LC1085

REV1.0-Revised DEC 2007

3A Bipolar Linear Regulator

DESCRIPTION

LC1085 is a series of low dropout three terminal regulators with a dropout of 1.3V at 3A load current.

Other than a fixed version (Vout ＝ 1.8V,2.5V,3.3V,5.0V ） , LC1085 has an adjustable version, The adjustable version can set the output voltage with two external resistors.

LC1085 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 ±2%.

LC1085 series is available in standard packages of TO-263-2L, TO-263-3L, TO-220 and TO-252

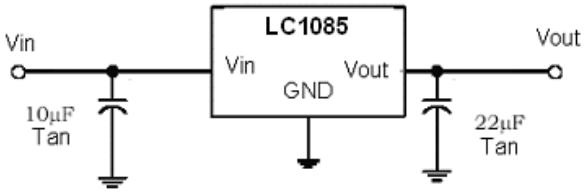
FEATURES

- 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 ±2%
- Range of operation input voltage: Max 15V
- Line regulation: 0.2% (Typical)
- Load regulation: 0.2% (Typical)
- Environment Temperature: -40℃~85℃

APPLICATIONS

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

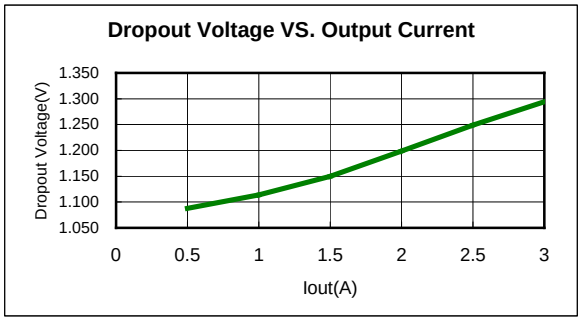
TYPICAL APPLICATION



Application circuit of LC1085 fixed version

NOTE: Input capacitor (Cin=10uF) and Output capacitor (Cout=22uF) are recommended in all application circuit. Tantalum capacitor is recommended.

ELECTRICAL CHARACTERISTICS



ORDERING INFORMATION

LC1085 [1][2][3][4][5]

Code	Description
[1]	Temperature&Rohs: C:-40~85°C ,Pb Free Rohs Std.
[2]	Package type: O:TO-252 M:TO-263-2L M3:TO-263-3L N:TO-220-3
[3]	Packing type: TR:Tape&Reel (Standard) TB:Tube（TO-220）
[4]	Output voltage: e.g. 18=1.8V 33=3.3V AD=Output adjustable
[5]	Voltage accuracy: Blank(default)=±2%

ABSOLUTE MAXIMUM RATING

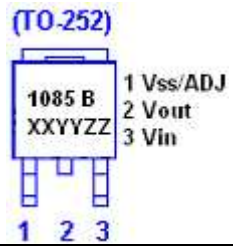
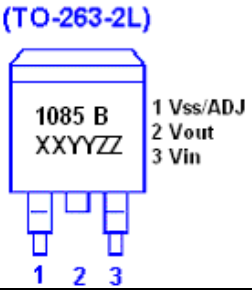
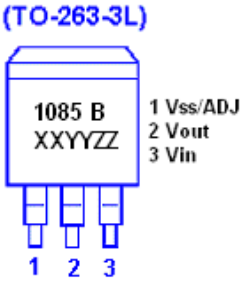
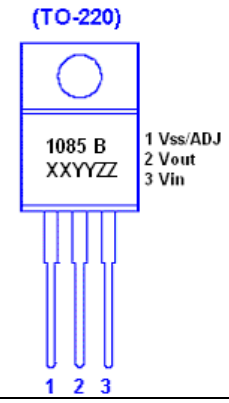
Parameter		Value
Max Input Voltage		15V
Operating Junction Temperature(Tj)		125°C
Ambient Temperature(Ta)		-40°C –85°C
Package Thermal Resistance	TO-252	12.5℃ / W
	TO-263	3℃ / W
	TO-220	3℃ / W
Storage Temperature(Ts)		-40°C -150°C
Lead Temperature & Time		260°C,10S

Note:
Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

RECOMMENDED WORK CONDITIONS

Parameter	Value
Input Voltage Range	Max.15V
Ambient Temperature	-40°C –85°C

PIN CONFIGURATION

Product Classification		LC1085COTR□□
Marking 1085 B XXYYZZ	1085:Product Code B:Fab Code XX: Output Voltage YY:Lot No. ZZ:Data Code	
Product Classification		LC1085CMTR□□
Marking 1085 B XXYYZZ	1085:Product Code B:Fab Code XX: Output Voltage YY:Lot No. ZZ:Data Code	
Product Classification		LC1085CM3TR□□
Marking 1085 B XXYYZZ	1085:Product Code B:Fab Code XX: Output Voltage YY:Lot No. ZZ:Data Code	
Product Classification		LC1085CNTB□□
Marking 1085 B XXYYZZ	1085:Product Code B:Fab Code XX: Output Voltage YY:Lot No. ZZ:Data Code	
Vss/Adj	Ground Pin/Adjustable	
Vin	Supply Voltage Input	
Vout	Output Voltage	

ELECTRICAL CHARACTERISTICS

Tj=25℃

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference Voltage	Iout=10mA, Vin-Vout=3V 10mA≤Iout≤3A ,1.5V≤Vin-Vout≤5V	1.238 1.225	1.25 1.25	1.262 1.275	V
Vout	Output Voltage	LC1085-1.80V Iout=0mA,Vin=4.8V,Tj=25℃ 10mA≤Iout≤3A ,3.4V≤Vin≤7V	1.782 1.764	1.80 1.80	1.818 1.836	V
		LC1085-2.50V Iout=0mA,Vin=4.8V,Tj=25℃ 10mA≤Iout≤3A ,4.1V≤Vin≤7V	2.475 2.45	2.50 2.50	2.525 2.55	V
		LC1085-3.3V Iout=0mA,Vin=6.3V,Tj=25℃ 10mA ≤Iout≤3A ,4.9V≤Vin≤8V	3.267 3.234	3.3 3.3	3.333 3.366	V
		LC1085-5.0V Iout=0mA,Vin=8.0V,Tj=25℃ 10mA ≤Iout≤3A ,6.6V≤Vin≤10V	4.95 4.90	5.0 5.0	5.05 5.10	V
ΔVout	Line Regulation (note 1)	LC1085-ADJ Iout=10mA 2.85V≤Vin≤10V		0.035	0.2	%
		LC1085-1.8V Iout=10mA 3.4V≤Vin≤10V		10	15	mV
		LC1085-2.5V Iout=10mA 4.1V≤Vin≤10V		10	15	mV
		LC1085-3.3V Iout=10mA 4.9V≤Vin≤10V		10	15	mV
		LC1085-5.0V Iout=10mA 6.6V≤Vin≤10V		10	15	mV
ΔVout	Load Regulation (note 1,2)	LC1085-ADJ Vin-Vout=3V, 10mA≤Iout≤3A		0.2	0.4	%
		LC1085-1.8V Vin-Vout=3V, 0≤Iout≤3A		3	15	mV
		LC1085-2.5V Vin-Vout=3V, 0≤Iout≤3A		3	15	mV

		LC1085-3.3V Vin-Vout=3V, 0≤Iout≤3A		3	15	mV
		LC1085-5.0V Vin-Vout=3V, 0≤Iout≤3A		3	15	mV
Vin-Vout	Dropout Voltage (note 3)	ΔVout, ΔVref =1%, Iout=3A		1.3	1.5	V
Ilimit	Current Limit	Vin-Vout=3V, Tj=25℃	3.2	4.5		A
	Minimum Load Current (note 4)	LC1085-ADJ		3	10	mA
Iq	Quiescent Current	Vin=10V		4	10	mA
IAdj	Adjust Pin Current (Adjustable Version)	Vin=4.25V, Iout=10mA		45	110	uA
Ripple Rejection		F=120Hz,Cout=25uF(tan), Iout=3A,Vin-Vout=3V	60			dB
Ichange	Adjust Pin Current Change	10mA≤Iout≤3A 1.5V≤Vin-Vout ≤6V		0.2	5	uA
	Temperature Stability	Iout=10mA, Vin-Vout=1.5V			0.5	%
θ_{JC}	Thermal Resistance junction to case	TO-252 TO-263 TO-220		12.5 3 3		℃/W

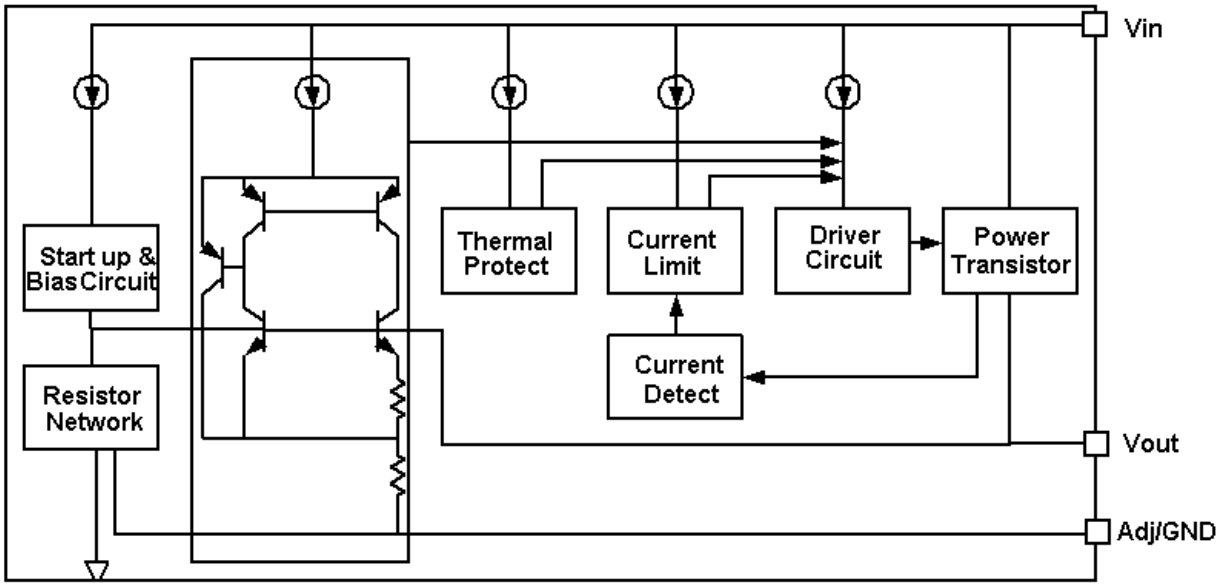
Note1:The Parameters of Line Regulation and Load Regulation in Table1 are tested under constant junction temperature.

Note2:When Iout varies between 0~3A,Vin-Vout varies between 1.5V~6V under constant junction temperature, the parameter is satisfied the criterion in table. If temperature varies between -50℃≤ T_A≤140℃, it needs output current to be larger than 10mA to satisfy the criterion.

Note3:Dropout Voltage is tested under Iout=3A and the following testing conditions: First step is to find out the Vout value(Vout1) when Vin1=Vout+1.5V, second step is to decrease Vin(Vin2) until Vout value is equal to 99%*Vout1(Vout2). Vdropout=Vin2-Vout2.

Note4：Minimum Load Current is defined as the minimum output current required to maintain regulation. When 1.5V≦Vin-Vout≦6V，the device is guaranteed to regulate if the output current is greater than 10mA.

BLOCK DIAGRAM



DETAILED DESCRIPTION

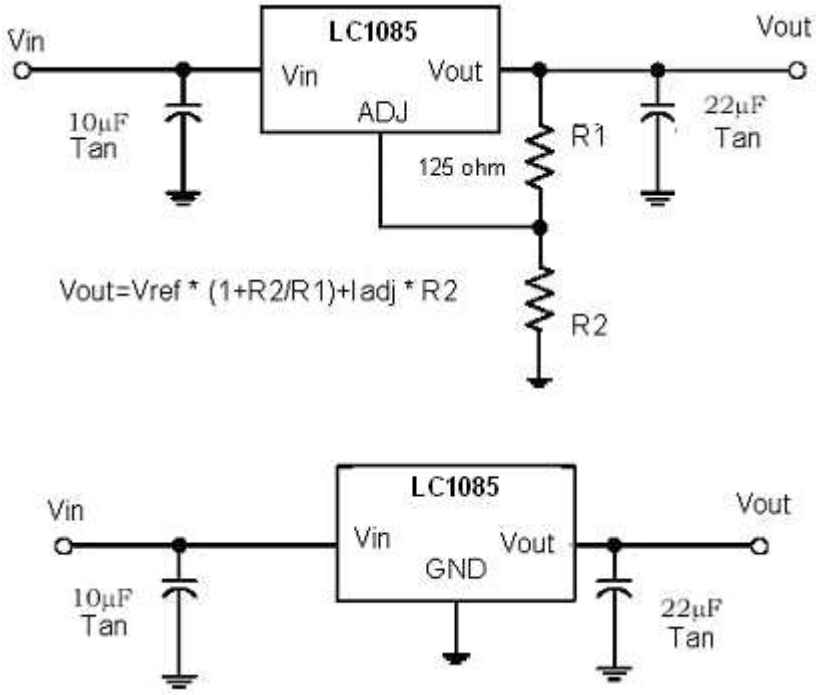
LC1085 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, 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℃ 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/℃.And the accuracy of output voltage is guaranteed by trimming technique.

TYPICAL APPLICATION

LC1085 has an adjustable version and fixed versions, Chart1 is its typical application:



Typical Application of LC1085

APPLICATION HINTS

Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.

Recommend using 22uF tan capacitor to assure circuit stability.

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 120Ω~200Ω ,the value of C_{Adj} should satisfy this equation: $2*Fripple*C_{Adj}<R1$. Recommend using 10uF tan capacitor.

OUTPUT VOLTAGE OF ADJUSTABLE VERSION

The LC1085 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.

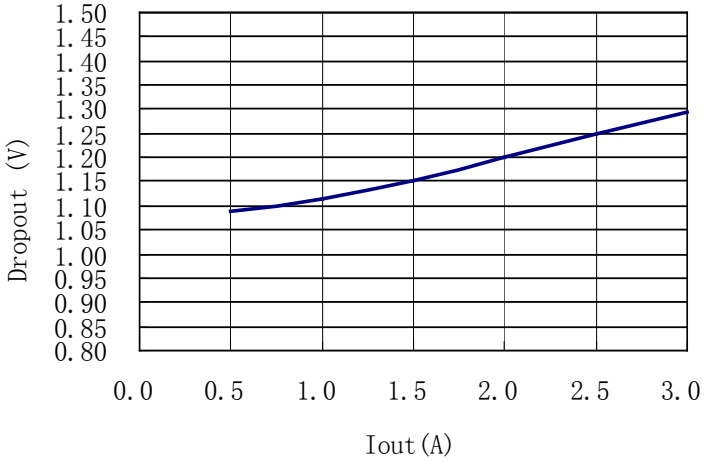
EXPLANATION

The output voltage of adjustable version satisfies this followed equation: VOut=VRef*(1+R2/R1)+IAdj*R2. We can ignore IAdj because IAdj (about 50uA) is much less than the current of R1(about 4mA).

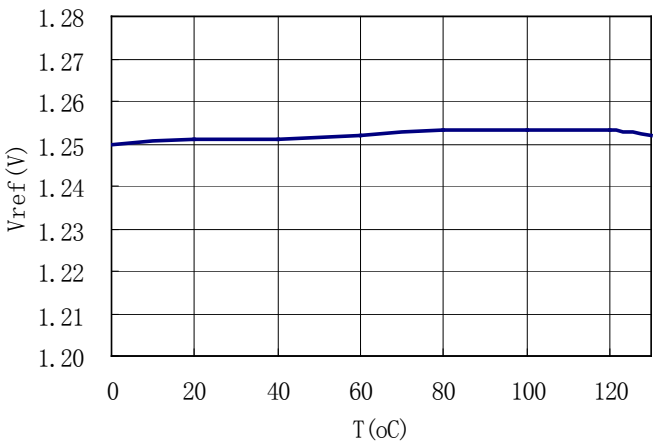
How to choose R1：The value of R1 should be in the range of 120Ω～200Ω to assure chip working normally without any load. To assure the electrical performance showed in table 1, the output current should be larger than 5mA. If R1 is too large, the minimum output current should be larger than 4mA , The best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

TYPICAL PERFORMANCE CHARACTERISTICS

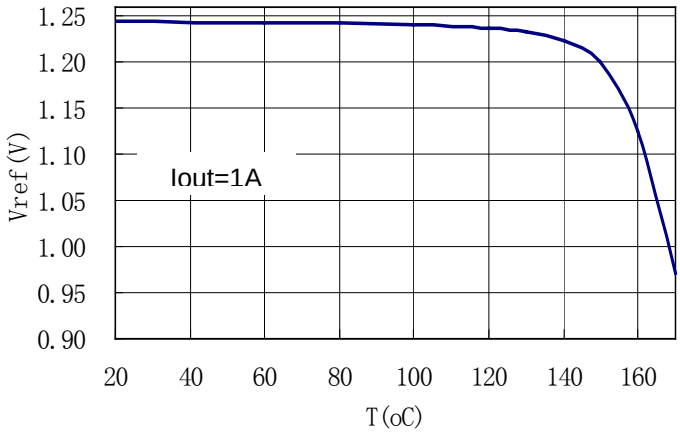
Dropout Voltage VS.Output Current



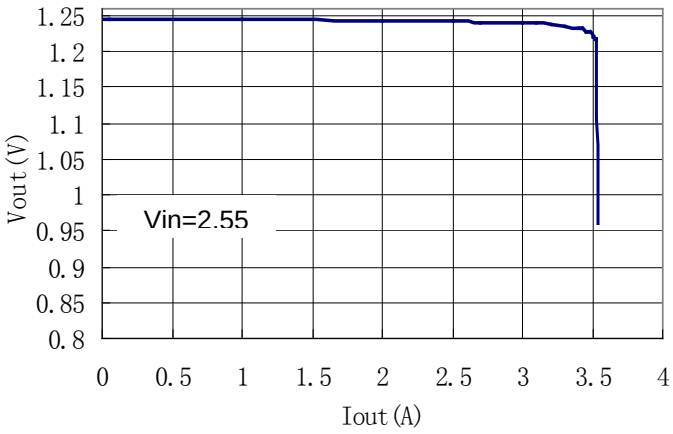
Reference Voltage VS.Temperature



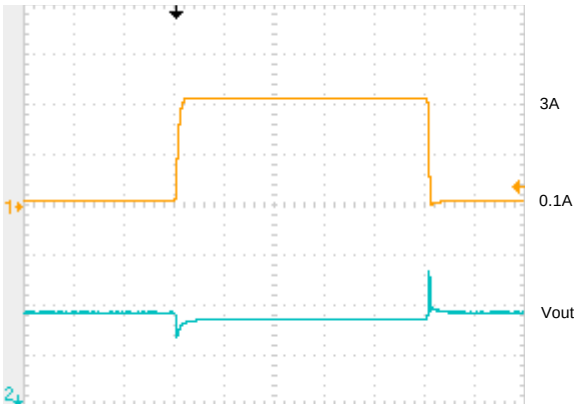
Reference Voltage VS. Thermal Protection



Output Voltage VS. Output Current

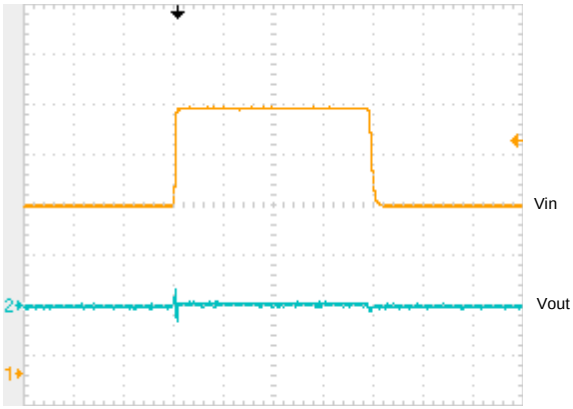


Load Transient Response



CH1 1.5A **CH2** 100mV **M** 100us
Vin=4.25V Vout=1.25V Iout=100mA to 3A Cin=Cout=10uF(tan)

Line Transient Response

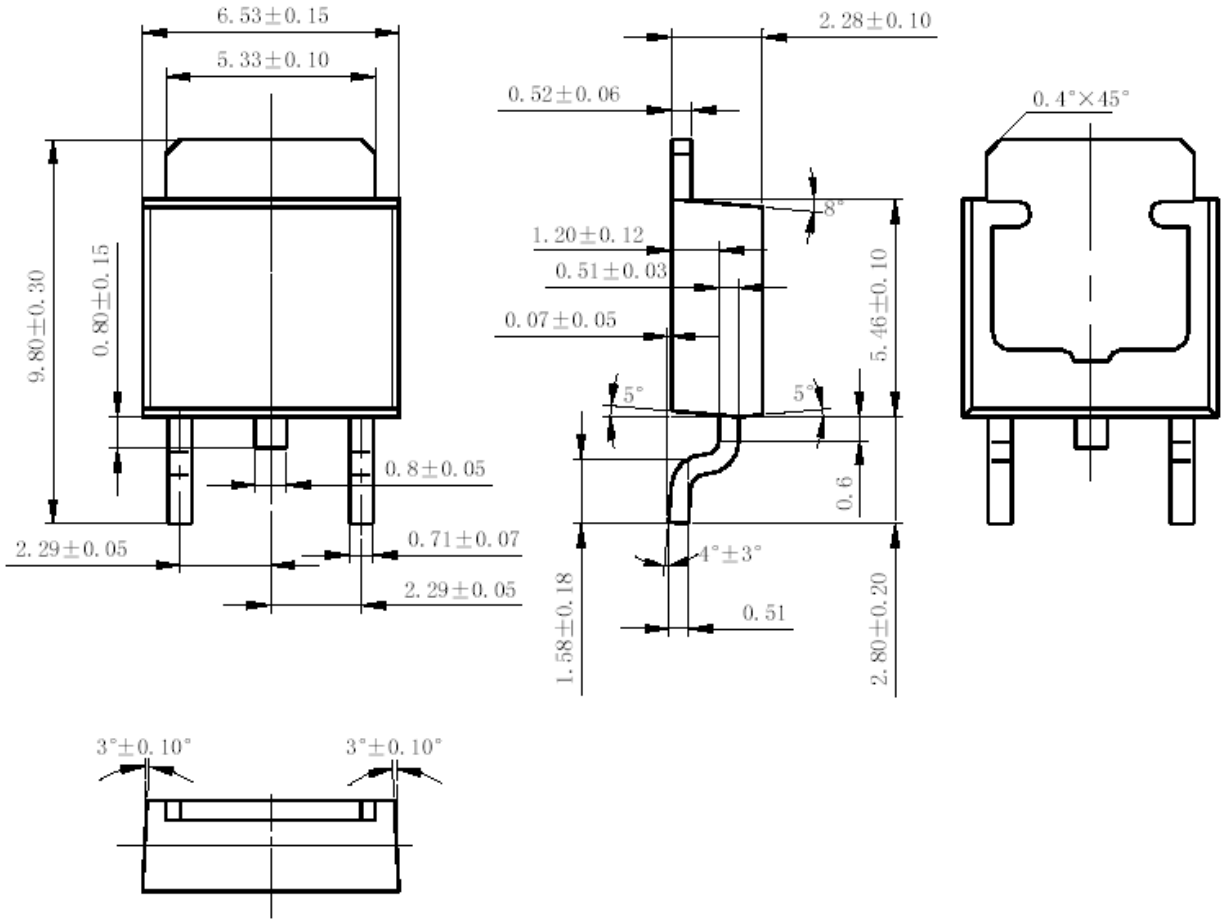


CH1 1.0V **CH2** 20.0mV **M** 250us
Vin=3.25V to 5.25V Vout=1.25V Iout=200mA
Cin=1uF (tan) Cout=10uF(tan)

PACKAGE LINE

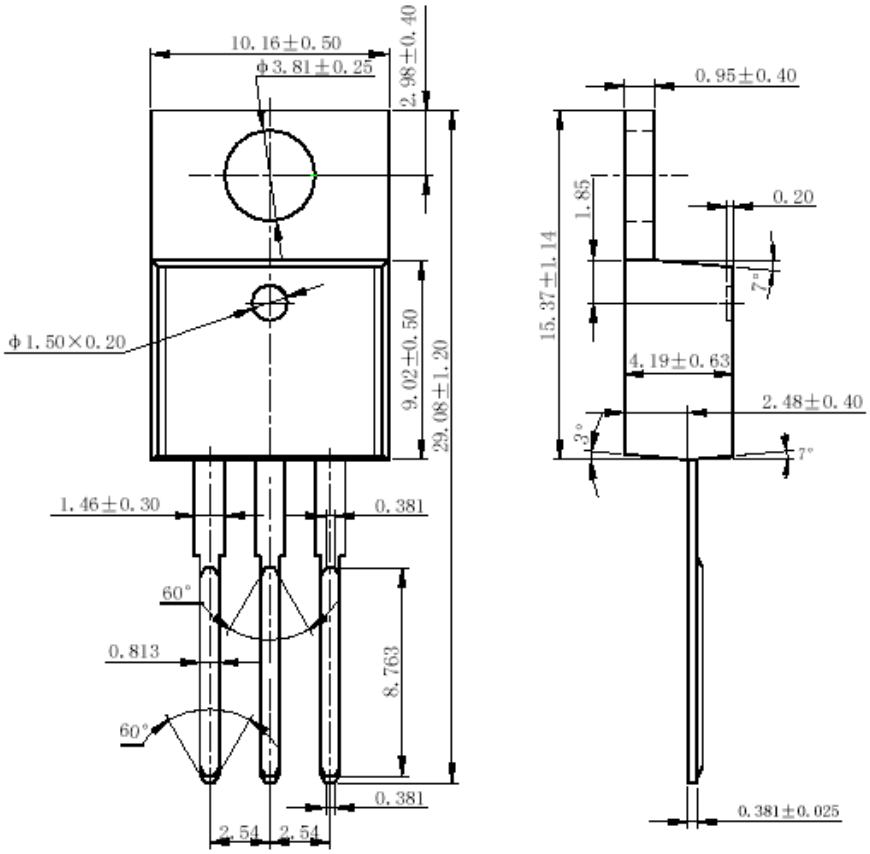
Package	TO-252	Devices per reel	2500	Unit	mm

Package specification：



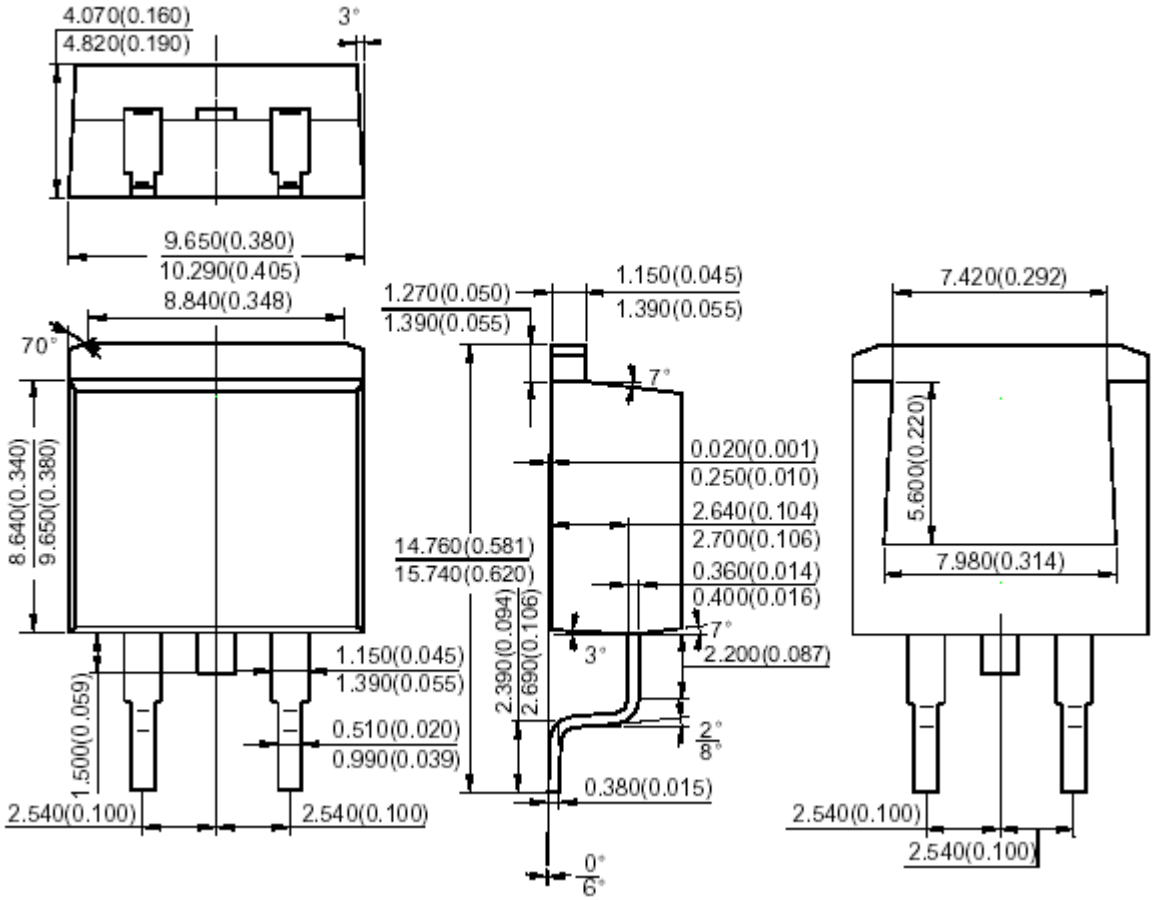
Package	TO-220	Devices per tube	50	Unit	mm

Package specification：



Package	TO-263-2L	Devices per reel	800	Unit	mm

Package specification：



Package	TO-263-3L	Devices per reel	800	Unit	mm

Package specification：