

## Ultralow Noise Microphone with Bottom Port and Analog Output

### DESCRIPTION

The ZTS6053 is a high quality, low cost, low power analog output bottom-ported omni-directional MEMS microphone. ZTS6053 consists of a MEMS microphone element and an preamplifier. ZTS6053 has a high SNR and flat wideband frequency response, resulting in natural sound with high intelligibility. Due to built-in filter, ZTS6053 shows high immunity to EMI.

The ZTS6053 is available in a thin 3.50mm × 2.65mm × 0.98mm surface-mount package. It is reflow solder compatible with no sensitivity degradation. The ZTS6053 is Halogen and Lead free.

### APPLICATIONS

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

### ORDERING INFORMATION

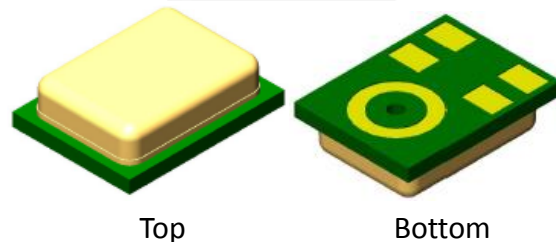
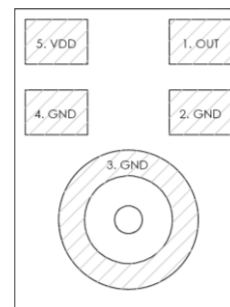
PART	RoHS	Ship, Quantity
ZTS6053	Yes	Tape and Reel, 5.2K

### FEATURES

- 3.50mm×2.65mm×0.98mm surface-mount package
- Stable sensitivity over power supply range of 1.5V-3.6V
- SNR of 65 dBA
- Sensitivity of -38dBV
- Low current consumption of <200μA
- Multi Chip Module (MCM) Package

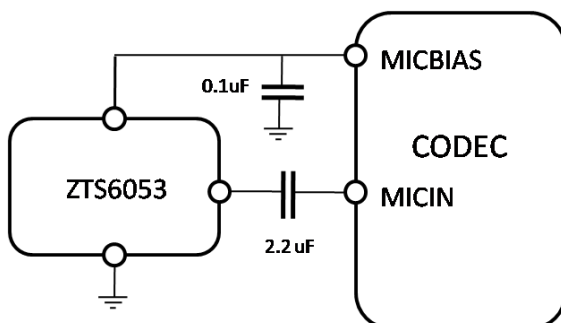
### Pins Configuration and Description

#### Bottom View



### Typical Applications

The ZTS6053 output can be connected to a codec microphone input or to a high input impedance gain stage. A dc-blocking capacitor is required at the output of the microphone.



Connect to Audio Codec

### Absolute Maximum Ratings

Supply Voltage (VDD) .....	-0.5V to +4.5V
OUT to GND .....	-0.3V to V <sub>DD</sub> +0.3V
Input Current to Any Pin .....	±5mA
Mechanical Shock .....	10000g
Vibration .....	Per MIL-STD-883 Method 2007, Test Condition B
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.

### Electro-Static Discharge Sensitivity

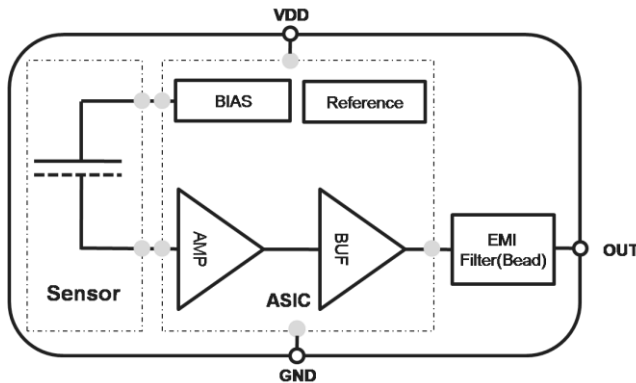


This integrated circuit can be damaged by ESD. It is recommended that all integrated circuits be handled with proper precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure.

### Pins Description

Pin	Symbol	Description
1	OUT	Analog output signal.
2,3,4	GND	Ground.
5	VDD	Power Supply.

### Functional Block Diagram

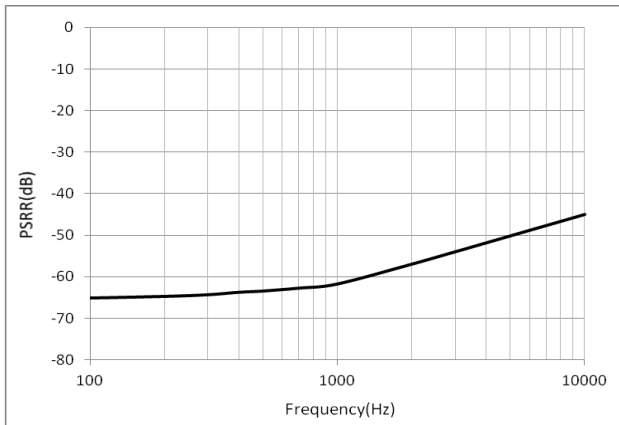
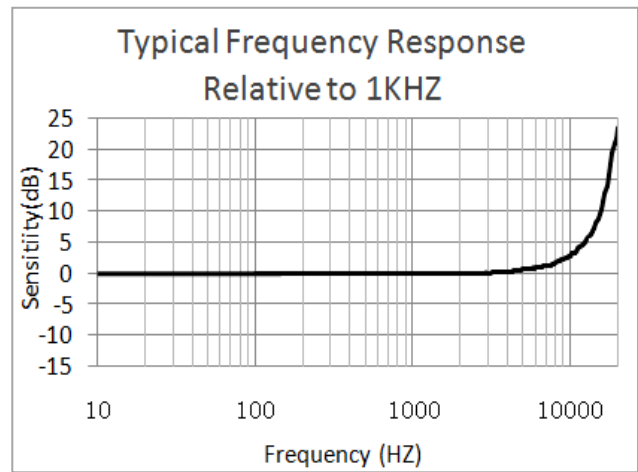
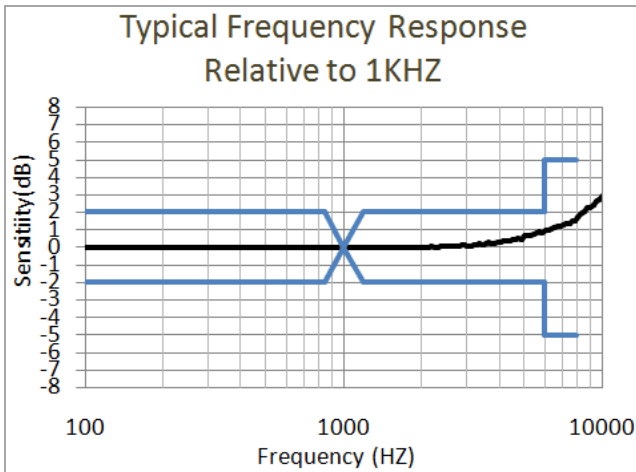


### Specifications

(T<sub>A</sub> = +15°C ~ +25°C, V<sub>DD</sub> = +1.8V, unless otherwise noted.)

PARAMETER	Symbol	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Directivity				Omni		
Supply Voltage	V <sub>DD</sub>		1.5		3.6	V
Current Consumption	I <sub>DD</sub>			120	200	μA
Sensitivity (Note)		1KHz, 94dB SPL	-39	-38	-37	dBV
Signal-to-Noise-Ratio	SNR	1KHz, 94dB SPL, A-weighted		65		dB
Equivalent Input Noise	EIN			28		dBA SPL
Total Harmonic Distortion	THD	1KHz, 94dB SPL		0.1	0.3	%
Power Supply Rejection Ratio	PSRR	1kHz, 100mV V <sub>p-p</sub> , sine wave on V <sub>DD</sub>		65		dBA
Power Supply Rejection	PSR	217Hz, 100mV <sub>p-p</sub> square wave on V <sub>DD</sub>		-100		dBV
Maximum Acoustic Input				125		dB SPL
Output Impedance	Z <sub>out</sub>				400	Ω
Output DC Offset				0.8		V
Output Current Limit				90		μA
Polarity				Noninverting		

**Typical Performance Characteristics**



### TDMA Disturbance Immunity

- 65 dB Max @500~2500MHz ( Direct RF injection test according to set figure , this set figure is based on below block diagram. )

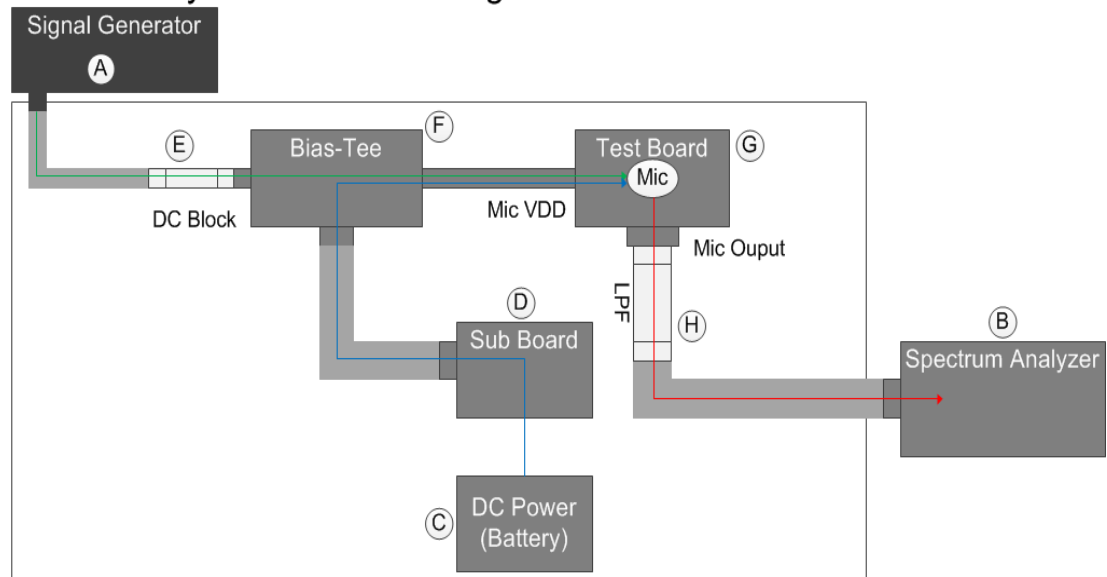
#### Instrument settings

Signal Generator

- modulation: 1 kHz, AM, depth 80%
- test frequency and amplitude from frequency/amplitude table

MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm
100	-4.08	600	-2.85	1100	-1.64	1600	-0.52	2100	0.05
200	-3.68	700	-2.61	1200	-1.33	1700	-0.29	2200	0.12
300	-3.31	800	-2.39	1300	-1.25	1800	-0.11	2300	0.27
400	-3.24	900	-2.11	1400	-1.08	1900	-0.04	2400	0.31
500	-3.09	1000	-1.84	1500	-0.86	2000	-0.01	2500	0.45

### RF Immunity Measurement Diagram



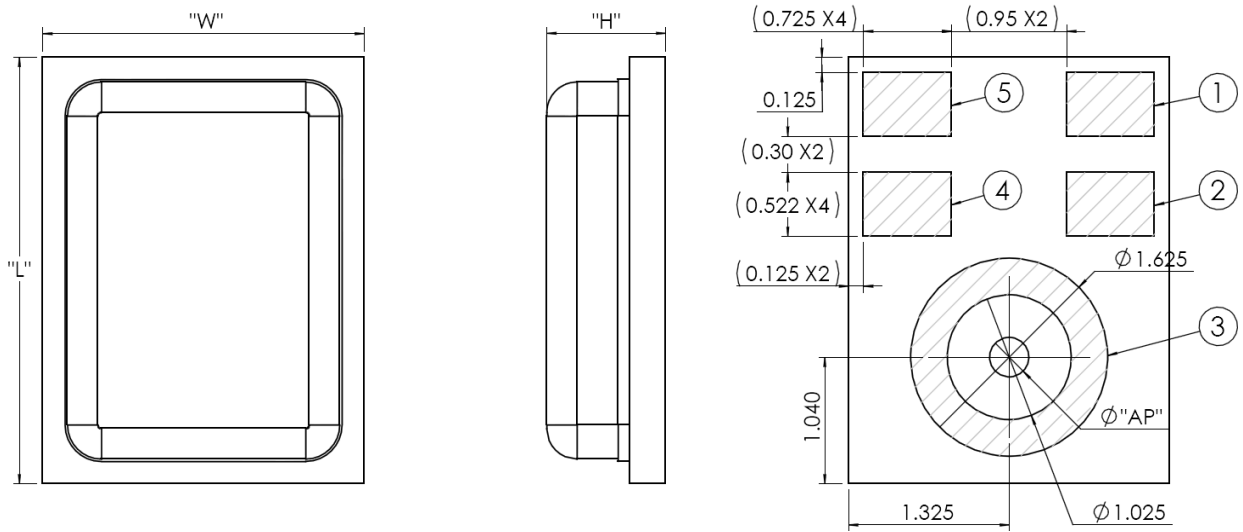
A	Signal Generator	Rode & Schwarz SMIQ 03B
B	Spectrum Analyzer	Audio Precision APx525
C	DC Power	Battery 3V
D	Sub Board with RL & Capacitor	C: 0.1Uf
E	DC block	Agilent 11742A
F	Bias-Tee	Mini-Circuits ZFBT-6GW
G	Test Board	ZTS6053 EVB
H	Low pass filter (Pass band 5M~2.5GHz)	Mini-Circuits SLP-2.5, SLP-5, SLP-150, SLP-450, SLP-1200, SLP-1650

## 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: 330 $\Omega$ Duration: 10 times Air Discharge: Level 4 (+/-15kV) Direct contact discharge: Level 4 (+/-8kV)
11. Human Body Mode	$\pm 2000$ Volt
12. Charged-Device Model	$\pm 250$ Volt
13. Reflow	5 reflow cycles with peak temperature of $260^{\circ}\text{C}$
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 SPECIFICATIOPNS**

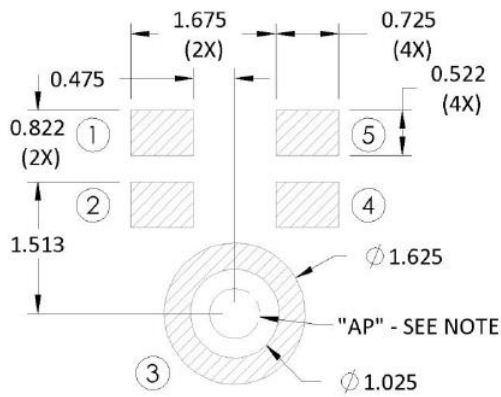


ITEM	DIMENSION	TOLERANCE	UNITS
Length (L)	3.50	±0.10	mm
Width (W)	2.65	±0.10	mm
Height (H)	0.98	±0.10	mm
Acoustic Port (AP)	$\phi$ 0.325	±0.05	mm

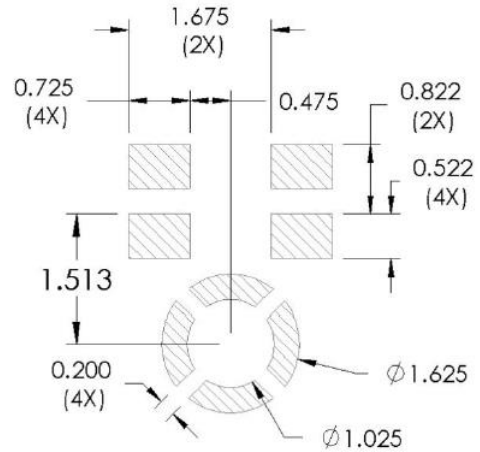
Pin	Symbol	Description
1	OUT	Analog output signal.
2,3,4	GND	Ground.
5	VDD	Power Supply.

**RECOMMENDED CUSTOMER LAND PATTERN**

The recommended PCB land pattern for the ZTS6053 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.



PCB Land Pattern Layout (Dimensions Shown in mm).

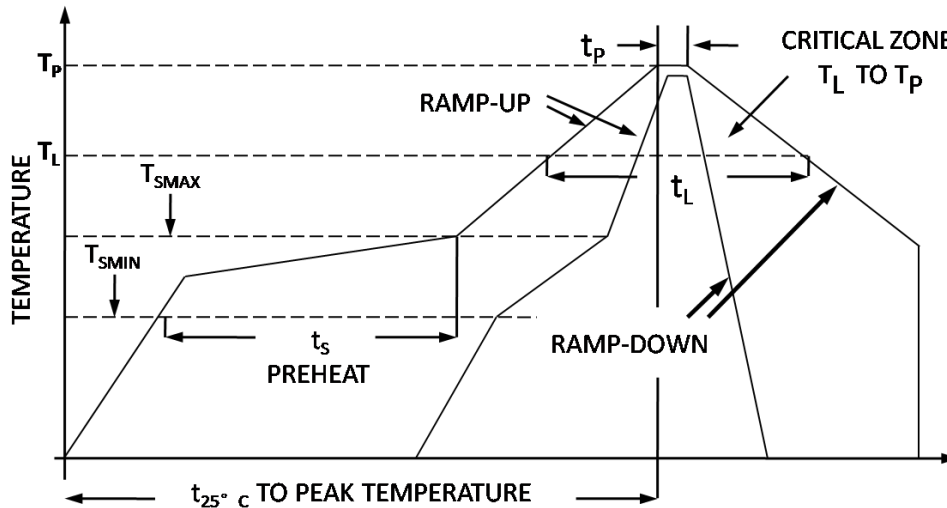


Suggested Solder Paste Stencil Pattern Layout.

**SOLDER FLOW 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.

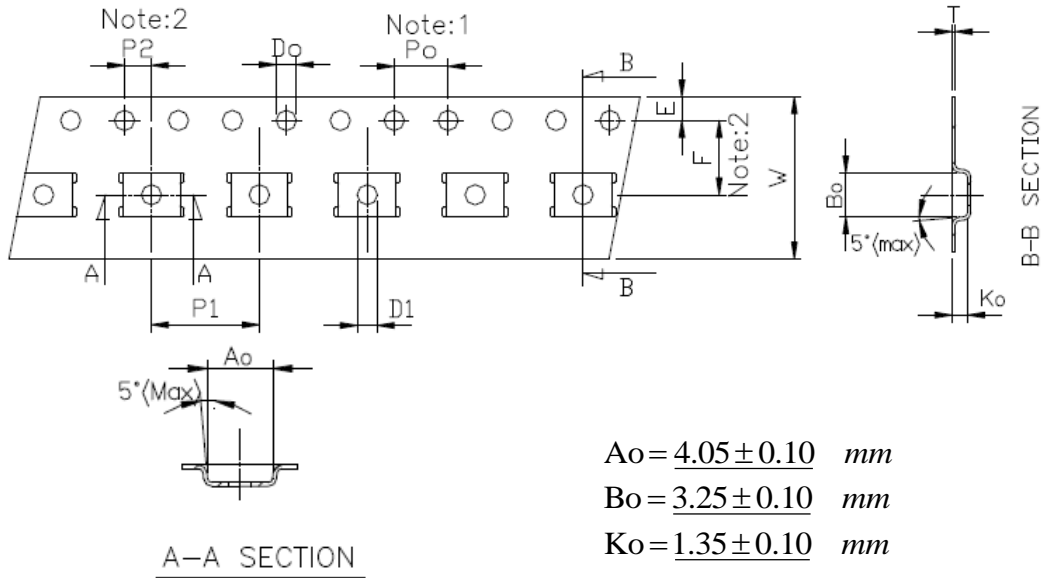


Pb-free and Sn63/Pb37 reflow profile requirements for soldering heat resistance:

Parameter	Reference	Pb-Free	Sn63/Pb37
Average Ramp Rate	T <sub>L</sub> to T <sub>P</sub>	1.25°C/sec max	1.25 °C /sec max
Prehear	Minimum Temperature	T <sub>S</sub> MIN	100°C
	Maximum Temperature	T <sub>S</sub> MAX	200°C
	Time	T <sub>S</sub> MIN to T <sub>S</sub> MAX	60sec to 120sec
Ramp-Up Rate	T <sub>S</sub> MAX to T <sub>L</sub>	1.25°C/sec	1.25 °C /sec
Time Maintained Above Liquidous	t <sub>L</sub>	60sec to 150sec	60sec to 150sec
Liquidous Temperature	T <sub>L</sub>	217°C	183 °C
Peak Temperature	T <sub>P</sub>	260°C +0°C/-5°C	215 °C +3 °C /-3 °C
Time Within +5°C of Actual Peak Temperature	t <sub>p</sub>	20 sec to 30 sec	20 sec to 30 sec
Ramp-Down Rate	T <sub>peak</sub>	6°C/sec max	6 °C /sec max
Time +25°C (t <sub>25oc</sub> ) to Peak Temperature		8 min max	6 min max



**PACKAGING**

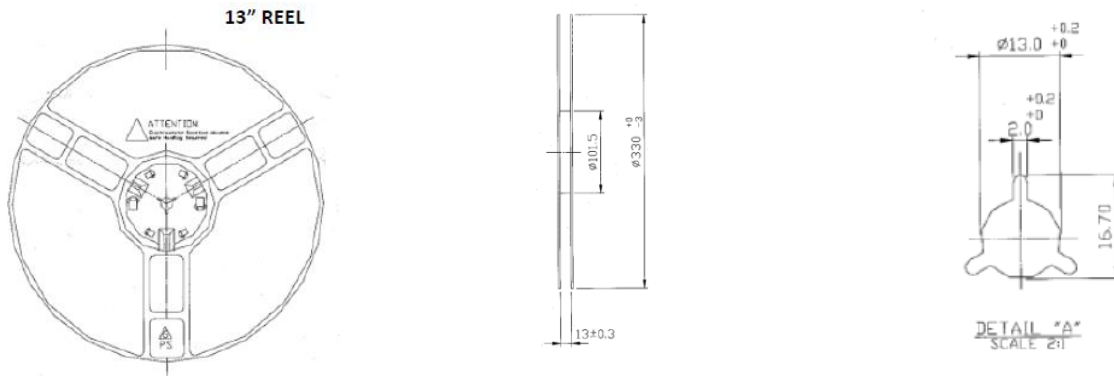


Unit : mm

Symbol	Spec.
K1	-
Po	4.0 ± 0.10
P1	8.0 ± 0.10
P2	2.0 ± 0.05
Do	1.55 ± 0.05
D1	1.50 (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

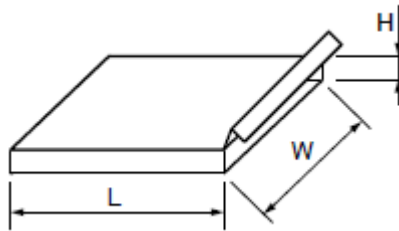
**Notice :**

- 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
ZTS6053	13"	5,200	5,200	46,800

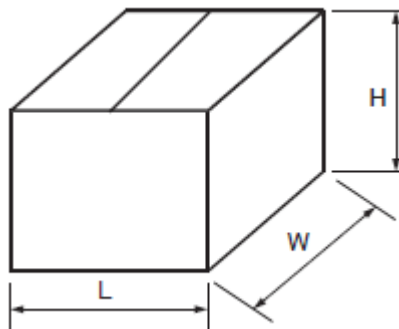
**Dimensions for Inner Box**



Unit : mm

L	W	H
335	339	45

**Dimensions for Outer Box**



Unit : mm

L	W	H
445	360	372