

3A LOW DROPOUT LINEAR REGULATOR

Outline:

BP1085 is a series of low dropout three terminal regulators with a dropout of 1.3V at 3A load current.

Other than a fixed version ($V_{out} = 1.8V, 2.5V, 3.3V, 5.0V$), BP1085 has an adjustable version. The adjustable version can set the output voltage with two external resistors.

BP1085 offers thermal shut down and current limit functions, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within $\pm 2\%$.

The BP1085 series is available in standard packages of TO-263-2L, TO-263-3L, TO-220 and TO-252.

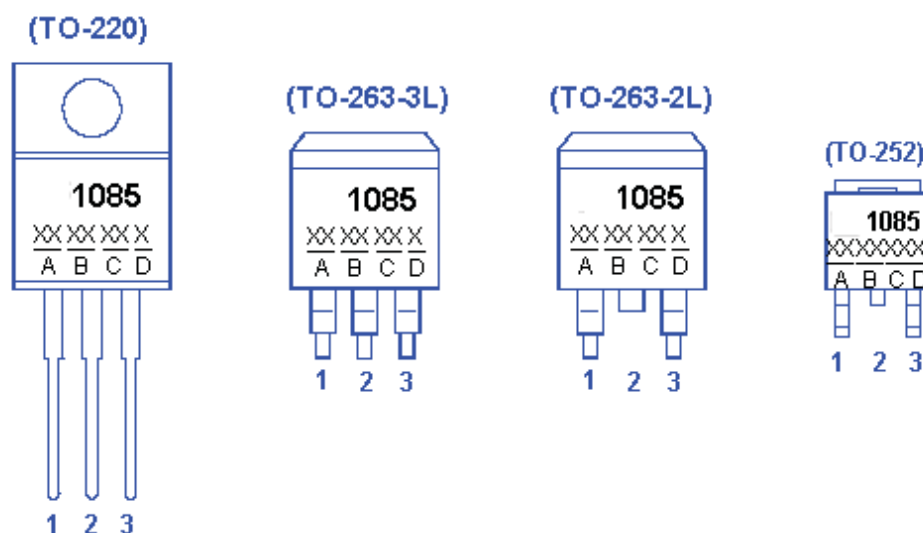
Features:

- Other than a fixed version and an adjustable version, output value can be customized on command.
- Maximum output current is 3A
- Output voltage accuracy is within $\pm 2\%$ ($\pm 1\%$ Customized)
- Range of operation input voltage: Max 18V
- Line regulation: 0.2% (Typical)
- Load regulation: 0.2% (Typical)
- Environment Temperature: $-50^{\circ}\text{C} \sim 140^{\circ}\text{C}$

Applications:

- Power Management for Computer Mother Board, Graphic Card
- Battery Charger
- Post Regulators for Switching Supplies

Pin Configuration:



Marking information:

- A:
Means
Manufacture
weeks
- B:
Means
Manufacture LOT
No.
- C:
Means Output
Voltage Value
- D:
Means Temp.
Range&Rohs Std

Pin Description:

Fixed Version

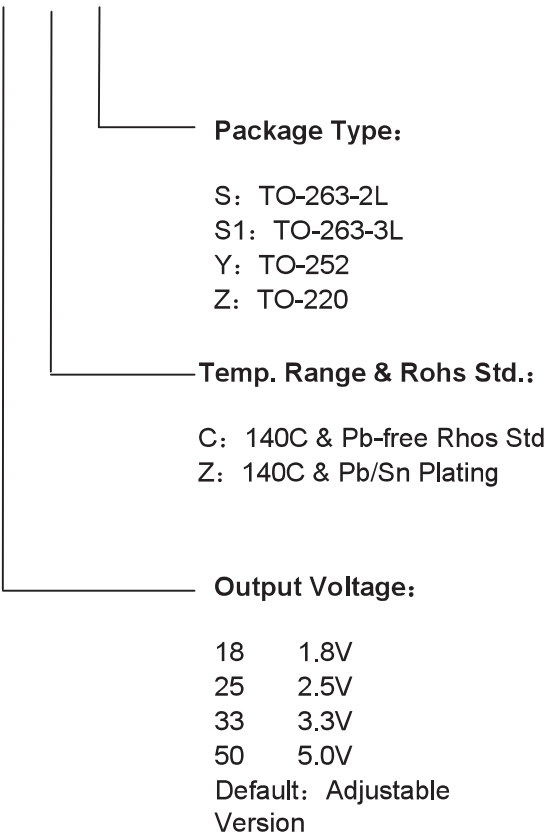
Pin No.	Symbol	Definition
1	GND	Ground
2	Vout	Output
3	Vin	Input

Adjustable Version

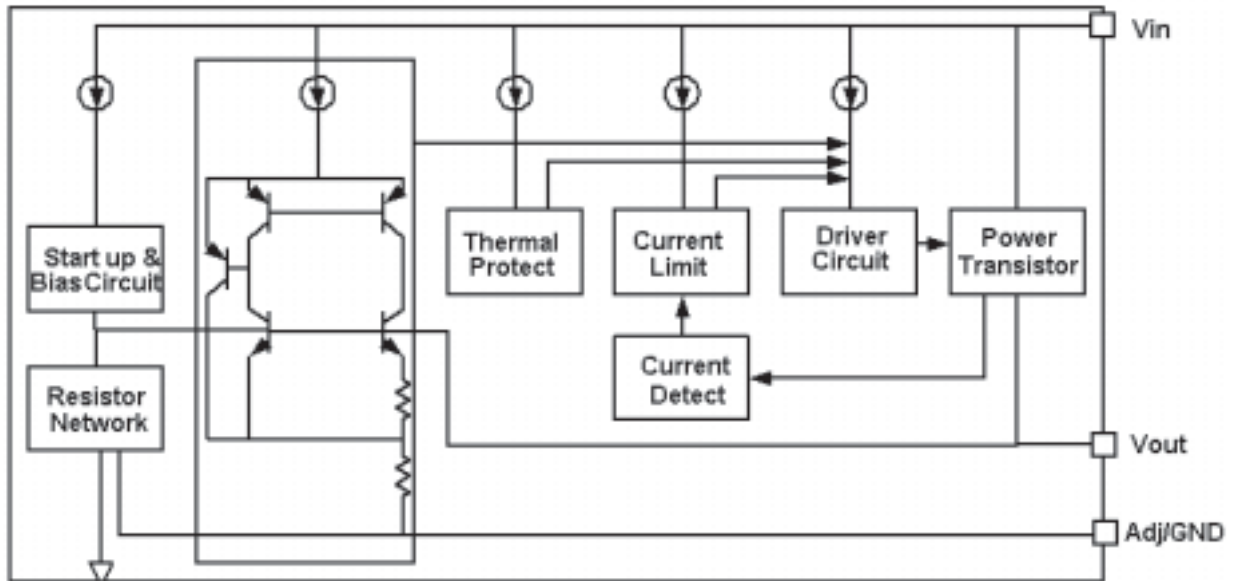
Pin No.	Symbol	Definition
1	Adj.	Adjustable
2	Vout	Output
3	Vin	Input

Ordering Information:

BP1085 -XX X X



Block Diagrams:



Absolute Maximum Ratings:

Maximum Input Voltage	18V
Junction Temperature (T _J)	150°C
Environment Temperature (T _A)	140°C
Storage Temperature (T _S)	-65~150°C
Lead Temperature and Time	260°C, 10S

Recommended Work Conditions:

Item	Min	Recommended	Max	Unit
Input Voltage Range			18	V
Environment Temperature	-50		140	°C

Electrical Characteristics (Table 1):

T_J=25°C

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{ref}	Reference Voltage	I _{out} =10mA, V _{in} -V _{out} =3V 10mA ≤ I _{out} ≤ 3A, 1.5V ≤ V _{in} -V _{out} ≤ 5V	1.238 1.225	1.25 1.25	1.262 1.275	V
V _{out}	Output Voltage	1085-1.80V I _{out} =0mA, V _{in} =4.8V, T _J =25°C 10mA ≤ I _{out} ≤ 3A, 3.4V ≤ V _{in} ≤ 7V	1.782 1.764	1.80 1.80	1.818 1.836	V
		1085-2.50V I _{out} =0mA, V _{in} =4.8V, T _J =25°C 10mA ≤ I _{out} ≤ 3A, 4.1V ≤ V _{in} ≤ 7V	2.475 2.45	2.50 2.50	2.525 2.55	V

		1085-3.3V $I_{out}=0mA, V_{in}=6.3V, T_j=25^{\circ}C$ $10mA \leq I_{out} \leq 3A, 4.9V \leq V_{in} \leq 8V$	3.267 3.234	3.3 3.3	3.333 3.366	V
		1085-5.0V $I_{out}=0mA, V_{in}=8.0V, T_j=25^{\circ}C$ $10mA \leq I_{out} \leq 3A, 6.6V \leq V_{in} \leq 10V$	4.95 4.90	5.0 5.0	5.05 5.10	V
ΔV_{out}	Line Regulation (note 1)	1085-ADJ $I_{out}=10mA$ $2.85V \leq V_{in} \leq 10V$		0.035	0.2	%
		1085-1.8V $I_{out}=10mA$ $3.4V \leq V_{in} \leq 10V$		1	5	mV
		1085-2.5V $I_{out}=10mA$ $4.1V \leq V_{in} \leq 10V$		1	5	mV
		1085-3.3V $I_{out}=10mA$ $4.9V \leq V_{in} \leq 10V$		1	5	mV
		1085-5.0V $I_{out}=10mA$ $6.6V \leq V_{in} \leq 10V$		1	5	mV
ΔV_{out}	Load Regulation (note 1,2)	1085-ADJ $V_{in}-V_{out}=3V, 10mA \leq I_{out} \leq 3A$		0.2	0.4	%
		1085-1.8V $V_{in}-V_{out}=3V, 0 \leq I_{out} \leq 3A$		3	15	mV
		1085-2.5V $V_{in}-V_{out}=3V, 0 \leq I_{out} \leq 3A$		3	15	mV
		1085-3.3V $V_{in}-V_{out}=3V, 0 \leq I_{out} \leq 3A$		3	15	mV
		1085-5.0V $V_{in}-V_{out}=3V, 0 \leq I_{out} \leq 3A$		3	15	mV
$V_{in}-V_{out}$	Dropout Voltage (note 3)	$\Delta V_{out}, \Delta V_{ref}=1\%, I_{out}=3A$		1.3	1.5	V
I_{limit}	Current Limit	$V_{in}-V_{out}=3V, T_j=25^{\circ}C$	3.2	4.5		A
	Minimum Load Current (note 4)	1085-ADJ		3	10	mA

I_q	Quiescent Current	$V_{in}=10V$		4	10	mA
I_{Adj}	Adjust Pin Current (Adjustable Version)	$V_{in}=4.25V$, $I_{out}=10mA$		45	110	μA
Ripple Rejection		$F=120Hz$, $C_{out}=25\mu F$ (tan), $I_{out}=3A$, $V_{in}-V_{out}=3V$	60			dB
I_{change}	Adjust Pin Current Change	$10mA \leq I_{out} \leq 3A$ $1.5V \leq V_{in}-V_{out} \leq 6V$		0.2	5	μA
	Temperature Stability	$I_{out}=10mA$, $V_{in}-V_{out}=1.5V$			0.5	%
θ_{JC}	Thermal Resistance junction to case	TO-252 TO-263 TO-220		12.5 3 3		$^{\circ}C / W$

Note:

- Note1: The Parameters of Line Regulation and Load Regulation in Table1 are tested under constant junction temperature.
- Note2: When I_{out} varies between 0~3A, $V_{in}-V_{out}$ varies between 1.5V~6V under constant junction temperature, the parameter is satisfied the criterion in table. If temperature varies between $-50^{\circ}C \leq T_A \leq 140^{\circ}C$, it needs output current to be larger than 10mA to satisfy the criterion.
- Note3: Dropout Voltage is tested under $I_{out}=3A$ and the following testing conditions: First step is to find out the V_{out} value(V_{out1}) when $V_{in1}=V_{out1}+1.5V$, second step is to decrease V_{in} (V_{in2}) until V_{out} value is equal to 99%* V_{out1} (V_{out2}). $V_{dropout}=V_{in2}-V_{out2}$.
- Note4: Minimum Load Current is defined as the minimum output current required to maintain regulation. When $1.5V \leq V_{in}-V_{out} \leq 6V$, the device is guaranteed to regulate if the output current is greater than 10mA.

Detailed Description:

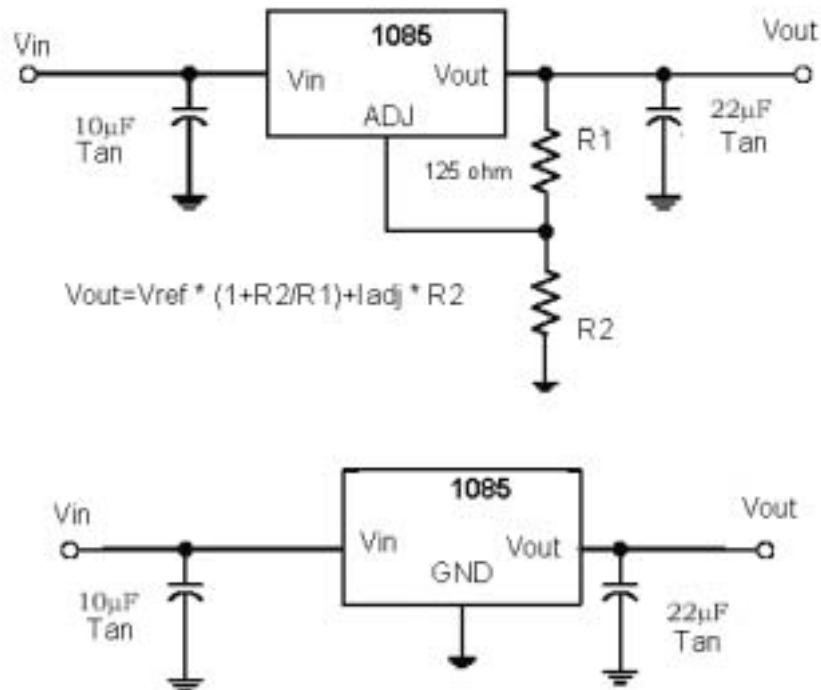
BP1085 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, current limit, power transistors and its driver circuit and so on.

The thermal shut down and current limit modules can assure chip and its application system working safety when the environment temperature is larger than $140^{\circ}C$ or output current is larger than 3.2A.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100ppm/ $^{\circ}C$. And the accuracy of output voltage is guaranteed by trimming technique.

Typical Application :

BP 1085 has an adjustable version and fixed versions, Chart1 is its typical application:



Typical Application of BP1085

Application Hints:

1. Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.
2. Recommend using 22uF tan capacitor to assure circuit stability.
3. Using a bypass capacitor(C_{Adj}) between the adjust terminal and ground can improve ripple rejection, This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of C_{Adj} should be less than the resistor's($R1$) which is between output and adjust pins to prevent ripple from being amplified at any ripple frequency. As $R1$ is normally in the range of $120\ \Omega \sim 200\ \Omega$, the value of C_{Adj} should satisfy this equation: $2 * F_{ripple} * C_{Adj} < R1$. Recommend using 10uF tan capacitor.

Output Voltage of Adjustable Version:

The BP1085 adjustable version provide 1.25V Reference Voltage. Any output voltage between 1.25V~13.8V can be available by choosing two external resistors (connection method is shown in chart 1). In chart 1, $R1, R2$ is the two external resistors.

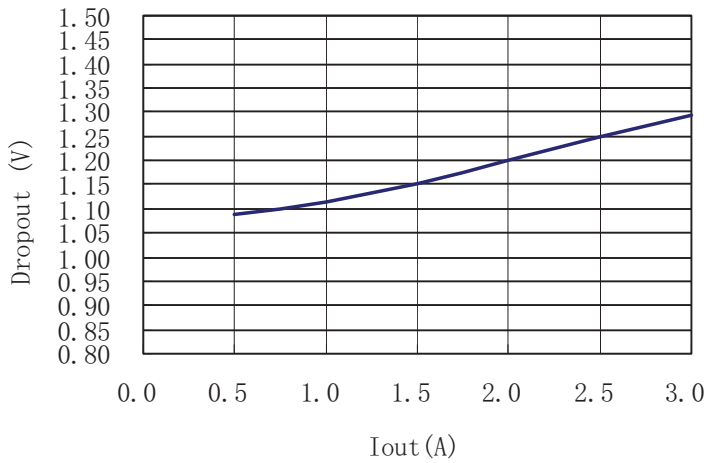
Explanation :

The output voltage of adjustable version satisfies this followed equation:
 $V_{Out} = V_{Ref} * (1 + R2/R1) + I_{Adj} * R2$. We can ignore I_{Adj} because I_{Adj} (about 50uA) is much less than the current of $R1$ (about 4mA).

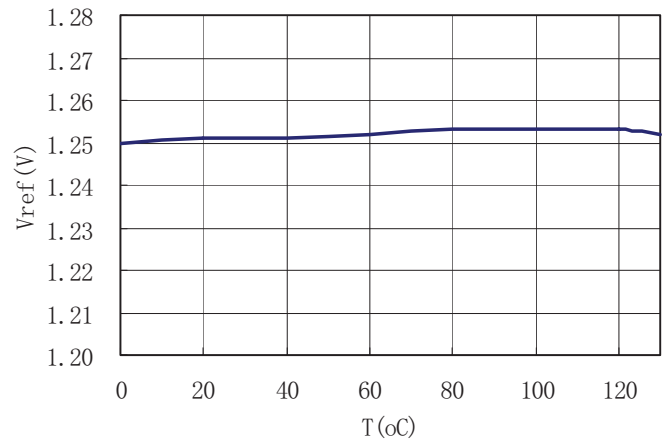
How to choose $R1$: The value of $R1$ should be in the range of $120\ \Omega \sim 200\ \Omega$ to assure chip working normally without any load. To assure the electrical performance showed in table 1, the output current should be larger than 5mA. If $R1$ is too large, the minimum output current should be larger than 4mA, The best working condition is to assure that the output current exceeds 10mA.

Typical Performance Characteristics:

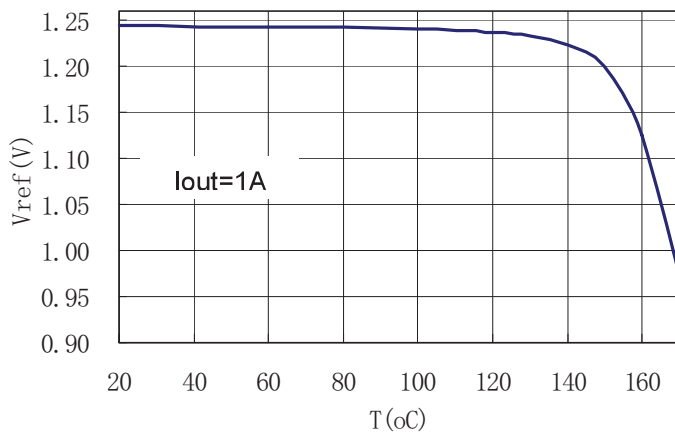
Dropout Voltage VS. Output Current



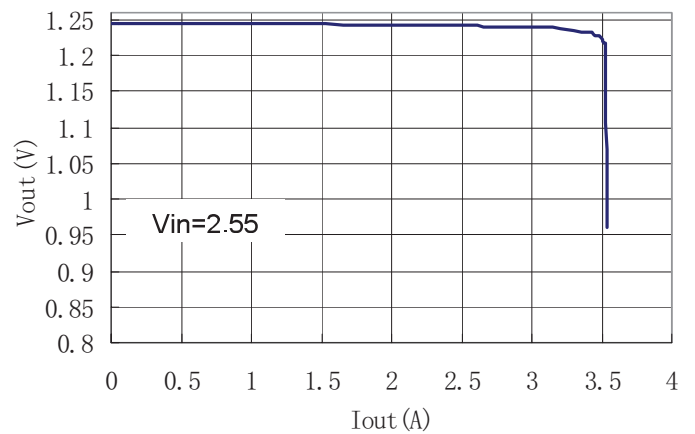
Reference Voltage VS. Temperature



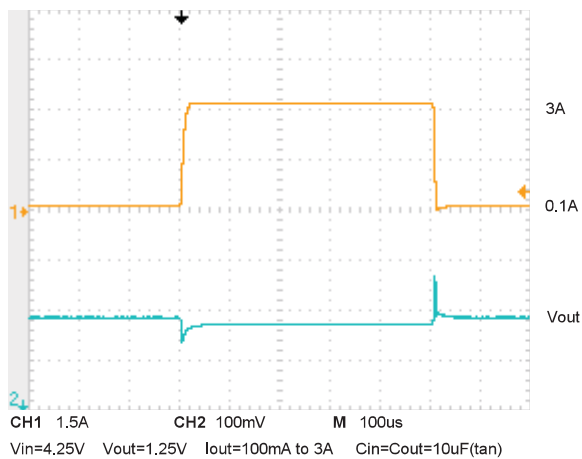
Reference Voltage VS. Thermal Protection



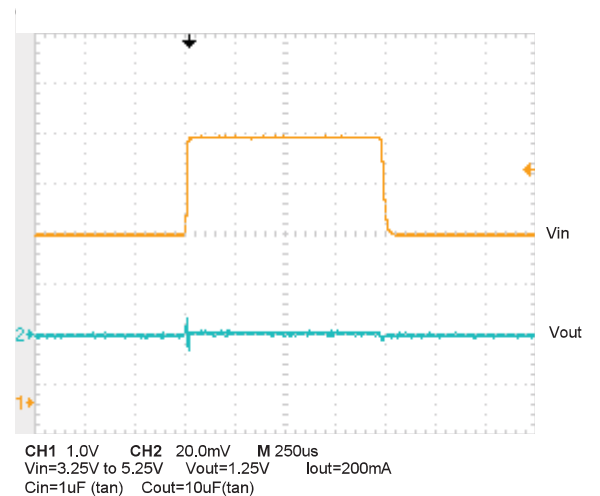
Output Voltage VS. Output Current



Load Transient Response



Line Transient Response

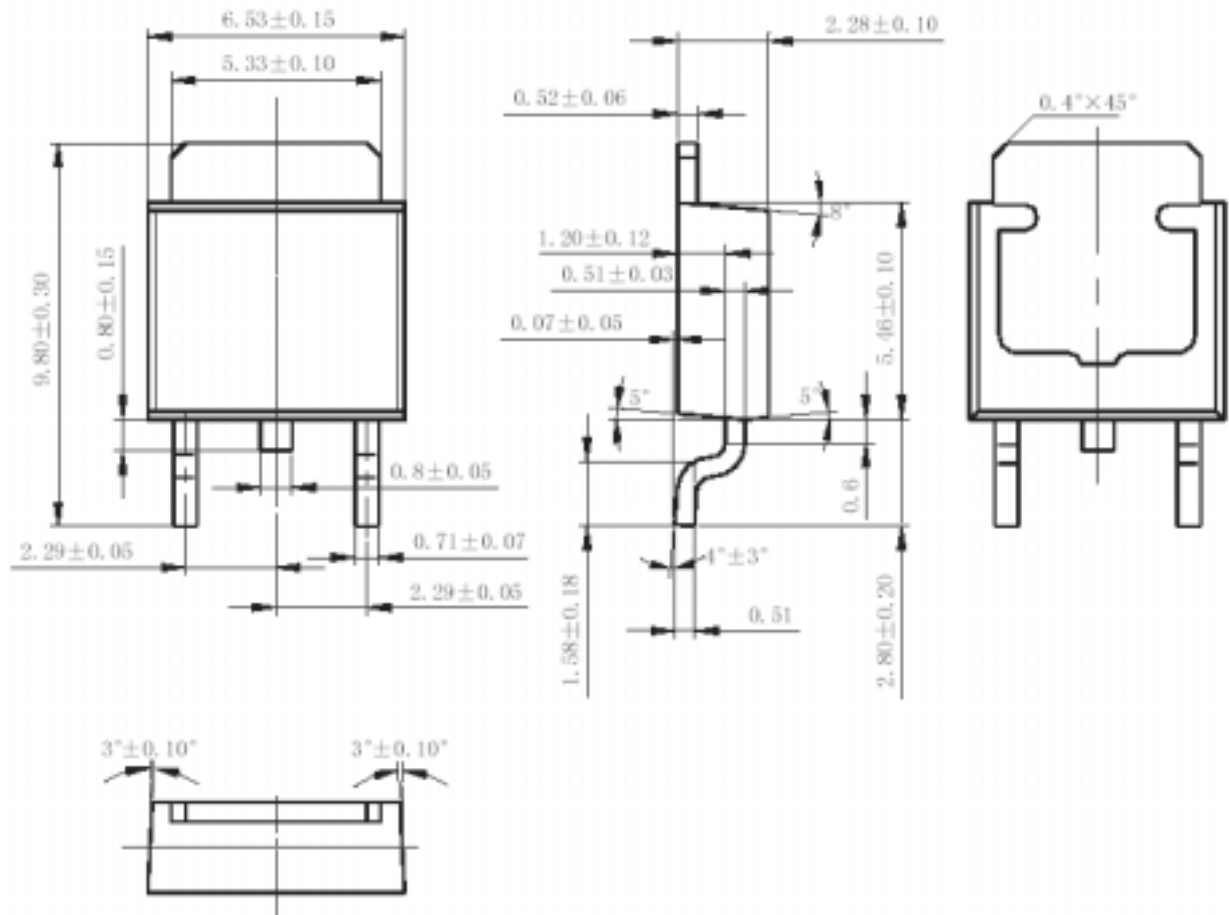


Package outline:

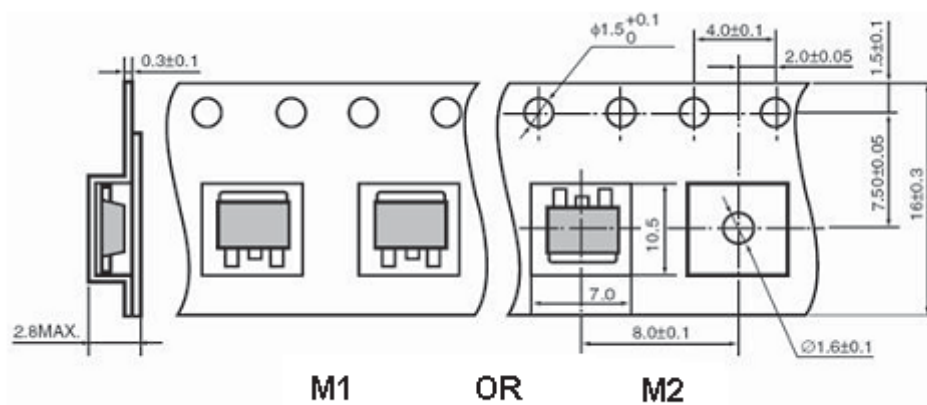
1.TO-252

Package	TO-252	Devices per reel	2500	Unit	mm
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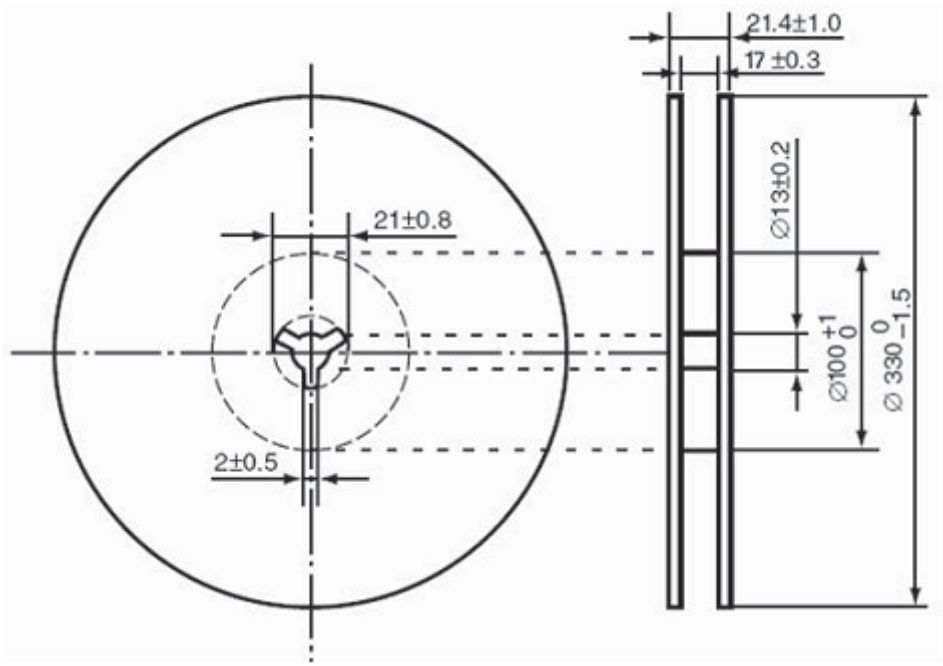
Package specification:



Taping dimension: (M1: Standard Type , M2: Customized)



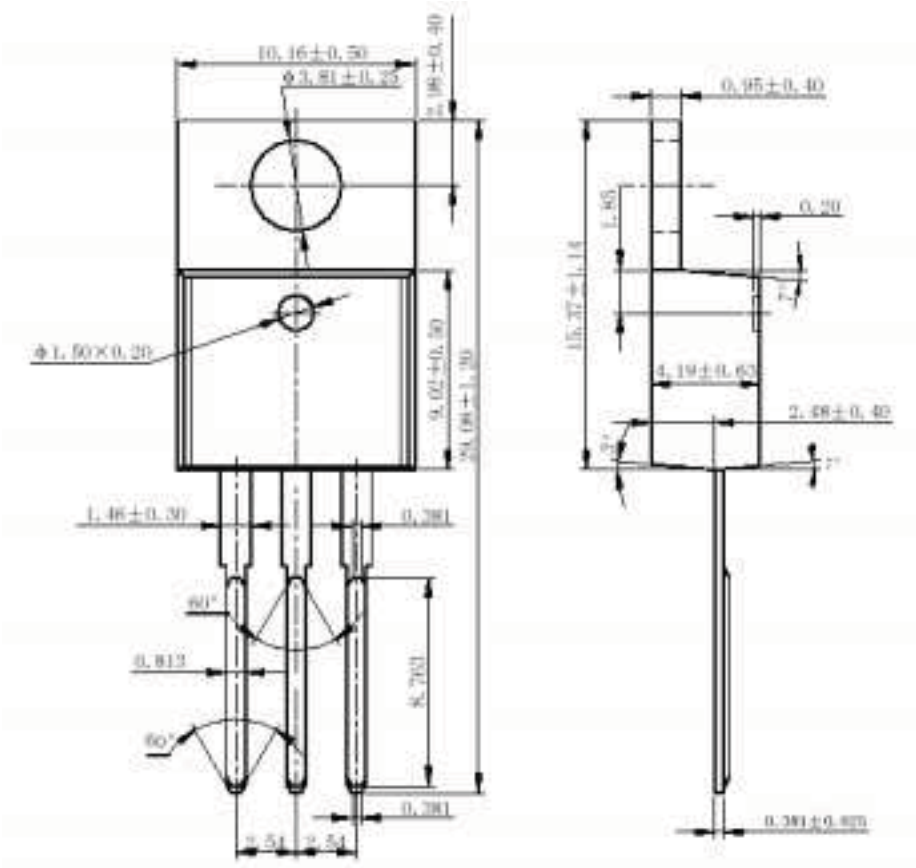
Taping reel dimension:



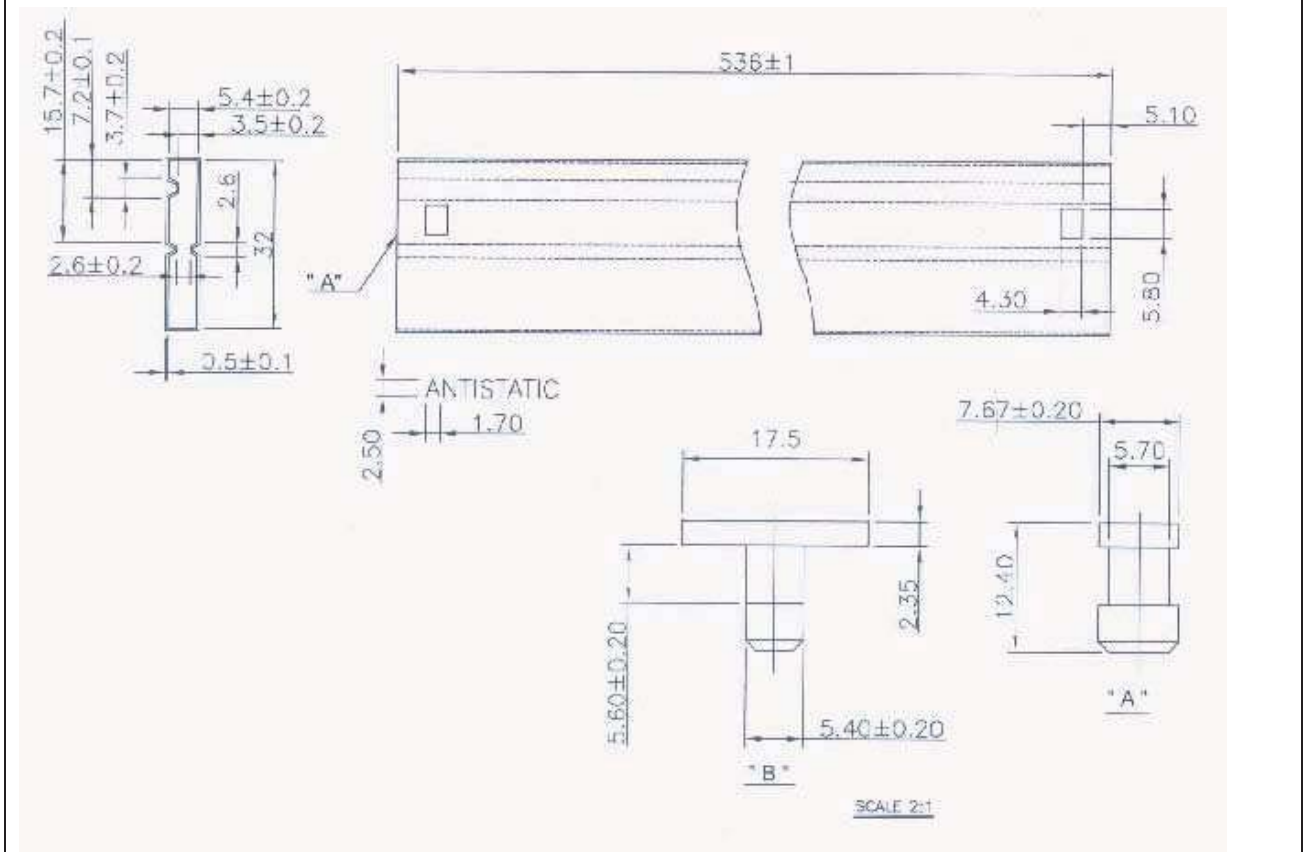
2.TO-220

Package	TO-220	Devices per tube	50	Unit	mm
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Package specification:



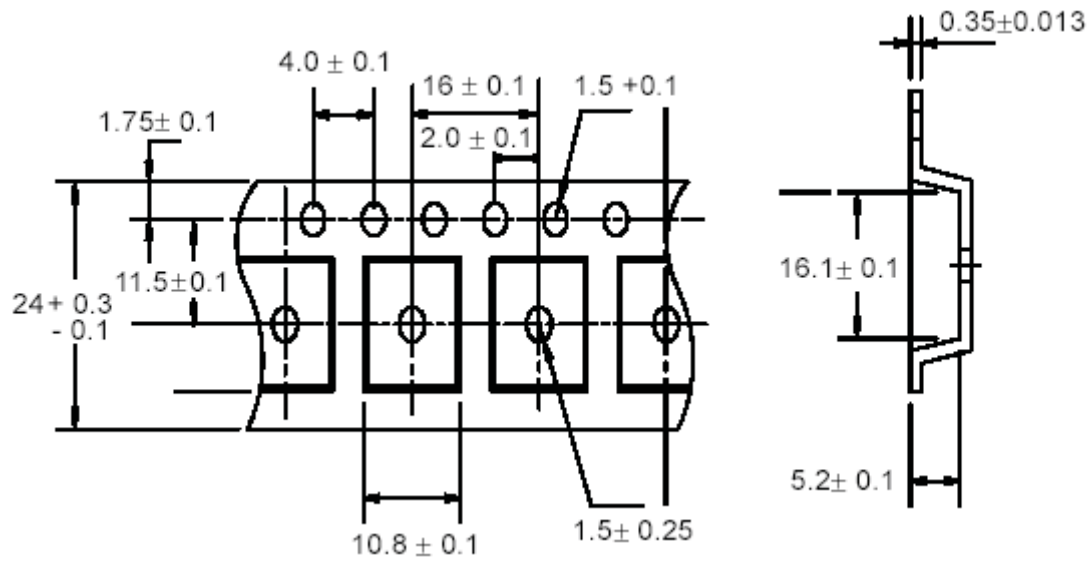
Tube dimension:



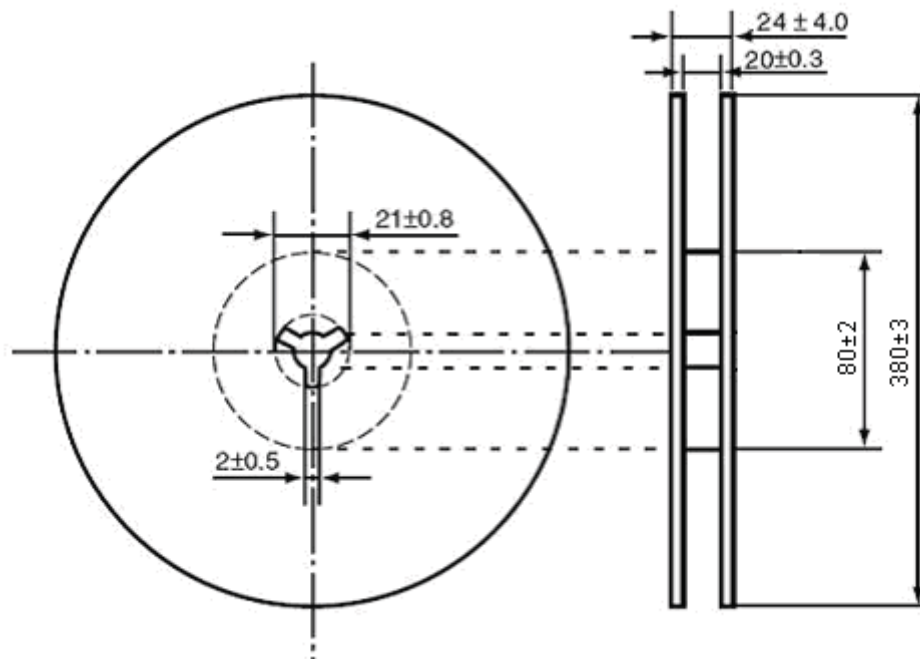
3.TO-263-2L

Package	TO-263	Devices per reel	1000	Unit	mm
Package specification: The technical drawing illustrates the BP1085 TO-263-2L package from three perspectives: top, side, and front views. Dimensions are provided in millimeters (mm) and inches (in) in parentheses. Key features include a central body with mounting tabs, a base with two leads, and specific angular requirements for the leads and body flanges. Top View Dimensions: - Overall width: 9.650 (0.380) - Width between mounting tabs: 4.070 (0.160) - Width of mounting tabs: 4.820 (0.190) - Width of central body: 10.290 (0.405) - Width of base: 8.840 (0.348) Side View Dimensions: - Overall height: 14.760 (0.581) - Height of central body: 15.740 (0.620) - Height of base: 2.390 (0.094) - Height of mounting tabs: 1.150 (0.045) - Height of base flange: 1.390 (0.055) - Lead height: 0.510 (0.020) - Lead width: 0.990 (0.039) - Lead spacing: 2.540 (0.100) Front View Dimensions: - Overall width: 7.980 (0.314) - Width of central body: 7.420 (0.292) - Width of base: 5.600 (0.220) - Width of mounting tabs: 1.150 (0.045) - Width of base flange: 1.390 (0.055) - Lead height: 0.510 (0.020) - Lead width: 0.990 (0.039) - Lead spacing: 2.540 (0.100) Angular Requirements: - Lead angle: 0°/6° - Base flange angle: 3° - Mounting tab angle: 7° - Lead angle: 2°/8°					

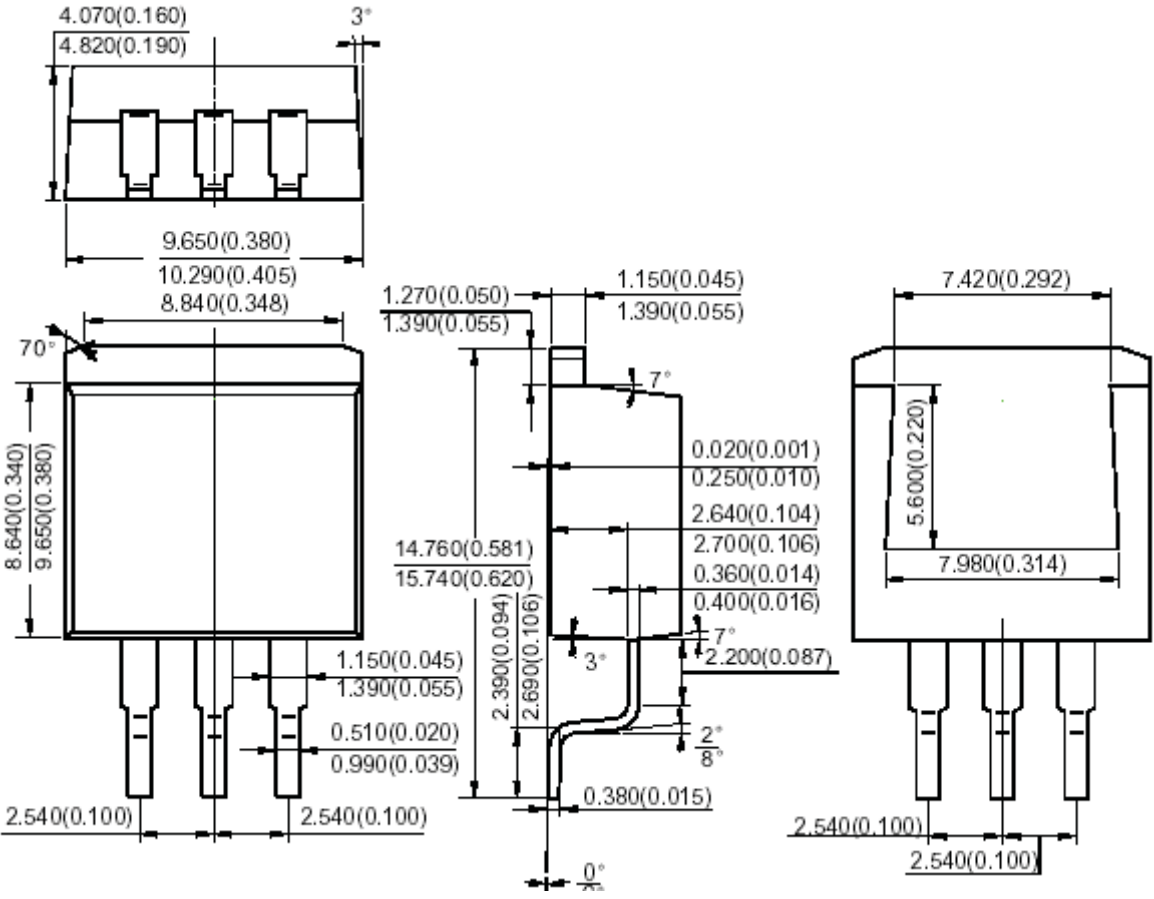
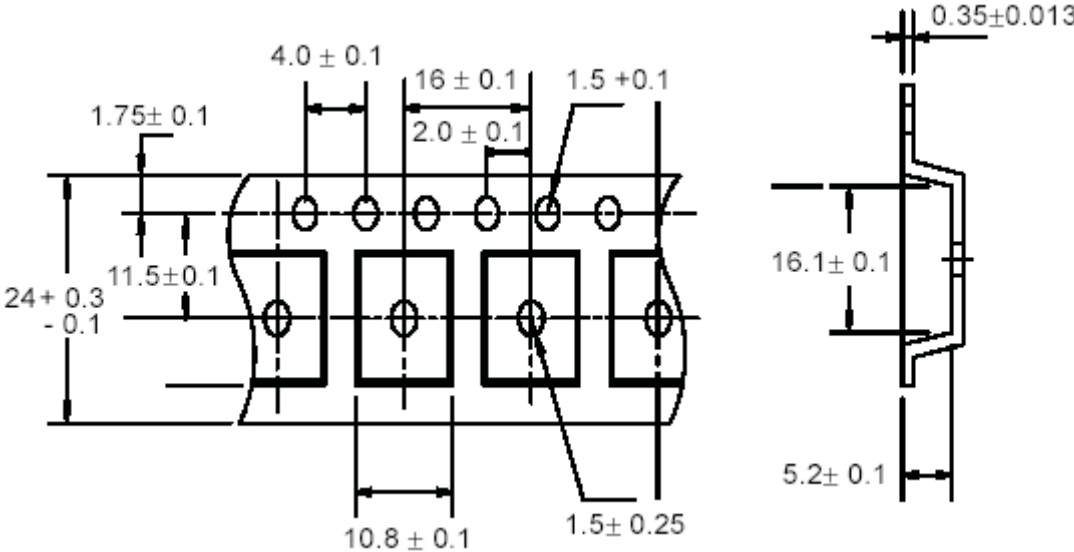
Taping dimension:



Taping reel dimension:



4.TO-263-3L

Package	TO-263	Devices per reel	1000	Unit	mm
Package specification: 					
Taping dimension: 					

Taping reel dimension:

