

SKiM429GD17E44F



SKiM® 93

Trench IGBT Modules

SKiM429GD17E44F

Features

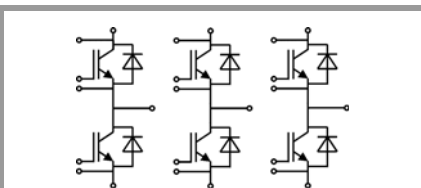
- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Insulated by Al_2O_3 DBC (Direct Bonded Copper) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB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

Typical Applications*

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

Remarks

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



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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Inverter - IGBT			
V_{CES}	$T_j = 25^\circ C$	1700	V
I_C	$\lambda_{paste}=0.8 W/(mK)$	$T_s = 25^\circ C$	608
	$T_j = 175^\circ C$	$T_s = 70^\circ C$	489
I_C	$\lambda_{paste}=2.5 W/(mK)$	$T_s = 25^\circ C$	789
	$T_j = 175^\circ C$	$T_s = 70^\circ C$	639
I_{Cnom}		420	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	1260	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 1000 V$	$T_j = 150^\circ C$	10
	$V_{GE} \leq 15 V$		
	$V_{CES} \leq 1700 V$		
T_j		-40 ... 175	$^\circ C$
Inverse - Diode			
I_F	$\lambda_{paste}=0.8 W/(mK)$	$T_s = 25^\circ C$	394
	$T_j = 175^\circ C$	$T_s = 70^\circ C$	308
I_F	$\lambda_{paste}=2.5 W/(mK)$	$T_s = 25^\circ C$	482
	$T_j = 175^\circ C$	$T_s = 70^\circ C$	379
I_{Fnom}		450	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	900	A
I_{FSM}	$t_p = 10 ms, \sin 180^\circ, T_j = 150^\circ C$	2322	A
T_j		-40 ... 175	$^\circ C$
Module			
$I_t(RMS)$	$T_{terminal} = 80^\circ C,$	700	A
T_{stg}		-40 ... 125	$^\circ C$
V_{isol}	AC sinus 50 Hz, $t = 1 min$	3000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 420 A$ $V_{GE} = 15 V$ chipllevel	$T_j = 25^\circ C$	1.90	2.25	V
		$T_j = 150^\circ C$	2.25	2.45	V
V_{CE0}	chipllevel	$T_j = 25^\circ C$	1.10	1.20	V
		$T_j = 150^\circ C$	1.00	1.10	V
r_{CE}	$V_{GE} = 15 V$ chipllevel	$T_j = 25^\circ C$	1.90	2.5	m Ω
		$T_j = 150^\circ C$	3.0	3.2	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 16.8 mA$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0 V, V_{CE} = 1700 V, T_j = 25^\circ C$	0.15	0.5		mA
C_{ies}	$V_{CE} = 25 V$ $V_{GE} = 0 V$	$f = 1 MHz$	33		nF
C_{oes}		$f = 1 MHz$	1.38		nF
C_{res}		$f = 1 MHz$	1.08		nF
Q_G	$V_{GE} = -8 V \dots +15 V$		3360		nC
R_{Gint}	$T_j = 25^\circ C$		2.7		Ω
$t_{d(on)}$	$V_{CC} = 1200 V$	$T_j = 150^\circ C$	498		ns
t_r	$I_C = 420 A$ $R_{G on} = 2.2 \Omega$	$T_j = 150^\circ C$	62		ns
		$T_j = 150^\circ C$	178		mJ
E_{on}	$R_{G off} = 2.2 \Omega$	$T_j = 150^\circ C$	178		mJ
$t_{d(off)}$	$di/dt_{on} = 7450 A/\mu s$	$T_j = 150^\circ C$	922		ns
t_f	$di/dt_{off} = 1920 A/\mu s$	$T_j = 150^\circ C$	220		ns
E_{off}	$V_{GE} = +15/-15 V$	$T_j = 150^\circ C$	189		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 W/(mK)$		0.079		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 W/(mK)$		0.051		K/W



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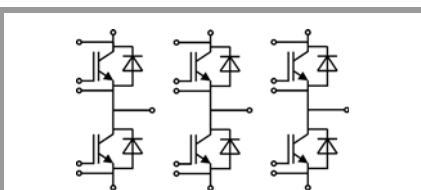
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 420 A$ $V_{GE} = 0 V$ chipelevel	$T_j = 25^\circ C$		1.93	2.32	V
		$T_j = 150^\circ C$		2.04	2.43	V
V_{F0}	chipelevel	$T_j = 25^\circ C$		1.32	1.56	V
		$T_j = 150^\circ C$		1.08	1.22	V
r_F	chipelevel	$T_j = 25^\circ C$		1.46	1.80	m Ω
		$T_j = 150^\circ C$		2.3	2.9	m Ω
I_{RRM}	$I_F = 420 A$	$T_j = 150^\circ C$		577		A
Q_{rr}	$di/dt_{off} = 7630 A/\mu s$	$T_j = 150^\circ C$		150		μC
E_{rr}	$V_{GE} = +15/-15 V$ $V_{CC} = 1200 V$	$T_j = 150^\circ C$		119		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 W/(mK)$			0.169		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 W/(mK)$			0.125		K/W
Module						
L_{CE}				10	15	nH
R_{CC+EE}	measured per switch	$T_s = 25^\circ C$		0.3		m Ω
		$T_s = 125^\circ C$		0.5		m Ω
W				1042		g
Temperature Sensor						
R_{100}	$T_r=100^\circ C (R_{25}=1000\Omega)$			1670 \pm 1%		Ω
$R(T)$	$R(T)=1k\Omega[1+A(T-25^\circ C)+B(T-25^\circ C)^2]$, $A = 7.64 \cdot 10^{-3} C^{-1}$, $B = 1.73 \cdot 10^{-5} C^{-2}$					



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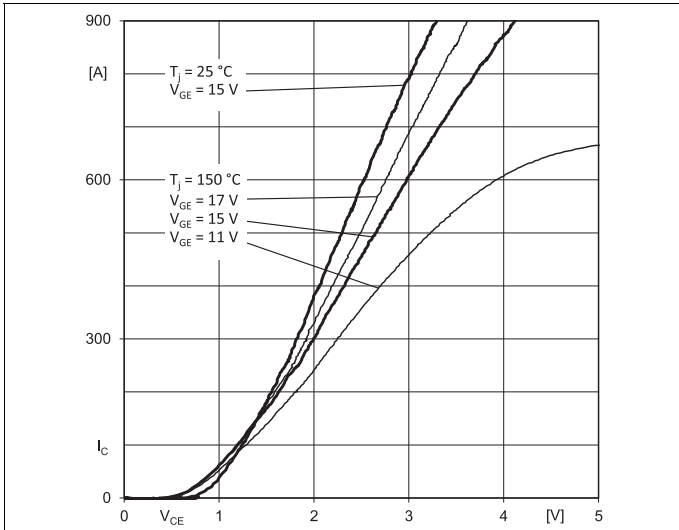


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

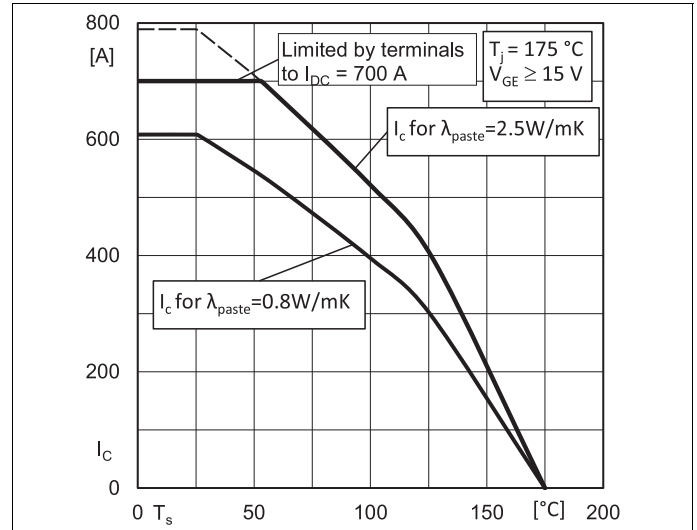


Fig. 2: Typ. rated current vs. temperature $I_c = f(T_s)$

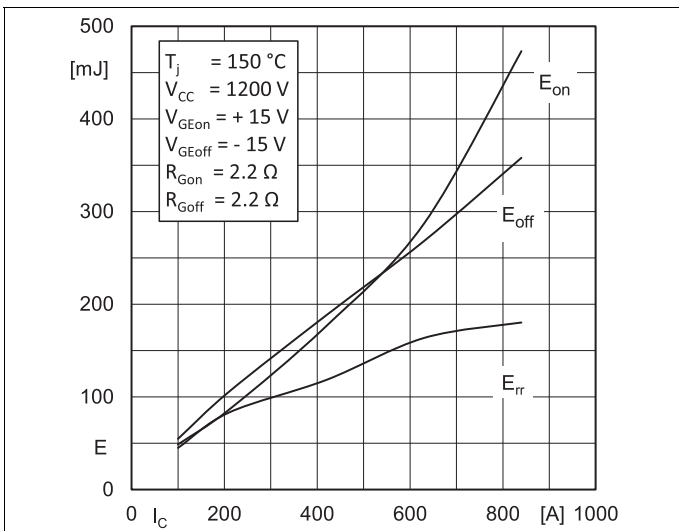


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

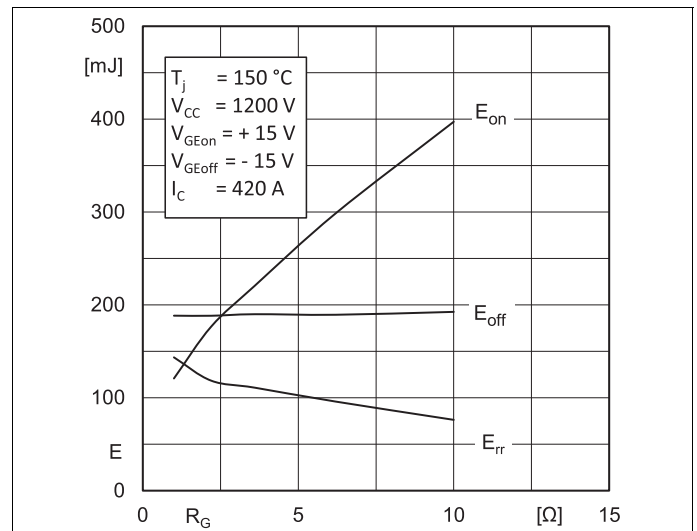


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

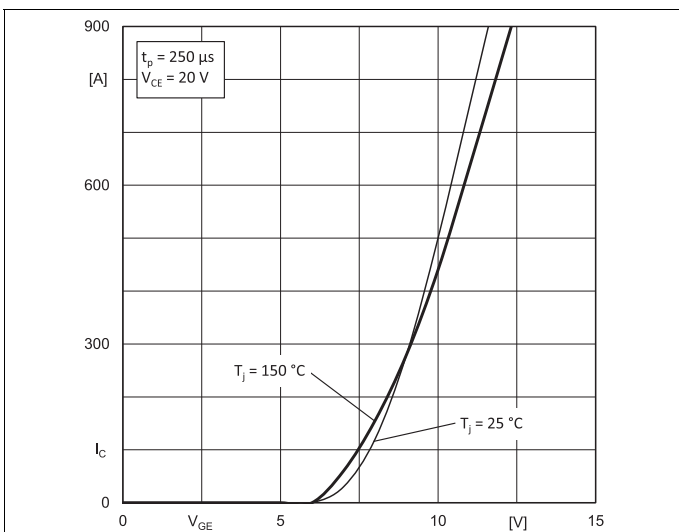


Fig. 5: Typ. transfer characteristic

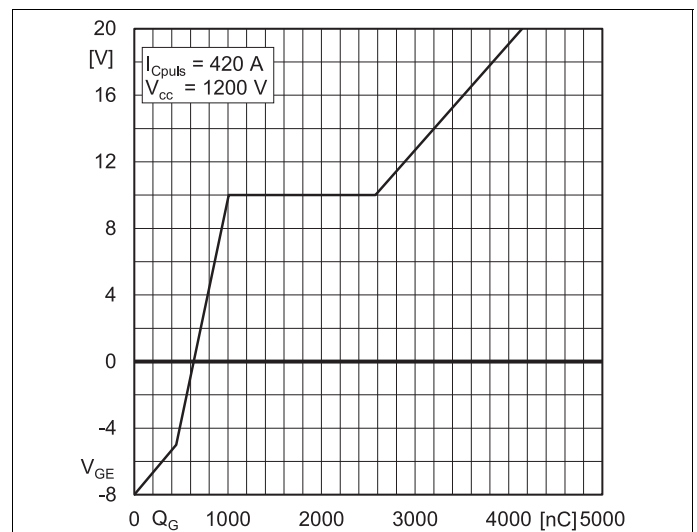


Fig. 6: Typ. gate charge characteristic

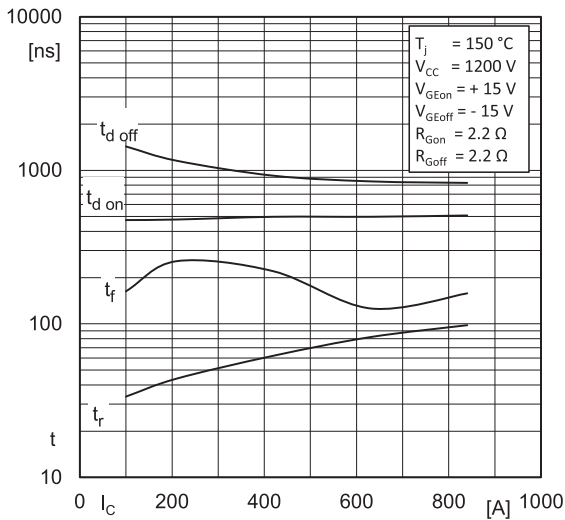


Fig. 7: Typ. switching times vs. I_C

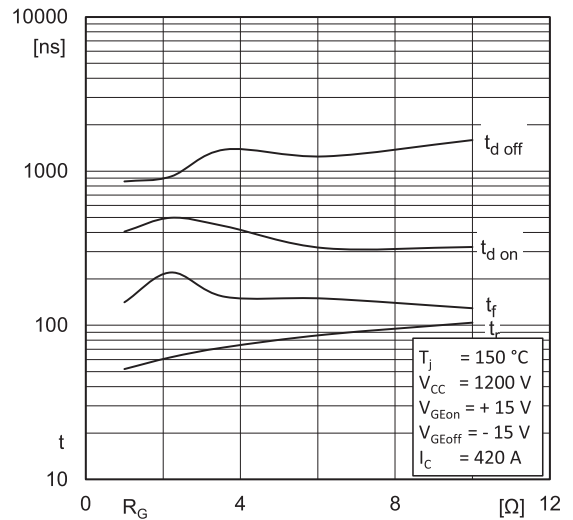


Fig. 8: Typ. switching times vs. gate resistor R_G

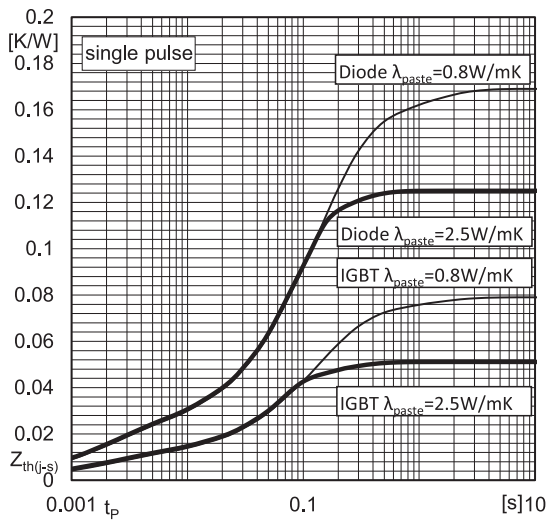


Fig. 9: Typ. transient thermal impedance

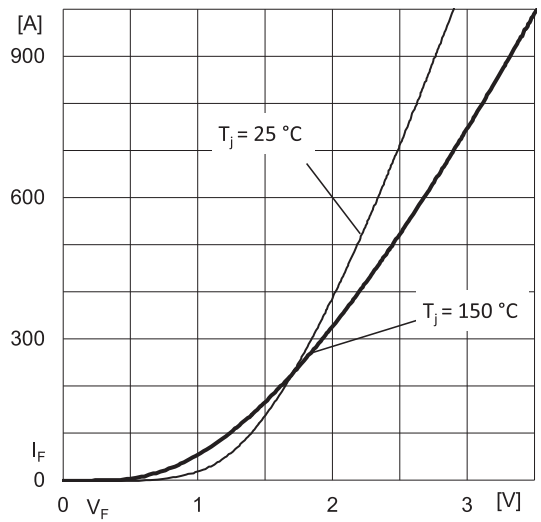


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

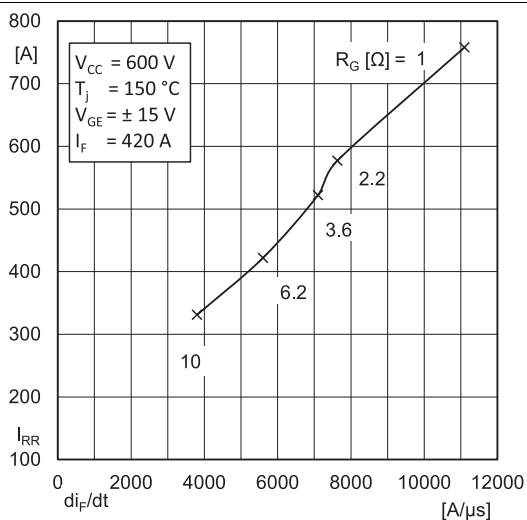


Fig. 11: Typ. CAL diode peak reverse recovery current

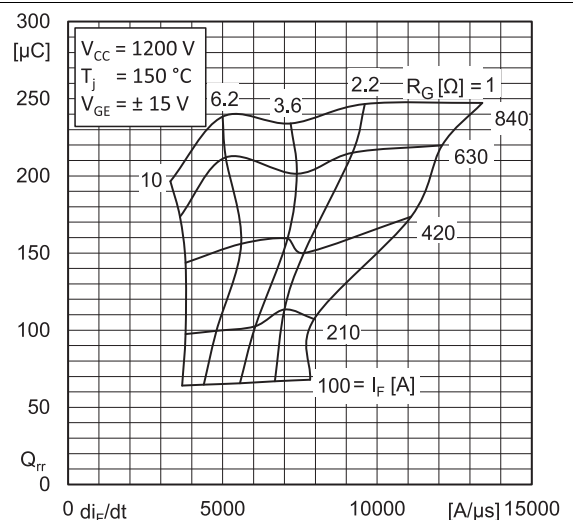
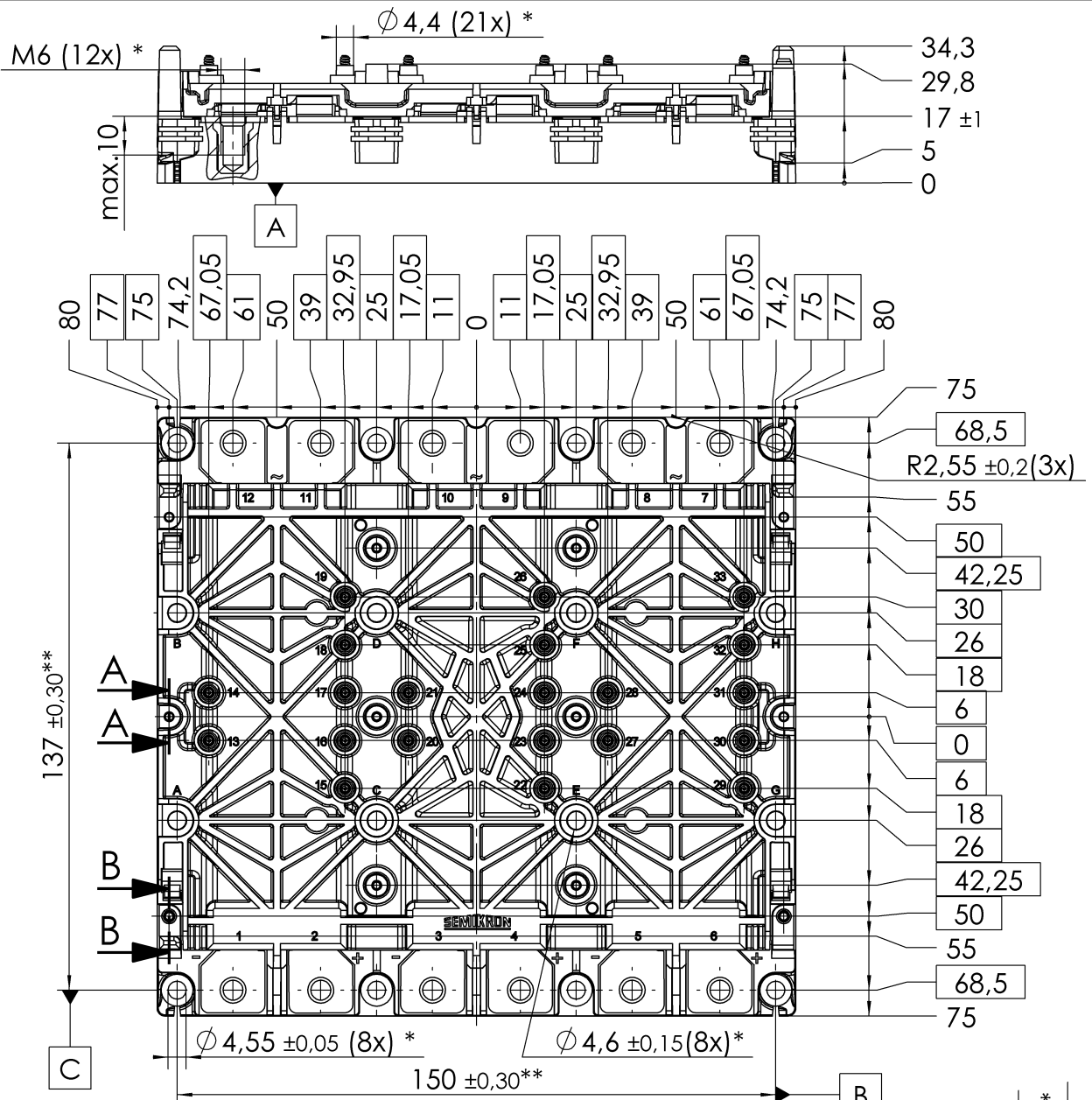
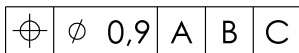


Fig. 12: Typ. CAL diode recovery charge

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* all pos. dimensions valid when mounted

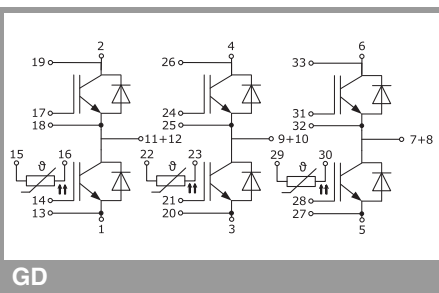
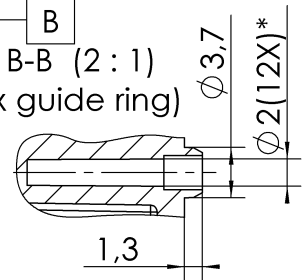
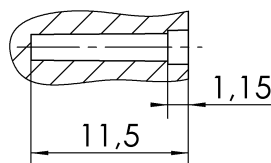


** valid for the outer 4 inserts

General Tolerances DIN ISO 2768-m
PCB spring landing pad = $\varnothing 3,5 \pm 0,2$

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

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



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

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