Description

The APX803/D is used for microprocessor (µP) supervisory circuits to monitor the power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V powered circuits.

These circuits perform a single function: they assert a reset signal on power up and whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for a fixed period of time after VCC has risen above the reset threshold. For the APX803D this period is a minimum of 1ms while for other APX803 variants it is at least 140ms. The reset comparator is designed to ignore fast transients on VCC, and the outputs are guaranteed to be in the correct logic state for VCC down to 1V.

The APX803 is available with different reset thresholds suitable for operation with a variety of supply voltages, however the APX803D is available with a 2.93V threshold voltage.

The APX803/D have an open collector active low RESET output and compliment Diodes APX809/10 which have push-pull output stages. Low supply current makes the APX803/D ideal for use in portable equipment. The APX803/D are available in two pin out variants of the 3-pin SOT23 package.

Features

- Precision Monitoring of +2.5V, +3V, +3.3V, and +5V Power-Supply Voltages
- Fully Specified Over Temperature
- Open-drain RESET Active Low
- Power-On/power supply glitch Reset Pulse
  - APX803D 2ms (Typ)
  - APX803 200ms (Typ)
- 30µA Supply Current (Typ.)
- Guaranteed Reset Valid to VCC = +1V
- No External Components
- SOT23 and SOT23R: Available in “Green” Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)


Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical µP and μC Power Monitoring
- Portable/Battery Powered Equipment

Apex803
Document number: DS32132 Rev. 2 - 2

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September 2010
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Typical Application Circuit

![Application Circuit Diagram]

Pin Descriptions

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>RESET</td>
<td>Reset Output Pin</td>
</tr>
<tr>
<td></td>
<td>Active Low Open Drain</td>
</tr>
<tr>
<td>VCC</td>
<td>Operating Voltage Input</td>
</tr>
</tbody>
</table>

Functional Block Diagram

![Functional Block Diagram]
## Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD HBM</td>
<td>Human Body Model ESD Protection</td>
<td>2</td>
<td>kV</td>
</tr>
<tr>
<td>ESD MM</td>
<td>Machine Model ESD Protection</td>
<td>200</td>
<td>V</td>
</tr>
<tr>
<td>V(_{CC})</td>
<td>Supply Voltage</td>
<td>-0.3 to +6.0</td>
<td>V</td>
</tr>
<tr>
<td>V(_{RESET})</td>
<td>RESET (open drain)</td>
<td>-0.3 to 6</td>
<td>V</td>
</tr>
<tr>
<td>I(_{CC})</td>
<td>Input Current, V(_{CC})</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>I(_{O})</td>
<td>Output Current, RESET</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>P(_{D})</td>
<td>Continuous Power Dissipation (T(_{A}) = +70°C), derate 4mW/°C above +70°C</td>
<td>400</td>
<td>mW</td>
</tr>
<tr>
<td>T(_{OP})</td>
<td>Operating Junction Temperature Range</td>
<td>-40 to +105</td>
<td>°C</td>
</tr>
<tr>
<td>T(_{ST})</td>
<td>Storage Temperature Range</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

## Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V(_{CC})</td>
<td>Supply Voltage</td>
<td>1.1</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>V(_{IN})</td>
<td>Input Voltage</td>
<td>0</td>
<td>(V(_{CC})+0.3)</td>
<td>V</td>
</tr>
<tr>
<td>V(_{RESET})</td>
<td>RESET output voltage</td>
<td>0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>T(_{A})</td>
<td>Operating Ambient Temperature Range</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>dV(_{CC})/dt</td>
<td>V(<em>{CC}) Rate of rise (V(</em>{CC}) = 0~V(_{I}))</td>
<td></td>
<td>100</td>
<td>V/μs</td>
</tr>
</tbody>
</table>
### Electrical Characteristics (TA = 25°C)

TA = -40 to 85°C unless otherwise note. Typical values are at TA = +25 °C.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICC</td>
<td>Supply Current</td>
<td>VT_H + 0.2V</td>
<td>30</td>
<td>40</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>VTH</td>
<td>Reset Threshold</td>
<td>TA = 25°C</td>
<td>2.21</td>
<td>2.25</td>
<td>2.30</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-23</td>
<td>2.59</td>
<td>2.63</td>
<td>2.66</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-26</td>
<td>2.89</td>
<td>2.93</td>
<td>2.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803D-29</td>
<td>2.89</td>
<td>2.93</td>
<td>2.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-31</td>
<td>3.04</td>
<td>3.08</td>
<td>3.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-40</td>
<td>3.94</td>
<td>4.00</td>
<td>4.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-44</td>
<td>4.31</td>
<td>4.38</td>
<td>4.45</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>APX803-46</td>
<td>4.56</td>
<td>4.63</td>
<td>4.70</td>
<td></td>
</tr>
<tr>
<td>VOL</td>
<td>RESET Output Voltage Low</td>
<td>VCC = VT_H-0.2, ISINK = 1.2mA</td>
<td>0.3</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = VT_H-0.2, ISINK = 3.5mA</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC &gt; 1.0V, ISINK = 50µA</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IOH</td>
<td>RESET Output High leakage current</td>
<td>VCC &gt; VT_H +0.2</td>
<td>1</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>θJA</td>
<td>Thermal Resistance Junction-to-Ambient</td>
<td>SOT23/SOT23R (Note 2)</td>
<td>201</td>
<td></td>
<td></td>
<td>°C/W</td>
</tr>
<tr>
<td>θJC</td>
<td>Thermal Resistance Junction-to-Case</td>
<td>SOT23/SOT23R (Note 2)</td>
<td>56</td>
<td></td>
<td></td>
<td>°C/W</td>
</tr>
</tbody>
</table>

Notes:  
1. Test condition for SOT23 and SOT23R: Devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.  
2. Final datasheet limits to be determined by characterization and correlation.
Typical Performance Characteristics

**Figure 1**
RESET Threshold Voltage vs. Temperature

**Figure 2**
RESET Threshold Voltage vs. Temperature

**Figure 3**
RESET Timeout Period vs. Temperature

**Figure 4**
RESET Timeout Period vs. Temperature

**Figure 5**
Supply Current vs. Temperature

**Figure 6**
Supply Current vs. Vcc
Typical Performance Characteristics (Continued)

![Nch Driver Sink Current vs. Vcc](image1)

**Figure 7**

![Nch Driver Sink Current vs. Vcc](image2)

**Figure 8**

![Nch Driver Output Current vs. VDS](image3)

**Figure 9**

![Nch Driver Output Current vs. VDS](image4)

**Figure 10**
Microprocessors (μPs) and microcontrollers (μC) have a reset input to ensure that it starts up in a known state. The APX803/D drive the μP’s reset input to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the VCC supply voltage declines below a preset threshold and keep it asserted for a fixed period of time after VCC has risen above the reset threshold. For the APX803D this period is a minimum of 1ms while for other APX803 variants it is at least 140ms. The APX803/D have an open-drain output stage.

Ensuring a Valid Reset Output Down to VCC = 0

RESET is guaranteed to be a logic low for VCC > 1V. Once VCC exceeds the reset threshold, an internal timer keeps RESET low for the reset timeout period; after this interval, RESET goes high. If a brownout condition occurs (VCC dips below the RESET reset threshold), RESET goes low. Any time VCC goes below the reset threshold, the internal timer resets to zero, and RESET goes low. The internal timer starts after VCC returns above the reset threshold, and RESET remains low for the reset timeout period.

When VCC falls below 1V, the APX803/D RESET output no longer sinks current — it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to RESET can drift to undetermined voltages. This presents no problem in most applications since most μP and other circuitry is inoperative with VCC below 1V.

Interfacing to μP with Bidirectional Reset Pins

Since the RESET output on the APX803/D is open drain, this device interfaces easily with μP/μC that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the μP supervisor’s RESET output directly to the microcontroller’s (μC’s) RESET pin with a single pull-up resistor allows either device to assert reset.

Supervising and monitoring Multiple Supplies

Generally, the pull-up resistor connected to the APX803/D will connect to the supply voltage that is being monitored at the IC’s VCC pin. However, some systems may use the APX803/D open-drain output to level-shift from the monitored supply to reset the μP powered by a different supply voltage or monitor multiple supplies that will be fed into 1 μC/μP reset input.
APX803/D
3-PIN MICROPROCESSOR RESET CIRCUIT

Ordering Information

**APX 803 - XX XX G - 7**

- **Output type:**
  - 03 : Active-Low, Open Drain

- **Voltage:**
  - 46 : 4.63
  - 44 : 4.38
  - 40 : 4.00
  - 31 : 3.08
  - 29 : 2.93
  - 26 : 2.63
  - 23 : 2.25

- **Package:**
  - SA : SOT23
  - SR : SOT23R

- **Green:**
  - G : Green

- **Packing:**
  - 7 : Tape & Reel

**APX 803 D - 29 XX G - 7**

- **Output type:**
  - 03 : Active-Low, Open Drain

- **Voltage:**
  - 29 : 2.93

- **Package:**
  - SA : SOT23
  - SR : SOT23R

- **Green:**
  - G : Green

- **Packing:**
  - 7 : Tape & Reel

---

### Device | Package Code | Packaging (Note 4) | 7” Tape and Reel | Part Number Suffix
--- | --- | --- | --- | ---
APX803-XXSAG-7 | SA | SOT23 | 3000/Tape & Reel | -7
APX803-XXSRG-7 | SR | SOT23R | 3000/Tape & Reel | -7
APX803D-29SAG-7 | SA | SOT23 | 3000/Tape & Reel | -7
APX803D-29SRG-7 | SR | SOT23R | 3000/Tape & Reel | -7

Notes: 4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
Marking Information

(1) SOT23 and SOT23R

( Top View )

XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
   a~z : 27~52 week; z represents
   52 and 53 week
X : A~Z : Green

<table>
<thead>
<tr>
<th>Device</th>
<th>Package</th>
<th>Identification Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>APX803-46SA</td>
<td>SOT23</td>
<td>V3</td>
</tr>
<tr>
<td>APX803-44SA</td>
<td>SOT23</td>
<td>V4</td>
</tr>
<tr>
<td>APX803-40SA</td>
<td>SOT23</td>
<td>V5</td>
</tr>
<tr>
<td>APX803-31SA</td>
<td>SOT23</td>
<td>V6</td>
</tr>
<tr>
<td>APX803-29SA</td>
<td>SOT23</td>
<td>V7</td>
</tr>
<tr>
<td>APX803-26SA</td>
<td>SOT23</td>
<td>V8</td>
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<tr>
<td>APX803-23SA</td>
<td>SOT23</td>
<td>V9</td>
</tr>
<tr>
<td>APX803-46SR</td>
<td>SOT23R</td>
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<tr>
<td>APX803-44SR</td>
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<td>S5</td>
</tr>
<tr>
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<td>SOT23R</td>
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</tr>
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<td>APX803D-29SA</td>
<td>SOT23</td>
<td>VN</td>
</tr>
<tr>
<td>APX803D-29SR</td>
<td>SOT23R</td>
<td>SN</td>
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</tbody>
</table>
Package Outline Dimensions (All Dimensions in mm)

(1) Package Type: SOT23 and SOT23R

Notes: 5. Package outline dimensions as shown on Diodes Inc. package outline dimensions document AP02002, which can be found on our website at http://www.diodes.com/datasheets/ap02002.pdf
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APX803-31SAG-7  APX803-31SRG-7  APX803-40SAG-7  APX803-40SRG-7  APX803-44SAG-7  APX803-44SRG-7
APX803-46SAG-7  APX803D-29SAG-7  APX803D-29SRG-7