



# 5 AMP POSITIVE VOLTAGE REGULATORS

# LAS 1900 SERIES

T-58-11-13

## FEATURES

- Guaranteed Power Dissipation 50 Watts (@ 80°C Case)
- Guaranteed input-output differential: + 2.6 Volts
- Low noise, band gap reference
- Remote sense capability
- Sample power cycled burn-in
- Guaranteed thermal resistance junction to case: 0.9°C/W
- Available in TO-3 and TO-247 packages
- Grounded case

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MINIMUM	MAXIMUM	UNITS
Input Voltage	$V_{IN}$		30(35) <sup>(1)(2)</sup>	Volts
Power Dissipation	$P_D$		Internally Limited <sup>(3)</sup>	
Thermal Resistance: Junction To Case	$\theta_{JC}$		0.9	°C/Watt
Operating Junction Temperature Range	$T_J$			°C
LAS 1900		-55	150	
LAS 19U		0	125	
LAS1900P				
Storage Temperature Range	$T_{STG}$	-65	150	°C
Lead Temperature (Soldering, 60 Seconds Time Limit)	$T_{LEAD}$		300	°C

<sup>(1)</sup> 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 LAS 19U.

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

<sup>(3)</sup> For operation above 80°C  $T_{CASE}$ , derate @ 1.111 watt °C.

## DEVICE SELECTION GUIDE

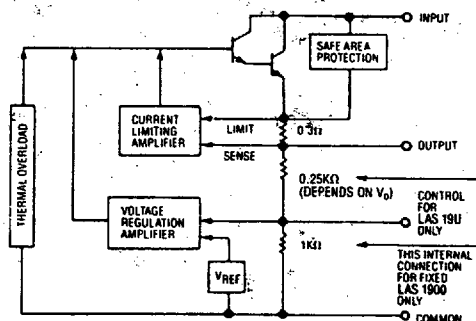
$V_{OUT}$	$V_{OUT}$ TOLERANCE		
	± 5%	+ 5%, - 3%	± 2%
5	LAS 1905	LAS 1905B	LAS 19A05
	LAS 1905P	LAS 1905BP	LAS 19A05P
12	LAS 1912	LAS 1912B	LAS 19A12
	LAS 1912P	LAS 1912BP	LAS 19A12P
4 to 30	LAS 19U (Adjustable/Remote Sense)		

## DESCRIPTION

The LAS 1900 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 5.0 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 copper and copper/steel TO-3 packages are utilized for high reliability and low thermal resistance, while the TO-247 package is intended for cost effective designs. A low-noise, temperature stable band gap reference is the key design factor insuring excellent temperature regulation of the LAS 1900 Series. This, coupled to a very low output impedance, insures superior load regulation.

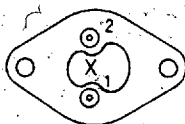
The LAS 19U, a four terminal, adjustable regulator is available with an output range from +4 to +30 Volts, providing remote sense capability with a single potentiometer.

## BLOCK DIAGRAM

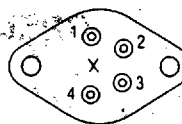


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Bottom View



Bottom View



1 - Input  
2 - Output  
Case is common

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

1 - Input  
2 - Common  
3 - Output  
Tab is Common

NOTE: Case temperature measured at point X.

## 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 <sup>2</sup> LAS 1900 <sup>1</sup> LAS 1900B <sup>1</sup> LAS 19A00 <sup>1</sup> LAS 19U <sup>5</sup>	$V_O$	$V_1$ to $V_2$	10mA to 5.0A	25°C	0.95  $V_O$   0.97  $V_O$   0.98  $V_O$   4.0	1.05  $V_O$   1.05  $V_O$   1.02  $V_O$   30.0	Volts
Input-Output Differential	$V_{IN}-V_O$		5.0A	0-125°C	2.6		Volts
Line Regulation <sup>2</sup>	REG (LINE)	$V_1$ to $V_3$	3.0A	25°C		1.0	% $V_O$
Load Regulation <sup>2</sup>	REG (LOAD)	$V_1$	10mA to 5.0A	25°C		0.6	% $V_O$
Quiescent Current	$I_O$	$V_1$	10mA	25°C		25.0	mA
Quiescent Current Line	$I_O$ (LINE)	$V_1$ to $V_2$	10mA	25°C		5.0	mA
Quiescent Current Load	$I_O$ (LOAD)	$V_1$	10mA to 5.0A	25°C		5.0	mA
Current Limit <sup>2</sup>	$I_{LIM}$	$V_0 + 5V$		25°C		15	Amps
Temperature Coefficient	$T_C$	$V_1$	0.1A	0-125°C		0.03	% $V_O$ /°C
Output Noise <sup>3</sup> Voltage	$V_N$	$V_1$	0.1A	0-125°C		10	$\mu V_{rms}/V$
Ripple Attenuation <sup>4</sup>	$R_A$	$V_0 + 5V$	2.0A	0-125°C	60		dB
Control Voltage LAS 19U	$V_C$	$V_1$ to $V_2$	10mA	25°C	3.6	4.0	Volts
Power Dissipation	$P_D$	$V_{IN}-V_{OUT}$ 2.6V to 10.0V	10mA to 5.0A	0-125°C		50	Watts

<sup>1</sup> Nominal output voltages are specified under Device Selection Guide.

<sup>2</sup> Low duty cycle pulse testing with Kelvin connections required. Die temperature changes must be accounted for separately.

<sup>3</sup> BW = 10Hz - 100KHz

<sup>4</sup> Ripple attenuation is specified for a 1Vrms, 120Hz, input ripple.

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

<sup>6</sup>  $V_0 = V_C (1 + R1/R2)$

R1 = Resistance from output to control

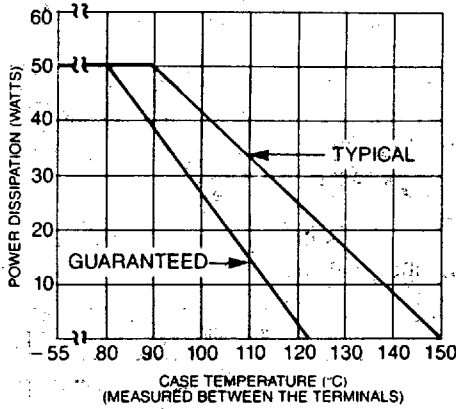
R2 = Resistance from control to common

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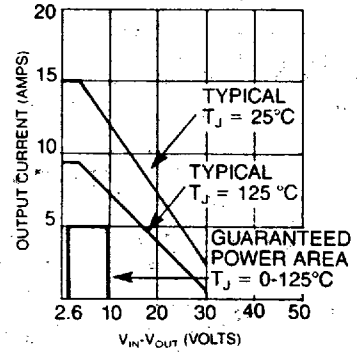
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### OPERATIONAL DATA

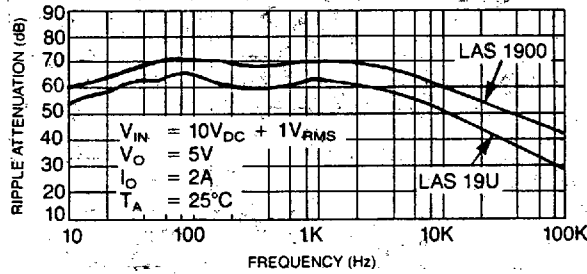
**POWER DERATING**



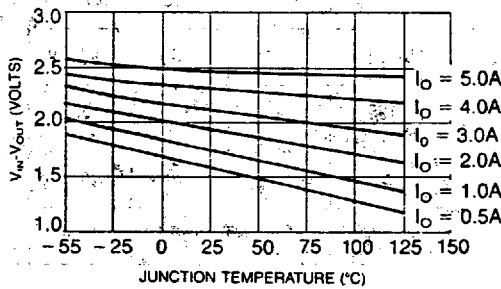
**CURRENT LIMIT**



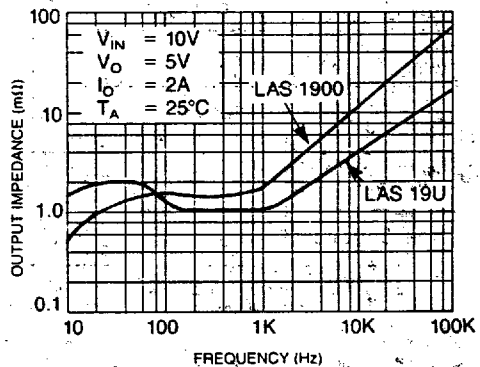
**TYPICAL RIPPLE ATTENUATION VS FREQUENCY**



**TYPICAL INPUT-OUTPUT VOLTAGE DIFFERENTIAL VS JUNCTION TEMPERATURE**



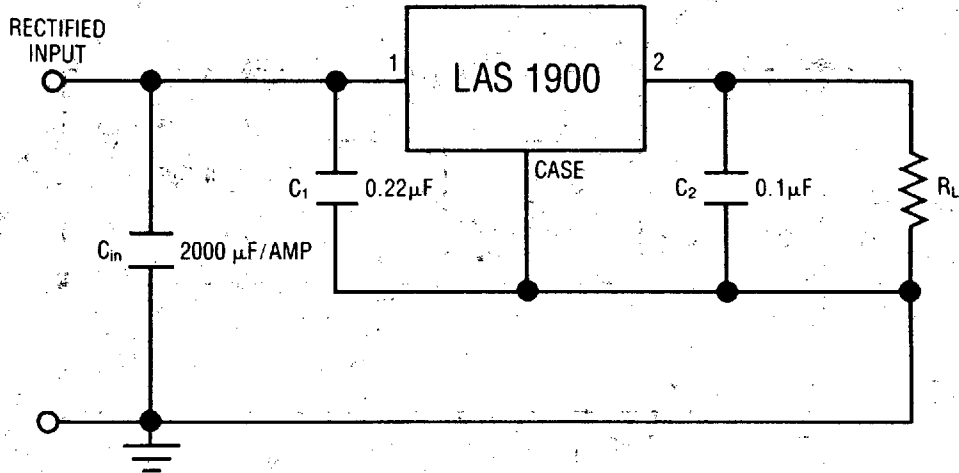
**TYPICAL OUTPUT IMPEDANCE VS FREQUENCY**



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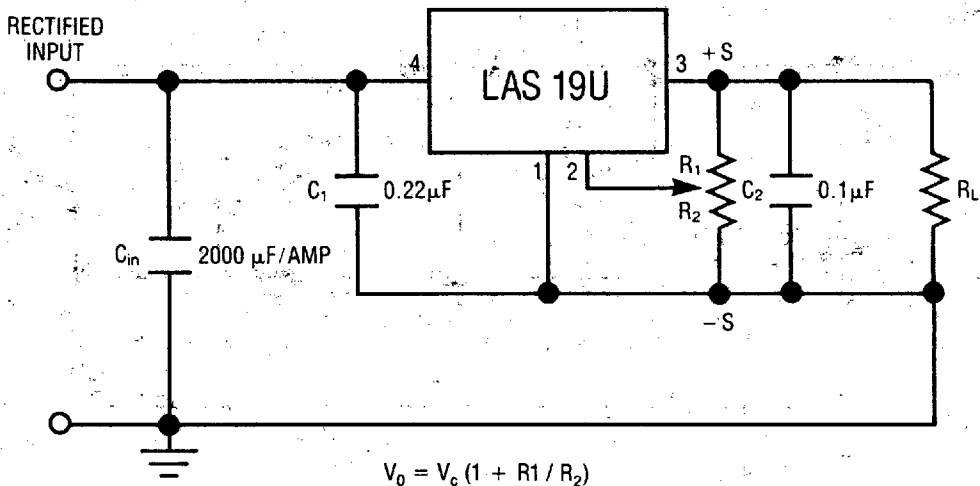
## TYPICAL APPLICATIONS

### FIXED VOLTAGE REGULATOR



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### ADJUSTABLE VOLTAGE REGULATOR<sup>1,2</sup>



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

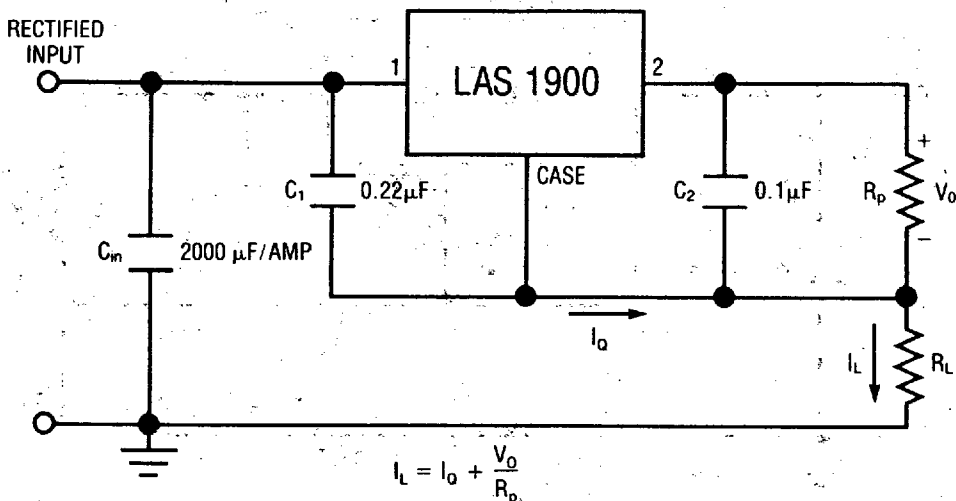
<sup>1</sup> C<sub>1</sub> and C<sub>2</sub> should be placed as close as possible to the regulator.

<sup>2</sup>  $\frac{V_0}{R_1 + R_2} \approx 10 \text{ mA}$

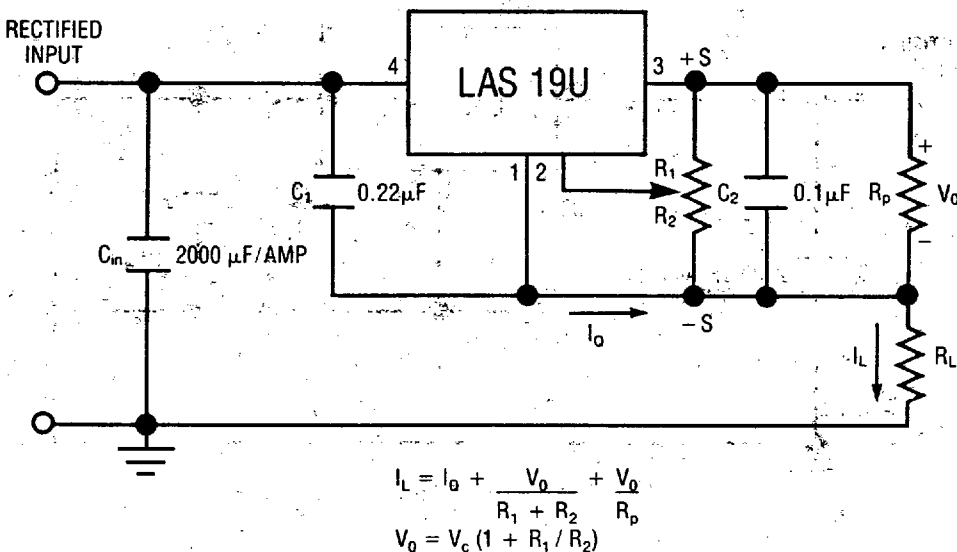
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## TYPICAL APPLICATIONS

### FIXED CURRENT REGULATOR<sup>1</sup>



### ADJUSTABLE CURRENT REGULATOR<sup>1,2</sup>



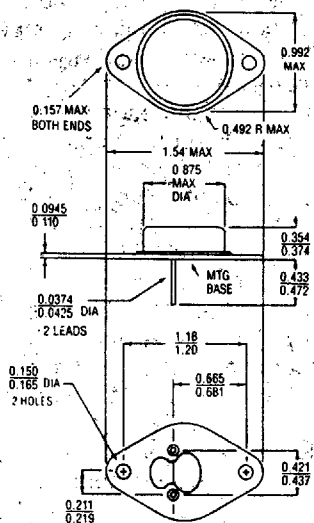
<sup>1</sup> C<sub>1</sub> and C<sub>2</sub> should be placed as close as possible to the regulator.

<sup>2</sup>  $\frac{V_o}{R_1 + R_2} \geq 10 \text{ mA}$

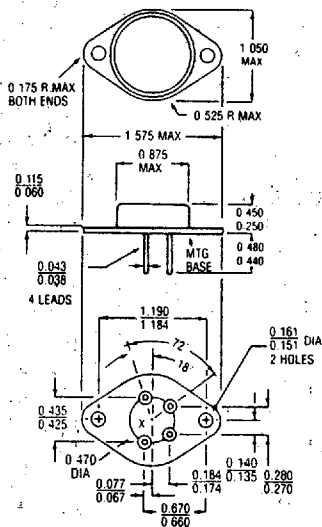
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# DEVICE OUTLINE

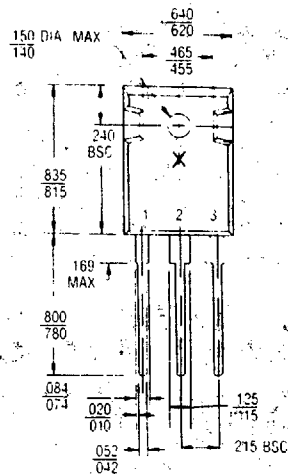
**TO-3 (COPPER/STEEL)**



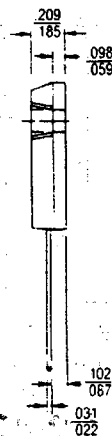
**TO-3**



**TO-247**



All dimensions are in inches.



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