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SK80MLLE120CR03TE1



SEMITOP®E1

Double Boost + Bypass (Full SiC)

SK80MLLE120CR03TE1

Features*

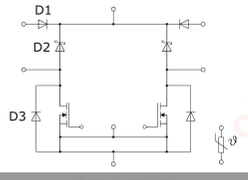
- Optimized design for superior thermal performance
- Extremely low inductance design
- Press-Fit contact technology
- 1200V Planar Gen3 SiC MOS
- Simple to drive with +15V gate voltage
- SiC Schottky diode
- New PEP diode technology for enhanced power and environmental robustness
- Integrated NTC temperature sensor
- UL recognized file no. E 63 532

Typical Applications

- Solar

Remarks

- Recommended $T_{j,op}$=-40 ...+150 °C
- Recommended turn-off / turn-on gate voltage V_{GS} = -4...0/+15V
- Diode1: Bypass and Protection Diodes D1 & D3
- Diode2: Boost SiC Diode D2



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
MOSFET 1				
V_{DSS}			1200	V
I_D	T_j = 175 °C	T_s = 25 °C	92	A
		T_s = 70 °C	77	A
I_{DM}	t_p limited by T_{vjmax}		240	A
V_{GS}	Transient Gate - Source voltage (t < 100ns)		-8 ... 19	V
T_j			-40 ... 175	°C
Integrated body diode				
I_{SM}	t_p limited by T_{vjmax}		240	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150°C		396	A

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 1				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_s = 25 °C	90	A
		T_s = 70 °C	70	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		350	A
i^2t	10 ms, sin 180°, T_j = 150 °C		612	A^2s
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_s = 25 °C	67	A
		T_s = 70 °C	54	A
I_{FRM}			80	A
I_{FSM}	8.3 ms sin 180°	T_j = 25 °C	140	A
		T_j = 150 °C	112	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	$\Delta T_{terminal}$ at PCB joint = 30 K, per pin	30	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC, sinusoidal, t = 1 min	2500	V

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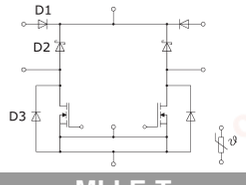
- Recommended $T_{j,op}$=-40 ...+150 °C
- Recommended turn-off / turn-on gate voltage V_{GS} = -4...0/+15V
- Diode1: Bypass and Protection Diodes D1 & D3
- Diode2: Boost SiC Diode D2

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
MOSFET 1						
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 23 mA, T_j = 25 °C		1.8	2.5	3.6	V
I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V, T_j = 25 °C				0.2	mA
I_{GSS}	V_{DS} = 0 V, V_{GS} = 15 V, T_j = 25 °C				400	nA
$R_{DS(on)}$	V_{GS} = 15 V, I_D = 83 A, chiplevel	T_j = 25 °C		16	22	mΩ
		T_j = 150 °C		25		mΩ
C_{iss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			6800		pF
C_{oss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			260		pF
C_{rss}	V_{GS} = 0 V, V_{DS} = 1000 V, f = 0.1 MHz			20		pF
R_{Gint}	T_j = 25 °C			5		Ω
Q_G	V_{DD} = 800 V, V_{GS} = -4 V ... 15 V, I_D = 83 A			236		nC
$t_{d(on)}$	V_{DD} = 600 V, V_{GS} = 15/-4 V, I_D = 80 A, R_{Gon} = 0.5 Ω, R_{Goff} = 0.5 Ω, di/dt$_{off}$ = 5.7 kA/µs, di/dt$_{on}$ = 5.4 kA/µs, dv/dt = 48 kV/µs	T_j = 150 °C		33		ns
$t_{d(off)}$		T_j = 150 °C		76		ns
t_r		T_j = 150 °C		16		ns
t_f		T_j = 150 °C		16		ns
E_{on}		T_j = 150 °C		0.44		mJ
E_{off}		T_j = 150 °C		0.55		mJ
$R_{th(j-s)}$	per MOSFET, HPTP / HP-PCM			0.57		K/W
Integrated body diode						
$V_F = V_{SD}$	$-I_D$ = 41 A, V_{GS} = -4 V, chiplevel	T_j = 25 °C		4.58		V
		T_j = 150 °C		4.30		V
$V_{F0} = V_{SD0}$	chiplevel	T_j = 25 °C		3.80		V
		T_j = 150 °C		3.60		V
$r_F = r_{SD}$	chiplevel	T_j = 25 °C		19		mΩ
		T_j = 150 °C		17		mΩ
t_{rr}	V_{DD} = 600 V, $-I_D$ = 80 A, V_{GS} = -4 V	T_j = 150 °C		-		ns
Q_{rr}		T_j = 150 °C		-		µC
I_{rr}		T_j = 150 °C		-		A
E_{rr}	di/dt$_{off}$ = 5.7 kA/µs	T_j = 150 °C		-		mJ

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	I_F = 40 A	T_j = 25 °C		1.07	1.33	V
	chiplevel	T_j = 150 °C		0.98	1.26	V
V_{F0}	chiplevel	T_j = 25 °C		0.89	1.09	V
		T_j = 150 °C		0.73	0.92	V
r_F	chiplevel	T_j = 25 °C		4.5	6.1	mΩ
		T_j = 150 °C		6.3	8.6	mΩ
I_R	T_j = 150 °C, V_{RRM}				2	mA
$R_{th(j-s)}$	per Diode, HPTP / HP-PCM			0.97		K/W



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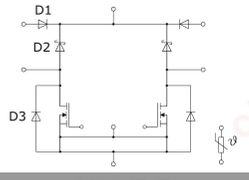
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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 2						
V_F	I_F = 40 A	T_j = 25 °C		1.40	1.60	V
	chiplevel	T_j = 150 °C		1.80	2.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.95	1.05	V
		T_j = 150 °C		0.83	0.90	V
r_F	chiplevel	T_j = 25 °C		11	14	mΩ
		T_j = 150 °C		24	30	mΩ
C_j	V_R = 800 V, f = 1 MHz, T_j = 25 °C			0.170		nF
Q_c	V_R = 800 V, di/dt_{off} = 500 A/µs, T_j = 25 °C			0.13		µC
$R_{th(j-s)}$	per Diode, HPTP / HP-PCM			0.73		K/W

Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
Module					
L_{CE}			10		nH
M_s	to heatsink	1.6		2.3	Nm
w	weight		25		g

Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
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

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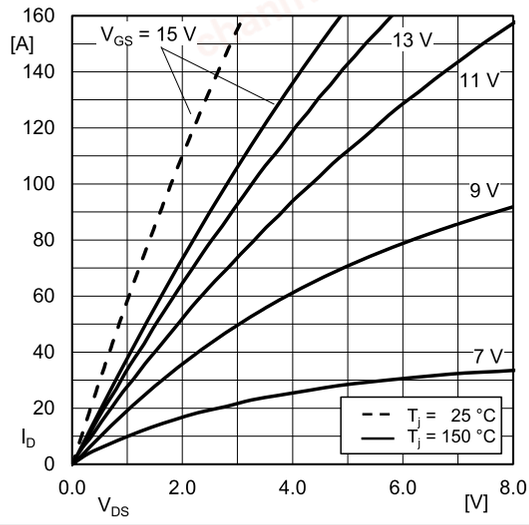


Fig.1: Typ. MOSFET forward output characteristic, incl. $R_{DD'+SS'}$

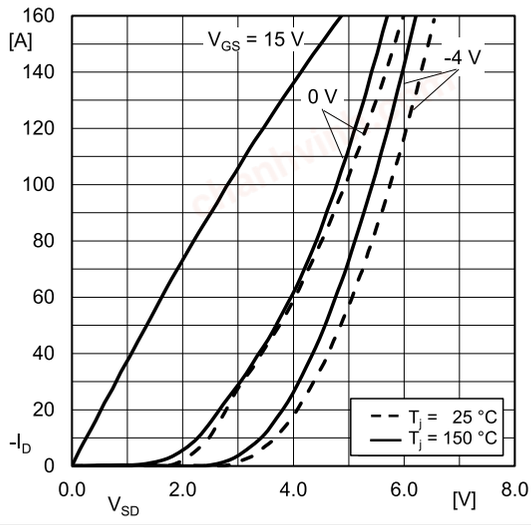


Fig. 1a: Typ. MOSFET reverse output characteristics, incl. $R_{DD'+SS'}$

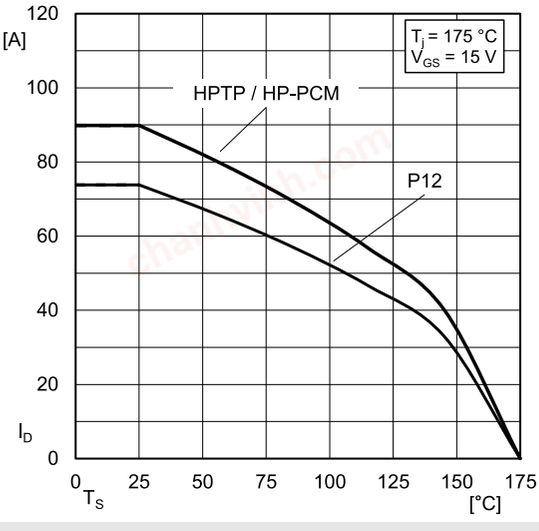


Fig. 2: MOSFET Rated current vs. Temperature $I_c=f(T_s)$

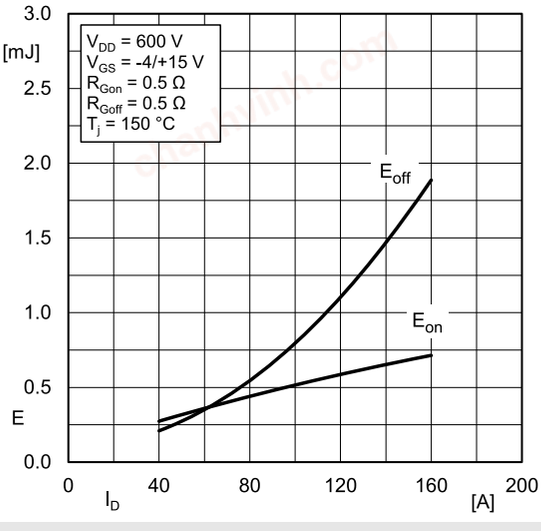


Fig. 3: Typ. MOSFET switching energy E = f (I_D)

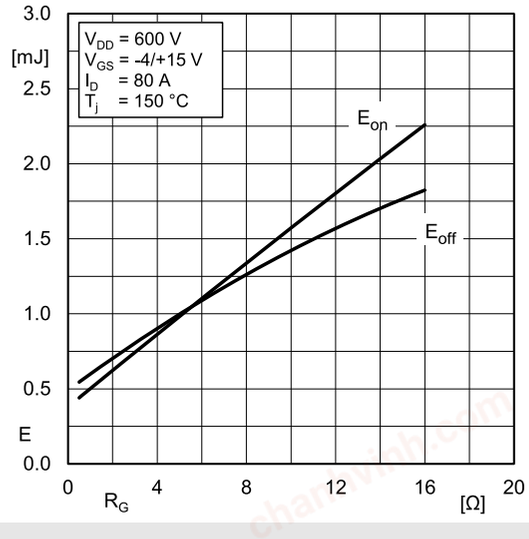


Fig. 4a: Typ. MOSFET switching energy E = f (R_G)

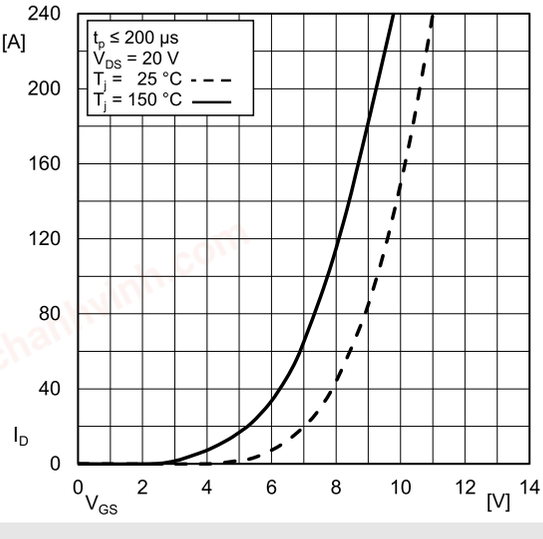


Fig. 5: Typ. MOSFET transfer characteristic

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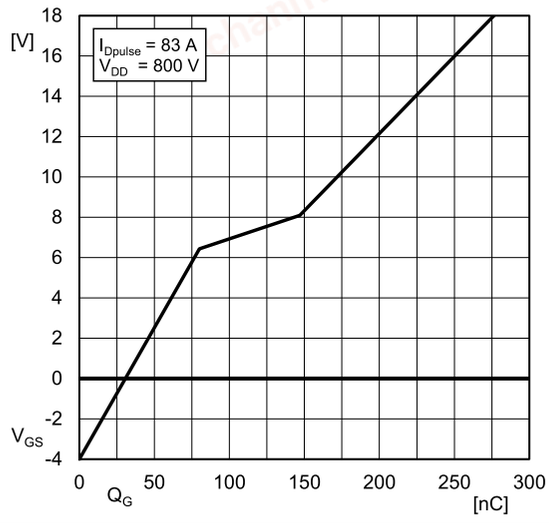


Fig. 6: Typ. MOSFET gate charge characteristic

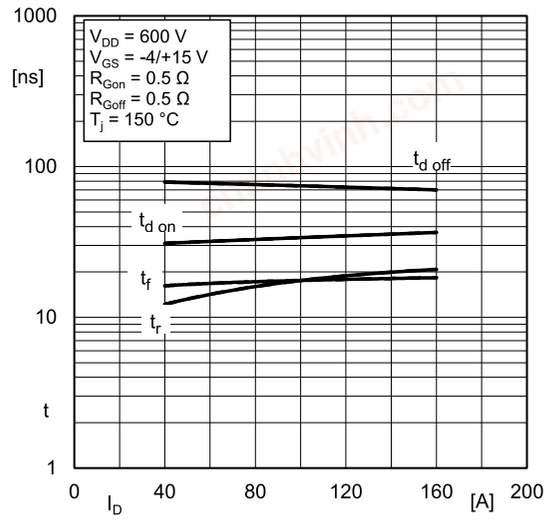


Fig. 7: Typ. MOSFET switching times t = f (I_D)

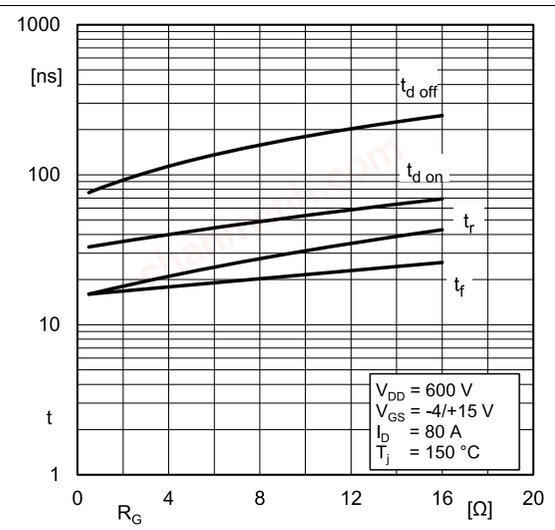


Fig. 8: Typ. MOSFET switching times t = f (R_G)

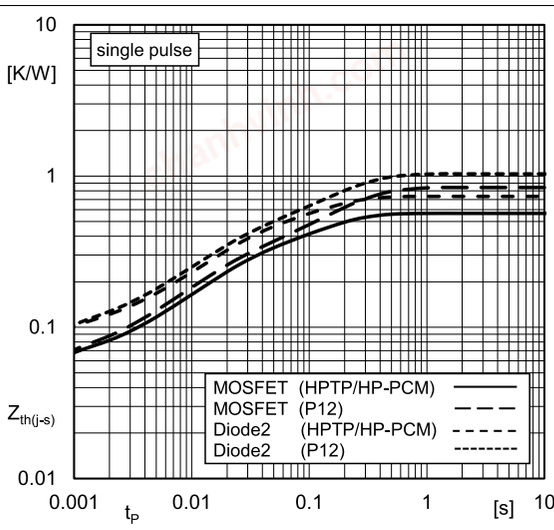


Fig. 9: Typ. transient thermal impedance

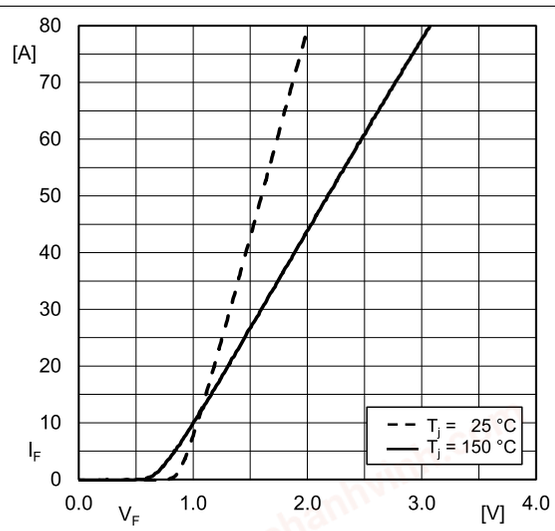


Fig. 10: Typ. Diode2 forward characteristic, incl. $R_{CC'+EE'}$

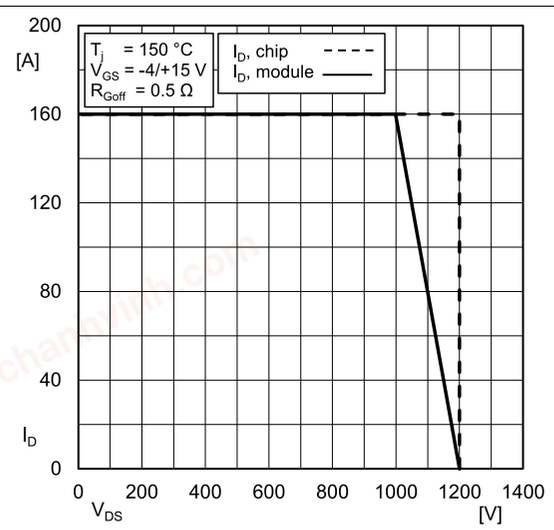


Fig. 13: MOSFET Reverse Bias Safe Operating Area (RBSOA)

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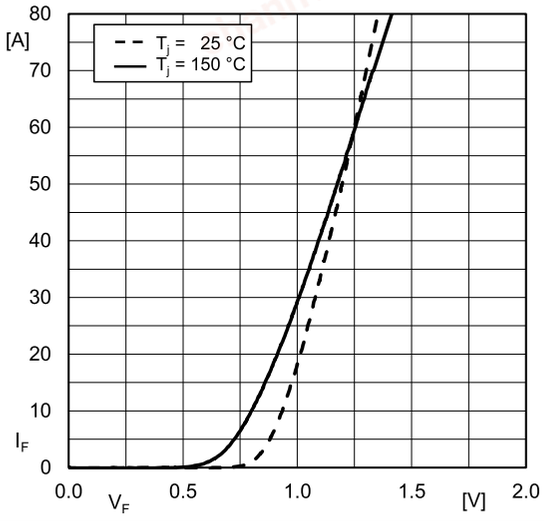
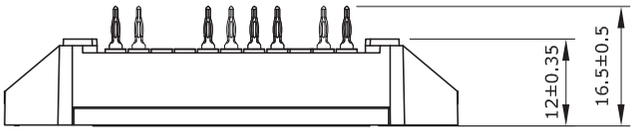


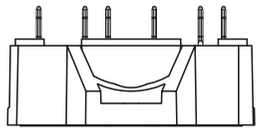
Fig. 14: Typ. Diode1 forward characteristic, incl. $R_{CC'+EE'}$

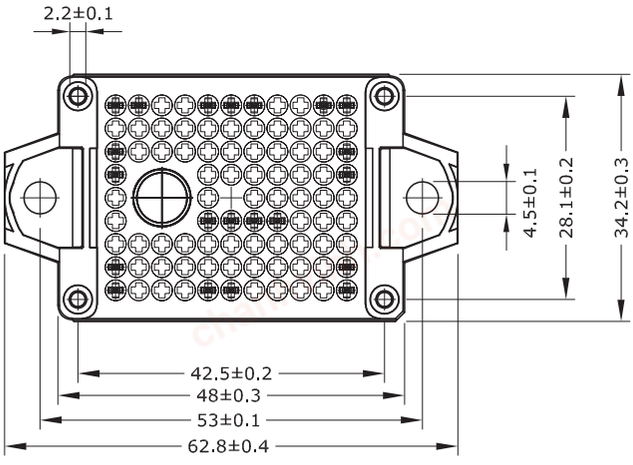
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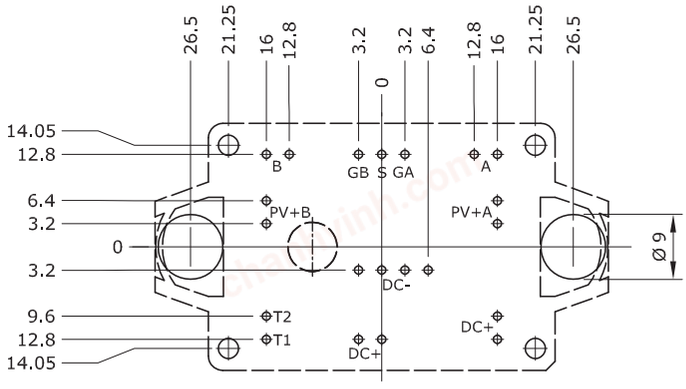
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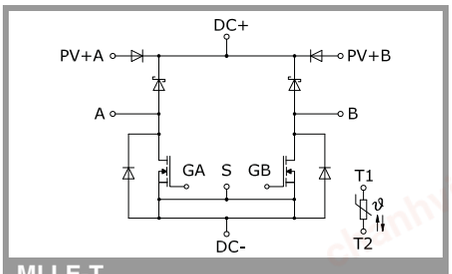






- Pin-Grid 3.2 mm
- Tolerance of PCB hole pattern ⌖ Ø0.1
- Diameters of drill ∅ 1.15mm
- Copper thickness in hole 25 - 50 µm
- Hole specification for contacts:
  refer to SEMITOP E1/E2 Mounting Instruction

SEMITOP®E1



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IMPORTANT INFORMATION AND WARNINGS

This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

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