150mA Low Dropout Voltage Regulator

FEATURES

- 5V Fixed Output
- 150mA current capability
- 250mV Dropout
- Programmable Reset Threshold
- 250μA Quiescent Current
- Over Temperature Protection
- Reverse Polarity Protection
- Integrated Pull Up Resistor on Logic Outputs
- -40° to 125°C Operating Range
- Available in 8 Pin and 14 Pin nSOIC or 20 Pin wSOIC packages.

Now Available in Lead Free Packaging

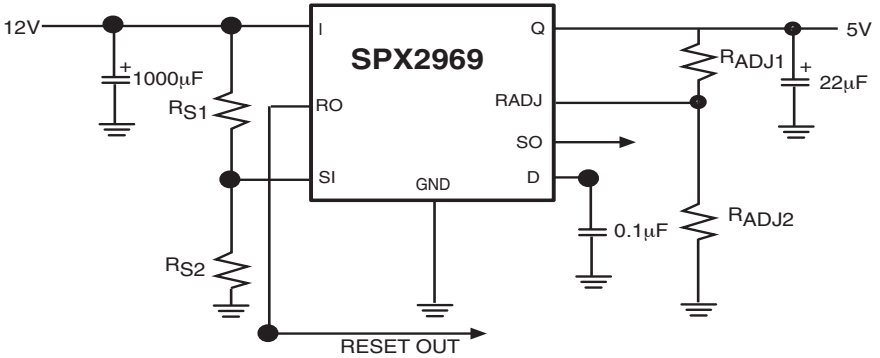
APPLICATIONS

- Automotive
- Industrial
- Wireless Base Station

DESCRIPTION

Sipex's SPX2969 is a low dropout linear regulator with integrated PNP pass transistor. The part is designed for automotive environment, and thus can withstand up to 45V and 125°C temperature range. The output voltage is set at a fixed 5V, and the part is guaranteed to deliver at least 150mA. The SPX2969 provides multiple protection mechanisms, including over-temperature and over-current conditions. The part has a built-in reset circuit to monitor when the output voltage is below 4.65V. The reset voltage threshold can be programmed down to 3.5V using an external resistor voltage divider, while the reset timing can be programmed via an external capacitor. A built in comparator compares the signal of the pin SI, normally fed by a voltage divider from the input voltage, with the reference and gives an early warning on the pin SO. Both the sense output and the reset output delay signals contain integrated 20kOhm pull up resistors. The part is available in three package types: 8 Pin and 14 Pin nSOIC or 20 Pin wSOIC packages.

TYPICAL APPLICATION CIRCUIT



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ABSOLUTE MAXIMUM RATINGS

Input Voltage ..... -40V to 45V
Input Current ..... internally limited
Sense Input Voltage ..... -40V to 45V
Sense Input Current ..... -1mA to 1mA
Reset Threshold Voltage ..... -0.3 to 7V
Reset Threshold Current ..... -10 to 10mA
Reset Delay Voltage ..... -0.3 to 7V
Reset Delay Current ..... internally limited
Ground Current ..... 50mA (min)
Reset Output Voltage ..... -0.3 to 7V
Reset Output Current ..... internally limited
Sense Output Voltage ..... -0.3 to 7V
Sense Output Current ..... internally limited
Output Voltage ..... -0.3 to 7V
Output Current ..... internally limited
Thermal Data
Junction Ambient (8 Pin NSOIC) ..... 163°C/W
Junction Ambient (20 Pin WSOIC) ..... 70°C/W
Junction Ambient (14 Pin NSOIC) ..... 70°C/W
Storage Temperature ..... -50°C to +150°C
Junction Temperature.(Note 1).....-50°C+150°C

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

ELECTRICAL CHARACTERISTICS

V_{IN} = 13.5V; -40°C < T_J < 125°C. The ♦ denotes the specifications which apply over the full operating temperature range, unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS		CONDITIONS
Output Volatage	V_Q	4.90	5.00	5.10	V	♦	1mA < I_Q 100mA 6V < V_I < 16V
Current Limit	I_Q	150	250	500	mA	♦	-
Current Consumption $I_q = I_I - I_Q$	I_q	-	240	300	µA		I_Q<1 mA, Tj< 85° C
Current Consumption $I_q = I_I - I_Q$	I_q	-	250	700	µA	♦	I_Q =10mA
Current Consumption $I_q = I_I - I_Q$	I_q	-	2	8	mA	♦	I_Q =50mA
Drop Voltage	V_{DR}	-	0.25	0.5	V	♦	I_Q =100mA (Q - I) when output drops below 2% (see note 2)
Load Regulation	V_Q	-	2	20	mV	♦	I_Q =5mA to 100mA
Line Regulation	V_Q	-	1	10	mV	♦	V_I =6V to 26V I_Q = 1 mA
Reset Generator							
Threshold Voltage	V_{RT}	4.50	4.65	4.80	V	♦	-
Reset Adjust	$V_{RADJ, TH}$	1.26	1.35	1.44	V	♦	V_Q =3.5V (see note 3)
Reset Pullup	-	10	20	40	K	♦	-
Saturation Voltage	$V_{RO, SAT}$	-	0.1	0.4	V	♦	R_{intern}

Note 1: Specifications in the -40°C to 150°C range are guaranteed by design, not production tested.
Note 2: Drop voltage = V_I - V_Q measured when the output voltage has dropped 100mV from the nominal value obtained at 13.5V input.
Note 3: The reset threshold V_{RT} can be decreased via an external voltage divider connected to the RADJ. In this case the reset condition is reached if V_Q < V_{RT} and V_{RADJ} < $V_{RAQDJ, TH}$. Dimensioning the voltage divider according to: $V_{THRES} = V_{RADJ, TH}$ X (R_{ADJ1} +R_{ADJ2})/R_{ADJ2}.

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ELECTRICAL CHARACTERISTICS

V_{IN} = 13.5V; -40°C < T_J < 125°C. The ♦ denotes the specifications which apply over the full operating temperature range, unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS		CONDITIONS
Reset Generator							
Upper Delay Switching Threshold	V_{UD}	1.4	1.8	2.2	V	♦	-
Lower Delay Switching Threshold	V_{LD}	0.3	0.45	0.60	V	♦	-
Saturation Voltage Delay Capacitor	$V_{D, SAT}$	-	-	0.1	V	♦	$V_Q < V_{RT}$
Charge Current	I_D	3.0	6.5	9.5	µA	♦	V_D =1V
Delay Time L‘ H	t_D	17	28	-	ms	♦	C_D = 100nF
Delay Time H‘ L	t_t	-	1	-	µs	♦	C_D = 100nF
Input Voltage Sense							
Sense Threshold High	$V_{SI, high}$	1.24	1.31	1.38	V	♦	-
Sense Threshold Low	$V_{SI, low}$	1.16	1.20	1.28	V	♦	-
Sense Output low Voltage	$V_{SO, low}$	-	0.1	0.4	V	♦	V_{SI} <1.20V V_Q > 3V R_{intern}
Sense Pull up	-	10	20	40	K	♦	-
Sense Input Current	i_{si}	-1	0.1	1	µA	♦	-
Sense Response Time	-		2		µs	♦	-

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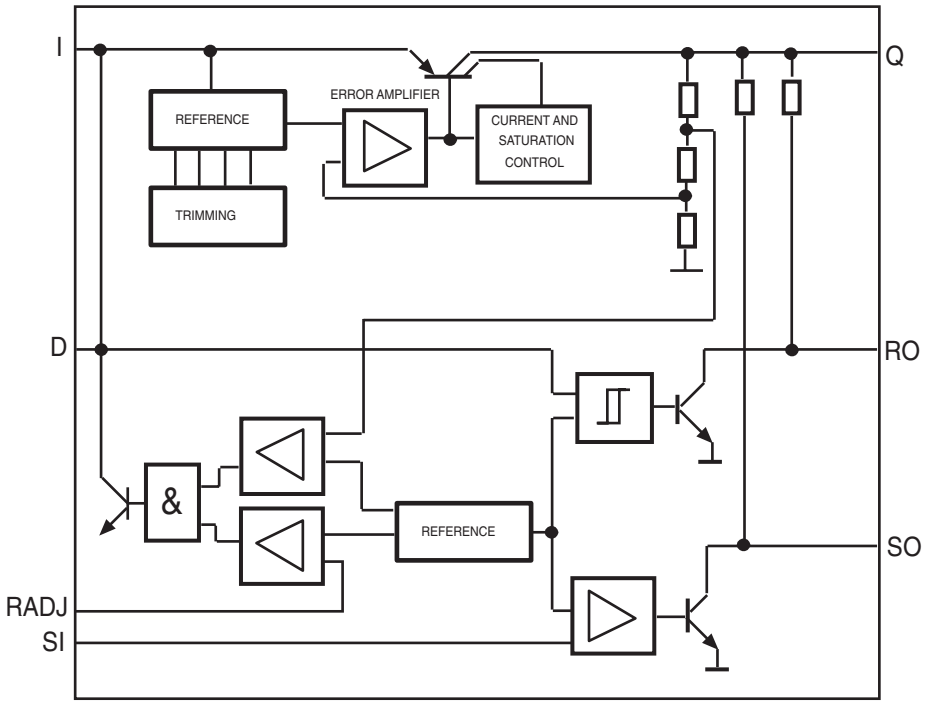
APPLICATIONS INFORMATION

The input capacitor C_I is necessary for compensating line influences. Using a resistor of approximately 1Ω in series with C_I, the oscillating circuit consisting of input inductivity and input capacitance can be damped. The output capacitor C_O is necessary for the stability of the regulating circuit. Stability is guarantted at values ≥ 10μF and an ESR ≤ 10Ω within the operating temerature range. For small tolerances of the reset delay the spread of the capacitance of the delay capacitor and its temperature coefficient should be noted.

BLOCK DIAGRAM



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PIN NUMBER	PIN NAME	DESCRIPTION (8 PIN NOIC)
1	V_{IN}	Input. block to GND with a Ceramic capacitor.
2	SENSE IN	Sense Input. If not need connect to Q
3	R_{ADJ}	Reset Threshhold Adj. If not needed connect to GND
4	DELAY	Reset Delay. To select delay time, connect to GND via capacitor.
5	GND	Ground
6	RESET	Reset Output. The open-collector output is internally linked to Q via a resistor. Keep it open if not needed.
7	SENSE OUT	Sense Output. The open-collector output is internally linked to Q via a resistor. Keep it open if not needed.
8	V_{OUT}	5V Output. Connect to GND with a 10µF capacitor, ESR<10

PIN NUMBER	PIN NAME	DESCRIPTION (20 PIN WIDE NOIC)
1	R_{ADJ}	Reset Threshold Adj. If not needed connect to GND
2	DELAY	Reset delay. To select delay time, connect to GND via capacitor.
3	NC	No Connect
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	NC	No connect
9	NC	No connect
10	RESET	Reset Output. The open-collector output is internally linked to Q via a 20K ohm pullup resistor. Keep open if not needed.
11	SENSE OUT	Sense output. The open collector output is internally linked to the output via a 20k ohm pullup resistor. Keep open if not needed.
12	V_{OUT}	5V Output. Conncet to GND with a 10 uF capacitor, ESR<10
13	NC	No Connect
14	GND	Ground
15	GND	Ground
16	GND	Ground
17	GND	Ground
18	NC	No Connect
19	V_{IN}	Input. Bypass to GND directly at the IC with a ceramic capacitor.
20	SENSE IN	Sense Input. If not needed connect to V_{OUT}

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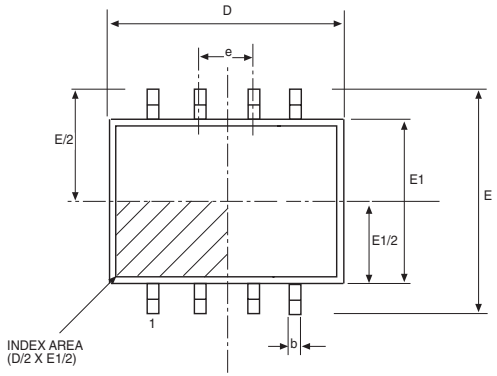
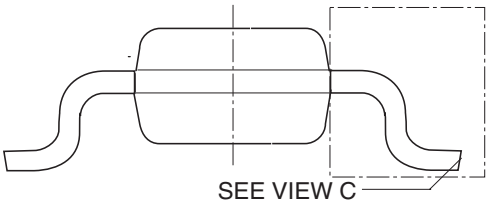
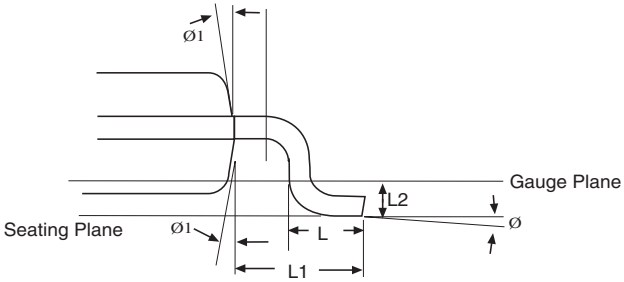
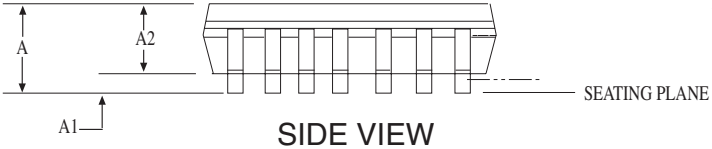


TOP VIEW



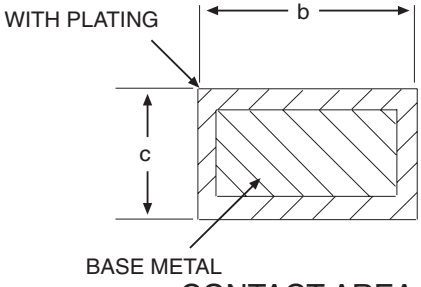


VIEW C



SIDE VIEW

8 Pin NSOIC (JEDEC MS-012, AA - VARIATION)	DIMENSIONS Minimum/Maximum (mm)		
COMMON HEIGHT DIMENSION			
SYMBOL	MIN	NOM	MAX
A	1.35	-	1.75
A1	0.10	-	0.25
A2	1.25	-	1.65
b	0.31	-	0.51
c	0.17	-	0.25
D	4.90 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
L	0.40	-	1.27
L1	1.04 REF		
L2	0.25 BSC		
Ø	0º	-	8º
Ø1	5º	-	15º



CONTACT AREA

PACKAGE: 8 PIN NSOIC

(Narrow refers to symbol E1)

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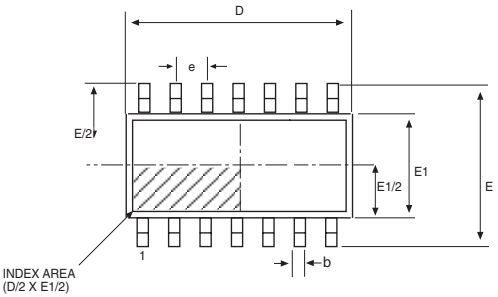
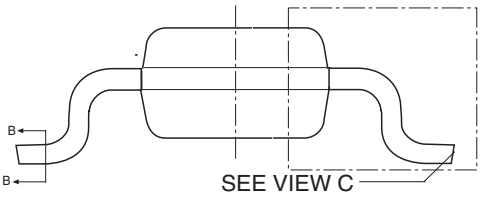
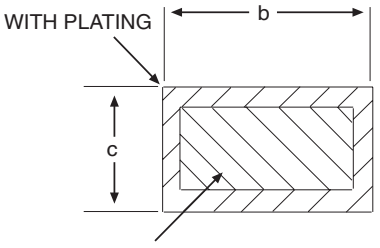
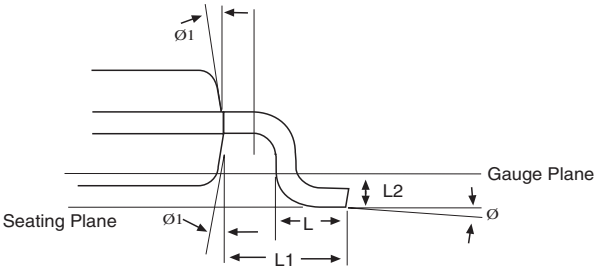


TOP VIEW

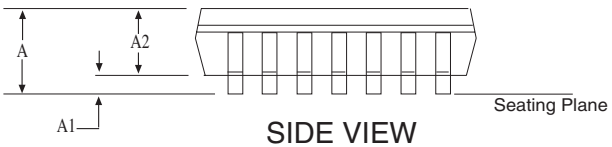




SECTION B-B



VIEW C



SIDE VIEW

14 Pin NSOIC (JEDEC MS-012, AB - VARIATION)	DIMENSIONS in (mm)		
SYMBOL	MIN	NOM	MAX
A	1.35	-	1.75
A1	0.10	-	0.25
A2	1.25	-	1.65
b	0.31	-	0.51
c	0.17	-	0.25
D	8.65 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
L	0.40	-	1.27
L1	1.04 REF		
L2	0.25 BSC		
Ø	0º	-	8º
Ø1	5º	-	15º

14 PIN NSOIC

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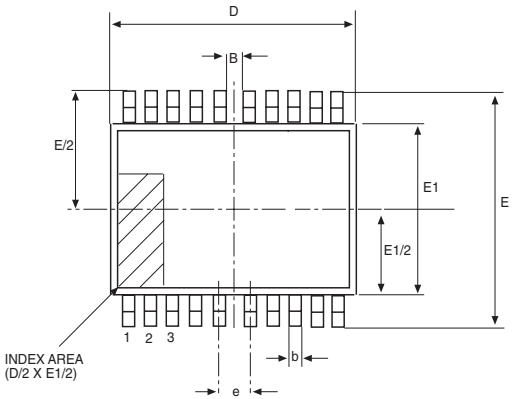
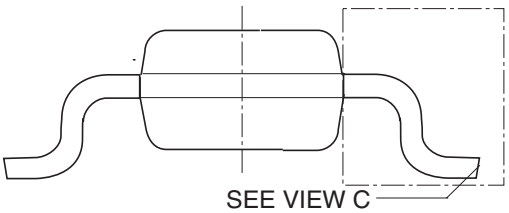
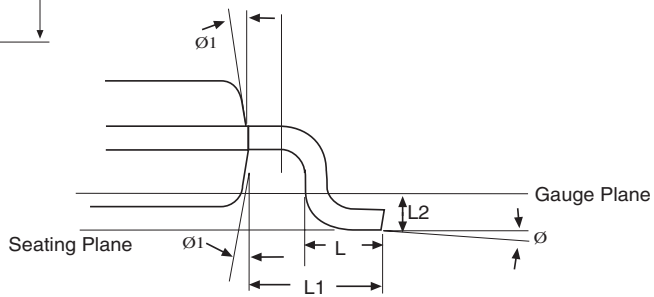


TOP VIEW





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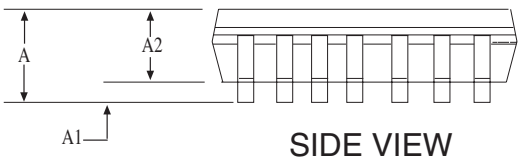
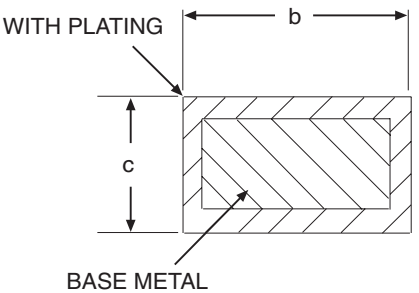


SIDE VIEW

20 Pin SOIC (WIDE) (JEDEC MS-013, AC - VARIATION)	DIMENSIONS Minimum/Maximum (mm)		
COMMON HEIGHT DIMENSION			
SYMBOL	MIN	NOM	MAX
A	2.35	-	2.65
A1	0.10	-	0.30
A2	2.05	-	2.55
b	0.31	-	0.51
c	0.20	-	0.30
D	12.80 BSC		
E	10.30 BSC		
E1	7.50 BSC		
e	1.27 BSC		
L	0.40	-	1.27
L1	1.04 REF		
L2	0.25 BSC		
Ø	0º	-	8º
Ø1	5º	-	15º



CONTACT AREA

20 PIN WSOIC
(wide refers to symbol E1)

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ORDERING INFORMATION

Part number	Output Voltage	Package Type
SPX2969S	5.0V	8 Pin NSOIC
SPX2969S/TR	5.0V	8 Pin NSOIC
SPX2969S1/TR	5.0V	14 Pin NSOIC
SPX2969S1/TR	5.0V	14 Pin NSOIC
SPX2969W1	5.0V	20 Pin WSOIC
SPX2969W1/TR	5.0V	20 Pin WSOIC

Available in lead free packaging. To order add "-L" suffix to part number.

Example: SPX2969S/TR = standard; SPX2969S-L/TR = lead free

/TR = Tape and Reel

Pack quantity is 1,500 for WSOIC and 2,500 for NSOIC.

Sipex Corporation

ANALOG EXCELLENCE

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