

## 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.

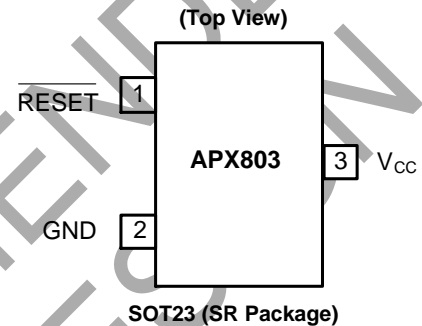
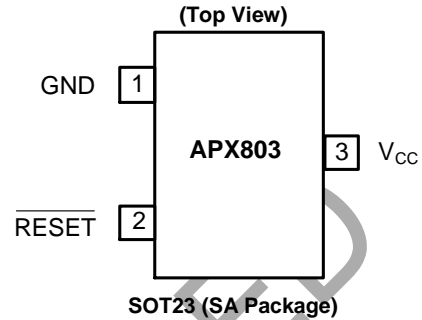
The APX803/D have an open collector active low  $\overline{\text{RESET}}$  output and compliment Diodes APX809/10 which have push-pull output stages. Low supply current makes the APX803/D ideal for use in portable equipment. The APX803/D are available in two pin out variants of the 3-pin SOT23 package.

## 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: Available in "Green" Molding Compound (No Br, Sb)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

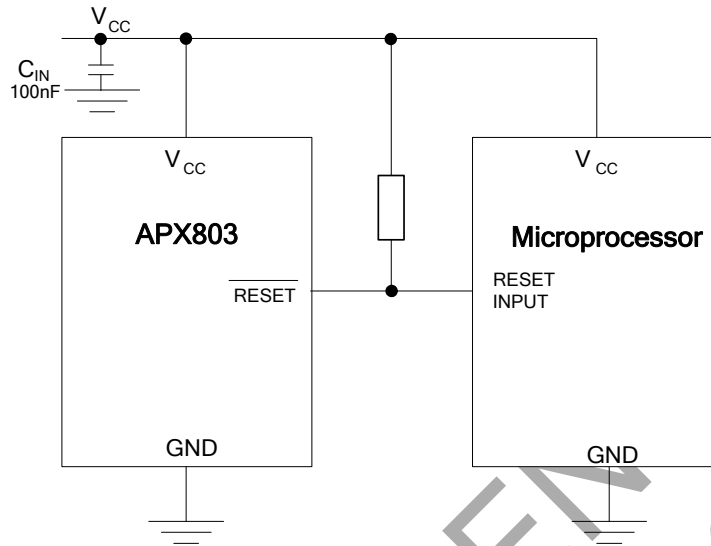
## Pin Assignments



## Applications

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

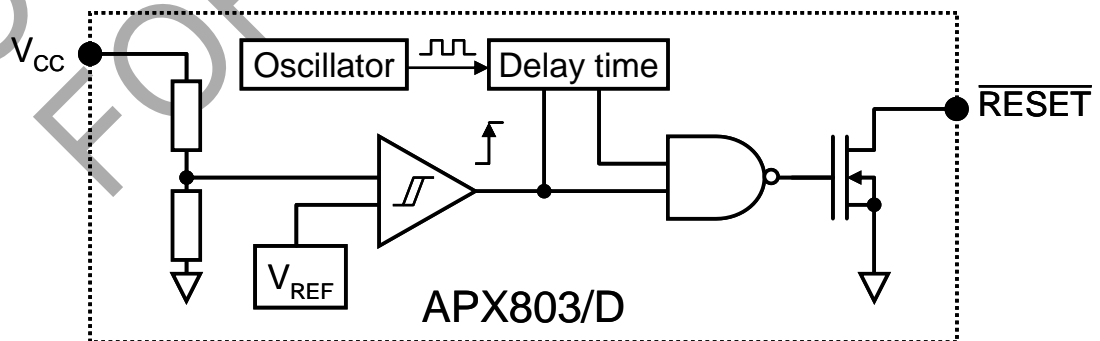
**Typical Applications Circuit**



**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 <sub>CC</sub>	Supply Voltage	-0.3 to +6.0	V
V <sub>RESET</sub>	$\overline{\text{RESET}}$ (Open Drain)	-0.3 to 6	V
I <sub>CC</sub>	Input Current, V <sub>CC</sub>	20	mA
I <sub>O</sub>	Output Current, $\overline{\text{RESET}}$	20	mA
P <sub>D</sub>	Continuous Power Dissipation (T <sub>A</sub> = +70°C), De-rate 4mW/°C above +70°C	400	mW
T <sub>OP</sub>	Operating Junction Temperature Range	-40 to +105	°C
T <sub>ST</sub>	Storage Temperature Range	-65 to +150	°C

### Recommended Operating Conditions

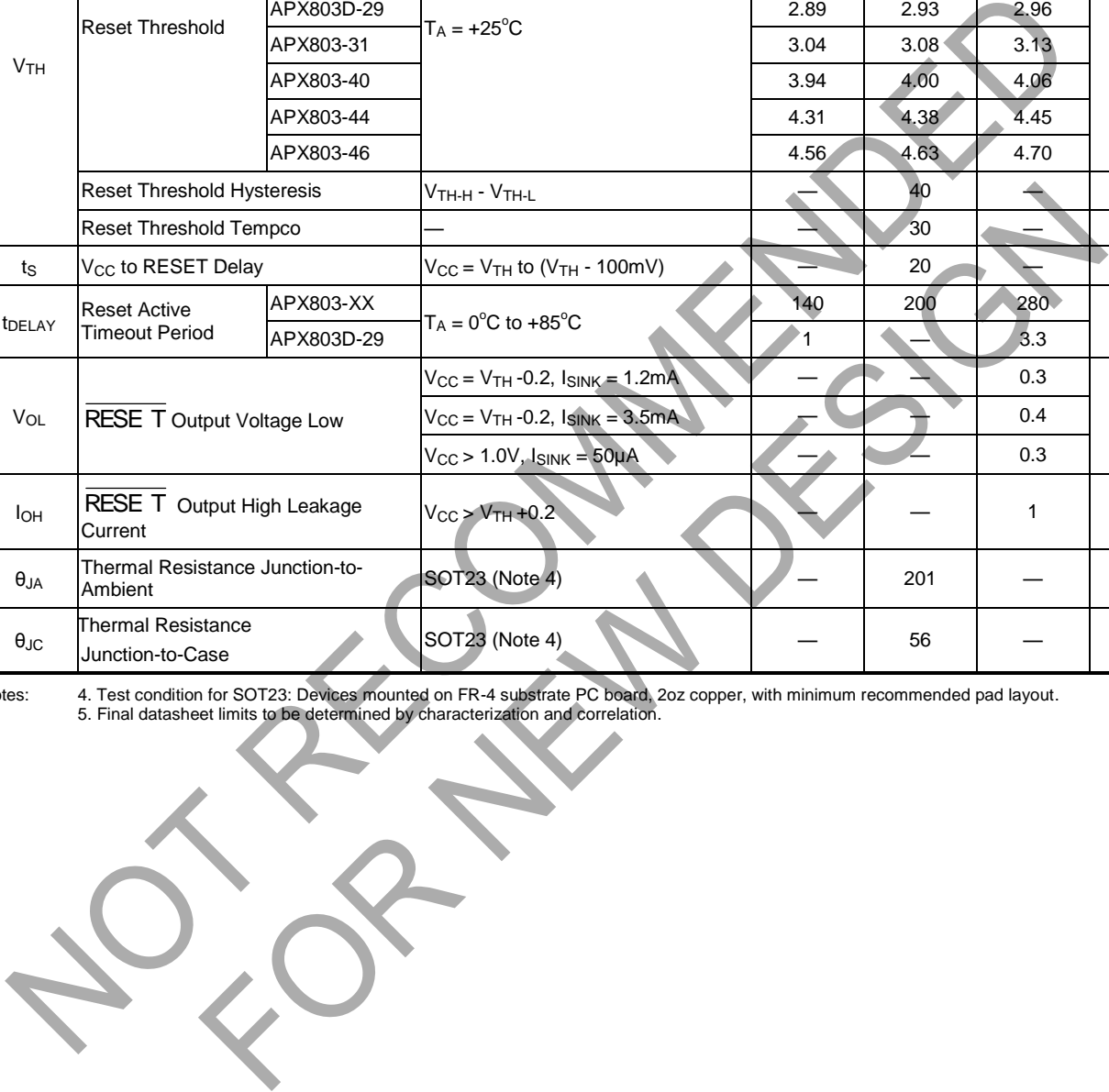
Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage	1.1	5.5	V
V <sub>IN</sub>	Input Voltage	0	(V <sub>CC</sub> + 0.3)	V
V <sub>RESET</sub>	$\overline{\text{RESET}}$ Output Voltage	0	5.5	V
T <sub>A</sub>	Operating Ambient Temperature Range	-40	+85	°C
dV <sub>CC</sub> /dt	V <sub>CC</sub> Rate of Rise (V <sub>CC</sub> = 0 to V <sub>T</sub> )	—	100	V/μs

NOT RECOMMENDED FOR NEW DESIGN

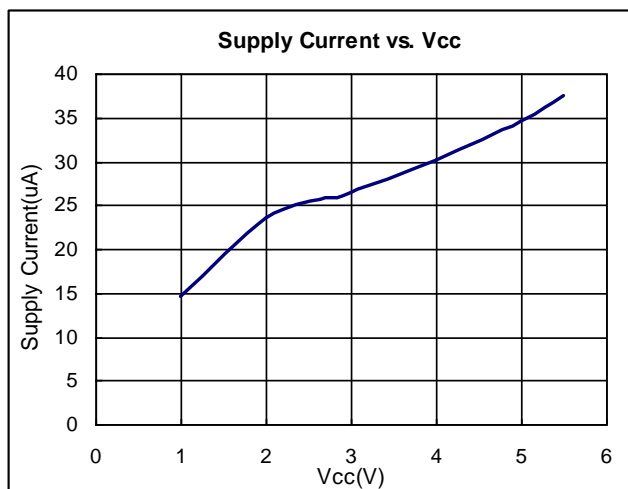
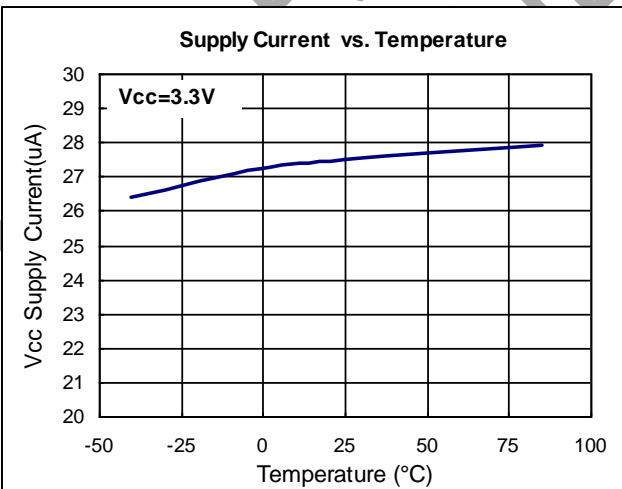
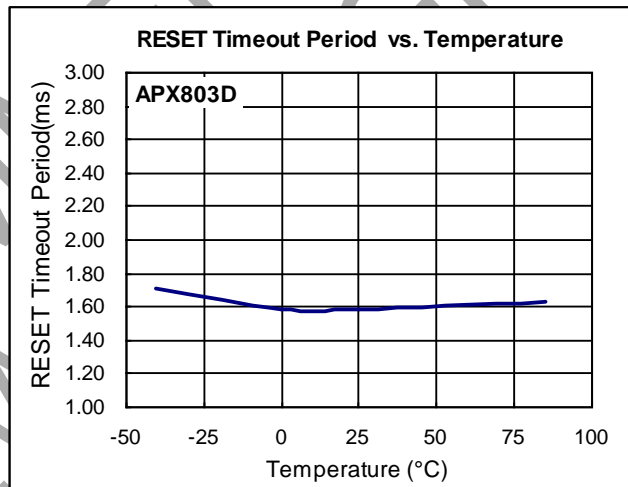
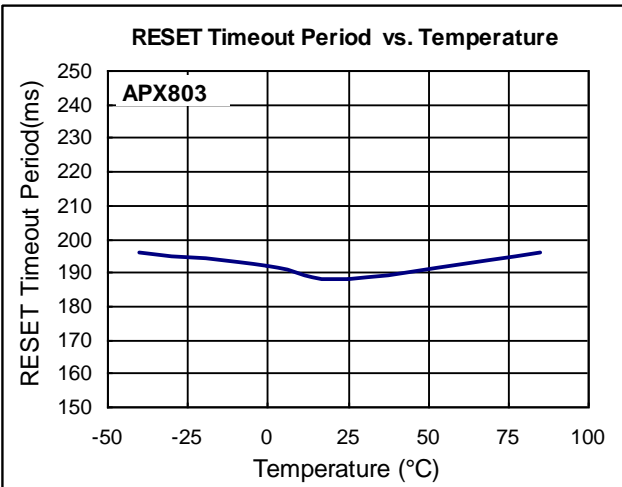
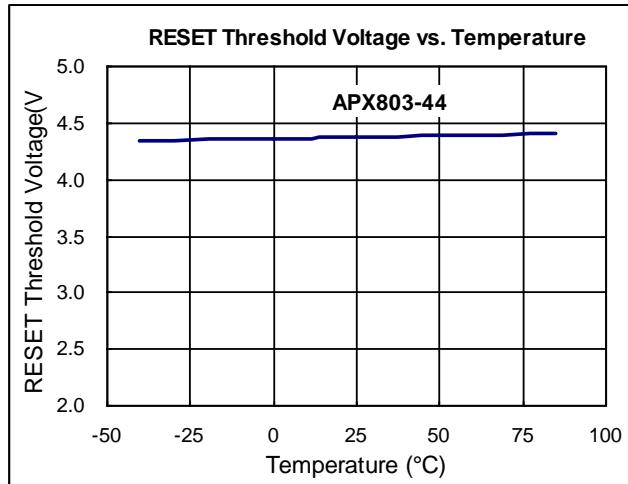
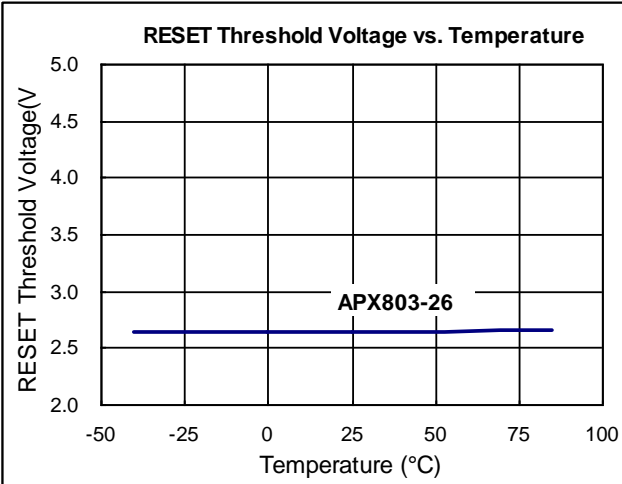
**Electrical Characteristics** (@ $T_A = -40$  to  $+85^\circ\text{C}$ , unless otherwise note. Typical values are at  $T_A = +25^\circ\text{C}$ .)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	
$I_{CC}$	Supply Current	$V_{TH} + 0.2V$	—	30	40	$\mu\text{A}$	
$V_{TH}$	Reset Threshold	$T_A = +25^\circ\text{C}$	APX803-23	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	$V_{TH-H} - V_{TH-L}$	—	40	—	mV	
	Reset Threshold Tempco	—	—	30	—	ppm/ $^\circ\text{C}$	
$t_s$	$V_{CC}$ to RESET Delay	$V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{mV})$	—	20	—	$\mu\text{s}$	
$t_{DELAY}$	Reset Active Timeout Period	$T_A = 0^\circ\text{C}$ to $+85^\circ\text{C}$	APX803-XX	140	200	280	ms
			APX803D-29	1	—	3.3	
$V_{OL}$	RESE T Output Voltage Low	$V_{CC} = V_{TH} - 0.2, I_{SINK} = 1.2\text{mA}$	—	—	0.3	V	
		$V_{CC} = V_{TH} - 0.2, I_{SINK} = 3.5\text{mA}$	—	—	0.4		
		$V_{CC} > 1.0V, I_{SINK} = 50\mu\text{A}$	—	—	0.3		
$I_{OH}$	RESE T Output High Leakage Current	$V_{CC} > V_{TH} + 0.2$	—	—	1	$\mu\text{A}$	
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT23 (Note 4)	—	201	—	$^\circ\text{C/W}$	
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT23 (Note 4)	—	56	—	$^\circ\text{C/W}$	

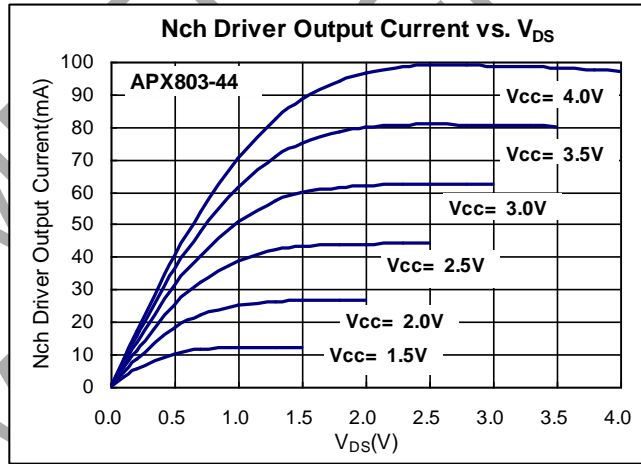
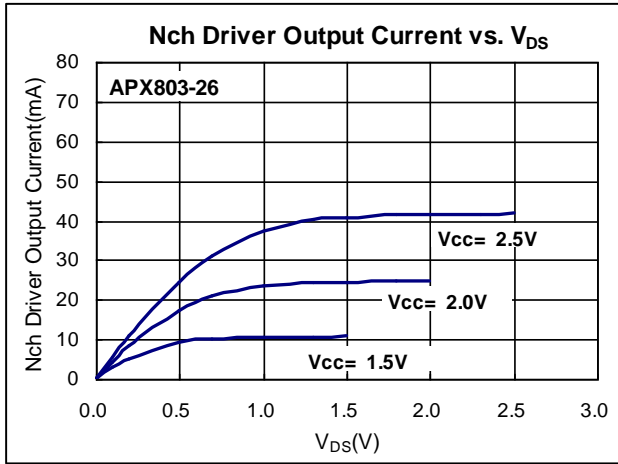
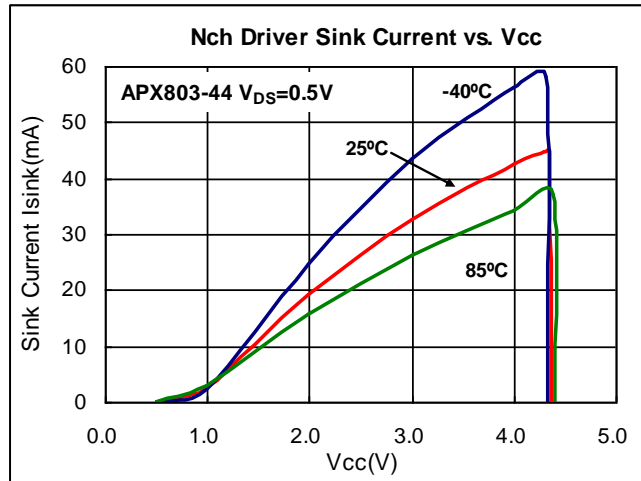
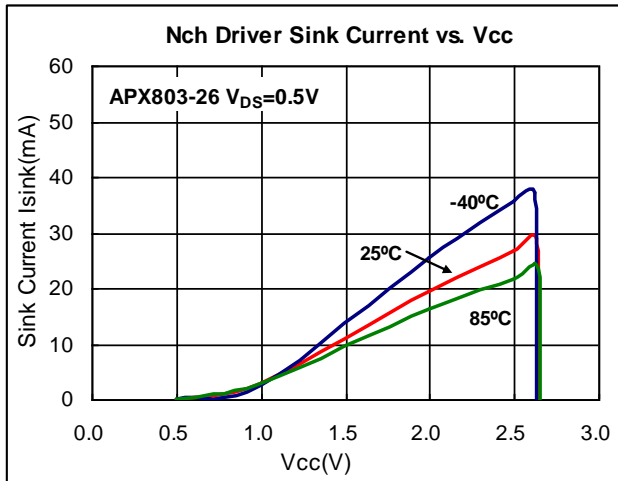
Notes: 4. Test condition for SOT23: Devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.  
 5. Final datasheet limits to be determined by characterization and correlation.



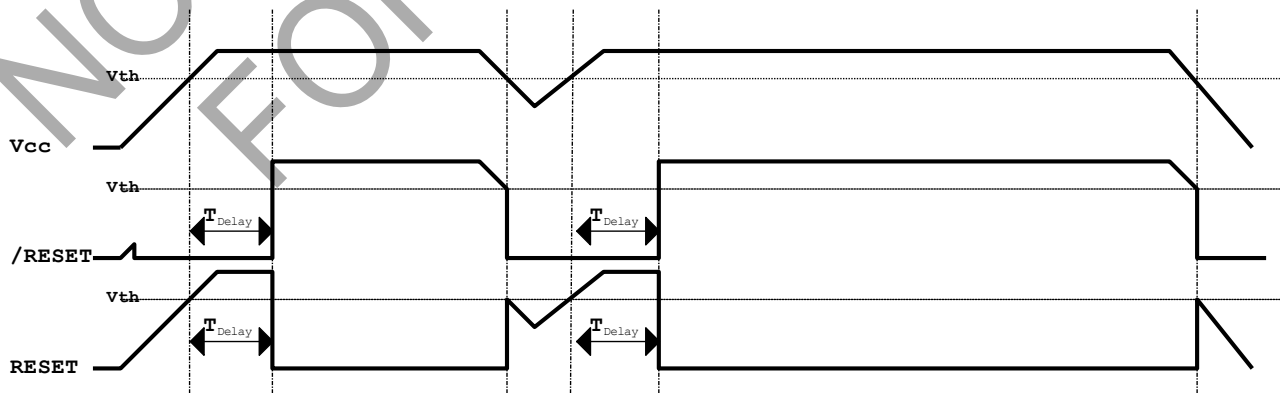
**Performance Characteristics**



**Performance Characteristics (Cont.)**



**Timing Diagram**



## Functional Description

Microprocessors ( $\mu$ Ps) 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 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 $V_{CC} = 0$

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

When  $V_{CC}$  falls below 1V, the APX803/D  $\overline{\text{RESET}}$  output no longer sinks current — it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to  $\overline{\text{RESET}}$  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

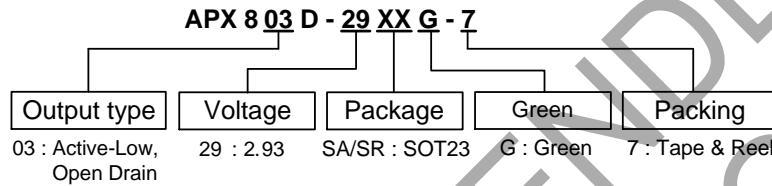
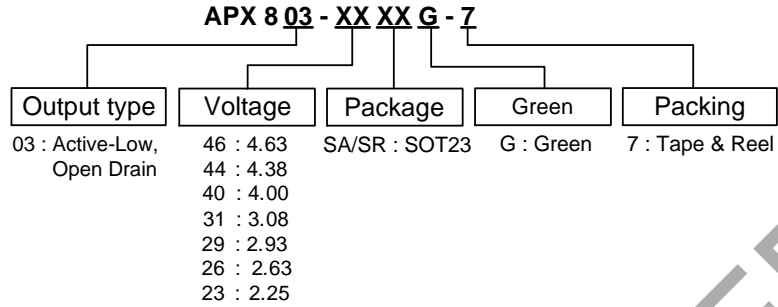
Since the  $\overline{\text{RESET}}$  output on the APX803/D is open drain, this device interfaces easily with  $\mu$ P/ $\mu$ C that have bidirectional reset pins, such as the Motorola 68HC11.

Connecting the  $\mu$ P supervisor's  $\overline{\text{RESET}}$  output directly to the microcontroller's ( $\mu$ C's)  $\overline{\text{RESET}}$  pin with a single pull-up resistor allows either device to assert reset.

#### Supervising and Monitoring Multiple Supplies

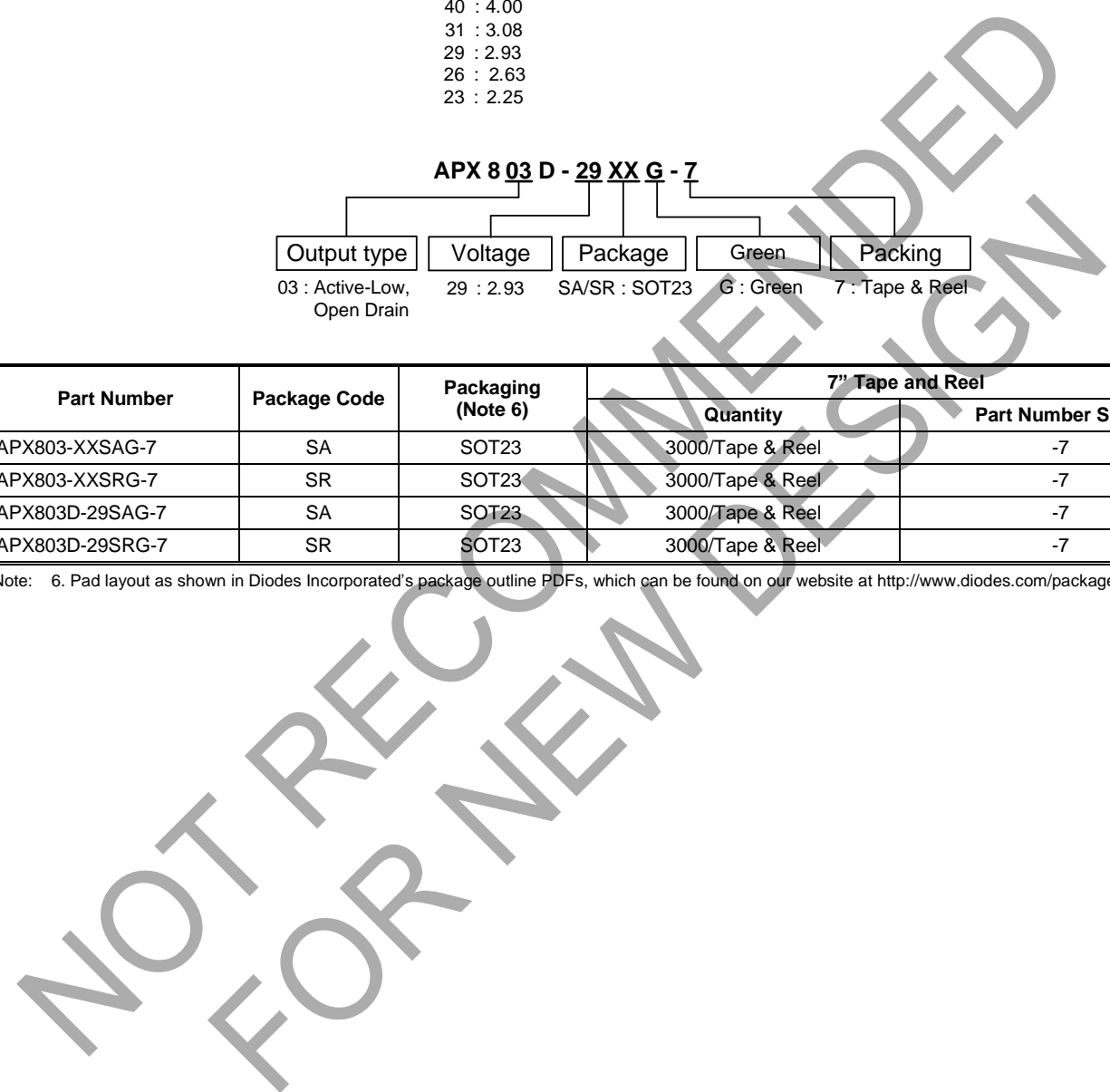
Generally, the pull-up resistor connected to the APX803/D will connect to the supply voltage that is being monitored at the IC's  $V_{CC}$  pin. However, some systems may use the APX803/D open-drain output to level-shift from the monitored supply to reset the  $\mu$ P powered by a different supply voltage or monitor multiple supplies that will be fed into 1  $\mu$ C/ $\mu$ P reset input.

**Ordering Information**



Part Number	Package Code	Packaging (Note 6)	7" Tape and Reel	
			Quantity	Part Number Suffix
APX803-XXSAG-7	SA	SOT23	3000/Tape & Reel	-7
APX803-XXSRG-7	SR	SOT23	3000/Tape & Reel	-7
APX803D-29SAG-7	SA	SOT23	3000/Tape & Reel	-7
APX803D-29SRG-7	SR	SOT23	3000/Tape & Reel	-7

Note: 6. 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>.

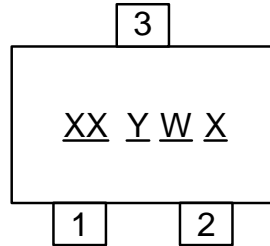




## Marking Information

(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

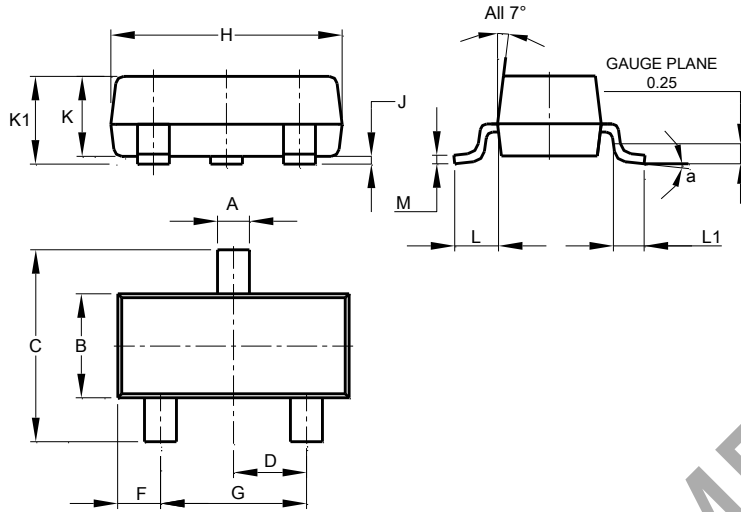
X : A~Z : Green

Device	Package	Identification Code
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	SOT23	S3
APX803-44SR	SOT23	S4
APX803-40SR	SOT23	S5
APX803-31SR	SOT23	S6
APX803-29SR	SOT23	S7
APX803-26SR	SOT23	S8
APX803-23SR	SOT23	S9
APX803D-29SA	SOT23	VN
APX803D-29SR	SOT23	SN

**Package Outline Dimensions**

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

**SOT23**

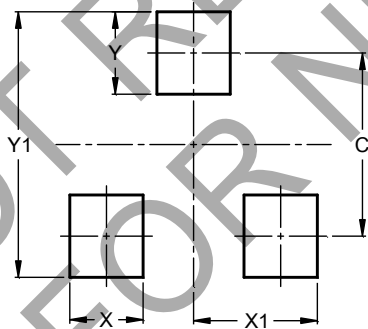


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

**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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