P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 60	0.135 at V_{GS} = - 10 V	- 3.9	18 nC
	0.165 at V_{GS} = - 4.5 V	- 3.0	

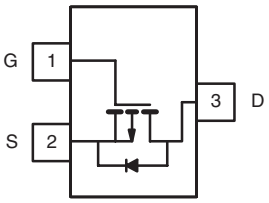
FEATURES

- DT-Trench Power MOSFET
- 100 % R_g Tested

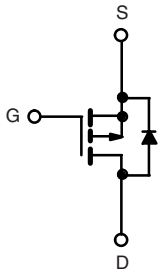
APPLICATIONS

- Load Switch
- DC/DC Converter

Pb-free
RoHS COMPLIANT



Top View



P-Channel MOSFET

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)	T_C = 25 °C	I_D	- 3.9	A
	T_C = 70 °C		- 2.8	
	T_A = 25 °C		- 2.6[b, c]	
	T_A = 70 °C		- 2.0[b, c]	
Pulsed Drain Current		I_{DM}	- 15	
Continous Source-Drain Diode Current	T_C = 25 °C	I_S	- 3.9	
	T_A = 25 °C		- 1.6[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	8	W
	T_C = 70 °C		4.7	
	T_A = 25 °C		1.75[b, c]	
	T_A = 70 °C		1.20[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]	t ≤ 5 s	R_{thJA}	80	110	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	45	55	

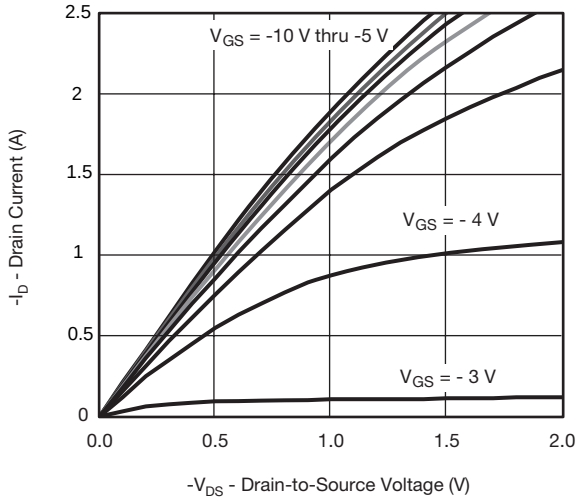
Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. Maximum under steady state conditions is 166 °C/W.

SPECIFICATIONS T_J = 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	- 60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 40		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			4.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = - 250 µA	- 1.2		- 2.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 48 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 48 V, V_{GS} = 0 V, T_J = 55 °C			- 5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 10 V	- 3.9			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 2.0 A		135	160	mΩ
		V_{GS} = - 4.5 V, I_D = - 1.0 A		165	200	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 48 V, I_D = - 2.0 A		10		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 48 V, V_{GS} = 0 V, f = 1 MHz		705		pF
Output Capacitance	C_{oss}			106		
Reverse Transfer Capacitance	C_{rss}			68		
Total Gate Charge	Q_g	V_{DS} = - 48 V, V_{GS} = - 10 V, I_D = - 2.0 A		18		nC
		V_{DS} = - 48 V, V_{GS} = - 4.5 V, I_D = - 1.0 A		10		
Gate-Source Charge	Q_{gs}			2.5		
Gate-Drain Charge	Q_{gd}			3.2		
Gate Resistance	R_g	f = 1 MHz		4.3		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 48 V, R_L = 8 Ω $I_D \cong$ - 1.0 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		18		ns
Rise Time	t_r			10		
Turn-Off Delay Time	$t_{d(off)}$			41		
Fall Time	t_f			13		
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 48 V, R_L = 8 Ω $I_D \cong$ - 2.0 A, V_{GEN} = - 10 V, R_g = 1 Ω		10		
Rise Time	t_r			6		
Turn-Off Delay Time	$t_{d(off)}$			33		
Fall Time	t_f			9		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 3.9	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	I_S = - 2.0 A, V_{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 2.0 A, dI/dt = 100 A/µs, T_J = 25 °C		26		ns
Body Diode Reverse Recovery Charge	Q_{rr}			33		nC
Reverse Recovery Fall Time	t_a			10		ns
Reverse Recovery Rise Time	t_b			8		

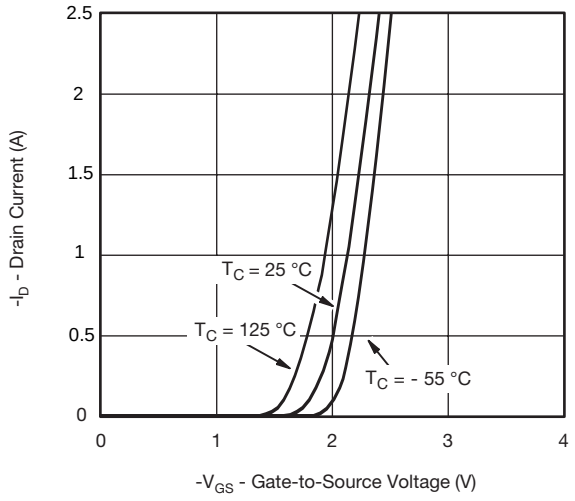
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

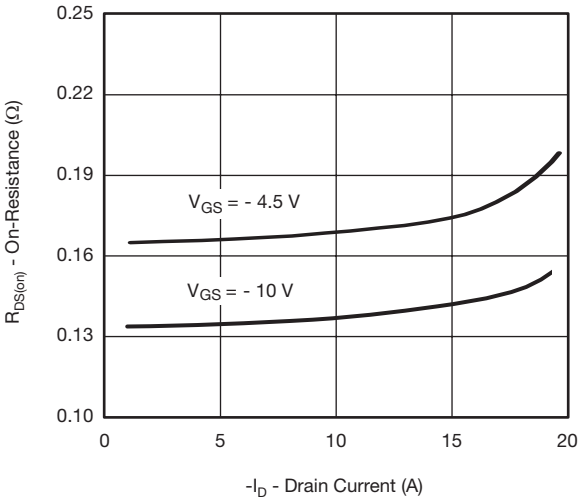
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



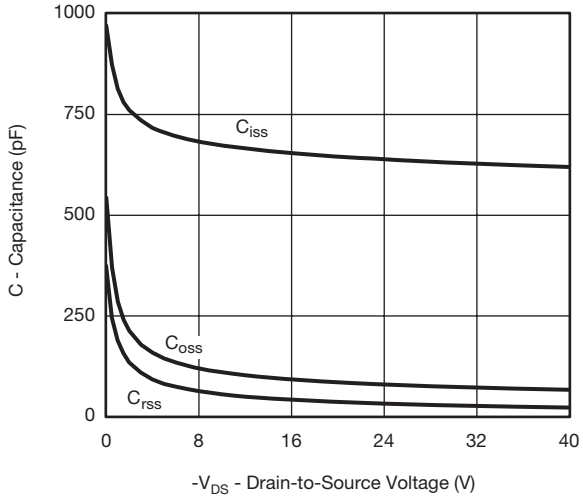
Output Characteristics



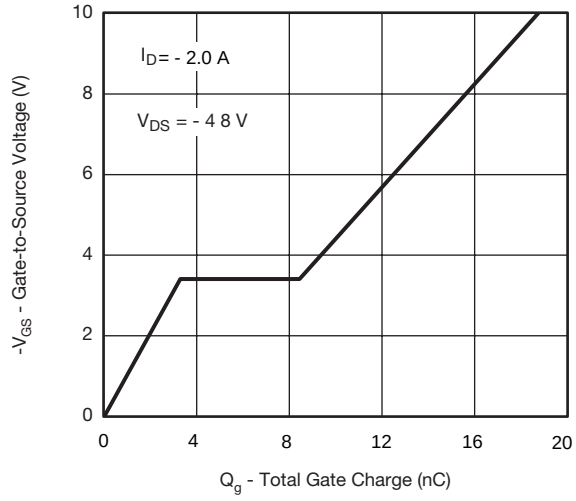
Transfer Characteristics



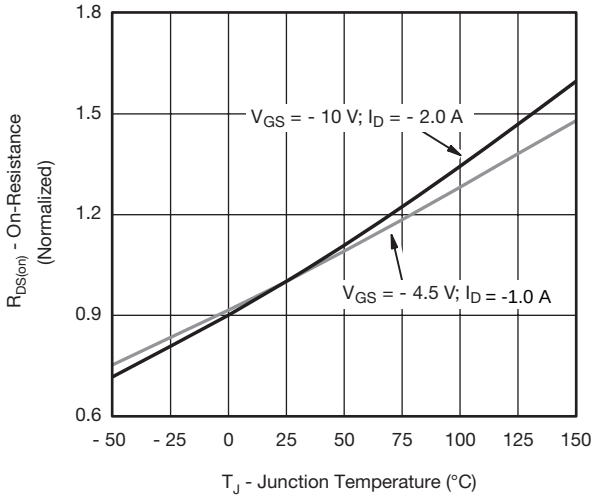
On-Resistance vs. Drain Current



Capacitance

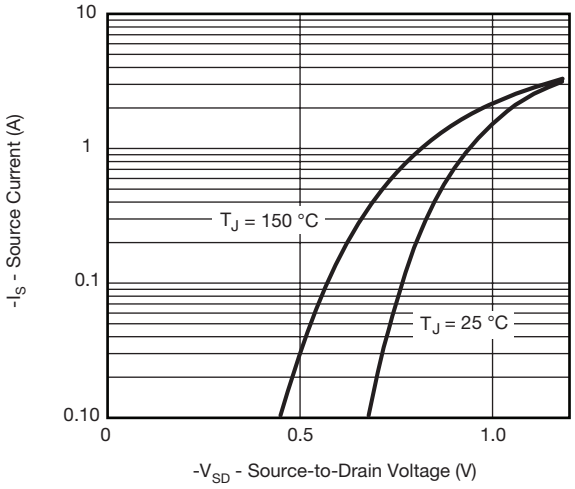


Gate Charge

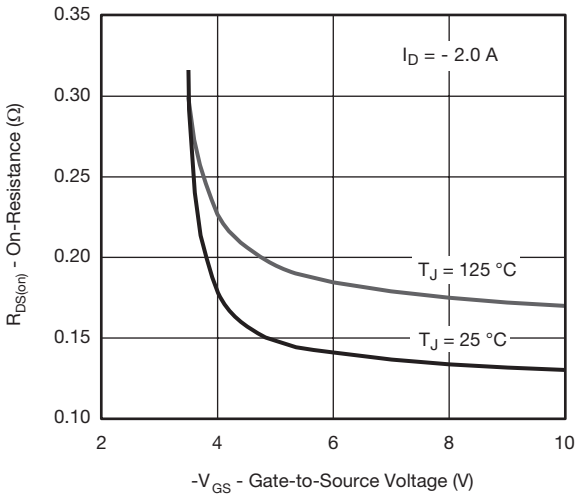


On-Resistance vs. Junction Temperature

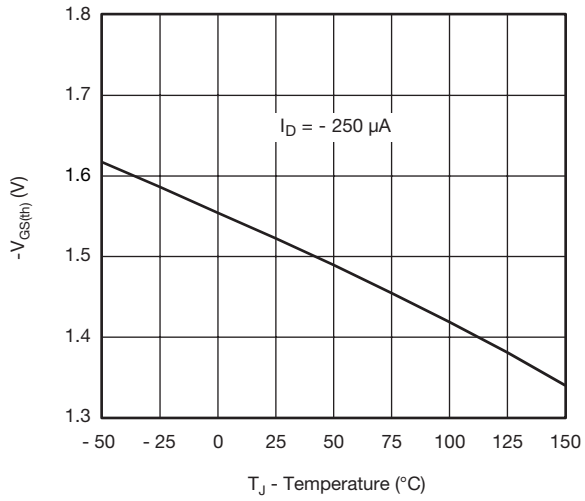
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



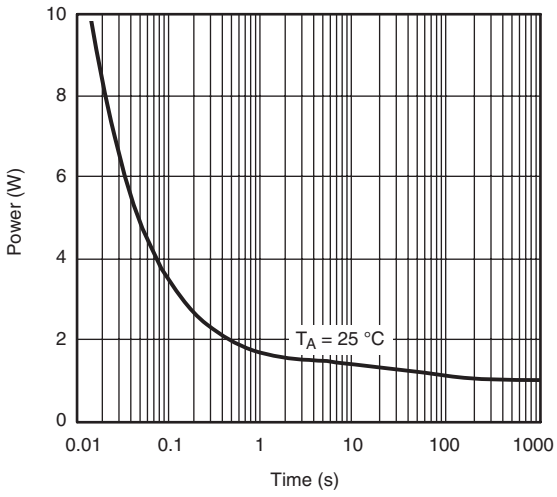
Source-Drain Diode Forward Voltage



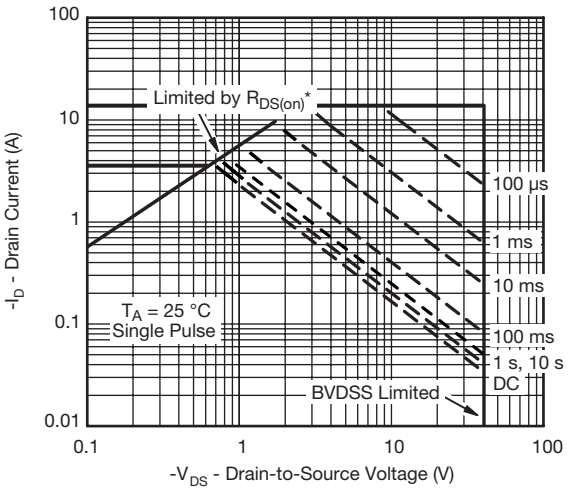
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



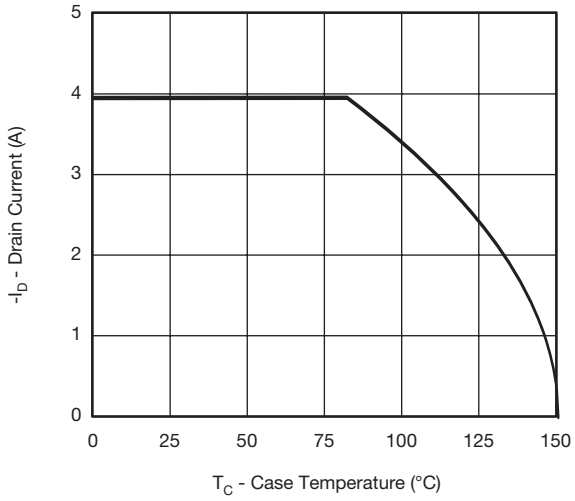
Single Pulse Power (Junction-to-Ambient)



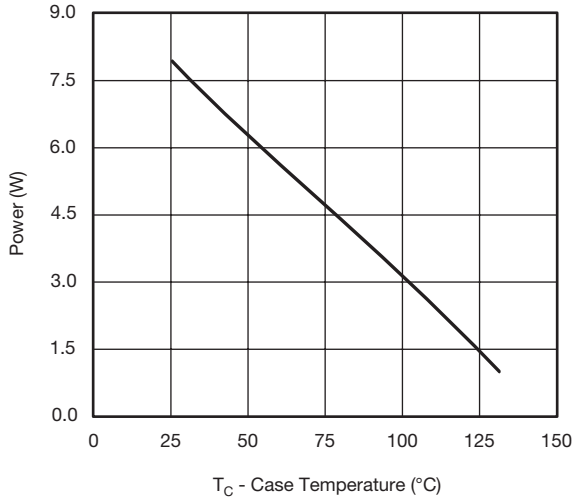
* $-V_{GS}$ > minimum $-V_{GS}$ at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

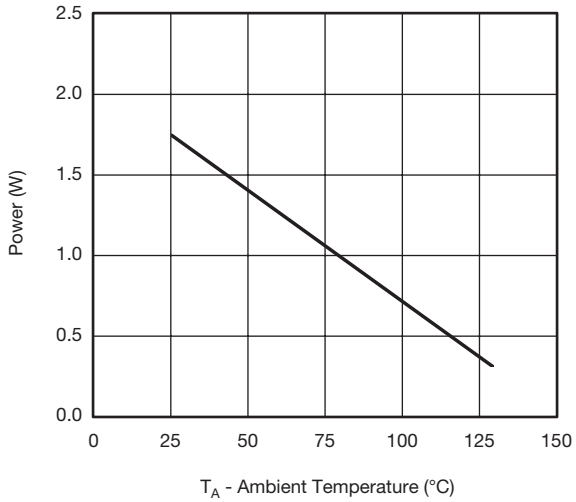
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



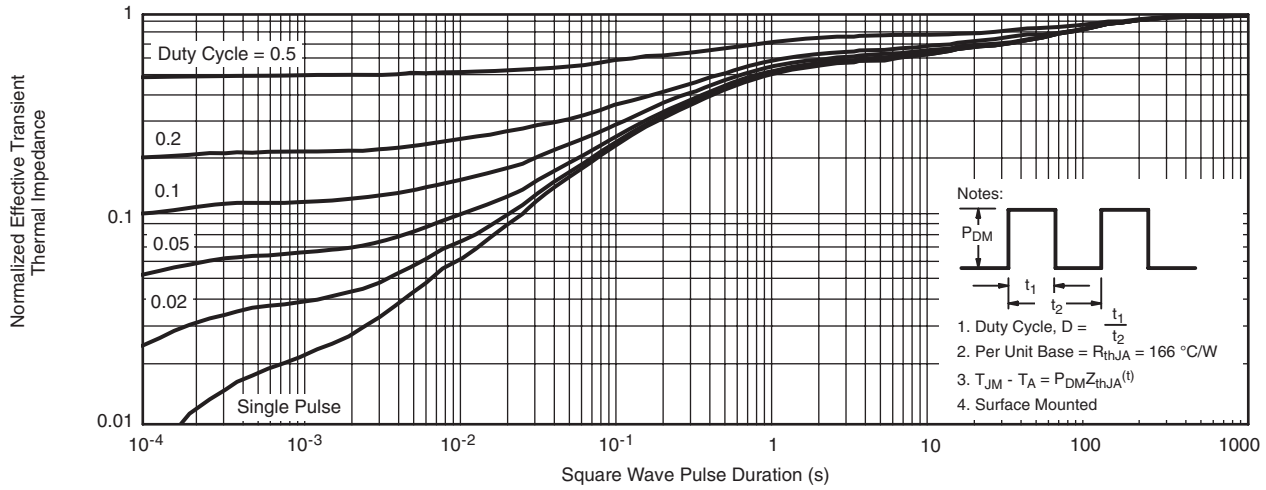
Power, Junction-to-Foot



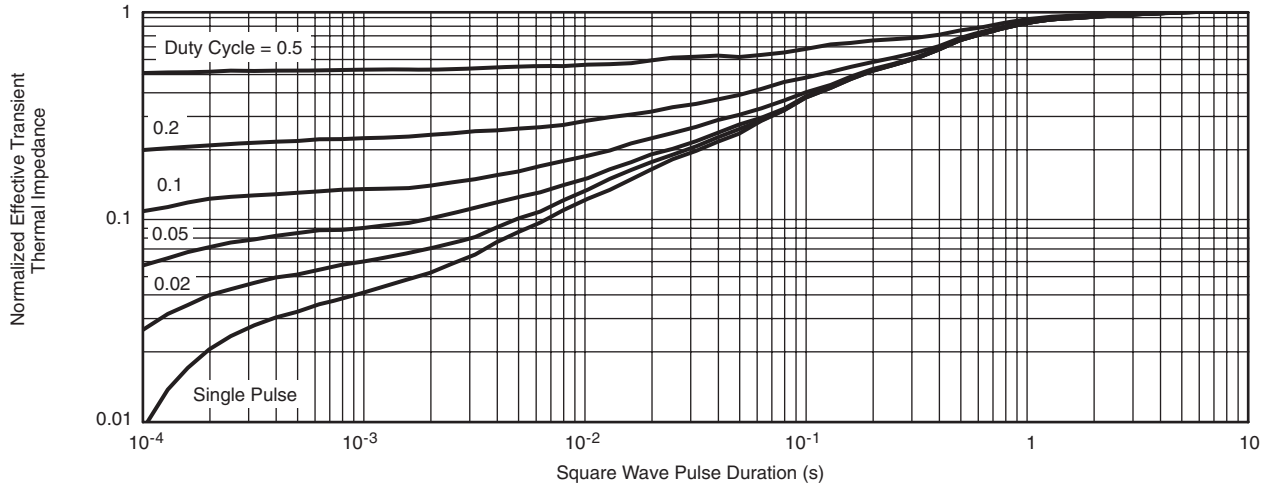
Power, Junction-to-Ambient

* 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

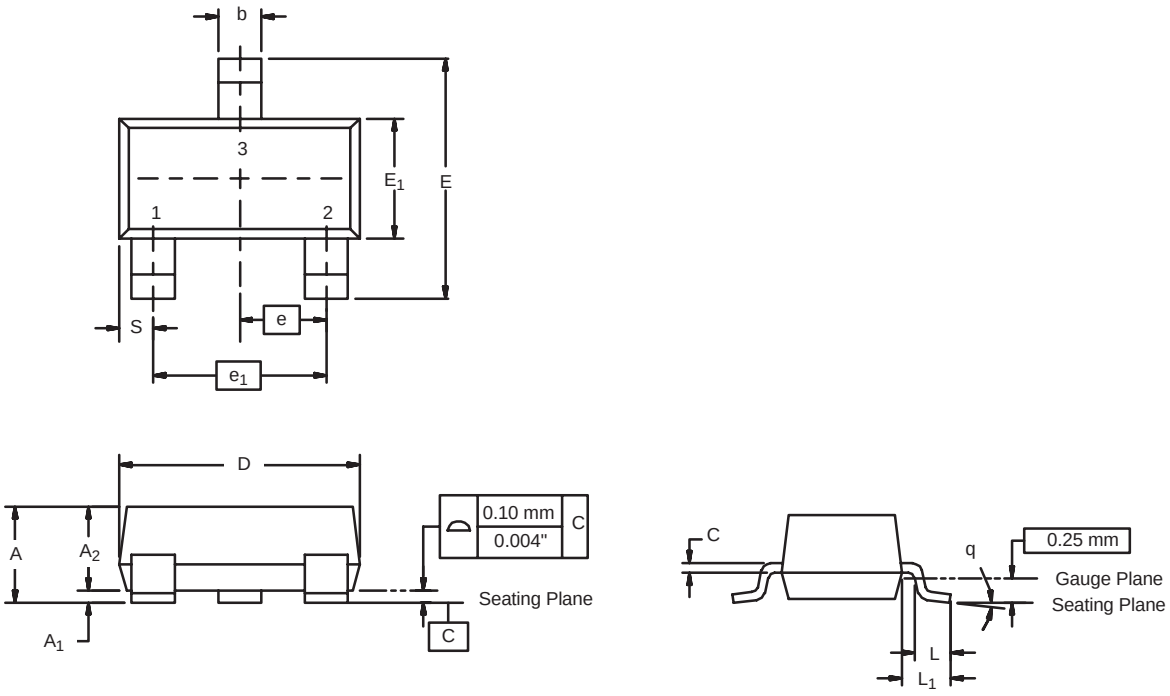


Normalized Thermal Transient Impedance, Junction-to-Ambient



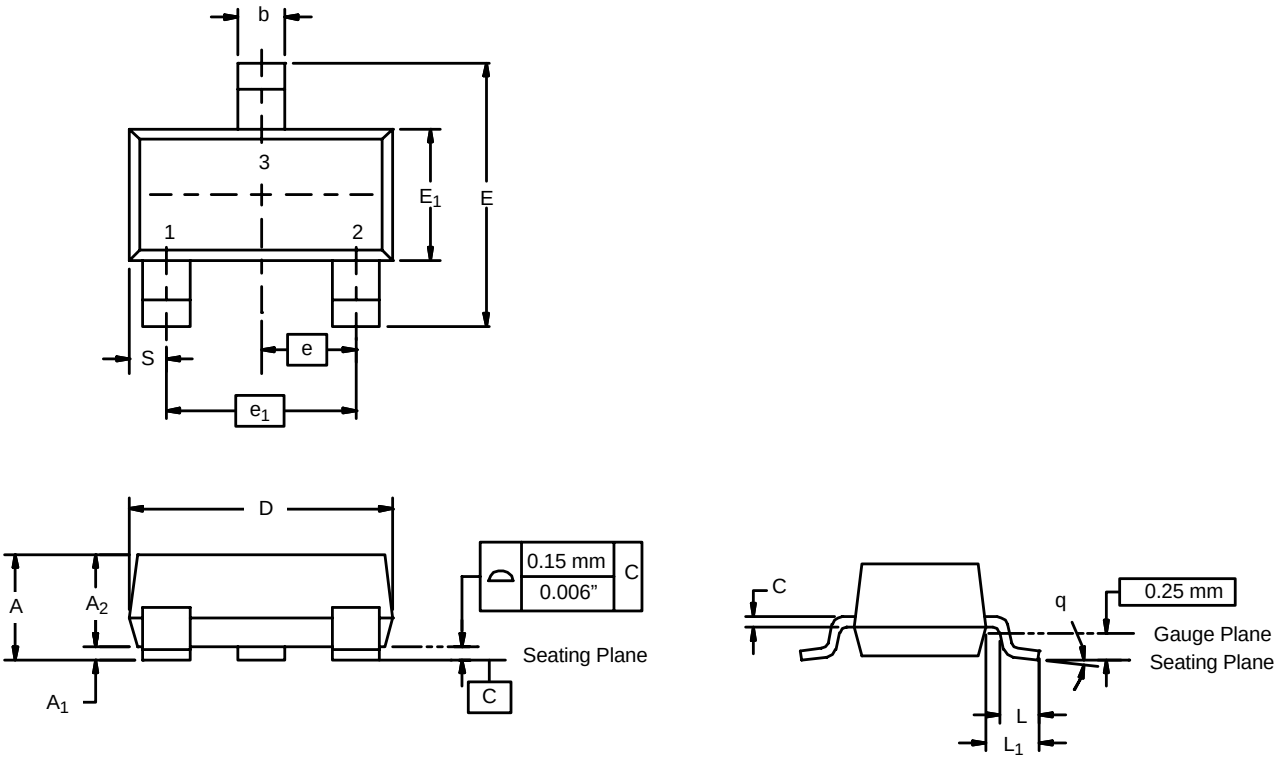
Normalized Thermal Transient Impedance, Junction-to-Foot

SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A_1	0.01	0.10	0.0004	0.004
A_2	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E_1	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e_1	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L_1	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°
ECN: S-03946-Rev. K, 09-Jul-01 DWG: 5479				

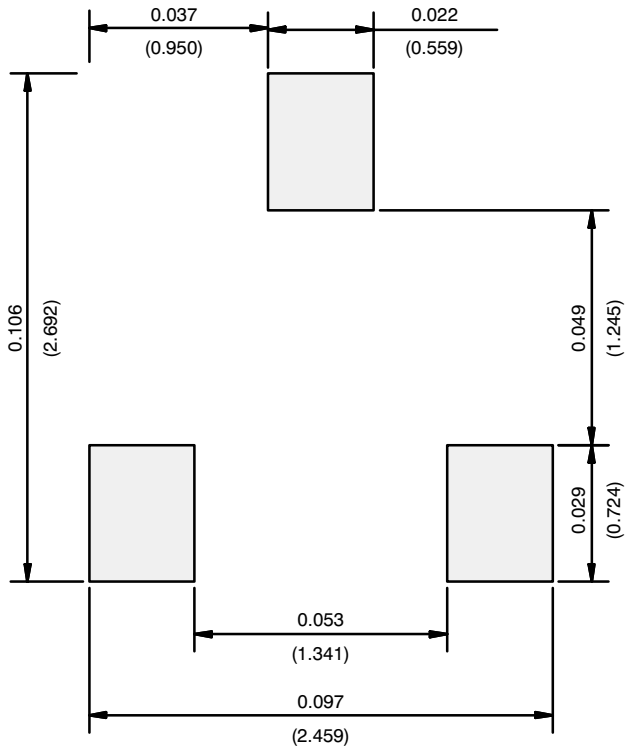
SOT-23-3L (TO-236-3L): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	—	1.45	—	0.057
A_1	0	0.15	0	0.006
A_2	0.90	1.30	0.035	0.052
b	0.30	0.50	0.012	0.020
c	0.08	0.25	0.003	0.010
D	2.70	3.10	0.100	0.122
E	2.40	3.00	0.090	0.120
E_1	1.40	1.80	0.055	0.071
e	0.95 TYP		0.037 TYP	
e_1	1.90 TYP		0.075 TYP	
L	0.35	0.55	0.013	0.022
L_1	0.64 TYP		0.025 TYP	
S	0.50 TYP		0.020 TYP	
q	0°	10°	0°	10°
ECN: S-31068—Rev. J, 26-May-13 DWG: 5901				

NOTE: Dimensions are in mm converted to inches.

RECOMMENDED MINIMUM PADS FOR SOT-23 & SOT-23-3L



Recommended Minimum Pads
Dimensions in Inches/(mm)

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