

DESCRIPTION

The LX8580 is a high-performance, very low dropout voltage regulator, designed for use with advanced microprocessors. This product can be used with separate voltage supplies for the control and power sections, allowing a power section dropout voltage as low as 100mV. The LX8580 can also be used in a single voltage supply configuration, with a dropout performance similar to that of the LX8584 (1.3V at 7A).

The LX8580 is supplied in a five-terminal TO-220 package, which allows the

implementation of remote (Kelvin) voltage sensing. This sensing compensates for output voltage variations due to load changes and resistive voltage drops in connectors and board traces. Typical load regulation measured at the sense pin is less than 1mV for a load current step of 7mA to 7A.

The LX8580 is ideal for generating a secondary 2 - 2.5V low voltage supply on a motherboard where a 3.3V supply is already available.

KEY FEATURES

- Low Dropout, 800mV Max. at 7A Output Current in Dual Supply Mode
- Fast Transient Response
- Remote Sensing
 - 1mV Load Regulation
 - Adjustable Output
 - No Supply Sequencing Problems in Dual Supply Mode

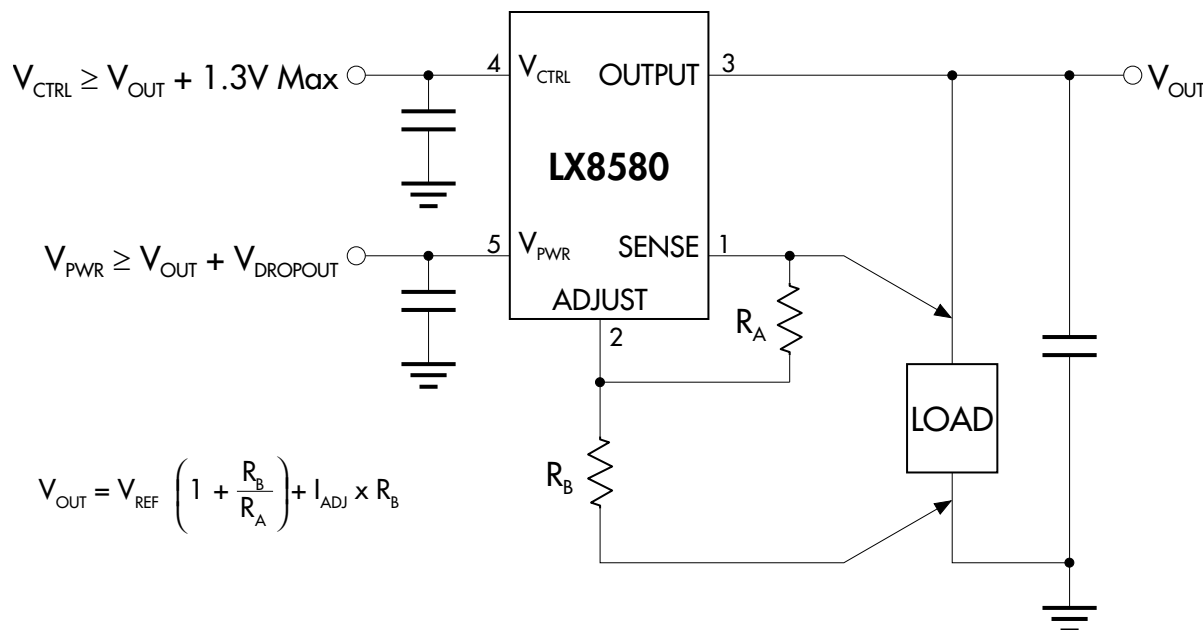
APPLICATIONS

- Microprocessor Supplies
- 3.3V to 2.5V Processor Power Supplies
- High-Current Regulators
- Post Regulators for Switching Supplies

NOTE: For current data & package dimensions, visit our web site: <http://www.linfinity.com>.

PRODUCT HIGHLIGHT

SPECIAL CAPABILITIES OF THE LX8580 TO ALLOW 44%
SMALLER LDO THERMAL DISSIPATION



PACKAGE ORDER INFORMATION

| T_A (°C) | Dropout Voltage | P Plastic TO-220 5-pin | DD Plastic TO-263 5-pin |
|------------|-----------------|------------------------|-------------------------|
| 0 to 125 | 0.1V - 0.8V | LX8580-00CP | LX8580-00CDD |

7A VERY LOW DROPOUT POSITIVE ADJUSTABLE REGULATOR

PRODUCTION DATA SHEET

ABSOLUTE MAXIMUM RATINGS (Note 1)

Power Dissipation Internally Limited
 V_{PWR} Input Voltage 7V
 V_{CTRL} Input Voltage 13V
 Operating Junction Temperature
 Plastic (P Package) 150°C
 Storage Temperature Range -65°C to 150°C
 Lead Temperature (Soldering, 10 seconds) 300°C
 Note 1. Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

THERMAL DATA

P PACKAGE:

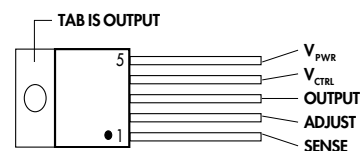
| | |
|---|---------|
| THERMAL RESISTANCE-JUNCTION TO TAB, θ_{JT} | 3.0°C/W |
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA} | 60°C/W |

DD PACKAGE:

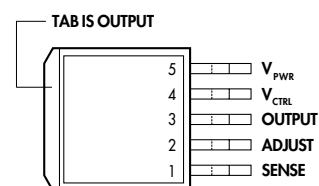
| | |
|---|---------|
| THERMAL RESISTANCE-JUNCTION TO TAB, θ_{JT} | 3.0°C/W |
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA} | 60°C/W |

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
 The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system.
 All of the above assume no ambient airflow.

PACKAGE PIN OUTS

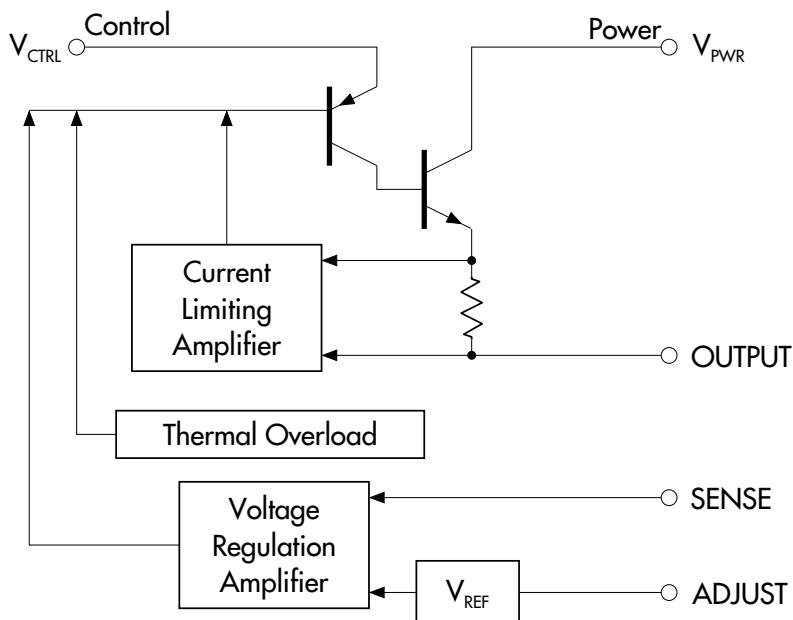


P PACKAGE
(Top View)



DD PACKAGE
(Top View)

BLOCK DIAGRAM



7A VERY LOW DROPOUT POSITIVE ADJUSTABLE REGULATOR

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ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, these specifications apply over the operating ambient temperatures $0^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

| Parameter | Symbol | Test Conditions | LX8580 | | | Units |
|---|----------------------------|---|--------|-------|-------|----------------------|
| | | | Min. | Typ. | Max. | |
| Reference Voltage | V_{REF} | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2\text{V}, I_{LOAD} = 10\text{mA}, T_J = 25^{\circ}\text{C}$ | 1.243 | 1.250 | 1.257 | V |
| | | $V_{CTRL} = 2.7\text{V to } 6\text{V}, V_{PWR} = 1.75\text{V to } 5.5\text{V}, I_{OUT} = 10\text{mA to } 4\text{A}$ | 1.237 | 1.250 | 1.263 | V |
| | | $V_{CTRL} = 2.7\text{V to } 6\text{V}, V_{PWR} = 2.05\text{V to } 5.5\text{V}, I_{OUT} = 10\text{mA to } 7\text{A}$ | 1.237 | 1.250 | 1.263 | V |
| Line Regulation | $\Delta V_{REF} (V_{IN})$ | $V_{CTRL} = 2.5\text{V to } 12\text{V}, V_{PWR} = 1.75\text{V to } 5.5\text{V}, I_{LOAD} = 10\text{mA}, T_J = 25^{\circ}\text{C}$ | | 1 | 3 | mV |
| | | $V_{CTRL} = 2.5\text{V to } 12\text{V}, V_{PWR} = 1.75\text{V to } 5.5\text{V}, I_{LOAD} = 10\text{mA}$ | | 2 | 6 | mV |
| Load Regulation | $\Delta V_{REF} (I_{OUT})$ | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.1\text{V}, I_{LOAD} = 10\text{mA to } 7\text{A} (V_{ADJ} = 0)$ | | 2 | 7 | mV |
| Thermal Regulation | $\Delta V_{OUT} (Pwr)$ | 30ms Pulse | | 0.002 | 0.020 | %/W |
| Thermal Resistance | $R_{\theta JT}$ | Control Circuitry/Power Transistor | | 0.65 | 2.70 | $^{\circ}\text{C/W}$ |
| Ripple Rejection | | $V_{CTRL} = V_{PWR} = 3.75\text{V Avg}, V_{RIPPLE} = 1\text{V}_{P-P}, V_{ADJ} = 0\text{V}, I_{OUT} = 4\text{A}$ | 60 | 80 | | dB |
| Control Pin Current (Note 3) | I_{CTRL} | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.05\text{V}, I_{LOAD} = 100\text{mA}$ | | 3 | 10 | mA |
| | | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.05\text{V}, I_{LOAD} = 4\text{A}$ | | 30 | 60 | mA |
| | | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 1.75\text{V}, I_{LOAD} = 4\text{A}$ | | 33 | 70 | mA |
| | | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.05\text{V}, I_{LOAD} = 7\text{A}$ | | 60 | 120 | mA |
| | | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.05\text{V}, I_{LOAD} = 0\text{mA} (V_{ADJ} = 0)$ | | 60 | 120 | μA |
| Current Limit | $I_{B(MAX)}$ | $V_{CTRL} = 2.75\text{V}, V_{PWR} = 2.05\text{V}, \Delta V_{OUT} = 100\text{mV} (V_{ADJ} = 0)$ | 7.1 | 9 | | A |
| Dropout Voltage (Control Section) Minimum V_{CTRL} (Note 2) ($V_{PWR} - V_{OUT}$) | $V_{CTRL} - V_{OUT}$ | $V_{PWR} = 2.05\text{V}, I_{LOAD} = 100\text{mA}$ | | 0.90 | 1.15 | V |
| | | $V_{PWR} = 2.05\text{V}, I_{LOAD} = 1\text{A}$ | | 1.00 | 1.15 | V |
| | | $V_{PWR} = 2.05\text{V}, I_{LOAD} = 2.75\text{A}$ | | 1.05 | 1.18 | V |
| | | $V_{PWR} = 2.05\text{V}, I_{LOAD} = 4\text{A}$ | | 1.06 | 1.20 | V |
| | | $V_{PWR} = 2.05\text{V}, I_{LOAD} = 7\text{A}$ | | 1.10 | 1.30 | V |
| Dropout Voltage (Power Section) Minimum V_{PWR} (Note 2) ($V_{PWR} - V_{OUT}$) ($V_{ADJ} = 0$) | $V_{PWR} - V_{OUT}$ | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 100\text{mA}$ | | 0.05 | 0.17 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 1\text{A}$ | | 0.10 | 0.22 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 2.75\text{A}$ | | 0.20 | 0.38 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 4\text{A}, T_J = 25^{\circ}\text{C}$ | | 0.30 | 0.40 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 4\text{A}$ | | 0.30 | 0.50 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 7\text{A}, T_J = 25^{\circ}\text{C}$ | | 0.52 | 0.62 | V |
| | | $V_{CTRL} = 2.75\text{V}, I_{LOAD} = 7\text{A}$ | | 0.56 | 0.80 | V |
| Minimum Load Current | | $V_{CTRL} = 5\text{V}, V_{PWR} = 3.3\text{V}, V_{ADJ} = 0\text{V}$ | | 5 | 10 | mA |

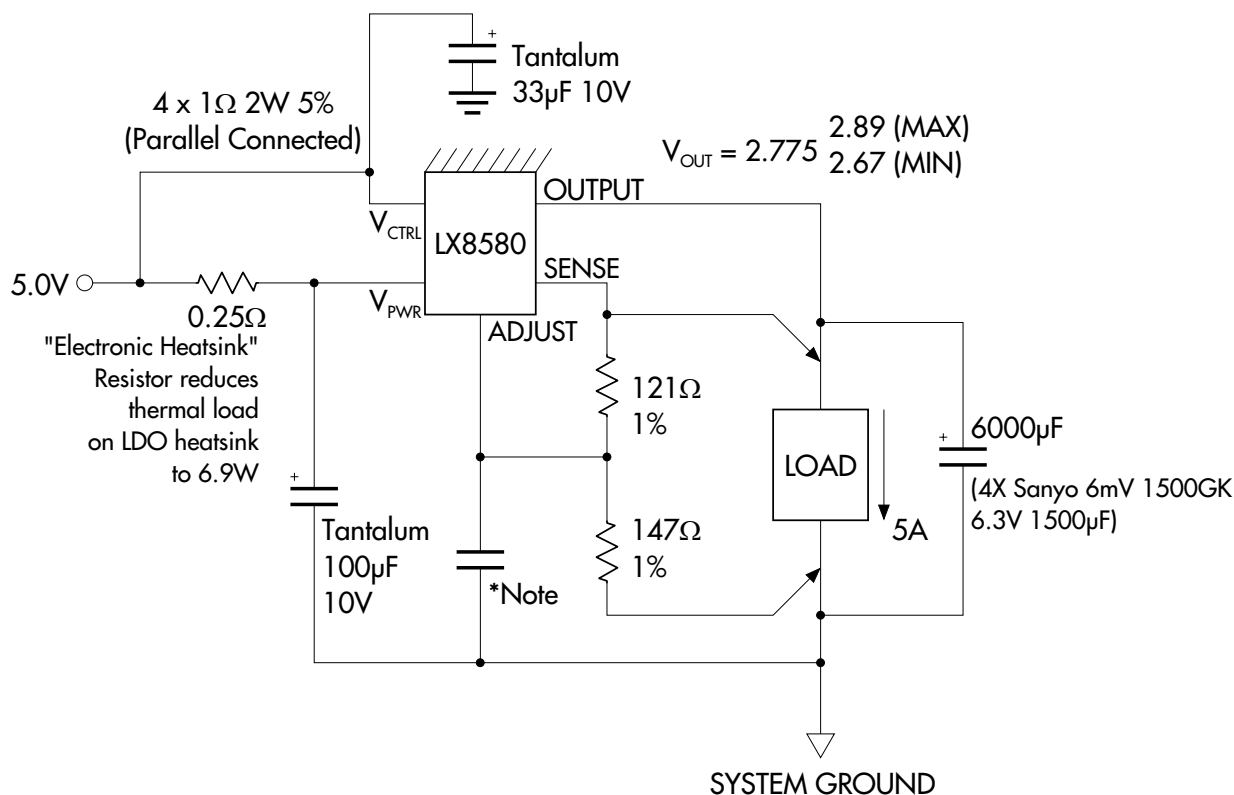
Note 2. Dropout is caused by either minimum control voltage (V_{CTRL}) or minimum power voltage (V_{PWR}). Both parameters are specified with respect to the output voltage. The specifications represent the minimum input/output voltage required to maintain 1% regulation.

Note 3. The control pin current is the drive current required for the output transistor. This current will track output current with roughly a 1:100 ratio. The minimum value is equal to the quiescent current of the device.

FUNCTIONAL PIN DESCRIPTION

| Pin | # | Description |
|------------|---|---|
| SENSE | 1 | This pin is the positive side of the reference voltage for the device. With this pin it is possible to Kelvin-sense the output voltage at load. |
| ADJUST | 2 | This pin is the negative side of the reference voltage for the device. Ripple rejection can be improved by adding a small bypass capacitor from the Adjust pin to ground. The capacitor value should be selected so that $C_R \leq 1 / 2\pi F_R R_A$, where F_R is the ripple frequency and R_A is the value of the resistor between the output and sense leads of the LX8580. |
| OUTPUT | 3 | This is the power output of the device. |
| V_{CTRL} | 4 | This pin is the voltage supply pin for the control circuitry of the device. The current flow into this pin will be about 1% of the output current. For the device to regulate, the voltage at this pin must be between 1.0V and 1.3V greater than the output voltage. |
| V_{PWR} | 5 | This is the collector of the power section of the LX8580. The output load current is supplied through this pin. For the device to regulate, the voltage at this pin must be between 0.1V and 0.8V greater than the output voltage (higher output currents require higher voltages between V_{PWR} and OUTPUT). |

BASIC APPLICATION CIRCUIT



*Note: For improved transient response, add capacitor as shown (typical 15μF).

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