ALPHA SEMICONDUCTOR
Excellence in Analog Power Products

# AS2937

## 500mA Low Dropout Voltage Regulators

**(Advanced Information) - Production Q2 '97**



### FEATURES

- Output Current 500mA
- Internal Short Circuit Current Limit
- Dropout Voltage 0.5V At 500mA Output
- Extremely Tight Load And Line Regulation
- Very Low Temperature Coefficient
- Mirror Image Insertion Protection
- Unregulated DC Input Can Withstand -20V Reverse Battery And +60V Positive Transients
- Direct Replacement For LM2937 Socket

### APPLICATIONS

- Battery Powered Systems
- Cordless Telephones
- Automotive Electronics
- Portable / Palm Top / Notebook Computers
- Portable Consumer Equipment
- Portable Instrumentation
- SMPS Post-Regulator
- Voltage Reference

### PRODUCT DESCRIPTION

The ALPHA Semiconductor AS2937 is a low power positive voltage regulator. The AS2937 offers 500mA output current with a dropout voltage of only 0.5V and over temperature dropout is up to 1 volt. The quiescent current is 10mA at differential output of 5V and output current of 500mA. A higher quiescent current can exist when the device is in dropout mode ($V_{in} - V_{out} \leq 3V$)

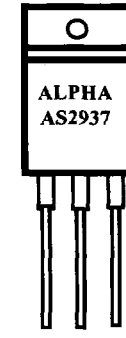
Other additional key features of this device include higher output current, positive transient protection of up to 60V (Load dump), and the ability to survive an unregulated input voltage transient of -20V below ground (reverse battery). The regulator will automatically shut down to protect both the internal circuits and the load. This device also features short circuit and thermal overload protection.

The AS2937 is offered in a 3-pin TO-220 package compatible with other 5 volt regulators. This device offers a variety of output voltages 5V, 8V, 10V, 12V, and 15V. AS2937 is a direct replacement to LM2937.

### ORDERING INFORMATION

| TO-220 3-PIN | Output Voltage | Oper. Temp. Range |
|---|---|---|
| AS2937U-5.0 | 5.0 | IND. |
| AS2937U-8.0 | 8.0 | IND. |
| AS2937U-10 | 10.0 | IND. |
| AS2937U-12 | 12.0 | IND. |
| AS2937U-15 | 15.0 | IND. |

### Pin Connections




$V_{In}$ GND $V_{OUT}$

**TO-220**
**Front View**

## ABSOLUTE MAXIMUM RATINGS

Power Dissipation ..... Internally Limited
Lead Temp. (Soldering, 10 Seconds) ..... 260°C
Storage Temperature Range ..... -65° to +150°C
Operating Junction Temperature Range ..... +150°C

Input Supply Voltage ..... -20 to +60V
Feedback Input Voltage ..... -1.5 to +30V
Shutdown Input Voltage ..... -0.3 to +30V
Error Comparator Output ..... -0.3 to +30V
ESD Rating is to be determined

## ELECTRICAL CHARACTERISTICS

at $V_{IN} = V_O + 5V$, $I_O = 750mA$, $C_O = 10\ \mu F$, unless otherwise specified. **Boldface** limits in type apply is over the entire operating temperature range. All other specifications are $T_A = 25°C$.

| PARAMETER | CONDITIONS | AS2937U-5.0 5V | | | AS2937U-8.0 8V | | | AS2937U-10.0 10V | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| | | $6.25V \le V_{IN} \le 26V$ | | | $9.4V \le V_{IN} \le 26V$ | | | $11.5V \le V_{IN} \le 26V$ | | | |
| Output Voltage | $5mA \le I_O \le 0.75A$ | 4.85<br>**4.75** | 5.0 | 5.15<br>**5.25** | 7.76<br>**7.60** | 8.0 | 8.24<br>**8.40** | 9.70<br>**9.50** | 10.0 | 10.3<br>**10.5** | V<br>V |
| Line Regulation | $V_O+2V \le V_{IN} \le 26V$<br>$I_O=5mA$ | | 15 | **50** | | 24 | **80** | | 30 | **100** | mV |
| Load Regulation | $50mA \le I_O \le 1A$ | | 5 | **50** | | 8 | **80** | | 10 | **100** | mV |
| Dropout Voltage | $I_L = 50$ mA<br>$I_L = 500$mA | | 110<br>0.5 | **250**<br>**1.0** | | 110<br>0.5 | **250**<br>**1.0** | | 0.5 | **250**<br>**1.0** | mV<br>V |
| Quiescent Current | $V_O + 2V \le V_{IN} \le 26V$<br>$I_O = 5mA$<br>$V_{IN}=V_O+5V$<br>$I_O=500mA$ | | 2<br><br>10 | **10**<br><br>**20** | | 2<br><br>10 | **10**<br><br>**20** | | 2<br><br>10 | **10**<br><br>**20** | mA<br><br>mA |
| Output Noise Voltage | 10HZ - 100kHz<br>$I_O = 5mA$ | | 150 | | | 240 | | | 300 | | $\mu V_{rms}$ |
| Ripple Rejection | $f_o = 120Hz$, $1V_{rms}$<br>$I_O = 100mA$ | 60<br>**54** | 72 | | 60<br>**54** | 72 | | 51<br>**45** | 63 | | dB<br>dB |
| Long Term Stability | | | 20 | | | 32 | | | 40 | | mV/ 1000Hr |
| Short Circuit Current | | 1.0 | **0.60** | | 1.0 | **0.60** | | 1.0 | **0.60** | | A |
| Maximum Line Transient | $R_o = 100\Omega$<br>$T \le 100mS$ | **60** | 75 | | **60** | 75 | | **60** | 75 | | V |
| Reverse Polarity DC Input Voltage | $R_o = 100\Omega$ | -15<br>**-15** | -30<br>**-30** | | -15<br>**-15** | -30<br>**-30** | | -15<br>**-15** | -30<br>**-30** | | V |
| Reverse Polarity Transient Input Voltage | $R_o = 100\Omega$<br>$T \le 100mS$ | -50<br>**-50** | -75 | | -50<br>**-50** | -75 | | -50<br>**-50** | -75 | | V |

**ELECTRICAL CHARACTERISTICS** at $V_{IN} = V_O + 5V$, $I_O = 1A$, $C_O = 22\ \mu F$, unless otherwise specified. Limits in **Boldface** apply over the entire operating temperature range. All other specifications are $T_A = 25°C$.

| PARAMETER | CONDITIONS | AS2937U-12.0 12V | | | AS2937U-15.0 15V | | | UNITS |
|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | |
| | | 13.6V≤$V_{IN}$≤26V | | | 16.75V≤$V_{IN}$≤26V | | | |
| Output Voltage | 5mA ≤$I_O$ ≤.75A | 11.64 | 12.0 | 12.36 | 14.55 | 15.0 | 15.45 | V |
| | | **11.40** | | **12.60** | **14.25** | | **15.75** | V |
| Line Regulation | $V_O$+2V≤$V_{IN}$≤ 26V<br>$I_O$=5mA | | 36 | **120** | | 45 | **150** | mV |
| Load Regulation | 50mA≤$I_O$≤ 500mA | | 12 | **120** | | 15 | **70** | mV |
| Dropout Voltage | $I_L$ = 50mA | | 110 | **250** | | 110 | **250** | mV<br>mV |
| | $I_L$ = 500mA | | 0.5 | **1.0** | | 0.5 | **1.0** | V<br>V |
| Quiescent Current | $V_O$+ 2V ≤$V_{IN}$≤26V<br>$I_O$ = 5mA | | 2 | **10** | | 2 | **10** | mA |
| | $V_{IN}$=$V_O$+5V<br>$I_O$=500mA | | 10 | **20** | | 10 | **20** | mA |
| Output Noise Voltage | 10HZ - 100kHz<br>$I_O$ = 5mA | | 360 | | | 450 | | $\mu V_{rms}$ |
| Long Term Stability | | | 44 | | | 56 | | mV/ 1000Hr |
| Short Circuit Current | | **0.60** | 1.0 | | **0.60** | 1.0 | | A |
| Maximum Line Transient | $R_o$ = 100Ω<br>T ≤ 100mS | **60** | 75 | | **60** | 75 | | V |
| Reverse Polarity DC Input Voltage | $R_o$ = 100Ω | -15<br>**-15** | -30<br>**-30** | | -15<br>**-15** | -30<br>**-30** | | V |
| Reverse Polarity Transient Input Voltage | $R_o$ = 100Ω<br>T ≤ 100mS | -50<br>**-50** | -75 | | -50<br>**-50** | -75 | | V |