



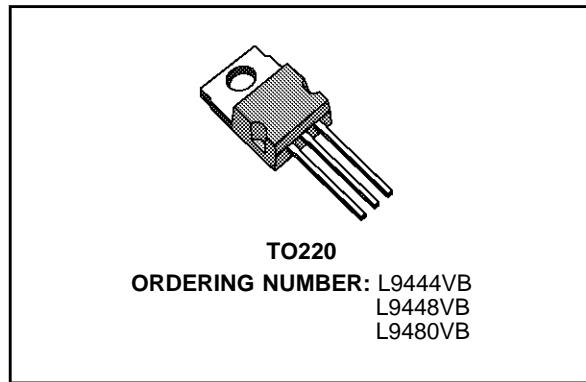
**SGS-THOMSON**  
MICROELECTRONICS

**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

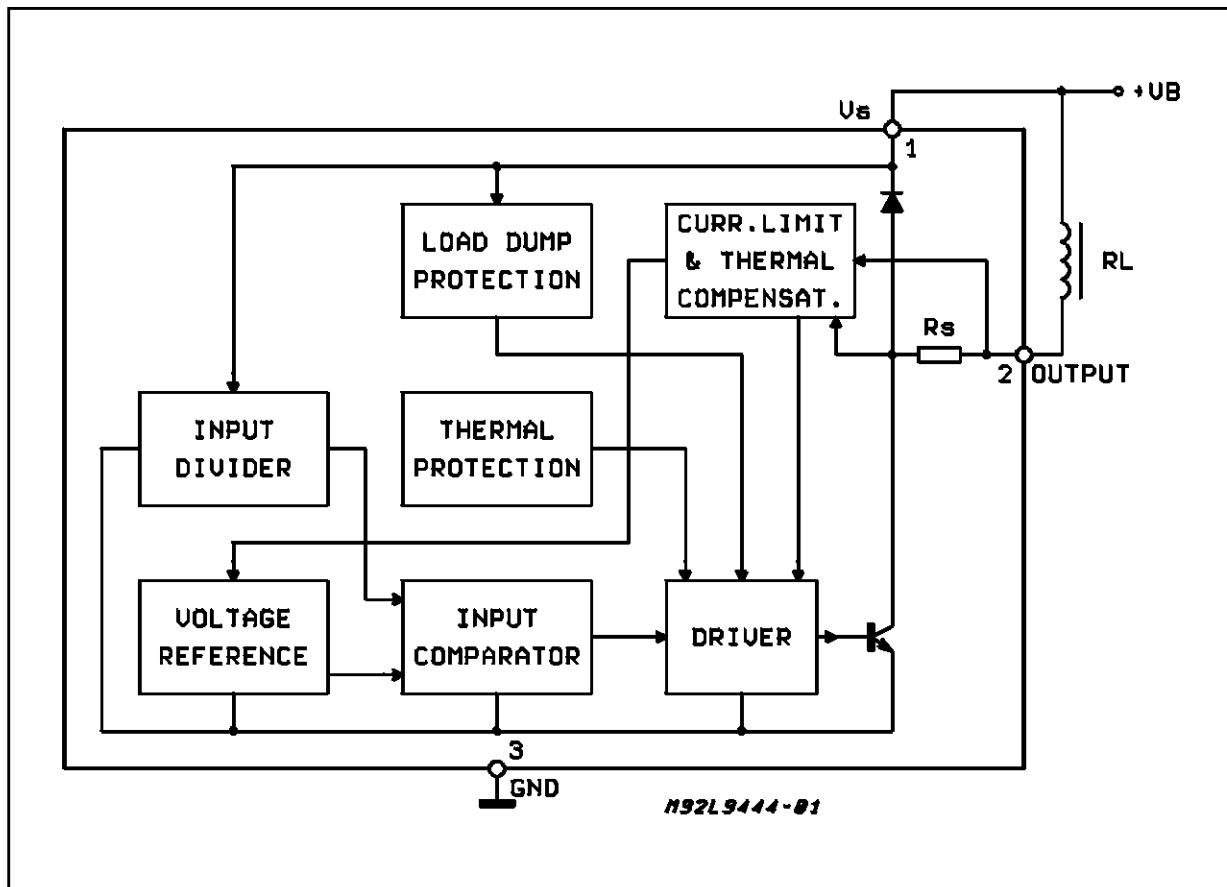


### DESCRIPTION

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

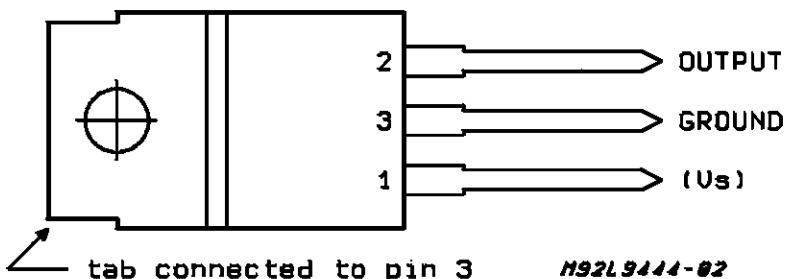
### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_S$	Transient Overvoltage : Load Dump : $5\text{ms} \leq T_{\text{rise}} \leq 10\text{ms}$ , $\tau_f$ Fall Time Constant $\leq 100\text{ms}$ , $R_{\text{source}} \geq 0.5\Omega$	80	V
$I_{\text{clamp}}$	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
$I_{\text{out}}$	Maximum Output Current	5.5	A
$T_j$ , $T_{\text{stg}}$	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 $\mu\text{F}$ ) 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.

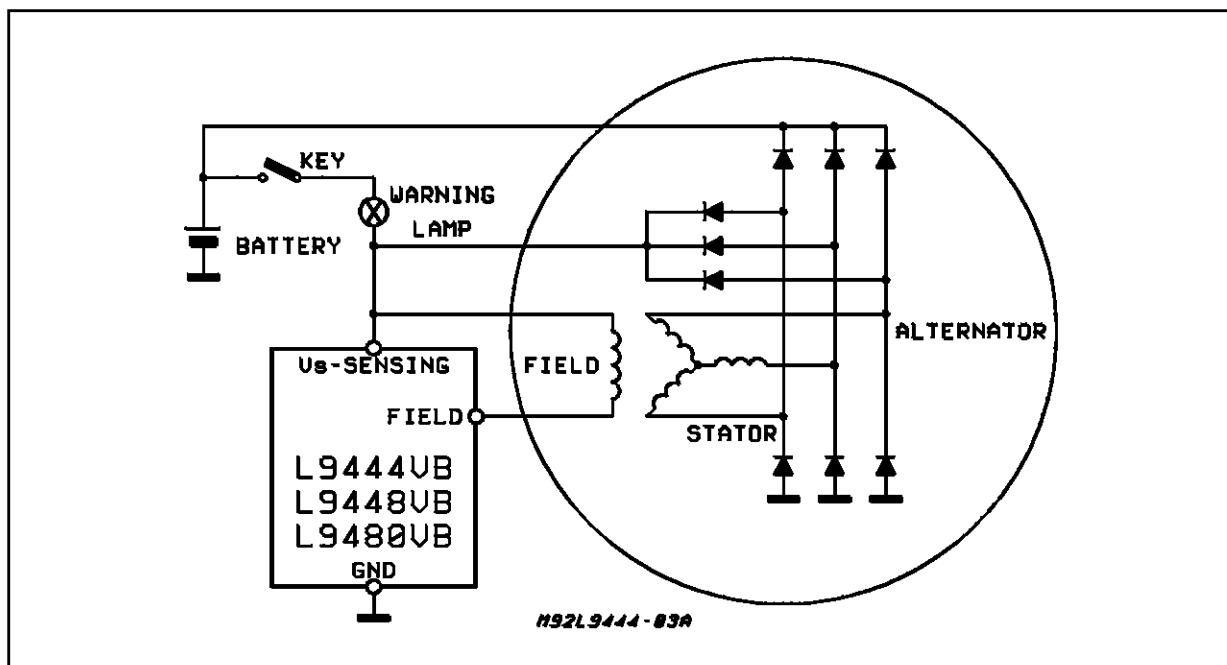
Finally the internal thermal shutdown avoids any possible device damage due to overtemperature problems.

**ELECTRICAL CHARACTERISTICS** ( $-40^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_r$	Regulation Voltage	$T_j = -40^{\circ}\text{C}$ for L9444VB	14.49	14.79	15.05	V
		for L9448VB	14.36	14.66	14.96	V
		for L9480VB	14.75	15.05	15.35	V
$C_T$	Temperature Coeff. of the Regulation Voltage	$T_j = 25^{\circ}\text{C}$	14.10	14.40	14.70	V
		$T_j = 125^{\circ}\text{C}$ for L9444VB	13.50	13.80	14.10	V
		for L9448VB	13.70	14.00	14.30	V
		for L9480VB	13.10	13.40	13.70	V
$eC_T$	Error on Nominal Temperature Coeff.		- 6			$\text{mV}/^{\circ}\text{C}$
			- 4			$\text{mV}/^{\circ}\text{C}$
			- 10			$\text{mV}/^{\circ}\text{C}$
$V_r$	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	$I_{field} = 200 \text{ mA}$	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	$I_{clamp} = 50 \text{ mA}$		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:  $I_n = <90\text{A}$ ;  $I_{alt}/I_{field} \geq 23$

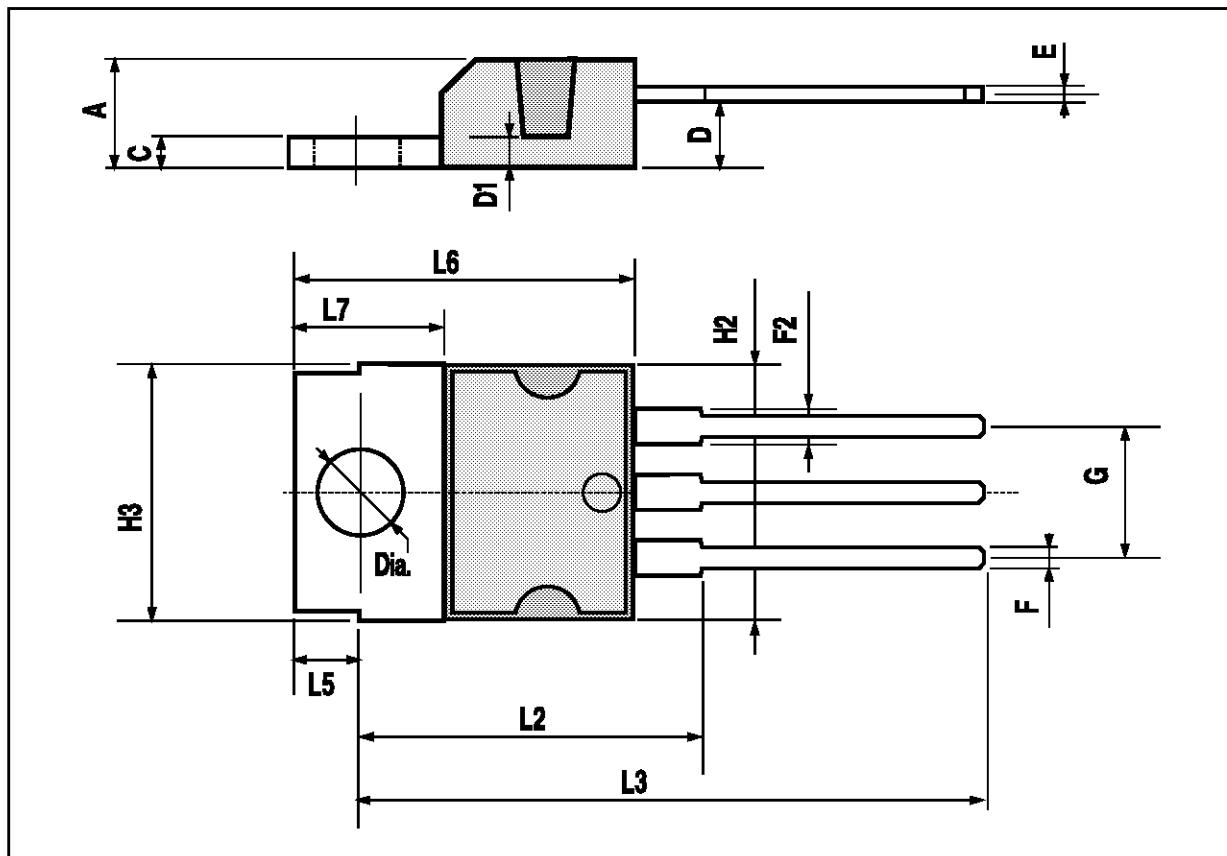
**APPLICATION CIRCUIT**



## L9444VB -L9448VB - L9480VB

### 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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