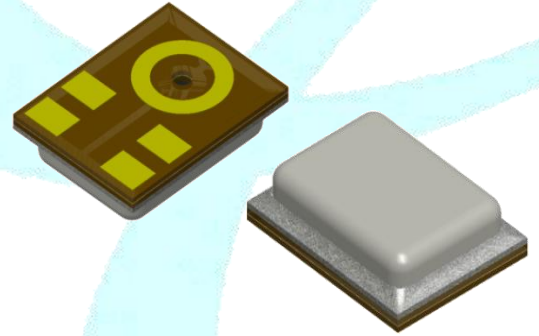


F1-(A)HDMOE-J098R26-5P

High SNR / Multiple Clock Mode
/ Narrow Sensitivity

OMNI-DIRECTIONAL
BOTTOM PORT



Best sound electronics

Value no1. Micro sound provider

Creative technology starts from respecting of life
of the individuals

Creative technologies to respect human life



Best sound electronics

Value no1. Micro sound provider

We offer you happiness with our excellent technology
beyond an ordinary sound what you expect

Superior technology to deliver happiness



Best sound electronics

Value no1. Micro sound provider

Keep basic fundamentals to fill sound with
new innovations

Creative technologies to respect human life



1. INTRODUCTION

- Digital MEMS Microphone - ½ Cycle PDM 16bit, Full Scale=120dBSPL
- Bottom Port Type - Sensitivity is Typical -26dBFS
- **High Signal to Noise Ratio(SNR) – Typical 64.3dB (A-weighted, 20Hz~20kHz) at Standard Mode**
- **Multiple Clock Mode – Stand by Mode, Low-Power Mode(LPM), Standard Mode(STM)**
- **Narrow Sensitivity – +/-1dB**
- Omni-directional
- Dual Channel supported
- RF Shielded - with embedded Ground
- Compatible with Sn/Pb and Halogen-free solder process
- RoHS compliant
- SMD reflow temperature of up to 260°C for over 30 seconds

2. APPLICATIONS

- Smartphones
- Ear-sets, Bluetooth Headsets
- Tablet Computers
- Wearable Devices
- Electrical Appliances
- Voice Recognition Systems of Appliances

3. MODEL NO.

F1-(A)HDMOE-J098R26-5P

4. GENERAL MICROPHONE SPECIFICATIONS

Test Condition : 23 ± 2°C, Room Humidity = 55 ± 20 %, VDD=1.8V, fclk = 2.4MHz, SELECT Pin is grounded, CLOAD = 1µF, unless otherwise noticed.

| Parameter | | Conditions | Min | Typ | Max | Units |
|-----------------------|----------------|--------------------------|-----|-----|------|-------|
| Clock Frequency Range | Sleep Mode | | 0 | - | 100 | kHz |
| | Low-Power Mode | | 700 | - | 1200 | kHz |
| | Standard Mode | | 2.0 | - | 4.0 | MHz |
| Sleep Mode Current | | fCLK < 100kHz | - | 4 | 20 | µA |
| Short Circuit Current | | Grounded DATA pin | 1 | - | 20 | mA |
| Output Load | | | - | - | 140 | pF |
| Fall-asleep Time | | fCLK < 100kHz | - | - | 10 | ms |
| Wake-up Time | | fCLK > 351kHz | - | - | 20 | ms |
| Power-up Time | | V _{DD} > V(min) | - | - | 50 | ms |
| Mode-Change Time | | | - | - | 10 | ms |

5. ELECTRO-ACOUSTIC CHARACTERISTICS

Test Condition : 23 ± 2°C, Room Humidity = 55 ± 20 %, VDD=1.8V, fclk = 2.4MHz, SELECT Pin is grounded, C_{LOAD} = 1μF, unless otherwise noticed.

| Parameter | Conditions | Min | Typ | Max | Units |
|---------------------------|--------------------------------------|-------------------|-----|-----|--------|
| Directivity | | Omni-directional | | | |
| Supply Voltage | | 1.64 | - | 3.6 | V |
| Data Format | | ½ Cycle PDM 16bit | | | - |
| Full Scale Acoustic Level | | 120 | | | dB SPL |
| Current consumption | fclk = 2.4MHz, load on DATA output | 500 | - | 800 | μA |
| | fclk = 3.072MHz, load on DATA output | 650 | - | 850 | |

● Standard Mode [STM]

Test Conditions : Measurement Clock Frequency=2.40 MHz , Vdd=1.8V

| | | | | | |
|-------------------------------------|--|-----|------|-----|-----------|
| Sensitivity | 94dB SPL at 1kHz | -27 | -26 | -25 | dBFS |
| Signal to Noise Ratio (SNR) | 94dB SPL at 1kHz, A-weighted (20Hz~20kHz) | - | 64.3 | - | dB(A) |
| Equivalent Input Noise (EIN) | 94dB SPL at 1kHz, A-weighted (20Hz~20kHz) | - | 29.7 | - | dB(A) SPL |
| Total Harmonic Distortion (THD) | 94dB SPL at 1kHz | - | 0.2 | 0.3 | % |
| | 112dB SPL at 1kHz | - | - | 1.0 | |
| | 119dB SPL at 1kHz | - | - | 3.0 | |
| | 120dB SPL at 1kHz | - | - | 5.0 | |
| Acoustic Overload Point (AOP) | THD>10%, at 1kHz | 121 | 122 | - | dB SPL |
| Power Supply Rejection Ratio (PSRR) | Measured with 1kHz sine wave and broad band noise, both 200mVpp | - | 55 | - | dBV/FS |
| Power Supply Rejection (PSR) | Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted | - | -86 | - | dBFS(A) |

● Low Power Mode [LPM]

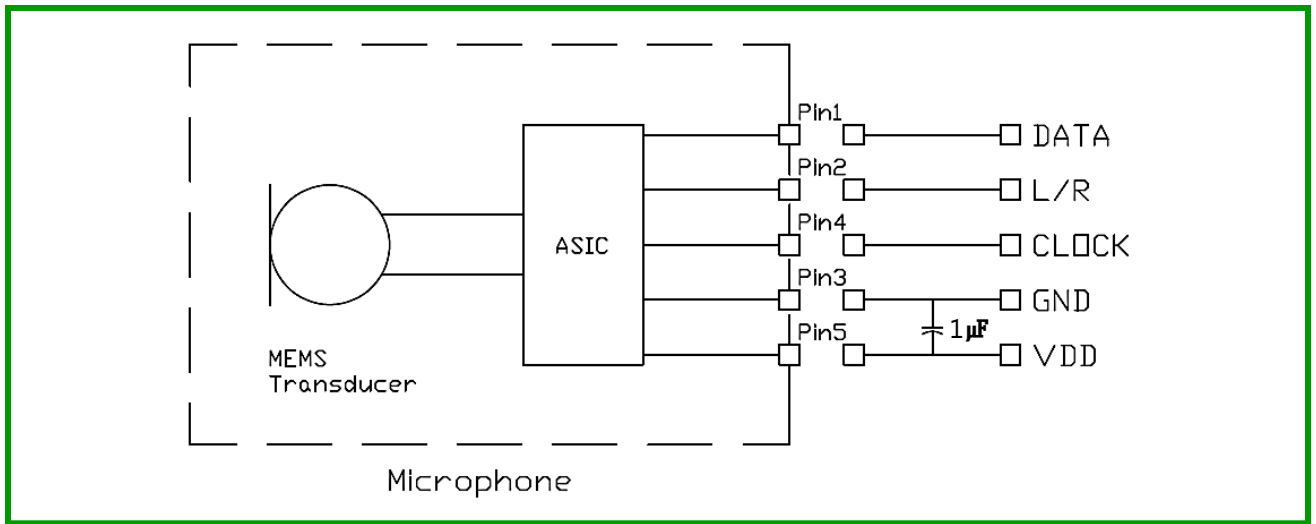
Test Conditions : Measurement Clock Frequency=768 kHz , Vdd=1.8V

| | | | | | |
|-------------------------------------|--|-----|-----|-----|-----------|
| Current consumption | Normal operation | 200 | - | 350 | μA |
| Sensitivity | 94dB SPL at 1kHz | -27 | -26 | -25 | dBFS |
| Signal to Noise Ratio (SNR) | 94dB SPL at 1kHz, A-weighted (20Hz~8kHz) | - | 62 | - | dB(A) |
| Equivalent Input Noise (EIN) | 94dB SPL at 1kHz, A-weighted (20Hz~8kHz) | - | 32 | - | dB(A) SPL |
| Total Harmonic Distortion (THD) | 94dB SPL at 1kHz | - | 0.2 | 0.3 | % |
| | 111dB SPL at 1kHz | - | - | 1.0 | |
| | 115dB SPL at 1kHz | - | - | 3.0 | |
| | 116dB SPL at 1kHz | - | - | 5.0 | |
| Acoustic Overload Point (AOP_) | THD>10%, at 1kHz | 121 | 122 | - | dB SPL |
| Power Supply Rejection Ratio (PSRR) | Measured with 1kHz sine wave and broad band noise, both 200mVpp | - | 46 | - | dBV/FS |
| Power Supply Rejection (PSR) | Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted | - | -64 | - | dBFS(A) |

6. INTERFACE PARAMETER

| Parameter | Conditions | Min | Typ | Max | Units |
|----------------------------|--|---------------------|-----|---------------------|-------|
| Clock Frequency | | 0.7 | - | 1.2 | MHz |
| | | 2.0 | - | 4.0 | |
| Stand by Clock Frequency | | - | - | 100 | kHz |
| Clock Duty Cycle | $f_{CLK} \leq 2.4\text{MHz}$ | 40 | - | 60 | % |
| | $2.4\text{MHz} < f_{CLK}$ | - | 50 | - | % |
| Clock Input Impedance | | 1000 | - | - | MΩ |
| LR Input Impedance | | 1000 | - | - | MΩ |
| Input Logic Low Level | | -0.3 | - | $0.3 \times V_{DD}$ | V |
| Input Logic High Level | | $0.7 \times V_{DD}$ | - | $V_{DD} + 0.3$ | V |
| Output Logic Low Level | | -0.3 | - | $0.3 \times V_{DD}$ | V |
| Output Logic High Level | | $0.7 \times V_{DD}$ | - | $V_{DD} + 0.3$ | V |
| Clock Rise / Fall Time | | - | - | 10 | ns |
| Delay Time for Data driven | | 18 | 55 | - | ns |
| Delay Time for Valid Data | Rload, min = 100kΩ Cload, max = 200pF VDD = 1.64 to 3.6V | - | - | 100 | ns |
| Delay Time for High Z | | 0 | 5 | 10 | ns |

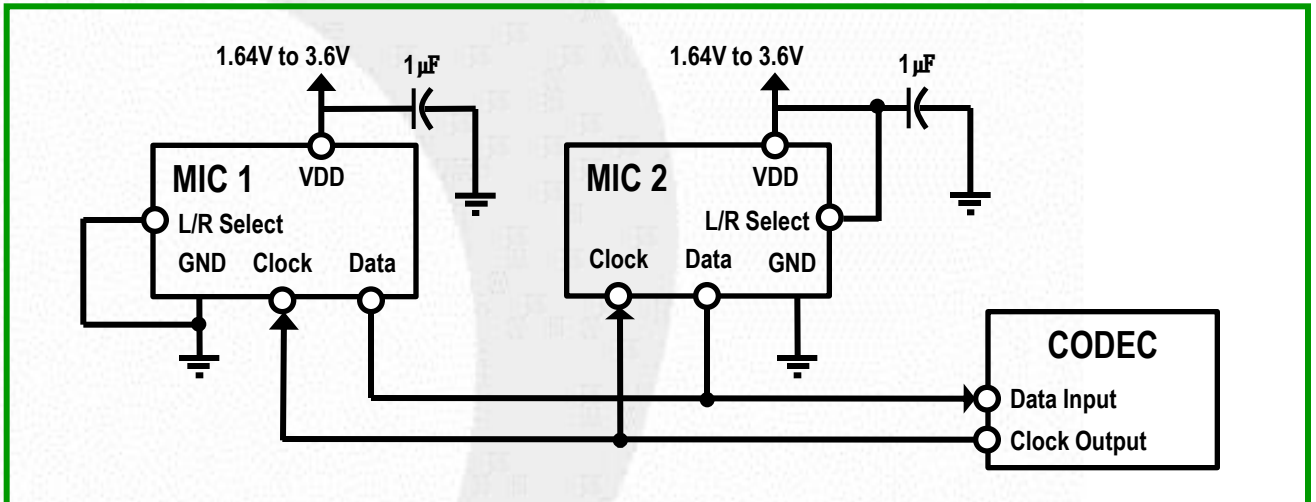
7. MEASUREMENT CIRCUIT



8. PIN DESCRIPTION

| Pin Name | Description |
|------------|--|
| VDD | Supply and IO voltage for the microphone |
| L/R Select | Left/Right (DATA2 / DATA1) Channel selection |
| CLOCK | Clock input to the microphone |
| DATA | PDM data output from the microphone |
| GND | Ground |

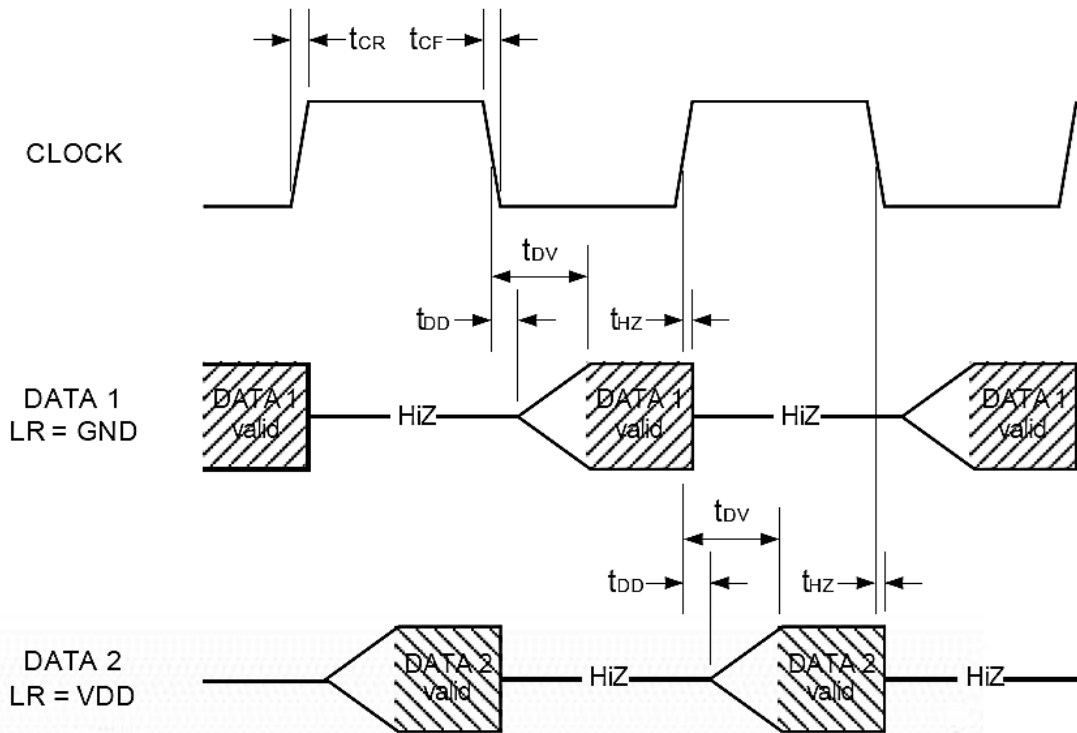
9. INTERFACE CIRCUIT & CHANNEL DATA CONFIGURATION



| Data symbol in interface timing chart | L/R Select connected to | Data asserted at | Data sampled at |
|---------------------------------------|-------------------------|--------------------|--------------------|
| DATA1 [MIC1(Low)] | GND | Falling clock edge | Rising clock edge |
| DATA2 [MIC2(High)] | V _{DD} | Rising clock edge | Falling clock edge |

Note : Stereo operation is accomplished by connecting the L/R Sel. pin either to VDD or GND on the phone PWB. Bypass Capacitors near each MIC. on VDD are recommended to provide maximum SNR performance.

10. INTERFACE TIMING CHART



With defining a minimum value for t_{DD} and a maximum value for t_{HZ} it is secured that the driven DATA signals of the right and the left channel don't overlap. A definition of a maximum value for t_{DD} is not necessary, instead t_{DV} defines the time until the driven DATA is valid.

11. ENVIRONMENTAL CHARACTERISTICS AND STANDARD CONDITIONS

| Item | Min | Typ | Max | Unit |
|-----------------------------|-----|-----|------|------|
| Operating temperature range | -40 | - | +100 | °C |
| Storage temperature range | -40 | - | +100 | °C |
| Relative humidity | 25 | - | 85 | % |
| Air Pressure | 860 | - | 1060 | mBar |
| Standard temperature range | 15 | 20 | 25 | °C |
| Standard Relative humidity | 40 | - | 60 | % |

12. TYPICAL FREQUENCY RESPONSE CURVE

Far Field Measurement Condition

Temperature : 23 ± 2 °C

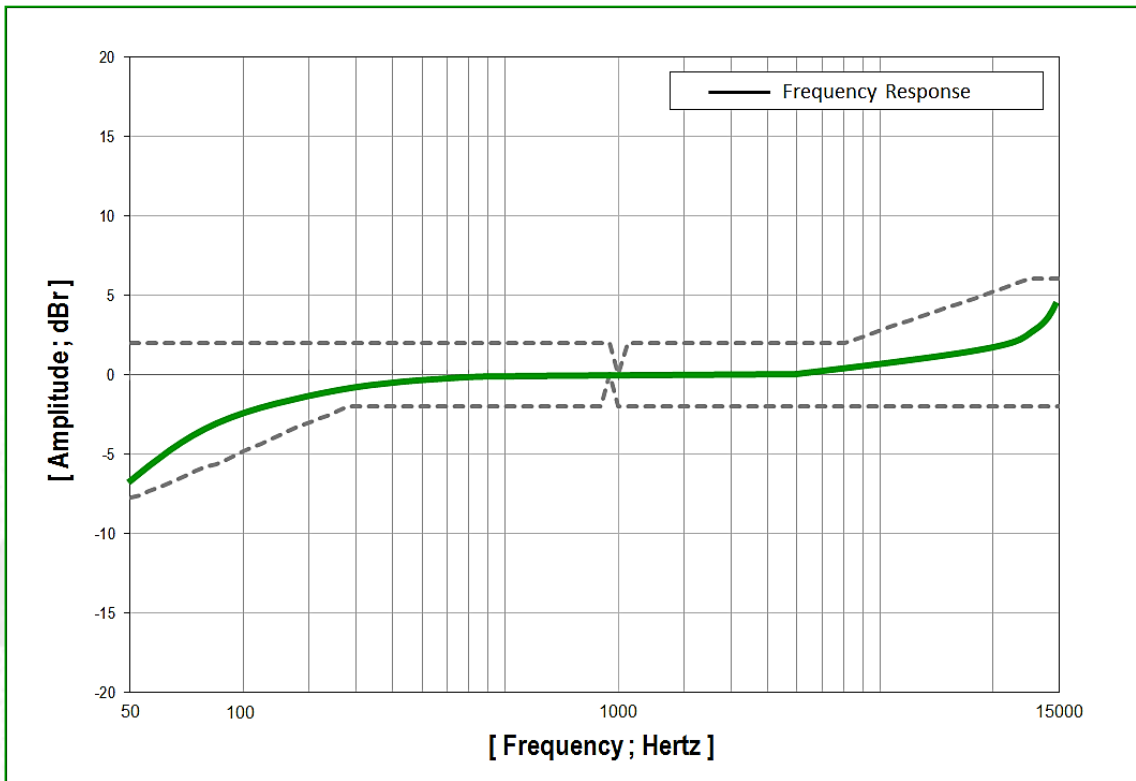
Supply Voltage : 1.8V

Clock Frequency : 2.4MHz

Acoustic stimulus : 1Pa (94dB SPL at 1kHz) at 50 cm from the loud-speaker.

The loud-speaker must be calibrated to make a flat frequency response input signal.

Position : The frequency response of microphone unit measured at 50cm from the loud-speaker



■ Frequency Mask Specification

| Frequency [Hz] | Lower Limit [dBr] | Upper Limit [dBr] | Note |
|----------------|-------------------|-------------------|-----------------------|
| 50 | -8 | +2 | 0dBr = dBV/Pa at 1kHz |
| 150 ~ 1000 | -2 | +2 | |
| 1000 | 0 | 0 | |
| 1000 ~ 4000 | -2 | +2 | |
| 15000 | -2 | +6 | |

Note : Band Frequency Range

1. Narrow Band : 300Hz ~ 3.4kHz

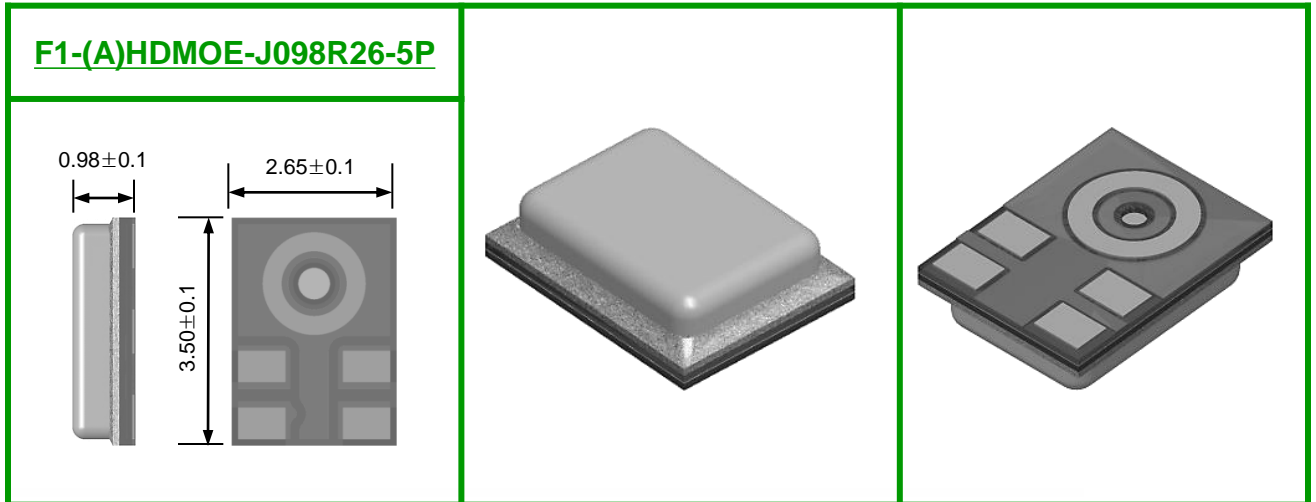
2. Wide Band : 100Hz ~ 7kHz

3. Super Wide Band : 50Hz ~ 14kHz

13. MECHANICAL CHARACTERISTICS

※ PCB design & Pin size can be changed by model No.

SMD Type



Lettering

