

### SLOVENSKI STANDARD SIST EN 62276:2013

01-marec-2013

## Enokristalne rezine za površinske zvočnovalovne naprave (SAW) - Specifikacija in merilna metoda

Single crystal wafers for surface acoustic wave (SAW) devices applications - Specifications and measuring method

Einkristall-Wafer für Oberflächenwellen-(OFW-)Bauelemente - Festlegungen und Messverfahren iTeh STANDARD PREVIEW

(standards.iteh.ai)
Tranches monocristallines pour applications utilisant des dispositifs à ondes acoustiques de surface (OAS) - Spécifications et méthodes de mesure

https://standards.iteh.ai/catalog/standards/sist/621cc188-015f-4250-af37-

Ta slovenski standard je istoveten z: EN 62276-2013

ICS:

31.140 Piezoelektrične in Piezoelectric and dielectric

dielektrične naprave devices

SIST EN 62276:2013 en

**SIST EN 62276:2013** 

## iTeh STANDARD PREVIEW (standards.iteh.ai)

### **EUROPEAN STANDARD**

### EN 62276

### NORME EUROPÉENNE EUROPÄISCHE NORM

January 2013

ICS 31.140

Supersedes EN 62276:2005

English version

# Single crystal wafers for surface acoustic wave (SAW) device applications - Specifications and measuring methods

(IEC 62276:2012)

Tranches monocristallines pour applications utilisant des dispositifs à ondes acoustiques de surface (OAS) - Spécifications et méthodes de mesure (CEI 62276:2012)

Einkristall-Wafer für Oberflächenwellen-(OFW-)Bauelemente -Festlegungen und Messverfahren (IEC 62276:2012)

# iTeh STANDARD PREVIEW (standards.iteh.ai)

This European Standard was approved by CENELEC on 2012-11-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration sixt/621cc188-015f-4250-af37-cfa0431a7464/sist-en-62276-2013

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### **CENELEC**

European Committee for Electrotechnical Standardization Comité Européen de Normalisation Electrotechnique Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

#### **Foreword**

The text of document 49/1005/FDIS, future edition 2 of IEC 62276, prepared by IEC TC 49, "Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection", was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62276:2013.

The following dates are fixed:

•	latest date by which the document has	(dop)	2013-08-23
	to be implemented at national level by		
	publication of an identical national		
	standard or by endorsement		
•	latest date by which the national	(dow)	2015-11-23
	standards conflicting with the		
	document have to be withdrawn		

This document supersedes EN 62276:2005.

EN 62276:2013 includes the following significant technical changes with respect to EN 62276:2005:

- terms and definitions are rearranged in accordance with the alphabetical order;
- "reduced LN" is appended to terms and definitions; PREVIEW
- "reduced LT" is appended to terms and definitions; s.iteh.ai)
- reduction process is appended to terms and definitions on

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

#### **Endorsement notice**

The text of the International Standard IEC 62276:2012 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60862-1	NOTE	Harmonized as EN 60862-1.
IEC 60862-2	NOTE	Harmonized as EN 60862-2.
IEC 60862-3	NOTE	Harmonized as EN 60862-3.
IEC 61019-1	NOTE	Harmonized as EN 61019-1.
IEC 61019-2	NOTE	Harmonized as EN 61019-2.
ISO 4287	NOTE	Harmonized as EN ISO 4287.

## Annex ZA (normative)

## Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	EN/HD	<u>Year</u>
IEC 60410	1973	Sampling plans and procedures for inspection by attributes	1 -	-
IEC 60758	2008	Synthetic quartz crystal - Specifications and guidelines for use	EN 60758	2009

# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 62276:2013

**SIST EN 62276:2013** 

## iTeh STANDARD PREVIEW (standards.iteh.ai)



**IEC 62276** 

Edition 2.0 2012-10

## INTERNATIONAL STANDARD

## NORME INTERNATIONALE



Single crystal wafers for surface acoustic wave (SAW) device applications – Specifications and measuring methods iteh.ai)

Tranches monocristallines pour applications utilisant des dispositifs à ondes acoustiques de surface (OAS) — Spécifications et méthodes de mesure

cfa0431a7464/sist-en-62276-2013

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE CODE PRIX



ICS 31.140

ISBN 978-2-83220-433-7

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

Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

### CONTENTS

INT	RODU	JCTION		7
1	Scop	e		8
2	Norm	ative re	ferences	8
3	Term	s and de	efinitions	8
	3.1	Single	crystals for SAW wafer	8
	3.2	_	and definitions related to LN and LT crystals	
	3.3		and definitions related to all crystals	
	3.4		38	
	3.5		ons of appearance defects	
	3.6		erms and definitions	
4	Requ		S	
	4.1		al specification	
		4.1.1	Synthetic quartz crystal	
		4.1.2	LN	
		4.1.3	LT	
		_		
	4.2	Wafer	LBO, LGSspecifications STANDARD PREVIEW	15
		4.2.1		
		4.2.2	General (standards.iteh.ai) Diameters and tolerances	15
		4.2.3	Thickness and tolerance EN 62276:2013	
		4.2.4	Orientation flatteh ai/catalog/standards/sist/621cc188-015f-4250-af37	16
		4.2.5	Secondary flat .cfa0431a7464/sist-en-62276-2013.	
		4.2.6	Back surface roughness	
		4.2.7	Warp	
		4.2.8	TV5 or TTV	16
		4.2.9	Front (propagation) surface finish	17
		4.2.10	Front surface defects	
		4.2.11	Surface orientation tolerance	18
		4.2.12	Inclusions	18
		4.2.13	Etch channel density and position of seed for quartz wafer	18
			Bevel	
		4.2.15	Curie temperature and tolerance	18
		4.2.16	Lattice constant	18
		4.2.17	Bulk resistivity (conductivity) for reduced LN and LT	18
5	Samp	oling pla	n	19
	5.1	Sampli	ng	19
	5.2	Sampli	ng frequency	19
	5.3	Inspect	tion of whole population	19
6	Test	methods	S	19
	6.1	Diamet	er	19
	6.2		ess	
	6.3		sion of OF	
	6.4		ation of OF	
	6.5			
	6.6			

	6.7	TTV	20
	6.8	Front surface defects	20
	6.9	Inclusions	20
	6.10	Back surface roughness	20
	6.11	Orientation	20
	6.12	Curie temperature	20
		Lattice constant	
		Bulk resistivity	
7	Identi	fication, labelling, packaging, delivery condition	21
	7.1	Packaging	
	7.2	Labelling and identification	
	7.3	Delivery condition	
8	Meas	urement of Curie temperature	
	8.1	General	
	8.2	DTA method	
	8.3	Dielectric constant method	
9		urement of lattice constant (Bond method)	
10	Meas	urement of face angle by X-ray	24
		Measurement principle	
	10.2	Measuring surface orientation of wafer	25
	10.3	Measuring surface orientation of water	25
		Measuring OF flat orientation dards.iteh.ai)	
		Typical wafer orientations and reference planes	
11		urement of bulk resistivitySIST.EN.622762013	
	11.1	Resistance measurement of a water cta0431a7464/sist-en-62276-2013	26
	11.2	Electrode	26
		Bulk resistivity	
12		I inspections	
		Front surface inspection method	27
		normative) Expression using Euler angle description for piezoelectric single	20
•		information). Many factoring and the CAW and factoring	
		informative) Manufacturing process for SAW wafers	
Bibl	iograp	hy	40
_		- Wafer sketch and measurement points for TV5 determination	
Figu	ıre 2 -	- Schematic diagram of TTV	11
Figu	ure 3 -	- Schematic diagram of warp	11
Figu	ıre 4 -	- Example of site distribution for LTV measurement	12
Figu	ıre 5 -	- LTV value of each site	12
Figu	ıre 6 -	- Schematic of a DTA system	22
_		- Schematic of a dielectric constant measurement system	
_		- The Bond method	
		- Measurement method by X-ray	
_		Relationship between cut angle and lattice planes	
		Measuring circuit	
_		-	
Figi	ıre 12	- Resistance measuring equipment	26

Figure 13 – Shape of electrode	27
Figure A.1 – Definition of Euler angles to rotate coordinate system (X, Y, Z) onto $(x_1,x_2,x_3)$	30
Figure A.2 – SAW wafer coordinate system	30
Figure A.3 – Relationship between the crystal axes, Euler angles, and SAW orientation for some wafer orientations	32
Figure B.1 – Czochralski crystal growth method	34
Figure B.2 – Example of non-uniformity in crystals grown from different starting melt compositions	36
Figure B.3 – Schematic of a vertical Bridgman furnace and example of temperature distribution	37
Table 1 – Description of wafer orientations	14
Table 2 – Roughness, warp, TV5 and TTV specification limits	17
Table 3 – Crystal planes to determine surface and OF orientations	25
Table 4 – Electrode size	27
Table A.1 – Selected SAW substrate orientations and corresponding Euler angles	31

# iTeh STANDARD PREVIEW (standards.iteh.ai)

#### SIST EN 62276:2013

#### INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SINGLE CRYSTAL WAFERS FOR SURFACE ACOUSTIC WAVE (SAW) DEVICE APPLICATIONS – SPECIFICATIONS AND MEASURING METHODS

#### **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. EC 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.

  SIST EN 62276:2013
- 5) IEC itself does not provide any attestation of conformity independent certification bodies provide conformity assessment services and, in some areast 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 62276 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

This second edition cancels and replaces the first edition of IEC 62276 published in 2005. This second edition constitutes a technical revision.

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

- terms and definitions are rearranged in accordance with the alphabetical order;
- "reduced LN" is appended to terms and definitions;
- "reduced LT" is appended to terms and definitions;
- reduction process is appended to terms and definitions.

**-6-**

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

FDIS	Report on voting
49/1005/FDIS	49/1011/RVD

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

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

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

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

IMPORTANT - The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SIST EN 62276:2013

62276 © IEC:2012

**-7-**

#### INTRODUCTION

A variety of piezoelectric materials are used for surface acoustic wave (SAW) filter and resonator applications. Prior to the 1996 Rotterdam IEC TC 49 meeting, wafer specifications were typically negotiated between users and suppliers. During the meeting, a proposal was announced to address wafer standardization. This standard has been prepared in order to provide industry standard technical specifications for manufacturing piezoelectric single crystal wafers to be used in surface acoustic wave devices.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 62276:2013