INTERNATIONAL STANDARD

ISO/IEC 15776

First edition
2001-12

VME64bus – Specification

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

PRICE CODE XF

For price, see current catalogue

CONTENTS

VME64bus – SPECIFICATION

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.
3) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 15776 was prepared by subcommittee 26: Microprocessor systems, of ISO/IEC joint technical committee 1: Information technology.

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

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

INTRODUCTION

The architectural concepts of VMEbus are based on the VERSAbus developed by Motorola in the late 1970s. Motorola's European Microsystems group in Munich, West Germany proposed the development of a VERSAbus-like product line of computers and controllers based on the Eurocard mechanical standard. To demonstrate the concept, Max Loesel and Sven Rau developed three prototype boards: (1) a 68000 CPU card, (2) a dynamic memory card, and (3) a static memory card. They named the new bus VERSAbus-E, which was later renamed "VME" by Lyman Hevle, then VP of the Motorola Microsystems Operation (and later the founder of VITA). VME is the acronym for VERSA-module Europe. Motorola, Mostek, and Signetics agreed to jointly develop and support the new bus architecture in early 1981.

John Black of Motorola, Craig McKenna of Mostek, and Cecil Kaplinsky of Signetics developed the first draft of the VMEbus specification. In October of 1981, at the Systems 81 trade show in Munich, West Germany, Motorola, Mostek, and Signetics announced their joint support for VMEbus, and placed Revision A of the specification in the public domain.

In August of 1982, Revision B of the VMEbus specification was published by the newly formed VMEbus Manufacturers Group (now VITA). This new revision refined the electrical specifications for the signal line drivers and receivers, and also brought the mechanical specifications more in line with the developing IEC 60297 standard, the formal specifications for Eurocard mechanical formats.

In the latter part of 1982, the French delegation of the International Electrotechnical Commission (IEC) proposed Revision B of the VMEbus specification as an international standard. The IEC SC47B subcommittee nominated Mira Pauker of Philips, France, as the chairperson of an editorial committee, formally starting international standardization of the VMEbus.

In March of 1983, the IEEE Microprocessor Standards Committee (MSC) requested authorization to establish a working group to standardize the VMEbus in the US. This request was approved by the IEEE Standards Board, and the P1014 Working Group was established. Wayne Fischer was appointed first chairman of the working group. John Black served as chairman of the P1014 Technical Subcommittee.

The IEC, IEEE, and VMEbus Manufacturers Group (now VITA) distributed copies of Revision B for comment, and received requests for changes to the document as a result. These comments made it clear that it was time to go forward past revision B. In December of 1983, a meeting was held that included John Black, Mira Pauker, Wayne Fischer, and Craig McKenna. It was agreed that a revision C should be created, and that it should take into consideration all comments received by the three organizations. John Black and Shlomo Pri-Tal of Motorola incorporated the changes from all sources into a common document. The VMEbus Manufacturers Group (now VITA) labeled the document Revision C.1 and placed it in the public domain. The IEEE labeled it P1014 Draft 1.2, and the IEC labeled it IEC 60821 Bus. Subsequent ballots in the IEEE P1014 group and in the MSC resulted in more comments, and required that the IEEE P1014 draft be updated. This work resulted in the ANSI/IEEE 1014-1987 specification.

In 1989, John Peters of Performance Technologies, Inc. (Rochester, NY) developed the initial concept of VME64: multiplexing address and data lines (A64/D64) on the VMEbus. This concept was shown for the first time in 1989 and placed in the VITA Technical Committee in 1990 as a performance enhancement to the VMEbus specification. In 1991, the PAR (Project Authorization Request) for P1014R (revisions to the VMEbus specification) was granted by the IEEE. Ray Alderman, Technical Director of VITA, co-chaired the activity with Kim Clohessy of DY 4 Systems (Nepean, Ontario, Canada).

At the end of 1992, the additional enhancements to VMEbus (A40/D32, Locked Cycles, Rescinding DTACK*, Autoslot-ID, Auto System Controller, and enhanced DIN connector mechanicals) required more work to complete this document. In 1992, the VITA Technical Committee suspended work with the IEEE and sought accreditation as a standards developer organization (SDO) with the American National Standards Institute. The original IEEE Par P1014R was subsequently withdrawn by the IEEE. The VITA Technical Committee returned to using the public domain VMEbus C.1 specification as its base level document to which it added new enhancements. This enhancement work was undertaken entirely by the VITA Technical Committee resulting in this document. The tremendous undertaking of the document editing was accomplished by Kim Clohessy of DY 4 Systems, the technical co-chair of the activity with great help from Frank Hom who created the mechanical drawings, and with exceptional contributions by each chapter editor.

Additional enhancements proposed to the VME64 Subcommittee have been placed in another VITA subcommittee: the VME64 Extensions Document. Two other activities began in late 1992: (1) BLLI (VMEbus Board-level Live Insertion Specifications), and (2) VSLI (VMEbus System-level Live Insertion with Fault Tolerance).

New activities begun in 1993 using the base-VME architecture involve the implementation of high-speed serial and parallel sub-buses for use as I/O interconnections and data mover subsystems. These architectures can be used as message switches, routers, and small multiprocessor parallel architectures.

VITA's application for recognition as an accredited standards developer organization of ANSI (American National Standards Institute) was granted in June 1993. Numerous other documents, including mezzanine, P2, and serial bus standards, have been placed with VITA as the Public Domain Administrator of these technologies.

VMEbus Specification Genealogy

VMEbus	Revision B and C.1 (Public Domain)
IEEE 1014-1987	Versatile Backplane Bus VMEbus
VITA 1-1994	VME64 Specification
IEEE 1096-1988	VSBbus Specification (IEEE)
IEC 60821:1991	VMEbus – Microprocessor system bus for 1 byte to 4 byte data
IEEE 1101.1	IEEE Standard for Mechanical Core Specifications for Microcomputers Using IEC 60603-2 Connectors
IEEE 1101.2	IEEE Standard for Mechanical Core Specification for Conduction-Cooled Eurocards

This standard was constructed through the many hours of hard work by the members of the VME64 Subcommittee (of the VITA Technical Committee) and the commitment of their companies to this standard.

NAME	COMPANY
Ray Alderman	PEP Modular Computers
Michael Humphrey	VITA
John Rynearson	VITA
Martin Blake	BICC-VERO UK
Kim Clohessy	DY 4 Systems, Inc.
Jing Kwok	DY 4 Systems, Inc.
Clarence Peckham	Heurikon Corporation
Dennis Terry	Heurikon Corporation
Wayne Fischer	Force Computers Inc.
Jack Regula	Consultant
Tad Kubic	Dawn VME Products, Inc.
Will Hamsher	AMP, Inc.
Doug Reubendall	AMP, Inc.
William Mahusen	Performance Technologies, Inc.
Thanos Mentzelopoulos	Ironics, Inc.
Joel Silverman	Radstone Technology Corp.
Colin Davies	Radstone Technology UK
Frank Hom	Electronic Solutions
Keith Burgess	Mizar
John Black	Micrology PBT
Greg Hill	Hewlett-Packard Co.
Sam Babb	Hewlett Packard Co.
Ben LaPointe	Motorola GEG
Chau Pham	Motorola MCG
Mac Rush	Motorola MCG
Mike Hasenfratz	Micro Memory, Inc.
Richard DeBock	Matrix Corp.
Richard O'Connor	Newbridge Microsystems
Michael Bryant	PEP Modular Computers
Dr. Chris Eck	CERN-Geneva
Mike Thompson	Schroff, Inc.
Eike Waltz	Schroff, Inc.
Tom Baillio	Mercury Computer Systems, Inc.
Steve Corbesero	Mupac Corp.
Dave Horton	Cypress Semiconductor
Mike Maas	Cypress Semiconductor
Mike Munroe	Hybricon Corp.

The following are acknowledged for their extra contributions as chapter editors.

Kim Clohessy	DY-4 Systems Inc.
Wayne Fischer	Force Computers, Inc.
Chau Pham	Motorola MCG
Frank Hom	Electronic Solutions
Richard DeBock	Matrix Corp.
Jing Kwok	DY 4 Systems, Inc.
Mike Hasenfratz	Micro Memory, Inc.

CANVASS BALLOT

Consensus for this standard was achieved by use of the Canvass Method.

The following organizations, recognized as having an interest in the standardization of VME64, participated in the Canvass Ballot process. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

767 AWACS
Adept Technology
AMP
AT&T Bell Laboratories
Berg Electronics
Bit 3 Computer
CERN
CSPI
Cypress Semiconductor
Dawn VME Products
Dialogic Corporation
Digital Equipment Corp.
DY 4 Systems
Electronic Solutions
Force Computers
Harting Elektronik
Heurikon Corporation
Hewlett-Packard
Hughes Aircraft Company
Hybricon Corporation
IBM
IXTHOS
Loral Western Devel. Lab
Los Alamos Nat'l Lab
Matrix Corporation
Micro Memory
Micrology
MITRE Corporation
Motorola Computer Group
Mupac Corporation
Newbridge Microsystems
Object Technology Inc.
PEP Modular Computers
Philips Ind. Automation
Picosoft
Radstone Technology
Schroff
Technology Consulting
Texas Instruments
VERO Electronics
VITA
VME MEMBER
Winchester Electronics

VME64bus – SPECIFICATION

1 General

1.1 Scope and object

The VMEbus specification defines an interfacing system used to interconnect microprocessors, data storage, and peripheral control devices in a closely coupled hardware configuration. The system has been conceived with the following objectives:

a) to allow communication between devices on the VMEbus without disturbing the internal activities of other devices interfaced to the VMEbus;

b) to specify the electrical and mechanical system characteristics required to design devices that will reliably and unambiguously communicate with other devices interfaced to the VMEbus;

c) to specify protocols that precisely define the interaction between the VMEbus and devices interfaced to it;

d) to provide terminology and definitions that describe the system protocol;

e) to allow a broad range of design latitude so that the designer can optimize cost and/or performance without affecting system compatibility;

f) to provide a system where performance is primarily device limited, rather than system interface limited.

1.2 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 60297-1:1986, *Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 1: Panels and racks*

IEC 60297-2:1982, *Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 2: Cabinets and pitches of rack structures*

IEC 60297-3:1984, *Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3: Subracks and associated plug-in units*

IEC 60297-4:1995, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 4: Subracks and associated plug-in units – Additional dimensions*

IEC 60603-2:1995, *Connectors for frequencies below 3 MHz for use with printed boards – Part 2: Detail specification for two-part connectors with assessed quality, for printed boards, for basic grid of 2.54 mm (0.1 in) with common mounting features*

IEC 61076 (all parts), *Connectors with assessed quality, for use in d.c., low frequency analogue and digital high speed data applications*

IEEE 1101.2, *Standard for Mechanical Core Specifications for Conduction-Cooled Eurocards*

IEEE 1394, *Standard for a High Performance Serial Bus*