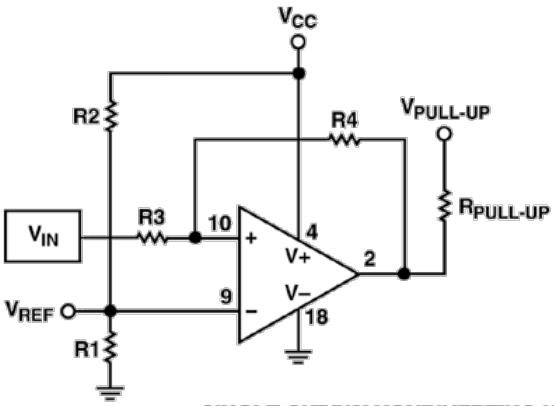

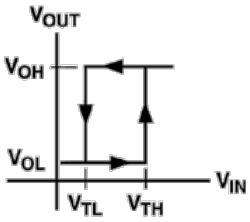

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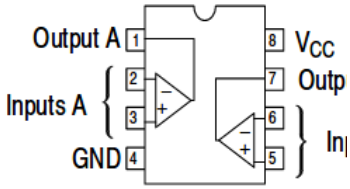
PIN CONNECTIONS



(Top View)

SINGLE-SUPPLY NONINVERTING HYSTERESIS:

$V_{REF} = V_{CC}*R1/(R1 + R2)$

$V_{TH} = ((R3 + R4)*V_{REF} - (R3*V_{OL}))/R4$

$V_{TL} = ((R3 + R4)*V_{REF} - (R3*V_{OH}))/R4$

$HYST = V_{TH} - V_{TL}$

$HYST = R3*(V_{OH} - V_{OL})/R4$

To verify following computations simply use: `$ python -m doctest -v comparators-Figs-05.html`

```
>>>
>>> R1=8.2e3
>>> P1=4.7e3
>>> R2=12e3
>>>
>>> def range_VREF():
...     i = VCC / (R1+P1+R2)
...     return [ i*R1, i*(R1+P1) ]
>>>
>>> VCC=15.0 ; range_VREF()
[4.9397590361445785, 7.771084337349398]
>>> VCC=18.5 ; range_VREF()
[6.092369477911647, 9.58433734939759]
>>>
>>>
>>> def VTH():
...     return ((R3+R4)*VREF - (R3*VOL))/R4
...
>>> def VTL():
...     voh=VCC
...     return ((R3+R4)*VREF - (R3*voh))/R4
...
>>> R3=27e3
>>> R4=560e3
>>> VOL=.2
>>>
>>> def tab():
...     global VREF
...     vr=[VREF+dv for dv in [-.2, -.1, 0.0, +.1, +.2]]
...     print("VCC=%7.2f" % VCC)
...     print(" R3=%7.1f   R4=%7.1f" % (R3, R4))
...     for VREF in vr:
...         print("VREF=%7.2f  VTL=%7.3f .. VTH=%7.3f  (4x: %7.3f..%7.3f)"
...               % (VREF, VTL(), VTH(), VTL()*4, VTH()*4) )
...
>>>
>>> VCC=15.0 ; VREF=7.164 ; tab()
VCC=  15.00
 R3=27000.0   R4=560000.0
VREF=   6.96  VTL=  6.577 .. VTH=  7.290  (4x:  26.306.. 29.160)
VREF=   7.06  VTL=  6.681 .. VTH=  7.395  (4x:  26.725.. 29.580)
VREF=   7.16  VTL=  6.786 .. VTH=  7.500  (4x:  27.145.. 29.999)
VREF=   7.26  VTL=  6.891 .. VTH=  7.605  (4x:  27.564.. 30.418)
VREF=   7.36  VTL=  6.996 .. VTH=  7.709  (4x:  27.983.. 30.838)
>>>
>>> VCC=18.5 ; VREF=7.164 ; tab()
VCC=  18.50
 R3=27000.0   R4=560000.0
VREF=   6.96  VTL=  6.408 .. VTH=  7.290  (4x:  25.631.. 29.160)
VREF=   7.06  VTL=  6.513 .. VTH=  7.395  (4x:  26.050.. 29.580)
VREF=   7.16  VTL=  6.617 .. VTH=  7.500  (4x:  26.470.. 29.999)
VREF=   7.26  VTL=  6.722 .. VTH=  7.605  (4x:  26.889.. 30.418)
VREF=   7.36  VTL=  6.827 .. VTH=  7.709  (4x:  27.308.. 30.838)
>>>
>>>
```