

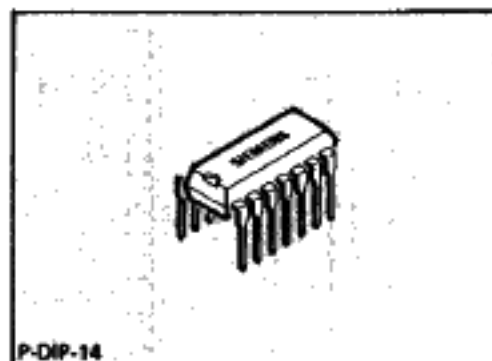
Proximity Switch

TCA 205

Features

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

Bipolar IC

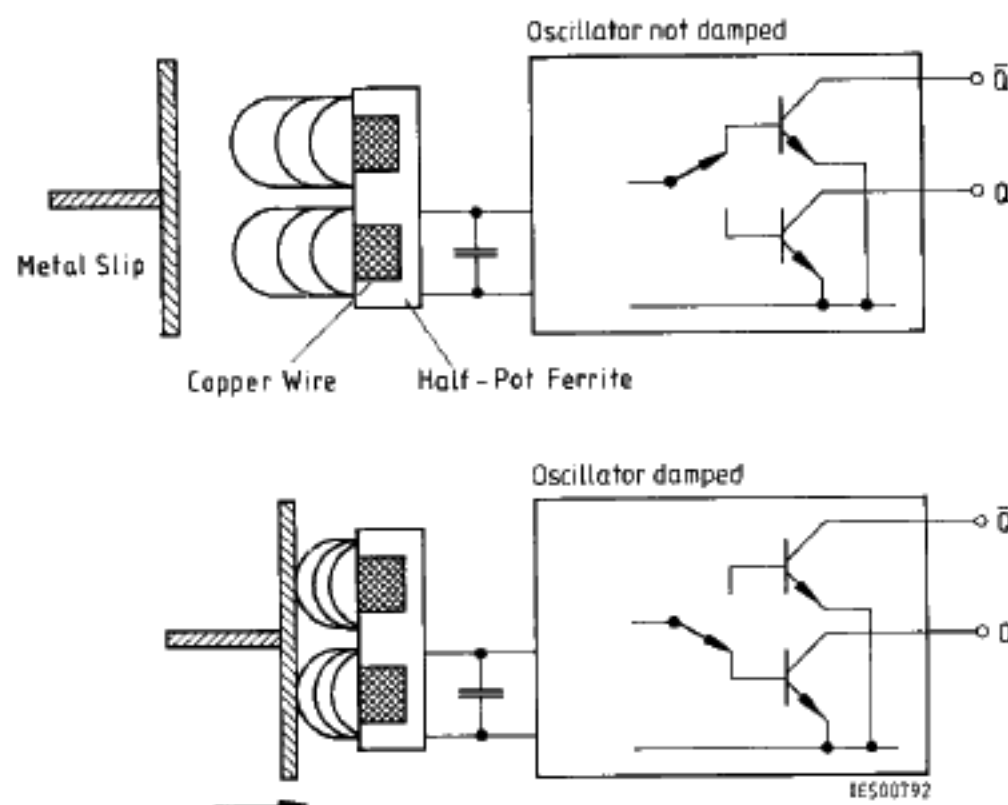


Type	Ordering Code	Package
■ TCA 205 A	Q67000-A1034	P-DIP-14

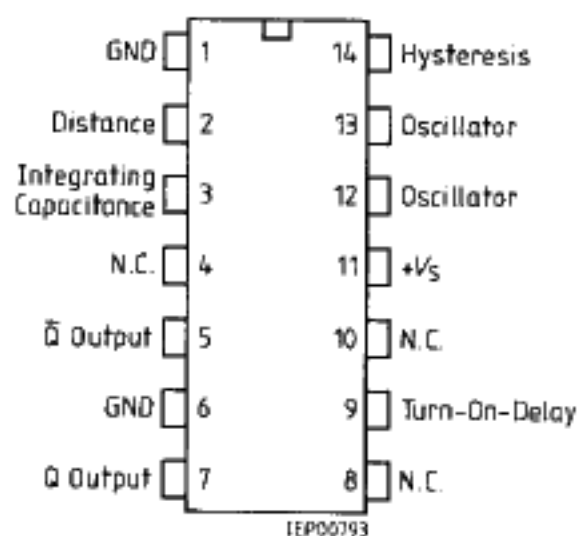
■ Not for new design.

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.

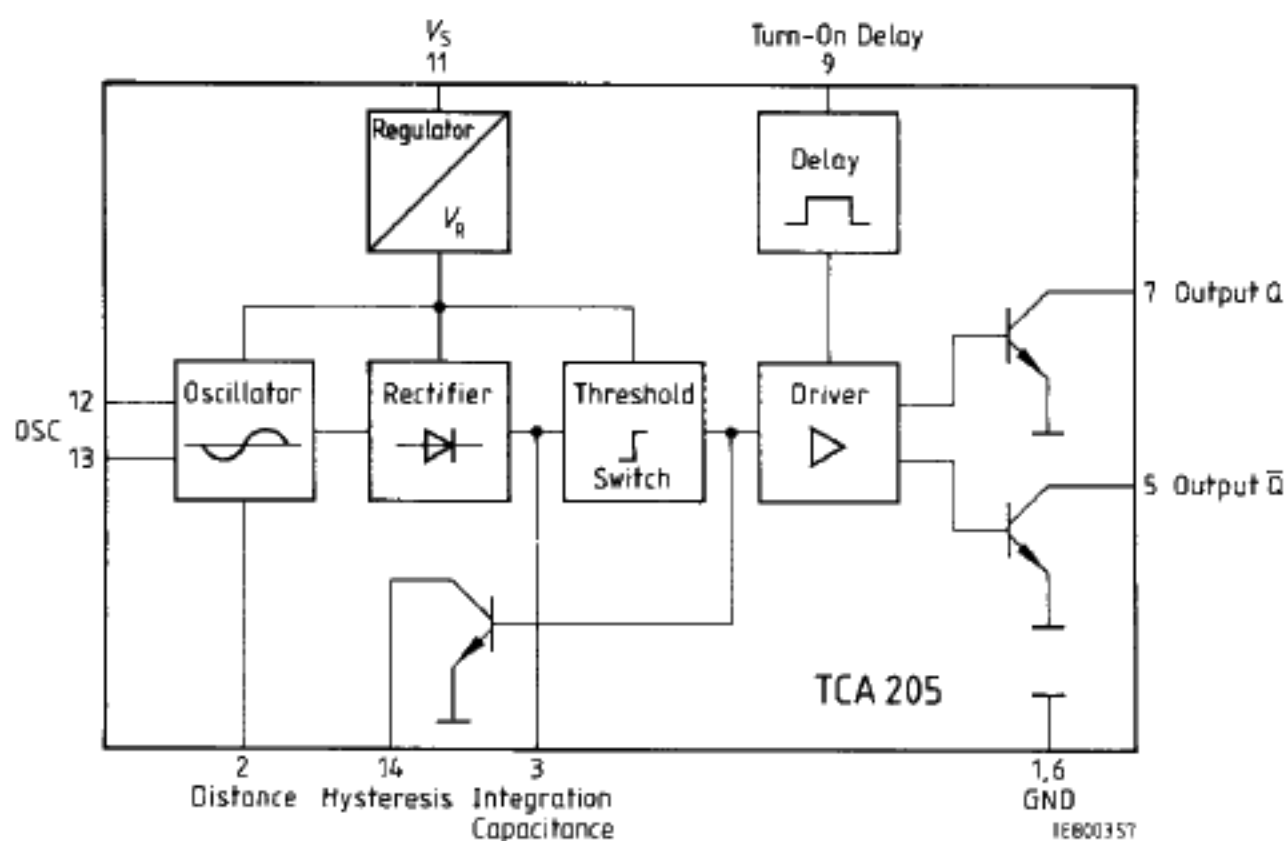
Operation Schematic



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

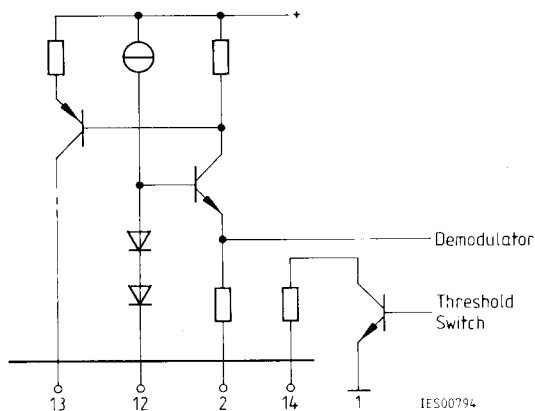
Characteristics
 $V_S = 12\text{ V}, T_A = 25\text{ °C}$

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	$I_{QL} = 5\text{ mA}$
	V_{QL}		1.25	1.5	V	$I_{QL} = 50\text{ mA}$
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	R_{HY}	0			kΩ	
Distance adjustment	R_{DI}	6 ¹⁾			kΩ	$R_{HY} \rightarrow \infty$
Hysteresis adjustment	R_{HY}	6 ¹⁾			kΩ	$R_{DI} \rightarrow \infty$
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	

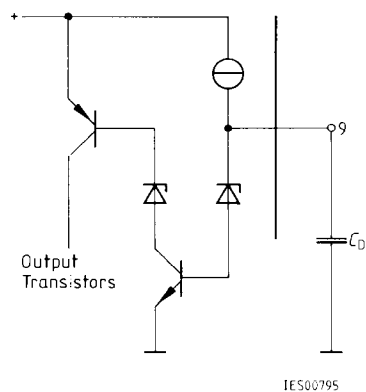
¹⁾ Parallel connection of R_{HY} to R_{DI} may at least amount to 6 kΩ

Schematic Circuit Diagrams

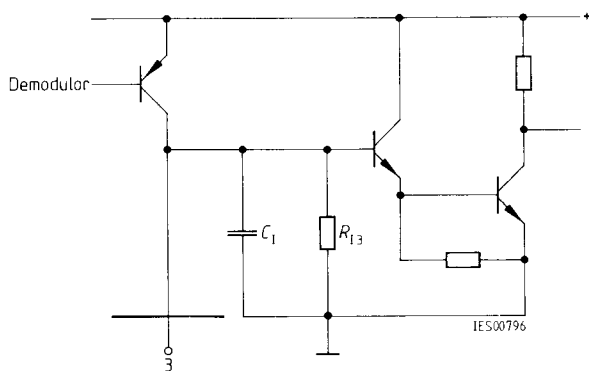
Oscillator



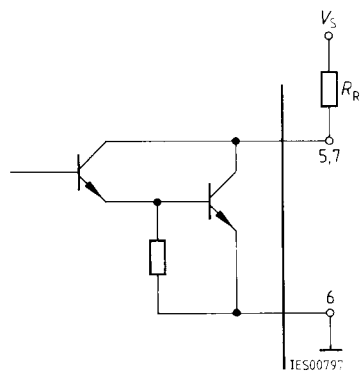
Turn-on delay



Integrating capacitor

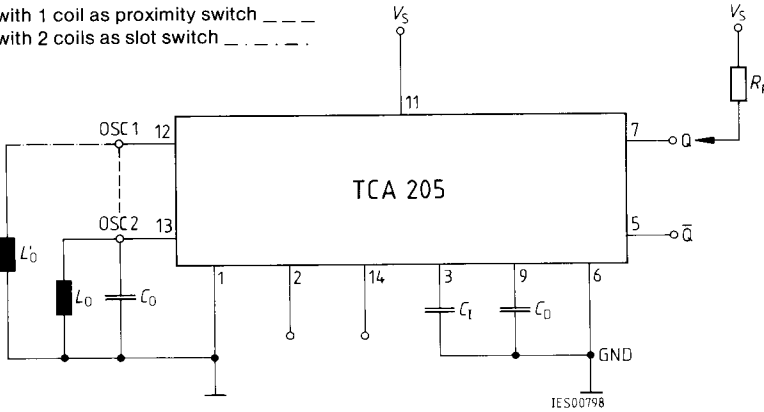


Outputs



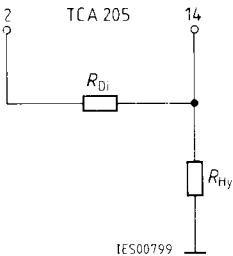
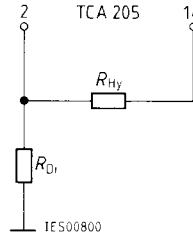
Application Circuit

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_1 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. 0Ω) compared with 2 circuit 2 (min. $6 \text{ k}\Omega$). 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 mm x 8.9 mm
L	= 642 μ H
n	= 100 CuLS 30 x 0.05

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

Circuitry

R_{DI} = 56 to 200 k Ω , metal layer	} circuit 2
R_{HY} = ∞	
C_0 = 1500 pF, STYROFLEX	
f = 162 kHz	

**Switching distance versus
ambient temperature**

