

#### DESCRIPTION

The LX432 series are low-voltage precision adjustable shunt regulators with a reference voltage of 1.24V. The output voltage may be set to any value between 1.24V and 20V by two external resistors.

These devices offer low output impedance for improved load regulation – typical output impedance is 200mΩ. The LX432 series operates with an operating current as low as 80μA, making these devices suitable for portable and micropower applications.

Low voltage operation enables the LX432 to be used in the feedback loop of isolated low voltage power supplies. The minimum output voltage is determined by the LX432 output voltage plus the forward voltage drop of the opto-coupler LED (typically 1.24 + 1.4 = 2.64V minimum). See figure 12.

The LX432 is offered in 3 and 5-Pin SOT-23 or TO-92 packages, and is a drop-in replacement for the TLV431 and SC431L devices.

**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

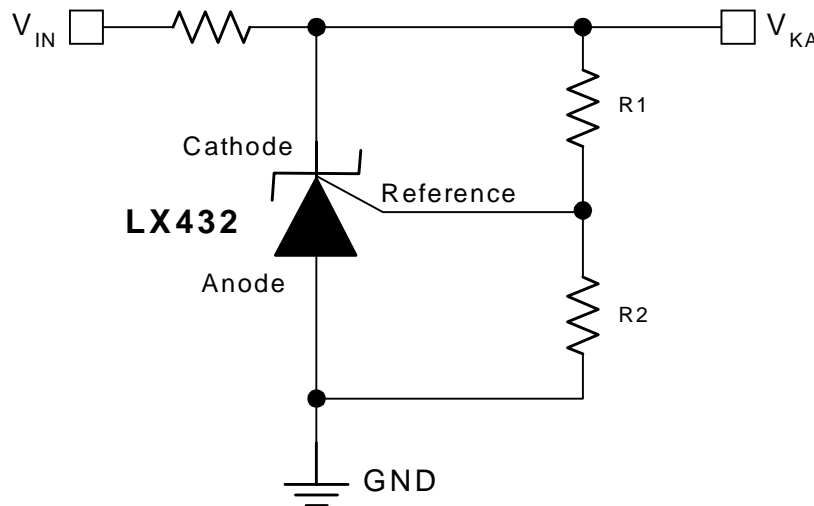
#### KEY FEATURES

- Low Voltage Operation: 1.24V Reference
- Initial Voltage Reference Accuracy 1%
- Adjustable Output Voltage From VREF to 20V
- Typical Output Dynamic Impedance Less Than 250mΩ
- Sink Current Capability 80μA To 20mA
- Direct Alternative To TLV431

#### APPLICATIONS

- Low Voltage Adjustable Power Supplies
- Instrumentation
- Computers
- Portable Equipment

#### PRODUCT HIGHLIGHT



#### PACKAGE ORDER INFO

T <sub>A</sub> (°C)	SC / SE Package Marking	PACKAGE ORDER INFO		
		SC Plastic SOT-23 3-Pin	SE Plastic SOT-23 5-Pin	LP Plastic TO-92 3-Pin
0 to 70	432C	LX432CSC	LX432CSE	LX432CLP
-40 to 85	432I	LX432ISC	LX432ISE	LX432ILP

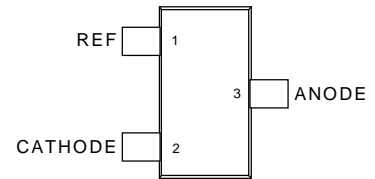
Note: Available in Tape & Reel.  
Append the letter "T" to the part number. (i.e. LX432CSET)  
TO-92 (LP) package also available in ammo-pack.

#### ABSOLUTE MAXIMUM RATINGS (NOTE 1)

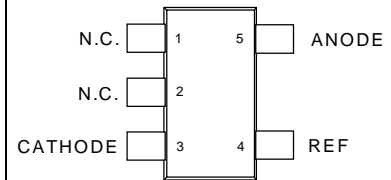
Cathode to Anode Voltage ( $V_{KA}$ ) .....	-0.3V to +20V
Reference Input Current ( $I_{REF}$ ).....	-50 $\mu$ A to 10 $\mu$ A
Continuous Cathode Current ( $I_K$ ).....	-25mA to 25mA
Operating Junction Temperature .....	150°C
Storage Temperature.....	-65°C to 150°C
Lead Temperature.....	300°C

Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

#### PACKAGE PIN OUT

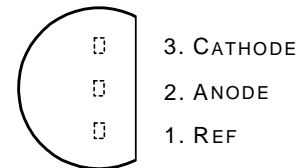


SC PACKAGE – 3-PIN



N.C. - No Internal Connection

SE PACKAGE – 5-PIN



LP PACKAGE – 3-PIN

(All Views Top View)

#### THERMAL DATA

##### SC 3-Pin Plastic Package

Thermal Resistance – Junction to Ambient, $\theta_{JA}$	(PC Mounted)	220°C/W
	(Non-PC Mounted)	410°C/W

##### SE 5-Pin Plastic Package

Thermal Resistance – Junction to Ambient, $\theta_{JA}$	(PC Mounted)	220°C/W
	(Non-PC Mounted)	410°C/W

##### LP 3-Pin Plastic Package

Thermal Resistance – Junction to Ambient, $\theta_{JA}$	156°C/W
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Junction Temperature Calculation:  $T_J = T_A + (P_D \times \theta_{JA})$ .

The  $\theta_{JA}$  numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

#### BLOCK DIAGRAM

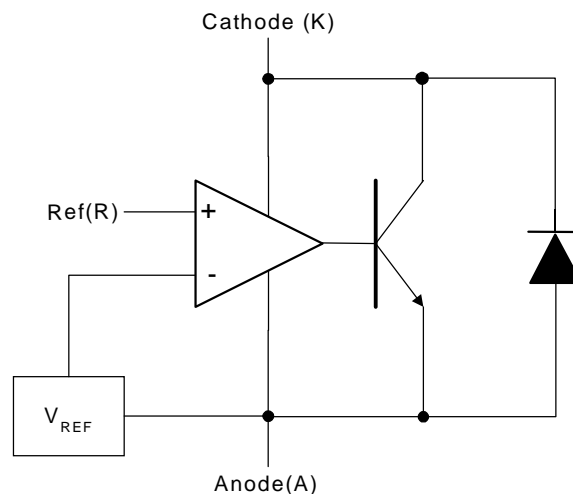


Figure 1 – Simplified Block Diagram

**ELECTRICAL CHARACTERISTICS**

Unless otherwise specified, the following specifications apply over the operating ambient temperature for the LX432C with  $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$  and the LX432I with  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$  except where otherwise noted.

Parameter	Symbol	Test Conditions	LX432			Units
			Min	Typ	Max	
Reference Voltage	$V_{REF}$	$I_K = 10\text{mA}, V_{KA} = V_{REF}, T_A = 25^{\circ}\text{C}$	1.228	1.24	1.252	V
Reference Voltage Drift (note 2)	$\Delta V_{REF}$	$I_K = 10\text{mA}, V_{KA} = V_{REF}, 0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$		3	12	mV
		$I_K = 10\text{mA}, V_{KA} = V_{REF}, -40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$		4	20	mV
Ratio of $V_{REF}$ Change In Cathode Voltage Change (note 3)	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_K = 10\text{mA}, V_{KA} = V_{REF} \text{ to } 16\text{V}, T_A = 25^{\circ}\text{C}$		-1	-2.7	mV/V
Reference Terminal Current	$I_{REF}$	$I_K = 10\text{mA}, V_{KA} = V_{REF}, T_A = 25^{\circ}\text{C}, R1=10\text{k}\Omega, R2=Open$		0.1	0.5	$\mu\text{A}$
Reference Current Drift (note 2)	$\Delta I_{REF}$	$I_K = 10\text{mA}, V_{KA} = V_{REF}, 0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$		0.05	0.3	$\mu\text{A}$
		$I_K = 10\text{mA}, V_{KA} = V_{REF}, -40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$		0.1	0.4	$\mu\text{A}$
Minimum Cathode Current For Regulation	$I_{K(MIN)}$	$V_{KA} = V_{REF}, T_A = 25^{\circ}\text{C}$		55	80	$\mu\text{A}$
Dynamic Impedance	$Z_{KA}$	$I_K = 0.1\text{mA} \text{ to } 15\text{mA}, V_{KA} = V_{REF}, T_A = 25^{\circ}\text{C}$		0.2	0.4	$\Omega$
Off-State Cathode Current	$I_{OFF}$	$V_{KA} = 16\text{V}, T_A = 25^{\circ}\text{C}$		0.004		$\mu\text{A}$

Note 2: These parameters are guaranteed by design.

Note 3:  $\frac{\Delta V_{REF}}{\Delta V_{KA}}$  Ratio of change in reference input voltage to the change in cathode voltage

**CHARACTERISTIC CURVES**

**STABILITY BOUNDARY CONDITION†**

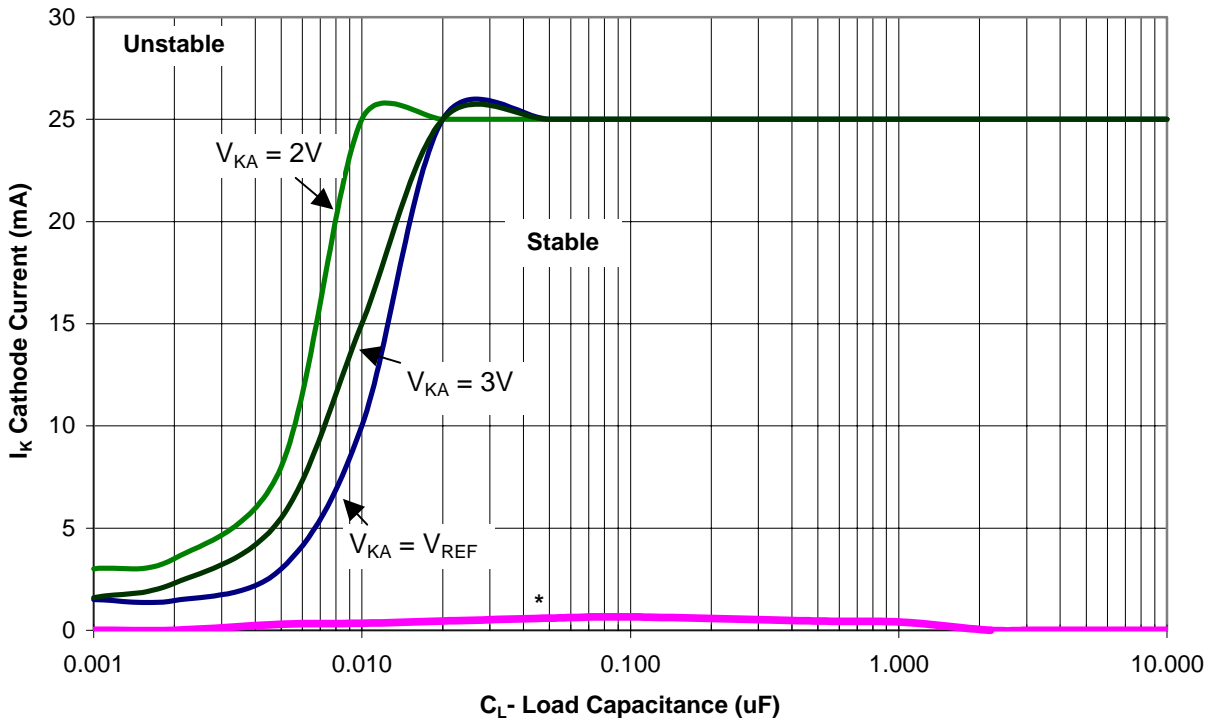


Figure 2 – Stability

\* Unstable below 700 $\mu A$  as indicated

† The unstable areas indicate loading conditions that may cause the device to oscillate.

**CHARACTERISTIC CURVES**

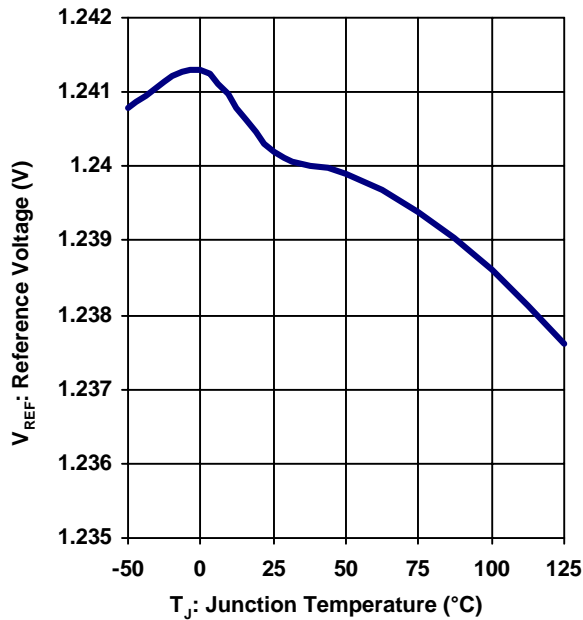


Figure 3 – Reference Voltage vs. Junction Temperature

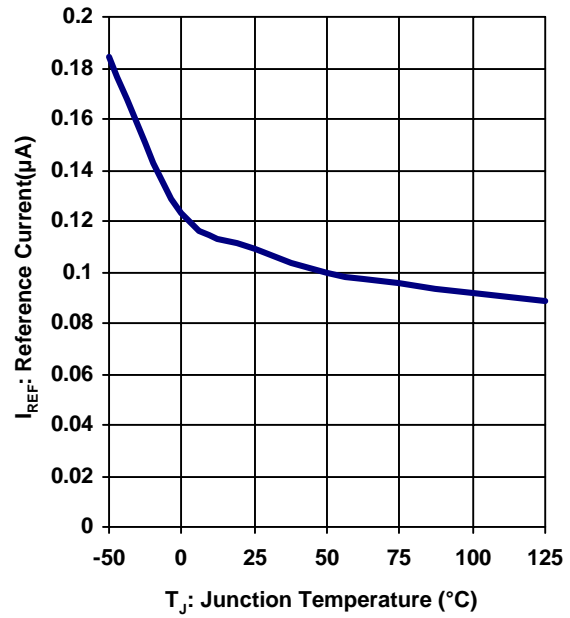


Figure 4 – Reference Current vs. Junction Temperature

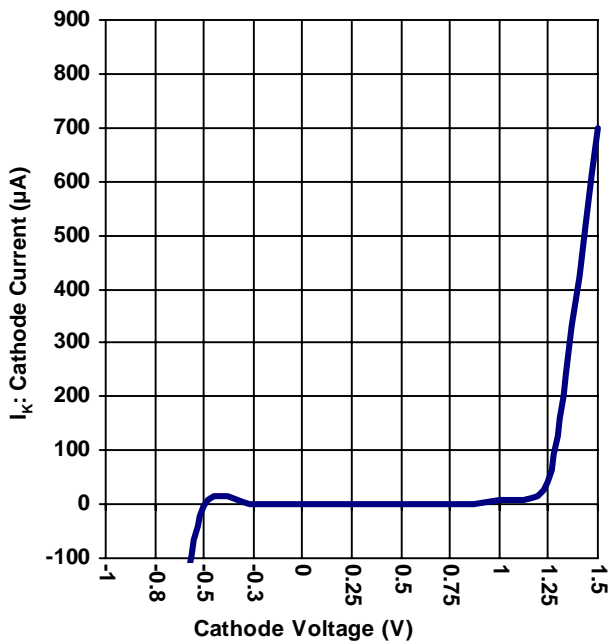


Figure 5 – Cathode Current vs. Cathode Voltage

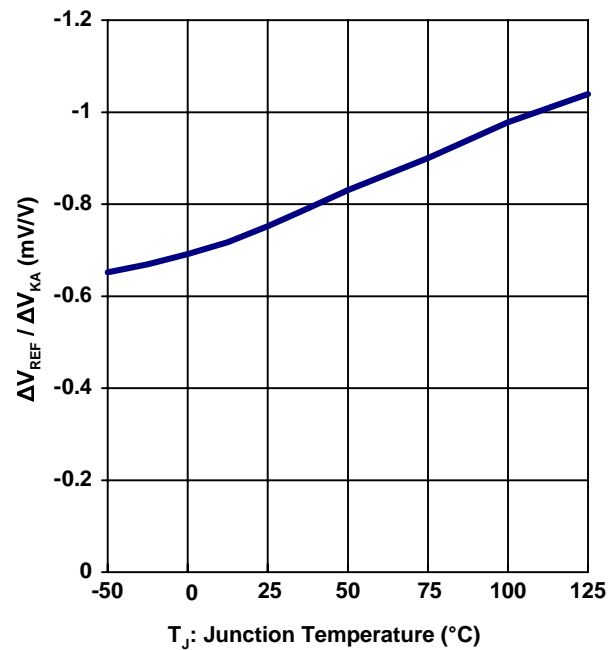


Figure 6 – ΔV<sub>REF</sub> / ΔV<sub>KA</sub> vs. Junction Temperature



## CHARACTERISTIC CURVES

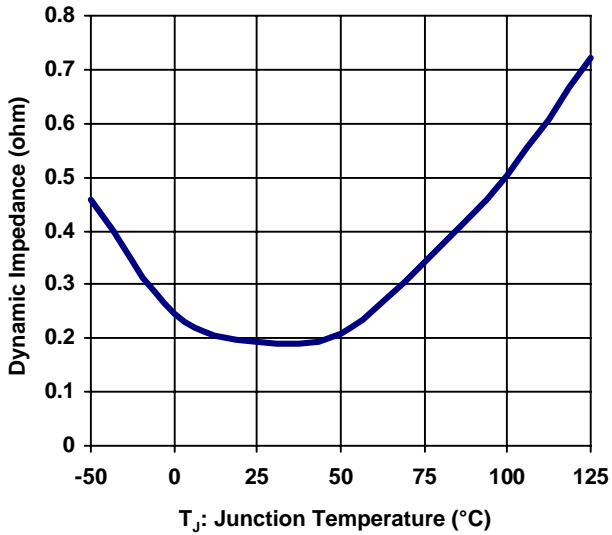


Figure 7 – Dynamic Impedance vs. Junction Temperature

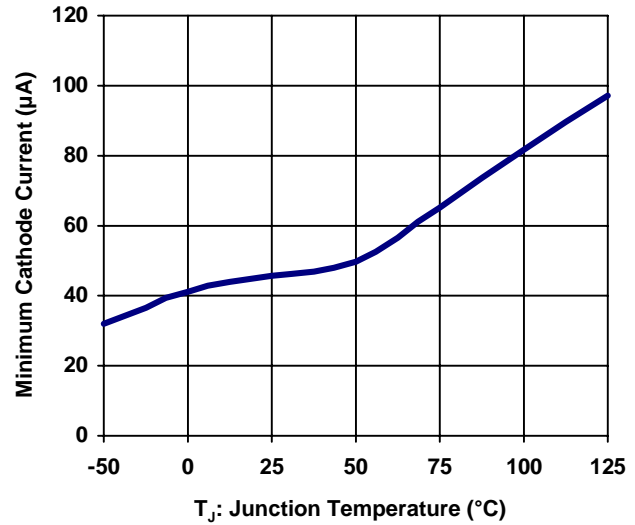


Figure 8 – Minimum Cathode Current for Regulation vs. Junction Temperature

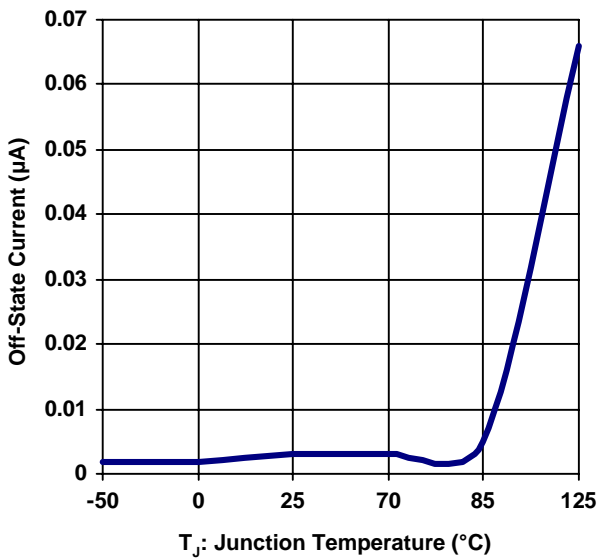


Figure 9 – Off-State Current vs. Junction Temperature

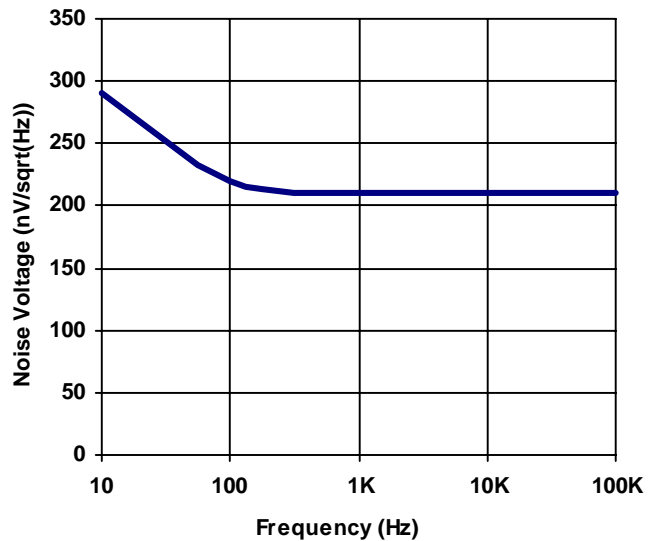


Figure 10 – Equivalent Input Noise Voltage vs. Frequency

PARAMETER MEASUREMENT INFORMATION

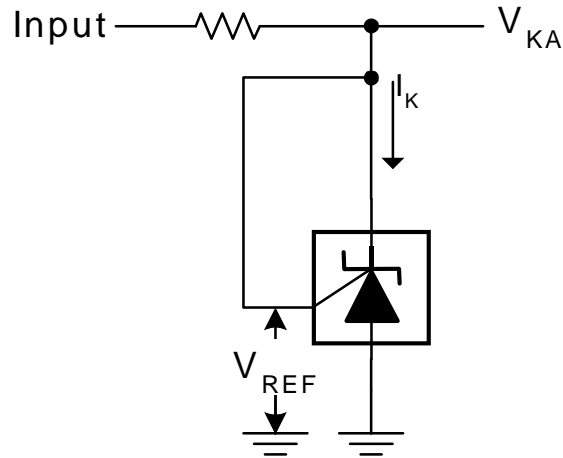


Figure 11 – Test Circuit For  $V_{KA} = V_{REF}$

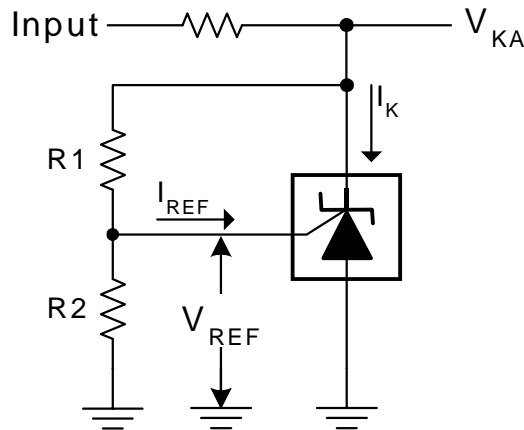


Figure 12 – Test Circuit For  $V_{KA} > V_{REF}$

$$V_O = V_{KA} = V_{REF} \times \left( 1 + \frac{R1}{R2} \right) + I_{REF} \times R1$$

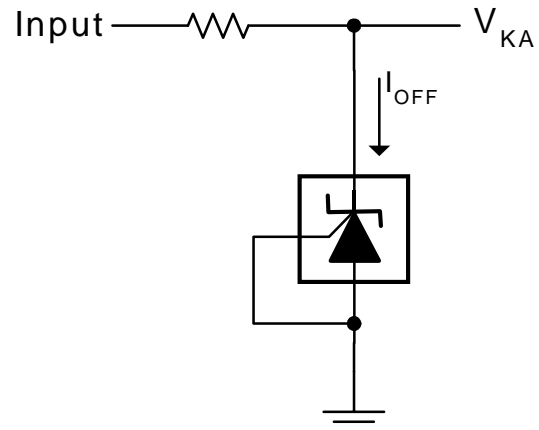


Figure 13 – Test Circuit For  $I_{OFF}$

TYPICAL APPLICATION

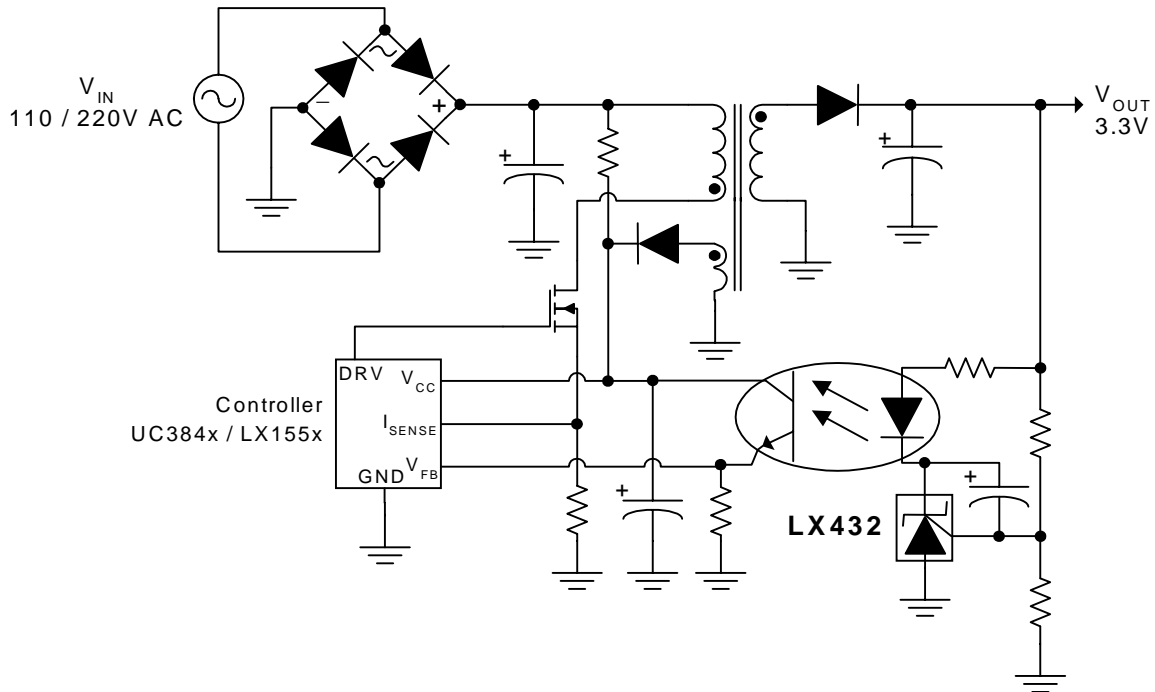


Figure 12 – LX432 In A Power Supply Isolated Feedback Application

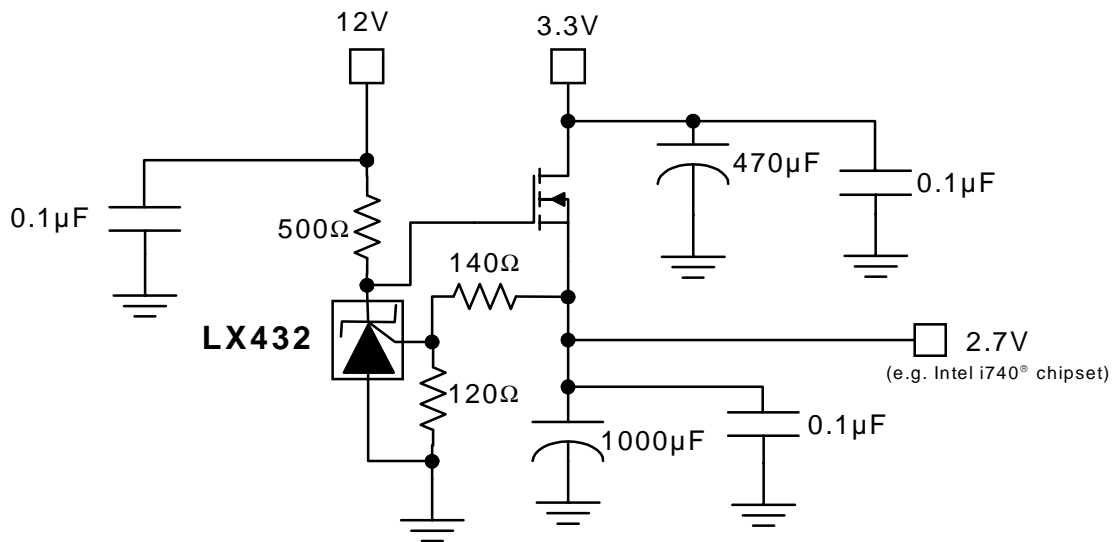
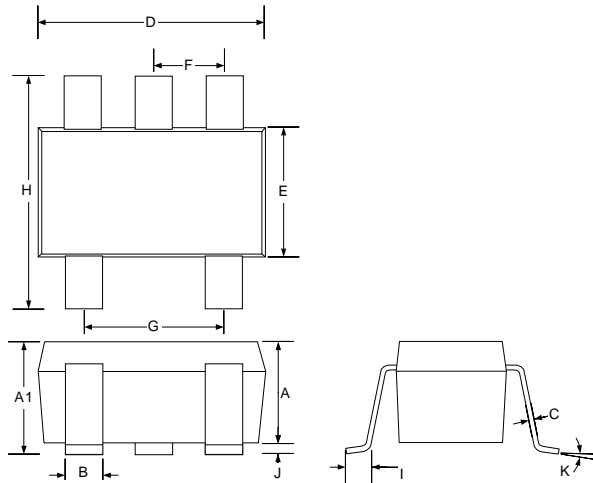


Figure 13 – LX432 in a 3.3V to 2.7V Low Dropout Regulator Application



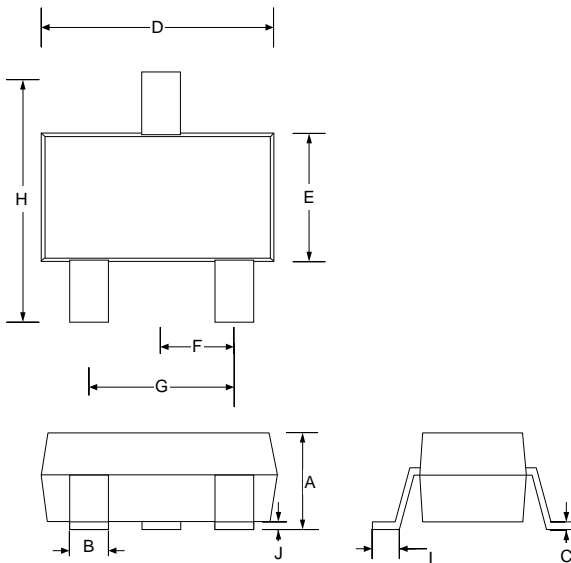
**PACKAGE DIMENSIONS**

**SE 5 Pin Plastic SOT-23**



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.30	0.035	0.051
A1	0.90	1.45	0.035	0.057
B	0.25	0.50	0.010	0.020
C	0.09	0.20	0.004	0.008
D	2.80	3.10	0.110	0.122
E	1.50	1.75	0.059	0.069
F	0.95 BSC		0.038 BSC	
G	1.90 BSC		0.075 BSC	
H	2.60	3.00	0.102	0.118
I	0.35	0.55	0.014	0.022
J	0.00	0.15	0.000	0.006
K	10° MAX		10° MAX	

**SC 3-Pin Plastic SOT-23**



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.89	1.12	0.035	0.044
B	0.37	0.51	0.015	0.020
C	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	1.20	1.40	0.047	0.055
F	0.89	1.09	0.035	0.043
G	1.78	2.05	0.070	0.080
H	2.10	2.64	0.083	0.104
I	0.35	0.55	0.014	0.022
J	0.013	0.10	0.0005	0.0039

**Note:**

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.



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## LX432

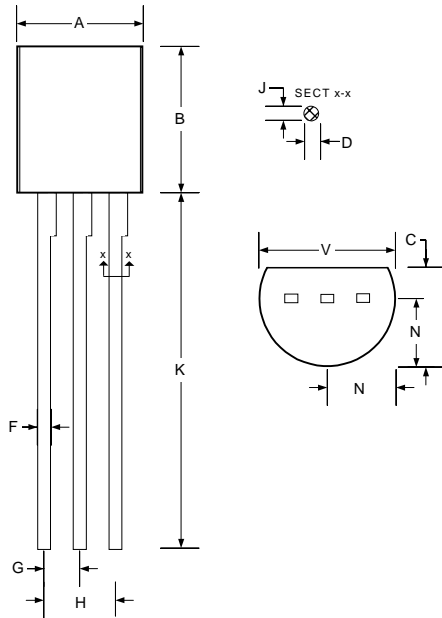
### Low Voltage Adjustable Precision Shunt Regulator

#### PRODUCTION DATA SHEET

### PACKAGE DIMENSIONS (CONTINUED)

#### LP

#### 3-Pin Plastic TO-92



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.45	5.20	0.175	0.205
B	4.32	5.33	0.170	0.210
C	3.18	4.19	0.125	0.165
D	0.41	0.55	0.016	0.022
F	0.41	0.48	0.016	0.019
G	1.15	1.39	0.045	0.055
H	2.42	2.66	0.095	0.105
J	0.39	0.50	0.015	0.020
K	12.70	-	0.500	-
N	2.05	2.66	0.080	0.105
V	3.43	-	0.135	-

#### Note:

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.



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LX432

Low Voltage Adjustable Precision Shunt Regulator

PRODUCTION DATA SHEET

## NOTES

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