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# KA337 / LM337

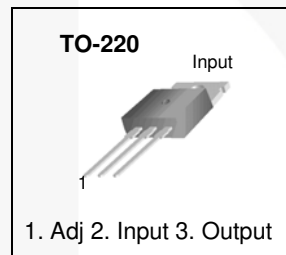
## 3-Terminal 1.5 A Negative Adjustable Regulator

### Features

- Output-Current in Excess of 1.5 A
- Output-Adjustable Between -1.25 V and -37 V
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output-Transistor Safe Area Compensation
- Floating Operation for High-Voltage Applications
- Standard 3-Pin TO-220 Package

### Description

The KA337 / LM337 are 3-terminal negative adjustable regulators. They supply in excess of 1.5 A over an output voltage range of -1.25 V to -37 V. These regulators require only two external resistors to set the output voltage and employ current limiting, thermal overload protection, and safe area compensation.



### Ordering Information

| Product Number | Package               | Packing Method | Operating Temperature |
|----------------|-----------------------|----------------|-----------------------|
| KA337TU        | TO-220 (Dual Gauge)   | Rail           | 0°C to +125°C         |
| LM337T         | TO-220 (Single Gauge) |                |                       |

### Block Diagram

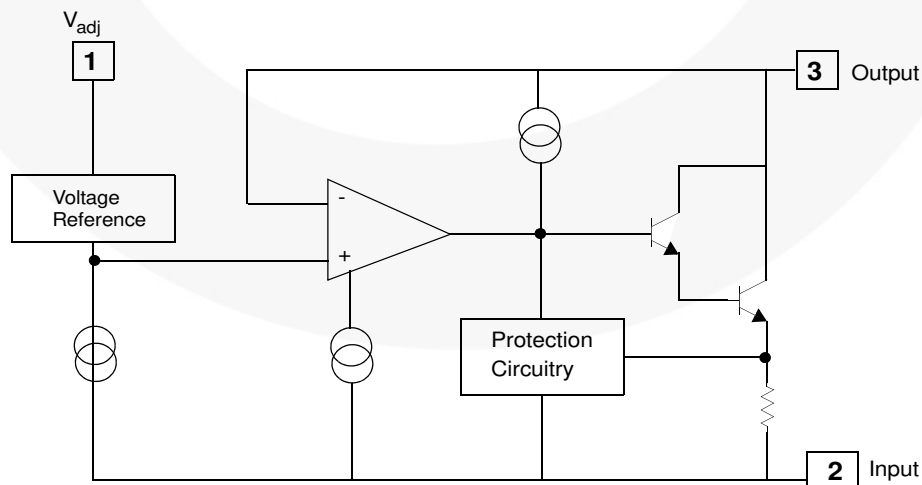


Figure 1. Block Diagram

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol          | Parameter                            | Value              | Unit               |
|-----------------|--------------------------------------|--------------------|--------------------|
| $ V_I - V_O $   | Input-Output Voltage Differential    | 40                 | V                  |
| $P_D$           | Power Dissipation                    | Internally Limited | W                  |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 4                  | $^\circ\text{C/W}$ |
| $T_{OPR}$       | Operating Temperature Range          | 0 to +125          | $^\circ\text{C}$   |
| $T_{STG}$       | Storage Temperature Range            | -65 to +125        | $^\circ\text{C}$   |

## Electrical Characteristics

$V_I - V_O = 5\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$ ,  $P_{D\text{MAX}} = 20\text{ W}$ ; unless otherwise specified.

| Symbol           | Parameter                                   | Conditions                                                                                                                   | Min.   | Typ.   | Max.   | Unit          |
|------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|---------------|
| $R_{line}$       | Line Regulation <sup>(1)</sup>              | $T_A = +25^\circ\text{C}$ ,<br>$3\text{ V} \leq  V_I - V_O  \leq 40\text{ V}$                                                |        | 0.01   | 0.04   | % / V         |
|                  |                                             | $3\text{ V} \leq  V_I - V_O  \leq 40\text{ V}$                                                                               |        | 0.02   | 0.07   |               |
| $R_{load}$       | Load Regulation <sup>(1)</sup>              | $T_A = +25^\circ\text{C}$ ,<br>$10\text{ mA} \leq I_O \leq 0.5\text{ A}$                                                     |        | 15     | 50     | mV            |
|                  |                                             | $10\text{ mA} \leq I_O \leq 1.5\text{ A}$                                                                                    |        | 15     | 150    |               |
| $I_{ADJ}$        | Adjustable Pin Current                      |                                                                                                                              |        | 50     | 100    | $\mu\text{A}$ |
| $\Delta I_{ADJ}$ | Adjustable Pin Current Change               | $T_A = +25^\circ\text{C}$ ,<br>$10\text{ mA} \leq I_O \leq 1.5\text{ A}$ ,<br>$3\text{ V} \leq  V_I - V_O  \leq 40\text{ V}$ |        | 2      | 5      | $\mu\text{A}$ |
| $V_{REF}$        | Reference Voltage                           | $T_A = +25^\circ\text{C}$                                                                                                    | -1.213 | -1.250 | -1.287 | V             |
|                  |                                             | $3\text{ V} \leq  V_I - V_O  \leq 40\text{ V}$ ,<br>$10\text{ mA} \leq I_O \leq 1.5\text{ A}$                                | -1.200 | -1.250 | -1.300 |               |
| $ST_T$           | Temperature Stability                       | $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$                                                                           |        | 0.6    |        | %             |
| $I_{L(MIN)}$     | Minimum Load Current to Maintain Regulation | $3\text{ V} \leq  V_I - V_O  \leq 40\text{ V}$                                                                               |        | 2.5    | 10.0   | mA            |
|                  |                                             | $3\text{ V} \leq  V_I - V_O  \leq 10\text{ V}$                                                                               |        | 1.5    | 6.0    |               |
| $e_N$            | RMS Noise, % of $V_{OUT}$                   | $T_A = +25^\circ\text{C}$ ,<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$                                                      |        | 0.003  |        | %             |
| RR               | Ripple Rejection Ratio                      | $V_O = -10\text{ V}$ , $f = 120\text{ Hz}$                                                                                   |        | 60     |        | dB            |
|                  |                                             | $C_{ADJ} = 10\text{ }\mu\text{F}^{(2)}$                                                                                      | 66     | 77     |        |               |
| ST               | Long-Term Stability                         | $T_J = 125^\circ\text{C}$ , 1000 Hours                                                                                       |        | 0.3    | 1.0    | %             |

### Notes:

1. Load and line regulation are specified at constant junction temperature. Change in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.
2.  $C_{ADJ}$ , when used, is connected between the adjustment pin and ground.

## Typical Performance Characteristics

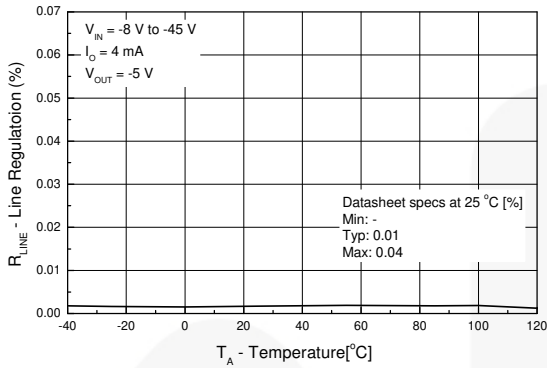


Figure 2. Line Regulation vs. Temperature

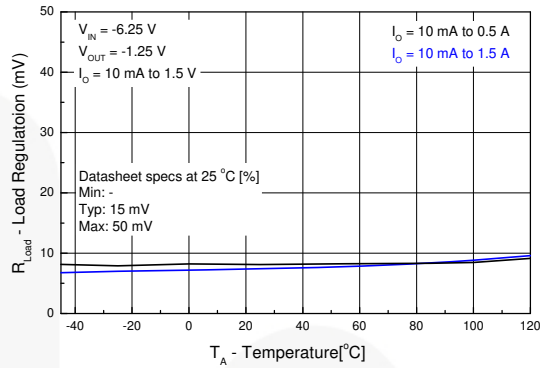


Figure 3. Load Regulations vs. Temperature

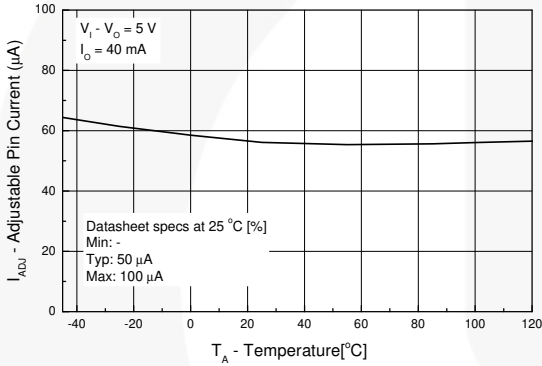


Figure 4. Adjustable Pin Current vs. Temperature

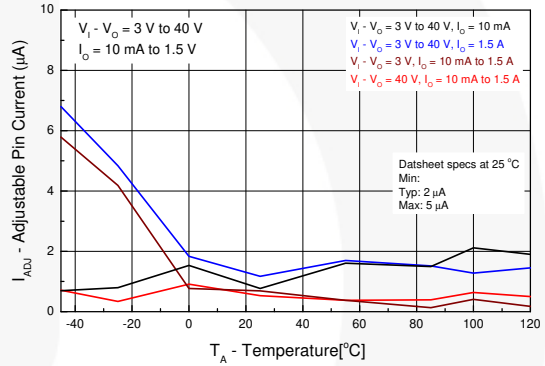


Figure 5. Adjustable Pin Current Change vs. Temperature

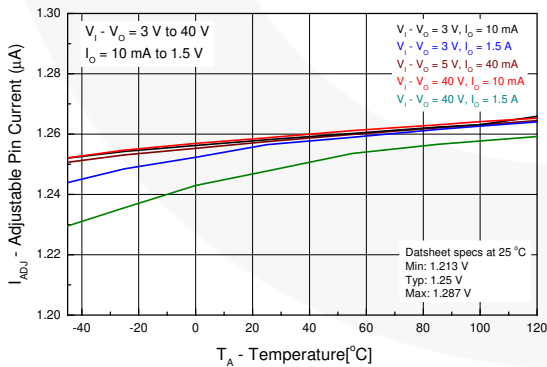


Figure 6. Reference Voltage vs. Temperature

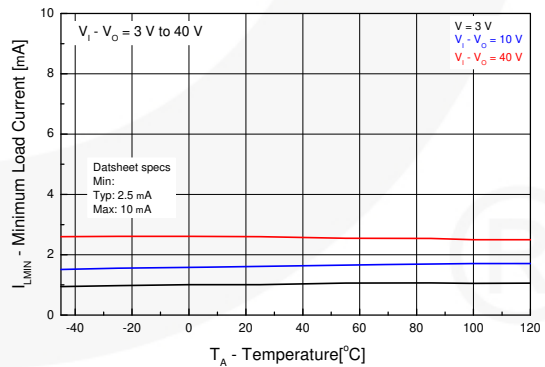


Figure 7. Minimum Load Current vs. Temperature

## Typical Performance Characteristics

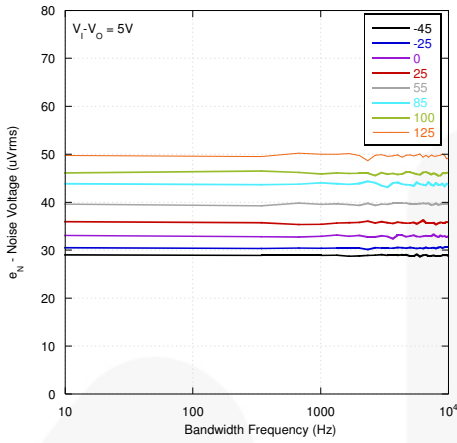


Figure 8. Noise Voltage vs. Temperature

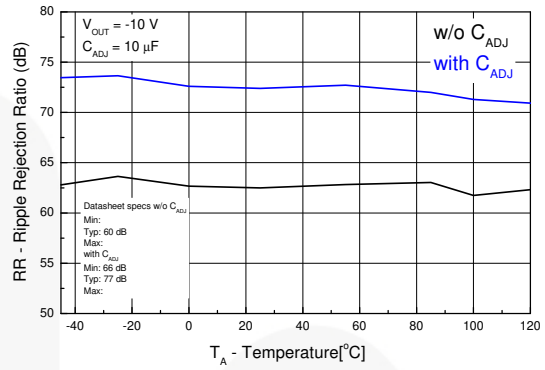


Figure 9. Ripple Rejection vs. Temperature

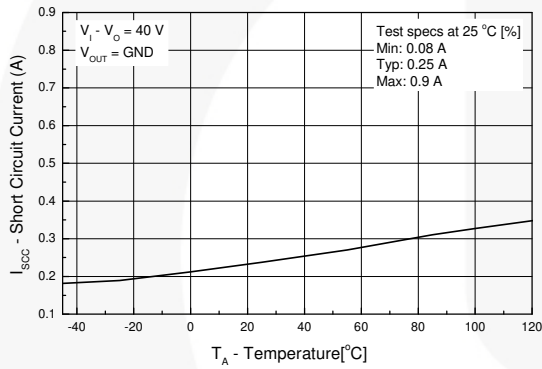


Figure 10. Short-Circuit Currents vs. Temperature

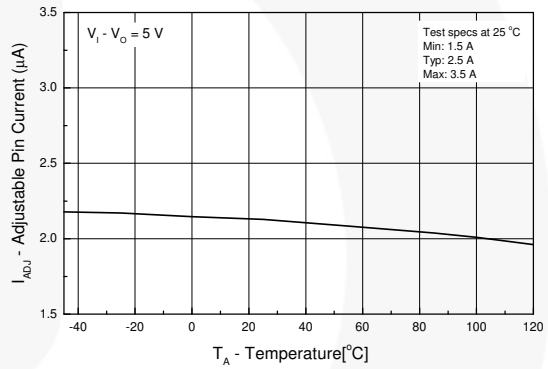
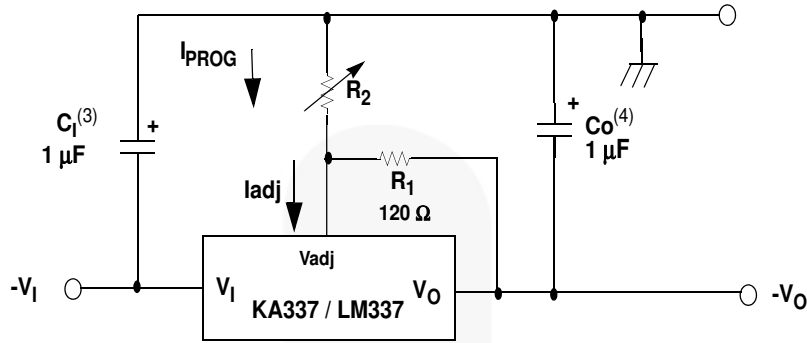


Figure 11. Peak Current vs. Temperature

**Typical Application**



**Figure 12. Typical Application**

**Notes:**

- 3.  $C_1$  is required if regulator is located more than 4 inches from power supply filter. 1.0  $\mu\text{F}$  solid tantalum or 10  $\mu\text{F}$  aluminum electrolytic is recommended.
  - 4.  $C_0$  is necessary for stability. 1.0  $\mu\text{F}$  solid tantalum or 10  $\mu\text{F}$  aluminum electrolytic is recommended.
- $V_0 = -1.25 \text{ V} (1 + R_2 / R_1)$ .

Physical Dimensions

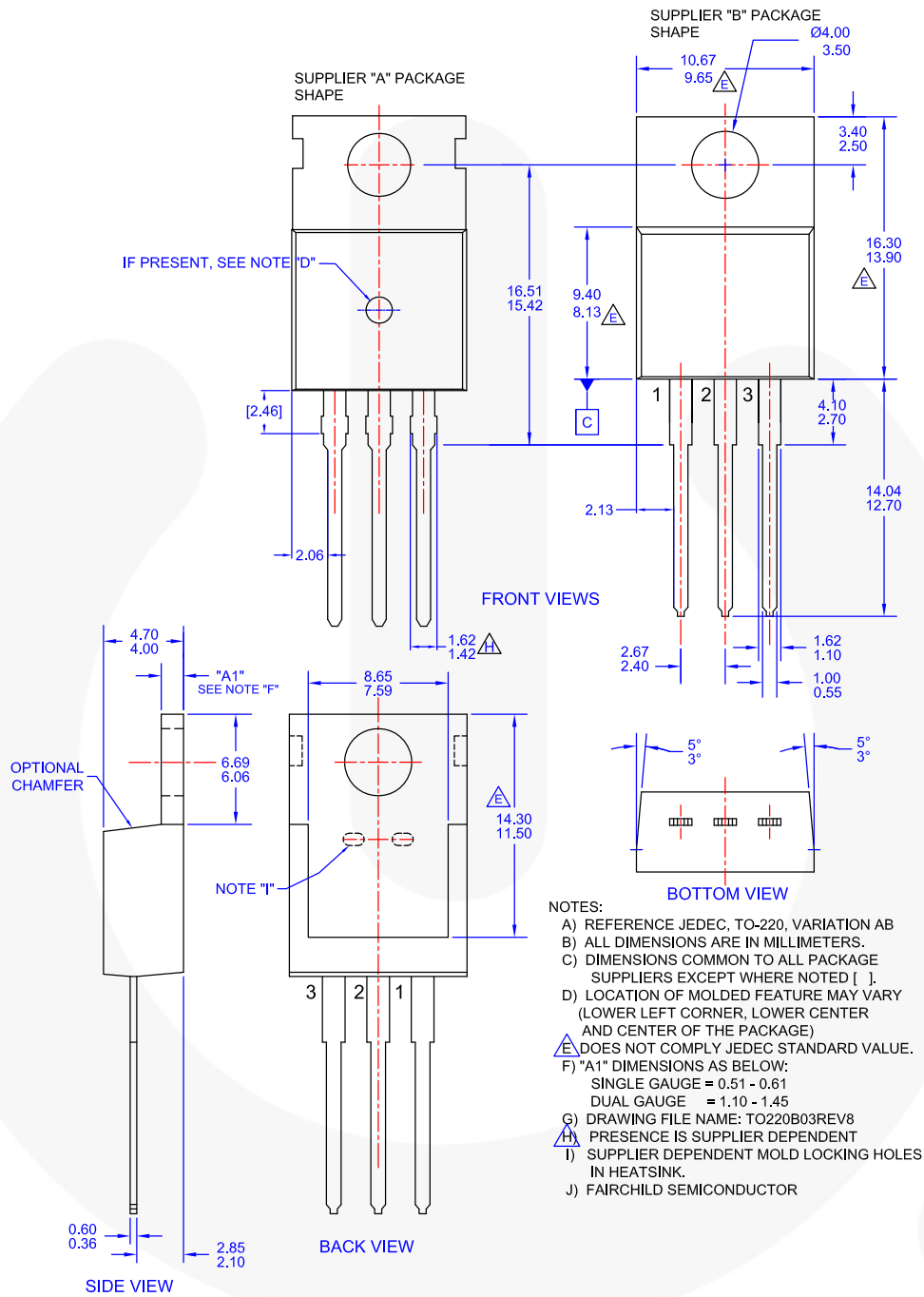







Figure 13. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB



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