SKiM609GAL12E4 V2

SKiM® 93

Trench IGBT Modules

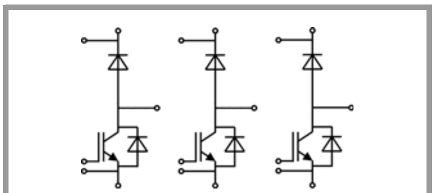
SKiM609GAL12E4 V2

Features*

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Insulated by Al_2O_3 DBC (Direct Bonded Copper) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB to the control terminals
- High short circuit capability, self limiting to 6 x I_C
- Integrated temperature sensor

Remarks*

- Case temperature limited to T_s = 125°C max; T_c = T_s (for baseplateless modules)
- Recommended T_{op} = -40 … +150°C



GAL

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	748	A
		T_s = 70 °C	608	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	845	A
		T_s = 70 °C	688	A
I_{Cnom}			600	A
I_{CRM}			1800	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V, V_{GE} ≤ 15 V, T_j = 150 °C, V_{CES} ≤ 1200 V		10	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	139	A
		T_s = 70 °C	110	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	172	A
		T_s = 70 °C	137	A
I_{FRM}			300	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		900	A
T_j			-40 ... 175	°C
Freewheeling diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	1328	A
		T_s = 70 °C	1052	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	1418	A
		T_s = 70 °C	1126	A
I_{FRM}			1200	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		6480	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C		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}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		1.75	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	5	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

SKiM® 93

Trench IGBT Modules

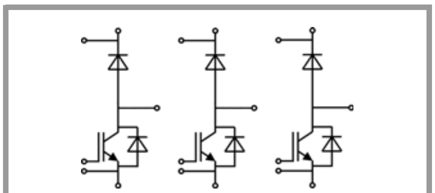
SKiM609GAL12E4 V2

Features*

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Insulated by Al_2O_3 DBC (Direct Bonded Copper) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB to the control terminals
- High short circuit capability, self limiting to 6 x I_C
- Integrated temperature sensor

Remarks*

- Case temperature limited to T_s = 125°C max; T_c = T_s (for baseplateless modules)
- Recommended T_{op} = -40 … +150°C



GAL

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
R_{Gint}	T_j = 25 °C			1.3		Ω
$t_{d(on)}$	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/-15 V	T_j = 150 °C		136		mJ
$t_{d(off)}$	$R_{G\,on}$ = 4.1 Ω	T_j = 150 °C		808		ns
t_f	$R_{G\,off}$ = 4.1 Ω	T_j = 150 °C		100		ns
E_{off}	di/dt_{on} = 5000 A/µs di/dt_{off} = 4400 A/µs	T_j = 150 °C		83		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.068		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.055		K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 150 A	T_j = 25 °C		2.14	2.46	V
	chiplevel	T_j = 150 °C		2.07	2.38	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	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	T_j = 150 °C		15		µC
E_{rr}	V_R = 600 V V_{GE} = +15/-15 V	T_j = 150 °C		9		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.501		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.361		K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 600 A	T_j = 25 °C		1.67	1.93	V
	chiplevel	T_j = 150 °C		1.42	1.67	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		0.62	0.71	mΩ
		T_j = 150 °C		0.87	0.95	mΩ
I_{RRM}	I_F = 600 A	T_j = 150 °C		510		A
Q_{rr}	di/dt_{off} = 5300 A/µs	T_j = 150 °C		123		µC
E_{rr} 1)	V_R = 600 V V_{GE} = +/-15 V	T_j = 150 °C		39		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.051		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.046		K/W

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	T_r=100°C (R_{25}=1000Ω)		1670 ± 1%		Ω
$R_{(T)}$	$R(T)=1k\Omega[1+A(T-25°C)+B(T-25°C)^2]$, $A = 7.64 \cdot 10^{-3}°C^{-1}$, $B = 1.73 \cdot 10^{-5}°C^{-2}$				

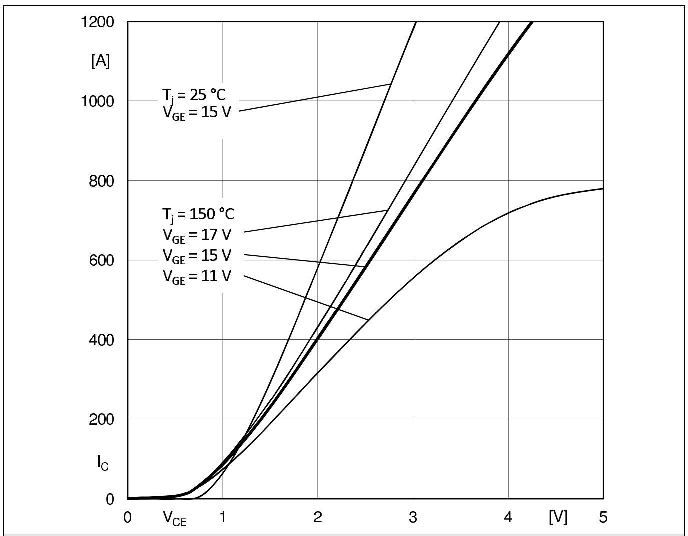


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

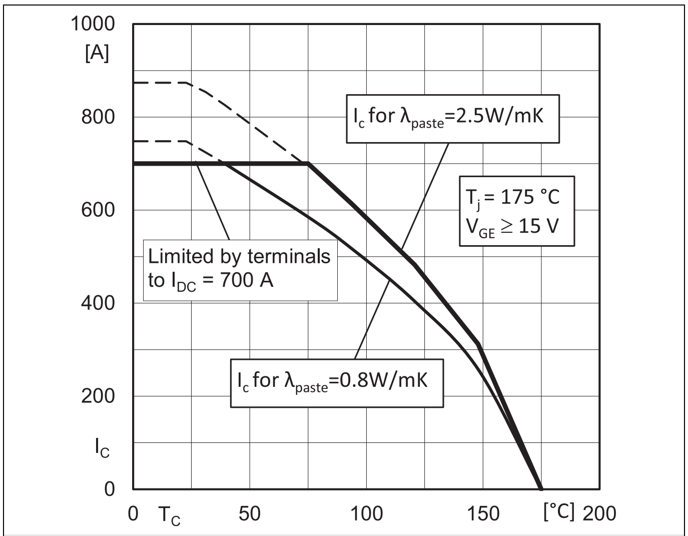


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

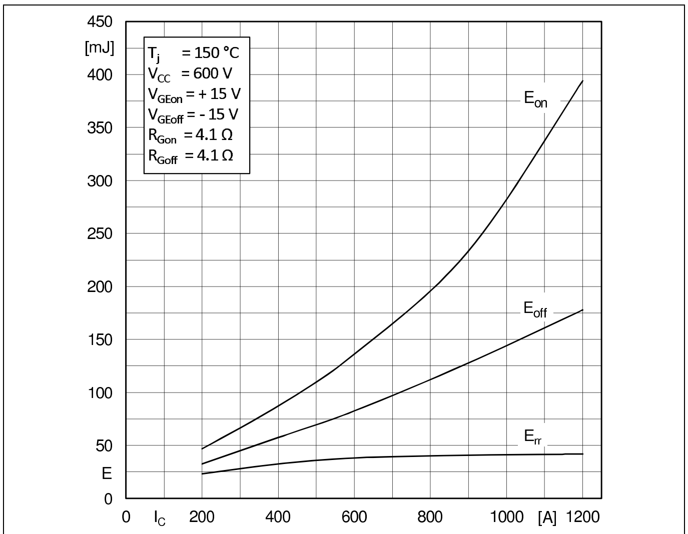


Fig. 3: Typ. turn-on /-off energy = f (I_C)

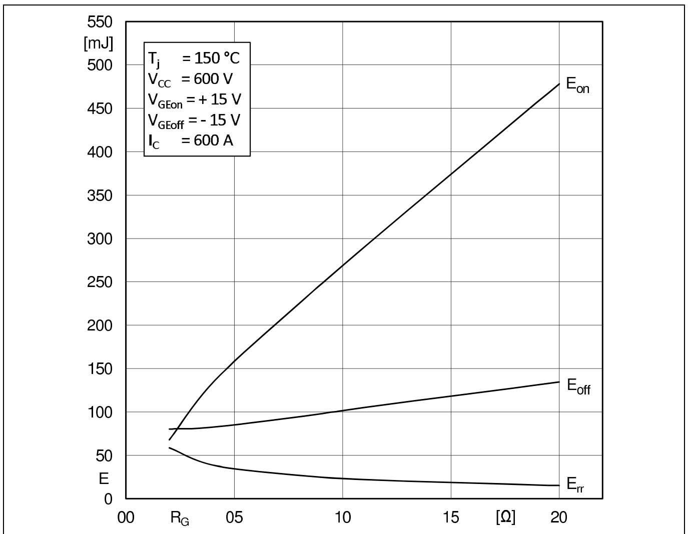


Fig. 4: Typ. turn-on /-off energy = f (R_G)

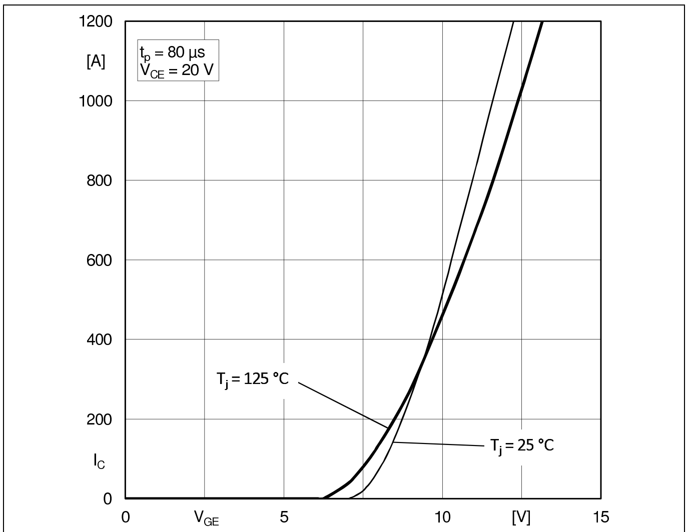


Fig. 5: Typ. transfer characteristic

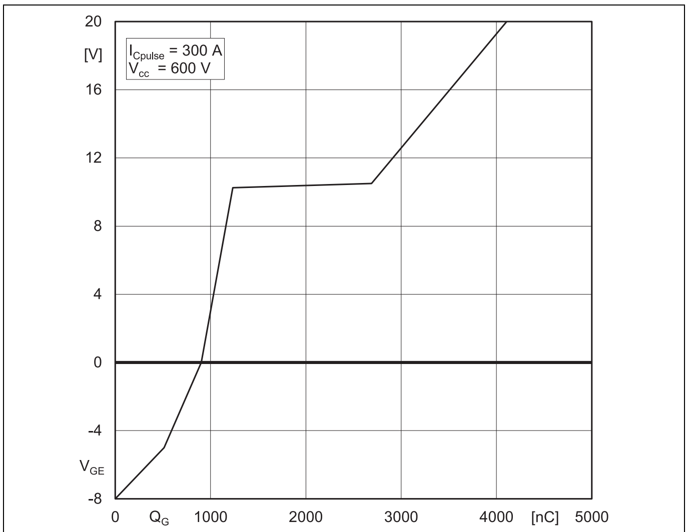


Fig. 6: Typ. gate charge characteristic

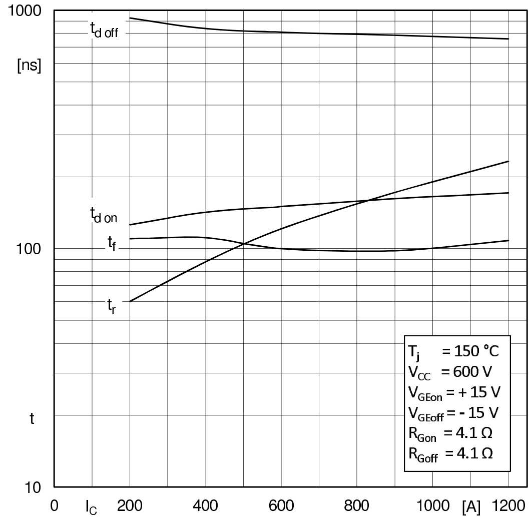


Fig. 7: Typ. switching times vs. I_C

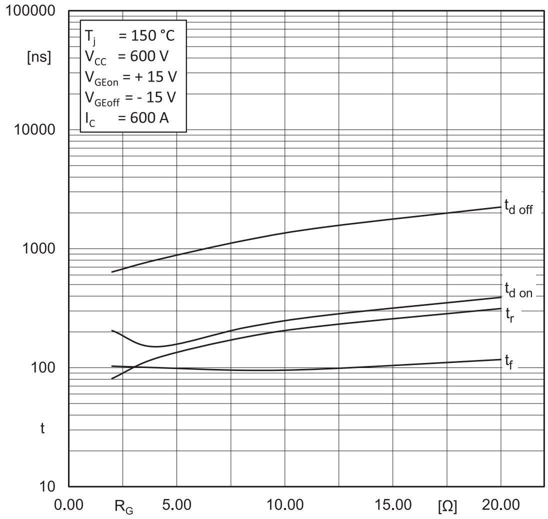


Fig. 8: Typ. switching times vs. gate resistor R_G

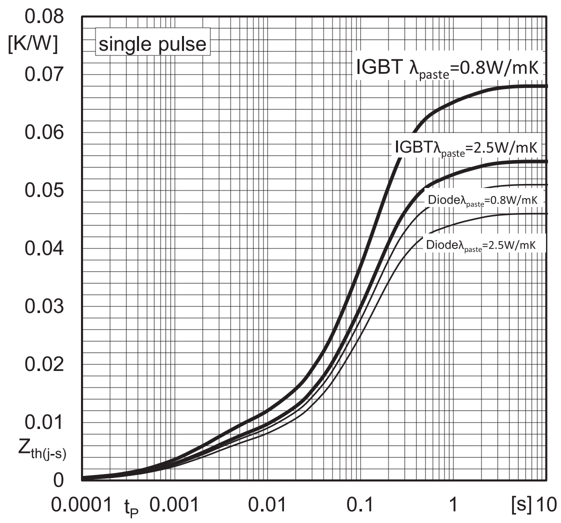


Fig. 9: Typ. transient thermal impedance

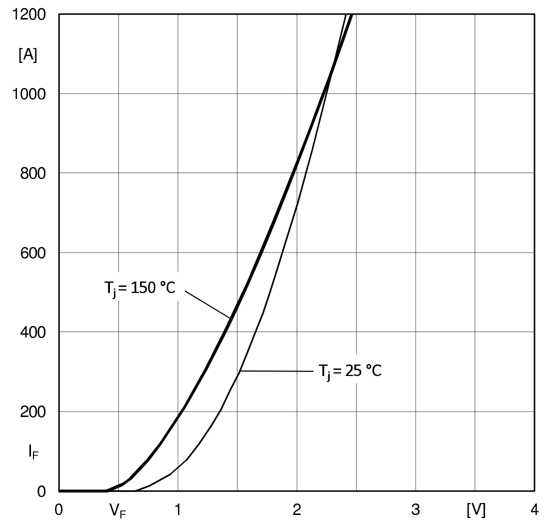


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

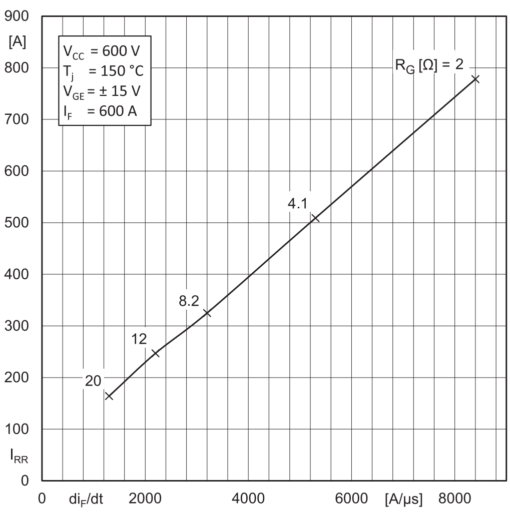


Fig. 11: Typ. CAL diode peak reverse recovery current

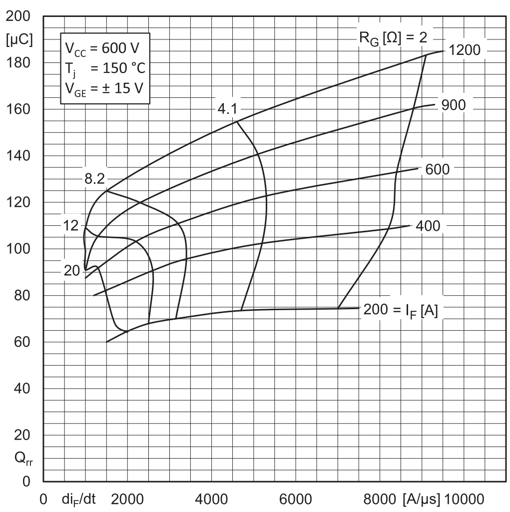
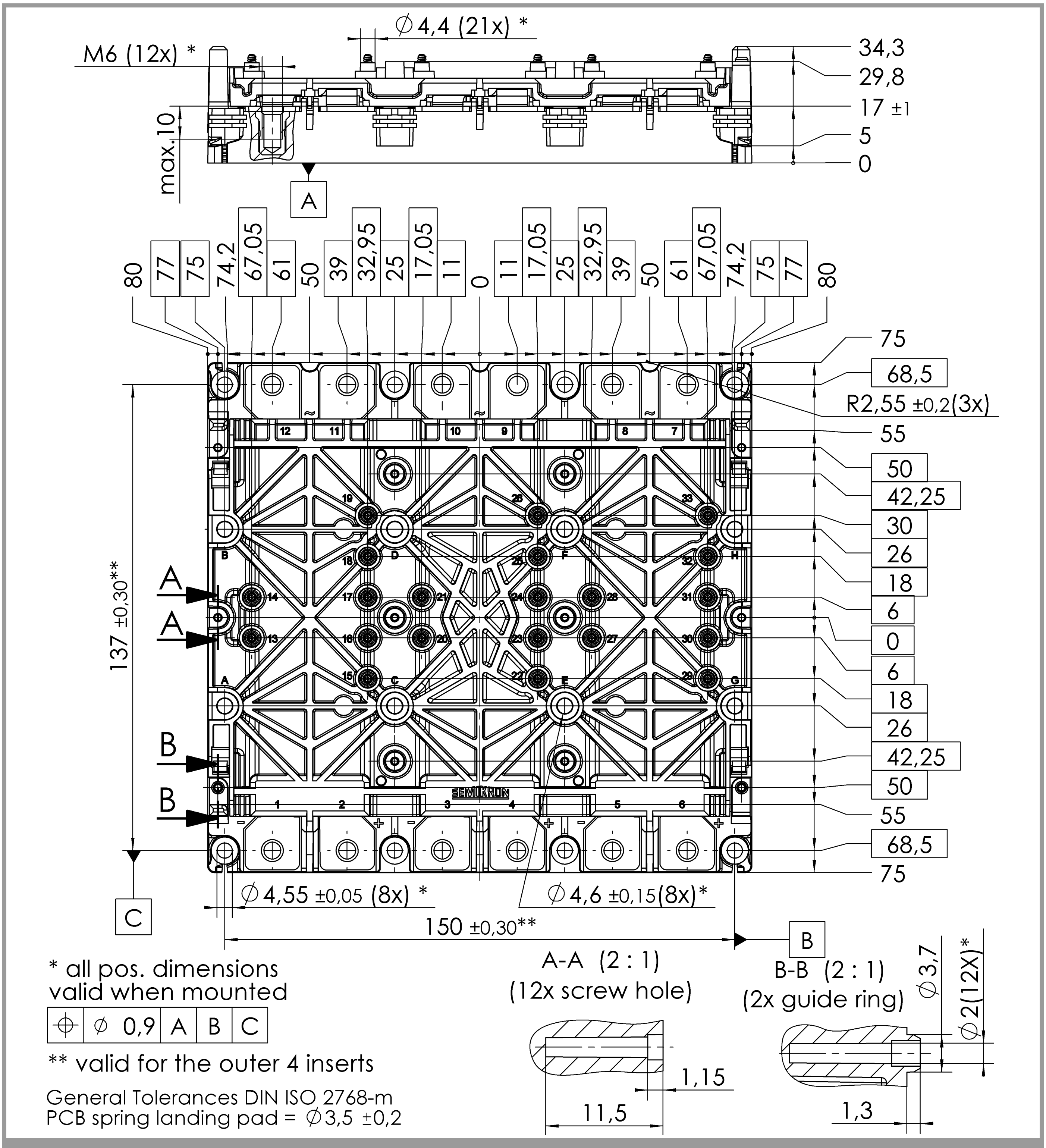
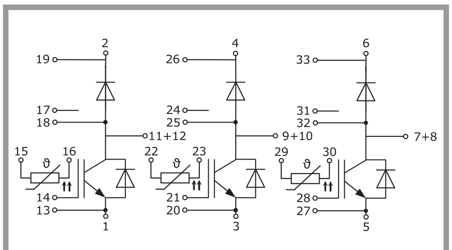


Fig. 12: Typ. CAL diode recovery charge



∅4,4 (21x) *
M6 (12x) *
max.10
34,3
29,8
17 ±1
5
0
A
80
77
75
74,2
67,05
61
50
39
32,95
25
17,05
11
0
75
68,5
R2,55 ±0,2(3x)
55
50
42,25
30
26
18
6
137 ±0,30**
B
C
∅4,55 ±0,05 (8x) *
∅4,6 ±0,15(8x)*
150 ±0,30**
SEMIKRON
A-A (2 : 1)
(12x screw hole)
B-B (2 : 1)
(2x guide ring)
∅3,7
∅2(12X)*
1,15
11,5
1,3
* all pos. dimensions
valid when mounted
⌖ ∅ 0,9 A B C
** valid for the outer 4 inserts
General Tolerances DIN ISO 2768-m
PCB spring landing pad = ∅3,5 ±0,2



11+12
9+10
7+8

GAL

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

***IMPORTANT INFORMATION AND WARNINGS**

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.

 © by SEMIKRON