

Single crystal wafers applied for surface acoustic wave device — Specification and measuring method

ICS 31.140

National foreword

This Published Document reproduces verbatim IEC/PAS 62276:2001.
The UK participation in its preparation was entrusted to Technical Committee EPL/49, Piezoelectric devices for frequency control and selection, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

Summary of pages

This document comprises a front cover, an inside front cover, the IEC/PAS title page, a blank page, the IEICE Standard title page, a blank page, pages i to v, a blank page, pages 1 to 26, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

This Published Document, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 5 February 2002

© BSI 5 February 2002

ISBN 0 580 38980 4

IEC/PAS 62276

Edition 1.0
2001-08

**Single crystal wafers applied
for surface acoustic wave device –
Specification and measuring method**

PUBLICLY AVAILABLE SPECIFICATION



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION



Reference number
IEC/PAS 62276



電子情報通信学会規格
The Institute of Electronics, Information and Communication
Engineers Standard

Single crystal wafers applied for surface acoustic wave
device 0
- Specification and Measuring method -

弾性表面波デバイス用単結晶ウェーハ
－規格と測定法－

IEICE/Std - 0002

2001 年 4月
April, 2001

(社)電子情報通信学会
The Institute of Electronics, Information and
Communication Engineers

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SINGLE CRYSTAL WAFERS APPLIED
FOR SURFACE ACOUSTIC WAVE DEVICE –
SPECIFICATION AND MEASURING METHOD**

FOREWORD

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public and established in an organization operating under given procedures.

IEC-PAS 62276 was submitted by the Japanese Institute of Electronics, Information and Communication Engineers and has been processed by IEC technical committee 49: Piezoelectric and dielectric devices for frequency control and selection.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:

Draft PAS	Report on voting
49/504/PAS	49/513/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this PAS may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

FOREWORD

Although the mobile communication is spreading rapidly with a global scale in recent years, the surface acoustic wave device is used, to the cellular phone that is used for these widely. Wafers of the various single crystal piezoelectricity materials are used for those devices. However, those standard is carried out individually between a manufacturer and user, that is actual situation.

As the demands of single crystal wafers are increasing, it is indispensable to standardize them such as the terms and definitions, test conditions, measurement methods of materials, and guide the use.

International Electrotechnical Commission located in Geneva is actively working for the international standardization in the electrotechnical field. Among many Technical Committees (TCs) in IEC, TC 49 is working on the Piezoelectric and Dielectric Devices for Frequency Control and Selection. TC 49 has ten Working Groups (WGs), and the Working Group 5 (WG 5) is working for the preparation and deliberation of the IEC standard on the piezoelectric single crystal.

The piezoelectric and dielectric devices for frequency control and selection in the Standard Committee of the Institute of Electronics, Information and Communication Engineers have gotten active as the interior deliberation party of IEC/TC 49. On the other hand, QIAJ (Quartz Industry Association of Japan) is the industry meeting that was organized with the maker of a crystal unit and the activity corresponding to TC 49/WG 5 is done by the material committee which belongs QIAJ. This document was issued by the material committee of QIAJ, under cooperation with the 10th work sectional meeting (WG 10) of TC 49.

When the Japanese National Committee for IEC/TC 49 proposed this documents as a new work item proposal (49/428/NP), however, was not approved (49/RVN/440), because only two countries; Germany and Japan, nominated experts to participate this project. According to the IEC rule for the New Work Items Proposal, it is required to start a new project that more than four P-member countries should nominate the name of experts and this proposal failed. But, the Japanese National Committee for IEC/TC 49 decided to continue the work to draft this standard, even though it was not approved, because we believed that this should be a very fundamental, useful and mandatory documents. Therefore, Technical Committee of QIAJ cooperated to make out this work and the draft was reviewed at the TC 49 Nara meeting, April, 2000 and recommended as a PAS document (49/RVN/474). Finally, this document has been completed

published as a standard of the Institute of Electronics, Informaion and Communication Engineers and a technical standard of QIAJ.

This standard is a fruit of collecting wisdom in the field of advanced technology in Japan and it is open for public as the Standard of the Institute of Electronics, Informaion and Communication Engineers. And it is expected that this standard will contribute to the development of technology in this fast growing field. This standard will be submitted to the IEC in the track of IEC PAS (Publicly Available Specification) for international circulation.

Finally, I would like to express my sincere appreciation to Mr.Kunihiko Nagai, Chairman, all members of the 10th work sectional meeting (WG 10) of the Japanese National Committee for IEC/TC 49 and Technical Committee of QIAJ, for their efforts develop this standard.

Mikio Takagi

Chairman

The Japanese National Committee for IEC/TC 49
in the Standard Committee of the Institute of
Electronics, Information and Communication Engineers.

Contributors to "Single crystal wafers applied for surface acoustic wave device
-Specification and Measuring method- "

Chief	Mr. Kunihiro Nagai (Toyo Communication Equipment)
Member	Mr. Kazushi Kamiyama (Kyocera)
Member	Mr. Masakazu Kurashige (Kinseki)
Member	Mr. Masami Mochizuki (Koike)
Member	Mr. Hajime Shimizu (Koto Crystal)
Member	Mr. Toshihiko Ryuou (Shinetsu Kagaku kogyo)
Member	Mr. Masayoshi Matsui (Sumitomo Metal Mining)
Member	Mr. Shinichi Shikada (Sumitomo Denki Kogyo)
Member	Mr. Susumu Maeda (Daishinku)
Member	Mr. Katsuma Moroishi (Tokyo Denpa)
Member	Dr. Sadao Matsumura (Toshiba)
Member	Dr. Junichi Kushibiki (Tohoku University)
Member	Dr. Masaaki Ono (Fujitsu Media Device)
Member	Mr. Junji Takahashi (Nihon Dempa Kogyo)
Member	Mr. Yutaka Mikawa (Fine Crystal)
Member	Heiji Takashima (Meidensha)
Member	Ietaka Sahashi (Yamaju Ceramics)

CONTENTS

Introduction -----	1
Section 1 : Specification for single crystal wafer-----	1
1 Scope-----	1
2 Reference documents-----	1
3 Terms and definitions-----	2
4 Symbols and abbreviated terms-----	5
5 Requirements-----	5
6 Sampling-----	7
7 Test methods-----	8
8 Identification, labeling, packaging, delivery condition-----	9
Section 2 Measuring method -----	10
1 Measuring method of Curie Temperature-----	10
2 Measurement of lattice constant(Bond method)-----	11
3 Measurement of face angle by X-ray-----	12
4 Appearance inspections-----	14
Annex A(Normative) Expression using Eulerian angle for piezoelectric Single crystal-----	16
Annex B(Informative) Crystal growth method-----	18
Annex C(Informative) Manufacturing lot-----	22
Annex D(Informative) Explanation of TTV, LTV and Sori-----	22
Annex E(Informative) Standard mechanical wafer process flow chart-----	24
Annex F(Informative) Reference-----	26

