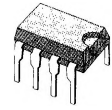
SGS-THOMSON MICROELECTRONICS

TDA0159A

PROXIMITY DETECTOR

- SUPPLY VOLTAGE : + 5 TO + 16 V
- OSCILLATOR FREQUENCY : 50 kHz TO 10 MHz
- OUTPUT CURRENT : ± 20 mA

MINIDIP/2



S0-8J

ORDER CODES : TDA0159ADP (Minidip)
TDA0159AFP (SO-8)

DESCRIPTION

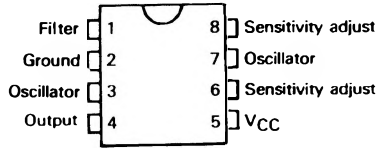
The TDA0159A has been designed for metallic body detection by detecting variations in high frequency Eddy current losses. The circuit acts as an oscillator with the addition of an external tuned circuit. Output signal level is varied by an approaching metallic object.

The circuit is protected against overvoltages (+ 26 to + 35 V) by a built-in peak limiter.

Output to ground and output to V_{CC} short-circuit protections are also implemented.

PIN CONNECTION

MINIDIP / SO-8



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (internally limited by zener)	26	V
I_O	Output Current (internally limited)	± 20	mA
f_{osc}	Oscillator Frequency	10	MHz
T_j	Junction Temperature	+ 150	°C
T_{stg}	Storage Temperature Range	− 55 to + 150	°C

OPERATING MODE

Between terminals 7 and 3 integrated circuit acts like a negative resistance equal to external resistor R1 connected on terminals 6 and 8.

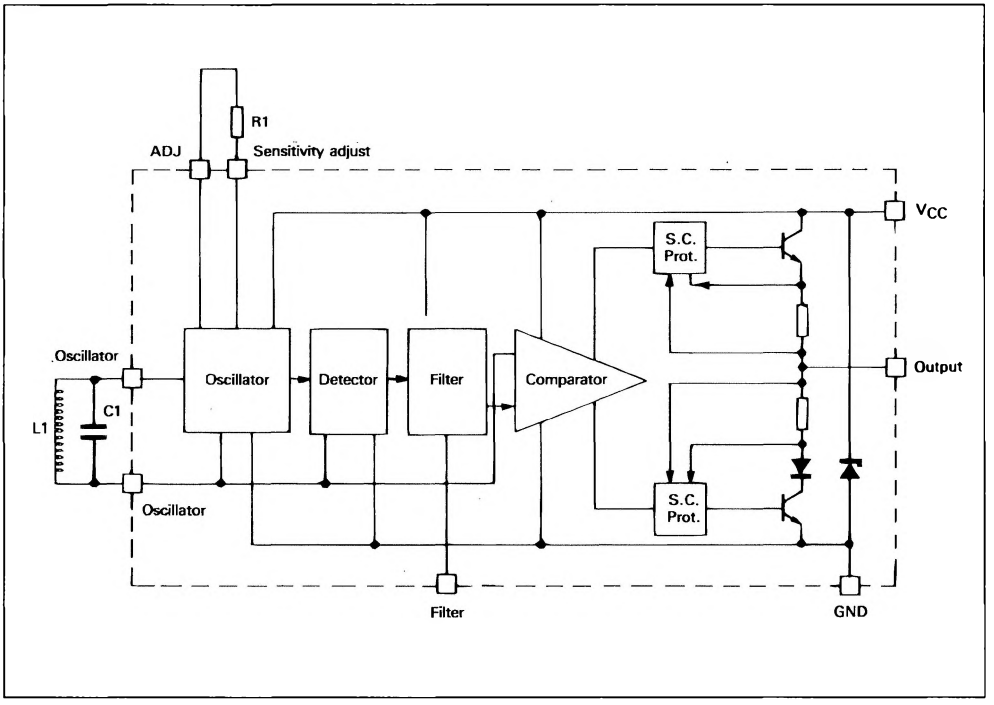
The oscillation stops when load resistance Rp of tuned circuit is smaller than R1. Then the output voltage is high (pin 4).

The oscillation sustains when loss resistance Rp of tuned circuit is higher than R1. Then the output voltage is low.

$$(fOSC = \frac{1}{2\pi \sqrt{(L1 \times C1)}})$$

Eddy currents induced by coil L1 in a metallic piece, fix loss resistance Rp.

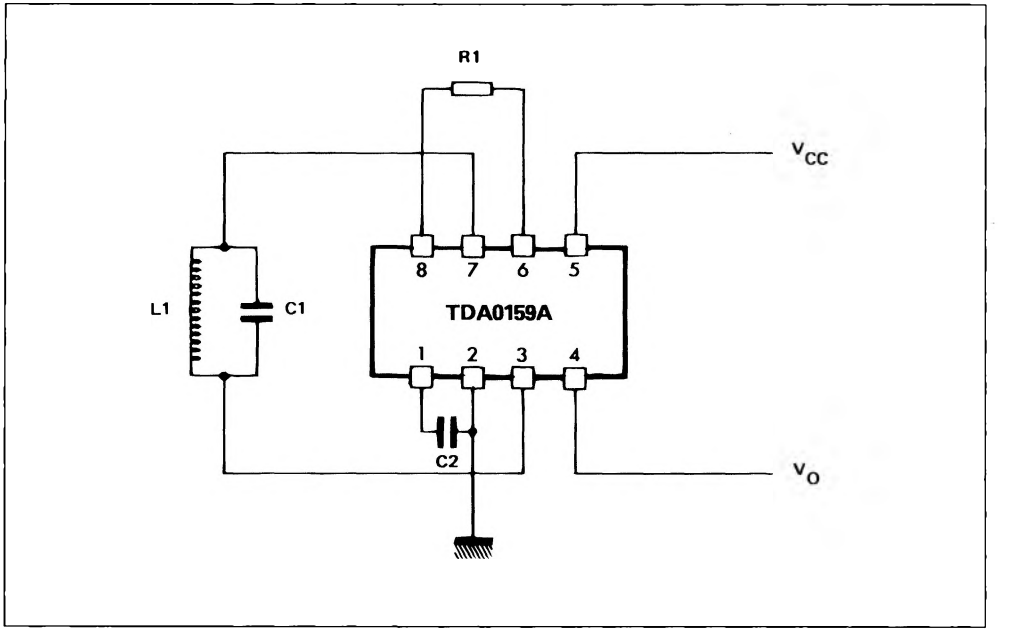
SCHEMATIC DIAGRAM



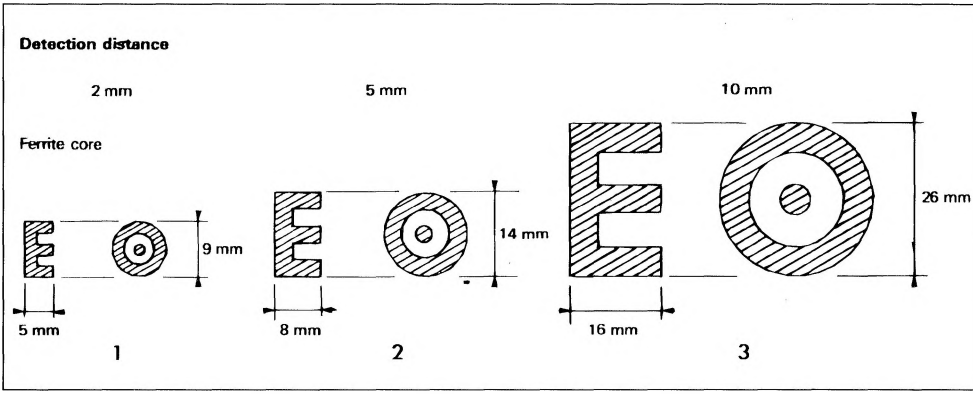
ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	5	–	16	V
$V_{CC(max)}$	Maximum Voltage (non–destructive t < 1 min)	–	–	24	V
$V_{CC(peak)}$	Clipping Voltage (limited by integrated zener diode, I_{CC} continuous < 10 mA, I_C pulse < 150 mA (peak), t < 10 ms)	26	30	35	V
I_{CC}	Supply Current (V_{CC} = + 13.5 V, I_O = 0)	–	2	–	mA
V_{OL}	Output Low Voltage (remote target V_{CC} = + 13.5 V, $I_O \geq$ – 10 mA)	–	–	2	V
V_{OH}	Output High Voltage Determined by Internal $V_{CC} \geq$ + 7 V (close target) 7 V ≤ V_{CC} ≤ + 16 V, $I_O \leq$ 10 mA 5 V ≤ V_{CC} ≤ + 7 V, $I_O \leq$ 4 mA	 5.4 3.9	 – –	 6.7 V_{CC}-0.2	V
f_{osc}	Oscillator Frequency (operating conditions)	–	–	10	MHz
f	Target Detection Frequency	–	–	10	kHz
R_n	Negative Value of the Resistance between Pin 7 and Pin 3 : 4 kΩ < R1 < 50 kΩ (R1 = sensitivity adjustement resistor)	0.9 x R1	R1	1.1 x R1	–
R1	Maximum Value of Sensitivity Adjustement Resistor R1 Connected between Pin 6 and Pin 8	–	–	50	kΩ
H_{yst}	Hysteresis (measured on detection range)	–	2	–	%

APPLICATION SCHEMATIC



TYPICAL APPLICATION EXAMPLES



	Detection Distance (*)	L1 (μH)	C1 (pF)	f_{osc} (kHz)	R1 (kΩ)	C2 pF
1	2 mm	30	120	2 650	6.8	–
2	5 mm	300	470	425	27	100
3	10 mm	2 160	4 700	50	27	10 000

* Ingot steel target.

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 / 100 mm)	40
2	Cofelec 432 FP 14 X 8 SE	1/2 CAR 142 – 2	THOMSON Fils et Câbles Thomrex 14 (14 / 100 mm)	100
3	Cofelec 432 FP 26 X 16 SE	1/2 CAR 262 – 2	THOMSON Fils et Câbles Thomrex 14 (14 / 100 mm)	200

* * 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 the value of R1 may be increased, resultaint in better sensitivity.