

### INTRODUCTION

TelCom's TC54 series of voltage detectors are designed to supersede a variety of discrete comparator circuits and bipolar technology voltage detectors.

These voltage detectors are especially suited for application in battery powered systems because of their extremely low  $1\mu\text{A}$  operating current. Each part is laser programmed to the desired trip point voltage over the range of 0.8V to 6.0V in 100mV steps. For complete design flexibility, complementary or open-drain output versions are available. TC54 package options include surface mount SOT-23 and SOT-89 or through-hole TO-92 types.

### OPERATION

The TC54VN equivalent circuit is shown in Figure 1. The internal precision temperature-compensated reference and comparator circuit consistently monitor  $V_{IN}$  for an under-voltage condition. When such a condition occurs, the output is forced to the active (LOW) state and remains there until  $V_{IN}$  is once again within tolerance. As shown in the timing diagram of Figure 1, the output is forced active when  $V_{IN} < (-V_{DET})$  (Where  $(-V_{DET})$  is the threshold voltage) and returns HIGH when  $V_{IN}$  exceeds  $(-V_{DET})$  plus 5% hysteresis (example: if  $(-V_{DET}) = 2.0\text{V}$ , the output will go HIGH when  $V_{IN} > 2.1\text{V}$ ).

### TC54 BLOCK DIAGRAM AND TIMING

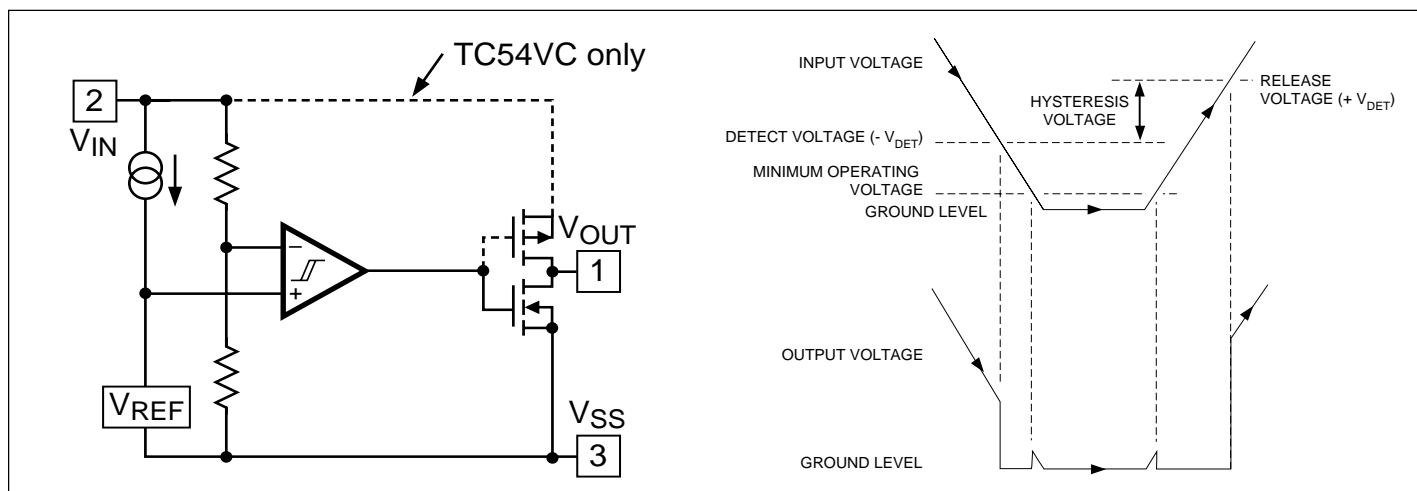


Figure 1.

### TC54 AS A MICROPROCESSOR RESET GENERATOR

Following a power outage, microprocessors require a reset to get them back into their starting state. Commonly used simple Schmitt trigger/capacitor circuits are inadequate since they do not accurately monitor the power supply voltage tolerance. The TC54 series overcomes this problem with precise voltage detection. Figure 2 shows a reset circuit using a standard TC54 and external RC time constant, replacing bipolar integrated voltage detectors (see Table 1).

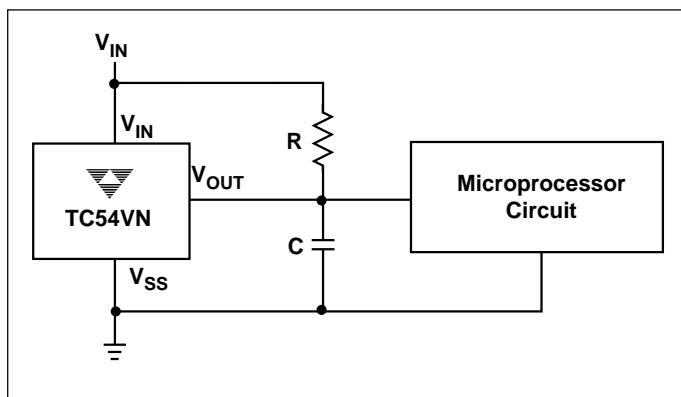


Figure 2. Microprocessor Reset Circuit using TC54 and External Delay

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Table 1. TC54 Cross Reference Listing

MFGR	PART#	TELCOM #	DESCRIPTION	TELCOM ATTRIBUTE
Motorola	MC33064P-5	TC54VN4502EZB	4.5V trip, -40 to +85C, TO-92	500 times less power
Motorola	MC34064P-5	TC54VN4502EZB	4.5V trip, 0 to +70C, TO-92	500 times less power
Motorola	MC34164P-3	TC54VN2702EZB	2.7V trip, 0 to +70C, TO-92	10 times less power
Motorola	MC34164P-5	TC54VN4302EZB	4.3V trip, 0 to +70C, TO-92	10 times less power
Motorola	MC33164P-3	TC54VN2702EZB	2.7V trip, -40 to +85C, TO-92	10 times less power
Motorola	MC33164P-5	TC54VN4302EZB	4.3V trip, -40 to +85C, TO-92	10 times less power
T.I.	TL7757ILP	TC54VN4502EZB	4.5V trip, -40 to +85C, TO-92	2000 times less power
T.I.	TL7757CLP	TC54VN4502EZB	4.5V trip, 0 to +70C, TO-92	2000 times less power

### MODIFYING THE TRIP POINT, $-V_{DET}$

Although the TC54 has a pre-programmed  $V_{DET}$ , it is sometimes necessary to make adjustments during prototyping. This can be accomplished by connecting an external resistor divider to a TC54 which has a  $V_{DET}$  lower than that of  $V_{SOURCE}$  (Figure 3).

To maintain detector accuracy, the bleeder current through the divider should be significantly higher than the  $1\mu A$  operating current required by the TC54. A reasonable value for this bleeder current is  $100\mu A$  (100 times the  $1\mu A$  required by the TC54). For example, if  $(-V_{DET}) = 2V$  and the desired trip point is  $2.5V$ , the value of  $R1 + R2$  is  $250K \text{ Ohms}$  ( $2.5V/100\mu A$ ). The value of  $R1 + R2$  can be rounded to the nearest standard value and plugged into the equation of Figure 3 to calculate values for  $R1$  and  $R2$ . 1% tolerance resistors are recommended.

### OTHER APPLICATIONS

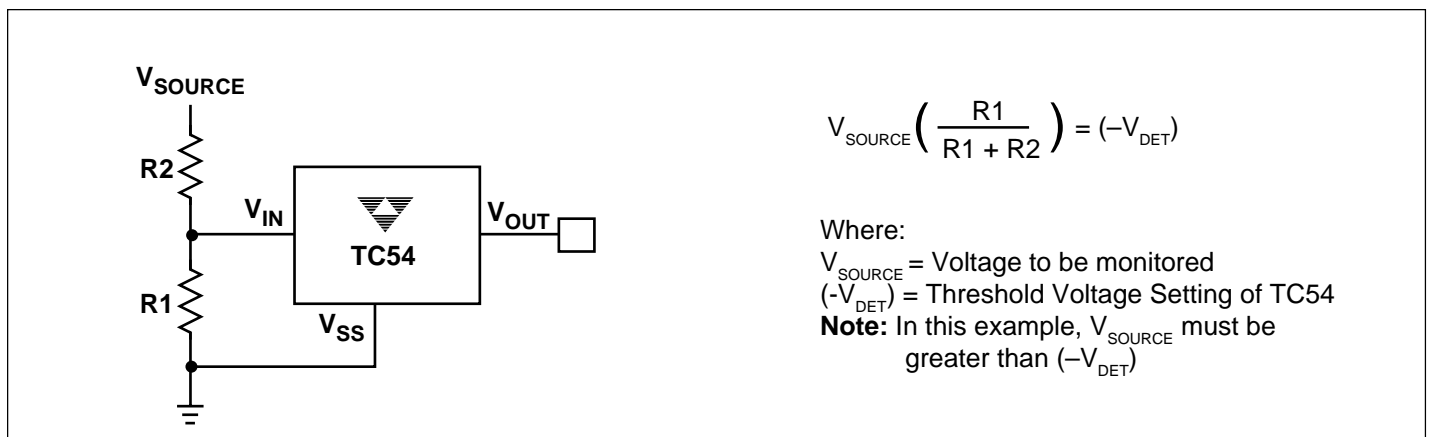


Figure 3. Modify trip point of TC54 using external resistor divider

# USING THE TELCOM TC54 VOLTAGE DETECTOR

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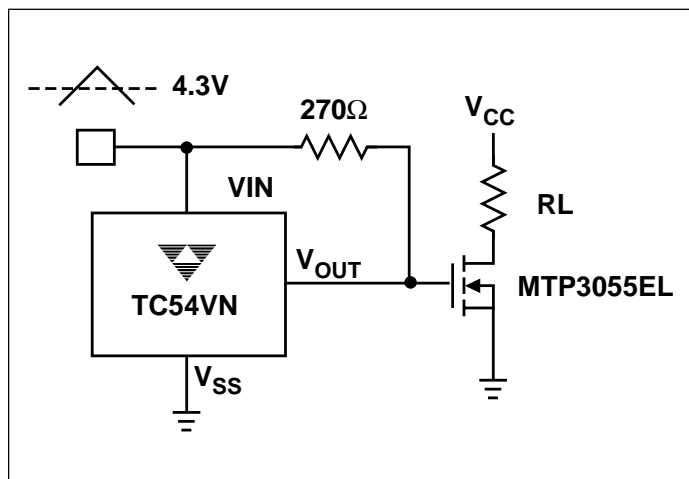


Figure 4. MOSFET low drive protection

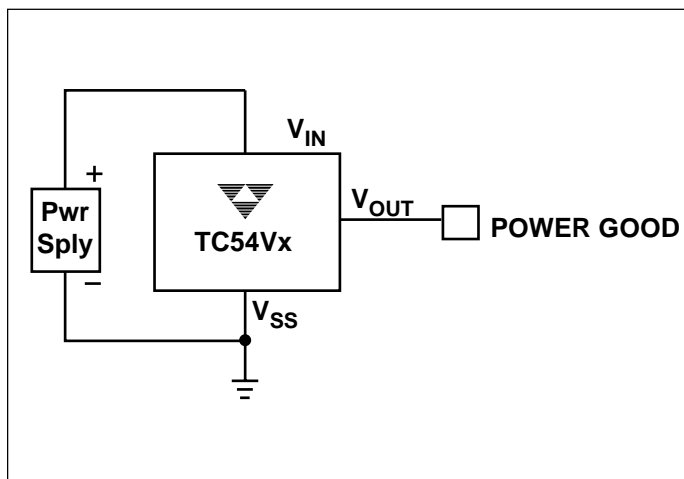


Figure 6. Power good monitor

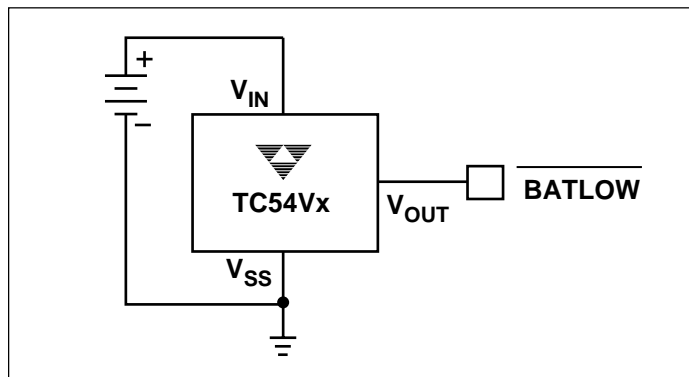


Figure 5. Battery voltage monitor

Low operating power and small physical size make the TC54 series ideal for many voltage detector applications, such as those shown below. Figure 4 shows a low-voltage gate drive protection circuit, which prevents overheating of the logic-level MOSFET due to insufficient gate voltage. When the input signal is below the threshold of the TC54VN, its output grounds the gate of the MOSFET. Figure 5 and 6 show the TC54 in conventional voltage monitoring applications.

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