



SEMITRANS® 10

IGBT R8 Modules

SKM1400GAL17R8

Features*

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

Typical Applications

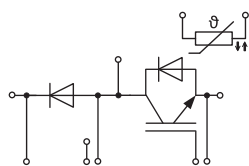
- Brake chopper
- Wind turbines

Remarks

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

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 175 °C	T _c = 25 °C	2337	A
		T _c = 100 °C	1527	A
I _{Cnom}			1400	A
I _{CRM}			2800	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1200 V V _{GE} ≤ 15 V V _{CES} ≤ 1700 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse diode				
V _{RRM}	T _j = 25 °C		1700	V
I _F	T _j = 175 °C	T _c = 25 °C	1874	A
		T _c = 100 °C	1168	A
I _{FRM}			2800	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		9024	A
T _j			-40 ... 175	°C
Freewheeling diode				
V _{RRM}	T _j = 25 °C		1700	V
I _F	T _j = 175 °C	T _c = 25 °C	1874	A
		T _c = 100 °C	1168	A
I _{FRM}			2800	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		9024	A
T _j			-40 ... 175	°C
Module				
T _{stg}			-40 ... 150	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 1400 A	T _j = 25 °C		1.63	1.95	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		1.96	2.27	V
V _{CE0}	chiplevel	T _j = 25 °C		1.06	1.12	V
		T _j = 150 °C		0.95	1.05	V
r _{CE}	V _{GE} = 15 V chiplevel	T _j = 25 °C		0.41	0.59	mΩ
		T _j = 150 °C		0.72	0.87	mΩ
V _{GE(th)}	V _{CE} = 10 V, I _C = 52.8 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1700 V, T _j = 25 °C				6.0	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		139.2		nF
C _{oes}		f = 1 MHz		4.80		nF
C _{res}		f = 1 MHz		0.43		nF
Q _G	V _{GE} = - 15 V...+ 15 V			8640		nC
R _{Gint}	T _j = 25 °C			1.3		Ω



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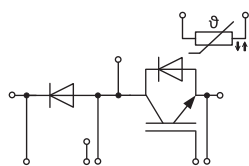
Typical Applications

- Brake chopper
- Wind turbines

Remarks

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
t _{d(on)}	V _{CC} = 900 V	T _j = 150 °C		536		ns
t _r	I _C = 1400 A	T _j = 150 °C		127		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		645		mJ
t _{d(off)}	R _{G on} = 0.67 Ω	T _j = 150 °C		645		ns
t _f	R _{G off} = 0.5 Ω	T _j = 150 °C		215		ns
E _{off}	di/dt _{on} = 10.4 kA/ μs di/dt _{off} = 6.8 kA/μs dv/dt = 3100 V/μs L _s = 36 nH	T _j = 150 °C		482		mJ
R _{th(j-c)}	per IGBT				0.02	K/W
R _{th(c-s)}	per IGBT (λ _{grease} =0.81 W/(m*K))			0.01		K/W
Inverse diode						
V _F = V _{EC}	I _F = 1400 A	T _j = 25 °C		1.84	2.19	V
	V _{GE} = 0 V	T _j = 150 °C		1.89	2.25	V
	chiplevel					
V _{F0}		T _j = 25 °C		1.32	1.56	V
	chiplevel	T _j = 150 °C		1.08	1.22	V
r _F		T _j = 25 °C		0.37	0.45	mΩ
	chiplevel	T _j = 150 °C		0.58	0.74	mΩ
I _{RRM}	I _F = 1400 A	T _j = 150 °C		1025		A
Q _{rr}	V _{GE} = -15 V	T _j = 150 °C		486		μC
	di/dt _{off} = 10.4 kA/ μs					
E _{rr}	V _R = 900 V	T _j = 150 °C		236		mJ
R _{th(j-c)}	per diode				0.032	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.013		K/W
Freewheeling diode						
V _F = V _{EC}	I _F = 1400 A	T _j = 25 °C		1.84	2.19	V
	V _{GE} = 0 V	T _j = 150 °C		1.89	2.25	V
	level = chiplevel					
V _{F0}		T _j = 25 °C		1.32	1.56	V
	chiplevel	T _j = 150 °C		1.08	1.22	V
r _F		T _j = 25 °C		0.37	0.45	mΩ
	chiplevel	T _j = 150 °C		0.58	0.74	mΩ
I _{RRM}	I _F = 1400 A	T _j = 150 °C		1025		A
Q _{rr}	di/dt _{off} = 10.4 kA/ μs	T _j = 150 °C		486		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		236		mJ
	V _R = 900 V					
R _{th(j-c)}	per diode				0.032	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.013		K/W
Module						
L _{CE}				10		nH
R _{CC'+EE'}	measured per switch, T _C = 25 °C			0.2		mΩ
R _{th(c-s)1}	calculated without thermal coupling (λ _{grease} =0.81 W/(m*K))			0.0028		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module (λ _{grease} =0.81 W/(m*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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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R ₁₀₀	T _c =100°C (R ₂₅ =5 kΩ)		493 ± 5%		Ω
B _{100/125}	R _(T) =R ₁₀₀ exp[B _{100/125} (1/T-1/T ₁₀₀)]; T[K];		3550 ±2%		K

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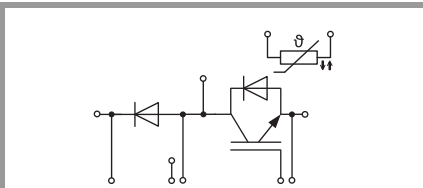
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- Brake chopper
- Windturbines

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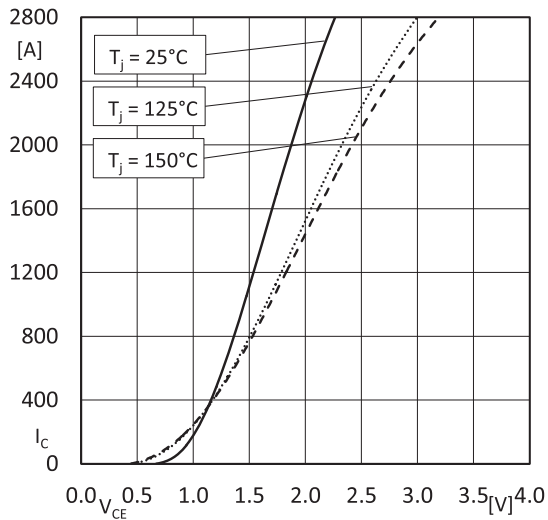


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15V$; (chiplevel)

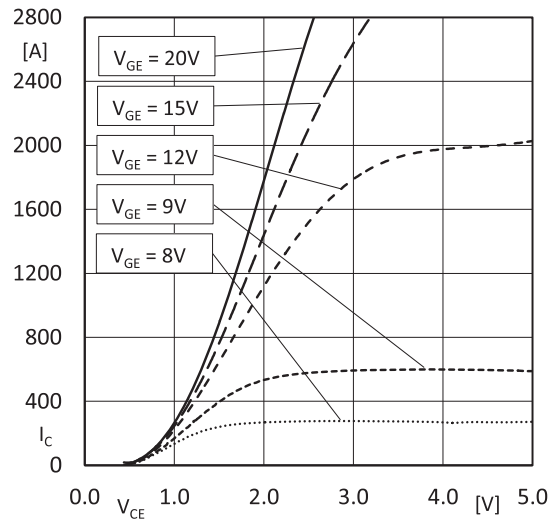


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_j = 150^\circ C$; (chiplevel)

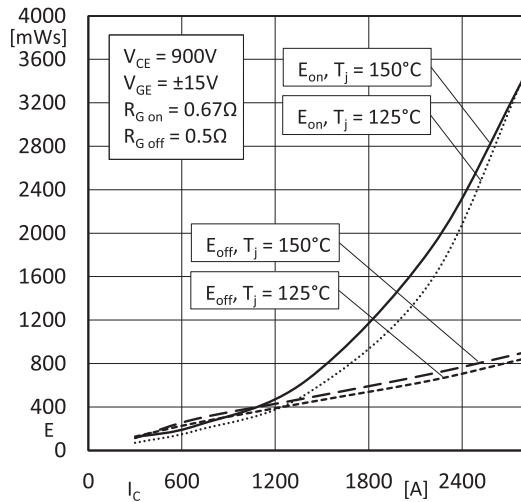


Fig. 3: Switching losses IGBT (typical); $E = f(I_C)$

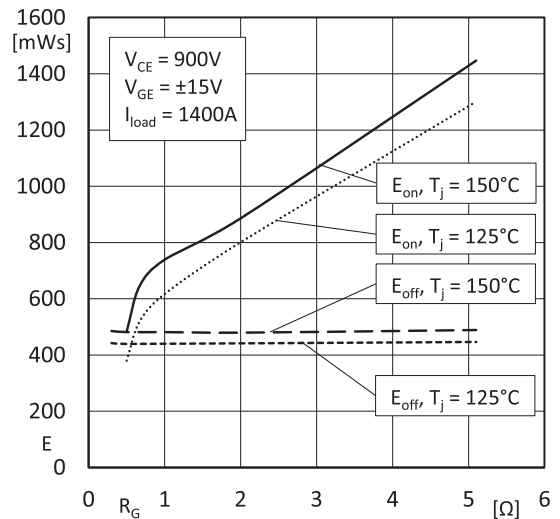


Fig. 4: Switching losses IGBT (typical); $E = f(R_G)$

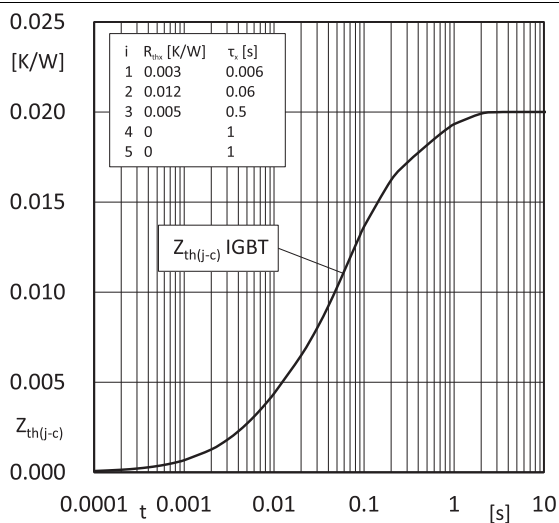


Fig. 5: Transient thermal impedance IGBT

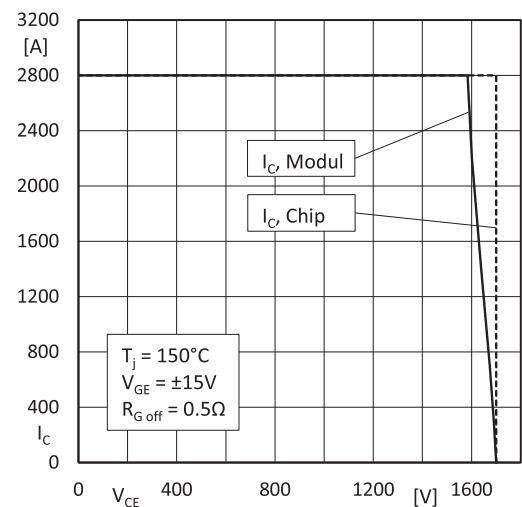
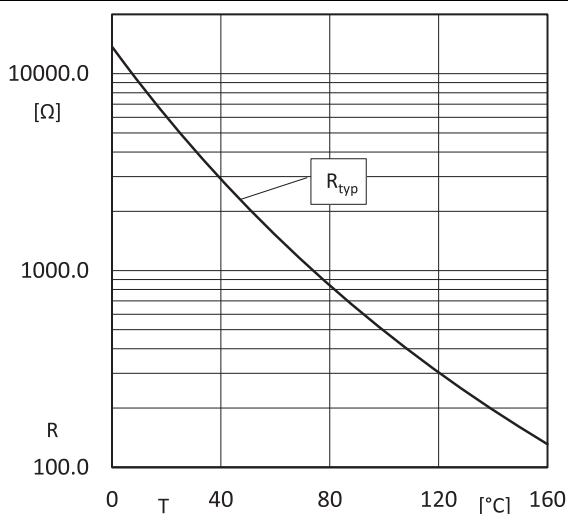
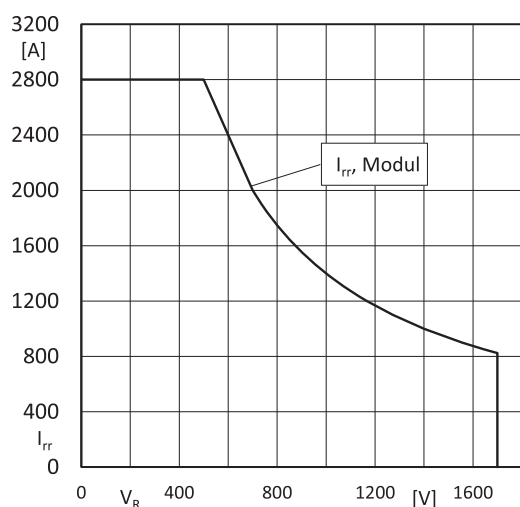
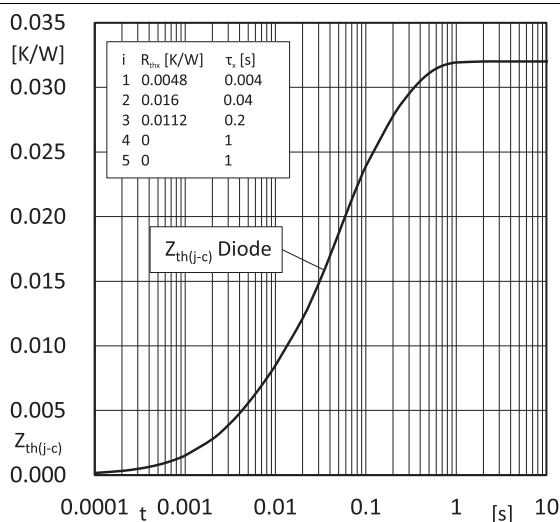
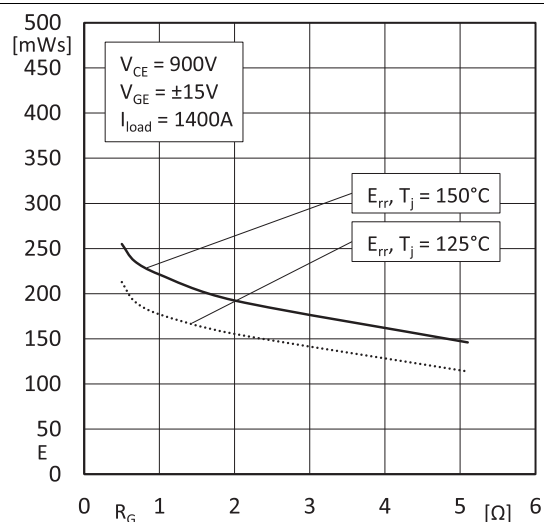
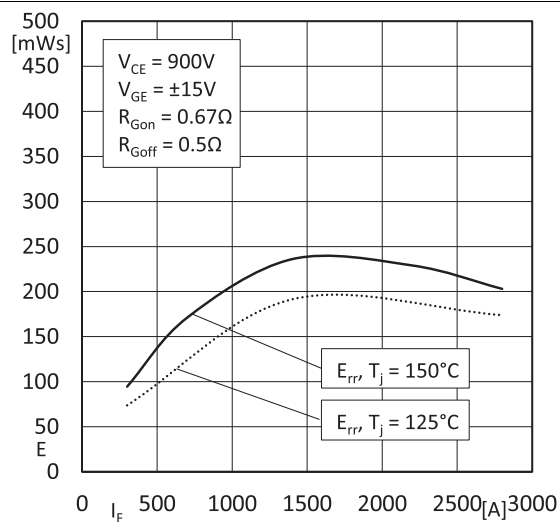
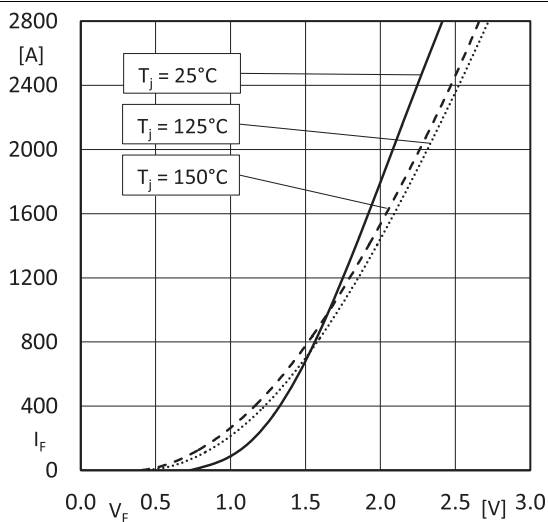


Fig. 6: RBSOA IGBT



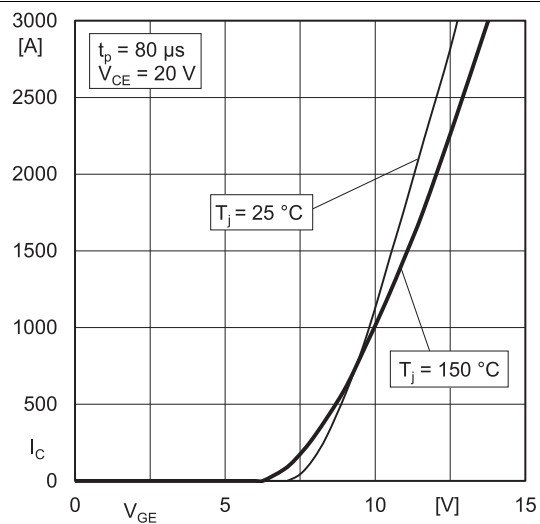


Fig. 13: Typ. transfer characteristic

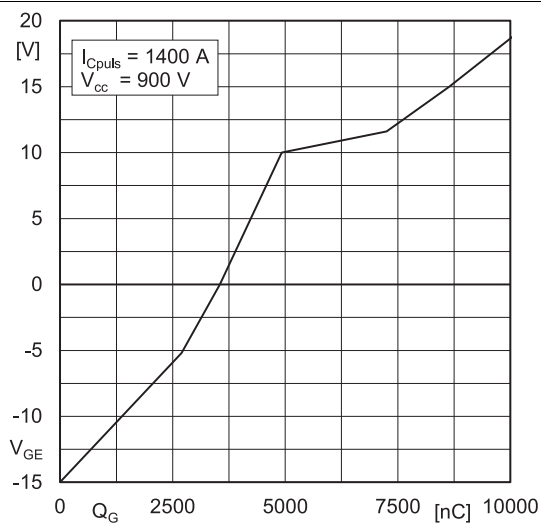
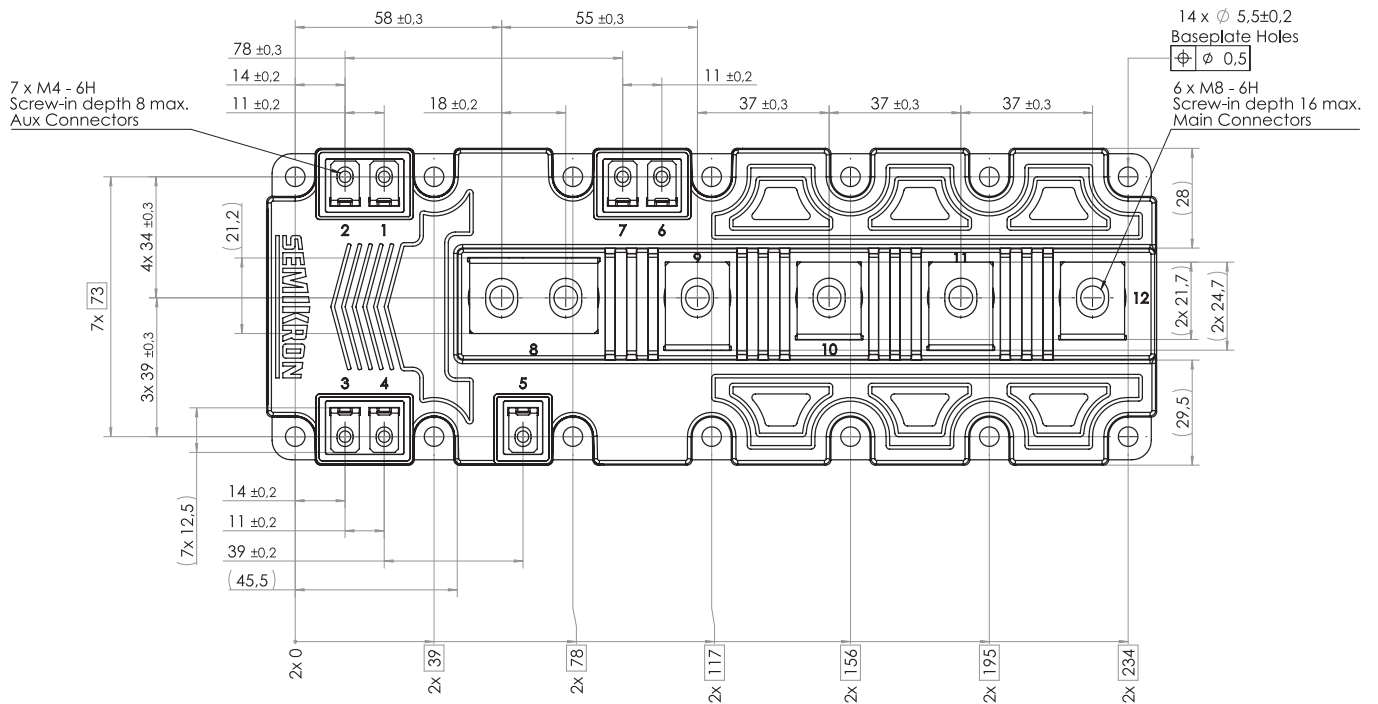
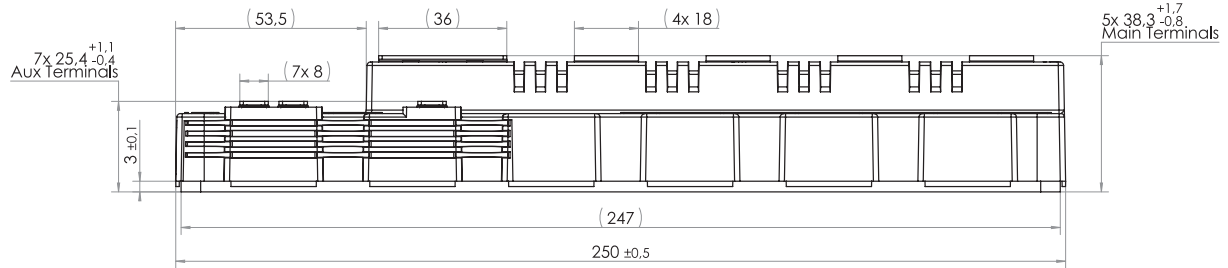
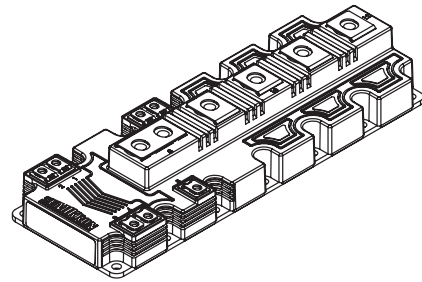
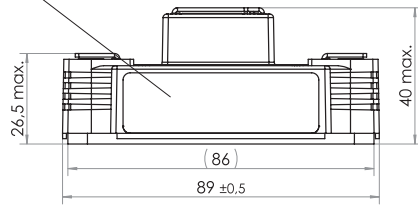


Fig. 14: Typ. gate charge characteristic

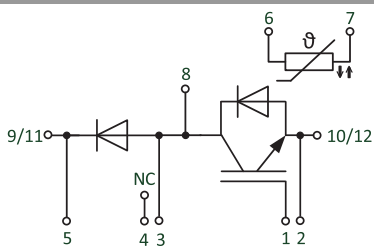
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Module label



- 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.

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