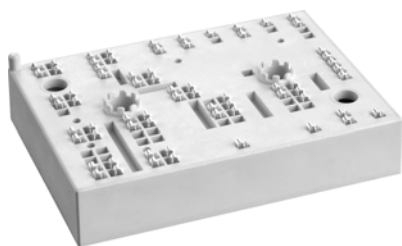


SKiiP 39GA12T4V1



MiniSKiiP® 3

IGBT module

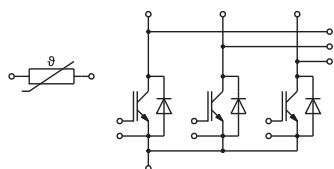
SKiiP 39GA12T4V1

Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_J \leq 150^\circ\text{C}$ (recommended $T_{J,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

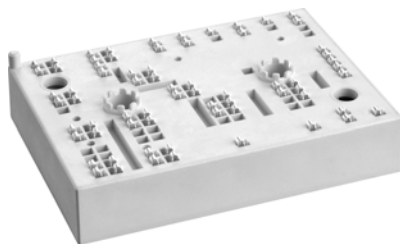


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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _J = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	167	A
	T _J = 175 °C	T _s = 70 °C	135	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	217	A
	T _J = 175 °C	T _s = 70 °C	177	A
I _{Cnom}			150	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		450	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _J = 150 °C	10	μs
T _J			-40 ... 175	°C
Inverse - Diode				
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	136	A
	T _J = 175 °C	T _s = 70 °C	107	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	163	A
	T _J = 175 °C	T _s = 70 °C	130	A
I _{Fnom}			150	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		450	A
I _{FSM}	t _p = 10 ms, sin 180°, T _J = 150 °C		900	A
T _J			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		160	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
V _{CE(sat)}	I _C = 150 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.25	2.45	V
V _{CE0}	chiplevel	T _j = 25 °C		0.80	0.90	V
		T _j = 150 °C		0.70	0.80	V
r _{CE}	V _{GE} = 15 V chiplevel	T _j = 25 °C		7.0	8.0	mΩ
		T _j = 150 °C		10	11	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 6 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _j = 25 °C			0.1	0.3	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		8.80		nF
C _{oes}		f = 1 MHz		0.58		nF
C _{res}		f = 1 MHz		0.47		nF
Q _G	- 8 V...+ 15 V			850		nC
R _{Gint}	T _j = 25 °C			5.0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		165		ns
t _r	I _C = 150 A	T _j = 150 °C		50		ns
E _{on}	R _{G on} = 1 Ω	T _j = 150 °C		22.5		mJ
	R _{G off} = 1 Ω	T _j = 150 °C				
t _{d(off)}	di/dt _{on} = 2840 A/μs	T _j = 150 °C		390		ns
t _f	di/dt _{off} = 1880 A/μs	T _j = 150 °C		80		ns
E _{off}	V _{GE} = +15/-15 V	T _j = 150 °C		14		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.33		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			0.21		K/W

SKiiP 39GA12T4V1



MiniSKiiP® 3

IGBT module

SKiiP 39GA12T4V1

Features

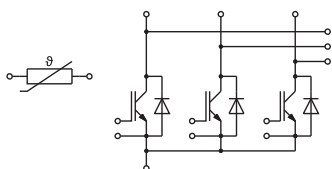
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Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 150 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel		$T_J = 25^{\circ}\text{C}$ 2.14 $T_J = 150^{\circ}\text{C}$ 2.07	2.46 2.38	V
V_{F0}	chipelevel		$T_J = 25^{\circ}\text{C}$ 1.30 $T_J = 150^{\circ}\text{C}$ 0.90	1.50 1.10	V
r_F	chipelevel		$T_J = 25^{\circ}\text{C}$ 5.6 $T_J = 150^{\circ}\text{C}$ 7.8	6.4 8.5	m Ω
I_{RRM}	$I_F = 150 \text{ A}$ $di/dt_{off} = 4020 \text{ A}/\mu\text{s}$ $V_{GE} = +15/-15 \text{ V}$ $V_{CC} = 600 \text{ V}$		$T_J = 150^{\circ}\text{C}$ 188 $T_J = 150^{\circ}\text{C}$ 27 $T_J = 150^{\circ}\text{C}$ 11.4		A μC mJ
Q_{rr}					
E_{rr}					
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.52		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.39		K/W
Module					
L_{CE}			-		nH
M_s	to heat sink	2		2.5	Nm
w			82		g
Temperature Sensor					
R_{100}	$T_r=100^{\circ}\text{C}$ ($R_{25}=1000\Omega$)		$1670 \pm 3\%$		Ω
$R(T)$	$R(T)=1000\Omega[1+A(T-25^{\circ}\text{C})+B(T-25^{\circ}\text{C})^2]$], $A = 7.635 \cdot 10^{-3} \text{ }^{\circ}\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^{\circ}\text{C}^{-2}$				



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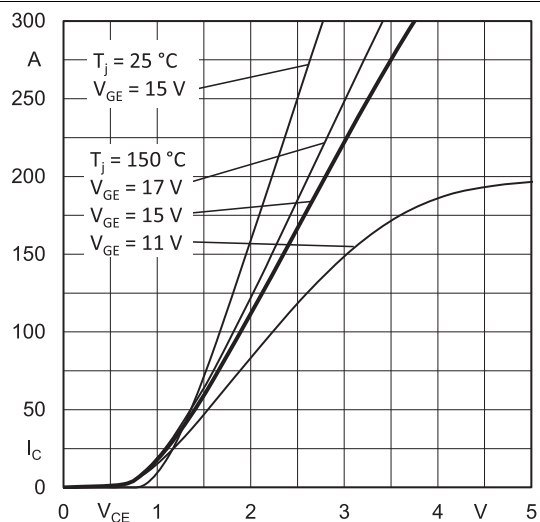


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

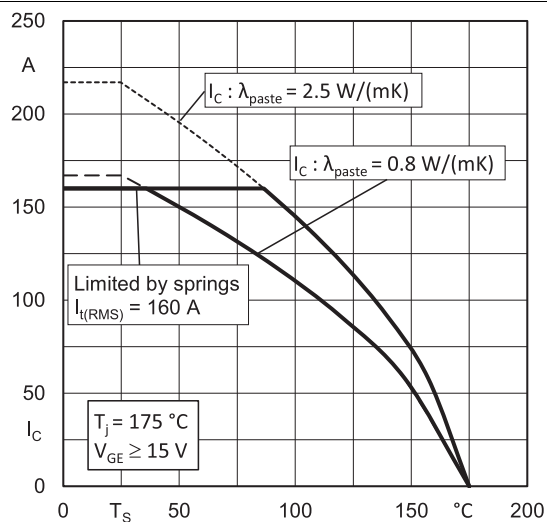


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

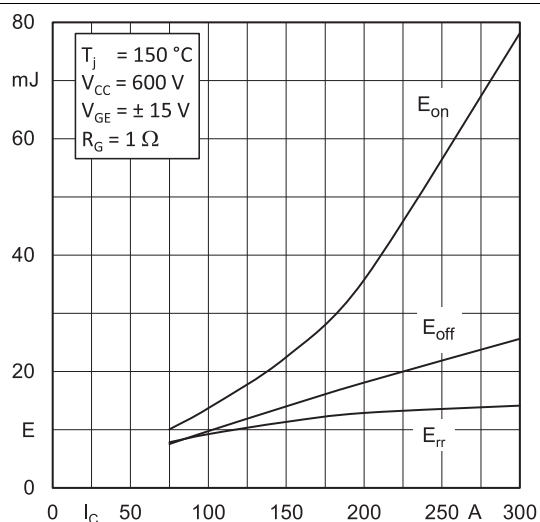


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

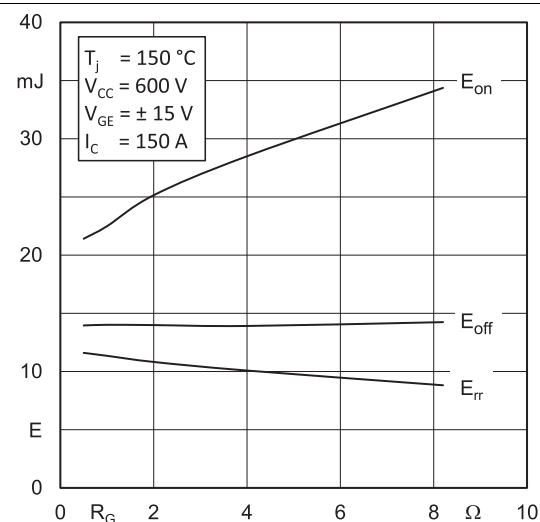


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

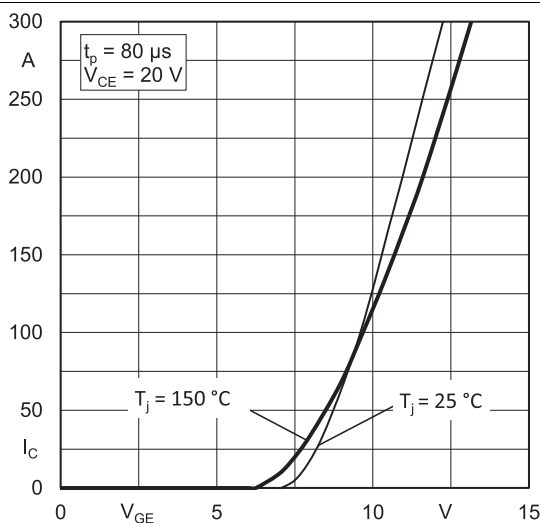


Fig. 5: Typ. transfer characteristic

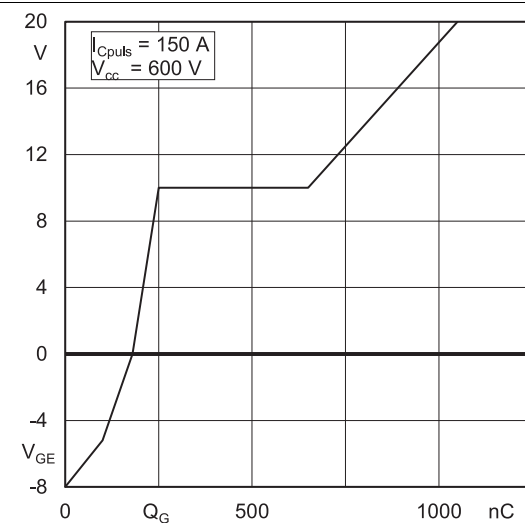


Fig. 6: Typ. gate charge characteristic

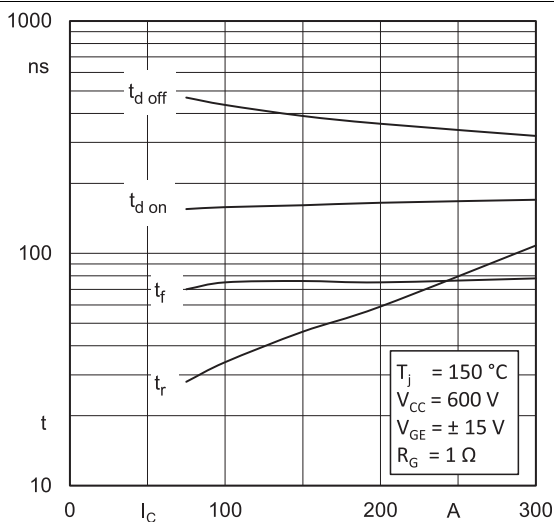


Fig. 7: Typ. switching times vs. I_C

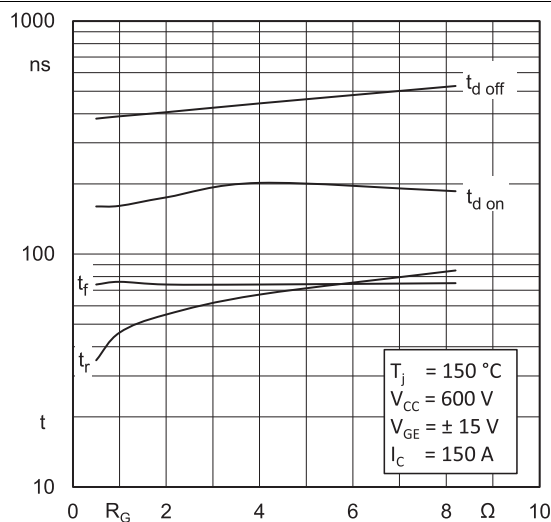


Fig. 8: Typ. switching times vs. gate resistor R_G

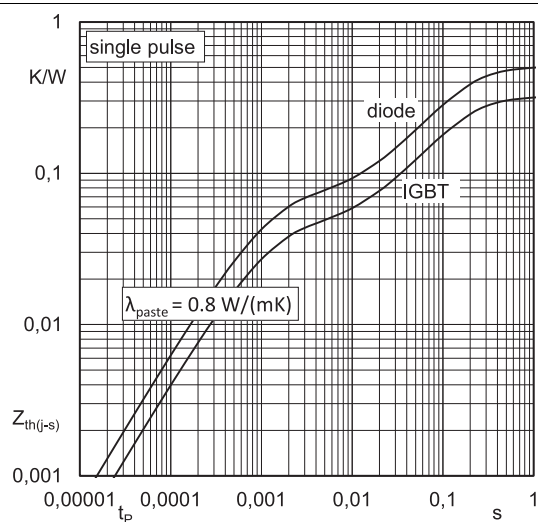


Fig. 9: Transient thermal impedance of IGBT and Diode

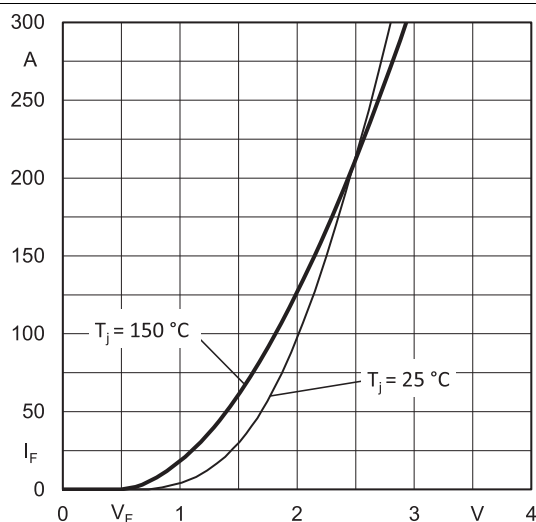


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'} + EE'$

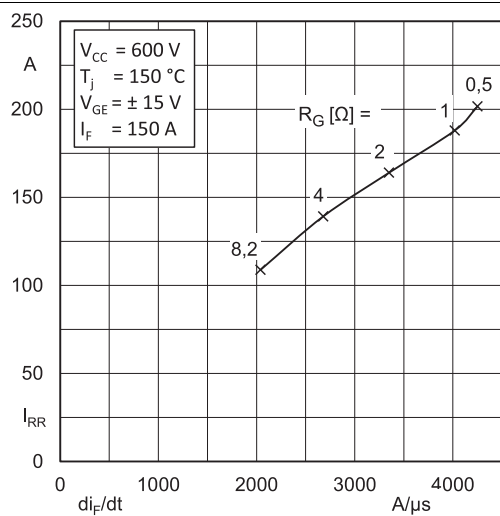


Fig. 11: Typ. CAL diode peak reverse recovery current

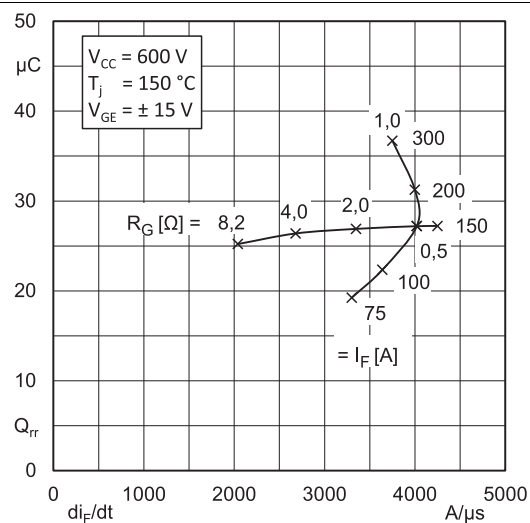


Fig. 12: Typ. CAL diode recovery charge



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

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