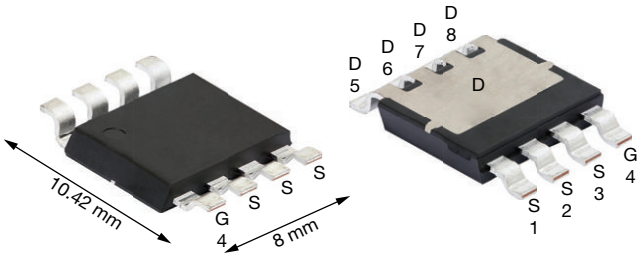
Automotive N-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® 8 x 8LR



Top View Bottom View

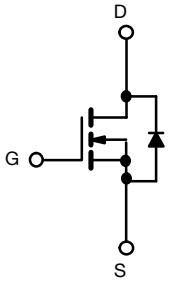
FEATURES

- TrenchFET® Gen IV power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Thin 1.6 mm package
- Very low thermal resistance
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.00065
I_D (A) [e]	413
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK 8 x 8LR
Lead (Pb)-free and halogen-free	SQJQ140ER (for detailed order number please see www.vishay.com/doc?79776)

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current [e]	T_C = 25 °C	I_D	413	A
	T_C = 125 °C		238	
Continuous source current (diode conduction) [e]		I_S	194	
Pulsed drain current [a, e]		I_{DM}	1653	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	84	
Single pulse avalanche energy		E_{AS}	352	mJ
Maximum power dissipation [e]	T_C = 25 °C	P_D	214	W
	T_C = 125 °C		71	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [b]	R_{thJA}	44	°C/W
Junction-to-case (drain) [d]		R_{thJC}	0.7	

Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %

b. When mounted on 1" square PCB (FR4 material)

c. See solder profile (www.vishay.com/doc?73257). The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection

d. As per JESD51-14

e. Values based on R_{thJC} and T_C of 25 °C. Actual values achievable will be dependent on the thermal characteristics of the complete system

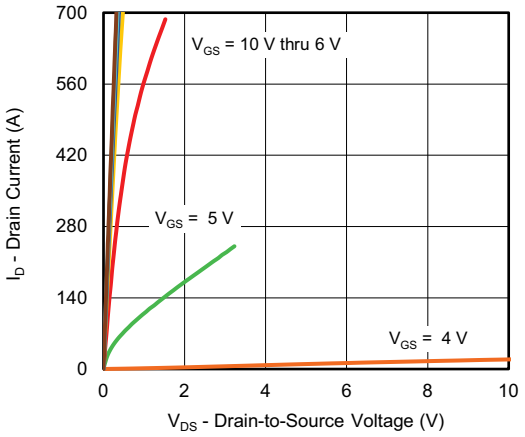
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.3	2.7	3.3	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 40 V	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = 40 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 40 V, T_J = 175 °C	-	-	150	
On-state drain current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	100	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A	-	0.00057	0.00065	Ω
		V_{GS} = 10 V	I_D = 20 A, T_J = 125 °C	-	-	0.0012	
		V_{GS} = 10 V	I_D = 20 A, T_J = 175 °C	-	-	0.0015	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 80 A		-	160	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	13 160	18 424	pF
Output capacitance	C_{oss}			-	3768	5276	
Reverse transfer capacitance	C_{rss}			-	226	317	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 20 V, I_D = 40 A	-	192	288	nC
Gate-source charge [c]	Q_{gs}			-	58	-	
Gate-drain charge [c]	Q_{gd}			-	39	-	
Gate resistance	R_g	f = 1 MHz		1.7	1.6	2.7	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 0.5 Ω I_D ≅ 40 A, V_{GEN} = 10 V, R_g = 1 Ω		-	24	36	ns
Rise time [c]	t_r			-	27	41	
Turn-off delay time [c]	$t_{d(off)}$			-	60	90	
Fall time [c]	t_f			-	26	39	
Source-Drain Diode Ratings and Characteristics [b]							
Reverse recovery time	t_{rr}	V_{DD} = 32 V, I_{FM} = 20 A, di/dt = 100 A/µs		-	88	176	ns
Reverse recovery charge	Q_{rr}			-	184	368	nC
Reverse recovery current	I_{RM}			-	-3.7	-	A
Pulsed current [a]	I_{SM}			-	-	776	A
Forward voltage	V_{SD}	I_F = 50 A, V_{GS} = 0		-	0.8	1.1	V

Notes

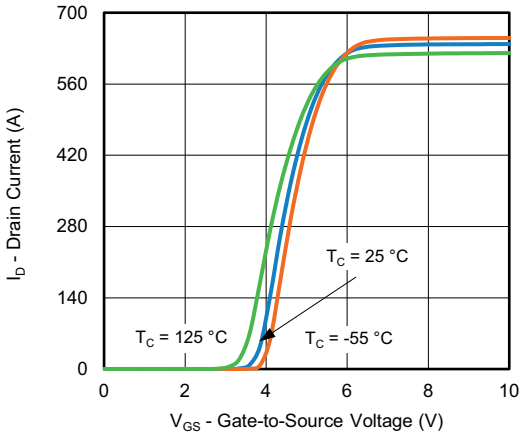
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

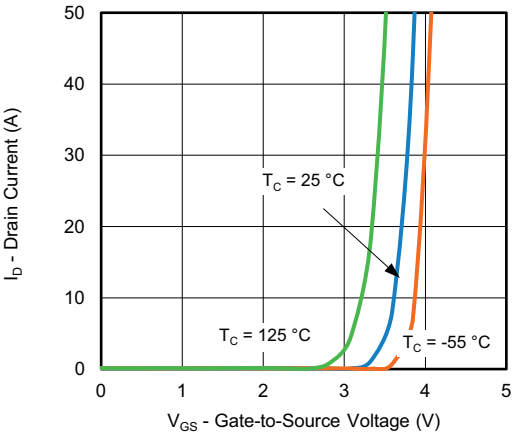
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



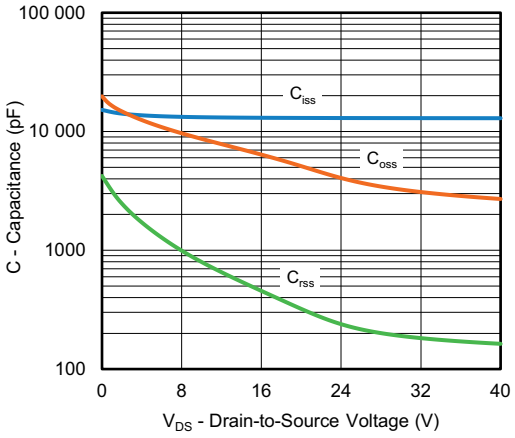
Output Characteristics



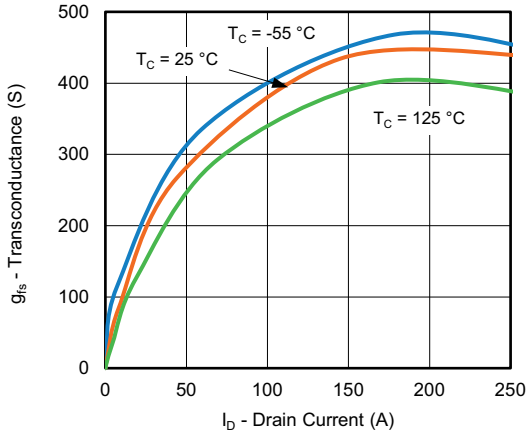
Transfer Characteristics



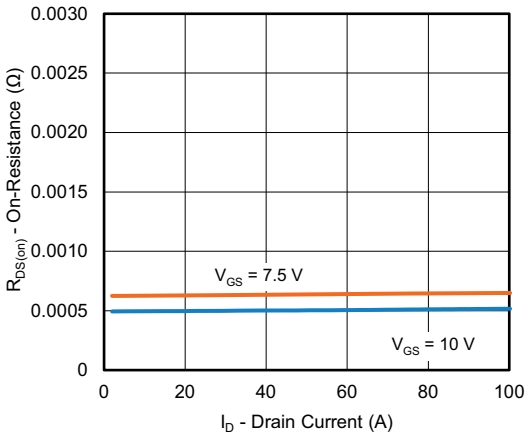
Transfer Characteristics



Capacitance

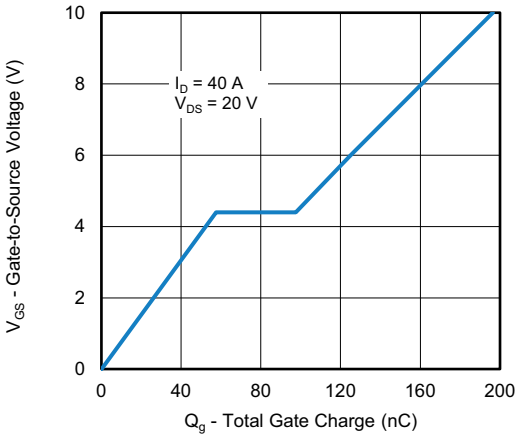


Transconductance

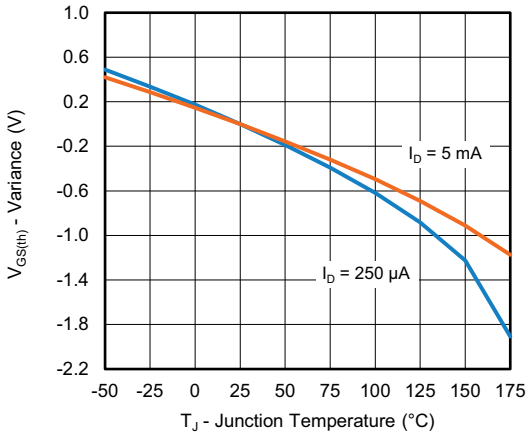


On-Resistance vs. Drain Current

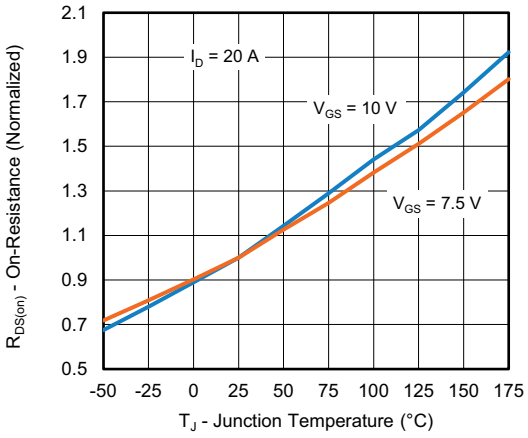
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



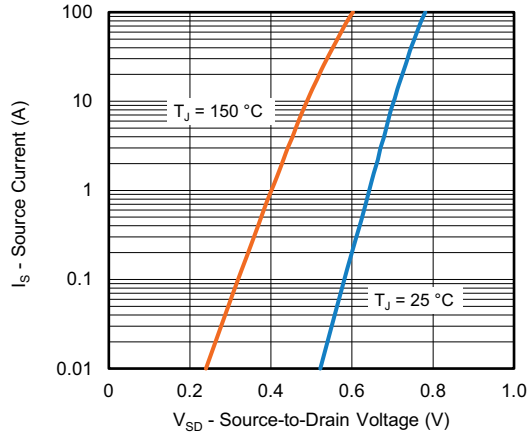
Gate Charge



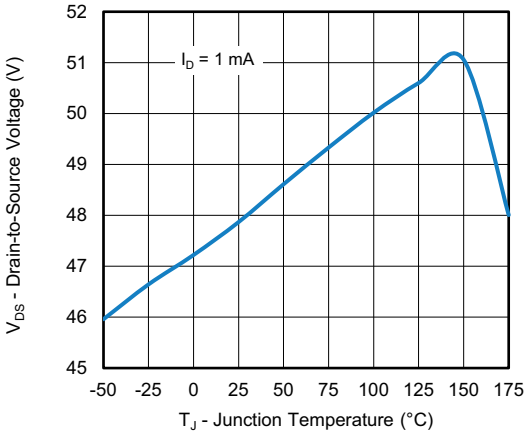
Threshold Voltage



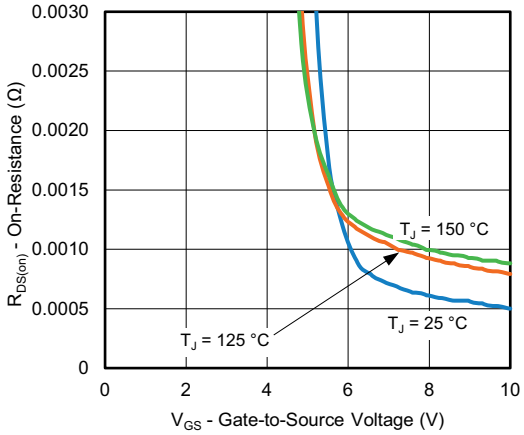
On-Resistance vs. Junction Temperature



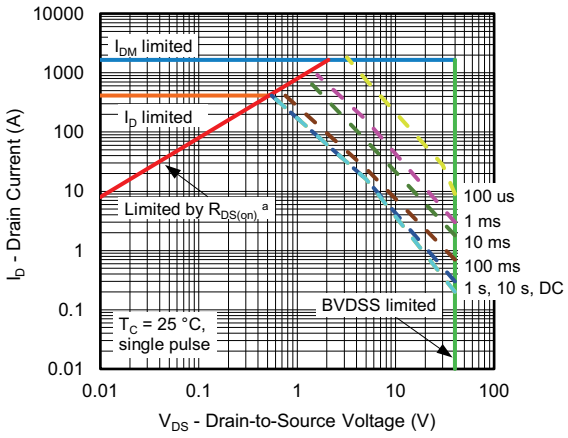
Source Drain Diode Forward Voltage



Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

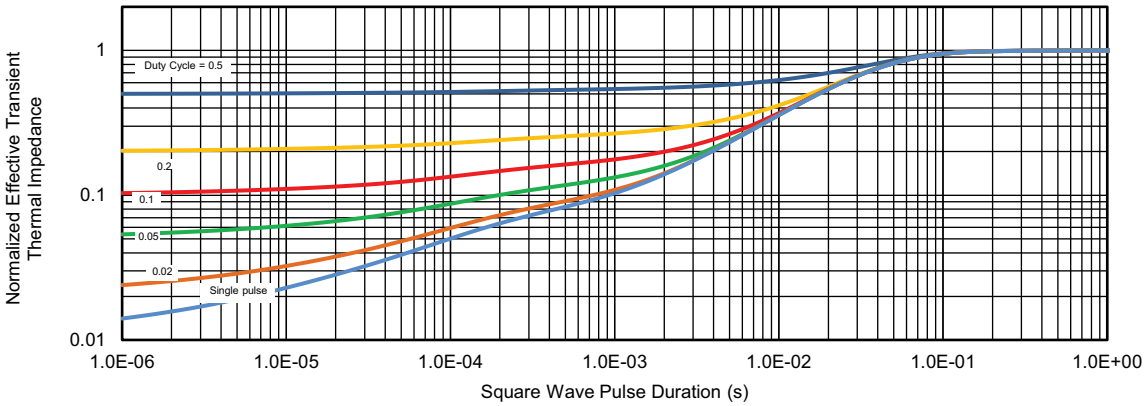


Safe Operating Area

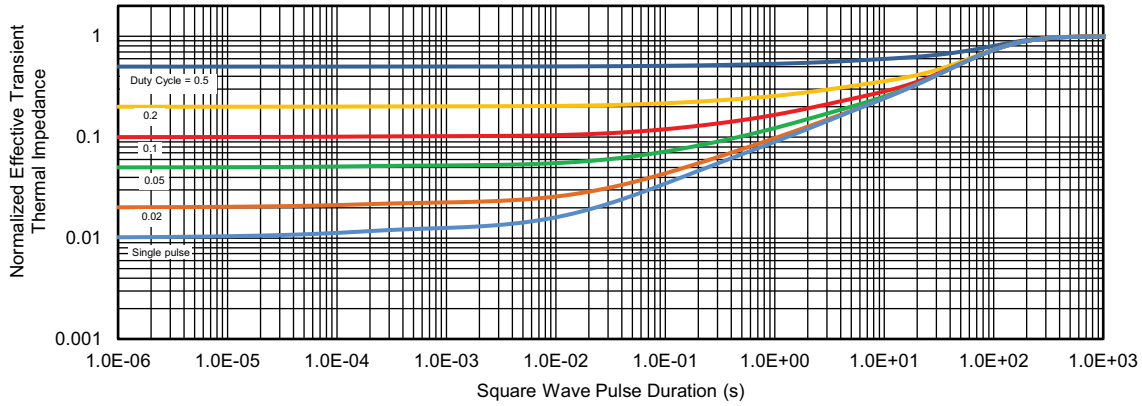
Note

a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Ambient

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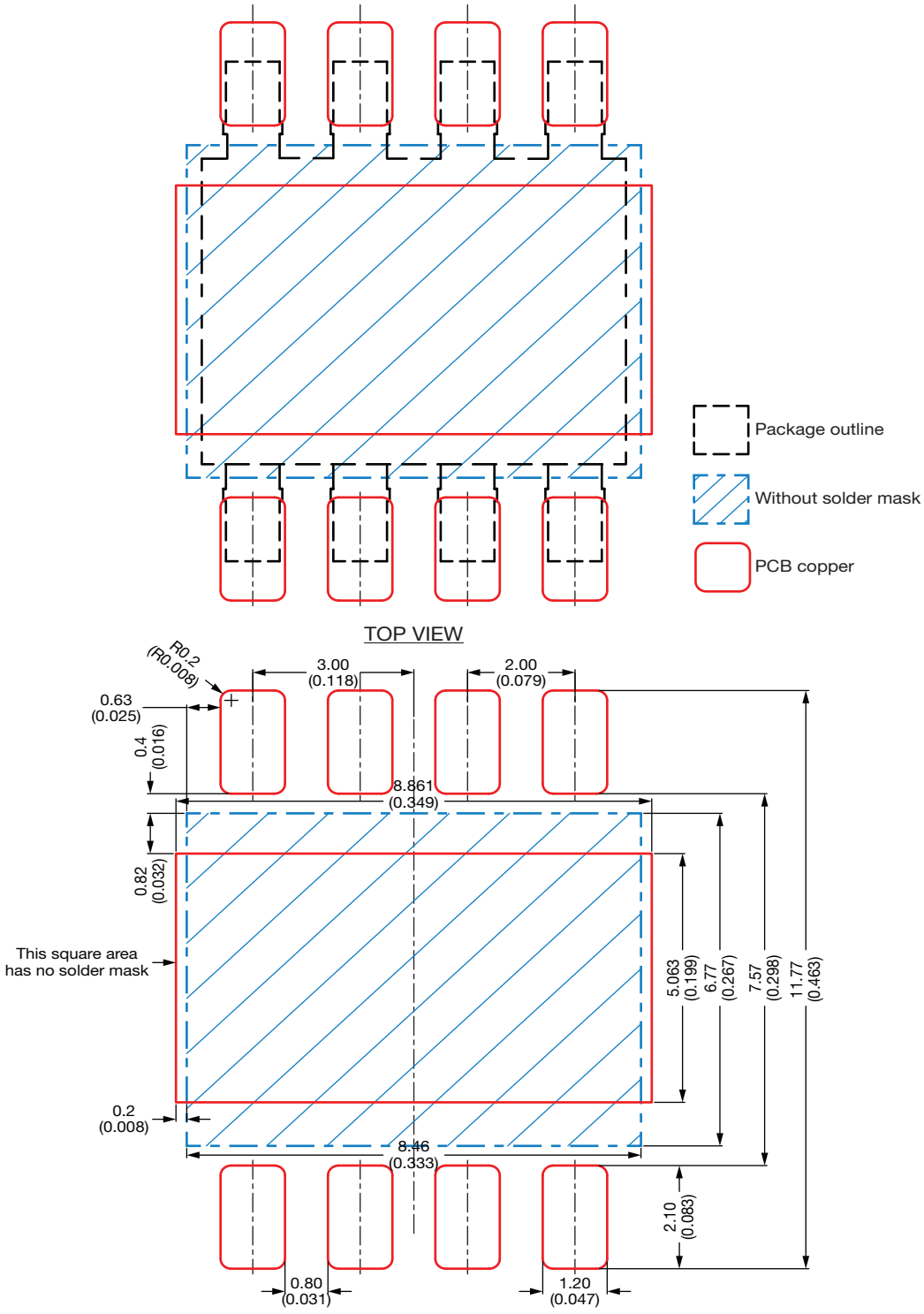
Recommended Land Pattern PowerPAK® 8 x 8LR



Notes

- This land pattern is for reference
- Proposed stencil thickness 200 µm
- All dimensions are in millimeter (inches)

ECN: C23-0461-Rev. B, 17-Apr-2023
DWG: 3002

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