



SKiM® 93

## Trench IGBT Modules

### SKiM459GD12E4

#### Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$  with positive temperature coefficient
- Low inductance case
- Insulated by  $Al_2O_3$  DCB (Direct Copper Bonded) 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  $6 \times I_C$
- Integrated temperature sensor

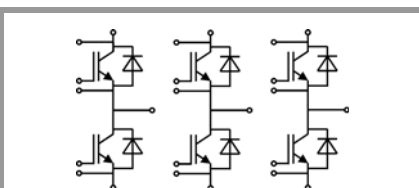
#### Typical Applications\*

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

#### Remarks

- Case temperature limited to  $T_s = 125^\circ\text{C}$  max;  $T_c = T_s$  (for baseplateless modules)
- Recommended  $T_{op} = -40 \dots +150^\circ\text{C}$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 450 A	T <sub>j</sub> = 25 °C		2.14	2.46	V
	chiplevel	T <sub>j</sub> = 150 °C		2.07	2.38	V
V <sub>F0</sub>	chiplevel	T <sub>j</sub> = 25 °C		1.30	1.50	V
		T <sub>j</sub> = 150 °C		0.90	1.10	V
r <sub>F</sub>	chiplevel	T <sub>j</sub> = 25 °C		1.87	2.1	mΩ
		T <sub>j</sub> = 150 °C		2.6	2.8	mΩ
I <sub>RRM</sub>	I <sub>F</sub> = 450 A	T <sub>j</sub> = 150 °C		570		A
Q <sub>rr</sub>	di/dt <sub>off</sub> = 8880 A/μs	T <sub>j</sub> = 150 °C		80		μC
E <sub>rr</sub>	V <sub>GE</sub> = +15/-15 V	T <sub>j</sub> = 150 °C		40		mJ
	V <sub>CC</sub> = 600 V					
R <sub>th(j-s)</sub>	per Diode, λ <sub>paste</sub> =0.8 W/(mK)			0.155		K/W
R <sub>th(j-s)</sub>	per Diode, λ <sub>paste</sub> =2.5 W/(mK)			0.115		K/W
Module						
L <sub>CE</sub>				10	15	nH
R <sub>CC'+EE'</sub>	measured per switch	T <sub>s</sub> = 25 °C		0.3		mΩ
		T <sub>s</sub> = 125 °C		0.5		mΩ
w				1042		g
Temperature Sensor						
R <sub>100</sub>	T <sub>Sensor</sub> = 100 °C (R <sub>25</sub> = 5 kΩ)			339		Ω
B <sub>100/125</sub>	R <sub>(T)</sub> = R <sub>100</sub> exp[B <sub>100/125</sub> (1/T-1/373)]; T[K];			4096		K



GD

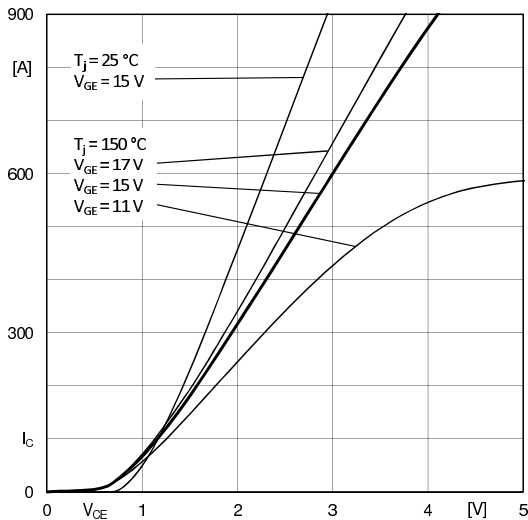


Fig. 1: Typ. output characteristic, inclusive  $R_{CC} + EE'$

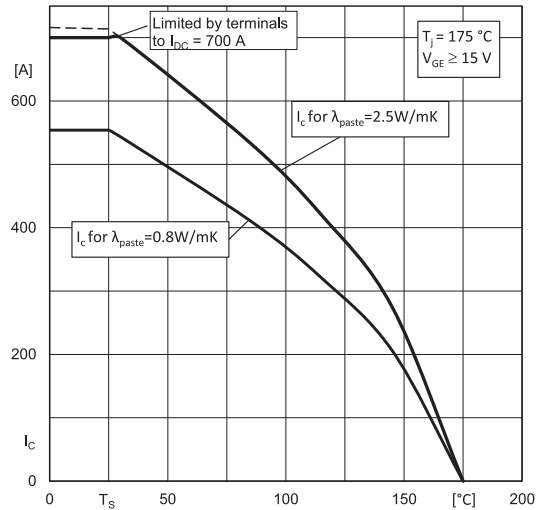


Fig. 2: Typ. rated current vs. temperature  $I_C = f(T_S)$

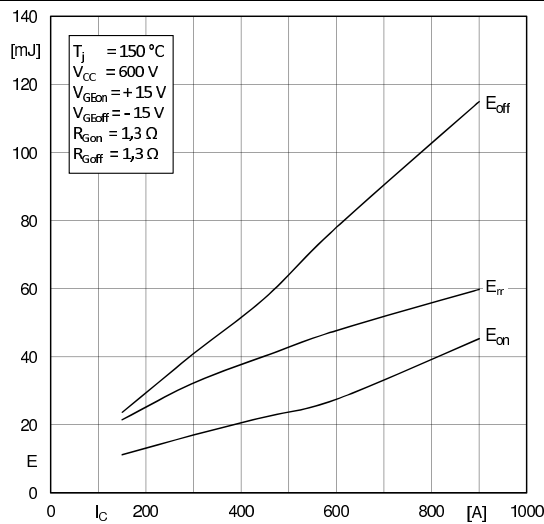


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

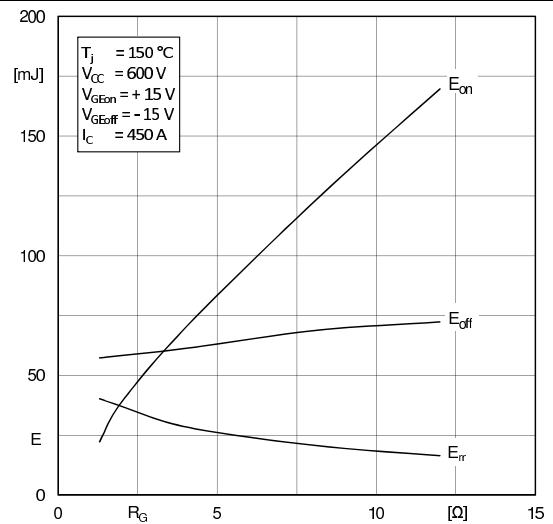


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

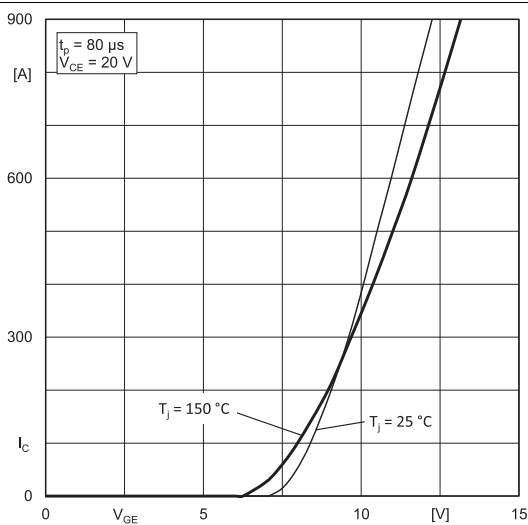


Fig. 5: Typ. transfer characteristic

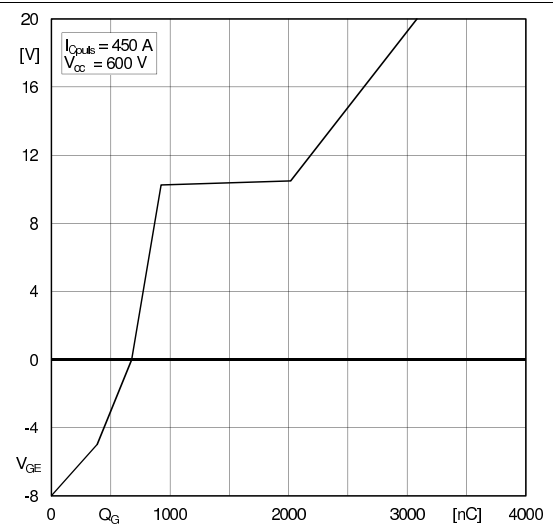
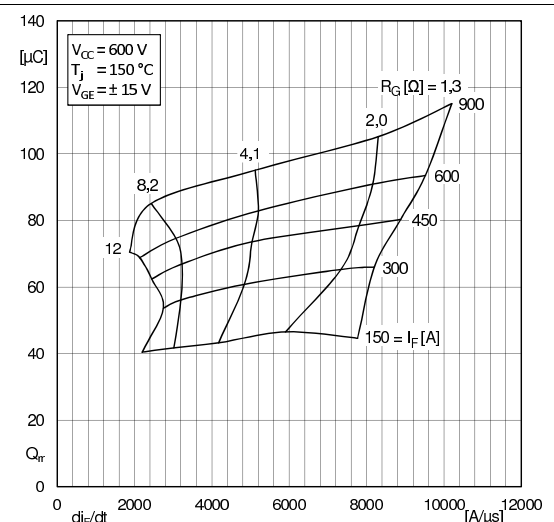
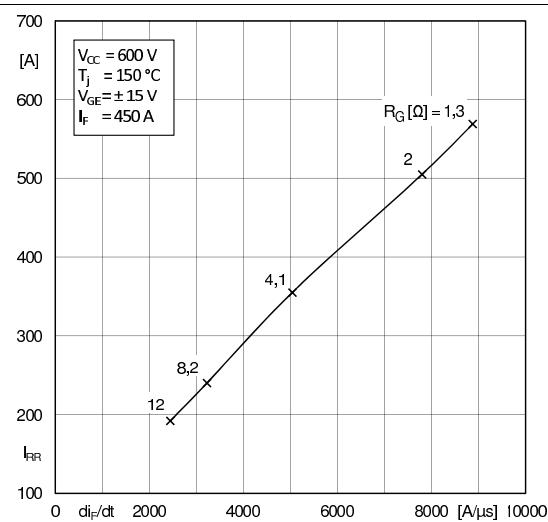
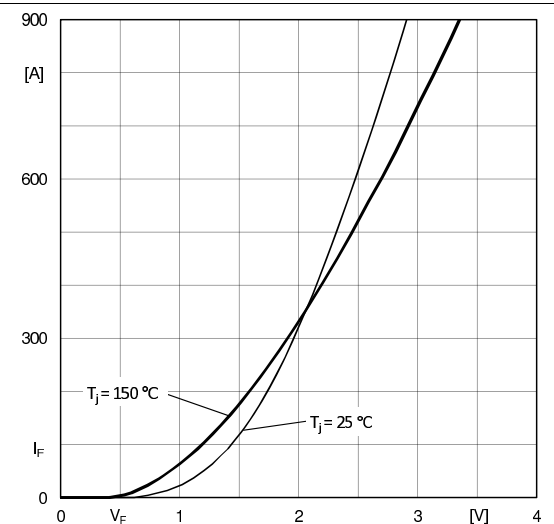
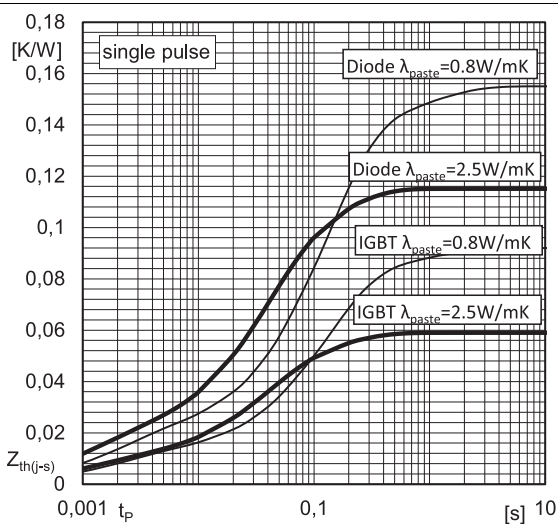
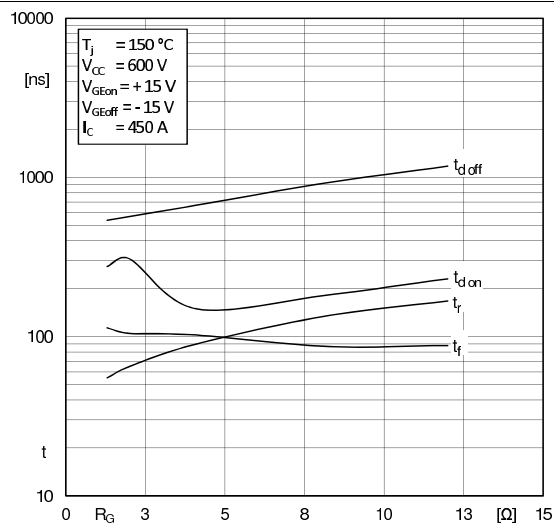
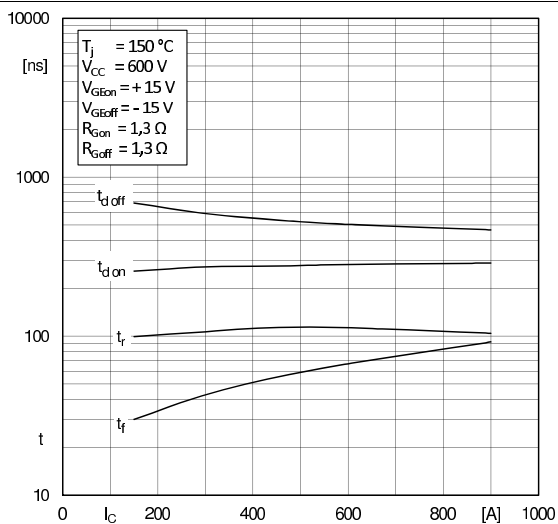
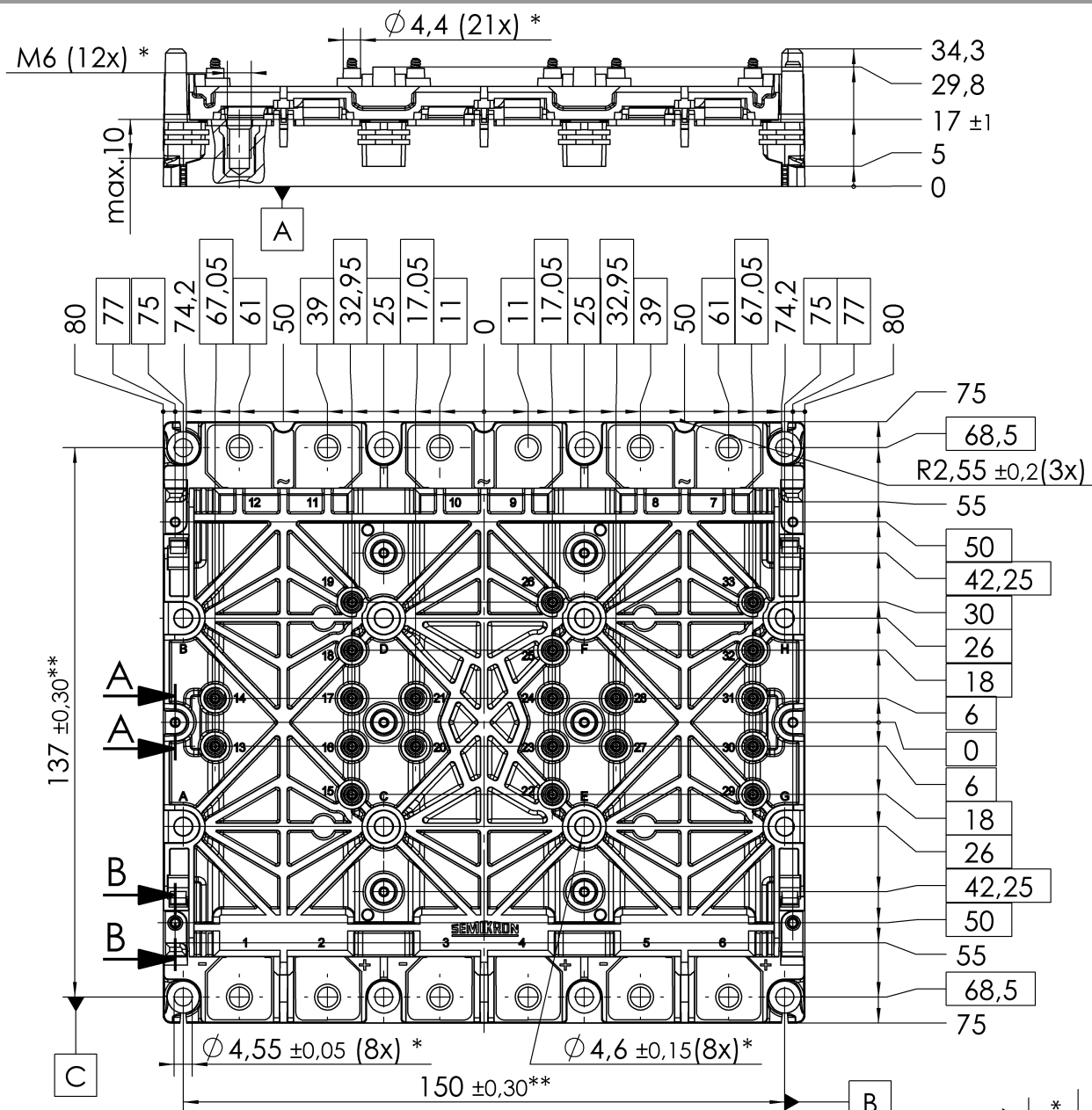


Fig. 6: Typ. gate charge characteristic





\* all pos. dimensions valid when mounted

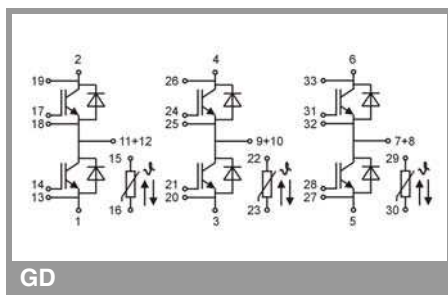
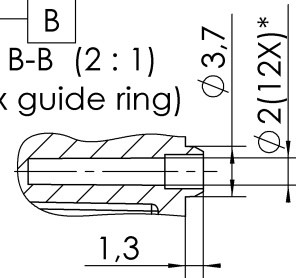
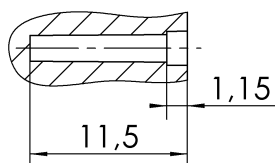
⊕ Ø 0,9 A B C

\*\* valid for the outer 4 inserts

General Tolerances DIN ISO 2768-m  
PCB spring landing pad = Ø 3,5 ± 0,2

A-A (2 : 1)  
(12x screw hole)

B-B (2 : 1)  
(2x guide ring)



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

## **\*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.