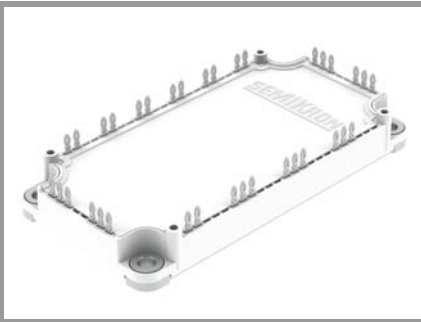


SEMiX156GD12T4p



SEMiX® 6p

Trench IGBT Modules

SEMiX156GD12T4p

Features*

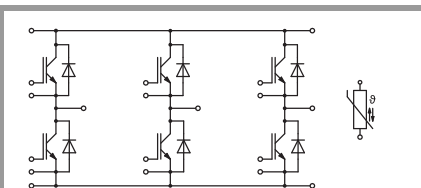
- Press Fit
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic Welding

Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.
- V_{isol} between temperature sensor and power section is only 2500V
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{jop} = -40 \dots 150^\circ\text{C}$)

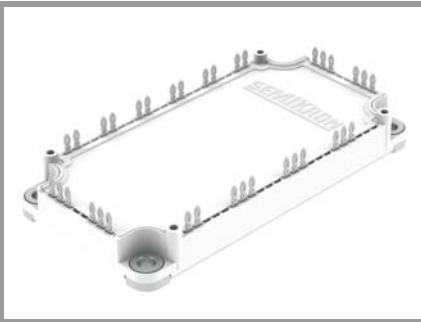


GD

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	239
		$T_c = 80^\circ\text{C}$	184
I_{Cnom}		150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	450	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 20\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10
			μs
T_j		-40 ... 175	$^\circ\text{C}$
Inverse diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	181
		$T_c = 80^\circ\text{C}$	136
I_{Fnom}		150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	300	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	900	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	per connector pin	50	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					
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1.80	2.05	V
		$T_j = 150^\circ\text{C}$	2.10	2.40	V
V_{CE0}	chipllevel	$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	6.7	7.7	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	9.3	10.7	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C = 6\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^\circ\text{C}$			2.0	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	9.3		nF
C_{oes}		$f = 1\text{ MHz}$	0.58		nF
C_{res}		$f = 1\text{ MHz}$	0.51		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		850		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		5.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$	151		ns
t_r	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	32		ns
E_{on}	$R_{G on} = 1.1\ \Omega$	$T_j = 150^\circ\text{C}$	11		mJ
$t_{d(off)}$	$R_{G off} = 1.1\ \Omega$	$T_j = 150^\circ\text{C}$	408		ns
t_f	$di/dt_{on} = 4950\text{ A}/\mu\text{s}$ $di/dt_{off} = 1600\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	76		ns
E_{off}	$dv/dt = 3500\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	17		mJ
$R_{th(j-c)}$	per IGBT			0.18	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.04		K/W

SEMiX156GD12T4p



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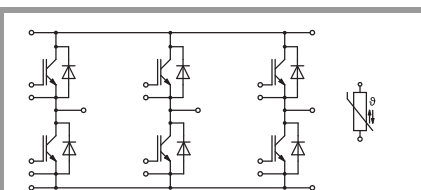
Typical Applications

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- UPS
- Electronic Welding

Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.
- V_{isol} between temperature sensor and power section is only 2500V
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{jop} = -40 \dots 150^\circ\text{C}$)

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 150 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.3	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		5.6	6.4	m Ω
		$T_j = 150^\circ\text{C}$		7.8	8.5	m Ω
I_{RRM}	$I_F = 150 \text{ A}$	$T_j = 150^\circ\text{C}$		235		A
Q_{rr}	$di/dt_{off} = 5000 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		26.5		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		11.5		mJ
$R_{th(j-c)}$	per diode				0.33	K/W
$R_{th(c-s)}$	per diode ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$)			0.05		K/W
Module						
L_{CE}				18		nH
$R_{CC'+EE'}$	measured per switch	$T_C = 25^\circ\text{C}$		1		m Ω
		$T_C = 125^\circ\text{C}$		1.4		m Ω
$R_{th(c-s)1}$	calculated without thermal coupling ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$)			0.004		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$)			0.006		K/W
M_s	to heat sink (M5)		3		6	Nm
M_t				-		Nm
				-		Nm
w				300		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



GD

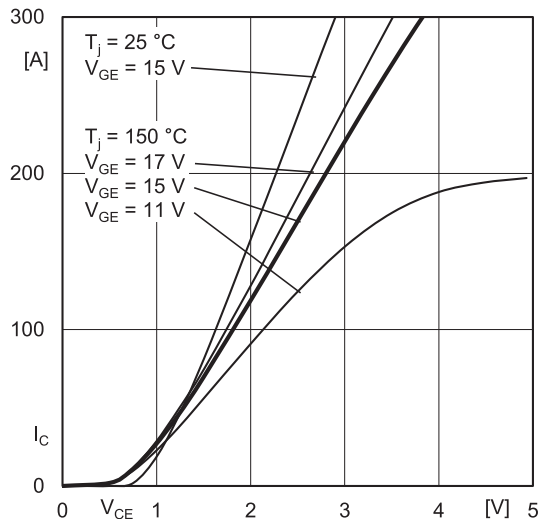


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

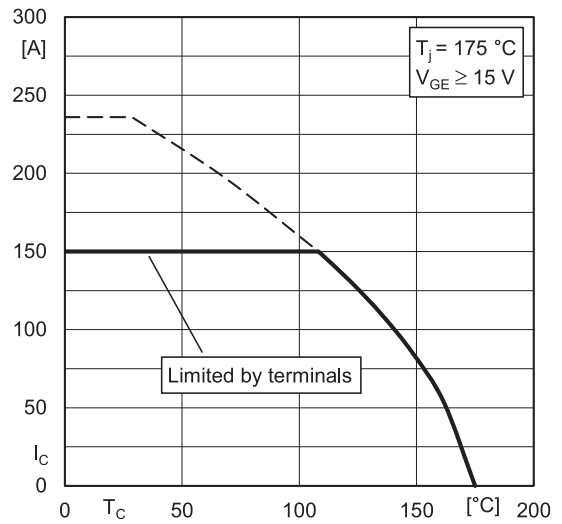


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

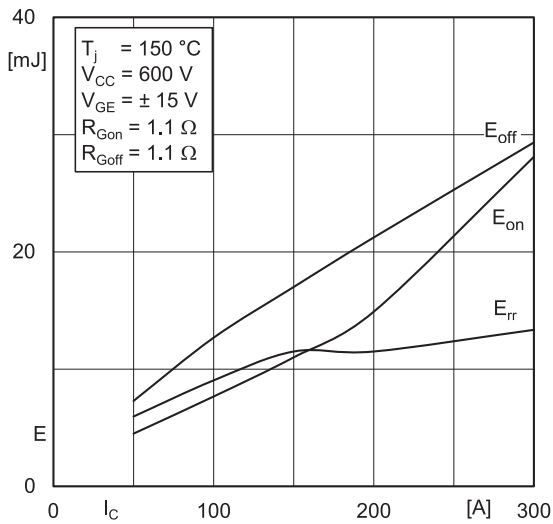


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

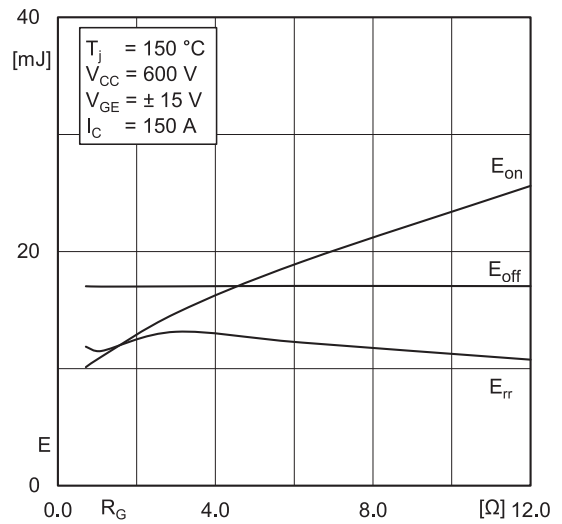


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

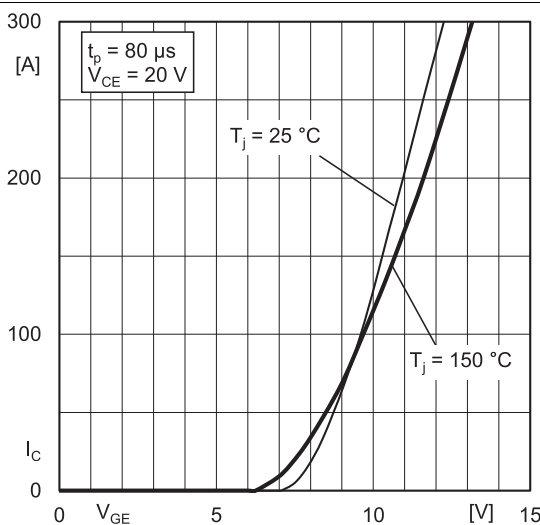


Fig. 5: Typ. transfer characteristic

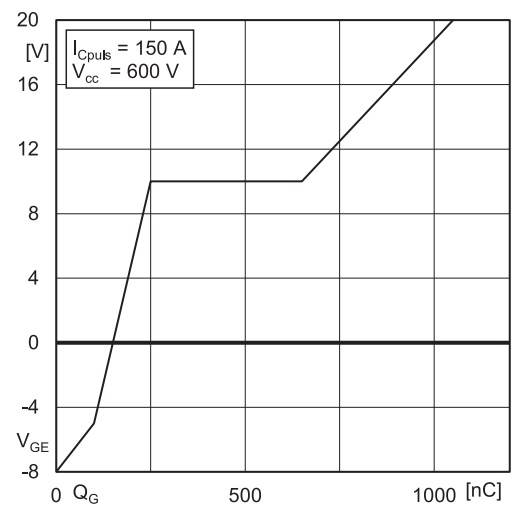
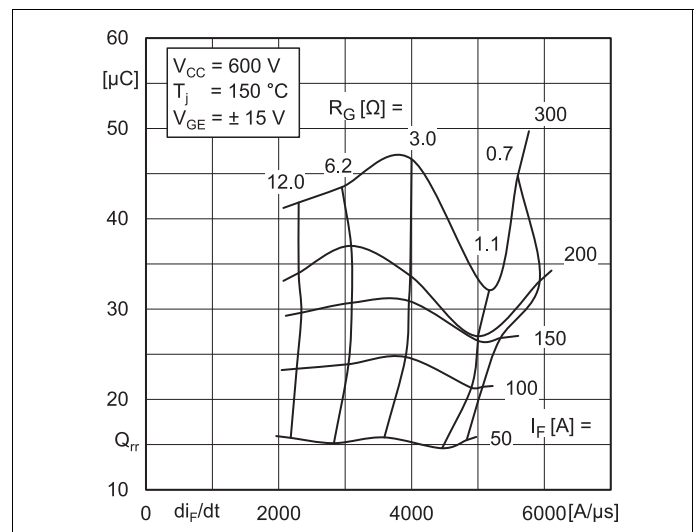
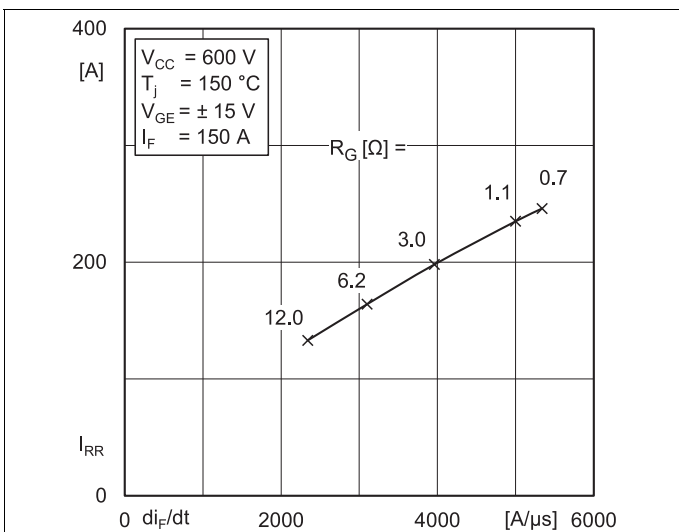
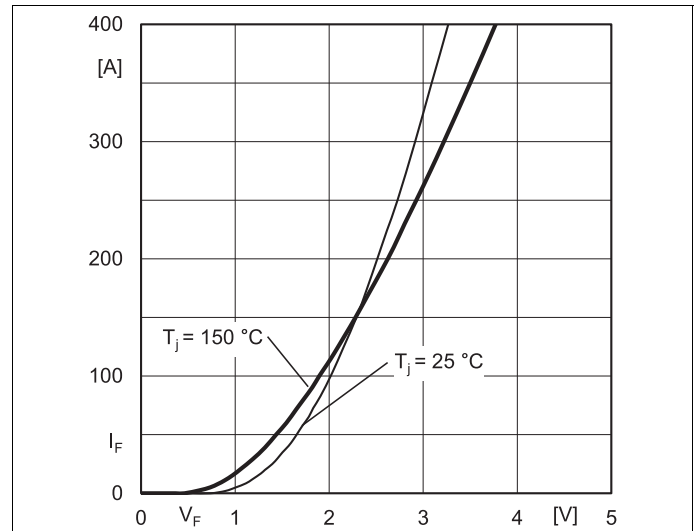
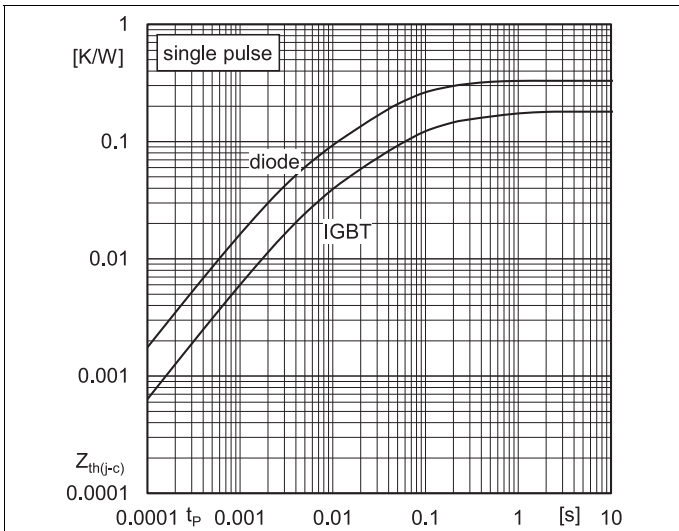
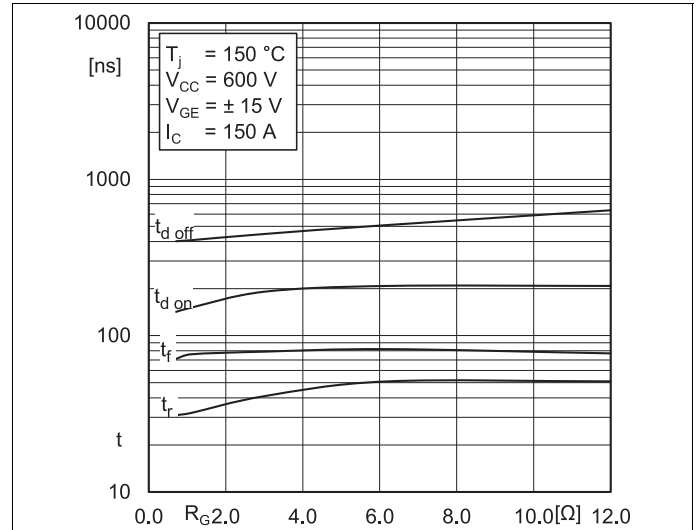
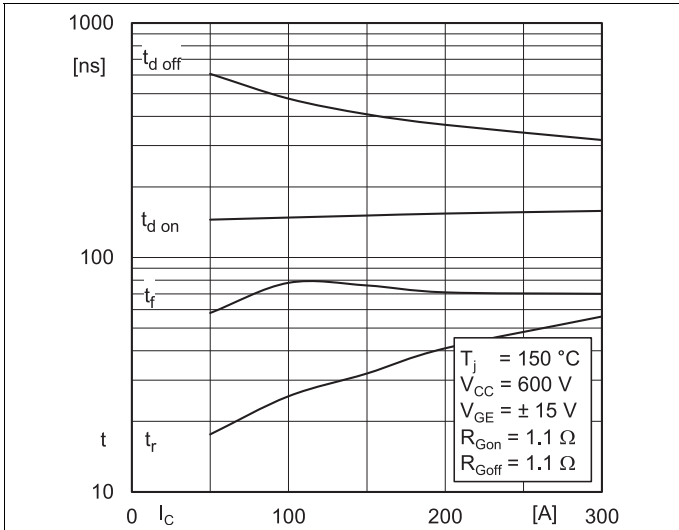
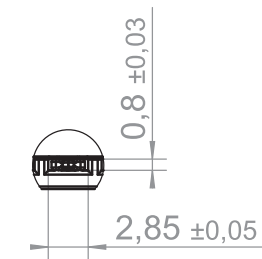
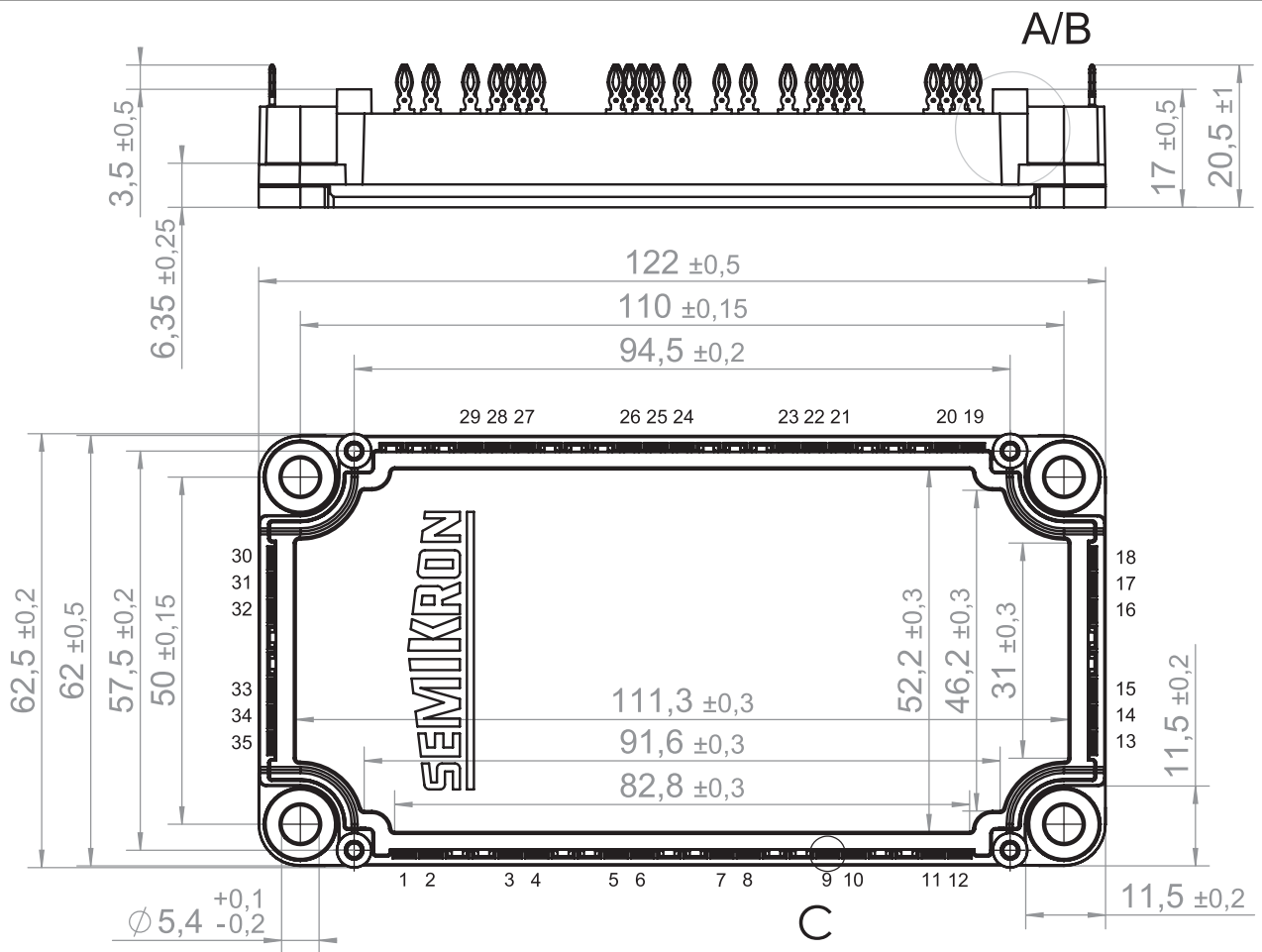


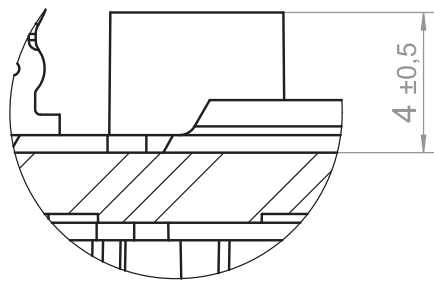
Fig. 6: Typ. gate charge characteristic



SEMiX156GD12T4p

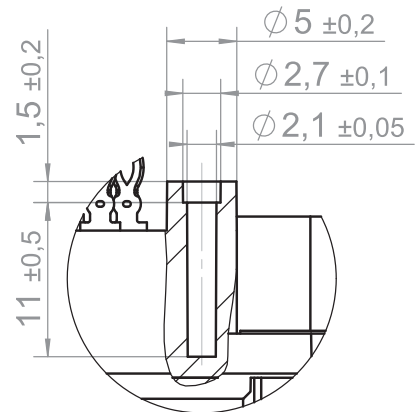


C (2 : 1)



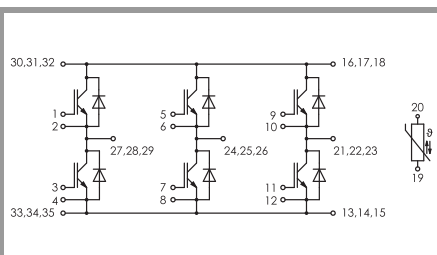
B (5 : 1)

Cross-sectional plane in the middle of the module

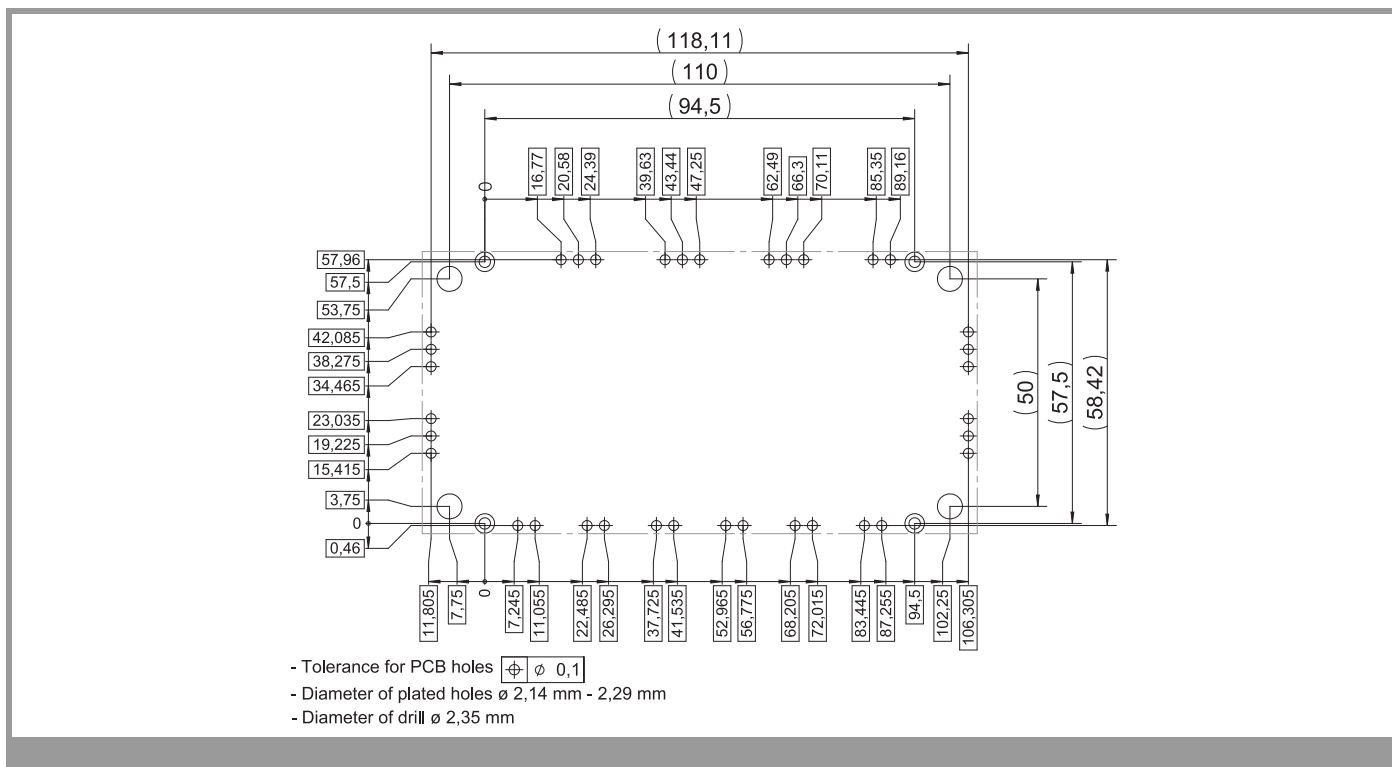


A (2 : 1)

Cut-out shows section through the center of the PCB-dome



pinout



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

*IMPORTANT INFORMATION AND WARNINGS

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