

SKM1400GB17P4



SEMITRANS® 10

IGBT4 Modules

SKM1400GB17P4

Features*

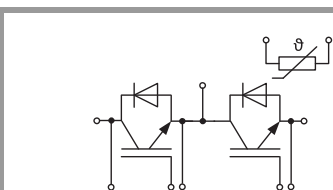
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- UL recognized, file no. E63532

Typical Applications

- Motor Drives
- UPS Systems
- Solar Inverters

Remarks

Recommended $T_{jop} = -40 \dots +150^{\circ}\text{C}$
 $I_{DC} \leq 1000\text{A}$ for $T_{Terminal} = 100^{\circ}\text{C}$



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Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}	$T_j = 25^{\circ}\text{C}$	1700	V	
I_C	$T_j = 175^{\circ}\text{C}$	$T_c = 25^{\circ}\text{C}$	2081	A
		$T_c = 100^{\circ}\text{C}$	1383	A
I_{Cnom}		1400	A	
I_{CRM}		2800	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 150^{\circ}\text{C}$	10	μs
T_j		-40 ... 175	$^{\circ}\text{C}$	
Inverse diode				
V_{RRM}	$T_j = 25^{\circ}\text{C}$	1700	V	
I_F	$T_j = 175^{\circ}\text{C}$	$T_c = 25^{\circ}\text{C}$	1702	A
		$T_c = 100^{\circ}\text{C}$	1052	A
I_{FRM}		2800	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25^{\circ}\text{C}$	9024	A	
T_j		-40 ... 175	$^{\circ}\text{C}$	
Module				
$I_{t(RMS)}$		1000	A	
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					
$V_{CE(sat)}$	$I_C = 1400\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^{\circ}\text{C}$	1.84	2.14	V
		$T_j = 150^{\circ}\text{C}$	2.33	2.64	V
V_{CE0}	chiplevel	$T_j = 25^{\circ}\text{C}$	0.90	1.00	V
		$T_j = 150^{\circ}\text{C}$	0.85	0.95	V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^{\circ}\text{C}$	0.67	0.82	$\text{m}\Omega$
		$T_j = 150^{\circ}\text{C}$	1.06	1.21	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 56.4\text{ mA}$	5.3	5.8	6.3	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1700\text{ V}, T_j = 25^{\circ}\text{C}$			5	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	114.0		nF
C_{oes}		$f = 1\text{ MHz}$	6.8		nF
C_{res}		$f = 1\text{ MHz}$	4.08		nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		15150		nC
R_{Gint}	$T_j = 25^{\circ}\text{C}$		1.6		Ω
$t_{d(on)}$	$V_{CC} = 900\text{ V}$ $I_C = 1400\text{ A}$	$T_j = 150^{\circ}\text{C}$	960		ns
t_r	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^{\circ}\text{C}$	150		ns
E_{on}	$R_{G on} = 1\ \Omega$	$T_j = 150^{\circ}\text{C}$	760		mJ
$t_{d(off)}$	$R_{G off} = 1\ \Omega$	$T_j = 150^{\circ}\text{C}$	1230		ns
t_f	$di/dt_{on} = 8.7\text{ kA}/\mu\text{s}$ $di/dt_{off} = 5.4\text{ kA}/\mu\text{s}$	$T_j = 150^{\circ}\text{C}$	210		ns
E_{off}	$dv/dt = 3200\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^{\circ}\text{C}$	615		mJ
$R_{th(j-c)}$	per IGBT			0.02	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.018		K/W
$R_{th(c-s)}$	per IGBT, pre-applied phase change material		0.014		K/W

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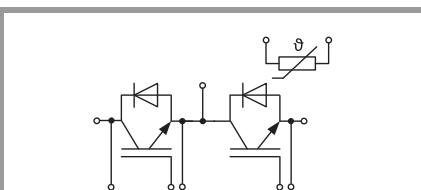
Typical Applications

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Remarks

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 $I_{DC} \leq 1000\text{A}$ for $T_{Terminal} = 100^\circ\text{C}$

Characteristics							
Symbol	Conditions		min.	typ.	max.	Unit	
Inverse diode							
$V_F = V_{EC}$	$I_F = 1400\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.84	2.19	V	
		$T_j = 150^\circ\text{C}$		1.89	2.25	V	
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.32	1.56	V	
		$T_j = 150^\circ\text{C}$		1.08	1.22	V	
r_F	chipelevel	$T_j = 25^\circ\text{C}$		0.37	0.45	m Ω	
		$T_j = 150^\circ\text{C}$		0.58	0.74	m Ω	
I_{RRM}	$I_F = 1400\text{ A}$	$T_j = 150^\circ\text{C}$		885		A	
Q_{rr}	$di/dt_{off} = 8.1\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		465		μC	
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$		220		mJ	
$R_{th(j-c)}$	per diode				0.037	K/W	
$R_{th(c-s)}$	per diode ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.023		K/W	
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.018		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 ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)			0.005		K/W	
		including thermal coupling, T_s underneath module ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.008		K/W	
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, pre-applied phase change material			0.007		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	



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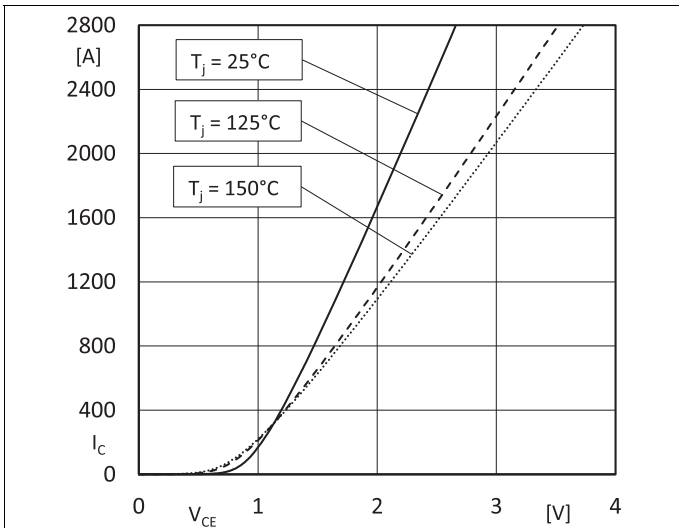


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15V$; (chipelevel)

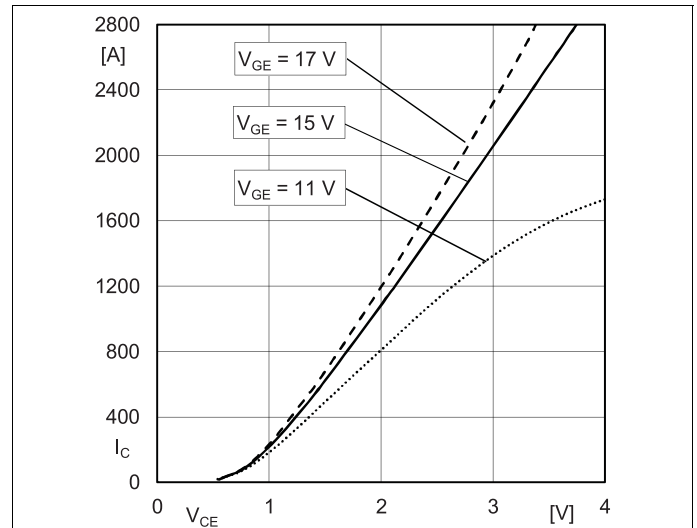


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_j = 150^\circ C$; (chipelevel)

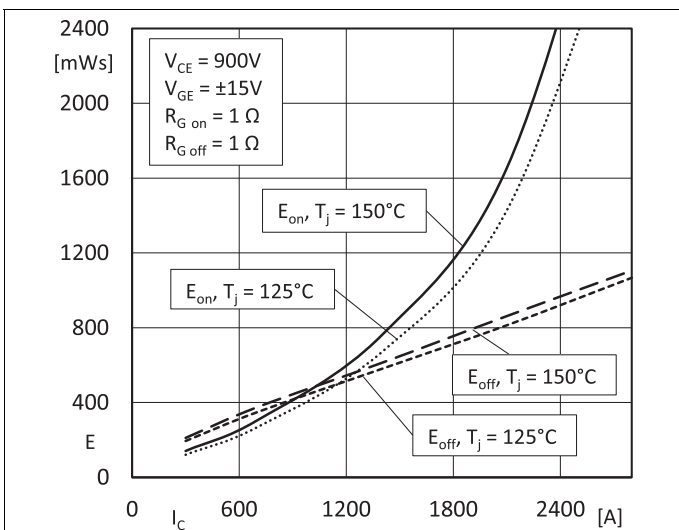


Fig. 3: Switching losses IGBT (typical); $E=f(I_C)$

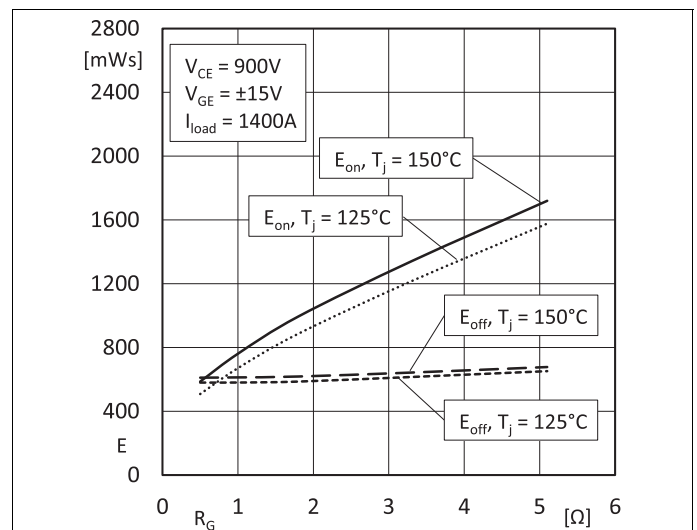


Fig. 4: Switching losses IGBT (typical); $E=f(R_G)$

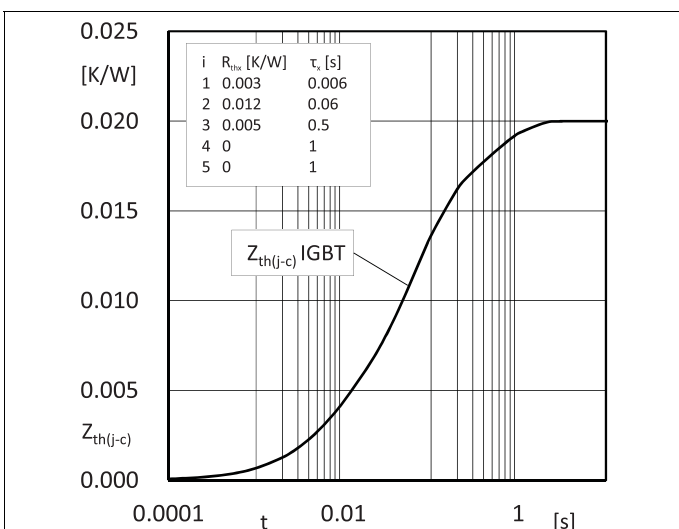


Fig. 5: Transient thermal impedance IGBT

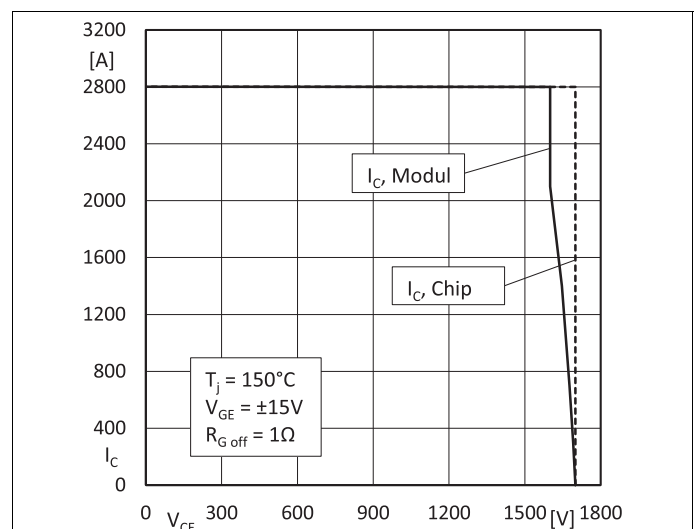


Fig. 6: RBSOA IGBT

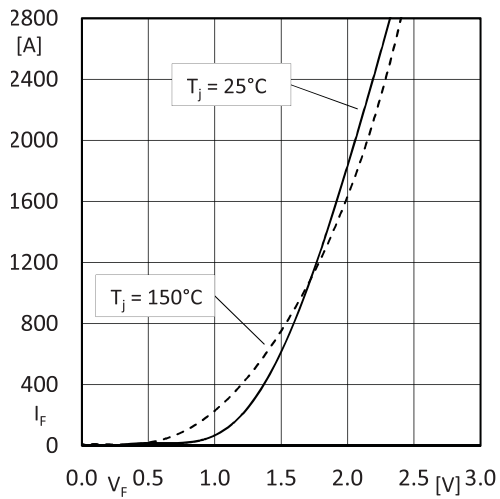


Fig. 7: Forward charact. Diode (typical); $I_F=f(V_F)$; (chipllevel)

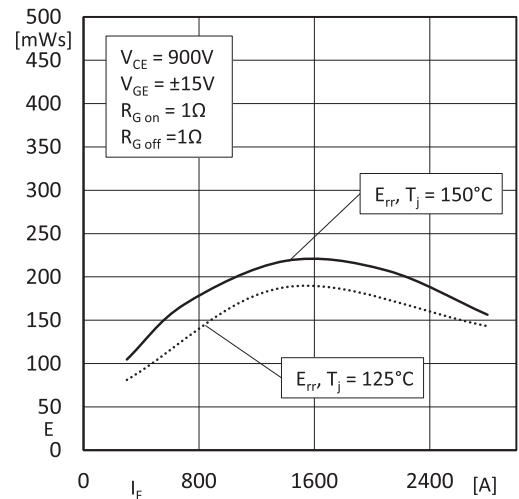


Fig. 8: Switching losses Diode (typical); $E=f(I_F)$

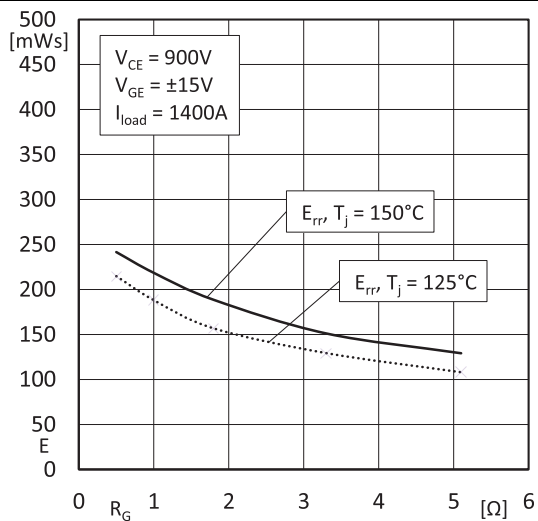


Fig. 9: Switching losses Diode (typical); $E=f(R_G)$

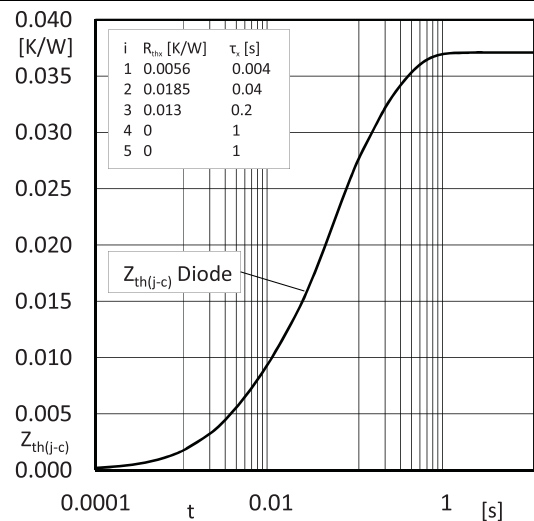


Fig. 10: Transient thermal impedance Diode

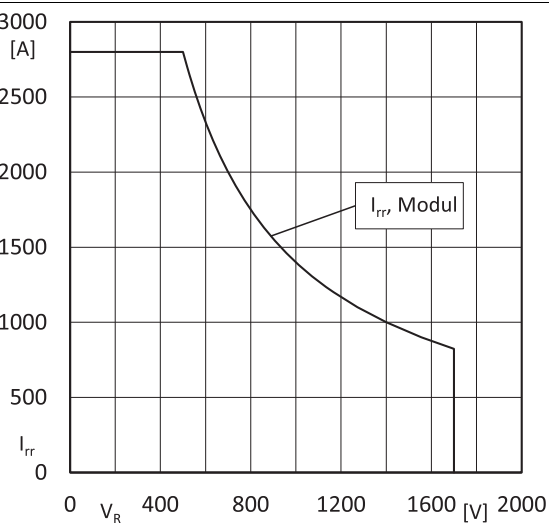


Fig. 11: RBSOA Diode

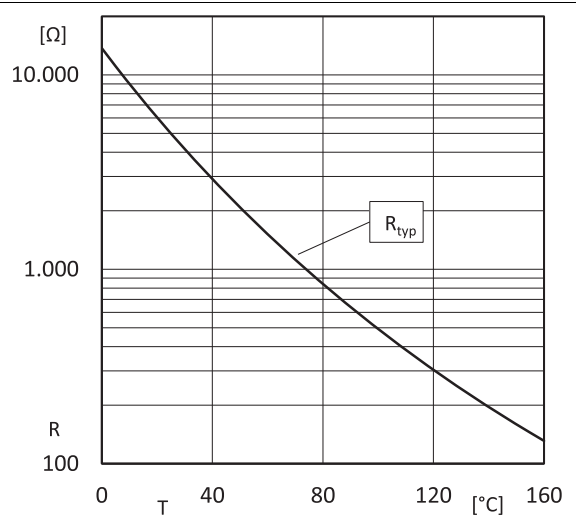


Fig. 12: NTC characteristics (typical)

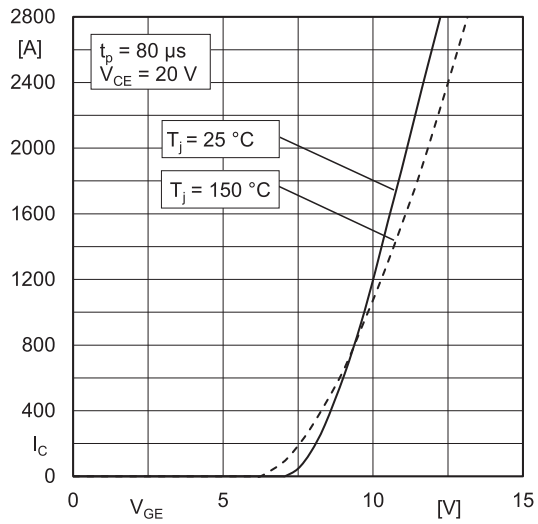


Fig. 13: Typ. transfer characteristic

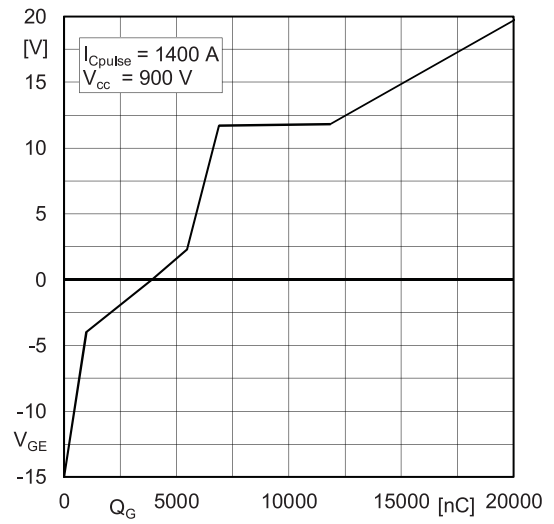
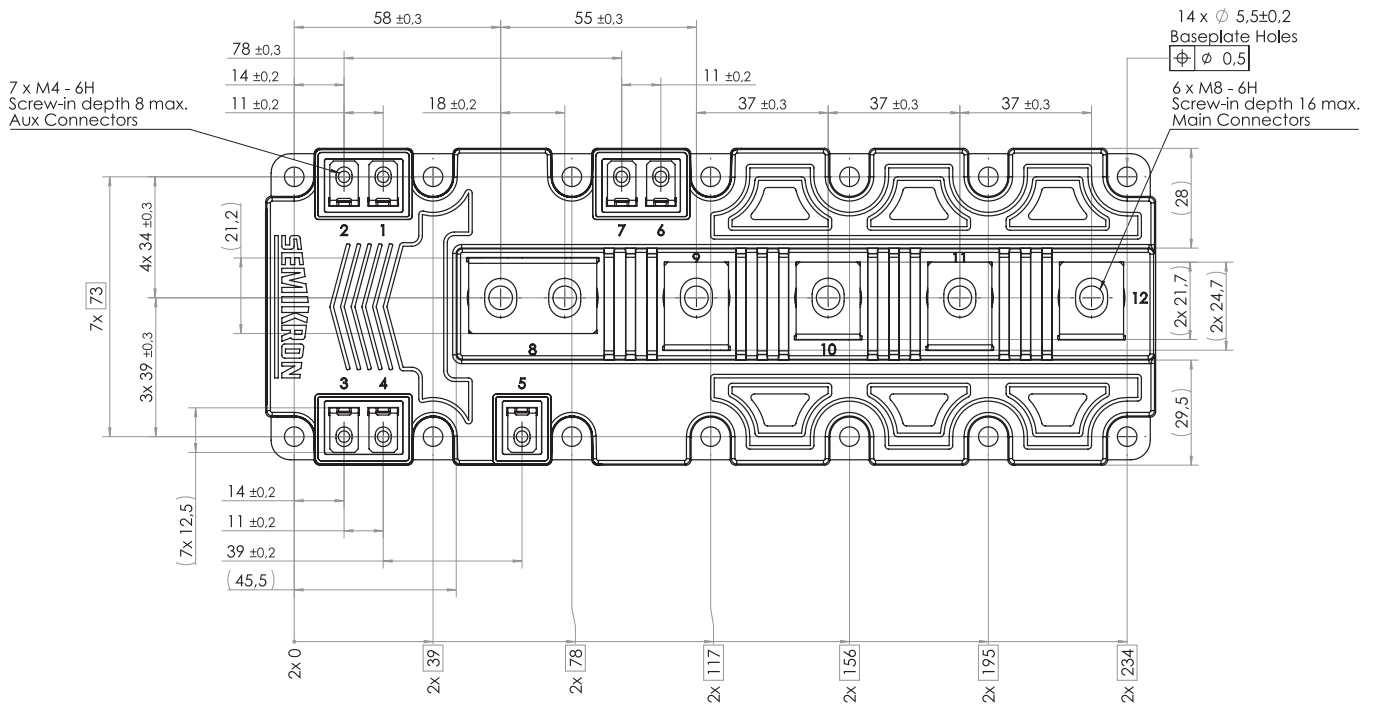
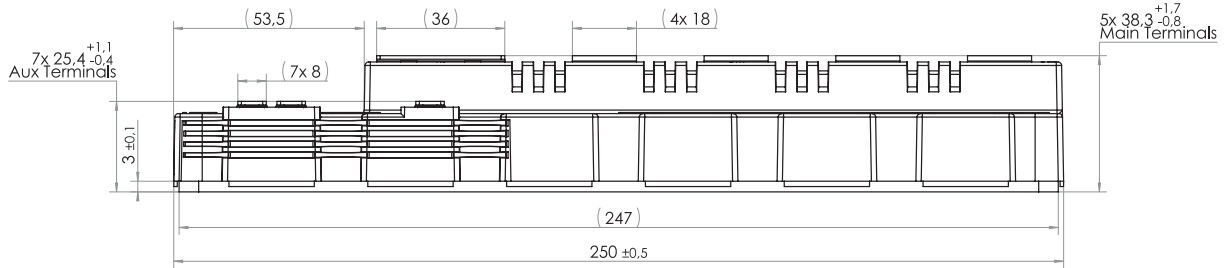
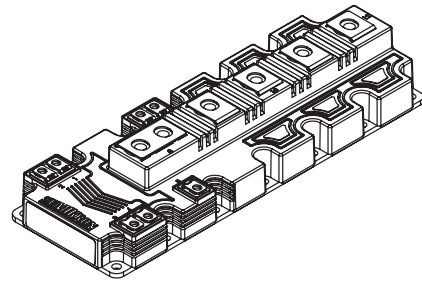
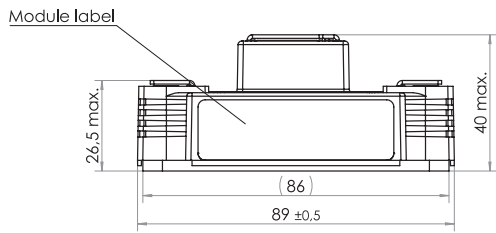


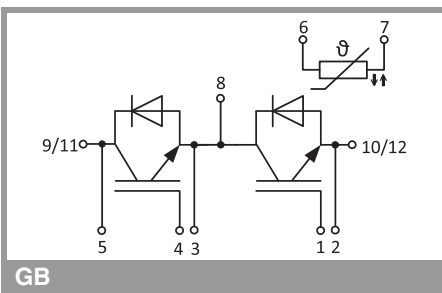
Fig. 14: Typ. gate charge characteristic

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- Dimensions in mm
- General tolerances $\pm 0.5\text{mm}$

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This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

***IMPORTANT INFORMATION AND WARNINGS**

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