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INTERNATIONAL STANDARD

Organic light emitting diode (OLED) displays – Part 2-1: Essential ratings and characteristics of OLED display modules

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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.
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International Standard IEC 62341-2-1 has been prepared by technical committee 110: Electronic display devices.

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

FDIS	Report on voting
110/651/FDIS	110/666/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.

A list of all parts in the IEC 62341 series, published under the general title *Organic light emitting diode (OLED) displays*, can be found on the IEC website.

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- withdrawn,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.

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

INTRODUCTION

IEC 62341 consists of the following parts, under the general title *Organic light emitting diode (OLED) displays:*

Part 1-1: Generic specifications
Part 1-2: Terminology and letter symbols
Part 2-1: Essential ratings and characteristics of OLED display modules
Part 5: Environmental testing methods
Part 5-2: Mechanical endurance testing methods
Part 5-3: Measuring methods of image sticking and lifetime
Part 6-1: Measuring methods of optical and electro-optical parameters
Part 6-2: Measuring methods of visual quality and ambient performance
Part 6-3: Measuring methods of image quality

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –

Part 2-1: Essential ratings and characteristics of OLED display modules

1 Scope

This part of IEC 62341 describes the essential ratings and characteristics of organic light emitting diode (OLED) display modules.

2 Normative references

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.

Void.

3 Organic light emitting diode (OLED) display modules

3.1 Types of OLED display modules

The OLED display modules include the following types:

– passive matrix monochrome OLED display modules,
– passive matrix colour OLED display modules,
– active matrix colour OLED display modules.

3.2 Principles and structure

The OLED display modules consist of OLED display panels, electronic circuits, and usually bezels.

EXAMPLE A thin film transistor (TFT) (polycrystalline silicon, oxide, organic materials) active matrix display cell with electronic circuits and connector pins.

3.3 Modes of operation

3.3.1 Addressing mode of operation

The addressing mode of operation for OLED display modules includes the following types:

– passive matrix,
– active matrix, etc.

3.3.2 Optical mode of operation

The addressing mode of operation for OLED display modules includes the following types:

– illumination mode: for example top-emission, bottom-emission,
– number of colours,
– number of grey scales.

3.4 Details of outline

3.4.1 Material and mechanical description

The material and mechanical description of OLED display modules is as follows:

– substrate material: for examples glass, plastic, etc.,
– bezel material: for example plastic, metal, etc.

3.4.2 Connection types

The connection types of OLED display modules are as follows:

– connector,
– flex cable,
– connection pins, etc.

3.4.3 Outline drawing and dimensions

The outline drawing and dimensions of OLED display modules are as follows:

– overall dimensions,
– bezel dimensions,
– active display area and display centre.

3.5 Limiting values (absolute maximum rating system) over the operating temperature range, unless otherwise stated

The following limiting values should be specified in Table 1.

Table 1 – Limiting values of OLED modules

Subclause	Characteristics	Symbol	Requirements		Unit
3.5.1	Operating temperature	T_{op}	Min.	Max.	°C
3.5.2	Operating humidity	H_{op}		Max.	%
3.5.3	Storage temperature	T_{stg}	Min.	Max.	°C
3.5.4	Storage humidity	H_{stg}		Max.	%
3.5.5	Supplied voltages Supply voltage for logic drive Supply voltage(s) for EL	 $V_{DD} - V_{SS}$ V_{EL}	 Min. Min.	 Max. Max.	V
3.5.6	Input signal voltages	V_{IN}	Min.	Max.	V

3.6 Electrical and optical characteristics

The following characteristics should be specified in Table 2.

Table 2 – Electrical and optical characteristics of OLED modules

Subclause	Characteristics	Condition at T_{op} = 25 °C unless otherwise specified	Symbol	Requirements		Unit
3.6.1	Supplied voltages					
	Supply voltage for logic drive		$V_{DD} - V_{SS}$	Min.	Max.	V
	Supply voltage(s) for EL		V_{EL}	Min.	Max.	
3.6.2	Input signal voltages		V_{IN}	Min.	Max.	
	High level input signal voltage		V_{INH}	Min.	Max.	
	Low level input signal voltage		V_{INL}	Min.	Max.	V
	Input analogue video signals (where appropriate)		V_{VID}	Min.	Max.	
3.6.3	Operating frequency (where appropriate)		f_{op}	Min.	Max.	Hz
	Frame frequency		f_{FRM}			
3.6.4	Supply currents	Conditions chosen to achieve maximum supply current, e.g. operating supply voltage, display pattern, etc. as appropriate	I_{tot} or I_{DD} and/or I_{EE}		Max.	mA
3.6.5	High level input signal current (where appropriate)		I_{INH}		Max.	mA
3.6.6	Low level input signal current (where appropriate)		I_{INL}		Max.	mA
3.6.7	Dark-room contrast ratio	Specified measuring method and conditions	$DRCR$	Min.		–
3.6.8	Ambient contrast ratio	Specified measuring method and conditions	ACR	Min.		–
3.6.9	Luminance (where appropriate)	Specified measuring method and conditions	L	Min.		cd/m^2
	Luminance uniformity (where appropriate)		L_{uni}	Min.		–
	Color uniformity (where appropriate)		$\Delta u'v'$	.	Max.	–
3.6.10	Viewing angle range	Specified definition of viewing direction and specified contrast ratio	θ_V and θ_H	Min.	Max.	°
3.6.11	Half luminance lifetime	Specified measuring method and conditions	T_{50}	Min.		h
3.6.12	Power consumption	Specified measuring method and conditions	P		Max.	W
3.6.13	Reflectance (where appropriate)	Specified measuring method and conditions	ρ		Max.	–
3.6.14	Chromaticity of white (x,y) (where appropriate)		x_W, y_W	[a]	[a]	–
	Chromaticity of red (x,y) (where appropriate)		x_R, y_R	[a]	[a]	
	Chromaticity of blue (x,y) (where appropriate)		x_B, y_B	[a]	[a]	
	Chromaticity of green (x,y) (where appropriate)		x_G, y_G	[a]	[a]	
3.6.15	Image sticking (where appropriate)	Specified measuring method and conditions	IS		Max.	–
[a] Items of value (i.e., minimum, maximum, typical or average) are determined in a detail specification.						

3.7 Supplementary information

3.7.1 Timing characteristics, timing of logic voltages and data/format interface specification.

3.7.2 Supply voltages sequence condition, where appropriate.

3.7.3 Operating voltage range, if appropriate, as a function of temperature at specified contrast ratio.

3.7.4 Handing and operating information.

3.7.5 Precautions with respect to electrostatic discharges.

3.7.6 Precautions of installation: mechanical and/or electrical.

3.7.7 Safety information.

3.7.8 Characterization of diffuse and specular reflectance and transmittance.

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