1.5A Adjustable Three-terminal Positive Voltage Regulator

LM317E Series Adjustable Three-Terminal Regulator

1 Introduction

The LM317E 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 LM317E 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 LM317E 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 Available Packages

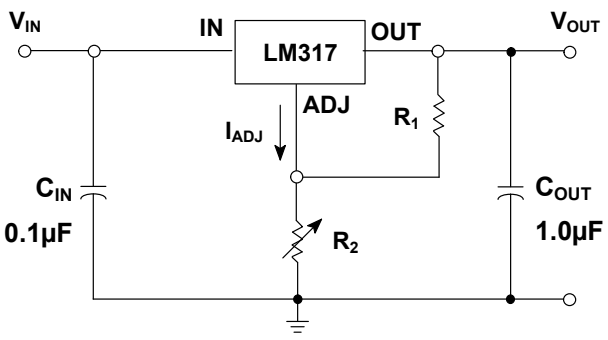
PART NUMBER	PACKAGE
LM317E	SOT-223
	TO-220-3L
	TO-220-3L(A)
	TO-252-2L
	TO-252-2L(B)
	TO-263-2L

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 Applications

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



Typical Application Circuit

Please carefully read the notice at the end of this data sheet about product use, data sheet changes and important statements.

5 Pin Configuration and Marking Information

5.1 Pin Configuration and Function

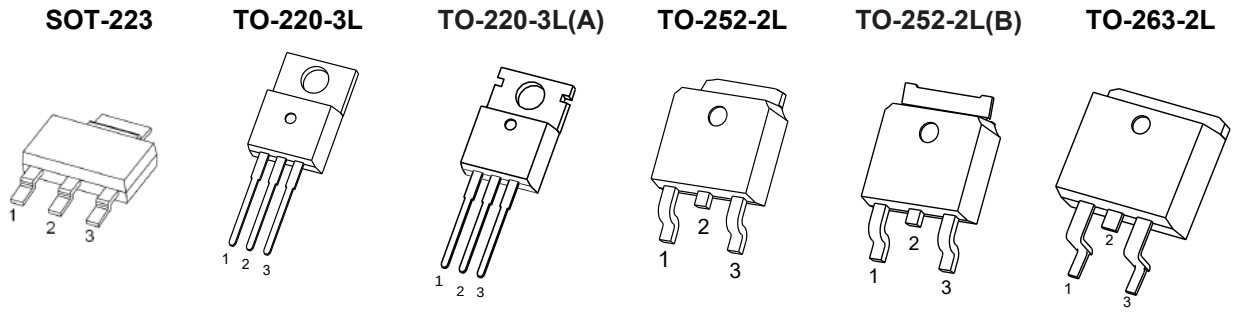
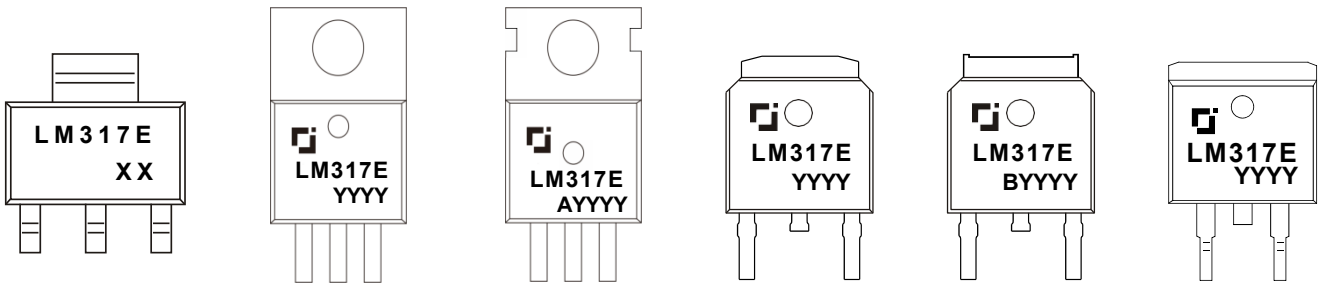


Figure 5-1. Package Top View

PIN NAME	LM317E				I / O	DESCRIPTION
	SOT-223	TO-220-3L/ TO-220-3L(A)	TO-252-2L/ TO-252-2L(B)	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.

5.2 Marking Information



SOT-223 **TO-220-3L** **TO-220-3L(A)** **TO-252-2L** **TO-252-2L(B)** **TO-263-2L**

"LM317E" : Device number.

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

6 Specifications

6.1 Absolute Maximum Ratings

(over operating free-air temperature range, unless otherwise specified)(1)

CHARACTERISTIC			SYMBOL	VALUE	UNITS
Maximum Input-to-output differential voltage			V_{IN} - V_{OUT}	40	V
Programmable output voltage range			V_{OUT}	37	
Maximum power dissipation	LM317E	SOT-223	$P_{D\ Max}$	Internally Limited(2)	W
		TO-220-3L/TO-220-3L(A)			
		TO-252-2L/TO-252-2L(B)			
		TO-263-2L			
Maximum junction temperature			$T_{J\ Max}$	150	℃
Storage temperature			T_{stg}	-65 ~ 150	℃
Soldering temperature & time			T_{solder}	260°C, 10s	-

(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.

6.2 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	℃
Operating ambient temperature	T_A	-	-(3)	-	℃

(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.

6 Specifications

6.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge(4)	Human body model	$V_{ESD-HBM}$	8000	V

(4) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body mode (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 mode (MM) is based on the JESD22-A115-A test standard and uses a 200pF capacitor to discharge directly to each pin of the device.

6.4 Thermal Information

THERMAL METRIC(5)	SYMBOL	LM317E		UNIT
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	**SOT-223**	**TO-220-3L/TO-220-3L(A)**	°C/W
		100.0	66.7	
		TO-252-2L/TO-252-2L(B)	**TO-263-2L**	
		80.0	62.5	
Junction-to-case thermal resistance	$R_{\Theta JC}$	**SOT-223**	**TO-220-3L/TO-220-3L(A)**	°C/W
		27.0	5.5	
		TO-252-2L/TO-252-2L(B)	**TO-263-2L**	
		14.5	5.5	
Maximum power dissipation for continuous operation	$P_{D\ Ref}$	**SOT-223**	**TO-220-3L/TO-220-3L(A)**	W
		1.00	1.50	
		TO-252-2L/TO-252-2L(B)	**TO-263-2L**	
		1.25	1.60	

(5) Thermal metric is measured in still air with T_A = 25°C and installed on a 1 in^2 FR-4 board covered with 2 ounces of copper.

6 Specifications

6.5 Electrical Characteristics

LM317E (V_{IN} - V_{OUT} = 5.0V, I_{OUT} = 500mA, C_{IN} = 1μF, C_{OUT} = 1μF, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS[6]			MIN.	TYP.[7]	MAX.	UNIT
Line regulation	LNR[8]	V_{IN} - V_{OUT} = 3.0 to 40V		T_J = 25°C	-	0.01	0.02	%/V
				T_J = 0 to 125°C	-	0.02	0.07	
Load regulation	LDR	I_{OUT} = 10 to 1500mA	V_{OUT} < 5.0V	T_J = 25°C	-	8.0	25	mV
				T_J = 0 to 125°C	-	20	70	
			V_{OUT} ≥ 5.0V	T_J = 25°C	-	0.1	0.5	%·V_{OUT}
				T_J = 0 to 125°C	-	0.3	1.5	
ADJUST terminal current	I_{ADJ}	-		T_J = 25°C	-	50	100	μA
Change in ADJUST terminal current	ΔI_{ADJ}	V_{IN} - V_{OUT} = 2.5 to 40V I_{OUT} = 10 to 1500mA		T_J = 25°C	-	0.2	5.0	μA
Reference voltage	V_{REF}	V_{IN} - V_{OUT} = 3.0 to 40V I_{OUT} = 10 to 1500mA		T_J = 25°C	1.20	1.25	1.30	V
Line regulation of reference voltage	LNR V_{REF}	V_{IN} - V_{OUT} = 3.0 to 40V		T_J = 25°C	-	0.02	0.07	%/V
Load regulation of reference voltage	LDR V_{REF}	I_{OUT} = 10 to 1500mA	V_{OUT} < 5.0V	T_J = 25°C	-	20	70	mV
			V_{OUT} ≥ 5.0V	T_J = 25°C	-	0.3	1.5	%·V_{OUT}
Output voltage temperature stability	ΔV_{OUT} / V_{OUT}	-		T_J = 0 to 125°C	-	1.0	-	%
Minimum load current to maintain regulation	$I_{OUT\ MIN}$	V_{IN} - V_{OUT} = 40V		T_J = 0 to 125°C	-	3.5	10	mA
Maximum output current	$I_{OUT\ MAX}$	V_{IN} - V_{OUT} ≤ 15V		T_J = 0 to 125°C	1.5	2.2	-	A
		V_{IN} - V_{OUT} = 40V		T_J = 25°C	0.15	0.4	-	
Output noise voltage (percentage of V_{OUT})	eN	f = 10 to 10kHz		T_J = 25°C	-	0.003	-	%
Ripple rejection	RR	f = 100Hz	C_{ADJ}[9] = 0μF	T_A = 25°C	-	60	-	dB
			C_{ADJ}[9] = 10μF		-	65	-	
		f = 1kHz	C_{ADJ}[9] = 0μF		-	64	-	
			C_{ADJ}[9] = 10μF		-	75	-	

Note:

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

(7) Typical numbers represent the most likely norm.

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

$$LDR = \frac{\Delta V_{OUT}}{V_{OUT} \times \Delta I_{OUT}}$$

where, ΔV_{OUT} is the variation of the output voltage, ΔV_{IN} is the variation of the input voltage.

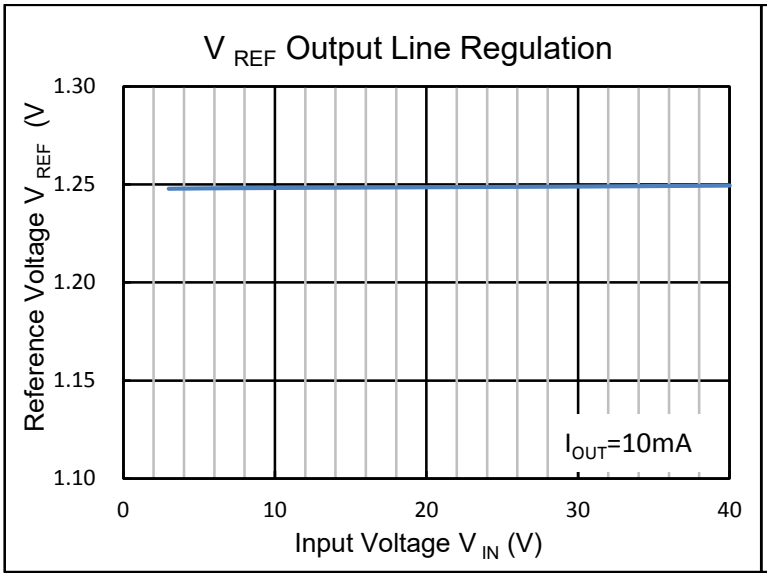
(9) C_{ADJ} is connected between the ADJ terminal and GND.

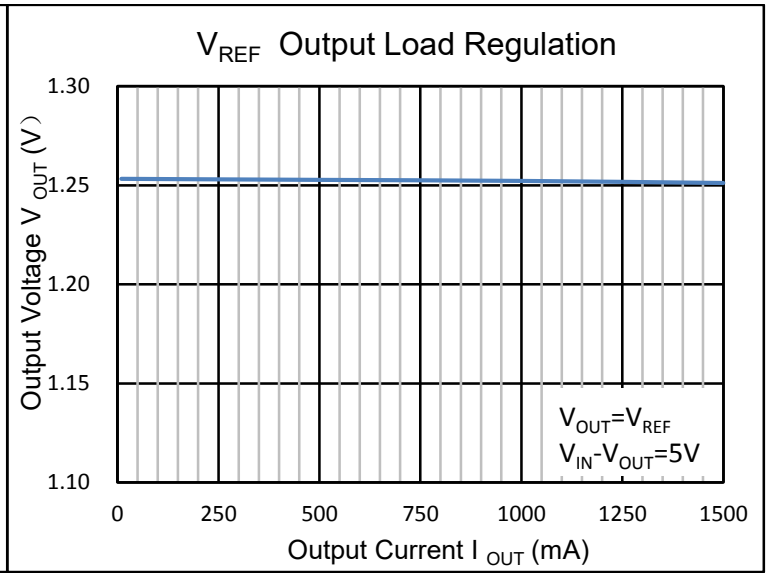
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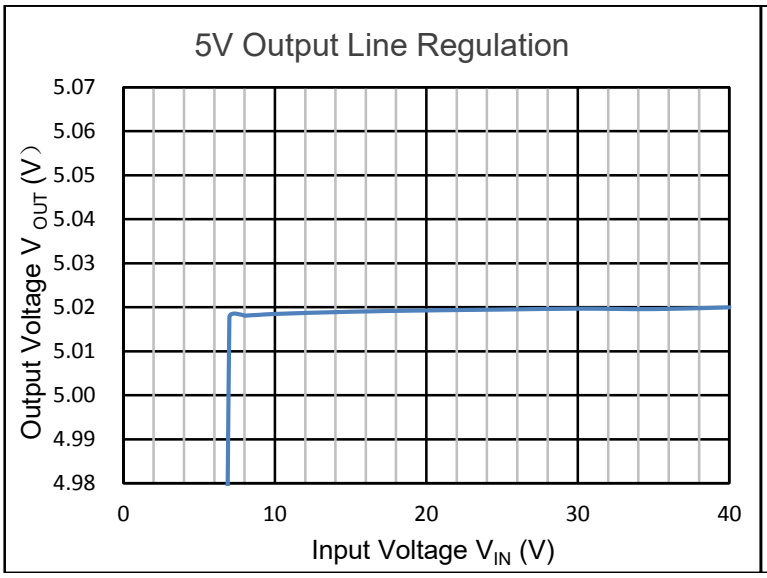
6 Specifications

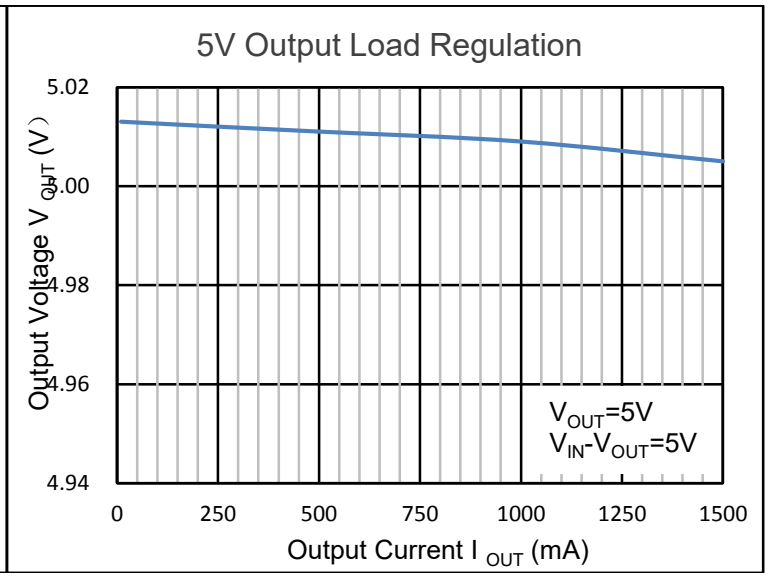
6.6 Typical Characteristics

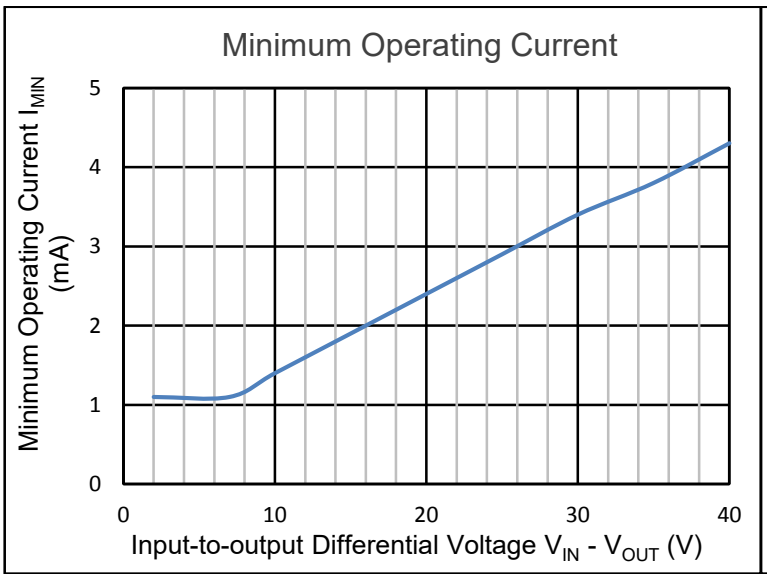
LM317E (C_{IN} = 0.1μF, C_{OUT} = 1μF, unless otherwise specified)

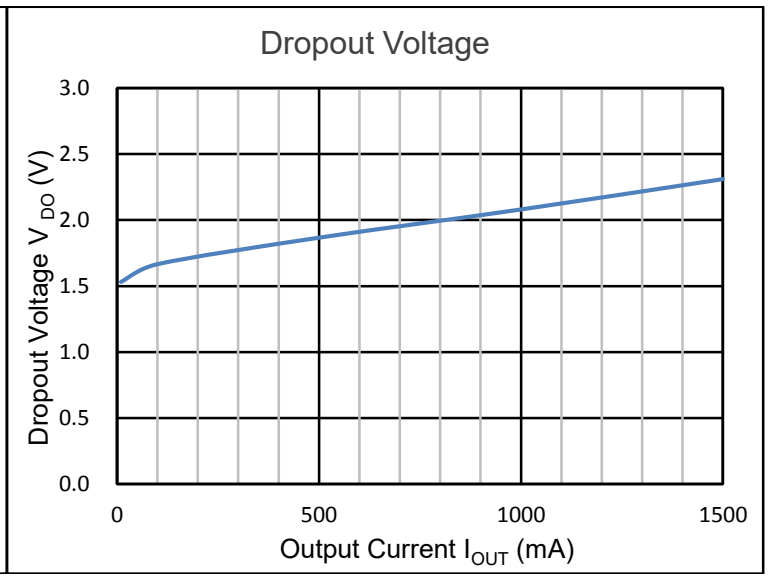








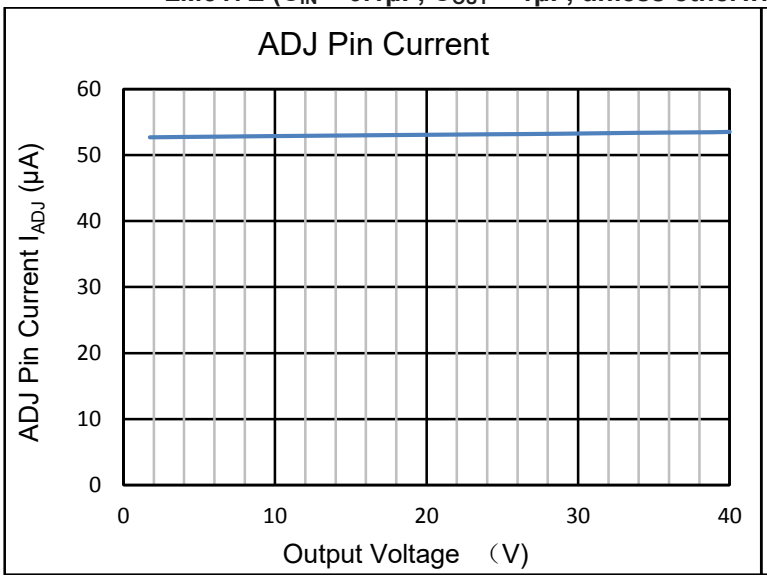


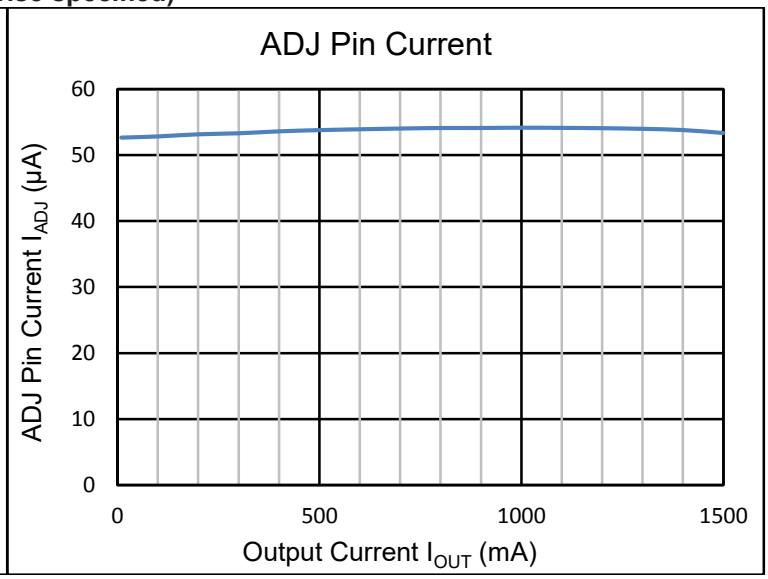


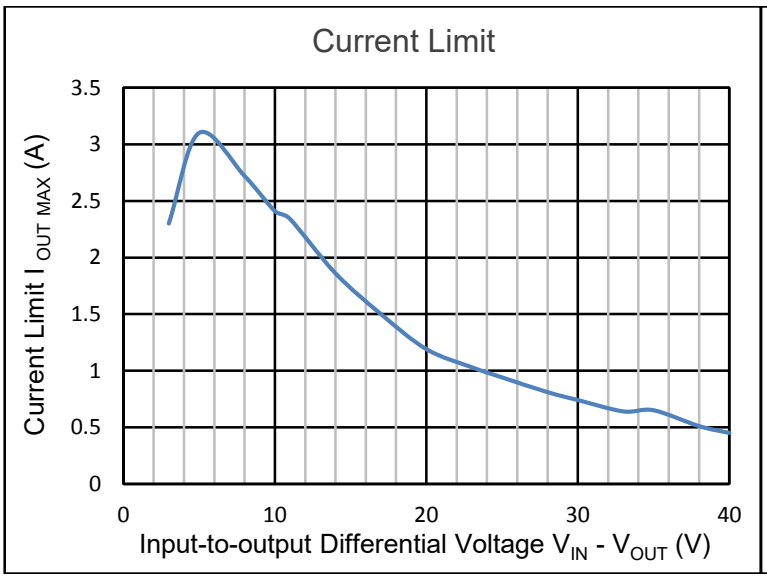
6 Specifications

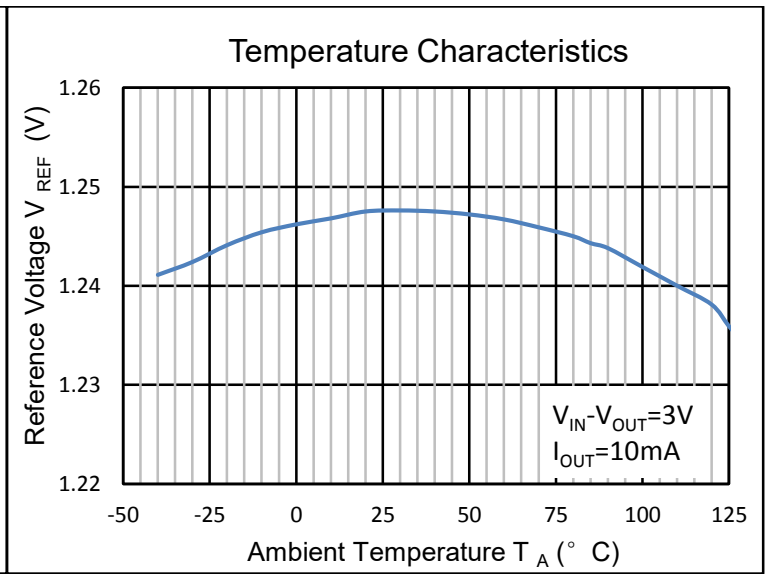
6.6 Typical Characteristics (continued)

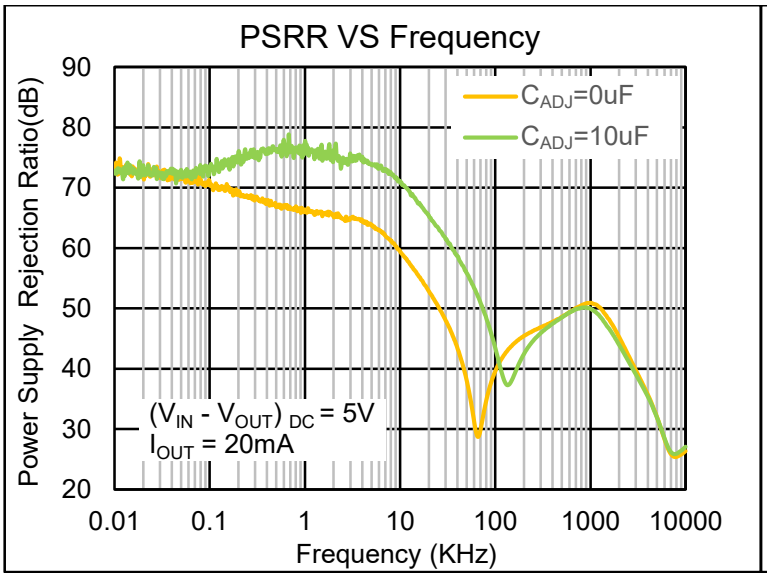
LM317E (C_{IN} = 0.1μF, C_{OUT} = 1μF, unless otherwise specified)

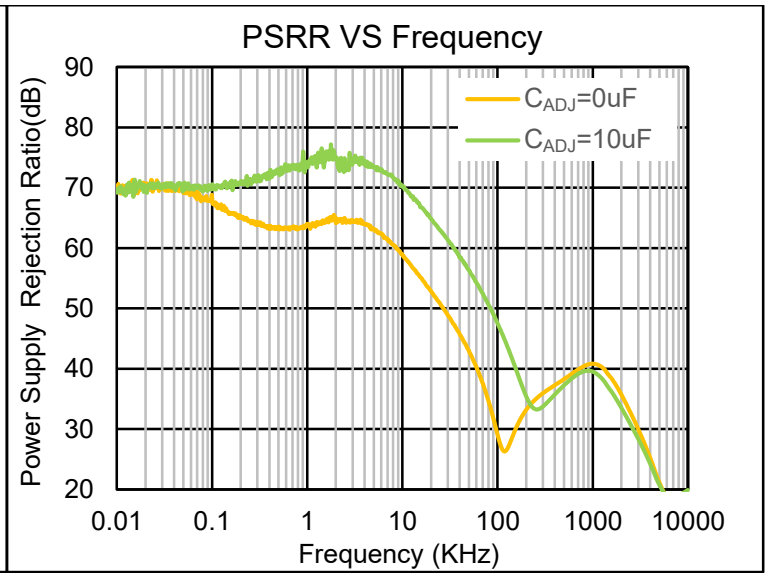












6 Specifications

6.6 Typical Characteristics (continued)

LM317E (C_{IN} = 0.1μF, C_{OUT} = 1μF, unless otherwise specified)

Load Transient (V_{OUT} = 5V, V_{IN} - V_{OUT} = 5V, I_{OUT} = 20 ~ 1500mA, CH 1 : V_{OUT} , CH 4 : I_{OUT})

C_{ADJ} = 0μF



C_{ADJ} = 10μF



Power up Response (V_{OUT} = 5V, V_{IN} = 0 ~ (V_{OUT} +5V), I_{OUT} = 20mA, CH 1 : V_{IN} , CH 2 : V_{OUT})

C_{ADJ} = 0μF



C_{ADJ} = 10μF

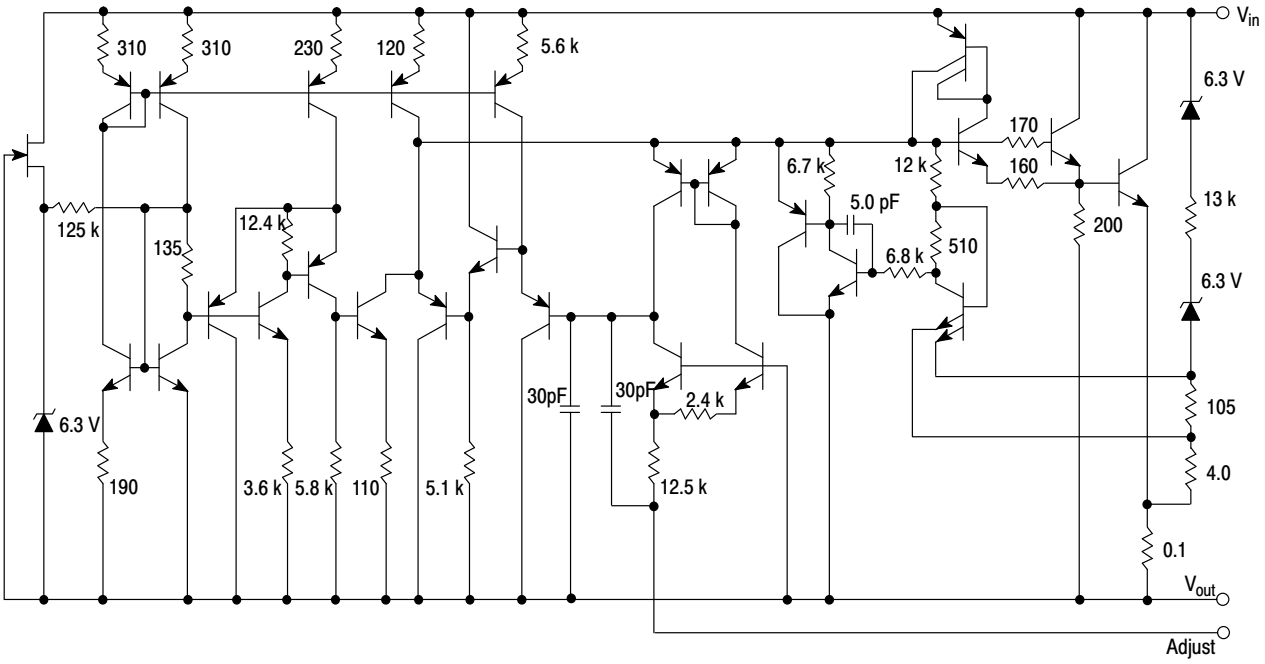


7 Detailed Description

7.1 Description

The LM317E is a three terminal positive voltage regulator with adjustable output. By setting two peripheral resistors, the output voltage range of the device can be set from 1.25V to 37V, and the current up to 1.5A can be provided. The LM317E integrates current limiting, thermal overload protection and safe operation area protection internally, and corresponding capacitors can be added to improve transient response. Therefore, the device is very easy to use, which is difficult to achieve with a standard three terminal regulator.

7.2 Representative Schematic Diagram



LM317E contains 29 transistors.

7.3 Feature Description

Comprehensive Overload Protection

The LM317E 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 LM317E 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 LM317E will be released from the protection state and output normally.

When the output is short circuited, the LM317E will also enter the protection state and maintain the current at a low level. If the short circuit is removed, the LM317E will release the protection status and output normally.

7 Detailed Description

7.3 Feature Description (continued)

Minimum Operating Current

The LM317E 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 LM317E 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.

Programmable Feedback

The device will provide 1.25V (typical value) bias 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 LM317E is a three terminal positive voltage regulator with adjustable output. During normal operation, the LM317E will maintain a reference voltage V_{REF} of 1.25V between OUT and ADJ This reference voltage V_{REF} is converted from R_1 to programming current I_{PROG} (see Figure 7-1), 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 100μA and keep constant. Therefore, in most applications, this item can be negligible.

Since the LM317E requires the minimum operating current and the minimum operating voltage difference for normal operation, the corresponding conditions shall be met in the circuit design.

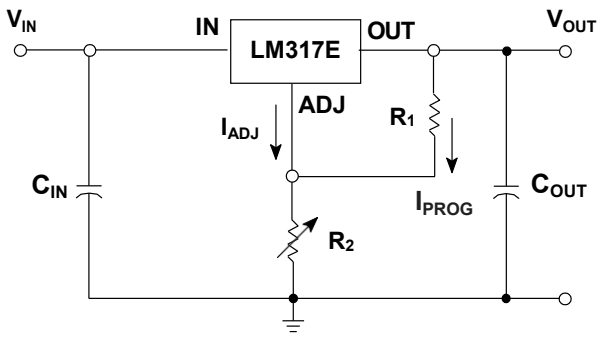


Figure 7-1. Basic Normal Operation

8 Application and Implementation

8.1 Application Information

Load Regulation

Following the following design recommendations can help the LM317E 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 0.1μF disc or 1.0μF tantalum input bypass capacitor C_{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_{ADJ} of 10μF (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 LM317E is stable with no output capacitance, like any feedback circuit, certain values of external capacitance can cause excessive ringing. An output capacitance C_{OUT} in the form of a 1.0μF tantalum or 25μF aluminum electrolytic capacitor on the output swamps this effect and insures stability. The C_{IN} and C_{OUT} should be placed as close to the corresponding device pins as possible.

When the LM317E is used as a reference voltage source instead of a peripheral resistor, it is recommended to use an input capacitor of 1.0μF 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 8-1 shows the LM317E with the recommended protection diodes for output voltages in excess of 25V or high capacitance values (C_{OUT} > 25μF, C_{ADJ} > 10μF). Diode D_1 prevents C_{OUT} from discharging through the IC during an input short circuit. Diode D_2 protects against capacitor C_{ADJ} discharging through the IC during an output short circuit. The combination of diodes D_1 and D_2 prevents C_{ADJ} from discharging through the IC during an input short circuit.

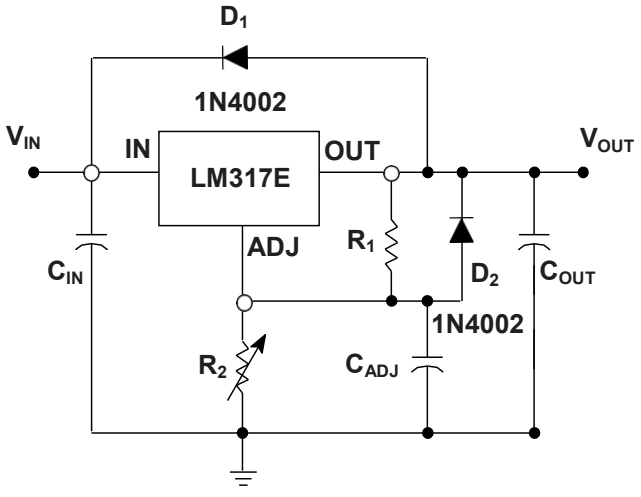


Figure 8-1. Voltage Regulator with Protection Diodes

8 Application and Implementation

8.2 System Example

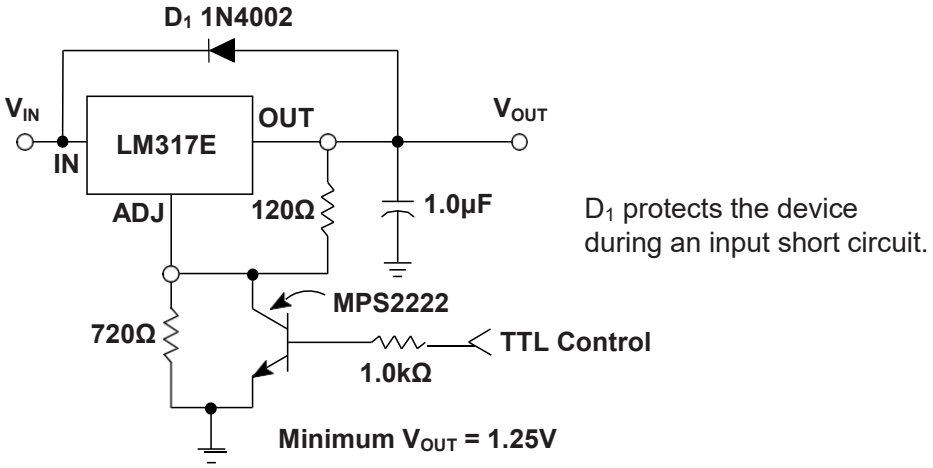


Figure 8-2. 5V Electronic Shutdown Regulator

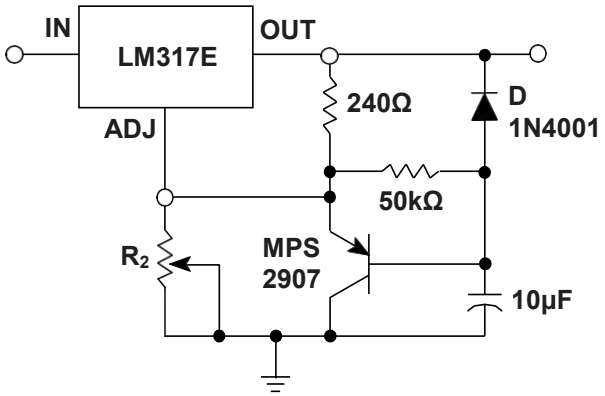
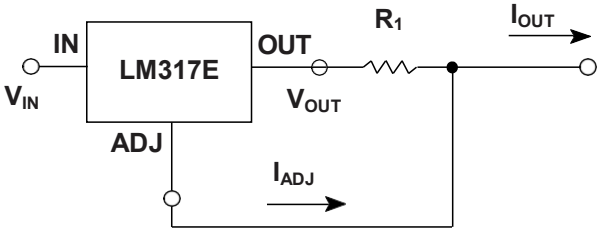


Figure 8-3. Slow Turn-On Regulator



$$I_{OUT} = \left(\frac{V_{REF}}{R_1} + I_{ADJ}\right) \approx \frac{1.25V}{R_1}$$

Figure 8-4. Current Regulator

NOTE

The application information in this section is not part of the data sheet component specification, and SZCJ 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.

9 Notes and Revision History

9.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of SZCJ https: ***www.***szcjsemi.com for more details.

9.2 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.

9.3 Revision History

June 2025: released LM317E Series rev - 1.0.

10 Orderable, Mechanical, and Packaging Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser based versions of this data sheet, refer to the left hand navigation.

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Orderable Information

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
LM317E	LM317E-G3W	SOT-223	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	Active
	LM317E-TBW	TO-220-3L	-40 ~ 125°C	RoHS & Green	N/A	Tube 3000 Units / Rail	Active
	LM317E-TBW	TO-220-3L(A)	-40 ~ 125°C	RoHS & Green	N/A	Tube 3000 Units / Rail	Active
	LM317E-TFW	TO-252-2L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	Active
	LM317E-TFW	TO-252-2L(B)	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	Active
	LM317E-TGW	TO-263-2L	-40 ~ 125°C	RoHS & Green	N/A	Tape and Reel 800 Units / Reel	Active
Others	-	-	-	-	-	-	Customized

Note:

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

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

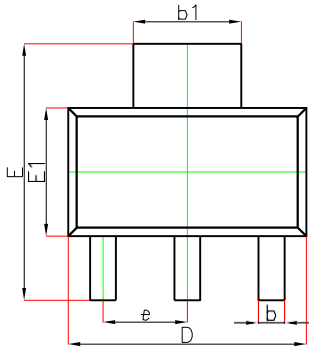
SORT: Specifically defined as follows:

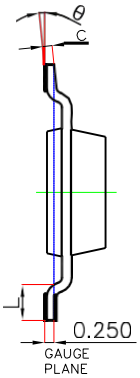
Active: Recommended for new products;
Customized: Products manufactured to meet the specific needs of customers;
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;
NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;
Obsolete: The device has been discontinued.

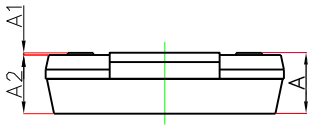
Mechanical Information

SOT-223 Mechanical Information

SOT-223 Outline Dimensions

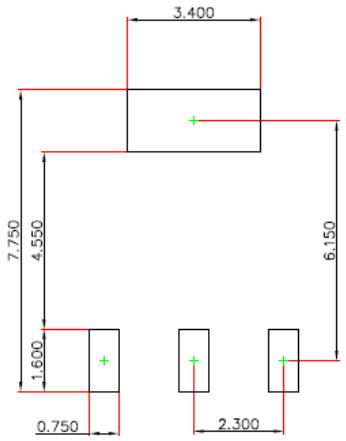






Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	——	1.800	——	0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
b1	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	6.700	7.300	0.264	0.287
E1	3.300	3.700	0.130	0.146
e	2.300(BSC)		0.091(BSC)	
L	0.750	——	0.030	——
θ	0°	10°	0°	10°

SOT-223 Suggested Pad Layout



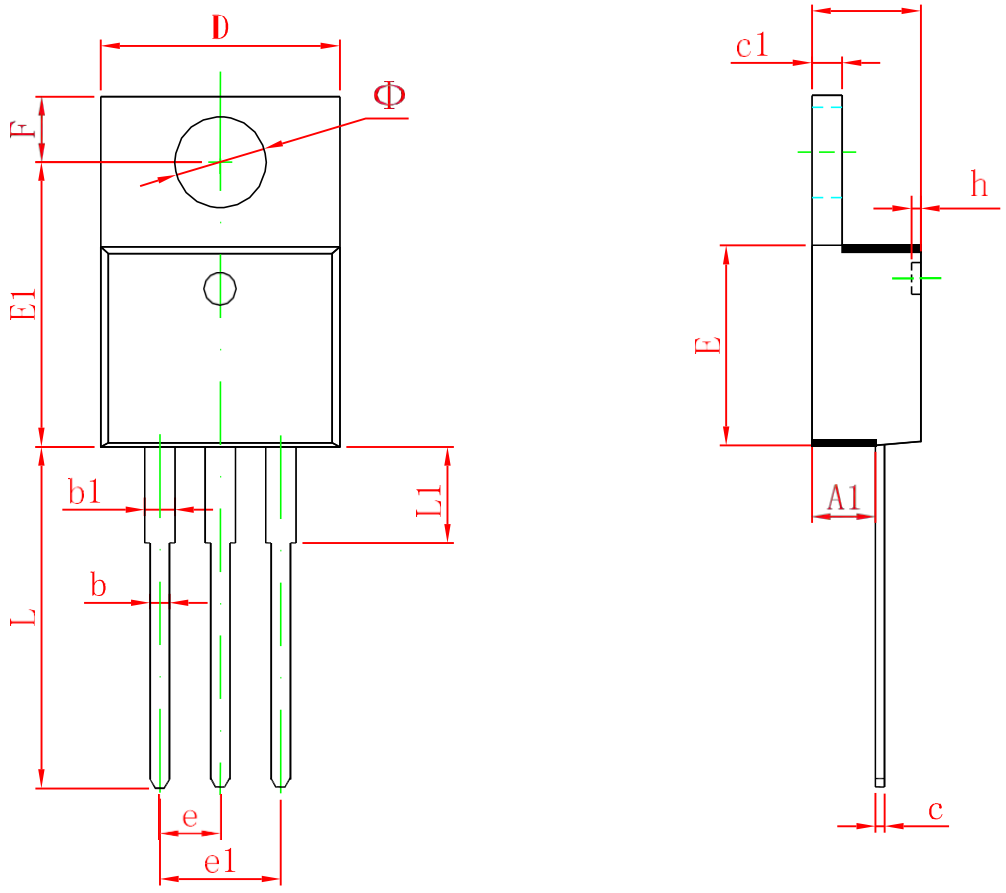
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purposes only.

Mechanical Information

TO-220-3L Mechanical Information

TO-220-3L Outline Dimensions

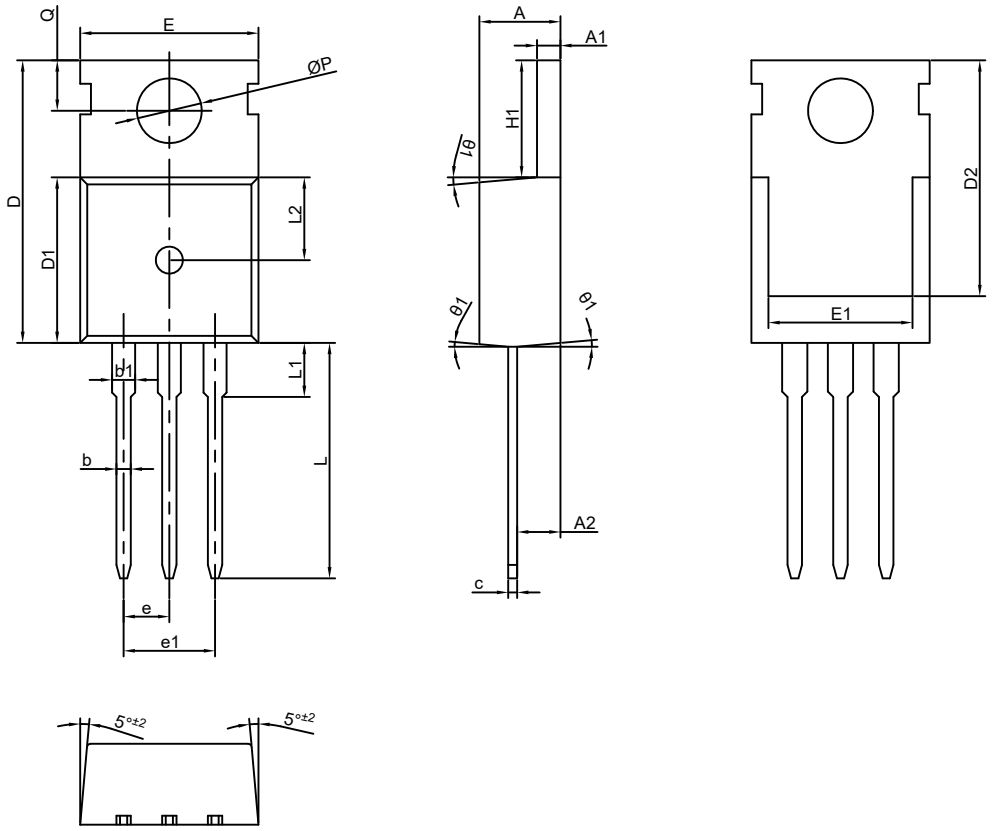


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	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

Mechanical Information

TO-220-3L(A) Mechanical Information

TO-220-3L(A) Outline Dimensions

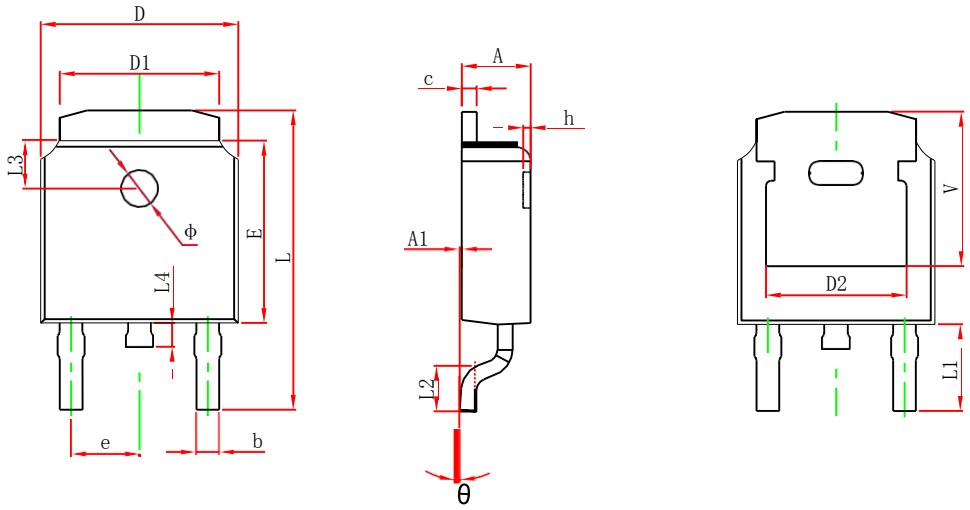


SYMBOL	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.400	4.500	4.600	0.173	0.177	0.181
A1	1.270	1.300	1.330	0.050	0.051	0.052
A2	2.300	2.400	2.500	0.091	0.094	0.098
b	0.700	-	0.900	0.028	-	0.035
b1	1.300	-	1.370	0.051	-	0.054
c	0.450	0.500	0.600	0.018	0.020	0.024
D	15.300	15.700	16.100	0.602	0.618	0.634
D1	9.100	9.200	9.300	0.358	0.362	0.366
D2	12.900	13.100	13.300	0.508	0.516	0.524
E	9.700	9.900	10.200	0.382	0.390	0.402
E1	7.700	7.900	8.100	0.303	0.311	0.319
e	2.450 Bsc.			0.096 Bsc.		
e1	5.08 Bsc.			0.200 Bsc.		
H1	6.300	6.500	6.700	0.248	0.256	0.264
L	12.780	13.080	13.380	0.503	0.515	0.527
L1	-	-	3.500	-	-	0.138
b2	4.06 Ref.			0.160 Bsc.		
ØP	3.550	3.600	3.650	0.140	0.142	0.144
Q	2.730	-	2.870	0.107	-	0.113
θ1	3°	5°	7°	3°	5°	7°

Mechanical Information

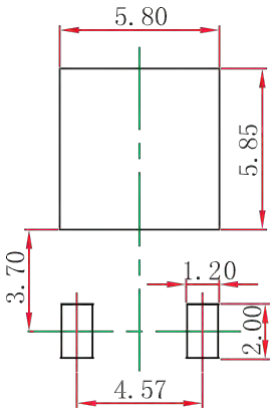
TO-252-2L Mechanical Information

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



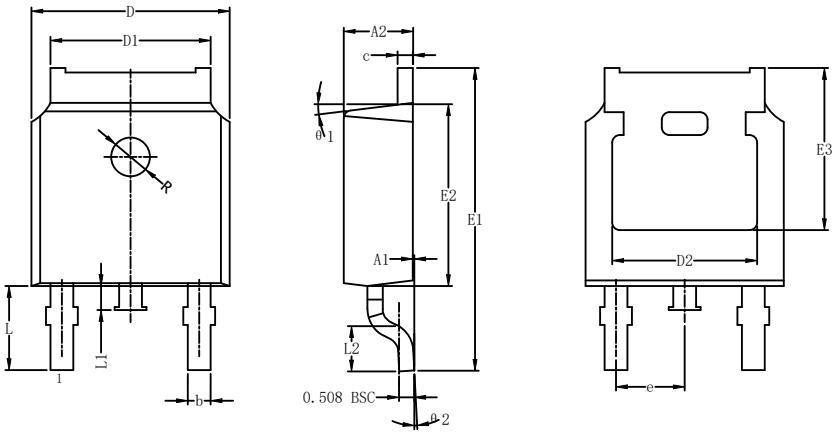
Note:

4. Controlling dimension: in millimeters.
5. General tolerance: ±0.05mm.
6. The pad layout is for reference purposes only.

Mechanical Information

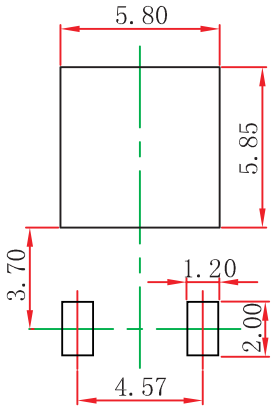
TO-252-2L(B) Mechanical Information

TO-252-2L(B) Outline Dimensions



SYMBOL	DISMENSIONS IN MILLIMETERS			DISMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.000	-	0.127	0.000	-	0.005
A2	2.200	2.300	2.400	0.087	0.091	0.094
b	0.660	0.760	0.860	0.026	0.030	0.034
c		0.508 REF.			0.508 REF.	
D	6.500	6.600	6.700	0.256	0.260	0.264
D1	5.100	5.320	5.460	0.201	0.209	0.215
D2		4.830 REF.			4.830 REF.	
e		2.286 BSC.			2.286 BSC.	
E1	9.700	9.900	10.100	0.382	0.390	0.398
E2	6.000	6.100	6.200	0.236	0.240	0.244
E3		5.200 REF.			5.200 REF.	
L		2.850 REF.			2.850 REF.	
L1	0.600	0.800	1.000	0.024	0.031	0.039
L2	1.400	1.500	1.700	0.055	0.059	0.067
R		1.300 REF.			1.300 REF.	
θ1		7° REF.			7° REF.	
θ2	0°	-	10°	0°	-	10°

TO-252-2L Suggest Pad Layout



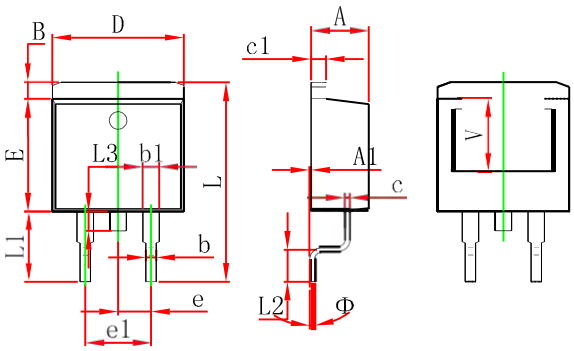
NOTE:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purposes only.

Mechanical Information

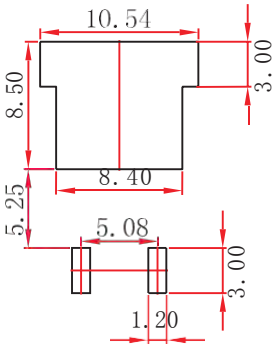
TO-263-2L Mechanical Information

TO-263-2L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimension s 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.	0.220R	EF.

TO-263-2L Suggest Pad Layout



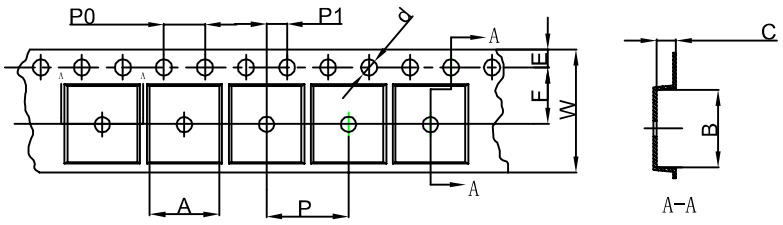
Note:

7. Controlling dimension: in millimeters.
8. General tolerance: ±0.05mm.
9. The pad layout is for reference purposes only.

Packaging Information

SOT-223 Tape and Reel Information

SOT-223 Embossed Carrier Tape

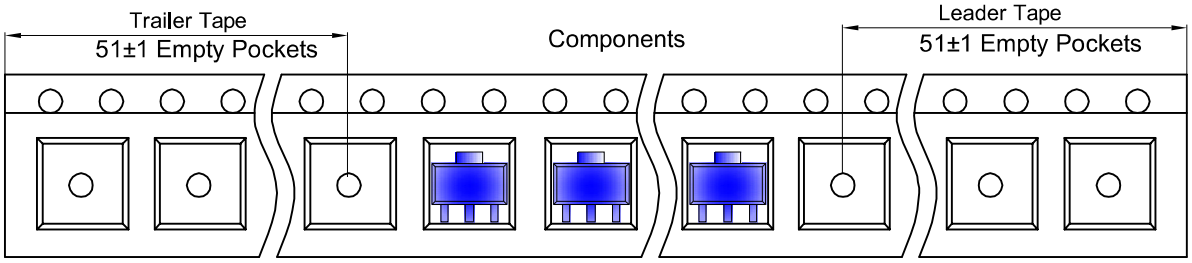


Packaging Description:

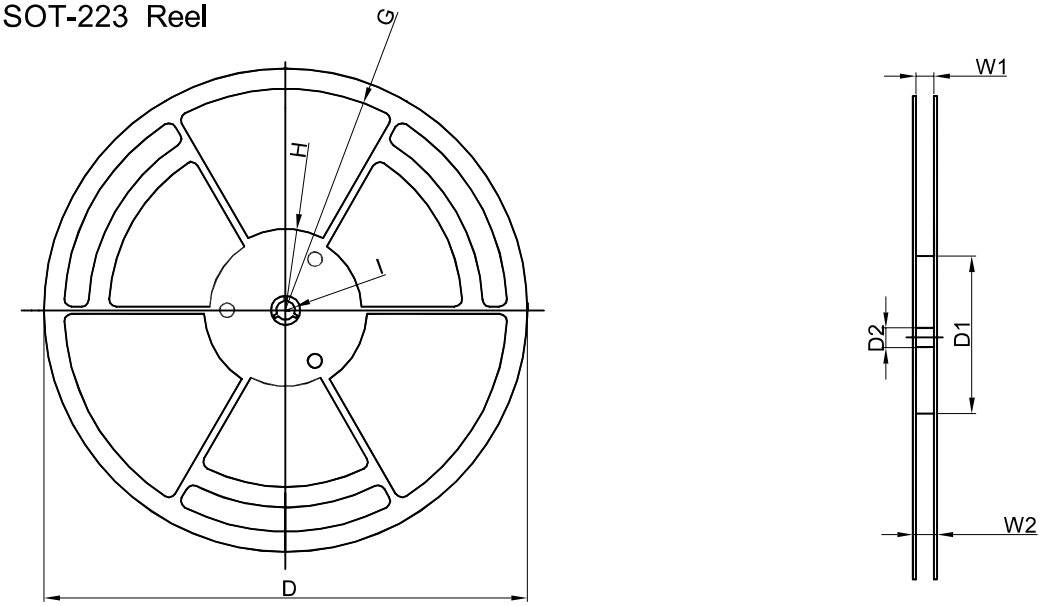
SOT-223 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts 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	φ330.00	100.00	13.00	R151.00	R56.00	R6.50	12.40	17.60

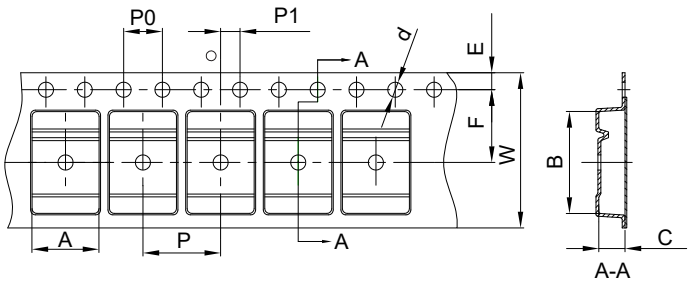
Reel	**Reel Size**	**Box**	**Box Size (mm)**	**Carton**	**Carton Size (mm)**
2,500 pcs	13 inch	5,000 pcs	360×360×65	25,000 pcs	378×358×382

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Packaging Information

TO-252-2L Tape and Reel Information

TO-252-2L Embossed Carrier Tape

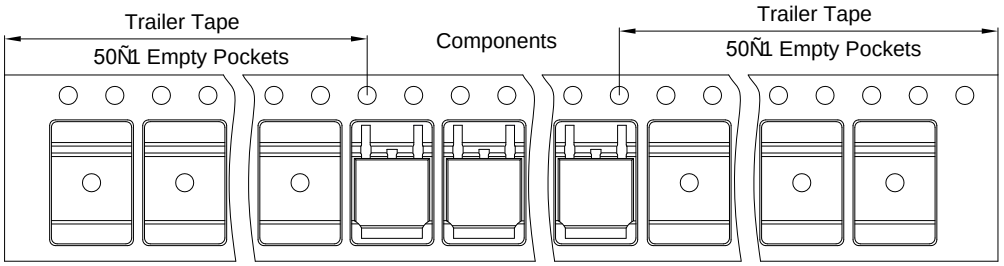


Packaging Description:

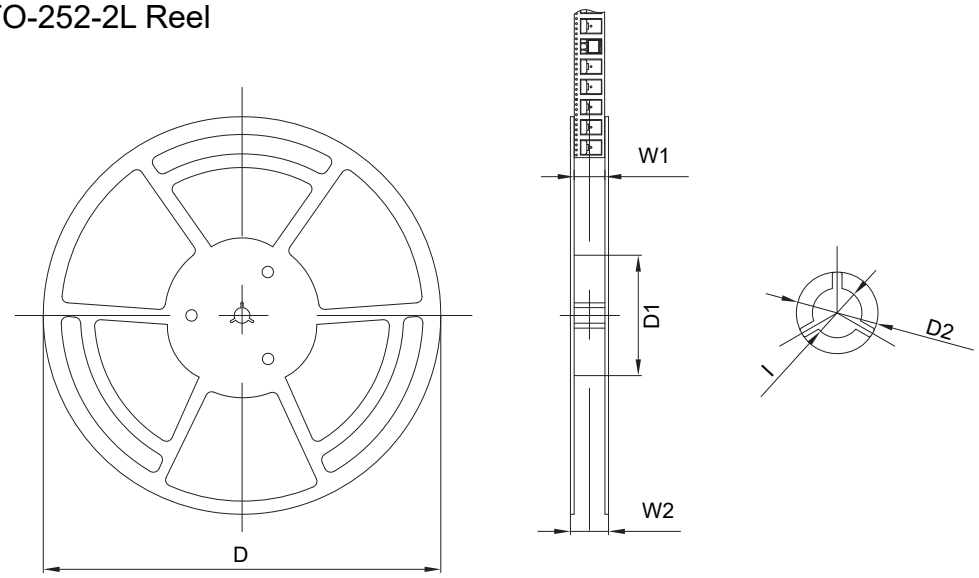
TO-252-2L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Hear Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2500 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	Φ1.55	1.75	7.50	4.00	8.00	2.00	16.00

TO-252-2L Tape Leader and Trailer



TO-252-2L Reel



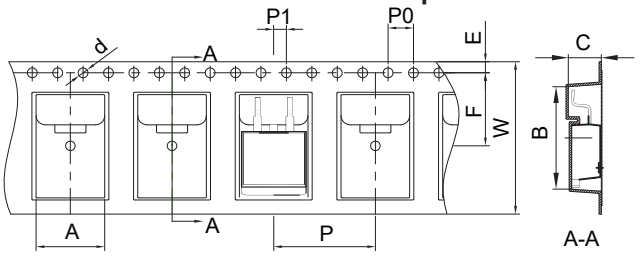
Dimensions are in millimeter						
Reel	D	D1	D2	W1	W2	I
13" Dia	330.00	100.00	Φ21.00	16.40	21.40	Φ13.00

Reel	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
2500 pcs	13 inch	5000 pcs	360×360×65	25000 pcs	378×358×382

Packaging Information

TO-263-2L Tape and Reel Information

TO-263-2L Embossed Carrier Tape

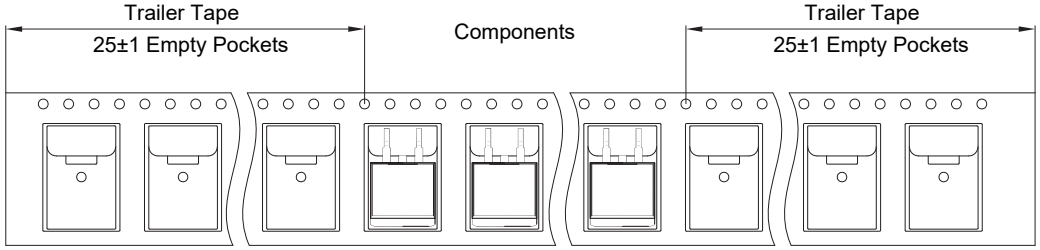


Packaging Description:

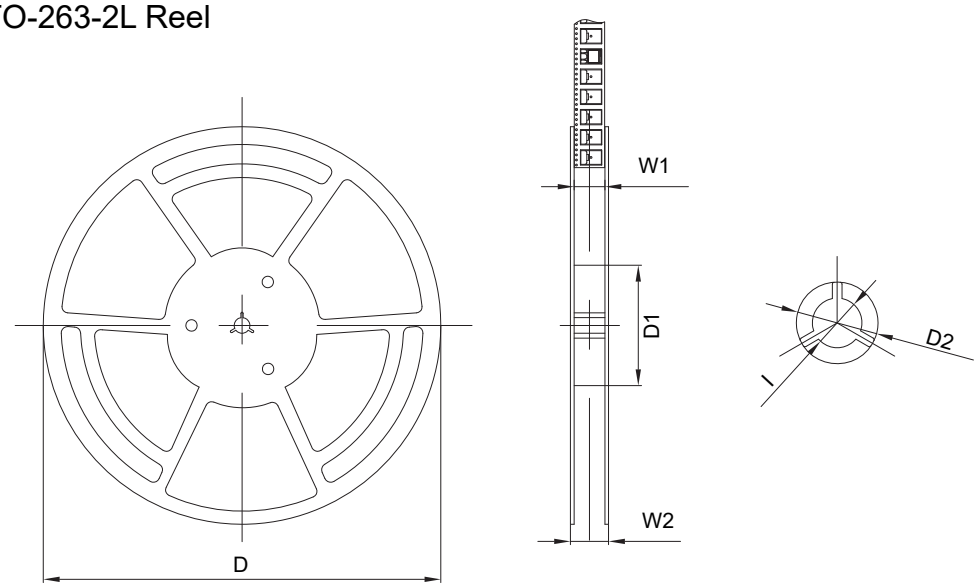
TO-263-2L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Hear Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts 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	10.80	16.13	5.21	Φ1.55	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	D	D1	D2	W1	W2	I
13" Dia	330.00	100.00	Φ21.00	24.40	30.40	Φ13.00

Reel	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
800 pcs	13 inch	1600 pcs	360×360×65	8000 pcs	378×358×382