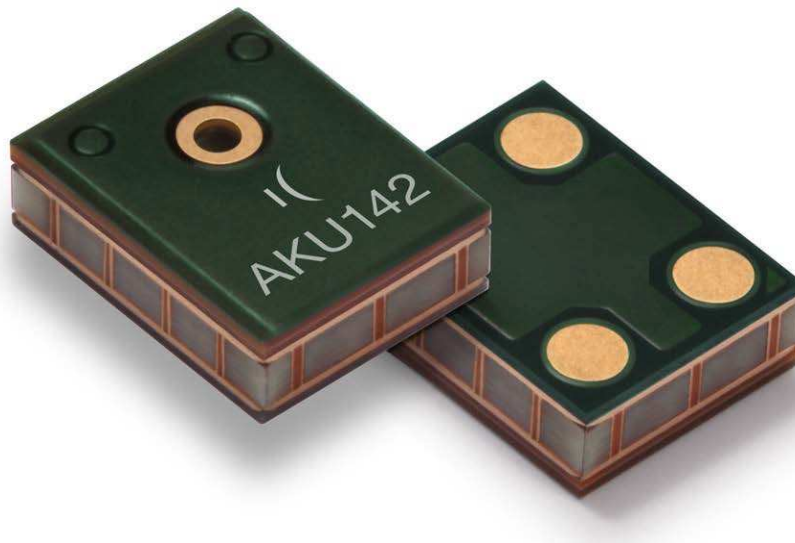



AKU142

Top Port, Analog MEMS Microphone



Data Sheet

Part number(s)	AKU142
Package type	4-pin LGA top port
Data sheet revision	1.0
Release date	13 July 2013
Document number	DS32-1.0 AKU142 Data Sheet
Notes	Specifications are subject to change without notice. Product photos and pictures are for illustration purposes only and may differ from the real product's appearance.

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AKU142

Analog, HD Voice MEMS Microphone

Key Features

- Top Port Design with Bottom Port Performance
- Analog output omni-directional microphone
- Excellent SNR: 63dB
- Sensitivity tolerance: +/- 2dB
- Flat frequency response for super-wideband audio
- Package immune to RF/EM interference
- Industry-standard SMT footprint
- Lead-free, RoHS compliant, and Halogen Free in accordance with IEC61249-2-21
- Thin top-port package: 2.95 x 3.76 x 1.10 mm³

Typical Applications


- Smartphones and mobile phones which require high quality acoustic performance in a small form factor microphone
- Multi-mic applications and noise cancellation algorithms which benefit from microphones with tightly matched sensitivity and phase
- Products designed to capture super-wideband audio that require a microphone with less than 5dB of frequency response variation from 50Hz-14kHz
- Other small, thin consumer electronic devices using more than one microphone

General Description

AKU142 is a surface-mountable Analog-Output MEMS microphone ideal for use in mobile consumer applications which require HD Voice quality audio. Designed specifically to meet the demanding requirements of mobile handset OEMs, AKU142 offers excellent acoustic performance with 63dB signal-to-noise ratio (SNR) and tight sensitivity matching of just +/-2dB between microphones.


Unlike other top port analog microphones, AKU142 offers a flat wideband frequency response, with deviations less than +/-5dB from 50Hz to 14kHz and a resonance past 20 kHz, delivering uniform audio capture across a broad acoustic spectrum.

AKU142 is available in an industry standard package footprint of 2.95mm x 3.76mm x 1.10mm.

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1. ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{DD} to GND	5.5V
ESD Tolerance	
Human Body Model	2000V
Machine Model	200V
Storage Temperature Range	-40°C to 105°C

2. STANDARD OPERATING CONDITIONS

Operating Temperature Range	-40°C to 85°C
Supply Voltage (V_{DD})	1.6V to 3.6V

3. ELECTRICAL AND ACOUSTIC SPECIFICATIONS

Unless otherwise noted, test conditions are:
 $V_{DD} = 2.0V$ $T_a = 25^\circ C$ RH = 50%

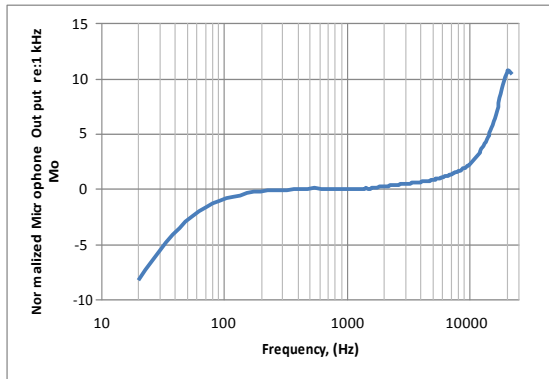
Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Directivity		Omni-directional			
Signal to Noise Ratio (SNR)	$f_{in} = 1 \text{ kHz}$, A-weighted, 20Hz-10kHz		63		dB
Low Frequency Corner	-3dB from 1kHz sensitivity value		60		Hz
Upper Frequency Corner	+3dB from 1kHz sensitivity value		11.5		kHz
Sensitivity ¹	1kHz, 94 dB SPL	-40	-38	-36	dBV/Pa
Total Harmonic Distortion (THD) ¹	@ 94dB SPL, $f_{in} = 1 \text{ kHz}$			1	%
	@ 114dB SPL, $f_{in} = 1 \text{ kHz}$			5	
Power Supply Rejection Ratio (PSRR)	100mVpp, $f = 217\text{Hz}$	60			dB
Current Consumption ¹	No load			300	μA
Output Impedance				200	Ω
Sensitivity loss across voltage	Change in sensitivity over 3.6 to 1.65v		0		dB
Part-to-part phase matching	From nominal @ 1kHz			± 10	$^\circ$
Polarity	Increasing sound pressure	Increasing output voltage			

Note 1: Parameter 100% tested

4. DEVICE CHARACTERISTICS

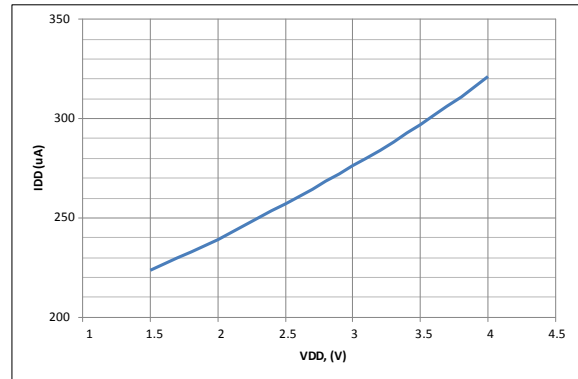
4.1 Frequency Response

(Measured frequency response normalized to 1kHz)



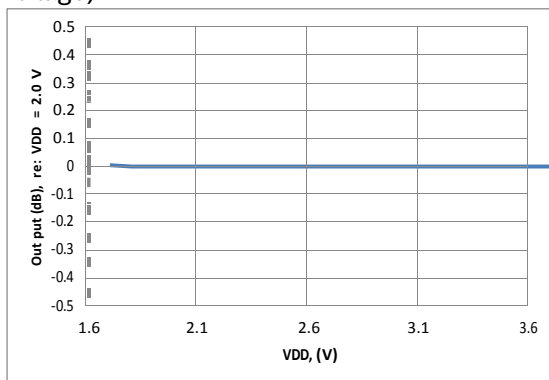
4.2 I_{DD} vs. V_{DD}

(Measured current consumption relative to supply voltage)



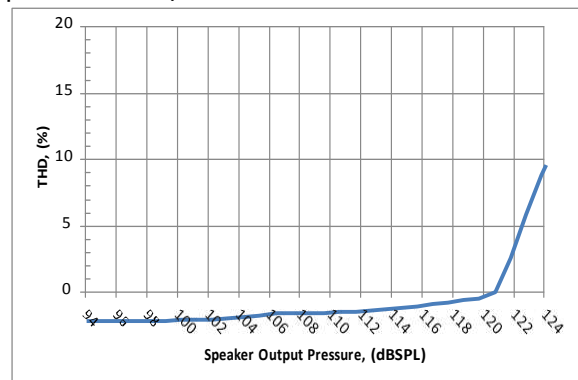
4.3 Sensitivity vs. VDD

(Measured sensitivity changes relative to supply voltage)



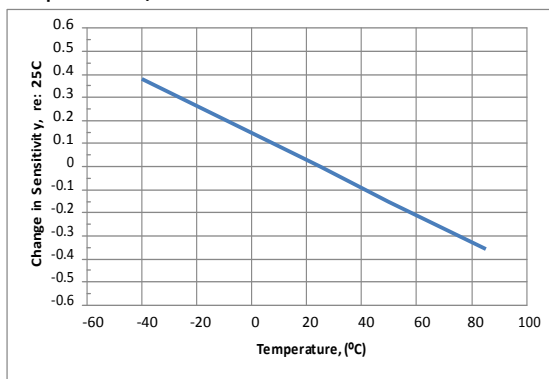
4.4 Total Harmonic Distortion

(Measured THD relative to speaker output pressure level)



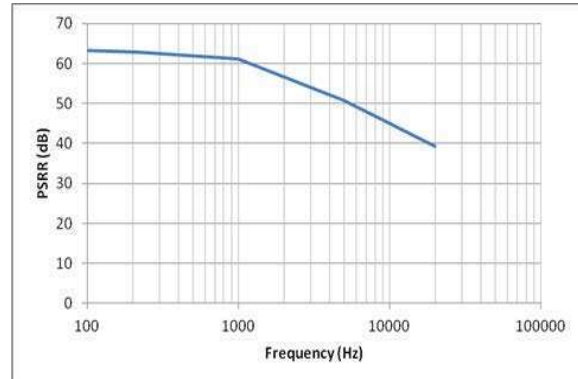
4.5 Sensitivity vs. Temperature

(Typical sensitivity changes relative to temperature)

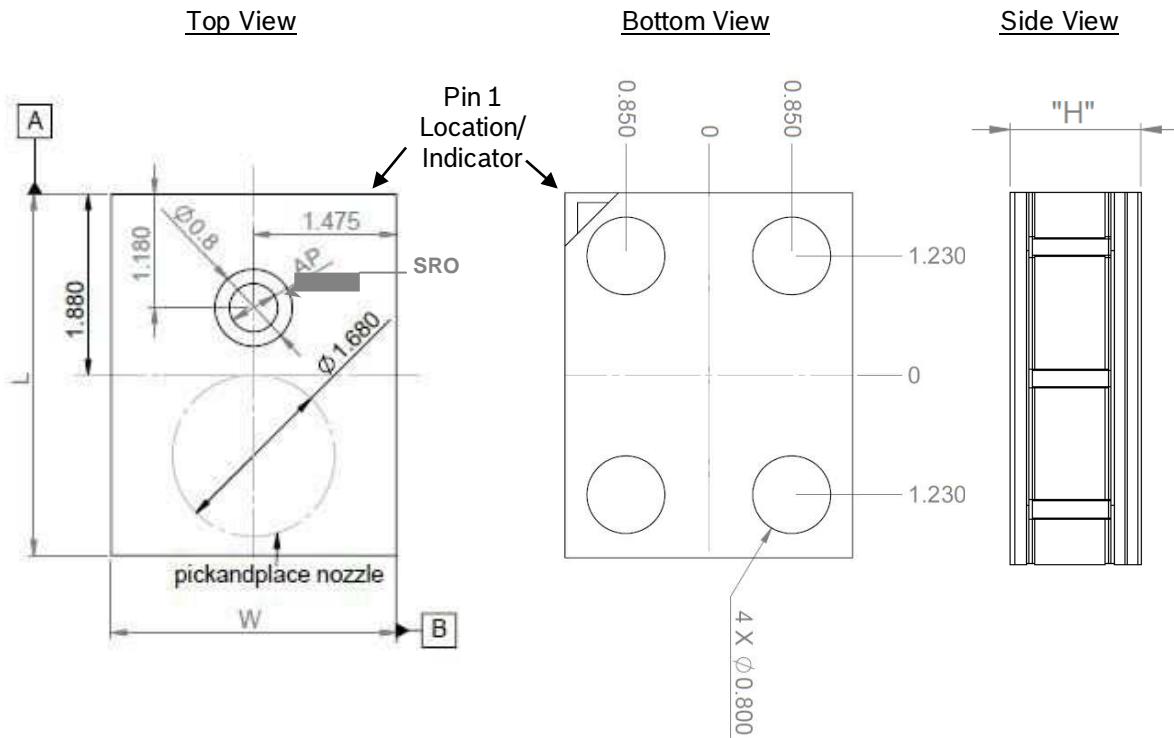


4.6 PSRR vs. Frequency

(Typical PSRR relative to frequency)



5. MECHANICAL SPECIFICATIONS

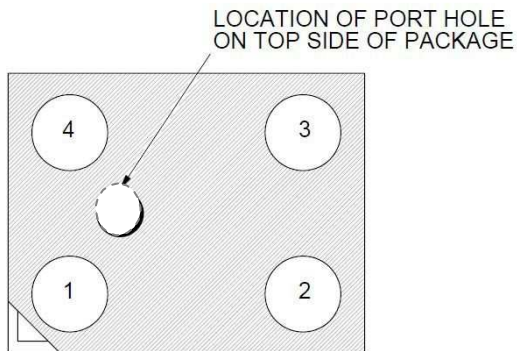


Item	Dimension	Tolerance	Units
Length (L)	3.76	± 0.10	mm
Width (W)	2.95	± 0.10	mm
Height (H)	1.10	± 0.10	mm
Acoustic Port (AP)	0.50	± 0.05	mm
Solder Mask (SRO)	0.850	± 0.05	mm
Planarity	Top/Bottom	± 0.05	mm
All dimensions in mm Tolerance ± 0.05 mm unless otherwise specified			

6. PIN-OUT AND CONNECTION DIAGRAMS

6.1 Pin-Out

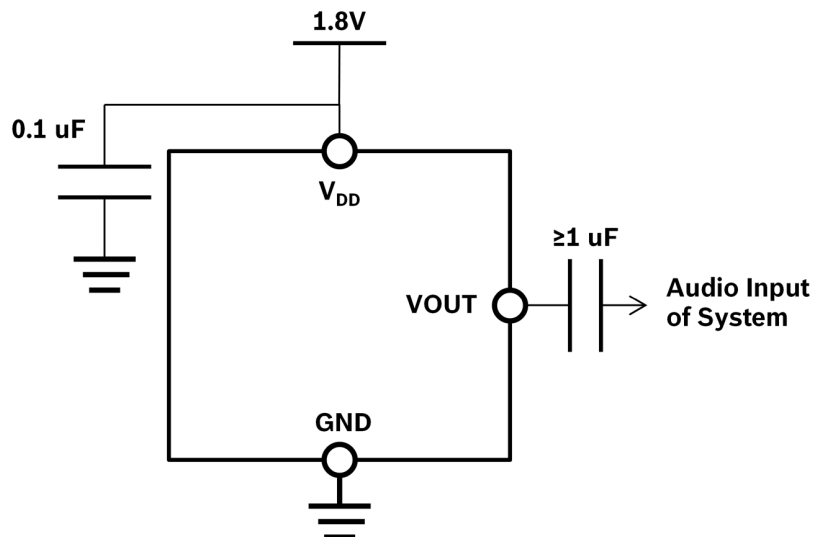
(As viewed from **bottom** of package)



Pin	Name	Function
1	V_{DD}	Power supply voltage for microphone
2	GND ¹	Ground
3	GND	Ground
4	V_{OUT}	Analog output voltage

Note 1: Pin 2 can be Ground or No Connect.
Pin 3 must be Ground.

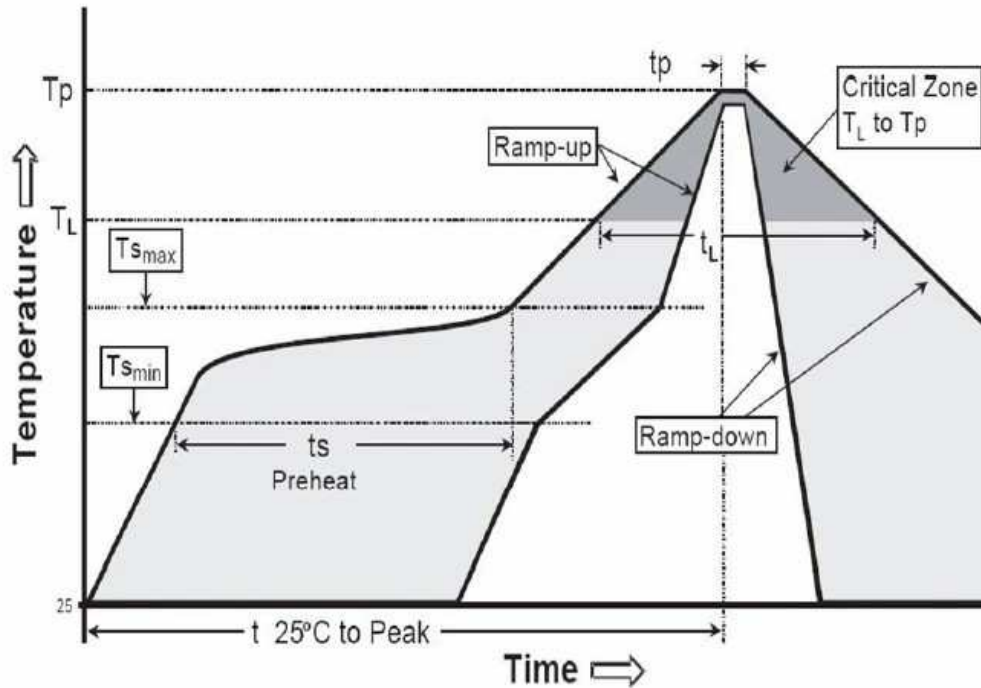
6.2 Typical Application Schematic



7. MANUFACTURING NOTES

7.1 Solder Reflow


Typical solder reflow profile



IPC-020C-5-1

Average ramp-up rate	Max. 3° C/s
Time t_s between $T_{s_{min}}$ (150° C) and $T_{s_{max}}$ ° C	60 – 120 s
Time t_L above liquidous temperature T_L (217° C)	60 – 90 s
Peak temperature T_p	max. 260° C
Time t_p at T_p	max. 20 s
Average ramp-down rate	max. 6° C/s

Please refer to AN60-Handling, Soldering, and Mounting Instructions for more detailed information and precautions.

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7.2. Microphone Handling

Although the microphone may not appear damaged immediately due to inappropriate handling, there can be long term effects that affect the lifetime of the component.

Rule of thumb: The microphone is an artificial ear so treat it like your own ear.

- Do not blow air into the acoustic port of the microphone for any reason. Do not shoot it with pressurized air
 - e.g. when cleaning the board or other components on the same board
- Do not apply vacuum to the microphone
 - See section 5.0 for pick & place location
- Do not insert liquids
 - If populated circuit boards are washed, the microphone must be protected
- Do not insert dust
 - The production facilities must be clean
 - e.g. if PCB routing/sawing is done close to the microphone after SMT assembly and reflow
- Do not insert any objects
 - If assembly or rework is done manually, care must be taken that the tools cannot enter the mic sound port
 - It is best to choose tool size so that it does not fit through the sound port of the microphone
- Do not cover the acoustic port with tape when heating during assembly or reflow
- Do not apply extreme mechanical stresses on the microphone, including mechanical shocks above 10kG or compression of the microphone package.
- After a bottom port microphone has been assembled on a circuit board, protect the sound port (now on the other side of the board) from dust, liquids, and other foreign materials as well as any tools and pressurized air.

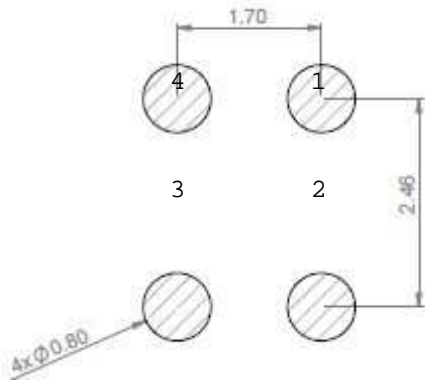
ESD Handling Procedures



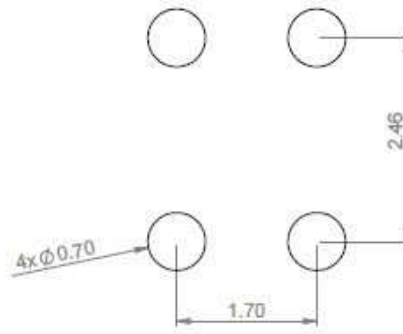
Follow CMOS handling procedures with Akustica MEMS microphones. Handle the microphone with proper workplace grounding to include wrist straps and ionized airflow over open trays and reels of microphones. Do not hot-swap/hot-plug during testing. Device pins have ESD ratings of 2kV/200V for HBM/MM respectively.


7.3 PCB Land Pattern and Stencil Pattern

PCB Land Pattern Layout



Suggested Solder Paste Stencil Pattern Layout



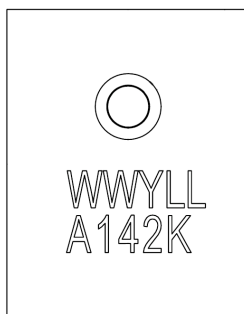
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8. RELIABILITY SPECIFICATIONS

The microphone sensitivity after stress must deviate by no more than 3 dB from the initial value.

	Test	Test Condition
1	Cold Temp Operation	Temperature = -40C, 1000 hours (with bias)
2	Hot Temp Operation	Temperature = 105C, 1000 hours (with bias)
3	Humidity Operation	Temperature = 85C, RH = 85%, 1000 hours (with bias)
4	Cold Temp Storage	Temperature = -40C, 1000 hours (without bias)
5	Hot Temp Storage	Temperature = 105C, 1000 hours (without bias)
6	Humidity Storage	Temperature = 85C, RH = 85%, 1000 hours (without bias)
7	Thermal Cycle	100 Cycles, -40 to +125C, 15min soaks, <30sec ramps
8	Vibration	Sinusoidal Vibration, 20-2000Hz, 4min sweeps, 16min along each of 3 axis, amplitude 3 limits of 20G and 0.06"
9	Mechanical Shock	10,000 G shocks, 5 impacts along each of 6 axes
10	Drop Test	Using 150gm aluminum fixture, 3 drops along each of 6 axes (total 18 drops) from 1.5m height onto concrete drop surface.
11	ESD (HBM)	+/-2000V, 1 discharge for each polarity, 11 pin combinations, 22 total discharges per microphone
12	ESD (MM)	+/- 200V, 1 discharge for each polarity, 11 pin combinations, 22 total discharges per microphone
13	ESD	+/- 8kV, contact discharge to lid with DUT grounded
14	Moisture Sensitivity Level	24 hour bake at 125C, followed by 168 hours at 85C, 85%RH, followed by 3 passes solder reflow (MSL Level 1)

9. PART MARKING INFORMATION

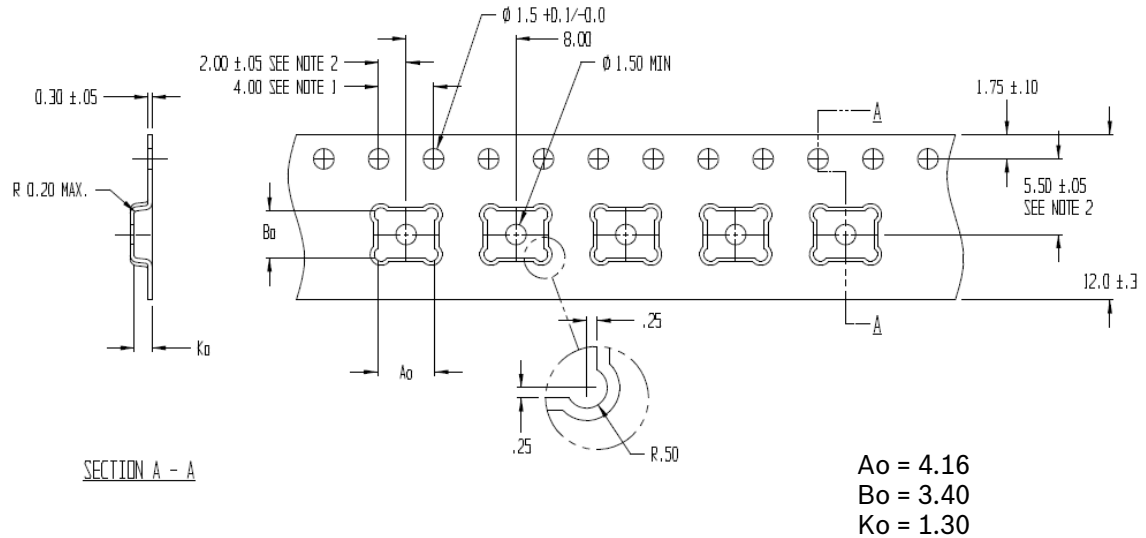


← Pin 1
Location

Line 1: WWYLL (WW= Work Week, Y= Year, LL= Lot Number
Processed During Work Week)
Line 2: A142X (A=Akustica, Part Code=142, X=Assembly Facility)

10. PACKAGING INFORMATION

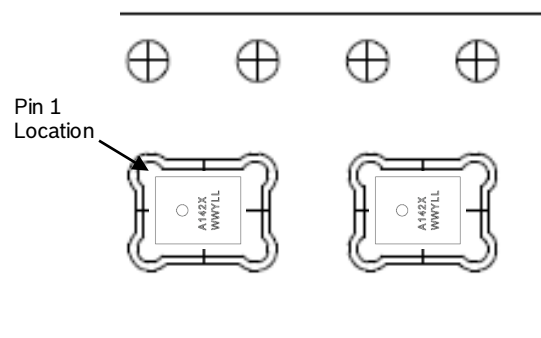
10.1 Tape Specification




Notes:

1. 10 sprocket hole pitch cumulative tolerance ± 0.2
2. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
3. A_0 and B_0 are calculated on a plane at a distance of "R" above the bottom of the pocket.

10.2 Component Orientation



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11. ORDERING INFORMATION

Part Number	Order Number	Part Code	Package	Shipping Method	Standard Quantity
AKU142	02730A0001.C00	A142	4-Pad LGA	13" Reel	5,700

For more information, sample requests or to place an order, please contact Akustica.

Akustica, Inc.
2835 E Carson St. Suite 301
Pittsburgh, PA / USA 15203
(412) 390-1730

sales@akustica.com
www.akustica.com/contact.asp

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