BS EN 61747-4:2012

BSI Standards Publication

Liquid crystal display devices

Part 4: Liquid crystal display modules and cells — Essential ratings and characteristics

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National foreword

This British Standard is the UK implementation of EN 61747-4:2012. It is identical to IEC 61747-4:2012. It supersedes BS EN 61747-4:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

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

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Liquid crystal display devices - Part 4: Liquid crystal display modules and cells - Essential ratings and characteristics

(IEC 61747-4:2012)

Dispositifs d'affichage à cristaux liquides - Partie 4: Modules et cellules d'affichage à cristaux liquides - Valeurs limites et caractéristiques essentielles
(CEI 61747-4:2012)

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CENELEC

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Foreword

The text of document 110/349/CDV, future edition 2 of IEC 61747-4, prepared by IEC/TC 110 "Electronic display devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61747-4:2012.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2013-07-31
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2015-10-31

This document supersedes EN 61747-4:1998.

EN 61747-4:2012 includes the following significant technical changes with respect to EN 61747-4:1998:

– 2.1 and 3.1 of EN 61747-4:1998 were deleted because these items are defined in EN 61747-1;

– 2.7.6, in 2.7, Supplementary information, of EN 61747-4:1998 was deleted because the scope of this standard is about passive matrix monochrome liquid crystal display modules;

– the item “Gray scale: digital or analog” in 2.3.1 of EN 61747-4:1998 was changed to “Gray scale: number” because it is more accurate;

– contrast mode: light symbol on dark background (“LOD” or “positive image”) or dark symbol on light background (“DOL” or “negative image”) was introduced in this part of EN 61747 to replace the description in 2.3.1 and 3.3.1 of EN 61747-4:1998.

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 61747-4:2012 was approved by CENELEC as a European Standard without any modification.

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.

Publication	Year	Title	EN/HD	Year
IEC 61747-1	1998	Liquid crystal and solid-state display devices - Part 1: Generic specification	EN 61747-1	1999

CONTENTS

LIQUID CRYSTAL DISPLAY DEVICES –

Part 4: Liquid crystal display modules and cells – Essential ratings and characteristics

1 Scope

This part of IEC 61747 describes the essential ratings and characteristics of LCD cells and passive matrix monochrome liquid crystal display modules.

It does not apply to active matrix LCD cells nor to multicolour cells.

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.

IEC 61747-1:1998, *Liquid crystal and solid-state display devices – Part 1: Generic specification*

3 Liquid crystal display modules

3.1 Principles and material used

Example: a TN display cell with electronic circuits and connector pins.

Where appropriate, a type of light source.

3.2 Modes of operation

3.2.1 Optical mode of operation

– illumination mode: for example reflective, transmissive, transflective
– gray scale: number
– contrast mode: light symbol on dark background (“LOD” or “positive image”) or dark symbol on light background (“DOL” or “negative image”)

3.2.2 Electrical mode of operation

– example: static mode or multiplex mode, etc.

3.3 Details of outline

3.3.1 Material, mechanical description

– examples: glass, plastic, metal, etc.
– construction: for example integrated backlight, bezel structure

3.3.2 Method of connection

– connector, flex cable or connection pins, etc.

3.3.3 Outline drawing and dimensions

– overall dimensions
– viewing area and display centre

3.3.4 Pinout table and/or connection diagram

– type of connectors

3.3.5 Preferred or designed viewing direction

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

3.4.1 Minimum and maximum operating temperature (T_{op})

3.4.2 Minimum and maximum storage temperature (T_{stg})

3.4.3 Minimum and maximum value of supply voltages for logic and LCD drive (V_{DD}-V_{SS}, V_{DD}-V_{EE}, V_{EE}-V_{SS}, V_O-V_{SS}, V_{DD}-V_O)

3.4.4 Minimum and maximum value of input signal voltage (V_{IN})

3.4.5 Where appropriate, maximum value of backlight voltage (V_{BL})

3.4.6 Where appropriate, maximum soldering temperature (T_{sld})

– maximum soldering time and minimum distance to module package should be specified

3.5 Electrical and optical characteristics

The following parameters should be specified in Table 1.

Table 1 – Electrical and optical characteristics of LCD modules

Reference	Characteristics	Condition at T_{op} = 25 °C unless otherwise specified	Symbol	Requirements	
3.5.1	Supply voltage for logic drive Supply voltage for LCD drive		V_{DD}-V_{SS} V_{DD}-V_{EE} V_{EE}-V_{SS} V_O-V_{SS} V_{DD}-V_O	Min.	Max.
3.5.2	Input signal voltages High level input signal voltage Low level input signal voltage		V_{IN} V_{IH} V_{IL}	Min.	Max.
3.5.3	Backlight voltages (where appropriate)		V_{BL}	Min.	Max.
3.5.4	Operating frequency (where appropriate) Frame frequency Oscillator frequency		f_{op} f_{FRM} f_{OSC}	Min.	Max.
3.5.5	Supply currents (without backlight)	Conditions chosen to achieve maximum supply current, e.g. operating supply voltage, display pattern, etc., as appropriate	I_{tot} I_{DD} and/or I_{EE}		Max.

Reference	Characteristics	Condition at T_{op} = 25 °C unless otherwise specified	Symbol	Requirements	
3.5.6	High level input signal current (where appropriate)		I_{IH}		Max.
3.5.7	Low level input signal current (where appropriate)		I_{IL}		Max.
3.5.8	Operating backlight current (where appropriate)		I_{BL}		Max.
3.5.9	Contrast ratio (diffused light and/or direct beam)	When the module has a backlight system, this system shall be used at a specified level during the contrast ratio measurements	CR_{diff} CR_{dir}	Min.	
3.5.10	Luminance (where appropriate)	Specified measuring method and conditions	L	Min.	
3.5.11	Viewing angle range	Specified definition of viewing direction and specified contrast ratio	θ_V and θ_H	Min.	Max.
3.5.12	Turn-on time	Specified temperature	t_{on}		Max.
3.5.13	Turn-off time	Specified temperature	t_{off}		Max.
3.5.14	Transmittance (regular and/or diffuse) (where appropriate)	Specified measuring method and conditions	τ_r and/or τ_d	Min.	
3.5.15	Reflectance (regular and/or diffuse) (where appropriate)	Specified measuring method and conditions	ρ_r and/or ρ_d	Min.	Max.

3.6 Supplementary information

(To be given only as far as necessary for the specification and use of the device.)

3.6.1 Angular dependence of contrast ratio

3.6.2 Switching times versus temperature

3.6.3 Timing characteristics and timing of logic voltages

3.6.4 Supply voltages sequence condition, where appropriate

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

3.6.6 Handling and operating information

3.6.7 Precautions with respect to electrostatic discharges

3.6.8 Precautions of installation: mechanical and/or electrical

3.6.9 Safety information

3.6.10 Characterization of diffuse and specular reflectance and transmittance

4 Liquid crystal display cells (LCD cells)

4.1 Principle and material used

Example: twisted nematic cell

4.2 Modes of operation

4.2.1 Optical mode of operation

– illumination mode: for example reflective, transmissive, transflective
– contrast mode: light symbol on dark background (“LOD” or “positive image”) or dark symbol on light background (“DOL” or “negative image”)

4.2.2 Electrical mode of operation

Static mode or multiplex mode

4.3 Details of outline

4.3.1 Mechanical description

Example: glass or plastic

4.3.2 Method of connection

4.3.3 Outline drawing

Dimensions and display pattern

4.3.4 Pinout table and/or connection diagram

4.3.5 LCD cell reference axis for definition of viewing angle

4.3.6 Recommended viewing direction

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

4.4.1 Minimum and maximum storage temperatures (T_{stg})

4.4.2 Minimum and maximum operating temperatures (T_{op})

4.4.3 Maximum ambient humidity (RH)

4.4.4 Minimum and maximum atmospheric pressure outside

4.4.5 Maximum mechanical shock

4.4.6 Maximum vibration

4.4.7 Maximum acceleration

4.4.8 Maximum bending strength of the cell

4.4.9 Maximum torsional strength of the cell

4.4.10 Maximum r.m.s. value of applied driving voltage

4.4.11 Maximum peak-to-peak value of applied driving voltage

4.4.12 Maximum d.c. voltage component of the applied driving voltage

4.4.13 Maximum soldering temperature and time, where appropriate

4.5 Electrical and optical characteristics

The following parameters should be specified in Table 2:

– viewing direction and contrast condition;
– electrical mode of operation.

Table 2 – Electrical and optical characteristics of LCD cells

Reference	Characteristics	Condition at T_{op} = 25 °C unless otherwise stated	Symbols	Requirements	
4.5.1	Driving voltage			Min.	Max.
4.5.2	Driving frequency			Min.	Max.
4.5.3	Threshold voltage	At specified frequency	V_{th}	Min.	Max.
4.5.4	Saturation voltage	At specified frequency	V_{sat}	Min.	Max.
4.5.5	Total current: All picture elements activated at MPX. ratio = 1	At specified voltage and frequency			Max.
4.5.6	Total capacitance: All picture elements activated at MPX. ratio = 1	At specified voltage and frequency			Max.
4.5.7	Contrast ratio	At specified viewing direction. Diffuse light and/or direct beam	CR_{dir} and/or CR_{diff}	Min.	
4.5.8	Turn-on time		t_{on}		Max.
4.5.9	Turn-off time		t_{off}		Max.
4.5.10	Where appropriate, regular and/or diffuse transmittance		τ_r and/or τ_d	Min.	
4.5.11	Where appropriate, regular and/or diffuse reflectance		ρ_r and/or ρ_d	Min.	Max.

4.6 Supplementary information

(To be given only as far as necessary for the specification and use of the device.)

4.6.1 Angular dependence of contrast ratio

4.6.2 Switching times versus temperature

4.6.3 Operating range

– threshold voltage versus temperature;
– operating voltage range as a function of temperature at specified contrast ratio.

4.6.4 Total picture element area

(Sum of all single picture element areas, for example, segments, symbols or dots.)

4.6.5 Handling and operation information

4.6.6 Precautions

4.6.7 Chromaticity co-ordinates

4.6.8 Uniformity characteristics

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