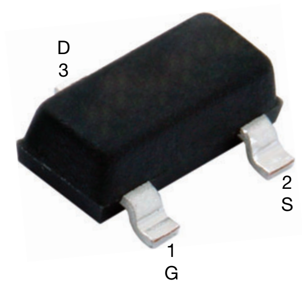
N-Channel 60 V (D-S) MOSFET

SOT-23 (TO-236)



Top View

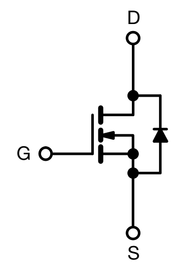
Marking Code: Si2308BDS (L8)

FEATURES

- Halogen-free according to IEC 61249-2-21 available
- TrenchFET® power MOSFET
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Battery Switch
- DC/DC Converter



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.156
$R_{DS(on)}$ max. (Ω) at V_{GS} = 4.5 V	0.192
Q_g typ. (nC)	2.3
I_D (A) [a]	2.1
Configuration	Single

ORDERING INFORMATION	
Package	TSOP-6 Single
Lead (Pb)-free	SI2308BDS-T1-E3
Lead (Pb)-free and halogen-free	SI2308BDS-T1-GE3
	SI2308BDS-T1-BE3

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	2.3	A
	T_C = 70 °C		1.8	
	T_A = 25 °C		1.9 [b,c]	
	T_A = 70 °C		1.5 [b,c]	
Pulsed drain current		I_{DM}	8	
Continuous source-drain diode current	T_C = 25 °C	I_S	1.39	
	T_A = 25 °C		0.91 [b,c]	
Avalanche current	L = 0.1 mH	I_{AS}	6	
Single pulse avalanche energy		E_{AS}	1.8	
Maximum power dissipation	T_C = 25 °C	P_D	1.66	W
	T_C = 70 °C		1.06	
	T_A = 25 °C		1.09 [b,c]	
	T_A = 70 °C		0.7 [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}	90	115	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	60	75	

Notes

a. T_C = 25 °C
b. Surface mounted on 1" x 1" FR4 board
c. t = 5 s
d. Maximum under steady state conditions is 130 °C/W

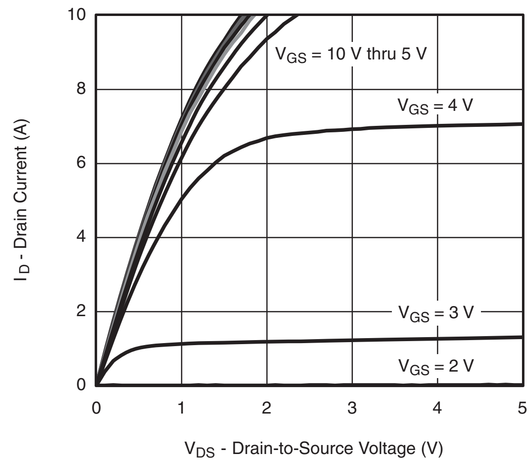
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{DS} = 0 V, I_D = 250 μA	60	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	I_D = 250 μA	-	55	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	-5	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1	-	3	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} = 60 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 55 °C	-	-	10	
On-state drain current [a]	$I_{D(on)}$	$V_{DS} \geq$ -5 V, V_{GS} = 10 V	8	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 1.9 A	-	0.130	0.156	Ω
		V_{GS} = 4.5 V, I_D = 1.7 A	-	0.160	0.192	
Forward Transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 1.9 A	-	5	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz	-	190	-	pF
Output capacitance	C_{oss}		-	26	-	
Reverse transfer capacitance	C_{rss}		-	15	-	
Total gate charge	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 1.9 A	-	4.5	6.8	nC
		V_{DS} = 30 V, V_{GS} = 4.5 V, I_D = 1.9 A	-	2.3	3.5	
Gate-source charge	Q_{gs}		-	0.8	-	
Gate-drain charge	Q_{gd}		-	1	-	
Gate resistance	R_g	f = 1 MHz	0.6	2.8	5.6	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 20 Ω $I_D \cong$ 1.5 A, V_{GEN} = 10 V, R_g = 1 Ω	-	4	6	ns
Rise time	t_r		-	10	15	
Turn-off delay time	$t_{d(off)}$		-	10	15	
Fall time	t_f		-	7	10.5	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 20 Ω I_D = 1.5 A, V_{GEN} = 4.5 V, R_g = 1 Ω	-	15	23	
Rise time	t_r		-	16	24	
Turn-off delay time	$t_{d(off)}$		-	11	17	
Fall time	t_f		-	11	17	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_C = 25 °C	-	-	1.39	A
Pulse diode forward current [a]	I_{SM}		-	-	8	
Body diode voltage	V_{SD}	I_S = 1.5 A	-	0.8	1.2	V
Body diode reverse recovery time	t_{rr}	I_F = 1.5 A, dI/dt = 100 A/μs, T_J = 25 °C	-	15	23	ns
Body diode reverse recovery charge	Q_{rr}		-	10	15	nC
Reverse recovery fall time	t_a		-	12	-	ns
Reverse recovery rise time	t_b		-	3	-	

Notes

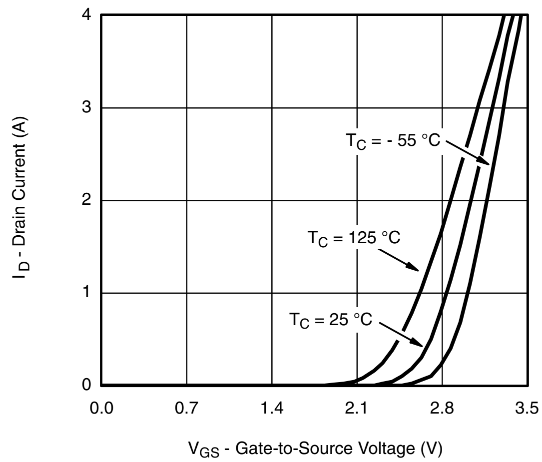
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing

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.

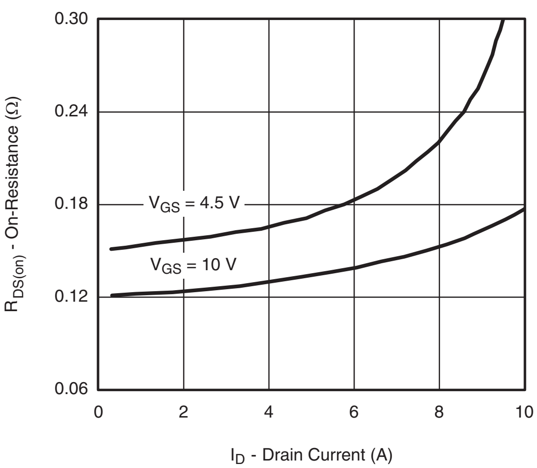
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



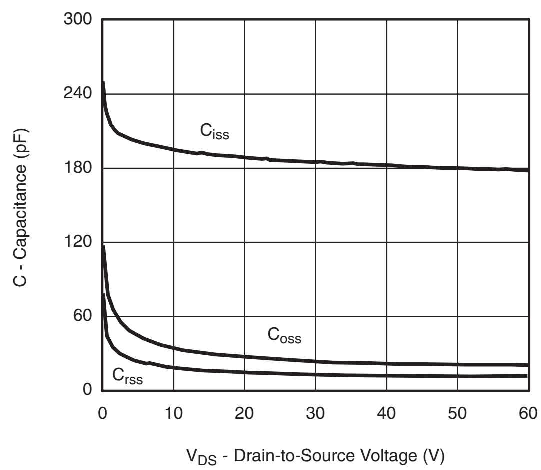
Output Characteristics



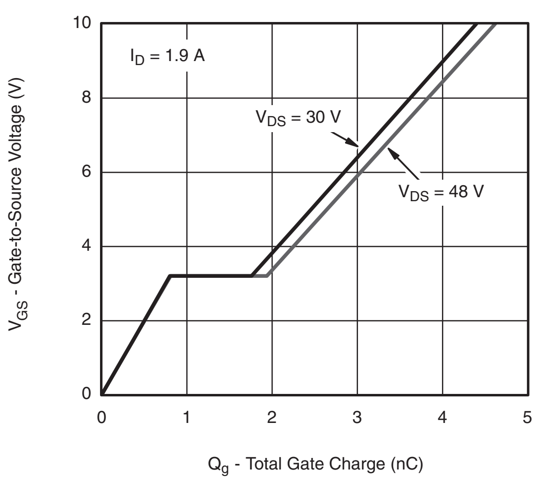
Transfer Characteristics



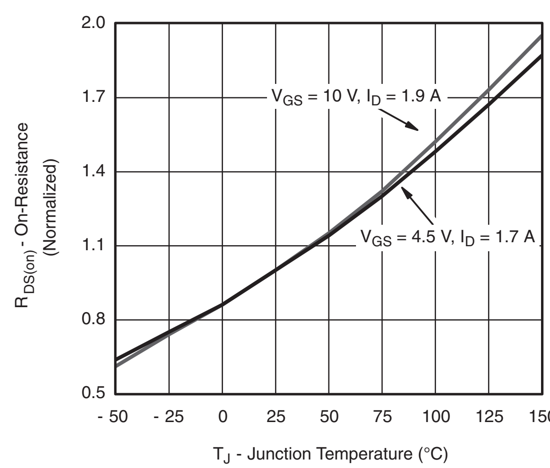
On-Resistance vs. Drain Current



Capacitance

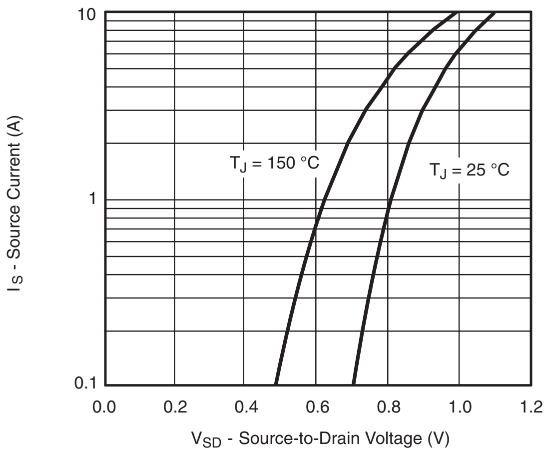


Gate Charge

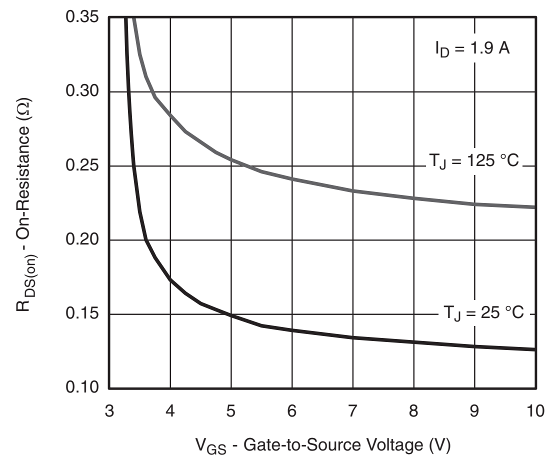


On-Resistance vs. Junction Temperature

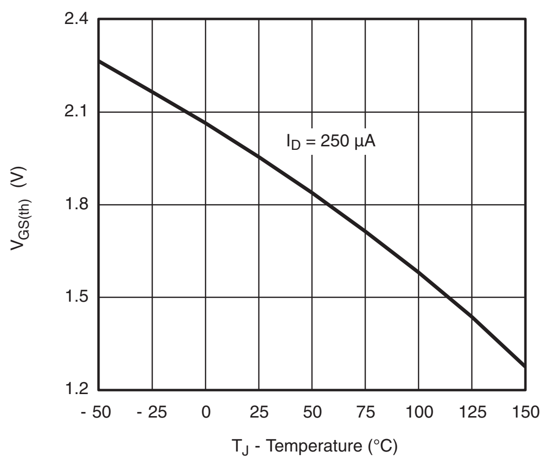
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



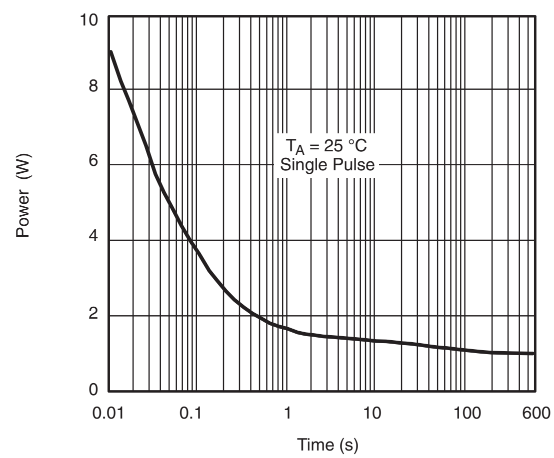
Source-Drain Diode Forward Voltage



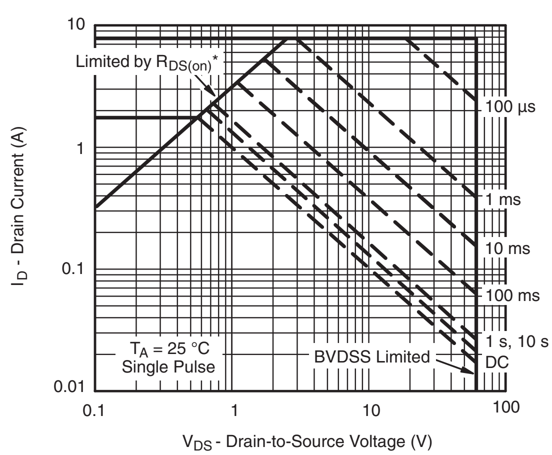
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



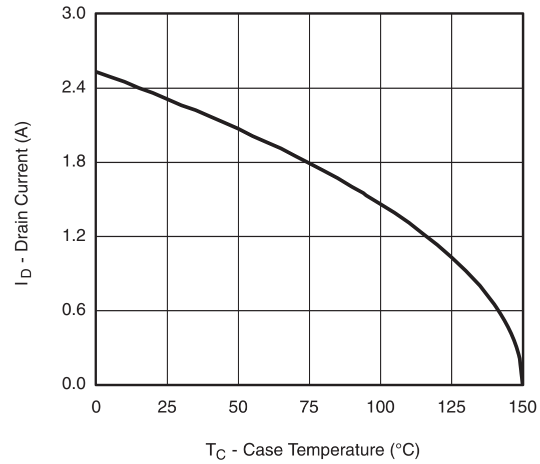
Single Pulse Power, Junction-to-Ambient



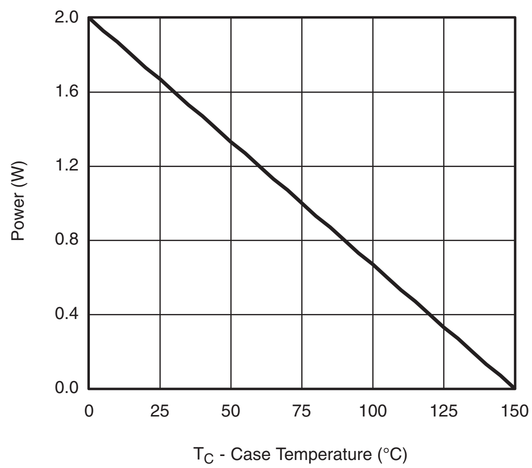
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

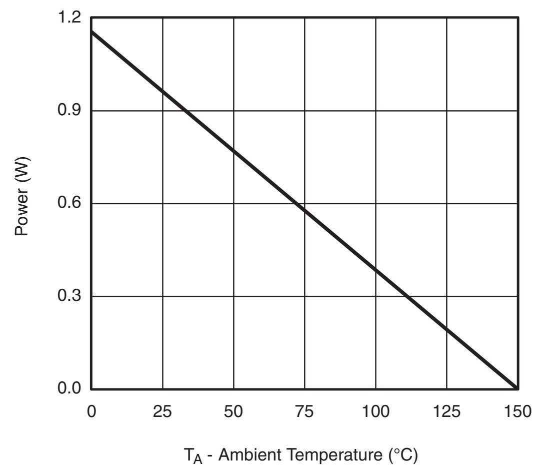
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Power Junction-to-Case

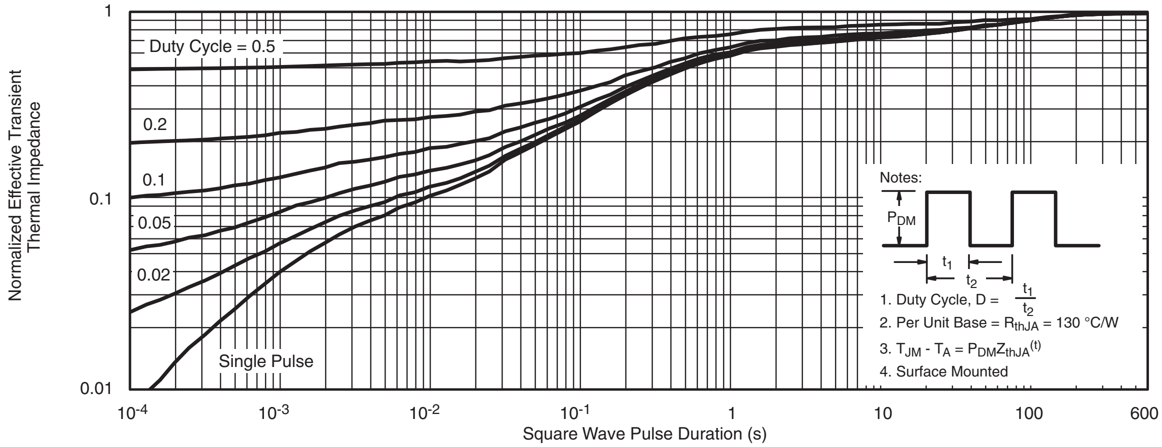


Power Junction-to-Ambient

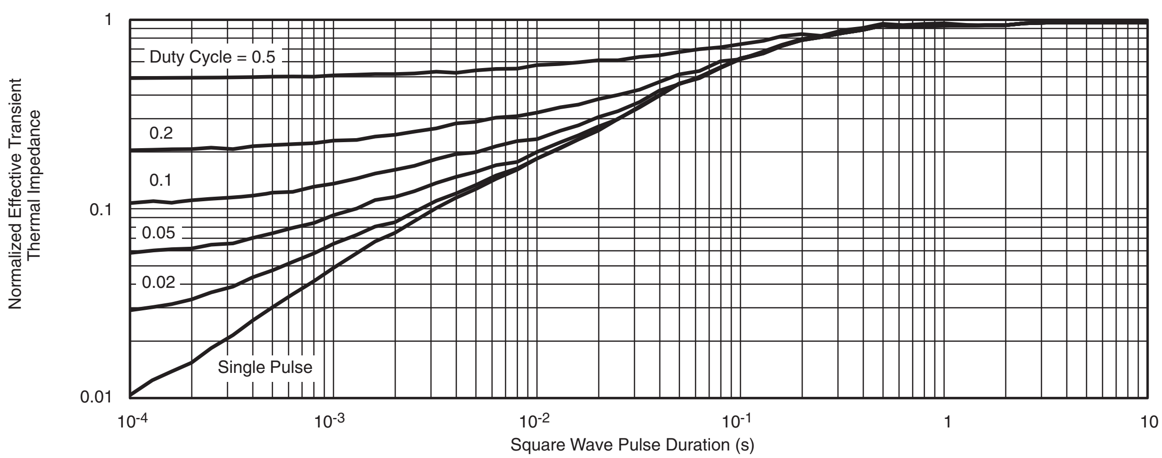
Note

a. 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

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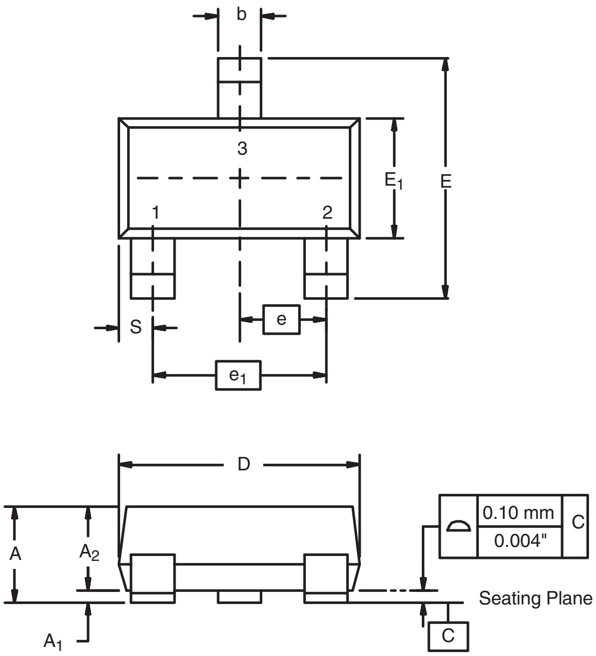
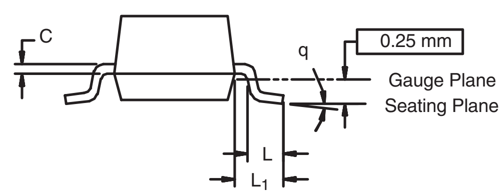
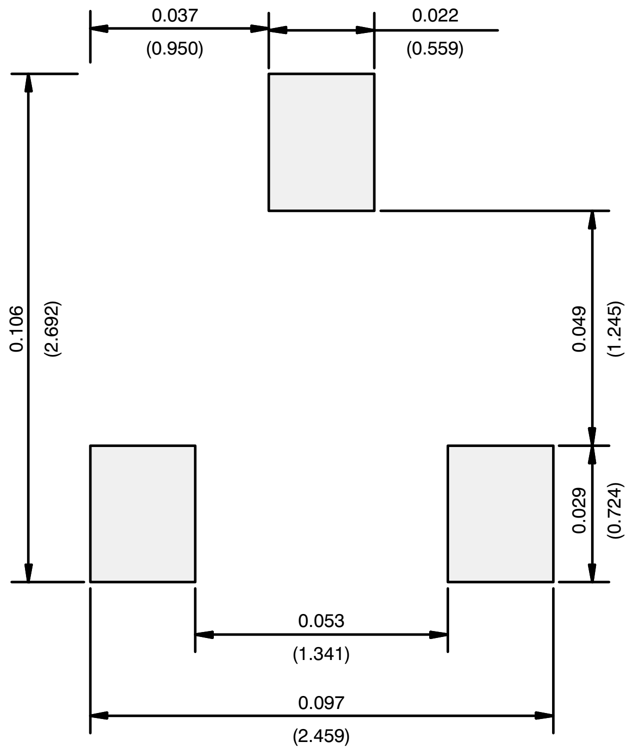
SOT-23 (TO-236): 3-LEAD





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				

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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