

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

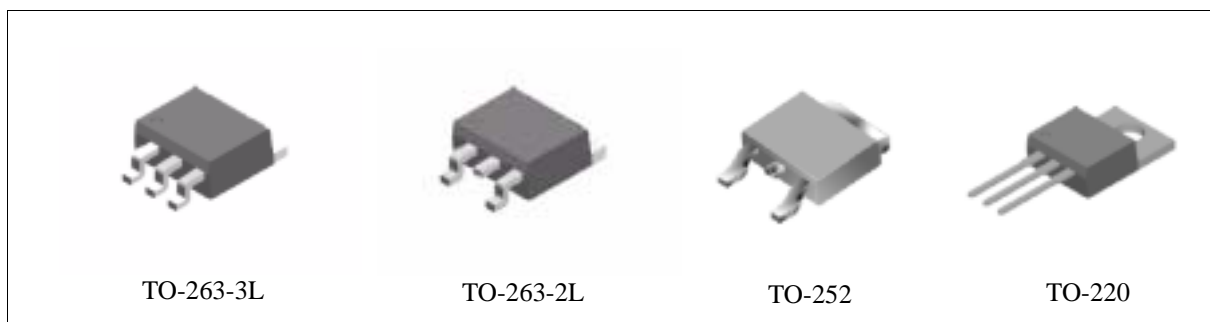
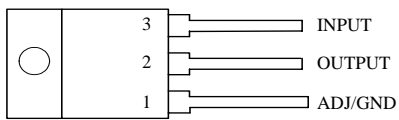


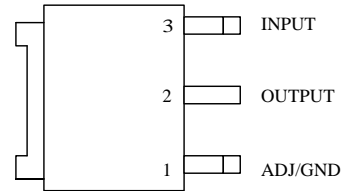
Figure 1. Package Types of LR1084

Pin Configuration

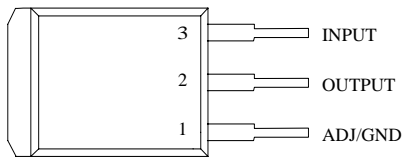
T Package
(TO-220)



D Package
(TO-252)



S Package
(TO-263-3L)



S Package
(TO-263-2L)

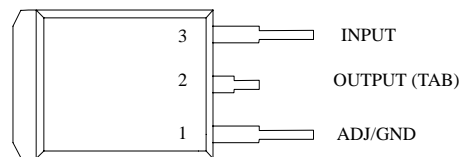


Figure 2. Pin Configuration of LR1084 (Top View)

Ordering Information

| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|-----------|-------------------|---------------|---------------|----------------|
| TO-252 | 0 to 125°C | LR1084D-ADJ | LR1084D-ADJ | Tube/Tape/Reel |
| | | LR1084D-1.5 | LR1084D-1.5 | |
| | | LR1084D-1.8 | LR1084D-1.8 | |
| | | LR1084D-2.5 | LR1084D-2.5 | |
| | | LR1084D-2.85 | LR1084D-2.85 | |
| | | LR1084D-3.3 | LR1084D-3.3 | |
| | | LR1084D-5.0 | LR1084D-5.0 | |
| TO-220 | 0 to 125°C | LR1084T-ADJ | LR1084T-ADJ | Tube |
| | | LR1084T-1.5 | LR1084T-1.5 | |
| | | LR1084T-1.8 | LR1084T-1.8 | |
| | | LR1084T-2.5 | LR1084T-2.5 | |
| | | LR1084T-2.85 | LR1084T-2.85 | |
| | | LR1084T-3.3 | LR1084T-3.3 | |
| | | LR1084T-5.0 | LR1084T-5.0 | |
| TO-263-3L | 0 to 125°C | LR1084S-ADJ | LR1084S-ADJ | Tube/Tape/Reel |
| | | LR1084S-1.5 | LR1084S-1.5 | |
| | | LR1084S-1.8 | LR1084S-1.8 | |
| | | LR1084S-2.5 | LR1084S-2.5 | |
| | | LR1084S-2.85 | LR1084S-2.85 | |
| | | LR1084S-3.3 | LR1084S-3.3 | |
| | | LR1084S-5.0 | LR1084S-5.0 | |
| TO-263-2L | 0 to 125°C | LR1084S2-ADJ | LR1084S2-ADJ | Tube/Tape/Reel |
| | | LR1084S2-1.5 | LR1084S2-1.5 | |
| | | LR1084S2-1.8 | LR1084S2-1.8 | |
| | | LR1084S2-2.5 | LR1084S2-2.5 | |
| | | LR1084S2-2.85 | LR1084S2-2.85 | |
| | | LR1084S2-3.3 | LR1084S2-3.3 | |
| | | LR1084S2-5.0 | LR1084S2-5.0 | |

Some of our products are available in Lead Free packages; If buyers need Lead Free product, please add -E1 after the part number in your order. For example, LR358M is a standard tin-lead product, LR358M-E1 means a Lead Free product.

LR1084 X - Y

Circuit Type



Package

- D: TO-252
- T: TO-220
- S: TO-263-3L
- S2: TO-263-2L

ADJ: Adjustable Output

- 1.5: Fixed Output 1.5V
- 1.8: Fixed Output 1.8V
- 2.5: Fixed Output 2.5V
- 2.85: Fixed Output 2.85V
- 3.3: Fixed Output 3.3V
- 5.0: Fixed Output 5.0V

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 |

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 1.225 | 1.250 1.250 | 1.262 1.270 | 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 1.47 | 1.5 1.5 | 1.515 1.53 | 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 1.764 | 1.8 1.8 | 1.818 1.836 | |
| | | 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 2.45 | 2.5 2.5 | 2.525 2.55 | |
| | | 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 2.793 | 2.85 2.85 | 2.879 2.907 | |
| | | 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 3.234 | 3.3 3.3 | 3.333 3.366 | |
| | | 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 4.9 | 5 5 | 5.05 5.1 | |
| Line Regulation | ΔV_{OUT} | LR1084-ADJ, $I_{OUT} = 10\text{mA}$, $2.85\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.015 0.035 | 0.2 0.2 | % |
| | | LR1084-1.5, $I_{OUT} = 10\text{mA}$, $3.1\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | LR1084-1.8, $I_{OUT} = 10\text{mA}$, $3.4\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | LR1084-2.5, $I_{OUT} = 10\text{mA}$, $4.1\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | LR1084-2.85, $I_{OUT} = 10\text{mA}$, $4.5\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | LR1084-3.3, $I_{OUT} = 10\text{mA}$, $4.9\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 6 6 | mV |
| | | LR1084-5.0, $I_{OUT} = 10\text{mA}$, $6.6\text{V} \leq V_{IN} \leq 10\text{V}$ | | 0.5 1 | 10 10 | mV |

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

Typical Performance Characteristics

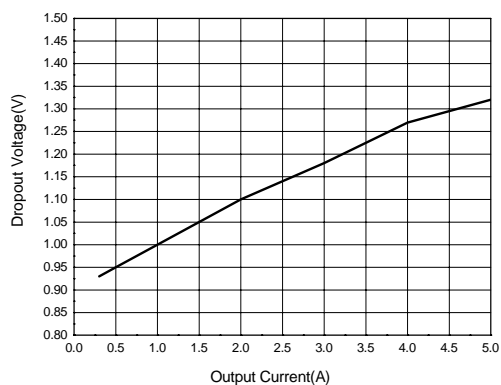


Figure 3. Dropout Voltage vs. Output Current

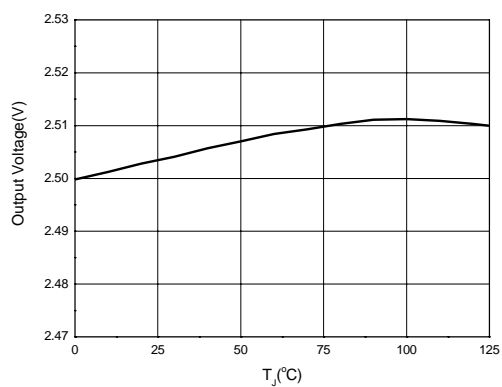


Figure 4. Output Voltage vs. Temperature

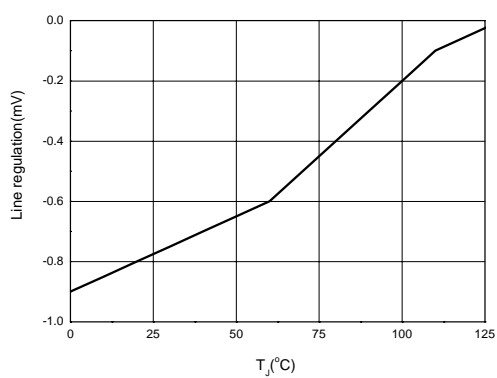


Figure 5. Line Regulation vs. Temperature

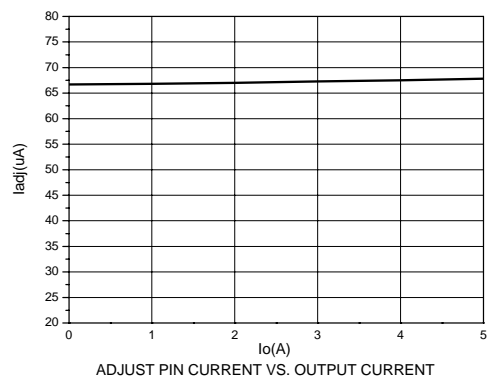


Figure 6. Adjust Pin Current vs. Output Current

Typical Performance Characteristics (Continued)

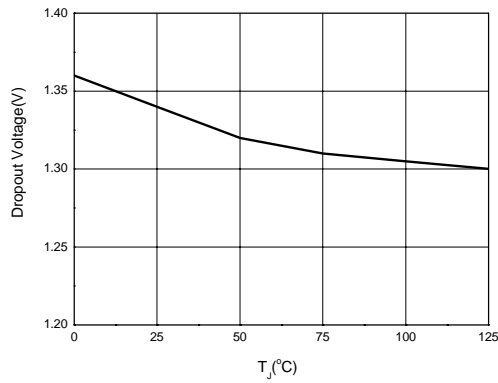


Figure 7. Dropout Voltage vs. Temperature

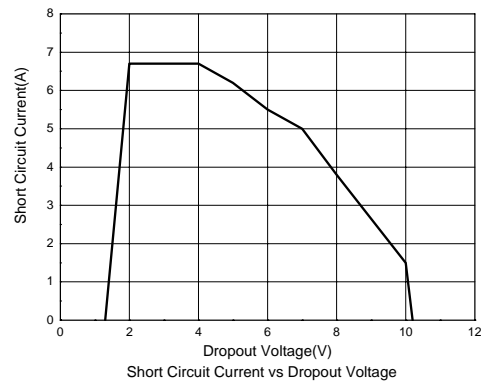


Figure 8. Short Circuit Current vs. Dropout Voltage

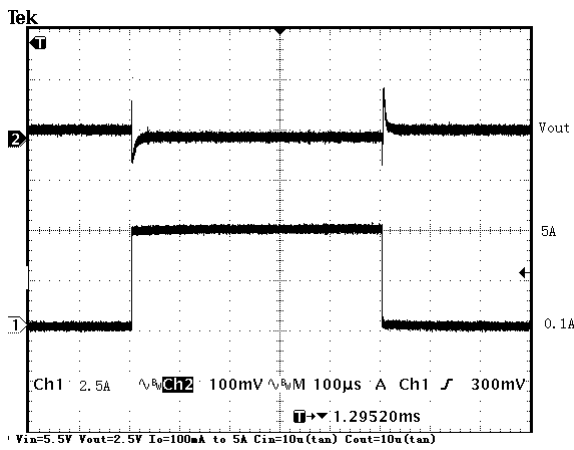


Figure 9. Load Transient Response

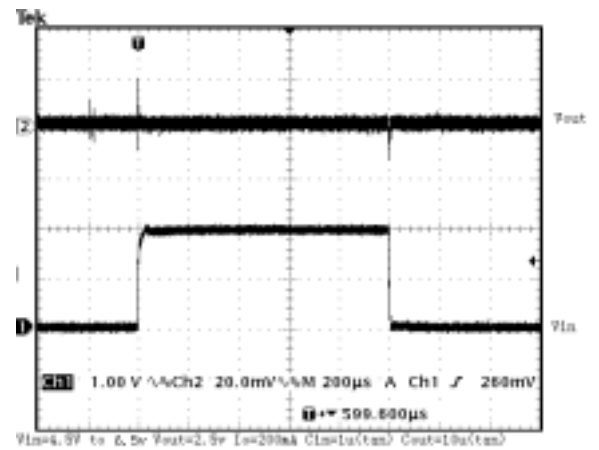


Figure 10. Line Transient Response

Typical Applications

Adjustable Output Voltage $V_{OUT} = V_{REF} \cdot (1 + R_2/R_1) + I_{ADJ} \cdot R_2$ Or $V_{OUT} = V_{REF} \cdot (1 + R_2/R_1)$, $V_{REF} = 1.25V$

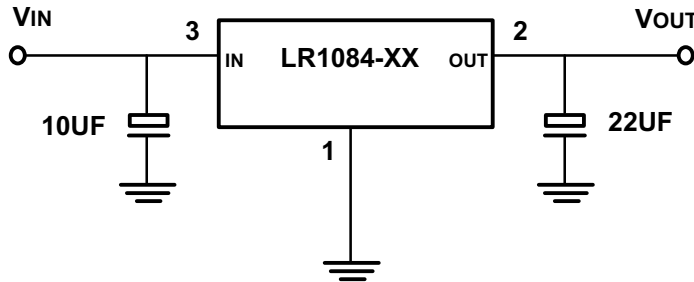


Fig 11. Fixed Output Regulator

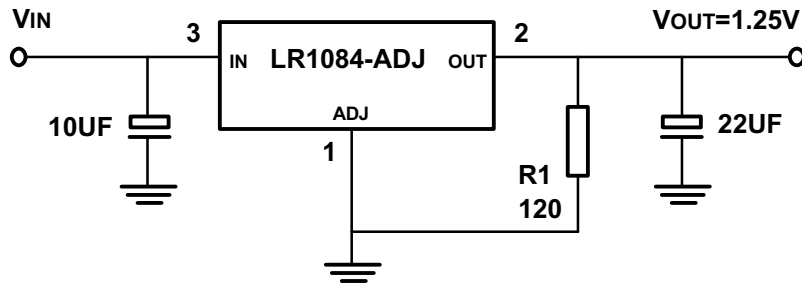


FIG 12 . Adjustable Output 1.25 Voltage Application Circuit

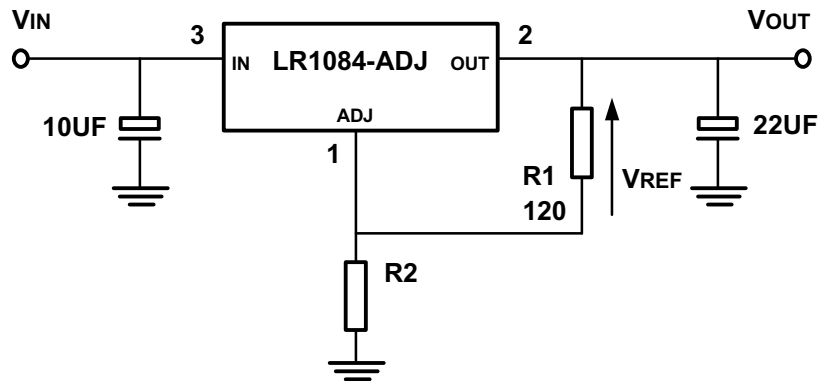


FIG 13 . Adjustable Output Voltage Application Circuit

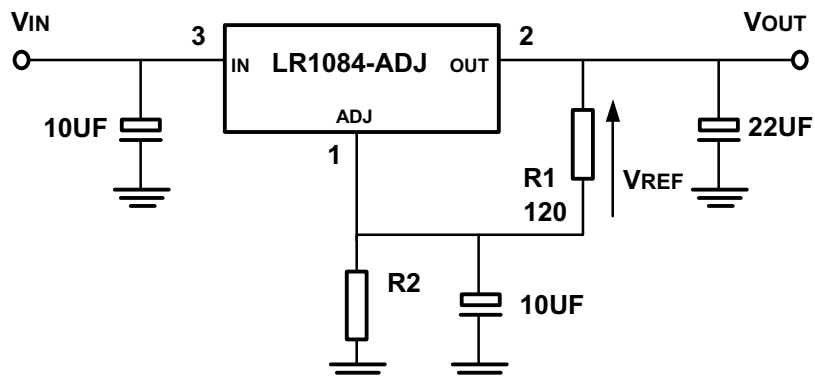
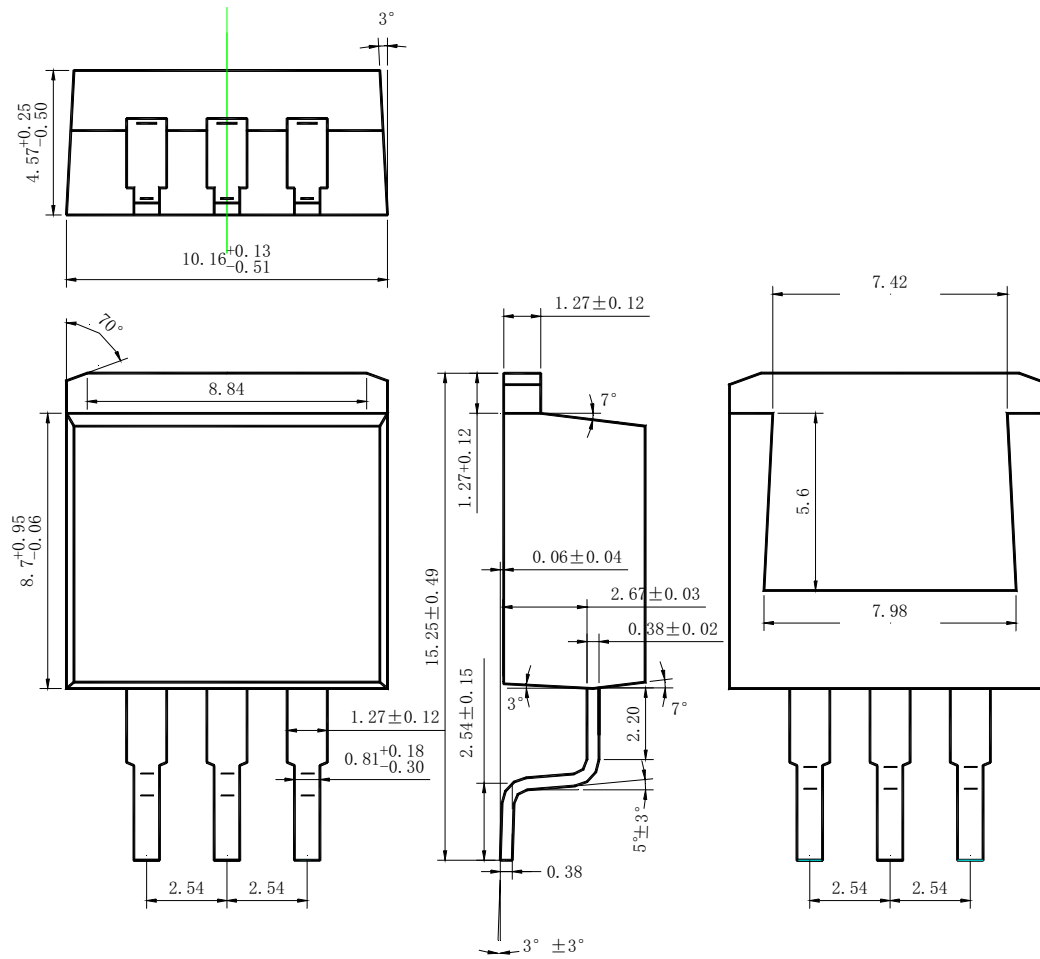


FIG 14 . Adjustable Output Voltage Application with improved Ripple Rejection

Mechanical Dimensions

TO-263-3L

Unit: mm



Mechanical Dimensions (Continued)

TO-263-2L

Unit: mm

