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INTERNATIONAL STANDARD

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Information Technology – Microprocessor Systems – Heterogeneous InterConnect (HIC) (Low-Cost, Low-Latency Scalable Serial Interconnect for Parallel System Construction)

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Abstract: Enabling the construction of high-performance, scalable, modular, parallel systems with low system integration cost is discussed. Complementary use of physical connectors and cables, electrical properties, and logical protocols for point-to-point serial scalable interconnect, operating at speeds of 10 200 Mb/s and at 1 Gb/s in copper and optic technologies, is described.

Keywords: flow control, encoding schemes, OMI/HIC, packet routing, parallelism, point-to-point serial scalable interconnect, protocols, routing fabric, serial links, serialization, silicon integration, switch chip, transaction layer, wormhole routing.

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INFORMATION TECHNOLOGY – MICROPROCESSOR SYSTEMS – HETEROGENEOUS INTERCONNECT (HIC) (LOW-COST, LOW-LATENCY SCALABLE SERIAL INTERCONNECT FOR PARALLEL SYSTEM CONSTRUCTION)

FOREWORD

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International Standards are drafted in accordance with ISO/IEC Directives, Part 3.

Annexes A, B and C form an integral part of this standard.

Annexes D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R and S are for information only.

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INTRODUCTION

(This introduction is not a normative part of ISO/IEC 14575:2000, but is included for information only.)

The construction of high-performance systems with parallel communications, parallel processing, and/or parallel I/O demands a fast, low-cost, low-latency interconnect. It must be fast and low-latency, otherwise it will be the limiting factor in system performance; and it must be low-cost, or it will dominate the system cost. It must also scale well in both performance and cost relative to the system size, otherwise highly parallel systems will be limited in performance or too expensive. Existing standards do not meet these criteria, because they are designed for communication over long distances (which incurs high costs), or because they aim at the extreme of currently achievable performance (which again increases costs), or because they are based on a restricted model such as a bus, which limits overall performance and scalability. A detailed rationale for this standard is given in annex D.

This standard has been developed to complement recent technical developments of highly integrated, low-power interconnect technology implemented in high-volume commodity VLSI processes, and to exploit the simplifications in encodings and protocols resulting from the use of relatively reliable media over relatively short distances. Aspects of the baseline for this standard have their origins in work on parallel systems, which has taken place in a number of ESPRIT projects. In particular, the routing strategy was established in the PUMA project, and the DS-Links were developed partially in the GP MIMD project. Work at interconnect for high-performance mainframe computers at Bull led to the development of the gigabit link technology implemented in Bi-CMOS and CMOS processes. More recently, these developments, together with corresponding optical technology, have been brought together in the OMI/HIC Project (Open Microprocessor Systems Initiative – High Performance Heterogeneous Interconnect – ESPRIT 7252).

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INFORMATION TECHNOLOGY – MICROPROCESSOR SYSTEMS – HETEROGENEOUS INTERCONNECT (HIC) (LOW-COST, LOW-LATENCY SCALABLE SERIAL INTERCONNECT FOR PARALLEL SYSTEM CONSTRUCTION)

1 Scope and object

This International Standard applies to physical connectors and cables, electrical properties, and logical protocols for point-to-point serial scalable interconnect, operating at speeds of 10 Mbit/s to 200 Mbit/s and at 1 Gbit/s in copper and optic technologies (as developed in Open Microprocessor Systems Initiative/Heterogeneous InterConnect Project (OMI/HIC)).

The object of this International Standard is to enable high-performance, scalable, modular, parallel systems to be constructed with low system integration cost; to support communications systems fabric; to provide a transparent implementation of a range of high-level protocols (communications, e.g. ATM, message passing, shared memory transactions, etc.), and to support links between heterogeneous systems.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits of methods of measurement*

IEC 60352-5:1995, *Solderless connections – Part 5: Solderless press-in connections – General requirements, test methods and practical guidance*

IEC 60512-2:1985, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests*

IEC 60512-3:1976, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 3: Current-carrying capacity tests*

IEC 60512-4:1976, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 4: Dynamic stress tests*

IEC 60512-5:1992, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests*

IEC 60512-6:1984, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 6: Climatic tests and soldering tests*

IEC 60512-7:1993, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 7: Mechanical operating tests and sealing tests*

IEC 60512-8:1993, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations*

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IEC 60512-9:1992, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods – Part 9: Miscellaneous tests*

IEC 60793-1, *Optical fibres – Part 1: Generic specification*

IEC 60793-2:1998, *Optical fibres – Part 2: Product specifications*

IEC 60825-1:1993, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*

IEC 60825-2:2000, *Safety of laser products – Part 2: Safety of optical fiber communication systems*

IEC 60874-1:1999, *Connectors for optical fibres and cables – Part 1: Generic specification*

IEC 60917 (all parts), *Modular order for the development of mechanical structures for electronic equipment practices*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test. Basic EMC publication*

IEC 61076-4-101:1995, *Connectors with assessed quality for use in d.c., low-frequency analogue and in digital high-speed applications – Part 4: Printed board connectors – Section 101: Detail specification for two-part connector modules having a grid of 2.0 mm for printed boards and backplanes*

IEC 61076-4-107, — *Connectors – Part 4-107: Detail specification for a twopart connector with assessed quality, for a basic grid of 2.0 mm, with free connectors for non-accessible insulation displacement* [1)]

IEC 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

IEC 61156-1:1994, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61196-1:1995, *Radio-frequency cables – Part 1: Generic specification – General, definitions, requirements and test methods*

IEC 61196-2:1995, *Radio-frequency cables – Part 2: Sectional specification for semi-rigid radio-frequency and coaxial cables with polytetrafluoroethylene (PTFE) insulation*

IEC 61754-6:1997, *Fibre optic connector interfaces – Part 6: Type MU connector family*

IEEE Std 100-1996, *The IEEE Standard Dictionary of Electrical and Electronics Terms*

IEEE Std 1301.3-1992, *IEEE Standard for Metric Practice for Microcomputers – Convection Cooled with 2.5 mm Connector (ANSI)*

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