

Omni-directional Microphone with Digital Output (Bottom Port)

DESCRIPTION

The ZTS6071M is a high quality, low power digital output bottom-ported omni-directional MEMS microphone. ZTS6071M consists of a MEMS microphone element and a preamplifier. ZTS6071M has a high SNR and flat wideband frequency response, resulting in natural sound with high intelligibility. Due to built-in filter, ZTS6071M shows high immunity to EMI.

The ZTS6071M is available in a thin 4.00mm × 3.00mm × 1.00mm surface-mount package. It is reflow solder compatible with no sensitivity degradation. The ZTS6071M is Halogen and Lead free.

APPLICATIONS

- Mobile telephones
- PDAs
- Digital video cameras
- Portable media devices with audio input

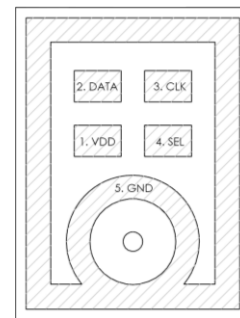
ORDERING INFORMATION

| PART | RoHS | Ship, Quantity |
|----------|------|---------------------|
| ZTS6071M | Yes | Tape and Reel, 5.2K |

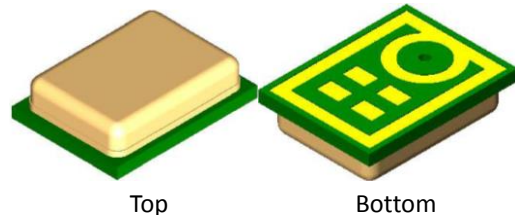
FEATURES

- 4.00mm×3.00mm×1.0mm surface-mount package
- Stable sensitivity over power supply range of 1.60V-3.60V
- SNR of 64dB(A)
- Sensitivity of -26dB FS
- Multi Chip Module (MCM) Package

Pins Configuration and Description



Bottom View

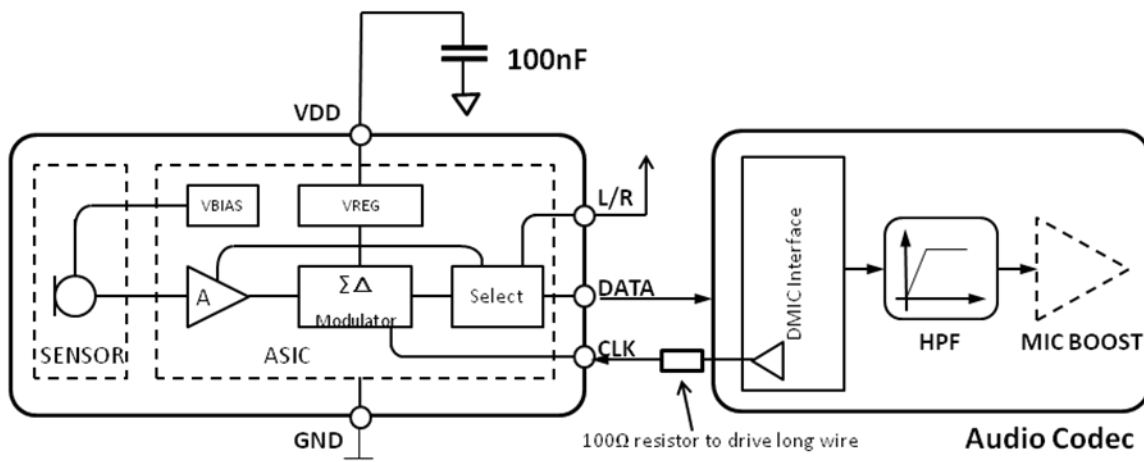


Top

Bottom

Isometric Views of ZTS6071M Microphone Package

Typical Applications



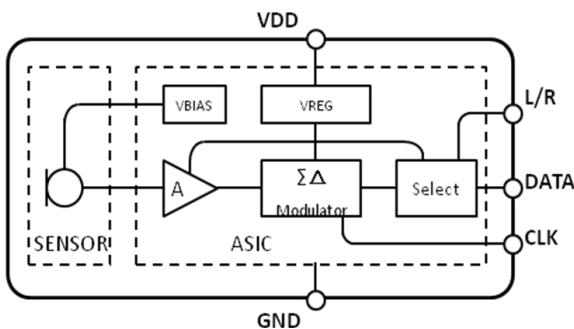
| Label | Select | Drives Data After | High-Z After |
|--------|---------------|--------------------|--------------------|
| Data_H | High | Rising Clock Edge | Falling Clock Edge |
| Data_L | Low (default) | Falling Clock Edge | Rising Clock Edge |

Absolute Maximum Ratings

CLOCK to Ground -0.3V to +6.0V
 SELECT, V_{DD}, DATA to Ground -0.3V to +6.0V
 Input Current ±5mA
 Data Output Short Circuit Indefinite to Ground or V_{DD}
 Operating Temperature Range -40°C to +100°C
 Storage Temperature Range -40°C to +100°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.

Microphone Block Diagram



Electro-Static Discharge Sensitivity

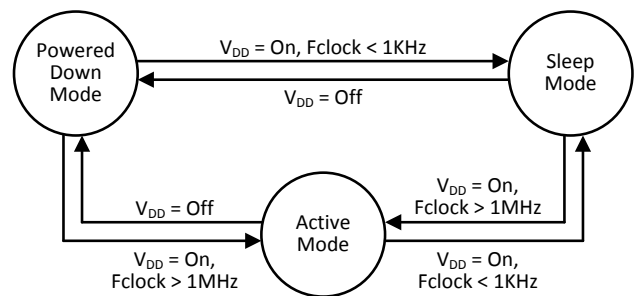


This integrated circuit can be damaged by ESD. It is recommended that all integrated circuits be handled with proper precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure.

Pins Description

| Pin | Symbol | Description |
|-----|--------|----------------------------------|
| 1 | VDD | Power Supply (V _{DD}). |
| 2 | DATA | Output. |
| 3 | CLOCK | Clock. |
| 4 | SELECT | Select. |
| 5 | GND | Ground |

Microphone State Diagram



Specifications

($T_A = +15^{\circ}\text{C} \sim +25^{\circ}\text{C}$, $V_{DD} = +1.8\text{V}$, $f_{\text{clock}} = 3.072\text{MHz}$, R.H. = 60%~70%, no load, unless otherwise noted.)

| PARAMETER | Symbol | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|----------------------------------|--------------------|---|----------------------|---------------------------|-----|----------------------|---------------|
| Supply Voltage (Note 1) | V_{DD} | | | 1.60 | | 3.60 | V |
| Current Consumption (Note 1,5,6) | I_{DD} | | | | 510 | 700 | μA |
| Sleep Current (Note 6) | I_{SLEEP} | $f_{\text{clock}} < 1\text{KHz}$ | | | 5 | 15 | μA |
| Directivity | | | | Omni-directional | | | |
| Sensitivity (Note 1) | S | 94dB SPL @ 1KHz | | -27 | -26 | -25 | dB FS |
| Signal to Noise Ratio | SNR | 94dB SPL @ 1KHz, A-weighted | | | 64 | | dB(A) |
| Total Harmonic Distortion | THD | 110dB SPL @ 1KHz | | | 0.2 | 1 | % |
| | | 120dB SPL @ 1KHz | | | | 10 | % |
| Power Supply Rejection | PSR | 217Hz, 100mV Vp-p, square wave on V_{DD} | $V_{DD}=1.8\text{V}$ | | -80 | | dB FS |
| | | | $V_{DD}=3.3\text{V}$ | | -80 | | |
| Polarity | | Increasing sound pressure | | Increasing density of 1's | | | |
| Acoustic Overload Point | AOP | 10% THD @ 1KHz | | | | 122 | dB SPL |
| Fall-Asleep Time (Note 2,3) | | $f_{\text{clock}} < 1\text{KHz}$ | | | | 10 | ms |
| Wake-Up Time (Note 2,4) | | $f_{\text{clock}} \geq 1\text{MHz}$ | | | | 10 | ms |
| Short Circuit Output Current | I_{SC} | Grounded output pin | | 2 | | 10 | mA |
| Output Load | C_{LOAD} | | | | | 100 | pF |
| Data Format | | | | 1/2 cycle PDM | | | |
| Clock Frequency | f_{clock} | | | 1.0 | | 3.25 | MHz |
| Clock Duty Cycle | | | | 40 | | 60 | % |
| Clock Rise/Fall Time | t_{edge} | | | | | 10 | ns |
| Logic Input Low | V_{IL} | | | -0.3 | | $0.35 \times V_{DD}$ | V |
| Logic Input High | V_{IH} | | | $0.65 \times V_{DD}$ | | $V_{DD} + 0.3$ | V |
| Logic Output Low | V_{OL} | $I_{\text{out}} = 2\text{mA}$ | | 0 | | $0.3 \times V_{DD}$ | V |
| Logic Output High | V_{OH} | $I_{\text{out}} = 2\text{mA}$ | | $0.7 \times V_{DD}$ | | V_{DD} | V |
| Delay Time for Valid Data | t_{dv} | APx525 (probe $C_{\text{in}} = 24\text{pF}$) | $V_{DD}=1.8$ | 25 | | 80 | ns |
| | | | $V_{DD}=3.3$ | 20 | | 80 | |
| Delay Time for High Z | t_{dz} | APx525 (probe $C_{\text{in}} = 24\text{pF}$) | $V_{DD}=1.8$ | 0 | | 25 | ns |
| | | | $V_{DD}=3.3$ | 0 | | 25 | |
| Settling time | t_{s} | | | 1.8V | | 2.65 | 5.5 |
| | | | | 3.3V | | | |
| Startup Time | | Powered Down → Active Mode | | 1.8V | | 2.65 | 5.5 |
| | | | | 3.3V | | | |

Note 1: 100% tested.

Note 2: Valid microphone states are: Power Down Mode (mic off), Sleep Mode (low current, no output, fast start-up), and Active Mode (normal operation).

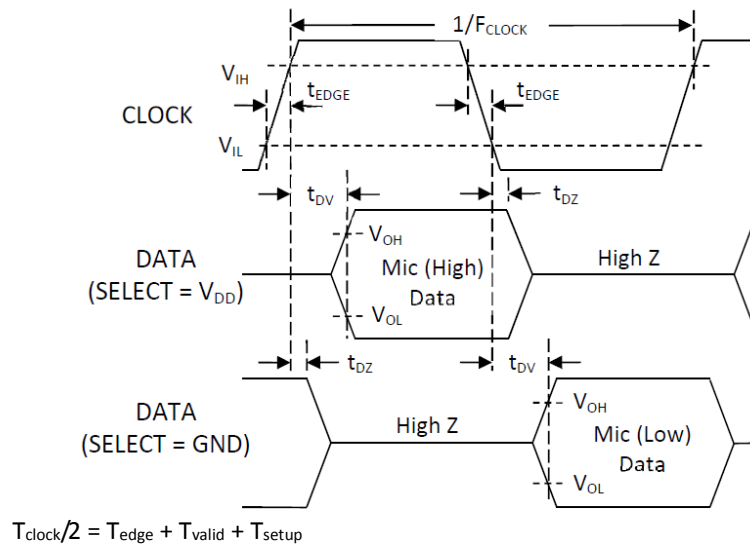
Note 3: Time from $f_{\text{clock}} < 1\text{KHz}$ to sleep current specification is met when transitioning from Active to Sleep Mode.

Note 4: Time from $f_{\text{clock}} \geq 1\text{MHz}$ to all applicable specifications are met when transitioning from Sleep to Active Mode.

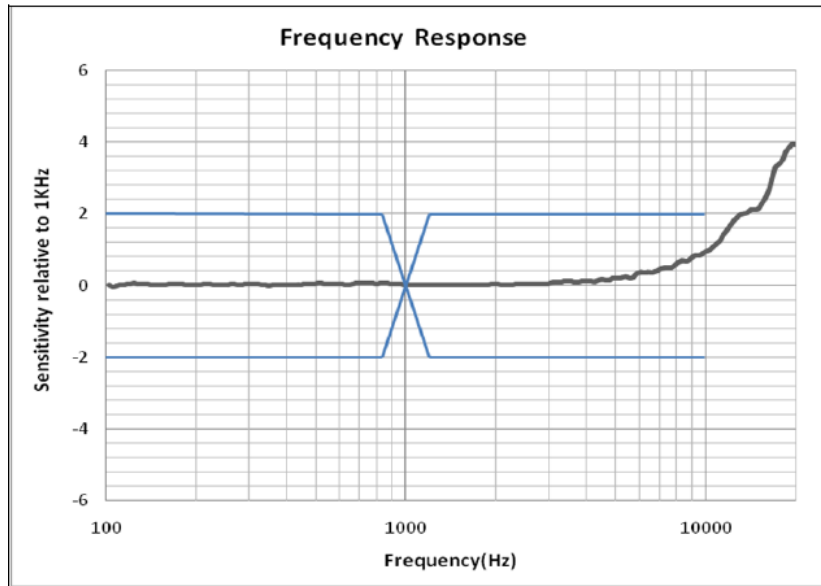
Note 5: $\Delta I_{DD} = 0.5 \times V_{DD} \times C_{\text{LOAD}} \times f_{\text{clock}}$

Note 6: Specified max values are measured at $V_{DD} = +3.6\text{V}$.

Timing Diagram



Typical Performance Characteristics

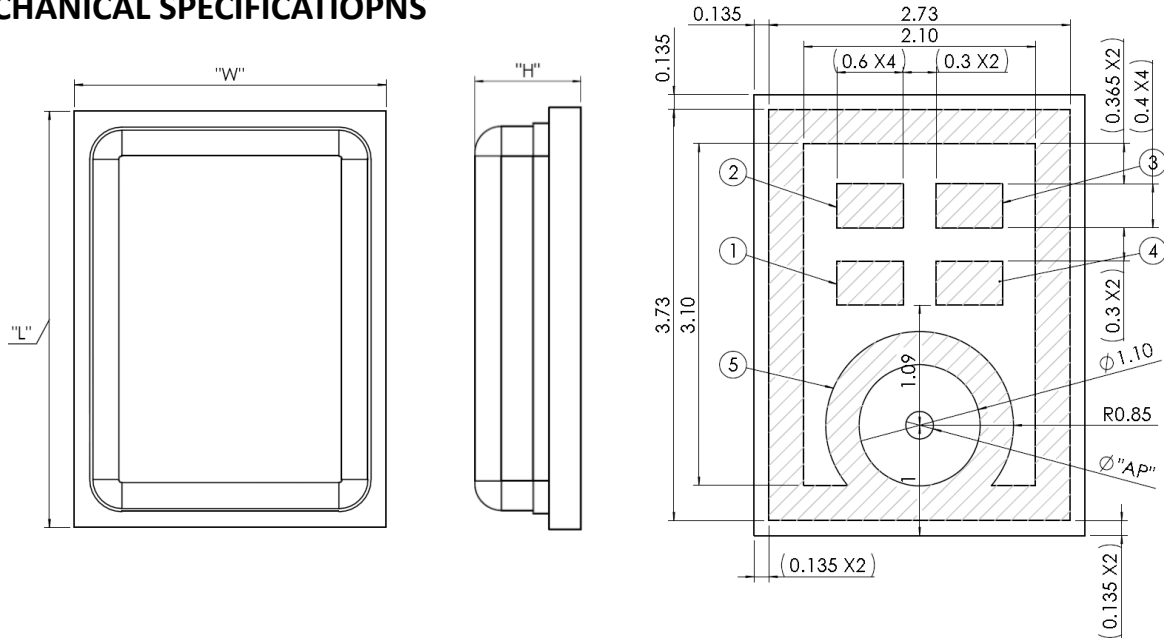


Reliability Tests

The microphone sensitivity after stress must deviate by no more than $\pm 3\text{dB}$ from the initial value.

| | |
|--|--|
| 1. Heat Test, Operational | Temperature: $125\pm 3^{\circ}\text{C}$ Duration: 1000 hours Voltage: Applied |
| 2. Cold Test, Operational | Temperature: $-40\pm 3^{\circ}\text{C}$ Duration: 1000 hours Voltage: Applied |
| 3. Heat Test, Non-Operational | Temperature: $125\pm 3^{\circ}\text{C}$ Duration: 1000 hours Voltage: Not Applied |
| 4. Cold Test, Non-Operational | Temperature: $-40\pm 3^{\circ}\text{C}$ Duration: 1000 hours Voltage: Not Applied |
| 5. Thermal Shock Test, Non-Operational | Temperature: $-40\pm 3^{\circ}\text{C}$ and $125\pm 3^{\circ}\text{C}$ Duration: 30 minutes each, during 5 minutes ramp, 256 cycles Voltage: Not applied |
| 6. Temperature humidity storage | Temperature: $85\pm 3^{\circ}\text{C}$ Humidity: $85\pm 3\% \text{RH}$ Duration: 1000 hours |
| | Temperature: $65\pm 3^{\circ}\text{C}$ Humidity: $95\pm 3\% \text{RH}$ Duration: 168 hours |
| 7. Free Fall Test 1.5m | Placed inside test fixture and dropped on concrete from height 1.5m. 4 times by each surface and corner |
| 8. Vibration | 4 cycles of 20 to 2000 Hz sinusoidal sweep with 20G peak acceleration lasting 12 minutes in X, Y, and Z directions |
| 9. Mechanical Shock | 5 pulses of 10000g in each of the $\pm X$, $\pm Y$, and $\pm Z$ directions |
| 10. Electrostatic Discharge Test | Capacitance: 150pF Resistance: 330Ω Duration: 10 times Air Discharge: Level 4(+/-15kV) Direct contact discharge: Level 4 (+/-8kV) |
| 11. Human Body Mode | ± 2000 Volt |
| 12. Charged-Device Model | ± 250 Volt |
| 13. Reflow | 5 reflow cycles with peak temperature of 260°C |
| 14. Solderability | $245\pm 5^{\circ}\text{C}$, 5sec, 95% Tin on pad surface |
| 15. Tumble test | 300 tumbles from a height of 1m onto a steel base. |
| 16. HAST | Temperature: $130\pm 3^{\circ}\text{C}$ Humidity: $85\pm 3\% \text{RH}$ Duration: 96 hours Voltage: Applied |
| 17. Air Blow | 0.45MPa, distance 3cm, time 10s |

MECHANICAL SPECIFICATIONNS

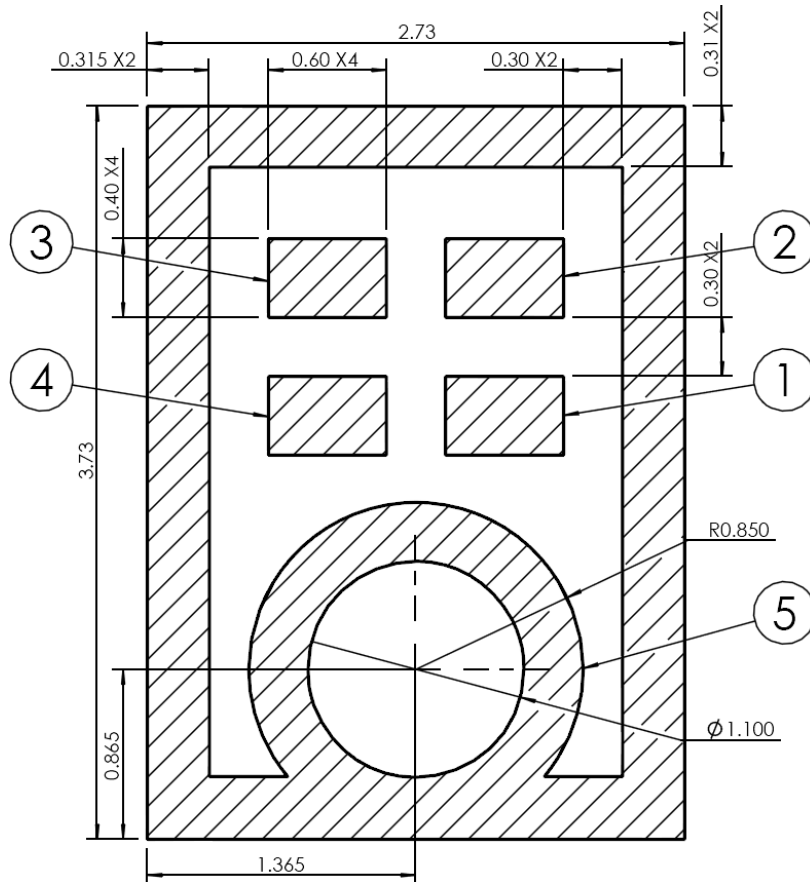


| Item | Dimension | Tolerance |
|--------------------|-----------|-----------|
| Length (L) | 4.00 | ±0.10 |
| Width (W) | 3.00 | ±0.10 |
| Height (H) | 1.00 | ±0.10 |
| Acoustic Port (AP) | ∅0.25 | ±0.05 |

| Pin# | Pin Name | Description |
|------|----------|---------------------|
| 1 | VDD | Power Supply (VDD). |
| 2 | DATA | Output. |
| 3 | CLOCK | Clock. |
| 4 | SELECT | Select. |
| 5 | GND | Ground |

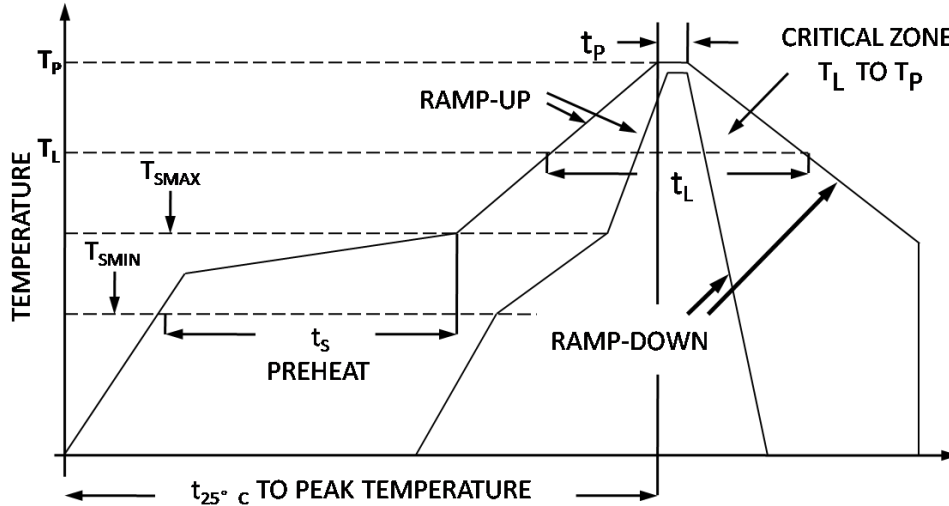
RECOMMENDED CUSTOMER LAND PATTERN

The recommended PCB land pattern for the ZTS6071M should have a 1:1 ratio to the solder pads on the microphone package. Care should be taken to avoid applying solder paste to the sound hole in PCB. The dimensions of suggested solder paste pattern refer to the land pattern **which should be shrunk by 0.025 per side**.



SOLDER REFLOW PROFILE

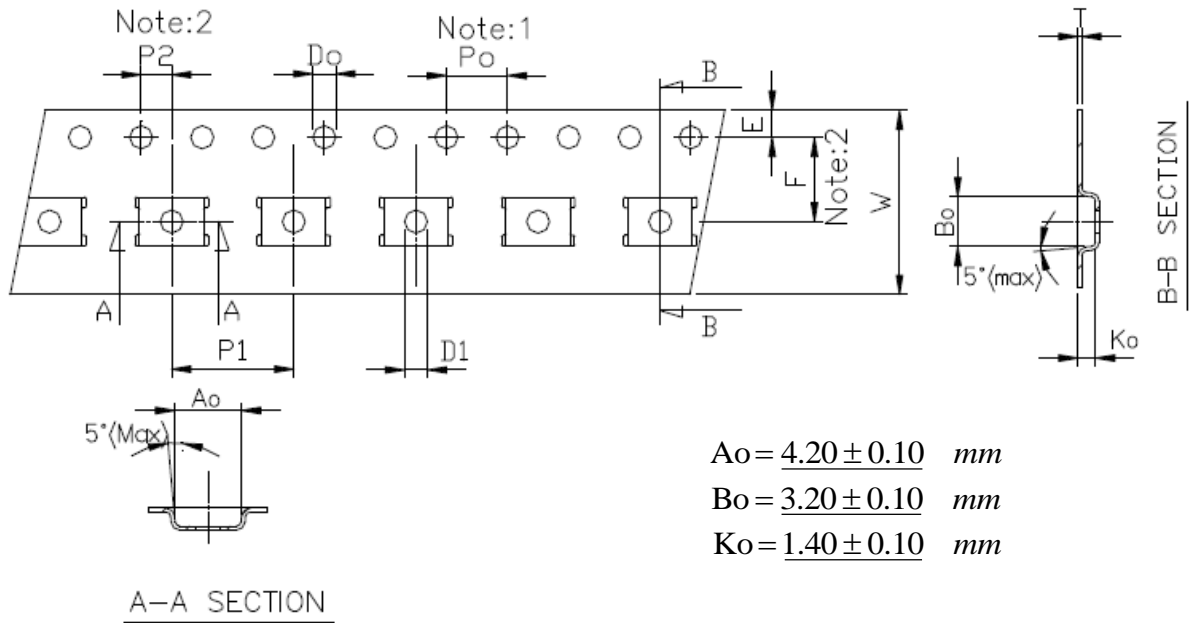
The reflow profile specified in this section describes expected maximum heat exposure of components during the reflow process of NMP product PWBs. Temperature is measured on top of component. All components have to tolerate at least this profile five times (5x) without affecting electrical performance, mechanical performance or reliability.



Pb-free and Sn63/Pb37 reflow profile requirements for soldering heat resistance:

| Parameter | Reference | Pb-Free | Sn63/Pb37 |
|---|---------------------|--------------------------|---------------------|
| Average Ramp Rate | T_L to T_P | 1.25°C/sec max | 1.25 °C /sec max |
| Prehear | Minimum Temperature | T_{SMIN} | 100°C |
| | Maximum Temperature | T_{SMAX} | 200°C |
| | Time | T_{SMIN} to T_{SMAX} | 60sec to 120sec |
| Ramp-Up Rate | T_{SMAX} to T_L | 1.25°C/sec | 1.25 °C /sec |
| Time Maintained Above Liquidous | t_L | 60sec to 150sec | 60sec to 150sec |
| Liquidous Temperature | T_L | 217°C | 183 °C |
| Peak Temperature | T_P | 260°C +0°C/-5°C | 215 °C +3 °C /-3 °C |
| Time Within +5°C of Actual Peak Temperature | t_p | 20 sec to 30 sec | 20 sec to 30 sec |
| Ramp-Down Rate | T_{peak} | 6°C/sec max | 6 °C /sec max |
| Time +25°C (t_{250c}) to Peak Temperature | | 8 min max | 6 min max |

PACKAGING

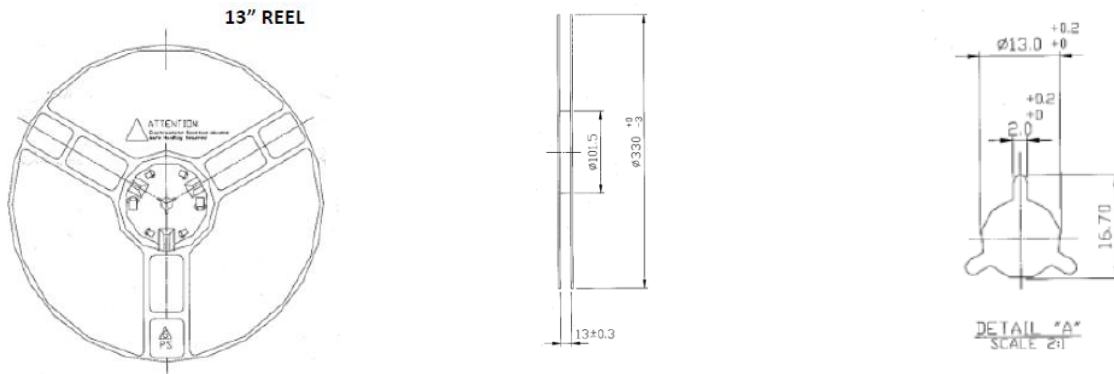


Unit : mm

| Symbol | Spec. |
|--------|-------------|
| K1 | - |
| Po | 4.0 ± 0.10 |
| P1 | 8.0 ± 0.10 |
| P2 | 2.0 ± 0.05 |
| Do | 1.55 ± 0.05 |
| D1 | 1.5 (MIN) |
| E | 1.75 ± 0.10 |
| F | 5.50 ± 0.05 |
| 10Po | 40.0 ± 0.10 |
| W | 12.0 ± 0.20 |
| T | 0.30 ± 0.05 |

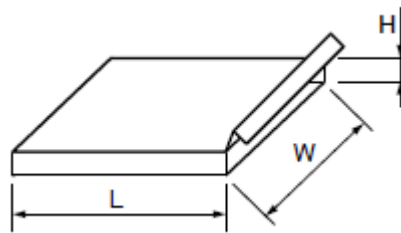
Notice :

- 1 · 10 Sprocket hole pitch cumulative tolerance is ± 0.1mm.
- 2 · Pocket position relative to sprocket hole measured as true position of pocket not pocket hole.
- 3 · Ao & Bo measured on a place 0.3mm above the bottom of the pocket to top surface of the carrier.
- 4 · Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
- 5 · Carrier camber shall be not that 1mm per 100mm through a length of 250mm.



| Part NO. | Reel Diameter | Quantity Per Reel | Quantity Per Inner Box | Quantity Per Outer Box |
|----------|---------------|-------------------|------------------------|------------------------|
| ZTS6071M | 13" | 5200 | 5200 | 46800 |

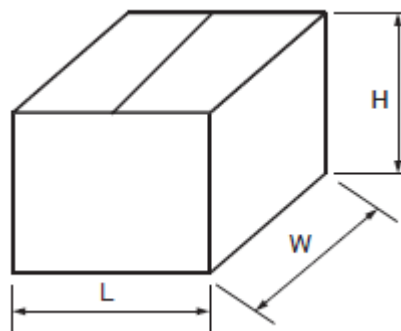
Dimensions for Inner Box



Unit : mm

| L | W | H |
|-----|-----|----|
| 335 | 339 | 45 |

Dimensions for Outer Box



Unit : mm

| L | W | H |
|-----|-----|-----|
| 445 | 360 | 372 |