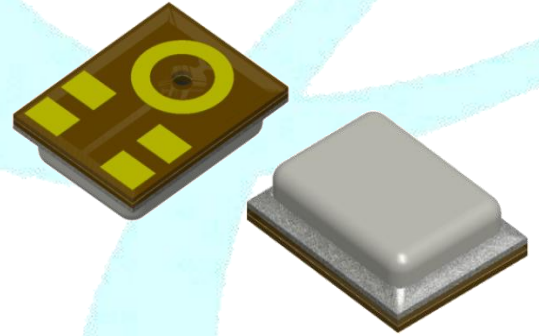


F4-(A)HDMOE-J098R3627-5P

High AOP / 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 24bit, Full Scale=128dB SPL
- Bottom Port Type – Sensitivity is Typical -36dBFS at Standard Mode,
Typical -27.5dBFS at Low Power Mode
- **High Acoustic Overload Point(AOP) – Min. 132dB SPL at fclk=2.4MHz**
- **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 capacitor
- 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.

F4-(A)HDMOE-J098R3627-5P

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	-	250	kHz
	Low-Power Mode		350	-	800	kHz
	Standard Mode		1.0	-	4.8	MHz
Sleep Mode Current		fCLK < 350kHz	-	25	50	µA
Short Circuit Current		Grounded DATA pin	1	-	20	mA
Output Load			-	-	200	pF
Fall-asleep Time		fCLK < 350kHz	-	-	50	ms
Wake-up Time		fCLK > 350kHz	-	-	50	ms
Power-up Time		V _{DD} > V(min)	-	-	50	ms
Mode-Change Time			-	-	50	ms

5. ELECTRO-ACOUSTIC CHARACTERISTICS

Test Condition : $23 \pm 2^\circ\text{C}$, Room Humidity = $55 \pm 20\%$, $V_{DD}=1.8\text{V}$, $f_{clk} = 2.4\text{MHz}$, SELECT Pin is grounded, $C_{LOAD} = 1\mu\text{F}$, unless otherwise noticed.

Parameter	Conditions	Min	Typ	Max	Units
Directivity		Omni-directional			
Supply Voltage		1.62	1.8	3.6	V
Data Format		½ Cycle PDM 24bit			-
Full Scale Acoustic Level		128			dB SPL
Current Consumption	$f_{clk} = 2.4\text{MHz}$, load on DATA output	1000	1100	1200	μA
	$f_{clk} = 3.072\text{MHz}$, load on DATA output	1100	1200	1300	
	$f_{clk} = 4.8\text{MHz}$, load on DATA output	1340	1440	1540	

● Standard Mode

Test Conditions : Measurement Clock Frequency=2.4 MHz , Vdd=1.8V

Sensitivity	94dB SPL at 1kHz	-37	-36	-35	dBFS
Signal to Noise Ratio (SNR)	94dB SPL at 1kHz, A-weighted (20Hz~20kHz)	-	63.5	-	dB(A)
Equivalent Input Noise (EIN)	94dB SPL at 1kHz, A-weighted (20Hz~20kHz)	-	30.5	-	dB(A) SPL
Total Harmonic Distortion (THD)	94dB SPL at 1kHz	-	-	0.1	%
	127dB SPL at 1kHz	-	-	1.0	%
	128dB SPL at 1kHz	-	-	3.0	%
	130dB SPL at 1kHz	-	-	5.0	%
Acoustic Overload Point (AOP)	THD>10%, at 1kHz	132	133	-	dB SPL
Power Supply Rejection Ratio (PSRR)	Measured with 1kHz sine wave and broad band noise, both 200mVpp	-	66	-	dBV/FS
Power Supply Rejection (PSR)	Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted	-	-99	-	dBFS(A)

● Low Power Mode

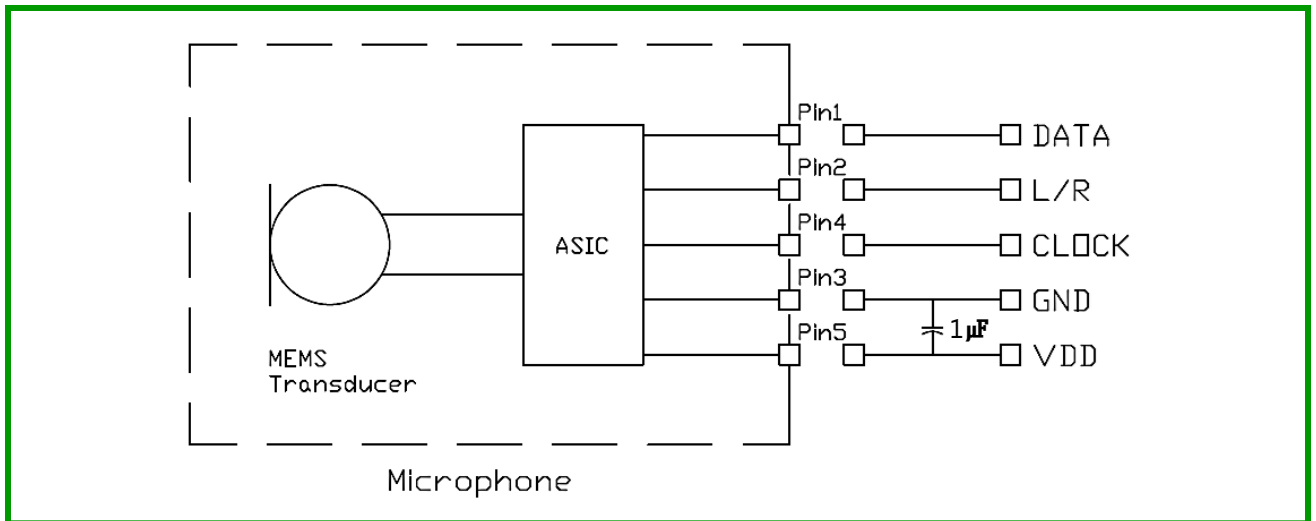
Test Conditions : Measurement Clock Frequency=768 kHz , Vdd=1.8V

Current consumption	load on DATA output	310	340	370	μA
Sensitivity	94dB SPL at 1kHz	-28.5	-27.5	-26.5	dBFS
Signal to Noise Ratio (SNR)	94dB SPL at 1kHz, A-weighted (20Hz~8kHz)	-	62.2	-	dB(A)
Equivalent Input Noise (EIN)	94dB SPL at 1kHz, A-weighted (20Hz~8kHz)	-	31.8	-	dB(A) SPL
Total Harmonic Distortion (THD)	94dB SPL at 1kHz	-	-	0.1	%
	120dB SPL at 1kHz	-	-	1.0	%
	121dB SPL at 1kHz	-	-	3.0	%
	122dB SPL at 1kHz	-	-	5.0	%
Acoustic Overload Point (AOP)	THD>10%, at 1kHz	123	124	-	dB SPL
Power Supply Rejection Ratio (PSRR)	Measured with 1kHz sine wave and broad band noise, both 200mVpp	-	58	-	dBV/FS
Power Supply Rejection (PSR)	Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted	-	-90	-	dBFS(A)

6. INTERFACE PARAMETER

Parameter	Conditions	Min	Typ	Max	Units
Clock Frequency		0.35	-	4.8	MHz
Stand by Clock Frequency		-	-	250	kHz
Clock Duty Cycle		40	-	60	%
Clock Input Impedance		1000	-	-	MΩ
LR Input Impedance		1000	-	-	MΩ
Input Logic Low Level		-0.3	-	0.35 x V _{DD}	V
Input Logic High Level		0.65 x V _{DD}	-	V _{DD} + 0.3	V
Output Logic Low Level		-	-	0.3 x V _{DD}	V
Output Logic High Level		0.7 x V _{DD}	-	-	V
Clock Rise / Fall Time		-	-	13	ns
Delay Time for Data driven		18	-	30	ns
Delay Time for Valid Data	R _{load} , min = 100kΩ C _{load} , max = 100pF V _{DD} = 1.62 to 3.6V	-	-	100	ns
Delay Time for High Z		5	-	16	ns

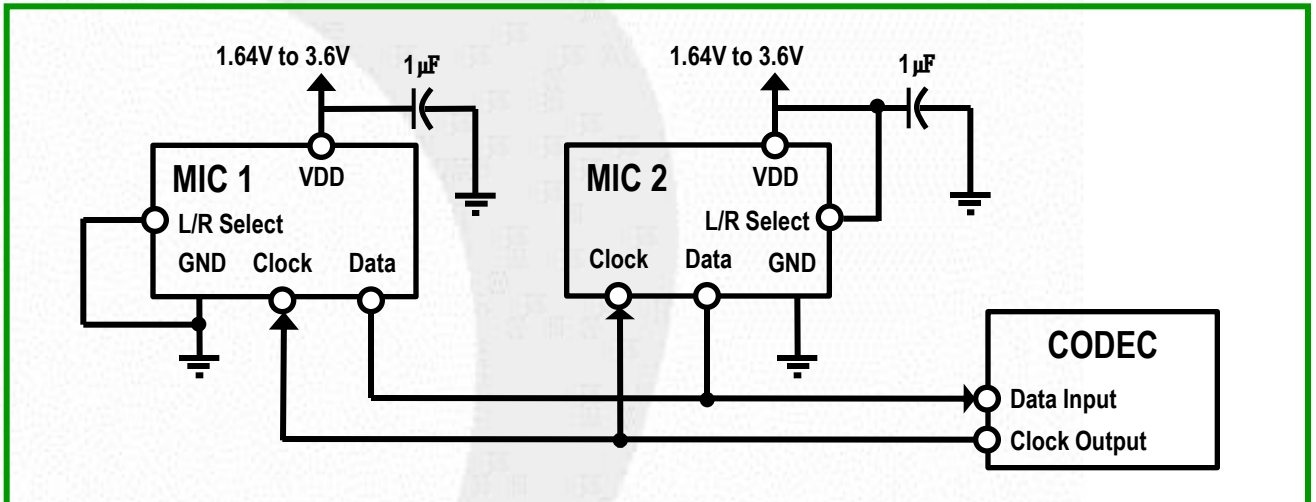
7. MEASUREMENT CIRCUIT



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

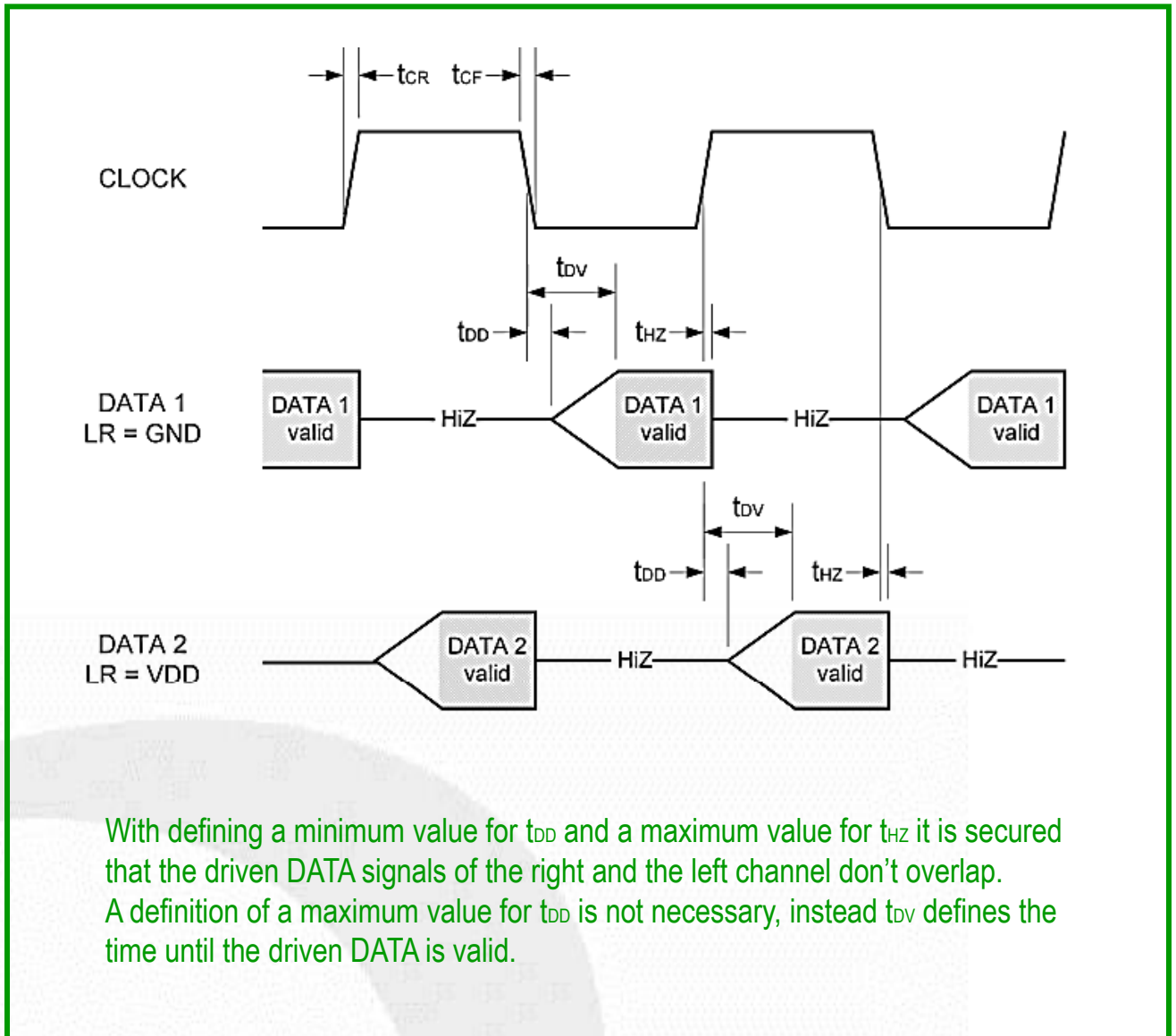
9. INTERFACE CIRCUIT & CHANNEL DATA CONFIGURATION



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



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

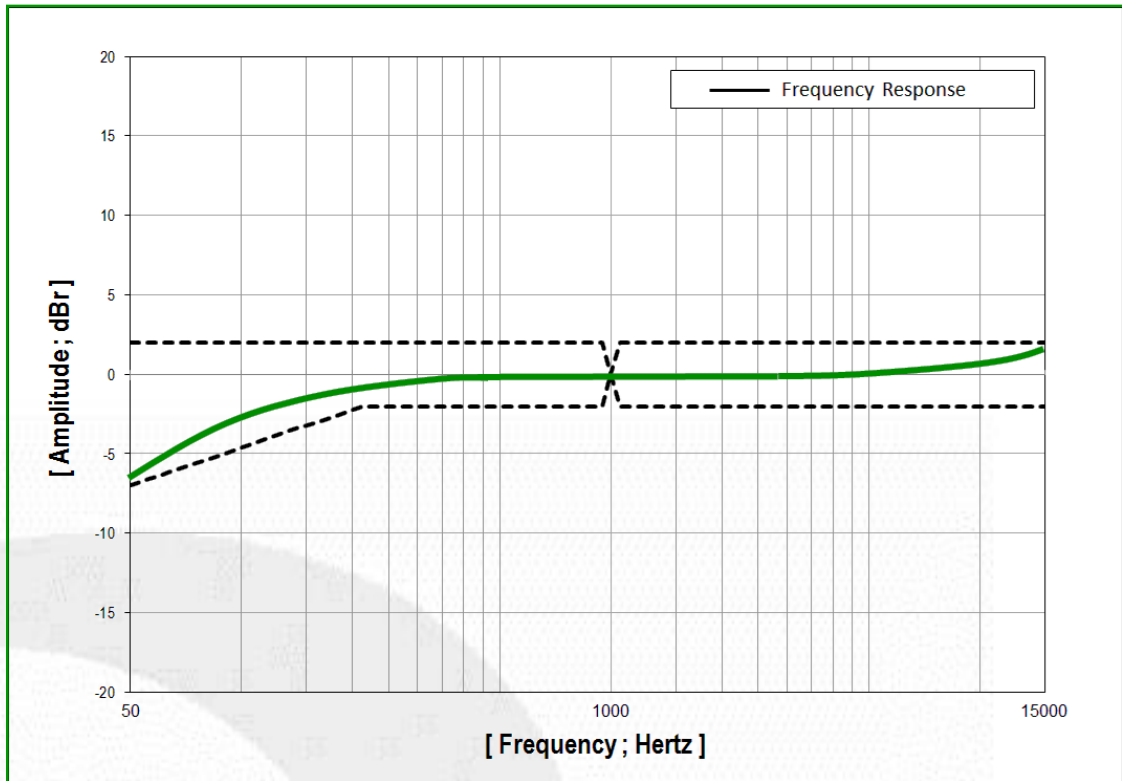
Supply Voltage : 1.8V

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	-7	+2	0dBr = dBFS at 1kHz
200 ~ 1000	-2	+2	
1000	0	0	
1000 ~ 15000	-2	+2	

Note : Band Frequency Range

1. Narrow Band : 300Hz ~ 3.4kHz

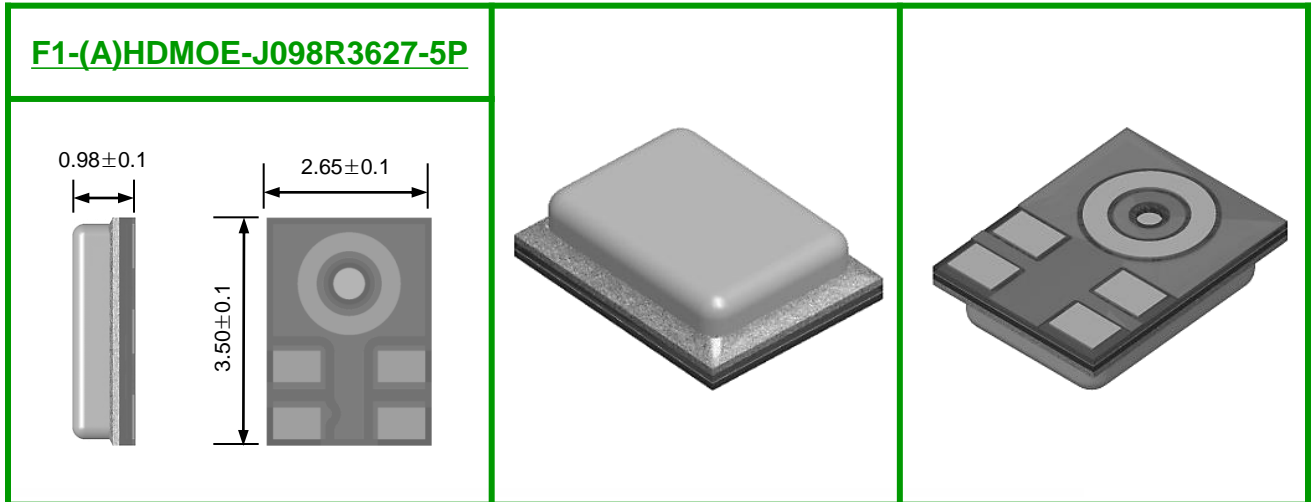
2. Wide Band : 100Hz ~ 7kHz

3. Super Wide Band : 50Hz ~ 14kHz

13. MECHANICAL CHARACTERISTICS

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

SMD Type



Lettering

