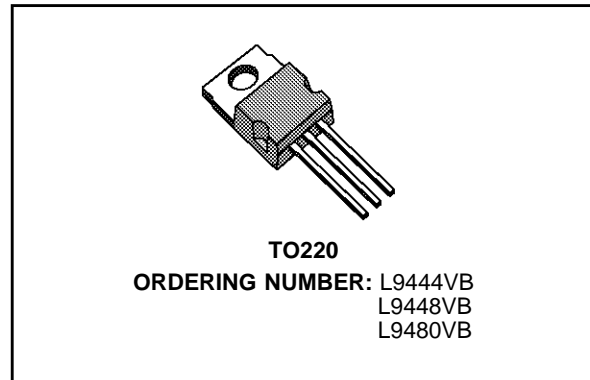


ONE CHIP CAR ALTERNATOR REGULATOR

ADVANCE DATA

- NO EXTERNAL COMPONENTS
- PRECISE TEMPERATURE COEFFICIENT
- PRECISE REGULATED VOLTAGE
- HIGH OUTPUT CURRENT
- SHORT CIRCUIT PROTECTED
- REVERSE BATTERY PROTECTION
- + 80 V LOAD DUMP PROTECTION
- LOW ENERGY SPIKE PROTECTION
- THERMAL SHUTDOWN
- VERY LOW START UP VOLTAGE

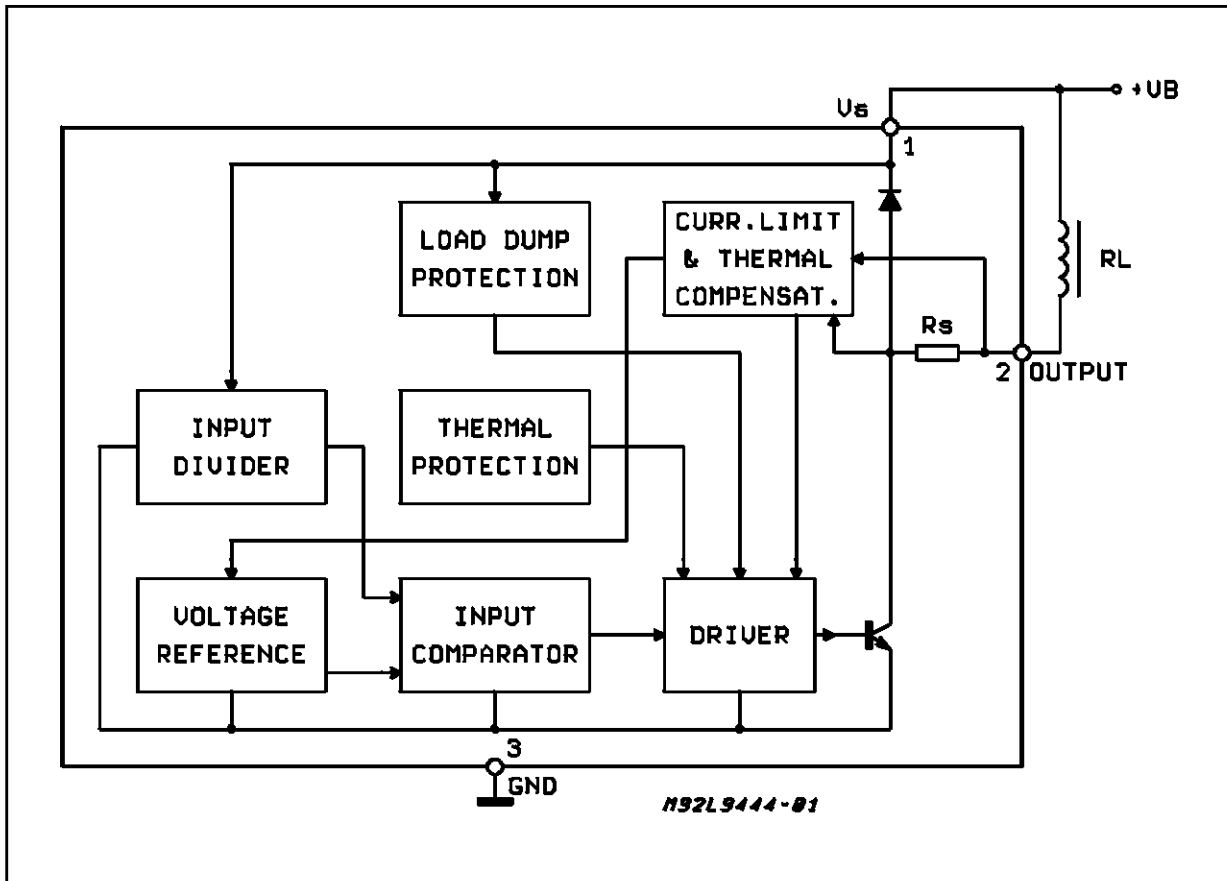


DESCRIPTION

The devices are a "single function" self-oscillating voltage regulator for car alternators. Integrating both the control section and the output power

stage on a single chip, the devices require no external components, reducing significantly the cost of the system and increasing reliability.

BLOCK DIAGRAM



L9444VB - L9448VB - L9480VB

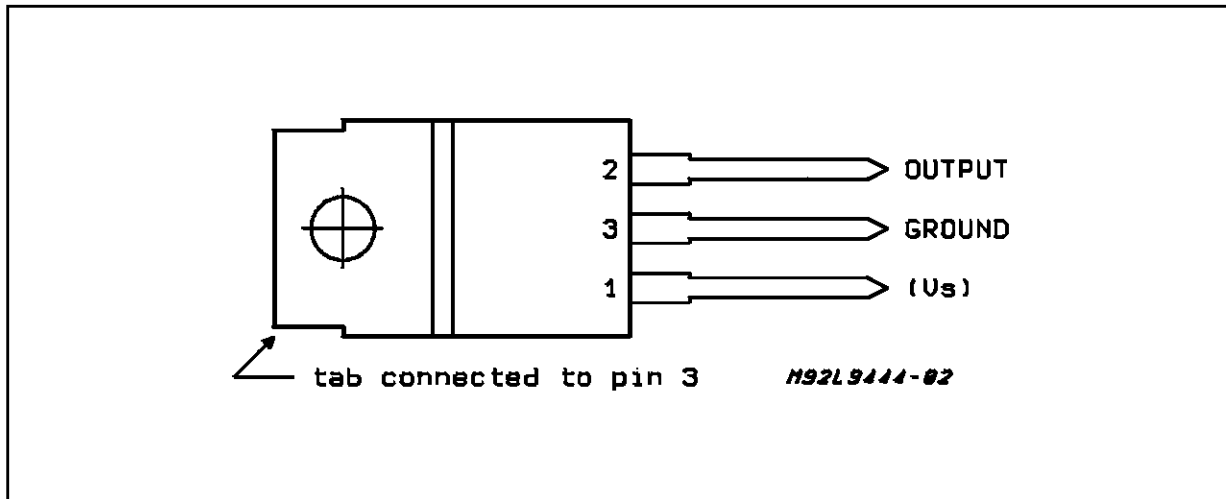
ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|--------------------------|---|---------------|------|
| V_S | Transient Overvoltage : Load Dump : $5\text{ms} \leq T_{\text{rise}} \leq 10\text{ms}$, τ_f Fall Time Constant $\leq 100\text{ms}$, $R_{\text{source}} \geq 0.5\Omega$ | 80 | V |
| I_{clamp} | Current into Low Energy Clamping Zener ($T_{\text{rise}} = 5\mu\text{s}$; $T_{\text{decay}} \leq 2\text{ms}$; duty cycle $\leq 5\%$) | 100 | mA |
| I_{out} | Maximum Output Current | 5.5 | A |
| T_j , T_{stg} | Junction and Storage Temperature Range | - 55 to + 150 | °C |

THERMAL DATA

| Symbol | Parameter | Value | Unit |
|------------------------|--|-------|------|
| $R_{\text{th i-case}}$ | Thermal Resistance Junction-case Max. | 3 | °C/W |

PIN CONNECTION (top view)



DEVICE OPERATION

The alternator voltage, rectified by the auxiliary diode trio, is compared with an external reference and the resulting signal switches the output stage, driving the alternator field coil.

As the regulator is a self-oscillating type, the switching frequency depends on the whole system parameter set (including the alternator characteristics).

The regulator has an integrated filter in the voltage sensing path. Consequently it doesn't need - in the standard application- any external component.

Anyway an external capacitor (0.1 - 1 μ F) must be inserted between V_S and Ground guaranteeing the correct behaviour of the device when the rectifying diodes feature very high switching spikes that are not filtered by the devices.

This external capacitor must also be used when the impedances of the cables connecting the al-

ternator to the battery are so high to cause a superimposed ripple on the alternator voltage higher than 3-4V.

The devices regulation voltage and the temperature coefficient may be independently set by suited metal mask selections ; furthermore the regulation voltage is trimmed within $\pm 1\%$ of the nominal value @ 25°C.

The devices have an unique -and patented- system to compensate the self-heating of the die due to the power dissipated in the output stage. In this way the internal reference voltage tracks the case temperature rather than the die one.

The device can withstand the reverse battery and the load dump (up to 80V) ; They can absorb, into the internal clamping zeners, low energy spikes up to a level of 100mA and its output is short circuit protected.

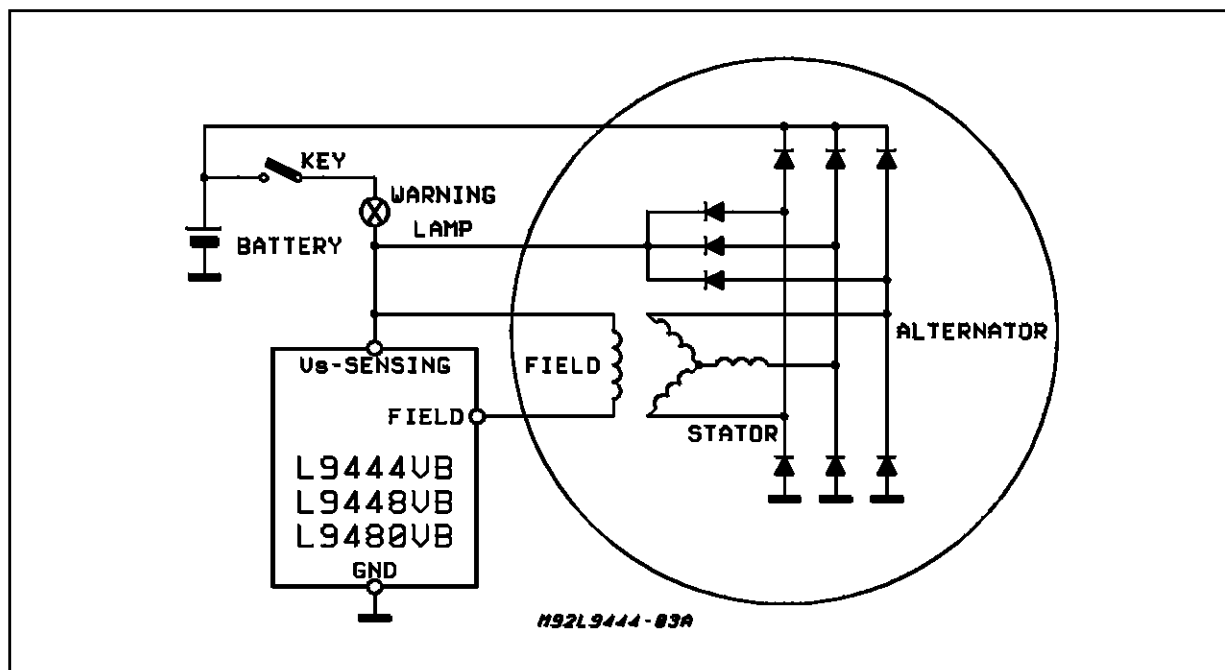
Finally the internal thermal shutdown avoids any possible device damage due to overtemperature problems.

ELECTRICAL CHARACTERISTICS (– 40 °C ≤ T_j ≤ 125 °C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|--|--|-------|--------------------|-------|-------------------------|
| V _r | Regulation Voltage | T _j = –40°C for L9444VB for L9448VB for L9480VB | 14.49 | 14.79 | 15.05 | V |
| | | | 14.36 | 14.66 | 14.96 | V |
| | | | 14.75 | 15.05 | 15.35 | V |
| | | T _j = 25°C | 14.10 | 14.40 | 14.70 | V |
| | | T _j = 125°C for L9444VB for L9448VB for L9480VB | 13.50 | 13.80 | 14.10 | V |
| | | | 13.70 | 14.00 | 14.30 | V |
| | | | 13.10 | 13.40 | 13.70 | V |
| C _T | Temperature Coeff. of the Regulation Voltage | for L9444VB for L9448VB for L9480VB | | - 6 - 4 - 10 | | mV/°C mV/°C mV/°C |
| eC _T | Error on Nominal Temperature Coeff. | | | ± 30 | | % |
| V _r | Load Regulation | 0.1 I _n < I _{alt} < 0.9 I _n (note 1) | | 250 | | mV |
| V _{su} | Control Circuit Minimum Start up Voltage | Measured at Supply Pin | | 2 | 3 | V |
| V _{sd} | Shutdown Voltage (dump protection threshold) | | | 22 | | V |
| V _{sat 1} | Output Saturation Voltage | I _{field} = 4 A _p | | 1.2 | 2 | V |
| V _{sat 2} | Start Up Saturation Voltage | I _{field} = 200 mA | | 0.7 | 1 | V |
| I _q | Quiescent Current | Field Off | | 20 | | mA |
| I _s | Supply Current | I _{field} = 4 A _p | | 50 | | mA |
| I _{fs} | Field Pin Sink Current | Field Off Field Pin @ 16 V | | | 5 | mA |
| V _{1 CLAMP} | Low Energy Clamping Zener Voltage | I _{clamp} = 50 mA | | 120 | | V |
| f _{sw} | Switching Frequency | 0.1 I _n < I _{alt} < 0.9 I _n | 30 | | 1000 | Hz |

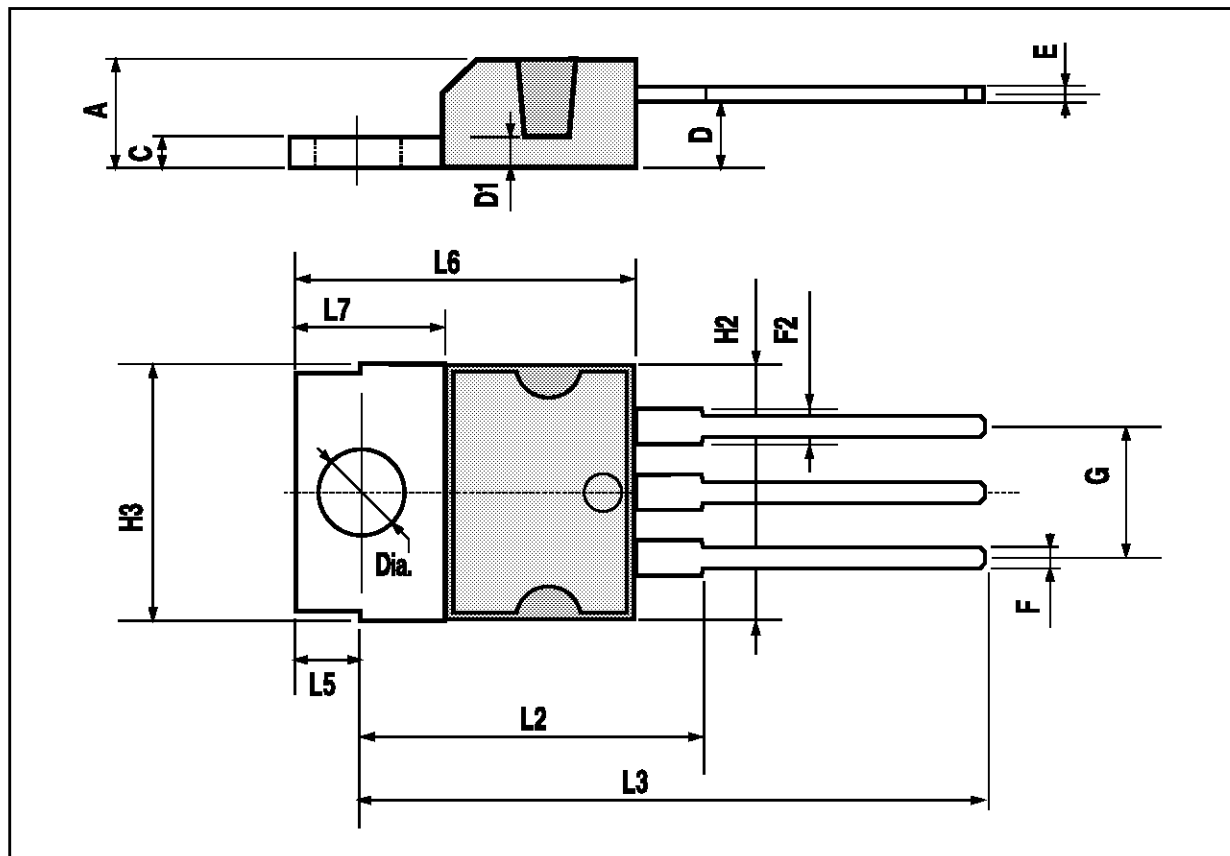
Note1: measured on an alternator with the following characteristics: I_n = <90A; I_{alt}/I_{field} >= 23

APPLICATION CIRCUIT



TO220 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 | 0.8 | | 1.05 | 0.031 | | 0.041 |
| F2 | 1.15 | | 1.4 | 0.045 | | 0.055 |
| G | 4.95 | 5.08 | 5.21 | 0.195 | 0.200 | 0.205 |
| H2 | | | 10.4 | | | 0.409 |
| H3 | 10.05 | | 10.4 | 0.396 | | 0.409 |
| L2 | | 16.2 | | | 0.638 | |
| L3 | 26.3 | 26.7 | 27.1 | 1.035 | 1.051 | 1.067 |
| 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 |
| Dia | 3.65 | | 3.85 | 0.144 | | 0.152 |



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