Dual Channel Voltage Detector

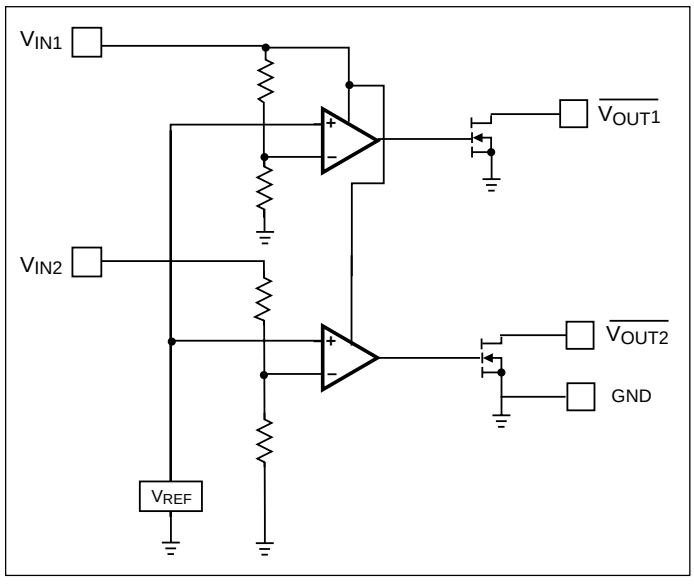
FEATURES

- **Two Independent Voltage Detectors in One Package**
- **Highly Accurate: ±2%**
- **Low Power Consumption ..... 2.0 µA, Typ.**
- **Detect Voltage Range ... 1.5V to 5.0V in 0.1V Steps**
- **Operating Voltage ..... 1.5V to 10.0V**
- **Output Configuration ..... N-Channel Open-Drain**
- **Space-Saving 5-Pin SOT-23A Package**

TYPICAL APPLICATIONS

- **Battery Life Monitors and Recharge Voltage Monitors**
- **Memory Battery Backup Circuitry**
- **Power-On Reset Circuits**
- **Power Failure Detection**
- **Delay Circuitry**

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The TC52 consists of two independent low power voltage detectors in a space-saving 5-pin SOT-23A package. Typical supply current consumption is only 2 µA at an input voltage of 2V. The voltage detection threshold settings are factory-programmed and guaranteed to ±2% accuracy. Threshold settings over a range of 1.5V to 5.0V in 100 mV steps are available. The TC52 is available with open drain (NMOS) configurations. Small size, high precision, low supply current, and low installed cost makes the TC52 the ideal voltage detector for a wide variety of voltage monitoring applications.

ORDERING INFORMATION

PART CODE TC52 N 45 27 E CT XX

Output Configuration:
N = Open-Drain

Detected Voltage 1*:
Ex: 45 = 4.5V

Detected Voltage 2*:
Ex: 27 = 2.7V

Temperature:
E: – 40°C to + 85°C

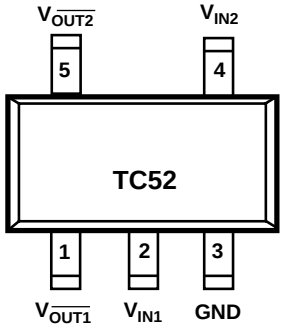
Package Type and Pin Count:
CT: 5-Pin SOT-23A

Taping Direction:
TR: Standard Taping
RT: Reverse Taping

*Other voltages are available. Please contact Microchip Technology Inc. for details.

PIN CONFIGURATION

5-Pin SOT-23A



TC52 Series

ABSOLUTE MAXIMUM RATINGS*

Input Voltage (V_{IN}) 12V
Output Voltage (V_{OUT}) ..... V_{IN} + 0.3V to V_{SS} – 0.3V
Output Current (I_{OUT}) ..... 50 mA
Power Dissipation (Pd)
SOT-23-5 ..... 100 mW
Operating Ambient Temperature (T_{OPR}) .. –40°C to +85°C
Storage Temperature (T_{STG}) ..... –40°C to +125°C

*Static-sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS: T_A = +25°C, unless otherwise specified, Note 1.

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
v_{IN}	Operating Voltage	V_{DF} (T)= 1.5 to 5.0V		1.5	—	10.0	V
I_{SS}	Supply Current	V_{IN1} = 1.5V		—	1.35	3.90	µA
		V_{IN1} = 2.0V		—	1.50	4.50	
		V_{IN1} = 3.0V		—	1.95	5.10	
		V_{IN1} = 4.0V		—	2.40	5.70	
		V_{IN1} = 5.0V		—	3.00	6.30	
$I_{IN}2$	Input Current V_{IN2}	V_{IN1} = 1.5V		—	0.45	1.30	µA
		V_{IN1} = 2.0V		—	0.50	1.50	
		V_{IN1} = 3.0V		—	0.65	1.70	
		V_{IN1}= 4.0V		—	0.80	1.90	
		V_{IN1}= 5.0V		—	1.00	2.10	
$V_{\overline{DET}1}$	Channel 1 Detect Voltage	Note 2		V_{T1} x0.98	$V_{T1} \pm 0.5\%$	V_{T1} x1.02	V
$V_{\overline{DET}2}$	Channel 2 Detect Voltage	Note 2		V_{T2} x0.98	$V_{T2} \pm 0.5\%$	V_{T2} x1.02	V
V_{HYS1}	Hysteresis Range 1			$V_{\overline{DET}1}$ x0.02	$V_{\overline{DET}1}$ x0.05	$V_{\overline{DET}1}$ x0.08	V
V_{HYS2}	Hysteresis Range 2			$V_{\overline{DET}2}$ x0.02	$V_{\overline{DET}2}$ x0.05	$V_{\overline{DET}2}$ x0.08	—
I_{OUT}	Output Current	V_{OL} = 0.5V	V_{IN1} = 1.0V	0.3	2.2	—	mA
			V_{IN1} = 2.0V	3.0	7.7	—	
			V_{IN1} = 3.0V	5.0	10.1	—	
			V_{IN1} = 4.0V	6.0	11.5	—	
			V_{IN1} = 5.0V	7.0	13.0	—	
$\Delta V_{\overline{DET}}/(\Delta T_{OPR} V_{\overline{DET}})$	Temperature Characteristics	–40°C ≤ T_{OPR} ≤ 85°C		—	±100	—	ppm/°C
t_{DLY}	Detection Time	(Time from V_{IN} = $V_{\overline{DET}}$ To V_{OUT} = V_{OL})		—	—	0.2	msec

NOTES: 1. Additional resistance between the V_{IN1} pin and the supply voltage may alter the electrical characteristics.
2. V_{T1}, V_{T2} are the factory-programmed voltage detection thresholds.

PIN DESCRIPTION

Pin Number	Name	Description
1	V_{OUT1}	Detector #1 Output
2	V_{IN}	Supply Voltage Input, Detect Voltage 1
3	GND	Ground
4	V_{IN2}	Detect Voltage 2
5	V_{OUT2}	Detect #2 Output

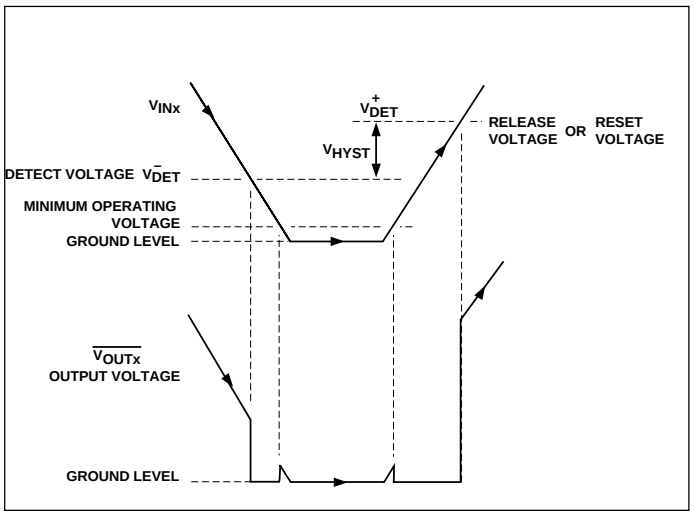


Figure 1. Timing Chart

DETAILED DESCRIPTION

Please refer to Figure 1. In normal steady-state operation and for either channel, when $V_{IN} > V^-_{DET}$, the output is high. (In the case of the TC52N, this is an open-drain condition.) If and when the input falls below V^-_{DET}, the output pulls 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 voltages. (See the *Electrical Characteristics* section).

The output, V_{OUT}, stays valid until the input voltage falls below the minimum operating voltage, $V_{IN(MIN)}$, of 0.7V. Below this minimum operating voltage, the output is undefined. During power-up or anytime V_{IN} has fallen below $V_{IN(MIN)}$, V_{OUT} remains undefined until V_{IN} rises above $V_{IN(MIN)}$, at which time the output becomes valid. V_{OUT} is maintained 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 assumes its inactive state (open-drain for TC52N).

APPLICATIONS

Pin 2 (V_{IN1}) acts as both the input to Voltage Detector #1, as well as the power supply input for the chip. As such, always assign V_{IN1} to monitor voltages between 1.5V and 10V. Failure to do this will result in unreliable detector operation due to an out-of-tolerance supply voltage. In high noise environments, it may be necessary to install a small input bypass capacitor (0.01 µF to 0.1 µF) from V_{IN1} to ground to minimize on-chip power supply noise.

Battery and Main Supply Monitor (Figure 2)

The circuit shown in Figure 2 provides both a processor supply monitor/reset function, as well as a low battery detect function. As shown, the TC52N3330ECT (N-Channel outputs) uses Detector 2 to monitor the system power supply rail. When the power supply is 10% below its nominal output voltage rating, the V_{OUT2} output is driven and held low. When the power supply voltage is above 3.0V nominal, V_{OUT2} is driven to an open circuit and the combination of R_1 and C_1 provides a reset time out delay. Detector 1 monitors the voltage on the main supply battery. A low battery condition is indicated when the battery voltage falls to 3.3V, at which time the main processor is interrupted to initiate a warning or system shutdown.

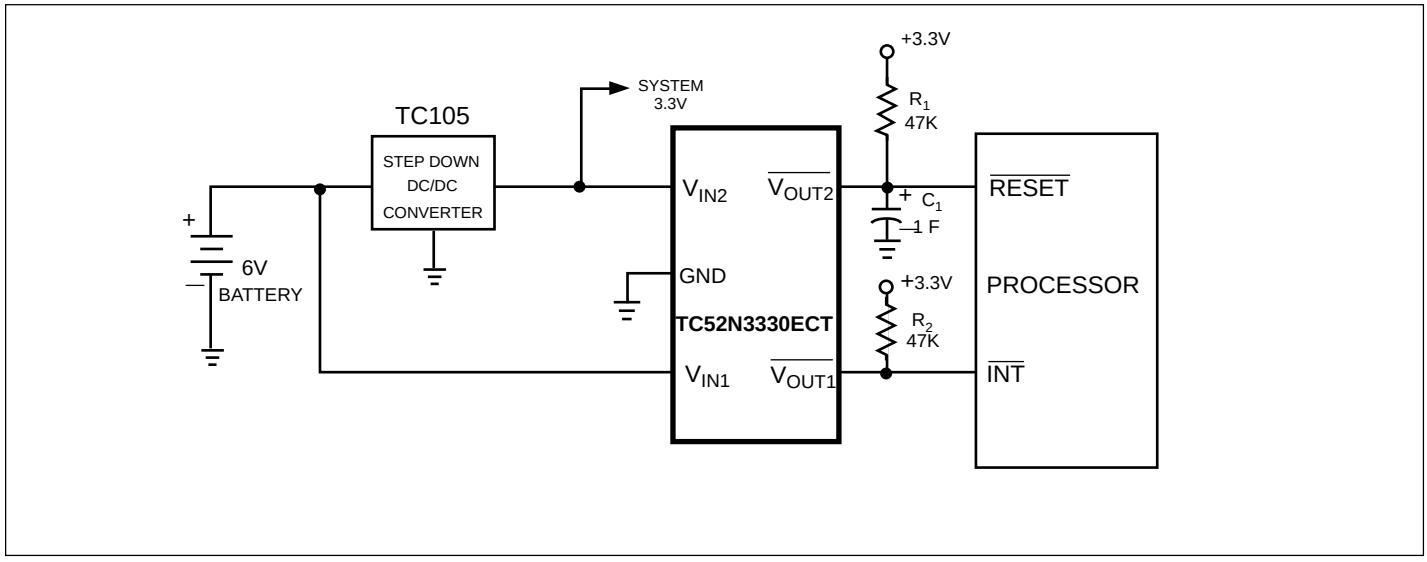
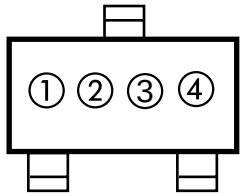


Figure 2. Supply Monitor and Processor Supervisor

TC52 Series

MARKINGS

5-Pin SOT-23A



① represents N-channel indication & integer part of output voltage

Symbol	Output
C	CMOS
N	Nch

②③ represents registration serial number

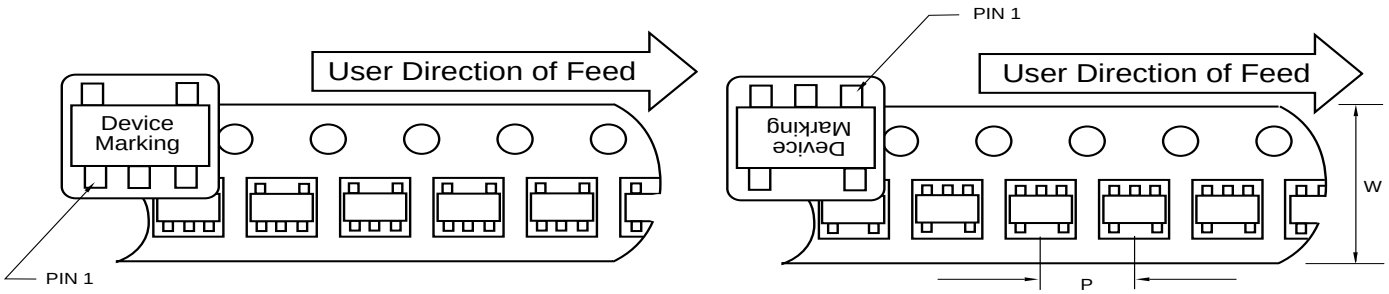
Symbol	Detect Voltage 1	Detect Voltage 2
0P	4.5	2.7

Note: Symbols for other custom voltages set prior to shipment.

④ represents assembly lot code

TAPING FORM

Component Taping Orientation for 5-Pin SOT-23A (EIAJ SC-74A) Devices



Standard Reel Component Orientation
TR Suffix Device
(Mark Right Side Up)

Reverse Reel Component Orientation
RT Suffix Device
(Mark Upside Down)

Carrier Tape, Number of Components Per Reel and Reel Size

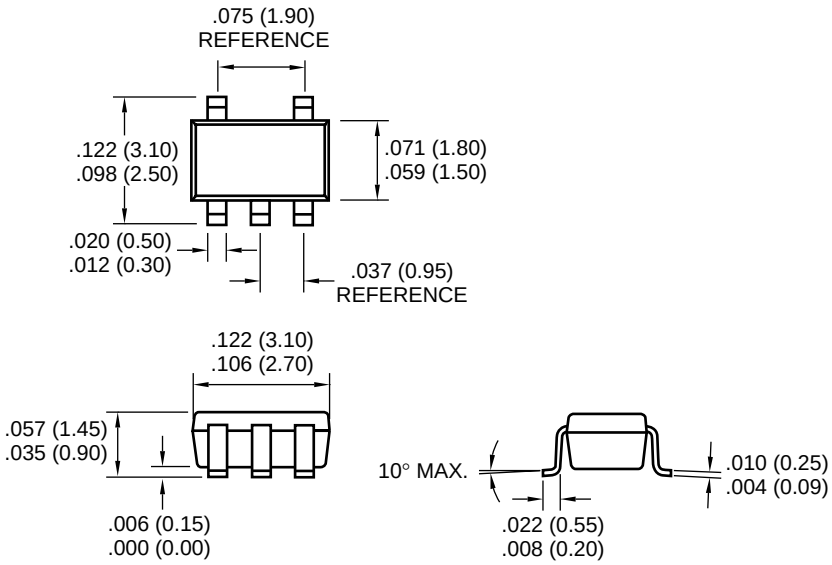
Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
5-Pin SOT-23A	8 mm	4 mm	3000	7 in

Tape and Reel Specifications Table

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
5-Pin SOT-23A	8 mm	4 mm	3000	7

PACKAGE DIMENSIONS

5-Pin SOT-23A (EIAJ SC-74A)



Dimensions: inches (mm)

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