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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



47/2978/CD

COMMITTEE DRAFT (CD)

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IEC TC 47 : SEMICONDUCTOR DEVICES

SECRETARIAT:
Korea, Republic of

SECRETARY:
Mr Cheolung Cha

OF INTEREST TO THE FOLLOWING COMMITTEES:

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

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TITLE:

Semiconductor devices - Chip-scale testing for autonomous vehicles - Part 6: Visual Imaging devices

NOTE FROM TC/SC OFFICERS:

This revised CD document reflects the scope and title change.(47/2939/Q and 47/2964/RQ)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Semiconductor devices – Chip-scale testing for autonomous vehicles - Part 6: Visual imaging devices

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IEC 63551-6 has been prepared by IEC technical committee TC47: Semiconductor devices. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available

at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

Semiconductor devices – Chip-scale testing for autonomous vehicles

Part 6: Visual imaging devices

1 Scope

This part of IEC 63551 specifies the standard testing conditions and testing methods that can be used to evaluate and determine the performance of visual imaging devices used in autonomous vehicle. This document applies to the performance testing for visual imaging devices used in autonomous vehicles.

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.

ISO 12233:2023, *Photography – Electronic still picture imaging – Resolution and spatial frequency responses*

ISO 15739:2013, *Photography – Electronic still-picture imaging – Noise measurements*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

visual imaging devices

essential photoelectric conversion components in autonomous vehicles, transforming environmental visible - light signals into digital image data. As fundamental sensing units, they provide raw visual inputs for environmental perception systems and are typically implemented through visible - light - sensitive CMOS or CCD sensor arrays. With the advancement of packaging technology, devices that integrate lenses with CMOS or CCD sensor arrays in a single package are also considered as visual imaging devices.

3.1.2

effective pixel

pixel that captures image data

3.1.3

signal-to-noise ratio

SNR

ratio of the output signal to the mean noise level, at a particular signal level

3.1.4

LED flicker

flicker in the image of a pulsed light source or objects illuminated by a pulsed light source because the exposure time of the visual imaging module does not coincide with the pulses of the light source

Note 1 to entry: Although the term "LED flicker" is used conventionally, the phenomenon of flicker is not confined to LED light sources but any pulsed light source.

3.1.5

spatial frequency response

SFR

relative amplitude response of an imaging system as a function of input spatial frequency

Note 1 to entry: The SFR is normally represented by a curve of the output response to an input sinusoidal spatial luminance distribution of unit amplitude, over a range of spatial frequencies. The SFR is divided by its value at the spatial frequency of 0 as normalization to yield a value of 1,0 at a spatial frequency of 0.

[SOURCE: ISO 12233:2023]

3.1.6

ghost image

undesired extra image formed by light reflected inside the module from a high-luminance source

3.2 Abbreviations

DR	dynamic range
DUT	device under test
FDI	Flicker Detection Index
FMC	Flicker Michelson Contrast
FOV	field of view
LED	light-emitting diode
LRI	Luminance Retention Index
PRNU	photo response non-uniformity
PWM	pulse width modulation
RPS	round per second
SFR	spatial frequency response
SNR	signal-to-noise ratio

4 Standard testing equipment

The standard testing equipment is as the following.

- a) goniometer: The goniometer shall independently rotate around horizontal and vertical axes, enabling adjustment of the yaw angle(horizontal rotation) or pitch angle (vertical rotation) of the DUT relative to its initial position. The goniometer shall achieve full 360° rotation around each axis. The available angular speed for rotation around both axes should be up to 2 RPS.
- b) surface light sources: The surface light source shall be a uniform surface light source. The spectral distribution characteristics of the light source shall conform to the standard D65 illuminant. It shall have continuously tunable luminance. The light source shall emit light uniformly across the surface. The spatial variance in illuminance shall be less than 2%.
- c) LED light sources: The LED light sources shall be PWM lights with colour temperature 6000K. They shall emit light uniformly throughout the surface and the spatial variance in illuminance shall be less than 2%. The PWM frequencies and duty cycles are listed in Table 1.

Table 1 – PWM frequency and duty cycle of LED light sources

Light source name	PWM frequency	Duty cycle	Note
Light source 1	30 Hz	20%	Approximate threshold for human vision.