

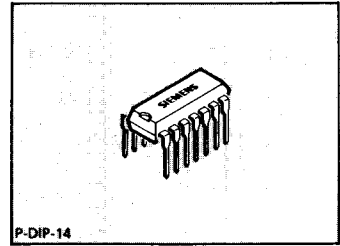
## Proximity Switch

TCA 205

### Features

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

Bipolar IC



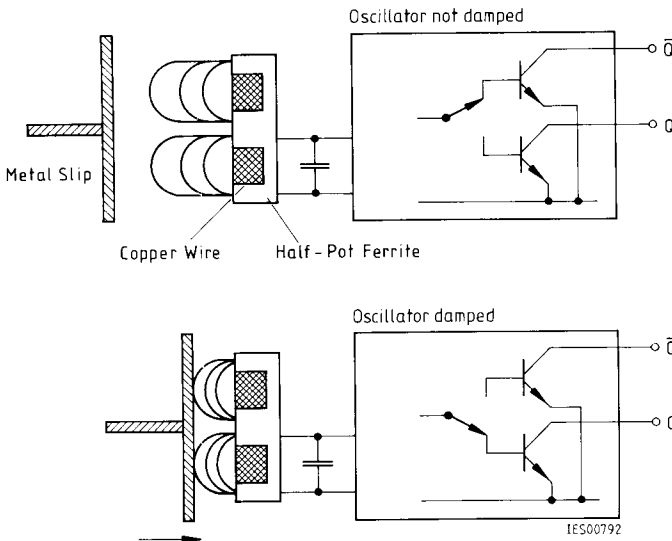
P-DIP-14

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

■ Not for new design.

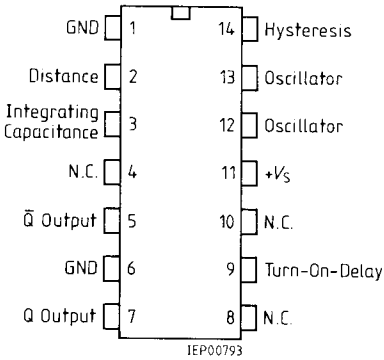
This IC is intended for applications in inductive proximity switches. The outputs switch when the oscillation is damped, e.g. by the approach of a metal object.

### Operation Schematic

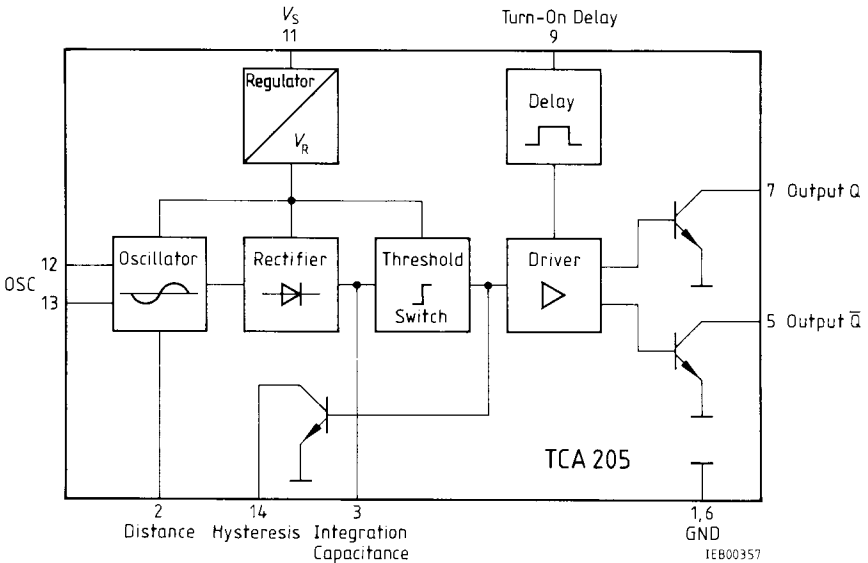


**Pin Configurations**

(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

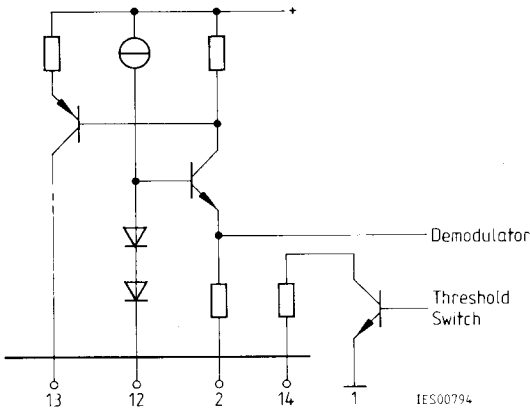
**Characteristics**
 $V_S = 12\text{ V}, T_A = 25\text{ °C}$ 

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	$V_{QL}$ $V_{QL}$		0.8 1.25	1 1.5	V V	$I_{QL} = 5\text{ mA}$ $I_{QL} = 50\text{ mA}$
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	$R_{Di}$ $R_{Hy}$	6			kΩ	
Hysteresis adjustment circuit 1						
Distance adjustment	$R_{Di}$ $R_{Hy}$	6 <sup>1)</sup>	6 <sup>1)</sup>		kΩ 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	

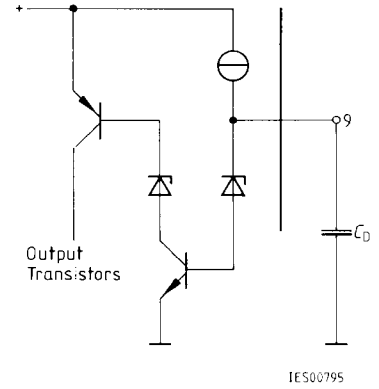
1) Parallel connection of  $R_{Hy}$  to  $R_{Di}$  may at least amount to 6 kΩ

**Schematic Circuit Diagrams**

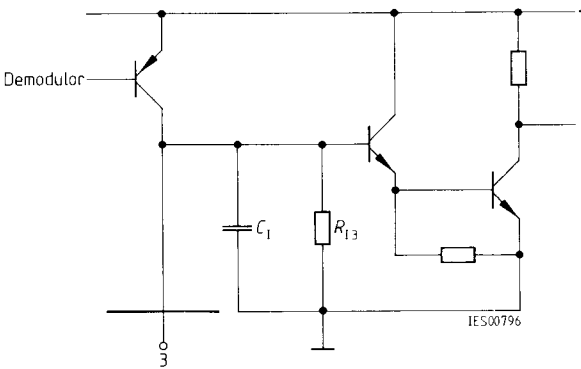
**Oscillator**



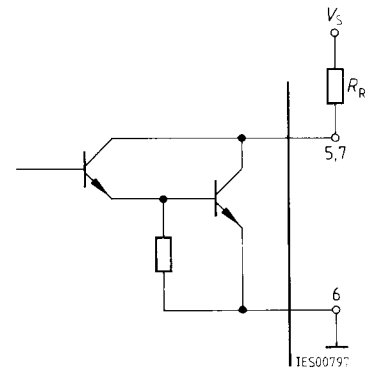
**Turn-on delay**



**Integrating capacitor**

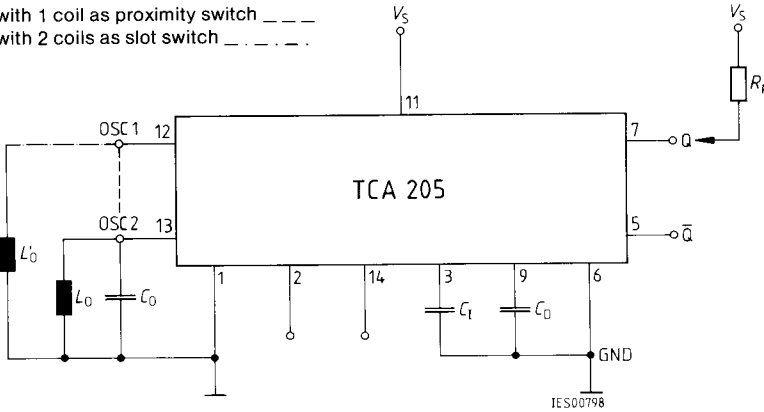


**Outputs**



**Application Circuit**

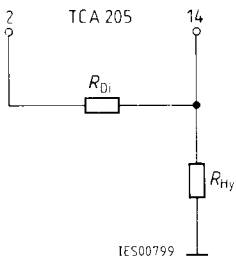
with 1 coil as proximity switch \_\_\_\_\_  
 with 2 coils as slot switch - - - - -



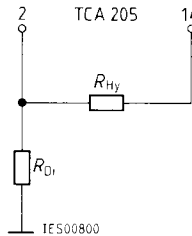
- $L_0, C_0$  oscillator
- $R_{Di}$  distance adjustment
- $R_{Hy}$  hysteresis adjustment
- $C_t$  integrating capacitor
- $C_D$  delay capacitor

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  $\Omega$ ) compared with 2 circuit 2 (min. 6 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  $\mu$ 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 $\Omega$ , metal layer } circuit 2  
     $R_{Hy}$  =  $\infty$   
     $C_0$  = 1500 pF, STYROFLEX  
     $f$  = 162 kHz

**Switching distance versus ambient temperature**

