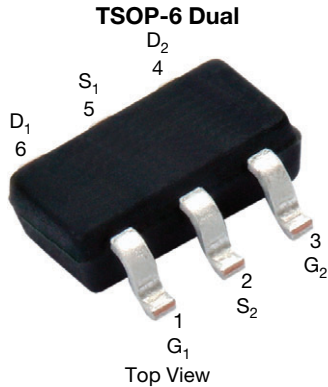


## Automotive Dual P-Channel 30 V (D-S) 175 °C MOSFET



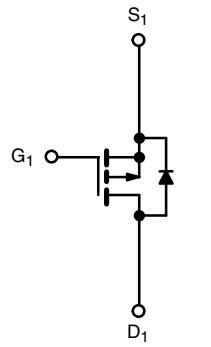
Marking code: 9B

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

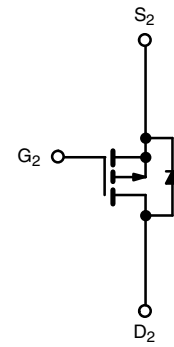
### FEATURES

- 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](http://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 <a href="http://www.vishay.com/doc?79771">www.vishay.com/doc?79771</a> )

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-30	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Continuous drain current ( $T_J = 150$ °C) <sup>a</sup>	$T_C = 25$ °C	-2.5	A
	$T_C = 125$ °C	-1.5	
Pulsed drain current	$I_{DM}$	-10.2	
Continuous source current (diode conduction) <sup>a</sup>	$I_S$	-2.1	W
Maximum power dissipation <sup>a</sup>	$T_C = 25$ °C	1.67	
	$T_C = 125$ °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 <sup>a</sup>	$R_{thJA}$	150	°C/W
Maximum junction-to-foot (drain)	$R_{thJF}$	90	

#### Note

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



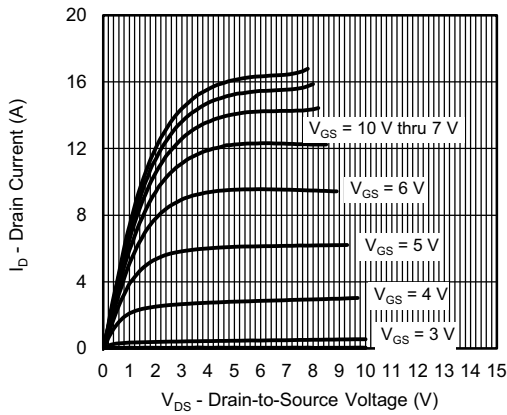
SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250 \mu\text{A}$		-0.6	-	-1.5	V
Gate-body leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{GS} = 0 \text{ V}$	$V_{DS} = -30 \text{ V}$	-	-	-1	$\mu\text{A}$
		$V_{GS} = 0 \text{ V}$	$V_{DS} = -30 \text{ V}$ , $T_J = 55^\circ\text{C}$	-	-	-5	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = -10 \text{ V}$	$V_{DS} \leq -5 \text{ V}$	-4	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10 \text{ V}$	$I_D = -0.4 \text{ A}$	-	0.140	0.155	$\Omega$
		$V_{GS} = -4.5 \text{ V}$	$I_D = -0.2 \text{ A}$	-	0.265	0.300	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -5 \text{ V}$ , $I_D = -1 \text{ A}$		-	2.2	-	S
Diode forward voltage <sup>a</sup>	$V_{SD}$	$I_S = -0.5 \text{ A}$ , $V_{GS} = 0 \text{ V}$		-	-0.83	-1.1	V
<b>Dynamic <sup>b</sup></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	$\Omega$
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**

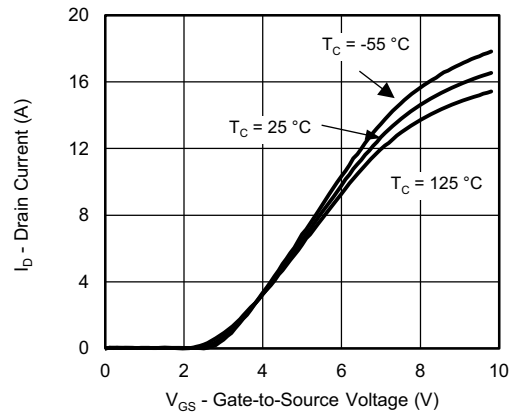
- a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2 \%$   
b. Guaranteed by design, not subject to production testing

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.

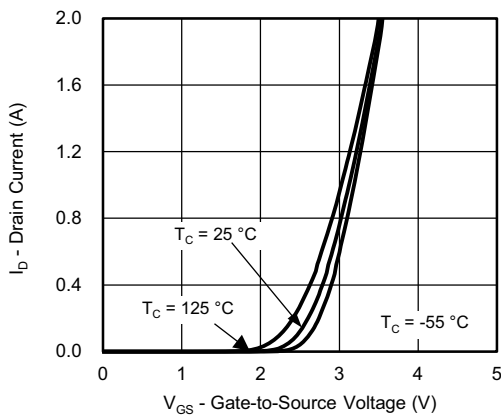
**TYPICAL CHARACTERISTICS** (25 °C unless otherwise noted)



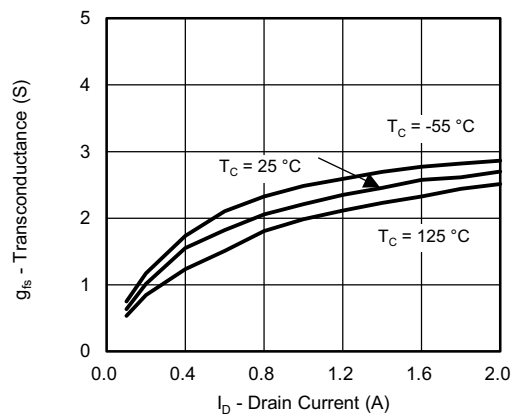
**Output Characteristics**



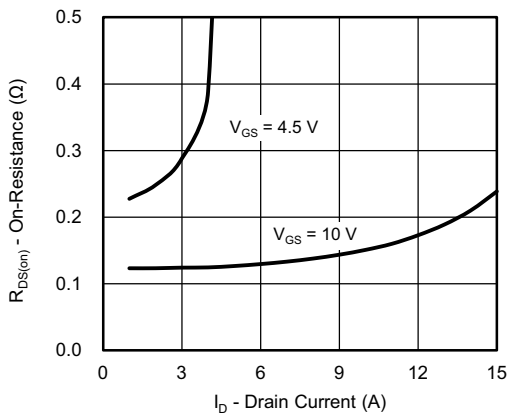
**Transfer Characteristics**



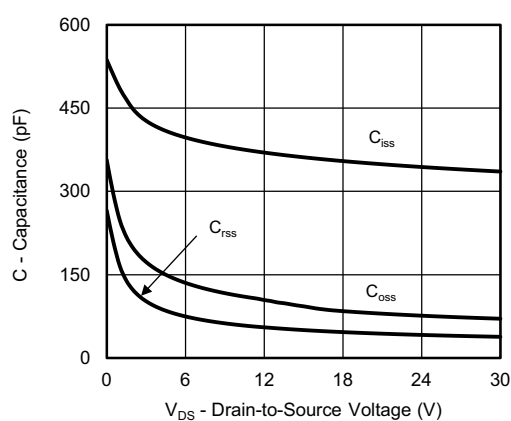
**Transfer Characteristics**



**Transconductance**

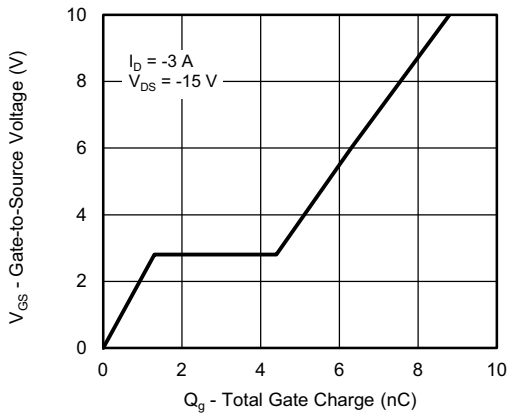


**On-Resistance vs. Drain Current**

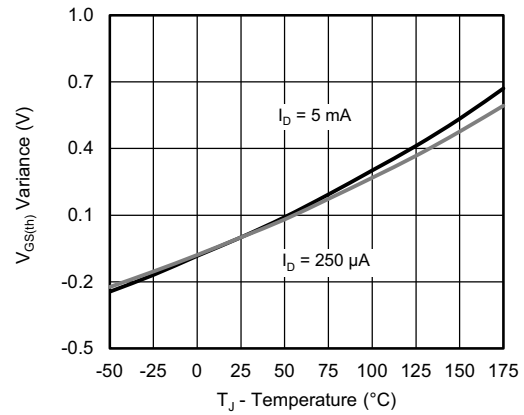


**Capacitance**

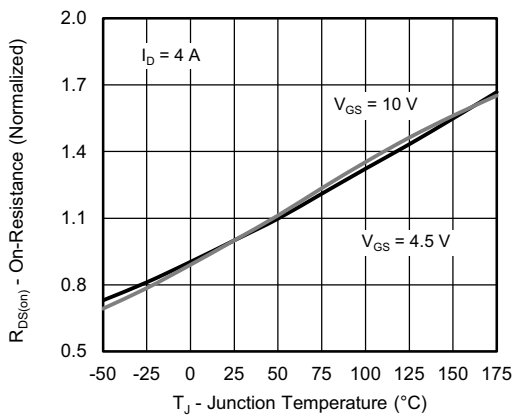
**TYPICAL CHARACTERISTICS** (25 °C unless otherwise noted)



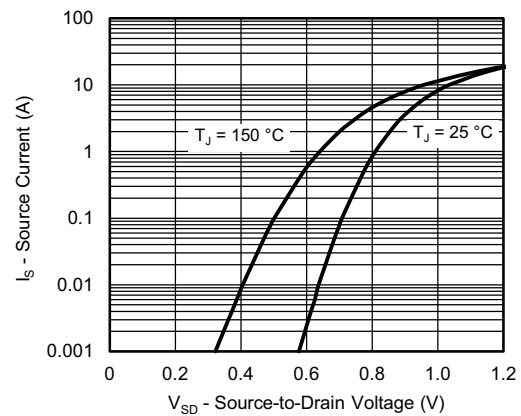
**Gate Charge**



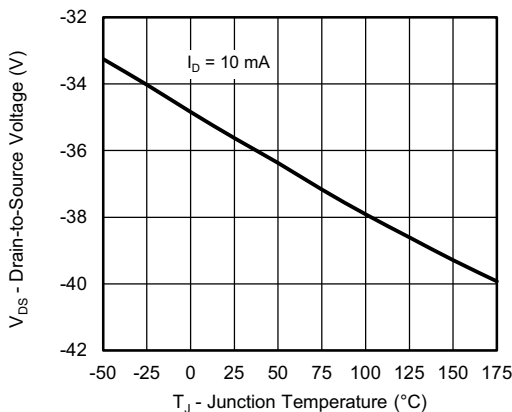
**Threshold Voltage**



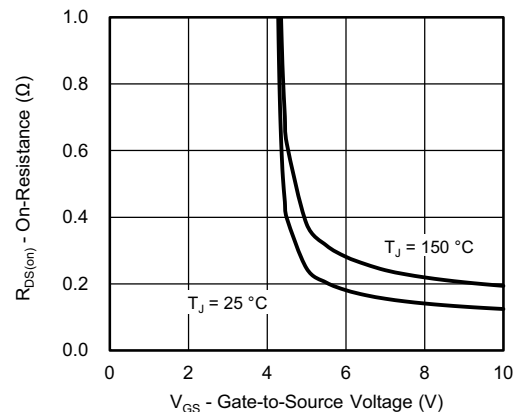
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

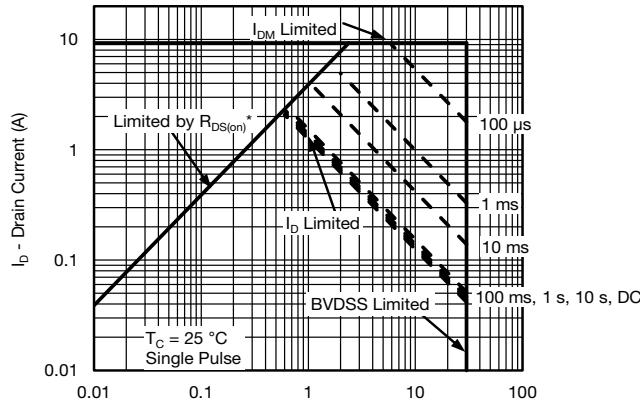


**Drain Source Breakdown vs. Junction Temperature**



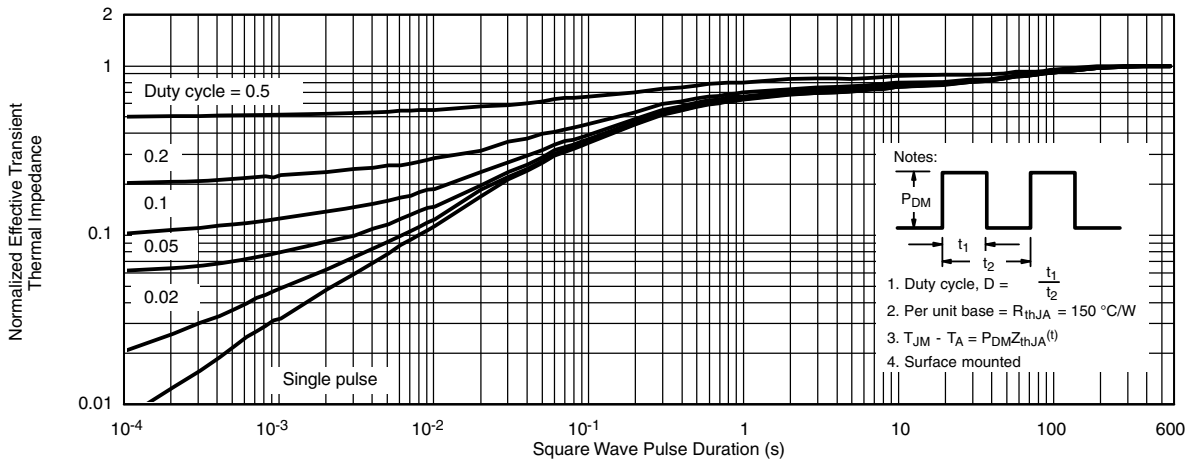
**On-Resistance vs. Gate-to-Source Voltage**

**TYPICAL CHARACTERISTICS** (25 °C unless otherwise noted)

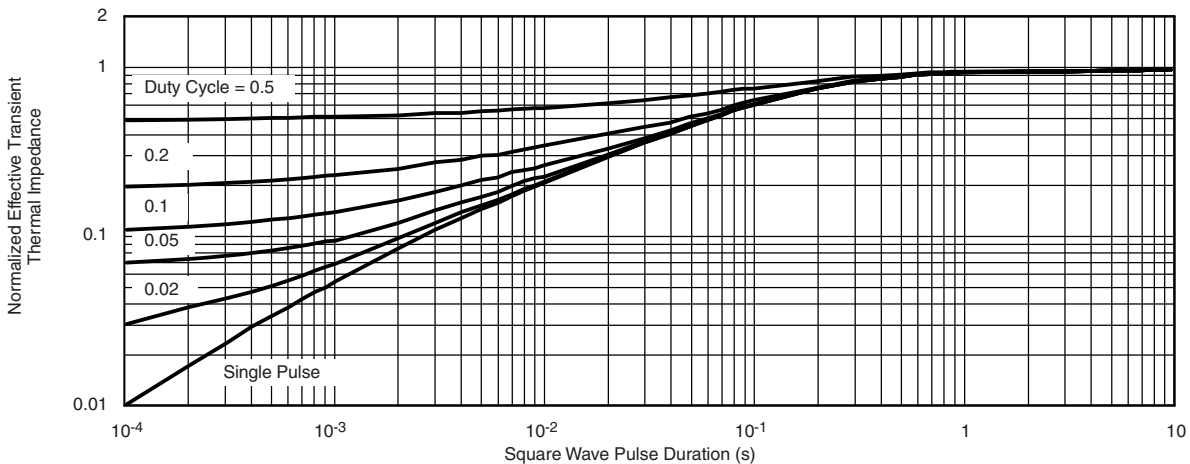


$V_{DS}$  - Drain-to-Source Voltage (V)  
 \*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**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

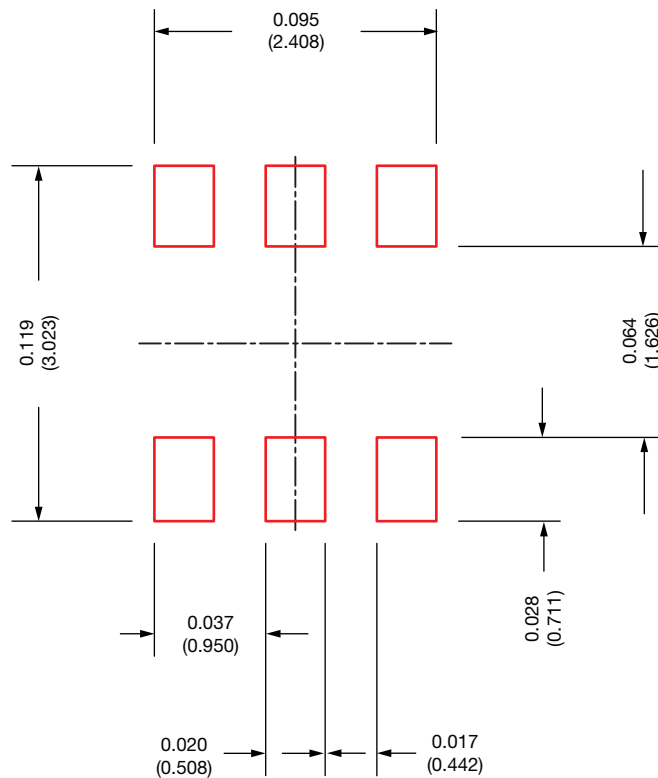
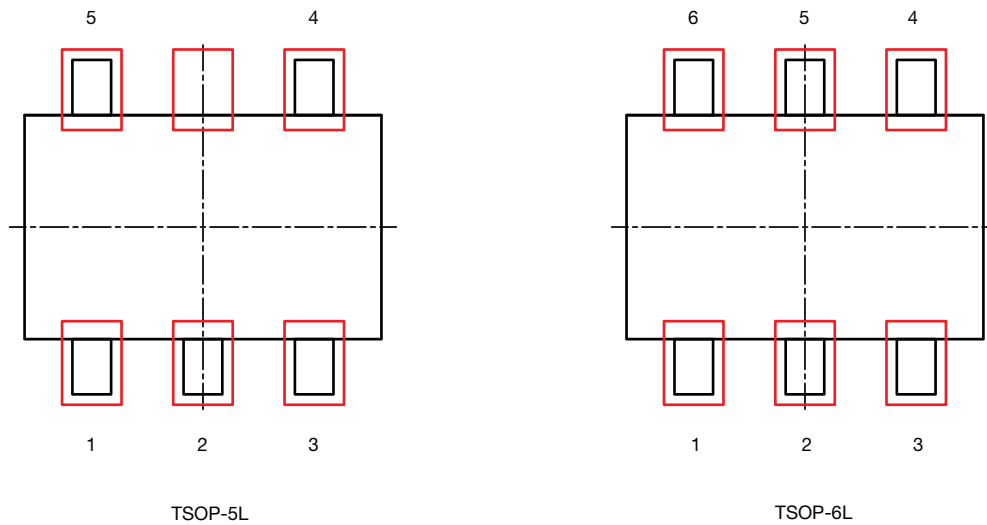


6-LEAD TSOP



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A <sub>1</sub>	0.01	-	0.10	0.0004	-	0.004
A <sub>2</sub>	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 <sub>1</sub>	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e <sub>1</sub>	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L <sub>1</sub>	0.60 Ref			0.024 Ref		
L <sub>2</sub>	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ <sub>1</sub>	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:  
S22-0593-Rev. A, 18-Jul-2022  
DWG: 3010



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