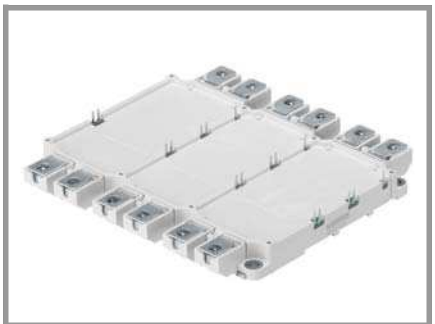
SEMiX223GD12E4c



SEMiX® 33c

Trench IGBT Modules

SEMiX223GD12E4c

Features

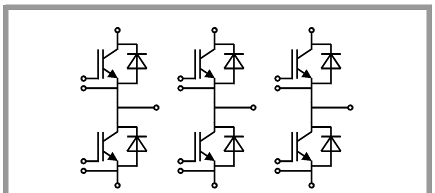
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperature limited to T_C=125°C max.
- Product reliability results are valid for T_j=150°C



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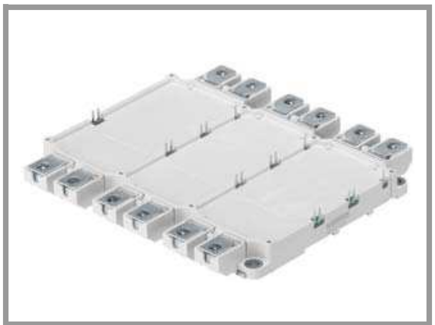
Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_c = 25 °C	333	A
		T_c = 80 °C	256	A
I_{Cnom}			225	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		675	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 20 V V_{CES} ≤ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
I_F	T_j = 175 °C	T_c = 25 °C	270	A
		T_c = 80 °C	202	A
I_{Fnom}			225	A
I_{FRM}	I_{FRM} = 3xI_{Fnom}		675	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		1161	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C		600	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50Hz, t = 1 min		4000	V

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
IGBT						
$V_{CE(sat)}$	I_C = 225 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.3	2.45	V
V_{CE0}	chiplevel	T_j = 25 °C		0.8	0.9	V
		T_j = 150 °C		0.7	0.8	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		4.7	5.3	mΩ
		T_j = 150 °C		6.9	7.3	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 9 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1200 V	T_j = 25 °C			3.0	mA
		T_j = 150 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		13.2		nF
C_{oes}		f = 1 MHz		0.87		nF
C_{res}		f = 1 MHz		0.71		nF
Q_G	V_{GE} = - 8 V...+ 15 V			1275		nC
R_{Gint}	T_j = 25 °C			3.33		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 225 A V_{GE} = ±15 V $R_{G on}$ = 1.5 Ω $R_{G off}$ = 1.5 Ω di/dt_{on} = 3630 A/µs di/dt_{off} = 2235 A/µs	T_j = 150 °C		213		ns
t_r		T_j = 150 °C		60		ns
E_{on}		T_j = 150 °C		22		mJ
$t_{d(off)}$		T_j = 150 °C		535		ns
t_f		T_j = 150 °C		113		ns
E_{off}		T_j = 150 °C		31.4		mJ
$R_{th(j-c)}$	per IGBT				0.135	K/W



SEMiX® 33c

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SEMiX223GD12E4c

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Remarks

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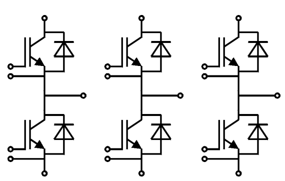
- Product reliability results are valid for T_j=150°C

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse diode						
$V_F = V_{EC}$	I_F = 225 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.2	2.49	V
		T_j = 150 °C		2.1	2.4	V
V_{F0}	chiplevel	T_j = 25 °C	1.1	1.3	1.5	V
		T_j = 150 °C	0.7	0.9	1.1	V
r_F	chiplevel	T_j = 25 °C	3.6	3.9	4.4	mΩ
		T_j = 150 °C	4.7	5.4	5.9	mΩ
I_{RRM}	I_F = 225 A di/dt_{off} = 3900 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		210		A
Q_{rr}		T_j = 150 °C		37		µC
E_{rr}		T_j = 150 °C		17.2		mJ
$R_{th(j-c)}$	per diode				0.22	K/W
Module						
L_{CE}				20		nH
$R_{CC'+EE'}$	res., terminal-chip	T_C = 25 °C		0.7		mΩ
		T_C = 125 °C		1		mΩ
$R_{th(c-s)}$	per module			0.014		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t		to terminals (M6)	2.5		5	Nm
						Nm
w					900	g
Temperature Sensor						
R_{100}	T_c=100°C (R_{25}=5 kΩ)			493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K



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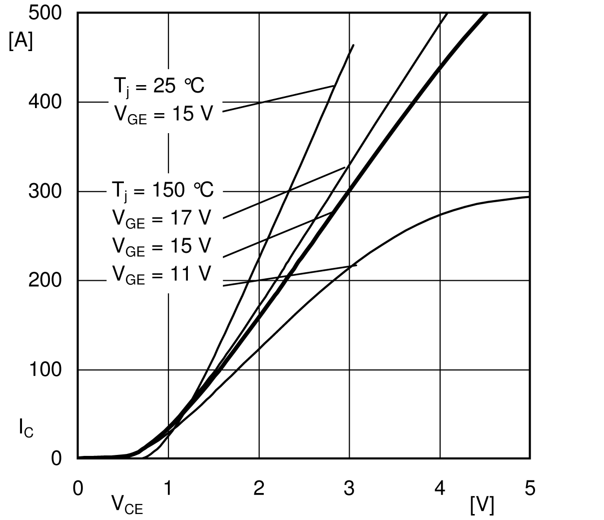

Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

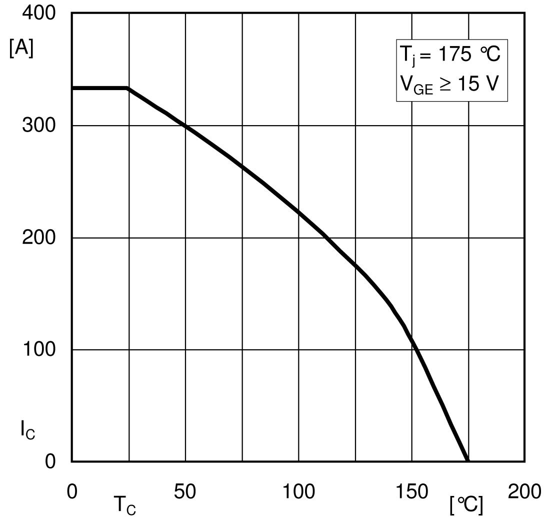

Fig. 2: Rated current vs. temperature $I_C = f (T_C)$

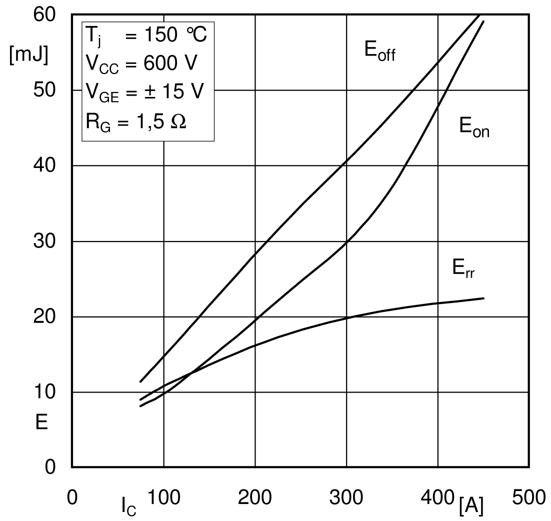

Fig. 3: Typ. turn-on /-off energy = f (I_C)

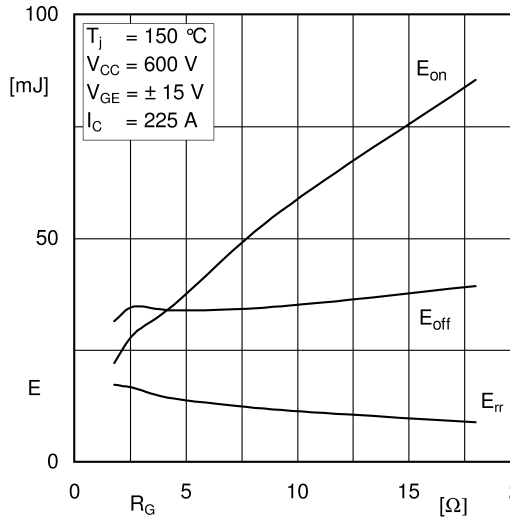

Fig. 4: Typ. turn-on /-off energy = f (R_G)

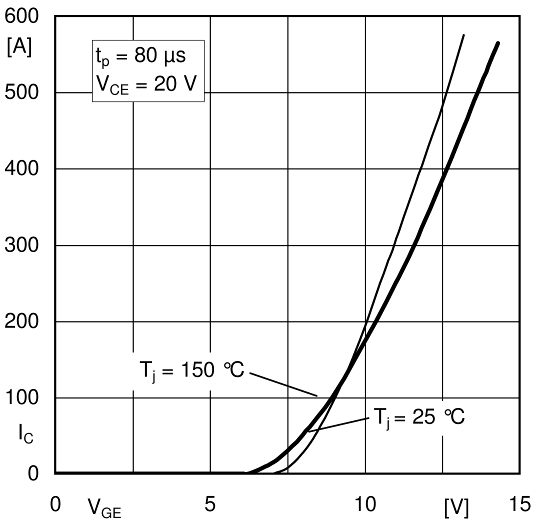

Fig. 5: Typ. transfer characteristic

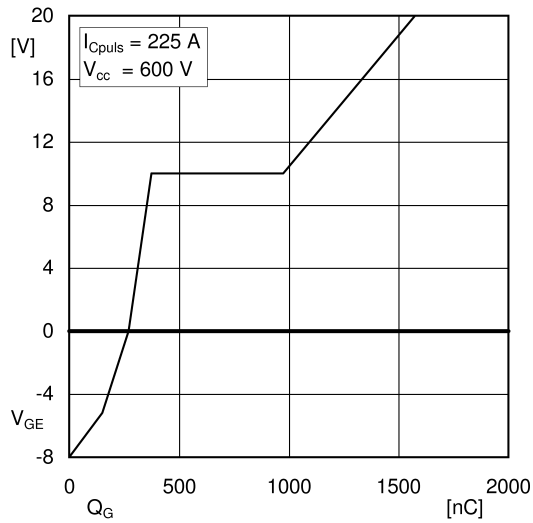

Fig. 6: Typ. gate charge characteristic

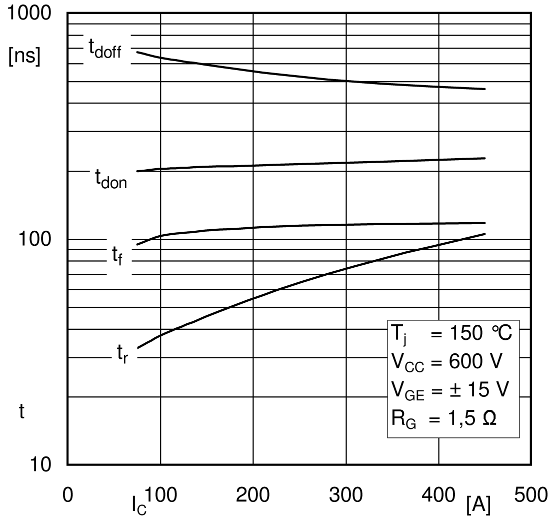

Fig. 7: Typ. switching times vs. I_C

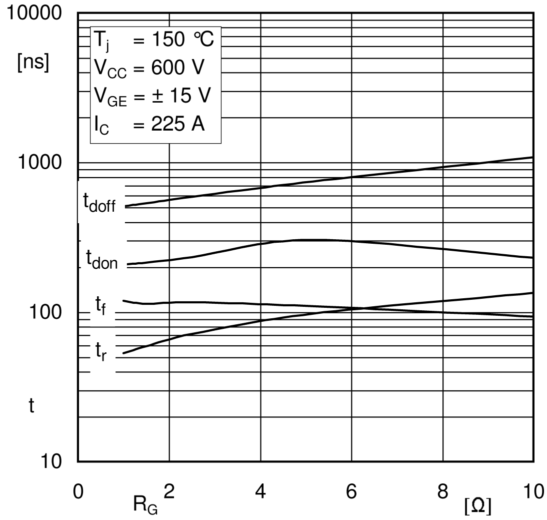

Fig. 8: Typ. switching times vs. gate resistor R_G

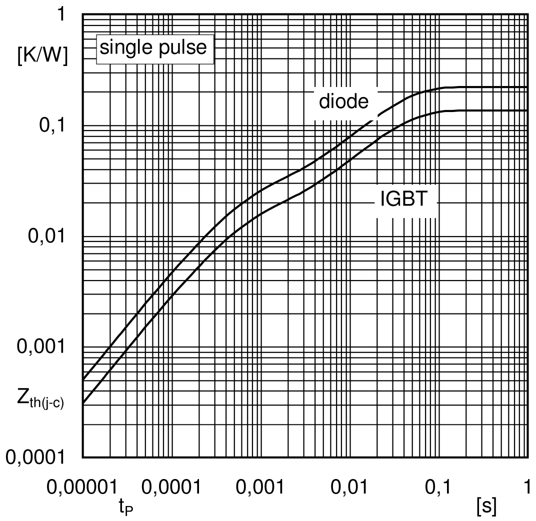

Fig. 9: Typ. transient thermal impedance

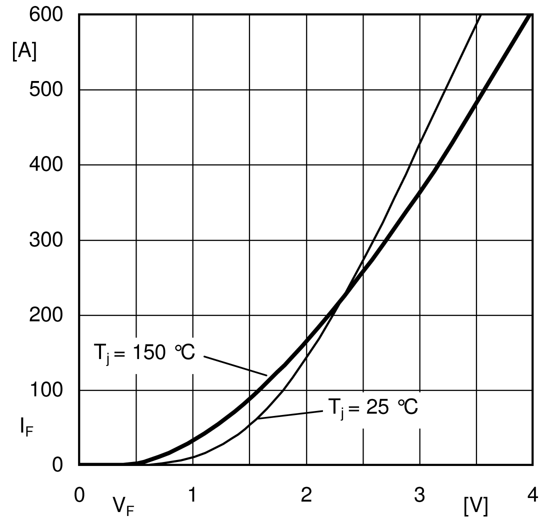

Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+ EE'}$

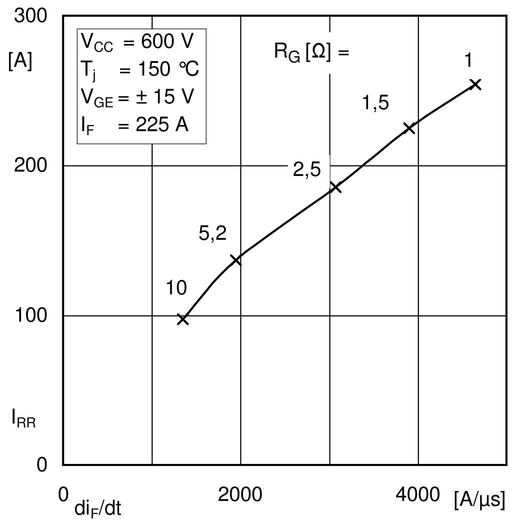

Fig. 11: Typ. CAL diode peak reverse recovery current

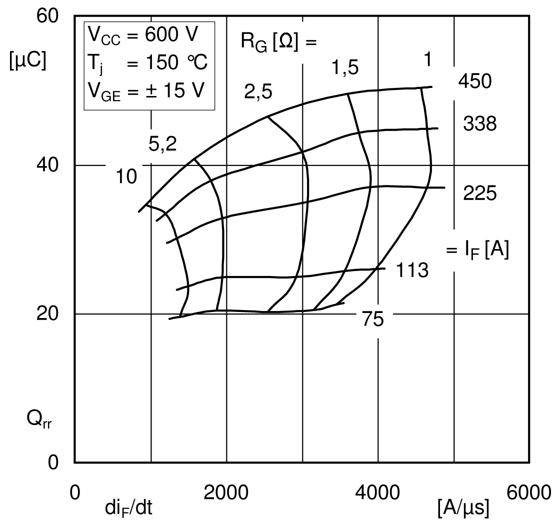

Fig. 12: Typ. CAL diode recovery charge

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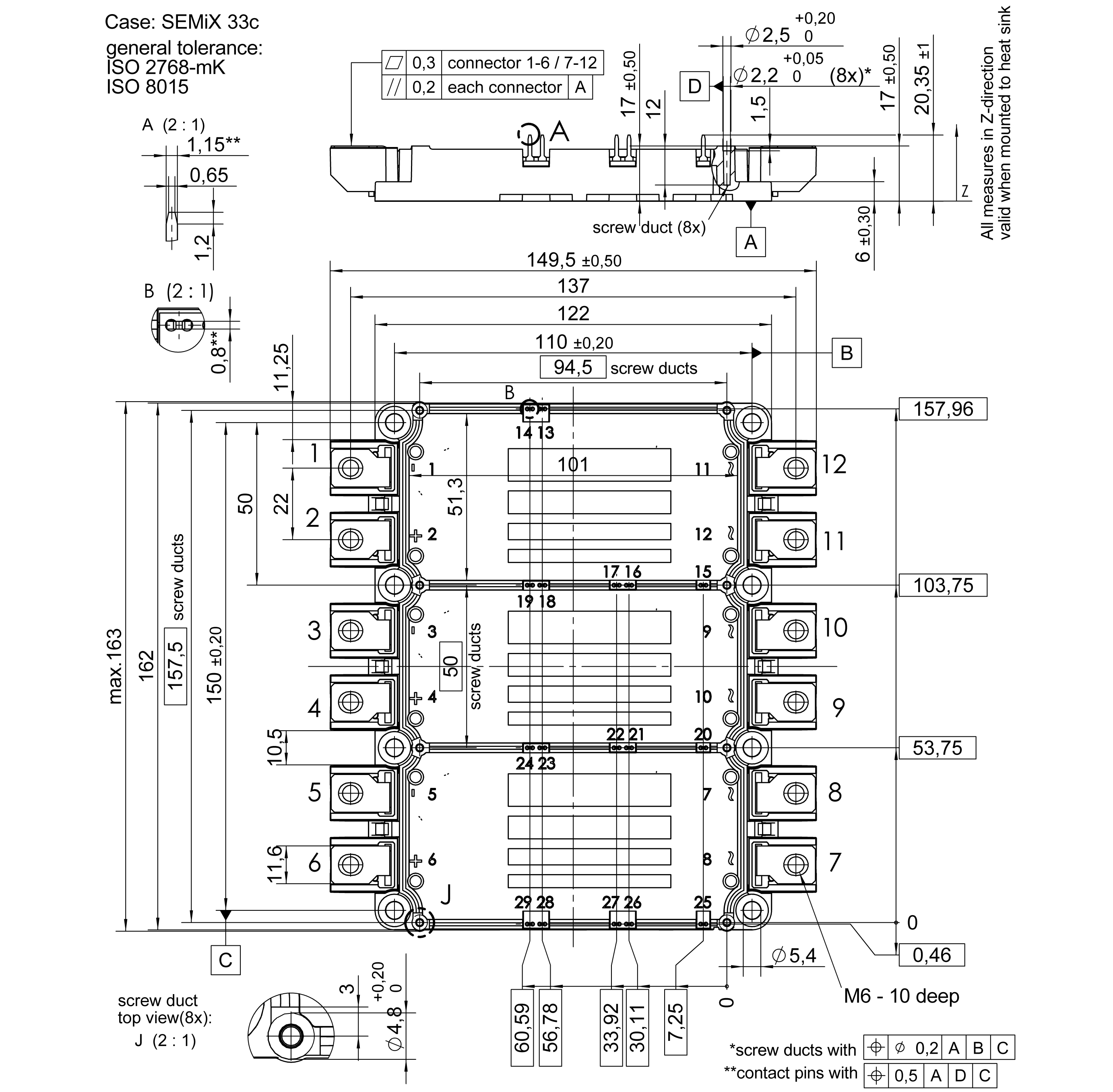

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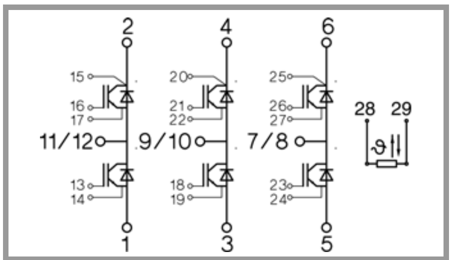

pinout

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

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