



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

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-1470

Email: info@E-XFL.COM

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

- Other specifications Both MB89630 series and MB89635R/636R/637R is the same.
- Electrical specifications/electrical characteristics Electrical specifications of the MB89635R/636R/637R series are the same as that of the MB89630 series. Electrical characteristics of both the series are much the same.

## ■ CORRESPONDENCE BETWEEN THE MB89630 AND MB89630R SERIES

- The MB89630R series is the reduction version of the MB89630 series.
- The the MB89630 and MB89630R series consist of the following products:

MB89630 series	MB89635	MB89636	MB89637	MB80P637	MB80D\/630
MB89630R series	MB89635R	MB89636R	MB89637R		



### • Pin assignment on package top (MB89PV630 only)

Pin no.	Pin name						
65	N.C.	73	A2	81	N.C.	89	OE
66	Vpp	74	A1	82	O4	90	N.C.
67	A12	75	A0	83	O5	91	A11
68	A7	76	N.C.	84	O6	92	A9
69	A6	77	O1	85	07	93	A8
70	A5	78	O2	86	O8	94	A13
71	A4	79	O3	87	CE	95	A14
72	A3	80	Vss	88	A10	96	Vcc

N.C.: Internally connected. Do not use.

(Continued)

	Pin no.		Ciro		
SH-DIP <sup>*1</sup> MDIP <sup>*2</sup>	QFP2 <sup>*3</sup>	QFP1 <sup>*4</sup> MQFP <sup>*5</sup>	Pin name	type	Function
9	1	2	P51/BZ	J	General-purpose I/O port Also serves as a buzzer output.
8	64	1	P52	J	General-purpose I/O port
7	63	64	P53/PTO2	J	General-purpose I/O port Also serves as the toggle output for the 8-bit PWM timer.
11 to 18	3 to 10	4 to 11	P60/AN0 to P67/AN7	I	N-ch open-drain output ports Also serve as an A/D converter analog input.
26, 25	18, 17	19, 18	P70/INT0/X1A, P71/INT1/X0A	B/E	Input-only ports These ports are a hysteresis input type. Also serve as an external interrupt input (at single- clock operation). Subclock crystal oscillator pins (at dual-clock operation)
24, 23	16, 15	17, 16	P72/INT2, P73/INT3	E	Input-only ports Also serve as an external interrupt input. These ports are a hysteresis input type.
22	14	15	P74/EC	E	General-purpose input port Also serves as the external clock input for the 16-bit timer/counter. This port is a hysteresis input type.
64	56	57	Vcc		Power supply pin
32, 57	24,49	25, 50	Vss		Power supply (GND) pin
19	11	12	AVcc		A/D converter power supply pin
20	12	13	AVR		A/D converter reference voltage input pin
21	13	14	AVss	_	A/D converter power supply pin Use this pin at the same voltage as Vss.

\*1: DIP-64P-M01

\*4: FPT-64P-M06 \*5: MQP-M64C-P01

\*2: MDP-64C-P02

\*3: FPT-64P-M23

# ■ I/O CIRCUIT TYPE

Туре	Circuit	Remarks
A	X1 X0 X0 X0 X0 X0 X0 X0 X0 X0 X0	<ul> <li>Crystal or ceramic oscillation type (main clock) External clock input selection versions of MB89PV630, MB89P637, MB89635R, MB89636R, and MB89637R At an oscillation feedback resistor of approximately 1 MΩ@5.0 V</li> </ul>
В	X1A X0A X0A X0A X0A X0A X0A X0A X0	<ul> <li>Crystal or ceramic oscillation type (subclock) MB89PV630, MB89P637, MB89635R, MB89636R, and MB89637R with dual-clock system At an oscillation feedback resistor of approximately 4.5 MΩ@5.0 V</li> </ul>
C	R R P-ch N-ch	<ul> <li>At an output pull-up resistor (P-ch) of approximately 50 kΩ@5.0 V</li> <li>Hysteresis input</li> </ul>
D		
E		<ul> <li>Hysteresis input</li> <li>Pull-up resistor optional (except P70 and P71)</li> </ul>
F	R P-ch P-ch N-ch 7/7 N-ch	<ul> <li>CMOS output</li> <li>CMOS input</li> <li>Pull-up resistor optional (except P22 and P23)</li> </ul>

## • 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.

## 6. OTPROM Option Bit Map

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0000н	Vacancy Readable and writable	Vacancy Readable and writable	Vacancy Readable and writable	Single/dual- clock system 1: Dual clock 0: Single clock	Reset pin output 1: Yes 0: No	Power-on reset 1: Yes 0: No	Oscillation sta 11:2 <sup>18</sup> /Fc 10:2 <sup>14</sup> /Fc	bilization (/Fсн) н 01:2 <sup>17</sup> /Fсн н 00:2 <sup>4</sup> /Fсн
<b>0001</b> н	P07	P06	P05	P04	P03	P02	P01	P00
	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up
	1: No	1: No	1: No	1: No	1: No	1: No	1: No	1: No
	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes
0002н	P17	P16	P15	P14	P13	P12	P11	P10
	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up
	1: No	1: No	1: No	1: No	1: No	1: No	1: No	1: No
	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes
0003н	P37	P36	P35	P34	P33	P32	P31	P30
	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up	Pull-up
	1: No	1: No	1: No	1: No	1: No	1: No	1: No	1: No
	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes	0: Yes
0004н	Vacancy Readable and writable	Vacancy Readable and writable	Vacancy Readable and writable	Vacancy Readable and writable	P43 Pull-up 1: No 0: Yes	P42 Pull-up 1: No 0: Yes	P41 Pull-up 1: No 0: Yes	P40 Pull-up 1: No 0: Yes
0005н	Vacancy Readable and writable	Vacancy Readable and writable	Vacancy Readable and writable	P74 Pull-up 1: No 0: Yes	P73 Pull-up 1: No 0: Yes	P72 Pull-up 1: No 0: Yes	Vacancy Readable and writable	Vacancy Readable and writable
0006н	Vacancy	Vacancy	Vacancy	Vacancy	Vacancy	Vacancy	Vacancy	Reserved bit
	Readable	Readable	Readable	Readable	Readable	Readable	Readable	Readable
	and writable	and writable	and writable	and writable	and writable	and writable	and writable	and writable

Note: Each bit is set to '1' as the initialized value.

# ■ 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 0000<sub>H</sub> to  $7FFF_{H}$  with the EPROM programmer.

## BLOCK DIAGRAM



# CPU CORE

## 1. Memory Space

The microcontrollers of the MB89630R series offer 64 Kbytes of memory for storing all of I/O, data, and program areas. The I/O area is located at the lowest address. The data area is provided immediately above the I/O area. The data area can be divided into register, stack, and direct areas according to the application. The program area is located at exactly the opposite end of I/O area, that is, near the highest address. Provide the tables of interrupt reset vectors and vector call instructions toward the highest address within the program area. The memory space of the MB89630R series is structured as illustrated below.



## ■ 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	ancy
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
11н	(R/W)	BUZR	Buzzer register
12н	(R/W)	PDR5	Port 5 data register
13н	(R/W)	PDR6	Port 6 data register
14н	(R)	PDR7	Port 7 data register
15н	(R/W)	PCR1	PWC pulse width control register 1
16н	(R/W)	PCR2	PWC pulse width control register 2
17н	(R/W)	RLBR	PWC reload buffer register
18н	(R/W)	TMCR	16-bit timer control register
19н	(R/W)	TCHR	16-bit timer count register (H)
1Ан	(R/W)	TCLR	16-bit timer count register (L)
1Bн		Vac	ancy
1Сн	(R/W)	SMR1	Serial mode register
1Dн	(R/W)	SDR1	Serial data register
1Ен		Vac	ancy
1Fн		Vac	cancy

Paramotor	Symbol	Pin name		Condition	Value			Unit	Remarks
Farameter	Symbol			Sonution	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	Vı =	: 0.0 V	25	50	100	kΩ	With pull-up resistor
	Icc1		Fсн Vcc t <sub>inst</sub> *	= 10 MHz = 5.0 V <sup>2</sup> = 0.4 μs	_	12	20	mA	
	Icc2	-	Fсн = 10 MHz Vcc = $3.0$ V trat <sup>2</sup> = 6.4 из		_	1.0	2	mA	MB89635R/ 636R/637R/ PV630
			linst	– 0.4 μ5		1.5	2.5	mA	MB89P637
Power supply	Iccs1			$F_{CH} = 10 \text{ MHz}$ $V_{CC} = 5.0 \text{ V}$ $t_{inst}^{*2} = 0.4 \mu s$	_	3	7	mA	
	Iccs2		Sleep r	$F_{CH} = 10 \text{ MHz}$ $V_{CC} = 3.0 \text{ V}$ $t_{inst}^{*2} = 6.4 \mu \text{s}$	_	0.5	1.5	mA	
	Iccl	-	$F_{CL} = 32.768 \text{ kHz},$ $V_{CC} = 3.0 \text{ V}$ Subclock mode			50	100	μA	MB89635R/ 636R/637R/ PV630
current <sup>*1</sup>		Vcc			_	500	700	μA	MB89P637
	Iccls					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	

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

(Continued)

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

Paramotor	Symbol	Bin namo	Condition		Value		Unit	Remarks	
Farameter	Symbol	Finname Condition		Min.	Тур.	Max.	Unit	itema ko	
Power cumply	IA		$F_{CH} = 10 \text{ MHz},$ when A/D conversion operates.	_	6	_	mA		
Power supply current <sup>*1</sup>	Іан	AVcc	$F_{CH} = 10 \text{ MHz},$ $T_A = +25^{\circ}\text{C},$ when A/D conversion in a stop.	_	_	1	μA		
Input capacitance	CIN	Other than AVcc, AVss, Vcc, and Vss	f = 1 MHz	_	10	_	pF		

\*1: The power supply current is measured at the external clock.

In the case of the MB89PV630, the current consumed by the connected EPROM and ICE is not counted.

\*2: For information on t<sub>inst</sub>, see "(4) Instruction Cycle" in "4. AC Characteristics".

### 4. AC Characteristics

### (1) Reset Timing

 $(V_{CC} = 5.0 \text{ V} \pm 10\%, \text{ AV}_{SS} = \text{V}_{SS} = 0.0 \text{ V}, \text{ } T_{A} = -40^{\circ}\text{C} \text{ to } +85^{\circ}\text{C})$ 

Parameter	Symbol	Condition	Val	he	Unit	Romarks
Falanielei	Symbol	Condition	Min.	Max.	Unit	Renarks
RST "L" pulse width	<b>t</b> zlzh		48 <b>t</b> HCYL	_	ns	



### (6) Bus Read Timing

Denematan	Cumb al	Din nome	Condition	Val	ue	l Init	Bomarka
Parameter	Зутрої	Pin name	Condition	Min.	Max.	Unit	Remarks
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		-	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	
BUFC $\uparrow \rightarrow$ valid address time	<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".



### (7) Bus Write Timing

Devementer	Symbol	Din nomo	Condition	Valu	e	Unit	Pomarke
Parameter	Symbol	Fin name	Condition	Min.	Max.	Unit	Remarks
Valid address $\rightarrow$ ALE $\downarrow$ time	<b>t</b> avll	AD7 to AD0,		1/4 t <sub>inst</sub> *1-64 ns*2	_	μs	
ALE $\downarrow$ time $\rightarrow$ address loss time	<b>t</b> llax	ALE A15 to A08		5	—	ns	
Valid address $\rightarrow \overline{WR} \downarrow time$	<b>t</b> avwl	WR, ALE		1/4 t <sub>inst</sub> *1-60 ns*2	—	μs	
WR pulse width	<b>t</b> wlwh	WR		1/2 t <sub>inst</sub> *1 – 20 ns*2	_	μs	
Write data $\rightarrow \overline{WR} \uparrow$ time	tovwн	AD7 to AD0, WR		1/2 t <sub>inst</sub> *1-60 ns*2	_	μs	
$\overline{WR} \uparrow \rightarrow address  loss time$	<b>t</b> whax	WR, A15 to A08	]	1/4 t <sub>inst</sub> *1-40 ns*2	—	μs	
$\overline{WR} \uparrow \rightarrow data  hold time$	<b>t</b> whdx	AD7 to AD0, WR		1/4 t <sub>inst</sub> *1-40 ns*2	_	μs	
$\overline{WR} \uparrow \rightarrow ALE \uparrow time$	twhlh	WR, ALE		1/4 t <sub>inst</sub> *1-40 ns*2	_	μs	
$\overline{WR} \downarrow \rightarrow CLK \uparrow time$	<b>t</b> wLCH			1/4 t <sub>inst</sub> *1-40 ns*2	—	μs	
$CLK \downarrow \to \overline{WR} \ \uparrow time$	<b>t</b> CLWH	WIN, OLN		0	_	ns	
ALE pulse width	<b>t</b> lhll	ALE		1/4 t <sub>inst</sub> *1-35 ns*2	_	μs	
ALE $\downarrow \rightarrow$ CLK $\uparrow$ time	<b>t</b> llch	ALE,CLK	1	1/4 t <sub>inst</sub> *1 – 30 ns*2	_	μs	

#### (Vcc = 5.0 V±10%, FcH = 10 MHz, AVss = Vss= 0.0 V, TA = $-40^{\circ}C$ to $+85^{\circ}C$ )

\*1: For information on t<sub>inst</sub>, see "(4) Instruction Cycle".

\*2: This characteristics are also applicable to the bus read timing.



### 7. Notes on Using A/D Converter

#### · Input impedance of the analog input pins

The output impedance of the external circuit for the analog input must satisfy the following conditions. If the output impedance of the external circuit is too high, an analog voltage sampling time might be insufficient (sampling time = 6  $\mu$ s at 10 MHz oscillation.) Therefore, it is recommended to keep the output impedance of the external circuit below 10 k $\Omega$ .



#### • Error

The smaller the | AVR-AVss |, the greater the error would become relatively.

## ■ PACKAGE DIMENSIONS





Please confirm the latest Package dimension by following URL. http://edevice.fujitsu.com/package/en-search/





Please confirm the latest Package dimension by following URL. http://edevice.fujitsu.com/package/en-search/







Please confirm the latest Package dimension by following URL. http://edevice.fujitsu.com/package/en-search/

## ■ MAIN CHANGES IN THIS EDITION

Page	Section	Change Results
49	■ MASK OPTIONS	Changed the explanation for "*" in "■ MASK OPTIONS".

The vertical lines marked in the left side of the page show the changes.

# 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.