



IGBT module

SK 151 GB 07F3 T

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

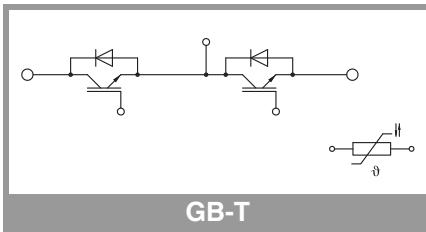
Remarks

Dynamic measurements set-up:

- IGBT switching on external 150A 600V Ultrafast diode
- Diode switching on external 20A 600V Trench3 IGBT

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

Characteristics		min.	typ.	max.	Unit
Symbol	Conditions				
Inverter - IGBT					
$V_{CE(\text{sat})}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.22	V
		$T_j = 150^\circ\text{C}$	2.18	2.55	V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	1.10	1.20	V
		$T_j = 150^\circ\text{C}$	1.00	1.10	V
r_{CE}	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	5.0	6.8	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	7.9	9.7	$\text{m}\Omega$
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}$, $I_C = 2.4\text{ mA}$	4.2	5.1	5.6	V
I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 600\text{ V}$, $T_j = 25^\circ\text{C}$			0.2	mA
C_{ies}	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	9.30		nF
C_{oes}	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.35		nF
C_{res}		$f = 1\text{ MHz}$	0.27		nF
Q_G	$V_{GE} = -15 \dots +15\text{ V}$		1380		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.6		Ω
$t_{d(on)}$	$V_{CC} = 300\text{ V}$	$T_j = 150^\circ\text{C}$	153		ns
t_r	$I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$	130		ns
E_{on}	$R_{G\text{ on}} = 15\text{ }\Omega$ $R_{G\text{ off}} = 15\text{ }\Omega$	$T_j = 150^\circ\text{C}$	8.8		mJ
$t_{d(off)}$	$di/dt_{\text{on}} = 974\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	719		ns
t_f	$di/dt_{\text{off}} = 3024\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	43		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	4		mJ
$R_{\text{th(j-s)}}$	per IGBT, $\lambda_{\text{paste}}=0.8\text{ W}/(\text{mK})$		0.41		K/W





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Typical Applications

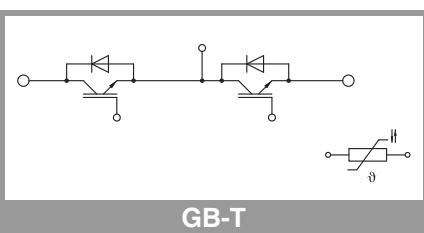
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- Switched mode power supplies
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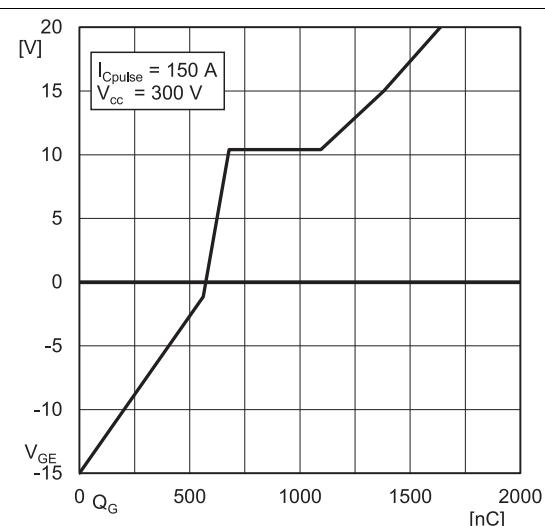
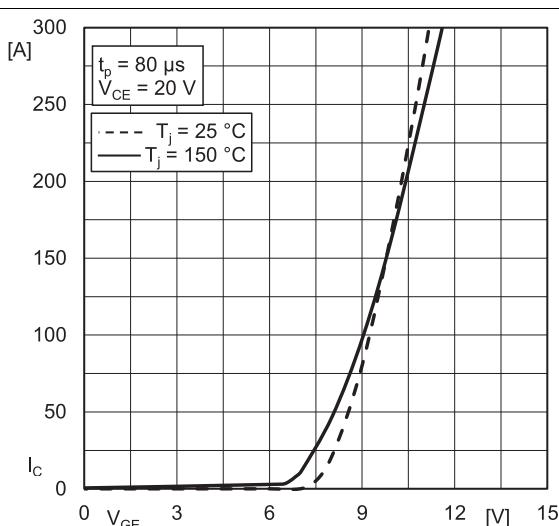
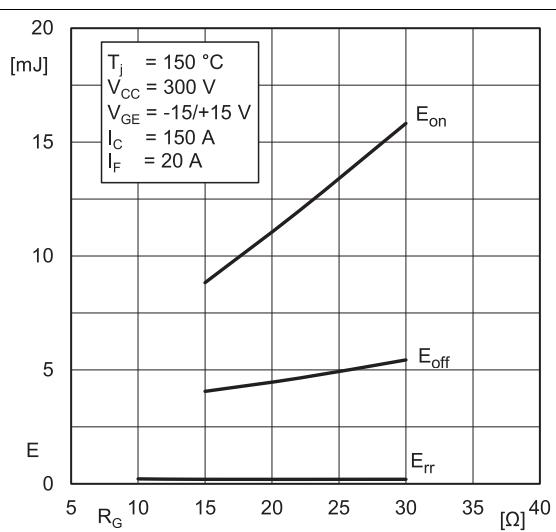
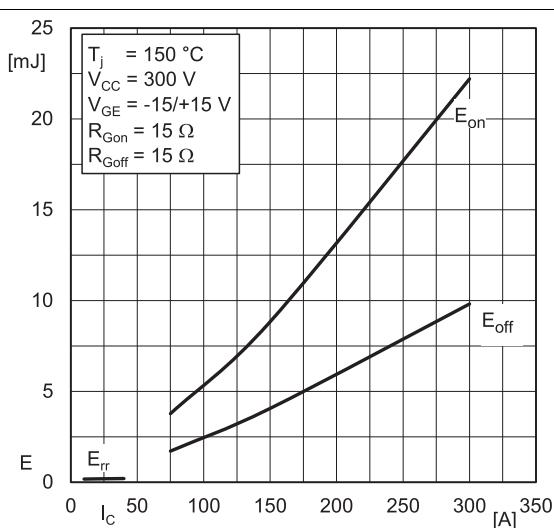
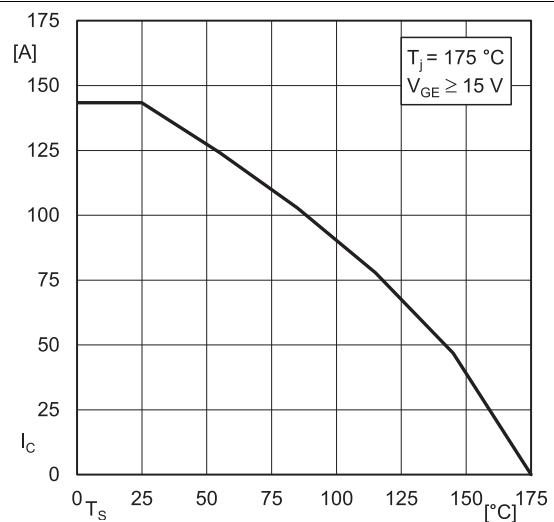
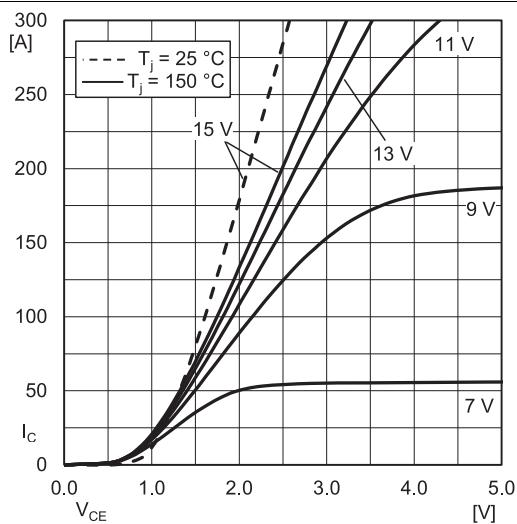
Remarks

Dynamic measurements set-up:

- IGBT switching on external 150A 600V Ultrafast diode
- 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_{FO}													
	chiplevel		T _j = 25 °C		0.99	1.10	V						
			T _j = 150 °C			0.80	0.89						
r_F													
	chiplevel		T _j = 25 °C		30	48	mΩ						
			T _j = 150 °C			44	56						
I_{RRM}													
	I _F = 20 A		T _j = 150 °C		32		A						
	di/dt _{off} = 3300 A/μs		T _j = 150 °C			2	μC						
Q_{rr}													
	V _{GE} = 15 V		T _j = 150 °C		0.2		mJ						
	V _{CC} = 300 V		T _j = 150 °C			2.46	K/W						
R_{th(j-s)}													
per diode, $\lambda_{\text{paste}}=0.8 \text{ W}/(\text{mK})$													
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			K						
				±2%									





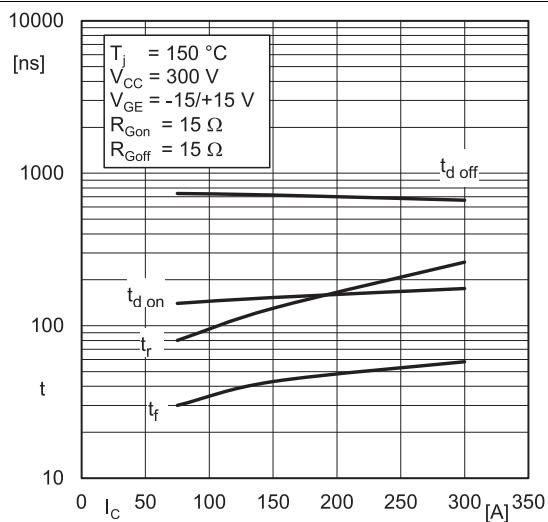


Fig. 7: Typ. switching times vs. I_C

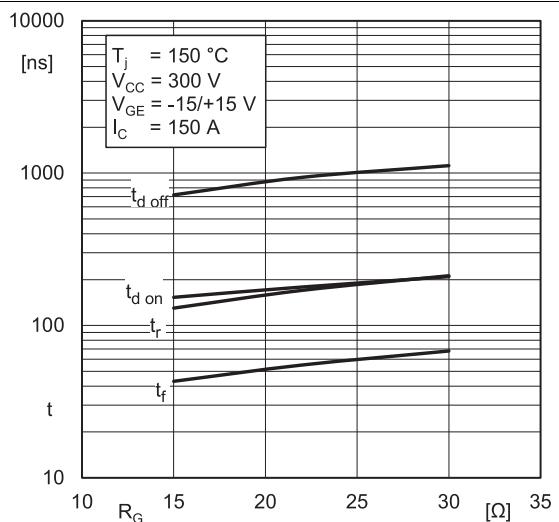


Fig. 8: Typ. switching times vs. gate resistor R_G

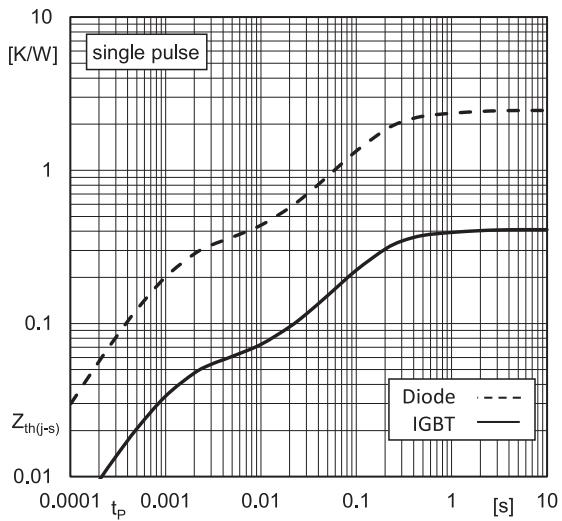


Fig. 9: Typ. transient thermal impedance of IGBT and Diode

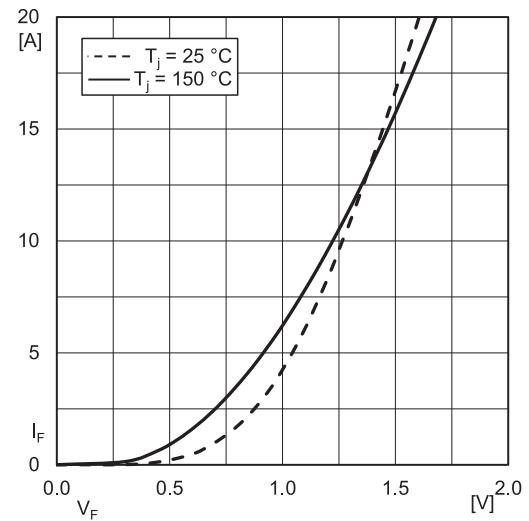
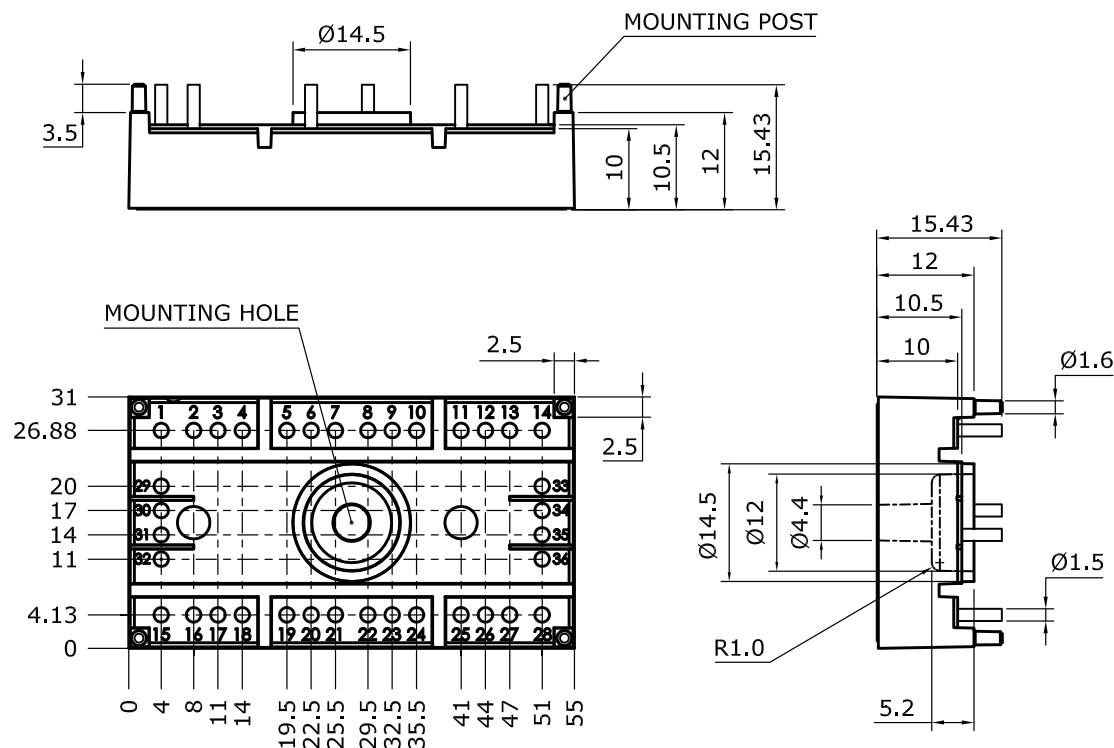


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC' + EE'}$

Dimensions: mm
Tolerance system: ISO 2768-m



Suggested hole diameter for solder pins in the circuit board:

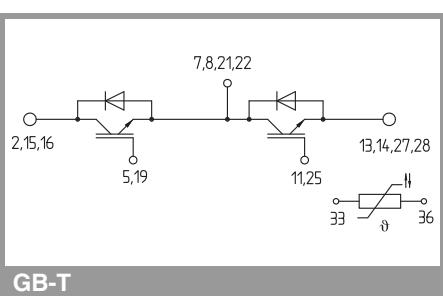
- 2.0 mm

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

- 2.0 mm

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SEMITOP®3



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

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