![ST logo]

# LNBP8
# LNBP9

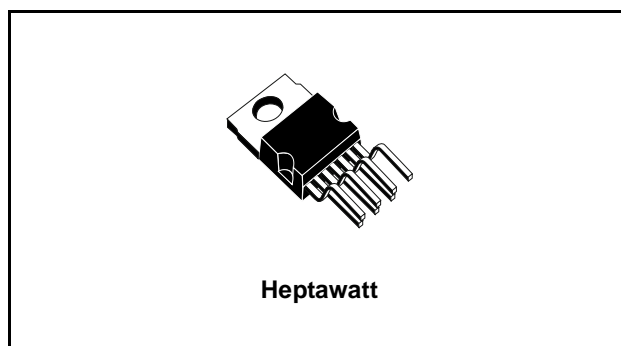## LNB SUPPLY AND CONTROL VOLTAGE REGULATOR

- SIMPLEST INTEGRATED SOLUTION FOR THE LNB REMOTE SUPPLY AND CONTROL
- 500mA GUARANTEED OUTPUT CURRENT
- DUAL INPUT SUPPLY FOR REDUCING POWER DISSIPATION
- 22KHZ BUILT-IN TONE OSCILLATOR (LNBP9 VERSION)
- FAST OSCILLATOR START-UP FOR DiSEqC$^{TM}$ ENCODING (LNBP9 VERSION)
- AUXILIARY MODULATION INPUT FOR MORE FLEXIBILITY (LNBP8 VERSION)
- STAND-BY FUNCTION
- SHORT CIRCUIT AND OVERTEMPERATURE PROTECTION
- AVAILABLE IN THRU-HOLE PACKAGE

**Heptawatt**

### DESCRIPTION

Intended for analog and digital satellite receivers, the LNBP is a monolithic linear voltage regulator, assembled in Heptawatt$^{TM}$, specifically designed to provide the powering voltages and the interfacing signals to the LNB down-converter.

The regulator output can be logic controlled to be 13V or 18V (typ.) by mean of the $V_{SEL}$ pin for the remote controlling of the LNB. In order to reduce the power dissipation of the device when the lowest output voltage is selected, the regulator has 2 supply inputs ($V_{CC1}$ and $V_{CC2}$). They must be powered respectively at 15V (min.) and 22V (min.), and an internal switch will automatically select the appropriate supply voltage according to the selected output voltage.

The TONE pin (only for the LNBP9 version) activates the internal oscillator so that the DC output is modulated by a 22KHz square wave. This internal oscillator is factory trimmed within a tolerance of +/- 2KHz, thus no further adjustment or external components are required.

A burst coding of the 22KHz tone can be accomplished thanks to the fast response of the TONE input and the prompt oscillator start-up. This helps designers which want to implement the DiSEqC$^{TM}$ protocols.

In order to improve design flexibility and to allow implementation of other LNB remote control standards, an analogic modulation input pin (EXTM) is available (LNBP8 version only). An appropriate DC blocking capacitor must be used to couple the modulating signal source to the EXTM pin.

Both versions integrate thermal and short circuit protection.

The device is packaged in Heptawatt for an easy thru-hole mounting. If an adequate Heatsink is provided and higher power losses are acceptable, both supply pins can be powered by the same 23V source without affecting any other circuit performance.

When the IC is powered and put in Stand-by (EN pin LOW), the regulator output is disabled and the IC power consumption is reduced to 300µA typ.

**Table 1: Order Codes**

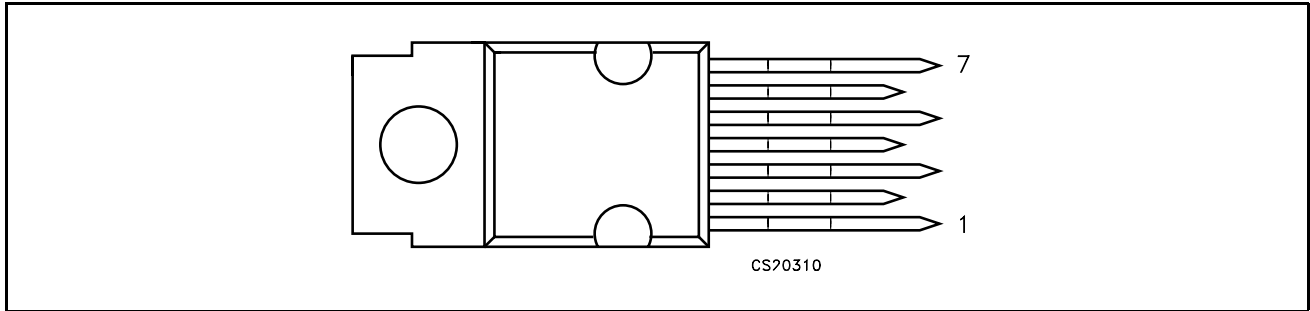| TYPE | HEPTAWATT |
|---|---|
| LNBP8 | LNBP8V7V |
| LNBP9 | LNBP9V7V |

**Figure 1: Pin Configuration** (top view)



CS20310

**Table 2: Pin Descriptions**

| PIN N° | NAME | FUNCTION |
|---|---|---|
| 1 | $V_{CC1}$ | Supply Input 1: 15V to 25V supply. It is automatically selected when $V_O$ = 13V |
| 2 | $V_{CC2}$ | Supply Input 2: 22V to 25V supply. It is automatically selected when $V_O$ = 18V |
| 3 | OUTPUT | Regulator output. It is 13V typ. when $V_{SEL}$ LOW and 18V typ. when $V_{SEL}$ HIGH |
| 4 | GND | GROUND |
| 5 | $V_{SEL}$ | Output Voltage Selection: Logic Control Input; if LOW $V_O$ = 13V, when HIGH $V_O$ = 18V |
| 6 | ENABLE | Logic Control Input; force LOW to put the IC in shutdown |
| 7 (LNBP9) | TONE | Logic Control Input; force HIGH to activate the internal 22KHz tone |
| 7 (LNBP8) | EXTM | External Modulation: Needs DC decoupling to the AC source. If not used can be left floating |

**Table 3: Absolute Maximum Ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC1}$, $V_{CC2}$ | Input Voltage | -0.3 to 28 | V |
| ENABLE, TONE, $V_{SEL}$ | Logic Input Voltage | -0.3 to 7 | V |
| OUTPUT | Output Voltage | 28 | V |
| $T_J$ | Operating Junction Temperature Range | -40 to 125 | °C |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | °C |

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

**Table 4: Thermal Data**

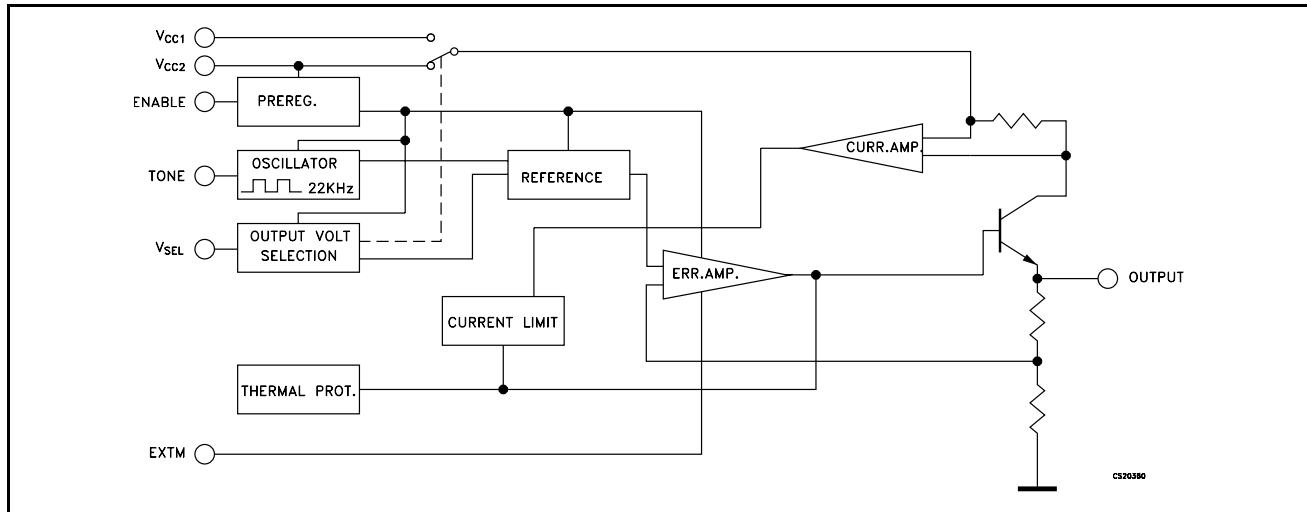| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{THJ-C}$ | Thermal Resistance Junction-case | 2 | °C/W |

**Figure 2: Block Diagram**



**Table 5: Electrical Characteristics** ($V_{CC1}$ = 16V, $V_{CC2}$ = 22V, $C_{I1}$ = $C_{I2}$ = 0.22µF, $C_O$ =0.1µF, ENABLE = H, TONE = L (LNBP9), EXTM floating (LNBP8), $I_O$ = 50mA, $T_J$ = 0 to 85°C unless otherwise specified.)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{CC1}$ | $V_{CC}$ Supply Input 1 | $I_O$ = 500 mA, TONE = H, $V_{SEL}$ = L | 15 | | 25 | V |
| $V_{CC2}$ | $V_{CC}$ Supply Input 2 | $I_O$ = 500 mA, TONE = H, $V_{SEL}$ = H | 22 | | 25 | V |
| $V_O$ | Output Voltage | $I_O$ = 500 mA, $V_{SEL}$ = L | 12.5 | 13 | 13.5 | V |
| | | $I_O$ = 500 mA, $V_{SEL}$ = H | 17.3 | 18 | 18.7 | V |
| $\Delta V_O$ | Line Regulation | $V_{CC1}$ = 15 to 18V, $V_{SEL}$ = L | | 4 | 40 | mV |
| | | $V_{CC2}$ = 22 to 25V, $V_{SEL}$ = H | | 4 | 40 | |
| $\Delta V_O$ | Load Regulation | $V_{CC1}$ = $V_{CC2}$ = 22V, $I_O$ = 50 to 500mA $V_{SEL}$ = L or H | | 80 | 180 | mV |
| $I_{MAX}$ | Output Current Limiting | | 500 | | 800 | mA |
| $f_{TONE}$ | Tone Frequency | LNBP9 version, TONE = H | 20 | 22 | 24 | KHz |
| $A_{TONE}$ | Tone Amplitude | LNBP9 version, TONE = H | 0.55 | 0.72 | 0.9 | V |
| $D_{TONE}$ | Tone Duty Cycle | LNBP9 version, TONE = H | 40 | 50 | 60 | % |
| $t_r, t_f$ | Tone Rise and Fall Time | LNBP9 version, TONE = H | 5 | 10 | 15 | µs |
| $G_{EXTM}$ | External Modulation Gain | LNBP8 version, $\Delta V_O/\Delta V_{EXTM}$, f = 10Hz to 40KHz | | 5 | | |
| $V_{EXTM}$ | External Modulation Input Voltage | LNBP8 version, AC Coupling | | | 400 | mV |
| $Z_{EXTM}$ | External Modulation Impedance | LNBP8 version, f = 10Hz to 40KHz | | 400 | | Ω |
| $V_{IL}$ | Control Input Logic LOW | ENABLE, TONE (LNBP9 version), $V_{SEL}$ | | | 0.8 | V |
| $V_{IH}$ | Control Input Logic HIGH | ENABLE, TONE (LNBP9 version), $V_{SEL}$ | 2.5 | | | V |
| $I_{IH}$ | Control Pins Input Current | $V_{IH}$ = 5V, ENABLE, TONE (LNBP9 version), $V_{SEL}$ | | 20 | | µA |
| $I_{CC}$ | Supply Current | Output Disabled (ENABLE = L) | | 0.3 | 1 | mA |
| | | Output Enabled (ENABLE = H), TONE = H $I_O$ = 500mA | | 3 | 6 | mA |
| $T_{SHDN}$ | Temperature Shutdown | | | 150 | | °C |

## TYPICAL APPLICATION CIRCUITS

### Figure 3: LNBP9 with 22KHz Tone Control Pin
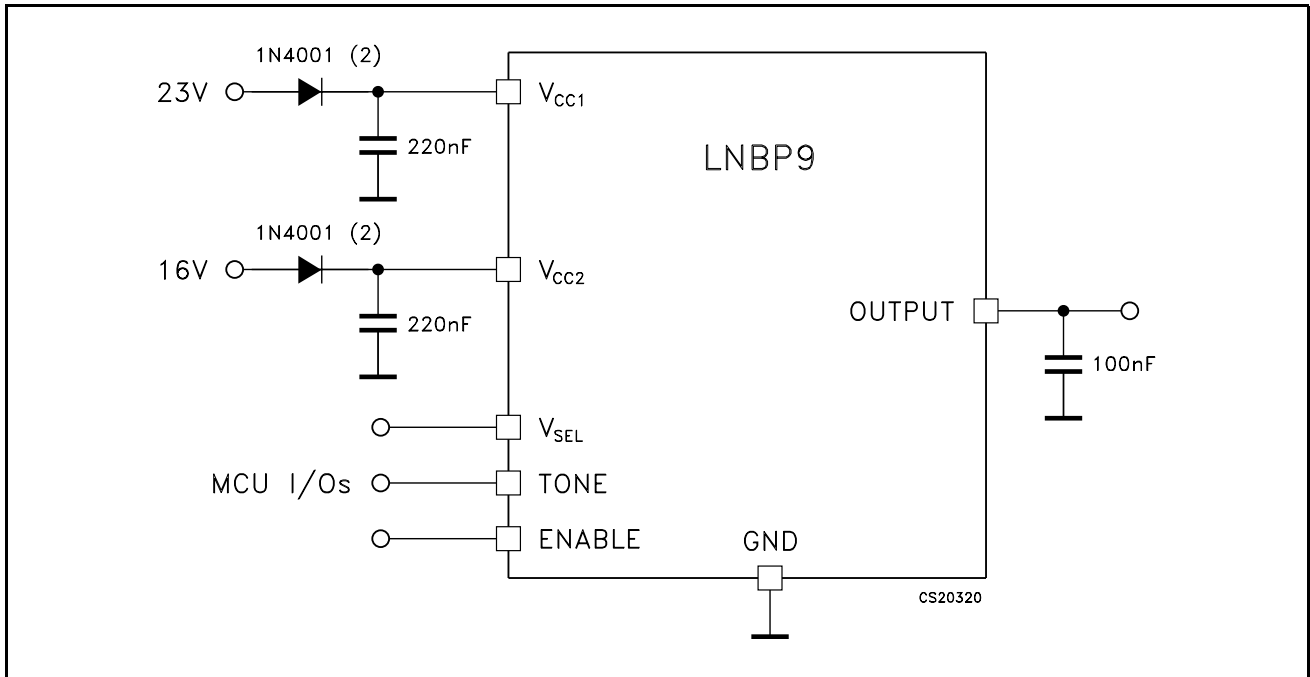


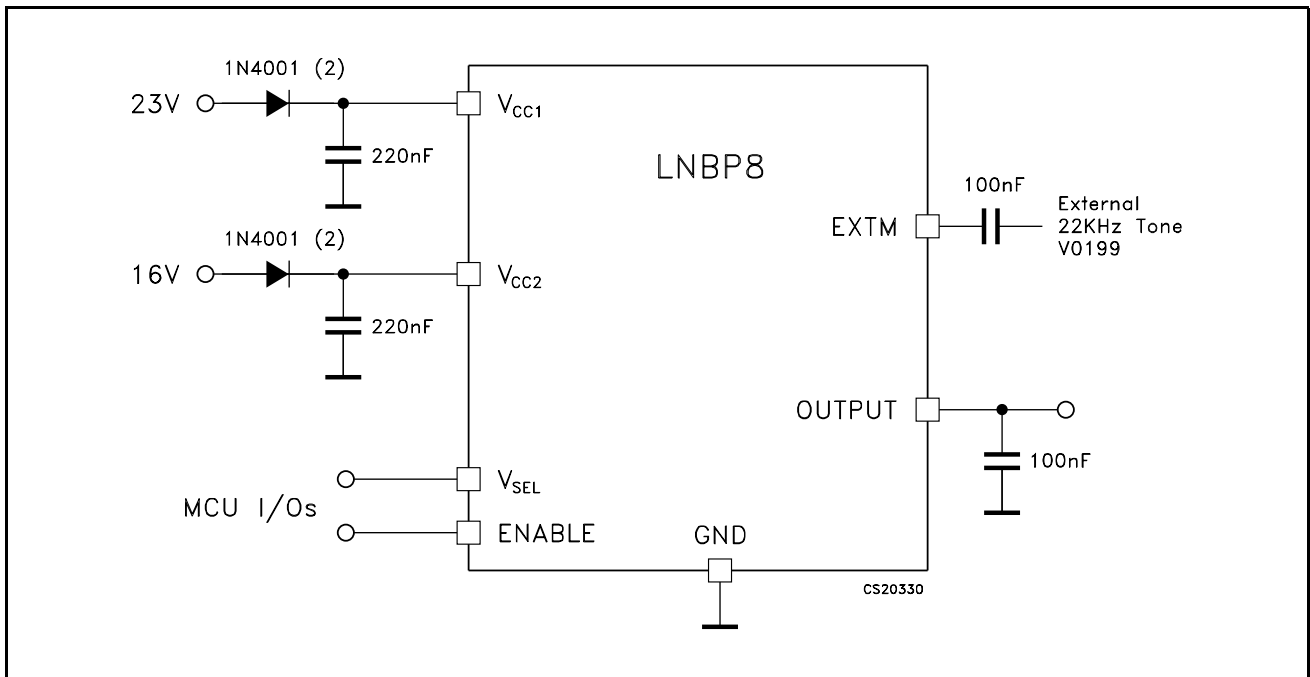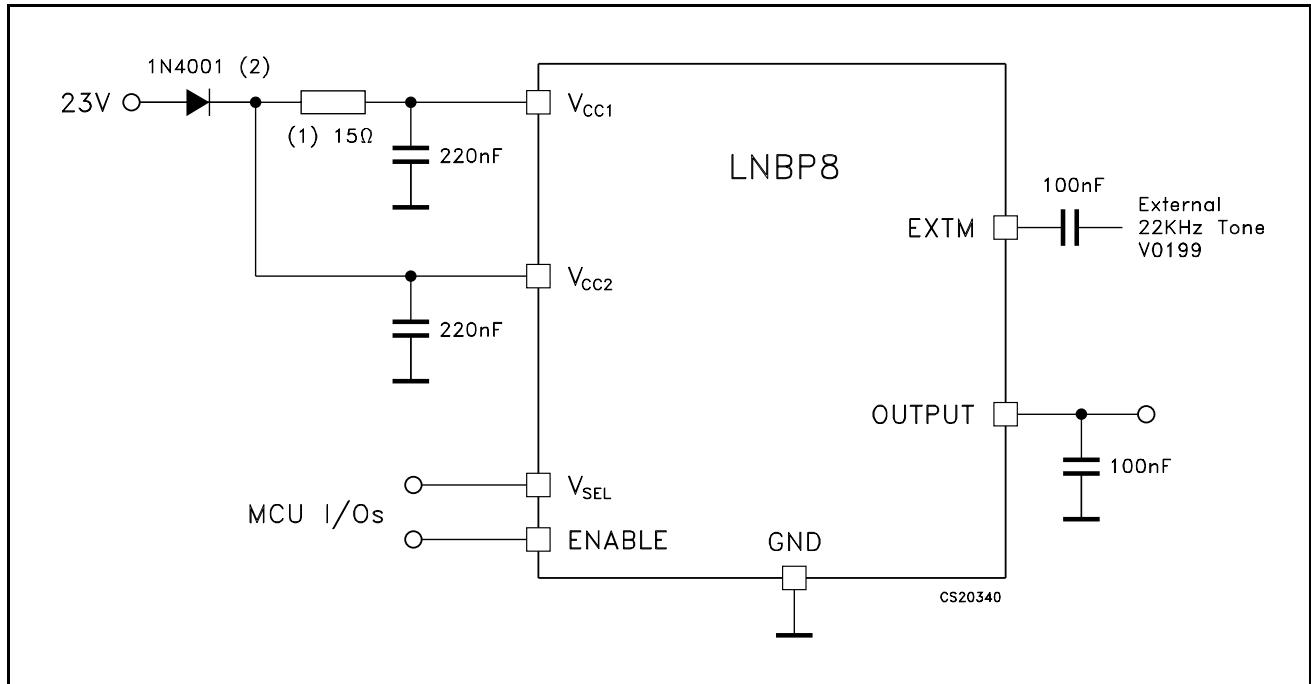### Figure 4: LNBP8 with external 22KHz Input Pin (EXTM)

**Figure 5: Single Supply Solution**



(1) In a single supply configuration the presence of the input resistor in the 12-15Ω range is suggested only to reduce the device power dissipation during the 13V output condition. The resistor can be omitted in spite of power dissipation increase.
(2) The input diodes are mandatory to protect the device from any reverse current.

# HEPTAWATT (VERTICAL) 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 |
| G | 2.34 | 2.54 | 2.74 | 0.092 | 0.100 | 0.108 |
| G1 | 4.88 | 5.08 | 5.28 | 0.192 | 0.200 | 0.208 |
| G2 | 7.42 | 7.62 | 7.82 | 0.292 | 0.300 | 0.308 |
| H2 | | | 10.4 | | | 0.409 |
| H3 | 10.05 | | 10.4 | 0.396 | | 0.409 |
| L | 16.70 | 16.90 | 17.10 | 0.657 | 0.665 | 0.673 |
| L1 | | 14.92 | | | 0.587 | |
| L2 | 21.24 | 21.54 | 21.84 | 0.836 | 0.848 | 0.860 |
| L3 | 22.27 | 22.52 | 22.77 | 0.877 | 0.887 | 0.896 |
| L4 | | | 1.29 | | | 0.051 |
| L5 | 2.6 | 2.8 | 3 | 0.102 | 0.110 | 0.118 |
| L6 | 15.1 | 15.5 | 15.8 | 0.594 | 0.610 | 0.622 |
| L7 | 6 | 6.35 | 6.6 | 0.236 | 0.250 | 0.260 |
| M | 2.55 | 2.8 | 3.05 | 0.100 | 0.110 | 0.120 |
| M1 | 4.83 | 5.08 | 5.33 | 0.190 | 0.200 | 0.210 |
| Dia1 | 3.65 | | 3.85 | 0.144 | | 0.152 |



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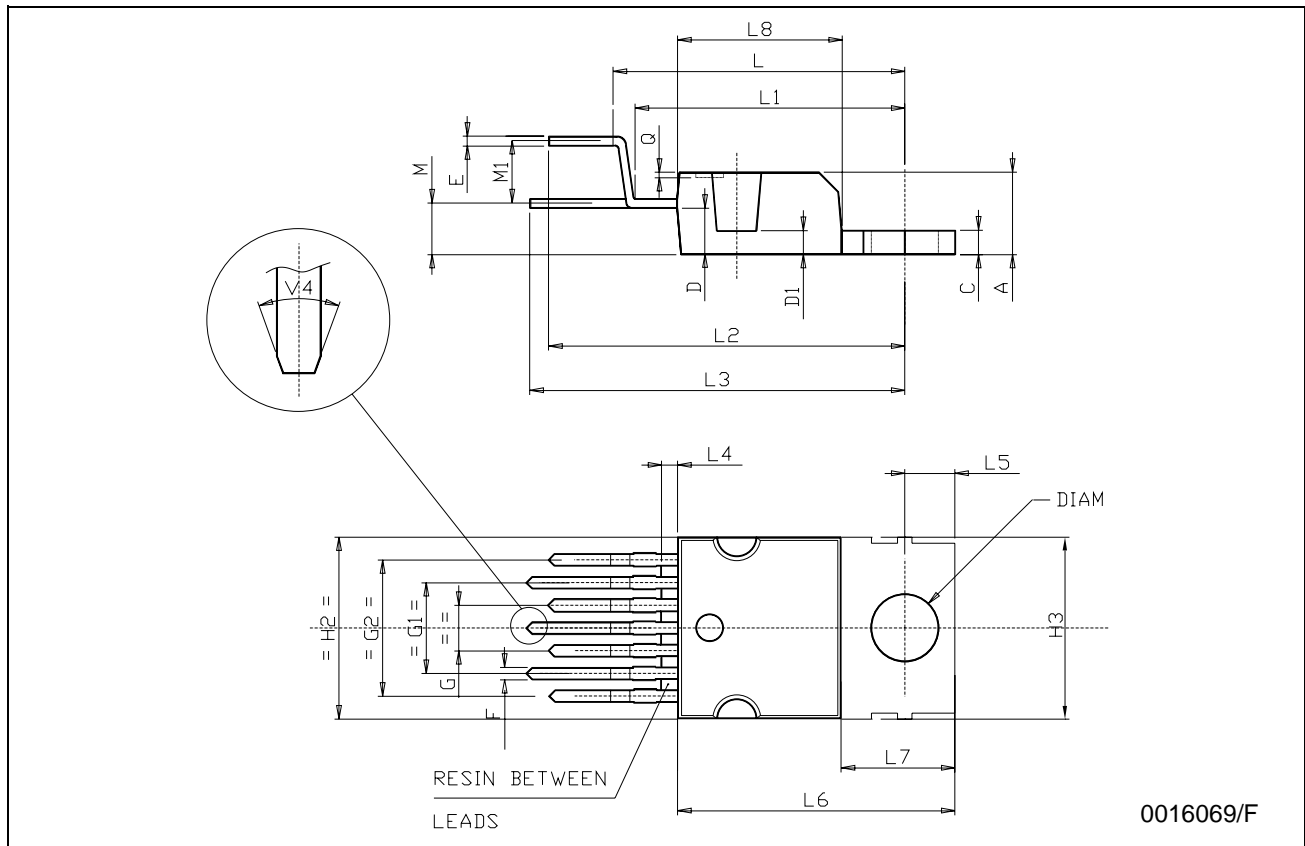
**Table 6: Revision History**

| Date | Revision | Description of Changes |
|------|----------|------------------------|
| 09-Nov-2004 | 1 | First Release. |

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