Obsolete Device

TC52

Dual-Channel Voltage Detector

Features

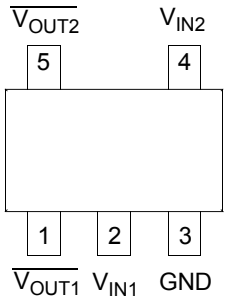
- Two Independent Voltage Detectors in One Package
- Highly Accurate: ±2%
- Low Power Consumption: 2.0 µA, typical
- Channel 1 Detect Voltage: 3.0V, 4.5V
- Channel 2 Detect Voltage: 2.7V
- Operating Voltage: 1.5V to 10.0V
- Output Configuration: N-Channel Open-Drain
- Space-Saving 5-Pin SOT-23 Package

Typical Applications

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

Package Type

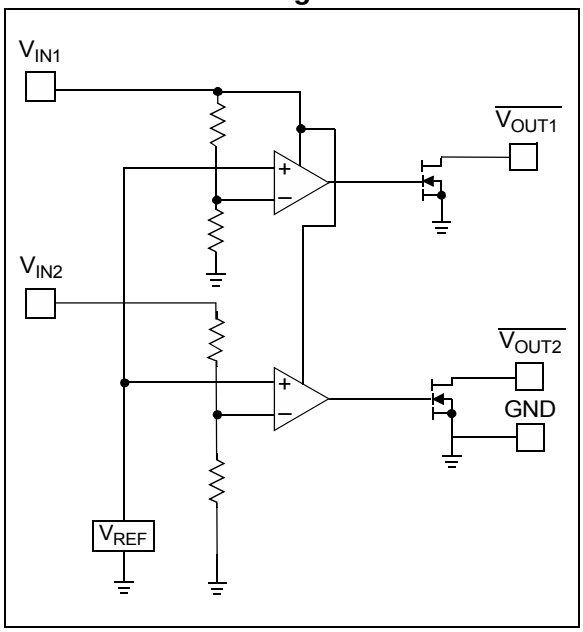
5-Pin SOT-23



Description

The TC52 consists of two independent low-power voltage detectors in a space-saving 5-pin SOT-23 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. 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.

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

Input Voltage .....+12V
Output Current .....50 mA
Output Voltage.....V_{IN} + 0.3V to V_{SS} – 0.3V
Power Dissipation
5-Pin SOT-23 .....100 mW
Operating Temperature Range.....-40°C to +85°C
Storage Temperature Range .....-40°C to +125°C

† **Notice:** 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 operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

Electrical Specifications: T_A = 25°C, unless otherwise specified. Note 1.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Operating Voltage	V_{IN}	1.5	—	10.0	V	V_{DF} (T) = 1.5 to 5.0V
Supply Current	I_{SS}	—	1.35	3.90	µA	V_{IN1} = 1.5V
		—	1.50	4.50		V_{IN1} = 2.0V
		—	1.95	5.10		V_{IN1} = 3.0V
		—	2.40	5.70		V_{IN1} = 4.0V
		—	3.00	6.30		V_{IN1} = 5.0V
Input Current V_{IN2}	I_{IN2}	—	0.45	1.30	µA	V_{IN1} = 1.5V
		—	0.50	1.50		V_{IN1} = 2.0V
		—	0.65	1.70		V_{IN1} = 3.0V
		—	0.80	1.90		V_{IN1} = 4.0V
		—	1.00	2.10		V_{IN1} = 5.0V
Channel 1 Detect Voltage	V_{DET1}-	V_{T1} x 0.98	V_{T1} ± 0.5%	V_{T1} x 1.02	V	Note 2
Channel 2 Detect Voltage	V_{DET2} -	V_{T2} x 0.98	V_{T2} ± 0.5%	V_{T2} x 1.02	V	Note 2
Hysteresis Range 1	V_{HYS1}	V_{DET1}- x 0.02	V_{DET1}- x 0.05	V_{DET1}- x 0.08	V	
Hysteresis Range 2	V_{HYS2}	V_{DET2}- x 0.02	V_{DET2}- x 0.05	V_{DET2}- x 0.08	V	
Output Current	I_{OUT}	0.3	2.2	—	mA	V_{OL} = 0.5V, V_{IN1} = 1.0V
		3.0	7.7	—		V_{OL} = 0.5V, V_{IN1} = 2.0V
		5.0	10.1	—		V_{OL} = 0.5V, V_{IN1} = 3.0V
		6.0	11.5	—		V_{OL} = 0.5V, V_{IN1} = 4.0V
		7.0	13.0	—		V_{OL} = 0.5V, V_{IN1} = 5.0V
Temperature Characteristics	ΔV_{DET} -/ (ΔT_{OPR} V_{DET} -)	—	±100	—	ppm/°C	-40°C ≤ T_{OPR} ≤ 85°C
Detection Time	t_{DLY}	—	—	0.2	msec	Time from V_{IN} = V_{DET}- to V_{OUT} = V_{OL}

Note 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.

2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin No. (5-Pin SOT-23)	Symbol	Description
1	V_{OUT1}	Detector #1 output
2	V_{IN}	Supply voltage input, detect voltage 1
3	GND	Ground terminal
4	V_{IN2}	Detect voltage 2
5	V_{OUT2}	Detector #2 output

3.0 DETAILED DESCRIPTION

In normal steady-state operation and for either channel, when $V_{IN} > V_{DET}$-, the output is high, see Figure 3-1. (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. (Also see Section 1.0, Electrical Characteristics).

The output, V_{OUT}, stays valid until the input voltage falls below the minimum operating voltage, V_{INMIN}, of 0.7V. Below this minimum operating voltage, the output is undefined. During power-up or anytime V_{IN} has fallen below V_{INMIN}, V_{OUT} will remain undefined until V_{IN} rises above V_{INMIN}, at which time the output becomes valid. V_{OUT} is maintained in its active low state while $V_{INMIN} < V_{IN} < V_{DET}$+. ($V_{DET}$+ = V_{DET}- + V_{HYST}). If and when the input rises above V_{DET}+, the output will assume its inactive state (open-drain for TC52N).

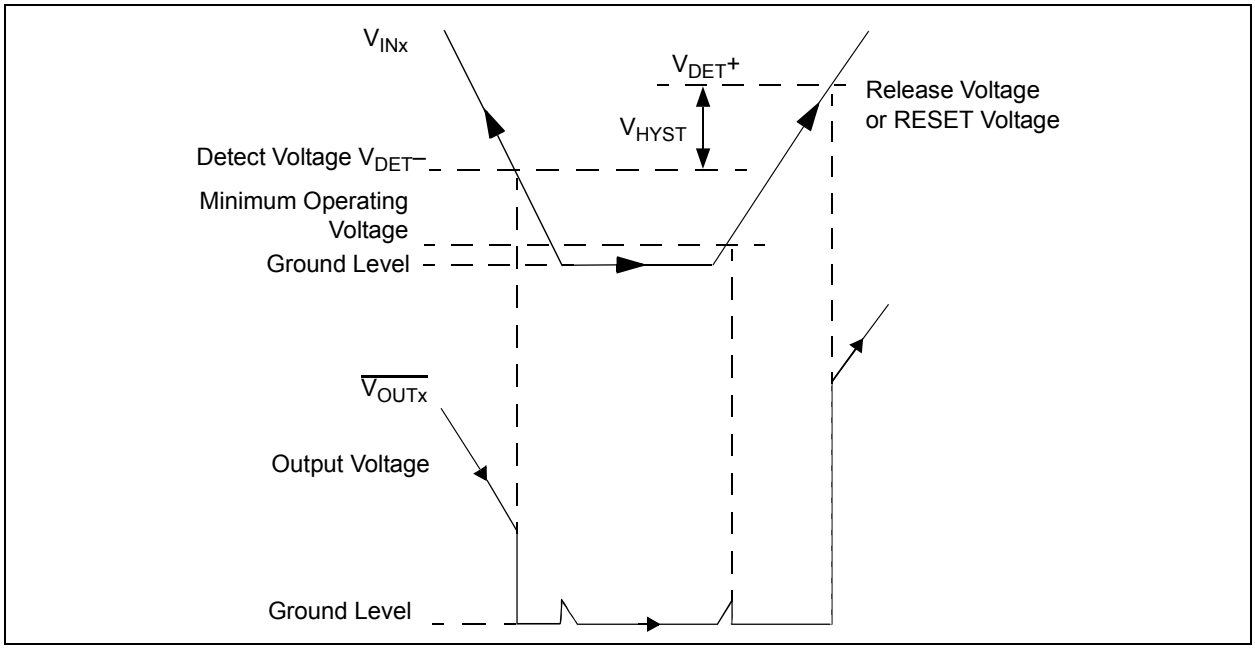


FIGURE 3-1: *Timing Diagram.*

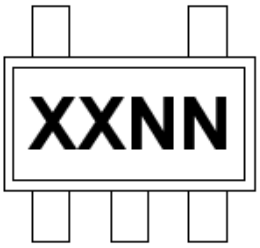
4.0 APPLICATION INFORMATION

Pin 2 (V_{IN1}) acts as both the input to Voltage Detector #1 and 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.

5.0 PACKAGING INFORMATION

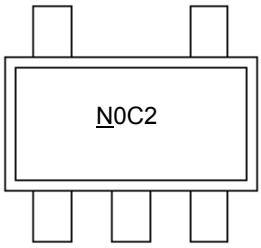
5.1 Package Marking Information

5-Lead SOT-23



Standard Markings for SOT-23	
Part Number	**Code**
TC52N3027ECTTR	N0C#
TC52N4527ECTTR	N0P#

Example



N-channel Indication and Integer Part of Output Voltage

Symbol	Output
N	Nch

Registration Serial Number

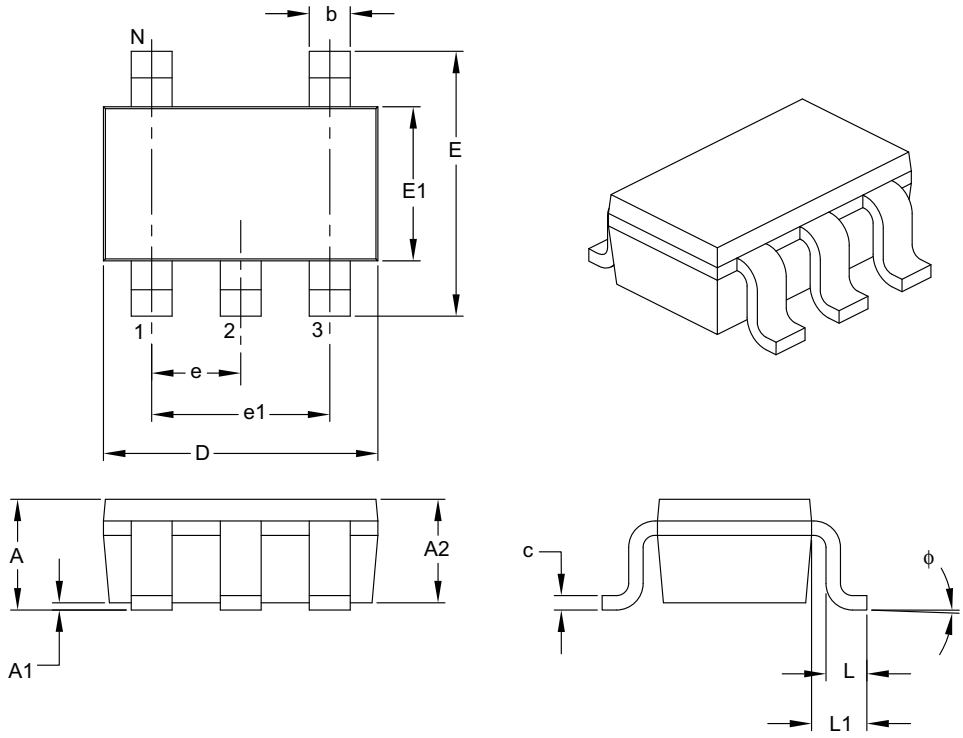
Symbol	Detected Voltage 1	Detected Voltage 2
0C	3.0	2.7
0P	4.5	2.7

Legend:	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

5-Lead Plastic Small Outline Transistor (CT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		5	
Lead Pitch	e		0.95 BSC	
Outside Lead Pitch	e1		1.90 BSC	
Overall Height	A	0.90	–	1.45
Molded Package Thickness	A2	0.89	–	1.30
Standoff	A1	0.00	–	0.15
Overall Width	E	2.20	–	3.20
Molded Package Width	E1	1.30	–	1.80
Overall Length	D	2.70	–	3.10
Foot Length	L	0.10	–	0.60
Footprint	L1	0.35	–	0.80
Foot Angle	ϕ	0°	–	30°
Lead Thickness	c	0.08	–	0.26
Lead Width	b	0.20	–	0.51

Notes:

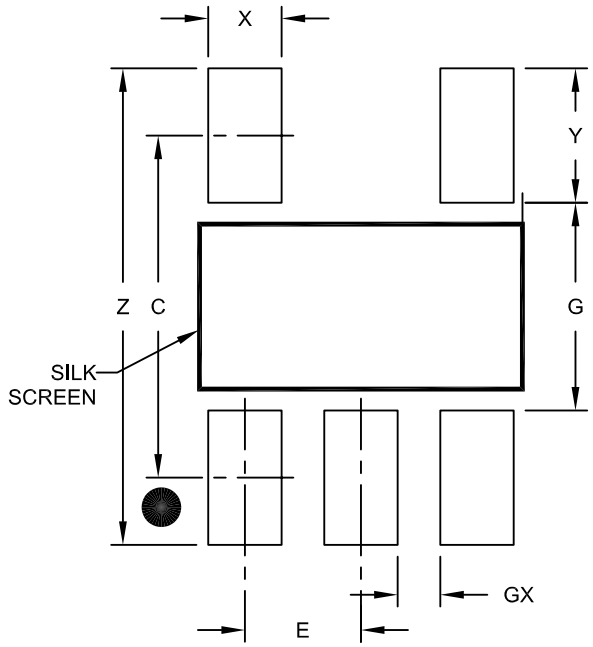
1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-091B

5-Lead Plastic Small Outline Transistor (CT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		0.95 BSC	
Contact Pad Spacing	C		2.80	
Contact Pad Width (X5)	X			0.60
Contact Pad Length (X5)	Y			1.10
Distance Between Pads	G	1.70		
Distance Between Pads	GX	0.35		
Overall Width	Z			3.90

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2091A

NOTES:

APPENDIX A: REVISION HISTORY

Revision E (February 2015)

- Updated device status to Obsolete.

Revision D (August 2013)

The following is the list of modifications:

1. Updated the detect voltage values in **“Features”**.
2. Updated the **“Package Type”** drawing.
3. Updated **Section 5.0, "Packaging Information"** with the latest package specification drawings.
4. Updated the **"Product Identification System"** section.

Revision C (December 2012)

- Added a note to each package outline drawing.

Revision B (May 2002)

- Undocumented changes.

Revision A (March 2001)

- Original Release of this Document.

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

PART NO.	X	XX	XX	-X	XX	XX
Device	Output Configuration	Detected Voltage 1	Detected Voltage 2	Temperature Range	Package	Tape and Reel

Device:	TC52N3027ECTTR:	3.0V and 2.7V Dual Channel Voltage Detector (Tape and Reel)
	TC52N4527ECTTR:	4.5V and 2.7V Dual Channel Voltage Detector (Tape and Reel)
Output Configuration:	N =	Open Drain
Detected Voltage 1:	30 =	3.0V
	45 =	4.5V
Detected Voltage 2:	27 =	2.7V
Temperature Range:	E =	-40°C to +125°C
Package:	CT =	Plastic Small Outline Transistor (CT), 5-Lead

Examples:

a) TC52N3027ECTTR: 3.0V and 2.7V Dual Channel Voltage Detector, 5LD SOT-23 package, Tape and Reel

b) TC52N4527ECTTR: 4.5V and 2.7V Dual Channel Voltage Detector, 5LD SOT-23 package, Tape and Reel

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