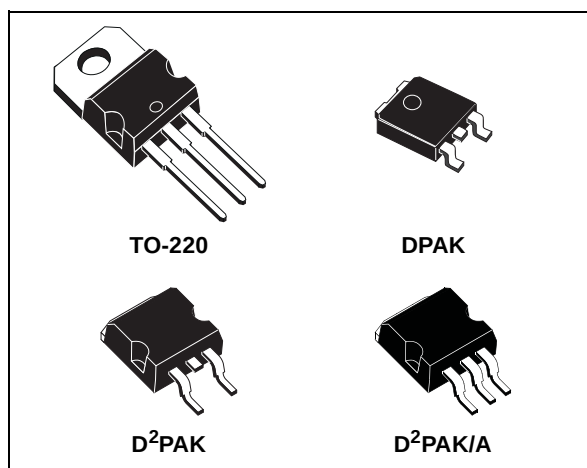




# LD1086 SERIES

## 1.5A LOW DROP POSITIVE VOLTAGE REGULATOR ADJUSTABLE AND FIXED

- TYPICAL DROPOUT 1.3V AT 1.5A
- THREE TERMINAL ADJUSTABLE OR FIXED OUTPUT VOLTAGE 1.5V, 1.8V, 2.5V, 2.85V, 3.3V, 3.6V, 5V, 8V, 9V, 12V.
- GUARANTEED OUTPUT CURRENT UP TO 1.5A
- OUTPUT TOLERANCE  $\pm 1\%$  AT 25°C AND  $\pm 2\%$  IN FULL TEMPERATURE RANGE
- INTERNAL POWER AND THERMAL LIMIT
- WIDE OPERATING TEMPERATURE RANGE -40°C TO 125°C
- PACKAGE AVAILABLE : TO-220, D<sup>2</sup>PAK, D<sup>2</sup>PAK/A, DPAK
- PINOUT COMPATIBILITY WITH STANDARD ADJUSTABLE VREG

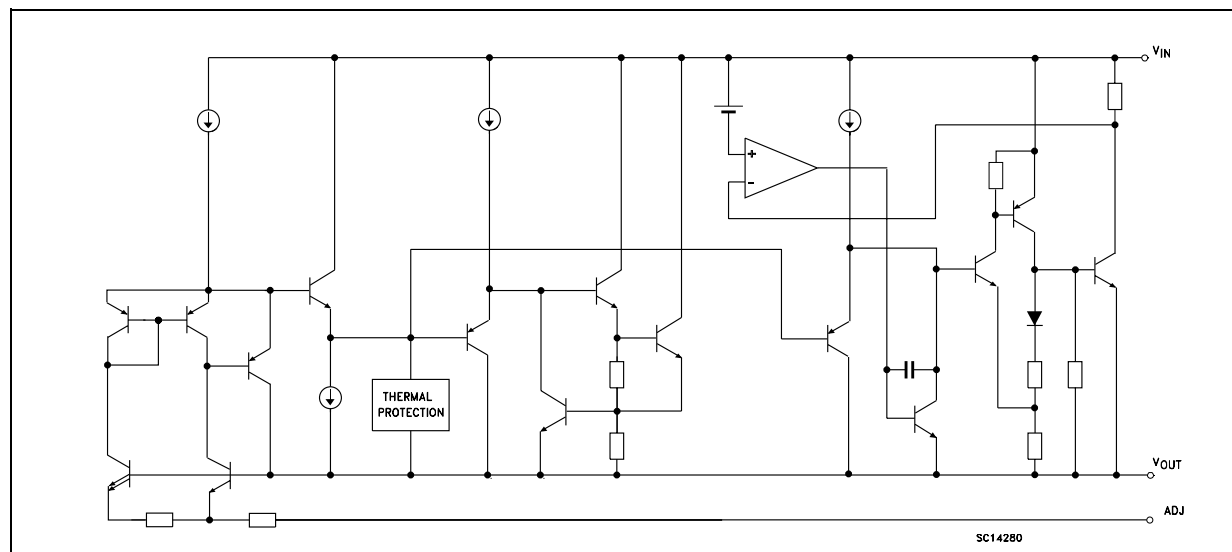


### DESCRIPTION

The LD1086 is a LOW DROP Voltage Regulator able to provide up to 1.5A of Output Current. Dropout is guaranteed at a maximum of 1.5V at the maximum output current, decreasing at lower loads. The LD1086 is pin to pin compatible with the older 3-terminal adjustable regulators, but has better performances in term of drop and output tolerance .

A 2.85V output version is suitable for SCSI-2 active termination. Unlike PNP regulators, where a part of the output current is wasted as quiescent current, the LD1086 quiescent current flows into the load, so increase efficiency. Only a 10 $\mu$ F minimum capacitor is need for stability. The device is supplied in TO-220, D<sup>2</sup>PAK, D<sup>2</sup>PAK/A and DPAK. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 1\%$  at 25°C.

### SCHEMATIC DIAGRAM



## LD1086 SERIES

### ABSOLUTE MAXIMUM RATINGS

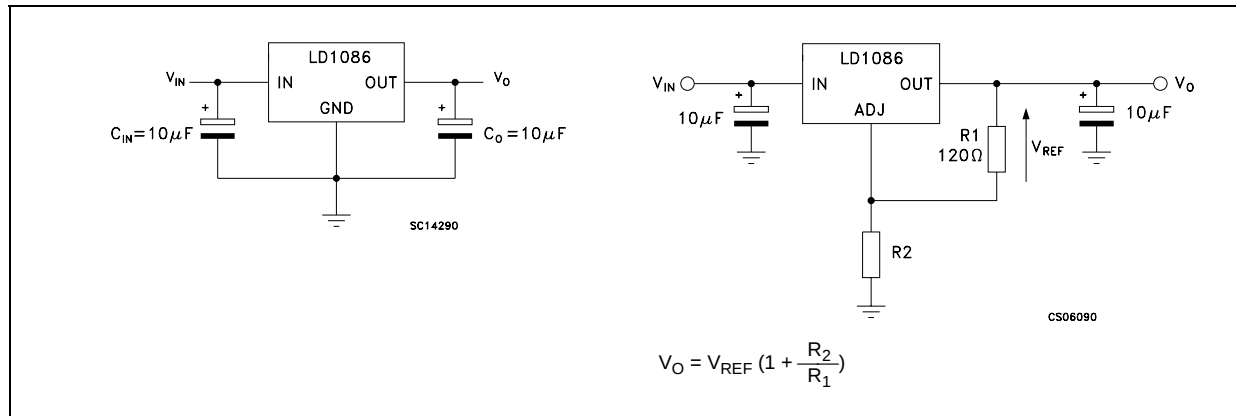
| Symbol           | Parameter <sup>2</sup>               | Value              | Unit |
|------------------|--------------------------------------|--------------------|------|
| V <sub>I</sub>   | DC Input Voltage                     | 30                 | V    |
| I <sub>O</sub>   | Output Current                       | Internally Limited | mA   |
| P <sub>D</sub>   | Power Dissipation                    | Internally Limited | mW   |
| T <sub>stg</sub> | Storage Temperature Range            | -55 to +150        | °C   |
| T <sub>op</sub>  | Operating Junction Temperature Range | -40 to +125        | °C   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

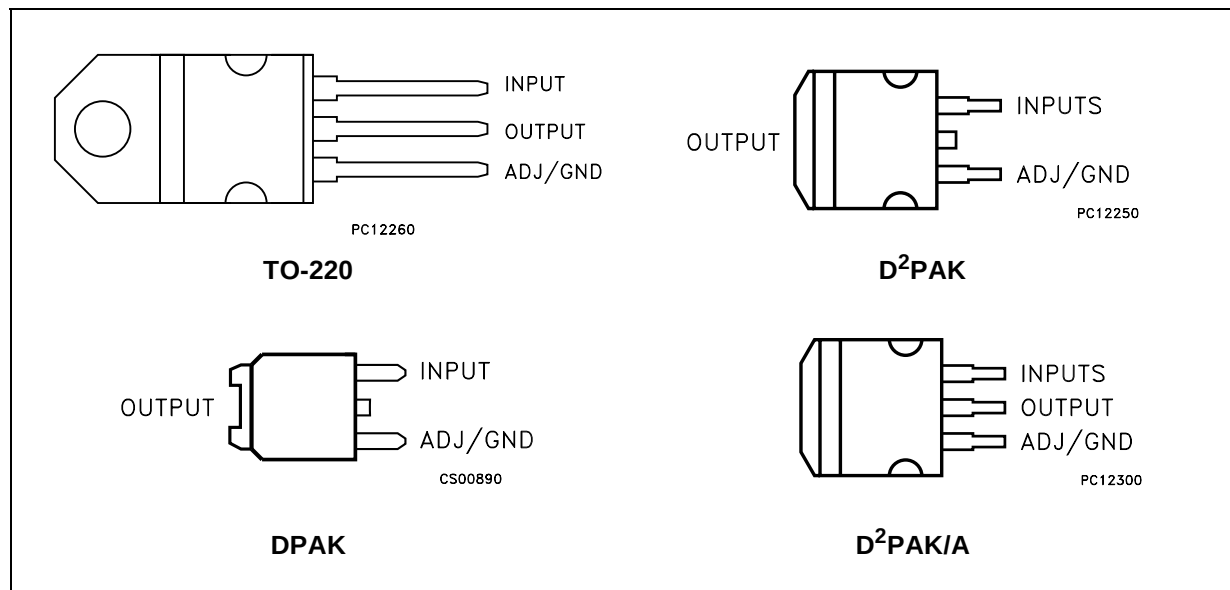
### THERMAL DATA

| Symbol                | Parameter                           | TO-220 | D <sup>2</sup> PAK | DPAK | Unit |
|-----------------------|-------------------------------------|--------|--------------------|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case    | 3      | 3                  | 8    | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient | 50     | 62.5               |      | °C/W |

### APPLICATION CIRCUITS



## CONNECTION DIAGRAM (top view)



## ORDERING CODES

| TO-220    | D²PAK (*)   | D²PAK/A (*) | DPAK (*)   | OUTPUT VOLTAGE |
|-----------|-------------|-------------|------------|----------------|
| LD1086V15 | LD1086D2T15 | LD1086D2M15 | LD1086DT15 | 1.5 V          |
| LD1086V18 | LD1086D2T18 | LD1086D2M18 | LD1086DT18 | 1.8 V          |
| LD1086V25 | LD1086D2T25 | LD1086D2M25 | LD1086DT25 | 2.5 V          |
| LD1086V28 | LD1086D2T28 | LD1086D2M28 | LD1086DT28 | 2.85 V         |
| LD1086V33 | LD1086D2T33 | LD1086D2M33 | LD1086DT33 | 3.3 V          |
| LD1086V36 | LD1086D2T36 | LD1086D2M36 | LD1086DT36 | 3.6 V          |
| LD1086V50 | LD1086D2T50 | LD1086D2M50 | LD1086DT50 | 5.0 V          |
| LD1086V80 | LD1086D2T80 | LD1086D2M80 | LD1086DT80 | 8.0 V          |
| LD1086V90 | LD1086D2T90 | LD1086D2M90 | LD1086DT90 | 9.0 V          |
| LD1086V12 | LD1086D2T12 | LD1086D2M12 | LD1086DT12 | 12.0 V         |
| LD1086V   | LD1086D2T   | LD1086D2M   | LD1086DT   | ADJ            |

(\*) Available in Tape & Reel with the suffix "R" for fixed version and "-R" for adjustable version.

## LD1086 SERIES

**ELECTRICAL CHARACTERISTICS OF LD1086#15** ( $V_I=4.5V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                              | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|------------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                      | 1.485 | 1.5   | 1.515 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 3.4$ to $30V$                                     | 1.47  | 1.5   | 1.53  | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 3.1$ to $18V$ $T_J = 25^\circ C$                 |       | 0.2   | 4     | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 3.1$ to $15V$                                    |       | 0.4   | 4     | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                       |       | 0.5   | 8     | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                          |       | 1     | 16    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                 |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                               |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                             | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                            | 0.05  | 0.02  |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                              |       | 0.01  | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 6.5 \pm 3V$ | 60    | 82    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                       |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                              |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                  |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#18** ( $V_I=4.8V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                              | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|------------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                      | 1.782 | 1.8   | 1.818 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 3.4$ to $30V$                                     | 1.764 | 1.8   | 1.836 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 3.4$ to $18V$ $T_J = 25^\circ C$                 |       | 0.2   | 4     | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 3.4$ to $15V$                                    |       | 0.4   | 4     | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                       |       | 0.5   | 8     | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                          |       | 1     | 16    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                 |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                               |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                             | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                            | 0.05  | 0.02  |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                              |       | 0.01  | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 6.8 \pm 3V$ | 60    | 82    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                       |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                              |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                  |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#25** ( $V_I=5.5V$ ,  $C_I = C_O=10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                            | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|----------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0\text{ mA}$ $T_J = 25^\circ C$                                     | 2.475 | 2.5   | 2.525 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 4.1$ to $30V$                                   | 2.45  | 2.5   | 2.55  | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0\text{ mA}$ $V_I = 4.1$ to $18V$ $T_J = 25^\circ C$                |       | 0.2   | 4     | mV   |
|              |                                           | $I_O = 0\text{ mA}$ $V_I = 4.1$ to $18V$                                   |       | 0.4   | 4     | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                     |       | 0.5   | 8     | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                        |       | 1     | 16    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                               |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                             |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                           | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                          | 0.05  | 0.2   |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                            |       | 0.008 | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120\text{ Hz}$ , $C_O = 25\mu F$ , $I_O = 1.5A$<br>$V_I = 7.5 \pm 3V$ | 60    | 81    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f=10\text{Hz}$ to $10\text{KHz}$                       |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                            |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#285** ( $V_I=5.85V$ ,  $C_I = C_O=10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                             | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0\text{ mA}$ $T_J = 25^\circ C$                                      | 2.821 | 2.85  | 2.879 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 4.5$ to $30V$                                    | 2.793 | 2.85  | 2.907 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0\text{ mA}$ $V_I = 4.5$ to $18V$ $T_J = 25^\circ C$                 |       | 0.2   | 6     | mV   |
|              |                                           | $I_O = 0\text{ mA}$ $V_I = 4.5$ to $18V$                                    |       | 0.5   | 6     | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                      |       | 1     | 12    | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                         |       | 2     | 20    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                              |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                            | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                           | 0.05  | 0.2   |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                             |       | 0.01  | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120\text{ Hz}$ , $C_O = 25\mu F$ , $I_O = 1.5A$<br>$V_I = 7.85 \pm 3V$ | 60    | 80    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f=10\text{Hz}$ to $10\text{KHz}$                        |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                             |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                 |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

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**ELECTRICAL CHARACTERISTICS OF LD1086#33** ( $V_I=6.3V$ ,  $C_I = C_O=10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                            | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|----------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0\text{ mA}$ $T_J = 25^\circ C$                                     | 3.267 | 3.3   | 3.333 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 4.9$ to $30V$                                   | 3.234 | 3.35  | 3.366 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0\text{ mA}$ $V_I = 4.9$ to $18V$ $T_J = 25^\circ C$                |       | 0.5   | 6     | mV   |
|              |                                           | $I_O = 0\text{ mA}$ $V_I = 4.9$ to $18V$                                   |       | 1     | 6     | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                     |       | 1     | 10    | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                        |       | 7     | 25    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                               |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                             |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                           | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                          | 0.05  | 0.2   |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                            |       | 0.008 | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120\text{ Hz}$ , $C_O = 25\mu F$ , $I_O = 1.5A$<br>$V_I = 8.3 \pm 3V$ | 60    | 79    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f=10\text{Hz}$ to $10\text{KHz}$                       |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                            |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#36** ( $V_I=6.6V$ ,  $C_I = C_O=10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                            | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|----------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0\text{ mA}$ $T_J = 25^\circ C$                                     | 3.564 | 3.6   | 3.636 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 5.2$ to $30V$                                   | 3.528 | 3.6   | 3.672 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0\text{ mA}$ $V_I = 5.2$ to $18V$ $T_J = 25^\circ C$                |       | 0.5   | 10    | mV   |
|              |                                           | $I_O = 0\text{ mA}$ $V_I = 5.2$ to $18V$                                   |       | 1     | 10    | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                     |       | 3     | 15    | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                        |       | 7     | 25    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                               |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                             |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                           | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                          | 0.05  | 0.2   |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                            |       | 0.01  | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120\text{ Hz}$ , $C_O = 25\mu F$ , $I_O = 1.5A$<br>$V_I = 8.6 \pm 3V$ | 60    | 78    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f=10\text{Hz}$ to $10\text{KHz}$                       |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                            |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#50** ( $V_I=8V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                             | Min. | Typ.  | Max. | Unit |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------|------|-------|------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                     | 4.95 | 5     | 5.05 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 6.6$ to $30V$                                    | 4.9  | 5     | 5.1  | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 6.6$ to $20V$ $T_J = 25^\circ C$                |      | 0.5   | 10   | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 6.6$ to $20V$                                   |      | 1     | 10   | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                      |      | 5     | 20   | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                         |      | 10    | 35   | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                |      | 1.3   | 1.5  | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                              |      | 5     | 10   | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                            | 1.5  | 2     |      | A    |
|              |                                           | $V_I - V_O = 25V$                                                           | 0.05 | 0.2   |      | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                             |      | 0.01  | 0.04 | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 10 \pm 3V$ | 60   | 75    |      | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                      |      | 0.003 |      | %    |
| S            | Temperature Stability                     |                                                                             |      | 0.5   |      | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                 |      | 0.5   |      | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#80** ( $V_I=11V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                             | Min. | Typ.  | Max. | Unit |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------|------|-------|------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                     | 7.92 | 8     | 8.08 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 9.8$ to $30V$                                    | 7.84 | 8     | 8.16 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 9.8$ to $20V$ $T_J = 25^\circ C$                |      | 1     | 18   | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 9.8$ to $20V$                                   |      | 2     | 18   | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                      |      | 8     | 30   | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                         |      | 12    | 60   | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                |      | 1.3   | 1.5  | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                              |      | 5     | 10   | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                            | 1.5  | 2     |      | A    |
|              |                                           | $V_I - V_O = 25V$                                                           | 0.04 | 0.2   |      | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                             |      | 0.01  | 0.04 | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 13 \pm 3V$ | 54   | 71    |      | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                      |      | 0.003 |      | %    |
| S            | Temperature Stability                     |                                                                             |      | 0.5   |      | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                 |      | 0.5   |      | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

## LD1086 SERIES

**ELECTRICAL CHARACTERISTICS OF LD1086#90** ( $V_I=12V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                             | Min. | Typ.  | Max. | Unit |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------|------|-------|------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                     | 8.91 | 9     | 9.09 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 11$ to $30V$                                     | 8.82 | 9     | 9.18 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 11$ to $20V$ $T_J = 25^\circ C$                 |      | 1     | 20   | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 11$ to $20V$                                    |      | 2     | 20   | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                      |      | 8     | 30   | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                         |      | 12    | 60   | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                |      | 1.3   | 1.5  | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                              |      | 5     | 10   | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                            | 1.5  | 2     |      | A    |
|              |                                           | $V_I - V_O = 25V$                                                           | 0.05 | 0.2   |      | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                             |      | 0.01  | 0.04 | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 14 \pm 3V$ | 54   | 70    |      | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                      |      | 0.003 |      | %    |
| S            | Temperature Stability                     |                                                                             |      | 0.5   |      | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                 |      | 0.5   |      | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**ELECTRICAL CHARACTERISTICS OF LD1086#120** ( $V_I=15V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol       | Parameter                                 | Test Conditions                                                             | Min.  | Typ.  | Max.  | Unit |
|--------------|-------------------------------------------|-----------------------------------------------------------------------------|-------|-------|-------|------|
| $V_O$        | Output Voltage (note 1)                   | $I_O = 0 \text{ mA}$ $T_J = 25^\circ C$                                     | 11.88 | 12    | 12.12 | V    |
|              |                                           | $I_O = 0$ to $1.5A$ $V_I = 13.8$ to $30V$                                   | 11.76 | 12    | 12.24 | V    |
| $\Delta V_O$ | Line Regulation                           | $I_O = 0 \text{ mA}$ $V_I = 13.8$ to $25V$ $T_J = 25^\circ C$               |       | 1     | 25    | mV   |
|              |                                           | $I_O = 0 \text{ mA}$ $V_I = 13.8$ to $25V$                                  |       | 2     | 25    | mV   |
| $\Delta V_O$ | Load Regulation                           | $I_O = 0$ to $1.5A$ $T_J = 25^\circ C$                                      |       | 12    | 36    | mV   |
|              |                                           | $I_O = 0$ to $1.5A$                                                         |       | 24    | 72    | V    |
| $V_d$        | Dropout Voltage                           | $I_O = 1.5A$                                                                |       | 1.3   | 1.5   | V    |
| $I_q$        | Quiescent Current                         | $V_I \leq 30V$                                                              |       | 5     | 10    | mA   |
| $I_{sc}$     | Short Circuit Current                     | $V_I - V_O = 5V$                                                            | 1.5   | 2     |       | A    |
|              |                                           | $V_I - V_O = 25V$                                                           | 0.05  | 0.2   |       | A    |
|              | Thermal Regulation                        | $T_A = 25^\circ C$ , 30ms pulse                                             |       | 0.01  | 0.04  | %/W  |
| SVR          | Supply Voltage Rejection                  | $f = 120 \text{ Hz}$ , $C_O = 25 \mu F$ , $I_O = 1.5A$<br>$V_I = 17 \pm 3V$ | 54    | 66    |       | dB   |
| eN           | RMS Output Noise Voltage<br>(% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10\text{Hz}$ to $10\text{KHz}$                      |       | 0.003 |       | %    |
| S            | Temperature Stability                     |                                                                             |       | 0.5   |       | %    |
| S            | Long Term Stability                       | $T_A = 125^\circ C$ 1000Hrs                                                 |       | 0.5   |       | %    |

NOTE 1: See short-circuit current curve for available output current at fixed dropout.

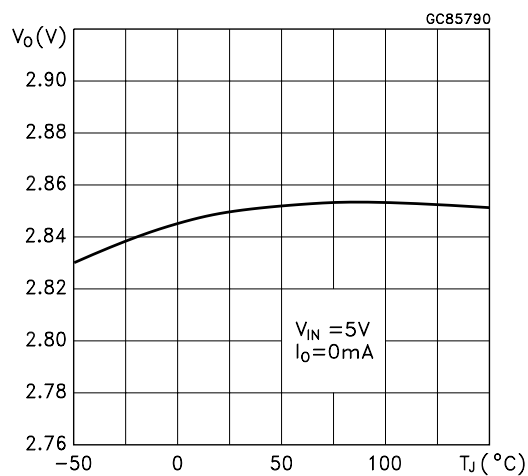
**ELECTRICAL CHARACTERISTICS OF LD1086#** ( $V_I=4.25V$ ,  $C_I = C_O = 10\mu F$ ,  $T_A = -40$  to  $125^\circ C$ , unless otherwise specified.)

| Symbol           | Parameter                              | Test Conditions                                                                             | Min.  | Typ.  | Max.  | Unit    |
|------------------|----------------------------------------|---------------------------------------------------------------------------------------------|-------|-------|-------|---------|
| $V_O$            | Output Voltage (note 1)                | $I_O = 10mA$ $T_J = 25^\circ C$                                                             | 1.237 | 1.25  | 1.263 | V       |
|                  |                                        | $I_O = 10mA$ to $1.5A$ $V_I = 2.85$ to $30V$                                                | 1.225 | 1.25  | 1.275 | V       |
| $\Delta V_O$     | Line Regulation                        | $I_O = 10mA$ $V_I = 2.8$ to $16.5V$ $T_J = 25^\circ C$                                      |       | 0.015 | 0.2   | %       |
|                  |                                        | $I_O = 10mA$ $V_I = 2.8$ to $16.5V$                                                         |       | 0.035 | 0.2   | %       |
| $\Delta V_O$     | Load Regulation                        | $I_O = 10mA$ to $1.5A$ $T_J = 25^\circ C$                                                   |       | 0.1   | 0.3   | %       |
|                  |                                        | $I_O = 0$ to $1.5A$                                                                         |       | 0.2   | 0.4   | %       |
| $V_d$            | Dropout Voltage                        | $I_O = 1.5A$                                                                                |       | 1.3   | 1.5   | V       |
| $I_{O(min)}$     | Minimum Load Current                   | $V_I = 30V$                                                                                 |       | 3     | 10    | mA      |
| $I_{sc}$         | Short Circuit Current                  | $V_I - V_O = 5V$                                                                            | 1.5   | 2.3   |       | A       |
|                  |                                        | $V_I - V_O = 25V$                                                                           | 0.05  | 0.2   |       | A       |
|                  | Thermal Regulation                     | $T_A = 25^\circ C$ , 30ms pulse                                                             |       | 0.01  | 0.04  | %/W     |
| SVR              | Supply Voltage Rejection               | $f = 120$ Hz, $C_O = 25 \mu F$ , $C_{ADJ} = 25 \mu F$ ,<br>$I_O = 1.5A$ $V_I = 6.25 \pm 3V$ | 60    | 88    |       | dB      |
| $I_{ADJ}$        | Adjust Pin Current                     | $V_I = 4.25V$ $I_O = 10$ mA                                                                 |       | 40    | 120   | $\mu A$ |
| $\Delta I_{ADJ}$ | Adjust Pin Current Change              | $I_O = 10mA$ to $1.5A$ $V_I = 2.8$ to $16.5V$ (note 1)                                      |       | 0.2   | 5     | $\mu A$ |
| eN               | RMS Output Noise Voltage (% of $V_O$ ) | $T_A = 25^\circ C$ $f = 10Hz$ to $10KHz$                                                    |       | 0.003 |       | %       |
| S                | Temperature Stability                  |                                                                                             |       | 0.5   |       | %       |
| S                | Long Term Stability                    | $T_A = 125^\circ C$ 1000Hrs                                                                 |       | 0.5   |       | %       |

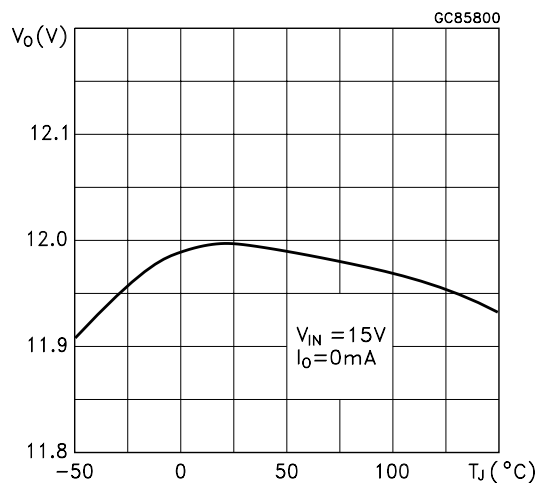
NOTE 1: See short-circuit current curve for available output current at fixed dropout.

**TYPICAL CHARACTERISTICS** (unless otherwise specified  $T_J = 25^\circ\text{C}$ ,  $C_I=C_O=10\mu\text{F}$ )

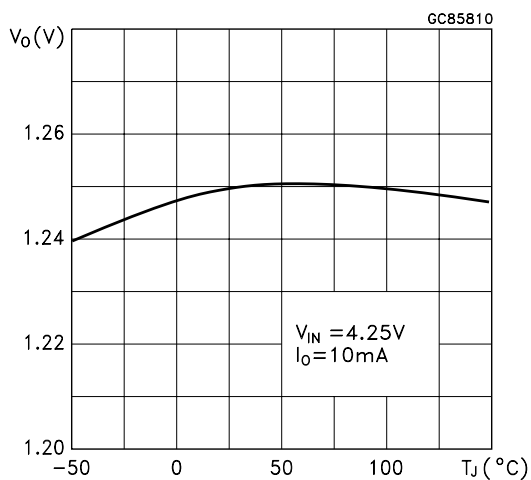
**Figure 1 : Output Voltage vs Temperature**



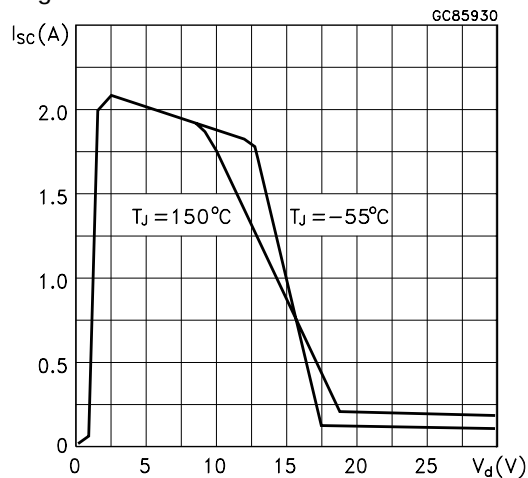
**Figure 2 : Output Voltage vs Temperature**



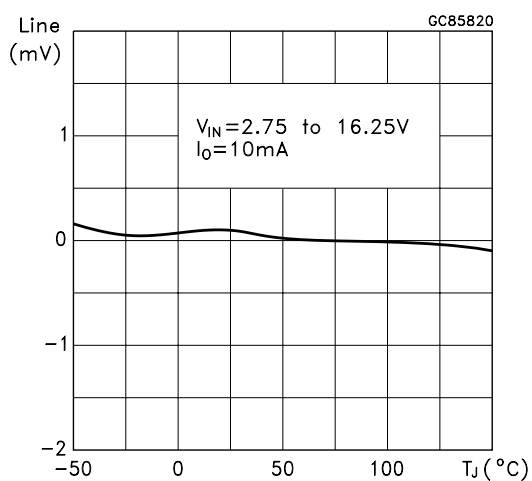
**Figure 3 : Output Voltage vs Temperature**



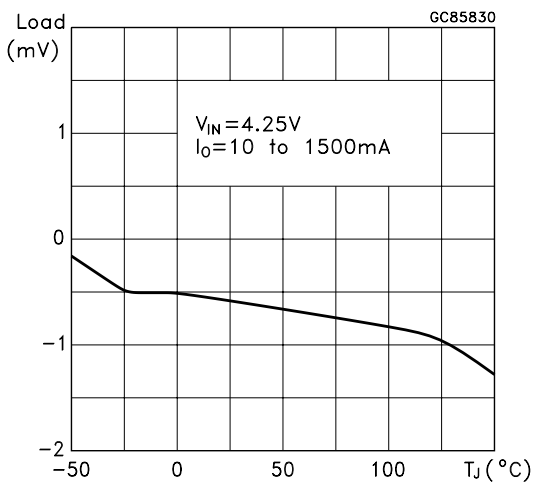
**Figure 4 : Short Circuit Current vs Dropout Voltage**

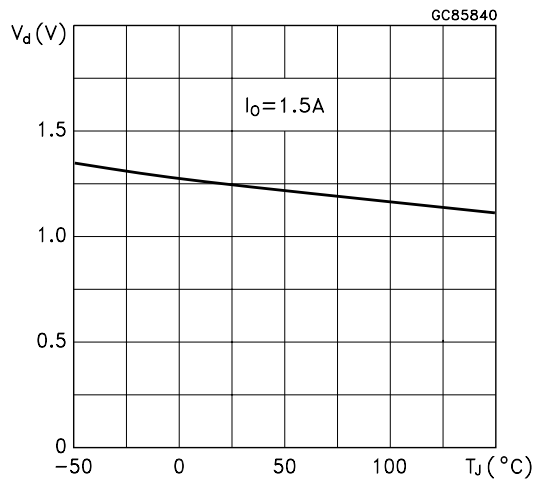
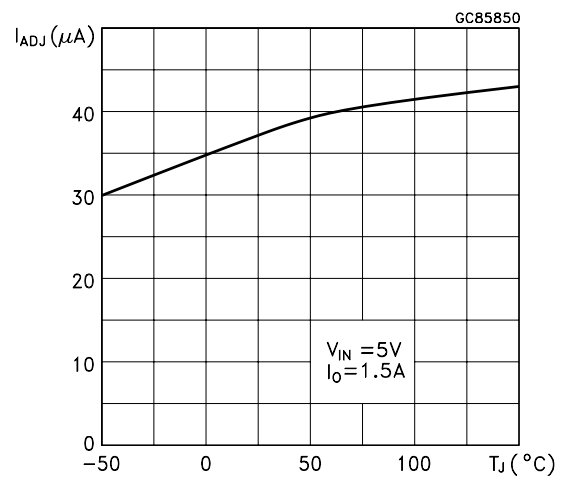
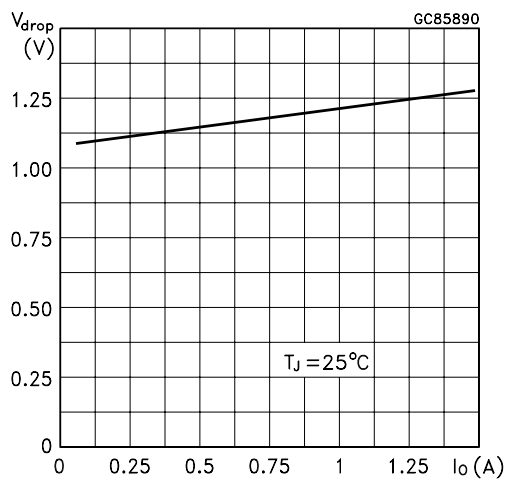
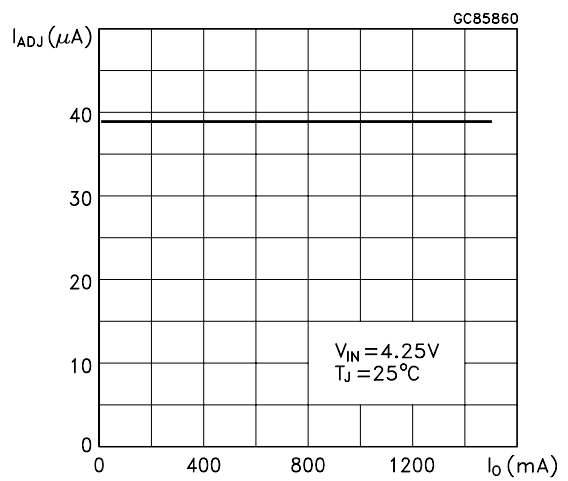
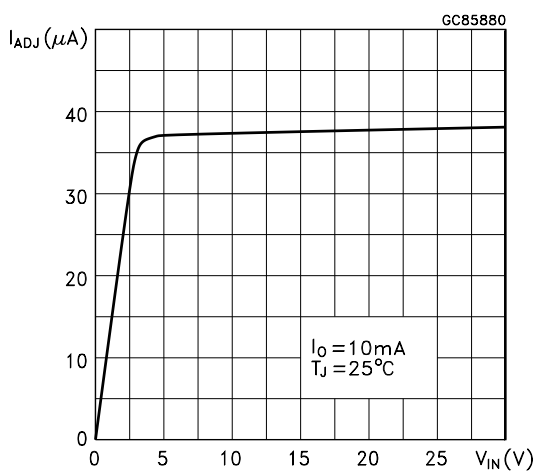
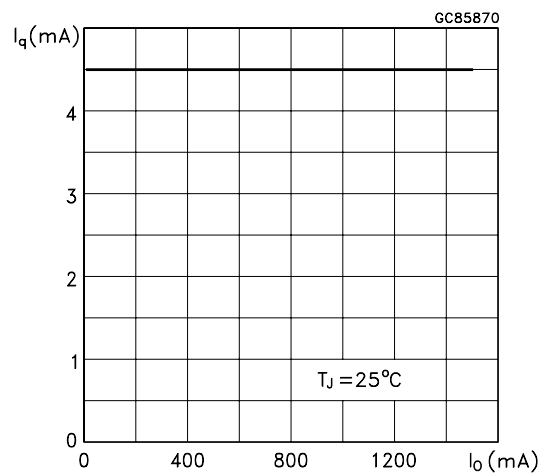


**Figure 5 : Line Regulation vs Temperature**

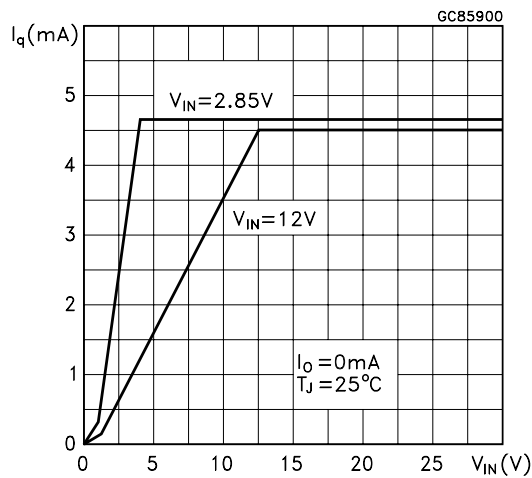


**Figure 6 : Load Regulation vs Temperature**

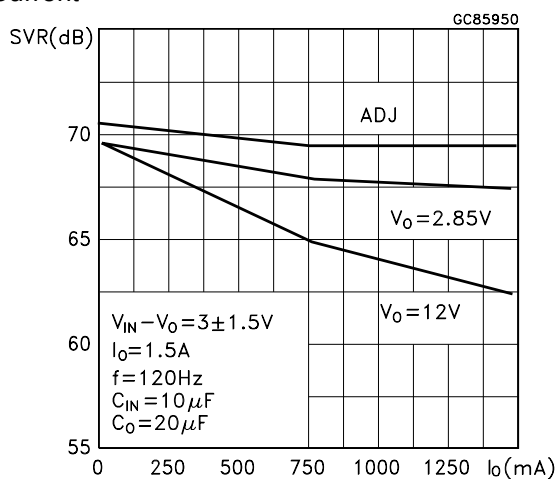


**Figure 7 : Dropout Voltage vs Temperature****Figure 10 : Adjust Pin Current vs Temperature****Figure 8 : Dropout Voltage vs Output Current****Figure 11 : Adjust Pin Current vs Output Current****Figure 9 : Adjust Pin Current vs Input Voltage****Figure 12 : Quiescent Current vs Output Current**

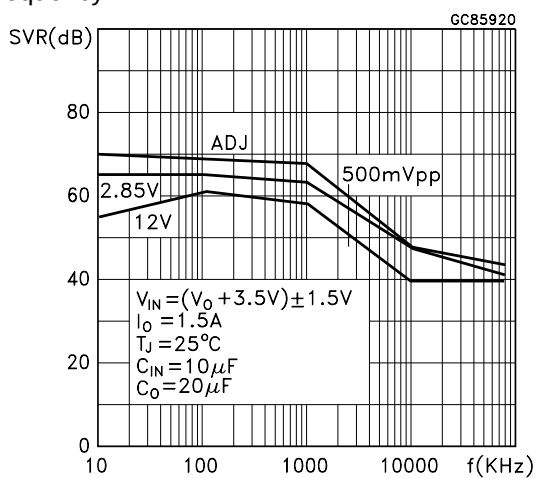
**Figure 13 : Quiescent Current vs Input Voltage**



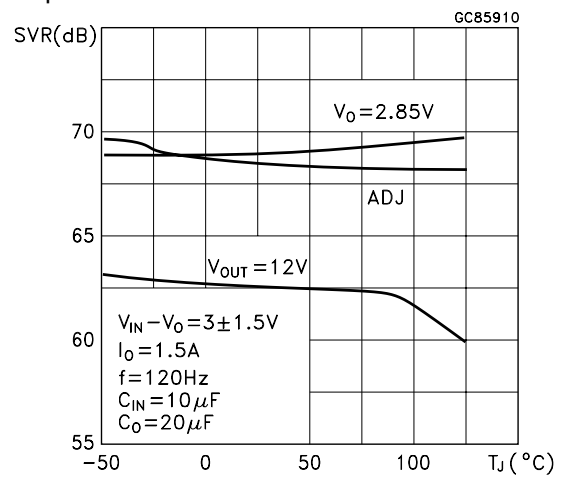
**Figure 14 : Supply Voltage Rejection vs Output Current**



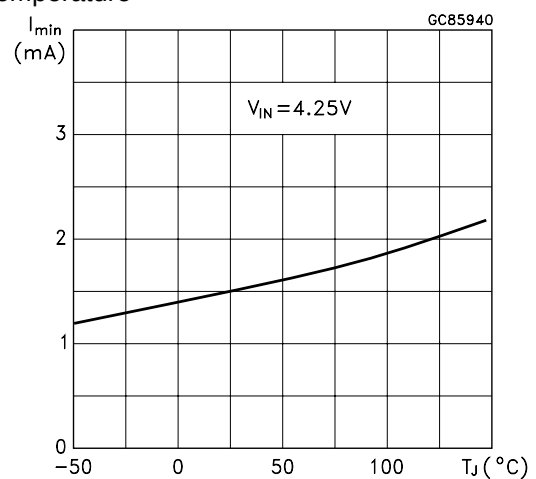
**Figure 15 : Supply Voltage Rejection vs Frequency**



**Figure 16 : Supply Voltage Rejection vs Temperature**



**Figure 17 : Minimum Load Current vs Temperature**



**Figure 18 : Stability for Adjustable**

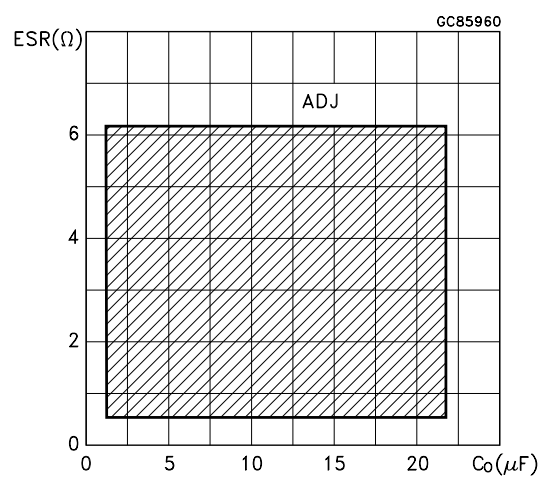


Figure 19 : Stability for 2.85V

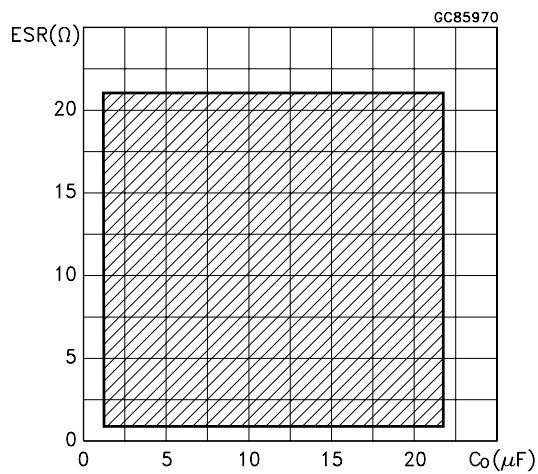


Figure 20 : Stability for 12V

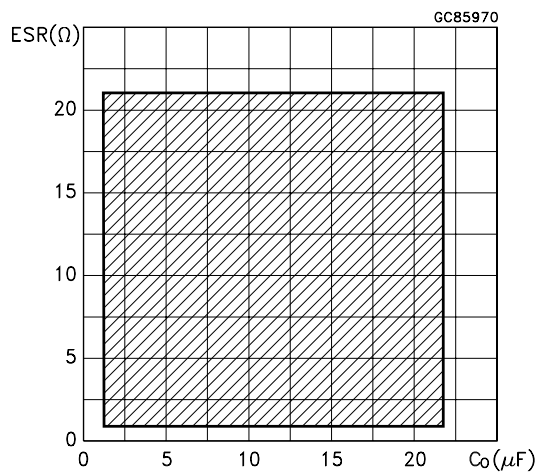


Figure 21 : Line Transient

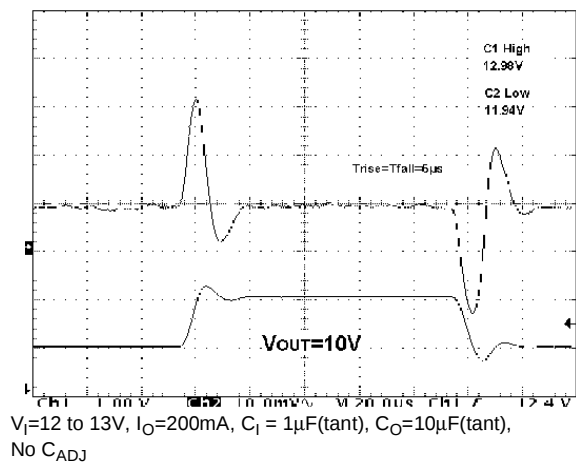


Figure 22 : Line Transient

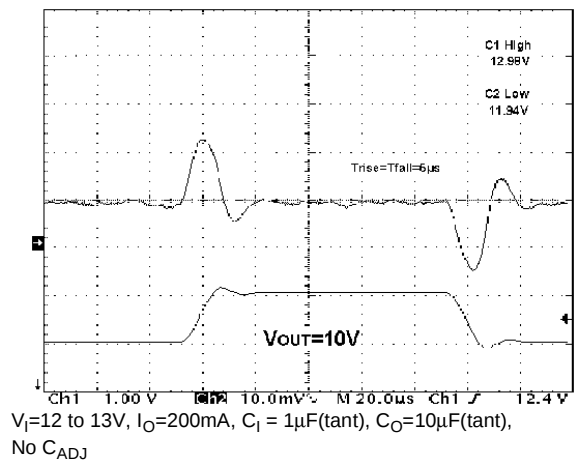


Figure 23 : Line Transient

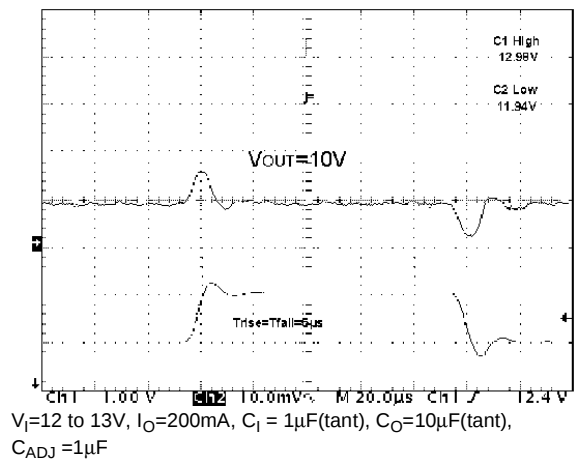


Figure 24 : Load Transient

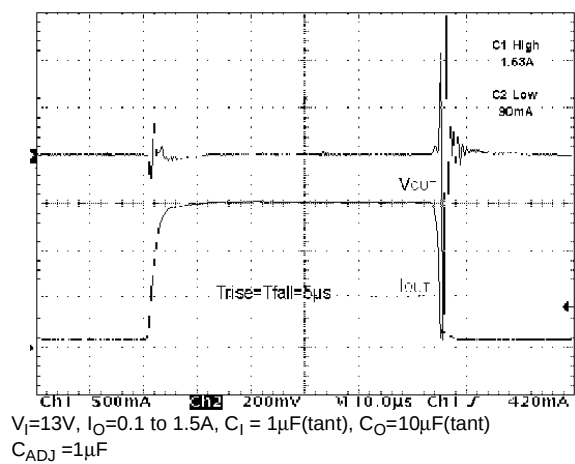


Figure 25 : Load Transient

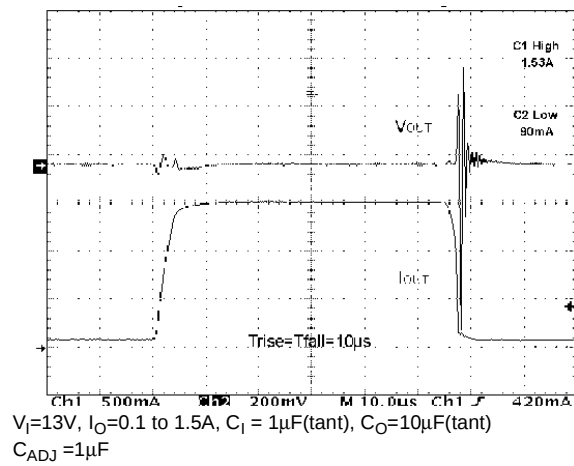
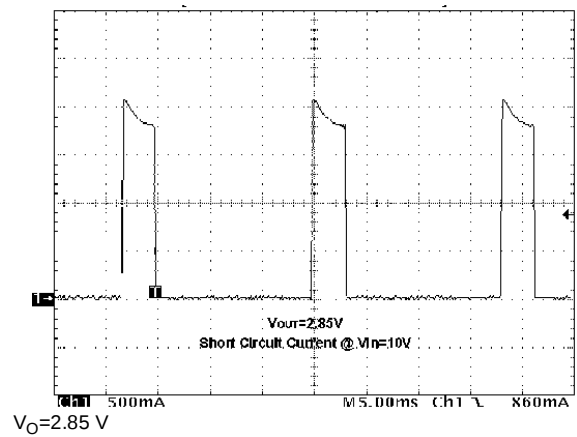
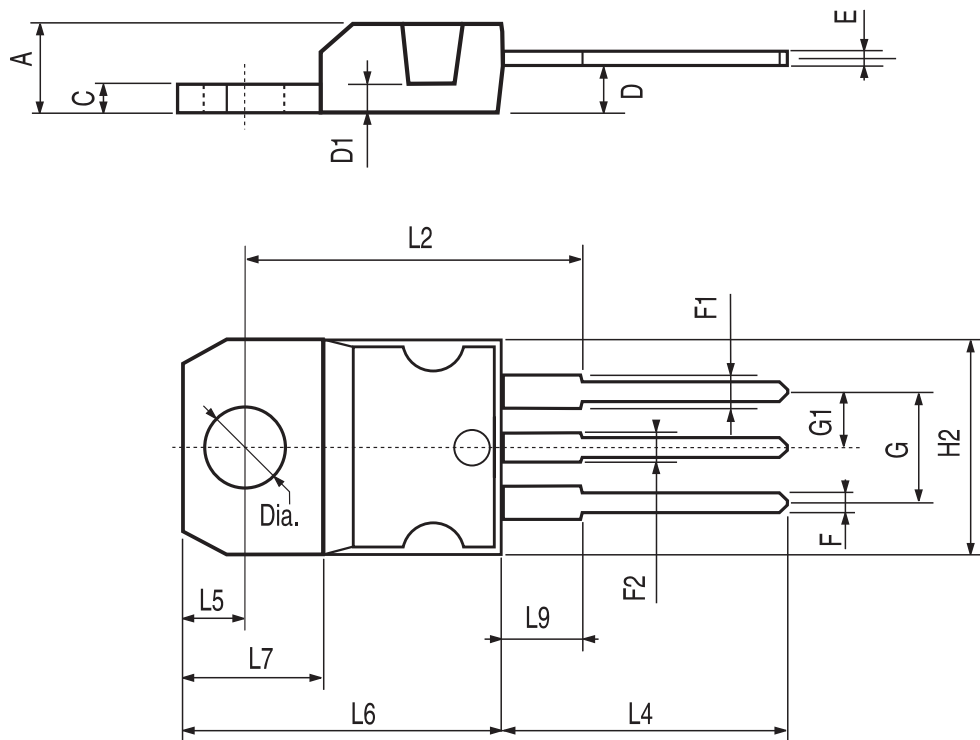


Figure 26 : Thermal Protection



## TO-220 MECHANICAL DATA

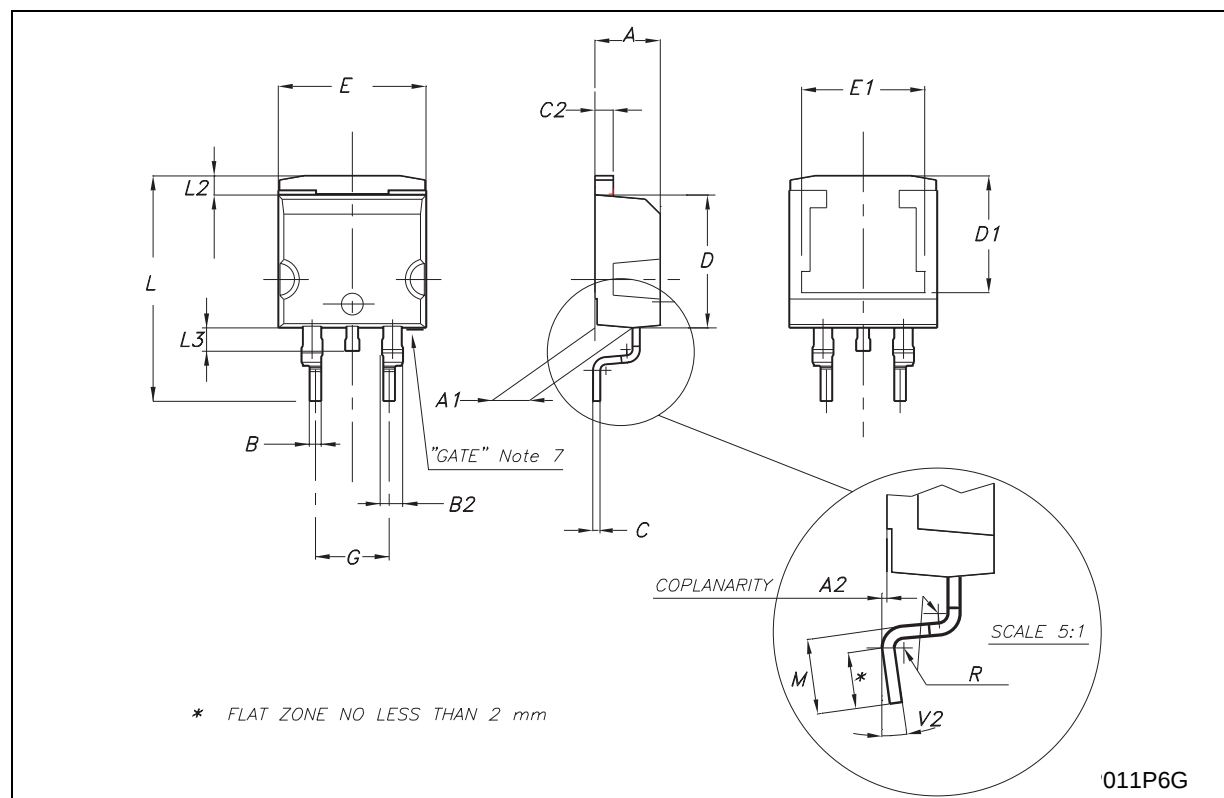
| DIM. | mm.   |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



P011C

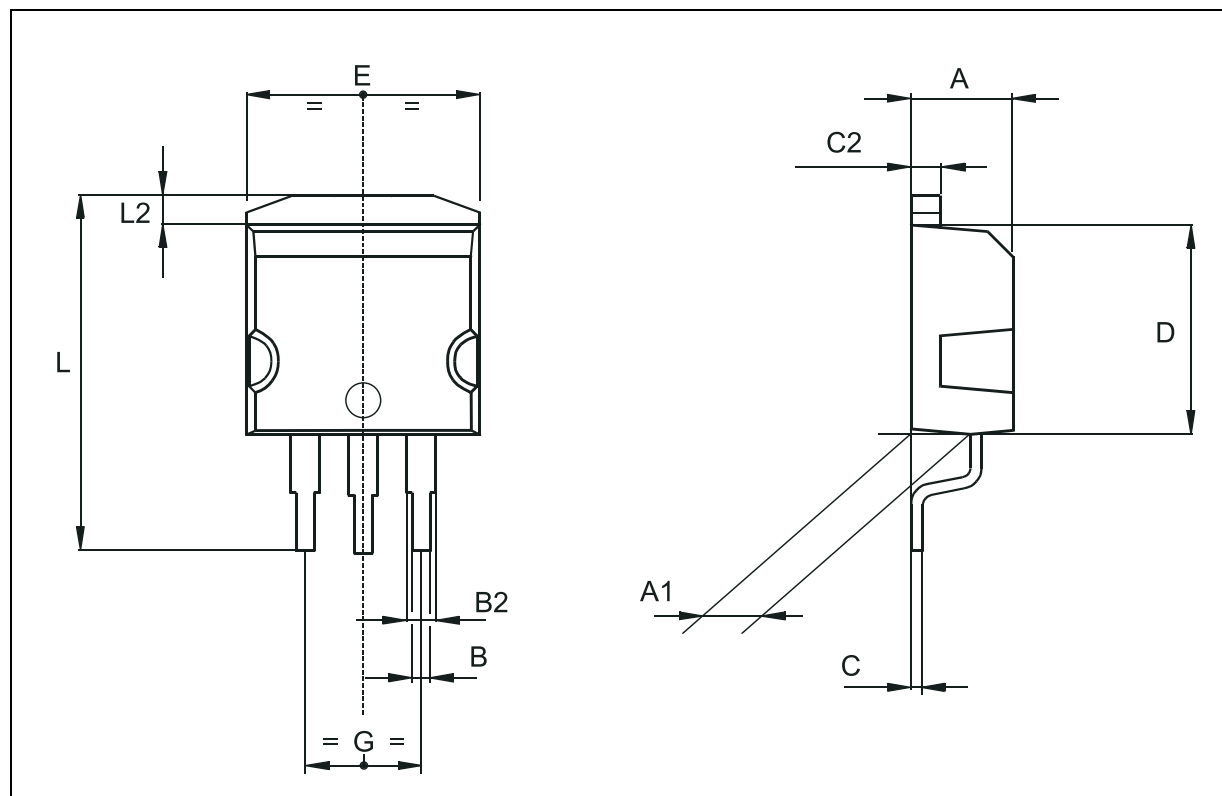
D<sup>2</sup>PAK MECHANICAL DATA

| DIM. | mm.  |     |       | inch  |       |       |
|------|------|-----|-------|-------|-------|-------|
|      | MIN. | TYP | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |     | 4.6   | 0.173 |       | 0.181 |
| A1   | 2.49 |     | 2.69  | 0.098 |       | 0.106 |
| A2   | 0.03 |     | 0.23  | 0.001 |       | 0.009 |
| B    | 0.7  |     | 0.93  | 0.027 |       | 0.036 |
| B2   | 1.14 |     | 1.7   | 0.044 |       | 0.067 |
| C    | 0.45 |     | 0.6   | 0.017 |       | 0.023 |
| C2   | 1.23 |     | 1.36  | 0.048 |       | 0.053 |
| D    | 8.95 |     | 9.35  | 0.352 |       | 0.368 |
| D1   |      | 8   |       |       | 0.315 |       |
| E    | 10   |     | 10.4  | 0.393 |       | 0.409 |
| E1   |      | 8.5 |       |       | 0.335 |       |
| G    | 4.88 |     | 5.28  | 0.192 |       | 0.208 |
| L    | 15   |     | 15.85 | 0.590 |       | 0.624 |
| L2   | 1.27 |     | 1.4   | 0.050 |       | 0.055 |
| L3   | 1.4  |     | 1.75  | 0.055 |       | 0.068 |
| M    | 2.4  |     | 3.2   | 0.094 |       | 0.126 |
| R    |      | 0.4 |       |       | 0.016 |       |
| V2   | 0°   |     | 8°    | 0°    |       | 8°    |



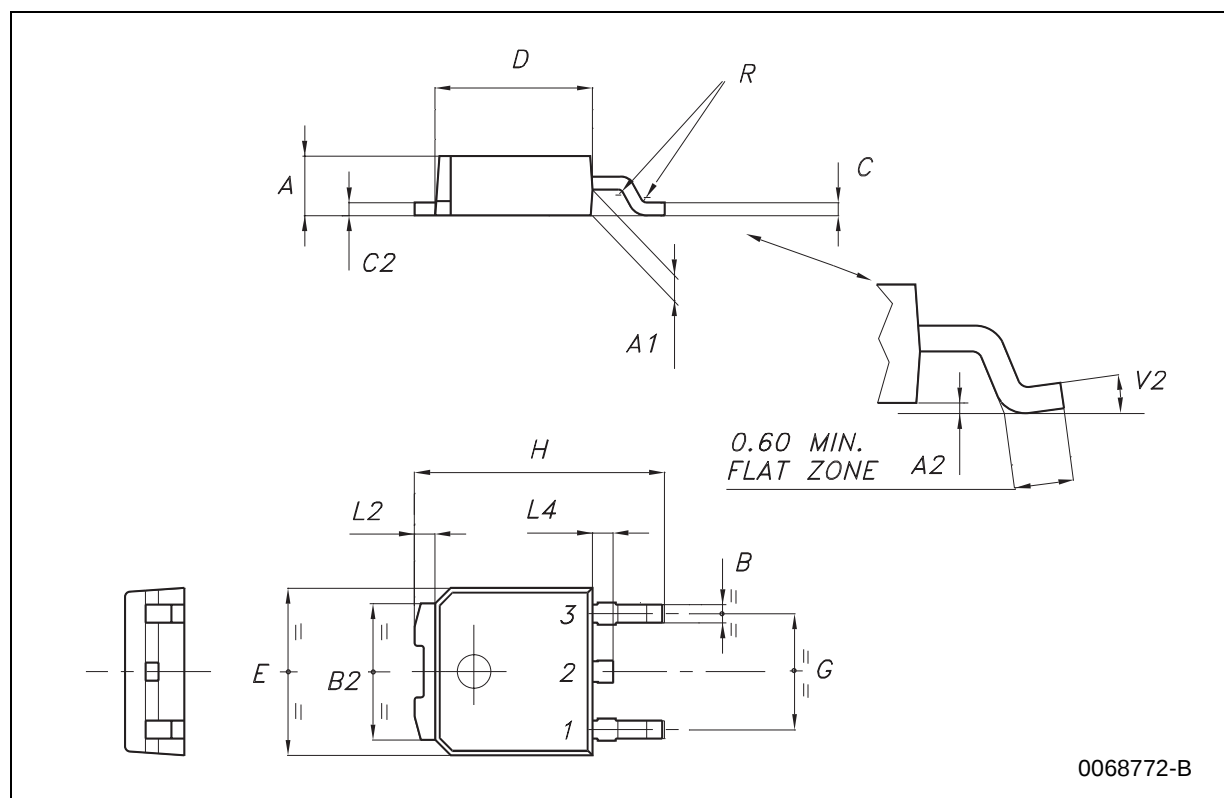
D<sup>2</sup>PAK/A MECHANICAL DATA

| DIM. | mm.  |     |       | inch  |      |       |
|------|------|-----|-------|-------|------|-------|
|      | MIN. | TYP | MAX.  | MIN.  | TYP. | MAX.  |
| A    | 4.40 |     | 4.60  | 0.173 |      | 0.181 |
| A1   | 2.49 |     | 2.69  | 0.098 |      | 0.106 |
| B    | 0.7  |     | 0.93  | 0.027 |      | 0.036 |
| B2   | 1.14 |     | 1.7   | 0.044 |      | 0.067 |
| C    | 0.45 |     | 0.60  | 0.017 |      | 0.023 |
| C2   | 1.21 |     | 1.36  | 0.047 |      | 0.053 |
| D    | 8.95 |     | 9.35  | 0.352 |      | 0.368 |
| E    | 10   |     | 10.4  | 0.393 |      | 0.409 |
| G    | 4.88 |     | 5.28  | 0.192 |      | 0.208 |
| L    | 15   |     | 15.85 | 0.590 |      | 0.106 |
| L2   | 1.27 |     | 1.4   | 0.050 |      | 0.055 |



## DPAK MECHANICAL DATA

| DIM. | mm.  |     |      | inch  |       |       |
|------|------|-----|------|-------|-------|-------|
|      | MIN. | TYP | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 2.2  |     | 2.4  | 0.086 |       | 0.094 |
| A1   | 0.9  |     | 1.1  | 0.035 |       | 0.043 |
| A2   | 0.03 |     | 0.23 | 0.001 |       | 0.009 |
| B    | 0.64 |     | 0.9  | 0.025 |       | 0.035 |
| B2   | 5.2  |     | 5.4  | 0.204 |       | 0.212 |
| C    | 0.45 |     | 0.6  | 0.017 |       | 0.023 |
| C2   | 0.48 |     | 0.6  | 0.019 |       | 0.023 |
| D    | 6    |     | 6.2  | 0.236 |       | 0.244 |
| E    | 6.4  |     | 6.6  | 0.252 |       | 0.260 |
| G    | 4.4  |     | 4.6  | 0.173 |       | 0.181 |
| H    | 9.35 |     | 10.1 | 0.368 |       | 0.397 |
| L2   |      | 0.8 |      |       | 0.031 |       |
| L4   | 0.6  |     | 1    | 0.023 |       | 0.039 |



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