

SK80TMLI12F4Tp



SEMITOP® 3 Press-Fit

3-Level TNPC

SK80TMLI12F4Tp

Features*

- One screw mounting module
- Low inductive design
- Press-Fit contact technology
- Fully compatible with other SEMITOP® Press-Fit types
- 1200V Trench IGBT4 Fast (F4)
- 650V Trench IGBT3 (E3)
- Robust and soft switching CAL 4F diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

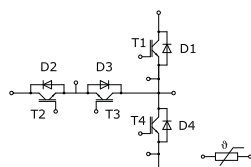
Typical Applications

- UPS
- Solar

Remarks*

- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT1				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _s = 25 °C	88	A
		T _s = 70 °C	72	A
I _{Cnom}			80	A
I _{CRM}			240	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 1200 V		10	μs
T _j			-40 ... 175	°C
IGBT2				
V _{CES}	T _j = 25 °C		650	V
I _C	T _j = 175 °C	T _s = 25 °C	79	A
		T _s = 70 °C	63	A
I _{Cnom}			75	A
I _{CRM}			225	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 360 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 650 V		6	μs
T _j			-40 ... 175	°C
Diode1				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _s = 25 °C	81	A
		T _s = 70 °C	64	A
I _{FRM}			150	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		430	A
T _j			-40 ... 175	°C
Diode2				
V _{RRM}	T _j = 25 °C		650	V
I _F	T _j = 175 °C	T _s = 25 °C	108	A
		T _s = 70 °C	84	A
I _{FRM}			200	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		820	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	ΔT _{terminal} at PCB joint = 30 K, per pin		35	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC, sinusoidal, t = 1 min		2500	V



TMLI-T



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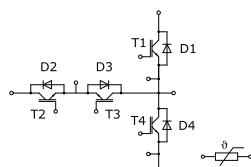
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
V _{CE(sat)}	I _C = 80 A	T _j = 25 °C		2.05	2.40	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.59	2.85	V
V _{CE0}	chiplevel	T _j = 25 °C		0.80	0.90	V
		T _j = 150 °C		0.70	0.80	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		16	19	mΩ
	chiplevel	T _j = 150 °C		24	26	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 3 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C				1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		4.6		nF
C _{oes}		f = 1 MHz		0.37		nF
C _{res}		f = 1 MHz		0.27		nF
Q _G	V _{GE} = - 15 V...+ 15 V			667		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		22		ns
t _r	I _C = 80 A	T _j = 150 °C		23		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		1.75		mJ
t _{d(off)}	R _{G on} = 0.5 Ω	T _j = 150 °C		183		ns
t _f	R _{G off} = 0.5 Ω	T _j = 150 °C		59		ns
E _{off}	di/dt _{on} = 3100 A/μs di/dt _{off} = 783 A/μs dv/dt = 3200 V/μs	T _j = 150 °C		3		mJ
R _{th(j-s)}	per IGBT			0.54		K/W
IGBT2						
V _{CE(sat)}	I _C = 75 A	T _j = 25 °C		1.45	1.77	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		1.83	2.15	V
V _{CE0}	chiplevel	T _j = 25 °C		0.75	0.90	V
		T _j = 150 °C		0.68	0.83	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		9.3	12	mΩ
	chiplevel	T _j = 150 °C		15	18	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 1.2 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 650 V, T _j = 25 °C				0.2	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		4.62		nF
C _{oes}		f = 1 MHz		0.288		nF
C _{res}		f = 1 MHz		0.137		nF
Q _G	V _{GE} = - 15 V...+ 15 V			718		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		14		ns
t _r	I _C = 80 A	T _j = 150 °C		15		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		0.56		mJ
t _{d(off)}	R _{G on} = 0.5 Ω	T _j = 150 °C		132		ns
t _f	R _{G off} = 0.5 Ω	T _j = 150 °C		60		ns
E _{off}	di/dt _{on} = 5300 A/μs di/dt _{off} = 1000 A/μs dv/dt = 4200 V/μs	T _j = 150 °C		2.46		mJ
R _{th(j-s)}	per IGBT			0.82		K/W



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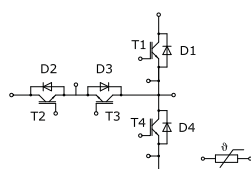
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- Diode1: outer Diodes D1 & D4
- Diode2: inner Diodes D2 & D3

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode1						
V _F = V _{EC}	I _F = 75 A	T _j = 25 °C		2.17	2.49	V
	chiplevel	T _j = 150 °C		2.11	2.42	V
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chiplevel	T _j = 25 °C		12	13	mΩ
		T _j = 150 °C		16	18	mΩ
I _{RRM}	I _F = 80 A	T _j = 150 °C		147		A
Q _{rr}	di/dt _{off} = 5300 A/μs V _R = 300 V	T _j = 150 °C		7.5		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		1.43		mJ
R _{th(j-s)}	per Diode			0.79		K/W
Diode2						
V _F = V _{EC}	I _F = 100 A	T _j = 25 °C		1.40	1.76	V
	chiplevel	T _j = 150 °C		1.38	1.77	V
V _{F0}	chiplevel	T _j = 25 °C		1.04	1.24	V
		T _j = 150 °C		0.85	0.99	V
r _F	chiplevel	T _j = 25 °C		3.6	5.3	mΩ
		T _j = 150 °C		5.3	7.8	mΩ
I _{RRM}	I _F = 80 A	T _j = 150 °C		113		A
Q _{rr}	di/dt _{off} = 3096 A/μs V _R = 300 V	T _j = 150 °C		7.3		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		1.47		mJ
R _{th(j-s)}	per Diode			0.79		K/W
Module						
L _{sCE1}				-		nH
L _{CE}				-		nH
R _{CC'+EE'}		T _s = 25 °C		-		mΩ
		T _s = 150 °C		-		mΩ
M _s	to heatsink		2.25		2.5	Nm
w				30		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



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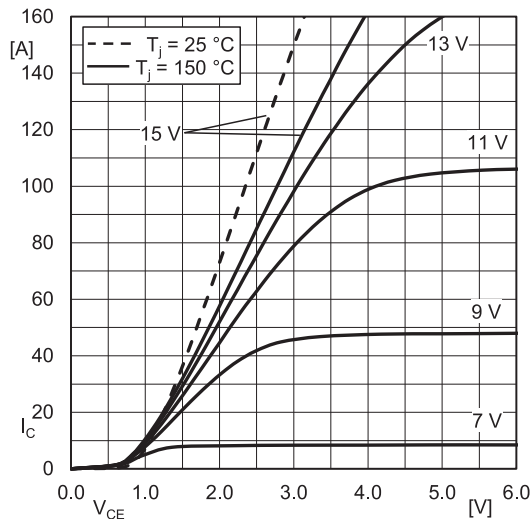


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

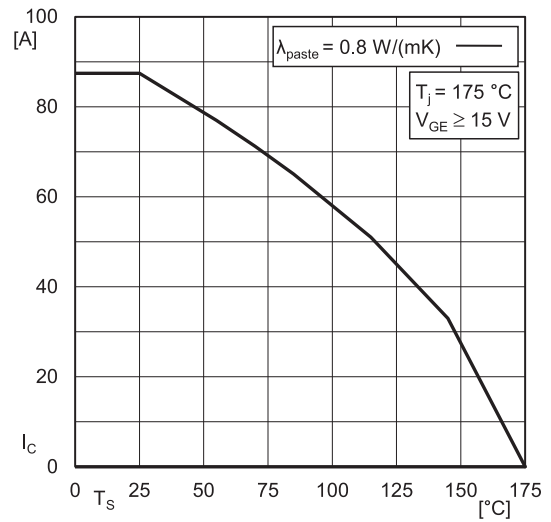


Fig. 2: IGBT1 rated current vs. Temperature $I_C=f(T_s)$

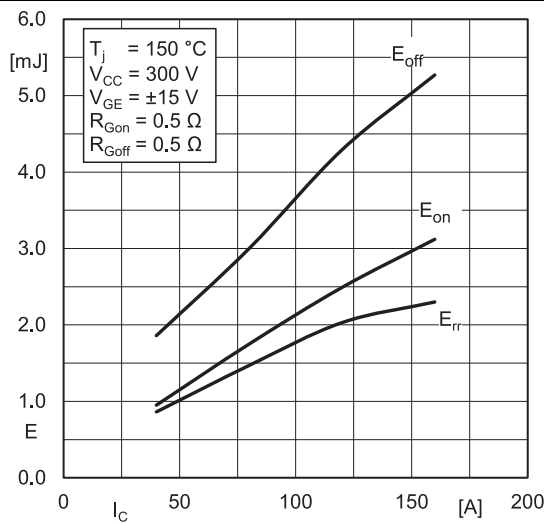


Fig. 3: Typ. IGBT1 & Diode2 turn-on /-off energy = $f(I_C)$

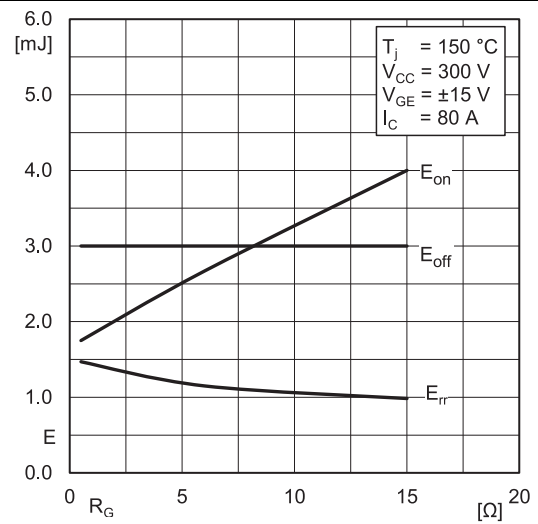


Fig. 4: Typ. IGBT1 & Diode2 turn-on /-off energy = $f(R_G)$

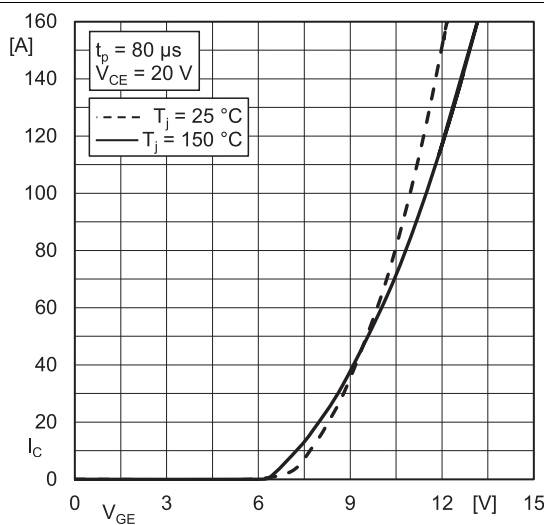


Fig. 5: Typ. IGBT1 transfer characteristic

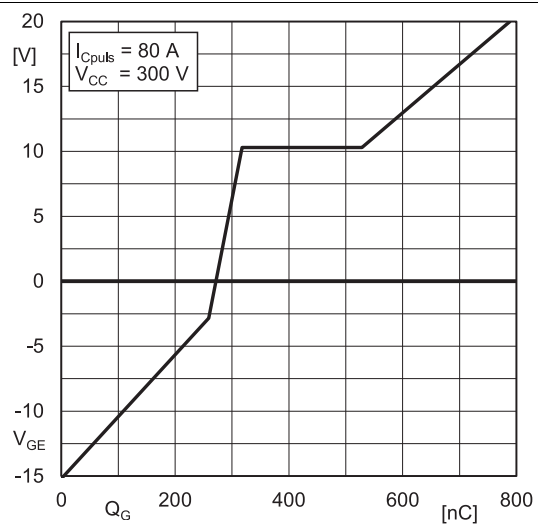


Fig. 6: Typ. IGBT1 gate charge characteristic

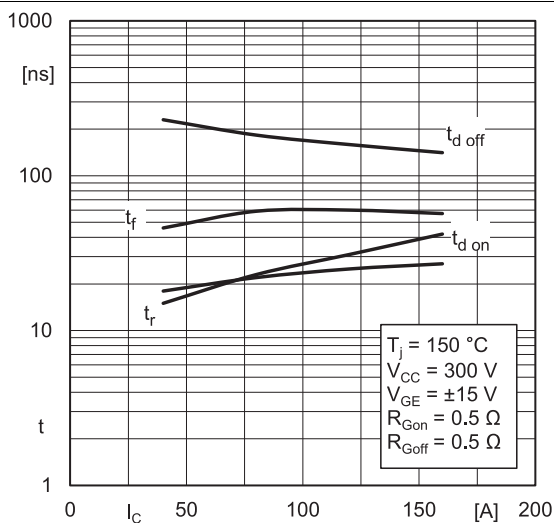


Fig. 7: Typ. IGBT1 switching times vs. I_C

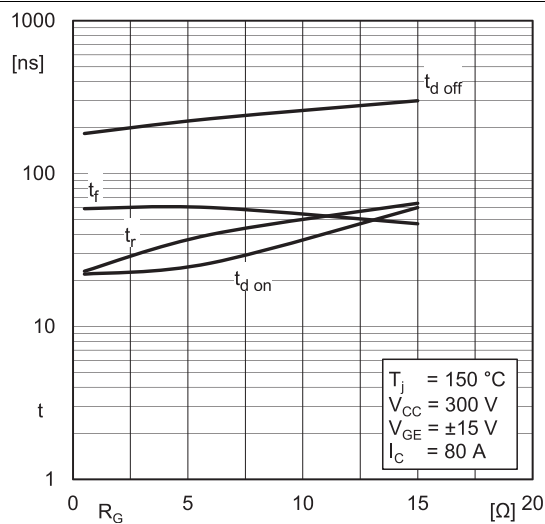


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

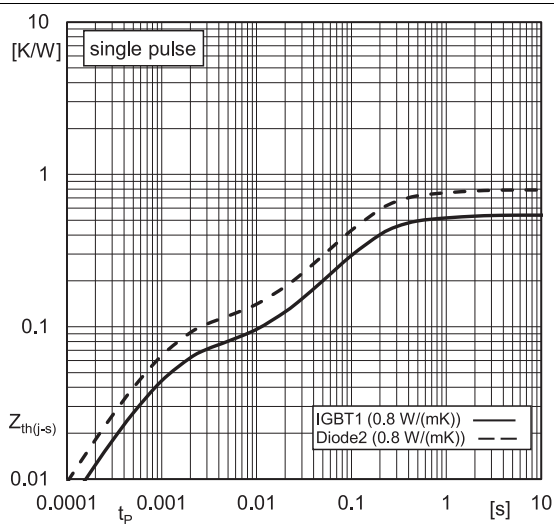


Fig. 9: Transient thermal impedance of IGBT1 & Diode2

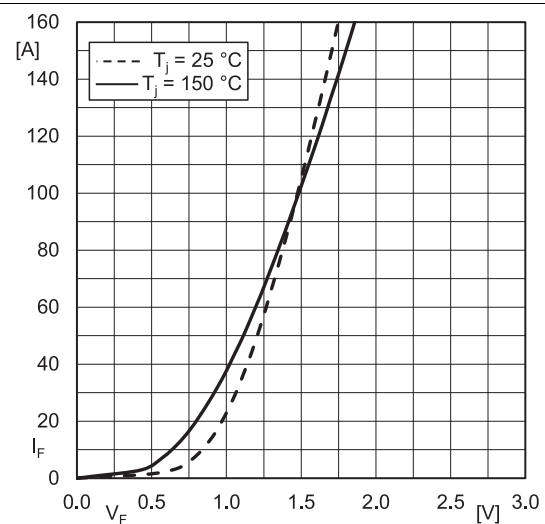


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

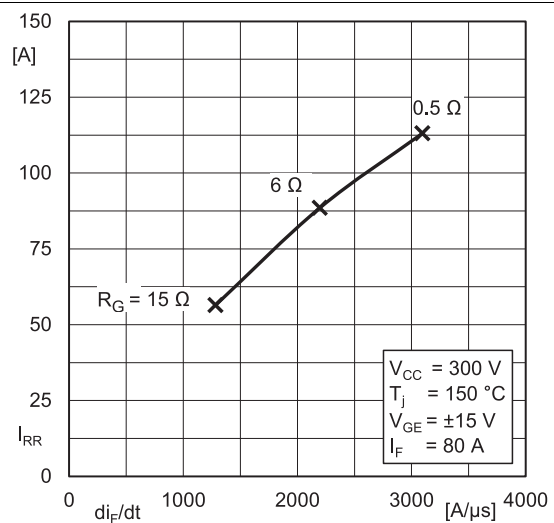


Fig. 11: Typ. Diode2 peak reverse recovery current

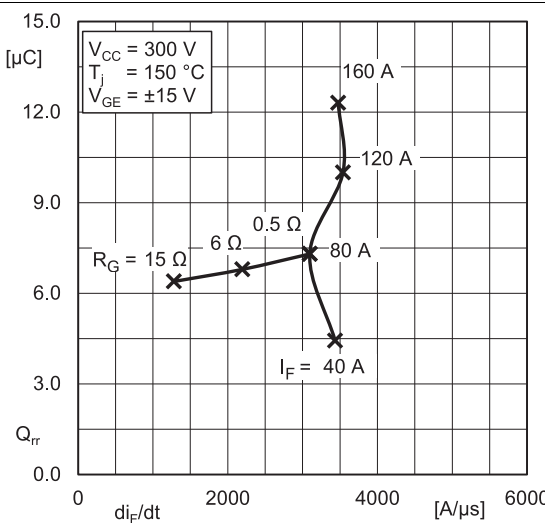


Fig. 12: Typ. Diode2 recovery charge

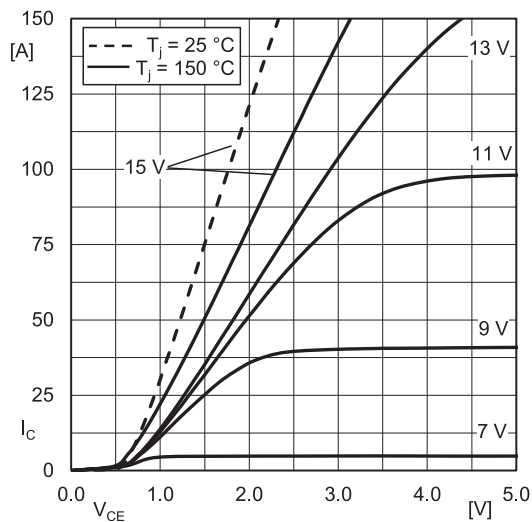


Fig. 13: Typ. IGBT2 output characteristic, incl. $R_{CC'+EE'}$

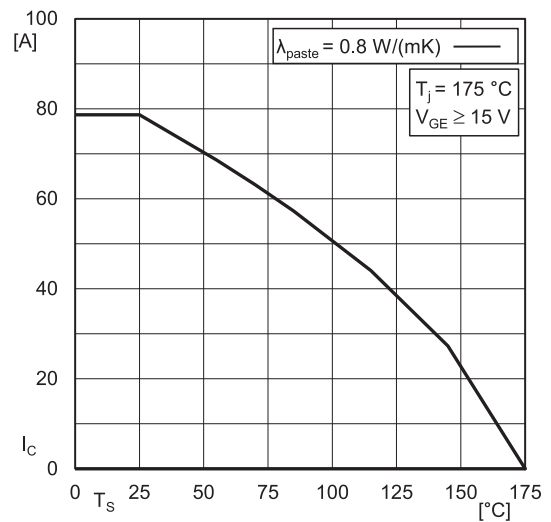


Fig. 14: IGBT2 Rated current vs. Temperature $I_C = f(T_s)$

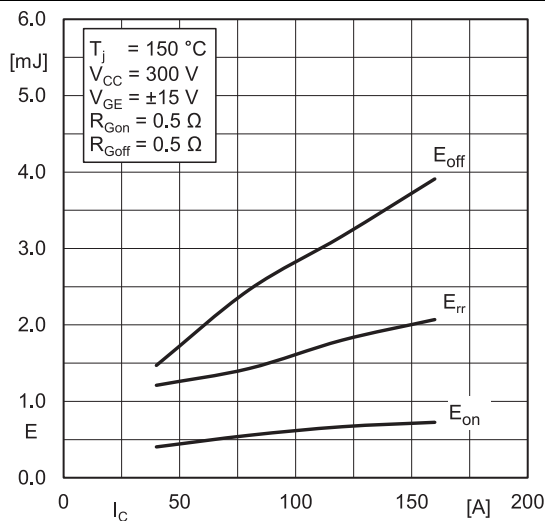


Fig. 15: Typ. IGBT2 & Diode1 turn-on /-off energy = $f(I_C)$

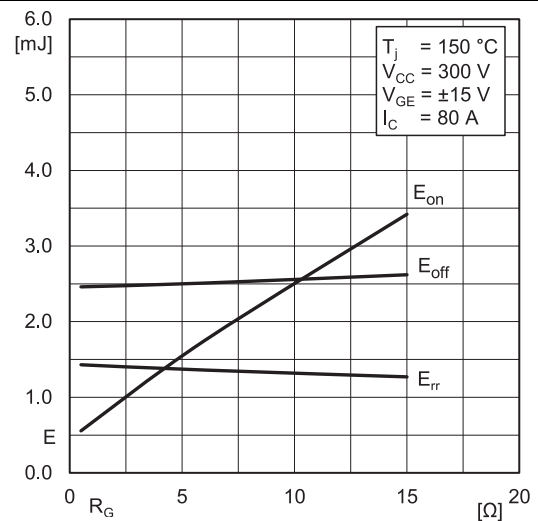


Fig. 16: Typ. IGBT2 & Diode1 turn-on /-off energy = $f(R_G)$

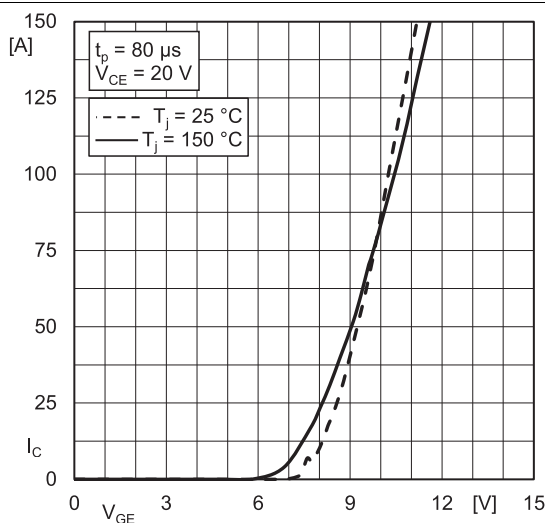


Fig. 17: Typ. IGBT2 transfer characteristic

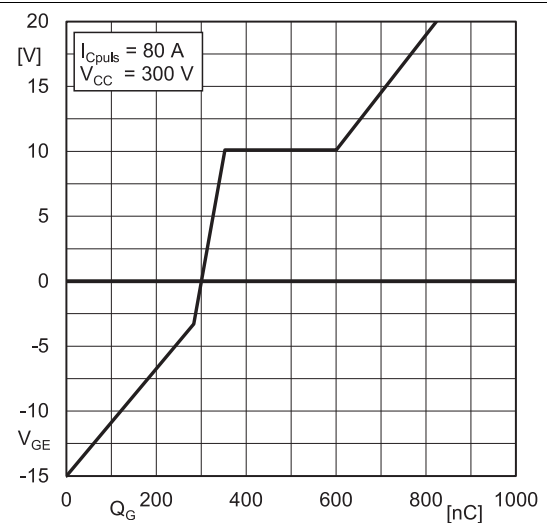
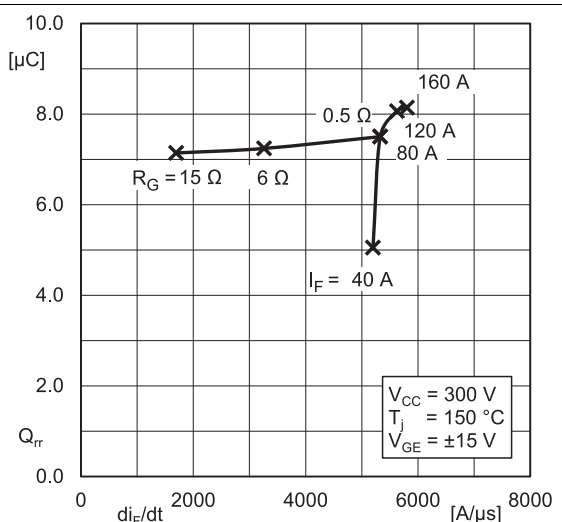
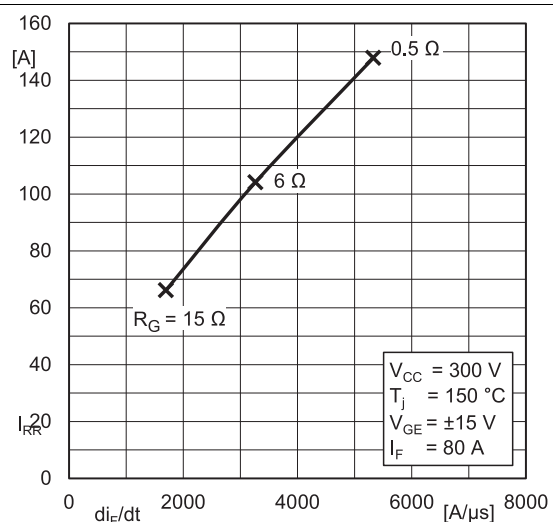
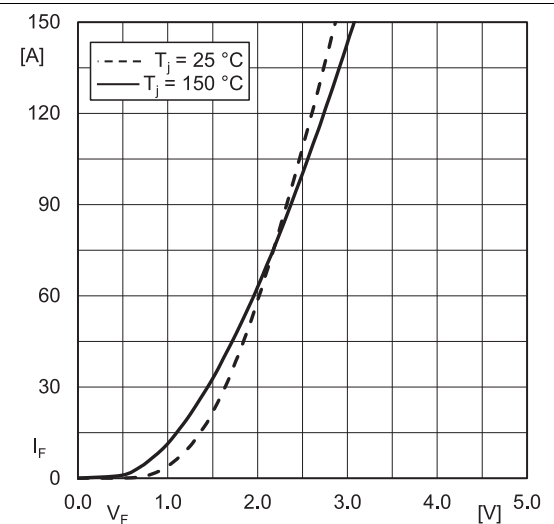
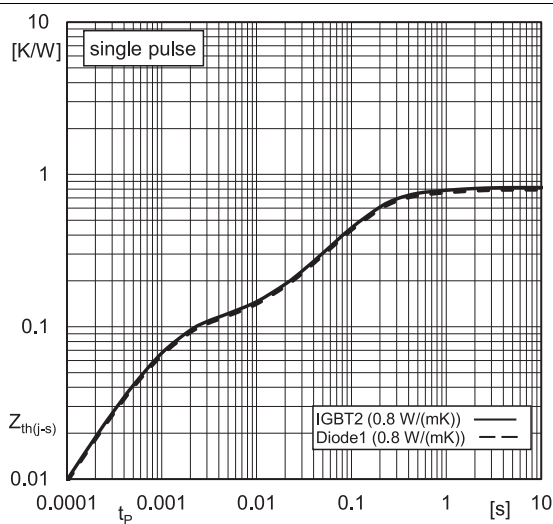
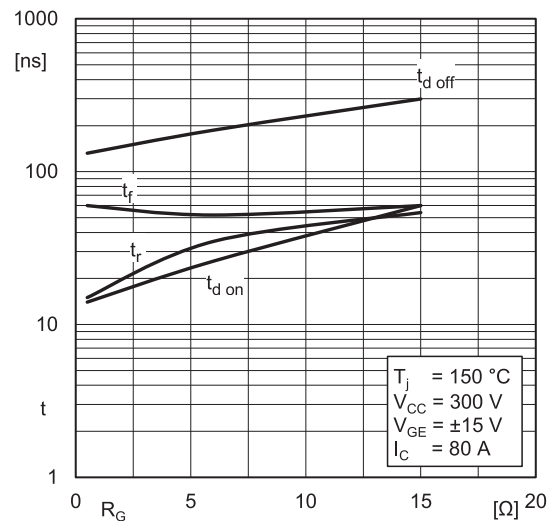
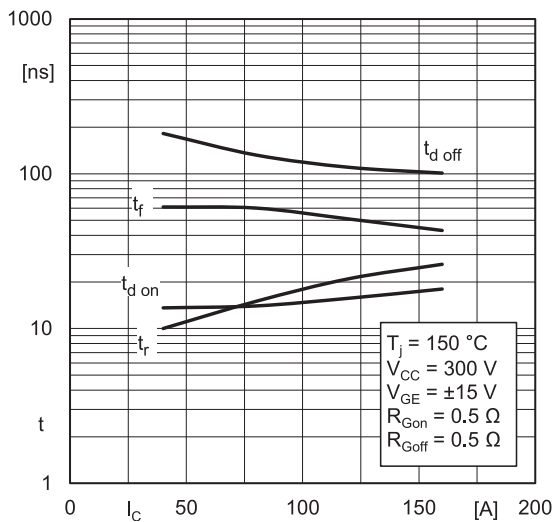


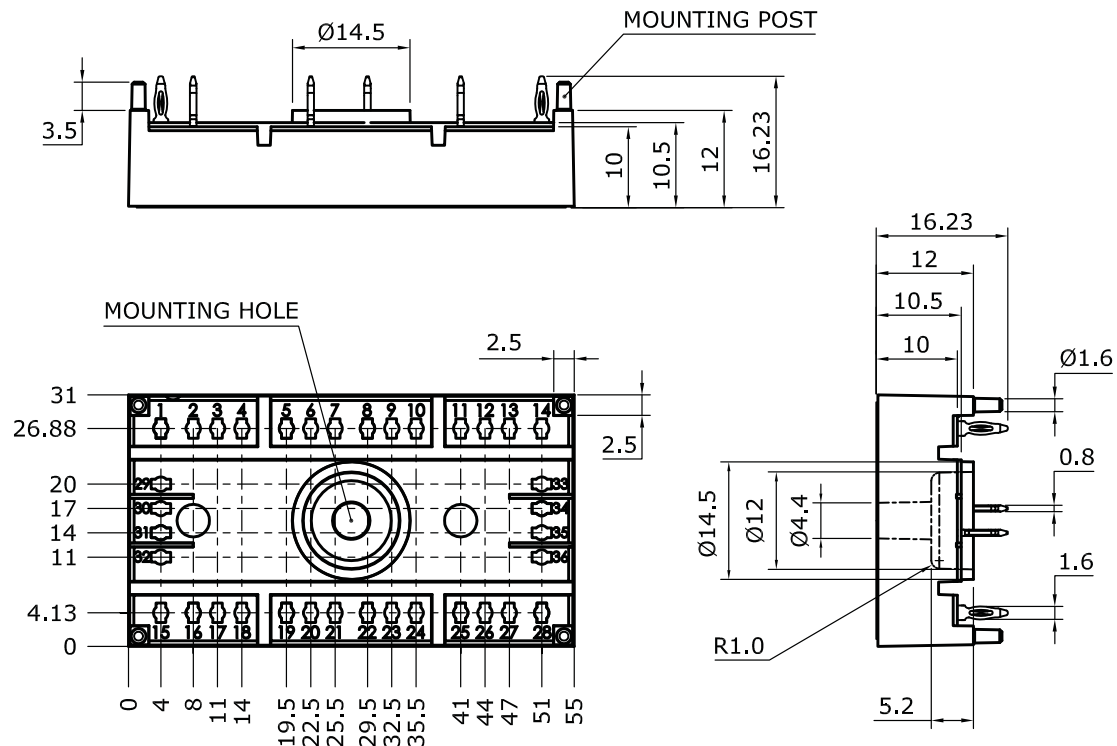
Fig. 18: Typ. IGBT2 gate charge characteristic



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Dimensions: mm

Tolerance system: ISO 2768-m



Suggested drilled hole diameter for terminal pins in the circuit board:

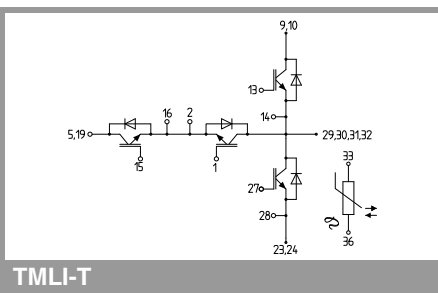
- minimum: 1.575 mm
- typical: 1.6 mm
- maximum: 1.625 mm

Suggested hole diameter for the mounting post in the circuit board:

- 2 mm

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SEMITOP 3 Press-Fit



TMLI-T

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

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