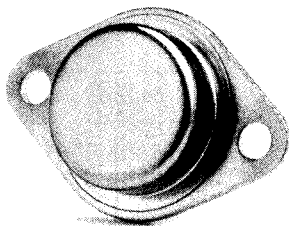


LAS 1400 SERIES

3 AMP POSITIVE VOLTAGE REGULATORS



FEATURES

- Guaranteed Power Dissipation 30 Watts @ 57.5°C case
- Guaranteed input-output differential: + 2.5 Volts
- Low noise, band gap reference
- Remote sense capability
- Sample power cycled burn-in
- Guaranteed thermal resistance junction to case: 2.25° C/W

DESCRIPTION

The LAS1400 Series voltage regulators are monolithic integrated circuits designed for use in applications requiring a well regulated positive output voltage. Outstanding features include full power usage up to 3.0 amperes of load current, internal current limiting, thermal shutdown, and safe area protection on the chip, providing protection of the series pass Darlington, under most operating conditions. Hermetically sealed steel TO-3 packages are utilized for high reliability and low thermal resistance. A low-noise temperature stable band-gap reference is the key design factor insuring excellent temperature regulation of the LAS1400 Series. This coupled to a very low output impedance insures superior load regulation.

The LAS14AU, a four terminal adjustable regulator is available with an output range from + 4 to + 30 Volts, providing remote sense capability with a single potentiometer.

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | MINIMUM | MAXIMUM | UNITS |
|---|---------------|---------|-----------------------------------|---------|
| Input Voltage | V_{IN} | | 30 (35) ⁽¹⁾⁽²⁾ | Volts |
| Power Dissipation | P_D | | Internally Limited ⁽³⁾ | |
| Thermal Resistance To Case | θ_{JC} | | 2.25 ⁽⁴⁾ | °C/Watt |
| Operating Junction Temperature Range | T_J | - 55 | 150 | °C |
| Storage Temperature Range | T_{STG} | - 65 | 150 | °C |
| Lead Temperature (Soldering, 60 Seconds Time Limit) | T_{LEAD} | | 300 | °C |

(1) Short circuit protection is only assured to V_{IN} max. Value of 30V applies to V_O of + 5V to + 12V. Value of 35V applies to V_O of 15V and LAS14AU.

(2) In case of short circuit, with input-output voltages approaching V_{IN} max, regulator may require the removal of the input voltage to restart.

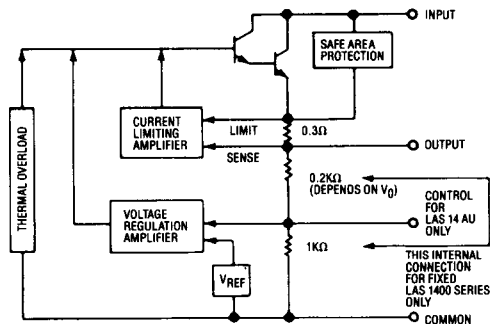
(3) For LAS 1400 operation above 57.5°C T_{CASE} derate @ 444mW/°C. For LAS14AU operation above 42.5°C T_{CASE} derate @ 364mW/°C.

(4) Thermal resistance of LAS14AU is 2.75°C/W.

DEVICE SELECTION GUIDE

| V_{OUT} | V_{OUT} TOLERANCE | | |
|-----------|--------------------------------------|------------|-----------|
| | ± 5% | + 5%, - 3% | ± 2% |
| 5 | LAS 1405 | LAS 1405B | LAS 14A05 |
| 12 | LAS 1412 | LAS 1412B | LAS 14A12 |
| 15 | LAS 1415 | LAS 1415B | LAS 14A15 |
| 4 to 35 | LAS 14AU (Adjustable / Remote Sense) | | |

BLOCK DIAGRAM



LAS 1400 SERIES

ELECTRICAL CHARACTERISTICS

Input voltage test conditions are as follows: $V_1 = V_0 + 3$ Volts, $V_2 = V_0 + 10$ Volts, $V_3 = V_0 + 15$ Volts, or the maximum input, whichever is less.

| Parameter | Symbol | Test Conditions | | | Test Limits | | Units |
|---|-----------------------|-----------------------------------|--------------|---------|--|---|-----------------|
| | | V_{IN} | I_o | T_j | Min | Max | |
| Output Voltage ² LAS 1400 ¹ LAS 1400B ¹ LAS 14A00 ¹ LAS 14AU ⁵ | V_0 | V_1 to V_2 | 10mA to 3.0A | 25°C | 0.95 V_0 0.97 V_0 0.98 V_0 4.0 | 1.05 V_0 1.05 V_0 1.02 V_0 30.0 | Volts |
| Input-Output Differential | $V_{IN}-V_0$ | | 3A | 0-125°C | 2.5 | | Volts |
| Line Regulation ² | REG _(LINE) | V_1 to V_3 | 2A | 25°C | | 1.0 | % V_0 |
| Load Regulation ² | REG _(LOAD) | $V_0 + 5V$ | 10mA to 3.0A | 25°C | | 0.6 | % V_0 |
| Quiescent Current | I_Q | V_1 | 10mA | 25°C | | 20.0 | mA |
| Quiescent Current Line | $I_{Q(LINE)}$ | V_1 to V_2 | 10mA | 25°C | | 5.0 | mA |
| Quiescent Current Load | $I_{Q(LOAD)}$ | V_1 | 10mA to 3.0A | 25°C | | 5.0 | mA |
| Current Limit ² | I_{LIM} | $V_0 + 5V$ | | 25°C | | 6.5 | Amps |
| Temperature Coefficient | T_C | V_1 | 0.1A | 0-125°C | | 0.02 | % $V_0/°C$ |
| Output Noise ³ Voltage | V_N | V_1 | 0.1A | 0-125°C | | 10 | $\mu V_{rms}/V$ |
| Ripple Attenuation ⁴ | R_A | $V_0 + 5V$ | 2.0A | 0-125°C | 60 | | dB |
| Control Voltage LAS 14AU | V_C | V_1 to V_2 | 10mA | 25°C | 3.6 | 4.0 | Volts |
| Power Dissipation | P_D | $V_{IN}-V_{OUT}$ 2.5V to 10.0V | 10mA to 3A | 0-125°C | | 30 | Watts |

(1) Nominal output voltages are specified under Device Selection Guide.

(2) Low duty cycle pulse testing with Kelvin connections required. Die temperature changes must be accounted for separately.

(3) BW = 10Hz - 100KHz

(4) Ripple attenuation is specified for a 1Vrms, 120Hz, input ripple.

Ripple attenuation is minimum of 60dB at 5V output and is 1 dB less for each volt increase in the output voltage.

(5) $V_0 = V_C (1 + R1 / R2)$

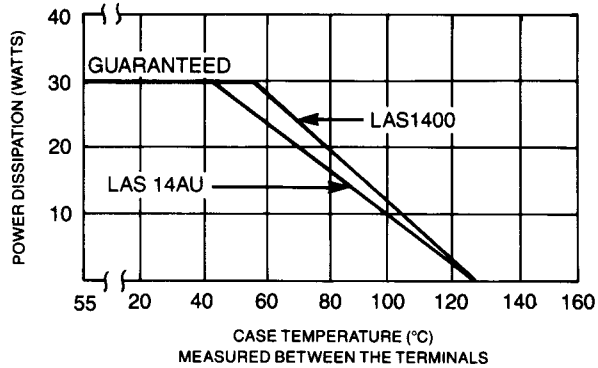
R1 = Resistance from output to control

R2 = Resistance from control to common

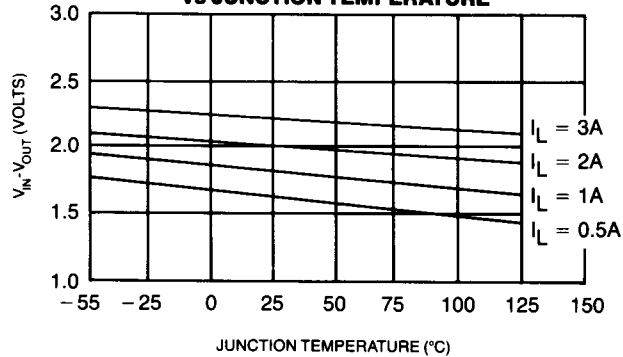
LAS 1400 SERIES

OPERATIONAL DATA

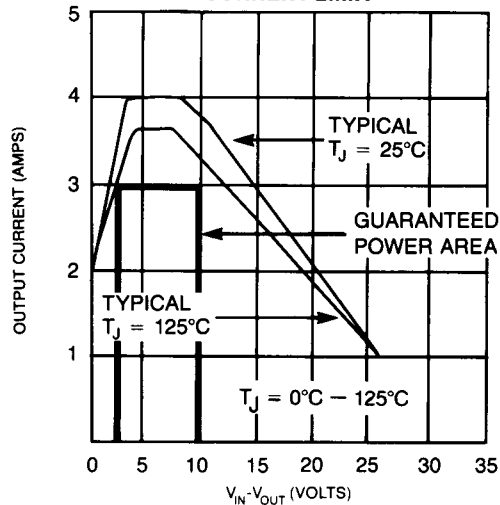
POWER DERATING



TYPICAL INPUT-OUTPUT VOLTAGE DIFFERENTIAL vs JUNCTION TEMPERATURE



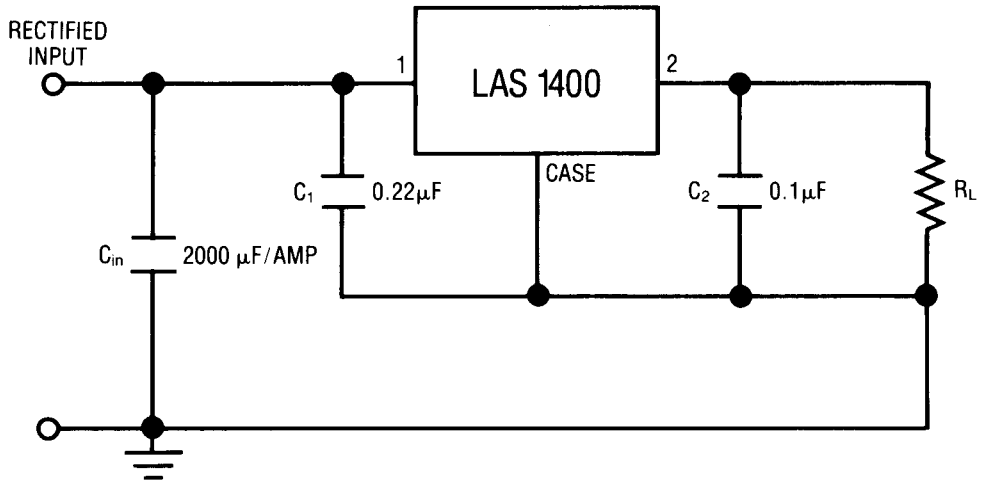
CURRENT LIMIT



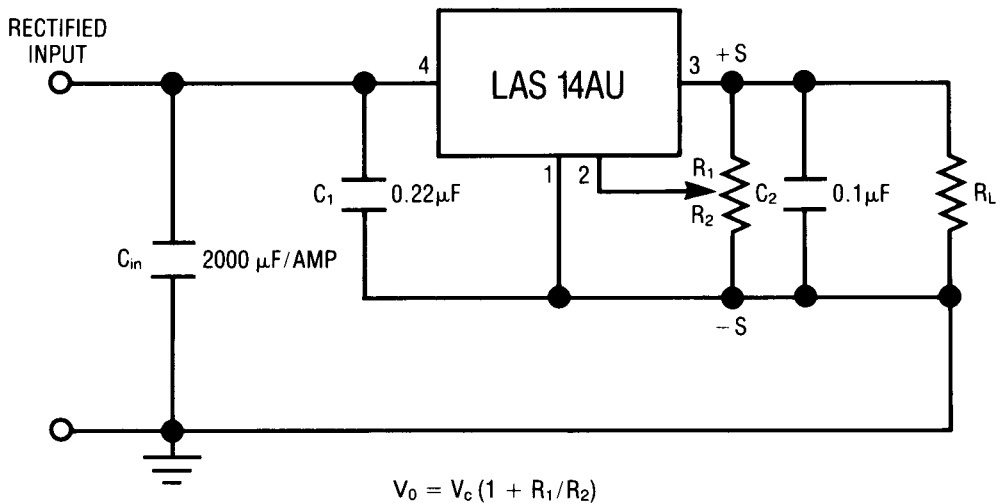
LAS 1400 SERIES

TYPICAL APPLICATIONS

FIXED VOLTAGE REGULATOR¹



ADJUSTABLE VOLTAGE REGULATOR^{1,2}



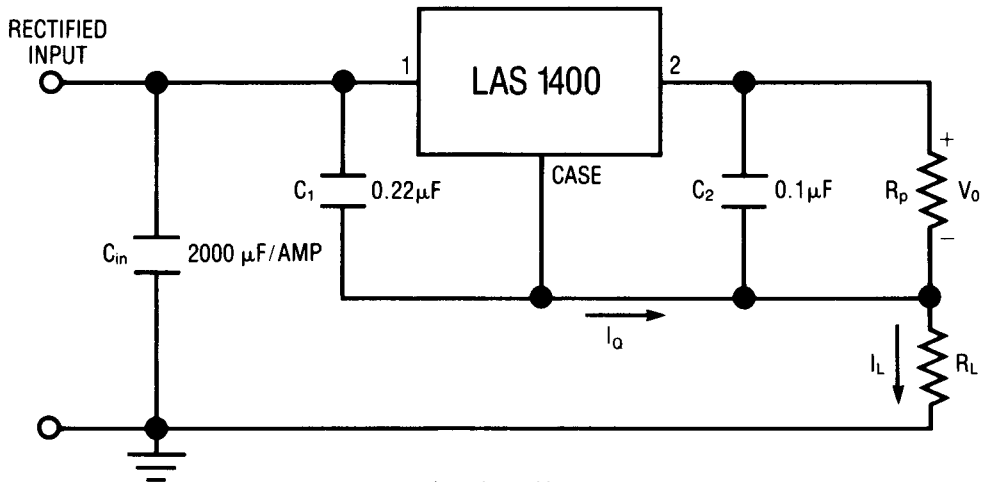
¹ C_1 and C_2 should be placed as close as possible to the regulator.

² $\frac{V_0}{R_1 + R_2} \geq 10 \text{ mA}$

LAS 1400 SERIES

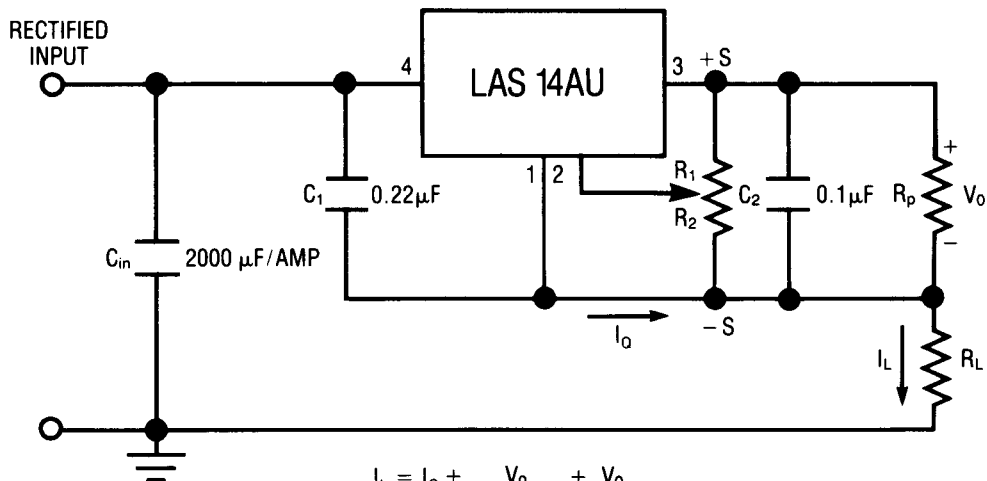
TYPICAL APPLICATIONS

FIXED CURRENT REGULATOR¹



$$I_L = I_0 + \frac{V_0}{R_p}$$

ADJUSTABLE CURRENT REGULATOR^{1,2}



$$I_L = I_0 + \frac{V_0}{R_1 + R_2} + \frac{V_0}{R_p}$$

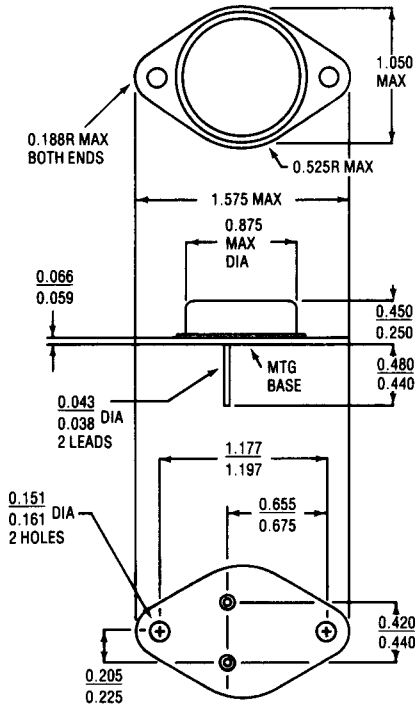
$$V_0 = V_c (1 + R_1/R_2)$$

¹ C₁ and C₂ should be placed as close as possible to the regulator.

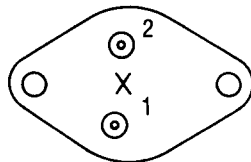
² $\frac{V_0}{R_1 + R_2} \geq 10 \text{ mA}$

LAS 1400 SERIES

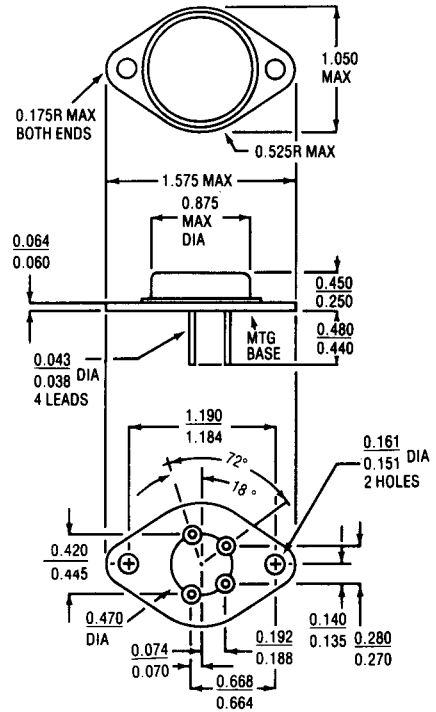
DEVICE OUTLINE



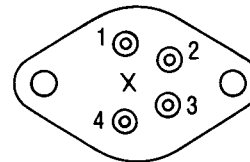
Bottom View



1 - Input
2 - Output
Case is common



Bottom View



1 - Common
2 - Control
3 - Output
4 - Input
Case is common

NOTE: Case temperature measured at point X.
All dimensions are in inches.