

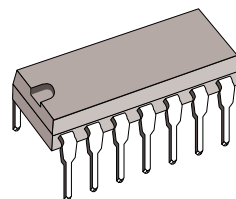
## PROXIMITY DETECTOR

- SUPPLY VOLTAGE : +4 TO +36V
- SUPPLY CURRENT : < 1.2mA
- OUTPUT TRANSISTORS : I = 20mA ;  
V<sub>CE (sat)</sub> ≤ 1100mV
- OSCILLATOR FREQUENCY : < 1MHz
- LOSS RESISTANCE : 5 TO 50kΩ.

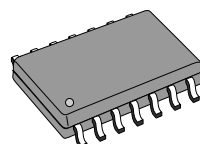
### DESCRIPTION

The TDE0160 is designed to detect metal bodies by the effect of Eddy currents on the HF losses of a coil. It has two complementary open collector outputs with peak limiting. Hysteresis is adjustable, and an electronic switching circuit is incorporated for disabling both outputs.

An internal zener diode maintains the supply voltage to the circuit in "dipole" operation.



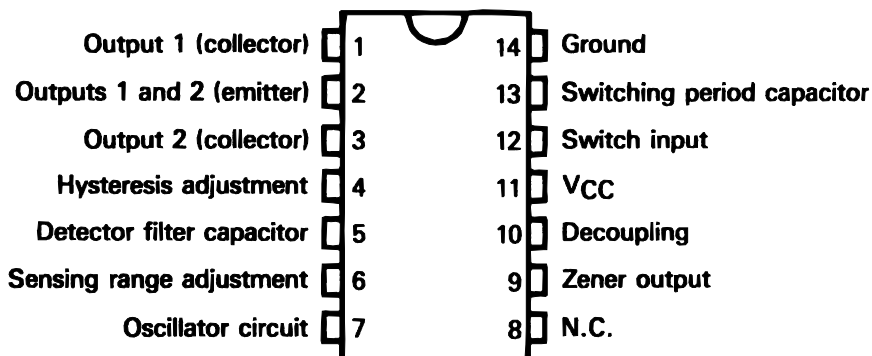
DIP14



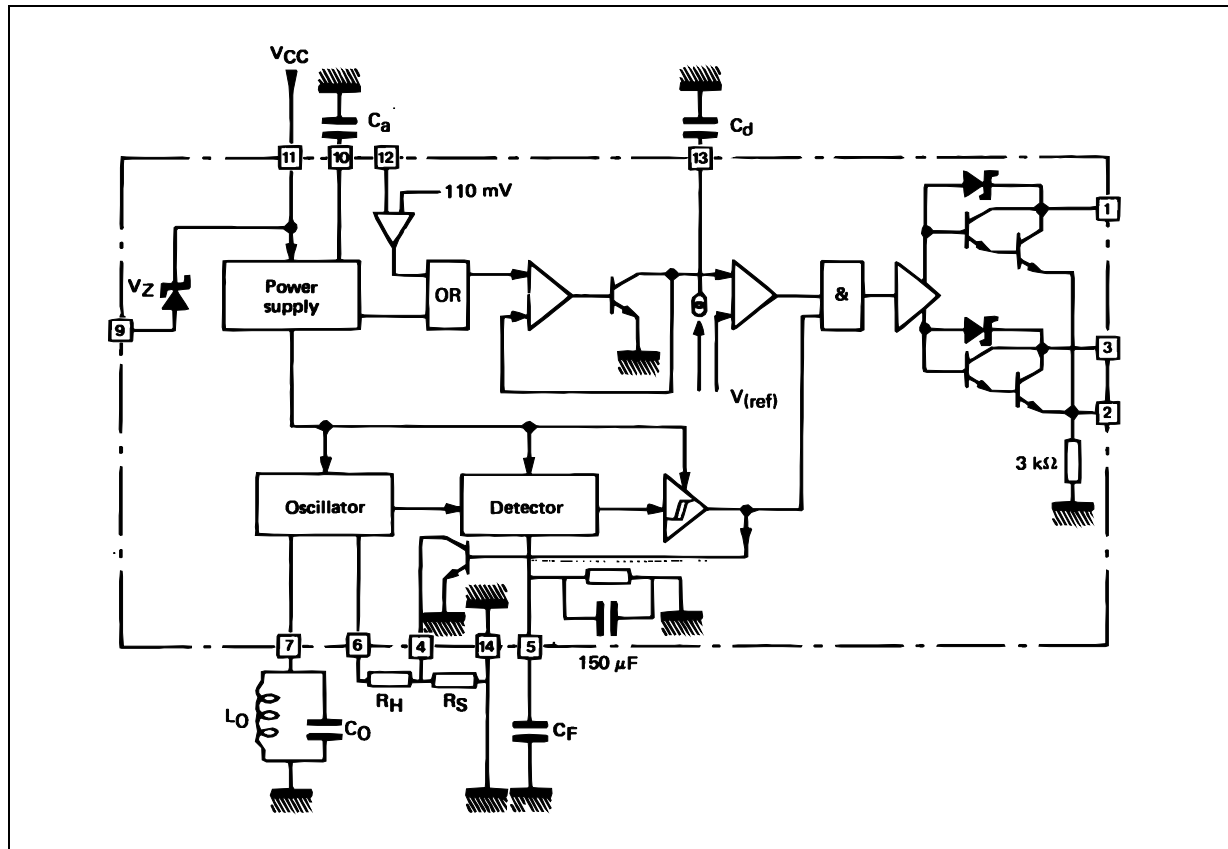
SO14

ORDERING NUMBERS : TDE0160DP (DIP14)  
TDE 0160FP (SO14)

### PIN CONNECTION (top view)



## SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol                  | Parameter                        | Value         | Unit |
|-------------------------|----------------------------------|---------------|------|
| $V_{CC}$                | Supply Voltage                   | 36            | V    |
| $V_{O^*}$               | Output Voltage*                  | 36            | V    |
| $I_O$ ( $I_1$ - $I_3$ ) | Output Current ( $I_1$ - $I_3$ ) | 40            | mA   |
| $I_Z$                   | Zener Current                    | 40            | mA   |
| $T_J$                   | Junction Temperature             | + 150         | °C   |
| $T_{oper}$              | Ambient Temperature Range        | - 25 to + 85  | °C   |
| $T_{stg}$               | Storage Temperature Range        | - 65 to + 150 | °C   |

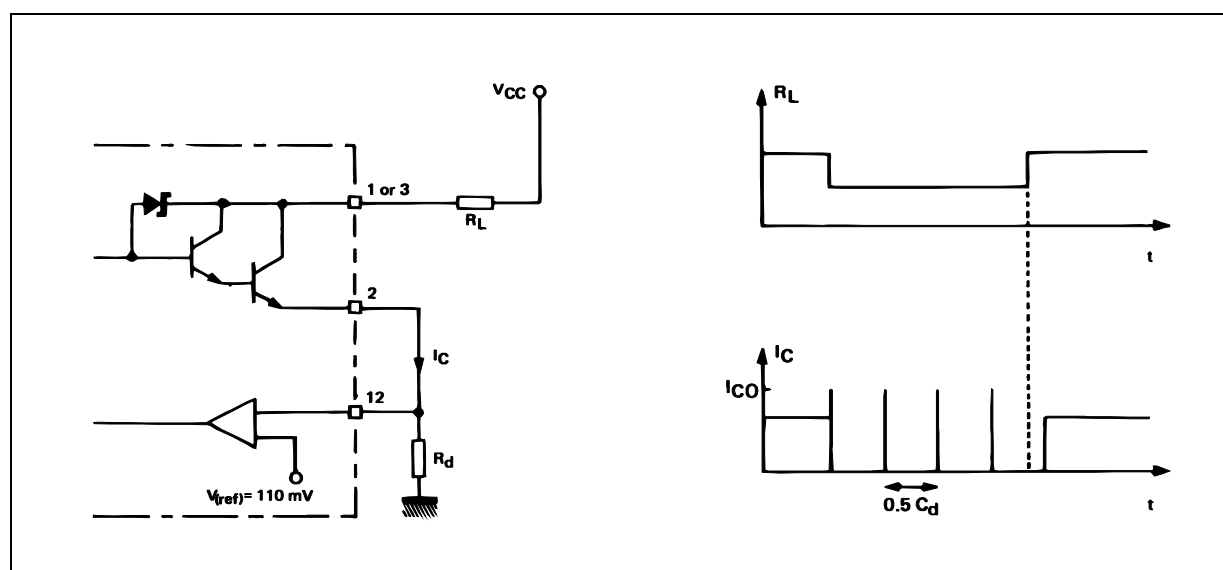
\* Internal peak limiting to protect against transient voltage surges.

**ELECTRICAL CHARACTERISTICS**

$T_{amb} = +25^{\circ}\text{C}$  unless otherwise specified

| Symbol    | Parameter                                                                                                | Min. | Typ.                    | Max. | Unit          |
|-----------|----------------------------------------------------------------------------------------------------------|------|-------------------------|------|---------------|
| $V_{CC}$  | Supply Voltage<br>Pin 11                                                                                 | 4    |                         | 36   | V             |
| $V_Z$     | Zener Voltage ( $I_Z = 20\text{mA}$ )<br>Pins 9-11                                                       | 3    |                         | 4    | V             |
| $I_{CC}$  | Supply Current<br>Pin 11                                                                                 |      |                         | 1.2  | mA            |
| –         | Limiting ( $I = 0.1\text{mA}$ )<br>Pin 1 or 3                                                            |      | 42                      |      | V             |
| –         | Output Transistor Saturation Voltage<br>( $I_1$ or $I_3 = +20\text{mA}$ )<br>Pin 1 or 3                  |      | 0.9                     | 1.1  | V             |
| –         | Output Transistor Leakage Current ( $V = +30\text{V}$ )<br>Pin 1 or 3                                    |      |                         | 2    | $\mu\text{A}$ |
| –         | Switching Threshold<br>Pin 12                                                                            | 90   | 110                     | 130  | mV            |
| $R_n$     | Negative Resistance*<br>( $5\text{k}\Omega < R_H < 50\text{k}\Omega$ , $f = 100\text{kHz}$ , $R_S = 0$ ) |      | $R_n = R_H$             |      |               |
| –         | Inherent Hysteresis ( $R_2 = 0$ )                                                                        |      | 1                       | 2    | %             |
| –         | Programmed Hysteresis ( $H < 15\%$ )                                                                     |      | $\frac{R_S}{R_S + R_H}$ |      | %             |
| $f_{osc}$ | Oscillation Frequency                                                                                    |      |                         | 1    | MHz           |
| –         | Switching Frequency (with matched oscillator circuit)                                                    |      | 750                     |      | Hz            |
| –         | Switching Time-delay                                                                                     |      | $0.5 C_d (\mu\text{F})$ |      | s             |
| –         | Switching Response Time ( $C_d = 10\text{nF}$ ; $V_{CC} = +20\text{V}$ )                                 |      | 10                      |      | $\mu\text{s}$ |

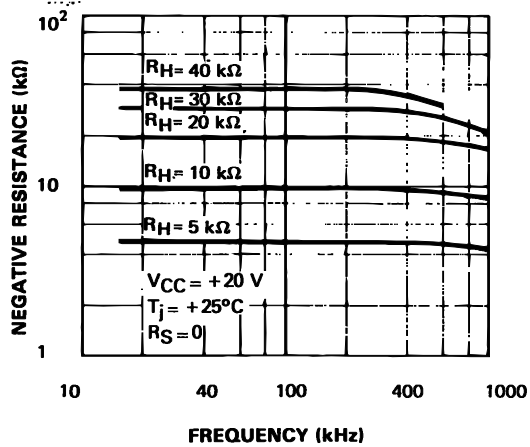
\* See characteristic curves

**SWITCHING OPERATION**

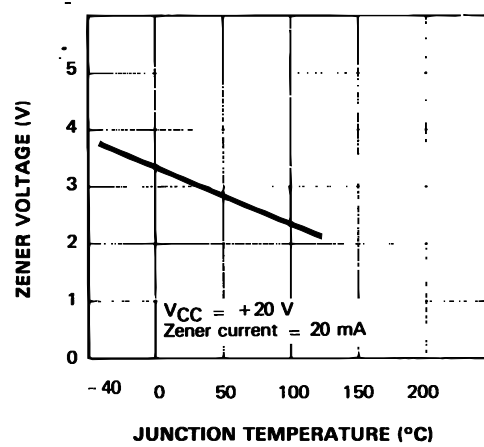
If  $I_C$  exceeds  $I_{CO}$ , where  $I_{CO} = \frac{V_{(ref)}}{R_d}$  the switch cuts off the output transistors and tests the value of current  $I_C$ , with time constant  $0.5 C_d$ .

On power up the internal start system cuts off the output transistors until  $V_{CC}$  reaches a value permitting normal operation of the circuit.

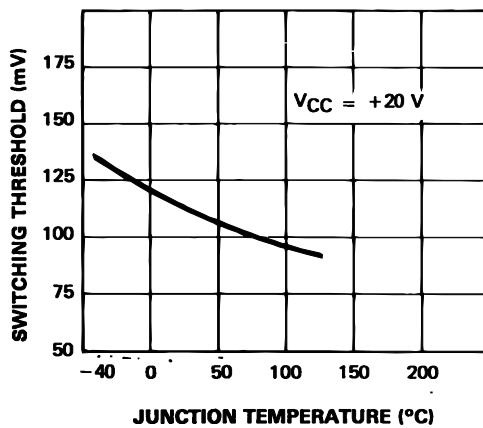
**NEGATIVE RESISTANCE  
vs  
FREQUENCY**



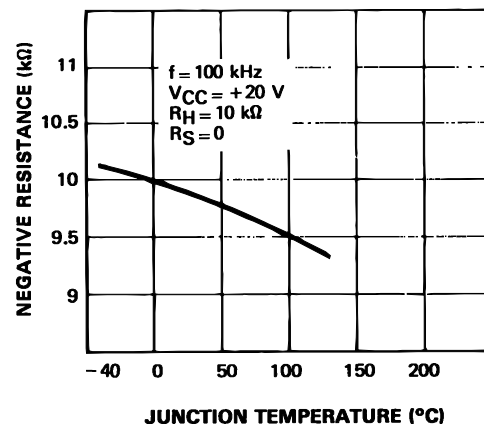
**ZENER VOLTAGE  
vs  
JUNCTION TEMPERATURE**



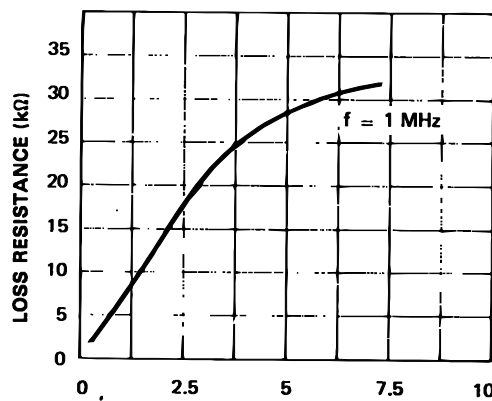
**SWITCHING THRESHOLD  
vs  
JUNCTION TEMPERATURE**



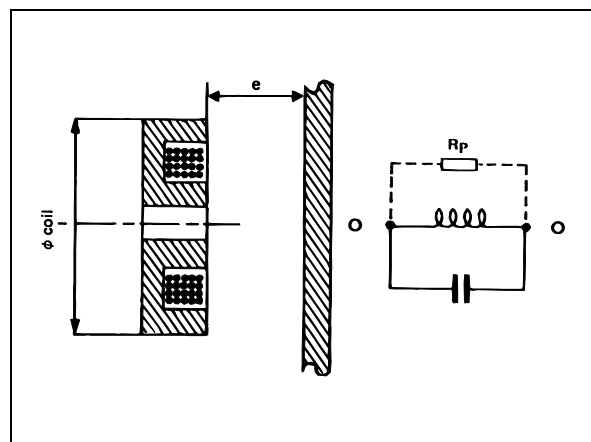
**NEGATIVE RESISTANCE  
vs  
JUNCTION TEMPERATURE**



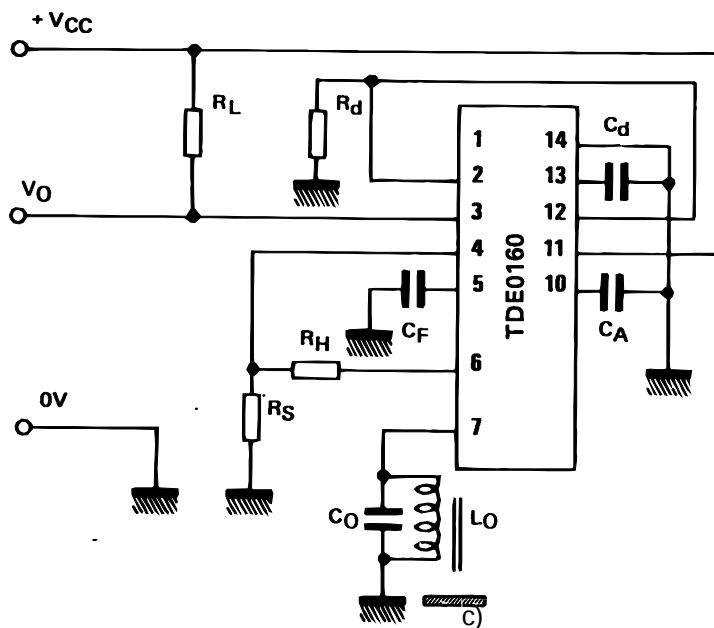
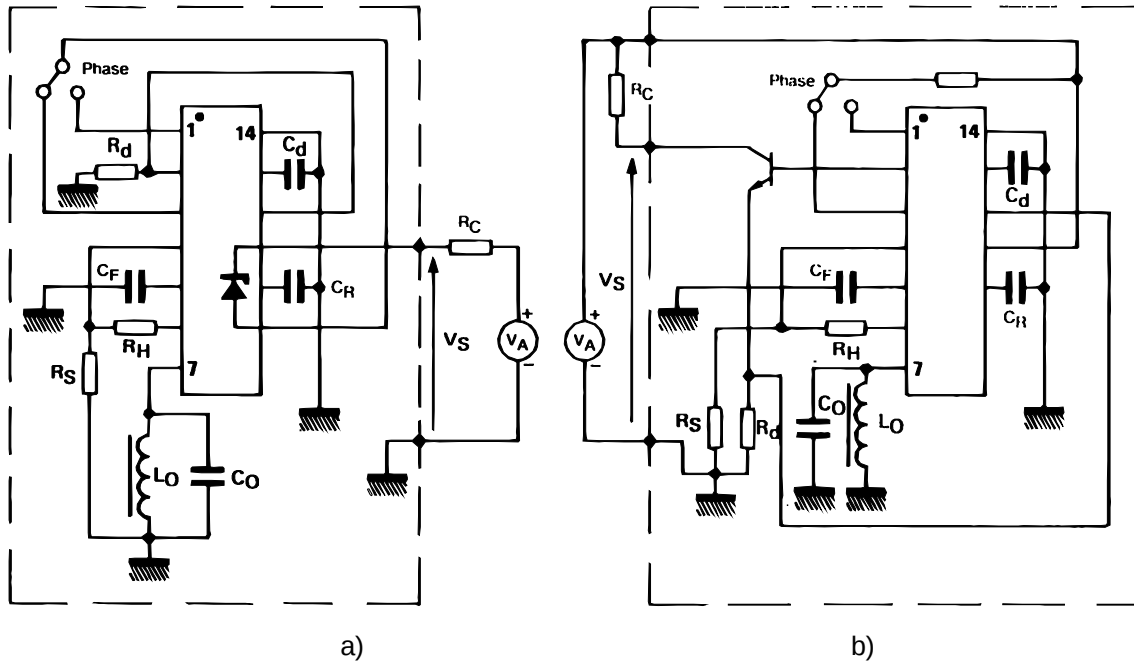
**LOSS RESISTANCE  
vs  
DETECTION RANGE (mm)**



**MILD STEEL**



## TYPICAL APPLICATION DIAGRAMS



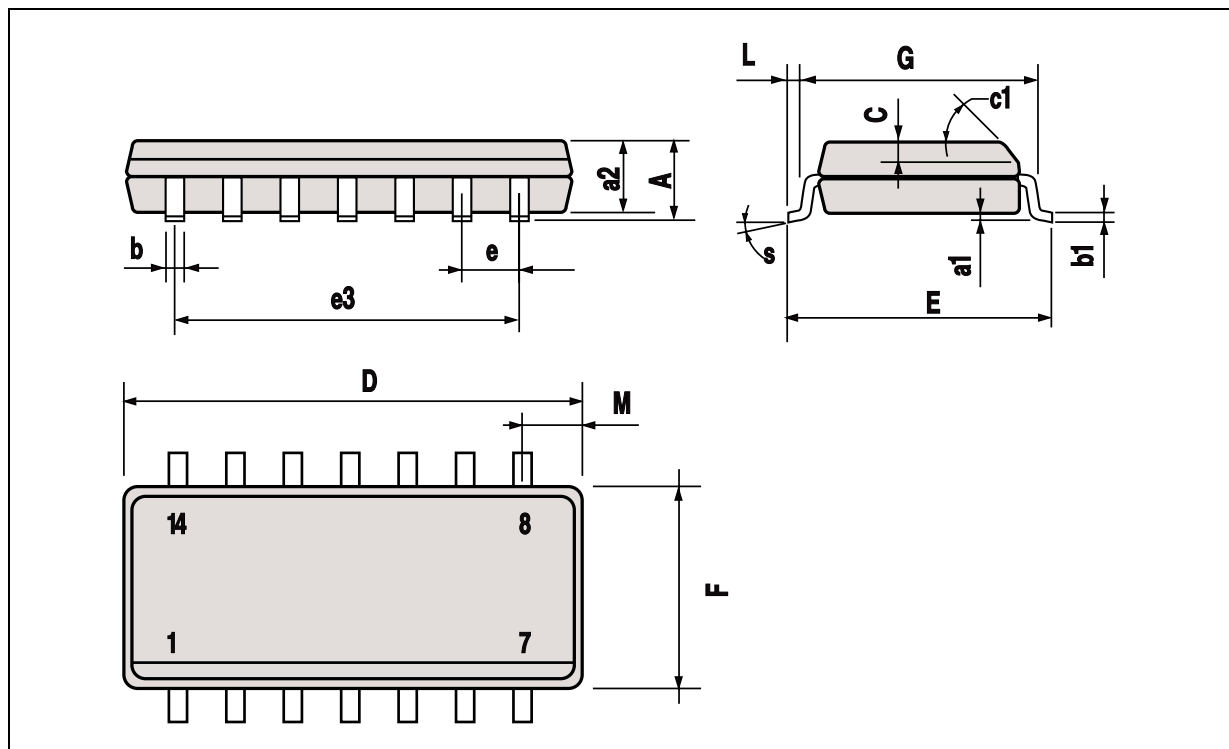
$C_a$  : 10nF  
 $C_f$  : 1nF  
 $C_d$  : 10nF  
 $C_o$  : 390pF  
 $L_o$  : 65 $\mu$ H to 1MHz  
 $R_d$  : 10k $\Omega$   
 $R_H$  : 15k $\Omega$   
 $R_S$  : 3k $\Omega$   
 $R_L$  : 2.5k $\Omega$

$V_{CC}$  : 20V  
 $f_o \approx 1$ MHz  
 $e_{mean} = 2.5$ mm

$\Phi$  coil : 14mm  
 Core COFELEC 432FP  
 Turns : 47  
 Stranded wire : 15 x 5/100

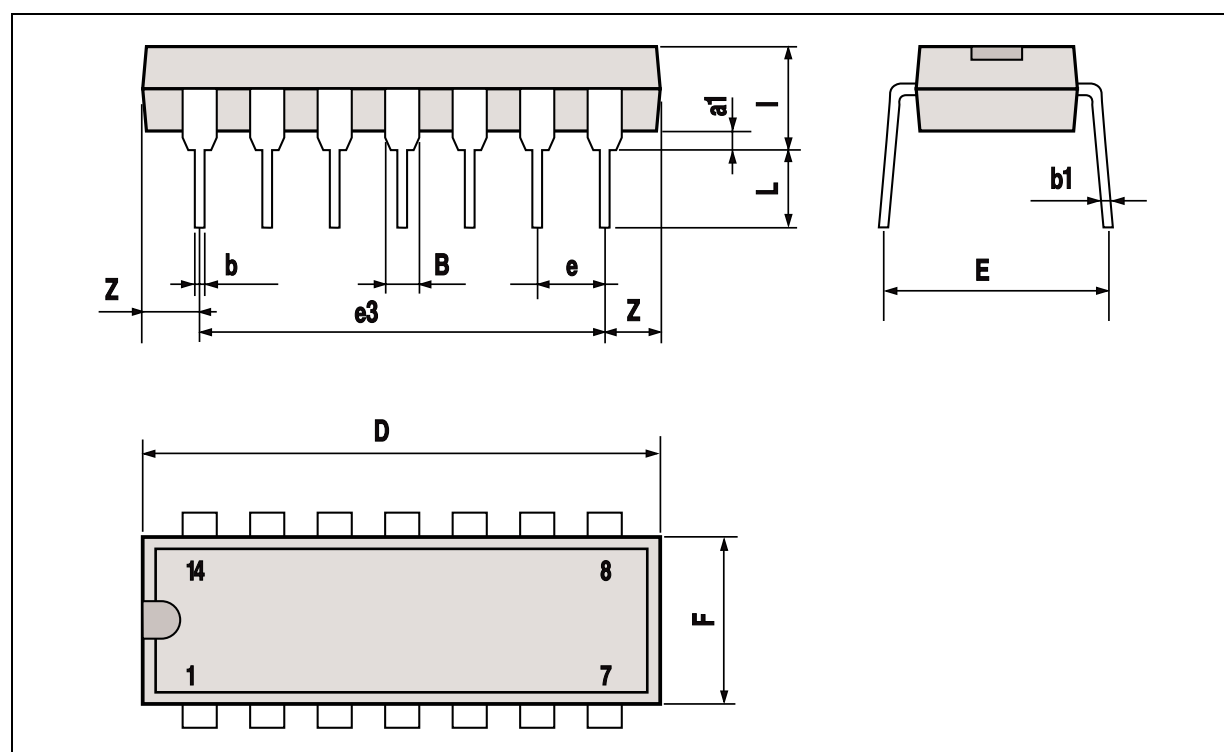
## SO14 PACKAGE MECHANICAL DATA

| DIM. | mm        |      |      | inch  |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | MIN.      | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |           |      | 1.75 |       |       | 0.069 |
| a1   | 0.1       |      | 0.25 | 0.004 |       | 0.009 |
| a2   |           |      | 1.6  |       |       | 0.063 |
| b    | 0.35      |      | 0.46 | 0.014 |       | 0.018 |
| b1   | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| C    |           | 0.5  |      |       | 0.020 |       |
| c1   | 45 (typ.) |      |      |       |       |       |
| D    | 8.55      |      | 8.75 | 0.336 |       | 0.344 |
| E    | 5.8       |      | 6.2  | 0.228 |       | 0.244 |
| e    |           | 1.27 |      |       | 0.050 |       |
| e3   |           | 7.62 |      |       | 0.300 |       |
| F    | 3.8       |      | 4.0  | 0.15  |       | 0.157 |
| L    | 0.4       |      | 1.27 | 0.016 |       | 0.050 |
| M    |           |      | 0.68 |       |       | 0.027 |
| S    | 8 (max.)  |      |      |       |       |       |



## DIP14 PACKAGE MECHANICAL DATA

| DIM. | mm   |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |      | 0.020 |       |       |
| B    | 1.39 |       | 1.65 | 0.055 |       | 0.065 |
| b    |      | 0.5   |      |       | 0.020 |       |
| b1   |      | 0.25  |      |       | 0.010 |       |
| D    |      |       | 20   |       |       | 0.787 |
| E    |      | 8.5   |      |       | 0.335 |       |
| e    |      | 2.54  |      |       | 0.100 |       |
| e3   |      | 15.24 |      |       | 0.600 |       |
| F    |      |       | 7.1  |       |       | 0.280 |
| I    |      |       | 5.1  |       |       | 0.201 |
| L    |      | 3.3   |      |       | 0.130 |       |
| Z    | 1.27 |       | 2.54 | 0.050 |       | 0.100 |



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