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
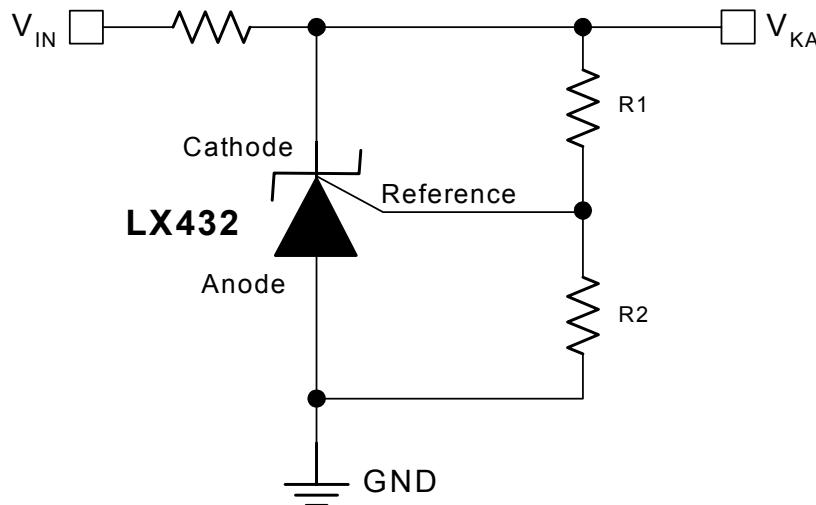
PACKAGE ORDER INFO

T_A (°C)	SC / SE Package Marking	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 letters "TR" to the part number. (i.e. LX432CSE-TR)
TO-92 (LP) package also available in ammo-pack.

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 1

ABSOLUTE MAXIMUM RATINGS (NOTE 1)

Cathode to Anode Voltage (V_{KA})..-0.3V to +20V
Reference Input Current (I_{REF})...-50µA to 10µA
Continuous Cathode Current (I_K)...-25mA to 25mA
Operating Junction Temperature..150°C
Storage Temperature...-65ºC 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.
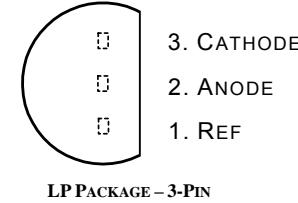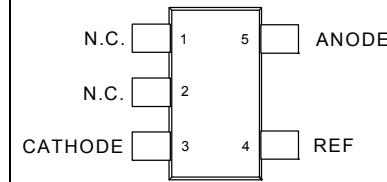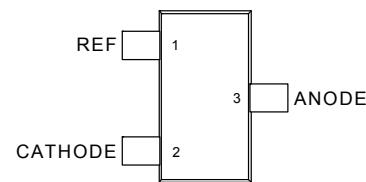
THERMAL DATA

SC	**3-Pin Plastic Package**		
Thermal Resistance – Junction to Ambient, θ_{JA}		(PC Mounted)	220°C/W
		(Non-PC Mounted)	410°C/W

SE	**5-Pin Plastic Package**		
Thermal Resistance – Junction to Ambient, θ_{JA}		(PC Mounted)	220°C/W
		(Non-PC Mounted)	410°C/W

LP	**3-Pin Plastic Package**	
Thermal Resistance – Junction to Ambient, θ_{JA}		156°C/W

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

PACKAGE PIN OUT

REF — 1
3 — ANODE
CATHODE — 2

SC PACKAGE – 3-PIN

N.C. — 1   5 — ANODE
N.C. — 2
CATHODE — 3   4 — REF

N.C. - No Internal Connection
SE PACKAGE – 5-PIN

3. CATHODE
2. ANODE
1. REF

LP PACKAGE – 3-PIN

(All Views Top View)

BLOCK DIAGRAM

Cathode (K)

Ref(R) — +

-

V_{REF}

Anode(A)
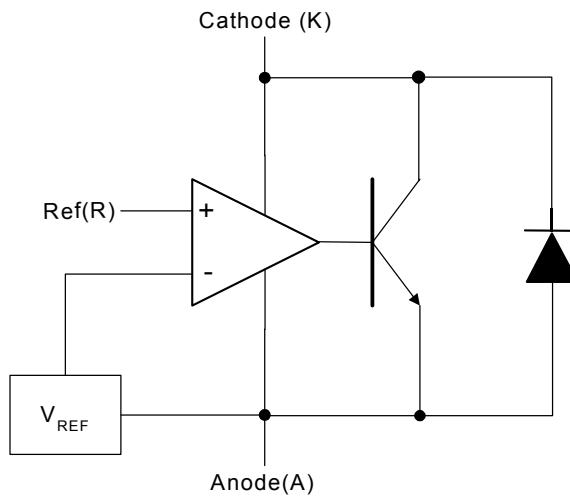
Figure 1 – Simplified Block Diagram

WWW.*Microsemi*.COM

PACKAGE DATA

Microsemi™®

Low Voltage Adjustable Precision Shunt Regulator

PRODUCTION DATA SHEET

ELECTRICAL CHARACTERISTICS

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

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

Note 2: These parameters are guaranteed by design.

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

Microsemi ™ ®

www.Microsemi.com

CHARACTERISTIC CURVES

STABILITY BOUNDARY CONDITION†
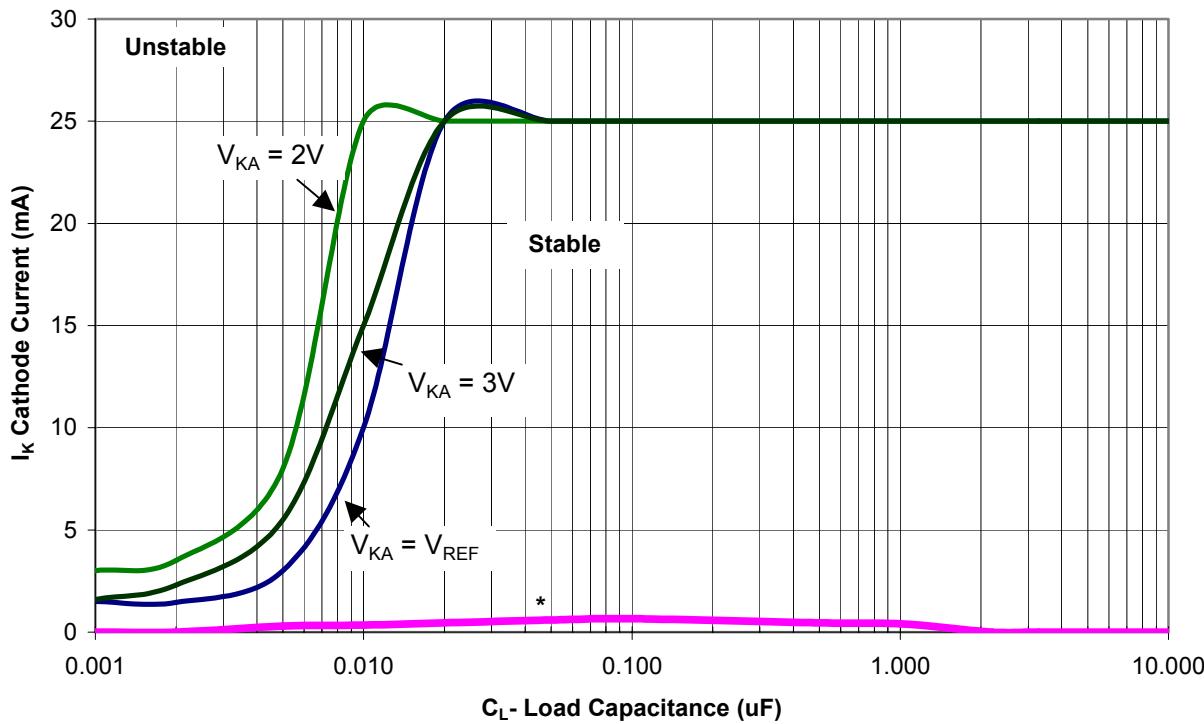
Figure 2 – Stability

* Unstable below 700µA as indicated

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

STABILITY

Copyright © 2000
Rev. 1.2d, 2004-08-24

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 4

Microsemi™®

Low Voltage Adjustable Precision Shunt Regulator

PRODUCTION DATA SHEET

CHARACTERISTIC CURVES
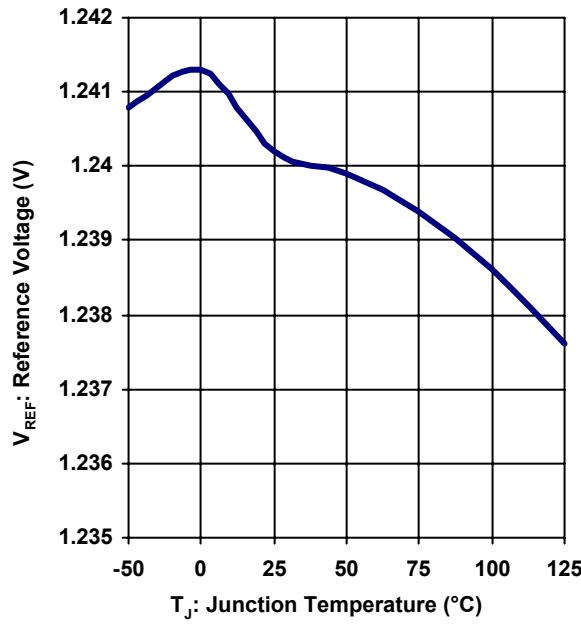
Figure 3 – Reference Voltage vs. Junction Temperature
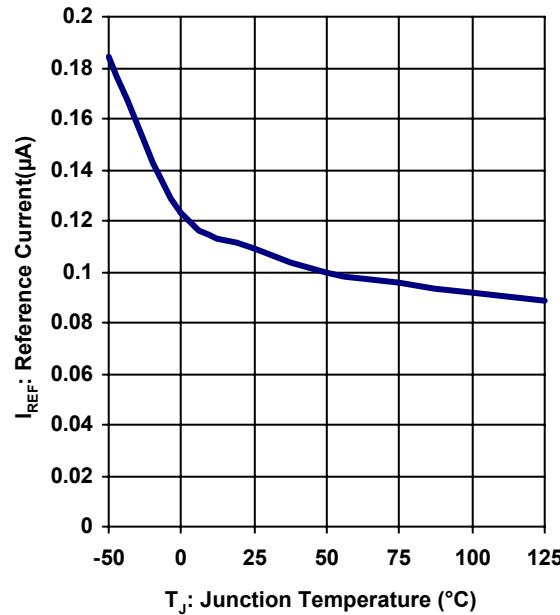

Figure 4 – Reference Current vs. Junction Temperature
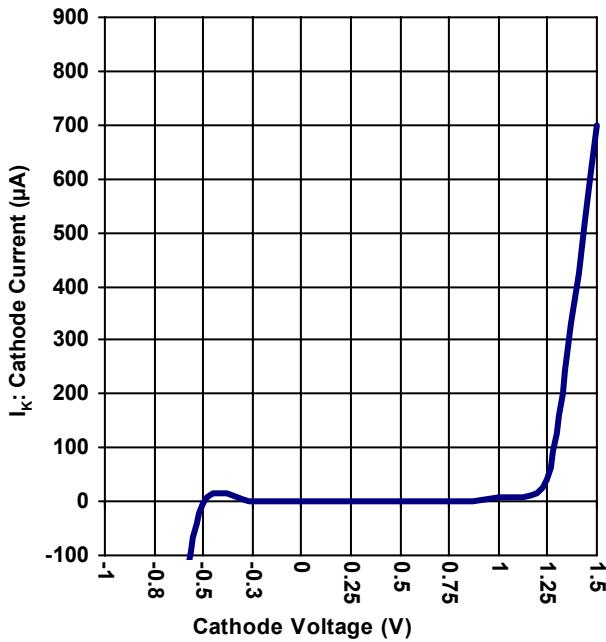
**Figure 5** – Cathode Current vs. Cathode Voltage

**Figure 6** – ΔV_{REF} / ΔV_{KA} vs. Junction Temperature

Copyright © 2000
Rev. 1.2d, 2004-08-24

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 5

Low Voltage Adjustable Precision Shunt Regulator

PRODUCTION DATA SHEET
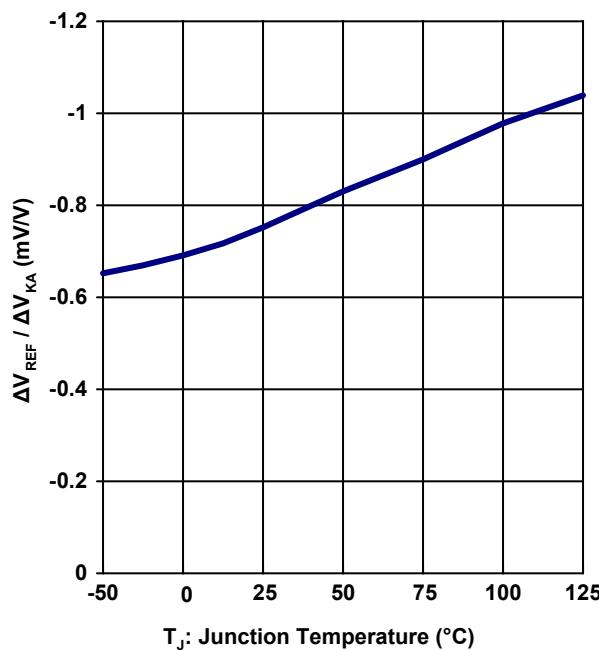
CHARACTERISTIC CURVES
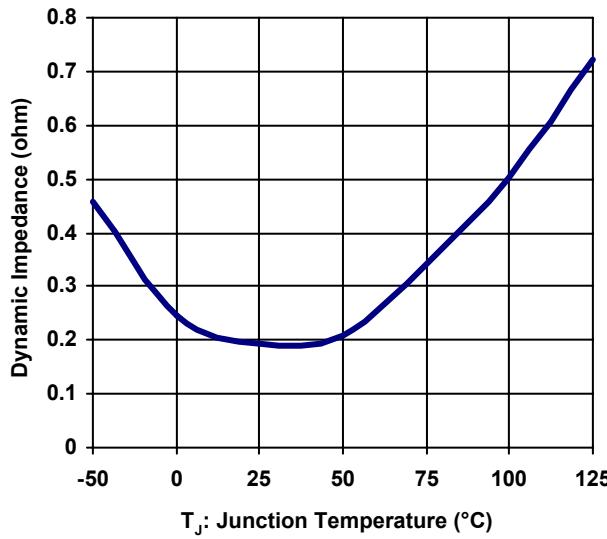
Figure 7 – Dynamic Impedance vs. Junction Temperature
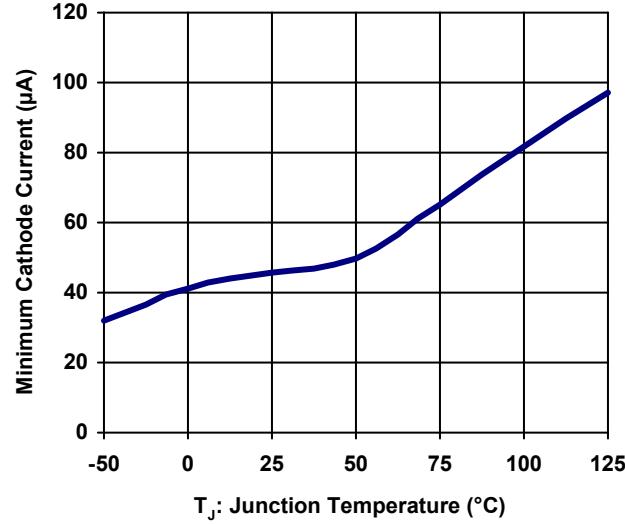

Figure 8 – Minimum Cathode Current for Regulation vs. Junction Temperature
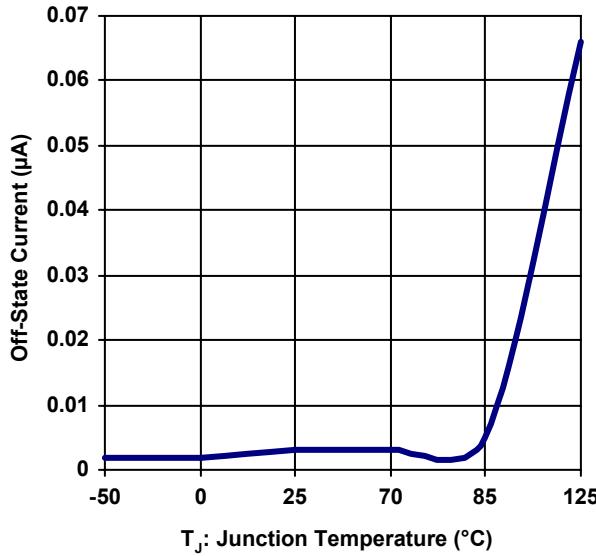
Figure 9 – Off-State Current vs. Junction Temperature
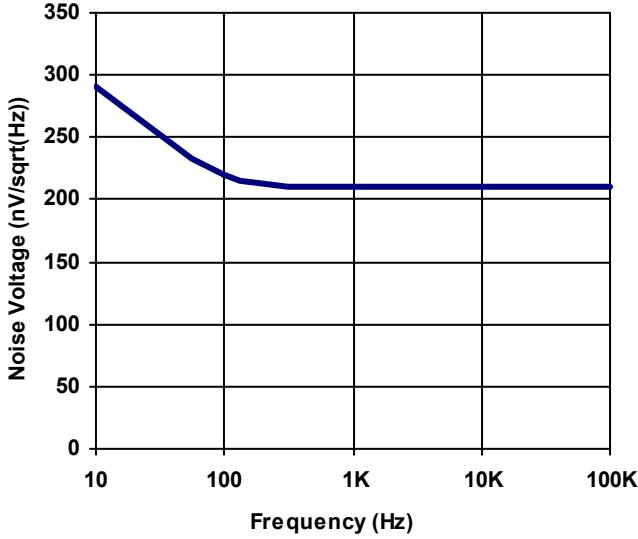
Figure 10 – Equivalent Input Noise Voltage vs. Frequency

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

WWW.*Microsemi*.COM

PARAMETER MEASUREMENT INFORMATION
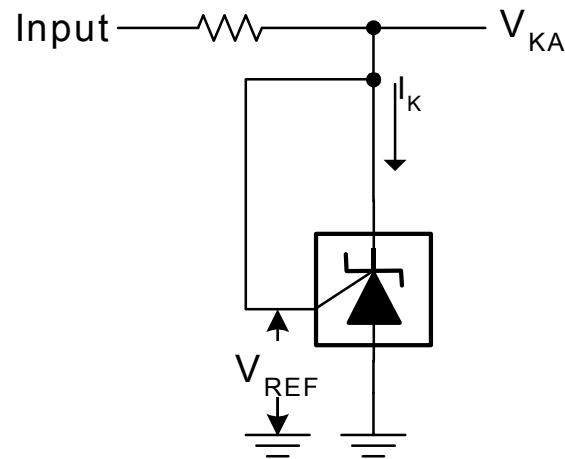
Figure 11 – Test Circuit For $V_{KA} = V_{REF}$
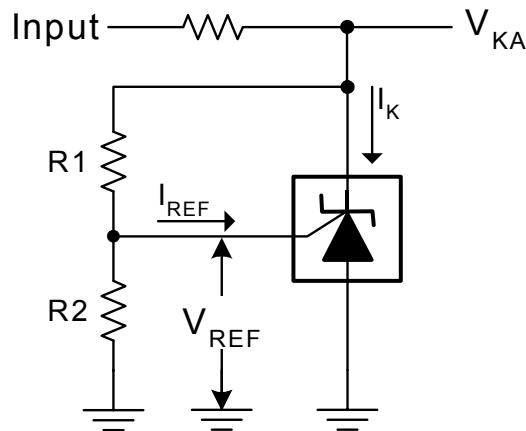
Figure 12 – Test Circuit For $V_{KA} > V_{REF}$
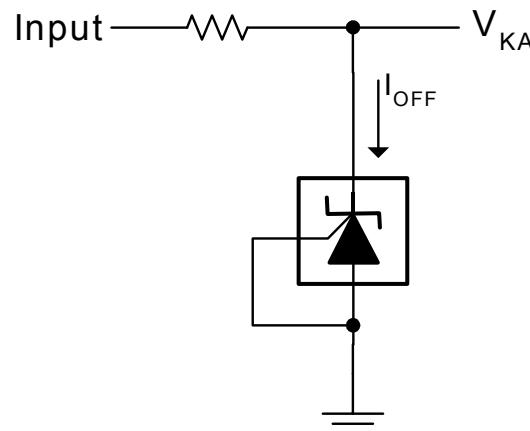
Figure 13 – Test Circuit For I_{OFF}

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

MEASUREMENT

TYPICAL APPLICATION
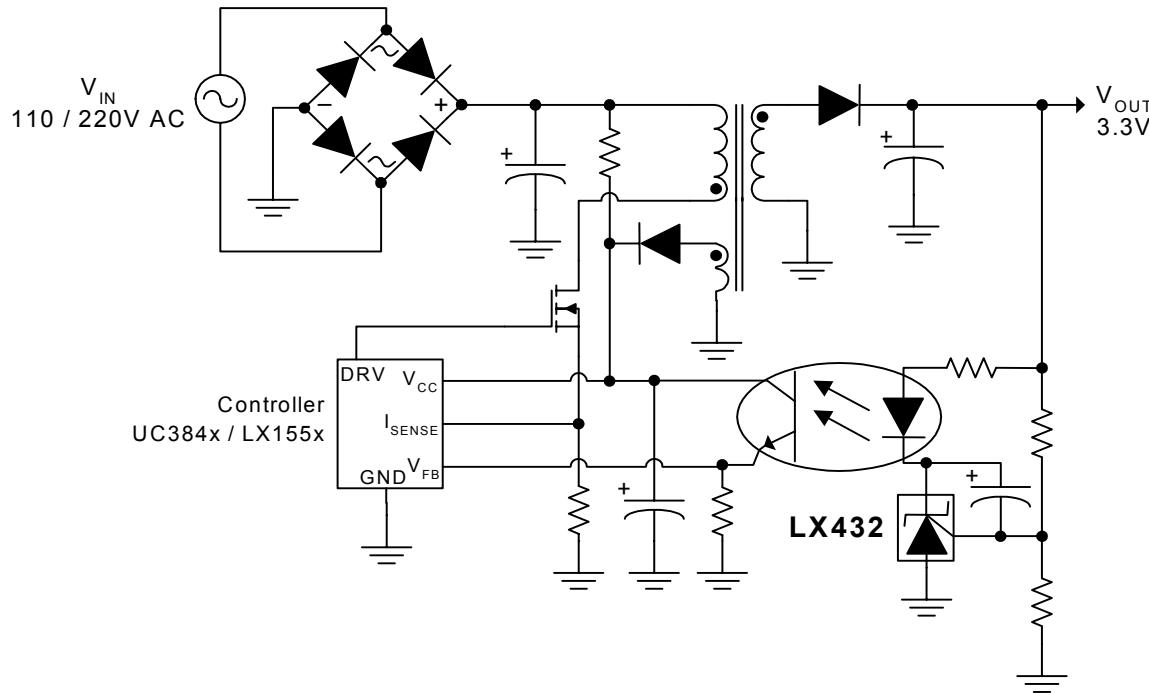
Figure 12 – LX432 In A Power Supply Isolated Feedback Application
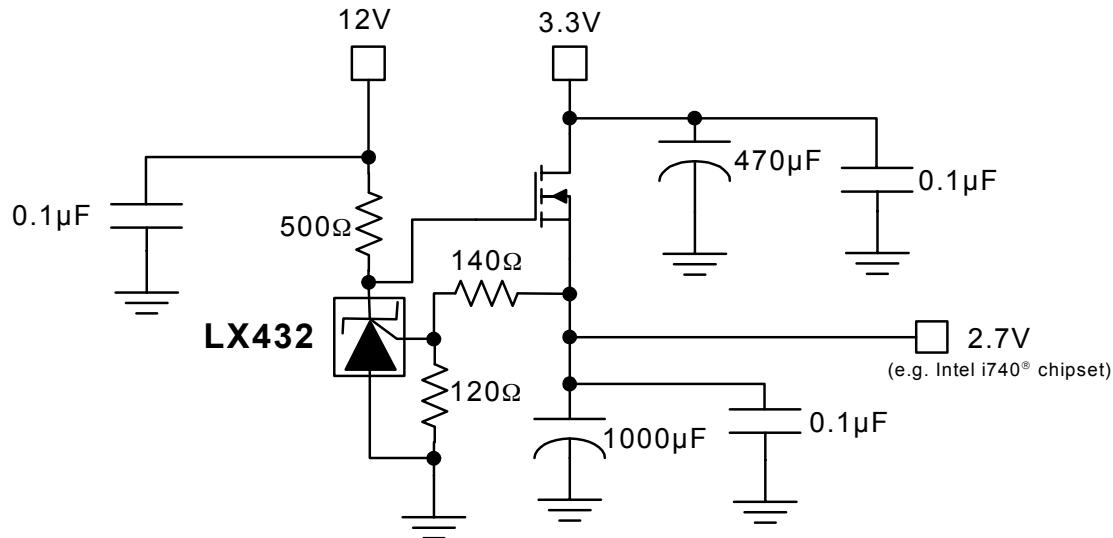
Figure 13 – LX432 in a 3.3V to 2.7V Low Dropout Regulator Application

Copyright © 2000
Rev. 1.2d, 2004-08-24

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 8

PACKAGE DIMENSIONS

SE — 5 Pin Plastic SOT-23
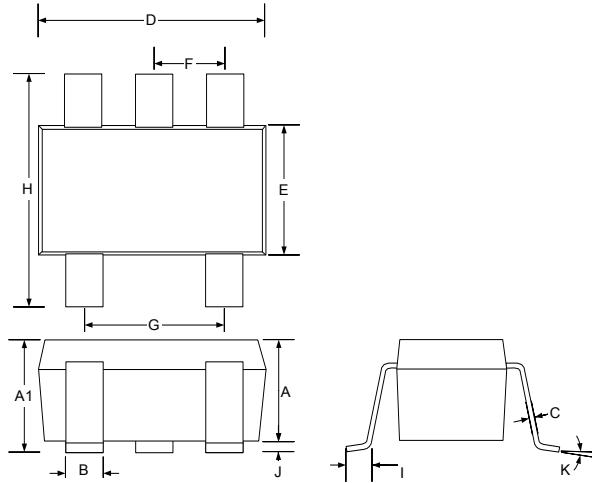
Dim	MILLIMETERS		INCHES	
	MIN	**MAX**	**MIN**	**MAX**
A	0.90	1.30	0.035	0.051
A1	0.90	1.45	0.035	0.057
B	0.25	0.50	0.010	0.020
C	0.09	0.20	0.004	0.008
D	2.80	3.10	0.110	0.122
E	1.50	1.75	0.059	0.069
F	0.95 BSC		0.038 BSC	
G	1.90 BSC		0.075 BSC	
H	2.60	3.00	0.102	0.118
I	0.35	0.55	0.014	0.022
J	0.00	0.15	0.000	0.006
K	10° MAX		10° MAX	

SC — 3-Pin Plastic SOT-23
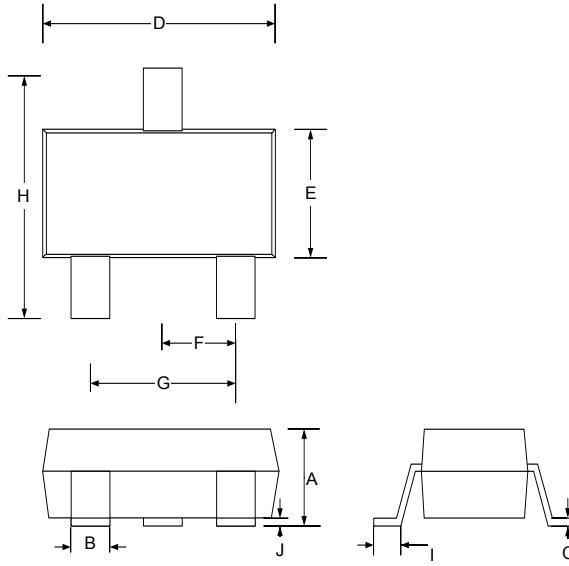
Dim	MILLIMETERS		INCHES	
	MIN	**MAX**	**MIN**	**MAX**
A	0.89	1.12	0.035	0.044
B	0.37	0.51	0.015	0.020
C	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	1.20	1.40	0.047	0.055
F	0.89	1.09	0.035	0.043
G	1.78	2.05	0.070	0.080
H	2.10	2.64	0.083	0.104
I	0.35	0.55	0.014	0.022
J	0.013	0.10	0.0005	0.0039

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.

Copyright © 2000
Rev. 1.2d, 2004-08-24

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 9

Microsemi

PACKAGE DIMENSIONS (CONTINUED)

LP **3-Pin Plastic TO-92**
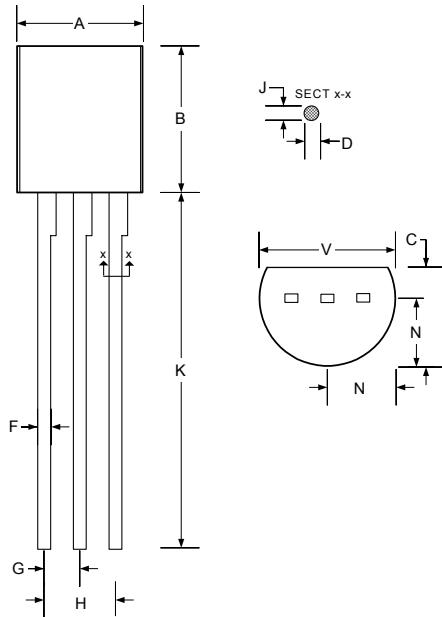
Dim	MILLIMETERS		INCHES	
	MIN	**MAX**	**MIN**	**MAX**
A	4.45	5.20	0.175	0.205
B	4.32	5.33	0.170	0.210
C	3.18	4.19	0.125	0.165
D	0.41	0.55	0.016	0.022
F	0.41	0.48	0.016	0.019
G	1.15	1.39	0.045	0.055
H	2.42	2.66	0.095	0.105
J	0.39	0.50	0.015	0.020
K	12.70	-	0.500	-
N	2.05	2.66	0.080	0.105
V	3.43	-	0.135	-

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.

NOTES

Copyright © 2000
Rev. 1.2d, 2004-08-24

Microsemi
Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

Page 11