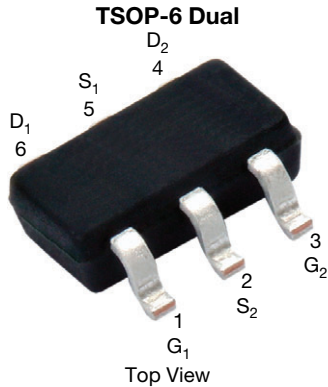


Automotive Dual P-Channel 30 V (D-S) 175 °C MOSFET



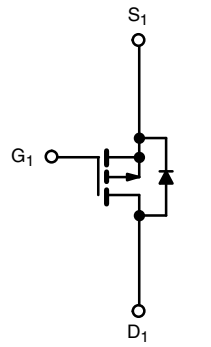
Marking code: 9B

PRODUCT SUMMARY	
V_{DS} (V)	-30
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	-0.155
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	-0.300
I_D (A)	-2.32
Configuration	Dual

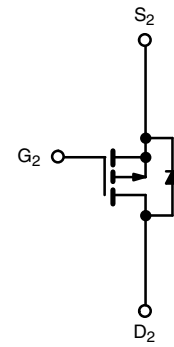
FEATURES

- 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


RoHS
 COMPLIANT
 HALOGEN
FREE


P-Channel MOSFET



P-Channel MOSFET

ORDERING INFORMATION	
Package	TSOP-6
Lead (Pb)-free and halogen-free	SQ3989EV (for detailed order number please see www.vishay.com/doc?79771)

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-30	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current ($T_J = 150$ °C) ^a	$T_C = 25$ °C	I_D	-2.5	A
	$T_C = 125$ °C		-1.5	
Pulsed drain current		I_{DM}	-10.2	
Continuous source current (diode conduction) ^a		I_S	-2.1	
Maximum power dissipation ^a	$T_C = 25$ °C	P_D	1.67	W
	$T_C = 125$ °C		0.56	
Unclamped inductive surge UIS		I_{AV}	-7	A
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Maximum junction-to-ambient ^a	Steady state	R_{thJA}	150	°C/W
Maximum junction-to-foot (drain)	Steady state	R_{thJF}	90	

Note

a. Surface mounted on 1" x 1" FR4 board



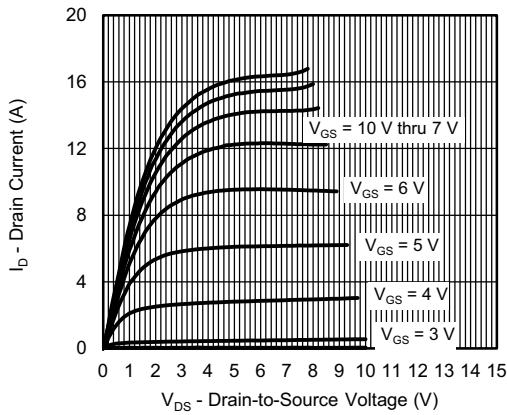
SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$		-0.6	-	-1.5	V
Gate-body leakage	I_{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{GS} = 0 \text{ V}$	$V_{DS} = -30 \text{ V}$	-	-	-1	μA
		$V_{GS} = 0 \text{ V}$	$V_{DS} = -30 \text{ V}, T_J = 55^\circ\text{C}$	-	-	-5	
On-state drain current ^a	$I_{D(on)}$	$V_{GS} = -10 \text{ V}$	$V_{DS} \leq -5 \text{ V}$	-4	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = -10 \text{ V}$	$I_D = -0.4 \text{ A}$	-	0.140	0.155	Ω
		$V_{GS} = -4.5 \text{ V}$	$I_D = -0.2 \text{ A}$	-	0.265	0.300	
Forward transconductance ^a	g_{fs}	$V_{DS} = -5 \text{ V}, I_D = -1 \text{ A}$		-	2.2	-	S
Diode forward voltage ^a	V_{SD}	$I_S = -0.5 \text{ A}, V_{GS} = 0 \text{ V}$		-	-0.83	-1.1	V
Dynamic ^b							
Total gate charge	Q_g	$V_{GS} = -10 \text{ V}$	$V_{DS} = -15 \text{ V}, I_D = -3 \text{ A}$	-	8.6	11.1	nC
Gate-source charge	Q_{gs}			-	1.2	-	
Gate-drain charge	Q_{gd}			-	3	-	
Gate resistance	R_g	$f = 1 \text{ MHz}$		2.5	-	7.2	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10 \text{ V}, R_L = 10 \Omega$ $I_D \cong -1 \text{ A}, V_{GEN} = -10 \text{ V}, R_g = 1 \Omega$		-	5.7	8	ns
Rise time	t_r			-	3	4	
Turn-off delay time	$t_{d(off)}$			-	13.8	18	
Fall time	t_f			-	2	3	

Notes

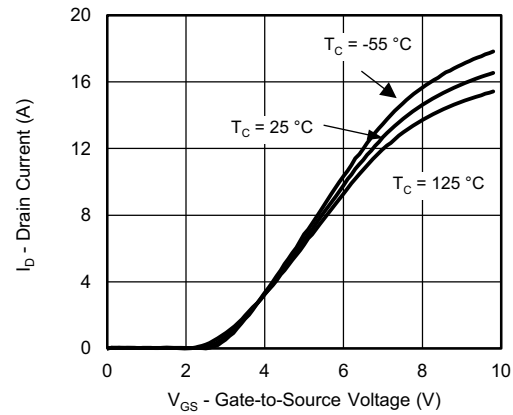
- a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing

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.

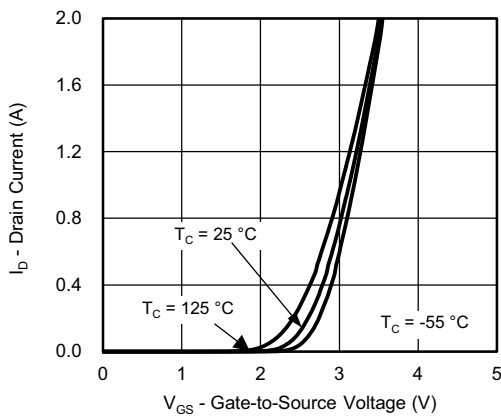
TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)



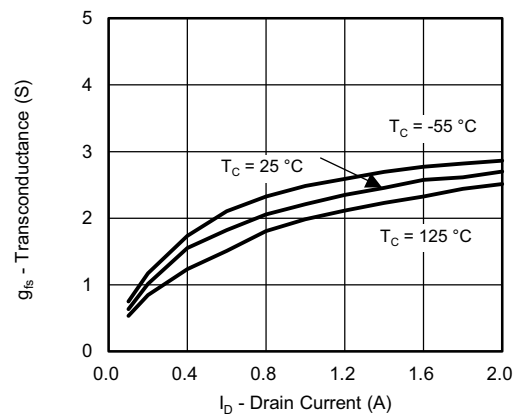
Output Characteristics



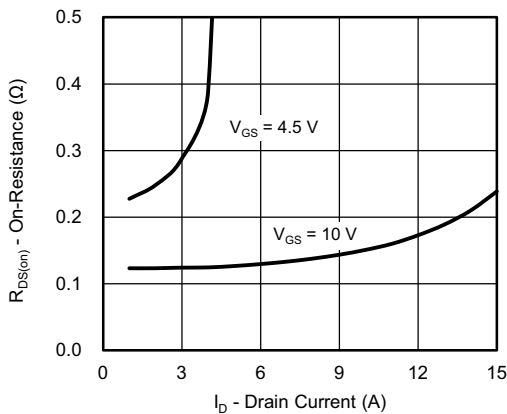
Transfer Characteristics



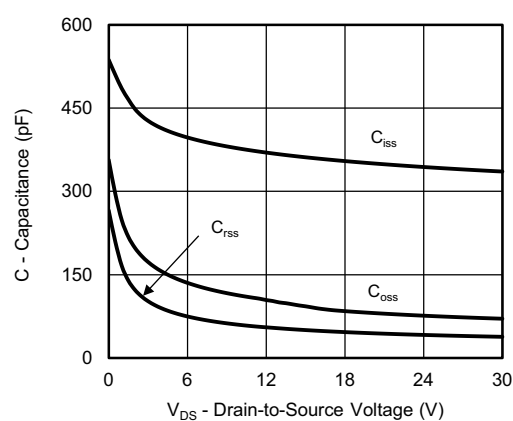
Transfer Characteristics



Transconductance

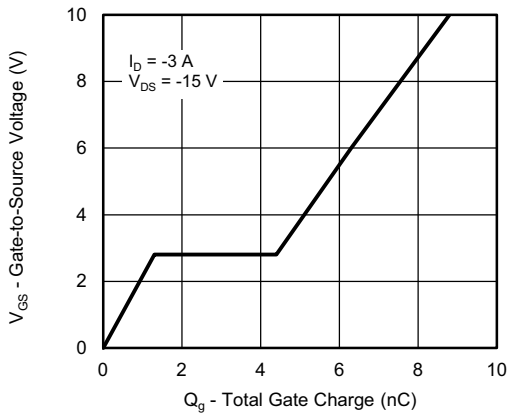


On-Resistance vs. Drain Current

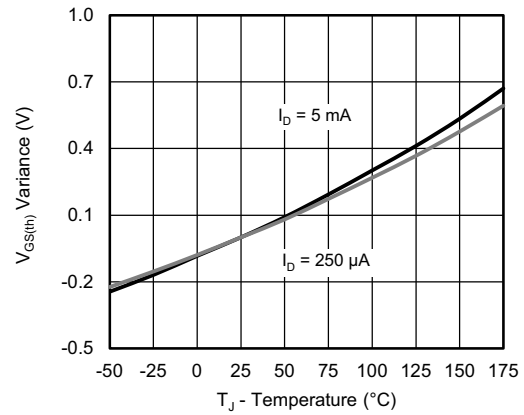


Capacitance

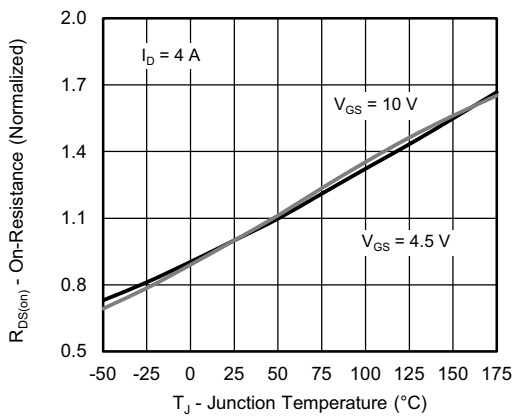
TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)



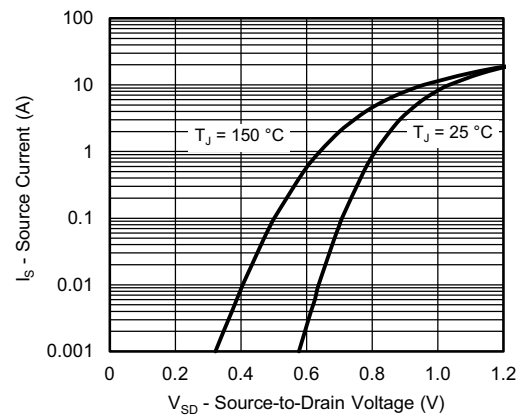
Gate Charge



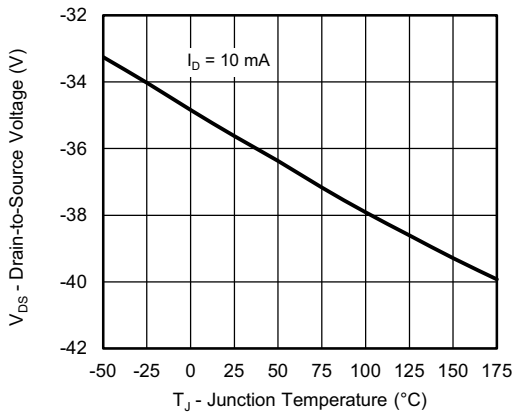
Threshold Voltage



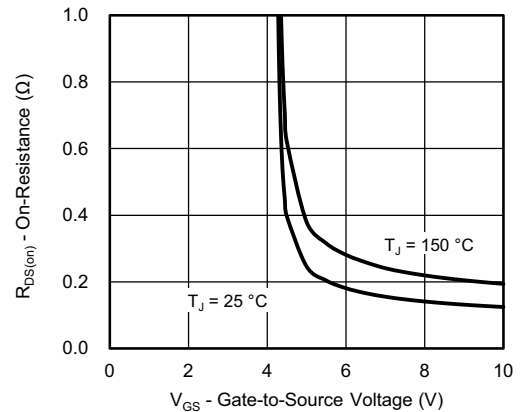
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



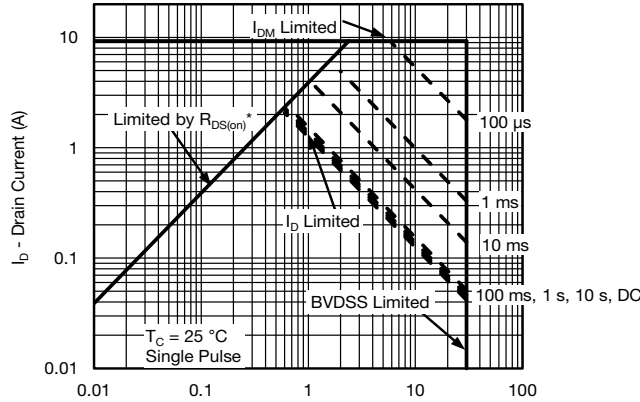
Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

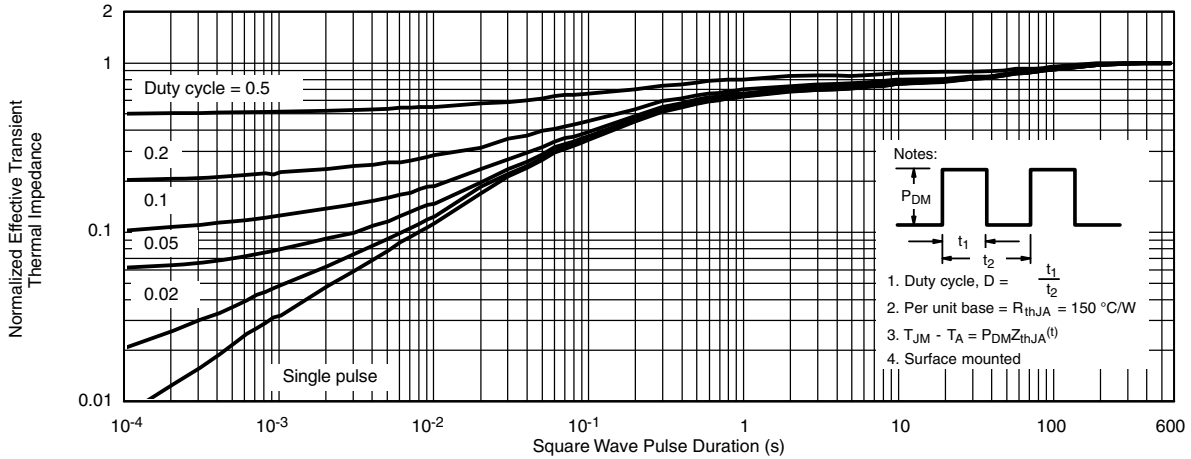


TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)

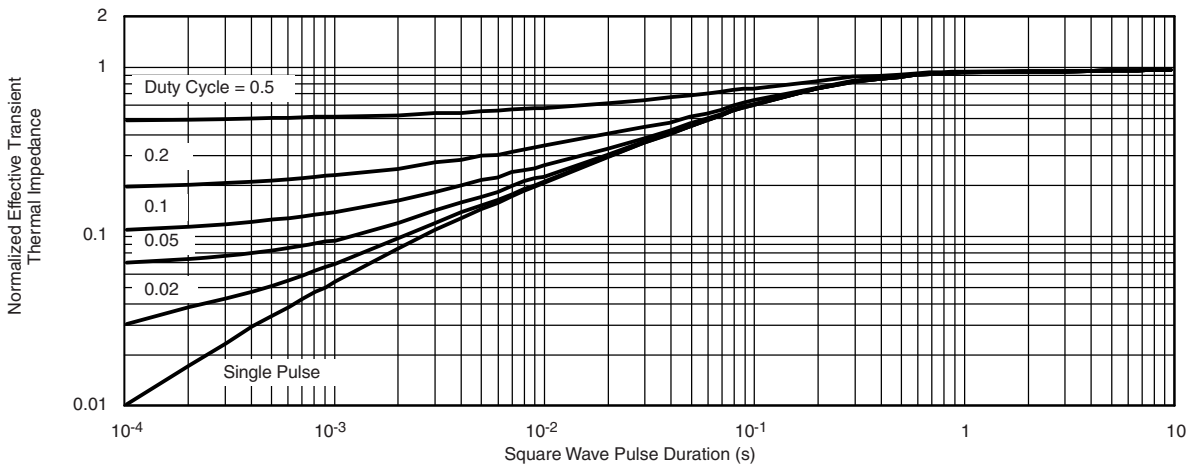


V_{DS} - Drain-to-Source Voltage (V)
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Ambient

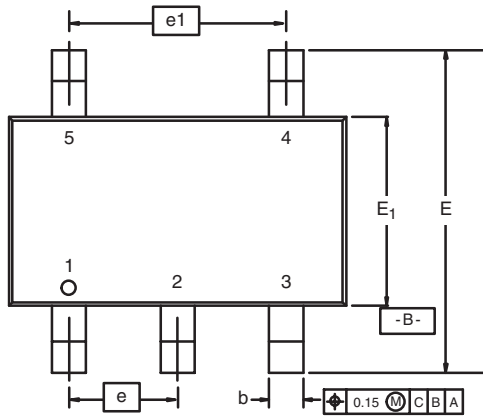


Normalized Thermal Transient Impedance, Junction-to-Foot

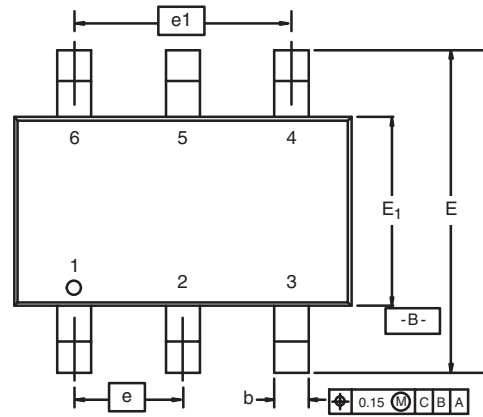
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TSOP: 5/6-LEAD

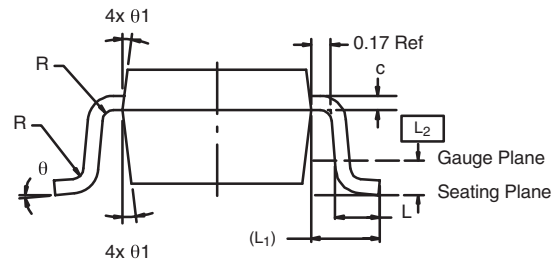
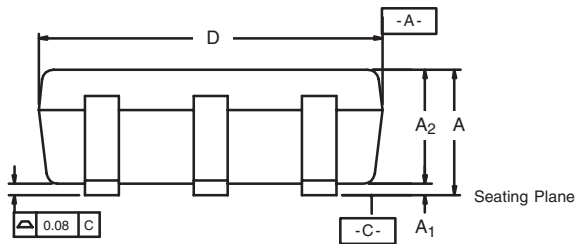
JEDEC Part Number: MO-193C



5-LEAD TSOP



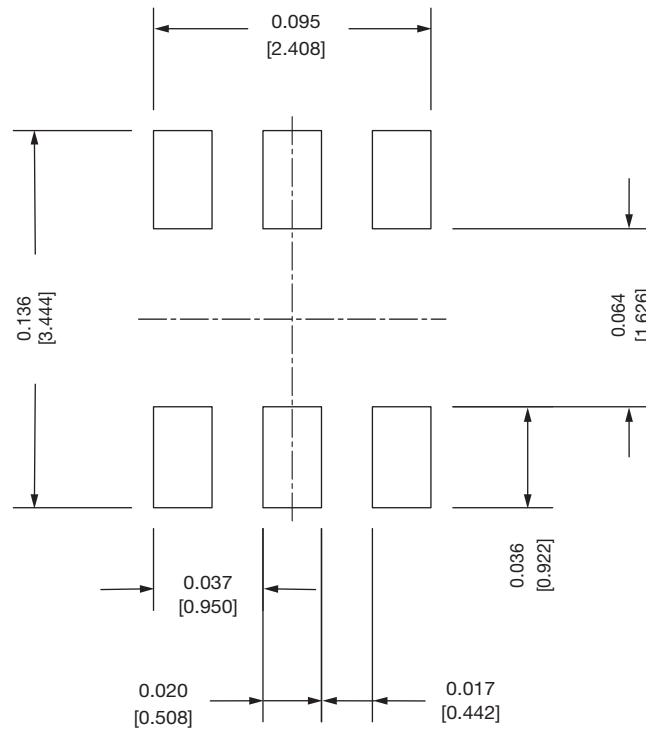
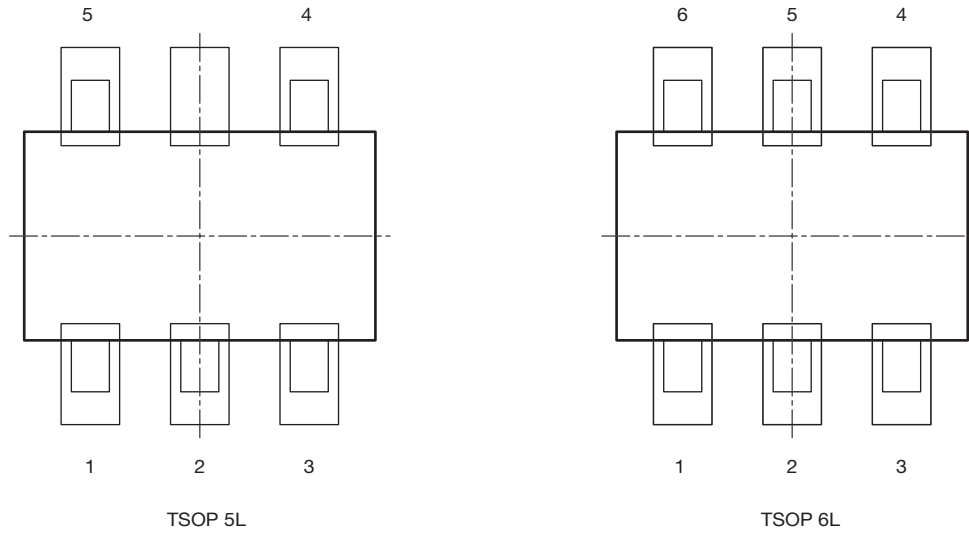
6-LEAD TSOP



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A₁	0.01	-	0.10	0.0004	-	0.004
A₂	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
E₁	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e₁	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L₁	0.60 Ref			0.024 Ref		
L₂	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ₁	7° Nom			7° Nom		
ECN: C-06593-Rev. I, 18-Dec-06						
DWG: 5540						



Recommended Land Pattern For 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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