# 3A Low-Dropout Linear Regulator

## Features

- Available in 1.5V, 1.8V, 2.5V, 3.3V version
- TO-220, TO-263-2, TO-263-3, TO-252-2 package
- Internal short circuit current limiting
- Internal over temperature protection
- Output current 3A

## Applications

- Post regulation for switching DC/DC converter
- High efficiency linear regulator
- Battery powered instrumentation
- Motherboard
- DVD-Video Player

## General Description

The AD1085-XX is a low dropout linear regulator with a dropout of 0.8V at 3A of load current. It is available in three fixed voltages: 1.5V, 1.8V, 2.5V and 3.3V. Refer to the AD1085 for the adjustable version.

The AD1085-XX provides over temperature and over current protection circuits to prevent it from being damaged by abnormal operating conditions.

The AD1085-XX is available in TO-220, TO-263-2, TO-263-3, TO-252-2 packages. A minimum of 220μF tantalum electrolytic capacitor is required at the output to improve the transient response and stability.

## ORDERING INFORMATION

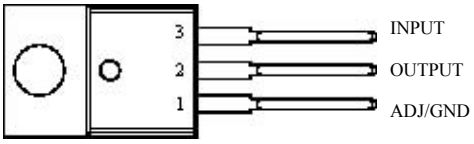
| TO-220<br>3-PIN | TO-263-2<br>3-PIN | TO-263-3<br>3-PIN | TO-252-2<br>DPAK | Oper. Temp.<br>Range |
|---|---|---|---|---|
| AD1085T | AD1085S | AD1085M | AD1085D | 0°C to +125°C |
| AD1085T-X | AD1085S-X | AD1085M-X | AD1085D-X | 0°C to +125°C |

TO-220 TO-263-2 TO-263-3 TO-252-2

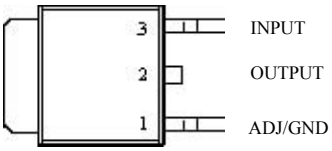
Figure 1. Package Types of AD1085

## Pin Configuration

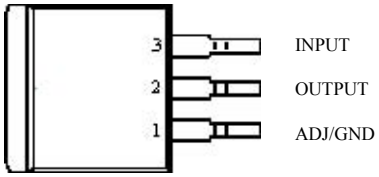
T Package
(TO-220-3)




D Package
(TO-252-2)




M Package
(TO-263-3)




S Package
(TO-263-2)

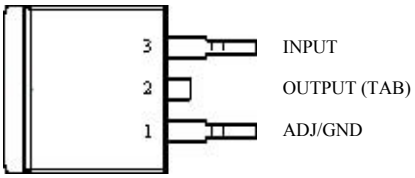



Figure 2. Pin Configuration of AD1085 (Top View)

## Functional Block Diagram

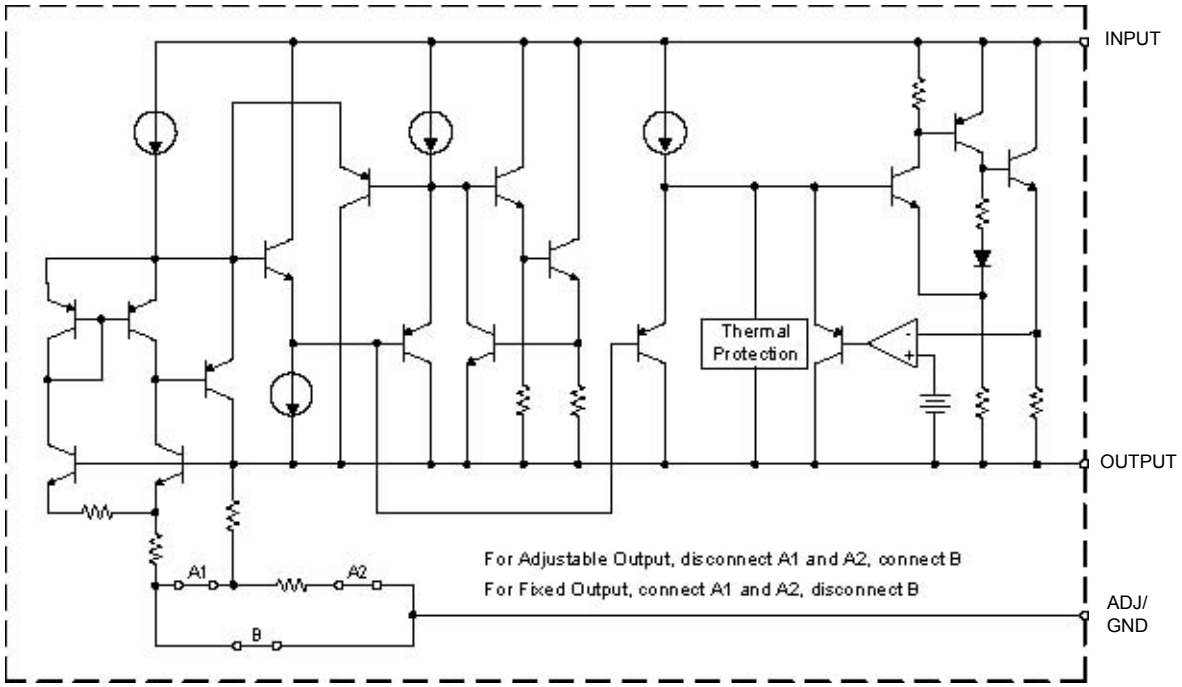
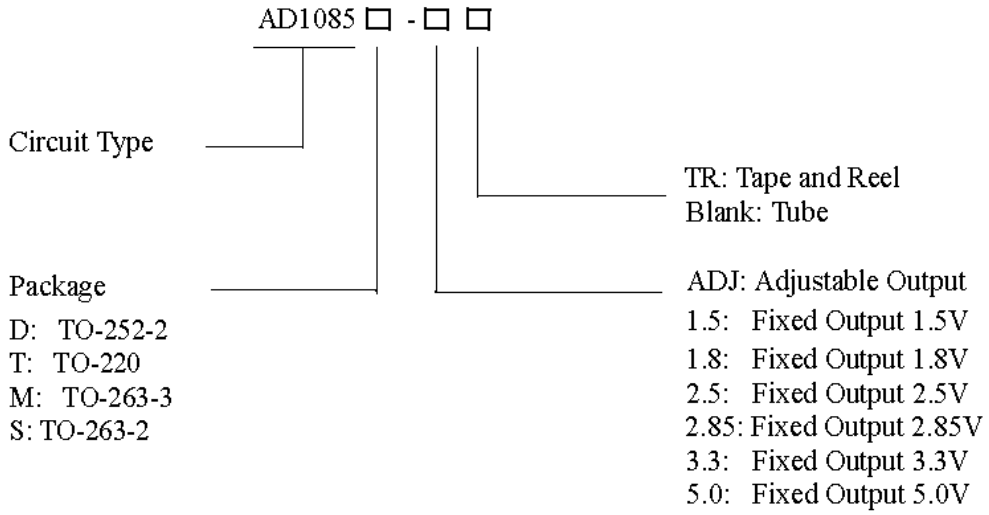



Figure 3. Functional Block Diagram of AD1085

## Ordering Information




## Absolute Maximum Ratings (Note 1)

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| Operating Junction Temperature | $T_J$ | 150 | | °C |
| Storage Temperature Range | $T_{STG}$ | -65 to 150 | | °C |
| Lead Temperature (Soldering, 10sec) | $T_{LEAD}$ | 260 | | °C |
| Thermal Resistance (Note 2) | θJA | TO-220-3 | 60 | °C /W |
| | | TO-252-2 | 100 | |
| | | TO-263-3 | 60 | |
| | | TO-263-2 | 60 | |
| ESD (Human Body Model) | ESD | 2000 | | V |
| Input Voltage(Max) | $V_{IN}$ | 12 | | V |
| Operating Junction Temperature Range(Max) | $T_J$ | 125 | | °C |

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.

Note 2: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, $\theta_{JA}$, and the ambient temperature, $T_A$. The maximum allowable power dissipation at any ambient temperature is calculated using: $P_{D(max)}=(T_{J(max)}-T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

## Electrical Characteristics

**$V_{IN}$ = 5V, $C_{IN}$ = $C_{OUT}$ = 220μF, $T_A$ = $T_J$ = 25°C unless otherwise specified.**

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reference Voltage | $V_{REF}$ | AD1085-ADJ, $I_{OUT}$=10mA,$V_{IN}$-$V_{OUT}$=3V, $T_J$=25℃,<br>10mA≤$I_{OUT}$≤3A, 1.5V≤$V_{IN}$-$V_{OUT}$≤5V | 1.238<br>1.225 | 1.250<br>1.250 | 1.262<br>1.275 | V |
| Output Voltage | $V_{OUT}$ | AD1085-1.5, $I_{OUT}$=0mA, $V_{IN}$=4.5V, $T_J$=25℃, 10mA≤<br>$I_{OUT}$≤ 3A, 3.0V≤$V_{IN}$≤ 6V | 1.485<br>1.47 | 1.5<br>1.5 | 1.515<br>1.53 | V |
| | | AD1085-1.8, $I_{OUT}$=0mA, $V_{IN}$=4.8V, $T_J$=25℃, 10mA≤<br>$I_{OUT}$≤3A, 3.3V≤$V_{IN}$≤7V | 1.782<br>1.764 | 1.8<br>1.8 | 1.818<br>1.836 | V |
| | | AD1085-2.5, $I_{OUT}$=0mA, $V_{IN}$=5.5V, $T_J$=25℃,<br>10mA≤$I_{OUT}$≤3A, 4.0V≤$V_{IN}$≤7V | 2.475<br>2.45 | 2.5<br>2.5 | 2.525<br>2.55 | V |
| | | AD1085-2.85, $I_{OUT}$=0mA, $V_{IN}$=6V, $T_J$=25℃,<br>10mA≤$I_{OUT}$≤3A, 4.4V≤$V_{IN}$≤8V | 2.821<br>2.793 | 2.85<br>2.85 | 2.879<br>2.907 | V |
| | | AD1085-3.3, $I_{OUT}$=0mA, $V_{IN}$=6.3V, $T_J$=25℃, 10mA≤<br>$I_{OUT}$≤3A, 4.8V≤$V_{IN}$≤ 8V | 3.267<br>3.234 | 3.3<br>3.3 | 3.333<br>3.366 | V |
| | | AD1085-5.0, $I_{OUT}$=0mA, $V_{IN}$=8V, $T_J$=25℃, 10mA≤<br>$I_{OUT}$≤ 3A, 6.5V≤$V_{IN}$≤10V | 4.95<br>4.90 | 5<br>5 | 5.05<br>5.10 | V |
| Line Regulation | $\Delta V_{OUT}$ | AD1085-ADJ, $I_{OUT}$=10mA, 2.85V≤$V_{IN}$≤10V | | 0.015<br>0.035 | 0.2<br>0.2 | % |
| | | AD1085-1.5, $I_{OUT}$=10mA, 3.0V≤$V_{IN}$≤10V | | 0.5<br>1 | 6<br>6 | mV |
| | | AD1085-1.8, $I_{OUT}$=10mA, 3.3V≤$V_{IN}$≤10V | | 0.5<br>1 | 6<br>6 | mV |
| | | AD1085-2.5, $I_{OUT}$=10mA, 4.0V≤ $V_{IN}$≤10V | | 0.5<br>1 | 6<br>6 | mV |
| | | AD1085-2.85, $I_{OUT}$=10mA, 4.4V≤ $V_{IN}$≤10V | | 0.5<br>1 | 6<br>6 | mV |
| | | AD1085-3.3, $I_{OUT}$=10mA, 4.8V≤ $V_{IN}$≤10V | | 0.5<br>1 | 6<br>6 | mV |

## Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for $T_J$=25°C. Limits appearing in Boldface type apply over the entire operating junction temperature range 0 to 125°C.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Line Regulation | $\Delta V_{OUT}$ | AD1085-5.0, $I_{OUT}$=10mA, 6.5V≤$V_{IN}$≤10V | | 0.5<br>1 | 10<br>10 | mV |
| | | AD1085-ADJ, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 0.1<br>0.2 | 0.3<br>0.4 | % |
| | | AD1085-1.5, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 3<br>7 | 15<br>20 | mV |
| | | AD1085-1.8, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 3<br>7 | 15<br>20 | mV |
| Load Regulation | $\Delta V_{OUT}$ | AD1085-2.5, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 3<br>7 | 15<br>20 | mV |
| | | AD1085-2.85, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 3<br>7 | 15<br>20 | mV |
| | | AD1085-3.3, 0mA≤$I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 3<br>7 | 15<br>20 | mV |
| | | AD1085-5.0, 0mA≤ $I_{OUT}$≤3A, $V_{IN}$-$V_{OUT}$=3V | | 5<br>10 | 20<br>35 | mV |
| Dropout Voltage | $V_{DROP}$ | $I_{OUT}$=3A, $\Delta V_{REF}$, $\Delta V_{OUT}$=1% | | 1.3 | 1.5 | V |
| Current Limit | $I_{LIMIT}$ | $V_{IN}$-$V_{OUT}$=3V | 3.2 | 4.5 | | A |
| Minimum Load Current | $I_{LOAD}$ (MIN) | $V_{IN}$=10V (AD1085-ADJ) | | 3 | 10 | mA |
| Quiescent Current | $I_Q$ | $V_{IN}$=10V (AD1085) | | 5 | 10 | mA |
| Ripple Rejection | PSRR | $f_{RIPPLE}$=120Hz, $C_{OUT}$=25μF, $I_{OUT}$=3A, $V_{IN}$-$V_{OUT}$ = 3V | 60 | 72 | | dB |
| Adjust Pin Current | $I_{ADJ}$ | $V_{IN}$ = 4.25V, $I_{OUT}$ = 10mA | | 55 | 120 | μA |
| Adjust Pin Current Change | $\Delta I_{ADJ}$ | 10mA ≤ $I_{OUT}$ ≤ 3A, 1.5V ≤ $V_{IN}$ -$V_{OUT}$ ≤ 6V | | 0.2 | 5 | μA |
| Long Term Stability | | $T_A$ = 125℃, 1000Hrs | | 0.5 | | % |
| Temperature Stability | | $I_{OUT}$=10mA, $V_{IN}$-$V_{OUT}$=1.5V | | 0.5 | | % |
| RMS Noise (% of $V_{OUT}$) | | $T_A$=25℃, 10Hz≤f≤10kHz | | 0.003 | | % |

## Typical Performance Characteristics

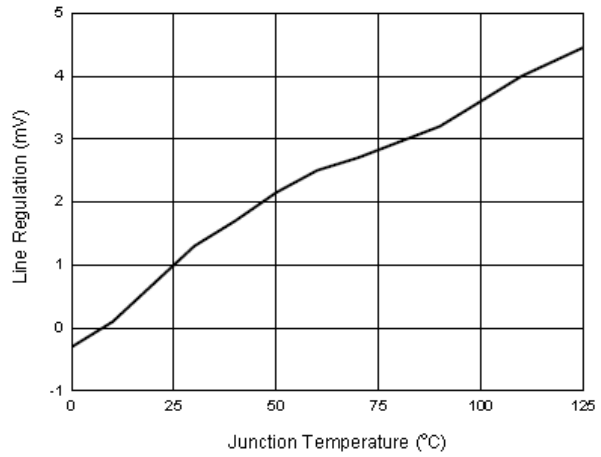



Figure 4. Line Regulation vs. Junction Temperature

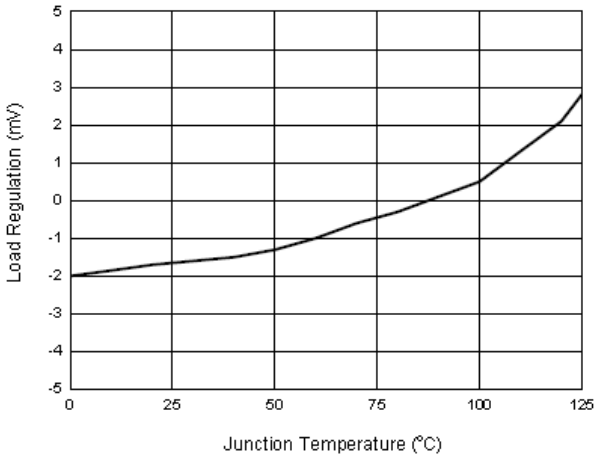



Figure 5. Load Regulation vs. Junction Temperature

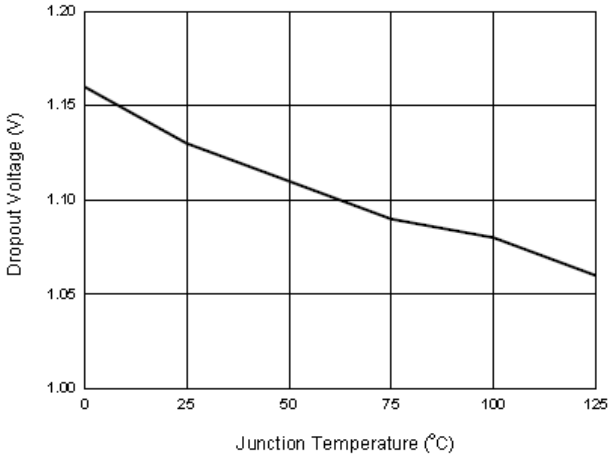



Figure 6. Dropout Voltage vs. Junction Temperature

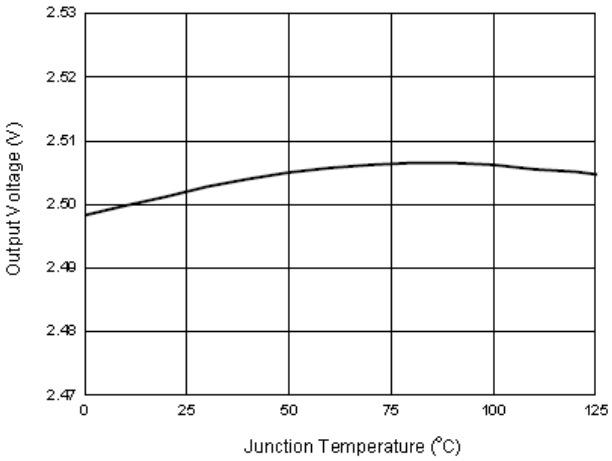



Figure 7. Output Voltage vs. Junction Temperature

## Typical Performance Characteristics (Continued)

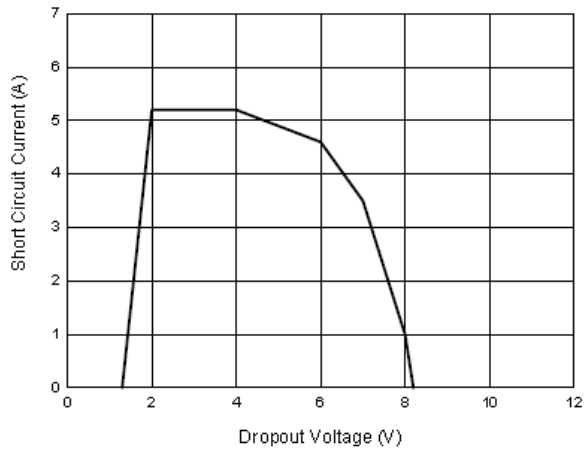



Figure 8. Short Circuit Current vs. Dropout Voltage

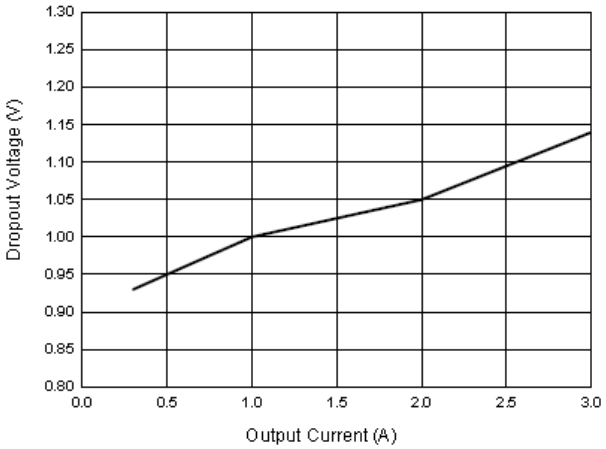



Figure 9. Dropout Voltage vs. Output Current

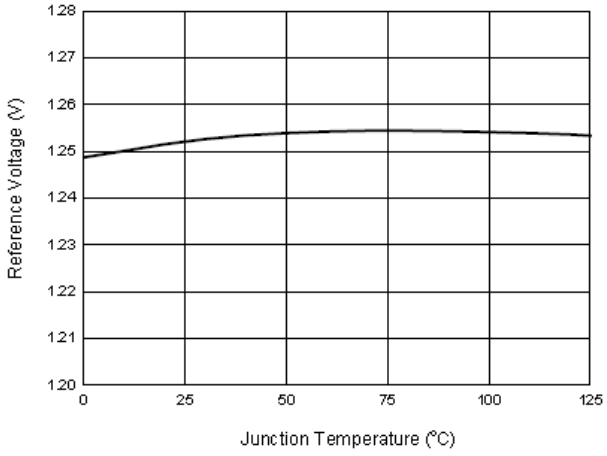



Figure10. Reference Voltage vs. Junction Temperature

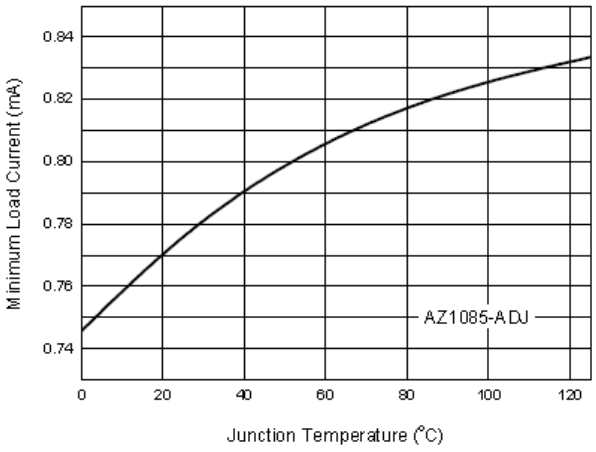



Figure11. Minimum Load Current vs. Junction Temperature

## Typical Performance Characteristics (Continued)

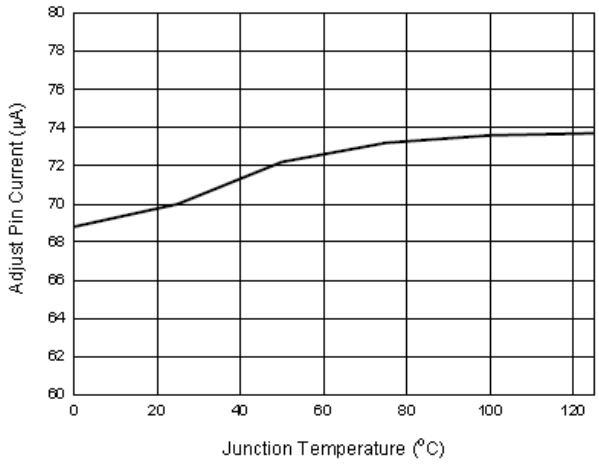



Figure12. Adjust Pin Current vs. Junction Temperature

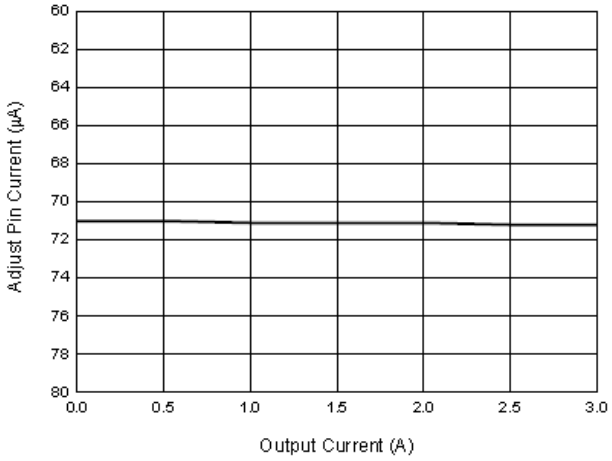



Figure13. Adjust Pin Current vs. Output Current

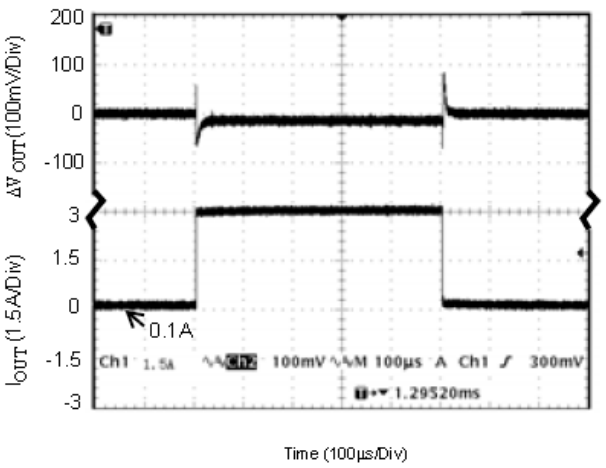



Figure 14. Load Transient Response
(Conditions: $V_{IN}$=5.5V, $V_{OUT}$=2.5V, $I_{OUT}$=100mA to 3A, $C_{IN}$=$C_{OUT}$=10µF)

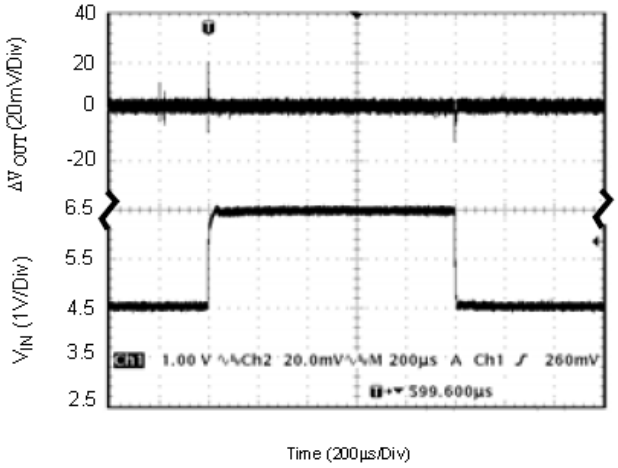



Figure 15. Line Transient Response
(Conditions: $V_{IN}$=4.5V to 6.5V, $V_{OUT}$=2.5V, $I_{OUT}$=200mA, $C_{IN}$=1µF, $C_{OUT}$=10µF)

## Typical Performance Characteristics (Continued)

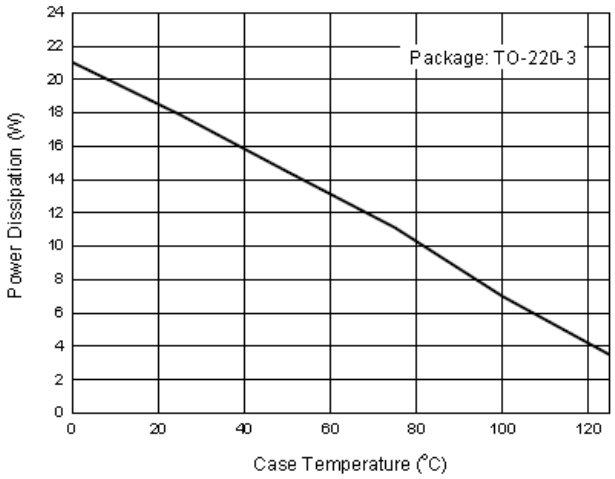



Figure16. Power Dissipation vs. Case Temperature

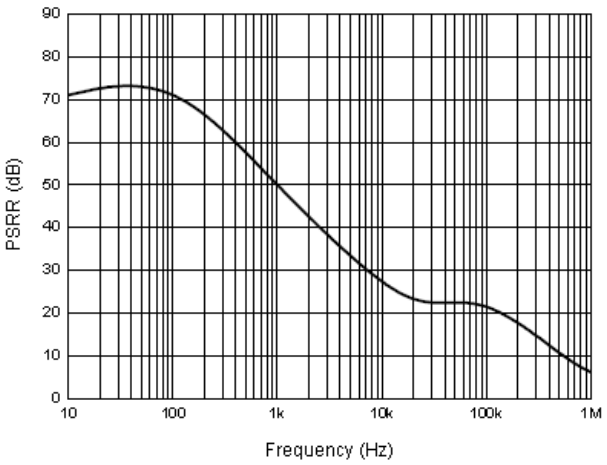



Figure17. PSRR vs. Frequency

## Typical Application

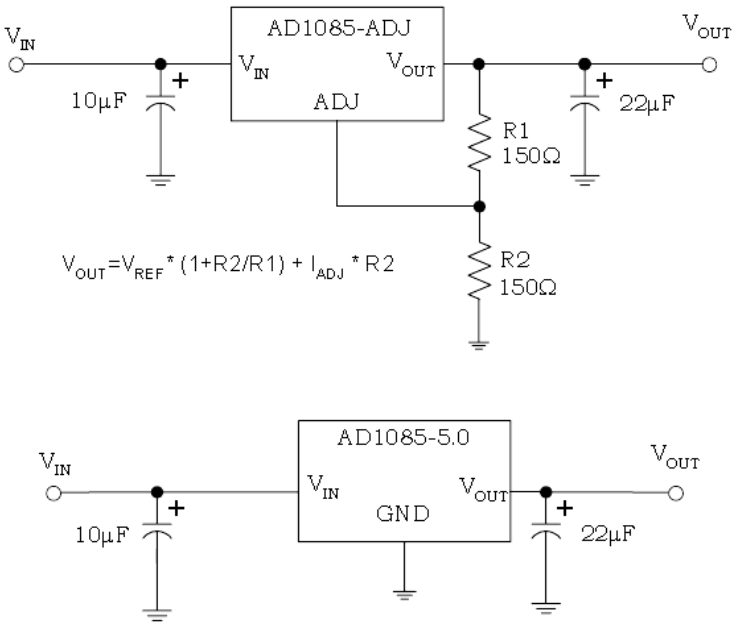
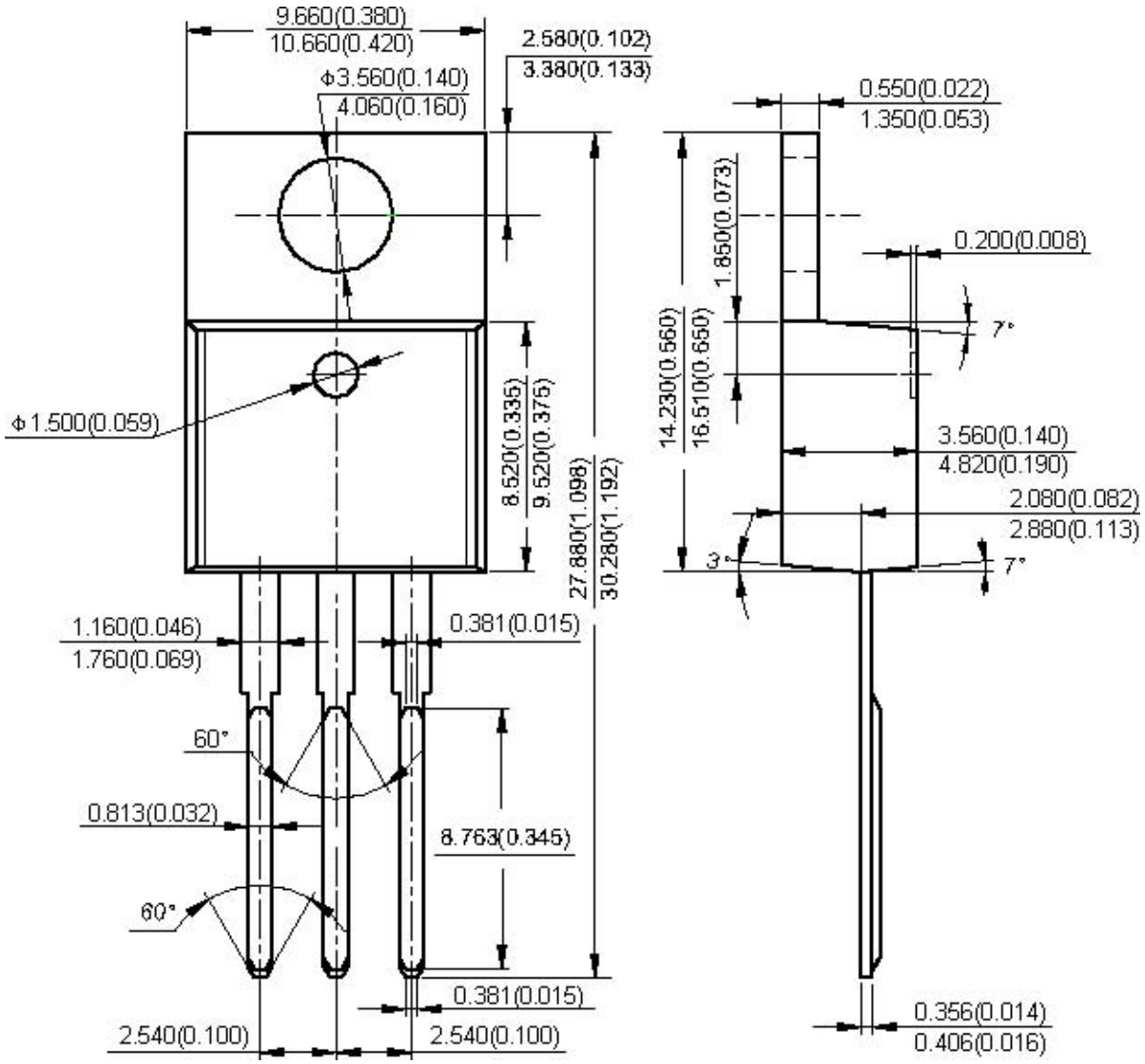



Figure 18. Typical Applications of AD1085

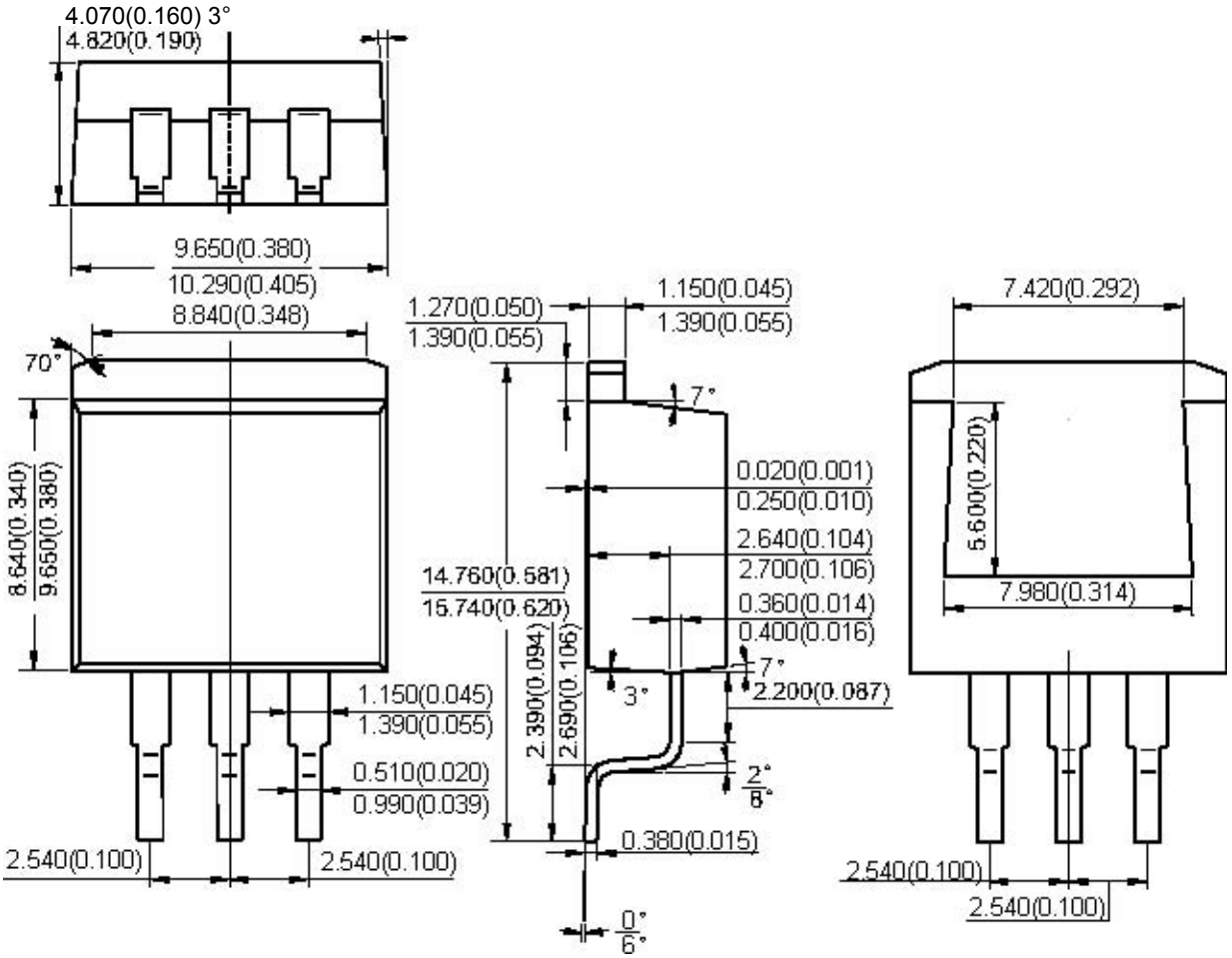
**Mechanical Dimensions**

**TO-220** **Unit: mm(inch)**



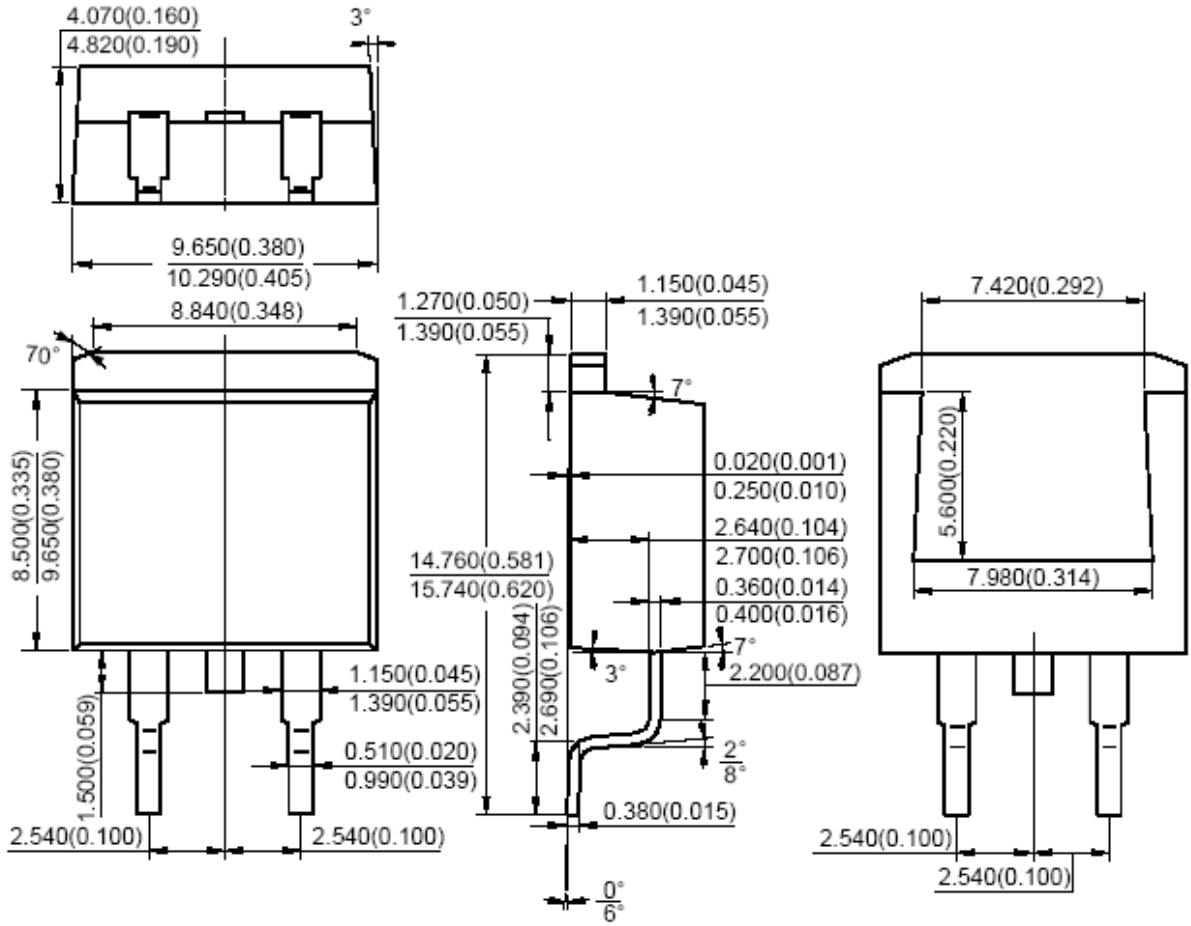
**Mechanical Dimensions (Continued)**

**TO-263-3** **Unit: mm(inch)**



**Mechanical Dimensions (Continued)**

**TO-263-2** **Unit: mm(inch)**



**Mechanical Dimensions (Continued)**

**TO-252-2** **Unit: mm(inch)**