

SEMiX604GB17E4s



SEMiX® 4s

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Features

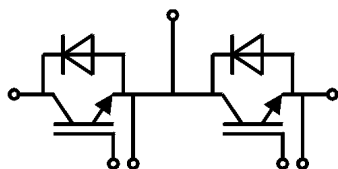
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognized, file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperature limited to $T_C=125^{\circ}\text{C}$ max.
- Product reliability results are valid for $T_J=150^{\circ}\text{C}$
- Dynamic values apply to the following combination of resistors:
 $R_{Gon,main} = 1,3/0,3 \Omega$ ($V_{cc}=1200\text{V}/900\text{V}$)
 $R_{Goff,main} = 1,3/0,3 \Omega$ ($V_{cc}=1200\text{V}/900\text{V}$)
 $R_{G,X} = 2,2 \Omega$
 $R_{E,X} = 0,5 \Omega$



GB

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
IGBT			
V_{CES}	$T_J = 25^{\circ}\text{C}$	1700	V
I_C	$T_J = 175^{\circ}\text{C}$	$T_C = 25^{\circ}\text{C}$	1015
		$T_C = 80^{\circ}\text{C}$	772
I_{Cnom}		600	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	1800	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 1000 \text{ V}$ $V_{GE} \leq 15 \text{ V}$ $V_{CES} \leq 1700 \text{ V}$	$T_J = 150^{\circ}\text{C}$	10
T_J		-40 ... 175	$^{\circ}\text{C}$
Inverse diode			
V_{RRM}	$T_J = 25^{\circ}\text{C}$	1700	V
I_F	$T_J = 175^{\circ}\text{C}$	$T_C = 25^{\circ}\text{C}$	629
		$T_C = 80^{\circ}\text{C}$	463
I_{Fnom}		600	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	1200	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^{\circ}, T_J = 25^{\circ}\text{C}$	3420	A
T_J		-40 ... 175	$^{\circ}\text{C}$
Module			
$I_{t(RMS)}$		600	A
T_{stg}		-40 ... 125	$^{\circ}\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1 \text{ min}$	4000	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 600 \text{ A}$ $V_{GE} = 15 \text{ V}$ chiplevel		$T_J = 25^{\circ}\text{C}$	1.90	2.20
			$T_J = 150^{\circ}\text{C}$	2.26	2.45
V_{CE0}	chiplevel		$T_J = 25^{\circ}\text{C}$	1.1	1.2
			$T_J = 150^{\circ}\text{C}$	1	1.1
r_{CE}	$V_{GE} = 15 \text{ V}$ chiplevel		$T_J = 25^{\circ}\text{C}$	1.3	1.7
			$T_J = 150^{\circ}\text{C}$	2.1	2.3
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 24 \text{ mA}$	5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0 \text{ V}$ $V_{CE} = 1700 \text{ V}$		$T_J = 25^{\circ}\text{C}$		5
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$		$f = 1 \text{ MHz}$	48	nF
C_{oes}			$f = 1 \text{ MHz}$	2.00	nF
C_{res}			$f = 1 \text{ MHz}$	1.52	nF
Q_G	$V_{GE} = -8 \text{ V...} +15 \text{ V}$		4800		nC
R_{Gint}	$T_J = 25^{\circ}\text{C}$		1.25		Ω
$t_{d(on)}$	$V_{CC} = 1200 \text{ V}$ $I_C = 600 \text{ A}$		$T_J = 150^{\circ}\text{C}$	390	ns
t_r	$V_{GE} = +15/-15 \text{ V}$		$T_J = 150^{\circ}\text{C}$	60	ns
E_{on}	$R_{Gon} = 2 \Omega$		$T_J = 150^{\circ}\text{C}$	255	mJ
$t_{d(off)}$	$R_{Goff} = 2 \Omega$		$T_J = 150^{\circ}\text{C}$	920	ns
t_f	$di/dt_{on} = 9930 \text{ A}/\mu\text{s}$ $di/dt_{off} = 2750 \text{ A}/\mu\text{s}$		$T_J = 150^{\circ}\text{C}$	180	ns
E_{off}	$du/dt = 5150 \text{ V}/\mu\text{s}$ $L_s = 30 \text{ nH}$		$T_J = 150^{\circ}\text{C}$	255	mJ



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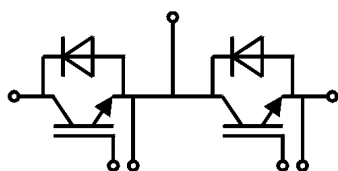
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 $R_{G,X} = 2,2 \Omega$
 $R_{E,X} = 0,5 \Omega$

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 900 \text{ V}$ $T_J = 150^\circ\text{C}$		330		ns
t_r	$I_C = 600 \text{ A}$ $T_J = 150^\circ\text{C}$		90		ns
E_{on}	$V_{GE} = +15/-15 \text{ V}$ $T_J = 150^\circ\text{C}$		49		mJ
$t_{d(off)}$	$R_{G on} = 1 \Omega$ $T_J = 150^\circ\text{C}$		800		ns
t_f	$di/dt_{on} = 6500 \text{ A}/\mu\text{s}$ $T_J = 150^\circ\text{C}$		230		ns
E_{off}	$di/dt_{off} = 2300 \text{ A}/\mu\text{s}$ $du/dt = 4300 \text{ V}/\mu\text{s}$ $L_s = 80 \text{ nH}$ $T_J = 150^\circ\text{C}$		213		mJ
$R_{th(j-c)}$	per IGBT			0.042	K/W

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverse diode					
$V_F = V_{EC}$	$I_F = 600 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel $T_J = 25^\circ\text{C}$		1.98	2.37	V
	$T_J = 150^\circ\text{C}$		2.11	2.52	V
V_{F0}	chipelevel $T_J = 25^\circ\text{C}$	1.16	1.32	1.56	V
	$T_J = 150^\circ\text{C}$		1.08	1.22	V
r_F	chipelevel $T_J = 25^\circ\text{C}$	0.9	1.1	1.3	m Ω
	$T_J = 150^\circ\text{C}$		1.7	2.2	m Ω
I_{RRM}	$I_F = 600 \text{ A}$ $di/dt_{off} = 7700 \text{ A}/\mu\text{s}$ $T_J = 150^\circ\text{C}$		560		A
Q_{rr}	$V_{GE} = -15 \text{ V}$ $T_J = 150^\circ\text{C}$		210		μC
E_{rr}	$V_R = 1200 \text{ V}$ $T_J = 150^\circ\text{C}$		150		mJ
I_{RRM}	$I_F = 600 \text{ A}$ $T_J = 150^\circ\text{C}$		660		A
Q_{rr}	$di/dt_{off} = 6100 \text{ A}/\mu\text{s}$ $T_J = 150^\circ\text{C}$		208		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_R = 900 \text{ V}$ $T_J = 150^\circ\text{C}$		155		mJ
$R_{th(j-c)}$	per diode			0.095	K/W
Module					
L_{CE}			22		nH
$R_{CC'+EE'}$	res. terminal-chip $T_C = 25^\circ\text{C}$		0.95		m Ω
	$T_C = 125^\circ\text{C}$		1.4		m Ω
$R_{th(c-s)}$	per module		0.03		K/W
M_s	to heat sink (M5)	3		5	Nm
M_t	to terminals (M6)	2.5		5	Nm
					Nm
w				400	g
Temperature Sensor					
R_{100}	$T_C=100^\circ\text{C}$ ($R_{25}=5 \text{ k}\Omega$)		493 $\pm$ 5%		Ω
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; $T[K]$;		3550 $\pm$ 2%		K



GB

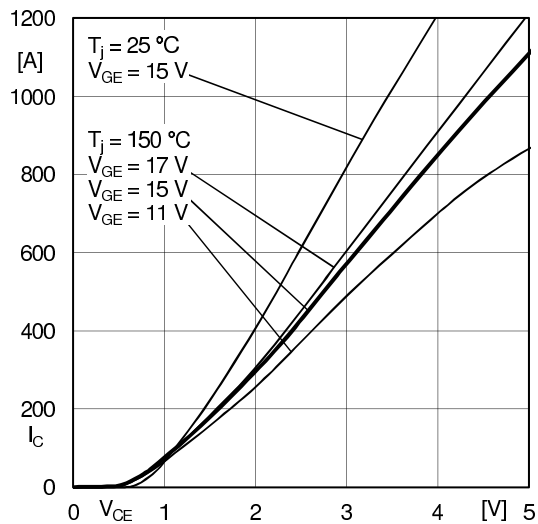


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

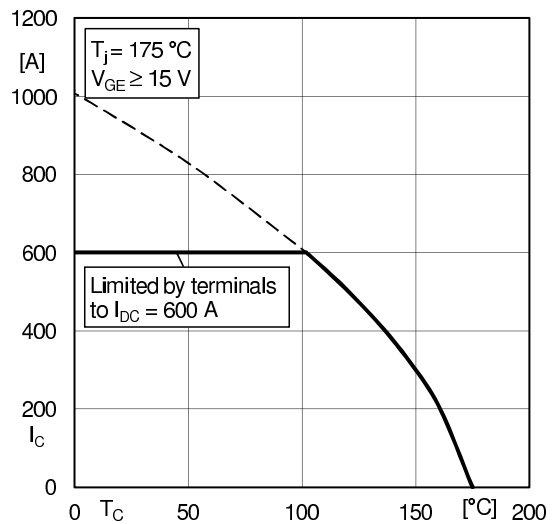


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

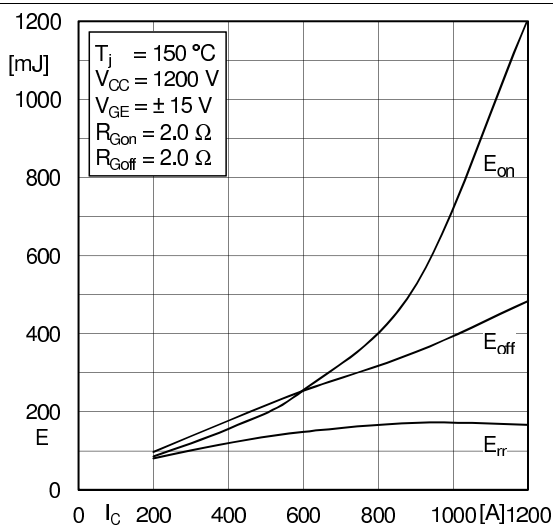


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

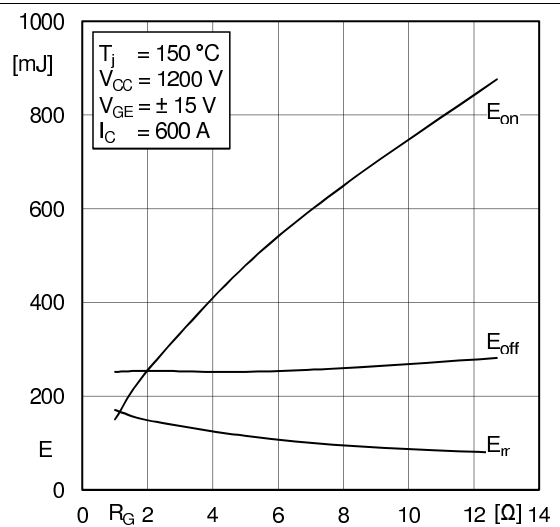


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

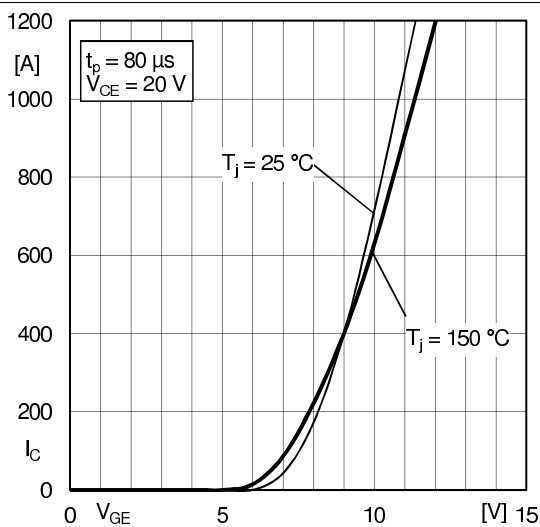


Fig. 5: Typ. transfer characteristic

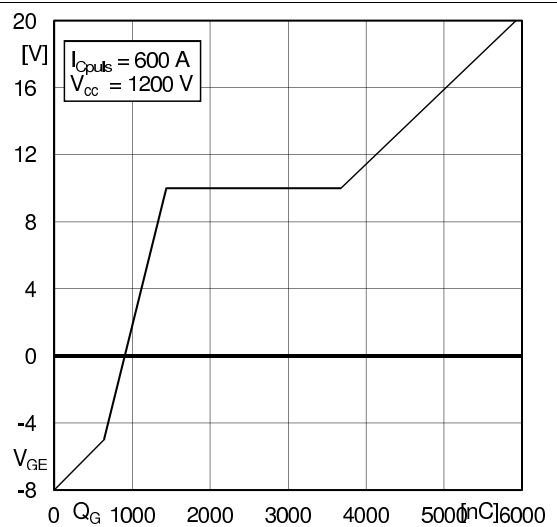


Fig. 6: Typ. gate charge characteristic

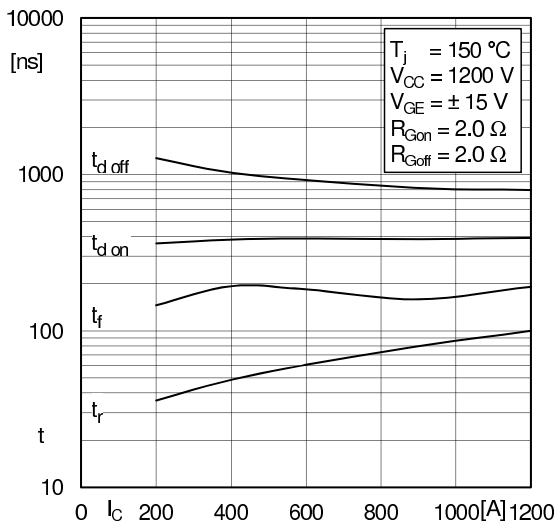


Fig. 7: Typ. switching times vs. I_C

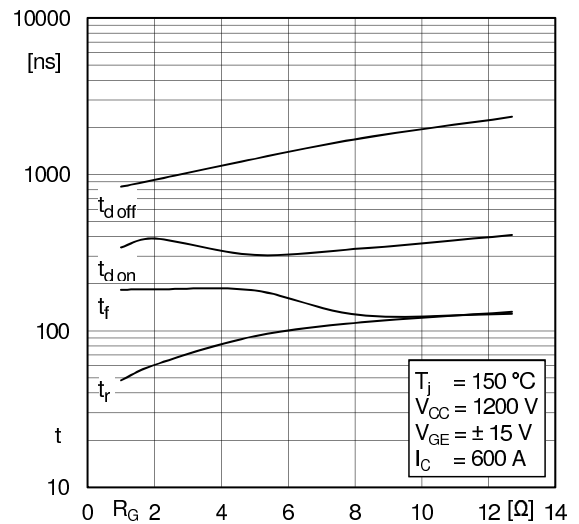


Fig. 8: Typ. switching times vs. gate resistor R_G

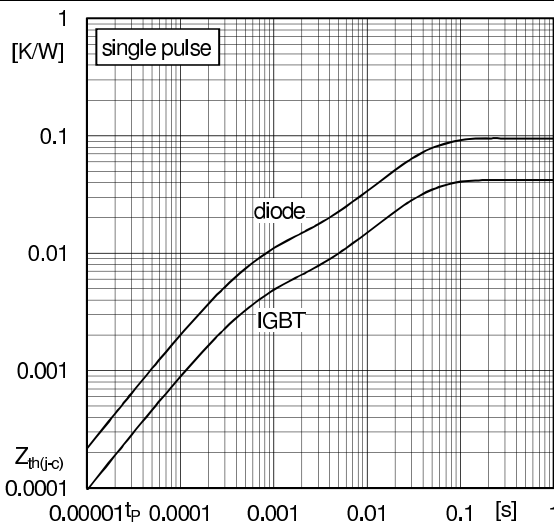


Fig. 9: Typ. transient thermal impedance

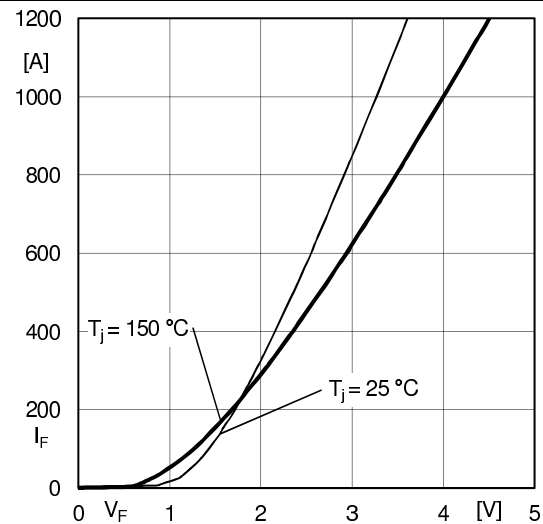


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

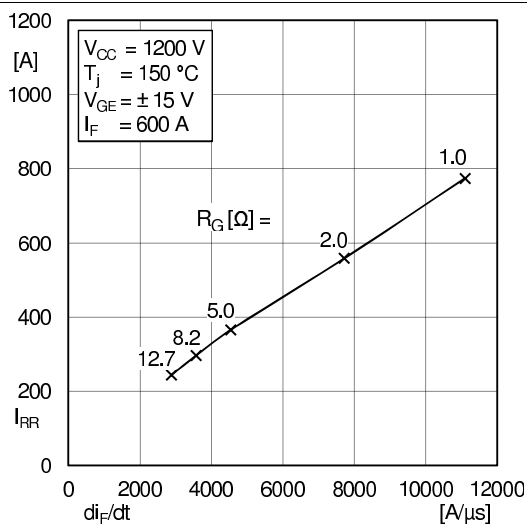


Fig. 11: Typ. CAL diode peak reverse recovery current

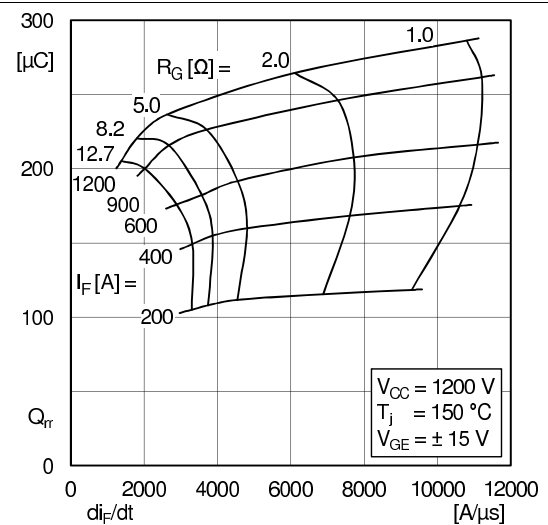
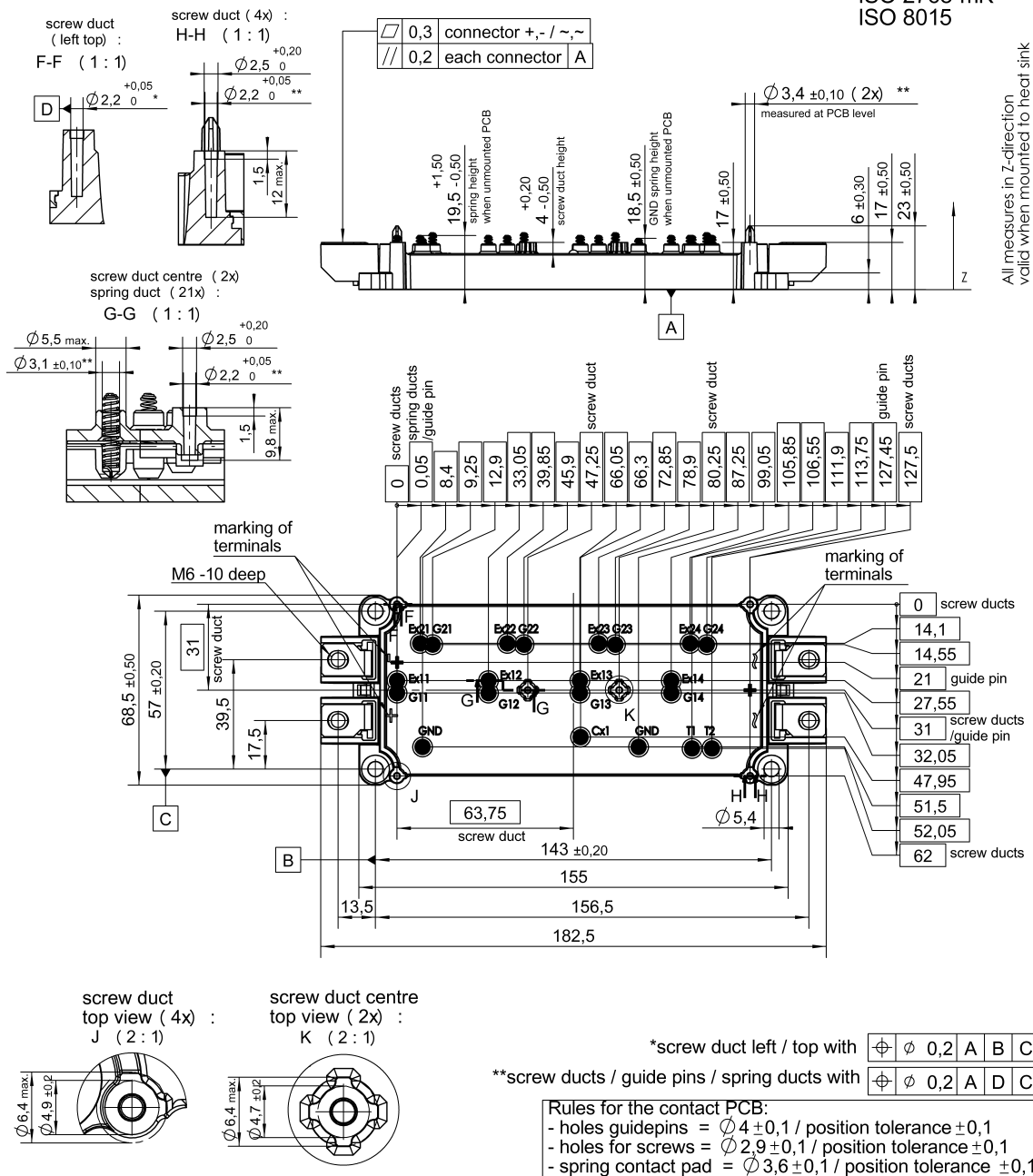


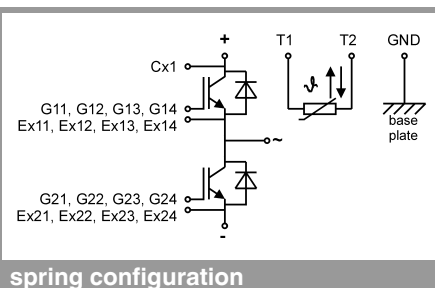
Fig. 12: Typ. CAL diode recovery charge

Case: SEMiX 4s

general tolerance:
ISO 2768-mK
ISO 8015



SEMiX 4s



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.