JIANGSU CHANGJING ELECTRONICS TECHNOLOGY CO., LTD

Wide Input Voltage Three Terminal Positive Voltage Regulator

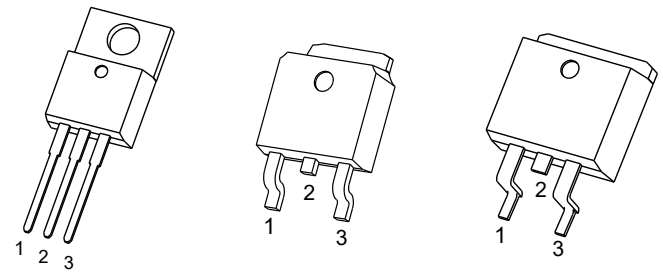
CJ7805B Three Terminal Voltage Regulator

1 Introduction

The CJ7805B is a three-terminal positive voltage regulator. It is designed for a variety of applications, including local on-card adjustment.

The CJ7805B is internally integrated with current limit, thermal shutdown protection and safety zone compensation, making it almost immune to the impact of output overload. If sufficient heat dissipation is provided, these regulators can provide up to 1A output current.

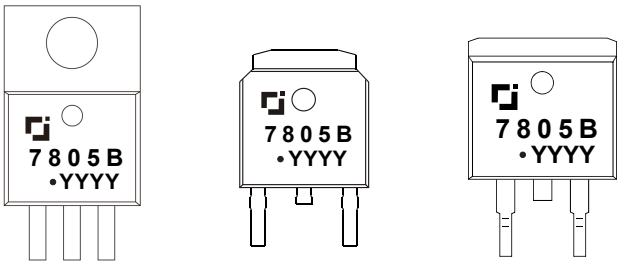
2 Available Packages



TO-220-3L **TO-252-2L** **TO-263-2L**

(Pin 1: IN, Pin 2: GND, Pin 3: OUT)

Figure 2-1. Pin Configuration



TO-220-3L **TO-252-2L** **TO-263-2L**

"•" Solid Dot: Green molding compound device.
YYYY: Code for production.

Figure 2-2. Marking Information

3 Features

- Output Current:
  up to 1A with good power dissipation
- Fixed 5.0V Output Voltage
- Output Voltage Tolerance:
  ±2% at T_J = 25°C
  ±4% over the Operating T_J
- Operating Junction Temperature:
  -40 ~ 125°C
- Output Transistor SOA Protection
- Short Circuit Protection
- Thermal Shutdown Protection

4 Applications

- High Efficiency Linear Regulator
- Microprocessor Power Supply
- Mother Board
- Post Regulation for Switching Supply

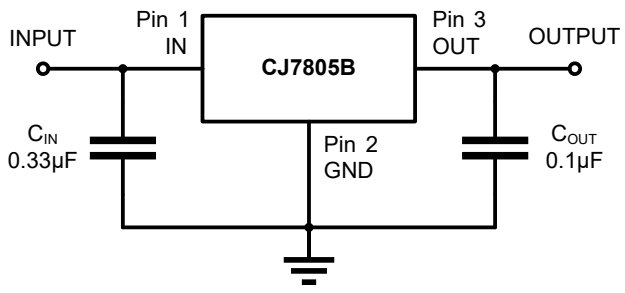


Figure 4-1. Typical Application Circuit

5 Specifications

5.1 Absolute Maximum Ratings

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

CHARACTERISTIC			SYMBOL	VALUE	UNIT
Maximum input voltage range(2)			$V_{IN\ MAX}$	36	V
Maximum output current			$I_{OUT\ MAX}$	1.0	A
Maximum power dissipation	CJ7805B	TO-220-3L	$P_{D\ Max}$	Internally Limited(3)	W
		TO-252-2L			
		TO-263-2L			
Maximum junction temperature			$T_{J\ Max}$	150	°C
Storage temperature			T_{stg}	-65 ~ 150	°C
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) All voltages are with respect to network ground terminal.

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

5.2 Recommend Operating Conditions

PARAMETER	SYMBOL	MIN.	NOM.	MAX.	UNIT
Input voltage range	V_{IN}	7.5	-	25	V
Operating junction temperature	T_J	-40	-	125	°C
Operating ambient temperature	T_A	-	-	-	°C

5 Specifications

5.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge(4)	Human body model	$V_{ESD-HBM}$	6000	V
	Machine model	V_{ESD-MM}	500	

(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 JESD22-115-A test standard and uses a 200pF capacitor to discharge directly to each pin of the device.

5.4 Thermal Information

THERMAL METRIC(5)	SYMBOL	CJ7805B			UNIT
		TO-220-3L	TO-252-2L	TO-263-2L	
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	65.1	78.9	62.3	°C/W
Junction-to-case thermal resistance	$R_{\Theta JC}$	5.4	5.8	5.3	°C/W
Reference maximum power dissipation for continuous operation	$P_{D\ Ref}$	1.53	1.60	1.60	W

(5) T_A = 25°C, all numbers are typical, and apply for packages soldered directly onto a PCB board in still air without extra heat dissipation pads.

5 Specifications

5.5 Electrical Characteristics

CJ7805B (V_{IN} = 10V, I_{OUT} = 500mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS(6)	MIN.	TYP.	MAX.	UNIT
Output voltage	V_{OUT}	T_J = 25°C	4.90	5.00	5.10	V
		I_{OUT} = 5mA to 1A, V_{IN} = 7.5V to 20V, T_J = -40 to 125°C, P_D ≤ 15W	4.80	5.00	5.20	
Line regulation	ΔV_{RLINE}	V_{IN} = 7.5V to 20V, I_{OUT} = 500mA	-	25	50	mV
Load regulation	ΔV_{RLOAD}	V_{IN} = 10V, I_{OUT} = 5mA to 1.5A	-	20	50	mV
Quiescent current	I_Q	V_{IN} = 10V, T_J = -40 to 125°C, I_{OUT} = 0mA	-	3.2	6.0	mA
Quiescent current change	ΔI_Q	V_{IN} = 10V, I_{OUT} = 5mA to 1A	-	0.1	0.8	mA
		V_{IN} = 8V to 25V, I_{OUT} = 500mA	-	0.3	0.8	
Output voltage temperature coefficient	ΔV_{OUT} / ΔT	-	-	0.4	-	mV/°C
	ΔV_{OUT} / (V_{OUT} × ΔT)		-	80	-	ppm/°C
Output noise voltage	V_N	f = 10Hz to 100kHz, T_A = 25°C	-	10	-	μV / V_{OUT}
Ripple rejection	RR	f = 120Hz, V_{IN} = 8V to 18V, I_{OUT} = 500mA	-	70	-	dB
Dropout voltage(7)	V_D	I_{OUT} = 1A	-	2.0	-	V
Output resistance	R_{OUT}	f = 1kHz	-	10	-	mΩ
Short circuit current	I_{SC}	V_{IN} = 35V, T_A = 25°C		50	-	mA
Peak current	I_{PK}	V_{IN} = 10V	-	2.2	-	A

Note:

(6) Pulse test technology is used to make T_J as close to T_A as possible. Thermal effects must be considered separately.

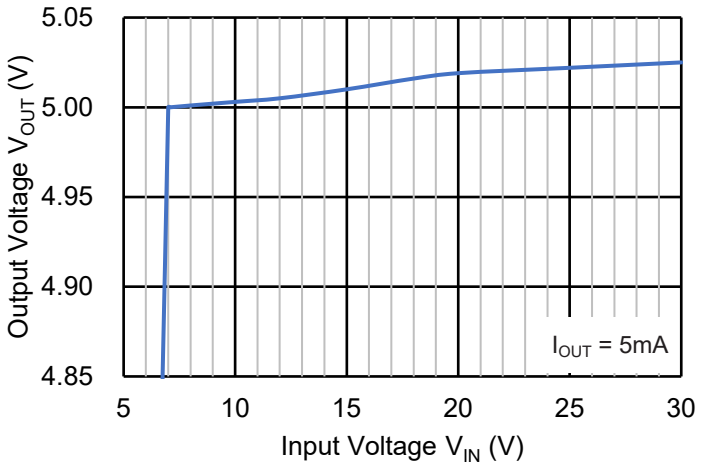
(7) The difference of output voltage and input voltage when input voltage is decreased gradually till output voltage equals to 95% of V_{OUT}.

5 Specifications

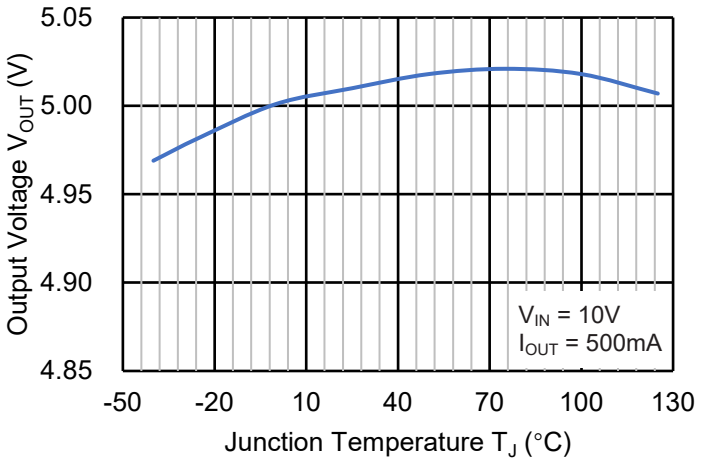
5.6 Typical Characteristics

CJ7805B (C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25°C, unless otherwise specified)

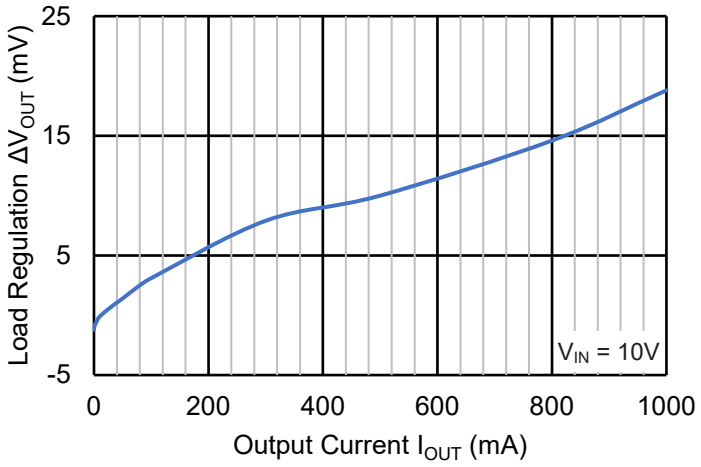
Line Regulation



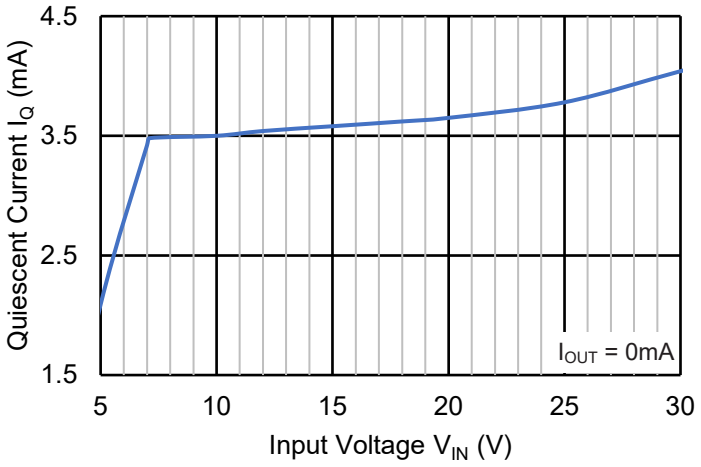
Temperature Characteristics



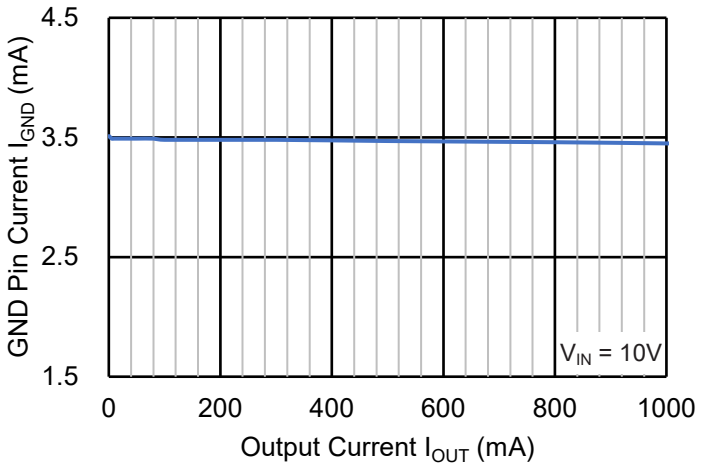
Load Regulation



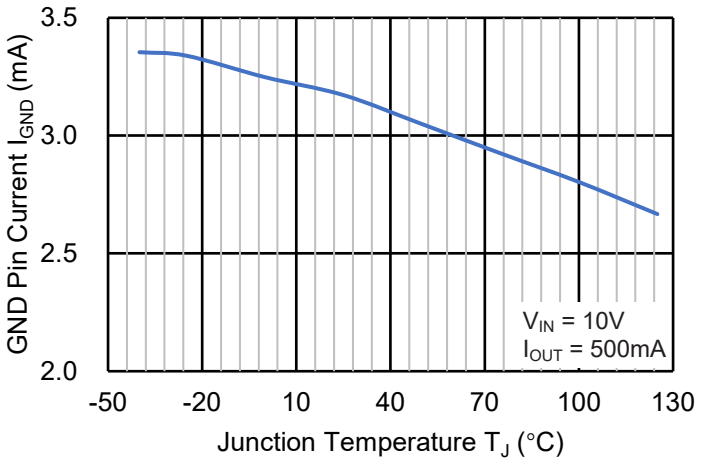
Quiescent Current



GND Pin Current



GND Pin Current

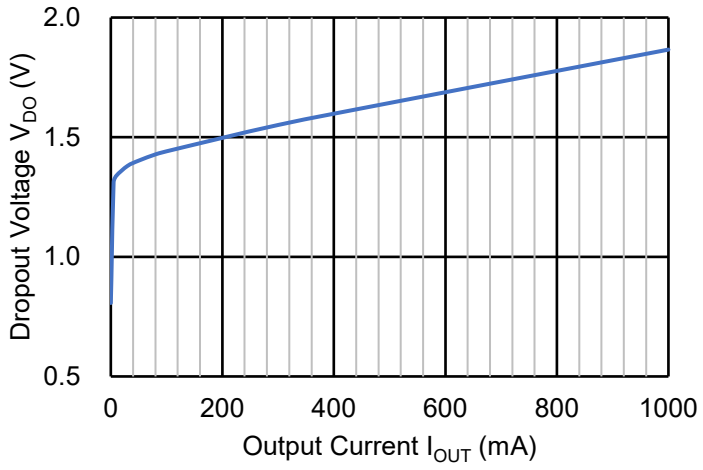


5 Specifications

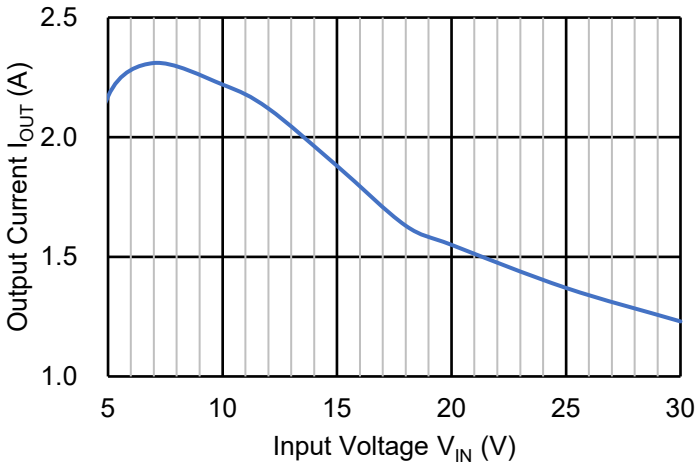
5.6 Typical Characteristics (continued)

CJ7805B (C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25°C, unless otherwise specified)

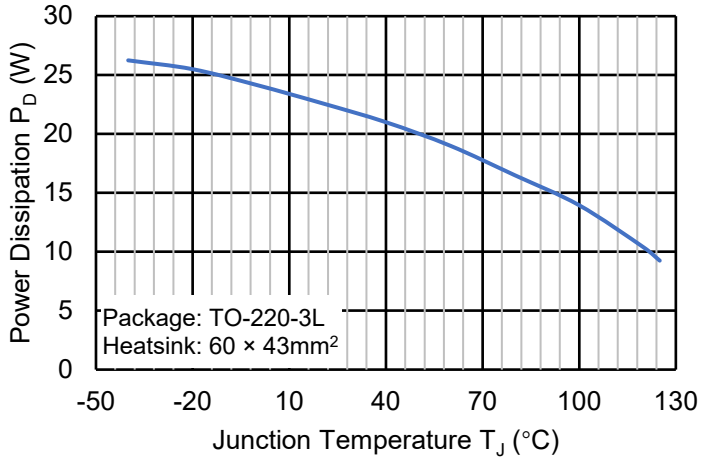
Dropout Voltage



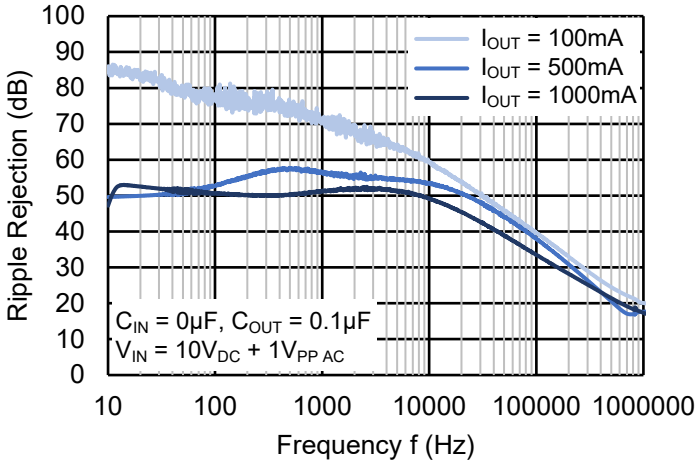
Output Current Limit



Power Dissipation



Ripple Rejection



5 Specifications

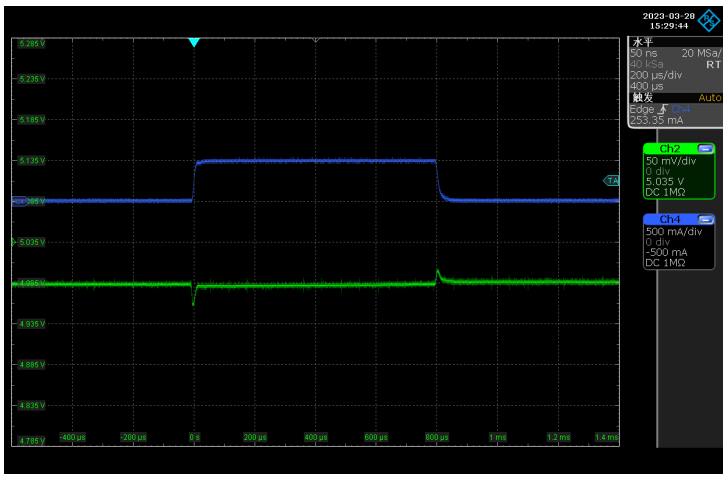
5.6 Typical Characteristics (continued)

CJ7805B (C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25°C, unless otherwise specified)

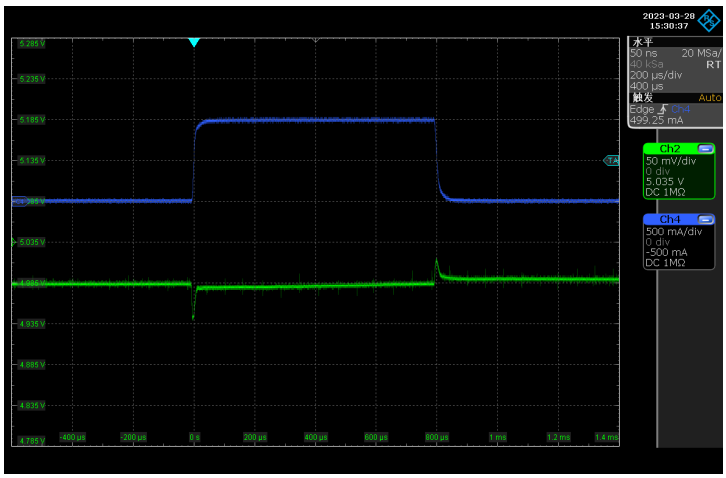
Load Transient

V_{IN} = 10V, CH_2: V_{OUT}, CH_4: I_{OUT}

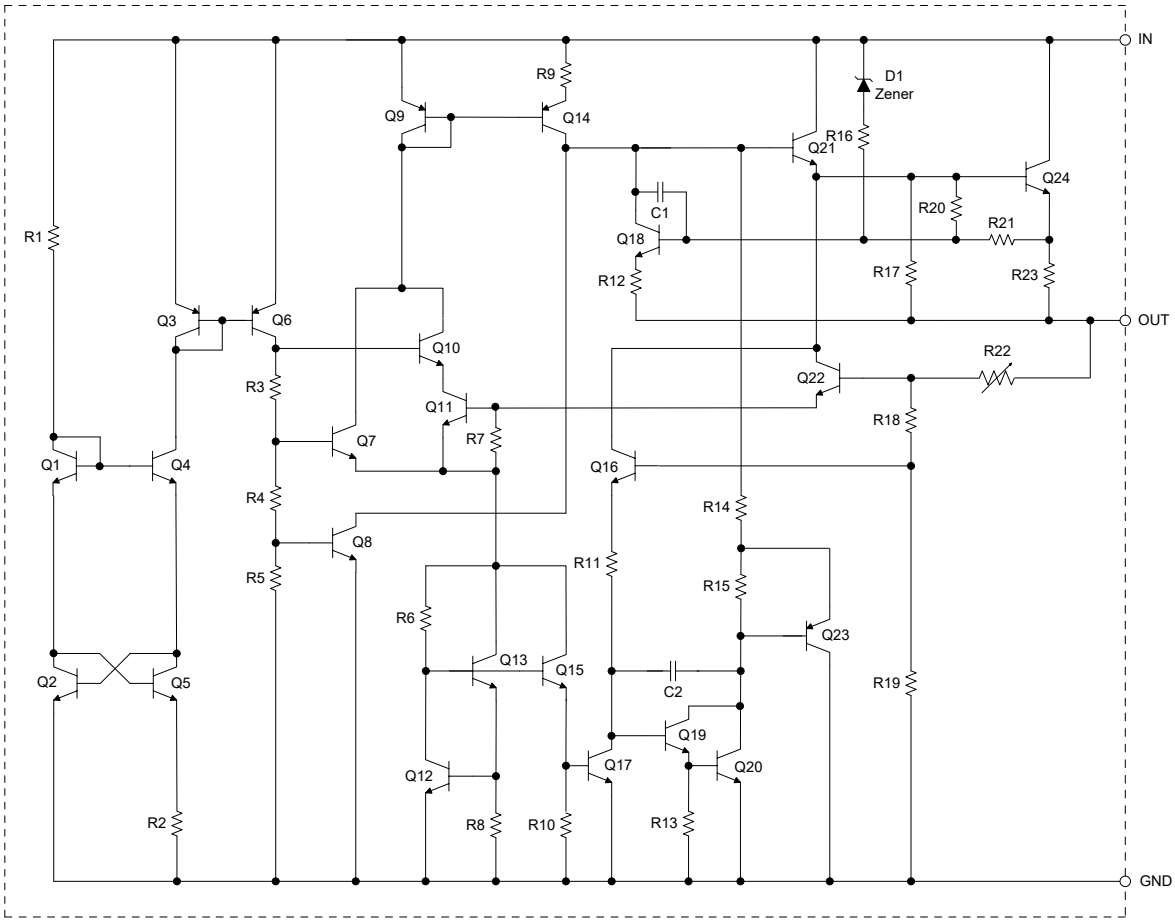
I_{OUT} = 10 to 500mA



I_{OUT} = 10 to 1000mA



5.7 Representative Schematic Diagram



6 Application and Implementation

6.1 Risk Alert and Precautions

The CJ7805B series is designed for thermal protection, output SOA protection and built-in current limit. However, like any IC regulator, precautions are necessary to reduce the possibility of accidental damage to the regulator. The following describes the possible causes of unit damage or failure:

Electrostatic Discharge (ESD) and Instantaneous Electrical Surge

Electrostatic discharge (ESD) is a common near-field hazard source. It comes from many sources, such as human body, mechanical equipment and electronic components themselves. ESD can cause phenomena such as high voltage and instantaneous high current in a very short time, resulting in damage or failure of the device due to electric shock.

In some applications, a short duration but high energy spike may occur in the circuit, including peak voltage and surge current. They may cause unstable operation of the regulator, accelerated aging and potential hazards, and even damage or malfunction of the regulator. These peaks are usually more likely to occur in hot-plug, switch inductance, heavy-load, and other types of circuits.

Precautions for ESD and Electrical Surge

In the practical application of the circuit, adopting the following suggestions can reduce the possibility of device failure due to the above reasons to a certain extent.

Using TVS:

Place a TVS between the IN and GND of the voltage regulator to absorb the peak voltage that may be generated due to ESD or other reasons. As shown in Figure 6-4;

Using Input Resistor:

Place a resistor with appropriate resistance in series before the IN of the voltage regulator, which can help the voltage regulator share part of the energy in case of surge. The resistance value of the resistance should not be too large. The specific resistance value depends on the application of the circuit. Generally, the resistance value of this resistance does not exceed 20Ω. As shown in Figure 6-5.

Using Electrolytic Capacitor:

For the application circuit using the low ESR multilayer ceramic capacitor (MLCC) type input capacitor, the LC resonant voltage spike caused by hot plugging or power transmission line inductance can be suppressed by using RC suppression circuit for parallel connection of the input capacitor. A very simple method is to parallel a suitable electrolytic capacitor to the input capacitor. As shown in Figure 6-6. For most 100μF/25V electrolytic capacitor has an ESR of about 0.2Ω at 100kHz. This can completely suppress the overshoot phenomenon of the input and minimize the possibility of IC damage due to input voltage spikes.

Figure 6-1 and Figure 6-2 show the impact of not using electrolytic capacitor [Test circuit is shown in Figure 6-3] and using 100μF/25V electrolytic capacitor parallel to the input capacitor [Test circuit is shown in Figure 6-6] on suppressing surge voltage. As shown in Figure 6-1., when the input is powered on from 0 to 10V, a peak voltage of up to 23V (shown in the RED part) is generated in front of the input terminal of the device. When the electrolytic capacitor is used, as shown in Figure 6-2., the peak voltage generated by power on is effectively suppressed (shown in the GREEN part).

6 Application and Implementation

6.1 Risk Alert and Precautions (continued)

Test Condition: C_{IN} = 10μF (MLCC), C_{OUT} = 100μF, V_{IN} = 0 ~ 10V, I_{OUT} = 100mA, CH_1: V_{IN}, CH_2: V_{OUT}.

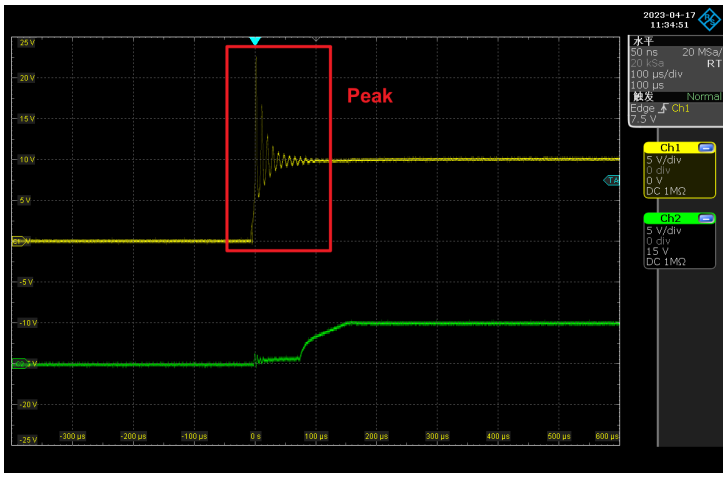


Figure 6-1. Test with the conventional circuit

[Test Circuit is shown in Figure 6-3]

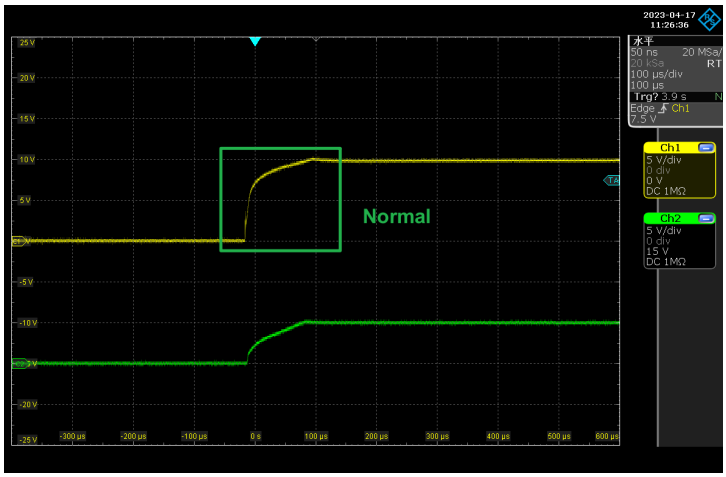


Figure 6-2. Test with the circuit that a 100μF/25V electrolytic capacitor parallel to the C_{IN}

[Test Circuit is shown in Figure 6-4]

For the CJ7805B, it is recommended that the peak voltage should not exceed 36V. **When the input voltage of the operating circuit may not meet the application conditions described above, it is recommended to adopt the circuit layout shown in Figure 6-3 to 6-4 in the circuit design.** During the power supply design process, the designer must inspect the application circuit to ensure that under no circumstances will the IC be damaged due to the reasons mentioned above.

Large Output Capacitance

The CJ7805B can obtain better transient response with the help of output capacitance. However, if the output capacitor is relatively large, the surge current generated by the charging of the output capacitor will also be large at the moment of power on of the regulator, and the large surge current passing through the regulator may damage the internal circuit. When the output capacitance is large, adopting the circuit design shown in Figure 6-4 will reduce the possibility of damage to the device due to large surge current to a certain extent. It is recommended that the selection of output capacitor should not exceed 20μF. **If the selection of output capacitor exceeds 20μF, it is recommended to adopt the circuit design in Figure 6-4 to reduce the possibility of accidental failure of the device due to large surge current during power on.**

6 Application and Implementation

6.2 Typical Application Circuits

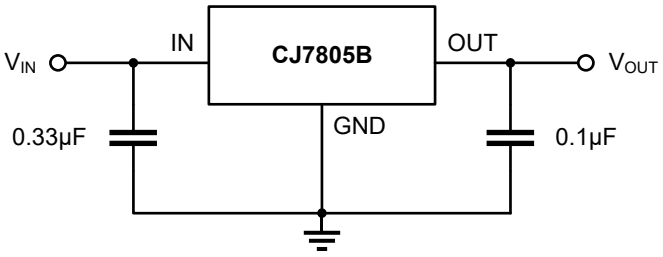


Figure 6-3. Conventional Circuit

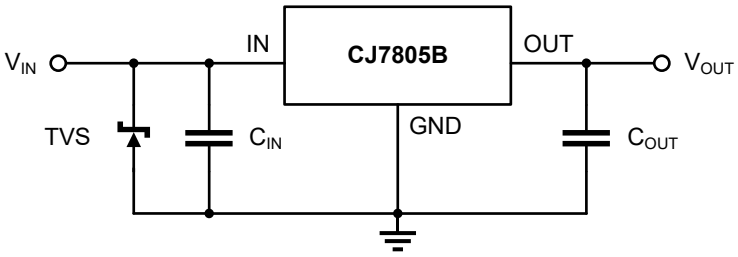


Figure 6-4. TVS is used at IN

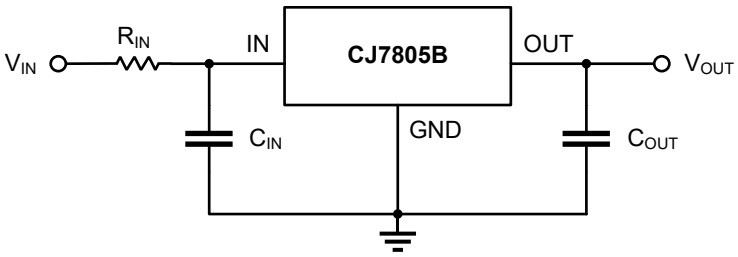


Figure 6-5. Resistance is used at IN

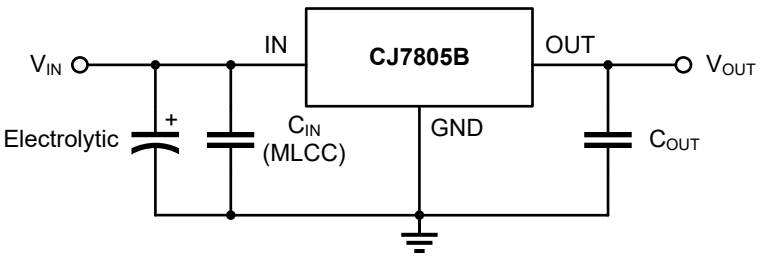


Figure 6-6. Electrolytic capacitor is used at IN

6.3 Bypass Capacitance Selection

A capacitance between IN and GND (C_{IN}) is required if the regulator is located far from the power supply filter. It is recommended to use a 0.33μF capacitor for C_{IN}, and the C_{IN} should be placed as close to the device IN pin and GND pin as possible.

It is recommended to use a 0.1μF capacitor between OUT and GND (C_{OUT}), and the C_{OUT} should be placed as close as possible between OUT and GND. The output capacitance can limit the high-frequency noise and help the device obtain the best stability and transient response.

The tolerance and temperature coefficient of the C_{IN} and C_{OUT} must be considered to ensure that the capacitor can work normally within the rated working ambient temperature and rated working conditions of the equipment.

It is recommended that the C_{OUT} should not exceed 20μF. When the C_{OUT} exceeds 20μF, it is recommended to use the circuit layout shown in Figure 9-2. See *Large Output Capacitance* for more details.

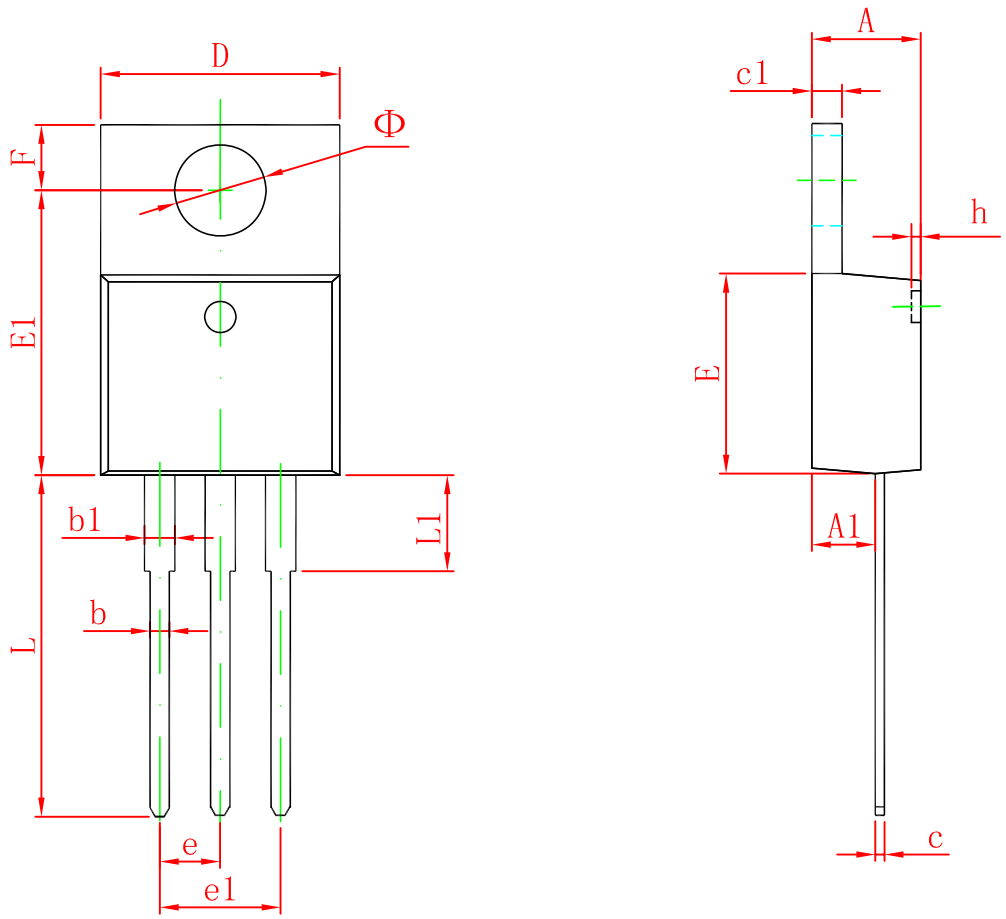
NOTE

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.

7 Mechanical Information

7.1 TO-220-3L Mechanical Information

TO-220-3L Outline Dimensions

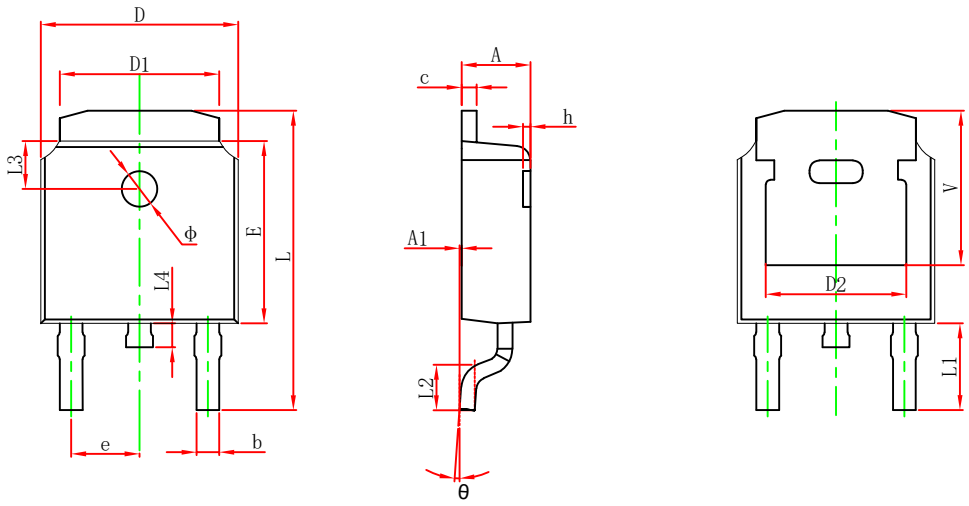


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460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

7 Mechanical Information

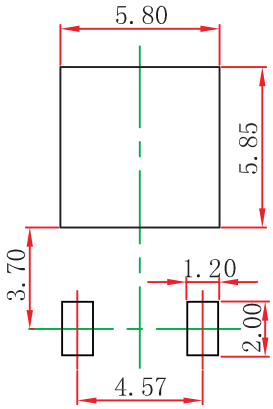
7.2 TO-252-2L Mechanical Information

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



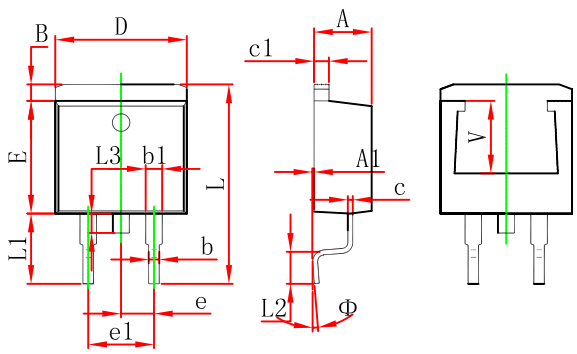
NOTE:

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

7 Mechanical Information

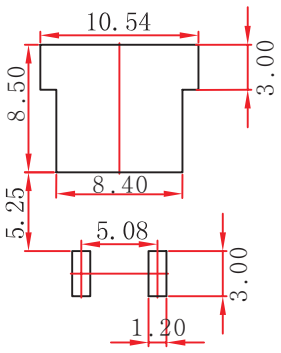
7.3 TO-263-2L Mechanical Information

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.		0.220REF.	

TO-263-2L Suggest Pad Layout



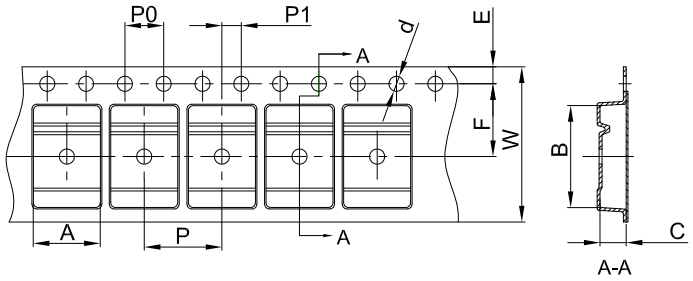
NOTE:

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

8 Packaging Information

8.1 TO-252-2L Tape and Reel Information

TO-252-2L Embossed Carrier Tape

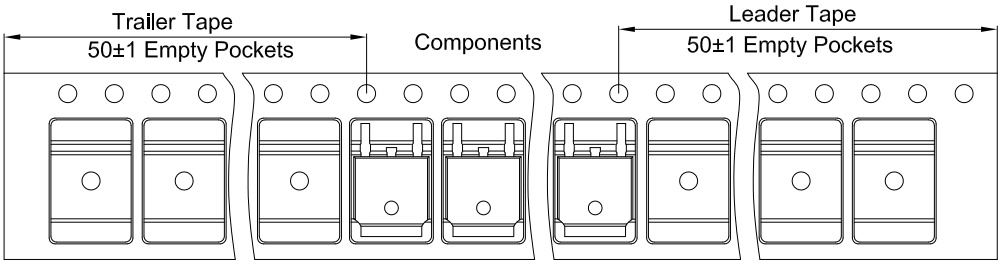


Packaging Description:

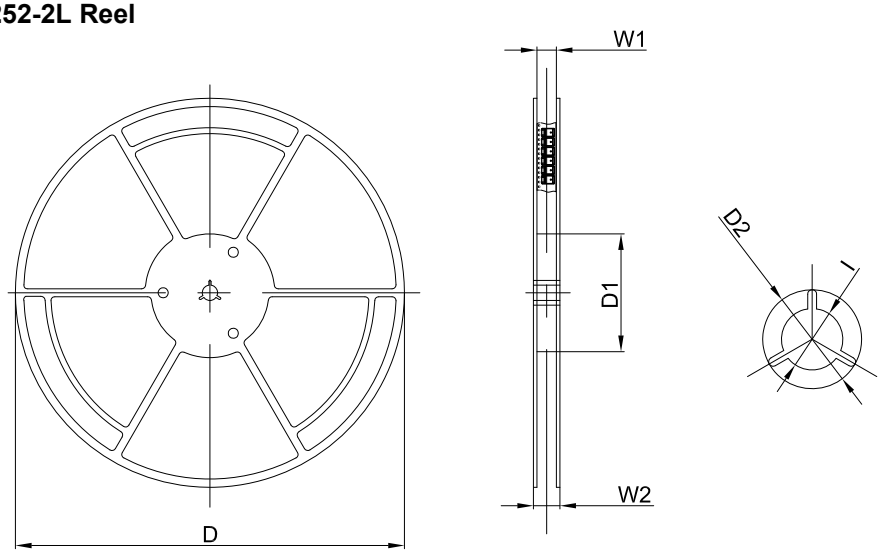
TO-252 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in 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	

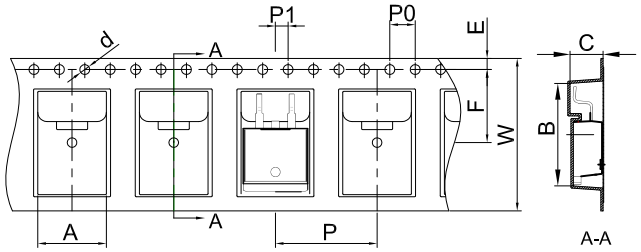
8 Packaging Information

8.2 TO-263-2L Tape and Reel Information

TO-263-2L Embossed Carrier Tape

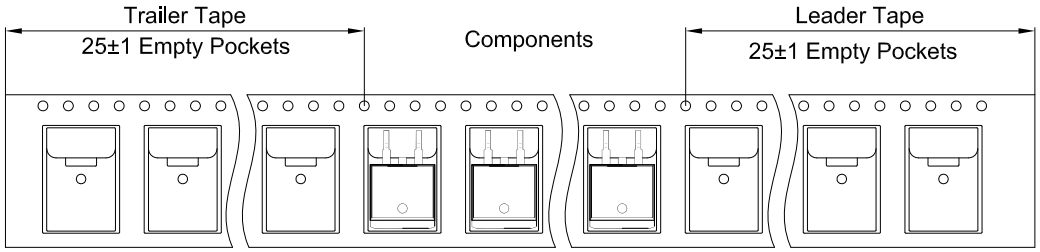
Packaging Description:

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).

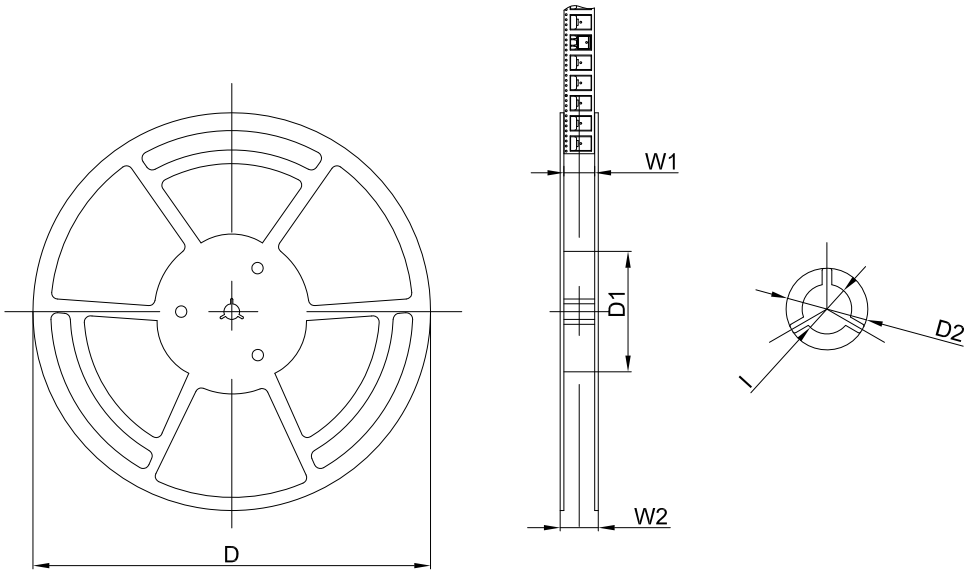


Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
TO-263-2L	10.80	16.13	5.21	Ø1.55	1.75	11.50	4.00	16.00	2.00	24.00

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	

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, please click the official website of JSCJ -- ***https: www.jscj-elec.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

May, 2023: released CJ7805B rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

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