WM7120A

Top Port Analogue Silicon Microphone

DESCRIPTION

The WM7120A is a low-profile silicon analogue microphone. It offers high Signal to Noise Ratio (SNR) and low power consumption and is suited to a wide variety of consumer applications.

The WM7120A incorporates Wolfson's proprietary CMOS/MEMS membrane technology, offering high reliability and high performance in a miniature, low-profile package. The WM7120A is designed to withstand the high temperatures associated with automated flow solder assembly processes. (Note that conventional microphones can be damaged by this process.)

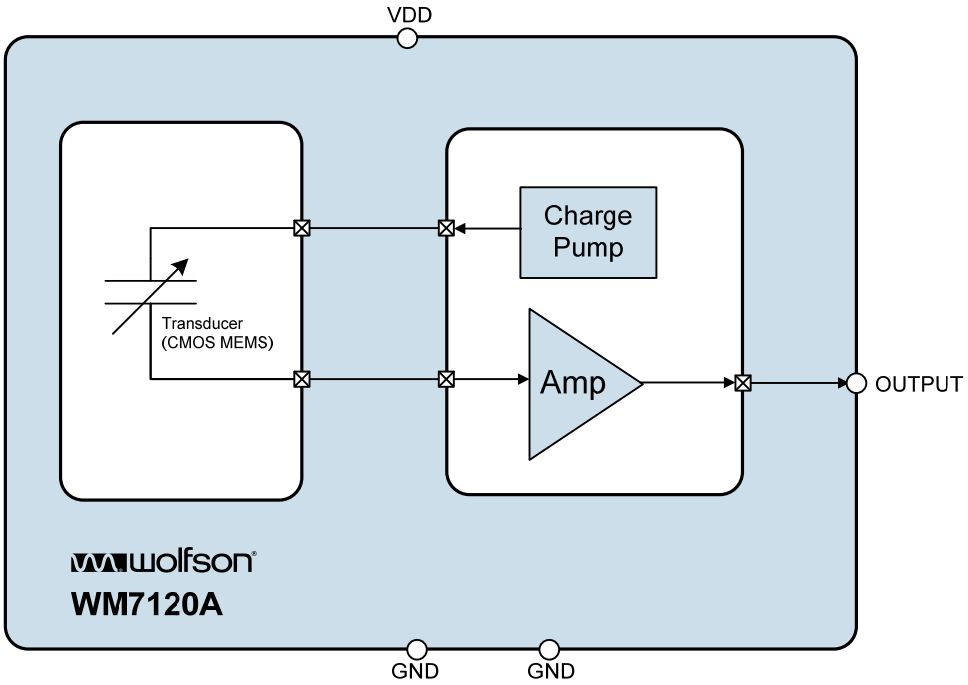
FEATURES

- High SNR 57dB, Sensitivity +/-3dB
- Low supply current 140µA
- Low profile packaging
- Support for automated flow solder assembly
- Analogue output
- Top Port Package
- 1.5V to 3.7V supply
- 3.76mm x 2.95mm x 1.10mm Package

APPLICATIONS

- Mobile phone handsets
- Portable media players
- Digital still cameras
- Digital video cameras
- Bluetooth headsets
- Portable navigation devices
- Portable games consoles

BLOCK DIAGRAM



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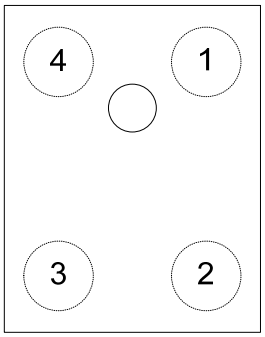
PIN CONFIGURATION



Top View

PIN DESCRIPTION

PIN	NAME	TYPE	DESCRIPTION
1	VDD	Supply	Analogue supply
2	GND	Supply	Analogue ground
3	GND	Supply	Analogue ground
4	OUTPUT	Analogue Output	Microphone analogue output

ORDERING INFORMATION

DEVICE	DESCRIPTION	TEMPERATURE RANGE	MOISTURE SENSITIVITY LEVEL	PEAK SOLDERING TEMPERATURE
WM7120AIMS/RV	Standard (tape and reel)	-40 to +100°C	MSL2A	+260°C

Note:

Reel quantity = 5700

All devices are Pb-free and Halogen free.

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings are stress ratings only. Permanent damage to the device may be caused by continuously operating at or beyond these limits. Device functional operating limits and guaranteed performance specifications are given under Electrical Characteristics at the test conditions specified.

ESD Sensitive Device. This device is manufactured on a CMOS process. It is therefore generically susceptible to damage from excessive static voltages. Proper ESD precautions must be taken during handling and storage of this device.

Wolfson tests its package types according to IPC/JEDEC J-STD-020 for Moisture Sensitivity to determine acceptable storage conditions prior to surface mount assembly. These levels are:

MSL1 = unlimited floor life at <30°C / 85% Relative Humidity. Not normally stored in moisture barrier bag.
MSL2 = out of bag storage for 1 year at <30°C / 60% Relative Humidity. Supplied in moisture barrier bag.
MSL2A = out of bag storage for 4 weeks at <30°C / 60% Relative Humidity. Supplied in moisture barrier bag.
MSL3 = out of bag storage for 168 hours at <30°C / 60% Relative Humidity. Supplied in moisture barrier bag.
The Moisture Sensitivity Level for each package type is specified in Ordering Information.

CONDITION	MIN	MAX
Supply Voltage	-0.3V	+4.2V
Operating temperature range, T_A	-40ºC	+100ºC
Storage temperature prior to soldering	30°C max / 60% RH max	
Storage temperature after soldering	-40ºC	+100ºC

IMPORTANT ASSEMBLY GUIDELINES

Do not put a vacuum over the port hole of the microphone. Placing a vacuum over the port hole can damage the device. For information on recommended pick and place vacuum point, refer to the package dimension drawing.

Do not board wash the microphone after a re-flow process. Board washing and the associated cleaning agents can damage the device. Do not expose to ultrasonic cleaning methods.

Do not use a vapour phase re-flow process. The vapour can damage the device.

Please refer to application note WAN_0273 (MEMS MIC Assembly and Handling Guidelines) for further assembly and handling guidelines.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analogue Supply Range	VDD	1.5		3.7	V
Ground	GND		0		V

ACOUSTIC AND ELECTRICAL CHARACTERISTICS

Test Conditions: VDD=2.1V, 1kHz test signal, T_A = 25°C

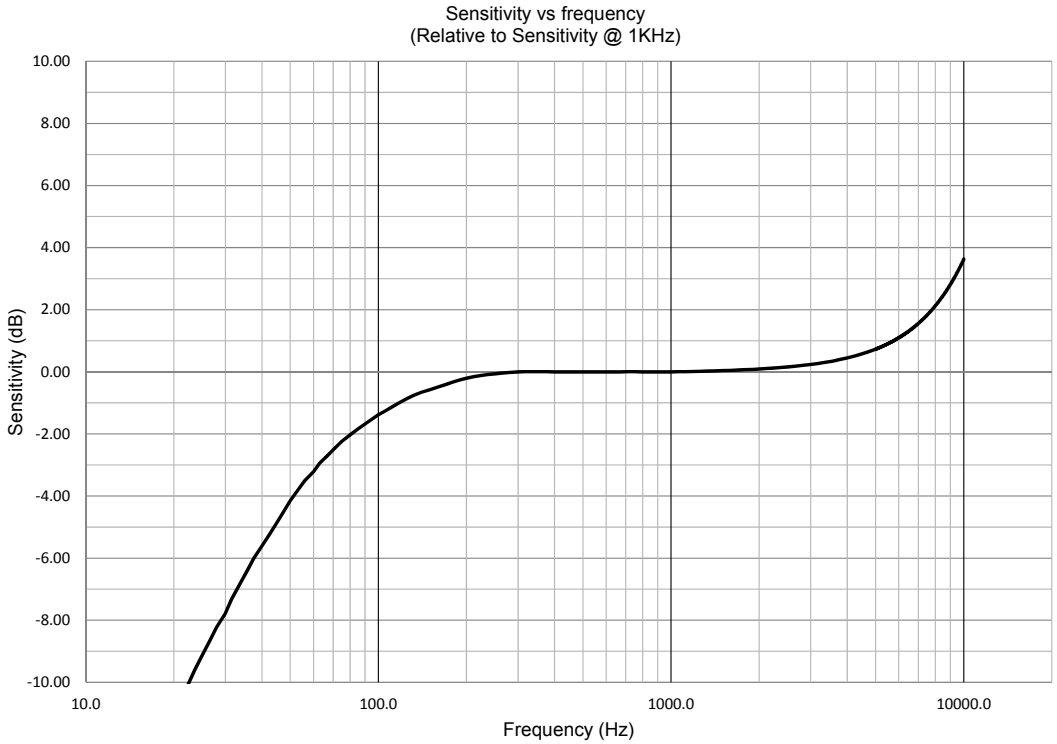
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Directivity				Omni-directional		
Sensitivity	S	94dB SPL	-45	-42	-39	dBV
Acoustic Overload		No Load THD < 10%		131		dB SPL
Signal to Noise Ratio	SNR	A-Weighted		57		dB
Total Harmonic Distortion	THD	104dB SPL		0.25		%
Dynamic Range	DR	A-Weighted, Noise floor to 1% THD		88		dB
Frequency Response		-3dB Low Frequency +3dB High Frequency		62 9300		Hz Hz
Acoustic Noise Floor		A-Weighted		37		dB SPL
Electrical Noise Floor		A-Weighted		-99		dBV
Power Supply Rejection Ratio	PSRR	100mV RMS, 217Hz		50		dB
Current Consumption	I_{VDD}			140	190	µA
Output DC Impedance	Z_{OUT}			100		Ω

TERMINOLOGY

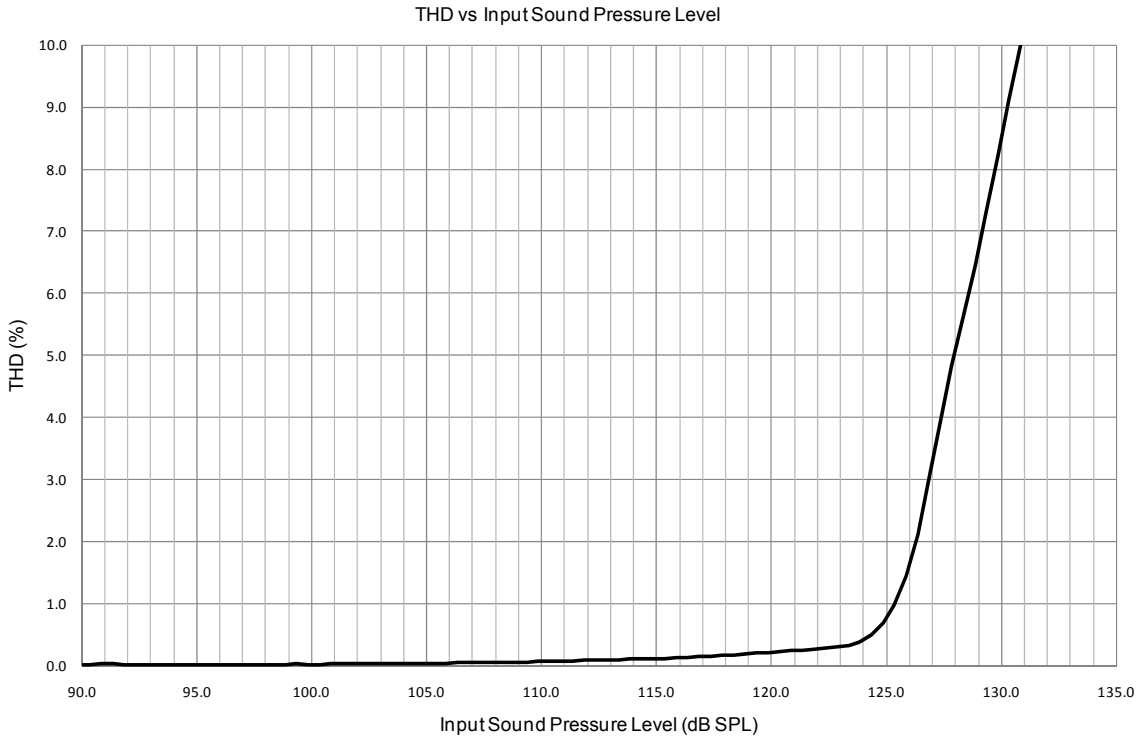
1. Sensitivity (dBV) - Sensitivity is a measure of the microphone output response to the acoustic pressure of a 1kHz 94dB SPL (1Pa RMS) sine wave.
2. Signal-to-Noise Ratio (dB) – SNR is a measure of the difference in level between the output response of a 1kHz 94dB SPL sine wave and the idle noise output.
3. Total Harmonic Distortion (dB) – THD is the ratio of the RMS sum of the harmonic distortion products in the specified bandwidth (see note below) relative to the RMS amplitude of the fundamental (ie. test frequency) output.
4. Dynamic Range (dB) – DR is the ratio of the 1% THD microphone output level (in response to a sine wave input) and the idle noise output level.
5. All performance measurements are carried out with 20 kHz low pass 'brick wall' filter and, where noted, an A-weighted filter. Failure to use these filters will result in higher THD and lower SNR values than are found in the Acoustic and Electrical Characteristics. The low pass filter removes out of band noise.

TYPICAL PERFORMANCE

FREQUENCY RESPONSE



THD RATIO



APPLICATIONS INFORMATION

RECOMMENDED EXTERNAL COMPONENTS

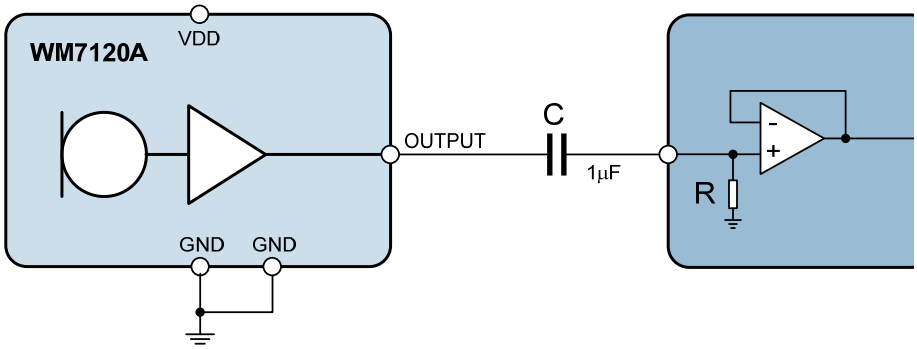


Figure 1 WM7120 Recommended External Components

A DC-blocking output capacitor is required on the OUTPUT pin, as illustrated in Figure 1. A single capacitor is required for a single-ended connection. The capacitor must be correctly selected as it affects the cut-off frequency of the output path. A low cut-off frequency is desirable as it means there is no significant filtering of the audio bandwidth.

The 3dB cut-off frequency of the output path is given by the equation below, where C is the output capacitance and R is the input resistance of the other circuit.

$$\text{3dB filter roll-off frequency} = \frac{1}{2\pi RC}$$

A typical recommended configuration, with 1uF DC-blocking capacitor and 20kΩ minimum input circuit impedance, gives a 3dB cut-off frequency of 10Hz or less. Tantalum electrolytic capacitors are particularly suitable for the DC-blocking components as they offer high stability in a small package size.

OPTIMISED SYSTEM RF DESIGN

For optimised RF design please refer to document WAN0278 (Recommended PCB Layout for

Microphone RF Immunity in Mobile Cell Phone Applications) for further information.

CONNECTION TO A WOLFSON AUDIO CODEC

Wolfson provides a range of audio CODECs incorporating an analogue microphone input interface; these support connection to silicon microphones such as the WM7120A.

The recommended connection of a WM7120A silicon microphone to the WM8280 is illustrated in Figure 2 (for single-ended mode) and Figure 3 (for pseudo-differential mode).

A DC-blocking capacitor is required, as described in the previous section. A 1µF decoupling capacitor is also recommended; this should be positioned close to the VDD pin of the WM7120A.

Further information on the WM8280 is provided in the product datasheet, which is available from the Wolfson website. The equivalent connections can be made to other Wolfson devices in a similar manner.

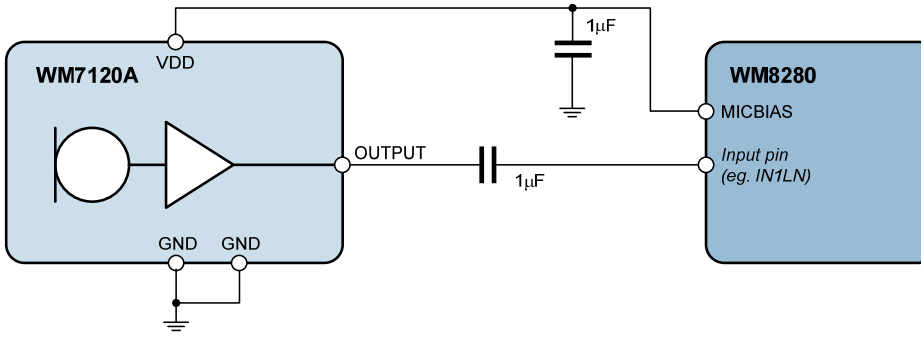


Figure 2 WM7120A Silicon Microphone Single-ended Connection to WM8280

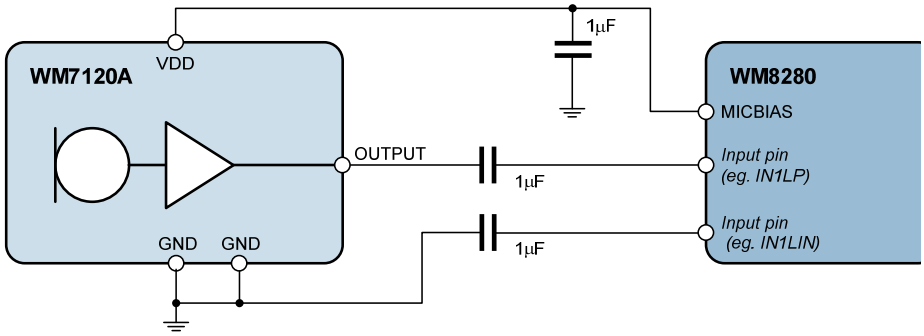


Figure 3 WM7120A Silicon Microphone Pseudo-differential Connection to WM8280

RECOMMENDED PCB LAND PATTERNS

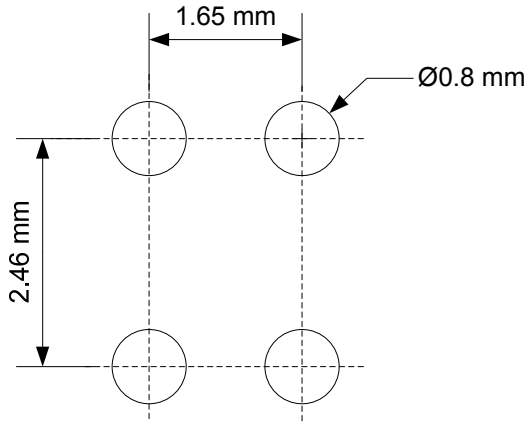
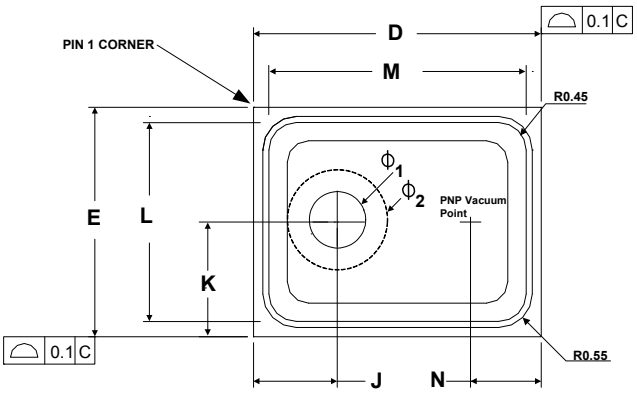


Figure 4 Recommended Customer PCB Land Pattern

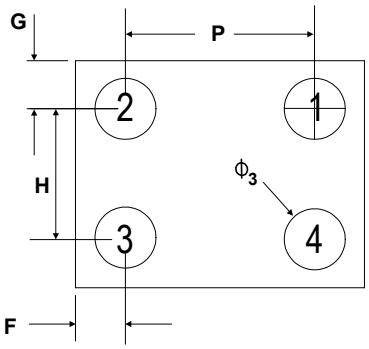
(Note that all other dimensions can be obtained from the package dimensions)

PACKAGE DIMENSIONS (LGA)

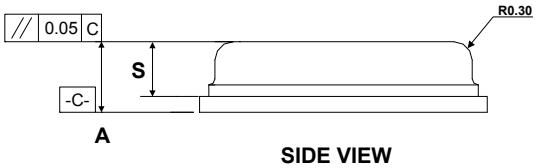
MS4: PACKAGE 3.76 x 2.95 x 1.10 mm BODY **DM100.C**



TOP VIEW



BOTTOM VIEW



SIDE VIEW

Symbols	Dimensions (mm)			
	MIN	NOM	MAX	NOTE
A	1.03	1.10	1.17	
D	3.66	3.76	3.86	
E	2.85	2.95	3.05	
F	0.55	0.65	0.75	
G	0.55	0.65	0.75	
H	1.60	1.65	1.70	
J	1.03	1.18	1.33	
K	1.33	1.48	1.63	
L	2.46	2.50	2.54	
M	3.27	3.31	3.35	
N		1.16		PNP Vacuum Point
P	2.41	2.46	2.51	
S	0.81	0.86	0.91	
ϕ_1	0.50	0.55	0.60	
ϕ_2		1.31		Gasket Area
ϕ_3	0.65	0.80	0.95	

NOTES:
1. THE SEATING PLANE IS REPRESENTED BY PRIMARY DATUM -C-
2. THE DEVIATION FROM THE SEATING PLANE DUE TO WARPAGE OR TWIST IS SPECIFIED AS MAX 50µm (FLATNESS).
3. LID SHOULD BE PARALLEL TO THE SEATING PLANE ±50µm.

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REVISION HISTORY

DATE	REV	ORIGINATOR	CHANGES
02/05/11	2.0	JMacD	First release of AE variant
	2.0	KC	Added the WM7120AE Updated the features for WM7120AE Electrical noise floor to 101dBV Updated the frequency response curve, the THD curves, Updated the +3dB frequency response to 9300Hz. Updated WM7120AE frequency response performance, and sensitivity performance Updated the reel quantity to 4800 Remove the 20kohms test condition. Modified the wording for 1uF and 20kohms to ensure 10Hz low frequency cut off
	2.0	JMacD	Package Diagram updated to DM058E Tolerances adjusted and dimensions standardized Updated tolerances for measurements G and J
06/05/11	2.0	JMacD/MR	Acoustic and Electrical Char: Acoustic Overload updated to 131.
10/05/11	2.0	MR	Updated the -3dB frequency response to 40Hz.
07/06/11	2.1	KC	Change on the pin configuration and top view.
01/07/11	2.1	JMacD/MR	Package Drawing update to reflect new pin numbering.
04/07/11	2.2	JMacD/MR	Order Code for Enhanced, 62Hz roll off updated to: WM7120AIMSE/V WM7120AIMSE/RV
11/10/11	2.3	JMacD	Package Diagram changed to DM100B.
09/09/11	3.0	KC	Added reference to WAN_0273. Updated the interface CODEC to WM8994. SNR updated to 57dB, Noise Floor to -99dBV and acoustic noise floor to 37 dB SPL.
20/02/12	3.1	KC/JMacD	Acoustic and Electrical Characteristics: Sensitivity unit changed from dB to dBV. Updated the terminology 1. Dynamic Range added. DR definition added
11/11/13	3.2	JMacD	Package Diagram updated to DM100C.
11/11/13	3.2	JMacD	CODEC reference changed to WM8280.
12/11/13	3.2	JMacD	Part number WM7120AIMSE/RV removed.
07/01/14	3.2	JMacD	Removed reference to WM7120 ‘E’ variant throughout. Part number WM7120AIMSE/V removed. Part number WM7120AIMS/V removed. Optimised System RF Design section added