



SEMITOP® 4 Press-Fit

IGBT module

SK100DBB07F3TD1p

Features

- One screw mounting module
- Solder free mounting with Press-Fit terminals
- Fully compatible with other SEMITOP® Press-Fit types
- Improved thermal performances by aluminum oxide substrate
- 650V Trench3 Fast IGBT technology
- 650V Rapid switching diode
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

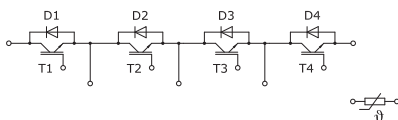
Typical Applications*

Three-level DC-DC converter

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		650	V
I _C	T _j = 175 °C	T _s = 25 °C	54	A
		T _s = 70 °C	43	A
I _{Cnom}			50	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		150	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 400 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 650 V		5	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	109	A
		T _s = 70 °C	87	A
I _{Cnom}			100	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		300	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 400 V, V _{GE} ≤ 15 V, T _j = 150 °C, V _{CES} ≤ 650 V		5	µs
T _j			-40 ... 175	°C
Diode1				
V _{RRM}	T _j = 25 °C		650	V
I _F	T _j = 175 °C	T _s = 25 °C	115	A
		T _s = 70 °C	90	A
I _{Fnom}			90	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		180	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		513	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	88	A
		T _s = 70 °C	69	A
I _{Fnom}			60	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		120	A
I _{FSM}	10 ms, sin 180°, T _j = 25 °C		342	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 100 °C, T _s = 60°C, per pin		40	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC, sinusoidal, t = 1 min		2500	V



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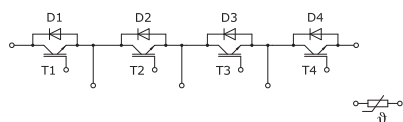
Typical Applications

Three-level DC-DC converter

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.85	2.22	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.18	2.55	V
V _{CE0}	chiplevel	T _j = 25 °C		1.10	1.20	V
		T _j = 150 °C		1.00	1.10	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		15	20	mΩ
	chiplevel	T _j = 150 °C		24	29	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 0.8 mA		4.2	5.1	5.6	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 650 V, T _j = 25 °C				0.1	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		3.1		nF
C _{oes}		f = 1 MHz		0.116		nF
C _{res}		f = 1 MHz		0.09		nF
Q _G	V _{GE} = - 15 V...+ 15 V			590		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		12		ns
t _r	I _C = 50 A	T _j = 150 °C		17		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		1		mJ
t _{d(off)}	R _{G on} = 6.2 Ω	T _j = 150 °C		130		ns
t _f	R _{G off} = 6.2 Ω	T _j = 150 °C		27		ns
E _{off}	di/dt _{on} = 3170 A/μs di/dt _{off} = 1800 A/μs	T _j = 150 °C		0.5		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			1		K/W
IGBT2						
V _{CE(sat)}	I _C = 100 A	T _j = 25 °C		1.85	2.22	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.18	2.55	V
V _{CE0}	chiplevel	T _j = 25 °C		1.10	1.20	V
		T _j = 150 °C		1.00	1.10	V
r _{CE}	V _{GE} = 15 V	T _j = 25 °C		7.5	10	mΩ
	chiplevel	T _j = 150 °C		12	15	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 1.6 mA		4.2	5.1	5.6	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 650 V, T _j = 25 °C				0.15	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		6.2		nF
C _{oes}		f = 1 MHz		0.232		nF
C _{res}		f = 1 MHz		0.18		nF
Q _G	V _{GE} = -15V ... +15 V			1180		nC
R _{Gint}	T _j = 25 °C			2.4		Ω
t _{d(on)}	V _{CE} = 300 V	T _j = 150 °C		240		ns
t _r	I _C = 100 A	T _j = 150 °C		54		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		4		mJ
t _{d(off)}	R _{G on} = 6.2 Ω	T _j = 150 °C		348		ns
t _f	R _{G off} = 6.2 Ω	T _j = 150 °C		20		ns
E _{off}	di/dt _{on} = 1900 A/μs di/dt _{off} = 4200 A/μs	T _j = 150 °C		1.5		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.5		K/W



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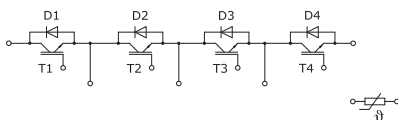
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Three-level DC-DC converter

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- Diode2: inner diodes D2 & D3

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode1						
V _F = V _{EC}	I _F = 90 A	T _j = 25 °C		1.35	1.77	V
	chiplevel	T _j = 150 °C		1.30	1.72	V
V _{F0}	chiplevel	T _j = 25 °C		0.95	1.15	V
		T _j = 150 °C		0.75	0.95	V
r _F	chiplevel	T _j = 25 °C		4.4	6.9	mΩ
		T _j = 150 °C		6.1	8.6	mΩ
I _{RRM}	I _F = 90 A	T _j = 150 °C		55		A
Q _{rr}	di/dt _{off} = 1850 A/μs V _R = 300 V	T _j = 150 °C		5.2		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		0.7		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.68		K/W
Diode2						
V _F = V _{EC}	I _F = 60 A	T _j = 25 °C		1.35	1.77	V
	chiplevel	T _j = 150 °C		1.30	1.72	V
V _{F0}	chiplevel	T _j = 25 °C		0.95	1.15	V
		T _j = 150 °C		0.75	0.95	V
r _F	chiplevel	T _j = 25 °C		6.7	10	mΩ
		T _j = 150 °C		9.2	13	mΩ
I _{RRM}	I _F = 60 A	T _j = 150 °C		73		A
Q _{rr}	di/dt _{off} = 3300 A/μs V _R = 300 V	T _j = 150 °C		4		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		0.8		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.83		K/W
Module						
L _{sCE1}				-		nH
L _{CE}				-		nH
R _{CC'+EE'}		T _s = 25 °C		-		mΩ
		T _s = 125 °C		-		mΩ
M _s	to heatsink		2.5		2.75	Nm
w				60		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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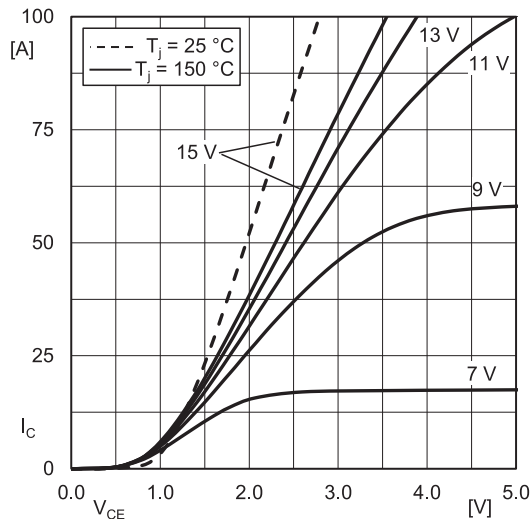


Fig. 1: Typ. IGBT1 output characteristic, incl. $R_{CC'+EE'}$

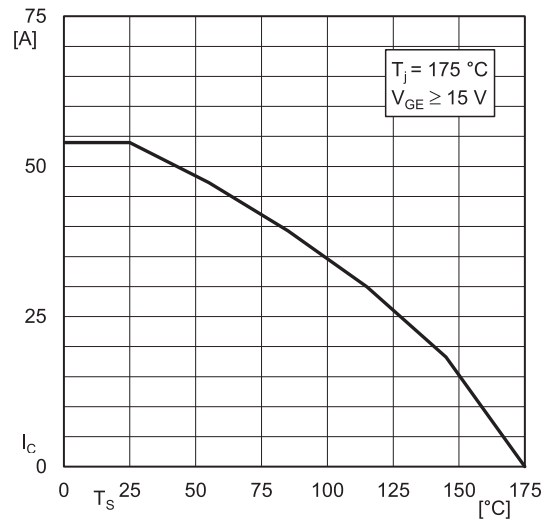


Fig. 2: IGBT1 rated current vs. Temperature $I_C=f(T_s)$

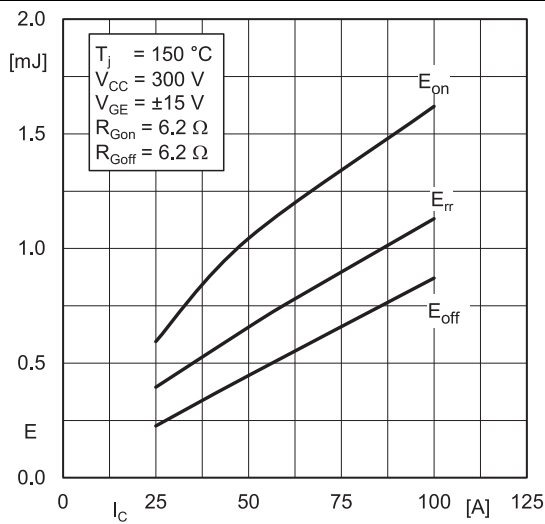


Fig. 3: Typ. IGBT1 & Diode2 turn-on /-off energy = $f(I_C)$

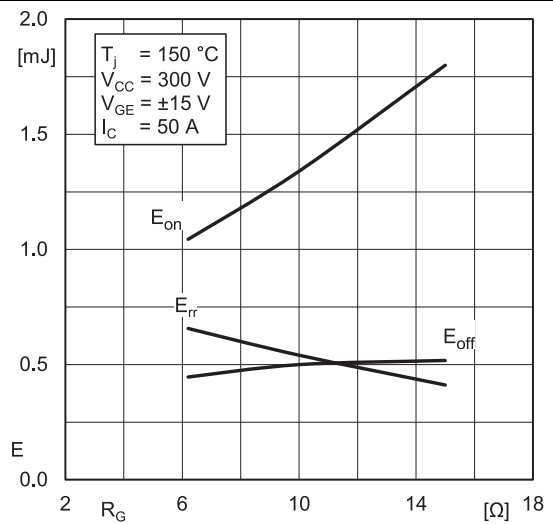


Fig. 4: Typ. IGBT1 & Diode2 turn-on /-off energy = $f(R_G)$

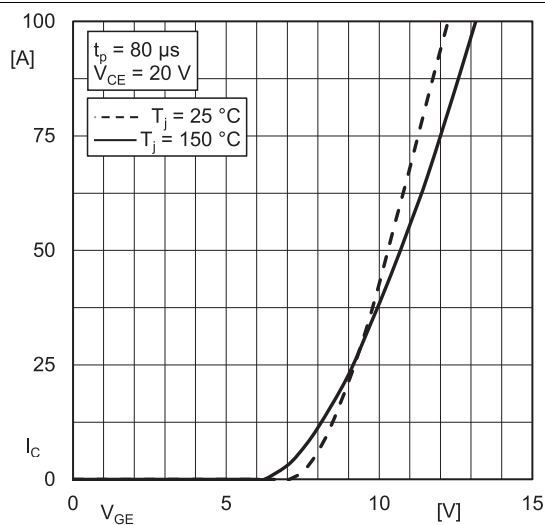


Fig. 5: Typ. IGBT1 transfer characteristic

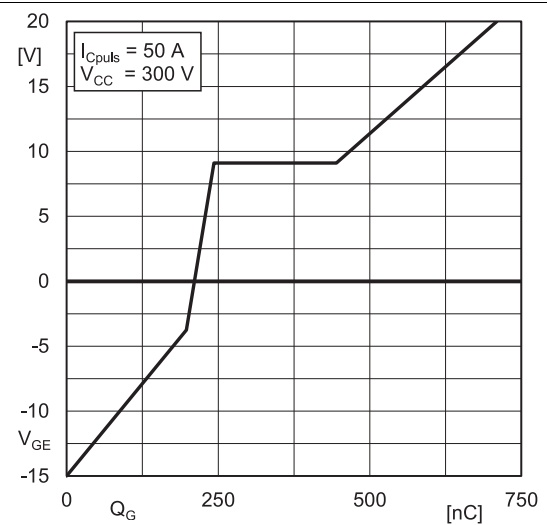


Fig. 6: Typ. IGBT1 gate charge characteristic

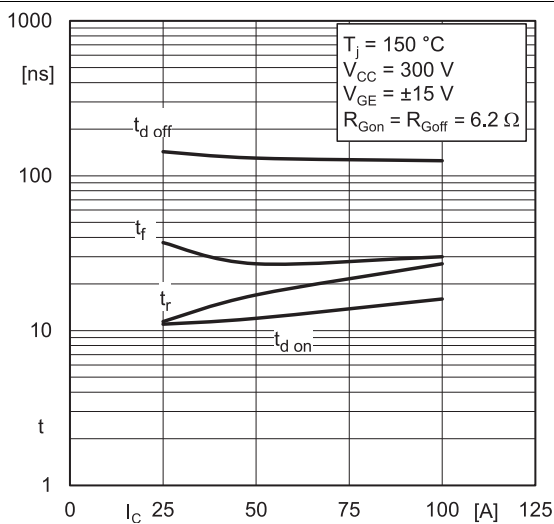


Fig. 7: Typ. IGBT1 switching times vs. I_C

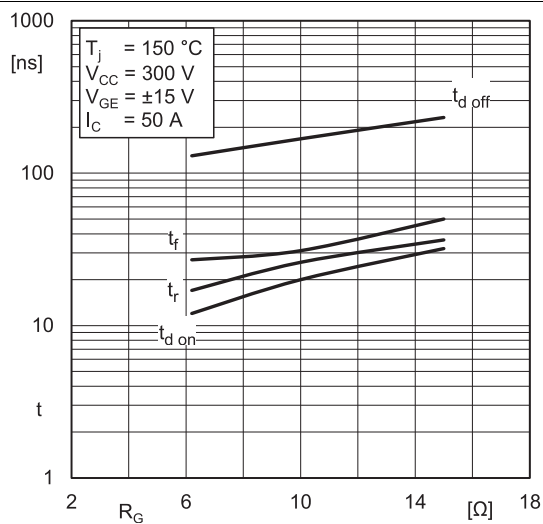


Fig. 8: Typ. IGBT1 switching times vs. gate resistor R_G

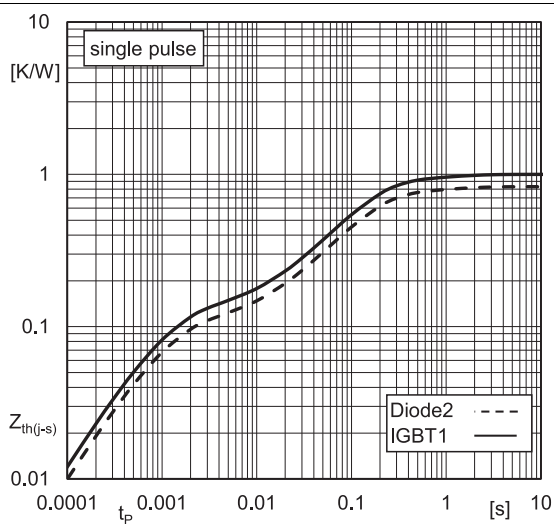


Fig. 9: Transient thermal impedance of IGBT1 & Diode2

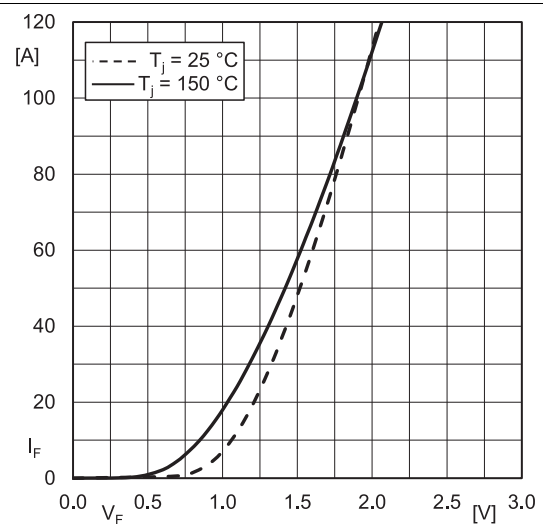


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

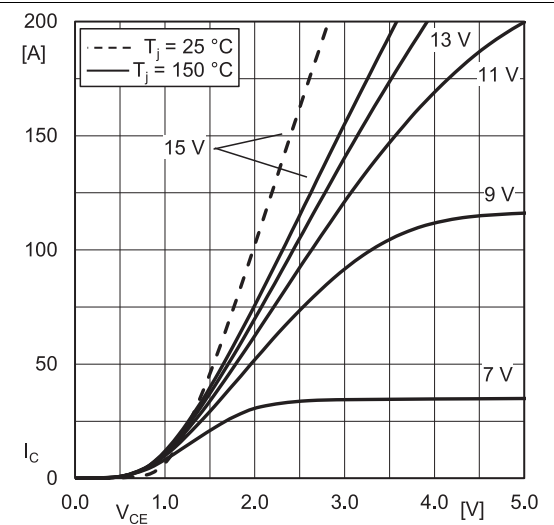


Fig. 13: Typ. IGBT2 output characteristic, incl. $R_{CC'+EE'}$

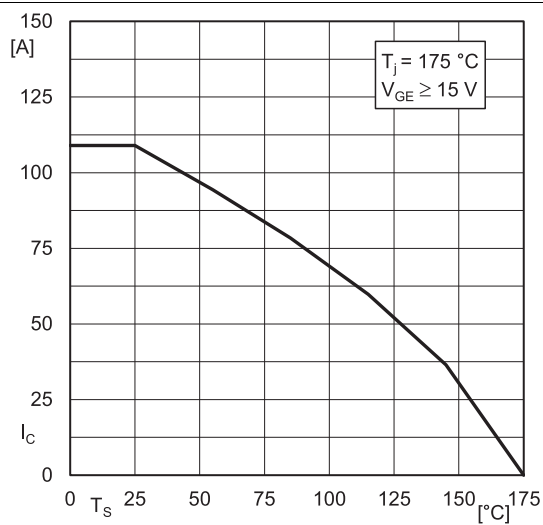


Fig. 14: IGBT2 Rated current vs. Temperature $I_C = f(T_s)$

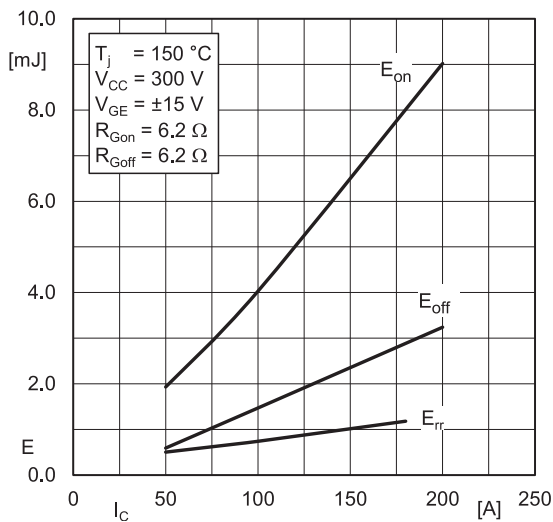


Fig. 15: Typ. IGBT2 & Diode1 turn-on /-off energy = $f(I_C)$

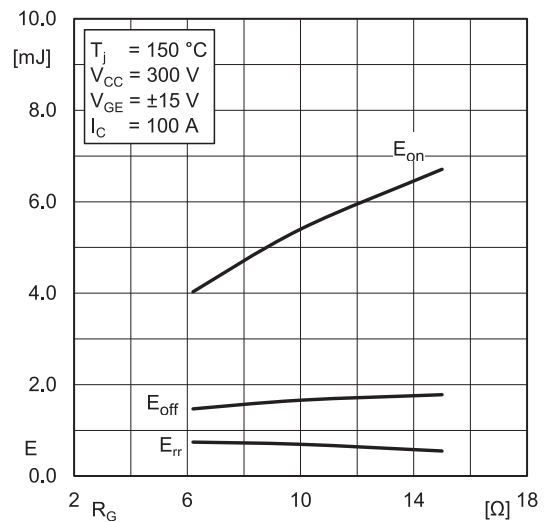


Fig. 16: Typ. IGBT2 & Diode1 turn-on /-off energy = $f(R_G)$

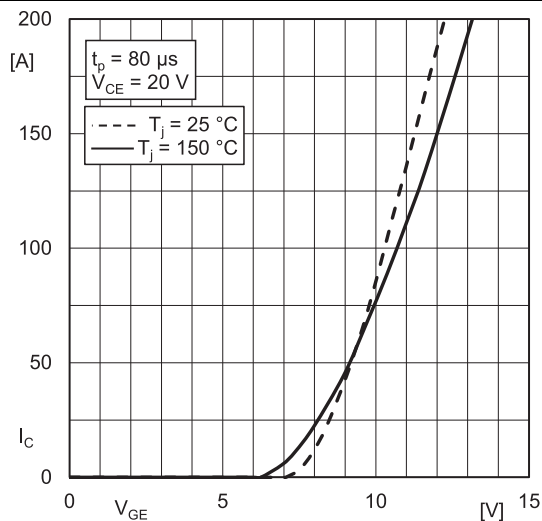


Fig. 17: Typ. IGBT2 transfer characteristic

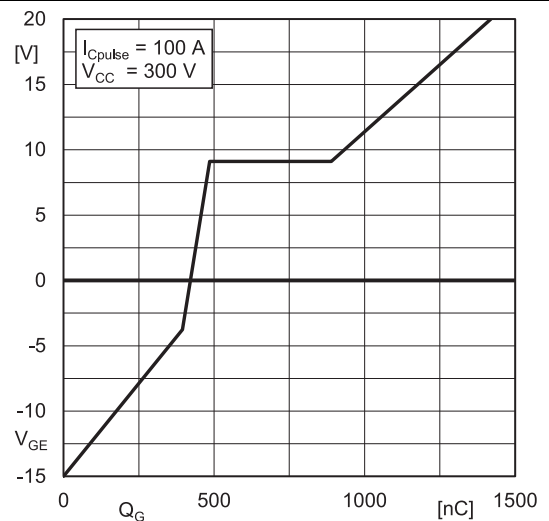


Fig. 18: Typ. IGBT2 gate charge characteristic

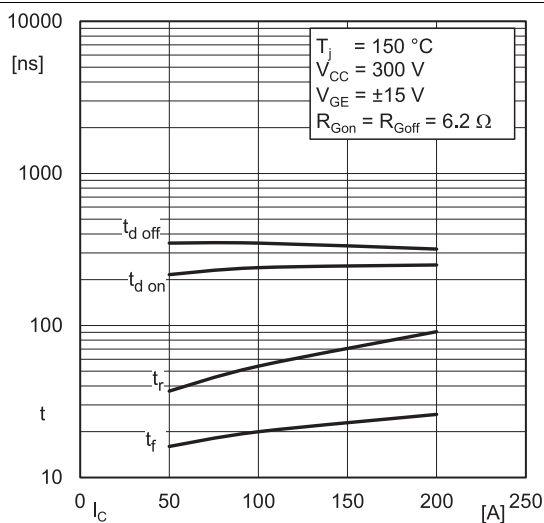


Fig. 19: Typ. IGBT2 switching times vs. I_C

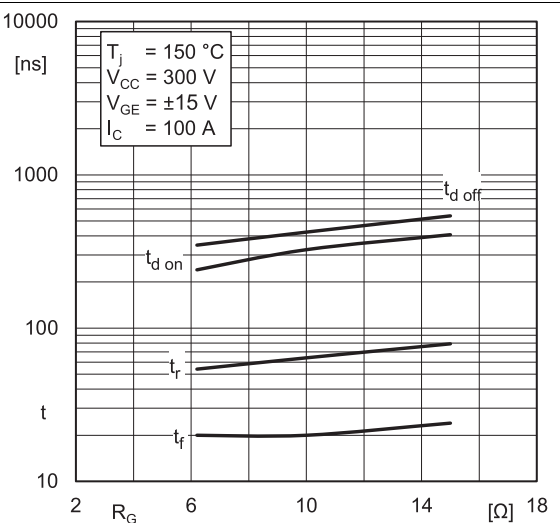


Fig. 20: Typ. IGBT2 switching times vs. gate resistor R_G

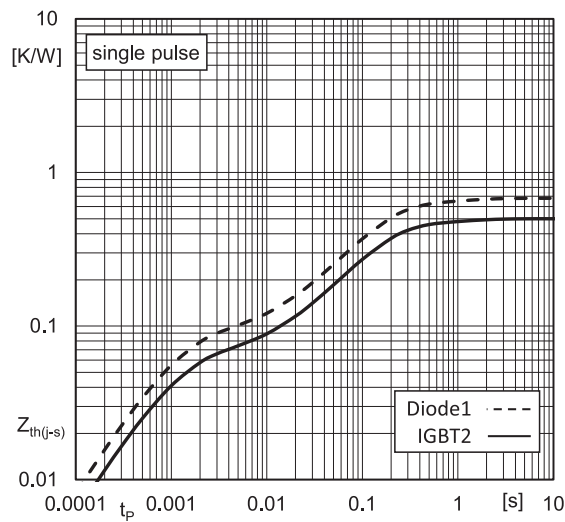


Fig. 21: Transient thermal impedance of IGBT2 & Diode1

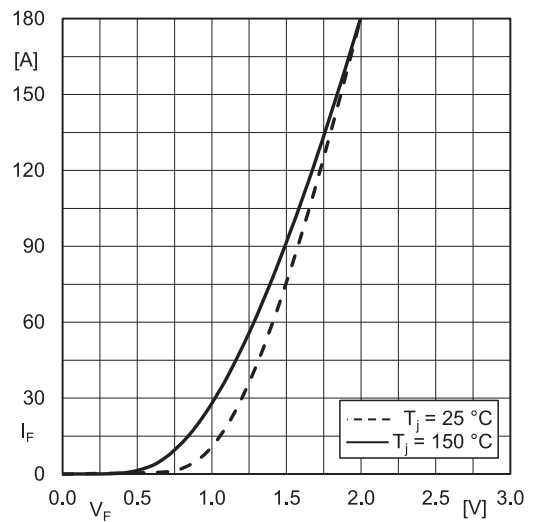
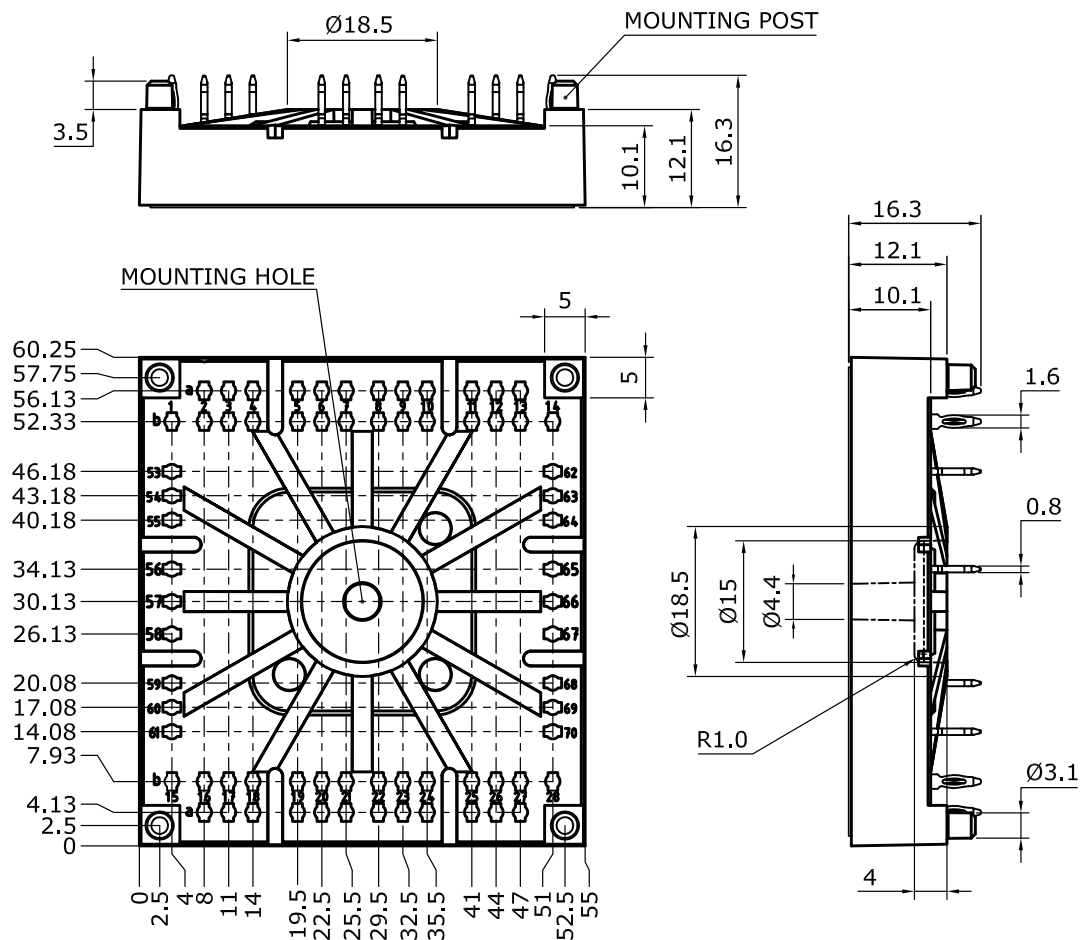


Fig. 22: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

Dimensions: mm

Tolerance system: ISO 2768-m



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

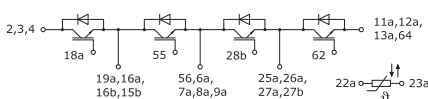
- minimum: 1.575 mm
- typical: 1.6 mm
- maximum: 1.625 mm

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

- 3.6 mm

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SEMIPOT 4 Press-Fit



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

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