SEMiX453GAL17E4s

SEMiX® 3s

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Features

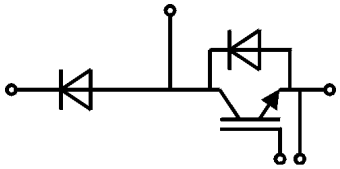
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognized, file no. E63532

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
- Dynamic values apply to the following combination of resistors:
  $R_{Gon,main}$ = 2,4 Ω
  $R_{Goff,main}$ = 2,4 Ω
  $R_{G,X}$ = 2,2 Ω
  $R_{E,X}$ = 0,5 Ω



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1700	V
I_C	T_j = 175 °C	T_c = 25 °C	762	A
		T_c = 80 °C	579	A
I_{Cnom}			450	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		1350	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 1000 V V_{GE} ≤ 15 V V_{CES} ≤ 1700 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1700	V
I_F	T_j = 175 °C	T_c = 25 °C	482	A
		T_c = 80 °C	354	A
I_{Fnom}			450	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		900	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2565	A
T_j			-40 ... 175	°C
Freewheeling diode				
V_{RRM}	T_j = 25 °C		1700	V
I_F		T_c = 25 °C	482	A
		T_c = 80 °C	354	A
I_{Fnom}			450	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		900	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		2565	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			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 = 450 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.90	2.20	V
		T_j = 150 °C		2.26	2.45	V
V_{CE0}	chiplevel	T_j = 25 °C		1.1	1.2	V
		T_j = 150 °C		1	1.1	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		1.8	2.2	mΩ
		T_j = 150 °C		2.8	3	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 18 mA		5.2	5.8	6.4	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1700 V	T_j = 25 °C			5	mA
						mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		36		nF
C_{oes}		f = 1 MHz		1.50		nF
C_{res}		f = 1 MHz		1.14		nF
Q_G	V_{GE} = - 8 V...+ 15 V			3600		nC
R_{Gint}	T_j = 25 °C			1.67		Ω

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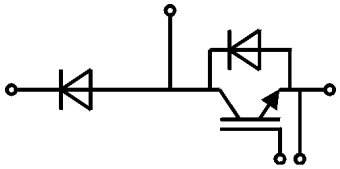

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$t_{d(on)}$	V_{CC} = 1200 V I_C = 450 A V_{GE} = +15/-15 V $R_{G\ on}$ = 3.3 Ω $R_{G\ off}$ = 3.3 Ω di/dt$_{on}$ = 7000 A/µs di/dt$_{off}$ = 2220 A/µs du/dt = 5160 V/µs L_s = 30 nH	T_j = 150 °C		455		ns
t_r		T_j = 150 °C		65		ns
E_{on}		T_j = 150 °C		250		mJ
$t_{d(off)}$		T_j = 150 °C		960		ns
t_f		T_j = 150 °C		170		ns
E_{off}		T_j = 150 °C		190		mJ
$t_{d(on)}$	V_{CC} = 900 V I_C = 450 A V_{GE} = +15/-15 V $R_{G\ on}$ = 3.3 Ω $R_{G\ off}$ = 3.3 Ω di/dt$_{on}$ = 4000 A/µs di/dt$_{off}$ = 2050 A/µs du/dt = 4600 V/µs L_s = 80 nH	T_j = 150 °C		490		ns
t_r		T_j = 150 °C		120		ns
E_{on}		T_j = 150 °C		118		mJ
$t_{d(off)}$		T_j = 150 °C		900		ns
t_f		T_j = 150 °C		200		ns
E_{off}		T_j = 150 °C		154		mJ
$R_{th(j-c)}$	per IGBT				0.056	K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 450 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.98	2.37	V
		T_j = 150 °C		2.11	2.52	V
V_{F0}	chiplevel	T_j = 25 °C	1.16	1.32	1.56	V
		T_j = 150 °C		1.08	1.22	V
r_F	chiplevel	T_j = 25 °C	1.2	1.5	1.8	mΩ
		T_j = 150 °C		2.3	2.9	mΩ
I_{RRM}	I_F = 450 A di/dt$_{off}$ = 6240 A/µs V_{GE} = -15 V V_R = 1200 V	T_j = 150 °C		440		A
Q_{rr}		T_j = 150 °C		150		µC
E_{rr}		T_j = 150 °C		100		mJ
I_{RRM}	I_F = 450 A di/dt$_{off}$ = 3700 A/µs V_{GE} = -15 V V_R = 900 V	T_j = 150 °C		400		A
Q_{rr}		T_j = 150 °C		150		µC
E_{rr}		T_j = 150 °C		87		mJ
$R_{th(j-c)}$	per diode				0.125	K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 450 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.98	2.37	V
		T_j = 150 °C		2.11	2.52	V
V_{F0}	chiplevel	T_j = 25 °C	1.16	1.32	1.56	V
		T_j = 150 °C		1.08	1.22	V
r_F	chiplevel	T_j = 25 °C	1.2	1.5	1.8	mΩ
		T_j = 150 °C		2.3	2.9	mΩ
I_{RRM}	I_F = 450 A di/dt$_{off}$ = 6240 A/µs V_{GE} = -15 V V_R = 1200 V	T_j = 150 °C		440		A
Q_{rr}		T_j = 150 °C		150		µC
E_{rr}		T_j = 150 °C		100		mJ
I_{RRM}	I_F = 450 A di/dt$_{off}$ = 3700 A/µs V_{GE} = -15 V V_R = 900 V	T_j = 150 °C		400		A
Q_{rr}		T_j = 150 °C		150		µC
E_{rr}		T_j = 150 °C		87		mJ
$R_{th(j-c)}$	per diode				0.125	K/W

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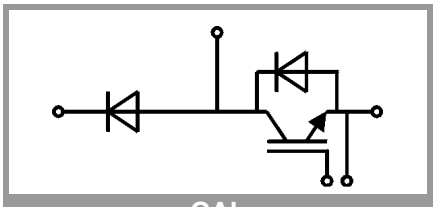
  $R_{E,X}$ = 0,5 Ω

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Module						
L_{CE}				20		nH
$R_{CC'+EE'}$	res. terminal-chip	T_C = 25 °C		0.85		mΩ
		T_C = 150 °C		1.2		mΩ
$R_{th(c-s)}$	per module			0.04		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t		to terminals (M6)	2.5		5	Nm
						Nm
w					300	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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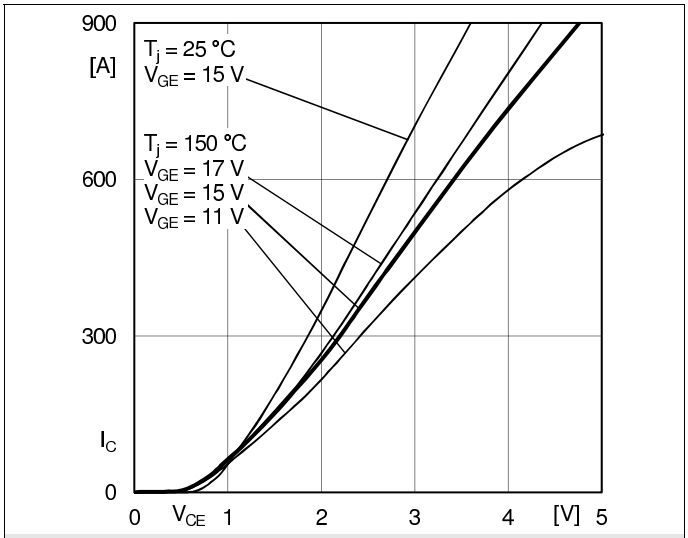


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

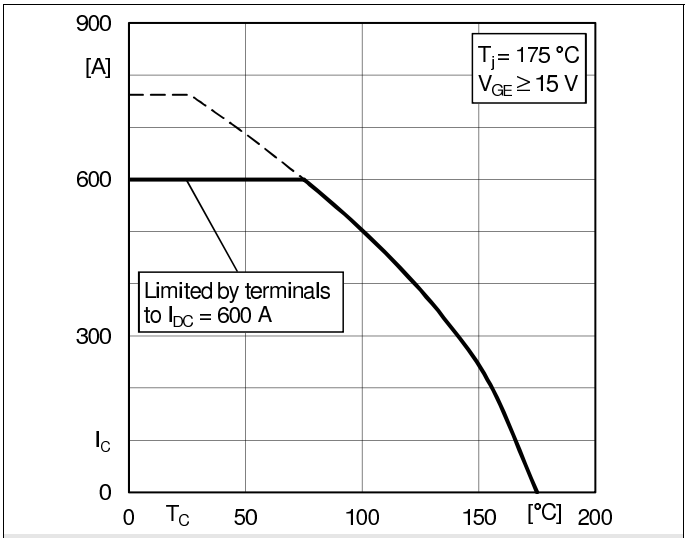


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

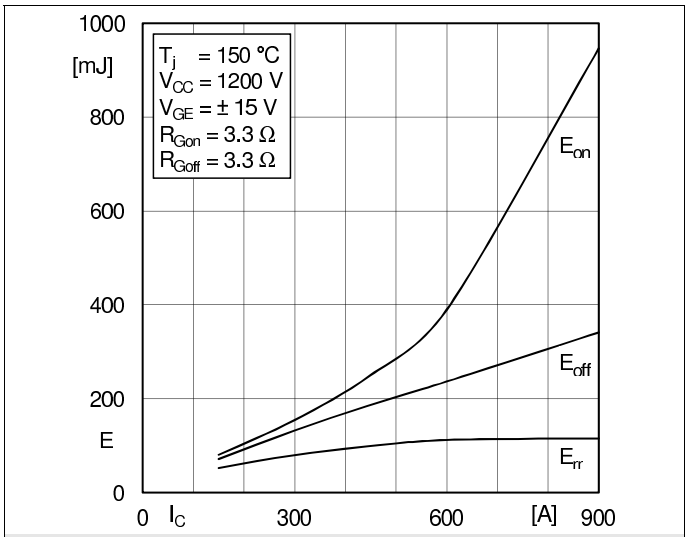


Fig. 3: Typ. turn-on /-off energy = f (I_C)

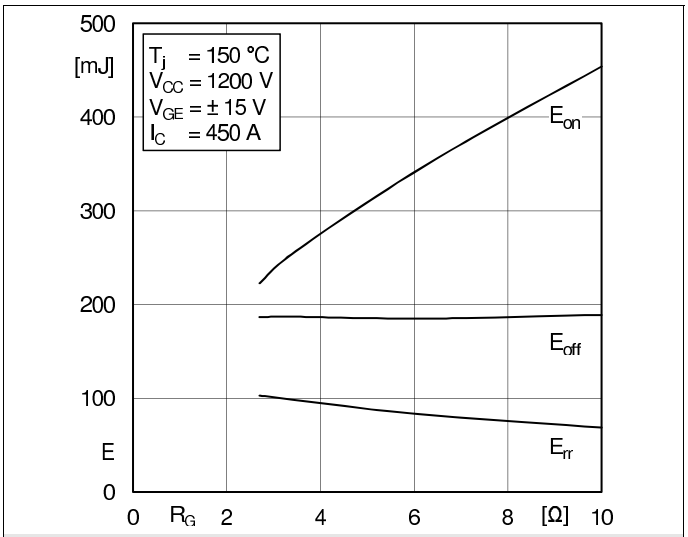


Fig. 4: Typ. turn-on /-off energy = f (R_G)

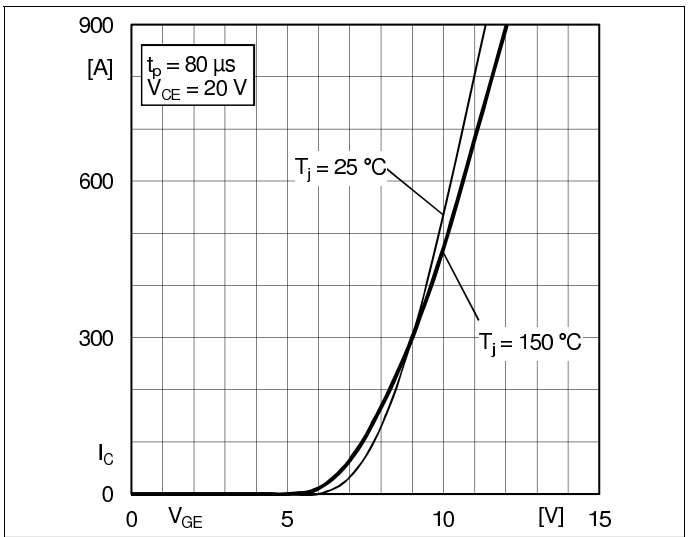


Fig. 5: Typ. transfer characteristic

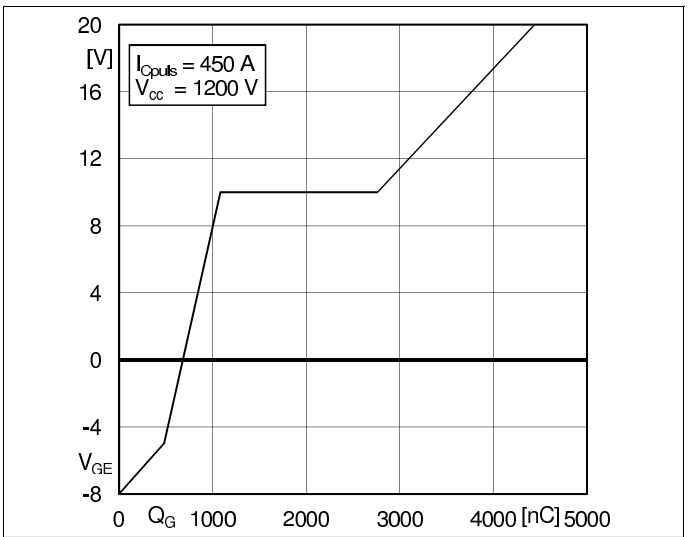


Fig. 6: Typ. gate charge characteristic

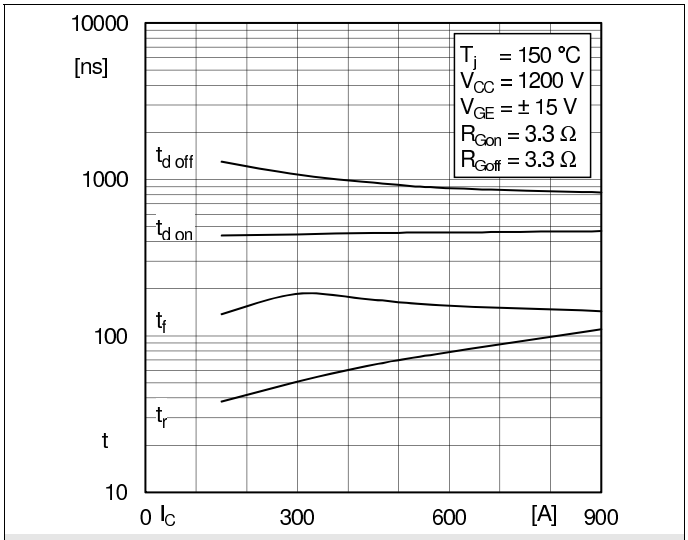


Fig. 7: Typ. switching times vs. I_C

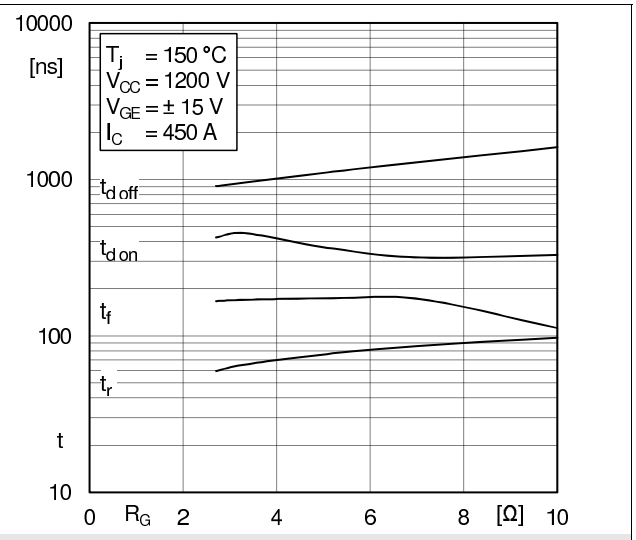


Fig. 8: Typ. switching times vs. gate resistor R_G

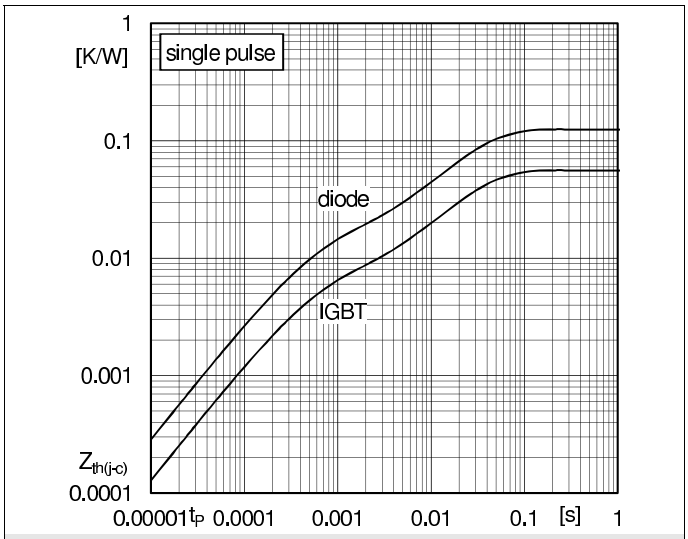


Fig. 9: Typ. transient thermal impedance

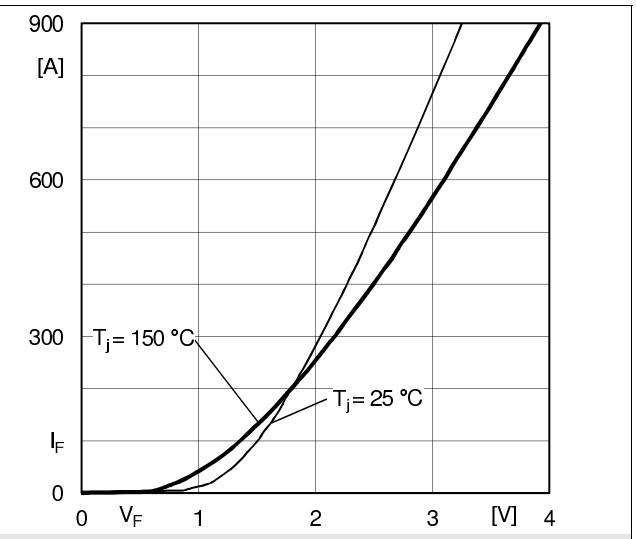


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

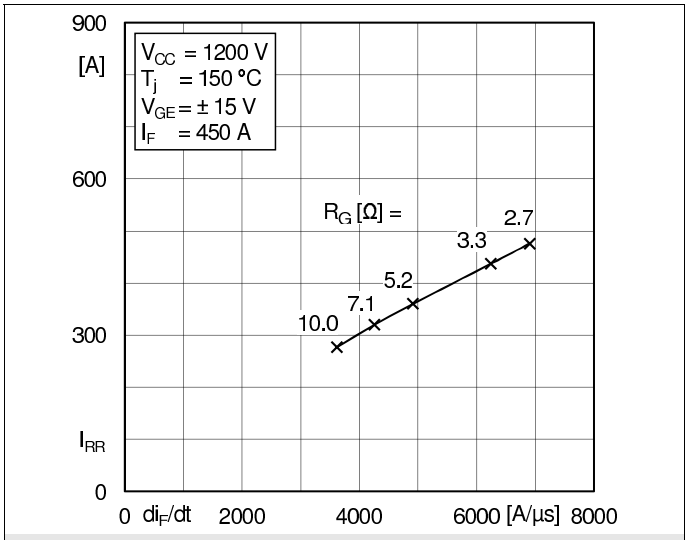


Fig. 11: Typ. CAL diode peak reverse recovery current

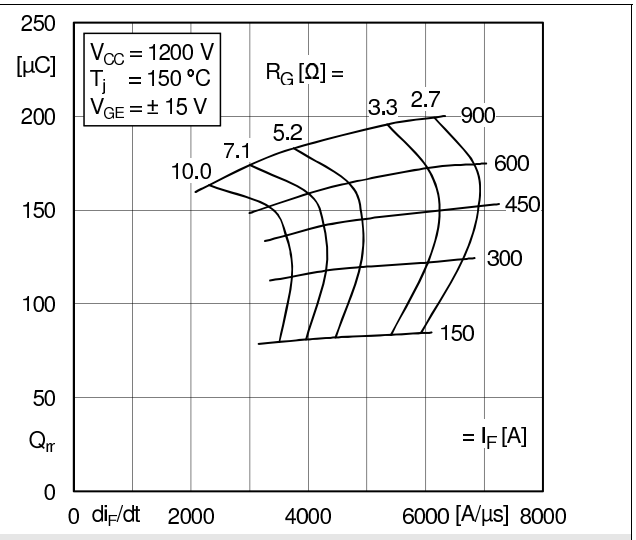
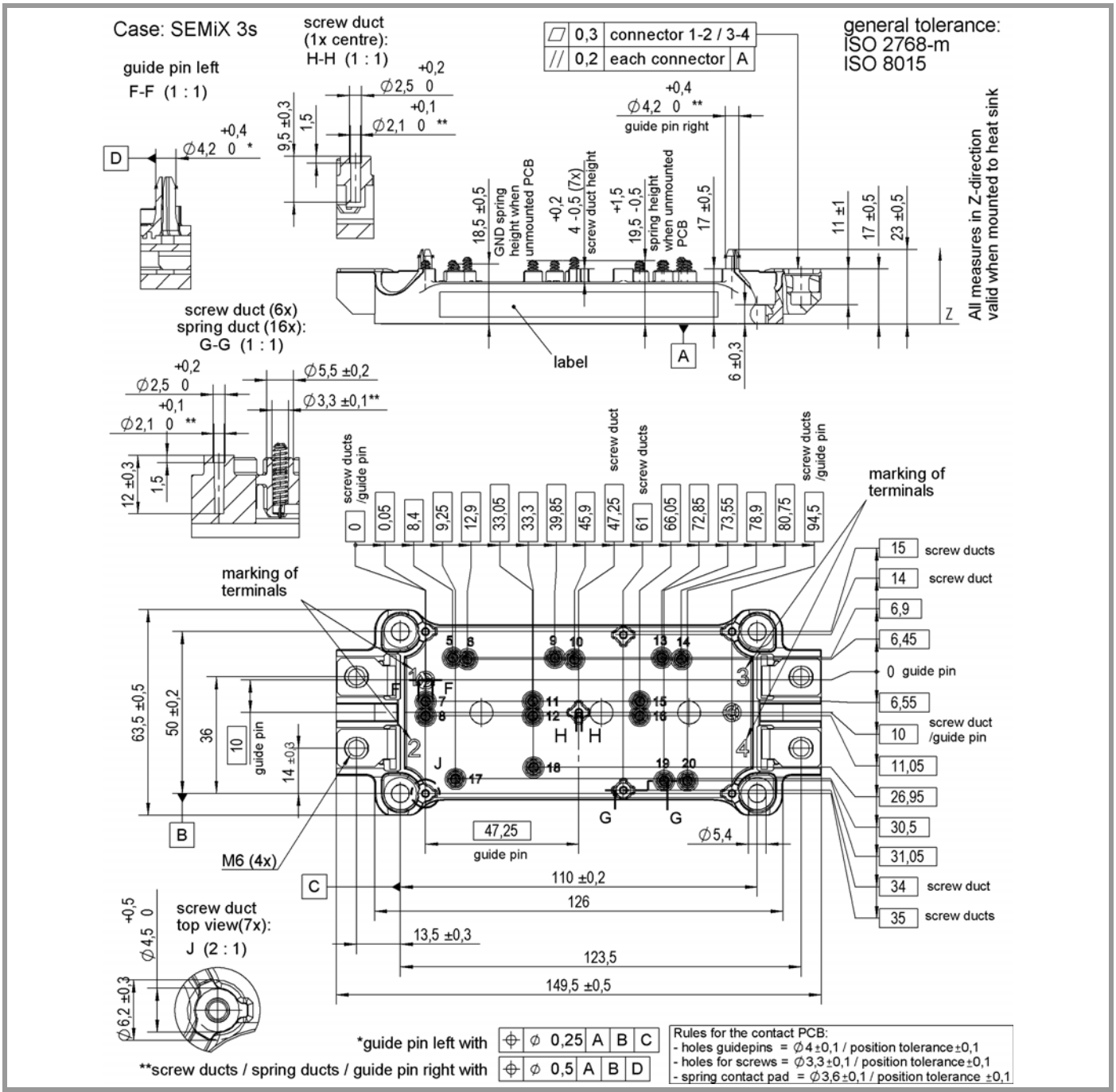


Fig. 12: Typ. CAL diode recovery charge



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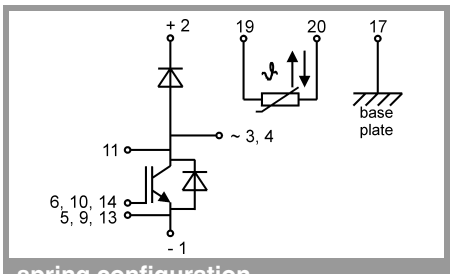

spring configuration

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

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.