

Description

The APX803S is used for microprocessor (μ P) supervisory circuits to monitor the power supplies in μ P and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with 5.0V, 3.3V, 3.0V and 2.5V 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 APX803S this period is a minimum of 1ms while for other APX803S 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.

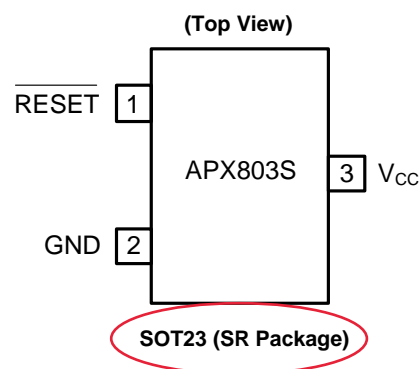
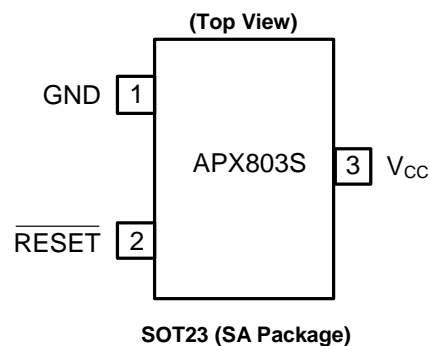
The APX803S is available with different reset thresholds suitable for operation with a variety of supply voltages. The APX803S has an open drain active low $\overline{\text{RESET}}$ output and compliment Diodes APX809S/810S which have push-pull output stages. Low supply current makes the APX803S ideal for use in portable equipment. The APX803S is available in two pin out variants of the 3-pin SOT23 package.

Features

- Precision Monitoring of 2.5V, 3.0V, 3.3V, and 5.0V Power-Supply Voltages
- Fully Specified Over Temperature
- Open-drain $\overline{\text{RESET}}$ Active Low
- Power-On/Power Supply Glitch Reset Pulse
 - APX803S00 1.7ms (Typ.)
 - APX803S05 50ms (Typ.)
 - APX803S 240ms (Typ.)
- 10 μ A Supply Current (Typ.)
- Guaranteed Reset Valid to $V_{CC} = 1V$
- Totally Lead-Free & Fully RoHS Compliant (Note 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 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.

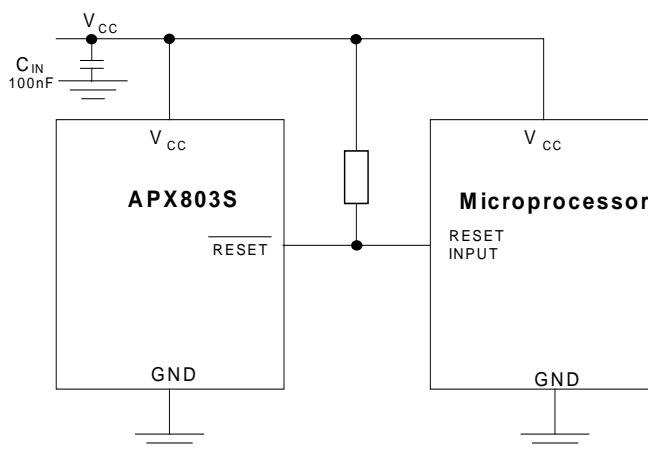
Pin Assignments



Applications

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

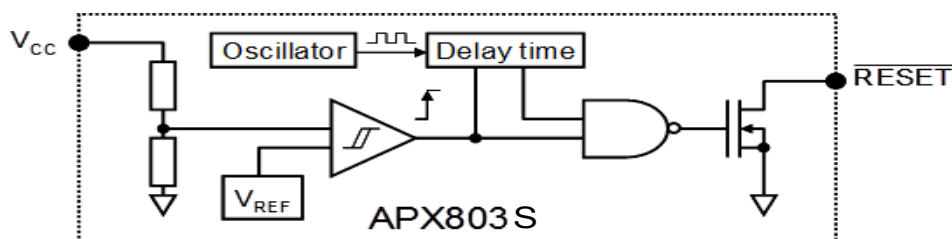
Typical Applications Circuit



Pin Descriptions

Pin Number		Pin Name	Description
SOT23 (SA Package)	SOT23 (SR Package)		
1	2	GND	Ground
2	1	RESET	Reset Output Pin Active Low Open Drain
3	3	VCC	Operating Voltage Input

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	3	kV
ESD MM	Machine Model ESD Protection	400	V
ESD CDM	Charged Device Model ESD Protection	1500	V
V _{CC}	Supply Voltage	-0.3 to +6.0	V
V _{RESET}	RESET (Open Drain)	-0.3 to 6	V
I _{CC}	Input Current, V _{CC}	20	mA
I _O	Output Current, RESET	20	mA
θ _{JA}	Thermal Resistance Junction-to-Ambient (SOT23 Package)	232	°C/W
θ _{JC}	Thermal Resistance Junction-to-Case (SOT23 Package)	87	°C/W
T _J	Junction Temperature	+150	°C
T _{ST}	Storage Temperature Range	-65 to +150	°C
dV _{CC} /dt	V _{CC} Rate of Rise (V _{CC} = 0 to V _T)	100	V/μs

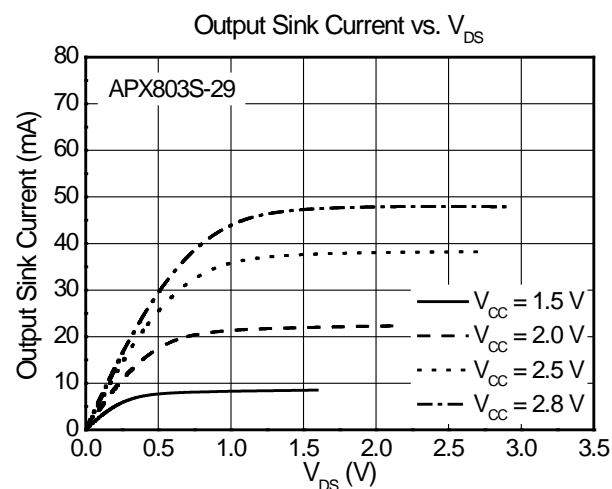
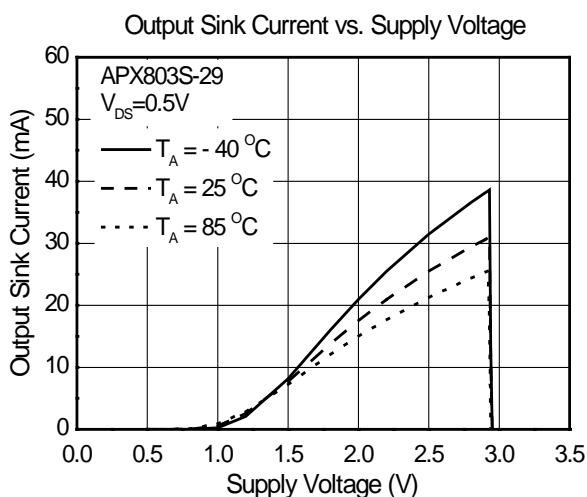
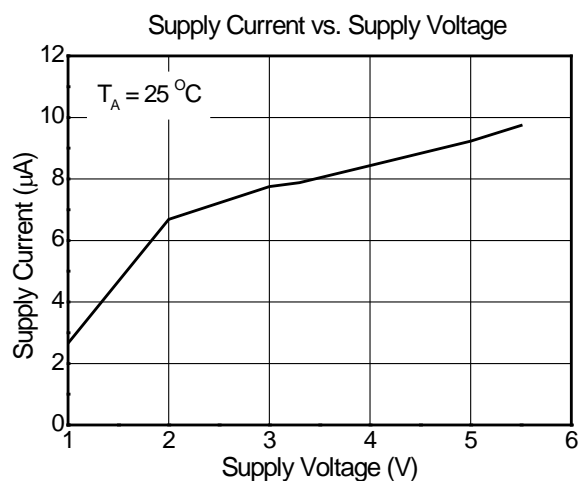
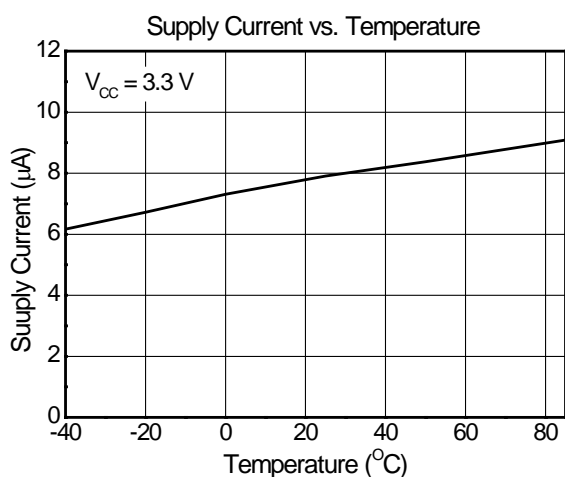
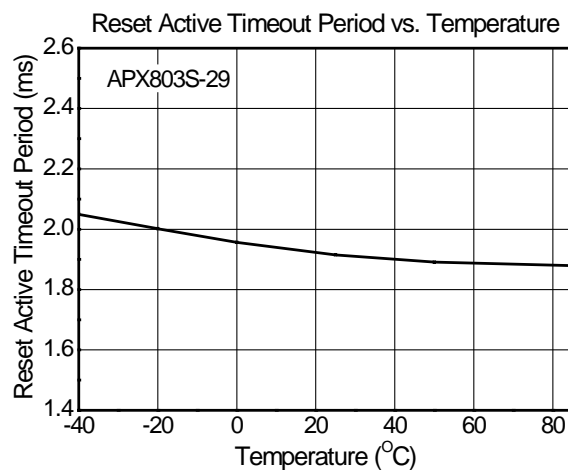
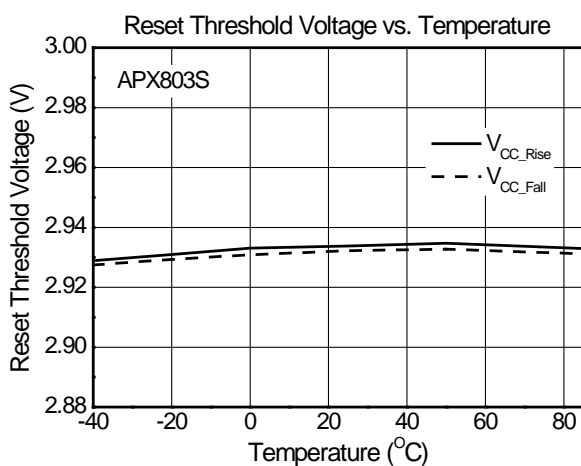
Recommended Operating Conditions (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	1.0	5.5	V
$V_{\overline{\text{RESET}}}$	RESET Output Voltage	0	5.5	V
T_A	Operating Ambient Temperature Range	-40	+85	$^\circ\text{C}$

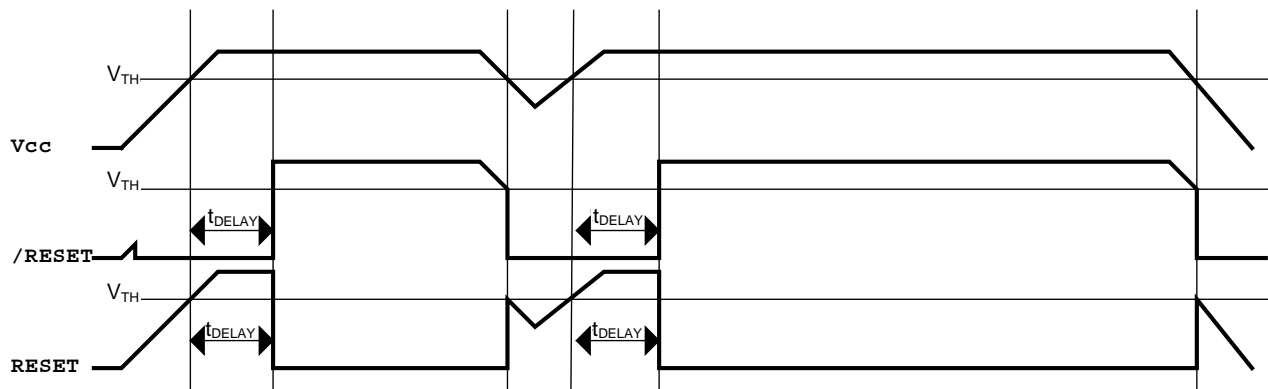
Electrical Characteristics (Typical values are @ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
I_{CC}	Supply Current	$V_{TH} + 0.2\text{V}$	—	10	15	μA
V_{TH}	Reset Threshold	APX803SXX-23	2.21	2.25	2.30	V
		APX803SXX-26	2.59	2.63	2.67	
		APX803SXX-29	2.89	2.93	2.97	
		APX803SXX-31	3.04	3.08	3.13	
		APX803SXX-40	3.94	4.00	4.06	
		APX803SXX-44	4.31	4.38	4.45	
		APX803SXX-46	4.56	4.63	4.70	
—	Reset Threshold Tempco	$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	—	30	—	ppm/ $^\circ\text{C}$
t_s	V_{CC} to RESET Delay	$V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{mV})$	—	20	—	μs
t_{DELAY}	Reset Active Timeout Period	APX803S-XX	140	240	280	ms
		APX803S05-XX	20	50	70	
		APX803S00-XX	1	1.7	3.3	
V_{OL}	RESET Output Voltage Low	$V_{CC} = V_{TH} - 0.2\text{V}$, $I_{\text{SINK}} = 1.2\text{mA}$	—	—	0.3	V
		$V_{CC} = V_{TH} - 0.2\text{V}$, $I_{\text{SINK}} = 3.5\text{mA}$	—	—	0.4	
		$V_{CC} > 1.0\text{V}$, $I_{\text{SINK}} = 50\mu\text{A}$	—	—	0.3	
I_{OH}	RESET Output High Leakage Current	$V_{CC} > V_{TH} + 0.2\text{V}$	—	—	1	μA

Performance Characteristics



Timing Diagram



Functional Description

Microprocessors (μP s) and microcontrollers (μC) have a reset input to ensure that it starts up in a known state. The APX803S 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 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 APX803S00 this period is a minimum of 1ms while for other APX803S variants it is at least 140ms. The APX803S has 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 APX803S \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.

Interfacing to μP with Bidirectional \overline{RESET} Pins

Since the \overline{RESET} output on the APX803S is open drain, this device interfaces easily with $\mu P/\mu C$ that has bidirectional \overline{RESET} pins, such as the Motorola 68HC11.

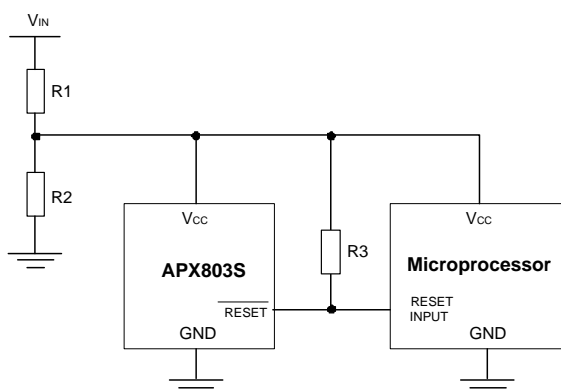
Connecting the μP supervisor's \overline{RESET} output directly to the microcontroller's (μC 's) \overline{RESET} pin with a single pull-up resistor allows either device to assert reset.

Supervising and Monitoring Multiple Supplies

Generally, the pull-up resistor connected to the APX803S will connect to the supply voltage that is being monitored at the IC's V_{CC} pin. However, some systems may use the APX803S 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 $\mu C/\mu P$ reset input.

Functional Description (Cont.)

Selection of Voltage Divider Value (Take APX803S00-29SA-7 as example)

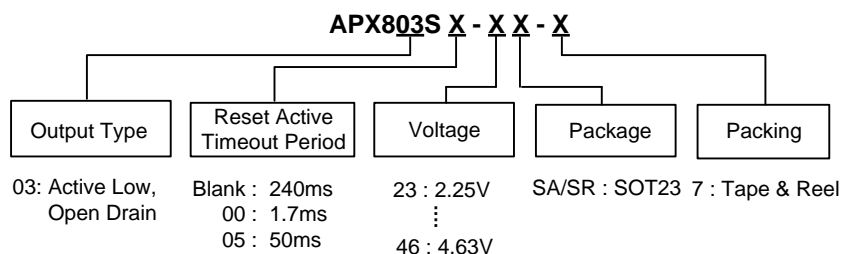


When V_{CC} just rises up to the V_{TH} value (2.93V in this case), the internal oscillator will start working, which may pull some considerable current from the source voltage, such as 60 μ A or so. Take above topology as real application example, below equation required to meet to make sure the IC boot up smoothly. Given $V_{CC} = 13.2V$ and $R_3 = 100k\Omega$, an appropriate R_1/R_2 value combination would be $R_1 = 15.6k\Omega$ and $R_2 = 7.3k\Omega$.

$$V_{CC} = \frac{\frac{R_2 \cdot R_3 \cdot R_{IN}}{R_2 \cdot R_3 + R_2 \cdot R_{IN} + R_3 \cdot R_{IN}}}{\frac{R_2 \cdot R_3 \cdot R_{IN}}{R_2 \cdot R_3 + R_2 \cdot R_{IN} + R_3 \cdot R_{IN}} + R_1} \times V_{IN}$$

Note: R_{IN} is defined as equivalent input resistance of APX803S00-29, 51.4k Ω derived by 2.93V/57 μ A in this case.

Ordering Information



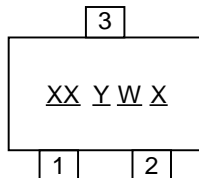
Part Number	Package Code	Packaging (Note 4)	7" Tape and Reel	
			Quantity	Part Number Suffix
APX803SXX-XXSA-7	SA	SOT23	3000/Tape & Reel	-7
APX803SXX-XXSR-7	SR	SOT23	3000/Tape & Reel	-7

Note: 4. 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

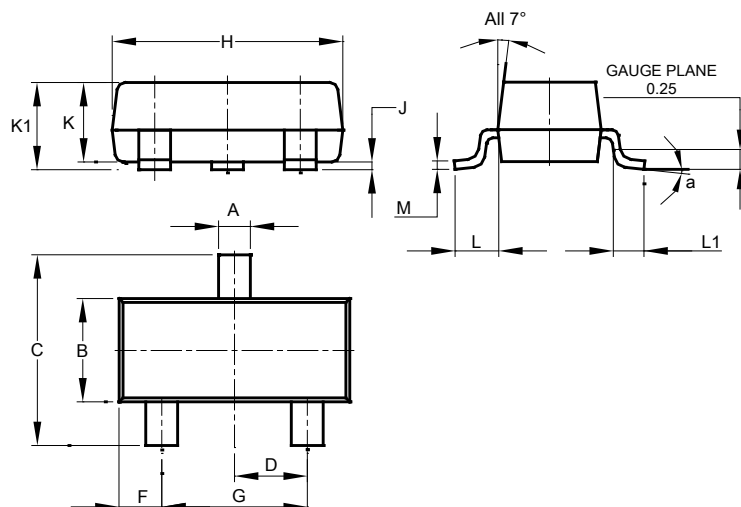
X : Internal code

Device	Package	Identification Code
APX803S-46SA	SOT23	V3
APX803S-44SA	SOT23	V4
APX803S-40SA	SOT23	V5
APX803S-31SA	SOT23	V6
APX803S-29SA	SOT23	V7
APX803S-26SA	SOT23	V8
APX803S-23SA	SOT23	V9
APX803S-46SR	SOT23	S3
APX803S-44SR	SOT23	S4
APX803S-40SR	SOT23	S5
APX803S-31SR	SOT23	S6
APX803S-29SR	SOT23	S7
APX803S-26SR	SOT23	S8
APX803S-23SR	SOT23	S9
APX803S00-46SA	SOT23	VA
APX803S00-44SA	SOT23	VB
APX803S00-40SA	SOT23	VC
APX803S00-31SA	SOT23	VD
APX803S00-29SA	SOT23	VE
APX803S00-26SA	SOT23	VF
APX803S00-23SA	SOT23	VG
APX803S00-46SR	SOT23	VH
APX803S00-44SR	SOT23	VJ
APX803S00-40SR	SOT23	VK
APX803S00-31SR	SOT23	VM
APX803S00-29SR	SOT23	VS
APX803S00-26SR	SOT23	VT
APX803S00-23SR	SOT23	VU
APX803S05-46SA	SOT23	VV
APX803S05-44SA	SOT23	VW
APX803S05-40SA	SOT23	VX
APX803S05-31SA	SOT23	VY
APX803S05-29SA	SOT23	VZ
APX803S05-26SA	SOT23	WA
APX803S05-23SA	SOT23	WB
APX803S05-46SR	SOT23	WC
APX803S05-44SR	SOT23	WD
APX803S05-40SR	SOT23	WE
APX803S05-31SR	SOT23	WF
APX803S05-29SR	SOT23	WG
APX803S05-26SR	SOT23	WH
APX803S05-23SR	SOT23	WZ

Package Outline Dimensions

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

SOT23

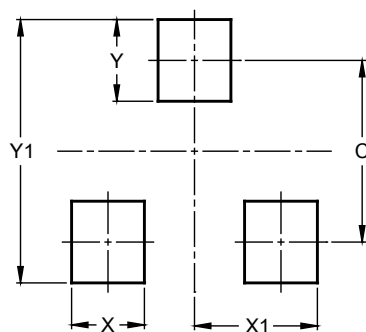


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

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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