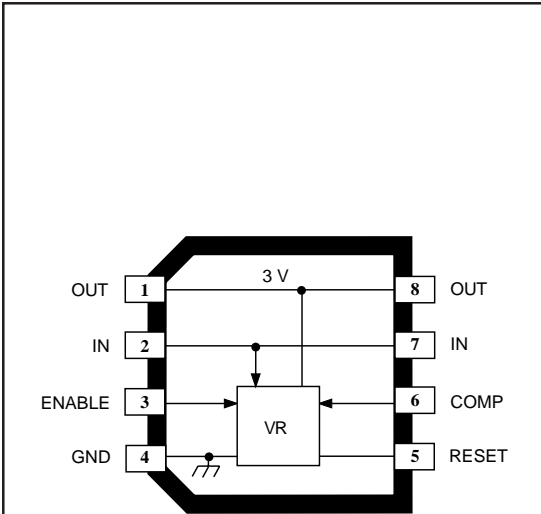


LOW-DROPOUT, 3 V REGULATOR — HIGH EFFICIENCY



Dwg. PS-020

Designed specifically to meet the requirement for extended operation of battery-powered equipment such as cordless and cellular telephones, the A8182SL voltage regulator offers the reduced dropout voltage and quiescent current essential for maximum battery life. Applicable also to palmtop computers and personal data assistants, the device delivers a regulated 3 V output at up to 150 mA.

A PMOS pass element provides a typical dropout voltage of only 85 mV at 60 mA of load current. The low dropout voltage permits deeper battery discharge before output regulation is lost. Furthermore, quiescent current does not increase as the dropout voltage is approached, an ideal feature in standby/resume power systems where data integrity is crucial. Regulator accuracy and excellent temperature characteristics are provided by a bandgap reference. An ENABLE input and RESET output gives the designer complete control over power up, standby, or power down.

This device is supplied in an 8-lead small-outline plastic package (SOIC) for surface-mount applications. The A8182SL is rated for operation over a temperature range of -20°C to +85°C.

ABSOLUTE MAXIMUM RATINGS

| | |
|---|-----------------|
| Input Voltage, V_I | 10 V |
| Output Current, I_O | 150 mA* |
| Enable Input Voltage, V_E | V_I |
| Reset Output Voltage, V_{OR} | V_I |
| Reset Output Current, I_{OR} | 1.0 mA |
| Operating Temperature Range, T_A | -20°C to +85°C |
| Junction Temperature, T_J | +150°C† |
| Storage Temperature Range, T_S | -40°C to +150°C |

* Output current rating is limited by input voltage, duty cycle, and ambient temperature. Under any set of conditions, do not exceed a junction temperature of +150°C. See next page.

† Fault conditions that produce excessive junction temperature will activate device thermal shutdown circuitry. These conditions can be tolerated but should be avoided.

FEATURES AND BENEFITS

- High Efficiency Provides Extended Battery Life
- 85 mV Typical Dropout Voltage at $I_O = 60$ mA
- 46 μ A Typical Quiescent Current at $V_I = 6$ V
Less than 1 μ A "Sleep" Current
- Up to 150 mA Output Current
- CMOS-Compatible ON/OFF Control
For Power-Up, Standby, or Shutdown
- Internal Thermal Protection
- Surface-Mount Package

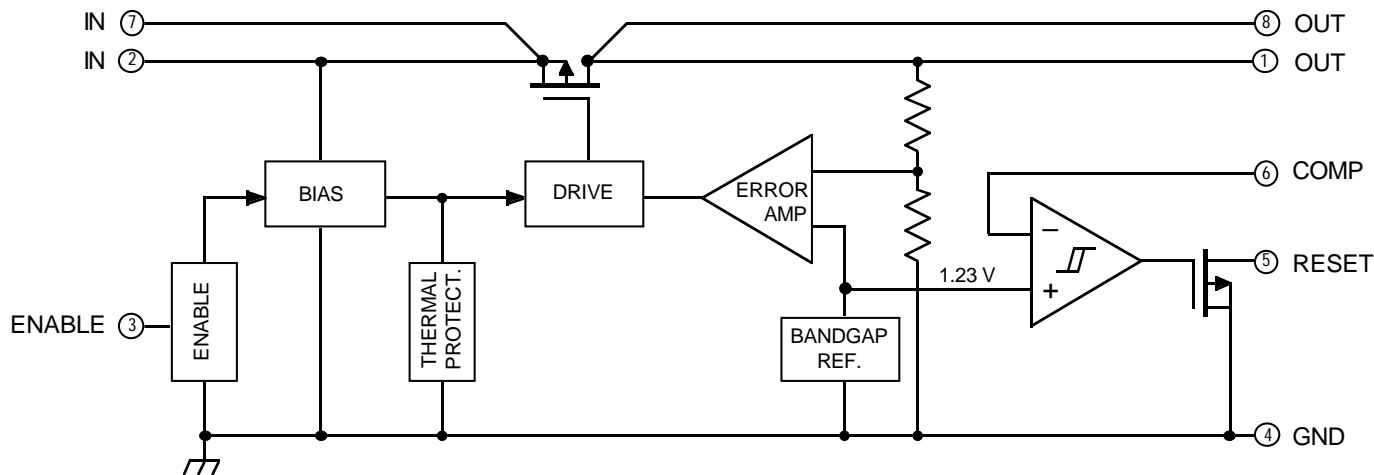
APPLICATIONS

- Cordless and Cellular Telephones
- Personal Data Assistants
- Personal Communicators
- Palmtop Computers

Always order by complete part number: **A8182SL**

8182 LOW-DROPOUT, 3 V REGULATOR

FUNCTIONAL BLOCK DIAGRAM



Dwg. FS-012-2

For proper operation, terminals 1 and 8 should be externally connected together, terminals 2 and 7 should be externally connected together.

MAXIMUM ALLOWABLE OUTPUT CURRENT with device mounted on 2.24" x 2.24" (56.9 mm x 56.9 mm) solder-coated copper-clad board in still air.

| T_A | Maximum Allowable Output Current in Milliamperes with $V_I = 8\text{ V}$, $T_J = 150^\circ\text{C}$, Period $\leq 10\text{ s}^*$ | | | | | | | | |
|-------|--|-----|-----|-----|-----|-----|-----|-----|-----|
| | dc (Duty Cycle) | | | | | | | | |
| | 100% | 90% | 80% | 70% | 60% | 50% | 40% | 30% | 20% |
| 25°C | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| 50°C | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| 70°C | 145 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| 85°C | 120 | 130 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |

$$* I_O = (T_J - T_A) / ((V_I - V_O) R_{\theta JA} \cdot dc) = (150 - T_A) / (5 \cdot 108 \cdot dc)$$

Output current rating can be increased (to 150 mA maximum) by heat sinking or reducing the input voltage. Conditions that produce excessive junction temperature will activate device thermal shutdown circuitry. These conditions can be tolerated but should be avoided.



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8182

LOW-DROPOUT, 3 V REGULATOR

ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$ (unless otherwise noted).

| Characteristic | Symbol | Test Conditions | Limits | | | | |
|---|----------------------------|---|---|------|-----------|---------------------------|---|
| | | | Min. | Typ. | Max. | Units | |
| Output Voltage | V_O | $4\text{ V} \leq V_I \leq 8\text{ V}$, $10\ \mu\text{A} \leq I_O \leq 100\text{ mA}$ | $T_A = +25^\circ\text{C}$ | 2.95 | 3.00 | 3.05 | V |
| | | | $-20^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | 2.90 | 3.00 | 3.10 | V |
| | | $V_I = 3\text{ V}$, $I_O = 60\text{ mA}$, $-20^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | 2.70 | — | — | V |
| Output Volt. Temp. Coeff. | α_{VO} | $V_I = 6\text{ V}$, $I_O = 10\text{ mA}$ | — | — | ± 0.5 | mV/ $^\circ\text{C}$ | |
| Line Regulation | $\Delta V_{O(\Delta V_I)}$ | $6\text{ V} \leq V_I \leq 8\text{ V}$, $I_O = 1\text{ mA}$ | — | 7.0 | 14 | mV | |
| | | $4\text{ V} \leq V_I \leq 6\text{ V}$, $I_O = 1\text{ mA}$ | — | 5.5 | 11 | mV | |
| Load Regulation | $\Delta V_{O(\Delta I_O)}$ | $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $V_I = 8\text{ V}$ | — | 12 | 30 | mV | |
| | | $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $V_I = 6\text{ V}$ | — | 11 | 25 | mV | |
| | | $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $V_I = 4\text{ V}$ | — | 8.0 | 20 | mV | |
| Dropout Voltage | $V_{I\text{min}} - V_O$ | $I_O = 60\text{ mA}$ | — | 85 | 150 | mV | |
| | | $I_O = 125\text{ mA}^*$ | — | 175 | TBD | mV | |
| Quiescent Current (GND terminal current) | I_Q | $V_I = 6\text{ V}$, $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $V_E \geq 2.0\text{ V}$ | — | 46 | 60 | μA | |
| | | $V_I = 8\text{ V}$, $1\text{ mA} \leq I_O \leq 100\text{ mA}$, $V_E \geq 2.0\text{ V}$ | — | 50 | 65 | μA | |
| | $I_{Q(\text{off})}$ | $4\text{ V} \leq V_I \leq 8\text{ V}$, $V_E \leq 0.8\text{ V}$ | — | 0.05 | 1.0 | μA | |
| ENABLE Input Voltage | V_{EH} | $4\text{ V} \leq V_I \leq 8\text{ V}$, | Output ON | 2.0 | — | — | V |
| | V_{EL} | $-20^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | Output OFF | — | — | 0.8 | V |
| ENABLE Input Current | I_E | $T_A \leq +85^\circ\text{C}$, $V_E = V_I = 8\text{ V}$ | — | — | ± 0.1 | μA | |
| COMP Threshold Voltage | $V_{C(t)}$ | $4\text{ V} \leq V_I \leq 8\text{ V}$, V_C increasing from 0 | 1.20 | 1.23 | 1.30 | V | |
| COMP Threshold Volt. TC | α_{VC} | $4\text{ V} \leq V_I \leq 8\text{ V}$ | — | — | ± 0.5 | mV/ $^\circ\text{C}$ | |
| COMP Threshold Hys. | $V_{C(\text{hys})}$ | $4\text{ V} \leq V_I \leq 8\text{ V}$ | 12 | 34 | 50 | mV | |
| COMP Input Current | I_C | $0\text{ V} \leq V_C \leq V_O$ | — | -25 | TBD | nA | |
| COMP Input Current TC | α_{IC} | $4\text{ V} \leq V_I \leq 8\text{ V}$ | — | -0.5 | -2.5 | nA/ $^\circ\text{C}$ | |
| RESET Leakage Current | I_{OR} | $V_{OR} = V_I = 10\text{ V}$, $T_A = +85^\circ\text{C}$ | — | — | 2.0 | μA | |
| RESET Output Voltage | V_{OR} | $I_{OR} = 500\ \mu\text{A}$ | — | 100 | 400 | mV | |
| Thermal Shutdown Temp. | T_J | | 150 | — | — | $^\circ\text{C}$ | |
| Thermal Resistance | $R_{\theta JA}$ | Mounted on 2.24" x 2.24" solder-coated copper-clad board in still air | — | 108 | — | $^\circ\text{C}/\text{W}$ | |

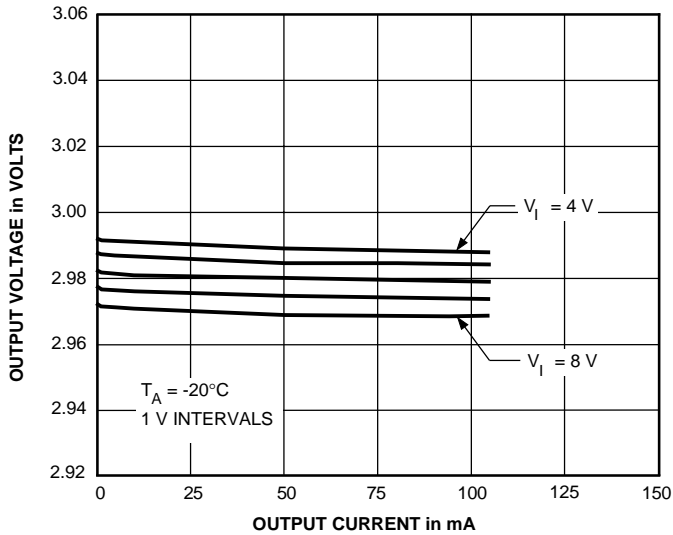
Typical values are at $T_A = +25^\circ\text{C}$ and are given for circuit design information only.

* Pulse test ($\leq 50\text{ ms}$). See previous page for duty cycle limitations.

8182 LOW-DROPOUT, 3 V REGULATOR

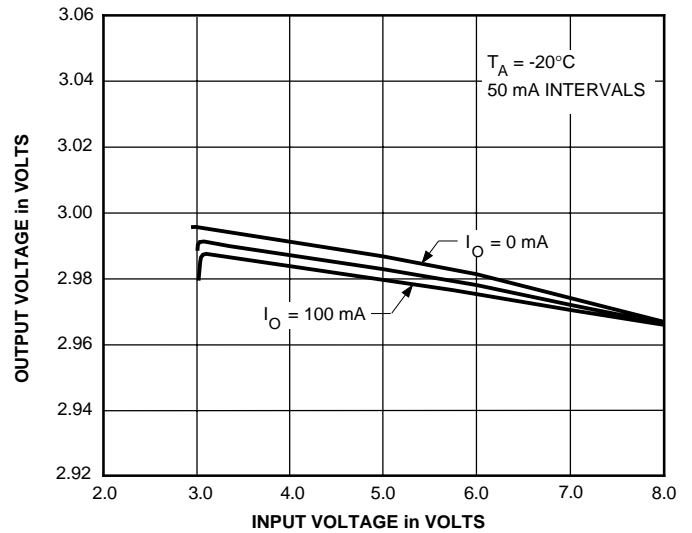
TYPICAL CHARACTERISTICS

LOAD REGULATION

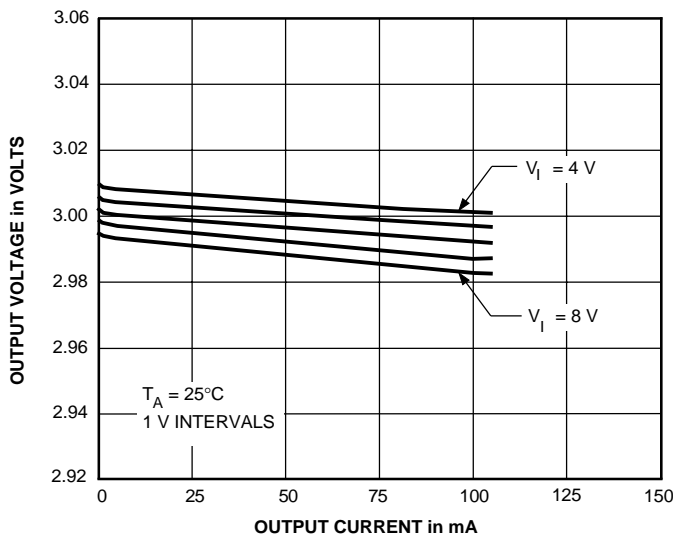


Dwg. GP-052

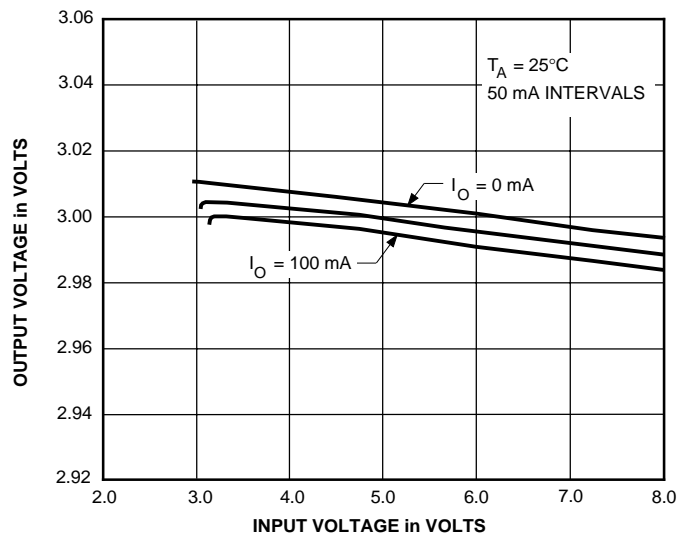
LINE REGULATION



Dwg. GP-053



Dwg. GP-052-1



Dwg. GP-053-1

CAUTION: Maximum allowable duty cycle will be significantly less than 100% at high temperatures, at high input voltages, or at high output currents. See Maximum Allowable Output Current table.

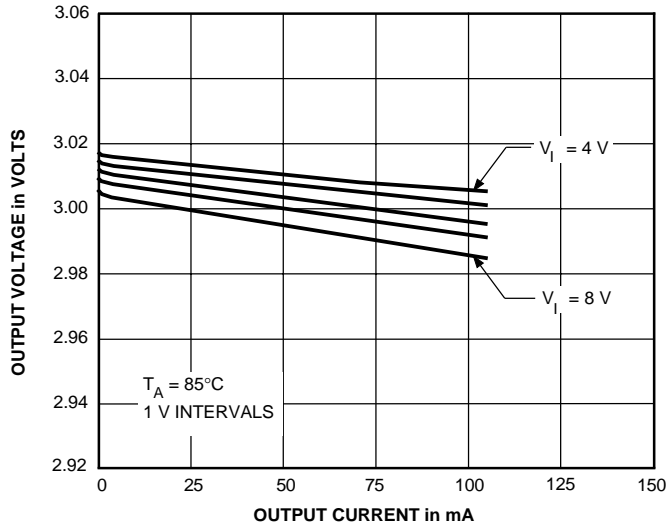


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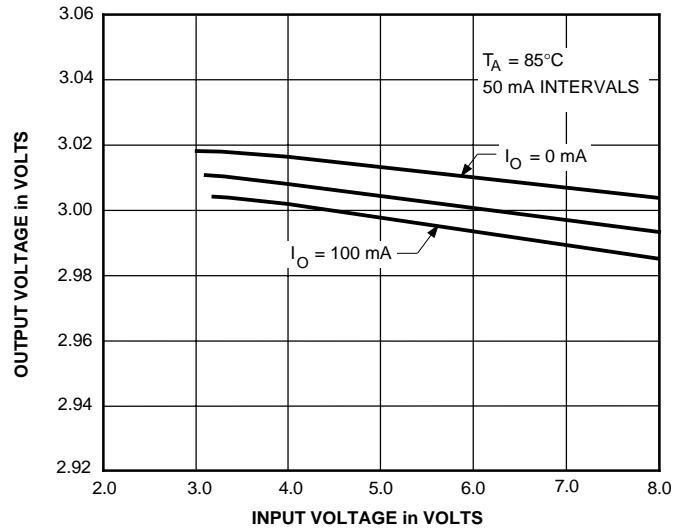
TYPICAL CHARACTERISTICS (cont'd)

LOAD REGULATION



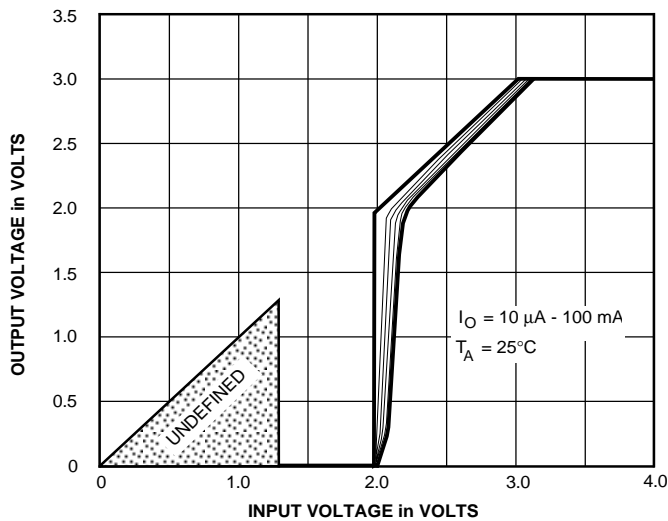
Dwg. GP-052-2

LINE REGULATION

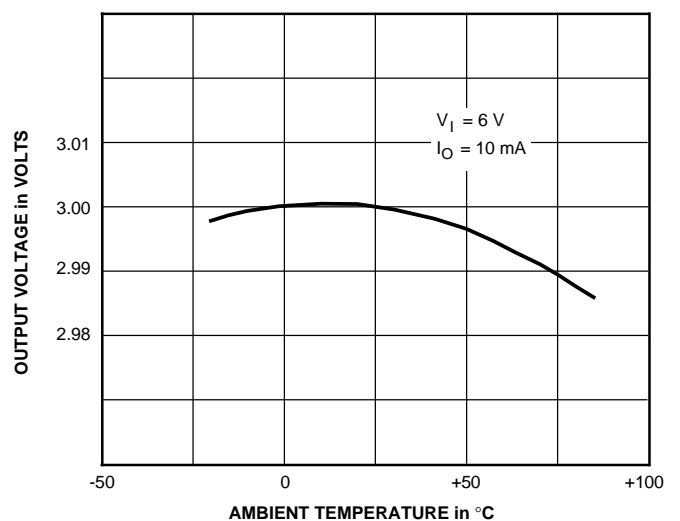


Dwg. GP-053-2

OUTPUT VOLTAGE



Dwg. GP-056-1

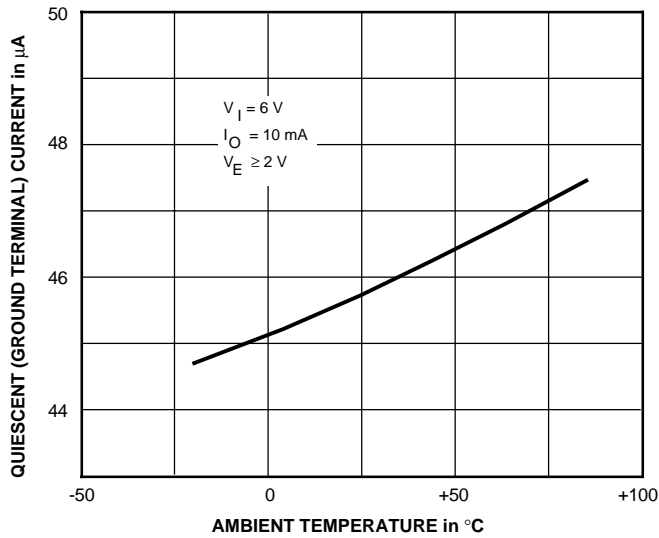


Dwg. GP-050

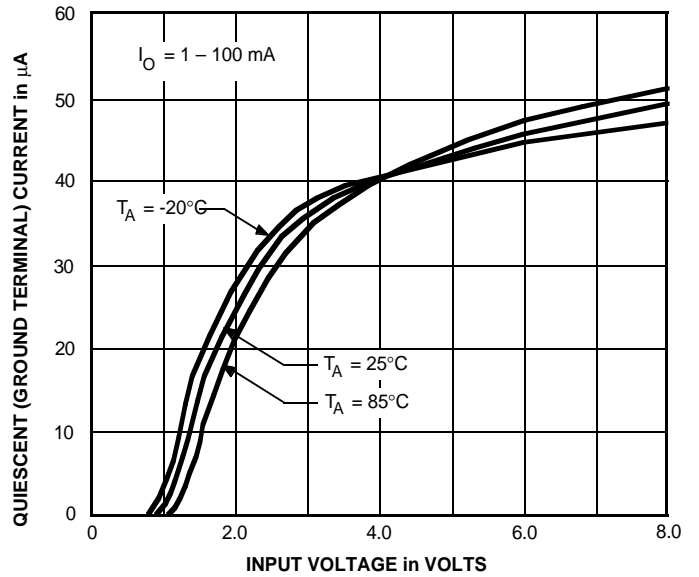
CAUTION: Maximum allowable duty cycle will be significantly less than 100% at high temperatures, at high input voltages, or at high output currents. See Maximum Allowable Output Current table.

8182 LOW-DROPOUT, 3 V REGULATOR

TYPICAL CHARACTERISTICS (cont'd) QUIESCENT (GROUND TERMINAL) CURRENT

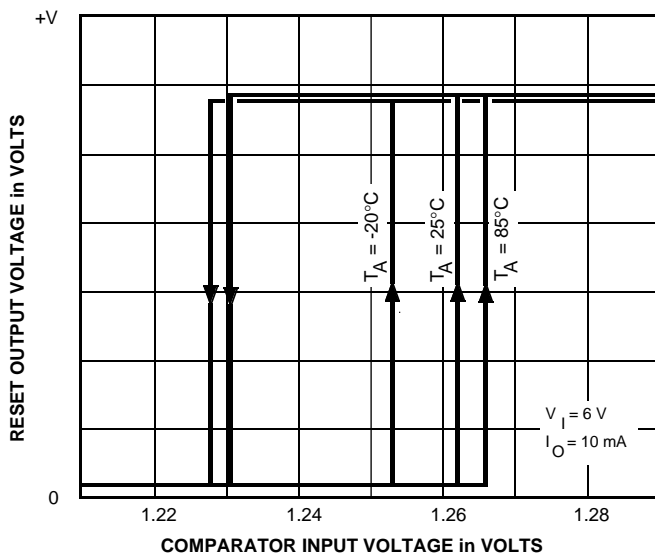


Dwg. GP-051



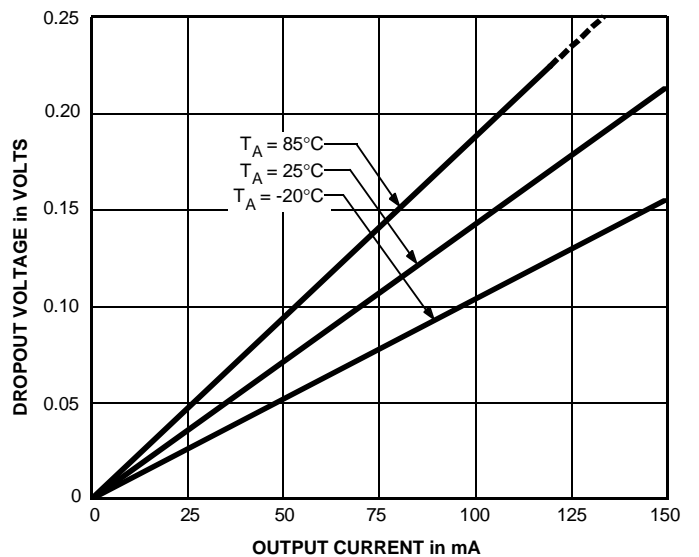
Dwg. GP-055

COMPARATOR VOLTAGE



Dwg. GP-057

DROPOUT VOLTAGE



Dwg. GP-054

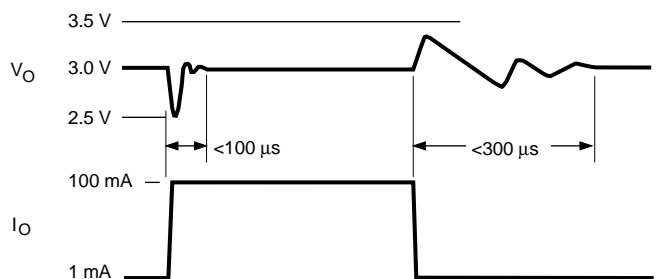
CAUTION: Maximum allowable duty cycle will be significantly less than 100% at high temperatures, at high input voltages, or at high output currents. See Maximum Allowable Output Current table.

8182 LOW-DROPOUT, 3 V REGULATOR

TYPICAL CHARACTERISTICS (concluded)

LOAD TRANSIENT PERFORMANCE

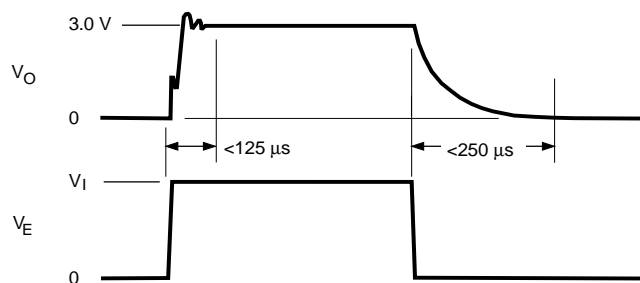
$V_I = 3.2 \text{ V to } 6.2 \text{ V}$, $C_O = 1 \mu\text{F}$, $T_A = 25^\circ\text{C}$



Dwg. WP-026

ENABLE TRANSIENT PERFORMANCE

$V_I = 3.2 \text{ V to } 6.2 \text{ V}$, $C_O = 1 \mu\text{F}$, $I_O = 60 \text{ mA}$, $T_A = 25^\circ\text{C}$

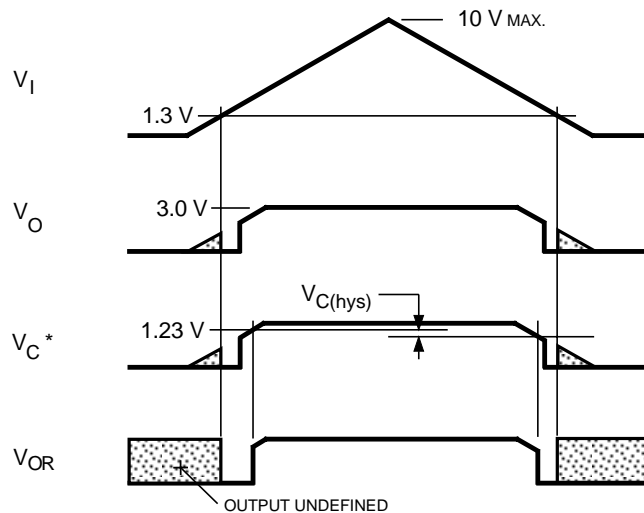


Dwg. WP-027

INPUT, COMPARATOR, & OUTPUT RELATIONSHIPS

The RESET output of the comparator produces a logic low whenever the COMP input is below 1.23 V. An out-of-regulation detector can be configured by dividing down the regulator output (an R/R divider is typical) and connecting it to the COMP input. As the regulator input is ramped up, the RESET signal becomes valid (low) at approximately $V_I = 1.3 \text{ V}$. The RESET signal will go high when $V_C = 1.23 \text{ V}$ ($V_O = 2.46 \text{ V}$ with an R/R divider). Comparator hysteresis prevents oscillations under low battery conditions.

The RESET open-drain output requires an external pull-up resistor. This can be returned to either the input supply or the regulator output, depending on system requirements. Note that the RESET sink current adds to the battery drain in a low-battery condition. Suggested values range from 100 k Ω to 1 M Ω . RESET should be left unconnected if it is not used.

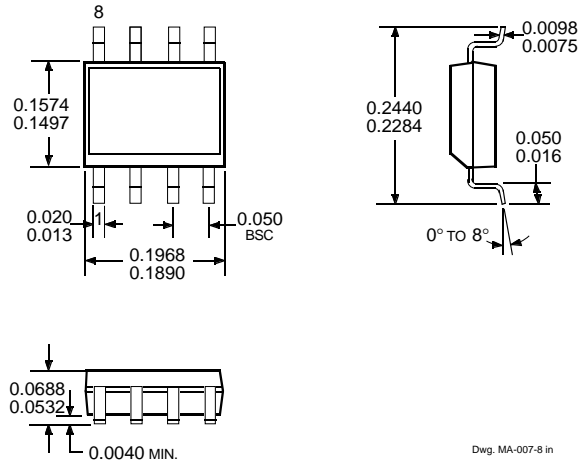


Dwg. WP-025

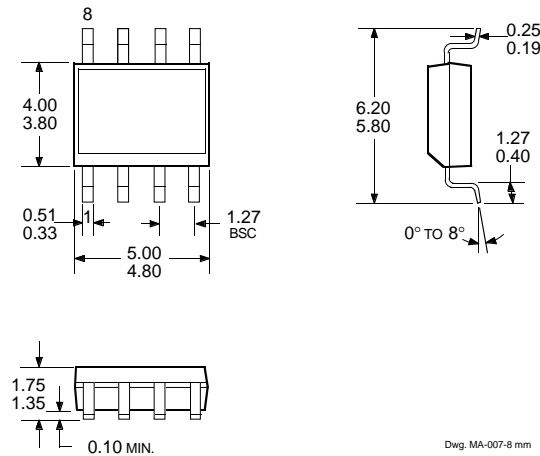
*Comparator input voltage is normally obtained from a resistive divider off of the output.

8182 LOW-DROPOUT, 3 V REGULATOR

Dimensions in Inches (Based on 1 mm = 0.03937")



Dimensions in Millimeters



Allegro MicroSystems, Inc. reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

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- NOTES:
1. Lead spacing tolerance is non-cumulative.
 2. Exact body and lead configuration at vendor's option within limits shown.