

# SKiM429GD17E4HD



SKiM® 93

## Trench IGBT Modules

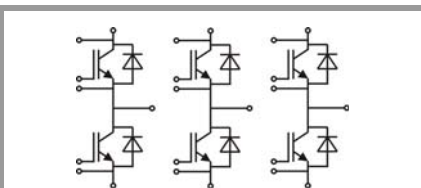
### SKiM429GD17E4HD

#### Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- Low inductance case
- Isolated by AL<sub>2</sub>O<sub>3</sub> DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts and electrical contacts
- High short circuit capability, self limiting to 6 x I<sub>C</sub>
- Integrated temperature sensor

#### Typical Applications\*

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



GD

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
<b>IGBT</b>				
V <sub>CES</sub>		1700	V	
I <sub>C</sub>	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 25 °C T <sub>s</sub> = 70 °C	595 479	A A
I <sub>Cnom</sub>		420	A	
I <sub>CRM</sub>	I <sub>CRM</sub> = 3xI <sub>Cnom</sub>	1260	A	
V <sub>GES</sub>		-20 ... 20	V	
t <sub>psc</sub>	V <sub>CC</sub> = 1200 V V <sub>GE</sub> ≤ 15 V V <sub>CES</sub> ≤ 1700 V	T <sub>j</sub> = 150 °C	10	µs
T <sub>j</sub>		-40 ... 175	°C	
<b>Inverse diode</b>				
I <sub>F</sub>	T <sub>j</sub> = 150 °C	T <sub>s</sub> = 25 °C T <sub>s</sub> = 70 °C	413 298	A A
I <sub>Fnom</sub>		420	A	
I <sub>FRM</sub>	I <sub>FRM</sub> = 2xI <sub>Fnom</sub>	840	A	
I <sub>FSM</sub>	t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 25 °C	3699	A	
T <sub>j</sub>		-40 ... 150	°C	
<b>Module</b>				
I <sub>t(RMS)</sub>	T <sub>terminal</sub> = 80 °C	700	A	
T <sub>stg</sub>		-40 ... 125	°C	
V <sub>isol</sub>	AC sinus 50 Hz, t = 1 min	3300	V	

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
<b>IGBT</b>					
V <sub>CE(sat)</sub>	I <sub>C</sub> = 420 A V <sub>GE</sub> = 15 V chipelevel	T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	1.90 2.1	2.25 2.3	V V
V <sub>CE0</sub>		T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	1.1 1	1.2 1.1	V V
r <sub>CE</sub>	V <sub>GE</sub> = 15 V	T <sub>j</sub> = 25 °C T <sub>j</sub> = 125 °C	1.9 2.6	2.5 2.9	mΩ mΩ
V <sub>GE(th)</sub>	V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> = 16.8 mA	5.2	5.8	6.4	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 V V <sub>CE</sub> = 1700 V	T <sub>j</sub> = 25 °C	0.15	0.45	mA mA
C <sub>ies</sub>	V <sub>CE</sub> = 25 V	f = 1 MHz	33.00		nF
C <sub>oes</sub>	V <sub>GE</sub> = 0 V	f = 1 MHz	1.38		nF
C <sub>res</sub>		f = 1 MHz	1.08		nF
Q <sub>G</sub>	V <sub>GE</sub> = - 8 V...+ 15 V		6660		nC
R <sub>Gint</sub>	T <sub>j</sub> = 25 °C		2.7		Ω
t <sub>d(on)</sub>	V <sub>CC</sub> = 1200 V	T <sub>j</sub> = 125 °C	390		ns
t <sub>r</sub>	I <sub>C</sub> = 420 A	T <sub>j</sub> = 125 °C	80		ns
E <sub>on</sub>	R <sub>G on</sub> = 3.6 Ω	T <sub>j</sub> = 125 °C	245		mJ
t <sub>d(off)</sub>	R <sub>G off</sub> = 3.6 Ω	T <sub>j</sub> = 125 °C	1005		ns
t <sub>f</sub>	di/dt <sub>on</sub> = 5200 A/µs di/dt <sub>off</sub> = 2200 A/µs	T <sub>j</sub> = 125 °C	170		ns
E <sub>off</sub>		T <sub>j</sub> = 125 °C	180		mJ
R <sub>th(j-s)</sub>	per IGBT		0.079		K/W

# SKiM429GD17E4HD



SKiM® 93

## Trench IGBT Modules

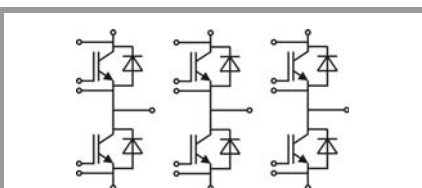
### SKiM429GD17E4HD

#### Features

- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- Low inductance case
- Isolated by AL<sub>2</sub>O<sub>3</sub> DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts and electrical contacts
- High short circuit capability, self limiting to 6 x I<sub>C</sub>
- Integrated temperature sensor

#### Typical Applications\*

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



GD

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse diode</b>						
$V_F = V_{EC}$	$I_F = 420\text{ A}$ $V_{GE} = 0\text{ V}$ chip	$T_j = 25\text{ °C}$		1.7	1.9	V
		$T_j = 125\text{ °C}$		1.6	1.8	V
$V_{F0}$		$T_j = 25\text{ °C}$	0.9	1.1	1.3	V
		$T_j = 125\text{ °C}$	0.7	0.9	1.1	V
$r_F$		$T_j = 25\text{ °C}$	1.3	1.3	1.3	mΩ
		$T_j = 125\text{ °C}$	1.8	1.8	1.8	mΩ
$I_{RRM}$	$I_F = 420\text{ A}$	$T_j = 125\text{ °C}$		500		A
$Q_{rr}$	$di/dt_{off} = 5990\text{ A}/\mu\text{s}$	$T_j = 125\text{ °C}$		140		μC
$E_{rr}$	$V_{GE} = -15\text{ V}$ $V_{CC} = 1200\text{ V}$	$T_j = 125\text{ °C}$		99		mJ
$R_{th(j-s)}$	per diode				0.169	K/W
<b>Module</b>						
$L_{CE}$				10	15	nH
$R_{CC'+EE'}$	terminal-chip	$T_s = 25\text{ °C}$		0.3		mΩ
		$T_s = 125\text{ °C}$		0.5		mΩ
$w$				1042		g
<b>Temperature sensor</b>						
$R_{100}$	$T_{Sensor} = 100\text{ °C}$ ( $R_{25} = 5\text{ k}\Omega$ )			339		Ω
$B_{100/125}$	$R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/373)]$ ; $T[\text{K}]$ ;			4096		K

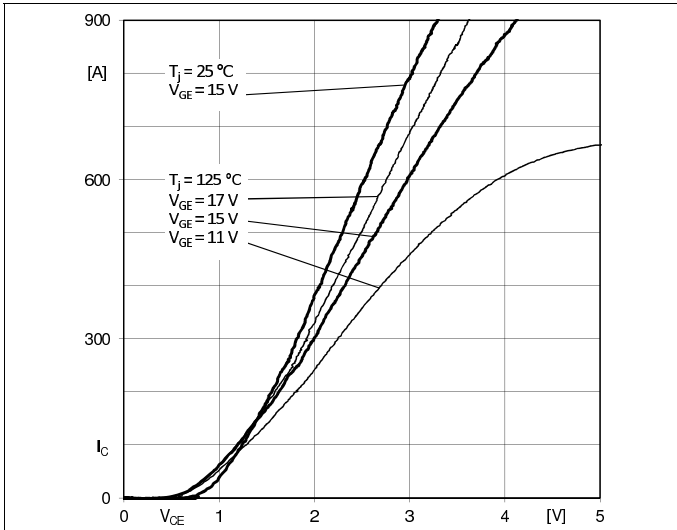


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'+EE'}$

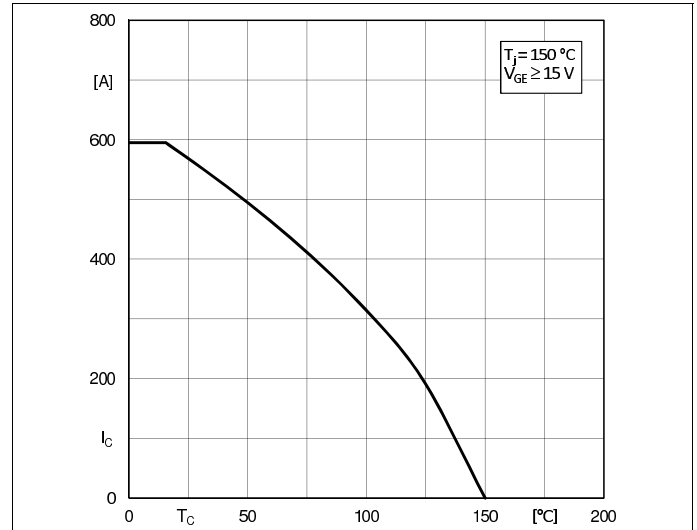


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

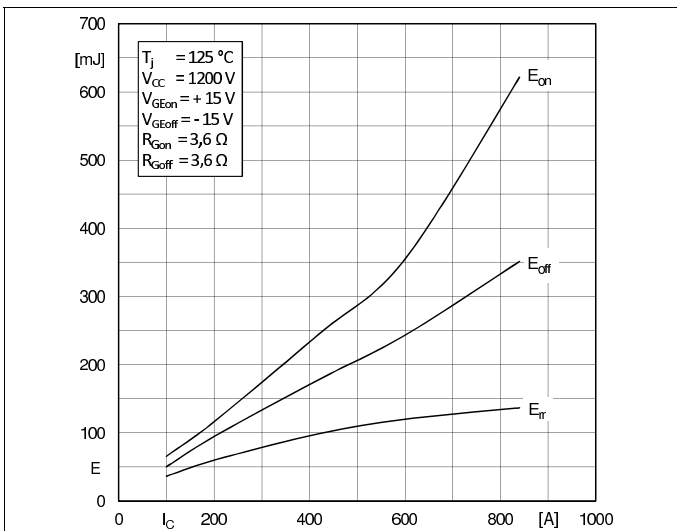


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

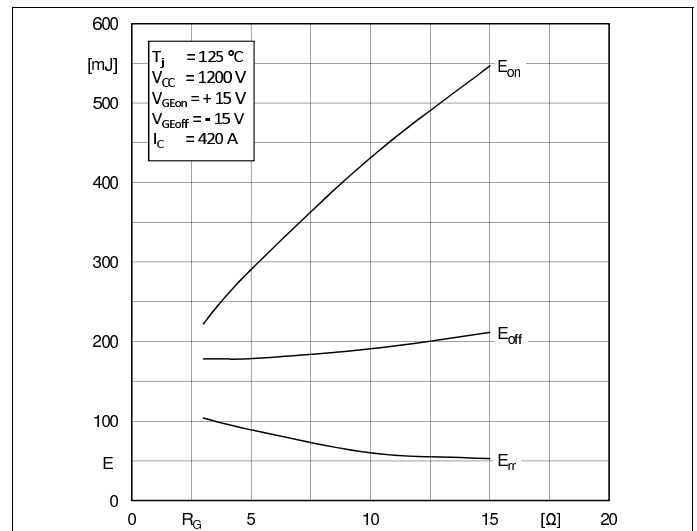


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

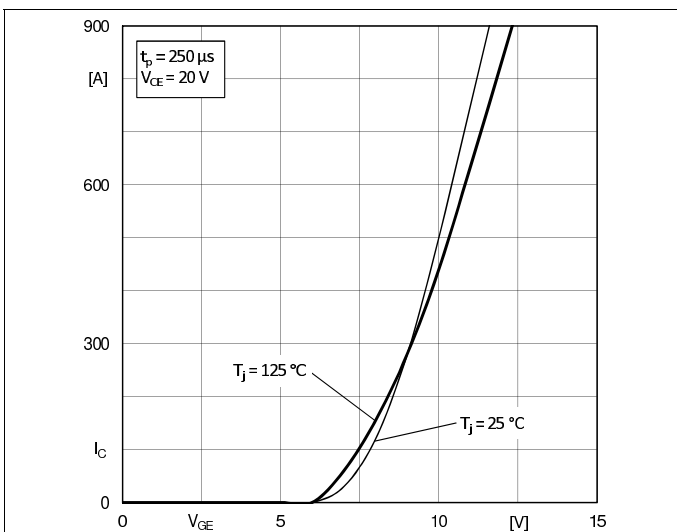


Fig. 5: Typ. transfer characteristic

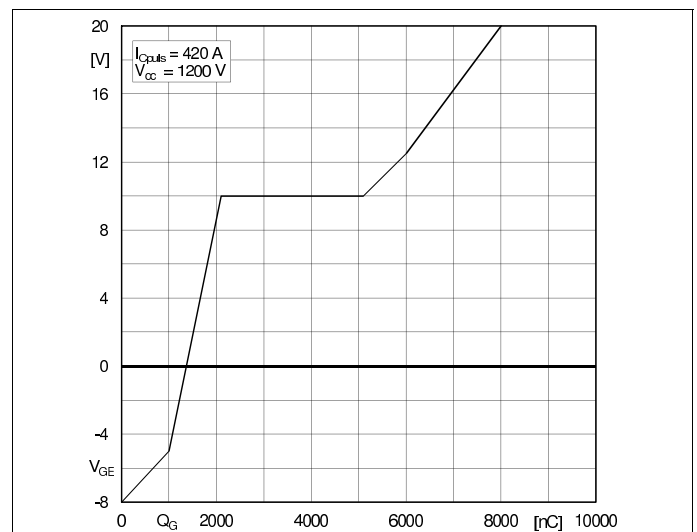


Fig. 6: Typ. gate charge characteristic

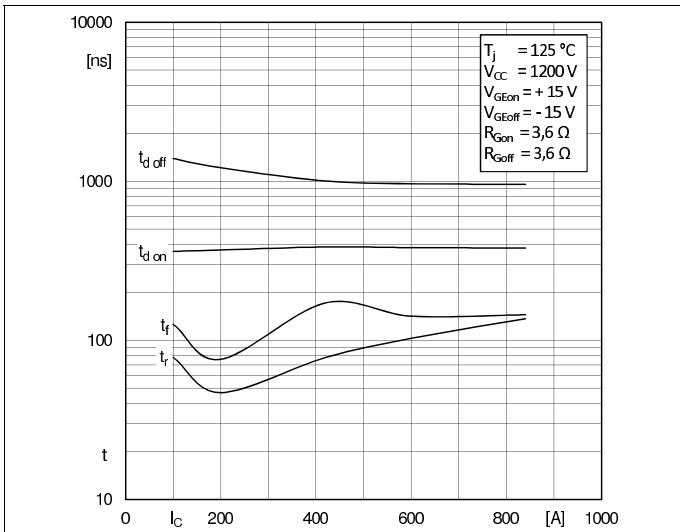


Fig. 7: Typ. switching times vs.  $I_C$

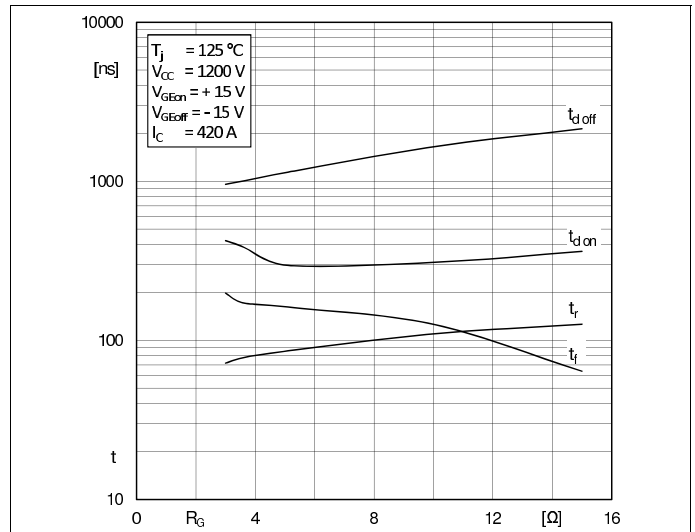


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

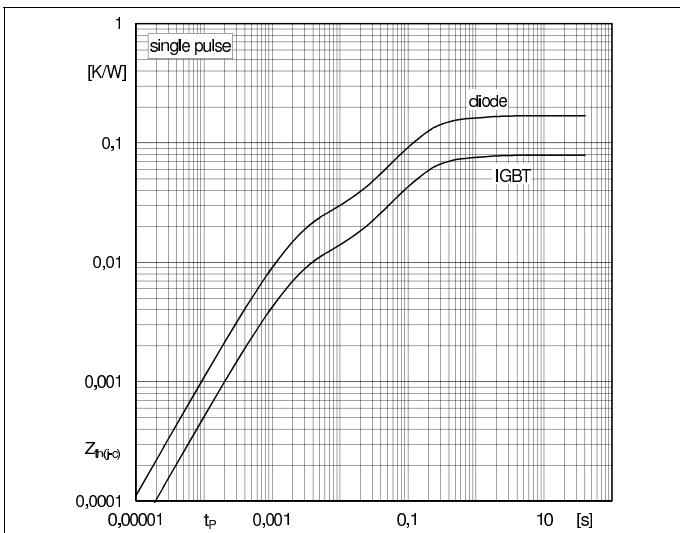


Fig. 9: Typ. transient thermal impedance

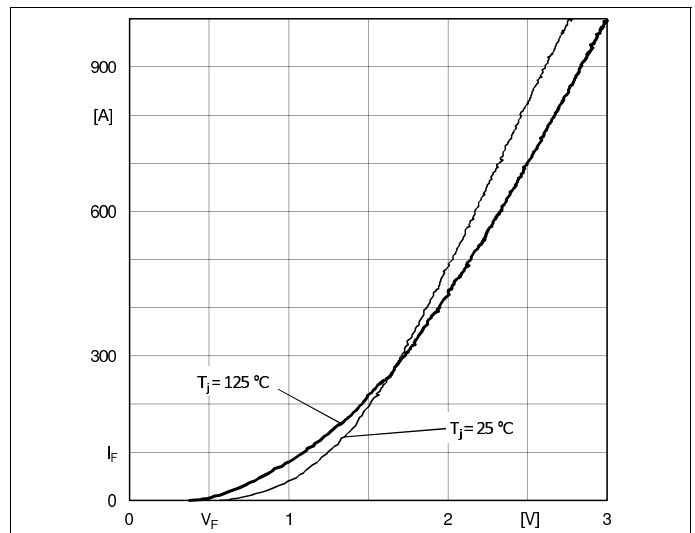


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC+EE}$

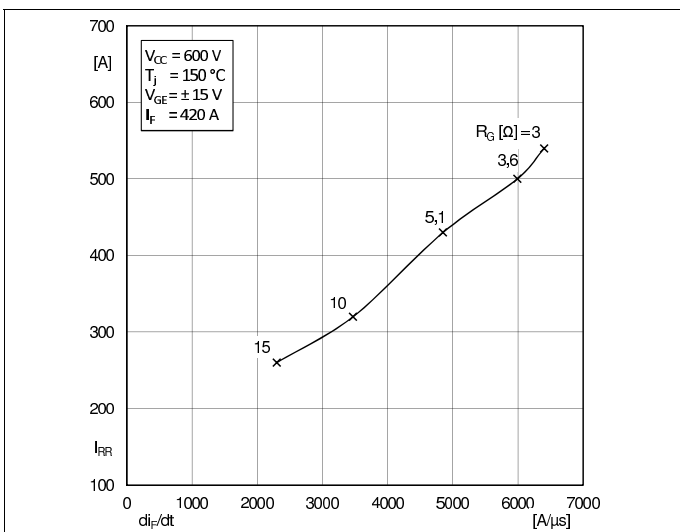


Fig. 11: Typ. CAL diode peak reverse recovery current

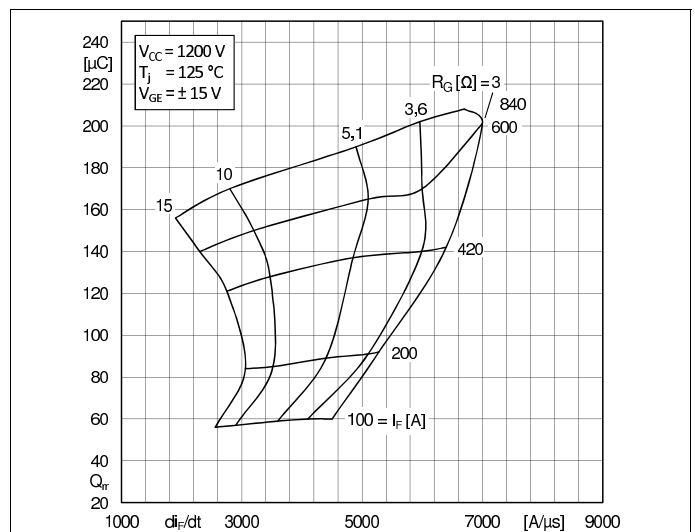
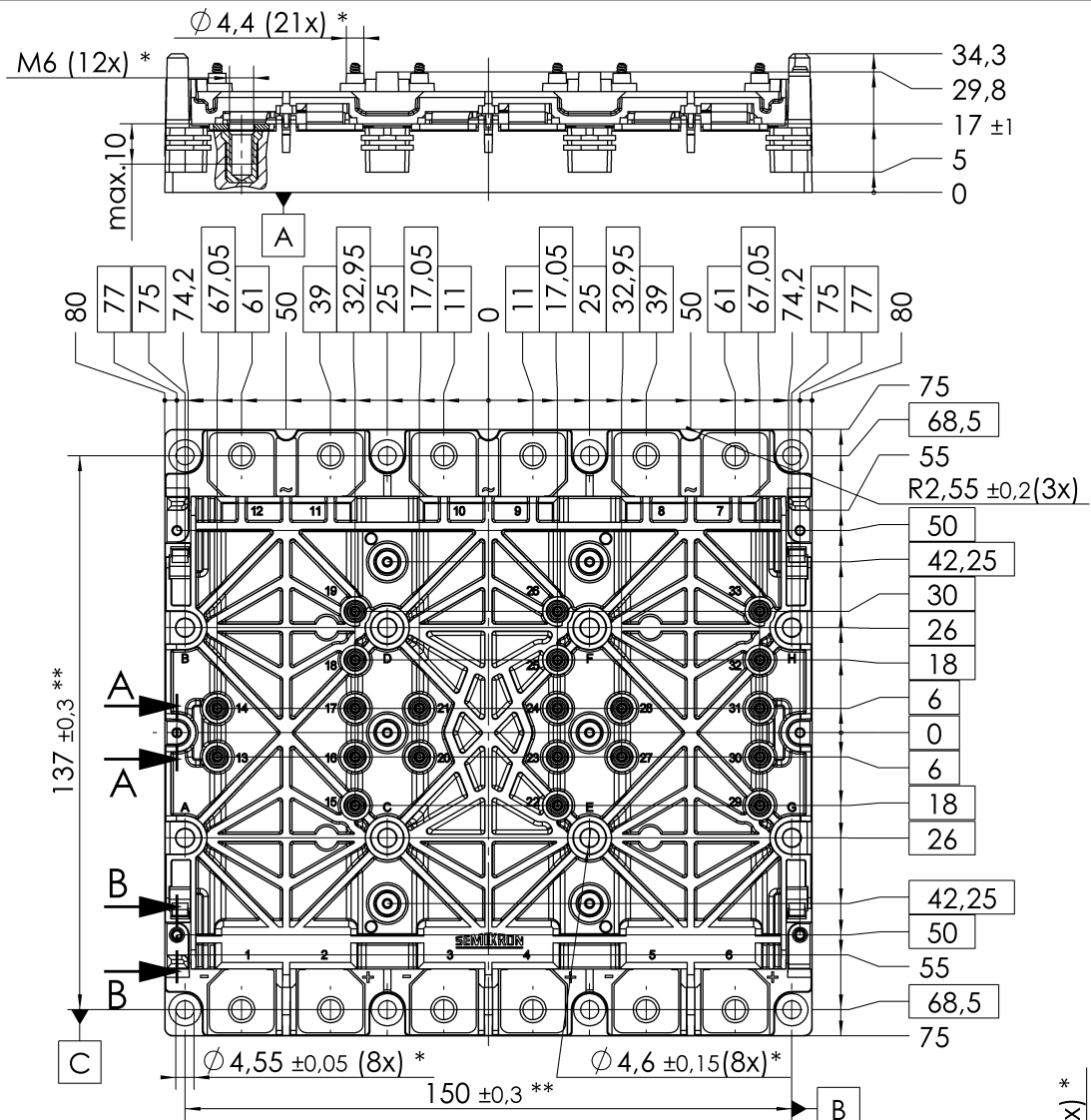
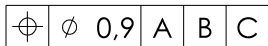


Fig. 12: Typ. CAL diode recovery charge

# SKiM429GD17E4HD



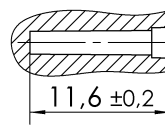
\* all pos. dimensions valid when mounted



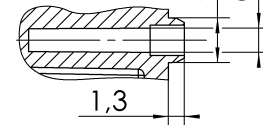
\*\* valid for the outer 4 inserts

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

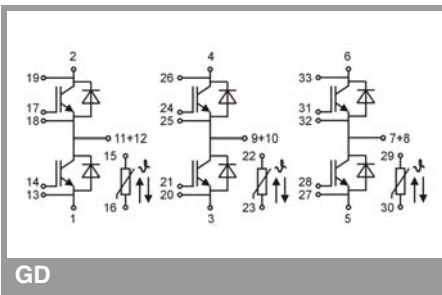
A-A (2:1)  
(12x screw hole)



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



SKIM 93



GD

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

\* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.