



SKiM® 93

Trench IGBT Modules

SKiM429GD17E4V5

Features*

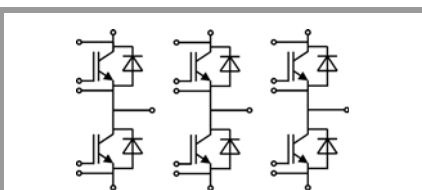
- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Insulated by Al_2O_3 DBC (Direct Bonded Copper) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB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

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 $T_{op} = -40 \dots +150^\circ C$



GD

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	A
		$T_j = 175^\circ C$	489	A
I_C	$\lambda_{paste}=2.5 W/(mK)$	$T_s = 25^\circ C$	785	A
		$T_j = 175^\circ C$	635	A
I_{Cnom}			420	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		1260	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 1000 V$ $V_{GE} \leq 15 V$ $V_{CES} \leq 1700 V$	$T_j = 150^\circ C$	10	μs
T_j			-40 ... 175	$^\circ C$
Inverse - Diode				
I_F	$\lambda_{paste}=0.8 W/(mK)$	$T_s = 25^\circ C$	394	A
		$T_j = 175^\circ C$	308	A
I_F	$\lambda_{paste}=2.5 W/(mK)$	$T_s = 25^\circ C$	482	A
		$T_j = 175^\circ C$	379	A
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						
$V_{CE(sat)}$	$I_C = 420 A$ $V_{GE} = 15 V$ chipelevel	$T_j = 25^\circ C$		1.90	2.25	V
		$T_j = 150^\circ C$		2.25	2.45	V
V_{CE0}	chipelevel	$T_j = 25^\circ C$		1.10	1.20	V
		$T_j = 150^\circ C$		1.00	1.10	V
r_{CE}	$V_{GE} = 15 V$ chipelevel	$T_j = 25^\circ C$		1.90	2.5	$m\Omega$
		$T_j = 150^\circ C$		3.0	3.2	$m\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 16.8 mA$		5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0 V, V_{CE} = 1700 V, T_j = 25^\circ C$				0.5	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
$t_{d(on)}$	$V_{CC} = 1200 V$ $I_C = 420 A$	$T_j = 150^\circ C$		498		ns
t_r		$T_j = 150^\circ C$		62		ns
E_{on}	$R_{G on} = 2.2 \Omega$ $R_{G off} = 2.2 \Omega$	$T_j = 150^\circ C$		178		mJ
$t_{d(off)}$		$T_j = 150^\circ C$		922		ns
t_f	$di/dt_{on} = 7450 A/\mu s$ $di/dt_{off} = 1920 A/\mu s$	$T_j = 150^\circ C$		220		ns
E_{off}		$T_j = 150^\circ C$		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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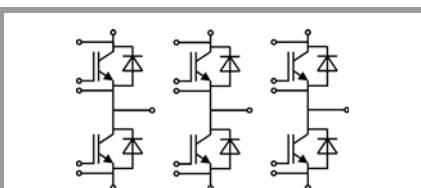
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 420 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 25^\circ C$		1.93	2.32	V
		$T_j = 150^\circ C$		2.04	2.43	V
V_{F0}	chipelevel	$T_j = 25^\circ C$		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	mΩ
		$T_j = 150^\circ C$		2.3	2.9	mΩ
I_{RRM}	$I_F = 420 \text{ A}$	$T_j = 150^\circ C$		577		A
Q_{rr}	$di/dt_{off} = 7630 \text{ A}/\mu\text{s}$	$T_j = 150^\circ C$		150		μC
E_{rr}	$V_{GE} = +15/-15 \text{ V}$ $V_{CC} = 1200 \text{ V}$	$T_j = 150^\circ C$		119		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$			0.169		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$			0.125		K/W
Module						
L_{CE}				10	15	nH
R_{CC+EE}	measured per switch	$T_s = 25^\circ C$		0.3		mΩ
		$T_s = 125^\circ C$		0.5		mΩ
W				1042		g
Temperature Sensor						
R_{100}	$T_r=100^\circ C$ ($R_{25}=1000\Omega$)			1670 ± 1%		Ω
$R(T)$	$R(T)=1k\Omega[1+A(T-25^\circ C)+B(T-25^\circ C)^2]$, $A = 7.64 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.73 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					

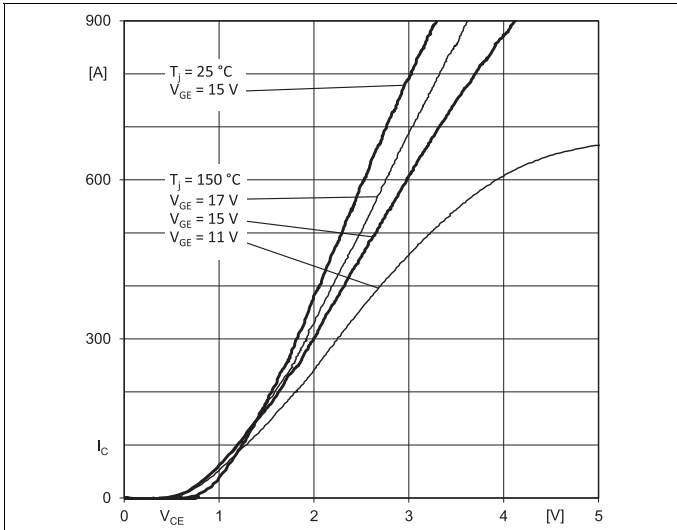


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

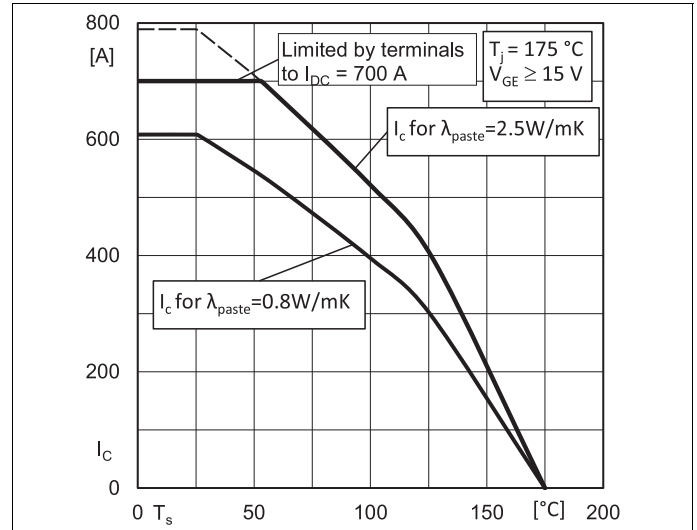


Fig. 2: Typ. rated current vs. temperature $I_c = f(T_s)$

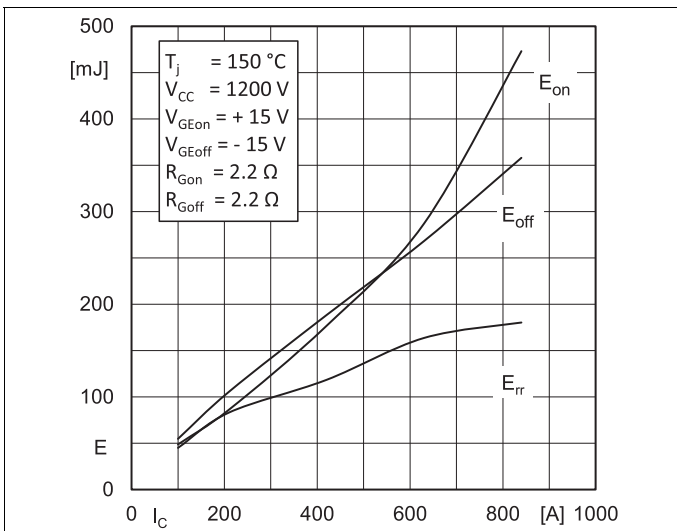


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

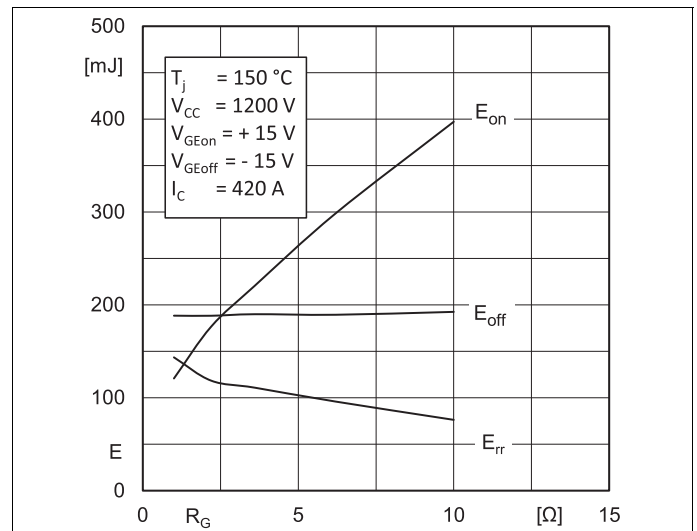


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

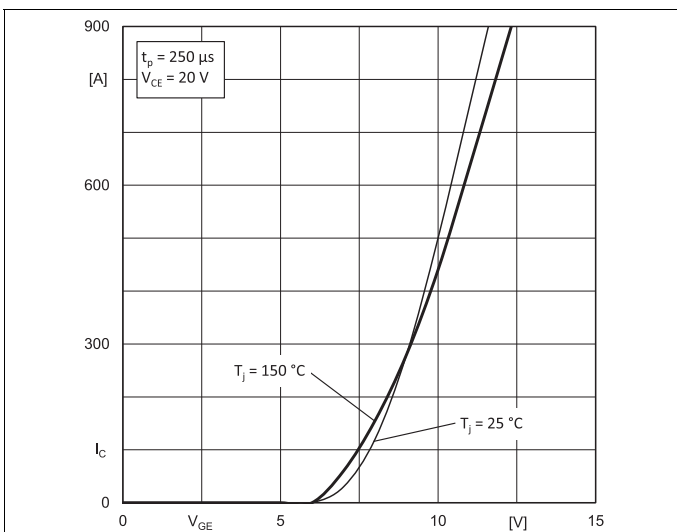


Fig. 5: Typ. transfer characteristic

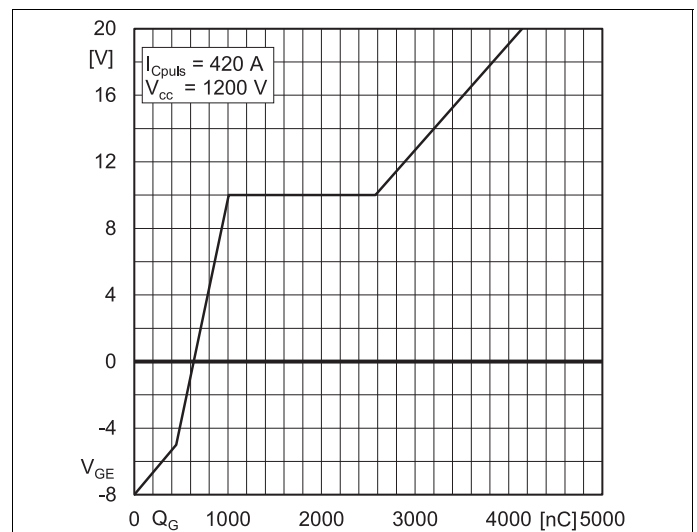


Fig. 6: Typ. gate charge characteristic

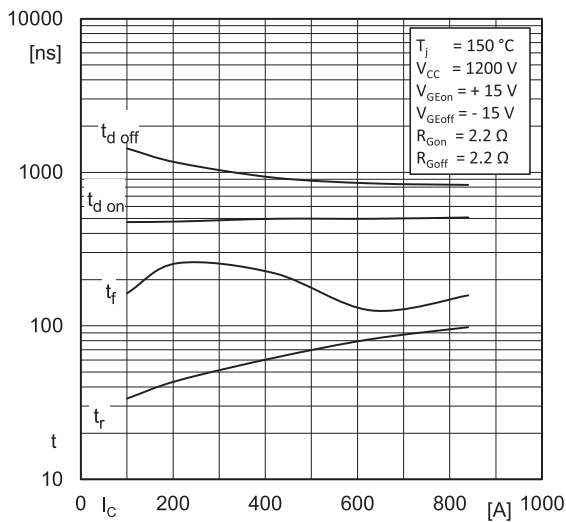


Fig. 7: Typ. switching times vs. I_C

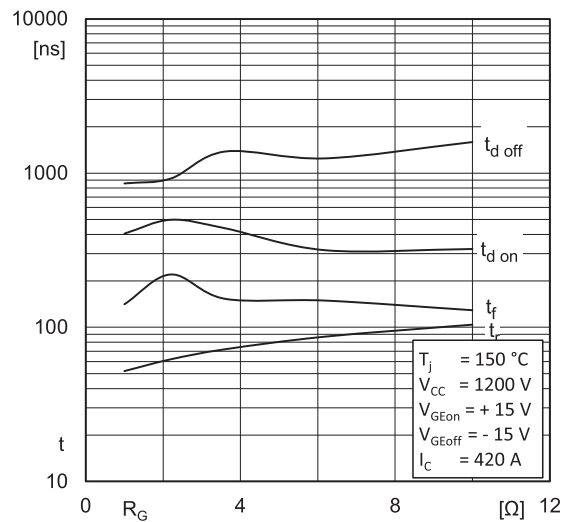


Fig. 8: Typ. switching times vs. gate resistor R_G

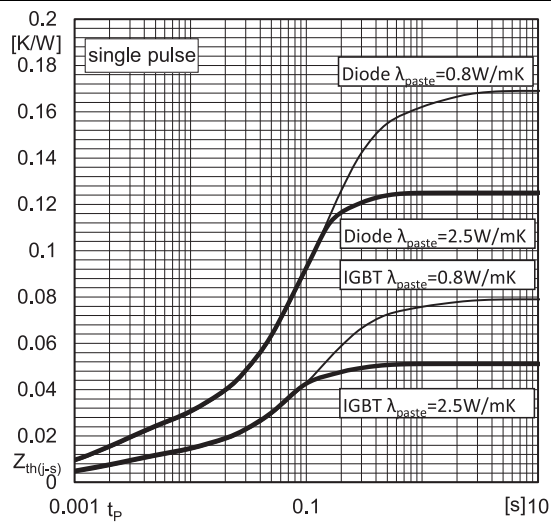


Fig. 9: Typ. transient thermal impedance

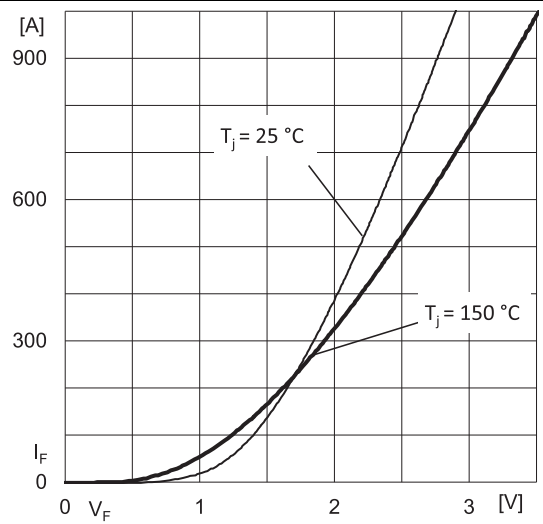


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

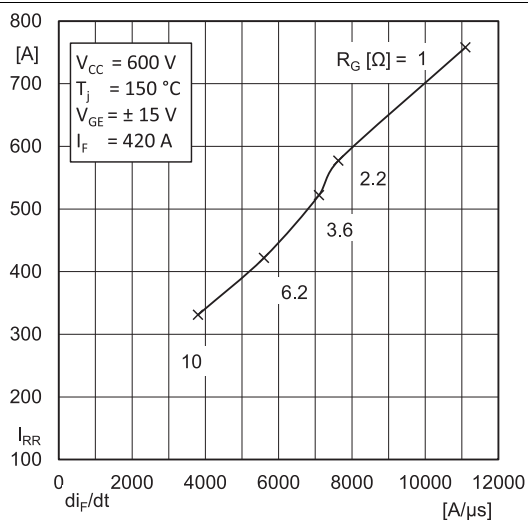


Fig. 11: Typ. CAL diode peak reverse recovery current

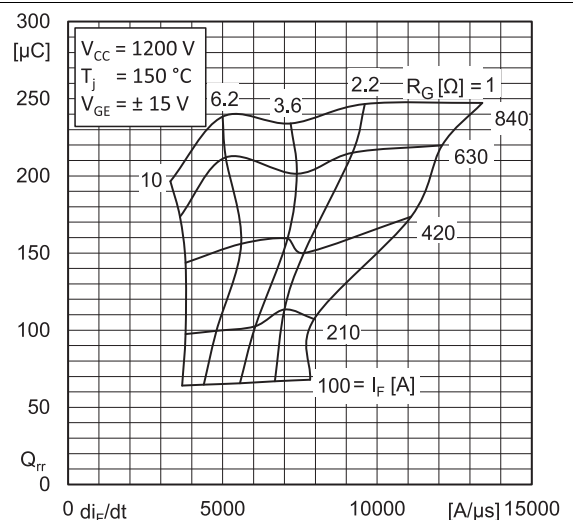
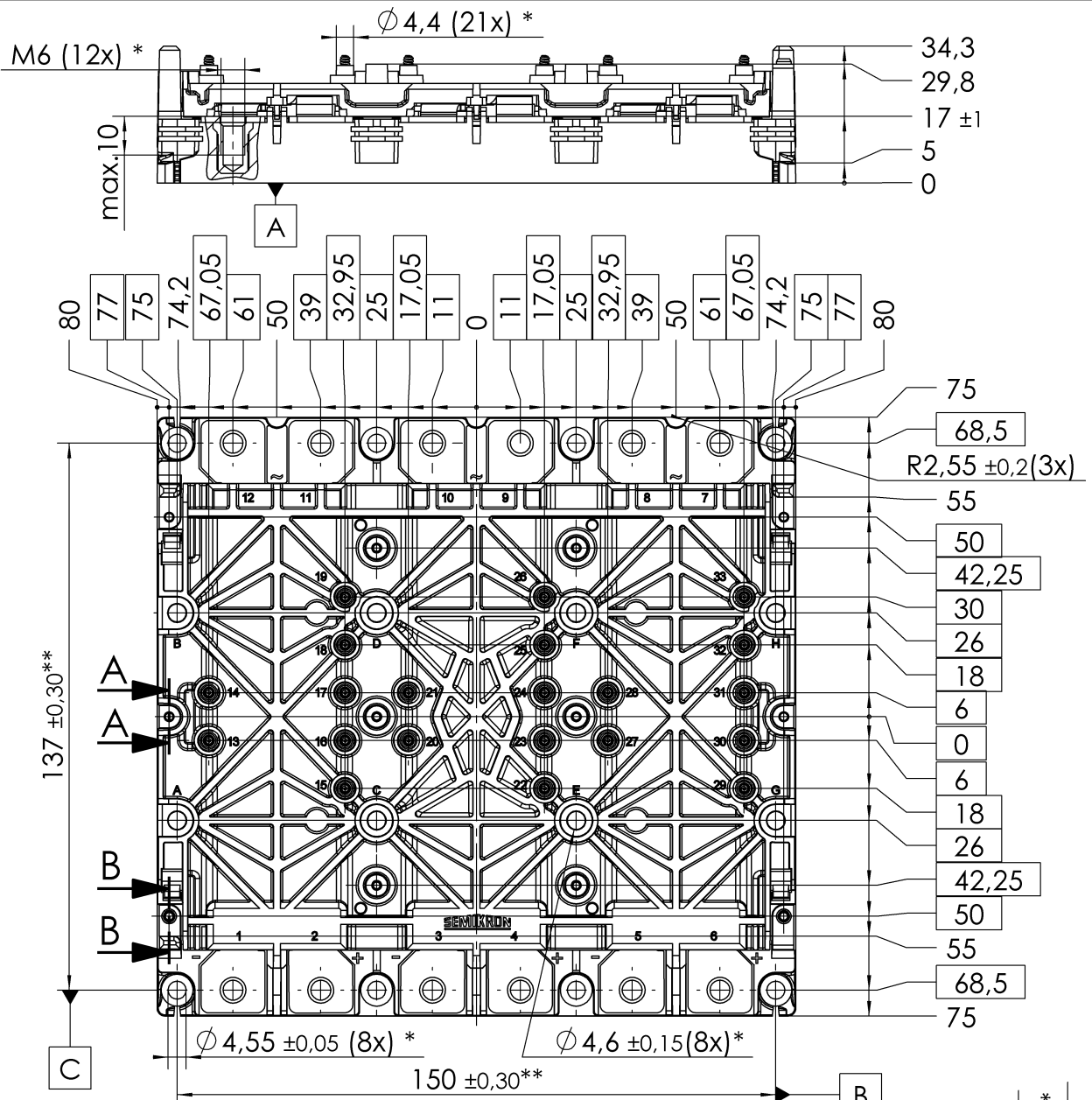


Fig. 12: Typ. CAL diode recovery charge

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* all pos. dimensions valid when mounted

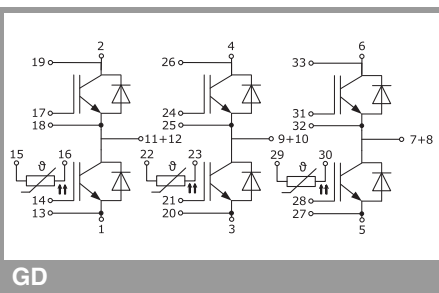
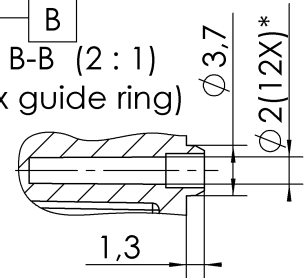
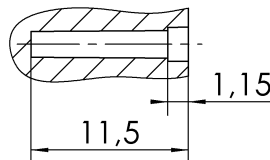
\varnothing	$\varnothing 0,9$	A	B	C
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** valid for the outer 4 inserts

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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