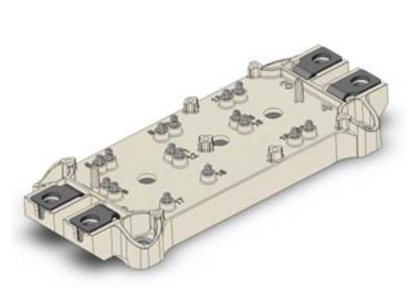


SEMiX® 3s

Trench IGBT Modules

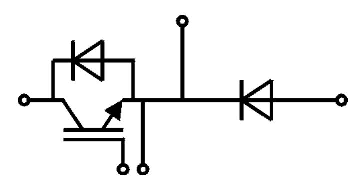
SEMiX653GAR176HDs

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders



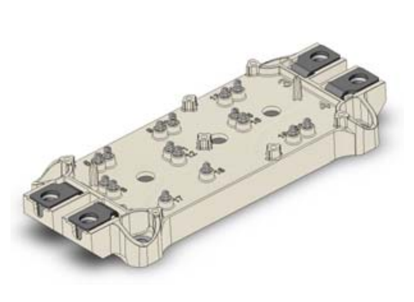
GAR

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			1700	V
I_C	T_j = 150 °C	T_c = 25 °C	619	A
		T_c = 80 °C	438	A
I_{Cnom}			450	A
I_{CRM}	$I_{CRM} = 2xI_{Cnom}$		900	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 1000 V $V_{GE} \leq$ 20 V $V_{CES} \leq$ 1700 V	T_j = 125 °C	10	µs
T_j			-55 ... 150	°C
Inverse diode				
I_F	T_j = 150 °C	T_c = 25 °C	545	A
		T_c = 80 °C	365	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		2900	A
T_j			-40 ... 150	°C
Freewheeling diode				
I_F	T_j = 150 °C	T_c = 25 °C	545	A
		T_c = 80 °C	365	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		2900	A
T_j			-40 ... 150	°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		2	2.45	V
		T_j = 125 °C		2.45	2.9	V
V_{CE0}		T_j = 25 °C		1	1.2	V
		T_j = 125 °C		0.9	1.1	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		2.2	2.8	mΩ
		T_j = 125 °C		3.4	4.0	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		0.1	0.3	mA
		T_j = 125 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		39.6		nF
C_{oes}		f = 1 MHz		1.65		nF
C_{res}		f = 1 MHz		1.31		nF
Q_G	V_{GE} = - 8 V...+ 15 V			4200		nC
R_{Gint}	T_j = 25 °C			1.67		Ω



SEMiX® 3s

Trench IGBT Modules

SEMiX653GAR176HDs

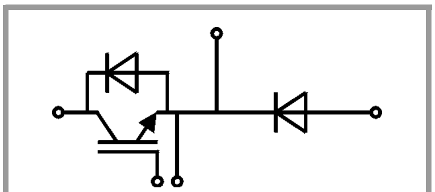
Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$t_{d(on)}$	V_{CC} = 1200 V	T_j = 125 °C		290		ns
t_r	I_C = 450 A	T_j = 125 °C		90		ns
E_{on}	$R_{G\ on}$ = 3.6 Ω	T_j = 125 °C		300		mJ
$t_{d(off)}$	$R_{G\ off}$ = 3.6 Ω	T_j = 125 °C		975		ns
t_f		T_j = 125 °C		190		ns
E_{off}		T_j = 125 °C		180		mJ
$R_{th(j-c)}$	per IGBT				0.054	K/W
Inverse diode						
$V_F = V_{EC}$	I_F = 450 A, V_{GE} = 0 V, chip	T_j = 25 °C		1.7	1.90	V
		T_j = 125 °C		1.7	1.9	V
V_{F0}		T_j = 25 °C	0.9	1.1	1.3	V
		T_j = 125 °C	0.7	0.9	1.1	V
r_F		T_j = 25 °C	1.3	1.3	1.3	mΩ
		T_j = 125 °C	1.8	1.8	1.8	mΩ
I_{RRM}	I_F = 450 A	T_j = 125 °C		380		A
Q_{rr}	di/dt_{off} = 4200 A/µs	T_j = 125 °C		130		µC
E_{rr}	V_{GE} = -15 V, V_{CC} = 1200 V	T_j = 125 °C		73		mJ
$R_{th(j-c)}$	per diode				0.11	K/W
Freewheeling diode						
$V_F = V_{EC}$	I_F = 450 A, V_{GE} = 0 V, chip	T_j = 25 °C		1.7	1.9	V
		T_j = 125 °C		1.7	1.9	V
V_{F0}		T_j = 25 °C	0.9	1.1	1.3	V
		T_j = 125 °C	0.7	0.9	1.1	V
r_F		T_j = 25 °C	1.3	1.3	1.3	mΩ
		T_j = 125 °C	1.8	1.8	1.8	mΩ
I_{RRM}	I_F = 450 A	T_j = 125 °C		380		A
Q_{rr}	di/dt_{off} = 4200 A/µs	T_j = 125 °C		130		µC
E_{rr}	V_{GE} = -15 V, V_{CC} = 1200 V	T_j = 125 °C		73		mJ
$R_{th(j-c)}$	per diode				0.11	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			0.04		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t		to terminals (M6)	2.5		5	Nm
						Nm
w					300	g
Temperatur 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



GAR

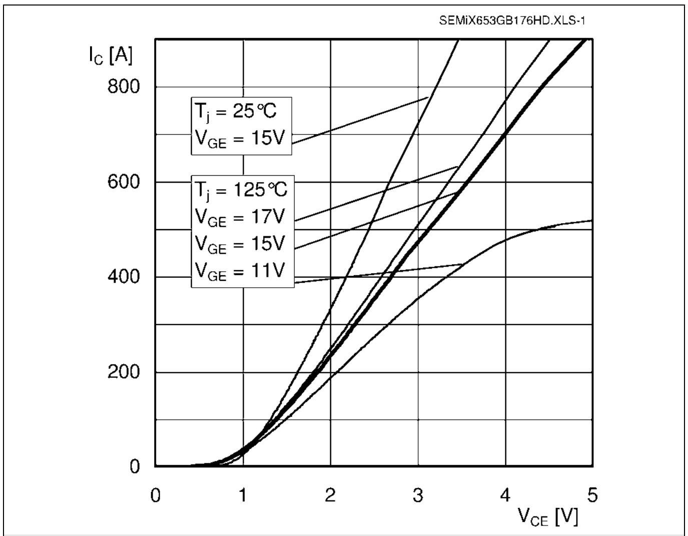


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

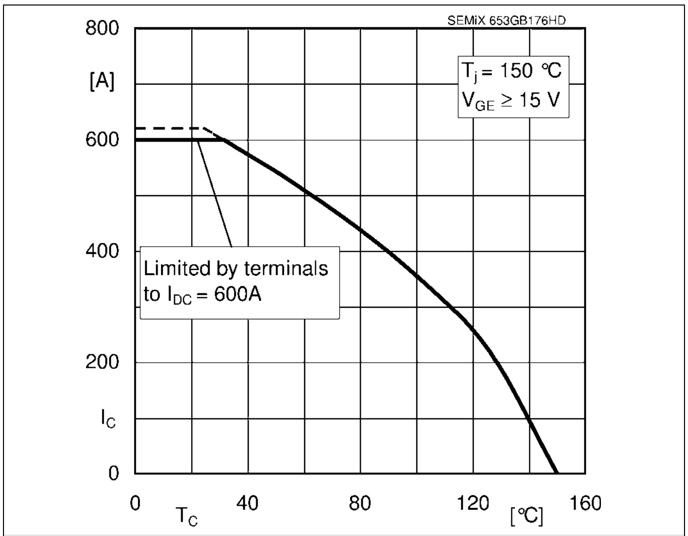


Fig. 2: Rated current vs. temperature $I_C = f\ (T_C)$

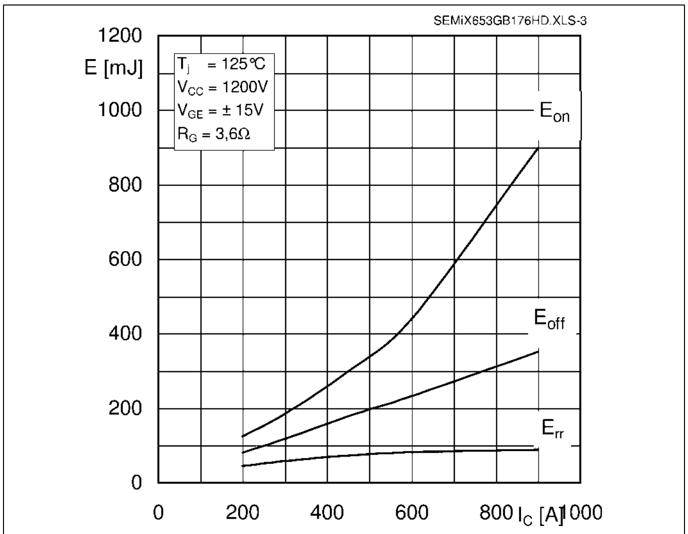


Fig. 3: Typ. turn-on /-off energy = f (I_C)

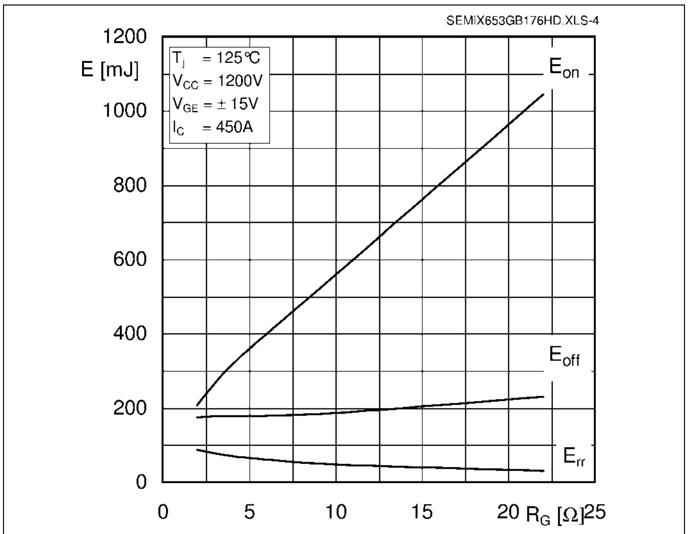


Fig. 4: Typ. turn-on /-off energy = f (R_G)

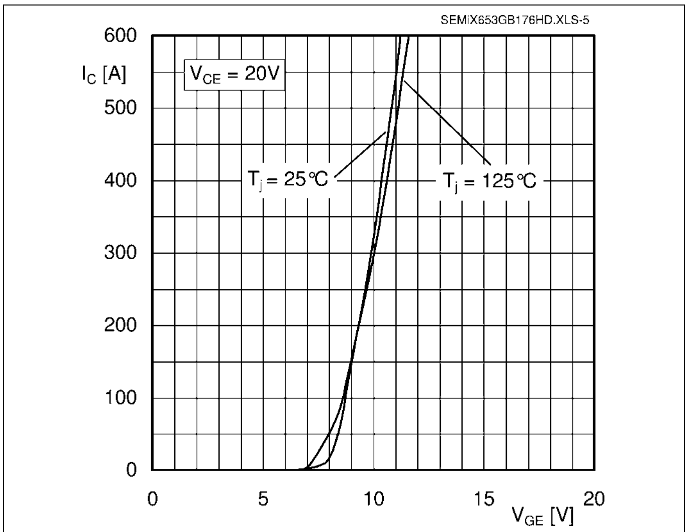


Fig. 5: Typ. transfer characteristic

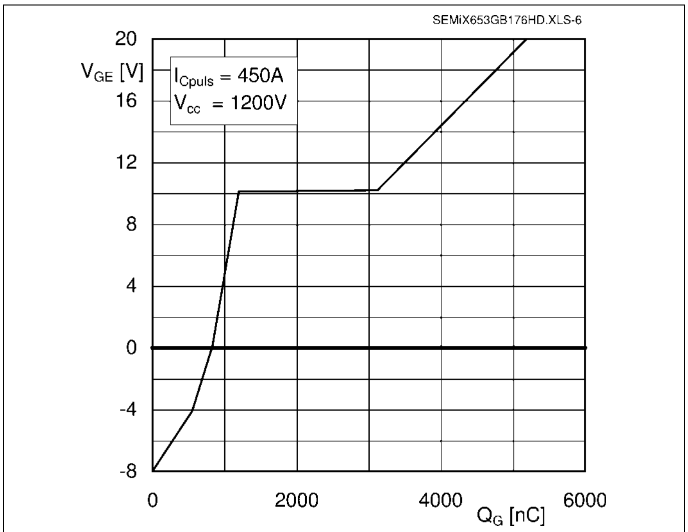


Fig. 6: Typ. gate charge characteristic

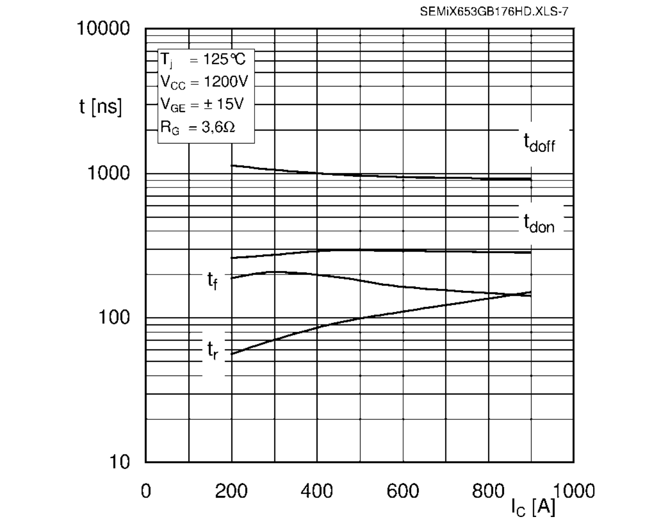


Fig. 7: Typ. switching times vs. I_C

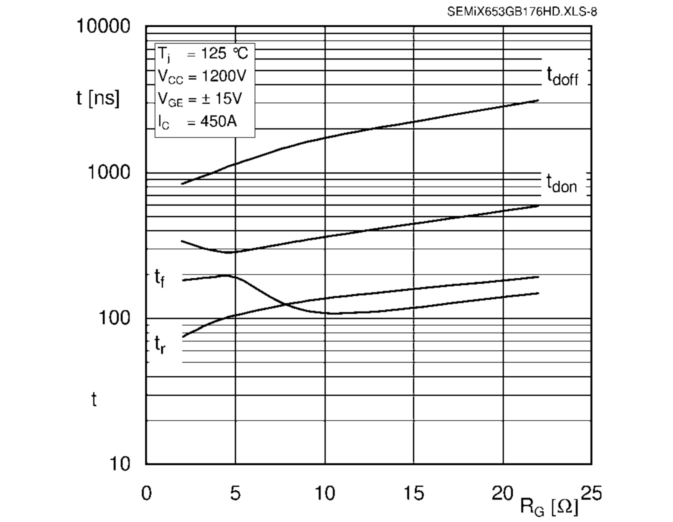


Fig. 8: Typ. switching times vs. gate resistor R_G

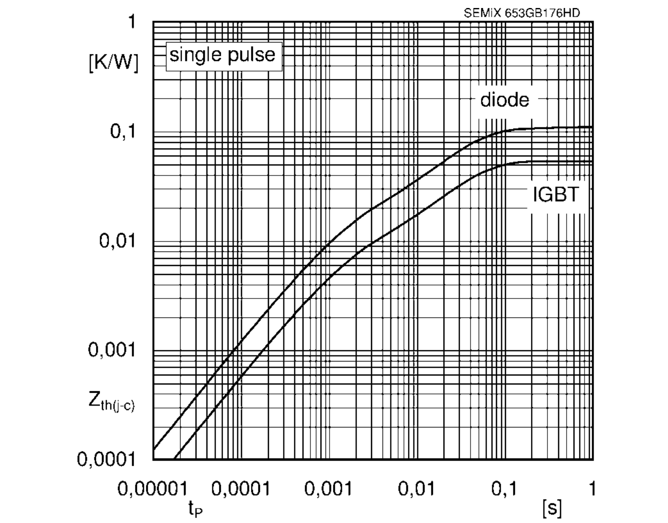


Fig. 9: Typ. transient thermal impedance

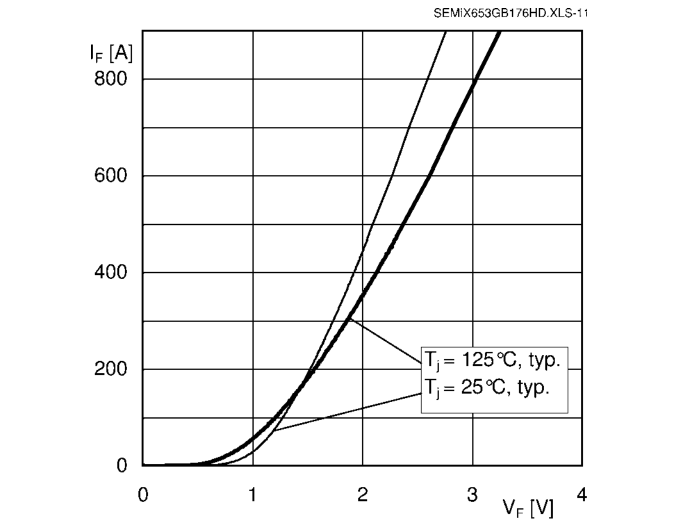


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

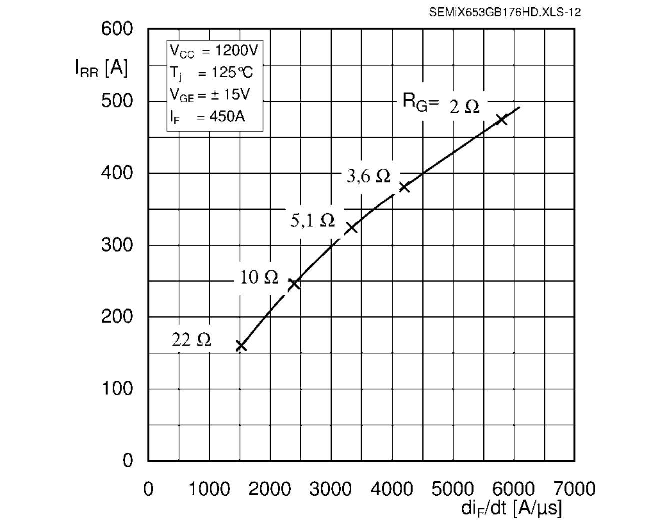


Fig. 11: Typ. CAL diode peak reverse recovery current

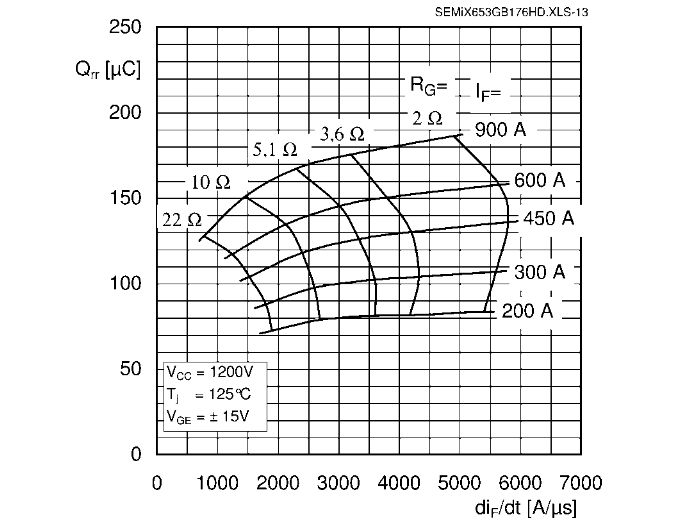
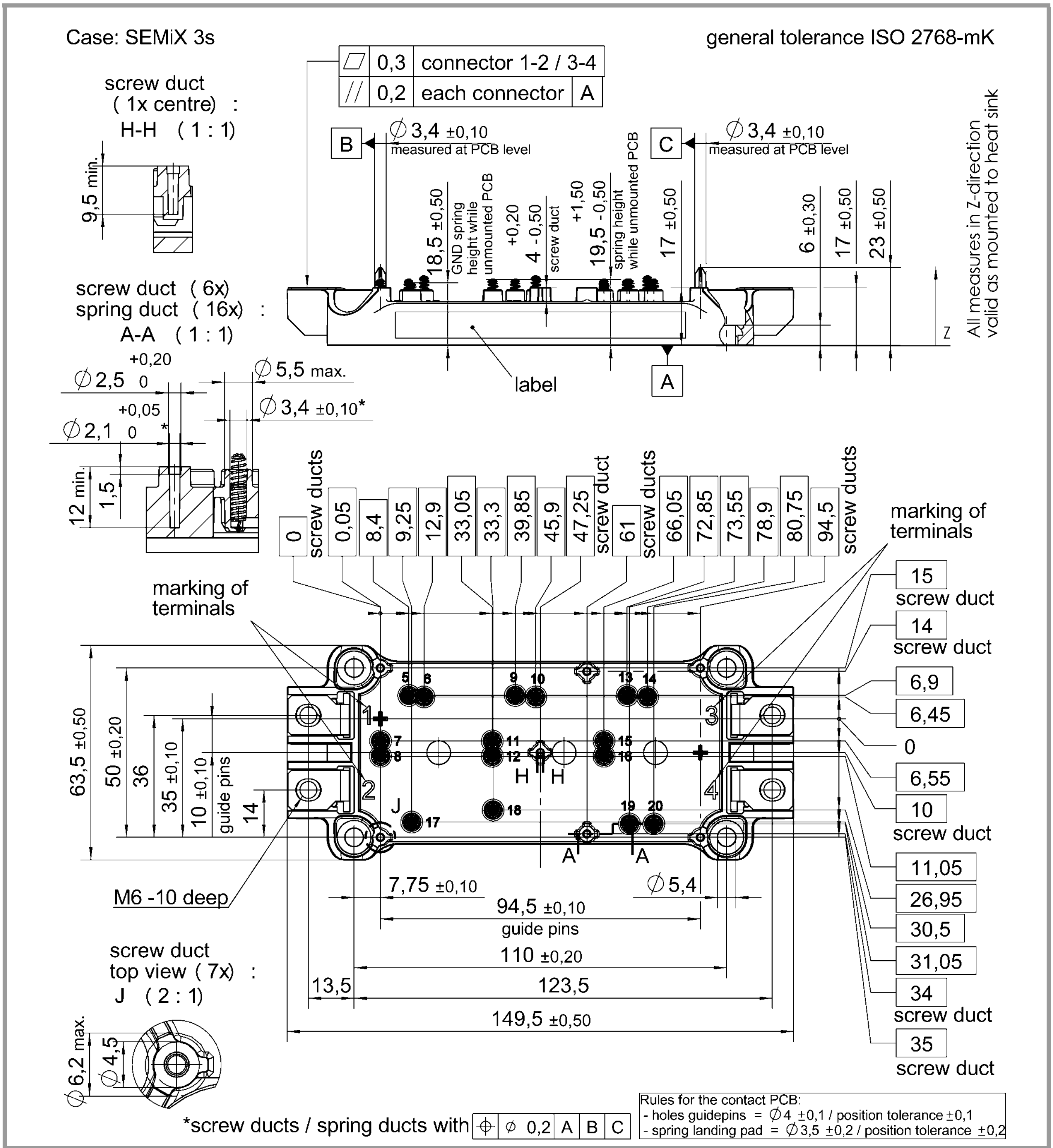
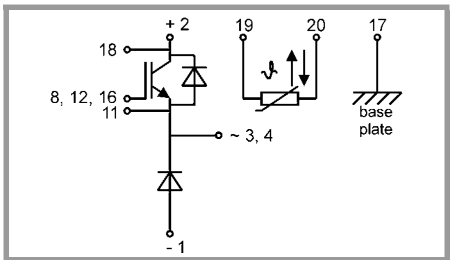


Fig. 12: Typ. CAL diode recovery charge



SEMiX 3s



spring configuration