

**5A LOW DROP LINEAR REGULATOR**

- SPLITTED SUPPLY VOLTAGE FOR IMPROVED EFFICIENCY:
  - $V_{PW}$ : 3V MIN. POWER SUPPLY VOLTAGE
  - $V_{SIG}$ : 4.5V MIN. SIGNAL SUPPLY VOLTAGE
- 5A OUTPUT CURRENT
- FAST LOAD TRANSIENT RESPONSE
- 0.75V TYP. DROP OUT VOLTAGE AT 5A
- INHIBIT WITH ZERO CURRENT CONSUMPTION
- POWER GOOD
- SHORT CIRCUIT PROTECTION
- THERMAL SHUTDOWN
- HEPTAWATT PACKAGE

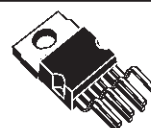
**APPLICATIONS**

- PENTIUM™ AND POWER PC™ SUPPLIES
- LOW COST SOLUTION FOR 3.3V TO 1.5V CONVERSION
- SUITABLE FOR APPLICATIONS WITH STAND BY FEATURE

**DESCRIPTION**

The L4956 is an adjustable monolithic linear regulator designed to satisfy very heavy load transient and efficient power conversion from 3.3V to 1.26V and lower, up to 5A.

**MULTIPOWER BCD TECHNOLOGY**



**HEPTAWATT**

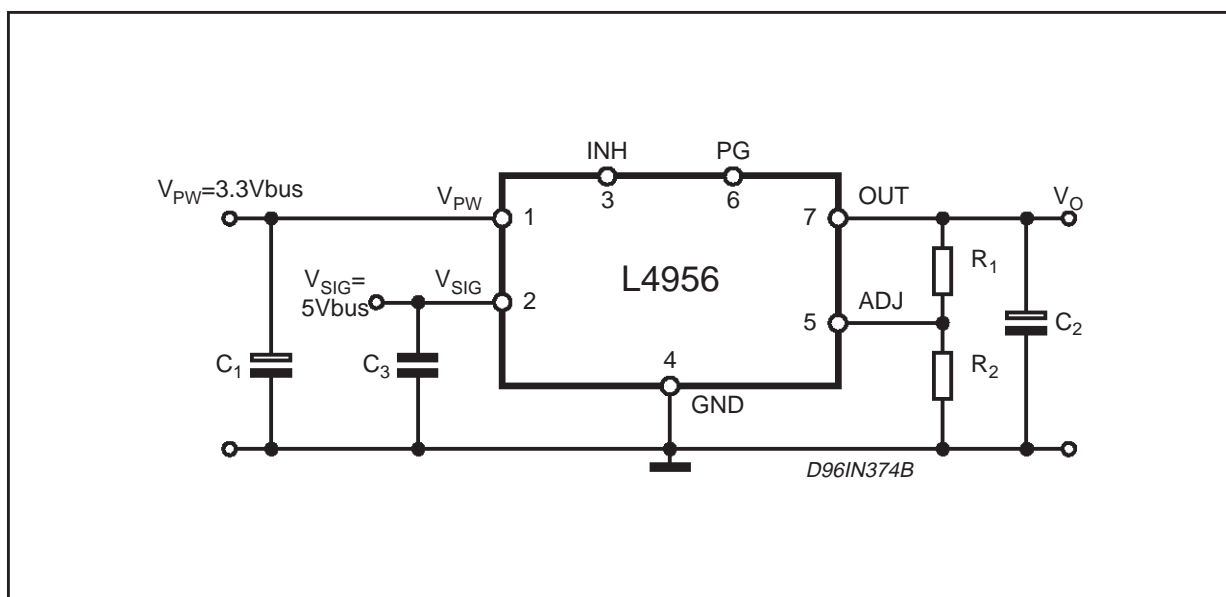
**ORDERING NUMBER: L4956**

Designed in BCDII technology, it uses a charge pump technique to have a proper internal N-channel gate drive. The signal supply voltage input  $V_{SIG}$  can operate from 4.5V up to an absolute of 7V and the power supply voltage input  $V_{PW}$  can operate from 3V min to an absolute of 7V. An  $R_{DS(on)}$  of 150mV gives a voltage drop of 750mV at 5A of load current.

Very fast load transients and  $\pm 1\%$  of reference voltage precision makes this device suitable for supplying last microprocessors generation and low voltage logics.

The Heptawatt package enriches the device with auxiliary functions like power good and inhibit.

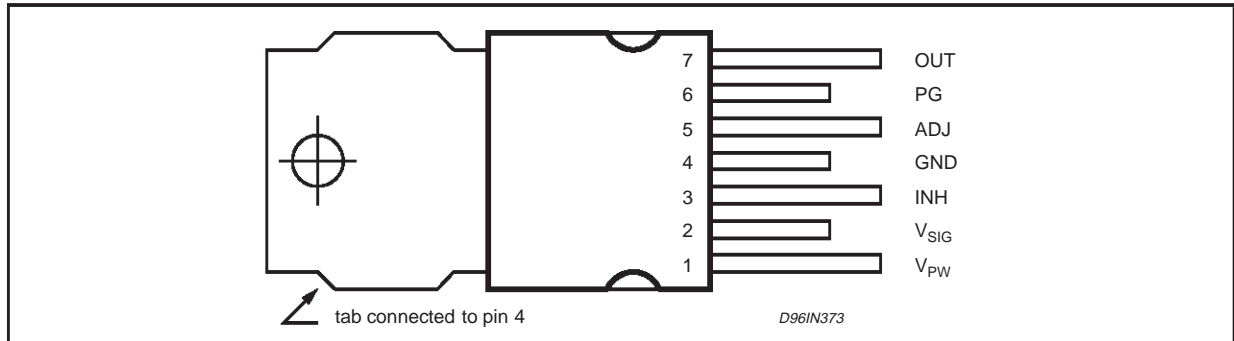
**TYPICAL APPLICATION**



**ABSOLUTE MAXIMUM RATINGS**

| Symbol            | Parameter                                    | Value          | Unit        |
|-------------------|--|----------------|-------------|
| $V_{PW}, V_{SIG}$ | Supply Input Voltage                         | 7              | V           |
|                   | ADJ pin                                      | -0.3 to 4      | V           |
|                   | PG and INH pins                              | 0 to $V_{SIG}$ | V           |
| $P_{TOT}$         | Power Dissipation @ $T_{amb} = 50^{\circ}C$  | 2              | W           |
|                   | Power Dissipation @ $T_{case} = 90^{\circ}C$ | 15             | W           |
| $T_{st}, T_i$     | Storage Temperature                          | -40 to +150    | $^{\circ}C$ |

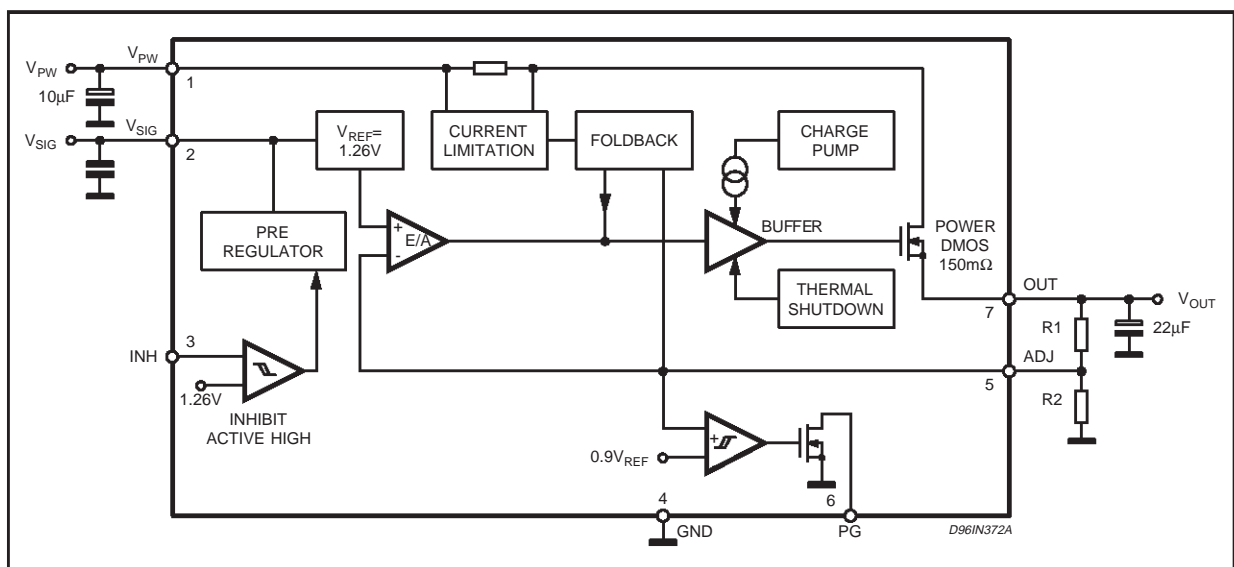
**PIN CONNECTION (Top view)**



**PIN FUNCTIONS**

| No. | Name      | Function   |
|-----|-----------|--|
| 1   | $V_{PW}$  | Unregulated power input voltage; this pin must be bypassed with a capacitor larger than $10\mu F$ .  |
| 2   | $V_{SIG}$ | Unregulated signal input voltage this pin has to be by passed with a minimum capacitor of $0.1\mu F$ .   |
| 3   | INH       | TTL-CMOS input. A logic level on this input disable the device. An internal pull-down insures insures full functionally even if the pin is open. |
| 4   | GND       | Ground.  |
| 5   | ADJ       | The output is connected directly to this terminal for $1.26V$ operation via divider for higher voltages.   |
| 6   | PG        | Open drain output, this pin is low when the output voltage is lower than 90%, otherwise is high.   |
| 7   | OUT       | Regulated output voltage. A minimum bypass capacitor of $22\mu F$ is required to insure stability.   |

**BLOCK DIAGRAM**



## THERMAL DATA

| Symbol           | Parameter                           | Value    | Unit |
|------------------|-------------------------------------|----------|------|
| $R_{th\ j-pins}$ | Thermal Resistance Junction-case    | 2.5      | °C/W |
| $R_{th\ j-amb}$  | Thermal Resistance Junction-ambient | 50       | °C/W |
|                  | Thermal Shutdown                    | Typ. 150 | °C   |
|                  | Thermal Hysteresis                  | Typ. 20  | °C   |

ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol           | Parameter                          | Test Condition  | Min.                                     | Typ.                 | Max.  | Unit          |
|------------------|------------------------------------|---|--|----------------------|-------|---------------|
| $V_{PW}$         | Power Operating Supply Voltage     |   | 3  |                      | 6.5   | V             |
| $V_{SIG}$        | Signal Operating Supply Voltage    |   | 4.5                                      |                      | 6.5   | V             |
| $V_{OUT}$        | Output Voltage (1)                 | $0 < T_j < 125^\circ\text{C}; V_{PW} = 3.3\text{V}$<br>$4.5\text{V} < V_{SIG} < 6.5\text{V}; 0.1\text{A} < I_O < 5\text{A}$             | 1.240                                    | 1.260                | 1.280 | V             |
|                  |                                    | $3\text{V} < V_{PW} < 5.5\text{V}; 4.5\text{V} < V_{SIG} < 6.5\text{V}$<br>$0.1\text{A} < I_O < 5\text{A}; 0 < T_j < 125^\circ\text{C}$ | 1.224                                    | 1.260                | 1.296 | V             |
| $\Delta V_{OUT}$ | Line regulation (1)                | $3\text{V} < V_{PW} < 5.5\text{V}; I_O = 10\text{mA}$<br>$4.5\text{V} < V_{SIG} < 6.5\text{V}$  |  | 0.5                  | 3     | mV            |
| $\Delta V_{OUT}$ | Load regulation (1)                | $V_{PW} = 3.3\text{V}; V_{SIG} = 5\text{V}$<br>$0.1\text{A} < I_O < 5\text{A}$  |  | 1                    | 5     | mV            |
|                  | Drop-out Voltage                   | $I_O = 5\text{A}$   |  | 0.75                 | 1.1   | V             |
|                  |                                    | $I_O = 5\text{A}, T_j = 125^\circ\text{C}$  |  | 1.1                  | 1.5   | V             |
| $I_O$            | Current Limiting                   | $0 < T_j < 125^\circ\text{C}$   | 5.1                                      | 6.3                  | 7.5   | A             |
|                  | Short Circuit Current              | $V_O = 0\text{V}, 0 < T_j < 125^\circ\text{C}$  |  | 1.8                  |       | A             |
| $I_Q$            | Quiescent Current at pin $V_{SIG}$ | $0.1\text{A} < I_O < 5\text{A}$<br>$4.5\text{V} < V_{SIG} < 6.5\text{V}$  |  | 1.5                  | 3     | mA            |
|                  |                                    | Stand By Current at pin $V_{SIG}$   | $INH = \text{HIGH } V_{SIG} = 5\text{V}$ |                      | 100   | 150           |
|                  | Inhibit Threshold                  | $0 < T_j < 125^\circ\text{C}$   | 1.1                                      | 1.26                 | 1.42  | V             |
|                  | Inhibit Histeresys                 |   |  | 0.2                  |       | V             |
|                  | Inhibit Bias Sink Current          |   |  | 5                    | 10    | $\mu\text{A}$ |
|                  | Power Good Threshold               |   |  | $0.9 \times V_{OUT}$ |       | V             |
|                  | Power Good Saturation              | $I_G = 4\text{mA}$  |  | 0.1                  | 0.4   | V             |
|                  | Power Good Histeresys              |   |  | 0.2                  |       | V             |

(1) Output voltage connected to ADJ.

Figure 1. DC Operating Area.

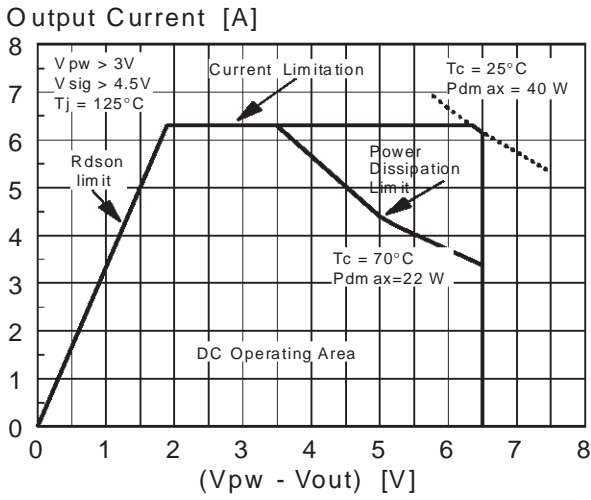


Figure 2. Output Voltage Stability vs. Junction Temperature

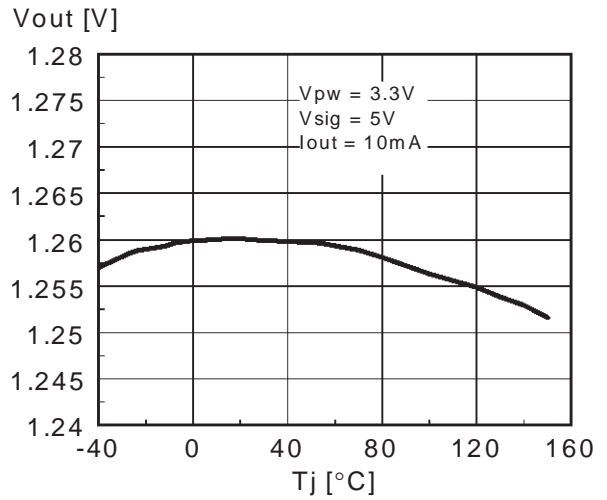


Figure 3. Load Regulation.

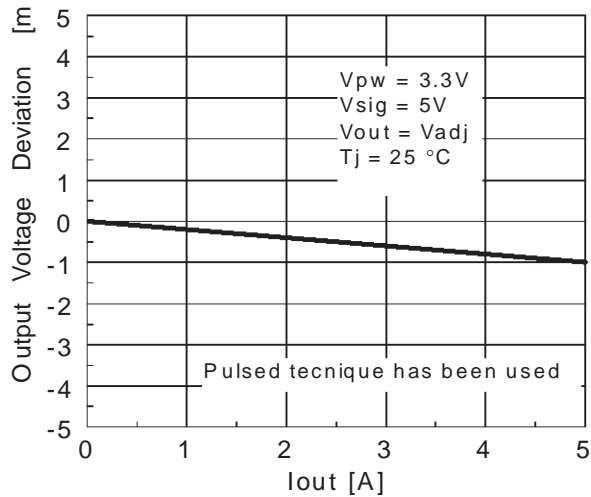


Figure 4. Dropout Voltage.

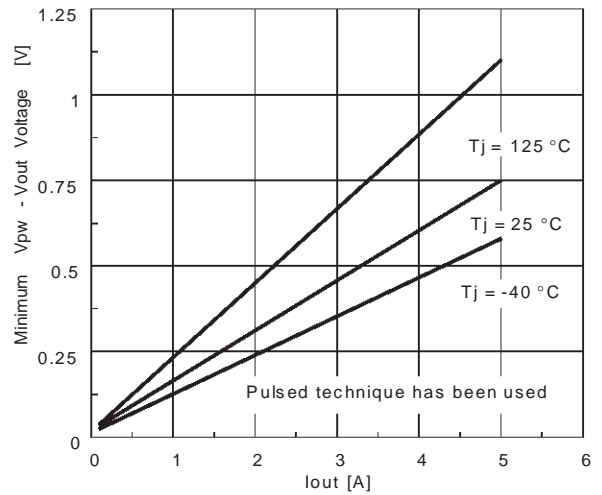


Figure 5. Maximum Output Current vs. Junction Temperature

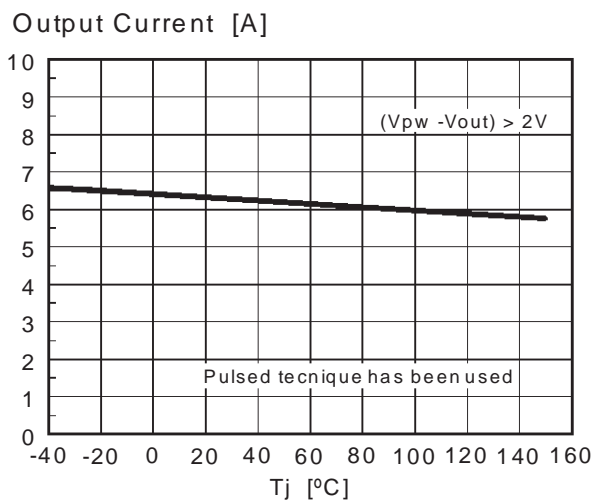
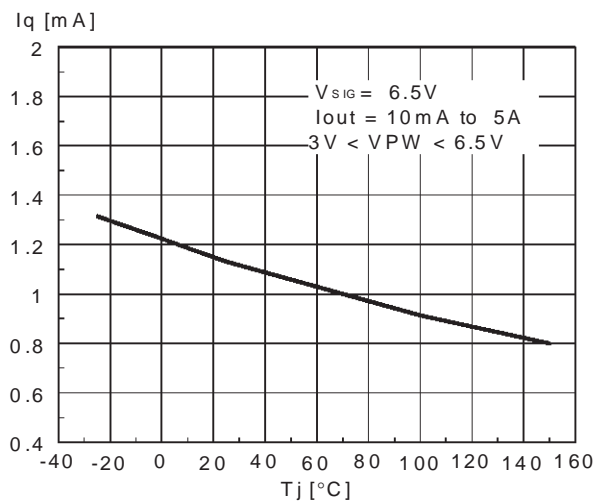
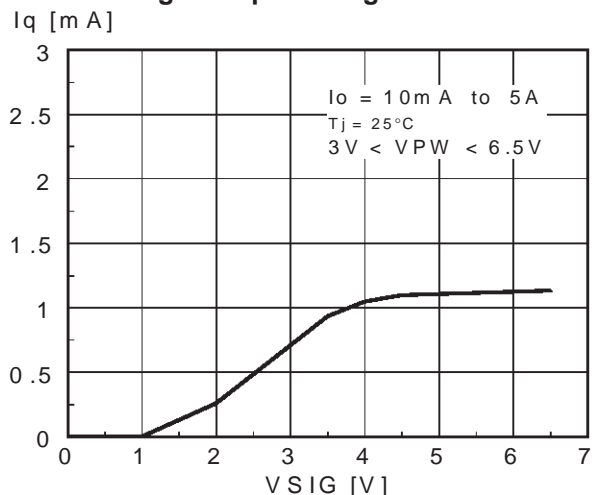


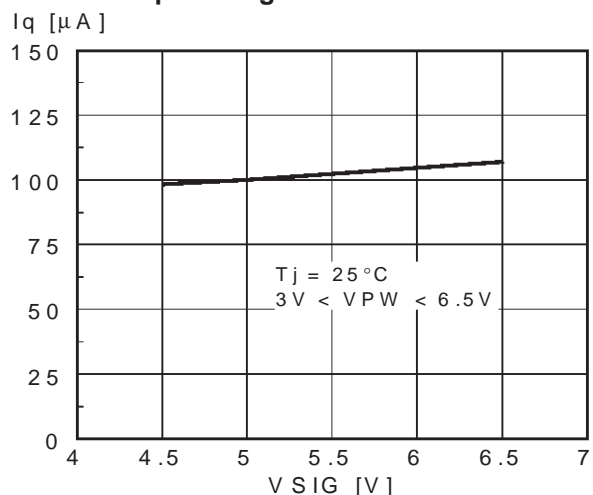
Figure 6. Quiescent Current at pin VSIG vs. Junction Temperature.



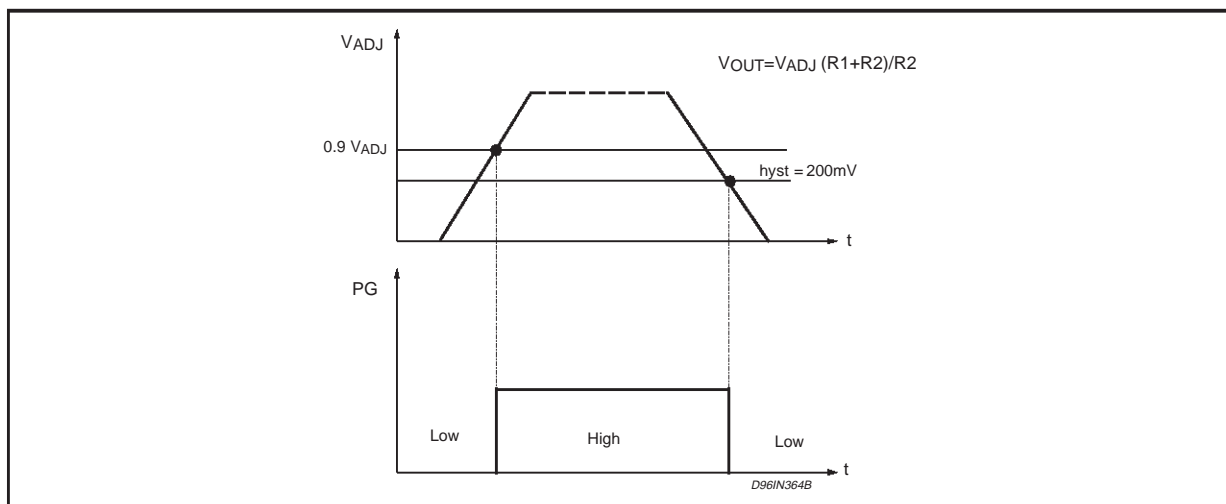
**Figure 7. Quiescent Current at pin VSIG vs. Signal Input Voltage.**



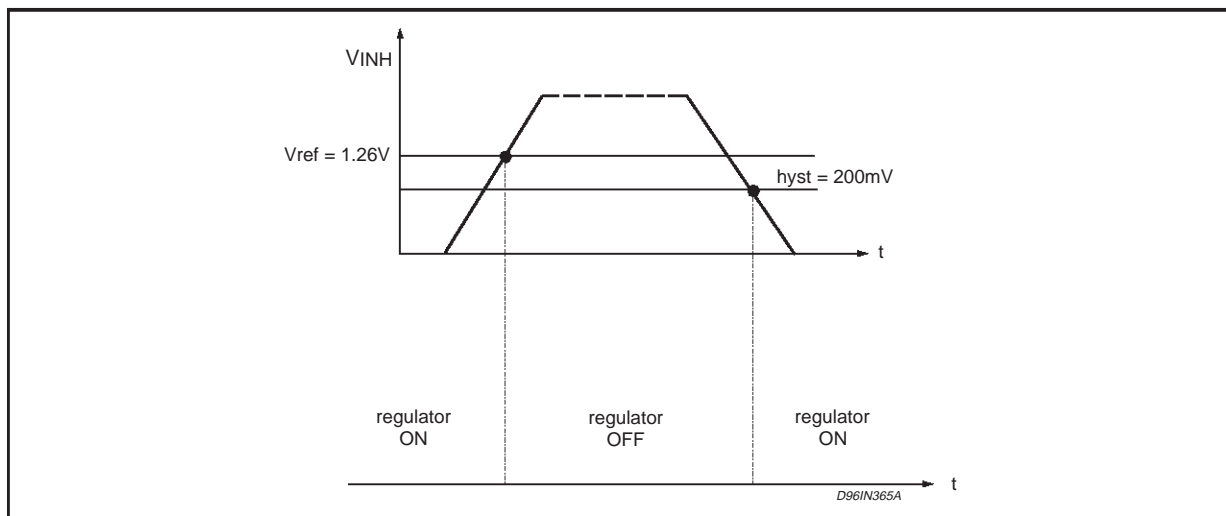
**Figure 8. Stand-By Current at pin VSIG vs. Signal Input Voltage with INH = LOGIC HIGH**



**Figure 9. Power Good Function**



**Figure 10. Inhibit Function**



LOAD TRANSIENT RESPONSE

Figure 11.

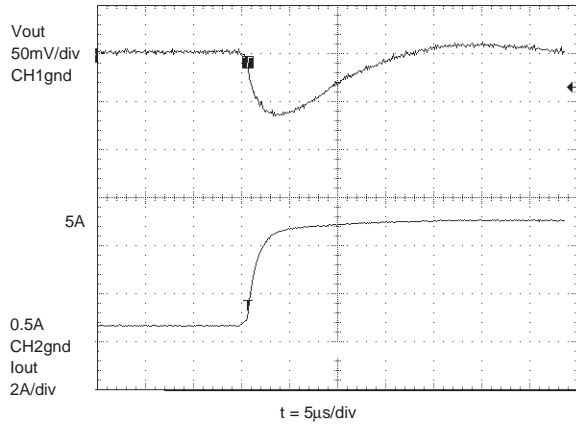


Figure 12.

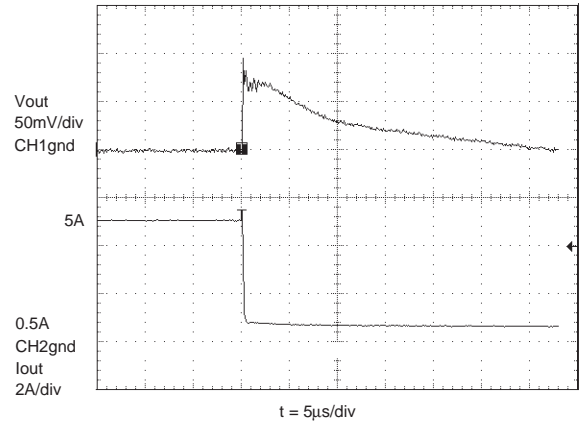
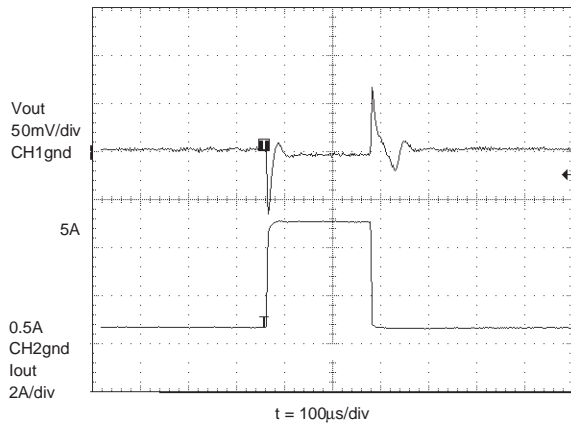


Figure 13.

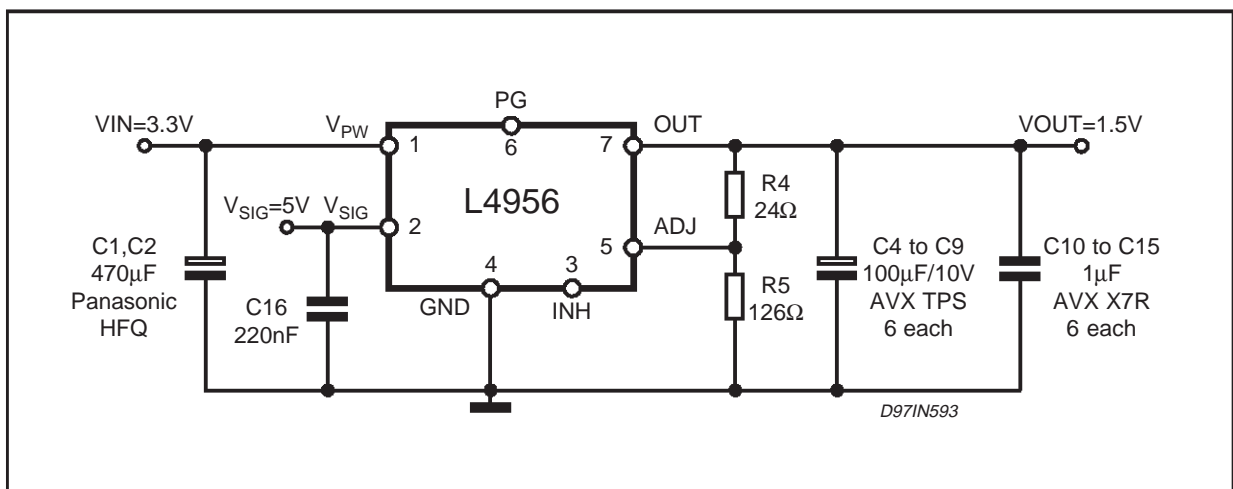


Test conditions:

$V_{PW} = 3.3V$ ;  $V_{SIG} = 5$ ;  $V_{out} = 1.5V$ ; Load Transient from 0.5A to 5A;

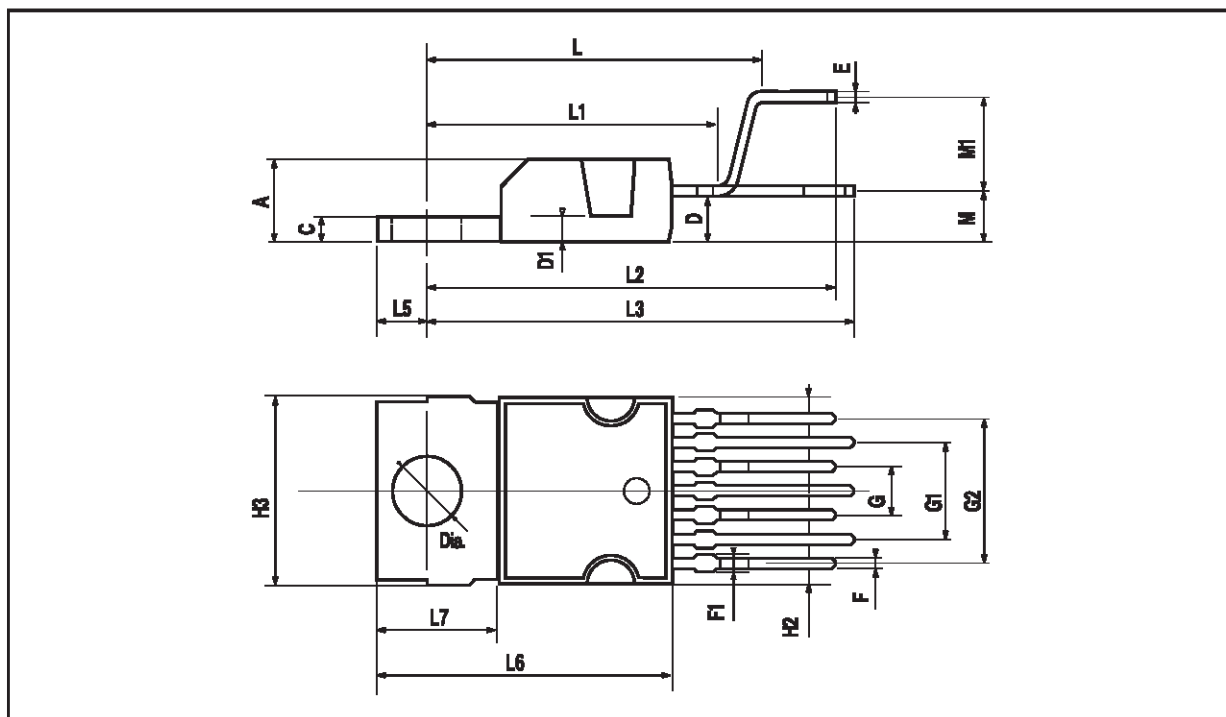
$$\frac{dI_{out}}{dt} = 20A/\mu s; T_j = 25^\circ C$$

Figure 14. Load transient test circuit.



## HEPTAWATT PACKAGE MECHANICAL DATA

| DIM. | mm    |       |      | inch  |       |       |
|------|-------|-------|------|-------|-------|-------|
|      | MIN.  | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |       |       | 4.8  |       |       | 0.189 |
| C    |       |       | 1.37 |       |       | 0.054 |
| D    | 2.4   |       | 2.8  | 0.094 |       | 0.110 |
| D1   | 1.2   |       | 1.35 | 0.047 |       | 0.053 |
| E    | 0.35  |       | 0.55 | 0.014 |       | 0.022 |
| F    | 0.6   |       | 0.8  | 0.024 |       | 0.031 |
| F1   |       |       | 0.9  |       |       | 0.035 |
| G    | 2.41  | 2.54  | 2.67 | 0.095 | 0.100 | 0.105 |
| G1   | 4.91  | 5.08  | 5.21 | 0.193 | 0.200 | 0.205 |
| G2   | 7.49  | 7.62  | 7.8  | 0.295 | 0.300 | 0.307 |
| H2   |       |       | 10.4 |       |       | 0.409 |
| H3   | 10.05 |       | 10.4 | 0.396 |       | 0.409 |
| L    |       | 16.97 |      |       | 0.668 |       |
| L1   |       | 14.92 |      |       | 0.587 |       |
| L2   |       | 21.54 |      |       | 0.848 |       |
| L3   |       | 22.62 |      |       | 0.891 |       |
| L5   | 2.6   |       | 3    | 0.102 |       | 0.118 |
| L6   | 15.1  |       | 15.8 | 0.594 |       | 0.622 |
| L7   | 6     |       | 6.6  | 0.236 |       | 0.260 |
| M    |       | 2.8   |      |       | 0.110 |       |
| M1   |       | 5.08  |      |       | 0.200 |       |
| Dia  | 3.65  |       | 3.85 | 0.144 |       | 0.152 |



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