

## VOLTAGE DETECTOR

### FEATURES

- Precise Detection Thresholds .... Standard  $\pm 2.0\%$   
Custom  $\pm 1.0\%$
- Small Packages ..... SOT-23A-3, SOT-89, TO-92
- Low Current Drain ..... Typ.  $1\mu\text{A}$
- Wide Detection Range ..... 2.1V to 6.0V
- Wide Operating Voltage Range ..... 1.5V to 10V

### APPLICATIONS

- Battery Voltage Monitoring
- Microprocessor Reset
- System Brownout Protection
- Switching Circuit in Battery Backup
- Level Discriminator

### PIN CONFIGURATIONS



### FUNCTIONAL BLOCK DIAGRAM



### GENERAL DESCRIPTION

The TC54 Series are CMOS voltage detectors, suited especially for battery-powered applications because of their extremely low  $1\mu\text{A}$  operating current and small surface-mount packaging. Each part is laser trimmed to the desired threshold voltage which can be specified from 2.1V to 6.0V, in 0.1V steps.

The device includes a comparator, low-current high-precision reference, laser-trimmed divider, hysteresis circuit and output driver. The TC54 is available with either an open-drain or complementary output stage.

In operation, the TC54's output (V<sub>OUT</sub>) remains in the logic HIGH state as long as V<sub>IN</sub> is greater than the specified threshold voltage (V<sub>DET</sub>). When V<sub>IN</sub> falls below V<sub>DET</sub>, the output is driven to a logic LOW. V<sub>OUT</sub> remains LOW until V<sub>IN</sub> rises above V<sub>DET</sub> by an amount V<sub>HYST</sub>, whereupon it resets to a logic HIGH.

### ORDERING INFORMATION

**PART CODE** TC54 V X XX X X X XX XXX

**Output form:** \_\_\_\_\_

N = Nch Open Drain  
C = CMOS Output

**Detected Voltage:** \_\_\_\_\_

Ex: 21 = 2.1V; 60 = 6.0V

**Extra Feature Code:** Fixed: 0 \_\_\_\_\_

**Tolerance:** \_\_\_\_\_

1 =  $\pm 1.0\%$  (custom)  
2 =  $\pm 2.0\%$  (standard)

**Temperature:** E:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  \_\_\_\_\_

**Package Type and Pin Count:** \_\_\_\_\_

CB: SOT-23A-3\*, MB: SOT-89-3, ZB: TO-92-3

**Taping Direction:** \_\_\_\_\_

Standard Taping  
Reverse Taping  
No suffix: TO-92 Bulk

\*SOT-23A-3 is equivalent to EIAJ (SC-59).



# VOLTAGE DETECTOR

TC54

## TIMING CHART



## DESCRIPTION OF OPERATION

Refer to the Timing Chart below. In normal steady-state operation, when  $V_{IN} > V_{DET}^+$ , the output will be at a logic high. In the case of the TC54V, this is an open-drain condition. If and when the input falls below  $V_{DET}^-$ , the output will pull down (Logic 0) to  $V_{SS}$ . Generally,  $V_{OUT}$  can pull down to within 0.5V of  $V_{SS}$  at rated output current and input voltage. (See the Electrical Characteristics section).

The output,  $V_{OUT}$ , will stay valid until the input voltage falls below the Minimum Operating Voltage,  $V_{IN(MIN)}$ , of 1.5V. Below this minimum operating voltage, the output is undefined. During power-up or anytime  $V_{IN}$  has fallen below  $V_{IN(MIN)}$ ,  $V_{OUT}$  will remain undefined until  $V_{IN}$  rises above  $V_{IN(MIN)}$ , at which time the output will become valid.  $V_{OUT}$  will be in its active low state while  $V_{IN(MIN)} < V_{IN} < V_{DET}^-$ . ( $V_{DET}^+ = V_{DET}^- + V_{HYST}$ ). If and when the input rises above  $V_{DET}^+$ , the output will assume its inactive state. (High for TC54VC, open-drain for TC54VN).

## APPLICATIONS

Refer to TelCom Semiconductor Application Note #2, *Using the TC54 Voltage Detector*.

## MARKING



① = output (Nch or CMOS) plus first voltage digit

	2	3	4	5	6
Nch	M	N	P	R	S
CMOS	C	D	E	F	H

ex: CMOS 3.x = ①○○○

② = first voltage decimal (0-9)

ex: CMOS 3.4 = ①④○○

③ & ④ = assembly lot number



①, ② & ③ = 54\_ (fixed)

④ = output (C = CMOS, N = Nch)

⑤ = first voltage digit (2-6)

⑥ = first voltage decimal (0-9)

⑦ = extra feature code : fixed : 0

⑧ = detecting accuracy

1 =  $\pm 1.0\%$  (custom), 2 =  $\pm 2.0\%$  (standard)

⑨, ⑩, ⑪ & ⑫ = assembly lot number