

#### Welcome to E-XFL.COM

#### What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "<u>Embedded -</u> <u>Microcontrollers</u>"

#### Details

Details	
Product Status	Active
Core Processor	F <sup>2</sup> MC-8L
Core Size	8-Bit
Speed	10MHz
Connectivity	EBI/EMI, Serial I/O, UART/USART
Peripherals	POR, PWM, WDT
Number of I/O	53
Program Memory Size	16KB (16K x 8)
Program Memory Type	Mask ROM
EEPROM Size	-
RAM Size	512 x 8
Voltage - Supply (Vcc/Vdd)	2.2V ~ 6V
Data Converters	A/D 8x10b
Oscillator Type	External
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-BQFP
Supplier Device Package	64-QFP (14x20)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb89635rpf-g-1444

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong

## ■ HANDLING DEVICES

### 1. Preventing Latchup

Latchup may occur on CMOS ICs if voltage higher than Vcc or lower than Vss is applied to input and output pins other than medium- and high-voltage pins or if higher than the voltage which shows on "1. Absolute Maximum Ratings" in section "■ Electrical Characteristics" is applied between Vcc and Vss.

When latchup occurs, power supply current increases rapidly and might thermally damage elements. When using, take great care not to exceed the absolute maximum ratings.

Also, take care to prevent the analog power supply (AVcc and AVR) and analog input from exceeding the digital power supply (Vcc) when the analog system power supply is turned on and off.

### 2. Treatment of Unused Input Pins

Leaving unused input pins open could cause malfunctions. They should be connected to a pull-up or pull-down resistor.

### 3. Treatment of Power Supply Pins on Microcontrollers with A/D and D/A Converters

Connect to be AVcc = DAVC = Vcc and AVss = AVR = Vss even if the A/D and D/A converters are not in use.

### 4. Treatment of N.C. Pins

Be sure to leave (internally connected) N.C. pins open.

### 5. Power Supply Voltage Fluctuations

Although V<sub>CC</sub> power supply voltage is assured to operate within the rated range, a rapid fluctuation of the voltage could cause malfunctions, even if it occurs within the rated range. Stabilizing voltage supplied to the IC is therefore important. As stabilization guidelines, it is recommended to control power so that V<sub>CC</sub> ripple fluctuations (P-P value) will be less than 10% of the standard V<sub>CC</sub> value at the commercial frequency (50 Hz to 60 Hz) and the transient fluctuation rate will be less than 0.1 V/ms at the time of a momentary fluctuation such as when power is switched.

### 6. Precautions when Using an External Clock

When an external clock is used, oscillation stabilization time is required even for power-on reset (option selection) and wake-up from stop mode.

## ■ PROGRAMMING TO THE EPROM ON THE MB89P637

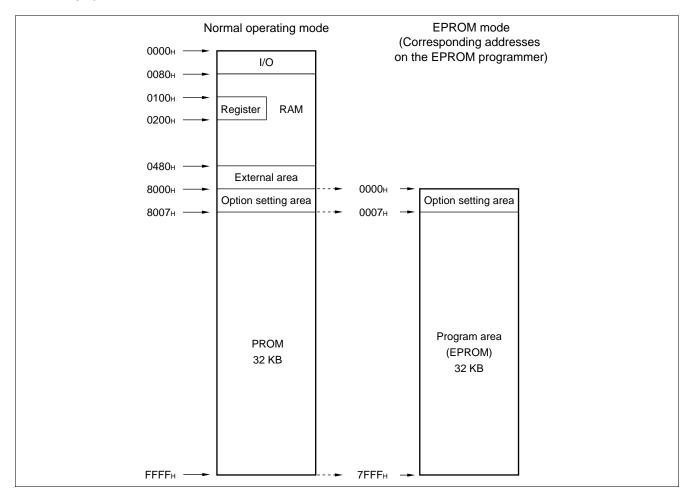
The MB89P637 is an OTPROM version of the MB89630 series.

### 1. Features

- 32-Kbytes PROM on chip
- Options can be set using the EPROM programmer.
- Equivalency to the MBM27C256A in EPROM mode (when programmed with the EPROM programmer)

### 2. Memory Space

Memory space in each mode is illustrated below.



### 3. Programming to the EPPROM

In EPROM mode, the MB89P637 functions equivalent to the MBM27C256A. This allows the PROM to be programmed with a general-purpose EPROM programmer by using the dedicated socket adapter.

However, the electronic signature mode cannot be used.

When the operating ROM area for a single chip is 32 Kbytes (8007<sup>H</sup> to FFFF<sub>H</sub>) the EPROM can be programmed as follows:

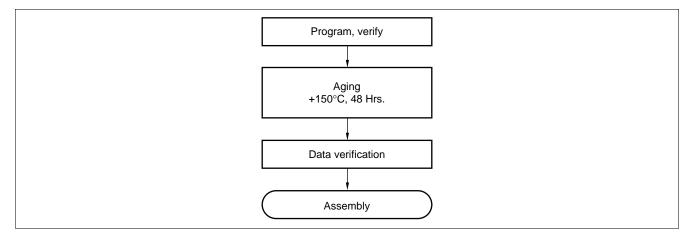


## • Programming procedure

- (1) Set the EPROM programmer to the MBM27C256A.
- (2) Load program data into the EPROM programmer at 0007<sup>H</sup> to 7FFF<sup>H</sup>. (Note that addresses 8000<sup>H</sup> to FFFF<sup>H</sup> in the operating mode assign to 0000<sup>H</sup> to 7FFF<sup>H</sup> in EPROM mode).
- (3) Load option data into addresses 0000H to 0006H of the EPROM programmer. (For information about each corresponding option, see "8. OTPROM Option Bit Map".)
- (4) Program with the EPROM programmer.

## 4. Recommended Screening Conditions

High-temperature aging is recommended as the pre-assembly screening procedure for a product with a blanked OTPROM microcomputer program.



## 5. Programming Yield

All bits cannot be programmed at Fujitsu shipping test to a blanked OTPROM microcomputer, due to its nature. For this reason, a programming yield of 100% cannot be assured at all times.

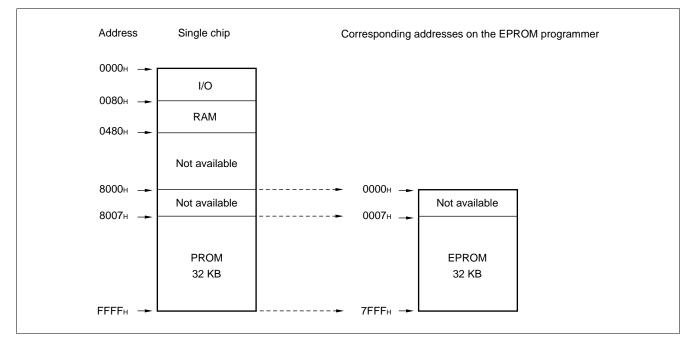
# ■ PROGRAMMING TO THE EPROM WITH PIGGYBACK/EVALUATION DEVICE

## 1. EPROM for Use

MBM27C256A-20CZ, MBM27C256A-20TV

## 2. Memory Space

Memory space in each mode, such as 32-Kbyte PROM, option area is diagrammed below.



## 3. Programming to the EPROM

- (1) Set the EPROM programmer to the MBM27C256A.
- (3) Program to 0000H to 7FFFH with the EPROM programmer.

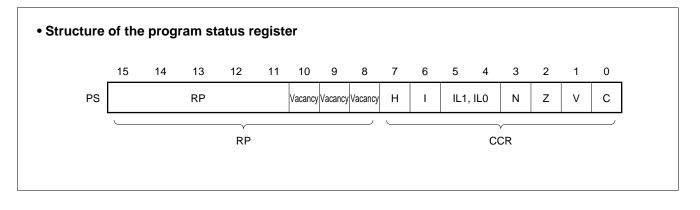
## 2. Registers

The F<sup>2</sup>MC-8L family has two types of registers; dedicated registers in the CPU and general-purpose registers in the memory. The following dedicated registers are provided:

Program counter (PC):	A 16-bit register for indicating the instruction storage positions
Accumulator (A):	A 16-bit temporary register for storing arithmetic operations, etc. When the instruction is an 8-bit data processing instruction, the lower byte is used.
Temporary accumulator (T):	A16-bit register which performs arithmetic operations with the accumulator When the instruction is an 8-bit data processing instruction, the lower byte is used.
Index register (IX):	A16-bit register for index modification
Extra pointer (EP):	A16-bit pointer for indicating a memory address
Stack pointer (SP):	A16-bit register for indicating a stack area
Program status (PS):	A16-bit register for storing a register pointer, a condition code

◄ 16 bits	-	Initial value
PC	: Program counter	FFFDH
A	: Accumulator	Indeterminate
Т	: Temporary accumulator	Indeterminate
IX	: Index register	Indeterminate
EP	: Extra pointer	Indeterminate
SP	: Stack pointer	Indeterminate
PS		= 0, IL1, IL0 = 11 other bit values are indeterminate

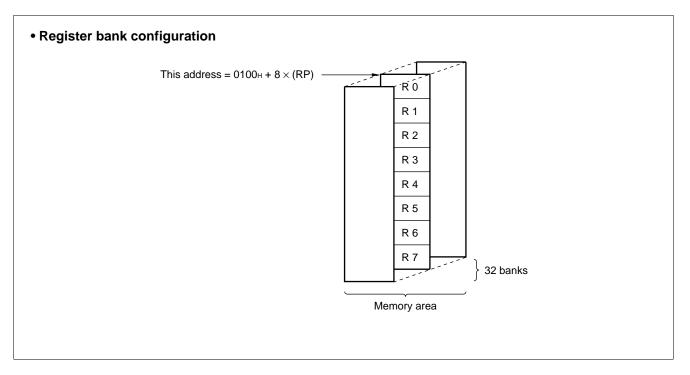
The PS can further be divided into higher 8 bits for use as a register bank pointer (RP) and the lower 8 bits for use as a condition code register (CCR). (See the diagram below.)



The following general-purpose registers are provided:

General-purpose registers: An 8-bit register for storing data

The general-purpose registers are 8 bits and located in the register banks of the memory. One bank contains eight registers and up to a total of 32 banks can be used on the MB89630R series. The bank currently in use is indicated by the register bank pointer (RP).



## ■ I/O MAP

Address	Read/write	Register name	Register description
00н	(R/W)	PDR0	Port 0 data register
01н	(W)	DDR0	Port 0 data direction register
02н	(R/W)	PDR1	Port 1 data register
03н	(W)	DDR1	Port 1 data direction register
04н	(R/W)	PDR2	Port 2 data register
05н	(W)	BCTR	External bus pin control register
06н		Vac	cancy
07н	(R/W)	SYCC	System clock control register
08н	(R/W)	STBC	System clock control register
09н	(R/W)	WDTE	Watchdog timer control register
0Ан	(R/W)	TBCR	Timebase timer control register
0Вн	(R/W)	WPCR	Watch prescaler control register
0Сн	(R/W)	CHG3	Port 3 switching register
0Dн	(R/W)	PDR3	Port 3 data register
0Ен	(W)	DDR3	Port 3 data direction register
0 <b>F</b> н	(R/W)	PDR4	Port 4 data register
10н	(W)	DDR4	Port 4 data direction register
<b>11</b> н	(R/W)	BUZR	Buzzer register
12н	(R/W)	PDR5	Port 5 data register
13н	(R/W)	PDR6	Port 6 data register
<b>14</b> н	(R)	PDR7	Port 7 data register
<b>15</b> н	(R/W)	PCR1	PWC pulse width control register 1
<b>16</b> н	(R/W)	PCR2	PWC pulse width control register 2
<b>17</b> н	(R/W)	RLBR	PWC reload buffer register
<b>18</b> н	(R/W)	TMCR	16-bit timer control register
<b>19</b> н	(R/W)	TCHR	16-bit timer count register (H)
1Ан	(R/W)	TCLR	16-bit timer count register (L)
1Вн		Vac	cancy
1Сн	(R/W)	SMR1	Serial mode register
1Dн	(R/W)	SDR1	Serial data register
1Ен		Vac	cancy
1Fн		Vac	cancy

# ■ ELECTRICAL CHARACTERISTICS

## 1. Absolute Maximum Ratings

(AVss = Vss = 0.0 V)

Devenetor	Symbol	Value		Unit	Remarks
Parameter	Symbol	Min.	Max.	Unit	Remarks
Power supply voltage	Vcc	Vss-0.3	Vss + 7.0	V	*
rower supply voltage	AVcc	Vss-0.3	Vss + 7.0	V	*
A/D converter reference input voltage	AVR	Vss-0.3	Vss + 7.0	V	AVR must not exceed "AVcc + 0.3 V".
	Vı	Vss-0.3	Vcc + 0.3	V	Except P50 to P53
Input voltage	Vı2	Vss-0.3	Vss + 7.0	V	P50 to P53
Output voltage	Vo	Vss-0.3	Vcc + 0.3	V	Except P50 to P53
Output voltage	V <sub>02</sub>	Vss-0.3	Vss + 7.0	V	P50 to P53
"L" level maximum output current	Iol		20	mA	
"L" level average output current	IOLAV		4	mA	Average value (operating current $\times$ operating rate)
"L" level total maximum output current	ΣΙοι		100	mA	
"L" level total average output current	ΣΙοιαν		40	mA	Average value (operating current $\times$ operating rate)
"H" level maximum output current	Іон		-20	mA	
"H" level average output current	Іонач		-4	mA	Average value (operating current $\times$ operating rate)
"H" level total maximum output current	ΣІон		-50	mA	
"H" level total average output current	ΣΙοήαν		-20	mA	Average value (operating current $\times$ operating rate)
Power consumption	PD		500	mW	
Operating temperature	TA	-40	+85	°C	
Storage temperature	Tstg	-55	+150	°C	

 $^{\ast}$  : Use AVcc and Vcc set at the same voltage.

Take care so that AV $_{CC}$  does not exceed V $_{CC}$ , such as when power is turned on.

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

## 3. DC Characteristics

(AVcc = Vcc = 5.0 V, AVss = Vss = 0							V, Ta	= −40°C to +85°C)
Parameter	Symbol	Pin name	Condition		Value		Unit	Remarks
rarameter	Cymbol	r in name	Condition	Min.	Тур.	Max.	0	Remarks
	VIH1	P00 to P07, P10 to P17, P22, P23, P31, P34, P37, P41, P43, P51 to P53		0.7 Vcc		Vcc + 0.3	V	P51 to P53 with pull-up resistor
"H" level input	VIH2	P51 to P53		0.7 Vcc		Vss + 6.0	V	Without pull-up resistor
voltage	Viнs	RST, MOD0, MOD1, P30, P32, P33, P35, P36, P40, P42,P50, P72 to P74		0.8 Vcc	_	Vcc + 0.3	V	P50 with pull-up resistor
	VIHS2	P50, P70, P71		0.8 Vcc		Vss + 6.0	V	Without pull-up resistor
	VIL	P00 to P07, P10 to P17, P22, P23, P31, P34, P37, P41, P43		Vss-0.3		0.3 Vcc	V	
"L" level input voltage	Vils	P30, P32, P33, P35, P36, P40, P42, P50 to P53, <u>P70</u> to P74, RST, MOD0, MOD1		Vss-0.3	_	0.2 Vcc	V	
Open-drain output pin application voltage	Vd	P50 to P53		Vss-0.3	_	Vss + 6.0	V	
"H" level output voltage	Vон	P00 to P07, P10 to P17, P20 to P27, P30 to P37, P40 to P43	Іон = -2.0 mA	4.0			V	
"L" level output voltage	Vol	P00 to P07, P10 to P17, P20 to P27, P30 to P37, P40 to P43, P50 to P53, P60 to P67, RST	lo∟= 4.0 mA		_	0.4	V	
Input leakage current (Hi-z output leakage current)	lu	P00 to P07, P10 to P17, P20 to P23, P30 to P37, P40 to P43, P50 to P53, P70 to P74, MOD0, MOD1	0.0 V < Vı < Vcc		_	±5	μΑ	Without pull-up resistor

 $(AV_{CC} = V_{CC} = 5.0 \text{ V}, \text{ AV}_{SS} = V_{SS} = 0.0 \text{ V}, \text{ T}_{A} = -40^{\circ}\text{C} \text{ to } +85^{\circ}\text{C})$ 

<b>.</b>		<b>-</b> .			Value			= -40°C to +85°C
Parameter	Symbol	Pin name	Condition	Min.	Тур.	Max.	Unit	Remarks
Pull-up resistance	Rpull	P00 to P07, P10 to P17, P30 to P37, P40 to P43, P50 to P53, P72 to P74	VI = 0.0 V	25	50	100	kΩ	With pull-up resistor
	Icc1		$F_{CH} = 10 \text{ MHz}$ $V_{CC} = 5.0 \text{ V}$ $t_{inst}^{*2} = 0.4 \mu\text{s}$	_	12	20	mA	
	Icc2		$F_{CH} = 10 \text{ MHz}$ $V_{CC} = 3.0 \text{ V}$	_	1.0	2	mA	MB89635R/ 636R/637R/ PV630
			$t_{inst}^{*2} = 6.4 \ \mu s$	_	1.5	2.5	mA	MB89P637
	Iccs1	-	$ \begin{array}{c} F_{CH} = 10 \text{ MHz} \\ \Psi \\ V_{CC} = 5.0 \text{ V} \\ t_{inst}^{*2} = 0.4  \mu s \end{array} $	_	3	7	mA	
Iccs₂ Power supply	-		_	0.5	1.5	mA		
		FcL = 32.768 kHz, Vcc = 3.0 V Subclock mode	_	50	100	μΑ	MB89635R/ 636R/637R/ PV630	
current <sup>*1</sup>		Vcc		—	500	700	μA	MB89P637
	Iccls	$\label{eq:Fcl} \begin{array}{l} F_{\text{CL}} = 32.768 \text{ kHz}, \\ V_{\text{CC}} = 3.0 \text{ V} \\ \textbf{Subclock sleep} \\ \textbf{mode} \end{array}$	_	25	50	μΑ		
Ісст		FcL = 32.768 kHz, Vcc = 3.0 V ● Watch mode ● Main clock stop mode at dual- clock system	_	3	15	μΑ		
	Іссн		<ul> <li>T<sub>A</sub> = +25°C</li> <li>Subclock stop mode</li> <li>Main clock stop mode at single-clock system</li> </ul>	_	_	1	μΑ	

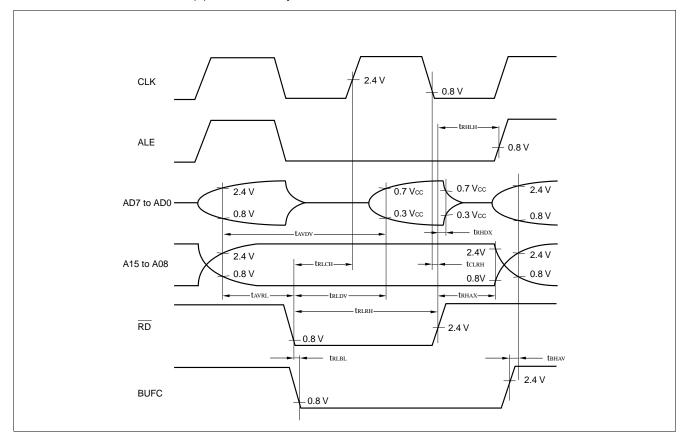
 $(AVcc = Vcc = 5.0 V, AVss = Vss = 0.0 V, T_A = -40^{\circ}C to +85^{\circ}C)$ 

## (6) Bus Read Timing

	1	( •	CC - 0.0 V⊥I		5 - V 55 - 0.0 V	TA — —	
Parameter	Symbol	Pin name	Condition	Val	ue	Unit	Remarks
Farameter	Symbol	Fininame	Condition	Min.	Max.	Unit	Relliars
Valid address $\rightarrow \overline{RD} \downarrow$ time	<b>t</b> avrl	RD, A15 to A08, AD7 to AD0		1/4 t <sub>inst</sub> *– 64 ns	—	μs	
RD pulse width	<b>t</b> rlrh	RD		1/2 t <sub>inst</sub> *– 20 ns	—	μs	
Valid address $\rightarrow$ data read time	tavdv	AD7 to AD0, A15 to A08	-	1/2 t <sub>inst</sub> *	200	μs	No wait
$\overline{RD} \downarrow \rightarrow data \ read \ time$	<b>t</b> rldv	RD, AD7 to AD0		1/2 t <sub>inst</sub> *– 80 ns	120	μs	No wait
$\overline{RD} \uparrow \rightarrow$ data hold time	<b>t</b> RHDX	AD7 to AD0, RD		0	_	μs	
$\overline{RD} \uparrow \rightarrow ALE \uparrow time$	<b>t</b> RHLH	RD, ALE		1/4 t <sub>inst</sub> *– 40 ns	_	μs	
$\overline{RD} \uparrow \rightarrow address$ loss time	<b>t</b> rhax	RD, A15 to A08		1/4 t <sub>inst</sub> *– 40 ns	—	μs	
$\overline{RD} \downarrow \rightarrow CLK \uparrow time$	<b>t</b> rlch	RD, CLK		1/4 t <sub>inst</sub> *– 40 ns	—	μs	
$CLK \downarrow \to \overline{RD} \uparrow time$	<b>t</b> clrh	KD, CLK		0	—	ns	
$\overline{RD} \downarrow \rightarrow BUFC \downarrow time$	<b>t</b> rlbl	RD, BUFC		-5	_	μs	
$\begin{array}{l} BUFC \uparrow \rightarrow valid \ address \\ time \end{array}$	<b>t</b> bhav	A15 to A08, AD7 to AD0, BUFC		5	_	μs	

### (Vcc = 5.0 V±10%, 10 MHz, AVss = Vss= 0.0 V, $T_{\text{A}}$ = –40°C to +85°C)

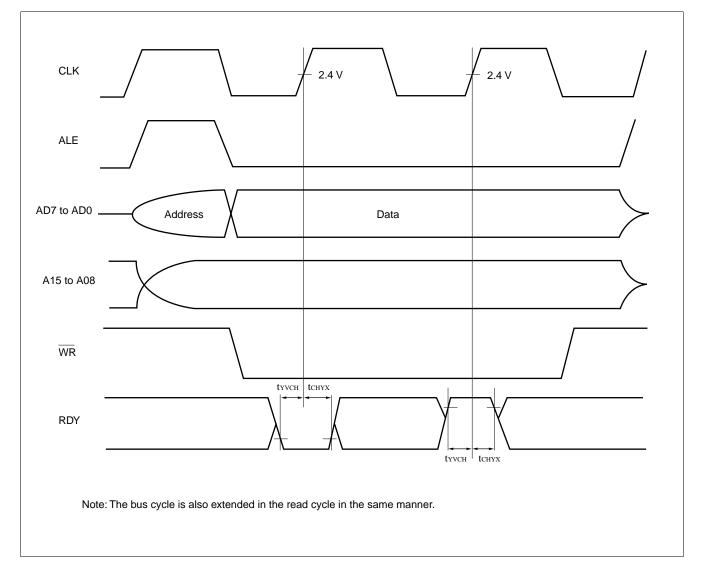
\* : For information on tinst, see "(4) Instruction Cycle".

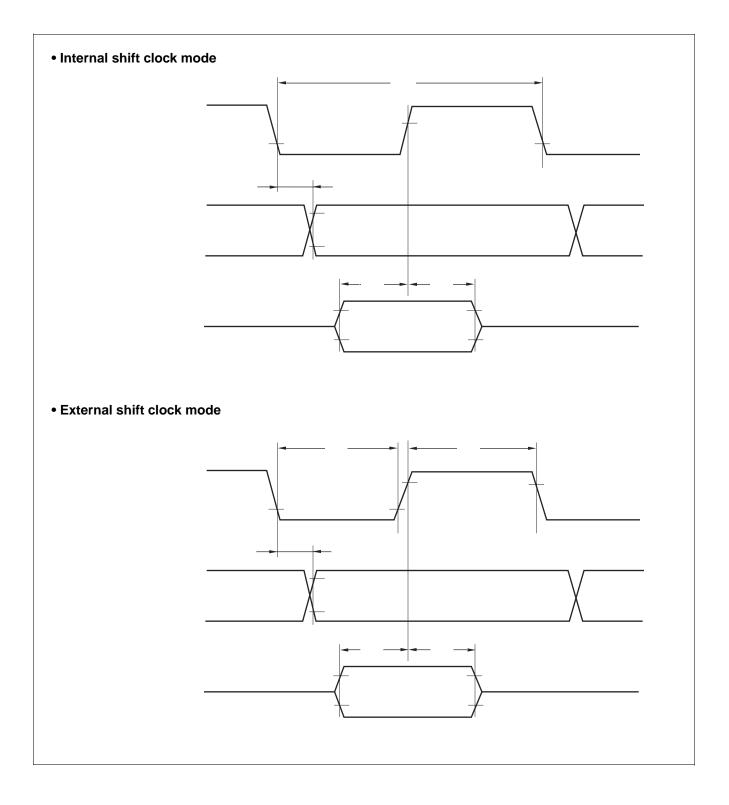


## (8) Ready Input Timing

(Vcc = 5.0 V±10%, Fcн = 10 MHz, AVss = Vss= 0.0 V, T <sub>A</sub> = -40°С to +85°С)								
Parameter	Symbol	Din nome	Condition	Va	lue	Unit	Remarks	
Farameter	Symbol	Pin name		Min.	Max.			
RDY valid $\rightarrow$ CLK $\uparrow$ time	tүүсн		RDY, CLK		60	—	ns	*
$CLK \uparrow \to RDY \text{ loss time}$	<b>t</b> снух	NDI, OLK		0		ns	*	

\* : This characteristics are also applicable to the read cycle.



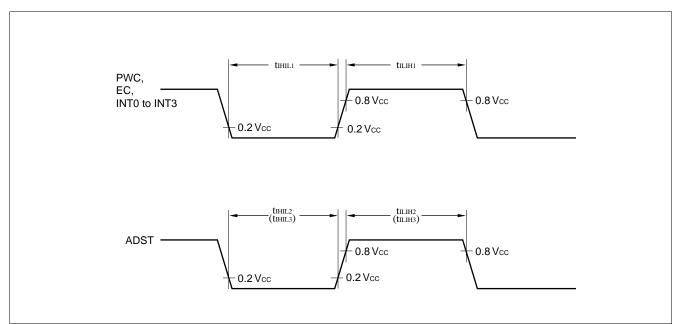


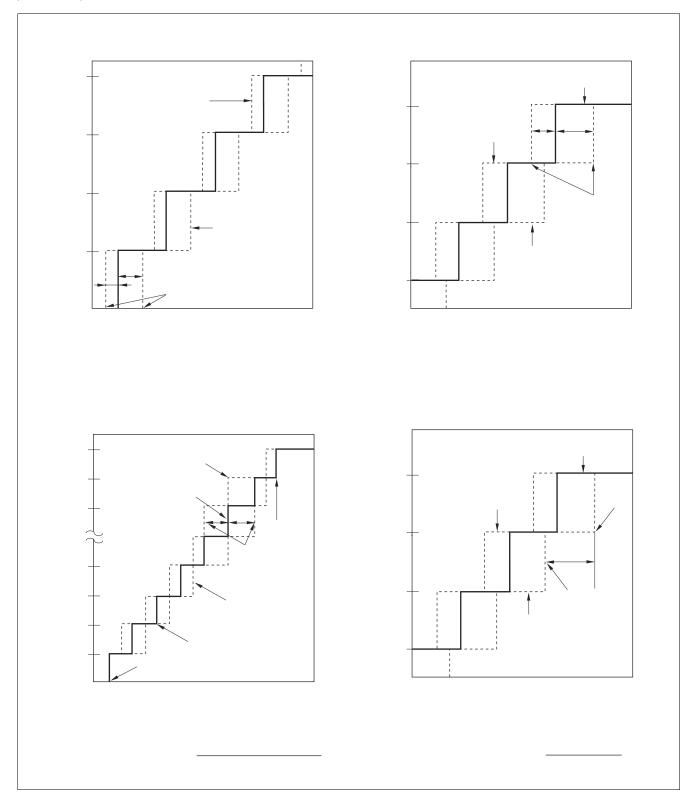
## (10) Peripheral Input Timing

Baramatar	Symbol	Pin name	Value		Unit	Demerke
Parameter	Symbol	Fin name	Min.	Max.	Unit	Remarks
Peripheral input "H" pulse width 1	tiliH1	PWC, INT0 to INT3,EC	2 tinst*	_	μs	
Peripheral input "L" pulse width 1	tiHi∟1		2 tinst*		μs	
Peripheral input "H" pulse width 2	tilih2	ADST	2 <sup>8</sup> tinst*		μs	A/D mode
Peripheral input "L" pulse width 2	tihil2	ADST	2 <sup>8</sup> tinst*		μs	A/D mode
Peripheral input "H" pulse width 3	<b>t</b> ILIH3	ADST	$2^8 t_{\text{inst}}^{*}$		μs	Sense mode
Peripheral input "L" pulse width 3	tініlз		2 <sup>8</sup> tinst*		μs	Sense mode

### (Vcc = 5.0 V $\pm$ 10%, AVss = Vss = 0.0 V, T<sub>A</sub> = -40°C to +85°C)

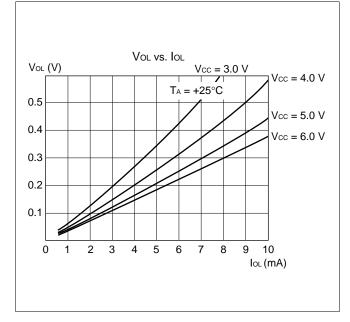
\* : For information on tinst, see "(4) Instruction Cycle".



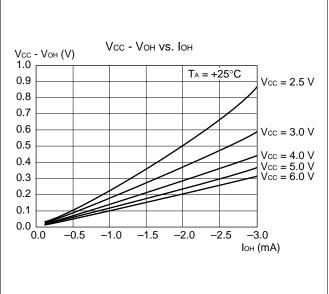


## ■ CHARACTERISTICS EXAMPLE

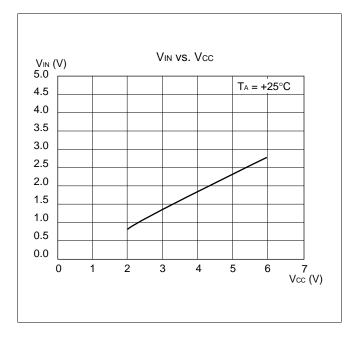
### (1) "L" Level Output Voltage



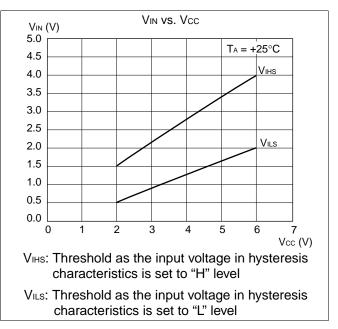
### (2) "H" Level Output Voltage



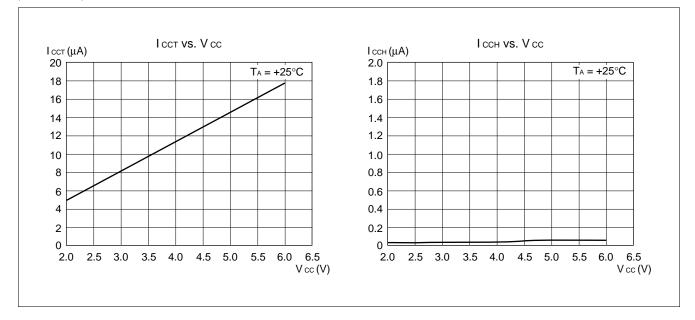
### (3) "H" Level Input Voltage/"L" Level Input Voltage (CMOS Input)



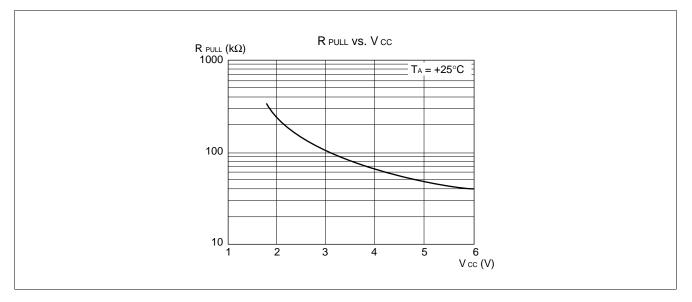
### (4) "H" Level Input Voltage/"L" Level Input Voltage (Hysteresis Input)



### (Continued)

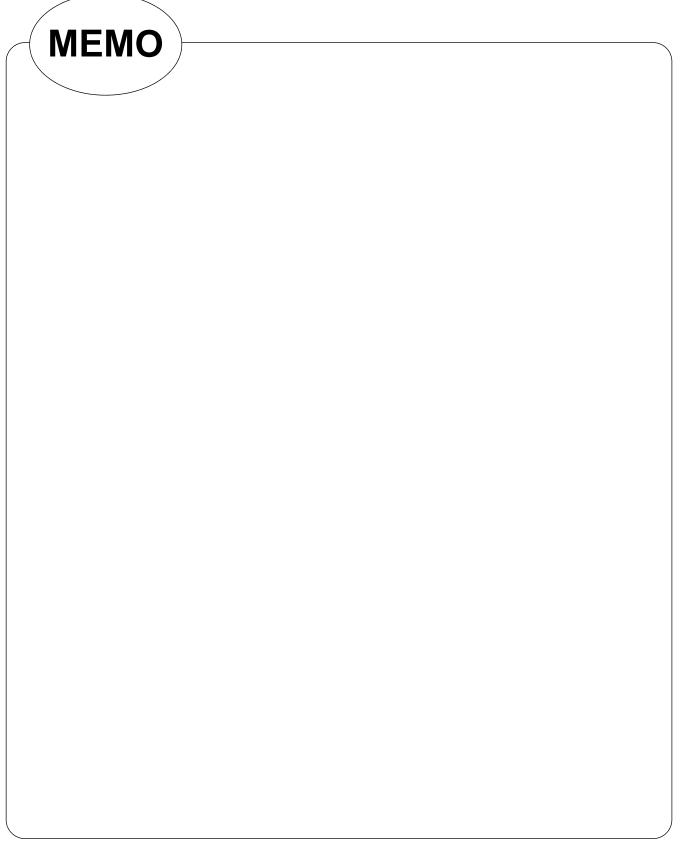


### (6) Pull-up Resistance



## ■ ORDERING INFORMATION

Part number	Package	Remarks
MB89635RP-SH MB89636RP-SH MB89637RP-SH MB89P637P-SH	64-pin Plastic SH-DIP (DIP-64P-M01)	
MB89635RPF MB89636RPF MB89637RPF MB89P637PF	64-pin Plastic QFP (FPT-64P-M06)	
MB89635RPMC MB89636RPMC MB89637RPMC	64-pin Plastic QFP (FPT-64P-M23)	
MB89PV630-101CF MB89PV630-102CF	64-pin Ceramic MQFP (MQP-64C-P01)	
MB89PV630-101C MB89PV630-102C	64-pin Ceramic MDIP (MDP-64C-P02)	



# FUJITSU MICROELECTRONICS LIMITED

Shinjuku Dai-Ichi Seimei Bldg., 7-1, Nishishinjuku 2-chome, Shinjuku-ku, Tokyo 163-0722, Japan Tel: +81-3-5322-3329 http://jp.fujitsu.com/fml/en/

For further information please contact:

#### North and South America

FUJITSU MICROELECTRONICS AMERICA, INC. 1250 E. Arques Avenue, M/S 333 Sunnyvale, CA 94085-5401, U.S.A. Tel: +1-408-737-5600 Fax: +1-408-737-5999 http://www.fma.fujitsu.com/

### Europe

FUJITSU MICROELECTRONICS EUROPE GmbH Pittlerstrasse 47, 63225 Langen, Germany Tel: +49-6103-690-0 Fax: +49-6103-690-122 http://emea.fujitsu.com/microelectronics/

### Korea

FUJITSU MICROELECTRONICS KOREA LTD. 206 Kosmo Tower Building, 1002 Daechi-Dong, Gangnam-Gu, Seoul 135-280, Republic of Korea Tel: +82-2-3484-7100 Fax: +82-2-3484-7111 http://kr.fujitsu.com/fmk/

### Asia Pacific

FUJITSU MICROELECTRONICS ASIA PTE. LTD. 151 Lorong Chuan, #05-08 New Tech Park 556741 Singapore Tel : +65-6281-0770 Fax : +65-6281-0220 http://www.fmal.fujitsu.com/

FUJITSU MICROELECTRONICS SHANGHAI CO., LTD. Rm. 3102, Bund Center, No.222 Yan An Road (E), Shanghai 200002, China Tel : +86-21-6146-3688 Fax : +86-21-6335-1605 http://cn.fujitsu.com/fmc/

FUJITSU MICROELECTRONICS PACIFIC ASIA LTD. 10/F., World Commerce Centre, 11 Canton Road, Tsimshatsui, Kowloon, Hong Kong Tel : +852-2377-0226 Fax : +852-2376-3269 http://cn.fujitsu.com/fmc/en/

Specifications are subject to change without notice. For further information please contact each office.

### All Rights Reserved.

The contents of this document are subject to change without notice.

Customers are advised to consult with sales representatives before ordering.

The information, such as descriptions of function and application circuit examples, in this document are presented solely for the purpose of reference to show examples of operations and uses of FUJITSU MICROELECTRONICS device; FUJITSU MICROELECTRONICS does not warrant proper operation of the device with respect to use based on such information. When you develop equipment incorporating the device based on such information, you must assume any responsibility arising out of such use of the information.

FUJITSU MICROELECTRONICS assumes no liability for any damages whatsoever arising out of the use of the information.

Any information in this document, including descriptions of function and schematic diagrams, shall not be construed as license of the use or exercise of any intellectual property right, such as patent right or copyright, or any other right of FUJITSU MICROELECTRONICS or any third party or does FUJITSU MICROELECTRONICS warrant non-infringement of any third-party's intellectual property right or other right by using such information. FUJITSU MICROELECTRONICS assumes no liability for any infringement of the intellectual property rights or other rights of third parties which would result from the use of information contained herein.

The products described in this document are designed, developed and manufactured as contemplated for general use, including without limitation, ordinary industrial use, general office use, personal use, and household use, but are not designed, developed and manufactured as contemplated (1) for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could have a serious effect to the public, and could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2) for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite).

Please note that FUJITSU MICROELECTRONICS will not be liable against you and/or any third party for any claims or damages arising in connection with above-mentioned uses of the products.

Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

Exportation/release of any products described in this document may require necessary procedures in accordance with the regulations of the Foreign Exchange and Foreign Trade Control Law of Japan and/or US export control laws.

The company names and brand names herein are the trademarks or registered trademarks of their respective owners.