

This is a preview - click here to buy the full publication



IEC 60679-1

Edition 4.0 2017-07

# INTERNATIONAL STANDARD

---

**Piezoelectric, dielectric and electrostatic oscillators of assessed quality –  
Part 1: Generic specification**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 31.140

ISBN 978-2-8322-4608-5

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms, definitions and general information .....	7
3.1 General.....	7
3.2 Terms and definitions.....	7
3.3 Preferred values for ratings and characteristics .....	21
3.3.1 General .....	21
3.3.2 Climatic category (40/85/56).....	22
3.3.3 Bump severity.....	22
3.3.4 Vibration severity.....	22
3.3.5 Shock severity.....	22
3.3.6 Leak rate .....	22
3.4 Marking.....	23
3.4.1 General .....	23
3.4.2 Packaging.....	23
4 Quality assessment procedures .....	23
4.1 General.....	23
4.2 Primary stage of manufacture .....	23
4.3 Structurally similar components .....	23
4.4 Subcontracting.....	23
4.5 Incorporated components.....	24
4.6 Manufacturer's approval.....	24
4.7 Approval procedures .....	24
4.7.1 General .....	24
4.7.2 Capability approval .....	24
4.7.3 Qualification approval .....	24
4.8 Procedures for capability approval .....	25
4.8.1 General .....	25
4.8.2 Eligibility for capability approval.....	25
4.8.3 Application for capability approval .....	25
4.8.4 Granting of capability approval .....	25
4.8.5 Capability manual .....	25
4.9 Procedures for qualification approval .....	25
4.9.1 General .....	25
4.9.2 Eligibility for qualification approval.....	25
4.9.3 Application for qualification approval .....	25
4.9.4 Granting of qualification approval .....	25
4.9.5 Quality conformance inspection .....	26
4.10 Test procedures .....	26
4.11 Screening requirements .....	26
4.12 Rework and repair work .....	26
4.12.1 Rework .....	26
4.12.2 Repair work .....	26
4.13 Certified test records.....	26
4.14 Validity of release .....	26
4.15 Release for delivery .....	26

4.16	Unchecked parameters .....	27
Annex A (normative)	Load circuit for logic drive .....	28
A.1	TTL and Schottky .....	28
A.2	CMOS .....	30
A.3	ECL .....	30
A.4	LVDS .....	31
Annex B (normative)	Latch-up test .....	32
B.1	Definition .....	32
B.1.1	Latch-up .....	32
B.1.2	Test procedure .....	32
B.2	Test method .....	32
Annex C (normative)	Electrostatic discharge sensitivity classification .....	33
C.1	Definition .....	33
C.1.1	Electrostatic discharge (ESD) .....	33
C.1.2	Test procedure .....	33
C.2	Test methods .....	33
C.2.1	General .....	33
C.2.2	Leaded oscillator .....	33
C.2.3	SMD oscillator .....	33
C.2.4	The impact of ESD on Oscillator in steady-state .....	33
Annex D (normative)	Digital interfaced crystal oscillator's function .....	34
Bibliography	.....	35
Figure 1	– Basic configurations of SAW resonators .....	9
Figure 2	– Example of the use of frequency offset .....	11
Figure 3	– Linearity of frequency modulation deviation .....	16
Figure 4	– Characteristics of an output waveform .....	18
Figure 5	– Definition of start-up time .....	19
Figure 6	– Clock signal with period jitter .....	19
Figure 7	– Phase jitter measures .....	20
Figure 8	– Gaussian distribution of jitter .....	20
Figure 9	– Jitter amplitude and period of jitter frequency .....	20
Figure 10	– Jitter tolerance according to ITU-T G.825, ATIS-0900101, Telcordia GR-253 and ETSI EN 300 462 .....	21
Figure A.1	– Circuit for TTL .....	28
Figure A.2	– Circuit for Schottky logic .....	29
Figure A.3	– Circuit for PECL .....	30
Figure A.4	– Circuit for LVDS .....	31
Table A.1	– Values to be used when calculating $R_1$ and $R_2$ .....	30
Table A.2	– Operating condition .....	31
Table A.3	– DC Electrical characteristics output load = 50 $\Omega$ to $V_{cc}$ -2V .....	31
Table D.1	– Function of the digital interface .....	34

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC OSCILLATORS OF ASSESSED QUALITY –

## Part 1: Generic specification

### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60679-1 has been prepared by IEC technical committee TC 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

This fourth edition cancels and replaces the third edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the title has been changed;
- b) additional matters related to oscillator using SAW or MEMS resonator in "Terms, definitions and general information" have been included;
- c) measurement methods of IEC 60679-1:2007 have been removed (they will be moved to IEC 62884 series);

- d) the content of Annex A has been extended;
- e) a new term and definition DIXO (Digital interfaced Crystal Oscillator) has been added;
- f) a new term and definition SSXO (Spread Spectrum Crystal Oscillator) has been added;
- g) Annex D has been added.

The text of this standard is based on the following documents:

FDIS	Report on voting
49/1229/FDIS	49/1233/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60679 series, published under the general title *piezoelectric, dielectric and electrostatic oscillators of assessed quality* can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

# PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC OSCILLATORS OF ASSESSED QUALITY –

## Part 1: Generic specification

### 1 Scope

This part of IEC 60679 specifies general requirements for piezoelectric, dielectric and electrostatic oscillators, including Dielectric Resonator Oscillators (DRO) and oscillators using FBAR (hereinafter referred to as "Oscillator"), of assessed quality using either capability approval or qualification approval procedures.

NOTE Dielectric Resonator Oscillators (DRO) and oscillators using FBAR are under consideration.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-561, *International electrotechnical vocabulary – Part 561: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection*. Available at [www.electropedia.org](http://www.electropedia.org)

IEC 60469, *Transitions, pulses and related waveforms – Terms, definitions and algorithms*

IEC 60617, *Graphical symbols for diagrams*. Available at <http://std.iec.ch/iec60617>

IEC 60748-2, *Semiconductor devices – Integrated circuits – Part 2: Digital integrated circuits*

IEC 60749-26, *Semiconductor devices – Mechanical and climatic test methods – Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)*

IEC 60749-27, *Semiconductor devices – Mechanical and climatic test methods – Part 27: Electrostatic discharge (ESD) sensitivity testing – Machine model (MM)*

IEC TR 61000-4-1, *Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of the IEC 61000-4 series*

IEC 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

IEC 62884-1:2017, *Measurement techniques of piezoelectric, dielectric, and electrostatic oscillators – Part 1: Basic methods for the measurement*

ISO 80000-1, *Quantities and units – Part 1: General*

Where any discrepancies occur for any reason, documents shall rank in the following order of precedence:

- detail specification;
- sectional specification;
- generic specification;
- any other international documents (for example of the IEC) to which reference is made.

The same order of precedence shall apply to equivalent national documents.