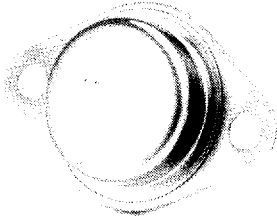


# 1.5 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATORS

LLM 117,  
LLM 317



## FEATURES

- Adjustable output down to 1.2V
- Line regulation typically 0.01%/V
- Load regulation typically 0.1%
- Current limit constant with temperature
- Standard 3-terminal, TO-3 package
- MIL-Temperature performance

## DESCRIPTION

The LLM 117 and LLM 317 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 1.5 amperes of load current, internal current limiting, thermal shut-down, and safe area protection on the die, 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.

The LLM 117 and LLM 317, three terminal adjustable regulators, are available with an output range from +1.2 to +37 Volts. The output voltage is easily set by two external resistors. Since the regulator is "floating", higher output voltages can be obtained as long as the maximum input-output voltage differential is not exceeded.

## ABSOLUTE MAXIMUM RATINGS

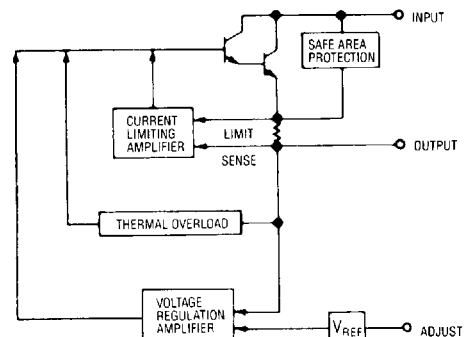
PARAMETER	SYMBOL	MINIMUM	MAXIMUM	UNITS
Input-Output Voltage Differential	$V_{IN} - V_{OUT}$		40	Volts
Power Dissipation	$P_D$		Internally Limited <sup>(1)</sup>	
Thermal Resistance Junction to Case	$\theta_{JC}$		3.0	°C/Watt
Operating Junction Temperature Range	$T_J$			°C
		-55	150	
		0	125	
Storage Temperature Range	$T_{STG}$	-65	150	°C
Lead Temperature (Soldering, 60 Seconds Time Limit)	$T_{LEAD}$		300	°C

(1) For LLM 117 operation above 90°C  $T_{case}$ , derate @ 333mW/°C.  
For LLM 317 operation above 65°C  $T_{case}$ , derate @ 333mW/°C.

## DEVICE SELECTION GUIDE

DEVICE	OPERATING JUNCTION TEMPERATURE RANGE
LLM 117	-55 TO 150°C
LLM 317	0 TO 125°C

## BLOCK DIAGRAM



LLM 117,  
LLM 317**1.5 AMP POSITIVE ADJUSTABLE  
VOLTAGE REGULATORS****ELECTRICAL CHARACTERISTICS\***

Parameter	Test Conditions <sup>1</sup>			Test Limits			Units	
	$V_{IN}-V_{OUT}$	$I_O$	$T_J$	Min	Typ	Max		
Line Regulation <sup>2</sup>	3V to 40V	0.5A	25°C		0.01	0.04	%/V	
LLM 317			25°C		0.01	0.02	%/V	
LLM 117					0.02	0.07	%/V	
LLM 317					0.02	0.05	%/V	
Load Regulation <sup>2</sup>	10mA to 1.5A		25°C		5	25	mV	
LLM 317			$V_O \leq 5V$	25°C		5	15	mV
LLM 117			$V_O \geq 5V$			0.1	0.5	%
LLM 317			$V_O \leq 5V$			0.1	0.3	%
LLM 117			$V_O \geq 5V$			20	70	mV
LLM 317			$V_O \leq 5V$			20	50	mV
LLM 117			$V_O \geq 5V$			0.3	1.5	%
LLM 317			$V_O \leq 5V$			0.3	1.0	%
Thermal Regulation <sup>3</sup>	5V	0.5A	25°C		0.04	0.07	%/W	
LLM 317			25°C		0.03	0.07	%/W	
LLM 117								
Adjust Pin Current	5V	0.5A			50	100	$\mu A$	
Adjust Pin Current Change	3.0V to 40V	10mA to 1.5A			0.2	5	$\mu A$	
LLM 317								
LLM 117								
Reference Voltage	3V to 40V	10mA to 1.5A		1.20	1.25	1.30	V	
Temperature Stability	5V	0.5A			1		%	
Minimum Load Current	40V				3.5	10.0	mA	
LLM 317					3.5	5.0	mA	
LLM 117								
Current Limit	$\leq 15V$ 40V		25°C	1.5	2.2		A	
LLM 317/LLM 117				0.15	0.4		A	
LLM 317				0.3	0.4		A	
LLM 117								
RMS Output Noise <sup>4</sup>	5V	0.5A	25°C		0.003		% $V_O$	
Ripple Rejection Ratio <sup>5</sup>	$C_{ADJ} = 10\mu F$	$V_O = 10V$		66	65	80	dB	

(<sup>1</sup>) Although power dissipation is internally limited, these specifications are applicable for power dissipations of 20 Watts.

(<sup>2</sup>) Low duty cycle pulse testing with Kelvin connections required. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.

(<sup>3</sup>) 20mS pulse

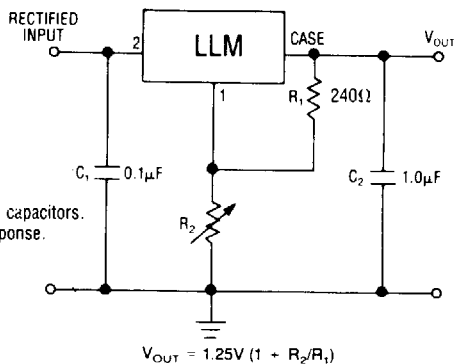
(<sup>4</sup>) BW = 10Hz to 10kHz

(<sup>5</sup>) 120Hz input ripple

(<sup>6</sup>) Unless otherwise specified, the following  $T_J$  conditions apply:

LLM 117 - -55 TO 150°C

LLM 317 - 0 TO 125°C

**TYPICAL APPLICATION  
ADJUSTABLE VOLTAGE REGULATOR<sup>1,2</sup>**

<sup>1</sup> $C_1$  needed if device is far from filter capacitors.

<sup>2</sup> $C_2$  optional - improves transient response.

$$V_{OUT} = 1.25V (1 + R_2/R_1)$$

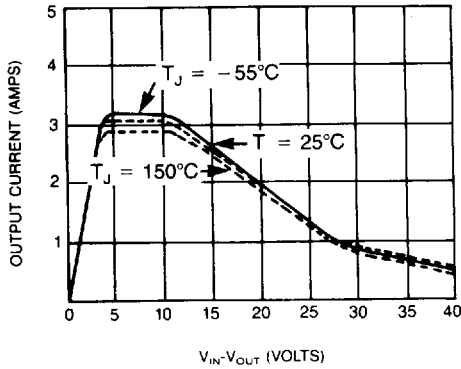
# 1.5 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATORS

LLM 117,  
LLM 317

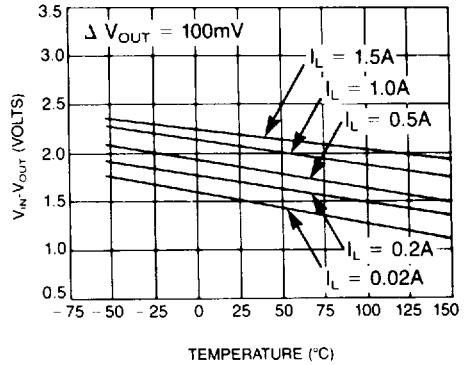
## OPERATIONAL DATA

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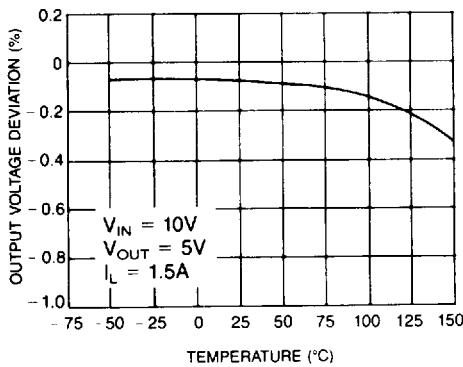
**CURRENT LIMIT**



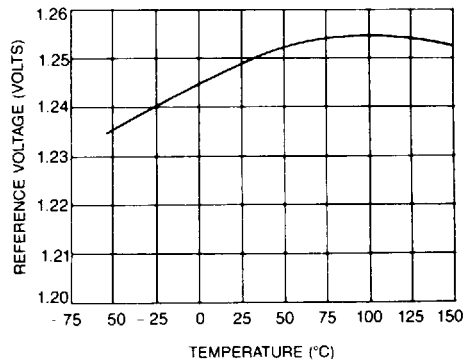
**DROPOUT VOLTAGE**



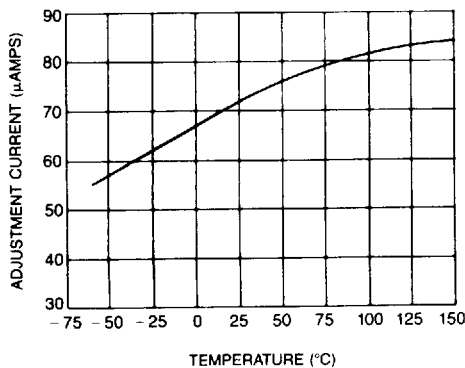
**LOAD REGULATION**



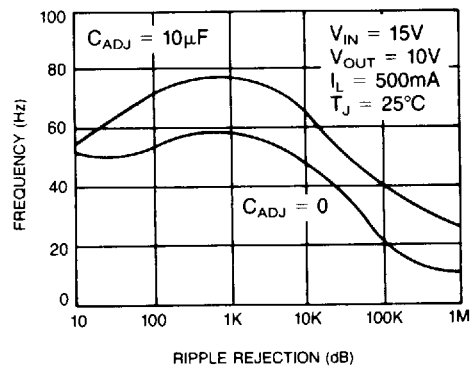
**TEMPERATURE STABILITY**

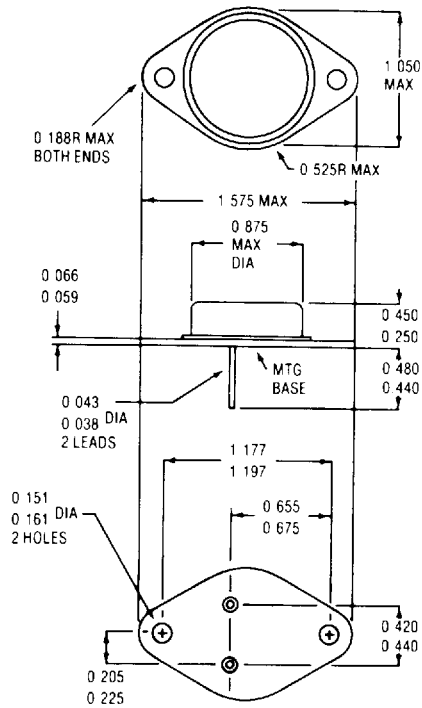
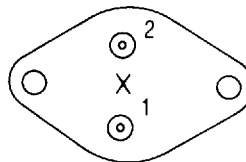


**ADJUSTMENT CURRENT**



**RIPPLE REJECTION**



LLM 117,  
LLM 317**1.5 AMP POSITIVE ADJUSTABLE  
VOLTAGE REGULATORS****DEVICE OUTLINE****Bottom View**

1 - Adjust  
2 - Input  
Case is Output

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