INTERNATIONAL STANDARD

IEC 60748-4-3

First edition
2006-08

Semiconductor devices – Integrated circuits –

Part 4-3: Interface integrated circuits – Dynamic criteria for analogue-digital converters (ADC)

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE W

For price, see current catalogue

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SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 4-3: Interface integrated circuits – Dynamic criteria for analogue-digital converters (ADC)

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International Standard IEC 60748-4-3 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

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

FDIS	Report on voting
47A/750/FDIS	47A/758/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 list of all the parts of the IEC 60748 series, under the general title *Semiconductor devices – Integrated circuits*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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.

INTRODUCTION

The use of ADCs has increased significantly in the last few years with the large increase in the use of digital signal processing. The majority of the processing of analogue signals now takes place in the digital domain, and this requires high precision in the conversion of signals from the analogue to the digital form. Consequently, the characterization of ADCs is of great importance.

IEC 60748-4 contains measuring methods for ADCs in which the test conditions are either static or change very slowly. However, some of the characteristics of an ADC can change to some degree with the rate of change of the input signal, and there are other characteristics that cannot be measured except under dynamic conditions. Consequently, a set of dynamic tests is required in order to obtain the response of an ADC when operated under dynamic conditions.

The output of a dynamic test consists of the set of output code values obtained during the test. This record, being the sequence in time of a set of values, gives information in the “time-domain”. The result of applying the Fourier Transform to the record is information that is in the “frequency domain”, and this contains the spectrum of the output over the range of frequencies of interest. In particular, distortion, noise and spurious output frequencies can then be evaluated.

This International Standard introduces a set of dynamic methods, which are now coming into use in industry and which rely mostly on measurements made with sinusoidal input signals, and of which the results are suitable for analysis in the frequency domain. It also includes a further dynamic method that uses a wide-band input signal. For the reasons explained below, industry has shown great interest in this particular method.

Linearity errors of an ADC are dependent on the amplitude of the input signal and its rate of change. Not so well known is that linearity errors also depend on the instantaneous amplitude distribution, i.e. amplitude probability density function (APDF) of the input signal. This source of error is usually a result of localized heating effects in the integrated circuit and is dependent on ADC architecture and internal circuit layout.

Single-frequency signals have an APDF concentrated at the extremes and therefore exaggerate the effect of errors at the ends of the input range compared to those nearer the centre. Conversely, a wide-band signal has an APDF concentrated more around the centre of the input range. A wide-band signal is much closer to the typical input signal in the majority of ADC applications than a single-frequency signal. Therefore, measurements made with such a signal will give more realistic error estimates.

A wide-band signal can be generated from a pseudo-random binary sequence. Although such a signal appears to be noisy, it contains only a set of defined frequencies and is therefore suitable for measuring errors.

SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 4-3: Interface integrated circuits – Dynamic criteria for analogue-digital converters (ADC)

1 Scope

This part of IEC 60748 specifies a set of measuring methods and requirements for testing ADCs under dynamic conditions, together with associated terminology and characteristics.

2 Normative references

The following referenced documents are indispensable for the application 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 60748-4:1997, *Semiconductor devices – Integrated circuits – Part 4: Interface integrated circuits*

IEC 60268-10:1991, *Sound system equipment – Part 10: Peak programme level meters*