

3-Pin Microprocessor Reset Circuits

Description

The FP6809 and FP6810 are cost-effective system supervisory circuits which are designed to monitor micro-processor voltage and V_{CC} in digital systems. They provide a reset signal to the host processor when necessary.

These circuits assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold. They keep reset signal asserted for at least 140ms after V_{CC} has risen above the reset threshold.

The FP6809-N has an open-drain output stage which requires a pull-up resistor while FP6809-C and FP6810-C have push-pull outputs. The FP6809 has an active-low $\overline{RESET}$ output while the FP6810 has an active-high RESET output.

The FP6809 and FP6810 are optimized to reject fast transient glitches on the V_{CC} line. Low supply current makes these devices suitable for portable equipments.

Pin Assignments

S3 Package (SOT-23-3)

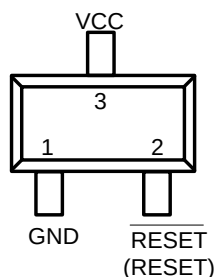


Figure 1. Pin Assignment of FP6809/FP6810

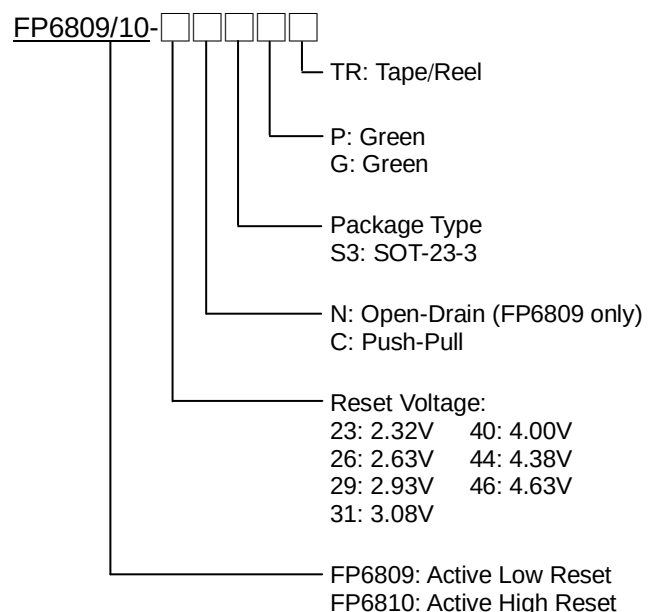
Features

- Precision Monitoring of Power-Supply Voltage
- 140ms Guaranteed Minimum Reset Output Duration
- Low Supply Current
- V_{CC} Transient Immunity
- Small SOT-23-3 Package
- No External Components
- Guaranteed Reset Valid to $V_{CC}=1V$
- Available in Three Output Configurations
 - Open-Drain $\overline{RESET}$ Output (FP6809-N)
 - Push-Pull $\overline{RESET}$ Output (FP6809-C)
 - Push-Pull RESET Output (FP6810-C)
- RoHS Compliant

Applications

- Computer
- Battery Powered Equipment
- Microprocessor Power Supply Monitoring
- Embedded System
- Automotive

Ordering Information



Note1: Please consult Fitipower sales office or authorized distributors for availability of special reset voltages.

SOT-23-3 Marking (FP6809)

Part Number	Product Code	Part Number	Product Code
FP6809-23NS3P	Cv	FP6809-23CS3P	CD
FP6809-23NS3G	Cv=	FP6809-23CS3G	CD=
FP6809-26NS3P	Cw	FP6809-26CS3P	CE
FP6809-26NS3G	Cw=	FP6809-26CS3G	CE=
FP6809-29NS3P	Cx	FP6809-29CS3P	CF
FP6809-29NS3G	Cx=	FP6809-29CS3G	CF=
FP6809-31NS3P	Cz	FP6809-31CS3P	CG
FP6809-31NS3G	Cz=	FP6809-31CS3G	CG=
FP6809-40NS3P	CA	FP6809-40CS3P	CH
FP6809-40NS3G	CA=	FP6809-40CS3G	CH=
FP6809-44NS3P	CB	FP6809-44CS3P	CJ
FP6809-44NS3G	CB=	FP6809-44CS3G	CJ=
FP6809-46NS3P	CC	FP6809-46CS3P	CK
FP6809-46NS3G	CC=	FP6809-46CS3G	CK=

SOT-23-3 Marking (FP6810)

Part Number	Product Code	Part Number	Product Code
FP6810-23CS3P	CL	FP6810-31CS3G	CP=
FP6810-23CS3G	CL=	FP6810-40CS3P	CR
FP6810-26CS3P	CM	FP6810-40CS3G	CR=
FP6810-26CS3G	CM=	FP6810-44CS3P	CS
FP6810-29CS3P	CN	FP6810-44CS3G	CS=
FP6810-29CS3G	CN=	FP6810-46CS3P	CT
FP6810-31CS3P	CP	FP6810-46CS3G	CT=

Typical Application Circuit

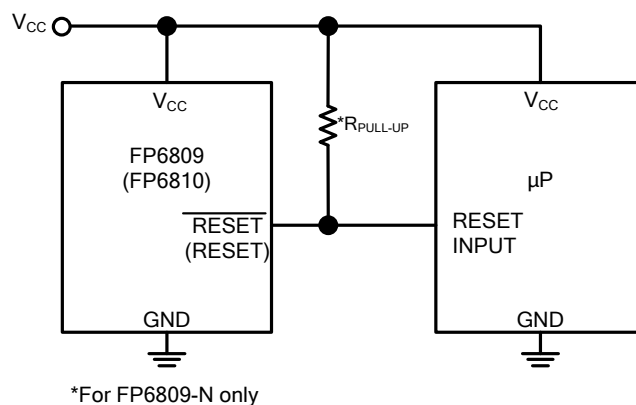


Figure 2. Typical Application Circuit of FP6809/FP6810

Functional Pin Description

Pin Name	Pin Function
GND	Ground
RESET (FP6809)	RESET Output remains low while V _{CC} is below the reset threshold, and for at least 140ms after V _{CC} rises above the reset threshold.
RESET (FP6810)	RESET Output remains high while V _{CC} is below the reset threshold, and for at least 140ms after V _{CC} rises above the reset threshold.
VCC	Supply Voltage

Block Diagram

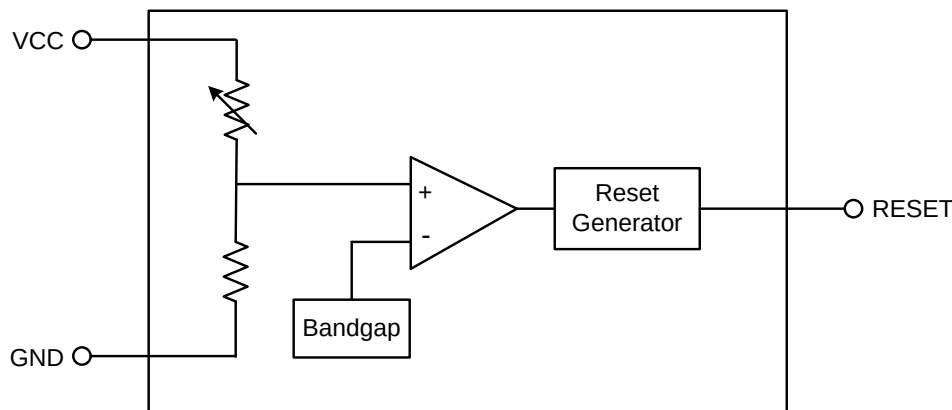


Figure 3. Block Diagram of FP6809/FP6810

Absolute Maximum Ratings

- Supply Voltage (VCC to GND) ----- -0.3V to +6V
- RESET, $\overline{\text{RESET}}$ Voltage (Push-Pull) ----- -0.3 to (Vcc+0.3V)
- $\overline{\text{RESET}}$ Voltage (Open Drain) ----- -0.3V to (Vcc+0.3V)
- Input Current, VCC ----- 20mA
- Output Current, RESET, $\overline{\text{RESET}}$ ----- 20mA
- Rate of Rise (VCC) ----- 100V/ μ s
- Power Dissipation @T_A=25°C, SOT-23-3 (P_D) ----- +0.4W
- Package Junction-to-Case Thermal Resistance SOT-23-3 (θ_{JC}) ----- +150°C/W
- Package Thermal Resistance SOT-23-3 (θ_{JA}) ----- +250°C/W
- Maximum Junction Temperature (T_J) ----- +150°C
- Storage Temperature (T_S) ----- -65°C to +150°C
- Lead Temperature (Soldering, 10s) (T_{LEAD}) ----- +260°C

Note 2 : Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Supply Voltage (VCC to GND) ----- +1.0V to +5.5V
- Operation Temperature Range ----- -40°C to +85°C

Electrical Characteristics

(V_{CC}=full range, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
VCC Range	V _{CC}		1.0		5.5	V
Supply Current	I _{CC}	V _{CC} <5.5V, FP68__-46/44/40		3		μA
		V _{CC} <3.6V, FP68__-23/26/29/31		3		
Reset Threshold	V _{TH}	FP6809-46/ FP6810-46	4.54	4.63	4.72	V
		FP6809-44/ FP6810-44	4.29	4.38	4.47	
		FP6809-40/ FP6810-40	3.92	4.00	4.08	
		FP6809-31/ FP6810-31	3.02	3.08	3.14	
		FP6809-29/ FP6810-29	2.87	2.93	2.99	
		FP6809-26/ FP6810-26	2.58	2.63	2.68	
		FP6809-23/ FP6810-23	2.27	2.32	2.37	
Reset Threshold T.C. (Note3)				30		ppm/°C
VCC to Reset Delay (Note3)		V _{CC} =V _{TH} to (V _{th} -100mV)		20		μs
Reset Active Timeout Period			140	240	560	ms
RESET Output Voltage Low (Push-Pull Active Low and Open-Drain Active Low, FP6809)	V _{OL}	V _{CC} =V _{TH} min, I _{SINK} =1.2mA, FP6809-23/26/29/31			0.3	V
		V _{CC} =V _{TH} min, I _{SINK} =3.2mA, FP6809-44/46			0.4	
		V _{CC} >1.0V, I _{SINK} =50μA			0.3	
RESET Output Voltage Low (Push-Pull Active High, FP6810)	V _{OL}	V _{CC} =V _{TH} max, I _{SINK} =1.2mA, FP6809-23/26/29/31			0.3	V
		V _{CC} =V _{TH} max, I _{SINK} =3.2mA, FP6809-44/46			0.4	
RESET Output Voltage High (Push-Pull Active Low, FP6809)	V _{OH}	V _{CC} >V _{TH} max, I _{SOURCE} =500μA, FP6809-23/26/29/31	0.8V _{CC}			V
		V _{CC} >V _{TH} max, I _{SOURCE} =800μA, FP6809-44/46	V _{CC} -1.5			
RESET Output Voltage High (Push-Pull Active High, FP6810)	V _{OH}	1.8V<V _{CC} <V _{TH} Min, I _{SOURCE} =150μA	0.8V _{CC}			V
RESET Open-Drain Output Leakage Current (FP6809-N)		V _{CC} >V _{TH} , RESET deasserted			1	μA

Note 3 : The specification is guaranteed by design, not production tested.

Typical Performance Curves

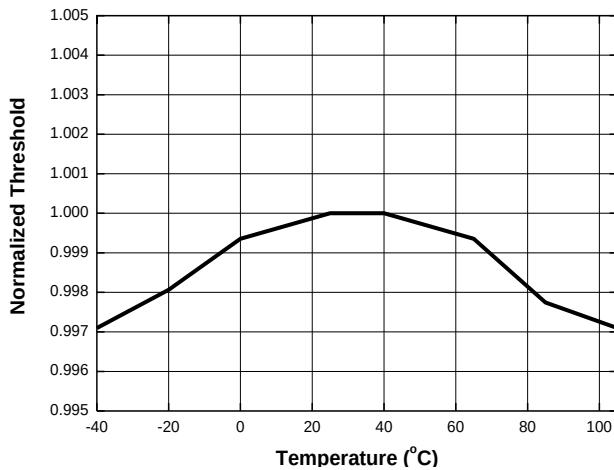


Figure 4. Normalized Reset Threshold vs. Temperature

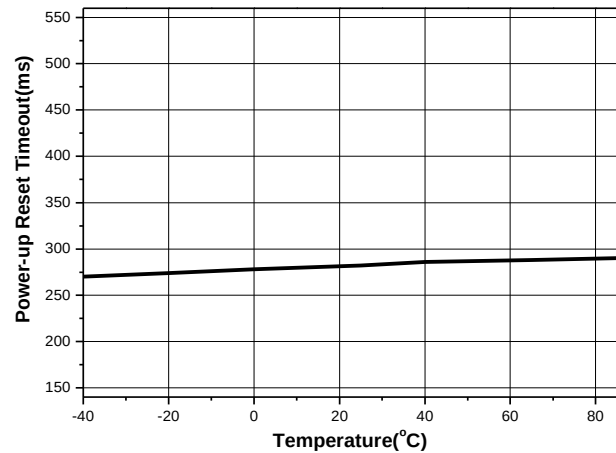


Figure 5. Power-up Timeout vs. Temperature

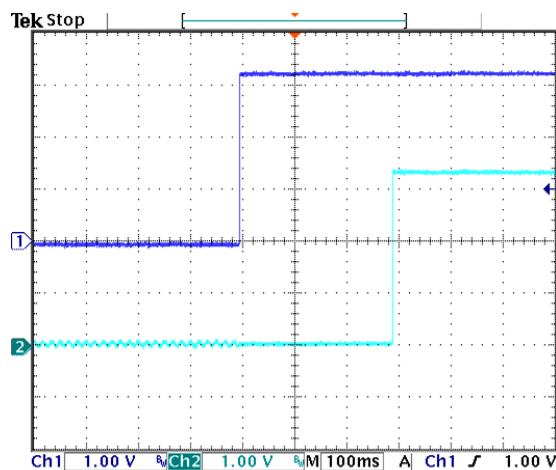


Figure 6. Power-Up $\overline{\text{RESET}}$ Timeout Waveforms;
CH1 : VCC CH2 : $\overline{\text{RESET}}$

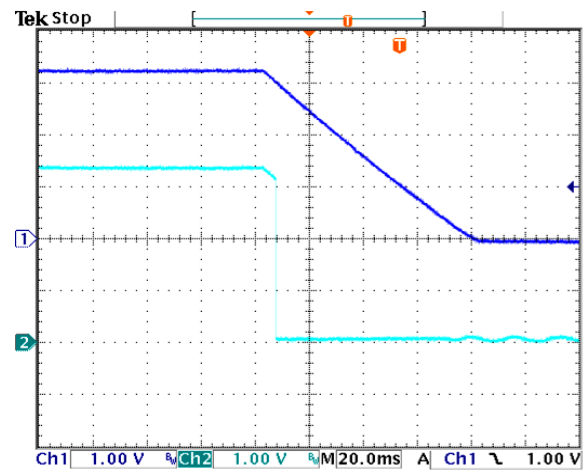


Figure 7. Power-Down $\overline{\text{RESET}}$ Delay Waveforms;
CH1 : VCC CH2 : $\overline{\text{RESET}}$

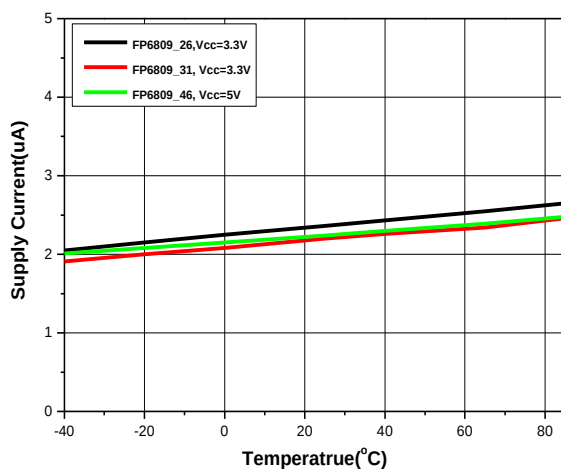


Figure 8. Supply Current vs. Temperature

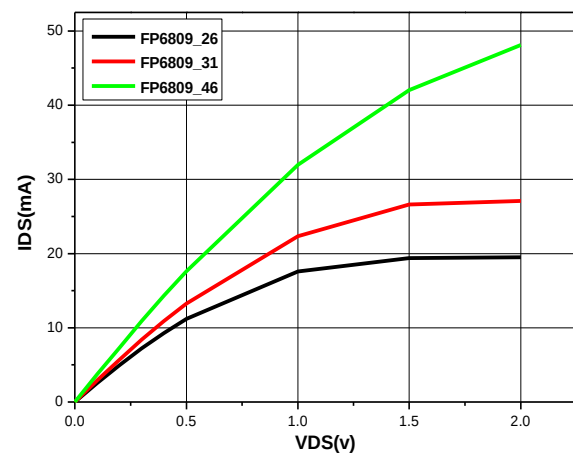


Figure 9. Output Sinking Capability

Typical Performance Curves (Continued)

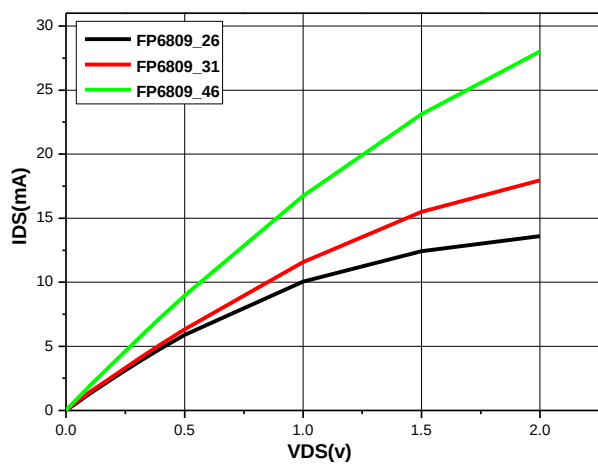


Figure 10. Output Sourcing Capability

Application Information

The FP6809/FP6810 are supervisory circuits, monitoring critical voltages and asserting reset signal to the subsequent devices. The reset signal can start the microprocessor in a known state, avoiding code- execution errors during power-up, power-down, or brownout conditions. $\overline{\text{RESET}}$ (RESET) is guaranteed to be a logic low (high) for $V_{TH} > V_{CC} > 0.9V$. Once V_{CC} exceeds the reset threshold, an internal timer keeps $\overline{\text{RESET}}$ (RESET) low (high) for the reset timeout. After this period, $\overline{\text{RESET}}$ (RESET) goes high (low). If V_{CC} falls below the reset threshold, $\overline{\text{RESET}}$ (RESET) goes low (high) immediately.

Whenever V_{CC} drops below V_{TH} , the internal timer resets to zero and $\overline{\text{RESET}}$ (RESET) goes low (high). The internal timer keeps activated only when $V_{CC} > V_{TH}$, and $\overline{\text{RESET}}$ (RESET) remains low (high) for the reset timeout interval.

Negative-Going V_{CC} Transients

In addition to issuing a reset to microprocessor during power-up, power-down, and brownout conditions, FP6809/FP6810 are relatively immune to short-duration negative-going V_{CC} transients (glitches). Figure 11 shows typical transient duration vs. reset comparator overdrive, for which the FP6809/FP6810 do not generate a reset signal. The graph was generated using a negative-going pulse applied to V_{CC} , as shown in Figure 12, starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative-going V_{CC} transient can have without causing a reset signal. As the reset comparator overdrive increases, the maximum allowable pulse width decreases. A typical 0.1 μ F bypass capacitor mounted as close as possible to the VCC pin provides additional transient immunity.

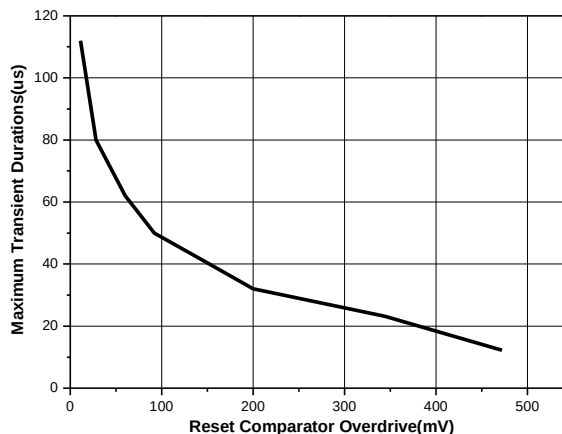


Figure 11. Maximum Transient Durations Without Causing a Reset Pulse vs. Reset Comparator Overdrive

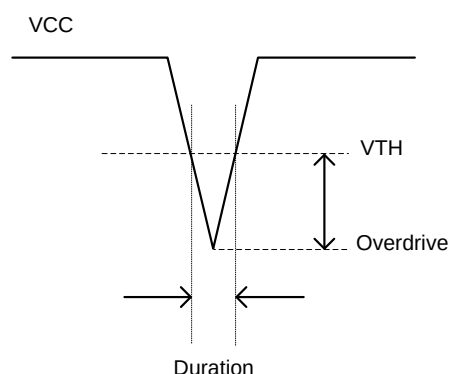


Figure 12. The VCC with Negative Going Transients

Application Information (Continued)

Benefits of Highly Accurate Reset Threshold

Most microprocessor supervisor ICs have 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 supply is 10% below nominal. In other words, the reset is guaranteed to assert after the power supply falls out of regulation, but keeps inactive even when power is at the minimum specified operating voltage of the system ICs.

Ensuring a Valid Reset Output Down to $V_{CC}=0$

When V_{CC} falls below 1V, the FP6809 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 for microprocessor's inoperative condition with V_{CC} below 1V. However, in applications where RESET must be valid down to 0V, adding a pull-down resistor to RESET causes stray leakage currents to flow to ground, providing some impedance between RESET and ground (Figure 13). $R1$ is recommended around 100k Ω .

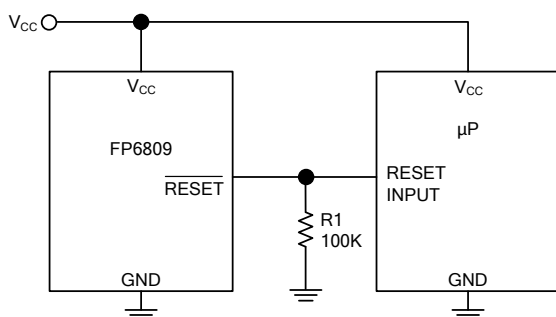


Figure 13. $\overline{\text{RESET}}$ Valid to $V_{CC}=0V$ Circuit

A 100k Ω pull-up resistor to V_{CC} is also recommended for FP6810 if RESET is required to remain valid for $V_{CC}<1V$.

Interfacing to μP s with Bidirectional Reset Pins

Since the RESET output of FP6809N is open drain, this device interfaces easily with μP that has bidirectional reset pins. Connect the FP6809N's RESET output directly to the microcontroller's RESET pin with a single pull-up resistor allows either device to assert reset (Figure 14).

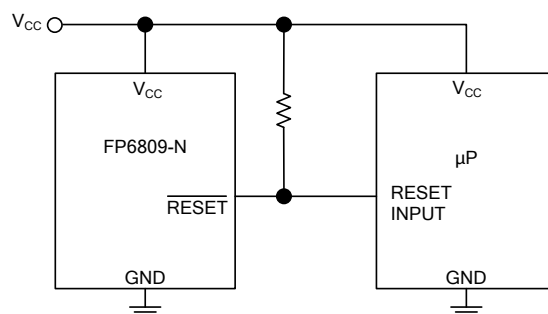
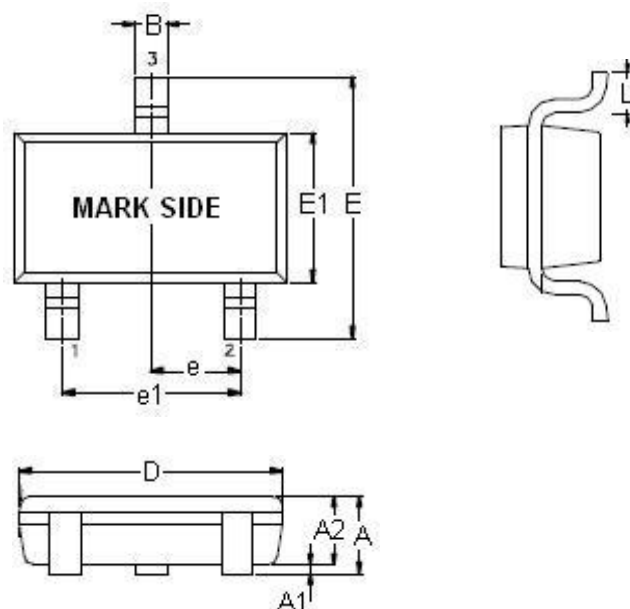


Figure14. Interfacing to μP s with Bidirectional Reset I/O

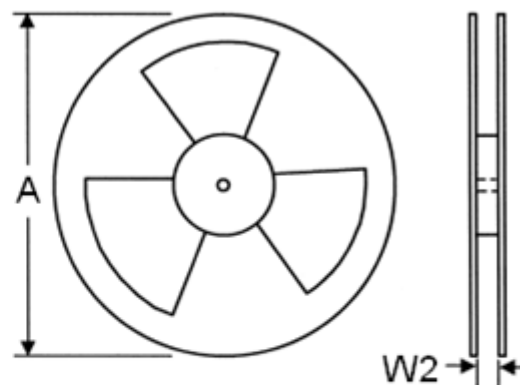
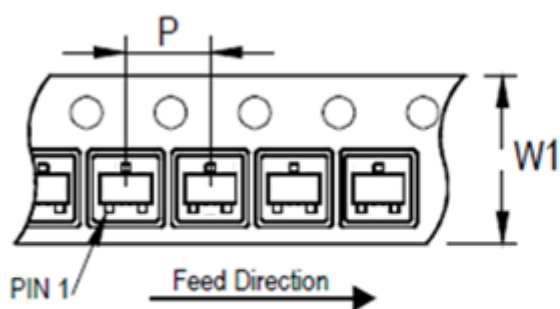
Outline Information

SOT-23-3 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
B	0.30	0.50
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.90	1.00
e1	1.80	2.00
L	0.30	0.60

Carrier Dimensions



Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
		in	mm			
8	4	7	180	8.4	300~1000	3,000

Life Support Policy

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