

**1.5A Adjustable Three-terminal Positive Voltage Regulator****LM317 Adjustable Three-Terminal Regulator****NOT RECOMMENDED FOR NEW DESIGN, USE *LM317C*****1 Introduction**

The LM317 is a three terminal positive voltage regulator with maximum 1.5A current output and adjustable output. The voltage regulator is very easy to use, which only needs two external resistors to set the output voltage, and the output voltage can be set in the range of 1.25V to 37V. In addition, the LM317 is also designed to integrate internal current limiting, thermal shutdown and safe working area compensation, which makes it relatively difficult to damage and basically prevent the burning of circuit fuses.

The LM317 serves a variety of applications, including local voltage stabilization and card voltage stabilization. It can also be used to make a programmable voltage regulator, or as a precision current regulator by connecting a fixed resistance between the adjustment point and the output.

**2 Applications**

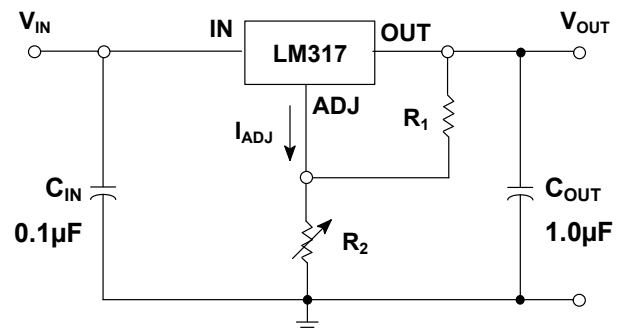
- Air Conditioner
- Base Station
- Desktop Computer
- Digital Sign
- Ethernet Switch
- IP Telephone: Wired and Wireless Motor Control
- Power Quality Meter
- Private Switch (PBX)
- Public Server
- Refrigerator
- Security Camera
- Signal or Waveform Generator
- Substation Control
- Washing Machine

**3 Features**

- The output current exceeds 1.5A
- The output is adjustable from 1.25V to 37V
- Internal thermal overload protection
- Temperature independent internal short circuit current limit
- Output transistor safe working area compensation
- Commonly used TO-252 package, as well as other forms of three pin package
- Avoid preparing multiple fixed voltages

**4 Available Packages**

PART NUMBER	PACKAGE
LM317	SOT-223
	TO-220-3L
	TO-252-2L
	TO-263-2L

**Typical Application Circuits**

## 5 Orderable Information

MODEL	DEVICE	PACKAGE	OP T <sub>J</sub>	ECO PLAN	MSL	PACKING OPTION	SORT
-	LM317	SOT-223	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	NoRD
		TO-220-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tube 50 Units / Rail	NoRD
		TO-220-3L	-40 ~ 125°C	non Green	Level 3 168 HR	Tube 50 Units / Rail	NoRD
		TO-252-2L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	NoRD
		TO-252-2L	-40 ~ 125°C	non Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	NoRD
		TO-263-2L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 800 Units / Reel	NoRD
		TO-263-2L	-40 ~ 125°C	non Green	Level 3 168 HR	Tape and Reel 800 Units / Reel	NoRD

**Note:**

**ECO PLAN:** For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

**MSL:** Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

**SORT:** Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

## 6 Pin Configuration and Marking Information

### 6.1 Pin Configuration and Function

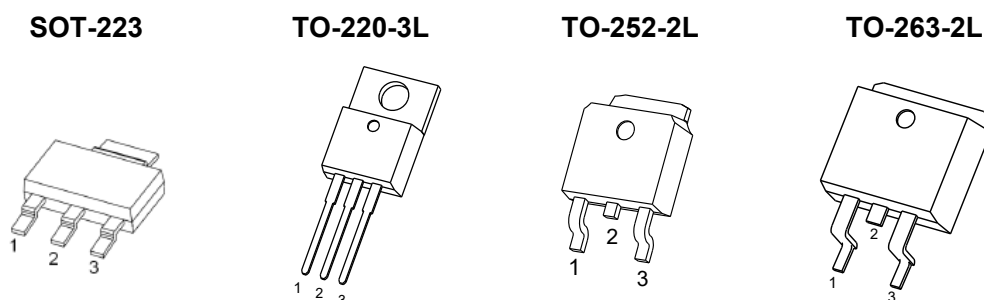
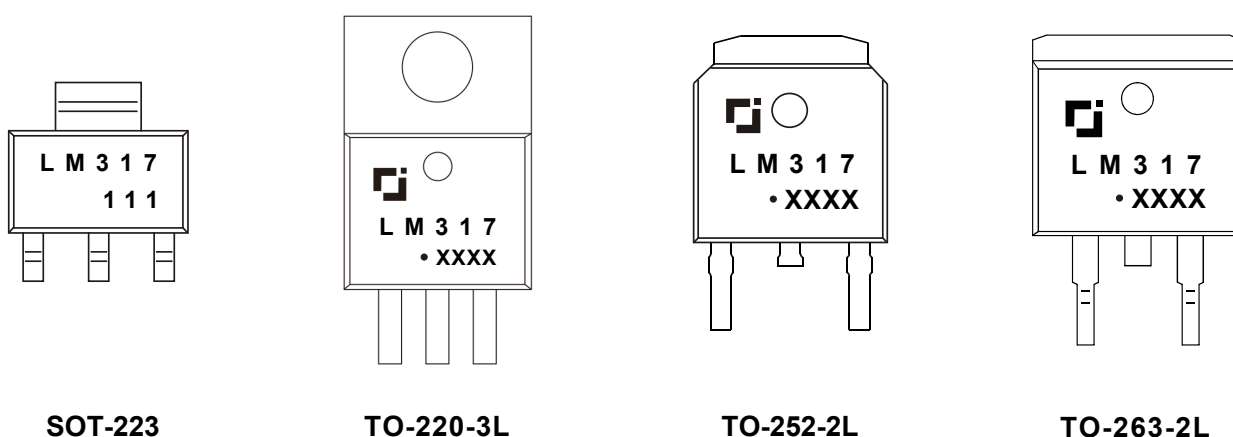


Figure 6-1. Package Top View

PIN NAME	LM317 Package Configuration and Function				I / O	DESCRIPTION
	SOT-223	TO-220-3L	TO-252-2L	TO-263-2L		
IN	3	3	3	3	I	Supply input pin.
ADJ	1	1	1	1	-	Adjustment pin. Connect to a resistor divider to set $V_{OUT}$ .
OUT	2	2	2	2	O	Voltage output pin.

### 6.2 Marking Information



"LM317" : Device number.

"111" : Fixed code.

"XXXX" : Code. Indicates weekly record information of production.

" • " : Green molding compound device. If none, the normal device.

## 7 Specifications

### 7.1 Absolute Maximum Ratings

(over operating free-air temperature range, unless otherwise specified)<sup>(1)</sup>

CHARACTERISTIC			SYMBOL	VALUE	UNITS
Maximum Input-to-output differential voltage			V <sub>IN</sub> - V <sub>OUT</sub>	40	V
Maximum programmable output voltage			V <sub>OUT</sub>	37	
Maximum power dissipation	LM317	SOT-223	P <sub>D</sub> Max	Internally Limited <sup>(2)</sup>	W
		TO-220-3L			
		TO-252-2L			
		TO-263-2L			
Maximum junction temperature			T <sub>J</sub> Max	150	°C
Storage temperature			T <sub>stg</sub>	-55 ~ 150	°C
Soldering temperature			T <sub>solder</sub>	230°C	-

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

(2) Refer to *Thermal Information* for details.

### 7.2 Recommended Operating Conditions

PARAMETER	SYMBOL	MIN.	NOM.	MAX.	UNIT
Input-to-output differential voltage	$V_{IN} - V_{OUT}$	3.0	-	40	V
Programmable output voltage	$V_{OUT}$	1.25	-	37	V
Output current range	$I_{OUT}$	0.01	-	1.5	A
Operating junction temperature	$T_J$	-40	-	125	°C
Operating ambient temperature	$T_A$	-	-(3)	-	°C

(3) It is necessary to ensure that the operating junction temperature of the device does not exceed the rated value of the recommended operating conditions when using the device for design.

## 7 Specifications

### 7.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge <sup>(4)</sup>	Human body model	$V_{ESD-HBM}$	2000	V
	Machine model	$V_{ESD-MM}$	200	

(4) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body model (HBM) electrostatic discharge test is based on the JESD22-114D test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ. The electrostatic discharge test in mechanical model (MM) is based on the JESD22-A115-A test standard and uses a 200pF capacitor to discharge directly to each pin of the device.

### 7.4 Thermal Information

THERMAL METRIC <sup>(5)</sup>	SYMBOL	LM317		UNIT
Junction-to-ambient thermal resistance	$R_{\theta JA}$	<b>SOT-223</b>	<b>TO-220-3L</b>	°C/W
		100.0	66.7	
		<b>TO-252-2L</b>	<b>TO-263-2L</b>	
		80.0	62.5	
Junction-to-case thermal resistance	$R_{\theta JC}$	<b>SOT-223</b>	<b>TO-220-3L</b>	°C/W
		27.0	5.5	
		<b>TO-252-2L</b>	<b>TO-263-2L</b>	
		14.5	5.5	
Maximum power dissipation for continuous operation	$P_{D \text{ Ref}}$	<b>SOT-223</b>	<b>TO-220-3L</b>	W
		1.00	1.50	
		<b>TO-252-2L</b>	<b>TO-263-2L</b>	
		1.25	1.60	

(5) Thermal metric is measured in still air with  $T_A = 25^\circ\text{C}$  and installed on a 1 in<sup>2</sup> FR-4 board covered with 2 ounces of copper.

## 7 Specifications

### 7.5 Electrical Characteristics

LM317 ( $V_{IN} - V_{OUT} = 5.0V$ ,  $I_{OUT} = 500mA$ ,  $C_{IN} = 1.0\mu F$ ,  $C_{OUT} = 1.0\mu F$ , unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS <sup>(6)</sup>		MIN.	TYP.	MAX.	UNIT	
Line regulation	LNR <sup>(7)</sup>	V <sub>IN</sub> - V <sub>OUT</sub> = 3.0 to 40V		T <sub>J</sub> = 25°C	-	0.01	0.04	% / V
				T <sub>J</sub> = 0 to 125°C	-	0.02	0.07	
Load regulation	LDR	I <sub>OUT</sub> = 10 to 1500mA	V <sub>OUT</sub> < 5.0V	T <sub>J</sub> = 25°C	-	18	25	mV
			V <sub>OUT</sub> < 5.0V	T <sub>J</sub> = 0 to 125°C	-	40	70	
			V <sub>OUT</sub> ≥ 5.0V	T <sub>J</sub> = 25°C	-	0.4	0.5	% · V <sub>OUT</sub>
				T <sub>J</sub> = 0 to 125°C	-	0.8	1.5	
ADJ terminal current	I <sub>ADJ</sub>	-		T <sub>J</sub> = 25°C	-	46	100	μA
Change in ADJ terminal current	ΔI <sub>ADJ</sub>	V <sub>IN</sub> - V <sub>OUT</sub> = 3.0 to 40V I <sub>OUT</sub> = 10 to 1500mA		T <sub>J</sub> = 25°C	-	2.0	5.0	μA
Reference voltage	V <sub>REF</sub>	V <sub>IN</sub> - V <sub>OUT</sub> = 3.0 to 40V I <sub>OUT</sub> = 10 to 1500mA		T <sub>J</sub> = 25°C	1.20	1.25	1.30	V
Output voltage temperature stability	ΔV <sub>OUT</sub> / V <sub>OUT</sub>	-		-	-	0.7	-	%
Temperature coefficient of output voltage	ΔV <sub>OUT</sub> / ΔT	-		-	-	±0.02	-	% / °C
Minimum load current to maintain regulation	I <sub>OUT MIN</sub>	V <sub>IN</sub> - V <sub>OUT</sub> = 40V		T <sub>J</sub> = 0 to 125°C	-	3.5	12	mA
Maximum output current	I <sub>OUT MAX</sub>	V <sub>IN</sub> - V <sub>OUT</sub> ≤ 15V		T <sub>J</sub> = 0 to 125°C	1.5	2.2	-	A
		V <sub>IN</sub> - V <sub>OUT</sub> = 40V		T <sub>J</sub> = 25°C	-	0.3	-	
Output noise voltage (percentage of V <sub>OUT</sub> )	eN	f = 10 to 10kHz		T <sub>J</sub> = 25°C	-	0.003	0.010	% · V <sub>OUT</sub>
Ripple rejection	RR	f = 100Hz	C <sub>ADJ</sub> <sup>(8)</sup> = 0μF	T <sub>A</sub> = 25°C	-	60	-	dB
			C <sub>ADJ</sub> <sup>(8)</sup> = 10μF		-	64	-	
		f = 1kHz	C <sub>ADJ</sub> <sup>(8)</sup> = 0μF		-	65	-	
			C <sub>ADJ</sub> <sup>(8)</sup> = 10μF		-	80	-	
Long-term stability	ST	per 1k hours		T <sub>J</sub> = 125°C	-	0.3	1.0	%

**Note:**

(6) Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

(7) The line regulation is calculated by the following formula:

$$LNR = \frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$$

where,  $\Delta V_{OUT}$  is the variation of the output voltage,  $\Delta V_{IN}$  is the variation of the input voltage.

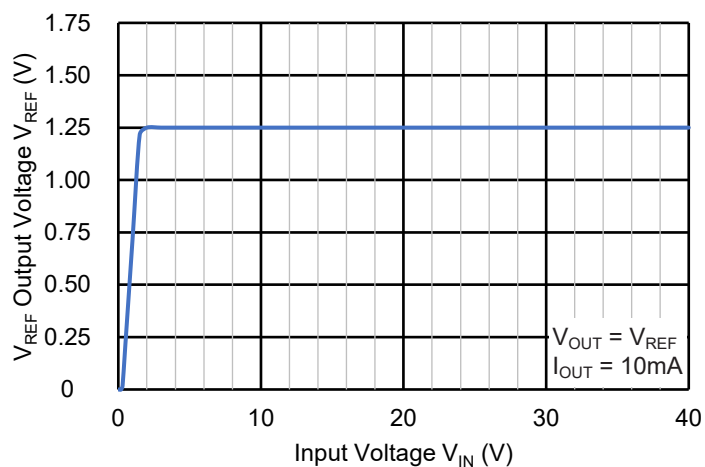
(8)  $C_{ADJ}$  is connected between the ADJ terminal and GND.

## 7 Specifications

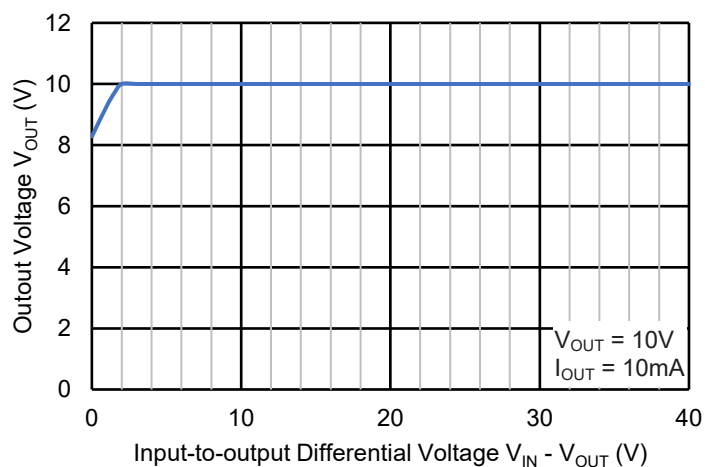
### 7.6 Typical Characteristics

LM317 ( $C_{IN} = 0.1\mu F$ ,  $C_{OUT} = 1.0\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

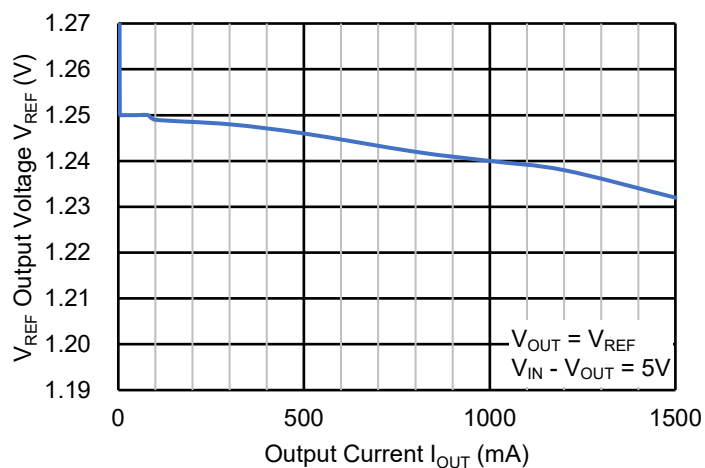
$V_{REF}$  Output Line Regulation



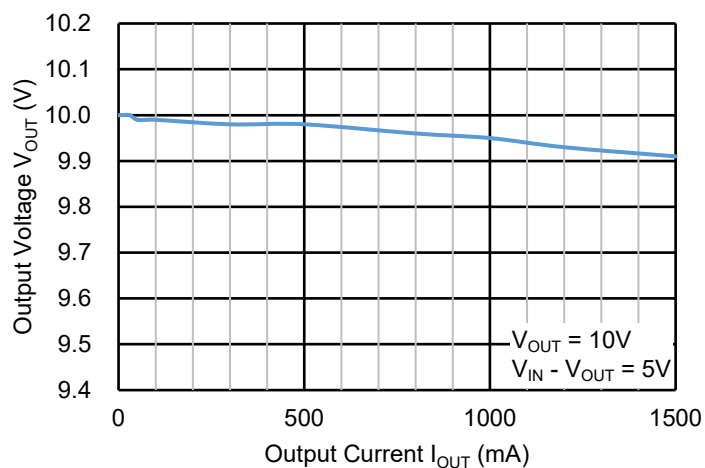
10V Output Line Regulation



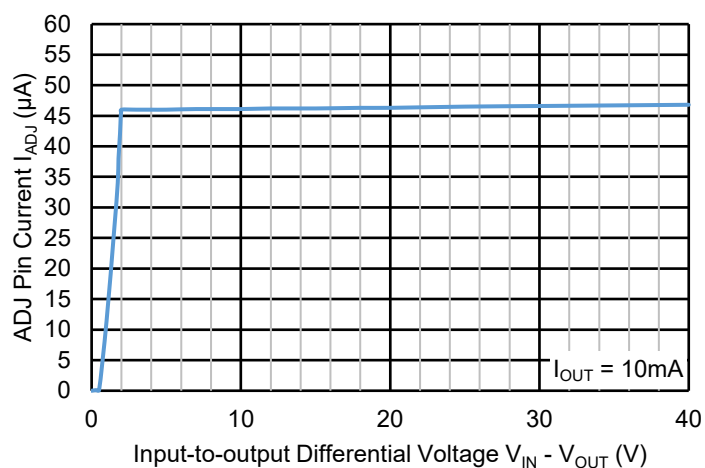
$V_{REF}$  Output Load Regulation



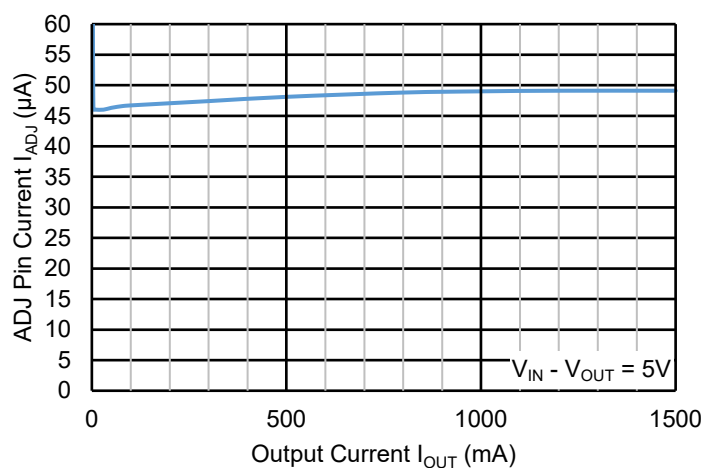
10V Output Load Regulation



ADJ Pin Current



ADJ Pin Current

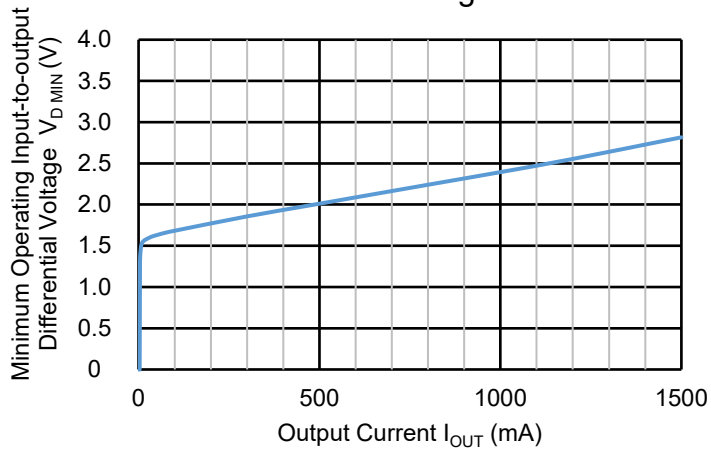


## 7 Specifications

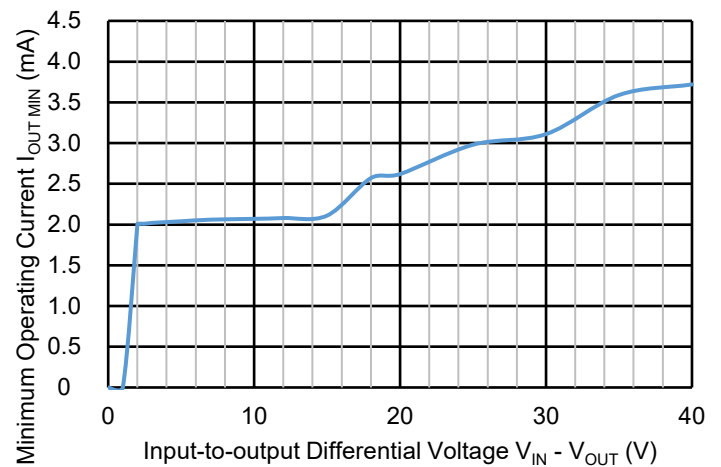
### 7.6 Typical Characteristics (continued)

LM317 ( $C_{IN} = 0.1\mu F$ ,  $C_{OUT} = 1.0\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

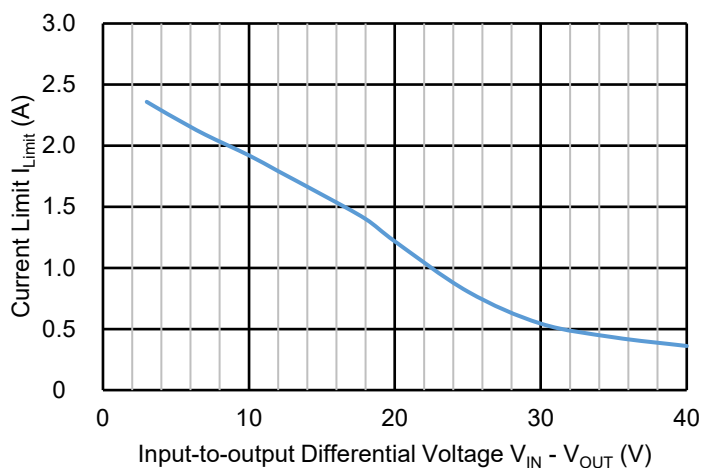
Minimum Operating Input-to-output  
Differential Voltage



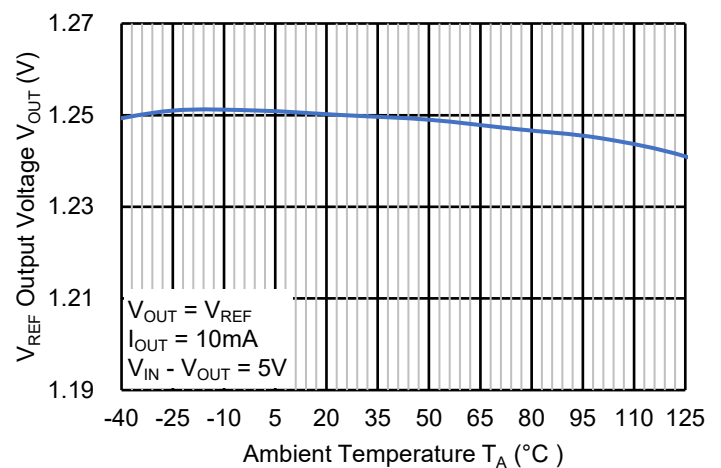
Minimum Operating Current



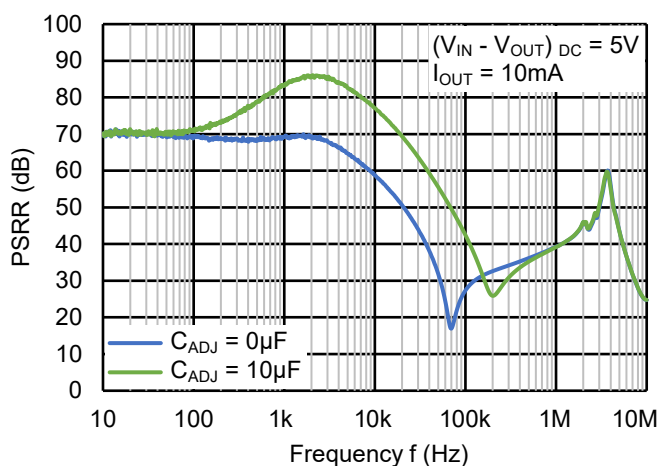
Output Current Limit



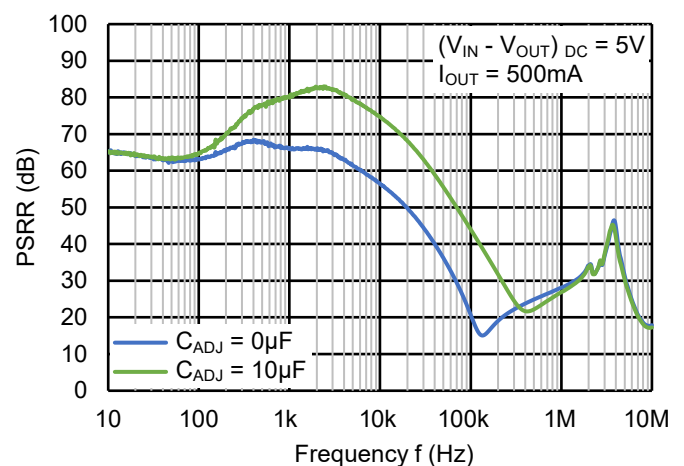
Temperature Characteristics



Power Supply Rejection Ratio



Power Supply Rejection Ratio





## 7 Specifications

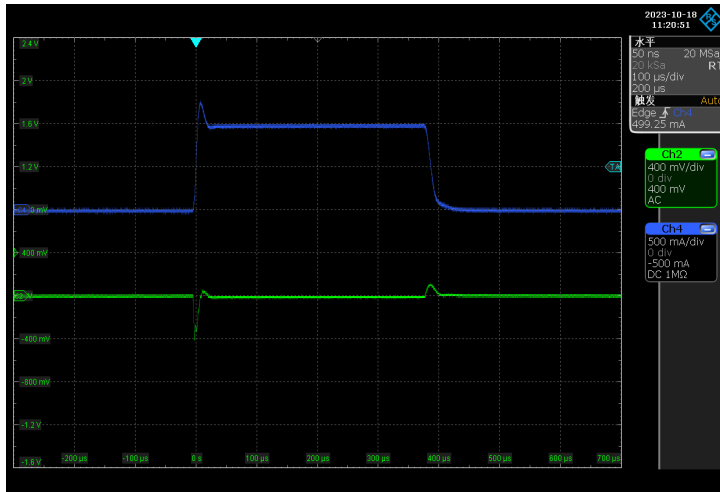
### 7.6 Typical Characteristics (continued)

LM317 ( $C_{IN} = 0.1\mu\text{F}$ ,  $C_{OUT} = 1.0\mu\text{F}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise specified)

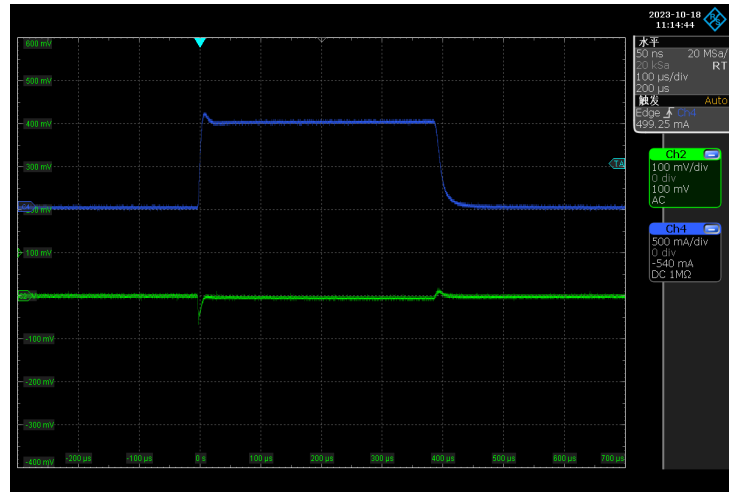
#### Load Transient

$V_{OUT} = 10\text{V}$ ,  $V_{IN} - V_{OUT} = 5\text{V}$ ,  $I_{OUT} = 10 \sim 1000\text{mA}$ , CH2:  $V_{OUT}$ , CH4:  $I_{OUT}$

$C_{ADJ} = 0\mu\text{F}$



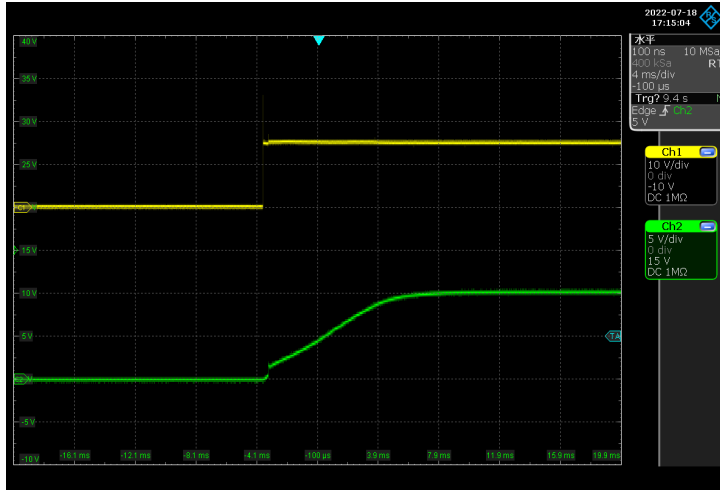
$C_{ADJ} = 10\mu\text{F}$



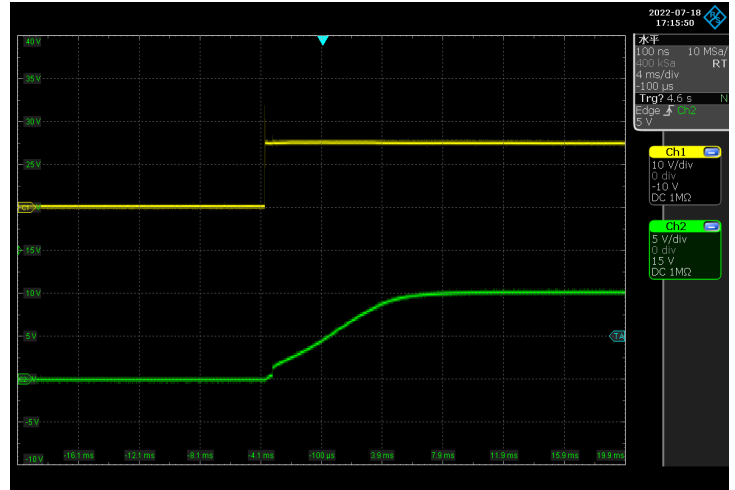
#### Power up Response

$V_{OUT} = 10\text{V}$ ,  $V_{IN} = 0 \sim (V_{OUT} + 5\text{V})$ ,  $C_{ADJ} = 10\mu\text{F}$ , CH1:  $V_{IN}$ , CH2:  $V_{OUT}$

$I_{OUT} = 10\text{mA}$



$I_{OUT} = 1000\text{mA}$

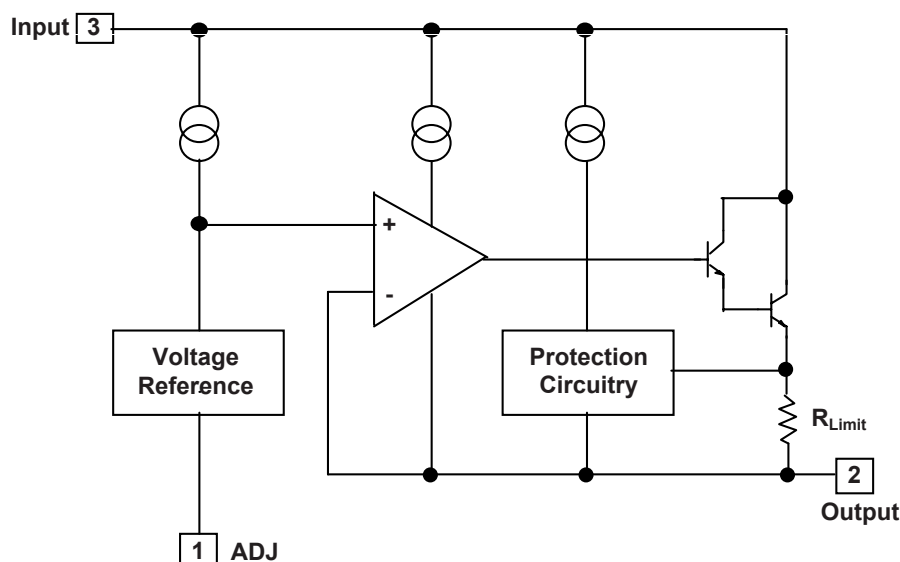


## 8 Detailed Description

### 8.1 Description

The LM317 is an adjustable 3-terminal positive voltage regulator designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.25 to 37V. It employs internal current limiting, thermal shut-down and safe area compensation.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

#### Comprehensive Overload Protection

The LM317 is internally integrated with current limit and thermal shutdown protection. When the output current is large or the junction temperature is higher than the rated range of the data sheet to a certain extent, the LM317 will enter the protection state and shut down the device to prevent accidental damage to the device. After the output current or junction temperature decreases to a certain extent, the LM317 will be released from the protection state and output normally.

When output is short circuited, the LM317 will also enter the protection state and maintain the current at a low level. If the short circuit is released, the LM317 will release the protection status and output normally.

To ensure reliable operation, please limit the junction temperature to the specified range of *Recommended Operating Conditions* in the data sheet. Applications that exceed the recommended temperature range may cause the device to exceed its operating specifications.

Although the internal protection circuitry of the device is designed to protect against thermal overall conditions, this circuitry is not intended to replace proper heat sinking. Continuously running the device into thermal shutdown or above the maximum recommended junction temperature reduces long-term reliability.

## 8 Detailed Description

### 8.3 Feature Description (continued)

#### Minimum Operating Current

The LM317 needs to provide bias current between OUT and ADJ to make the device work normally. The load or feedback must consume this minimum current for regulation, otherwise the output may be too high. Refer to the *Electrical Characteristics* for the minimum load current required to maintain regulation.

#### Minimum Operating Voltage Difference

The LM317 requires a voltage difference ( $V_{IN} - V_{OUT}$ ) of at least 3V between input and output before it can operate in the normal working state, otherwise the device may not maintain the normal output state. The relationship between the minimum working voltage difference and the output current is shown in *Minimum Operating Current*.

#### Programmable Feedback

The device will provide 1.25V (Typ.) bias output voltage between OUT and ADJ, and the output voltage or current (not both) can be easily programmed through external resistance. For current regulation applications, a single resistor with a resistance value of  $(1.25V / I_{OUT})$  and a rated power greater than  $((1.25V)^2 / R)$  shall be used. For voltage regulation applications, two resistors set the output voltage.

#### Normal Operation

The LM317 is a three terminal positive voltage regulator with adjustable output. During normal operation, the LM317 will maintain a reference voltage  $V_{REF}$  of 1.25V (Typ.) between OUT and ADJ. This reference voltage  $V_{REF}$  is converted from  $R_1$  to programming current  $I_{PROG}$  (see Figure 8-1), which flows to ground through  $R_2$ . The regulated output voltage is given by the following formula:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_2}{R_1}\right) + I_{ADJ} \times R_2$$

As an error term in the formula,  $I_{ADJ}$  is designed to be less than 100 $\mu$ A and keep constant. Therefore, in most applications, this item can be negligible. Since the LM317 requires the minimum operating current and the minimum operating voltage difference for normal operation, the corresponding conditions shall be met in the circuit design.

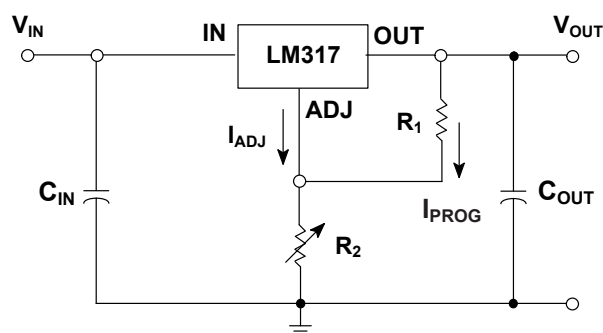


Figure 8-1. Basic Normal Operation

## 9 Application and Implementation

### 9.1 Application Information

#### Load Regulation

Following the following design recommendations can help the LM317 achieve better load regulation. The switching resistor  $R_1$  shall be connected as close to the voltage regulator as possible to minimize the voltage drop of the line effectively connected in series with the reference voltage and avoid poor adjustment rate. The grounding terminal of  $R_2$  can be returned close to the load grounding terminal to provide remote grounding sampling and improve the load adjustment rate.

#### External Capacitors

A  $0.1\mu\text{F}$  disc or  $1.0\mu\text{F}$  tantalum input bypass capacitor  $C_{\text{IN}}$  is recommended to reduce the sensitivity to input line impedance. The adjustment terminal may be bypassed to ground to improve ripple rejection.

A  $C_{\text{ADJ}}$  of  $10\mu\text{F}$  (between OUT and GND) is recommended to improve ripple rejection. It prevents amplification of the ripple as the output voltage is adjusted higher. Although the LM317 is stable with no output capacitance, like any feedback circuit, certain values of external capacitance can cause excessive ringing.

An output capacitance  $C_{\text{OUT}}$  in the form of a  $1.0\mu\text{F}$  tantalum or  $25\mu\text{F}$  aluminum electrolytic capacitor on the output swamps this effect and insures stability.

The input capacitance  $C_{\text{IN}}$  and output capacitance  $C_{\text{OUT}}$  should be placed as close to the corresponding device pins as possible ( $C_{\text{IN}}$  for IN,  $C_{\text{OUT}}$  for OUT). When the LM317 is used as a reference voltage source instead of a peripheral resistor, it is recommended to use an input capacitor of  $1\mu\text{F}$  or more to obtain better voltage stability.

#### Protection Diodes

When external capacitors are used with any IC regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator. Figure 9-1 shows the LM317 with the recommended protection diodes for output voltages in excess of 25V or high capacitance values ( $C_{\text{OUT}} > 25\mu\text{F}$ ,  $C_{\text{ADJ}} > 10\mu\text{F}$ ). Diode  $D_1$  prevents  $C_{\text{OUT}}$  from discharging through the IC during an input short circuit. Diode  $D_2$  protects against capacitor  $C_{\text{ADJ}}$  discharging through the IC during an output short circuit. The combination of diodes  $D_1$  and  $D_2$  prevents  $C_{\text{ADJ}}$  from discharging through the IC during an input short circuit.

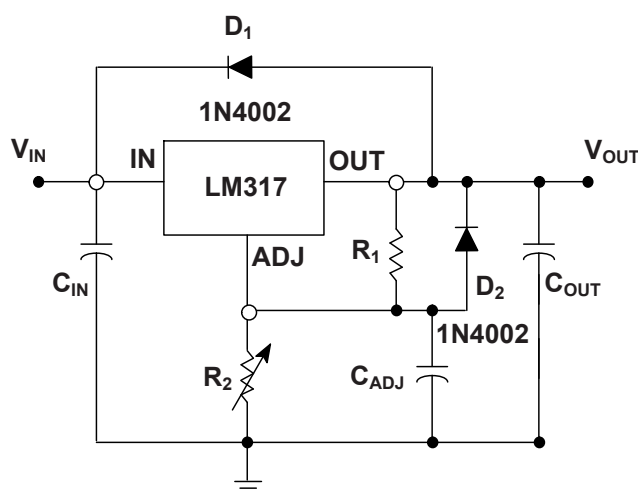


Figure 9-1. Voltage Regulator with Protection Diodes

## 9 Application and Implementation

### 9.2 System Example

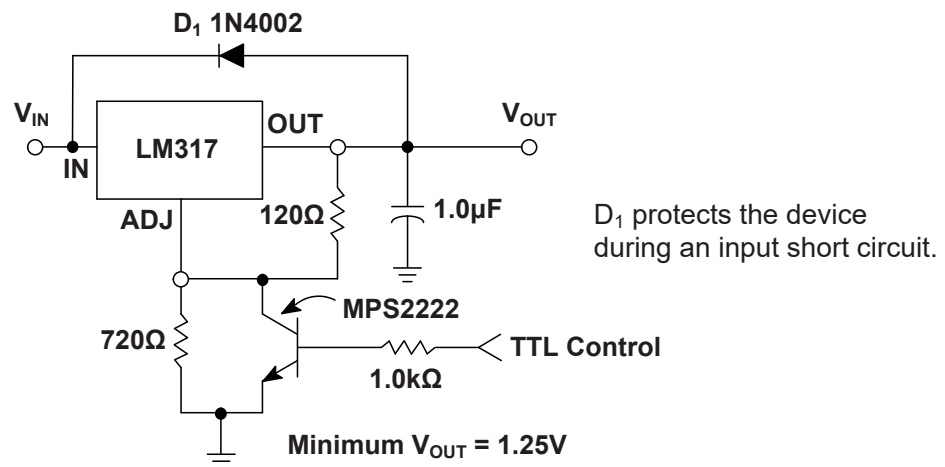


Figure 9-2. 5V Electronic Shutdown Regulator

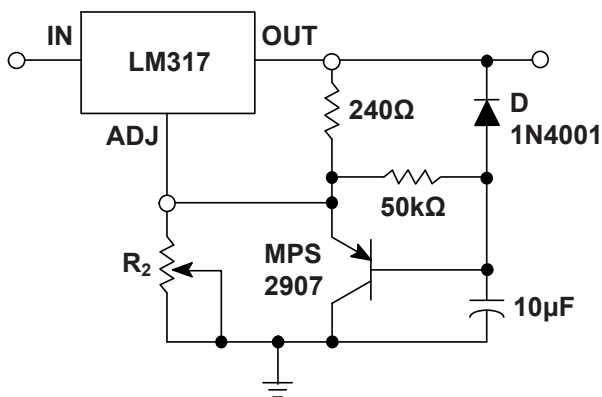


Figure 9-3. Slow Turn-On Regulator

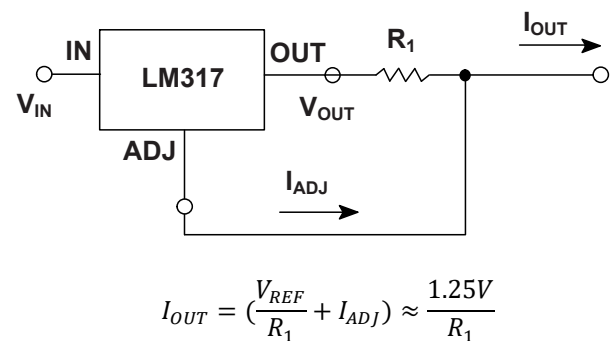


Figure 9-4. Current Regulator

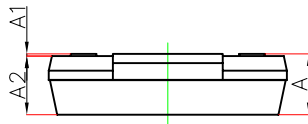
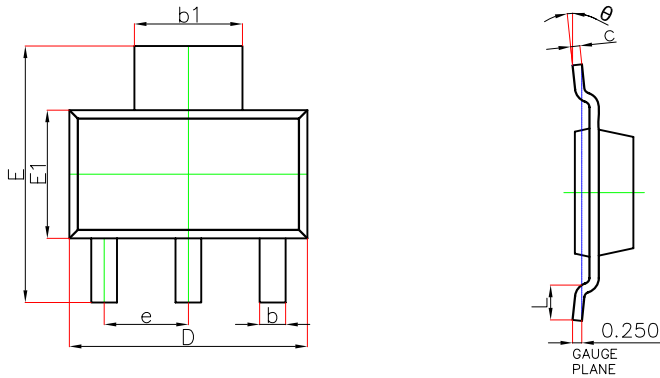
#### NOTE

The application information in this section is not part of the data sheet component specification, and JSCJ makes no commitment or statement to guarantee its accuracy or completeness. Customers are responsible for determining the rationality of corresponding components in their circuit design and making tests and verifications to ensure the normal realization of their circuit design.

## 10 Mechanical Information

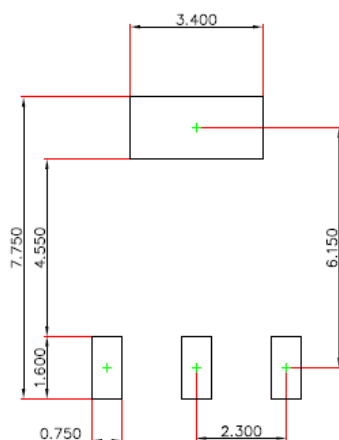
### 10.1 SOT-223 Mechanical Information

#### SOT-223 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	—	1.800	—	0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
$b_1$	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	6.700	7.300	0.264	0.287
E1	3.300	3.700	0.130	0.146
e	2.300(BSC)		0.091(BSC)	
L	0.750	—	0.030	—
$\theta$	0°	10°	0°	10°

#### SOT-223 Suggested Pad Layout



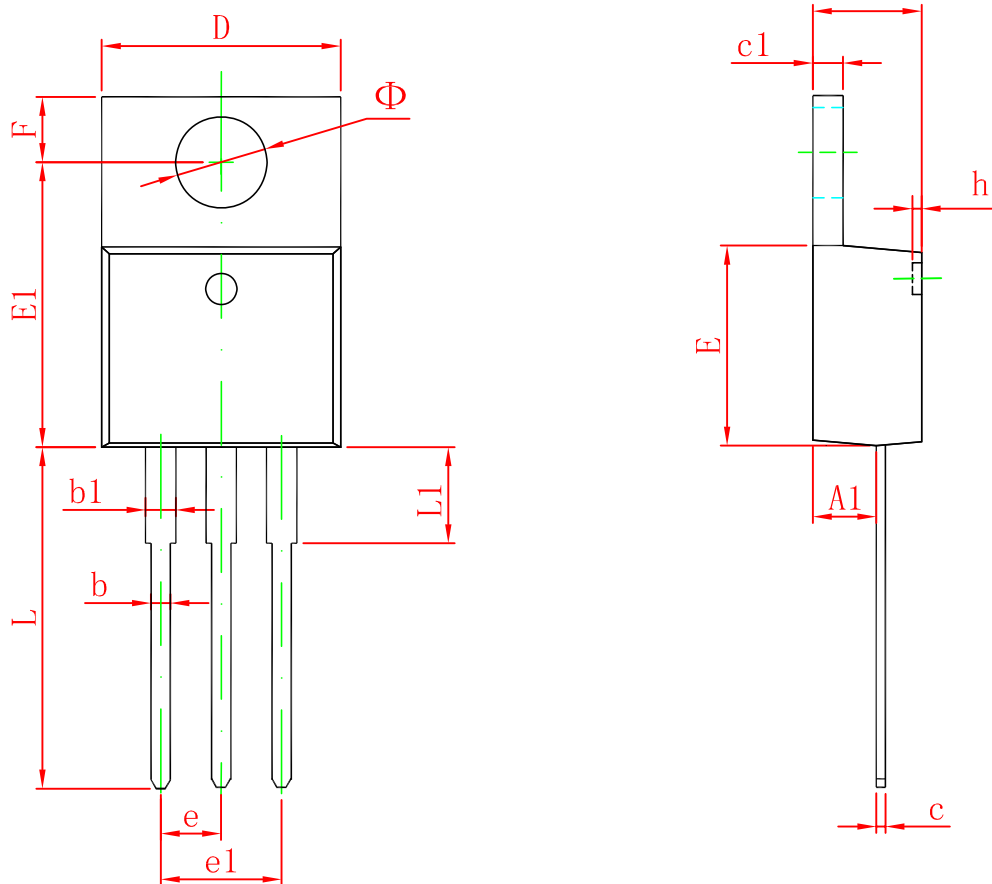
#### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

## 10 Mechanical Information

### 10.2 TO-220-3L Mechanical Information

#### TO-220-3L Outline Dimensions

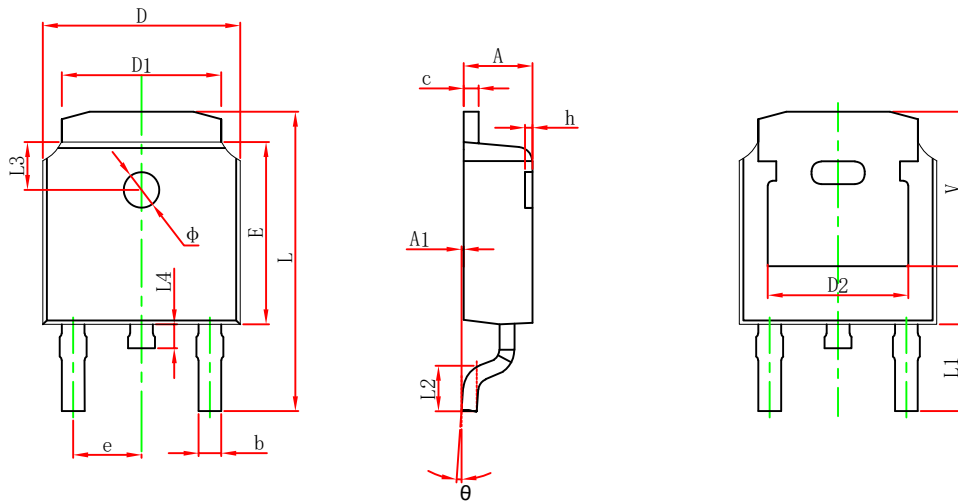


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
Φ	3.735	3.935	0.147	0.155

## 10 Mechanical Information

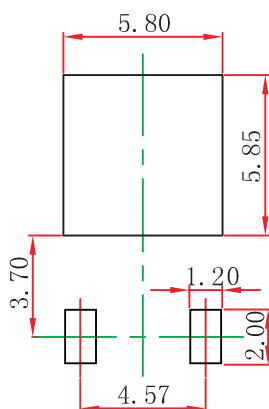
### 10.3 TO-252-2L Mechanical Information

#### TO-252-2L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

#### TO-252-2L Suggest Pad Layout



**Note:**

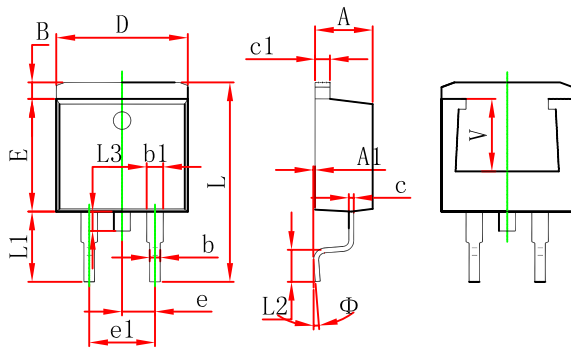
1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.



## 10 Mechanical Information

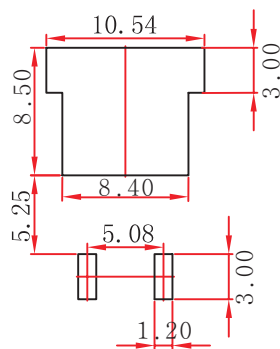
### 10.4 TO-263-2L Mechanical Information

#### TO-263-2L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.120	1.420	0.044	0.056
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	14.940	15.500	0.588	0.610
L1	4.950	5.450	0.195	0.215
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
Φ	0°	8°	0°	8°
V	5.600 REF.		0.220 REF.	

#### TO-263-2L Suggest Pad Layout



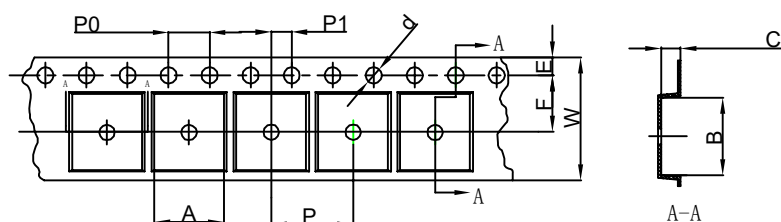
#### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

## 11 Packaging Information

### 11.1 SOT-223 Tape and Reel Information

#### SOT-223 Embossed Carrier Tape

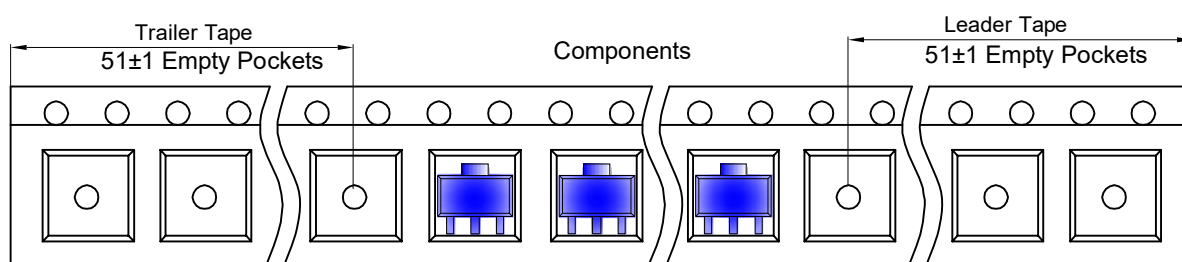


#### Packaging Description:

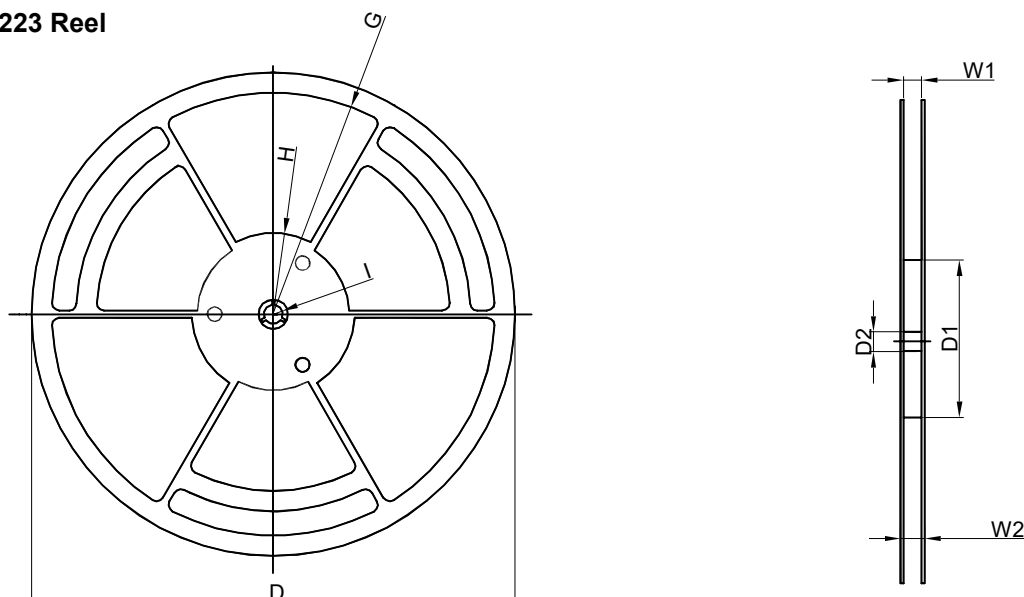
SOT-223 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33.0cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-223	6.765	7.335	1.88	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

#### SOT-223 Tape Leader and Trailer



#### SOT-223 Reel



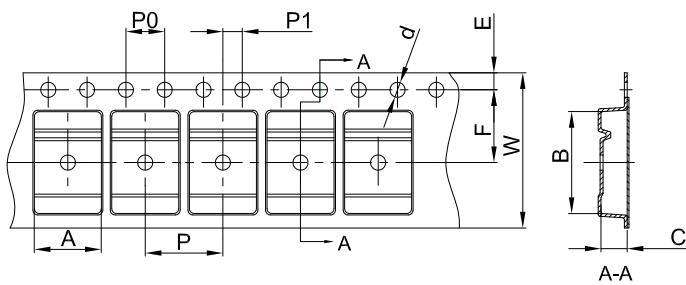
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13" Dia	Ø330.00	100.00	13.00	R151.00	R56.00	R6.50	12.40	17.60

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
2,500 pcs	13 inch	2,500 pcs	336×336×48	20,000 pcs	445×355×365	

## 11 Packaging Information

### 11.2 TO-252-2L Tape and Reel Information

#### TO-252-2L Embossed Carrier Tape

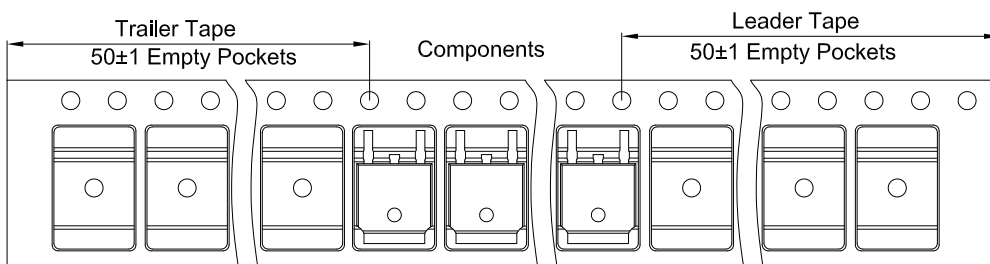


#### Packaging Description:

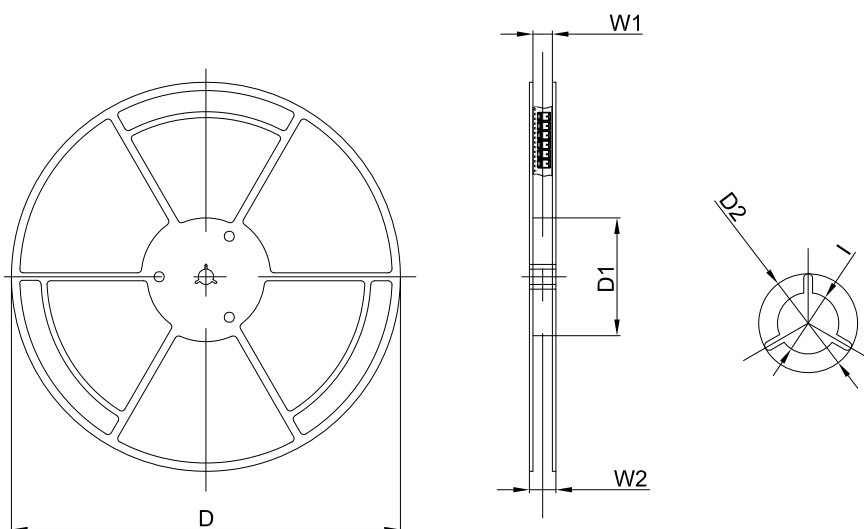
TO-252 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 25,00 units per 13" or 33.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
TO-252	6.90	10.50	2.70	Ø1.55	1.75	7.50	4.00	8.00	2.00	16.00

#### TO-252-2L Tape Leader and Trailer



#### TO-252-2L Reel



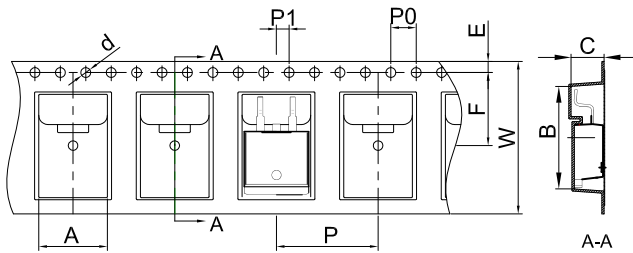
Dimensions are in millimeter						
Reel Option	D	D1	D2	W1	W2	I
13"Dia	330.00	100.00	Ø21.00	16.40	21.00	Ø13.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
2,500 pcs	13inch	2,500 pcs	340×336×29	25,000 pcs	353×346×365	

## 11 Packaging Information

### 11.3 TO-263-2L Tape and Reel Information

#### TO-263-2L Embossed Carrier Tape

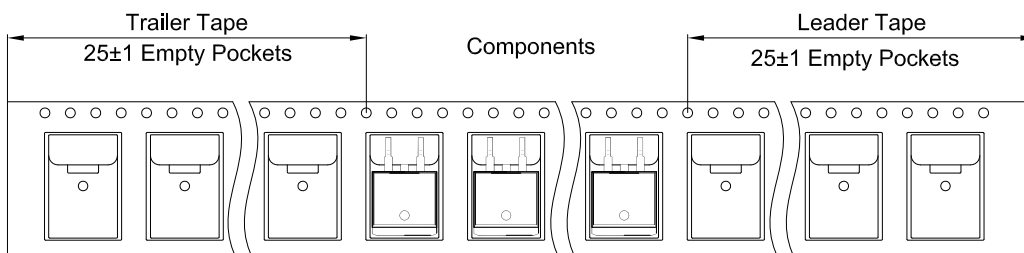


#### Packaging Description:

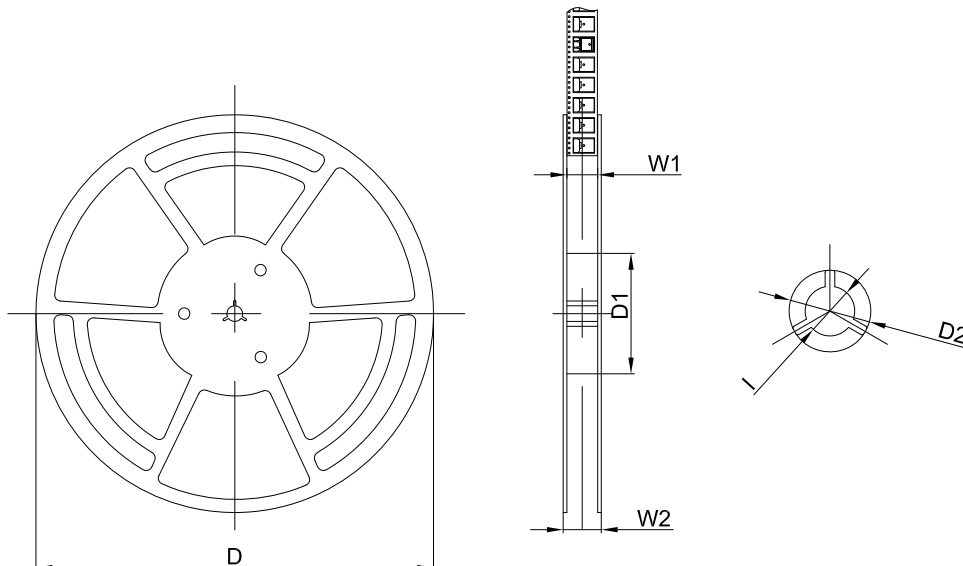
TO-263-2L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 800 units per 13" or 33.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
TO-263-2L	10.80	16.13	5.21	Ø1.55	1.75	11.50	4.00	16.00	2.00	24.00

#### TO-263-2L Tape Leader and Trailer



#### TO-263-2L Reel



Dimensions are in millimeter						
Reel Option	D	D1	D2	W1	W2	I
13"Dia	Ø330.00	100.00	Ø21.00	24.4	30.4	Ø13.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
800 pcs	13 inch	800 pcs	340×336×36	8,000 pcs	400×353×365	

## 12 Notes and Revision History

### 12.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- <https://www.jscj-elec.com> for more details.

### 12.2 Notes

#### Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

### 12.3 Revision History

#### December, 2023: changed from rev - 3.4 to rev - 3.5:

- Set the product status to "NoRD".

#### December, 2023: changed from rev - 3.3 to rev - 3.4:

- Page 6, Electrical Characteristics, output current is changed from 1.0A to 1.5A.

#### October, 2023: changed from rev - 3.2 to rev - 3.3:

- Page 1, Features, output adjustable range changed from "1.2V to 37V" to "1.25V to 37V";
- Page 4, Recommend Operating Conditions, output adjustable range changed from "1.2V to 37V" to "1.25V to 37V";
- Page 6, Electrical Characteristics, PSRR is changed from "120Hz" to "100Hz and 1kHz";
- Page 8, Typical Characteristics, added the figure of the "Temperature Characteristics";
- Page 9, Typical Characteristics, removed the figures of the "SCP".

#### February, 2023: changed from rev - 3.1 to rev - 3.2:

- Page 5, Thermal Information, added Junction-to-case thermal resistance  $R_{\theta JC}$ .

#### October, 2022: changed from rev - 3.0 to rev - 3.1:

- Changed the data sheet layout to JSCJ format.

#### July 2022: changed from rev - 2.0 to rev - 3.0:

- All data sheet, modified data sheet format;
- Assembled LM317 SOT-223 rev - 2.0, LM317 TO-220-3L rev - 2.0, LM317 TO-252-2L rev - 2.0 and LM317 TO-263-2L rev - 2.0 devices into LM317 rev - 3.0;
- Added Introduction, Applications, Available Package, Pin Configuration and Marking Information,
- Recommended Operating Conditions, ESD Ratings, Thermal Information, Detailed Description, Application
- and Implementation, Notes and Revision History section.

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