



RoHS compliant,  
lead-free SMD  
package

## FUNCTION

- On/off shock & acceleration sensing

## FEATURES

- Zeropower** - and nanowatt power models
- Surface mount device (SMD)** - RoHS compliant, lead-free, tape and reel
- High sensitivity & long life** - 99.9% pure gold plating
- Miniature size** - 3.3mm x 6.9mm
- Simple interface** - No signal conditioning required
- Multiple sensitivities** - 10G to 150G standard

## APPLICATIONS

- Shock and acceleration detection
- Shock & acceleration triggered wakeup
- GPS, RFID, alarms, automotive security, anti-tamper

## SWITCH ACCELERATIONS

- From 2G - 2000G
- \*G = acceleration of gravity

## PATENTS






Patented. US 7326866, 7067748, 7326867, 7421793.  
Patents pending.

## DESCRIPTION

The SQ-ASx series act like acceleration sensitive switches that open or close when accelerated past an acceleration threshold.

This sensor can be used to produce CMOS or TTL pulses to interrupt (wakeup) a microcontroller. Alternatively, these pulses can be counted to estimate the amount and duration of activity. The sensor is fully passive, requires no signal conditioning, and operates with zero current or only 0.25  $\mu$ A depending on model.

## FUNCTIONAL DIAGRAM

<b>ASA SERIES</b> Axial sensitive, single ended, normally closed	Opens when accelerated on axis 
<b>ASB SERIES</b> Omnidirectional, normally closed	Opens when accelerated on either axis or radially 
<b>ASC SERIES</b> Axial sensitive, single ended, normally open	Closes when accelerated on axis 
<b>ASD SERIES</b> Omnidirectional, normally open	Closes when accelerated on either axis or radially 
<b>ASE SERIES</b> Radially sensitive, normally open	Closes when accelerated radially 

\*See Theory of Operation for more details.

## TABLE OF CONTENTS

Table of Contents.....	2
Electrical Characteristics.....	3
Dimensions.....	3
Example PCB Landing.....	4
Theory of Operation.....	5
Part Comparison.....	6
Production Grades.....	6
Packaging Options.....	6
Example Complete Part Number.....	6
Limitations and Warnings.....	7
Testing.....	7
System Integration Testing.....	7
Notice.....	7
Further Information.....	7
Notes.....	7

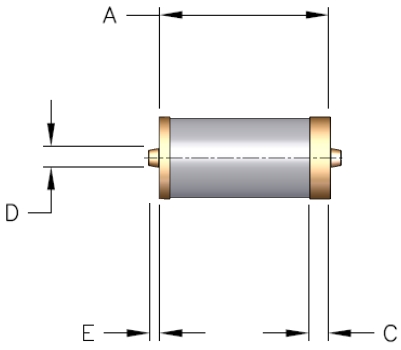
**ELECTRICAL CHARACTERISTICS**

PARAMETER	MIN	MAX	UNITS
Supply Voltage Range	0.5	12	V <sub>dc</sub>
Current Sink*	0.00025	5	mA

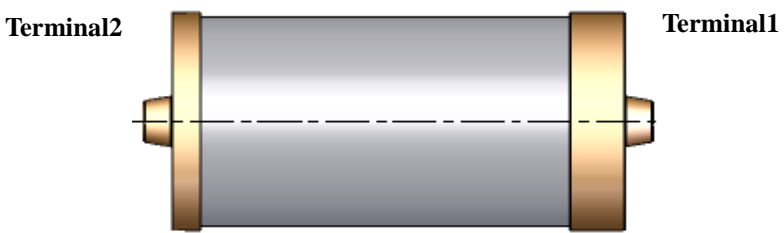
\*Current consumption is determined by the resistance of the application circuit and the supply voltage.

**DIMENSIONS**

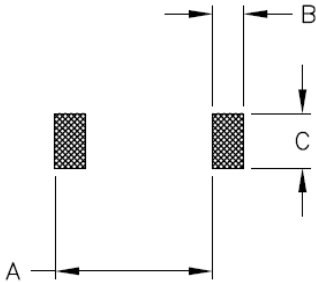
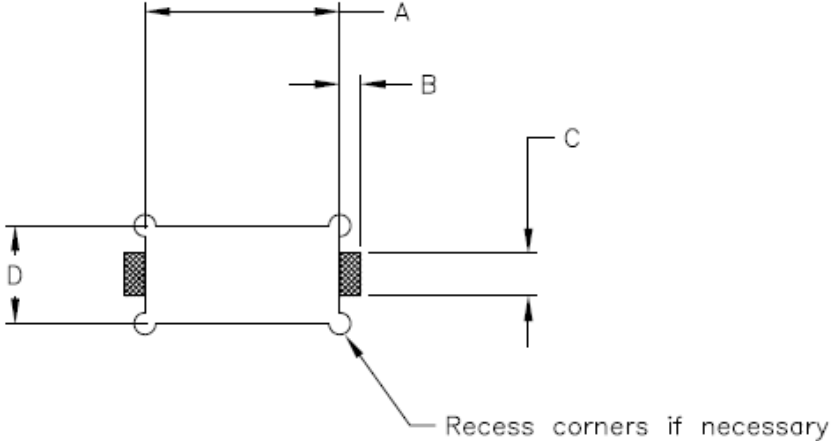
**PHYSICAL SIZE**



SYMBOL	DESCRIPTION	MM	TOLERANCE
A	Length	6.8	±0.25
B	Diameter	3.3	±0.1
C	Terminal Width	0.8	±0.25
D	Solder Nub Diameter	0.9	±0.25
E	Solder Nub Length	0.4	±0.1



**EXAMPLE PCB LANDING**

RECOMMENDED PCB LANDING			ALTERNATE, PCB CUTOUT LANDING (USE FOR LOWEST PROFILE )		
<b>SYMBOL</b>	<b>DESCRIPTION</b>	<b>MM</b>	<b>SYMBOL</b>	<b>DESCRIPTION</b>	<b>MM</b>
A	Pitch	6.0	A	RecessLength	7.25
B	PadLength	1.2	B	PadLength	0.8
C	PadWidth	2.1	C	PadWidth	1.5
					

**\*Note:** Alternative layouts may be used to optimize size or manufacturability

## THEORY OF OPERATION

### SQ-ASA

The SQ-ASA series sensor is normally a **closed** device. It is designed to be sensitive only in one direction. However, it will exhibit some off-axis sensitivity. Typical cross-axis open signals are in the 2–8 mS range, where  $\sigma$  is proportional to the duration of acceleration above the threshold.

### SQ-ASB

The SQ-ASB series sensor is normally a **closed** device. It is designed to be sensitive in all directions. It is about 4 times more sensitive off-axis than on-axis. Typical cross-axis open signals are in the 2–8 mS range, where  $\sigma$  is proportional to the duration of acceleration above the threshold. **NOTE:** If better accuracy is required, choose the cross-axis specification that matches your requirements and use two sensors at 90 degrees to one another, logically “OR” together.

### SQ-ASC

The SQ-ASC series sensor is normally an **open** device. It is designed to be sensitive only in one direction and is very immune to cross-axis acceleration. Only if a cross-axis event is 10 times greater than the rated threshold may the sensor trigger in cross-axis mode.

### SQ-ASD

The SQ-ASD series sensor is normally an **open** device. It is designed to be sensitive in all directions. The sensor will trigger radially in the terminal 1 → 2 direction when acceleration is applied. In the terminal 2 → 1 direction, the sensor will trigger after the acceleration is removed (rebound effect). **NOTE:** If using the rebound trigger in the 2 → 1 direction is not appropriate for the application, mount two sensors parallel in opposite directions.

### SQ-ASE

The SQ-ASE series sensor is normally an **open** device. It is designed to be sensitive in a radial direction. The sensor will trigger radially when acceleration is applied. **NOTE:** To achieve an omnidirectional response mount two sensors at 90 degrees to one another, logically “OR” together.

**PART COMPARISON**

PART NUMBER	TYPE	SENSITIVITY	ACCELERATION THRESHOLD (ON AXIS)	CROSS AXIS SENSITIVITY
SQ-ASA-150	Normally closed	One axis, single sided	1 50G	Crackle at 75G, less than < 10ms pulse width
SQ-ASB-010	Normally closed	Omnidirectional	5-20G	2-5G
SQ-ASB-035	Normally closed	Omnidirectional		
SQ-ASB-075	Normally closed	Omnidirectional		

**PRODUCTION GRADES**

GRADE	ASSEMBLY METHOD	SEALING	WASH TOLERANCE	PB-FREE, ROHS	OPERATING TEMPERATURE
C	Reflow Solder: 260°C peak Hand Assembly: 315°C peak, 2-3 seconds on end terminal	Yes	Washable	Yes	0°C to +70°C
I	Reflow Solder: 260°C peak Hand Assembly: 315°C peak, 2-3 seconds on end terminal	Yes	Washable	Yes	-40°C to +85°C

**PACKAGING OPTIONS**

PACKAGE CODE	DESCRIPTION
BB	Bulk bag, various sizes
CT	Cuttape, 100 piece multiples
TR	Tape on reel, 2000 pieces

**EXAMPLE COMPLETE PART NUMBER**

SQ-ASA-150-ITR

## LIMITATIONS AND WARNINGS

This product is not designed for use in life support and/or safety equipment where malfunction of the product can reasonably be expected to result in personal injury or death. Buyer uses this product in such applications at Buyer's own risk and agrees to defend, indemnify, and hold harmless SignalQuest, Inc. from any and all damages, claims, suits, or expenses resulting from such misuse.

## TESTING

The performance of each sensor is verified through build-time testing.

## SYSTEM INTEGRATION TESTING

Thorough testing should be carried out prior to product release to ensure system integration has not introduced unforeseen problems. The system integrator assumes the ultimate responsibility for the safety of the target application.

## NOTICE

Information furnished by SignalQuest, Inc. is believed to be accurate and reliable. However, this document may contain ERRORS and OMISSIONS. Accordingly, the designers should use this document as a reference rather than a strict design guideline and should perform thorough testing of any product that incorporates this or any other SignalQuest product. No responsibility is assumed by SignalQuest, Inc. for the use of this information, nor for any infringement of patents or other rights of third parties that may result from its use. Specifications are subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of SignalQuest, Inc. Trademarks and registered trademarks are the property of their respective companies.

## FURTHER INFORMATION

For pricing, delivery, and ordering information, please contact SignalQuest at (603) 448-6266. For updates on this and other documents, visit our website at [www.signalquest.com](http://www.signalquest.com).

## NOTES