



# NSM2402AT Top-Inlet Analog Silicon Microphone Specification

Rev. 2.0



### 1. GENERAL DESCRIPTION

NSM2402AT is a “slim-bodied” Silicon Microphone with analog output and top inlet for sound input. It is a cost-effective alternative to traditional electret condenser microphone (ECM). Provided on tap-and-reel, it is ideally suited for high volume applications. And it can be processed directly to customer’s PCB using standard automatic pick-and-place equipment and surface mounted via standard solder reflow equipment.

NSM0402AT can be used in (but not limited to) the following applications:

1. Portable communication device
2. Notebook and desktop
3. Headphone and headset accessories

### 2. ABSOLUTE MAXIMUM RATINGS

Supply voltage: VDD to GND.....-0.3V~5V

ESD Tolerance

The Lid Mode.....8kV

The I/O Pin Mode .....4kV

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min	Typ	Max	Unit
Operating Temperature		-40		+85	°C
Storage Temperature	Solder on PC board	-40		+105	°C
	In Tape and Reel	-10		+50	°C



### 3. ACOUSTIC & ELECTRICAL SPECIFICATIONS

Unless otherwise specified, test conditions are:

Typical specification are measured at  $V_{DD} = 3.0V$

Input sound pressure  $P_{IN} = 94dB \text{ SPL}@1kHz$

Test room temperature  $T_a = 25^\circ C$ , Room Humidity =  $50 \pm 20\%$

SNR & noise floor measurement is based on 20 – 20 KHz pass band with A-Weighting

Filter applied

PERFORMANCE					
Parameter	Conditions	Min	Typ	Max	Unit
Directivity		Omni-Directional			
Sensitivity	@1KHz (0 dB = 1V/Pa)	-45	-42	-39	dB
Signal-to-Noise Ratio	@1KHz (0 dB = 1V/Pa)		58		dB
Total Harmonic Distortion (THD) @ 100dB SPL	@1KHz		0.2	0.5	%
Total Harmonic Distortion (THD) @ 115dB SPL	@1KHz		0.5	1	%
Max Input Sound Pressure	@1KHz, THD < 10%		130		dB SPL
Power Supply Rejection (PSR)	217Hz, 100m Vpp square wave		-84	-79	dB
INPUT CHARACTERISTICS					
Power supply Voltage		1.6		3.6	V
Sensitivity Loss Across Power Supply Voltage	Change in sensitivity from 1.6V to 3.6V power supply voltage	No change			dB
Total Operation Current	1.6V-3.6V power supply voltage		160	200	uA
Standby Current	1.6V-3.6V power supply voltage			2	uA
OUTPUT CHARACTERISTICS					
Output Impedance	@1KHz (0 dB = 1 V/Pa)			200	$\Omega$



### 4. FREQUENCY RESPONSE CURVE

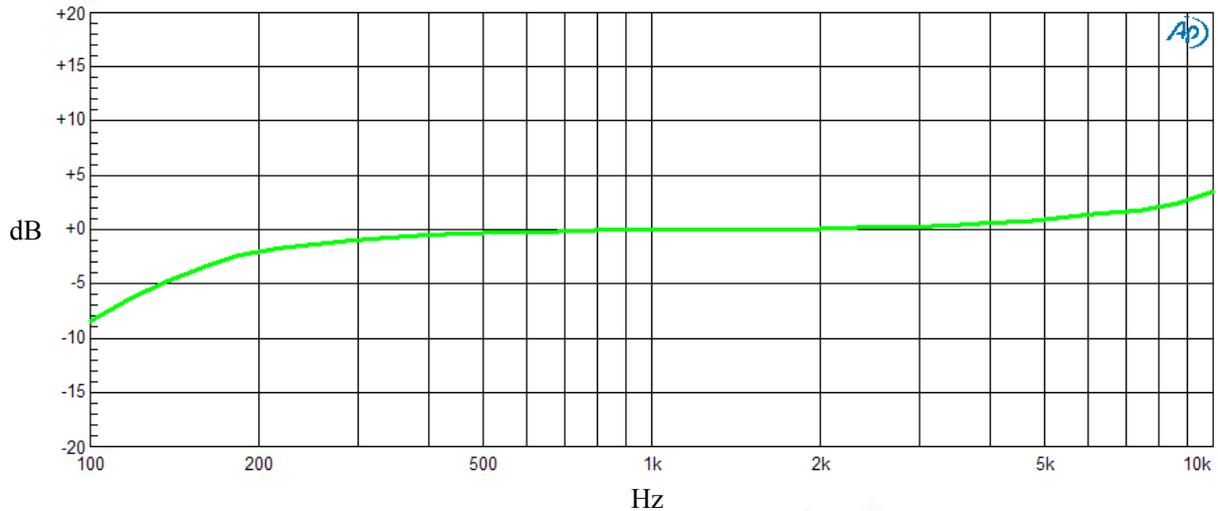
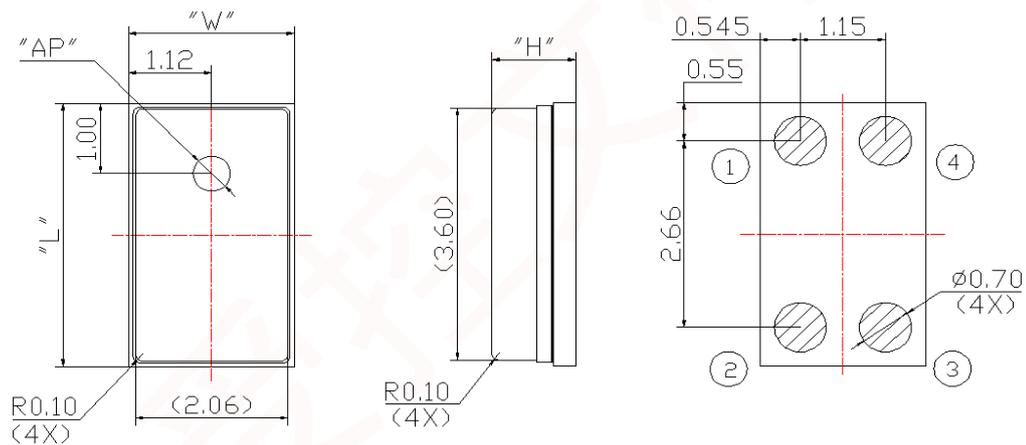


Figure 1. Typical free field frequency response (Normalized to 1 KHz)

### 5. MECHANICAL SPECIFICATIONS



ITEM	DIMENSION	TOLERANCE	UNITS
LENGTH(L)	3.76	±0.10	mm
WIDTH(W)	2.24	±0.10	mm
HEIGHT(H)	1.10	±0.10	mm
ACOUSTIC PORT(AP)	Φ0.50	±0.10	mm

PIN OUTPUT	
PIN#	FUNCTION
1	POWER(Vdd)
2	GROUND
3	GROUND
4	OUTPUT

Note:

Dimensions are in millimeters unless otherwise specified.  
Tolerance ±0.15mm unless otherwise specified

Figure 2. Detailed mechanical drawings



## 6. RECOMMENDED CUSTOMER LANDING PATTERN

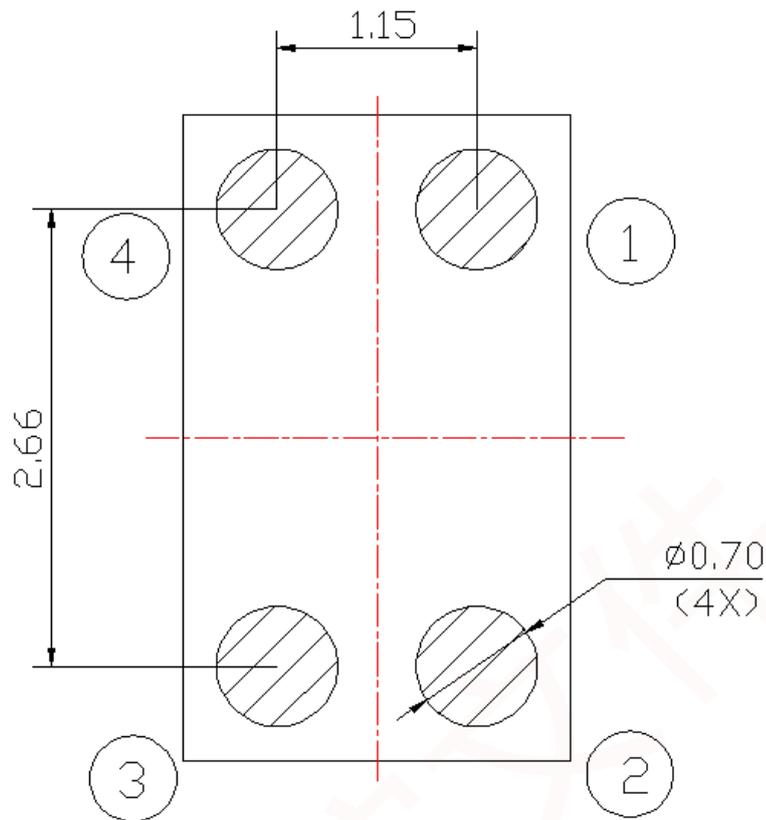


Figure 3. Recommended landing pattern on customers' PCB

## 7. RECOMMENDED INTERFACE CIRCUIT

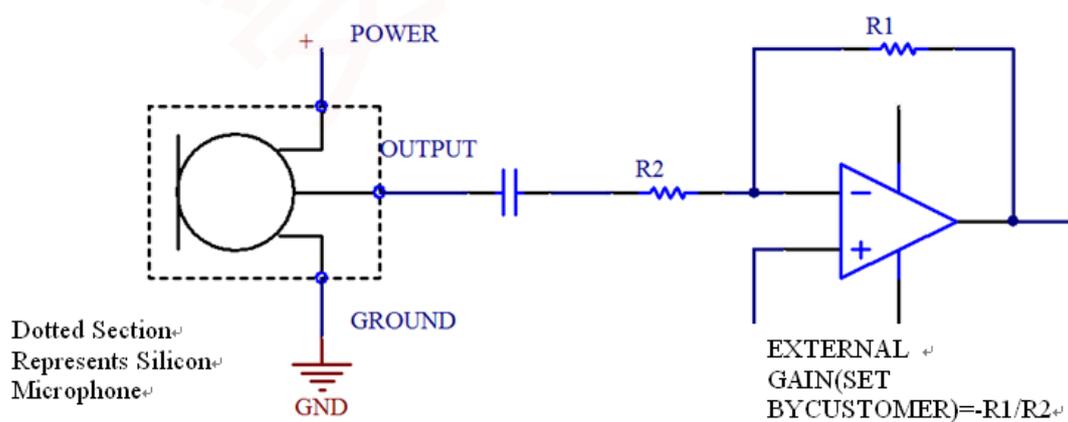
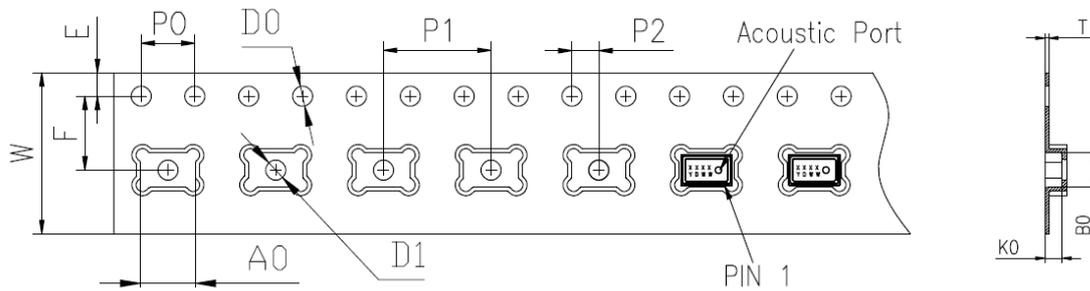


Figure 4. Recommended interface circuit for customers' applications



## 8. PACKAGING SPECIFICATIONS



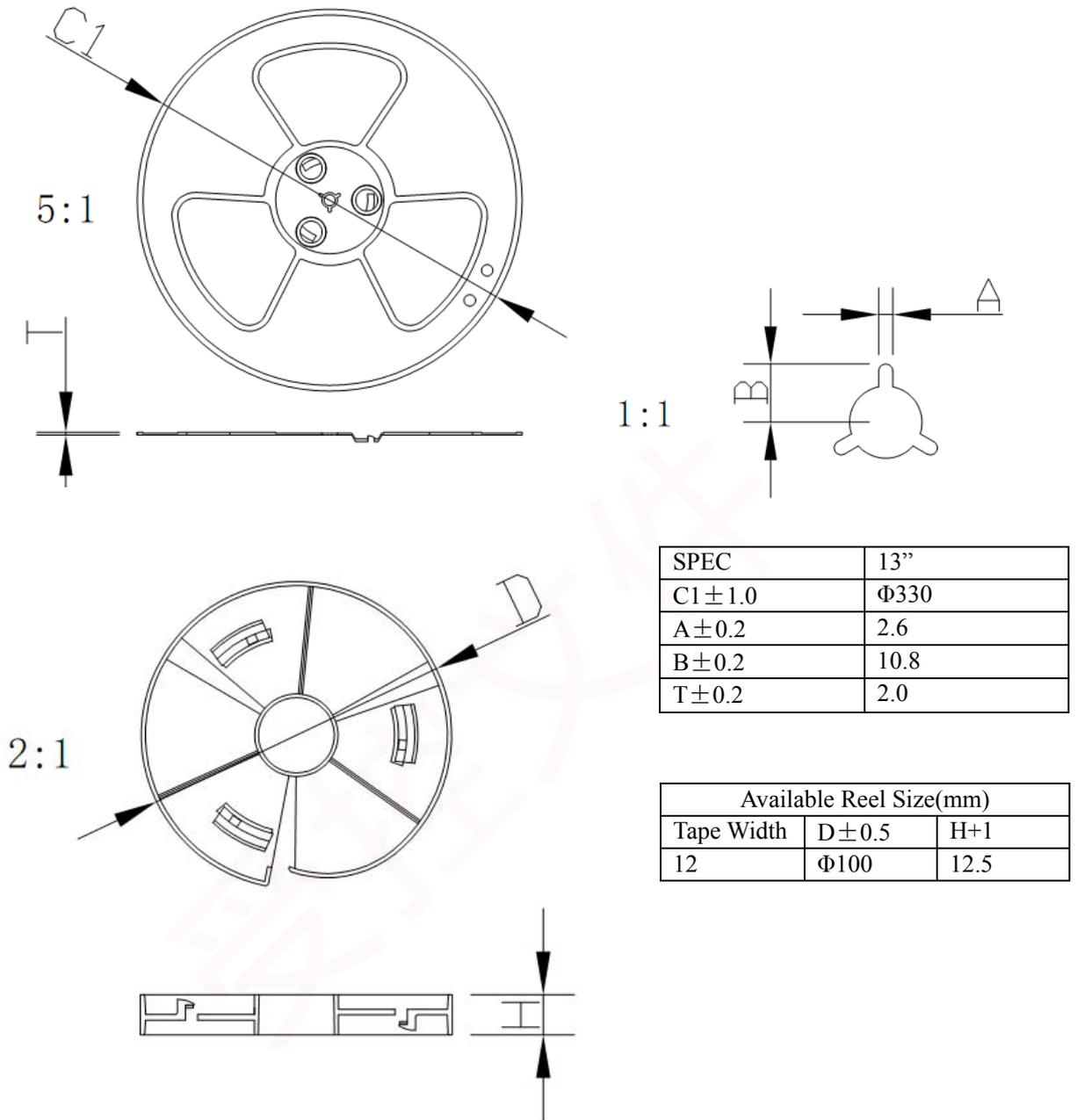
D0	1.5±0.1	W	12.0±0.30
D1	1.5±0.1	E	1.75±0.10
A0	4.06±0.10	F	5.50±0.10
B0	2.54±0.10	P0	4.00±0.10
K0	1.35±0.10	P1	8.0±0.10
T	0.3±0.05	P2	2.00±0.10

Notes:

- (1) Tape & Reel Per EIA-481 standard;
- (2) Label applied to external package and direct to reel

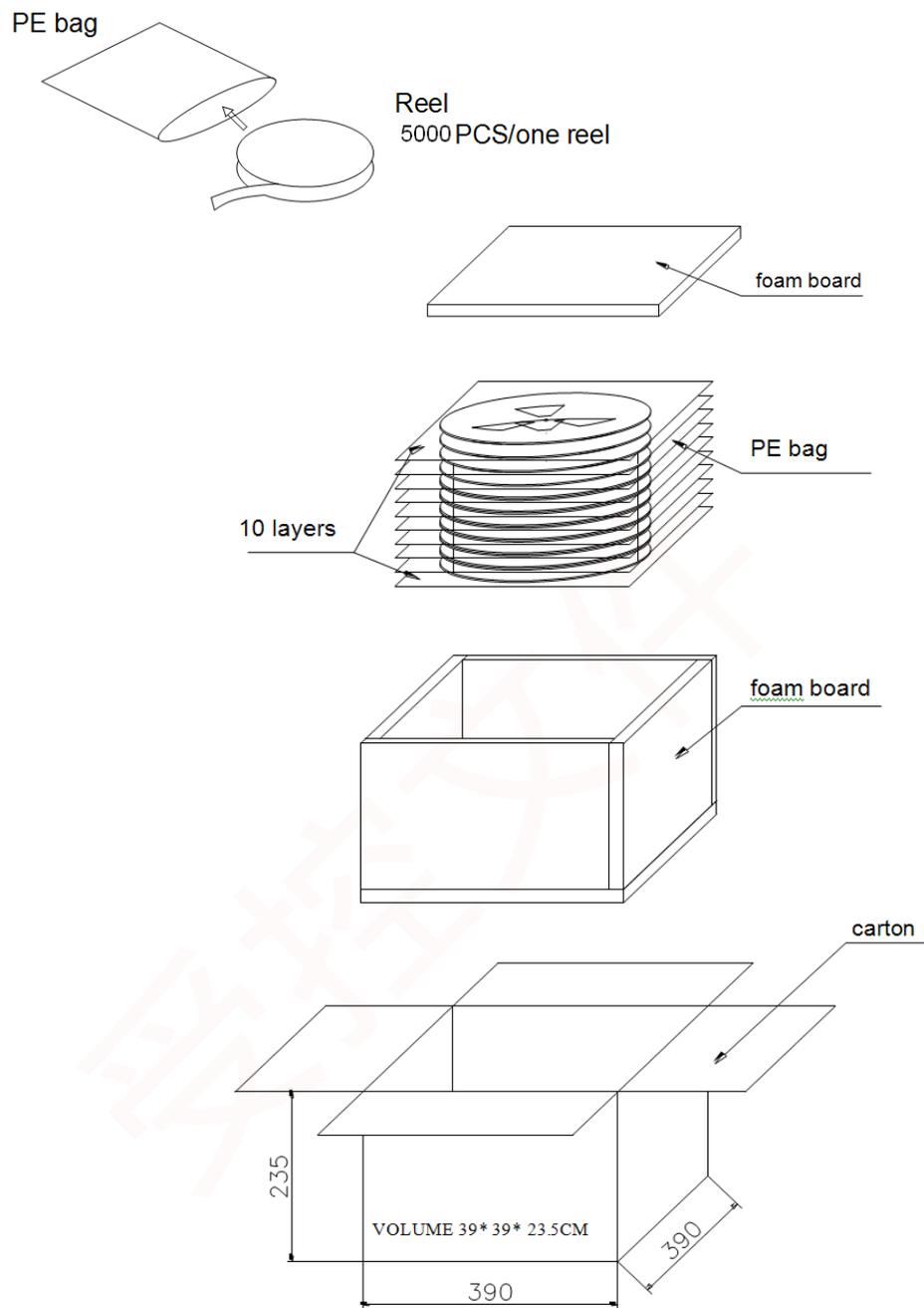
Order Part Number	Reel Diameter	Qty per Reel
NSM2402AT	13"	5,000

Figure 5. Tape Specification



5,000PCS PRODUCTS/1 reel

Figure 6. Reel Specification

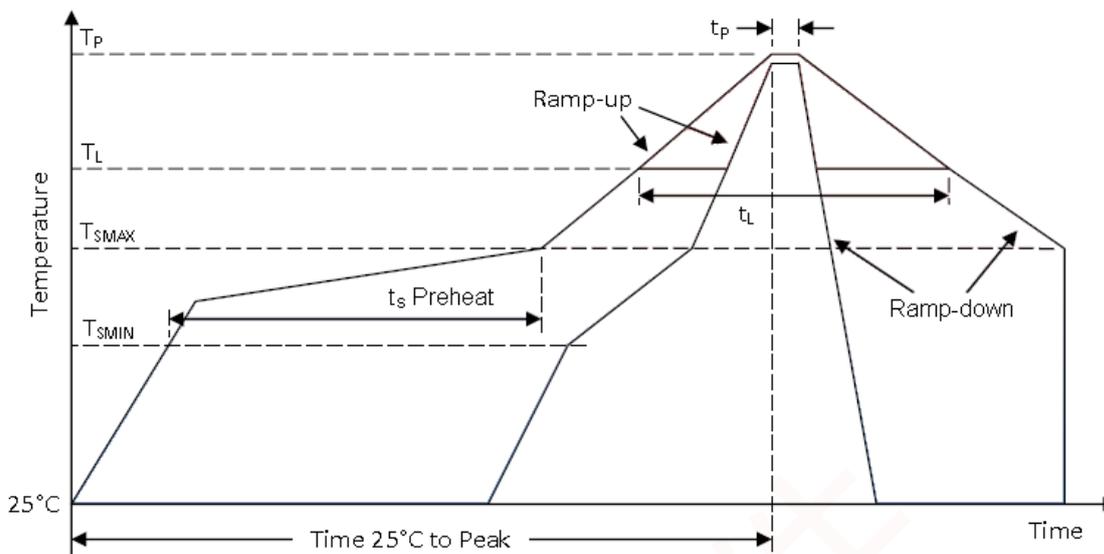


50,000 Pieces of Products per Carton

Figure 7. Packaging Specification



## 9. SOLDER REFLOW PROFILE



Profile Feature	Pb-Free
Average Ramp-up rate ( $T_{SMAX}$ to $T_P$ )	3°C/second max.
Preheat Temperature Min ( $T_{SMIN}$ ) Temperature Max ( $T_{SMAX}$ ) Time ( $T_{SMIN}$ to $T_{SMAX}$ ) ( $t_s$ )	150°C 200°C 60-180 seconds
Time maintained above: Temperature ( $T_L$ ) Time ( $t_L$ )	217°C 60-150 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	20-40 seconds
Ramp-down rate( $T_P$ to $T_{SMAX}$ )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

Figure 8. Recommended leadless solder reflow temperature profile

Notes:

1. Vacuuming over acoustical hole of the microphone is not allowed, because the Devices can be damaged by vacuum.
2. Washing the board after reflow process is not allowed, because board washing and Cleaning agents can damage the device. A device should not be exposed to ultrasonic processing or cleaning.
3. Recommended number of reflow is no more than 5 Times.



## 10. RELIABILITY SPECIFICATIONS

Test item	Detail	standard
Reflow Simulation	Refer to Sec.9 for solder reflow profile, total 5 times	/
Low Temperature Bias	Conditions:-40°C Duration:168 hours while under bias	IEC 60068-2-2 Test Aa
High Temperature Bias	Conditions: 105°C Duration:168 hours while under bias	IEC 60068-2-2 Test Ba
Thermal Shock	Conditions: 100 cycles of air-air thermal shock from -40 °C to 125 °C with 15-minute soaks	IEC 60068-2-4
Temperature/Humidity Bias	Conditions: 85°C/85%RH environment while under bias for 168 hours	JESD 22-A101A-B
Mechanical Shock	Conditions:3 pulses of 10,000g in the X,Y and Z direction	IEC 60068-2-27 Test Ea
Vibration Test	Test axis: X、 Y、 Z Conditions : 2~400Hz 1 oct/min Test time : 15 mins per axis Use fixture during the testing	IEC 60068-2-6
Drop Test	Conditions: For each sample, drop by all corners, edges, surfaces respectively. Steel floor. Drop height: 1800mm.	IEC 60068-2-32
ESD	Conditions: ±8KV direct contact to the lid when unit is grounded ,±4KV direct contact to the I/O pins.10 times	IEC 61000-4-2

Note: Immediately after reliability test, the samples shall be stored under climatic conditions such as that normally exist in ordinary rooms or laboratories. Unless otherwise noted, the recovery period shall be 2 hours at least before performance testing after test condition is performed, the sensitivity of the microphone shall not deviate more than 3dB from its initial value.



11. REVISION HISTORY:

Version	Date	Description	Change from	Change to
1.0	08/09/2011	Initial release		
1.1	06/06/2012	Updated the dimension of cap		
1.2	14/06/2012	Update mechanical specification and Solder reflow profile		
1.3	02/07/2012	Updated Reel specification		
1.4	20/08/2012	Updated Vibration Test		
1.5	10/10/2012	Updated absolute maximum ratings		
1.6	27/02/2013	1. Section 4 unit dBFS change to dB 2. Update metal cap dimension 3. Delete the dimension not related to the specifications marked in packaging 4. Updated Mechanical Shock 5. Updated Drop Test.	2.12mm × 3.66mm JEC 60068-2-27	2.06 mm × 3.60mm IEC 60068-2-27
1.7	10/05/2013	Updated solder reflow profile		
1.8	03/06/2013	Updated section 7		
1.9	19/07/2013	Updated section 8 packaging specification		
2.0	17/01/2014	Updated test voltage		

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