

# LR1084

## General Description

The LR1084 is a series of low dropout positive voltage regulators with a maximum dropout of 1.5V at 5A of load current.

The series features on-chip thermal limiting which provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures. It also includes a trimmed band-gap reference and a current limiting circuit.

The LR1084 is available in 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V versions. The fixed versions integrate the adjust resistors. It is also available in an adjustable version which can set the output voltage with two external resistors.

The LR1084 series is available in standard packages of TO-263-2L, TO-263-3L, TO-220 and TO-252.

## Features

- Low Dropout Voltage: 1.3V Typically at 5A
- Current Limiting and Thermal Protection
- Output Current: 5A
- Current Limit: 6.5A
- Operating Junction Temperature Range: 0 to 125°C
- Line Regulation: 0.015% (Typical)
- Load Regulation: 0.2% (Typical)

## Applications

- High Efficiency Linear Regulators
- Battery Chargers
- Post Regulation for Switching Supply
- Microprocessor Supply
- Desktop PCs, RISC and Embedded Processors' Supply

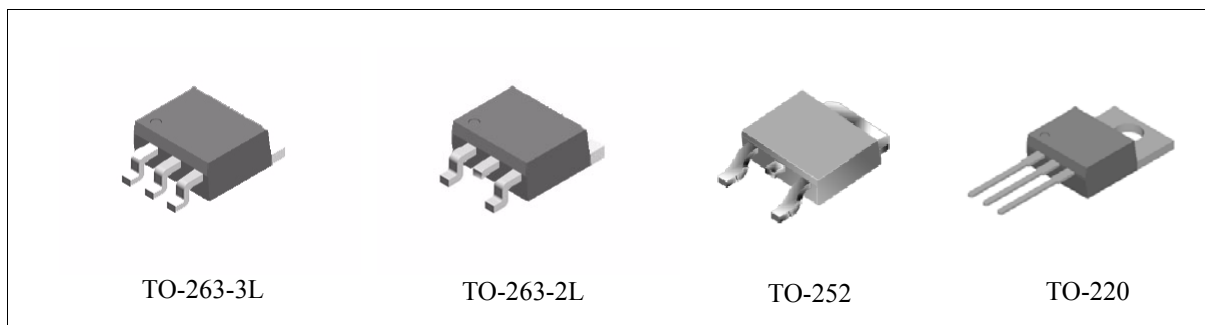
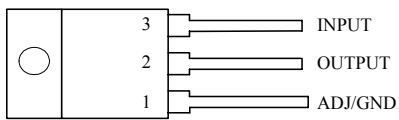


Figure 1. Package Types of LR1084

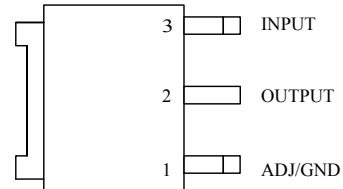
# LR1084

## Pin Configuration

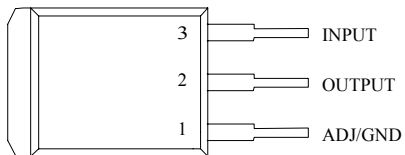
T Package  
(TO-220)



D Package  
(TO-252)



S Package  
(TO-263-3L)



S Package  
(TO-263-2L)

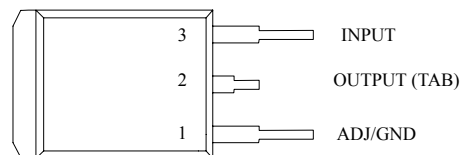


Figure 2. Pin Configuration of LR1084 (Top View)

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## Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Min	Max	Unit
Operating Junction Temperature Range	$T_J$		150	°C
Storage Temperature Range	$T_S$	-65	150	°C
Lead Temperature (Soldering, 10 sec.)	$T_{LEAD}$		300	°C
ESD (Human Body Model)	ESD		2000	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

## Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	$V_{IN}$		12	V
Operating Junction Temperature Range	$T_J$	0	125	°C

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## Electrical Characteristics

Typicals and limits appearing in normal type apply for  $T_J = 25^\circ\text{C}$ . Limits appearing in **Boldface** type apply over the entire operating junction temperature range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Voltage	$V_{REF}$	LR1084-ADJ, $I_{OUT} = 10\text{mA}$ , $V_{IN} - V_{OUT} = 3\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $1.5\text{V} \leq V_{IN} - V_{OUT} \leq 5\text{V}$	1.238 <b>1.225</b>	1.250 <b>1.250</b>	1.262 <b>1.270</b>	V
Output Voltage	$V_{OUT}$	LR1084-1.5, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 4.5\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $3.1\text{V} \leq V_{IN} \leq 6\text{V}$	1.485 <b>1.47</b>	1.5 <b>1.5</b>	1.515 <b>1.53</b>	V
		LR1084-1.8, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 4.8\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $3.4\text{V} \leq V_{IN} \leq 6\text{V}$	1.782 <b>1.764</b>	1.8 <b>1.8</b>	1.818 <b>1.836</b>	
		LR1084-2.5, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 5.5\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $4.1\text{V} \leq V_{IN} \leq 7\text{V}$	2.475 <b>2.45</b>	2.5 <b>2.5</b>	2.525 <b>2.55</b>	
		LR1084-2.85, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 6\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $4.5\text{V} \leq V_{IN} \leq 8\text{V}$	2.822 <b>2.793</b>	2.85 <b>2.85</b>	2.879 <b>2.907</b>	
		LR1084-3.3, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 6.3\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $4.9\text{V} \leq V_{IN} \leq 8\text{V}$	3.267 <b>3.234</b>	3.3 <b>3.3</b>	3.333 <b>3.366</b>	
		LR1084-5.0, $I_{OUT} = 0\text{mA}$ , $V_{IN} = 8\text{V}$ , $10\text{mA} \leq I_{OUT} \leq 5\text{A}$ , $6.6\text{V} \leq V_{IN} \leq 10\text{V}$	4.95 <b>4.9</b>	5 <b>5</b>	5.05 <b>5.1</b>	
Line Regulation	$\Delta V_{OUT}$	LR1084-ADJ, $I_{OUT} = 10\text{mA}$ , $2.85\text{V} \leq V_{IN} \leq 10\text{V}$		0.015 <b>0.035</b>	0.2 <b>0.2</b>	%
		LR1084-1.5, $I_{OUT} = 10\text{mA}$ , $3.1\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	6 <b>6</b>	mV
		LR1084-1.8, $I_{OUT} = 10\text{mA}$ , $3.4\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	6 <b>6</b>	mV
		LR1084-2.5, $I_{OUT} = 10\text{mA}$ , $4.1\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	6 <b>6</b>	mV
		LR1084-2.85, $I_{OUT} = 10\text{mA}$ , $4.5\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	6 <b>6</b>	mV
		LR1084-3.3, $I_{OUT} = 10\text{mA}$ , $4.9\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	6 <b>6</b>	mV
		LR1084-5.0, $I_{OUT} = 10\text{mA}$ , $6.6\text{V} \leq V_{IN} \leq 10\text{V}$		0.5 <b>1</b>	10 <b>10</b>	mV

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## Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for  $T_J = 25^{\circ}\text{C}$ . Limits appearing in **Boldface** type apply over the entire operating junction temperature range.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Load Regulation	$\Delta V_{\text{OUT}}$	LR1084-ADJ, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		0.1 <b>0.2</b>	0.3 <b>0.4</b>	%
		LR1084-1.5, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		3 <b>7</b>	15 <b>20</b>	mV
		LR1084-1.8, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		3 <b>7</b>	15 <b>20</b>	mV
		LR1084-2.5, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		3 <b>7</b>	15 <b>20</b>	mV
		LR1084-2.85, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		3 <b>7</b>	15 <b>20</b>	mV
		LR1084-3.3, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		3 <b>7</b>	15 <b>20</b>	mV
		LR1084-5.0, $0\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$		5 <b>10</b>	20 <b>35</b>	mV
Dropout Voltage		$I_{\text{O}} = 5\text{A}$ , $\Delta V_{\text{REF}} \Delta V_{\text{OUT}} = 1\%$		1.3	1.5	V
Current Limit	$I_{\text{LIMIT}}$	$V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$ ,	5.5	6.5		A
Minimum Load Current		$V_{\text{IN}} = 10\text{V}$ (LR1084-ADJ)		<b>3</b>	<b>10</b>	mA
Quiescent Current		$V_{\text{IN}} = 10\text{V}$ (LR1084)		<b>5</b>	<b>10</b>	mA
Ripple Rejection		$f_{\text{RIPPLE}} = 120\text{Hz}$ , $C_{\text{OUT}} = 25\mu\text{F}$ Tantalum, $I_{\text{OUT}} = 5\text{A}$ , $V_{\text{IN}} - V_{\text{OUT}} = 3\text{V}$	<b>60</b>	<b>72</b>		dB
Adjust Pin Current		$V_{\text{IN}} = 4.25\text{V}$ , $I_{\text{OUT}} = 10\text{mA}$		55	<b>120</b>	$\mu\text{A}$
Adjust Pin Current Change		$10\text{mA} \leq I_{\text{OUT}} \leq 5\text{A}$ , $1.5\text{V} \leq (V_{\text{IN}} - V_{\text{OUT}}) \leq 4.5\text{V}$		<b>0.2</b>	<b>5</b>	$\mu\text{A}$
Temperature Stability		$I_{\text{OUT}} = 10\text{mA}$ , $V_{\text{IN}} - V_{\text{OUT}} = 1.5$		<b>0.5</b>		%
Long Term Stability		$T_{\text{A}} = 125^{\circ}\text{C}$ , 1000Hrs		0.5		%
RMS Noise (% of $V_{\text{OUT}}$ )		$10\text{Hz} \leq f \leq 10\text{kHz}$		0.003		%
Thermal Resistance Junction -to-Case	$Q_{\text{JC}}$	TO-263 TO-220 TO-252		3 3		$^{\circ}\text{C} / \text{W}$

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## Typical Performance Characteristics

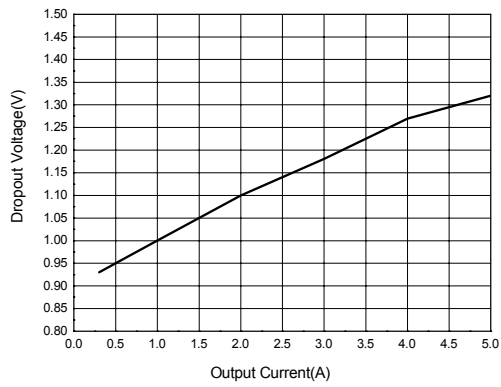


Figure 3. Dropout Voltage vs. Output Current

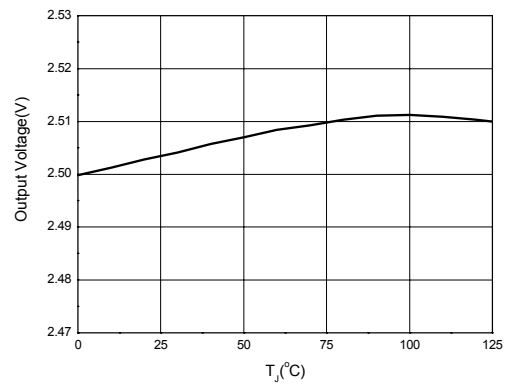


Figure 4. Output Voltage vs. Temperature

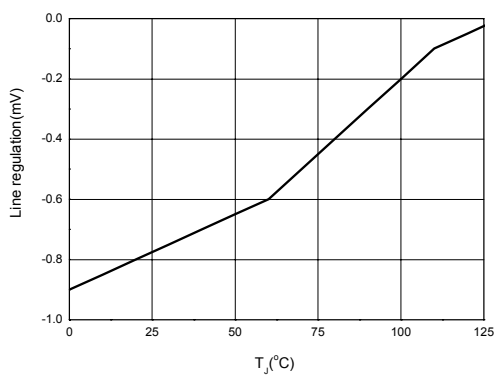


Figure 5. Line Regulation vs. Temperature

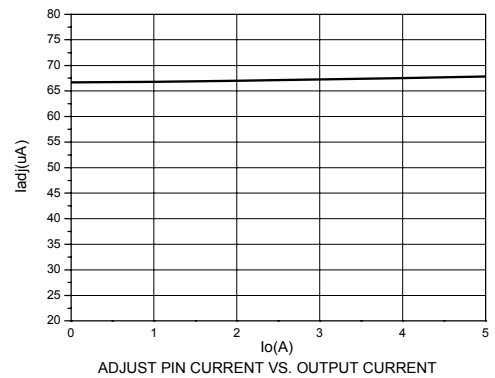


Figure 6. Adjust Pin Current vs. Output Current

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## Typical Performance Characteristics (Continued)

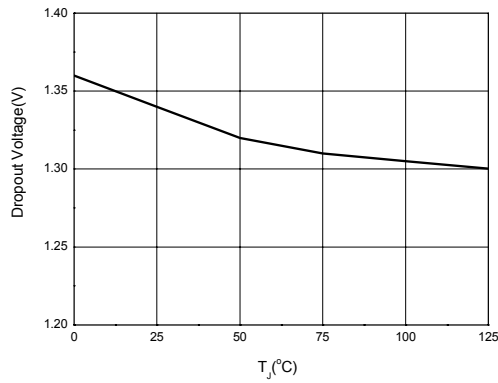


Figure 7. Dropout Voltage vs. Temperature

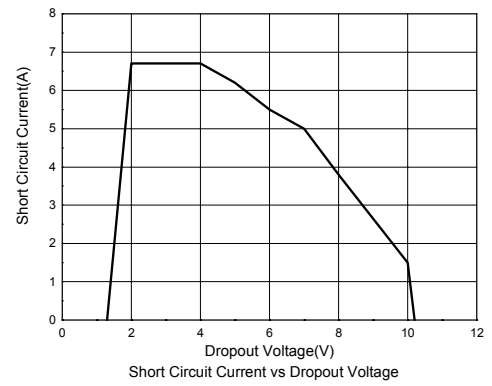


Figure 8. Short Circuit Current vs. Dropout Voltage

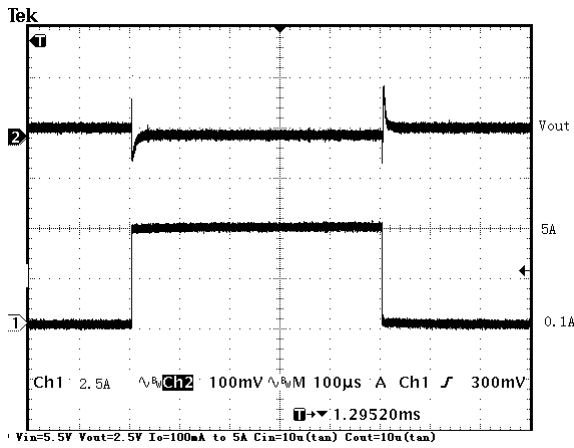


Figure 9. Load Transient Response

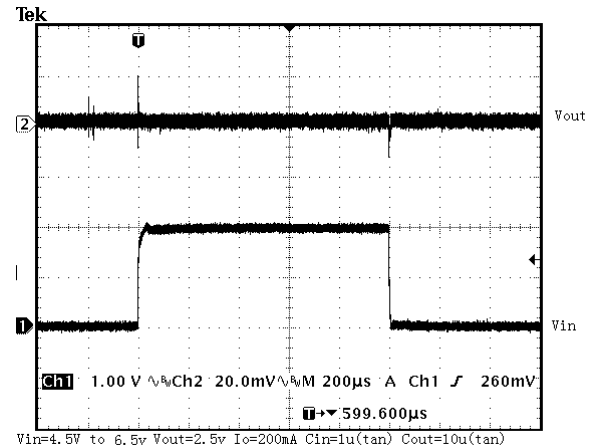


Figure 10. Line Transient Response

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## Typical Applications

Adjustable Output Voltage  $V_{OUT} = V_{REF} * (1 + R2/R1) + I_{ADJ} * R2$  Or  $V_{OUT} = V_{REF} * (1 + R2/R1)$ ,  $V_{REF} = 1.25V$

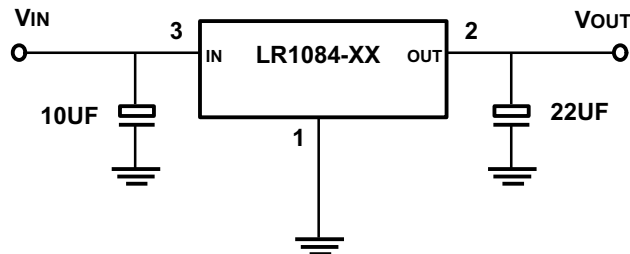


Fig 11. Fixed Output Regulator

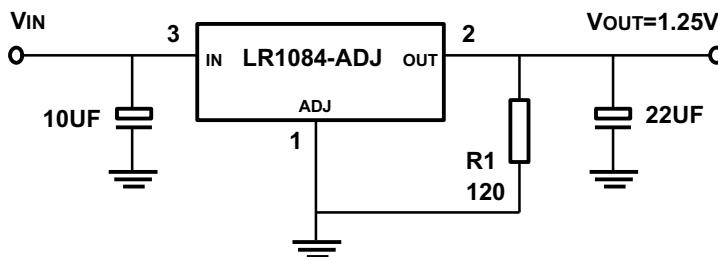


FIG 12 . Adjustable Output 1.25 Voltage Application Circuit

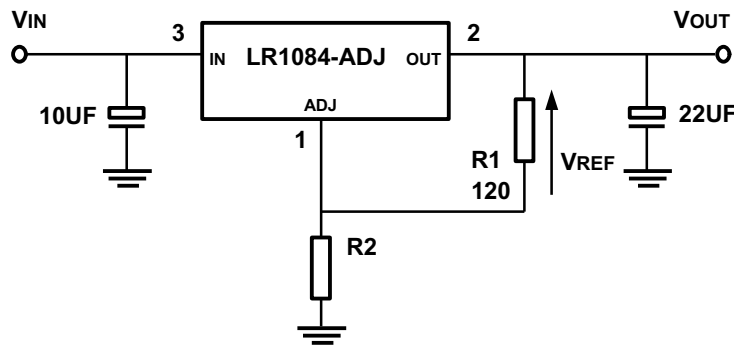


FIG 13 . Adjustable Output Voltage Application Circuit

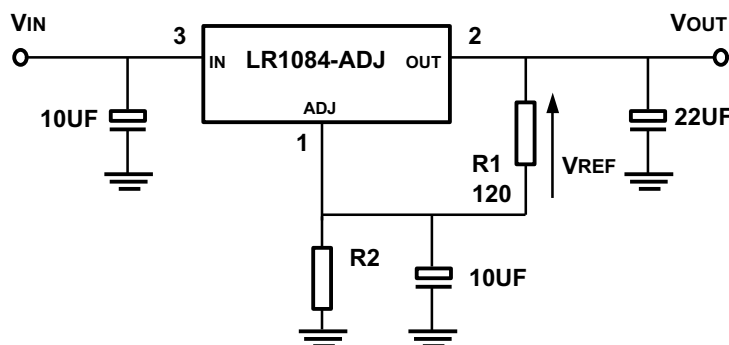


FIG 14 . Adjustable Output Voltage Application with improved Ripple Rejection

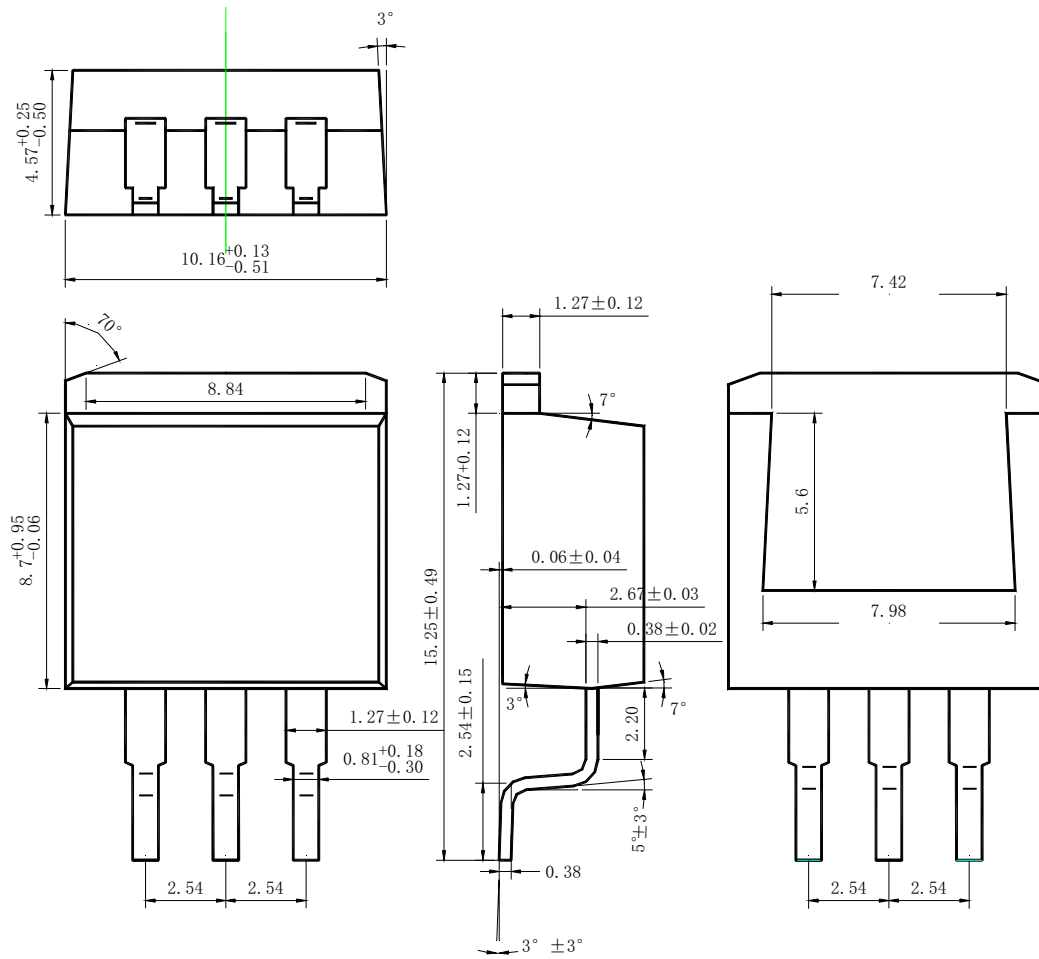


# LR1084

## Mechanical Dimensions

TO-263-3L

Unit: mm



# LR1084

## Mechanical Dimensions (Continued)

TO-263-2L

Unit: mm

