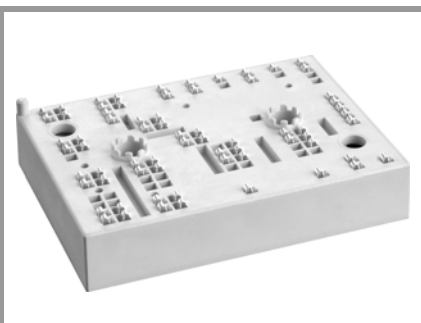


# SKiIP39MLI12T4V1



MiniSKiIP® 3

## 3-Level NPC IGBT-Module

### SKiIP39MLI12T4V1

#### Target Data

#### Features

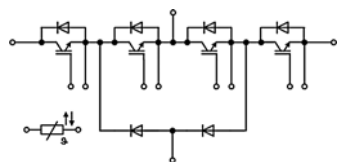
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- NTC T-Sensor

#### 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  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer diodes D1 & D4
- Diode2: inner diodes D2 & D3
- Diode5: clamping diodes D5 & D6

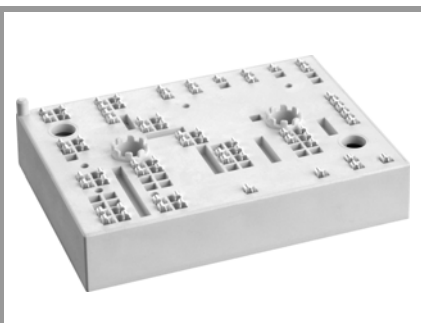
#### Footnotes

<sup>1)</sup> Please find further technical information on the SEMIKRON website.



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Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
<b>IGBT1</b>			
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	167
		$T_s = 70^\circ\text{C}$	135
$I_{Cnom}$		150	A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	450	A
$V_{GES}$		-20 ... 20	V
$t_{psc}$	$V_{CC} = 800\text{ V}, V_{GE} \leq 15\text{ V}, T_j = 150^\circ\text{C}, V_{CES} \leq 1200\text{ V}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>IGBT2</b>			
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	167
		$T_s = 70^\circ\text{C}$	135
$I_{Cnom}$		150	A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	450	A
$V_{GES}$		-20 ... 20	V
$t_{psc}$	$V_{CC} = 800\text{ V}, V_{GE} \leq 15\text{ V}, T_j = 150^\circ\text{C}, V_{CES} \leq 1200\text{ V}$	10	$\mu\text{s}$
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Diode1</b>			
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1200	V
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	134
		$T_s = 70^\circ\text{C}$	106
$I_{Fnom}$		150	A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	450	A
$I_{FSM}$	10 ms, sin 180°, $T_j = 25^\circ\text{C}$	900	A
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Diode2</b>			
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1200	V
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	134
		$T_s = 70^\circ\text{C}$	106
$I_{Fnom}$		150	A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	450	A
$I_{FSM}$	10 ms, sin 180°, $T_j = 25^\circ\text{C}$	900	A
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Diode5</b>			
$V_{RRM}$	$T_j = 25^\circ\text{C}$	1200	V
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	134
		$T_s = 70^\circ\text{C}$	106
$I_{Fnom}$		150	A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	450	A
$I_{FSM}$	10 ms, sin 180°, $T_j = 25^\circ\text{C}$	900	A
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Module</b>			
$I_t(\text{RMS})$	$T_{\text{terminal}} = 80^\circ\text{C}, 20\text{ A per spring}$	160	A
$T_{stg}$		-40 ... 125	$^\circ\text{C}$
$V_{\text{isol}}$	AC sinus 50 Hz, $t = 1\text{ min}$	2500	V



MiniSKiIP® 3

## 3-Level NPC IGBT-Module

### SKiIP39MLI12T4V1

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- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- NTC T-Sensor

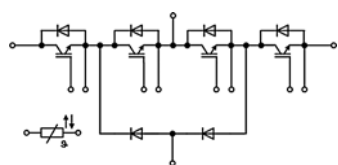
#### Remarks\*

- Max. case temperature limited to  $T_C = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$  (recommended  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- IGBT1: outer IGBTs T1 & T4
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- Diode1: outer diodes D1 & D4
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#### Footnotes

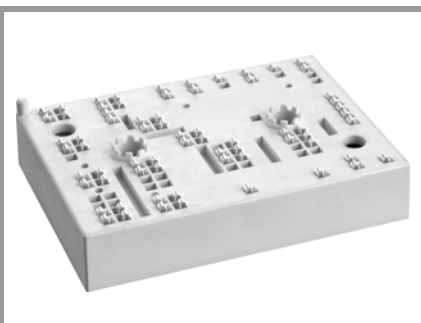
<sup>1)</sup> Please find further technical information on the SEMIKRON website.

Characteristics			min.	typ.	max.	Unit	
Symbol	Conditions						
<b>IGBT1</b>							
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.85	2.10	V	
		$T_j = 150^\circ\text{C}$		2.25	2.45	V	
$V_{CE0}$	chipelevel	$T_j = 25^\circ\text{C}$		0.80	0.90	V	
		$T_j = 150^\circ\text{C}$		0.70	0.80	V	
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		7.0	8.0	m $\Omega$	
		$T_j = 150^\circ\text{C}$		10	11	m $\Omega$	
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6\text{ mA}$		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	
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		8.80		nF	
$C_{oes}$		$f = 1\text{ MHz}$		0.58		nF	
$C_{res}$		$f = 1\text{ MHz}$		0.47		nF	
$Q_G$	$-8\text{ V} \dots +15\text{ V}$			850		nC	
$R_{Gint}$	$T_j = 25^\circ\text{C}$			5.0		$\Omega$	
$t_{d(on)}$	$V_{CE} = 600\text{ V}$ $I_C = 150\text{ A}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$				ns	
$t_r$		$T_j = 150^\circ\text{C}$				ns	
$E_{on}$		$T_j = 150^\circ\text{C}$			11.1		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$					ns
$t_f$		$T_j = 150^\circ\text{C}$					ns
$E_{off}$		$T_j = 150^\circ\text{C}$			16.9		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8\text{ W}/(\text{K}^*\text{m})$			0.33		K/W	
<b>IGBT2</b>							
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.85	2.10	V	
		$T_j = 150^\circ\text{C}$		2.25	2.45	V	
$V_{CE0}$	chipelevel	$T_j = 25^\circ\text{C}$		0.80	0.90	V	
		$T_j = 150^\circ\text{C}$		0.70	0.80	V	
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		7.0	8.0	m $\Omega$	
		$T_j = 150^\circ\text{C}$		10	11	m $\Omega$	
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6\text{ mA}$		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	
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		8.80		nF	
$C_{oes}$		$f = 1\text{ MHz}$		0.58		nF	
$C_{res}$		$f = 1\text{ MHz}$		0.47		nF	
$Q_G$	$-8\text{ V} \dots +15\text{ V}$			850		nC	
$R_{Gint}$	$T_j = 25^\circ\text{C}$			5.0		$\Omega$	
$t_{d(on)}$	$V_{CE} = 600\text{ V}$ $I_C = 150\text{ A}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$				ns	
$t_r$		$T_j = 150^\circ\text{C}$				ns	
$E_{on}$		$T_j = 150^\circ\text{C}$			5.5		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$					ns
$t_f$		$T_j = 150^\circ\text{C}$					ns
$E_{off}$		$T_j = 150^\circ\text{C}$			17.9		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8\text{ W}/(\text{K}^*\text{m})$			0.33		K/W	



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# SKiP39MLI12T4V1



MiniSKiP® 3

## 3-Level NPC IGBT-Module

### SKiP39MLI12T4V1

#### Target Data

#### Features

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

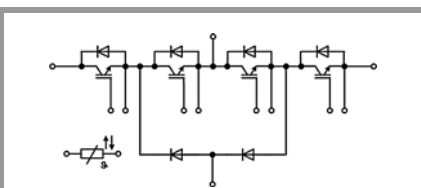
#### Remarks\*

- Max. case temperature limited to  $T_C = 125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$  (recommended  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer diodes D1 & D4
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- Diode5: clamping diodes D5 & D6

#### Footnotes

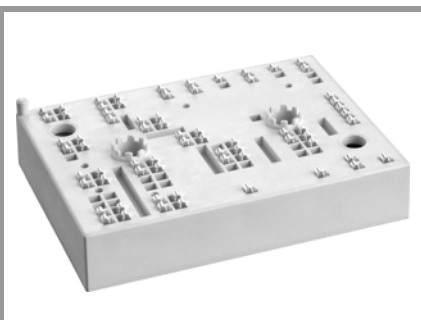
<sup>1)</sup> Please find further technical information on the SEMIKRON website.

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Diode1</b>						
$V_F = V_{EC}$	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
$V_{F0}$	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chipelevel	$T_j = 25^\circ\text{C}$		5.6	6.4	mΩ
		$T_j = 150^\circ\text{C}$		7.8	8.5	mΩ
$I_{RRM}$	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$				A
$Q_{rr}$		$T_j = 150^\circ\text{C}$				μC
$E_{rr}$	$V_R = 600\text{ V}$	$T_j = 150^\circ\text{C}$		10.9		mJ
$R_{th(j-s)}$		per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{K}^*\text{m})$		0.53		K/W
<b>Diode2</b>						
$V_F = V_{EC}$	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
$V_{F0}$	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chipelevel	$T_j = 25^\circ\text{C}$		5.6	6.4	mΩ
		$T_j = 150^\circ\text{C}$		7.8	8.5	mΩ
$I_{RRM}$	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$				A
$Q_{rr}$		$T_j = 150^\circ\text{C}$				μC
$E_{rr}^{1)}$	$V_R = 600\text{ V}$	$T_j = 150^\circ\text{C}$		-		mJ
$R_{th(j-s)}$		per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{K}^*\text{m})$		0.53		K/W
<b>Diode5</b>						
$V_F = V_{EC}$	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
$V_{F0}$	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chipelevel	$T_j = 25^\circ\text{C}$		5.6	6.4	mΩ
		$T_j = 150^\circ\text{C}$		7.8	8.5	mΩ
$I_{RRM}$	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$				A
$Q_{rr}$		$T_j = 150^\circ\text{C}$				μC
$E_{rr}$	$V_R = 600\text{ V}$	$T_j = 150^\circ\text{C}$		11.8		mJ
$R_{th(j-s)}$		per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{K}^*\text{m})$		0.53		K/W



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# SKiP39MLI12T4V1



MiniSKiP® 3

## 3-Level NPC IGBT-Module

### SKiP39MLI12T4V1

#### Target Data

#### Features

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- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
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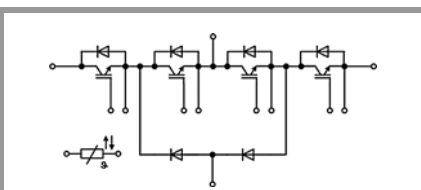
#### Remarks\*

- Max. case temperature limited to  $T_C=125^{\circ}\text{C}$
- Product reliability results valid for  $T_j \leq 150^{\circ}\text{C}$  (recommended  $T_{j,op} = -40 \dots +150^{\circ}\text{C}$ )
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer diodes D1 & D4
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#### Footnotes

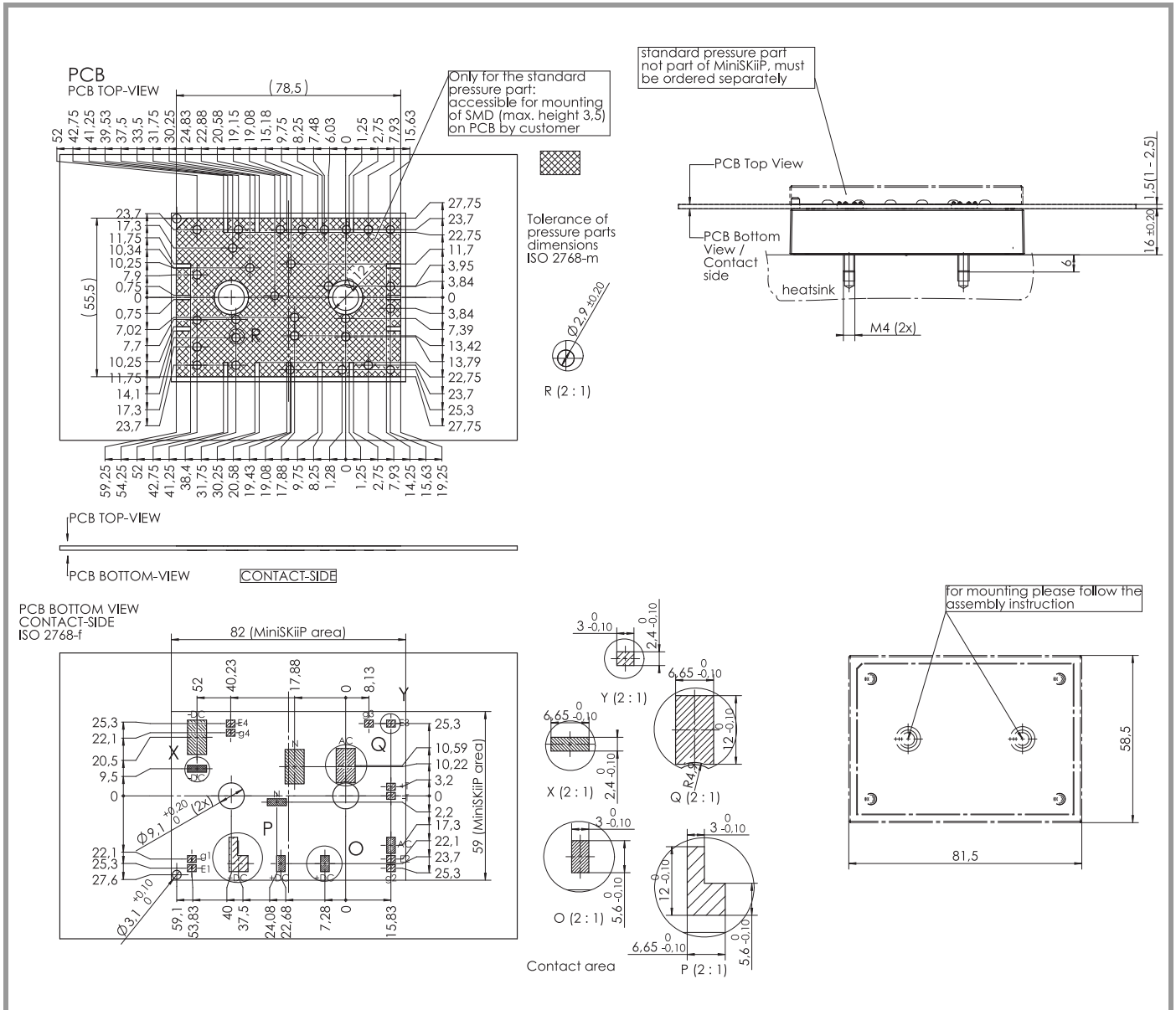
<sup>1)</sup> Please find further technical information on the SEMIKRON website.

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
<b>Module</b>					
$L_{SCE1}$					nH
$L_{SCE2}$			t.b.d.		nH
$R_{CC'+EE'}$					$T_s = 25^{\circ}\text{C}$ mΩ
					mΩ
$M_s$	to heat sink			2.5	Nm
$M_t$					Nm
					Nm
$w$			82		g
<b>Temperature Sensor</b>					
$R_{100}$	$T_c=100^{\circ}\text{C}$ ( $R_{25}=5\text{ k}\Omega$ ) <sup>1)</sup>		493		Ω
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$ ; T[K];		3550 ±2%		K

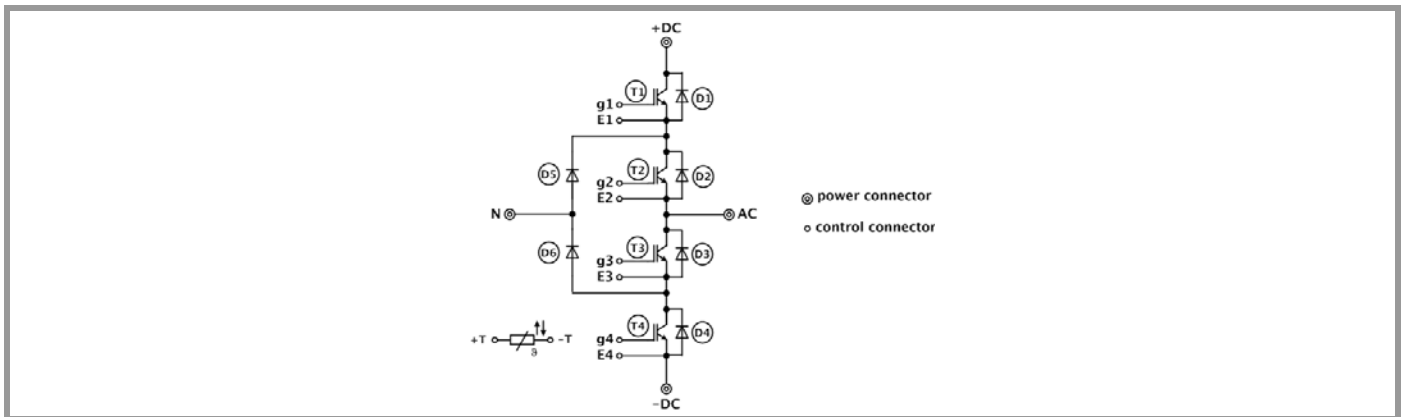


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# SKiIP39MLI12T4V1



pinout, dimensions



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.