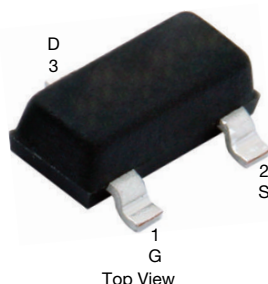


# P-Channel 40 V (D-S) MOSFET

SOT-23 (TO-236)



Top View

Marking code: G4

## PRODUCT SUMMARY

$V_{DS}$ (V)	-40
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.075
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.100
$Q_g$ typ. (nC)	6
$I_D$ (A)	-3.6 <sup>a</sup>
Configuration	Single

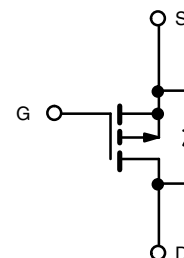
## FEATURES

- TrenchFET® Gen III p-channel power MOSFET
- 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)


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Battery switch
- Motor drive control
- Load switch



P-Channel MOSFET

## ORDERING INFORMATION

Package	SOT-23
Lead (Pb)-free and halogen-free	Si2319DDS-T1-GE3
Alternate manufacturing location	Si2319DDS-T1-BE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-40	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Continuous drain current ( $T_J = 150$ °C)	$T_C = 25$ °C	-3.6	A
	$T_C = 70$ °C	-2.9	
	$T_A = 25$ °C	-2.7 <sup>b, c</sup>	
	$T_A = 70$ °C	-2.2 <sup>b, c</sup>	
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	-15	
Continuous source-drain diode current	$T_C = 25$ °C	-1.4	
	$T_A = 25$ °C	-0.8 <sup>b, c</sup>	
Single pulse avalanche current	$I_{AS}$	-5	
Single pulse avalanche energy	$E_{AS}$	1.25	mJ
Maximum power dissipation	$T_C = 25$ °C	1.7	W
	$T_C = 70$ °C	1.1	
	$T_A = 25$ °C	1 <sup>b, c</sup>	
	$T_A = 70$ °C	0.6 <sup>b, c</sup>	
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 <sup>b</sup>	$R_{thJA}$	100	130	°C/W
Maximum junction-to-case (drain)	$R_{thJF}$	60	75	

### Notes

- Based on  $T_C = 25$  °C
- Surface mounted on 1" x 1" FR4 board
- $t = 5$  s
- Maximum under steady state conditions is 175 °C/W



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-40	-	-	V
V <sub>DS</sub> temperature coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA	-	-27.5	-	mV/°C
V <sub>GS(th)</sub> temperature coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA	-	3.2	-	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	-1	-	-2.5	V
Gate-source leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C	-	-	-15	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ -10 V, V <sub>GS</sub> = -10 V	-10	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.7 A	-	0.062	0.075	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.4 A	-	0.081	0.100	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -2.7 A	-	10	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	650	-	pF
Output capacitance	C <sub>oss</sub>		-	54	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	43	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.7 A	-	12.5	19	nC
Gate-source charge	Q <sub>gs</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.7 A	-	6	12	
Gate-drain charge	Q <sub>gd</sub>		-	1.8	-	
Gate resistance	R <sub>g</sub>		-	2	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	2	10	20	Ω
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, R <sub>L</sub> = 9.1 Ω, I <sub>D</sub> ≅ -2.2 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	10	20	ns
Rise time	t <sub>r</sub>		-	20	30	
Turn-off delay time	t <sub>d(off)</sub>		-	20	30	
Fall time	t <sub>f</sub>		-	12	24	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, R <sub>L</sub> = 9.1 Ω, I <sub>D</sub> ≅ -2.2 A, V <sub>GEN</sub> = -4.5 V, R <sub>g</sub> = 1 Ω	-	30	45	
Rise time	t <sub>r</sub>		-	32	48	
Turn-off delay time	t <sub>d(off)</sub>		-	20	30	
Fall time	t <sub>f</sub>		-	15	30	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	-1.4	A
Pulse diode forward current	I <sub>SM</sub>		-	-	-15	
Body diode voltage	V <sub>SD</sub>	I <sub>S</sub> = -2.2 A, V <sub>GS</sub> = 0 V	-	-0.8	-1.2	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -2.2 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C	-	15	30	ns
Body diode reverse recovery charge	Q <sub>rr</sub>		-	9	18	nC
Reverse recovery fall time	t <sub>a</sub>		-	10.5	-	ns
Reverse recovery rise time	t <sub>b</sub>		-	4.5	-	

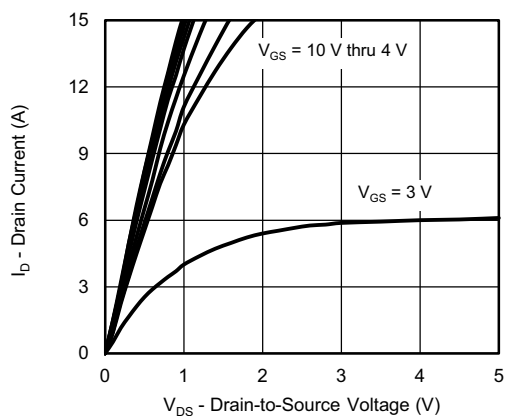
**Notes**

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

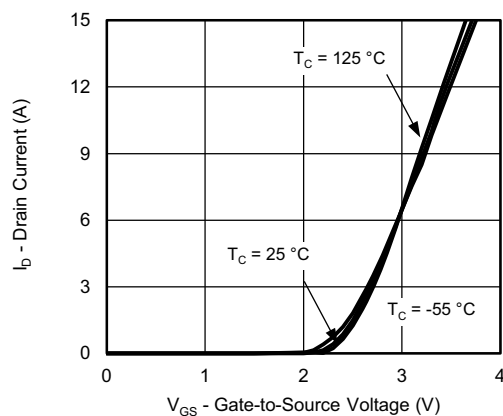
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



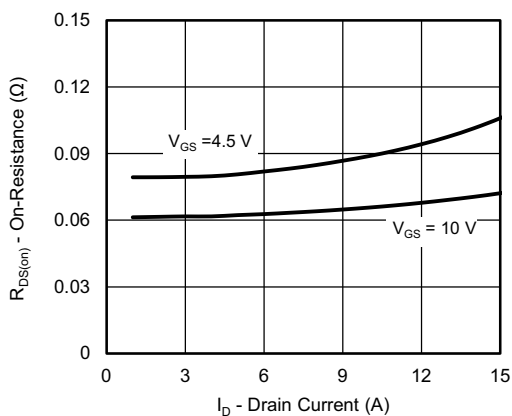
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



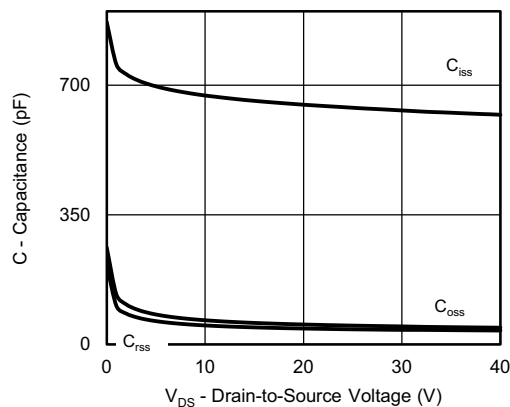
**Output Characteristics**



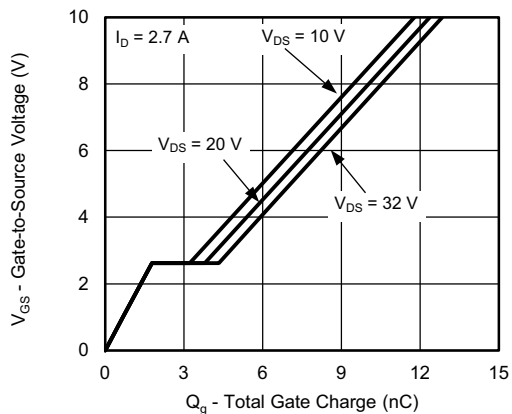
**Transfer Characteristics**



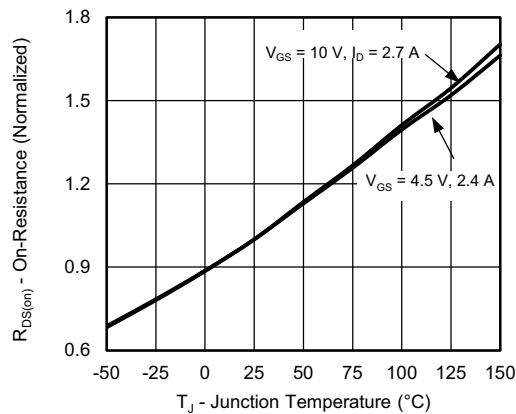
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



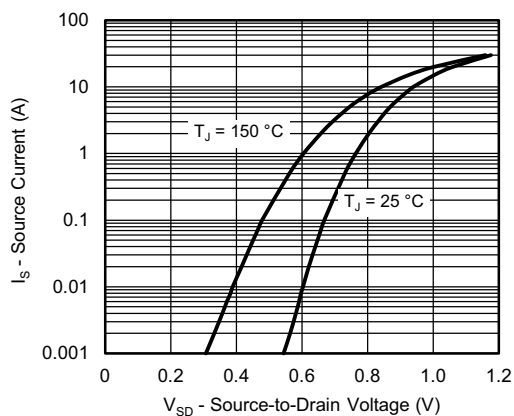
**Gate Charge**



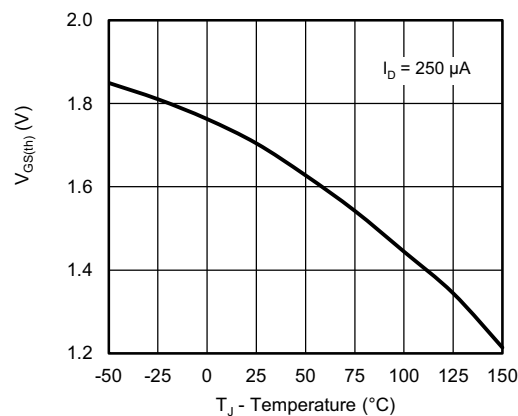
**On-Resistance vs. Junction Temperature**



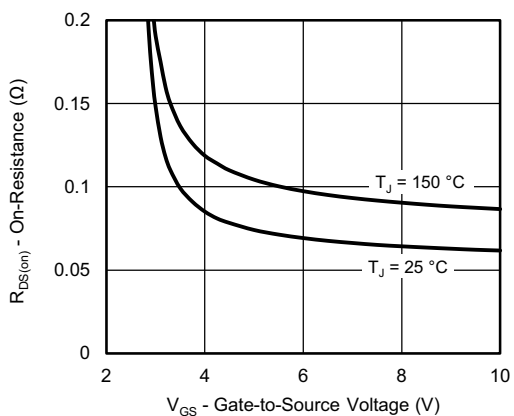
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



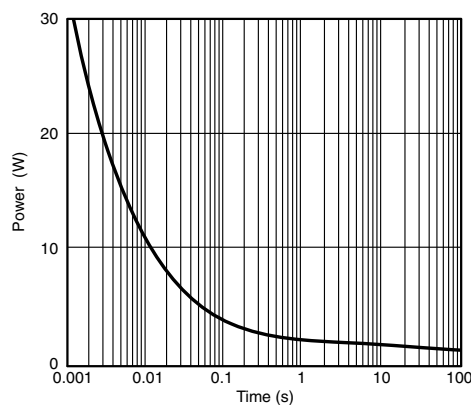
**Source-Drain Diode Forward Voltage**



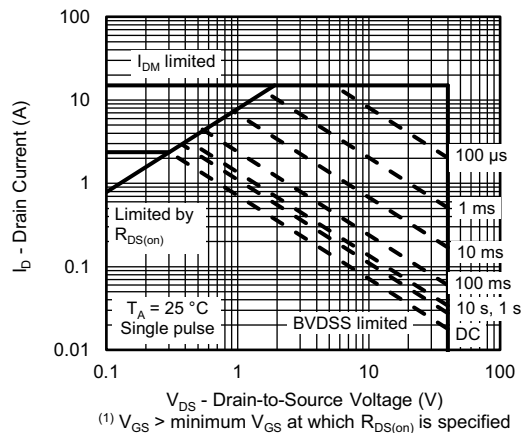
**Threshold Voltage**



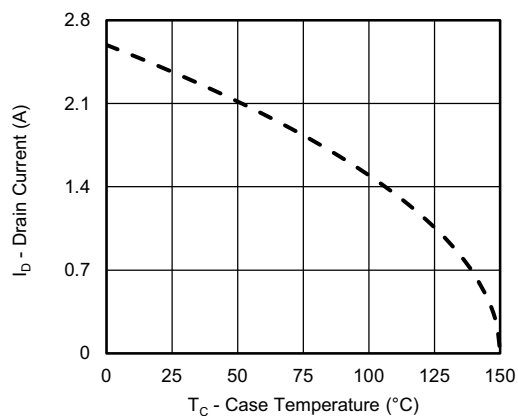
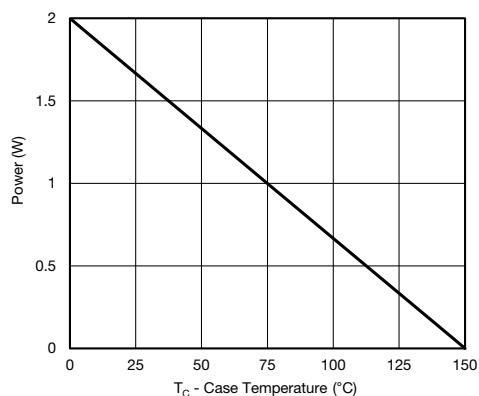
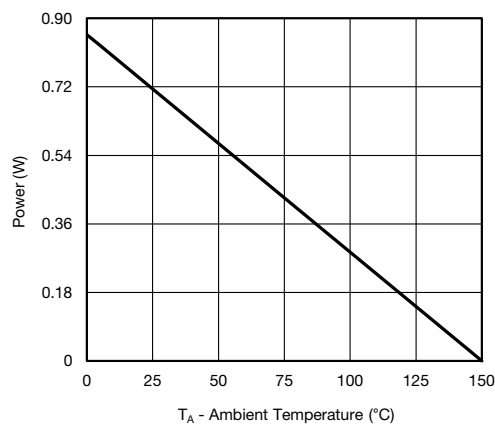
**On-Resistance vs. Gate-to-Source Voltage**



**Single Pulse Power, Junction-to-Ambient**



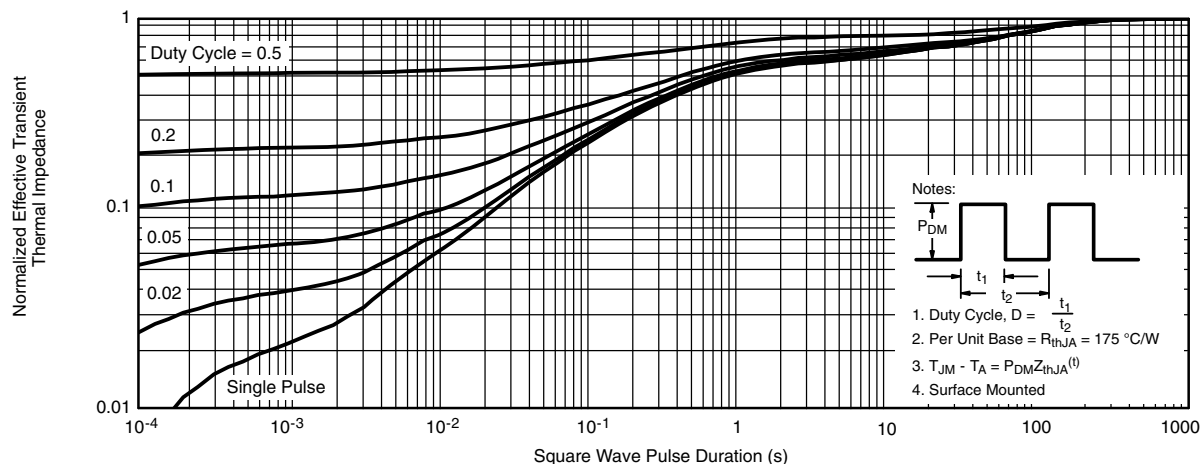
**Safe Operating Area, Junction-to-Ambient**

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

**Current Derating <sup>a</sup>**

**Power, Junction-to-Case**

**Power, Junction-to-Ambient**
**Note**

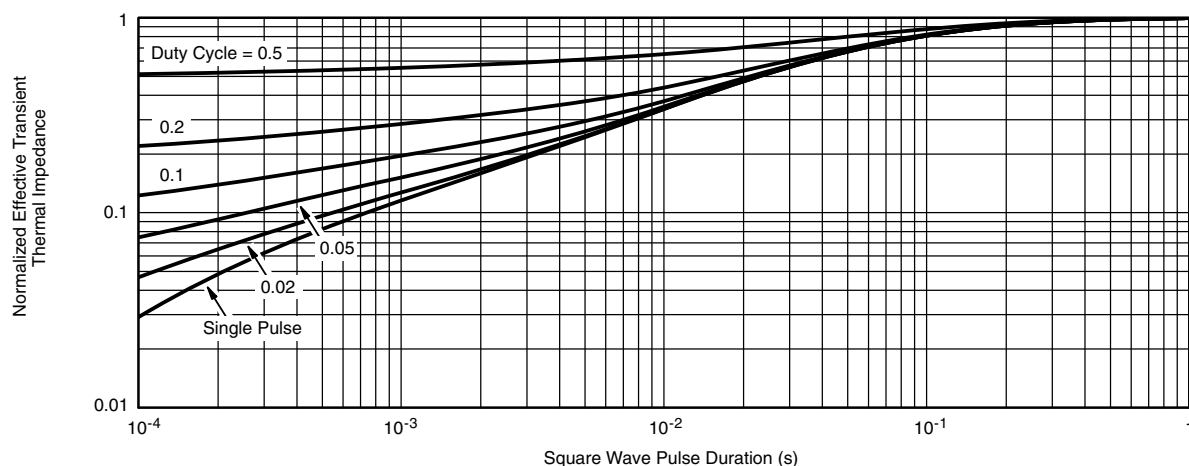
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



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



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

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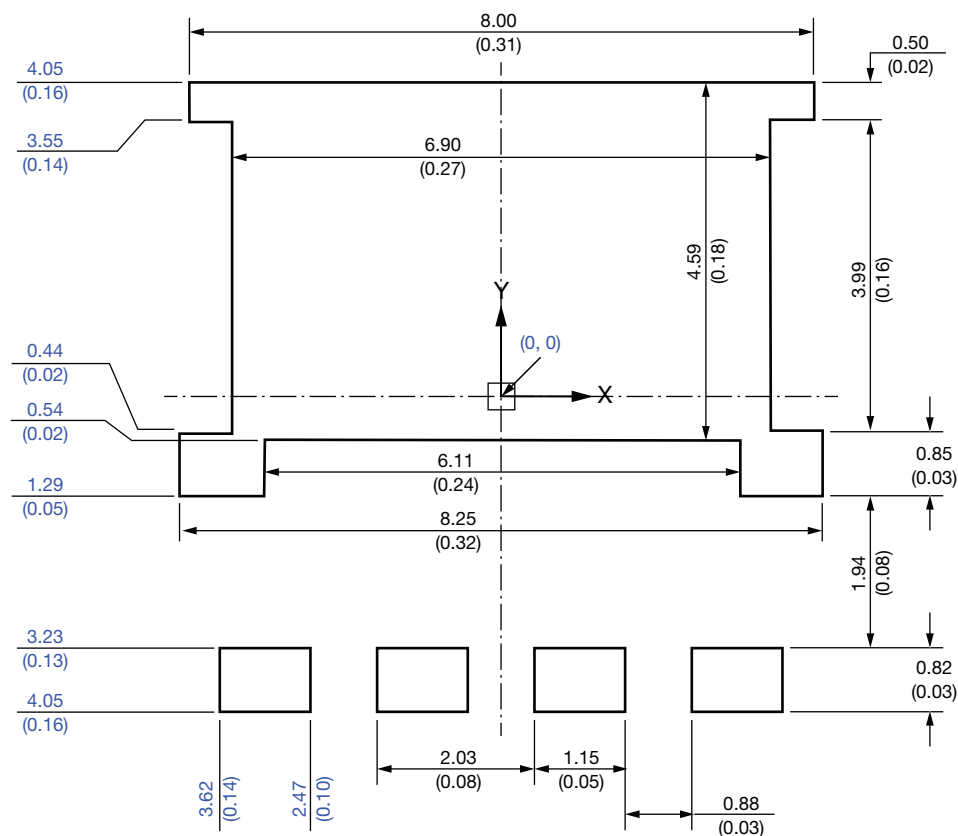
## SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A <sub>1</sub>	0.01	0.10	0.0004	0.004
A <sub>2</sub>	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 <sub>1</sub>	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e <sub>1</sub>	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L <sub>1</sub>	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 PowerPAK® 8 x 8L Single



Dimensions in millimeters (inches)

### Note

- Linear dimensions are in black, the same information is provided in ordinate dimensions which are in blue.





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