

SKiIP 29TMLI12F4V1



MiniSKiIP® 2

3-Level TNPC Inverter (*)

SKiIP 29TMLI12F4V1

Target Data

Features

- Fast Trench 4 IGBTs
- Trench IGBTs
- Robust and soft diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

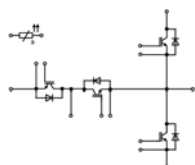
Remarks

- Case temperature limited to $T_C=125^\circ\text{C}$ max.; $T_C = T_S$ (for baseplateless modules)
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{jop} = -40 \dots +150^\circ\text{C}$)
- IGBT 1: outer IGBTs T1&T4
- IGBT 2: inner IGBTs T2&T3
- Diode 1: outer diodes D1&D4
- Diode 2: inner diodes D2&D3

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT 1			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	137
		$T_s = 70^\circ\text{C}$	105
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	153
		$T_s = 70^\circ\text{C}$	124
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	$^\circ\text{C}$

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT 2			
V_{CES}	$T_j = 25^\circ\text{C}$	650	V
I_C	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	134
		$T_s = 70^\circ\text{C}$	100
I_C	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	150
		$T_s = 70^\circ\text{C}$	120
I_{Cnom}		150	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	450	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 360\text{ V}$ $V_{GE} \leq 15\text{ V}$ $V_{CES} \leq 650\text{ V}$	$T_j = 150^\circ\text{C}$	6
T_j		-40 ... 175	$^\circ\text{C}$

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Diode 1			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	132
		$T_s = 70^\circ\text{C}$	98
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	148
		$T_s = 70^\circ\text{C}$	117
I_{Fnom}		150	A
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	450	A
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	774	A
T_j		-40 ... 175	$^\circ\text{C}$



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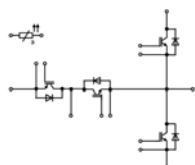
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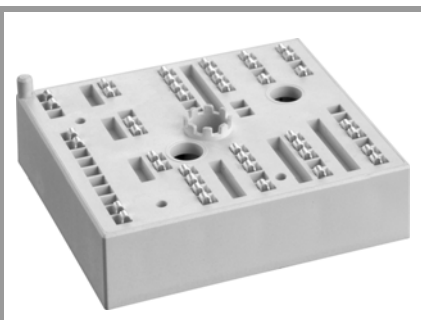
Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	$T_j = 25^\circ\text{C}$		650	V
I_F	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	143	A
		$T_s = 70^\circ\text{C}$	111	A
I_{Fnom}			150	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		300	A
I_{FSM}	10 ms sin 180°	$T_j = 25^\circ\text{C}$	1200	A
		$T_j = 150^\circ\text{C}$	1100	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20 A per spring		100	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.05	2.40		V
		$T_j = 150^\circ\text{C}$	2.50	2.85		V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.8	0.9		V
		$T_j = 150^\circ\text{C}$	0.7	0.8		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	8.3	10		mΩ
		$T_j = 150^\circ\text{C}$	12	14		mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}$, $I_C = 5.2\text{ mA}$		5.2	5.8	6.4	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 MHz	8.80			nF
C_{oes}		f = 1 MHz				nF
C_{res}		f = 1 MHz	0.47			nF
Q_G	- 8 V...+ 15 V					nC
R_{Gint}	$T_j = 25^\circ\text{C}$		5			Ω
$t_{d(on)}$	$V_{CE} = 300\text{ V}$ $I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$				ns
t_r		$T_j = 150^\circ\text{C}$				ns
E_{on}						mJ
$t_{d(off)}$						ns
t_f						ns
E_{off}	$V_{GE\ neg} = -15\text{ V}$ $V_{GE\ pos} = 15\text{ V}$					mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W/K}^*\text{m}$		0.33			K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Module						
M_s	to heat sink		2		2.5	Nm
w	weight			55		g

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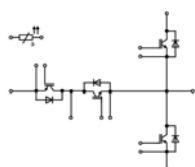
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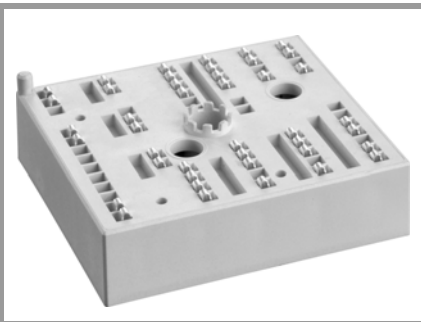
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 2						
$V_{CE(sat)}$	$I_C = 150 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.45	1.77	V
		$T_j = 150^\circ\text{C}$		1.70	2.10	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$		0.9	1	V
		$T_j = 150^\circ\text{C}$		0.82	0.9	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		3.7	5.1	m Ω
		$T_j = 150^\circ\text{C}$		6	8	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE} \text{ V}, I_C = 2.4 \text{ mA}$		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
		$T_j = 150^\circ\text{C}$				mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$		9.24		nF
C_{oes}		$f = 1 \text{ MHz}$		0.60		nF
C_{res}		$f = 1 \text{ MHz}$		0.27		nF
Q_G	$-8 \text{ V} \dots +15 \text{ V}$			1360		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			2		Ω
$t_{d(on)}$	$V_{CE} = 300 \text{ V}$	$T_j = 150^\circ\text{C}$				ns
t_r	$I_C = 150 \text{ A}$	$T_j = 150^\circ\text{C}$				ns
E_{on}		$T_j = 150^\circ\text{C}$				mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$				ns
t_f		$T_j = 150^\circ\text{C}$				ns
E_{off}	$V_{GE \text{ neg}} = -15 \text{ V}$ $V_{GE \text{ pos}} = 15 \text{ V}$	$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8 \text{ W/K} \cdot \text{m}$			0.46		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
$V_F = V_{EC}$	$I_F = 150 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.2	2.5	V
		$T_j = 150^\circ\text{C}$		2.1	2.4	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		5.8	6.6	m Ω
		$T_j = 150^\circ\text{C}$		8.1	8.8	m Ω
I_{RRM}	$I_F = 150 \text{ A}$	$T_j = 150^\circ\text{C}$				A
Q_{rr}	$V_{GE} = -15 \text{ V}$ $V_R = 300 \text{ V}$	$T_j = 150^\circ\text{C}$				μC
E_{rr}		$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8 \text{ W/K} \cdot \text{m}$			0.45		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
$V_F = V_{EC}$	$I_F = 150 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.4	1.8	V
		$T_j = 150^\circ\text{C}$		1.4	1.8	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1	1.2	V
		$T_j = 150^\circ\text{C}$		0.9	1	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}	$I_F = 150 \text{ A}$	$T_j = 150^\circ\text{C}$				A
Q_{rr}	$V_{GE} = -15 \text{ V}$ $V_R = 300 \text{ V}$	$T_j = 150^\circ\text{C}$				μC
E_{rr}		$T_j = 150^\circ\text{C}$				mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8 \text{ W/K} \cdot \text{m}$			0.63		K/W

SKiiP 29TMLI12F4V1



MiniSKiiP® 2

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R ₁₀₀	T _r = 100 °C, tolerance = 3 %		1670 ± 3%		Ω
B _{100/125}	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		3550 ± 2%		K

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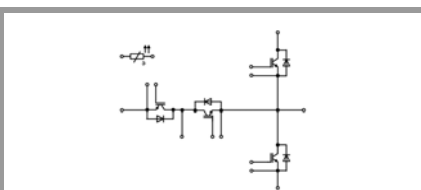
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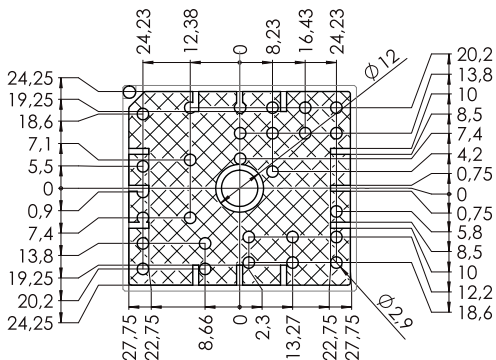


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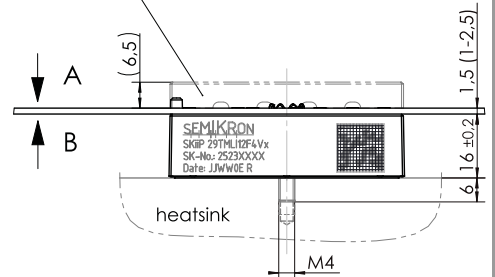
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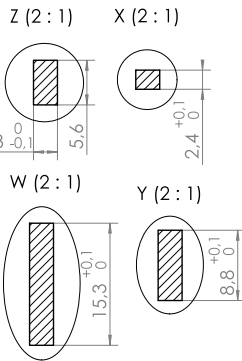
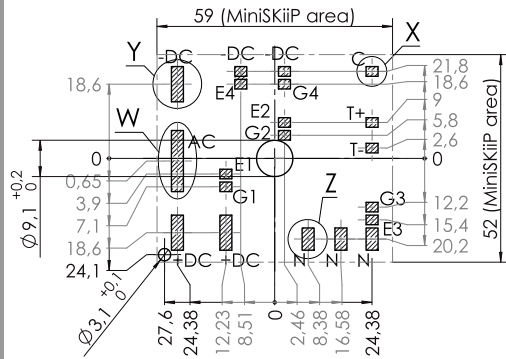
A
Mounting area for SMD, height max. 3,5
only valid for standard pressure part



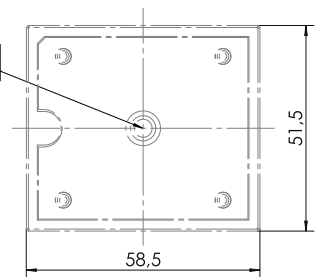
standard pressure part
not part of MiniSKiIP, must
be ordered separately



B

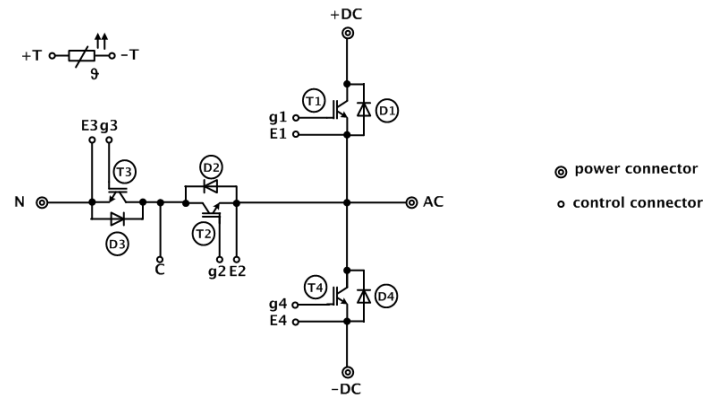


For mounting please follow
the assembly instruction



pinout, dimensions

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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.