

## Description

The APX803/D is used for microprocessor ( $\mu$ P) supervisory circuits to monitor the power supplies in  $\mu$ P 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  $V_{CC}$  supply voltage declines below a preset threshold, keeping it asserted for a fixed period of time after  $V_{CC}$  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  $V_{CC}$ , and the outputs are guaranteed to be in the correct logic state for  $V_{CC}$  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.

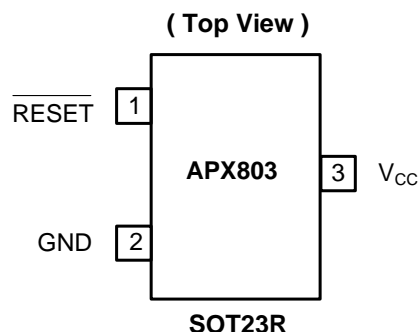
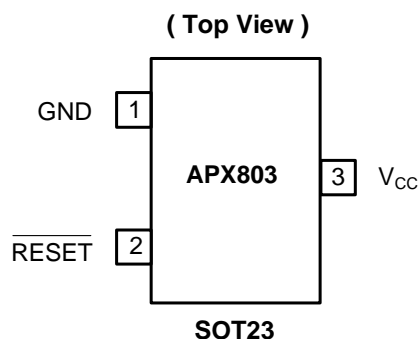
The APX803/D have an open collector active low  $\overline{\text{RESET}}$  output and compliment Diodes APX809/10 which have push-pull output stages.. Low supply current makes the APX803/D ideal for use in portable equipment. The APX803/D are available in two pin out variants of the 3-pin SOT23 package.

## Features

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

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).

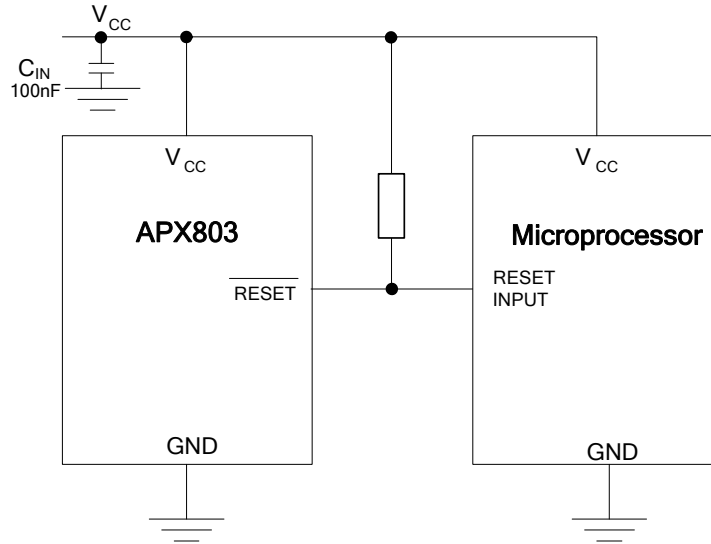
## Pin Assignments



## Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical  $\mu$ P and  $\mu$ C Power Monitoring
- Portable/Battery Powered Equipment

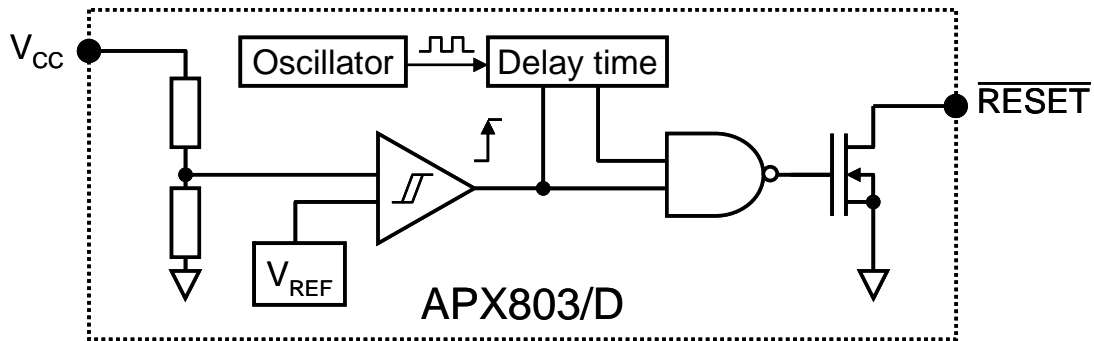
**Typical Application Circuit**



**Pin Descriptions**

Pin Name	Description
GND	Ground
$\overline{\text{RESET}}$	Reset Output Pin Active Low Open Drain
V <sub>CC</sub>	Operating Voltage Input

**Functional Block Diagram**



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD MM	Machine Model ESD Protection	200	V
$V_{CC}$	Supply Voltage	-0.3 to +6.0	V
$V_{RESET}$	$\overline{RESET}$ (open drain)	-0.3 to 6	V
$I_{CC}$	Input Current, $V_{CC}$	20	mA
$I_o$	Output Current, $\overline{RESET}$	20	mA
$P_D$	Continuous Power Dissipation ( $T_A = +70^\circ\text{C}$ ), de-rate 4mW/ $^\circ\text{C}$ above +70 $^\circ\text{C}$	400	mW
$T_{OP}$	Operating Junction Temperature Range	-40 to +105	$^\circ\text{C}$
$T_{ST}$	Storage Temperature Range	-65 to +150	$^\circ\text{C}$

### 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
$V_{RESET}$	$\overline{RESET}$ output voltage	0	5.5	V
$T_A$	Operating Ambient Temperature Range	-40	85	$^\circ\text{C}$
$dV_{CC}/dt$	$V_{CC}$ Rate of rise ( $V_{CC} = 0 \sim V_T$ )		100	V/ $\mu\text{s}$

### Electrical Characteristics (T<sub>A</sub> = 25°C)

T<sub>A</sub> = -40 to 85°C unless otherwise note. Typical values are at T<sub>A</sub> = +25 °C.

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit	
I <sub>CC</sub>	Supply Current	V <sub>TH</sub> + 0.2V		30	40	μA	
V <sub>TH</sub>	Reset Threshold	APX803-23	T <sub>A</sub> = 25°C	2.21	2.25	2.30	V
		APX803-26		2.59	2.63	2.66	
		APX803-29		2.89	2.93	2.96	
		APX803D-29		2.89	2.93	2.96	
		APX803-31		3.04	3.08	3.13	
		APX803-40		3.94	4.00	4.06	
		APX803-44		4.31	4.38	4.45	
		APX803-46		4.56	4.63	4.70	
		Reset Threshold hysteresis	V <sub>TH-H</sub> - V <sub>TH-L</sub>		40		mV
		Reset Threshold Tempco			30		ppm/°C
t <sub>S</sub>	V <sub>CC</sub> to RESET delay	V <sub>CC</sub> = V <sub>TH</sub> to (V <sub>TH</sub> - 100mV)		20		μs	
t <sub>DELAY</sub>	Reset Active Timeout Period	APX803-XX	T <sub>A</sub> = 0°C to +85°C	140	200	280	ms
		APX803D-29		1		3.3	
V <sub>OL</sub>	RESET Output Voltage Low	V <sub>CC</sub> = V <sub>TH</sub> - 0.2, I <sub>SINK</sub> = 1.2mA			0.3	V	
		V <sub>CC</sub> = V <sub>TH</sub> - 0.2, I <sub>SINK</sub> = 3.5mA			0.4		
		V <sub>CC</sub> > 1.0V, I <sub>SINK</sub> = 50uA			0.3		
I <sub>OH</sub>	RESET Output High leakage current	V <sub>CC</sub> > V <sub>TH</sub> + 0.2			1	μA	
θ <sub>JA</sub>	Thermal Resistance Junction-to-Ambient	SOT23/SOT23R (Note 2)		201		°C/W	
θ <sub>JC</sub>	Thermal Resistance Junction-to-Case	SOT23/SOT23R (Note 2)		56		°C/W	

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

**Typical Performance Characteristics**

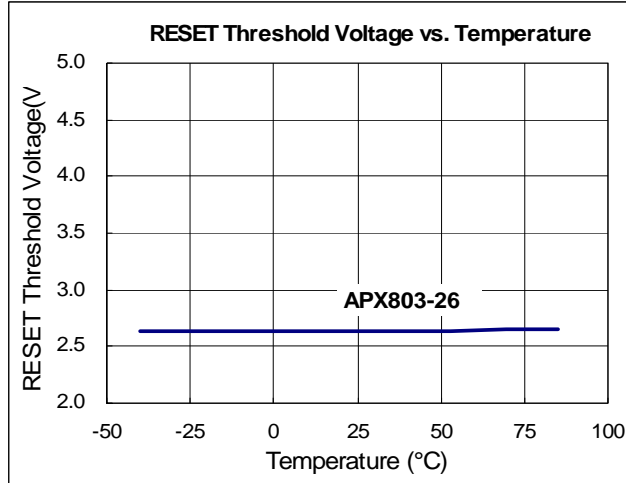


Figure 1

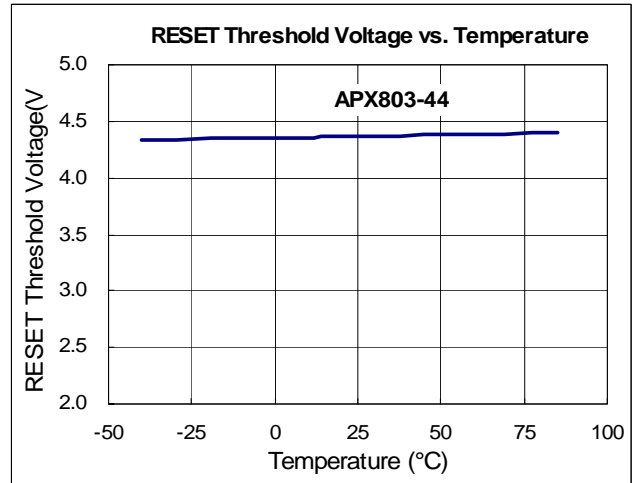


Figure 2

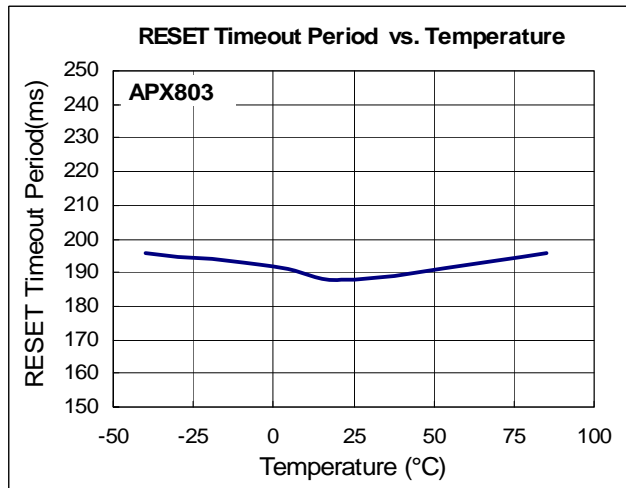


Figure 3

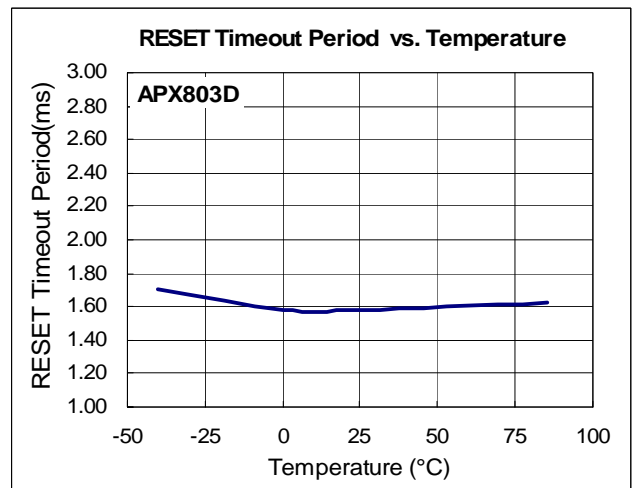


Figure 4

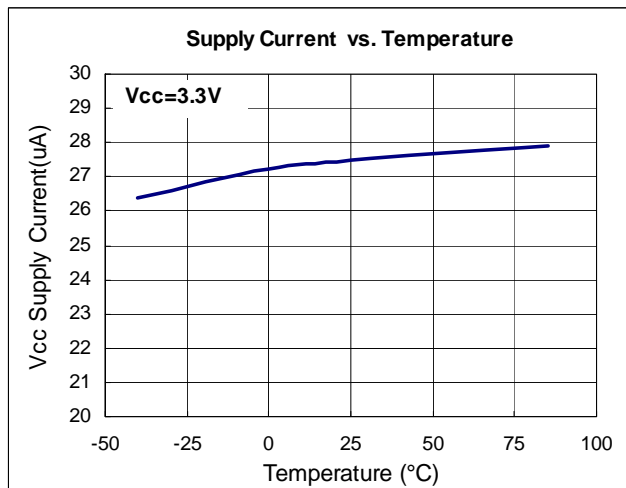


Figure 5

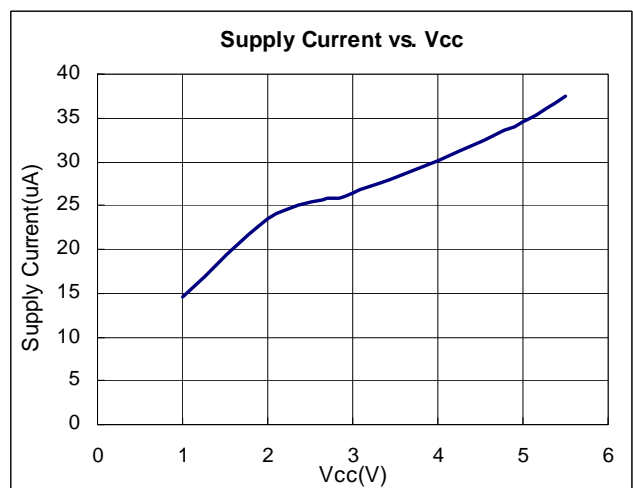


Figure 6

**Typical Performance Characteristics (Continued)**

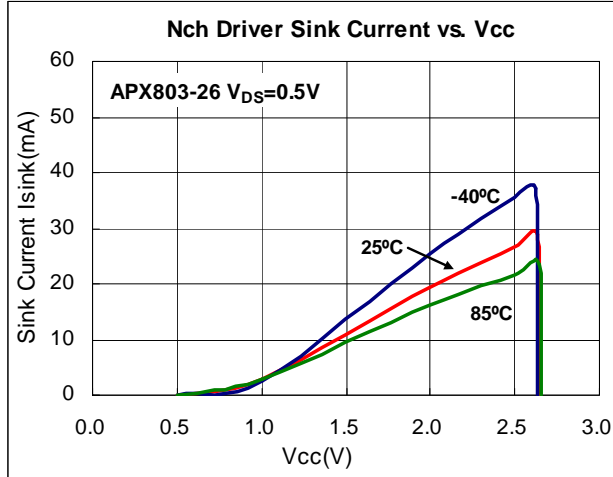


Figure 7

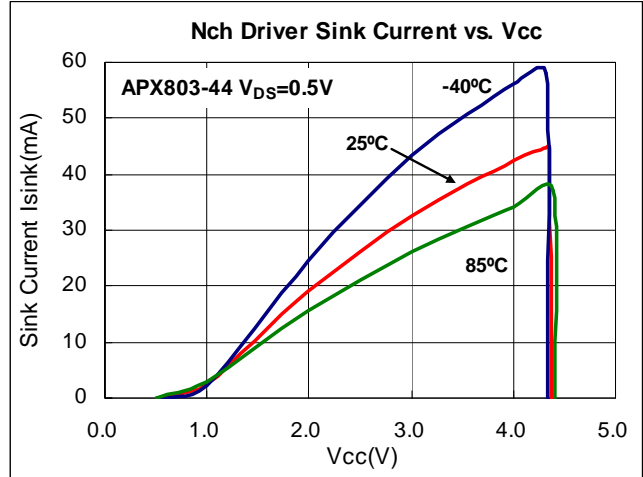


Figure 8

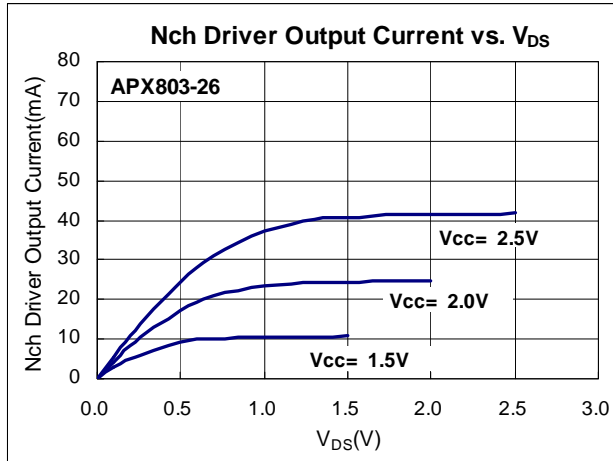


Figure 9

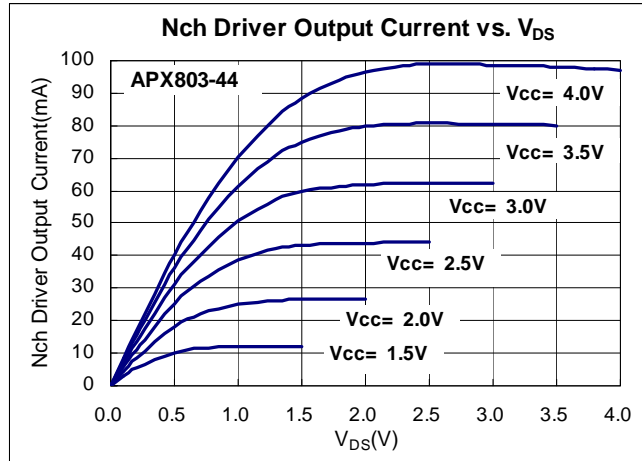
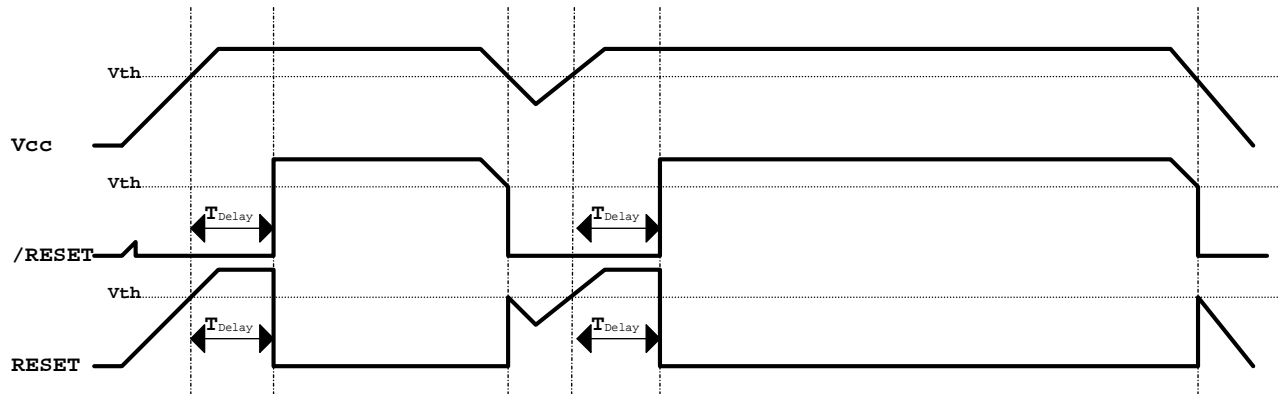


Figure 10

## Timing Diagram



## Functional Description

Microprocessors ( $\mu P$ s) and microcontrollers ( $\mu C$ ) have a reset input to ensure that it starts up in a known state. The APX803/D drive the  $\mu P$ 's reset input 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 and keep it asserted for a fixed period of time after  $V_{CC}$  has risen above the reset threshold. For the APX803/D 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 $V_{CC} = 0$

$\overline{RESET}$  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 APX803/D  $\overline{RESET}$  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  $\mu P$  and other circuitry is inoperative with  $V_{CC}$  below 1V.

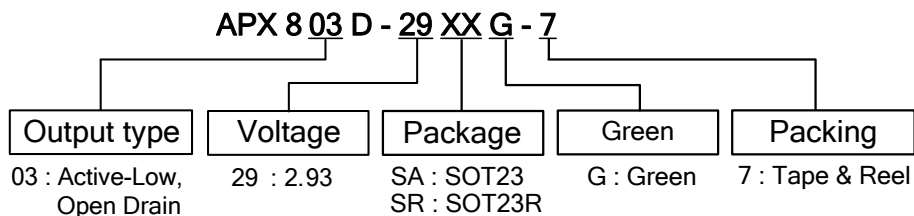
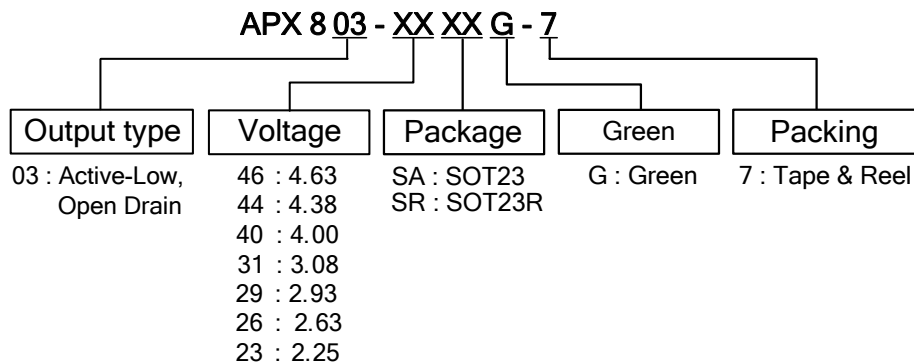
### Interfacing to $\mu P$ with Bidirectional Reset Pins

Since the  $RESET$  output on the APX803/D is open drain, this device interfaces easily with  $\mu P/\mu C$  that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the  $\mu P$  supervisor's  $RESET$  output directly to the microcontroller's ( $\mu C$ '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  $V_{CC}$  pin. However, some systems may use the APX803/D open-drain output to level-shift from the monitored supply to reset the  $\mu P$  powered by a different supply voltage or monitor multiple supplies that will be fed into 1  $\mu C/\mu P$  reset input.

**Ordering Information**



Device	Package Code	Packaging (Note 4)	7" Tape and Reel	
			Quantity	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

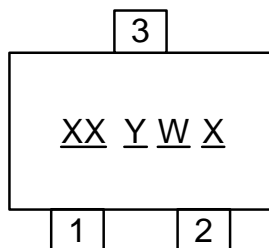
Notes: 4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.



**Marking Information**

(1) SOT23 and SOT23R

( Top View )

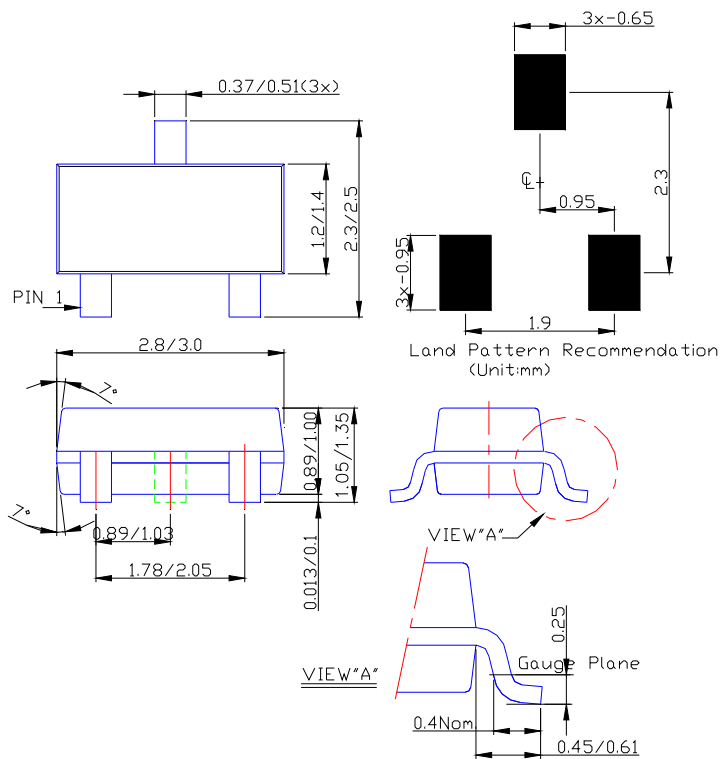


XX : Identification code  
Y : Year 0~9  
W : Week : A~Z : 1~26 week;  
a~z : 27~52 week; z represents  
52 and 53 week  
X : A~Z : Green

Device	Package	Identification Code
APX803-46SA	SOT23	V3
APX803-44SA	SOT23	V4
APX803-40SA	SOT23	V5
APX803-31SA	SOT23	V6
APX803-29SA	SOT23	V7
APX803-26SA	SOT23	V8
APX803-23SA	SOT23	V9
APX803-46SR	SOT23R	S3
APX803-44SR	SOT23R	S4
APX803-40SR	SOT23R	S5
APX803-31SR	SOT23R	S6
APX803-29SR	SOT23R	S7
APX803-26SR	SOT23R	S8
APX803-23SR	SOT23R	S9
APX803D-29SA	SOT23	VN
APX803D-29SR	SOT23R	SN

**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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