

SKM1400GB12P4



SEMITRANS® 10

IGBT4 Modules

SKM1400GB12P4

Features*

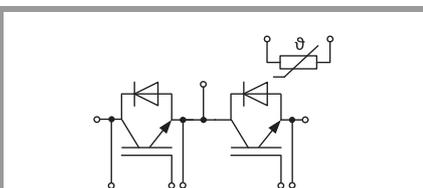
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- UL recognized, file no. E63532

Typical Applications

- Motor Drives
- UPS Systems
- Solar Inverters

Remarks

Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$



GB

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V	
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	2165	A
		$T_c = 100^\circ\text{C}$	1453	A
I_{Cnom}		1400	A	
I_{CRM}		2800	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j		-40 ... 175	$^\circ\text{C}$	
Inverse diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V	
I_F	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	1768	A
		$T_c = 100^\circ\text{C}$	1135	A
I_{FRM}		2800	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	7296	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
T_{stg}		-40 ... 150	$^\circ\text{C}$	
V_{isol}	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V	

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$V_{CE(sat)}$	$I_C = 1400\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.75	2.07	V
		$T_j = 150^\circ\text{C}$	2.18	2.44	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	0.68	0.83	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	1.06	1.17	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 49.2\text{ mA}$	5.1	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^\circ\text{C}$			6	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	81.6		nF
C_{oes}		$f = 1\text{ MHz}$	5.28		nF
C_{res}		$f = 1\text{ MHz}$	4.50		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		7500		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.8		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 1400\text{ A}$	$T_j = 150^\circ\text{C}$	353		ns
t_r	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	119		ns
E_{on}	$R_{G on} = 1\ \Omega$	$T_j = 150^\circ\text{C}$	150		mJ
$t_{d(off)}$	$R_{G off} = 1\ \Omega$	$T_j = 150^\circ\text{C}$	803		ns
t_f	$di/dt_{on} = 11\text{ kA}/\mu\text{s}$ $di/dt_{off} = 6.9\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	171		ns
E_{off}	$dv/dt = 3300\text{ V}/\mu\text{s}$ $L_s = 36\text{ nH}$	$T_j = 150^\circ\text{C}$	277		mJ
$R_{th(j-c)}$	per IGBT			0.02	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.008		K/W

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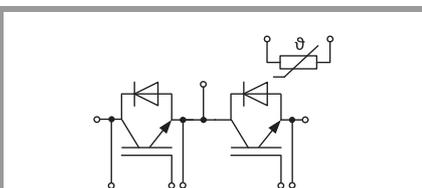
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 1400 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.06	2.37	V
		$T_j = 150^\circ\text{C}$		2.03	2.35	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		0.54	0.62	m Ω
		$T_j = 150^\circ\text{C}$		0.81	0.89	m Ω
I_{RRM}	$I_F = 1400 \text{ A}$	$T_j = 150^\circ\text{C}$		1014		A
Q_{rr}	$di/dt_{off} = 11 \text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		214		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		85		mJ
$R_{th(j-c)}$	per diode				0.033	K/W
$R_{th(c-s)}$	per diode ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^*\text{K})$)			0.01		K/W
Module						
L_{CE}				10		nH
$R_{CC'+EE'}$	measured per switch, $T_C = 25^\circ\text{C}$			0.2		m Ω
$R_{th(c-s)1}$	calculated without thermal coupling ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^*\text{K})$)			0.0022		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81 \text{ W}/(\text{m}^*\text{K})$)			0.004		K/W
M_s	to heat sink M5		4		6	Nm
M_t	to terminals M8		8		10	Nm
	to terminals M4		1.8		2.1	Nm
w					1250	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

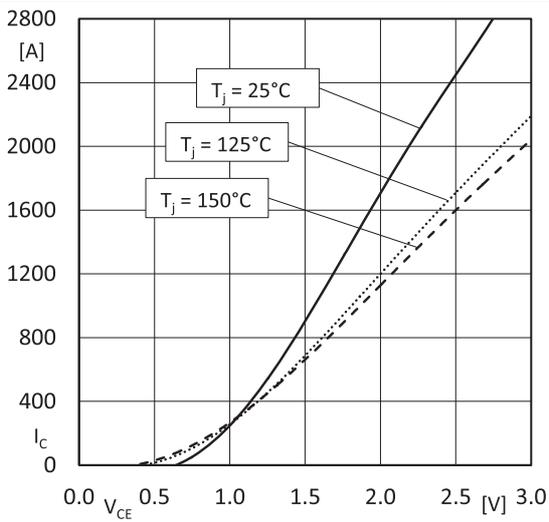


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15V$; (chipllevel)

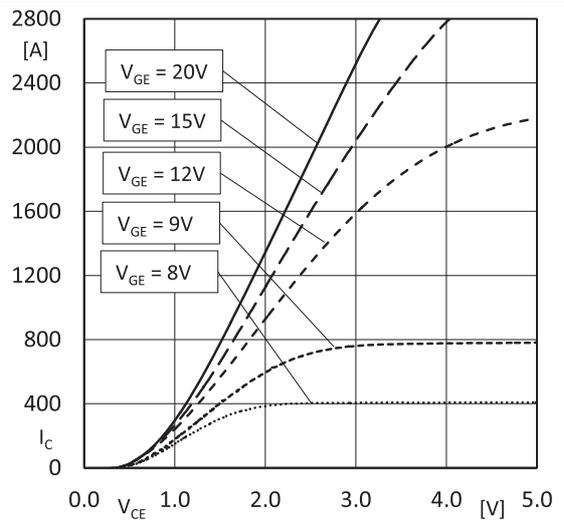


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_j = 150^\circ C$; (chipllevel)

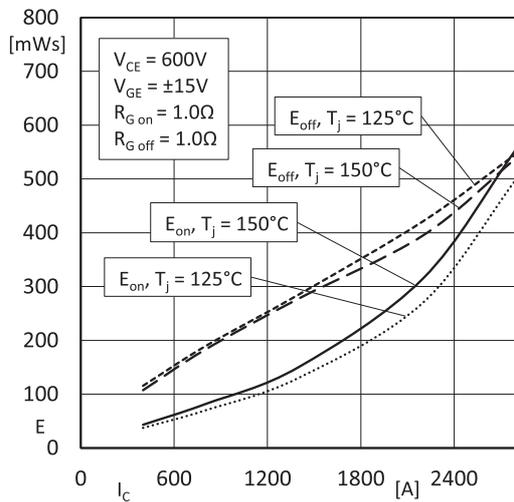


Fig. 3: Switching losses IGBT (typical); $E=f(I_C)$

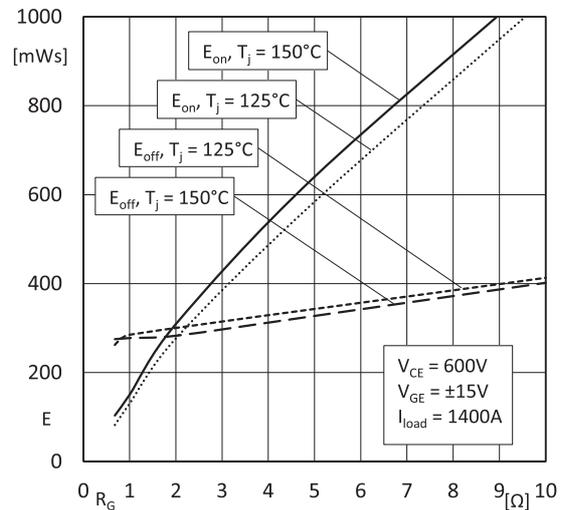


Fig. 4: Switching losses IGBT (typical); $E=f(R_G)$

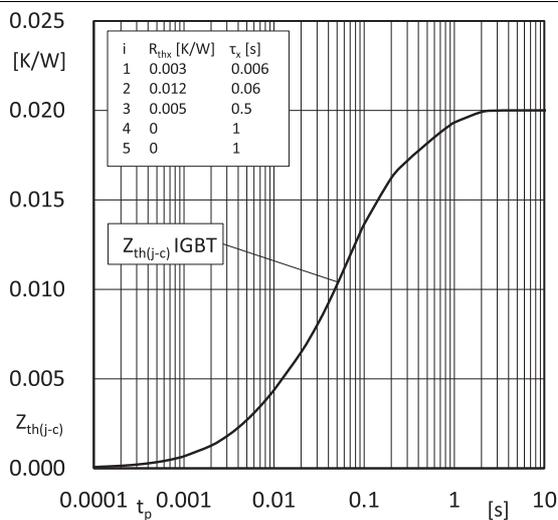


Fig. 5: Transient thermal impedance IGBT

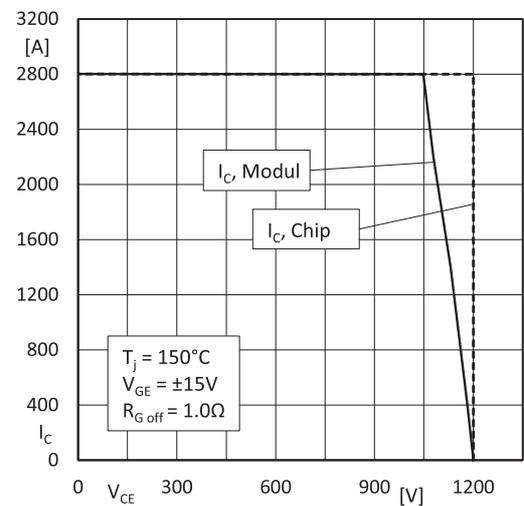


Fig. 6: RBSOA IGBT

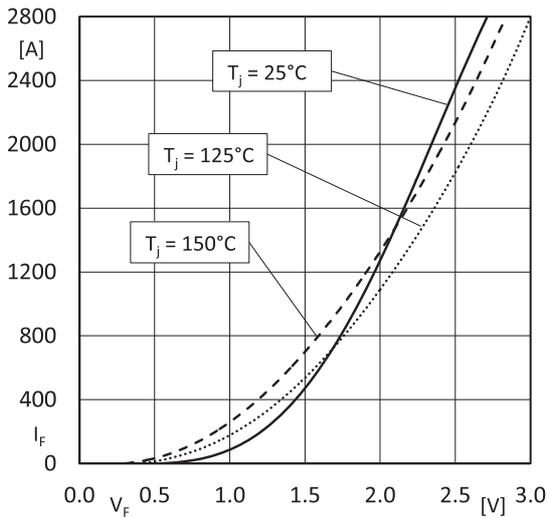


Fig. 7: Forward charact. Diode (typical); $I_F=f(V_F)$; (chipllevel)

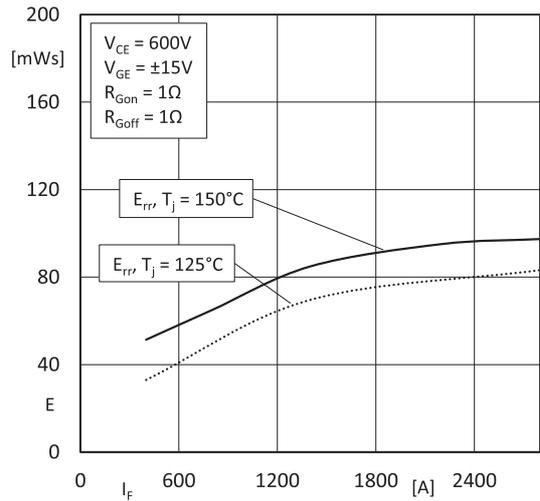


Fig. 8: Switching losses Diode (typical); $E=f(I_F)$

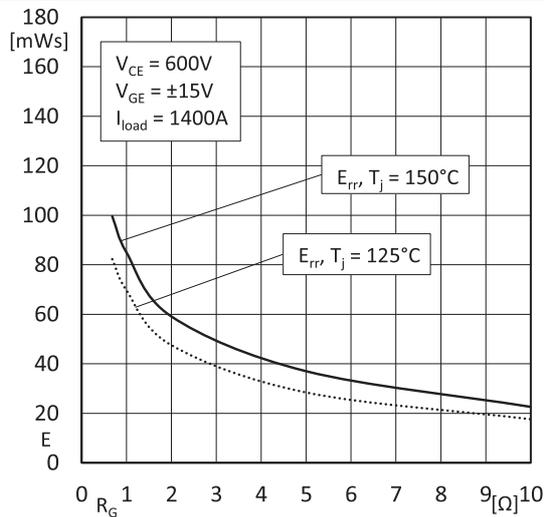


Fig. 9: Switching losses Diode (typical); $E=f(R_G)$

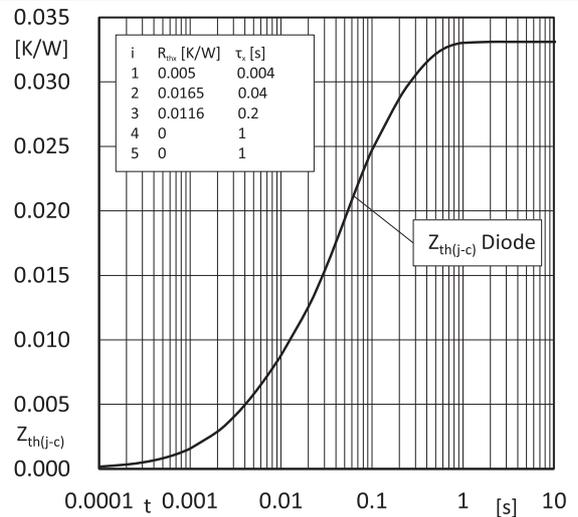


Fig. 10: Transient thermal impedance Diode

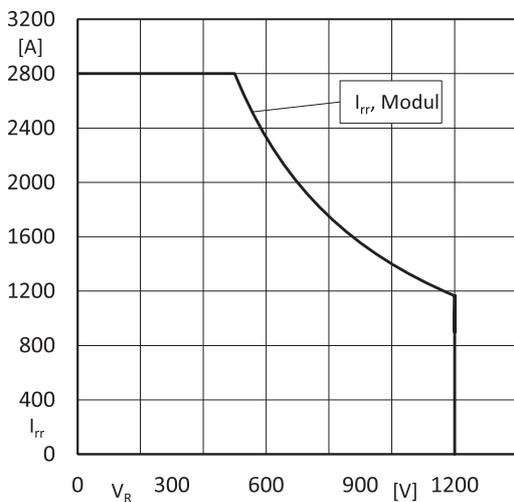


Fig. 11: RBSOA Diode

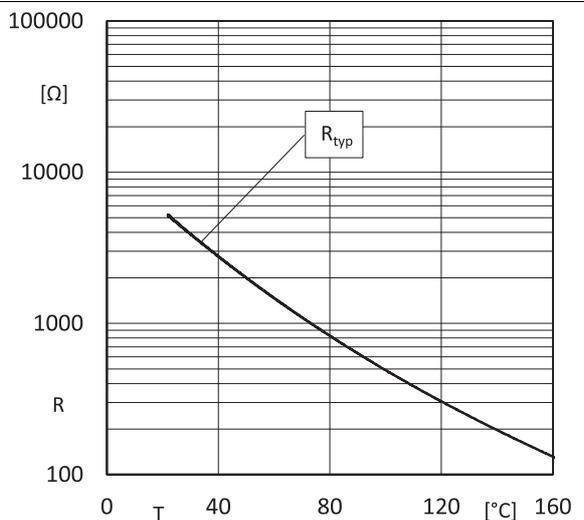


Fig. 12: NTC characteristics (typical)

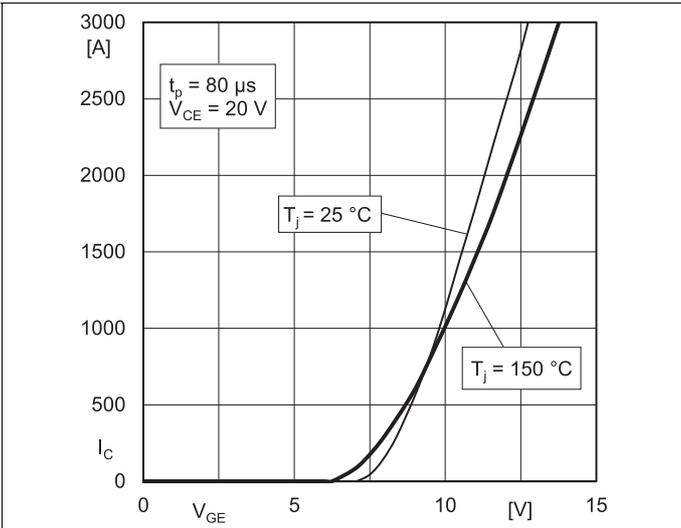


Fig. 13: Typ. transfer characteristic

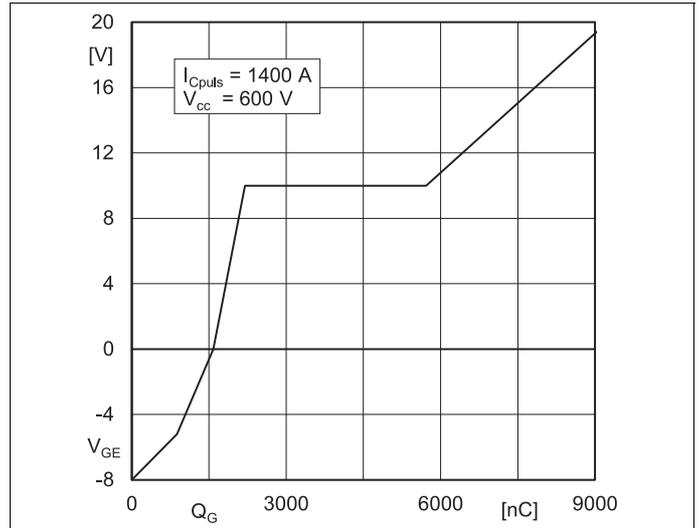
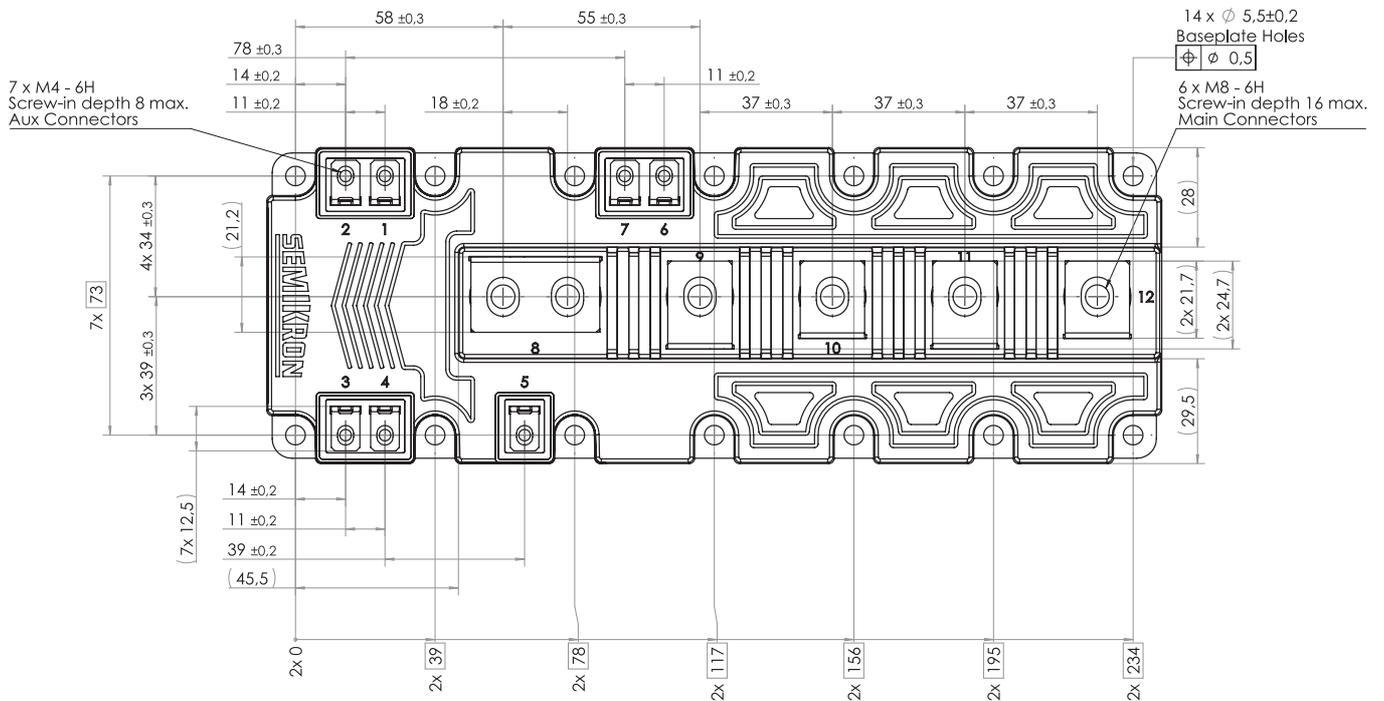
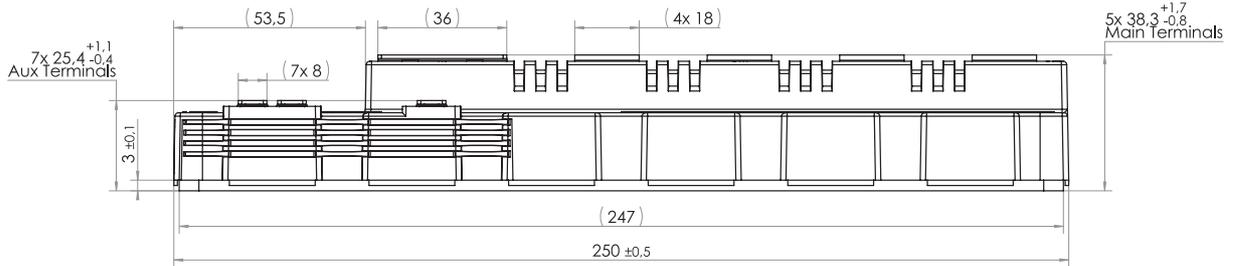
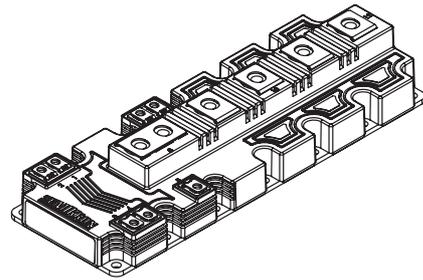
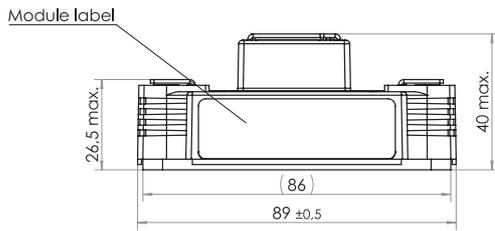


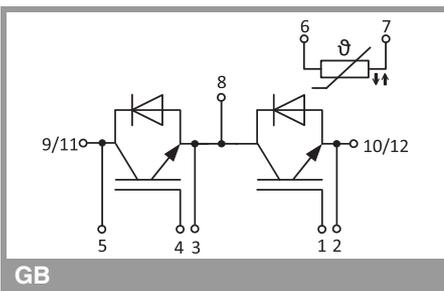
Fig. 14: Typ. gate charge characteristic

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- Dimensions in mm
- General tolerances ±0.5mm

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

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