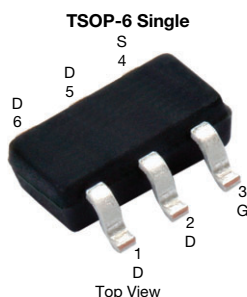


P-Channel 20 V (D-S) MOSFET



Marking code: BQ

PRODUCT SUMMARY	
V_{DS} (V)	-20
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -4.5$ V	0.0240
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -2.5$ V	0.0321
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -1.8$ V	0.0511
Q_g typ. (nC)	19.8
I_D (A) ^{a, d}	-8
Configuration	Single

ORDERING INFORMATION	
Package	TSOP-6
Lead (Pb)-free and halogen-free	Si3493DDV-T1-GE3
Alternate manufacturing location	Si3493DDV-T1-BE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	-20	V	
Gate-source voltage	V_{GS}	± 8		
Continuous drain current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	-8 ^a	A	
	$T_C = 70^\circ\text{C}$	-8		
	$T_A = 25^\circ\text{C}$	-7.5 ^{b, c}		
	$T_A = 70^\circ\text{C}$	-6 ^{b, c}		
Pulsed drain current ($t = 100\ \mu\text{s}$)	I_{DM}	-32		
Continuous source-drain diode current	$T_C = 25^\circ\text{C}$	-3		
	$T_A = 25^\circ\text{C}$	-1.67 ^{b, c}		
Single pulse avalanche current	$L = 0.1\ \text{mH}$	-10		
Single pulse avalanche energy	E_{AS}	5	mJ	
Maximum power dissipation	$T_C = 25^\circ\text{C}$	3.6	W	
	$T_C = 70^\circ\text{C}$	2.3		
	$T_A = 25^\circ\text{C}$	2 ^{b, c}		
	$T_A = 70^\circ\text{C}$	1.3 ^{b, c}		
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	$t \leq 5\ \text{s}$	R_{thJA}	50	62.5
Maximum junction-to-case (drain)	Steady state	R_{thJC}	28	35

Notes

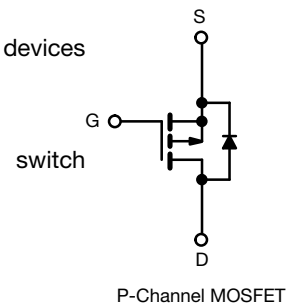
- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 5\ \text{s}$
- Maximum under steady state conditions is 110 $^\circ\text{C}/\text{W}$

FEATURES

- TrenchFET[®] Gen III p-channel power MOSFET
- $R_{DS(on)}$ rating at $V_{GS} = -1.8\ \text{V}$
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

APPLICATIONS

- Battery management in mobile devices
- Battery switch
- Load switch
- PA



RoHS
COMPLIANT
HALOGEN
FREE

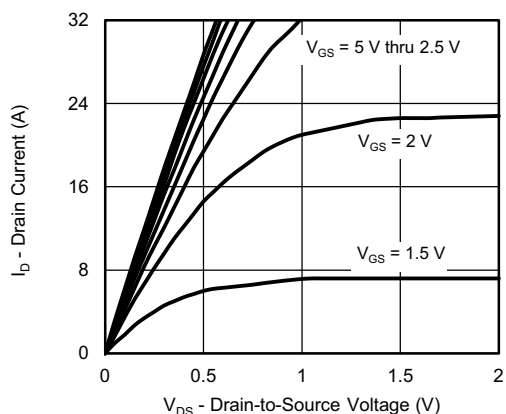
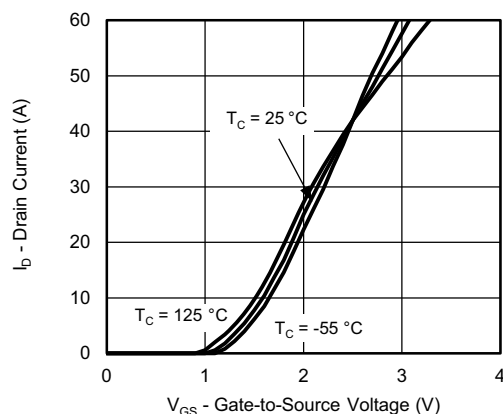
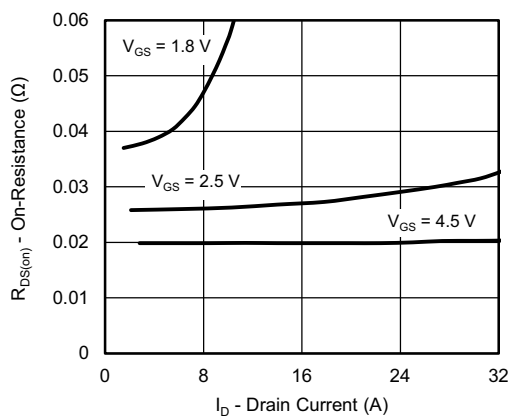
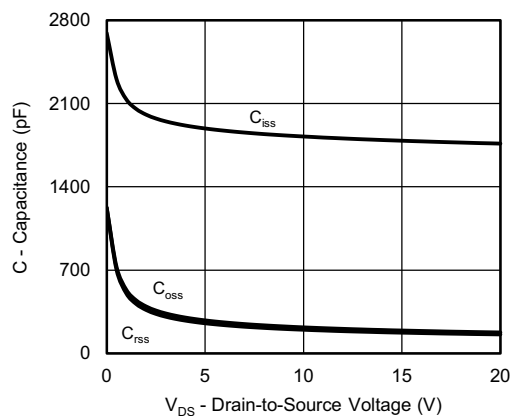
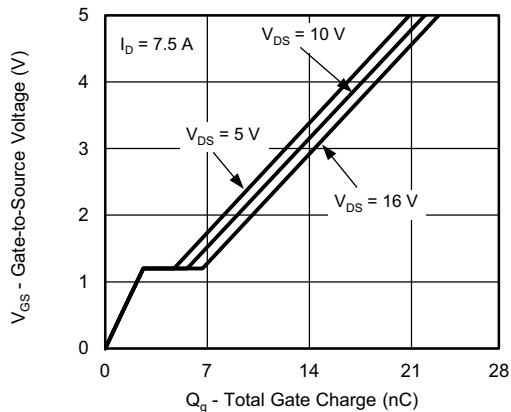
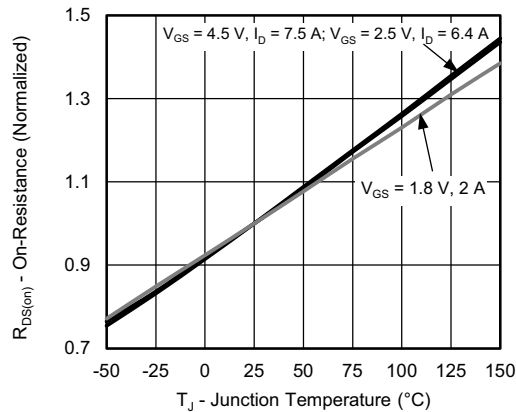


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = -250 μA	-20	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = -250 μA	-	-12	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	2.5	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =-250 μA	-0.4	-	-1	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V	-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = -20 V, V _{GS} = 0 V	-	-	-1	μA
		V _{DS} = -20 V, V _{GS} = 0 V, T _J = 70 °C	-	-	-10	
On-state drain current ^a	I _{D(on)}	V _{DS} ≥ -10 V, V _{GS} = -4.5 V	-20	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -4.5 V, I _D = -7.5 A	-	0.0200	0.0240	Ω
		V _{GS} = -2.5 V, I _D = -6.4 A	-	0.0257	0.0321	
		V _{GS} = -1.8 V, I _D = -2 A	-	0.0378	0.0511	
Forward transconductance ^a	g _{fs}	V _{DS} = -10 V, I _D = -7.5 A	-	30	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	-	1825	-	pF
Output capacitance	C _{oss}		-	210	-	
Reverse transfer capacitance	C _{rss}		-	200	-	
Total gate charge	Q _g	V _{DS} = -10 V, V _{GS} = -8 V, I _D = -7.5 A	-	34.8	52.2	nC
		V _{DS} = -10 V, V _{GS} = -4.5 V, I _D = -7.5 A	-	19.8	30	
Gate-source charge	Q _{gs}		-	2.6	-	
Gate-drain charge	Q _{gd}		-	3	-	
Gate resistance	R _g	f = 1 MHz	2.12	10.6	21.2	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = -10 V, R _L = 1.67 Ω, I _D ≅ -6 A, V _{GEN} = -4.5 V, R _g = 1 Ω	-	25	38	ns
Rise time	t _r		-	30	45	
Turn-off delay time	t _{d(off)}		-	95	145	
Fall time	t _f		-	40	60	
Turn-on delay time	t _{d(on)}	V _{DD} = -10 V, R _L = 1.67 Ω, I _D ≅ -6 A, V _{GEN} = -8 V, R _g = 1 Ω	-	8	16	
Rise time	t _r		-	20	30	
Turn-off delay time	t _{d(off)}		-	115	173	
Fall time	t _f		-	40	60	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	-8	A
Pulse diode forward current	I _{SM}		-	-	-32	
Body diode voltage	V _{SD}	I _S = -6 A, V _{GS} = 0 V	-	-0.8	-1.2	V
Body diode reverse recovery time	t _{rr}	I _F = -6 A, di/dt = 100 A/μs, T _J = 25 °C	-	21	32	ns
Body diode reverse recovery charge	Q _{rr}		-	9	18	nC
Reverse recovery fall time	t _a		-	9	-	ns
Reverse recovery rise time	t _b		-	12	-	

Notes

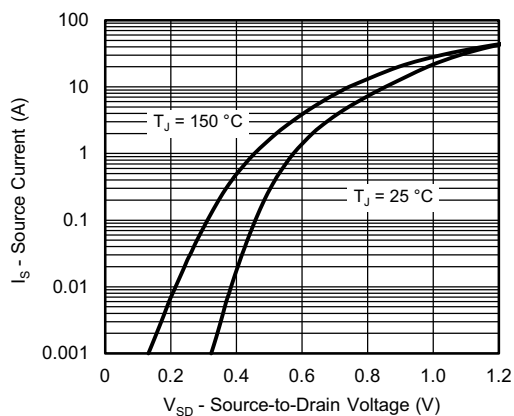
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing

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.

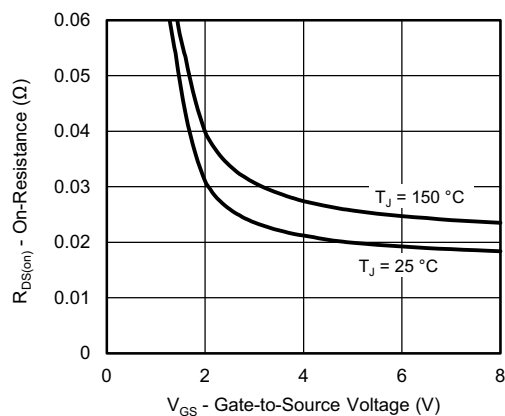
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature



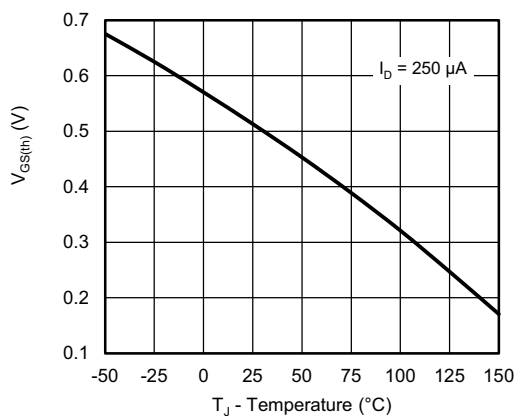
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



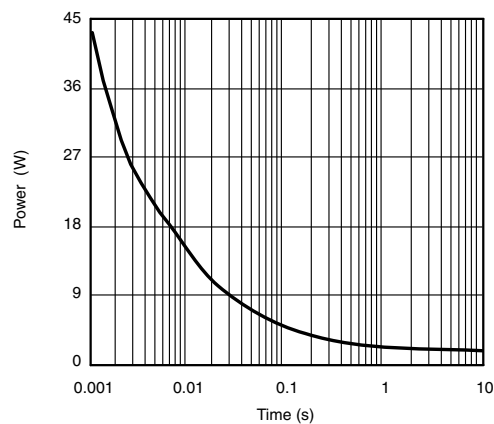
Source-Drain Diode Forward Voltage



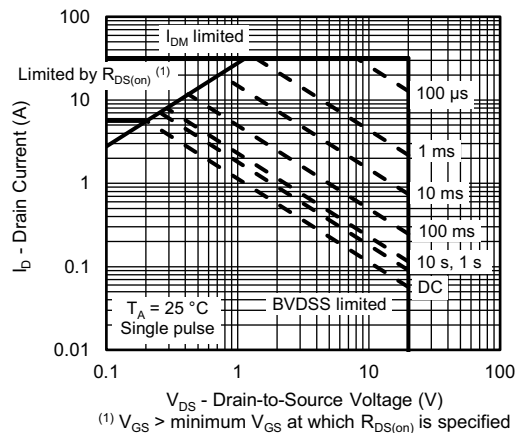
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



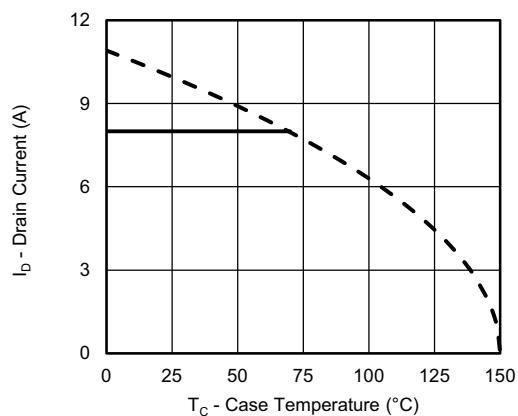
Single Pulse Power, Junction-to-Ambient



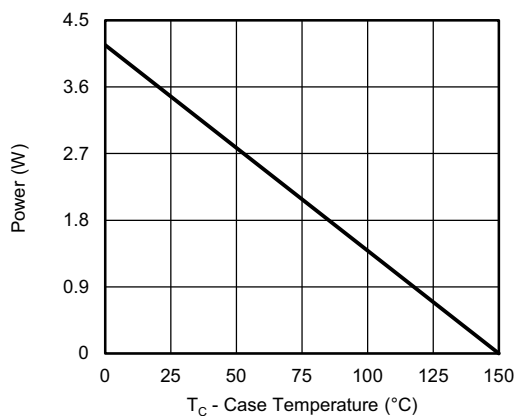
Safe Operating Area, Junction-to-Ambient



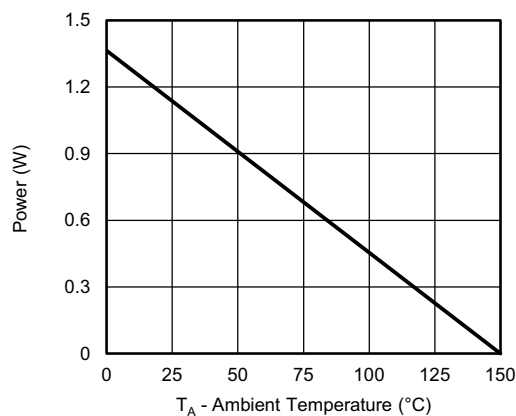
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



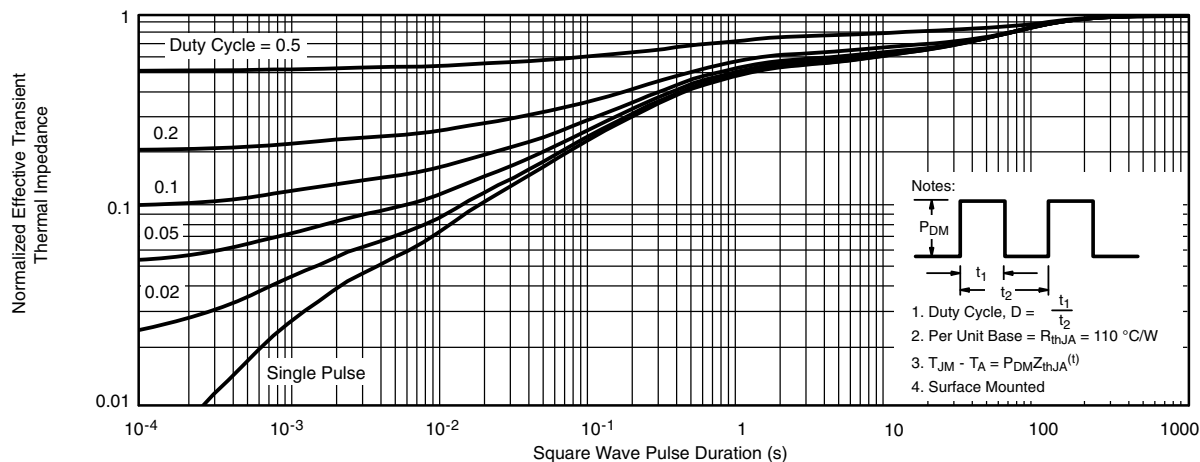
Power, Junction-to-Ambient

Note

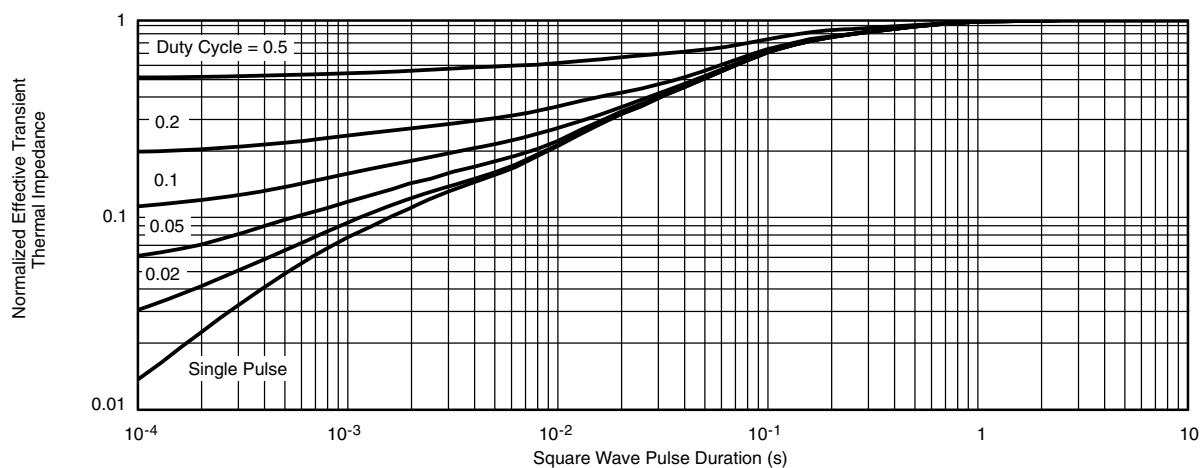
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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TSOP: 5/6-LEAD

JEDEC Part Number: MO-193C



5-LEAD TSOP



6-LEAD TSOP



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A ₁	0.01	-	0.10	0.0004	-	0.004
A ₂	0.90	-	1.00	0.035	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E ₁	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e ₁	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L ₁	0.60 Ref			0.024 Ref		
L ₂	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ ₁	7° Nom			7° Nom		
ECN: C-06593-Rev. I, 18-Dec-06						
DWG: 5540						

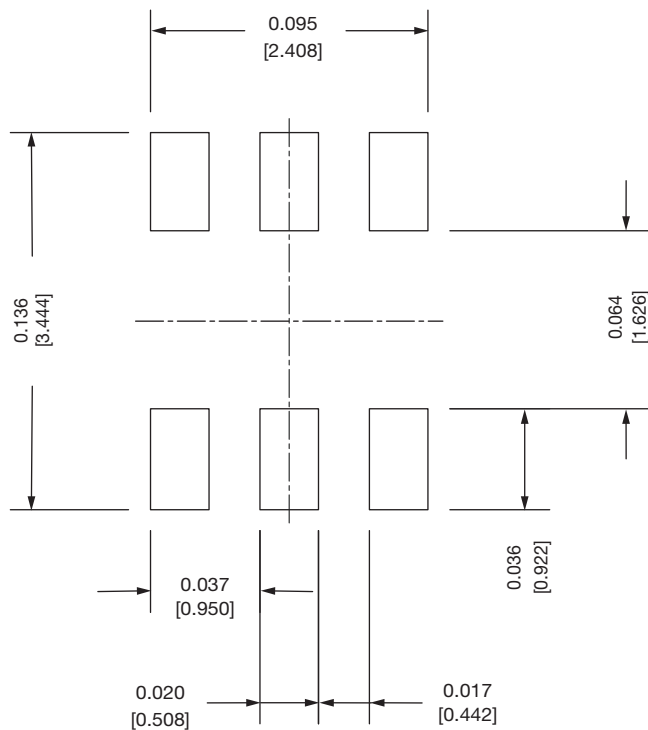
Recommended Land Pattern For TSOP-5L / TSOP-6L



TSOP 5L



TSOP 6L


Note

- All dimensions are in inches (millimeter)

ECN: C22-0860-Rev. B, 24-Oct-2022
DWG: 3010



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