

SKiiP 11NAB12T4V1



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

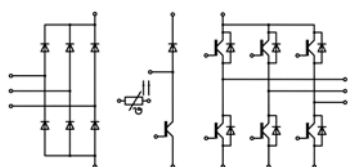
Typical Applications*

- Inverter up to 8 kVA
- Typical motor power 4 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	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	12	A
		$T_s = 70^\circ\text{C}$	12	A
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	12	A
		$T_s = 70^\circ\text{C}$	12	A
I_{Cnom}			8	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		24	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	μs
T_j			-40 ... 175	$^\circ\text{C}$
Chopper - IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$		1200	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	12	A
		$T_s = 70^\circ\text{C}$	12	A
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	12	A
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V_{GES}			-20 ... 20	V
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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	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	14	A
		$T_s = 70^\circ\text{C}$	11	A
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	15	A
		$T_s = 70^\circ\text{C}$	12	A
I_{Fnom}			8	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		24	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		36	A
T_j			-40 ... 175	$^\circ\text{C}$
Freewheeling - Diode				
V_{RRM}	$T_j = 25^\circ\text{C}$		1200	V
I_F	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	14	A
		$T_s = 70^\circ\text{C}$	11	A
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	15	A
		$T_s = 70^\circ\text{C}$	12	A
I_{Fnom}			8	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$		24	A
I_{FSM}	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		36	A
T_j			-40 ... 175	$^\circ\text{C}$



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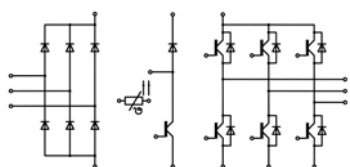
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Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
Rectifier - Diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V	
I_F	$T_s = 25^\circ\text{C}, T_j = 150^\circ\text{C}$	39	A	
I_{Fnom}		8	A	
I_{FSM}	10 ms	$T_j = 25^\circ\text{C}$	220	A
	sin 180°	$T_j = 150^\circ\text{C}$	200	A
I^2t	10 ms	$T_j = 25^\circ\text{C}$	242	A ² s
	sin 180°	$T_j = 150^\circ\text{C}$	200	A ² s
T_j		-40 ... 150	°C	
Module				
$I_t(\text{RMS})$	$T_{\text{terminal}} = 80^\circ\text{C}, 20\text{A per spring}$	20	A	
T_{stg}		-40 ... 125	°C	
V_{isol}	AC sinus 50Hz, 1 min	2500	V	

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(\text{sat})}$	$I_C = 8\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	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}	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	131	150	mΩ
		$T_j = 150^\circ\text{C}$	194	206	mΩ
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$	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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.49		nF
C_{oes}		$f = 1\text{ MHz}$	0.05		nF
C_{res}		$f = 1\text{ MHz}$	0.03		nF
Q_G	- 8 V...+ 15 V		45		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.00		Ω
$t_{d(\text{on})}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	31		ns
t_r	$I_C = 8\text{ A}$	$T_j = 150^\circ\text{C}$	31		ns
E_{on}	$R_{G\text{ on}} = 47\ \Omega$	$T_j = 150^\circ\text{C}$	0.87		mJ
$t_{d(\text{off})}$	$R_{G\text{ off}} = 47\ \Omega$	$T_j = 150^\circ\text{C}$	290		ns
t_f		$T_j = 150^\circ\text{C}$	70		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	0.74		mJ
$R_{\text{th}(j-s)}$	per IGBT		1.84		K/W
Chopper - IGBT					
$V_{CE(\text{sat})}$	$I_C = 8\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	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
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		$T_j = 150^\circ\text{C}$	194	206	mΩ
$V_{GE(\text{th})}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$	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		45		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0.00		Ω

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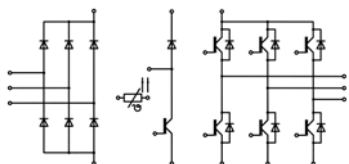
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		31		ns
t_r	$I_C = 8\text{ A}$	$T_j = 150^\circ\text{C}$		31		ns
E_{on}	$R_{G\ on} = 47\ \Omega$	$T_j = 150^\circ\text{C}$		0.87		mJ
	$R_{G\ off} = 47\ \Omega$	$T_j = 150^\circ\text{C}$		290		ns
$t_{d(off)}$		$T_j = 150^\circ\text{C}$		70		ns
t_f		$T_j = 150^\circ\text{C}$		70		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		0.74		mJ
$R_{th(j-s)}$	per IGBT			1.84		K/W
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 8\text{ A}$	$T_j = 25^\circ\text{C}$		2.3	2.6	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 150^\circ\text{C}$		2.4	2.7	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		$T_j = 25^\circ\text{C}$		129	144	m Ω
		$T_j = 150^\circ\text{C}$		181	198	m Ω
I_{RRM}	$I_F = 8\text{ A}$	$T_j = 150^\circ\text{C}$		8.3		A
Q_{rr}	$di/dt_{off} = 380\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		1.35		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.57		mJ
$R_{th(j-s)}$	per Diode			2.53		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	$I_F = 8\text{ A}$	$T_j = 25^\circ\text{C}$		2.3	2.6	V
	$V_{GE} = 0\text{ V}$ chiplevel	$T_j = 150^\circ\text{C}$		2.4	2.7	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
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I_{RRM}	$I_F = 8\text{ A}$	$T_j = 150^\circ\text{C}$		8.3		A
Q_{rr}	$di/dt_{off} = 380\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		1.35		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.57		mJ
$R_{th(j-s)}$	per Diode			2.53		K/W
Rectifier - Diode						
$V_F = V_{EC}$	$I_F = 8\text{ A}$	$T_j = 25^\circ\text{C}$		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		$T_j = 25^\circ\text{C}$		15	29	m Ω
		$T_j = 125^\circ\text{C}$			34	m Ω
$R_{th(j-s)}$	per Diode			1.5		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				35		g
Temperatur Sensor						
R_{100}	$T_r = 100^\circ\text{C}$, tolerance = 3 %			1670 \pm 3%		Ω
$R(T)$	$R(T) = 1000\ \Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3}\ \text{C}^{-1}$, $B = 1.731 \cdot 10^{-5}\ \text{C}^{-2}$					

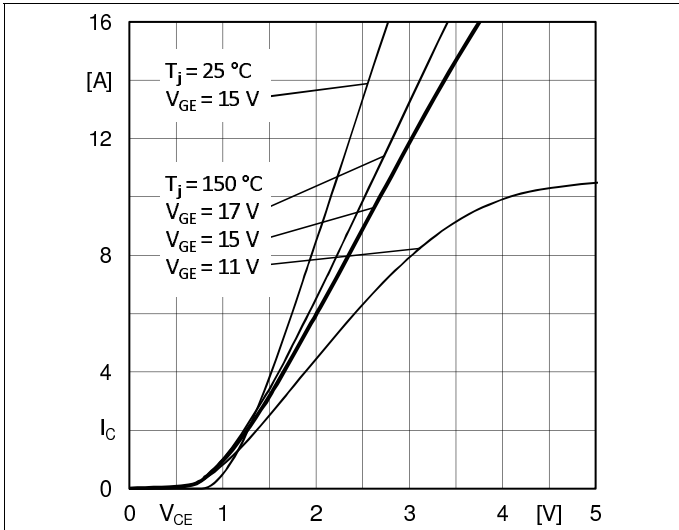


Fig. 1: Typ. output characteristic

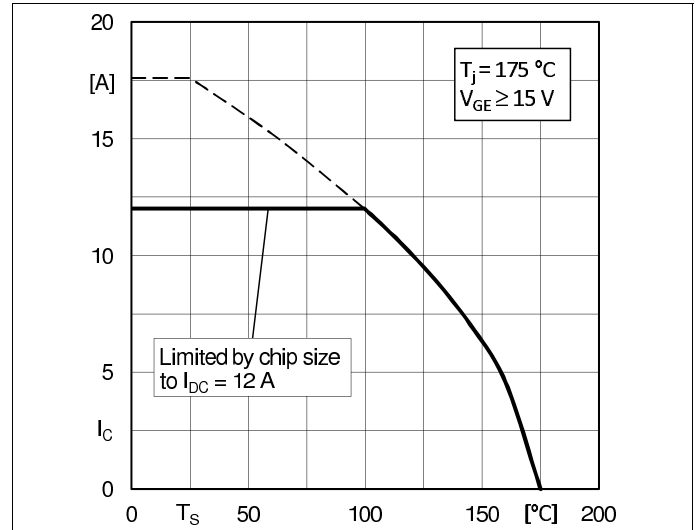


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

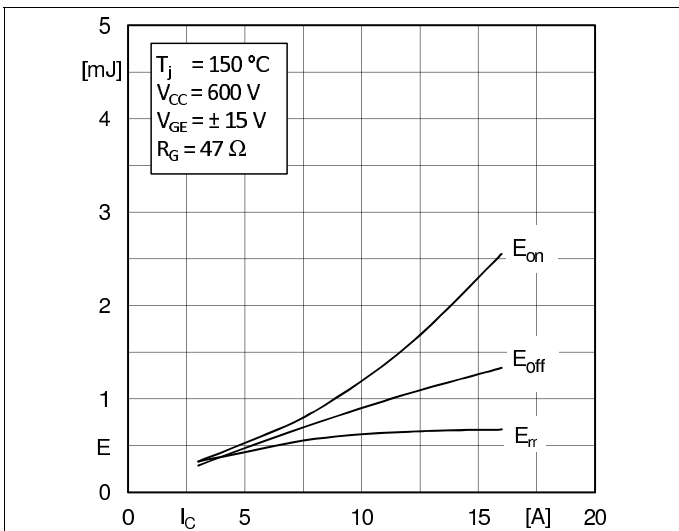


Fig. 3: Typ. turn-on /-off energy = f(Ic)

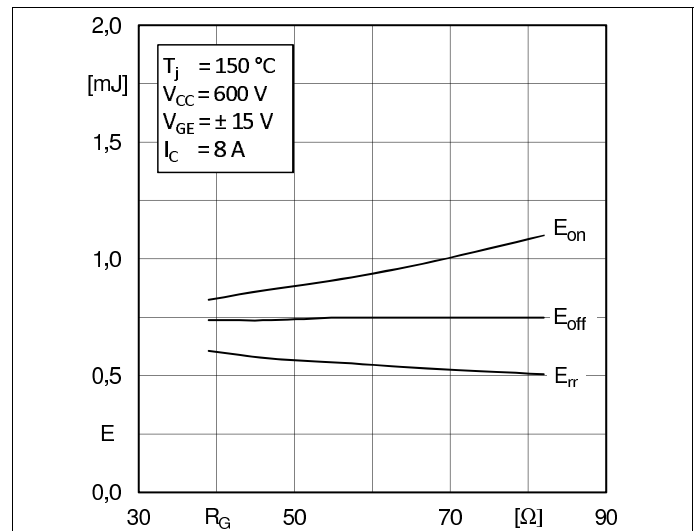


Fig. 4: Typ. turn-on /-off energy = f(Rg)

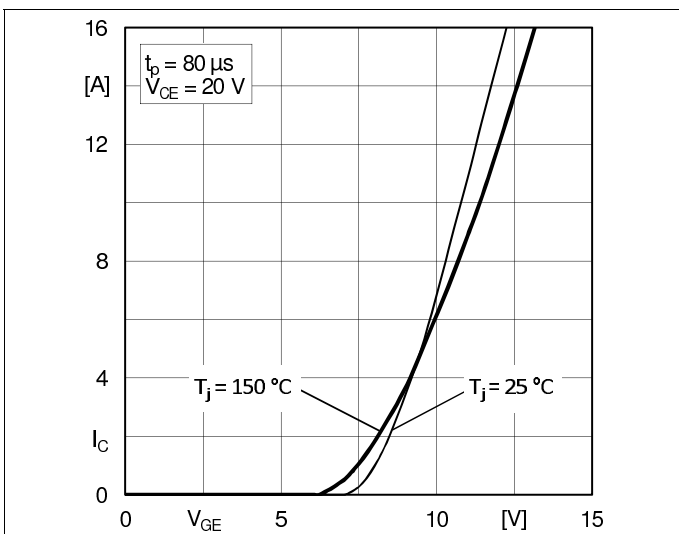


Fig. 5: Typ. transfer characteristic

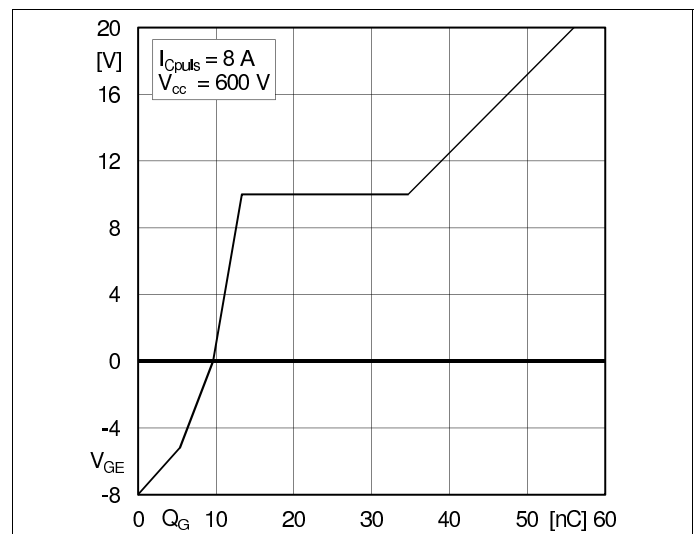


Fig. 6: Typ. gate charge characteristic

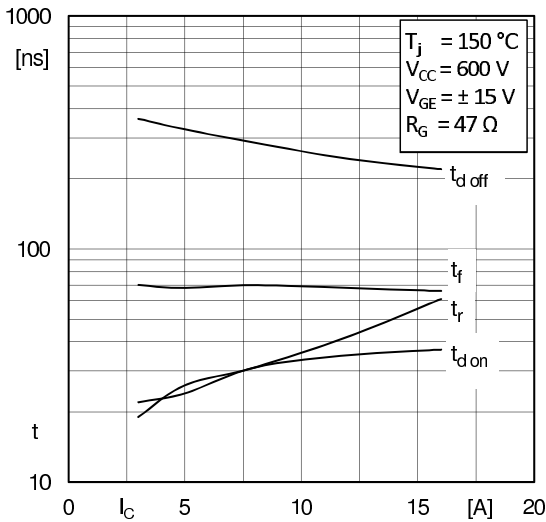


Fig. 7: Typ. switching times vs. I_C

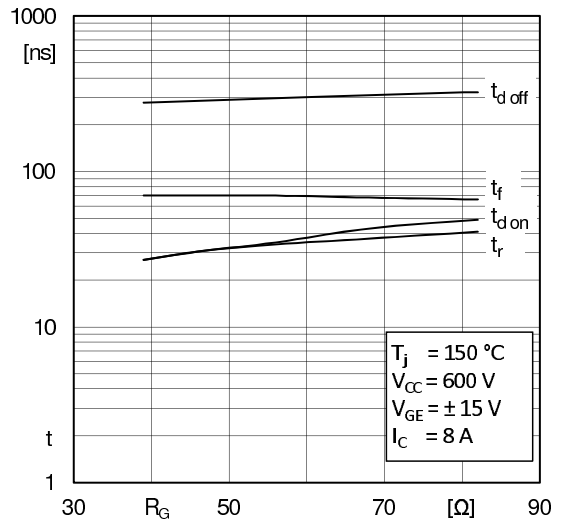


Fig. 8: Typ. switching times vs. gate resistor R_G

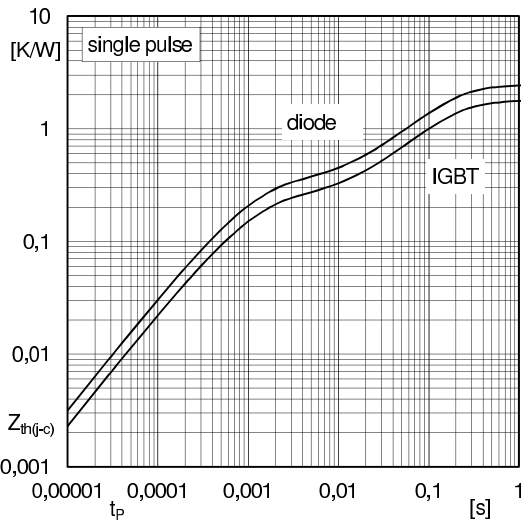


Fig. 9: Transient thermal impedance of IGBT and Diode

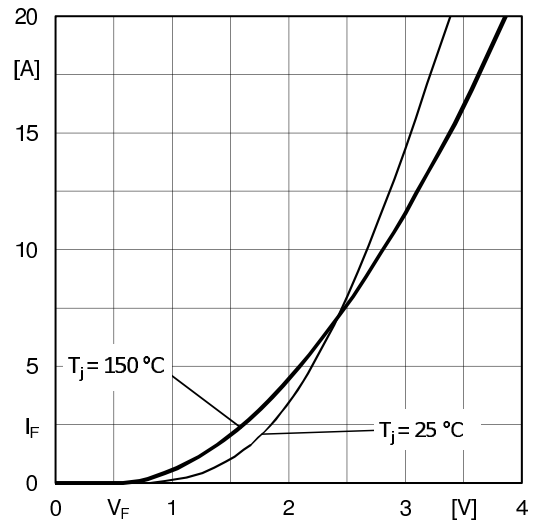


Fig. 10: CAL diode forward characteristic

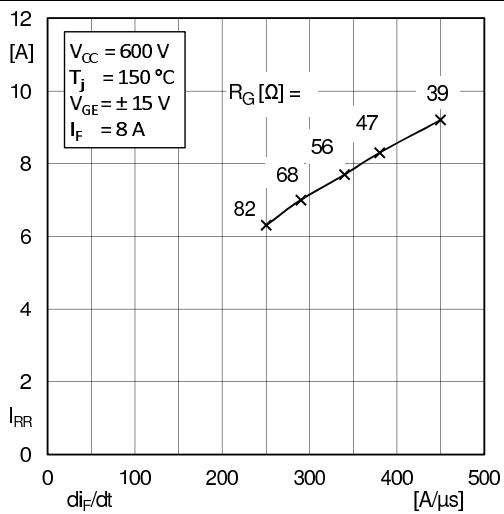


Fig. 11: Typ. CAL diode peak reverse recovery current

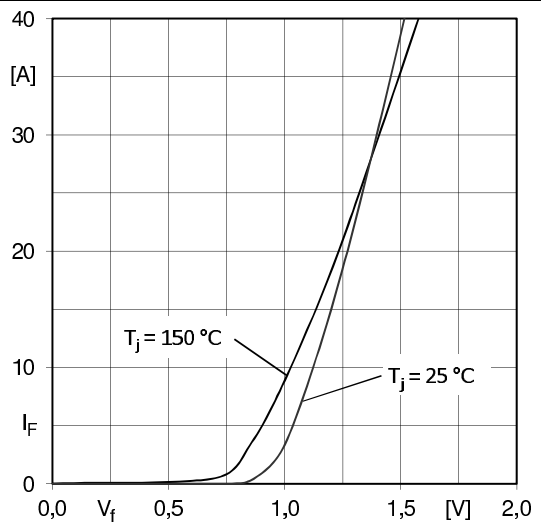
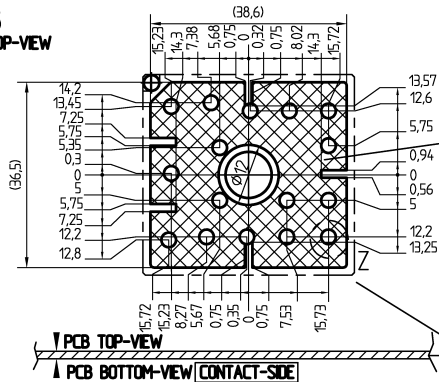
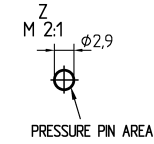


Fig. 12: Typ. input bridge forward characteristic

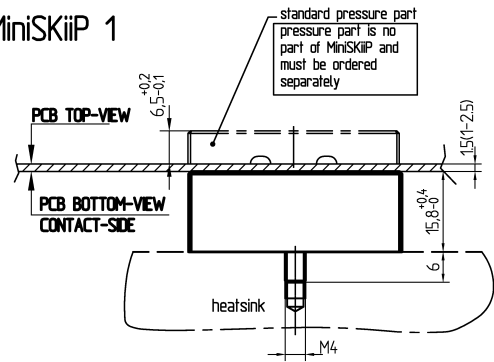
PCB PCB TOP-VIEW



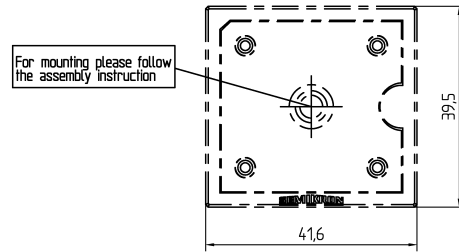
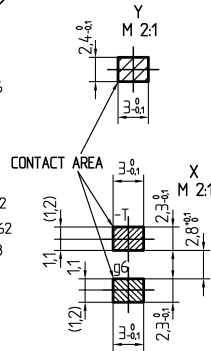
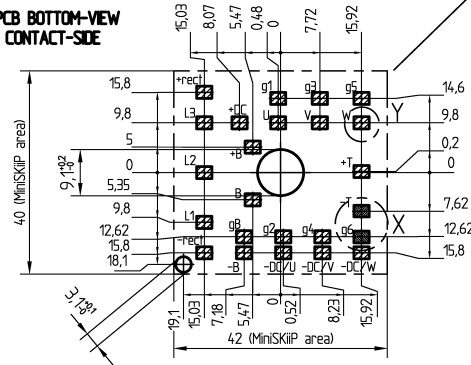
Only for the standard pressure part:
Accessible for mounting of SMD (max height 35) on PCB by customer



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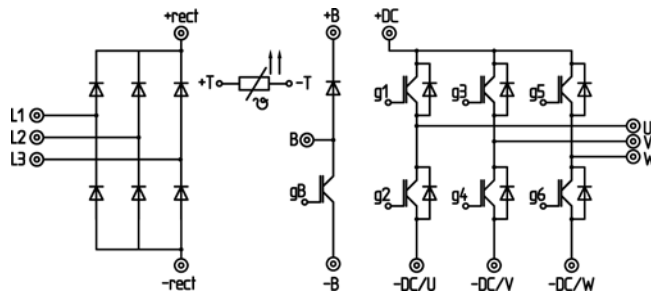
PCB BOTTOM-VIEW CONTACT-SIDE



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.