SGS-THOMSON MICROELECTRONICS

L4905

DUAL 5V REGULATOR WITH RESET

ADVANCE DATA

- DOUBLE BATTERY OPERATING
- OUTPUT CURRENTS: $I_{01} = 200mA$ $I_{02} = 300mA$
- FIXED PRECISION OUTPUT VOLTAGE 5V ± 1%
- 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 1μA AT OUTPUT 1
- LOW QUIESCIENT CURRENT (INPUT 1)
- INPUT OVERVOLTAGE PROTECTION UP TO 60V
- RESET OUTPUT HIGH
- OUTPUT TRANSISTORS SOA PROTECTION
- SHORT CIRCUIT AND THERMAL OVERLOAD PROTECTION

The L4905 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.

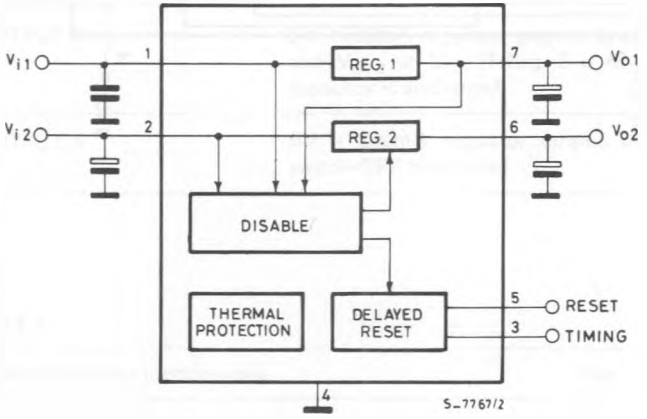
Heptawatt

ORDERING NUMBER: L4905

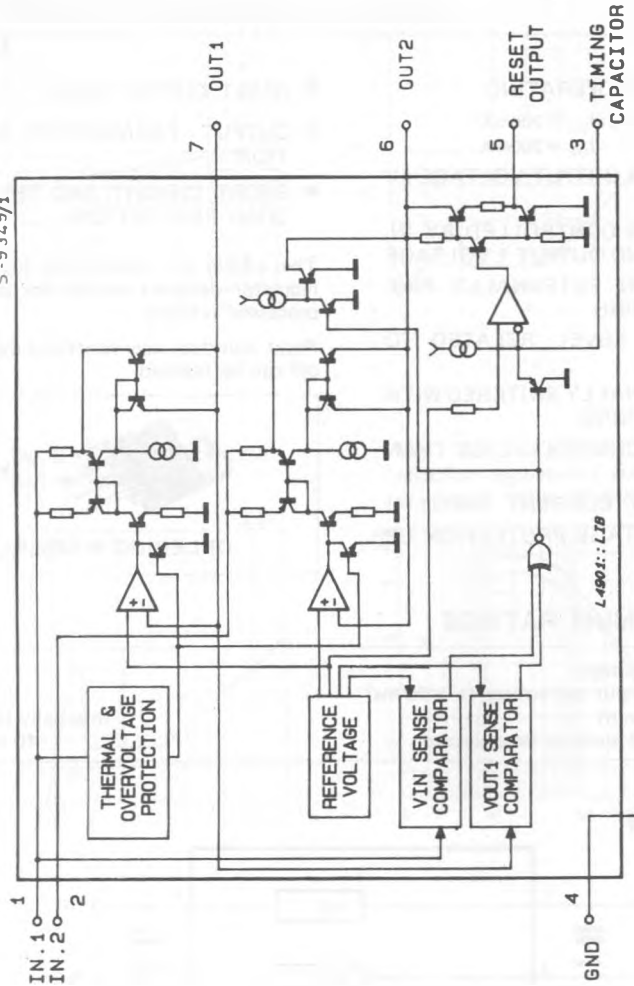
ABSOLUTE MAXIMUM RATINGS

V_{IN}	DC input voltage	28	V
	Transient input overvoltage (t = 40 ms)	60	V
I_o	Output current	internally limited	
T_j	Storage and junction temperature	-40 to 150	°C

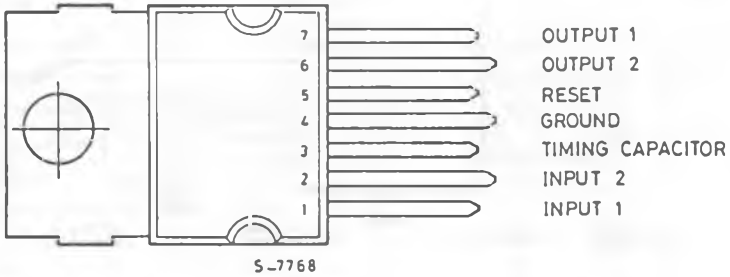
BLOCK DIAGRAM



SCHEMATIC DIAGRAM



CONNECTION DIAGRAM
(Top view)



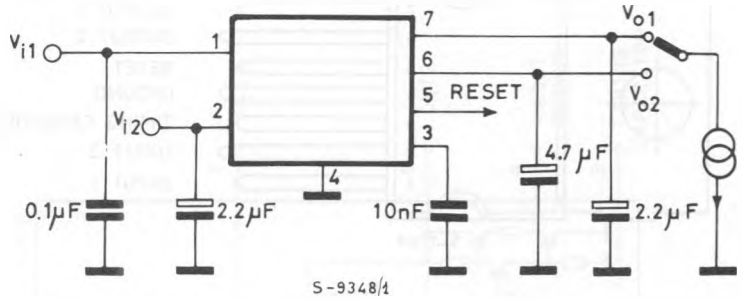
PIN FUNCTIONS

N°	NAME	FUNCTION
1	INPUT 1	Low quiescent current 200mA regulator input.
2	INPUT 2	300mA regulator input.
3	TIMING CAPACITOR	If Reg. 2 is switched-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	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} (ms) = C_t (nF)
6	OUTPUT 2	5V - 300mA regulator output. Enabled if $V_{O1} > V_{RT}$ and $V_{IN2} > V_{IT}$. If Reg. 2 is switched-OFF the C_{02} capacitor is discharged.
7	OUTPUT 1	5V - 200mA regulator output with low leakage (in switch-OFF condition).

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	4	°C/W

TEST CIRCUIT



ELECTRICAL CHARACTERISTICS ($V_{IN1} = V_{IN2} = 14,4V$, $T_{amb} = 25°$ unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
V_i	DC operating input voltage				24	V
V_{01}	Output voltage 1	R load 1KΩ	5.0	5.05	5.1	V
V_{02H}	Output voltage 2 HIGH	R load 1KΩ	V_{01}-0.1	5	V_{01}	V
V_{02L}	Output voltage 2 LOW	I_{02} = -5mA		0.1		V
I_{01}	Output current 1	ΔV_{01} = -100mV	200			mA
I_{L01}	Leakage output 1 current	V_{IN} = 0 $V_{01} \leq 3V$			1	μA
I_{02}	Output current 2	ΔV_{02} = -100mV	300			mA
V_{i01}	Output 1 dropout voltage (*)	I_{01} = 10mA I_{01} = 100mA I_{01} = 200mA		0.7 0.8 1.05	0.8 1 1.3	V V
V_{IT}	Input threshold voltage		V_{01}+1.2	6.4	V_{01}+1.7	V
V_{ITH}	Input threshold voltage hyst.			250		mV
ΔV_{01}	Line regulation 1	7V < V_{IN} < 24V I_{01} = 5mA		5	50	mV
ΔV_{02}	Line regulation 2	I_{02} = 5mA		5	50	mV
ΔV_{01}	Load regulation 1	5mA < I_{01} < 200mA		40	80	mV
ΔV_{02}	Load regulation 2	5mA < I_{02} < 300mA		50	100	mV
I_Q	Quiescent current	0 < V_{IN} < 13V 7V < V_{IN} < 13V $I_{02} = I_{01} \leq 5mA$		4.5 1.6	6.5 3.5	mA mA
I_{Q1}	Quiescent current 1	6.3V < V_{IN1} < 13V V_{IN2} = 0 $I_{01} \leq 5mA$ I_{02} = 0		0.6	0.9	mA

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
V_{RT}	Reset threshold voltage		V_{02}-0.15	4.9	V_{02}-0.05	V
V_{RTH}	Reset threshold hysteresis		30	50	80	mV
V_{RH}	Reset output voltage HIGH	I_R = 500μA	V_{02}-1	4.12	V_{02}	V
V_{RL}	Reset output voltage LOW	I_R = -5mA		0.25	0.4	V
t_{RD}	Reset pulse delay	C_t = 10nF	3	5	11	ms
t_d	Timing capacitor discharge time	C_t = 10nF			20	μs
$\frac{\Delta V_{01}}{\Delta T}$	Thermal drift	-20°C ≤ T_{amb} ≤ 125°C		0.3 -0.8		mV/°C
$\frac{\Delta V_{02}}{\Delta T}$	Thermal drift	-20°C ≤ T_{amb} ≤ 125°C		0.3 -0.8		mV/°C
SVR1	Supply voltage rejection	f = 100Hz V_R = 0.5V I_o = 100mA	54 50	84		dB
SVR2	Supply voltage rejection		50	80		dB
T_{JSD}	Thermal shut down			150		°C

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

APPLICATION INFORMATION

In power supplies for μP 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 L4905 makes it very easy to supply such equipments; it provides two voltage regulators (both 5V high precision) with separate inputs plus a reset output for the data save function.

CIRCUIT OPERATION (see Fig. 1)

After switch on Reg. 1 saturates until V_{01} 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_{02}) switches on and the reset output (V_R) also goes high after a programmable time T_{RD} (timing capacitor).

V_{02} 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 ($V_{01} < V_{RT}$);
- 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_{01} output features:

- 5V internal reference without voltage divider between the output and the error comparator;
- very low drop series regulator element utilizing current mirrors;
- permit high output impedance and then very low leakage current error even in power down condition.

This output may therefore be used to supply circuits continuously, such as volatile RAMs, allowing the use of a back-up battery. The V_{01}

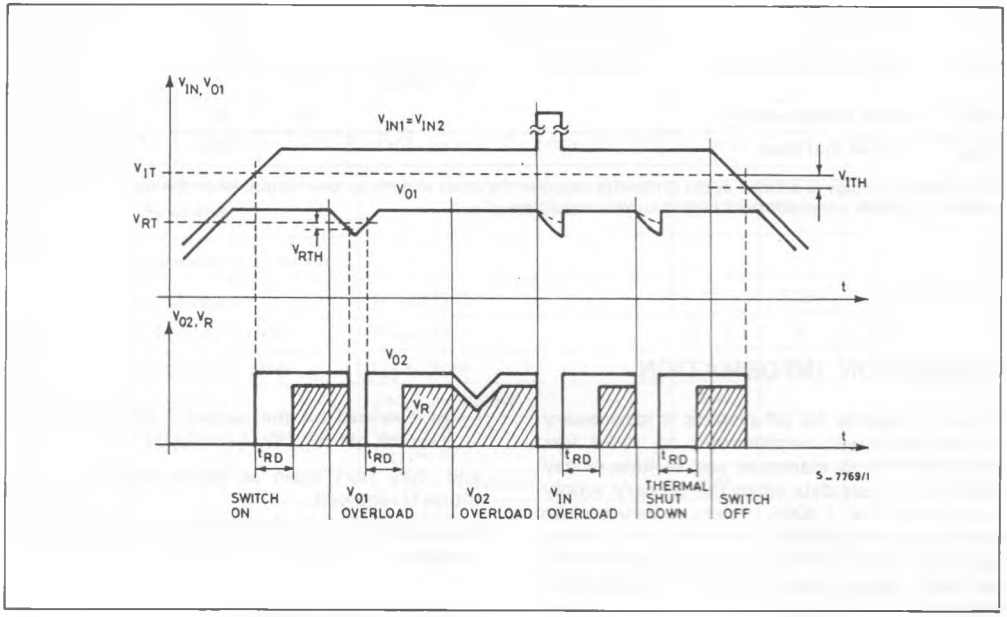
CIRCUIT OPERATION (continued)

regulator also features low consumption (0.6mA typ.) to minimize battery drain in applications where the V_1 regulator is permanently connected to a battery supply.

The V_{02} output can supply other non essential 5V circuits wich 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.

Fig. 1



APPLICATION SUGGESTIONS

Fig. 2 shows an application circuit for a μP system typically used in trip computers or in car radios with programmable tuning.

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.

Fig. 4 shows the L4905 with a back up battery on the V_{01} output to maintain a CMOS time-of-day clock and a stand by type N-MOS μP. 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 SUGGESTION (continued)

Fig. 2

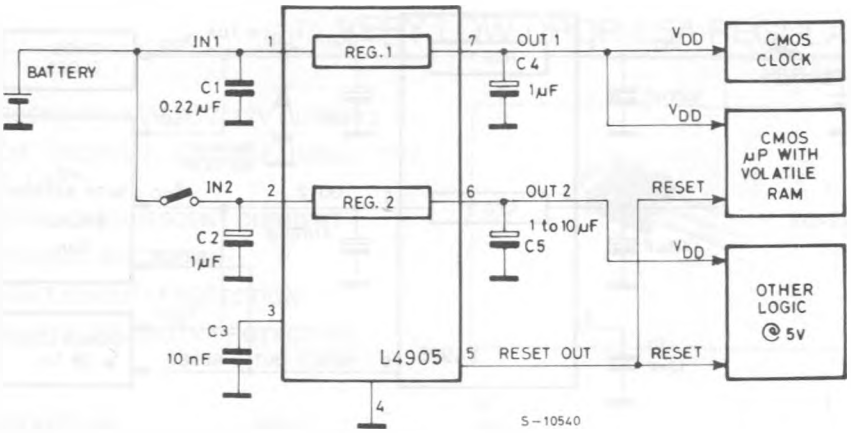
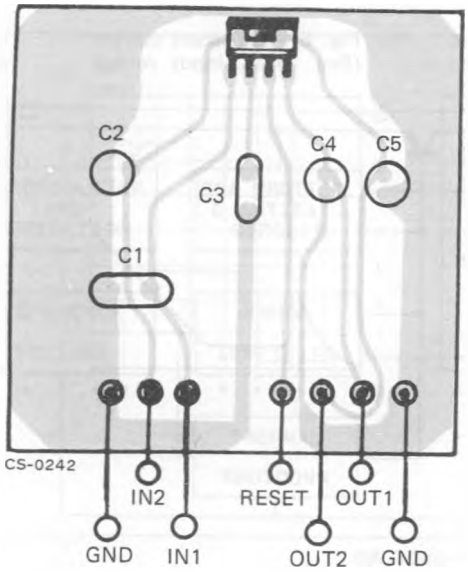


Fig. 3 - P.C. board component layout of fig. 2 (1 : 1 scale)



APPLICATION SUGGESTION (continued)

Fig. 4

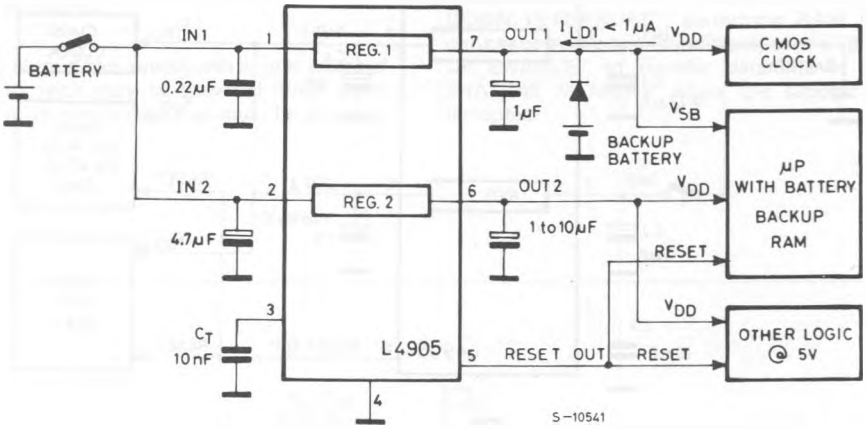


Fig. 5 - Quiescent current (Reg. 1) vs. output current

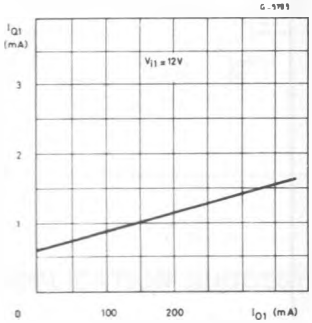


Fig. 6 - Quiescent current (Reg. 1) vs. input voltage

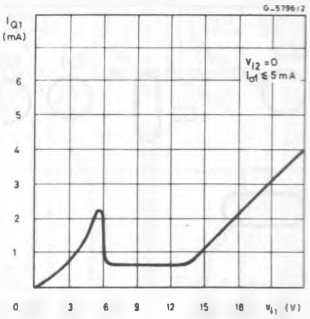


Fig. 7 - Total quiescent current vs. input voltage