

Operating Manual

Model 3255A Accelerometer



Measurement Specialties, Inc.
Vibration Sensors Design Center
32 Journey, Suite 150
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Tel: 949-716-7324

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vibration@meas-spec.com

Warranty

Measurement Specialties, Inc. accelerometers are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warrant is in lieu of any other warranty, expressed, implied, or statutory; and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

Receiving Inspection

Every Measurement Specialties, Inc. accelerometer is carefully inspected and is in perfect working condition at the time of shipment. Each accelerometer should be checked as soon as it is received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

Service Concerns

If a Measurement Specialties, Inc. instrument requires service, first contact the nearest Measurement Specialties, Inc. representative. They may be able to solve the problem without returning the unit to the factory. If it is determined that factory service is required, call Customer Service at the regional headquarters for an RMA number before return.

Returns

All units being returned to the factory require an RMA (Return Material Authorization) number before they will be accepted. This number may be obtained by calling Customer Service at the regional headquarters with the

following information; model number(s), quantity, serial number(s), and symptoms of the problem, if being returned for service. You must include the original purchase order number if under warranty.

Recalibration Services

The Vibration Sensors Design Center and its two manufacturing facilities in China and France offer factory re-calibration services for Piezoresistive, Piezoelectric and Integrated Electronics Piezoelectric (IEPE, ISOTRON, ICP, etc.) accelerometers. NIST (US), DKD (Germany), COFRAC (France) traceable calibration services on sensitivity at 100 Hz (102 or 120 Hz in Europe) and full frequency sweeps are offered. Contact the regional headquarters for pricing information.

Inquiries

Address all inquiries on operation or applications to your nearest Sales Representative, or to the Vibration Applications Support as follows:

Global Headquarters

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European Headquarters

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Tel: +33 (0) 561 194 543

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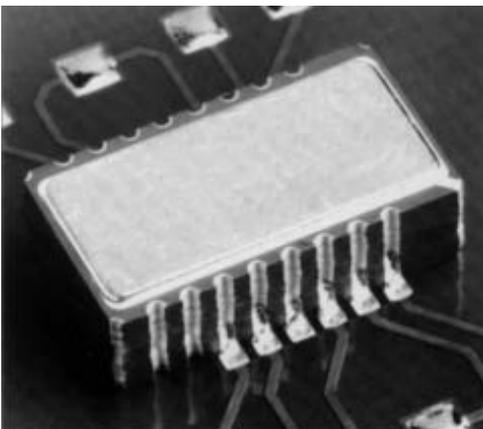
Description

The Model 3255A is a signal conditioned MEMS accelerometer designed to be mounted on circuit boards and is ideal for embedded applications. The accelerometer is packaged in a hermetic ceramic LCC package and sealed with a gold-plated Kovar lid (100% gross leak testing is performed in production). The accelerometer is offered in ranges from $\pm 25g$ to $\pm 500g$ with a flat response from DC up to greater than 1500Hz.

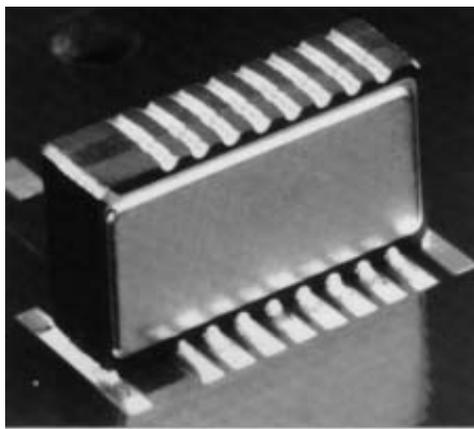
The Model 3255A package contains three chips; a silicon MEMS piezo-resistive sensor in a four active leg Wheatstone bridge configuration, an ASIC which provides the signal conditioning and the temperature compensation, and a memory chip with correction coefficients. The package can be mounted in one of two orientations, allowing the measurement axis to be either parallel or perpendicular to the mounting surface without the use of costly brackets.

Mounting Orientations

The model 3255A accelerometer has a unique feature in that it can be installed in two different mounting configurations; parallel and perpendicular to the applied acceleration. In the standard horizontal mounting configuration the sensitive axis is perpendicular to the mounting surface. In the vertical mounting configuration the sensitive axis is parallel to the mounting surface. Alignment is critical as any misalignment in the mounting will be exhibited as transverse sensitivity error. This mounting scheme is patent protected per United States Patent 5,503,016.



Horizontal Mounting Configuration



Vertical Mounting Configuration

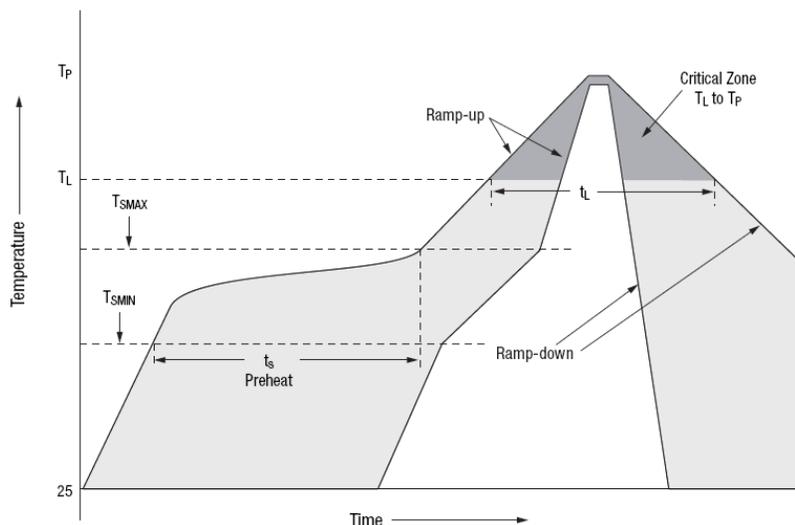
Installation

The model 3255A accelerometer is designed to be soldered to printed circuit boards or hybrid substrates. It is critical that the substrate has a low coefficient of expansion and that you have good mechanical coupling between the sensor and the mounting surface to ensure good transmissibility. Ceramic circuit boards are preferred but FR4 boards can also be used with a suggested thickness of 0.062" (1.57mm). It is recommended to reflow solder the model 3255A accelerometer but it can also be manually soldered in cases where reflow soldering is not practical. For reflow soldering the following guidelines should be followed.

- Design the mounting pads on the circuit board according to the recommended dimensions shown on the following page depending on horizontal or vertical installation.
- Use a suitable RMA flux coated solder paste.
- A recommended stencil thickness is .008" (0.2mm).
- Secure the accelerometer during reflow soldering to ensure proper vertical alignment.
- Use of inert N₂ gas is recommended.

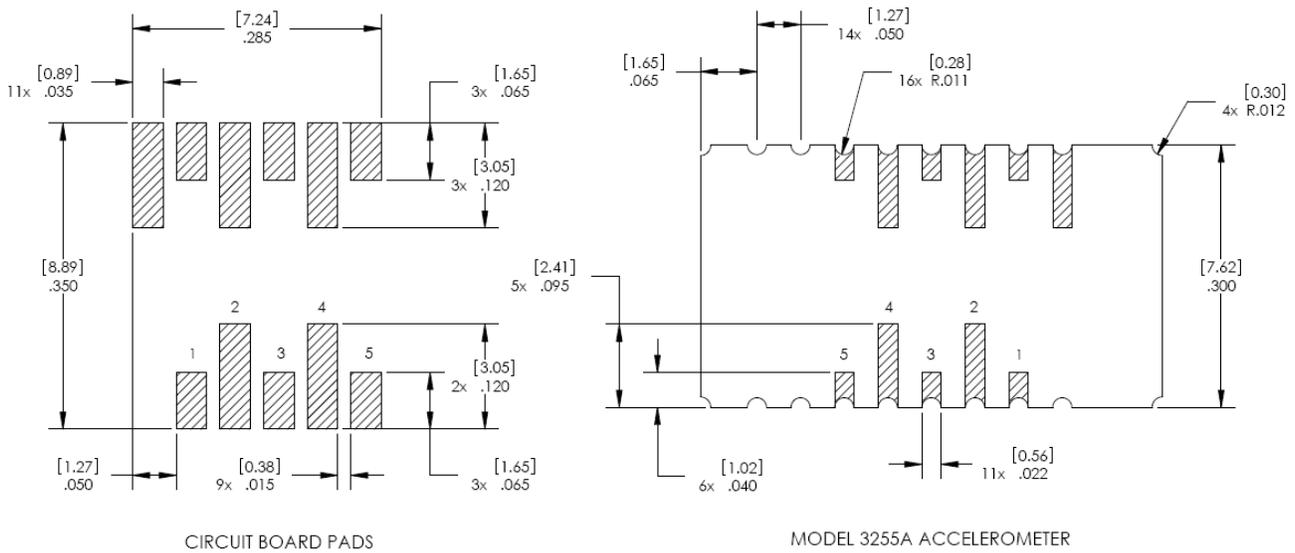
The following table defines recommended solder reflow profiles for common Eutectic and Lead-Free solders. However, it is always recommended to consult with the solder paste manufacturer for the proper profile.

Profile Feature	SnPb Eutectic	SnAgCu Lead-Free
Ramp-up Rate	1.0-3.0 °C/sec	1.0-3.0 °C/sec
Preheat (soak) Temperature Min (T _{S MIN}) Temperature Max (T _{S MAX}) Time (t _{S MIN} to t _{S MAX})	Consult solder paste manufacturer recommended profile	Consult solder paste manufacturer recommended profile
Time Above Liquidus Temp (TAL) Temperature (T _L) Time (t _L)	30-90 sec	30-90 sec
Peak Temperature (T _P)	205-220 °C	235-245 °C
Ramp-down Rate	4 °C/sec max	4 °C/sec max

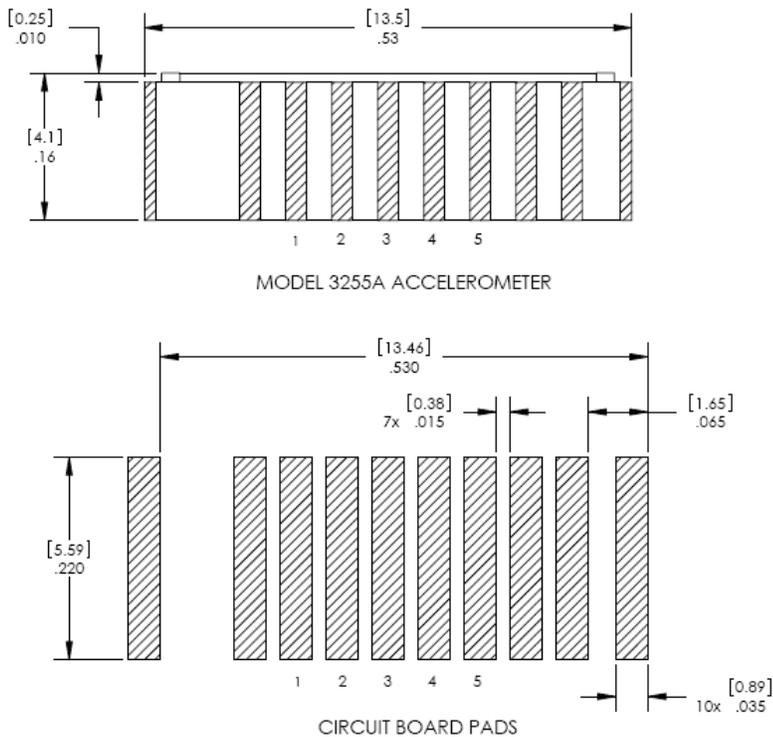


Don't electrically connect to undesignated pads but they are suitable for additional mechanical support.

Recommended mounting pads for horizontal installation:



Recommended mounting pads for vertical installation:



DIMENSIONS ARE IN INCHES [mm]

If the accelerometer is to be subjected to high amplitude shocks during operation then it is also recommended to apply a thin layer of epoxy underneath the accelerometer after solder attachment. A low viscosity cyanoacrylate with a room temperature cure such as Loctite 4501 is recommended. For maximum mounting rigidity, encapsulating the sensor with potting compound after the reflow process can be critical. Encapsulant, such as Stycast 2651-40 by Emerson & Cuming, is recommended.

Note that the gold-plated pads of the 3255A are also suitable for conductive epoxy attachment should solder reflow not be a convenient mounting solution.

Excitation

The model 3255A is a piezo-resistive (PR) accelerometer that requires a clean and stable, low noise dc power supply or battery supply. The output sensitivity is ratiometric to excitation voltage so any ripple in the excitation will affect the sensitivity accordingly. The accelerometers are calibrated at 5Vdc excitation but can also be used with an excitation voltage from 2.7-5.5Vdc. However, it is recommended that you contact the Vibration Application Support prior to using a non-standard excitation voltage as it will affect the calibrated sensitivity and ZMO.

The model 3255A includes an internal ASIC that can be permanently damaged by voltage spikes or too high excitation voltage. The ASIC can also be damaged by reversed excitation voltage.

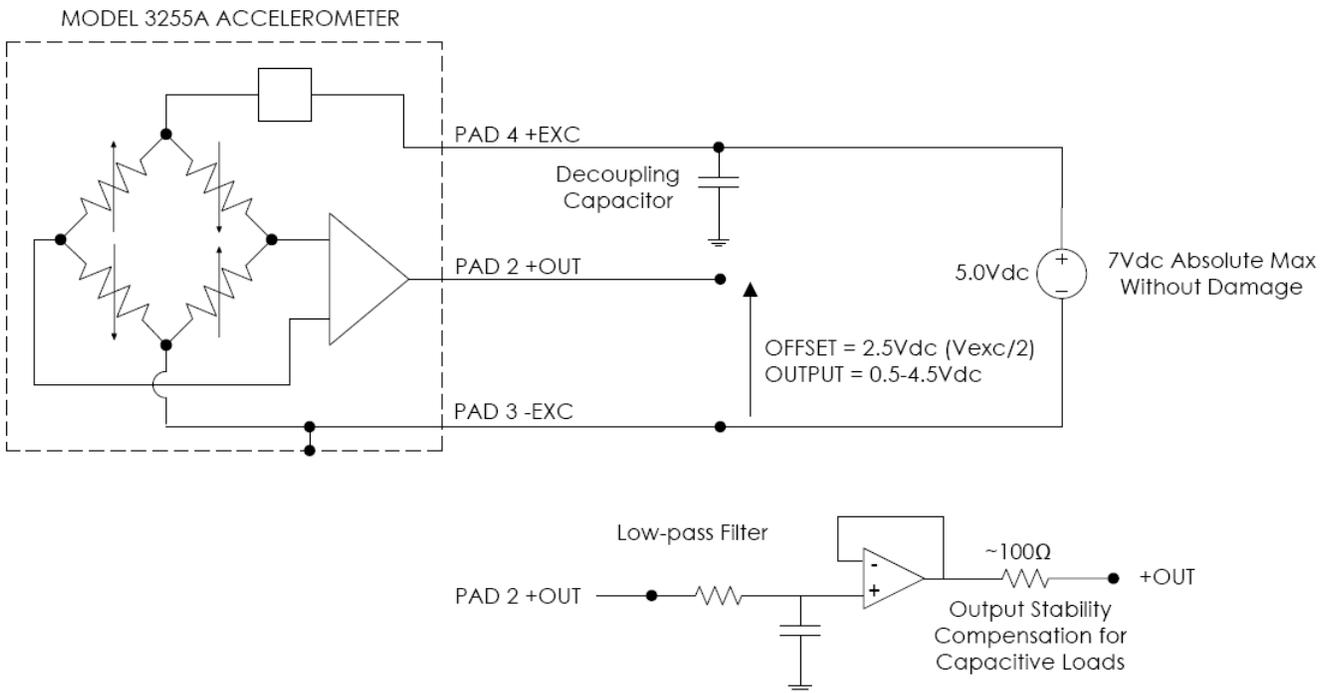
For this reason the positive and negative excitation voltages should not be reversed and the accelerometer shall never be powered by more than 5.5Vdc (7Vdc absolute maximum).

Wiring

The accelerometer is designed to be operated from 5.0Vdc excitation and provide a 0.5-4.5V full scale output. The output is DC-coupled and is used in single-ended mode. The recommended electrical hookup for operation is detailed below.

At 5Vdc excitation, a 2.5Vdc bias will be present on the output leads and the output of the accelerometer will be 0.5-4.5V full scale. The accelerometer should be connected to the interface circuitry as detailed below.

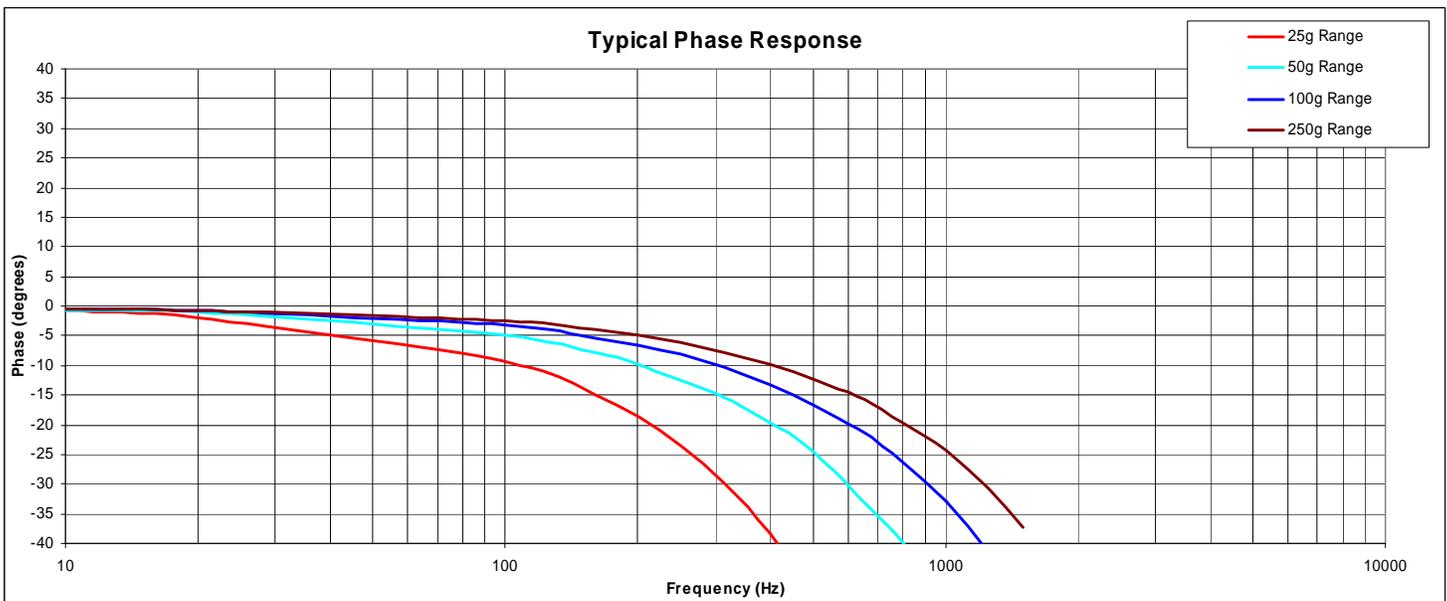
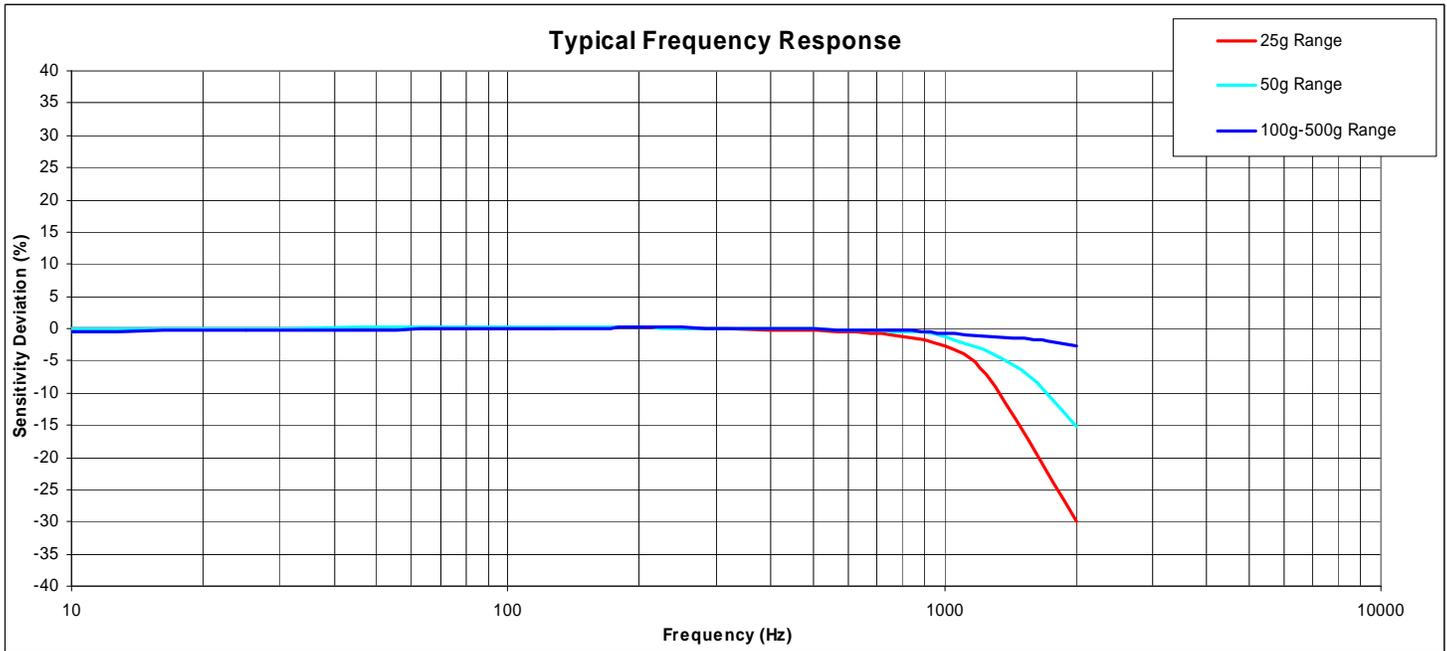
- A decoupling capacitor with value of 0.1µF or greater is recommended on the positive excitation line to reduce noise.
- A unity gain LP filter, with its filter corner set just beyond pass-band of interest, is recommended to decrease high frequency noise and drive long lines.



Caution: The accelerometer can be permanently damaged by reverse polarity

Frequency Response & Phase Deviation Curves

The typical frequency response and phase deviation curves for the model 3255A accelerometer are illustrated below.

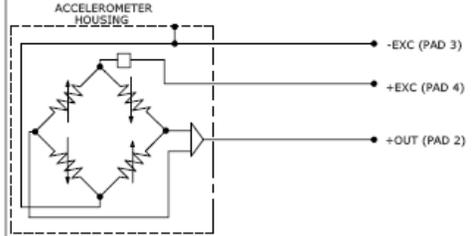


Model 3255A Specifications (may be updated without prior notice):

SPECIFICATIONS:
All values are typical at +24°C (+75°F), and 5Vdc excitation unless otherwise stated.

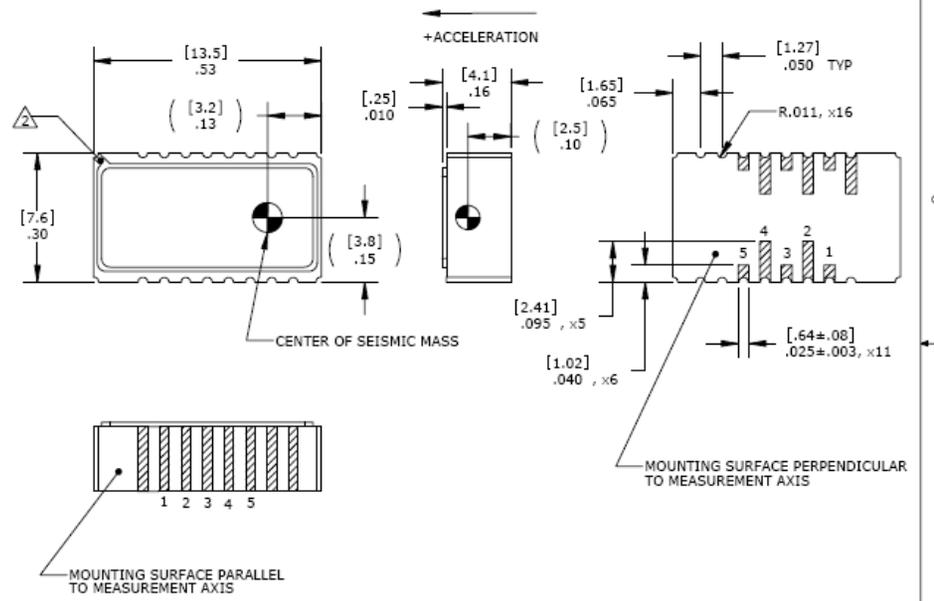
PARAMETERS	VALUE						UNITS
	-025	-030	-050	-100	-250	-500	
DASH NO.	±25	±30	±50	±100	±250	±500	g
DYNAMIC RANGE	80	67	40	20	8	4	mV/g
FREQUENCY RESPONSE ±5%	0-800	0-800	0-1000	0-1200	0-1500	0-1500	Hz
RESIDUAL NOISE (PASSBAND)	800	700	400	400	400	400	µV RMS
NATURAL FREQUENCY	4000	4000	4000	6000	8000	10000	Hz
DAMPING	0.7	0.7	0.7	0.7	0.6	0.5	
SHOCK LIMIT	10000	10000	10000	10000	10000	10000	g

PARAMETERS	VALUE	UNITS
ZERO ACCELERATION OUTPUT (RATIOMETRIC)	2500 ± 100	mV
TRANSVERSE SENSITIVITY	< 3	%
NON-LINEARITY (BF5L)	± 1	% FSO
THERMAL ZERO SHIFT, -20 to +85°C (-4 to +185°F), REFERENCE 24°C (75°F)	± 3.5	%FSO
THERMAL SENSITIVITY SHIFT, -20 to +85°C (-4 to +185°F), REFERENCE 24°C (75°F)	± 4	%
EXCITATION VOLTAGE (RATIOMETRIC)	2.7 to 5.5	Vdc
EXCITATION CURRENT	< 5	mA
FULL SCALE OUTPUT VOLTAGE	± 2	Vpk (FSO=2V)
OUTPUT IMPEDANCE	< 2	Ω
INSULATION RESISTANCE (@100Vdc)	> 100	MΩ
OPERATING AND STORAGE TEMPERATURE	-54 to +121 (-65 to +250)	°C (°F)
HUMIDITY	Hermetic	
WEIGHT	1.5	Grams
TURN ON TIME	< 100	msec



- NOTES:**
- MATERIAL: CERAMIC CARRIER, BLACK KOVAR LID, AU PLATED
 SOLDERABLE GOLD PADS
 - ORIENTATION FEATURE
 - DO NOT ELECTRICALLY CONNECT UNDESIGNATED PADS IN SENSOR APPLICATION.
 - MODEL NUMBER: 3255A-XXX
 RANGE g [e.g. 050 IS 50g RANGE]

REVISIONS				
REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPR./DATE
A	INITIAL RELEASE PER ECO30410	AR/8-18-09	IZ/8-18-09	TFC/8-18-09
B	REVISED PER ECO30426	AR/10-20-09	IZ/10-20-09	TFC/10-20-09
C	REVISED PER ECO30445	AR/5-5-10	IZ/5-5-10	TFC/5-5-10



UNLESS OTHERWISE SPECIFIED:	NAME	DATE	 Aliso Viejo, CA 92656 MODEL 3255A, ACCELEROMETER
DIMENSIONS ARE IN INCHES (MM)	DRAWN	A. Rao 8-18-09	
TOLERANCES:	CHECKED	I. Zheng 8-18-09	
ANGULAR: ±5° TWO PLACE DECIMAL ±.03 [8] THREE PLACE DECIMAL ±.010 [25]	ENG APPR.	T. Connolly 8-18-09	
MATERIAL	MFG APPR.		SIZE DWG. NO.
FINISH	Q.A. APPR.		B OD-3255A
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	SCALE:	WEIGHT:	SHEET 1 OF 1