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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## Proximity Detectors

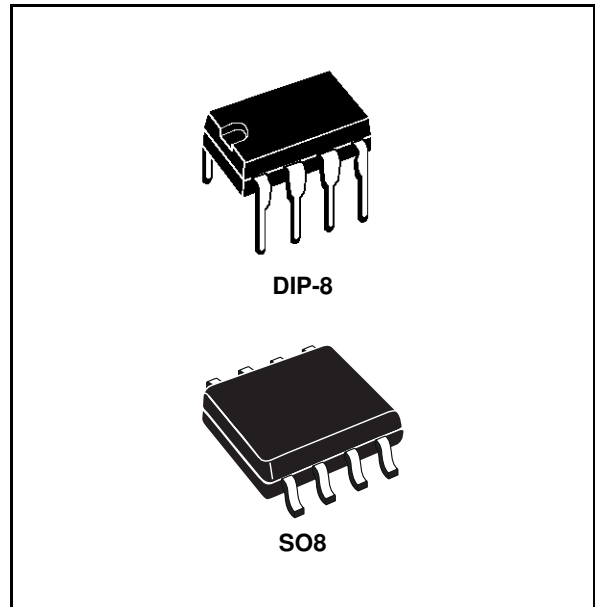
### Features

- 10mA Output Current
- Oscillator Frequency 10MHz
- Supply Voltage +4 to +35V

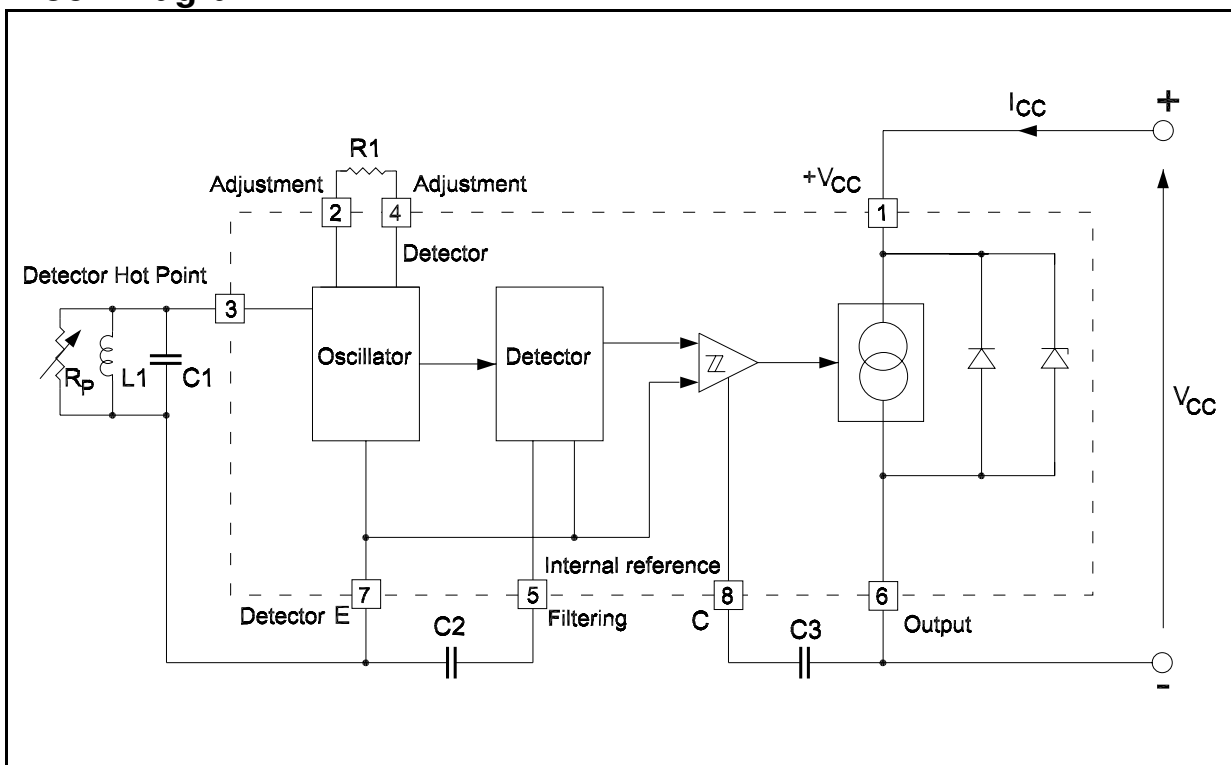
### Description

These monolithic integrated circuits are designed for metallic body detection by sensing variations in high frequency Eddy current losses. Using an externally-tuned circuit, they act as oscillators. The output signal level is altered by an approaching metallic object.

The output signal is determined by supply current changes. Independent of supply voltage, this current is high or low, according to the presence or absence of a closely located metallic object.



### Block Diagram



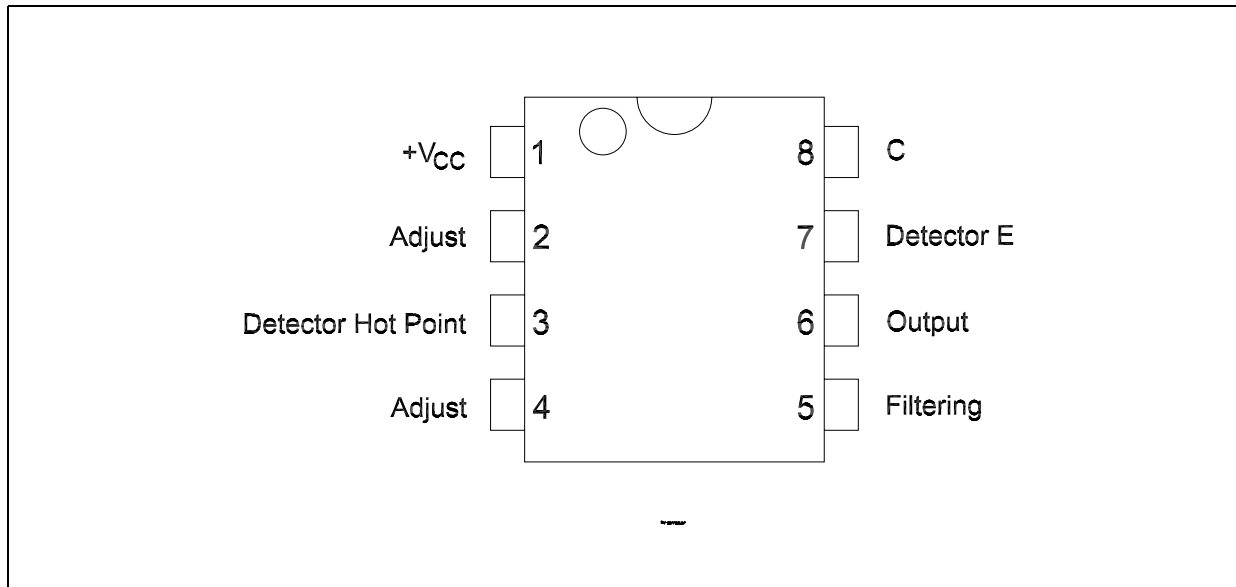
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# 1 Connections

Figure 1. Pin Connections (top view)



## 2 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	35	V
$T_J$	Operating Temperature Range	+150	°C
$T_{STG}$	Storage Temperature Range	-55 to 150	°C

### 2.1 Electrical characteristics

$-40 < T_A < +100^\circ\text{C}$ ,  $P_{TOT} < 150\text{mW}$ , unless otherwise specified.

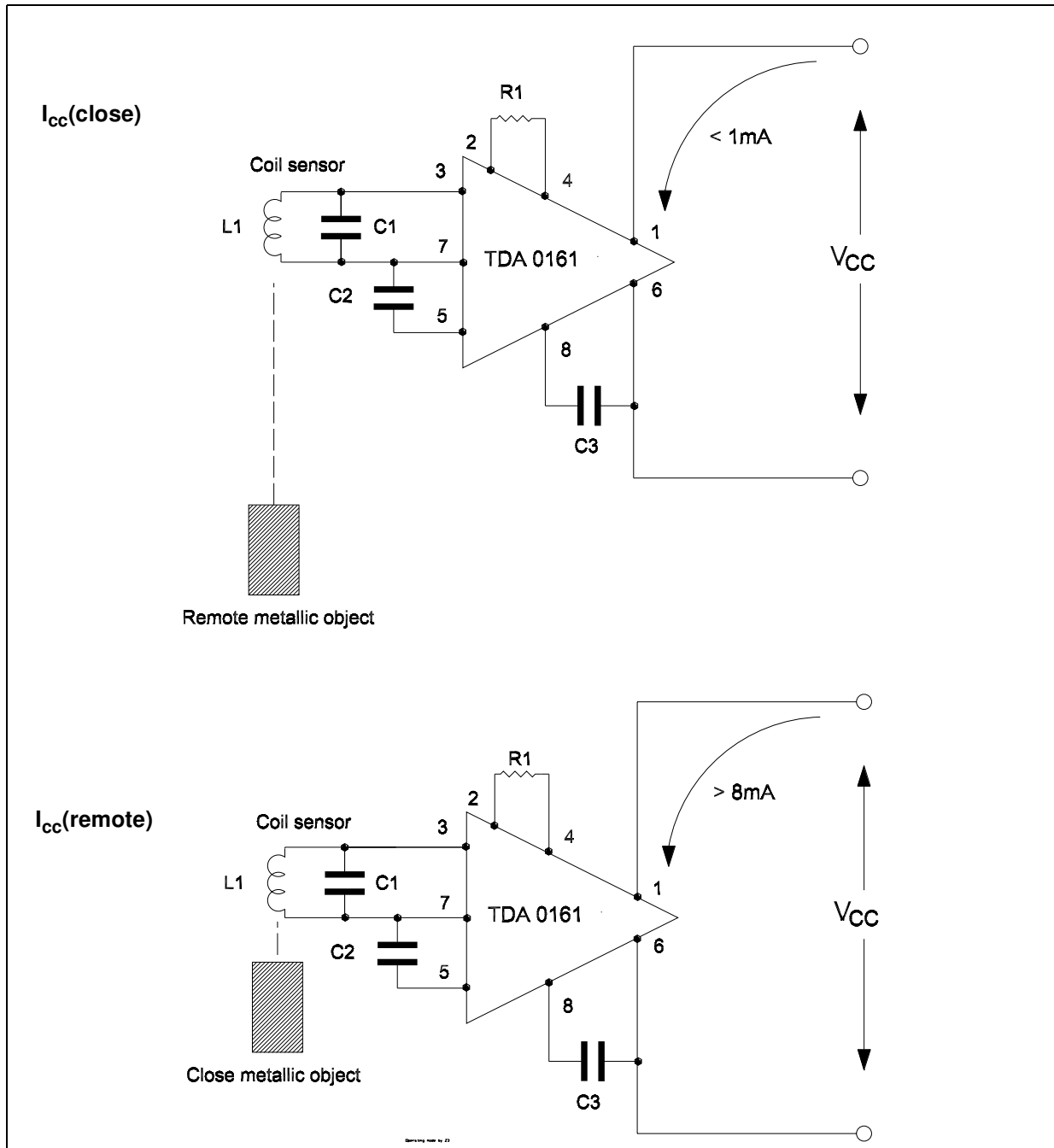
**Table 2. Electrical Characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{CC}$	Supply Voltage		4		35	V
	Reverse Voltage Limitation	$I_{CC} = -100\text{mA}$		-1		V
$I_{CC}$	Supply Current close target	$T_A = +25^\circ\text{C}$ $+4\text{V} < V_{CC} < +35\text{V}$	8	10	12	mA
$I_{CC}$	Supply Current remote target	$+4\text{V} < V_{CC} < +35\text{V}$			1	mA
	Supply Current transition time	$C3 = 0$		1		$\mu\text{s}$
		$C3 \neq 0$		$100 \times C3$ (nF)		$\mu\text{s}$
$f_{OSC}$	Oscillator Tuning Frequency				10	MHz
$f_O$	Output Frequency	$C3 = 0$	0		10	kHz
$\Delta I_{CC}$	Output Current Ripple	$C3 = 0$ , $C2$ (pF) $> 150/f_{OSC}$ (MHz)			20	$\mu\text{A}$
$R_n$	Negative Resistance on Terminals A and E	$4\text{k}\Omega < R1 < 50\text{k}\Omega$ , $f_{OSC} < 3\text{MHz}$	$0.9 R1$	$R1$	$1.1 R1$	
HYST	Hysteresis at Detection Point	$C2$ (pF) $> 150/f_{OSC}$ (MHz)	0.5		5	%

### 3 Operating Mode

Between pins 3 and 7, the integrated circuit acts like a negative resistor with a value equal to that of the external resistor R1 (connected between pins 2 and 4). The oscillation stops when the tuned circuit loss resistance ( $R_p$ ) becomes smaller than R1. As a result,  $I_{CC(close)} = 10\text{mA}$  (pins 1 and 6). The oscillation is sustained when  $R_p$  is higher than R1, and  $I_{CC(remote)} = 1\text{mA}$  (pins 1 and 6). Eddy currents induced by coil L1 in a metallic body determine the value of  $R_p$ .

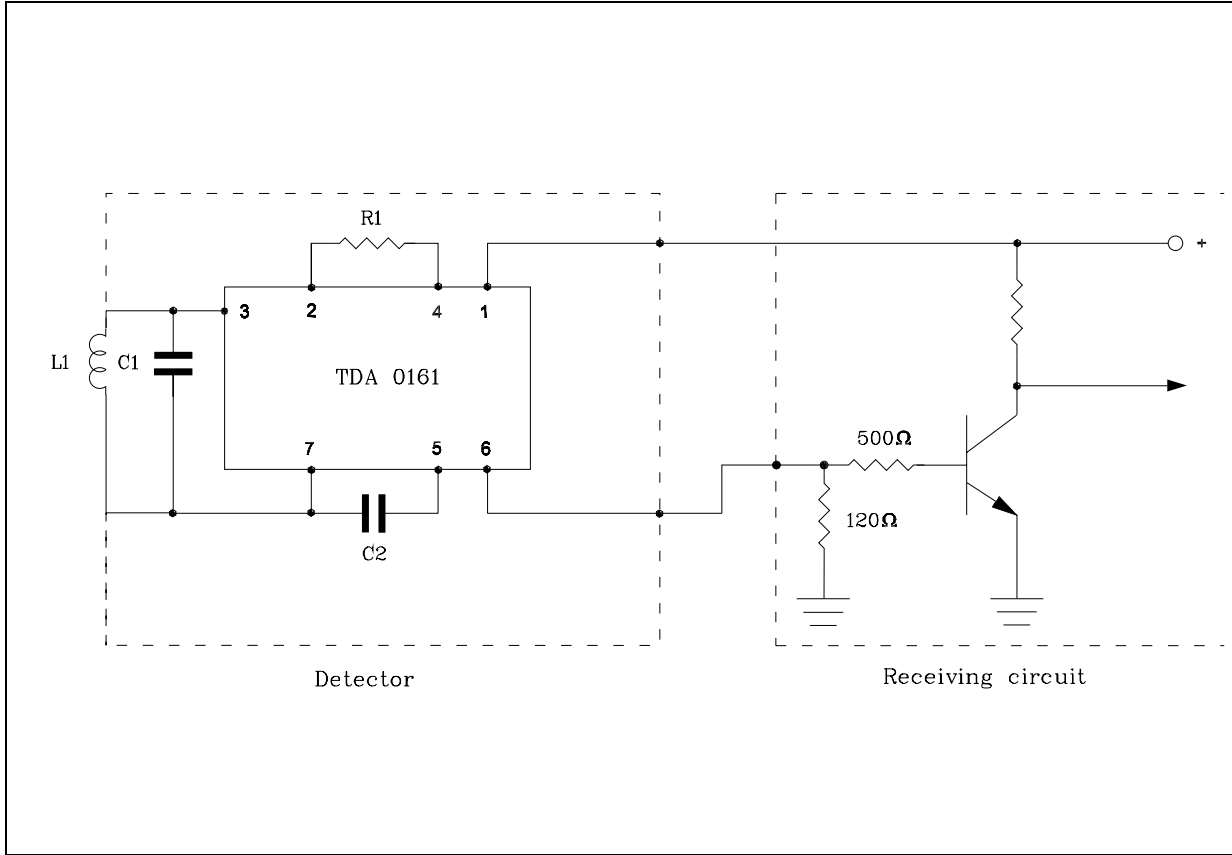
Figure 2. Electrical Scheme



If the circuit is used at frequency higher than 3MHz, it is recommended to connect a capacitor of 100pF between pins 7 and 6

# 4 Typical Applications

**Figure 3. Application Interface Connection Diagram**



**Table 3. Detection Range**

Detection Range (#)	L1 (μH)	C1 (pF)	f <sub>OSC</sub> (kHz)	R1 (kΩ)	C2 (pF)
2mm	30 (1)	120	2650	6.8	47
5mm	300 (2)	470	425	27	470
10mm	2160 (3)	4700	50	27	3300

**Table 4. Coil Characteristics**

	Core	Coil Former	Wire (##)	Number of Turns
1	Cofelec 432 FP 9 x 5 SE	1/2 Car 091 - 2	THOMSON Fils et Câbles Thomrex 14 (14 / 100mm)	40
2	Cofelec 432 FP 14 x 8 SE	1/2 Car 142 - 2		100
3	Cofelec 432 FP 26x 16 SE	1/2 Car 262 - 2		200

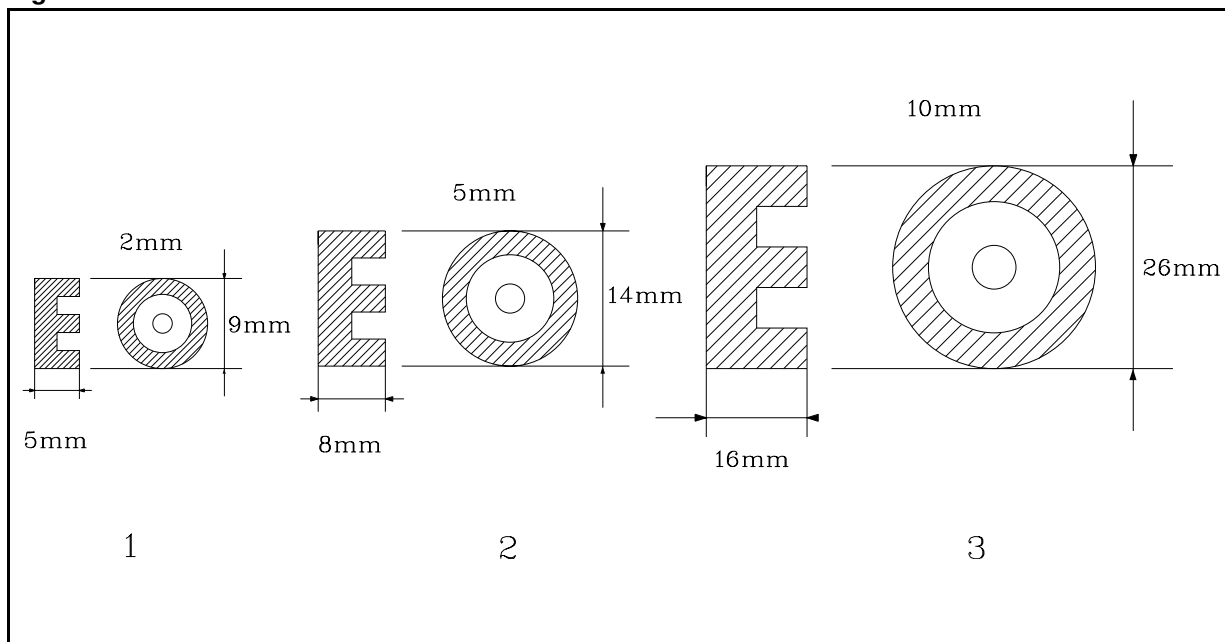
#) .Ingot steel target

##).The above results are obtained with single wire coil. When using Litz wire instead of single wire, the parallel resistance of the coil becomes higher and value of R1 may be increased, resulting in better sensitivity



### 4.1 Typical Application Example

Figure 4. Detection distance

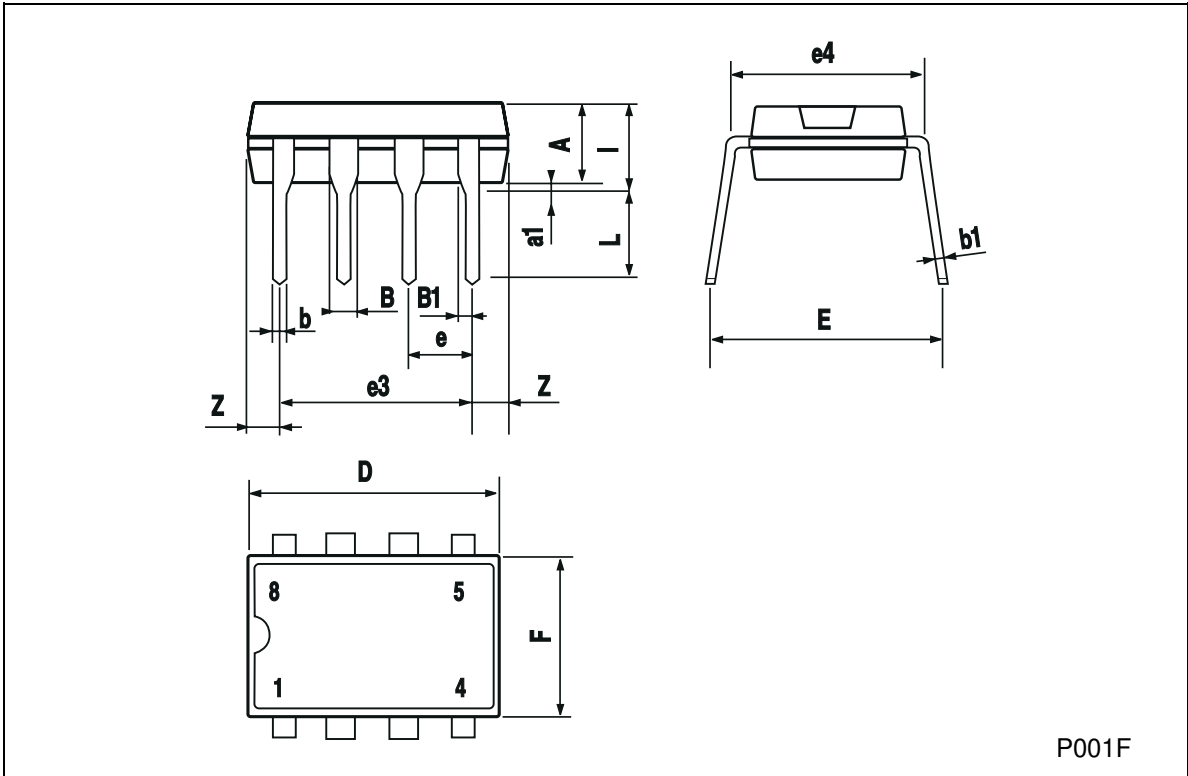




# 5 Package Mechanical Data

## Plastic DIP-8 MECHANICAL DATA

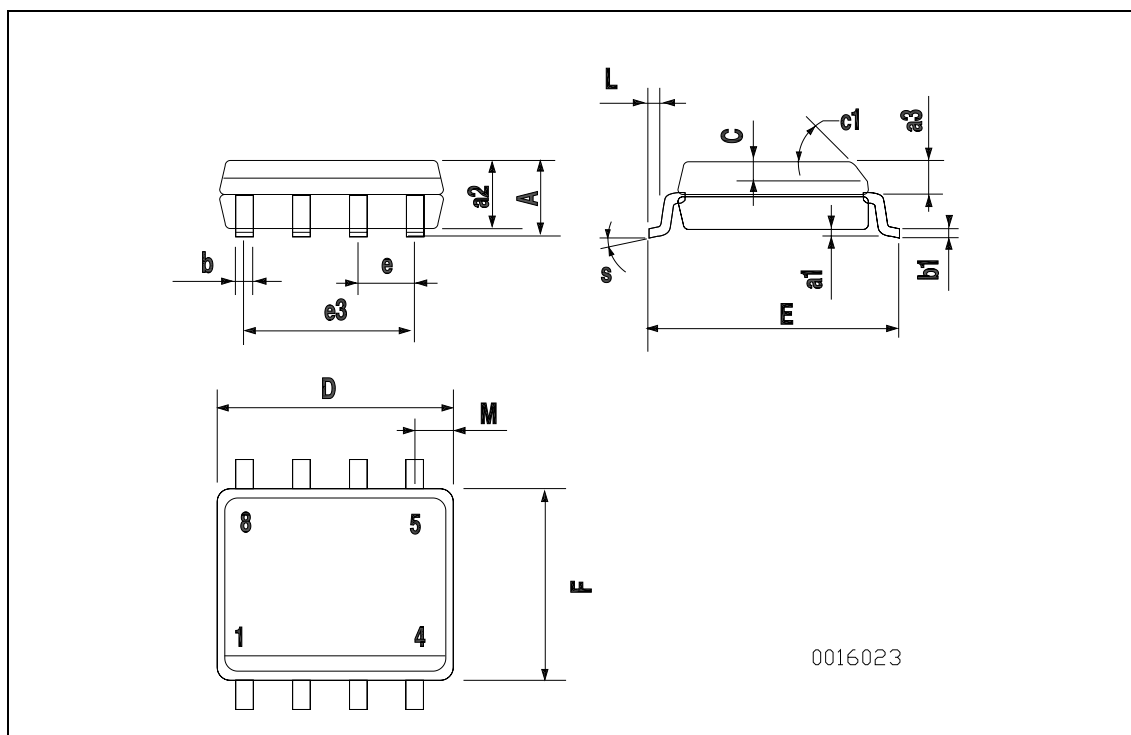
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063



P001F

## SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					



## 6 Order codes

Part number	Temp range	Package	Packing
TDA0161DP	150°C	DIP-8	Tube
TDA0161FP	150°C	SO8	Tube
TDA0161FPT	150°C	SO8	Tape and Reel

## 7 Revision history

Date	Revision	Changes
06-Jan-2003	1	Initial release.
12-Oct-2005	2	Final release.

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