



## Microcomputers General Catalog

### Mitsubishi Provides New Approaches to Your-Ever Evolving Needs

The Mitsubishi microcomputers (MCUs) originally designed using its advanced technology and consisting of a variety of product lines can respond to your ever-evolving needs with time. For example, the M32R/E Series with embedded flash memory, which is fabricated on the base of the “eRAM” technology developed by Mitsubishi for the first time in the world, is highly evaluated and steadily increasing its demands in many applications fields.

Furthermore, by practicing Mitsubishi’s innovative concept, eRAM/SI (System Integration), sophisticated systems where such memories as DRAM, SRAM, or flash memory co-resides with the CPU core meeting the system requirements can be integrated in a single chip.

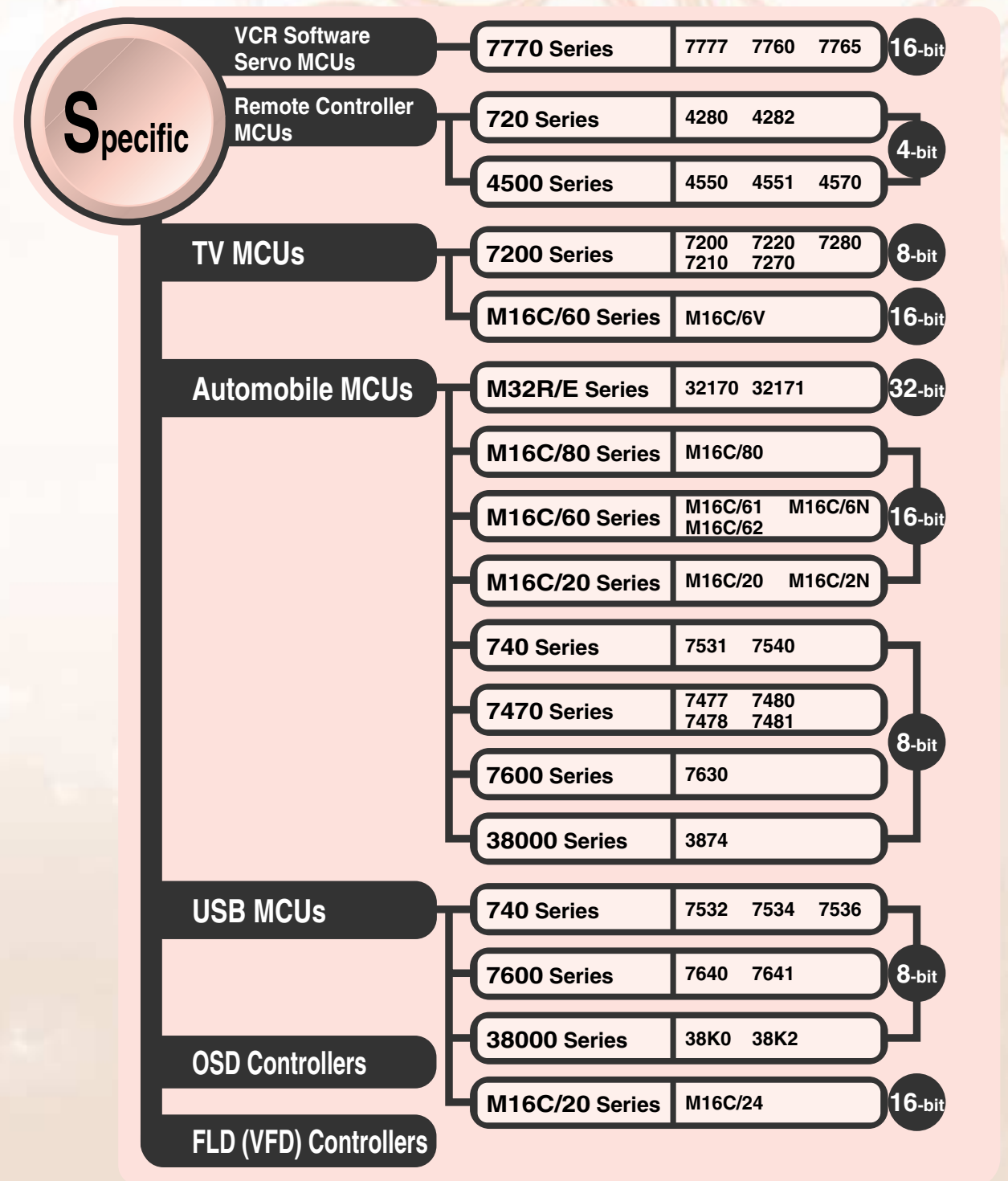
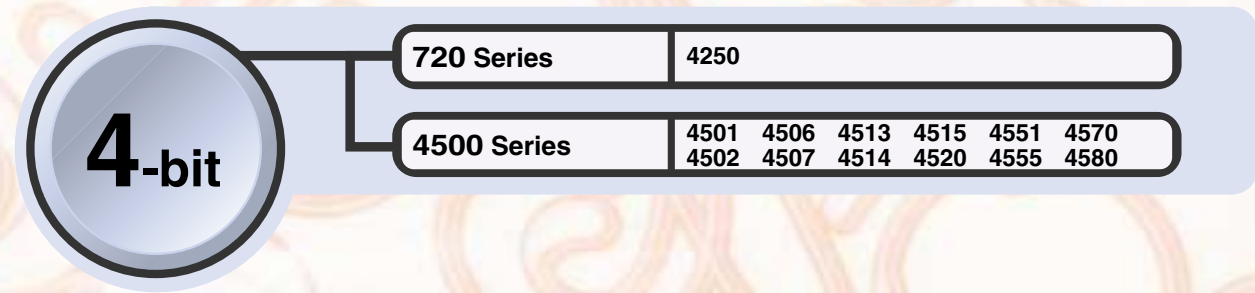
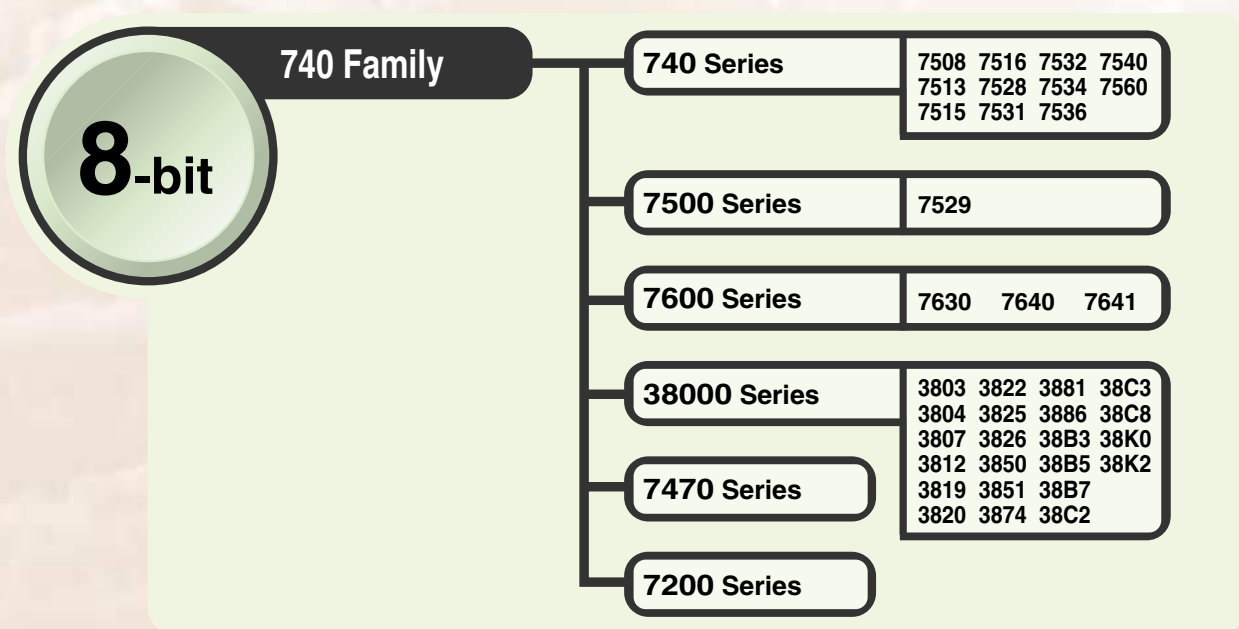
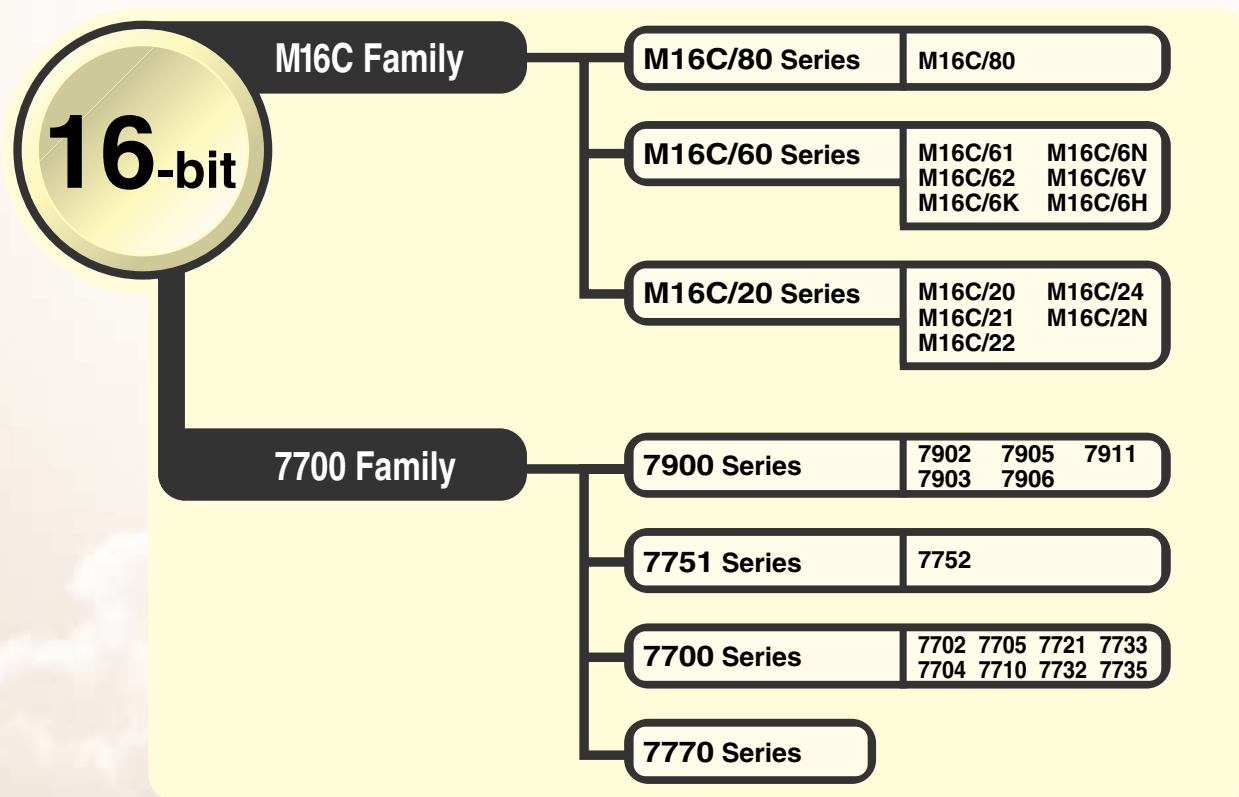
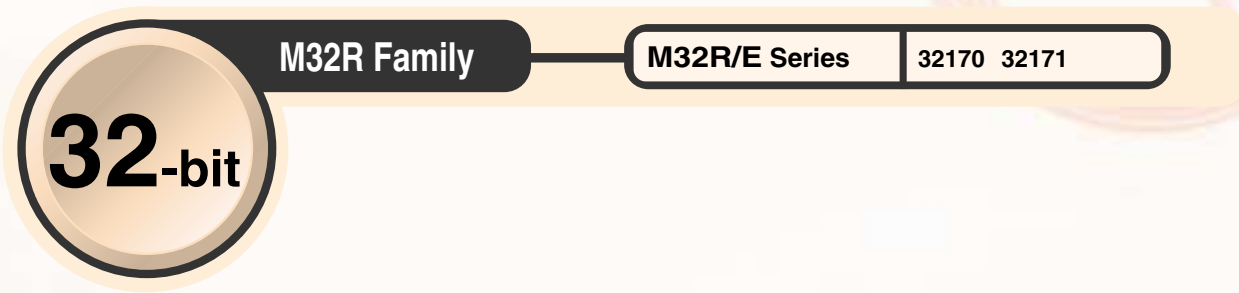
Thus, Mitsubishi Electric Corporation always answers your needs with advanced approaches to them.

**Note:** eRAM is a trademark of Mitsubishi Electronics America, Inc.



Lineup	1
Selection	3
M32R Family	11
M16C Family	13
7700 Family	20
740 Family	27
720/4500 Series	35
VCR Software Servo MCUs	38
Remote Controller MCUs	39
TV MCUs	40
Automobile MCUs	41
USB MCUs	44
OSD Controllers/ FLD(VFD) Controllers	45
Evaluation/ Application Boards	46
Development Support Tools	47
Introduction to Mitsubishi Web Sites	49
Appendixes	51

# Mitsubishi Microcomputers (MCUs) : Leading-edge System-On-a-chip Technology



• For supported MCUs, please contact a Mitsubishi local sales office in your region.  
• All brands and names are the property of their respective owners.

# Selection / Applications

Bit	Family	Series	Group	Related Pages	Applications															
					TV • Digital TV	VCR • DVC	Audio Equipment	Electric Household Appliance	Camera • DSC	Amusement Game • Electronic Musical Instruments	Remote Controller	Office Automation Equipment	PC Peripherals (External Memory)	PC Peripherals (Input System)	Communication Equipment (Telephone)	FA • Power Source	Automobile • Navigation Systems	Home Information Equipment		
32	M32R	M32R/E	32170	12•41	●	●	●	●		●		●	●	●	●	●	●	●	●	
			32171	12•41	●	●	●	●		●		●	●	●	●	●	●	●	●	●
16	M16C	M16C/80	M16C/80	19•42	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
		M16C/60	M16C/61	14•42	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
			M16C/62	14•42	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
			M16C/6H	16		●														
			M16C/6K ★	15								●		●						
			M16C/6N ★	16•42														●	●	
			M16C/6V	16•40	●															
		M16C/20	M16C/20	17•42		●	●	●	●	●	●	●		●				●	●	
			M16C/21	17		●	●	●		●									●	
			M16C/22 ★★	18			●	●	●	●							●			
			M16C/24	18•44			●		●	●			●	●	●	●				
			M16C/2N ★★	18•42															●	
		7700	7900	7902 ★★	21			●	●	●		●	●	●	●	●	●			●
				7903 ★	21			●	●	●		●	●	●	●	●				●
	7905 ★★			22		●		●	●	●										
	7906 ★★			22		●		●	●	●										
	7911 ★★			21			●	●	●		●	●	●	●	●	●				●
	7751		7752	23					●		●	●	●	●						
	7700		7702	24			●		●		●	●	●	●						●
			7704	25				●										●		
7705			25				●										●			
7710			25							●	●		●						●	
7721			26								●		●	●						
7732			24											●	●					
7733			26					●		●		●		●	●				●	
7735			26					●		●		●		●	●				●	
7770	7760		38			●														
	7765		38			●														
	7777	38			●															

★ New Product, ★★ Under Development



# Selection / Standard Functions

## 32-bit MCUs

Family	Series	Group	Related Pages	Multiplier		DMAC	A-D Converter (10-bit)	16-bit	Timers		Serial I/O		Flash Memory	CAN	Boundary Scan	On-chip Debug Circuit (SDI)	Low Power Source Voltage (3.3 V or Less)	Number of Pins
				Instruction	Accumulation				32-bit	UART Only	UART/Clock Sync.							
<b>M32R</b>	<b>M32R/E</b>	<b>32170</b>	12-41	●	●	●	●	●	●	●	●	●	●	●	●	●	●	240-255**
		<b>32171</b>	12-41	●	●	●	●	●	●	●	●	●	●	●	●	●	●	144

## 16-bit MCUs (M16C Family)

Family	Series	Group	Related Pages	Multiplier		DMAC	8-bit	10-bit	A-D Converter		Timer (16-bit)	Sub-clock	Serial I/O		Flash Memory	DRAMC	USB	CAN	BEAN	OSD	LCD	FLD (VFD) Controller	Bus Interface	Low Power Source Voltage (3.3 V or Less)	Number of Pins			
				Instruction	Accumulation				D-A Converter	UART Only			Clock Synchronous Only	UART/Clock Sync.												Specific PWM	I <sup>2</sup> C-BUS	
<b>M16C</b>	<b>M16C/80</b>	<b>M16C/80</b>	19-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	100-144			
		<b>M16C/60</b>	<b>M16C/61</b>	14-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	100		
		<b>M16C/62</b>	14-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	80-100			
		<b>M16C/6H</b>	16	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	144		
		<b>M16C/6K*</b>	15	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	100-144		
		<b>M16C/6N*</b>	16-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	100		
		<b>M16C/6V</b>	16-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	64-100		
		<b>M16C/20</b>	<b>M16C/20</b>	17-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	52-56	
			<b>M16C/21</b>	17	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	100	
			<b>M16C/22 **</b>	18	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	120-144	
			<b>M16C/24</b>	18-44	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	●	80
			<b>M16C/2N**</b>	18-42	●	●	●	●	●	●	●	●	●	●	(Note 2)	●	●	●	●	●	●	●	●	●	●	●	●	56-80

Notes 1: This applies to the 80-pin version.  
2: The subset of I<sup>2</sup>C-BUS is available.

## 16-bit MCUs (7700 Family)

Family	Series	Group	Related Pages	Multiplier		DMAC	8-bit	10-bit	A-D Converter		Timer (16-bit)	Sub-clock	Serial I/O		Flash Memory	DRAMC	Low Power Source Voltage	Number of Pins
				Instruction	Accumulation				D-A Converter	UART Only			Clock Synchronous Only	UART/Clock Sync.				
<b>7700</b>	<b>7900</b>	<b>7902 **</b>	21	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7903 *</b>	21	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7905 **</b>	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	64
		<b>7906 **</b>	22	●	●	●	●	●	●	●	●	●	●	●	●	●	●	42
		<b>7911 **</b>	21	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
	<b>7751</b>	<b>7752</b>	23	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
	<b>7700</b>	<b>7702</b>	24	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
		<b>7704</b>	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
		<b>7705</b>	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	64
		<b>7710</b>	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
		<b>7721</b>	26	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7732</b>	24	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
		<b>7733</b>	26	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
		<b>7735</b>	26	●	●	●	●	●	●	●	●	●	●	●	●	●	●	80
	<b>7770</b>	<b>7760</b>	38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7765</b>	38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7777</b>	38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100
		<b>7777</b>	38	●	●	●	●	●	●	●	●	●	●	●	●	●	●	100

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8-bit MCUs																							
Family	Series	Group	Related Pages	Multiply/Divide Instruction		A-D Converter		Timers			Serial I/O			Flash Memory	DMAC	I <sup>2</sup> C-BUS	USB	CAN	LCD	FLD (WFD) Controller	Number of Pins		
				8-bit	10-bit	8-bit	10-bit	8-bit	16-bit	Sub-clock	UART Only	Clock Synchronous Only	UART/Clock Sync.									Specific PWM	
740	740	7508	32	●	●	●	●	●	●	●	●	●	●								80		
		7513	34	●	●	●	●	●	●	●	●	●	●	●					●			100	
		7515	33	●	●	●	●	●	●	●	●	●	●	●								48	
		7516	28·33	●	●	●	●	●	●	●	●	●	●	●								48	
		7528	* 34	●	●	●	●	●	●	●	●	●	●	●						●			100
		7531	28·43	●	●	●	●	●	●	●	●	●	●	●									32·36
		7532	44	●	●	●	●	●	●	●	●	●	●	●									32·36
		7534	* 44	●	●	●	●	●	●	●	●	●	●	●									32·36·42
		7536	44	●	●	●	●	●	●	●	●	●	●	●									42
		7540	** 28·43	●	●	●	●	●	●	●	●	●	●	●									32·36
	7560	** 31	●	●	●	●	●	●	●	●	●	●	●							●		100	
	7470	7477	43	●	●	●	●	●	●	●	●	●	●									32	
		7478	43	●	●	●	●	●	●	●	●	●	●									42·56	
		7480	43	●	●	●	●	●	●	●	●	●	●									32	
		7481	43	●	●	●	●	●	●	●	●	●	●									42·44	
	7500	7529	31	●	●	●	●	●	●	●	●	●	●								●	100	
		7600	7630	32·43	●	●	●	●	●	●	●	●	●							●		44	
	38000	7640	44	●	●	●	●	●	●	●	●	●	●									80	
		7641	** 44	●	●	●	●	●	●	●	●	●	●									80	
		3803	* 29	●	●	●	●	●	●	●	●	●	●									64	
		3804	* 29	●	●	●	●	●	●	●	●	●	●									64	
		3807	29	●	●	●	●	●	●	●	●	●	●									80	
		3812	30	●	●	●	●	●	●	●	●	●	●									64	
		3819	30	●	●	●	●	●	●	●	●	●	●								●	100	
		3820	31	●	●	●	●	●	●	●	●	●	●								●	80	
		3822	31	●	●	●	●	●	●	●	●	●	●								●	80	
		3825	31	●	●	●	●	●	●	●	●	●	●								●	100	
		3826	34	●	●	●	●	●	●	●	●	●	●								●	100	
		3850	28	●	●	●	●	●	●	●	●	●	●									42	
		3851	28	●	●	●	●	●	●	●	●	●	●									42	
		3874	32·43	●	●	●	●	●	●	●	●	●	●									80	
		3881	33	●	●	●	●	●	●	●	●	●	●									64	
		3886	29·33	●	●	●	●	●	●	●	●	●	●									80	
		38B3	** 30	●	●	●	●	●	●	●	●	●	●									●	80
		38B5	30	●	●	●	●	●	●	●	●	●	●									●	80
		38B7	* 30	●	●	●	●	●	●	●	●	●	●									●	100
		38C2	** 31·34	●	●	●	●	●	●	●	●	●	●									●	64
	38C3	31	●	●	●	●	●	●	●	●	●	●									●	80	
	38C8	* 31	●	●	●	●	●	●	●	●	●	●									●	144	
	38K0	** 44	●	●	●	●	●	●	●	●	●	●									●	64	
	38K2	** 44	●	●	●	●	●	●	●	●	●	●									●	64	
	7200	7200	40	●	●	●	●	●	●	●	●	●										64·80	
7210		40	●	●	●	●	●	●	●	●	●										52·64·80		
7220		40	●	●	●	●	●	●	●	●	●										42		
7270		40	●	●	●	●	●	●	●	●	●										42·52·64		
7280		40	●	●	●	●	●	●	●	●	●										64		

Note: UART/USB selectable.

4-bit MCUs															
Family	Series	Group	Related Pages	A-D Converter				Timers				Sub-clock	Serial I/O	LCD	Number of Pins
				8-bit	10-bit	8-bit	9-bit	10-bit	12-bit	14-bit					
—	720	4250	36			●									20
		4280	39			●									20
		4282	* 39			●									20
	4500	4501	* 36		●	●									20
		4502	* 36		●	●									24
		4506	** 36		●	●									20
		4507	** 36		●	●									24
		4513	36		●	●							●		32
		4514	36		●	●							●		42
		4515	36		●	●				●					36
		4520	3	●		●							●	●	64
		4550	39			●	●						●	●	80
		4551	37·39			●	●						●	●	48
		4555	37			●	●						●	●	48
		4570	36·39			●	●			●					36
		4580	* 36			●	●								20

\* New Product, \*\* Under Development

# Selection / Internal Peripheral Functions

Flash Memory Incorporated (Flash MCUs)																	
Bit	Family	Series	Group	Related Pages	MCU	Internal Memory		Power Source Voltage (V)	Programming Voltage (V)								
						Flash Memory	RAM										
32	M32R	M32R/E	32170	12•41	M32170FxVFP/WG**	768K	40K	4.5 to 5.5 (External I/Os), 3.0 to 3.6 (Internal Logic)	3.0 to 3.6								
						512K	32K										
			32171	12•41	M32171FxVFP	384K	32K										
						512K	16K										
16	M16C	M16C/80	M16C/80	19•42	M30803FGFP	256K	20K	2.7 to 5.5	4.2 to 5.5								
					M30803FGGP												
					M30805FGGP *												
					M30800FCFP												
					M30800FCGP												
		M16C/60	M16C/62	14•42	M30624FGAFP	256K	20K	2.7 to 5.5	2.2 to 3.6	2.7 to 3.6 (When the power source voltage < 2.4 V)							
					M30624FGAGP												
					M30625FGAGP												
					M30624FGMFP												
					M30624FGMGP												
					M30625FGMGP												
					M30620FCAFP						128K	10K	2.7 to 5.5	4.2 to 5.5			
					M30620FCAGP												
					M30621FCAGP												
					M30620FCMFP												
		M30620FCMGP															
		M30621FCMGP															
		M30620FCTFP **	4.2 to 5.5	4.2 to 5.5													
		M30621FCTGP **															
		M30621FCUGP **															
		M30621FCUGP **															
		M16C/6K	M16C/6K	15	M306K7F8LRP **	64K	3K	3.0 to 3.6	4.5 to 5.5								
					M306K6F8LGP **												
					M306K5F8LRP *												
					M306K2F8LGP *												
		M16C/6N	M16C/6N	16•42	M306N0FGTFP *	256K	10K	4.2 to 5.5	4.2 to 5.5								
					M306N1FCTFP *	128K	5K										
		M16C/20	M16C/20	17•42	M30201F6FP	48K	2K	4.0 to 5.5	11.4 to 12.6								
					M30201F6SP												
					M30201F6TFP												
					M30218FCFP					128K	12K	4.0 to 5.5	11.4 to 12.6				
					M30220FCGP **												
					M30220FCRP **												
					M30221FCFP **												
					M302N2FCTGP **									128K	5K	4.0 to 5.5	4.5 to 5.5
					M302N1F4TFP **												
					M16C/22									M16C/22	18	M30220FCGP **	128K
		M30221FCFP **															
		M16C/2N	M16C/2N	18•42	M302N2FCTGP **	128K	5K	4.0 to 5.5	4.5 to 5.5								
					M302N1F4TFP **	32K	2K										
7700	7900	7902	21	M37902FJCHP **	498K	12K	4.5 to 5.5	4.5 to 5.5									
				M37902FGCHP **	248K	6K	4.5 to 5.5	4.5 to 5.5									
				M37902FGMHP **			3.0 to 3.6	3.0 to 3.6									
				M37902FCCHP **			4.5 to 5.5	4.5 to 5.5									
				M37902FCMHP **	120K	4K	3.0 to 3.6	3.0 to 3.6									
				7903	21	M37903F8CHP *	61K	2K	4.5 to 5.5	4.5 to 5.5							
				7905	22	M37905F8CFP **	60K	3K	4.5 to 5.5	4.5 to 5.5							
						M37905F8CSP **											
				7906	22	M37906F8CFP **	60K	3K	4.5 to 5.5	4.5 to 5.5							
						M37906F8CSP **											
				7911	21	M37911FGCHP **	260K	6K	4.5 to 5.5	4.5 to 5.5							
				7760	38	M37760FFHGP	120K	3K	4.0 to 5.5	11.4 to 12.6							
				7765	38	M37765FFAGP **			4.5 to 5.5								
				8	740	740	7516	28•33	M37516F8HP **	32K	1K	2.7 to 5.5	4.5 to 5.5				
									M37516F8HHP **								
7600	7641	44	M37641F8FP **			32K	2.5K	3.0 to 3.6	4.5 to 5.25								
			M37641F8HP **														
38000	3803	29	M38039FFFP *			60K	2K	4.0 to 5.5	11.7 to 12.6								
			M38039FFSP *														
			M38039FFHP *														
	3804	29	M38049FFFP *			60K	2K	4.0 to 5.5	11.7 to 12.6								
			M38049FFSP *														
	3804	29	M38049FFHP *			60K	2K	4.0 to 5.5	11.7 to 12.6								
			M38049FFSP *														
	3850	28	M38507F8FP **			32K	1K	2.7 to 5.5	4.5 to 5.5								
			M38507F8SP **														
	3851	28	M38517F8FP **			32K	2K	4.0 to 5.25	4.5 to 5.25								
M38517F8SP **																	
3886	29•33	M38869FFAGP	60K			2K	4.0 to 5.5	11.7 to 12.6									
		M38869FFAHP															
38B7	30	M38B79FFFP **	60K			2K	4.0 to 5.5	11.7 to 12.6									
38C2	31•34	M38C29FFFP **	60K			2K	2.5 to 5.5	4.5 to 5.5									
		M38C29FFHP **															
38K0	44	M38K09F8FP **	32K	2K	4.0 to 5.25	4.5 to 5.25											
		M38K09F8HP **															
38K2	44	M38K29F8FP **	32K	2K	4.0 to 5.25	4.5 to 5.25											
		M38K29F8HP **															

★ New Product, ★★ Under Development

A-D and D-A Converter Incorporated						
Bit	Family	Series	Group	Related Pages		
<b>32</b>	<b>M32R</b>	M32R/E	32170	12•41		
			32171	12•41		
<b>16</b>	<b>M16C</b>	M16C/80	M16C/80	19•42		
			M16C/60	M16C/61	14•42	
				M16C/62	14•42	
		M16C/6H		16		
		M16C/6K		*	15	
		M16C/6N		*	16•42	
		M16C/6V		16•40		
		M16C/20	M16C/21		17	
			M16C/22	**	18	
			M16C/2N	**	18•42	
		<b>7700</b>	<b>7900</b>	7902	**	21
				7903	*	21
	7905			**	22	
	7906			**	22	
	7911			**	21	
	7751			23		
7700			25			
7770			38			
<b>8</b>	<b>740</b>	<b>740</b>	7508	32		
			38000	3803	*	29
			3804	*	29	
			3807		29	
			3874		32•43	
			3886		29•33	

DMA Controller Incorporated						
Bit	Family	Series	Group	Related Pages		
<b>32</b>	<b>M32R</b>	M32R/E	32170	12•41		
			32171	12•41		
<b>16</b>	<b>M16C</b>	M16C/80	M16C/80	19•42		
			M16C/60	M16C/61	14•42	
				M16C/62	14•42	
		M16C/6H		16		
		M16C/6K		*	15	
		M16C/6N		*	16•42	
		M16C/6V		16•40		
		M16C/20	M16C/21		17	
			M16C/22	**	18	
			M16C/24		18•44	
		<b>7700</b>	<b>7700</b>	7721		26
				7640		44
	<b>8</b>	<b>740</b>	<b>7600</b>	7641	*	44

BEAN Function Incorporated				
Bit	Family	Series	Group	Related Pages
<b>16</b>	<b>M16C</b>	M16C/20	M16C/2N	** 18•42

USB Function Incorporated					
Bit	Family	Series	Group	Related Pages	
<b>16</b>	<b>M16C</b>	M16C/20	M16C/24	18•44	
<b>8</b>	<b>740</b>	<b>740</b>	7532	44	
			7534	*	44
			7536		44
		<b>7600</b>	7640		44
			7641	**	44
		<b>38000</b>	38K0	**	44
			38K2	**	44

CAN Controller Incorporated				
Bit	Family	Series	Group	Related Pages
<b>32</b>	<b>M32R</b>	M32R/E	32170	12•41
			32171	12•41
<b>16</b>	<b>M16C</b>	M16C/60	M16C/6N	* 16•42
<b>8</b>	<b>740</b>	7600	7630	32•43

LCD Driver Incorporated							
Bit	Family	Series	Group	Related Pages			
<b>16</b>	<b>M16C</b>	M16C/20	M16C/22	** 18			
<b>8</b>	<b>740</b>	<b>740</b>	7513		34		
			7528	*	34		
			7560	**	31		
			7500		31		
			<b>38000</b>	3820		31	
				3822		31	
		3825			31		
		3826			34		
		38C2		**	31•34		
		38C3			31		
		38C8		*	31		
		4520			37		
		<b>4</b>	—	<b>4500</b>	4550		39
					4551		37•39
4555					39		

FLD (VFD) Driver Incorporated					
Bit	Family	Series	Group	Related Pages	
<b>16</b>	<b>M16C</b>	M16C/20	M16C/21	17	
<b>8</b>	<b>740</b>	<b>38000</b>	3812		30
			3819		30
			38B3	**	30
			38B5		30
			38B7	*	30

Bus Interface Incorporated					
Bit	Family	Series	Group	Related Pages	
<b>16</b>	<b>M16C</b>	M16C/60	M16C/6K	* 15	
<b>8</b>	<b>740</b>	<b>7600</b>	7640		44
			7641	*	44
		<b>38000</b>	3881		33
			3886		29•33

★ New Product, ★★ Under Development



# Selection /ROM Size

ROM (Byte)	Bit Family	4-bit	8-bit					16-bit				32-bit	
		720 Series / 4500 Series <sup>(Note)</sup>	740 Family					7700 Family		M16C Family		M32R Family	
768K													32170
512K													32170 32171
498K									7902**				
384K													32170 32171
260K									7911**				
256K										M16C/80* M16C/62	M16C/6N*		
248K									7902**				
192K										M16C/6V			
128K										M16C/80* M16C/61 M16C/62 M16C/6N**	M16C/21 M16C/22** M16C/24 M16C/2N**		
124K									7733 7735				
120K									7902** 7777 7710 7760	7765**			
96K									7760		M16C/61 M16C/62 M16C/6N**	M16C/21 M16C/22**	
80K			7280						7777 7765				
64K									7760		M16C/61 M16C/62	M16C/6K* M16C/2N**	
62K			7200	7210	7220								
61K										7903*			
60K			7508 7513 7529 3803*	3804* 3807 3819 3825	3874 3886 38B3** 38B5	38B7* 7270 7280 38C2**	38C8* 3826** 7560**	7702 7710 7905** 7906**					
56K								7777					
48K			7508 3803* 3804* 3807	3812 3819 3822 3825	3874 38B3** 38B5 38C2**	38C3 7200 7225**	3826**	7702 7905** 7906**		M16C/20 M16C/24			
40K			3819	7528*	7220	7270					M16C/24		
32K			7513 7516** 7640 7641** 3803*	3804* 3807 3812 3820 3822	3825 3826 3850** 3851** 3874	3886 7200 7220 7225** 7270	7540** 38K0** 38K2**	7702 7735 7704 7906** 7705 7905** 7710 7733		M16C/61 M16C/62 M16C/20 M16C/2N**			
24K			7516 7527 3803* 3804*	3812 3822 3825 3850	3851 3874 38B5 38C2**	38C3 7200 7270	7225**	7702 7704 7705		M16C/22**			
20K			7529										
16K	4570		7515 7531 7540** 7532 7536 7477 7478	7480 7481 7630 3803* 3804* 3807 3820	3822 3825 3850 3851 3874 3881 7210	7220 7540** 38C2** 38C3	38K2**	7702 7704 7705					
12K			7210	7220									
8K	4513 4514 4520	4550 4551 4570	7531 7532 7536	7477 7478 7480	7481 3812 3820	3850 7210	7534*						
6K	4513 4514	4520 4550											
4K	4513 4515 4555 4550	4551 4570 4501* 4502*	4580* 4506** 4507**										
2K	4520 4513 4501*	4502* 4580* 4282*	4506** 4507**										
1K	4280	4282*											
External ROM Version			3807					7702 7732 7704 7733 7705 7735 7710 7752 7721 7903**		M16C/80* M16C/61 M16C/62 M16C/6H			

Note: As for the 720 Series, (word x 9 bits) is applied. As for the 4500 Series, (word x 10 bits) is applied. ★ New Product, ★★ Under Development  
 □ represents an MCU group which consists of the flash memory version and One Time PROM, EPROM versions. This group does not have the mask ROM version.

Number of Pins	Form	Package Name	Lead Pitch (mm)	4-bit	8-bit	16-bit		32-bit	
				720 Series / 4500 Series	740 Family	7700 Family	M16C Family	M32R Family	
255	FBGA	255F7F	0.8 (Note)					32170**	
240	QFP	240P6Y-A	0.5					32170	
144	LQFP	144P6Q-A	0.5		38C8*			M16C/6H M16C/80* M16C/22**	
	TQFP	144PFB-A	0.4					M16C/6K* M16C/22**	
120	QFP	120P6R-A	0.4					M16C/22**	
100	QFP	100P6S-A	0.65		7529 3819 38B7** 3825 3826 7560**		7752 7721	M16C/80 M16C/61 M16C/62 M16C/6N* M16C/6V M16C/21	
	LQFP	100P6Q-A	0.5		7513 3825 3826		7911** 7903* 7902**	M16C/80* M16C/61 M16C/62 M16C/6K*	
	TQFP	100PFB-A	0.4		7513	3825	7528*		
	QFN	100D0	0.65		7513 3819	3825 3826		7777 7760 7777	M16C/61 M16C/62
80	QFP	80P6N-A	0.8	4550	7640 7641** 3807 3820	3822 38B5 38C3 7200	7210 38B3**	7702 7704 7710 7732	M16C/24
		80P6S-A	0.65		7508 3820 3822	3874 3886		7702 7710 7732	M16C/61 M16C/62 M16C/2N**
	LQFP	80P6D-A	0.5					7702 7710 7732	7733 7735
		80P6Q-A	0.5		3820 3822 3886	7641**		7702 7710 7732	7733 7735
QFN	80D0	0.8	4550	7630 7640 3807	3820 3822 3874	3886 38C3 38B5	7702 7704 7710	7733 7735	
64	SDIP	64P4B	1.778	4520	3803 3804*	3812 7200	7270 7280	7705 7905**	M16C/6V*
	QFP	64P6N-A	0.8	4520	3803 3804*	3812 7210	38C2** 38K0**	38K2** 7905**	
	LQFP	64P6Q-A	0.5		3803 3804*	3881 38C2**	38K0** 38K2**		
	SDIP	64S1B-E	1.778	4520	3812			7705	
	QFN	64D0	0.8	4520	3812 3881				
56	QFP	56P6N-A	0.8		7478				
		56P6S-A	0.65						M16C/20 M16C/2N**
52	SDIP	52P4B	1.778		7210	7270		M16C/20	
48	QFP	48P6S-A	0.65	4551	4555				
	LQFP	48P6D-A	0.5		7515	7516			
44	QFP	44P6N-A	0.8		7481	7630			
	QFN	44P0X	0.5		7516**				
42	SSOP	42P2R-A/E	0.8	4514		3850	3851	7220	7270
		42P2R-E	0.8					7906**	7906**
	SDIP	42P4B	1.778		7536 7478	7481 3850	3851 7220	7270 7534*	
		42S1B-A	1.778		7478	7481	3850	3851	
36	SSOP	36P2R-A	0.8	4515	4570	7531	7532	7540**	7534*
32	SOP	32P2W-A	1.27			7477	7480		
	SDIP	32P4B	1.778	4513		7531	7477	7480	7540**
	LQFP	32P6U-A	0.8	4513		7531	7532	7540**	7534*
24	SSOP	24P2Q-A	0.8	4502*	4507**				
20	SOP	20P2N-A	1.27	4250	4580*				
				4280	4506**				
	SSOP	20P2E/F-A	0.65	4280	4282*				

Note: Ball pitch (mm)

For details of each package, refer to the latest datasheets or catalogs.

★ New Product, ★★ Under Development

# 32-bit M32R Family

The M32R Family consists of Mitsubishi original 32-bit RISC MCUs developed for high-end embedded applications. The M32R CPU is a compact CPU core yet provides extremely fast computations. The M32R Family offers a vast lineup of MCUs, providing excellent system solutions for a variety of application fields, including general-purpose industry products and automobiles.

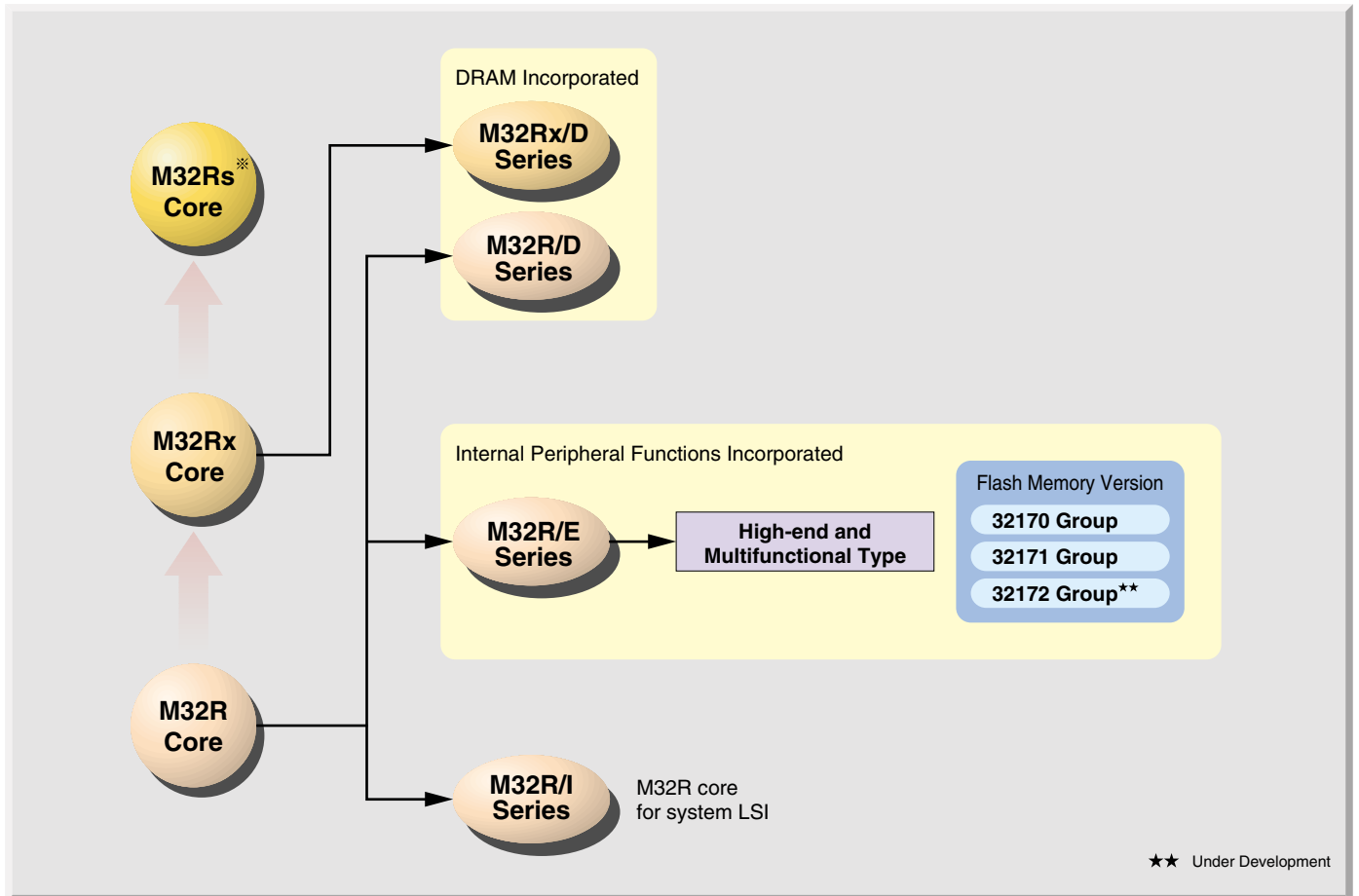
## M32R Family Features

- The M32R CPU is a Mitsubishi's original 32-bit high-performance compact RISC core.
- Most of the often-used instructions can quickly be executed only in 1 clock.
- Compounded instructions are provided to perform 2 operations in 1 clock, such as load-and-update-address and store-and-update-address instructions.
- 16/32-bit instruction formats are used to ensure high code efficiency.
- On the programming model, a wide 4-Gbyte logic address space is provided, so that it is unnecessary to take segment-partitioning into consideration.
- DSP intrusions (multiply-accumulator included) come standard on all variations.

## M32R Family CPU Core Overview

M32R CPU Core	Architecture	Mitsubishi Original 32-bit RISC
	Linear Logic Address Space	4 GBytes
	Instructions	83 (16-bit/32-bit Length Instructions)
	General-purpose Registers	32-bit x 16
	Control Registers	32-bit x 5
	DSP Function	Multiply-Accumulate Function : 32-bit x 16-bit Multiplier + 56-bit Accumulator
	Pipelines	5 Stages

## M32R Family Expansion



## ■ M32R Family Series Expansion

### M32R/E Series

The M32R/E Series has integrated the ROM/RAM onto a single chip along with the peripheral functions and M32R CPU core. Many variations are available, including 'high-performance/multifunctional type' MCUs. The M32R/E Series offers system solutions across a wide stretch of application fields, from general-purpose industry/automobiles to portable consumer products.

#### ■ M32R/E Series Features

- M32R CPU core and peripheral I/Os, ROM/RAM all on a single chip
- Internal peripheral I/Os work in combination so that the MCU can be adapted for various applications.

## ■ High-end and Multifunctional MCUs

### 32170 Group

The **M32170FxVFP/WG**, with a 768-Kbyte DINOR-type flash memory (the largest memory in the industry), offers greatly enhanced internal peripheral functions, such as 40-Kbyte RAM, 64 channels of timers, CAN controller, etc. The wide operating ambient temperature range (−40°C to 125°C) makes these MCUs most appropriate to high-end applications, requiring high precision and high reliability.

### 32171 Group

The **M32171FxVFP** is software-compatible with the 32170 Group, and the same operation speed as that of the 32170 Group is kept. This MCU saves the peripheral I/Os and the number of pins.

## ■ Product Expansion

Items		Products			M32170FxVFP/WG**			M32171FxVFP			
CPU Core		M32R CPU Core									
Internal Operation Frequency (MHz)		40, 32 (Clock synthesizer incorporated : x 4)									
Internal Memory	ROM (Flash Memory) (bytes)	768K	512K	384K	512K	384K					
	RAM (bytes)	40K	32K	32K	16K	16K					
Peripherals	Multi-Junction I/O (ch)	35			11						
	Timers (MJT)	16-bit Input (ch)	11			8					
		32-bit Input (ch)				8					
	A-D Converter (ch)	32 (10-bit)			16 (10-bit)						
	DMAC (ch)				10						
	Serial I/O (ch)	6			3						
	Real-time Debugger (RTD) (ch)				1						
	Interrupt Controller	Interrupt management for internal peripheral I/Os: 8 levels of interrupt priorities selectable (incl. interrupt disabled state)									
	Wait Controller	Wait control for external extended area: can be extended by waits (1 to 4) and external signals.									
	CAN (ch)				1						
	Boundary Scan	Available									
	On-chip Debug Circuit (SDI)	Available									
Power Source Voltage (V)	3.3 (Internal), 5 (I/O)										
Package	240-pin QFP, 255-pin FBGA**				144-pin LQFP						
Operating Ambient Temperature (°C)	−40 to 85 (@ 40 MHz), −40 to 125 (@ 32 MHz) <sup>(Note)</sup>										

**Note:** The continuous operation at 125°C is not guaranteed. For details about the development of the system requiring operations at 125°C, please contact an authorized Mitsubishi Semiconductor product distributor.

★★ Under Development

# 16-bit M16C Family

M16C Family is a Mitsubishi original MCU family based on a new design concept offering customers complete system support. This high-performance, 16-bit MCU family provides high memory efficiency, fully adaptable for C programming, yet power saving. The low noise emission and improved noise immunity meet current application and market needs. Each of these MCUs also has the address match interrupt function useful for program correction.

## Features

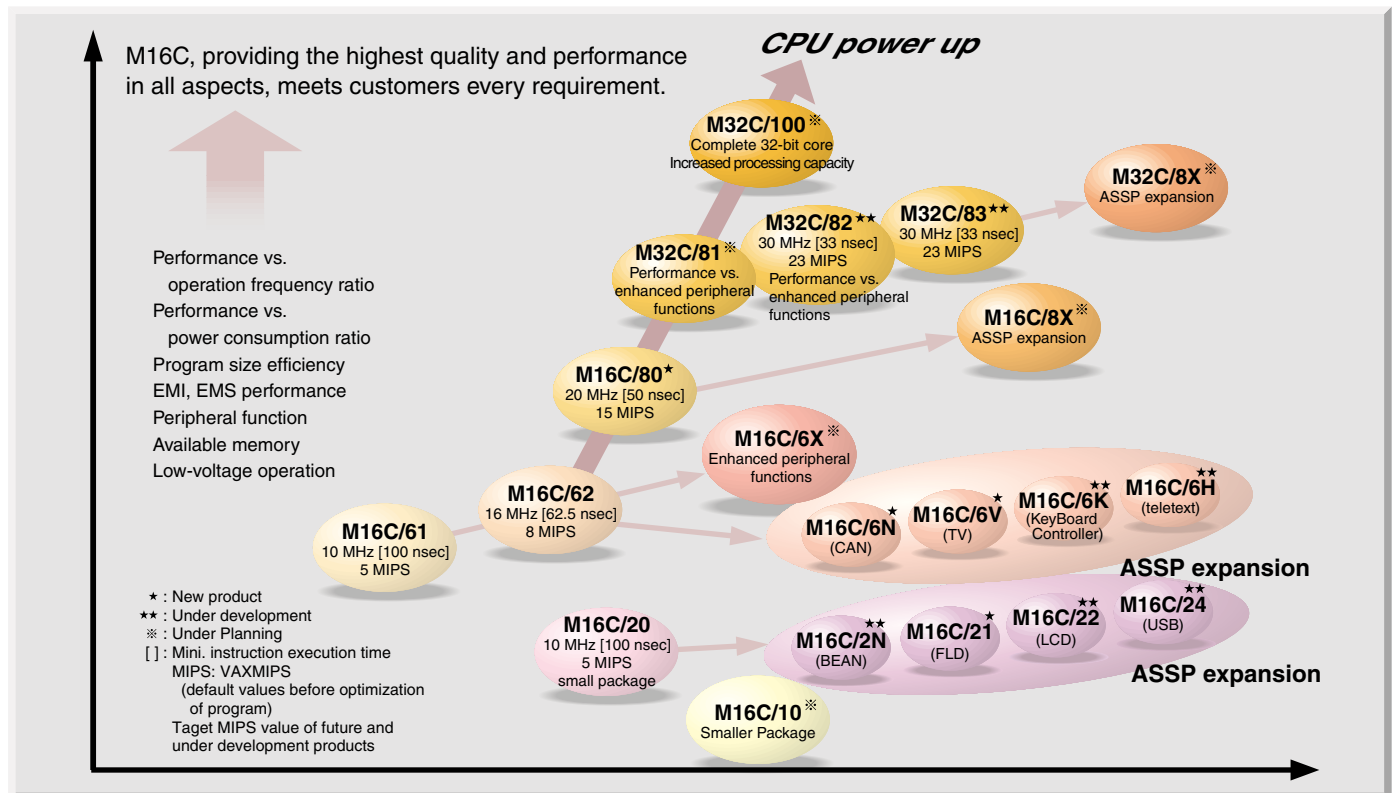
- High C Programming Efficiency  
High programming object efficiency with C language, reaching the industry's top levels.
- High-speed Processing  
Many instructions executed in 1 cycle.  
Increased processing speed by reducing instruction execution cycles.
- Low Voltage Operating, Low Power Consumption  
Based on proven results of conventional Mitsubishi MCUs.
- Powerful Instructions  
High-speed multiplication with built-in multiplier.  
Enhanced memory-to-memory operation and bit manipulation instructions.

- Wide Seamless Address Space  
M16C/20 Series and M16C/60 Series : 1 Mbyte  
M16C/80 Series : 16 Mbytes
- High-functional Internal Peripherals  
Large-sized memory, DMAC, etc. are incorporated for various applications.
- Low Noise Emission  
Enhanced countermeasures against noise emission.
- High Noise Immunity  
Enhanced immunity against strong external noise.
- Program Correction Function  
Debugging with external E<sup>2</sup>PROM.
- Improved System Development Environment  
High performance compact emulator and complete software tools.

## Series Expansion

M16C Family consists of the M16C/60 Series, M16C/20 Series which consists of the ASSP products for the specific application fields, and M16C/80 Series with the enhanced CPU. We are currently developing the M32C/80 Series to provide enhanced operating frequency versions.

## M16C Family Road Map



## Applications

Audio Equipment, Camera, Electric Household Appliance, Office Equipment, Communication Equipment, Portable Equipment, PC Peripherals, Automobile, Factory Automation	M16C/61 Group	M16C/62 Group
Audio Equipment, Electric Household Appliance, Office Automation Equipment, Sensor Control, Automobile, Factory Automation, Barcode Reader, Sub-MCUs, etc.	M16C/80 Group	
Audio Equipment, Microwave Oven	M16C/20 Group	
Audio Equipment, Electric Household Appliance, Camera, Amusement Game, Communication Equipment	M16C/21 Group	
Note book-size PCs	M16C/22 Group	
PC Peripherals	M16C/6K Group	
Automobile	M16C/24 Group	
High-end TV	M16C/6N Group	M16C/2N Group
VCR	M16C/6V Group	
	M16C/6H Group	

## M16C/60 Series

### M16C/61 Group with Built-in SIM Serial I/O

The M16C/61 Group consists of general-purpose MCUs with internal large-sized capacity RAM and can operate at low power source voltage. Each of these MCUs incorporates serial I/O for SIM <sup>(Note1)</sup>, and offers several types of RAM variations.

### M16C/62 Group with Enhanced Peripherals

The M16C/62 Group is the enhanced version of the M16C/61 Group with expanded serial I/Os (x 5), timers (x 11) and external interrupts (x 8). The following functions are also added:

- Serial I/O for I<sup>2</sup>C-BUS (subset)
- Serial I/O for IEBus <sup>(Note2)</sup>
- Timer for 3-phase motor control (only for the 100-pin version)

Also, the flash memory versions are provided.

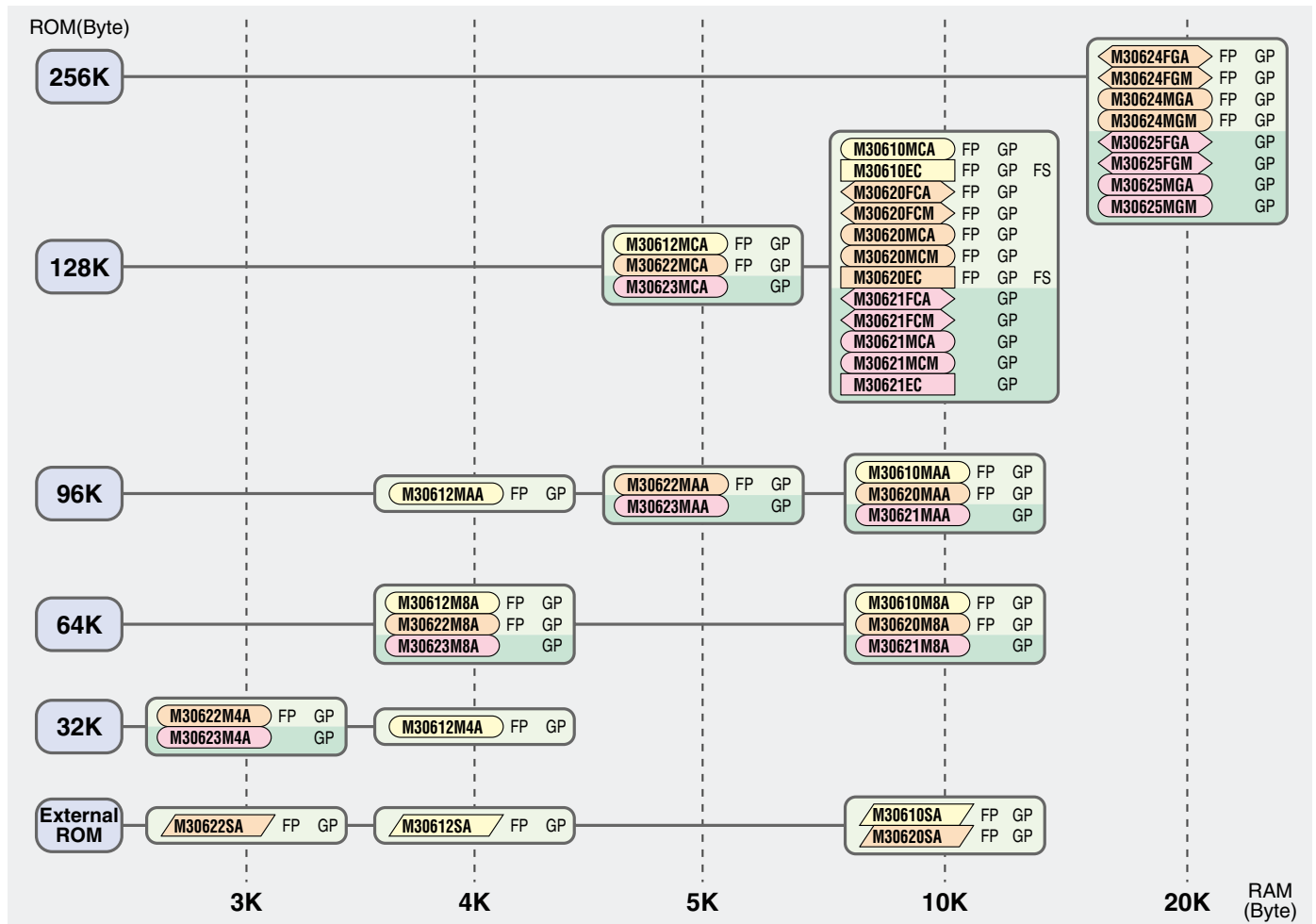
### M16C/60 CPU Specifications

Performance	Machine Cycles	100 ns (5 V at 10 MHz) As for the M16C/62 Group, 62.5 ns (5 V at 16 MHz)
	Processing Speed	5 MIPS (10 MHz) 8 MIPS (16 MHz)
	Address Space	1 M bytes
Number of Instructions	91	
Registers	General-purpose Registers : 16-bit x 6 x 2 Banks Dedicated Registers : 16-bit x 5	

Notes1: SIM = Subscriber Identity Module

2: IEBus is a trademark of NEC Corporation.

### Product Lineup (ROM/RAM Expansion)



- "M" of M3xxxxMx indicates the mask ROM version.
- "E" of M3xxxxEx indicates the EPROM or One Time PROM version.
- ◇ "F" of M3xxxxFx indicates the flash memory version.
- ▭ "S" of M3xxxxSx indicates the external ROM version.

Note: For the M16C/60 Series MCUs dedicated to automobiles, see page 42.

		Package		Lead Pitch (mm)
80-pin	GP	80-pin QFP	(80P6S-A)	0.65
	FP	100-pin QFP	(100P6S-A)	
100-pin	GP	100-pin LQFP	(100P6Q-A)	0.5
	FS(Windowed)	100-pin QFN	(100D0)	—

## Product Expansion

Items		M16C/61					M16C/62 (100-pin version)					M16C/62 (80-pin version)							
Internal Memory	ROM (Kbytes)	—	32K	64K	96K	128K	—	32K	64K	96K	128K	256K	32K	64K	96K	128K	256K		
	RAM (Kbytes)	4K	10K	4K	4K	10K	4K	10K	5K	10K	3K	10K	3K	4K	10K	5K	10K	5K	10K
I/O Ports	Input only	1																	
	CMOS I/O	85										68							
	N-channel open-drain	2																	
DMAC (channels)		2																	
16-bit Timers		5 + 3					5 + 6												
CRC Operation Circuit		1																	
Serial I/O	Clock Sync./UART	3										2							
	Clock Synchronous	—																	
	UART only	—										1							
A-D Converter (resolution x channels)		10-bit x (8 + 2)																	
D-A Converter (resolution x channels)		8-bit x 2																	
External Interrupts (sources)		5					8					5							
Watchdog Timer		Available																	
Packages		100-pin QFP (100P6S-A) 100-pin LQFP (100P6Q-A)					100-pin QFP (100P6S-A) 100-pin LQFP (100P6Q-A)					80-pin QFP (80P6S-A)							
Power Source Voltage (V)		4.0 to 5.5 (10 MHz) 2.7 to 5.5 ( 7 MHz with 1 wait)					4.2 to 5.5 at 16 MHz (Mask ROM version, Flash memory version) 4.5 to 5.5 at 16 MHz (One Time PROM version) 2.7 to 5.5 at 10 MHz with 1 wait (Mask ROM version, Flash memory version) 2.7 to 5.5 at 7 MHz with 1 wait (One Time PROM version) (M version: 2.7 to 3.6 V at 10 MHz, 2.2 to 3.6 V at 7 MHz with 1 wait)												
Operating Ambient Temperature (°C)		-20 to 85, -40 to 85																	
Minimum Instruction Execution Time (ns)		100 (10 MHz)					62.5 (16 MHz)												
Number of Basic Instructions		91																	

## M16C/6K Group (for Notebook-sized PC)

In addition to the same function as the M16C/62 Group, the following functions, necessary for the notebook-sized PCs' keyboard control, power management, battery management, are added:

- Host bus interface
- Key scan input/output
- Multi-master I<sup>2</sup>C-BUS interface
- 14-bit PWM

Also, flash memory versions are under development. Moreover, the following will be provided:

- Enhanced power management function
- Detect function of multiple external events



- Notebook-sized PC

## Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M306K5M8-XXXRP ★★	Mask ROM	64K	3K
M306K2M8-XXXGP ★★			
M306K7F8LRP ★★	Flash Memory		
M306K6F8LGP ★★			
M306K5F8LRP ★			
M306K2F8LGP ★			

★ New Product, ★★ Under Development

## Product Expansion

Items		Group	M16C/6K★
Internal Memory	ROM (Kbytes)		64K
	RAM (Kbytes)		3K
I/O Ports	Input only		1
	CMOS I/O		68 (100-pin version), 102 (144-pin version)
	N-channel open-drain		18 (100-pin version), 26 (144-pin version)
DMAC (channels)			2
16-bit Timers			5 + 6
CRC Operation Circuit			—
Serial I/O	Clock Sync./UART		3
	Clock Synchronous		2
	UART only		—
A-D Converter (resolution x channels)			10-bit x (8 + 2)
D-A Converter (resolution x channels)			8-bit x 2
External Interrupts (sources)			15
Watchdog Timer			Available
Other Functions			Host Bus Interface 4 ch, Comparator, 14-bit PWM, I <sup>2</sup> C-BUS (option) 2 ch, PS2 Interface 3 ch
Packages			100-pin LQFP (100P6Q-A), 144-pin TQFP (144PFB-A)
Power Source Voltage (V)			3.0 to 3.6
Operating Ambient Temperature (°C)			-20 to 85
Minimum Instruction Execution Time (ns)			125 (8 MHz)
Number of Basic Instructions			91

★ New Product

## M16C/60 Series

### M16C/6N Group (CAN Controller Incorporated)

M16C/60 Series consists of MCUs featuring M16C/60 CPU core and rich internal peripheral functions, such as the CAN controller. Each of these MCUs is equipped with large-sized-capacity buffers and can transmit/receive data of which kinds are up to 16. These MCUs are appropriate to the network appliances requiring high-speed processing (up to 1 Mbps) with the heavy communication traffic.

The M16C/6N Group is based on the CAN specifications version 2.0B.

- Channel: 1 channel (**M306N1**), 2 channels (**M306N0**)
- Transmit/Receive buffers: 16 slots
- Transfer rate (Max.): 1 Mbps

 ● Automobile

### Product Lineup

MCU	Memory Type	Internal Memory		CAN (ch)
		ROM(Byte)	RAM(Byte)	
<b>M306N0MCT-XXXFP</b> ★	Mask ROM	128K	5K	2
<b>M306N1MCT-XXXFP</b> ★★				1
<b>M306N1MAT-XXXFP</b> ★★				1
<b>M306N0FGTFP</b> ★	Flash Memory	256K	10K	2
<b>M306N1FCTFP</b> ★★		128K	5K	1

★ New Product, ★★ Under Development

### M16C/6V Group (TV Controller Incorporated)

In addition to the rich internal peripheral functions of the M16C/60 Series, some new functions for TV control, such as the high-end OSD function, data slicer for closed-caption, are added. This group incorporates the powerful OSD function, which easily displays the various menus, etc.

The 64-pin version and on-chip multi-master I<sup>2</sup>C-BUS interface version have been added to the lineup as new products.

- OSD Functions  
Triple layer, Split (RAM), Color-dot OSD (ROM), Analog RGB

 ● High-end TV

### Product Lineup

MCU	Memory Type	Internal Memory		Package
		ROM(Byte)	RAM(Byte)	
<b>M306V0ME-XXXFP</b>	Mask ROM	192K	5K	100P6S-A
<b>M306V2ME-XXXFP</b> ★				64P4B
<b>M306V5ME-XXXSP</b> ★				64P4B
<b>M306V0EEFP</b>	One time PROM	192K	5K	100P6S-A
<b>M306V2EEFP</b> ★				64P4B
<b>M306V5EESP</b> ★				64P4B

★ New Product

### M16C/6H Group

#### (For European VCR Teletext Applications)

M16C/6H Group MCUs are basically M16C/60 Series MCUs with the OSD and TELETEXT data slicer functions, providing an enhanced array of peripheral functions. The data-slicer's buffer RAM is incorporated for PDC, VPS, and VBI data slicing.

 ● VCR

### Product Lineup

MCU	Memory Type	Internal Memory		RAM for FONTS <sup>(Note)</sup>
		ROM(Byte)	RAM(Byte)	
<b>M306H0SFP</b>	External ROM	—	5K	128 characters
<b>M306H1SFP</b>				256 characters

Note: 1 character = 12 x 10 dots

### Product Expansion

Items		Group			M16C/6N*
Internal Memory	ROM (bytes)	96K*	128K*	256K*	
	RAM (bytes)	3K*	5K*	10K*	
I/O Ports	Input only				1
	CMOS I/O				85
	N-channel open-drain				2
DMAC (channels)					2
16-bit Timers					5 + 6
CRC Operation Circuit					1
Serial I/O	Clock Sync./UART				3
	Clock Synchronous				1
	UART only				—
A-D Converter (resolution x channels)					10-bit x 26
D-A Converter (resolution x channels)					8-bit x 2
External Interrupts (sources)					9
Watchdog Timer					Available
Other Functions					CAN Ver 2.0B Controller
Packages					100-pin QFP (100P6S-A)
Power Source Voltage (V)					4.0 to 5.5 (20 MHz with 1 wait, 16 MHz) : Mask ROM version, 4.2 to 5.5 (20 MHz with 1 wait, 16 MHz) : Flash memory version
Operating Ambient Temperature (°C)					-40 to 85
Minimum Instruction Execution Time (ns)					62.5 (16 MHz)
Number of Basic Instructions					91

★ New Product

### Product Expansion

Items		Group			M16C/6V
Internal Memory	ROM (Kbytes)				192K
	RAM (Kbytes)				5K
I/O Ports	Input only				—
	CMOS I/O				76 (100-pin version), 44 (64-pin version)
	N-channel open-drain				2
DMAC (channels)					2
16-bit Timers					5 + 3 (100-pin version), 5 + 2 + 1 (64-pin version)
CRC Operation Circuit					—
Serial I/O	Clock Sync./UART				2
	Clock Synchronous				—
	UART only				—
	Multi-master I <sup>2</sup> C-BUS				2, 1 (compact version : <b>M306V0</b> )
A-D Converter (resolution x channels)					8-bit x 6
D-A Converter (resolution x channels)					8-bit x 2
External Interrupts (sources)					3
Watchdog Timer					Available
Other Functions					OSD function (512 kinds of color), OSD function (64 kinds of color : <b>M306V0</b> ) Data slicer for CCD, HSYNC counter
Packages					100-pin QFP (100P6S-A), 64-pin SDIP (64P4B)
Power Source Voltage (V)					4.5 to 5.5
Operating Ambient Temperature (°C)					-10 to 70
Minimum Instruction Execution Time (ns)					100 (10 MHz)
Number of Basic Instructions					91

### Product Expansion

Items		Group			M16C/6H
Internal Memory	ROM (Kbytes)				—
	RAM (Kbytes)				5K
I/O Ports	Input only				1
	CMOS I/O				48
	N-channel open-drain				2
	Output only				9
DMAC (channels)					2
16-bit Timers					5 + 6
CRC Operation Circuit					1
Serial I/O	Clock Sync./UART				3
	Clock Synchronous				2
	UART only				—
A-D Converter (resolution x channels)					8-bit x (8 + 2)
D-A Converter (resolution x channels)					8-bit x 2
External Interrupts (sources)					8
Watchdog Timer					Available
Other Functions					OSD function (40 characters x 25 lines) Data slicer for TELETEXT (PDC, VPS, VBI)
Packages					144-pin QFP (144P6Q-A)
Power Source Voltage (V)					4.75 to 5.25
Operating Ambient Temperature (°C)					-20 to 70
Minimum Instruction Execution Time (ns)					100 (10 MHz)
Number of Basic Instructions					91



## M16C/20 Series

### M16C/20 Series CPU Specifications

Performance	Machine Cycles	100 ns (5 V at 10 MHz) As for the M16C/24 Group, 83 ns (5 V at 12 MHz)
	Processing Speed	5 MIPS (10 MHz as for the M16C/24 Group) 6 MIPS (16 MHz)
	Address Space	1 Mbyte
Number of Instructions	91	
Registers	General-purpose Registers :16-bit x 6 x 2 Banks Dedicated Registers :16-bit x 5	

### M16C/20 Group Compact Type

The M16C/20 Group has compactly integrated the M16C CPU core, internal ROM/RAM, peripheral functions, etc., and this group features the reduced number of pins. This group also incorporates an A-D converter, serial I/O, 16-bit timer, etc., and the CPU incorporates a multiplier, enabling high-speed operations.

### Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M30201M4-XXXSP ★	Mask ROM	32K	1K
M30201M4-XXXFP			
M30201M6-XXXFP ★★			
M30201F6SP	Flash Memory	48K	2K
M30201F6FP			

★ New Product, ★★ Under Development

### M16C/21 Group with FLD (VFD) Driver Incorporated

Inheriting the rich internal peripheral functions of the M16C/61 Group, the FLD (VFD; Vacuum Fluorescent Display) function is added to the M16C/21 Group. Therefore, this group is appropriate to the appliances requiring high-speed processing such as sound control, electric household appliances (breakdown voltage < V<sub>cc</sub> – 50 V).



● Audio equipment ● Microwave oven

### Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M30217MA-XXXXFP	Mask ROM	96K	5K
M30218MC-XXXXFP			
M30218FCFP	Flash Memory	128K	12K

### M16C/20 Series

#### M16C/20 Series

- M16C/20 Group (Compact Type)
- M16C/21 Group (with FLD (VFD) Driver Incorporated)
- M16C/22 Group (with LCD Driver Incorporated)
- M16C/24 Group (with USB Function Incorporated)
- M16C/2N Group (with BEAN Function Incorporated)

### Product Expansion

Items		Group	
		M16C/20	M30201
Internal Memory	ROM (Kbytes)	32K	48K
	RAM (Kbytes)	1K	2K
I/O Ports	Input only	—	
	CMOS I/O	43	
	N-channel open-drain	—	
DMAC (channels)		—	
16-bit Timers		1 + 2 + 3	
CRC Operation Circuit		—	
Serial I/O	Clock Sync./UART	1	
	Clock Synchronous	—	
	UART only	1	
A-D Converter (resolution x channels)		10-bit x (8 + 5)	
D-A Converter (resolution x channels)		—	
External Interrupts (sources)		3	
Watchdog Timer		Available	
Other Functions		LED drive port pins: 8	
Packages		52-pin SDIP (52P4B) 56-pin QFP (56P6S-A)	
Power Source Voltage (V)		4.0 to 5.5 (10 MHz) 2.7 to 5.5 (3.5 MHz) (Flash Memory version: 4.0 to 5.5)	
Operating Ambient Temperature (°C)		–20 to 85	
Minimum Instruction Execution Time (ns)		100 (10 MHz)	
Number of Basic Instructions		91	

### Product Expansion

Items		Group	
		M16C/21	M30218
Internal Memory	ROM (Kbytes)	96K	128K
	RAM (Kbytes)	5K	12K
I/O Ports	Input only	—	
	CMOS I/O	48	
	N-channel open-drain	—	
DMAC (channels)		2	
16-bit Timers		5 + 3	
CRC Operation Circuit		1	
Serial I/O	Clock Sync./UART	2	
	Clock Synchronous	1 (with automatic transfer function)	
	UART only	—	
A-D Converter (resolution x channels)		10-bit x 8	
D-A Converter (resolution x channels)		8-bit x 2	
External Interrupts (sources)		6	
Watchdog Timer		Available	
Other Functions		FLD (VFD) function (56 control pins)	
Packages		100-pin QFP (100P6S-A)	
Power Source Voltage (V)		4.0 to 5.5 (10MHz) 2.7 to 5.5 (3.5MHz) (Flash Memory version: 4.0 to 5.5)	
Operating Ambient Temperature (°C)		–20 to 85	
Minimum Instruction Execution Time (ns)		100 (10 MHz)	
Number of Basic Instructions		91	

## M16C/22 Group with LCD Driver Incorporated (Under Development)

Inheriting most of the internal peripheral functions of the M16C/20 Group, also, the LCD display function is added to the M16C/22 Group. Therefore, this group is appropriate to the appliances, requiring sophisticated processing of information, such as cameras, meters, and LCD display appliances.

- Applications**
- Audio equipment
  - Electric household appliance
  - Compact camera
  - Amusement game
  - Communication equipment

### Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M30220MA-XXXGP ★ M30220MA-XXXRP ★	Mask ROM	96K	6K
M30220FCGP ★★ M30220FCRP ★★	Flash Memory	128K	10K
M30221M3-XXXFP ★	Mask ROM	24K	1.5K
M30221FCFP ★★	Flash Memory	128K	10K

★ New Product, ★★ Under Development

## M16C/24 Group with USB Function Incorporated

These 16-bit MCUs incorporate the USB function based on the USB specifications version 1.1. Each of these MCUs is equipped with the high-performance DMA controller, FIFO, and various internal peripheral functions in order to be applicable to all of USB devices.

- Applications**
- PC peripherals

### Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M30240M5-XXXFP	Mask ROM	40K	3K
M30240M6-XXXFP		48K	3K
M30240ECP	One time PROM	128K	5K

## M16C/2N Group with BEAN<sup>(Note)</sup> Function Incorporated (Under Development)

- Applications**
- Automobile

**Note: BEAN (Body Electronics Area Network) =**  
Communication Protocol Developed by Toyota Motor Corporation.

### Product Lineup

MCU	Memory Type	Internal Memory	
		ROM(Byte)	RAM(Byte)
M302N1M4T-XXXFP ★★ M302N2M4T-XXXGP ★★ M302N2M8T-XXXGP ★★	Mask ROM	32K	2K
M302N1F4TFP ★★ M302N2FCTGP ★★	Flash Memory	32K 128K	2K 5K

★★ Under Development

### Product Expansion

Items		Group			
		M16C/22**			
		M30220		M30221	
Internal Memory	ROM (Kbytes)	96K*	128K**	24K*	128K**
	RAM (Kbytes)	6K*	10K**	1.5K*	10K**
I/O Ports	Input only			1	
	CMOS I/O	102		81	
	N-channel open-drain			2	
DMAC (channels)				2	
16-bit Timers				8 + 6	
CRC Operation Circuit				—	
Serial I/O	Clock Sync./UART	3		2	
	Clock Synchronous			—	
	UART only			—	
A-D Converter (resolution x channels)		10-bit x 8		10-bit x 7	
D-A Converter (resolution x channels)		8-bit x 3		8-bit x 2	
External Interrupts (sources)				8	
Watchdog Timer				Available	
Other Functions		LCD drive control circuit			
		48SEG x 4COM		40SEG x 4COM	
Packages		144-pin QFP (144PFB-A, 144P6Q-A)		120-pin QFP (120P6R-A)	
Power Source Voltage (V)		4.0 to 5.5 (10 MHz) 2.7 to 5.5 (7 MHz with 1 wait)			
Operating Ambient Temperature (°C)		-20 to 85			
Minimum Instruction Execution Time (ns)		100 (10 MHz)			
Number of Basic Instructions		91			

★ New Product, ★★ Under Development

### Product Expansion

Items		Group		
		M16C/24		
		M30240		
Internal Memory	ROM (Kbytes)	40K	48K	128K
	RAM (Kbytes)	3K		5K
I/O Ports	Input only	—		
	CMOS I/O	63		
	N-channel open-drain	—		
DMAC (channels)		2		
16-bit Timers		5 + 3		
CRC Operation Circuit		1		
Serial I/O	Clock Sync./UART	3		
	Clock Synchronous	—		
	UART only	—		
A-D Converter (resolution x channels)		10-bit x 8		
D-A Converter (resolution x channels)		—		
External Interrupts (sources)		4		
Watchdog Timer		Available		
Other Functions		USB communication function, LED drive port pins : 8		
Packages		80-pin QFP (80P6N-A)		
Power Source Voltage (V)		4.1 to 5.25		
Operating Ambient Temperature (°C)		0 to 70		
Minimum Instruction Execution Time (ns)		83 (12 MHz)		
Number of Basic Instructions		91		

### Product Expansion

Items		Group			
		M16C/2N**			
		M302N1		M302N2	
Internal Memory	ROM (Kbytes)	32K**	32K**	64K**	128K**
	RAM (Kbytes)	2K**	2K**		5K**
I/O Ports	Input only	—			
	CMOS I/O	45	68		
	N-channel open-drain	—			
DMAC (channels)		—			
16-bit Timers		1 + 2 + 3			
CRC Operation Circuit		—			
Serial I/O	Clock Sync./UART	1			
	Clock Synchronous	—			
	UART only	1			
A-D Converter (resolution x channels)		10-bit x (8 + 5)	10-bit x (8 + 5 + 3)		
D-A Converter (resolution x channels)		—			
External Interrupts (sources)		3	6		
Watchdog Timer		Available			
Other Functions		On-chip BEAN protocol controller (1 ch)			
Packages		56-pin QFP (56P6S-A)	80-pin QFP (80P6S-A)		
Power Source Voltage (V)		4.0 to 5.5			
Operating Ambient Temperature (°C)		-40 to 85			
Minimum Instruction Execution Time (ns)		100 (10 MHz)			
Number of Basic Instructions		91			

★★ Under Development

## M16C/80 Series

### M16C/80 Group

The M16C/80 Group is positioned as the upper-class group in the M16C Family, providing MCUs with superior features such as reduced number of instruction cycles, improved operating frequency, high-efficiency of C language code (top-class memory efficiency in the industry), and high-speed interrupt processing. As for internal peripheral functions, the M16C/80 Group incorporates the DRAM controller and X-Y converter in addition to the M16C/62 Group's multifunctional internal peripherals.

### Features

- Reduced Number of Cycles**  
 For frequently-used instructions, 1 cycle is required, and for high-functional instructions, 2 or 3 cycles are required. The processing for which a competitor's RISC MCU requires 3 or 4 instructions can be completed only in 1 instruction with few cycles.
- Improved Memory Code and Bus Cycle Efficiency**  
 Enhanced instructions and addressing modes provide a very high memory code efficiency. For the same processing, the M16C/80 Series realizes a smaller code size than competitor's RISC MCUs. This results in a 50 % decrease in bus cycles, allowing even large-sized programs to be executed at high speed.
- Interrupt Processing Time Shorten**  
 Interrupt sequence with the highest priority has been shortened to 5 cycles from 18 cycles. The interrupt return cycle has also been shortened to 3 cycles from 6 cycles.

### M16C/80 CPU Specifications

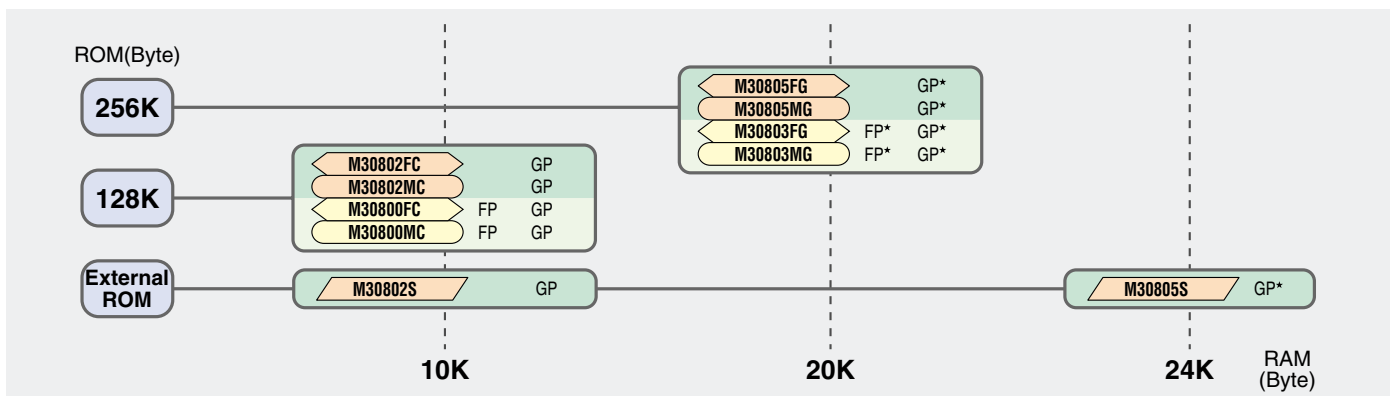
Performance	Machine Cycles	50 ns (5 V at 20 MHz)
	Processing Speed	15 MIPS (20 MHz)
	Address Space	16 MByte
Number of Instructions	106	
Registers	General-purpose Registers : 16-bit x 4 x 2 Banks 24-bit x 4 x 2 Banks	
	Dedicated Registers : 16-bit x 1, 24-bit x 4 High-speed Interrupt Registers and DMAC-related Registers are Incorporated.	

### Product Expansion

Group		M16C/80 (100-pin version)		M16C/80 (144-pin version)*	
Internal Memory	ROM (Kbytes)	128K	256K*	—	128K   256K*
	RAM (Kbytes)	10K	20K*	10K*   24K*	10K   20K*
I/O Ports	Input only	1			
	CMOS I/O	85			
	N-channel open-drain	2			
DMAC (channels)		4			
16-bit Timers		5 + 6			
CRC Operation Circuit		1			
Serial I/O	Clock Sync./UART	5			
	Clock Synchronous	—			
	UART only	—			
A-D Converter (resolution x channels)		10-bit x (8 + 2)			
D-A Converter (resolution x channels)		8-bit x 2			
External Interrupts (sources)		8			
Watchdog Timer		Available			
Other Functions		DRAM controller, X-Y converter, Wait insertion (variable)			
Packages		100-pin QFP, 100-pin LQFP		144-pin LQFP	
Power Source Voltage (V)		4.2 to 5.5 (20 MHz) 2.7 to 5.5 (10 MHz)			
Operating Ambient Temperature (°C)		-20 to 85, -40 to 85			
Minimum Instruction Execution Time (ns)		50 (20 MHz)			
Number of Basic Instructions		106			

★ New Product

### Product Lineup (ROM/RAM Expansion)



- “M” of M3xxxxMx indicates the mask ROM version.
- “E” of M3xxxxEx indicates the flash memory version.
- “S” of M3xxxxSx indicates the external ROM version.

Package			Lead Pitch (mm)
100-pin	FP	100-pin QFP (100P6S-A)	0.65
	GP	100-pin LQFP (100P6Q-A)	
144-pin	GP	144-pin LQFP (144P6Q-A)	0.5

★ New Product

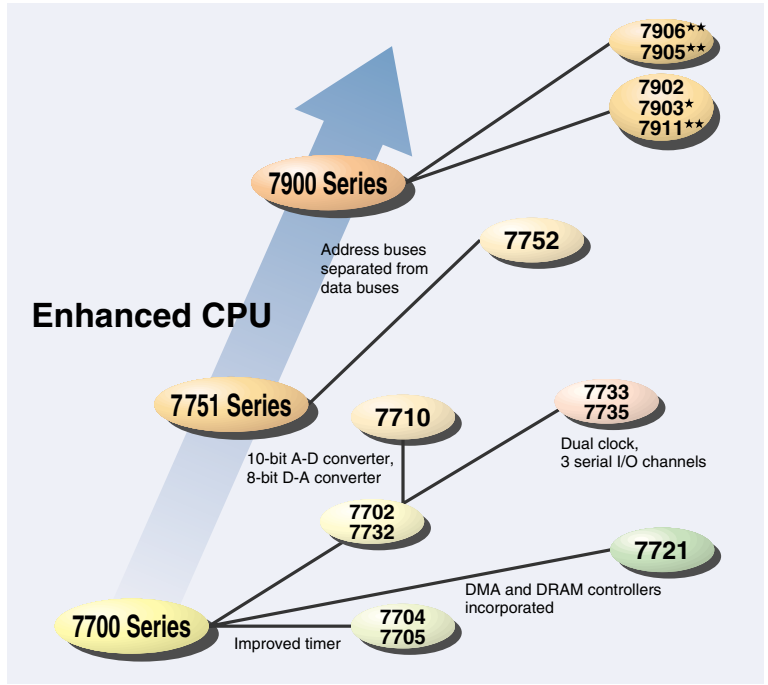
# 16-bit 7700 Family

The 7700 Family features Mitsubishi's original 16-bit MCUs, developed to meet the increasing functions and faster speeds required by today's industrial and consumer equipment. Its CPU core is quite unique in that it has 16-bit processing architecture but can be switched to 8-bit processing, if necessary. Moreover, it has instruction queue buffers and data buffers for faster CPU operations. It also supports a large 16-Mbyte program / data memory and can process large-sized data.

## Product Lineup

- Expansive lineup
- Low-power-source-voltage operation, Power saving function, Enhanced noise immunity
- Increased speed, Enhanced performances
- Flash MCU expansion

## 7700 Family Expansion



★ New Product, ★★ Under Development

## Application Map

Application Field	Basic Type	Enhanced Power Saving Function	For Motor Control	Increased Speed		DMAC, DRAMC, RTP	For VCR Software Servo	For Automobile
				Multiplied Accumulation Instruction	32-bit Operation Instruction			
Office Automation Equipment, Communication Equipment (PHS, etc.), PC Peripherals, Portable Equipment, Electric Household Appliance	7702 7710 7732	7733 7735						
Electric Household Appliance (Air Conditioner, Refrigerator, Washer, etc.), Factory Automation (Inverter)			7704 7705	7906★★ 7905★★				
PC Peripherals, Office Automation Equipment, Communication Equipment				7752	7902★★ 7903★ 7911★★			
Printer, Facsimile, Copier						7721		
VCR							(See page 39)	
Automobile								(See page 42)

★ New Product, ★★ Under Development

## 7900 Series

While maintaining software compatibility with the conventional 7700 Series and 7751 Series, the enhanced instructions and CPU performance are realized.

- High-end MCUs appropriate to PC peripherals, etc
- Software-compatible with the conventional 7700/7751 Series MCUs
- ROM code efficiency is 30% better than the 7700 Series MCUs
- Flash memory version: single-power-source operation is available
- Improved connectivity with external devices: chip selection and bus separation are available.

## 7902 Group

## 7903 Group

## 7911 Group (Under Development)

- Increased speed
- Clock synthesizer incorporated (7902 and 7911 Groups)



- Printer
- Facsimile
- CD-ROM drive
- DVD-ROM drive

## 7900 Series CPU Core Specifications

Number of Instructions	203 instructions (103 7700 Family basic instructions + 100 new instructions)
Minimum Instruction Execution Time	38 ns (at 26 MHz operating frequency)
Address Space	16 Mbytes

## Product Expansion

Items	Group	7902**	7903*	7911**
Programmable I/O Port Pins		84	84 65 (External ROM version)	84
16-bit Timer		5 + 3		
Serial I/O (channels)	Clock Sync./UART	2		
	UART only	—		
A-D Converter (channels)	8-bit	—		
	10-bit	8		
D-A Converter (resolution x channels)		8-bit x 3	8-bit x 2	8-bit x 3
Interrupt Sources	External	6		
	Internal	16	15	
12-bit Watchdog Timer		Available		
Other Functions		<ul style="list-style-type: none"> <li>• Chip select x 4</li> <li>• Separate Bus</li> <li>• Real-time output</li> <li>• Clock synthesizer</li> </ul>	<ul style="list-style-type: none"> <li>• Chip select x 4</li> <li>• Separate Bus</li> <li>• Real-time output</li> </ul>	<ul style="list-style-type: none"> <li>• Chip select x 4</li> <li>• Separate Bus</li> <li>• Real-time output</li> <li>• Clock synthesizer</li> </ul>

★ New Product, ★★ Under Development

## Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Ambient Temperature (°C)	Package
			ROM (Byte)	RAM (Byte)				
7902	M37902FJCHP ★★	Flash Memory	498K	12K	38	4.5 to 5.5	-20 to 85	100P6Q-A
	M37902FGCHP ★★		248K	6K		3.0 to 3.6		
	M37902FGMHP ★★				120K	4K		
	M37902FCCHP ★★		3.0 to 3.6					
	M37902FCMHP ★★	Mask ROM	38	4.5 to 5.5				
7903	M37903F8CHP *	Flash Memory	61K	2K	38	4.5 to 5.5	-20 to 85	100P6Q-A
	M37903S4CHP ★★	External ROM	—					
7911	M37911FGCHP ★★	Flash Memory	260K	6K	38	4.5 to 5.5	-20 to 85	100P6Q-A

★ New Product, ★★ Under Development

## 7900 Series

### 7906 Group

- Motor control function  
Three-phase motor drive waveform output/Pulse motor waveform output: selectable
- 42-pin package



• Air conditioner • Motor control equipment

### 7905 Group

- Motor control function (2 circuits)  
Three-phase motor drive waveform output/Pulse motor waveform output: selectable
- 10-bit A-D converter (12 channels)
- Sub-clock oscillation circuit



• Air conditioner • Refrigerator • Motor control equipment

## Product Expansion

Items		Group	7906**	7905**
Programmable I/O Port Pins			30	50
16-bit Timer			10 + 3	
Serial I/O (channels)	Clock Sync./UART		2	3
	UART only		—	
A-D Converter (channels)	8-bit		—	
	10-bit		5	12
D-A Converter (resolution x channels)			8-bit x 2	
Interrupt Sources	External		5	8
	Internal		21	23
12-bit Watchdog Timer			Available	
Other Functions			<ul style="list-style-type: none"> <li>• Motor control waveform output function</li> <li>• Clock synthesizer</li> </ul>	<ul style="list-style-type: none"> <li>• Motor control waveform output function (2 circuits)</li> <li>• Clock synthesizer</li> <li>• Sub-clock oscillation circuit</li> </ul>

\*\* Under Development

## Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Ambient Temperature (°C)	Package
			ROM (Byte)	RAM (Byte)				
7906	M37906F8CFP **	Flash Memory	60K	3K	50	4.5 to 5.5	-20 to 85	42P2R-E
	M37906F8CSP **							42P4B
	M37906M8C-XXXFP **							42P2R-E
	M37906M8C-XXXSP **	Mask ROM	48K	1K				42P4B
	M37906M6C-XXXFP **							42P2R-E
	M37906M6C-XXXSP **							42P4B
	M37906M4C-XXXFP **							42P2R-E
M37906M4C-XXXSP **	42P4B							
7905	M37905F8CFP **	Flash Memory	60K	3K	50	4.5 to 5.5	-20 to 85	64P6N-A
	M37905F8CSP **							64P4B
	M37905M8C-XXXFP **							64P6N-A
	M37905M8C-XXXSP **	Mask ROM	48K	1K				64P4B
	M37905M6C-XXXFP **							64P6N-A
	M37905M6C-XXXSP **							64P4B
	M37905M4C-XXXFP **							64P6N-A
	M37905M4C-XXXSP **	64P4B						

\*\* Under Development

## 7751 Series

CPU performance of this series has been greatly enhanced with the following, compared with the conventional 7700 Series:

- Multiplied accumulation instruction added
- Increased operating frequency
- Reduced instruction execution cycles

### 7751 Series CPU Core Specifications

Number of Instructions	109 instructions (103 7700 Family basic instructions + 6 instructions)
Minimum Instruction Execution Time	100 ns (at 20 MHz operating frequency)
Address Space	16 Mbytes

## 7752 Group

The 7752 Group supports 100-pin packages and separate-bus method.



- HDD
- PC peripherals such as CD-ROM drive
- Office equipment such as copier
- Inverter air conditioner

### Product Expansion

Group		7752
Items		
Programmable I/O Port Pins		51
16-bit Timer		5 + 3
Serial I/O (channels)	Clock Sync. /UART	2
	UART only	—
A-D Converter (channels)	8-bit	—
	10-bit	8
D-A Converter (resolution x channels)		8-bit x 2
Interrupt Sources	External	4
	Internal	16
12-bit Watchdog Timer		Available
Other Functions		<ul style="list-style-type: none"> <li>• Chip select x 5</li> <li>• Separate bus</li> <li>• Key-input interrupt</li> </ul>

### Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Ambient Temperature (°C)	Package
			ROM (Byte)	RAM (Byte)				
7752	M37752S6CGP	External ROM	—	3K	100	4.5 to 5.5	-20 to 85	100P6S-A

## 7700 Series

### General-purpose MCUs with Internal ROM 7702 Group

The 7702 Group is the base of the 7700 Series.



- Copier
- HDD
- Electronic musical instrument
- Data terminal
- Print engine for page printer
- Cellular telephone
- Personal Digital Assistant (PDA) product

### General-purpose MCUs featuring external ROM 7732 Group

The 7732 Group is the external ROM version of the 7702 Group with the real-time port function added.



- Cellular telephone
- Copier
- Printer
- Electronic typewriter
- Facsimile
- Personal Digital Assistant (PDA) product

### 7700 Series CPU Core Specifications

Number of Instructions	103 instructions
Minimum Instruction Execution Time	160 ns (at 12.5 MHz operating frequency)
Address Space	16 Mbytes

### Product Expansion

Group		7702	7732
Items	Programmable I/O Port Pins	68	37
16-bit Timer		5 + 3	
Serial I/O (channels)	Clock Sync./UART	2	
	UART only	—	
A-D Converter (channels)	8-bit	8	
	10-bit	—	
D-A Converter (resolution x channels)		—	
Interrupt Sources	External	3	
	Internal	16	
12-bit Watchdog Timer		Available	
Other Functions		—	● Pulse output ports

### Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Ambient Temperature (°C)	Package
			ROM (Byte)	RAM (Byte)				
7702	M37702M8BXXXFP	Mask ROM	60K	—	160	4.5 to 5.5	-20 to 85	80P6N-A
	M37702M8BXXXHP				500	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
	M37702M8LXXXHP				One time PROM	160	4.5 to 5.5	-20 to 85
	M37702E8BXXXFP	500				2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
	M37702E8BXXXHP	Windowed EPROM (Note)				160	4.5 to 5.5	-20 to 85
	M37702E8LXXXFP				Mask ROM	500	2.7 to 5.5	-40 to 85
	M37702M6BXXXFP		48K	160		4.5 to 5.5	-20 to 85	
	M37702M6LXXXFP	500		2.7 to 5.5		-40 to 85		
	M37702E6BXXXFP	One time PROM		160	4.5 to 5.5	-20 to 85	80D0	
	M37702E6LXXXFP			500	2.7 to 5.5	-40 to 85	80P6N-A	
	M37702E6BFS			Windowed EPROM (Note)	160	4.5 to 5.5		-20 to 85
	M37702M4BXXXFP	32K			500	2.7 to 5.5		-40 to 85
	M37702M4LXXXFP		Mask ROM		160	4.5 to 5.5	-20 to 85	80P6S-A
	M37702M4LXXXGP			500	2.7 to 5.5	-40 to 85	80P6N-A	
	M37702E4BXXXFP			One time PROM	160	4.5 to 5.5	-20 to 85	80P6S-A
	M37702E4LXXXFP		500		2.7 to 5.5	-40 to 85	80D0	
	M37702E4LXXXGP		Windowed EPROM (Note)		160	4.5 to 5.5	-20 to 85	80P6N-A
	M37702E4BFS	Mask ROM		500	2.7 to 5.5	-40 to 85	80P6S-A	
	M37702MDBXXXFP			24K	160	4.5 to 5.5	-20 to 85	80P6N-A
	M37702M3BXXXFP		16K		500	2.7 to 5.5	-40 to 85	80P6S-A
	M37702M2BXXXFP				One time PROM	160	4.5 to 5.5	-20 to 85
	M37702M2LXXXGP			500		2.7 to 5.5	-40 to 85	80P6N-A
	M37702M2LXXXHP		Windowed EPROM (Note)	160		4.5 to 5.5	-20 to 85	80P6S-A
	M37702E2BXXXFP	16K		500	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A	
	M37702E2LXXXGP			One time PROM	160	4.5 to 5.5	-20 to 85	80D0
	M37702E2LXXXHP		500		2.7 to 5.5	-40 to 85	80P6N-A	
	M37702E2BFS		Windowed EPROM (Note)		160	4.5 to 5.5	-20 to 85	80P6S-A
	M37702S1BFP			External ROM	500	2.7 to 5.5	-40 to 85	80P6N-A
M37702S1LGP	160				4.5 to 5.5	-20 to 85	80P6S-A	
M37732S4BFP	External ROM	—	2K		160	4.5 to 5.5	-20 to 85	80P6N-A
M37732S4LGP				500	2.7 to 5.5	-40 to 85	80P6S-A	
M37732S4LHP				160	4.5 to 5.5	-20 to 85	80P6D-A / 80P6Q-A	
M37732S4BHP							80P6S-A	

Note: The windowed EPROM version is only for evaluation.



## 7700 Series

### MCUs with Enhanced Analog Functions

#### 7710 Group

The 7710 Group has the enhanced 7702 Group peripheral functions and upper-compatibility with that group. The 7710 Group features 10-bit resolution in A-D conversion and 8-bit D-A converter and pulse-output ports.

- Copier
- HDD
- Data terminal
- Barcode reader
- Electronic musical instrument
- Print engine for page printer

### MCUs for Inverter Drive

#### 7704 Group

#### 7705 Group

These general-purpose MCUs are equipped with timers enhanced for motor control.

## Product Expansion

Items		Group	7710	7704	7705
Programmable I/O Port Pins			68		53
16-bit Timer				5 + 3	
Serial I/O (channels)	Clock Sync./UART		2		—
	UART only		—		1
A-D Converter (channels)	8-bit		—	8	
	10-bit		8	—	
D-A Converter (resolution x channels)			8-bit x 2	—	
Interrupt Sources	External		3		2
	Internal		16		14
12-bit Watchdog Timer			Available		
Other Functions			•Pulse output ports	•Motor control function	

## Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Ambient Temperature (°C)	Package
			ROM (Byte)	RAM (Byte)				
7710	M37710MFBXXXFP	Mask ROM	120K	2K	160	4.5 to 5.5	-20 to 85	80P6N-A
	M37710MFLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A/80P6Q-A
	M37710EFBXXXFP	One time PROM			160	4.5 to 5.5	-20 to 85	80P6N-A
	M37710EFLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A/80P6Q-A
	M37710EFBFS	Windowed EPROM <sup>(Note)</sup>			160	4.5 to 5.5	-20 to 85	80D0
	M37710M8BXXXFP	Mask ROM			60K	2K	160	4.5 to 5.5
	M37710M8LXXXHP		500	2.7 to 5.5			-40 to 85	80P6D-A/80P6Q-A
	M37710E8BXXXFP	One time PROM	160	4.5 to 5.5			-20 to 85	80P6N-A
	M37710E8LXXXHP		500	2.7 to 5.5			-40 to 85	80P6D-A/80P6Q-A
	M37710E8BFS	Windowed EPROM <sup>(Note)</sup>	160	4.5 to 5.5			-20 to 85	80D0
	M37710M4BXXXFP	Mask ROM	32K	1K			160	4.5 to 5.5
	M37710M4BXXXGFP				500	2.7 to 5.5	-40 to 85	80P6S-A
	M37710M4LXXXFP	One time PROM			160	4.5 to 5.5	-20 to 85	80P6N-A
	M37710E4BXXXGFP				500	2.7 to 5.5	-40 to 85	80P6S-A
	M37710E4LXXXFP	Windowed EPROM <sup>(Note)</sup>			160	4.5 to 5.5	-20 to 85	80D0
	M37710E4BFS	External ROM			—	2K	160	4.5 to 5.5
M37710S4BFP	500		2.7 to 5.5	-40 to 85			80P6D-A/80P6Q-A	
7704	M37704M4BXXXFP	Mask ROM	32K	1K	160	4.5 to 5.5	-20 to 85	80P6N-A
	M37704E4BXXXFP	One time PROM						80D0
	M37704E4BFS	Windowed EPROM <sup>(Note)</sup>						80P6N-A
	M37704M3BXXXFP	Mask ROM	24K	512	250	4.5 to 5.5	-20 to 85	80P6N-A
	M37704M2AXXXFP	One time PROM	16K					80D0
	M37704E2AXXXFP	Windowed EPROM <sup>(Note)</sup>	—					80P6N-A
	M37704S1AFP	External ROM	—					80D0
7705	M37705M4BXXXSP	Mask ROM	32K	1K	160	4.5 to 5.5	-20 to 85	64P4B
	M37705E4BXXXSP	One time PROM						64S1B-E
	M37705M3BXXXSP	Mask ROM	24K	512	250	4.5 to 5.5	-20 to 85	64P4B
	M37705M2AXXXSP	One time PROM	16K					64S1B-E
	M37705E2AXXXSP	Windowed EPROM <sup>(Note)</sup>	—					64P4B
	M37705S1ASP	External ROM	—					64P4B

Note: The windowed EPROM version is only for evaluation.

## 7700 Series

### MCUs Featuring Enhanced Power Saving Function

#### 7733 Group

#### 7735 Group

Each of the 7733/7735 Groups consists of general-purpose MCUs featuring enhanced power saving function (50 % better than the 7702 Group MCUs) with internal 32 kHz clock oscillation circuit.



- Cellular Phone
- DECT
- Personal Digital Assistant (PDA) product

### MCUs Incorporating DMA Controller

#### 7721 Group

The 7721 Group consists of MCUs developed for the office automation and telecommunication market in which large-sized memory and high-speed data transfer (memory-to-memory and memory-to-I/O) are required. Each MCU incorporates a DMA controller and a DRAM controller.



- Printer
- Facsimile
- Image scanner
- High-speed modem
- Network controller

## Product Expansion

Items		Group	7733	7735	7721
Programmable I/O Port Pins			68		53
16-bit Timer			5 + 3		
Serial I/O (channels)	Clock Sync./UART		3		2
	UART only		—		
A-D Converter (channels)	8-bit		—		8
	10-bit		8		—
D-A Converter (resolution x channels)			—		
Interrupt Sources	External		3		
	Internal		16		20
12-bit Watchdog Timer			Available		
Other Functions			<ul style="list-style-type: none"> <li>• Clock oscillation circuit</li> <li>• A-D converter: reference-voltage-input cutoff function</li> <li>• 7702/7710-type external bus</li> </ul>	<ul style="list-style-type: none"> <li>• Clock oscillation circuit</li> <li>• A-D converter: reference-voltage-input cutoff function</li> <li>• 7735-type external bus</li> </ul>	<ul style="list-style-type: none"> <li>• 4-channel DMA controller</li> <li>• DRAM controller</li> <li>• Real-time output</li> </ul>

## Product Lineup

Group	MCU	Memory Type	Internal Memory		Minimum Instruction Execution Time (ns)	Operating Voltage (V)	Operating Temperature (°C)	Package		
			ROM (Byte)	RAM (Byte)						
7733	M37733MHBXXXFP	Mask ROM	124K	3.9K	160	4.5 to 5.5	-20 to 85	80P6N-A		
	M37733MHLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A		
	M37733EBBXXXFP	One time PROM			160	4.5 to 5.5	-20 to 85	80P6N-A		
	M37733EHLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A		
	M37733EHBFS	Windowed EPROM (Note)			160	4.5 to 5.5	-20 to 85	80D0		
	M37733M4BXXXFP	Mask ROM			32K	2K	333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
	M37733M4LXXXHP						160	4.5 to 5.5	-20 to 85	80P6N-A
	M37733S4BFP	External ROM			—	—	333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
M37733S4LHP	160		4.5 to 5.5	-20 to 85			80P6N-A			
7735	M37735MHBXXXFP	Mask ROM	124K	3.9K	160	4.5 to 5.5	-20 to 85	80P6N-A		
	M37735MHLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A		
	M37735EBBXXXFP	One time PROM			160	4.5 to 5.5	-20 to 85	80P6N-A		
	M37735EHLXXXHP				333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A		
	M37735EHBFS	Windowed EPROM (Note)			160	4.5 to 5.5	-20 to 85	80D0		
	M37735M4BXXXFP	Mask ROM			32K	2K	333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
	M37735M4LXXXHP						160	4.5 to 5.5	-20 to 85	80P6N-A
	M37735S8LHP	External ROM			—	—	333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
	M37735S4BFP						160	4.5 to 5.5	-20 to 85	80P6N-A
	M37735S4LHP						333	2.7 to 5.5	-40 to 85	80P6D-A / 80P6Q-A
M37735S4LHP	160		4.5 to 5.5	-20 to 85			80P6N-A			
7721	M37721S2BFP	External ROM	—	1K	160	4.5 to 5.5	-20 to 85	100P6S-A		
	M37721S1BFP								512	

Note: The windowed EPROM version is only for evaluation.

# 8-bit 740 Family

The 740 Family is applicable to a wide range of system needs due to superior features like instruction sets, which are highly appropriate to control applications, high-level peripheral functions, and low power consumption. This family offers a wide variety of MCUs with a rich array of functions. Whatever the applications, from household electric appliances to industrial equipment, the Mitsubishi lineup has an MCU to meet the needs of the user's system.

## Features

- Wide product lineup with diverse features to meet diverse needs
- A variety of ROM/RAM expansion with pin-compatibility maintained
- Supports EPROM and One Time PROM versions
- Supports small-sized (low pin-count) package
- Increased speed, enhanced peripheral functions
- Lowest power consumption class in the industry
- High-level software development environment

## Application Map

Applications	General-purpose MCUs featuring low pin-count package (See page 28.)	General-purpose MCUs (See page 29.)	MCUs with built-in FLD (VFD) driver (See page 30.)	MCUs with built-in LCD driver (See page 31.)	MCUs with built-in specific functions (See the corresponding page.)
VCR					
Audio Equipment					
Electric Household Appliance	7531 7540**	3803* 3804*	3812 3819 38B5 38B3** 38B7*		
Telephone	3850 3851	3807 3886			3826 (see page 34.)
Amusement Products					
Remote Controller					
Compact Camera				7529 3820 3822 3825 38C2** 38C3 38C8* 7560**	7513 7528* (see page 34.)
Smart Battery					7515 7516 (see page 33.)
Communication Equipment					3826 (see page 34.)
OA Equipment		3807			
Automobile	(see page 41.)				3874 7630 (see page 32.)
Communication					7508 (see page 32.)
PC Peripherals					3881 3886 (For the following USB MCUs, see page 44.) 7532 7534* 7536 7640 7641* 38K0** 38K2**
TV					7200 7270 7210 7280 7220 (For TV MCUs, see page 40.)

## General-purpose MCUs Featuring Low Pin-count Package

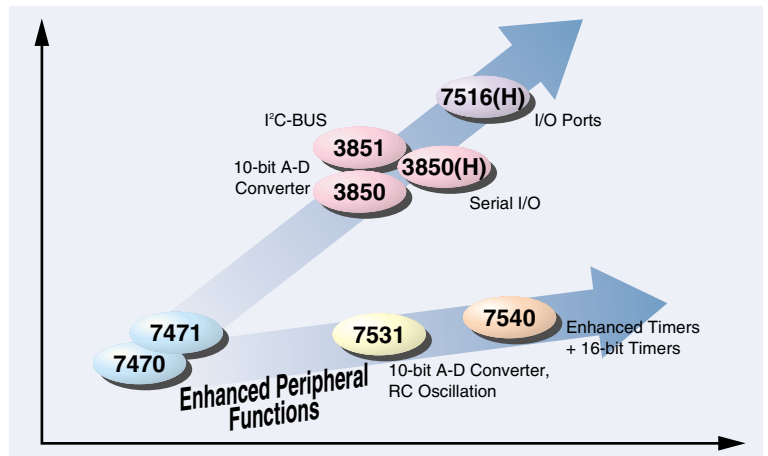
In response to the trends of system downsizing and cost reduction, we have integrated the functions and performance of the 8-bit MCU into a small (low pin-count) package. Each of these MCUs also has a built-in serial I/O for clock synchronous/UART communication and an A-D converter to enable analog signal input into a digital-signal-processing MCU, making the MCU adaptable to compact electric household appliances.

- Applications**
- Remote controller
  - VCR
  - Audio equipment
  - Household electric appliance
  - Telephone
  - Amusement products

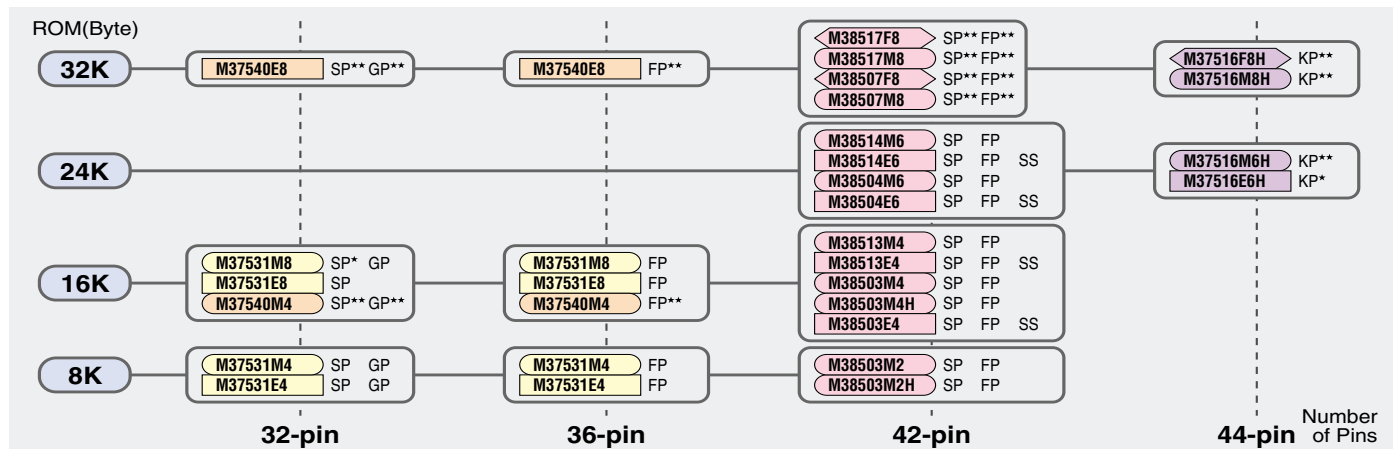
### Note : I<sup>2</sup>C-BUS (3851 and 7516 Groups)

Purchase of MITSUBISHI ELECTRIC CORPORATION'S I<sup>2</sup>C components conveys a license under the Philips I<sup>2</sup>C Patents Rights to use these components an I<sup>2</sup>C system, provided that the system conforms to the I<sup>2</sup>C Standard Specification as defined by Philips.

## Expansion



## Product Lineup



Package	Lead Pitch (mm)	SP	FP	SP	SS (Windowed)	KP	
32-pin SDIP (32P4B)	1.778	32-pin SDIP (32P4B)	1.778	42-pin SDIP (42P4B)	1.778	44-pin QFN (44P0X)	0.5
32-pin SOP (32P2W-A)	1.27	36-pin SSOP (36P2R-A)	0.8	42-pin SSOP (42P2R-A/E)	0.8		
32-pin LQFP (32P6U-A)	0.8			42-pin SDIP (42S1B-A)	1.778		

- "M" of M3xxxxMx indicates the mask ROM version.
- "E" of M3xxxxEx indicates the EPROM or One Time PROM version.
- ◻ "F" of M3xxxxFx indicates the flash memory version.

## Product Expansion

Items		Group		7531		7540**		3850(H)			3851		7516**		
Internal Memory	ROM (Kbytes)	8	16	16	32	8	16	24	32**	16	24	32**	24	32	
	RAM (bytes)	256	384	512	768	512	512	640	1K**	512	640	1K**	640	1K	
I/O Ports	C MOS Input	—													
	C MOS Input/Output	29	25	29	25	32						34			
	N-channel Open-drain	—													
Timers	8-bit x 3			8-bit x 4, 16-bit x 1			8-bit x 4								
Serial I/O (channels)	Clock Sync./UART	—			8-bit x 1			8-bit x 1							
	Clock Sync. Only	8-bit x 1			(8-bit x 1)			—							
	UART only	8-bit x 1			—			8-bit x 1							
A-D Converter (resolution x channels)	10-bit x 8	10-bit x 6	10-bit x 8	10-bit x 6	10-bit x 5						10-bit x 6				
External Interrupt Sources	4	3	5	4	6			7							
Sub-clock Circuit	—														
Key-on Wakeup Function	8														
Other Functions	• Watchdog timer • RC oscillation						• Watchdog timer • 8-bit PWM • I <sup>2</sup> C-BUS (3851)						• Watchdog timer • 8-bit PWM • I <sup>2</sup> C-BUS (option)		
Package	36-pin SSOP	32-pin SDIP	32-pin LQFP	36-pin SSOP	32-pin LQFP	32-pin LQFP	32-pin SDIP	42-pin SSOP 42-pin SDIP						44-pin QFN	
Operating Voltage (V)	2.2 to 5.5														
Operating Ambient Temperature (°C)	-20 to 85														
Minimum Instruction Execution Time (μs)	0.5 (8 MHz)			0.34 (6 MHz)			0.5 (8 MHz)								
Number of Basic Instructions	69														

\*\* Under Development

# 8-bit 740 Family

## General-purpose MCUs

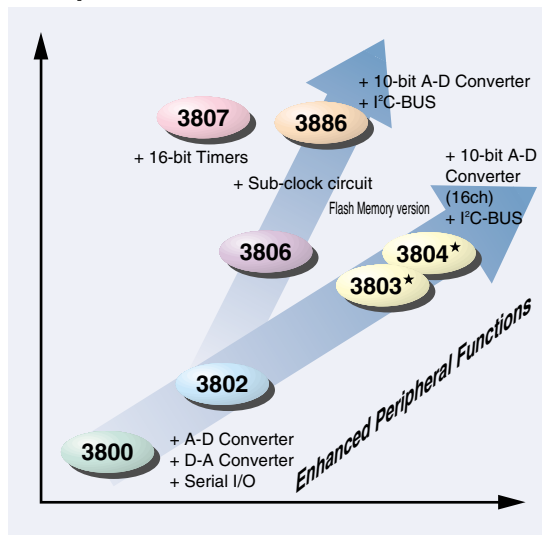
This MCU type offers a variety of packages (64-pin to 80-pin types), and each MCU has the standard CMOS I/O ports. On a base of ample memory and package expansion, a wide lineup is available, with many internal peripheral devices, such as an A-D converter, D-A converter, multifunctional timer, and serial I/O.

- Applications**
- Audio equipment
  - Electric household appliance
  - Telephone
  - Amusement product
  - OA equipment

### Note : I<sup>2</sup>C-BUS (3804 and 3886 Groups)

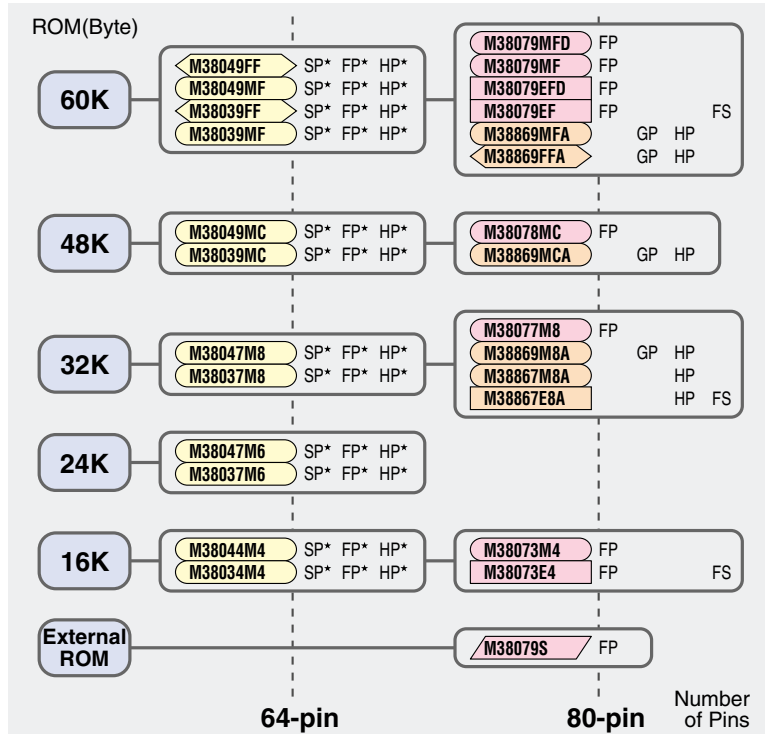
Purchase of MITSUBISHI ELECTRIC CORPORATION'S I<sup>2</sup>C components conveys a license under the Philips I<sup>2</sup>C Patents Rights to use these components an I<sup>2</sup>C system, provided that the system conforms to the I<sup>2</sup>C Standard Specification as defined by Philips.

## Expansion



★ New Product

## Product Lineup



Package	Lead Pitch (mm)	SP	64-pin SDIP (64P4B)	1.778	FP	80-pin QFP (80P6N-A)	0.8
		FP	64-pin QFP (64P6N-A)	0.8	GP	80-pin QFP (80P6S-A)	0.65
		HP	64-pin LQFP (64P6Q-A)	0.5	HP	80-pin LQFP (80P6Q-A)	0.5
		FS (Windowed)	80-pin QFN (80D0)	—			

- "M" of M3xxxxMx indicates the mask ROM version. ★ New Product
- "E" of M3xxxxEx indicates the EPROM or One Time PROM version.
- ▭ "F" of M3xxxxFx indicates the flash memory version.
- ▭ "S" of M3xxxxSx indicates the external ROM version.

## Product Expansion


Group		3803*					3804*					3886			3807					
Internal Memory	ROM (Kbytes)	16	24	32	48	60	16	24	32	48	60	32	48	60	0	16	32	48	60	
	RAM (bytes)	640	1K	2K			640	1K	2K	1K		2K			2K	512	1K	1.5K	2K	
I/O Ports	CMOS Input															2				
	CMOS Input/Output	54														68				
	N-channel Open-drain	2														8				
Timers		8-bit x 4														8-bit x 4				
		16-bit x 1														8-bit x 3				
Serial I/O (channels)	Clock Sync./UART	8-bit x 2														8-bit x 1				
	Clock Sync. Only	8-bit x 1																		
A-D Converter (resolution x channels)		10-bit x 16														10-bit x 8				
D-A Converter (channels)		8-bit x 2														8-bit x 4				
External Interrupt Sources		8														9				
Sub-clock Circuit		Available																		
Key-on Wakeup Function		—														8				
Watchdog timer		Available																		
PWM		8-bit x 1														14-bit x 2				
I <sup>2</sup> C-BUS		—														Available (option)				
Other Functions		—														<ul style="list-style-type: none"> <li>• Comparator x 8</li> <li>• Bus interface</li> </ul>				
Package		64-pin SDIP, 64-pin QFP, 64-pin LQFP														80-pin QFP, 80-pin LQFP				
Operating Voltage (V)		2.7 to 5.5														2.7 to 5.5				
Operating Ambient Temperature (°C)		-20 to 85														-20 to 85				
Minimum Instruction Execution Time (μs)		0.24 (16.8 MHz)														0.4 (10 MHz)				
Number of Basic Instructions																71				

D version : Wide operating temperature range version (3807 Group)  
A version : High-speed version (3886 Group)

★ New Product

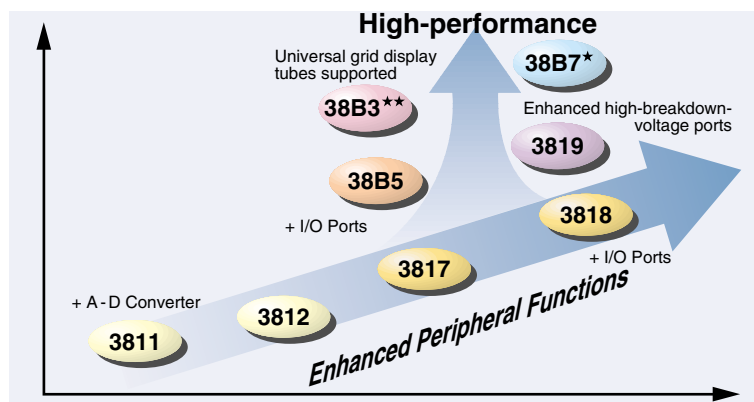
## MCUs with built-in FLD (VFD) Driver

This lineup is being developed with HBV output ports<sup>(Note 1)</sup> which directly drive vacuum fluorescent display tubes. It is ideally appropriate to display applications in VCRs, microwave ranges, audio equipment. Each of the 38B3, 38B5, 38B7 Groups has a built-in automatic display circuit applicable with the universal grid display tubes, providing a high degree of display flexibility. For the FLD (VFD) controllers and digit expanders, see page 45.

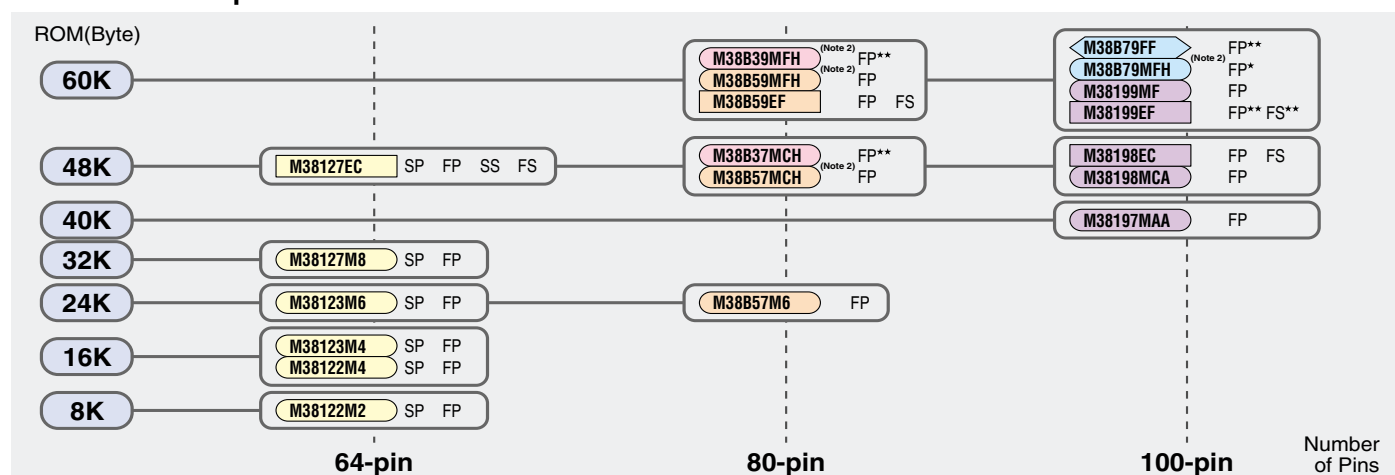
-  ● VCR ● Audio equipment
- Electric household appliance

Note 1: HBV output ports = High-Breakdown-Voltage output ports

## Expansion



## Product Lineup



Package	Lead Pitch (mm)	SP	64-pin SDIP (64P4B)	1.77	FP	80-pin QFP (80P6N-A)	0.8	FP	100-pin QFP (100P6N-A)	0.65
		FP	64-pin QFP (64P6N-A)	0.8	FS (Windowed)	80-pin QFN (80D0)	—	FS (Windowed)	100-pin QFN (100D0)	—
		SS (Windowed)	64-pin SDIP (64S1B-E)	1.77						
		FS (Windowed)	64-pin QFN (64D0)	—						

- "M" of M3xxxxMx indicates the mask ROM version.
- "E" of M3xxxxEx indicates the EPROM or One Time PROM version.
- "F" of M3xxxxFx indicates the flash memory version.

Note 2: "H version" means the mask option version for the HBV pull-down resistor. "A version" means the "withstand voltage = Vcc-45V" version.

## Product Expansion

Group		3812	38B5	38B3**	3819	38B7*
Internal Memory	ROM (Kbytes)	8   16   24   32   48	24   48   60	48   60	40   48   60	60
	RAM (bytes)	384   512   1K	1K   2K	1K   2K	1K   1.5K   2K	2K
I/O Ports	CMOS Input	2		1	2	—
	CMOS Input/Output	18		27	34	39
	N-channel Open-drain	4		8		—
	High-breakdown-voltage P-channel open-drain	28		36		52
	TLL-level Input	4		16	4	40
Timers		8-bit x 6	8-bit x 6, 16-bit x 1		8-bit x 6	8-bit x 6, 16-bit x 1
Serial I/O (channels)	Clock Sync./UART	—	8-bit x 1		—	8-bit x 1
	Clock Sync. Only	8-bit x 1		—	8-bit x 2	1
	UART Only (with automatic transfer function)	—		8-bit x 1		1
A-D Converter (resolution x channels)	8-bit x 8		10-bit x 12		8-bit x 16	10-bit x 16
FLD (VFD) Controller/Driver	—		40 (Controller output)		Segment: 16 to 42, Digit: 6 to 16	56 (Controller output)
External Interrupt Sources					5	
Sub-clock Circuit					Available	
Key-on Wakeup Function					—	
PWM		8-bit x 1	8-bit x 1, 14-bit x 1		8-bit x 1	8-bit x 1, 14-bit x 1
Other Functions		• Zero cross detection input	• Interrupt interval determination circuit • Middle-breakdown-voltage port x 8 • Gradation display • Buzzer output	• Interrupt interval determination circuit • Gradation display • Buzzer output	• Interrupt interval determination circuit • Zero cross detection input • 8-bit D-A converter x 1	• Interrupt interval determination circuit • 8-bit D-A converter x 1 • Gradation display • Buzzer output
Package		64-pin SDIP, 64-pin QFP	80-pin QFP		100-pin QFP	
Operating Voltage (V)			4.0 to 5.5			
Operating Ambient Temperature (°C)		-10 to 85	-20 to 85		-10 to 85	-20 to 85
Minimum Instruction Execution Time (μs)		0.63 (6.3 MHz)	0.48 (4.2 MHz)		0.48 (8.4 MHz)	0.48 (4.2 MHz)
Number of Basic Instructions			71			

★ New Product, ★★ Under Development

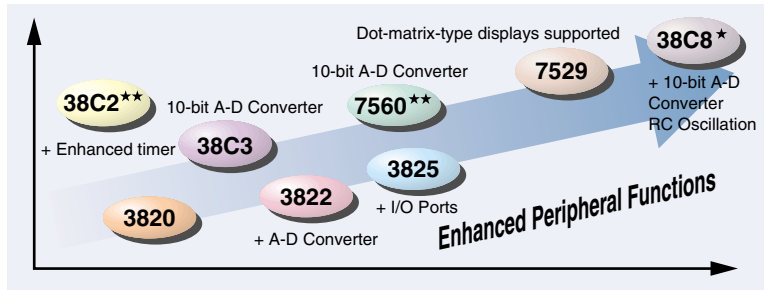
# 8-bit 740 Family

## MCUs with Built-in LCD Driver

Each of these MCUs has a built-in LCD controller/driver and is applicable to a variety of segment-type and dot-matrix-type displays. Moreover, the power saving is enabled with the sub-clock oscillation circuit and key-on wakeup function, which are appropriate to portable equipment.

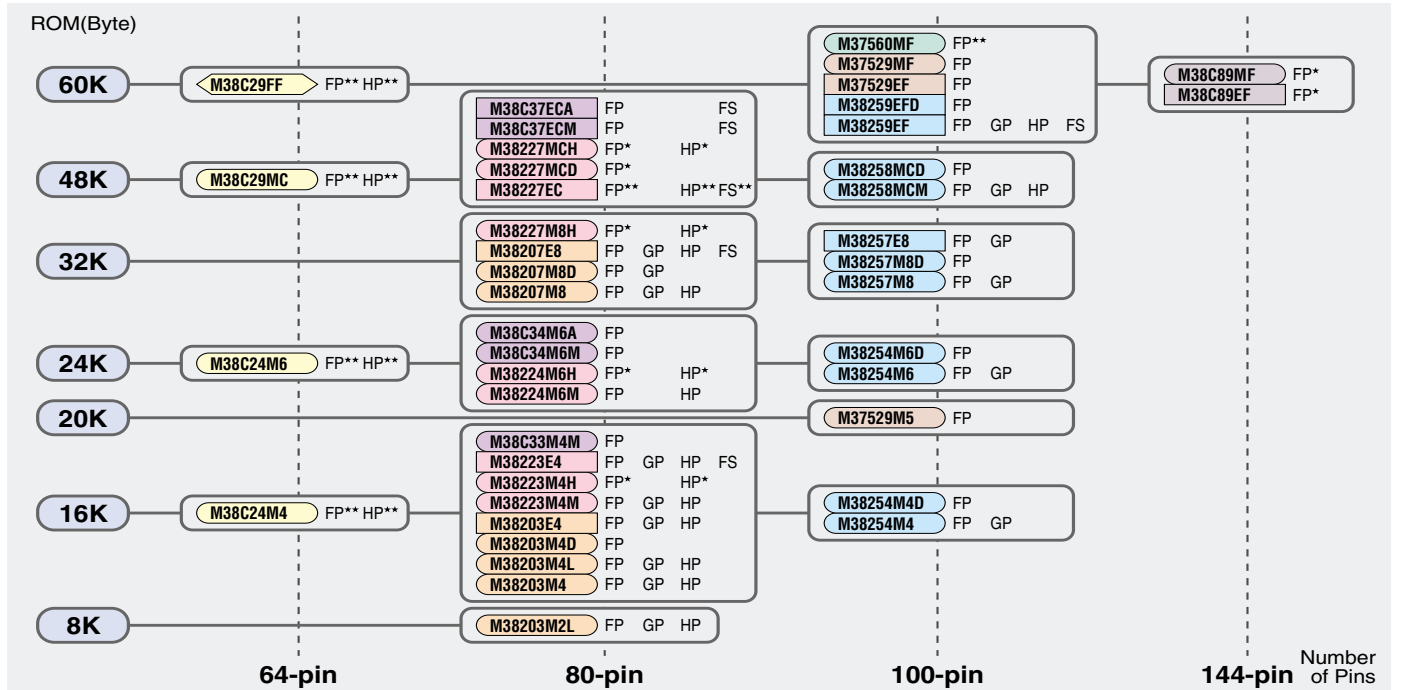
- Remote controller
- Audio equipment
- Household electric appliance
- Telephone
- Compact camera

## Expansion



★ New Product, ★★ Under Development

## Product Lineup



Package	Lead Pitch (mm)	FP	64-pin QFP (64P6N-A)	0.8	FP	80-pin QFP (80P6N-A)	0.8	FP	100-pin QFP (100P6S-A)	0.65	FP	144-pin LQFP (144P6Q-A)	0.5
		HP	64-pin LQFP (64P6Q-A)	0.5	GP	80-pin QFP (80P6S-A)	0.65	GP	100-pin LQFP (100P6Q-A)	0.5			
		HP			HP	80-pin LQFP (80P6Q-A)	0.5	HP	100-pin TQFP (100PF6-A)	0.4			
		FS (Windowed)			FS (Windowed)	80-pin QFN (80D0)	—	FS (Windowed)	100-pin QFN (100D0)	—			

- "M" of M3xxxxMx indicates the mask ROM version.
- "E" of M3xxxxEx indicates the EPROM or One Time PROM version.
- ◁ "F" of M3xxxxFx indicates the flash memory version.

★ New Product  
★★ Under Development

## Product Expansion

Group		38C2**	3820	3822	38C3	3825	7560**	7529	38C8*
Internal Memory	ROM (Kbytes)	16   24   48   60	8   16   32	8   16   24   32   48*	16   24   48	16   24   32   48   60	60	20   60	60
	RAM (bytes)	640   2K	512   1K	384   512   640   1K   1K*	512   640   1K	640   1K   1.5K   2K	2.5K	512   2K	2K
I/O Ports	CMOS Input	—	9	5	—	—	1	—	—
	CMOS Input/Output	51	43	49	57 (TTL input: 8)	44	55	44	35
	CMOS Output	—	—	—	8	—	8	—	—
Timers		8-bit x 4, 16-bit x 2	8-bit x 3, 16-bit x 2	8-bit x 6, 16-bit x 1	8-bit x 3, 16-bit x 2				
Serial I/O	Clock sync./UART	8-bit x 2	8-bit x 1		—	8-bit x 1		8-bit x 2	8-bit x 1
	Clock sync. Only	—	8-bit x 1	—	8-bit x 1	—	8-bit x 1	—	—
A-D converter (resolution x channels)		10-bit x 8	—	8-bit x 8	10-bit x 8	8-bit x 8		—	10-bit x 8
LCD Controller/Driver		Segment: 24, Common: 4	Segment: 40, Common: 4	Segment: 32, Common: 4		Segment: 40, Common: 4 (Voltage multiplier incorporated)		Segment: 36/52, Common: 32/16 (Voltage multiplier incorporated)	Segment: 52/68, Common: 32/16 (Voltage multiplier incorporated)
External Interrupt Sources		6	7	8	6	8	7	5	
Sub-clock Circuit		Available							
Key-on Wakeup Function		8							
Watchdog timer		Available							
Package		64-pin QFP 64-pin LQFP	80-pin QFP			100-pin QFP 100-pin LQFP 100-pin TQFP	100-pin QFP		144-pin LQFP
Operating Voltage (V)		Mask ROM version : 1.8 to 5.5 Flash Memory version : 2.5 to 5.5	2.5 to 5.5 (Note) (L version : 2.2 to 5.5) (D version : 3.0 to 5.5)	(M version : 2.2 to 5.5 (Note)) (H version : 2.0 to 5.5) (D version : 3.0 to 5.5)	2.5 to 5.5 (Note) (M version : 2.2 to 5.5)	2.5 to 5.5 (Note) (M version : 2.2 to 5.5) (D version : 3.0 to 5.5)	2.5 to 5.5		2.2 to 5.5 (Note)
Operating Ambient Temperature (°C)		-20 to 85							
Minimum Instruction Execution Time (µs)		0.25 (8 MHz)							
Number of Basic Instructions		71							

★ New Product, ★★ Under Development

D version: Wide operating temperature range version (3820 and 3825 Groups)  
L and M versions: Low-power-voltage version (3820, 3822, 38C3, and 3825 Groups)  
Note: The operating voltage of each of the EPROM and One Time PROM Versions is in the range from 2.5 to 5.5V.

## MCUs with Built-in Communication Protocol Controller

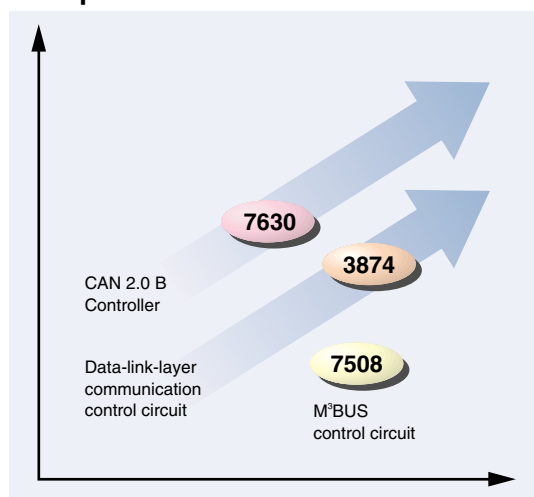
Each of these MCUs makes it possible to build LANs (max.: approx. 40 kbps) according to the customer's specific communication protocols. It is highly appropriate to applications which require dispersion control, such as car audio equipment, automotive electronics, vending machines, etc.

**Applications** • Communication • Automobile

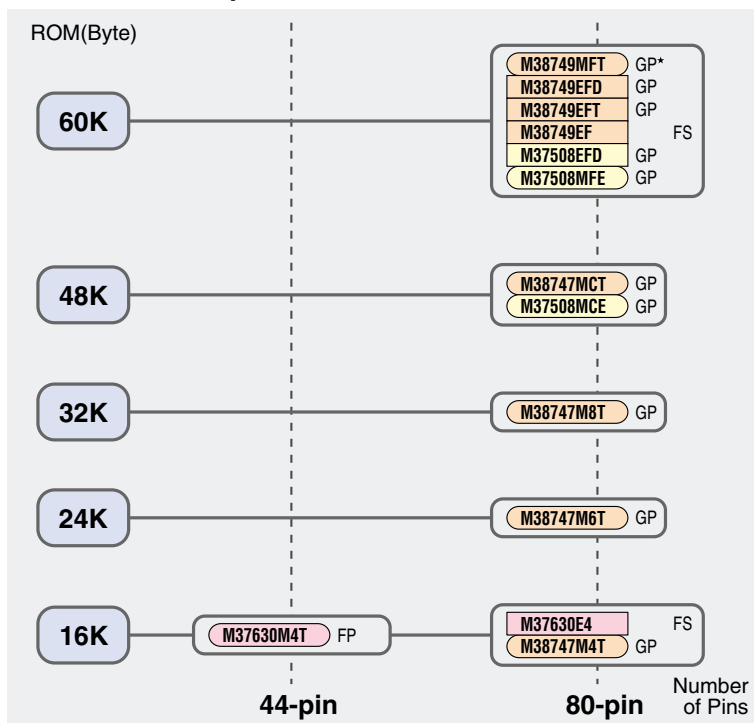
### Note: 3874 Group

Please contact a Mitsubishi local sales office in your region.

## Expansion



## Product Lineup



Package	Lead Pitch (mm)	FP	44-pin QFP (44P6N-A)	0.8	GP	80-pin QFP (80P6S-A)	0.65
					FS (Windowed)	80-pin QFN (80D0)	—

○ "M" of M3xxxxMx indicates the mask ROM version. ★ New Product  
□ "E" of M3xxxxEx indicates the EPROM or One Time PROM version.

## Product Expansion

Items		Group		7508					3874					7630	
Internal Memory	ROM (Kbytes)	48	60	16	24	32	48	60*						16	
	RAM (bytes)	1K	2K	1K	1K	1K	1K	2K*						512	
I/O Ports	CMOS Input	1													
	CMOS Input/Output	72												35	
	N-channel Open-drain	—													
Timers		8-bit x 3 16-bit x 2													
Serial I/O (channels)	Clock Sync./UART	8-bit x 1												—	
	Clock Sync. Only	8-bit x 1													
	UART Only (arbitrary-bit-length transfer/automatic transfer: selectable)	8-bit x 1												—	
	UART only	—												8-bit x 1	
A-D Converter (resolution x channels)		8-bit x 8													
D-A Converter (resolution x channels)		8-bit x 1												—	
External Interrupt Sources		9												6	
Sub-clock Circuit		Available												—	
Key-on Wakeup Function		8													
Watchdog Timer		Available													
Other Functions		• M²BUS communication control circuit				• Data-link-layer communication control circuit				• CAN 2.0 Controller					
Package		80-pin QFP												44-pin QFP	
Operating Voltage (V)		3.0 to 5.5												4.0 to 5.5	
Operating Ambient Temperature (°C)		-40 to 85													
Minimum Instruction Execution Time (μs)		0.32 (6.4 MHz)												0.2 (10 MHz)	
Number of Basic Instructions		71													

D, E, F, and T versions: Wide operating temperature range versions (7508, 3874, 7630, and 7632 Groups)

★ New Product



## Keyboard Control MCUs and Smart Battery MCUs

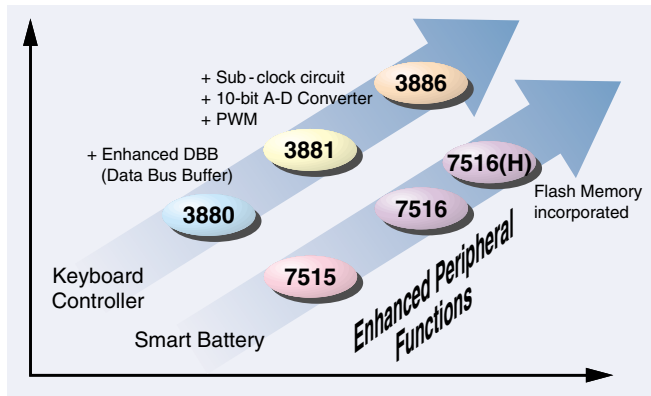
### ● Keyboard Control MCUs

3881 Group    3886 Group

Keyboard control MCUs are equipped with a bus interface circuit and comparator circuit.

Applications ● Keyboard ● Input device ● PC peripherals

### Expansion



### ● MCUs for Smart Batteries

7515 Group    7516 Group

This MCU has a built-in 10-bit A-D converter with the highest resolution in the industry and is highly appropriate to lithium batteries. It is also geared for smart batteries with the ultra compact package and I<sup>2</sup>C-BUS interface.

Applications ● Smart battery

#### 1 : I<sup>2</sup>C-BUS (3886 Group)

Purchase of MITSUBISHI ELECTRIC CORPORATION'S I<sup>2</sup>C components conveys a license under the Philips I<sup>2</sup>C Patents Rights to use these components an I<sup>2</sup>C system, provided that the system conforms to the I<sup>2</sup>C Standard Specification as defined by Philips.

#### 2 : Special-purpose firmware

MultiKey™/3881L, MultiKey™/3886L

MultiKey/388xL is a Phoenix's general-purpose keyboard control firmware. MultiKey/388xL includes the power management function, HOTKEY function, SMBus communication function, and ACPI function, etc.

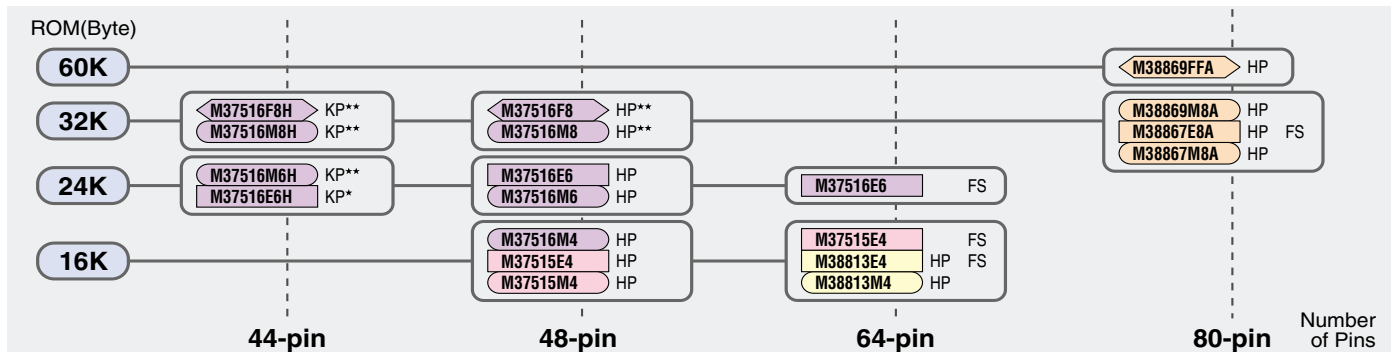
\*Phoenix Technologies Ltd. (U.S.A: +1-408-570-1000)

\*MultiKey is a trademark of Phoenix Technologies Ltd.

●SMBus (System Management Bus) : a special-purpose serial bus for notebook PCs. It is advocated by 7 companies including Intel Corporation, Duracell, and Mitsubishi Electric Corporation.

●ACPI (Advanced Configuration and Power Interface) : a BIOS interface for power management of the next-generation PCs. It is advocated by Intel Corporation, Microsoft Corporation, and TOSHIBA CORPORATION.

## Product Lineup



Package	Lead Pitch (mm)	Part Number	Pin Count	Lead Pitch (mm)	Part Number	Pin Count	Lead Pitch (mm)	Part Number	Pin Count	Lead Pitch (mm)	Part Number	Pin Count
KP	0.5	M37516F8H	44	0.5	HP	48	0.5	HP	64	0.5	FP	80
HP	0.5	M37516M8H	44	0.5	HP	48	0.5	FS (Windowed)	64	—	GP	80
HP	0.5	M37516M6H	44	0.5	HP	48	0.5	HP	64	0.5	HP	80
HP	0.5	M37516M6E6H	44	0.5	HP	48	0.5	HP	64	0.5	FS (Windowed)	80
HP	0.5	M37516M4	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M37516E6	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M37516E4	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M37515E4	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M38813E4	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M38813M4	48	0.5	HP	48	0.5	HP	64	0.5	—	—
HP	0.5	M38869FFA	80	0.5	HP	80	0.5	HP	80	0.5	—	—
HP	0.8	M38869M8A	80	0.8	HP	80	0.8	HP	80	0.8	—	—
HP	0.8	M38867E8A	80	0.8	HP	80	0.8	HP	80	0.8	—	—
HP	0.5	M38867M8A	80	0.5	HP	80	0.5	HP	80	0.5	—	—

○ "M" of M3xxxMx indicates the mask ROM version.  
 □ "E" of M3xxxEx indicates the EPROM or One Time PROM version.  
 ◁ "F" of M3xxxFx indicates the flash memory version.

★ New Product, ★★ Under Development

## Product Expansion

Group		3881	3886	7515	7516
Internal Memory	ROM (Kbytes)	16	32   60	16	16   24   32**
	RAM (bytes)	512	1K   2K	512	512   640   1K**
I/O Ports	CMOS Input	—	—	—	—
	CMOS Input/Output	40	64	38	38, 34 (M37516F8HKP)
	N-channel Open-drain	6	8	—	2
Timers		8-bit x 3	—	8-bit x 4	—
Serial I/O (channels)	Clock sync./UART	—	—	8-bit x 1	—
	Clock sync. Only	—	8-bit x 1	—	8-bit x 1
	UART only	—	—	—	—
A-D Converter (resolution x channels)		—	—	10-bit x 8	10-bit x 8, 10-bit x 6 (M37516F8HKP)
D-A Converter (resolution x channels)		—	8-bit x 2	—	—
External Incompact Sources		8	9	—	7
PWM		—	14-bit x 2	—	8-bit x 1
Sub-clock Circuit		—	—	Available	—
Key-on Wakeup Function		—	8	—	—
Comparator		—	8	—	—
Bus Interface		—	Available	—	—
Other Functions		—	—	●I <sup>2</sup> C-BUS (option) ●Watchdog timer	—
Package		64-pin LQFP	80-pin LQFP	48-pin LQFP	48-pin LQFP, 44-pin QFN
Operating Voltage (V)		2.7 to 5.5	2.7 to 5.5 (Flash Memory version : 4.0 to 5.5)	—	2.7 to 5.5
Operating Ambient Temperature (°C)		—	—	-20 to 85	—
Minimum Instruction Execution Time (ns/μs)		0.5μs (8 MHz)	0.4μs (10 MHz)	—	0.5 (8 MHz)
Number of Basic Instructions		—	—	71	—

Note: This applies only for the flash memory version.

★★ Under Development

## MCUs for Communication Equipment and Compact Cameras

### ● MCUs for Communication Equipment 3826 Group

These MCUs are adaptable to systems with built-in LCD drivers, particularly appropriate to communication equipment. DTFM and CTCSS output are possible by using the internal 8-bit D-A converter. Internal peripheral functions such as serial I/O communication and PWM output have also been enhanced, making this MCU applicable to the wide range of products requiring LCD.

 ● Communication equipment

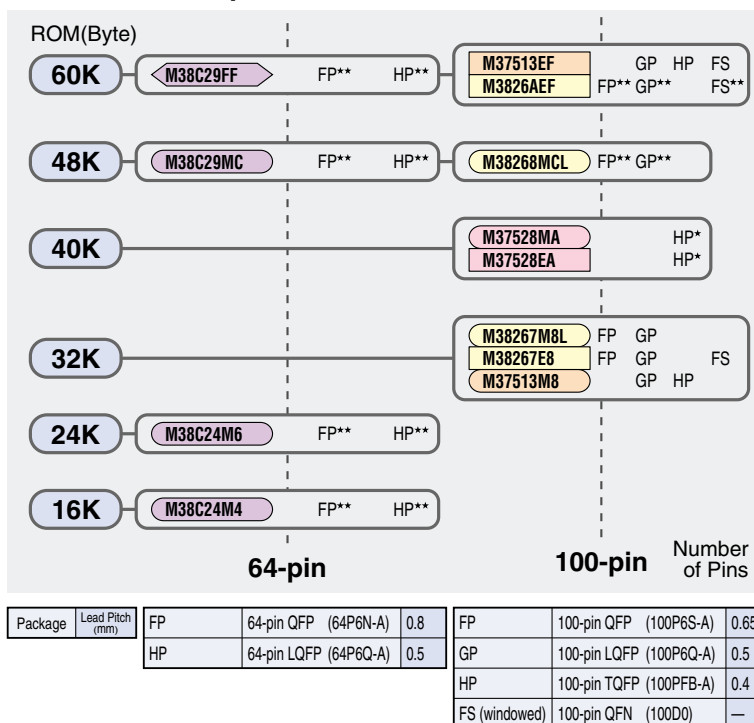
### ● MCUs for Compact Cameras

38C2 Group 7513 Group 7528 Group

These MCUs are adaptable to systems with built-in LCD drivers, particularly appropriate to compact camera appliances, compared with other MCUs which incorporate LCD driver (7528 Group).

 ● Compact camera

## Product Lineup



M of M3xxxxMx indicates the mask ROM version. ★ New Product  
E of M3xxxxEx indicates the EPROM or One Time PROM version. ★★ Under Development  
F of M3xxxxFx indicates the flash memory version.

## Product Expansion

Items	Group	3826			7513		7528*	38C2**			
		32	48**	60**	32	60	40	16	24	48	60
Internal Memory	ROM (Kbytes)	32	48**	60**	32	60	40	16	24	48	60
	RAM (bytes)	1K	1.5K**	2.5K**	1K	2K	1K	640		2K	
I/O Ports	CMOS Input	1					7	—			
	CMOS Input/Output	55					57	51			
	N-channel Open-drain	1			—		8	—			
	CMOS Output	8					—				
Timers		8-bit x 3, 16-bit x 2						8-bit x 4, 16-bit x 2			
Serial I/O (channels)	Clock Sync./UART	8-bit x 1						8-bit x 2			
	Clock sync. Only	8-bit x 1						—			
	UART Only	—									
A-D Converter (resolution x channels)		8-bit x 8		10-bit x 8		10-bit x 12	10-bit x 8				
D-A Converter (resolution x channels)		8-bit x 2						—			
External Interrupt Sources		8		7		6					
PWM		8-bit x 1						10-bit x 2			
Sub-clock Circuit		Available									
Key-on Wakeup Function		8									
Other Functions		●DTMF/CTCSS function ●LCD controller/driver Segment : 40 Common : 4 (Voltage multiplier incorporated)			●LCD controller/driver Segment : 40 Common : 4 (Voltage multiplier incorporated)		●LCD controller/driver Segment : 28 Common : 4 ●DC-DC voltage multiplier ●Reset circuit, Battery detection, Temperature detection		●LCD controller/driver Segment : 24 Common : 4 ●Watchdog timer		
Package		100-pin QFP 100-pin LQFP		100-pin LQFP 100-pin TQFP		100-pin TQFP	64-pin QFP 64-pin LQFP				
Operating Voltage (V)		2.2 to 5.5 (Note)		2.2 to 5.5		2.2 to 5.5 (Note)	Mask ROM version : 1.8 to 5.5 Flash Memory version : 2.5 to 5.5				
Operating Ambient Temperature (°C)		-20 to 85									
Minimum Instruction Execution Time (μs)		0.5 (8 MHz)					0.25 (8 MHz)				
Number of Basic Instructions		71									

Note: The operating voltage of each EPROM / One Time PROM version is in the range from 2.5 to 5.5 V.

★ New Product, ★★ Under Development

# 4-bit 720/4500 Series

Mitsubishi 4-bit MCUs are categorized into the following types:

- General-purpose MCUs used to control a variety of equipment**  
4250, 4570, 4580 Groups  
(with 10-bit A-D converter incorporated),  
4501, 4502, 4506, 4507, 4513, 4514, 4515 Groups
- MCUs with built-in LCD drivers for driving LC panels**  
4520, 4551, 4555 Groups
- Remote control MCUs, which output various carrier waves** (See page 39.)

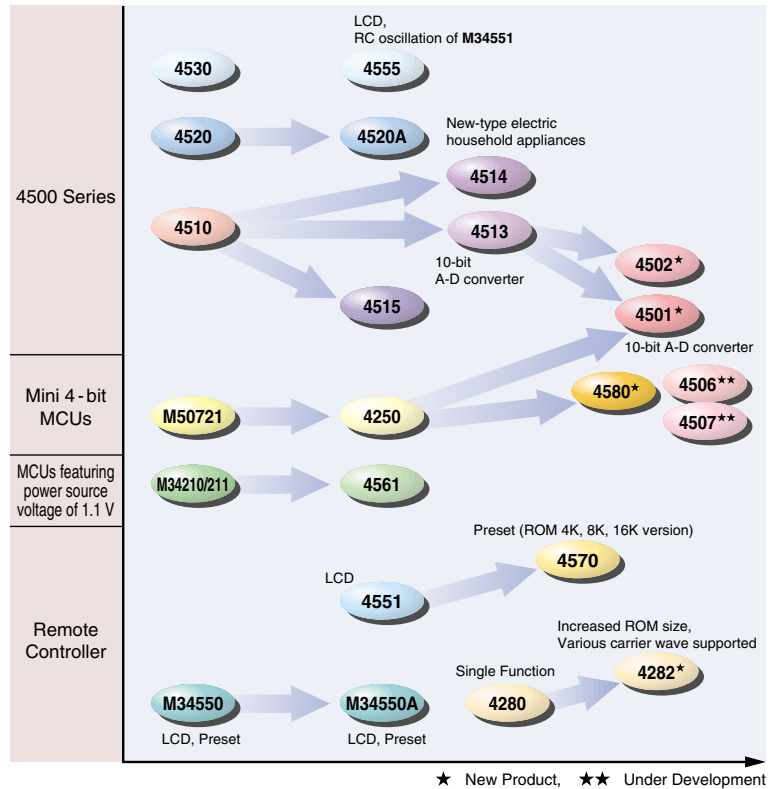
With the low voltage requirements and low power consumption, the 4-bit MCUs support size-conscious applications, such as remote controllers, compact electric household appliances, PC peripherals, and battery chargers. Internal peripheral circuits reduce the number of devices required by the application. Moreover, the One Time PROM version, including 20-pin MCUs, is fully supported.

## 720 Series, 4500 Series

- 10-bit\* instruction set with high ROM code efficiency  
\* As for the 720 series, 9-bit system is applied.
- Small-sized Package
- High-performance peripheral circuits : watchdog timer, voltage drop detection circuit, etc.
- One Time PROM version supported.
- Development support tools for Windows™ (4500 Series)

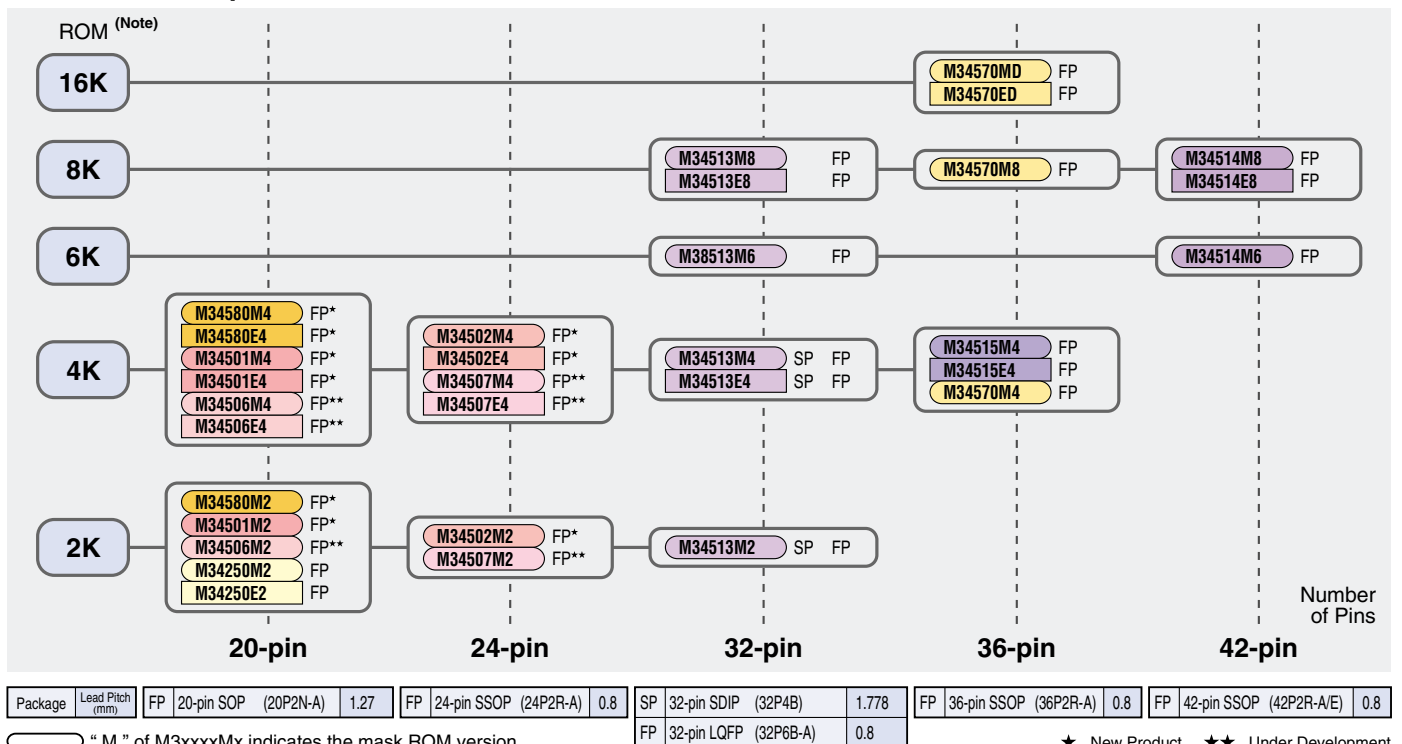
**Note:** Windows is a registered trademark of Microsoft Corporation in the U.S. and other countries.

## 4-bit MCUs Expansion



- Remote Controller
- Mini Electric Household Product
- PC, Input device of amusement game
- Battery charger

## Product Lineup



“ M ” of M3xxxxMx indicates the mask ROM version.

“ E ” of M3xxxxEx indicates the EPROM or One Time PROM version.

**Note:** As for the 720 Series, (word x 9 bits) is applied. As for the 4500 Series, (word x 10 bits) is applied.

## General-purpose MCUs

### Product Expansion

Group		4250	4570			4580*	
CPU Core		720	4500				
Internal Memory	ROM (word x 10 bits)	2048 (Note 1)	4096	8192	16384	2048	4096
	RAM (word x 4 bits)	64	128				
I/O Ports	N-channel Open-drain Output	16 (including 8 ports which can handle 7 V)	10			—	
	N-channel Open-drain Input/Output	—	12			14	
	Input Only	—	—				
Timers		8-bit x 1	10-bit x 1, 8-bit x 2			8-bit x 2	
A-D Converter (resolution x channels)		—					
Serial I/O		—					
Interrupt Sources		2 (External x 1)	4 (External x 1)			3 (External x 1)	
Sub-clock Circuit		—					
RAM hold function		Available					
Key-on Wakeup Function		8	13			12	
Other Functions		• Drives LED directly	• Drives LED directly • Reset (Voltage drop detection circuit) • Watchdog timer • Carrier-wave generation circuit			• Drives LED directly • Reset (Voltage drop detection circuit) • Watchdog timer • Multi comparator	
Package		20-pin SOP	36-pin SSOP			20-pin SOP	
Operating Voltage (V)		2.2 to 5.5 (Note 2)	2.0 to 5.5 (Note 2)			VRST (Note 3) to 5.5	
Minimum Instruction Execution Time (μs)		1 (4 MHz)	0.75 (4 MHz)			0.68 (4.4 MHz)	
Operating Ambient Temperature (°C)		–20 to 85	–20 to 70			–20 to 85	
Number of Basic Instructions		70	99			108	

Notes 1: ROM (word x 9 bits)

2: The operating voltage of each EPROM / One Time PROM version is in the range from 2.5 to 5.5V.

3: VRST = Voltage drop detection voltage

★ New Product

## General-purpose MCUs (with built-in 10-bit A-D Converter)

### Product Expansion

Group		4501*		4502*		4506**		4507**		4513		4514		4515		
CPU Core		4500														
Internal Memory	ROM (word x 10 bits)	2048	4096	2048	4096	2048	4096	2048	4096	2048	4096	6144	8192	6144	8192	4096
	RAM (word x 4 bits)	128	256	128	256	128	256	128	256	128	256	384	384	384	256	
I/O Ports	N-channel Open-drain Output	—														
	N-channel Open-drain Input/Output	14	18	14	18	18	18 (including 8 ports which can handle 12 V)		28	28 (including 8 ports which can handle 12 V)		18	18 (including 6 ports which can handle 12 V)			
	Input Only	—										3		2		
Timers		8-bit x 2						8-bit x 4				8-bit x 1, 12-bit x 1				
A-D Converter (resolution x channels)		10-bit x 2		10-bit x 4		10-bit x 2		10-bit x 4				10-bit x 8		10-bit x 12		
Serial I/O		Not Available										Available				
Interrupt Sources		4 (External x 1)														
Sub-clock Circuit		—														
RAM hold function		Available														
Key-on Wakeup Function		12						10				9				
Other Functions		• Drives LED directly • Reset (Voltage drop detection circuit) • Watchdog timer				• Drives LED directly • Watchdog timer				• Drives LED directly • Reset (Voltage drop detection circuit) • Watchdog timer • Voltage comparator function				• Drives LED directly • Reset (Voltage drop detection circuit) • Watchdog timer		
Package		20-pin SOP		24-pin SSOP		20-pin SOP		24-pin SSOP		32-pin SDIP 32-pin LQFP		42-pin SSOP		36-pin SSOP		
Operating Voltage (V)		VRST (Note 1) to 5.5				2.0 to 5.5				2.0 to 5.5 (Note 2)						
Minimum Instruction Execution Time (μs)		0.68 (4.4 MHz)														
Operating Ambient Temperature (°C)		–20 to 85														
Number of Basic Instructions		111	113	110	112	123	128	103								

Notes 1: VRST = Voltage drop detection voltage

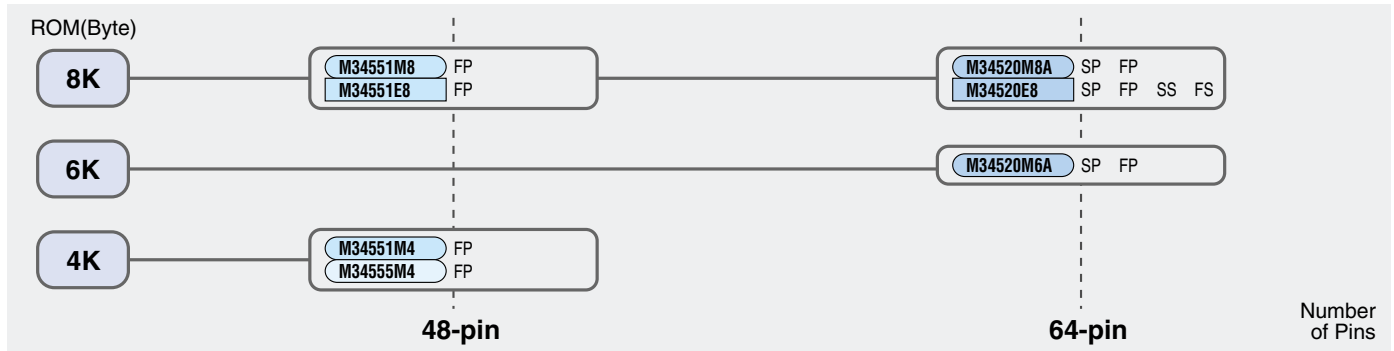
2: The operating voltage of each EPROM / One Time PROM version is in the range from 2.5 to 5.5V.

★ New Product, \*\* Under Development

# 4-bit 720/4500 Series

## MCUs with built-in LCD drivers

### Product Lineup



Package	Lead Pitch (mm)	FP	48-pin QFP (48P6S-A)	0.65	SP	64-pin SDIP (64P4B)	1.778
					FP	64-pin QFP (60P6N-A)	0.8
					SS	64-pin Ceramic (64S1B-E)	1.778
					FS	64-pin Ceramic (64D0)	—

“M” of M3xxxxMx indicates the mask ROM version.  
 “E” of M3xxxxEx indicates the EPROM or One Time PROM version.

### Product Expansion

Items		Group		4520		4551		4555					
Internal Memory	ROM (word x 10 bits)	6144	8192	4096	8192	4096							
	RAM (word x 4 bits)	384				280							
I/O Ports	N-channel Open-drain Output	—				8							
	N-channel Open-drain Input/Output	19 (including 10 ports which can handle 12 V)				8							
	HBV P-channel Open-drain Input/Output	—				—							
	Input Only	12				4							
Timers		8-bit x 4				8-bit x 1, 14-bit x 1							
A-D Converter (resolution x channels)		8-bit x 8				—							
Serial I/O		Available				—							
Interrupt Sources		8 (External x 2)				3 (External x 1)							
Sub-clock Circuit		Available											
RAM hold function		Available											
Key-on Wakeup Function		9				8				9			
Other Functions		<ul style="list-style-type: none"> <li>• Zero-cross detection circuit</li> <li>• Real-time output</li> <li>• LCD control circuit Segment 27 Common 4</li> <li>• Watchdog timer</li> </ul>				<ul style="list-style-type: none"> <li>• Reset (Voltage drop detection circuit)</li> <li>• Watchdog timer</li> <li>• LCD control circuit Segment 20 Common 4</li> <li>• Carrier-wave generation circuit</li> </ul>				<ul style="list-style-type: none"> <li>• RC oscillation circuit</li> <li>• Reset (Voltage drop detection circuit)</li> <li>• Watchdog timer</li> <li>• LCD control circuit Segment 20 Common 4</li> </ul>			
Package		64-pin SDIP 64-pin QFP				48-pin QFP							
Operating Voltage (V)		2.2 to 5.5 (Note)								2.2 to 5.5			
Minimum Instruction Execution Time (μs)		0.75 (4 MHz)				1.5 (2 MHz)							
Operating Ambient Temperature (°C)		-20 to 85 (M34520E8SS : -20 to 70)				-20 to 70							
Number of Basic Instructions		129				92							

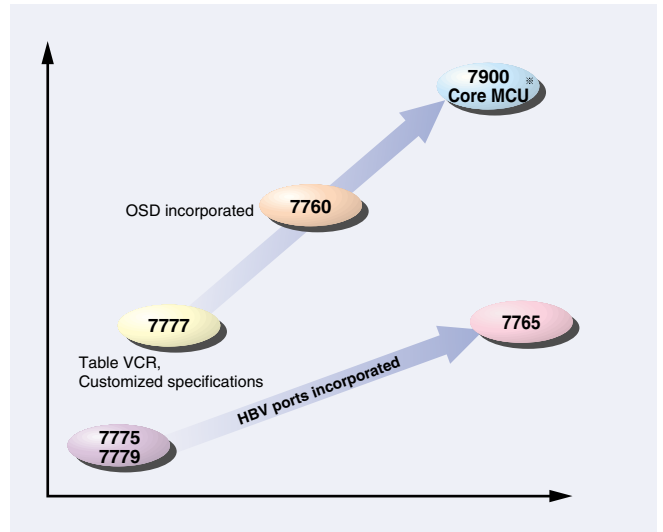
Note: The operating voltage of each EPROM / One Time PROM version is in the range from 2.5 to 5.5 V.

# VCR Software Servo MCUs

## 7770 Series

The VCR software servo MCUs of the 7700 Family have been developed particularly for VCR control. They feature high-performance internal peripheral functions such as an analog amplifier, clock count function, real-time pattern output function, OSD, etc.

## Expansion



※ Planning stage

## Product Expansion

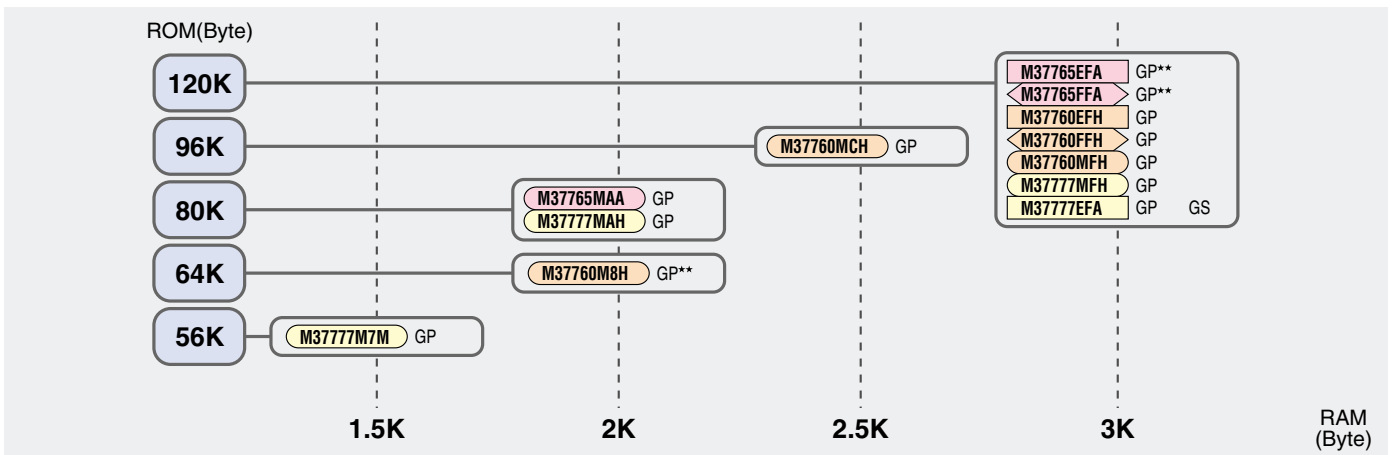
Items		7777			7760			7765	
Internal Memory	ROM (Kbyte)	56	80	120	64	96	120	80	120** (Note 1)
	RAM (byte)	1536	120K	3072	2048	2560	3072	2048	3072** (Note 1)
Clock Frequency (MHz)		12 (Double Speed)						9 (Double Speed)	
Minimum Instruction Execution Time (ns)		167						222	
Functions	CTL Amp.	Available						—	
	HBV Ports (Note 2)	—						Available	
	I <sup>2</sup> C-BUS	Available						Available	
	OSD	—			Available				
Package		100-pin TQFP							
Operating Voltage (V)		4.5 to 5.5, 2.6 to 5.5 (at 32 kHz)			4.0 to 5.5, 2.6 to 5.5 (at 32 kHz) Flash Memory version : 4.0 to 5.5			4.5 to 5.5 2.7 to 5.5 (at 32 kHz) Flash Memory version : 4.5 to 5.5	
Operating Ambient Temperature (°C)		-20 to 70						-10 to 70	

Note 1: This applies to the flash memory and One Time PROM version.

Note 2: HBV Ports = High-Breakdown-Voltage Ports

★★ Under Development

## Product Lineup



○ "M" of M3xxxxMx indicates the mask ROM version.

□ "E" of M3xxxxEx indicates the EPROM or One Time PROM version.

◻ "F" of M3xxxxFx indicates the flash memory version.

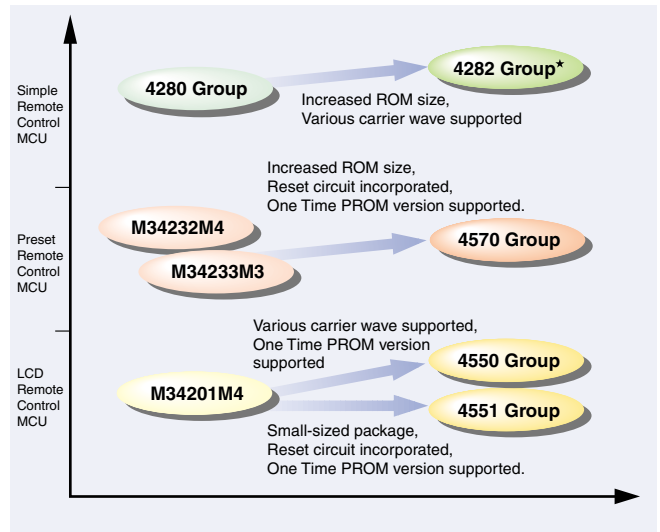
Package		Lead Pitch (mm)
GP	100-pin TQFP (100P6P-E)	0.65
GS	100-pin QFN (100D0)	

★★ Under Development

# Remote Controller MCUs

These 4-bit MCUs for remote control transmitters make it possible to output transmission codes with different configurations, to output multiple customized codes, to input user-selected key combinations, etc.

## Expansion



★ New Product

## Product Lineup

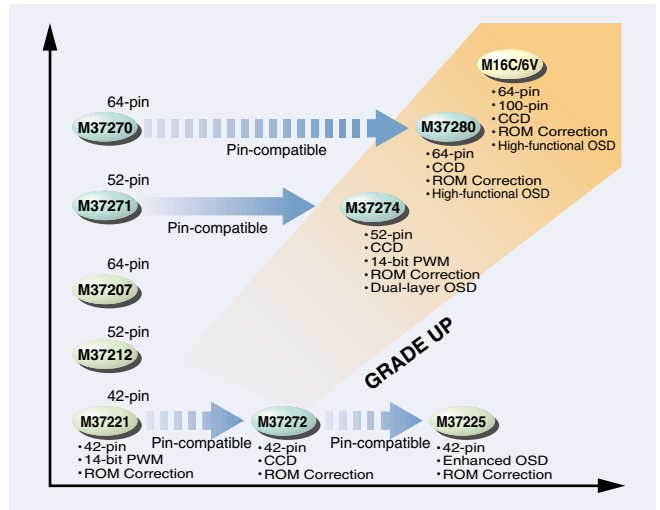
Type	MCU	Memory Type	Memory Size (bytes)		Operating Ambient Temperature (°C)	Operating Voltage (V)	Ports for Key-matrix		I/O Ports for Expansion	Stack register (stage)	Signal Output for Remote Control	Functions			Package																																			
			ROM (words x bits)	RAM (words x bits)			Input	Output				LCD Driver	RAM Hold Function	Number of Carrier Wave Modes (Note)																																				
Simple Remote Control	M34280M1-XXXFP	Mask ROM	1024 x 9	32 x 4	-20 to 85	1.8 to 3.6	7	8	0	4	1	—	●	7	20-pin SOP (20P2N-A)																																			
	M34280M1-XXXGP														20-pin SSOP (20P2E/F-A)																																			
	M34280E1FP	One Time PROM													2048 x 9	64 x 4	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●	P	20-pin SOP (20P2N-A)																							
	M34280E1GP																										20-pin SSOP (20P2E/F-A)																							
	M34282M1-XXXGP*	Mask ROM																									2048 x 9	64 x 4	-20 to 70	2.5 to 3.6	8	10	10	8	1	—	●	P	20-pin SSOP (20P2E/F-A)											
	M34282M2-XXXGP*																																							20-pin SSOP (20P2E/F-A)										
M34282E2GP**	One Time PROM	16384 x 10	280 x 4	-20 to 70	2.5 to 5.5	8	5	7	8	1	●	●	12	48-pin QFP (48P6S-A)																																				
M34550M4-XXXFP	Mask ROM																																							4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●	P
M34550M6A-XXXFP															6144 x 10																																			
M34550M8A-XXXFP	Mask ROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	10	8	1	—	●	P														36-pin SSOP (36P2R-A)										
M34550E8FP																											8192 x 10																							
M34550E8FS	EPROM																										16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)											
M34570M4-XXXFP	Mask ROM	4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●	P	80-pin QFP (80P6N-A)																																					
M34570M8-XXXFP		8192 x 10																																																
M34570MD-XXXFP	Mask ROM	16384 x 10												368 x 4																											-20 to 70	2.5 to 3.6	8	10	10	8	1	—	●	P
M34570EDFP															16384 x 10																																			
M34550M4-XXXFP	Mask ROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P														80-pin LCC (80D0)										
M34550M6A-XXXFP																											6144 x 10																							
M34550M8A-XXXFP	Mask ROM		16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●														P	80-pin LCC (80D0)																						
M34550E8FP																													8192 x 10																					
M34550E8FS	EPROM	16384 x 10												368 x 4															-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)											
M34551M4-XXXFP	Mask ROM																																								4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●
M34551M8-XXXFP															8192 x 10																																			
M34551E8FP	One Time PROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P														80-pin LCC (80D0)										
M34551M4-XXXFP	Mask ROM		4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●	P														80-pin LCC (80D0)																							
M34551M8-XXXFP			8192 x 10																																															
M34551E8FP	One Time PROM	16384 x 10	368 x 4											-20 to 70														2.5 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)													
M34551M4-XXXFP	Mask ROM																																					4096 x 10	-20 to 70		2.2 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)
M34551M8-XXXFP																																						8192 x 10												
M34551E8FP	One Time PROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P												80-pin LCC (80D0)												
M34551M4-XXXFP	Mask ROM			4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●	●														P													80-pin LCC (80D0)										
M34551M8-XXXFP				8192 x 10																																														
M34551E8FP	One Time PROM	16384 x 10	368 x 4	-20 to 70										2.5 to 3.6														8	10	13	8	1	●	●	P	80-pin LCC (80D0)														
M34551M4-XXXFP	Mask ROM																																				4096 x 10		-20 to 70		2.2 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)
M34551M8-XXXFP																																					8192 x 10													
M34551E8FP	One Time PROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P											80-pin LCC (80D0)													
M34551M4-XXXFP	Mask ROM				4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1	●														●											P		80-pin LCC (80D0)										
M34551M8-XXXFP					8192 x 10																																													
M34551E8FP	One Time PROM	16384 x 10	368 x 4	-20 to 70	2.5 to 3.6									8														10	13	8	1	●	●	P	80-pin LCC (80D0)															
M34551M4-XXXFP	Mask ROM																																			4096 x 10			-20 to 70		2.2 to 3.6	8	10	13	8	1	●	●	P	80-pin LCC (80D0)
M34551M8-XXXFP																																				8192 x 10														
M34551E8FP	One Time PROM														16384 x 10	368 x 4	-20 to 70	2.5 to 3.6	8	10	13	8	1	●	●	P										80-pin LCC (80D0)														
M34551M4-XXXFP	Mask ROM					4096 x 10	-20 to 70	2.2 to 3.6	8	10	13	8	1														●										●	P		80-pin LCC (80D0)										
M34551M8-XXXFP						8192 x 10																																												

Note: P= Various carrier waves

★ New Product, ★★ Under Development

Each of these MCUs has embedded tuning functions and 8-bit 740 Family CPU core: OSD, PWM, and A-D converter/comparator, etc. In addition to MCU series featuring the embedded Closed Caption Decoder (CCD) for the North American TV market, we have developed new MCU series featuring the CPU core of the M16C/60 Series, and rich internal peripheral functions, such as the CCD and OSD functions.

## Expansion



## Product Lineup

Type	Group	MCU	Memory Type	Memory Size (bytes)		Package	Timer	Serial I/O	I <sup>2</sup> C-BUS	A-D (Note 3) (resolution x channels)	PWM	14-bit PWM	ROM Correction	HBV Port (12V)	OSD		CCD	Remarks										
				ROM (Note 1)	RAM										Displayed Characters characters x lines	Kinds of Characters												
VS	7220	M37220M2-XXXSP	Mask ROM	8K	256	42P4B	8 x 4	1	1 (Note 2)	6-bit x 6	8-bit x 6	1	●	6	20 x 2	128	—											
		M37220M3-XXXSP		12K	256										24 x 2	256												
		M37221M4-XXXSP		16K	320																							
		M37221M6-XXXSP		24K	384																							
		M37221M8-XXXSP		32K	576																							
		M37221MA-XXXSP	40K	704																								
		M37221EFSP	One Time PROM	62K	1280	42P2R-A/E	8 x 4	1	1 (Note 2)	6-bit x 6	8-bit x 6	1	●	6	20 x 2	128	—											
		M37220M3-XXXFP	Mask ROM	12K	256										24 x 2	381												
		M37224M3-XXXSP	Mask ROM	12K	320																							
		M37221M6-XXXFP	Mask ROM	24K	384	42P2R-A/E	8 x 4	1	1 (Note 2)	8-bit x 8 *	2	●	6	24 x 2	381	—												
	M37221EASFP/FP	One Time PROM	40K	704																								
	M37225M6-XXXSP	Mask ROM	24K	1024	42P4B	8 x 4	1	1 (Note 2)	8-bit x 8 *	2	●	6	24 x 2	381	—													
	M37225M8-XXXSP	Mask ROM	32K	576																								
	M37225ECSP	One Time PROM	48K	2048	52P4B	8 x 4	1	—	5-bit x 5	6-bit x 8	1	—	12	18 x 2	96	—												
	M37211M2-XXXSP	Mask ROM	8K	192										52P4B/64P6N-A	8 x 4			1	—	6-bit x 8	8-bit x 8	1	—	12	24 x 2	256	—	
	M37210M3-XXXSP/FP	Mask ROM	12K	256																								
	M37210M4-XXXSP	Mask ROM	16K	320										52P4B/80P6N-A	8 x 4			1	1 (Note 2)	6-bit x 8	8-bit x 8	1	●	12	24 x 2	256	—	
	M37210E4SP/FP	One Time PROM	16K	320																								
	M37212M4-XXXSP	Mask ROM	16K	320										52P4B/80P6N-A	8 x 4			1	1 (Note 2)	6-bit x 8	8-bit x 8	1	●	12	24 x 2	256	—	
	M37212M6-XXXSP/FP	Mask ROM	24K	384																								
M37212M8-XXXSP	Mask ROM	32K	576	52P4B/80P6N-A	8 x 4	1	1 (Note 2)	6-bit x 8	8-bit x 8	1	●	12	24 x 2	256	—													
M37212EFSP/FP	One Time PROM	62K	1280																									
M37207M8-XXXSP	Mask ROM	32K	576	64P4B	8 x 6	1	1 (Note 2)	6-bit x 8	8-bit x 10	1	●	10	24 x 3	384	—													
M37207MC-XXXSP	Mask ROM	48K	768																									
M37207MF-XXXSP/FP	Mask ROM	62K	1024																									
M37207EFSP/FP	One Time PROM	62K	1024																									
CCD	7270	M37272M6-XXXSP/FP	Mask ROM	24K	1024	42P4B	8 x 6	1	1 (Note 2)	6-bit x 6	8-bit x 6	—	●	6	32 x 2	254	●											
		M37272M8-XXXSP/FP	Mask ROM	32K	1152										42P2R-A/E	8 x 6			1	1 (Note 2)	6-bit x 6	8-bit x 6	—	●	6	32 x 2	254	
		M37272E8SP/FP	One Time PROM	60K	1472	52P4B	8 x 6	1	1 (Note 2)	6-bit x 6	8-bit x 6	—	●	6			32 x 2	254								●		
		M37272MA-XXXSP	Mask ROM	40K	1472																							
		M37272EFSP	One Time PROM	60K	1472	52P4B	8 x 6	1	1 (Note 2)	6-bit x 6	8-bit x 6	—	●	6	32 x 2	254	●											
		M37273M8-XXXSP	Mask ROM	32K	1152																							
		M37273E8SP	One Time PROM	60K	1472	52P4B	8 x 6	1	1 (Note 2)	8-bit x 6 *	8-bit x 7	1	●	7	36 x 12	256	●	Dual-layer OSD										
		M37273MF-XXXSP	Mask ROM	60K	1472																							
		M37273EFSP	One Time PROM	60K	1472	52P4B	8 x 6	1	1 (Note 2)	8-bit x 4 *	8-bit x 7	—	—	7	40 x 16	320	●	Dual-layer OSD										
		M37274MA-XXXSP	Mask ROM	40K	832																							
	M37274EFSP	One Time PROM	60K	1086	64P4B	8 x 6	1	1 (Note 2)	8-bit x 4 *	8-bit x 8	—	—	11	40 x 16	320	●	Dual-layer OSD											
	M37271MF-XXXSP	Mask ROM	60K	1024																								
	M37271EFSP	One Time PROM	60K	1024	64P4B	8 x 6	1	1 (Note 2)	8-bit x 4 *	8-bit x 8	—	—	11	40 x 16	320	●	Dual-layer OSD											
	M37270MF-XXXSP	Mask ROM	60K	1024																								
	M37270EFSP	One Time PROM	60K	1024	64P4B	8 x 6	1	1 (Note 2)	8-bit x 8 *	8-bit x 8	—	●	8	32 x 16	572	●	Triple-layer OSD											
	M37280MF-XXXSP	Mask ROM	60K	1088																								
	M37280MK-XXXSP	Mask ROM	80K	1536																								
	M16C/6V	M16C/6V	M306V0ME-XXXFP	Mask ROM	192K	5120	100P6S-A	16 x 8	2	1 (Note 2)	8-bit x 6 *	16-bit x 2 (Note 4)	—	●	—	42 x 16	825	●	Triple-layer (OSD : 64 colors)									
			M306V2ME-XXXFP *				64P4B									890	Triple-layer (OSD : 512 colors)											
			M306V5ME-XXXSP *				100P6S-A									825	Triple-layer (OSD : 64 colors)											
M306V0EEFP			One Time PROM	100P6S-A			890									Triple-layer (OSD : 512 colors)												
M306V2EEFP *				64P4B			890									Triple-layer (OSD : 512 colors)												
M306V5EESP *				64P4B			890									Triple-layer (OSD : 512 colors)												

Notes 1: The RAM size of an MCU with built-in ROM correct function includes the ROM correct memory.  
 2: Multi-master I<sup>2</sup>C-BUS; 1 channel x 2 systems  
 3: \* indicates an A-D converter. All others are A-D comparators.  
 4: PWM output using 16-bit timer enabled (2 channels).

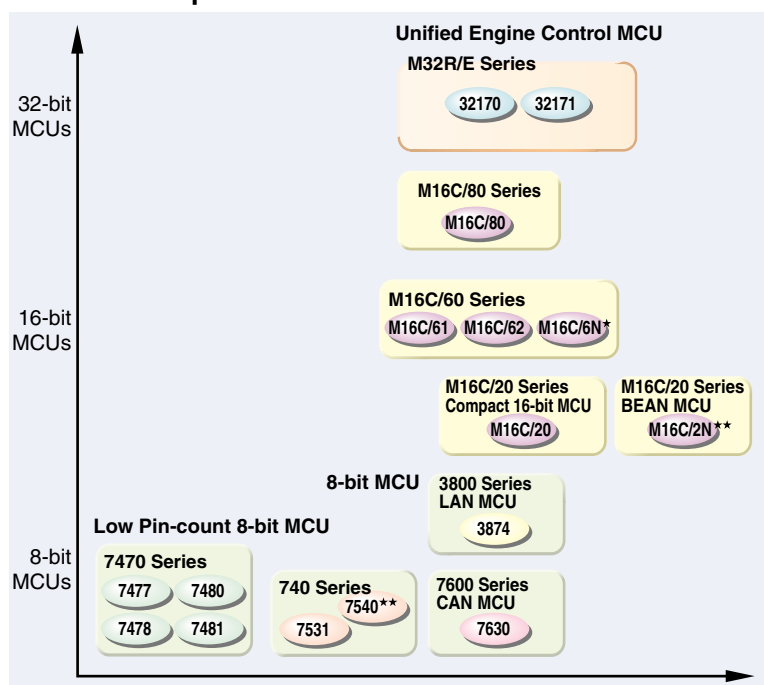
★ New Product



Although MCUs become more sophisticated and multifunctional, and application fields continue to expand, some MCUs may not be able to fulfill itself depending on the usage purpose or environment requirements.

The MCUs introduced here are geared for wide operating temperature ranges, making them applicable for outdoor control equipment, car audio, air conditioners, and other products.

### Product Expansion



★ New Product, ★★ Under Development

### 32-bit Automobile MCUs Lineup

#### M32R/E Series

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
32170	M32170FxVFP M32170FxVWG**	768K 512K 384K	40K 32K 32K	10	25	-40 to 85	External I/O : 4.5 to 5.5	2	155	<ul style="list-style-type: none"> <li>• Output Timer x 35</li> <li>• I/O Timer x 10</li> <li>• 16-bit Input Timer x 11</li> <li>• 32-bit Input Timer x 8</li> <li>• 10-bit A-D Converter (16 x 2 channels)</li> <li>• DMAC (10 channels)</li> <li>• Serial I/O x 6</li> <li>• CAN 1ch</li> </ul>	240P6Y-A 255F7F**
				8	31.25	(Note) -40 to 125					
32171	M32171FxVFP	512K 384K	16K 16K	10	25	-40 to 85	Internal Logic : 3.0 to 3.6	2	95	<ul style="list-style-type: none"> <li>• Output Timer x 11</li> <li>• I/O Timer x 10</li> <li>• 16-bit Input Timer x 8</li> <li>• 32-bit Input Timer x 8</li> <li>• 10-bit A-D Converter (16 channels)</li> <li>• DMAC (10 channels)</li> <li>• Serial I/O x 3</li> <li>• CAN 1ch</li> </ul>	144P6Q-A
				8	31.25	(Note) -40 to 125					

Before adopting the above products for engine control, please contact an authorized Mitsubishi Semiconductor product distributor.

★★ Under Development

**Note:** The continuous operation at 125°C is not guaranteed. For details about the development of the system requiring operations at 125°C, please contact an authorized Mitsubishi Semiconductor product distributor.

16-bit Automobile MCUs Lineup

M16C/60 Series

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
M16C/61	M30613M4T-XXXGP M30613E4T-XXXGP	32K	4K	10	100	-40 to 85	4.0 to 5.5		70	<ul style="list-style-type: none"> <li>• 10-bit A-D Converter (26 channels)</li> <li>• 16-bit Timer x 8</li> <li>• UART x 3 (clock synchronous serial I/O selectable)</li> <li>• DMAC (2 channels) • D-A Converter (2 channels)</li> <li>• Watchdog Timer • CRC Code Generating Circuit</li> </ul>	80P6S
	M30612M8T-XXXFP M30612E8T-XXXFP**	64K	4K								
M16C/62	M30622M8T-XXXFP M30622M8V-XXXFP	64K	4K	16	62.5	-40 to 125	4.2 to 5.5	1	87	<ul style="list-style-type: none"> <li>• 10-bit A-D Converter (26 channels)</li> <li>• 16-bit Timer x 11</li> <li>• UART x 3 (clock synchronous serial I/O selectable)</li> <li>• Serial I/O x 2</li> <li>• DMAC (2 channels)</li> <li>• D-A Converter (2 channels)</li> <li>• Watchdog Timer</li> <li>• Three-phase PWM Output Timer x 6</li> <li>• CRC Code Generating Circuit</li> </ul>	100P6S-A
	M30622MCT-XXXFP M30622ECT-XXXFP M30622ECTFP	128K	5K			-40 to 85	4.5 to 5.5				
	M30622MCV-XXXFP M30622ECV-XXXFP M30622ECVFP					-40 to 125	4.5 to 5.5				
	M30620MCT-XXXFP**	128K	10K			-40 to 85	4.2 to 5.5				
	M30620FCT-XXXFP* M30620FCTFP* M30620FCUFP**					-40 to 105					
	M30623M4T-XXXGP	32K	3K			-40 to 85	4.2 to 5.5				
	M30623M8T-XXXGP M30623M8V-XXXGP	64K	4K			-40 to 125					
	M30623MCT-XXXGP M30623ECT-XXXGP M30623ECTGP	128K	5K			-40 to 85	4.5 to 5.5				
	M30623MCV-XXXGP M30623ECV-XXXGP M30623ECVGP					-40 to 125	4.5 to 5.5				
	M30621FCTGP** M30621FCUGP**	128K	10K			-40 to 85 -40 to 105	4.2 to 5.5				
M16C/6N	M306N1MAT-XXXFP**	96K	3K	20		-40 to 85	4.2 to 5.5		87	<ul style="list-style-type: none"> <li>• CAN Ver 2.0B Controller (2 channels or 1 channel)</li> <li>• 10-bit A-D Converter (26 channels)</li> <li>• 16-bit Timer x 11</li> <li>• UART x 3 (clock synchronous serial I/O selectable)</li> <li>• Serial I/O x 1 • DMAC (2 channels)</li> <li>• D-A Converter (2 channels) • Watchdog Timer</li> <li>• Three-phase PWM Output Timer x 6</li> <li>• CRC Code Generating Circuit</li> </ul>	100P6S-A
	M306N0MCT-XXXFP* M306N1MCT-XXXFP**	128K	5K								
	M306N1FCTFP**										
	M306N0FGTFP*	256K	10K								

M16C/20 Series

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
M16C/20	M30201M4T-XXXFP	32K	1K	10	100	-40 to 85	2.7 to 5.5		43	<ul style="list-style-type: none"> <li>• 10-bit A-D Converter (13 channels)</li> <li>• 16-bit Timer x 6</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• UART x 1</li> <li>• Watchdog Timer</li> </ul>	56P6S-A
	M30201F6TFP	48K	2K				4.0 to 5.5				
	M30201M6T-XXXFP**						2.7 to 5.5				
M16C/2N	M302N1M4T-XXXFP** M302N1F4TFP**	32K	2K	10	100	-40 to 85	4.0 to 5.5		45	<ul style="list-style-type: none"> <li>• BEAN Controller Incorporated</li> <li>• 10-bit A-D Converter (13 channels) • 16-bit Timer x 6</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• UART x 1 • Watchdog Timer • Ring Oscillation Enabled</li> <li>• Oscillation Stop Detect Circuit</li> </ul>	56P6S-A
	M302N2M4T-XXXGP**										
	M302N2M8T-XXXGP**	64K							68	<ul style="list-style-type: none"> <li>• BEAN Controller Incorporated</li> <li>• 10-bit A-D Converter (16 channels) • 16-bit Timer x 6</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• UART x 1 • Watchdog Timer</li> <li>• Ring Oscillation Enabled</li> <li>• Oscillation Stop Detect Circuit</li> </ul>	80P6S-A
	M302N2FCTGP**	128K	5K								

M16C/80 Series

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
M16C/80	M30800MCT-XXXFP* M30800FCTFP**	128K	10K	20	50	-40 to 85	4.2 to 5.5	1	87	<ul style="list-style-type: none"> <li>• 10-bit A-D Converter (26 channels) • 16-bit Timer x 11 • UART x 5 (clock synchronous serial I/O selectable) • DMAC (4 channels)</li> <li>• D-A Converter (2 channels) • Watchdog Timer • Three-phase PWM Output Timer x 6 • CRC Code Generating Circuit • X-Y Converter</li> </ul>	100P6S-A

Before adopting the above products for engine control, please contact an authorized Mitsubishi Semiconductor product distributor.

★ New Product, ★★ Under Development

**8-bit Automobile MCUs Lineup**

**740 Series**

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
7531	M37531M4T-XXXSP	8K	256	8	500	-40 to 85	4.0 to 5.5	—	25	<ul style="list-style-type: none"> <li>• 8-bit Timer x 3</li> <li>• UART x 1</li> <li>• Clock Synchronous Serial I/O x 1</li> <li>• 10-bit A-D Converter</li> <li>• Watchdog Timer</li> <li>• RC Oscillation Enabled</li> </ul>	32P4B
	M37531M4T-XXXGP			4	1000		2.4 to 5.5				
	M37531E4T-XXXGP*			8	500	-40 to 125	4.0 to 5.5				32P6B
	M37531M4V-XXXGP			4	1000		2.4 to 5.5				
	M37531E4V-XXXGP*			8	500	4.0 to 5.5					
7540	M37540M4T-XXXGP**	16K	512	6	340	-40 to 85	4.0 to 5.5	—	25	<ul style="list-style-type: none"> <li>• 8-bit Timer x 4</li> <li>• 16-bit Timer x 1</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• Clock Synchronous Serial I/O x 1</li> <li>• 10-bit A-D Converter</li> <li>• Watchdog Timer</li> <li>• RC/Ring Oscillation Enabled</li> <li>• Oscillation Stop Detect Circuit</li> </ul>	32P6U-A 36P2R-A
	M37540M4T-XXXFP**			4	1000		2.4 to 5.5				

**7470 Series**

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
7477	M37477M2T-XXXSP	4K	128	8	500	-40 to 85	4.5 to 5.5	8	18	<ul style="list-style-type: none"> <li>• 8-bit Timer x 4</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• 8-bit A-D Converter</li> <li>• PWM Output x 1</li> </ul>	32P4B
	M37477M2T-XXXFP			4	1000		2.7 to 5.5				32P2W-A
	M37477M2V-XXXFP	8	500	-40 to 125	4.5 to 5.5	32P2W-A					
	M37477M4T-XXXSP	4	1000		2.7 to 5.5						
	M37477M4T-XXXFP	8K	192	8	500	-40 to 85	4.5 to 5.5				32P4B
	M37477M4V-XXXFP	4		1000	2.7 to 5.5		32P2W-A				
	M37477M8T-XXXSP	16K	384	8	500	-40 to 85	4.5 to 5.5				32P4B
	M37477M8T-XXXFP			4	1000		2.7 to 5.5				32P2W-A
	M37477E8T-XXXSP	8	500	-40 to 125	4.5 to 5.5	32P2W-A					
	M37477E8T-XXXFP	4	1000		2.7 to 5.5						
7478	M37478M2T-XXXSP	4K	128	8	500	-40 to 85	4.5 to 5.5	16	20	<ul style="list-style-type: none"> <li>• 16-bit Timer x 2</li> <li>• 8-bit Timer x 2</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• 8-bit A-D Converter</li> <li>• PWM Output x 2</li> <li>• Watchdog Timer</li> </ul>	42P4B
	M37478M2T-XXXFP			4	1000		2.7 to 5.5				56P6N-A
	M37478M2V-XXXFP	8	500	-40 to 125	4.5 to 5.5	56P6N-A					
	M37478M4T-XXXSP	4	1000		2.7 to 5.5						
	M37478M4T-XXXFP	8K	192	8	500	-40 to 85	4.5 to 5.5				42P4B
	M37478M4V-XXXFP	4		1000	2.7 to 5.5		56P6N-A				
	M37478M8T-XXXSP	16K	384	8	500	-40 to 85	4.5 to 5.5				42P4B
	M37478M8T-XXXFP			4	1000		2.7 to 5.5				56P6N-A
	M37478E8T-XXXSP	8	500	-40 to 125	4.5 to 5.5	56P6N-A					
	M37478E8T-XXXFP	4	1000		2.7 to 5.5						
7480	M37480M8T-XXXSP	16K	448	8	500	-40 to 85	4.5 to 5.5	8	18	<ul style="list-style-type: none"> <li>• 16-bit Timer x 2</li> <li>• 8-bit Timer x 2</li> <li>• UART x 1 (clock synchronous serial I/O selectable)</li> <li>• 8-bit A-D Converter</li> <li>• PWM Output x 2</li> <li>• Watchdog Timer</li> </ul>	32P4B
	M37480M8T-XXXFP			4	1000		2.7 to 5.5				32P2W-A
	M37480E8T-XXXSP			8	500	-40 to 125	4.5 to 5.5				32P2W-A
	M37480E8T-XXXFP			4	1000		2.7 to 5.5				
	M37480M8V-XXXFP			8	500	-40 to 125	4.5 to 5.5				44P6N-A
M37480E8V-XXXFP	4	1000	2.7 to 5.5								
7481	M37481M8T-XXXSP	16K	448	8	500	-40 to 85	4.5 to 5.5	12	24	<ul style="list-style-type: none"> <li>• 8-bit A-D Converter</li> <li>• PWM Output x 2</li> <li>• Watchdog Timer</li> </ul>	42P4B
	M37481M8T-XXXFP			4	1000		2.7 to 5.5				44P6N-A
	M37481E8T-XXXSP			8	500	-40 to 125	4.5 to 5.5				44P6N-A
	M37481E8T-XXXFP			4	1000		2.7 to 5.5				
	M37481M8V-XXXFP			8	500	-40 to 125	4.5 to 5.5				44P6N-A
M37481E8V-XXXFP	4	1000	2.7 to 5.5								

**7600 Series**

Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
7630	M37630M4T-XXXFP	16K	512	10	200	-40 to 85	4.0 to 5.5	1	35	<ul style="list-style-type: none"> <li>• CAN Controller</li> <li>• 16-bit Timer x 2</li> <li>• 8-bit Timer x 3</li> <li>• UART x 1</li> <li>• Clock Synchronous Serial I/O x 1</li> <li>• 8-bit A-D Converter</li> </ul>	44P6N-A

**38000 Series**

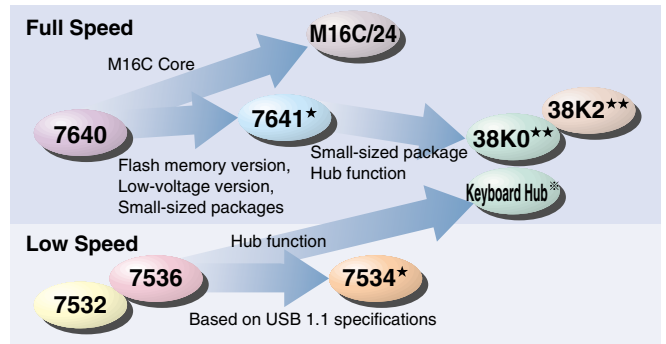
Group	MCU	Memory Size (bytes)		Clock Frequency (MHz)	Minimum Instruction Execution Time (ns)	Operating Ambient Temperature (°C)	Power Source Voltage (V)	Input Ports	I/O Ports	Functions	Packages
		ROM	RAM								
3874	M38747M4T-XXXGP	16K	1K	6.4	320	-40 to 85	3.0 to 5.5	1	72	<ul style="list-style-type: none"> <li>• Communication Protocol Controller</li> <li>• 8-bit Timer x 3</li> <li>• 16-bit Timer x 2</li> <li>• UART x 1</li> <li>• Serial I/O x 2</li> <li>• 8-bit A-D Converter</li> <li>• 8-bit D-A Converter</li> <li>• Watchdog Timer</li> </ul>	80P6S-A
	M38747M6T-XXXGP	24K									
	M38747M8T-XXXGP	32K									
	M38747MCT-XXXGP	48K									
	M38749MFT-XXXGP*	60K	2K								
M38749EFT-XXXGP	60K										

Before adopting the above products for engine control, please contact an authorized Mitsubishi Semiconductor product distributor.

★ New Product, ★★ Under Development

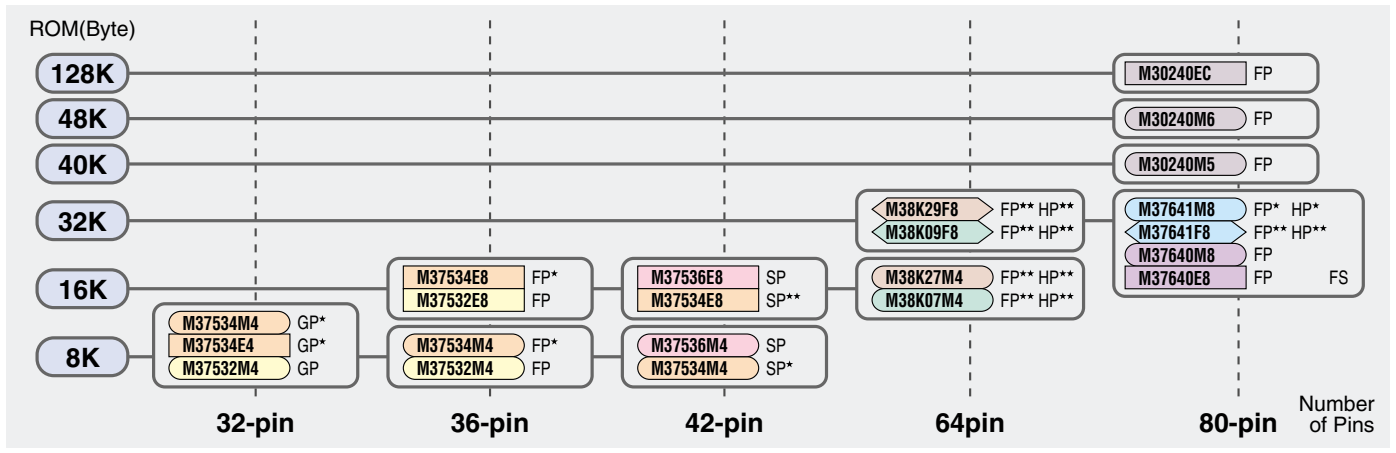
The Mitsubishi USB MCUs lineup offers 8-bit MCUs for Low Speed USB applications, 8/16-bit MCUs for Full Speed USB applications, and 8-bit MCUs for Hub applications. The Mitsubishi USB MCUs lineup can cover a wide range of application fields, such as audio equipment, musical instruments, printers, scanners, modems and other PC peripherals.

## Expansion



★ New Product, ★★ Under Development, ※ Planning stage

## Product Lineup



Package	Lead Pitch (mm)	GP	32-pin LQFP (32P6U-A)	0.8	FP	36-pin SSOP (36P2R-A)	0.8	SP	42-pin SDIP (42P4B)	1.778	FP	64-pin QFP (64P6N-A)	0.8	FP	80-pin QFP (80P6N-A)	0.8	
											HP	64-pin LQFP (64P6Q-A)	0.5		FS (Windowed)	80-pin QFN (80D0)	—

○ "M" of M3xxxxMx indicates the mask ROM version.  
 □ "E" of M3xxxxEx indicates the EPROM or One Time PROM version.  
 ◁ "F" of M3xxxxFx indicates the flash memory version.

★ New Product, ★★ Under Development

## Product Expansion

Items		Group		7532		7534*		7536		7640		7641*		38K0**		38K2**		M16C/24		
Internal Memory	ROM (Kbytes)	8	16	8	16	8	16	32	32	16	32	16	32	16	32	40	48	128		
	RAM (bytes)	256	384	256	384	256	384	1K	1K	2.5K <sup>(Note)</sup>	1K	2K	1K	2K	3K	5K				
I/O Ports	CMOS Input	—																		
	CMOS Input/Output	28 (36-pin), 24 (32-pin)		33 (42-pin), 28 (36-pin), 24 (32-pin)		33		66		48		44		63						
	N-channel Open-drain	—																		
DMA Controller (channels)	—																			
Timers	8-bit x 3																			
Serial I/O (channels)	Clock Sync./UART	—																		
	Clock sync. Only	8-bit x 1																		
	UART Only	7/8/9-bit x 2																		
A-D Converter (resolution x channels)	10-bit x 8 (36-pin), 10-bit x 6 (32-pin)	10-bit x 8 (42/36-pin), 10-bit x 6 (32-pin)		10-bit x 8		—		10-bit x 8		—										
	D-A Converter (resolution x channels)	—																		
External Interrupt Sources	3 (36-pin), 2 (32-pin)		4 (42-pin), 3 (36-pin), 2 (32-pin)		4		5		4											
PWM	—																			
Sub-clock Circuit	Available																			
Key-on Wakeup Function	8																			
Bus Interface	Available																			
USB Function	Low Speed																			
	Full Speed																			
Package	Based on USB 1.0 specifications																			
	Based on USB 1.1 specifications																			
Operating Voltage (V)	Based on USB 1.0 specifications																			
	USB Pullup Power-source-output Pin																			
Operating Ambient Temperature (°C)	—																			
	—																			
Minimum Instruction Execution Time (μs)	0.34 μs (6 MHz)																			
Number of Basic Instructions	69																			

Note: This applies only for the flash memory version.

★ New Product, ★★ Under Development



# OSD Controllers, FLD (VFD; Vacuum Fluorescent Display) Controllers

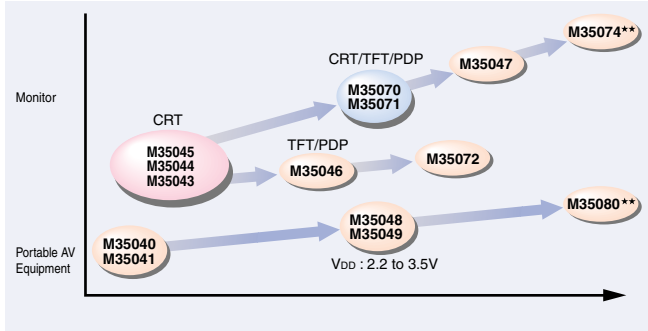
## OSD Controllers

These OSD controllers are appropriate to the following:

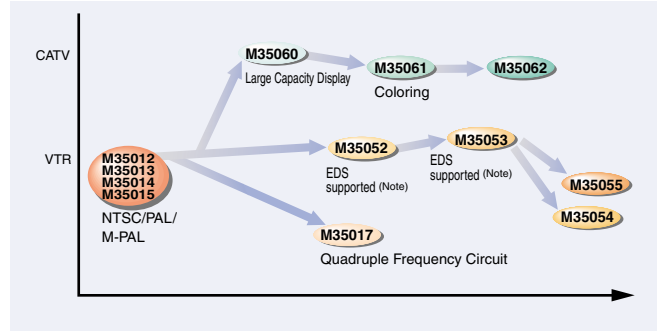
- Display in program setting of AV equipment, such as TVs, VCRs, BS tuners
- Display in various adjustment menu of TFT/PDP monitors

- Also, OSD controllers supporting the low-power-source-voltage system are developed for the portable equipment, such as digital cameras.

## Product Expansion



★★ Under Development



Note: EDS = Extended Data Service

## OSD Controller Lineup

Type	Group	Product	Screen Composition	Synchronous Signal Generation	Kinds of Characters	Functions	Package	
Composite Output Only	3501	M35014-XXXSP	24 Characters x 10 Lines	NTSC/PAL/MPAL	64	—	20P4B	
		M35013-XXXSP			128			
		M35012-XXXSP			256			
		M35015-XXXSP			512			
	3505	M35052-XXXSP/FP		fsc Input, Built-in VCO, NTSC/PAL/MPAL	128	EDS supported	20P4B/20P2Q	
		M35053-XXXSP/FP			256			
		M35054-XXXFP			128			
3501	M35017-XXXSP/FP	fsc Input, NTSC/PAL/MPAL	256	—	20P2Q			
Digital RGB Output Only	3504	M35040-XXXFP	24 Characters x 10 Lines	—	128	Operating Frequency : 6.3 to 7.7 MHz (Low-power-source-voltage operation is also available.)	20P2Q	
		M35041-XXXFP			256			
		M35048-XXXFP	24 Characters x 12 Lines x 2 Pages		256 + 128	Operating Frequency : 6.3 to 16 MHz (External input) (Low-power-source-voltage operation : 2.2 to 3.5 V)		
		M35049-XXXFP			256 + 256			
	3504	M35043-XXXSP/FP	24 Characters x 12 Lines		128	Operating Frequency : 30 to 60 MHz	20P4B/20P2Q	
		M35044-XXXSP/FP			192			Operating Frequency : 20 to 80 MHz
		M35045-XXXSP/FP			256			
		M35046-XXXSP/FP						Operating Frequency : 20 to 80 MHz (External input)
	3507	M35047-XXXSP/FP	24 Characters x 12 Lines x 2 Pages		255 (ROM) 8 (RAM)	Operating Frequency : 20 to 100 MHz, I <sup>2</sup> C-BUS supported		
		M35070-XXXSP/FP			256 + 256			Operating Frequency : 20 to 90 MHz, I <sup>2</sup> C-BUS supported
		M35071-XXXSP/FP			256 + 128			
		M35072-XXXFP			256 + 256			Operating Frequency : 20 to 80 MHz (External input)
3507	M35074-XXXSP**	24 Characters x 12 Lines	512	Operating Frequency : 20 to 100 MHz	20P4B			
	3506	M35060-XXXSP	40 Characters x 17 Lines (40 Characters) x 16 Lines	Built-in VCO, NTSC/PAL/MPAL	256	RAM Fonts : 63 Characters	32P4B	
		M35061-XXXSP/FP			128	RAM Fonts : 7 Characters	32P4B/32P2W	
M35062-XXXSP		32P4B						
Digital RGB Output, Composite Output	35080	M35080FP**	128 x 96 Dots x 2 Pages (Bitmap)	—	512	RGB 3-bit Analog Output, Operating Frequency : 5 to 20 MHz, Power Source Voltage : 2.7 to 3.3 V	24P2Q	

★★ Under Development

## FLD (VFD) Controllers

Our FLD (VFD) controllers are most appropriate to display applications in VCRs and other AV equipment. Their serial I/O ports are effective for easy system control.

## FLD (VFD) Controller, Digit expander Lineup






Product	Oscillation Frequency (MHz)	Package	Operating Voltage (V)	Operating Ambient Temperature (°C)	HBV (V)
M35500BGP	4	44P6X	4.0 to 5.5	-20 to 85	Vcc -45V
M35501FP <sup>(Note)</sup>	2	24P2E-A			
M35502AFP		36P2R-G			

Note: Digit Expander



# Evaluation/Application Boards

To help users quickly grasp the features of our MCUs, Mitsubishi has also prepared evaluation boards, training kits, etc., for each MCU series. We also offer reference kits resembling finished products.

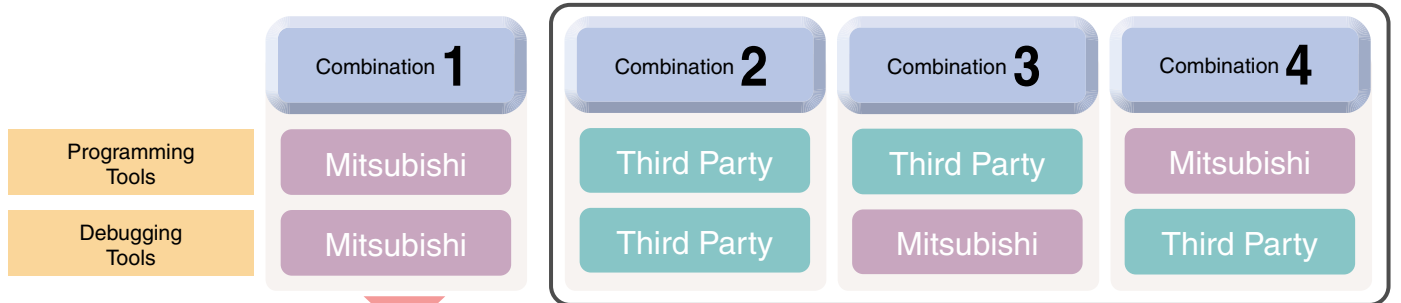
Target MCU Series	Specifications	Description	Order Code
M32R/E Series	<b>MSA2114G51/G52</b> <b>MSA2114G61/G62</b> <b>MSA2128G50 (Under development)</b>	Evaluation board for 32170/32171 Group <ul style="list-style-type: none"> <li>● 32170 Group : MSA2114G51/G52</li> <li>● 32171 Group : MSA2114G61/G62</li> <li>● M32170F6VWG : MSA2128G50 (FBGA Type)</li> </ul> MSA2114G52 and MSA2114G62 are socket-type boards. (The others are packaging-type boards.)	<b>MSCH-APP-H</b> 
M16C/20 Series M16C/60 Series M16C/80 Series	<b>MSA0654-G01</b> <b>MSA0654-G02</b> <b>MSA0801-G02</b> <b>MSA0802-G02 (Under development)</b>	<ul style="list-style-type: none"> <li>● M16C Starter-kit2 Offers C-compiler, a debugger and the MCU board all in one package.</li> <li>● Perfect for <b>M16C/80, M16C/60, M16C/61, M16C/62, or M16C/20 Group</b> evaluation and user training.</li> </ul>	<b>MSCH-APP-H</b> 
	—	<ul style="list-style-type: none"> <li>● EMS/EMI evaluation board</li> </ul>	
	<b>MSA0652-G01</b> <b>MSA0652-G02</b> <b>MSA0250</b> <b>MSA0800-G02 (Under development)</b>	<ul style="list-style-type: none"> <li>● Mini-Emulator</li> <li>● All necessary software and documentation required to compile, download, execute, and debug C programs.</li> </ul>	<b>MSCH-APP-H</b> 
	<b>MSA0655-G01</b> <b>MSA0655-G02</b>	<ul style="list-style-type: none"> <li>● PC Card-type Flash Memory Programmer for Standard serial I/O Mode</li> </ul>	<b>MSCH-APP-H</b> 



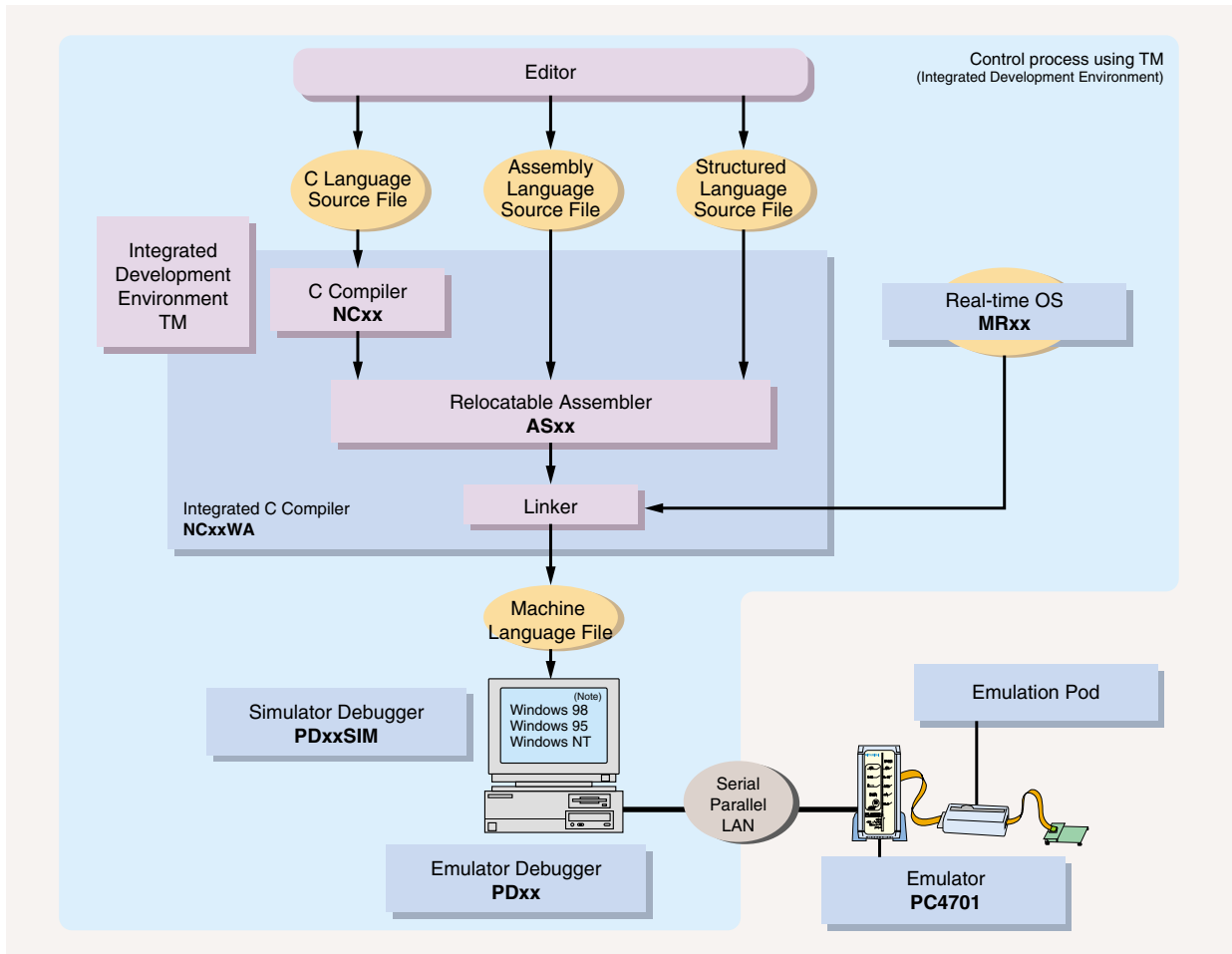
## Mitsubishi Tools

Mitsubishi Electric helps you build development environments compatible with a wide range of 4-bit to 32-bit MCUs. Functions are continuously enhanced and new products regularly developed to meet evolving customer needs. In addition to Mitsubishi proprietary tools, many third party tools are compatible with Mitsubishi MCUs. Greater convenience is our constant goal for user support. Mitsubishi now provides real-time support through our own homepage and e-mail.

### Combination of Mitsubishi and Third-party Tools



## Mitsubishi Tool Product Line



### Programming Environment

- Windows 98/95 & Windows NT 4.0 compatible
- Advanced integrated development environment
- High-performance C compiler
- Real-time OS supporting development of real-time control systems

### Debugging Environment

- Simulator debuggers for independent program evaluation
- Emulator debuggers with user-friendly interface and various source-level debugging functions
- Emulators supporting high-speed operation of MCUs
- Accessory tools for connecting to all kinds of target systems

Note : Windows and Windows NT are registered trademarks of Microsoft Corporation in the U.S. and other countries.

## Third-party Tools

As part of the Mitsubishi microcomputer development environment, a variety of tools with a rich array of functions are available from major third-party companies. For details, refer to the Mitsubishi Tool Homepage or each third-party homepage.

### Third-party Tool Product Line

MCU		Cross Tools	Real-time OSs	Emulators	
32-bit	M32R Family	D-CC/M32R, D-C++/M32R Wind River Systems	pSOSystem/pRISM+ Wind River Systems	ADViCE YDC	
		GNUPro Red Hat	pOSEK Wind River Systems	EZlyzer YDC	
		OPENplus Gaio Technology	Tornado, VxWorks Wind River Systems	UniSTAC <b>NEW</b> Sophia Systems	
			OPENplus (G-OS) Gaio Technology	SingleStep Wind River Systems	
16-bit	M16C/80 Series	Embedded Workbench IAR Systems	OPENplus (G-OS) Gaio Technology	ADViCE YDC	
		OPENplus Gaio Technology		MultiSTAC Sophia Systems	
	M16C Family	M16C/60 M16C/20 Series	Embedded Workbench IAR Systems	osCAN M16C Vector Informatik	ADViCE YDC
			EDE TASKING	RTXC Embedded Power	MultiSTAC Sophia Systems
		OPENplus Gaio Technology	OPENplus (G-OS) Gaio Technology	Ultra-M16C Ashling Microsystems	
			embOS M16C <b>NEW</b> SEGGER Microcontroller Systeme	EMUL-M16C-PC Nohau	
			Nucleus µPLUS <b>NEW</b> Accelerated Technology		
		7900 Series		ADViCE YDC	
	7700 Family	7700 7751 7770 Series	Embedded Workbench IAR Systems	embOS M7700 <b>NEW</b> SEGGER Microcontroller Systeme	ADViCE YDC
			OPENplus Gaio Technology		Ultra-7700 Ashling Microsystems
	8-bit	740 Family	Embedded Workbench IAR Systems	osCAN M7600 Vector Informatik	ADViCE YDC
			OPENplus Gaio Technology		

### Programmers

NET IMPRESS  
YDC

AF9709, AF9708, AF9723  
Ando Electric

Flasher 3 **NEW**  
SEGGER Microcontroller Systeme

ALL-11 **NEW**  
HI-LO SYSTEMS

MFW-1, SFW-62SA **NEW**  
Sunny Giken

For details on the application of the programmer to production facilities, contact the manufacturer of the programmer.



# Introduction to Our MCU-related Homepages: Mitsubishi MCU Technical Information & Development Support Tools

Take a look at Mitsubishi's MCU-related homepages, where you can find just about anything you need to know about our MCUs. The Mitsubishi MCU Technical Information Homepage covers everything from MCU specifications to application technology, and the Mitsubishi Tool Homepage offers information concerning our wide range of development support tools.

Mitsubishi MCU Technical Information Homepage  
<http://www.infocom.mesc.co.jp/indexe.htm>

Top Page
Links to the top page of the Mitsubishi MCU Technical Information Homepage.
What's New
Announces updates and changes in the Mitsubishi MCU Technical Information Homepage.
Main Menu
Shows the main menu of the Mitsubishi MCU Technical Information Homepage.
Contact
Links to the menu to contact with our local sales offices.

Japanese
Links to our Japanese site.
Documents
Documents for downloading.
Introduction to MCU Family/Series & Application-Specific MCUs
Technical information for Mitsubishi MCUs categorized by Family/Series and application field (CAN, USB, TV, etc).
Mitsubishi Development Support Tools
Links to the Mitsubishi Tool Homepage.
Third Party Development Support Tools
Links to the Third Party Tool Homepage.



## Information for Mitsubishi MCU Users

### Technical News

The latest product information, such as updated Usage Notes, ready to be downloaded for reference during system development.

### Document Downloading

The most current Datasheets and User's Manuals (PDF) for Mitsubishi MCUs, ready to be downloaded to your PC.

### FAQ

The answers to the most frequently asked questions (FAQ) from our users, in easy-to-understand Q & A format.

### Accessory Tools

Introduces system evaluation tools such as evaluation boards, starter kits, etc. The latest software versions are also available here for immediate downloading.

### Free Software

Download helpful tools for use on your PC, free-of-charge.

## Information for Prospective Customers

### Introduction to Mitsubishi MCUs

Download our MCU General Catalog or specific MCU Family/Series catalogs in PDF. Learn more about Mitsubishi MCU product expansions and memory variations.

# Mitsubishi Tool Homepage

[http://www.tool-spt.mesc.co.jp/index\\_e.htm](http://www.tool-spt.mesc.co.jp/index_e.htm)

This site provides the latest information on Mitsubishi development support tools and the latest version software for current Mitsubishi tool customers, and this site provides various information such as the product outline and trial version software for prospective customers.



## Search

You can quickly search the entire site.

## What's New

Look here for the information newly updated in this homepage and topics related to Mitsubishi tool products. This is your guide to new products and upgrades.

## Topics

New and upgraded products are featured here every month.



### For Current Mitsubishi Tool Customers

#### Tool News

Information updates regarding Mitsubishi development support tools are made twice monthly.

#### FAQs

Here, inquiries as to Mitsubishi development support tools and responses are presented in a Q&A format.

#### Online Upgrade

Customers with licensed IDs for software products can download the latest version of their software from this site, free of charge.

#### PC4701M Emulator

This site specially provides the various information of the new emulator PC4701M.

### For Prospective Mitsubishi Tool Customers

#### Products (Data Sheets)

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

#### Manual Download

Download the major products' manuals in PDF format for detailed specifications of the Mitsubishi tool products.

#### Trial Software Download

The site for downloading trial versions of Mitsubishi's software tools.

#### Third Parties

This homepage provides some information about third-party products and contact information.



# Mitsubishi MCUs / Group List

MCU	Page	MCU	Page	MCU	Page	MCU	Page	MCU	Page	MCU	Page	MCU	Page
M30201	17 · 42	M306V5	16 · 40	M35017	45	M37211	40	M37630	32 · 43	M38077	29	M38747	32 · 43
M30217	17	M30800	19 · 42	M35040	45	M37212	40	M37640	44	M38078	29	M38749	32 · 43
M30218	17	M30802	19	M35041	45	M37220	40	M37641	44	M38079	29	M38813	33
M30220	18	M30803	19	M35043	45	M37221	40	M37702	24	M38122	30	M38867	29 · 33
M30221	18	M30805	19	M35044	45	M37224	40	M37704	25	M38123	30	M38869	29 · 33
M30240	18 · 44	M32170	12 · 41	M35045	45	M37225	40	M37705	25	M38127	30	M38B37	30
M302N1	18 · 42	M32171	12 · 41	M35046	45	M37270	40	M37710	25	M38197	30	M38B39	30
M302N2	18 · 42	M34250	35	M35047	45	M37271	40	M37721	26	M38198	30	M38B57	30
M30610	14	M34280	39	M35048	45	M37272	40	M37732	24	M38199	30	M38B59	30
M30612	14 · 42	M34282	39	M35049	45	M37273	40	M37733	26	M38203	31	M38B79	30
M30613	42	M34501	35	M35052	45	M37274	40	M37735	26	M38207	31	M38C24	31 · 28
M30620	14 · 42	M34502	35	M35053	45	M37280	40	M37752	23	M38223	31	M38C29	31
M30621	14 · 42	M34506	35	M35054	45	M37477	43	M37760	38	M38224	31	M38C33	31
M30622	14 · 42	M34507	35	M35055	45	M37478	43	M37765	38	M38227	31	M38C34	31
M30623	14 · 42	M34513	35	M35060	45	M37480	43	M37777	38	M38254	31	M38C37	31
M30624	14	M34514	35	M35061	45	M37481	43	M37902	21	M38257	31	M38C89	31
M30625	14	M34515	35	M35062	45	M37508	32	M37903	21	M38258	31	M38K07	44
M306H0	16	M34520	37	M35070	45	M37513	34	M37905	22	M38259	31	M38K09	44
M306H1	16	M34550	39	M35071	45	M37515	33	M37906	22	M38267	34	M38K27	44
M306K2	17	M34551	37 · 39	M35072	45	M37516	28 · 33	M37911	21	M38268	34	M38K29	44
M306K5	17	M34555	37	M35074	45	M37528	34	M38034	29	M3826A	34		
M306K6	17	M34570	35 · 39	M35080	45	M37529	31	M38037	29	M38503	28		
M306K7	17	M34580	35	M35500	45	M37531	28 · 43	M38039	29	M38504	28		
M306N0	16 · 42	M35012	45	M35501	45	M37532	44	M38044	29	M38507	28		
M306N1	16 · 42	M35013	45	M35502	45	M37534	44	M38047	29	M38513	28		
M306V0	16 · 40	M35014	45	M37207	40	M37536	44	M38049	29	M38514	28		
M306V2	16 · 40	M35015	45	M37210	40	M37540	28 · 43	M38073	29	M38517	28		

Group	Page	Group	Page	Group	Page	Group	Page	Group	Page	Group	Page	Group	Page
32170	12 · 41	3826	34	4280	39	7200	40	7531	28 · 43	7733	26	M16C/20	17 · 42
32171	12 · 41	3850	28	4282	39	7210	40	7532	44	7735	26	M16C/21	17
3501	45	3851	28	4501	36	7220	40	7534	44	7752	23	M16C/22	18
3504	45	3874	32 · 43	4502	36	7270	40	7536	44	7760	38	M16C/24	18 · 44
3505	45	3881	33	4506	36	7280	40	7540	28 · 43	7765	38	M16C/2N	18 · 42
3506	45	3886	29 · 33	4507	36	7477	43	7560	31	7777	38	M16C/61	14 · 42
3507	45	38B3	30	4513	36	7478	43	7630	32 · 43	7902	21	M16C/62	14 · 42
3803	29	38B5	30	4514	36	7480	43	7640	44	7903	21	M16C/6H	16
3804	29	38B7	30	4515	36	7481	43	7641	44	7905	22	M16C/6K	15
3807	29	38C2	31 · 34	4520	37	7508	32	7702	24	7906	22	M16C/6N	16 · 42
3812	30	38C3	31	4550	39	7513	34	7704	25	7911	21	M16C/6V	16 · 40
3819	30	38C8	31	4551	37 · 39	7515	33	7705	25			M16C/80	19 · 42
3820	31	38K0	44	4555	37	7516	28 · 33	7710	25				
3822	31	38K2	44	4570	36 · 39	7528	34	7721	26				
3825	31	4250	36	4580	36	7529	31	7732	24				



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