



PRODUCT INFORMATION

Part Numbers

CM06M-03S28-BD-1
 Legacy # CEM-DB60221-283AD-L01CAR-00-0

Revision 0-2019

Type

Omni-Directional Digital Electret Condenser Microphone

Description

This DECM (Digital electret condenser microphone) and an ECM consists of a preamplifier ,a delta sigma modulator ,and on chip voltage regulator. The A/D conversion is performed by a 4th order $\Delta\Sigma$ modulator.



Compliance

- **RoHS, Lead Free**
- **ISO 9001:2000**



Date	ECN #	Rev #	Description	Page	Prepared By	Approved By



1. Electrical Characteristics

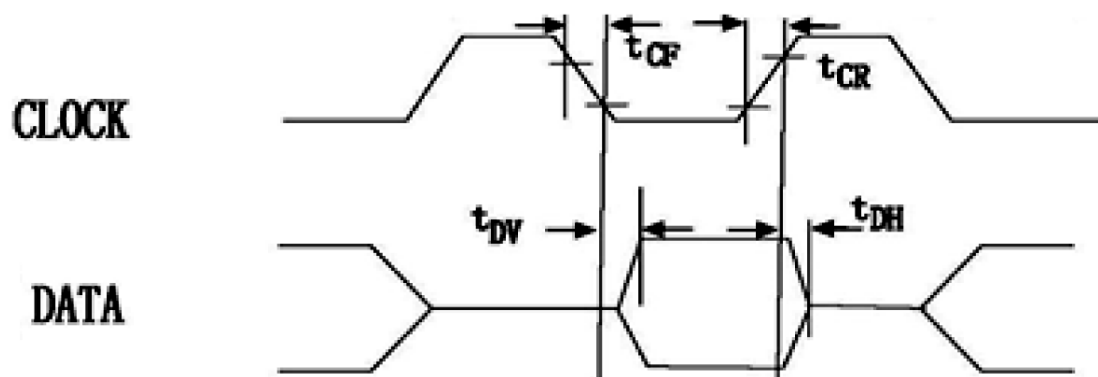
This DECM (Digital electret condenser microphone) and an ECM consists of a preamplifier ,a delta sigma modulator ,and on chip voltage regulator. The A/D conversion is performed by a 4th order $\Delta\Sigma$ modulator.

No	Parameter	Symbol	Min	Typ	Max	Unit	Comments
1.1	Sensitivity(analog signals output)	S	-31	-28	-25	dB	0dB=1V/Pa, at 1kHz
1.2	Noise transfer function cut-off	NTF		0.055 x fCLK		MHz	Relative to fCLK
1.3	Modulator order			4			Given by design
1.4	Idle mode tone frequency	fT	22			KHz	@ Fclk=1 MHz
1.5	Clock freq.(sample rate)	fCLK	1	2.4	3	MHz	
1.6	Clock duty cycle	fDC	40	50	60	%	
1.7	Jitter tolerance	δ			0.5	ns	
1.8	Output Voltage low	VIOL	-0.3		0.35 X VDD	V	
1.9	Output Voltage high	VIOH	0.65 X VDD		VDD+0.3	V	
1.10	Output current at high voltage	IH	1		10	mA	Short circuit current
1.11	Extended Vdd range		2.4	3.3	3.63	V	
1.12	Signal to Noise Ratio	S/N	57			dB	at 1kHz S.P.L=1Pa (A-Weighted Curve)

2. Digital Logic Characteristics

Symbol	Parameter	Min	Typical	Max	Units
V _{IT+}	Positive-going input threshold voltage		1.82		V
V _{IT-}	Negative-going input threshold voltage		1.27		V
ΔV_{IT}	Input hysteresis		0.55		V
V _{IOL}	Data input/output logic low level	-0.3		0.35*V _{DD}	V
V _{IOH}	Data input/output logic high level	0.65*V _{DD}		V _{DD} +0.3	V

	High Impedance	Data sampled at
DATA	Falling clock	Rising clock



Timing diagram of CLK and DATA signals



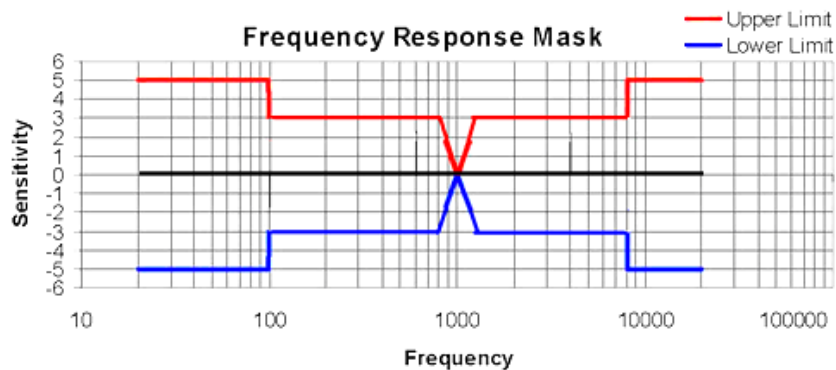
3. Frequency Response Curve

The microphone must fulfill the relative frequency response tolerance window specifications with the following measurement conditions.

- TEMPERATURE: +20°C
- ACOUSTIC STIMULUS: 1Pa (94dB SPL) - measured at 50 cm from the Hi-Fi loudspeaker. The loudspeaker must be equalized for flat frequency response.
- POSITION: The far field measurement point is located 50cm from the Hi-Fi speaker. The speaker must be positioned away from any reflecting surfaces. The 1Pa acoustic stimulus is at the microphone position.

Frequency Response Mask for Digital microphones

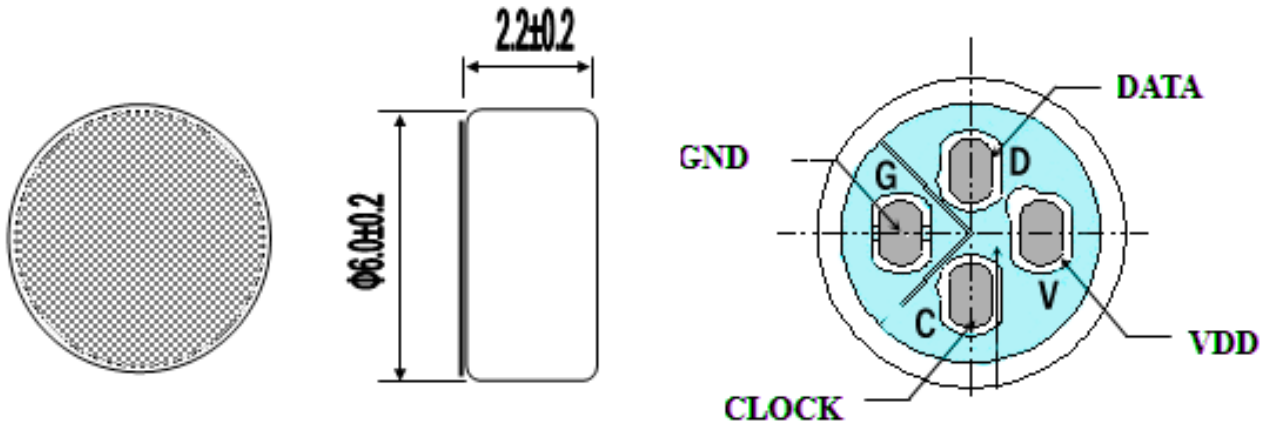
Frequency / Hz	Lower limit	Upper limit	Unit
20 ... 100	-5	+5	dBr 1kHz
100 ... 8000	-3	+3	dBr 1kHz
8000 ... 20 000	-5	+5	dBr 1kHz



NOTE: The distribution of the sensitivity must be a Normal Distribution and the Cpk value for the sensitivity must be at least 1.66 in all conditions.

4. Mechanical Characteristics

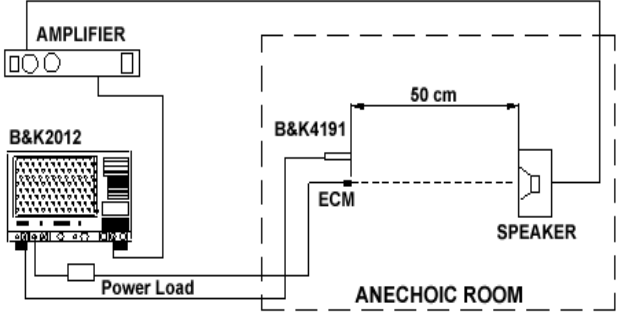
- 4.1. Weight: 0.3 grams
- 4.2. All dimensions in millimeter (mm).
- 4.3. Tolerance: as specified.
- 4.4. Microphone Dimensions: 6.0 mm x 2.2 mm



Name	Function
GND	Ground
CLK	User-adjustable clock input to microphone
DATA	Microphone PDM data output
V _{DD}	Power supply and IO voltage for microphone



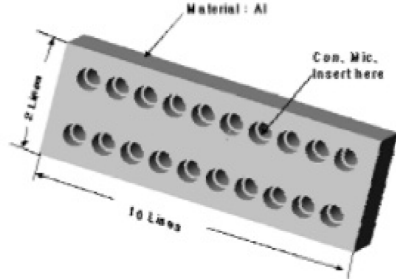
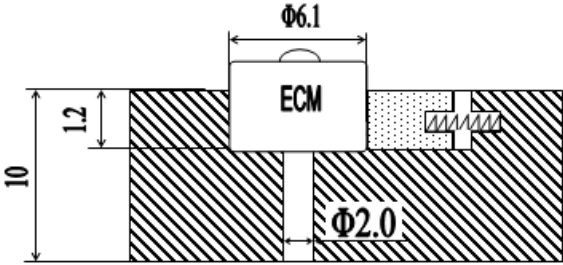
5. Measurement Circuit

Measurement Set Up	Measurement Conditions
 <p>The diagram shows a measurement setup within an anechoic room. An amplifier is connected to a B&K2012 microphone and a speaker. A B&K4191 microphone is positioned 50 cm from the speaker. An ECM (Equivalent Circuit Model) is connected to the B&K4191 microphone. A power load is connected to the amplifier.</p>	<p>In Normal Weather Environment Temperature: 5~+35°C Relative Humidity: 45 ~ 85% Air Pressure: 86 ~ 106Kpa</p> <p>In Arbitrate Weather Environment Temperature: 20±2°C Relative Humidity: 60 ~ 70% Air Pressure: 86 ~ 106Kpa</p>
Testing Procedure	
<ol style="list-style-type: none"> 1. Measure the microphones under standard operating condition. 2. Put the microphone and standard microphone face to the sound source (speaker), the distance between sound source and microphone & standard microphone is 50 cm. And keep the center distance 5cm between them to ensure that the change of sound pressure should be kept within ± 1 dB. 3. Keep the sound source pressure within ± 1 dB from speaker Measured by standard microphone. 4. The sensitivity of microphone can obtain its output voltage when sound source kept within 1,000 Hz. & 0.1 Pa. 	

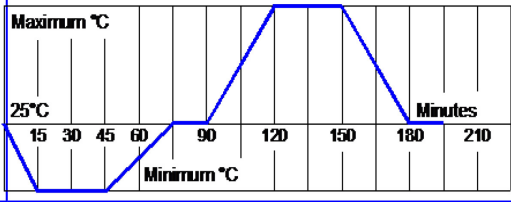


6. Soldering Condition

- 6.1. We suggest using anti-static welding machine which can control soldering temperature automatically.
- 6.2. Soldering temperature should be controlled under 320°C and soldering time for each terminal should be 1~2 seconds
- 6.3. Microphone should be fixed on the metal block (heat sink), which has high radiation effects, and heat sink shall contact with MIC tightly.
- 6.4. Microphone may easily be destroyed by the static electricity and the countermeasure for eliminating the static electricity shall be executed (worktable and human body shall be ground connection)
- 6.5. Heat Sink

6.5.a. Shape of heat sink	6.5.b. Shape of hole at fixed part
	

7. Reliability

Thermal Operating Temperature Test	240 hours continuous operation at Rated Voltage , at Maximum Rated Operating Temperature * 240 hours continuous operation at Rated Voltage , at Minimum Rated Operating Temperature *
Thermal Storage Temperature Test	96 hours storage at Maximum Rated Storage Temperatures * 96 hours storage at Minimum Rated Storage Temperatures *
Temperature Shock	30 cycles of Minimum and Maximum Operating Temperature Each cycle shall be set per diagram and is 3 hours long * <div data-bbox="992 1016 1500 1245" style="float: right; border: 1px solid black; padding: 5px;"> <p style="text-align: center;">SINGLE CYCLE</p>  </div>
Highly Accelerated Temperature and Humidity Stress Test (HAST)	The DUTs are soldered onto a test PCB. The PCB is placed in the oven and the input terminal leads are brought out and connected to the electrical power supply. The test PCB is powered up using the electrical power supply that is designed to maintain a constant voltage of the maximum rated voltage for the duration of the test. The oven is programmed to maintain a temperature of 110°C, 85% RH for 264 hours with a pressure of 122 KPa introduced *
Humidity Test	Precondition at +25°C for 1 hour . Then expose to +70°C with 90 to 95% relative humidity for 120 hours *
ESD Sensitivity	Perform ESD sensitivity threshold measurements for each contact according to MIL-STD-883G, Method 3,015.7 for Human Body Model. Identify the ESD threshold levels indicating passage of 8,000V Human Body Model. *
Termination Strength	Maximum of 9.8 N (1.0 Kg) load pull test, applied to each terminal in axial direction for 1 minute
Drop Test	Samples are mounted on a test PCB. The PCB itself was then glued onto a metal fixture slightly bigger than the PCB. The fixture was dropped naturally from the 1.5 m height onto a steel surface. The test was repeated in six directions for three times, total 18 times and inspected for mechanical damage *
Random Vibrations	Vibrate randomly along three perpendicular directions for 30 minutes in each direction . The Power Spectral Density of the vibration had a + 3 dB/octave rise from 20 Hz to 80 Hz, a constant value of 0.053 g ² /Hz from 80 Hz. to 350 Hz and finally a -3 dB/octave drop from 350 Hz to 2,000 Hz. Having subjected the units to vibration, they were tested for all electrical and acoustic parameters
Mechanical Shock	Subject samples to half sine shock pulses (3,000 g's ±15% for 0.3 ms) in each direction, totally 6 shocks
Sinusoidal Vibration	Vibrate randomly from 10 Hz to 55 Hz, 1 octave/minute with 2 mm amplitude (peak to peak) for 2 hours in each direction For this test are that the PCB must deflect at least 1mm before mechanical failure of the unit occurs
Life Test	Subject samples to +125°C for 168 hours under full maximum rated voltage
* Reliability Test Performance	Parts should conform to original performance within ±3 dB, after 3 hours of recovery period



8. Concept of Unit

The difference between concept of “PASCAL” unit and the one unit “ μbar ” can be explained as follows:
In calibrating the sensitivity of ECMs, the sensitivity is manifested differently according as the units “PASCAL” or “ μbar ”. For example:

$$-60 \text{ dB (0 dB = 1 V / } \mu\text{bar)} - -42 \text{ dB (0 dB = 1 V / Pa)}$$

9. Construction Materials

ITEM	PART NAME	MATERIAL	QTY
10	Chip Capacitor	100000PF	1
9	IC		1
8	P.C.B	FR-4	1
7	Copper Ring		1
6	HOUSING CHAMBER		1
5	ELECTRET BACK		1
4	SPACER		1
3	POLARIZED DIAPHRAGM		1
2	CASE	AL-mg alloy	1
1	FELT	Fabric cloth	1



10. Part Number Description




Code	Description
CEM	Challenge Electronics Microphone
-	dash
D	Digital
B	Back Electret
60	6.0 mm diameter
22	2.2 mm height
1	PCB Type
-	dash
283	Sensitivity 28 ± 3 dB
A	
D	
-	dash
L01	Solder termination
CAR	Capacitor
-	dash
00	
-	dash
0	

11. Warranty

For a period of one (1) year from date of shipping under normal handling and operations conditions
This warranty does not apply to products damaged through misuse, abuse, improper installation, alteration, rework, or attempt to repair



12. Packaging

<p>100 Parts →  X 1</p> <p>↓ X 10</p> <p>1,000 Parts →  X 10</p> <p>↓ X 30</p> <p>30,000 Parts →  X 30</p>	MARKING	Small Box			
	Middle Box	Dimensions	X1	8 cm	
	Part Number		Y1	8 cm	
	Other PN if required		Z1	1 cm	
	Quantity	Quantity		100	
	Lot and/or Date Code	Middle Box			
	Bundle Number	Dimensions	X2	17.5 cm	
	Shipping Box		Y2	8.5 cm	
	Part Number		Z2	5 cm	
	Other PN (if required)	Quantity	1,000		
	Quantity	SHIPPING BOX			
	Lot and/or Date Code	Dimensions	X3	55 cm	
	PO Number		Y3	23 cm	
	Net Weight		Z3	23.5 cm	
Gross Weight	Number of Bundles		30		
Box Number of Boxes	Quantity		30,000		
Made in China	Approximate Gross Weight		9.9 Kg.		

Revision	Description	By	Date
0-2019	Revised PN CEM-DB60221-283AD-L01CAR-00-0	WS	11/14/2019