

SKiIP 23NAB12T4V1



MiniSKiIP® 2

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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

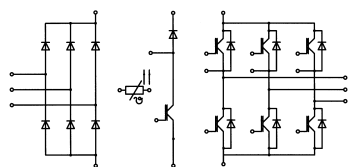
Typical Applications*

- 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. Top = $-40 \dots +150^\circ\text{C}$)

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Inverter - IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	33
		$T_s = 70^\circ\text{C}$	26
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	37
		$T_s = 70^\circ\text{C}$	30
I_{Cnom}		25	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	75	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 1200\text{ V}$	$T_j = 150^\circ\text{C}$	10
T_j		-40 ... 175	$^\circ\text{C}$
Chopper - IGBT			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	33
		$T_s = 70^\circ\text{C}$	26
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	37
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T_j		-40 ... 175	$^\circ\text{C}$
Inverse - Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	29
		$T_s = 70^\circ\text{C}$	22
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	32
		$T_s = 70^\circ\text{C}$	26
I_{Fnom}		25	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	75	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$	100	A
T_j		-40 ... 175	$^\circ\text{C}$
Freewheeling - Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	29
		$T_s = 70^\circ\text{C}$	22
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	32
		$T_s = 70^\circ\text{C}$	26
I_{Fnom}		25	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	75	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$	100	A
T_j		-40 ... 175	$^\circ\text{C}$



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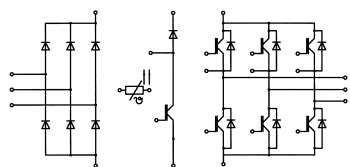
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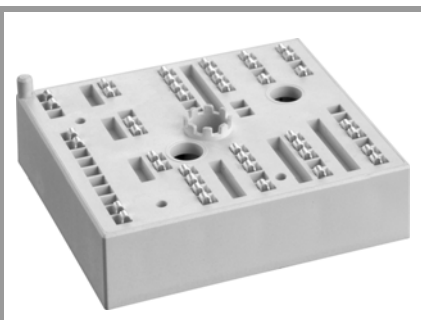


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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Rectifier - Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V
I_F	$T_s = 25^\circ\text{C}, T_j = 150^\circ\text{C}$	52	A
I_{Fnom}		13	A
I_{FSM}	10 ms	$T_j = 25^\circ\text{C}$	370
	sin 180°	$T_j = 150^\circ\text{C}$	270
I^2t	10 ms	$T_j = 25^\circ\text{C}$	685
	sin 180°	$T_j = 150^\circ\text{C}$	365
T_j		-40 ... 150	$^\circ\text{C}$
Module			
$I_t(\text{RMS})$	$T_{\text{terminal}} = 80^\circ\text{C}, 20\text{A per spring}$	40	A
T_{stg}		-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50Hz, 1 min	2500	V

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(\text{sat})}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ 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
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$	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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	1.43		nF
C_{oes}		$f = 1\text{ MHz}$	0.12		nF
C_{res}		$f = 1\text{ MHz}$	0.09		nF
Q_G	- 8 V...+ 15 V		142		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.00		Ω
$t_{d(\text{on})}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	28		ns
t_r	$I_C = 25\text{ A}$	$T_j = 150^\circ\text{C}$	40		ns
E_{on}	$R_{G\text{ on}} = 24\ \Omega$	$T_j = 150^\circ\text{C}$	2.65		mJ
$t_{d(\text{off})}$	$R_{G\text{ off}} = 24\ \Omega$	$T_j = 150^\circ\text{C}$	295		ns
t_f		$T_j = 150^\circ\text{C}$	68		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	2.3		mJ
$R_{th(j-s)}$	per IGBT		1.2		K/W
Chopper - IGBT					
$V_{CE(\text{sat})}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ 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
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$	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
		$T_j = 150^\circ\text{C}$			mA
Q_G	- 8 V...+ 15 V		142		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.00		Ω

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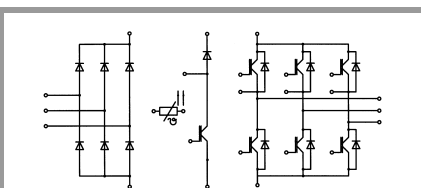
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Chopper - IGBT					
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	28		ns
t_r	$I_C = 25\text{ A}$	$T_j = 150^\circ\text{C}$	40		ns
E_{on}	$R_{G\ on} = 24\ \Omega$	$T_j = 150^\circ\text{C}$	2.65		mJ
	$R_{G\ off} = 24\ \Omega$	$T_j = 150^\circ\text{C}$	295		ns
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	68		ns
t_f		$T_j = 150^\circ\text{C}$	68		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	2.3		mJ
$R_{th(j-s)}$	per IGBT		1.2		K/W
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 25\text{ A}$	$T_j = 25^\circ\text{C}$	2.40	2.7	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 150^\circ\text{C}$	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}	$I_F = 25\text{ A}$	$T_j = 150^\circ\text{C}$	24		A
Q_{rr}	$di/dt_{off} = 850\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	3.7		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	1.6		mJ
$R_{th(j-s)}$	per Diode		1.52		K/W
Freewheeling - Diode					
$V_F = V_{EC}$	$I_F = 25\text{ A}$	$T_j = 25^\circ\text{C}$	2.4	2.7	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 150^\circ\text{C}$	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}	$I_F = 25\text{ A}$	$T_j = 150^\circ\text{C}$	24		A
Q_{rr}	$di/dt_{off} = 850\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	3.7		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	1.6		mJ
$R_{th(j-s)}$	per Diode		1.52		K/W
Rectifier - Diode					
$V_F = V_{EC}$	$I_F = 13\text{ A}$	$T_j = 25^\circ\text{C}$	1	1.21	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 125^\circ\text{C}$		1.1	V
V_{F0}		$T_j = 25^\circ\text{C}$		1.0	V
		$T_j = 125^\circ\text{C}$		0.8	V
r_F		$T_j = 25^\circ\text{C}$	9.2	18	m Ω
		$T_j = 125^\circ\text{C}$		21	m Ω
$R_{th(j-s)}$	per Diode		1.25		K/W
Module					
M_s	to heat sink		2	2.5	Nm
w			65		g
Temperatur Sensor					
R_{100}	$T_r = 100^\circ\text{C}$, tolerance = 3 %		1670 \pm 3%		Ω
$R(T)$	$R(T) = 1000\ \Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3}\ \text{C}^{-1}$, $B = 1.731 \cdot 10^{-5}\ \text{C}^{-2}$				

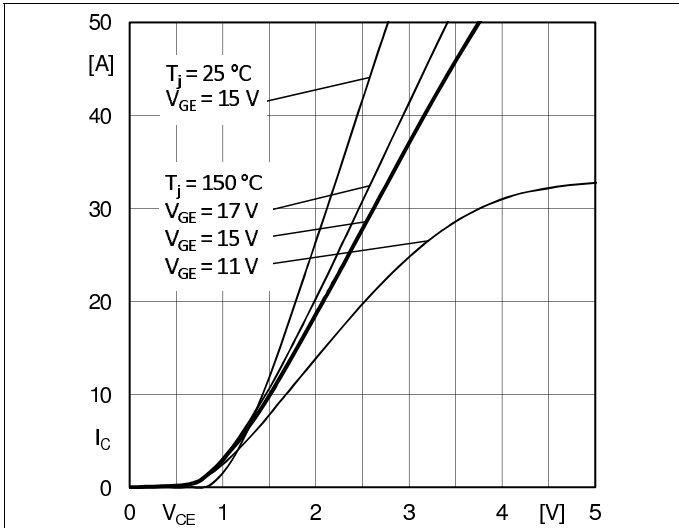


Fig. 1: Typ. output characteristic

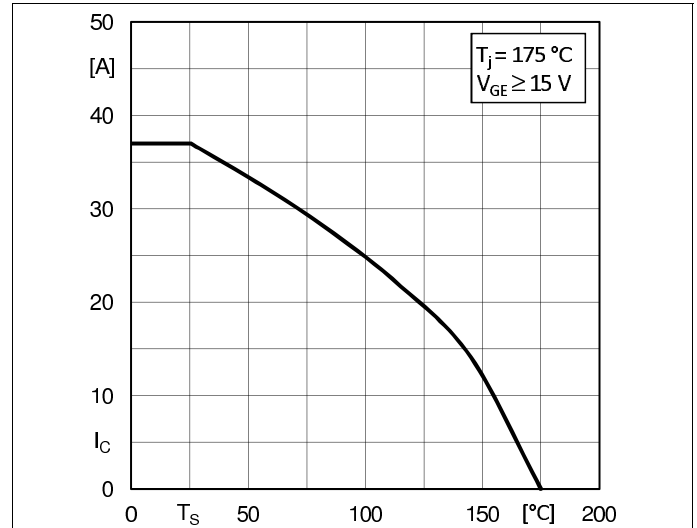


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

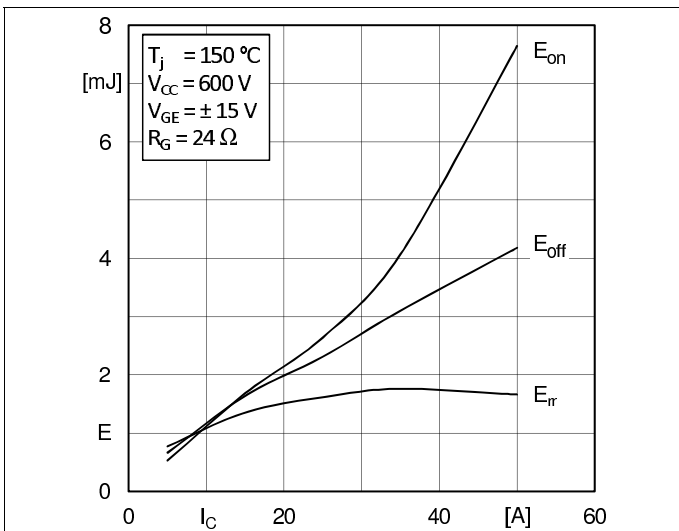


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

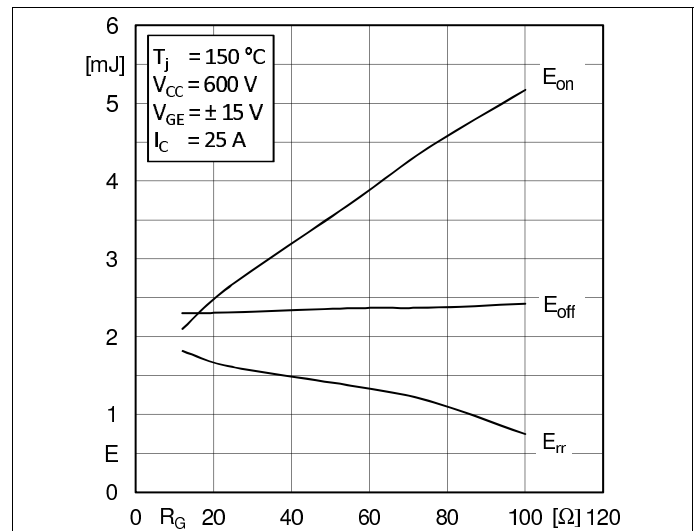


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

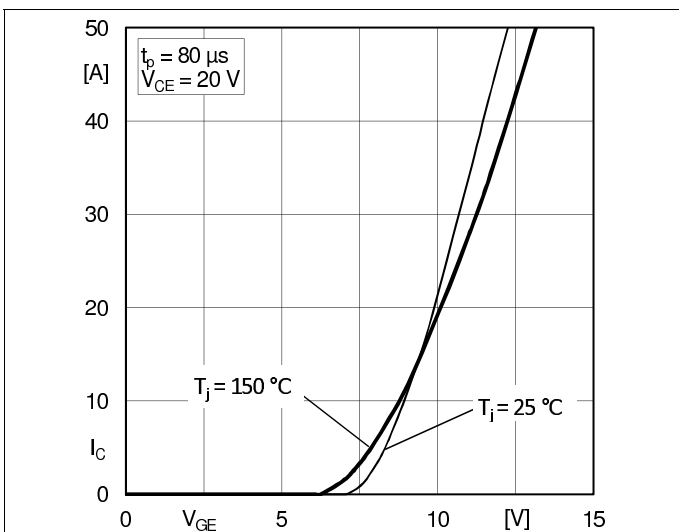


Fig. 5: Typ. transfer characteristic

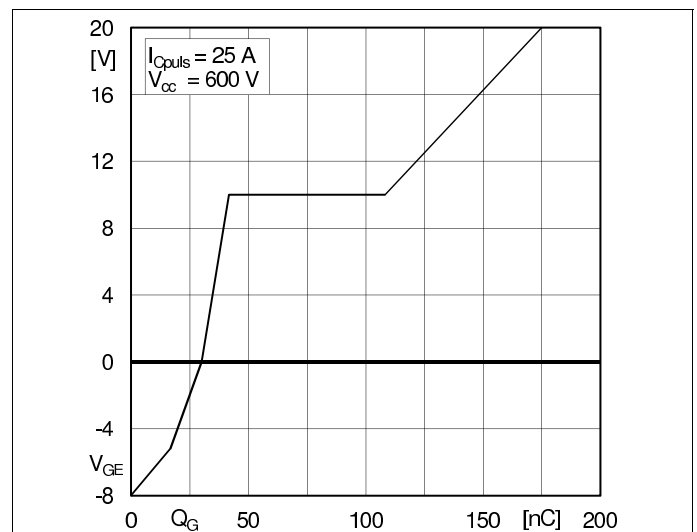


Fig. 6: Typ. gate charge characteristic

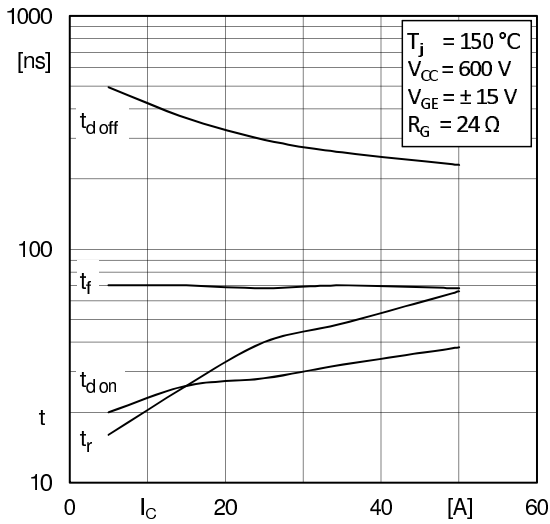


Fig. 7: Typ. switching times vs. I_C

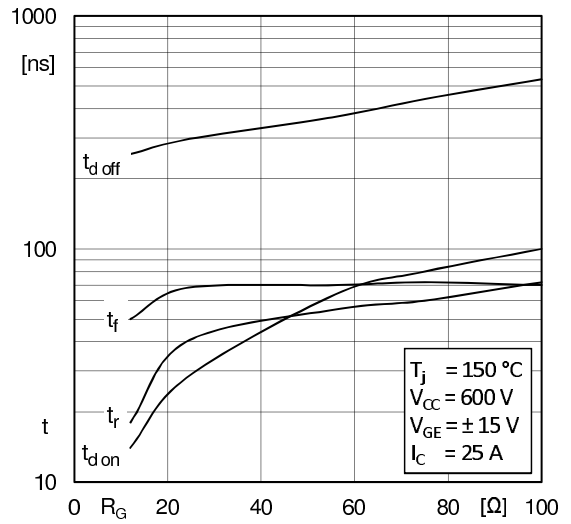


Fig. 8: Typ. switching times vs. gate resistor R_G

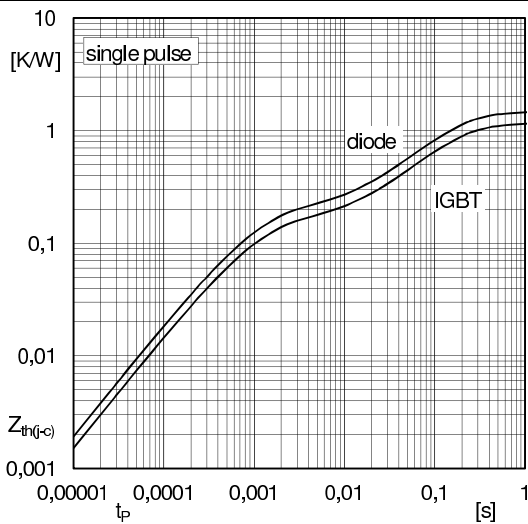


Fig. 9: Transient thermal impedance of IGBT and Diode

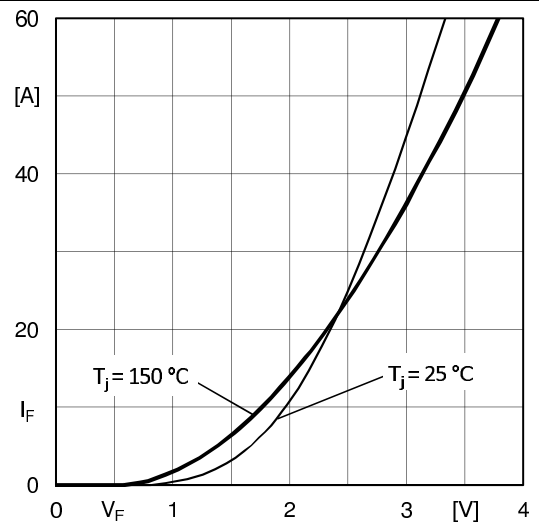


Fig. 10: CAL diode forward characteristic

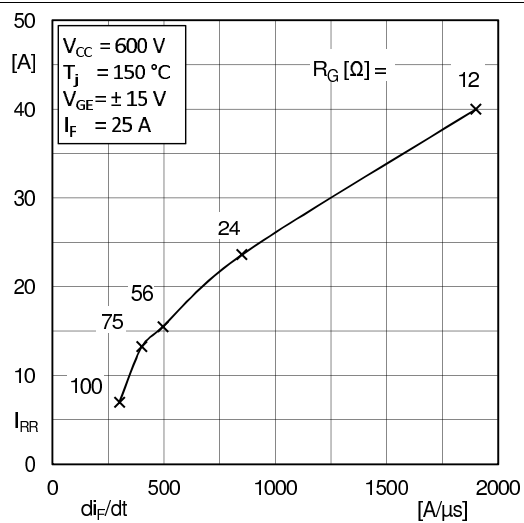


Fig. 11: Typ. CAL diode peak reverse recovery current

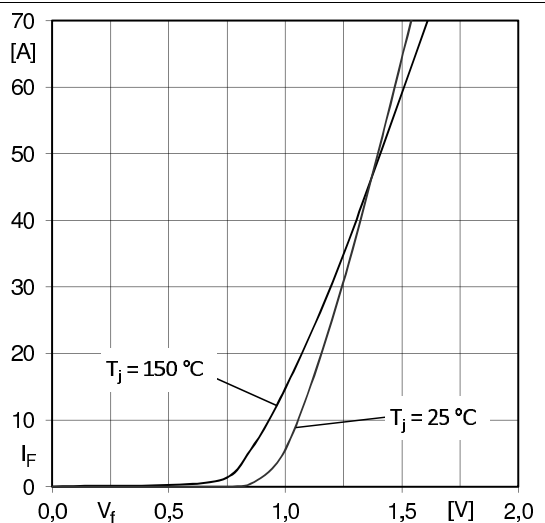
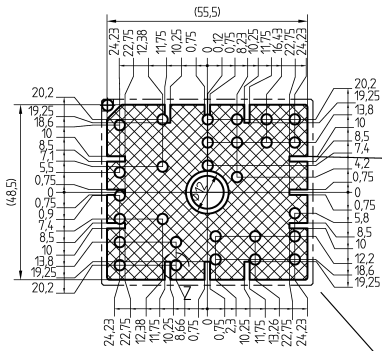


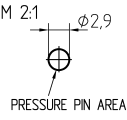
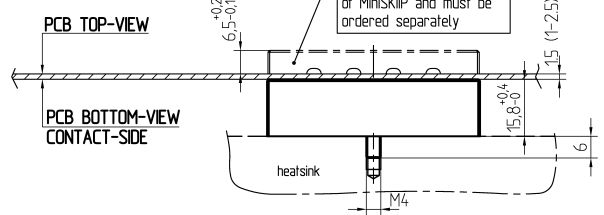
Fig. 12: Typ. input bridge forward characteristic

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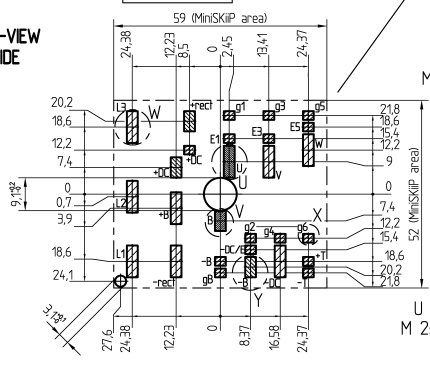
PCB
PCB TOP-VIEW



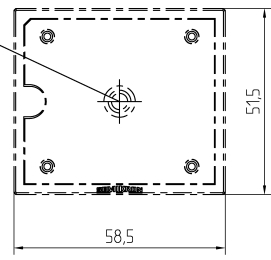
MiniSKiiP 2



PCB BOTTOM-VIEW CONTACT-SIDE



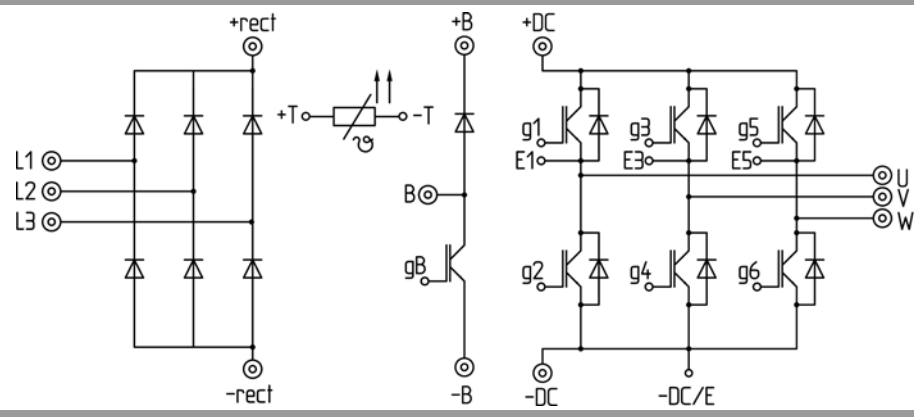
For mounting please follow the assembly instruction



measure: mm
tolerance: ISO 2768-f

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pinout, dimensions



⊙ power connector
• control connector

pinout

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

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.