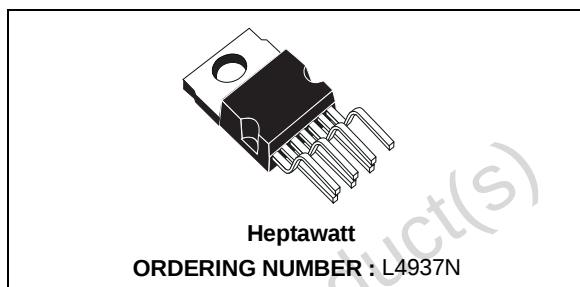


## DUAL MULTIFUNCTION VOLTAGE REGULATOR

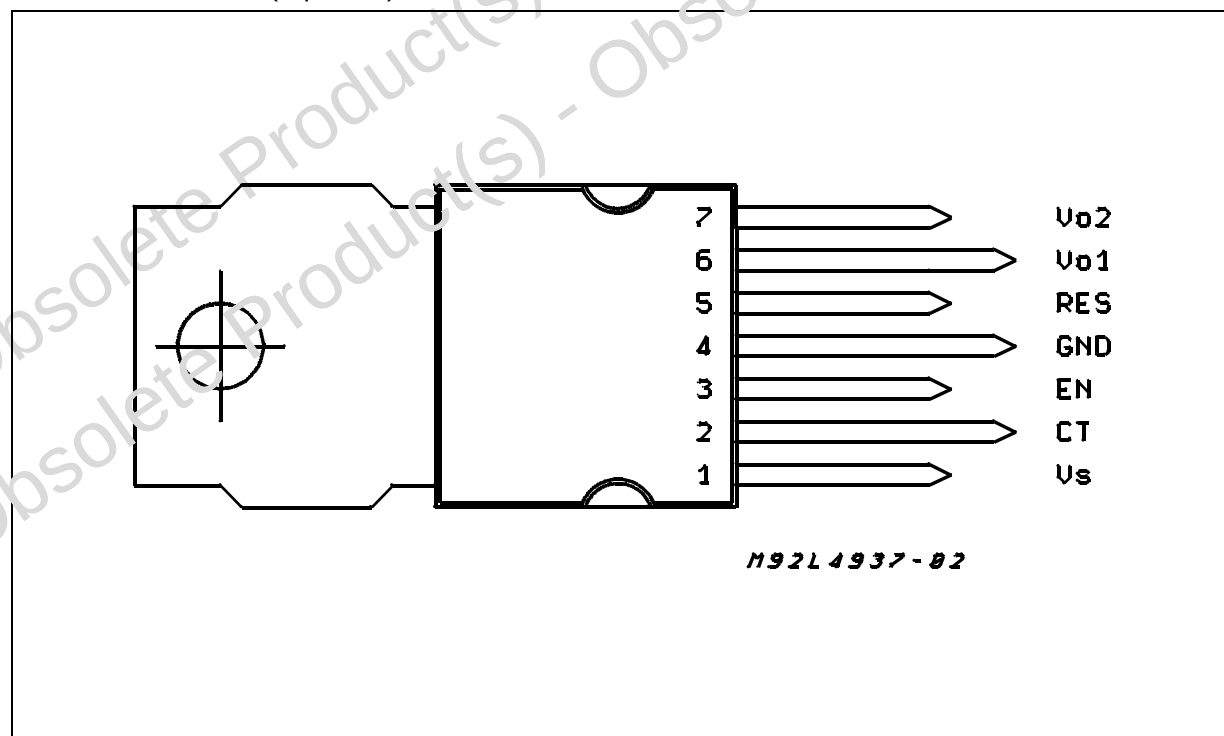
- STANDBY OUTPUT VOLTAGE PRECISION  $5V \pm 2\%$
- OUTPUT 2 TRACKED TO THE STANDBY OUTPUT
- OUTPUT 2 DISABLE FUNCTION FOR STANDBY MODE
- VERY LOW QUIESCENT CURRENT, LESS THAN  $250\mu A$ , IN STANDBY MODE
- OUTPUT CURRENTS :  $I_{O1} = 50mA$ ,  $I_{O2} = 500mA$
- VERY LOW DROPOUT (max  $0.4V/0.6V$ )
- OPERATING TRANSIENT SUPPLY VOLTAGE UP TO  $40V$
- POWER-ON RESET CIRCUIT SENSING THE STANDBY OUTPUT VOLTAGE
- POWER-ON RESET DELAY PULSE DEFINED BY THE EXTERNAL CAPACITOR
- THERMAL SHUTDOWN AND SHORT CIRCUIT PROTECTIONS



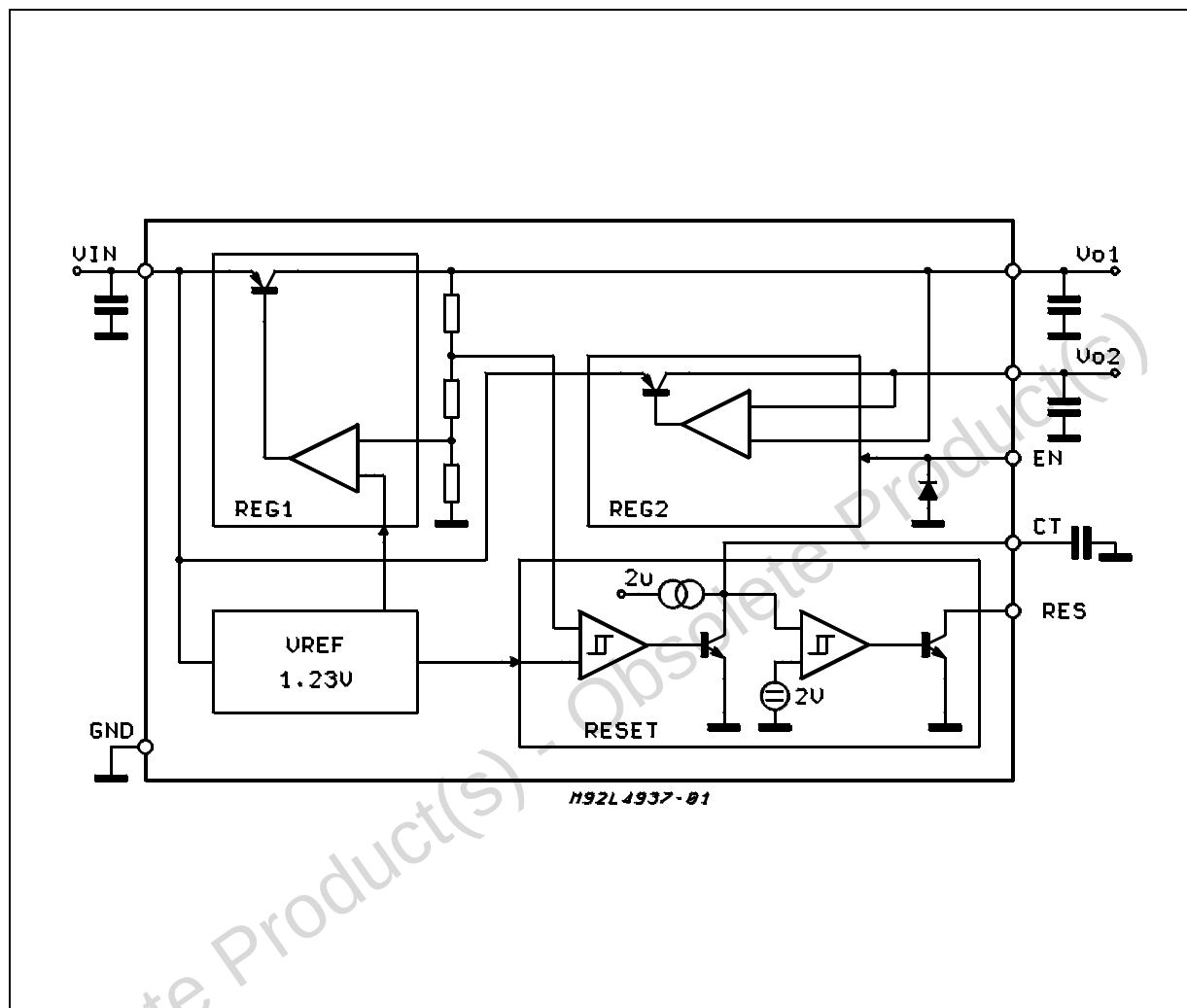
### DESCRIPTION

The L4937N is a monolithic integrated dual voltage regulators with two very low dropout outputs and additional functions such as power-on reset and input voltage sense. It is designed for supplying micro-computer controlled systems specially in automotive applications.

### PIN CONNECTION (top view)



## BLOCK DIAGRAM



## THERMAL DATA

| Symbol                | Parameter                        | Value | Unit |
|-----------------------|----------------------------------|-------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case | 3     | °C/W |



**ELECTRICAL CHARACTERISTICS** ( $V_S = 14V$ ;  $-40^{\circ}C \leq T_J \leq 125^{\circ}C$  unless otherwise specified)

| Symbol            | Parameter                                                    | Test Conditions                                                                              | Min.     | Typ.       | Max.        | Unit               |
|-------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------|------------|-------------|--------------------|
| $V_S$             | Operating Supply Voltage                                     |                                                                                              |          |            | 25          | V                  |
| $V_{O1}$          | Standby Output Voltage                                       | $6V \leq V_S \leq 25V$<br>$1mA \leq I_{O1} \leq 50mA$                                        | 4.90     | 5.00       | 5.10        | V                  |
| $V_{O2} - V_{O1}$ | Output Voltage 2 Tracking Error (note 1)                     | $6V \leq V_S \leq 25V$<br>$5mA \leq I_{O2} \leq 500mA$<br>Enable = LOW                       | -25      |            | +25         | mV                 |
| $V_{DP1}$         | Dropout Voltage 1                                            | $I_{O1} = 10mA$<br>$I_{O1} = 50mA$                                                           |          | 0.1<br>0.2 | 0.25<br>0.4 | V<br>V             |
| $V_{IO1}$         | Input to Output Voltage Difference in Undervoltage Condition | $V_S = 4V$ , $I_{O1} = 35mA$                                                                 |          |            | 0.4         | V                  |
| $V_{DP2}$         | Dropout Voltage 2                                            | $I_{O2} = 100mA$<br>$I_{O2} = 500mA$                                                         |          | 0.2<br>0.3 | 0.3<br>0.6  | V<br>V             |
| $V_{IO2}$         | Input to Output Voltage Difference in Undervoltage Condition | $V_S = 4.6V$ , $I_{O2} = 350mA$                                                              |          |            | 0.6         | V                  |
| $V_{OL1,2}$       | Line Regulation                                              | $6V \leq V_S \leq 25V$<br>$I_{O1} = 1mA$ ; $I_{O2} = 5mA$                                    |          |            | 20          | mV                 |
| $V_{OLO1}$        | Load Regulation 1                                            | $1mA \leq I_{O1} \leq 50mA$                                                                  |          |            | 25          | mV                 |
| $V_{OLO2}$        | Load Regulation 2                                            | $5mA \leq I_{O2} \leq 500mA$                                                                 |          |            | 50          | mV                 |
| $I_{LIM1}$        | Current Limit 1                                              | $V_{O1} = 4.5V$<br>$V_{O1} = 0V$ (note 2)                                                    | 55<br>25 | 100<br>50  | 200<br>100  | mA<br>mA           |
| $I_{LIM2}$        | Current Limit 2                                              | $V_{O2} = 0V$                                                                                | 550      | 1000       | 1700        | mA                 |
| $I_{QSB}$         | Quiescent Current Standby Mode (output 2 disabled)           | $I_{O1} = 0.3mA$ ; $T_J < 100^{\circ}C$<br>$V_{EN} \geq 2.4V$<br>$V_S = 14V$<br>$V_S = 3.5V$ |          | 210<br>340 | 290<br>850  | $\mu A$<br>$\mu A$ |
| $I_Q$             | Quiescent Current                                            | $I_{O1} = 50mA$<br>$I_{O1} = 500mA$                                                          |          |            | 30          | mA                 |

**ENABLE**

|              |                                            |                                              |           |           |            |                    |
|--------------|--------------------------------------------|----------------------------------------------|-----------|-----------|------------|--------------------|
| $V_{ENL}$    | Enable Input LOW Voltage (output 2 active) |                                              | -0.3      |           | 1.5        | V                  |
| $V_{ENH}$    | Enable Input HIGH Voltage                  |                                              | 2.4       |           | 7          | V                  |
| $V_{ENhyst}$ | Enable Hysteresis                          |                                              | 30        | 75        | 200        | mV                 |
| $I_{EN}$     | Enable Input Current                       | $0V < V_{EN} < 1.2V$<br>$2.5V < V_{EN} < 7V$ | -10<br>-1 | -1.5<br>0 | -0.5<br>+1 | $\mu A$<br>$\mu A$ |

**ELECTRICAL CHARACTERISTICS** (continued)**RESET**

| Symbol           | Parameter                             | Test Conditions                                   | Min.           | Typ. | Max.           | Unit    |
|------------------|---------------------------------------|---------------------------------------------------|----------------|------|----------------|---------|
| $V_{Rt}$         | Reset Low Threshold Voltage           | $V_S = 14V$                                       | $V_{o1} - 0.4$ | 4.7  | $V_{o1} - 0.1$ | V       |
| $V_{Rth}$        | Reset Threshold Hysteresis            |                                                   | 50             | 100  | 200            | mV      |
| $t_{RD}$         | Reset Pulse Delay                     | $C_T = 100nF$ ; $t_R > 100\mu s$                  | 55             | 100  | 180            | ms      |
| $t_{RR}$         | Reset Reaction Time                   | $C_T = 100nF$                                     | 1              | 10   | 50             | $\mu s$ |
| $V_{RL}$         | Reset Output LOW Voltage              | $R_{RES} = 10K\Omega$ to $V_{o1}$ $V_S \geq 1.5V$ |                |      | 0.4            | V       |
| $I_{LRES}$       | Reset Output HIGH Leakage             | $V_{RES} = 5V$                                    |                |      | 1              | $\mu A$ |
| $V_{CTth}$       | Delay Comparator Threshold            |                                                   |                | 2.0  |                | V       |
| $V_{CTth, hyst}$ | Delay Comparator Threshold Hysteresis |                                                   |                | 100  |                | mV      |

**Note :** 1 :  $V_{o2}$  connected to ADJ. $V_{o2}$  can be set to higher values by inserting an external resistor divider.  
2 : Foldback characteristic

**FUNCTIONAL DESCRIPTION**

The L4937N is based on the SGS-THOMSON Microelectronics modular voltage regulator approach. Several out-standing features and auxiliary functions are provided to meet the requirements of supplying the microprocessor systems used in automotive applications.

Furthermore the device is suitable also in other applications requiring two stabilized voltages.

The modular approach allows other features and functions to be realized easily when required.

**STANDBY REGULATOR**

The standby regulator uses an Isolated Collector Vertical PNP transistor as the regulating element. This structure allows a very low dropout voltage at currents up to 50mA. The dropout operation of the standby regulator is maintained down to 2V input supply voltage. The output voltage is regulated up to the transient input supply voltage of 40V. This feature avoids functional interruptions which could be generated by overvoltage pulses.

The typical curve of the standby output voltage as a function of the input supply voltage is shown in fig. 1.

The current consumption of the device (quiescent current) is less than 250 $\mu A$  when output 2 is disabled (standby mode). The dropout voltage is controlled to reduce the quiescent current peak in the undervoltage region and to improve the transient response in this region.

The quiescent current is shown in fig. 2 as a function of the supply input voltage 2.

**OUTPUT 2 VOLTAGE**

The output 2 regulator uses the same output structure as the standby regulator, but rated for an output current of 500mA.

The output 2 regulator works in tracking mode with the standby output voltage as a reference voltage.

The output 2 regulator can be switched off via the Enable input.

Figure 1 : Output Voltage vs. Input Voltage.

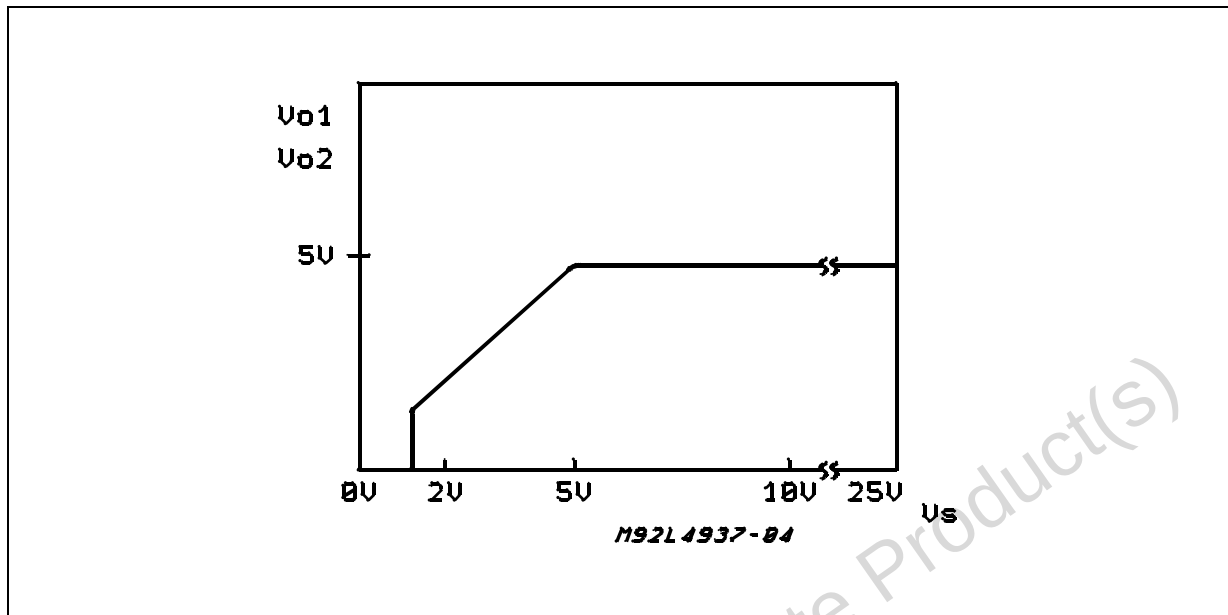
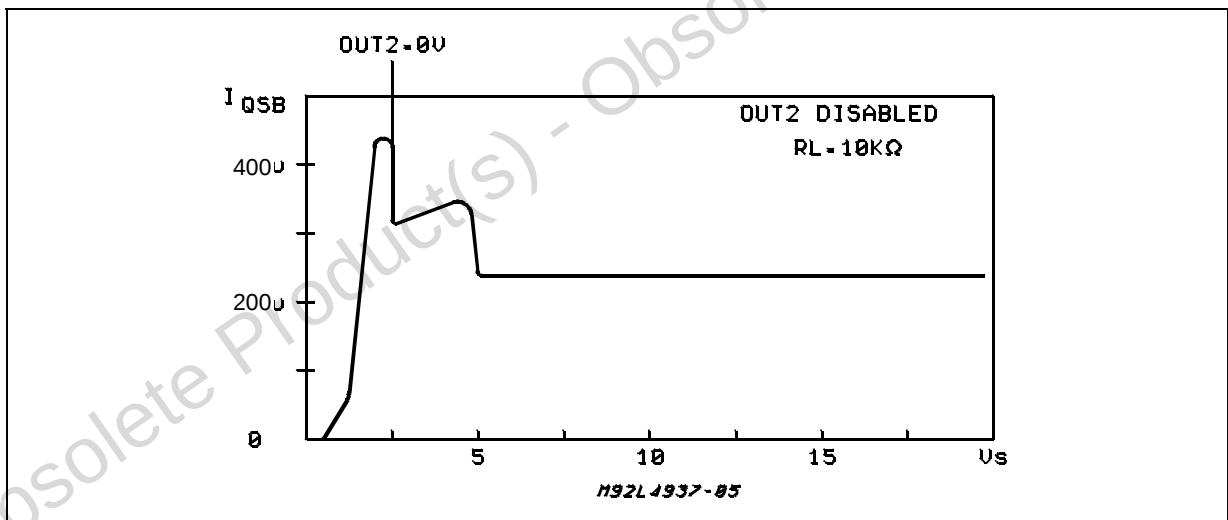


Figure 2 : Quiescent Current vs. Supply Voltage.



## RESET CIRCUIT

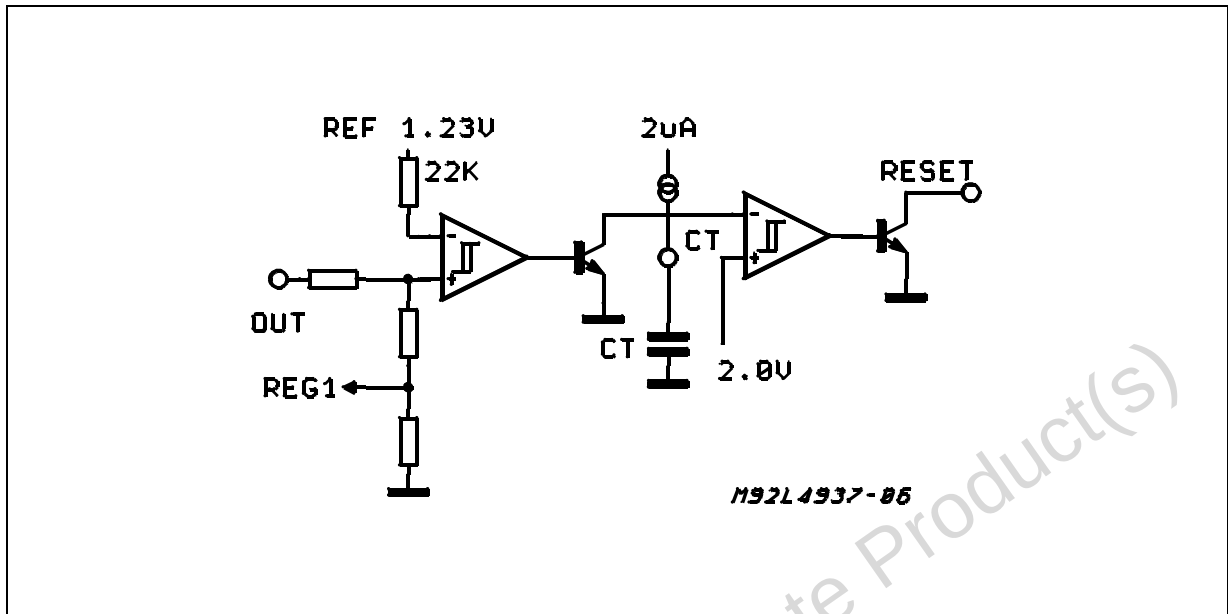
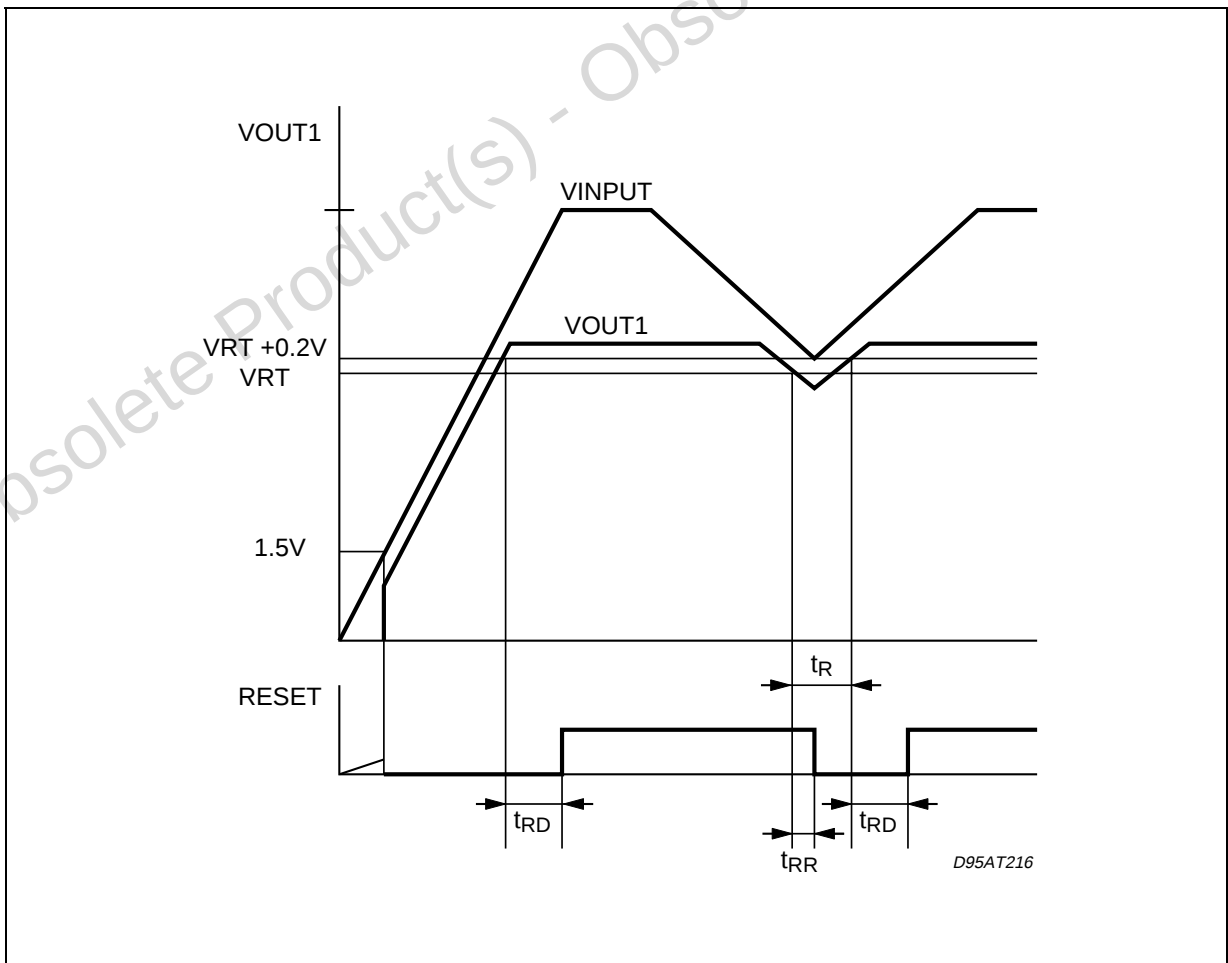
The block circuit diagram of the reset circuit is shown in fig. 3. The reset circuit supervises the standby output voltage. The reset threshold of 4.7V is defined by the internal reference voltage and the standby output divider.

The reset pulse delay time  $t_{RD}$ , is defined by the charge time of an external capacitor  $C_T$  :

$$t_{RD} = \frac{C_T \times 2V}{2\mu A}$$

The reaction time of the reset circuit depends on the discharge time limitation of the reset capacitor  $C_T$  and is proportional to the value of  $C_T$ .

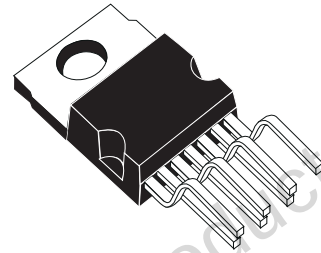
The reaction time of the reset circuit increases the noise immunity. In fact, if the standby output voltage drops below the reset threshold for a time shorter than the reaction time  $t_{RR}$ , no reset output variation occurs. The nominal reset delay is generated for standby output voltage drops longer than the time necessary for the complete discharging of the capacitor  $C_T$ . This time is typically equal to 50µs if  $C_T = 100nF$ . The typical reset output waveforms are shown in fig.

**Figure 3 :** Block Diagram of the Reset Circuit.**Figure 4 :** Typical Reset Output Waveforms.

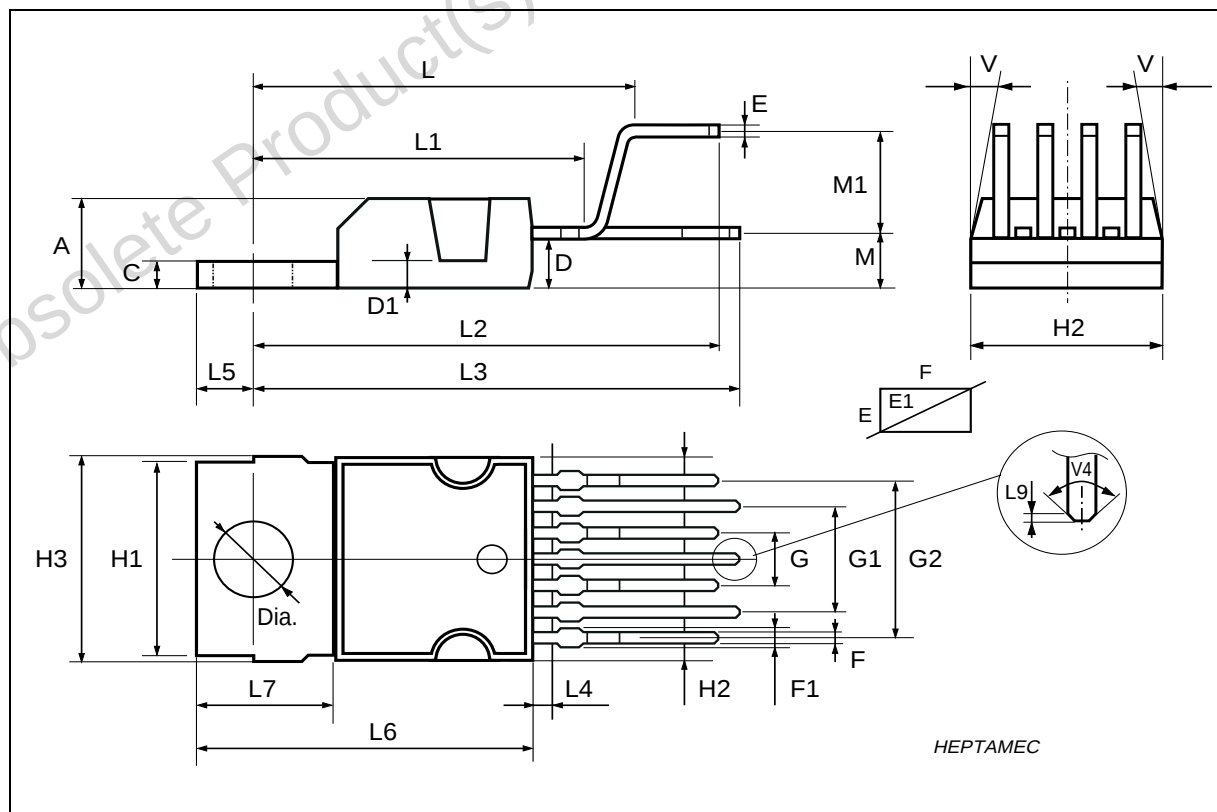
## L4937N

| 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 |
| E1   | 0.7        |       | 0.97  | 0.028 |       | 0.038 |
| F    | 0.6        |       | 0.8   | 0.024 |       | 0.031 |
| F1   |            |       | 0.9   |       |       | 0.035 |
| G    | 2.34       | 2.54  | 2.74  | 0.095 | 0.100 | 0.105 |
| G1   | 4.88       | 5.08  | 5.28  | 0.193 | 0.200 | 0.205 |
| G2   | 7.42       | 7.62  | 7.82  | 0.295 | 0.300 | 0.307 |
| H2   |            |       | 10.4  |       |       | 0.409 |
| H3   | 10.05      |       | 10.4  | 0.396 |       | 0.409 |
| L    | 16.7       | 16.9  | 17.1  | 0.657 | 0.668 | 0.673 |
| L1   |            | 14.92 |       |       | 0.587 |       |
| L2   | 21.24      | 21.54 | 21.84 | 0.386 | 0.848 | 0.860 |
| L3   | 22.27      | 22.52 | 22.77 | 0.877 | 0.891 | 0.896 |
| L4   |            |       | 1.29  |       |       | 0.051 |
| L5   | 2.6        | 2.8   | 3     | 0.102 | 0.110 | 0.118 |
| L6   | 15.1       | 15.5  | 15.8  | 0.594 | 0.610 | 0.622 |
| L7   | 6          | 6.35  | 6.6   | 0.236 | 0.250 | 0.260 |
| L9   |            | 0.2   |       |       | 0.008 |       |
| M    | 2.55       | 2.8   | 3.05  | 0.100 | 0.110 | 0.120 |
| M1   | 4.83       | 5.08  | 5.33  | 0.190 | 0.200 | 0.210 |
| V4   | 40° (typ.) |       |       |       |       |       |
| Dia  | 3.65       |       | 3.85  | 0.144 |       | 0.152 |

### OUTLINE AND MECHANICAL DATA



### Heptawatt V



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