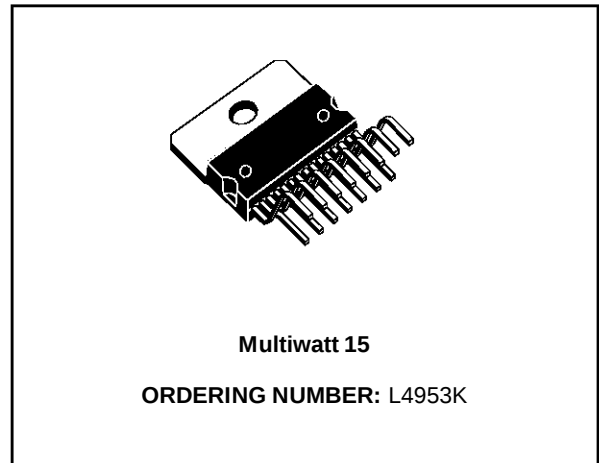


## MULTIFUNCTION VOLTAGE REGULATOR FOR CAR RADIO

PRELIMINARY DATA

- 3 OUTPUTS:  
8.25V (500mA); 5V (1A); 5V (100mA) STANDBY
- OUT1 (8.25V) AND OUT2 (5V) WITH INDEPENDENT ENABLE CONTROL FOR STANDBY MODE
- 1.5A HIGH SIDE DRIVER WITH CLAMPED OUTPUT (16V)
- LOGIC OUTPUT FOR:
  - SUPPLY UNDERVOLTAGE (LVW)
  - OVERVOLTAGE (FAULT)
  - THERMAL PROTECTION (FAULT)
- RESET FUNCTION
- IGNITION COMPARATOR
- REVERSE BATTERY AND LOAD DUMP PROTECTION
- THERMAL SHUTDOWN



### DESCRIPTION

The L4953K contains a triple voltage regulator and a power switch.

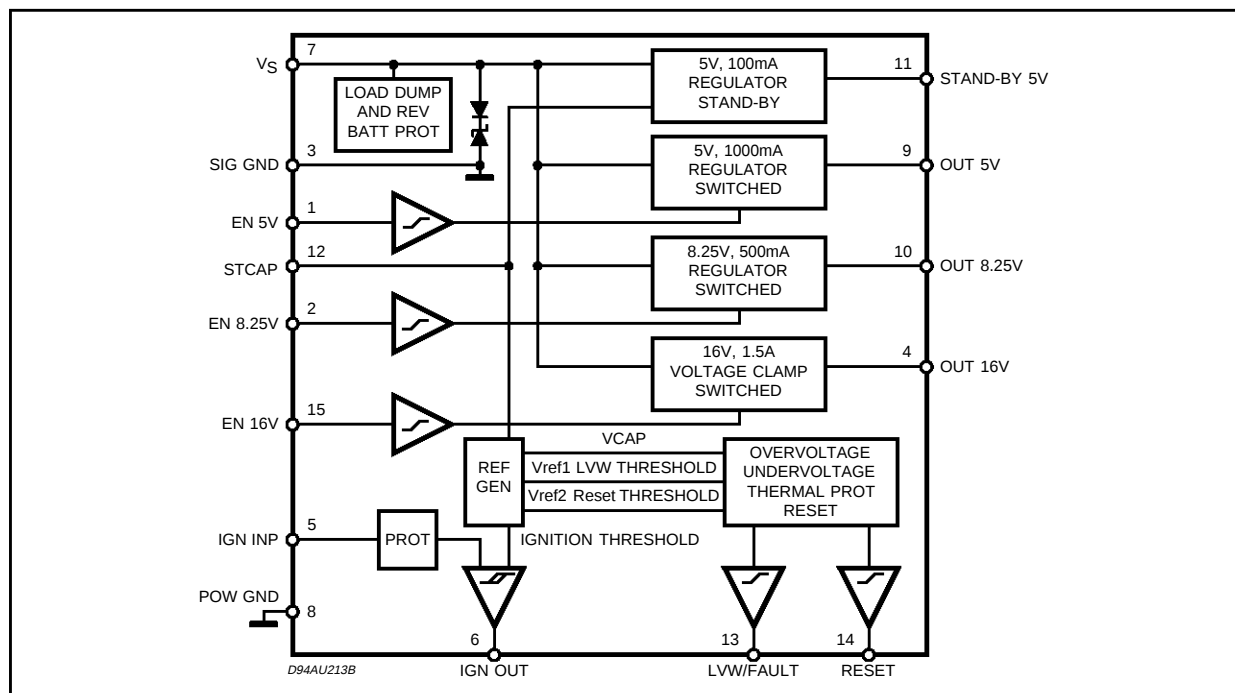
The IC includes a monitoring circuit to warn if a

low voltage or no voltage condition is occurring.

In stand-by output is active as long as possible even when in thermal shutdown or any other fault conditions.

The STCAP pin allows the use of a reserve supply capacitor that will hold enough energy for the 5V Stand-by line to allow the  $\mu$ P to store data.

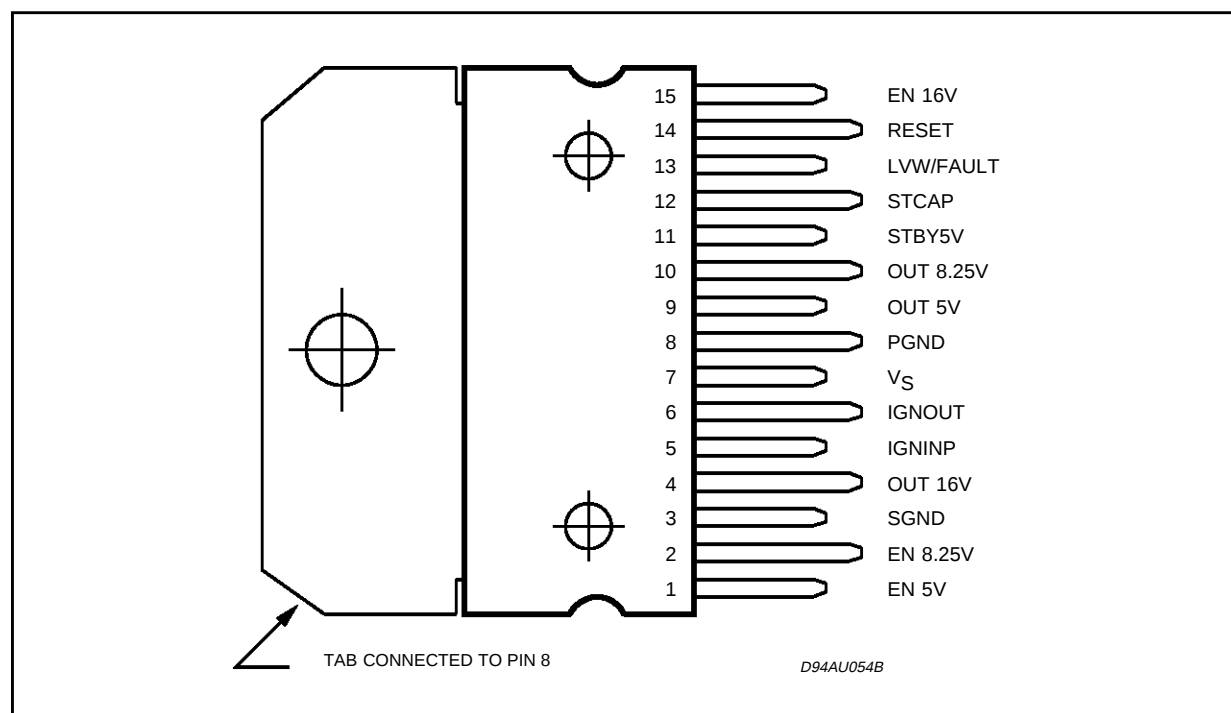
### BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter                   | Value              | Unit |
|------------------|-----------------------------|--------------------|------|
| V <sub>SDC</sub> | DC Operating Supply Voltage | –14 to 28          | V    |
| V <sub>STR</sub> | Transient Supply Voltage    | 50                 | V    |
| I <sub>O</sub>   | Output Current              | internally limited |      |
| T <sub>op</sub>  | Operating Temperature Range | –40 to 85          | °C   |
| T <sub>stg</sub> | Storage Temperature         | –55 to 150         | °C   |

## PIN CONNECTION (Top view)



## THERMAL DATA

| Symbol                 | Parameter                        | Value | Unit |
|------------------------|----------------------------------|-------|------|
| R <sub>th j-case</sub> | Thermal Resistance Junction-case | 2     | °C/W |

**ELECTRICAL CHARACTERISTICS** ( $V_S = 14V$ ,  $T_{amb} = 25^\circ C$ , unless otherwise specified.)

| Symbol     | Parameter                             | Test Condition                              | Min. | Typ. | Max. | Unit       |
|------------|---------------------------------------|---------------------------------------------|------|------|------|------------|
| $V_S$      | Operating Supply Voltage              |                                             | 11   |      | 18   | V          |
| En         | Output Noise Voltage                  | Any reg. supply,<br>$f = 100Hz$ to $200KHz$ |      | 200  | 400  | $\mu V$    |
| $T_{shud}$ | Thermal Shutdown Junction Temperature |                                             |      | 155  |      | $^\circ C$ |

**5V STAND-BY OUTPUT VOLTAGE**

|                   |                              |                                  |      |     |      |    |
|-------------------|------------------------------|----------------------------------|------|-----|------|----|
| $V_{5st-by}$      | Stand-by Output Voltage      |                                  | 4.75 | 5   | 5.25 | V  |
| $\Delta V_{line}$ | Line Regulation              | $11V < V_S < 16V$                |      | 5   | 50   | mV |
| $\Delta V_{load}$ | Load Regulation              | $5mA < I_{out} < 100mA$          |      | 45  | 150  | mV |
| $V_{dropout}$     | Dropout Voltage              | $I_{out} = 100mA$ , $V_S = 5.5V$ |      | 0.2 | 0.6  | V  |
| $I_{qst-by}$      | Quiescent Current @ Stand-by |                                  |      | 0.3 | 0.5  | mA |

**5V/1000mA SWITCHED OUTPUT VOLTAGE**

|                   |                   |                               |      |     |      |            |
|-------------------|-------------------|-------------------------------|------|-----|------|------------|
| $V_{out5}$        | 5V Output Voltage | no load                       | 4.75 | 5   | 5.25 | V          |
| $\Delta V_{line}$ | Line Regulation   | $7V < V_S < 18V$              |      | 5   | 50   | mV         |
| $\Delta V_{load}$ | Load Regulation   | $5mA < I_{out} < 1A$          |      | 12  | 50   | mV         |
| $V_{dropout}$     | Dropout Voltage   | $I_{out} = 1A$ , $V_S = 5.5V$ |      | 1   | 1.5  | V          |
| $I_q$             | Quiescent Current | $75mA < I_{out} < 1A$         |      | 30  | 100  | mA         |
| SWon              | Switch ON         |                               | 3.5  |     |      | V          |
| SW off            | Switch OFF        |                               |      |     | 1.5  | V          |
| SW hyst           | Switch Hysteresis |                               | 100  | 200 | 350  | mV         |
| $R_{in}$          | Input Impedance   |                               | 25   | 40  | 50   | K $\Omega$ |

**8.25V/500mA SWITCHED OUTPUT VOLTAGE**

|                   |                          |                                         |          |      |     |            |
|-------------------|--------------------------|-----------------------------------------|----------|------|-----|------------|
| $V_{out}$         | 8.25V Output Voltage     | no load                                 | 7.9      | 8.25 | 8.6 | V          |
| $\Delta V_{line}$ | Line Regulation          | $11V < V_S < 18V$                       |          | 5    | 50  | mV         |
| $\Delta V_{load}$ | Load Regulation          | $I_{out} = 500mA$                       |          | 12   | 50  | mV         |
| $V_{dropout}$     | Dropout Voltage          | $I_{out} = 500mA$ , $5.5V < V_S < 8.8V$ |          | 0.4  | 0.9 | V          |
| $I_q$             | Quiescent Current        | $I_{out} = 500mA$                       |          | 10   | 25  | mA         |
| SVR               | Supply Voltage Rejection | $f = 100Hz$<br>$f = 10KHz$              | 55<br>40 | 75   |     | dB         |
| SWon              | Switch ON                |                                         | 3.5      |      |     | V          |
| SW off            | Switch OFF               |                                         |          |      | 1.5 | V          |
| SW hyst           | Switch Hysteresis        |                                         | 100      | 200  | 350 | mV         |
| $R_{in}$          | Input Impedance          |                                         | 25       | 40   | 50  | K $\Omega$ |

**HIGH SIDE DRIVER WITH CLAMPED OUTPUT (16V)**

|               |                           |                                   |     |     |      |            |
|---------------|---------------------------|-----------------------------------|-----|-----|------|------------|
| $V_{out16}$   | Max. Output Voltage       | $V_S = 18V$                       | 15  |     | 16.2 | V          |
| $I_o$         | Output Continuous Current | $V_S = 15V$                       | 1.5 |     |      | A          |
| $V_{dropout}$ | Dropout Voltage           | $I_{out} = 1A$ , $6V < V_S < 15V$ |     | 0.4 | 0.9  | V          |
| SWon          | Switch ON                 |                                   | 3.5 |     |      | V          |
| SW off        | Switch OFF                |                                   |     |     | 1.5  | V          |
| SW hyst       | Switch Hysteresis         |                                   | 100 | 200 | 350  | mV         |
| $R_{in}$      | Input Impedance           |                                   | 25  | 40  | 50   | K $\Omega$ |

**ELECTRICAL CHARACTERISTICS** (continued)LVW/FAULT (referred to  $V_S$ )

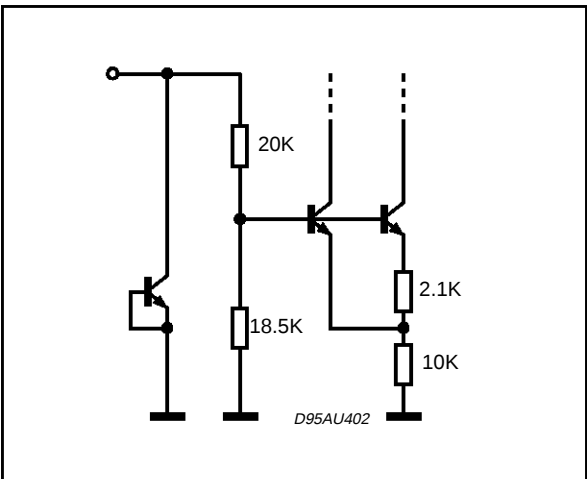
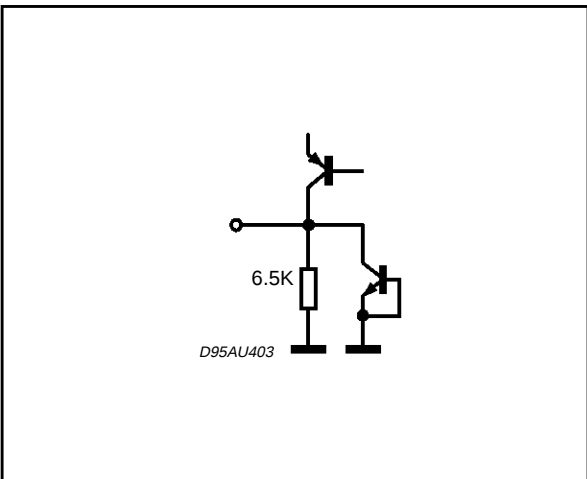
| Symbol                  | Parameter            | Test Condition | Min. | Typ. | Max. | Unit    |
|-------------------------|----------------------|----------------|------|------|------|---------|
| $THON_{LVW}$            | LVW ON Threshold     |                | 8.55 | 9.00 | 9.45 | V       |
| $THOFF_{LVW}$           | LVW OFF Threshold    |                | 8.75 | 9.20 | 9.65 | V       |
| $\Delta(LVW-out\ 8.25)$ | LVW- $V_{out\ 8.25}$ |                | 0.5  | 0.65 |      | V       |
| HYST                    | Threshold Hysteresis |                | 50   | 200  | 350  | mV      |
| $OUT_{LV}$              | LVW Output Voltage   |                |      |      | 1.5  | V       |
| $I_{leak}$              | Leakage Current      |                |      |      | 50   | $\mu A$ |

RESET (referred to 5V st-by)

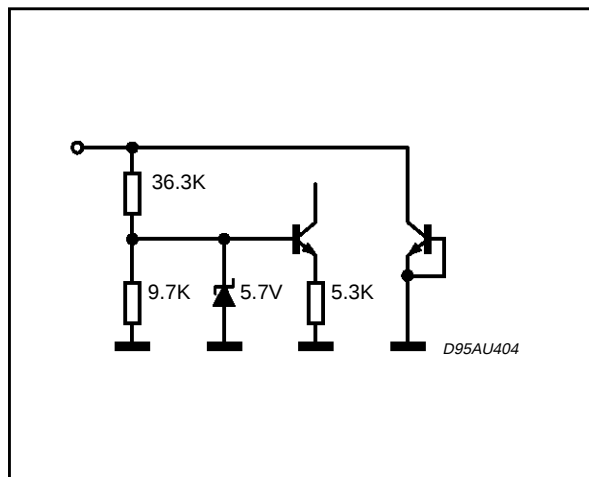
|                 |                            |  |     |     |     |         |
|-----------------|----------------------------|--|-----|-----|-----|---------|
| $THON_{reset}$  | Reset ON Threshold         |  | 3.6 | 3.8 | 4   | V       |
| $THOFF_{reset}$ | Reset OFF Threshold        |  | 3.8 | 4   | 4.2 | V       |
| $HYST_{reset}$  | Reset Threshold Hysteresis |  | 50  | 100 | 250 | mV      |
| $OUT_{reset}$   | Reset Output Voltage       |  |     |     | 1.5 | V       |
| $I_{leak}$      | Reset Leakage Current      |  |     |     | 50  | $\mu A$ |

IGNITION

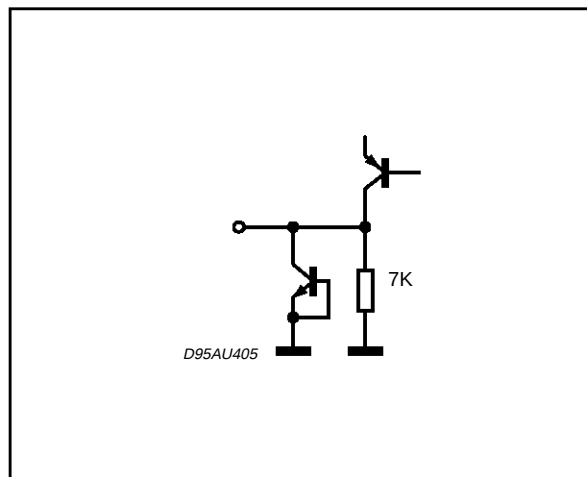
|              |                                     |  |     |     |             |    |
|--------------|-------------------------------------|--|-----|-----|-------------|----|
| $TH_{ign}$   | Ign Comparator Positive Threshold   |  | 5.5 | 6.5 | 7.5         | V  |
| $HYST_{ign}$ | Ign Comparator Threshold Hysteresis |  | 100 | 300 | 500         | mV |
| $IGN_{high}$ | Ignition Comparator Output High     |  | 3.5 |     | $V_{st-by}$ | V  |

**CIRCUIT CONFIGURATION - PIN EQUIVALENT CIRCUITS****PIN 1:** EN 5V**PIN 2:** EN 8.25V**PIN 4:** OUT 16V

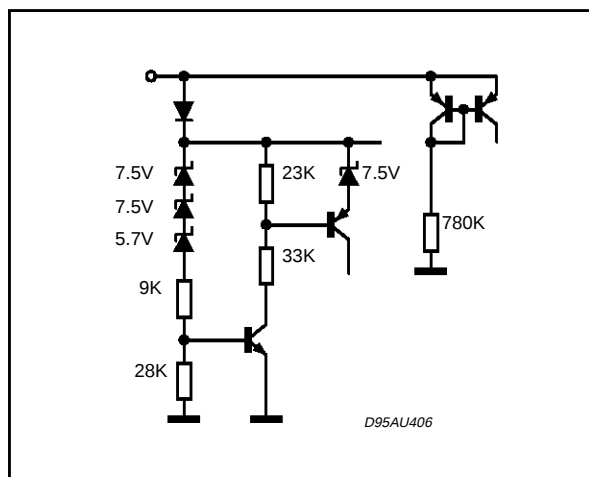
PIN 5: ING INP



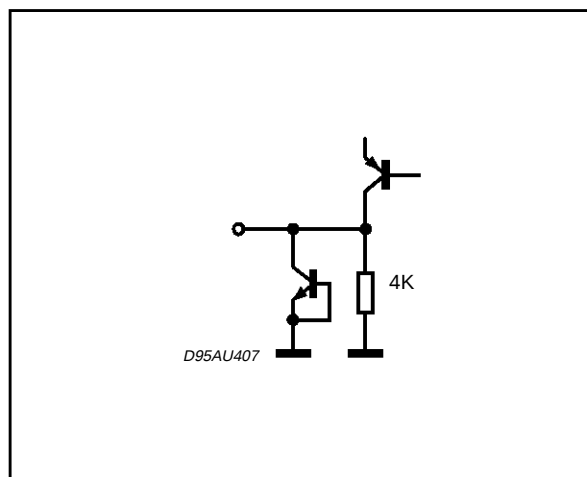
PIN 6: IGN OUT



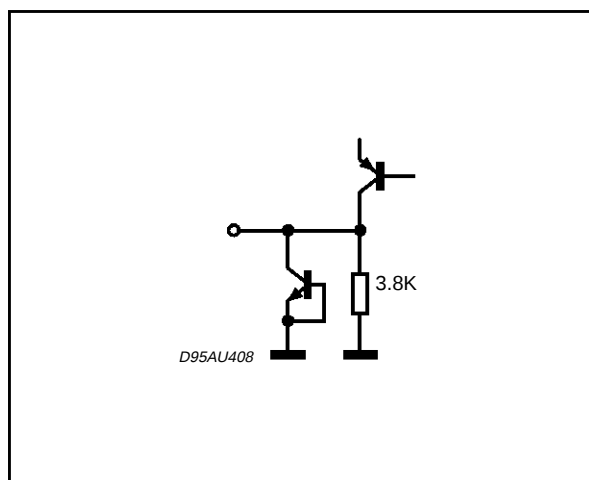
PIN 7: VS



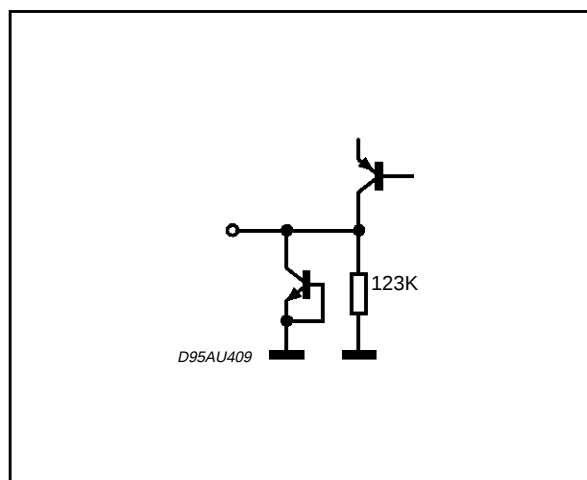
PIN 9: OUT 5V



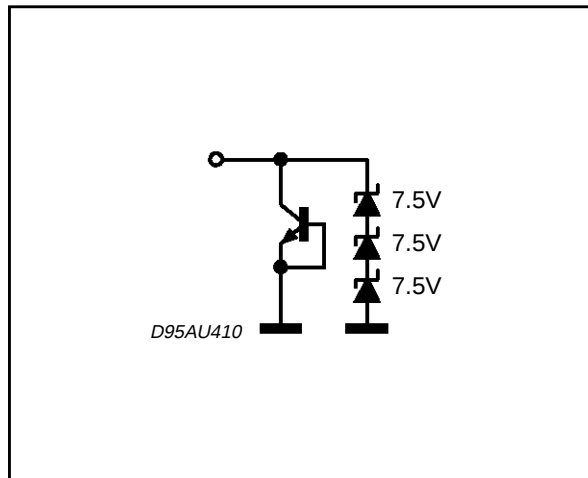
PIN 10: OUT 8.25V



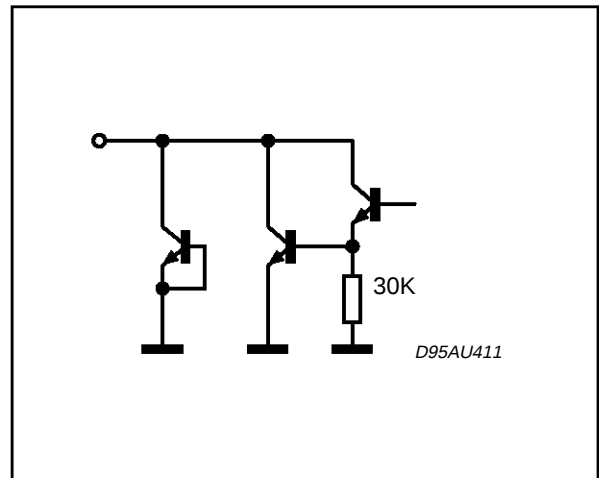
PIN 11: STAND-BY 5V



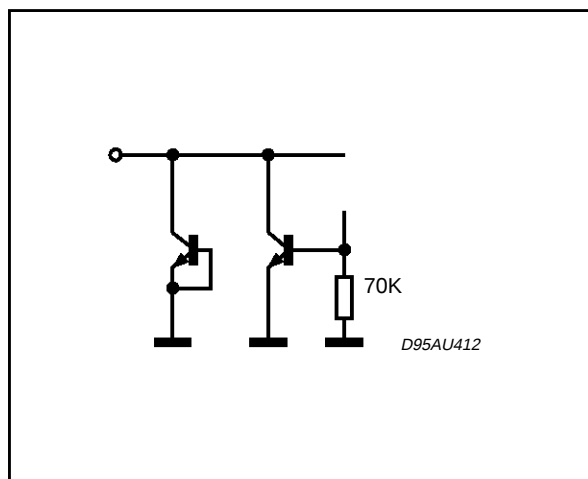
**PIN 12: ST-CAP**



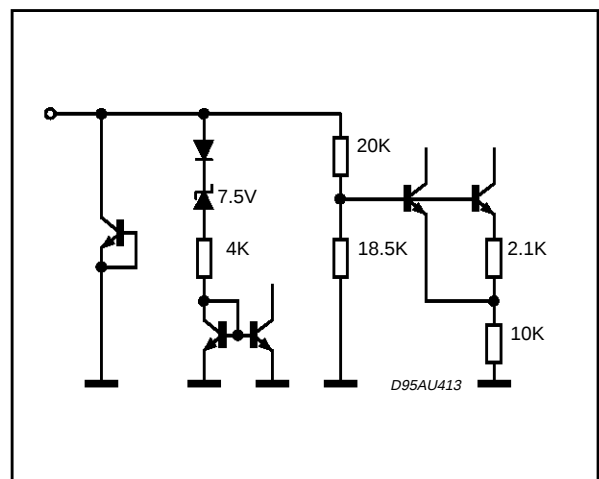
**PIN 13: LVW/ FAULT**



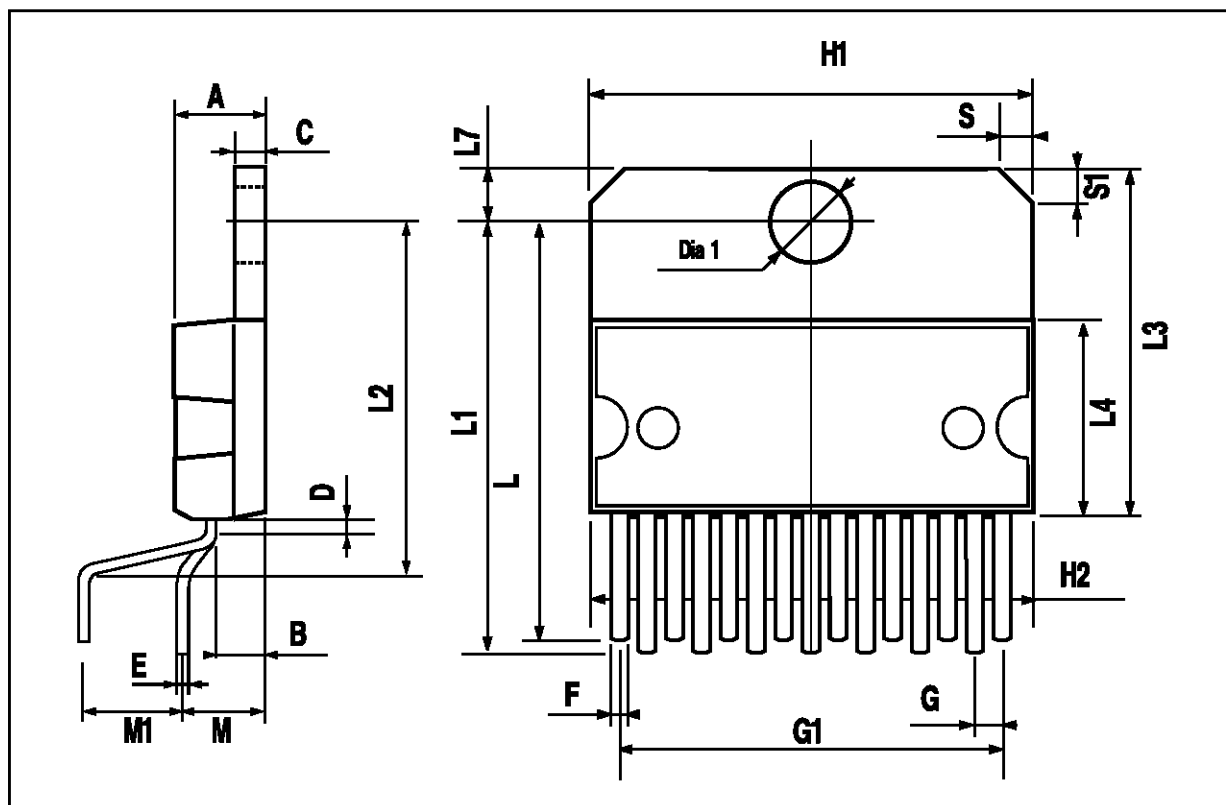
**PIN 14: RESET**



**PIN 15: EN 16V**



| DIM. | mm    |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |       |       | 5     |       |       | 0.197 |
| B    |       |       | 2.65  |       |       | 0.104 |
| C    |       |       | 1.6   |       |       | 0.063 |
| D    |       | 1     |       |       | 0.039 |       |
| E    | 0.49  |       | 0.55  | 0.019 |       | 0.022 |
| F    | 0.66  |       | 0.75  | 0.026 |       | 0.030 |
| G    | 1.02  | 1.27  | 1.52  | 0.040 | 0.050 | 0.060 |
| G1   | 17.53 | 17.78 | 18.03 | 0.690 | 0.700 | 0.710 |
| H1   | 19.6  |       |       | 0.772 |       |       |
| H2   |       |       | 20.2  |       |       | 0.795 |
| L    | 21.9  | 22.2  | 22.5  | 0.862 | 0.874 | 0.886 |
| L1   | 21.7  | 22.1  | 22.5  | 0.854 | 0.870 | 0.886 |
| L2   | 17.65 |       | 18.1  | 0.695 |       | 0.713 |
| L3   | 17.25 | 17.5  | 17.75 | 0.679 | 0.689 | 0.699 |
| L4   | 10.3  | 10.7  | 10.9  | 0.406 | 0.421 | 0.429 |
| L7   | 2.65  |       | 2.9   | 0.104 |       | 0.114 |
| M    | 4.25  | 4.55  | 4.85  | 0.167 | 0.179 | 0.191 |
| M1   | 4.63  | 5.08  | 5.53  | 0.182 | 0.200 | 0.218 |
| S    | 1.9   |       | 2.6   | 0.075 |       | 0.102 |
| S1   | 1.9   |       | 2.6   | 0.075 |       | 0.102 |
| Dia1 | 3.65  |       | 3.85  | 0.144 |       | 0.152 |



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