# WMM7035DBHN0

## Bottom port digital silicon Microphone

Http//:www.willsemi.com

## Descriptions

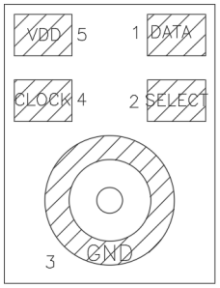
WMM7035DBHN0 is a Silicon Microphone with digital output and bottom inlet for sound input. It consists of a MEMS sensor and an encoder IC. It converts sensor analog output signal into 1-bit digital PDM data. The digital output format eliminates AC coupling capacitor, reduces RF noise coupling and eases PCB layout requirement.

WMM7035DBHN0 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.

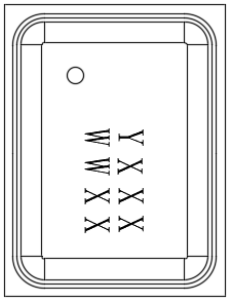
WMM7035DBHN0 can be used to implement the array microphones. Speech quality can be significantly improved by combining two microphones.

The WMM7035DBHN0 is manufactured in a compact 3.50mm*2.65mm*0.98mm, 5-pin package.

**Product appearance**




**Pin configuration (Bottom view)**




**Marking (Top view)**

**Y = Year code**
**WW = Week code**
**X X X**
**X X = Batch 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
- Portable music recorders

**Order information**

| Device | Package(mm) | Shipping |
|---|---|---|
| WMM7035DBHN0-5/TR | 3.50*2.65*0.98 | 5000/Reel&Tape |

## Absolute maximum ratings

| Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage | VDD to GND | -0.3 | - | 6.5 | V |
| | L/R,CLOCK,DATA Voltage to GND | -0.4 | - | VDD+0.4V | V |
| Operating Temperature | | -40 | - | +85 | ℃ |
| Storage Temperature | Solder on PCB | -40 | - | +125 | ℃ |
| | In Tape and Reel | -10 | - | +50 | ℃ |

Stresses exceeding these “Absolute Maximum Ratings” could cause permanent damage to the microphone. These are stress rating only. Functional operation at these or any other conditions beyond those indicated under “Absolute and Electrical Characteristics” is not implied. Exposure beyond those indicated under “Acoustic and Electrical Characteristics” for extended periods may affect microphone reliability.

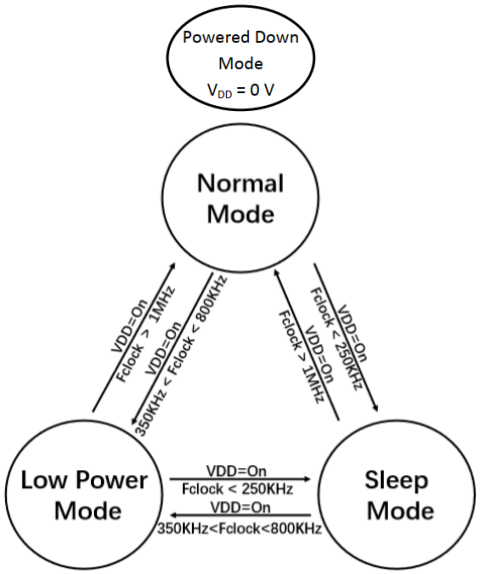
## ACOUSTIC & ELECTRICAL SPECIFICATIONS

TEST CONDITIONS: 23 ±2°C, 55±20% R.H., VDD=1.8V, Fclock=2.048MHz, Duty Cycle=50%, SELECT pin grounded, no load, unless otherwise indicated.

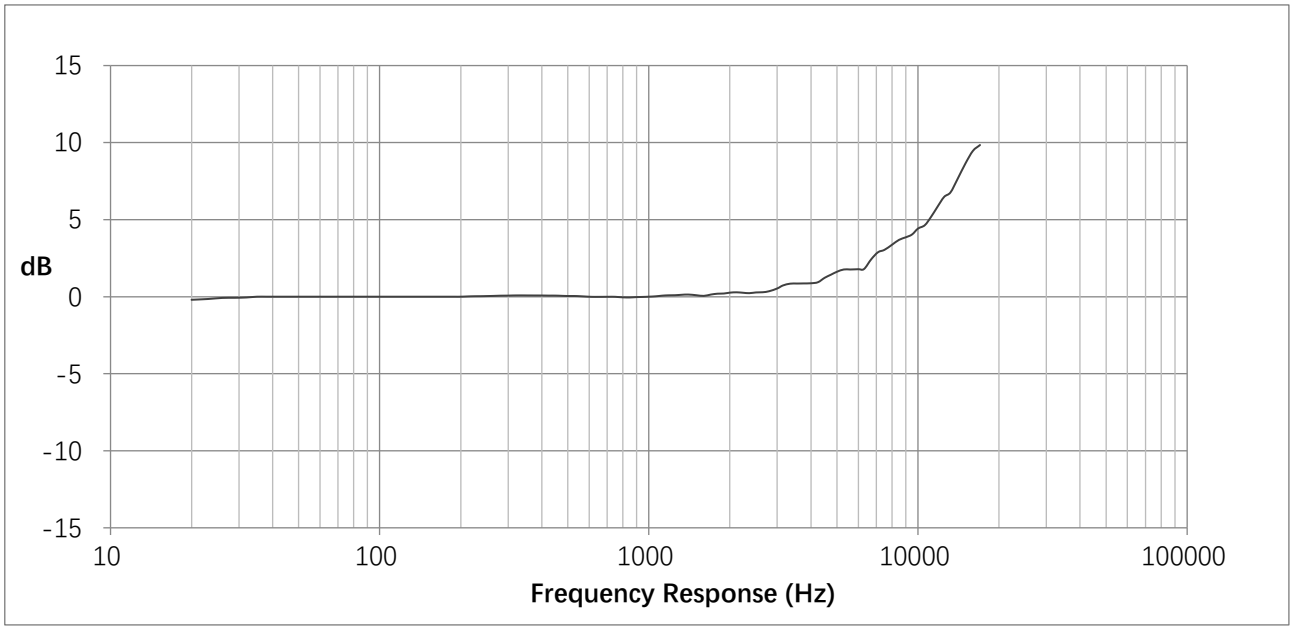
| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | $V_{DD}$ | | 1.6 | - | 3.6 | V |
| Supply Current | | $I_{DD}$ | Normal operation, Fclk(1MHz~4.8MHz) | - | 640 | - | uA |
| | | $I_{low\_power}$ | Low power mode, Fclk(350kHz~800KHz) | - | 300 | - | uA |
| | | $I_{sleep}$ | Sleep mode, Fclk(<250KHz) | - | 42 | - | uA |
| Clock Frequency Rang | Sleep mode | | | 0 | - | 250 | KHz |
| | Low power mode | | | 350 | - | 800 | KHz |
| | Standard Performance Mode | | | 1 | - | 4.8 | MHz |
| Sensitivity | | Sense | 94dB SPL @1KHz | -27 | -26 | -25 | dBFS |
| Signal to Noise Ratio | | SNR | Normal mode 94dB SPL @1KHz, A-weighted | - | 65 | - | dB(A) |
| | | | Low power mode 94dB SPL @1KHz, A-weighted | - | 64 | - | dB(A) |
| Total Harmonic Distortion | | THD | 94dB SPL @1KHz, S=Typ | - | 0.15 | - | % |
| Acoustic Overload Point | | AOP | 10%THD @1KHz, S=Typ | - | 120 | - | dB SPL |
| Power Supply Rejection | | PSR+N | 100 mVpp square wave @ 217Hz, A-weighted | - | -86 | - | dBFS(A) |
| Power Supply Rejection Ratio | | PSRR | 200 mVpp sinewave @ 1 kHz | - | 65 | - | dBv/FS |
| DC Output | | ZOUT | DC fullscale=±100 | - | 1 | - | %FS |
| Directivity | | | | Omnidirectional | | | |
| Data Format | | | | 1/2 Cycle 1 bit PDM | | | |
| Logic Input High | | $V_{ih}$ | | 0.65x $V_{DD}$ | - | VDD+0 .3 | V |
| Logic Input Low | | $V_{il}$ | | -0.3 | - | 0.35x VDD | V |
| Logic Output High | | $V_{oh}$ | | VDD-0.45 | - | - | V |
| Logic Output Low | | $V_{ol}$ | | - | - | 0.45 | V |
| Output Load | | $C_{LOAD}$ | | - | - | 140 | pF |
| Short Circuit Output Current | | | 94dB SPL @1KHz | 1 | | 20 | mA |
| Clock Duty Cycle | | | | 40 | | 60 | % |
| Clock Rise/Fall Time | | $T_{EDGE}$ | | - | - | 15 | ns |

1. 100% tested.
2. IDD varies with CLOAD according to: ΔIDD = 0.5*VDD*ΔCLOAD*FCLOCK.
3. Maximum specifications are measured at maximum VDD. Typical specifications are measured at standard test Conditions .
4. Valid microphones states are: Power Down Mode (mic off), Low Power Mode (mic clock speed), Sleep Mode (low current, DATA = high-Z, fast startup), and Normal Mode (normal operation).
5. Time from FCLOCK <250 kHz to ISLEEP specification is met when transitioning from Normal Mode to Sleep Mode.
6. Time from FCLOCK ⩾ 1 MHz to all applicable specifications are met when transitioning from Sleep Mode to Normal Mode.

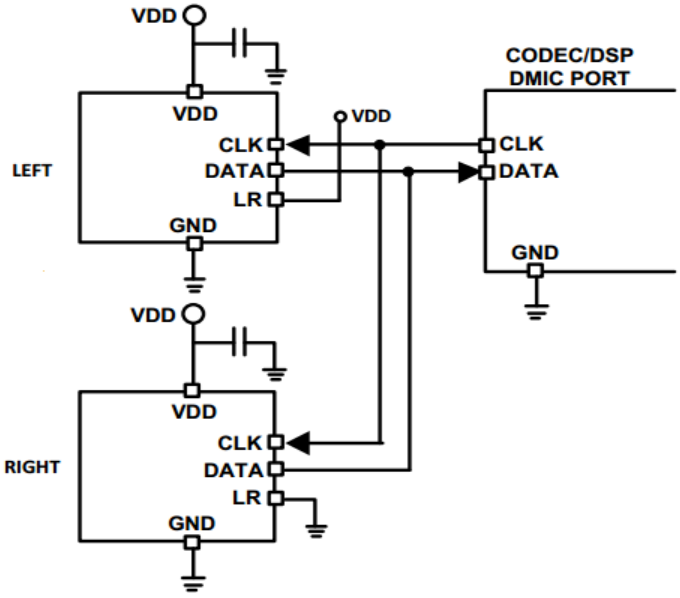
## MICROPHONE STATE DIAGRAM




## Frequency response curve



## Application informations

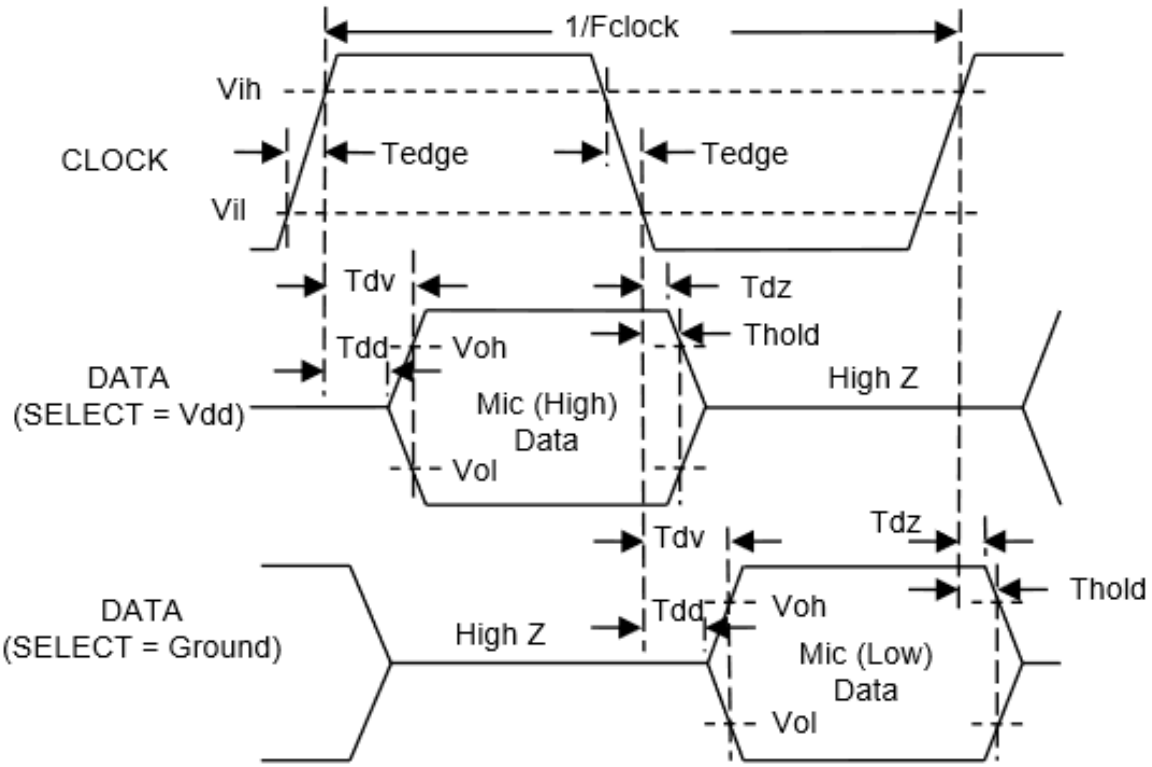



| Microphone | SELECT | Asserts DATA On | Latch DATA On |
|---|---|---|---|
| Mic (High) | $V_{DD}$ | Rising Clock Edge | Falling Clock Edge |
| Mic (Low) | GND | Falling Clock Edge | Rising Clock Edge |

Note:

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

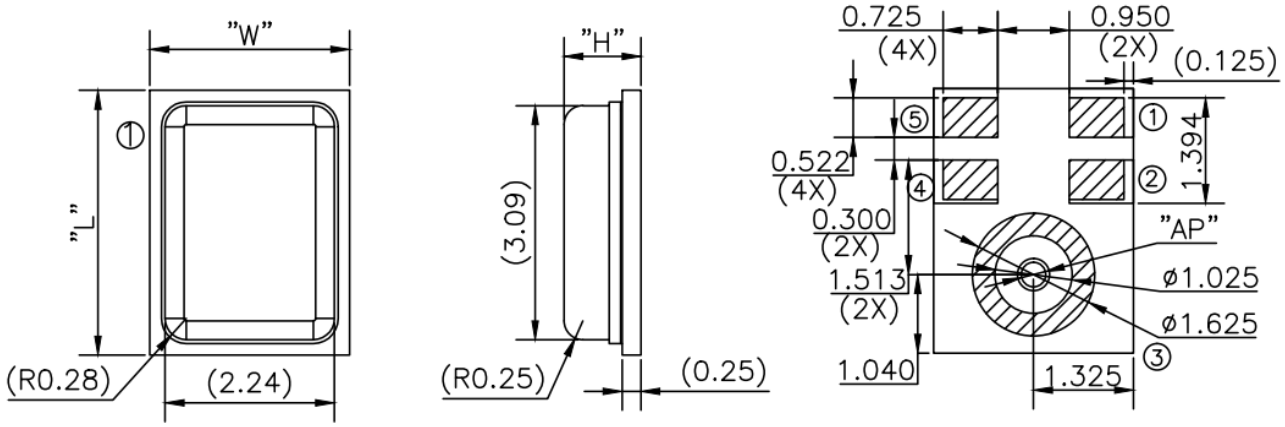
## Clock Timing Diagram




## Timing Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Low to High Threshold | Vl-h | 0.65*VDD | | VDD+0.3 | V | |
| High to Low Threshold | Vh-l | -0.3 | | 0.35*VDD | V | |
| DATA into Hi Z Time | Tdz | 0 | | 20 | ns | RL=1MΩ，CL=12pF |
| DATA Valid Time | Tdv | 24 | 36 | 48 | ns | RL=1MΩ，CL=12pF |
| Clock Jitter | | | | 0.5 | ns | Period jitter in RMS |
| Clock Duty Cycle | | 40 | 50 | 60 | % | |
| Clock Frequency | | 350 | 2400 | 4800 | KHZ | |

## MECHANICAL SPECIFICATIONS



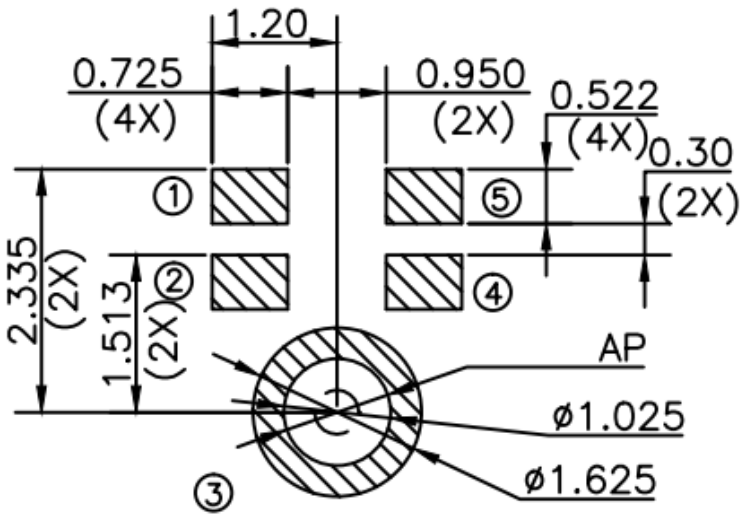

| Item | Dimension | Tolerance |
|---|---|---|
| Length(L) | 3.50 | ±0.10 |
| Width(W) | 2.65 | ±0.10 |
| Height(H) | 0.98 | ±0.10 |
| Acoustic Port (AP) | Ø0.325 | ±0.05 |

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

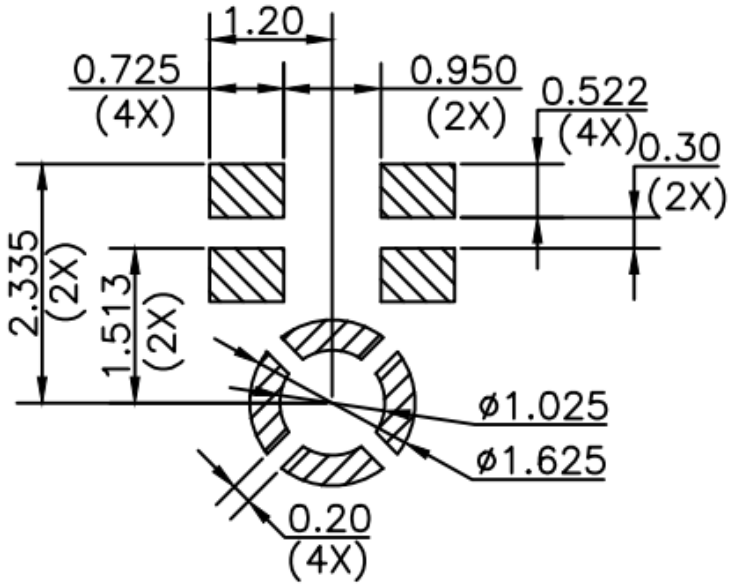
Notes:

- 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

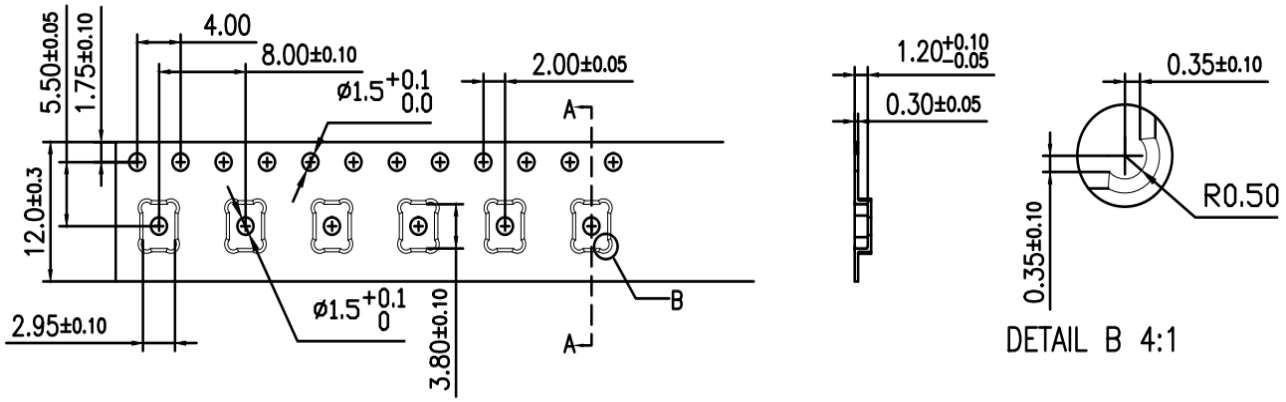


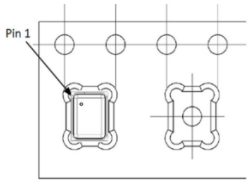

## EXAMPLE SOLDER STENCIL PATTERN




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

## PACKAGING & MARKING DETAIL



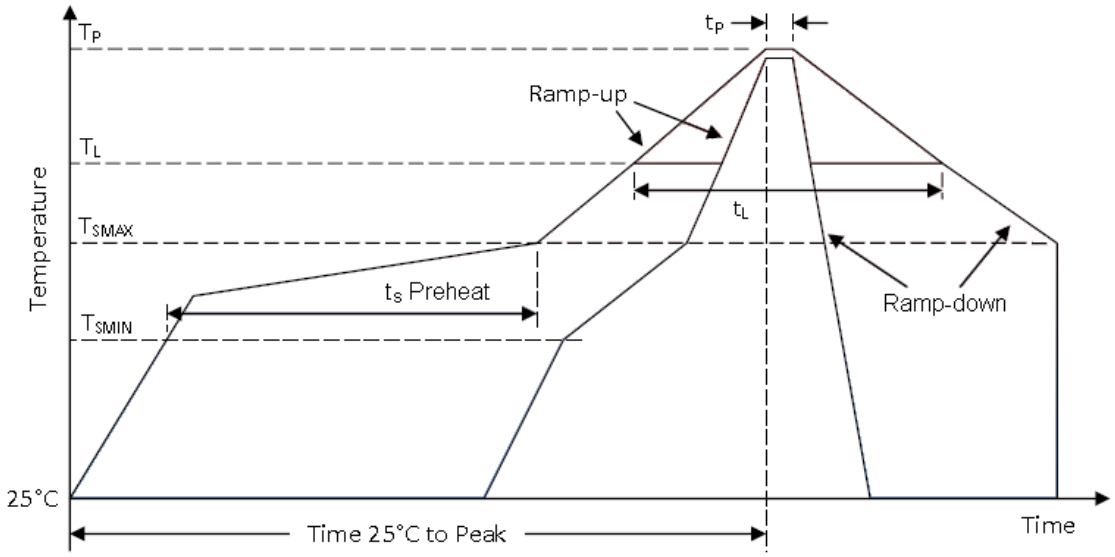




| Model Number | Reel Diameter | Quantity Per Reel |
|---|---|---|
| WMM7035DBHN0 | 13” | 5,000 |

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<br>• Temperature Min ($T_{SMIN}$)<br>• Temperature Max ($T_{SMAX}$)<br>• Time ($T_{SMIN}$ to $T_{SMAX}$) ($t_S$) | 150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>• Temperature ($T_L$)<br>• Time ($t_L$) | 217°C<br>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. |
| Salt mist | (50 ± 5)g/L, pH is 6.5 to 7.2, with 96 hours.( GB/T 2423.17-2008) (note 2) |

Note:

1. 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%)
2. The salt mist do not evaluate performance.