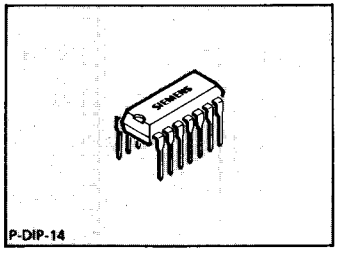
Proximity Switch

TCA 205

Bipolar IC

Features

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

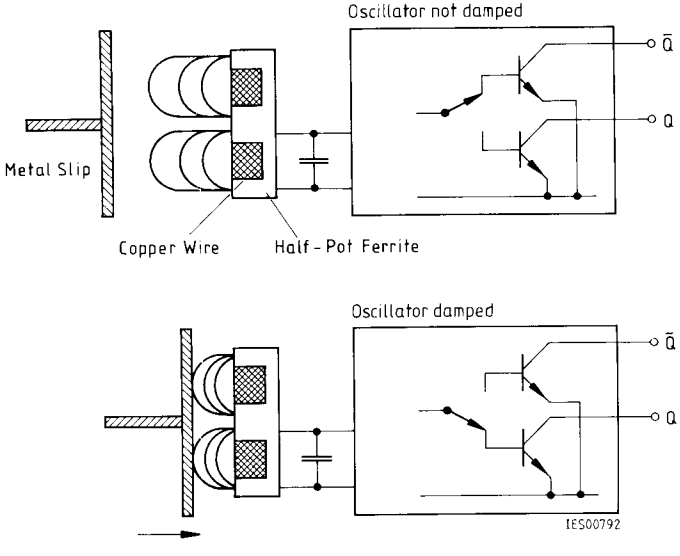


Type	Ordering Code	Package
■ TCA 205 A	Q67000-A1034	P-DIP-14

■ 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



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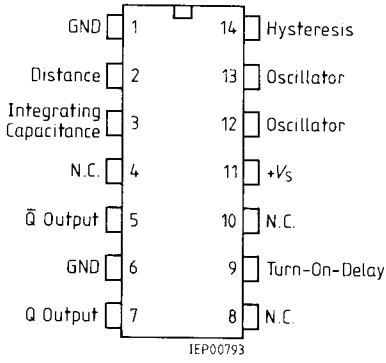
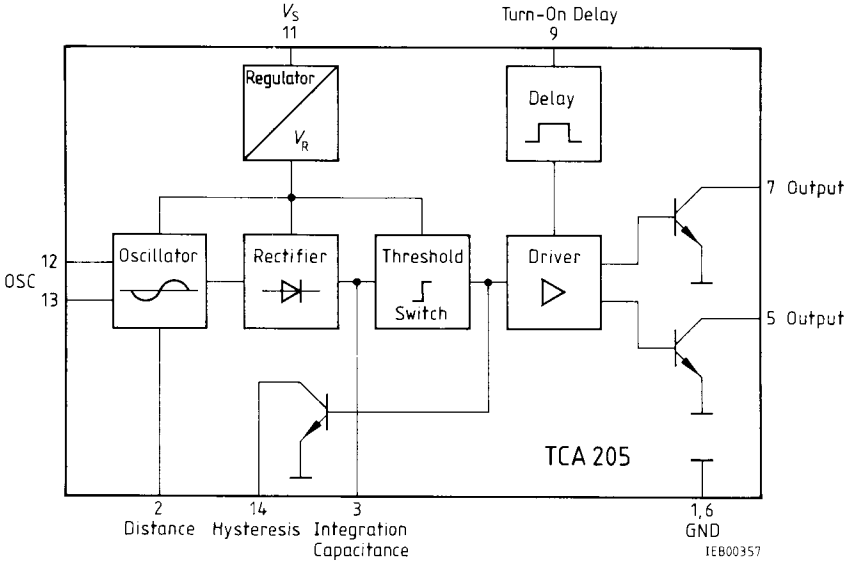
Pin Configurations
(top view)



Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Supply voltage Output voltage	V_S V_Q	30 30	V V
Output current	I_Q	50	mA
Junction temperature Storage temperature range	T_j T_{stg}	150 −55 to 125	°C °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

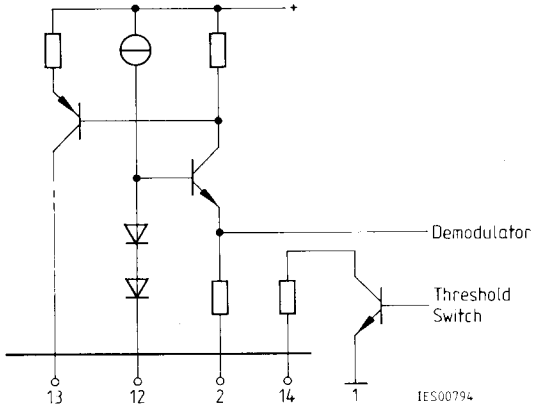
$V_S = 12$ V, $T_A = 25$ °C

Parameter	Symbol	Limit Values min.	typ.	max.	Unit	Test Conditions
Open-loop supply current consumption	I_S		1	2	mA	open pins
L-output voltage per output	$V_{Q\,L}$ $V_{Q\,L}$		0.8 1.25	1 1.5	V V	$I_{Q\,L} = 5$ mA $I_{Q\,L} = 50$ mA
H-output current per output	$I_{Q\,H}$			10	µA	$V_{Q\,H} = 30$ V
Integrating capacitance	C_I		10		nF	
Internal resistance at 3	$R_{I\,3}$	200	350	660	kΩ	
Threshold voltage at 3	$V_{S\,3}$		1.3	1.5	V	
Distance adjustment (circuit 1) Hysteresis adjustment (circuit 1)	R_{Di} R_{Hy}	6 0			kΩ kΩ	
Distance adjustment (circuit 2) Hysteresis adjustment (circuit 2)	R_{Di} R_{Hy}	6[1]) 6[1])			kΩ kΩ	$R_{Hy} \rightarrow \infty$ $R_{Di} \rightarrow \infty$
Turn-on delay	t_{Don}		200		ms/µF	
Oscillating frequency Switching frequency without C_I	f_{OSC} f_S	0.015		1.5 5	MHz kHz	

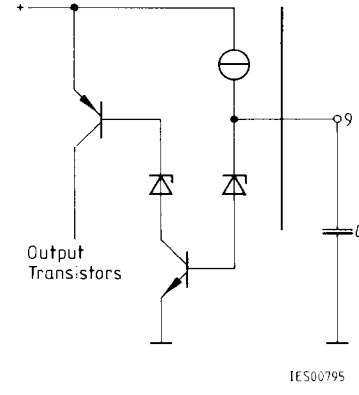
[1]) Parallel connection of R_{Hy} to R_{Di} may at least amount to 6 kΩ

Schematic Circuit Diagrams

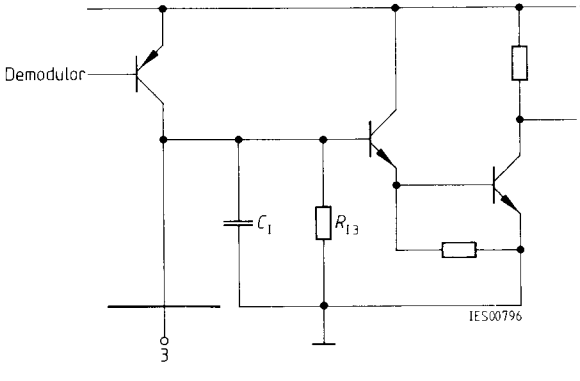
Oscillator



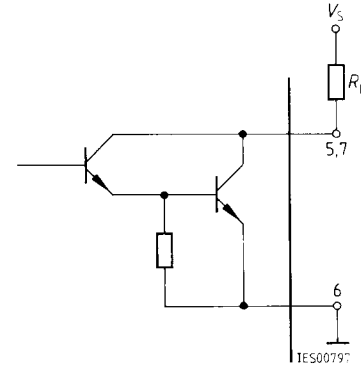
Turn-on delay



Integrating capacitor

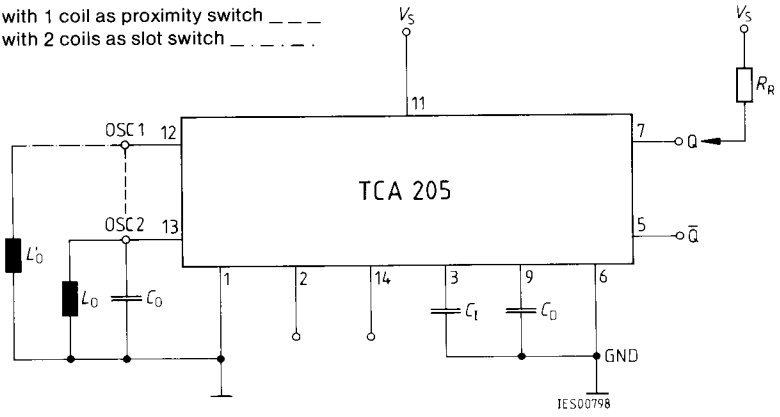


Outputs



Application Circuit

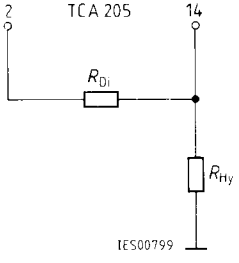
with 1 coil as proximity switch _ _ _
with 2 coils as slot switch _ . _ . _ .



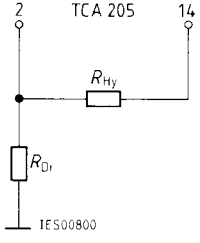
L_0, C_0	oscillator
R_{Di}	distance adjustment
R_{Hy}	hysteresis adjustment
C_I	integrating capacitor
C_D	delay capacitor

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 kΩ). 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
Ø = 25 mm x 8.9 mm
L = 642 µH
n = 100 CuLS 30 x 0.05

Measuring plate

30 mm x 30 mm x 1 mm, Fe

Circuitry

R_{Di} = 56 to 200 kΩ, metal layer
R_{Hy} = ∞
C_0 = 1500 pF, STYROFLEX
f = 162 kHz

} circuit 2

Switching distance versus ambient temperature