WMM7035DBIR0

Bottom port digital silicon Microphone

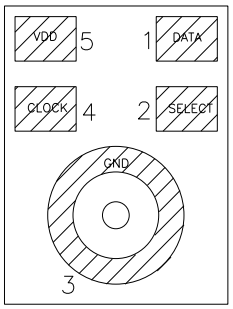
Descriptions

WMM7035DBIR0 is a Silicon Microphone with digital output and bottom inlet for sound input. It consists of a MEMS sensor and an encoder IC. It converts sensor analog output signal into 1-bit digital PDM data. The digital output format eliminates AC coupling capacitor, reduces RF noise coupling and eases PCB layout requirement.

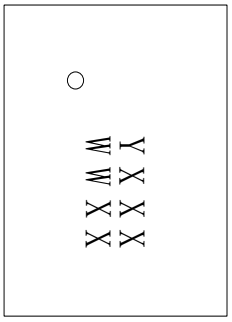
WMM7035DBIR0 is a cost-effective alternative to traditional electret condenser microphone (ECM). Provided on tap-and-reel, it is ideally suited for high volume applications. And it can be processed directly to customer's PCB using standard automatic pick-and-place equipment and surface mounted via standard solder reflow equipment.

WMM7035DBIR0 can be used to implement the array microphones. Speech quality can be significantly improved by combining two microphones.

The WMM7035DBIR0 is manufactured in a compact 3.50mm*2.65mm*0.98mm, 5-pin package.



Pin configuration (Bottom view)



Marking (Top view)

Y = Year code
WW = Week code
X X = Data code

Features

- PDM Output
- High SNR
- Multiple performance modes
- Ultra-Stable Performance
- Standard SMD Reflow
- RoHS/Halogen free compliant
- Omnidirectional

Applications

- Smart phones
- Smart speakers
- Portable communication device
- Notebook and desktop
- Digital still cameras
- Smart home electronics

Order information

Device	Package(mm)	Shipping
WMM7035DBIR0-5/TR	3.50*2.65*0.98	8000/Reel&Tape

Absolute Maximum Ratings

Parameter	Maximum Ratings	Unit
Supply voltage	3.6	V
Voltage on any pin	3.6	V
Operation temperature range	-40~85	℃
Storage temperature range	-40~100	℃

Stresses at the maximum ratings shown in Table 1 may cause permanent damage to the device. These are stress ratings only at which the device may not function when an operation at these or any other condition beyond those specified under “Electro-Acoustic Specifications”.

Acoustic & Electrical Specifications

Normal Mode Electrical Specifications

Test condition: +25±2℃, 60%～70% RH, 86~106Kpa, F_{CLK}=2.4MHz, V_{DD}=1.8V, no load, unless otherwise noted.

Symbol	Description	Min.	Typ.	Max.	Units
F_{CLK}	Clock Frequency	1.2	2.4	3.3	MHz
I_{DD}	Supply Current[1]		850	1100	uA
S	Sensitivity[3],94dB SPL@1KHz	-38	-37	-36	dBFS[2]
ΔS	Sensitivity drop	<0.5			dBFS
SNR	20-5kHz Bandwidth, A-Weighted		69.5		dB(A)
	20-8kHz Bandwidth, A-Weighted		68.5		dB(A)
	20-20KHz Bandwidth, A-weighted	65.5	67.5		dB(A)
THD	94dB SPL@1KHz		0.08	0.5	%
	121dB SPL@1KHz		1		%
AOP	10%THD@1KHz		128		dBSPL
PSR	Measured with 217Hz,100mVpp square wave		-97	-80	dBFS
LFRO	Low frequency roll off		30		Hz

Low Power Mode Electrical Specifications

Test condition: +25±2℃, 60%～70% RH, 86~106Kpa, F_{CLK}=768KHz, V_{DD}=1.8V, no load, unless otherwise noted.

Symbol	Description	Min.	Typ.	Max.	Units
F_{CLK}	Clock Frequency	450	768	850	KHz
I_{DD}	Supply Current		280	350	uA
S	Sensitivity,94dB SPL@1KHz	-22	-21	-20	dBFS
ΔS	Sensitivity drop	<0.5			dBFS
SNR	20Hz~8KHz Bandwidth, A-weighted		66		dB(A)
THD	94dB SPL@1KHz		0.1	0.5	%
	106dB SPL@1KHz		1		%
AOP	10%THD@1KHz		117		dBSPL
PSR	Measured with 217Hz,100mV$_{pp}$ square wave		-86	-70	

Note 1: The current consumption depends on the applied clock frequency and the load on the DATA output

Note 2: dBFS=20*logA/B, where A is the level of signal, and B is the level that corresponds to full-scale level

Note 3: Relative to the rms level of a sine wave with positive amplitude equal to100%1s density and Negative amplitude equal to 0% 1s density

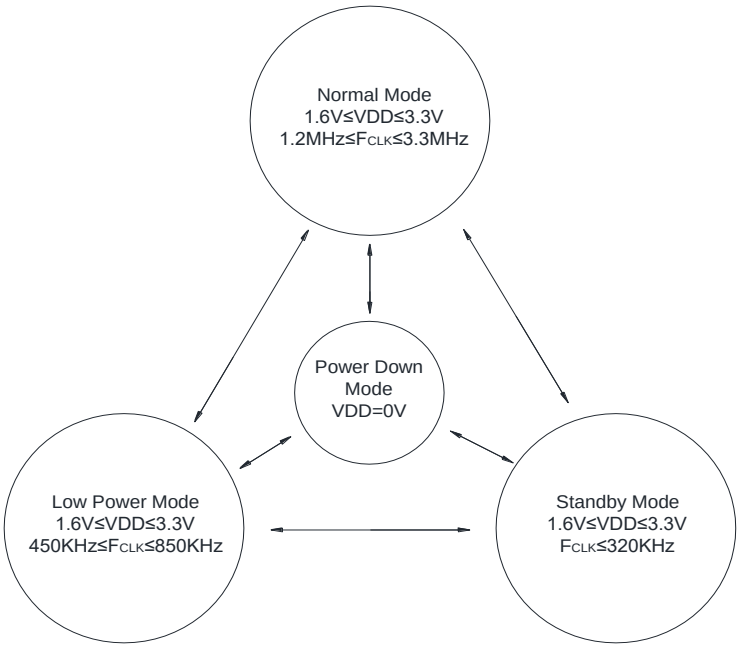
Note 4: Frequency response, sensitivity and current consumption are tested by 100% on product line.

General Electrical Specifications

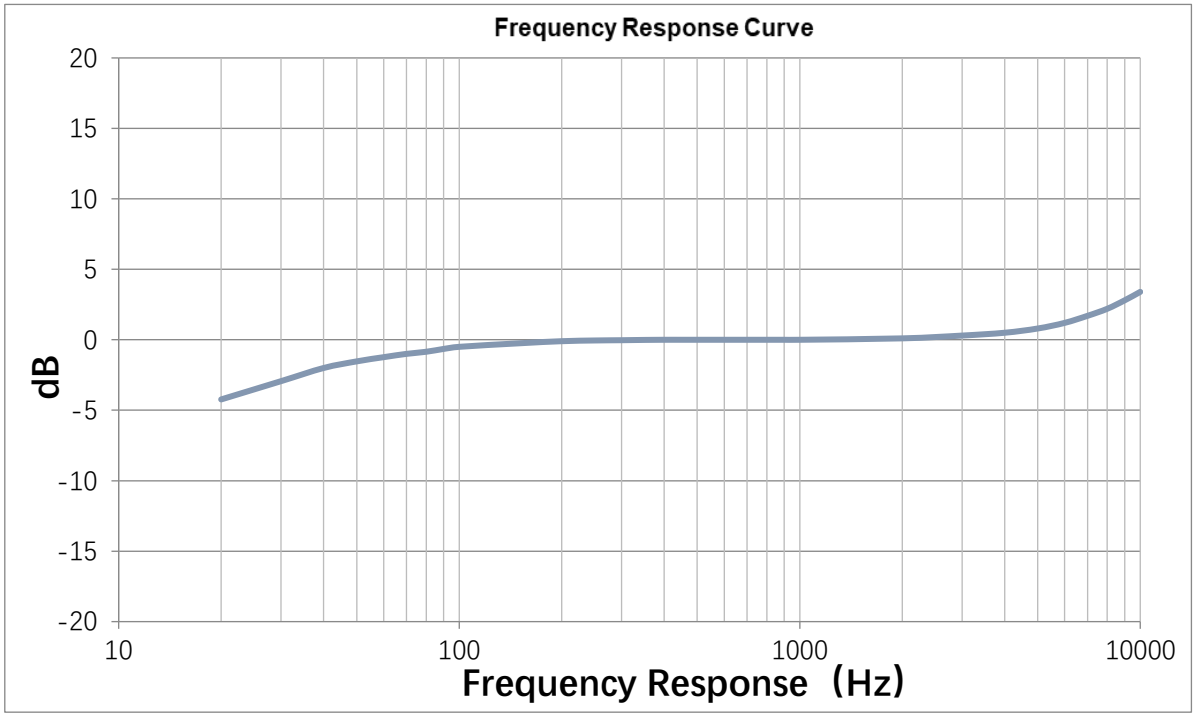
Test condition: +25±2℃, 60%～70% RH, 86~106Kpa,no load, unless otherwise noted.

Symbol	Description		Min.	Typ.	Max.	Units
V_{DD}	Supply Voltage		1.6	1.8	3.3	V
F_{CLK}	Clock Frequency	Standby Mode			320	KHz
		Low Power Mode	450	768	850	KHz
		Normal Mode	1.2	2.4	3.3	MHz
Data Format			1/2 Cycle PDM			
Directivity			Omni-directional			
Polarity	Increasing sound pressure		Increasing density of 1’s			
I_{SC}	Shortcircuitcurrent,Grounded DATA		1		20	mA
C_{LOAD}	Load capacitance				200	pF
Reset time	Time to start up in anymode after VDD has been off for more than10ms, while CLOCK remained on				20	ms
Start-up time	Start-up into normal mode or LP mode				20	ms
Mode-switch time	Mode-switch Normal mode to LP mode or LP mode to Normal mode			20		ms

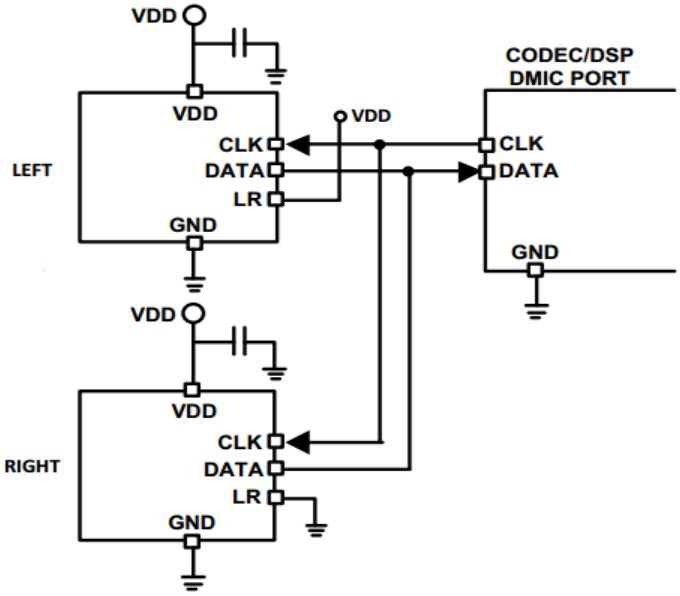
Microphone State Diagram



Frequency Response Curve



Application Information

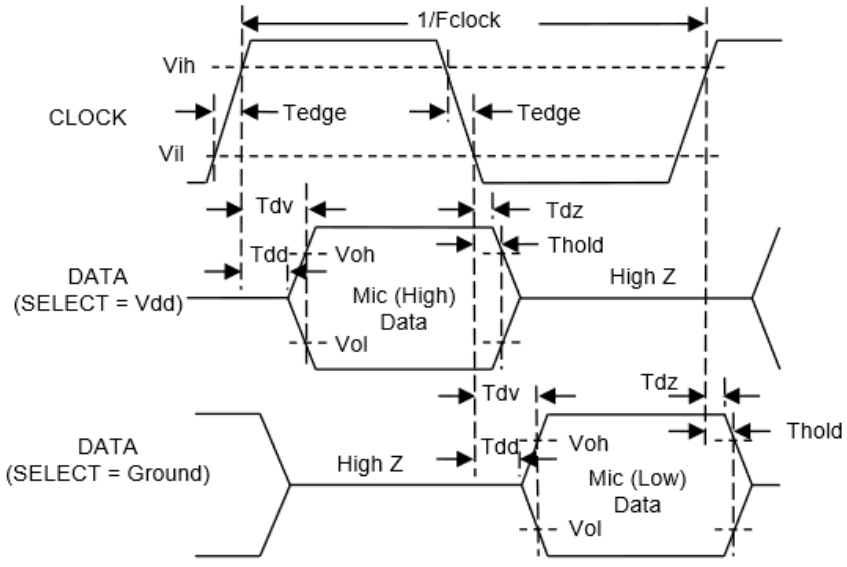


Microphone	SELECT	Asserts DATA On	Latch DATA On
Mic (High)	V_{DD}	Rising Clock Edge	Falling Clock Edge
Mic (Low)	GND	Falling Clock Edge	Rising Clock Edge

Note:

- All GND pins must be connected to ground.
- Capacitors near the microphone should not contain Class 2 dielectrics.

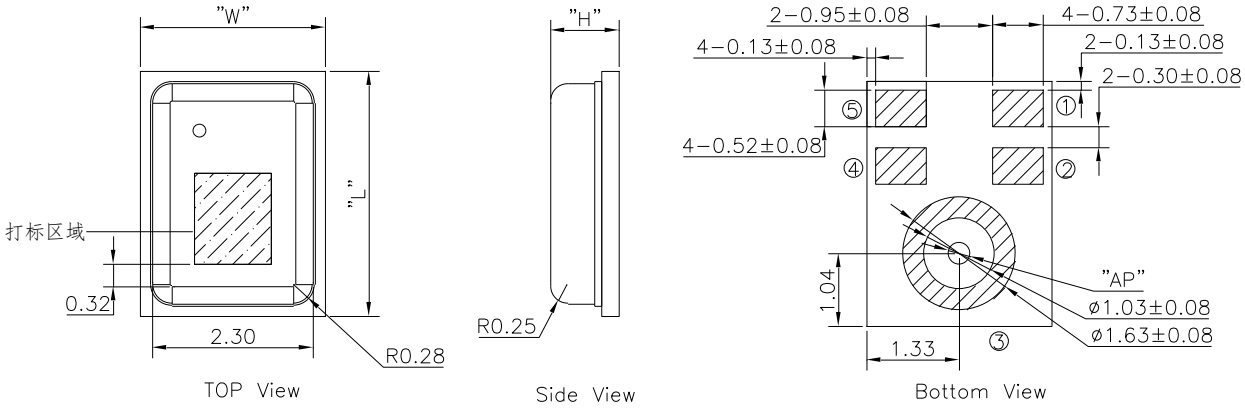
Clock Timing Diagram



Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Clock duty cycle		45		55	%	
Operation Voltage	V_{DD}	1.6		3.3	V	
Input Logic Low Level	V_{IL}	-0.3		$0.28\times V_{DD}$	V	
Input Logic High Level	V_{IH}	$0.65\times V_{DD}$		$V_{DD}+0.3$	V	
Hysteresis width	V_{hys}	0.08				
Output Logic Low Level	V_{OL}			$0.3\times V_{DD}$	V	
Output Logic High Level	V_{OH}	$0.7\times V_{DD}$			V	
Clock rise time	t_{CR}			13	ns	
Clock fall time	t_{CF}			13	ns	
Delay time for DATA driven	t_{DD}	28			ns	
Delay time for data valid	t_{DV}			100	ns	
Delay time for data high Z	t_{Hz}	14		26	ns	

Mechanical Specifications



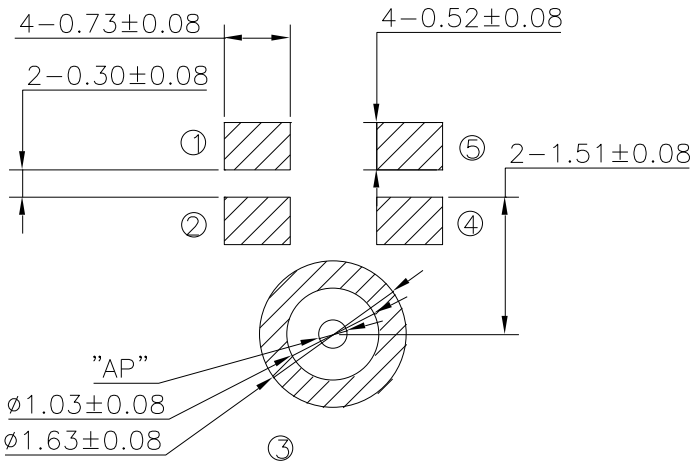
Item	Dimension	Tolerance
Length(L)	3.50	±0.10
Width(W)	2.65	±0.10
Height(H)	0.98	±0.10
Acoustic Port (AP)	Ø0.60	±0.05

Pin#	Pin Name	Description
1	DATA	PDM Output
2	SELECT	Lo/Hi (L/R) Select This pin is internally pulled low but should not be left floating.
3	GND	GND
4	CLOCK	Clock input
5	VDD	Power Supply

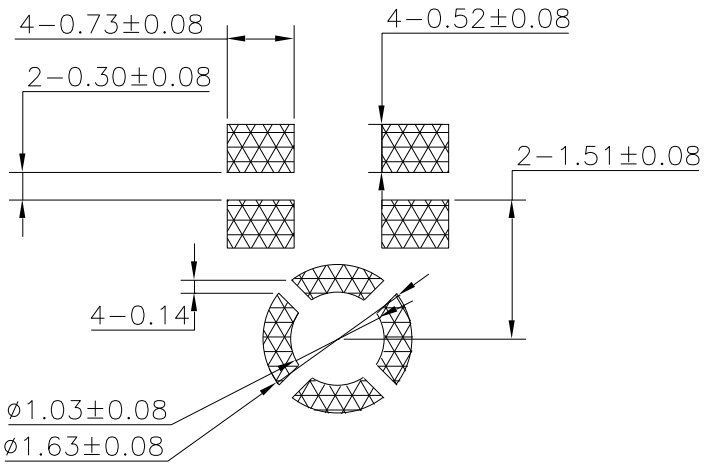
Notes:

- Dimensions are in millimeters unless otherwise specified.
- Tolerance is ±0.10mm unless otherwise specified.
- Pick Area only extends to 0.25 mm of any edge or hole unless otherwise specified.
- Suggestion to use the same date code microphone in one array microphone module.

Example Land Pattern

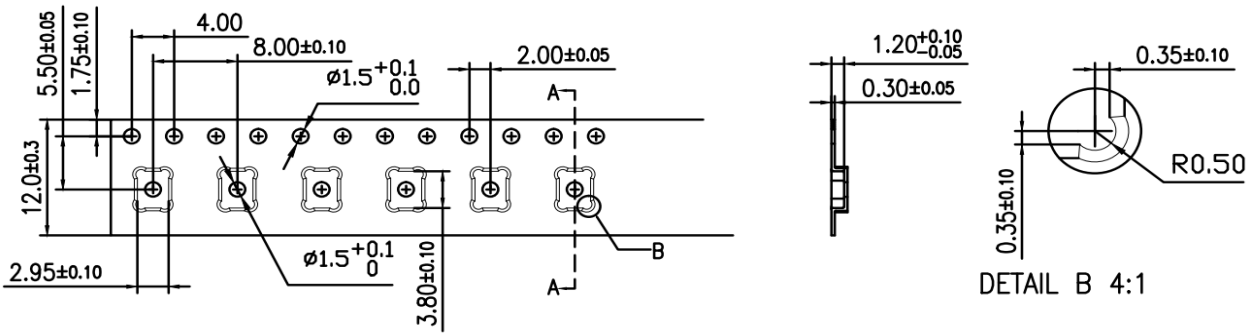


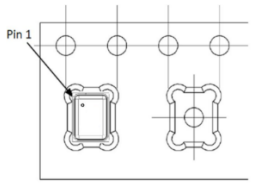
Example Solder Stencil Pattern



Notes: Dimensions are in millimeters unless otherwise specified.
Further optimizations based on application should be performed.

Packaging & Marking Detail



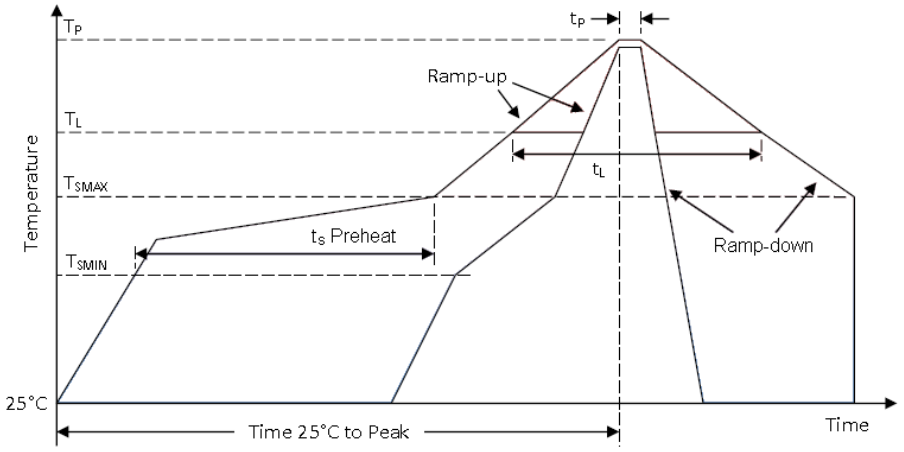


Model Number	Reel Diameter	Quantity Per Reel
WMM7035DBIR0	13”	5,000

Notes:

- Dimensions are in millimeters unless otherwise specified.
- Vacuum pickup only in the pick area indicated in Mechanical Specifications.
- Tape & reel per EIA-481.
- Labels applied directly to reel and external package.

Referenced 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

Note:
All temperatures refer to topside of the package, measured on the package body surface.

Additional Notes

(A) MSL (moisture sensitivity level) Class 1.
(B) Maximum of 3 reflow cycles is recommended.
(C) In order to minimize device damage:

- Do not board wash or clean after the reflow process.
- Do not brush board with or without solvents after the reflow process.
- Do not directly expose to ultrasonic processing, welding, or cleaning.
- Do not insert any object in port hole of device at any time.
- Do not apply over 30 psi of air pressure into the port hole.
- Do not pull a vacuum over port hole of the microphone.
- Do not apply a vacuum when repacking into sealed bags at a rate faster than 0.5 atm/sec.

Materials Statement

Meets the requirements of the European RoHS and Halogen-Free.

Reliability Specifications

Test	Description
Thermal Shock	100 cycles air-to-air thermal shock from -40°C to +125°C with 15 minute soaks. (IEC 68-2-4)
High Temperature Storage	1000 hours at +105°C environment. (IEC 68-2-2 Test Ba)
Low Temperature Storage	1000 hours at -40°C environment. (IEC 68-2-2 Test Aa)
High Temperature Bias	1000 hours at +105°C under bias. (IEC 68-2-2 Test Ba)
Low Temperature Bias	1000 hours at -40°C under bias. (IEC 68-2-2 Test Aa)
Temperature / Humidity Bias	1000 hours at +85°C /85% R.H. under bias. (JESD22-A101A-B)
Vibration	4 cycles of 20 to 2,000 Hz sinusoidal sweep with 20g peak acceleration lasting 12 minutes in X, Y, and Z directions. (Mil-Std-883E, method 2007.2 A)
ESD-HBM	3 discharges of ±3.5kV direct contact to I/O pins. (ESD STM5.2)
ESD-LID/GND	3 discharges of ±8 kV direct contact to lid while unit is grounded. (IEC 61000-4-2)
ESD-MM	3 discharges of ±200V direct contact to I/O pins. (ESD STM5.2)
Reflow	5 reflow cycles with peak temperature of +260°C.
Mechanical Shock	3 pulses of 10000g in the X, Y, and Z direction. (IEC 68-2-27, Test Ea)
Drop Test	To be no interference in operation after dropped to marble or 1.0cm steel plate 18 times from 1.5 meter height.

Note:

After reliability tests are performed, the sensitivity of the microphones shall not deviate more than 3 dB from its initial value. (The measurement to be done after 2 hours of conditioning at 20±2 °C, R.H 60%～70%)