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DIRECT

Electronics Tech.

(ZTT)

Ceramic Resonators

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▶ Product Introduction

Direct ceramic resonator with built-in capacitor (ZTT) is compatible to Murata resonator CST series.

Benefit Features :

- Built-in load capacitance reduced parts cost and mounting cost.
- Faster start-up time as compared to quartz crystals.
- Excellent temperature stability ($\pm 0.3\%$).
- High density mounting.
- Simplified circuit.
- Low cost.

Direct resonators provide an attractive alternative to quartz crystals for oscillation frequency stabilization in many applications. When compared to quartz devices, ceramics' easily mass production, low cost, mechanical ruggedness, and small size often outweigh the reduced precision to which frequencies can be controlled.

Additionally, (ZTT) resonators are better equipped to handle fluctuations in external circuit or power supply voltage due to their use of mechanical resonance and providing stable oscillation without adjustment. Further, these characteristics offer for a much faster rise times and are independent of drive level considerations.

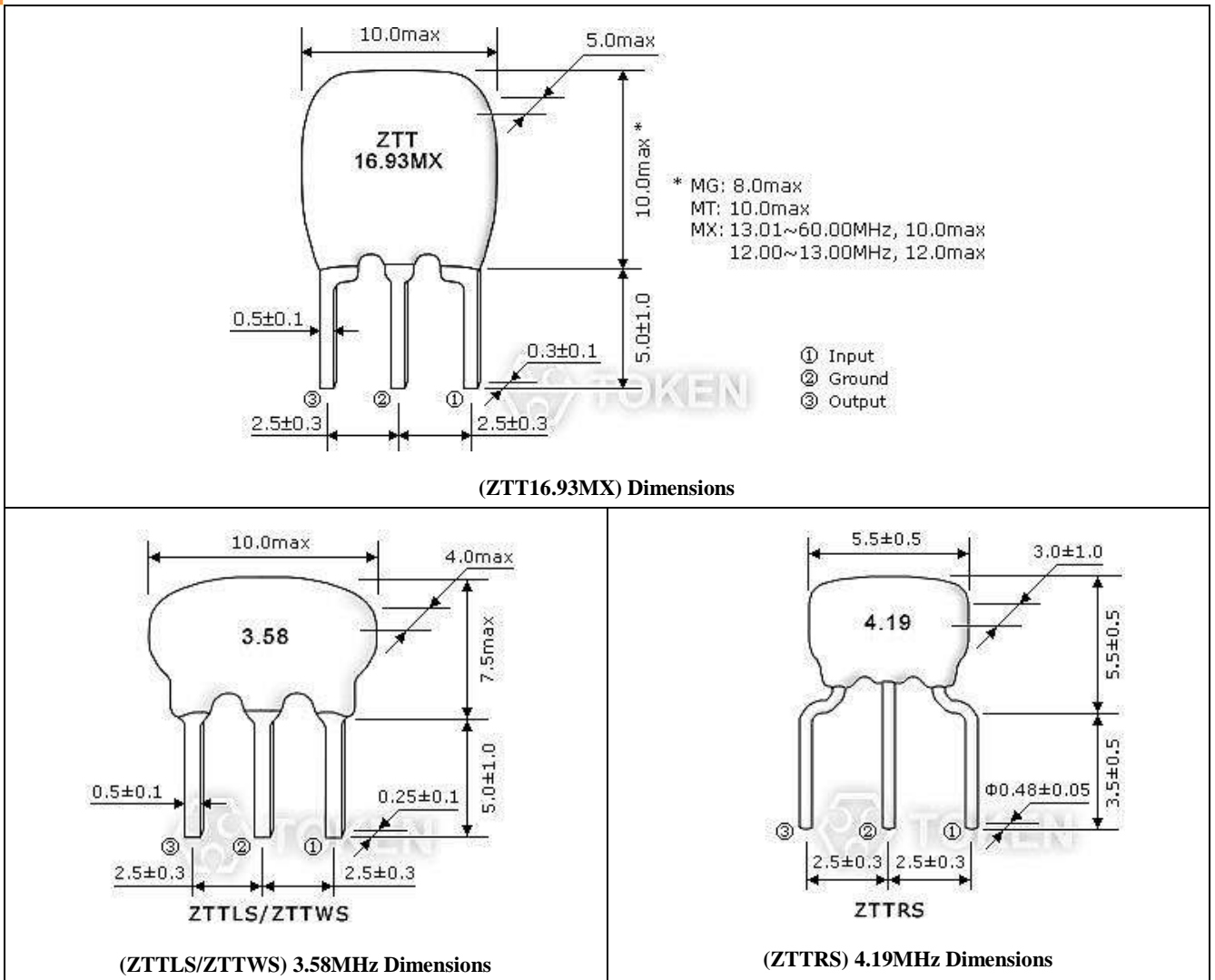
Direct resonator (ZTT) series is used as standard clocks for microprocessors in various electronic devices. Direct produces miniaturized, high-performance (ZTT) resonator series using its superior fabrication, assembly and packaging technologies. The ZTT device offers frequency range from 1.79 MHz to 60.00 MHz with an initial frequency tolerance of $\pm 0.5\%$, stability tolerance $\pm 0.3\%$ at $-20^{\circ}\text{C} \sim +80^{\circ}\text{C}$, and aging tolerance $\pm 0.3\%$. The ZTT resonator features built-in capacitance with 3 lead terminals to eliminate any need for external loading capacitors and reduces component count. These devices conform to the RoHS directive.

Application of specific designs also available including tighter tolerances and frequency adjusted to requirements. Contact us with your specific needs. For more information, please link to Direct official website "[Ceramic Resonators](#)".



Dimensions

Dimensions (Unit: mm) (ZTT)



► Technical Characteristics**Technical Characteristics (ZTT)**

Part Number	Frequency Range (MHz)	Frequency Accuracy (at 25°C) (%)	Stability in Temperature (-20°C ~ +80°C) (%)	Operating Temperature (°C)	Aging For Ten Years (%)
ZTT***MG	1.79 ~ 6.00	±0.5	±0.3	-20 ~ +80	±0.3
ZTWS***MG	1.79 ~ 6.00	±0.5	±0.3	-20 ~ +80	±0.3
ZTTL***MG	3.00 ~ 8.00	±0.5	±0.3	-20 ~ +80	±0.3
ZTTR***MG	3.00 ~ 10.00	±0.5	±0.3	-20 ~ +80	±0.3
ZTT***MT	6.00 ~ 13.00	±0.5	±0.3	-20 ~ +80	±0.3
ZTT***MX	12.00 ~ 60.00	±0.5	±0.3	-20 ~ +80	±0.3



▶ **Test Circuit for MOS IC**

Test Circuit for MOS IC (ZTT)

Loading Capacitor (C1 & C2)

The stability of the oscillation circuit is mainly determined by the C1 & C2 values. If the load capacitance is too small, unstable oscillation will occur because of oscillation waveform distortion. If too high, a stop in oscillation can be expected. When comparing the same IC, oscillation circuits with lower frequencies require higher capacitance.

Feedback Resistor (R = 1MΩ):

A Feedback Resistor is used to determine the oscillation circuit bias. The feedback resistance will contribute to instability if it is too large by reducing feedback. Conversely, if it is too small, increases in current will be realized thereby reducing gain. Recent developments in IC design allows for the integration of the feedback resistor in many cases.

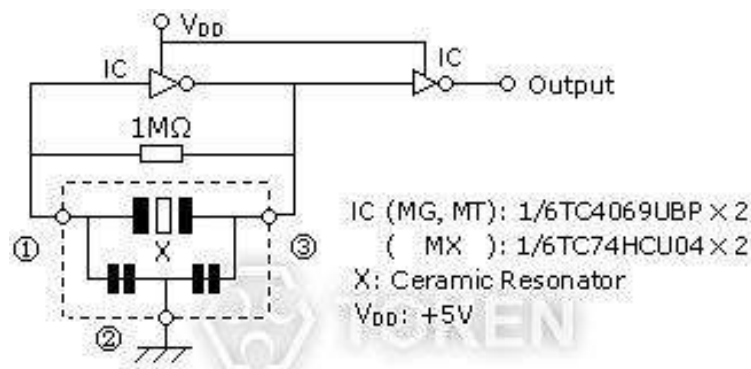
Damping Resistor (Rd optional):

Abnormal harmonic oscillation can be suppressed using a dampening resistor. The dampening resistor and load capacitors work together as a low-pass filter to reduce gain in the MHz range of oscillation.

Bias resistor (Rb optional):

A Bias Resistor can be utilized in the Resonator Oscillation Circuit to change the bias point when a reduction in IC gain is required, or to suppress unstable oscillation. This may be especially considered when a 3 stage buffered IC, or TTL IC, is used.

Direct Engineers can help with the circuit design if needed.



MHz (ZTT) Test Circuit for MOS IC

Resonator Optimum and IC Evaluations (ZTT)

Tolerance is determined by the design of the resonator. However stability and correlation is determined by the IC evaluation. The microcontroller is evaluated with the ceramic resonators to determine the best possible circuit conditions to achieve stability and stable oscillation.

In addition, frequency correlation is measured to meet the tight initial frequency tolerance required. For the tight tolerance resonators the IC evaluation must be completed on the final circuit board layout. The final circuit boards provide the most accurate measurement of the frequency correlation.

This measurement will account for the effects of stray capacitance on the oscillation frequency. Once the correlation is determined the frequency of the resonator is adjusted to compensate for the correlation.



Order Codes

Order Codes (ZTT)

ZTT16.93MX	P
Part Number	Package
P	Bulk
TR	Taping Reel

General Information

Direct Cuts Resonator Size and Cost

Direct's Resonators are made of high stability piezoelectric ceramics that function as a mechanical resonator. This device has been developed to function as a reference signal generator. The frequency is primarily adjusted by the size and thickness of the ceramic element. With the advance of the IC technology, various equipment may be controlled by a single LSI (Large-Scale Integration) integrated circuit, such as the one-chip microprocessor.

Resonator can be used as the timing element in most microprocessor based equipment. In the future, more and more applications will use **ceramic resonator** because of its high stability non-adjustment performance, miniature size and cost savings.

Typical applications include TVs, VCRs, remote controls and toys, voice synthesizers, automotive electronic devices, copiers, telephones, cameras, communication equipment.

Direct offers a full range of industry standard through hole and surface mount resonators both with and without internal capacitors. For standard Operating Temperatures (-20°C to 80°C), and for Automotive applications (-40°C to +125°C), with a wide range of frequencies and frequency stability options. Additionally, Direct Application Engineering and Design capabilities allow for custom design and characterization requirements that meet the demands of most applications.

