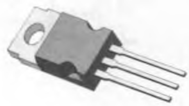
L4940 Series

VERY LOW DROP 1.5A REGULATORS

PRELIMINARY DATA

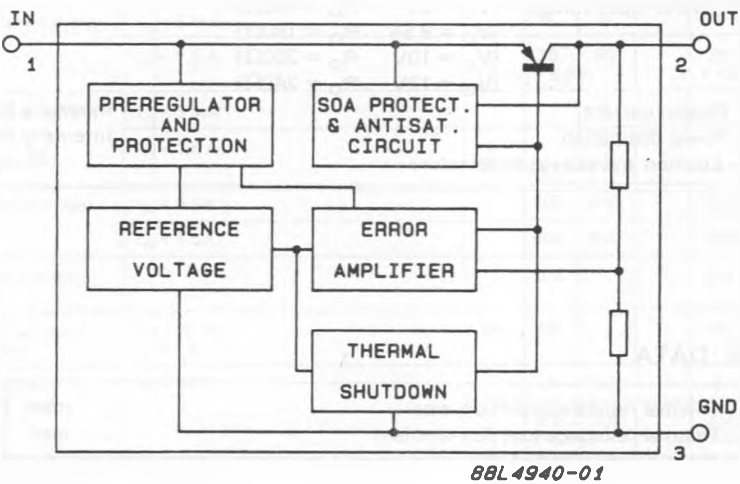
- PRECISE 5V, 8.5V, 10V, 12V OUTPUTS
- LOW DROPOUT VOLTAGE (500mV TYP AT 1.5A)
- VERY LOW QUIESCENT CURRENT
- THERMAL SHUTDOWN
- SHORT CIRCUIT PROTECTION
- REVERSE POLARITY PROTECTION


TO-220

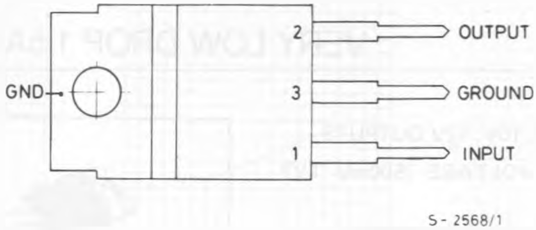
INTRODUCTION

The L4940 series of three terminal positive regulators is available in TO-220 package and with several fixed output voltages, making it useful in a wide range of industrial and consumer applications. Thanks to its very low input/output voltage drop, these devices are particularly suitable for battery powered equipments, reducing consumption and prolonging battery life. Each type employs internal current limiting, antisaturation circuit, thermal shut-down and safe area protection.

BLOCK DIAGRAM



CONNECTION DIAGRAM AND ORDERING NUMBERS
(Top view)



ORDERING NUMBERS	OUTPUT VOLTAGE
L4940V5	5V
L4940V85	8.5V
L4940V10	10V
L4940V12	12V

ABSOLUTE MAXIMUM RATINGS

V_I	Forward input voltage		30	V
V_{IR}	Reverse input voltage	(V_O = 5V R_O = 100Ω)	-15	V
		(V_O = 8.5V R_O = 180Ω)		
		(V_O = 10V R_O = 200Ω)		
		(V_O = 12V R_O = 240Ω)		
I_O	Output current		Internally limited	
P_{tot}	Power dissipation		Internally limited	
T_j, T_{stg}	Junction and storage temperature		-40 to 150	°C

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	3	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	50	°C/W

TEST CIRCUITS

Fig. 1 - DC Parameters

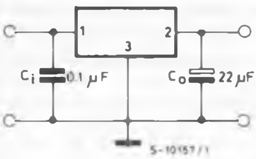


Fig. 2 - Load Regulation

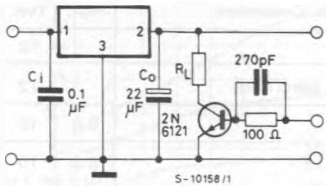
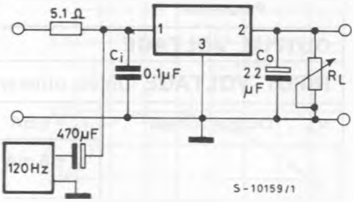


Fig. 3 - Ripple Rejection



ELECTRICAL CHARACTERISTICS (Refer to the test circuits $T_j = 25°C$, $C_i = 0.1\mu F$, $C_o = 22\mu F$, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
OUTPUT VOLTAGE				5			8.5		V
INPUT VOLTAGE (unless otherwise specified)				7			10.5		V
V_o	Output voltage	I_o = 0.5A	4.9	5	5.1	8.3	8.5	8.7	V
		I_o = 5 mA to 1.5A	4.8	5 (V_i= 6.5 to 16V)	5.2	8.15	8.5 (V_i= 10.2 to 16V)	8.85	V
V_i	Operating input voltage	I_o = 5 mA			17			17	V
ΔV_o	Line regulation	I_o = 5 mA		4 (V_i= 6V to 17V)	10		4 (V_i= 9.5 to 17V)	9	mV
ΔV_o	Load regulation	I_o = 5 mA to 1.5A		8	25		12	30	mV
		I_o = 0.5A to 1A		5	15		8	16	mV
I_Q	Quiescent current	I_o = 5 mA		5	8		4	8	mA
		I_o = 1.5 A		30 (V_i = 6.5V)	50		30 (V_i = 10.2V)	50	mA
ΔI_Q	Quiescent current	I_o = 5 mA			3			2.5	mA
		I_o = 1.5 A		(V_i= 6.5 to 16V)	15		(V_i= 10.2 to 16V)	15	mA
V_d	Dropout voltage	I_o = 0.5A		200	400		200	400	mV
		I_o = 1.5A		500	900		500	900	mV
$\frac{\Delta V_o}{\Delta T}$	Output voltage drift			0.5			0.8		mV/°C
SVR	Supply voltage rejection	f = 120 Hz I_o = 1A	58	68		58	66		dB
I_{sc}	Short circuit current limit	V_i = 14V		2	2.7		2	2.7	A
				2.2 (V_i = 6.5V)	2.9		2.2 (V_i = 10.2V)	2.9	A
Z_o	Output impedance	f = 1 KHz I_o = 0.5A		30			32		mΩ
e_N	Output noise	B = 100 Hz to 100 KHz		30			30		µV/V_o

ELECTRICAL CHARACTERISTICS (Refer to the test circuits $T_j = 25°C$, $C_i = 0.1\mu F$, $C_o = 22\mu F$, unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit
OUTPUT VOLTAGE				10			12		V
INPUT VOLTAGE (unless otherwise specified)				12			14		V
V_o	Output voltage	I_o = 0.5A	9.8	10	10.2	11.75	12	12.25	V
		I_o = 5 mA to 1.5A	9.6	10	10.4	11.5	12	12.5	
				(V_i= 11.7 to 16V)			(V_i= 13.8 to 17V)		
V_i	Operating input voltage	I_o = 5 mA			17			17	V
ΔV_o	Line regulation	I_o = 5 mA		3	8		3	7	mV
				(V_i = 11 to 17V			(V_i = 13 to 14V)		
ΔV_o	Load regulation	I_o = 5 mA to 1.5A		15	35		15	35	mV
		I_o = 0.5A to 1A		10	20		10	25	
I_Q	Quiescent current	I_o = 5 mA		4	8		4	8	mA
		I_o = 1.5A		30	50		30	50	
				(V_i = 11.7V)			(V_i = 13.8V)		
ΔI_Q	Quiescent current change	I_o = 5 mA			2			1.5	mA
		I_o = 1.5A			13			10	
				(V_i= 11.7 to 16V)			(V_i = 13.8V)		
V_d	Dropout voltage	I_o = 0.5A		200	400		200	400	mV
		I_o = 1.5A		500	900		500	900	
$\frac{\Delta V_o}{\Delta T}$	Output voltage drift			1			1.2		mV/°C
SVR	Supply voltage rejection	f = 120 Hz I_o = 1A	56	62		55	61		dB
I_{sc}	Short circuit current limit	V_i = 14V		2	2.7		2	2.7	A
		V_i = 11.7V		2.2	2.9		–	–	
Z_o	Output impedance	f = 1KHz I_o = 0.5A		36			40		mΩ
e_N	Output noise voltage	B = 100 Hz to 100 KHz		30			30		µV/V_o

Fig. 4 - Dropout voltage vs. output current

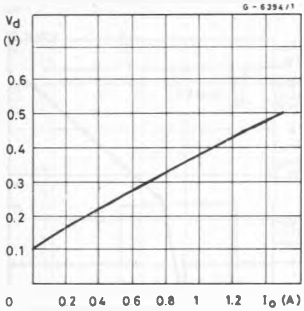


Fig. 5 - Dropout voltage vs. temperature

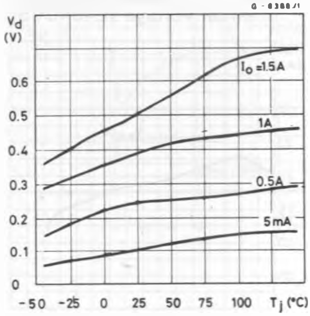


Fig. 6 - Output voltage vs. temperature (L4940V5)

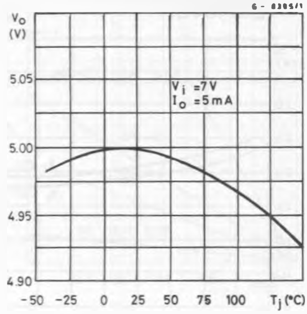


Fig. 7 - Output voltage vs. temperature (L4940V85)

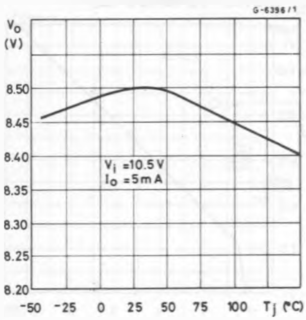


Fig. 8 - Output voltage vs. temperature (L4040V10)

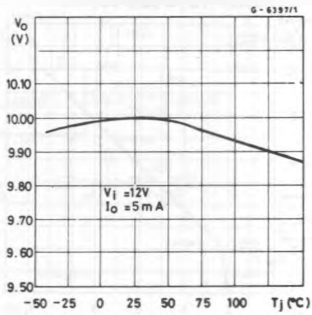


Fig. 9 - Output voltage vs. temperature (L4940V12)

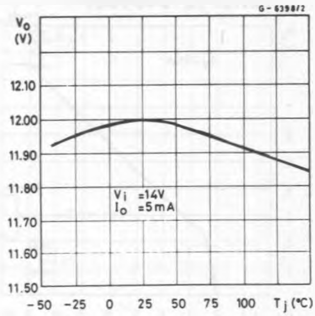


Fig. 10 - Quiescent current vs. temperature (L4940V5)

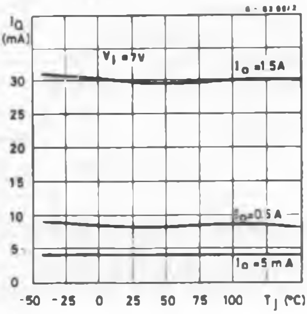


Fig. 11 - Quiescent current vs. input voltage (L4940V5)

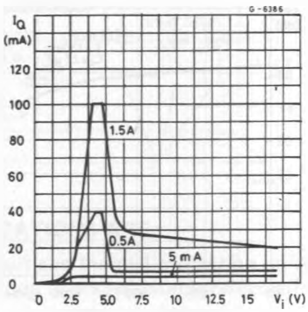


Fig. 12 - Quiescent current vs. output current (L4940V5)

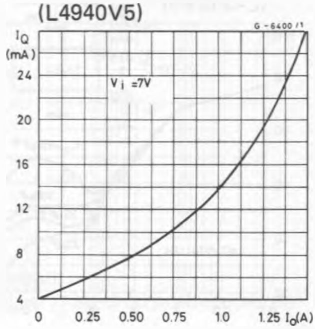


Fig. 13 - Short circuit current vs. temperature (L4940V5)

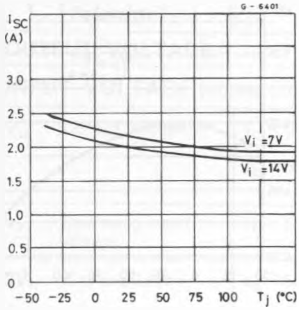


Fig. 14 - Peak output current vs. input/output differential voltage (L4940V5)

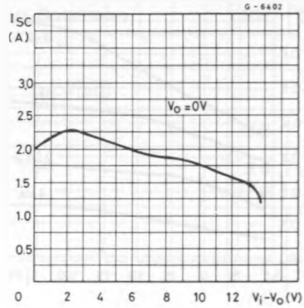


Fig. 15 - Low voltage behavior (L4940V5)

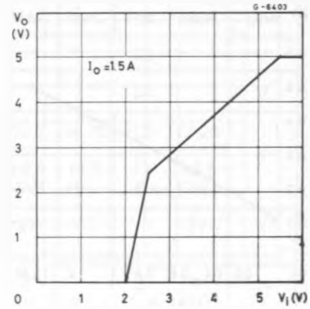


Fig. 16 - Low voltage behavior (L4940V85)

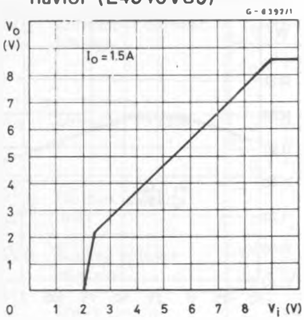


Fig. 17 - Low voltage behavior (L4940V10)

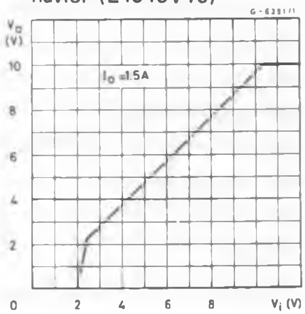


Fig. 18 - Low voltage behavior (L4940V12)

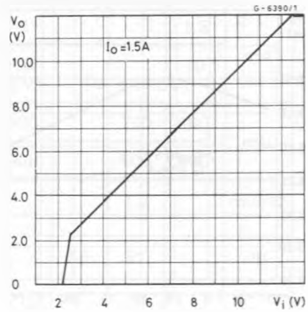


Fig. 19 - Supply voltage rejection vs. frequency (L4940V5)

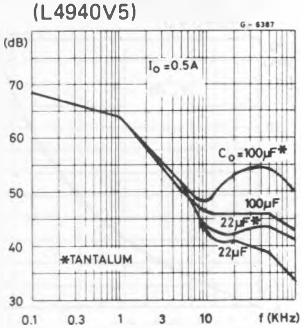


Fig. 20 - Supply voltage rejection vs. output current

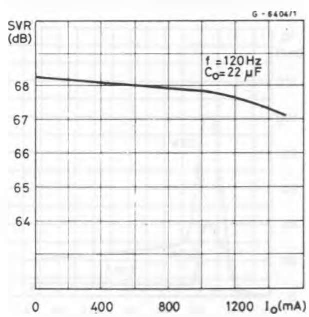
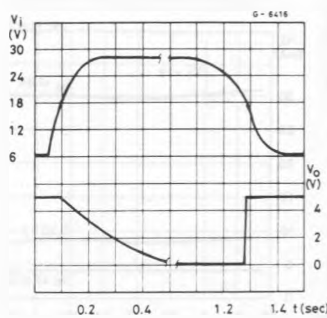


Fig. 21 - Load dump characteristics (L4940V5)



SGS-THOMSON

Fig. 22 - Line transient response (L4940V5)

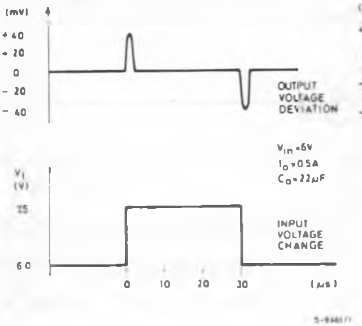


Fig. 23 - Load transient response

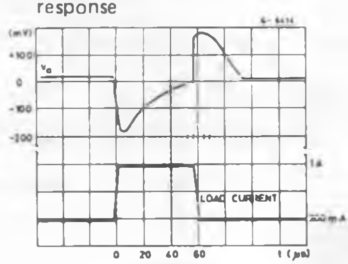


Fig. 24 - Total power dissipation

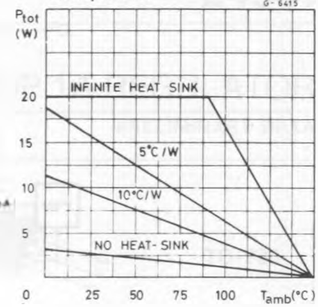


Fig. 25 - Distributed supply with on-card L4940 and L4941 low-drop regulators

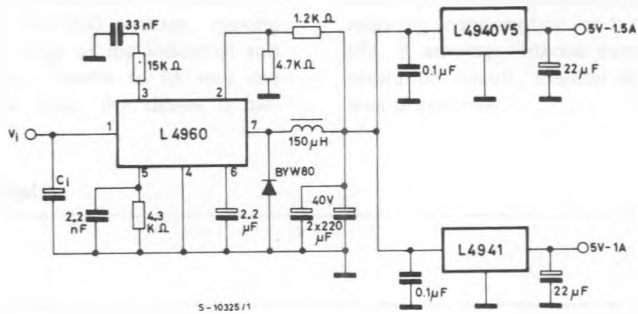
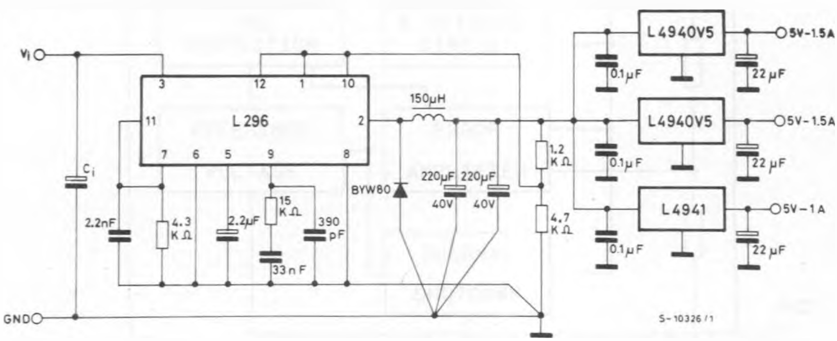


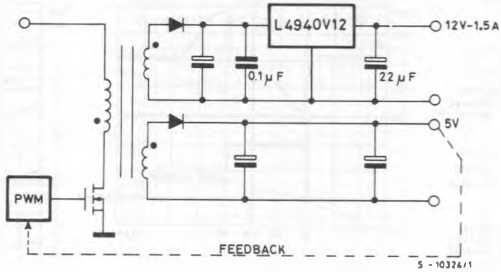
Fig. 26 - Distributed supply with on-card L4940 and L4941 low-drop regulators



ADVANTAGES OF THESE APPLICATIONS ARE:

- On card regulation with short circuit and thermal protection on each output.
- Very high total system efficiency due to the switching preregulation and very low-drop postregulations.

Fig. 27



ADVANTAGES OF THIS CONFIGURATION ARE:

- Very high regulation (line and load) on both the output voltages.
- 12V output short-circuit and thermally protected.
- Very high efficiency on the 12V output due to the very low drop regulator.