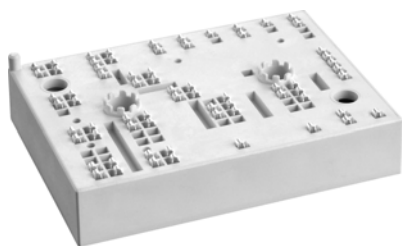


SKiiP 39AC12T4V1



MiniSKiiP® 3

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Features

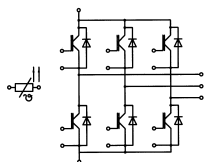
- Trench 4 IGBT's
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

Typical Applications*

- Inverter up to 50 kVA
- Typical motor power 30 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. $T_{op} = -40 \dots +150^\circ\text{C}$)
- For short circuit: Soft R_{Goff} recommended



AC

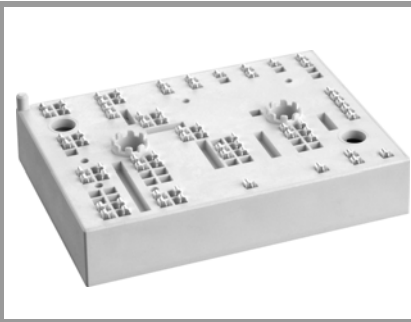
Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Inverter - IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	167
		$T_s = 70^\circ\text{C}$	135
I_{Cnom}		150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	450	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10
T_j		-40 ... 175	$^\circ\text{C}$
Inverse - Diode			
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	136
		$T_s = 70^\circ\text{C}$	107
I_{Fnom}		150	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	450	A
I_{FSM}	10 ms, sin 180° , $T_j = 150^\circ\text{C}$	900	A
T_j		-40 ... 175	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20A per spring	160	A
T_{stg}		-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$	2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipsevel		$T_j = 25^\circ\text{C}$	1.85	2.10
			$T_j = 150^\circ\text{C}$	2.25	2.45
V_{CE0}			$T_j = 25^\circ\text{C}$	0.8	0.9
			$T_j = 150^\circ\text{C}$	0.7	0.8
r_{CE}	$V_{GE} = 15\text{ V}$		$T_j = 25^\circ\text{C}$	7.0	8.0
			$T_j = 150^\circ\text{C}$	10	11
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 6\text{ mA}$	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
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$		$f = 1\text{ MHz}$	8.80	nF
C_{oes}			$f = 1\text{ MHz}$	0.58	nF
C_{res}			$f = 1\text{ MHz}$	0.47	nF
Q_G	- 8 V...+ 15 V		850		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		5.00		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	165		ns
t_r	$I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$	50		ns
E_{on}	$R_{G on} = 1\text{ }\Omega$	$T_j = 150^\circ\text{C}$	22.5		mJ
$t_{d(off)}$	$R_{G off} = 1\text{ }\Omega$	$T_j = 150^\circ\text{C}$	390		ns
t_f	$di/dt_{on} = 2840\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	80		ns
E_{off}	$di/dt_{off} = 1880\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	14		mJ
$R_{th(j-s)}$	per IGBT		0.33		K/W

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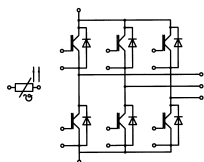
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- For short circuit: Soft R_{Goff} recommended

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V _F = V _{EC}	I _F = 150 A	T _j = 25 °C		2.1	2.5	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.1	2.4	V
V _{F0}		T _j = 25 °C		1.3	1.5	V
		T _j = 150 °C		0.9	1.1	V
r _F		T _j = 25 °C		5.6	6.4	mΩ
		T _j = 150 °C		7.8	8.5	mΩ
I _{RRM}	I _F = 150 A	T _j = 150 °C		188		A
Q _{rr}	di/dt _{off} = 4020 A/μs	T _j = 150 °C		27		μC
E _{rr}	V _{GE} = -15 V	T _j = 150 °C		11.4		mJ
	V _{CC} = 600 V					
R _{th(j-s)}	per Diode			0.52		K/W
Module						
M _s	to heat sink		2		2.5	Nm
w				95		g
Temperatur Sensor						
R ₁₀₀	T _C =100°C (R ₂₅ =1000Ω)			1670 ± 3%		Ω
R(T)	R(T)=1000Ω[1+A(T-25°C)+B(T-25°C) ²], A = 7.635*10 ⁻³ °C ⁻¹ , B = 1.731*10 ⁻⁵ °C ⁻²					



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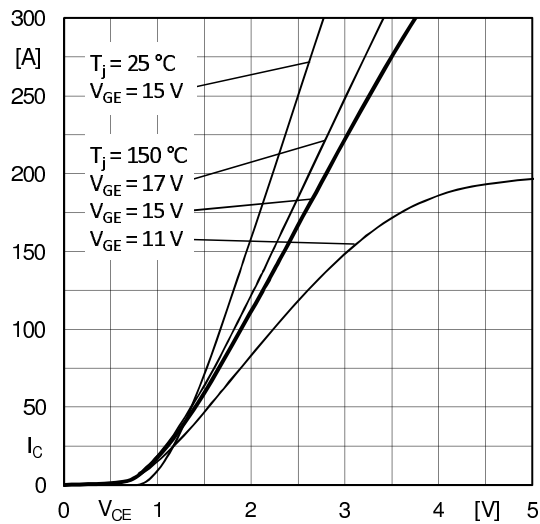


Fig. 1: Typ. output characteristic, inclusive $R_{CC'} + E_{E'}$

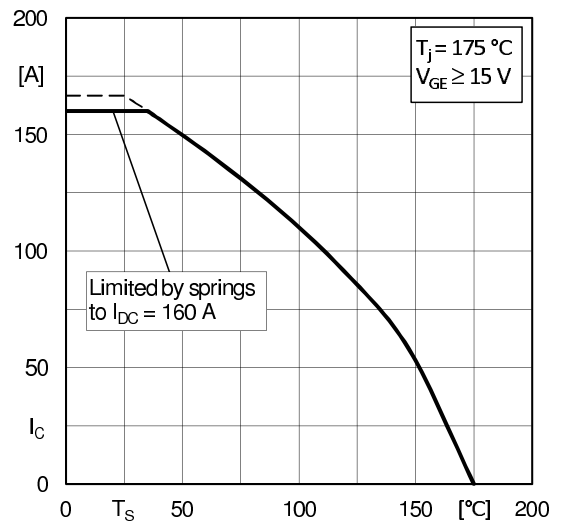


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

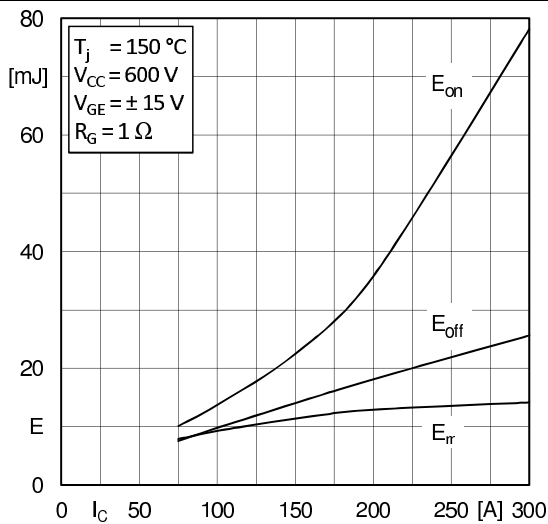


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

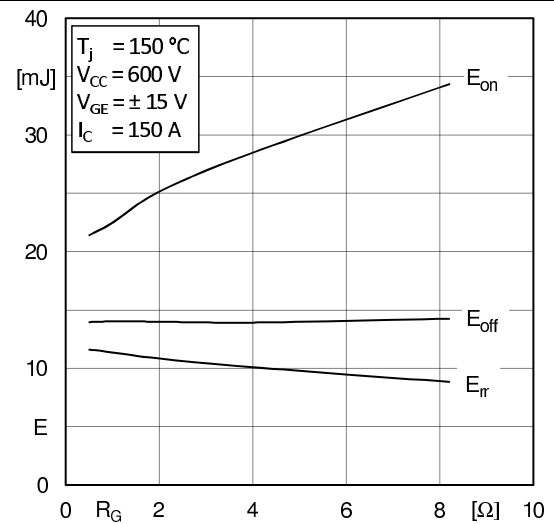


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

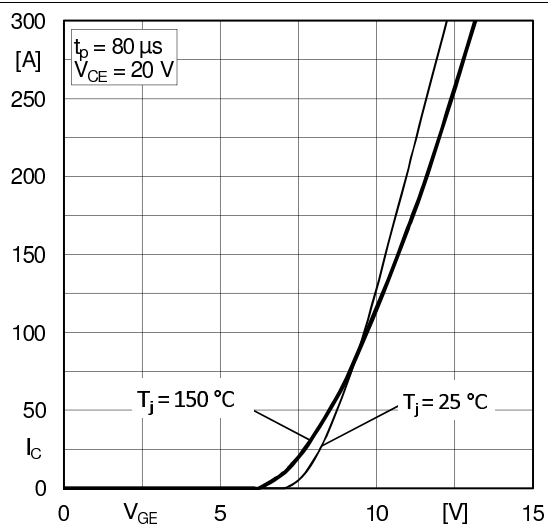


Fig. 5: Typ. transfer characteristic

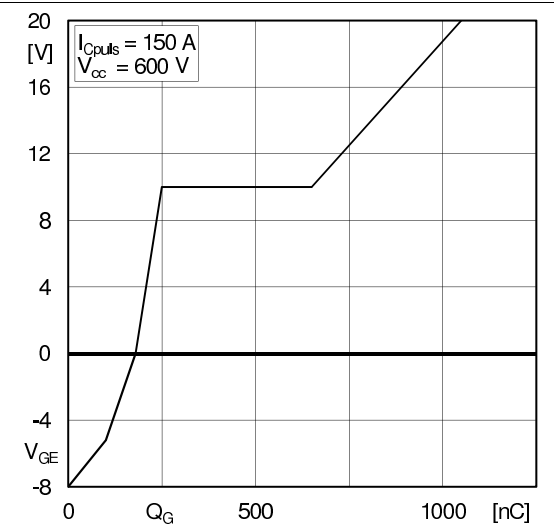


Fig. 6: Typ. gate charge characteristic

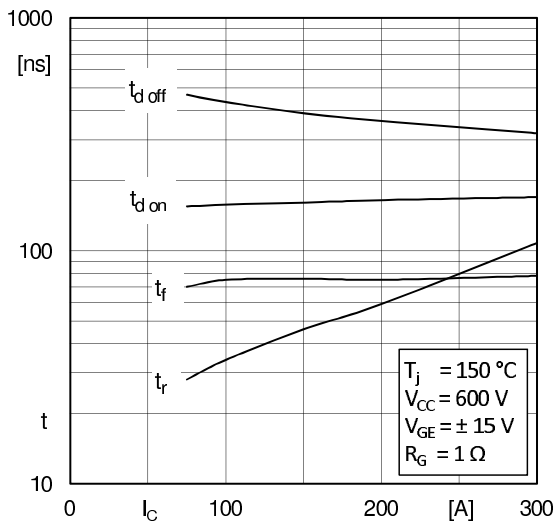


Fig. 7: Typ. switching times vs. I_C

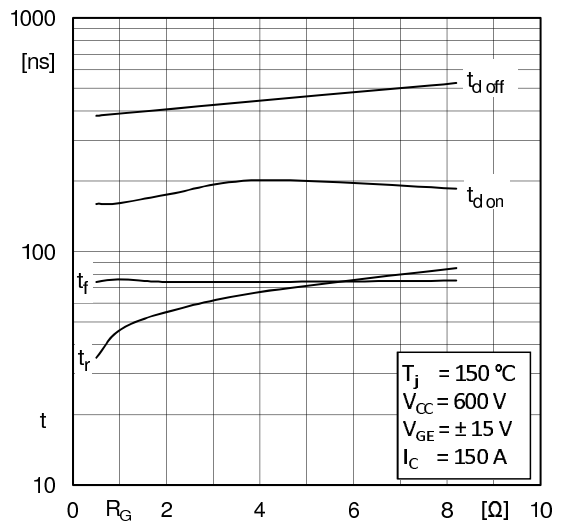


Fig. 8: Typ. switching times vs. gate resistor R_G

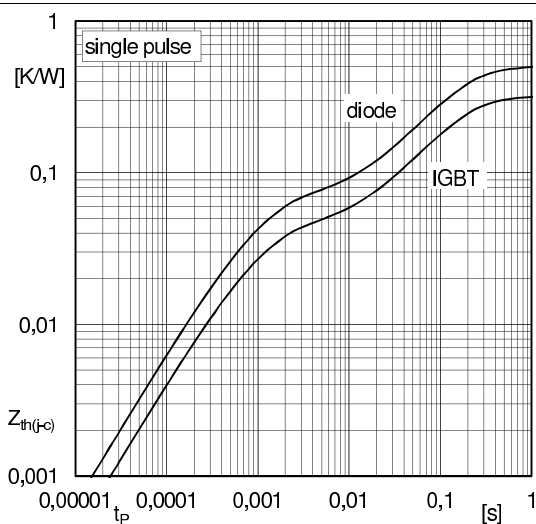


Fig. 9: Transient thermal impedance of IGBT and Diode

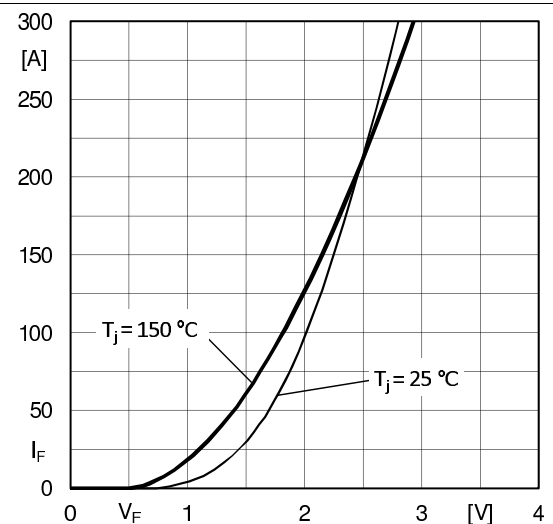


Fig. 10: CAL diode forward characteristic

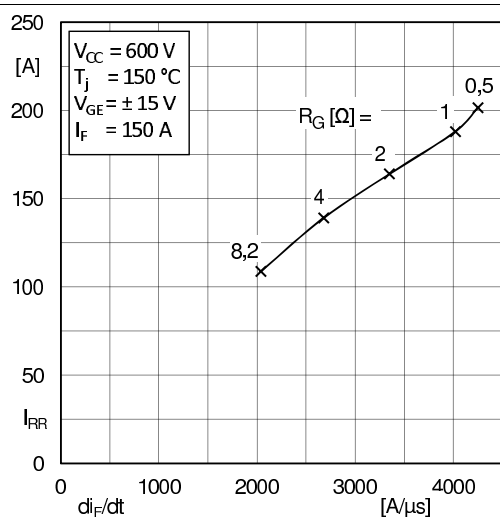


Fig. 11: Typ. CAL diode peak reverse recovery current

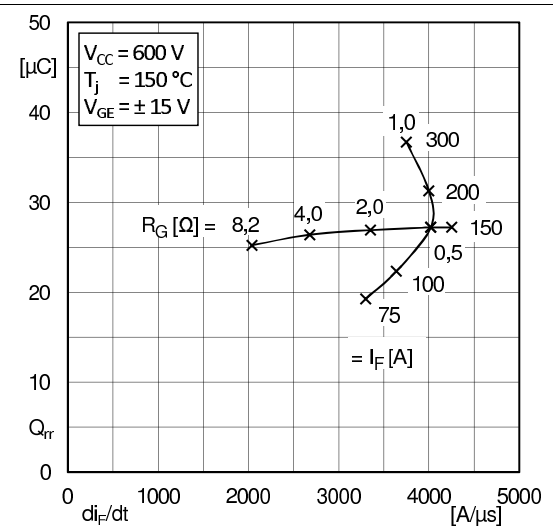
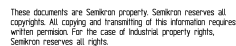


Fig. 12: Typ. CAL diode recovery charge



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