



**SEMITRANS® 10**

## IGBT R8 Modules

### SKM1000GB17R8

#### Features\*

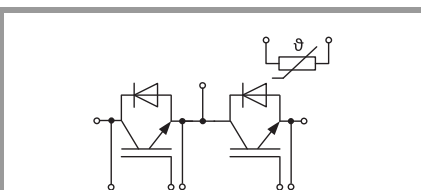
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- UL recognized, file no. E63532

#### 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	
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1700	V	
$I_C$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	1574	A
		$T_c = 100^\circ\text{C}$	1027	A
$I_{Cnom}$		1000	A	
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	2000	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 1200\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Inverse diode</b>				
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1700	V	
$I_F$	$T_j = 175^\circ\text{C}$	$T_c = 25^\circ\text{C}$	1449	A
		$T_c = 100^\circ\text{C}$	905	A
$I_{Fnom}$		1000	A	
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	2000	A	
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$	6240	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$T_{stg}$		-40 ... 150	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50 Hz, $t = 1\text{ min}$	4000	V	

Characteristics						
Symbol	Conditions	min.	typ.	max.	Unit	
<b>IGBT</b>						
$V_{CE(sat)}$	$I_C = 1000\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.66	1.99	V	
		$T_j = 150^\circ\text{C}$	2.01	2.33	V	
$V_{CE0}$	chipelevel	$T_j = 25^\circ\text{C}$	1.06	1.12	V	
		$T_j = 150^\circ\text{C}$	0.95	1.05	V	
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	0.60	0.87	$\text{m}\Omega$	
		$T_j = 150^\circ\text{C}$	1.06	1.28	$\text{m}\Omega$	
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 36\text{ mA}$	5	5.8	6.5	V	
$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = 1700\text{ V}, T_j = 25^\circ\text{C}$			6.0	mA	
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	90.0		nF	
$C_{oes}$		$f = 1\text{ MHz}$	3.00		nF	
$C_{res}$		$f = 1\text{ MHz}$	0.24		nF	
$Q_G$	$V_{GE} = -15\text{ V} / +15\text{ V}$		5640		nC	
$R_{Gint}$	$T_j = 25^\circ\text{C}$		1.8		$\Omega$	
$t_{d(on)}$	$V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$	476		ns	
$t_r$	$I_C = 1000\text{ A}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	105		ns	
$E_{on}$	$R_{Gon} = 0.7\ \Omega$	$T_j = 150^\circ\text{C}$	465		mJ	
$t_{d(off)}$	$R_{Goff} = 0.7\ \Omega$	$T_j = 150^\circ\text{C}$	713		ns	
$t_f$	$di/dt_{on} = 7.8\text{ kA}/\mu\text{s}$ $di/dt_{off} = 4.8\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	158		ns	
$E_{off}$	$dv/dt = 4600\text{ V}/\mu\text{s}$ $L_s = 24\text{ nH}$	$T_j = 150^\circ\text{C}$	332		mJ	
$R_{th(j-c)}$	per IGBT			0.03	K/W	
$R_{th(c-s)}$	per IGBT ( $\lambda_{grease} = 0.81\text{ W}/(\text{m}^2\text{K})$ )		0.016		K/W	



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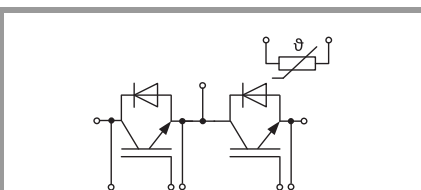
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**GB**

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse diode</b>						
$V_F = V_{EC}$	$I_F = 1000 \text{ A}$ $V_{GE} = 0 \text{ V}$ 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 $\Omega$
		$T_j = 150^\circ\text{C}$		0.73	0.92	m $\Omega$
$I_{RRM}$	$I_F = 1000 \text{ A}$	$T_j = 150^\circ\text{C}$		711		A
$Q_{rr}$	$di/dt_{off} = 8.1 \text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		325		$\mu\text{C}$
$E_{rr}$	$V_{GE} = -15 \text{ V}$ $V_{CC} = 900 \text{ V}$	$T_j = 150^\circ\text{C}$		159		mJ
$R_{th(j-c)}$	per diode				0.042	K/W
$R_{th(c-s)}$	per diode ( $\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$ )			0.017		K/W
<b>Module</b>						
$L_{CE}$				10		nH
$R_{CC'+EE'}$	measured per switch, $T_C = 25^\circ\text{C}$			0.2		m $\Omega$
$R_{th(c-s)1}$	calculated without thermal coupling ( $\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$ )			0.0041		K/W
$R_{th(c-s)2}$	including thermal coupling, $T_s$ underneath module ( $\lambda_{grease}=0.81 \text{ W}/(\text{m}^2\text{K})$ )			0.007		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
<b>Temperature Sensor</b>						
$R_{100}$	$T_c=100^\circ\text{C}$ ( $R_{25}=5 \text{ k}\Omega$ )			$493 \pm 5\%$		$\Omega$
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$ ; $T[\text{K}]$ ;			$3550$ $\pm 2\%$		K

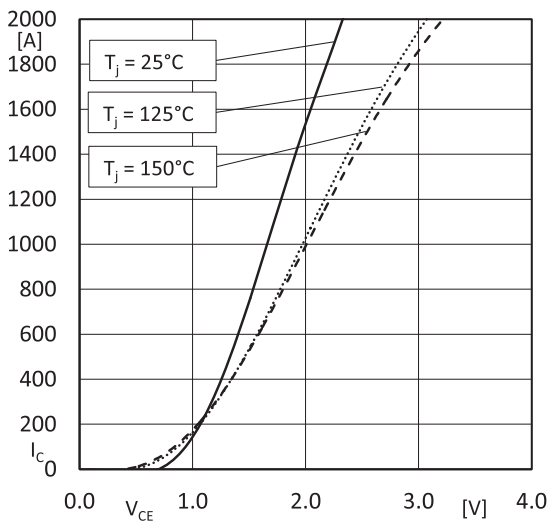


Fig. 1: Output characteristics IGBT (typical);  $I_C = f(V_{CE})$ ;  $V_{GE} = 15V$ ; (chipelevel)

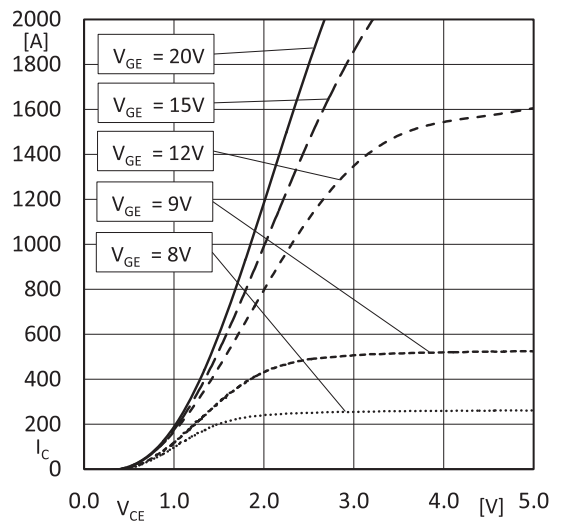


Fig. 2: Output characteristics IGBT (typical);  $I_C = f(V_{CE})$ ;  $T_j = 150^\circ C$ ; (chipelevel)

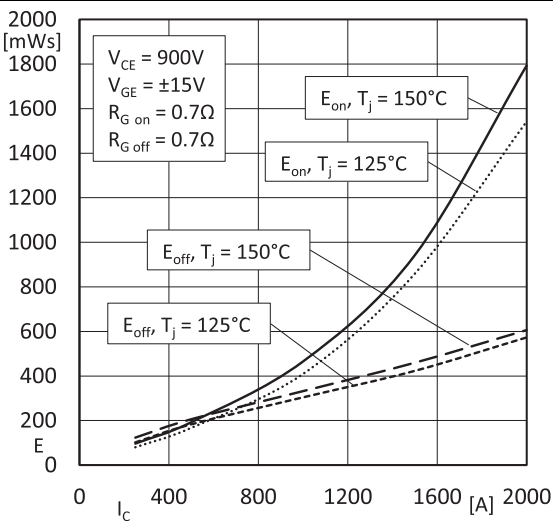


Fig. 3: Switching losses IGBT (typical);  $E=f(I_C)$

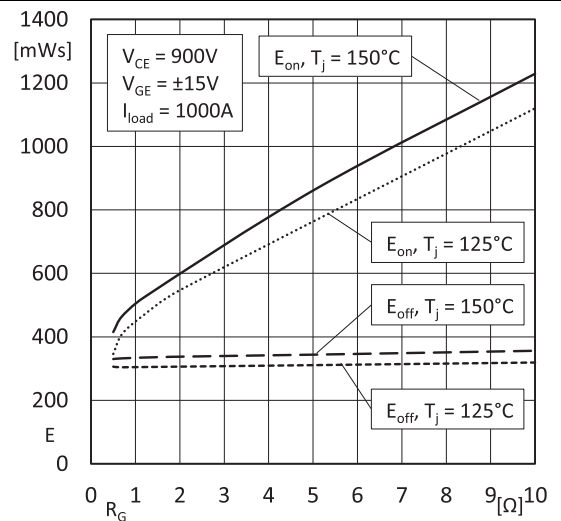


Fig. 4: Switching losses IGBT (typical);  $E=f(R_G)$

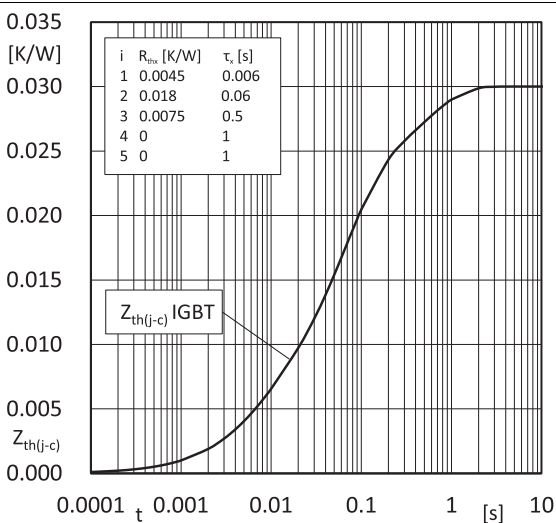


Fig. 5: Transient thermal impedance IGBT

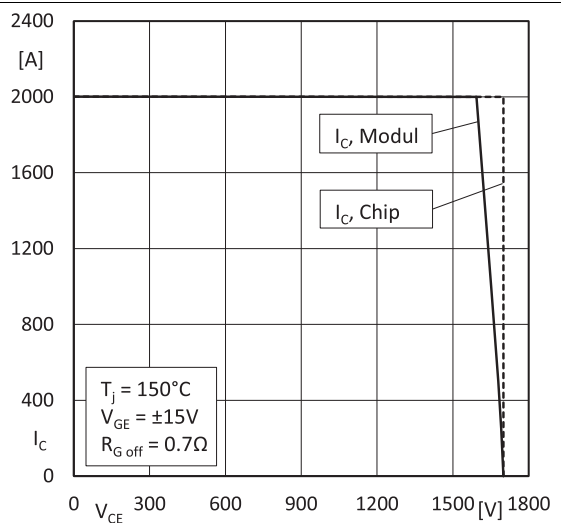


Fig. 6: RBSOA IGBT

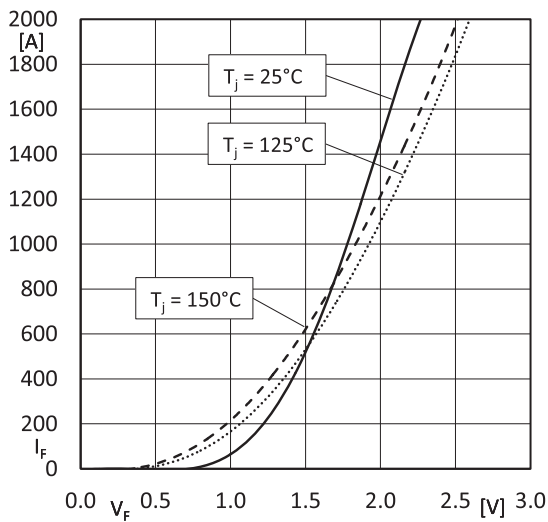


Fig. 7: Forward charact. Diode (typical);  $I_F=f(V_F)$ ; (chipllevel)

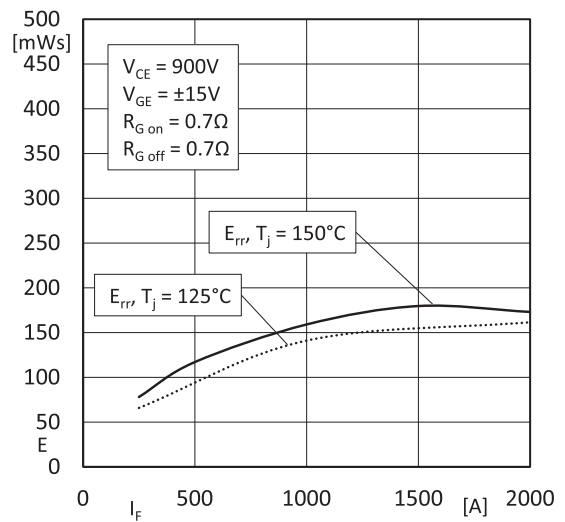


Fig. 8: Switching losses Diode (typical);  $E=f(I_F)$

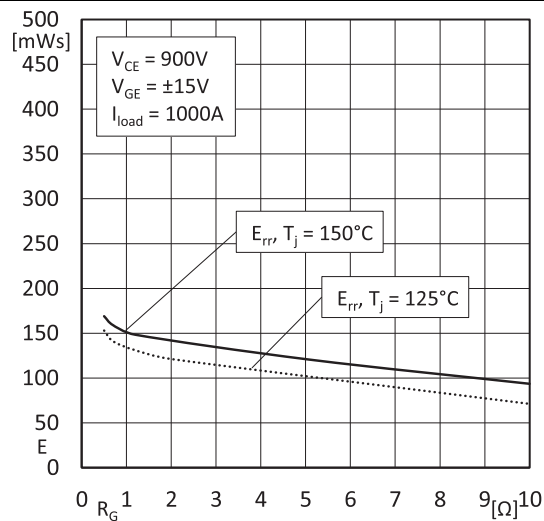


Fig. 9: Switching losses Diode (typical);  $E=f(R_G)$

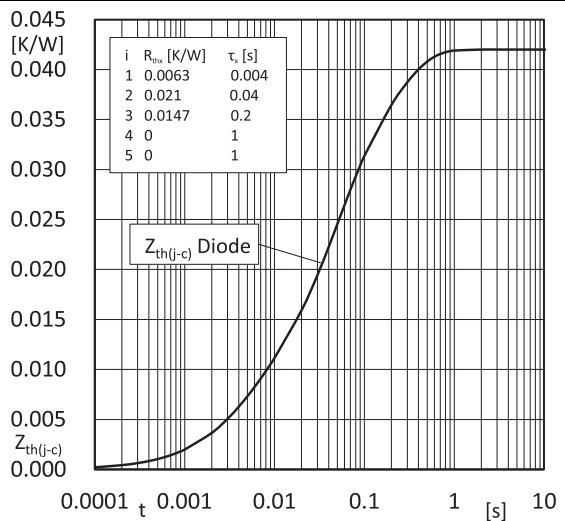


Fig. 10: Transient thermal impedance Diode

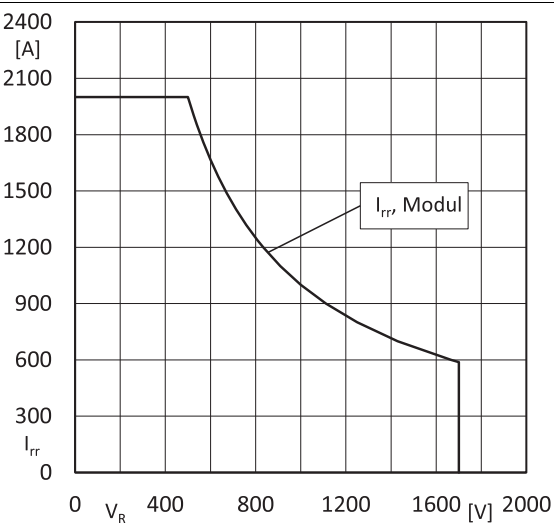


Fig. 11: RBSOA Diode

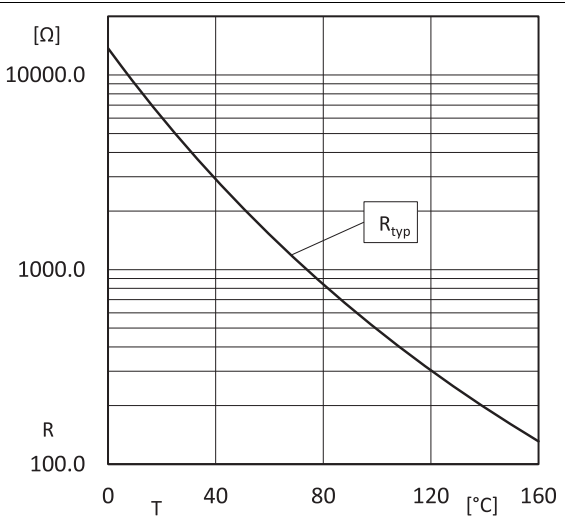


Fig. 12: NTC characteristics (typical)

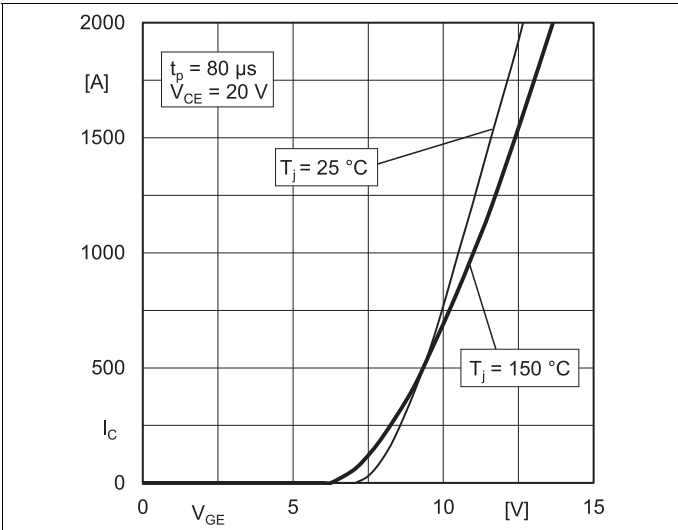


Fig. 13: Typ. transfer characteristic

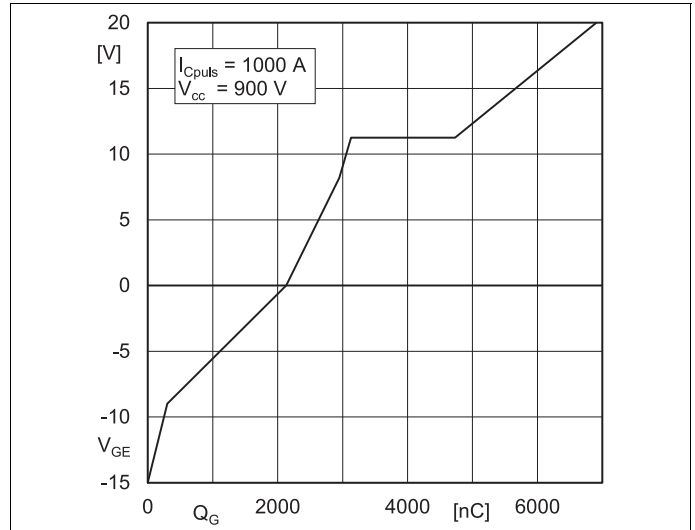
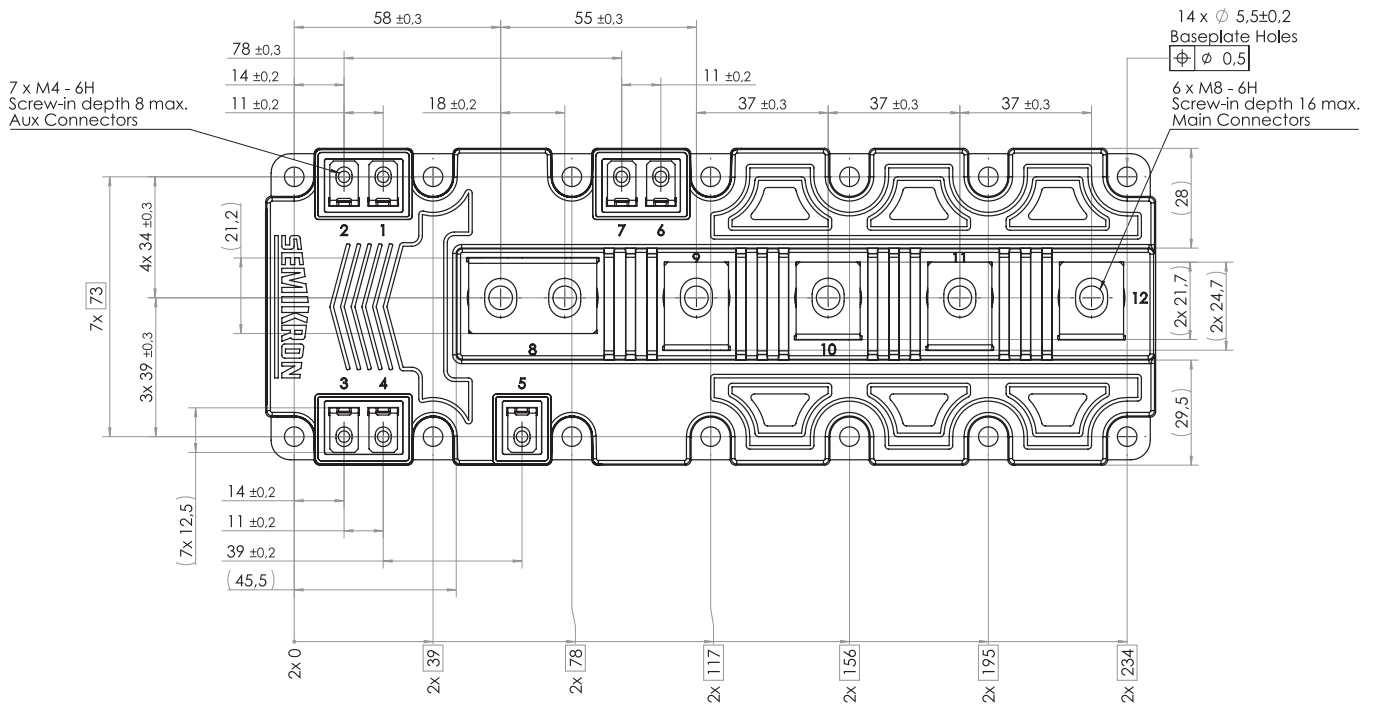
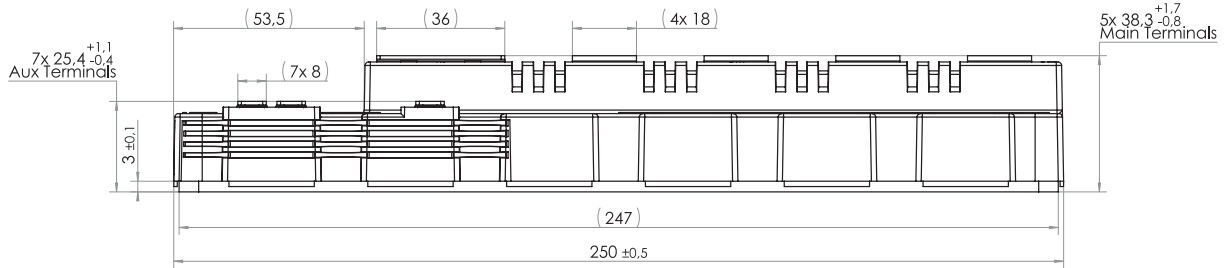
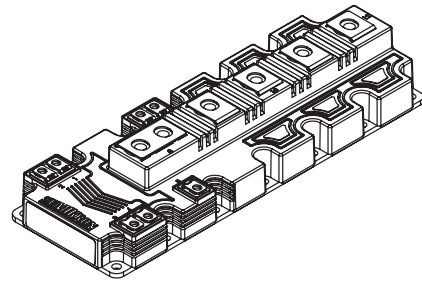
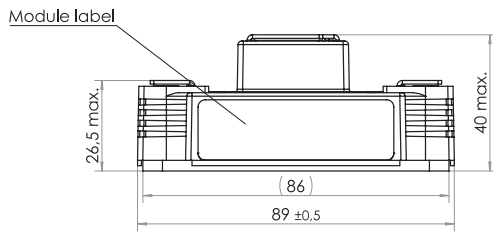


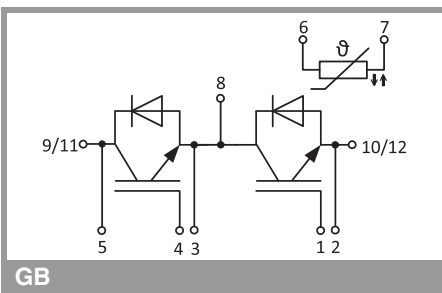
Fig. 14: Typ. gate charge characteristic

# SKM1000GB17R8



- Dimensions in mm
- General tolerances  $\pm 0.5$ mm

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

## **\*IMPORTANT INFORMATION AND WARNINGS**

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