MITSUBISHI

Mitsubishi Microcomputers

USB Devices

Already Employed in Many USB Applications

Covering Low-speed and Full-speed Devices

Supports General-Purpose MCUs,ASSPs,and Custom MCUs

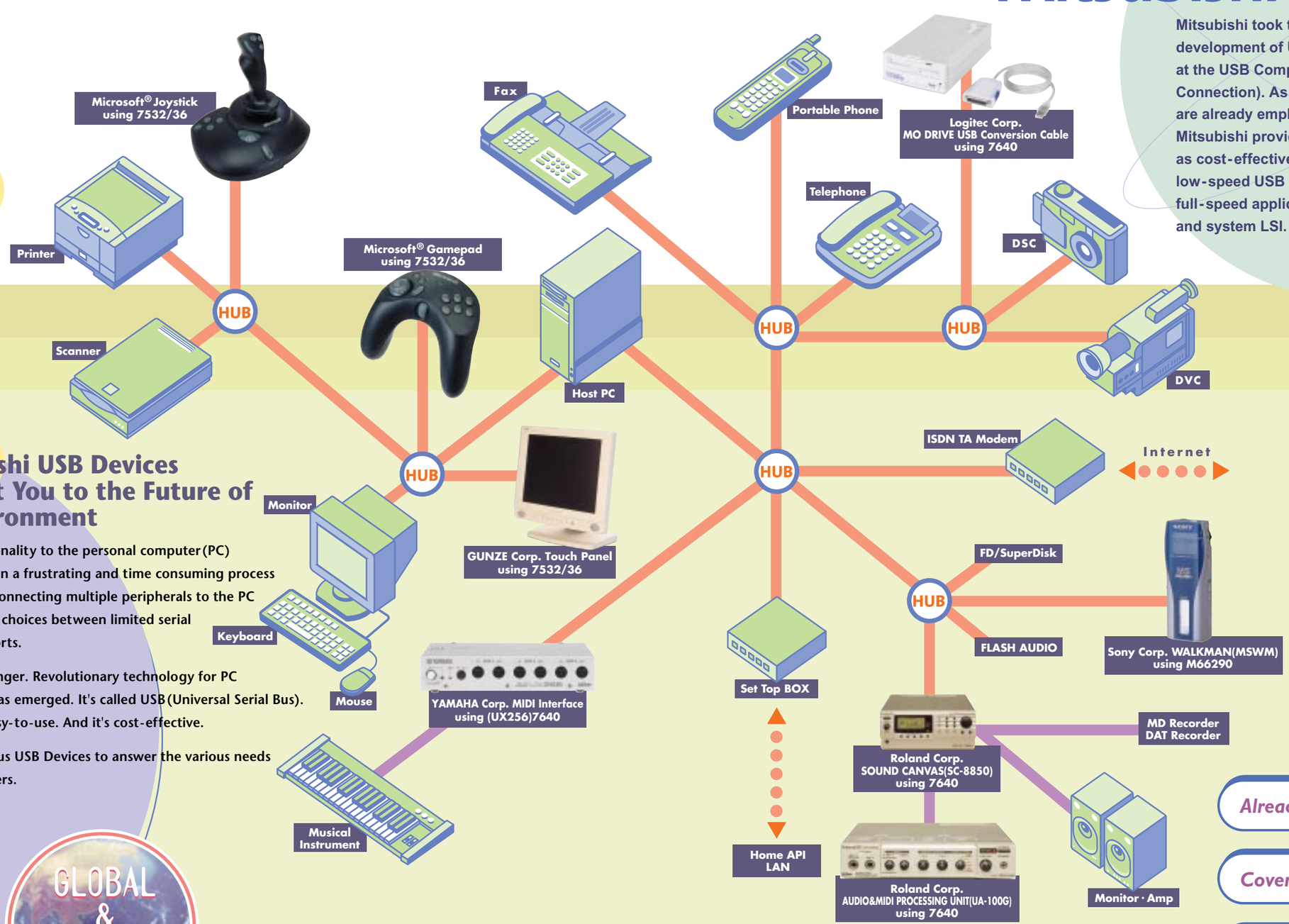
USB UNIVERSAL SERIAL BUS

USB DEVICES

Mitsubishi's USB devices provide standard Windows 98 communication interfaces all in one system. Our wide range of USB devices meets the needs of all USB-ready products.

Various PC Peripherals
Mitsubishi Semiconductors
Mitsubishi USB devices

Mitsubishi took the lead amongst competitors in the development of USB MCUs and was extremely successful at the USB Compliance Workshops (Test for USB Connection). As a proven result, Mitsubishi USB MCUs are already employed in various USB applications. Mitsubishi provides a wide variety of USB MCUs:such as cost-effective and small-package MCUs for low-speed USB applications, sophisticated MCUs for full-speed applications, and ASSP with MITSUBISHI IP, and system LSI.



Mitsubishi USB Devices Connect You to the Future of PC Environment

Adding functionality to the personal computer (PC) has always been a frustrating and time consuming process for PC users. Connecting multiple peripherals to the PC means making choices between limited serial and parallel ports.

But not any longer. Revolutionary technology for PC connectivity has emerged. It's called USB (Universal Serial Bus). It's fast. It's easy-to-use. And it's cost-effective.

We offer various USB Devices to answer the various needs of our customers.

Already Employed in Many USB Applications

Covering Low-speed and Full-speed Devices

Supports General-Purpose MCUs, ASSPs, and Custom MCUs

Various Mitsubishi USB Devices

Our low-speed 8-bit MCU has been specifically developed for low-cost HID MCU applications. The full-speed 8-bit MCU basically supports any type of application, as it offers large capacity FIFO, 2-ch independent DMA, 8042 interface, etc. This MCU is also applicable for ASSP employing the Mitsubishi IP, as well as system LSI developments.

1 Already Employed in Many USB Devices.

For keyboard, mouse, printer, DSC, audio equipment, and other applications. Our USB devices are already employed in various USB-enabled peripherals.

2 Supports Low-speed and Full-speed Devices.

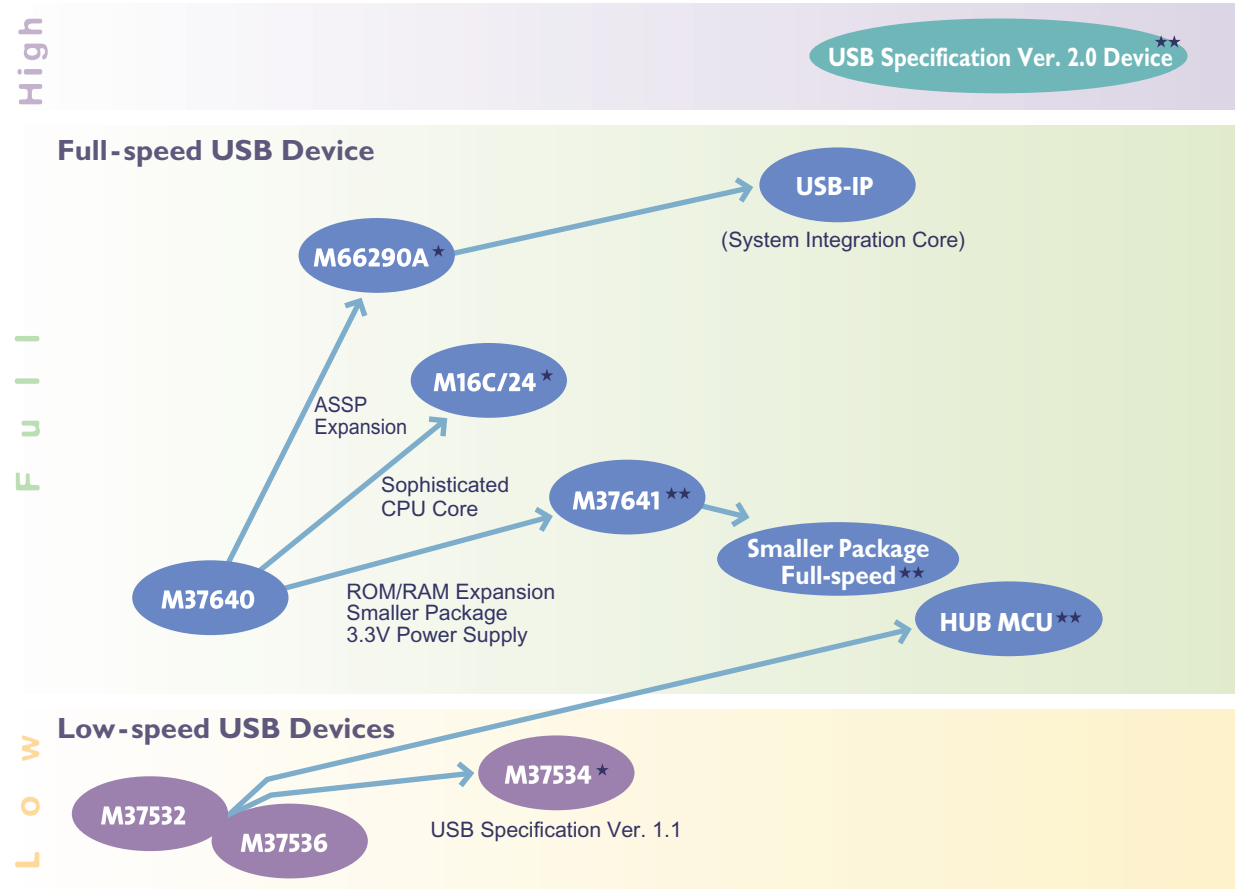
Mitsubishi USB Devices support a wide variety of USB applications from low-speed applications, such as Human Interface Devices (HID), to full-speed applications, such as digital cameras and scanners.

3 Supports General-Purpose MCUs, ASSPs, and System LSIs.

We are now developing general-purpose MCUs, custom MCUs with our original peripheral ASIC library (USB-IP), and ASICs with the on-chip USB function (USB ASICs). USB ASICs can easily be connected to our general-purpose 16-bit and 32-bit MCUs. In this way, Mitsubishi meets a wide range of requirements for various customer devices with a powerful line-up of USB devices.

◆ USB Device Road Map

Mitsubishi provides semiconductors equipped with the USB function for various USB products.



★New Product ★★Under Development

Selection Map

◆USB MCUs

Group		8Bit 7532	8Bit 7536	8Bit 7534	8Bit 7640	8Bit 7641	16Bit M16/24
Structure							
Built-in memory	ROM (KByte)	8 / 16*1	8 / 16*1	8 / 16*1	32	32 32*2	40 48 128*1
	RAM (Byte)	256 / 384	256 / 384	256 / 384	1K	1K 2.5K*2	3K 5K
I/O Ports		24(5)*3 28(6)*3	33(7)*3	24(5)*3 28(6)*3 33(7)*3	66	66	63(8*3)
Timer		8 bits×3	8 bits×3	8 bits×3	8 bits×3, 16 bits×2	8 bits×3, 16 bits×2	16 bits×(5+3)
Serial I/O (channel)	Clock synchronous/UART	—	—	—	—	—	3
	Clock synchronous-only	8 bits×1	8 bits×1	8 bits×1	8 bits×1	8 bits×1	—
	UART-only	—	—	—	7/8/9 bits×2	7/8/9 bits×2	—
	USB/UART	1	1	1	—	—	—
A-D converter (resolution-channel)		10 bits×6 10 bits×8	10 bits×8	10 bits ×6 10 bits ×8 10 bits ×8	—	—	10 bits×8
CRC arithmetic circuit		—	—	—	—	—	1
External interrupt (source)		2 3	4	2 3 4	4	4	4
Sub-clock circuit		—	—	—	Effective	Effective	—
Key-on wakeup function		8	8	8	8	8	16
Bus interface		—	—	—	Effective	Effective	—
DMA controller (channel)		—	—	—	2	2	2
Package		32-pin LQFP 36-pin SSOP	42-pin SDIP	32-pin LQFP 36-pin SSOP 42-pin SDIP	80-pin QFP	80-pin QFP 80-pin LQFP	80-pin QFP
Operation voltage (V)		4.1 to 5.5	4.1 to 5.5	4.1 to 5.5	4.15 to 5.25	4.15 to 5.25 3.00 to 3.60	4.1 to 5.25
USB function		Low-speed	Low-speed	Low-speed	Full-speed	Full-speed	Full-speed
		USB Specification Ver.1.0	USB Specification Ver.1.0	USB Specification Ver.1.1	USB Specification Ver.1.1	USB Specification Ver.1.1	USB Specification Ver.1.1
		Control, Interrupt	Control, Interrupt	Control, Interrupt	Control, Interrupt, Bulk, Isochronous	Control, Interrupt, Bulk, Isochronous	Control, Interrupt, Bulk, Isochronous
		2 Endpoints	2 Endpoints	2 Endpoints	5 Endpoints	5 Endpoints	5 Endpoints
		—	—	—	FIFO Built-in Total 1472 bytes*4 Max 800 bytes*5	FIFO Built-in Total 3712 bytes*4 Max 2048 bytes*5	FIFO Built-in Total 512 bytes*4 Max 128 bytes*5
		USB Pull-up Power Output Pin	USB Pull-up Power Output Pin	USB Pull-up Power Output Pin	USB Pull-up Power Output Pin	USB Pull-up Power Output Pin	USB Pull-up Power Output Pin
Application		Input device for game, mouse, keyboard Other PC peripheral devices			Audio, musical instrument, printer, scanner, modem, other PC peripheral devices		Printer, scanner, modem, other PC peripheral devices

*1. One Time PROM version *2. Built-in Flash Memory version *3. LED Drive Port *4. Total number of built-in FIFOs
*5. Maximum number of bytes allowing transmissions to and from just one endpoint. Using the double buffer mode doubles transmission capability.

◆USB ASSP

	M66290A
DMA Request	Effective
JTAG Function	Built-in
Package	48-pin TQFP, 48-pin LQFP
Operation Voltage (V)	3.00 to 3.60
Operation Temperature (˚C)	0 to 70
Others	16-Bit CPU Bus Interface Built-in PLL Clock Input (6/12/24/48MHz)
USB Function	Full-speed
	USB Specification Ver.1.1
	Control, Interrupt, Bulk, Isochronous
	6 Endpoints
	Built-in FIFO (1024 bytes)*2 3kbytes*1
	USB Pull-up Power Output Pin
	Vbus Detection Voltage
Application	Musical instrument, printer, scanner, modem, portable phone, DSC, other PC peripheral devices

*1. Total number of built-in FIFO *2. Maximum number of bytes allowing transmissions to and from just one endpoint. Using the double buffer mode doubles transmission capability.

Low-speed USB

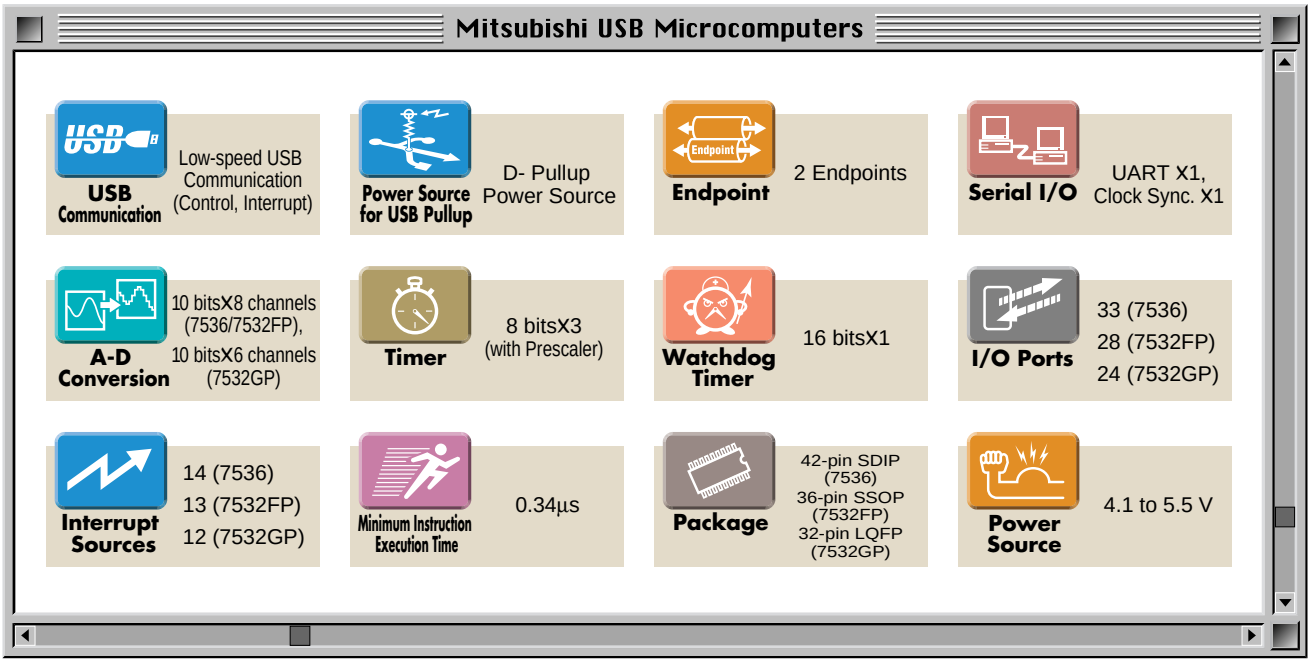
8 bit

740 Series

7532/7536 Group

USB DEVICE

The 7532/7536 Group consists of 8-bit single-chip MCUs with the low-speed USB function (compliant with USB Specification Ver. 1.0). The sophisticated 10-bit A-D converter, key-on wakeup function, and other functions for HID class devices make these MCUs excellent for applications such as keyboard, mouse, and game input device.



7532/7536 Group MCU Lineup

Part Number	Package	Memory Size		Clock <MHz> (MAX)	Minimum Instruction Execution Time <µs>	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW> (at clock= 6 MHz)
		ROM <KBytes>	RAM <Bytes>					
M37536M4-XXXSP	42-pin SDIP (42P4B)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37536E8SP	42-pin SDIP (42P4B)	16	384	6	0.34	4.1 to 5.5	–20 to 85	30
M37532M4-XXXGP	32-pin LQFP (32P6B-A)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37532M4-XXXFP	36-pin SSOP (36P2R-A)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37532E8FP	36-pin SSOP (36P2R-A)	16	384	6	0.34	4.1 to 5.5	–20 to 85	30

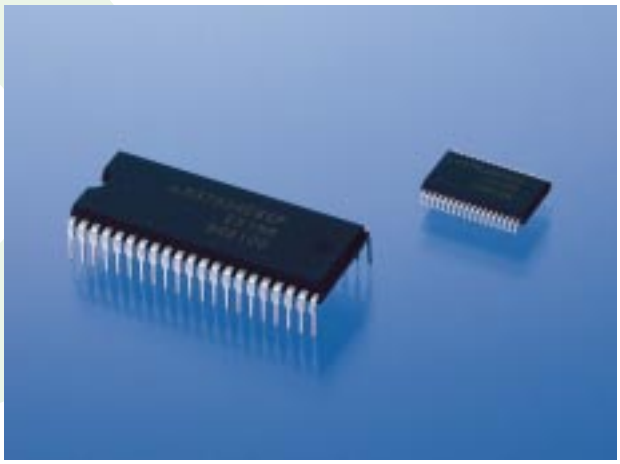
740 Series

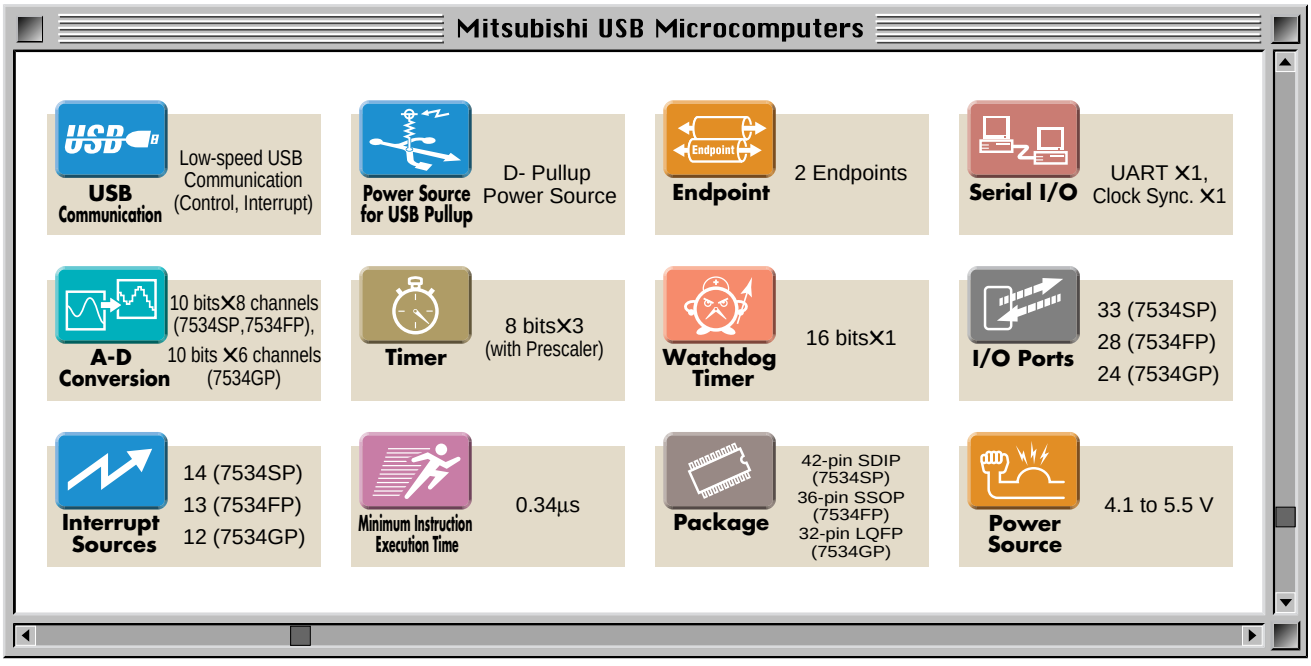
Under Development

7534 Group

USB DEVICE

The 7534 Group consists of 8-bit single-chip MCUs with the low-speed USB function (Compliant with USB Specification Ver. 1.1). The sophisticated 10-bit A-D converter, key-on wakeup function, and other functions for HID class devices make these MCUs excellent for applications such as keyboard, mouse, and game input device.





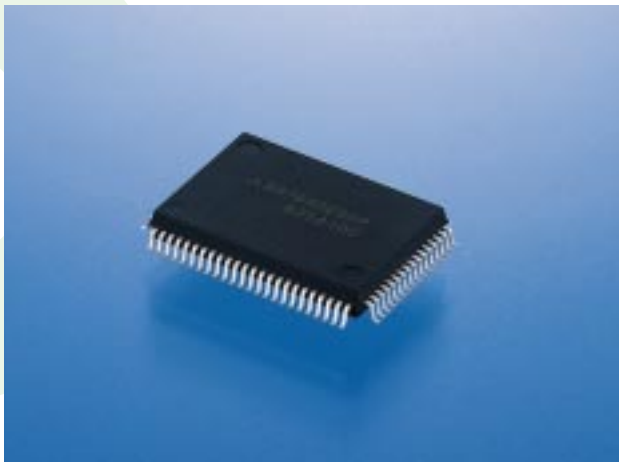
7534 Group MCU Lineup

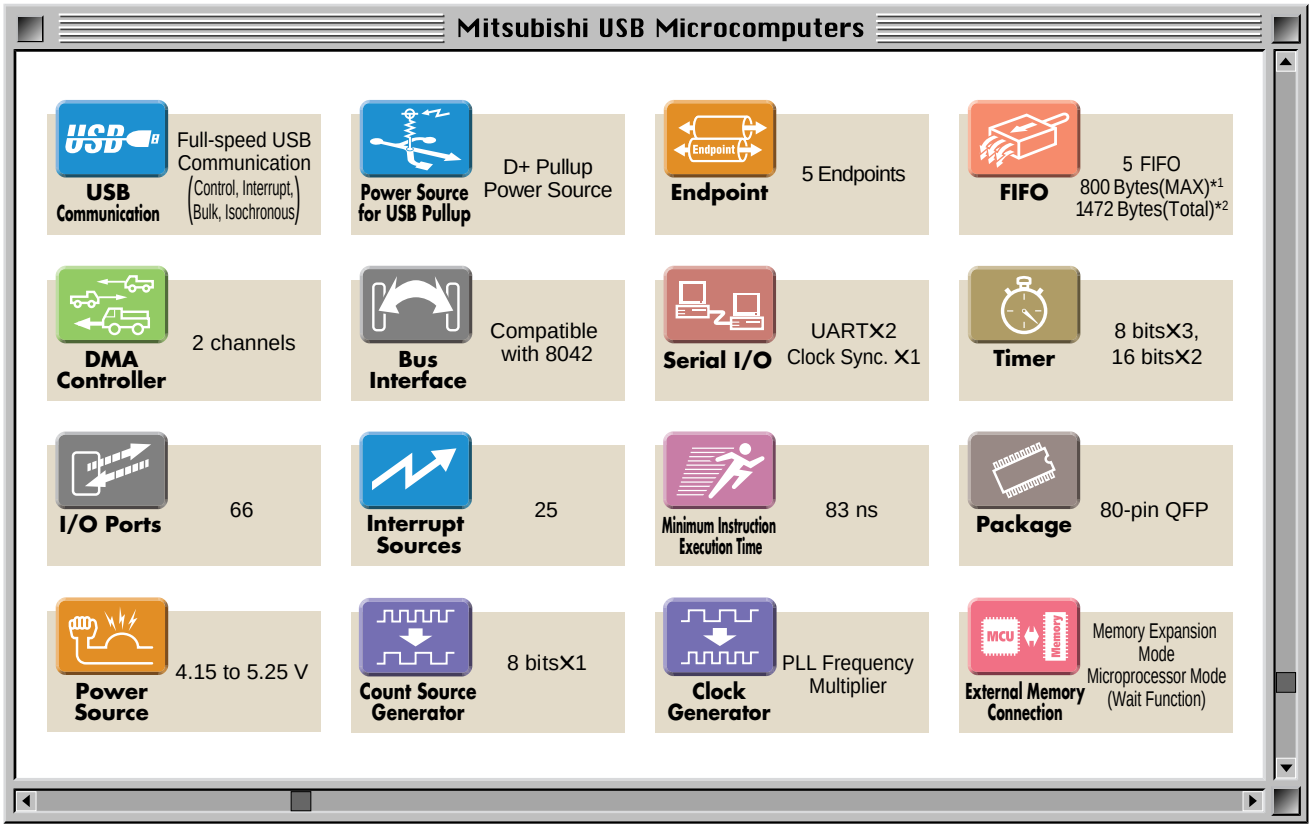
Part Number	Package	Memory Size		Clock <MHz> (MAX)	Minimum Instruction Execution Time <µs>	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW> (at clock= 6 MHz)
		ROM <KBytes>	RAM <Bytes>					
M37534M4-XXXSP	42-pin SDIP (42P4B)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37534E8SP	42-pin SDIP (42P4B)	16	384	6	0.34	4.1 to 5.5	–20 to 85	30
M37534M4-XXXGP	32-pin LQFP (32P6B-A)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37534M4-XXXFP	36-pin SSOP (36P2R-A)	8	256	6	0.34	4.1 to 5.5	–20 to 85	30
M37534E8FP	36-pin SSOP (36P2R-A)	16	384	6	0.34	4.1 to 5.5	–20 to 85	30

7600 Series 7640 Group

USB DEVICE

The 7640 Group consists of 8-bit single-chip MCUs with the full-speed USB function (compliant with USB Specification Ver. 1.1). The sophisticated DMA controller, large-capacity FIFO, and all necessary internal peripherals make these MCUs perfect for all classes of USB devices.





*1. Maximum number of bytes allowing transmissions to and from just one Endpoint. Using the double buffer mode doubles transmission capability.
*2. Total number of built-in FIFO

7640 Group MCUs Lineup

Part Number	Package	Memory Size		Clock <MHz> (MAX)	Minimum Instruction Execution Time <ns>	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW> (at clock= 24MHz)
		ROM <KBytes>	RAM <Bytes>					
M37640M8-XXXFP	80-pin QFP (80P6N-A)	32	1024	24*	83	4.15 to 5.25	–20 to 85	380
M37640E8FP	80-pin QFP (80P6N-A)	32	1024	24*	83	4.15 to 5.25	–20 to 85	380
M37640E8FS	80-pin QFN (80D0)	32	1024	24*	83	4.15 to 5.25	–20 to 85	380

*Use 12MHz internal clock.

Under Development

7600 Series 7641 Group

USB DEVICE

The 7641 Group consists of 8-bit single-chip MCUs with the full-speed USB function (compliant with USB Specification Ver. 1.1). 7641 MCUs have complete pin assignment and peripheral function compatibility with 7640 MCUs, and even more powerful USB functions. We now offer both mask ROM and Flash Memory versions. Both versions support 3V low power-consumption operation. Added to all this, the 7641 small package advantage is just what it takes to optimize the miniaturization of your system.

Mitsubishi USB Microcomputers

USB Communication	Full-speed USB Communication Built-in USB transceiver Based on Specification 1.1 (Control, Interrupt,) (Bulk, Isochronous)
Power Source for USB Pullup	D+ Pullup Power Source
Endpoint	5 Endpoints
FIFO	5 FIFO 2048 Bytes (MAX)*1 3712 Bytes (Total)*2 Size-Changeable FIFOs
DMA Controller	2 channels
Bus Interface	Compatible with 8042
Serial I/O	UARTX2 Clock Sync. X1
Timer	8bitsX3, 16 bitsX2
I/O Ports	66
Interrupt Sources	25
Minimum Instruction Execution Time	83 ns
Package	80-pin QFP 80-pin LQFP
Power Source	3.00 to 3.60 V
Count Source Generator	8 bitsX1
Clock Generator	Built-in PLL
External Memory Connection	Memory Expansion Mode Microprocessor Mode (Wait Function)

*1. Maximum number of bytes allowing transmissions to and from just one Endpoint. Using the double buffer mode doubles transmission capability.
*2. Total number of built-in FIFO

7641 Group MCU Lineup

Part Number	Package	Memory Size ROM <KBytes>	Memory Size RAM <KBytes>	Clock <MHz> (MAX)	Minimum Instruction Execution Time <ns>	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW> (at clock= 24MHz)
M37641M8-XXXFP	80-pin QFP (80P6N-A)	32	1	24*2	83	4.15 to 5.25 3.00 to 3.60	-20 to 85	5V : 380 3V : 130
M37641M8-XXXHP	80-pin LQFP (80P6Q-A)	32	1	24*2	83	4.15 to 5.25 3.00 to 3.60	-20 to 85	5V : 380 3V : 130
M37641F8FP	80-pin LQFP (80P6N-A)	32*1	2.5	24*2	83	4.15 to 5.25 3.00 to 3.60	-20 to 85	5V : 380 3V : 130
M37641F8HP	80-pin LQFP (80P6Q-A)	32*1	2.5	24*2	83	4.15 to 5.25 3.00 to 3.60	-20 to 85	5V : 380 3V : 130

*1. Flash memory
*2. Use 12MHz internal clock at 5V, 6MHz clock at 3V.

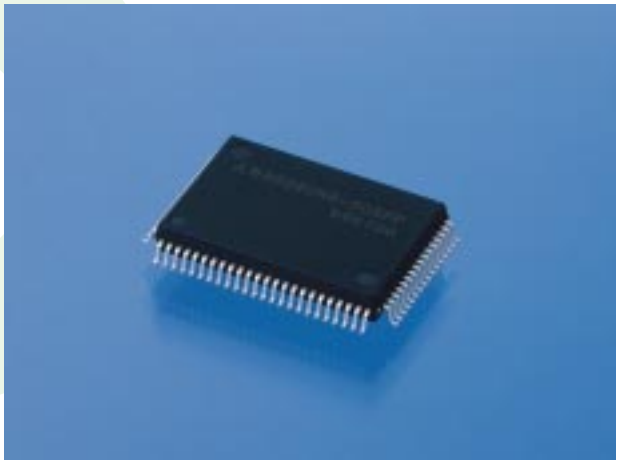
New Product

M16C/20 Series

M16C/24 (M30240) Group

USB DEVICE

The M16C/24 Group offers 16-bit single-chip MCUs with a full-speed USB function, fully USB Specification Ver. 1.1 compliant. Embedding a powerful M16C CPU core, these MCUs offer a powerful array of features including sophisticated instructions, high code efficiency, 1M byte address space, and high-speed instruction execution.



Mitsubishi USB Microcomputers

USB Communication: Full-speed USB Communication, Built-in USB transceiver, Based on Specification 1.1 (Control, Interrupt, Bulk, Isochronous)	**Power Source for USB Pullup**: D+ Pullup Power Source	**Endpoint**: 5 Endpoints	**FIFO**: 5 FIFO, 128 Bytes(MAX)*1, 512 Bytes(Total)*2
DMA Controller: 2 channels	**A-D Conversion**: 10 bits X 8 channels	**Serial I/O**: UART/ Clock Sync. X 3	**Timer**: Multi-function 16 bitsX 5, Internal interrupt 16 bitsX 3
I/O Ports: 63, High-current port : 5, LED drive port : 8	**Interrupt Sources**: 29	**Minimum Instruction Execution Time**: 83 ns	**Package**: 80-pin QFP
Power Source: 4.10 to 5.25 V	**Clock Generator**: Built-in PLL	**CRC Arithmetic circuit**: $X^{16}+X^{12}+X^5+1$, 1	**Watchdog Timer**: 15 bitsX 1

*1. Maximum number of bytes allowing transmissions to and from just one Endpoint. Using the double buffer mode doubles transmission capability.
*2. Total number of built-in FIFO

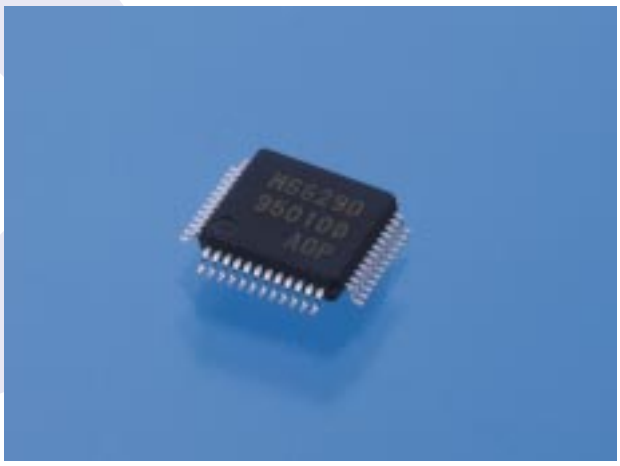
M16C/24 Group Lineup

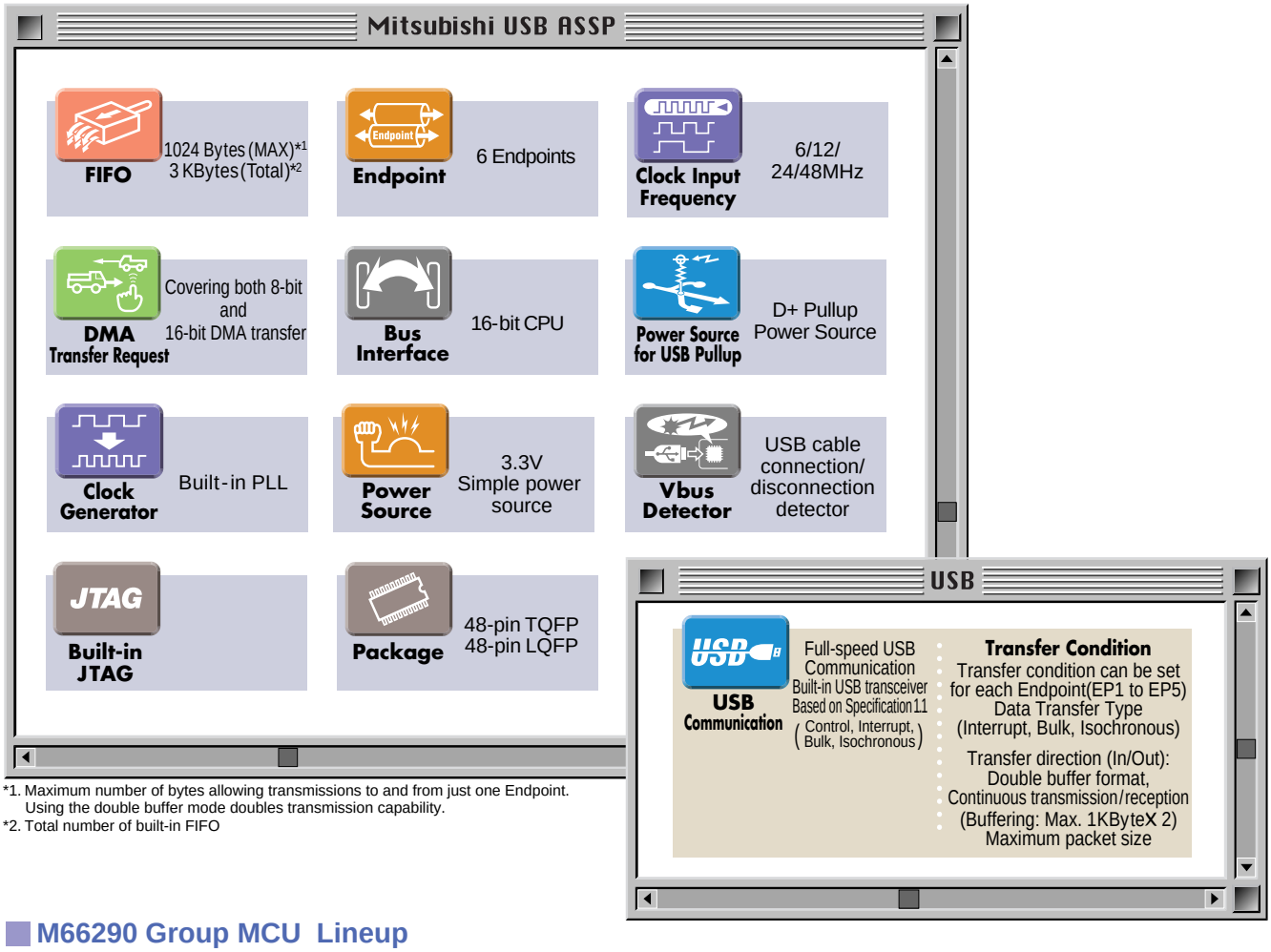
Part Number	Package	Memory Size ROM <KBytes>	Memory Size RAM <KBytes>	Clock <MHz> (MAX)	Minimum Instruction Execution Time <ns>	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW> (at clock= 12MHz)
M30240M5-XXXFP	80-pin QFP (80P6N-A)	40	3	12	83	4.1 to 5.25	–20 to 85	350
M30240M6-XXXFP	80-pin QFP (80P6N-A)	48	3	12	83	4.1 to 5.25	–20 to 85	350
M30240ECFP	80-pin QFP (80P6N-A)	128	5	12	83	4.1 to 5.25	–20 to 85	350

M66290AGP/FP

USB DEVICE

The M66290A is our USB device controller, fully compliant with the USB Version 1.1 specification, and featuring the full-speed transmission mode. It comes with a USB transceiver circuit and supports all four transfer types: Control, Isochronous, Interrupt and Bulk. The M66290A includes a built-in 3K-byte FIFO for data transfer and offers up to 6 Endpoint. As each Endpoint is programmable for various data transfers, the M66290A supports any USB transmission system. The M66290A is developed with Mitsubishi's original, widely used Full-speed IP, ensuring smooth upgrades to system LSIs for future developments.





*1. Maximum number of bytes allowing transmissions to and from just one Endpoint. Using the double buffer mode doubles transmission capability.
*2. Total number of built-in FIFO

M66290 Group MCU Lineup

Part Number	Package	Power Source <Vcc>	Operating Temperature <°C>	Power Consumption <mW>
M66290AGP	48-pin LQFP (48P6Q-A)	3.0 to 3.6	0 to 70	132
M66290AFP	48-pin TQFP (48P6X-A)	3.0 to 3.6	0 to 70	132

Full-speed USB

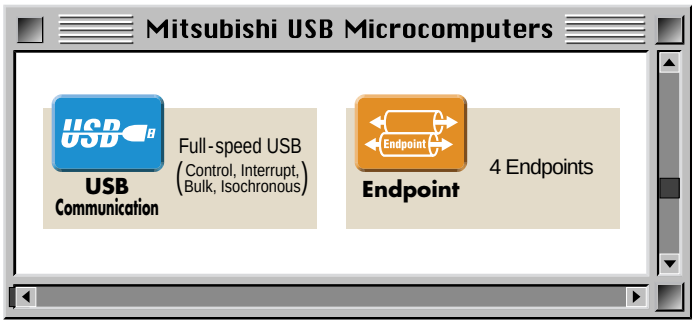
8 bit

Under Development

Low-Pin Count Full Speed MCU

USB DEVICE

Mitsubishi's low-pin count, full-speed MCU is an 8-bit single chip MCU equipped with the full-speed USB function (USB Specification Version 1.1 compliant).
This MCU ensures a wide range of applications in USB ready devices, providing slave bus interface, a sophisticated 10-bit A-D converter, key-on wakeup, and more.



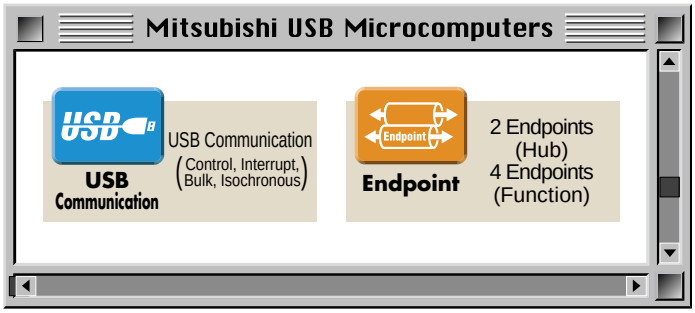
8 bit

Under Development

USB Hub

USB DEVICE

Our USB hub MCU is an 8-bit single chip MCU equipped with the USB Hub function as defined in the USB Version 1.1 specification.
In addition to 2 downstream ports, this MCU provides slave bus interface, a sophisticated 10-bit A-D converter, key-on wakeup and more, for easy use with all USB ready devices.

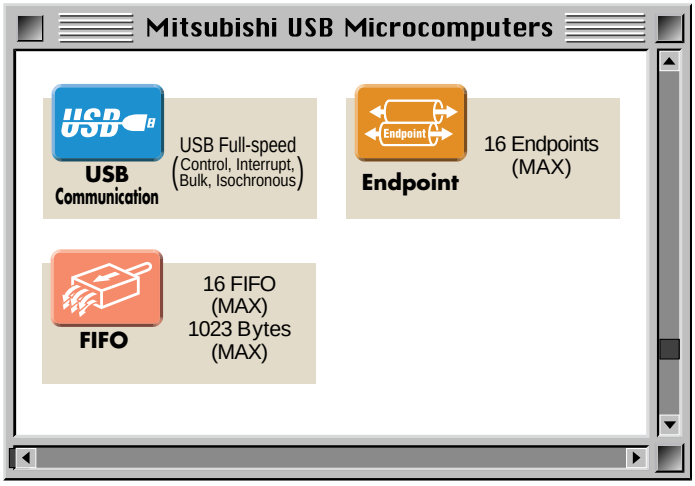


USB -IP

USB-IP

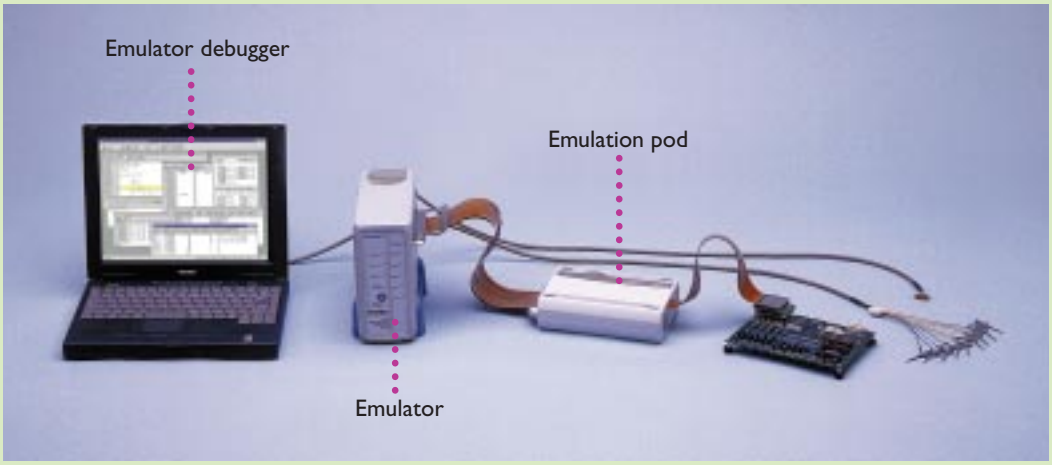
USB DEVICE

USB-IP is an MCU equipped with the USB function as a library, based on the USB Version 1.1 specification.
A system LSI, consisting of the M32R/I (Risc architecture, 32-bit CPU core), and DRAM will also be available.



Mitsubishi Microcomputer Development Support Tools

Mitsubishi Electric helps you build development environments compatible with a wide range of MCUs. Functions are continuously enhanced and new products regularly developed to meet evolving customer needs. And Mitsubishi now provides real-time support through the Internet.



◆Mitsubishi Development Support Tools

●●● 8-bit 740 family development support tools

MCU Group	Asembler	Simulator debugger	Emulator debugger	Emulator	Emulation pod	PROM programming adapter
7532 7534 7536	SRA74*1	PD38SIM	PD38	PC4701*2	M38000TL2-FPD	PCA 7435FPG02(for 36-pin 0.8mm-pitch SSOP) PCA7435SPG02(for 32/42-pin 1.778mm-pitch SDIP)
7640					M37640T-RPD-E	PCA7440FP(for 80-pin 0.8mm-pitch QFP) PCA7440FS(for 80-pin 0.8mm-pitch LCC)

*1. SRA74 includes the integrated development environment TM, assembler etc.
*2. PC4701 is a generic name for emulators PC4701M, PC4701HS and PC4701L.

●●● 16-bit M16C family development support tools

MCU Group	C compiler	Real-time OS	Simulator debugger	Emulator debugger	Emulator	Emulation pod	PROM programming adapter
M16C/24	NC30WA *1	MR30*2	PD30SIM	PD30	PC4701*3	M30240T-RPD-E **	PCA7302E1F-80(for 80-pin 0.8mm-pitch QFP) PCA7302E1F-80(for 80-pin 0.8mm-pitch LCC)

*1. NC30WA includes integrated development environment TM, C compiler NC30, assembler AS30, etc.
*2. MR30 is a generic name for OS development kit (MR30K) and mass-production contract (MR30S).
*3. PC4701 is a generic name for emulators PC4701M, PC4701HS and PC4701L.
** : Under development

●●● Third-party programmers for 16-bit M16C family

MCU Group	Product name	Contact
M16C/24	Programmer R4945, R4945A	Advantest Corporation http://www.advantest.co.jp/index-e.html

Mitsubishi Tool Homepage http://www.tool-spt.mesc.co.jp/index_e.htm

USB Development / Evaluation Products

Mitsubishi Electric helps you build demo boards for the trial USB interface control program (USB F/W) and for evaluation of the your system development. With these demo boards added to your development environment, USB protocol control is no longer necessary. The end result easier and faster system development.

USB Interface Control Program (USB F/W)

F/W for USB device class products

(1) HID F/W for mouse (M37532)
(2) HID F/W for keyboard (M37536)

F/W for standard USB specifications

M37640/M37641**	M16C/24	M66290A

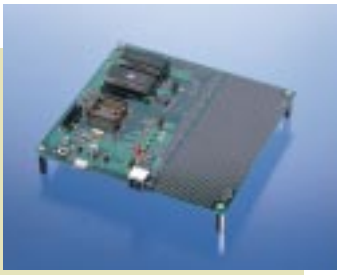
※ M37641 is under development.

Demo Board/Evaluation Board

Demo board for 7532 Group performs demo for mouse applications.
(For 7532 Group only)

MSA75115 : Mouse Demo Board (7532 Group only)

Equipped with hardware required to evaluate USB and other peripherals functions of 7641 Group.
Communicates with PC through RS-232C connection.
Evaluation in memory expansion mode and microprocessor mode also performed.
Equipped with standard hardware such as test pins and LED.
(For 7641 Group only)



MSA7641 : 7641 Group Evaluation Board (Under development)

Demo board for 7536 Group performs demo for keyboard applications.
(For 7536 Group only)

MSA75125 : Keyboard Demo Board (7536 Group only)

Equipped with hardware required to evaluate USB and other peripherals functions of M16C/24 Group.
Communicates with PC by RS-232C connection.
Equipped with standard hardware such as test pins and LED.
(For M16C/24 Group only)

MSA0207 : M16C/24 Group Evaluation Board

Equipped with hardware required to evaluate USB and other peripherals functions of 7640 Group.
Communicates with PC by RS-232C connection.
Evaluation in memory expansion mode and microprocessor mode also performed.
Equipped with standard hardware such as test pins and LED.
(For 7640 Group only)

MSA7605 : 7640 Group Evaluation Board

Utility board equipped with hardware to evaluate USB function and M66290A.
Easily connected to user's system with two built-in DIP connectors (10-pin, 2-line).
This board can be used for testing USB communication.

MSA0029B

MSA0030

Includes easy-to-use debug function. Use as evaluation board for operation testing and debugging USB programs using M66290A. Equipped with hardware required for Mitsubishi 16-bit MCU, M66290A, and USB function.

Introduction to Mitsubishi MCU Technical Information Homepage

Mitsubishi MCU Technical Information Homepage http://www.infomicom.mesc.co.jp/

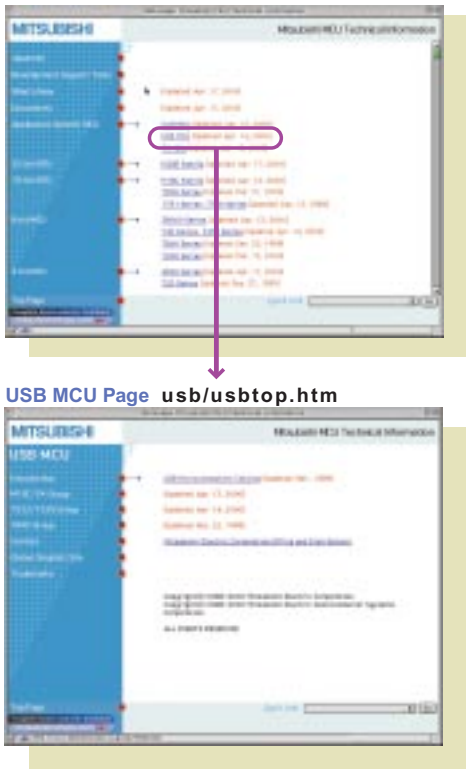
◆USB
Download the PDF file for a description of basic USB technology and the current USB specification.

◆MCU
Download the PDF file for this catalog.

◆Each MCU Group Homepage
Each MCU Group homepage provides product data sheets, users manual, application notes, and FAQs (frequently asked questions).
Each document can be downloaded as a PDF.
Evaluation boards and other small tools are introduced in each Group homepage as well.

◆Contact for USB technical questions
When contacting us with technical questions, please send us your name, company name, address, department, FAX number, and the type number of the product you are using (Ex: M30240M6-XXXFP). In addition, if you are alredy dealing with a local Mitsubishi representative, please include the name of that company and contact person.

● **USB Technical Support.**
(E-Mail: support@apl.mesc.co.jp)



Mitsubishi Development Support Tool HomePage http://www.tool-spt.mesc.co.jp/index_e.htm

For Current Customers

Tool News
Information updates regarding Mitsubishi Tools are made twice monthly.

FAQs
Inquiries about Mitsubishi Tools and responses are in a Q&A format.

Online Upgrade
Customers with licensed IDs for software products can download the latest version of their software without charge.

PC4701M
This site especially provides the various information of the new emulator PC4701M. The latest version of emulator debugger is downloadable.

For Future Customers

Products
Data sheets for each Mitsubishi Tool product, describing product outline, characteristics and functions in the HTML format.

Manual Download
You can download the manuals (PDF) of major products.

Trial Software Download
You can download the latest C compilers and simulator debuggers (trial versions).

Third Parties
This site provides some information about third-party products and contact information.

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