SEMITRANS® 10

IGBT M7 Modules

SKM1800GB12M7ST

Features*

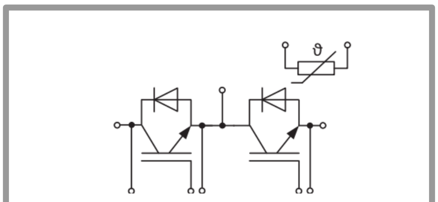
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- Low loss high density IGBT´s
- Fast & soft switching inverse CAL diodes
- UL recognized, file no. E63532

Typical Applications

- Motor Drives
- UPS Systems
- Solar Inverters

Remarks

- Max. case temperature limited to $T_c = T_s = 125$ °C
- Recommended T_{jop} = -40 ... +150 °C
- $I_{DC} \leq 1000$ A for $T_{Terminal}$ = 100 °C



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_c = 25 °C	2475	A
		T_c = 100 °C	1629	A
I_{Cnom}			1800	A
I_{CRM}			3600	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq 15$ V $V_{CES} \leq 1200$ V	T_j = 150 °C	8	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	2219	A
		T_c = 100 °C	1404	A
I_{FRM}			3600	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		7296	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			1000	A
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 = 1800 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.55	1.88	V
		T_j = 150 °C		1.80	2.37	V
V_{CE0}	chiplevel	T_j = 25 °C		0.87	0.95	V
		T_j = 150 °C		0.76	0.91	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		0.38	0.52	mΩ
		T_j = 150 °C		0.58	0.81	mΩ
$V_{GE(th)}$	V_{CE} = 10V, I_C = 180 mA		5.4	6.0	6.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				5.0	mA
C_{ies}	V_{CE} = 10 V V_{GE} = 0 V	f = 1 MHz		360.0		nF
C_{oes}		f = 1 MHz		10.97		nF
C_{res}		f = 1 MHz		3.84		nF
Q_G	V_{GE} = - 8 V / + 15 V			17310		nC
R_{Gint}	T_j = 25 °C			0.3		Ω
$t_{d(on)}$	V_{CC}= 600 V I_C= 1800 A V_{GE} = +15V/-15V R_{Gon} = 1 Ω R_{Goff} = 0.5 Ω di/dt_{on} = 9.2 kA/µs di/dt_{off} = 12.8 kA/µs dv/dt = 5406 V/µs L_S= 15 nH	T_j = 150 °C		498		ns
t_r		T_j = 150 °C		195		ns
E_{on}		T_j = 150 °C		287		mJ
$t_{d(off)}$		T_j = 150 °C		694		ns
t_f		T_j = 150 °C		117		ns
E_{off}		T_j = 150 °C		232		mJ
$R_{th(j-c)}$	per IGBT				0.023	K/W
$R_{th(c-s)}$	per IGBT, (λ_{grease} = 0.81 W/(m*K))			0.012		K/W
$R_{th(c-s)}$	per IGBT, pre-applied phase change material			0.006		K/W

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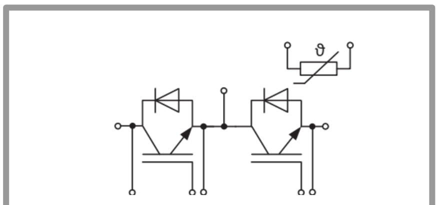

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse diode						
$V_F = V_{EC}$	I_F = 1800 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		1.80	2.13	V
		T_j = 150 °C		1.83	2.17	V
V_{F0}	chiplevel	T_j = 25 °C		1.19	1.40	V
		T_j = 150 °C		0.97	1.10	V
r_F	chiplevel	T_j = 25 °C		0.34	0.40	mΩ
		T_j = 150 °C		0.48	0.60	mΩ
I_{RRM}	I_F = 1800 A, di/dt_{off} = 9.9 kA/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		1067		A
Q_{rr}		T_j = 150 °C		338		µC
E_{rr}		T_j = 150 °C		140		mJ
$R_{th(j-c)}$	per diode				0.036	K/W
$R_{th(c-s)}$	per diode, (λ_{grease} = 0.81 W/(m*K))			0.017		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material			0.009		K/W
Module						
L_{CE}				10		nH
$R_{CC'+EE'}$	measured per switch, T_C = 25 °C			0.20		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling (λ_{grease}=0.81 W/(m*K))			0.0019		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module (λ_{grease}=0.81 W/(m*K))			0.003		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, pre-applied phase change material			0.002		K/W
M_s	to heat sink M5		4		6	Nm
M_t		to terminal M8	8		10	Nm
		to terminal M4	1.8		2.1	Nm
w					1250	g
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

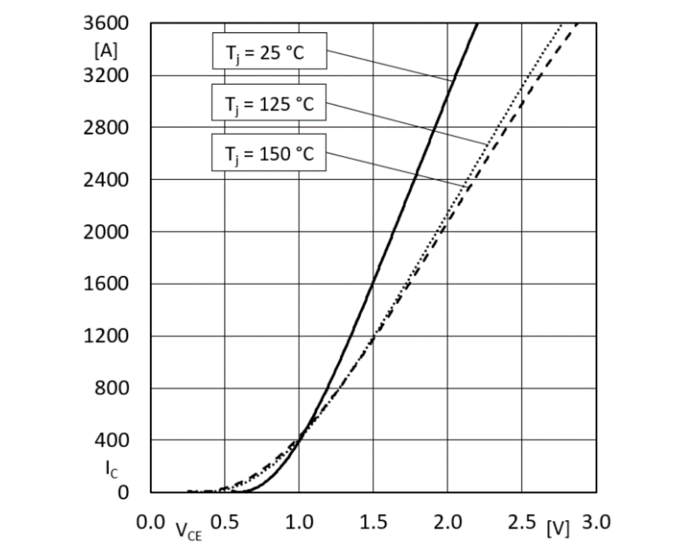


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; V_{GE} = 15 V; (chiplevel)

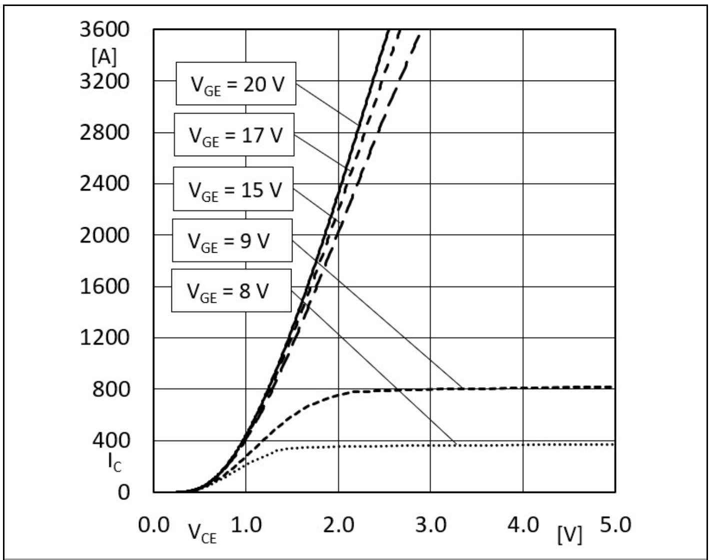


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; T_j = 150 °C; (chiplevel)

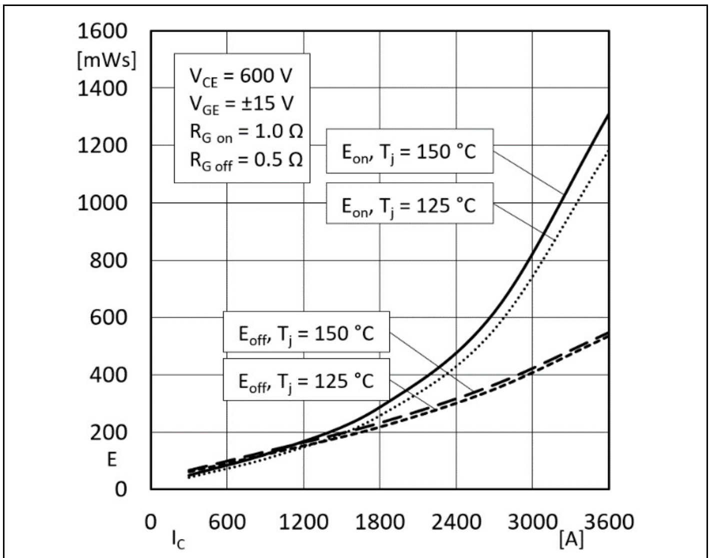


Fig. 3: Switching losses IGBT (typical); $E = f(I_C)$

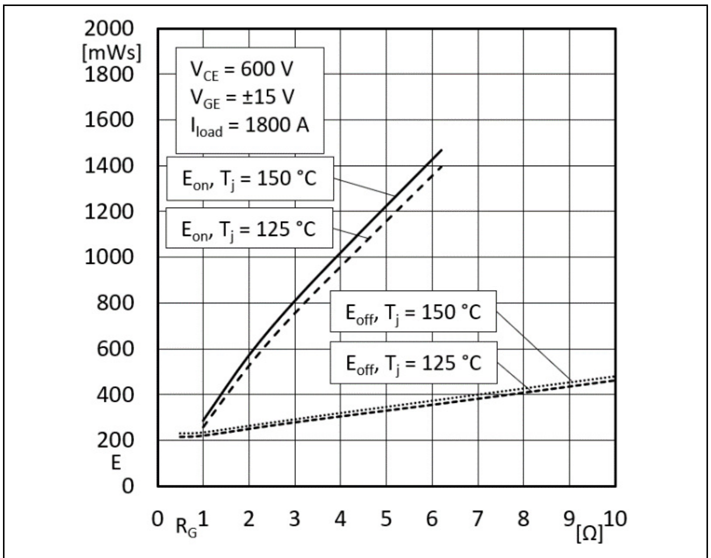


Fig. 4: Switching losses IGBT (typical); $E = f(R_G)$

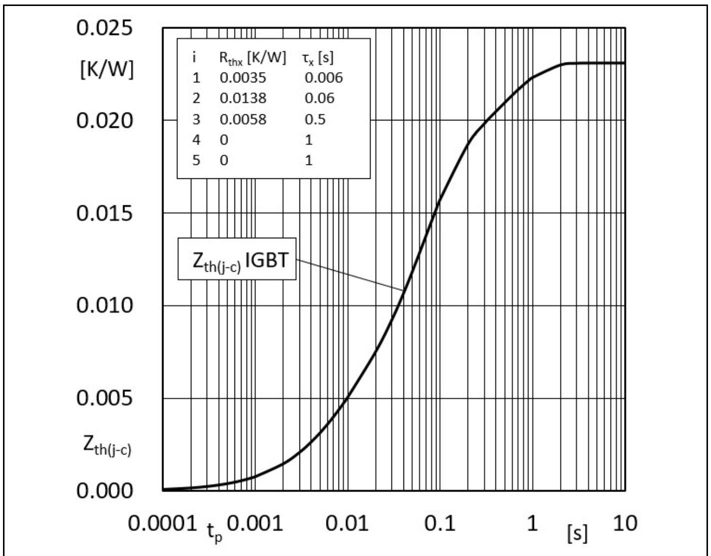


Fig. 5: Transient thermal impedance IGBT

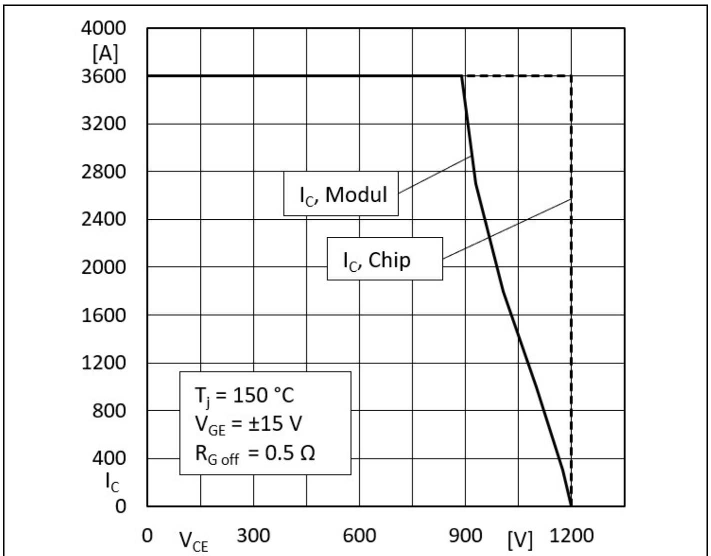


Fig. 6: RBSOA IGBT

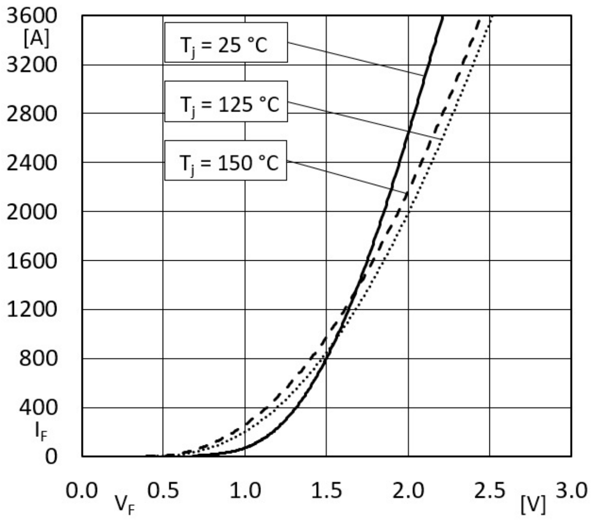


Fig. 7: Forward characteristics Diode (typical), $I_F = f(V_F)$; (chiplevel)

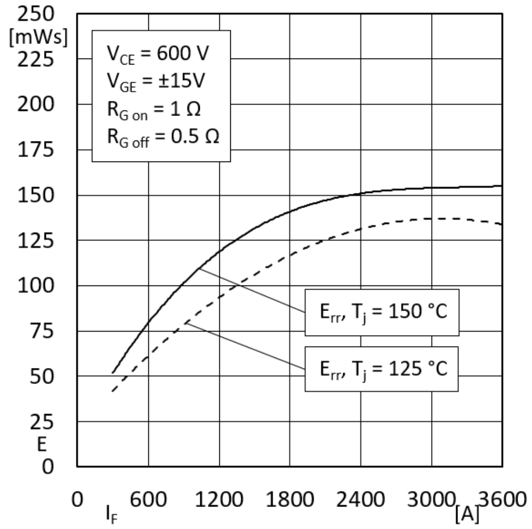


Fig. 8: Switching losses Diode (typical); $E = f(I_F)$

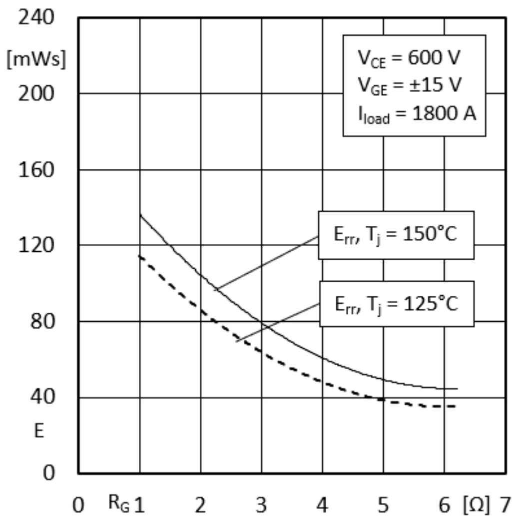


Fig. 9: Switching losses Diode (typical); $E = f(R_G)$

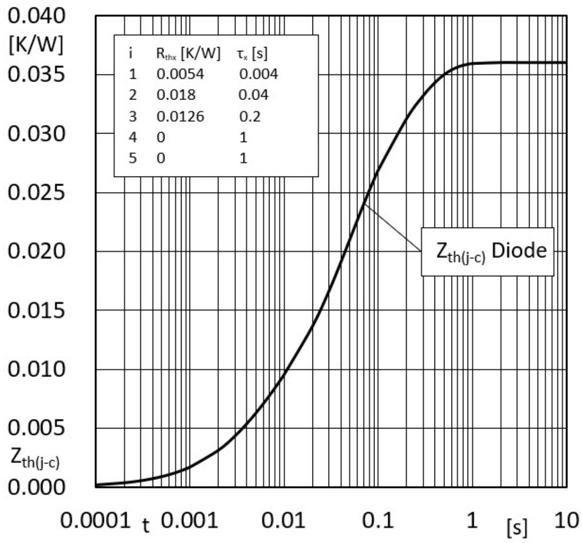


Fig. 10: Transient thermal impedance Diode

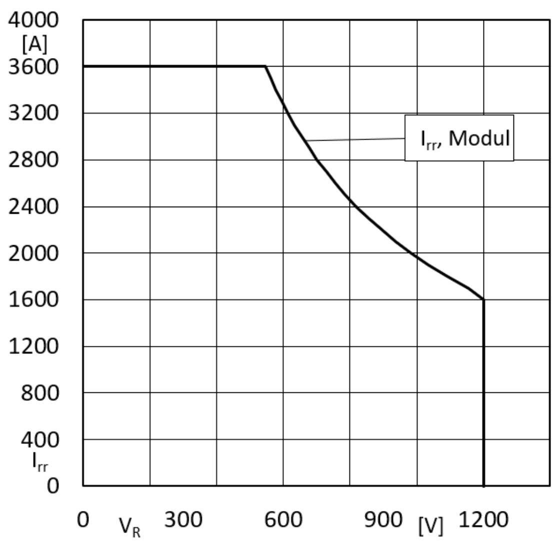


Fig. 11: RBSOA Diode

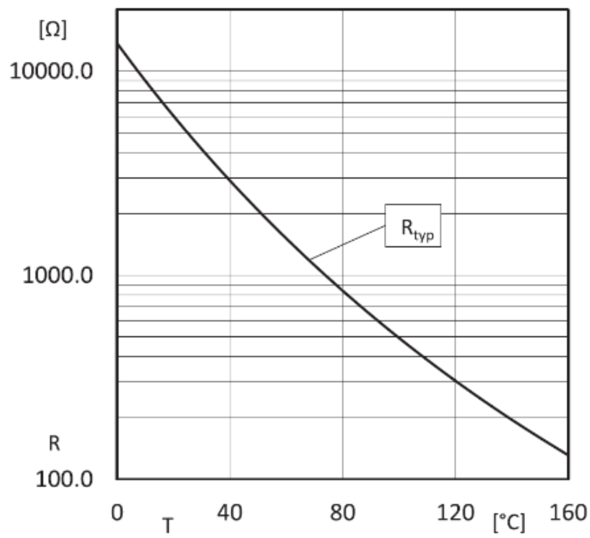


Fig. 12: NTC characteristics (typical)

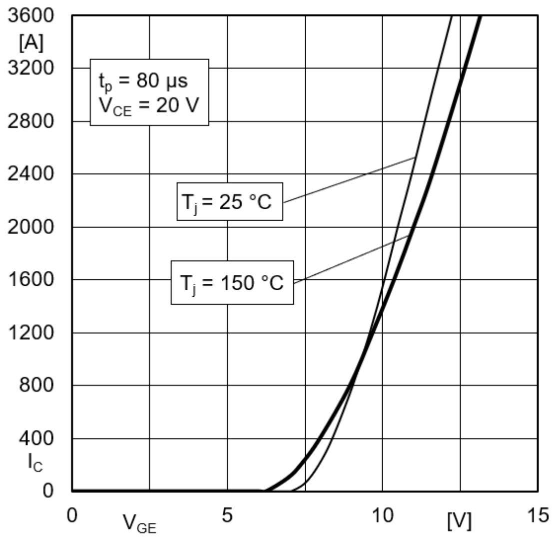


Fig. 13: Typical transfer characteristic

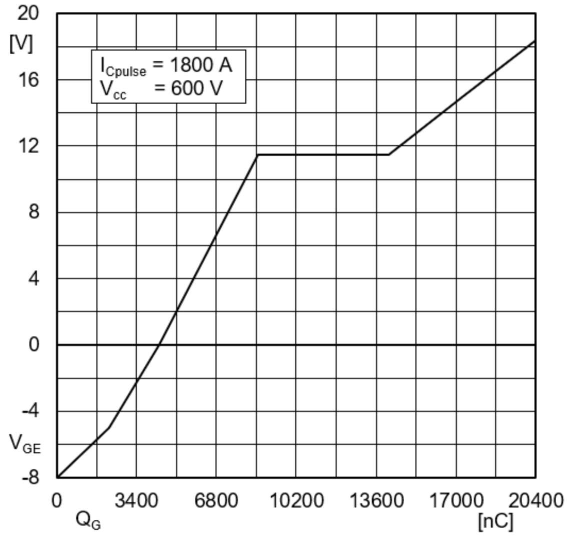
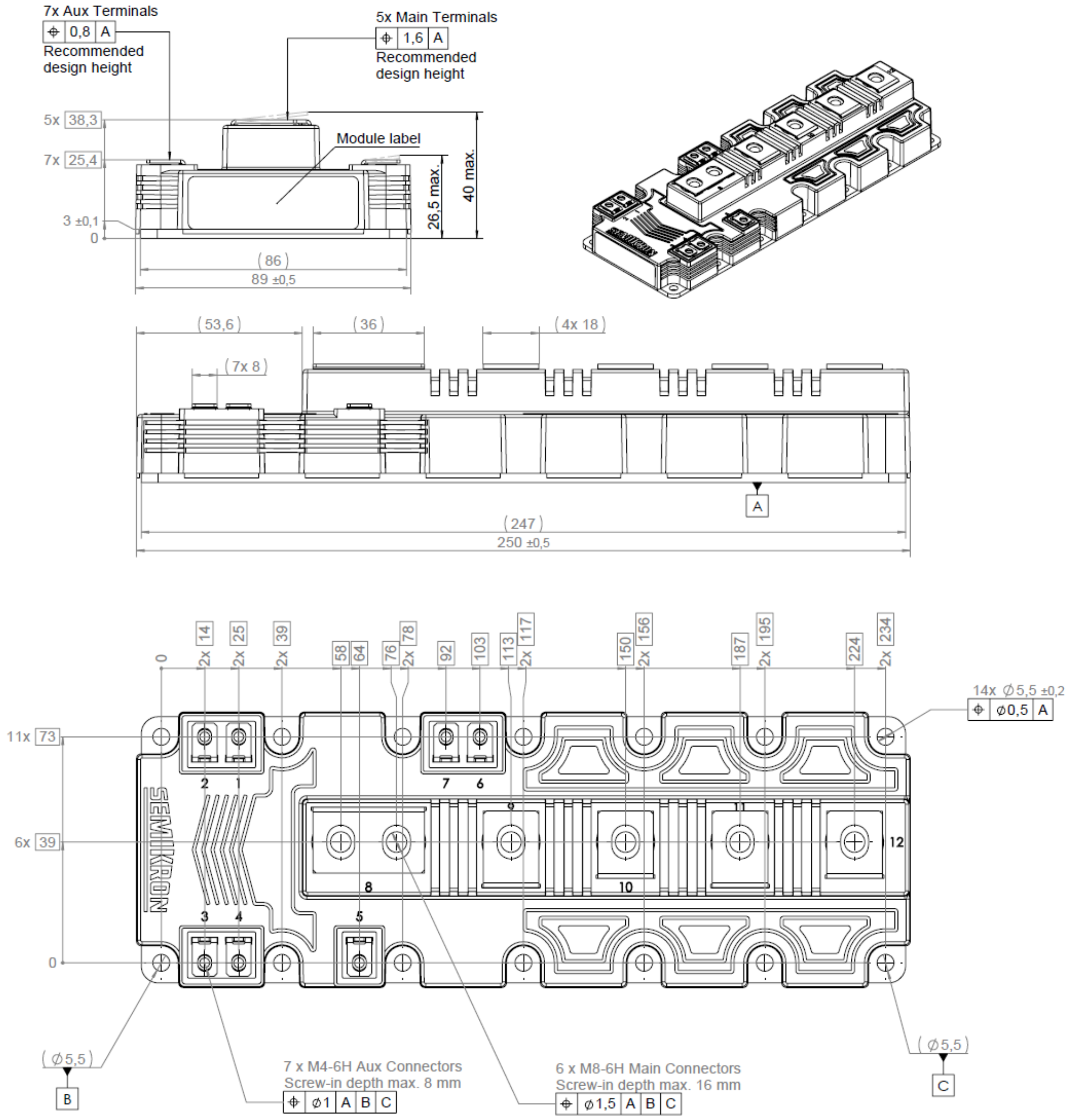


Fig. 14: Typical gate charge characteristic



• Dimensions in mm
• General tolerances ±0,5mm

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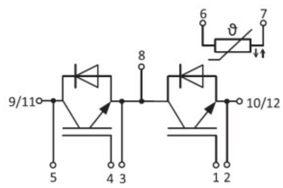

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This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

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