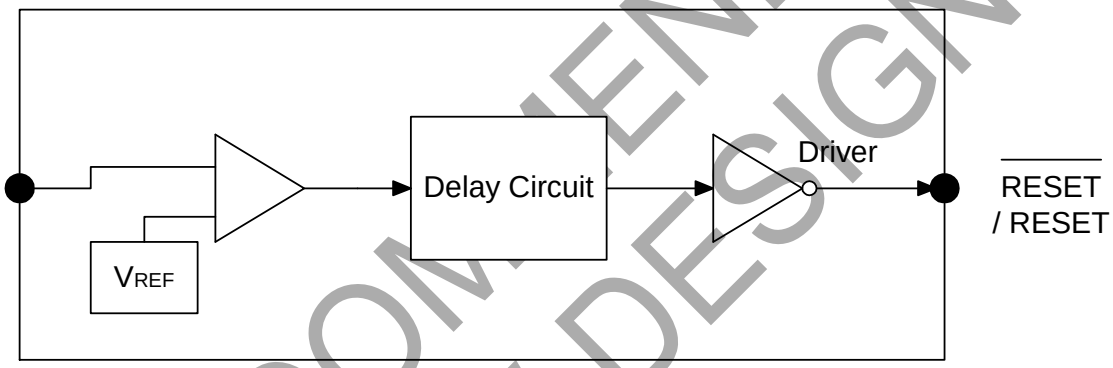
## Pin Descriptions

| Pin Name | Description |
|---|---|
| GND | Ground |
| $\overline{\text{RESET}}$ (RESET) | Reset Output Pin<br>L: for APX809<br>H: for APX810 |
| $V_{CC}$ | Operating Voltage Input |

## Functional Block Diagram




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| ESD HBM | Human Body Model ESD Protection | 5 | kV |
| ESD MM | Machine Model ESD Protection | 500 | V |
| $V_{CC}$ | Supply Voltage | -0.3 to +6.0 | V |
| $V_{RESET}$ | RESET, $\overline{\text{RESET}}$ (Push-pull) | -0.3 to ($V_{CC}$ + 0.3) | V |
| $I_{CC}$ | Input Current, $V_{CC}$ | 20 | mA |
| $I_O$ | Output Current, RESET, $\overline{\text{RESET}}$ | 20 | mA |
| $P_D$ | Continuous Power Dissipation ($T_A$ = +70°C), De-rate 4mW/°C above +70°C | 400 | mW |
| $T_{OP}$ | Operating Junction Temperature Range | -40 to +105 | °C |
| $T_{ST}$ | Storage Temperature Range | -65 to +150 | °C |

## Recommended Operating Conditions

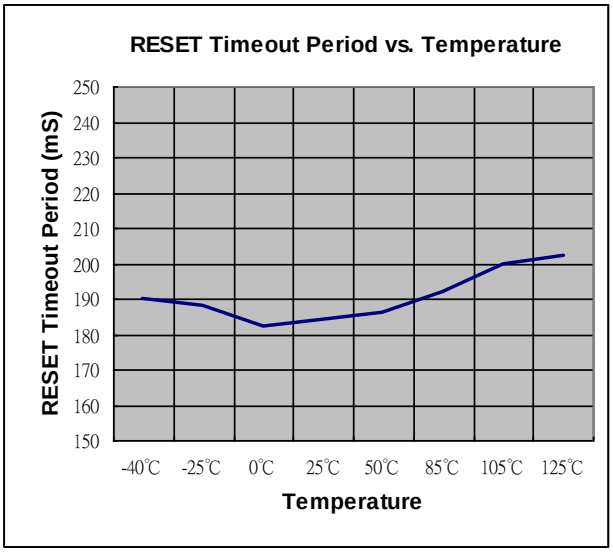
| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 1.1 | 5.5 | V |
| $V_{IN}$ | Input Voltage | 0 | ($V_{CC}$ + 0.3) | V |
| $T_A$ | Operating Ambient Temperature Range | -40 | +85 | °C |
| $t_R$ | $V_{CC}$ Rising Time ($V_{CC}$ = 0 to $V_T$) | — | 100 | µs |

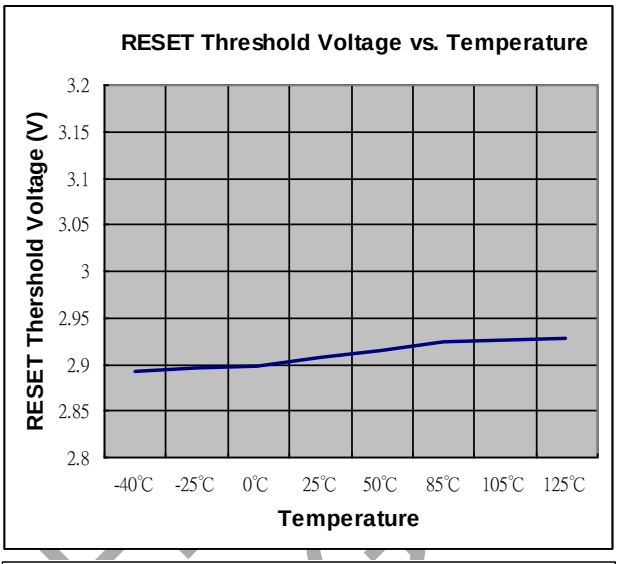
## Electrical Characteristics (@$T_A$ = -40 to +85°C, unless otherwise note. Typical values are at $T_A$ = +25°C.)

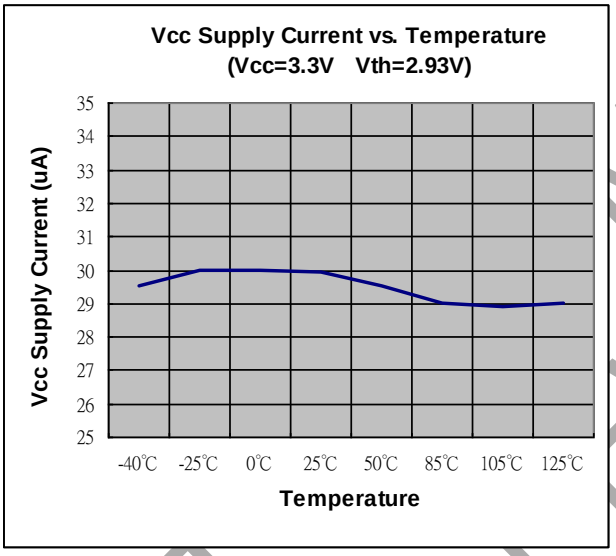
| Symbol | Parameter | | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_{CC}$ Range | | $T_A$ = 0°C to +70°C | 1.0 | — | 5.5 | V |
| $I_{CC}$ | Supply Current | | $V_{TH}$ + 0.2V | — | 30 | 40 | µA |
| $V_{TH}$ | Reset Threshold | APX809/810-23 | $T_A$ = 0°C to +85°C | 2.21 | 2.25 | 2.30 | V |
| | | APX809/810-26 | | 2.59 | 2.63 | 2.69 | |
| | | APX809/810-29 | | 2.88 | 2.93 | 3.00 | |
| | | APX809/810-31 | | 3.02 | 3.08 | 3.15 | |
| | | APX809/810-40 | | 3.93 | 4.00 | 4.08 | |
| | | APX809/810-44 | | 4.31 | 4.38 | 4.47 | |
| | | APX809/810-46 | | 4.56 | 4.63 | 4.72 | |
| | | APX809/810-23 | $T_A$ = -40°C to +85°C | 2.20 | 2.25 | 2.30 | V |
| | | APX809/810-26 | | 2.57 | 2.63 | 2.69 | |
| | | APX809/810-29 | | 2.86 | 2.93 | 3.00 | |
| | | APX809/810-31 | | 3.00 | 3.08 | 3.15 | |
| | | APX809/810-40 | | 3.92 | 4.00 | 4.08 | |
| | | APX809/810-44 | | 4.29 | 4.38 | 4.47 | |
| | | APX809/810-46 | | 4.54 | 4.63 | 4.72 | |
| | Reset Threshold Tempco | | — | — | 30 | — | ppm/°C |
| $t_S$ | Set-up Time | | $V_{CC}$ = $V_{TH}$ to ($V_{TH}$ - 100mV) | — | 20 | — | µs |
| $t_{DELAY}$ | Reset Active Timeout Period | | $T_A$ = 0°C to +85°C | 140 | 200 | 280 | ms |
| $V_{OL}$ | $\overline{RESET}$ Output Voltage Low (APX809) | | $V_{CC}$ = $V_{TH}$ -0.2, $I_{SINK}$ = 1.2mA | — | — | 0.3 | V |
| | | | $V_{CC}$ = $V_{TH}$ -0.2, $I_{SINK}$ = 3.2mA | — | — | 0.4 | |
| | | | $V_{CC}$ > 1.0V, $I_{SINK}$ = 50µA | — | — | 0.3 | |
| $V_{OH}$ | $\overline{RESET}$ Output Voltage-High (APX809) | | $V_{CC}$ > $V_{TH}$ +0.2, $I_{SOURCE}$ = 500µA | 0.8$V_{CC}$ | — | — | V |
| | | | $V_{CC}$ > $V_{TH}$ +0.2, $I_{SOURCE}$ = 800µA | $V_{CC}$ - 1.5 | — | — | |
| $V_{OL}$ | RESET Output Voltage-Low (APX810) | | $V_{CC}$ = $V_{TH}$ +0.2, $I_{SINK}$ = 1.2mA | — | — | 0.3 | V |
| | | | $V_{CC}$ = $V_{TH}$ +0.2, $I_{SINK}$ = 3.2mA | — | — | 0.4 | |
| $V_{OH}$ | RESET Output Voltage-High (APX810) | | 1.8V < $V_{CC}$ < $V_{TH}$ -0.2, $I_{SOURCE}$ = 150µA | 0.8$V_{CC}$ | — | — | V |
| $\theta_{JA}$ | Thermal Resistance Junction-to-Ambient | | SOT23 (Note 4) | — | 201 | — | °C/W |
| $\theta_{JC}$ | Thermal Resistance Junction-to-Case | | SOT23 (Note 4) | — | 56 | — | °C/W |

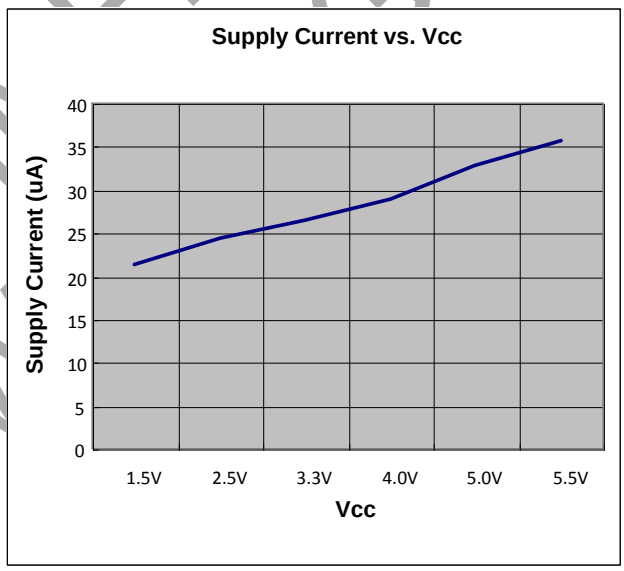
Note: 4. Test condition for SOT23: Devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

## Performance Characteristics

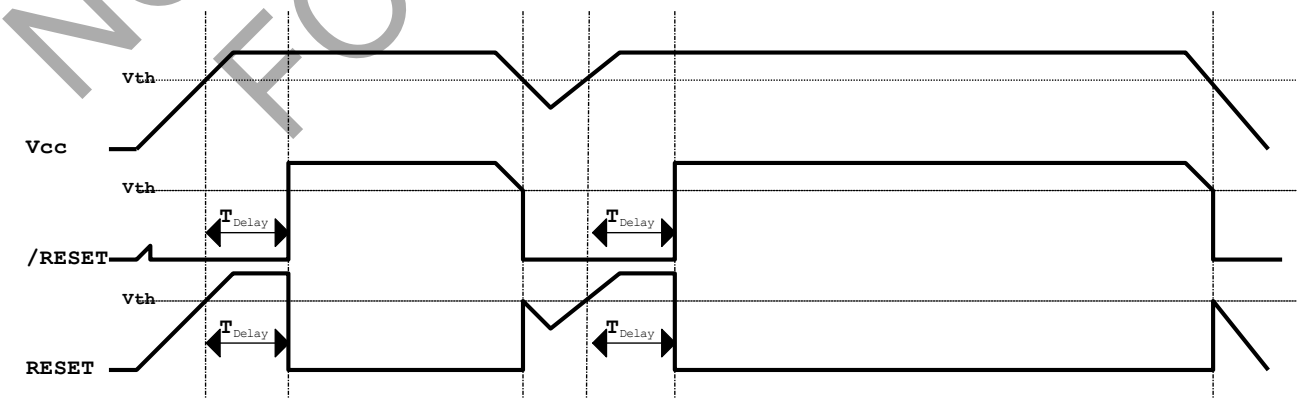



## Timing Diagram



## Functional Description

A microprocessor's (µP's) reset input starts the µP in a known state. The APX809/810 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the $V_{CC}$ supply voltage declines below a preset threshold, keeping it asserted for at least 240ms after $V_{CC}$ has risen above the reset threshold. The APX809/810 have a push-pull output stage.

**Ensuring a Valid Reset Output**

**Down to $V_{CC}$ = 0**

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

When $V_{CC}$ falls below 1V, the APX809 $\overline{RESET}$ output no longer sinks current — it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{RESET}$ can drift to undetermined voltages.

This presents no problem in most applications since most µP and other circuitry is inoperative with $V_{CC}$ below 1V. However, in applications where $\overline{RESET}$ must be valid down to 0V, adding a pull down resistor to $\overline{RESET}$ causes any stray leakage currents to flow to ground, holding $\overline{RESET}$ low. R1's value is not critical; 100k are large enough not to load $\overline{RESET}$ and small enough to pull $\overline{RESET}$ to ground. For the APX810 if RESET is required to remain valid for $V_{CC}$ < 1V.

**Benefits of Highly Accurate Reset Threshold**

Most µP supervisor ICs has reset threshold voltages between 5% and 10% below the value of nominal supply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal. When using ICs rated at only the nominal supply ±5%, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.

## Ordering Information

**APX 8 XX - XX XX G - 7**

| Enable | Voltage | Package | Green | Packing |
|---|---|---|---|---|
| 09 : Active-Low<br>10 : Active-High | 46 : 4.63<br>44 : 4.38<br>40 : 4.00<br>31 : 3.08<br>29 : 2.93<br>26 : 2.63<br>23 : 2.25 | SA/SR : SOT23 | G : Green | 7 : Tape & Reel |

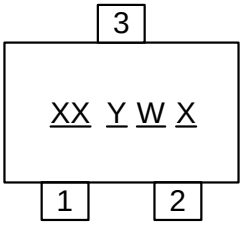
| Part Number | Package Code | Packaging (Note 5) | 7" Tape and Reel | |
|---|---|---|---|---|
| | | | Quantity | Part Number Suffix |
| APX809-XXSAG-7 | SA | SOT23 | 3000/Tape & Reel | -7 |
| APX810-XXSAG-7 | SA | SOT23 | 3000/Tape & Reel | -7 |
| APX809-XXSRG-7 | SR | SOT23 | 3000/Tape & Reel | -7 |
| APX810-XXSRG-7 | SR | SOT23 | 3000/Tape & Reel | -7 |

Note: 5. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at http://www.diodes.com/package-outlines.html.

## Marking Information

**(1) SOT23**

**( Top View )**



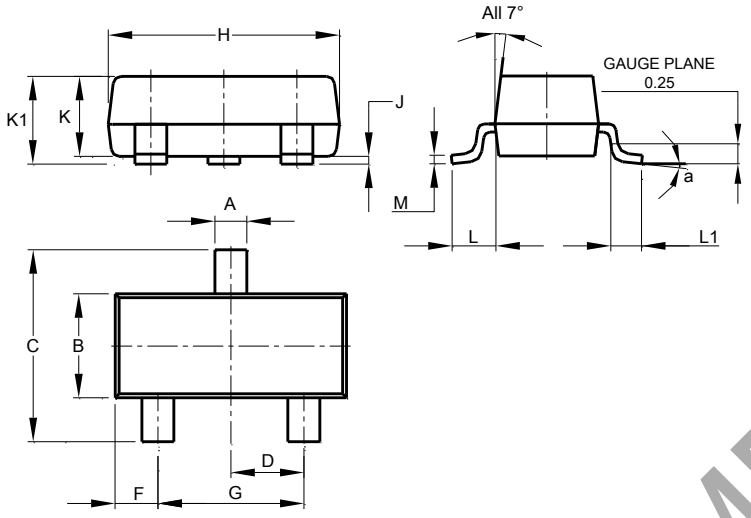

XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : A~Z : Green

| Device | Package | Identification Code |
|---|---|---|
| APX809-46SA | SOT23 | X2 |
| APX809-44SA | SOT23 | X3 |
| APX809-40SA | SOT23 | X4 |
| APX809-31SA | SOT23 | X5 |
| APX809-29SA | SOT23 | X6 |
| APX809-26SA | SOT23 | X7 |
| APX809-23SA | SOT23 | X8 |
| APX810-46SA | SOT23 | XA |
| APX810-44SA | SOT23 | XB |
| APX810-40SA | SOT23 | XC |
| APX810-31SA | SOT23 | XD |
| APX810-29SA | SOT23 | XE |
| APX810-26SA | SOT23 | XF |
| APX810-23SA | SOT23 | XG |
| APX809-46SR | SOT23 | Y2 |
| APX809-44SR | SOT23 | Y3 |
| APX809-40SR | SOT23 | Y4 |
| APX809-31SR | SOT23 | Y5 |
| APX809-29SR | SOT23 | Y6 |
| APX809-26SR | SOT23 | Y7 |
| APX809-23SR | SOT23 | Y8 |
| APX810-46SR | SOT23 | YA |
| APX810-44SR | SOT23 | YB |
| APX810-40SR | SOT23 | YC |
| APX810-31SR | SOT23 | YD |
| APX810-29SR | SOT23 | YE |
| APX810-26SR | SOT23 | YF |
| APX810-23SR | SOT23 | YG |

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT23**

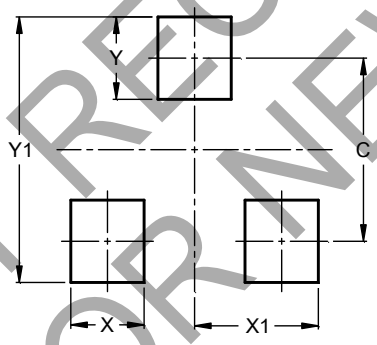



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 0.890 | 1.00 | 0.975 |
| **K1** | 0.903 | 1.10 | 1.025 |
| **L** | 0.45 | 0.61 | 0.55 |
| **L1** | 0.25 | 0.55 | 0.40 |
| **M** | 0.085 | 0.150 | 0.110 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT23**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.0 |
| **X** | 0.8 |
| **X1** | 1.35 |
| **Y** | 0.9 |
| **Y1** | 2.9 |

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