

SKiiP 13AC12T4V1



MiniSKiiP® 1

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Features

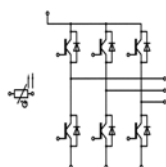
- Trench 4 IGBT's
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

Typical Applications*

- Inverter up to 14 kVA
- Typical motor power 7,5 kW

Remarks

- V_{CEsat} , V_F = chip level value
- 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. $T_{op} = -40 \dots +150^\circ\text{C}$)



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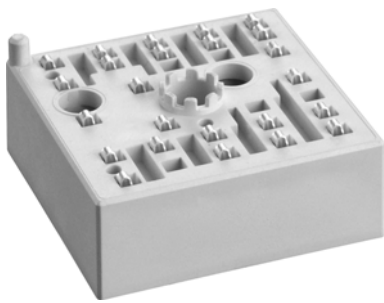
Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
Inverter - IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V	
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	41	A
		$T_s = 70^\circ\text{C}$	34	A
I_{Cnom}		25	A	
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	75	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j		-40 ... 175	$^\circ\text{C}$	
Inverse - Diode				
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	32	A
		$T_s = 70^\circ\text{C}$	26	A
I_{Fnom}		25	A	
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	75	A	
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	100	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20A per spring	40	A	
T_{stg}		-40 ... 125	$^\circ\text{C}$	
V_{isol}	AC sinus 50Hz, t = 1 min	2500	V	

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	42	48	m Ω
		$T_j = 150^\circ\text{C}$	62	66	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 1\text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA
					mA
C_{ies}	$V_{CE} = 25\text{ V}$		1.43		nF
C_{oes}	$V_{GE} = 0\text{ V}$		0.12		nF
C_{res}			0.09		nF
Q_G	- 8 V...+ 15 V		142		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.00		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	44		ns
t_r	$I_C = 25\text{ A}$	$T_j = 150^\circ\text{C}$	46		ns
E_{on}	$R_{Gon} = 39\ \Omega$ $R_{Goff} = 39\ \Omega$	$T_j = 150^\circ\text{C}$	3.7		mJ
$t_{d(off)}$	$di/dt_{on} = 465\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	330		ns
t_f	$di/dt_{off} = 350\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	62		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	2.4		mJ
$R_{th(j-s)}$	per IGBT		1		K/W

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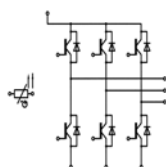
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 25 \text{ A}$ $V_{GE} = 0 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$		2.4	2.7	V
		$T_j = 150^\circ\text{C}$		2.5	2.8	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F		$T_j = 25^\circ\text{C}$		44	50	m Ω
		$T_j = 150^\circ\text{C}$		62	68	m Ω
I_{RRM}	$I_F = 25 \text{ A}$	$T_j = 150^\circ\text{C}$		19		A
Q_{rr}	$di/dt_{off} = 640 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		4		μC
E_{rr}	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		1.64		mJ
$R_{th(j-s)}$	per Diode			1.52		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				35		g
Temperatur Sensor						
R_{100}	$T_C = 100^\circ\text{C}$ ($R_{25} = 1000\Omega$)			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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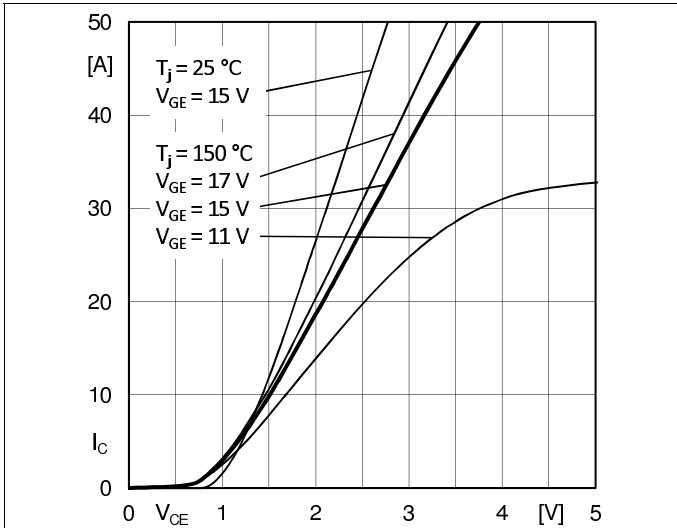


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

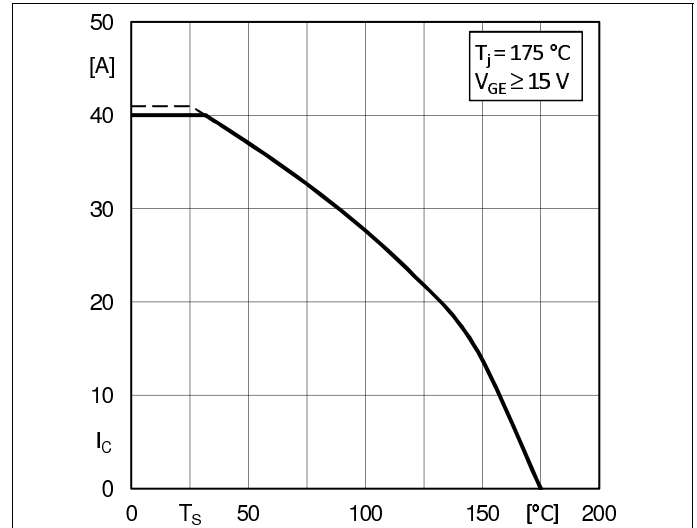


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

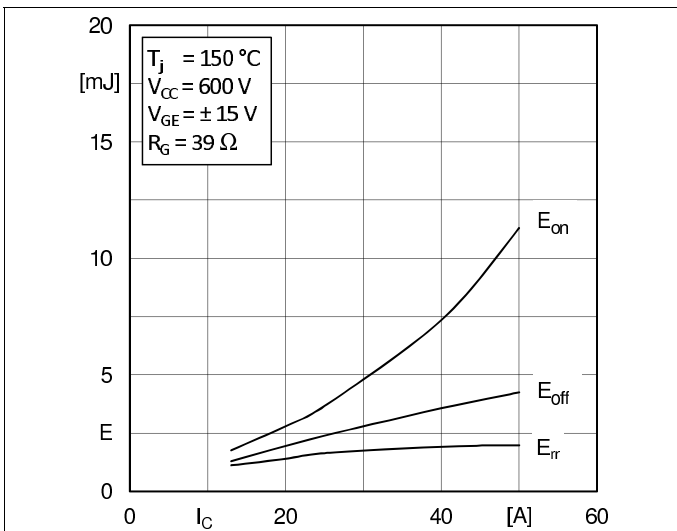


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

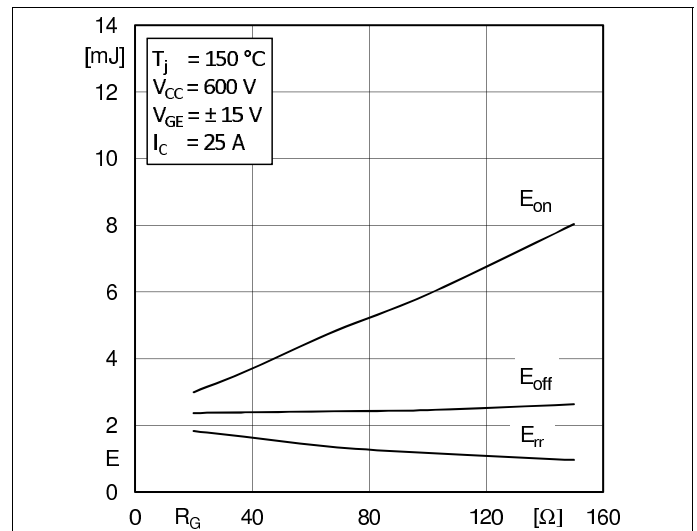


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

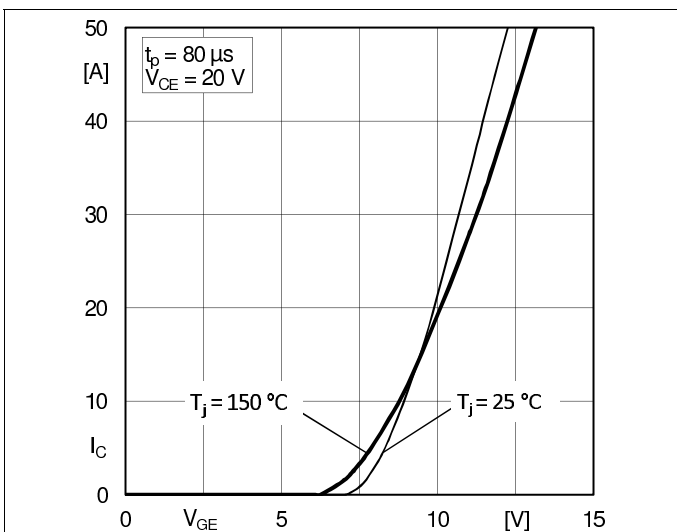


Fig. 5: Typ. transfer characteristic

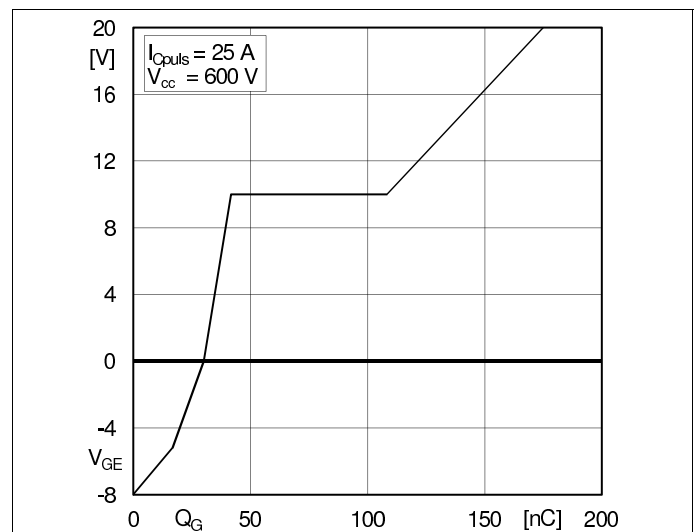


Fig. 6: Typ. gate charge characteristic

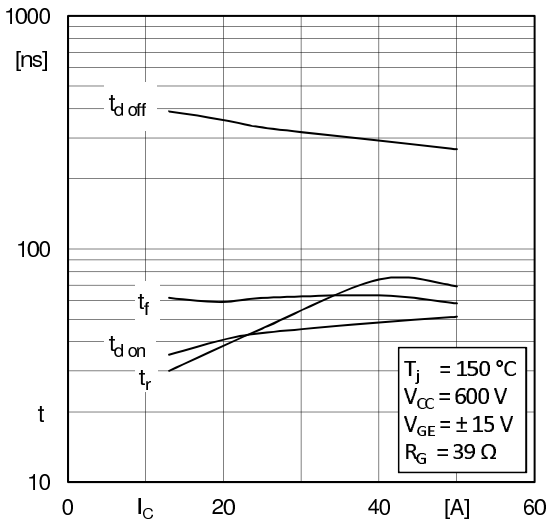


Fig. 7: Typ. switching times vs. I_C

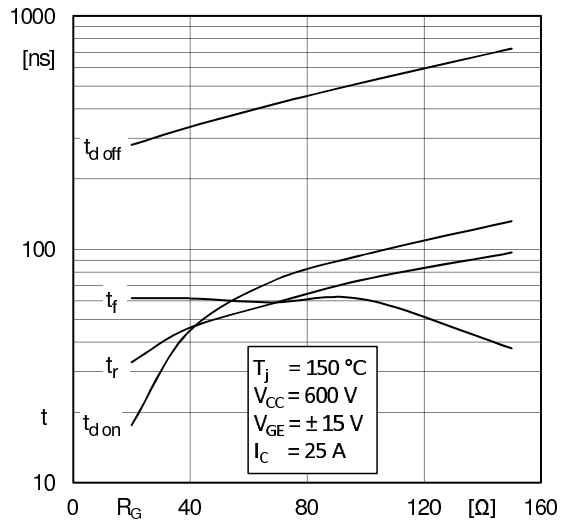


Fig. 8: Typ. switching times vs. gate resistor R_G

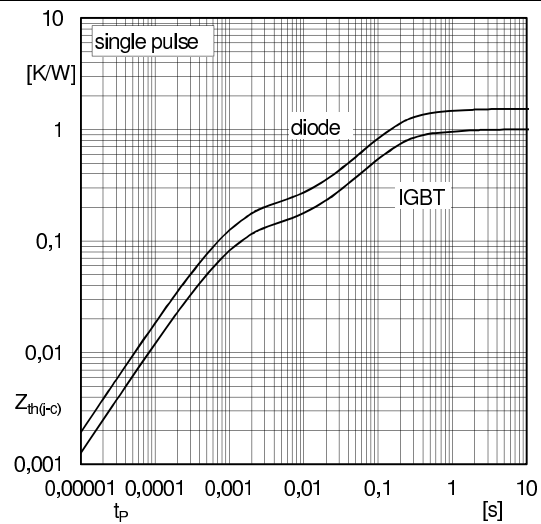


Fig. 9: Transient thermal impedance of IGBT and Diode

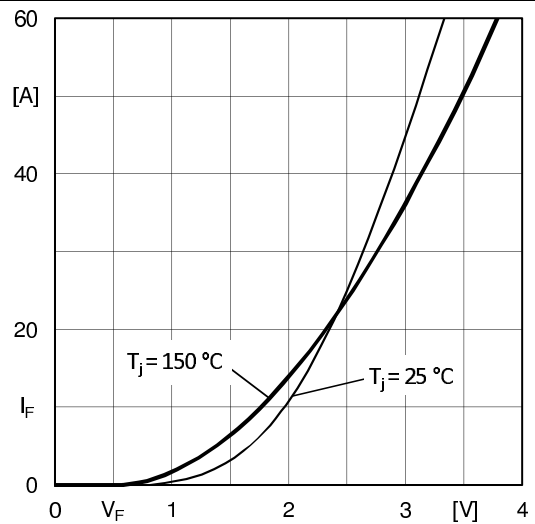


Fig. 10: CAL diode forward characteristic

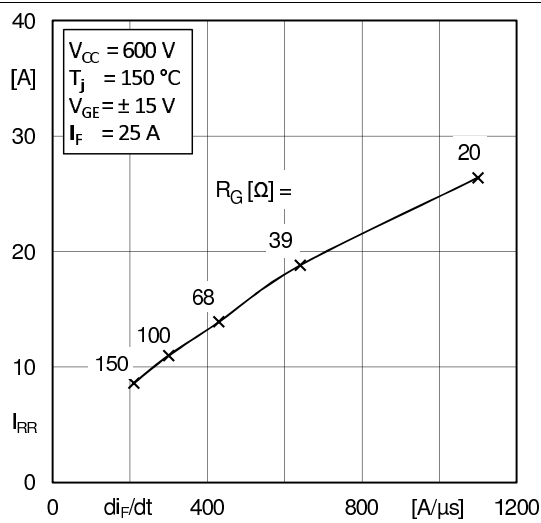


Fig. 11: Typ. CAL diode peak reverse recovery current

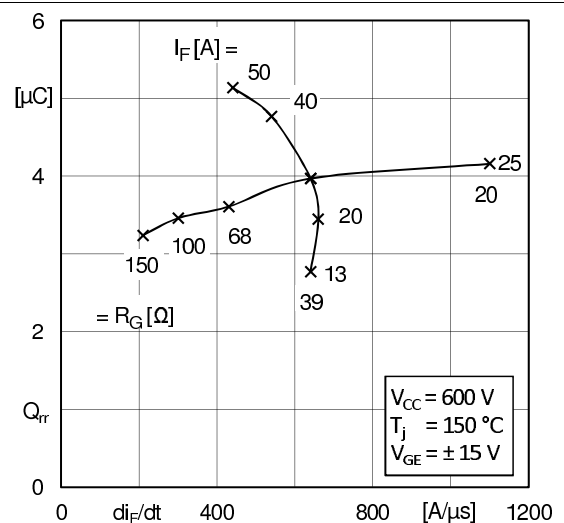


Fig. 12: Typ. CAL diode recovery charge

