

MiniSKiiP® 3 Dual

## Half-Bridge

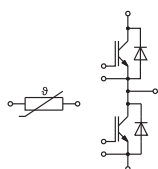
### SKiiP 39GB12E4V1

#### Features\*

- Trench 4 IGBT's
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized file no. E63532

#### Remarks

- Case temp. limited to  $T_C = 125^\circ\text{C}$  max. (for baseplateless modules  $T_C = T_S$ )
- product rel. results valid for  $T_j \leq 150$  (recomm. Top =  $-40 \dots +150^\circ\text{C}$ )

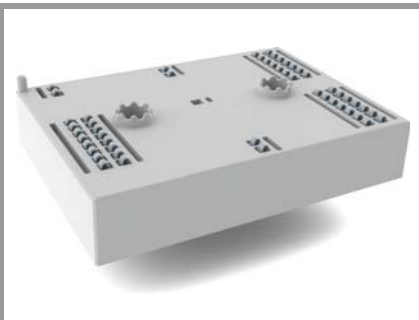


GB

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>	λ <sub>paste</sub> =0.8 W/(mK)	T <sub>s</sub> = 25 °C	389	A
	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 70 °C	313	A
I <sub>C</sub>	λ <sub>paste</sub> =2.5 W/(mK)	T <sub>s</sub> = 25 °C	582	A
	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 70 °C	474	A
I <sub>Cnom</sub>			400	A
I <sub>CRM</sub>			1200	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				
I <sub>F</sub>	λ <sub>paste</sub> =0.8 W/(mK)	T <sub>s</sub> = 25 °C	363	A
	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 70 °C	287	A
I <sub>F</sub>	λ <sub>paste</sub> =2.5 W/(mK)	T <sub>s</sub> = 25 °C	422	A
	T <sub>j</sub> = 175 °C	T <sub>s</sub> = 70 °C	335	A
I <sub>FRM</sub>			800	A
I <sub>FSM</sub>	10 ms, sin 180°, T <sub>j</sub> = 150 °C		1980	A
T <sub>j</sub>			-40 ... 175	°C
Module				
I <sub>t(RMS)</sub>	T <sub>terminal</sub> = 80 °C, 20 A per spring		280	A
T <sub>stg</sub>	module without TIM		-40 ... 125	°C
V <sub>isol</sub>	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
V <sub>CE(sat)</sub>	I <sub>C</sub> = 400 A	T <sub>j</sub> = 25 °C		1.80	2.05	V
	V <sub>GE</sub> = 15 V chiplevel	T <sub>j</sub> = 150 °C		2.20	2.40	V
V <sub>CE0</sub>	chiplevel	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	T <sub>j</sub> = 25 °C		2.5	2.9	mΩ
	chiplevel	T <sub>j</sub> = 150 °C		3.8	4.0	mΩ
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 15.2 mA		5	5.8	6.5	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V, T <sub>j</sub> = 25 °C				4.0	mA
C <sub>ies</sub>	V <sub>CE</sub> = 25 V V <sub>GE</sub> = 0 V	f = 1 MHz		24.60		nF
C <sub>oes</sub>		f = 1 MHz		1.62		nF
C <sub>res</sub>		f = 1 MHz		1.38		nF
Q <sub>G</sub>	V <sub>GE</sub> = - 8 V...+ 15 V			2260		nC
R <sub>Gint</sub>	T <sub>j</sub> = 25 °C			1.9		Ω
t <sub>d(on)</sub>	V <sub>CC</sub> = 600 V	T <sub>j</sub> = 150 °C		183		ns
t <sub>r</sub>	I <sub>C</sub> = 400 A	T <sub>j</sub> = 150 °C		62		ns
E <sub>on</sub>	R <sub>G on</sub> = 1.5 Ω	T <sub>j</sub> = 150 °C		20.8		mJ
	R <sub>G off</sub> = 1.5 Ω	T <sub>j</sub> = 150 °C				
t <sub>d(off)</sub>	di/dt <sub>on</sub> = 6940 A/μs	T <sub>j</sub> = 150 °C		520		ns
t <sub>f</sub>	di/dt <sub>off</sub> = 2930 A/μs	T <sub>j</sub> = 150 °C		118		ns
E <sub>off</sub>	V <sub>GE</sub> = +15/-15 V L <sub>s</sub> = 25 nH	T <sub>j</sub> = 150 °C		49.7		mJ
R <sub>th(j-s)</sub>	per IGBT, λ <sub>paste</sub> =0.8 W/(mK)			0.16		K/W
R <sub>th(j-s)</sub>	per IGBT, λ <sub>paste</sub> =2.5 W/(mK)			0.08		K/W

# SKiiP 39GB12E4V1



MiniSKiiP® 3 Dual

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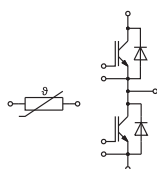
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 400 A V <sub>GE</sub> = 0 V chiplevel	T <sub>j</sub> = 25 °C		2.20	2.52	V
		T <sub>j</sub> = 150 °C		2.15	2.47	V
V <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		2.3	2.6	mΩ
		T <sub>j</sub> = 150 °C		3.1	3.4	mΩ
I <sub>RRM</sub>	I <sub>F</sub> = 400 A	T <sub>j</sub> = 150 °C		425		A
Q <sub>rr</sub>	di/dt <sub>off</sub> = 6840 A/μs	T <sub>j</sub> = 150 °C		63.2		μC
E <sub>rr</sub>	V <sub>GE</sub> = -15 V V <sub>CC</sub> = 600 V	T <sub>j</sub> = 150 °C		30.2		mJ
R <sub>th(j-s)</sub>	per Diode, λ <sub>paste</sub> =0.8 W/(mK)			0.19		K/W
R <sub>th(j-s)</sub>	per Diode, λ <sub>paste</sub> =2.5 W/(mK)			0.15		K/W
Module						
L <sub>CE</sub>				15		nH
M <sub>s</sub>	to heat sink		2		2.5	Nm
w				76		g
Temperature Sensor						
R <sub>100</sub>	T <sub>c</sub> =100°C (R <sub>25</sub> =5 kΩ)			493 ± 5%		Ω
B <sub>25/85</sub>	R <sub>(T)</sub> =R <sub>25</sub> *exp[B <sub>25/85</sub> *(1/T-1/298)], T[K]			3420		K



GB

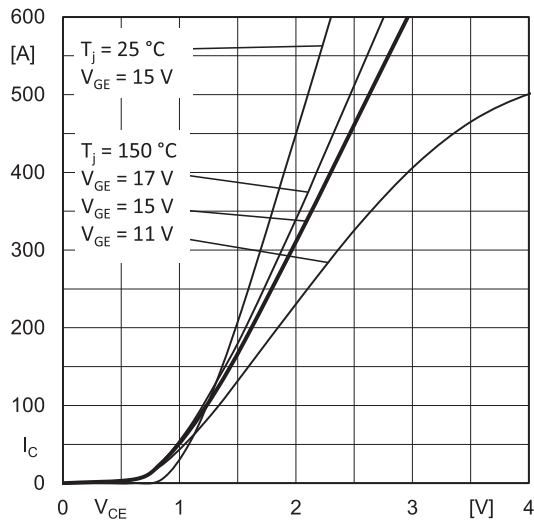


Fig. 1: Typ. output characteristic

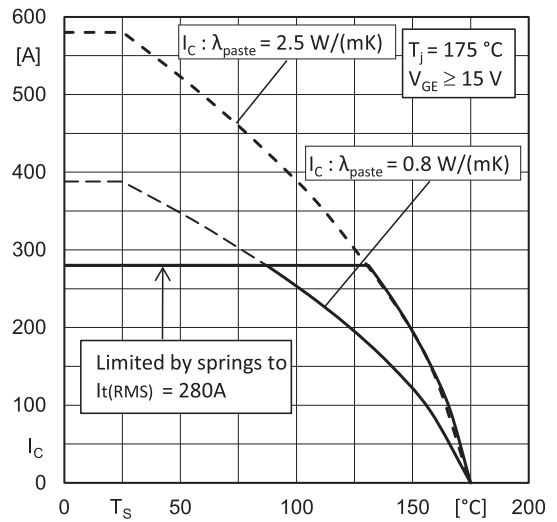


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

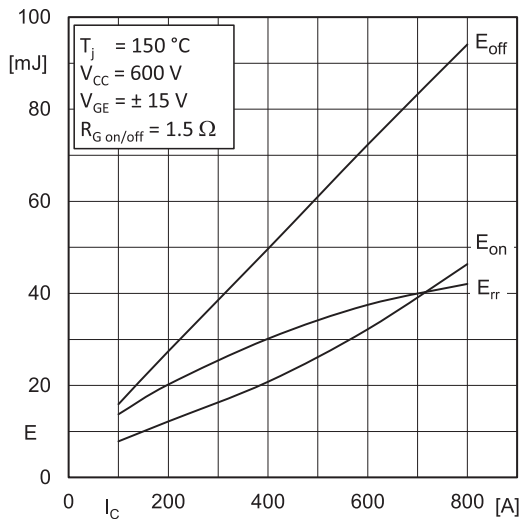


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

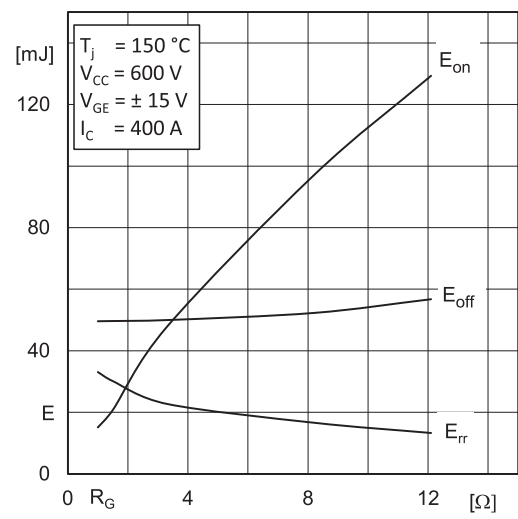


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

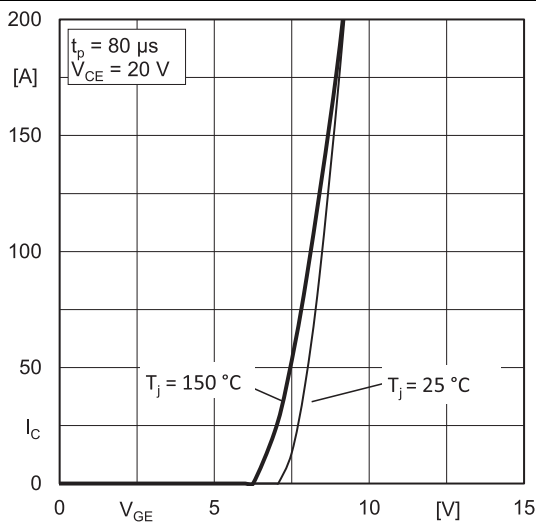


Fig. 5: Typ. transfer characteristic

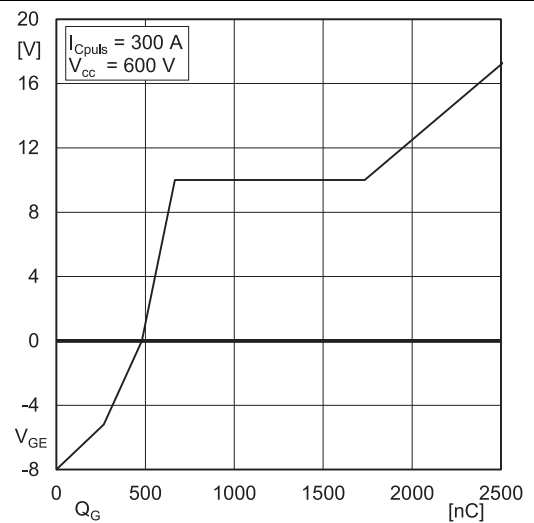


Fig. 6: Typ. gate charge characteristic

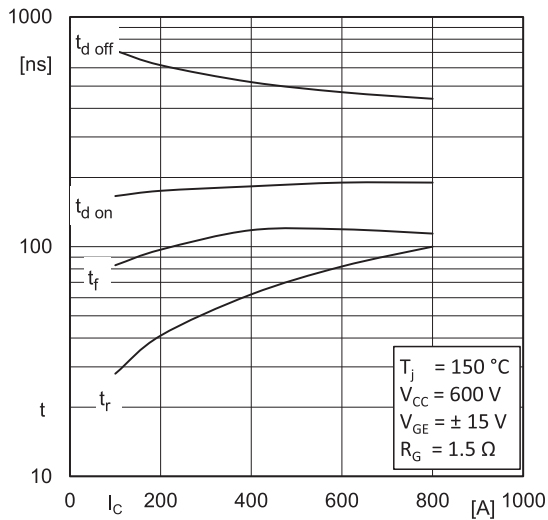


Fig. 7: Typ. switching times vs.  $I_C$

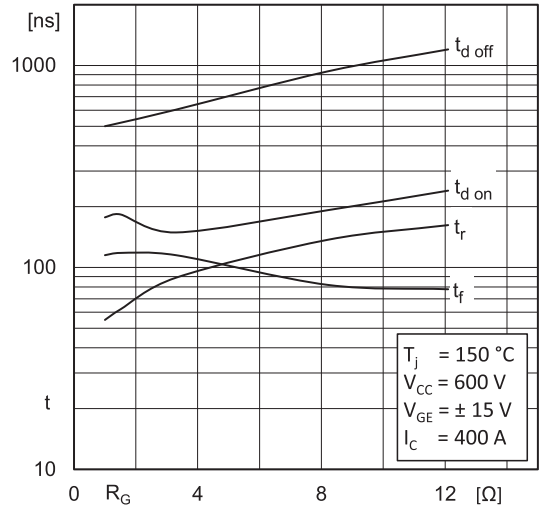


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

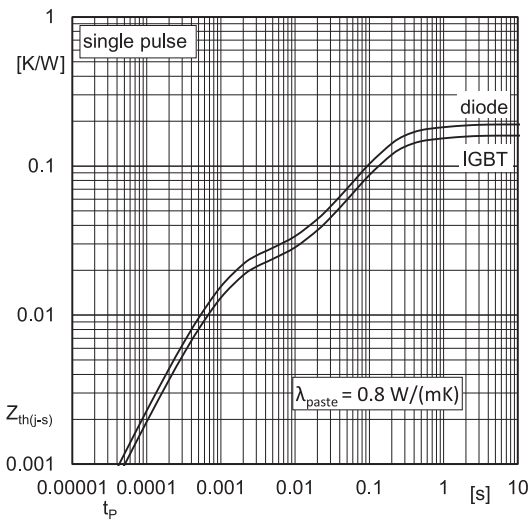


Fig. 9: Typ. transient thermal impedance

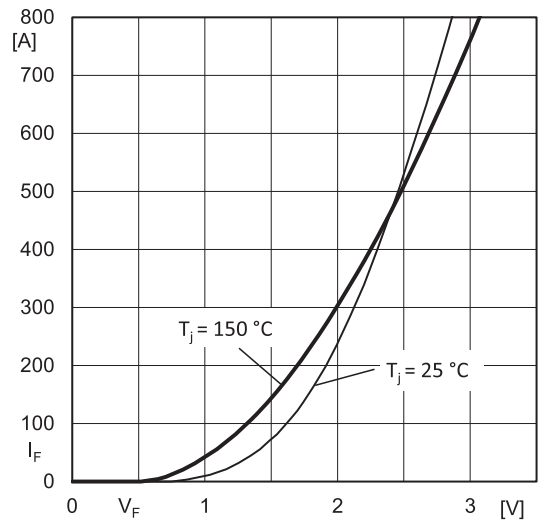


Fig. 10: Typ. CAL diode forward characteristic

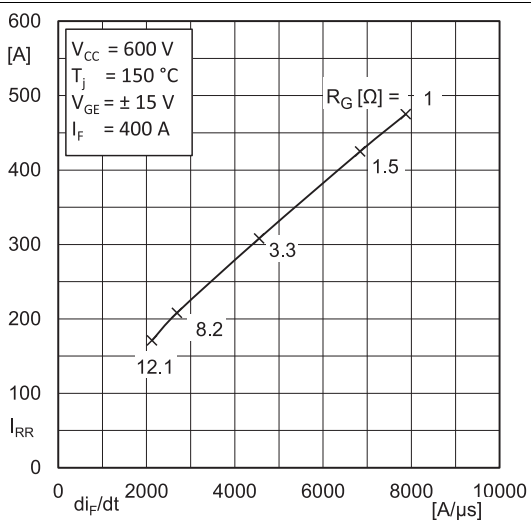


Fig. 11: Typ. CAL diode peak reverse recovery current

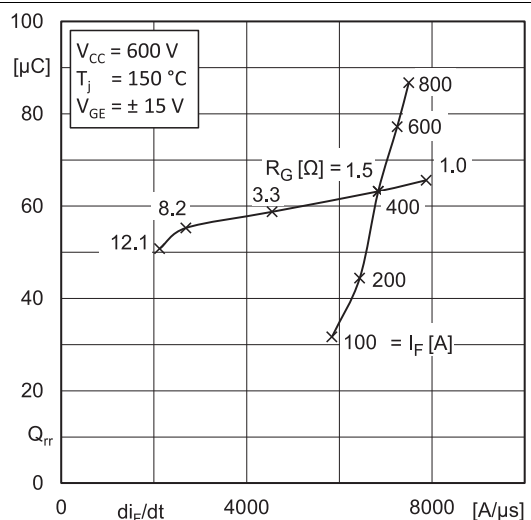
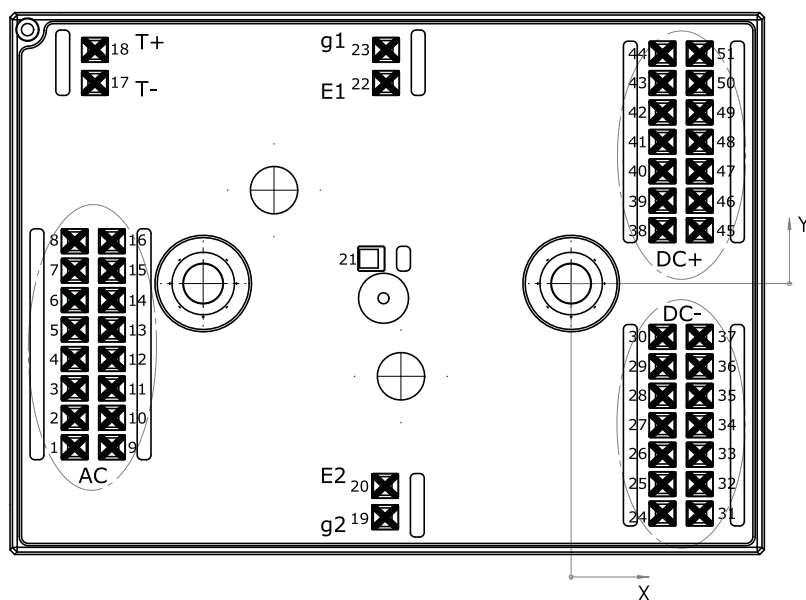


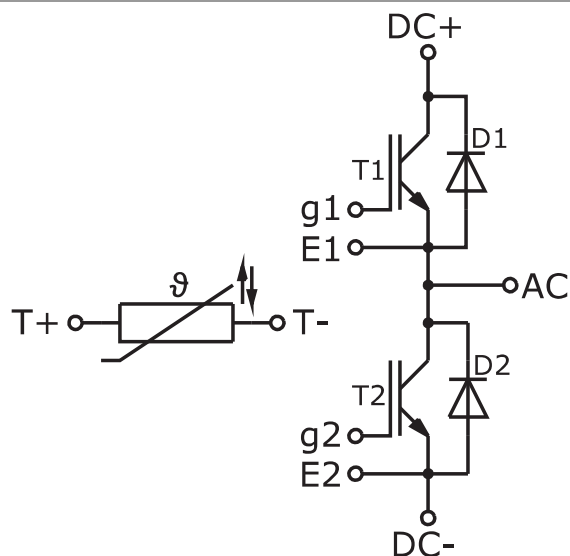
Fig. 12: Typ. CAL diode recovery charge

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	-53,98	-17,80	AC	18	-51,78	25,40	T+	35	13,98	-12,20	DC-
2	-53,98	-14,60	AC	19	-20,23	-25,40	g2	36	13,98	-9,00	DC-
3	-53,98	-11,40	AC	20	-20,23	-22,00	E2	37	13,98	-5,80	DC-
4	-53,98	-8,20	AC	21	-21,73	2,70		38	9,93	5,80	DC+
5	-53,98	-5,00	AC	22	-20,13	21,80	E1	39	9,93	9,00	DC+
6	-53,98	-1,80	AC	23	-20,13	25,40	g1	40	9,93	12,20	DC+
7	-53,98	1,40	AC	24	9,93	-25,00	DC-	41	9,93	15,40	DC+
8	-53,98	4,60	AC	25	9,93	-21,80	DC-	42	9,93	18,60	DC+
9	-49,93	-17,80	AC	26	9,93	-18,60	DC-	43	9,93	21,80	DC+
10	-49,93	-14,60	AC	27	9,93	-15,40	DC-	44	9,93	25,00	DC+
11	-49,93	-11,40	AC	28	9,93	-12,20	DC-	45	13,98	5,80	DC+
12	-49,93	-8,20	AC	29	9,93	-9,00	DC-	46	13,98	9,00	DC+
13	-49,93	-5,00	AC	30	9,93	-5,80	DC-	47	13,98	12,20	DC+
14	-49,93	-1,80	AC	31	13,98	-25,00	DC-	48	13,98	15,40	DC+
15	-49,93	1,40	AC	32	13,98	-21,80	DC-	49	13,98	18,60	DC+
16	-49,93	4,60	AC	33	13,98	-18,60	DC-	50	13,98	21,80	DC+
17	-51,78	21,80	T-	34	13,98	-15,40	DC-	51	13,98	25,00	DC+

all values in [mm]



Pinout and Dimensions



Pinout

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

## **\*IMPORTANT INFORMATION AND WARNINGS**

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