



Specifications of Digital Silicon Microphone

GTM4030DT261SFD0

Rev 1.0

(RoHS Compliant & Halogen Free)

GMEMS Approvals	Documentor	Verifier	Approver
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Customer Approvals	TESTED BY	CHECKED BY	APPROVED BY



1. PRODUCT DESCRIPTION

GTM4030DT261SFD0 is an omni-directional miniature MEMS digital microphone with a package size of 4.00×3.00×1.00 mm and a top-port for sound input. It consists of a MEMS sensor and an encoder IC, which converts sensor analog output signal into 1-bit digital PDM data. The digital output format eliminates AC coupling capacitor, reduces RF noise coupling, and eases PCB layout requirement.

GTM4030DT261SFD0 has high performance and reliability, that is, its sensitivity will not be affected by temperature, vibration, humidity, and/or time. It is able to endure lead-free soldering reflow process temperatures up to 260°C commonly used in the SMT process. Provided on tap-and-reel, GTM4030DT261SFD0 is ideally suited for low-cost high-volume applications.

2. APPLICATIONS:

1. Smart electronic devices
2. Portable communication device
3. Notebooks, tablets, and desktops
4. Headphone and headset accessories
5. Digital video cameras

3. FEATURES

- | | |
|-------------------------------|---------------------------------------|
| ➤ 4×3×1mm Top-port Package | ➤ High Reliability |
| ➤ Sensitivity of -26(±1) dBFS | ➤ Great RF Immunity |
| ➤ SNR of 64dB(A) | ➤ Lead-free Reflow Process Compatible |
| ➤ Low Power Consumption | ➤ Supports Dual Multiplexed Channels |
| ➤ Flat Frequency Response | ➤ Omni-directional |
| ➤ PDM Output | ➤ Ultra-Stable Performance |

4. ABSOLUTE MAXIMUM RATINGS

Supply Voltage: VDD to GND-0.3V~5V

L/R, CLOCK, DATA Voltage to GND.....-0.3V~ (VDD+0.3V)

ESD Tolerance

The Lid Mode8kV

The I/O Pin Mode4kV



TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min	Typ	Max	Unit
Operating Temperature		-40		+85	°C
Storage Temperature	Solder on PC board	-40		+105	°C
	In Tape and Reel	-10		+50	°C

CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

5. ACOUSTIC & ELECTRICAL SPECIFICATIONS

Test Conditions:

Ta = 25°C, R.H. = 50±20%, V_{DD} = 3.0V, F_{clock}=2.048MHz, Duty Cycle = 50%, No Load

Input sound pressure P_{IN} = 94dB SPL@1kHz

SNR & noise floor measurement is based on 100Hz ~ 10KHz passband with A-Weighting filter applied unless specifically specified in the table below.

Parameter	Conditions	Min	Typ	Max	Unit
Directivity		Omni-Directional			
Power Supply Voltage		1.6		3.6	V
Sensitivity	@1KHz (0 dB = 1V/Pa)	-27	-26	-25	dBFS
Signal-to-Noise Ratio (SNR)	@1KHz (0 dB = 1V/Pa)		64		dB(A)
Total Harmonic Distortion (THD)	94dB SPL @ 1KHz		0.2		%
Acoustic Overload Point (AOP)	@1KHz, THD < 10%		125		dB SPL
Power Supply Rejection (PSR)	217Hz, 100m Vpp square wave		-90	-80	dBFS
Operating Clock Frequency		1.024	2.048	3.250	MHz
Sensitivity Loss Across Power Supply Voltage	Change in sensitivity from 1.6V to 3.6V power supply voltage	No change			dB
Total Operation Current	No load on DATA		800		uA
Standby Current	Clock off		32	42	uA
Load Capacitance				100	pF
Data Format		1/2 Cycle 1-bit PDM			



6. INTERFACE SPECIFICATIONS

Parameter	Conditions	Min	Typ	Max	Unit
Logic Input High	Vih	0.65*V DD		VDD+0.3	V
Logic Input Low	Vil	-0.3		0.35*V DD	V
Logic Output High	Voh	VDD-0.45			V
Logic Output Low	Vol			0.45	V
Clock Duty Cycle		40		60	%
Clock Rising/Falling Edge	Tedge			15	ns

7. FREQUENCY RESPONSE CURVE

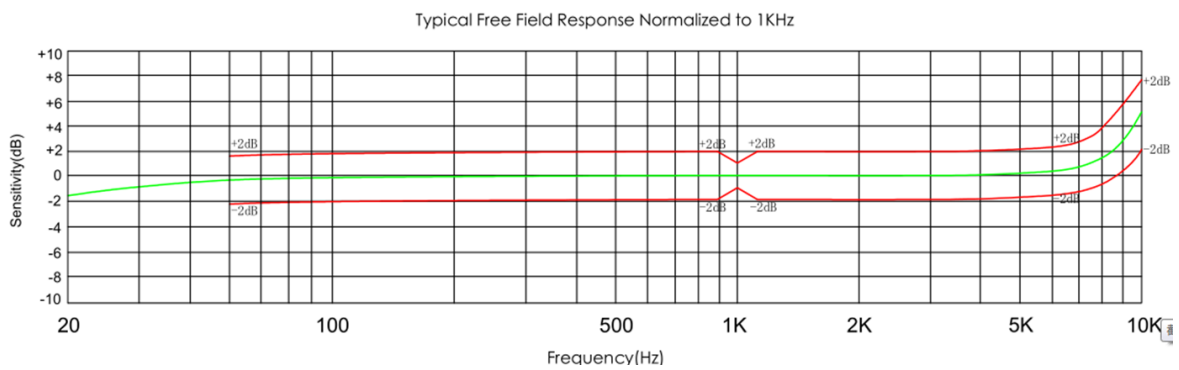
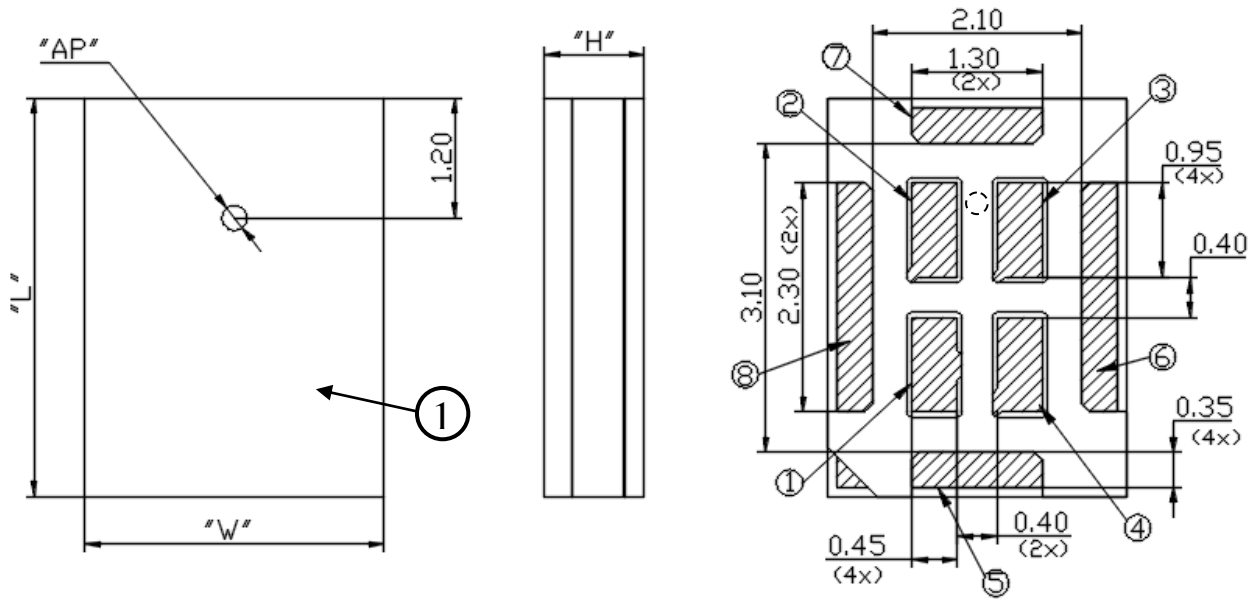


Figure 1. Typical free field frequency response (Normalized to 1 KHz)

8. MECHANICAL SPECIFICATIONS



ITEM	DIMENSION	TOLERANCE	UNITS
LENGTH(L)	4.00	±0.10	mm
WIDTH(W)	3.00	±0.10	mm
HEIGHT(H)	1.00	±0.10	mm
ACOUSTIC PORT(AP)	Φ0.25	±0.05	mm

PIN OUTPUT	
PIN#	FUNCTION
1	POWER (VDD)
2	L/R
3	CLOCK (CLK)
4	DATA
5	GROUND (GND)

Note:

Dimensions are in millimeters unless otherwise specified.
 Tolerance ±0.15mm unless otherwise specified

Figure 2. Detailed mechanical drawings

9. RECOMMENDED CUSTOMER LANDING PATTERN

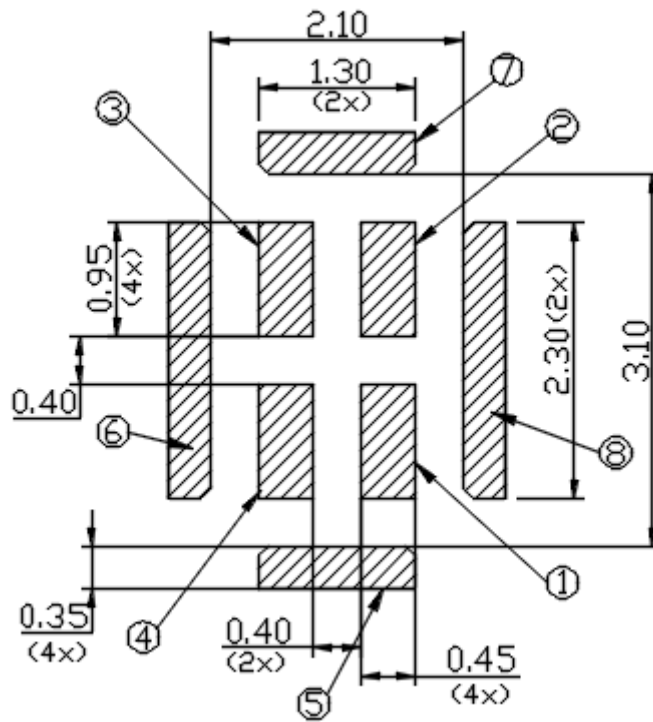


Figure 3. Recommended landing pattern on customers' PCB

10. EXAMPLE SOLDER STENCIL PATTERN

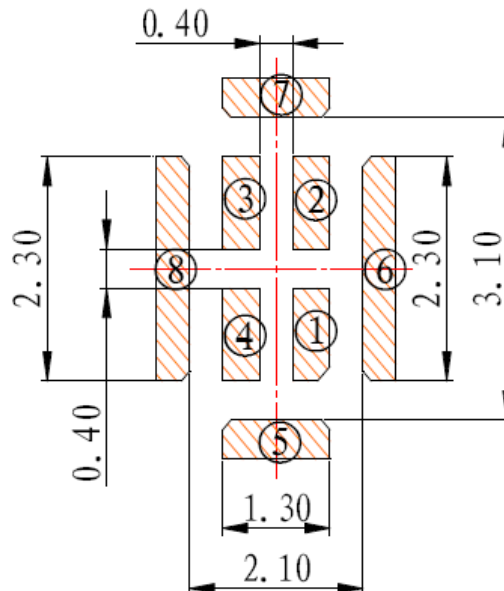
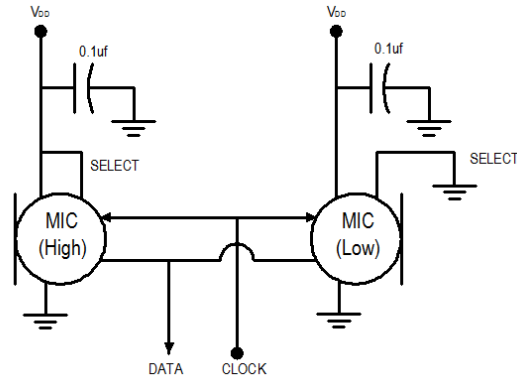


Figure 4. Example solder stencil pattern

11.RECOMMENDED INTERFACE CIRCUIT



Label	Select	Drives data after	High_Z after
MIC(High)	V _{DD}	Rising clock edge	Falling clock edge
MIC(Low)	GND	Falling clock edge	Rising clock edge

Figure 5. Schematic of GTM4030DT261SFD0 for two-Mic array configuration

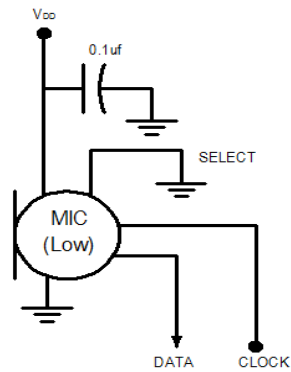


Figure 6. Schematic of GTM4030DT261SFD0 for one-microphone configuration

12. TIMING DIAGRAM

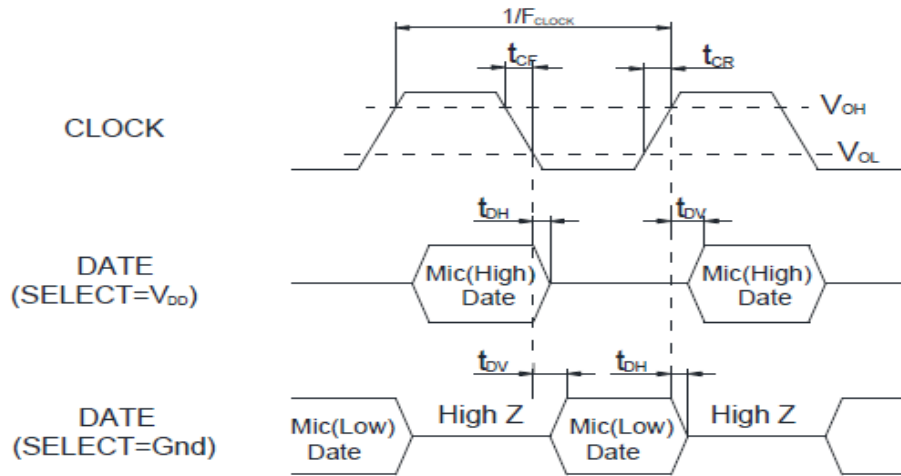
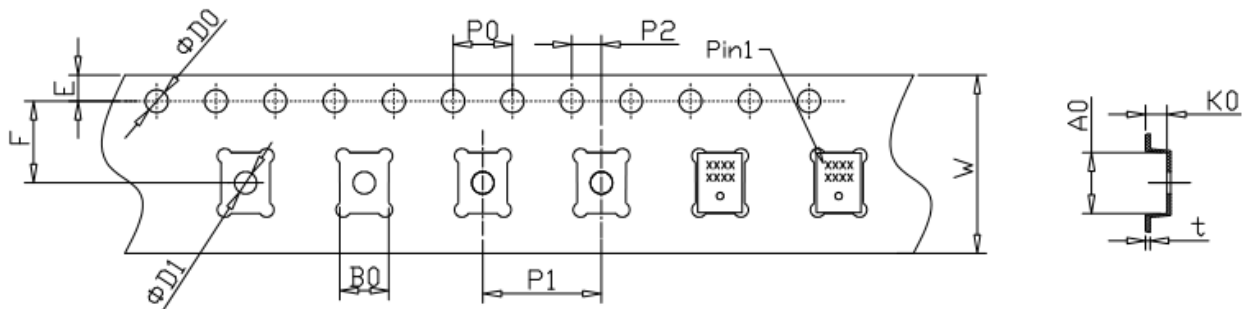


Figure 7. Timing Diagram for GTM4030DT261SFD0

13. PACKAGING SPECIFICATIONS



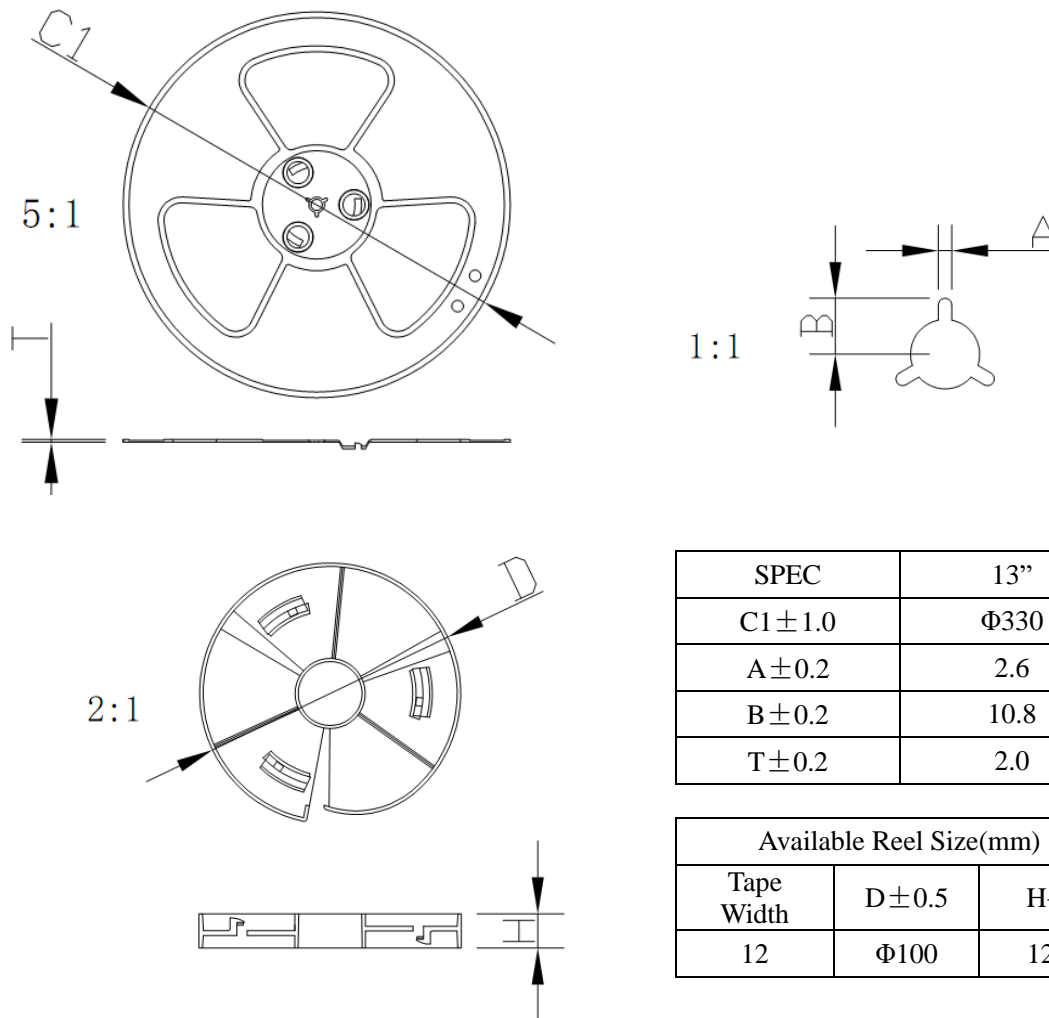
D0	1.5±0.1	W	12.0±0.30
D1	1.5±0.1	E	1.75±0.10
A0	4.25±0.10	F	5.50±0.10
B0	3.25±0.10	P0	4.00±0.10
K0	1.20±0.10	P1	8.00±0.10
T	0.3±0.05	P2	2.00±0.10

Notes:

- (1) Dimensions are in millimeters unless otherwise specified;
- (2) Tape & Reel Per EIA-481 standard;
- (3) Label applied to external package and direct to reel;
- (4) Shelf life: Twelve (12) months when devices are to be stored in factory supplied, unopened ESD moisture sensitive bag under maximum environmental conditions of 30°C, 70% R.H.

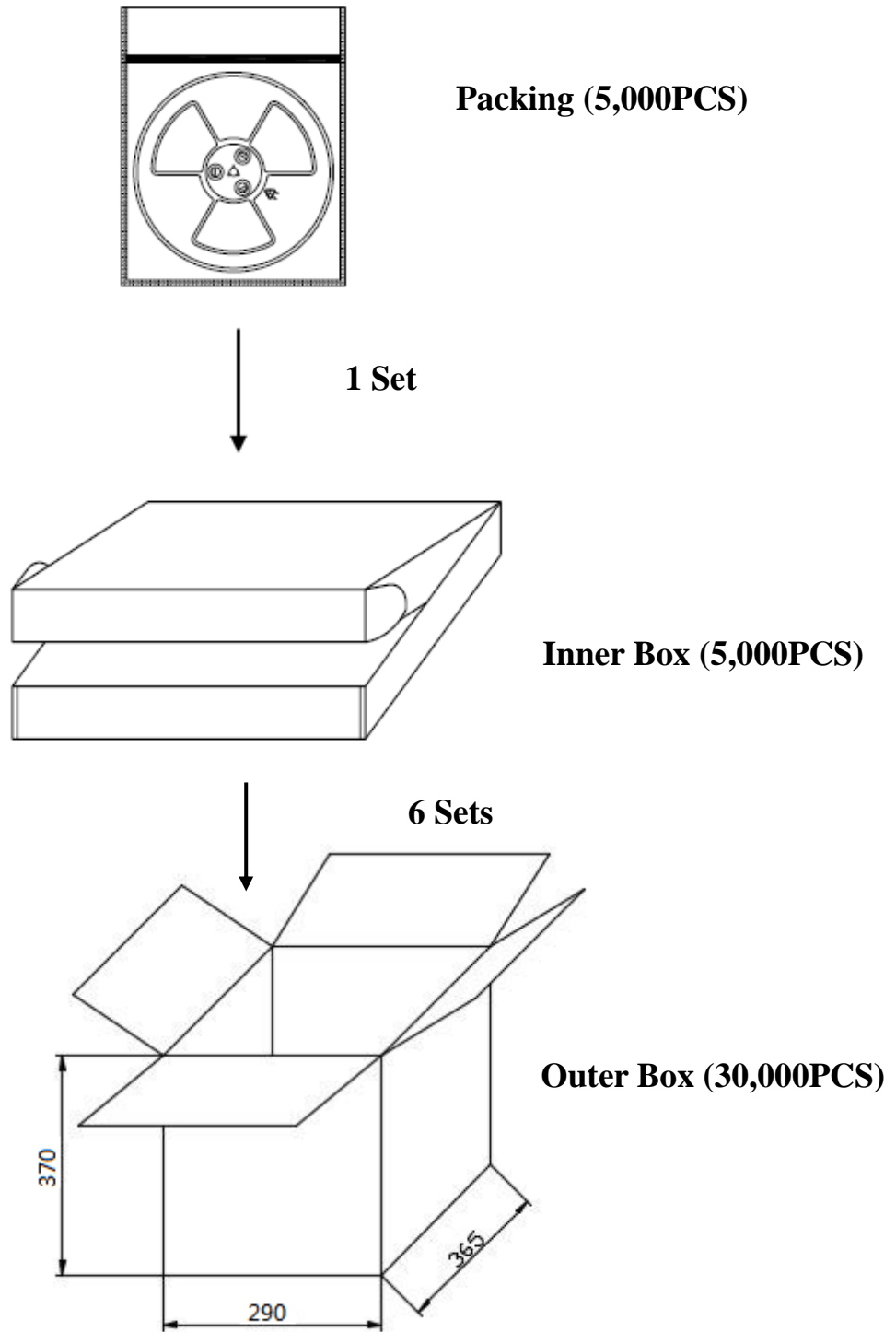
Order Part Number	Reel Diameter	Qty per Reel
GTM4030DT261SFD0	13"	5,000

Figure 8. Tape Specification



5,000PCS Products/1 Reel

Figure 9. Reel Specification

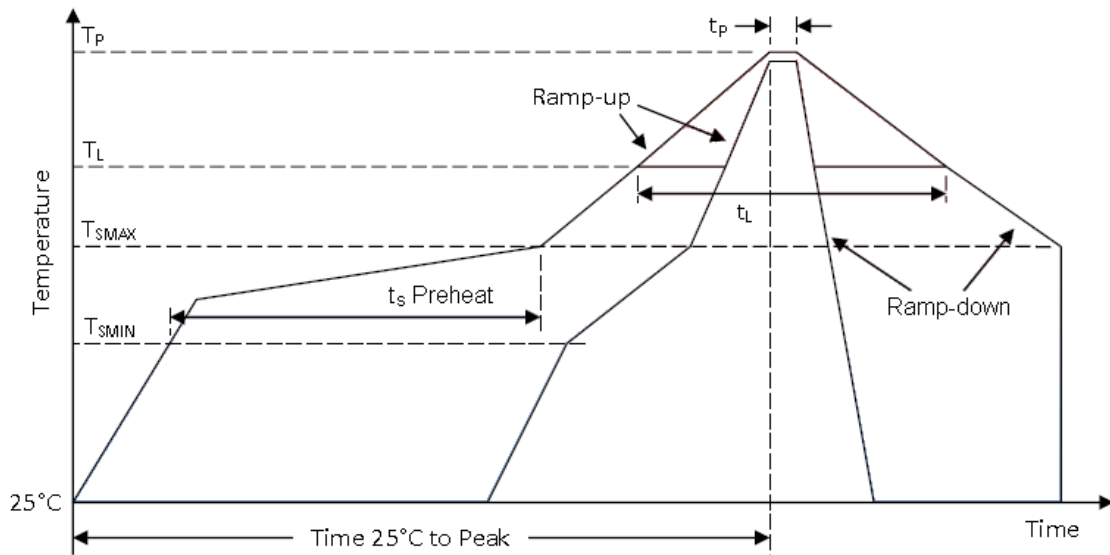


30,000 Pieces of Products per Carton

Figure 10. Packaging Specification



14.SOLDER REFLOW PROFILE



Profile Feature	Pb-Free
Average Ramp-up Rate (T_{SMAX} to T_P)	3°C/second max.
Preheat Temperature Min (T_{SMIN}) Temperature Max (T_{SMAX}) Time (T_{SMIN} to T_{SMAX}) (t_s)	150°C 200°C 60-180 seconds
Time maintained above: Temperature (T_L) Time (t_L)	217°C 60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_p)	20-40 seconds
Ramp-down Rate(T_P to T_{SMAX})	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

Figure 11. Recommended leadless solder reflow temperature profile

Notes:

1. Vacuuming over acoustical hole of the microphone is not allowed, because the device can be damaged by vacuum.
2. Washing the board after reflow process is not allowed, because board washing and cleaning agents can damage the device. A device should not be exposed to ultrasonic processing or cleaning.
3. Recommended number of reflow is no more than 5 times.
4. Do not apply over 30 psi of air pressure into the port hole.
5. MSL (moisture sensitivity level) Class 1.



15.RELIABILITY SPECIFICATIONS

Test item	Detail	standard
Reflow Simulation	Refer to Sec.9 for solder reflow profile, total 5 times	/
Low Temperature Bias	Conditions: -40°C Duration:168 hours while under bias	IEC 60068-2-2 Test Aa
High Temperature Bias	Conditions: 105°C Duration:168 hours while under bias	IEC 60068-2-2 Test Ba
Thermal Shock	Conditions: 100 cycles of air-air thermal shock from -40°C to 125°C with 15-minute soaks	IEC 60068-2-4
Temperature/Humidity Bias	Conditions: 85°C/85%RH environment while under bias for 168 hours	JESD 22-A101A-B
Mechanical Shock	Conditions:3 pulses of 10,000g in the X,Y and Z direction	IEC 60068-2-27 Test Ea
Vibration Test	Test axis: X,Y,Z Conditions: 2~400Hz 1 oct/min Test time: 15 mins per axis Use fixture during the testing	IEC 60068-2-6
Drop Test	Conditions: For each sample, drop by all corners, edges, surfaces respectively. Steel floor. Drop height: 1800mm.	IEC 60068-2-32
ESD	Conditions: ±8KV direct contact to the lid when unit is grounded, ±4KV direct contact to the I/O pins.10 times	IEC 61000-4-2

Note:

Immediately after reliability test, the samples shall be stored under climatic conditions such as that normally exist in ordinary rooms or laboratories. Unless otherwise noted, the recovery period shall be 2 hours at least before performance testing. After test condition is performed, the sensitivity of the microphone shall not deviate more than 3dB from its initial value.

