SPX431A,B,C

Precision Adjustable Shunt Regulator

FEATURES

- Trimmed Bandgap: 0.5%, 1% and 2%
- Wide Operating Current: 1mA to 150mA
- Extended Temperature Range: 0°C to 105°C
- Low Temperature Coefficient: 30 ppm/°C
- Improved Replacement in Performance for TL431
- Low Cost Solution
- Available in Lead Free, RoHS compliant packaging: SOIC, SOT-89, SOT-23-3, SOT-23-5, and TO-92

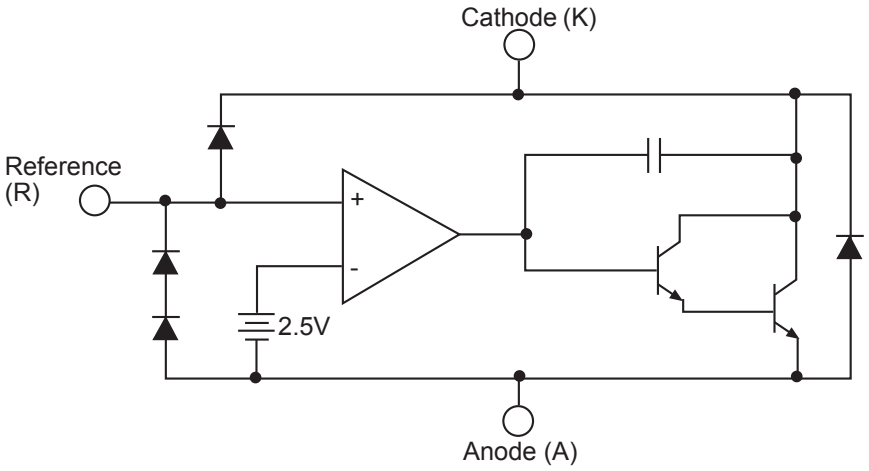
APPLICATIONS

- Battery Operated Equipment
- Adjustable Supplies
- Switching Power Supplies
- Error Amplifiers
- Single Supply Amplifier
- Monitors/VCRs/TVs
- Personal Computers

DESCRIPTION

The SPX431 is a three-terminal adjustable shunt voltage regulator providing a highly accurate bandgap reference. The SPX431 acts as an open-loop error amplifier with a 2.5V temperature compensation reference. The SPX431 has thermal stability, wide operating current of 150mA and broad temperature range of 0°C to 150°C, making it suitable for a variety of applications which require a low-cost, high performance solution. SPX431A tolerance of 0.5% is proven to be sufficient to overcome all other errors in the system to virtually eliminate the need for trimming in the power supply manufacturer's assembly line and contribute a significant cost savings. The output voltage may be adjusted to any value between V_{REF} and 36 volts with two external resistors. The SPX431 is available in SOIC-8, SOT-23-3, SOT-23-5, SOT89, and TO-92 packages.

TYPICAL APPLICATIONS CIRCUIT



ABSOLUTE MAXIMUM RATINGS

Cathode-Anode Reverse Breakdown V_{KA} 37V
Anode-Cathode Forward Current, (<10ms) I_{AK} 1A
Operating Cathode Current I_{KA} 150mA
Reference Input Current I_{REF} 10mA
Continuous Power Dissipation at 25°C P_D
SOIC-8 ..... 750mW
SOT-23-5 ..... 200 mW
SOT-23-3 ..... 417 mW
SOT-89 ..... 1000mW\
TO-92 ..... 775mW
Junction Temperature T_J ..... 150 °C
Storage Temperature T_{STG} ..... -65 to 150 °C

NOTE: Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

RECOMMENDED CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Cathode Voltage	V_{KA}	V_{REF} to 36	V
Cathode Current	I_K	10	mA

TYPICAL THERMAL RESISTANCES

PACKAGE	$Ø_{JA}$	$Ø_{JC}$	TYPICAL DERATING
SOIC-8	124.8°C/W	45°C/W	5.7 mW/°C
TO-92	131.9°C/W	80°C/W	6.3 mW/°C
SOT-89	107.1°C/W	8°C/W	9.1 mW/°C
SOT-23-5	191°C/W	150°C/W	1.7 mW/°C
SOT-23-3	300°C/W	136°C/W	3.3 mW/°C

Typical deratings of the thermal resistances are given for ambient temperature >25°.

ELECTRICAL CHARACTERISTICS

Electrical characteristics at 25°C I_K = 10mA V_K = V_{REF}, unless otherwise specified.

Parameter	Symbol	Test Conditions	Test Circuit	SPX431A			SPX431B			SPX431C			Unit
				Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Reference Voltage	V_{REF}	T_J = 0°C to 105°C	1 1	2.490 2.469	2.503	2.515 2.536	2.470 2.449	2.495	2.520 2.541	2.445	2.495	2.545	V V
ΔV_{REF} with Temp.	TC		1		0.07	0.20		0.07	0.20		0.07	0.20	mV/°C
Ratio of Change in V_{REF} to Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_K}$	V_{REF} to 10V 10V to 36V	2	-2.7 -2	-1.0 -0.4	0.3	-2.7 -2.0	-1.0 -0.4	0.3	-2.7 -2	-1.0 -0.4	0.3	mV/V
Reference Input Current	I_{REF}		2		0.7	4		0.7	4		0.7	4	µA
I_{REF} Temp Deviation	ΔI_{REF}	T_J = 0°C to 105°C	2		0.4	1.2		0.4	1.2		0.4	1.2	µA
Min I_K for Regulation	$I_{K(MIN)}$		1		0.4	1		0.4	1		0.4	1	mA
Off State Leakage	$I_{K(OFF)}$	V_{REF} = 0V, V_{KA} = 36V	3		0.04	250		0.04	500		0.04	1000	nA
Dynamic Output Impedance	Z_{KA}	f_Z = 1kHz I_K = 1 to 150mA	1		0.15	0.5		0.15	0.5		0.15	0.5	Ω

CALCULATING AVERAGE TEMPERATURE COEFFICIENT (TC)

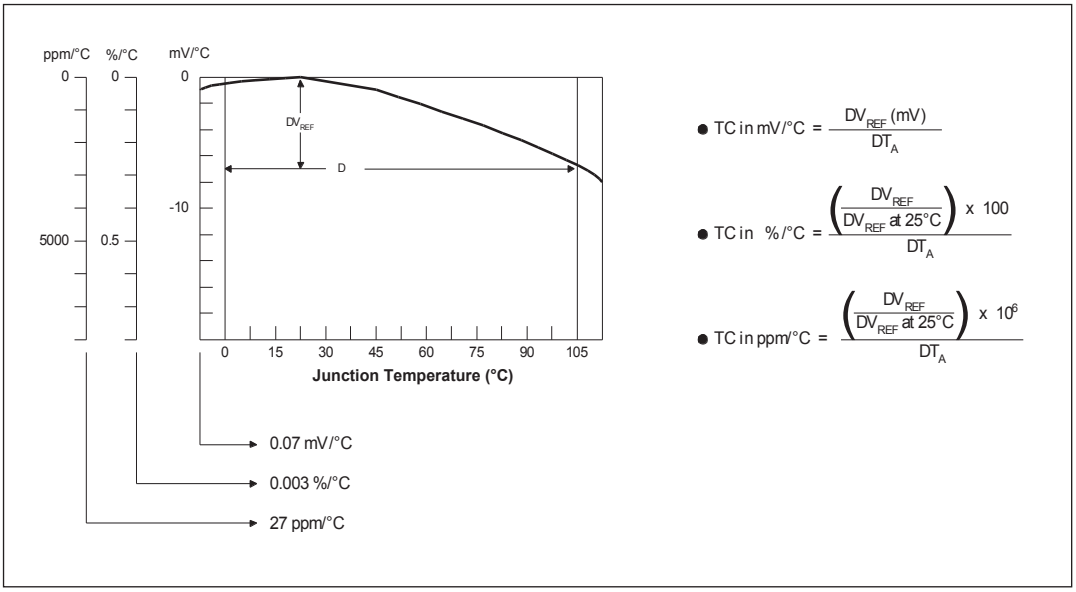
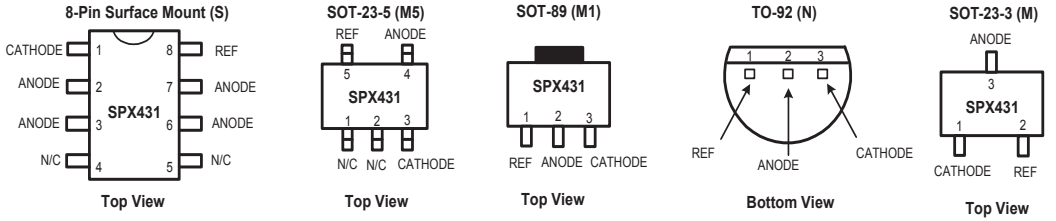
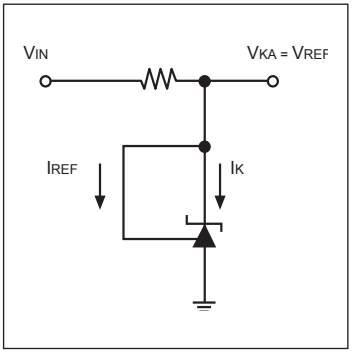


Figure 1. VREF VS Temperature.

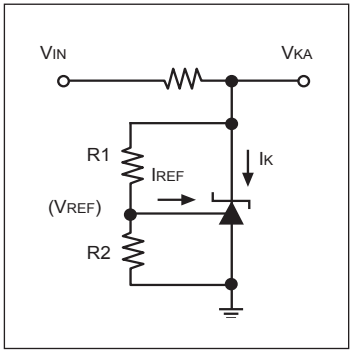
PACKAGE PINOUTS



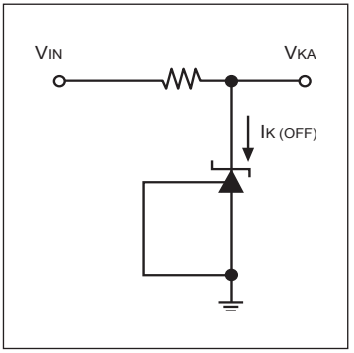
TEST CIRCUITS



Test Circuit 1.
Test Circuit for $V_{KA} = V_{REF}$

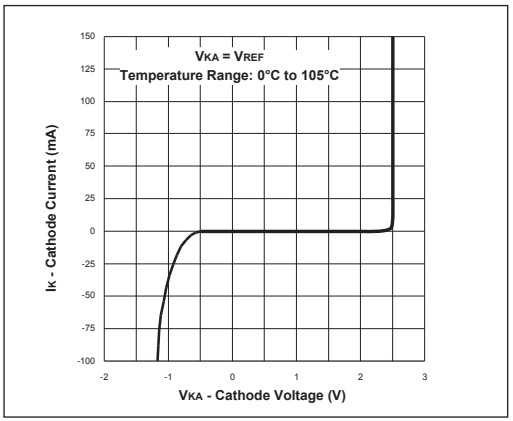


Test Circuit 2.
Test Circuit for $V_{KA} > V_{REF}$

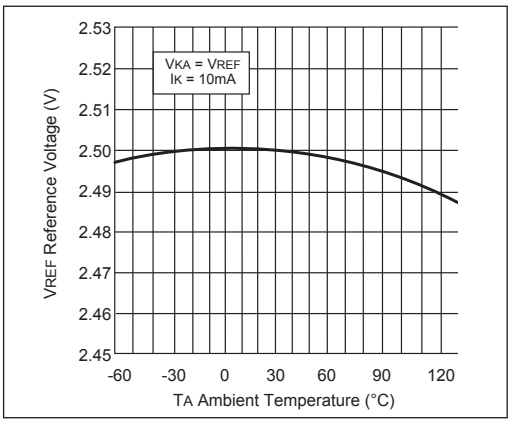


Test Circuit 3.
Test Circuit for I_{KOFF}

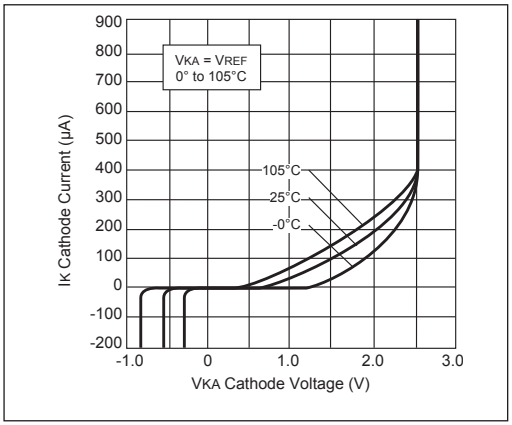
TYPICAL PERFORMANCE CHARACTERISTICS



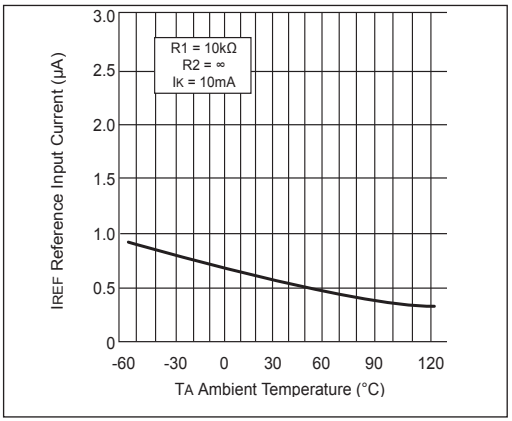
High Current Operating Characteristics



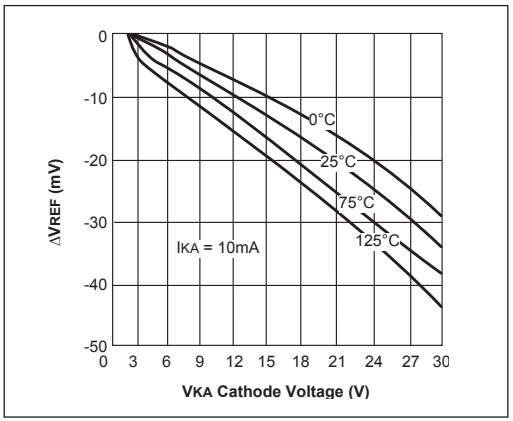
Reference Voltage vs. Ambient Temperature



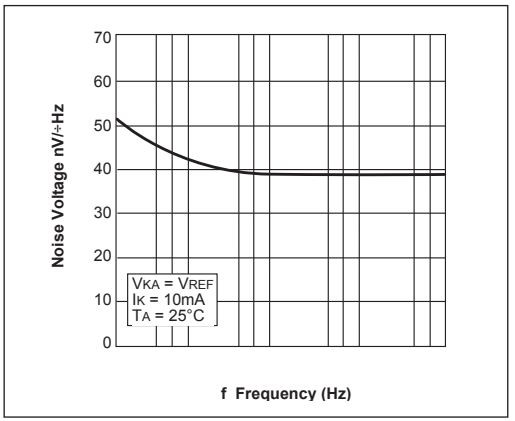
Low Current Operating Characteristics



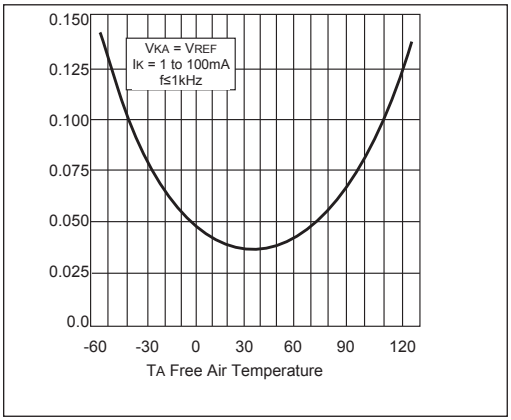
Reference Input Current vs. Ambient Temperature



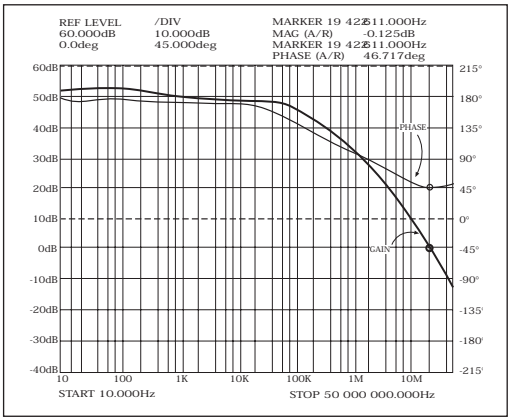
Reference Voltage Line Regulation vs, Cathode Voltage and TAMBIENT



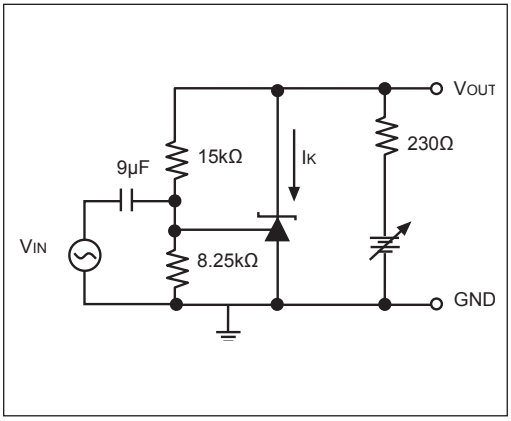
Noise Voltage vs. Frequency



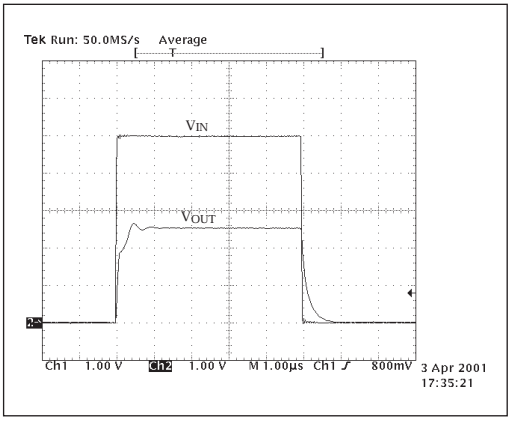
Low Frequency Dynamic Output Impedance vs. TAMBIENT



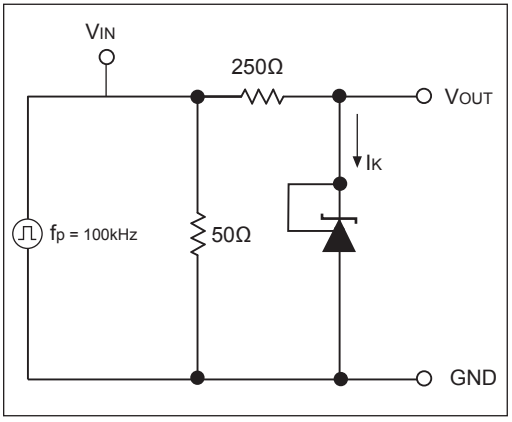
Small Signal Gain and Phase vs. Frequency; IK = 10mA, TA = 25°C



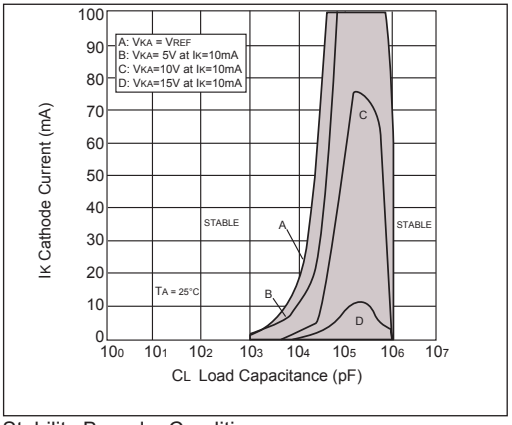
Test Circuit for Gain and Phase Frequency Response



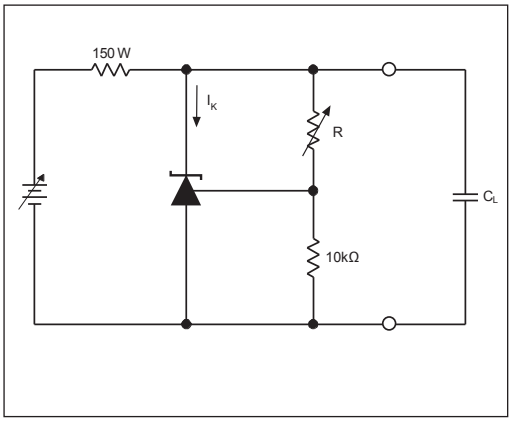
FZ = 100kHz, IK = 10mA, TA = 25°C



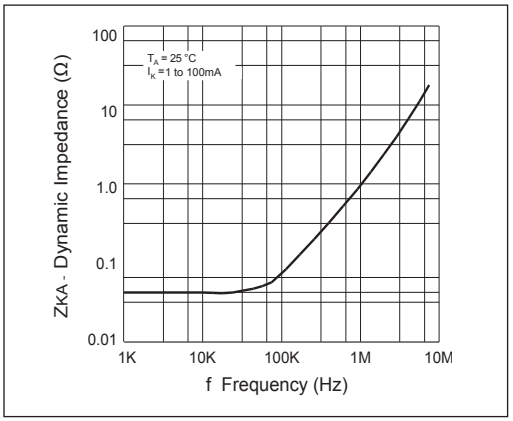
Test Circuit for Pulse Response



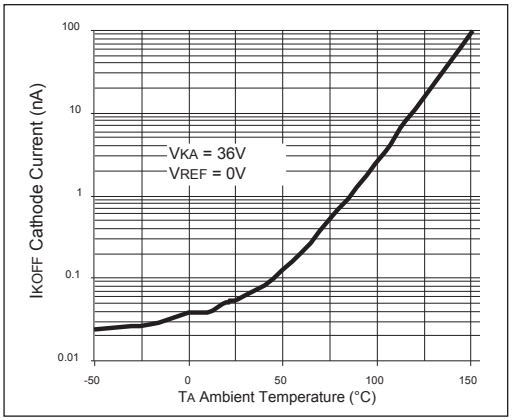
Stability Boundry Conditions



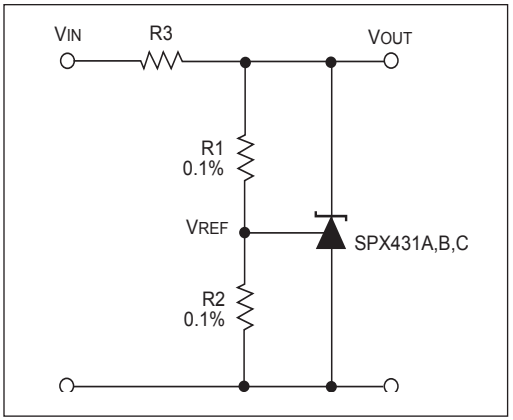
Test Circuit for Stability



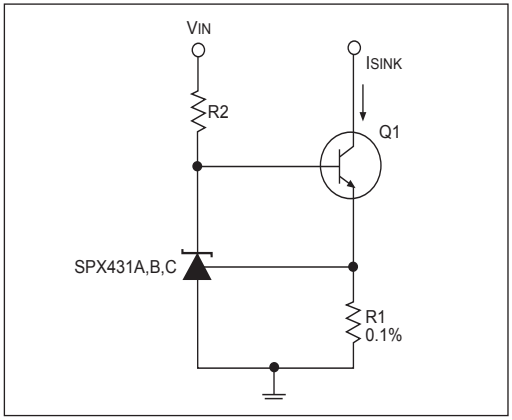
Dynamic Output Impedance T_A = 25°C, I_K = 1 to 100mA



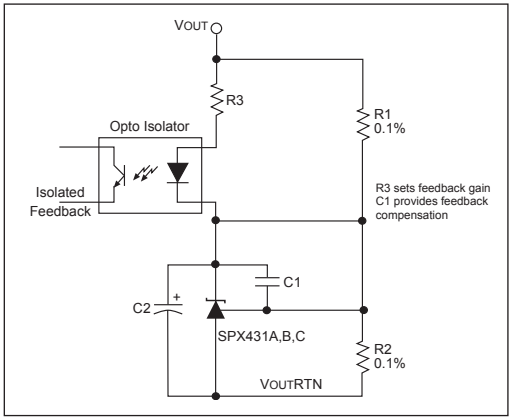
Off-State Leakage



Shunt Regulator V_{OUT} = (1+R1/R2)V_{REF}



Constant Current, Sink, I_{SINK} = V_{REF}/R1



Reference Amplifier for Isolated Feedback in Off-Line DC-DC Converters

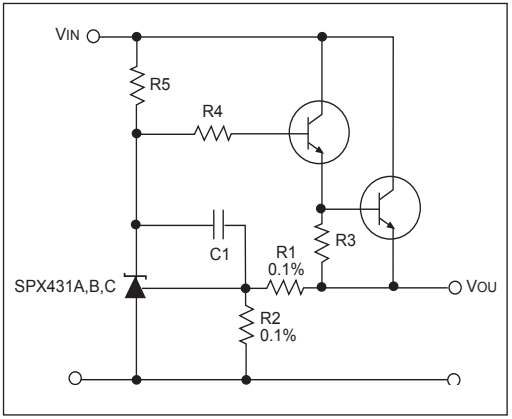


Figure 23. Precision High Current Series Regulator
$V_{OUT} = (1+R1/R2)V_{REF}$

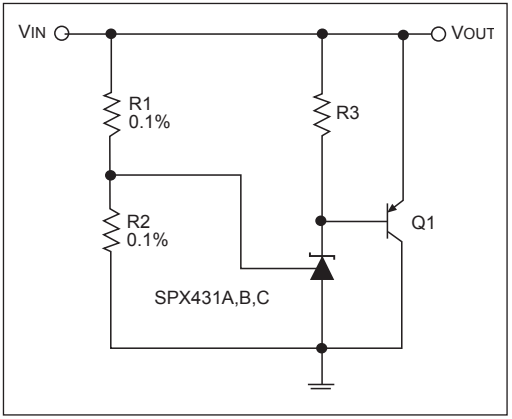


Figure 24. High Current Shunt Regulator
$V_{OUT} = (1+R1/R2)V_{REF}$

* Resistor values are chosen such that the effect to I_{REF} is negligible.

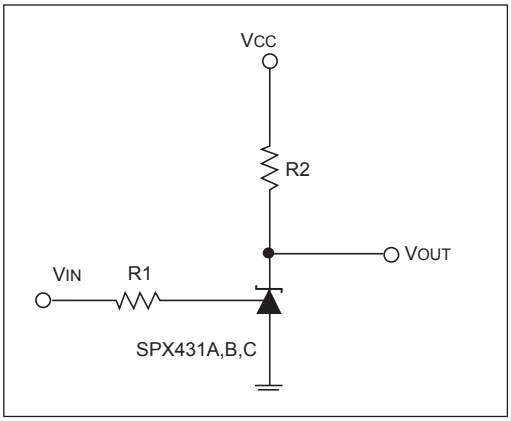
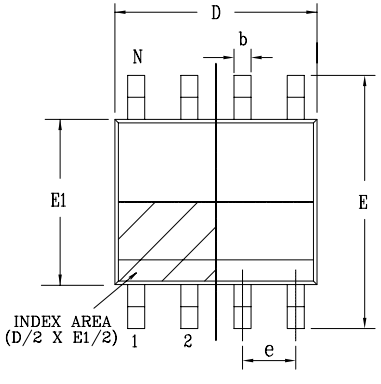


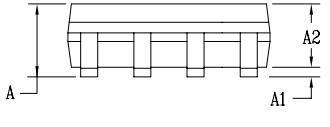
Figure 25. Single Supply Comparator with Temperature Compensated Threshold. V_{IN} Threshold = 2.5V

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

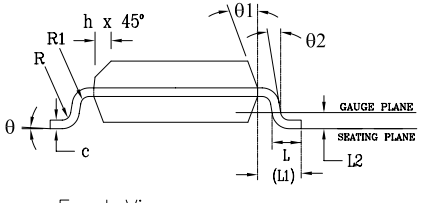


Top View

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	—	—
θ	0°	—	8°	0°	—	8°
θ1	5°	—	15°	5°	—	15°
θ2	0°	—	—	0°	—	—
D	4.90 BSC			0.193 BSC		
N	8			8		



Side View

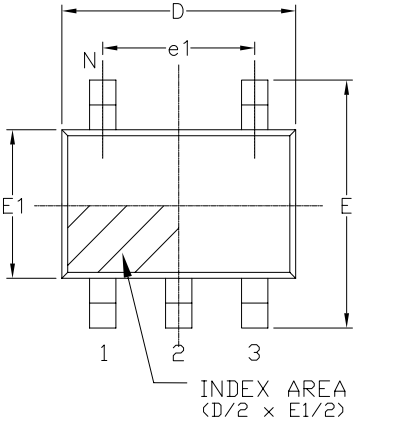


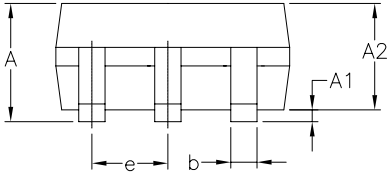
Front View

Solved by Sipex	SIPEX CORPORATION		
	8 PIN SOICN PACKAGE OUTLINE		
Packaging Approval:	Drawing No: 8-PIN SOICN		
By: JL / Date: 07/19/06	Revision: B	Sheet: 1 OF 1	

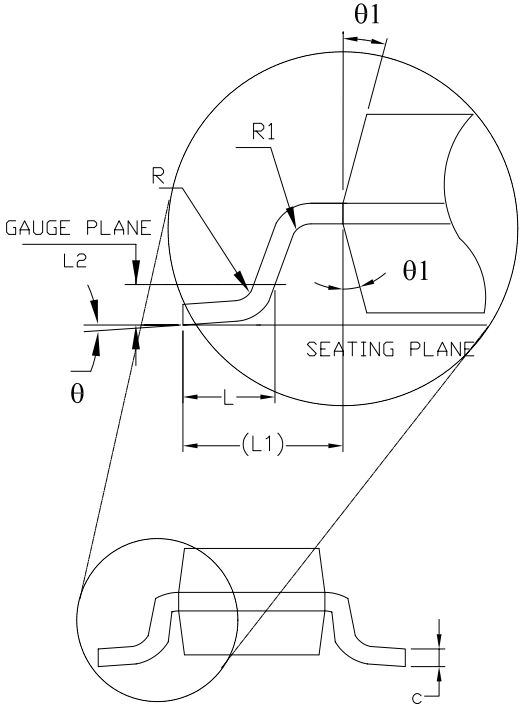
REVISION HISTORY			
REV.	DISCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	10/3/05	JL
B	DRAWING FORMAT MODIFICATION	07/25/06	JL

Top View





Side View



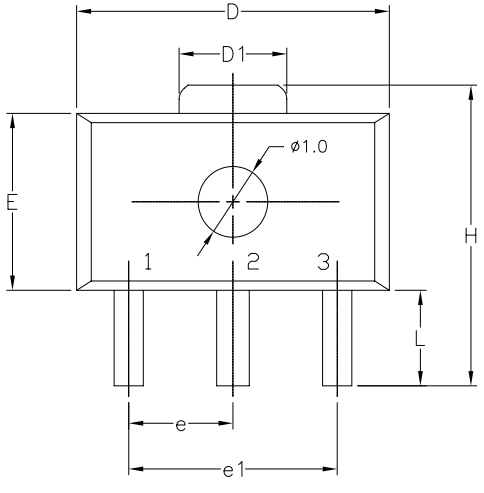
Front View

5 Pin SOT-23 JEDEC MO-178 Variation AA						
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
θ	0°	4°	8°	0°	4°	8°
θ1	5°	10°	15°	5°	10°	15°
N	5			5		

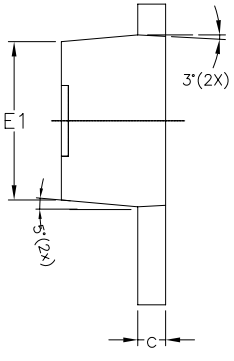
Solved by Sipex		SIPEX CORPORATION	
		5 PIN SOT-23 PACKAGE OUTLINE	
Packaging Approval:		Drawing No:	5-PIN SOT-23
By: JL	Date: 07/25/06	Revision: B	Sheet: 1 OF 1

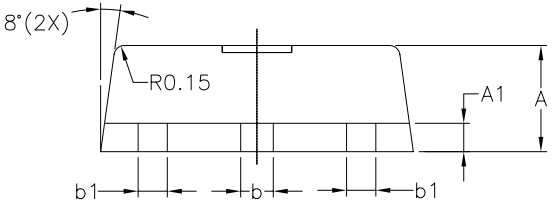
REVISION HISTORY			
REV.	DISCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	02/02/06	JL
B	DRAWING FORMAT MODIFICATION	09/11/06	JL

Top View



Front View



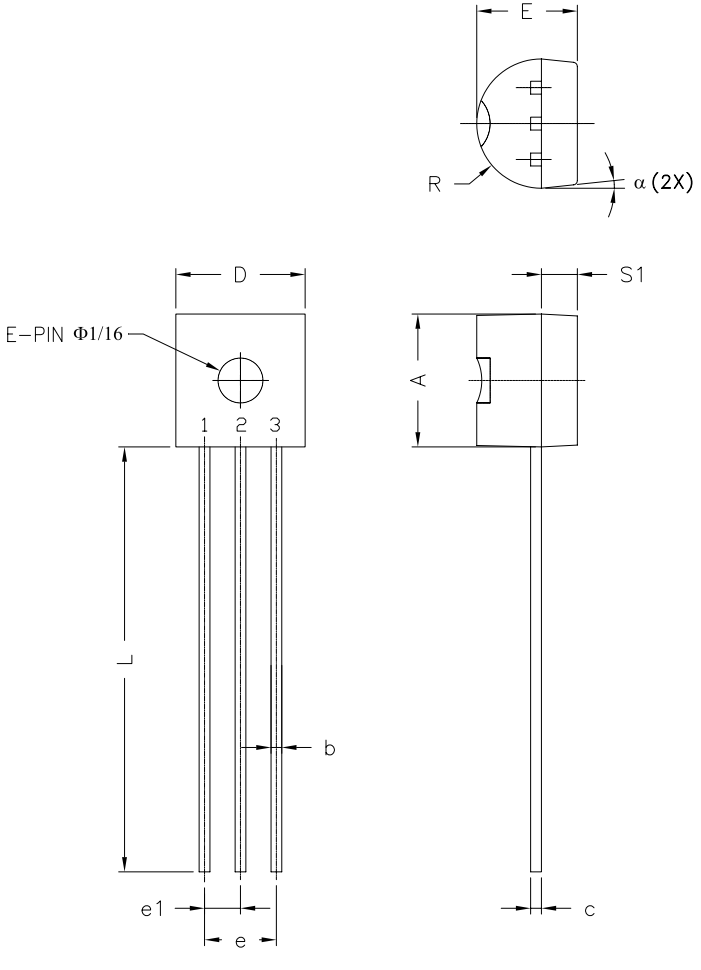


Side View

3 Pin SOT-89 JEDEC TO-243 Variation AA						
SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.40	1.50	1.60	0.055	0.059	0.063
A1	0.30	0.40	0.50	0.011	0.015	0.019
b	0.44	0.47	0.56	0.017	0.018	0.022
b1	0.36	0.42	0.48	0.014	0.016	0.019
c	0.35	0.40	0.44	0.014	0.015	0.017
D	4.40	4.50	4.60	0.173	0.177	0.181
D1	1.62	1.60	1.83	0.064	0.062	0.072
E	2.29	2.50	2.60	0.090	0.098	0.102
E1	2.13	—	2.29	0.084	—	0.090
e	1.50 BSC			0.059 BSC		
e1	3.00 BSC			0.118 BSC		
H	3.94	—	4.25	0.155	—	0.167
L	0.89	—	1.20	0.035	—	0.047
N	3			3		

Solved by Sipex		SIPEX CORPORATION	
		3 PIN SOT-89 PACKAGE OUTLINE	
Packaging Approval:		Drawing No: 3-PIN SOT-89	
By: JL	Date: 09/11/06	Revision: B	Sheet: 1 OF 1

REVISION HISTORY			
REV.	DISCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	09/23/05	JL
B	DRAWING FORMAT MODIFICATION	08/15/06	JL

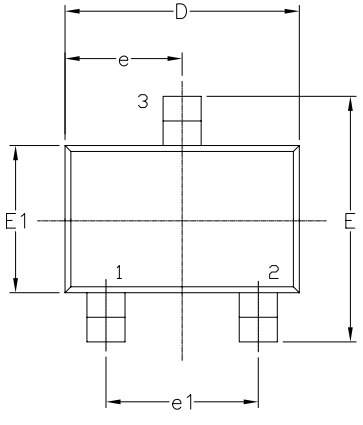


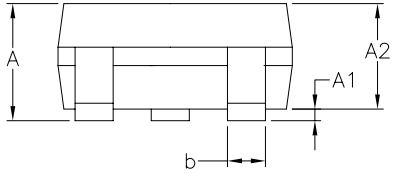
3 Pin TO-92 JEDEC TO-226-AA				
SYMBOLS	DIMENSIONS IN INCH (Control Unit)		DIMENSIONS IN MM (Reference Unit)	
	MIN	MAX	MIN	MAX
A	0.170	0.210	4.32	5.33
b	0.014	0.020	0.36	0.51
c	0.016	0.022	0.41	0.55
D	0.175	0.205	4.45	5.20
E	0.125	0.165	3.18	4.19
e	0.095	0.105	2.42	2.66
e1	0.045	0.055	1.15	1.39
L	0.500	0.610	12.70	15.49
R	0.045	0.095	2.16	2.41
S1	0.045	0.060	1.14	1.52
α	4°	6°	4°	6°
N	3		3	

Solved by Sipex		SIPEX CORPORATION	
		3 PIN TO-92 PACKAGE OUTLINE	
Packaging Approval:		Drawing No:	3-PIN TO-92
By: JL	Date: 08/15/06	Revision: B	Sheet: 1 OF 1

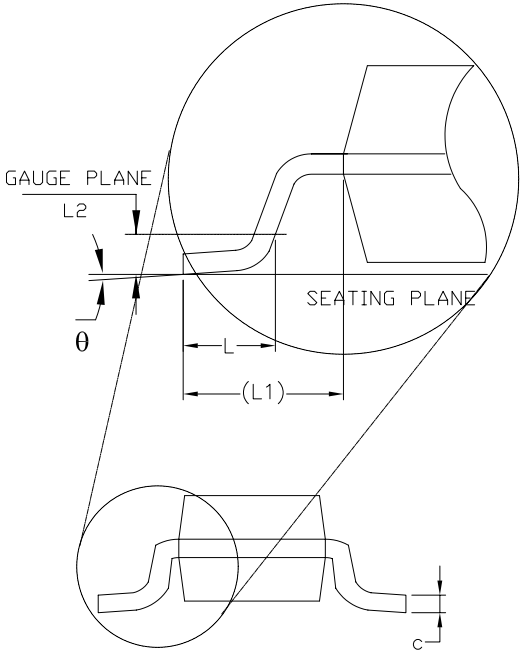
REVISION HISTORY			
REV.	DISCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	10/25/05	JL
B	DRAWING FORMAT MODIFICATION	07/25/06	JL

Top View





Side View



Front View

3 Pin SOT-23 JEDEC TO-236 Variation AB						
SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	—	1.12	0.035	—	0.044
A1	0.01	—	0.10	0.000	—	0.004
A2	0.88	0.95	1.02	0.035	0.037	0.040
b	0.30	—	0.50	0.012	—	0.020
c	0.08	—	0.20	0.003	—	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	2.10	—	2.64	0.083	—	0.104
E1	1.20	1.30	1.40	0.047	0.051	0.055
e	0.95 BSC			0.038 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.40	0.50	0.60	0.016	0.020	0.024
L1	0.54 REF			0.021 REF		
L2	0.25 BSC			0.010 BSC		
θ	0°	—	8°	0°	—	8°
N	3			3		

Solved by Sipex		SIPEX CORPORATION	
		3 PIN SOT-23 PACKAGE OUTLINE	
Packaging Approval:		Drawing No:	3-PIN SOT-23
By: JL	Date: 07/25/06	Revision: B	Sheet: 1 OF 1

ORDERING INFORMATION

PART NUMBER	ACCURACY	OUTPUT VOLTAGE	PACKAGE
SPX431AM5	0.5%	2.503V	5-Pin SOT-23
SPX431AM5/TR	0.5%	2.503V	5-Pin SOT-23
SPX431AM1	0.5%	2.503V	3-Pin SOT-89
SPX431AM1/TR	0.5%	2.503V	3-Pin SOT-89
SPX431AS	0.5%	2.503V	8-Pin SOIC
SPX431AS/TR	0.5%	2.503V	8-Pin SOIC
SPX431AN	0.5%	2.503V	3-Pin TO-92
SPX431AM	0.5%	2.503V	3-Pin SOT-23
SPX431AM/TR	0.5%	2.503V	3-Pin SOT-23
SPX431BM5	1.0%	2.495V	5-Pin SOT-23
SPX431BM5/TR	1.0%	2.495V	5-Pin SOT-23
SPX431BM1	1.0%	2.495V	3-Pin SOT-89
SPX431BM1/TR	1.0%	2.495V	3-Pin SOT-89
SPX431BS	1.0%	2.495V	8-Pin SOIC
SPX431BS/TR	1.0%	2.495V	8-Pin SOIC
SPX431BN	1.0%	2.495V	3-Pin TO-92
SPX431BM	1.0%	2.495V	3-Pin SOT-23
SPX431BM/TR	1.0%	2.495V	3-Pin SOT-23
SPX431CM5	2.0%	2.495V	5-Pin SOT-23
SPX431CM5/TR	2.0%	2.495V	5-Pin SOT-23
SPX431CM1	2.0%	2.495V	3-Pin SOT-89
SPX431CM1/TR	2.0%	2.495V	3-Pin SOT-89
SPX431CS	2.0%	2.495V	8-Pin SOIC
SPX431CS/TR	2.0%	2.495V	8-Pin SOIC
SPX431CN	2.0%	2.495V	3-Pin TO-92
SPX431CM	2.0%	2.495V	3-Pin SOT-23
SPX431CM/TR	2.0%	2.495V	3-Pin SOT-23

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

Example: SPX431AM5/TR = standard; SPX431AM5-L/TR = lead free

/TR = Tape and Reel

TR pack quantity is 3000 for SOT-23-3, 2500 for SOT-23-5, SOT-89 and NSOIC, and 2000 for TO-92 in ammo pack.

Sipex Corporation

Headquarters and Sales Office
233 South Hillview Drive
Milpitas, CA 95035
TEL: (408) 934-7500
FAX: (408) 935-7600

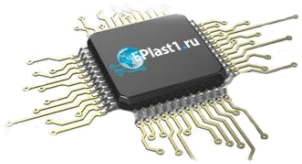
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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