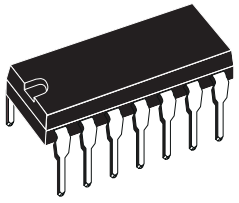
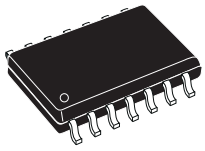
TDE0160

PROXIMITY DETECTOR

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



DIP14



SO14

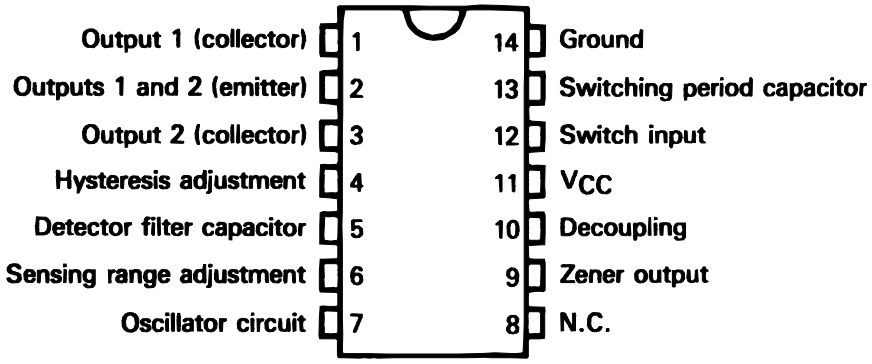
ORDERING NUMBERS : TDE0160DP (DIP14)
TDE 0160FP (SO14)

DESCRIPTION

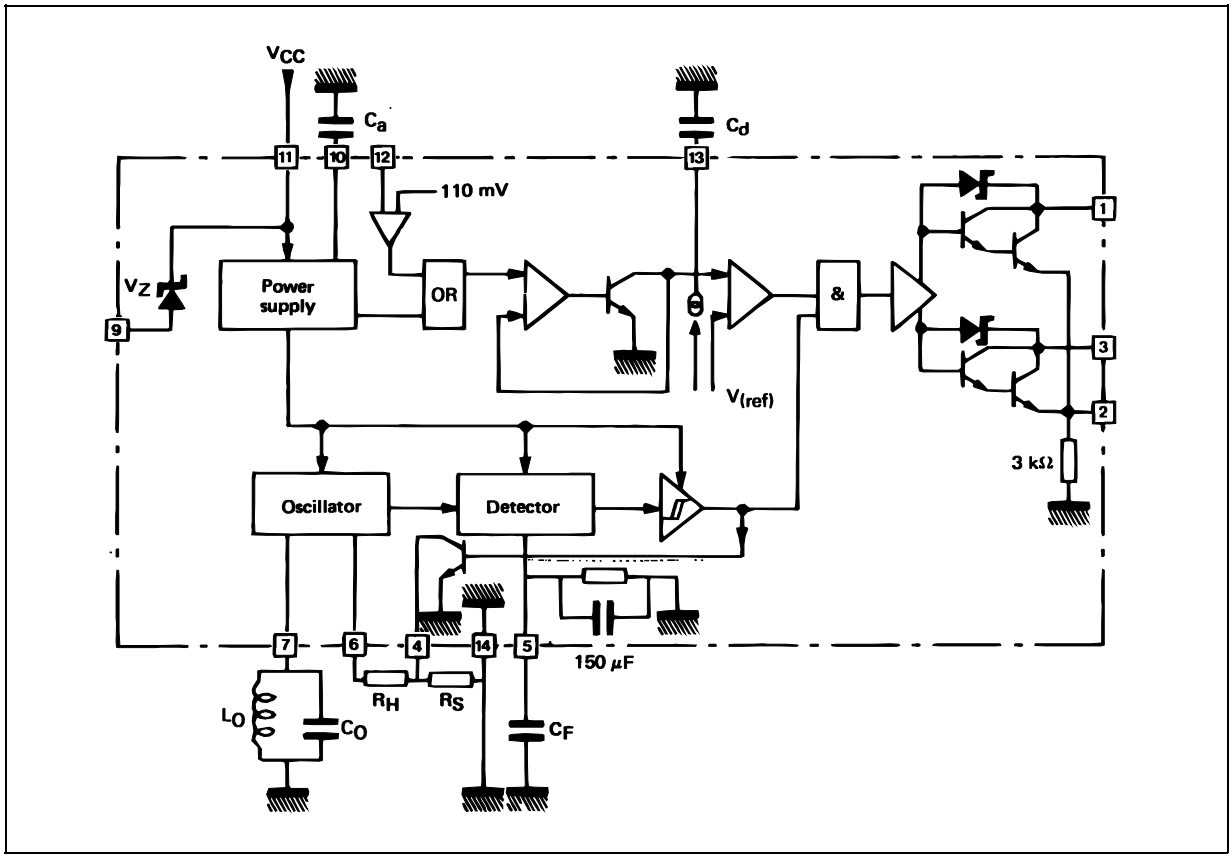
The TDE0160 is designed to detect metal bodies by the effect of Eddy currents on the HF losses of a coil. It has two complementary open collector outputs with peak limiting. Hysteresis is adjustable, and an electronic switching circuit is incorporated for disabling both outputs.

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

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.

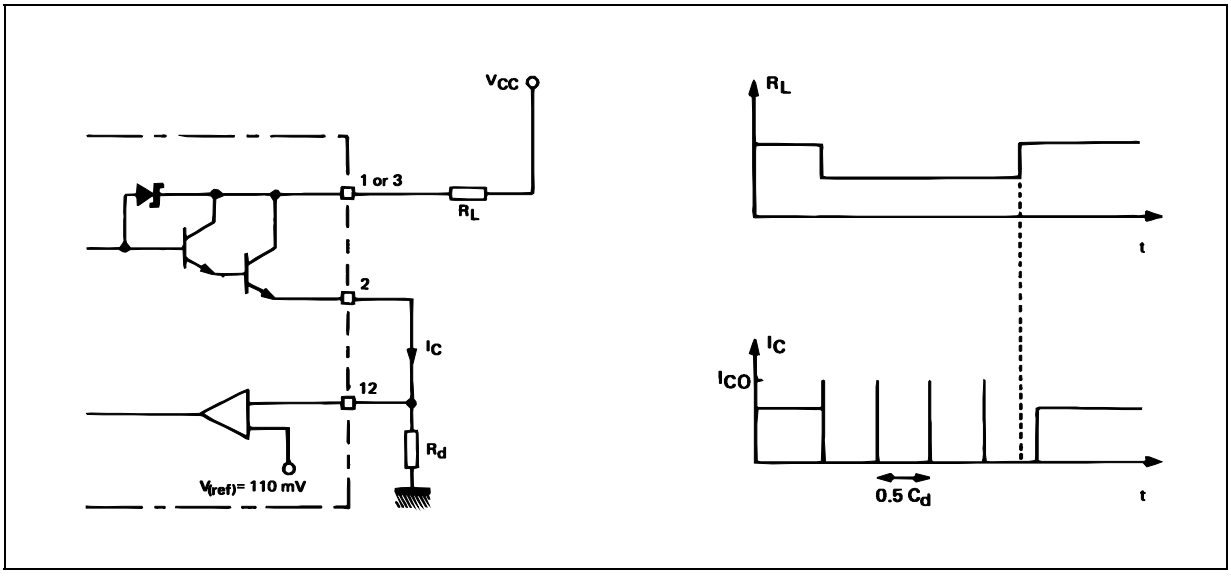
ELECTRICAL CHARACTERISTICS

T_{amb} = +25°C unless otherwise specified

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	Pin 11	4		36	V
V_Z	Zener Voltage (I_Z = 20mA)	Pins 9-11	3		4	V
I_{CC}	Supply Current	Pin 11			1.2	mA
–	Limiting (I = 0.1mA)	Pin 1 or 3		42		V
–	Output Transistor Saturation Voltage (I_1 or I_3 = +20mA)	Pin 1 or 3		0.9	1.1	V
–	Output Transistor Leakage Current (V = +30V)	Pin 1 or 3			2	µA
–	Switching Threshold	Pin 12	90	110	130	mV
R_n	Negative Resistance* ($5k\Omega < R_H < 50k\Omega$, f = 100kHz, 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 (µF)		s
–	Switching Response Time (C_d = 10nF ; V_{CC} = +20V)			10		µs

* See characteristic curves

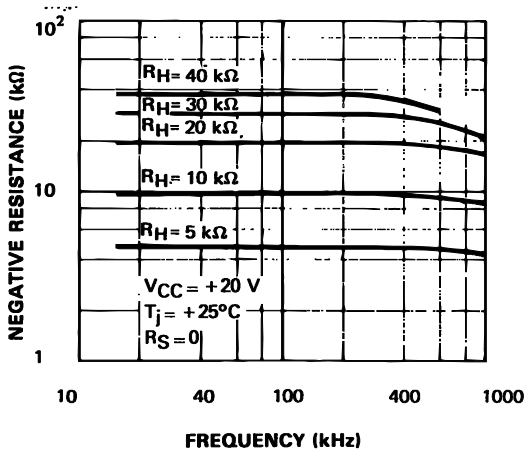
SWITCHING OPERATION



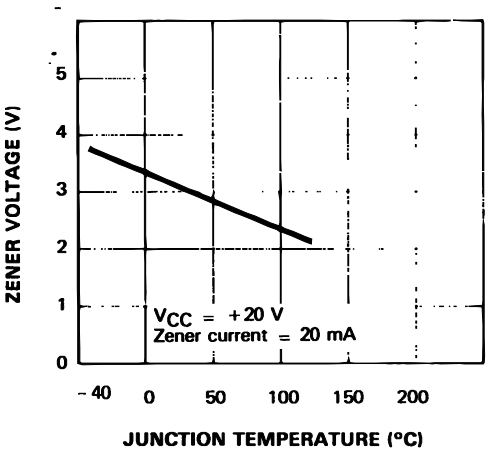
If I_C exceeds I_{CO}, where $I_{CO} = \frac{V_{(ref)}}{R_d}$ the switch cuts off the output transistors and tests the value of current I_C, with time constant 0.5 C_d.

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

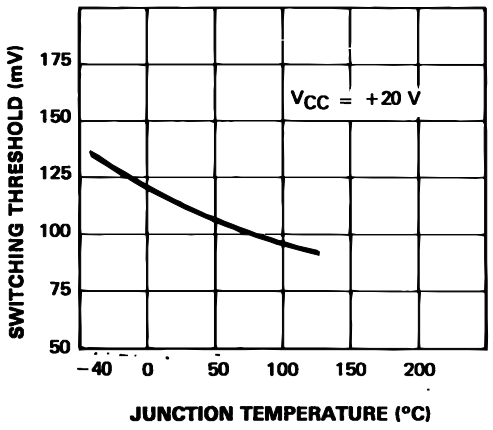
NEGATIVE RESISTANCE
vs
FREQUENCY



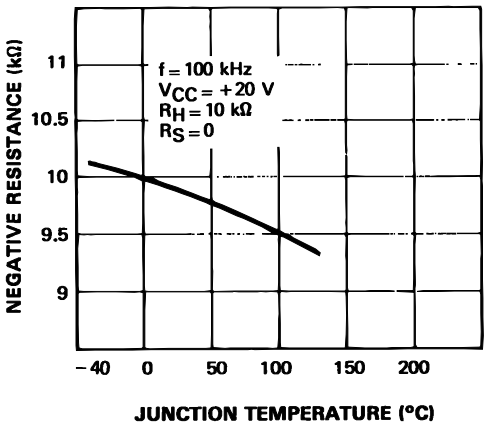
ZENER VOLTAGE
vs
JUNCTION TEMPERATURE



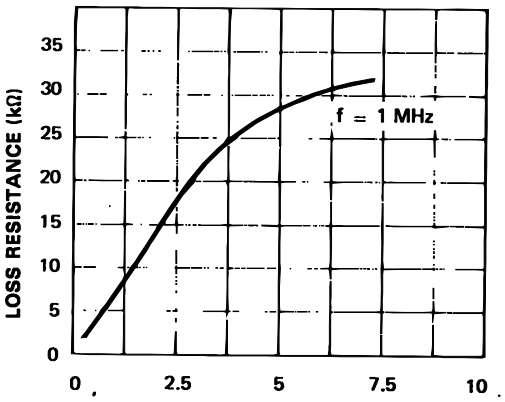
SWITCHING THRESHOLD
vs
JUNCTION TEMPERATURE



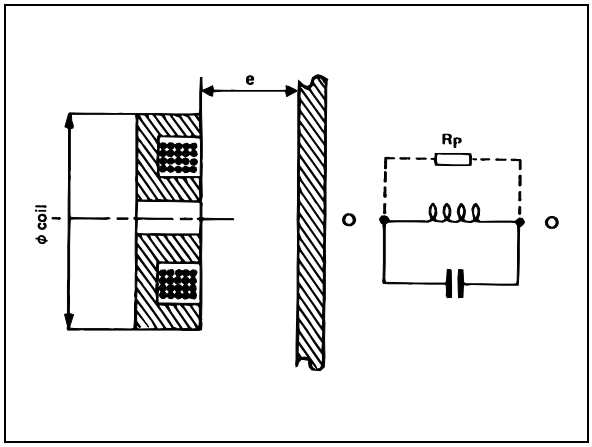
NEGATIVE RESISTANCE
vs
JUNCTION TEMPERATURE



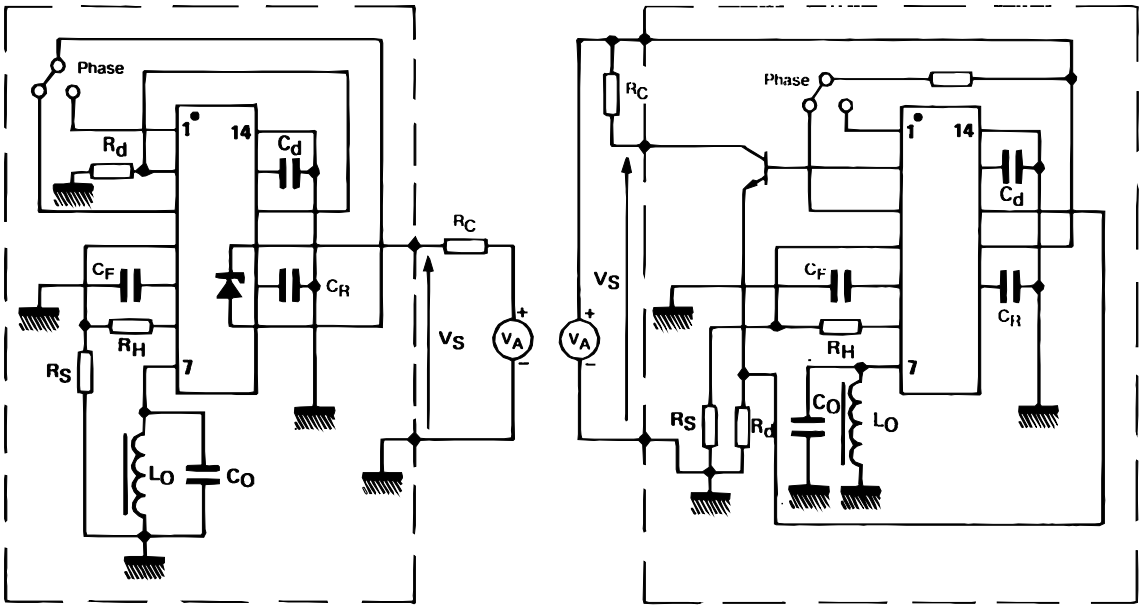
LOSS RESISTANCE
vs
DETECTION RANGE (mm)

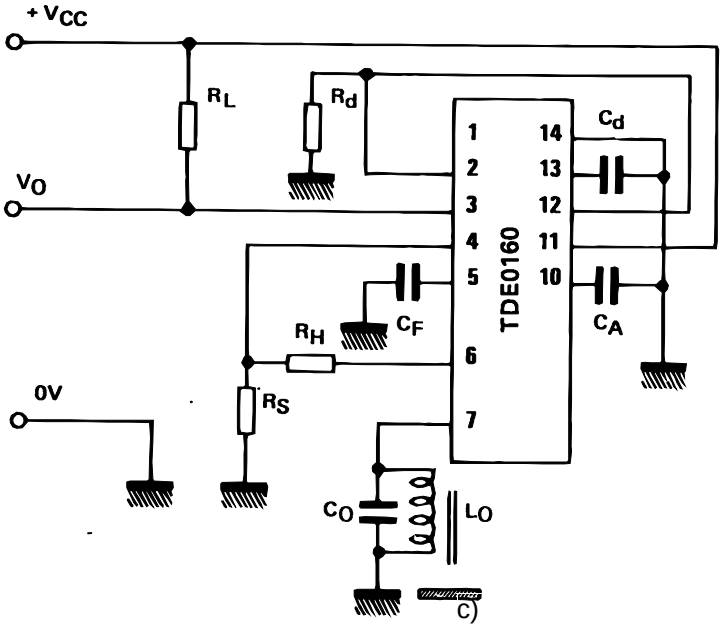


MILD STEEL



TYPICAL APPLICATION DIAGRAMS





C_a :	10nF
C_f :	1nF
C_d :	10nF
C_o :	390pF
L_o :	65µH to 1MHz
R_d :	10kΩ
R_H :	15kΩ
R_s :	3kΩ
R_L :	2.5kΩ

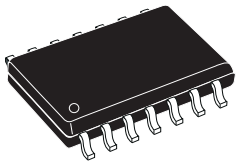
V_{CC} : 20V
$f_o \approx$ 1MHz
e_{mean} = 2.5mm

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

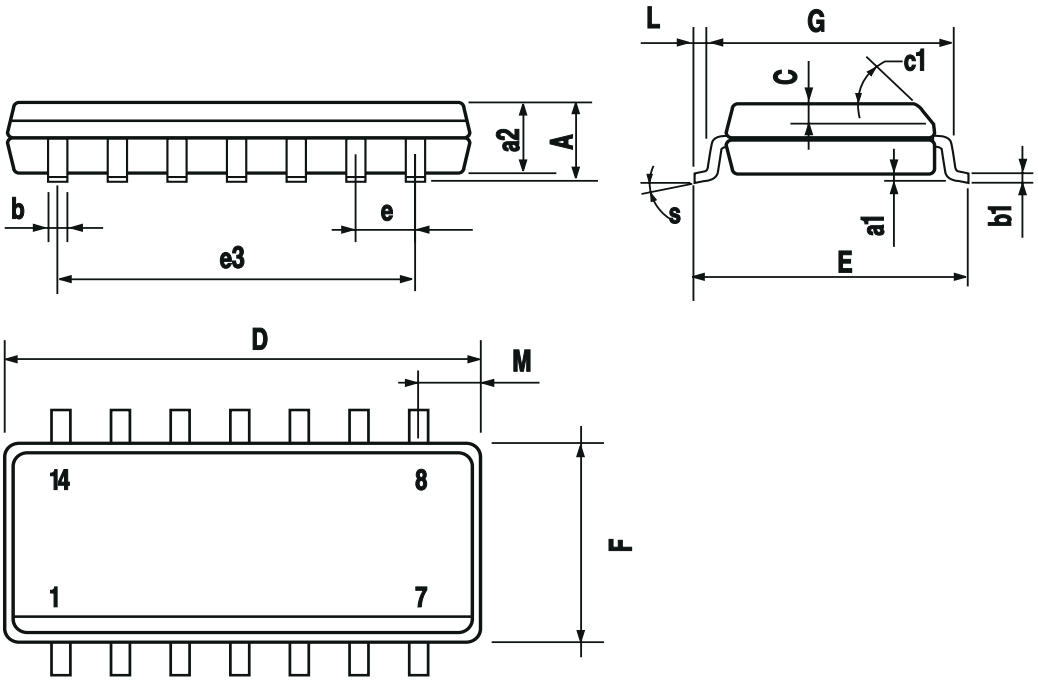
DIM.	mm			inch		
	MIN..	TYP.	MAX..	MIN..	TYP..	MAX..
A			1.75			0.069
a1	0.1		0.25	0.004		0.009
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D (1)	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F (1)	3.8		4	0.150		0.157
G	4.6		5.3	0.181		0.209
L	0.4		1.27	0.016		0.050
M			0.68			0.027
S	8° (max)					

(1) D and F do not include mold flash or protrusions. Mold flash or potrusions shall not exceed 0.15mm (.006inch).

OUTLINE AND MECHANICAL DATA

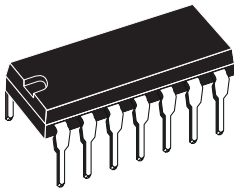


SO14



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

OUTLINE AND MECHANICAL DATA



DIP14