LINFINITY MICROELECTRONICS

THE INFINITE POWER OF INNOVATION

LX432

LOW VOLTAGE ADJUSTABLE PRECISION SHUNT REGULATORS

PRODUCTION DATA SHEET

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 250mΩ. 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 10.

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 LinFinity's web site: http://www.linfinity.com.

KEY FEATURES

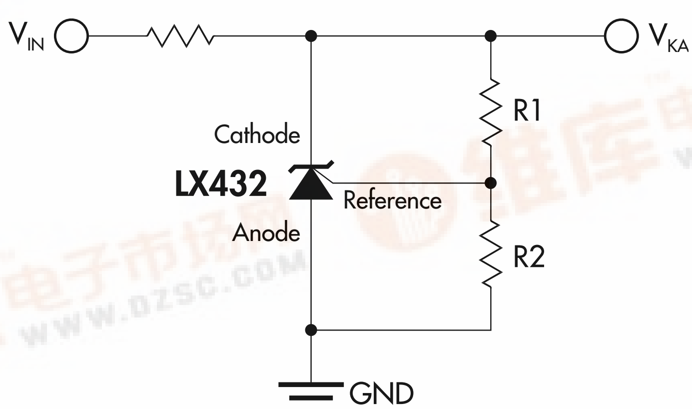
- Low Voltage Operation: 1.24V Reference
- Initial Voltage Reference Accuracy 1%
- Adjustable Output Voltage From V_{REF} To 20V
- Typical Output Dynamic Impedance Less Than 250mΩ
- Sink Current Capability 80µA To 20mA
- Direct Alternative To TLV431

APPLICATIONS

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

PRODUCT HIGHLIGHT

TYPICAL PROGRAMMABLE VOLTAGE REFERENCE CIRCUIT



PACKAGE ORDER INFORMATION

T_A (°C)	SC Plastic SOT-23 3-pin	SE Plastic SOT-23 5-pin	LP Plastic TO-92 3-pin
0 to 70	LX432CSC	LX432CSE	LX432CLP
-40 to 85	LX432ISC	LX432ISE	LX432ILP

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

Low Voltage Adjustable Precision Shunt Regulators

PRODUCTION DATA SHEET

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
Plastic (SC, SE & LP Packages) .... 150°C
Storage Temperature Range .... -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 the specified terminal. Pin numbers refer to DIL packages only.

THERMAL DATA

SC PACKAGE:

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

SE PACKAGE:

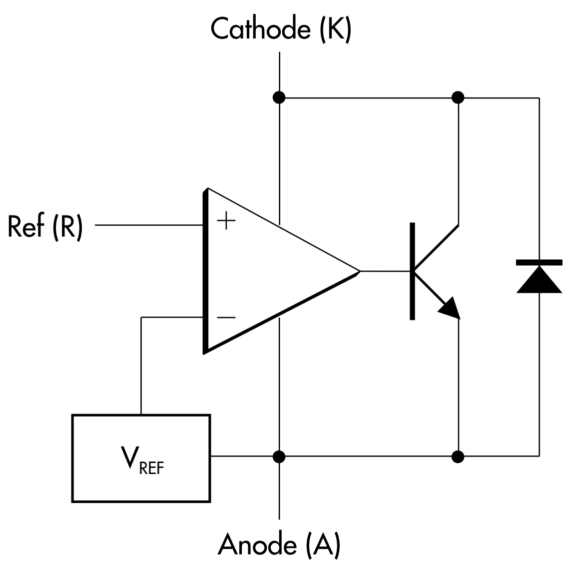
Thermal Resistance - Junction to Ambient, θ_{JA}	(PC-Mounted)	220°C/W
	(Non-PC Mounted)	410°C/W

LP PACKAGE:

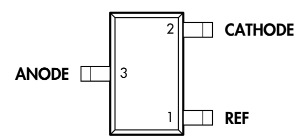
Thermal Resistance-Junction to Ambient, θ_{JA}	156°C/W

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

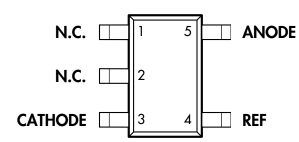
BLOCK DIAGRAM



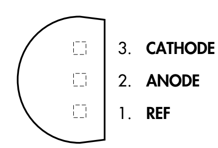
PACKAGE PIN OUTS



SC PACKAGE — 3-Pin
(Top View)



SE PACKAGE — 5-Pin
(Top View)



LP PACKAGE
(Top View)

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for LX432C with 0°C ≤ T_A ≤ 70°C, and the LX432I with -40°C ≤ T_A ≤ 85°C.)

Parameter	Symbol	Test Conditions	LX432			Units
			Min.	Typ.	Max.	
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 ≤ T_A ≤ 70°C		3	12	mV
		I_K = 10mA, V_{KA} = V_{REF}, -40°C ≤ T_A ≤ 85°C		4	20	mV
Ratio Of V_{REF} Change In Cathode Voltage Change (Note 3)	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	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=10kΩ, R2 = Open		0.1	0.5	µA
Reference Current Drift (Note 2)	ΔI_{REF}	I_K = 10mA, V_{KA} = V_{REF}, 0°C ≤ T_A ≤ 70°C		0.05	0.3	µA
		I_K = 10mA, V_{KA} = V_{REF}, -40°C ≤ T_A ≤ 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. $\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of change in reference input voltage to the change in cathode voltage.

GRAPH / CURVE INDEX

Characteristic Curves

FIGURE #

1. Reference Voltage vs. Junction Temperature

2. Reference Current vs. Junction Temperature

3. Cathode Current vs. Cathode Voltage

4. ΔV_{REF} / ΔV_{KA} vs. Junction Temperature

5. Dynamic Impedance vs. Junction Temperature

6. Minimum Cathode Current For Regulation vs. Junction Temperature

7. Off-State Current vs. Junction Temperature

8. Equivalent Input Noise Voltage vs. Frequency

FIGURE INDEX

Parameter Measurement Information

FIGURE #

9. Test Circuit For $V_{KA} = V_{REF}$

10. Test Circuit For $V_{KA} > V_{REF}$

11. Test Circuit For I_{OFF}

Typical Applications

FIGURE #

12. Flyback With Isolation Using LX431 Or LX431A As Voltage Reference And Error Amplifier

13. LX432 In 3.3V To 2.7V Low Dropout Regulator Application

CHARACTERISTIC CURVES

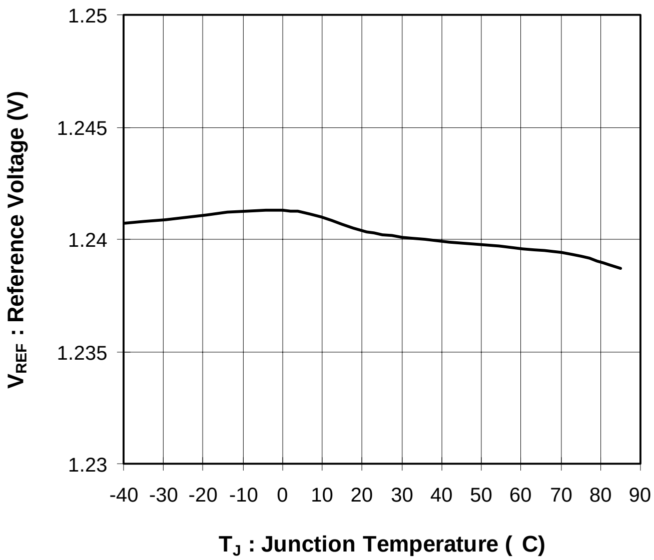


FIGURE 1 — Reference Voltage vs. Junction Temperature

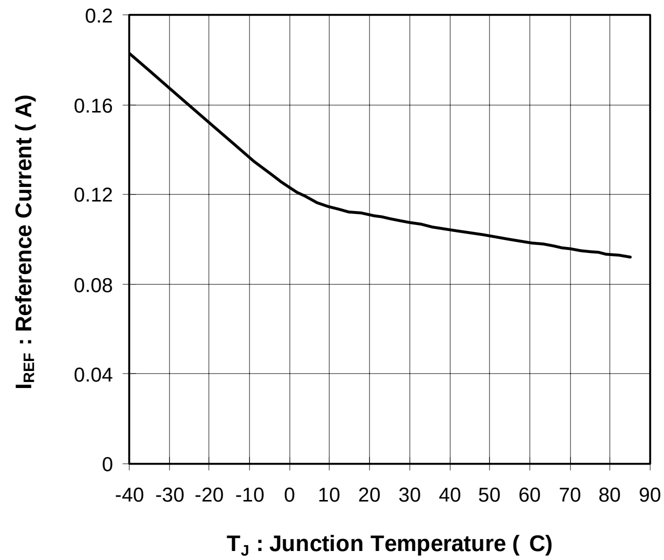


FIGURE 2 — Reference Current vs. Junction Temperature

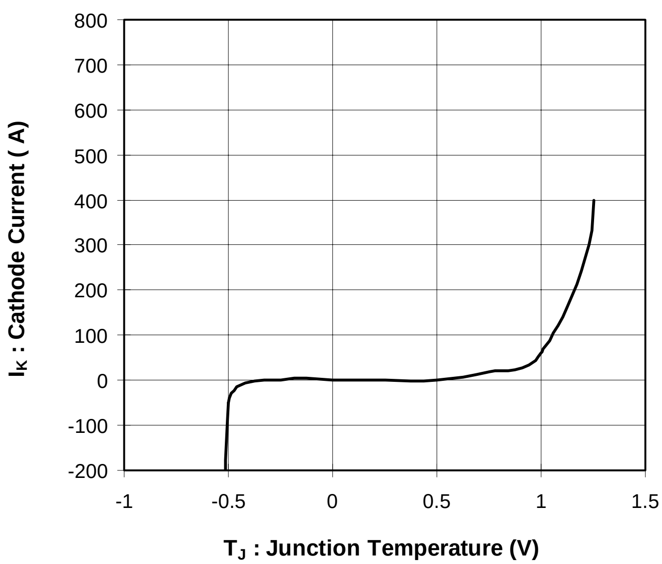


FIGURE 3 — Cathode Current vs. Cathode Voltage

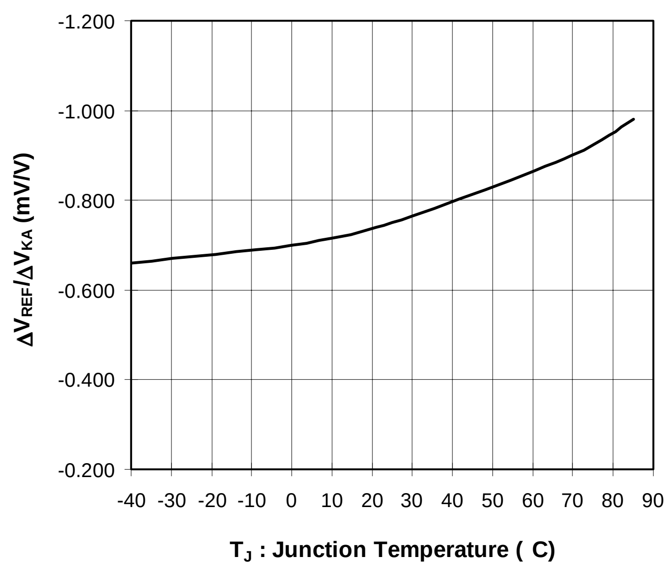


FIGURE 4 — ΔV_{REF} / ΔV_{KA} vs. Junction Temperature

CHARACTERISTIC CURVES

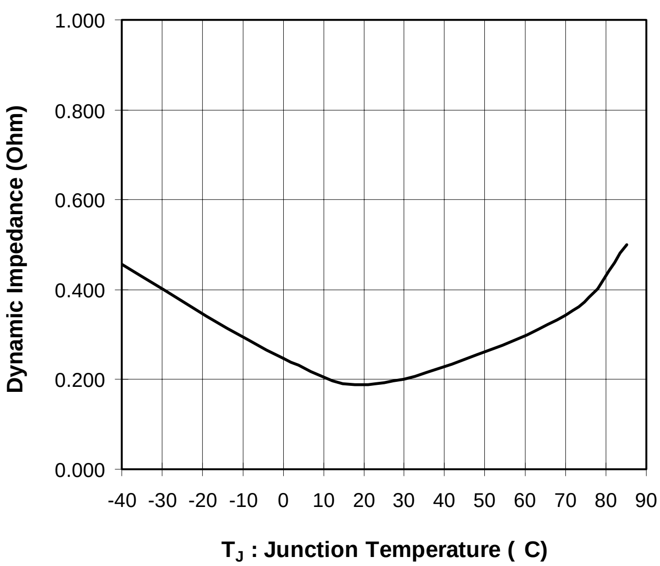


FIGURE 5 — Dynamic Impedance vs. Junction Temperature

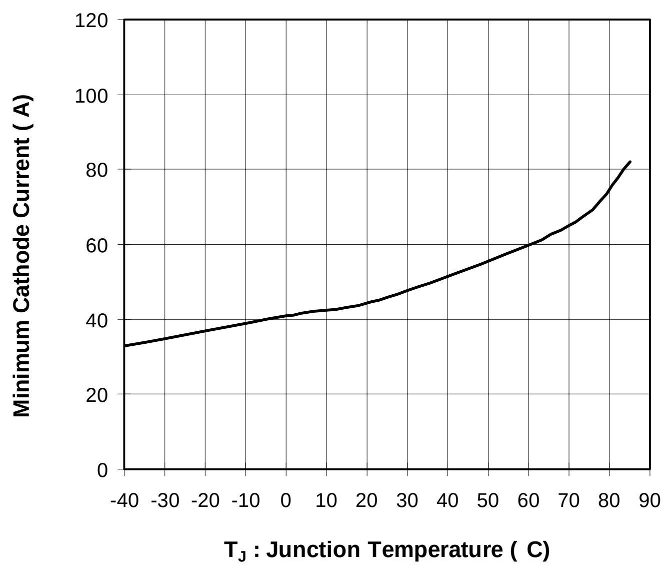


FIGURE 6 — Minimum Cathode Current for Regulation vs. Junction Temperature

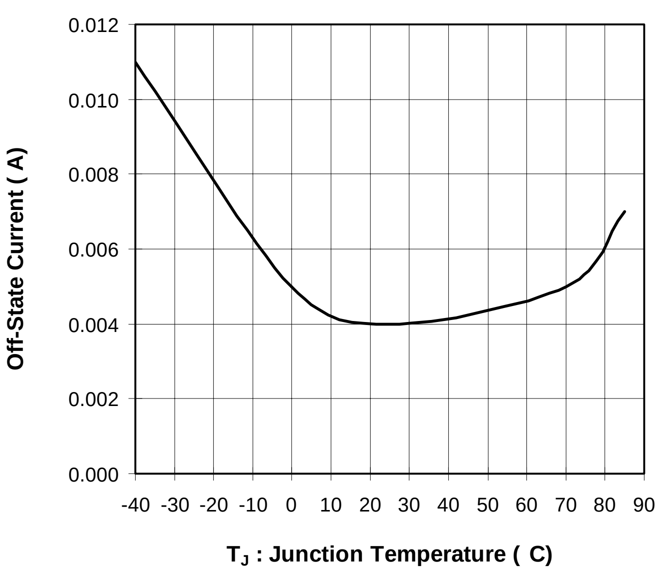


FIGURE 7 — Off-State Current vs. Junction Temperature

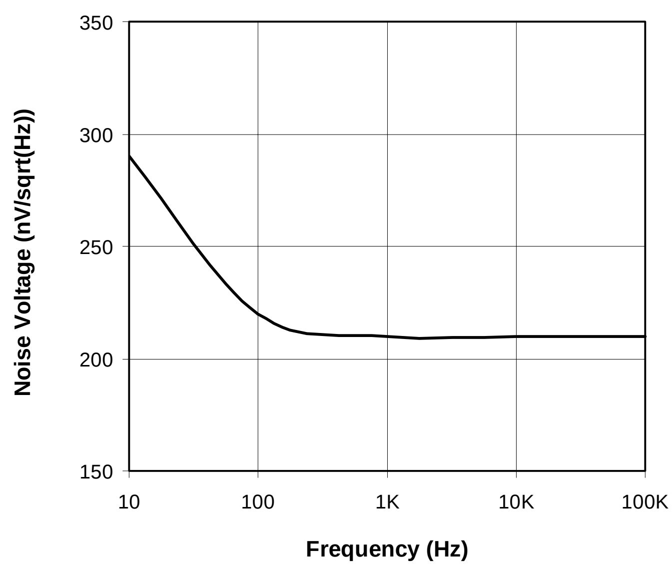


FIGURE 8 — Equivalent Input Noise Voltage vs. Frequency

PARAMETER MEASUREMENT INFORMATION

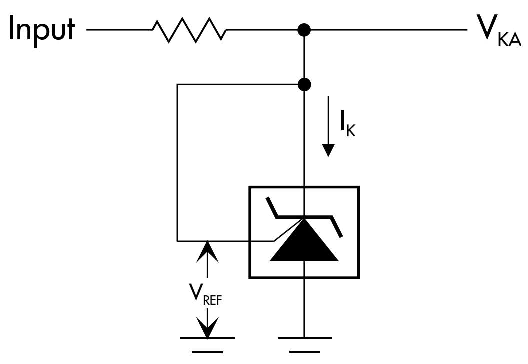


FIGURE 9 — Test Circuit For $V_{KA} = V_{REF}$

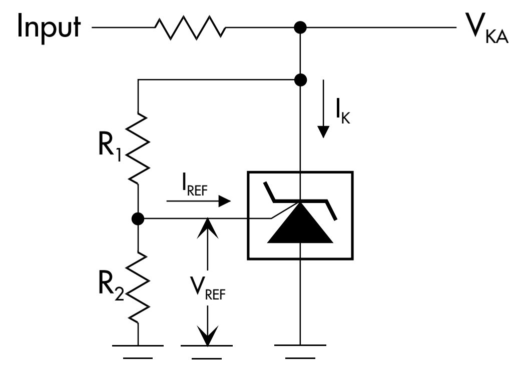


FIGURE 10 — Test Circuit For $V_{KA} > V_{REF}$

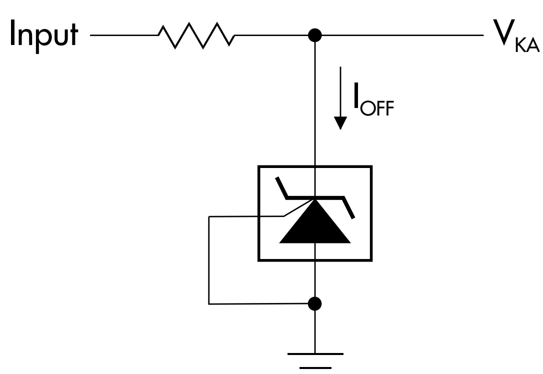


FIGURE 11 — Test Circuit For I_{OFF}

TYPICAL APPLICATION

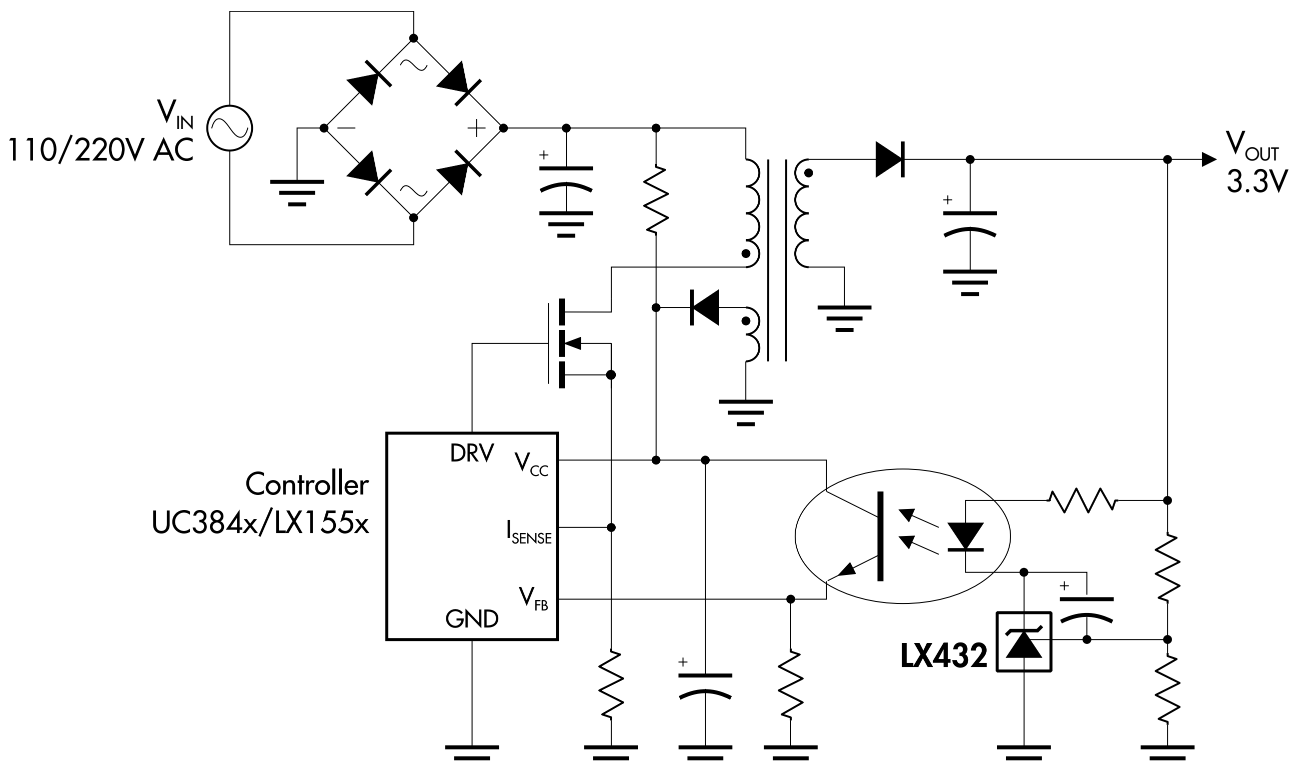


FIGURE 12 — LX432 In A Power Supply Isolated Feedback Application

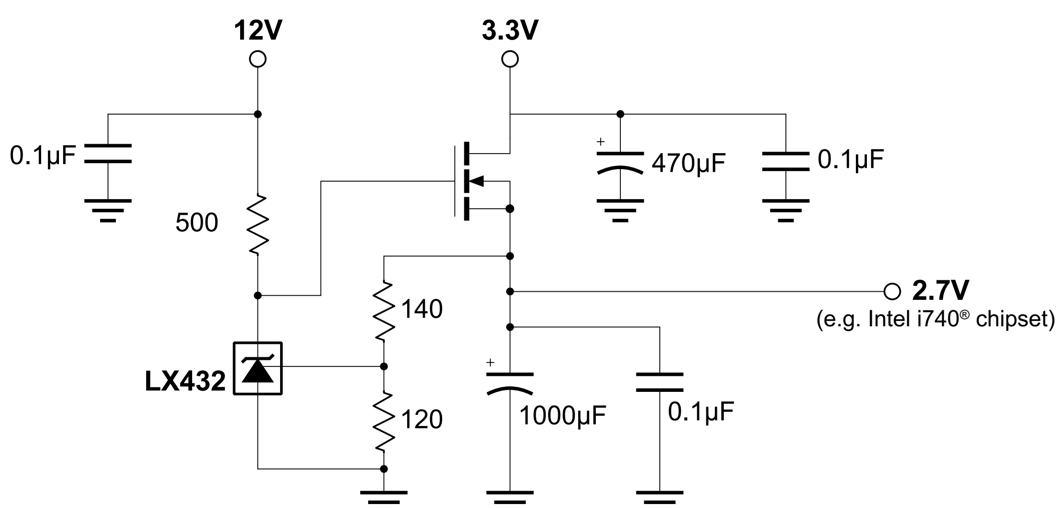


FIGURE 13 — LX432 In 3.3V To 2.7V Low Dropout Regulator Application