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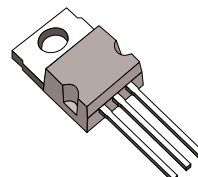
L9444VB/L9448VB
L9480VB

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

TO220
ORDERING NUMBER: L9444VB
L9448VB
L9480VB

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

M92L9444-01
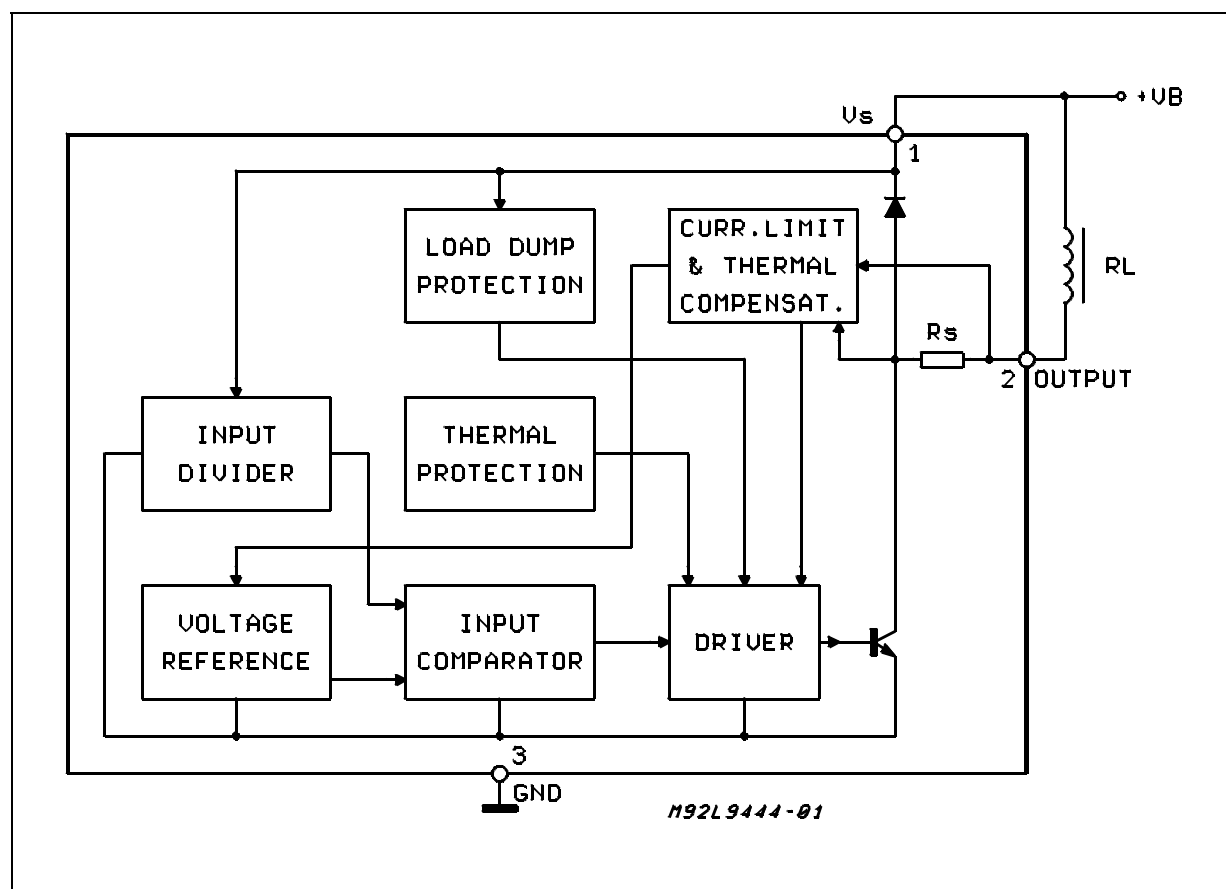
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	Transient Overvoltage : Load Dump : 5ms $\leq T_{rise} \leq$ 10ms, τ_f Fall Time Constant $\leq$ 100ms, $R_{source} \geq 0.5\Omega$	80	V
I_{clamp}	Current into Low Energy Clamping Zener (T_{rise} = 5µs ; $T_{decay} \leq$ 2ms ; 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
$R_{th\ i\text{-}case}$	Thermal Resistance Junction-case	Max.	3	°C/W

PIN CONNECTION (top view)

2 OUTPUT
3 GROUND
1 (Vs)

tab connected to pin 3   M92L9444-02
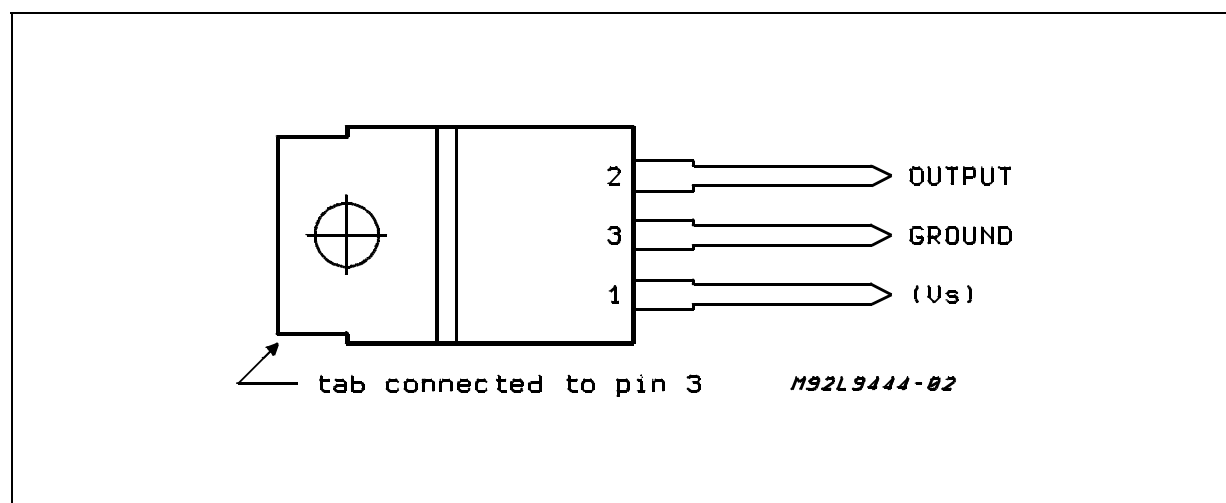
DEVICE OPERATION

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 - 1µF) 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 alternator 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.

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ELECTRICAL CHARACTERISTICS ($-40\ °C \leq T_J \leq 125\ °C$ 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 14.36 14.75	14.79 14.66 15.05	15.05 14.96 15.35	V V V
		$T_j = 25°C$	14.10	14.40	14.70	V
		$T_j = 125°C$ for L9444VB for L9448VB for L9480VB	13.50 13.70 13.10	13.80 14.00 13.40	14.10 14.30 13.70	V V 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 Regualtion	$0.1\ I_n < I_{alt} < 0.9\ I_n$ (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	$01\ I_n < I_{alt} < 0.9\ I_n$	30		1000	Hz

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

APPLICATION CIRCUIT

M92L9444-83A

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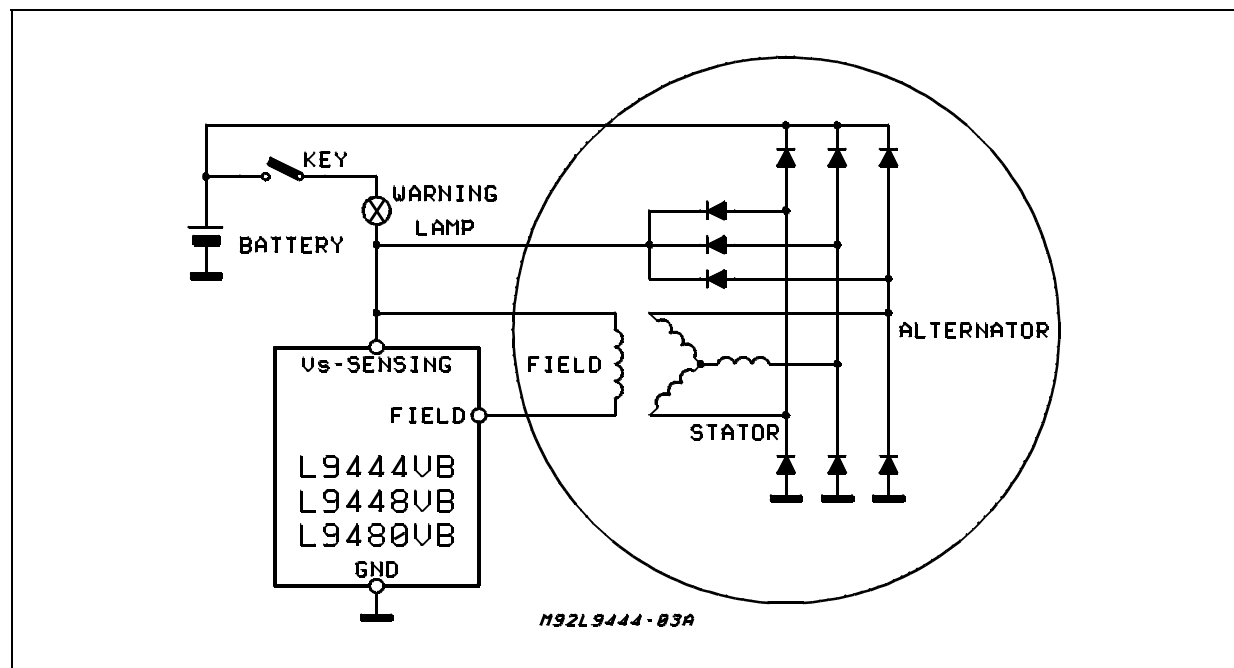
TO220 PACKAGE MECHANICAL DATA

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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