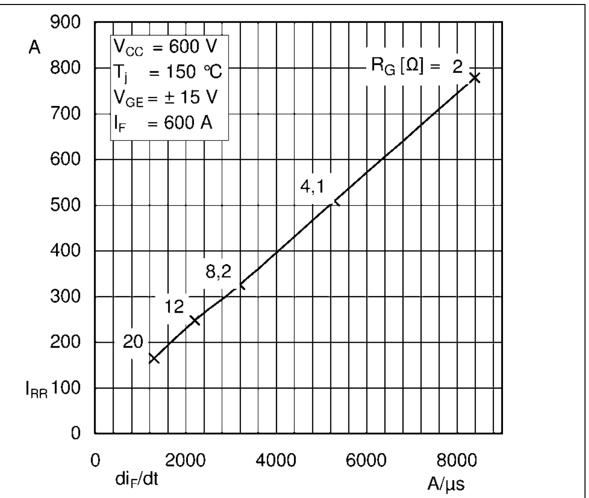


Fig. 11: Typ. CAL diode peak reverse recovery current

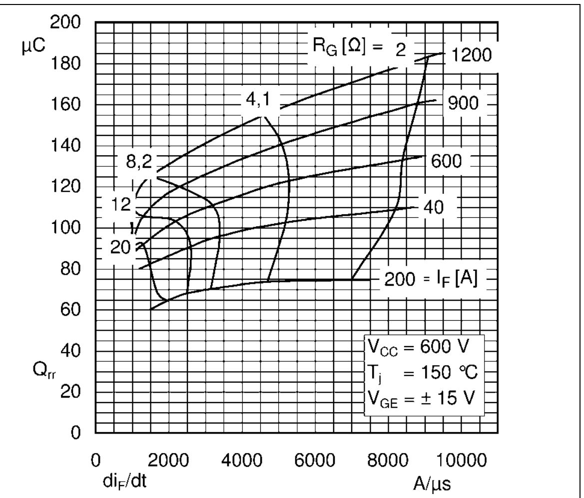
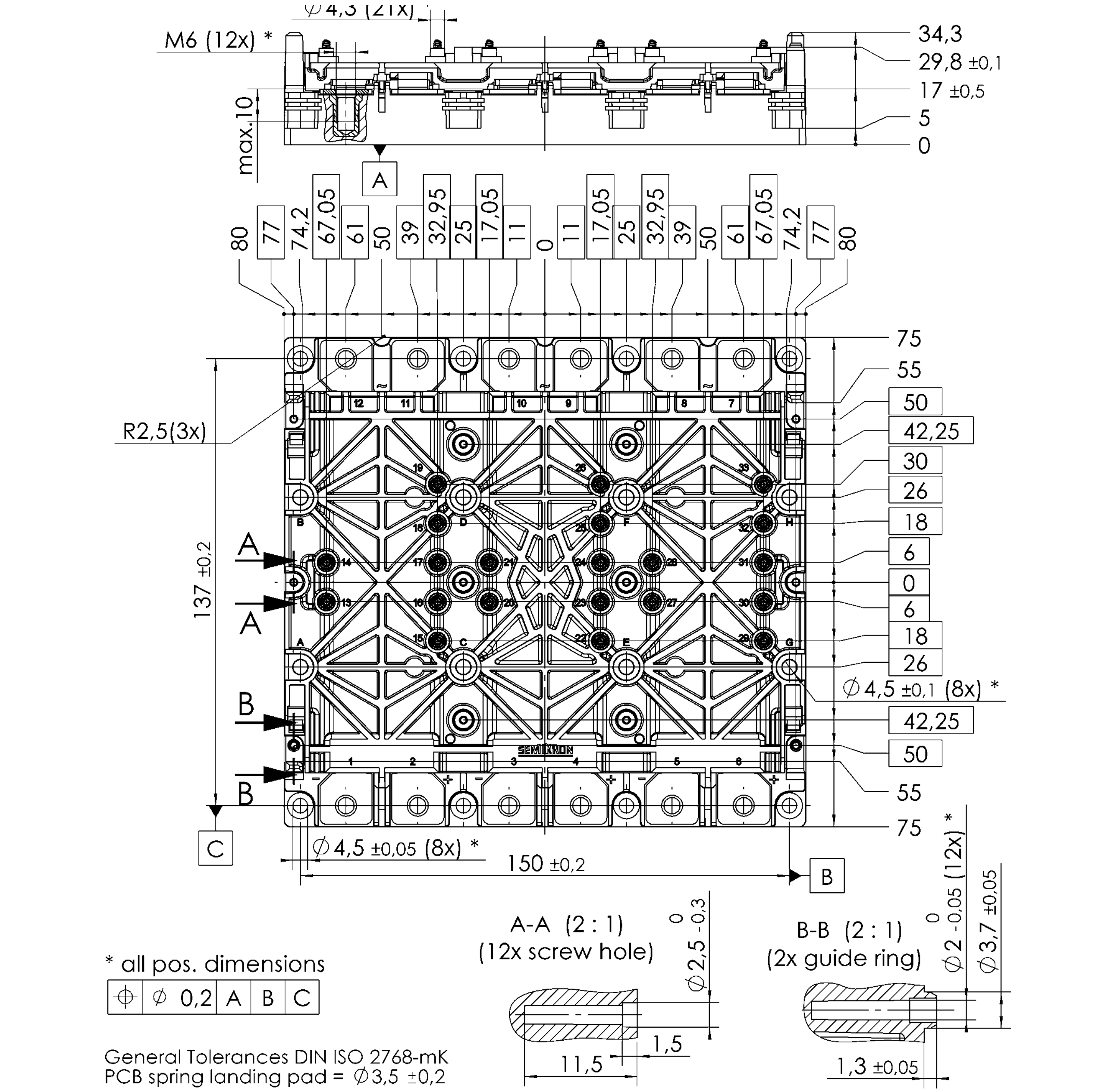


Fig. 12: Typ. CAL diode recovery charge



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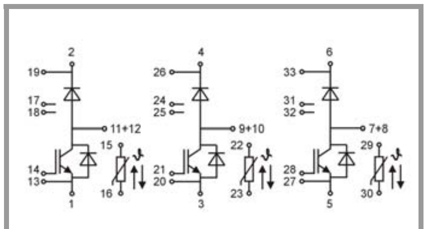

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

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