



SKiM® 63

Trench IGBT Modules

SKiM306GD12E4

Features

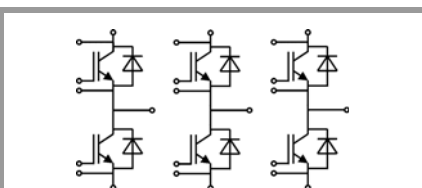
- IGBT 4 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Insulated by Al_2O_3 DBC (Direct Bonded Copper) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB 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}	$T_j = 25^\circ C$		1200	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ C$	410	A
		$T_j = 175^\circ C$	333	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ C$	485	A
		$T_j = 175^\circ C$	396	A
I_{Cnom}			300	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		900	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800 \text{ V}$	$T_j = 150^\circ C$	10	μs
	$V_{GE} \leq 15 \text{ V}$			
	$V_{CES} \leq 1200 \text{ V}$			
T_j			-40 ... 175	$^\circ C$
Inverse - Diode				
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ C$	305	A
		$T_j = 175^\circ C$	242	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ C$	371	A
		$T_j = 175^\circ C$	297	A
I_{Fnom}			300	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		900	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 150^\circ C$		1620	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, $t = 1 \text{ min}$		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	$I_C = 300 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ C$	1.85	2.10		V
		$T_j = 150^\circ C$	2.25	2.45		V
V_{CE0}	chipelevel	$T_j = 25^\circ C$	0.80	0.90		V
		$T_j = 150^\circ C$	0.70	0.80		V
r_{CE}	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ C$	3.5	4.0		m Ω
		$T_j = 150^\circ C$	5.2	5.5		m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 12 \text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0 \text{ V}, V_{CE} = 1200 \text{ V}, T_j = 25^\circ C$		0.1	0.3		mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	17.6			nF
C_{oes}		$f = 1 \text{ MHz}$	1.16			nF
C_{res}		$f = 1 \text{ MHz}$	0.94			nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$			1700		nC
R_{Gint}	$T_j = 25^\circ C$			2.5		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ C$		252		ns
t_r	$I_C = 300 \text{ A}$ $R_{Gon} = 1 \Omega$	$T_j = 150^\circ C$		44		ns
		$T_j = 150^\circ C$		19		mJ
E_{on}	$R_{Goff} = 1 \Omega$	$T_j = 150^\circ C$		19		mJ
$t_{d(off)}$	$di/dt_{on} = 6590 \text{ A}/\mu s$	$T_j = 150^\circ C$		506		ns
t_f	$di/dt_{off} = 4000 \text{ A}/\mu s$	$T_j = 150^\circ C$		70		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ C$		39		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$			0.116		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$			0.086		K/W



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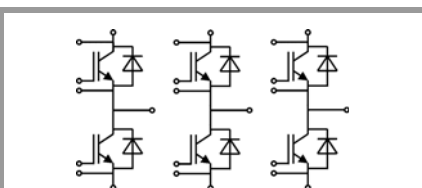
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 300 \text{ A}$	$T_j = 25^\circ C$		2.14	2.46	V
		chipelevel	$T_j = 150^\circ C$	2.07	2.38	V
V_{F0}	chipelevel	$T_j = 25^\circ C$		1.30	1.50	V
		$T_j = 150^\circ C$		0.90	1.10	V
r_F	chipelevel	$T_j = 25^\circ C$		2.8	3.2	m Ω
		$T_j = 150^\circ C$		3.9	4.3	m Ω
I_{RRM}	$I_F = 300 \text{ A}$	$T_j = 150^\circ C$		448		A
Q_{rr}	$di/dt_{off} = 8000 \text{ A}/\mu\text{s}$	$T_j = 150^\circ C$		47		μC
E_{rr}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ C$		21		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$			0.218		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$			0.159		K/W
Module						
L_{CE}				9	13	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				761		g
Temperature Sensor						
R_{100}	$T_{Sensor} = 100^\circ C$ ($R_{25} = 5 \text{ k}\Omega$)			339		Ω
$B_{100/125}$	$R(T) = R_{100} \exp[B_{100/125}(1/T - 1/373)]$; $T[K]$;			4096		K

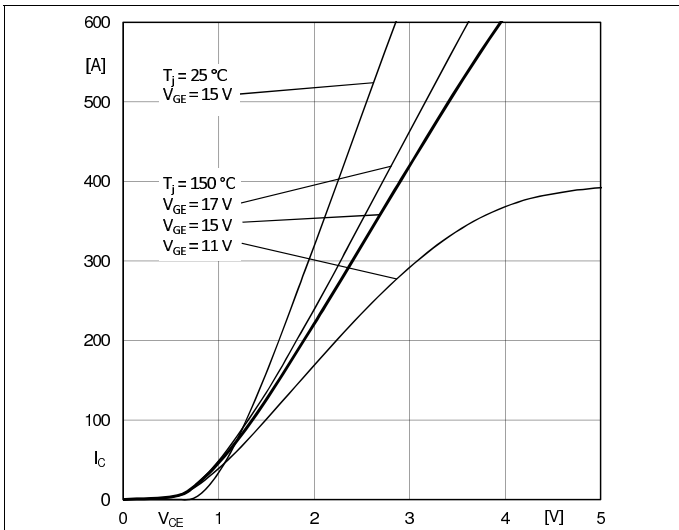


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

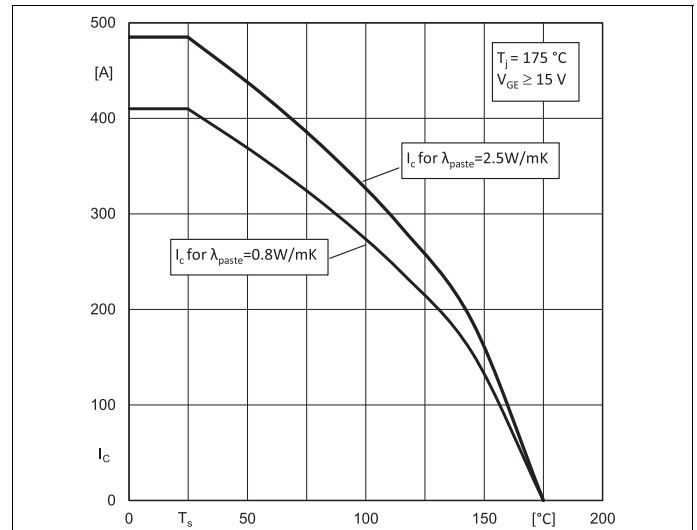


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

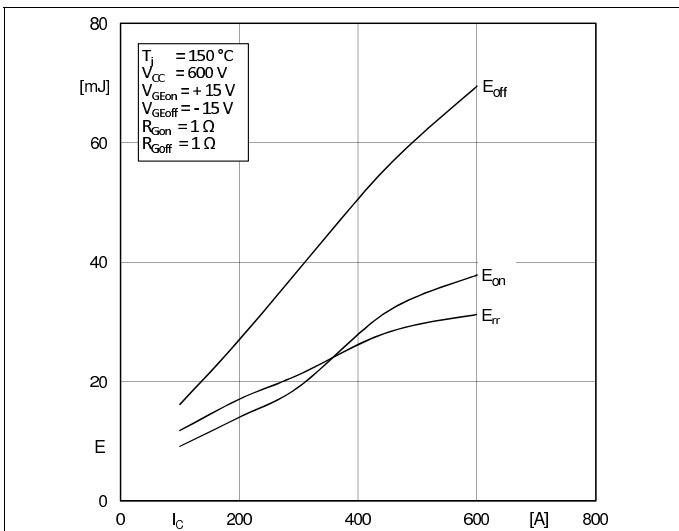


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

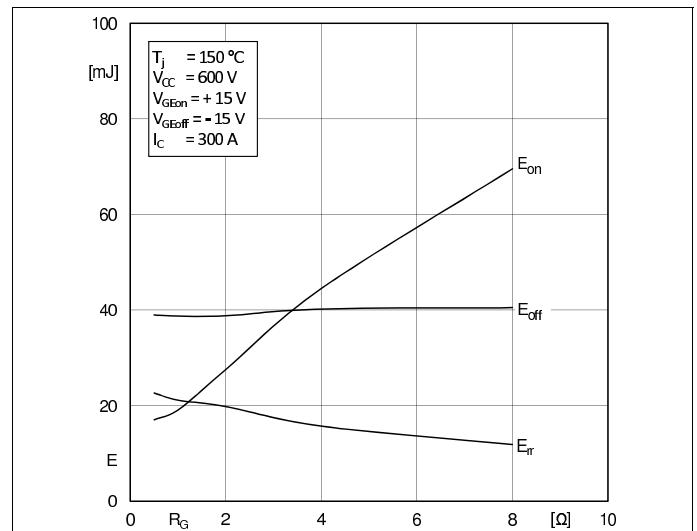


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

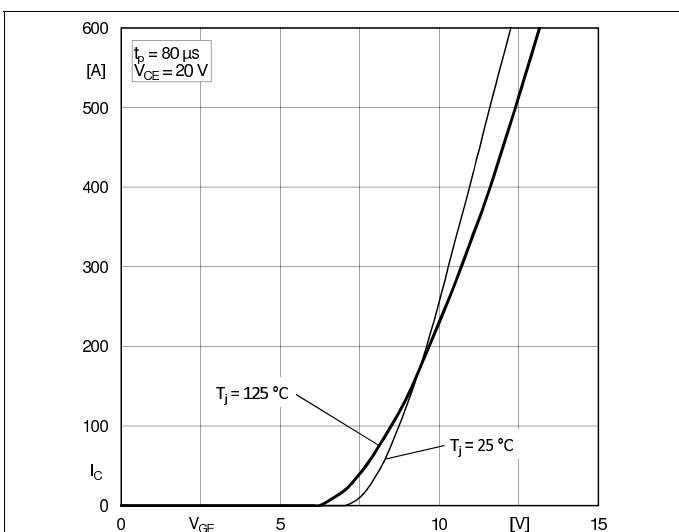


Fig. 5: Typ. transfer characteristic

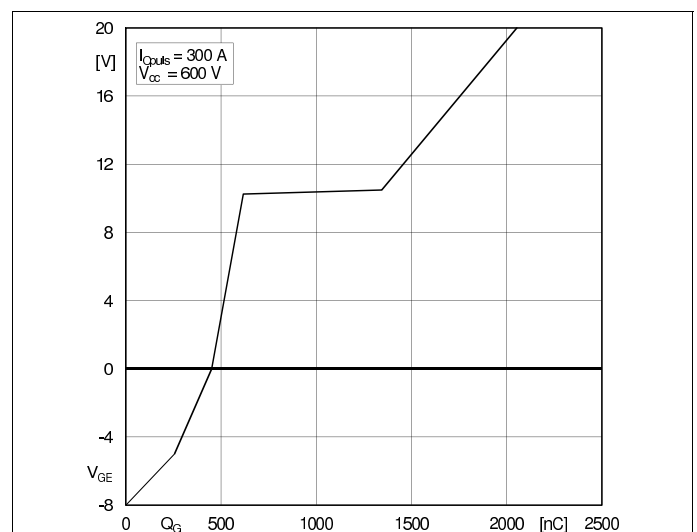


Fig. 6: Typ. gate charge characteristic

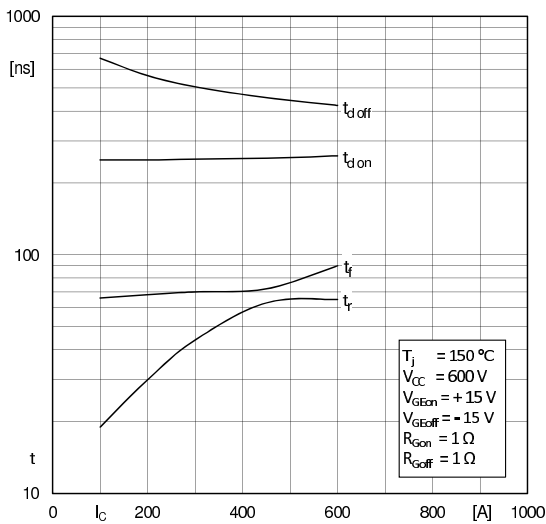


Fig. 7: Typ. switching times vs. I_c

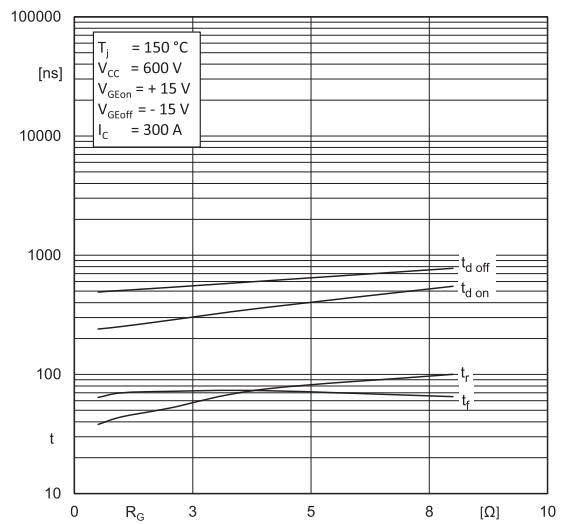


Fig. 8: Typ. switching times vs. gate resistor R_G

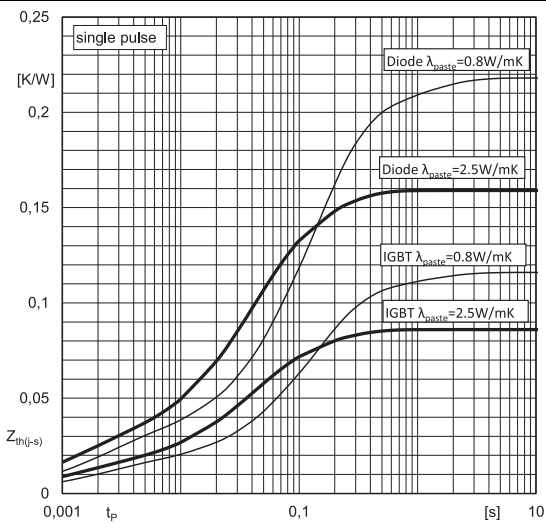


Fig. 9: Typ. transient thermal impedance

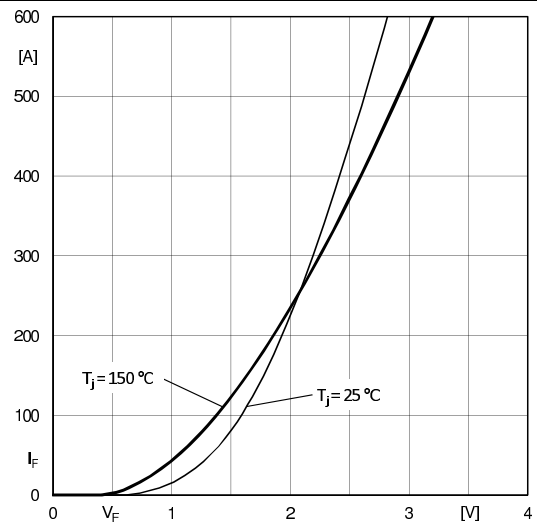


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

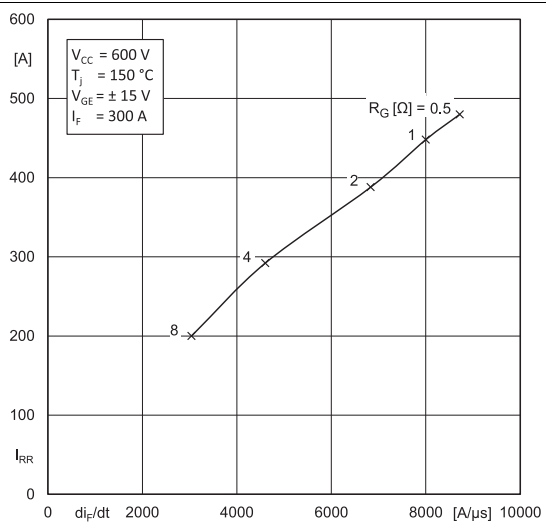


Fig. 11: Typ. CAL diode peak reverse recovery current

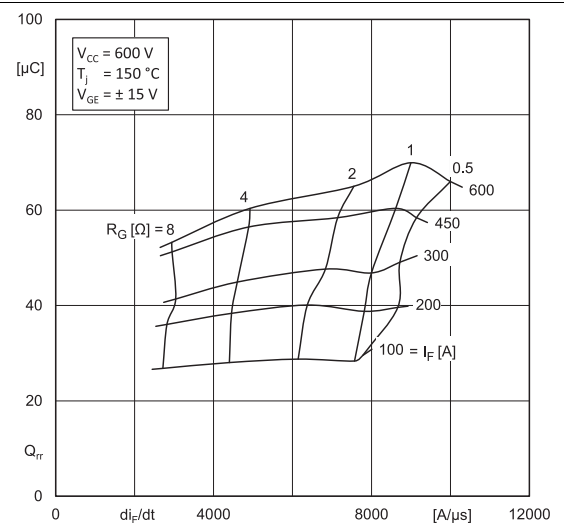
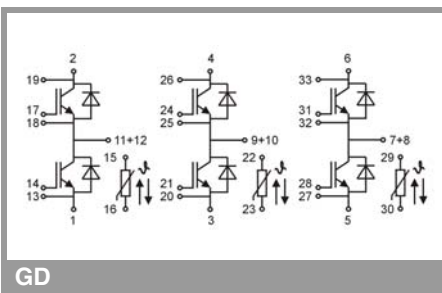
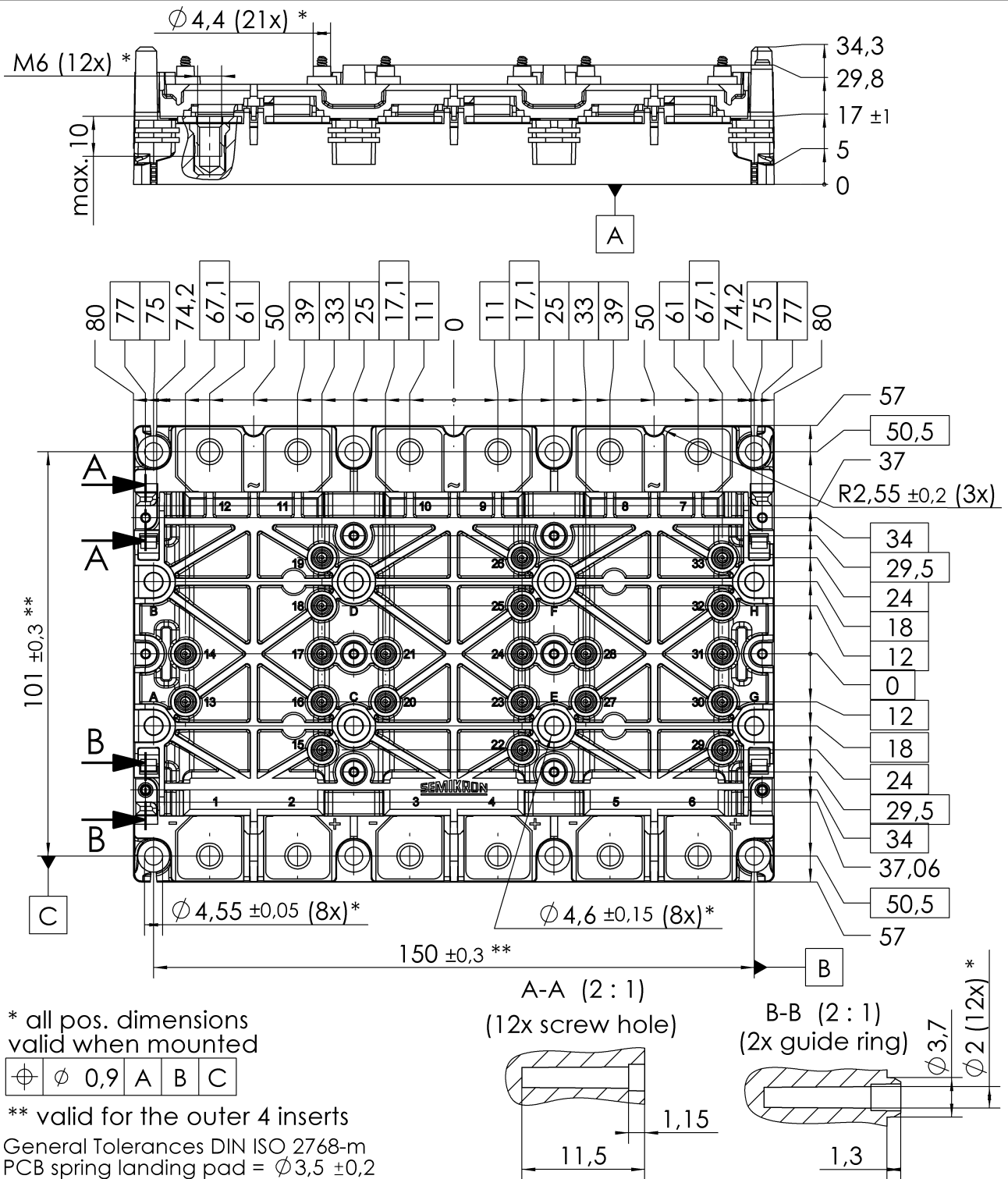


Fig. 12: Typ. CAL diode recovery charge

SKiM306GD12E4



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

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