

# TC1272/TC1273/TC1274

## 3-Pin Reset Monitors for 5V Systems

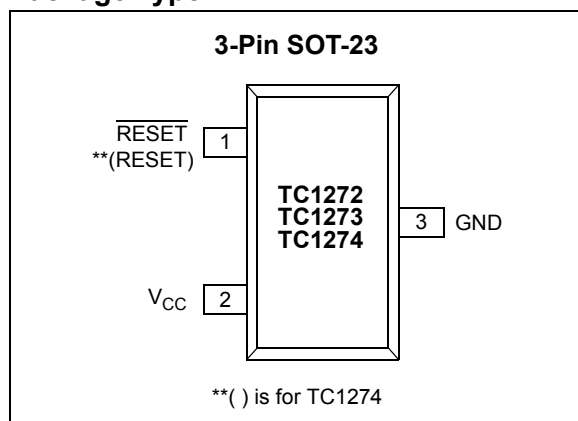
### Features

- Precision  $V_{CC}$  Monitor for 5.0V Systems
- 100 ms Minimum RESET, RESET Output Duration
- Output Valid to  $V_{CC} = 1.2V$
- $V_{CC}$  Transient Immunity
- Small 3-Pin SOT-23 Package
- No External Components

### Applications

- Computers
- Embedded Systems
- Battery-Powered Equipment
- Critical  $\mu P$  Power Supply Monitoring

### Package Type



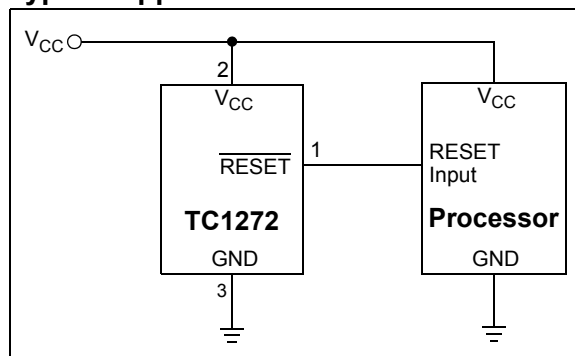
### General Description

The TC1272/TC1273/TC1274 are cost-effective system supervisor circuits designed to monitor  $V_{CC}$  in digital systems and provide a reset signal to the host processor when necessary. No external components are required.

The reset output is driven active within 20  $\mu s$  of  $V_{CC}$  falling through the reset voltage threshold. RESET is maintained active for a minimum of 100 ms after  $V_{CC}$  rises above the reset threshold. The TC1274 has an active-high RESET output, while the TC1272 and TC1273 have an active-low RESET output. The TC1272 and TC1274 each have a complimentary output, while the TC1273 has an open-drain output. The output of the TC1272 and TC1273 is valid down to  $V_{CC} = 1.2V$ . The TC1274 is valid down to  $V_{CC} = 1.8V$ . All three devices are available in a 3-Pin SOT-23 package.

The TC1272/TC1273/TC1274 devices are optimized to reject fast transient glitches on the  $V_{CC}$  line.

### Typical Application Circuit



# TC1272/TC1273/TC1274

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings†

Supply Voltage ( $V_{CC}$  to GND) ..... +6.0V  
 $\overline{\text{RESET}}$ , RESET ..... -0.3V to ( $V_{CC} + 0.3V$ )  
 Input Current,  $V_{CC}$  ..... 20 mA  
 Output Current,  $\overline{\text{RESET}}$ , RESET ..... 20 mA  
 Power Dissipation ( $T_A \leq 70^\circ\text{C}$ )  
     3-Pin SOT-23 (derate 4 mW/ $^\circ\text{C}$  above  $+70^\circ\text{C}$ )  
     ..... 230 mW  
 Operating Temperature Range .....  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$   
 Storage Temperature Range .....  $-65^\circ\text{C}$  to  $+150^\circ\text{C}$

† 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 CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ . Typical values are at $T_A = +25^\circ\text{C}$ .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
<b>Supply Voltage</b>						
TC1272, TC1273	$V_{CC}$	1.2	—	5.5	V	Note 1
TC1274	$V_{CC}$	1.8	—	5.5	V	
Output Voltage @ 0-500 $\mu\text{A}$	$V_{OH}$	$V_{CC} - 0.5V$	$V_{CC} - 0.1V$	—	V	TC1272, TC1274 (Note 1)
<b>Output Current @ 2.4 Volts</b>						
$V_{CC} = 5V$ TC1272	$I_{OH}$	—	10	—	mA	Note 2
$V_{CC} = 4V$ TC1274	$I_{OH}$	—	8	—	mA	
Output Current @ 0.4 Volts	$I_{OL}$	+10	30	—	mA	Note 2, Note 5
<b>Operating Current</b>						
$V_{CC} < 5.5V$ : TC1272, TC1274	$I_{CC}$	—	17	40	$\mu\text{A}$	Note 3
$V_{CCTP} < V_{CC} < 5.5V$ : TC1273	$I_{CC}$	—	17	40	$\mu\text{A}$	Note 3
$V_{CC} < V_{CCTP}$ : TC1273	$I_{CC}$	—	700	1200	$\mu\text{A}$	Note 3
$V_{CC}$ Trip Point (TC1272/3/4-5)	$V_{CCTP-5}$	4.50	4.62	4.75	V	Note 1
$V_{CC}$ Trip Point (TC1272/3/4-10)	$V_{CCTP-10}$	4.25	4.37	4.49	V	Note 1
$V_{CC}$ Trip Point (TC1272/3/4-15)	$V_{CCTP-15}$	4.00	4.12	4.24	V	Note 1
Output Capacitance	$C_{OUT}$	—	9	—	pF	
Internal Pull-Up Resistor	$R_P$	3	6	9	$k\Omega$	
<b>AC Electrical Characteristics:</b> $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$ .						
RESET Active Time	$t_{RST}$	100	200	300	ms	
$V_{CC}$ Detect to $\overline{\text{RESET}}$ TC1272, TC1273	$t_{RPD1}$	—	20	50	$\mu\text{s}$	$V_{CC(Low)} = 1V$ , Figure 4-2
$V_{CC}$ Detect to RESET - TC1274	$t_{RPD2}$	—	20	50	$\mu\text{s}$	$V_{CC(Low)} = 1V$ , Figure 4-4
$V_{CC}$ Slew Rate ( $V_{CCTP(MAX)}$ to $V_{CCTP(MIN)}$ )	$t_F$	300	—	—	$\mu\text{s}$	Figure 4-2, Figure 4-4
$V_{CC}$ Slew Rate ( $V_{CCTP(MIN)}$ to $V_{CCTP(MAX)}$ )	$t_R$	0	—	—	ns	Figure 4-1, Figure 4-3
$V_{CC}$ Detect to $\overline{\text{RESET}}$ TC1272, TC1273	$t_{RPU1}$	100	200	300	ms	Note 4, Figure 4-1
$V_{CC}$ Detect to RESET - TC1274	$t_{RPU2}$	100	200	300	ms	Note 4, Figure 4-3

**Note 1:** All voltages referenced to ground.

**Note 2:** Measured with  $V_{CC} \geq 2.7$  volts.

**Note 3:** Measured with RESET output open for TC1272/TC1273; measured with RESET output open for TC1274.

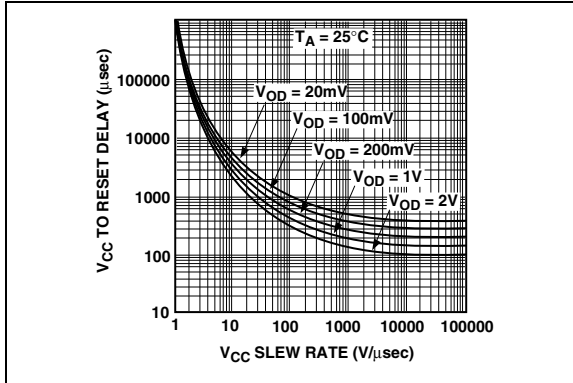
**Note 4:**  $t_R = 5 \mu\text{s}$ .

**Note 5:** A 1  $k\Omega$  external resistor may be required in some applications for proper operation of the microprocessor reset control circuit when using the TC1273.

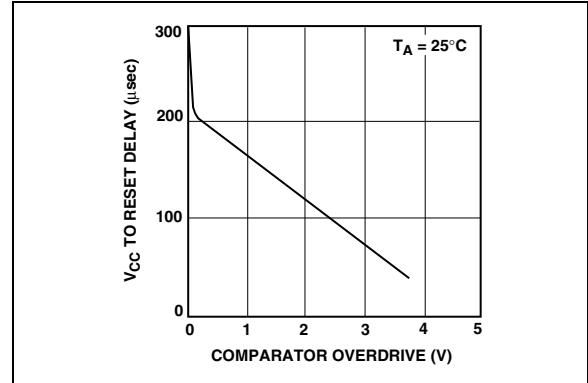
## 2.0 TYPICAL PERFORMANCE CURVES

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

**Note:** Unless otherwise indicated,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . Typical values are at  $T_A = +25^{\circ}\text{C}$ .  
Comparator Overdrive voltage ( $V_{OD}$ ) is defined in Figure 4-5



**FIGURE 2-1:**  $V_{CC}$  Detect to Reset (RESET).



**FIGURE 2-2:** Reset Delays vs. Comparator Overdrive.

# TC1272/TC1273/TC1274

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## 3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 3-1.

**TABLE 3-1: PIN FUNCTION TABLES**

Pin No.	Symbol	Function
1	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ Output (TC1272 and TC1273)
1	RESET	RESET Output (TC1274)
2	$V_{CC}$	Supply voltage (1.2V to 5.5V TC1272 and TC1273; 1.8V to 5.5V TC1274)
3	GND	Ground

### 3.1 $\overline{\text{RESET}}$ Output ( $\overline{\text{RESET}}$ )

The  $\overline{\text{RESET}}$  output remains low while  $V_{CC}$  is below the reset voltage threshold, and for 200 ms (100 ms minimum) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1272 is complimentary, while the output stage of the TC1273 is open-drain.

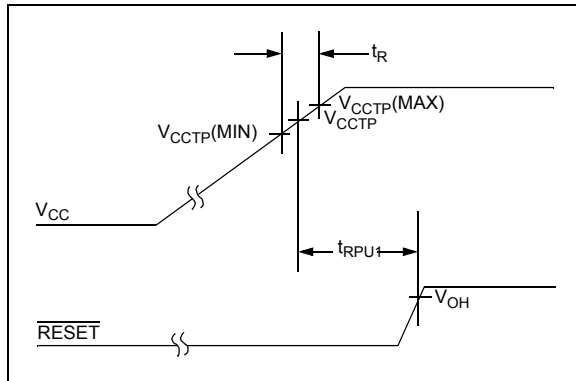
### 3.2 RESET Output (RESET)

The RESET output remains high while  $V_{CC}$  is below the reset voltage threshold, and for 200 ms (100 ms minimum) after  $V_{CC}$  rises above reset threshold. The output stage of the TC1274 is complimentary.

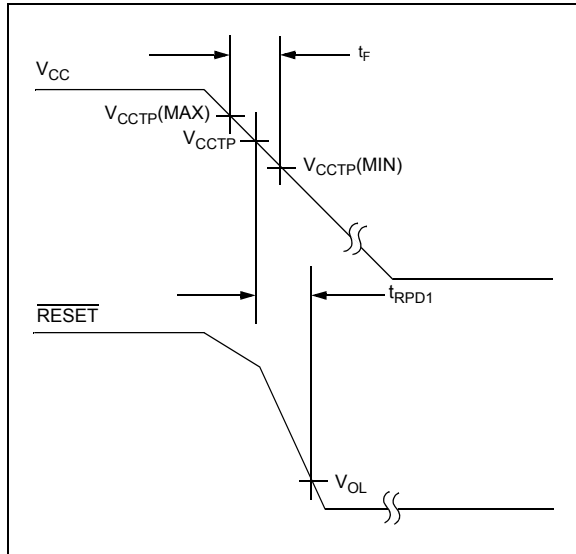
## 4.0 APPLICATIONS INFORMATION

### 4.1 Operation – Power Monitor

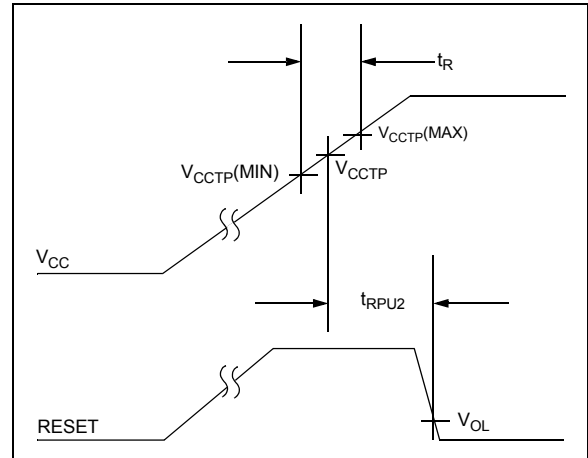
The TC1272/TC1273/TC1274 is designed to function as a voltage monitor for +5V systems. These devices provide a RESET signal to indicate that the  $V_{CC}$  has dropped below a preset voltage level that is selected by the suffix part number. In addition, the RESET is held active for approximately 200 ms after the power supply has risen above the voltage threshold level to allow time for the power supply to stabilize before system operation commences.



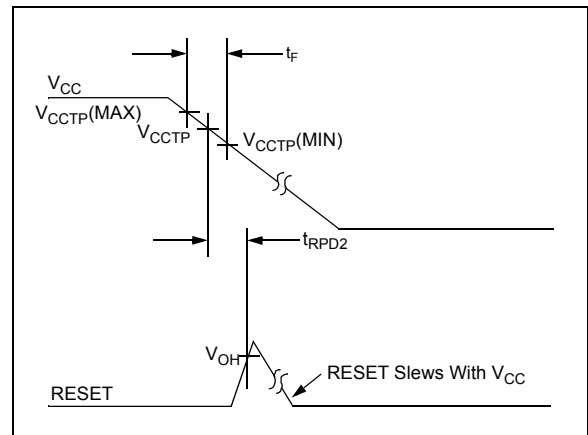
**FIGURE 4-1:** Timing Diagram – Power Up (TC1272/TC1273).



**FIGURE 4-2:** Timing Diagram – Power Down (TC1272/TC1273).



**FIGURE 4-3:** Timing Diagram – Power Up (TC1274).



**FIGURE 4-4:** Timing Diagram – Power Down (TC1274).

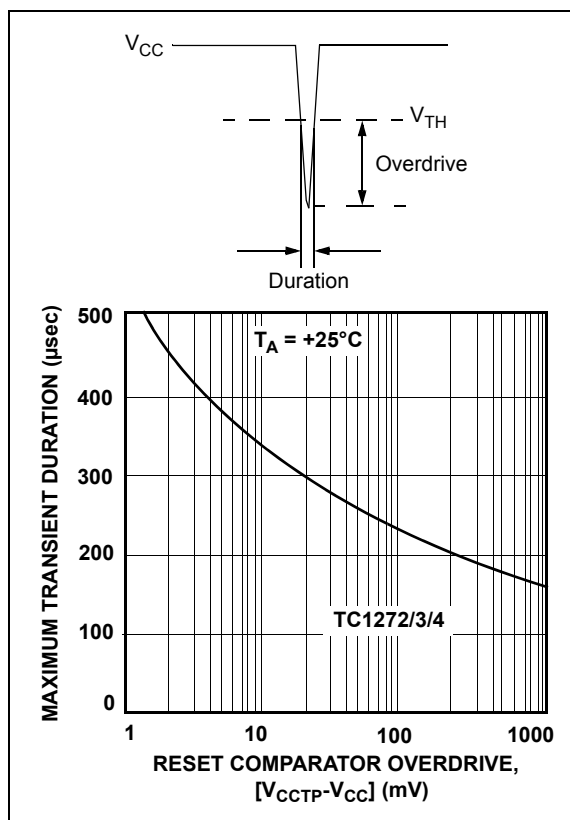
# TC1272/TC1273/TC1274

## 4.2 $V_{CC}$ Transient Rejection

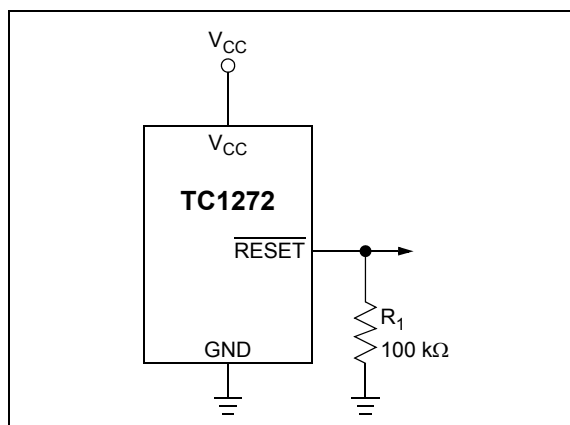
The TC1272/TC1273/TC1274 provides accurate  $V_{CC}$  monitoring and reset timing during power-up, power-down and brownout/sag conditions, and rejects negative-going transients (glitches) on the power supply line. Figure 4-5 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive that lays **under** the curve will **not** generate a reset signal. Combinations above the curve are detected as a brownout or power-down condition. Transient immunity can be improved by adding a capacitor in close proximity to the  $V_{CC}$  pin of the TC1272/TC1273/TC1274.

## 4.3 RESET Signal Integrity During Power-Down

The TC1272  $\overline{\text{RESET}}$  output is valid to  $V_{CC} = 1.2V$ . Below this voltage the output becomes an "open circuit" and does not sink current. This means CMOS logic inputs to the  $\mu P$  will be floating at an undetermined voltage. Most digital systems are completely shut down well above this voltage. However, in situations where  $\overline{\text{RESET}}$  must be maintained valid to  $V_{CC} = 0V$ , a pull-down resistor must be connected from  $\overline{\text{RESET}}$  to ground to discharge stray capacitances and hold the output low (Figure 4-6). This resistor value, though not critical, should be chosen such that it does not appreciably load  $\overline{\text{RESET}}$  under normal operation (100 k $\Omega$  will be suitable for most applications). Similarly, a pull-up resistor to  $V_{CC}$  is required for the TC1274 to ensure a valid high  $\overline{\text{RESET}}$  for  $V_{CC}$  below 1.8V.



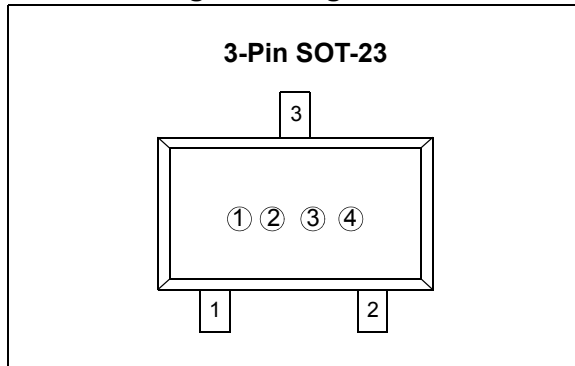
**FIGURE 4-5:** Maximum Transient Duration vs. Overdrive For Glitch Rejection At  $+25^\circ C$ .



**FIGURE 4-6:** Ensuring Reset Valid To  $V_{CC} = 0V$ .

## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information



① & ② represents part number code +  
temperature range and voltage

Reset $V_{CC}$ Threshold (V)	TC1272 Code	TC1273 Code	TC1274 Code
4.62	X1	Y1	Z1
4.37	X2	Y2	Z2
4.12	X3	Y3	Z3

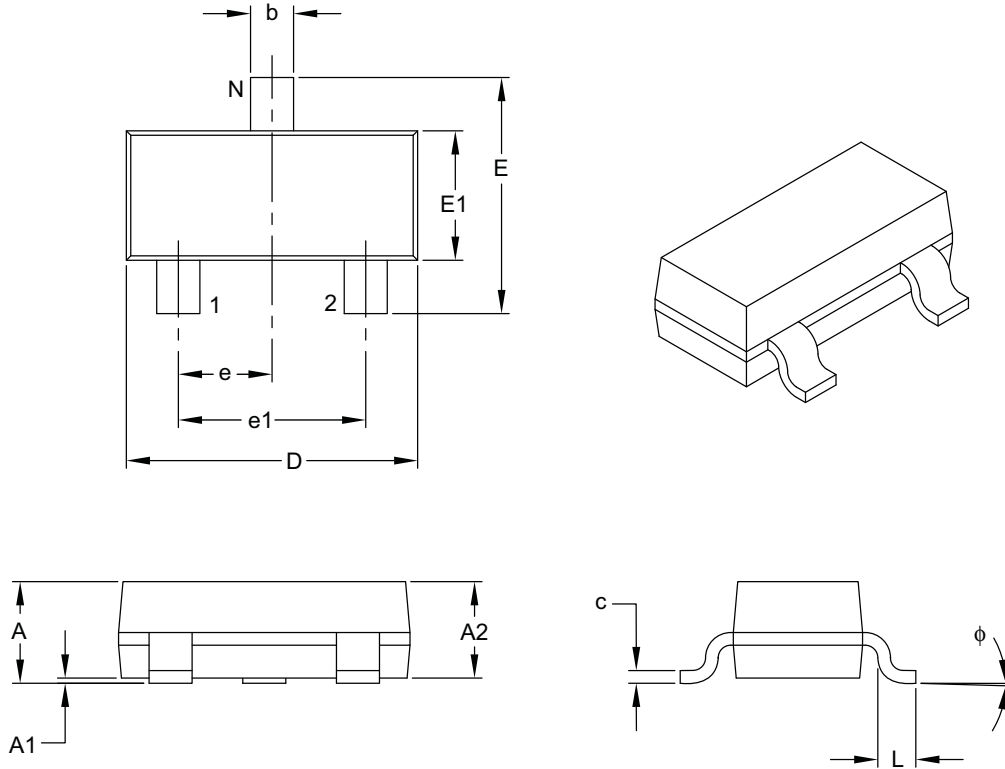
③ represents year and quarter code

④ represents lot ID number

# TC1272/TC1273/TC1274

## 3-Lead Plastic Small Outline Transistor (TT or NB) [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		3		
Lead Pitch	e		0.95 BSC		
Outside Lead Pitch	e1		1.90 BSC		
Overall Height	A		0.89	–	1.12
Molded Package Thickness	A2		0.79	0.95	1.02
Standoff	A1		0.01	–	0.10
Overall Width	E		2.10	–	2.64
Molded Package Width	E1		1.16	1.30	1.40
Overall Length	D		2.67	2.90	3.05
Foot Length	L		0.13	0.50	0.60
Foot Angle	φ		0°	–	10°
Lead Thickness	c		0.08	–	0.20
Lead Width	b		0.30	–	0.54

### Notes:

- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-104B



# TC1272/TC1273/TC1274

## PRODUCT IDENTIFICATION SYSTEM

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

<u>PART NO.</u>	<u>XX</u>	<u>X</u>	<u>/XX</u>
Device	Reset V <sub>CC</sub> Threshold	Temperature Range	Package
Device:	TC1272: 3-Pin Reset Monitor - Complementary TC1273: 3-Pin Reset Monitor - Open-Drain TC1274: 3-Pin Reset Monitor - Complementary		
Reset V <sub>CC</sub> Threshold Voltage	5 = 4.62V 10 = 4.37V 15 = 4.12V		
Temperature Range:	E = -40°C to +85°C		
Package:	NB = Plastic Small Outline Transistor (SOT-23), 3-lead		

**Examples:**  
a) TC1272-10ENBTR: 4.37V Reset  
b) TC1272-15ENBTR: 4.12V Reset  
c) TC1272-5ENBTR: 4.62V Reset  
  
a) TC1273-10ENBTR: 4.37V Reset  
b) TC1273-15ENBTR: 4.12V Reset  
c) TC1273-5ENBTR: 4.62V Reset  
  
a) TC1274-10ENBTR: 4.37V Reset  
b) TC1274-15ENBTR: 4.12V Reset  
c) TC1274-5ENBTR: 4.62V Reset

# TC1272/TC1273/TC1274

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NOTES:

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- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
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