



Linear Voltage Regulator – LM117

Positive Adjustable 1.5A output Voltage Regulator in bare die form

Rev 1.0
03/03/18

Description

The LM117 is a high voltage adjustable 3-terminal voltage regulator with guaranteed 1.5A output current and equipped with internal limiting + thermal shutdown features for overload immunity. Output voltage is set by two external resistors. Additional to standard regulator function, the device can be used as a simple adjustable switching regulator; a programmable output regulator; or by connecting a fixed resistor between adjustment pin and output, can be used as a precision current regulator. A shutdown mechanism can be introduced by clamping the adjust terminal to ground which programs output to 1.2V where most loads draw little current.

Features:

- Full Military Temperature Range
- Output current in excess of 1.5A
- Adjustable output between 1.2V - 37V
- Internal short circuit current limit
- Internal thermal overload protection
- Output transistor Safe-Area Compensation
- Floating operation for high voltage applications
- 0.01% Line, 0.3% Load regulation maximum
- Negative Voltage complement is [LM137](#)

Ordering Information

The following part suffixes apply:

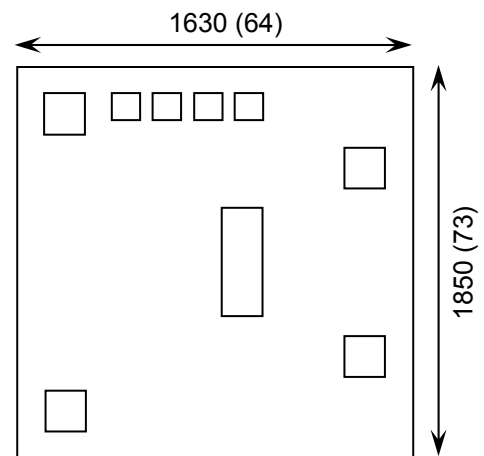
- No suffix - MIL-STD-883 /2010B Visual Inspection
- "H" - MIL-STD-883 /2010B Visual Inspection + MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-883 /2010A Visual Inspection (Space) + MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

www.siliconsupplies.com/quality/bare-die-lot-qualification

Die Dimensions in μm (mils)



Supply Formats:

- Default – Die in Waffle Pack (100 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Tape & Reel – On request
- In Metal or Ceramic package – On request

Mechanical Specification

Die Size (Unsawn)	1630 x 1850 64 x 73	μm mils
Minimum Bond Pad Size	140 x 140 5.51 x 5.51	μm mils
Die Thickness	350 (± 20) 13.78 (± 0.79)	μm mils
Top Metal Composition	Al 1%Si 2.2 μm	
Back Metal Composition	Ti/Ni/Ag 1.2 μm	

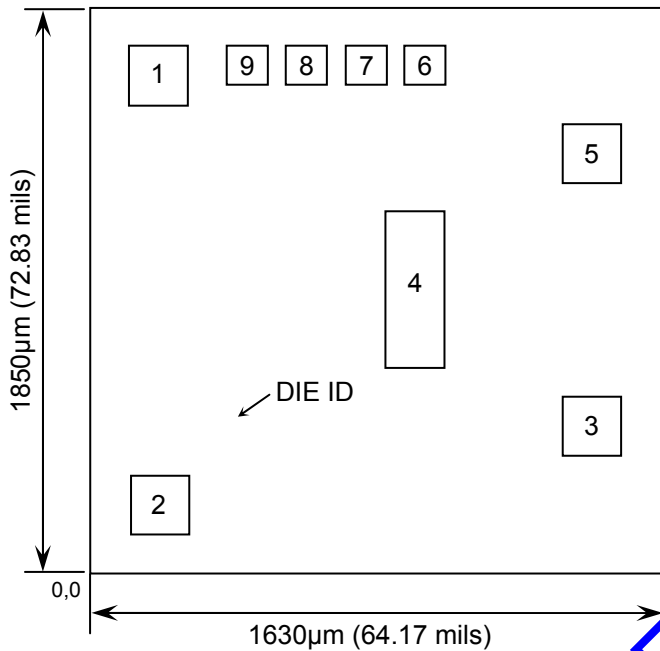




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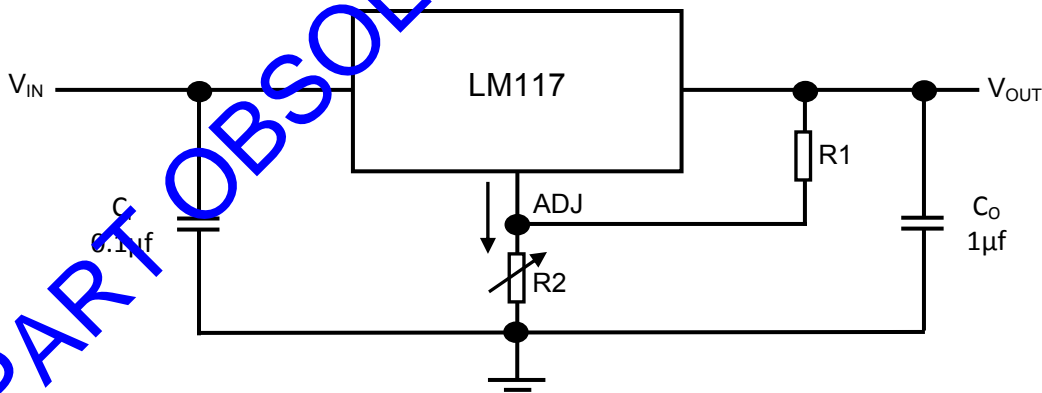
Pad Layout and Functions



PAD	FUNCTION	COORDINATES (mm)	
		X	Y
1	V _{OUT}	0.073	1.637
2	ADJ	0.073	0.073
3	V _{OUT}	1.400	0.331
4	V _{IN} (X2 wires)	0.773	0.714
5	V _{OUT}	1.400	1.402
6	NC	0.641	1.715
7	NC	0.512	1.715
8	NC	0.383	1.715
9	NC	0.254	1.715

NC = NO CONNECT
CONNECT CHIP BACK TO V_{OUT}

Typical Application



1.2V–25V Adjustable Regulator

$$V_{OUT} = 1.25V \left(1 + \frac{R_2}{R_1}\right) + I_{ADJ} * R_2$$

I_{ADJ} tolerance <100µA

C₁ is required if the regulator is located an appreciable distance from power supply filter. C₀ is not required for stability; however it does improve transient response. For optimum stability and transient response locate C₁ C₀ as close as possible to the regulator.





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Absolute Maximum Ratings¹

PARAMETER	SYMBOL	VALUE	UNIT
Input–Output Voltage differential	$V_{IN} - V_{OUT}$	40	V
Power Dissipation	P_D	Internally Limited	
Operating Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNIT
Output Voltage	V_{OUT}	1.25	37	V
Input–Output Voltage differential	$V_{IN} - V_{OUT}$	4	40	V
Output Current	I_{OUT}	0.01	1.5	A
Operating Junction Temperature Range	T_J	-55 to 125		°C

DC Electrical Characteristics, $V_{IN} - V_{OUT} = 5V$, $I_{OUT} = 0.5A$, $I_{MAX} = 1.5A$, $T_J = -55^\circ C$ to $+125^\circ C$ (unless noted otherwise)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Reference Voltage	V_{REF}	$3V \leq V_{IN} - V_{OUT} \leq 40V$, $10mA \leq I_{OUT} \leq I_{MAX}$	1.20	1.25	1.30	V
Line Regulation ²	ΔV_{OUT}	$3V \leq V_{IN} - V_{OUT} \leq 40V$, $T_J = 25^\circ C$	-	0.01	0.02	% / V_{OUT}
		$3V \leq V_{IN} - V_{OUT} \leq 40V$	-	0.02	0.05	
Load Regulation ²	ΔV_{OUT}	$V_{IN} \leq 5V$, $10mA \leq I_{OUT} \leq I_{MAX}$, $T_J = 25^\circ C$	-	5	25	mV
		$V_{IN} \geq 3V$, $10mA \leq I_{OUT} \leq I_{MAX}$, $T_J = 25^\circ C$	-	0.1	0.3	% / V_{OUT}
		$V_{IN} \leq 5V$, $10mA \leq I_{OUT} \leq I_{MAX}$	-	20	70	mV
		$V_{IN} \geq 5V$, $10mA \leq I_{OUT} \leq I_{MAX}$	-	0.3	1	% / V_{OUT}
Thermal Regulation		20ms pulse, $T_J = 25^\circ C$	-	0.03	0.07	% / W
Adjustment Pin Current	I_{ADJ}		-	50	100	μA
Adjustment Pin Current Change	ΔI_{ADJ}	$2.5V \leq V_{IN} - V_{OUT} \leq 40V$, $10mA \leq I_L \leq I_{MAX}$, $P_D \leq P_{MAX}$	-	0.2	5	μA
Temperature Stability	-	$T_{LOW} \leq T_J \leq T_{HIGH}$	-	1	-	%
Minimum Load Current	I_L	$ V_{IN} - V_{OUT} = 40V$	-	3.5	5	mA
Output Current Limit ³	I_{MAX}	$ V_{IN} - V_{OUT} \leq 15V$, $P \leq 20W$	1.5	2.2	-	A
		$ V_{IN} - V_{OUT} = 40V$, $P \leq 20W$, $T_J = 25^\circ C$	0.3	0.40	-	

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability.

2. Regulation is measured at a constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specifications for thermal regulation.





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PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
RMS Output Noise, % of V_{OUT}	eN	$10\text{ Hz} \leq f \leq 10\text{ kHz}$, $T_J = 25^{\circ}C$	-	0.003	-	%
Ripple Rejection Ratio	RR	$V_{OUT} = 10V$, $f = 120\text{ Hz}$, $C_{ADJ} = 0\mu F$	-	65	-	dB
		$V_{OUT} = 10V$, $f = 120\text{ Hz}$, $C_{ADJ} = 10\mu F$	66	80	-	
Long Term Stability	-	$T_A = 125^{\circ}C$, 1000 hrs	-	0.3	1	%
Thermal Resistance ³	$R\theta_{JC}$	$T_{LOW} \leq T_J \leq T_{HIGH}$	-	2	-	$^{\circ}C/W$

3. Assembled in TO-3 package. Die performance is dependent on die attach, substrate choice & assembly method.

Typical Electrical Characteristics, $T_J = 25^{\circ}C$ (unless noted otherwise)

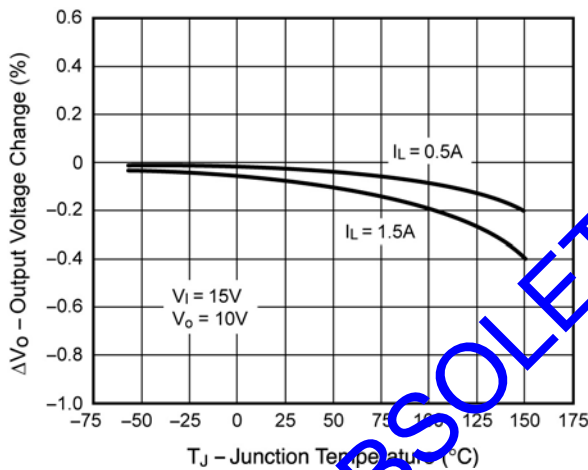


Figure 1 – Load Regulation

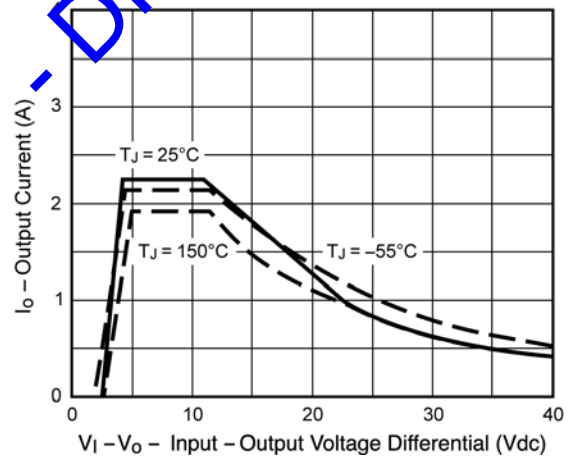


Figure 2 – Current Limit

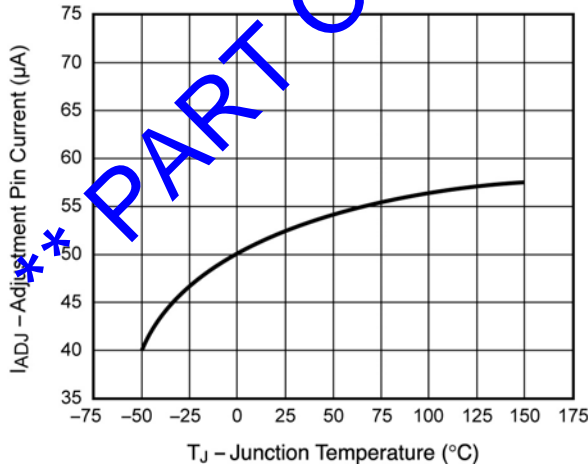


Figure 3 – Adjustment Pin Current

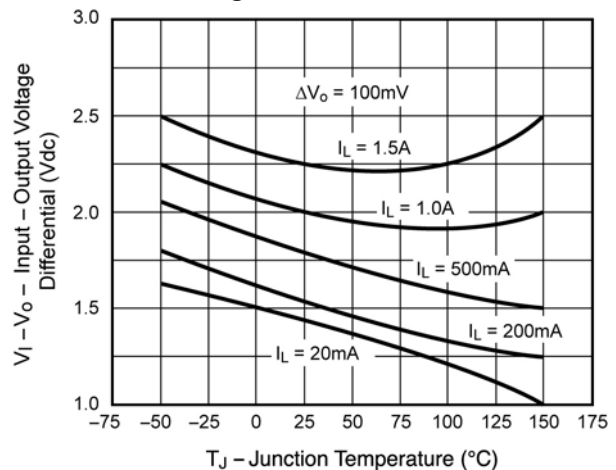


Figure 4 – Dropout Voltage





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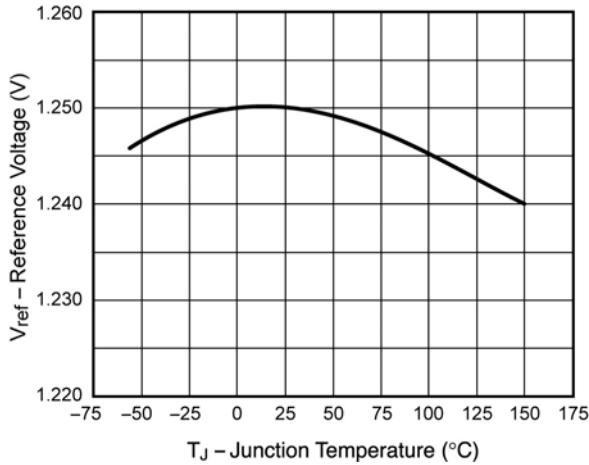


Figure 5 – Temperature Stability

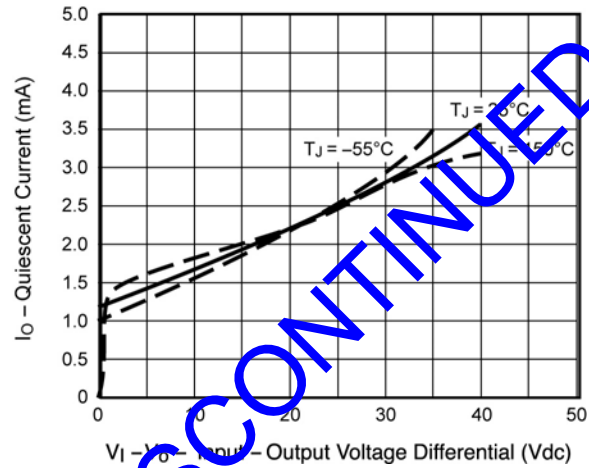


Figure 6 – Minimum Operating Current

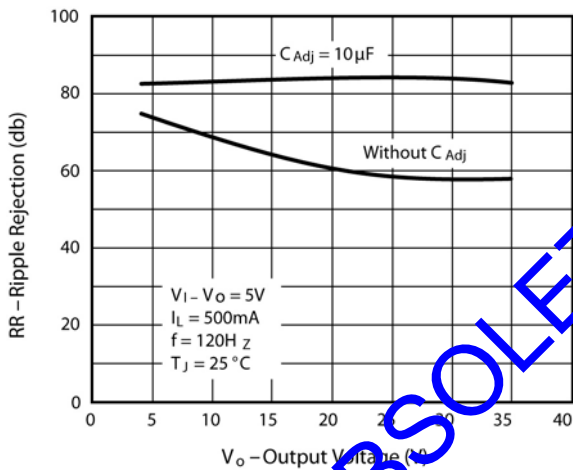


Figure 7 – Ripple Rejection versus Output Voltage

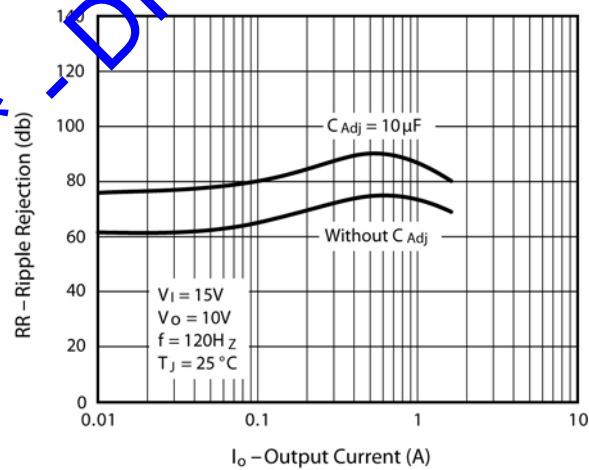


Figure 8 – Ripple Rejection versus Output Current

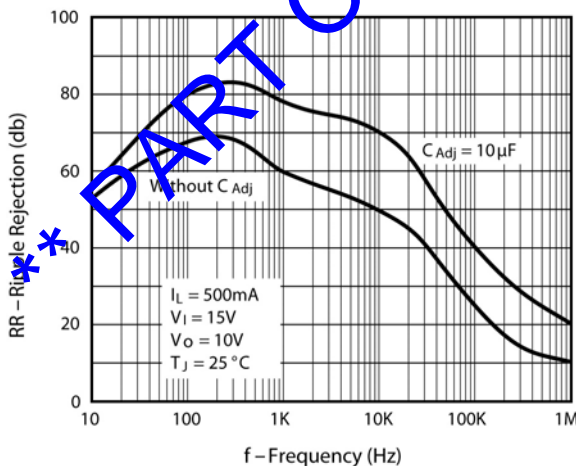


Figure 9 – Ripple Rejection versus Frequency

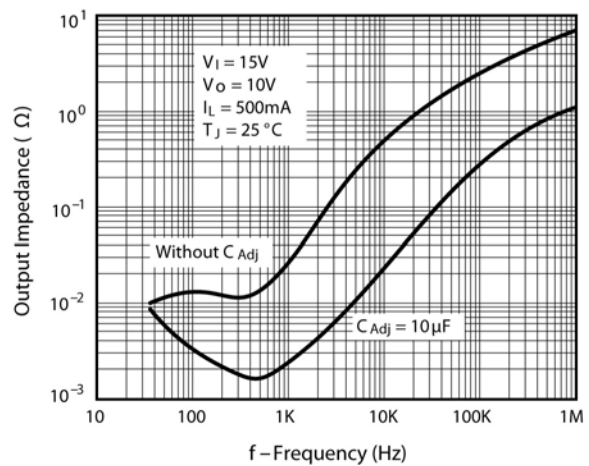


Figure 10 – Output Impedance





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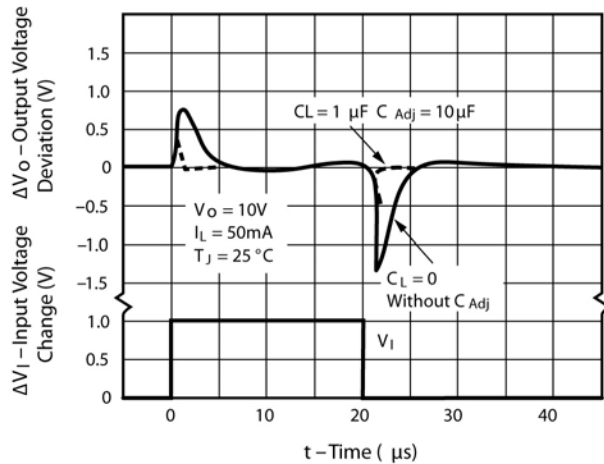


Figure 11– Line Transient Response

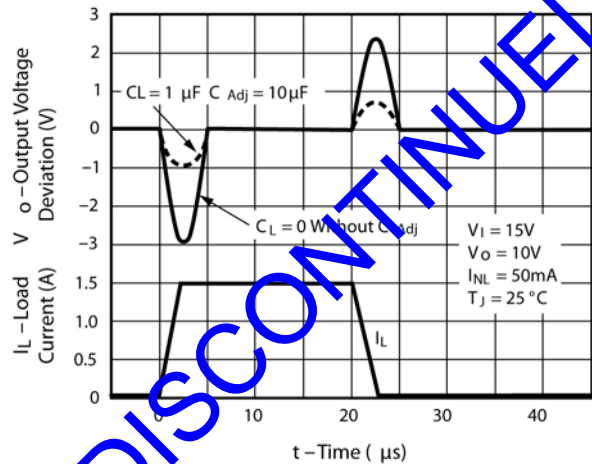


Figure 12– Load Transient Response

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