

# SK 120 GB 12F4 T



SEMITOP® 3

## IGBT module

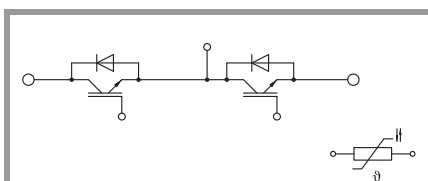
### SK 120 GB 12F4 T

#### Features\*

- Compact design
- One screw mounting module
- Optimum heat transfer and isolation through AlN direct copper bonding (DBC)
- Trench4 Fast IGBT technology
- CAL4F 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



GB-T

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V <sub>CES</sub>	T <sub>j</sub> = 25 °C		1200	V
I <sub>C</sub>	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 25 °C	174	A
		T <sub>s</sub> = 70 °C	143	A
I <sub>Cnom</sub>			120	A
I <sub>CRM</sub>			240	A
V <sub>GES</sub>			-20 ... 20	V
t <sub>psc</sub>	V <sub>CC</sub> = 800 V V <sub>GE</sub> ≤ 15 V V <sub>CES</sub> ≤ 1200 V	T <sub>j</sub> = 150 °C	10	μs
T <sub>j</sub>			-40 ... 175	°C
Inverse - Diode				
V <sub>RRM</sub>	T <sub>j</sub> = 25 °C		1200	V
I <sub>F</sub>	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 25 °C	29	A
		T <sub>s</sub> = 70 °C	24	A
I <sub>FRM</sub>			30	A
I <sub>FSM</sub>	10 ms, sin 180°, T <sub>j</sub> = 150 °C		65	A
T <sub>j</sub>			-40 ... 175	°C
Module				
I <sub>t(RMS)</sub>	ΔT <sub>terminal</sub> at PCB joint = 30 K, per pin		60	A
T <sub>stg</sub>	module without TIM		-40 ... 125	°C
V <sub>isol</sub>	AC, sinusoidal, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
V <sub>CE(sat)</sub>	I <sub>C</sub> = 120 A	T <sub>J</sub> = 25 °C		2.05	2.40	V
	V <sub>GE</sub> = 15 V chipelevel	T <sub>J</sub> = 150 °C		2.59	2.85	V
V <sub>CE0</sub>	chipelevel	T <sub>J</sub> = 25 °C		0.80	0.90	V
		T <sub>J</sub> = 150 °C		0.70	0.80	V
r <sub>CE</sub>	V <sub>GE</sub> = 15 V chipelevel	T <sub>J</sub> = 25 °C		10	13	mΩ
		T <sub>J</sub> = 150 °C		16	17	mΩ
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 4.5 mA		5.2	5.8	6.4	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V, T <sub>J</sub> = 25 °C				1.6	mA
C <sub>ies</sub>	V <sub>CE</sub> = 25 V V <sub>GE</sub> = 0 V	f = 1 MHz		6.90		nF
C <sub>oes</sub>		f = 1 MHz		0.56		nF
C <sub>res</sub>		f = 1 MHz		0.41		nF
Q <sub>G</sub>	V <sub>GE</sub> = - 15 V...+ 15 V			412		nC
R <sub>Gint</sub>	T <sub>J</sub> = 25 °C			2.7		Ω
t <sub>d(on)</sub>	V <sub>CC</sub> = 600 V	T <sub>J</sub> = 150 °C		156		ns
t <sub>r</sub>	I <sub>C</sub> = 120 A	T <sub>J</sub> = 150 °C		51		ns
E <sub>on</sub>	R <sub>G on</sub> = 2.2 Ω	T <sub>J</sub> = 150 °C		8.8		mJ
t <sub>d(off)</sub>	R <sub>G off</sub> = 2.2 Ω	T <sub>J</sub> = 150 °C		346		ns
t <sub>f</sub>	di/dt <sub>on</sub> = 2354 A/μs	T <sub>J</sub> = 150 °C		42		ns
E <sub>off</sub>	di/dt <sub>off</sub> = 2264 A/μs	T <sub>J</sub> = 150 °C		7.47		mJ
R <sub>th(j-s)</sub>	per IGBT, λ <sub>paste</sub> =0.8 W/(mK)			0.22		K/W

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## IGBT module

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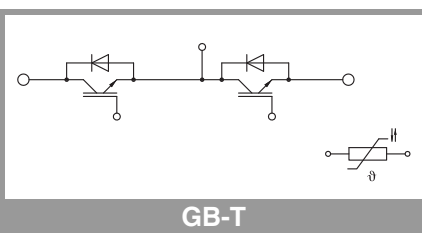
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 15 A	T <sub>j</sub> = 25 °C		2.38	2.71	V
	chiplevel	T <sub>j</sub> = 150 °C		2.44	2.77	V
V <sub>F0</sub>	chiplevel	T <sub>j</sub> = 25 °C		1.30	1.50	V
		T <sub>j</sub> = 150 °C		0.90	1.10	V
r <sub>F</sub>	chiplevel	T <sub>j</sub> = 25 °C		72	81	mΩ
		T <sub>j</sub> = 150 °C		103	111	mΩ
I <sub>RRM</sub>	I <sub>F</sub> = 120 A	T <sub>j</sub> = 150 °C		43.4		A
Q <sub>rr</sub>	di/dt <sub>off</sub> = 2350 A/μs	T <sub>j</sub> = 150 °C		5.7		μC
E <sub>rr</sub>	V <sub>GE</sub> = -15 V	T <sub>j</sub> = 150 °C		2.04		mJ
	V <sub>CC</sub> = 600 V	T <sub>j</sub> = 150 °C				
R <sub>th(j-s)</sub>	per diode, λ <sub>paste</sub> =0.8 W/(mK)			1.25		K/W
Module						
L <sub>CE</sub>				-		nH
M <sub>s</sub>	to heatsink		2.25		2.5	Nm
w				29		g
Temperature Sensor						
R <sub>100</sub>	T <sub>c</sub> =100°C (R <sub>25</sub> =5 kΩ)			493 ± 5%		Ω
B <sub>100/125</sub>	R(T)=R <sub>100</sub> exp[B <sub>100/125</sub> (1/T-1/T <sub>100</sub> )]; T[K];			3550 ±2%		K



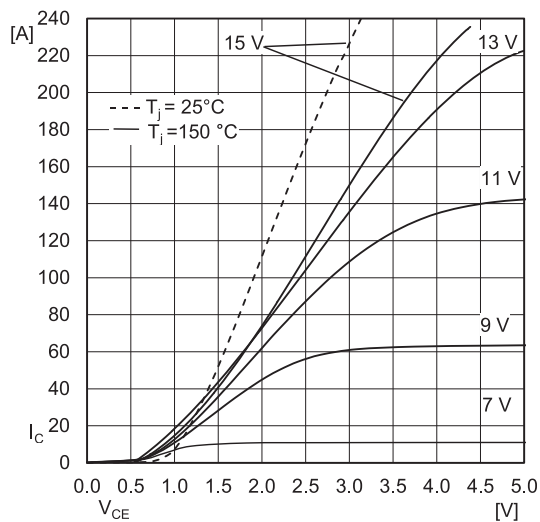


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'} + EE'$

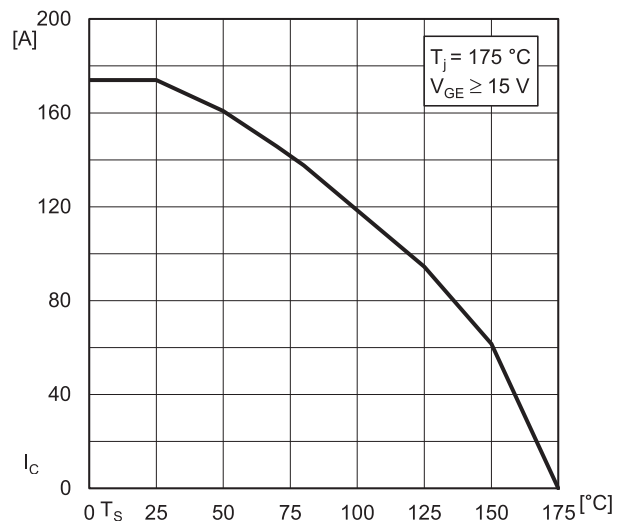


Fig. 2: Typ. rated current vs. temperature  $I_C = f(T_S)$

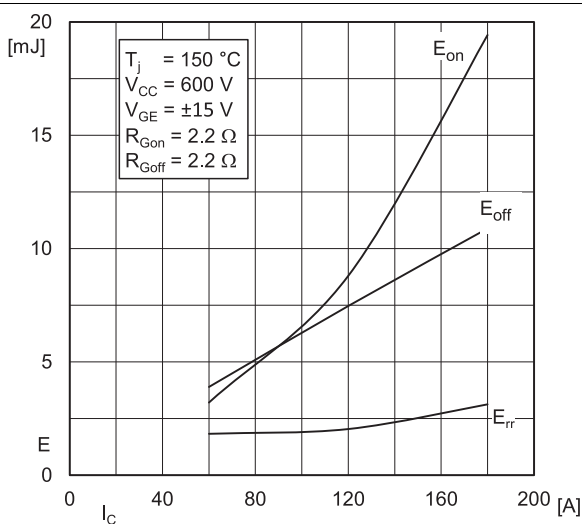


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

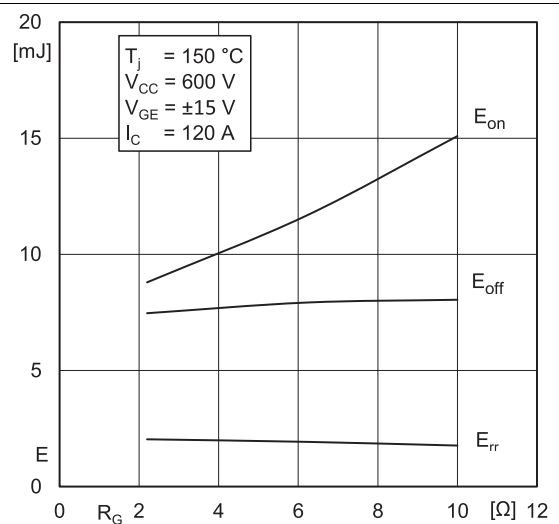


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

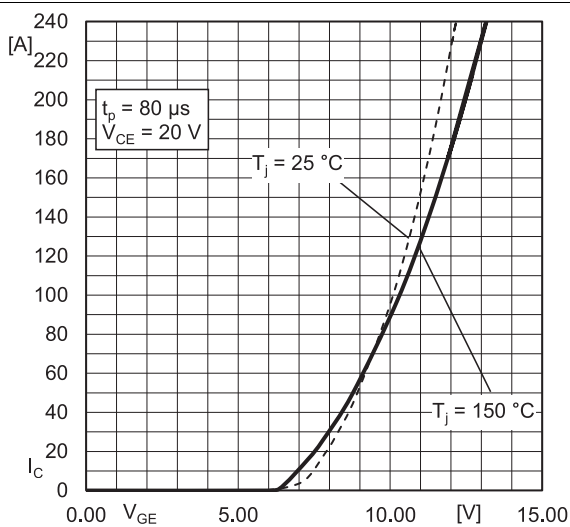


Fig. 5: Typ. transfer characteristic

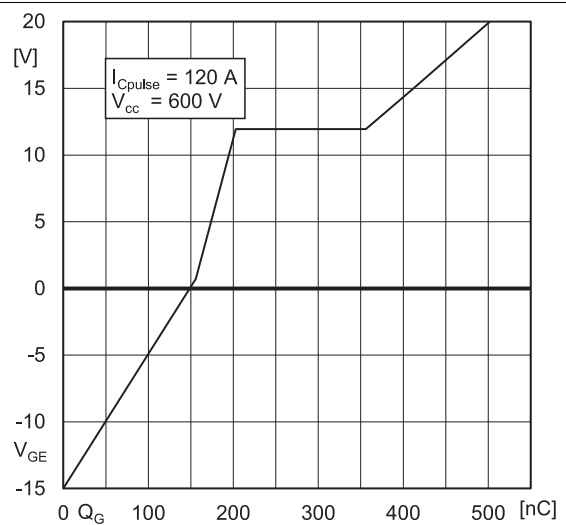


Fig. 6: Typ. gate charge characteristic

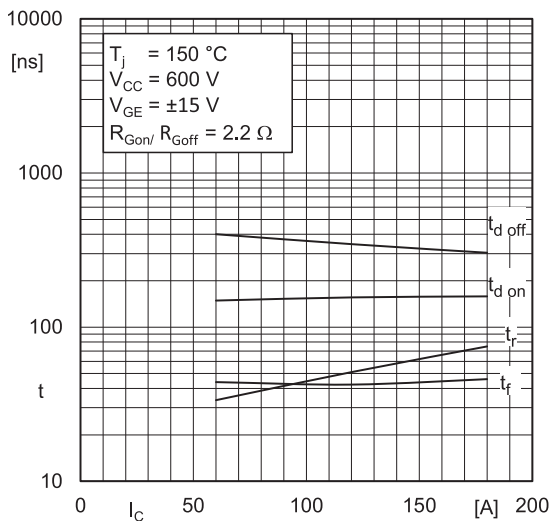


Fig. 7: Typ. switching times vs.  $I_C$

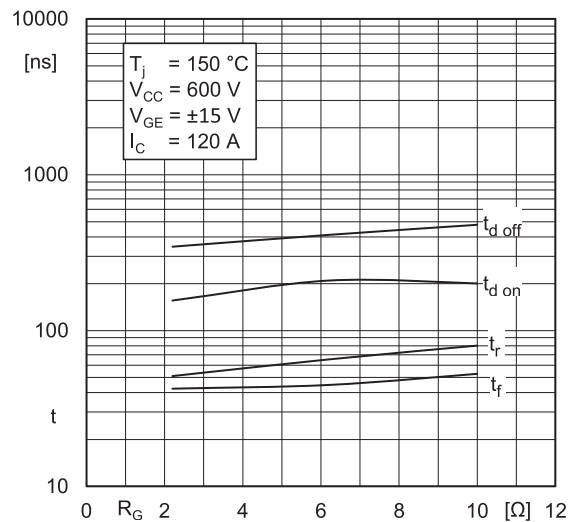


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

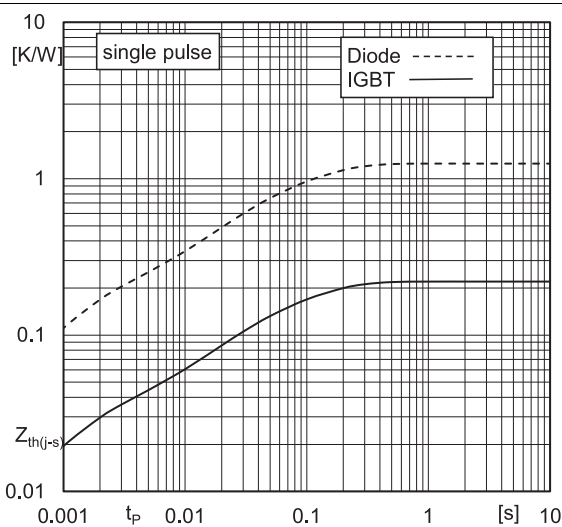


Fig. 9: Typ. transient thermal impedance

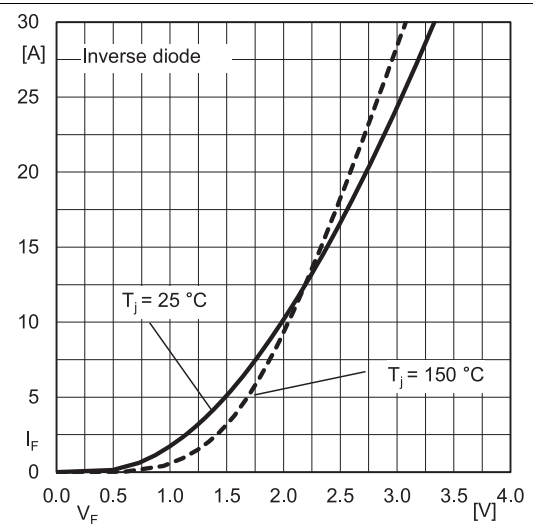


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC'} + EE'$

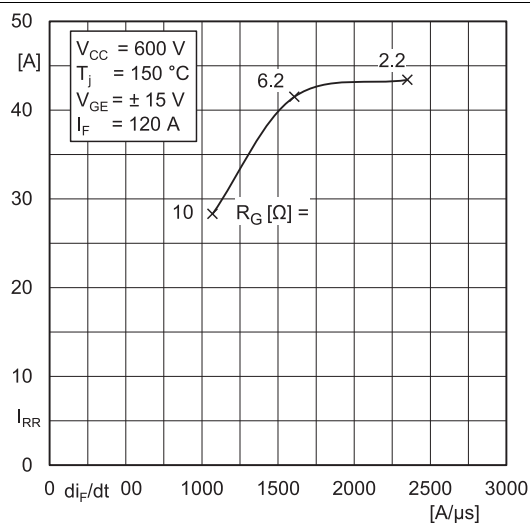
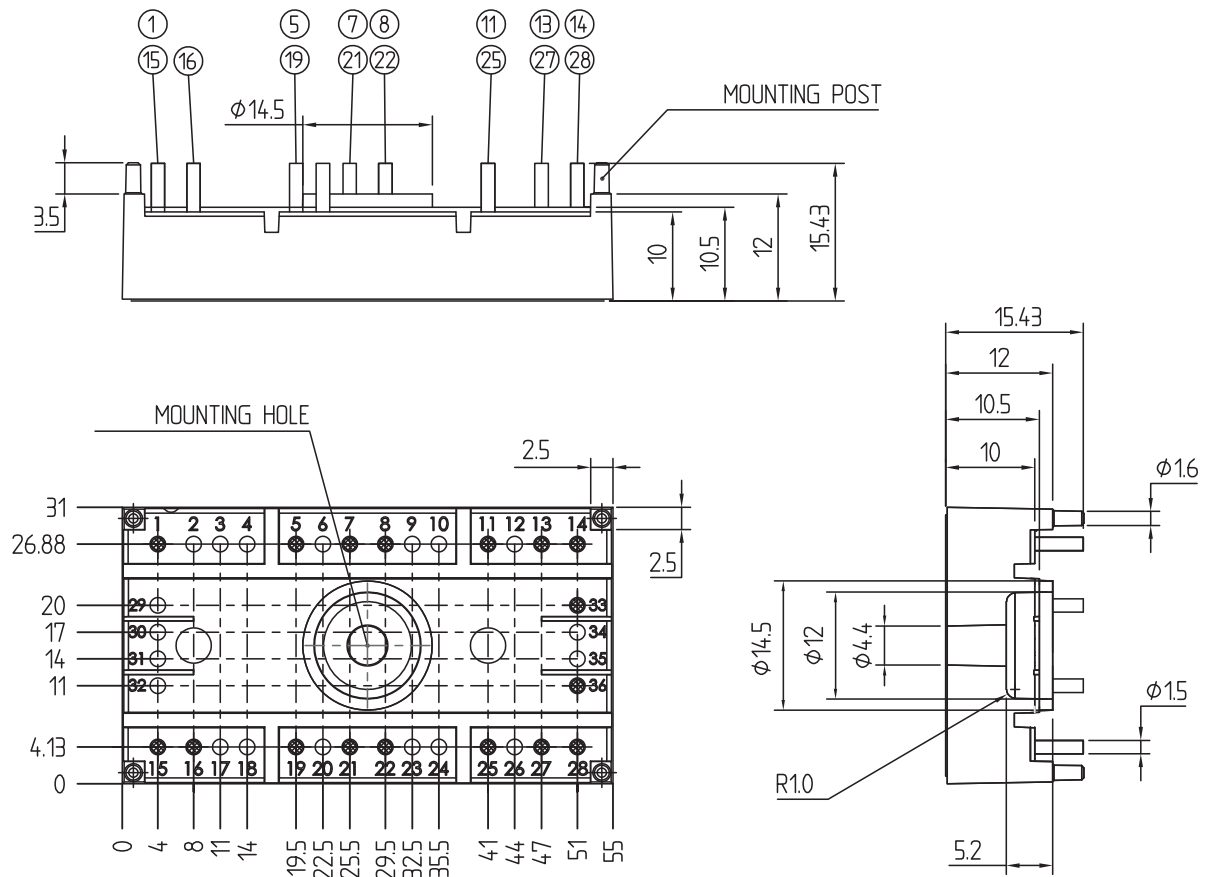


Fig. 11: Typ. CAL diode peak reverse recovery current

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Dimensions: mm

Tolerance system: ISO 2768-m



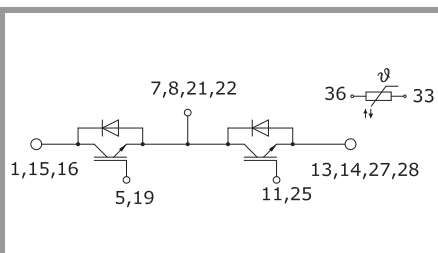
-Hole specification for contacts:  
refer Mounting Instruction SEMITOP® Classic

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

- refer Mounting Instruction SEMITOP® Classic

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

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