

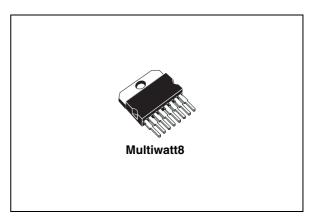
Car alternator voltage regulator

Features

- For air and liquid cooled applications
- DF output (inverted field monitor)
- Thermal protection
- Fleld driver, lamp driver, relay driver, and DF (field monitor) short circuit protected
- Load response control
- Single phase autostart

Description

The L9466 is a monolithic multifunction generator Voltage regulator intended for use in automotive charging applications.



This All Silicon Voltage Regulator regulates the output of an automotive generator by controlling the field winding current by means of a variable frequency PWM high side driver.

Table 1. Device summary

Order code	Package	Packing	
L9466N	Multiwatt8	Tube	

Contents L9466

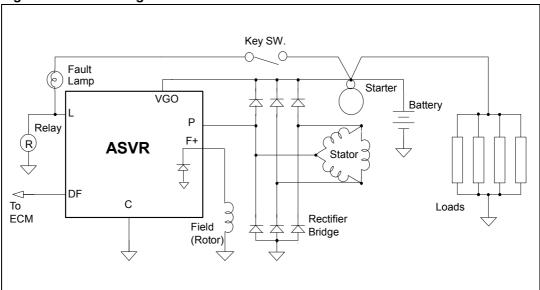
Contents

1	Block diagram		
2	Pin o	description4	
3	Elec	trical specifications 5	
	3.1	Absolute maximum ratings	
	3.2	Thermal data 5	
	3.3	Electrical characteristics	
4	Pack	rage information	
5	Revi	sion history	

L9466 Block diagram

1 Block diagram

Figure 1. Block diagram



57

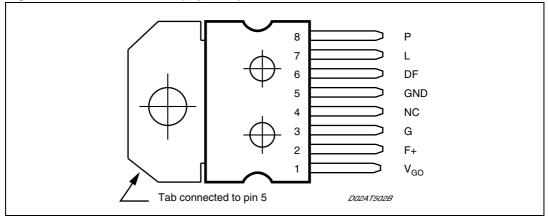
Pin description L9466

2 Pin description

Table 2. Pin description

N°	Pin	Description		
1	V_{GO}	Generator Output – Voltage Sense and Power Supply to ASVR		
2	F+	Field Driver - High Side Drive Output		
3	G	Ground for ASVR (Must be connected for Ground for ASVR)		
4	NC	Not connected		
5	Gnd	nternally connected to the Tab or Slug in MW-8.		
6	DF	DF Inverted Field Monitor Output		
7	L	amp - Low Side Driver; Relay - High Side Driver		
8	Р	Phase Sense Input		

Figure 2. Pin connection (top view)



3 Electrical specifications

3.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
I _{OC}	Output current capability	Internally limited	
P _{tot}	Power dissipation	6	W
	Short circuit protected	All terminal, to VGO and ground	

3.2 Thermal data

Table 4. Thermal data

Symbol	Parameter	Value	Unit
Tj	Junction temperature	-40 to +150	°C
T _{stg}	Storage temperature	-50 to +150	°C
T _{sd}	Thermal shut-down	175 ± 15	°C
R _{th j-case}	Thermal resistance junction to case	1.5	°C/W

3.3 Electrical characteristics

Table 5. Electrical characteristics

 $(T_{case} = -35^{\circ}C \text{ to } +150^{\circ}C \text{ continuous unless otherwise specified})$

Symbol	Parameter	Test condition	Min.	Тур.	Max.	Unit
V _{OS}	Operating supply voltage	T_{case} = +25°C to =150°C	8		Vov	V
V _{OS}	Operating supply voltage	$T_{case} = -40^{\circ}\text{C to } +25^{\circ}\text{C}$	10		Vov	V
I _{SB}	Stand-by current	V_{GO} = 12.6V; T_{case} = 25°C; 10k Ω ; F+, G & Tab (Slug) Grounded; L, DF, & P unconnected; Regulator not activated.			300	μА
V _{SP}	Regulator set-point		Cui	rve show	n in <i>Figui</i>	re 3
V _{NB}	Generator output, no battery	No battery, I _{OUT} = 2A to 50% Max. Load	V _{SP} - 2		V _{SP} + 2	V
T _C	Thermal compensation	Voltage @ V _{GO}	Cui	rve show	n in <i>Figui</i>	<i>e 3</i>
V _{LR}	Load regulation	6500 grpm, 10% to 95% load			300	mV
V _{SR}	Speed regulation	15A load, 2000 to 20,000 grpm			100	mV
V _{F-ON}	Output saturation voltage	$I_F = 6A$, $V_{GO} = 14.0V$, $T_{case} = 25^{\circ}C$			750	mV

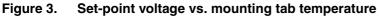
577

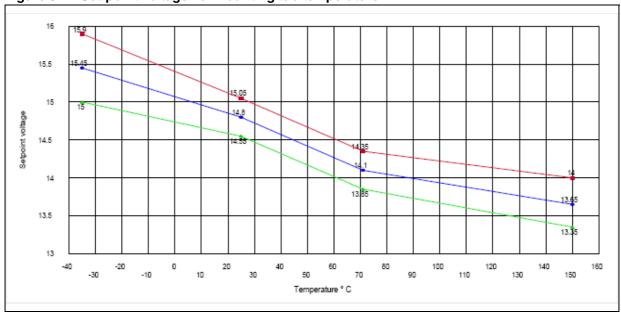
Table 5. Electrical characteristics (continued)

(T_{case} = -35°C to +150°C continuous unless otherwise specified)

Symbol	Parameter	Test condition	Min.	Тур.	Max.	Unit
V _{F-ON}	Output saturation voltage	$I_F = 5A$, $V_{GO} = 13.5V$, $T_{case} = 125^{\circ}C$			850	mV
I _{F-LIM}	Field limit current ⁽¹⁾	Current F+ Terminal to Gnd. @ T _{case} ≤ 25°C	9.0			Α
I _{F-LIM}	Field limit current ⁽¹⁾	Current F+ Terminal to Gnd. @ T _{case} = +150°C	6.0			Α
I _{G-MIN}	Min. generator current load	Current measured @ generator output	0.5			Α
V _{D-F}	Field discharge diode	$I_F = 6A$, $T_{case} = 25$ °C			1.85	V
I _{D-R}	Diode reverse current	V _R = 20V			1	mA
F _{OSC}	Oscillation frequency	During LRC operation	340	400	460	Hz
V_{DF}	DF saturation voltage	$I_{DF} \le 10 mA$			0.8	V
I _{DF-LK}	DF output leakage current	V _{DF} < 25V			10	μΑ
F _{TURBO}	Internal clock frequency	$V_{DF} = 32 - 35V$; at $2.2k\Omega$		4X		Hz
F _{TURBO}	IRD, SS, LRC Rate	$V_{DF} = 32 - 35V$; at 2.2k Ω		÷ 16		

The Field Drive capability shall not decrease as a function of temperature between 25°C and 150°C, at a rate faster than -0.024A/°C (for example, Field Drive shall be capable of ≥7.2A at 100°C).





6/11

Table 6. Diagnostic ($T_{case} = -35^{\circ}C$ to $+150^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Units
V _{OV}	Over-voltage		V _{SP} + 1	V _{SP} + 1.3	V _{SP} + 2	V
V _{UV}	Under-voltage	$F_P > F_{P-LRC}$	0.95		1.8	V
V _{L-SAT}	Lamp ON saturation voltage	I _L = 0.5A (sinked by ASVR)	>V _{L-ACT}	1.33	1.45	V
V _{L-SAT-BO}	Lamp ON voltage ⁽¹⁾	I_L < 0.5A, VGO = Open; T_{case} = -35°C to 85°C		3.8	5	V
V _{L-RLY}	Lamp OFF (relay drive) saturation voltage (vs. B+)	I _L = 750mA (Sourced by ASVR) (²⁾ T _{case} < 125°C			1.85	V
T _{DELAY}	Fault indication delay time	Delay before Lamp ON	0.9	1.1	1.3	S

This condition can happen when the connection between the battery and VGO or the output terminal of the generator is broken. The 1.1 second delay is not required, and current is sinked by ASVR.

Table 7. Fault indication table

Conditions	T _{Delay}
Initial KEY-ON Bulb and Wiring Check (Lamp ON for 1 sec. \pm 15% after initial KEY-ON)	No
$V_{GO} > V_{OV}$	Yes
$V_P < V_{P-F}$ AND $V_{GO} < V_{SP}$	Yes
F _P < F _{P-TR} @ V _{P-TR}	Yes
No Connection Between Battery and V _{GO}	No
At Start: Lamp ON until F _P >F _{P-IR} AND V _P >V _{P-F} i.e. until V _P reaches 8V.	No

Table 8. Regulation features

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
V _{L-PD}	L terminal regulator activate threshold	VGO=12.6V	0.8	1	1.15	V
I _{L-PD}	L terminal pull down current	$V_L = V_{L-ACT}$ VGO=12.6V	0.09		0.78	mA
V _{P-IR}	Initiate regulation phase voltage threshold	Regulator Activated	1.1	1.3	1.5	V
l _P	Phase terminal current sink	V _P > 1.5V and < 12.6V VGO = 12.6V	0.25		3.5	mA
F _{P-IR}	Initiate regulation phase frequency		123	145	167	Hz
F _{P-TR}	Terminate regulation phase frequency		59	72	86	Hz
IRD	Initiate regulation delay	Regulator activated, V _{P-IR} and F _{P-IR} Conditions Met First Time.	1.7	2	2.3	s

5/

^{2.} When no fault is detected the Lamp terminal is pulled up by ASVR.

Table 8. Regulation features (continued)

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
FSDC	Field strobe duty cycle	Regulator activated AND (regulation terminated OR regulation NOT initiated)	16	18.75	22	%
LRC	Load response control rate	Field drive duty cycle increase	8.5	10	11.5	%/s
F _{P-LRC}	LRC transition frequency	LRC enabled if F _P < F _{P-LRC}	255	300	345	Hz
SS	Soft-start	LRC enabled until V _{SP} reached regardless other conditions	34	40	46	%/s

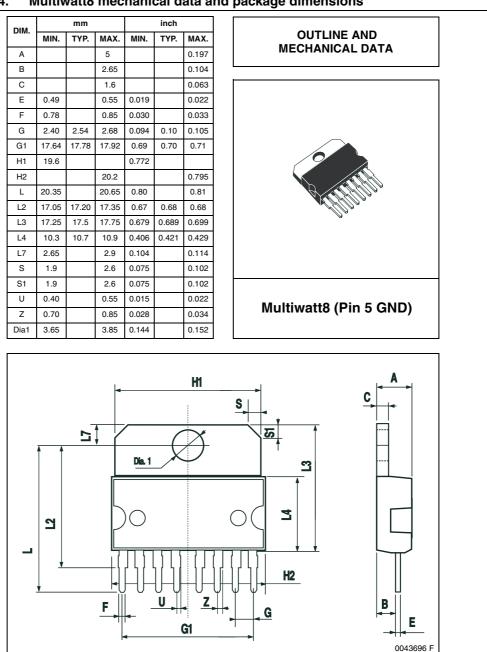
L9466 Package information

4 Package information

In order to meet environmental requirements, ST (also) offers these devices in ECOPACK[®] packages. ECOPACK[®] packages are lead-free. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label.

ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

Figure 4. Multiwatt8 mechanical data and package dimensions



5/

Revision history L9466

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
17-May-1994	1	Initial release.
21-Oct-2008	2	Revalidation document. Document reformatted. Updated Section 2: Pin description on page 4.
19-Sep-2013 3 Updated Disclaimer.		Updated Disclaimer.

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