

SEMiX404GB17E4s



SEMiX® 4s

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Features

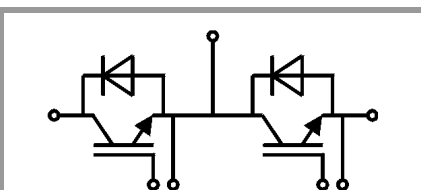
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognized, file no. E63532

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:
 $R_{Gon,main} = 2,35 \Omega$
 $R_{Goff,main} = 2,35 \Omega$
 $R_{G,X} = 2,2 \Omega$
 $R_{E,X} = 0,5 \Omega$



GB

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1700	V	
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	633	A
		$T_c = 80^\circ\text{C}$	490	A
I_{Cnom}		400	A	
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	1200	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	μs
T_j		-40 ... 175	$^\circ\text{C}$	
Inverse diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1700	V	
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	412	A
		$T_c = 80^\circ\text{C}$	303	A
I_{Fnom}		400	A	
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	800	A	
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	2340	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					
$V_{CE(sat)}$	$I_C = 400 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.90	2.20	V
		$T_j = 150^\circ\text{C}$	2.30	2.60	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.8	3.3	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	4	4.5	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 16 \text{ mA}$	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	mA
					mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	36		nF
C_{oes}		$f = 1 \text{ MHz}$	1.36		nF
C_{res}		$f = 1 \text{ MHz}$	1.16		nF
Q_G	$V_{GE} = -8 \text{ V...} + 15 \text{ V}$		3200		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.88		Ω
$t_{d(on)}$	$V_{CC} = 1200 \text{ V}$ $I_C = 400 \text{ A}$	$T_j = 150^\circ\text{C}$	390		ns
t_r	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	55		ns
E_{on}	$R_{Gon} = 3 \Omega$	$T_j = 150^\circ\text{C}$	190		mJ
$t_{d(off)}$	$R_{Goff} = 3 \Omega$	$T_j = 150^\circ\text{C}$	910		ns
t_f	$di/dt_{on} = 7380 \text{ A}/\mu\text{s}$ $di/dt_{off} = 2040 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	170		ns
E_{off}	$du/dt = 4950 \text{ V}/\mu\text{s}$ $L_s = 30 \text{ nH}$	$T_j = 150^\circ\text{C}$	165		mJ

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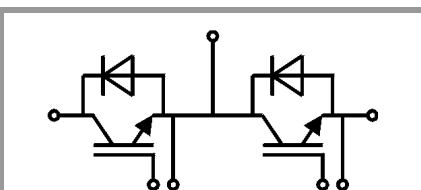
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 900 \text{ V}$	$T_j = 150^\circ\text{C}$		430		ns
t_r	$I_C = 400 \text{ A}$	$T_j = 150^\circ\text{C}$		100		ns
E_{on}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$		90		mJ
$t_{d(off)}$	$R_{G on} = 3 \Omega$	$T_j = 150^\circ\text{C}$		860		ns
t_f	$R_{G off} = 3 \Omega$	$T_j = 150^\circ\text{C}$		200		ns
E_{off}	$di/dt_{on} = 4100 \text{ A}/\mu\text{s}$ $di/dt_{off} = 1700 \text{ A}/\mu\text{s}$ $du/dt = 4100 \text{ V}/\mu\text{s}$ $L_s = 80 \text{ nH}$	$T_j = 150^\circ\text{C}$		136		mJ
$R_{th(j-c)}$	per IGBT				0.062	K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 400 \text{ A}$	$T_j = 25^\circ\text{C}$		2.00	2.40	V
	$V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 150^\circ\text{C}$		2.15	2.57	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	$T_j = 25^\circ\text{C}$	1.4	1.7	2.1	m Ω
		$T_j = 150^\circ\text{C}$		2.7	3.4	m Ω
I_{RRM}	$I_F = 400 \text{ A}$	$T_j = 150^\circ\text{C}$		400		A
Q_{rr}	$di/dt_{off} = 5870 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		140		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_R = 1200 \text{ V}$	$T_j = 150^\circ\text{C}$		97		mJ
I_{RRM}	$I_F = 400 \text{ A}$	$T_j = 150^\circ\text{C}$		360		A
Q_{rr}	$di/dt_{off} = 3600 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		140		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_R = 900 \text{ V}$	$T_j = 150^\circ\text{C}$		85		mJ
$R_{th(j-c)}$	per diode				0.145	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
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; $T[\text{K}]$;			$3550 \pm 2\%$		K



GB

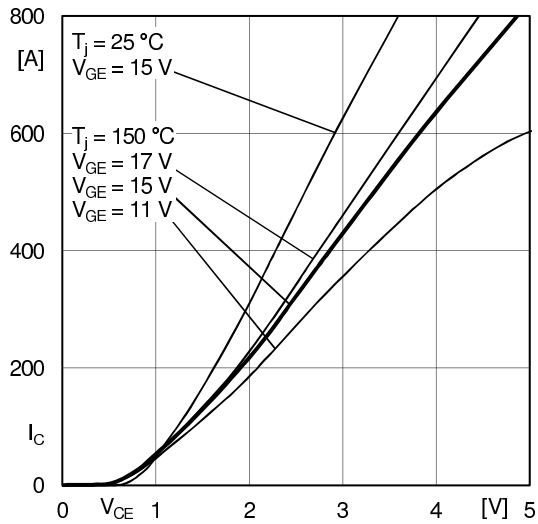


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

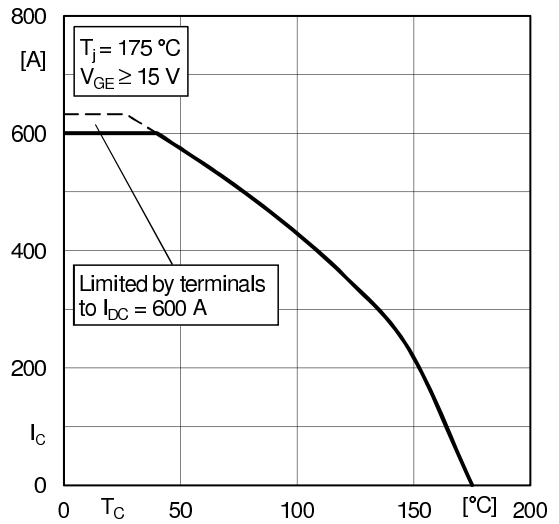


Fig. 2: Rated current vs. temperature $I_c = f(T_C)$

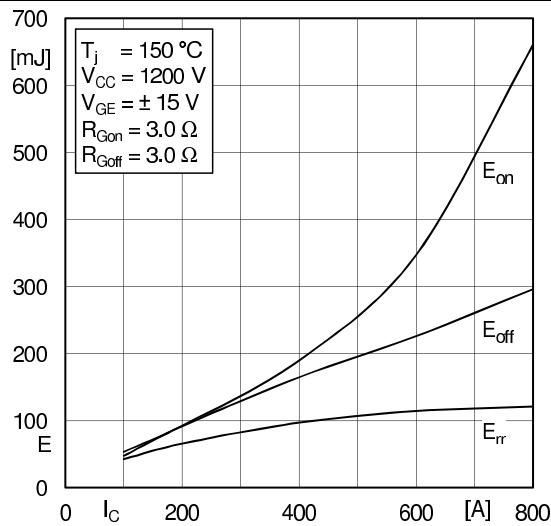


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

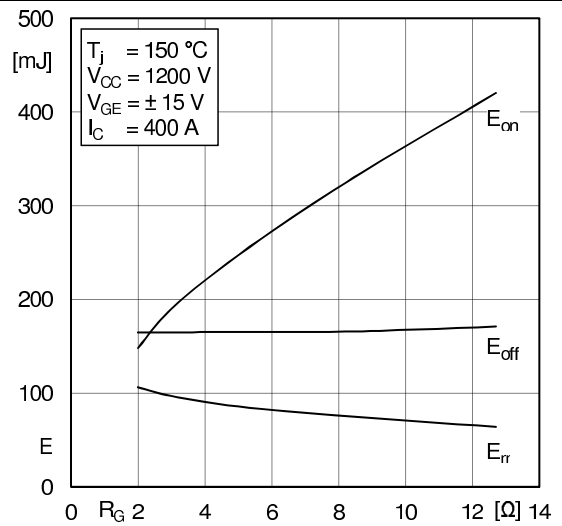


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

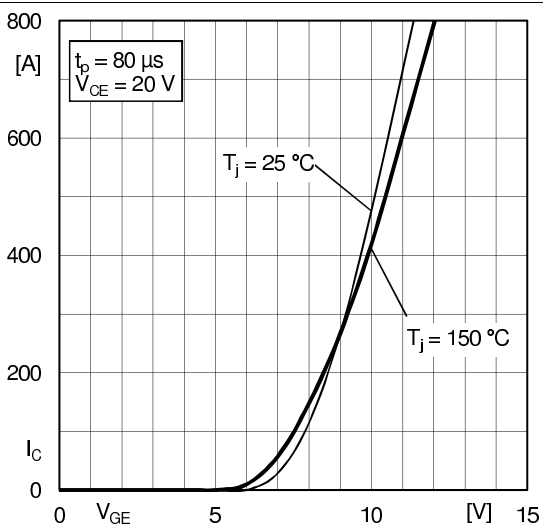


Fig. 5: Typ. transfer characteristic

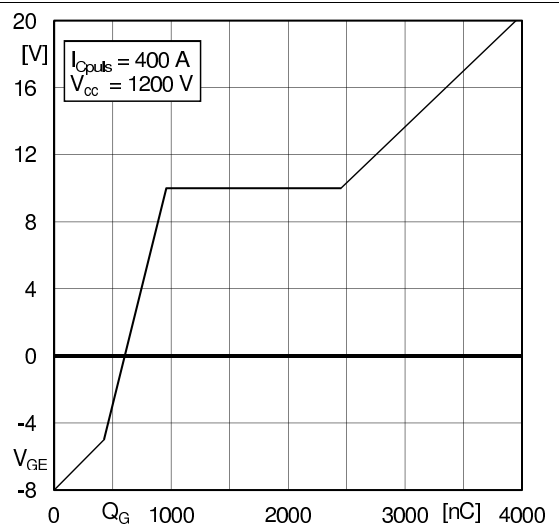


Fig. 6: Typ. gate charge characteristic

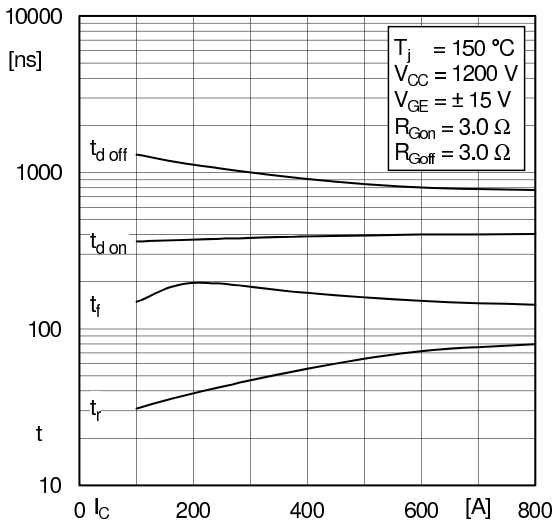


Fig. 7: Typ. switching times vs. I_C

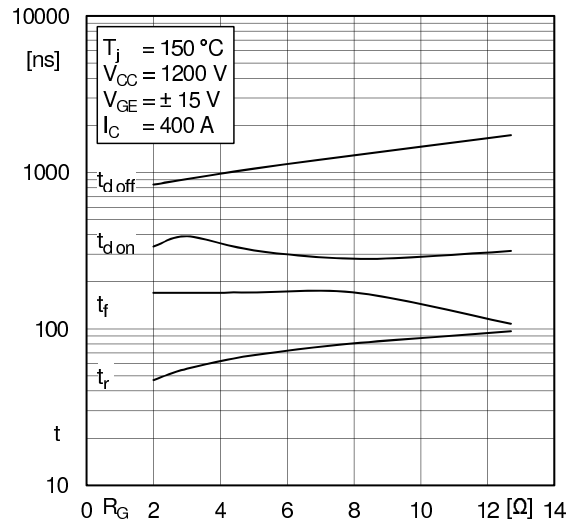


Fig. 8: Typ. switching times vs. gate resistor R_G

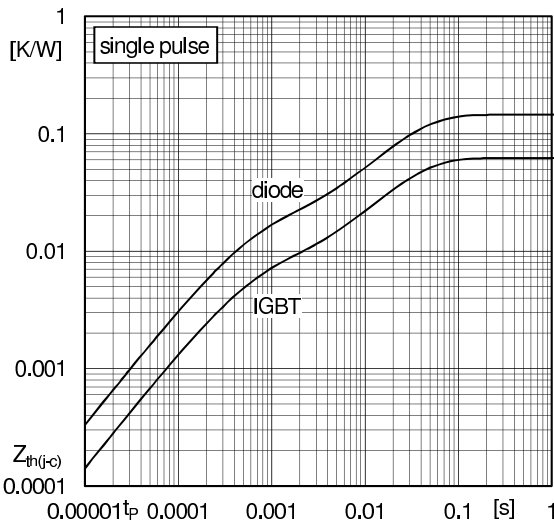


Fig. 9: Typ. transient thermal impedance

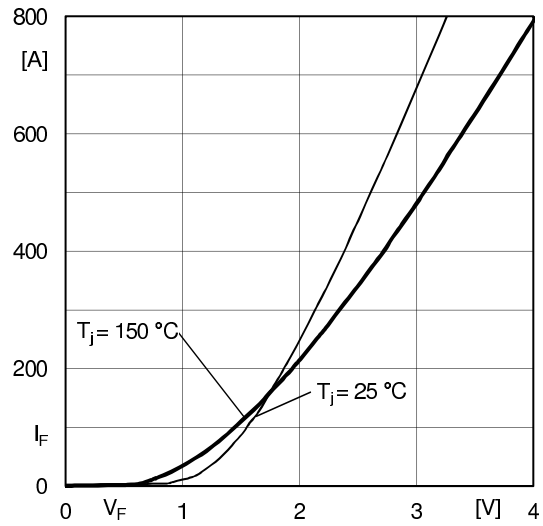


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

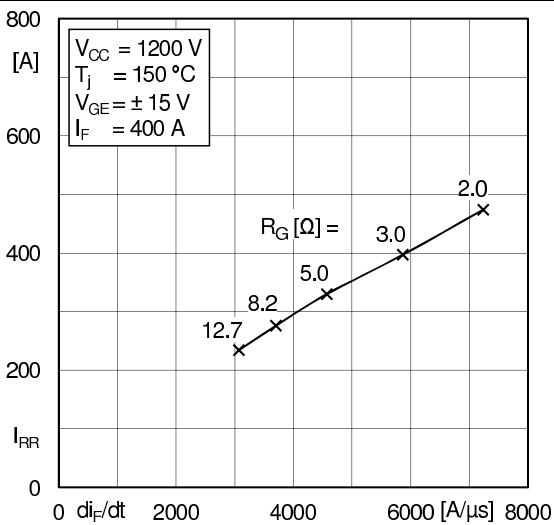


Fig. 11: Typ. CAL diode peak reverse recovery current

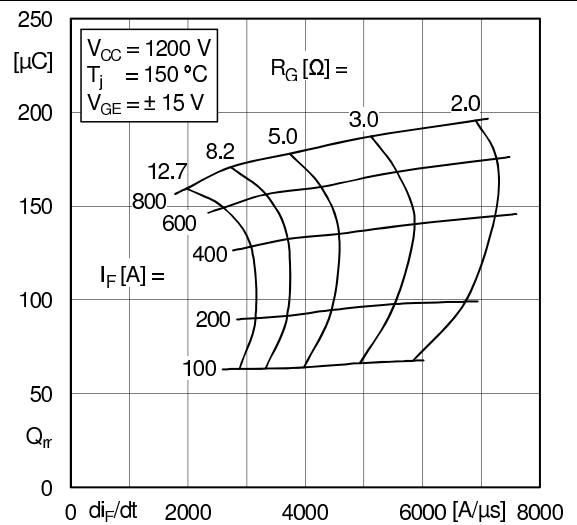
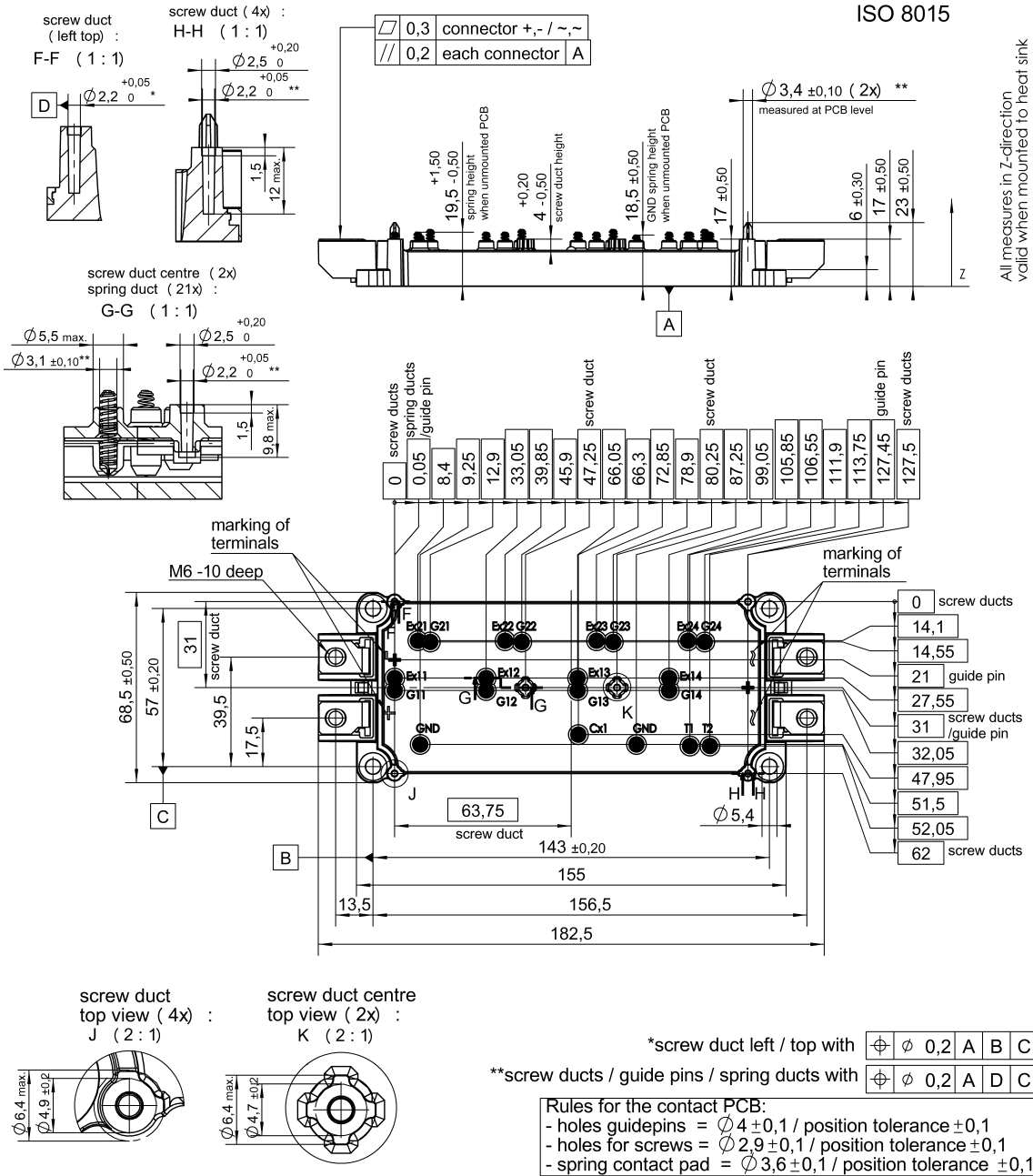


Fig. 12: Typ. CAL diode recovery charge

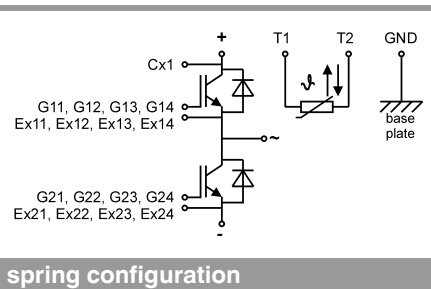
SEMiX404GB17E4s

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.