SKiM® 63

Trench IGBT Modules

SKiM406GD066HD

Features

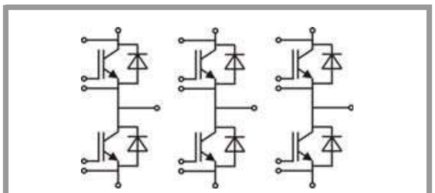
- IGBT 3 Trench Gate Technology
- Solderless sinter technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Isolated by Al_2O_3 DCB (Direct Copper Bonded) ceramic substrate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB to the control terminals
- High short circuit capability, self limiting to 6 x 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°C max; $T_c = T_s$ (for baseplateless modules)
- Recommended T_{op} = -40 … +150°C



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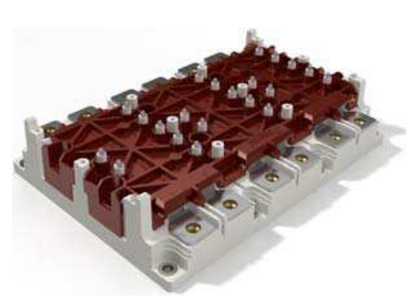
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			600	V
I_C	T_j = 175 °C	T_s = 25 °C	468	A
		T_s = 70 °C	374	A
I_{Cnom}			400	A
I_{CRM}	$I_{CRM} = 2xI_{Cnom}$		800	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 600 V	T_j = 150 °C	6	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_s = 25 °C	360	A
		T_s = 70 °C	281	A
I_{Fnom}			400	A
I_{FRM}	$I_{FRM} = 2xI_{Fnom}$		800	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2340	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C		700	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	I_C = 400 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.85	V
		T_j = 150 °C		1.70	2.10	V
V_{CE0}		T_j = 25 °C		0.9	1	V
		T_j = 150 °C		0.85	0.9	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		1.4	2.1	mΩ
		T_j = 150 °C		2.1	3.0	mΩ
$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C = 6.4 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 600 V	T_j = 25 °C		0.1	0.3	mA
		T_j = 150 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		24.64		nF
C_{oes}		f = 1 MHz		1.54		nF
C_{res}		f = 1 MHz		0.73		nF
Q_G	V_{GE} = - 8 V...+ 15 V			3200		nC
R_{Gint}	T_j = 25 °C			0.5		Ω
$t_{d(on)}$	V_{CC} = 300 V I_C = 400 A $R_{G\,on}$ = 3 Ω $R_{G\,off}$ = 5 Ω di/dt_{on} = 5900 A/µs di/dt_{off} = 6000 A/µs	T_j = 150 °C		180		ns
t_r		T_j = 150 °C		80		ns
E_{on}		T_j = 150 °C		8		mJ
$t_{d(off)}$		T_j = 150 °C		950		ns
t_f		T_j = 150 °C		50		ns
E_{off}		T_j = 150 °C		25		mJ
$R_{th(j-s)}$	per IGBT				0.135	K/W



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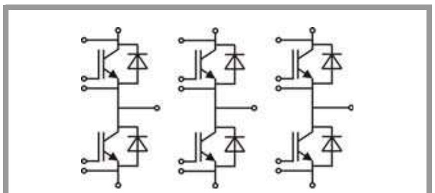

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse diode						
$V_F = V_{EC}$	I_F = 400 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.5	1.8	V
		T_j = 150 °C		1.6	1.8	V
V_{F0}		T_j = 25 °C		1	1.1	V
		T_j = 150 °C		0.85	0.95	V
r_F		T_j = 25 °C		1.3	1.7	mΩ
		T_j = 150 °C		1.8	2.2	mΩ
I_{RRM}	I_F = 400 A di/dt_{off} = 5900 A/µs V_{GE} = -15 V V_{CC} = 300 V	T_j = 150 °C		350		A
Q_{rr}		T_j = 150 °C		49		µC
E_{rr}		T_j = 150 °C		12		mJ
$R_{th(j-s)}$	per diode				0.243	K/W
Module						
L_{CE}				9	13	nH
$R_{CC'+EE'}$	terminal-chip	T_s = 25 °C		0.3		mΩ
		T_s = 125 °C		0.5		mΩ
w				761		g
Temperature Sensor						
R_{100}	T_{Sensor} = 100 °C (R_{25} = 5 kΩ)			339		Ω
$B_{100/125}$	$R_{(T)} = R_{100}exp[B_{100/125}(1/T-1/373)]$; T[K];			4096		K

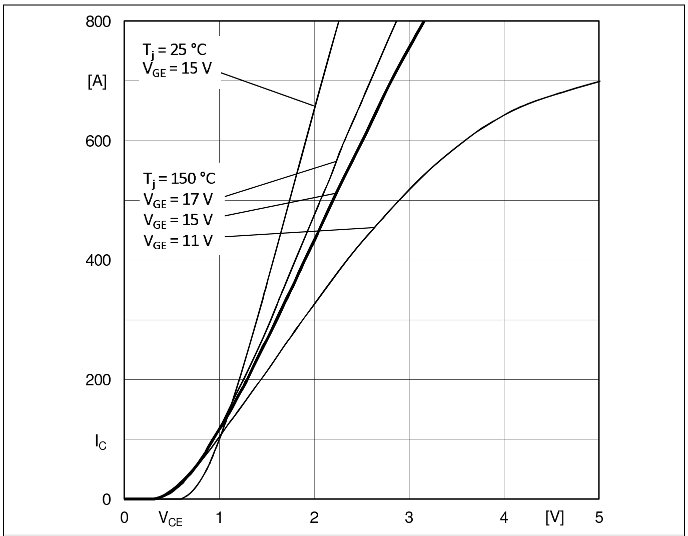


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

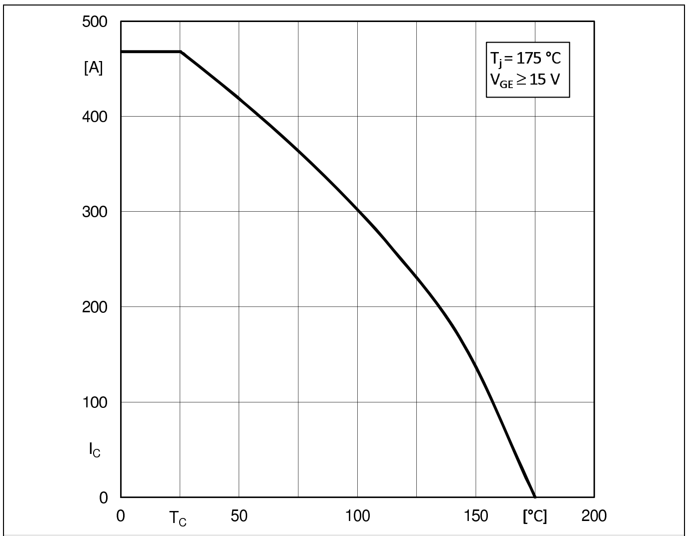


Fig. 2: Rated current vs. temperature $I_C = f (T_C)$

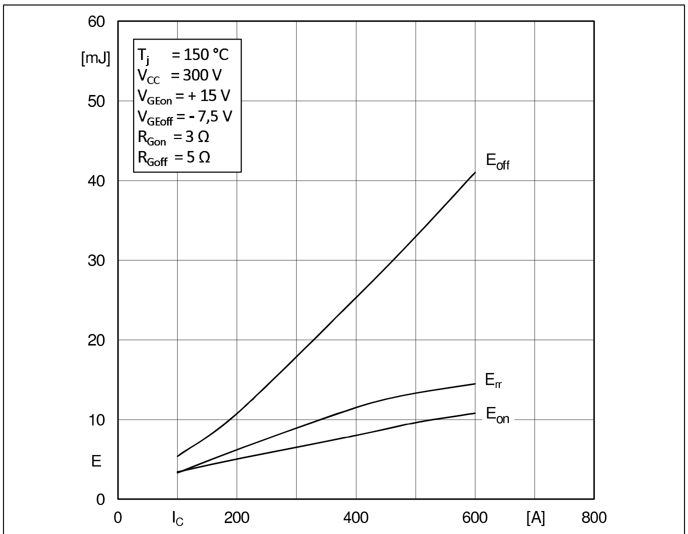


Fig. 3: Typ. turn-on /-off energy = f (I_C)

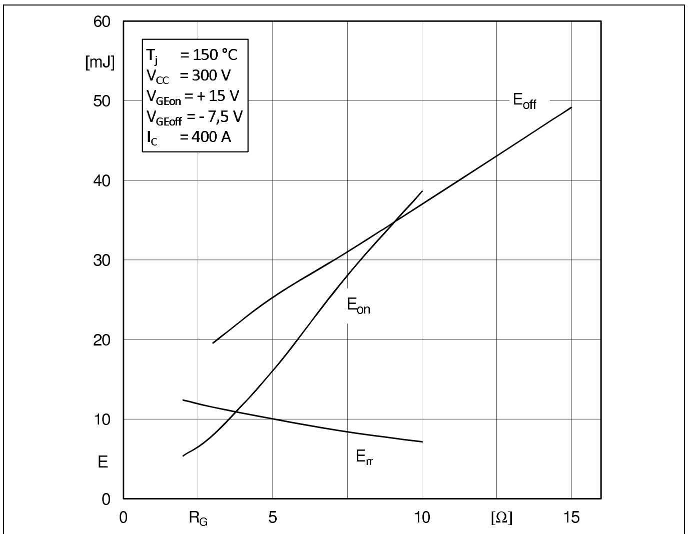


Fig. 4: Typ. turn-on /-off energy = f (R_G)

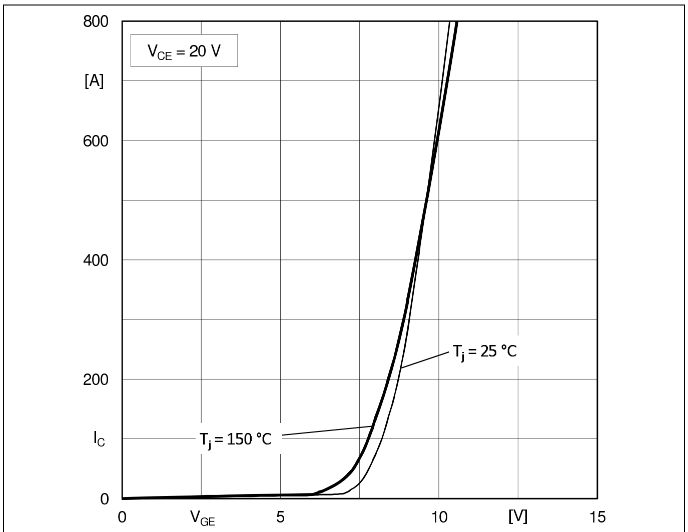


Fig. 5: Typ. transfer characteristic

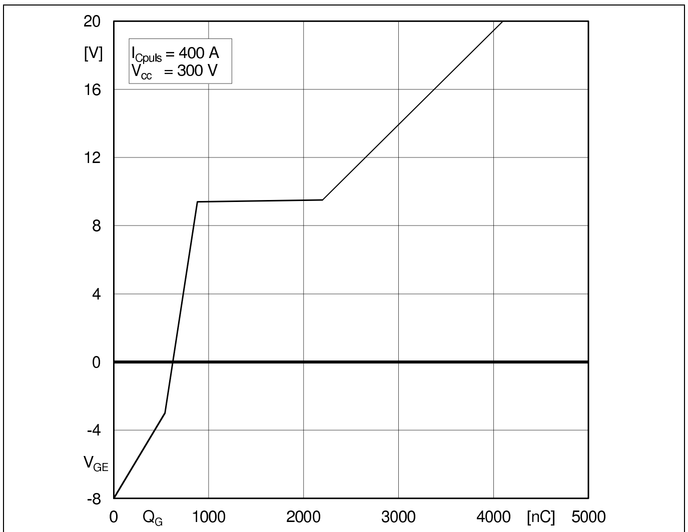


Fig. 6: Typ. gate charge characteristic

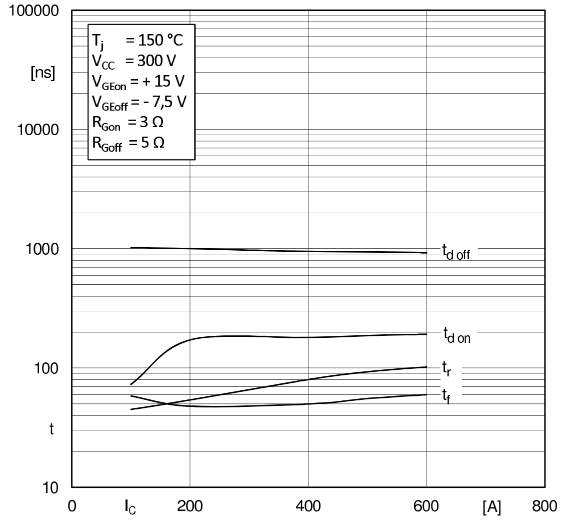


Fig. 7: Typ. switching times vs. I_C

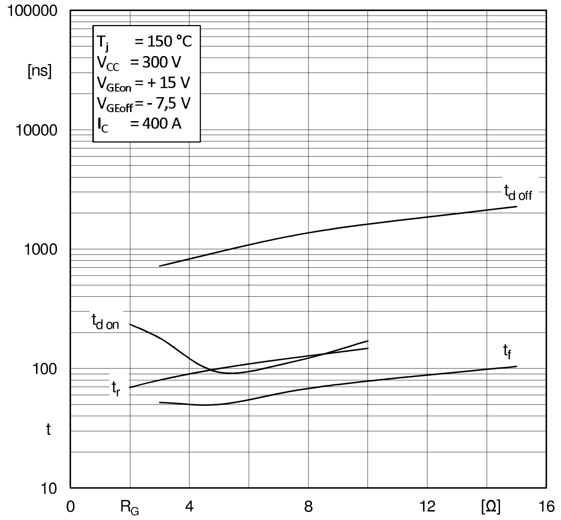


Fig. 8: Typ. switching times vs. gate resistor R_G

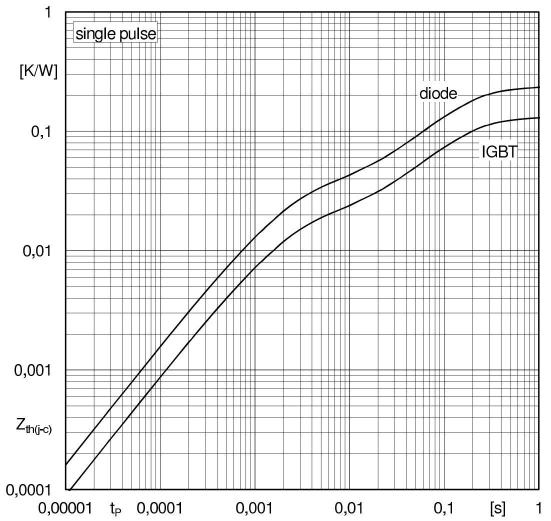


Fig. 9: Typ. transient thermal impedance

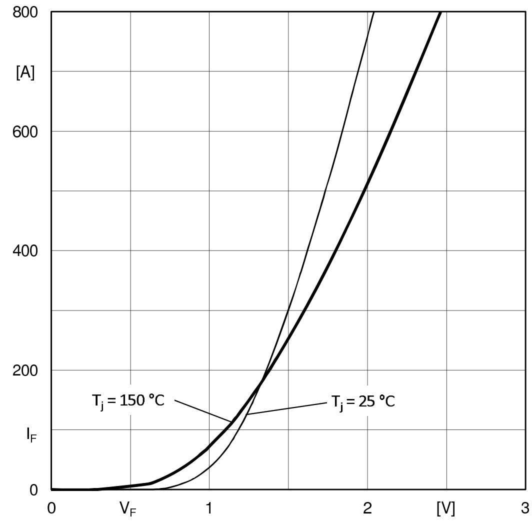


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

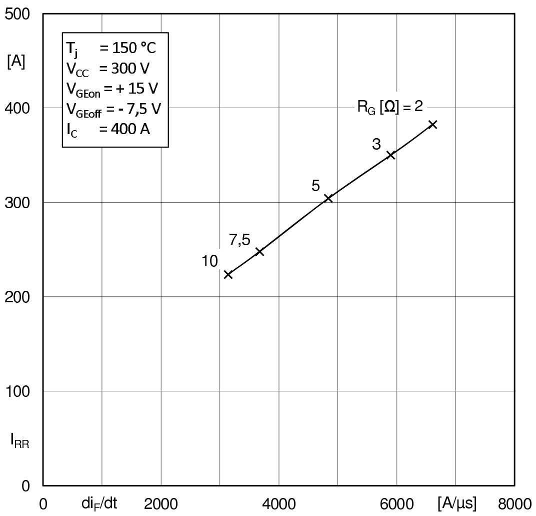


Fig. 11: Typ. CAL diode peak reverse recovery current

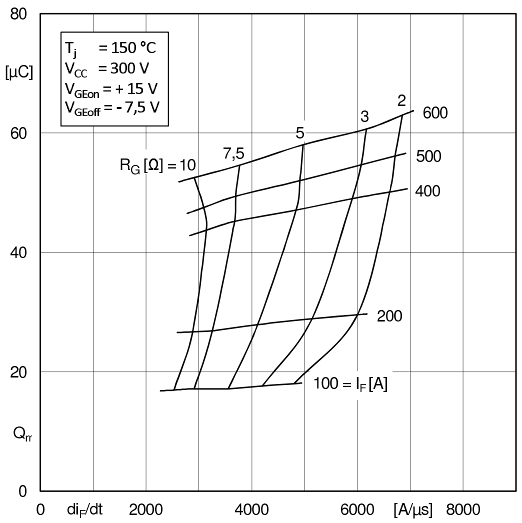
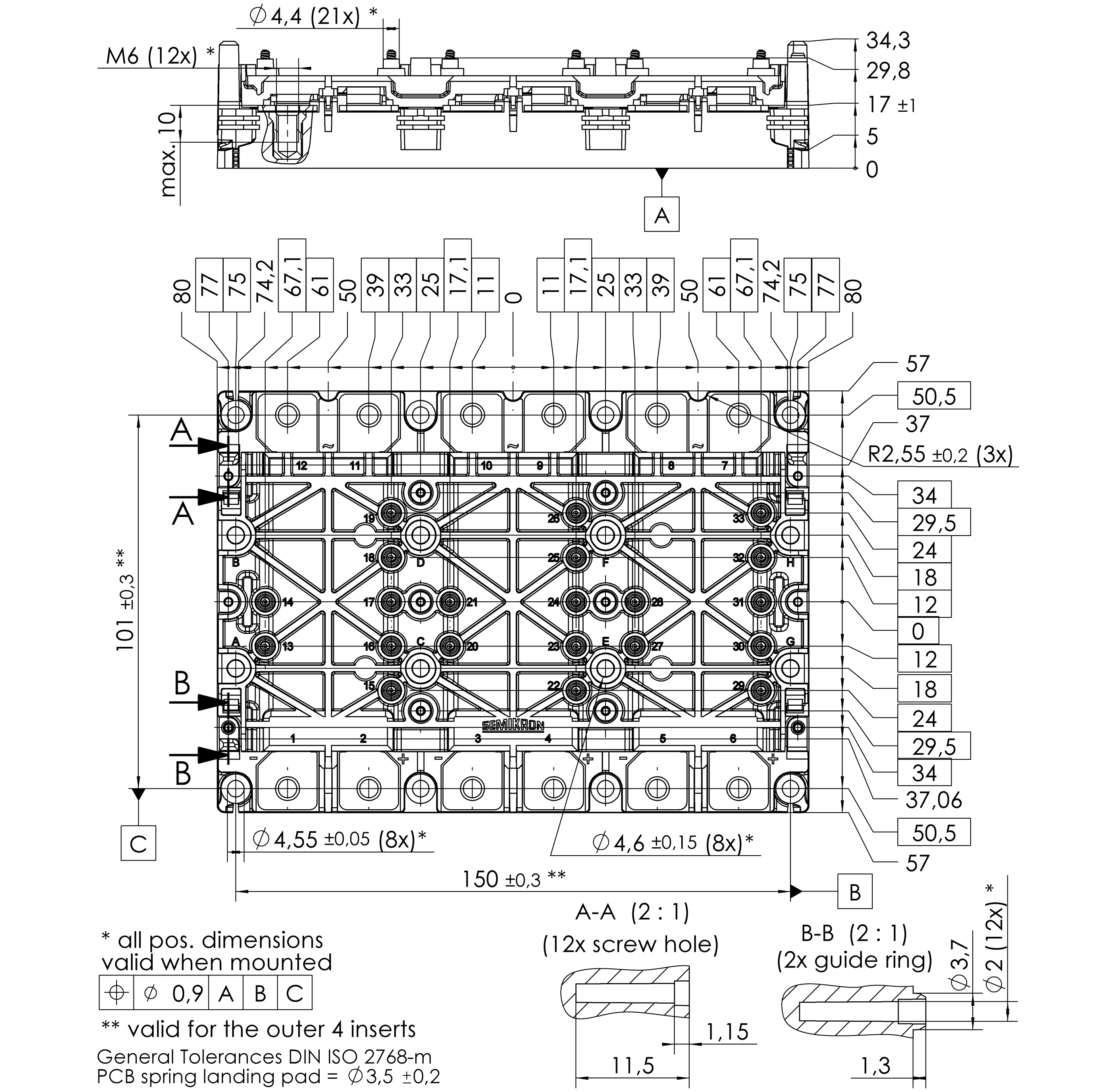


Fig. 12: Typ. CAL diode recovery charge



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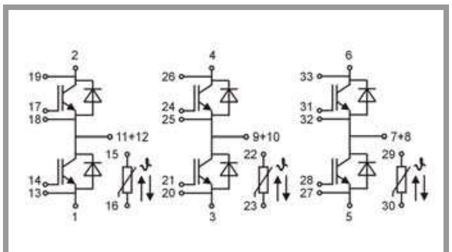

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX