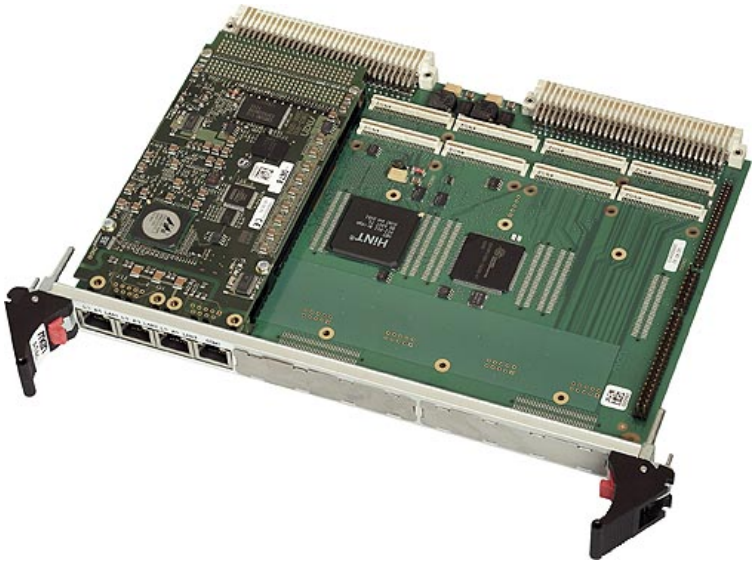
# A14C – 6U VME64 MPC8540 CPU Board

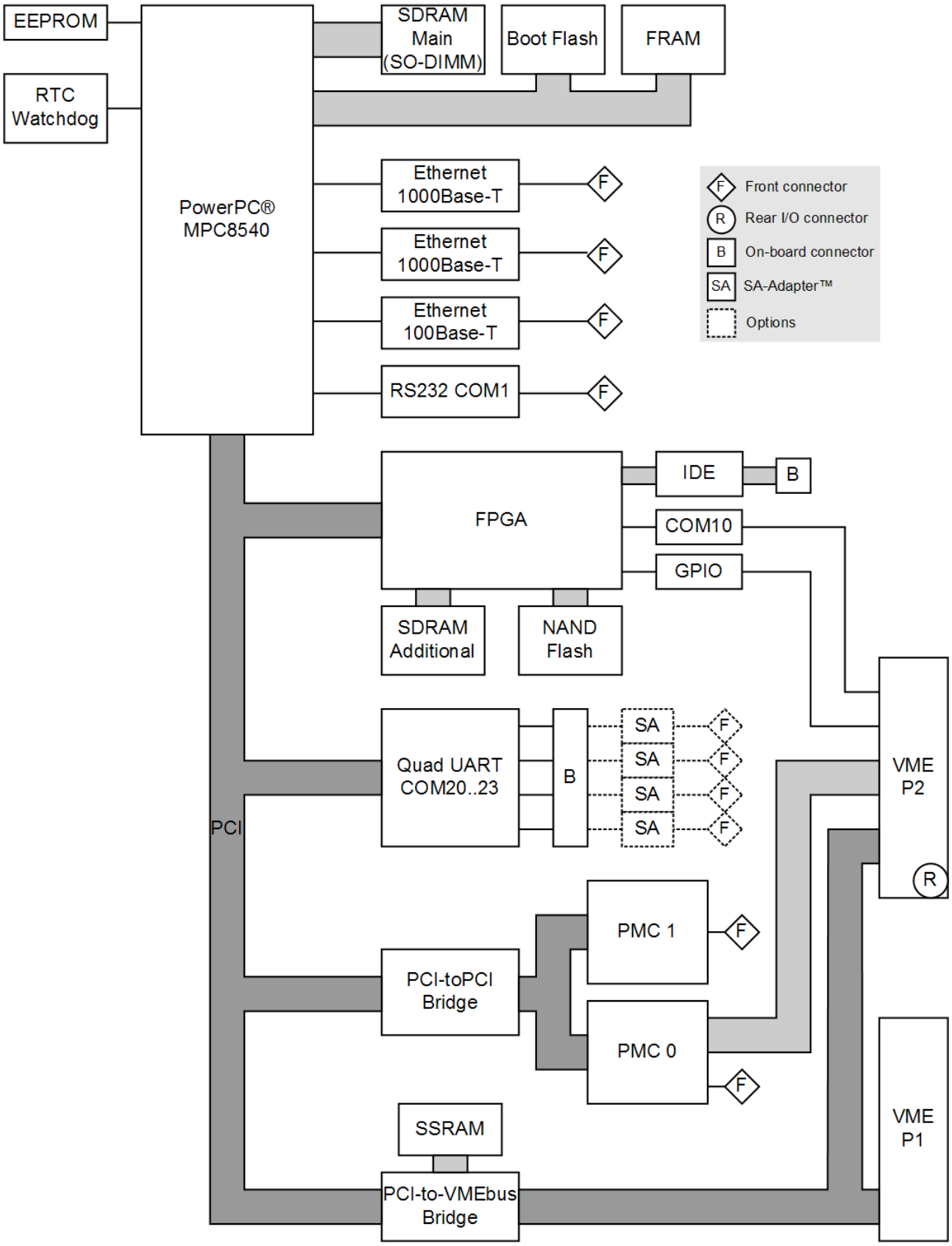
- **PowerPC® MPC8540 / 800MHz**
- **FPGA 12,000 LEs (approx.144,000 gates)**
- **1-slot 64-bit VMEbus master and slave**
- **Up to 2 GB (ECC) DRAM**
- **NAND Flash, FRAM**
- **Graphics via PMC or FPGA**
- **2 Gigabit/1 Fast Ethernet**
- **Up to 6 COMs**
- **Parallel ATA for onboard hard disk**
- **Further I/O individually via FPGA**
- **2 PMC slots**
- **MENMON™ BIOS for PowerPC® cards**



The A14C is an advanced PowerPC® based single-board computer for embedded applications. It features full VME64 support and it can be used as a master or a slave in a VMEbus environment. The CPU card provides 1 MB local shared SRAM for slave access and communication between the local CPU and another VMEbus master.
The A14C is controlled by an MPC8540 integrated PowerPC® processor working at 800MHz. The SBC is equipped with a DDR SO-DIMM socket for data storage, with NAND Flash for program storage as well as with non-volatile FRAM. The board provides front-panel access for two Gigabit Ethernet, one fast Ethernet and one COM via four RJ45 connectors. Four more UARTs are optionally accessible via SA-Adapters™ for front connection.

Additional functionality such as graphics, touch, CAN, binary I/O etc. can be realized as IP cores in FPGA for the needs of the individual application. The corresponding PHYs are available via SA-Adapters™ on a transition module to the rear.
The FPGA acts as a standard PCI device on the A14C. The FPGA functions are loaded by software during power-up within less than 1s. FPGA updates can be carried out dynamically during operation.
In addition, the A14C can be equipped with PMC mezzanine cards supporting 64 bits/66 MHz as well as front I/O and rear I/O (PIM).
The A14C comes with MENMON™ support. This firmware/BIOS can be used for bootstrapping operating systems (from disk, Flash or network), for hardware testing, or for debugging applications without running any operating system.

# Diagram


EEPROM
RTC Watchdog
PowerPC® MPC8540
SDRAM Main (SO-DIMM)
Boot Flash
FRAM
Ethernet 1000Base-T
Ethernet 1000Base-T
Ethernet 100Base-T
RS232 COM1
F
Front connector
R
Rear I/O connector
B
On-board connector
SA
SA-Adapter™
Options
FPGA
IDE
COM10
GPIO
SDRAM Additional
NAND Flash
Quad UART COM20..23
SA
PCI
PMC 1
PMC 0
PCI-toPCI Bridge
SSRAM
PCI-to-VMEbus Bridge
VME P2
VME P1

# Technical Data

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| **CPU** | ■ PowerPC®<br>□ MPC8540 PowerQUICC™ III<br>□ 800MHz (666..833MHz optional)<br>□ e500 PowerPC® core with SPE APU and MMU<br>□ Integrated Northbridge and Southbridge<br>□ High memory bandwidth |
| **Memory** | ■ 2x32KB L1 data and instruction cache, 256KB L2 cache / SRAM integrated in MPC8540<br>■ Up to 2GB SDRAM system memory<br>□ SO-DIMM slot for SDRAM modules<br>□ DDR2100 with or without ECC<br>□ 133MHz memory bus frequency<br>■ Up to 1GB soldered NAND Flash (and more), FPGA-controlled<br>■ Up to 16MB additional SDRAM, FPGA-controlled, e.g. for video data and NAND Flash firmware<br>■ 8MB boot Flash<br>■ 32KB non-volatile FRAM<br>■ Serial EEPROM 4kbits for factory settings |
| **Mass Storage** | ■ Parallel IDE (PATA)<br>□ One port for hard-disk drives<br>□ Drive can be connected via ribbon cable or mounted directly on the CPU board using MEN adapter kit (instead of PMC modules)<br>□ Only one VMEbus slot needed even with hard disk<br>□ PIO mode 0 support<br>■ Up to 1GB soldered ATA NAND Flash (and more), FPGA-controlled |
| **I/O** | ■ Three Ethernet channels<br>□ Two 10/100/1000Base-T Ethernet channels<br>□ One 10/100Base-T Ethernet channel<br>□ Three RJ45 connectors at front panel<br>□ Two onboard LEDs to signal LAN Link and Activity<br>■ One RS232 UART (COM1)<br>□ One RJ45 connector at front panel<br>□ Data rates up to 115.2kbit/s<br>□ 16-byte transmit/receive buffer<br>□ Handshake lines: CTS, RTS<br>■ One LVTTL UART (COM10)<br>□ FPGA-controlled<br>□ Accessible via rear I/O<br>□ Data rates up to 115.2kbit/s<br>□ 60-byte transmit/receive buffers<br>□ Handshake lines: CTS, RTS; DCD, DSR, DTR; RI<br>■ Quad UART (COM20..COM23)<br>□ Physical interface using SA-Adapters™ via 10-pin ribbon cable on I/O connector<br>□ RS232..RS485, isolated or not: for free use in system (e. g. cable to front)<br>□ Data rates up to 115.2kbit/s<br>□ 128-byte transmit/receive buffer<br>□ Handshake lines: CTS, RTS; DCD, DSR, DTR; RI<br>■ GPIO<br>□ 39 GPIO lines<br>□ FPGA-controlled<br>□ Accessible via rear I/O |
| **Front Connections** | ■ Three Ethernet (RJ45)<br>■ COM1 (RJ45)<br>■ COM20..COM23 (optional, instead of PMC modules, or in second front-panel slot)<br>■ PMC 0 and 1 |

# Technical Data

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| **Rear I/O** | ■ COM10<br>■ GPIO<br>■ Mezzanine rear I/O: PMC 0 |
| **FPGA** | ■ Standard factory FPGA configuration:<br>□ Main bus interface<br>□ 16Z070_IDEDISK - IDE controller for NAND Flash<br>□ 16Z043_SDRAM - Additional SDRAM controller (16MB)<br>□ 16Z023_IDENHS - IDE controller (PIO mode 0; non-hot-swap)<br>□ 16Z025_UART - UART controller (controls COM10)<br>□ 16Z034_GPIO - GPIO controller (40 lines, 5 IP cores)<br>■ The FPGA offers the possibility to add customized I/O functionality. See FPGA. |
| **Mezzanine Slots** | ■ Two PMC slots<br>□ Compliant with PMC standard IEEE 1386.1<br>□ Up to 64-bit/64-MHz, 3.3V V(I/O)<br>□ PMC I/O module (PIM) support through J4 |
| **Miscellaneous** | ■ Real-time clock with GoldCap backup<br>■ Power supervision and watchdog<br>■ Reset button, GPIO-controlled, in ejector handle |
| **Local PCI Bus** | ■ 32-bit/33-MHz, 3.3V V(I/O)<br>■ Compliant with PCI Specification 2.2 |
| **VMEbus** | ■ Compliant with VME64 Specification<br>■ Slot-1 function with auto-detection<br>■ Master<br>□ D08(EO):D16:D32:D64:A16:A24:A32:ADO:BLT:RMW<br>■ Slave<br>□ D08(EO):D16:D32:D64:A16:A24:A32:BLT:RMW<br>■ 1MB shared fast SRAM<br>■ DMA<br>■ Mailbox functionality<br>■ Interrupter D08(O):I(7-1):ROAK<br>■ Interrupt handler D08(O):IH(7-1)<br>■ Single level 3 fair requester<br>■ Single level 3 arbiter<br>■ Bus timer<br>■ Location Monitor<br>■ Performance<br>□ Coupled read/write D32 non-block transfer rate 6.5 MB/s<br>□ DMA read/write D32 BLT transfer rate 12.1 MB/s<br>□ DMA read/write D64 MBLT transfer rate 25 MB/s |
| **Electrical Specifications** | ■ Supply voltage/power consumption:<br>□ +5V (-3%/+5%), 3A typ.<br>□ +12V (-5%/+5%), only provided for PMCs that need 12V<br>□ -12V (-5%/+5%), only provided for PMCs that need 12V<br>■ MTBF: 92,800h @ 40°C (derived from MIL-HDBK-217F) |
| **Mechanical Specifications** | ■ Dimensions: standard double Eurocard, 233.3mm x 160mm<br>■ Weight (without PMC modules): 450g |

# Technical Data

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| **Environmental Specifications** | ■ Temperature range (operation):<br>□ 0..+60°C<br>□ Airflow: min. 10m³/h<br>■ Temperature range (storage): -40..+85°C<br>■ Relative humidity (operation): max. 95% non-condensing<br>■ Relative humidity (storage): max. 95% non-condensing<br>■ Altitude: -300m to + 3,000m<br>■ Shock: 15g/11ms<br>■ Bump: 10g/16ms<br>■ Vibration (sinusoidal): 2g/10..150Hz<br>■ Conformal coating on request |
| **Safety** | ■ PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers |
| **EMC** | ■ Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) |
| **BIOS** | ■ MENMON™ |
| **Software Support** | ■ VxWorks®<br>■ Linux (ELinOS)<br>■ QNX®<br>■ For more information on supported operating system versions and drivers see Downloads. |

# FPGA

**This product offers the possibility to add customized I/O functionality in FPGA.**

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| **Flexible Configuration** | ■ Customized I/O functions can be added to the FPGA.<br>■ It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility.<br>■ You can find more information on our web page "User I/O in FPGA" |
| **FPGA Capabilities** | ■ FPGA Altera® Cyclone® EP1C12<br>□ 12,060 logic elements<br>□ 239,616 total RAM bits<br>■ Connection<br>□ Available pin count: 47 pins<br>□ Functions available via onboard and rear I/O connectors |

# Configuration & Options

## Standard Configurations

| Article No. | CPU Type | Clock | System RAM | NAND Flash | Additional SDRAM | FRAM | Boot Flash | Mezzanine Slots | Operation Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 01A014C00 | MPC8540 | 800 MHz | 512 MB (no ECC) | 128 MB | 16 MB | 32 KB | 8 MB | 2 PMC | 0..+60°C |

## Options

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| **CPU** | ■ Type<br>□ MPC8540<br>□ MPC8560<br>■ Clock<br>□ 666..833 MHz |
| **Memory** | ■ System RAM<br>□ 256 MB, 512 MB, 1 GB or 2 GB<br>□ With or without ECC<br>■ NAND Flash<br>□ 0 MB up to maximum available<br>■ Additional SDRAM<br>□ 0 MB or 16 MB<br>■ FRAM<br>□ 0 MB or 32 MB<br>■ Boot Flash<br>□ 8 MB or 16 MB |
| **I/O** | ■ Quad UART (COM20..23)<br>□ Direct onboard connection via 10-pin connectors, instead of PMCs<br>■ Front Connections<br>□ D-Sub instead of RJ45 connectors |
| **Mezzanine Slots** | ■ 2 PMC<br>■ 3 PC-MIP® |
| **Operation Temperature** | ■ 0..+60°C |

**Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.**

# Ordering Information

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|---|---|---|
| **Standard A14C Models** | **01A014C00** | MPC8540/800MHz, 512MB DRAM, 128MB NAND Flash, 16MB graphics memory, 32KB FRAM, 2 PMC slots, 0..+60°C |
| **SA-Adapters™** | You can find a more detailed overview of possible carrier board/SA-Adapter™ combinations along with software support in our option matrix (PDF). | |
| | **05A013-00** | Mounting kit for 4 SA-Adapters™ for 6U VME/cPCI boards, incl. 1-slot front panel and ribbon cable, without SA-Adapters™ |
| | **08SA01-00** | RS232, not optically isolated, 0..+60°C |
| | **08SA02-00** | RS422/485, half duplex, optically isolated, 0..+60°C |
| | **08SA02-01** | RS422/485, full duplex, optically isolated, 0..+60°C |
| | **08SA02-07** | RS422/485, full duplex, optically isolated, -40..+85°C screened |
| | **08SA03-00** | 1 RS232, optically isolated, 0..+60°C |
| | **08SA03-01** | 1 RS232, optically isolated, -40..+85°C screened |
| **Systems & Card Cages** | MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request.<br>For details please contact your local sales representative. | |
| **Miscellaneous Accessories** | **05F006-00** | RS232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m |
| | **05P000-01** | 25 mounting screw sets to fix PMC/XMC modules on carrier boards |
| | **08AD71-00** | AD71, 2.5" hard disk adapter for A13, A14, A15, D6, D7 |
| **Software: Linux** | This product is designed to work under Linux. See below for potentially available separate software packages from MEN.<br><br>This product is designed to work under ELinOS Embedded Linux by SYSGO. For more information and product support please contact www.sysgo.com. | |
| | **13Z014-90** | Linux device driver (MEN) for PCI-to-VME bridge on A12, A13, A14, A15, A17, A19, A20, A21B/A21C and B11 |
| | **13Z017-06** | MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO |
| | **13Z025-90** | Linux native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART |
| | **13Z100-91** | Linux FPGA update tool (MEN) |
| **Software: VxWorks®** | This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets. | |
| | **10EM03-60** | VxWorks® BSP (MEN) for EM3, EM3A, EM8, EM8A, EK7, A14C and F13 |
| | **13P010-60** | VxWorks® UART driver (MEN) for P10 and P11 |
| | **13Z017-06** | MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO |
| | **13Z025-60** | VxWorks® native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART |
| | **13Z100-60** | VxWorks® FPGA update tool (MEN) |

# Ordering Information

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| **Software: QNX®** | This product is designed to work under QNX®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets. | |
| | **10EM03-40** | QNX® BSP (MEN) for EM3, EM3A, EM8, EM8A, EK7, A14C and F13 |
| | **13Z017-06** | MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO |
| | **13Z025-40** | QNX® 6.3 native driver (MEN) for 16Z025_UART and 16Z125_UART |
| | **13Z025-41** | QNX® 6.4 native driver (MEN) for 16Z025_UART and 16Z125_UART |
| | **13Z025-42** | QNX® 6.5 native driver (MEN) for 16Z025_UART and 16Z125_UART |
| | **13Z100-40** | QNX® FPGA update tool (MEN) |
| **Software: Firmware/BIOS** | MENMON™ is MEN's firmware/BIOS for PowerPC® platforms. | |
| | **14EM03-00** | MENMON™ (Firmware) for EM3, EM3A, EM8, EM8A, A14C and F13 (object code) |

**For operating systems not mentioned here contact MEN sales.**

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| **Documentation** | Compare Chart 6U VMEbus CPU and I/O cards » Download | |
| | **20A014CER** | A14C Errata |
| | **20A014-00** | A14C User Manual |
| | **21MENM-00** | MENMON™ User Manual |
| | **21Z025-90** | 16Z025_UART and 16Z125_UART under Linux User Manual |
| | **22Z025-ER** | 16Z025_UART Errata |

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