SK200TMLI12F4TE2

SEMITOP®E2

3-Level TNPC Inverter

Engineering Sample

SK200TMLI12F4TE2

Target Data

Features

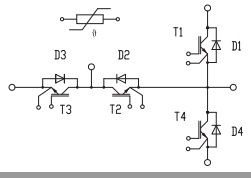
- Low inductive design
- Press-Fit contact technology
- Rugged mounting due to integrated mounting clamps
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DBC)
- 1200V Fast Trench4 IGBT and 650V Trench3 IGBT technology
- CAL4F technology FWD
- Integrated NTC temperature sensor
- UL recognized, file no. E 63 532

Remarks*

- Recommended Tjop= -40 ... +150°C
- IGBT1: outer IGBTs T1 & T4
- IGBT2: inner IGBTs T2 & T3
- Diode1: outer diodes D1 & D4
- Diode2: inner diodes D2 & D3

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT1				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_s = 25 °C	154	A
		T_s = 70 °C	124	A
I_{Cnom}			200	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		600	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V, V_{GE} ≤ 15 V, T_j = 150 °C, V_{CES} ≤ 1200 V		10	µs
T_j			-40 ... 175	°C
IGBT2				
V_{CES}	T_j = 25 °C		650	V
I_C	T_j = 175 °C	T_s = 25 °C	79	A
		T_s = 70 °C	63	A
I_{Cnom}			100	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 360 V, V_{GE} ≤ 15 V, T_j = 150 °C, V_{CES} ≤ 650 V		6	µs
T_j			-40 ... 175	°C
Diode1				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_s = 25 °C	67	A
		T_s = 70 °C	53	A
I_{Fnom}			75	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		150	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		430	A
T_j			-40 ... 175	°C
Diode2				
V_{RRM}	T_j = 25 °C		650	V
I_F	T_j = 175 °C	T_s = 25 °C	83	A
		T_s = 70 °C	64	A
I_{Fnom}			100	A
I_{FRM}	I_{FRM} = 2 x I_{Fnom}		200	A
I_{FSM}	10 ms, sin 180°, T_j = 25 °C		820	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			t.b.d.	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min		2500	V



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Typical Applications

- Three-level inverter

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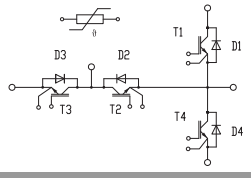
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT1						
$V_{CE(sat)}$	I_C = 200 A V_{GE} = 15 V chiplevel	T_j = 25 °C		2.05	2.40	V
		T_j = 150 °C		2.50	2.85	V
V_{CE0}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		6.3	7.5	mΩ
		T_j = 150 °C		9.0	10	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 7.6 mA		5.2	5.8	6.4	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				-	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		12.3		nF
C_{oes}		f = 1 MHz				nF
C_{res}		f = 1 MHz		0.69		nF
Q_G	V_{GE} = - 8 V...+ 15 V			1130		nC
R_{Gint}	T_j = 25 °C			3.8		Ω
$t_{d(on)}$	V_{CE} = 300 V I_C = 150 A V_{GE} = +15/-15 V $R_{G\ on}$ = 2.5 Ω $R_{G\ off}$ = 2.5 Ω	T_j = 150 °C				ns
t_r		T_j = 150 °C				ns
E_{on}		T_j = 150 °C		7.2		mJ
$t_{d(off)}$		T_j = 150 °C				ns
t_f		T_j = 150 °C				ns
E_{off}		T_j = 150 °C		4.5		mJ
$R_{th(j-s)}$	per IGBT			0.4		K/W
IGBT2						
$V_{CE(sat)}$	I_C = 100 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.45	1.85	V
		T_j = 150 °C		1.70	2.10	V
V_{CE0}	chiplevel	T_j = 25 °C		0.90	1.00	V
		T_j = 150 °C		0.82	0.90	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		5.5	8.5	mΩ
		T_j = 150 °C		8.8	12	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1.6 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V, T_j = 25 °C				-	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		6.16		nF
C_{oes}		f = 1 MHz		0.384		nF
C_{res}		f = 1 MHz		0.183		nF
Q_G	V_{GE} = - 8 V...+ 15 V			800		nC
R_{Gint}	T_j = 25 °C			2.0		Ω
$t_{d(on)}$	V_{CE} = 300 V I_C = 100 A V_{GE} = +15/-15 V $R_{G\ on}$ = 2.5 Ω $R_{G\ off}$ = 2.5 Ω	T_j = 150 °C				ns
t_r		T_j = 150 °C				ns
E_{on}		T_j = 150 °C		2.2		mJ
$t_{d(off)}$		T_j = 150 °C				ns
t_f		T_j = 150 °C				ns
E_{off}		T_j = 150 °C		2.6		mJ
$R_{th(j-s)}$	per IGBT			1		K/W



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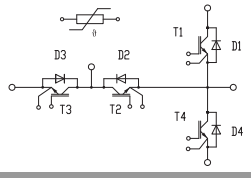

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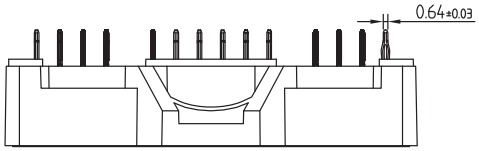
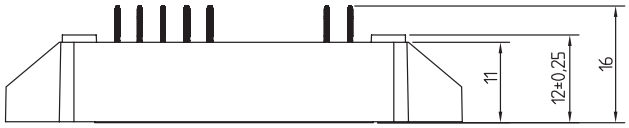
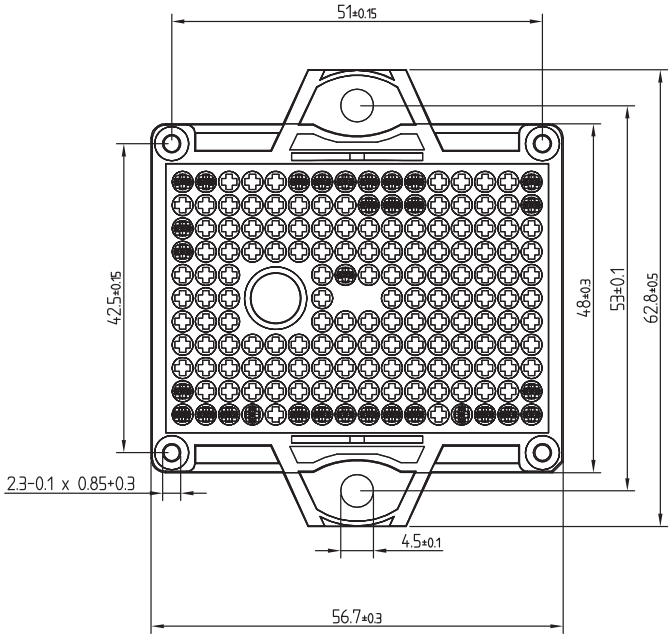
Characteristics

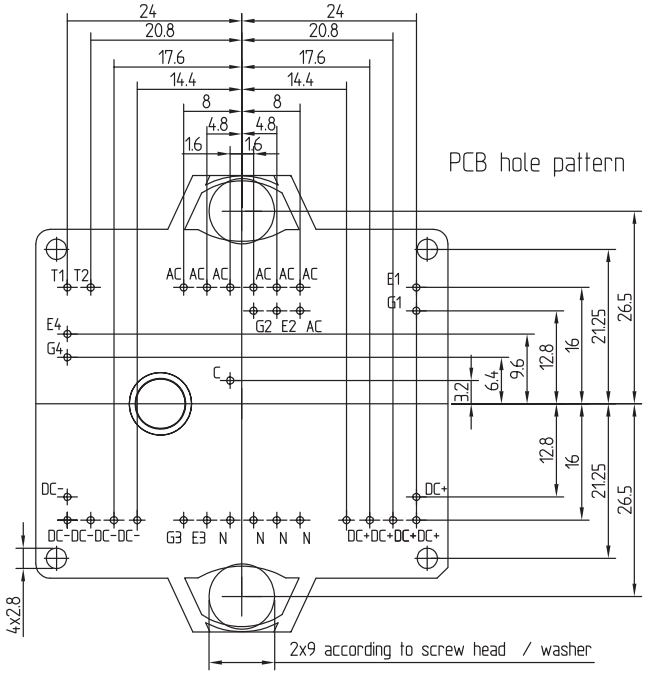
Symbol	Conditions		min.	typ.	max.	Unit
Diode1						
$V_F = V_{EC}$	I_F = 75 A	T_j = 25 °C		2.17	2.49	V
	chiplevel	T_j = 150 °C		2.11	2.42	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		12	13	mΩ
		T_j = 150 °C		16	18	mΩ
I_{RRM}	I_F = 75 A	T_j = 150 °C		-		A
Q_{rr}		T_j = 150 °C		-		µC
E_{rr}	V_{GE} = +15/-15 V	T_j = 150 °C		4		mJ
$R_{th(j-s)}$	per Diode			1.05		K/W
Diode2						
$V_F = V_{EC}$	I_F = 100 A	T_j = 25 °C		1.40	1.76	V
	chiplevel	T_j = 150 °C		1.38	1.77	V
V_{F0}	chiplevel	T_j = 25 °C		1.04	1.24	V
		T_j = 150 °C		0.85	0.99	V
r_F	chiplevel	T_j = 25 °C		3.6	5.3	mΩ
		T_j = 150 °C		5.3	7.8	mΩ
I_{RRM}	I_F = 100 A	T_j = 150 °C				A
Q_{rr}	V_R = 300 V	T_j = 150 °C				µC
E_{rr}	V_{GE} = +15/-15 V	T_j = 150 °C		2.6		mJ
$R_{th(j-s)}$	per Diode			1.15		K/W
Module						
L_{sCE1}				t.b.d.		nH
L_{CE}				t.b.d.		nH
$R_{CC'+EE'}$		T_s = 25 °C				mΩ
				t.b.d.		mΩ
M_s	to heatsink		2		2.1	Nm
M_t						Nm
						Nm
w				34		g
Temperature Sensor						
R_{100}	T_c=100°C (R_{25}=5 kΩ)			493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K

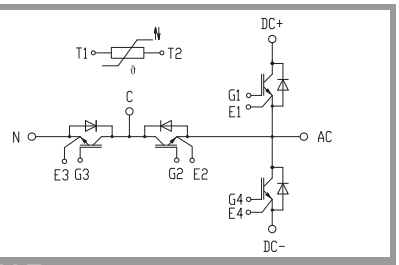






-Pin-Grid 3.2mm
-Tollerance of PCB hole pattern ⌖ 0.1
-Diameters of drill Ø1.15
and copper thickness in hole 25-50 µm





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

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