

SKM1400GAR17R8



SEMITRANS® 10

IGBT R8 Modules

SKM1400GAR17R8

Features*

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

Typical Applications

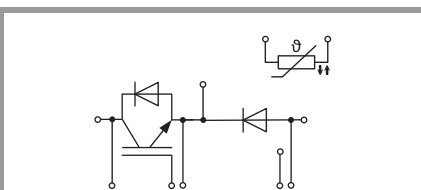
- Brake chopper
- Windturbines

Remarks

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

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	$T_j = 25^{\circ}\text{C}$		1700	V
I_C	$T_j = 175^{\circ}\text{C}$	$T_c = 25^{\circ}\text{C}$	2337	A
		$T_c = 100^{\circ}\text{C}$	1527	A
I_{Cnom}			1400	A
I_{CRM}			2800	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 1200\text{ V}$	$T_j = 150^{\circ}\text{C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1700\text{ V}$			
T_j			-40 ... 175	$^{\circ}\text{C}$
Inverse diode				
V_{RRM}	$T_j = 25^{\circ}\text{C}$		1700	V
I_F	$T_j = 175^{\circ}\text{C}$	$T_c = 25^{\circ}\text{C}$	1874	A
		$T_c = 100^{\circ}\text{C}$	1168	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	$^{\circ}\text{C}$
Freewheeling diode				
V_{RRM}	$T_j = 25^{\circ}\text{C}$		1700	V
I_F	$T_j = 175^{\circ}\text{C}$	$T_c = 25^{\circ}\text{C}$	1874	A
		$T_c = 100^{\circ}\text{C}$	1168	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				
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	$T_j = 25^{\circ}\text{C}$	1.63	1.95		V
		$T_j = 150^{\circ}\text{C}$	1.96	2.27		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	$T_j = 25^{\circ}\text{C}$	0.41	0.59		$\text{m}\Omega$
		$T_j = 150^{\circ}\text{C}$	0.72	0.87		$\text{m}\Omega$
$V_{GE(th)}$	$V_{CE} = 10\text{ V}, I_C = 52.8\text{ mA}$		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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	139.2			nF
C_{oes}		$f = 1\text{ MHz}$	4.80			nF
C_{res}		$f = 1\text{ MHz}$	0.43			nF
Q_G	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		8640			nC
R_{Gint}	$T_j = 25^{\circ}\text{C}$		1.3			Ω



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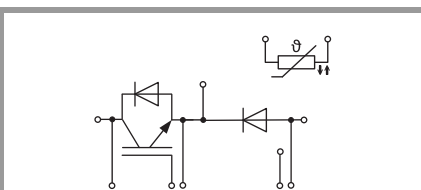
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- Brake chopper
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
IGBT					
$t_{d(on)}$	$V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$	528		ns
t_r	$I_C = 1400\text{ A}$	$T_j = 150^\circ\text{C}$	127		ns
E_{on}	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 0.67\ \Omega$	$T_j = 150^\circ\text{C}$	632		mJ
$t_{d(off)}$	$R_{G off} = 0.5\ \Omega$	$T_j = 150^\circ\text{C}$	636		ns
t_f	$di/dt_{on} = 10.7\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	161		ns
E_{off}	$di/dt_{off} = 7.5\text{ kA}/\mu\text{s}$ $dv/dt = 4300\text{ V}/\mu\text{s}$ $L_s = 36\text{ nH}$	$T_j = 150^\circ\text{C}$	496		mJ
$R_{th(j-c)}$	per IGBT			0.02	K/W
$R_{th(c-s)}$	per IGBT ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.01		K/W
Inverse diode					
$V_F = V_{EC}$	$I_F = 1400\text{ A}$	$T_j = 25^\circ\text{C}$	1.84	2.19	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 150^\circ\text{C}$	1.89	2.25	V
V_{F0}	chiplevel	$T_j = 25^\circ\text{C}$	1.32	1.56	V
		$T_j = 150^\circ\text{C}$	1.08	1.22	V
r_F	chiplevel	$T_j = 25^\circ\text{C}$	0.37	0.45	m Ω
		$T_j = 150^\circ\text{C}$	0.58	0.74	m Ω
I_{RRM}	$I_F = 1400\text{ A}$	$T_j = 150^\circ\text{C}$	1015		A
Q_{rr}	$V_{GE} = -15\text{ V}$ $di/dt_{off} = 10.1\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	516		μC
E_{rr}	μs $V_R = 900\text{ V}$	$T_j = 150^\circ\text{C}$	269		mJ
$R_{th(j-c)}$	per diode			0.032	K/W
$R_{th(c-s)}$	per diode ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.013		K/W
Freewheeling diode					
$V_F = V_{EC}$	$I_F = 1400\text{ A}$	$T_j = 25^\circ\text{C}$	1.84	2.19	V
	$V_{GE} = 0\text{ V}$ level = chiplevel	$T_j = 150^\circ\text{C}$	1.89	2.25	V
V_{F0}	chiplevel	$T_j = 25^\circ\text{C}$	1.32	1.56	V
		$T_j = 150^\circ\text{C}$	1.08	1.22	V
r_F	chiplevel	$T_j = 25^\circ\text{C}$	0.37	0.45	m Ω
		$T_j = 150^\circ\text{C}$	0.58	0.74	m Ω
I_{RRM}	$I_F = 1400\text{ A}$	$T_j = 150^\circ\text{C}$	1015		A
Q_{rr}	$di/dt_{off} = 10.1\text{ kA}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	516		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_R = 900\text{ V}$	$T_j = 150^\circ\text{C}$	269		mJ
$R_{th(j-c)}$	per diode			0.032	K/W
$R_{th(c-s)}$	per diode ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.013		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 ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.0028		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81\text{ W}/(\text{m}^2\text{K})$)		0.005		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

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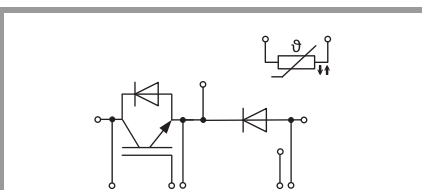
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Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
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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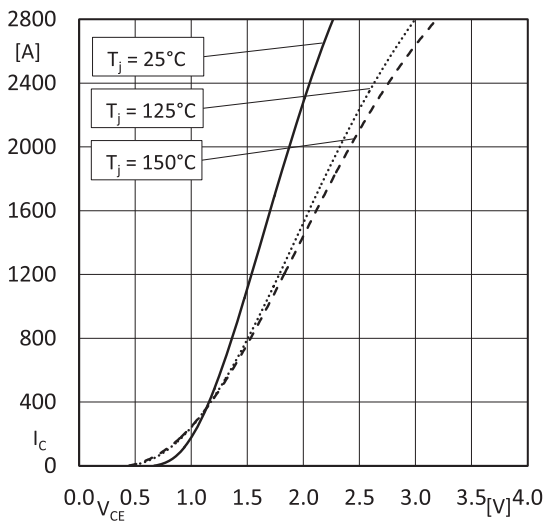


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15\text{V}$; (chipllevel)

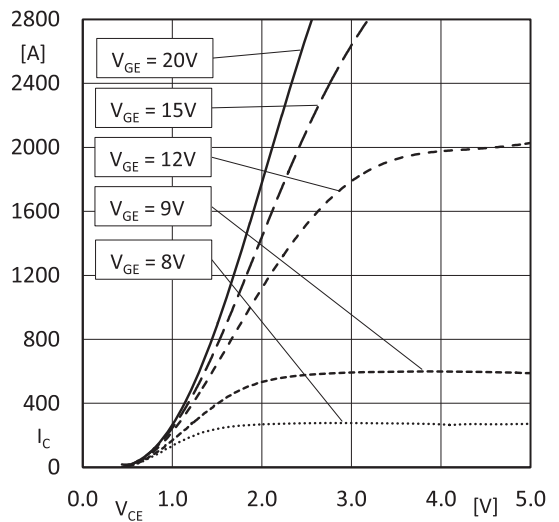


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_j = 150^\circ\text{C}$; (chipllevel)

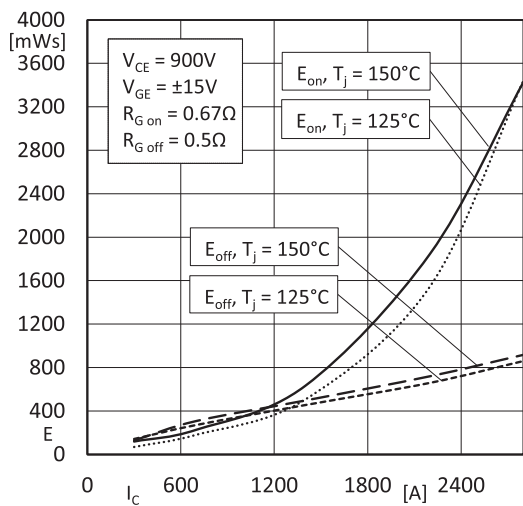


Fig. 3: Switching losses IGBT (typical); $E=f(I_C)$

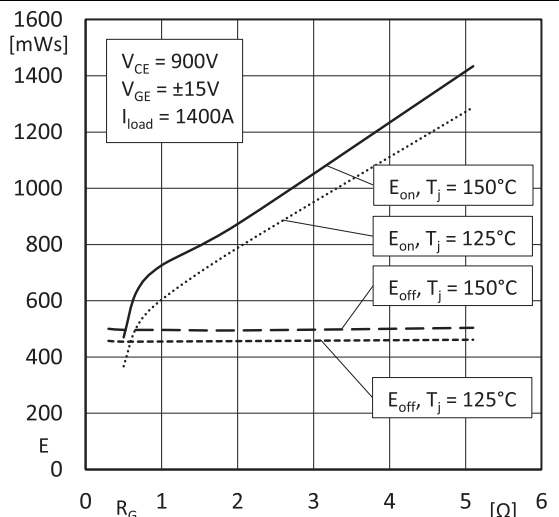


Fig. 4: Switching losses IGBT (typical); $E=f(R_G)$

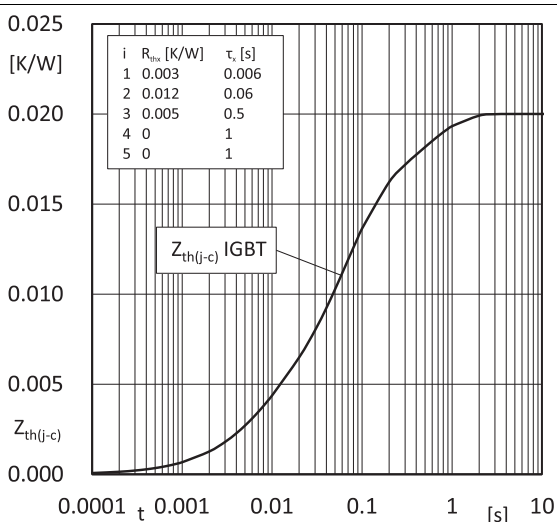


Fig. 5: Transient thermal impedance IGBT

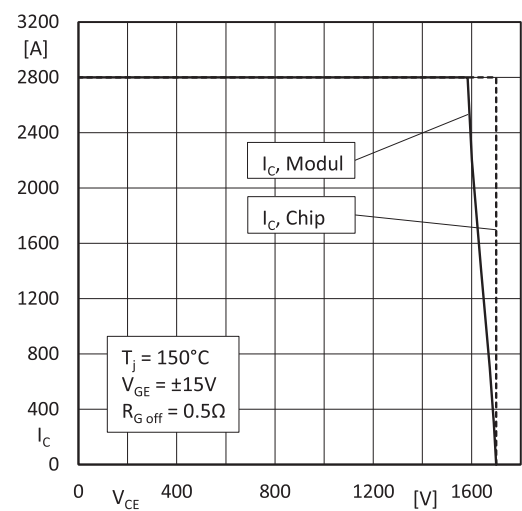


Fig. 6: RBSOA IGBT

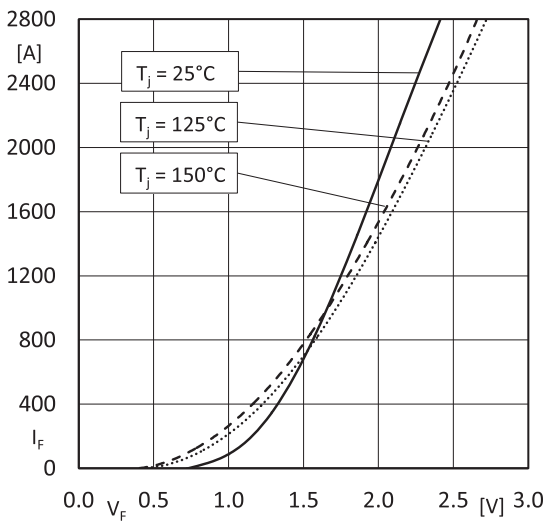


Fig. 7: Forward charact. Diode (typical); $I_F=f(V_F)$; (chipllevel)

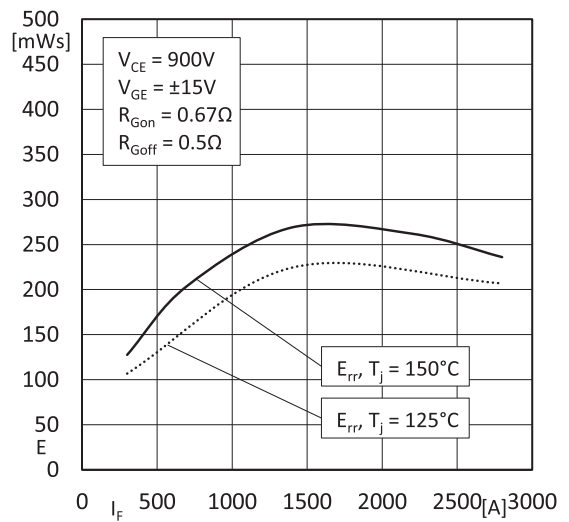


Fig. 8: Switching losses Diode (typical); $E=f(I_F)$

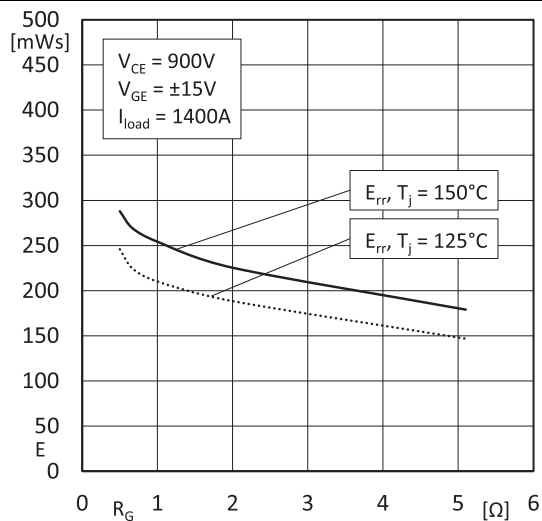


Fig. 9: Switching losses Diode (typical); $E=f(R_G)$

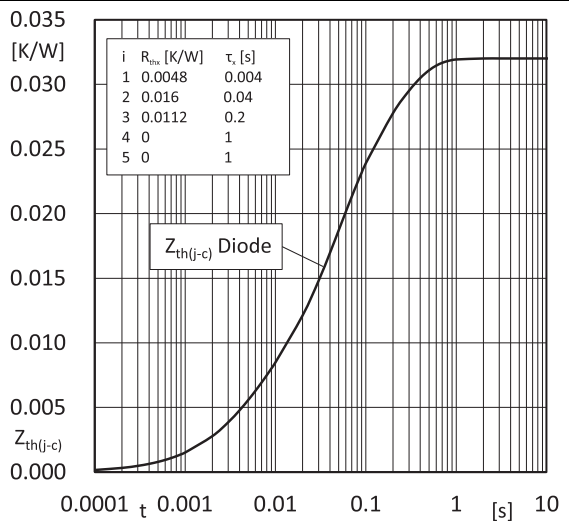


Fig. 10: Transient thermal impedance Diode

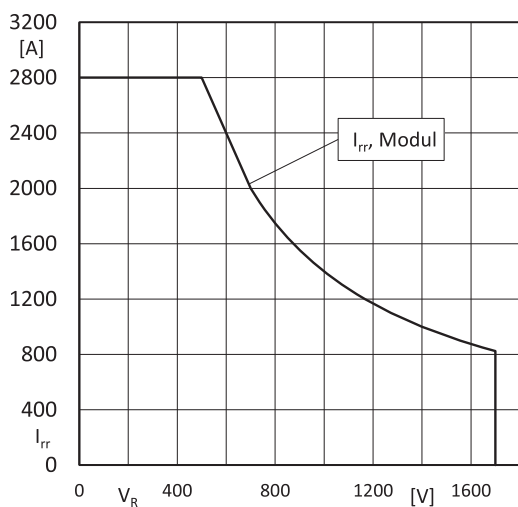


Fig. 11: RBSOA Diode

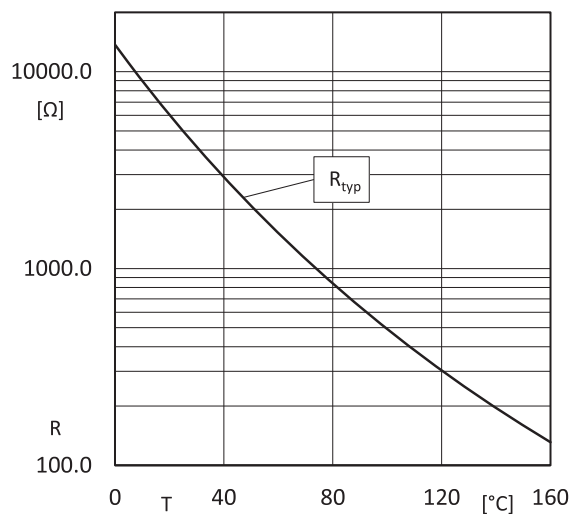


Fig. 12: NTC characteristics (typical)

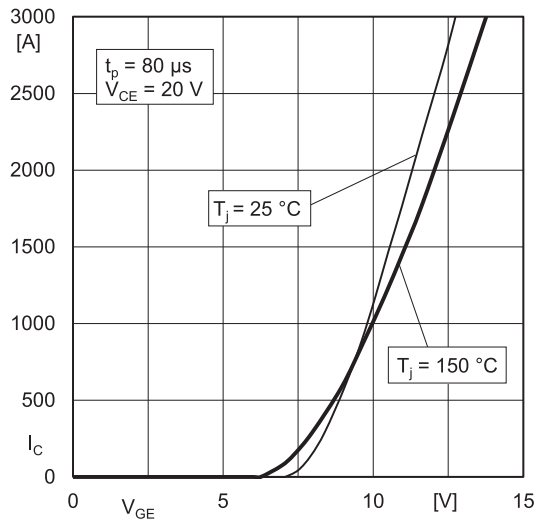


Fig. 13: Typ. transfer characteristic

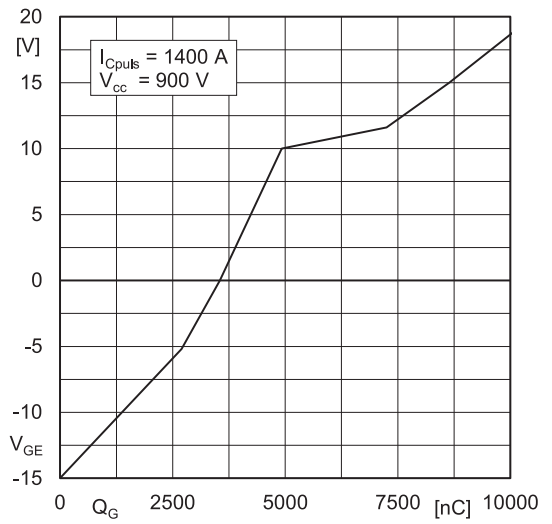
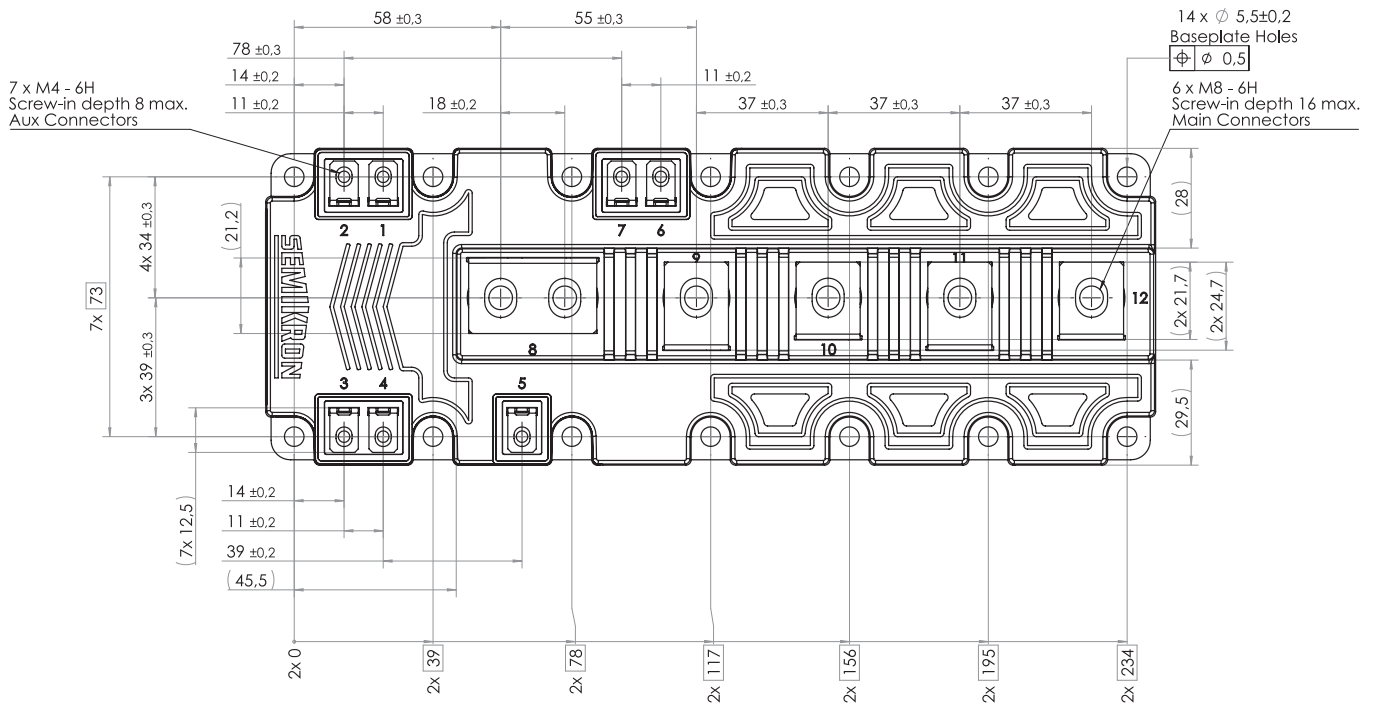
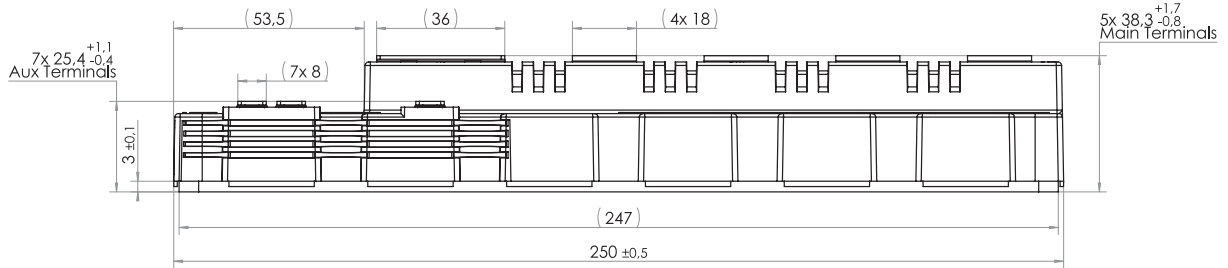
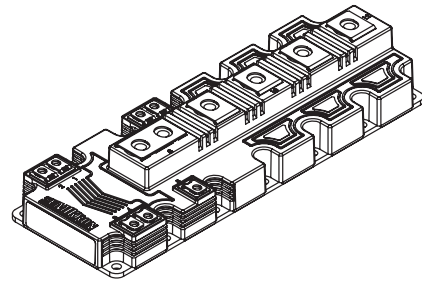
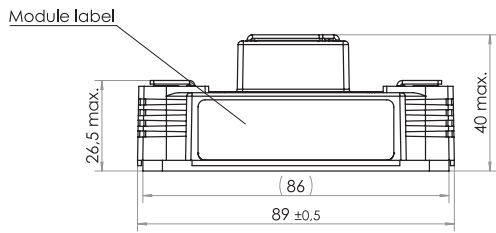


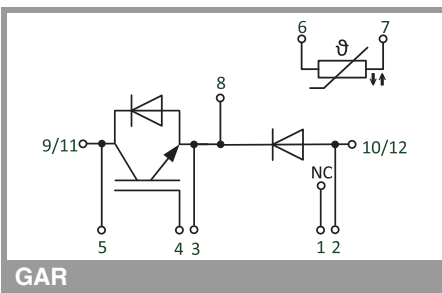
Fig. 14: Typ. gate charge characteristic

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- Dimensions in mm
- General tolerances ±0.5mm

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

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