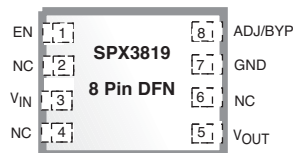


## 500mA, Low-Noise LDO Voltage Regulator

### FEATURES

- Low Noise: 40 $\mu$ V Possible
- High Accuracy: 1%
- Reverse Battery Protection
- Low Dropout: 340mV at Full Load
- Low Quiescent Current: 90 $\mu$ A
- Zero Off-Mode Current
- Fixed Output: 1.2V, 1.5V, 1.8V, 2.5V, 3.0V, 3.1V, 3.3V, 5.0V. Adj. Output also available.
- Available in RoHS Compliant, Lead Free Packages: 5 Pin SOT-23, 8 Pin Narrow SOIC and 8 pin 2X3 DFN



### APPLICATIONS

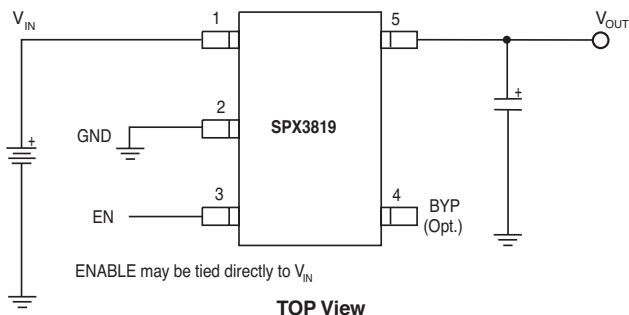
- Battery Powered Systems
- Cordless Phones
- Radio Control Systems
- Portable/Palm Top/Notebook Computers
- Portable Consumer Equipment
- Portable Instrumentation
- Bar Code Scanners
- SMPS Post Regulators

### DESCRIPTION

The SPX3819 is a positive voltage regulator with a low dropout voltage and low noise output. In addition, this device offers a very low ground current of 800 $\mu$ A at 100mA output. The SPX3819 has an initial tolerance of less than 1% max and a logic compatible ON/OFF switched input. When disabled, power consumption drops to nearly zero. Other key features include reverse battery protection, current limit, and thermal shutdown. The SPX3819 includes a reference bypass pin for optimal low noise output performance. With its very low output temperature coefficient, this device also makes a superior low power voltage reference.

The SPX3819 is an excellent choice for use in battery-powered applications such as cordless telephones, radio control systems, and portable computers. It is available in several fixed voltages -- 1.2V, 1.5V, 1.8V, 2.5V, 3.0V, 3.1V, 3.3V, 5.0V -- or with an adjustable output. This device is offered in 8 pin NSOIC, 8 pin DFN and 5-pin SOT-23 packages.

### TYPICAL APPLICATION CIRCUIT



## ABSOLUTE MAXIMUM RATINGS

Power Dissipation .....	Internally Limited
Lead Temp. (Soldering, 5 Seconds) .....	260°C
Operating Junction Temperature Range .....	-40°C to +125°C
Input Supply Voltage .....	-20V to +20V
Enable Input Voltage .....	-20V to +20V

## RECOMMENDED OPERATING CONDITIONS

Input Voltage .....	+2.5V to +16V
Operating Junction Temperature Range .....	-40°C to +125°C
Enable Input Voltage .....	0.0V to $V_{IN}$

## ELECTRICAL CHARACTERISTICS

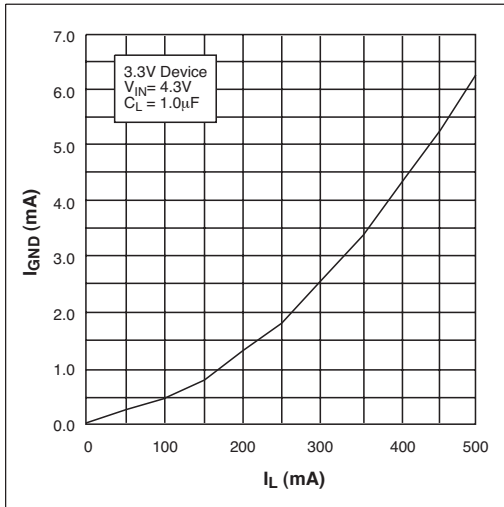
$T_J=25^\circ\text{C}$ ,  $V_{OUT} + 1\text{V}$ , for 1.2V Option  $V_{IN}=V_{OUT} + 1.2\text{V}$   $I_L=100\mu\text{A}$ ,  $C_L=1\mu\text{F}$ , and  $V_{ENABLE} \geq 2.4\text{V}$ . The ♦ denotes the specifications which apply over full operating temperature range  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , unless otherwise specified.

PARAMETER	MIN	TYP	MAX	UNITS	♦	CONDITIONS
Output Voltage Tolerance	-1 -2		+1 +2	%	♦	
Output Voltage Temperature Coef.		57		ppm/°C		
Line Regulation		0.04	0.1	%/V		$V_{IN}=V_{OUT} + 1\text{V}$ to 16V
Load Regulation		0.05	0.4	%		$I_L = 0.1\text{mA}$ to 500mA
Dropout Voltage ( $V_{IN}-V_O$ )(Note 2)		10	60 80	mV	♦	$I_L = 100\mu\text{A}$
		125	175 250	mV	♦	$I_L = 50\text{mA}$
		180	350 450	mV	♦	$I_L = 150\text{mA}$
		340	550 700	mV	♦	$I_L = 500\text{mA}$
Quiescent Current ( $I_{GND}$ )		0.05	3 8	$\mu\text{A}$	♦	$V_{ENABLE} \leq 0.4\text{V}$ $V_{ENABLE} \leq 0.25\text{V}$
Ground Pin Current ( $I_{GND}$ )		90	150 190	$\mu\text{A}$	♦	$I_L = 100\mu\text{A}$
		250	650 900	$\mu\text{A}$	♦	$I_L = 50\text{mA}$
		1.0	2.0 2.5	mA	♦	$I_L = 150\text{mA}$
		6.5	25.0 30.0	mA	♦	$I_L = 500\text{mA}$
Ripple Rejection (PSRR)		70		dB		
Current Limit ( $I_{LIMIT}$ )		800	950	mA	♦	$V_{OUT} = 0.0\text{V}$
Output Noise ( $e_{NO}$ )		300		$\mu\text{V}_{RMS}$		$I_L=10\text{mA}$ , $C_L=1.0\mu\text{F}$ , $C_{IN}=1\mu\text{F}$ , (10Hz-100kHz)
		40		$\mu\text{V}_{RMS}$		$I_L=10\text{mA}$ , $C_L=10\mu\text{F}$ , $C_{BYP}=1\mu\text{F}$ , $C_{IN}=1\mu\text{F}$ , (10Hz-100kHz)
Input Voltage Level Logic Low ( $V_{IL}$ )			0.4	V		OFF
Input Voltage Level Logic High ( $V_{IH}$ )	2			V		ON
ENABLE Input Current		0.01 3	2 20	$\mu\text{A}$		$V_{IL} \leq 0.4\text{V}$ $V_{IH} \geq 2.0\text{V}$
Thermal Resistance (Note 1)		191		°C/W	♦	SOT-23-5 / Junction to Ambient
		128.4		°C/W	♦	NSOIC-8 / Junction to Ambient
		59		°C/W	♦	DFN-8 / Junction to Ambient

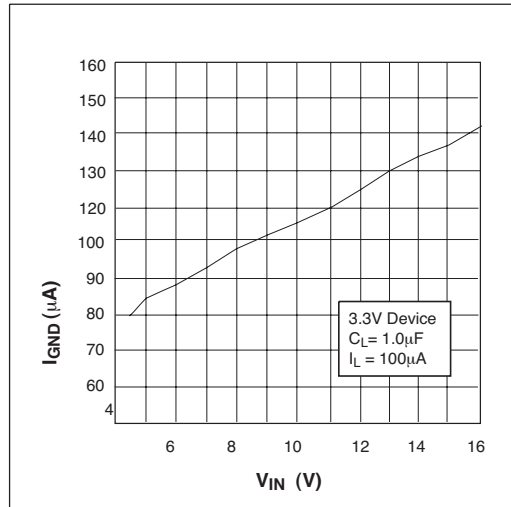
### NOTES

**Note 1:** The maximum allowable power dissipation is a function of maximum operating junction temperature,  $T_{J(max)}$  the junction to ambient thermal resistance, and the ambient  $\theta_{JA}$ , and the ambient temperature  $T_A$ . The maximum allowable power dissipation at any ambient temperature is given:  $P_{D(max)} = (T_{J(max)} - T_A) / \theta_{JA}$ , exceeding the maximum allowable power limit will result in excessive die temperature; thus, the regulator will go into thermal shutdown. The  $\theta_{JA}$  of the SPX3819 is 220°C/W mounted on a PC board.

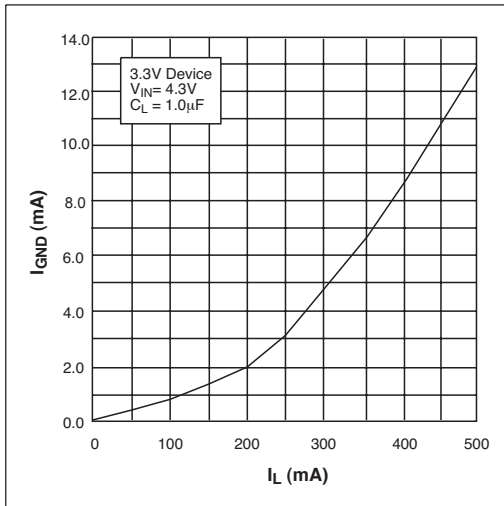
**Note 2:** Not applicable to output voltage 2V or less.



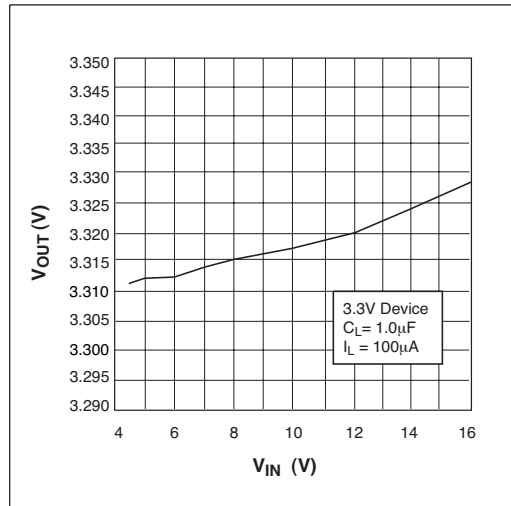
Ground Current vs Load Current



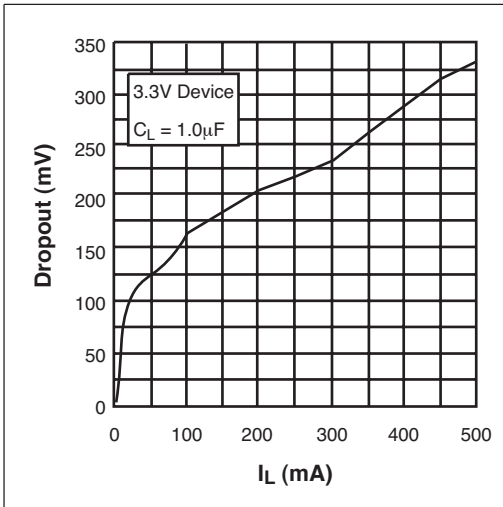
Ground Current vs Input Voltage



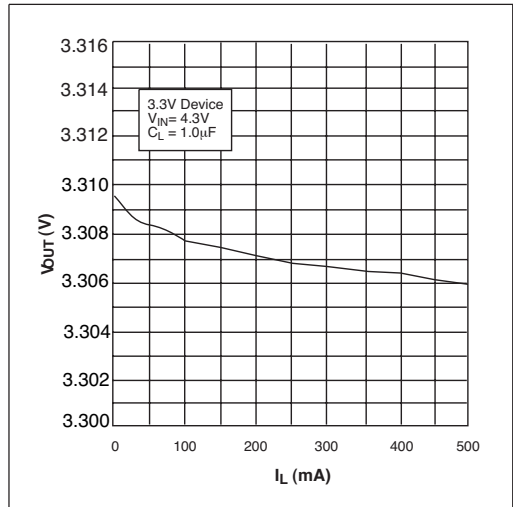
Ground Current vs Load Current in Dropout



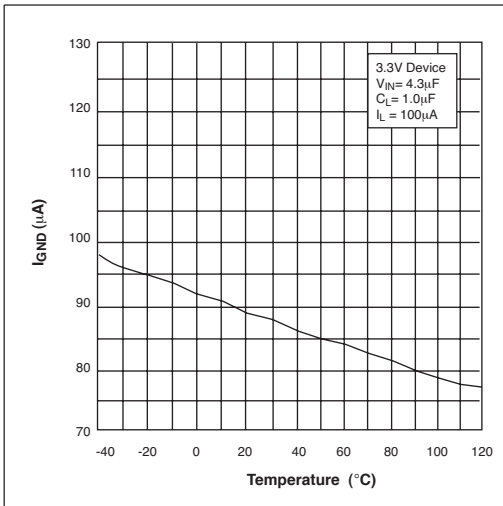
Output Voltage vs Input Voltage



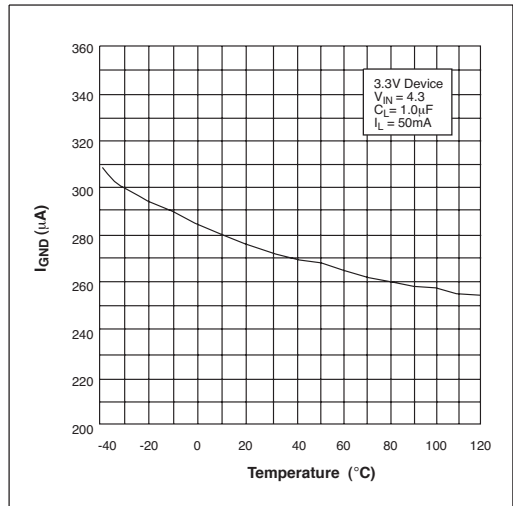
Dropout Voltage vs Load Current



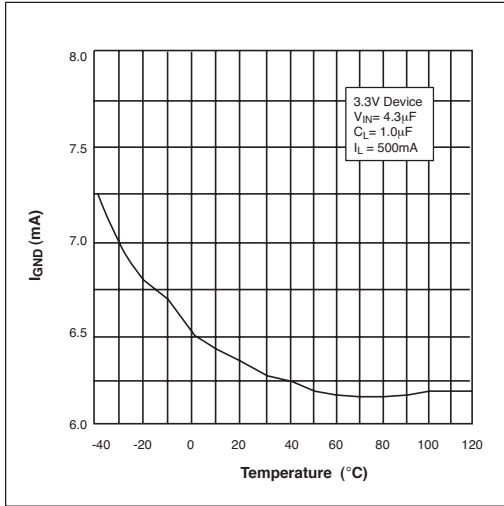
Output Voltage vs Load Current



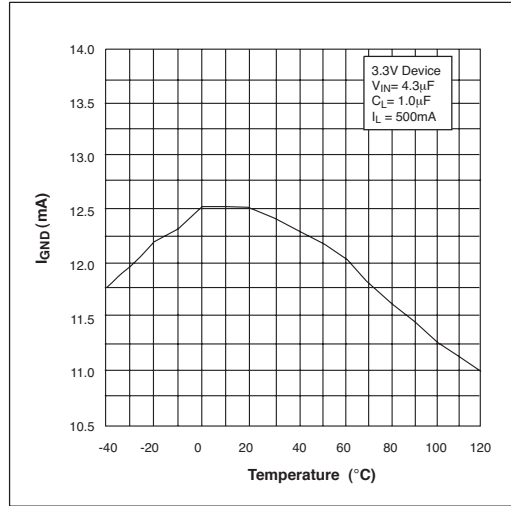
Ground Current vs Temperature with 100µA Load



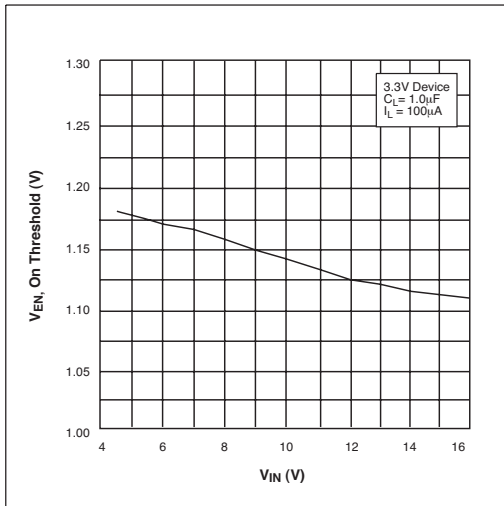
Ground Current vs Temperature with 50mA Load



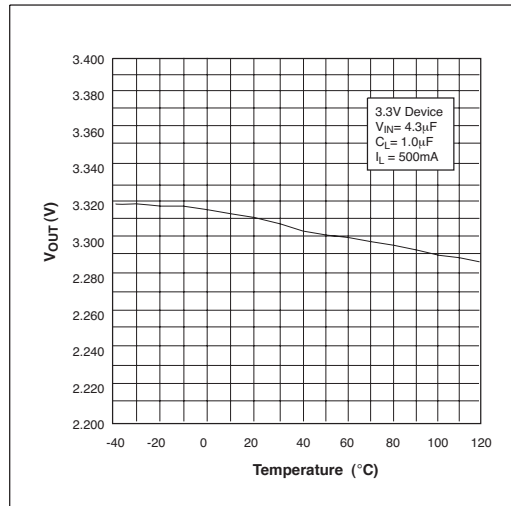
Ground Current vs Temperature with 500mA Load



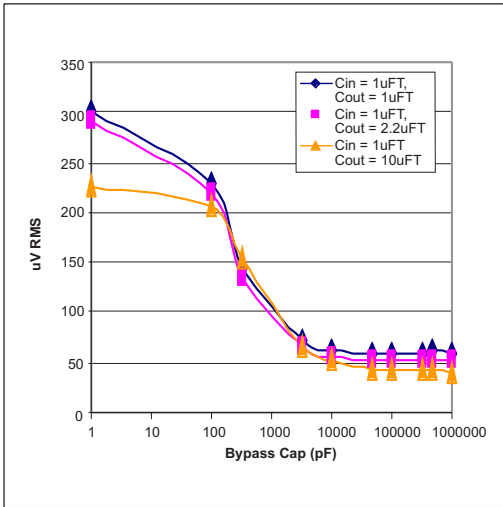
Ground Current vs Temperature in Dropout



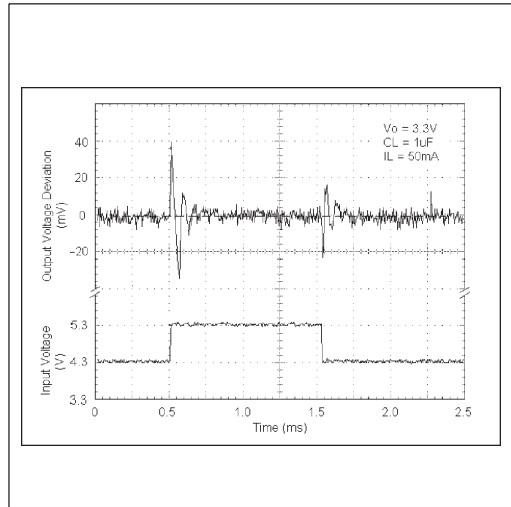
ENABLE Voltage, ON threshold, vs Input Voltage



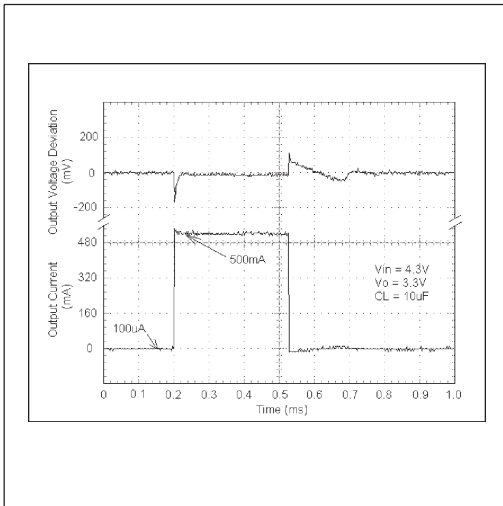
Output Voltage vs Temperature



Output Noise vs Bypass Capacitor Value  $I_L = 10mA$ , 10Hz - 100kHz



Line Transient Response for 3.3V Device



Load Transient Response for 3.3V Device

The SPX3819 requires an output capacitor for device stability. Its value depends upon the application circuit. In general, linear regulator stability decreases with higher output currents. In applications where the SPX3819 is sourcing less current, a lower output capacitance may be sufficient. For example, a regulator outputting only 10mA, requires approximately half the capacitance as the same regulator sourcing 150mA.

Bench testing is the best method for determining the proper type and value of the capacitor since the high frequency characteristics of electrolytic capacitors vary widely, depending on type and manufacturer. A high quality 2.2 $\mu$ F aluminum electrolytic capacitor works in most application circuits, but the same stability often can be obtained with a 1 $\mu$ F tantalum electrolytic.

With the SPX3819 adjustable version, the minimum value of output capacitance is a function of the output voltage. The value decreases with higher output voltages, since closed loop gain is increased.

### Typical Applications Circuits

A 10nF capacitor on the BYP pin will significantly reduce output noise, but it may be left unconnected if the output noise is not a major

concern. The SPX3819 start-up speed is inversely proportional to the size of the BYP capacitor. Applications requiring a slow ramp-up of the output voltage should use a larger C<sub>BYP</sub>. However, if a rapid turn-on is necessary, the BYP capacitor can be omitted.

The SPX3819's internal reference is available through the BYP pin.

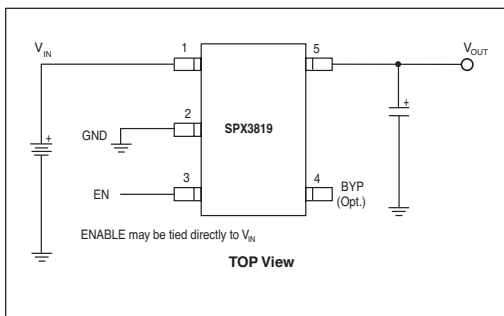
*Figure 1* represents a SPX3819 standard application circuit. The EN (enable) pin is pulled high (>2.0V) to enable the regulator.

To disable the regulator, EN < 0.4V.

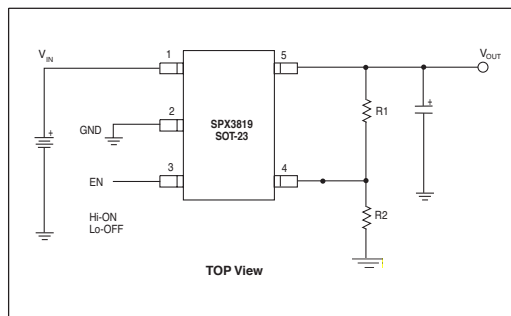
The SPX3819 in *Figure 2* illustrates a typical adjustable output voltage configuration. Two resistors (R<sub>1</sub> and R<sub>2</sub>) set the output voltage. The output voltage is calculated using the formula:

$$V_{OUT} = 1.235V \times \left[ 1 + R_1/R_2 \right]$$

R<sub>2</sub> must be > 10 k $\Omega$  and for best results, R<sub>2</sub> should be between 22 k $\Omega$  and 47k $\Omega$ .



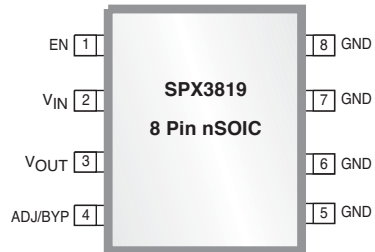
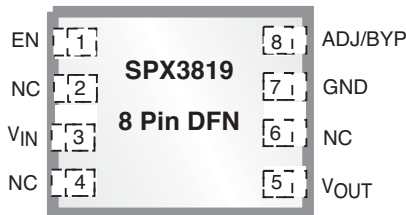
*Figure 1. Standard Application Circuit*



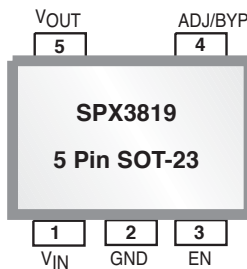
*Figure 2. Typical Adjustable Output Voltage Configuration*

Pin # nSOIC	Pin # DFN	Pin # SOT-3	Pin Name	Description
2	3	1	V <sub>IN</sub>	Supply Input
5-8	7	2	GND	Ground
3	5	5	V <sub>OUT</sub>	Regulator Output
1	1	3	EN	Enable(input). CMOS compatible control input. Logic high = enable; logic low or open = shutdown
4	8	4	ADJ/BYP	Adjust(input). Feedback input. Connect to resistive voltage-divider network
-	4, 6	-	NC	No Connect

**PACKAGE: PINOUTS**

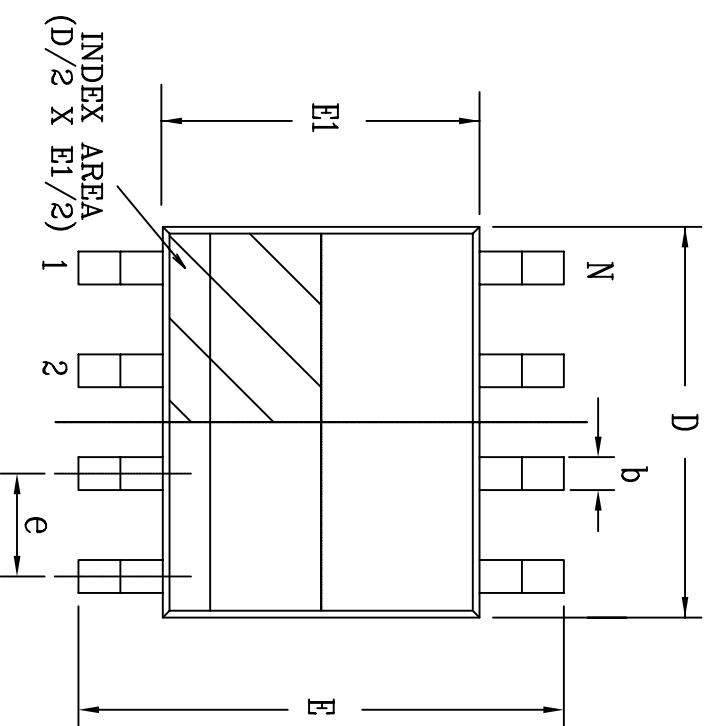


Note: The bottom exposed pad for the SPX3819 DFN package is connected to GND.

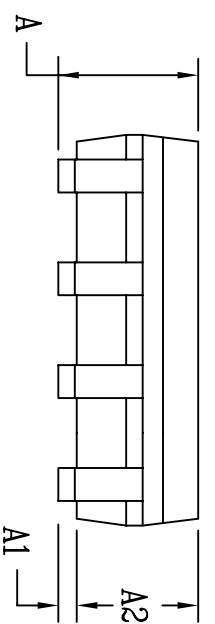




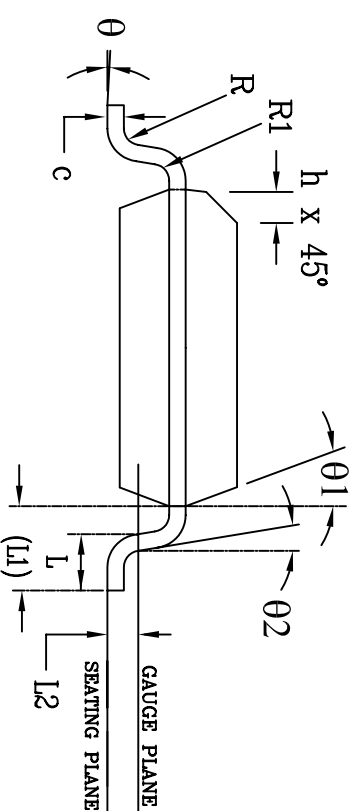
REVISION HISTORY				
REV.	DESCRIPTION	DATE	APP'D	
A	DRAWING ORIGINATION	08/16/05	JL	
B	DRAWING FORMAT MODIFICATION	07/19/06	JL	



Top View




Side View



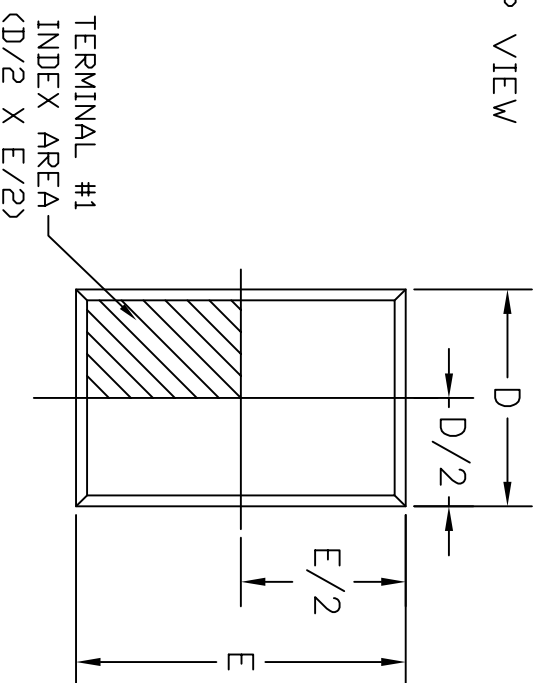
Front View

8 Pin SOICN		JEDEC MS-012		Variation AA		
SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	—	1.75	0.053	—	0.069
A1	0.10	—	0.25	0.004	—	0.010
A2	1.25	—	1.65	0.049	—	0.065
b	0.31	—	0.51	0.012	—	0.020
c	0.17	—	0.25	0.007	—	0.010
E	6.00 BSC			0.236 BSC		
E1	3.90 BSC			0.154 BSC		
e	1.27 BSC			0.050 BSC		
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
L1	1.04 REF			0.041 REF		
L2	0.25 BSC			0.010 BSC		
R	0.07	—	—	0.003	—	—
R1	0.07	—	—	0.003	—	—
theta	0°	—	8°	0°	—	8°
theta1	5°	—	15°	5°	—	15°
theta2	0°	—	—	0°	—	—
D	4.90 BSC			0.193 BSC		
N	8			8		

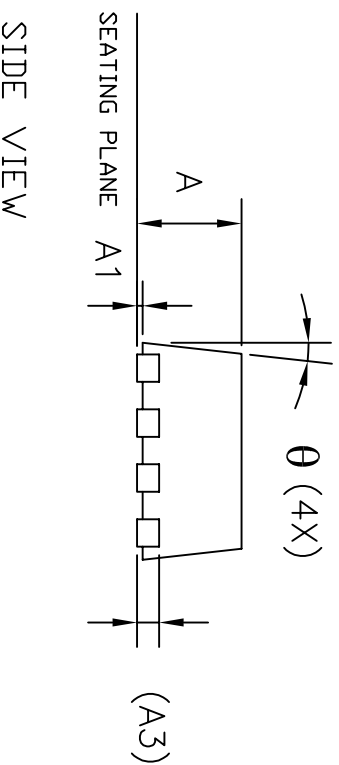
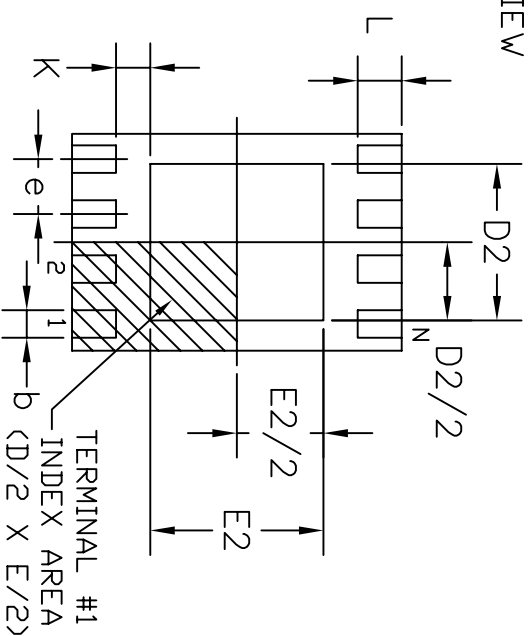
		<b>SIPEX CORPORATION</b>		
Packaging Approval:		Drawing No:		8-PIN SOICN
By: JL	Date: 07/19/06	Revision: B	Sheet: 1	OF 1

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	08/18/05	JL
B	MODIFY DRAWING FORMAT	07/17/06	JL

TOP VIEW



BOTTOM VIEW



SIDE VIEW

SYMBOLS		DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX	
A	0.80	0.90	1.00	0.032	0.036	0.039	
A1	0.00	0.02	0.05	0.000	0.001	0.002	
A3	0.20 REF			0.008 REF			
b	0.18	0.25	0.30	0.007	0.010	0.012	
D	2.00 BSC			0.079 BSC			
D2	1.50	—	1.75	0.059	—	0.069	
E	3.00 BSC			0.118 BSC			
E2	1.60	—	1.90	0.063	—	0.075	
e	0.50 BSC			0.020 BSC			
L	0.30	0.40	0.50	0.012	0.016	0.020	
K	0.20	—	—	0.008	—	—	
theta	0°	—	14°	0°	—	14°	
N	8			8			
ND	4			4			

8LD 2x3 DFN JEDEC MO-229 Variation VCED-2



**SIPEX CORPORATION**

8 PIN 2x3 DFN PACKAGE OUTLINE

Packaging Approval:

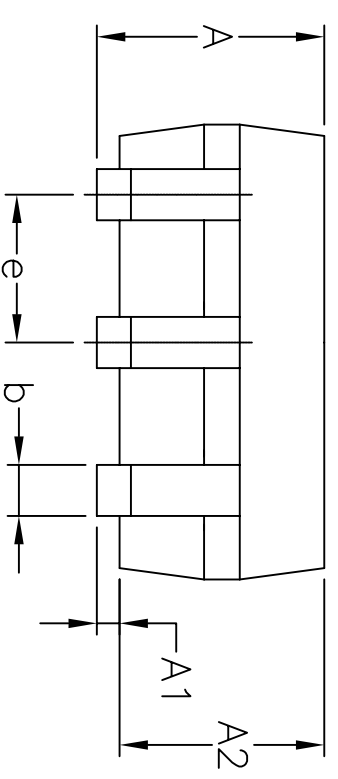
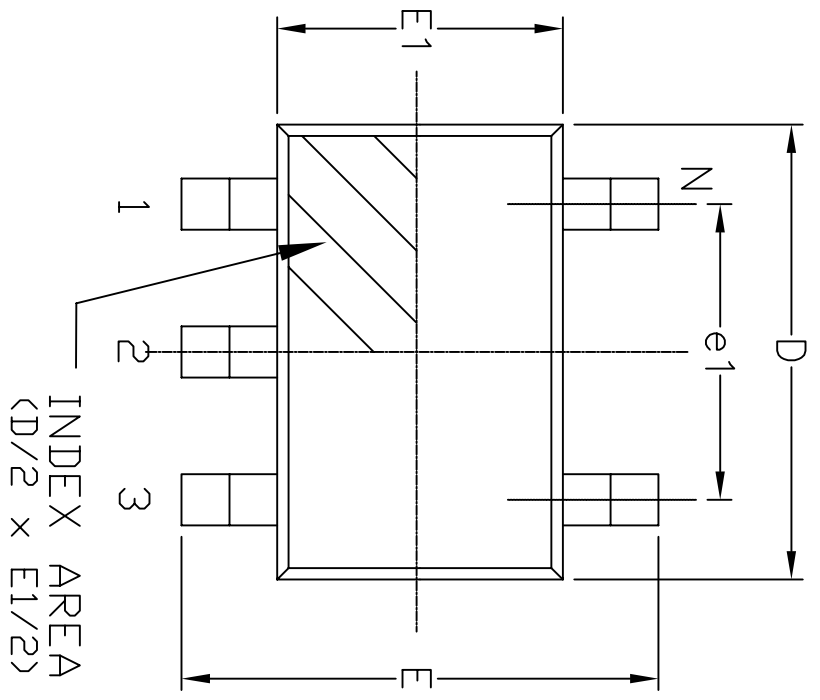
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By: JL Date: 07/17/06

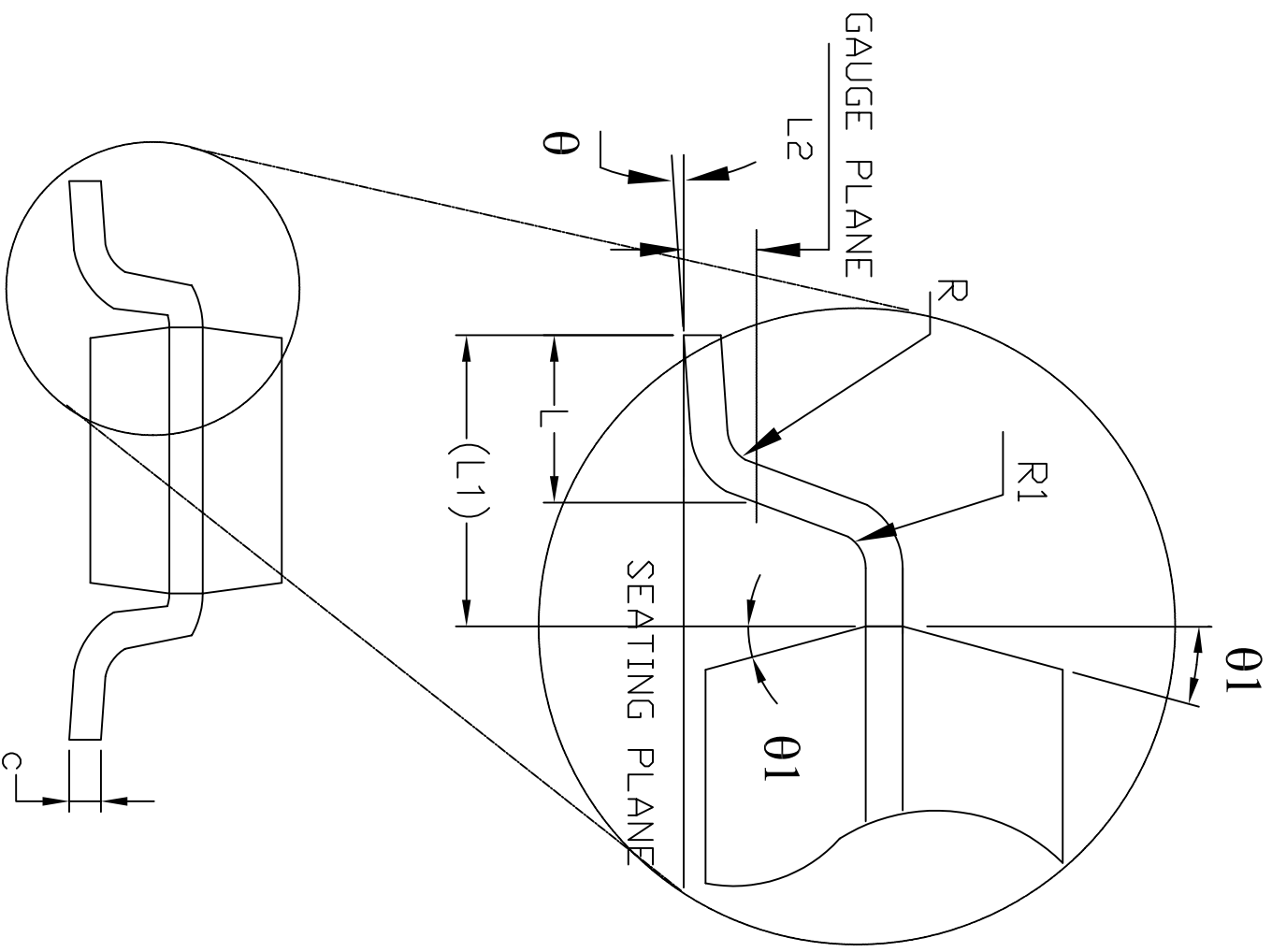
Revision: B Sheet: 1 OF 1

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	10/3/05	JL
B	DRAWING FORMAT MODIFICATION	07/25/06	JL

Top View




Side View



Front View

SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	1.45	—	—	0.057
A1	0.00	—	0.15	0.000	—	0.006
A2	0.90	1.15	1.30	0.036	0.045	0.051
b	0.30	—	0.50	0.012	—	0.020
c	0.08	—	0.22	0.003	—	0.009
D	2.90 BSC			0.115 BSC		
E	2.80 BSC			0.111 BSC		
E1	1.60 BSC			0.063 BSC		
e	0.95 BSC			0.038 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	0.45	0.60	0.012	0.018	0.024
L1	0.60 REF			0.024 REF		
L2	0.25 BSC			0.010 BSC		
R	0.10	—	—	0.004	—	—
R1	0.10	—	0.25	0.004	—	0.010
theta	0°	4°	8°	0°	4°	8°
theta1	5°	10°	15°	5°	10°	15°
N	5			5		

		<b>SIPEX CORPORATION</b>	
Packaging Approval:		Drawing No: 5-PIN SOT-23	
By: JL	Date: 07/25/06	Revision: B	Sheet: 1 OF 1

## ORDERING INFORMATION

Part Number	Accuracy	MSL Level	Status	Package	Pack Type	Quantity	RoHS
SPX3819S-L/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-1-8/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-2-5/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-3-0/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-3-1/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-3-3/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L-5-0/TR	0.01	L1 @ 260°C	Active	NSOIC8	Tape & Reel	2500	Yes
SPX3819S-L	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-1-8	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-2-5	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-3-0	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-3-1	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-3-3	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819S-L-5-0	0.01	L1 @ 260°C	Active	NSOIC8	TUBE	98	Yes
SPX3819M5-L	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-1-2	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-1-5	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-1-8	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-2-5	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-3-0	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-3-1	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-3-3	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L-5-0	0.01	L1 @ 260°C	Active	SOT-23-5	Not in Bulk	2500	Yes
SPX3819M5-L/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-1-2/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-1-5/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-1-8/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-2-5/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-3-0/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-3-1/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-3-3/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819M5-L-5-0/TR	0.01	L1 @ 260°C	Active	SOT-23-5	Tape & Reel	2500	Yes
SPX3819R2-L-1-2	0.01	L1 @ 250°C	CF	DFN8	Not in Bulk	3000	Yes
SPX3819R2-L-1-2/TR	0.01	L1 @ 250°C	CF	DFN8	Tape & Reel	3000	Yes
SPX3819S-L-1-2/TR	0.01	L1 @ 260°C	CF	SOIC-8	Tape & Reel	2500	Yes
SPX3819S-L-1-5/TR	0.01	L1 @ 260°C	CF	SOIC-8	Tape & Reel	2500	Yes
SPX3819S-L-1-2	0.01	L1 @ 260°C	CF	SOIC-8	TUBE	98	Yes
SPX3819S-L-1-5	0.01	L1 @ 260°C	CF	SOIC-8	TUBE	98	Yes

**ORDERING INFORMATION**

Part Number	Accuracy	MSL Level	Status	Package	Pack Type	Quantity	RoHS
SPX3819R2-L	0.01	L1 @ 250°C	EOL	DFN8	Not in Bulk	3000	Yes
SPX3819R2-L-1-5	0.01	L1 @ 250°C	EOL	DFN8	Not in Bulk	3000	Yes
SPX3819R2-L-1-8	0.01	L1 @ 250°C	EOL	DFN8	Not in Bulk	3000	Yes
SPX3819R2-L-3-3	0.01	L1 @ 250°C	EOL	DFN8	Not in Bulk	3000	Yes
SPX3819R2-L-5-0	0.01	L1 @ 250°C	EOL	DFN8	Not in Bulk	3000	Yes
SPX3819R2-1-2	0.01	L1 @ 240°C	EOL	DFN8	Not in Bulk	3000	No
SPX3819R2-3-3	0.01	L1 @ 240°C	EOL	DFN8	Not in Bulk	3000	No
SPX3819R2-1-2/TR	0.01	L1 @ 240°C	EOL	DFN8	Tape & Reel	3000	No
SPX3819S/TR	0.01	L1 @ 240°C	EOL	NSOIC8	Tape & Reel	2500	No
SPX3819S-2-5/TR	0.01	L1 @ 240°C	EOL	NSOIC8	Tape & Reel	2500	No
SPX3819S	0.01	L1 @ 240°C	EOL	NSOIC8	TUBE	98	No
SPX3819S-2-5	0.01	L1 @ 240°C	EOL	NSOIC8	TUBE	98	No
SPX3819S-3-3/TR	0.01	L1 @ 240°C	EOL	SOIC-8	Tape & Reel	2500	No
SPX3819S-1-8	0.01	L1 @ 240°C	EOL	SOIC-8	TUBE	98	No
SPX3819S-3-3	0.01	L1 @ 240°C	EOL	SOIC-8	TUBE	98	No
SPX3819S-5-0	0.01	L1 @ 240°C	EOL	SOIC-8	TUBE	98	No
SPX3819M5	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-1-2	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-1-5	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-1-8	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-2-5	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-3-0	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-3-1	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-3-3	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5-5-0	0.01	L1 @ 240°C	EOL	SOT-23-5	Not in Bulk	2500	No
SPX3819M5/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-1-2/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-1-5/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-1-8/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-2-5/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-3-0/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-3-3/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No
SPX3819M5-5-0/TR	0.01	L1 @ 240°C	EOL	SOT-23-5	Tape & Reel	2500	No

For further assistance:

Email: [Sipexsupport@sipex.com](mailto:Sipexsupport@sipex.com)  
 WWW Support page: <http://www.sipex.com/content.aspx?p=support>  
 Sipex Application Notes: <http://www.sipex.com/applicationNotes.aspx>



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