

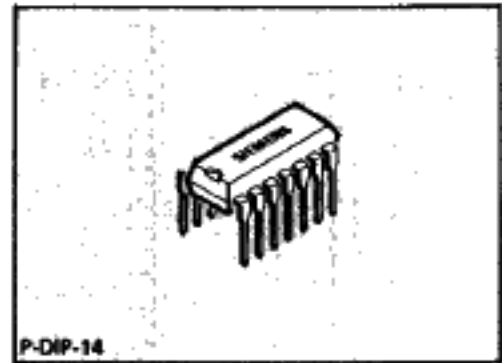
Proximity Switch

TCA 205

Features

- Large supply voltage range
- High output current
- Antivalent outputs
- Adjustable switching distance
- Adjustable hysteresis
- Turn-on delay

Bipolar IC

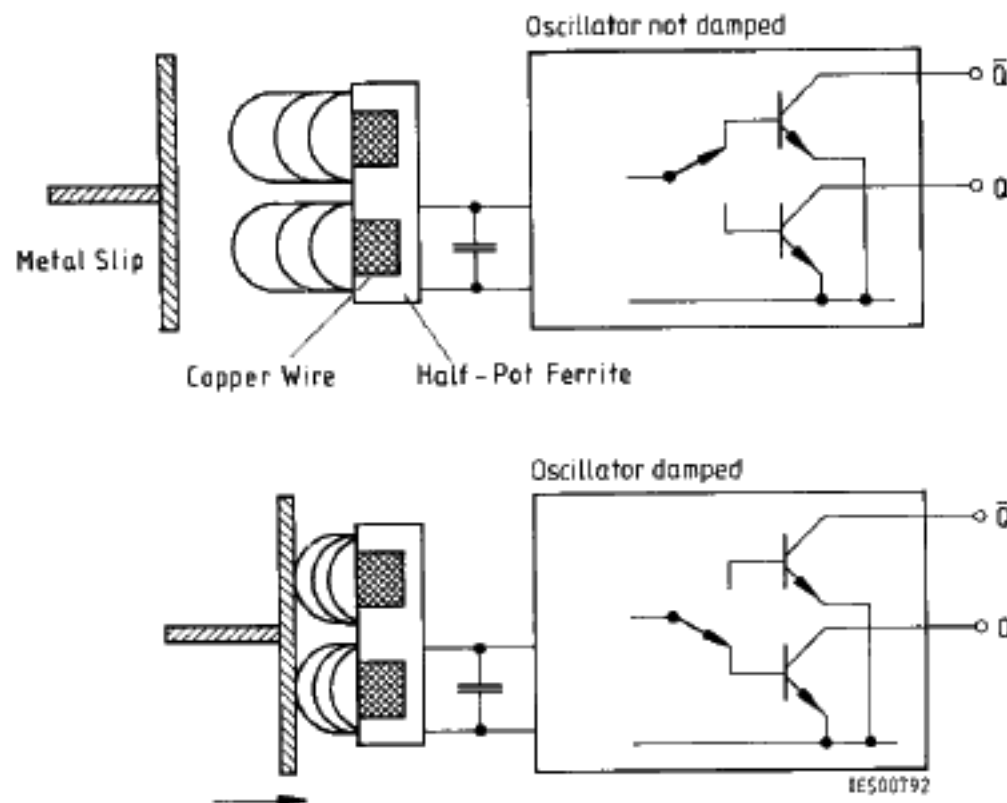


Type	Ordering Code	Package
■ TCA 205 A	Q67000-A1034	P-DIP-14

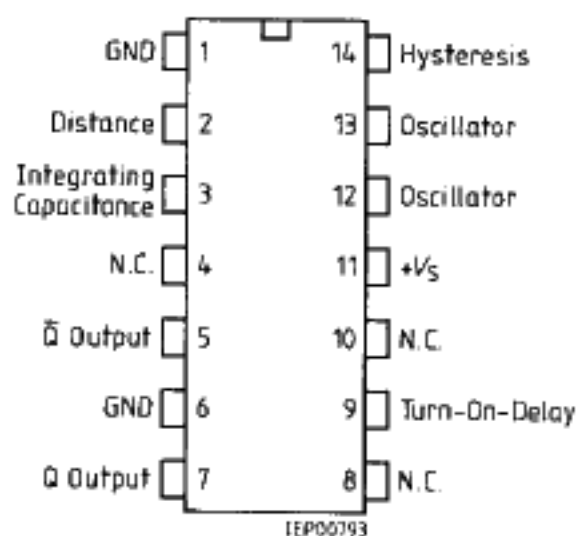
■ Not for new design.

This IC is intended for applications in inductive proximity switches. The outputs switch when the oscillation is damped, e.g. by the approach of a metal object.

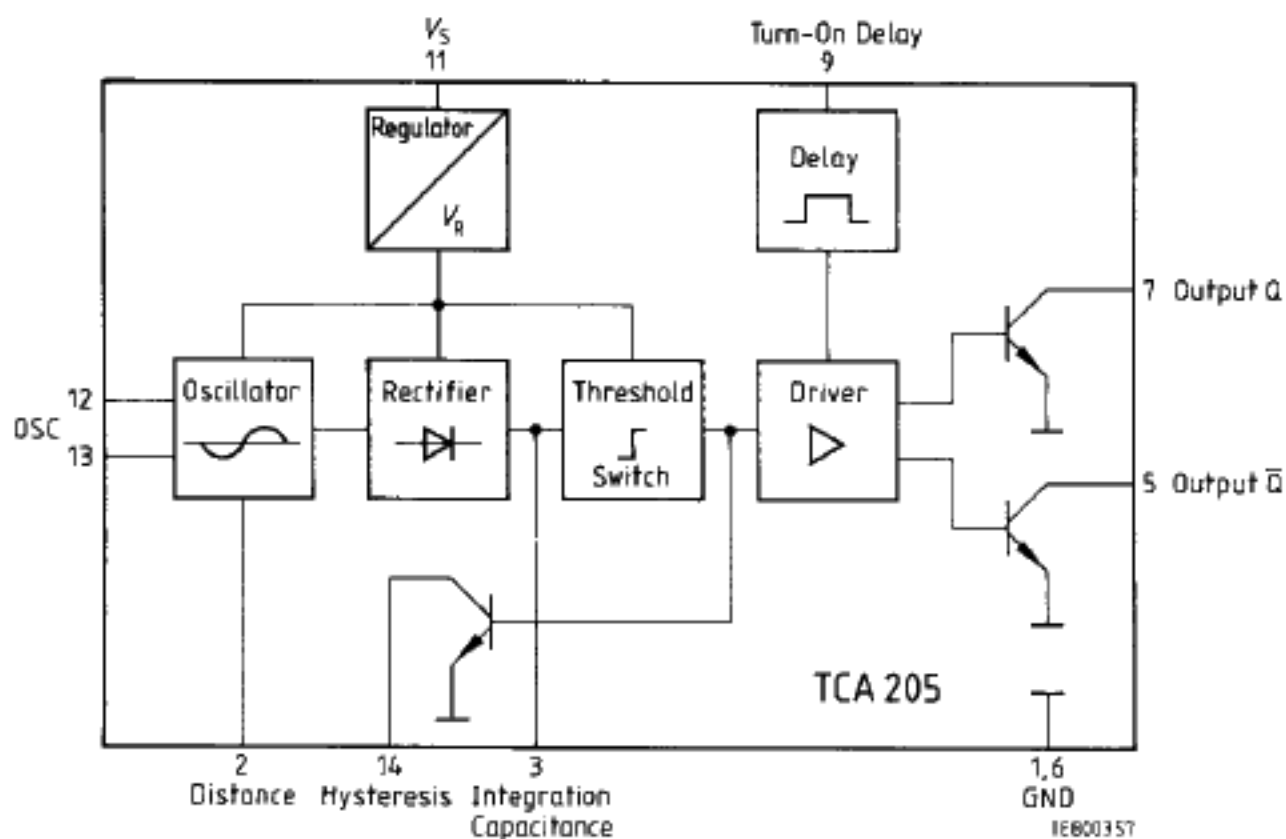
Operation Schematic



Pin Configurations (top view)



Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Supply voltage	V_S	30	V
Output voltage	V_Q	30	V
Output current	I_Q	50	mA
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-55 to 125	°C
Thermal resistance system - air TCA 205 A	$R_{th SA}$	85	K/W

Operating Range

Supply voltage	V_S	4.75 to 30	V
Ambient temperature	T_A	-25 to 85	°C

Characteristics

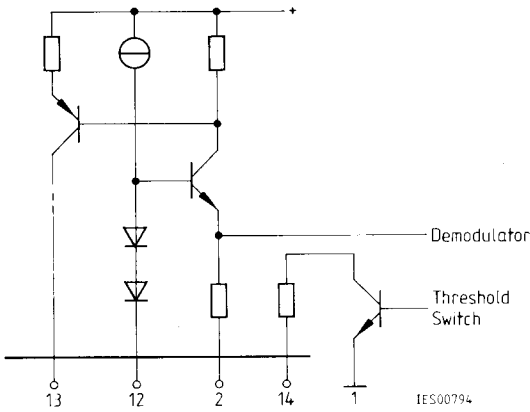
$V_S = 12\text{ V}$, $T_A = 25\text{ °C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		min.	typ.	max.		
Open-loop supply current consumption	I_S		1	2	mA	open pins
L-output voltage per output	V_{QL}		0.8	1	V	$I_{QL} = 5\text{ mA}$ $I_{QL} = 50\text{ mA}$
	V_{QL}		1.25	1.5	V	
H-output current per output	I_{QH}			10	μA	$V_{QH} = 30\text{ V}$
Integrating capacitance	C_I		10		nF	
Internal resistance at 3	R_{I3}	200	350	660	kΩ	
Threshold voltage at 3	V_{S3}		1.3	1.5	V	
Distance adjustment	R_{Di}	6			kΩ	
Hysteresis adjustment circuit 1						
Distance adjustment	R_{Di}	6 ¹⁾			kΩ	$R_{Hy} \rightarrow \infty$ $R_{Di} \rightarrow \infty$
Hysteresis adjustment circuit 2						
Turn-on delay	t_{Don}		200		ms/μF	
Oscillating frequency	f_{osc}	0.015		1.5	MHz	
Switching frequency without C_I	f_S			5	kHz	

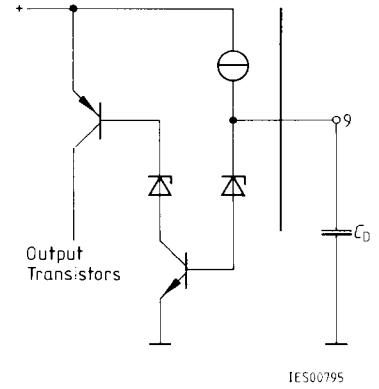
1) Parallel connection of R_{Hy} to R_{Di} may at least amount to 6 kΩ

Schematic Circuit Diagrams

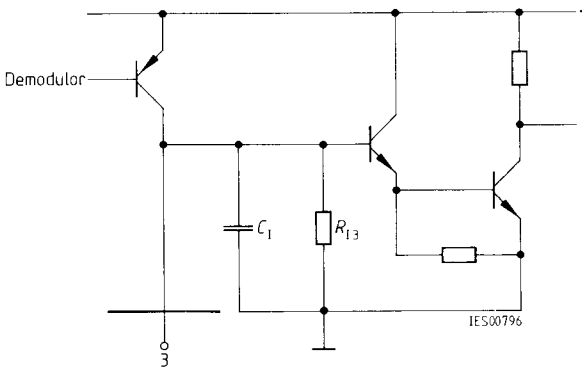
Oscillator



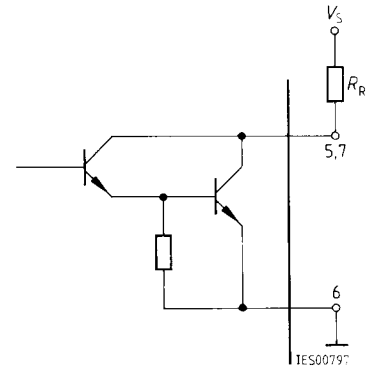
Turn-on delay



Integrating capacitor

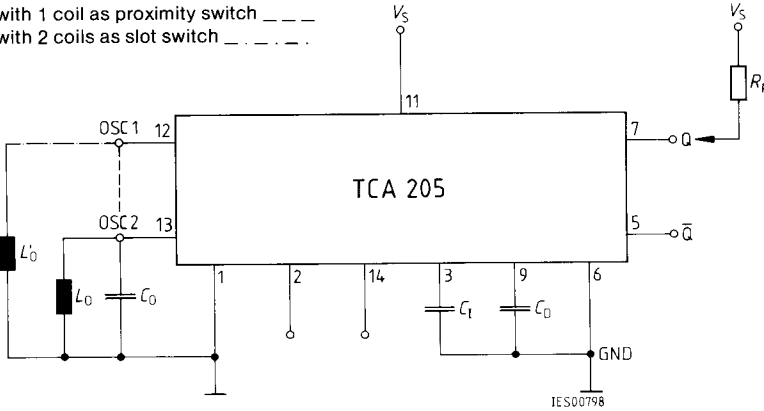


Outputs



Application Circuit

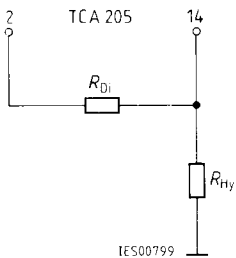
with 1 coil as proximity switch _____
 with 2 coils as slot switch - - - - -



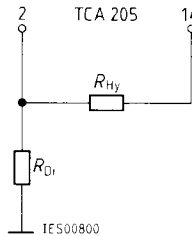
- L_0, C_0 oscillator
- R_{Di} distance adjustment
- R_{Hy} hysteresis adjustment
- C_t integrating capacitor
- C_D delay capacitor

The resistance of distance and hysteresis R_{Di} and R_{Hy} , for proximity switch TCA 205 A; may be applied as follows:

1. Series hysteresis



2. Parallel hysteresis



Circuit 1 is more suitable for proximity switches with oscillator frequencies of $f > 200$ kHz to 300 kHz, and small distances. Circuit 2 is more favorable for AF proximity switches having larger distances. This is due to the lower R_{Hy} values enabled by circuit 1 (min. 0 Ω) compared with 2 circuit 2 (min. 6 k Ω). Starting at frequencies of 200 kHz, high R_{Hy} values effect in addition to the hysteresis also the oscillator phase. Practical applications, however, require little phase response to receive a clear evaluation.

Application Example for a Proximity Switch

Coil data pot core B65939-A-X22
 coil former B65940-A-M1
 $\varnothing = 25 \text{ mm} \times 8.9 \text{ mm}$
 $L = 642 \mu\text{H}$
 $n = 100 \text{ CuLS } 30 \times 0.05$

Measuring plate 30 mm x 30 mm x 1 mm, Fe

Circuitry $R_{D1} = 56 \text{ to } 200 \text{ k}\Omega$, metal layer } circuit 2
 $R_{HY} = \infty$
 $C_0 = 1500 \text{ pF}$, STYROFLEX
 $f = 162 \text{ kHz}$

Switching distance versus ambient temperature

