

N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.030
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.035
I _D (A)	7
Configuration	Single

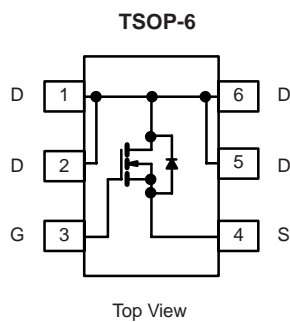
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Low On-Resistance
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



APPLICATIONS

- DC/DC Converters, High Speed Switching



ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	60	V
Gate-Source Voltage	V _{GS}	± 20	
Continuous Drain Current	I _D	T _C = 25 °C	7
		T _C = 125 °C	4
Continuous Source Current (Diode Conduction)	I _S	6	A
Pulsed Drain Current ^a	I _{DM}	29	
Single Pulse Avalanche Current	I _{AS}	10	
Single Pulse Avalanche Energy	E _{AS}	5	mJ
Maximum Power Dissipation ^a	P _D	T _C = 25 °C	5
		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	R _{thJA}	110	°C/W
Junction-to-Foot (Drain)	R _{thJF}	30	

Notes

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).

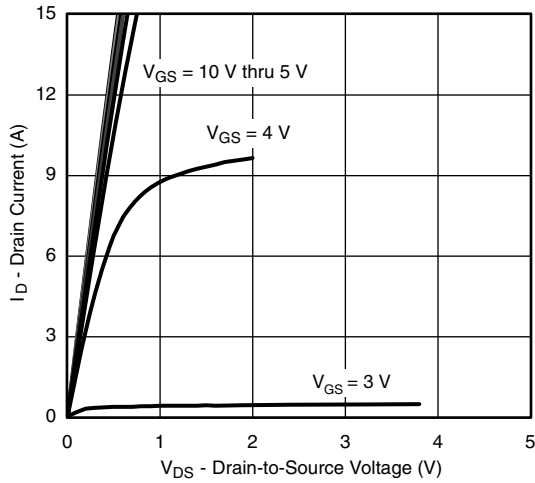
SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	-	2.5	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$	-	-	± 500	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	± 1	mA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	150	
On-State Drain Current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}$ $V_{DS} \geq 5\text{ V}$	10	-	-	A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ $I_D = 5\text{ A}$	-	0.030	-	Ω
		$V_{GS} = 10\text{ V}$ $I_D = 5\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	0.050	-	
		$V_{GS} = 10\text{ V}$ $I_D = 5\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	0.070	-	
		$V_{GS} = 4.5\text{ V}$ $I_D = 4\text{ A}$	-	0.035	-	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 4\text{ A}$	-	12	-	S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$ $V_{DS} = 30\text{ V}, f = 1\text{ MHz}$	-	560	700	μF
Output Capacitance	C_{oss}		-	85	105	
Reverse Transfer Capacitance	C_{rss}		-	55	70	
Total Gate Charge ^c	Q_g	$V_{GS} = 4.5\text{ V}$ $V_{DS} = 30\text{ V}, I_D = 4\text{ A}$	-	7.6	12	nC
Gate-Source Charge ^c	Q_{gs}		-	2.1	-	
Gate-Drain Charge ^c	Q_{gd}		-	4.1	-	
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.2	2.4	3.6	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 7.5\text{ }\Omega$ $I_D \cong 4\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	9	14	ns
Rise Time ^c	t_r		-	12	18	
Turn-Off Delay Time ^c	$t_{d(off)}$		-	19	29	
Fall Time ^c	t_f		-	7	11	
Source-Drain Diode Ratings and Characteristics ^b						
Pulsed Current ^a	I_{SM}		-	-	29	A
Forward Voltage	V_{SD}	$I_F = 1.6\text{ A}, V_{GS} = 0$	-	0.75	1.2	V

Notes

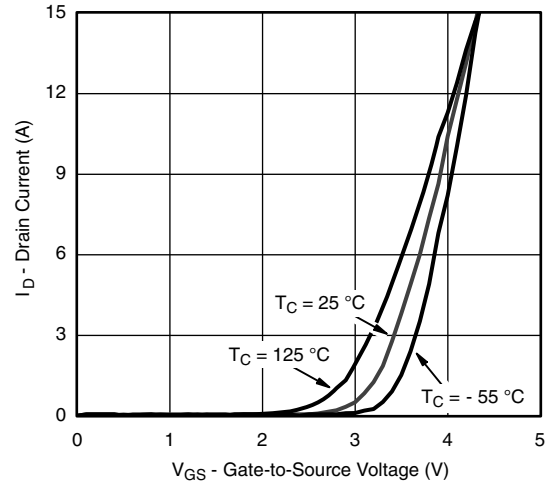
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

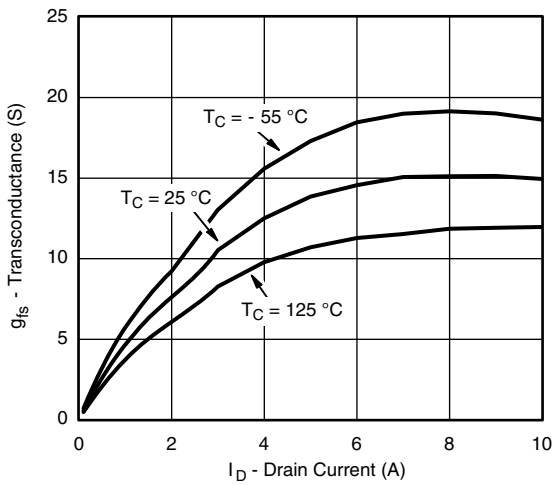
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



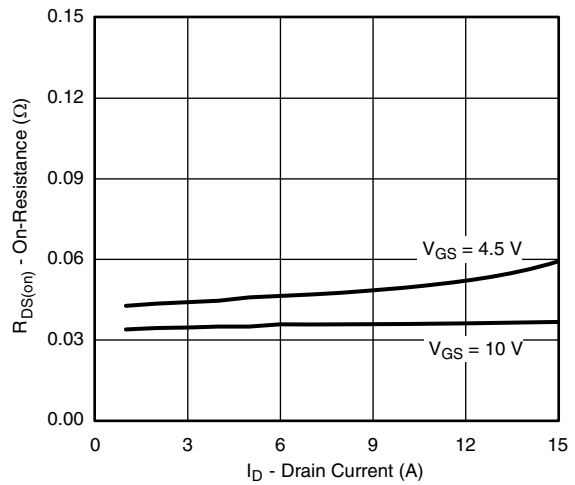
Output Characteristics



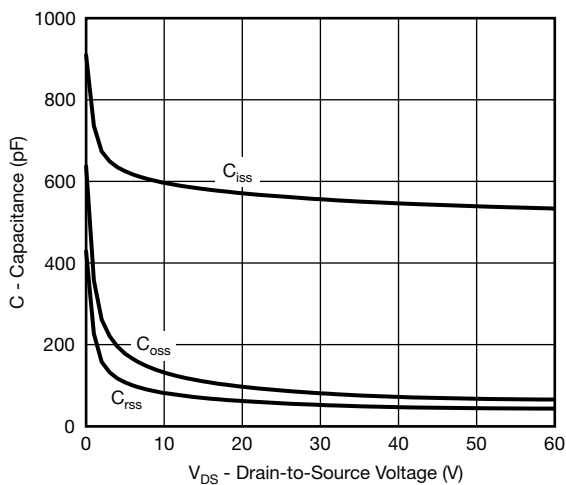
Transfer Characteristics



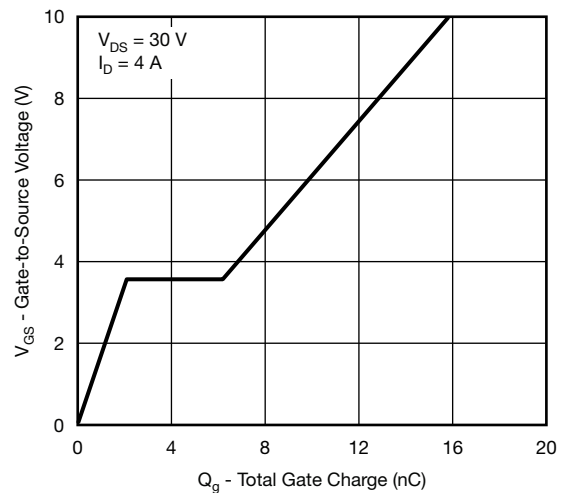
Transconductance



On-Resistance vs. Drain Current

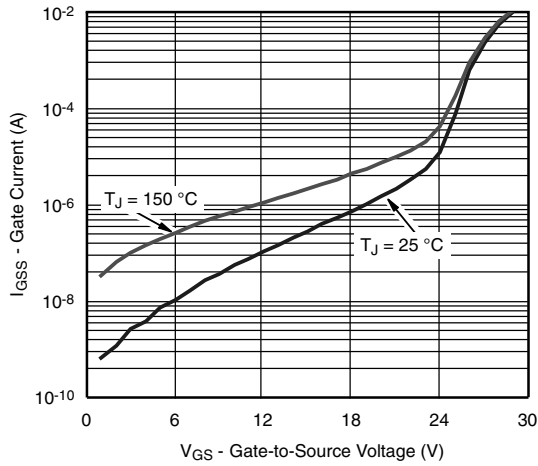


Capacitance

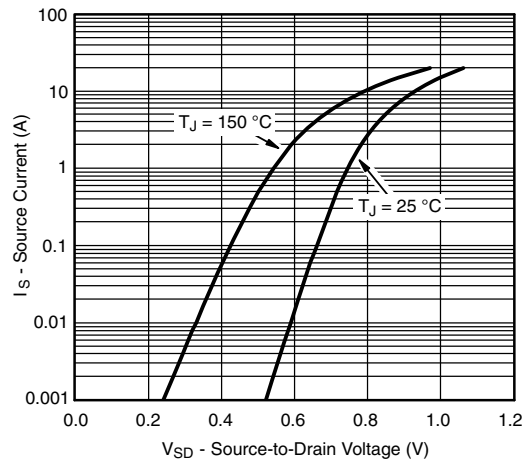


Gate Charge

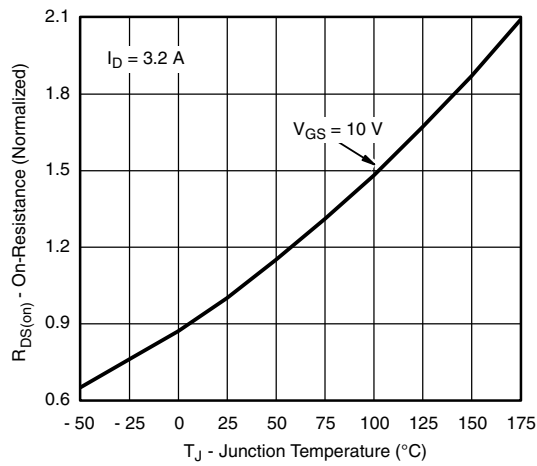
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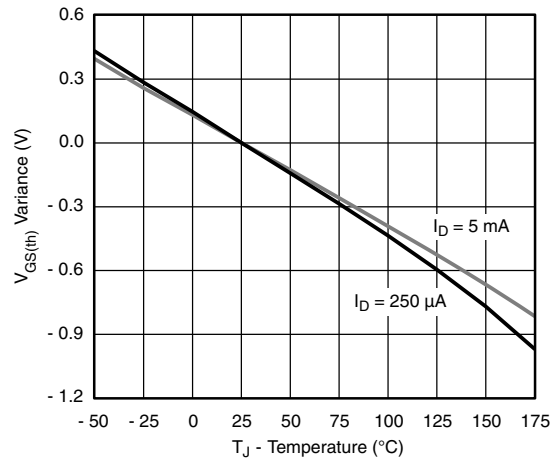
Gate Current vs. Gate-Source Voltage



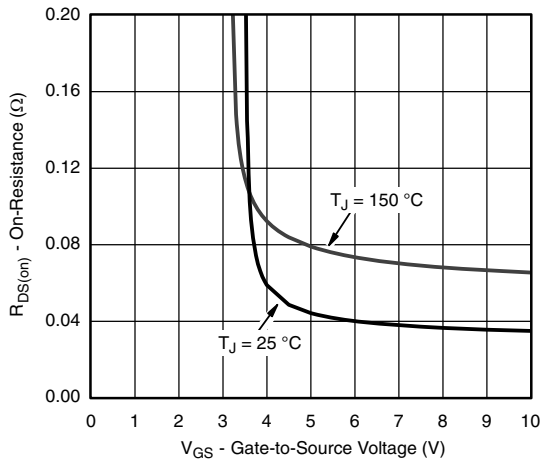
Source-Drain Diode Forward Voltage



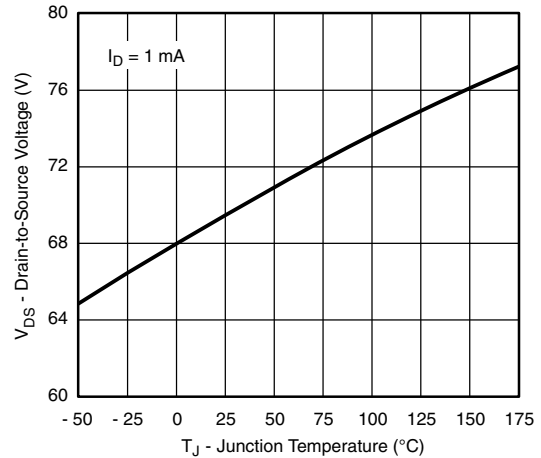
On-Resistance vs. Junction Temperature



Threshold Voltage

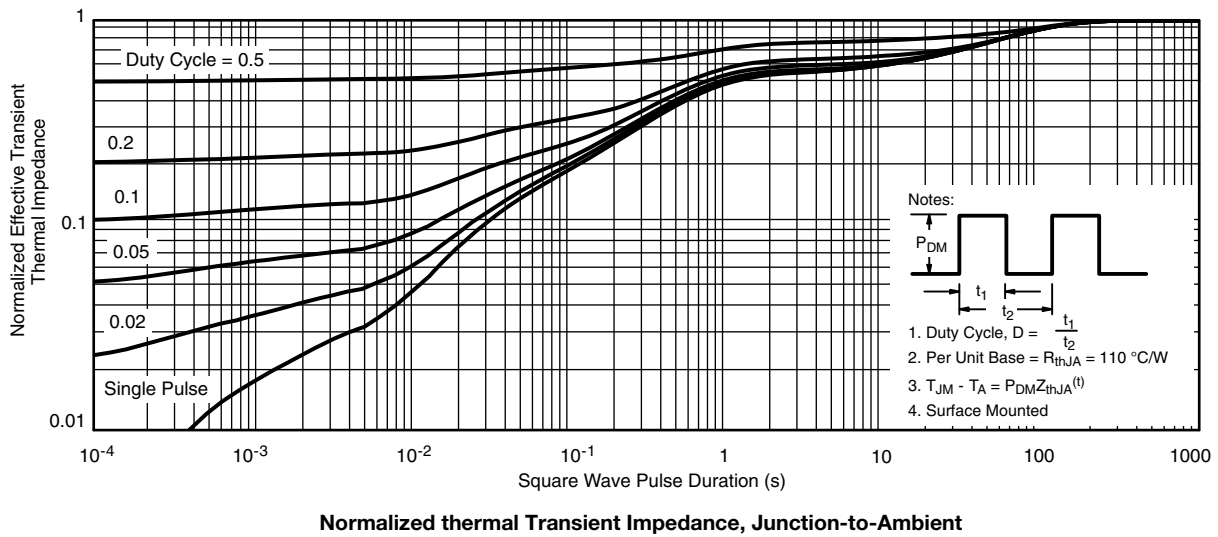
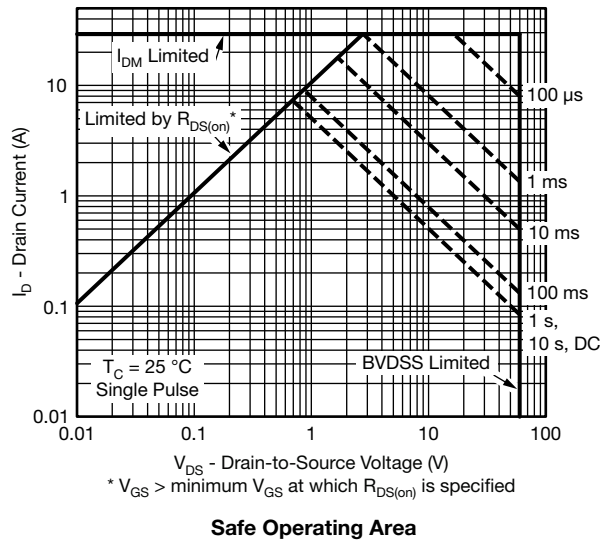


On-Resistance vs. Gate-Source Voltage

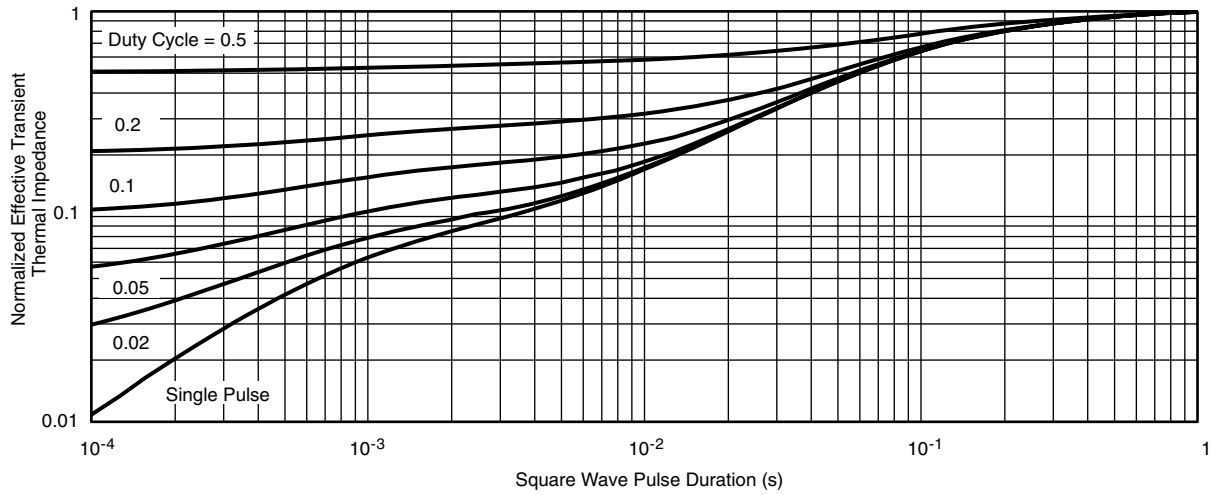


Drain-Source Breakdown vs. Junction Temperature

THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

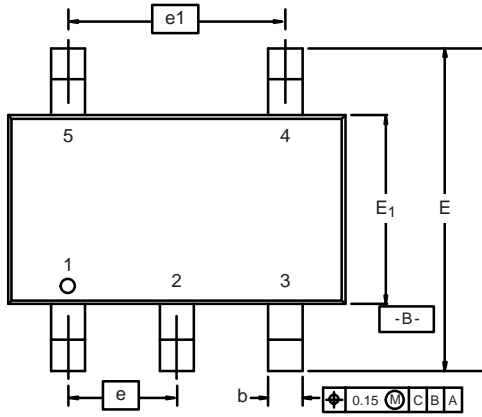


Normalized thermal Transient Impedance, Junction-to-Foot

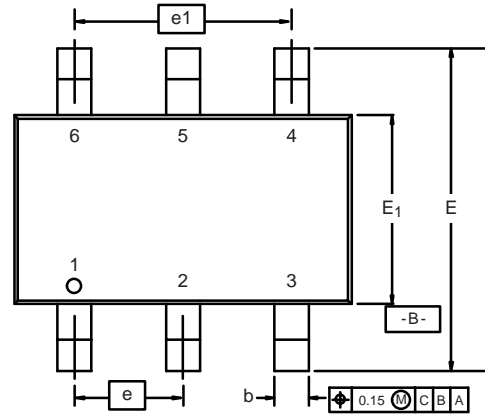
Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^\circ\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Foot ($25\text{ }^\circ\text{C}$)
 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.

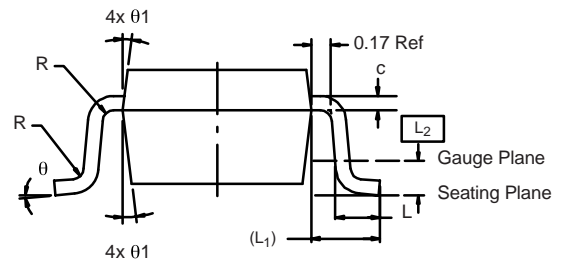
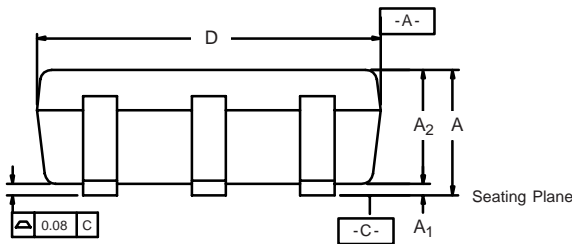
TSOP: 5/6-LEAD
JEDEC Part Number: MO-193C



5-LEAD TSOP

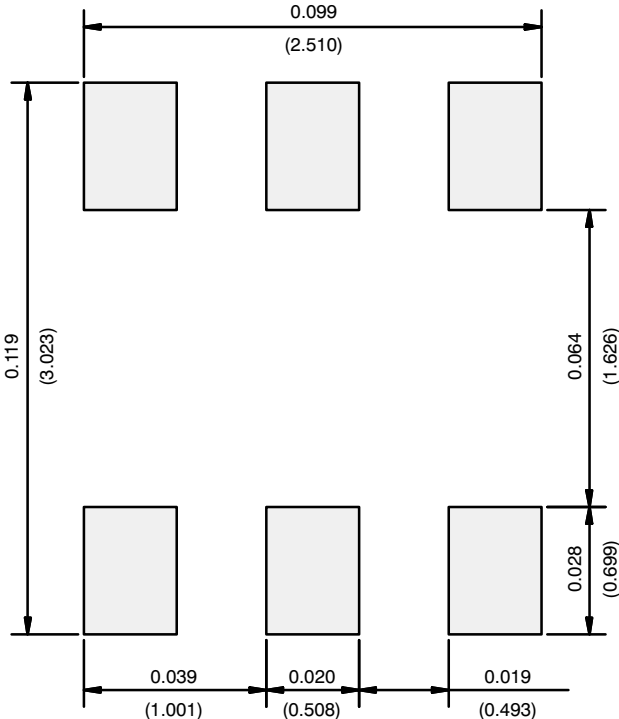


6-LEAD TSOP



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. 1, 18-Dec-06 DWG: 5540						

RECOMMENDED MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads
Dimensions in Inches/(mm)

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