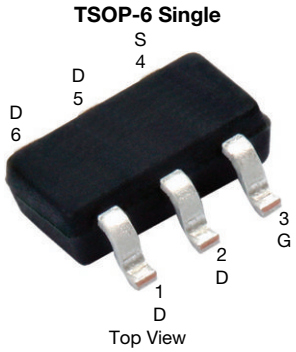
Automotive P-Channel 40 V (D-S) 175 °C MOSFET



Marking Code: 9L

FEATURES

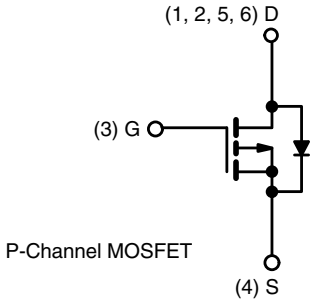
- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE



PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.058
$R_{DS(on)}$ (Ω) at V_{GS} = -4.5 V	0.092
I_D (A)	-6.9
Configuration	Single

ORDERING INFORMATION	
Package	TSOP-6
Lead (Pb)-free and halogen-free	SQ3419CEV (for detailed order number please see www.vishay.com/doc?79771)

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	T_C = 25 °C	I_D	-6.9	A
	T_C = 125 °C		-4	
Continuous source current (diode conduction)		I_S	-6.3	
Pulsed drain current [a]		I_{DM}	-27	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	-16.5	
Single pulse avalanche energy		E_{AS}	13.6	mJ
Maximum power dissipation	T_C = 25 °C	P_D	5	W
	T_C = 125 °C		1.6	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Junction-to-ambient	PCB mount [b]	R_{thJA}	110	°C/W
Junction-to-foot (drain)		R_{thJF}	30	

Notes

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

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

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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 V, I_D = -250 µA		-40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA		-1.5	-2.0	-2.5	
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	-10	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = -10 V	I_D = -2.5 A	-	0.048	0.058	Ω
		V_{GS} = -10 V	I_D = -2.5 A, T_J = 125 °C	-	0.075	-	
		V_{GS} = -10 V	I_D = -2.5 A, T_J = 175 °C	-	0.086	-	
		V_{GS} = -4.5 V	I_D = -2 A	-	0.076	0.092	
Forward transconductance [b]	g_{fs}	V_{DS} = -20 V, I_D = -4 A		-	8	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = -20 V, f = 1 MHz	-	745	990	pF
Output capacitance	C_{oss}			-	134	180	
Reverse transfer capacitance	C_{rss}			-	83	100	
Total gate charge [c]	Q_g	V_{GS} = -4.5 V	V_{DS} = -20 V, I_D = -4 A	-	8.35	11.3	nC
Gate-source charge [c]	Q_{gs}			-	2.9	-	
Gate-drain charge [c]	Q_{gd}			-	4.0	-	
Gate resistance	R_g	f = 1 MHz		2.6	5.7	7.9	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 5 Ω $I_D \cong$ -4 A, V_{GEN} = -10 V, R_g = 1 Ω		-	8	12	ns
Rise time [c]	t_r			-	24	36	
Turn-off delay time [c]	$t_{d(off)}$			-	26	39	
Fall time [c]	t_f			-	31	47	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}			-	-	-27	A
Forward voltage	V_{SD}	I_F = -1.6 A, V_{GS} = 0 V		-	-0.8	-1.2	V
Body diode reverse recovery time	t_{rr}	I_F = -3 A, di/dt = 100 A/µs		-	24	48	ns
Body diode reverse recovery charge	Q_{rr}			-	23	46	nC
Reverse recovery fall time	t_a			-	16	-	ns
Reverse recovery rise time	t_b			-	8	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-2.17	-	A

Notes

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

b. Guaranteed by design, not subject to production testing

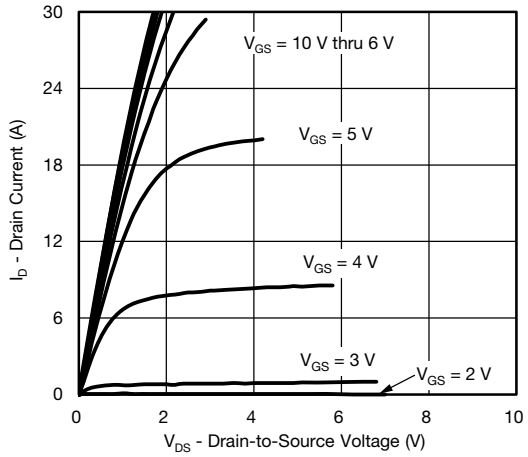
c. Independent of operating temperature

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.

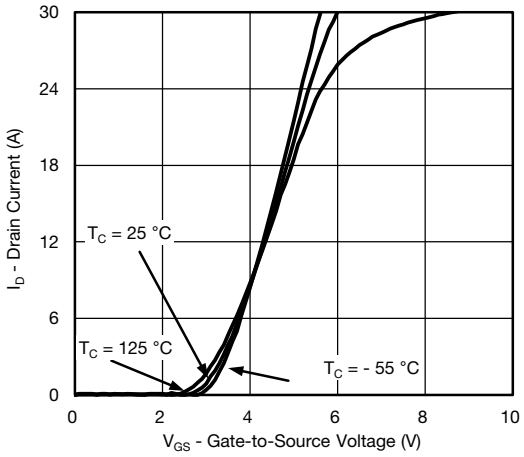
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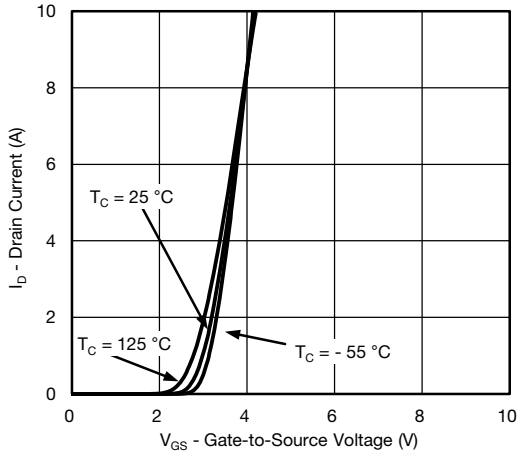
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



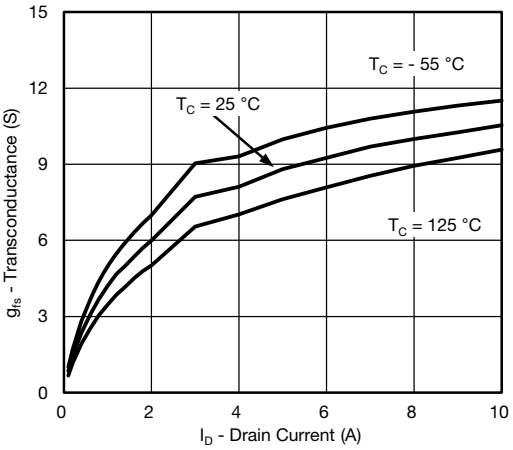
Output Characteristics



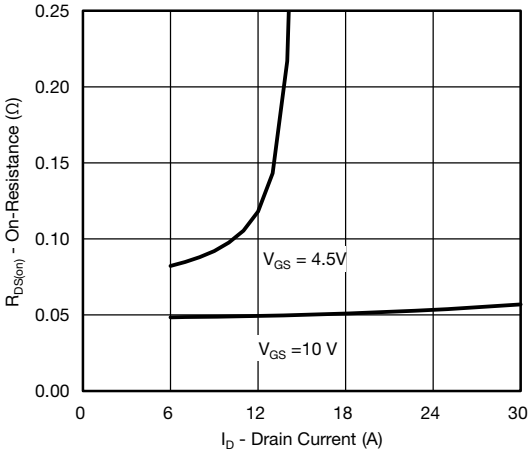
Transfer Characteristics



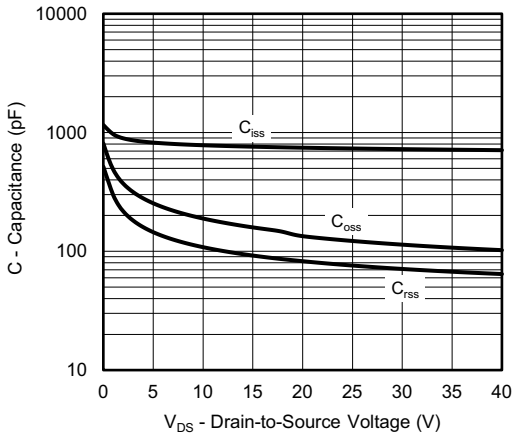
Transfer Characteristics



Transconductance



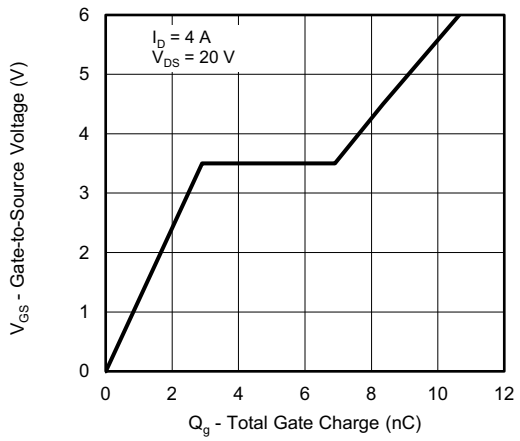
On-Resistance vs. Drain Current



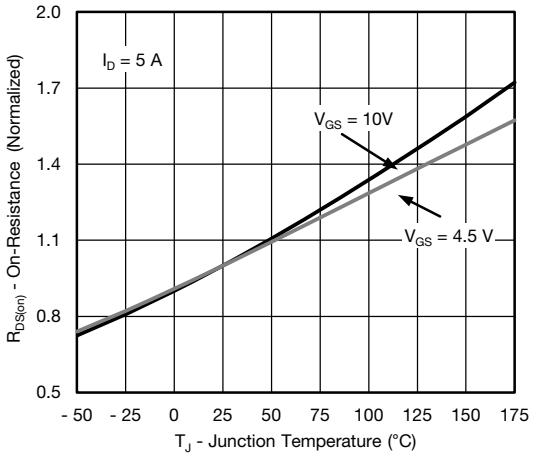
Capacitance

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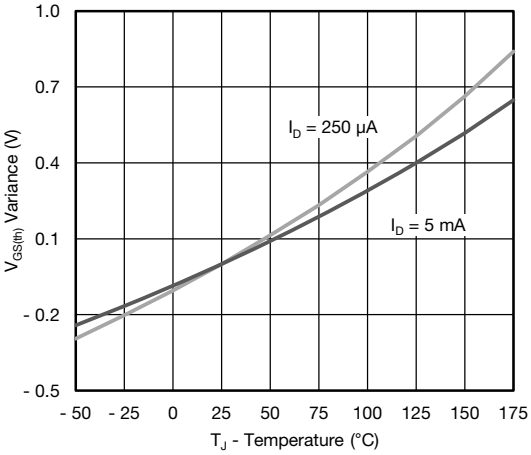
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



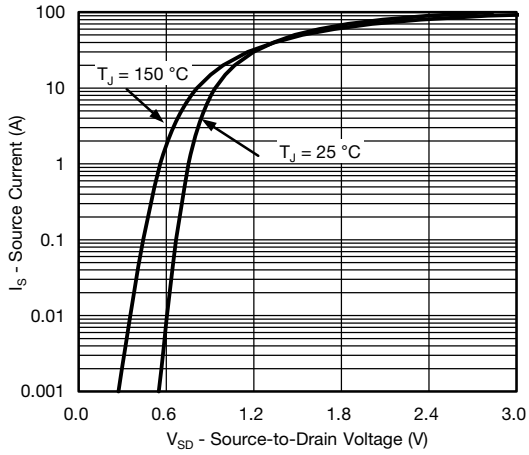
Gate Charge



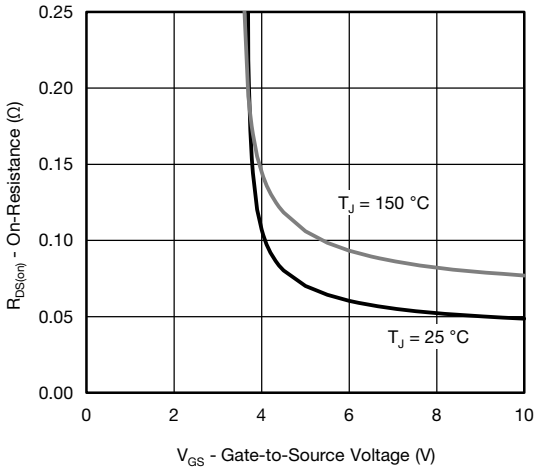
On-Resistance vs. Junction Temperature



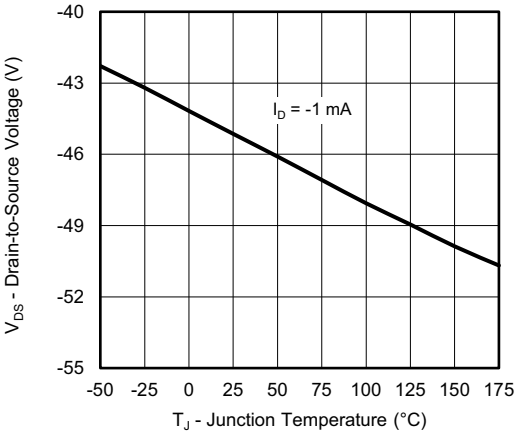
Threshold Voltage



Source Drain Diode Forward Voltage



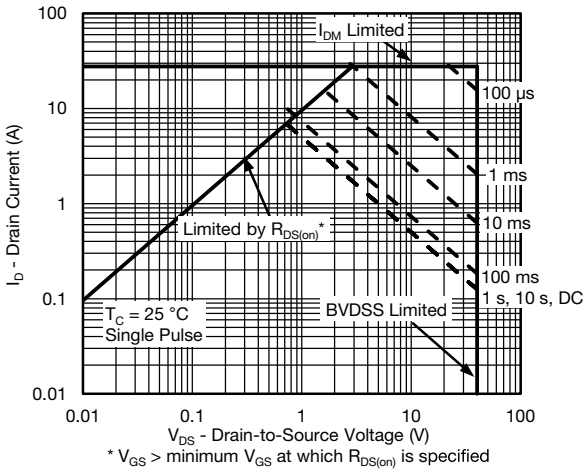
On-Resistance vs. Gate-to-Source Voltage



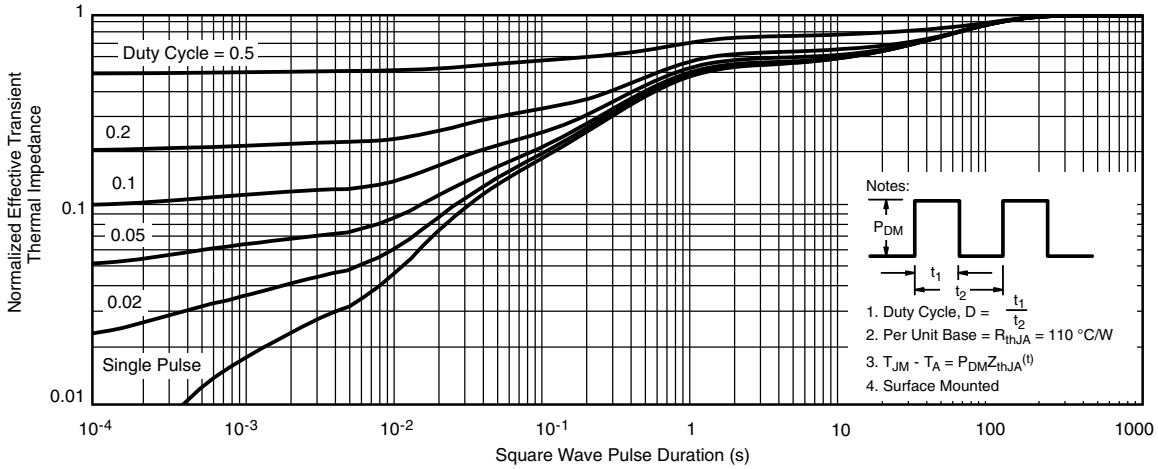
Drain Source Breakdown vs. Junction Temperature

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



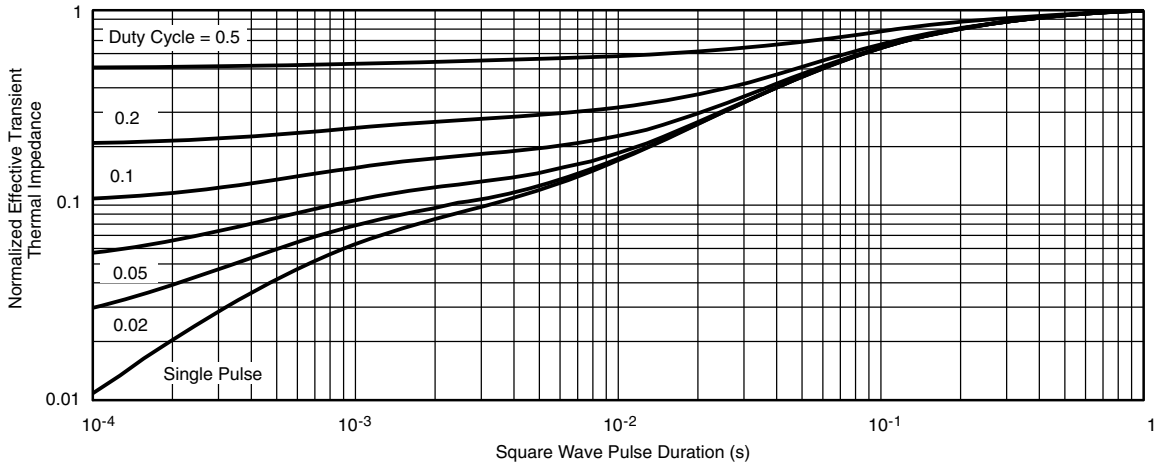
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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



Normalized Thermal Transient Impedance, Junction-to-Foot

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

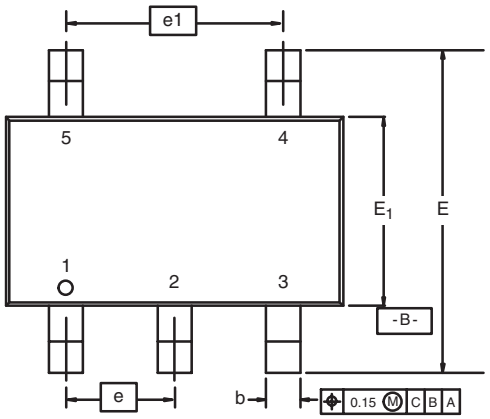
  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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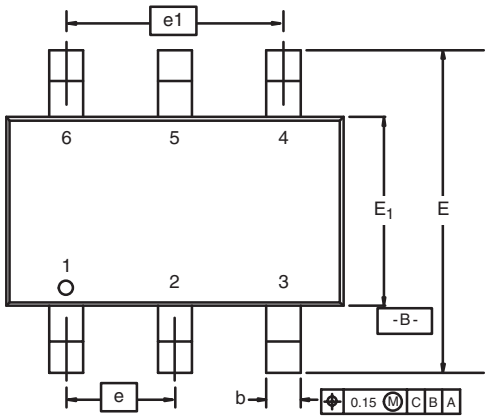
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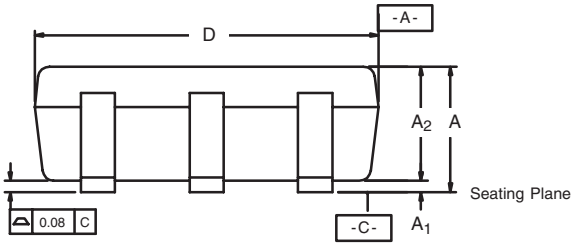
TSOP: 5/6–LEAD
JEDEC Part Number: MO-193C

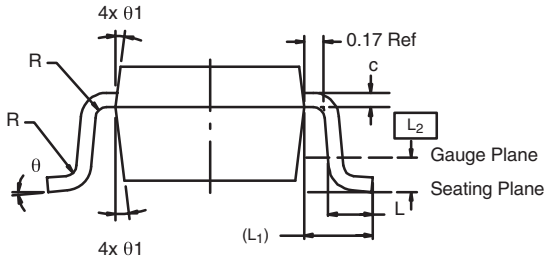


5-LEAD TSOP



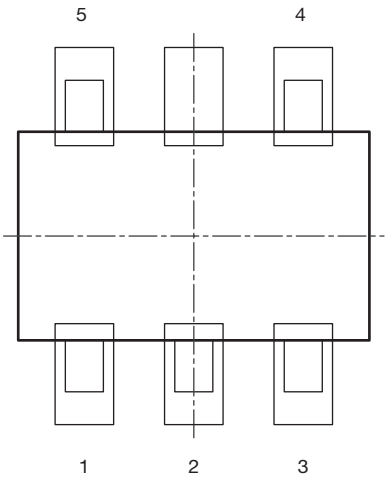
6-LEAD TSOP



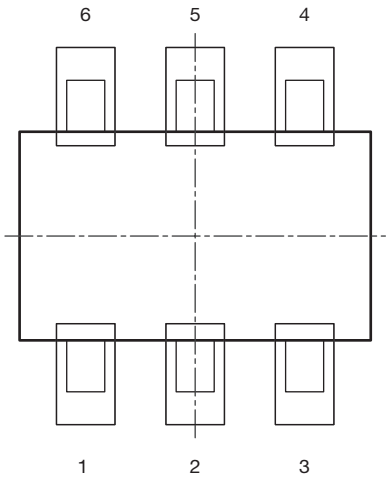


Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A_1	0.01	-	0.10	0.0004	-	0.004
A_2	0.90	-	1.00	0.035	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E_1	1.55	1.65	1.70	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						

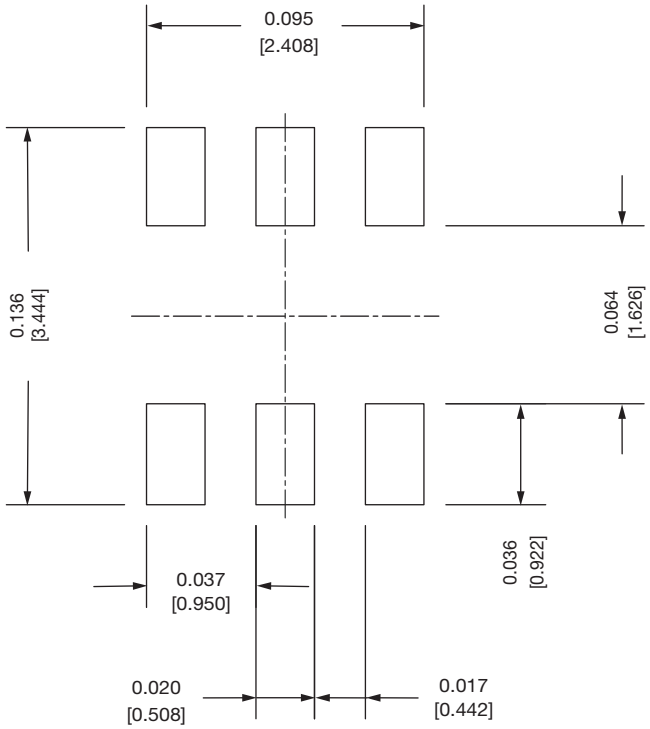
Recommended Land Pattern For TSOP-5L / TSOP-6L



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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