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National Semiconductor

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LM432
Dual Op Amp with On-Chip Fixed 2.5V Reference

General Description

The LM432 integrates two operational amplifiers and one 2.5V reference. The reference is based on the LMV431 adjustable shunt regulator with the output voltage adjusted to a fixed 2.5V. The Op Amps are similar to the LM358 with a common-mode input range that includes ground. Integrating the reference and Op Amps creates a solution for low cost charging applications.

Applications

- Low cost charging circuitry
- Power supplies and adapters

Features

Dual Op Amp Circuitry

(Typical for V_S= 5V)

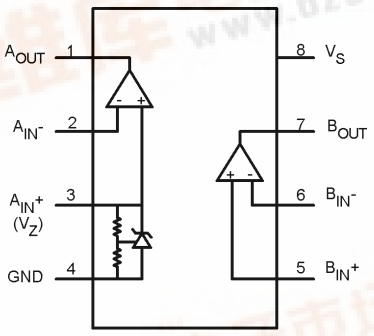
- Input offset voltage 0.6mV
- Input offset current 1nA
- Input bias current 3nA
- Common-mode input voltage range 0V to V_S−1V
- Power supply current 150µA

Reference Circuitry

- Reference voltage 2.5V
- Reference voltage deviation (−40˚C to 85˚C) 4mV
- Sink Current Capability 0.2mA to 10mA

Connection Diagram

8-Pin SOIC



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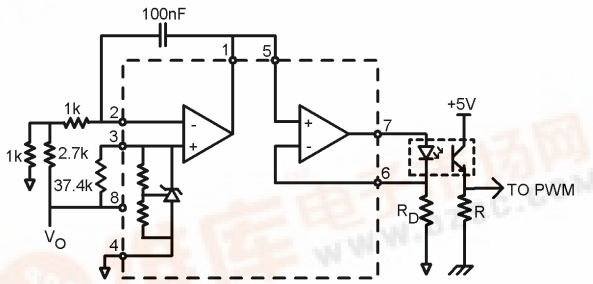
Top View

Application Circuit



DS101390-2

Optocoupler Driver Circuit for Power Supply Isolation

Ordering Information

Symbol	Part Number	Package Markiing	Transport Media	NSC Drawing
8-Pin SOIC	LM432MA	LM432MA	Rails	M08A
	LM432MAX	LM432MA	2.5k Unit Tape and Reel	

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Absolute Maximum Ratings (Notes 1, 3)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Suppy Voltage (V_S)	20V
Storage Temperature	−65˚C to 150˚C
Junction Temperature (T_J)	150˚C
ESD Human Body Model	2kV
Input Voltage Range	−0.3V to 20V

Operating Ratings (Note 2), (Note 3)

Temperature Range	−40˚C to 85˚C
Supply Voltage (Note 8)	2.5V to 16V
Thermal Resistance(θ_{JA})	162˚C/W

Electrical Characteristics

The following specifications apply for both amplifiers at V_S = 5V, V_{CM} = 2.5V, V_O = 2.5V, R_L = ∞, and T_J = 25˚C, unless otherwise noted.

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
OP Amp Circuitry						
V_{OS}	Input Offset Voltage	Amplifier B only	−4	0.6	4	mV
I_{OS}	Input Offset Current	Amplifier B only		1	50	nA
I_B	Input Bias Current	Amplifier B only		3	150	nA
V_{CM}	Common-Mode Input Voltage Range	Amplifier B only, CMRR > 50dB	0		V_S-1	V
I_S	Power Supply Current	Total for both amplifiers		150	500	µA
A_V	Voltage Gain	V_S = 16V, 1V < V_O < 11V, R_L = 10kΩ connected to V_S/2	65	100		dB
V_{OL}	Output Voltage Low			2	50	mV
V_{OH}	Output Voltage High		V_S – 1.5	V_S – 1.3		V
I_{SOURCE}	Output Current Source		20	30		mA
I_{SINK}	Output Current Sink		5	11		mA
Reference Circuitry For Op Amp A The following specifications apply for I_Z = 200µA and T_J = 25˚C, unless otherwise noted.						
V_Z	Reference Voltage at IN^+ Terminal		2.450	2.5	2.550	V
V_{ZDEV}	Reference Voltage Deviation at IN^+ Terminal Over Temperature (Note 6),(Note 9)	−40˚C ≤ T_J ≤ 85˚C		4	65	mV
$I_{Z\ (MIN)}$	Minimum Cathode Current for Regulation at IN^+ (V_Z) Terminal			150	200	µA
r_z	Dynamic Output Impedance (Note 7)	200µA < I_Z < 1mA, Freq = 0Hz		0.2		Ω

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.

Note 2: Operating Rating indicate conditions for which the device is functional. These rating do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 3: All voltages are measured with respect to GND = $0V_{DC}$, unless otherwise specified.

Note 4: Typicals represent the most likely parametic norm.

Note 5: Guaranteed to National's Average Outgoing Quality Level (AOQL).

Note 6: Reference voltage deviation, V_{ZDEV}, is defined as the maximum variation of the reference input voltage over the full temperature range.

Note 7: The Dynamic Output Impendance, r_z, is defined as $r_z = \Delta V_Z/\Delta I_Z$

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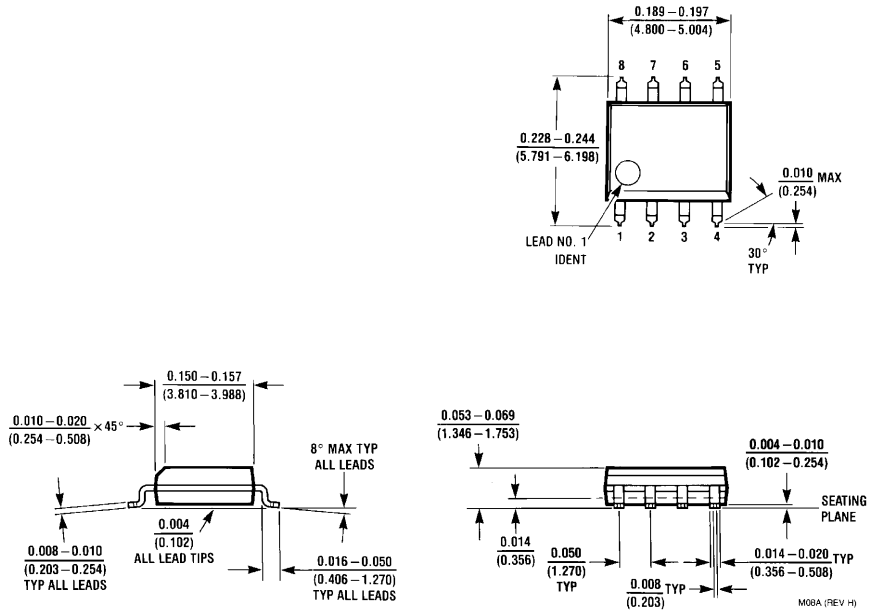
Note 8: Minimum value of operating voltage is for Amplifier B only.

Note 9: Typical Temperature drift $\Delta V/\Delta T$ = 12.8ppm/˚C

Physical Dimensions inches (millimeters) unless otherwise noted



8-Pin SOIC
NS Package Number M08A

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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