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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 22319.6-2023

Measurement of quartz crystal unit parameters - Part 6: Measurement of drive level dependence (DLD)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1.Structure and Drafting Rules of Standardization Documents"

Drafting.

This document is Part 6 of GB/T 22319 "Measurement of Parameters of Quartz Crystal Components". GB/T 22319 has published the following parts.

---Part 6.Measurement of excitation level dependence (DLD);

---Part 7.Measurement of activity jumps of quartz crystal components;

---Part 8.Measuring fixtures for surface mount quartz crystal components;

---Part 9.Measurement of parasitic resonance of quartz crystal components;

---Part 11.Criteria for determining load resonant frequency and effective load capacitance using automated network analysis techniques and error correction

method.

This document is equivalent to IEC 60444-6.2021 "Measurement of Quartz Crystal Component Parameters Part 6.Excitation Level Dependence (DLD)

Measurement".

Please note that some content in this document may be subject to patents. The publisher of this document assumes no responsibility for identifying patents.

Introduction

The excitation level is characterized by the power or voltage across the crystal element, or the current flowing through the crystal element. It drives the harmonic through the

piezoelectric effect.

The oscillator produces mechanical oscillations. In this process, acceleration work is converted into kinetic energy and elastic energy, and power consumption is converted into heat. The latter conversion is due to

Caused by internal and external friction of the quartz resonator.

Friction loss is related to the speed of the vibrating particle. When the oscillation is no longer linear, or when the internal friction of the quartz resonator or its surface and connection points

When speed, stretch or strain, displacement or acceleration reaches critical levels, friction losses will increase (see Appendix A). thus causing changes in resistance and frequency

ation, and because these parameters are temperature-dependent, causing further changes in resistance and frequency.

These changes can be observed on all crystal elements at high excitation levels (such as 1mW or above for AT-cut crystals).

And they also cause irreversible changes in frequency and resistance. Continuing to increase the excitation level may damage the resonator.

In addition to the above effects, some crystal components can also be observed at low excitation levels (such as AT-cut crystals below 1μW or 50μA).

to changes in frequency and resistance. In this case, if the loop gain is insufficient, it will be difficult to start the oscillation. In crystal filters, transmission loss and jitter

There will be changes.

In addition, the coupling between the specified vibration mode and other modes (such as the resonator itself, the mounting and the filling gas) is also related to the excitation level.

related.

Because these modes have different temperature responses, coupling causes frequency and resistance changes in a given mode over a narrow temperature range. this change

Increases with increasing excitation level. However, this effect is not considered further in this paper.

GB/T 22319 "Measurement of Parameters of Quartz Crystal Components" aims to establish standard measurement methods for quartz crystal component parameters. It is planned to be composed of the following departments.

Composition.

---Part 1.Basic method for measuring the resonant frequency and resonant resistance of

quartz crystal components using the pi-type network zero-phase method. The purpose is

It specifies the basic methods and applicable measurement networks for measuring the resonant frequency and resonant resistance of quartz crystal components.

---Part 2.Phase offset method for measuring dynamic capacitance of quartz crystal components. The purpose is to specify the measurement of quartz crystal element dynamic

capacitive method.

---Part 4.Measurement methods and methods of load resonant frequency and load resonant resistance RL of quartz crystal components with frequencies up to 30MHz

He derived calculations of parameters. The purpose is to specify the use of physical load capacitance to measure parameters such as the load resonant frequency of quartz crystal components.

counting method.

---Part 5.Method for determining equivalent electrical parameters using automatic network analysis technology and error correction. The purpose is to provide for the use of network

A measurement method that uses network analysis technology and uses linear equivalent circuits to determine the parameters of quartz crystal components.

---Part 6.Measurement of excitation level dependence (DLD). The purpose is to specify the use of pi-type network or oscillator method to measure quartz crystals

Body component DLD method.

---Part 7.Measurement of activity jumps of quartz crystal components. The purpose is to specify the activity jump of quartz crystal elements within the temperature range.

Changing measurement methods.

---Part 8.Measuring fixtures for surface mount quartz crystal components. Purpose is to specify accurate measurement of leadless surface mount quartz

Measurement fixtures for resonant frequency, resistance and equivalent circuit parameters of crystal components.

---Part 9.Measurement of parasitic resonance of quartz crystal components. The purpose is to provide for the use of automatic network analysis techniques and resistance method measurement

A method of measuring parasitic (unwanted) resonances in quartz crystal components.

---Part 11.Standard method for determining load resonant frequency and effective load capacitance using automated network analysis techniques and error correction

Law. The purpose is to specify the effective load when measuring the load resonant

frequency and nominal frequency of quartz crystal components without loading a physical load capacitance.

method of loading capacitance.

Measurement of Quartz Crystal Element Parameters

Part 6.Measurement of stimulus level dependence (DLD)

1 Scope

This document is applicable to the measurement of excitation level dependence (DLD) of quartz crystal components. This document specifies two test methods (A and C) and

A baseline measurement method (Method B). Method A is based on the pi-type network of IEC 60444-5 and is applicable to the entire

Frequency Range. Reference measurement method B is based on the pi-type network or reflection method of IEC 60444-5 or IEC 60444-8 and is applicable to this article

the entire frequency range covered by the software. Method C is the oscillator method, which is suitable for the measurement of large quantities of fundamental frequency quartz crystal components under fixed conditions.

Note. The measurement methods specified in this document are not only applicable to AT cut types, but also to other crystal cut types and vibration modes, such as double-angle cut types and vibration modes.

(IT, SC) and tuning fork crystal components (by using high impedance test fixtures).

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations

For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to

this document.

IEC 60444-5 Measurement of parameters of quartz crystal components Part 5.Determination of equivalence using automated network analysis techniques and error correction

IEC 60444-8 Measurement of parameters of quartz crystal components Part 8.Measuring fixtures for surface mount quartz crystal components (Meas-

crystal units)