# ACE1084

## 5A Bipolar Linear Regulator

### Description

ACE1084 is a series of low dropout three terminal regulators with a typical dropout voltage of 1.4V at 5A load current.

Other than fixed voltage versions (1.8V, 2.5V, 3.3V, 5.0V), ACE1084 has an adjustable voltage version, with which desired voltage can be achieved by setting the values of two external resistors of the application circuitry.

ACE1084 offers thermal shut down and current limit functions to assure the stability of chip and power system.

ACE1084 series is available in standard packages of TO-263-2L, TO-263-3L, TO-220 and TO-252.

### Features

- Fixed and adjustable versions.
- Maximum output current: 5A
- Maximum input voltage: 15V
- Line regulation: 0.2% (Typical)
- Load regulation: 0.2% (Typical)
- On-Chip Thermal Shutdown
- Operation environment Temperature:-25 ~85°C

### Application

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

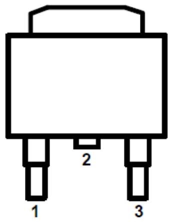
### Absolute Maximum Ratings

| Parameter | | Value |
|---|---|---|
| Max Input Valtage | | 15V |
| Operating Junction Temperature(Tj) | | 150°C |
| Ambient Temperature | | -25°C-85°C |
| Package Thermal Resistance | TO-252 | 12.5°C/W |
| | TO-263 | 3°C/W |
| | TO-220 | 3°C/W |
| Storage temperature(Ts) | | -40°C-150°C |
| Lead Temperature & Time | | 260°C,10S |

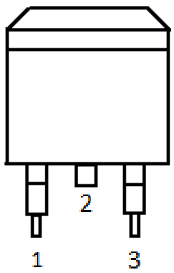
Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

## Packaging Type

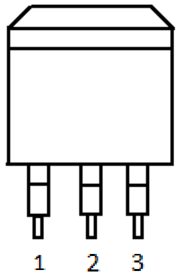
TO-252



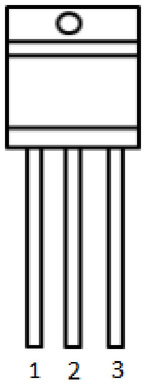

TO-263-2L




TO-263-3L




TO-220




## Pin Configuration

| Pin Number | Description |
|---|---|
| 1 | $V_{SS}$/ADJ |
| 2 | $V_{OUT}$ |
| 3 | $V_{IN}$ |

## Recommended work conditions

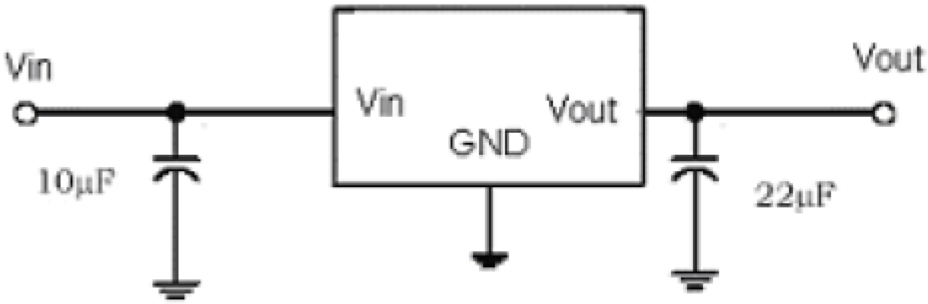
| Parameter | Value |
|---|---|
| Input Voltage Range | Max. 15V |
| Operating Junction Temperature ($T_J$) | 0°C ~ 125°C |

## Ordering information

ACE1084 XX XX + H

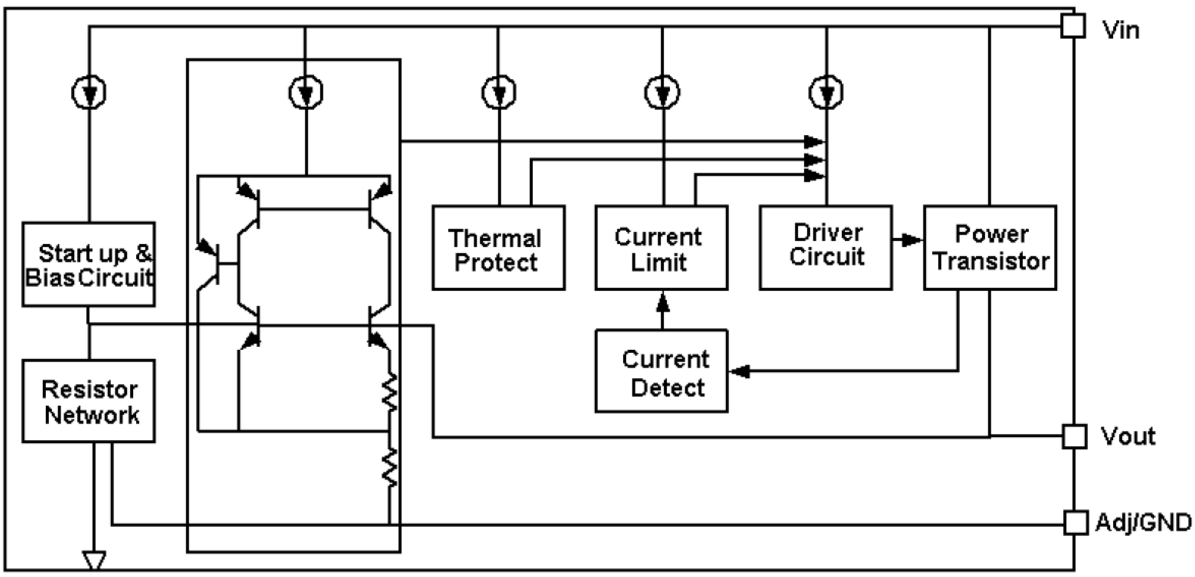
- Halogen - free
- Pb - free
- YM: TO-252
  1WN: TO-263-3
  2WN: TO-263-2
  ZM: TO-220
- Output Voltage: 1.8V/2.5V/3.3V/5.0V/ Default: Adjustable Version

## Typical Application




Note: Input capacitor ($C_{in}$=10uF) and Output capacitor ($C_{out}$=22uF) are recommended in all application circuit.

## Block Diagram



## Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reference Voltage | Vref | 10mA≦Iout≦SA,1.5V≦Vin-Vout≦5V | 1.225 | 1.25 | 1.275 | V |
| Output Voltage | Vout | ACE1084-1.80V<br>Iout=0mA,Vin=4.8V,Tj=25°C<br>10mA≦Iout≦5A, 3.4V≦Vin≦7V | 1.773<br>1.764 | 1.80<br>1.80 | 1.827<br>1.836 | V |
| | | ACE1084-2.50V<br>Iout=0mA,Vin=5.5V,Tj=25°C<br>10mA≦Iout≦5A, 4.1V≦Vin≦7V | 2.462<br>2.45 | 2.50<br>2.50 | 2.537<br>2.55 | V |
| | | ACE1084-3.3V<br>Iout=0mA,Vin=6.3V,Tj=25°C<br>10mA≦Iout≦5A, 4.9V≦Vin≦8V | 3.25<br>3.234 | 3.3<br>3.3 | 3.350<br>3.366 | V |
| | | ACE1084-5.0V<br>Iout=0mA,Vin=8.0V,Tj=25°C<br>10mA≦Iout≦5A, 6.6V≦Vin≦10V | 4.925<br>4.90 | 5.0<br>5.0 | 5.075<br>5.10 | V |
| Line Regulation | ∆Vout | ACE1084-ADJ<br>Iout=10mA, 2.85V≦Vin≦10V | | 10 | 40 | mV |
| | | ACE1084-1.8V<br>Iout=10mA, 3.4V≦Vin≦10V | | 10 | 40 | |
| | | ACE1084-2.5V<br>Iout=10mA, 4.1V≦Vin≦10V | | 10 | 40 | |
| | | ACE1084-3.3V<br>Iout=10mA, 4.9V≦Vin≦10V | | 10 | 40 | |
| | | ACE1084-5.0V<br>Iout=10mA, 6.6V≦Vin≦10V | | 10 | 40 | |
| Load Regulation | ∆Vout | ACE1084-ADJ<br>Vin-Vout=1.6v, 0≦Iout≦4A | | 16 | 50 | mV |
| | | ACE1084-1.8V<br>Vin-Vout=1.6v, 0≦Iout≦4A | | 16 | 50 | |
| | | ACE1084-2.5V<br>Vin-Vout=1.6v, 0≦Iout≦4A | | 16 | 50 | |
| | | ACE1084-3.3V<br>Vin-Vout=1.6v, 0≦Iout≦4A | | 16 | 50 | |
| | | ACE1084-5.0V<br>Vin-Vout=1.6v, 0≦Iout≦4A | | 16 | 50 | |
| Quiescent Current | $I_Q$ | ACE1084-1.2V, Vin=10V | | 5 | 10 | mA |
| | | ACE1084-1.8V, Vin=10V | | 5 | 10 | |
| | | ACE1084-2.5V, Vin=10V | | 5 | 10 | |
| | | ACE1084-3.3V, Vin=10V | | 5 | 10 | |
| | | ACE1084-5.0V, Vin=10V | | 5 | 10 | |

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Dropout Voltage (note 3) | Vin-Vout | ΔVout, ΔVref =1%，Iout=5A | | 1.4 | | V |
| Current Limit | | $V_{in}$-$V_{out}$=2V, $T_J$=25℃ | | 7 | | A |
| Minimum load Current | Imin | ACE1084-ADJ | | 3 | 10 | mA |
| Quiescent Current | $I_q$ | Vin=10V | | 5 | 10 | mA |
| Adjust Pin Current(Adjustable Version) | $I_{Adj}$ | 2.85V≦Vin≦4.25V,10mA≦Iout≦5A | | 45 | 120 | uA |
| Ripple Rejection | | F-120Hz,Cout=25uF, Iout=5A,Vin-Vout=3V | 60 | | | dB |
| Adjust Pin Current Change | $I_{change}$ | 10mA ≦Iout≦5A 1.5V≦Vin-Vout≦6V | | 0.4 | 10 | uA |
| Temperature Stability | | Iout=10mA, Vin-Vout=1.5v | | | 0.5 | % |
| Thermal Resistance Junction to case | θ*JC* | TO-252<br>TO-263<br>TO-220 | | 12.5<br>3<br>3 | | °C/W |
| Over Temperature Protection | OTP | | | 150 | | °C |

Note：

1. Line Regulation and Load Regulation in Table1 are tested under constant junction temperature.
2. When load current varies between 0~5A and Vin-Vout ranges from 1.5V~6V at constant junction temperature, the parameter is satisfied the criterion in table. If temperature varies between 0°C≤TA≤80°C，it needs output current to be larger than 10mA to satisfy the criterion.
3. Dropout Voltage is the voltage difference between the input and output pin when the input voltage is minimum to maintain the lowest spec output voltage.
4. Minimum Load Current is defined as the minimum output current necessary to maintain regulation. Specified output accuracy can be met when the output current exceeds the minimum load current (10mA) and the dropout voltage (Vin-Vout) lies between 1.5V and 6V.

## Detailed Description

ACE1084 is a series of low dropout voltage three terminal regulators. Its circuit has a trimmed band gap reference to ensure output voltage accuracy independent of temperature variance. On-chip thermal shutdown provides protection against overload and conditions as elevated ambient temperature.

Its application circuitry requires minimum number of external components. Both fixed voltage and adjustable voltage versions need input and output capacitors to assure output voltage stability. Any desired output voltage from 1.25V to 10V can be achieved with adjustable version by assigning proper values to two external resistors in its application circuitry (as shown in Figure.1, as R1, R2 are the two external resistors.).

## Typical Application

ACE1084 has an adjustable version and fixed versions, Figure.1 shows their typical application circuitry.

A 10uF capacitor connected between input and GND as bypass capacitor and a 22uF capacitor between output and GND are recommended for all application.

Using a bypass capacitor ($C_{Adj}$) between the adjust terminal and ground can improve ripple rejection. The bypass capacitor prevents ripple from being amplified in case the output voltage is increased. The impedance of $C_{Adj}$ should be less than the resistance of R1 to prevent ripple from being amplified at any frequency. As R1 is normally in the range of 120Ω~200Ω, the value of $C_{Adj}$ should satisfy the following condition:

$$1/(2\pi * Frequency_{Ripple} * Cadj) < R_1$$

A 10µF capacitor is recommended.

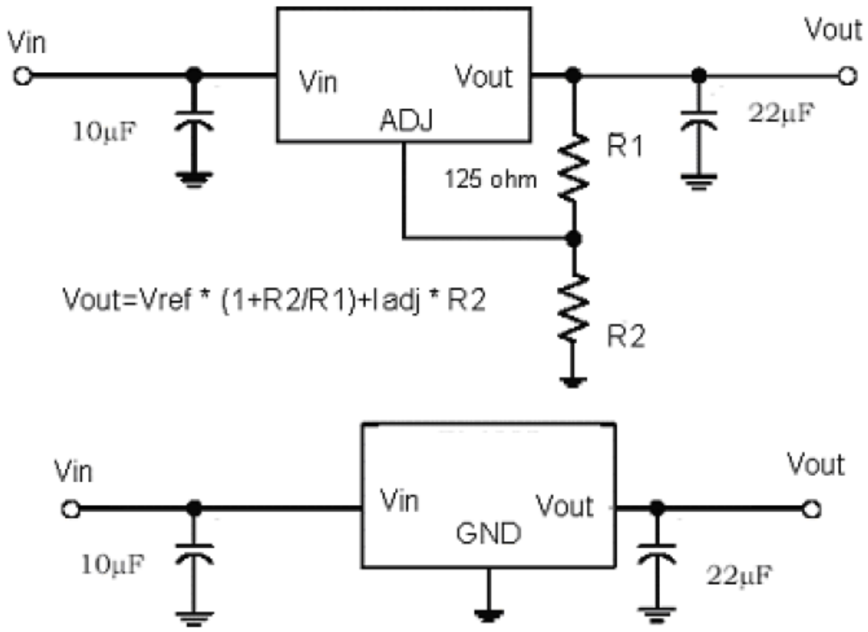



Figure1. Typical Application of ACE1084

## Explanation

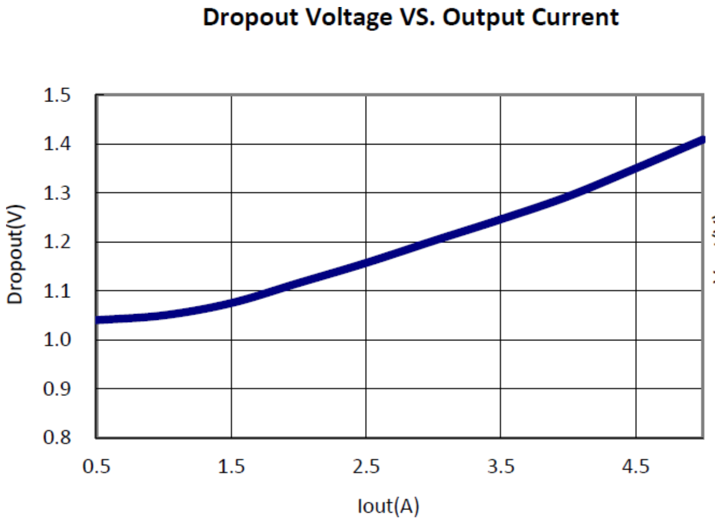
The output voltage of adjustable version satisfies this followed equation:

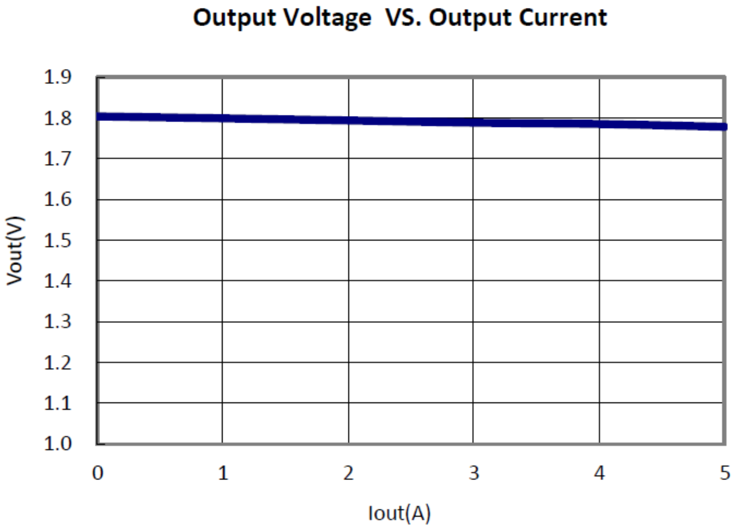
$$V_{out}= V_{Ref} \times (1+R_2/R_1)+IAdj \times R_2.$$

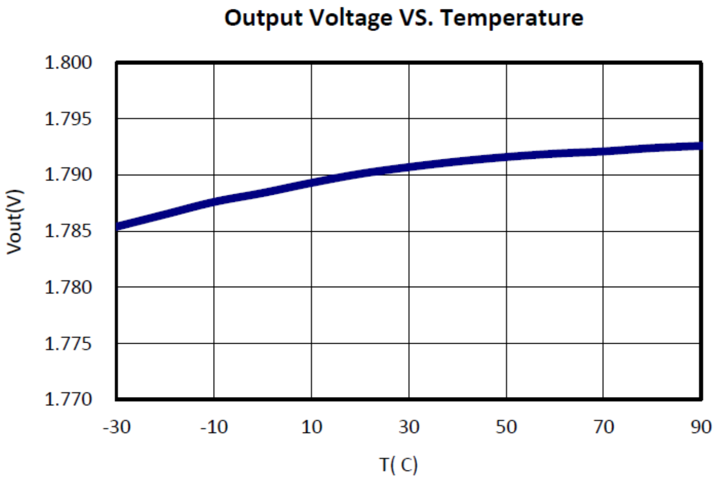
The second term $I_{Adj} \times R_2$ can be ignored since the adjustable pin current $I_{Adj}$ (~ 50µA) is much less than the current through $R_1$ (~ 4mA).

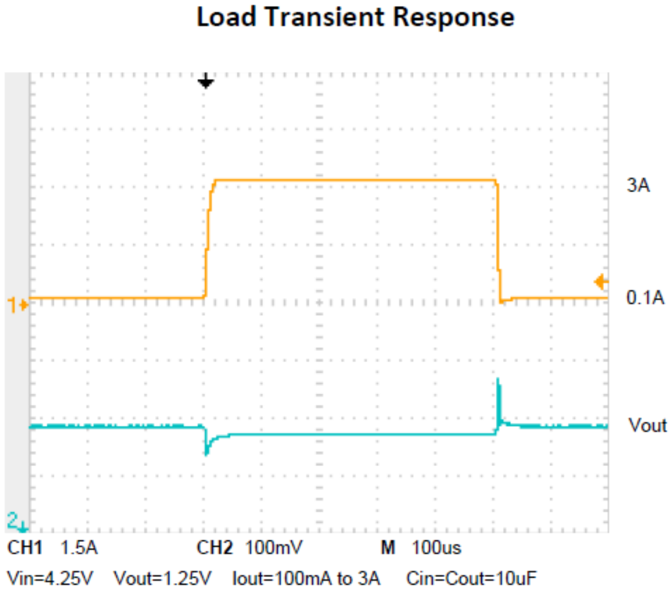
The value of $R_1$ is preferred in the range of 120Ω～200Ω and the total output current of the adjustable version of ACE1084 needs to exceed 10mA to assure normal chip operation.

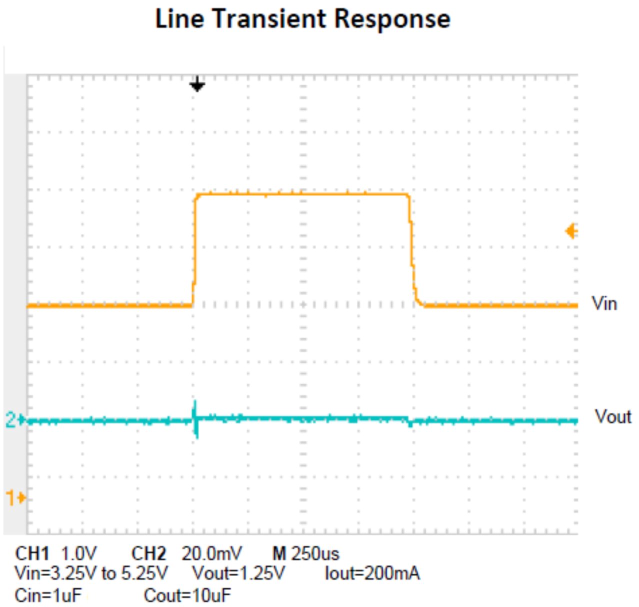
## Typical Performance Characteristic



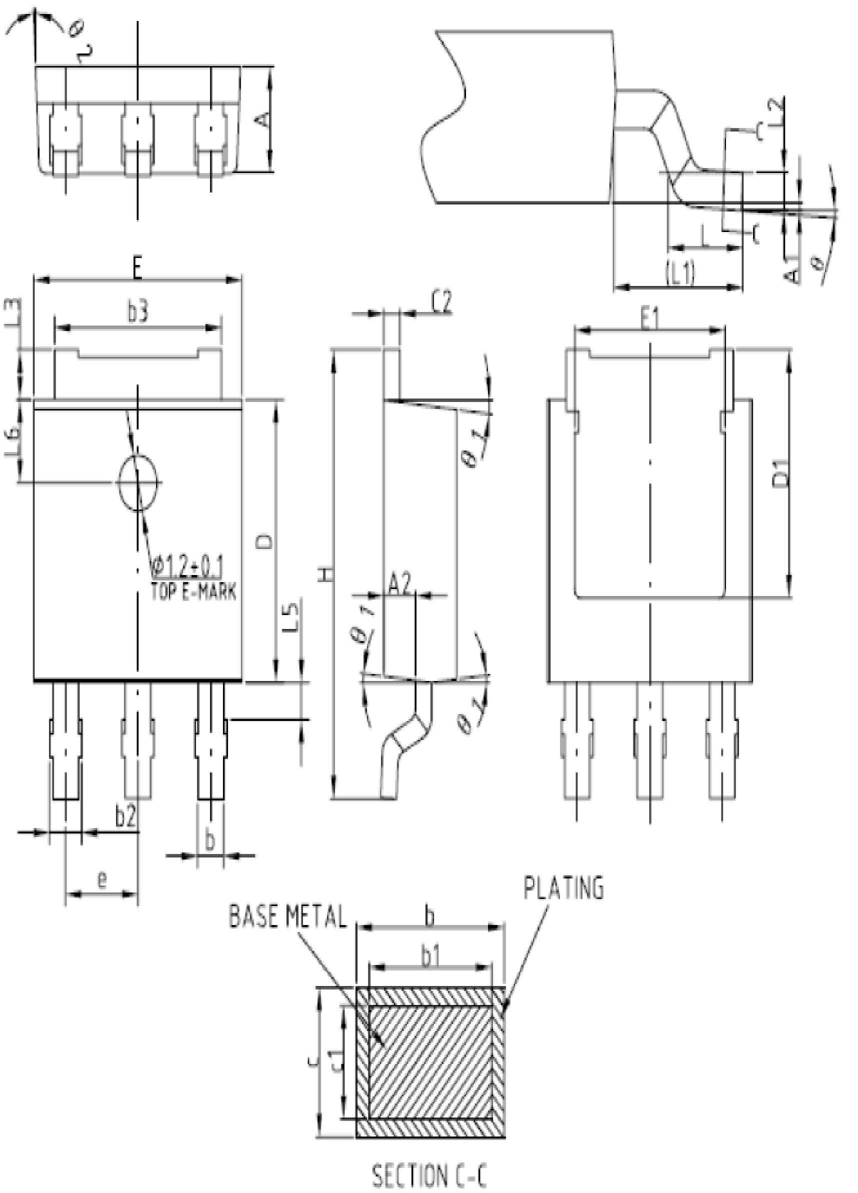



## Packing Information

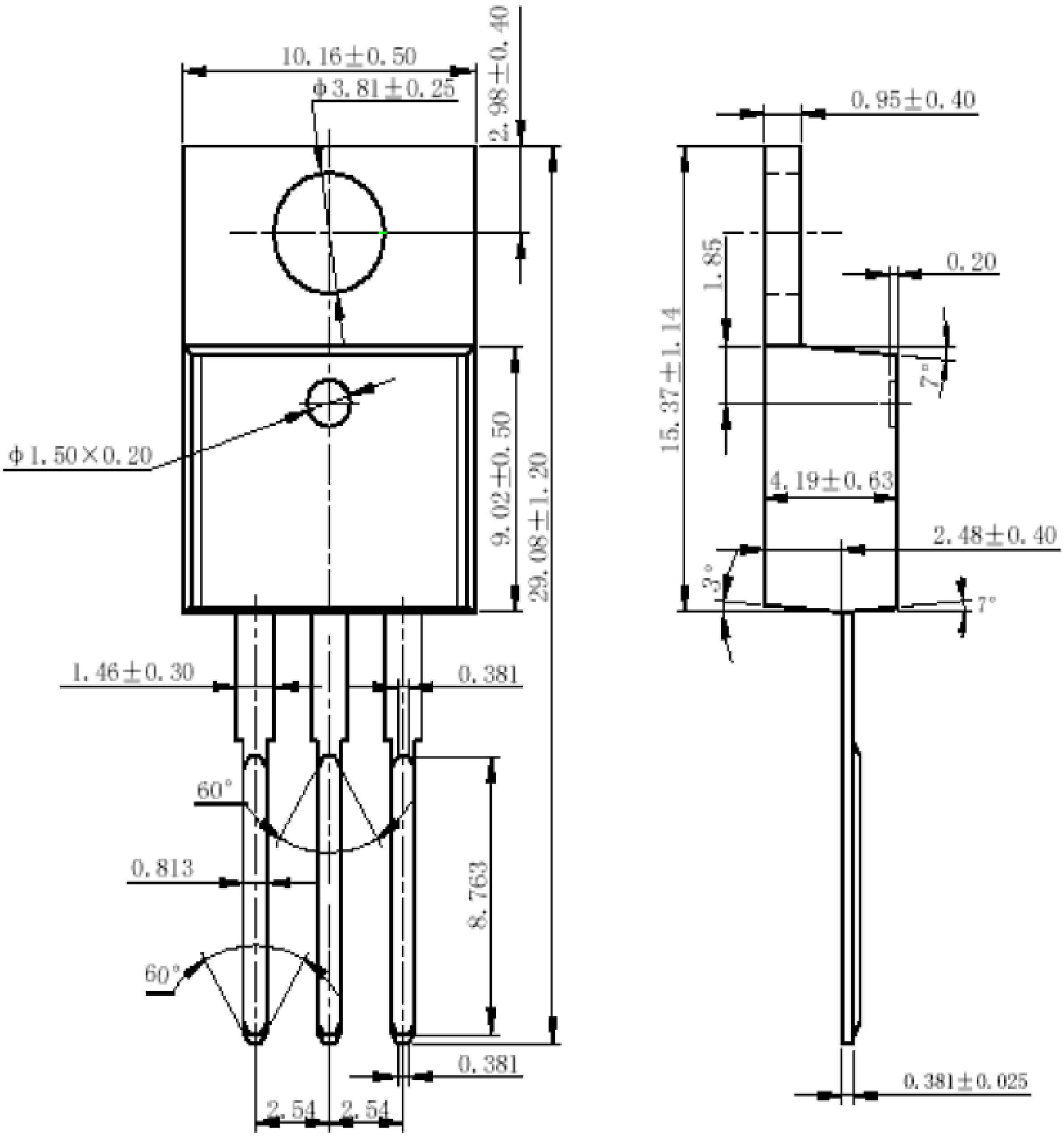
### TO-252




| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 2.20 | 2.30 | 2.38 |
| A1 | 0 | – | 0.10 |
| A2 | 0.90 | 1.00 | 1.10 |
| b | 0.77 | – | 0.89 |
| b1 | 0.76 | 0.81 | 0.86 |
| b2 | 0.77 | – | 1.10 |
| b3 | 5.23 | 5.33 | 5.43 |
| c | 0.47 | – | 0.60 |
| c1 | 0.46 | 0.51 | 0.56 |
| c2 | 0.47 | – | 0.60 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | 5.25 | – | – |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | – | – |
| e | 2.28BSC | | |
| H | 9.80 | 10.10 | 10.40 |
| L | 1.40 | 1.50 | 1.70 |
| L1 | 2.90REF | | |
| L2 | 0.51BSC | | |
| L3 | 0.90 | – | 1.25 |
| L5 | 0.90 | – | 1.50 |
| L6 | 1.80REF | | |
| θ | 0° | – | 8° |
| θ1 | 3° | 5° | 7° |
| θ2 | 1° | 3° | 5° |

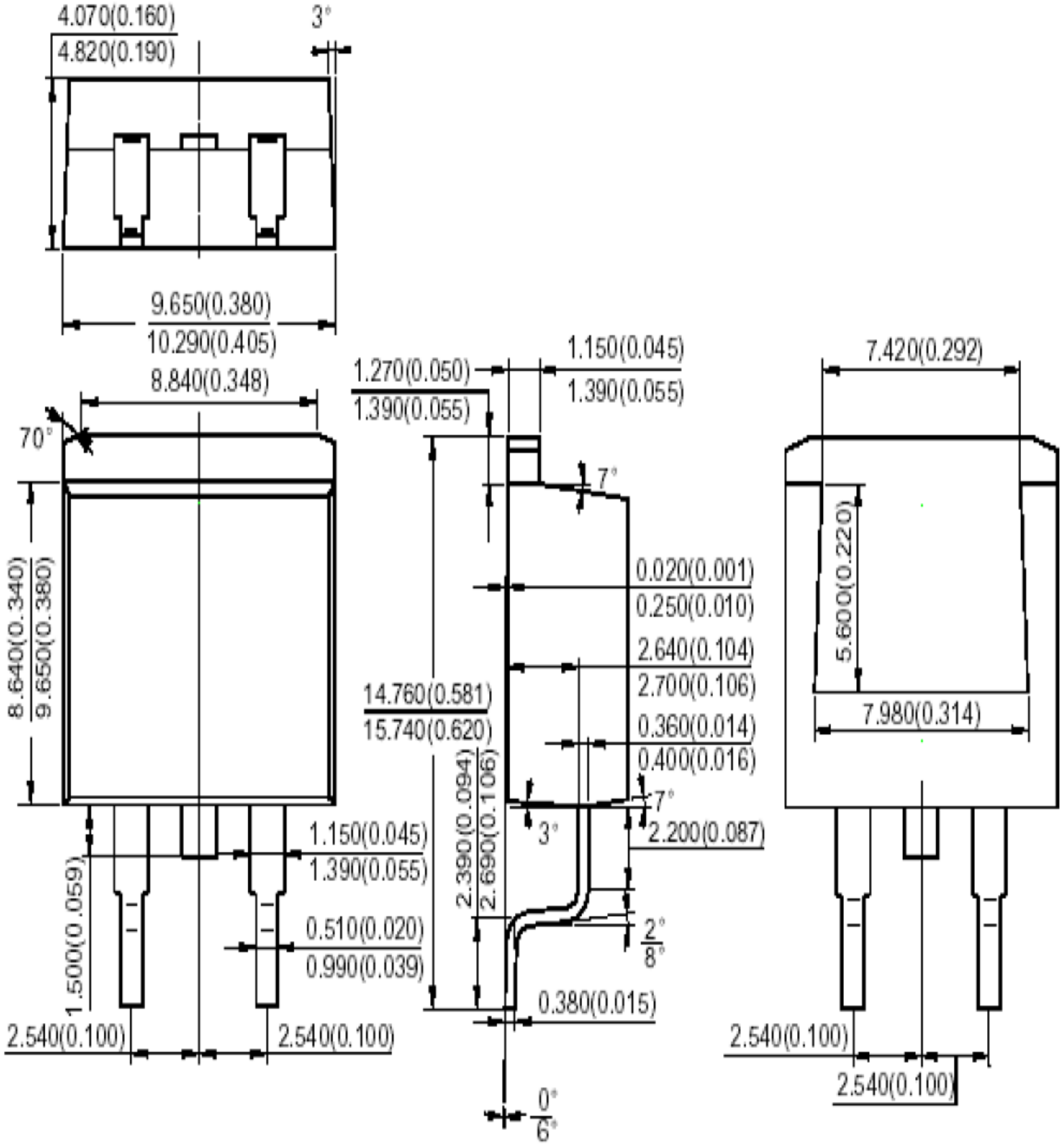
## Packing Information

### TO-220



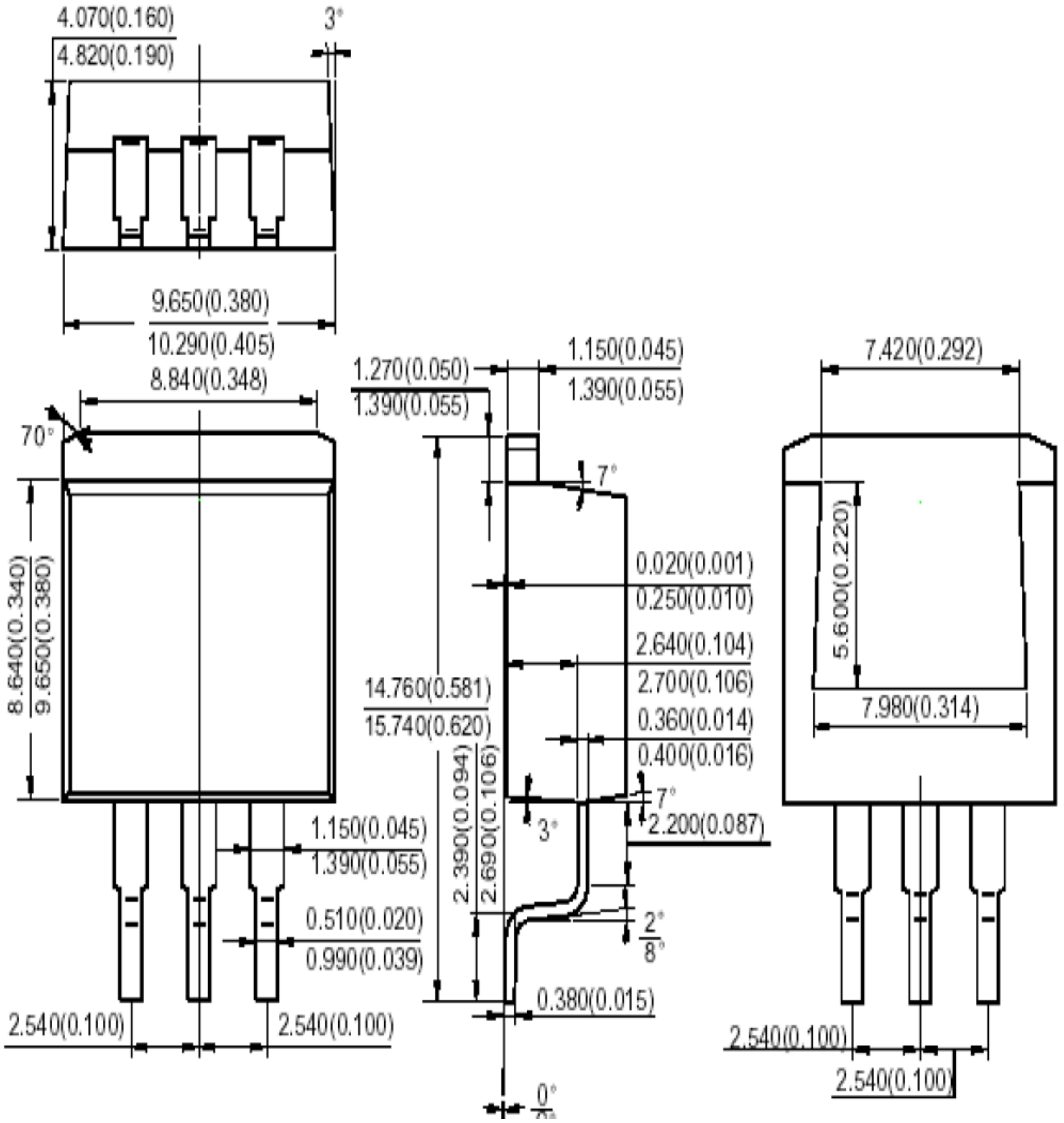
## Packing Information

**TO-263-2**



## Packing Information

### TO-263-3



Notes

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