

MiniSKiiP® 3

3-phase bridge inverter

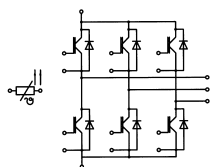
SKiiP 38AC176V2

Features

- Trench 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

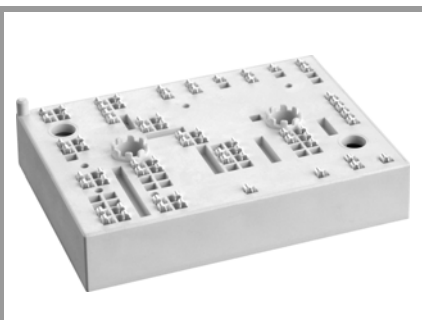


AC

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$		1700	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	118	A
		$T_j = 175^\circ\text{C}$	95	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	151	A
		$T_s = 70^\circ\text{C}$	122	A
I_{Cnom}			100	A
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$		200	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 1200 \text{ V}$ $V_{GE} \leq 20 \text{ V}$ $V_{CES} \leq 1700 \text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
T_j			-40 ... 175	$^\circ\text{C}$
Inverse - Diode				
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	115	A
		$T_j = 175^\circ\text{C}$	89	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	142	A
		$T_s = 70^\circ\text{C}$	111	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		300	A
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$		860	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_t(\text{RMS})$	$T_{terminal} = 80^\circ\text{C}$, 20 A per spring		120	A
T_{stg}			-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1 \text{ min}$		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	$I_C = 100 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.00	2.40	V
		$T_j = 150^\circ\text{C}$		2.45	2.90	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$		1.00	1.20	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		10	12	m Ω
		$T_j = 150^\circ\text{C}$		16	18	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 4 \text{ mA}$		5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 1700 \text{ V}$, $T_j = 25^\circ\text{C}$			0.1	0.3	mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$		8.82		nF
C_{oes}		$f = 1 \text{ MHz}$		0.37		nF
C_{res}		$f = 1 \text{ MHz}$		0.29		nF
Q_G	- 8 V...+ 15 V			934		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			4.8		Ω
$t_{d(on)}$	$V_{CC} = 900 \text{ V}$	$T_j = 150^\circ\text{C}$		160		ns
t_r	$I_C = 100 \text{ A}$ $R_{Gon} = 1 \Omega$	$T_j = 150^\circ\text{C}$		35		ns
		$T_j = 150^\circ\text{C}$				
E_{on}	$R_{Goff} = 1 \Omega$	$T_j = 150^\circ\text{C}$		23.8		mJ
$t_{d(off)}$	$di/dt_{on} = 3000 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		580		ns
t_f	$di/dt_{off} = 600 \text{ A}/\mu\text{s}$ $du/dt = 4500 \text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		150		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$ $L_s = 40 \text{ nH}$	$T_j = 150^\circ\text{C}$		32.2		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$			0.38		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$			0.25		K/W

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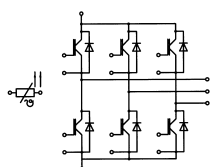
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 100\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		1.76	2.10	V
		$T_j = 150^\circ\text{C}$		1.77	2.09	V
V_{F0}	chipllevel	$T_j = 25^\circ\text{C}$		1.32	1.56	V
		$T_j = 150^\circ\text{C}$		1.08	1.22	V
r_F	chipllevel	$T_j = 25^\circ\text{C}$		4.4	5.4	m Ω
		$T_j = 150^\circ\text{C}$		6.9	8.7	m Ω
I_{RRM}	$I_F = 100\text{ A}$	$T_j = 150^\circ\text{C}$		226		A
Q_{rr}	$di/dt_{off} = 4000\text{ A}/\mu\text{s}$ +15/-15	$T_j = 150^\circ\text{C}$		38.5		μC
E_{rr}	$V_{CC} = 900\text{ V}$	$T_j = 150^\circ\text{C}$		26.2		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			0.61		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			0.45		K/W
Module						
L_{CE}				20		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
$R(T)$	$R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



AC

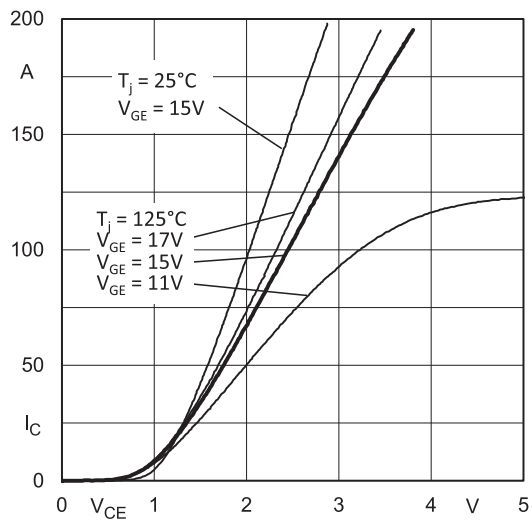


Fig. 1: Typ. output characteristic

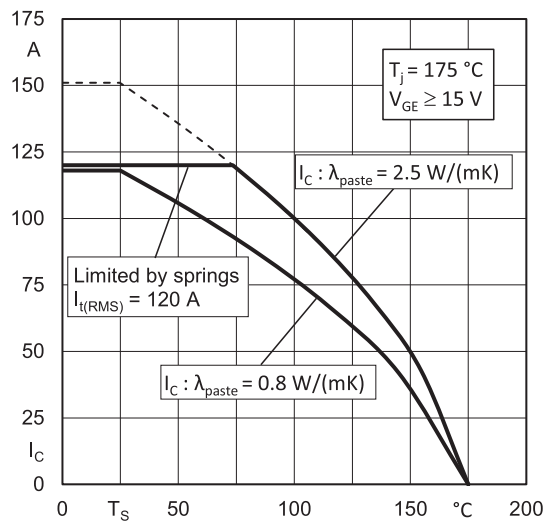


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

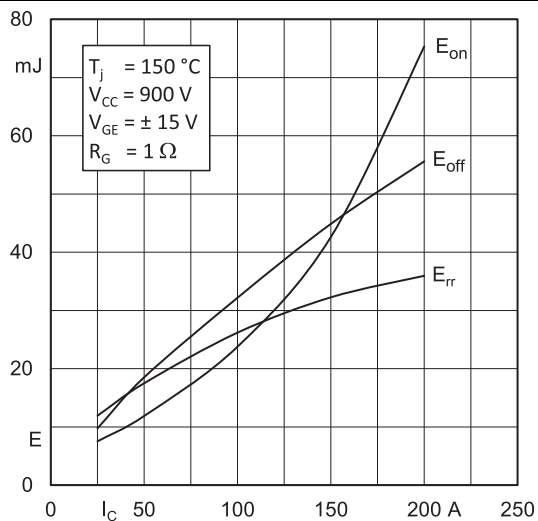


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

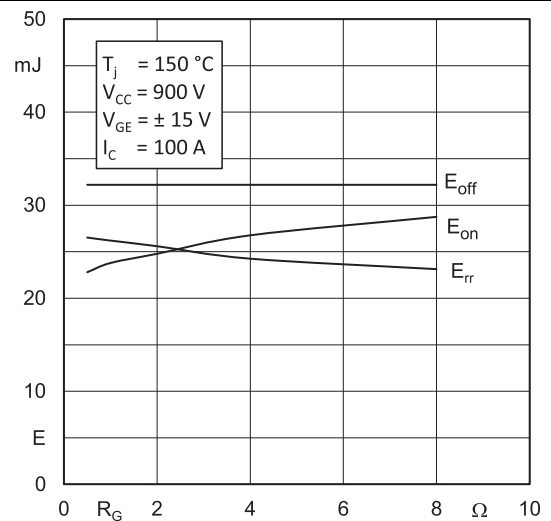


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

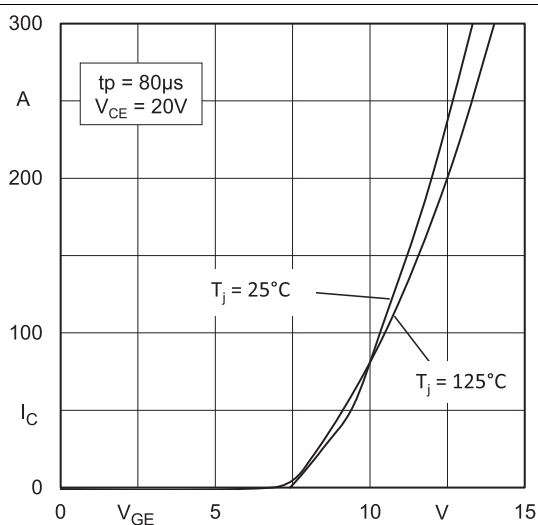


Fig. 5: Typ. transfer characteristic

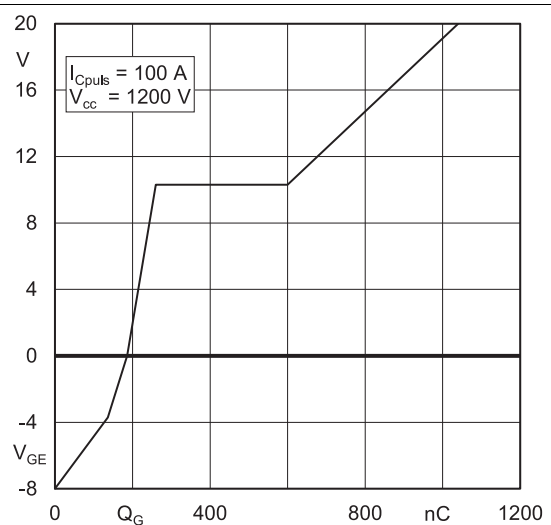
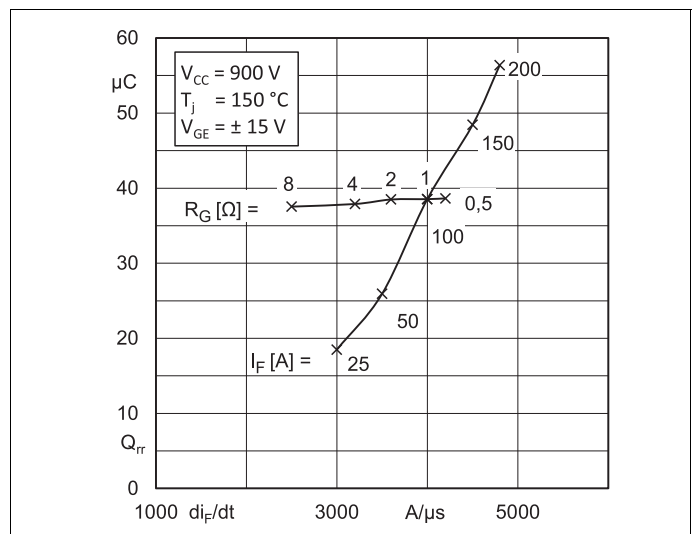
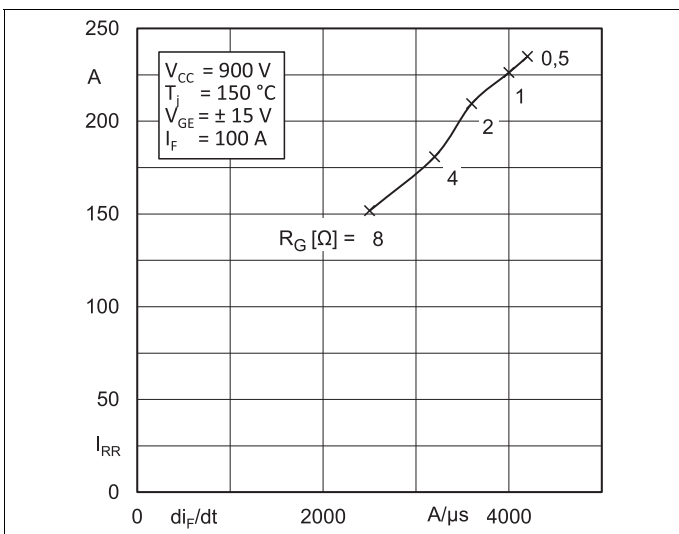
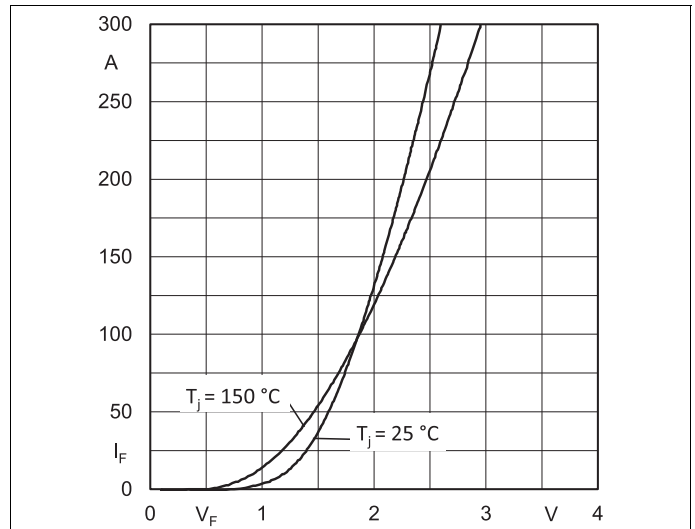
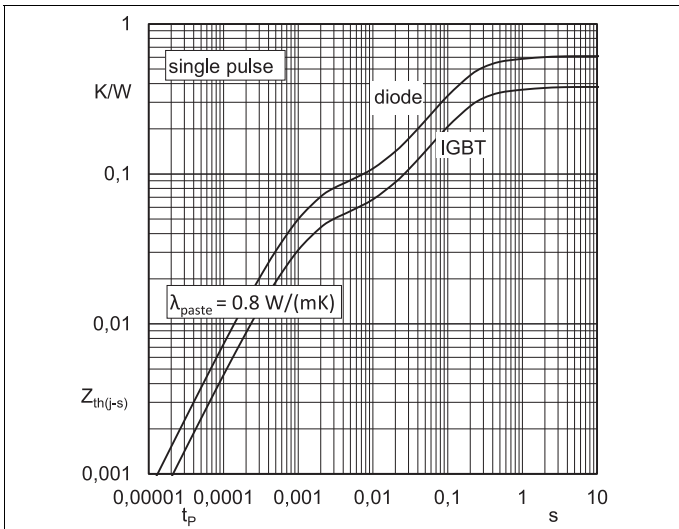
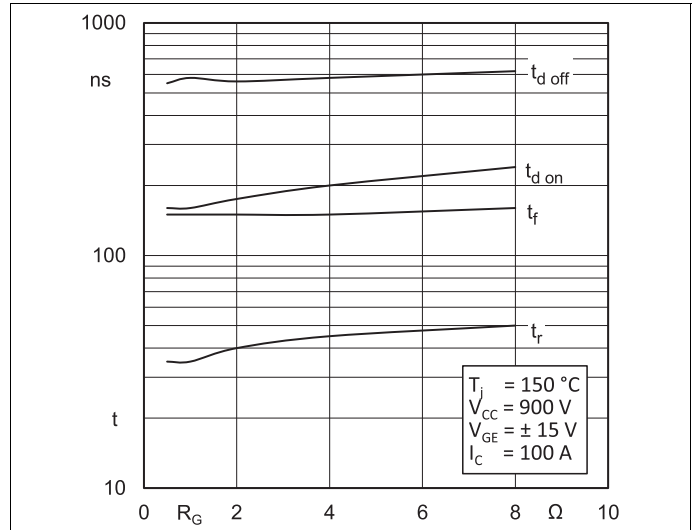
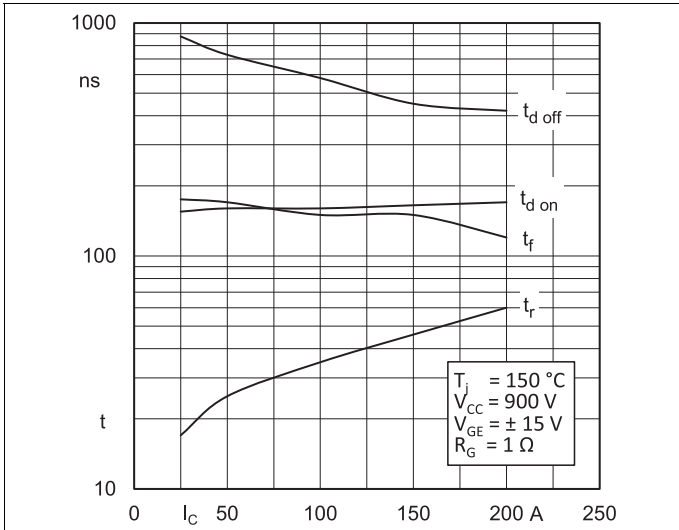
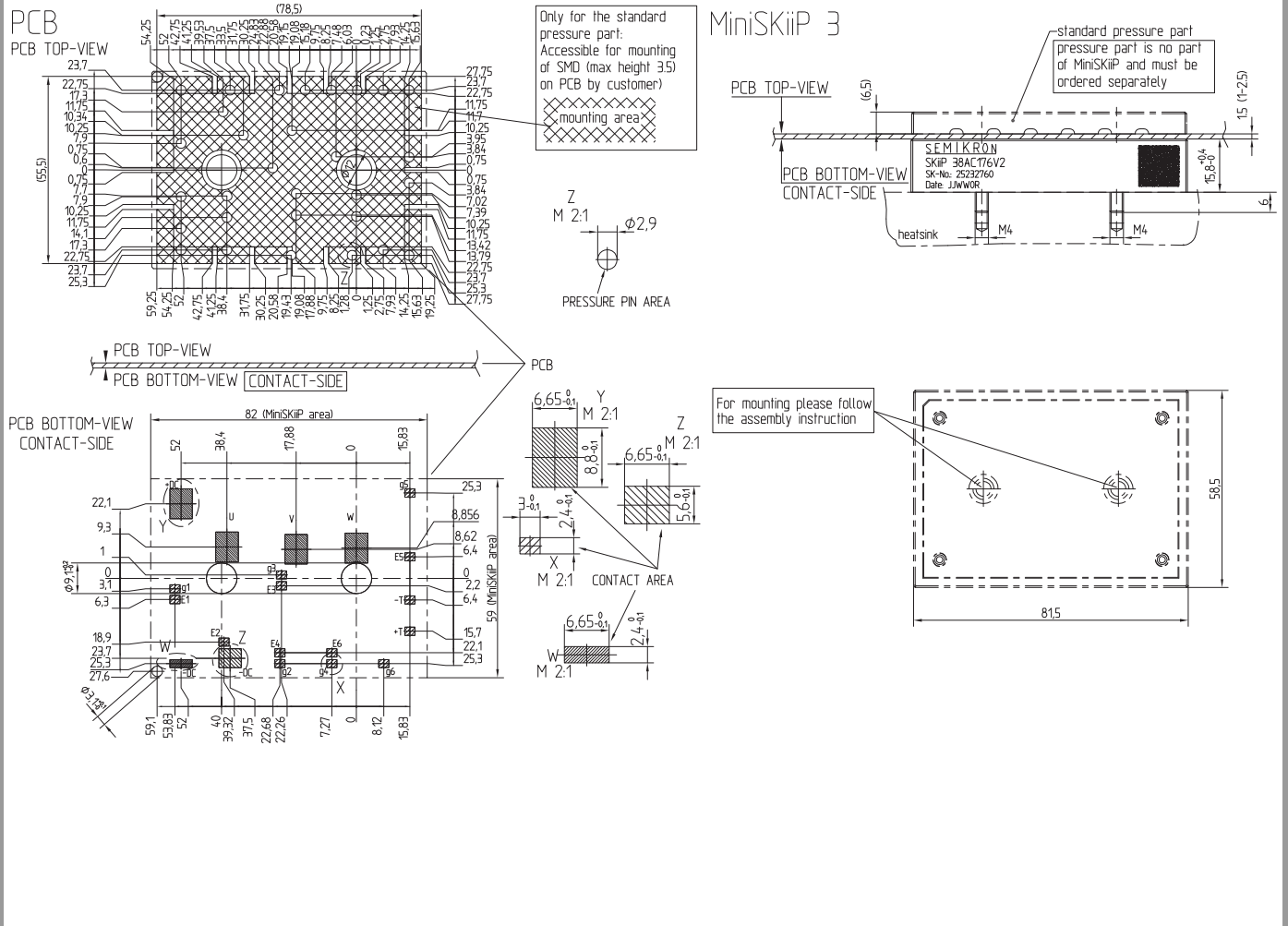
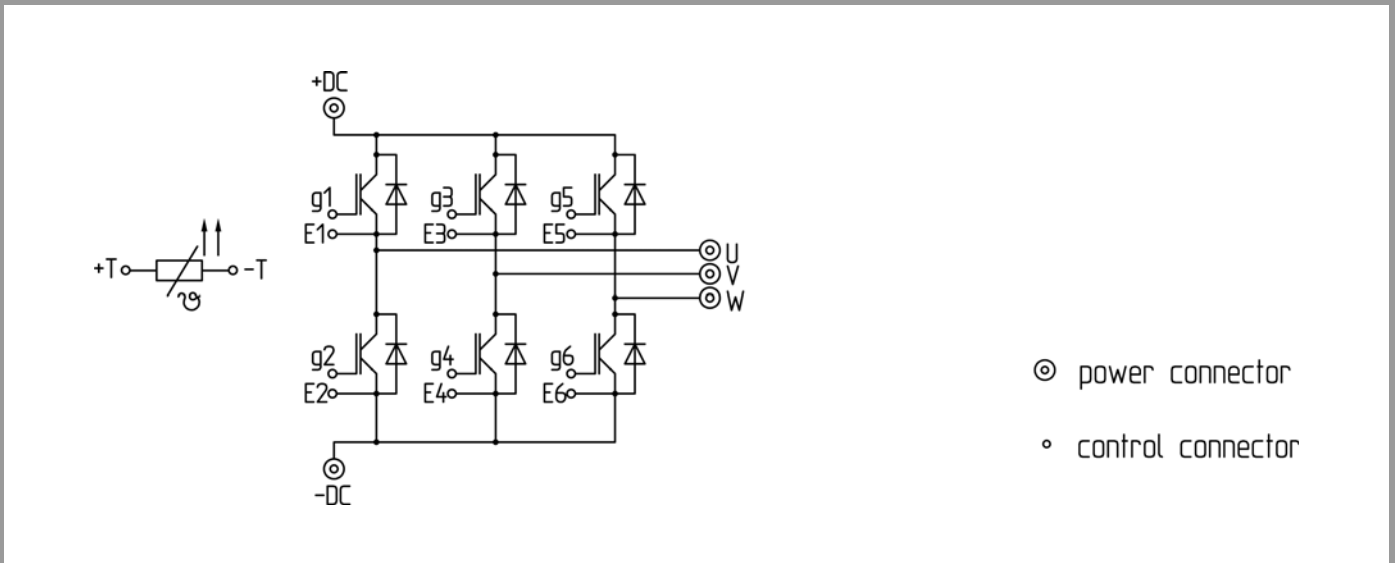


Fig. 6: Typ. gate charge characteristic





pinout, dimensions



pinout

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

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