苏州敏芯微电子技术股份有限公司
MEMSensing Microsystems (Suzhou, China) Co., Ltd.

Data Sheet

V 1.1 / Jan. 2017

MSM261D4030H1AP

PDM digital output MEMS microphone with Multi-modes

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GENERAL DESCRIPTION

MSM261D4030H1AP is an omnidirectional, Top-ported, PDM digital output MEMS microphone. It has high performance and reliability.

MSM261D4030H1AP is available in a thin 4 mm × 3 mm × 1 mm proprietary OCLGA package. It is SMT compatible with no sensitivity degradation.

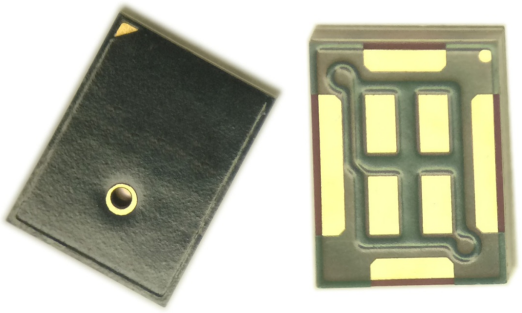
APPLICATIONS

- Mobile Phone
- Laptop
- Tablet computer
- Bluetooth headset
- Earphone
- Wearable intelligent equipment

FEATURES

- High SNR
- Fourth-order Σ-Δ modulator
- Digital PDM output
- Compatible with Sn/Pb and Pb-free solder processes
- RoHS/Halogen free compliant
- Multiple performance modes (Sleep, Low-Power, Standard Performance)
- Sensitivity Matching within +/-1dB

PRODUCT VIEW



ABSOLUTE MAXIMUM RATINGS

Parameter	Maximum value	Unit
Supply Voltage	−0.3 to 4.0	V
Sound Pressure Level	140	dB SPL
Temperature Range	−40 to 100	°C
Electrostatic discharge protection	2 (HBM)	kV

ACOUSTIC & ELECTRICAL SPECIFICATIONS

TEST CONDITIONS: 23 ±2°C, 55±20% R.H., VDD=1.8 V, f_{CLOCK}=2.4 MHz, SELECT pin grounded, no load, unless otherwise indicate

General Microphone Specifications

Parameter		Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage		V_{DD}		1.6	-	3.6	V
Clock Frequency Range	Sleep Mode			0		50	KHz
	Low-Power Mode			150		900	KHz
	Standard Performance Mode			1.1		4.0	MHz
Sleep Current		I_{SLEEP}	f_{CLOCK} ≤ 50 kHz	-	1		µA
DC Output			Fullscale = ±100	-	4	-	% FS
Directivity				Omnidirectional			
Polarity			Increasing sound	increasing density of 1's			
Data Format				½ Cycle PDM			
Short Circuit Current		I_{SC}	Grounded DATA pin	1	-	10	mA
Output Load		C_{LOAD}		-	-	200	pF
Fall-asleep Time			f_{CLOCK} ≤ 50 kHz	-	-	30	µs
Wake-up Time			f_{CLOCK} ≥ 151 kHz	-	-	200	µs
Power-up Time			V_{DD} ≥ V(min)	-	-	50	ms
Mode-Change Time				-	-	10	ms

Standard Performance Mode

TEST CONDITIONS: f_{CLOCK} = 2.4 MHz, V_{DD}=1.8 V, unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	I_{DD}	f_{CLOCK}=2.4 MHz	-	670	-	µA
Sensitivity	S	94 dB SPL @ 1 kHz	-27	-26	-25	dBFS
Signal to Noise Ratio	SNR	20 kHz bandwidth, A-weighted f_{CLOCK}=2.4 MHz	-	64	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.2	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	120	-	dB SPL
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz	-	50	-	dBV/FS
Power Supply Rejection	PSR+N	100 mVpp square wave @ 217 Hz, A-weighted	-	-80	-	dBFS(A)

Low-Power Mode

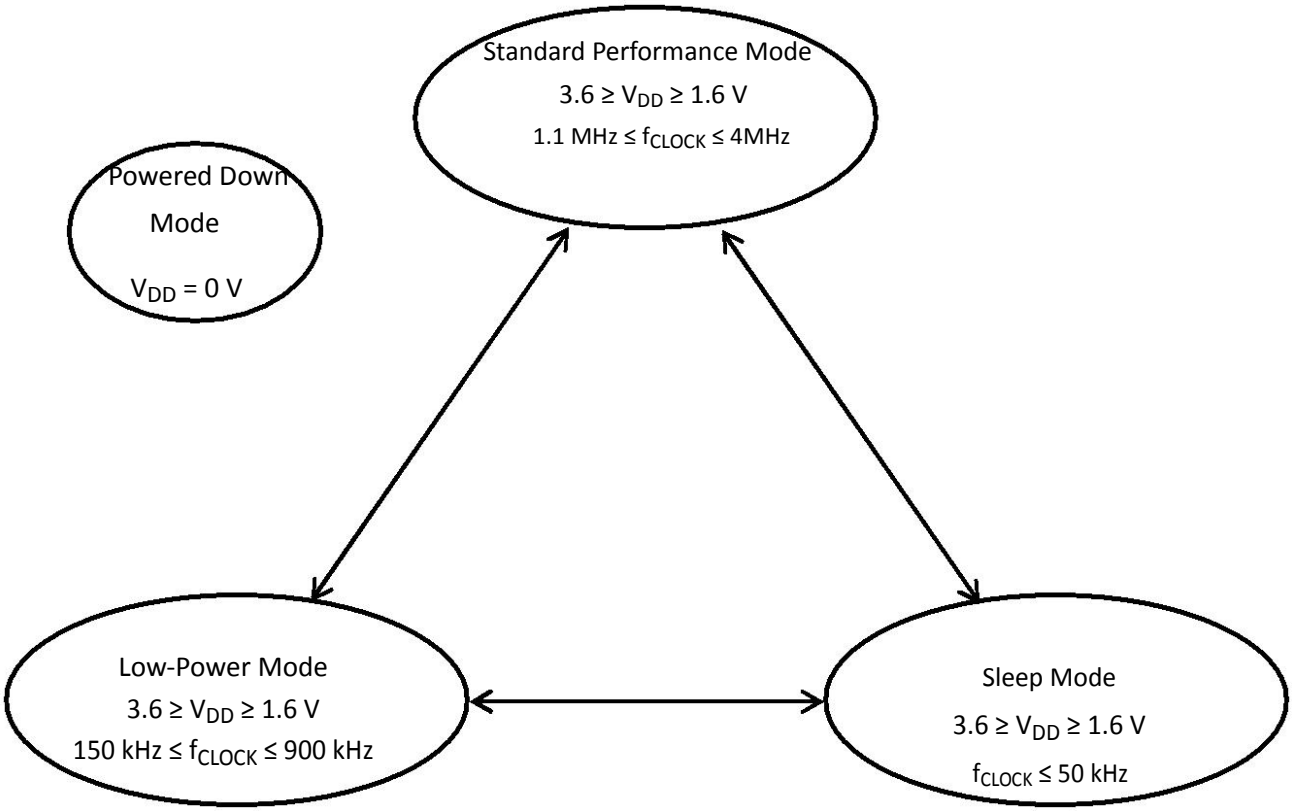
TEST CONDITIONS: f_{CLOCK} =768 kHz, V_{DD}=1.8 V, unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	I_{DD}	f_{CLOCK}=768KHz	-	290	-	μA
Sensitivity	S	94 dB SPL @ 1 kHz	-26	-25	-24	dBFS
Signal to Noise Ratio	SNR	94 dB SPL @ 1 kHz, A-weighted(20Hz-8KHz)	-	62	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.2	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	120	-	dB SPL
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz	-	50	-	dBV/FS
Power Supply Rejection	PSR+N	100 mVpp square wave @ 217 Hz, A-weighted(20Hz-8KHz)	-	-80	-	dBFS(A)

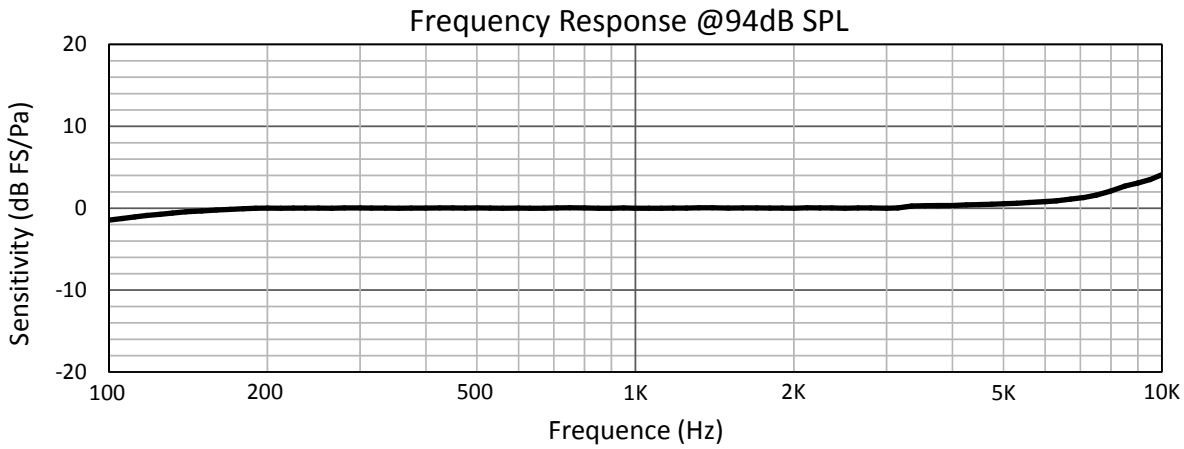
Microphone Interface Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Logic Input High	V_{IH}		0.7xV_{DD}	-	3.6	V
Logic Input Low	V_{IL}		-0.3	-	0.3xV_{DD}	V
Logic Output High	V_{OH}	I_{OUT} = 2 mA	V_{DD} -0.45	-	-	V
Logic Output Low	V_{OL}	I_{OUT} = 2 mA	-	-	0.45	V
Clock Duty Cycle		-	40	-	60	%

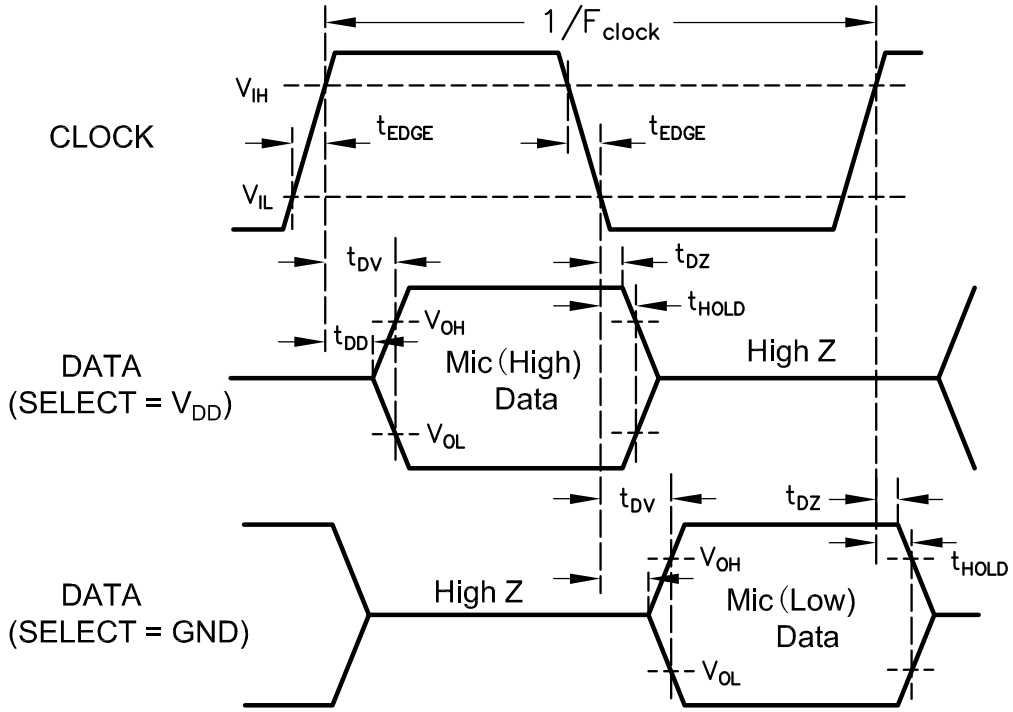
MICROPHONE STATE DIAGRAM



TYPICAL FREQUENCY RESPONSE



TIMING DIAGRAM

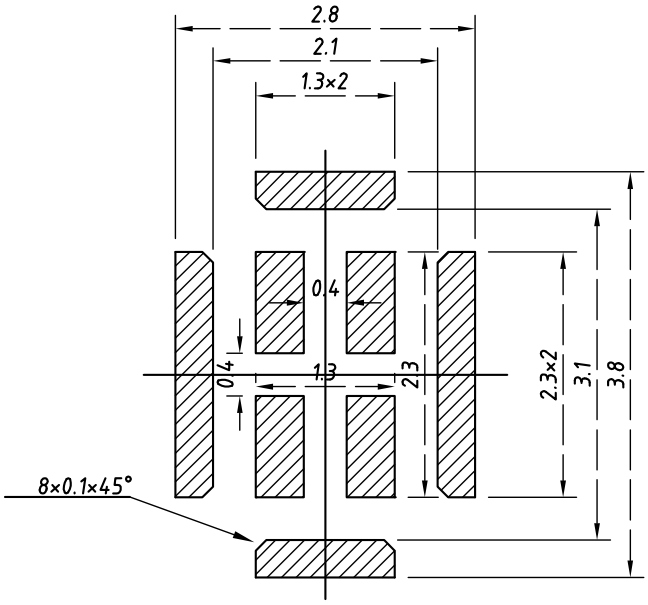


Parameter	Symbol	Min	Typ	Max
Clock Rise/Fall Time	t_{EDGE}	-	-	13ns
Delay Time to High Z	t_{DZ}	3ns	-	16ns
Delay Time to Data Line Driven	t_{DD}	18ns	28ns	40ns

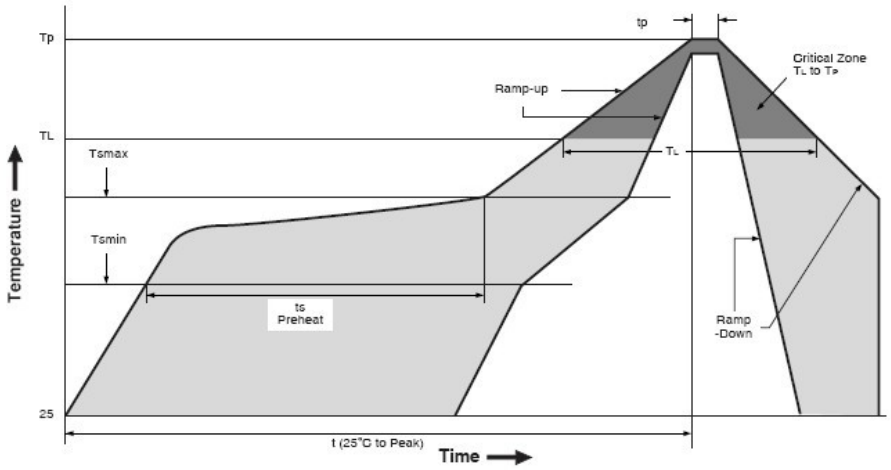
※ t_{HOLD} and t_{DV} are related to load.

SMT Parameters：

1. Recommend PCB land pattern layout：（unit: mm）

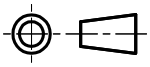


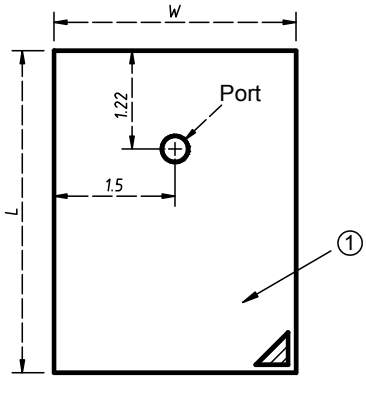
2. Recommend reflow profile:

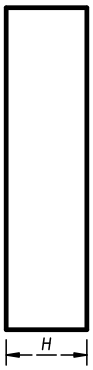


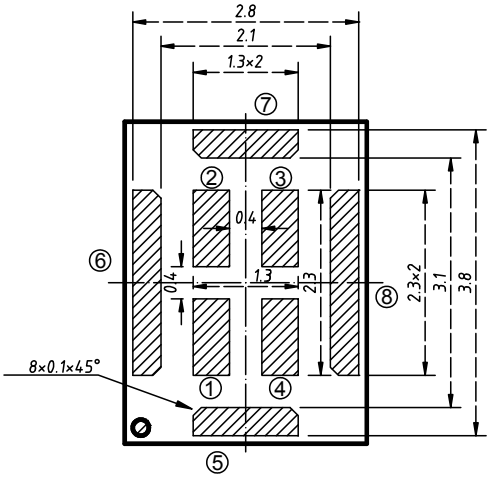
Description	Parameter	Pb-free
Average ramp rate	T_L to T_P	3 °C/sec max
Preheat		
Minimum temperature	T_{SMIN}	150 °C
Maximum temperature	T_{SMAX}	200 °C
Time(T_{SMIN} to T_{SMAX})	t_S	60 sec to 120 sec
Ramp-up rate	T_{SMAX} to T_L	1.25 °C/sec max
Time maintained above liquidus temperature	t_L	60 sec to 150 sec
Liquidus temperature	T_L	217 °C
Peak temperature	T_P	260 °C max
Time within 5°C of actual peak temperature	t_P	20 sec to 40 sec
Ramp-down rate	T_L to T_P	6 °C/sec max
Time 25 °C (t25 °C) to peak temperature	t	8 minutes max

OUTLINE DIMENSIONS AND PIN DEFINITION：









TOP VIEW　　SIDE VIEW　　BOTTOM VIEW

PIN function description

PIN#	Function
1	VDD
2	L/R
3	CLK
4	DATA
5,6,7,8	GND

Item	Dimension	Tolerance
Length (L)	4.00	±0.10
Width (W)	3.00	±0.10
Height (H)	1.00	±0.10
Port (AP)	Ø0.325	±0.05

Dimensions are in millimeters

Tolerance is ±0.15mm unless otherwise specified.

ADDITIONAL NOTES

(A) MSL (moisture sensitivity level) Class 2a.

(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.

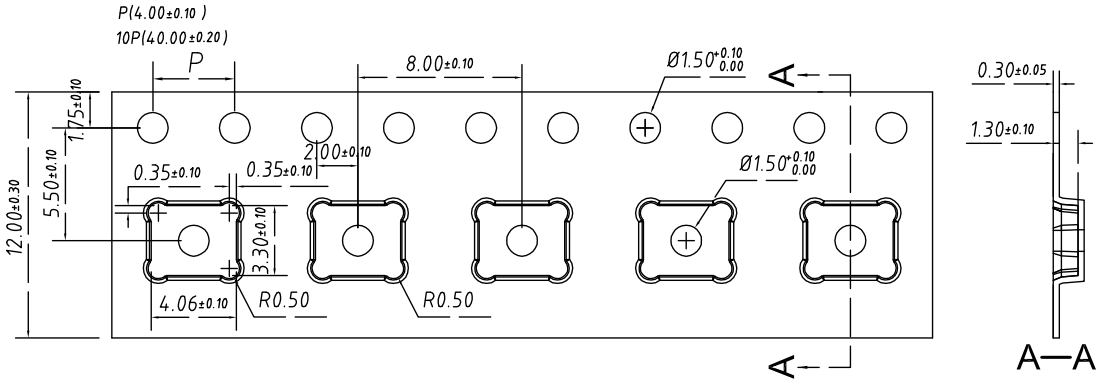
Do not apply air pressure into the port hole.

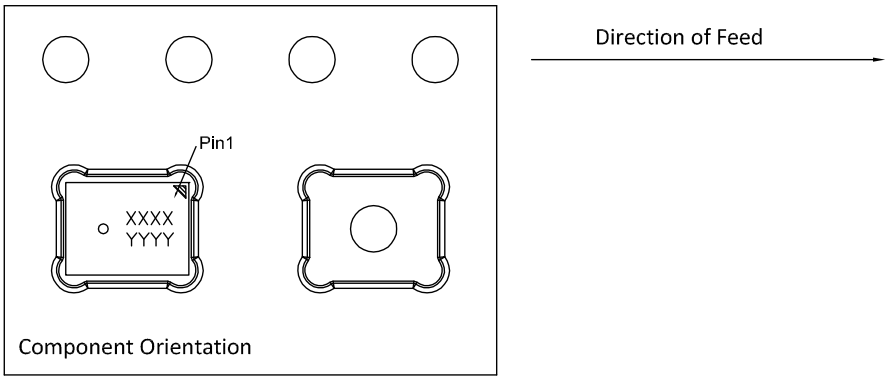
Do not pull a vacuum over port hole of the microphone.

MATERIALS STATEMENT

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

PACKAGING & MARKING DETAIL:





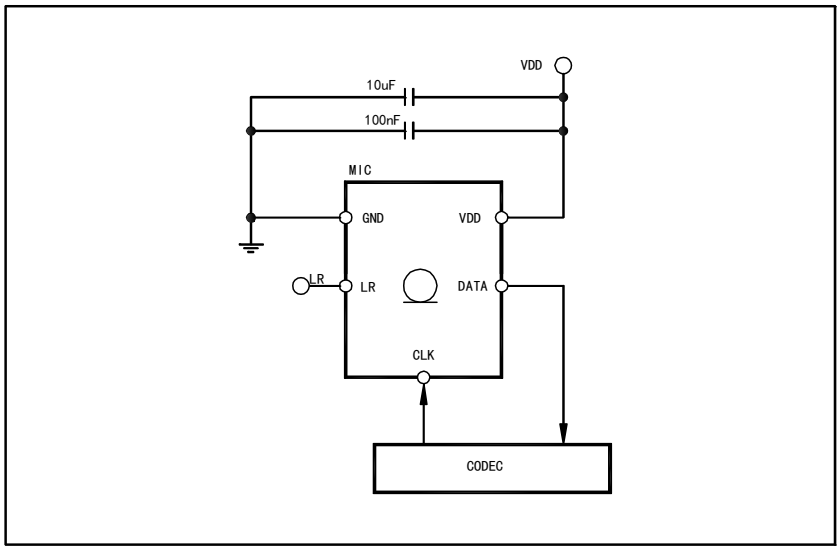
Note:

1) Dimensions are in mm;
2) Don't put the vacuum suction nozzle alignment the port hole;
3) Tape &Reel Per EIA-481 standard;
4) Label applied to external package and direct to reel;
5) Static voltage <100V;

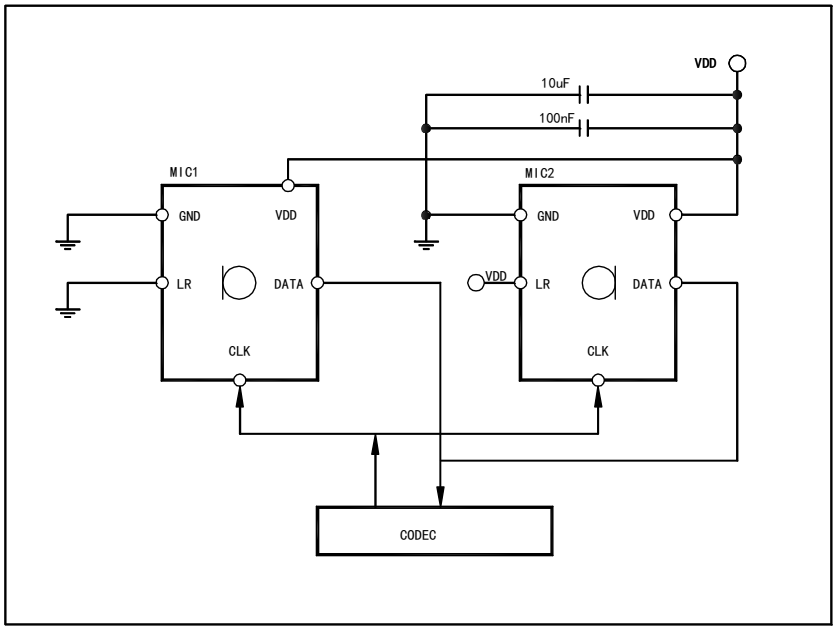
Model Number	Reel Diameter	Quantity Per Reel
MSM261D4030H1AP	13 inch	5700

RECOMMENDED INTERFACE CIRCUIT：

Figuer 1. MSM261D4030H1AP electrical connections



Figuer 2. Electrical connections for stereo configurations



Power supply decoupling capacitors (100nF ceramic,10uF ceramic) should be placed as near as possible to VDD of the device.(common design practice)

Label:	L/R:	Drives data after:	High-Z after:
Data2	High	Rising clock edge	Falling clock edge
Data1	Low	Falling clock edge	Rising clock edge

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	1,000 hours at +105°C environment (IEC 68-2-2 Test Ba)
Low Temperature Storage	1,000 hours at -40°C environment (IEC 68-2-2 Test Aa)
Reflow	5 reflow cycles with peak temperature of +260°C
ESD-HBM/LID-GND	3 discharges of ±2 kV direct contact to I/O pins. (MIL 883E, Method 3015.7)& 3 discharges of ±8 kV direct contact to lid while unit is grounded. (IEC 61000-4-2)
Vibration	4 cycles of 20 to 2,000 Hz sinusoidal sweep with 20 G peak acceleration lasting 12 minutes in X, Y and Z directions. (Mil-Std-883E, Method 2007.2 A)
Mechanical Shock	3 pulses of 3,000 G in the X, Y and Z direction (IEC 68-2-27, Test Ea)
High Temperature Bias	1,000 hours at +105°C under bias (IEC 68-2-2 Test Ba)
Low Temperature Bias	1,000 hours at -40°C under bias (IEC 68-2-2 Test Aa)
Temperature/Humidity Bias	1,000 hours at +85°C/85% R.H. under bias. (JESD22-A101A-B)
Drop Test	To be no interference in operation after dropped to 1.0cm steel plate 18 times from 1.5 meter height

NOTE: Sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of conditioning at 20±2℃, R.H 60%～70%)

REVISION HISTORY:

Revision	Subjects (major changes since last revision)	Date
1.0	Initial Release	2016-10-31
1.1	Modified the Timing diagram	2017-1-16

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