To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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Renesas

USB Device

Renesas Electoronics
www.renesas.com

2009.10

State-of-the-art technologies of the Renesas <EqUSB> support the future of society.

The USB specification established to connect the PC peripheral equipment is currently used for a number of different products in various scenarios, such as office equipment, mobile devices, AudioVideo equipment, and industrial equipment.
For topical On-The-Go, Embedded Host, and advanced Wireless USB,
Renesas continues to provide you with the ideal USB devices to meet customer needs.

EqUSB

Easy, high quality USB

Easy to design

A wide variety of lineup from wired USB to wireless USB allows easy design of devices, which are so user-friendly.

High quality

The Renesas <EqUSB> passed USB Compliance Program. It has been already used in a wide variety of USB embedded products in the market.

High performance

The original IP library of the Renesas <EqUSB> allows customers to select the most suitable system. Its excellent development environment and our powerful alliances with various partner vendors fully support your system development.

■ Road Map

	Peripheral	Host
Wireless USB	Wireless USB ASSP Wireless USB-IP	
Hi-Speed USB2.0	USB ASSP 32bit MCU SuperH Family USB-IP	USB ASSP 32bit MCU SuperH Family USB-IP
Full-Speed USB2.0	USB ASSP 32bit MCU SuperH Family 32/16/8bit MCU H8SX/H8S/M16C/740 Family USB-IP	32bit MCU SuperH Family USB-IP

EQUSB

Easy, high quality USB

Hub

Hub

Hub

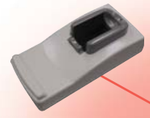
Hub

Yamaha Corporation
Conference microphone speaker (PJP-25UR)
using M30245

Sony Corporation
IC Recorder (ICD-SX77/66)
using M66592

Ricoh Company, Ltd.
Digital Camera (GR DIGITAL)
using M66592

Hitachi-Omron Terminal Solutions, Corp.
Finger Vein Authentication device
using M66291



Pioneer Corporation
Plasma TV
(North America: PDP-5010FD,
Europe: PDP-LX508D)
using M66596

Brother Industries, Ltd.
Sewing & Embroidery
(Innovis4000)
using SH7727

Roland Corporation
Audio Capture (UA-101)
using M66592

OLYMPUS Imaging Corporation
Digital Camera (E-1)
using M66591

OLYMPUS Imaging Corp.
IC Recorder (WS-331M)
using M66592

Roland Corporation
Synthesizer (V-Synth GT)
using R8A66597

Panasonic Communications
Interactive Panaboard (UB-8325)
using M66291

Sony Corporation
Visual IC Recorder (ICD-CX50)
using M66592

Hitachi, Ltd.
HDD/DVD Hybrid Camcorder (DS-HS803)
using M66592

Yamaha Corporation
High-end microphone speaker for conference
(PJP-50USB)
using M66291

Fostex Company
DVD/HD Location Recorder(PD-606)
using M66596

Yamaha Corporation
Electone STAGEA (ELS-01U/ELS-01CU)
using SH7727

Sony Corporation
Linear PCM Recorder
(PCM-D1)
using M66592

Nagano Japan Radio Co., Ltd.
Nameliner (880pro)
using M66591

Sony Corporation
IC Recorder (ICD-ST40)
using M66291

Sony Corporation
Stereo IC Recorder
(ICD-MX50)
using M66592

Fuji Photo Film Co., Ltd.
Digital Camera FinePix S7000
using M66591

Brother Industries, Ltd.
Sewing & Embroidery (PR-620)
usina SH7727

Roland Corporation
Recreational keyboard
(VIMA RK-300)
using R8A66597

Roland Corporation
Music Workstation
(Fantom-G8/G7/G6)
using M66592, R8A66597

AI Solutions
Barcode label printer
(Marvelio® TP4030)
using M66592

Fostex Company
Live Recording Mixer (LR16)
using M66596

OLYMPUS Imaging Corp.
IC Recorder (DS-50)
using M66592

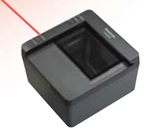
OLYMPUS Imaging Corp.
Linear PCM Recorder (LS-10)
using M66592

OLYMPUS Imaging Corp.
Digital Camera (μ-10 DIGITAL)
using M66291

Roland Corporation
24bit 96kHz WAVE/MP3 RECORDER
(R-09HR)
using M66592

Fuji Photo Film Co., Ltd.
Digital Camera FinePix F710
using M66591

Panasonic Corporation
System Solutions Company
e Passport Reader (JT-P100MR)
using M66592



Ricoh Company, Ltd.
GelSprinter (Aficio GX e3350N)
using M66592

Yamaha Corporation
Portable Keyboard (PSR-E413)
using 38K0

Sony Corporation
Fingerprint Identity
Token "PUPPY"
FIU-850-C04, FIU-850-D04, FIU-880-C04
using M66592

Ricoh Company, Ltd.
Digital Camera (Caplio 500Gwide)
using M66592

Renesas <EQUSB>, already available in every field.

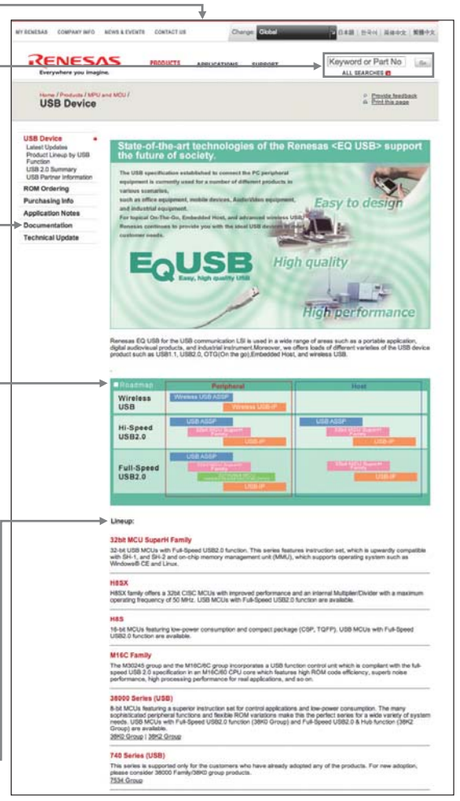
Various Renesas USB device

Renesas USB device Website

We will comprehensively support customer's development with rich development support information.

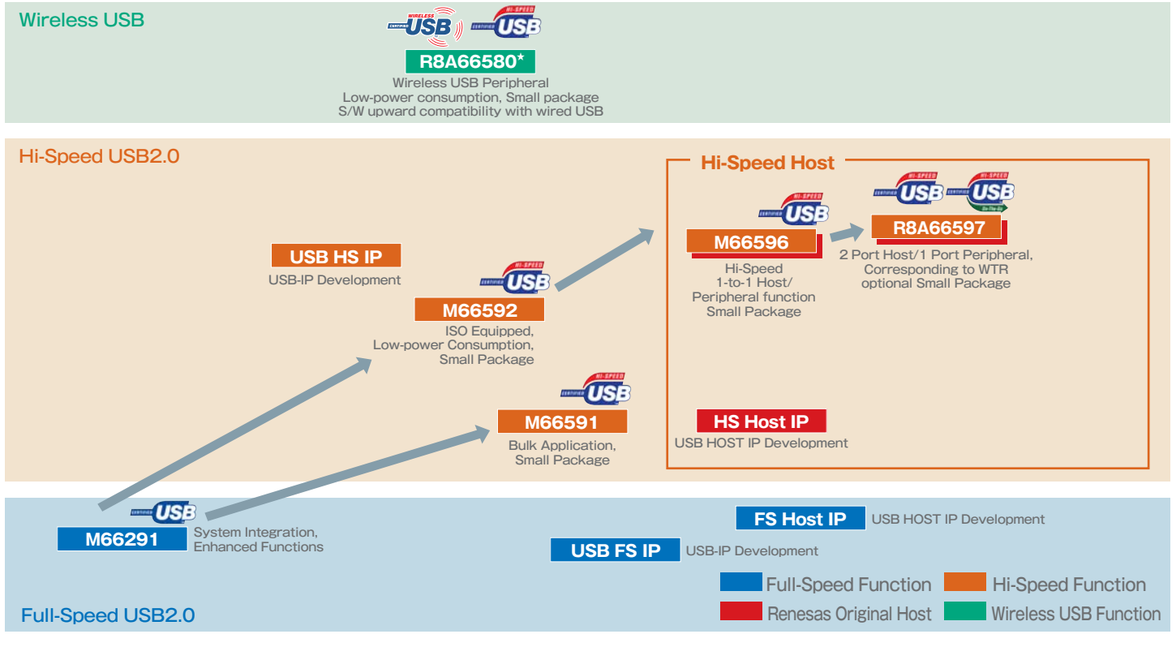
http://www.renesas.com/en/usb

Contact	Please use this contact information for technical inquiries, etc.
Various searches	Please use the various search functions.
Document	The hardware manual, the software manual, etc., are available for download.
Product expansion	Information regarding each device can be accessed from the expansion plan, too.
Lineup	Relevant documents, such as application notes, etc., in addition to the product specifications of each device, are also available for downloading.



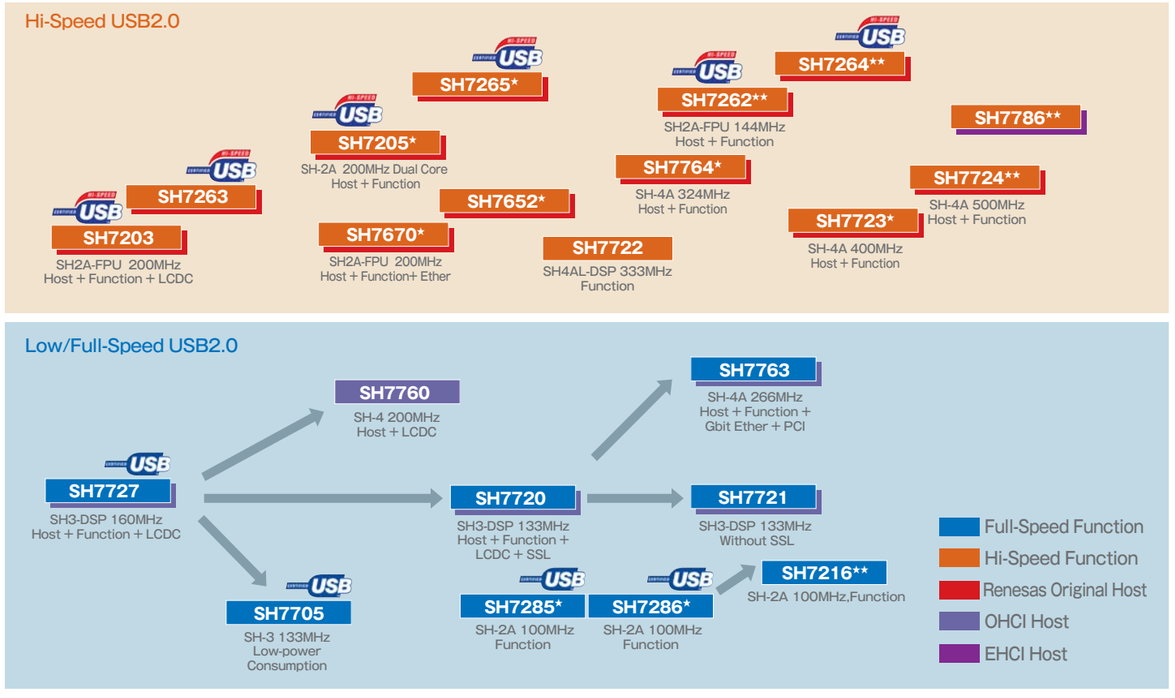
USB ASSP Road Map

★:New product



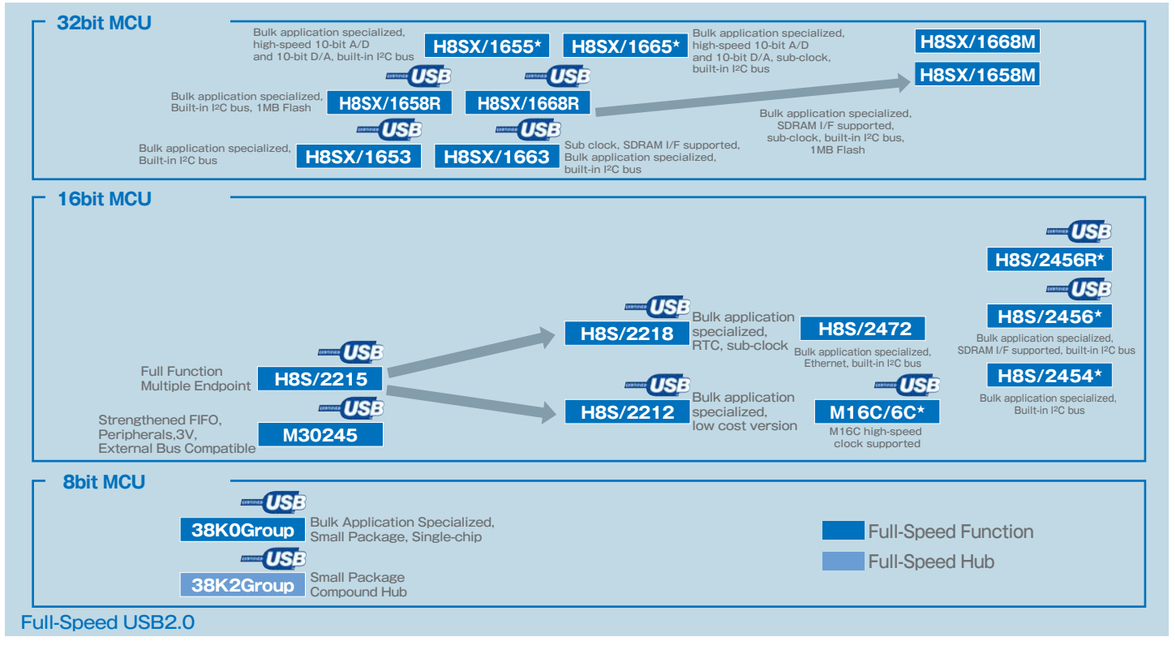
USB MCU Road Map (SuperH Family)

★:New product ★★:Under development



USB MCU Road Map (M16C, H8SX, H8S, 740 Family)

★:New product



Selection Map

★:New product ★★:Under development

■Wireless USB

		Package	Operation Voltage (V)	Operating Temperature (℃)	DMA interface	Other Functions: PLL	Other Functions	spec	Wireless USB Function: Speed*6	Transfer type	Endpoints(Pipes)	FIFO Buffer(Byte) Totoal*4	UWB PHY	Supported encryption type	USB Function: USB Port	USB Host	USB Function	Speed*6	Transfer type*7	Endpoints(Pipes) Host	Endpoints(Pipes) Function	FIFO Buffer(Byte) Totoal*4	FIFO Buffer(Byte) Max*5	Other Functions			Application
ASSP	R8A66580★	100-pin LFBGA	Power Source 3.0 to 3.6 I/O1.6 to 2.0/2.7to3.6	−20 to 85	2ch	Frequency multiplying circuit	16-bit CPU bus interface 8-bit split bus interface	Wireless USB 1.0	Peripheral 53.3/80/106.7/160/ 200/320/400/480Mbps	Ctr.,Bulk,Int.	8 Endpoints	32K	Connection using MAC-PHY Interface Ver.1.2	Built-in AES-128CCM	1	○	○*3	HS, FS, LS (Host Only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		16K	2048	Built-in USB Pull-down Resistor (In Host Mode), Built-in USB Pull-up Resistor (In Peripheral Mode)	Built-in USB output Resistor(In Full-Speed), Built-in USB Termination Resistor (In Hi-Speed)	Vbus Detector	Consumer electronics / Digital home appliances, DVC, DSC, IC recorder, DTV, DVD recorder

■USB2.0 Wireless ASSP

		Package	Operation Voltage (V)	Operating Temperature (℃)	DMA interface	Other Functions: PLL	Other Functions	USB Function: USB Port	USB Host	USB Function	Speed*6	Transfer type*7	Endpoints(Pipes) Host	Endpoints(Pipes) Function	FIFO Buffer(Byte) Total*4	FIFO Buffer(Byte) Max*5	Other Functions			Application
ASSP	R8A66597	80-pin LQFP 81-pin LFBGA	Power Source 3.0 to 3.6 I/O 1.6 to 2.0/ 2.7 to 3.6	−20 to 85 −40 to 85*1	2ch			2	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		8.5K	2048	Built-in USB Pull-down Resistor (In Host Mode), Built-in USB Pull-up Resistor (In Peripheral Mode)	Built-in USB output Resistor(In Full-Speed), Built-in USB Termination Resistor (In Hi-Speed)	Vbus Detector	DVD recorder, Mobile information terminal, Set top box, Audio equipment, DSC, DVC, Printer, External storage equipment
	M66596	64-pin LQFP,64-pin FBGA 64-pin VFBGA	Power Source 1:1.35 to 1.65, Power Source 2:3.0 to 3.6, I/O1.6 to 2.0/2.7 to 3.6	−20 to 85	2ch		16-bit CPU bus interface (For address/data bus, there are separate type and multiplex type options) 8-bit split bus interface	1	○	○*3	HS,FS	Ctr.,Bulk,Int.,Iso.	8 Endpoints		5K	2048				
	M66592	64-pin LQFP,64-pin FBGA 64-pin VFBGA	Power Source 1:1.35 to 1.65, Power Source 2:3.0 to 3.6, I/O1.6 to 2.0/2.7 to 3.6	−20 to 85	2ch	Frequency multiplying circuit		1	–	○	HS,FS	Ctr.,Bulk,Int.,Iso.	–	8 Endpoints	5K	2048	Built-in USB Pull-up Resistor			
	M66591	80-pin LQFP	Power Source 3.3 to 3.6, I/O 1.7 to 2.0/ 2.7 to 3.6	−20 to 85	1ch			1	–	○	HS,FS	Ctr.,Bulk,Int.	–	7 Endpoints	3.5K	512	USB Pull-up Power Supply Output Terminal, Power Management Support Output Terminal	–		Electronic music instrument, printer, scanner, modem, cellular phone, DVC, DSC, other PC peripheral equipment
	M66291	48-pin LQFP 52-pin VQFN	Power Source 3.3 to 3.6, I/O 2.7 to 3.6/ 4.5 to 5.5	−20 to 85	2ch		8/16-bit CPU bus interface	1	–	○	FS	Ctr.,Bulk,Int.,Iso.	–	7 Endpoints	3K	1024	USB Pull-up Power Supply Output Terminal			

USB MCU

		Package	Operation Voltage (V)	Operating Temperature (℃)	DMAC etc.	Other Functions: I/O Ports	Other Functions	USB Function: USB Port	USB Host	USB Function	Speed*6	Transfer type*7	Endpoints(Pipes) Host	Endpoints(Pipes) Function	FIFO Buffer(Byte) Total*4	FIFO Buffer(Byte) Max*5	Other Functions			Application
32bit	SH7722	449-pin BGA	1.15 to 1.3V(266MHz), 1.25 to 1.35V(333MHz)/ 3.0 to 3.6V(I/O)	−20 to 70/ −40 to 85	DMAC x 6ch	149	H.264/MPEG4 codec JPEG codec, LCDC NAND Flash I/F, camera I/F, IIC, SCIF	1	–	○	HS,FS	Ctr.,Bulk,Int.,Iso.	8 Endpoints		4K	2048				One-segment navigation, Portable navigation, Portable multimedia player, Camera applicable equipment
	SH7723*	449-pin BGA	1.15 to 1.3V 3.0 to 3.6V(I/O)	−20 to 70/ −40 to 85	DMACx12ch	170	H.264/MPEG4 codec LCDC,SDHI camera I/F,IIC,SCIF ATAPI,2DG	1	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		16K	2048				One-segment navigation, Portable navigation, Portable multimedia player, Camera applicable equipment
	SH7724**	449-pin BGA 441-pin POP	1.2 3.0 to 3.6/1.8(I/O),1.8V(DDR)	−20 to 70/ −40 to 85	DMACx12ch	180	H.264/MPEG4 codec LCDC, 5Mpixelcameral/F, JPU, SPU, FSI ATAPI, 2DG, NAND Flash Interface (MMC4.2)	2	1	○	○*3	HS,FS,LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		16K	2048				One-segment navigation, Portable navigation, Portable multimedia player, Camera applicable equipment
									1	○	○*3	HS,FS,LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		16K	2048				
	SH7262/SH7264**	176-pin QFP(SH7262) 208-pin QFP(SH7264)	1.1 to 1.3V/ 3.0 to 3.6V(I/O)	−20 to 85/ −40 to 85	DMACx16ch	99(SH7262) 129(SH7264)	SSI, NAND Flash interface, SDHI, IIC3, VDC3	1	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		8K	2048				Audio Equipment, Car Audio Equipment, Home Audio
	SH7670*	256-pin BGA	1.1 to 1.3/3.0 to 3.6(I/O)	−20 to 70/ −40 to 85	DMACx8ch	94	EtherCSTIF,SSI,SDHI,IIC3	1	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		8K	2048	With USB Pull-up Control Terminal			DVD Recorder, Thin TV Set, Audio Compo, Printer, Copy, Industrial Equipment
	SH7265/SH7205*	404-pin BGA	1.1 to 1.3/3.0 to 3.6(I/O)	−20 to 70/ −40 to 85	DMACx14ch	107	RCAN-TL1,SSIF,AND/ NAND Flash interface IIC3,ATAPI	2	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		10K	2048				Audio Equipment, Car Audio Equipment, Home Audio
	SH7764*	404-pin BGA	1.1 to 1.3/3.0 to 3.6(I/O)	−20 to 85/ −40 to 85	DMACx6ch	77	EtherC,LCDC SSI, NAND Flash interface I²Cbus,ATAPI	1	○	○*3	HS,FS, LS(Host only)	Ctr.,Bulk,Int.,Iso.	10 Endpoints		5K	2048				Home Audio, Home Server, Car Navigation
	SH7203 SH7263	240-pin QFP	1.1 to 1.3/3.0 to 3.6(I/O)	−20 to 85/ −40 to 85	DMACx8ch	99	LCDC NAND Flash interface I²Cbus,CAN	1	○	○*3	HS,FS	Ctr.,Bulk,Int.,Iso.	8 Endpoints		8K	2048				Audio Equipment, Car Audio Equipment, Industrial Equipment
	SH7786**	593-pin BGA	1.25V(typ)/1.5V(typ)/ 3.0-3.6V(I/O)	−20 to 85/ −40 to 85	DMACx24ch	60	PCI-e, DU/EtherC NAND Flash interface TMU, I²C, SCIF, SSI etc.	2	○	○	HS,FS,LS	Ctr.,Bulk,Int.,Iso.	127 Endpoints	10 Endpoints	10K	2048				Amusement Equipment, Network Equipment, Industrial Equipment
	SH7763	449-pin BGAFP	1.15 to 1.35/3.0 to 3.6(I/O) 2.3 to 2.7(DDR)	−20 to 75	DMACx6ch	107	Giga Ethernet Controller PCI Bus Controller LCDC, Security Accelerator, MMCIF,RTC,IrDA,I²C Bus	2	○	○	FS,LS (Host only)	Ctr.,Bulk,Int.,Iso.	127 Endpoints	6 Endpoints	544 (double buffer), Host common memory: DDR-SDRAM space					Network Equipment, IT Terminal, Digital Appliance
	SH7727	240-pin HQFP 240-pin CSP	1.75 to 2.05/3.6(I/O)(160MHz)	−20 to 75	DMACx4ch	104	DSP,LCDC,Built-in RTC	2	○	○	FS,LS(Host only)	Ctr.,Bulk,Int.,Iso.(Host only)	127 Endpoints	4 Endpoints	288 (double buffer), Host common memory: SDRAM space		USB pull-up control is a general purpose I/O			FAX, Printer, DSC, AV Equipment
	SH7720 SH7721	256-pin CSP(17mm□) 256-pin CSP(11mm□)	1.4 to 1.6/3.0 to 3.6(I/O)	−20 to 75	DMACx6ch	117	DSP,LCDC,MMCIF, SSL Accelerator,RTC,IrDA,I²C Bus	2	○	○	FS,LS (Host only)	Ctr.,Bulk,Int.,Iso.	127 Endpoints	6 Endpoints	544 (double buffer), Host common memory: SDRAM space of area 3		With USB Pull-up Control Terminal			FAX, DSC, Printer, IP-phone, Mobile Display Terminal
	SH7760	256-pin BGA	1.4 to 1.6/3.0 to 3.6(I/O)	−20 to 75/−40 to 85	DMACx8ch	70(MAX)	LCDC,I²C Bus, Audio interface	1	○	–	FS,LS	Ctr.,Bulk,Int.,Iso.	127 Endpoints	–	Host-shared memory:Internal RAM 8KByte		–			Simple Navigation, FA, POS, AV Equipment
	SH7216**	176-pin LQFP(20mm□) 176-pin LQFP(24mm□) 176-pin BGA(13mm□)	3.0 to 3.6	−40 to 85	DMACx8ch DTCx1ch	110	EtherC,I2C,RSPI,CAN,MTU2, MTU2S,CMT,SCI,SCIF,A/D	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	128	Vbus Detector			AC servo, Multi-purpose inverter, Robot Camera applicable equipment
	SH7285/SH7286*	SH7285:144-pin LQFP(20mm□) SH7286:176-pin LQFP(20mm□) 176-pin LQFP(24mm□)	3.0 to 3.6V/4.5 to 5.5V	−20 to 85/ −40 to 85	DMACx8ch DTCx1ch	SH7286:111 SH7285:55	SCI,SCIF,SSU,I2C, CAN(SH7286 only),MTU2,MTU2S, CMT,POE,A/D,D/A(SH7286 only)	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	128				AC servo, Multi-purpose inverter, Robot Camera applicable equipment
	SH7705	208-pin LQFP 208-pin CSP	1.4 to 1.6/3.0 to 3.6(I/O)	−20 to 75	DMACx4ch	105	RTC,IrDA	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				DSC, DVC, Printer, FAX
	H8SX/1665*	144-pin LQFP(20mm□) 145-pin LGA(9mm□)			EXDMAx2ch DMAx4ch DTCx85ch	101	I²Cx2ch,SCIx6ch,High-speed10bitA/D, 10bitD/A bus interface,PPG,SDRAMI/F, 32K Timer,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				POS Scanner
	H8SX/1655*	120-pin LQFP(14mm□)			EXDMAx2ch DMAx4ch DTCx85ch	84	I²Cx2ch, SCIx6ch, High-speed10bitA/D, 10bitD/A bus interface,PPG,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				POS Scanner
	H8SX/1668R H8SX/1668M	144-pin LQFP(20mm□) 176-pin BGA(13mm□)			EXDMAx2ch DMAx4ch DTCx85ch	101	I²Cx2ch,SCIx6ch, bus interface,PPG SDRAMI/F,Sub-clock circuit,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				POS Scanner
	H8SX/1658R H8SX/1658M	120-pin LQFP(14mm□)			EXDMAx2ch DMAx4ch DTCx85ch	84	I²Cx2ch,SCIx6ch, bus interface,PPG,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64	With USB Pull-up Control Terminal			POS Scanner
	H8SX/1663	144-pin LQFP(20mm□)			DMACx4ch DTCx85ch	101	I²Cx2ch, SCIx6ch, bus interface,PPG SDRAMI/F,Sub-clock circuit,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				POS Scanner
	H8SX/1653	120-pin TQFP(14mm□)	3.0 to 3.6	−20 to 75 (−40 to 85)*1	DMACx4ch DTCx85ch	84	I²Cx2ch,SCIx6ch, bus interface,PPG,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				POS Scanner
16 bit	H8S/2472*	176-pin BGA(13mm□)			DTCx85ch E-DMACx1ch (for Ether net)	128	Ether Net, SCI x3ch,I²Cx6ch, SSUx1ch CRCcalculation circuit,bus interface,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	288	64				Notebook PC, Memory card reader, PC server, other PC peripheral devices
	H8S/2456R/2456*	144-pin LQFP(20mm□)			EXDMACx2ch DMACx4ch DTCx85ch	114	I²Cx4ch, SCIx5ch,SSUx1ch,bus interface SDRAMI/F(Only R-version),E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	312	128				Printer, Scanner, other peripheral devices
	H8S/2454*	120-pin LQFP(14mm□)			DMACx4ch DTCx85ch	94	I²Cx4ch, SCIx5ch,SSUx1ch Bus interface,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	312	128				Printer, Scanner, other peripheral devices
	H8S/2215	120-pin TQFP(14mm□) 112-pin BGA(10mm□)			DMAx4ch DTCx85ch	75	Bus interface,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.Iso.	–	9 Endpoints	1288	256				Printer, Scanner, other peripheral devices
	H8S/2218	100-pin TQFP(12mm□) 112-pin BGA(10mm□)			DMAx4ch	69	Bus interface,Sub-clock circuit,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	456	128				Printer, Scanner, other peripheral devices
	H8S/2212	64-pin LQFP(10mm□) 64-pin QFN(8mm□)			DMAx4ch	37	Sub-clock circuit,E10A compliant	1	–	○	FS	Ctr.,Bulk,Int.	–	4 Endpoints	456	128				Printer, Scanner, other peripheral devices
	M16C/6C*	100-pin LQFP(14mm□)	2.7 to 5.5		DMAx4ch	88	I²Cx1ch,SCIx6ch, CRCcalculation circuit(2 types),Sub-clock circuit	1	–	○	FS	Ctr.,Bulk,Int.	–	7 Endpoints	584	128				Printer, scanner, other peripheral equipments, consumer equipment, and industrial equipment
	M30245	100-pin LQFP	3.0 to 3.6		DMAx4ch	83(8)*2	CRCcalculation circuit (2 types),Sub-clock circuit	1	–	○	FS	Ctr.,Bulk,Int.Iso.	–	9 Endpoints	3.2K	1024				Digital Audio, Other PC Peripheral Devices
8bit	38K0	64-pin LQFP (0.5mm pitch/0.8mm pitch)	3.00 to 5.25	−20 to 85	–	48(4)*2	Bus interface	1	–	○	FS	Ctr.,Bulk,Int.Iso.	–	4 Endpoints	–	64(expanded to built-in RAM)*5	USB Pull-up Power Supply Output Terminal	–		Other PC peripheral devices
	38K2					44(4)*2		1	–	○	FS Hub	Ctr.,Bulk,Int.Iso.	–	2 Endpoints (Hub) + 4 Endpoints (Function)	–					

*1.Wide temperature type *2.LED Drive port *3.When the Function is used, the Host cannot be used. *4.Total number of built-in FIFO *5.Maximum number of bytes allowing set to just one Endpoint. Using the double buffer mode doubles transmission capability.
*6.HS: Hi-Speed, FS: Full Speed, LS: Low-Speed *7.Ctr.: Control transfer, Bulk: Bulk transfer, Int.: Interrupt transfer, Iso.: Isochronous transfer

Wireless USB Function / Hi-Speed Function / Full-Speed Function / OHCI Host / EHCI Host / Renesas Original Host

RENESAS USB DEVICE PRODUCT LINEUP

Optimum devices are prepared for various applications.

Mobile device
Cellular phone
Portable audio device
DSC/DVC
Photo frame
Portable navigation system
IC recorder
Electronic datebook
PDA

Digital AV equipment
Flat-screen television
HDD recorder
Set-top box
Home server
Audio compo
DVD player

Electronic music instrument
Electronic keyboard
Electronic piano
Synthesizer

PC peripheral equipment
Card reader
Printer
Scanner
PC monitor

OA equipment
Facsimile
Copy machine
Complex machine
Projector
Electronic blackboard
Interactive teleconference system
TV conference system

Communication equipment
Modem
IT terminal
IP telephone

Industrial instrument
POS system
Barcode reader
ATM
Vending machine
FA equipment
Monitoring camera
Camera application

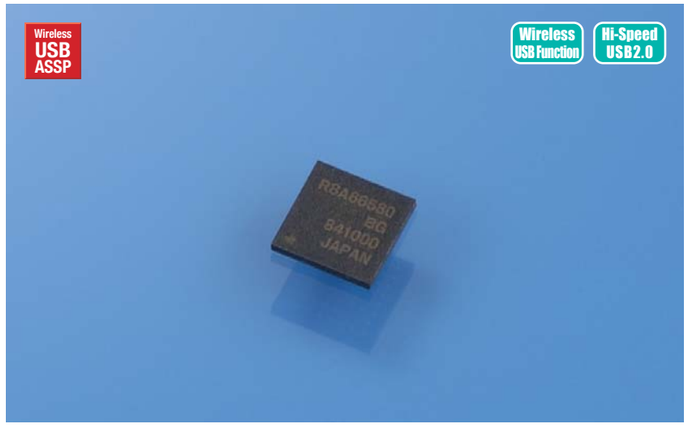
Car accessory
Car navigation system
Car audio system

■ : Optimum model ■ : Supported model

EQUSB
Easy, high quality USB

Wireless USB Function

R8A66580BG



Supported application: Mobile device / Digital AV equipment / Electronic music instrument / PC peripheral equipment / OA equipment / Communication equipment / Industrial instrument / Car accessory

The R8A66580 is the controller suitable for embedded application, which directly changes the existing wired USB product to the wireless USB product.

The R8A66580 is a peripheral function controller compliant with "Wireless USB Specification Rev.1.0". It can perform the wireless communication by combining with "MAC-PHY interface Specification Ver.1.2" compliant PHY chip. The features of the R8A66580 are ultra-low power consumption and ultra-small package (5.5mm X 5.5mm). It is suitable for the compact size and battery-driven products such as DSC and portable player etc.. The R8A66580 succeeds the design architecture of Renesas's USB controllers to ensure the compatibility.

Block diagram

WiMedia MAC WiMedia MAC standard 1.0-compliant Self Beaconing Device	**Sprit Bus** 8-bit split bus I/F	**Wireless USB** Transmission rate 53.3/80/106.7/160/200/320/400/480Mbps
UWB PHY I/F WiMedia MAC-PHY Interface standard 1.2-compliant	**Power Source for USB Pull-up** D+ Pull-up Power Source (Supply Control)	**USB Host** *1 1 port
Encryption AES-128CCM support by H/W	**PLL Frequency Multiplier Built-in**	**USB Function** *2 1 port
External PHY Resume Input Terminal 1 (UWB PHY resume by an external terminal)	**Interrupt Pin** 1-pin polarity set, interrupt source can be assigned	**Speed** HS/FS (USB) LS (USB Host only)
Clock Input Frequency 12MHz	**Vbus Detector** USB cable connection/ disconnection detector	**FIFO** 32K(Total)*4 (Wireless USB) 2K(MAX)*3 16K(Total)*4 (USB)
DMA Interface 2ch (1ch:Used for both Internal and external)	**Built-in Resistor** D+, D- Termination Resistor D+, D- Pull-down Resistor (In Host Mode) D+ Pull-up Resistor (In Peripheral Mode)	**Endpoint (Pipe)** 8 Endpoints (Wireless USB) 10 Endpoints (USB)
Bus Interface 16-bit separate CPU bus I/F	**Low-Power Sleep State** S/W Settable	Isochronous Transfer Supported (USB only)

Part Number	Pin	Package	Package Code	Supply Voltage (V)	I/O Voltage (V)	Operating Temperature (°C)	Current Consumption (mA)
R8A66580BG ★	100	LFBGA	PLBG0100KA-A	3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	TBD

*1. One stage of an external HUB can be connected (When the Full-Speed function is connected via Hi-Speed hub, the pay load of Isochronous corresponds to 188 bytes or less.)
*2.When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

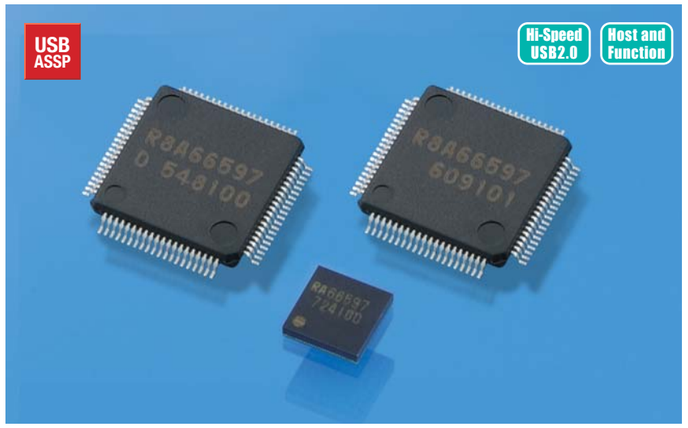
★: New product

Hi-Speed USB2.0 Host and Function

R8A66597FP/DFP/BG

The USB Host can be easily established. The USB memory, keyboard, mouse and multimedia device can be communicated with more than one USB device at the same time.

The R8A66597 is the USB controller that is the upper model of the M66596. It is possible to select either a host function (up to 2 ports) or 1 port peripheral function by this model's register settings. The host function enables the connection of an external HUB (up to one stage *1) and communications for up to 10 devices. The Embedded Host can be easily realized and the function has been expanded so that the On-the-Go can be realized. In addition, it is now possible to incorporate a large variety of products thanks to the development of products that can tolerate a wide temperature range. This product has been developed using Renesas's original USB-IP, and it can be smoothly integrated into a System LSI.



Block diagram

Clock Input Frequency 12/24/48MHz	**PLL Frequency Multiplier** Built-in	**USB Host** *1 2 port
DMA Interface 2ch	**Interrupt Pin** 1-pin polarity set, interrupt source can be assigned	**USB Function** *2 1 port
Bus Interface 16-bit CPU Bus I/F, Separate/ Multiplex selectable	**Vbus Detector** USB cable connection/ disconnection detector	**Speed** HS/FS/LS (Host only)
Split Bus 8-bit Split Bus I/F	**Built-in Resistor** D+, D-Termination Resistor D+, D-Pull-down Resistor (In Host Mode) D+ Pull-up Resistor (In Peripheral Mode)	**FIFO** 2K (Max)*3 8.5K(Total)*4
Power Source for USB Pull-up D+ Pull-up Power Source (Supply Control)	**Low-Power Sleep State** S/W Settable	**Endpoint (Pipe)** 10 Endpoints
		Isochronous Transfer Supported

Part Number	Pin	Package	Package Code	Supply Voltage (V)	I/O Voltage (V)	Operating Temperature (°C)	Current Consumption (mA)
R8A66597FP	80	LQFP	PLQP0080LA-A	3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS：70 FS：25
R8A66597DFP	80	LQFP	PLQP0080LA-A	3.3	1.6 to 2.0/2.7 to 3.6	−40 to 85*	HS：70 FS：25
R8A66597BG	81	LFBGA	PLBG0081KA-A	3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS：70 FS：25

*Wide temperature type

*1. One stage of an external HUB can be connected (When the Full-Speed function is connected via Hi-Speed hub, the pay load of Isochronous corresponds to 188 bytes or less.)

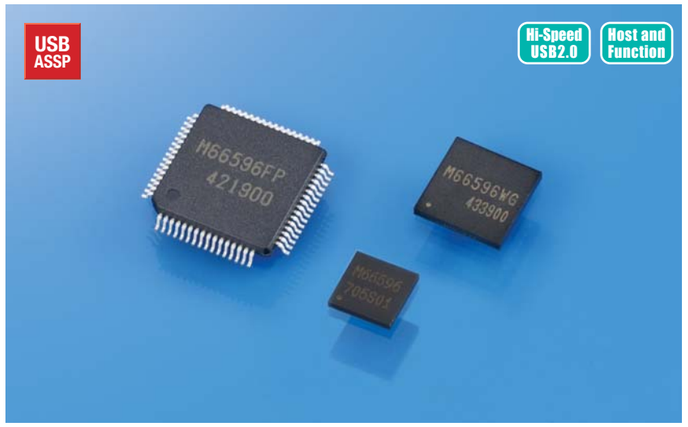
*2.When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function

M66596FP/WG/UG

The M66596 can establish a simple and compact USB host system. It is suitable for the connection with a USB memory and a portable music player.

The M66596 is a USB controller conforming to USB2.0 specifications that are suitable for embedding applications. It is possible to select either a host function or peripheral function by this model's register settings. The Embedded Host can be easily realized and one-to-one high-speed transfer with USB peripheral occurs when the USB host function is selected. The development from the USB peripheral equipment to the USB host equipment can be easily implemented thanks to USB peripheral controller the M66592 and pin compatibility. This product has been developed using Renesas's original USB-IP, and it can be smoothly integrated into a System LSI.



Block diagram

Clock Input Frequency 12/24/48MHz	**PLL Frequency Multiplier** Built-in	**USB Host** 1 port
DMA Interface 2ch	**Interrupt Pin** 1-pin polarity set, interrupt source can be assigned	**USB Function** *1 1 port
Bus Interface 16-bit CPU Bus I/F, Separate/ Multiplex selectable	**Vbus Detector** USB cable connection/ disconnection detector	**Speed** HS/FS/LS (Host only)
Split Bus 8-bit Split Bus I/F	**Built-in Resistor** D+, D-Termination Resistor D+, D-Pull-down Resistor (In Host Mode) D+ Pull-up Resistor (In Peripheral Mode)	**FIFO** 2K (Max)*2 5K (Total)*3
Power Source for USB Pull-up D+ Pull-up Power Source (Supply Control)	**Low-Power Sleep State** S/W Settable	**Endpoint (Pipe)** 8 Endpoints
		Isochronous Transfer Supported

Part Number	Pin	Package	Package Code	Supply Voltage (V)	I/O Voltage (V)	Operating Temperature (°C)	Current Consumption (mA)
M66596FP	64	LQFP	64P6X-B	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS：40 FS：18
M66596WG	64	FBGA	64FHX-A	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS：40 FS：18
M66596UG	64	VFBGA	64FHX-C	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS：40 FS：18

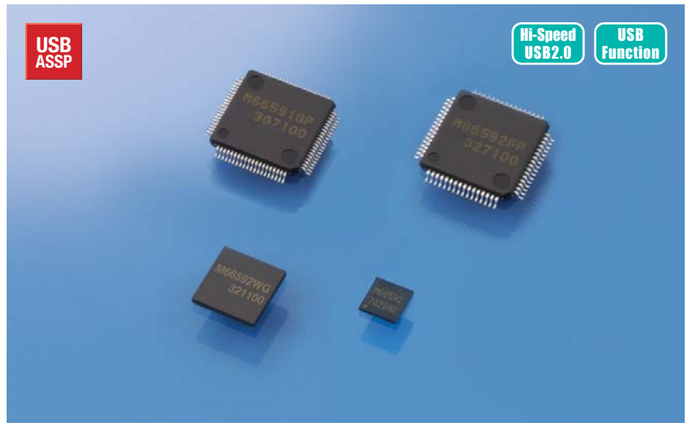
*1. When the Function is used, the Host cannot be used. *2. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *3. Total number of built-in FIFO.

Hi-Speed USB2.0 Function

M66592FP/WG/UG
M66591GP

Functions that cover video / music field in addition to small package and Bulk application are mounted. The industry leading class low power consumption is realized.

The M66591 and M66592 are Hi-Speed USB peripheral controllers complying with USB2.0 specifications. The M66592 furnishes low power consumption in an ultra small 5mm square package (M66592UG) that is suitable for mobile device applications. In addition, the 8-bit split (a DMA interface independent from the CPU bus) furnishes high-speed communications without stressing the CPU.
These products has been developed using Renesas's original USB-IP and each can be smoothly integrated into a System LSI.



Block diagram

Clock Input Frequency 12/24/48MHz	**Interrupt Pin** 1-pin polarity set, interrupt source can be assigned (M66592 Fix to polarity)	**USB Function** 1 port
DMA Interface 2ch (M66592) 1ch (M66591)	**Vbus Detector** USB cable connection/ disconnection detector	**Speed** HS/FS
Bus Interface 16-bit CPU Bus I/F, Separate/Multiplex selectable	**Built-in Resistor** D+, D-Termination Resistor D+ Pull-up Resistor (M66592)	**FIFO** 512K(Max)*1 3.5K (Total) *2 (M66591) 2K (Max)*1 5K (Total) *2 (M66592)
Split Bus 8-bit Split Bus I/F	**Low-Power Sleep State** S/W Settable (M66592)	**Endpoint (Pipe)** 7 Endpoints (M66591) 8 Endpoints (M66592)
PLL Frequency Multiplier Built-in	**USB Power Management Output Function** Configured Condition (M66591) Suspend Condition (M66591)	Isochronous Transfer Supported (M66592 only)

Part Number	Pin	Package	Package Code	Supply Voltage (V)	I/O Voltage (V)	Operating Temperature (°C)	Current Consumption (mA)
M66592FP	64	LQFP	64P6X-B	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS: 40 FS: 18
M66592WG	64	FBGA	64FHX-A	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS: 40 FS: 18
M66592UG	64	VFBGA	64FHX-C	1.5/3.3	1.6 to 2.0/2.7 to 3.6	−20 to 85	HS: 40 FS: 18
M66591GP	80	LQFP	PLQP0080LA-A	3.3	1.7 to 2.0/2.7 to 3.6	−20 to 85	184

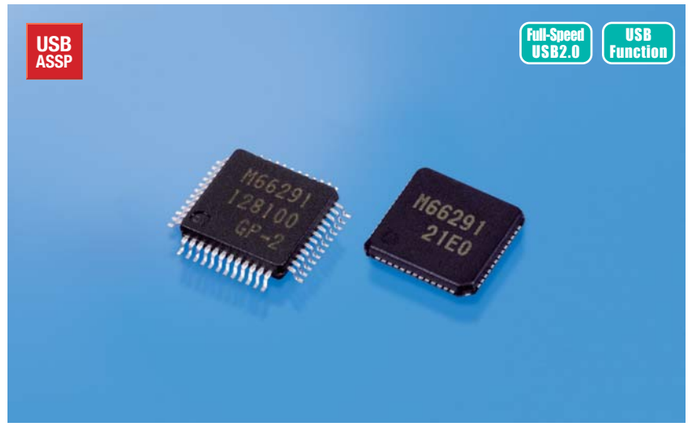
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. Total number of built-in FIFO.

Full-Speed USB2.0 Function

M66291GP/HP

The industry leading class high-speed USB data communications are realized. The M66291 supports various Full-Speed USB product applications and realizes low power consumption.

The M66291 is a Full-Speed USB peripheral controller complying with USB2.0 specifications. It also flexibly supports a variety of DMA modes thanks to the built-in DMA interface (2-ch) and features selectable polarity. In addition, the M66291 comes equipped with 2 interrupt pins that enable the polarity settings, so various interrupt factors can be allocated freely. The connection to a CPU with a 5V power supply is available because the I/O power supply is 2.7 to 5.5V. This product has been developed using Renesas's original USB-IP, and it can be smoothly integrated into a System LSI.



Block diagram

Clock Input Frequency 6/12/24/48MHz *3	**PLL Frequency Multiplier** Built-in	**USB Function** 1 port
DMA Interface 2ch polarity set, 8/16 bit correspondence	**Interrupt Pin** 2-pin polarity set, interrupt source can be assigned	**Speed** FS
Bus Interface 8/16 bit CPU		**FIFO** 1K (Max)*1 3K (Total)*2
Power Source for USB Pull-up D+ Pull-up Power Source (Supply Control)	**Vbus Detector** USB cable connection/ disconnection detector	**Endpoint (Pipe)** 7 Endpoints
		Isochronous Transfer Supported

Part Number	Pin	Package	Package Code	Supply Voltage (V)	I/O Voltage (V)	Operating Temperature (°C)	Current Consumption (mA)
M66291GP	48	LQFP	PLQP0048KB-A	3.3	2.7 to 3.6/4.5 to 5.5	−20 to 85	15
M66291HP	52	HVQFN	PVQN0052LA-B	3.3	2.7 to 3.6/4.5 to 5.5	−20 to 85	15

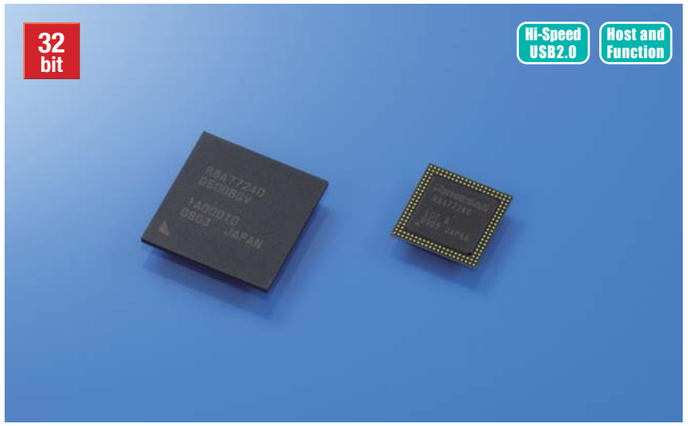
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. Total number of built-in FIFO.
*3. When I/O voltage=2.7 to 3.6V, clock input is 6/12/24/48MHz. When I/O voltage=4.5 to 5.5V, clock input is 24/48MHz.

Hi-Speed USB2.0 Host and Function
SH7780 Series

SH7724

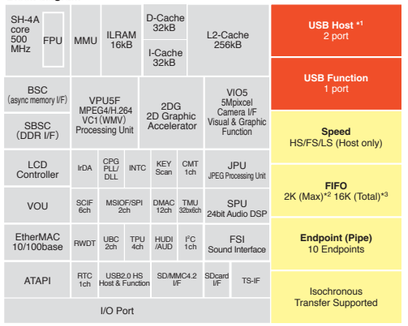
The SH7724 is suitable for the One-segment supported PND and car navigation equipment. The playback and the video recording of HD are also realized.

The SH7724 (SH-MobileR2R) is a 32-bit RISC microprocessor with built-in USB Host and Function complying with Hi-Speed USB2.0 specifications. The SH7724 enables 500MHz operation that increasing the speed by approximately 1.3× of that of existing product "SH7723 (SH-MobileR2)", and it also improves the performance and functions for realizing the HD-compliant video playback and recording. 1-port USB host function and 1-port peripheral function can be operated at the same time by setting the register.



Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

Block diagram



(USB-IP equivalent to R8A66597 is mounted)

Part Number	Pin	Package	Package Code	Memory capacity (Byte) Cache memory	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
R8A77240D500BG★★	449	BGA	PRBG0449GA-A	64K(L1), 256K(L2)	16K	L	1.2/3.0 to 3.6,1.8	−40 to 85	500
R8A77240B500BB★★	441	BGA (POP supported)	PVBG0441KA-B					−20 to 70	

★★:Under development

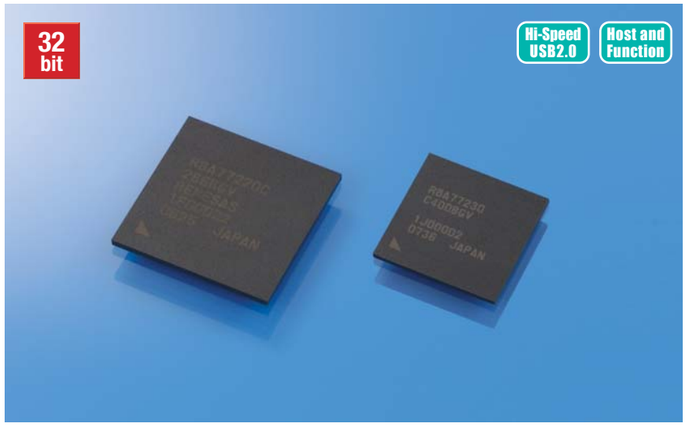
* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*3. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function
SH7780 Series

SH7722/SH7723

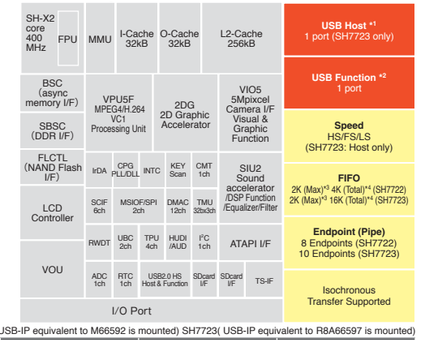
The SH7722 and SH7723 are suitable for multimedia equipment that requires high-end and low power at the same time such as One-segment supported car navigation equipment and portable media player.

The SH7722 (SH-MobileR) is a 32-bit RISC microprocessor embedded with a USB Function conforming to Hi-Speed USB2.0. The operation is available at up to 333MHz, as well as various multimedia support functions such as MPEG4・H.264, 2D graphic accelerator, LCD controller, camera interface and sound I/O. The SH7723 (SH-MobileR2) is a 32-bit RISC microprocessor embedded with a USB Host/Function conforming to Hi-Speed USB2.0. The operation is available at up to 400MHz. The SH7723 also has an FPU, the 256KB second cache and various multimedia support functions. The USB module supports all transfer types with USB2.0 specifications.



Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

SH7723 block diagram



SH7722(USB-IP equivalent to M66592 is mounted) SH7723(USB-IP equivalent to R8A66597 is mounted)

Part Number	Pin	Package	Package Code	Memory capacity (Byte) Cache memory	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
R8A77220AC266BAV	449	BGA	PLBG0417KB-A	64K	148K	L	1.15 to 1.3/3.0 to 3.6	−20 to 70	266
R8A77220AC266BGV			PRBG0449GA-A				1.25 to 1.35/3.0 to 3.6	−40 to 85	333
R8A77230AC400BG★	449	BGA	PRBG0449GA-A	64K(L1) 256K(L2)	16K	L	1.15 to 1.3/3.0 to 3.6	−20 to 70	400
R8A77230AD400BG★								−40 to 85	

★:New product

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function
SH7260 Series

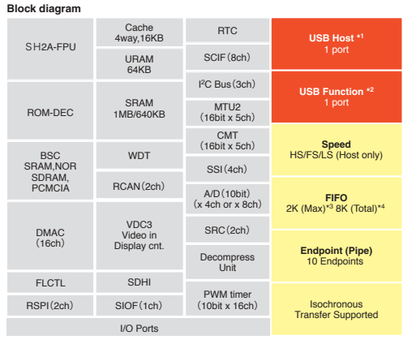
SH7262/SH7264

The SH7262/7264 is embedded with high-capacity SRAM, Hi-speed USB controller and video display controller. It is suitable for audio equipment, graphic dashboard equipment and OA/ industrial instrument.

The SH7262/7264 is a 32-bit RISC microprocessor embedded with USB Host and Function conforming to Hi-Speed USB2.0 specifications. It has FPU built-in high performance CPU core "SH2A-FPU" and the operation is available at up to a maximum operation frequency of 144MHz. The compressing and expanding processing of audio data such as MP3, WMA and AAC, which is required for audio applications, can be realized in higher speed with smaller program size thanks to high signal processing performance and ROM code efficiency. The USB module supports all transfer types based on the USB2.0 specifications.

Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

Block diagram



(USB-IP equivalent to R8A66597 is mounted)

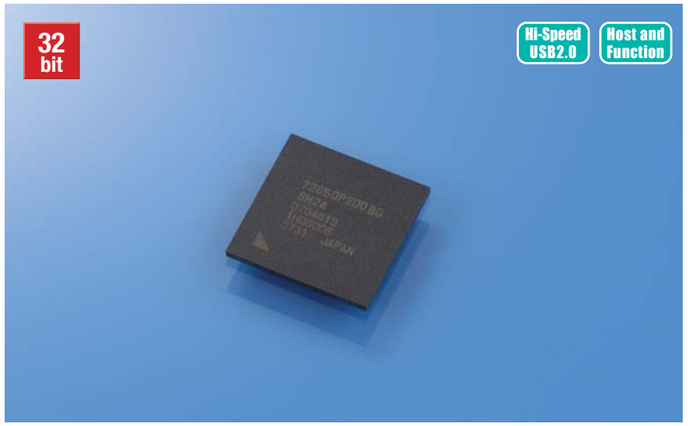
Part Number	Pin	Package	Package Code	Memory capacity (Byte) Cache memory	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
R5S72620P144FP★★	176	QFP	PLQP0176KB-A	16K	1088K	L	1.1 to 1.3/3.0 to 3.6	−40 to 85	144
R5S72621P144FP★★									
R5S72622P144FP★★									
R5S72623P144FP★★									
R5S72620W144FP★★								−20 to 85	
R5S72621W144FP★★									
R5S72622W144FP★★									
R5S72623W144FP★★									
R5S72624P144FP★★					704K			−40 to 85	
R5S72625P144FP★★									
R5S72626P144FP★★									
R5S72627P144FP★★									
R5S72624W144FP★★								−20 to 85	
R5S72625W144FP★★									
R5S72626W144FP★★									
R5S72627W144FP★★									
R5S72640P144FP★★	208		PLQP0208KB-A		1088K			−40 to 85	
R5S72641P144FP★★									
R5S72642P144FP★★									
R5S72643P144FP★★									
R5S72640W144FP★★								−20 to 85	
R5S72641W144FP★★									
R5S72642W144FP★★									
R5S72643W144FP★★									
R5S72644P144FP★★					704K			−40 to 85	
R5S72645P144FP★★									
R5S72646P144FP★★									
R5S72647P144FP★★									
R5S72644W144FP★★								−20 to 85	
R5S72645W144FP★★									
R5S72646W144FP★★									
R5S72647W144FP★★									

★★:Under development

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. When the Function is used, the Host cannot be used.
*3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*4. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function
SH7260 Series

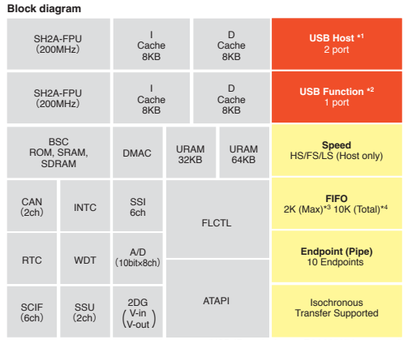
SH7265/SH7205



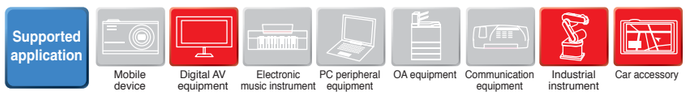
The SH7265 is suitable for the dissemination model of car audio, car navigation system and the products for multimedia equipment, and the SH7205 is suitable for the products of consumer equipment and industrial instrument.

The SH7265/7205 is a 32-bit RISC microprocessor embedded with 2 ports for a USB Host (2 ports) and Function conforming to Hi-Speed USB2.0 specifications. The SH7625/7205 is a multi-core microcontroller product with two built-in "SH2A-FPUs", and the operation is available at up to a maximum operation frequency of 200MHz. Since each core individually has FPU, the single SH7625/7205 product can operate data processing of industrial instruments or musical devices.
In addition, it has various interfaces and peripheral functions. The USB module supports all transfer types based on the USB2.0 specifications with a 10KB FIFO that can be set at a maximum of 10 Endpoints.

Block diagram



(USB-IP equivalent to R8A66597 is mounted)



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
R5S72650P200BG★	272	BGA	PRBG0272GA-A	16K	112K	L	1.1 to 1.3/3.0 to 3.6	−40 to 85	200
R5S72651P200BG★									
R5S72652P200BG★									
R5S72653P200BG★								−20 to 85	
R5S72050W200BG★							1.1 to 1.36/3.0 to 3.6		

★New product

* F: Flash memory version,, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

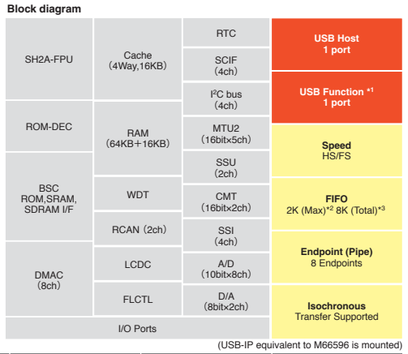
Hi-Speed USB2.0 Host and Function
SH7260/SH7200 Series

SH7263/SH7203

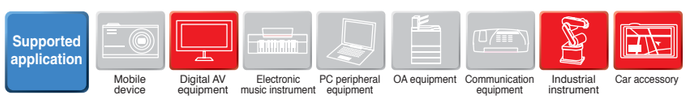
The SH7263 is suitable for the digital audio equipment such as car audio and home audio, and the SH7203 is suitable for the industrial instrument such as sequencer and robot.

The SH7263/SH7203 is a 32-bit RISC microprocessor embedded with USB Host and Function conforming to Hi-Speed USB2.0 specifications. In addition to the 200MHz "SH2A-FPU" core, 16KB cache memory and 80KB internal RAM, the device features abundant peripheral functions such as color LCDC, DMAC, audio interface, CDROM decoder and sampling rate converter. The USB module complies with all transfer types of USB2.0 specifications and is capable of setting the 8KB FIFO up to 8 Endpoints.

Block diagram



(USB-IP equivalent to M66596 is mounted)

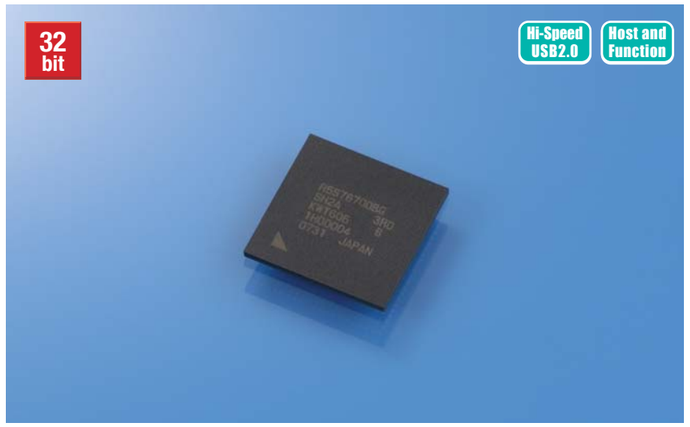


Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
R5S72630P200FP	240	QFP	QFP3232-240Cu	16K	80K	L	1.1 to 1.3/3.0 to 3.6	−40 to 85	200
R5S72631P200FP									
R5S72632P200FP									
R5S72633P200FP									
R5S72030P200FP	240	QFP	QFP3232-240Cu	16K	80K	L	1.1 to 1.36/3.0 to 3.6	−20 to 85	200

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. When the Function is used, the Host cannot be used. *2. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *3. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function
SH-Ether Series

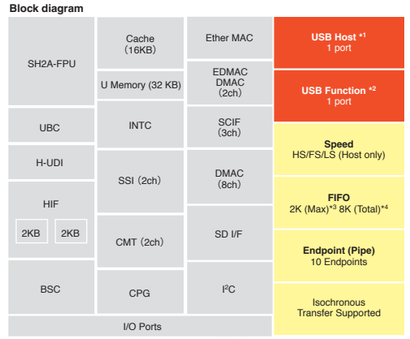
SH7670



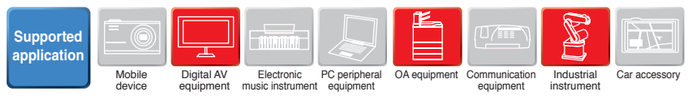
The SH7670 is suitable for the digital audio equipment such as DVD recorder, flat-screen television and audio compo and the industrial instrument such as sequencer and monitoring camera.

The SH7670 is a 32-bit RISC microprocessor embedded with USB Host and Function conforming to Hi-Speed USB2.0 specifications. It is embedded with 32-bit CPU core "SH2A-FPU" and realizes the high processing function of 480MIPS when the maximum operation frequency is 200MHz. In addition, the Ethernet controller, the host of USB2.0 and the Function are integrated in one chip for the first time in Renesas, so the LAN controller that has been required as an external part and LSI dedicated to USB2.0 can be reduced.

Block diagram



(USB-IP equivalent to R8A66597 is mounted)

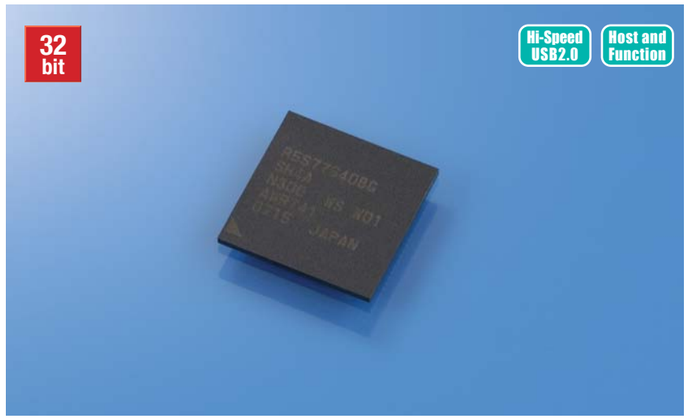


Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
R5S76700B200BG	256	BGA	P-LFBGA1717-256	16K	32K	L	1.1 to 1.3/3.1 to 3.5	−20 to 70	200
R5S76710B200BG									
R5S76720B200BG									
R5S76730B200BG									
R5S76700D133BG								−40 to 85	
R5S76710D133BG									
R5S76720D133BG									
R5S76730D133BG									

* F: Flash memory version,, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

Hi-Speed USB2.0 Host and Function
SH7780 Series

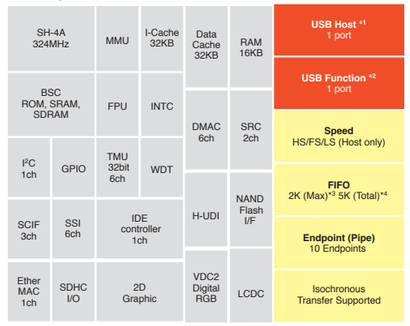
SH7764



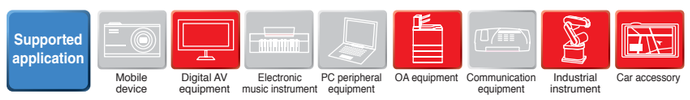
The SH7764 is suitable for the products for digital audio and multimedia applications such as home audio equipment and car navigation equipment.

The SH7764 is a high performance microprocessor embedded with USB Host and Function conforming to Hi-Speed USB2.0 specifications, and an FPU with "SH-4A" core. The operation is available at up to 324MHz. The CPU supports 583MIPS at maximum, and the FPU supports single precision and double-precision calculation, up to 2.3GFLOPS.
The SH7764 allow high-speed processing of audio codec (WMA/MP3/AAC) and image data (2D/3D), and also, with hardware support for vector operation and sine/cosine operation, it allows high-speed 3D graphics processing. The USB module supports all transfer types based on the USB2.0 specifications with a 5KB FIFO that can be set at a maximum of 10 Endpoints.

Block diagram



(USB-IP equivalent to R8A66597 is mounted)



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
R5S77640N300BG★	404	BGA	PRBG0404GA-A	32KB+32KB	16K	L	1.15 to 1.35/3.0 to 3.6	−40 to 85	324
R5S77640P300BG★								−20 to 85	

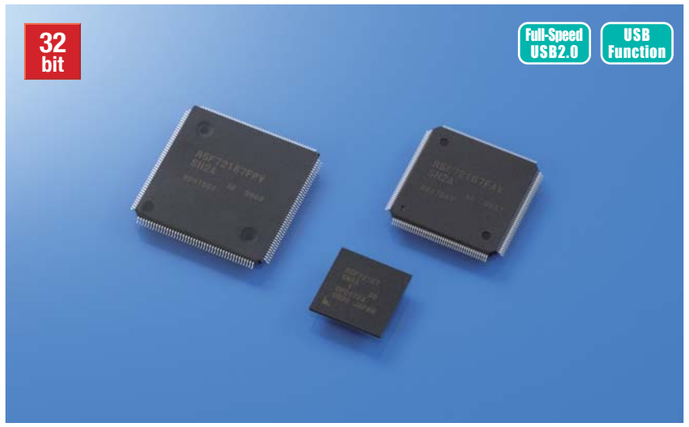
★:New product

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. One stage of external HUB can be connected (for the Full-Speed function connection via Hi-Speed hub, the pay load of Iso. Transfer corresponds to 188 bytes or less.)
*2. When the Function is used, the Host cannot be used. *3. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *4. Total number of built-in FIFO.

Full-Speed USB2.0 Function
SH7216 Series

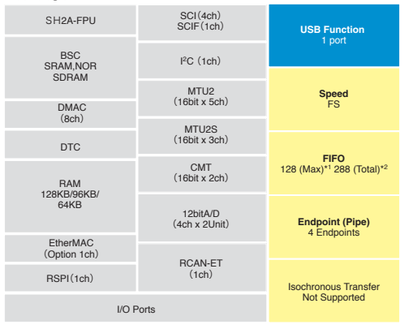
SH7216

The speed is increased from operation of our company's existing product SH7211 series at 160MHz to 200MHz to realize the improvement of performance by 1.25 times.
In addition, 1MB large capacity flash memory and high-capacity RAM are incorporated.



With the SH7216 series, 32-bit CPU core "SH-2A" is embedded. The increase of consumption current due to speeding up is controlled by incorporating the power supply voltage reduction circuit and reducing the consumption current and the single supply operation at 3.3V is realized for high-speed operation at 200MHz. The peripheral function is embedded with PWM timer and 12-bit A/D converter, and Ethernet, USB and CAN are incorporated as a communication module.

Block diagram



Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (Vcc)	Operating Temperature (°C)	Clock (MHz)
R5F72145BDFA★★	176	LQFP (20mm□)	PLQP0176LB-A	512K	64K	F	3.0 to 3.6	−40 to 85	200
R5F72146BDFA★★				768K	96K				
R5F72147BDFA★★				1M	128K				
R5F72145BDFP★★		LQFP (24mm□)	PLQP0176KB-A	512K	64K				
R5F72146BDFP★★				768K	96K				
R5F72147BDFP★★				1M	128K				
R5F72145BDBG★★		BGA (13mm□)	PLBG0176GA-A	512K	64K				
R5F72146BDBG★★				768K	96K				
R5F72147BDBG★★				1M	128K				
R5F72145ADFA★★		LQFP (20mm□)	PLQP0176LB-A	512K	64K				
R5F72146ADFA★★				768K	96K				
R5F72147ADFA★★				1M	128K				
R5F72145ADFP★★		LQFP (24mm□)	PLQP0176KB-A	512K	64K				
R5F72146ADFP★★				768K	96K				
R5F72147ADFP★★				1M	128K				
R5F72145ADBG★★		BGA (13mm□)	PLBG0176GA-A	512K	64K				
R5F72146ADBG★★				768K	96K				
R5F72147ADBG★★				1M	128K				
R5F72165BDFA★★		LQFP (20mm□)	PLQP0176LB-A	512K	64K				
R5F72166BDFA★★				768K	96K				
R5F72167BDFA★★				1M	128K				
R5F72165BDFP★★		LQFP (24mm□)	PLQP0176KB-A	512K	64K				
R5F72166BDFP★★				768K	96K				
R5F72167BDFP★★				1M	128K				
R5F72165BDBG★★		BGA (13mm□)	PLBG0176GA-A	512K	64K				
R5F72166BDBG★★				768K	96K				
R5F72167BDBG★★				1M	128K				
R5F72165ADFA★★		LQFP (20mm□)	PLQP0176LB-A	512K	64K				
R5F72166ADFA★★				768K	96K				
R5F72167ADFA★★				1M	128K				
R5F72165ADFP★★		LQFP (24mm□)	PLQP0176KB-A	512K	64K				
R5F72166ADFP★★				768K	96K				
R5F72167ADFP★★				1M	128K				
R5F72165ADBG★★		BGA (13mm□)	PLBG0176GA-A	512K	64K				
R5F72166ADBG★★				768K	96K				
R5F72167ADBG★★				1M	128K				

* F: Flash memory version,, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.

★★:Under development

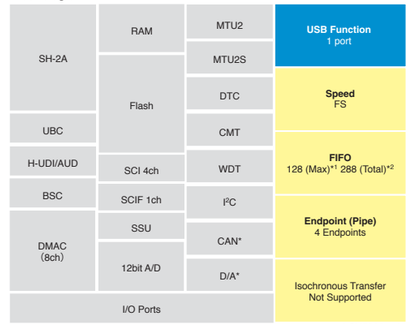
Full-Speed USB2.0 Function
SH7280 Series

SH7285/SH7286

The SH7285/7286 is embedded with abundant peripheral functions such as serial interface, multifunctional timer unit and 12-bit A/D converter.
It is suitable for AC servo, general-purpose inverter and robot etc.

The SH7285/7286 is embedded with 32-bit CPU core "SH-2A" realizes the operation of a maximum of 100MHz and 200MIPS high-speed processing. It also has a built-in large-capacity flash memory (SH7286: up to 1MB, SH7285: up to 768KB). A newly embedded register bank allows high-speed register spilling at the time of interrupt, and significantly improves real time performance. Because the USB Function is based on USB2.0 and the USB standard commands and USB state are processed nearly fully automatically with hardware, the system development is simple.

Block diagram



* SH7286 only

Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (Vcc)	Operating Temperature (°C)	Clock (MHz)
R5F72855N100FP	144	LQFP	PLQP0144KA-A	512K	24K	F	3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72855D100FP							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72856N100FP				768K	32K		3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72856D100FP							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72865N100FP	176	LQFP	PLQP0176KB-A	512K	24K		3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72865D100FP							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72865N100FA			PLQP0176LB-A				3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72865D100FA							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72866N100FP			PLQP0176KB-A	768K	32K		3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72866D100FP							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72866N100FA			PLQP0176LB-A				3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72866D100FA							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72867N100FP			PLQP0176KB-A	1M	32K		3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72867D100FP							3.0 to 3.6/4.5 to 5.5	−40 to 85	100
R5F72867N100FA			PLQP0176LB-A				3.0 to 3.6/4.5 to 5.5	−20 to 85	100
R5F72867D100FA							3.0 to 3.6/4.5 to 5.5	−40 to 85	100

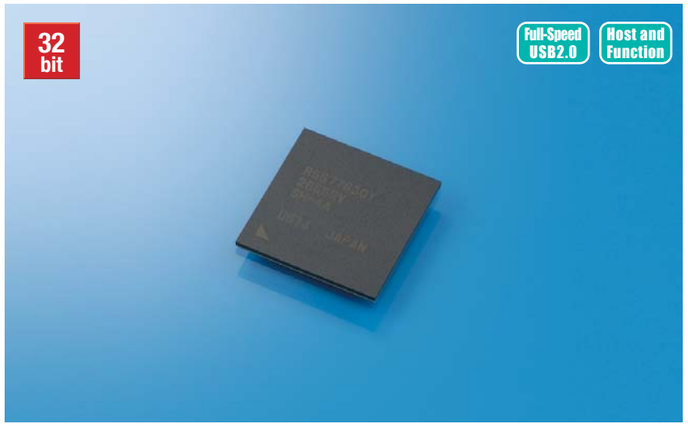
* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.

Full-Speed USB2.0 Function and OHCI1.0 Host
SH7700 Series

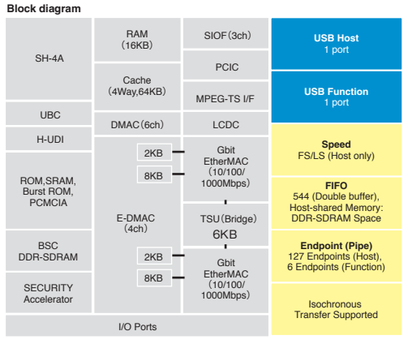
SH7763

The SH7763 is embedded with various peripheral functions such as gigabit Ethernet controller. It can support the network equipment, OA and industrial instruments widely.

The SH7763 adopts "SH-4A" core and is embedded with various peripheral functions such as gigabit Ethernet controller, PCI bus controller, color LCD controller, security accelerator (can be selected with lineup), USB Host/Function (full speed). The SH7763 can support various systems and realizes the superior cost performance by selecting these functions as occasion demands.



Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
R5S77630AY266BGV	449	BGA	PRBG0449GA-A	64K	16K	L	1.15 to 1.35/3.0 to 3.6/2.3 to 2.7	−20 to 75	266
R5S77631AY266BGV	449	BGA	PRBG0449GA-A	64K	16K	L	1.15 to 1.35/3.0 to 3.6/2.3 to 2.7	−20 to 75	266
R5S77632AY266BGV	449	BGA	PRBG0449GA-A	64K	16K	L	1.15 to 1.35/3.0 to 3.6/2.3 to 2.7	−20 to 75	266

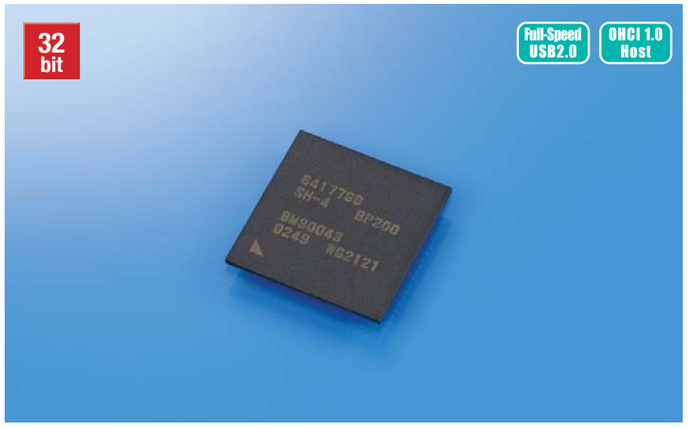
* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

Full-Speed USB（OHCI1.0 Host ）
SH7750 Series

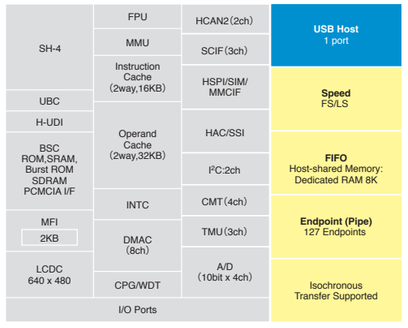
SH7760

The SH7760 is suitable for the electronic equipment such as simple navigation system, POS terminal mounted on the color liquid crystal and audio equipment.

The SH7760 is a 32-bit RISC microprocessor embedded with USB Host with Low-Speed and Full- Speed OHCI1.0 specifications. In addition to the "SH-4" core with the highly efficient floating point arithmetic unit, 16KB instruction cache memory and 32KB data cache memory, the device features abundant peripheral functions such as 65536-color LCDC, DMAC, UART with FIFO, audio interface, 32-bit automatic reloading timer, WDT. An external bus interface can control FLASH, SRAM, byte control SRAM and SDRAM.



Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vdd/Vddq)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
HD6417760BL200ADV	256	BGA	PLBG0256GB-A	48K	—	L	1.4 to 1.6/3.0 to 3.6	−40 to 85	200
HD6417760BL200AV	256	BGA	PLBG0256GB-A	48K	—	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	200

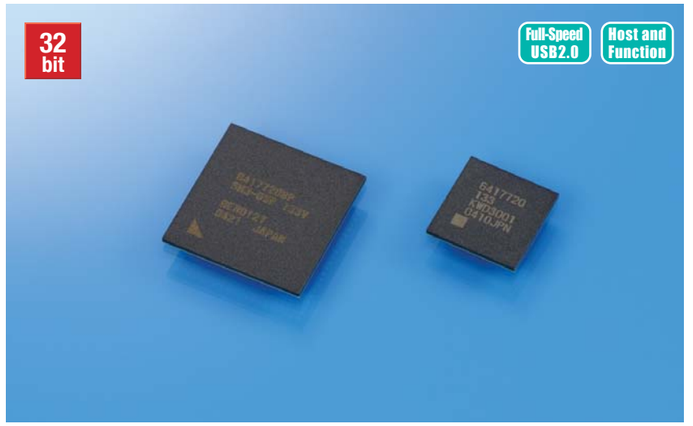
* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

Full-Speed USB2.0 Function and OHCI1.0 Host
SH7700 Series

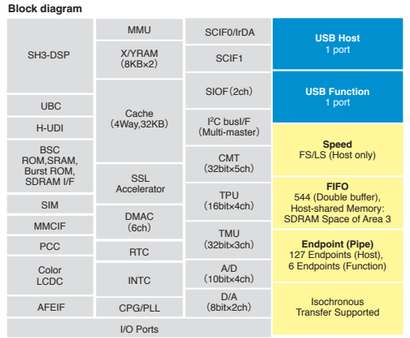
SH7720/SH7721

The SH7720/SH7721 is suitable for OA equipment, industrial instrument and mobile terminal thanks to abundant peripheral functions such as color LCD controller, USB, and the low power consumption.

The SH7720/SH7721 adopts "SH3-DSP" core and is embedded with abundant peripheral functions such as color LCD controller, SSL security accelerator (SH7720 only), USB Host / Function (full speed) and various card interfaces. These functions can realize the high-cost performance system and it can be applied to the mobile terminal by utilizing the low power consumption mode.



Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
HD6417720BP133CV	256	CSP	PLBG0256GA-A	32K	16K	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
HD6417720BL133CV									
HD6417320BP133CV	256	CSP	PLBG0256GA-A	32K	16K	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
HD6417320BL133CV									
R8A77210C133BGV	256	CSP	PLBG0256GA-A	32K	16K	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
R8A77210C133BAV									
R8A77211C133BGV	256	CSP	PLBG0256GA-A	32K	16K	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
R8A77211C133BAV									

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

Full-Speed USB2.0 Function and OHCI1.0 Host

SH7700 Series

SH7727

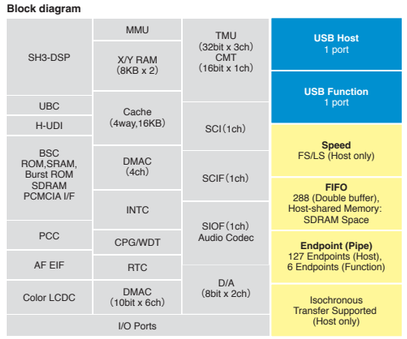
The SH7727 is embedded with peripheral functions such as high-end SH3-DSP core, color LCD controller and USB.

It is suitable for OA equipment and industrial instruments.

The SH7727 adopts "SH3-DSP" core and is embedded with peripheral functions such as color LCD controller, USB Host/Function (full speed). It is suitable for OA equipment and industrial instruments. The operation frequency can be selected from 160MHz and 100MHz, and the package type can be selected from HQFP and CSP.

Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
HD6417727F160CV	240	HQFP	PRQP0240KC-B	16K	16K	L	1.75 to 2.05/3.0 to 3.6	−20 to 75	160
HD6417727F100CV				16K	16K	L	1.6 to 2.05/2.6 to 3.6	−20 to 75	100
HD6417727BP160CV	240	CSP	PLBG0240JA-A	16K	16K	L	1.75 to 2.05/3.0 to 3.6	−20 to 75	160
HD6417727BP100CV				16K	16K	L	1.6 to 2.05/2.6 to 3.6	−20 to 75	100

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

Full-Speed USB2.0 Function

SH7700 Series

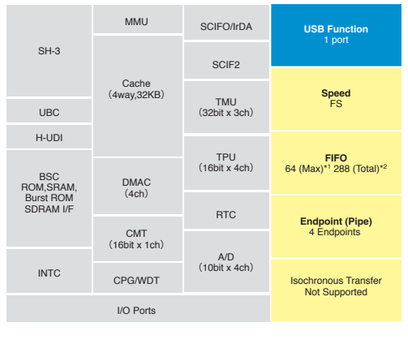
SH7705

The SH7705 is suitable for the mobile terminal that requires high-speed processing and low power consumption at the same time thanks to built-in strong power management function.

The SH7705 is embedded with abundant peripheral functions such as DMAC, serial interface, IrDA1.0, RTC and WDT in addition to high-end "SH-3" core and large-capacity cache memory of 32KB. The external bus interface can be directly connected to Flash, ROM, SRAM, byte-select SRAM, as well as 512Mbit large-capacity SDRAM. For the USB module, because the USB standard commands and USB state are processed nearly fully automatically with hardware, the system development is simple. With the bulk Endpoint engineered in a double-buffer mode, the high-speed transmission becomes a reality.

Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (Vcc/VccQ)	Operating Temperature (°C)	Clock (MHz)
				Cache memory	RAM				
HD6417705F133B	208	LQFP	PLQP0208KA-A	32K	—	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
HD6417705F100B				32K	—	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	100
HD6417705BP133B	208	CSP	TTBG0208JA-A	32K	—	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	133
HD6417705BP100B				32K	—	L	1.4 to 1.6/3.0 to 3.6	−20 to 75	100

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. Total number of built-in FIFO.

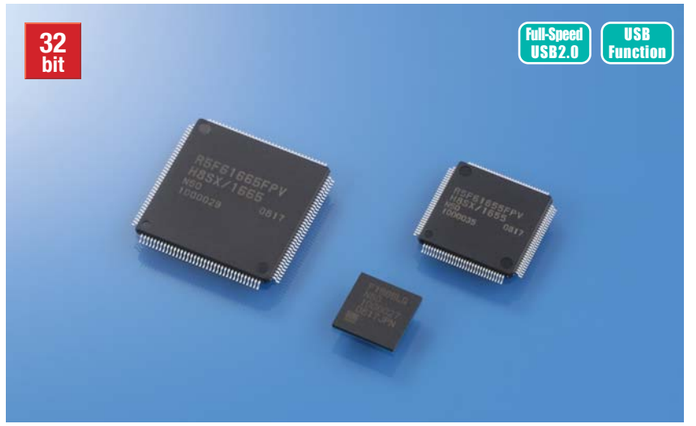
Full-Speed USB2.0 Function

H8SX Family

H8SX/1665/1655 Group

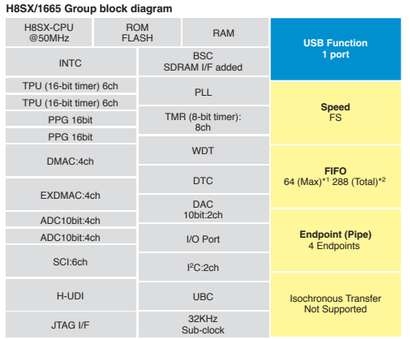
The H8SX/1665/1655 Group offers the optimum solution to consumer, industrial and OA equipment. It can be also applied to POS terminal and IC card transaction terminal etc. in a combination with Secure IC.

The H8SX/1665/1655 Group mounts high-speed "H8SX CPU" core with a maximum operation frequency of 50MHz and incorporates 512KB/384KB large-capacity flash memory and 40KB RAM. This H8SX/1668/1658 product group offers pin function upward compatibility and peripheral functions such as high-speed 10bit-A/D and 10bitD/A, are strengthened. For the USB module, because the USB standard commands and USB state are processed nearly fully automatically with hardware, the system development is simple. Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality.



Supported application: Mobile device | Digital AV equipment | Electronic music instrument | PC peripheral equipment | OA equipment | Communication equipment | Industrial instrument | Car accessory

H8SX/1665 Group block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte)		ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
				ROM	RAM				
R5F61665* 50FPV★	144	LQFP	PLQP0144RA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61662* 50FPV★	144	LQFP	PLQP0144RA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61665* 50LPV★	145	LGA	PTLG0145JB-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61662* 50LPV★	145	LGA	PTLG0145JB-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61655* 50FPV★	120	LQFP	PLQP0120LA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61652* 50FPV★	120	LQFP	PLQP0120LA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version

*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.

*2. Total number of built-in FIFO.

*: Clarifying quality grade ★:New product

Full-Speed USB2.0 Function
H8SX Family

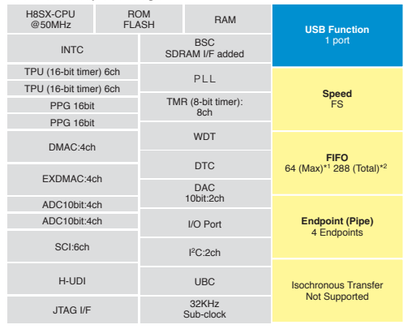
H8SX/1668R/1668M Group
H8SX/1658R/1658M Group

Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

The H8SX/1668R/1668M Group incorporates low voltage detection circuit and power-on reset in addition to the functions of H8SX/1665/1655 Group. The usability has been improved to reduce the external parts.

The H8SX/1668R/1668M Group and the H8SX/1658R/1658M Group mount high-speed "H8SX CPU" core with 50MHz maximum operation frequencies and incorporate the 1MB/512KB/384KB large-capacity flash memory and 56KB/40KB RAM. This H8SX/1663/1653 product Group offers pin function upward compatibility and peripheral functions such as AD, TPU and EXDMAC, are strengthened. In addition, H8SX/1668M and H8SX/1658M have an LVD/POR function that allows the reduction of external parts. The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware. Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality.

H8SX/1665 Group block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
R5F61668R*50FPV	144	LQFP	PLQP0144KA-A	1M	56K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61668M*50FPV									
R5F61664R*50FPV	144	LQFP	PLQP0144KA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61664M*50FPV									
R5F61663R*50FPV	144	LQFP	PLQP0144KA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61663M*50FPV									
R5F61668R*50BGV	176	BGA	PLBG0176GA-A	1M	56K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61668M*50BGV									
R5F61664R*50BGV	176	BGA	PLBG0176GA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61664M*50BGV									
R5F61663R*50BGV	176	BGA	PLBG0176GA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61663M*50BGV									
R5F61658R*50FPV	120	LQFP	PLQP0120LA-A	1M	56K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61658M*50FPV									
R5F61654R*50FPV	120	LQFP	PLQP0120LA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61654M*50FPV									
R5F61653R*50FPV	120	LQFP	PLQP0120LA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61653M*50FPV									

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.
*: Clarifying quality grade

Full-Speed USB2.0 Function
H8SX Family

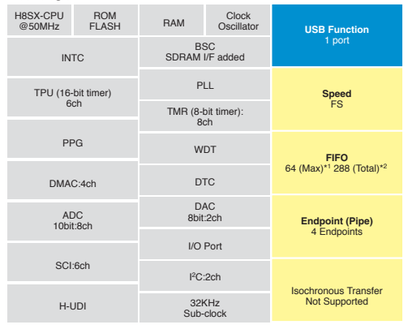
H8SX/1653/1663 Group

Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

The H8SX/1653/1663 Group incorporates abundant peripheral functions such as high-end H8SX CPU core and USB communications in a compact package. The USB communications with PC and the system control are balances.

The H8SX/1653/1663 Group mounts a high-speed "H8SX CPU" core with 50MHz maximum operation frequencies and incorporates 512K/384KB large-capacity flash memory and 40KB RAM. This H8SX/1653/1663 product group offers abundant peripheral functions such as data transfer function, SCI (Smart Card I/F, supporting High-Speed SCI), timer, A/D, D/A. The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware. Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality.

Block diagram



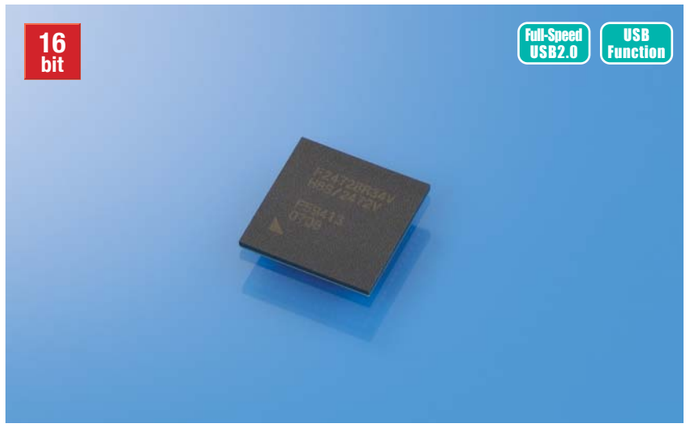
Part Number	Pin	Package	Package Code	Memory capacity (Byte) Cache memory	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
R5F61653*50FTV	120	LQFP	PTQP0120LA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61654*50FTV				512K	40K				
R5F61664*50FPV	144	LQFP	PLQP0144KA-A	384K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	50
R5F61663*50FPV				512K	40K				

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. Total number of built-in FIFO.
*: Clarifying quality grade

Full-Speed USB2.0 Function
H8S Family

H8S/2472 Group

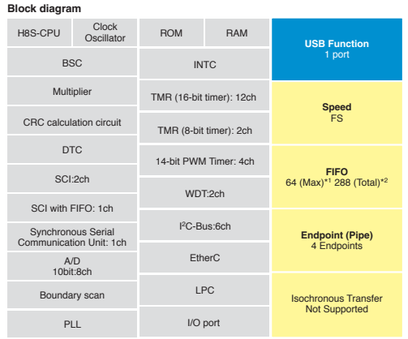
The H8S/2472 Group is a single chip MCU with built-in Flash/RAM, which realizes Ether communications. It can be applied as a gateway of Ethernet and USB.



Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

The H8S/2472 Group is embedded with high-speed CPU with 34MHz (at four times greater than 8.5MHz) operation, 512KB large-capacity flash memory and 40KB RAM. The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware. Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality. The on-chip emulator E10A-USB conforming to JTAGI/F is also prepared to provide the development with a cheaper development tool.

Block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
R4F2472VBR*V	176	BGA	PLBG0176GA-A	512K	40K	F	3.0 to 3.6	−20 to 75(−40 to 85)	34

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. Total number of built-in FIFO.
*: Clarifying quality grade

Full-Speed USB2.0 Function
H8S Family

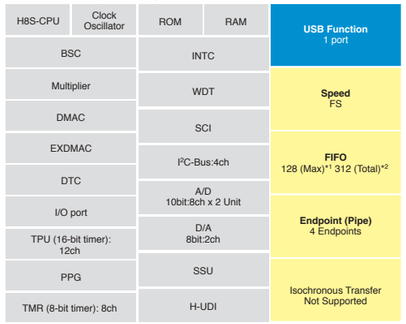
H8S/2456R/2456/2454 Group

Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

The H8S/2456R/2456/2454 Group can be applied to various applications of consumer, industrial and OA equipment thanks to multichannel serial interface and timer unit.

In addition to the high-speed 32MHz (double speed of 16MHz) CPU, 256KB flash memory and 64KB RAM, the H8S/2456R/2456/2454 Group is embedded with abundant peripheral functions such as serial interface (Smart Card I/F), I2C bus, 16-bit timer, 8-bit timer and synchronous serial communication. The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware. Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality. The E10A-USB on-chip emulator conforming to JTAG I/F is also prepared to provide the development with a cheaper development tool.

H8SS/2456R Group block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
R4F24569*VRFQV★	144	LQFP	PLQP0144KA-A	256K	64K	F	3.0 to 3.6	−20 to 75(−40 to 85)	32
R4F24568*VRFQV★				256K	48K	F			
R4F24565*VRFQV★				128K		F			
R4S24562*VRFQV★				—	64K	L			
R4S24561*VRFQV★				—	48K	L			
R4F24569*VFQV★				256K	64K	F			
R4F24568*VFQV★				256K	48K	F			
R4F24565*VFQV★				128K		F			
R4S24562*VFQV★				—	64K	L			
R4S24561*VFQV★				—	48K	L			
R4F24549*VFPV★	120	LQFP	PLQ0120LA-A	256K	64K	F	3.0 to 3.6	−20 to 75(−40 to 85)	32
R4F24548*VFPV★				256K	48K	F			
R4F24545*VFPV★				128K		F			
R4S24542*VFPV★				—	64K	L			
R4S24541*VFPV★				—	48K	L			

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.
*: Clarifying quality grade ★: New product

Full-Speed USB2.0 Function
H8S Family

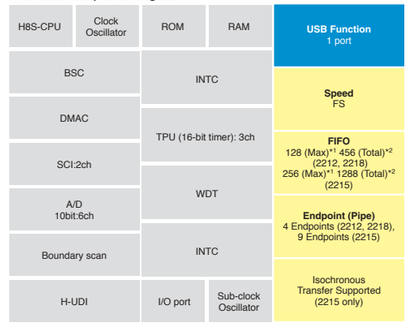
H8S/2212/2215/2218 Group

Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

The H8S/2212/2215/2218 Group is equipped with a strong communication function. The power management functions such as sleep mode and standby mode are incorporated and these groups are suitable for the mobile equipment that requires low power consumption at the same time.

In addition to high-speed CPU with 24MHz operation and 128KB/256KB large-capacity flash memory, the H8S/2212/2215/2218 Group is embedded with abundant peripheral functions such as DMAC, serial interface, 16-bit timer, RTC and WDT.
The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware. Supports is furnished for 4 type (H8S/2215 Group) and 3-type (H8S/2212 and 2218 Groups) transfer modes, and because the bulk Endpoint (the H8S/2215 Group has isochronous support) is engineered with a double-buffer mode, the high-speed data transfer becomes a reality. Through USB, meanwhile, an onboard rewritable flash memory version is also available.

H8SS/2218 Group block diagram



Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
HD64F2212FP	64	LQFP	PLQP0064KC-A	128K	12K	F	3.0 to 3.6	−20 to 75(−40 to 85)*	24
HD64F2211FP				64K	8K	F			
HD6432211(***)FP				64K	8K	M			
HD6432210(***)FP				32K	4K	M			
HD64F2215RTE	120	TQFP	PTQP0120LA-A	256K	20K	F			24/48
HD64F2215TTE				256K	20K	F			24/48
HD64F2215TE				256K	16K	F			16/48
HD64F2215RBR	112	P-LFBGA	PLBG0112GA-A	256K	20K	F			24/48
HD64F2215TBR				256K	20K	F		−20 to 75(−40 to 85)*	24/48
HD64F2215BR				256K	16K	F			16/48
HD6432215B(***)TE	120	TQFP	PTQP0120LA-A	128K	16K	M		−20 to 75(−40 to 85)*	16/48
HD6432215C(***)TE				64K	8K	M			
HD6432215B(***)BR	112	P-LFBGA	PLBG0112GA-A	128K	16K	M		−20 to 75(−40 to 85)*	
HD6432215C(***)BR				64K	8K	M			
HD64F2218TF	100	TQFP	PTQP0100LC-A	128K	12K	F		−20 to 75(−40 to 85)*	24
HD6432217(***)TF				64K	8K	M			
HD64F2218BR	112	P-LFBG	PLBG0112GA-A	128K	12K	F		−20 to 75(−40 to 85)*	
HD6432217(***)BR				64K	8K	M			

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.
*: Wide temperature type

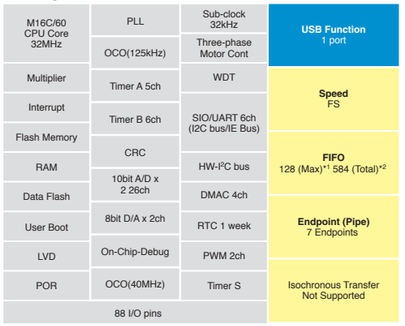
Full-Speed USB2.0 Function
M16C/6C Series

M16C/6C Group

The M16C/6C Group mounts a high-end M16C CPU core to realize the highest 32MHz operation for M16C/60 series.
Up to 512KB flash memory and 31KB RAM are incorporated.

The M16C/6C Group offers the compatibility with the M16C/6x Group. In addition to various peripheral functions, built-in two circuits of A/D converter and a 16-bit IC/OC timer have enriched the peripheral functions furthermore.
The system development is simple and allows the USB module to process USB standard commands and virtually automatic USB state using the hardware.
Three types of transfer modes (Control, Bulk and Interrupt) are supported and with a bulk Endpoint engineered with a double buffer composition, the high-speed data transmission becomes a reality. For the development environment, a single wire on-chip debugger E8a is available to make the development process simpler by a customer.

Block diagram



Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
R5F36CAMNFB★	100	LQFP	PLQP0100KB-A	512K	31K	F	2.7 to 5.5	−20 to 85	32
R5F36CAMDFB★	100	LQFP	PLQP0100KB-A	512K	31K	F	2.7 to 5.5	−40 to 85	32
R5F36CAMNFA★	100	LQFP	PRQP0100JD-B	512K	31K	F	2.7 to 5.5	−20 to 85	32
R5F36CAMDFA★	100	LQFP	PRQP0100JD-B	512K	31K	F	2.7 to 5.5	−40 to 85	32
R5F36CAKNFB★	100	LQFP	PLQP0100KB-A	384K	31K	F	2.7 to 5.5	−20 to 85	32
R5F36CAKDFB★	100	LQFP	PLQP0100KB-A	384K	31K	F	2.7 to 5.5	−40 to 85	32
R5F36CAKNFA★	100	LQFP	PRQP0100JD-B	384K	31K	F	2.7 to 5.5	−20 to 85	32
R5F36CAKDFA★	100	LQFP	PRQP0100JD-B	384K	31K	F	2.7 to 5.5	−40 to 85	32
R5F36CAENFB★	100	LQFP	PLQP0100KB-A	256K	20K	F	2.7 to 5.5	−20 to 85	32
R5F36CAEDFB★	100	LQFP	PLQP0100KB-A	256K	20K	F	2.7 to 5.5	−40 to 85	32
R5F36CAENFA★	100	LQFP	PRQP0100JD-B	256K	20K	F	2.7 to 5.5	−20 to 85	32
R5F36CAEDFA★	100	LQFP	PRQP0100JD-B	256K	20K	F	2.7 to 5.5	−40 to 85	32
R5F36CA6NFB★	100	LQFP	PLQP0100KB-A	128K	12K	F	2.7 to 5.5	−20 to 85	32
R5F36CA6DFB★	100	LQFP	PLQP0100KB-A	128K	12K	F	2.7 to 5.5	−40 to 85	32
R5F36CA6NFA★	100	LQFP	PRQP0100JD-B	128K	12K	F	2.7 to 5.5	−20 to 85	32
R5F36CA6DFA★	100	LQFP	PRQP0100JD-B	128K	12K	F	2.7 to 5.5	−40 to 85	32

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.
★:New product

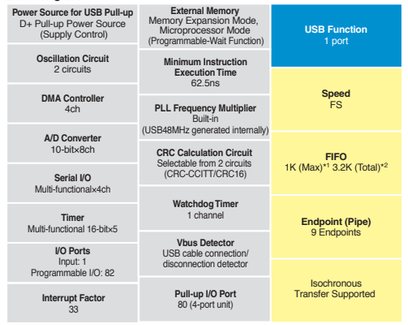
Full-Speed USB2.0 Function
M16C/20 Series

M30245

The M30245 Group is the M16C CPU core that supports isochronous Abundant peripheral functions such as audio interface and memory card interface are incorporated.

The M30245 (M16C/24 Group) consists of 16-bit single-chip MCUs with built in USB function control unit confirming to Full-Speed USB2.0 specifications. With "M16C CPU" embedded at the core, the M16C family is equipped with abundant peripheral functions and high-speed processing in addition to USB pull-up power source circuit, USB clock generator and various USB control functions. The addition of a multi-bit serial I/O enables an audio interface function, while the greater CRC calculating function enhances the memory card interface. In addition, other steps facilitating the audio application are implemented, making this system simple to configure for use in memory card application fields.

Block diagram



Supported application: Mobile device, Digital AV equipment, Electronic music instrument, PC peripheral equipment, OA equipment, Communication equipment, Industrial instrument, Car accessory

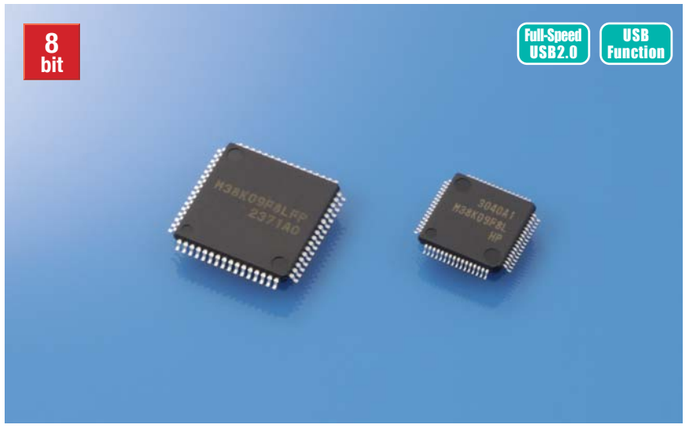
Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	Memory capacity (Byte) RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
M30245M8-XXXGP	100	LQFP	PTQP0100KB-A	64K	5K	M	3.0 to 3.6	−20 to 85	16
M30245MC-XXXGP	100	LQFP	PTQP0100KB-A	128K	10K	M	3.0 to 3.6	−20 to 85	16
M30245FCGP	100	LQFP	PTQP0100KB-A	128K	10K	F	3.0 to 3.6	−20 to 85	16

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode.
*2. Total number of built-in FIFO.

Full-Speed USB2.0 Function

38000Series

38K0 Group



The 38K0 Group is specialized for Bulk application with a small package.
It is suitable for one-chip USB converter with built-in serial I/O or bus interface.

The 38K0 Group consists of 8-bit single-chip MCUs with built-in USB functions in compliance with Full-Speed USB2.0. The built-in 4 endpoints, external bus interface×1, serial I/O×1, 8-bit timer×3 and A/D converter (8-channel) enable a variety of USB functions. In addition, 38K0 Group MCUs are suitable for USB conversion devices since the internal RAM can be accessed directly from USB and external interfaces.

Block diagram

Power Source for USB Pull-up D+ Pull-up Power Source	**I/O Ports** 48 (LED: 4)	**USB Function** 1 port
Bus Interface 8-bit×1 DMA Specification	**Pull-up I/O Port** 10	**Speed** FS
Serial I/O UART/Clock Sync. 8-bit×1ch	**Interrupt Factor** 15	**FIFO** USB Buffer Max 64 (Built-in RAM is used) *1
A/D Converter 10-bit×8ch	**Minimum Instruction** Execution Time 250ns	**Endpoint (Pipe)** 4 Endpoints
Timer 8-bit×3 (with Prescaler)	**PLL Frequency Multiplier** Built-in (USB48MHz generated internally)	Isochronous Transfer Supported

Supported application: Mobile device; Digital AV equipment; Electronic music instrument; PC peripheral equipment; OA equipment; Communication equipment; Industrial instrument; Car accessory

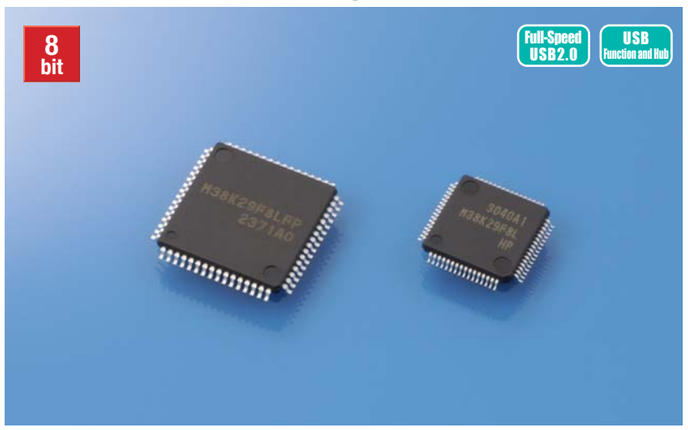
Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
M38K07M4L-XXXFP	64	LQFP	PLQP0064GA-A	16K	1K	M	3.00 to 5.25	−20 to 85	12*2
M38K07M4L-XXXHP	64	LQFP	PLQP0064KB-A	16K	1K	M	3.00 to 5.25	−20 to 85	12*2
M38K09F8LFP	64	LQFP	PLQP0064GA-A	32K	2K	F	3.00 to 5.25	−20 to 85	12*2
M38K09F8LHP	64	LQFP	PLQP0064KB-A	32K	2K	F	3.00 to 5.25	−20 to 85	12*2

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. This is the oscillation frequency that can be connected to external. For the internal clock, use 6MHz at 3V, and 6MHz or 8MHz at 5V.

Full-Speed USB2.0 Function and Hub

38000 Series

38K2 Group



Compound USB Hub of Hub + function
Abundant peripheral functions are embedded to realize Hub + function application equipment with one chip.

The 38K2 Group consists of 8-bit single-chip MCUs with built-in USB Hub + USB functions in compliance with Full-Speed USB2.0. The built-in down stream ports×2, 6 endpoints (USB functions: 4, USB Hub: 2), external bus interface×1, serial I/O×1, 8-bit timer×3 and A/D converter (8-channel) enable a variety of USB Hub + USB functions. In addition, 38K2 Group MCUs are suitable for USB conversion devices since the internal RAM can be accessed directly from USB and external interface.

Block diagram

Power Source for USB Pull-up D+ Pull-up Power Source	**I/O Ports** 44 (LED: 4)	**USB Function + USB Hub** 1 port+ (2-downstream port)
Bus Interface 8-bit×1 DMA Specification	**Pull-up I/O Port** 10	**Speed** FS
Serial I/O UART/Clock Sync. 8-bit×1ch	**Interrupt Factor** 16	**FIFO** USB Buffer Max 64 (Built-in RAM is used) *1
A/D Converter 10-bit×8ch	**Minimum Instruction** Execution Time 250ns	**Endpoint (Pipe)** 2 Endpoints (Hub), 2 Endpoints (Function)
Timer 8-bit×3 (with Prescaler)	**PLL Frequency Multiplier** Built-in (USB48MHz generated internally)	Isochronous Transfer Supported

Supported application: Mobile device; Digital AV equipment; Electronic music instrument; PC peripheral equipment; OA equipment; Communication equipment; Industrial instrument; Car accessory

Part Number	Pin	Package	Package Code	Memory capacity (Byte) ROM	RAM	ROM Type*	Supply Voltage (V)	Operating Temperature (°C)	Clock (MHz)
M38K27M4L-XXXFP	64	LQFP	PLQP0064GA-A	16K	1K	M	3.00 to 5.25	−20 to 85	12*2
M38K27M4L-XXXHP	64	LQFP	PLQP0064KB-A	16K	1K	M	3.00 to 5.25	−20 to 85	12*2
M38K29F8LFP	64	LQFP	PLQP0064GA-A	32K	2K	F	3.00 to 5.25	−20 to 85	12*2
M38K29F8LHP	64	LQFP	PLQP0064KB-A	32K	2K	F	3.00 to 5.25	−20 to 85	12*2

* F: Flash memory version, L: ROM-less version, M: Mask ROM version, O: One-time PROM version
*1. The number of bytes settable for one pipe. The total doubles when using the double buffer mode. *2. This is the oscillation frequency that can be connected to external. For the internal clock, use 6MHz at 3V, and 6MHz or 8MHz at 5V.

USB2.0 Host

USB Host-IP

USB Host-IP consists of OHCI Host-IP, EHCI Host-IP and Renesas original Host-IP, which is librarized Renesas USB ASSP. It is possible to choose a number of Endpoints and FIFO capacity according to the system.

*1. It does not support High Band Width of Isochronous and Interrupt type.
One stage of an external HUB can be connected
(When the Full-Speed function is connected via Hi-Speed hub, the pay load of Isochronous corresponds to 188 bytes or less.)

Block diagram

- **USB Communication Function** FS/LS (OHCI)
- **USB Communication Function** HS/FS/LS (EHCI, Renesas original*1)
- **FIFO** Special memory (with modifiable size) or external memory area available (OHCI, EHCI) Special memory 16KByte (Max) (Renesas original)
- **Endpoint (Pipe)** 32 Endpoints (Max) (OHCI, EHCI) 10 Endpoints (Fixation) (Renesas original)
- Isochronous Transfer Supported

USB2.0 Function

USB-IP

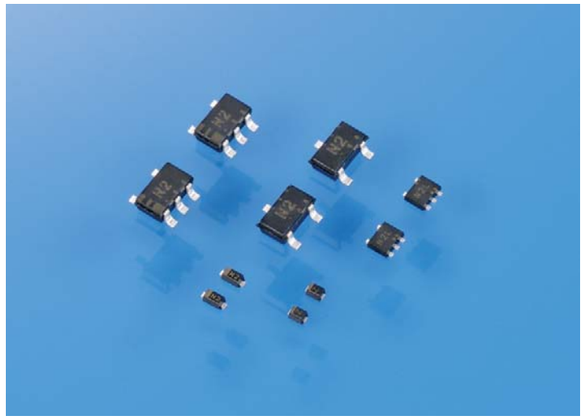
USB-IP is librarized Renesas USB ASSP and consists of Full-Speed and Hi-Speed types. It is possible to choose a number of Endpoints and FIFO capacity according to the system.

Block diagram

- **USB Communication Function** FS
- **USB Communication Function** HS
- **FIFO** 4KByte (Max) (FS) 16KByte (Max) (HS)
- **Endpoint (Pipe)** 16 Endpoints (Max) (FS) 8 Endpoints (Max) (HS)
- Isochronous Transfer Supported

USB2.0 (480 Mbps) supporting low-capacitance surge absorption Zener diode

HZM6.2/6.8Z4MFA (MPAK-5, 4 elements),
HZM6.2/6.8Z4MWA (MPAK-3, 2 elements),
RKZ6.2Z4MFAKT/RK6.8Z4KT (VSON-5; 4 elements),
HZD6.2/6.8Z4 (SFP, 1 element),
HZL6.2/6.8Z4 (EFP, 1 element)



Protecting an electric equipment and an electron device from ESD surge in a high-speed signal transmission path.

Electrical characteristics*2

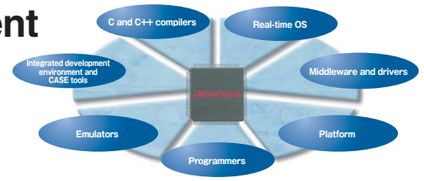
Item	Code	Test condition		6.2Z4 (6.2V) Min.	Typ.	Max.	6.8Z4 (6.8V) Min.	Typ.	Max.	Unit
Zener voltage	Vz	Iz=5mA 40ms Pulse		5.9	—	6.5	6.47	—	7.0	V
Reverse leak current	IR	VR=3.5V		—	—	—	—	—	2.0	μA
		VR=5.5V		—	—	3.0	—	—	—	μA
Junction capacitance	C	VR=0V f=1MHz	2.4 elements	—	4.0	4.5	—	4.0	4.5	pF
			1 elements	—	—	4.0	—	—	4.0	pF
Dynamic resistance	Rd	Iz=5mA		—	—	60	—	—	30	Ω
ESD*3	—	C=150pF R=330Ω 10 times forward and reverse impression		8	—	—	8	—	—	kV

*2 Value per one element *3 Based on IEC61000-4-2 / Judgment with reverse leak current

Renesas Development Environment

Web http://www.renesas.com/tools

- Development environment for getting the most from Renesas microcontrollers
- Powerful alliances with a wide variety of partner vendors
- Renesas backs up customer system development efforts with full support services



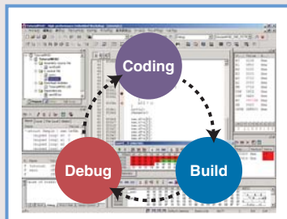
Renesas Integrated Development Environment

http://www.renesas.com/hew

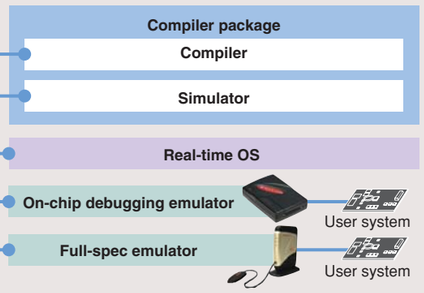
Seamless system development provided by Renesas' High-performance Embedded Workshop

The Renesas development environment links the tools necessary for application development, including compilers and debuggers (emulator software), and supports the development process, from coding through verification, in a single application. Since this environment provides consistency across the various tools used provided at each stage in the development process, development proceeds smoothly as though these multiple functions were provided by a single tool.

- An easy to use GUI that is the same for all Renesas microcontrollers
- Software tools and documentation can be upgraded easily over the internet
- Coordination with products (such as CASE tools) from partner companies



Screen Image of the High-performance Embedded Workshop



Emulator Lineup

http://www.renesas.com/emulation_debugging

- Wide range of lineup of emulators that can be selected for your purpose
- Easily operatable from High-performance Embedded Workshop

On-chip Debugging Emulators

E10A-USB

SH / H8SX / H8S

The emulator with an excellent cost-performance ratio
- The emulator is capable of evaluating a users system in electric properties as close as a final product.
- The emulator is USB bus powered and thus external power supply is not needed.
- PC Interface: USB

Web http://www.renesas.com/e10a_usb

E8a

M16C

The emulator that can be used to program the flash memory
- This product package includes a set of development tools, such as an integrated development environment, an emulator debugger, a compiler package free evaluation version, and flash development tool kit free evaluation version.
- The emulator is capable of evaluating a users system in electric properties as close as a final product.
- The emulator is USB bus powered and thus external power supply is not needed.
- PC Interface: USB

Web http://www.renesas.com/e8a

Full-spec Emulators

E200F

SH

The E200F emulator is a high performance emulator with on-chip debugging emulation and bus trace functions.
- Real-time emulation with a maximum operating frequency of MCU is available
- PC interface: USB

Web http://www.renesas.com/e200f

E6000H

H8SX

E6000

H8S

Highly-functional emulator that provides efficient debugging environment
- Enhanced emulation functions such as C language source level debugging, trace and break
- PC Interface: USB

Web http://www.renesas.com/e6000h
http://www.renesas.com/e6000

Compact Emulator

M38000T2-CPE

740

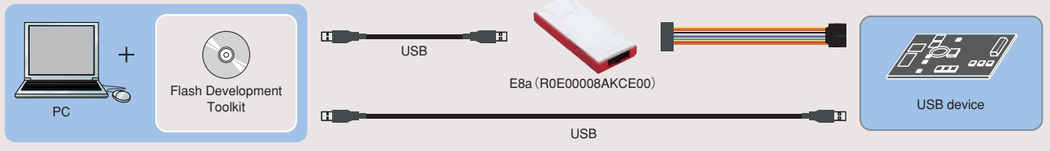
Compact in-circuit emulator has many functions and is affordably priced.
- This product package includes a set of development tools, such as an integrated development environment, an emulator debugger, and a compiler/assembler free evaluation version.
- The compact emulator that supports full-scale development with advanced functions such as real-time trace
- PC interface: USB

Web http://www.renesas.com/cpe

Flash Development Toolkit

http://www.renesas.com/fdt

- Microcontroller flash memory can be programmed by connecting the E8a and using the Flash Development Toolkit. In addition, when a USB boot microcomputer is used, it is possible to connect a PC to a microcomputer directly with USB. For information on the target MCUs, refer to the lists on the next page.



Development Tools for SuperH Family

MCU		Software tool		Hardware tool				Programming tool (flash programming software,adapter board)
				Economy model	High-performance model			
Series	Group	RTOS (μITRON)	C/C++ Compiler Package *3 (integrated development environment bundled)	On-chip debugging emulator (emulator software bundled)*5 *6	Full-spec emulator (emulator software bundled)	User system interface board or evaluation chip unit	Options	
SH7780	SH7764★	HI7750/4 (R0R40775TXW02w)*1 or HI7300/PX (R0R50730PXW01w)*1*2		HS0005KCU01H/02H (E10A-USB) Note: The emulator software for SH7724 group is under development	—	—	—	
	SH7763							
	SH7724(SH-MobileR2R)★★							
	SH7723★				R0E0200F2EMU00 (E200F) *7		R0E0200F0ETU00*11 (External bus trace unit) R0E0200F0EPU00 (Extended profile unit)	
	SH7722★	HI7700/4(R0R40770TXW02w)*1 or HI7300/PX (R0R50730PXW01w)*1*2				—		—
SH7750	SH7760	HI7750/4(R0R40775TXW02w)*1			—		—	
SH7700	SH7727	HI7700/4 (R0R40770TXW02w)*1						
	SH7721							
	SH7720							
	SH7705							
SH-Ether	SH7670★							
SH7216★★	SH7216★★	HI7000/4 (R0R40700TXW02w)*1		HS0005KCU01H/02H (E10A-USB) Note: The emulator software is under development	R0E0200F1EMU00 (E200F) *7*8 Note: The emulator software is under development	R0E572160VKK00*9 ★★(evaluation chip unit) + R0E0200F1CKL11★★ (user system interface common cable) + R0E572167CFK10*10★★ (user system interface conversion board for PLQP0176KB-A [Previous code: FP-176EV]) or R0E572167CFL10*10★★ (user system interface conversion board for PLQP0176LB-A [Previous code: FP-176AV]) or R0E572167CBK10*10★★ (user system interface conversion board for PLBG0176GA-A [Previous code: BP-176])	R0E0200F0EPU00 (extended profile unit) R0E0200F1ETU00*12 (external bus trace unit) R0E0200F1MSR00 (8MByte) *12 (emulation memory unit) or R0E0200F1MSR01 (16MByte) *12 (emulation memory unit)	Flash Development Toolkit (R0C00000FDW04R) ★★ HS0008EASF5H (RS232C) *13 *14 or E8a(USB) *15 *16
SH7200	SH7205★	HI7200/MP(R0R50720MXW01w)*1	C/C++ Compiler Package for SuperH Family (MISRA C supported*4)	HS0005KCU04H (E10A-USB)	—	—	—	—
	SH7203				R0E0200F1EMU00 (E200F) *7*8		R0E0200F0EPU00 (extended profile unit) R0E0200F1ETU00 (external bus trace unit) R0E0200F1MSR00 (8MByte)*9 (emulation memory unit) or R0E0200F1MSR01(16MByte)*9 (emulation memory unit)	
SH7260	SH7262★★, SH7264★★	HI7000/4 (R0R40700TXW02w)*1		HS0005KCU01H/02H (E10A-USB)	—	—	—	—
	SH7263				R0E0200F1EMU00 (E200F) *7*8		R0E0200F0EPU00 (extended profile unit) R0E0200F1ETU00*9 (external bus trace unit) R0E0200F1MSR00 (8MByte)*9 (emulation memory unit) or R0E0200F1MSR01(16MByte)*9 (emulation memory unit)	
	SH7265★	HI7200/MP(R0R50720MXW01w)*1		HS0005KCU04H (E10A-USB)	—		—	
SH7280	SH7285★	HI7000/4 (R0R40700TXW02w)*1		HS0005KCU01H/02H (E10A-USB)	R0E0200F1EMU00 (E200F) *7*8	R0E572800VKK00 *9 (evaluation chip unit) + R0E572850CFK00*10 (user interface board for PLQP0144KA-A [Previous code: FP-144LV]) or R0E572860CFK00*10 (user interface board for PLQP0176KB-A [Previous code: FP-176EV]) or R0E572860CFL00*10 (user interface board for PLQP0176LB-A [Previous code: FP-176AV])	R0E0200F1ETU00 *12 (external bus trace unit) R0E0200F0EPU00 (extended profile unit) R0E0200F1MSR00 (8MByte) *12 (emulation memory unit) or R0E0200F1MSR01 (16MByte) *12 (emulation memory unit)	Flash Development Toolkit (R0C00000FDW04R) ★★ HS0008EASF5H (RS232C)*13*14 or E8a(USB)*15*16
	SH7286★							

Development Tools for M16C Family

MCU		Software tool		Hardware tool		Programming tool*20 (flash programming software, adapter board)
Series	Group	RTOS (μITRON)	C Compiler Package *3 (integrated development environment bundled)	On-chip debugging emulator (emulator software bundled)	Full-spec emulator (emulator software bundled)	
M16C/60	M16C/6C★	M3T-MR30/4 (R0R30600TRW02wE)*1	C compiler package for R8C, M16C Family (R32C/M32C/M16C)*21 (MISRA C supported *4)	E8a (R0E00008AKCE00) *17	—	Flash Development Toolkit *19 (E8a emulator is required for programming)
M16C/20	M16C/24(M30245)			—	PC4701U*18 + M30245T3-RPD-E	*20

Development Tools for H8SX and H8S Families

MCU		Software tool		Hardware tool				Programming tool	
				Economy model	High-performance model				
Series	Group	RTOS (μITRON)	C/C++ Compiler Package *3 (integrated development environment bundled)	On-chip debugging emulator (emulator software bundled)*5 *6	Full-spec emulator (emulator software bundled)	User cable or user system interface board	Options	Flash writing software	Adapter board
H8SX/1600	H8SX/1653	HI1000/4 (R0R41600TXW01w)*1	C/C++ Compiler Package for H8SX, H8S, H8 Family (MISRA C supported *4)	HS0005KCU01H/02H (E10A-USB)	HS1650EPH60H*23 (E6000H) + HS6000EIU02H (USB-Adapter) Note: The package deal type name above is HS1650EPH160H-U	HS1653ECN61H (for PTQP0120LA-A [Previous code: TFP-120])	—	Flash Development Toolkit*19	HS0008EASF5H (RS-232C) *13*14 or E8a (USB) *15*16
	H8SX/1663					HS1664ECH61H (for PLQP0144KA-A [Previous code: FP-144L])			
	H8SX/1668R					HS1668RECH61H (for PLQP0144KA-A [Previous code: FP-144L])			
	H8SX/1658R					HS1658RECN61H (for PLQP0120LA-A [Previous code: FP-120B])			
	H8SX/1665				— Note: For evaluating functions except ADC (1μs conversion mode) and 10-bit DA output, E6000H for the H8SX/1668R group can be used.			Flash Development Toolkit*19★★	HS0008EASF5H (RS-232C) *13*14 or E8a (USB) *15
	H8SX/1655				— Note: For evaluating functions except ADC (1μs conversion mode) and 10-bit DA output, E6000H for the H8SX/1658R group can be used.				HS0008EASF5H (RS-232C) *13*14 or E8a (USB) *15*16
H8S/2400	H8S/2472 , H8S/2462			(debug MCU board for PLQP0144KA-A [Previous code: FP-144LV]) or R0E424548PFK00 *22 (debug MCU board for PLQP0120LA-A [Previous code: FP-120BV]) or R0E424548PFK01 *22 (debug MCU board for PLQP0120KA-A)	—	—		Flash Development Toolkit*19	HS0008EASF5H (RS-232C) *13*14 or E8a (USB) *15
	H8S/2456* H8S/2454*								
H8S/2200	H8S/2218			HS0005KCU01H/02H (E10A-USB)	HS2214EPJ62H (E6000) + HS6000EIU02H (USB-Adapter) Note: The package deal type name above is HS2214EP162H-U	HS2218ECN61H (for PTQP0100LC-A [Previous code: TFP-100G]) or HS2218ECB62H (for PLBG0112GA-A [Previous code: BP-112])	HS6000 EMS12H (Extended 4MB memory board)		HS0008EASF5H (RS-232C) *13*14 or E8a (USB) *15*16
	H8S/2212					HS2212ECH61H (for PLQP0064KC-A [Previous code: FP-64E])	—		
	H8S/2215			HS0005KCU01H/02H (E10A-USB) Only the H8S/2215R, H8S/2215T corresponds		HS2215RECN61H (for PTQP0120LA-A [Previous code: TFP-120]) or HS2215RECB62H (for PLBG0112GA-A [Previous code: BP-112])	HS6000 EMS12H (Extended 4MB memory board)		

Development Tools for 740 Family

MCU		Software tool	Hardware tool			Programming tool
Series	Group	Assembler Package *3 (integrated development environment bundled)	Compact emulator (emulator software bundled)	Emulator MCU	Package type of target	
38000	38K0	M3T-SRA74	M38000T2-CPE*17	M38K09RFS	PLQP0064KB-A [Previous code: 64P6Q-A] (64-pin 0.5mm-pitch LQFP) or PLQP0064GA-A [Previous code: 64P6U-A] (64-pin 0.8mm-pitch QFP)	*20
	38K2			M38K29RFS		

*1. w="1": evaluation license for one host machine w="5": evaluation license for up to five host machines w="A": evaluation license for up to ten host machines w="K": mass production license for up to 1,000 user systems w="U": mass production license, no limit on the number of user systems w="Z": mass production license, no limit on the number of user system, with kernel source code*2. HI7300/PX supports SH-4A and SH4AL-DSP microcomputers.*3. The compiler package includes integrated development environment (High-performance Embedded Workshop), compiler, assembler, simulator debugger and other items. The assembler package includes integrated development environment (High-performance Embedded Workshop, TM), assembler, simulator debugger and other items.*4. MISRA C rule inspection function is added by installing the separately available MISRA C rule checker SQMlint (type name: R0C00000SCW01R).*5. HS0005KCU01H only uses H-UDI function of device. HS0005KCU02H uses H-UDI function and AUD function of device. However, in case of the device of H8S family, HS0005KCU02H can implement only the debug using H-UDI function. Only the flash memory version is supported and the ROM-less mode cannot be used.*6. The user interface cable HS0005ECK01H (option) is prepared for the connection to Mictor38pin connector for HS0005KCU02H.*7. A host interface (USB cable) is bundled.*8. You can use it with system configuration of on-chip configuration.*9. A trace cable (R0E0200F0ACC00) is necessary. When you attach more than one optional product, only one trace cable is used.*10. An evaluation chip unit is necessary.*11. A trace cable (R0E0200F0ACC00) is bundled.*12. An evaluation chip unit, a trace cable and a user interface board are necessary.*13. The programming software is not bundled. Please purchase one separately.*14. HS0008EASF4H can be also used.*15. With E8a (type name: R0E00008AKCE00), an evaluation version (for free, without support) of Flash Development Toolkit (type name: R0C00000FDW04R) is bundled as programming software. For development and mass production, please purchase the product version (for value, with support) separately.*16. HS0008EAUF1H can be also used as a USB adapter board.*17. Software for emulator (integrated development environment High-performance Embedded Workshop, emulator debugger, evaluation version of compiler, evaluation version of Flash Development Toolkit) is included (evaluation version is free, without support). However, the evaluation version of Flash Development Toolkit is not included with M38000T2-CPE. For the bundled software, a old product or old version may be bundled depending on the shipment time. The latest version can be downloaded from internet (for free). http://www.renesas.com/download*18. The latest version of M16C PC4701 emulator debugger can be downloaded from internet (for free). http://www.renesas.com/download*19. For Flash Development Toolkit (type name: R0C00000FDW04R), the product version (for value, with support) and the evaluation version (for free, without support) are available.*20. Programmers made by various partner vendors are prepared.*21. C compiler package for R32C series, C compiler package (M3T-NC308WA) for M32C series and C compiler package (M3T-NC30WA) for M16C series and R8C family are bundled*22. The E10A-USB emulator can be used for the system development using the terminal for user debug interface (H-UDI) and the dual-purpose terminal by using the debug MCU board.*23. When it is not connected to the user system, the user interface board is necessary. ★New product ★★Under development

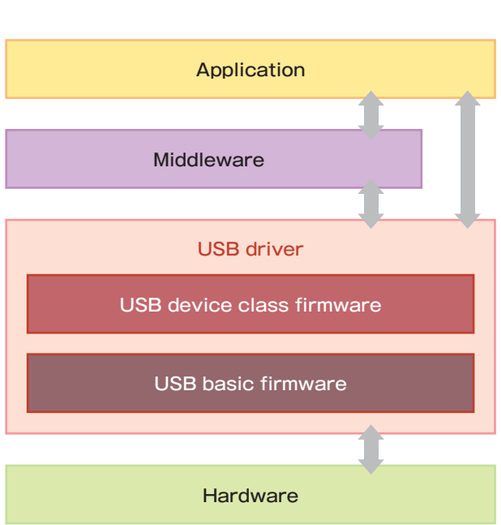
3rd Party Programmer Manufacturers

Data I/O Corporation	http://www.dataio.com	**SMH Technologies**	http://www.softecmicro.com/ E-mail pietro.poletto@smh-tech.com	**Sunny Giken Inc.**	support_api@renesas.com (Renesas Solutions Corp.) E-mail http://www.sunnygiken.co.jp/english/
Flash Support Group, Inc.	http://www.j-fsg.co.jp/e/form_ask01.html	**Sophia Systems Co., Ltd.**	http://www.sophia-systems.com/ E-mail intsales@sophia-systems.co.jp	**Wave Technology Co., Ltd.**	http://www.wavetechnology.co.jp/en/contact.html E-mail e_sales@y1000.com
Minato Electronics Inc.	http://www.minato.co.jp/en/index.html E-mail int-support@minato.co.jp	**SUISEI ELECTRONICS SYSTEM CO., LTD.**	http://www.suisei.co.jp/index_e.html E-mail support@suisei.co.jp	**Yokogawa Digital Computer Corporation**	http://www.yokogawa-digital.com/en/NETIMPRESS.html E-mail info-impress@yokogawa-digital.com

USB Development / Evaluation Products

Renesas supports you build demo boards for the trial USB driver and for evaluation of 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.
They also strongly support our customers' USB system development through our agreements with partner vendors.

Layer configuration of USB driver



Outline of function

- ·User application inherent in system
- ·Software library required for realizing functions of the system such as video, image, audio and file system
- ·USB device class driver conforming to various USB device classes
- ·USB hardware control driver (Enumeration, device status management and data communications are realized)
- ·USB device

USB Driver Correspondence Table

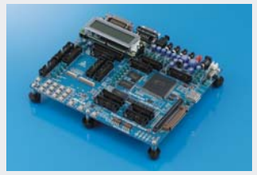
Type name	Function					Host		
	USB basic firmware	USB device class firmware				USB basic firmware	USB device class firmware	
		HID	Mass Storage	Comm.	Printer		Mass Storage	HID
SH7722	◎*1						—	
SH7723	◎*1					◎*1		
SH7203/SH7263	◎		＊	＊		◎	○*1	
SH7205/SH7265	◎		＊	＊		◎	○*1	
SH7262/SH7264	◎		＊	＊		◎	△*1	
SH7670	◎		＊	＊		◎	△*1	
SH7285/SH7286	◎*2		△	◎				
SH7216	◎*2	◎	◎	◎	◎		—	
SH7705	◎*2		◎	◎	◎			
SH7727	◎*2		◎	◎	◎	◎		
SH7720	◎*2		◎	◎	◎	◎		
SH7760			—			◎		
SH7763	◎*2		◎	◎	◎	◎		
H8SX/1653	◎*2		◎	◎	◎			
H8S/2456	◎*2	◎	◎	◎	◎			
H8S/2472	◎*2	◎	◎	◎	◎			
H8S/2212,H8S/2218	◎*2	◎	◎	◎	◎			
H8S/2215	◎*2	◎	◎	◎	◎			
M16C/6C	◎*2	◎	◎	◎	◎		—	
M30245	◎							
38K0,38K2	◎			○				
M66291	◎			○				
M66591	◎							
M66592	◎		△	△				
M66596/R8A66597	◎*1 (M66596: OS-noncompliant version is also provided)		○*1			◎*1 (M66596: OS-noncompliant version is also provided)	○*1	○*1 (R8A66597 only)
R8A66580	△ (USB,Wireless USB) *1					△ (USB) *1		

◎: Sample (free of charge) ○: On sale △: Under development ＊: Under consideration —: N/A
(Note) ⋆1. Only OS-compliance version is provided. For the item without a mark (without ⋆1), only OS-noncompliant version is provided. *2. USB Basic Firmware is included in each USB Device Class Firmware.

Memo

Demo Board/Evaluation Board — Hi-Speed MCU

P0K572630D001BR＜SH7263 Evaluation Board＞



Equipped with hardware required to evaluate the SH7263 USB, LCDC, SSI and other functions of the SH7263. Standard embedding of USB interface, LCD module interface, audio interface, and other advantages and is suitable for advanced development of USB application products such as digital audio devices. In addition, all I/O ports of SH7263 are connected to the expansion connectors, enabling simple evaluation of peripheral functions and H/W expansion.

SH7722 Solution Engine

Evaluation board embedded with the H/W for evaluating the H.264/MPEG4 dynamic picture image, camera, USB, LCDC, SD Card, and other functions of SH7722. An environment where a main OS, such as a μITRON or WindowsCE, can function and the on-chip debugger can connect as ready.
It is also possible to use this as an easy program evaluation board in combination with a simple monitoring program. This board is a product of Hitachi ULSI Systems Co., Ltd.

Demo Board/Evaluation Board — Full-Speed MCU

SH7721 Solution Engine Light
SH7727 Solution Engine Light

Evaluation board embedded with the H/W for evaluating built-in USB, LCDC, SIOF and other functions of SH7720 and SH7727. The environment where main OS such as μITRON and the on-chip debugger connection run is ready. Connection with various USB ASSP utility boards (*1) is possible through relay board M3A-ZA53. It is also possible to use it as an easy program evaluation board in combination with a simple monitor program. This board is a product of Hitachi ULSI Systems Co., Ltd.
*1: Option : M3A-0032, M3A-0037G01, M3A-0038G01, M3A-0039, M3A-0040

HSB8SX1653F, HSB8SX1654F <H8SX/1653 Group Evaluation Board>
HSB8SX1663F, HSB8SX1664F <H8SX/1663 Group Evaluation Board>

Evaluation board for CPUs equipped with the H8SX/1653 or 1663 Groups. Application as a program evaluation board by connecting a full emulator or an on-chip emulator. This board is a product of Hokuto Denshi Co., Ltd.

HSB8S2215RST <H8S/2215 Group Evaluation Board>
HSB8S2215ST <H8S/2215 Group Evaluation Board>
HSB8S2218ST <H8S/2218 Group Evaluation Board>
HSB8S2212ST <H8S/2212 Group Evaluation Board>

These boards contain the H8S/2215, H8S/2218 and H8S/2212 group, and it is possible to use them as an easy program evaluation board in combination with a monitor program. Emulator connection is possible and the flash chip is loadable. In addition, the USB starter's kit is also available as an evaluation kit.

M3A-0245 <M16C/24 Group M30245 Evaluation Board>

Equipped with hardware required to evaluate USB and other peripherals functions of M30245. Loading of emulator connection or a flash-chip is possible. The board M3A-7754*1 for pitch conversion board can be connected and program rewriting of a flash-chip is easy. Moreover, since the connector which can be used to expand the universal board etc. is supported, the functional evaluation according to the use is possible. It can be used as an easy program evaluation board in combination with a simple monitor program. *1: Option

M3A-8K02 <38K0 Group/38K2 Group Evaluation, Development Board>

Evaluation/development board for the 38K0 Group and 38K2 Group. Embedded with circuits needed for USB function and USB hub, application of the external circuit use universal board (G04) facilitates simple development and evaluation of USB systems. Replacing the two-board set upper surface boards (G02, G03) makes it possible to conduct inspections with both flash-chips and debuggers. Since it is possible to exchange Vcc = 5V/ 3.3 V, and USB rewriting/serial rewriting of flash memory with an easy switch, changes in peripheral setup can be performed in a short time.

Demo Board / Evaluation Board — Full-Speed/Hi-Speed USB ASSP

M3A-0032<M66291GP Utility Board>

A utility board embedded with the H/W required for M66291GP and USB communication. Two PCB connectors (13-pin x 2-line) are prepared for microprocessor connection. This connector is compatible with other Renesas USB ASSP utility boards, and is easily connectable to systems using Renesas USB ASSP. This comes equipped with a 12-MHz quartz-crystal oscillator, USB connector, test pin, and jumper SW for bus mode selection (expansion function of the M66291GP).

M3A-0037G01<M66591GP Utility Board>

A Utility board equipped with the H/W required for M66591GP and USB communication, and including controlled D+/D- line impedance matching. Features two built-in PCB connectors (25-pin x 2-line) for MCU board and split bus connections. These connectors are compatible with other Renesas USB ASSP utility boards, and easily connectable to systems using Renesas USB ASSP. This comes equipped with a 24-MHz quartz-crystal oscillator, USB connector, test pin, and jumper SW for interface power supply change.

M3A-0038G01<M66592FP Utility Board>

A utility board embedded with the H/W required for M66592FP and USB communication, and including controlled D+/D- line impedance matching. Features two built-in PCB connectors (25-pin x 2-line) for MCU board and split bus connections. These connectors are compatible with other Renesas USB ASSP utility boards, and easily connectable to systems using Renesas USB ASSP. This comes equipped with a 24-MHz quartz-crystal oscillator, USB connector, test pin, and jumper SW for interface power supply change.

M3A-0039<M66596FP Utility Board>

A utility board embedded with the H/W required for M66596FP and USB communication, and including controlled D+/D- line impedance matching. Features two built-in PCB connectors (25-pin x 2-line) for MCU board and split bus connections. These connectors are compatible with other Renesas USB ASSP utility boards, and are easily connectable to systems using Renesas USB ASSP. This comes equipped with a 24-MHz quartz-crystal oscillator, USB connector, test pin, and jumper SW for interface power supply change.

M3A-0040<R8A66597FP Utility Board>

A utility board embedded with the H/W required for R8A66597FP and USB communication and including controlled D+/D- line impedance matching. Features two built-in PCB connectors (25-pin x 2-line) for MCU board and split bus connections. These connectors are compatible with other Renesas USB ASSP utility boards, and are easily connectable to systems using Renesas USB ASSP. This comes equipped with a 24-MHz quartz-crystal oscillator, USB connector, test pin, and jumper SW for interface power supply change.

Demo Board / Evaluation Board — USB ASSP Evaluation Tool

M3A-0033<Renesas USB ASSP Evaluation Motherboard>

CPU board with a simple debugger embedded with M16C/80. By combining it with various USB ASSP utility boards (*1), all Renesas USB ASSP can easily be evaluated. It comes equipped with M16C/80, 10 MHz, a RS-232C driver, and interface connector for PC.

*1. Option:M3A-0037G01, M3A-0038G01, M3A-0039, M3A-0040
Bundle:M3A-0032

M3A-ZA53<for SuperH Solution Engine>
Converter Board for USB ASSP Utility Board

Relay board for evaluating Renesas USB ASSP from the SuperH Solution Engine™ using various USB ASSP utility boards (*1). It can be used in combination with the processor system Solution Engine™ (*2) and various USB ASSP utility boards.

*1. Option: M3A-0032, M3A-0037G01, M3A-0038G01, M3A-0039, M3A-0040
*2. Option: SH7727, SH7721

(An instance)

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http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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