

SKiIP 28MLI07E3V1



MiniSKiIP® 2

3-Level NPC IGBT-Module

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Features

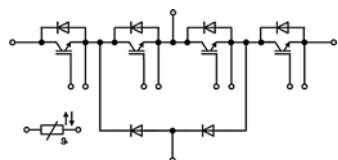
- 650V Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- NTC T-Sensor

Typical Applications*

- Uninterruptible power supplies (UPS)
- Solar inverters

Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.; $T_C=T_S$ (valid for baseplate-less modules)
- Product reliability results are valid for $T_{jop}=150^\circ\text{C}$



MLI

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V_{CES}			650	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	135	A
		$T_j = 175^\circ\text{C}$	107	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	163	A
		$T_j = 175^\circ\text{C}$	130	A
I_{Cnom}			150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$		450	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 360 \text{ V}$	$T_j = 150^\circ\text{C}$	6	μs
	$V_{GE} \leq 15 \text{ V}$			
	$V_{CES} \leq 650 \text{ V}$			
T_j			-40 ... 175	$^\circ\text{C}$
Inverse diode				
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	126	A
		$T_j = 175^\circ\text{C}$	97	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	151	A
		$T_j = 175^\circ\text{C}$	118	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		300	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 25^\circ\text{C}$		1200	A
T_j			-40 ... 175	$^\circ\text{C}$
Clamping diode				
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	126	A
		$T_j = 175^\circ\text{C}$	97	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	151	A
		$T_j = 175^\circ\text{C}$	118	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		300	A
I_{FSM}	10 ms, sin 180°, $T_j = 25^\circ\text{C}$		1200	A
T_j			-40 ... 175	$^\circ\text{C}$
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20\text{A per spring}$		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
IGBT						
$V_{CE(sat)}$	$I_C = 150 \text{ A}$	$T_j = 25^\circ\text{C}$	1.45	1.90		V
		$T_j = 150^\circ\text{C}$	1.70	2.10		V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	0.90	1.00		V
		$T_j = 150^\circ\text{C}$	0.82	0.90		V
r_{CE}	$V_{GE} = 15 \text{ V}$	$T_j = 25^\circ\text{C}$	3.7	6.0		m Ω
		$T_j = 150^\circ\text{C}$	5.9	8.0		m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 2.4 \text{ mA}$		5.1	5.8	6.4	V
I_{CES}	$V_{GE} = 0 \text{ V}$	$V_{CE} = 650 \text{ V}$	$T_j = 25^\circ\text{C}$	0.1	0.3	mA
				-		mA
C_{ies}	$V_{CE} = 25 \text{ V}$	$f = 1 \text{ MHz}$		9.24		nF
C_{oes}	$V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$		0.58		nF
C_{res}		$f = 1 \text{ MHz}$		0.27		nF

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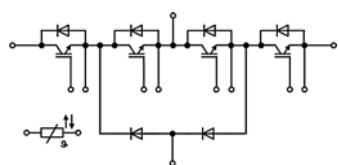
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MLI

Characteristics						
Symbol	Conditions	min.	typ.	max.	Unit	
IGBT						
Q_G	$V_{GE} = -8 \text{ V...} + 15 \text{ V}$		1200		nC	
R_{Gint}	$T_j = 25^\circ\text{C}$		2.0		Ω	
T1 / T4						
$t_{d(on)}$	$V_{CE} = 300 \text{ V}$	$T_j = 150^\circ\text{C}$	108		ns	
t_r	$I_C = 150 \text{ A}$	$T_j = 150^\circ\text{C}$	73		ns	
E_{on}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	5.5		mJ	
$t_{d(off)}$	$R_{G on} = 3 \Omega$	$T_j = 150^\circ\text{C}$	268		ns	
t_f	$R_{G off} = 1.6 \Omega$	$T_j = 150^\circ\text{C}$	76		ns	
E_{off}	$di/dt_{on} = 2100 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	5.6		mJ	
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.55		K/W	
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.41		K/W	
T2 / T3						
$t_{d(on)}$	$V_{CE} = 300 \text{ V}$	$T_j = 150^\circ\text{C}$	106		ns	
t_r	$I_C = 150 \text{ A}$	$T_j = 150^\circ\text{C}$	64		ns	
E_{on}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	2		mJ	
$t_{d(off)}$	$R_{G on} = 3 \Omega$	$T_j = 150^\circ\text{C}$	268		ns	
t_f	$R_{G off} = 1.6 \Omega$	$T_j = 150^\circ\text{C}$	77		ns	
E_{off}	$di/dt_{on} = 2520 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	5.2		mJ	
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.55		K/W	
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.41		K/W	
Inverse diode						
$V_F = V_{EC}$	$I_F = 150 \text{ A}$	$T_j = 25^\circ\text{C}$	1.40	1.76	V	
	$V_{GE} = 0 \text{ V}$	$T_j = 150^\circ\text{C}$	1.39	1.77	V	
	chipelevel	$T_j = 25^\circ\text{C}$	1.04	1.24	V	
		$T_j = 150^\circ\text{C}$	0.85	0.99	V	
r_F	chipelevel	$T_j = 25^\circ\text{C}$	2.4	3.5	m Ω	
		$T_j = 150^\circ\text{C}$	3.6	5.2	m Ω	
I_{RRM}	$I_F = 150 \text{ A}$	$T_j = 150^\circ\text{C}$	121		A	
Q_{rr}	$di/dt_{off} = 2450 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	20		μC	
E_{rr}	$V_{GE} = -15 \text{ V}$	$T_j = 150^\circ\text{C}$	5.5		mJ	
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.75		K/W	
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.58		K/W	
Clamping diode						
$V_F = V_{EC}$	$I_F = 150 \text{ A}$	$T_j = 25^\circ\text{C}$	1.40	1.76	V	
	$V_{GE} = 0 \text{ V}$	$T_j = 150^\circ\text{C}$	1.39	1.77	V	
	chipelevel	$T_j = 25^\circ\text{C}$	1.04	1.24	V	
		$T_j = 150^\circ\text{C}$	0.85	0.99	V	
r_F	chipelevel	$T_j = 25^\circ\text{C}$	2.4	3.5	m Ω	
		$T_j = 150^\circ\text{C}$	3.6	5.2	m Ω	
I_{RRM}	$I_F = 150 \text{ A}$	$T_j = 150^\circ\text{C}$	116		A	
Q_{rr}	$di/dt_{off} = 2210 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	13.2		μC	
E_{rr}	$V_{GE} = -15 \text{ V}$	$T_j = 150^\circ\text{C}$	2.6		mJ	
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$		0.75		K/W	
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$		0.58		K/W	
Module						
M_s	to heat sink		2	2.5	Nm	
w	weight		55		g	
Temperature Sensor						
R_{25}	NTC, $T_r = 25^\circ\text{C}^1)$		5.0 \pm 5%		k Ω	

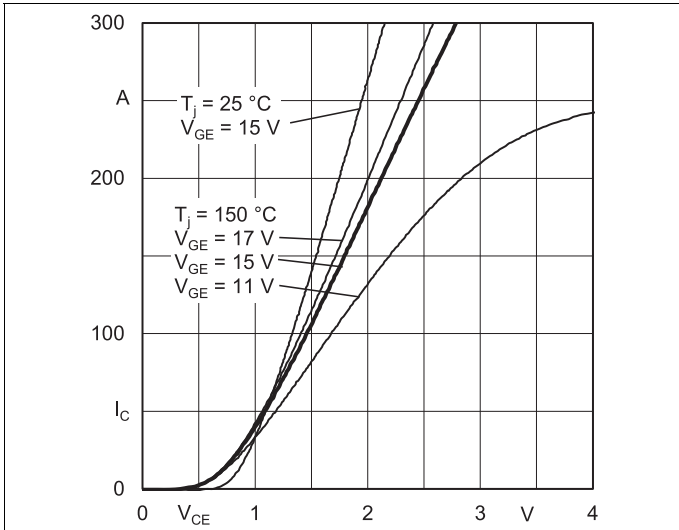


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

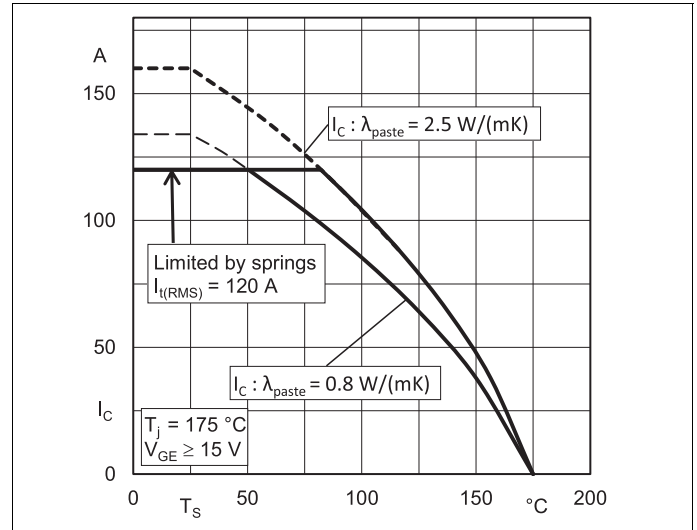


Fig. 2: Rated current vs. temperature $I_c = f(T_s)$

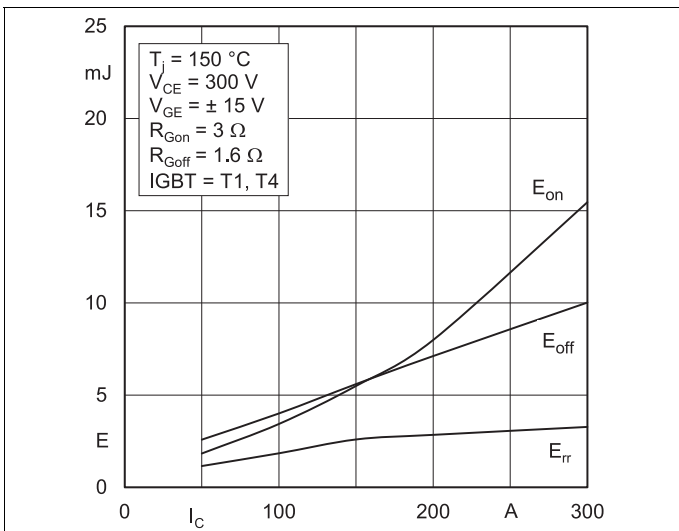


Fig. 3: Typ. turn-on /-off energy = $f(I_c)$

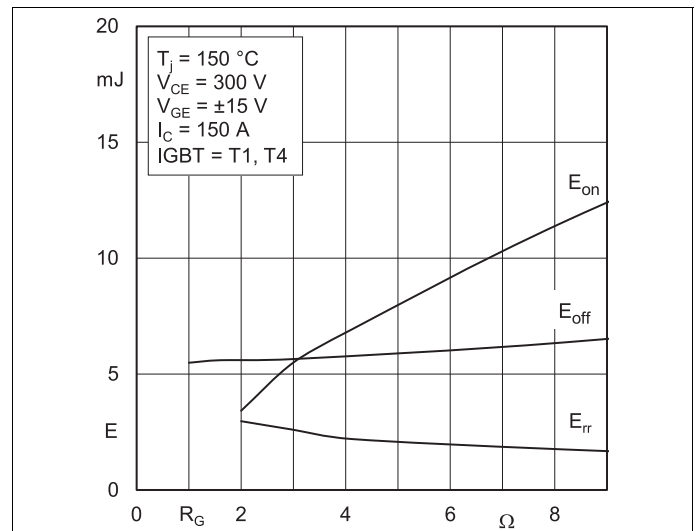


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

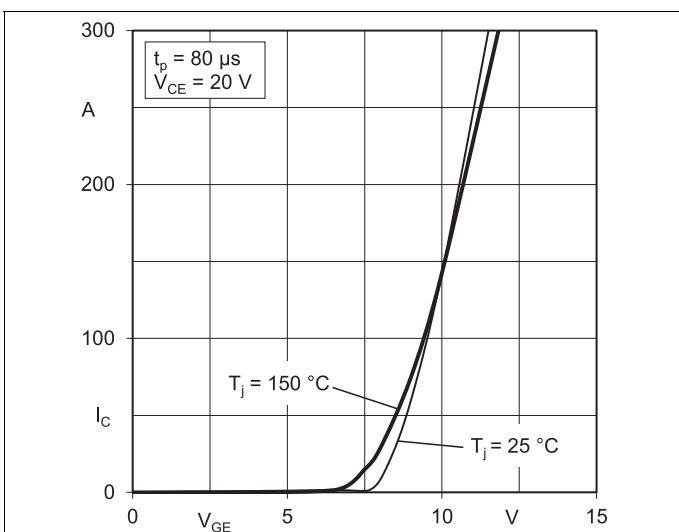


Fig. 5: Typ. transfer characteristic

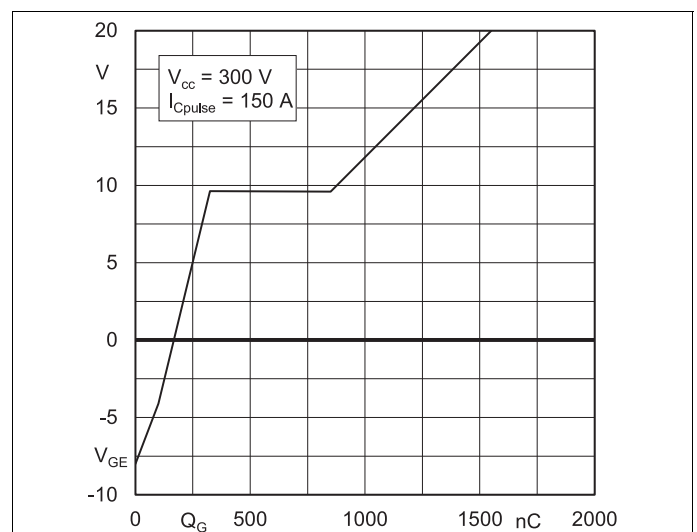
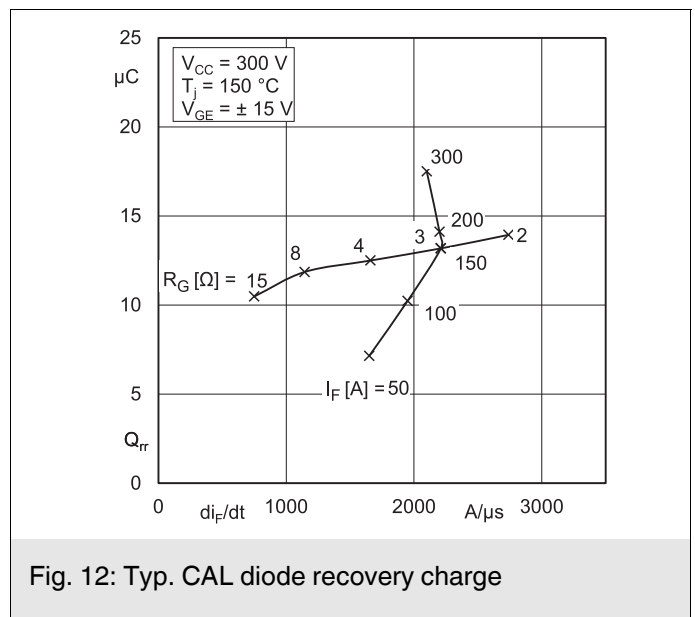
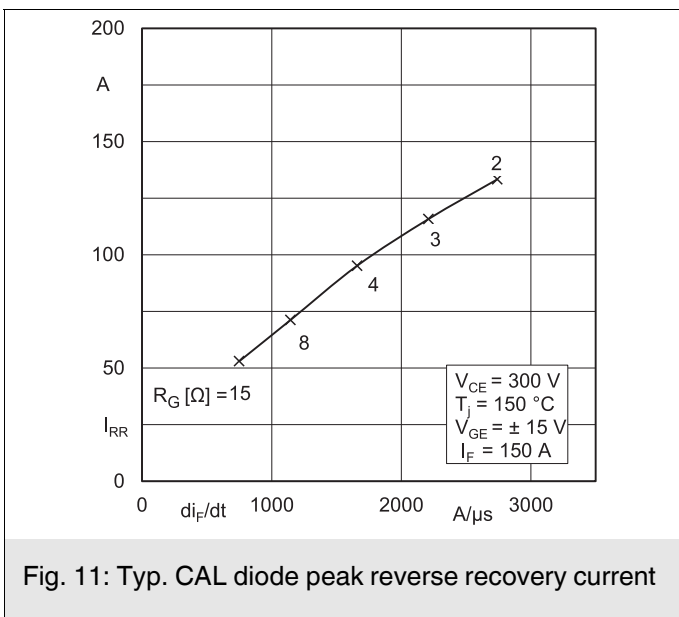
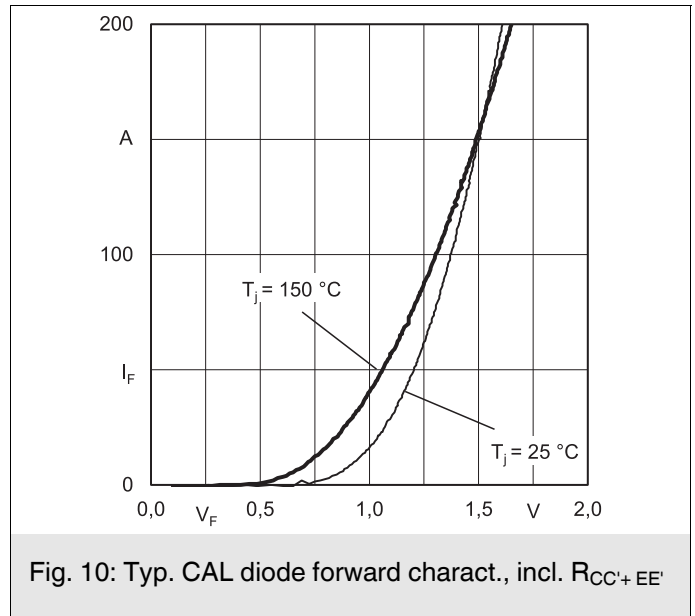
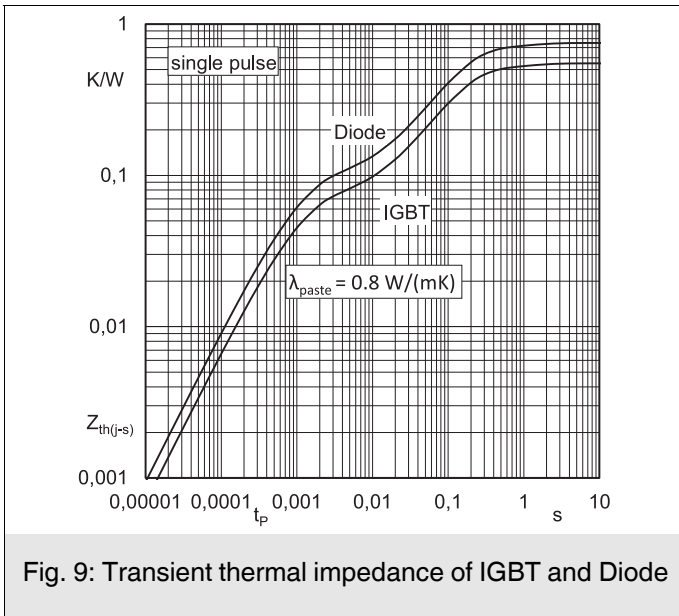
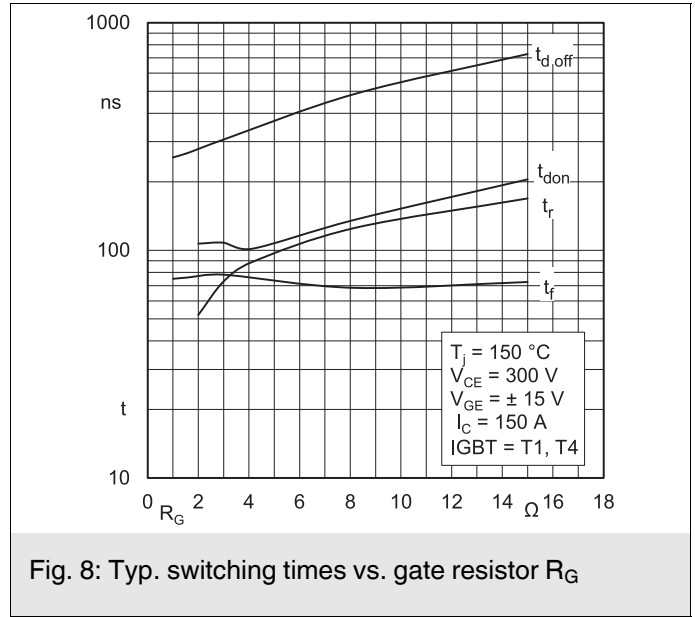
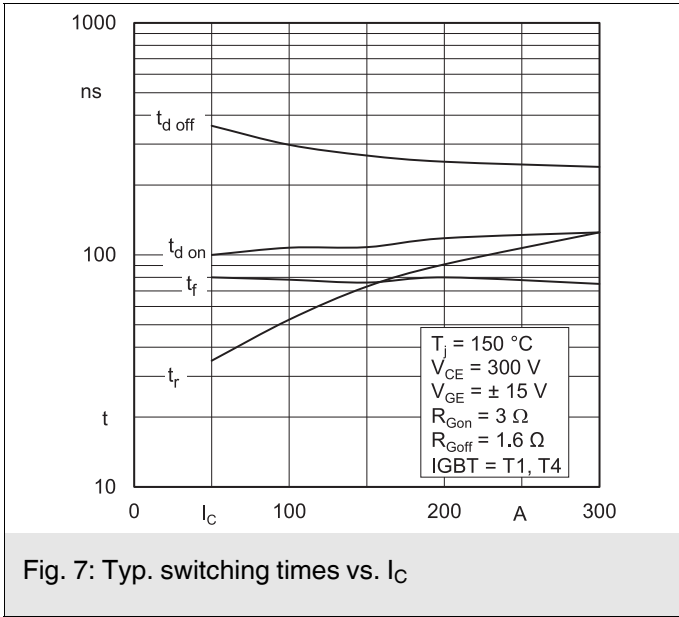
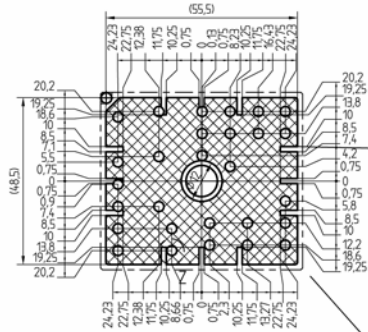


Fig. 6: Typ. gate charge characteristic

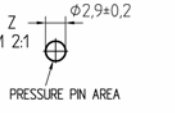


PCB PCB TOP-VIEW

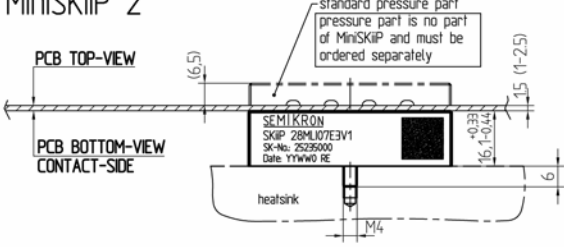


Only for the standard pressure part:
Accessible for mounting of SMD (max height 3.5) on PCB by customer

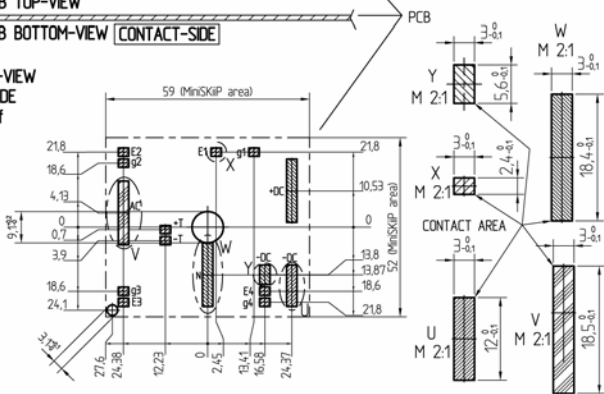
Tolerances of pressure part dimensions ISO 2768-m



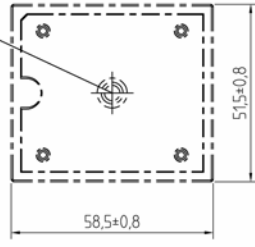
MiniSKiIP 2



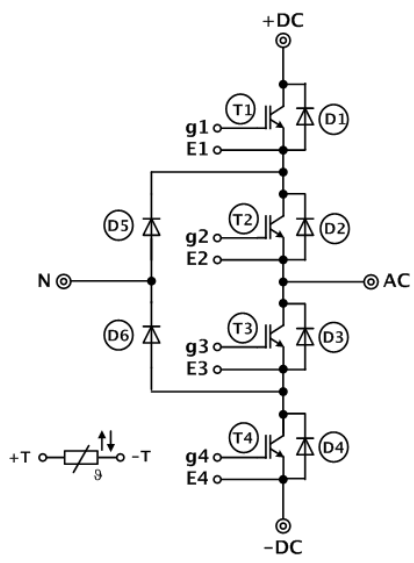
PCB TOP-VIEW PCB BOTTOM-VIEW CONTACT-SIDE



For mounting please follow the assembly instruction



pinout, dimensions



⊙ power connector
○ control connector

pinout

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

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