Features

- Precision V_DD Monitor
- 140 msec Minimum RESET, Output Duration
- Output Valid to V_DD = 1.2V
- V_DD Transient Immunity
- Small 3-Pin SOT-23B Package
- No External Components

Applications

- Computers
- Embedded Systems
- Battery-Powered Equipment
- Critical µP Power Supply Monitoring

Typical Application Circuit

General Description

The TC1272A are cost-effective system supervisor circuits designed to monitor V_DD 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 65 µsec (typ.) of V_DD falling through the reset voltage threshold. RESET is maintained active for a minimum of 140 msec after V_DD rises above the reset threshold. The TC1272A has a complimentary output. The output of the TC1272A is valid down to V_DD = 1.2V. The device is available in a 3-Pin SOT-23B package.

The TC1272A device is optimized to reject fast transient glitches on the V_DD line.

Package Type

Note: 3-Pin SOT-23B is equivalent to JEDEC TO-236.
1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

- Supply Voltage (VDD to GND) ........................................ 6.0V
- RESET ................................................................. –0.3V to (VDD +0.3V)
- Input Current, VDD .................................................. 20 mA
- Output Current, RESET ................................................ 20 mA
- dV/dt (VDD) ............................................................. 100V/µsec
- Operating Temperature Range ..................... –40°C to +125°C
- Power Dissipation (TA = 70°C): 3-Pin SOT-23B (derate 4 mW/°C above +70°C) ....320 mW
- Storage Temperature Range........................–65°C to +150°C
- Maximum Junction Temperature, TJ.............................. 150°C

† Notice: Stresses above those listed under “Maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

PIN FUNCTION TABLE

<table>
<thead>
<tr>
<th>NAME</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>RESET</td>
<td>RESET push-pull output remains low while VDD is below the reset voltage threshold and for 140 msec (min.) after VDD rises above reset threshold</td>
</tr>
<tr>
<td>VDD</td>
<td></td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS

- VDD = Full Range, TA = Operating Temperature Range, unless otherwise noted. Typical values are at TA = +25°C, VDD = 5V for L/M/J, 3.3V for T/S, 3.0V for R and 2.5V for Z (Note 1).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sym</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDD Range</td>
<td></td>
<td>1.0</td>
<td>—</td>
<td>5.5</td>
<td>V</td>
<td>TA = 0°C to +70°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2</td>
<td>—</td>
<td>5.5</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td>Supply Current</td>
<td>Icc</td>
<td>—</td>
<td>12</td>
<td>30</td>
<td>µA</td>
<td>TC1272AL/M/J: VDD &lt; 5.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>—</td>
<td>9</td>
<td>25</td>
<td>µA</td>
<td>TC1272ALR/S/T/Z: VDD &lt; 3.6V</td>
</tr>
<tr>
<td>Reset Threshold (Note 2)</td>
<td></td>
<td>4.56</td>
<td>4.63</td>
<td>4.70</td>
<td>V</td>
<td>TC1272AL: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.50</td>
<td>—</td>
<td>4.75</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.31</td>
<td>4.38</td>
<td>4.45</td>
<td>V</td>
<td>TC1272AM: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.25</td>
<td>—</td>
<td>4.50</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.93</td>
<td>4.00</td>
<td>4.06</td>
<td>V</td>
<td>TC1272AJ: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.89</td>
<td>—</td>
<td>4.10</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.04</td>
<td>3.08</td>
<td>3.11</td>
<td>V</td>
<td>TC1272AT: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.00</td>
<td>—</td>
<td>3.15</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.89</td>
<td>2.93</td>
<td>2.96</td>
<td>V</td>
<td>TC1272AS: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.85</td>
<td>—</td>
<td>3.00</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.59</td>
<td>2.63</td>
<td>2.66</td>
<td>V</td>
<td>TC1272AR: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.55</td>
<td>—</td>
<td>2.70</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.28</td>
<td>2.32</td>
<td>2.35</td>
<td>V</td>
<td>TC1272AZ: TA = +25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.25</td>
<td>—</td>
<td>2.38</td>
<td>V</td>
<td>TA = –40°C to +125°C</td>
</tr>
<tr>
<td>Reset Threshold Tempco</td>
<td>—</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>ppm/°C</td>
<td></td>
</tr>
<tr>
<td>VDD to Reset Delay</td>
<td></td>
<td>—</td>
<td>65</td>
<td>—</td>
<td>µsec</td>
<td>VDD = VTH to (VTH – 100 mV)</td>
</tr>
<tr>
<td>(Note 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Note 2)</td>
</tr>
<tr>
<td>Reset Active Time Out</td>
<td></td>
<td>140</td>
<td>320</td>
<td>560</td>
<td>msec</td>
<td></td>
</tr>
<tr>
<td>Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESET Output Voltage Low</td>
<td>VDL</td>
<td>—</td>
<td>—</td>
<td>0.3</td>
<td>V</td>
<td>TC1272AR/S/T/Z: VDD = VTH min, ISINK = 1.2 mA</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>0.4</td>
<td>—</td>
<td>V</td>
<td>TC1272AL/M/J: VDD = VTH min, ISINK = 1.2 mA</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>0.3</td>
<td>—</td>
<td>V</td>
<td>VDD &gt; 1.0V, ISINK = 50 µA</td>
</tr>
<tr>
<td>RESET Output Voltage High</td>
<td>VOL</td>
<td>0.8</td>
<td>VDD</td>
<td>—</td>
<td>V</td>
<td>TC1272ASR/S/T/Z: VDD &gt; VTH max, ISOURCE = 500 µA</td>
</tr>
<tr>
<td></td>
<td>VDD</td>
<td>1.5</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>TC1272AL/M/J: VDD &gt; VTH max, ISOURCE = 800 µA</td>
</tr>
</tbody>
</table>

Note 1: Production testing done at TA = +25°C, overtemperature limits ensured by QC screen.

2: RESET Output for TC1272A.
2.0 TYPICAL PERFORMANCE CHARACTERISTICS

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.

**FIGURE 2-1:** Supply Current vs. Temperature.

**FIGURE 2-2:** Supply Current vs. Temperature.

**FIGURE 2-3:** Power-up Reset Time Out vs. Temperature.

**FIGURE 2-4:** Normalized Reset Threshold vs. Temperature.
3.0 APPLICATIONS INFORMATION

3.1 VDD Transient Rejection

The TC1272A provides accurate VDD monitoring and reset timing during power-up, power-down and brown-out/sag conditions. These devices also reject negative-going transients (glitches) on the power supply line. Figure 3-1 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive that lies under the curve will not generate a reset signal.

Combinations above the curve are detected as a brown-out or power-down condition. Transient immunity can be improved by adding a capacitor in close proximity to the VDD pin of the TC1272A.

3.2 RESET Signal Integrity During Power-Down

The TC1272A RESET output is valid to VDD = 1.0V. Below this voltage, the output becomes an "open circuit" and does not sink current. This means CMOS logic inputs to the microcontroller will be floating at an undetermined voltage. Most digital systems are completely shut down well above this voltage. However, in situations where RESET must be maintained valid to VDD = 0V, a pull-down resistor must be connected from RESET to ground to discharge stray capacitances and hold the output low (Figure 3-2). This resistor value, though not critical, should be chosen such that it does not appreciably load RESET under normal operation (100 kΩ will be suitable for most applications).

FIGURE 3-2: The addition of R1 at the RESET output of the TC1272A ensures that the RESET output is valid to VDD = 0V.

FIGURE 3-1: Maximum Transient Duration vs. Overdrive for Glitch Rejection at +25°C.
3.3 Controllers and Processors With Bidirectional I/O Pins

Some microcontrollers have bidirectional reset pins. Depending on the current drive capability of the controller pin, an indeterminate logic level may result if there is a logic conflict. This can be avoided by adding a 4.7 kΩ resistor in series with the output of the TC1272A (Figure 3-3). If there are other components in the system that require a reset signal, they should be buffered so as not to load the reset line. If the other components are required to follow the reset I/O of the microcontroller, the buffer should be connected as shown with the solid line.

**FIGURE 3-3:** Interfacing the TC1272A to a Bidirectional RESET I/O.
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

Legend:

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Part Number + temperature range and voltage (two-digit code)</td>
</tr>
<tr>
<td>2</td>
<td>Part Number + temperature range and voltage (two-digit code)</td>
</tr>
<tr>
<td>3</td>
<td>Lot ID number</td>
</tr>
<tr>
<td>4</td>
<td>Year and work week</td>
</tr>
<tr>
<td>5</td>
<td>Year and work week</td>
</tr>
<tr>
<td>6</td>
<td>Year and work week</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>SOT-23</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC1272AZVNBTTR</td>
<td>BA</td>
</tr>
<tr>
<td>TC1272ARVNBTTR</td>
<td>BB</td>
</tr>
<tr>
<td>TC1272ASVNBTTR</td>
<td>BC</td>
</tr>
<tr>
<td>TC1272ATVNBTTR</td>
<td>BD</td>
</tr>
<tr>
<td>TC1272AVBNTR</td>
<td>BE</td>
</tr>
<tr>
<td>TC1272AMVNBTTR</td>
<td>BF</td>
</tr>
<tr>
<td>TC1272AVNBTR</td>
<td>BG</td>
</tr>
</tbody>
</table>
3-Lead Plastic Small Outline Transistor (NB) (SOT-23)

Notes:
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.
JEDEC Equivalent: TO-236
Drawing No. C04-104

* Controlling Parameter
§ Significant Characteristic

<table>
<thead>
<tr>
<th>Units</th>
<th>INCHES*</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension Limits</td>
<td>MIN</td>
<td>NOM</td>
</tr>
<tr>
<td>Number of Pins</td>
<td>n</td>
<td>3</td>
</tr>
<tr>
<td>Pitch</td>
<td>p</td>
<td>.038</td>
</tr>
<tr>
<td>Outside lead pitch (basic)</td>
<td>p&lt;sup&gt;1&lt;/sup&gt;</td>
<td>.076</td>
</tr>
<tr>
<td>Overall Height</td>
<td>A</td>
<td>.035</td>
</tr>
<tr>
<td>Molded Package Thickness</td>
<td>A2</td>
<td>.035</td>
</tr>
<tr>
<td>Standoff §</td>
<td>A1</td>
<td>.000</td>
</tr>
<tr>
<td>Overall Width</td>
<td>E</td>
<td>.083</td>
</tr>
<tr>
<td>Molded Package Width</td>
<td>E1</td>
<td>.047</td>
</tr>
<tr>
<td>Overall Length</td>
<td>D</td>
<td>.110</td>
</tr>
<tr>
<td>Foot Length</td>
<td>L</td>
<td>.014</td>
</tr>
<tr>
<td>Foot Angle</td>
<td>φ</td>
<td>0</td>
</tr>
<tr>
<td>Lead Thickness</td>
<td>C</td>
<td>.004</td>
</tr>
<tr>
<td>Lead Width</td>
<td>B</td>
<td>.015</td>
</tr>
<tr>
<td>Mold Draft Angle Top</td>
<td>α</td>
<td>0</td>
</tr>
<tr>
<td>Mold Draft Angle Bottom</td>
<td>β</td>
<td>0</td>
</tr>
</tbody>
</table>
4.2 Product Tape and Reel Specifications

FIGURE 4-1: EMBOSSED CARRIER DIMENSIONS (8, 12, 16, AND 24 MM TAPE ONLY)

TABLE 1: CARRIER TAPE/CAVITY DIMENSIONS

<table>
<thead>
<tr>
<th>Case Outline</th>
<th>Package Type</th>
<th>Carrier Dimensions</th>
<th>Cavity Dimensions</th>
<th>Output Quantity Units</th>
<th>Reel Diameter in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>W mm</td>
<td>P mm</td>
<td>A0 mm</td>
<td>B0 mm</td>
</tr>
<tr>
<td>NB SOT-23</td>
<td>3L</td>
<td>8</td>
<td>4</td>
<td>3.15</td>
<td>2.77</td>
</tr>
</tbody>
</table>

FIGURE 4-2: 3-LEAD SOT-23 DEVICE TAPE AND REEL SPECIFICATIONS
PRODUCT IDENTIFICATION SYSTEM

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

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>Device</th>
<th>V_DD Reset Threshold</th>
<th>Temperature Range</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>TC1272A: Supervisor circuit with active-low RESET output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XXXXX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V_DD Reset Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>L = 4.63V</td>
</tr>
<tr>
<td>M = 4.38V</td>
</tr>
<tr>
<td>J = 4.00V</td>
</tr>
<tr>
<td>T = 3.08V</td>
</tr>
<tr>
<td>S = 2.93V</td>
</tr>
<tr>
<td>R = 2.63V</td>
</tr>
<tr>
<td>Z = 2.32V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>V = -40°C to +125°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBTR = SOT-23B, 3-pin (Tape and Reel)</td>
</tr>
</tbody>
</table>

Examples:

a) TC1272AZVNBTR: Supervisor w/2.32 V_DD option.
b) TC1272ARVNBTR: Supervisor w/2.63 V_DD option.
c) TC1272ASVNBTR: Supervisor w/2.93 V_DD option.
d) TC1272ATVNBTR: Supervisor w/3.08 V_DD option.
e) TC1272AJVNBTR: Supervisor w/4.00 V_DD option.
f) TC1272AMVNBTR: Supervisor w/4.38 V_DD option.
g) TC1272ALVNBTR: Supervisor w/4.63 V_DD option.

Sales and Support

Data Sheets

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

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2. The Microchip Corporate Literature Center U.S. FAX: (480) 792-7277
3. The Microchip Worldwide Site (www.microchip.com)

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Los Angeles
18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 949-263-1888
Fax: 949-263-1338

San Jose
1300 Terra Bella Avenue
Mountain View, CA 94043
Tel: 650-215-1444
Fax: 650-961-0286

Toronto
6285 Northam Drive, Suite 108
Mississauga, Ontario L4V 1X5, Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC
Australia
Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Unit 706B
Wan Tai Bei Hai Bldg.
No. 6 Chaoyangmen Bei Str.
Beijing, 100027, China
Tel: 86-10-85262100
Fax: 86-10-85262104

China - Chengdu
Rm. 2401-2402, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-86766200
Fax: 86-28-86766599

China - Fuzhou
Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506
Fax: 86-591-7503521

China - Hong Kong SAR
Unit 901-6, Tower 2, Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Shenzhen
Rm. 1812, 18/F, Building A, United Plaza
No. 5022 Binhe Road,
Futian District
Shenzhen 518033, China
Tel: 86-755-82901380
Fax: 86-755-8295-1393

Korea
168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea 135-882
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or 82-2-558-5934

Singapore
200 Middle Road
#07-02 Prime Centre
Singapore, 18980
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan
Kaohsiung Branch
30F - 1 No. 5
Min Chuan 2nd Road
Kaohsiung 806, Taiwan
Tel: 886-7-536-4818
Fax: 886-7-536-4803

EUROPE
Austria
Duriaostrasse 2
4A-4000 Wels
Austria
Tel: 43-7242-2244-399
Fax: 43-7242-2244-393

Denmark
Regus Business Centre
Laurup høj 1-3
Ballerpark DK-2750 Denmark
Tel: 45-4420-9895 Fax: 45-4420-9910

France
Parc d’Activite du Moulin de Massy
43 Rue du Saule Trapu
BâTiment A - 1er Etage
91300 Massy, France
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-60-79

Germany
Steinheilstrasse 10
D-85737 Ismaning, Germany
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy
Via Quasimodo, 12
20025 Legnano (MI)
Tel: 39-0331-742611
Fax: 39-0331-498781

Netherlands
P. A. De Biesbosch 14
NL-5152 SC Drunen, Netherlands
Tel: 31-13-69-53-63-20
Fax: 31-13-69-30-90-79

United Kingdom
505 Eskdale Road
Winnersh Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44-118-921-5869
Fax: 44-118-921-5820

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