IEC 62149-4

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic active components and devices – Performance standards – Part 4: 1 300 nm fibre optic transceivers for Gigabit Ethernet application

Composants et dispositifs actifs à fibres optiques – Normes de fonctionnement –
Partie 4: Emetteurs-récepteurs à fibres optiques de 1 300 nm pour application Gigabit Ethernet

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PERFORMANCE STANDARDS –

Part 4: 1 300 nm fibre optic transceivers for Gigabit Ethernet application

FOREWORD

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International Standard IEC 62149-4 has been prepared by subcommittee 86C: Fibre optic active devices, of IEC technical committee 86: Fibre optics.

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

CDV	Report on voting
86C/912/CDV	86C/949/RVC

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 second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision that includes changes and additions to the performance tables reflecting new technology.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 62149 series, published under the general title *Fibre optic active components and devices – Performance standards,* 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- withdrawn,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.

INTRODUCTION

Fibre optic transceivers are used to convert electrical signals into optical signals and vice versa. This specification covers the performance standard for 1 300 nm fibre optic transceivers for Gigabit Ethernet application. The ISO/IEC 8802-3 Gigabit Ethernet standard is used as the basis for determining the optical characteristics of the transceiver, which operates with a line rate of 1,25 Gbit/s.

FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PERFORMANCE STANDARDS –

Part 4: 1 300 nm fibre optic transceivers for Gigabit Ethernet application

1 Scope

This part of IEC 62149 covers the performance specification for 1 300 nm fibre optic transceiver modules used for the ISO/IEC 8802-3 Gigabit Ethernet application. The performance standard contains a definition of the product performance requirements together with a series of sets of tests and measurements with clearly defined conditions, severities, and pass/fail criteria. The tests are intended to be run on a "once-off" basis to prove any product's ability to satisfy the performance standard's requirements.

A product that has been shown to meet all the requirements of a performance standard can be declared as complying with the performance standard, but should then be controlled by a quality assurance/quality conformance program.

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 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-38, *Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

IEC 60028-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60749-25, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-26*, Semiconductor devices – Mechanical and climatic test methods – Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)*

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60938-1, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic specification*

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61300-2-47, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-47: Tests – Thermal shocks*

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

3 Symbols and abbreviated terms

For the purposes of this document the following symbols and abbreviations apply.

3.1 Symbols

E_r	extinction ratio
RH	relative humidity
I_{IL}	data input current – low
I_{IH}	data input current – high
I_{out}	output current
P_o	optical output power
P_d	alarm on level
P_a	alarm off level
R_{DL}	data output load
S	receiver sensitivity
TD	transmit disable function
T_{amb}	ambient operating temperature
T_{stg}	storage temperature
T_f	data output fall time
T_r	data output rise time
V_{cc}	power supply voltage
$V_{IL} - V_{CC}$	data input voltage – low
$V_{IH} - V_{CC}$	data input voltage – high
V_{oh}	alarm output high voltage
V_{ol}	alarm output low voltage
$V_{ol} - V_{CC}$	data output voltage – low
$V_{oh} - V_{CC}$	data output voltage – high
V_{pp}	transmitter differential input voltage swing
λ_{ce}	central wavelength
$\Delta\lambda$	spectral width (r.m.s.)

3.2 Abbreviated terms

ESD	electrostatic discharge
HBM	human body model

4 Product parameters

4.1 Absolute limiting ratings

Absolute limiting (maximum and/or minimum) ratings, as shown in Table 1, imply that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the normal performance parameters. It should not be assumed that limiting values of more than one parameter can be applied at any one time.

Table 1 – Absolute limiting ratings

Parameter	Symbol	Minimum	Maximum	Unit
Storage temperature	T_{stg}	–40	+85	°C
Ambient operating temperature	T_{amb}	–10	+80	°C
Lead soldering temperature			260/10	°C/s
Output current	I_{out}	0	50	mA
Data input voltage		–0,5	V_{cc}	V
Transmitter differential input voltage swing	V_{pp}	0,30	1,40	V
Supply voltage [a]		–0,5	(V_{nom} +40 %)	V
Relative humidity [b]	RH	5	85	%

[a] Nominal operating voltages (V_{nom}) of 5 V and 3,3 V apply. Refer to Annex A for variant references.

[b] No condensation allowed.

4.2 Operating environment

The parameters for the operating environment are shown in Table 2.

Table 2 – Operating environment

Parameter	Symbol	Minimum	Maximum	Unit
Supply voltage [a]	V_{cc}	(V_{nom} – 5 %)	(V_{nom} + 5 %)	V
Ambient operating temperature	T_{amb}	0	70	°C
Relative humidity [b]	RH	5	85	%

[a] Nominal operating voltages (V_{nom}) of 5 V. For 3,3 V nominal operating voltage limits are 3,15 V to 3,45 V.

[b] No condensation allowed.

4.3 Functional specification

The specifications in Tables 3 and 4 describe the functional requirements required to meet the ISO/IEC 8802-3 PHY specifications.

Table 3 – Receiver section: functional specification

Parameter	Symbol	Minimum	Maximum	Unit
Receiver sensitivity [a]	S		-19	dBm
Maximum optical input power		–3		dBm
Optical return loss		12		dB
Alarm on level [f]	P_d	–45	–20	dBm
Alarm off level [f]	P_a		–19	dBm
Hysteresis		0,5	4,0	dB
Alarm response time			600	µs
Alarm output high voltage (option 1) [b]	V_{oh}	–1,1	–0,8	V
Alarm output low voltage (option 1) [b]	V_{ol}	–2,0	–1,6	V
Alarm output high voltage (option 2) [c]	V_{oh}	2	V_{CC}	V
Alarm output low voltage (option 2) [c]	V_{ol}	0	0,8	V
Data output voltage – low [d]	V_{OL}–V_{CC}	–1,950	–1,620	V
Data output voltage – high [d]	V_{OH}–V_{CC}	–1,045	–0,740	V
Data output load [e] [g]	R_{DL}	50		Ω

NOTE Refer to table 2 for operating environment.

[a] Minimum sensitivity and saturation levels for 1E-12 BER measured with a 9 dB extinction ratio source and (2^7 – 1) PRBS test signal.

[b] These voltages are measured with respect to V_{cc}.

[c] Outputs compatible with TTL and LVTTL inputs.

[d] Outputs compatible with 10K, 10KH, 100K ECL and PECL inputs.

[e] Outputs terminated to V_{CC}– 2 V.

[f] Alarm triggered when receive sensitivity is below that specified. Hysteresis value specified as $P_a - P_d$.

[g] Basic value.

Table 4 – Transmitter section: functional specification

Parameter	Symbol	Minimum	Maximum	Unit
Central wavelength	λ_{ce}	1 270	1 355	nm
Spectral width (r.m.s.)	$\Delta\lambda$		4	nm
Optical output power (singlemode fibre) [a]	P_o	–11,0	–3,0	dBm
Optical output power (multimode fibre) [a e]	P_o	–11,5	–3,5	dBm
Extinction ratio	E_r	9		dB
Optical output rise time (20 % – 80 %) [e]	T_r		0,26	ns
Optical output fall time (80 % – 20 %) [e]	T_f		0,26	ns
Output eye [b]				
Transmit disable function (optional) [d]	TD			
Data input current – low	I_{IL}	–350		µA
Data input current – high	I_{IH}		350	µA
Data input voltage – low [c]	$V_{IL} - V_{CC}$	–1,810	–1,475	V
Data input voltage – high [c]	$V_{IH} - V_{CC}$	–1,165	–0,880	V
Transmitter differential input voltage swing	V_{pp}	0,3		V

NOTE Refer to Table 2 for operating environment.

[a] Output eye is power coupled into a singlemode fibre, 62,5/125 multimode fibre, or 50/125 multimode fibre.

[b] Compliant with ISO/IEC 8802-3.

[c] Compatible with 10K, 10KH, 100K ECL, and PECL signals.

[d] Optional transmit disable function. Normal TTL function. Transmitter output enabled with no signal present. With logic 'high' input, transmitter output is disabled.

[e] Measured at the output of a mode conditioning patchcord as specified in ISO/IEC 8802-3, Subclause 38.11.4.

4.4 Diagrams

The diagrams in Figures 1 and 2 are representative examples for the receiver section and transmitter section.

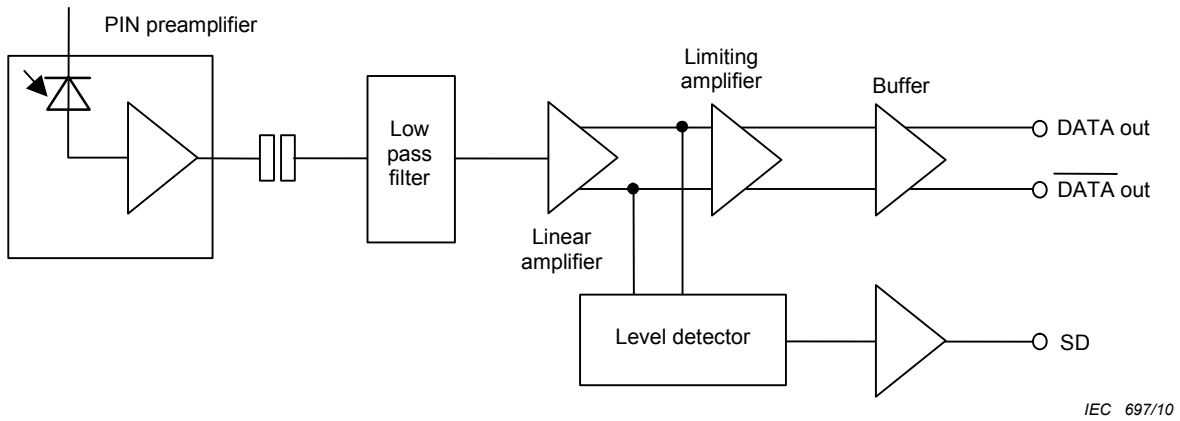

Figure 1 – Receiver section schematic