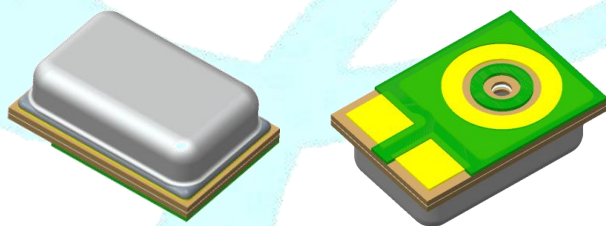


F4-(S)MOE-N090R38-3P

Little Compact
/ 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

- Analog MEMS Microphone
- Single Mode
- Bottom Port Type - Sensitivity is Typical -38dBV/Pa
- Narrow Sensitivity – +/-1dB
- Omni-directional
- 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
- Smart Speaker, Set Top Box
- Tablet Computers
- Wearable Devices
- Electrical Appliances
- Voice Recognition Systems of Appliances

3. MODEL NO.

F4-(S)MOE-N090R38-3P

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Absolute maximum rating	Units
Vdd to Ground	3.6	V
OUT to Ground	-0.3 to Vdd+0.3	V
Input Current to Any Pin	1	mA

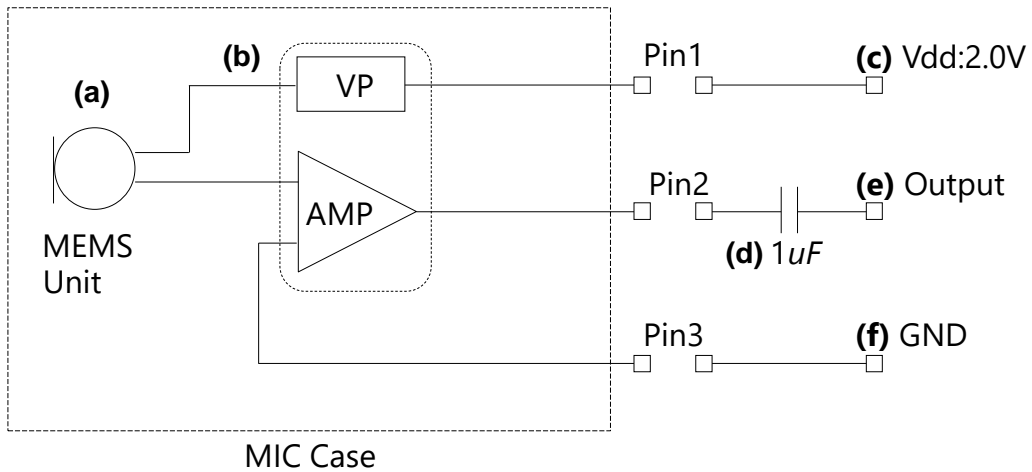
Caution : Stresses above those listed n “Absolute maximum ratings” may cause permanent damage to the device.
These are stress ratings only. Functional operation at these or any other conditions beyond those indicated under “ELECTRO-ACOUSTIC CHARACTERISTICS” is not implied. Exposure beyond those indicated under “ELECTRO-ACOUSTIC CHARACTERISTICS” for extended periods may affect device reliability.

5. ELECTRO-ACOUSTIC CHARACTERISTICS

Test Condition : 23 ± 2°C, Room Humidity = 55 ± 20 %, VDD=2.0V

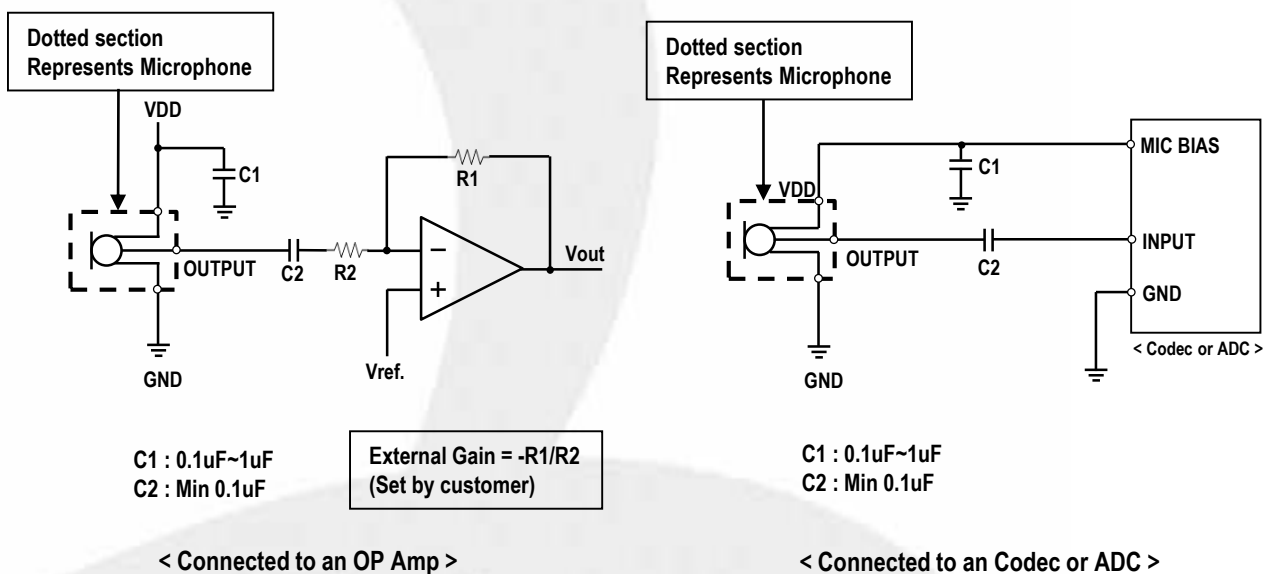
Parameter	Conditions	Min	Typ	Max	Units
Directivity		Omni-directional			
Operating Voltage (Vdd)		1.6	-	3.6	V
Sensitivity Change across Voltage	Vdd=1.6V ~ 3.6V	No Change			dB
Sensitivity (S)	94dB SPL at 1kHz, 0dB=1V/Pa	-39	-38	-37	dBV/Pa
Low Frequency Roll Off (LFRO)	-3dB relative to 1kHz	-	100	-	Hz
Output Impedance (Zout)	94dBSPL at 1kHz	-	-	200	Ω
Current Consumption	Vdd=1.6 ~ 3.6V	60	-	160	μA
Signal to Noise Ratio (SNR)	94dBSPL at 1kHz, A-weighted (20Hz~20kHz)	60	62.5	66	dB(A)
Equivalent Input Noise (EIN)	94dBSPL at 1kHz, A-Weighted (20Hz ~20kHz)	-	31.5	-	dB(A)SPL
Power Supply Rejection (PSR)	100mVp-p square wave at 217Hz, Vdd=1.8V, A-weighted	-	-95	-	dBV(A)
Power Supply Rejection Ratio (PSRR)	200mVp-p sine wave at 1kHz, Vdd=1.8V	-	60	-	dB
Total Harmonic Distortion (THD)	94dBSPL at 1kHz	-	0.2	0.5	%
	110dBSPL at 1kHz	-	-	1.0	
	118dBSPL at 1kHz	-	-	3.0	
	120dBSPL at 1kHz	-	-	5.0	
Acoustic Overload Point (AOP)	THD>10% at 1kHz	121	124	-	dB SPL
DC Output Voltage	Vdd=1.6 ~ 3.6V	-	0.86	-	V
Start-up time		0.1	-	100	ms

6. MEASUREMENT CIRCUIT



- (a) **MEMS Unit** : Membrane & Back Plate (transmit the electric signal modified from sound signal to ASIC)
- (b) **ASIC** : Impedance converter (Mechanical Signal → Electric Signal)
- (c) **Vdd** : Power Supply (Operation of ASIC)
- (d) **Rectifier Capacitor** : Removed Direct Current Factor
- (e) **Output** : Output Signal of Microphone's Sensitivity
- (f) **GND** : Ground

7. RECOMMENDED INTERFACE CIRCUIT



Note. Follow the Amp or Codec manufacturer's recommendations for circuits and layout

8. TYPICAL FREQUENCY RESPONSE CURVE(FAR FIELD)

Far Field Measurement Condition

- Temperature : 23 ± 2 °C
- Supply Voltage : 2.0V
- 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.

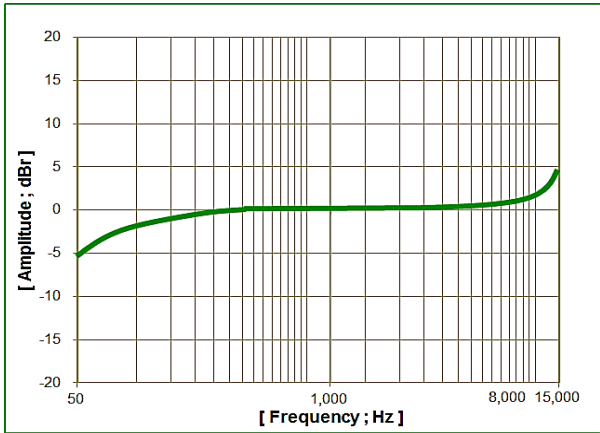


Figure 1. Typical Frequency Response, Normalized to 1 kHz

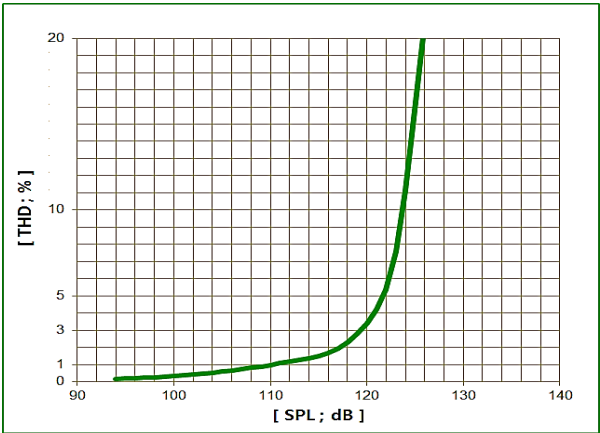


Figure 2. THD vs. Input Level

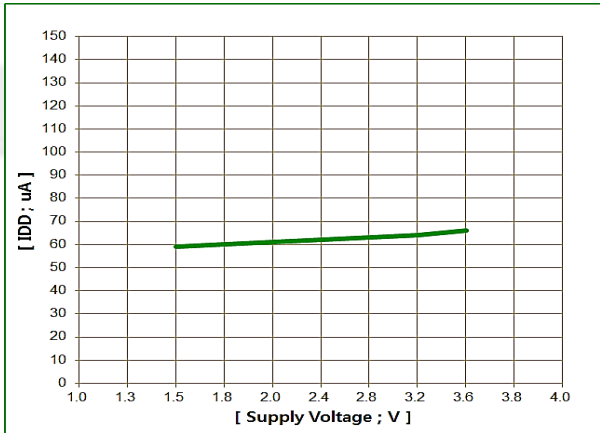


Figure 3. Typical IDD vs VDD

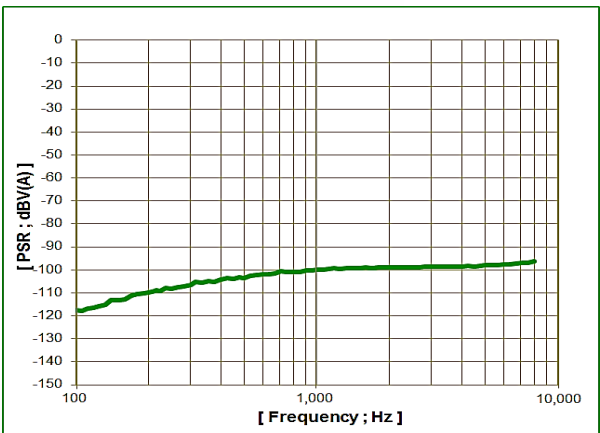


Figure 4. Typical Power Supply Rejection (PSR) vs. Frequency

Frequency Mask Specification

Frequency [Hz]	100	200	400	900	1000	1200	5000	10000	Note
Lower Limit [dBr]	0	+2	+3	+3	0	+3	+4	+4	0dBr = dBV/Pa at 1kHz
Upper Limit [dBr]	-6	-4	-3	-3	0	-3	-2	-2	

- Note : Band Frequency Range
1. Narrow Band : 300Hz ~ 3.4kHz
2. Wide Band : 100Hz ~ 7kHz
3. Super Wide Band : 50Hz ~ 14kHz

9. MECHANICAL CHARACTERISTICS

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

SMD Type

F4-(S)MOE-N090R38-3P

0.90±0.1

1.85±0.1

2.75±0.1

Lettering

MEV1.0

E : Engineering Sample

P : Pre-Production

M : Mass Production

F4

30

19

Version1

Year

Week

Version2

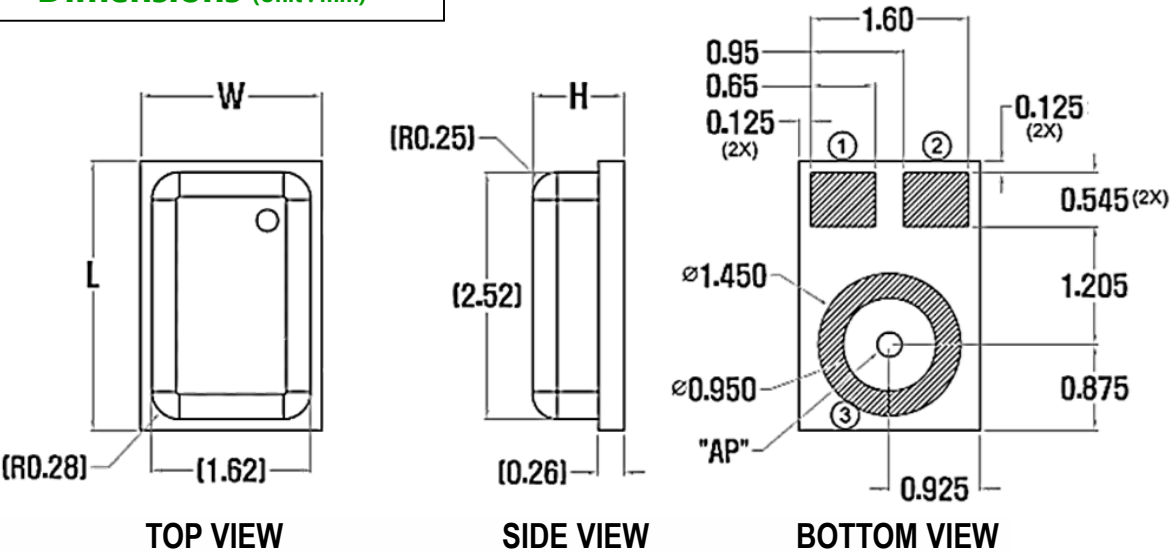
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9. MECHANICAL CHARACTERISTICS

- Mechanical dimensions & Pad Lay-out

Dimensions (Unit : mm)



Item	Dimension	Tolerance (+/-)	Units
Length (L)	2.75	0.10	mm
Width (W)	1.85	0.10	mm
Height (H)	0.90	0.10	mm
Acoustic Port (AP)	Φ 0.25	0.05	mm

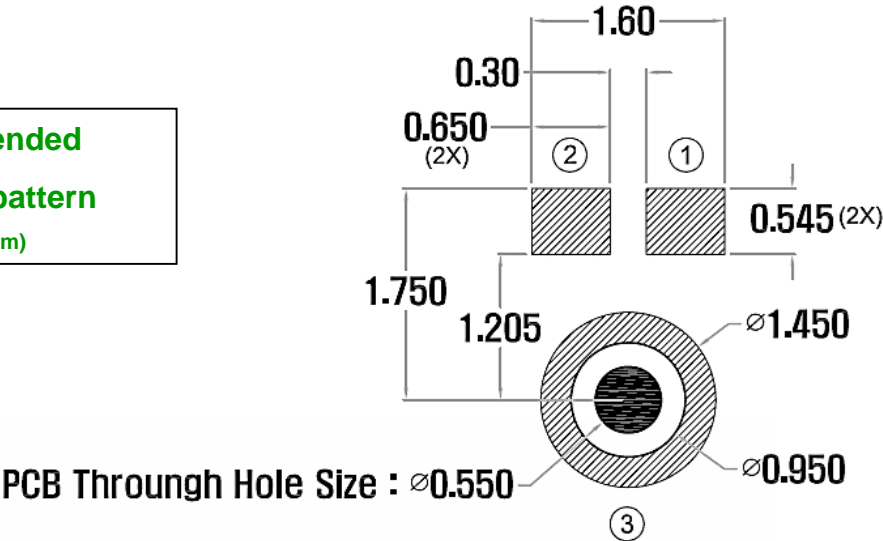
Pin #	Pin Name	Type	Description
1	Power (VDD)	Power	Power Supply
2	Output (Vout)	Signal	Output Signal
3	GND	Ground	Ground

Note : All ground Pins must be connected to ground.
"3" Pin must be sealed by solder paste on the phone PWB.
General Tolerance ±0.08mm.

9. MECHANICAL CHARACTERISTICS

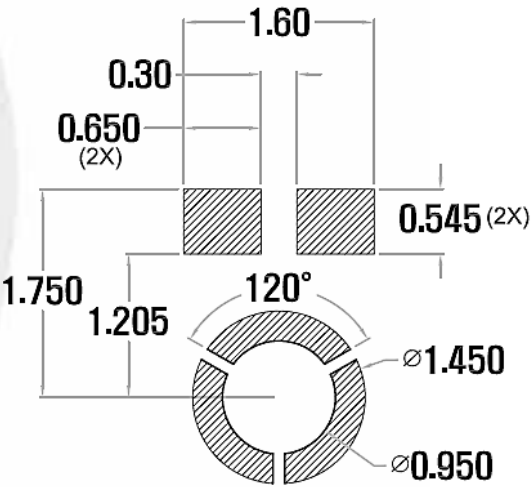
- Recommended Land Pattern & Stencil Pattern

Recommended
PCB land pattern
(Unit : mm)



Recommended
solder stencil pattern
(Unit : mm)

(thickness of metal mask: 0.10T)



10. RELIABILITY TEST CONDITIONS

Note : After test conditions are performed, the sensitivity of the microphone shall not deviate more than $\pm 3\text{dB}$ from its initial value.

TEST	DESCRIPTION
TEMPERATURE STORAGE	[High Temperature Storage] +80°C \pm 3°C x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
	[Low Temperature Storage] -30°C \pm 3°C x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
TEMPERATURE CYCLE	(-25°C \pm 2°C x 30min -> +20°C \pm 2°C x 10min -> +70°C \pm 2°C x 30min -> +20°C \pm 2°C x 10min) x 5cycles (The measurement to be done after 2 hours of conditioning at room temperature)
THERMAL SHOCK	(+85°C \pm 2°C -> -40°C \pm 2°C Change time : 20sec) x 96cycles Maintain : 30min (The measurement to be done after 2 hours of conditioning at room temperature)
HIGH TEMPERATURE AND HUMIDITY	+85°C \pm 2, 85 \pm %RH, Bias(3.6V) x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
	+70°C \pm 2, 95 \pm %RH x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
ESD (Electrostatic Discharge)	Air discharge : $\pm 8\text{kV}$, $\pm 10\text{kV}$, $\pm 12\text{kV}$, $\pm 15\text{kV}$ Vdd, Data, CLK, L/R, GND Pad each 5 times (Non-ground)
	Contact discharge : $\pm 2\text{kV}$, $\pm 4\text{kV}$, $\pm 6\text{kV}$, $\pm 8\text{kV}$ Vdd, Data, CLK, L/R, GND Pad each 5 times (Non-ground)
VIBRATION	Signal 5Hz to 500Hz, acceleration spectral density of 0.01g ² /Hz in each of 3 axes, 120 min in each axis (360min in total)
DROP	To be no interference in operation after dropped to steel floor 18 times from 1.52 meter height in state of packing
REFLOW SENSITIVITY	5 reflow cycles. Refer to reflow profile from specification item 14.

11 . TEMPERATURE CONDITIONS (Maximum Ratings)

11.1 STORAGE TEMPERATURE : -40°C ~ +100°C

11.2 OPERATING TEMPERATURE : -40°C ~ +100°C