

To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

3812 Group

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

DESCRIPTION

The 3812 group is the 8-bit microcomputer based on the 740 family core technology.

The 3812 group has six 8-bit timers, and an 8-channel A-D converter as additional functions.

The various microcomputers in the 3812 group include variations of internal memory size and packaging. For details, refer to the section on part numbering.

FEATURES

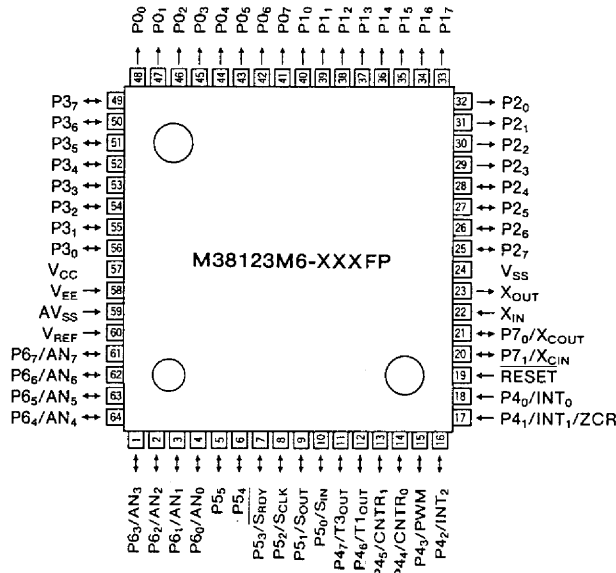
- Basic machine-language instructions 71
- The minimum instruction execution time $0.63\mu\text{s}$
(at 6.3MHz oscillation frequency)
- Memory size
ROM 4K to 60K bytes
RAM 192 to 1024 bytes
- Programmable input/output ports 34
- High-breakdown-voltage output ports 28
- Software pull-up/pull-down resistors (P2₄-P2₇, P5₀-P5₅)
- Interrupts 14 sources, 13 vectors
- Timers 8-bitX6
- Serial I/O 8-bitX1 (Clock-synchronized)

- A-D converter 8-bitX8 channel
- Zero cross detection input 1 channel
- 2 Clock generating circuit
Clock (X_{IN}-X_{OUT}) Internal feedback resistor
Sub-clock (X_{CIN}-X_{COUT}) without internal feedback resistor
(connect to an external ceramic resonator or a quartz-crystal oscillator)
- Power source voltage
In high-speed mode 4.0 to 5.5V
(at 6.3MHz oscillation frequency and high-speed selected)
In middle-speed mode 2.8 to 5.5V
(at 6.3MHz oscillation frequency and middle-speed selected)
In low-speed mode 2.8 to 5.5V
(at 32KHz oscillation frequency)
- Power dissipation
In high-speed mode 38mW
(at 6.3MHz oscillation frequency)
In low-speed mode $300\mu\text{W}$
(at 32kHz oscillation frequency)
- Operating temperature range -10 to +85°C

APPLICATIONS

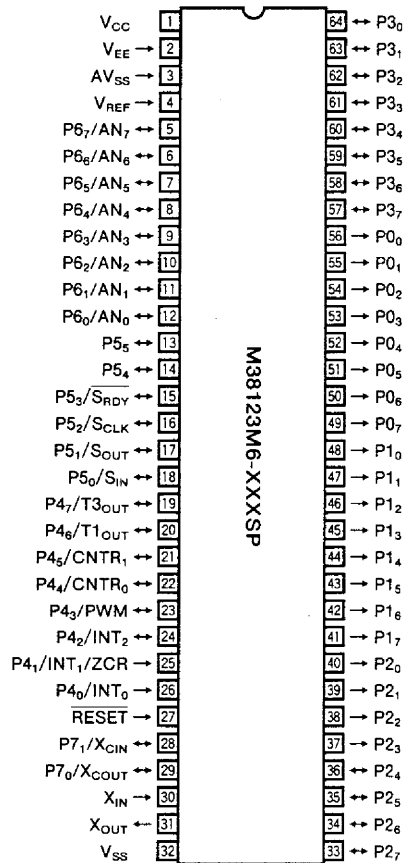
VCRs, tuners, musical instruments, office automation, etc.

PIN CONFIGURATION (TOP VIEW)



SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PIN CONFIGURATION (TOP VIEW)

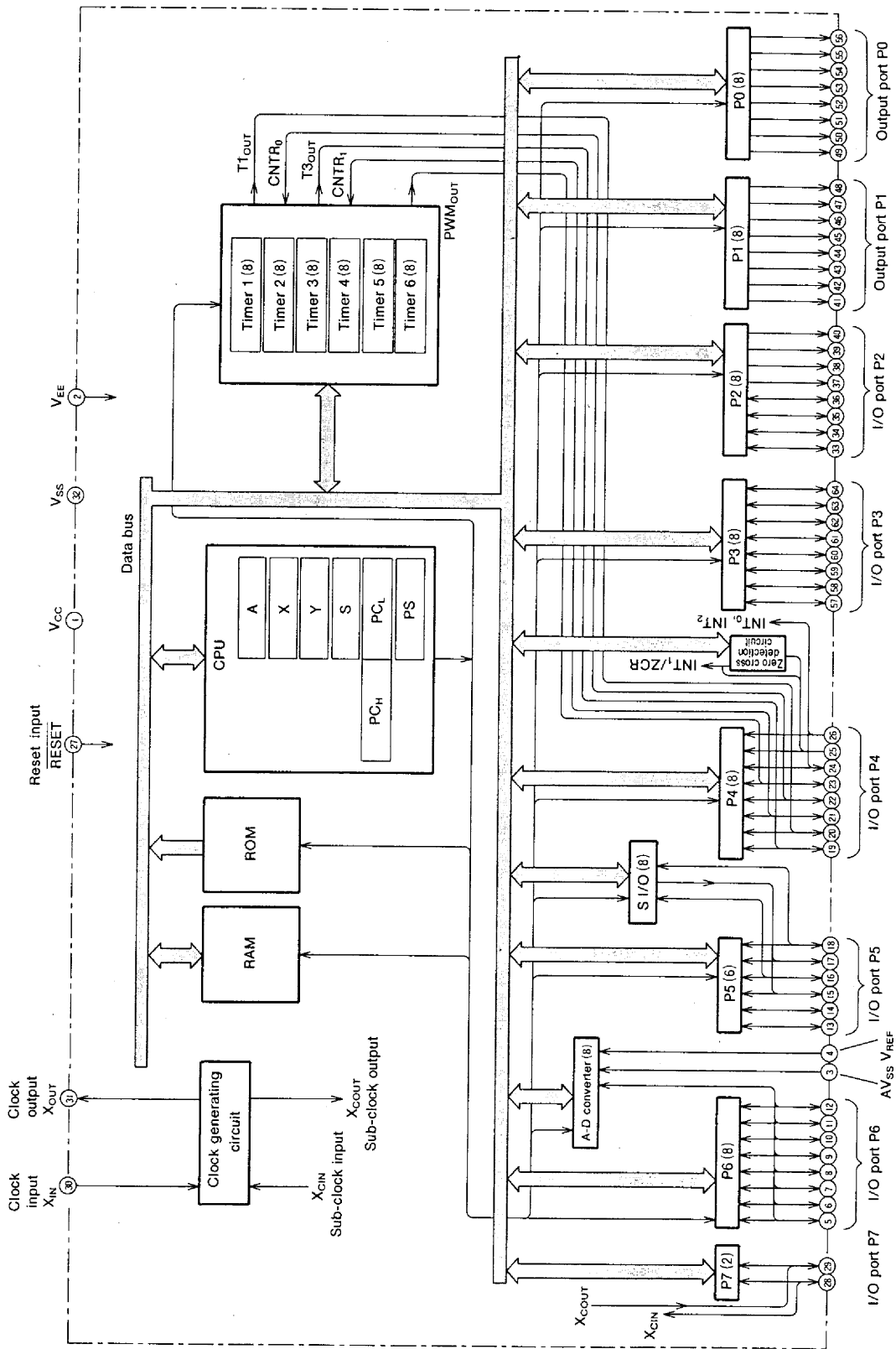


Package type : 64P4B

64-pin shrink plastic-molded DIP

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

FUNCTIONAL BLOCK DIAGRAM (Package : 64P4B)



SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PIN DESCRIPTION

| Pin | Name | Function | |
|---|------------------------------|---|--|
| | | | Function except a port function |
| V _{CC} , V _{SS} | Power source | • Apply voltage of 4.0 to 5.5V to V _{CC} , and 0V to V _{SS} . | |
| V _{EE} | Pull-down power source input | • Applies voltage supplied to pull-down resistors of ports P0, P1, and P2 ₀ -P2 ₃ . | |
| V _{REF} | Analog reference voltage | • Reference voltage input pin for A-D converter | |
| AV _{SS} | Analog power source | • Analog power source input pin for A-D converter • Connect AV _{SS} to V _{SS} . | |
| RESET | Reset input | • Reset input pin for active "L" | |
| X _{IN} | Clock input | • Input and output signals for the internal clock generating circuit. • Feedback resistor is built in between X _{IN} pin and X _{OUT} pin. • Connect a ceramic resonator or a quartz-crystal oscillator between the X _{IN} and X _{OUT} pins to set the oscillation frequency. • If an external clock is used, connect the clock source to the X _{IN} pin and leave the X _{OUT} pin open. • This clock is used as the oscillating source of system clock. | |
| X _{OUT} | Clock output | | |
| P0 ₀ -P0 ₇ | Output port P0 | • 8-bit output port • Each port builds in pull-down resistor between the output and the V _{EE} pin. • The high-breakdown-voltage p-channel open-drain output • At reset these pins are set to the V _{EE} pin level. | |
| P1 ₀ -P1 ₇ | Output port P1 | | |
| P2 ₀ -P2 ₃ | Output port P2 | • 4-bit output port with the same function as port P0. | |
| P2 ₄ -P2 ₇ | I/O port P2 | • 4-bit I/O port • I/O direction register allows each pin to be individually programmed as either input or output. • At reset this port is set to input mode. • Pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-down. • TTL input level • CMOS 3-state output | |
| P3 ₀ -P3 ₇ | I/O port P3 | • 8-bit I/O port with the same function as port P2 ₄ -P2 ₇ • CMOS compatible input level • The high-breakdown-voltage P-channel open-drain. | |
| P4 ₀ /INT ₀ , P4 ₁ /INT ₁ / ZCR | Input port P4 | • 2-bit input port. • CMOS compatible input level | External interrupt input pins A zero cross detection circuit input pin (P4 ₁) |
| P4 ₂ /INT ₂ | I/O port P4 | • 6-bit CMOS I/O port with the same function as port P2 ₄ -P2 ₇ • CMOS compatible input level • CMOS 3-state output | |
| P4 ₃ /PWM | | | A PWM output pin (Timer output pin) |
| P4 ₄ /CNTR ₀ , P4 ₅ /CNTR ₁ | | | Timer 2, Timer 4 input pins |
| P4 ₆ /T1 _{OUT} , P4 ₇ /T3 _{OUT} | | | Timer 1, Timer 3 output pins |

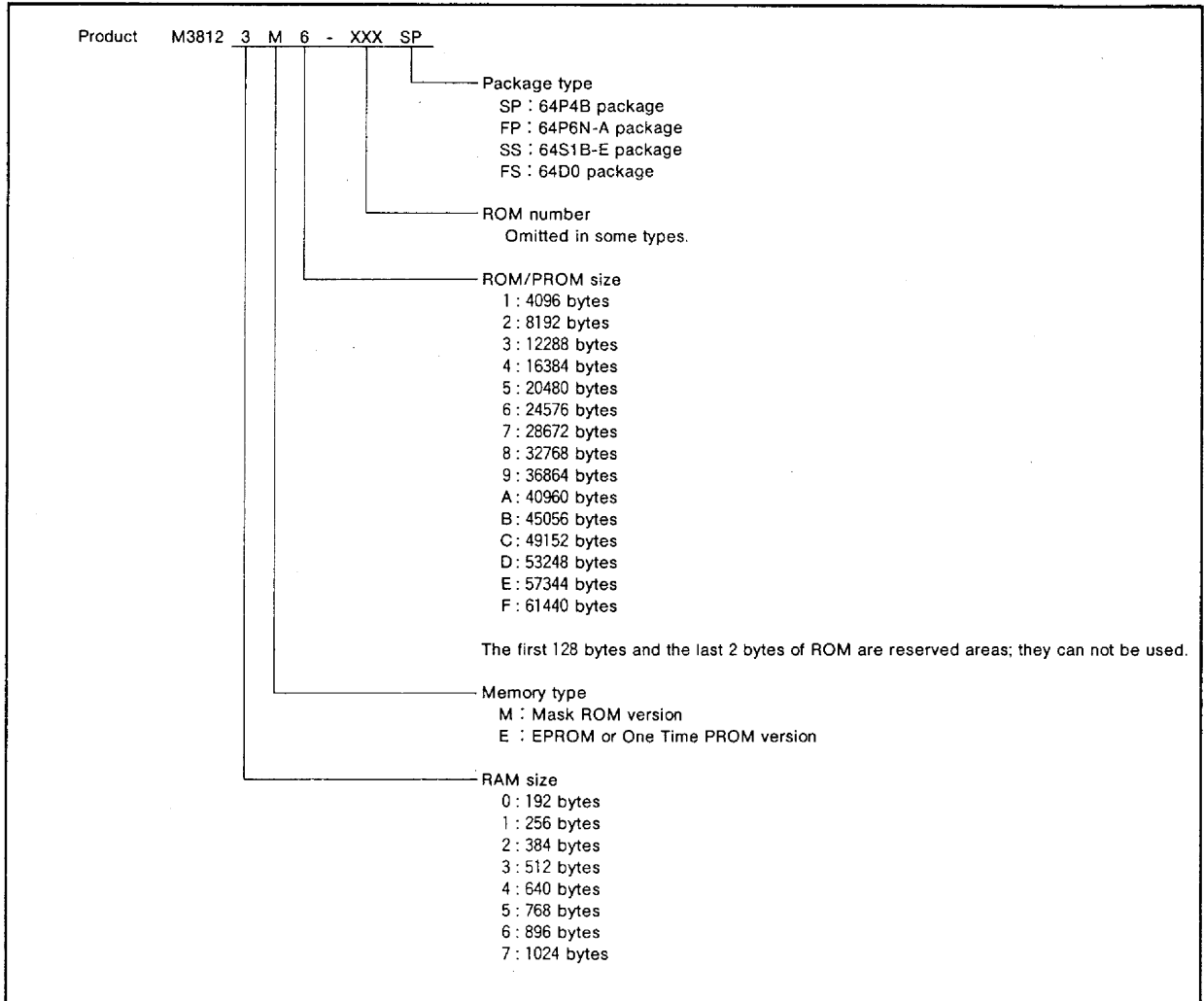
SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PIN DESCRIPTION (Continued)

| Pin | Name | Function | Function except a port function |
|---|-------------|---|---|
| | | | |
| P5 ₀ /S _{IN} , P5 ₁ /S _{OUT} , P5 ₂ /S _{CLK} , P5 ₃ /S _{RDY} | I/O port P5 | <ul style="list-style-type: none"> • 8-bit CMOS I/O port with the same function as port P2₄-P2₇ • Keep the input voltage of this port between 0V and V_{CC}. • The pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-up. • CMOS compatible input level • N-channel open-drain output | Serial I/O pins |
| P5 ₄ , P5 ₅ | | <ul style="list-style-type: none"> • 2-bit CMOS I/O port with the same function as port P2₄-P2₇ • The pull-up/pull-down register and I/O direction register allow each pin to be programmed as pull-up. • CMOS compatible input level • CMOS 3-state output | |
| P6 ₀ /AN ₀ - P6 ₇ /AN ₇ | I/O port P6 | <ul style="list-style-type: none"> • 8-bit CMOS I/O port with the same function as port P2₄-P2₇ • CMOS compatible input level • CMOS 3-state output | A-D converter input pins |
| P7 ₀ /X _{COU} , P7 ₁ /X _{CIN} | I/O port P7 | <ul style="list-style-type: none"> • 2-bit CMOS I/O port with the same function as port P2₄-P2₇ • CMOS compatible input level • CMOS 3-state output | An I/O pin for the internal sub-clock generating circuit (connect a ceramic resonator or a quartz-crystal oscillator) |

SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

PART NUMBERING



SINGLE-CHIP 8-BIT CMOS MICROCOMPUTER

GROUP EXPANSION

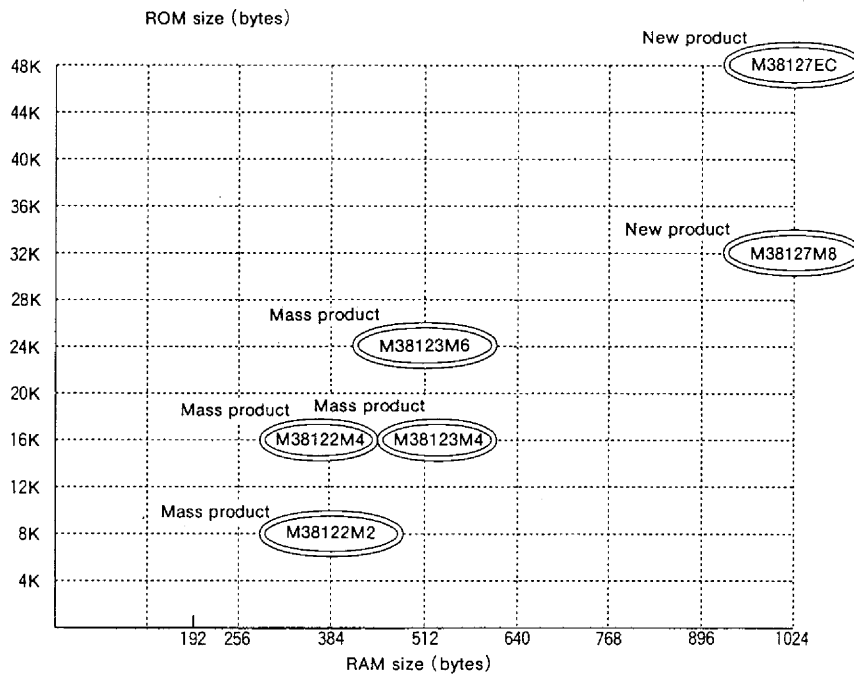
Mitsubishi plans to expand the 3812 group as follows:

- (1) Support for mask ROM, One Time PROM, and EPROM versions
 ROM/PROM size 8K to 48K bytes
 RAM size 384 to 1024 bytes

(2) Packages

- 64P4B Shrink plastic molded DIP
 64P6N-A Plastic molded QFP
 64S1B-E Shrink ceramic DIP (EPROM version)
 64D0 Ceramic LCC (EPROM version)

Memory Expansion Plan



Currently supported products are listed below.

As of May 1996

| Product | (P) ROM size (bytes) ROM size for User in () | RAM size (bytes) | Package | Remarks |
|----------------|--|------------------|------------------|-------------------------------|
| M38122M2-XXXSP | 8192 | 384 | 64P4B | Mask ROM version |
| M38122M2-XXXFP | (8062) | | 64P6N-A | Mask ROM version |
| M38122M4-XXXSP | 16384 (16254) | | 64P4B | Mask ROM version |
| M38122M4-XXXFP | | | 64P6N-A | Mask ROM version |
| M38123M4-XXXSP | | 512 | 64P4B | Mask ROM version |
| M38123M4-XXXFP | | | 64P6N-A | Mask ROM version |
| M38123M6-XXXSP | 64P4B | | Mask ROM version | |
| M38123M6-XXXFP | 64P6N-A | | Mask ROM version | |
| M38127M8-XXXSP | 32768 | 1024 | 64P4B | Mask ROM version |
| M38127M8-XXXFP | (32638) | | 64P6N-A | Mask ROM version |
| M38127EC-XXXSP | 49152 (49022) | | 64P4B | One Time PROM version |
| M38127EC-XXXFP | | | 64P6N-A | One Time PROM version |
| M38127ECSP | | | 64P4B | One Time PROM version (blank) |
| M38127ECFP | | | 64P6N-A | One Time PROM version (blank) |
| M38127ECSS | | | 64S1B-E | EPROM version |
| M38127ECFS | | | 64D0 | EPROM version |

Renesas Technology Corp.

Nippon Bldg., 6-2, Otemachi 2-chome, Chiyoda-ku, Tokyo, 100-0004 Japan

Keep safety first in your circuit designs!

- Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the selection of the Mitsubishi semiconductor product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Mitsubishi Electric Corporation or a third party.
- Mitsubishi Electric Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Mitsubishi Electric Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for the latest product information before purchasing a product listed herein.
- The information described here may contain technical inaccuracies or typographical errors. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors. Please also pay attention to information published by Mitsubishi Electric Corporation by various means, including the Mitsubishi Semiconductor home page (<http://www.mitsubishichips.com>).
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
- Mitsubishi Electric Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Mitsubishi Electric Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
- Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for further details on these materials or the products contained therein.

