

P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 60	0.098 at $V_{GS} = - 10$ V	- 3.5	5.1 nC
	0.110 at $V_{GS} = - 4.5$ V	- 3.1	

FEATURES

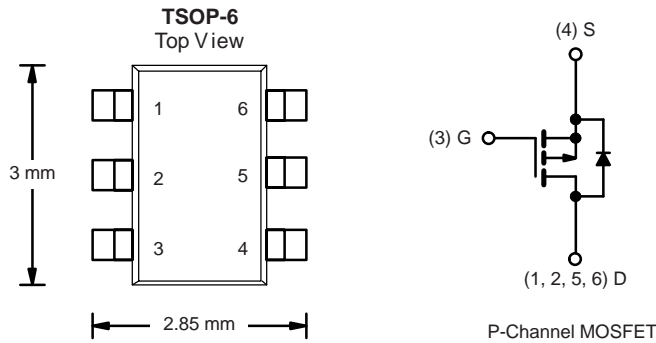
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	- 60	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	- 3.5	A
		$T_C = 70$ °C	- 3.2	
		$T_A = 25$ °C	- 3.5 ^{b, c}	
		$T_A = 70$ °C	- 3.2 ^{b, c}	
Pulsed Drain Current	I_{DM}	- 10		
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	- 2.5	
		$T_A = 25$ °C	- 1.67 ^{b, c}	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	3.0	W
		$T_C = 70$ °C	2.0	
		$T_A = 25$ °C	2.0 ^{b, c}	
		$T_A = 70$ °C	1.3 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	55	62.5	°C/W	
Maximum Junction-to-Foot (Drain)	R_{thJF}	34	41		

Notes:

- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under Steady State conditions is 110 °C/W.

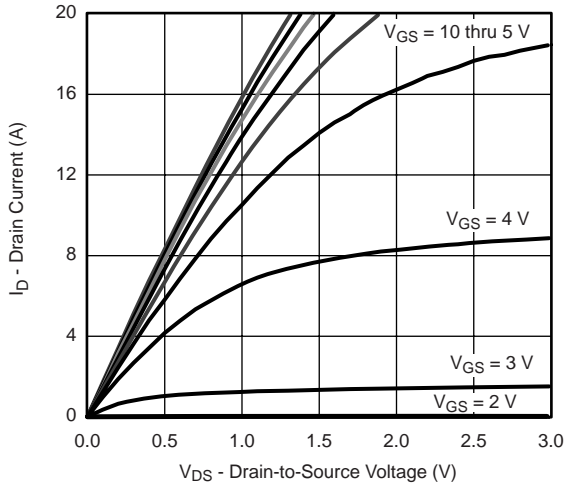
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-31		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		4.5			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-1.0		-3.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -10\text{ V}$	-10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -2.1\text{ A}$		0.075	0.098	Ω
		$V_{GS} = -4.5\text{ V}, I_D = -2.1\text{ A}$		0.085	0.110	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -2.1\text{ A}$		8		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		950		μF
Output Capacitance	C_{oss}		80			
Reverse Transfer Capacitance	C_{rss}		63			
Total Gate Charge	Q_g	$V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -2.1\text{ A}$		10	15	nC
				5.1	8	
Gate-Source Charge	Q_{gs}	$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -2.1\text{ A}$		1.8		
Gate-Drain Charge	Q_{gd}			2.5		
Gate Resistance	R_g	$f = 1\text{ MHz}$		7		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 4.6\text{ }\Omega$ $I_D \cong -2.3\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		40	60	ns
Rise Time	t_r			80	120	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			12	20	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 4.6\text{ }\Omega$ $I_D \cong -2.3\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		5	10	
Rise Time	t_r			13	20	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-2.5	A
Pulse Diode Forward Current ^a	I_{SM}				-7	
Body Diode Voltage	V_{SD}	$I_S = -2.3\text{ A}$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -2.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		20	30	ns
Body Diode Reverse Recovery Charge	Q_{rr}			20	30	nC
Reverse Recovery Fall Time	t_a			14		ns
Reverse Recovery Rise Time	t_b			6		

Notes:

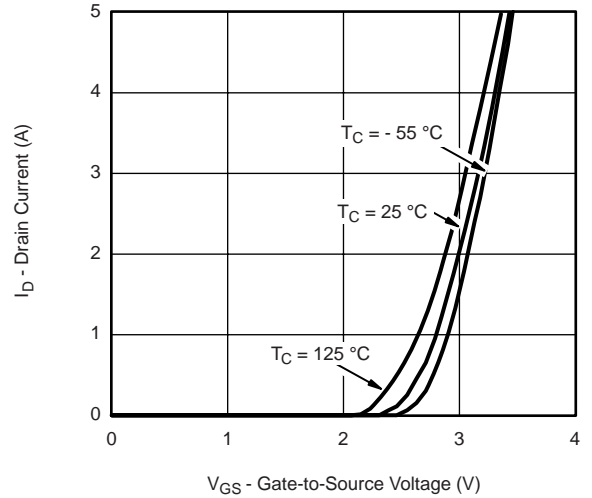
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
- b. Guaranteed by design, not subject to production testing.

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.

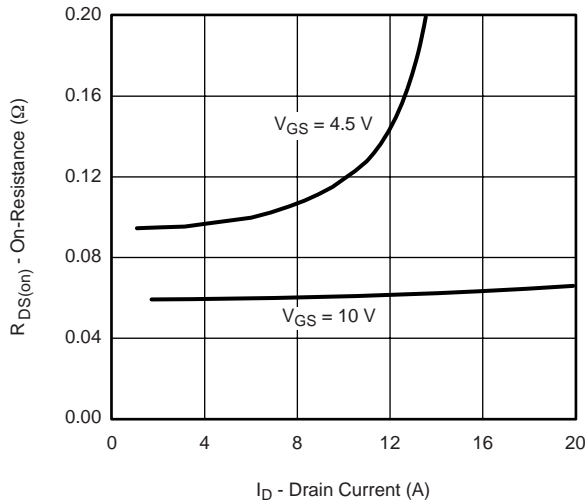
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Output Characteristics



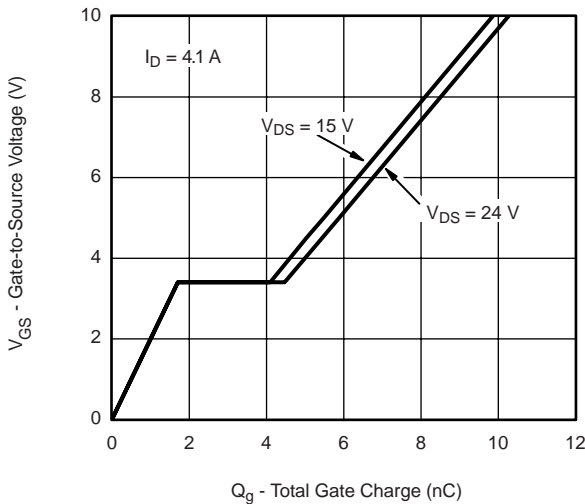
Transfer Characteristics



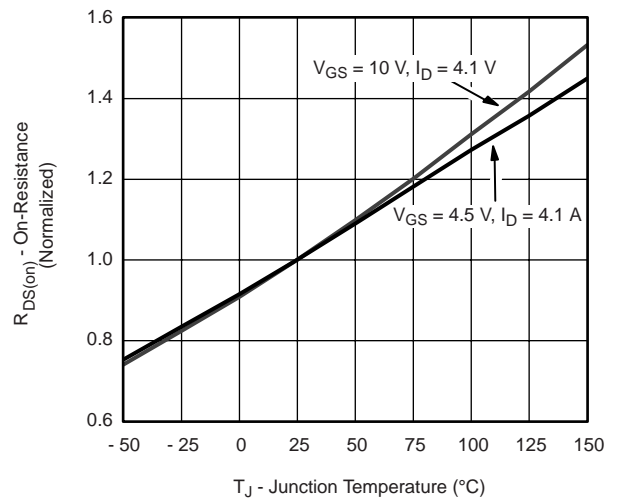
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

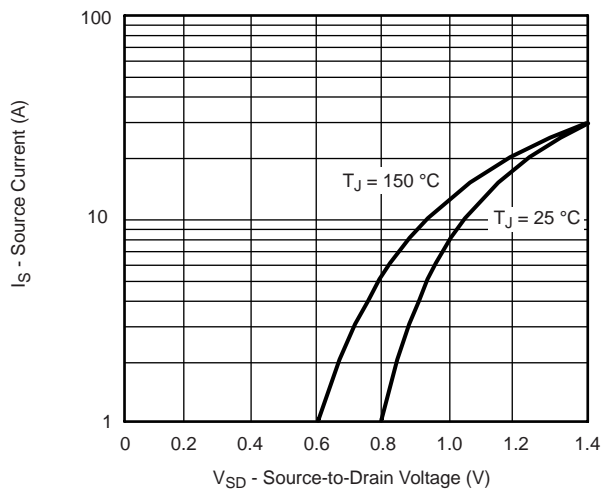


Gate Charge

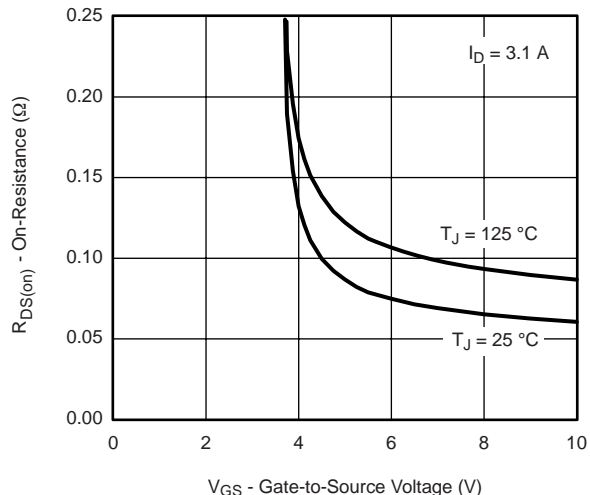


On-Resistance vs. Junction Temperature

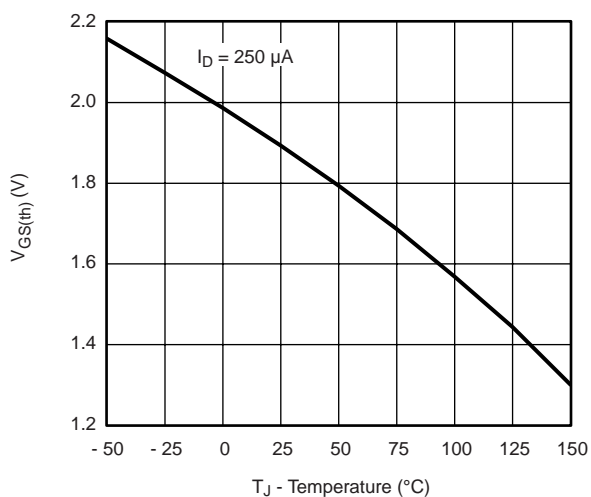
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



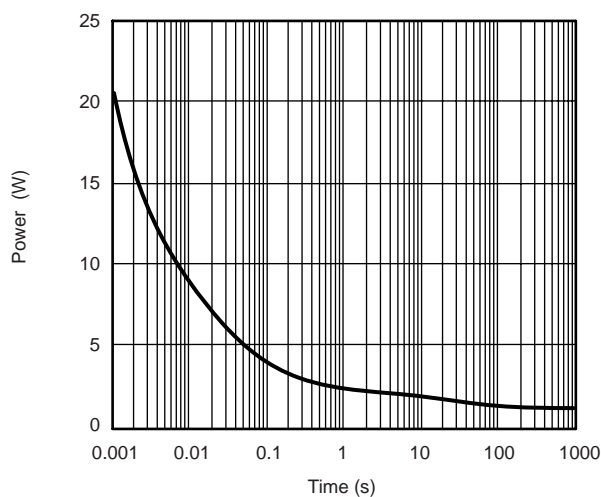
Source-Drain Diode Forward Voltage



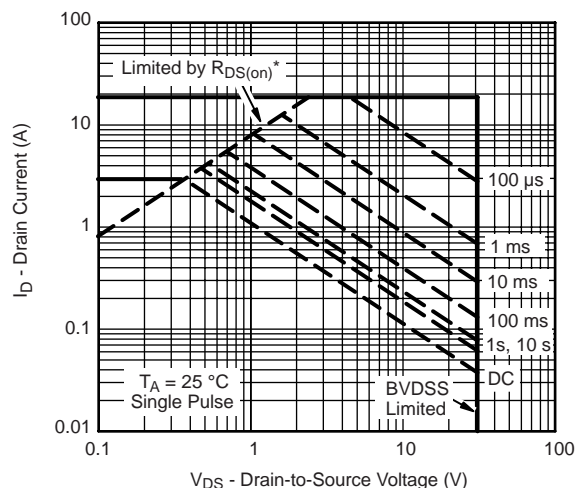
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



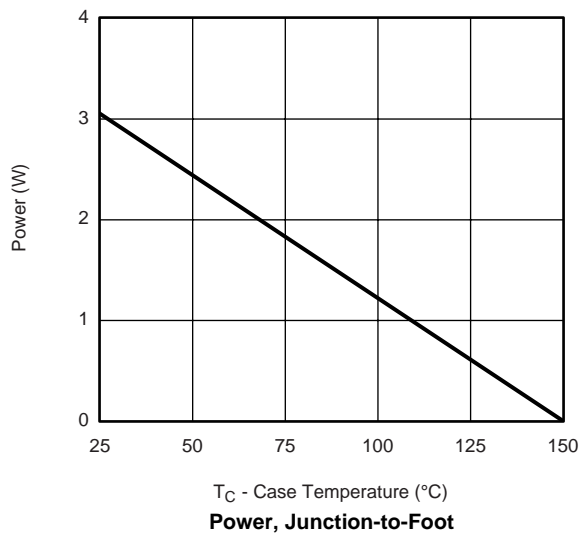
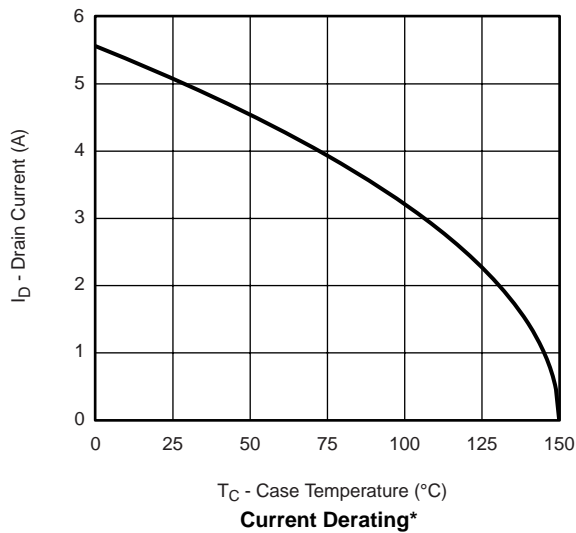
Single Pulse Power



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

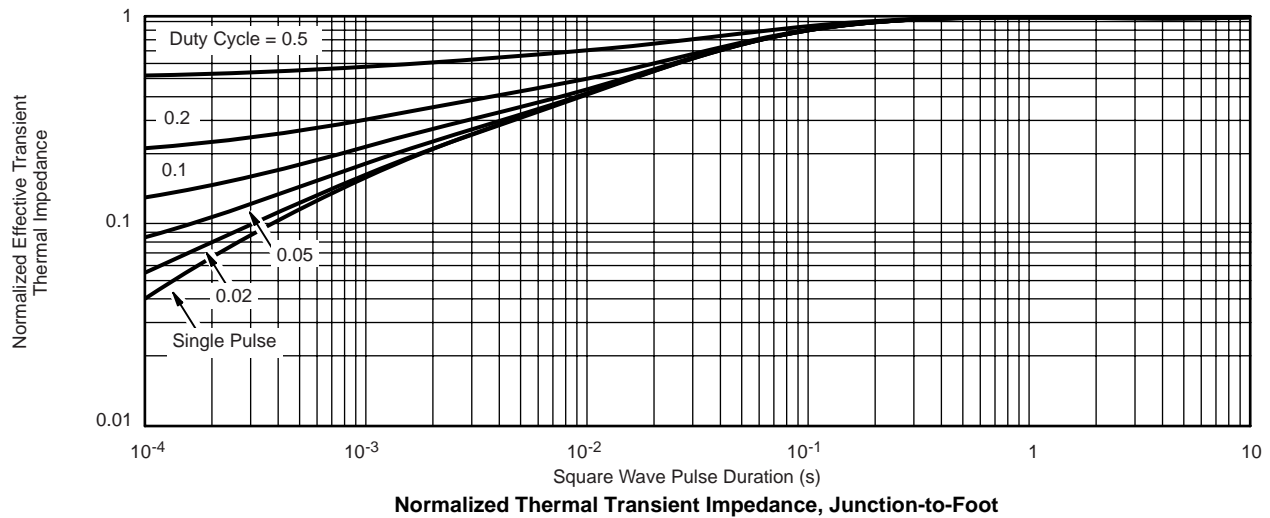
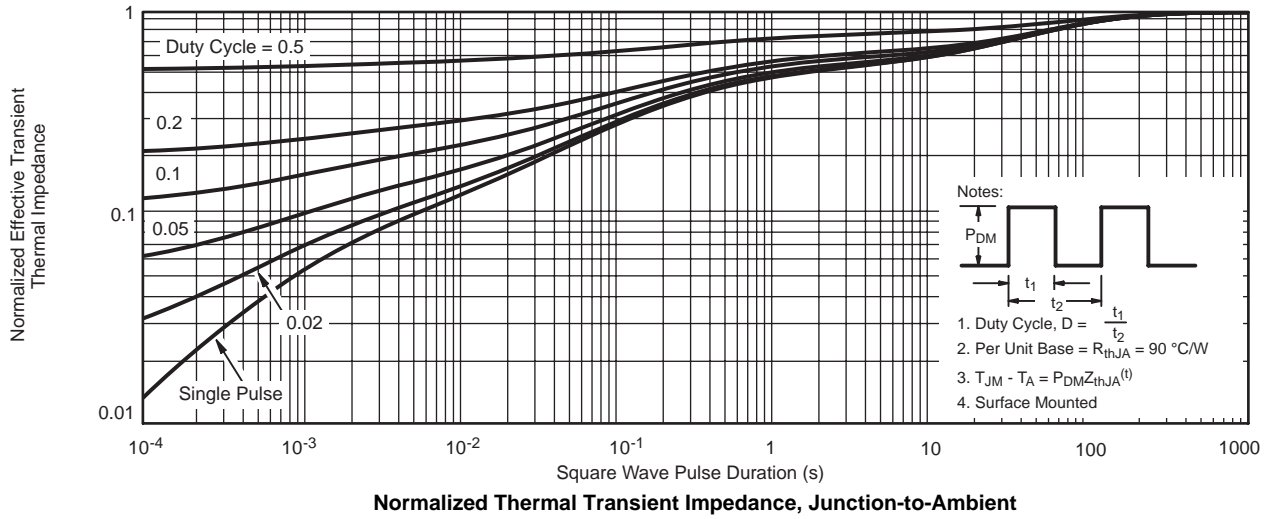
Safe Operating Area

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



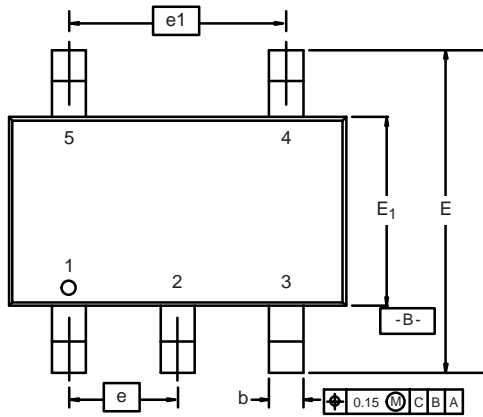
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

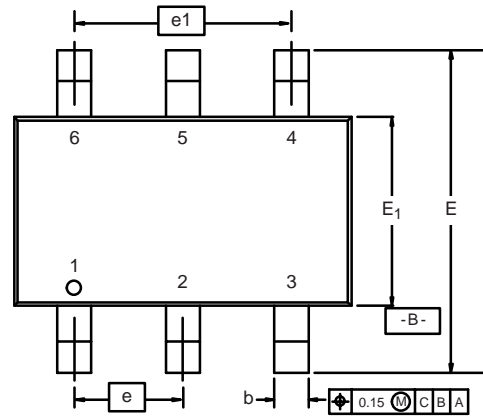


TSOP: 5/6-LEAD

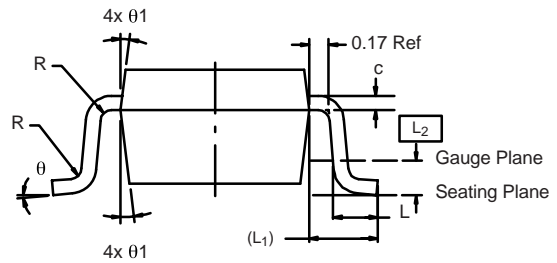
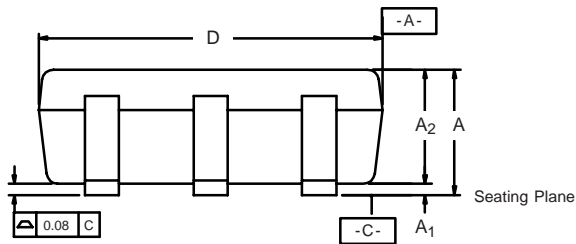
JEDEC Part Number: MO-193C



5-LEAD TSOP

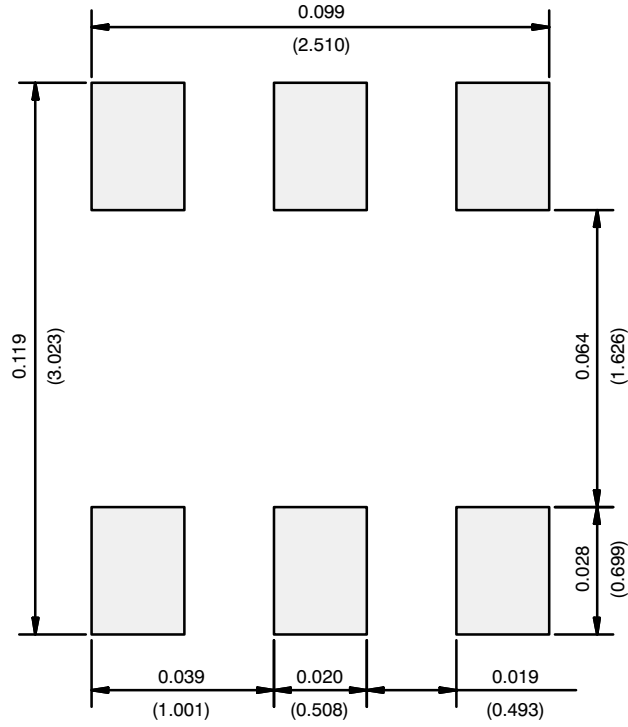


6-LEAD TSOP



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 MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads
Dimensions in Inches/(mm)

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