SK 151 GB 07F3 T

SEMITOP® 3

IGBT module

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Features*

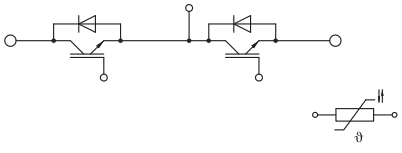
- Compact design
- One screw mounting module
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DBC)
- 650V Fast Trench3 IGBT technology
- CAL diode technology
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

Typical Applications

- Switching (not for linear use)
- Inverter
- Switched mode power supplies
- UPS

Remarks

Dynamic measurements set-up:
- IGBT switching on external 150A 600V Ultrafast diode
- Diode switching on external 20A 600V Trench3 IGBT



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_s = 25 °C	145	A
		T_s = 70 °C	115	A
I_{Cnom}			150	A
I_{CRM}			450	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 400 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 650 V	T_j = 150 °C	5	µs
T_j			-40 ... 175	°C
Inverse - Diode				
V_{RRM}	T_j = 25 °C		600	V
I_F	T_j = 175 °C	T_s = 25 °C	27	A
		T_s = 70 °C	21	A
I_{FRM}			40	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		95	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin		60	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	I_C = 150 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.22	V
		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 chiplevel	T_j = 25 °C		5.0	6.8	mΩ
		T_j = 150 °C		7.9	9.7	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}$, I_C = 2.4 mA		4.2	5.1	5.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V, T_j = 25 °C				0.2	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		9.30		nF
C_{oes}		f = 1 MHz		0.35		nF
C_{res}		f = 1 MHz		0.27		nF
Q_G	V_{GE} = -15 ... +15 V			1380		nC
R_{Gint}	T_j = 25 °C			1.6		Ω
$t_{d(on)}$	V_{CC} = 300 V	T_j = 150 °C		153		ns
t_r	I_C = 150 A	T_j = 150 °C		130		ns
E_{on}	$R_{G\ on}$ = 15 Ω	T_j = 150 °C		8.8		mJ
$t_{d(off)}$	$R_{G\ off}$ = 15 Ω di/dt_{on} = 974 A/µs	T_j = 150 °C		719		ns
t_f	di/dt_{off} = 3024 A/µs	T_j = 150 °C		43		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		4		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.41		K/W

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Remarks

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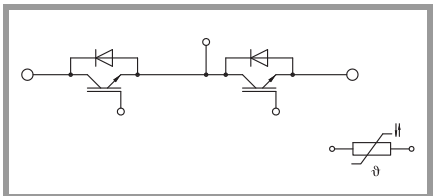
- Diode switching on external 20A 600V Trench3 IGBT

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverse - Diode						
$V_F = V_{EC}$	I_F = 20 A	T_j = 25 °C		1.59	2.06	V
	chiplevel	T_j = 150 °C		1.68	2.01	V
V_{F0}	chiplevel	T_j = 25 °C		0.99	1.10	V
		T_j = 150 °C		0.80	0.89	V
r_F	chiplevel	T_j = 25 °C		30	48	mΩ
		T_j = 150 °C		44	56	mΩ
I_{RRM}	I_F = 20 A di/dt_{off} = 3300 A/µs V_{GE} = 15 V V_{CC} = 300 V	T_j = 150 °C		32		A
Q_{rr}		T_j = 150 °C		2		µC
E_{rr}		T_j = 150 °C		0.2		mJ
$R_{th(j-s)}$	per diode, λ_{paste}=0.8 W/(mK)			2.46		K/W
Module						
L_{CE}				-		nH
M_s	to heatsink		2.25		2.5	Nm
w				29		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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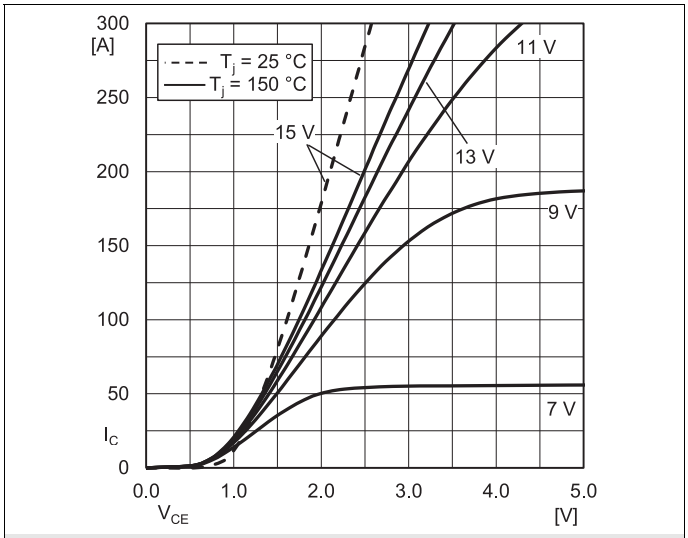


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

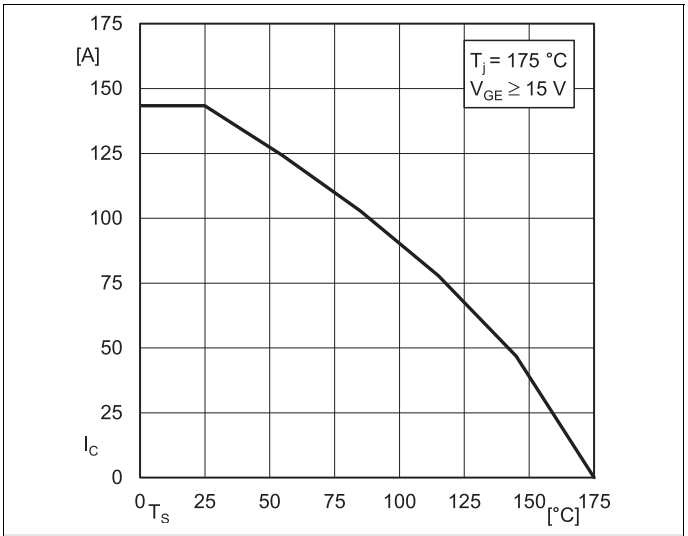


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

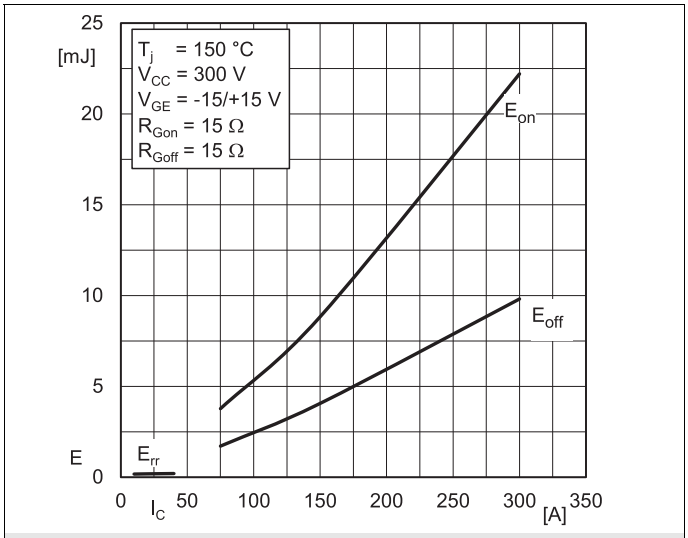


Fig. 3: Typ. turn-on /-off energy = f (I_C)

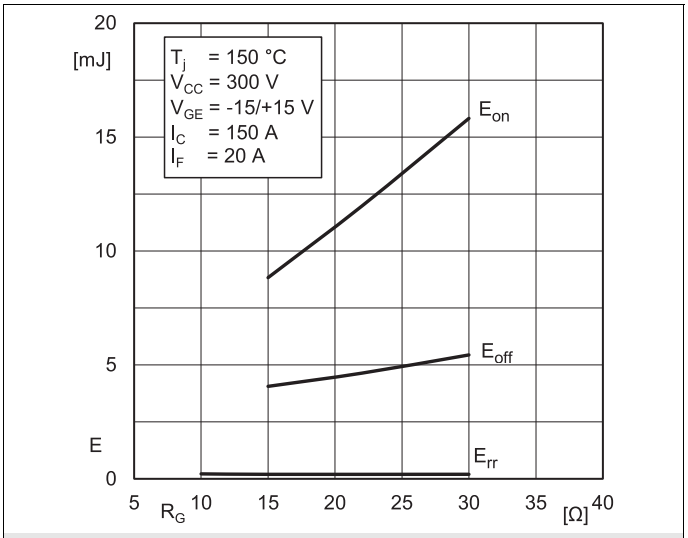


Fig. 4: Typ. turn-on /-off energy = f (R_G)

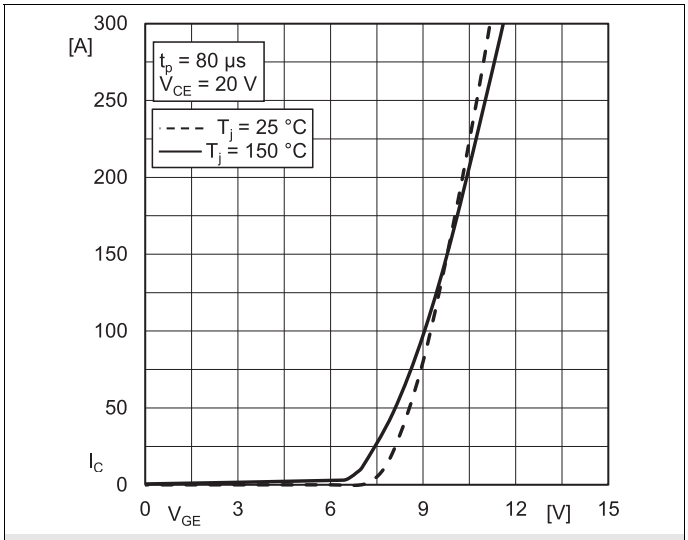


Fig. 5: Typ. transfer characteristic

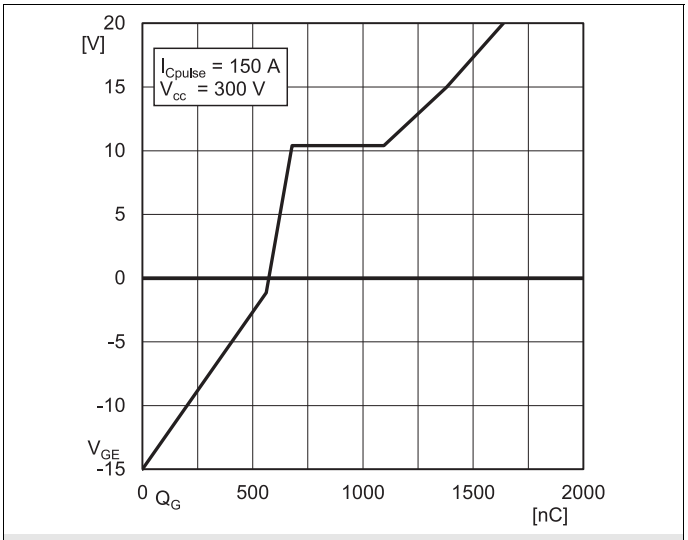


Fig. 6: Typ. gate charge characteristic

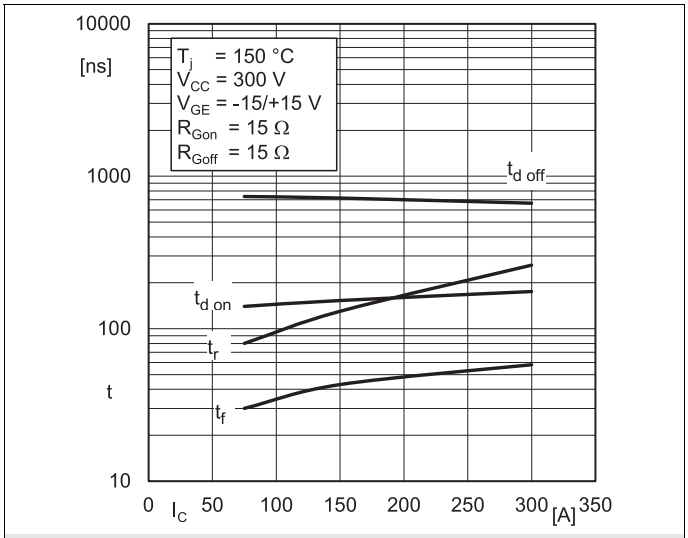


Fig. 7: Typ. switching times vs. I_C

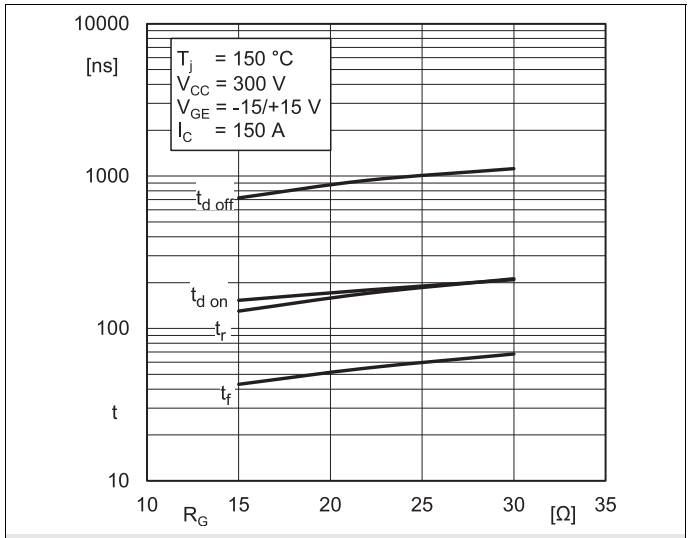


Fig. 8: Typ. switching times vs. gate resistor R_G

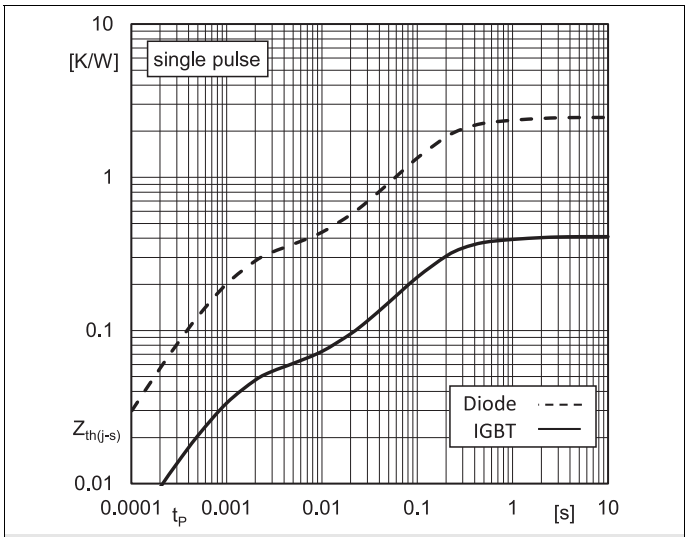


Fig. 9: Typ. transient thermal impedance of IGBT and Diode

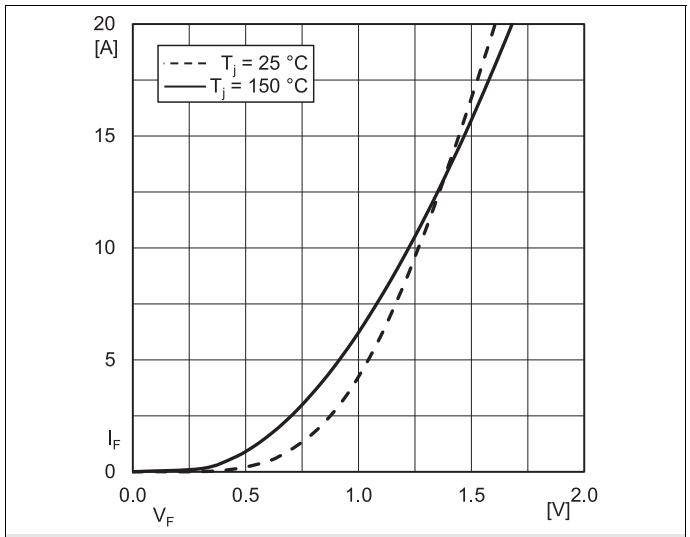
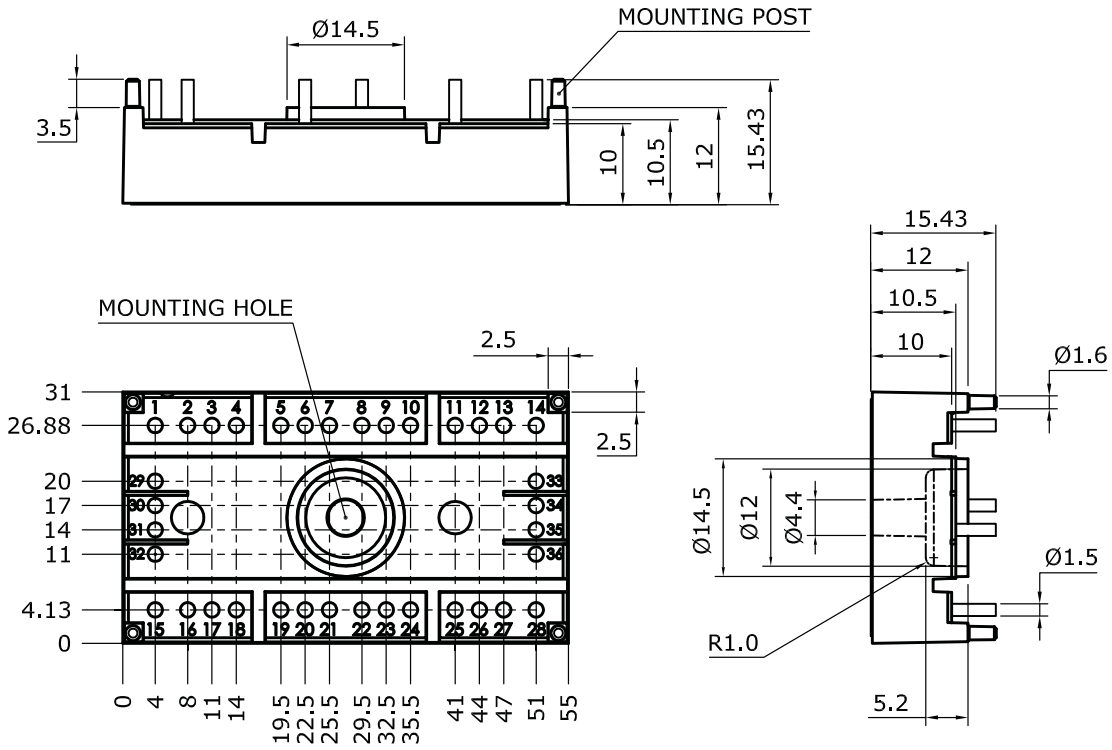


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

Dimensions: mm
Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

- 2.0 mm

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

- 2.0 mm

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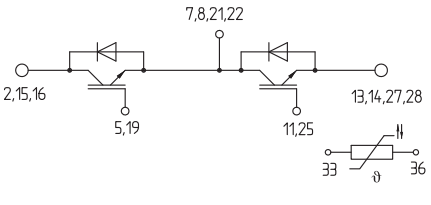

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This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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