



SEMITRANS® 10

IGBT4 Modules

SKM1000GB17E4

Features*

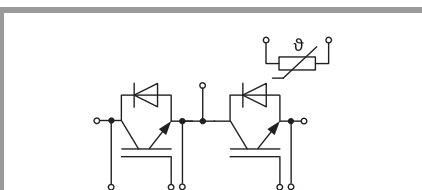
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- UL recognized, file no. E63532

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 $T_{Terminal} = 100^\circ\text{C}$



GB

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1700	V	
I_C	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	1300	A
		$T_c = 100^\circ\text{C}$	850	A
I_{Cnom}		1000	A	
I_{CRM}		2000	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	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	1427	A
		$T_c = 100^\circ\text{C}$	890	A
I_{FRM}		2000	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	6240	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						
$V_{CE(sat)}$	$I_C = 1000\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.99	2.31	V	
		$T_j = 150^\circ\text{C}$	2.44	2.77	V	
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	1.10	1.20	V	
		$T_j = 150^\circ\text{C}$	1.00	1.10	V	
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	0.89	1.11	m Ω	
		$T_j = 150^\circ\text{C}$	1.44	1.67	m Ω	
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 36\text{ mA}$	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	
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	70.8		nF	
C_{oes}		$f = 1\text{ MHz}$	2.58		nF	
C_{res}		$f = 1\text{ MHz}$	2.28		nF	
Q_G	$V_{GE} = +15\text{ V} / -15\text{ V}$		7200		nC	
R_{Gint}	$T_j = 25^\circ\text{C}$		1.5		Ω	
$t_{d(on)}$	$V_{CC} = 900\text{ V}$ $I_C = 1000\text{ A}$	$T_j = 150^\circ\text{C}$	730		ns	
t_r	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	115		ns	
E_{on}	$R_{G on} = 1.2\ \Omega$	$T_j = 150^\circ\text{C}$	450		mJ	
$t_{d(off)}$	$R_{G off} = 1.2\ \Omega$	$T_j = 150^\circ\text{C}$	990		ns	
t_f	$di/dt_{on} = 8.2\text{ kA}/\mu\text{s}$ $di/dt_{off} = 4.7\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	175		ns	
E_{off}	$dv/dt = 3800\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$	370		mJ	
$R_{th(j-c)}$	per IGBT			0.034	K/W	
$R_{th(c-s)}$	per IGBT ($\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$)		0.016		K/W	
$R_{th(c-s)}$	per IGBT, pre-applied phase change material		0.013		K/W	



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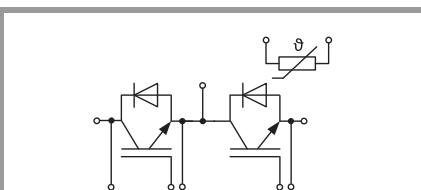
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverse diode					
$V_F = V_{EC}$	$I_F = 1000\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.78	2.12	V
		$T_j = 150^\circ\text{C}$	1.81	2.14	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$	1.32	1.56	V
		$T_j = 150^\circ\text{C}$	1.08	1.22	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$	0.46	0.56	m Ω
		$T_j = 150^\circ\text{C}$	0.73	0.92	m Ω
I_{RRM}	$I_F = 1000\text{ A}$	$T_j = 150^\circ\text{C}$	800		A
Q_{rr}	$di/dt_{off} = 8.38\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	360		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$	200		mJ
$R_{th(j-c)}$	per diode			0.043	K/W
$R_{th(c-s)}$	per diode ($\lambda_{grease}=0.81\text{ W}/(\text{m}^*\text{K})$)		0.017		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material		0.014		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 ($\lambda_{grease}=0.81\text{ W}/(\text{m}^*\text{K})$)		0.0041		K/W
	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81\text{ W}/(\text{m}^*\text{K})$)		0.007		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, pre-applied phase change material		-		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



GB

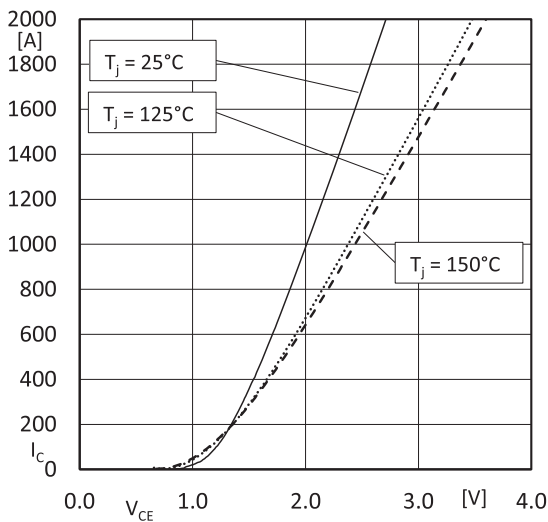


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15V$; (chipllevel)

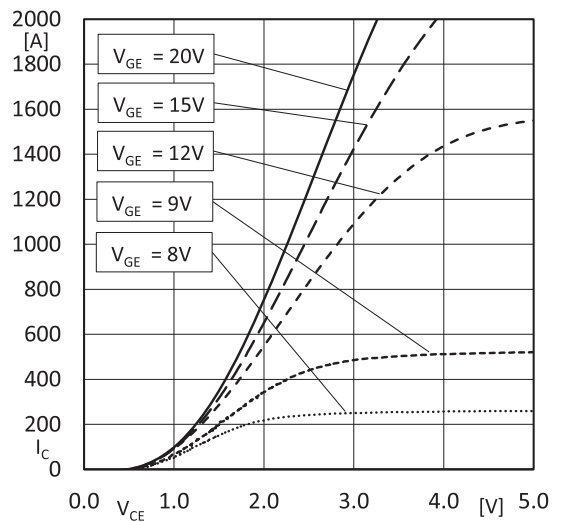


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_j = 150^\circ C$; (chipllevel)

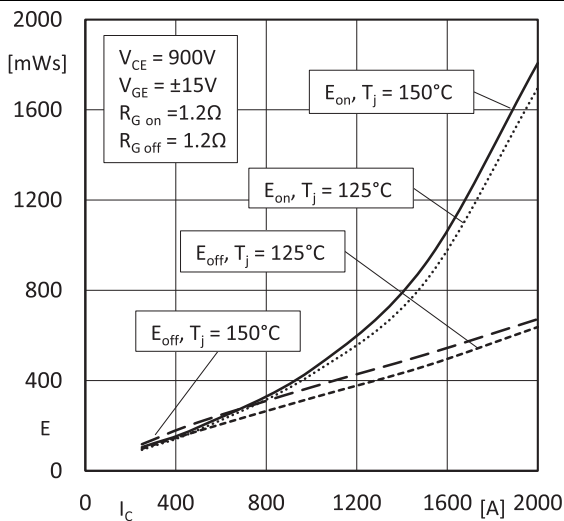


Fig. 3: Switching losses IGBT (typical); $E=f(I_C)$

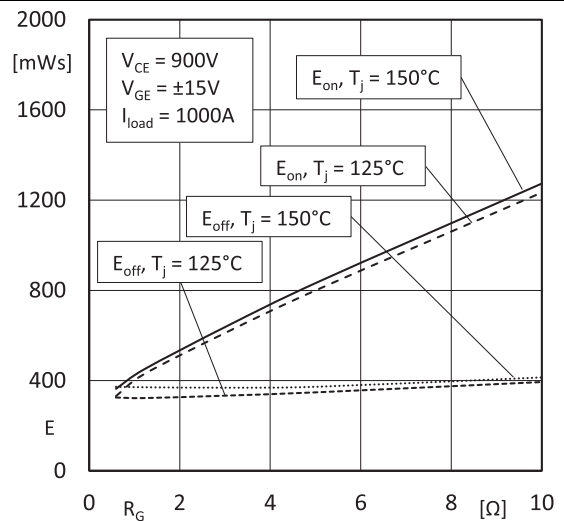


Fig. 4: Switching losses IGBT (typical); $E=f(R_G)$

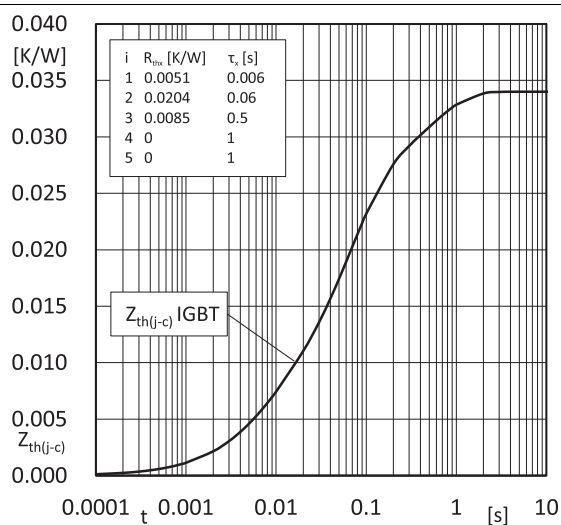


Fig. 5: Transient thermal impedance IGBT

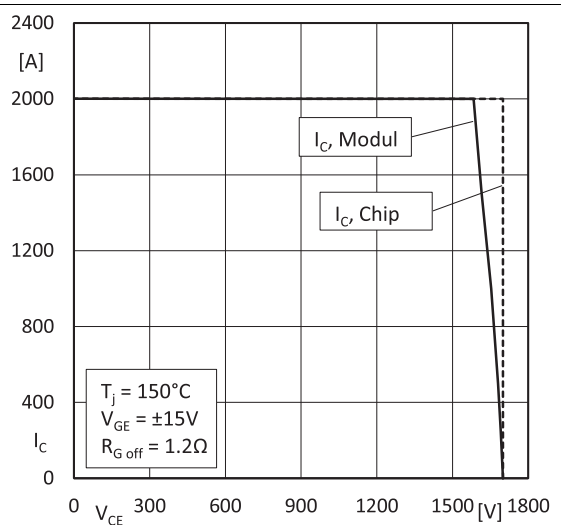


Fig. 6: RBSOA IGBT

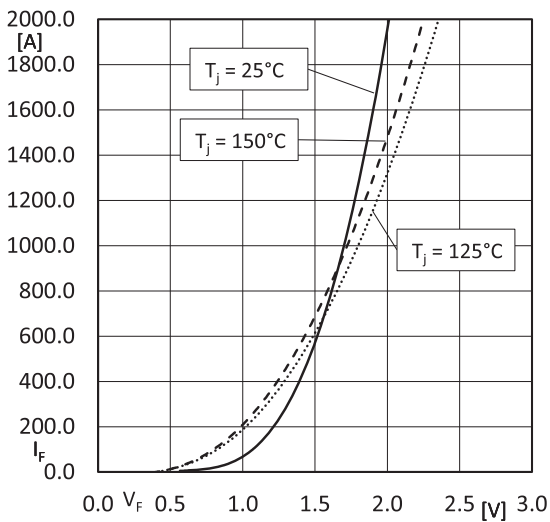


Fig. 7: Forward charact. Diode (typical); $I_F=f(V_F)$; (chipllevel)

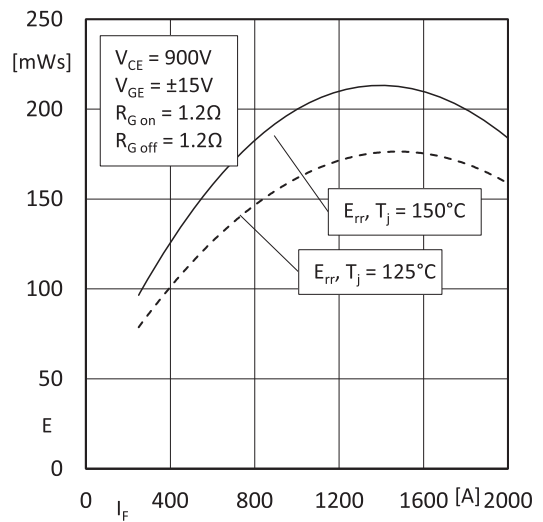


Fig. 8: Switching losses Diode (typical); $E=f(I_F)$

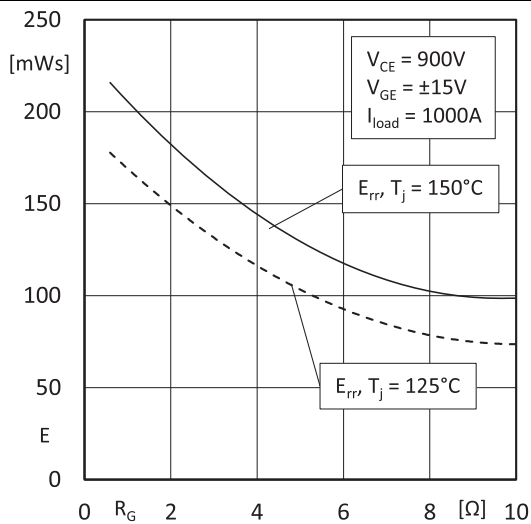


Fig. 9: Switching losses Diode (typical); $E=f(R_G)$

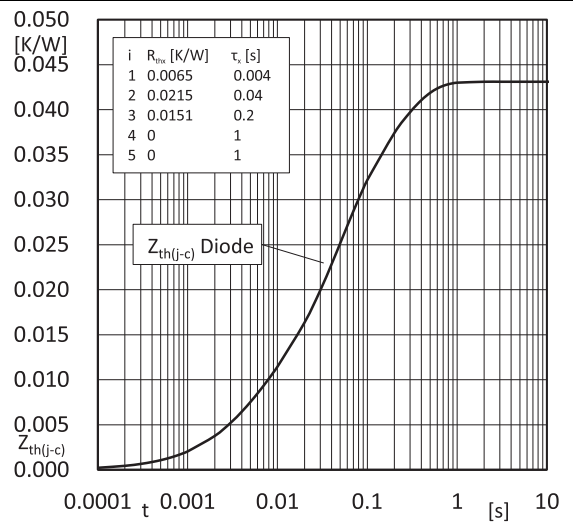


Fig. 10: Transient thermal impedance Diode

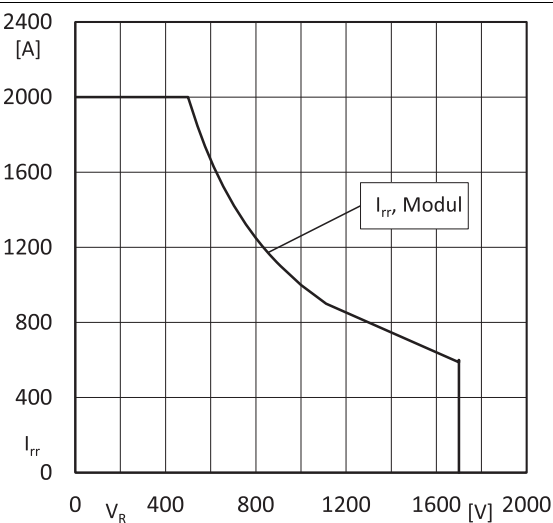


Fig. 11: RBSOA Diode

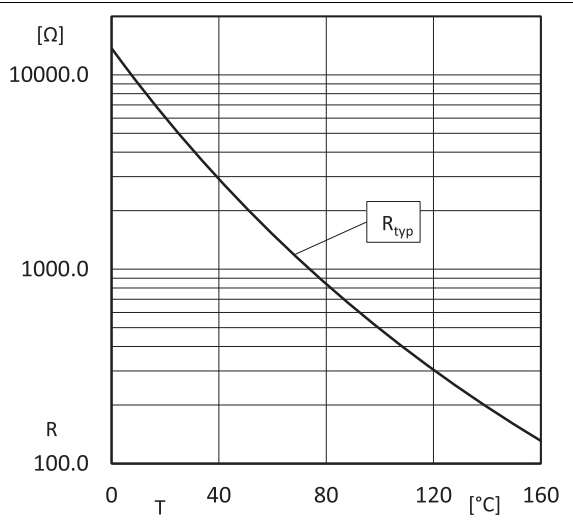


Fig. 12: NTC characteristics (typical)

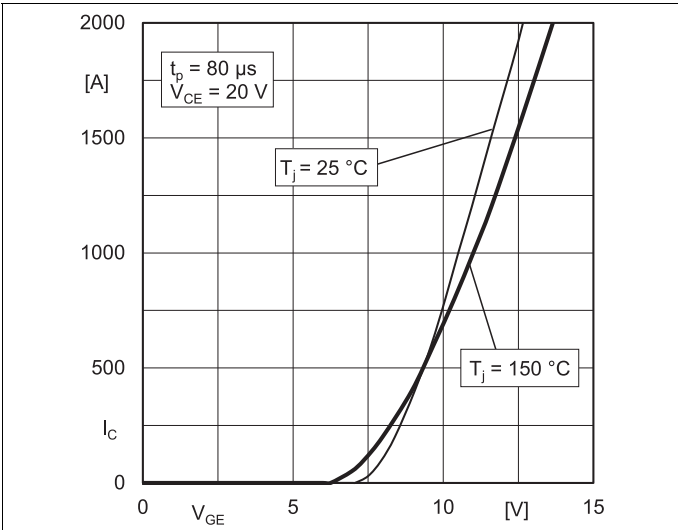


Fig. 13: Typ. transfer characteristic

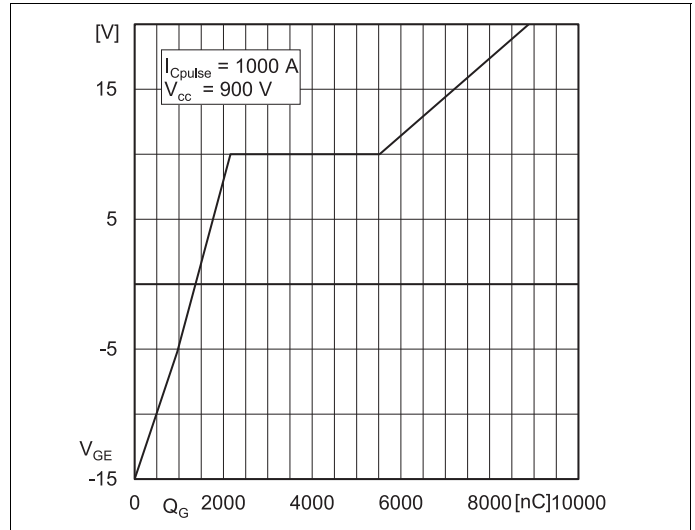
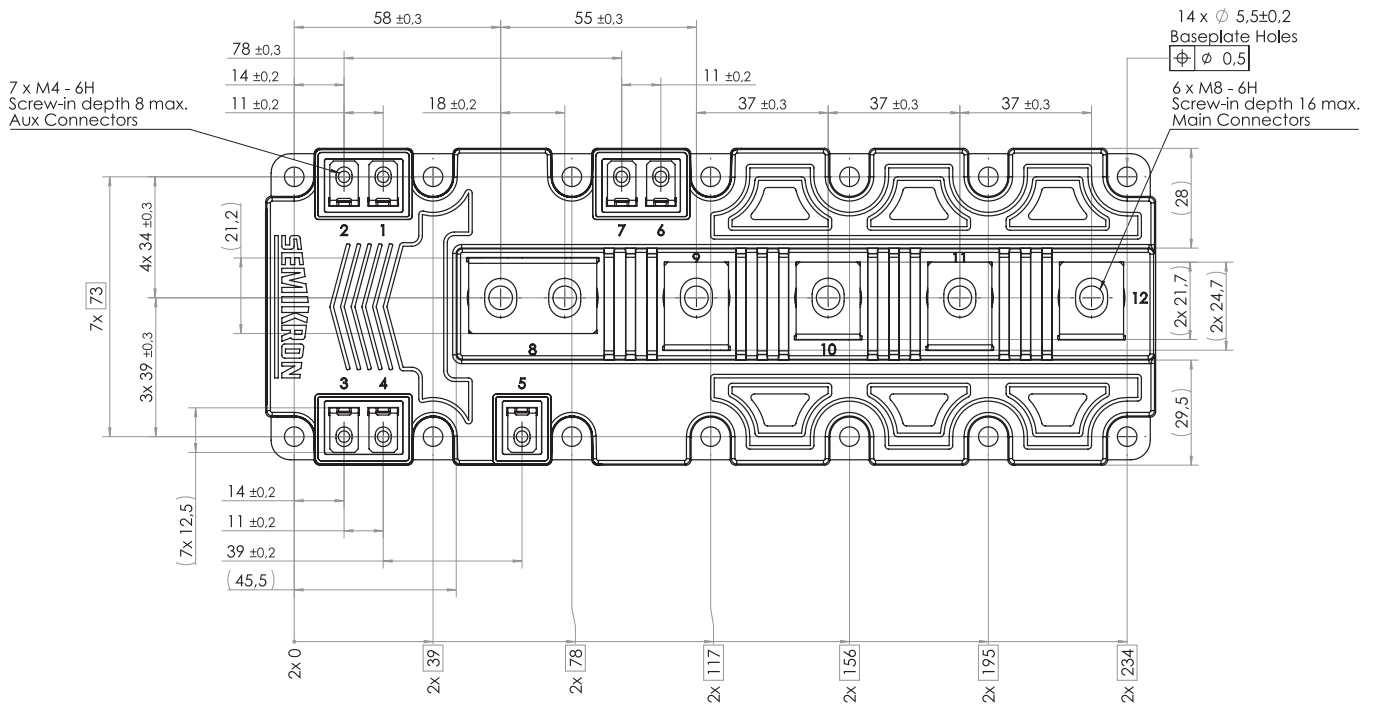
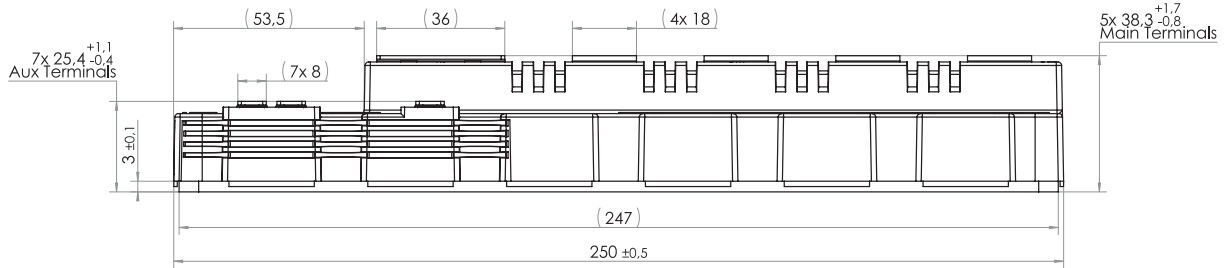
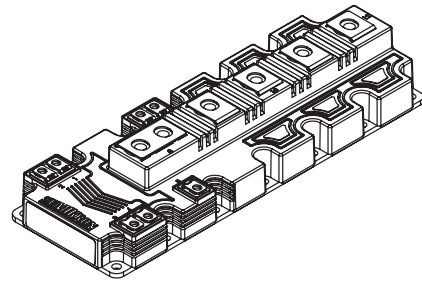
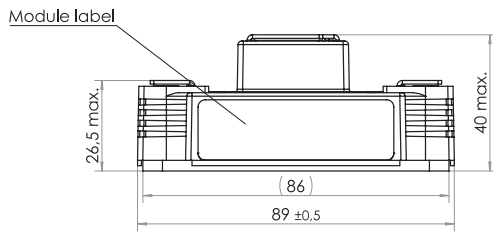


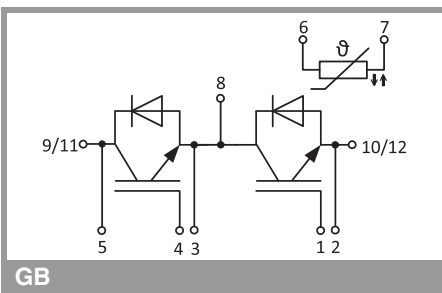
Fig. 14: Typ. gate charge characteristic

SKM1000GB17E4



- Dimensions in mm
- General tolerances ±0.5mm

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

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