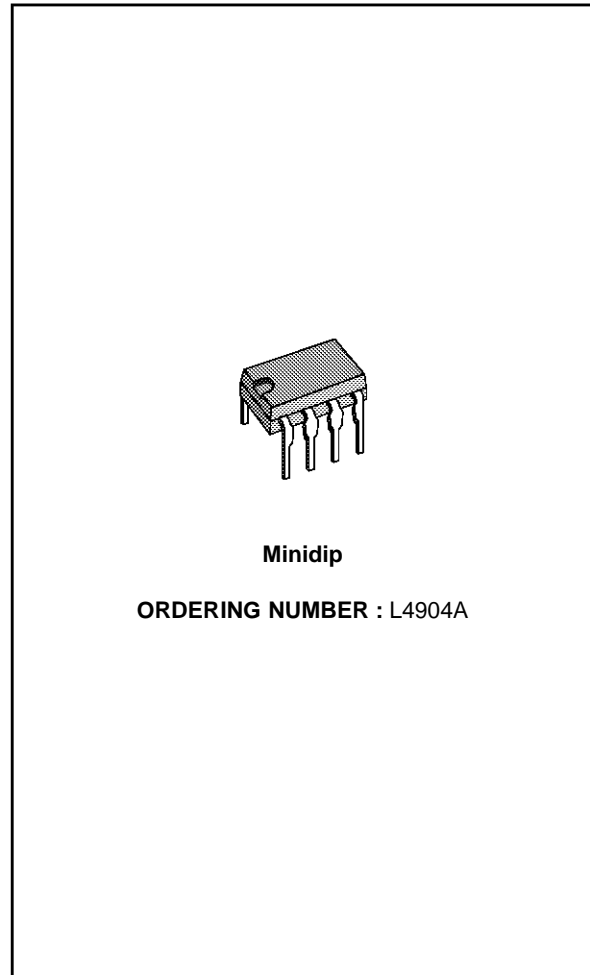


**DUAL 5V REGULATOR WITH RESET**

PRELIMINARY DATA

- OUTPUT CURRENTS :  $I_{O1} = 50\text{mA}$   
 $I_{O2} = 100\text{mA}$
- FIXED PRECISION OUTPUT VOLTAGE  
 $5\text{V} \pm 2\%$
- RESET FUNCTION CONTROLLED BY INPUT VOLTAGE AND OUTPUT 1 VOLTAGE
- RESET FUNCTION EXTERNALLY PROGRAMMABLE TIMING
- RESET OUTPUT LEVEL RELATED TO OUTPUT 2
- OUTPUT 2 INTERNALLY SWITCHED WITH ACTIVE DISCHARGING
- LOW LEAKAGE CURRENT, LESS THAN  $1\mu\text{A}$  AT OUTPUT 1
- LOW QUIESCENT CURRENT (Input 1)
- INPUT OVERVOLTAGE PROTECTION UP TO 60V
- RESET OUTPUT NORMALLY HIGH
- OUTPUT TRANSISTORS SOA PROTECTION
- SHORT CIRCUIT AND THERMAL OVERLOAD PROTECTION

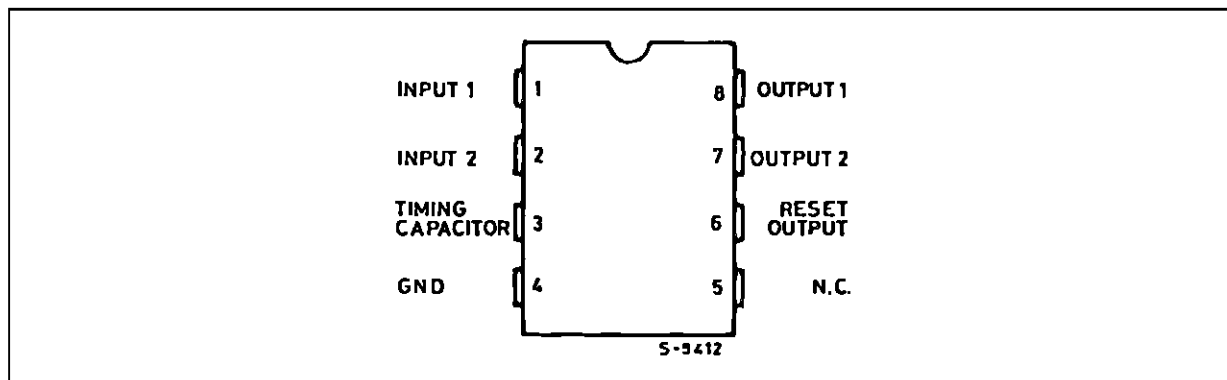


**DESCRIPTION**

The L4904A is a monolithic low drop dual 5V regulator designed mainly for supplying microprocessor systems.

Reset and data save functions during switch on/off can be realized.

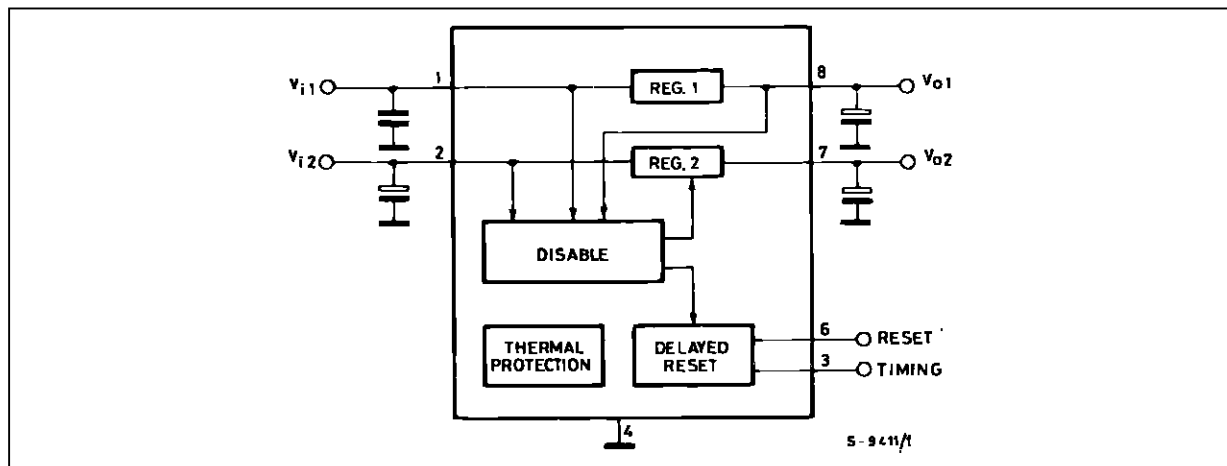
**PIN CONNECTION**



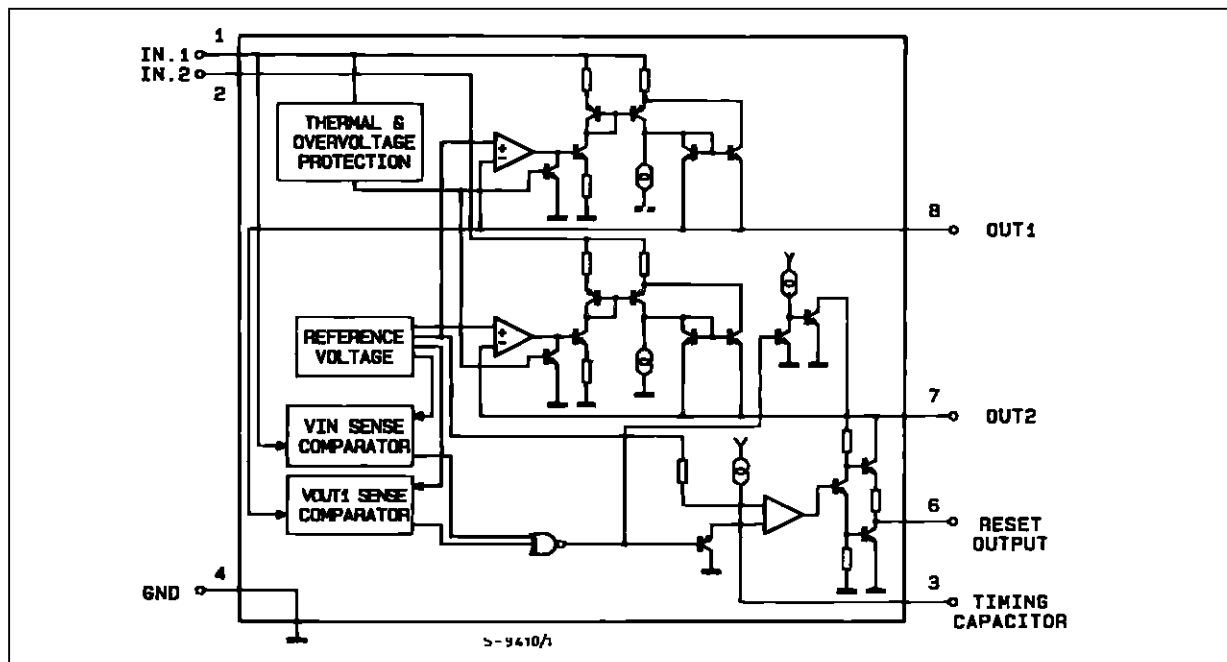
**PIN FUNCTIONS**

N°	Name	Function
1	Input 1	Low Quiescent Current 50mA Regulator Input.
2	Input 2	100mA Regulator Input.
3	Timing Capacitor	If Reg. 2 is switching-ON the delay capacitor is charged with a 10µA constant current. When Reg. 2 is switched-OFF the delay capacitor is discharged.
4	GND	Common Ground.
5	N.C.	Not connected.
6	Reset Output	When pin 3 reaches 5V the reset output is switched high. Therefore $t_{RD} = C_t \left( \frac{5V}{10\mu A} \right)$ ; $t_{RD} \text{ (ms)} = C_t \text{ (nF)}$ .
7	Output 2	5V – 100mA Regulator Output. Enabled if $V_{O1} > V_{RT}$ and $V_{IN2} > V_{IT}$ . If Reg. 2 is switched-OFF the $C_{O2}$ capacitor is discharged.
8	Output 1	5V – 50mA regulator output with low leakage in switch-OFF condition.

**BLOCK DIAGRAM**



**SCHEMATIC DIAGRAM**



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{IN}$	DC Input Voltage	24	V
	Transient Input Overvoltage (t = 40ms)	60	V
$I_o$	Output Current	Internally Limited	
$P_{tot}$	Power Dissipation at $T_{amb} = 50^\circ\text{C}$	1	W
$T_j$	Storage and Junction Temperature	- 40 to 150	$^\circ\text{C}$

## THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max 100	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ( $V_{IN} = 14.4\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_i$	DC Operating Input Voltage				20	V
$V_{O1}$	Output Voltage 1	R Load 1k $\Omega$	4.95	5.05	5.15	V
$V_{O2H}$	Output Voltage 2 HIGH	R Load 1k $\Omega$	$V_{O1} - 0.1$	5	$V_{O1}$	V
$V_{O2L}$	Output Voltage 2 LOW	$I_{O2} = -5\text{mA}$		0.1		V
$I_{O1}$	Output Current 1	$\Delta V_{O1} = -100\text{mV}$	50			mA
$I_{LO1}$	Leakage Output 1 Current	$V_{IN} = 0$ , $V_{O1} \leq 3\text{V}$			1	$\mu\text{A}$
$I_{O2}$	Output Current 2	$\Delta V_{O2} = -100\text{mV}$	100			mA
$V_{I01}$	Output 1 Dropout Voltage (*)	$I_{O1} = 10\text{mA}$ $I_{O1} = 50\text{mA}$		0.7	0.8	V
				0.75	0.9	V
$V_{IT}$	Input Threshold Voltage		$V_{O1} + 1.2$	6.4	$V_{O1} + 1.7$	V
$V_{ITH}$	Input Threshold Voltage Hyst.			250		mV
$\Delta V_{O1}$	Line Regulation	$7\text{V} < V_{IN} < 18\text{V}$ , $I_{O1} = 5\text{mA}$		5	50	mV
$\Delta V_{O2}$	Line Regulation 2	$7\text{V} < V_{IN} < 18\text{V}$ , $I_{O2} = 5\text{mA}$		5	50	mV
$\Delta V_{O1}$	Load Regulation 1	$V_{IN} = 8\text{V}$ , $5\text{mA} < I_{O1} < 50\text{mA}$		5	20	mV
$\Delta V_{O2}$	Load Regulation 2	$V_{IN} = 8\text{V}$ , $5\text{mA} < I_{O2} < 100\text{mA}$		10	50	mV
IQ	Quiescent Current	$I_{O2} = I_{O1} \leq 5\text{mA}$ $0 < V_{IN} < 13\text{V}$ $7\text{V} < V_{IN} < 13\text{V}$		4.5	6.5	mA
				1.6	3.5	
$I_{Q1}$	Quiescent Current 1	$6.3\text{V} < V_{IN1} < 13\text{V}$ , $V_{IN2} = 0$ $I_{O1} \leq 5\text{mA}$ , $I_{O2} = 0$		0.6	0.9	mA
$V_{RT}$	Reset Threshold Voltage		$V_{O2} - 0.15$	4.9	$V_{O2} - 0.05$	V
$V_{RTH}$	Reset Threshold Hysteresis		30	50	80	mV
$V_{RH}$	Reset Output Voltage HIGH	$I_R = 500\mu\text{A}$	$V_{O2} - 1$	4.12	$V_{O2}$	V
$V_{RL}$	Reset Output Voltage LOW	$I_R = -5\text{mA}$		0.25	0.4	V
$t_{RD}$	Reset Pulse Delay	$C_t = 10\text{nF}$	3		11	ms
$t_d$	Timing Capacitor Discharge Time	$C_t = 10\text{nF}$			20	$\mu\text{s}$
$\frac{\Delta V_{O1}}{\Delta T}$	Thermal Drift	$-20^\circ\text{C} \leq \langle 0 \rangle T_{amb} \leq 125^\circ\text{C}$		0.3		$\text{mV}/^\circ\text{C}$
				-0.8		
$\frac{\Delta V_{O2}}{\Delta T}$	Thermal Drift	$-20^\circ\text{C} \leq \langle 0 \rangle T_{amb} \leq 125^\circ\text{C}$		0.3		$\text{mV}/^\circ\text{C}$
				-0.8		
$S_{VR1}$	Supply Voltage Rejection	f = 100Hz, $V_R = 0.5\text{V}$ , $I_o = 50\text{mA}$	50	84		dB
$S_{VR2}$	Supply Voltage Rejection	f = 100Hz, $V_R = 0.5\text{V}$ , $I_o = 100\text{mA}$	50	80		dB
$T_{JSD}$	Thermal Shut Down			150		$^\circ\text{C}$

\* The dropout voltage is defined as the difference between the input and the output voltage when the output voltage is lowered of 25 mV under constant output current condition.

TEST CIRCUIT

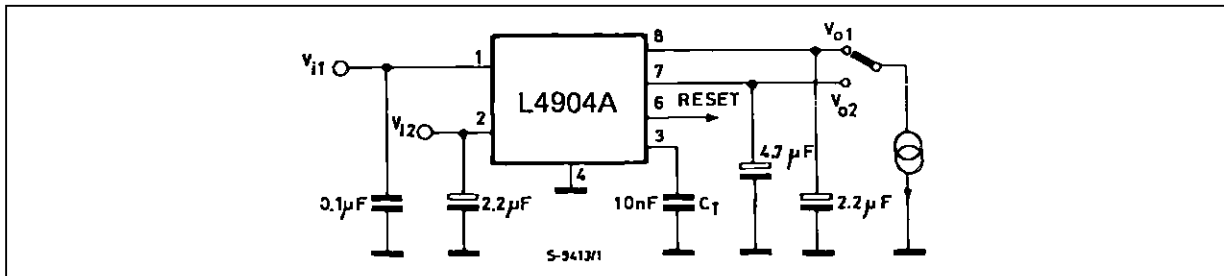
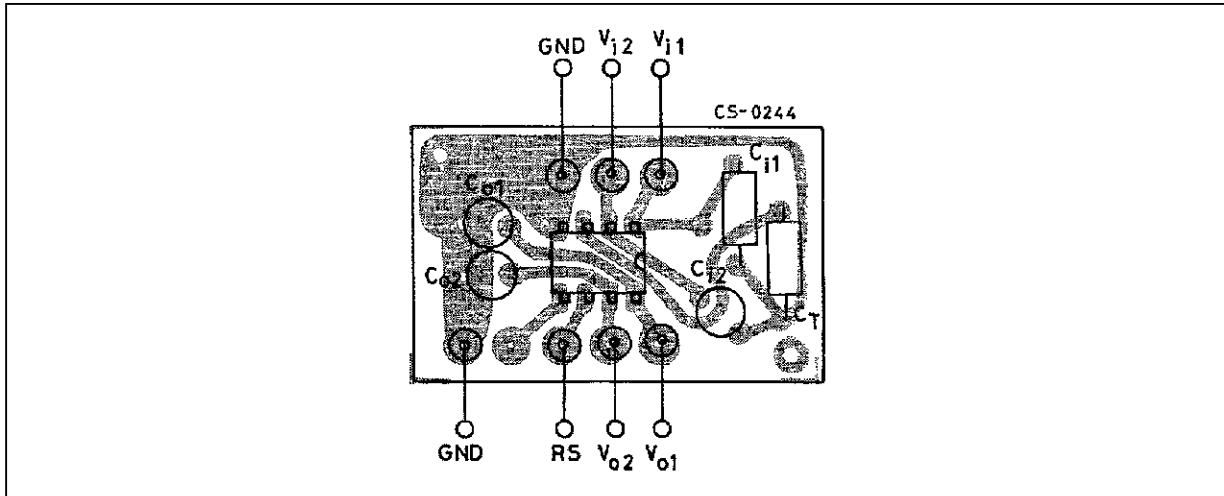


Figure 1 : P.C. Board and Components Layout of the Test Circuit (1:1 scale)



APPLICATION INFORMATION

In power supplies for  $\mu P$  systems it is necessary to provide power continuously to avoid loss of information in memories and in time of day clocks, or to save data when the primary supply is removed. The L4904A makes it very easy to supply such equipments ; it provides two voltage regulators (booth 5V high precision) with separate inputs plus a reset output for the data save function.

CIRCUIT OPERATION (see Figure 2)

After switch on Reg. 1 saturates until  $V_{o1}$  rises to the nominal value.

When the input 2 reaches  $V_{IT}$  and the output 1 is higher than  $V_{RT}$  the output 2 ( $V_{o2}$ ) switches on and the reset output ( $V_R$ ) also goes high after a programmable time  $T_{RD}$  (timing capacitor).

$V_{o2}$  and  $V_R$  are switched together at low level when one of the following conditions occurs :

- an input overvoltage
- an overload on the output 1 ( $V_{o1} < V_{RT}$ ) ;
- a switch off ( $V_{IN} < V_{IT} - V_{ITH}$ ) ;

and they start again as before when the condition is removed.

An overload on output 2 does not switch Reg. 2, and does not influence Reg. 1.

The  $V_{o1}$  output features :

- 5 V internal reference without voltage divider between the output and the error comparator ;
- very low drop series regulator element utilizing mirrors ;

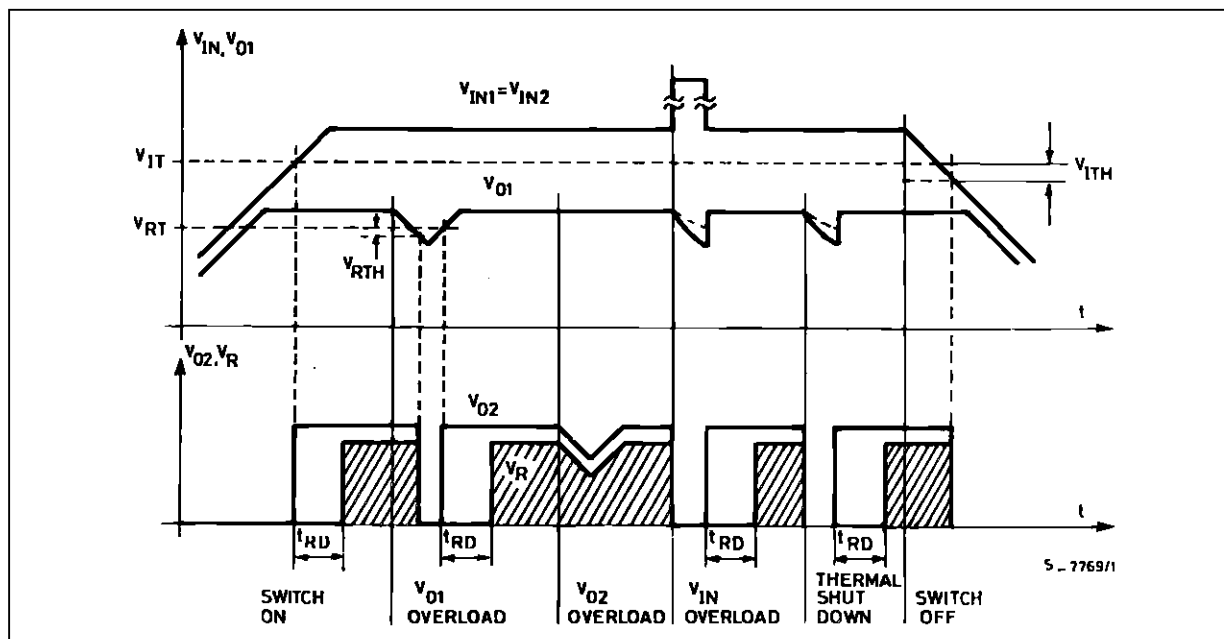
permit high output impedance and then very low leakage current even in power down conditions.

This output may therefore be used to supply circuits continuously, such as volatile RAMs, allowing the use of a back-up battery. The  $V_{o1}$  regulator also features low consumption (0.6 mA typ.) to minimize battery drain in applications where the  $V_1$  regulator is permanently connected to a battery supply.

The  $V_{o2}$  output can supply other non essential 5 V circuits which may be powered down when the system is inactive, or that must be powered down to prevent uncorrect operation for supply voltages below the minimum value.

The reset output can be used as a "POWER DOWN INTERRUPT", permitting RAM access only in correct power conditions, or as a "BACK-UP ENABLE" to transfer data into in a NV SHADOW MEMORY when the supply is interrupted.

Figure 2



### APPLICATION SUGGESTIONS

Figure 3 shows an application circuit for a  $\mu$ P system.

Reg. 1 is permanently connected to a battery and supplies a CMOS time-of-day clock and a CMOS microcomputer chip with volatile memory.

Reg. 2 may be switched OFF when the system is inactive.

Figure 4 shows the L4904A with a back up battery on the  $V_{O1}$  output to maintain a CMOS time-of-day clock and a stand by type C-MOS  $\mu$ P. The reset

output makes sure that the RAM is forced into the low consumption stand by state, so the access to memory is inhibit and the back up battery voltage cannot drop so low that memory contents are corrupted.

In this case the main on-off switch disconnects both regulators from the supply battery.

Application Circuits of a Microprocessor system (Figure 3) or with data save battery (Figure 4). The reset output provide delayed rising front at the turn-off of the regulator 2.

Figure 3

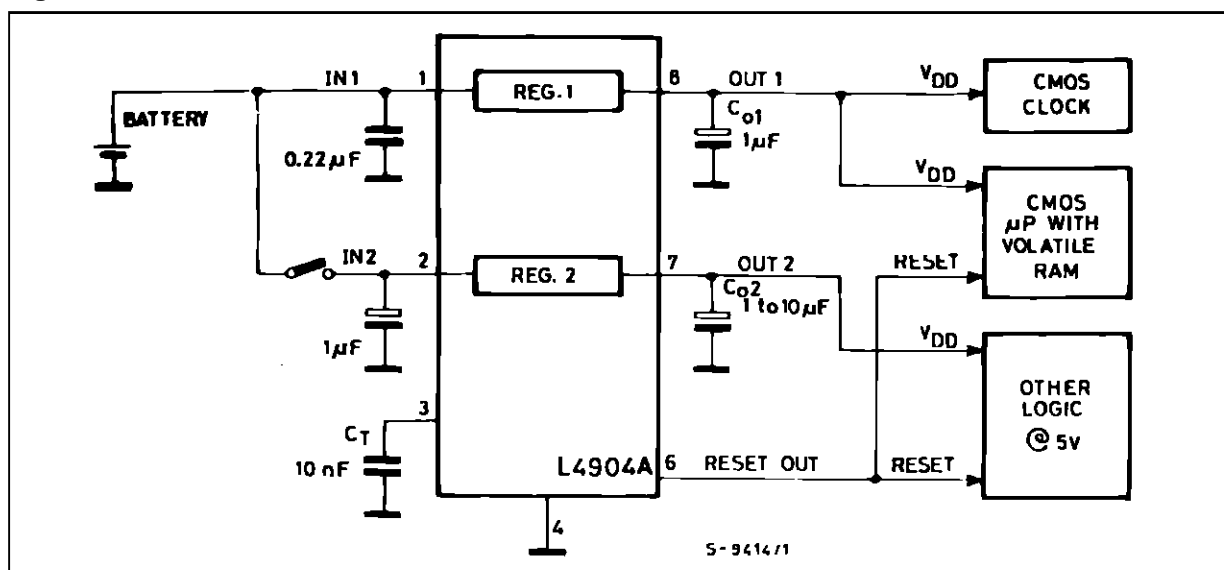
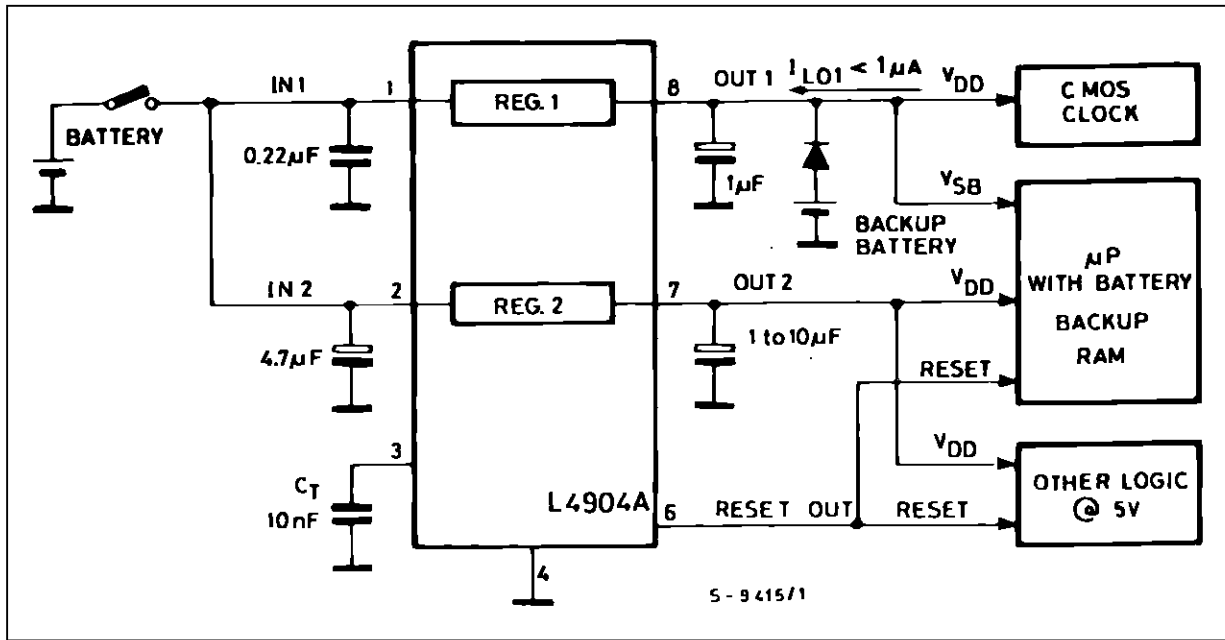
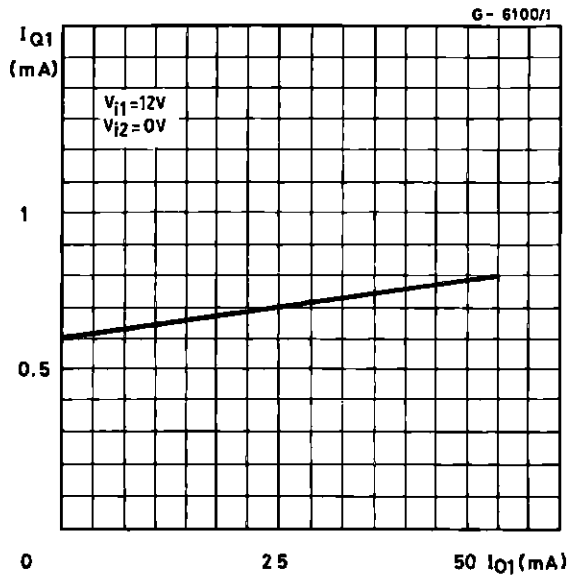


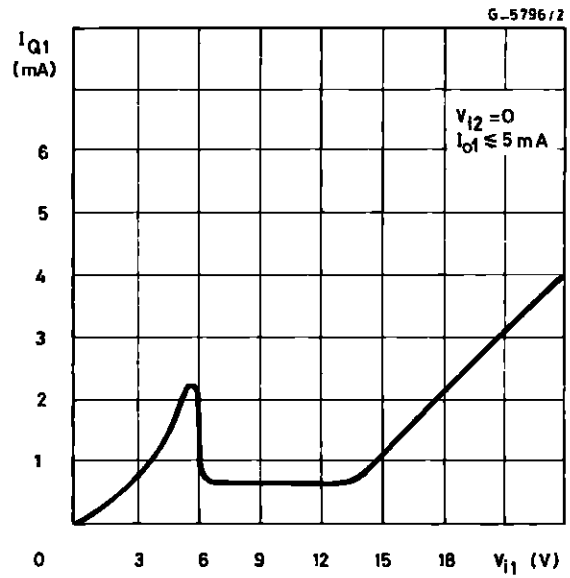
Figure 4



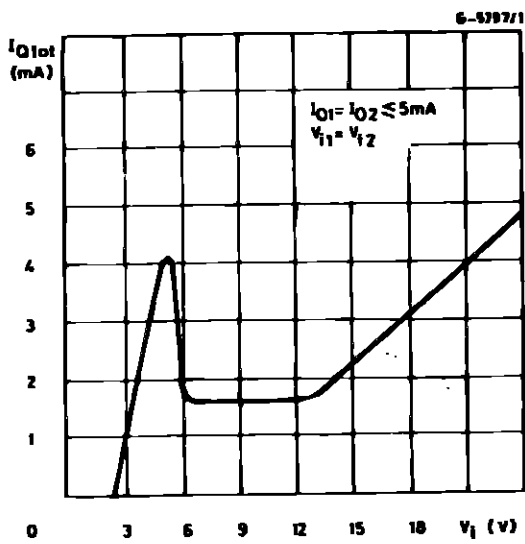
**Figure 5 :** Quiescent Current (reg. 1) versus Output Current



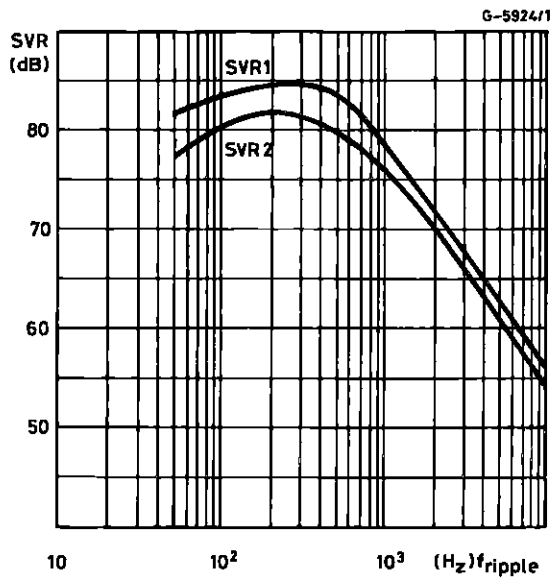
**Figure 6 :** Quiescent Current (reg. 1) versus Input Voltage



**Figure 7 :** Total Quiescent Current versus Input Voltage

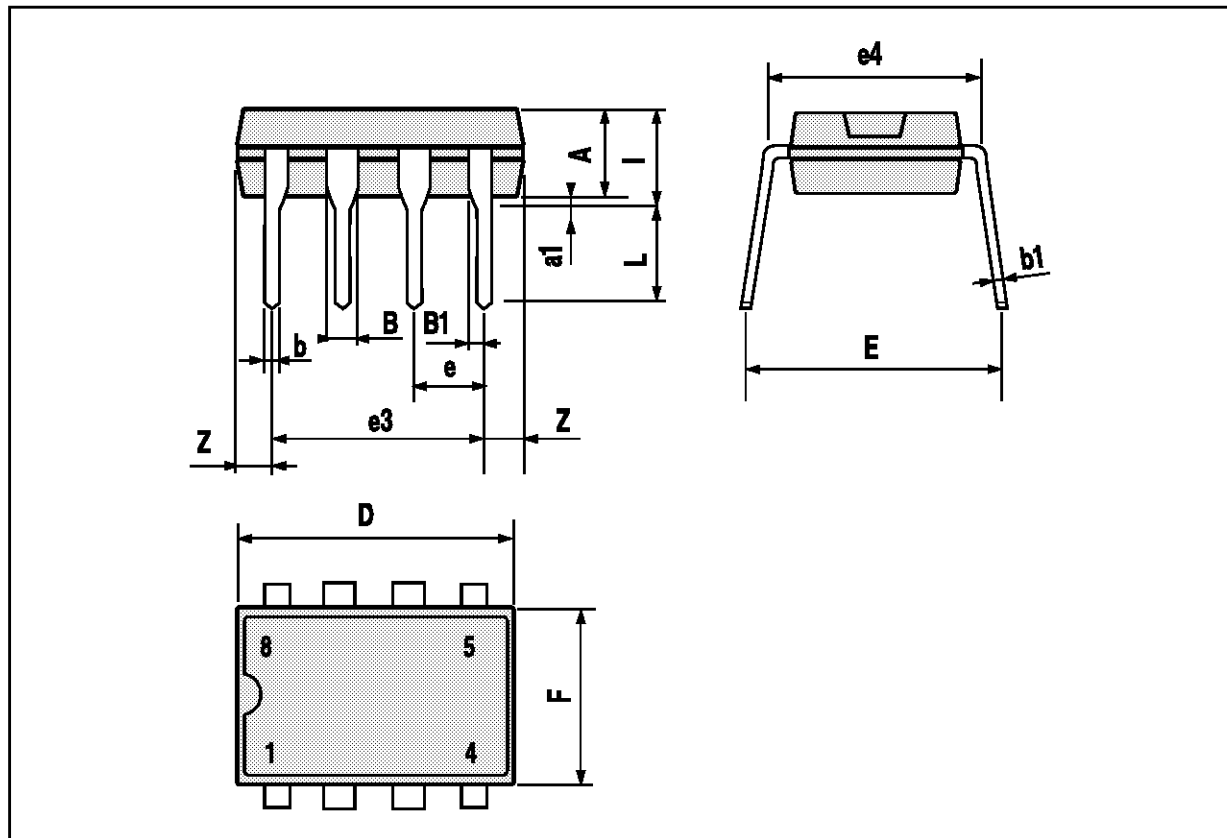


**Figure 8 :** Supply Voltage Rejection Regulators 1 and 2 versus Input Ripple Frequency



MINIDIP PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060



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