

To our customers,

Old Company Name in Catalogs and Other Documents

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

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

April 1st, 2010
Renesas Electronics Corporation

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

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

7548/7549 Group, 7546/7547 Group

Differences between 7548/49 Group and 7546/47 Group

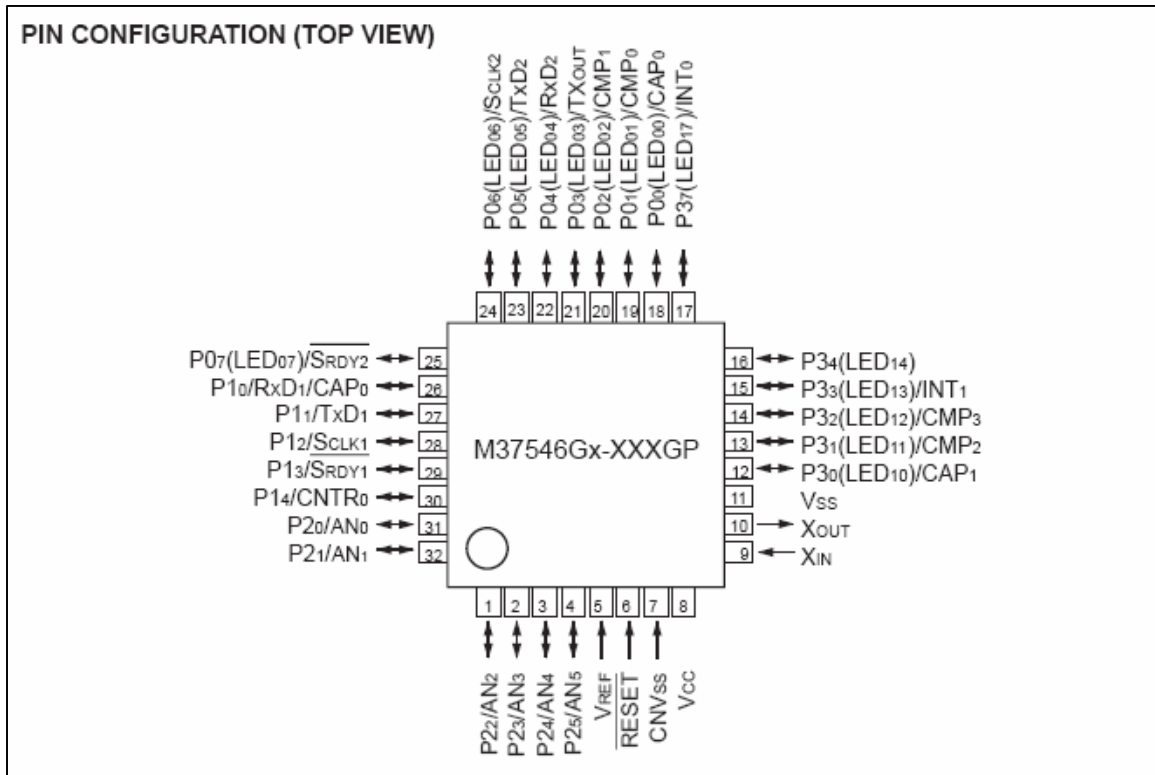
1. Differences between 7548/49 Group and 7546/47 Group

	7546/47 Group		7548/49 Group	
	7546	7547	7548	7549
Applicable Product	M37546G2-XXXGP/HP/SP M37546G2GP/HP/SP M37546G4-XXXGP/HP/SP M37546G4GP/HP/SP	M37547G2-XXXFP M37547G2FP M37547G4-XXXFP M37547G4FP	M37548G3-XXXFP M37548G3FP M37548G2-XXXFP M37548G2FP M37548G1-XXXFP M37548G1FP	M37549G3-XXXFP M37549G3FP M37549G2-XXXFP M37549G2FP M37549G1-XXXFP M37549G1FP
Package	PLQP0032GB-A(32P6U-A) PWQN0036KA-A(36PJW-A) PRDP0032BA-A(32P4B)	PRSP0036GA-A (36P2R-A)	PLSP0020JB-A (20P2F-A)	PRSP0024GA-A (24P2Q-A)
ROM Type: ROM/RAM Size (Bytes)	QzROM: 8K/384 (for G2) QzROM: 16K/512 (for G4)		QzROM: 2K/192 (for G1) QzROM: 4K/256 (for G2) QzROM: 6K/256 (for G3)	
Programmable I/O	25	29	15	19
LED Ports	16 (Total electrical current: 80 mA)		8	
Interrupts	18 sources, 16 vectors (six external sources)		12 sources, 12 vectors (four external sources)	
Timer	8-bit x 2 (Timer 1, X)		8-bit x 2 (Timer 1, 2)	
	16-bit x 2 (Timer A, B)		16-bit x 1 (Timer A)	
Output Compare	4-channels		3-channels	
Input Capture	2-channels		1-channel	
Serial Interface	8-bit x 2 (UART or Clock-synchronized)		8-bit x 1 (UART or Clock-synchronized)	
A/D Converter	10-bit x 6-channels	10-bit x 8-channels	10-bit x 6-channels	10-bit x 8-channels
On-Chip Oscillator	2MHz(Typ.)		High-speed: 4MHz(Typ.) Low-speed: 250kHz(Typ.)	

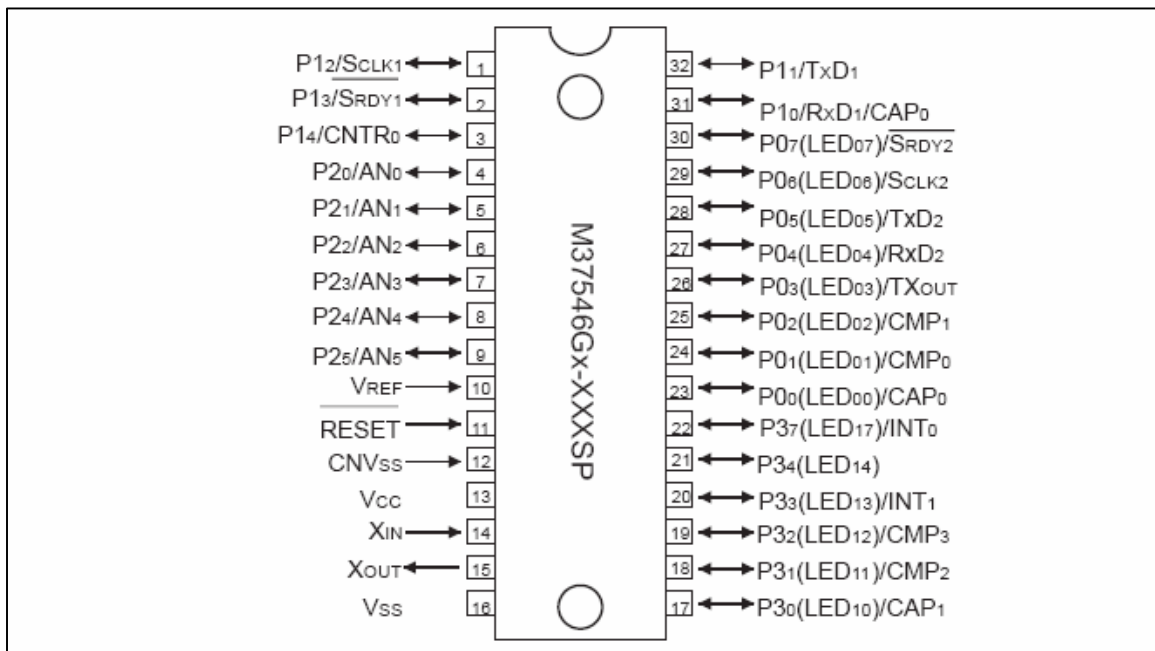
2. Pin configuration of 7548/49 Group and 7546/47 Group

The 7548/49 Group and 7546/47 Group are NOT pin compatible. The differences of the pin configuration and package type are indicated below.

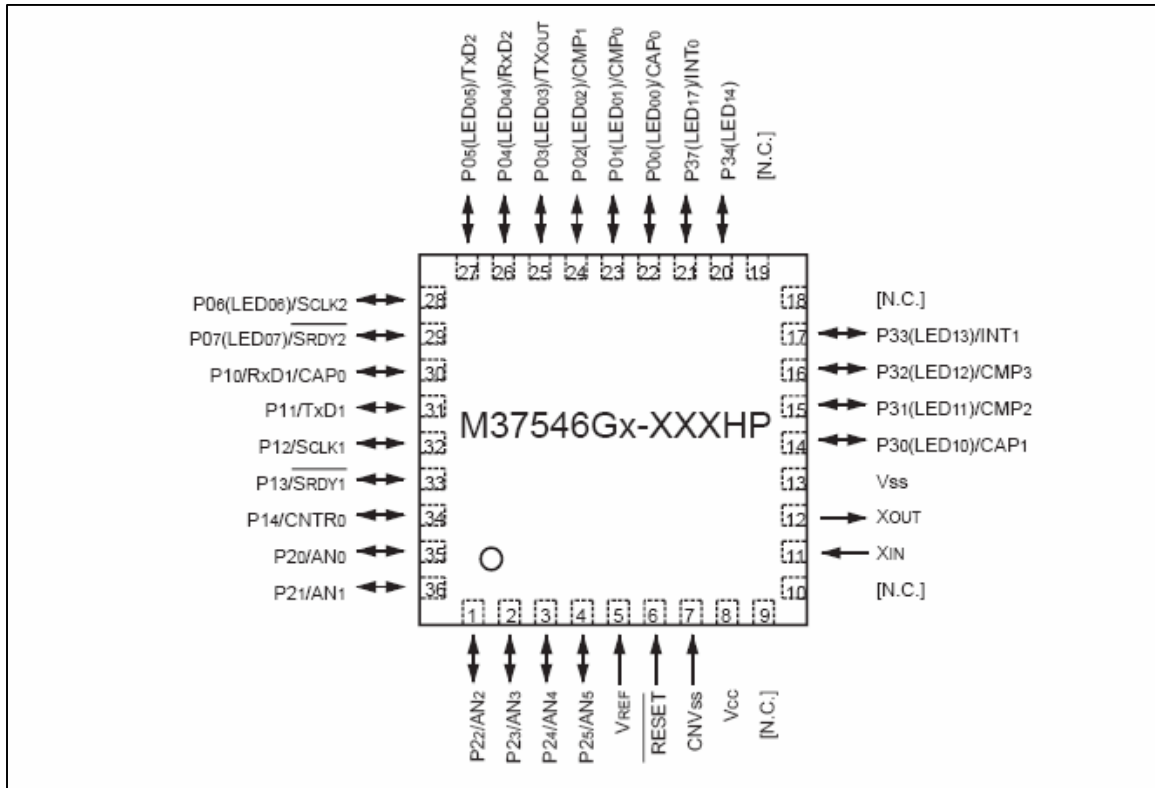
7546/47 Group Pin Configuration & Package Type



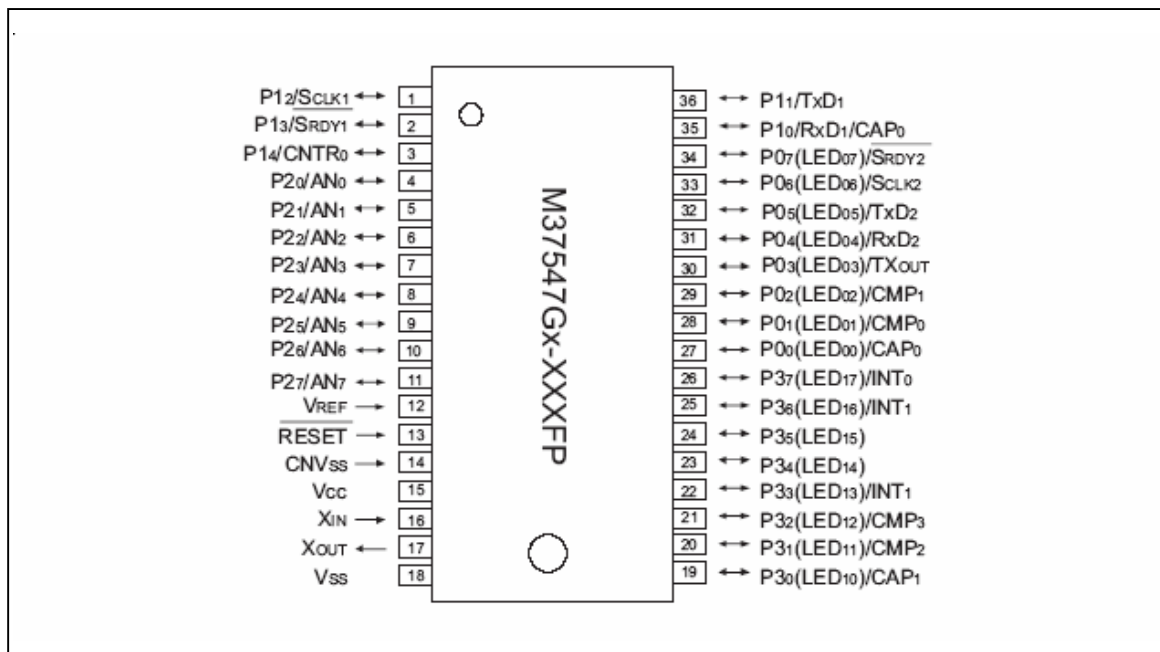
Package type: PLQP0032GB-A (32P6U-A)



Package type: PRDP0032BA-A (32P4B)

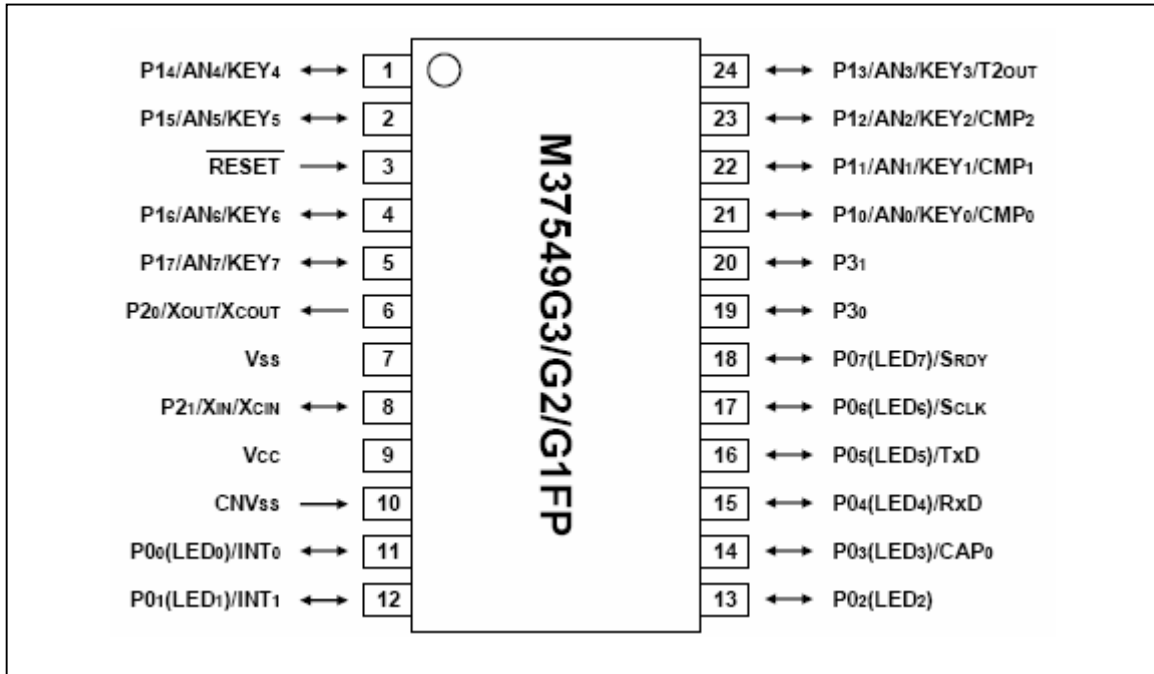


Package type: PWQN0036KA-A (36PJW-A)

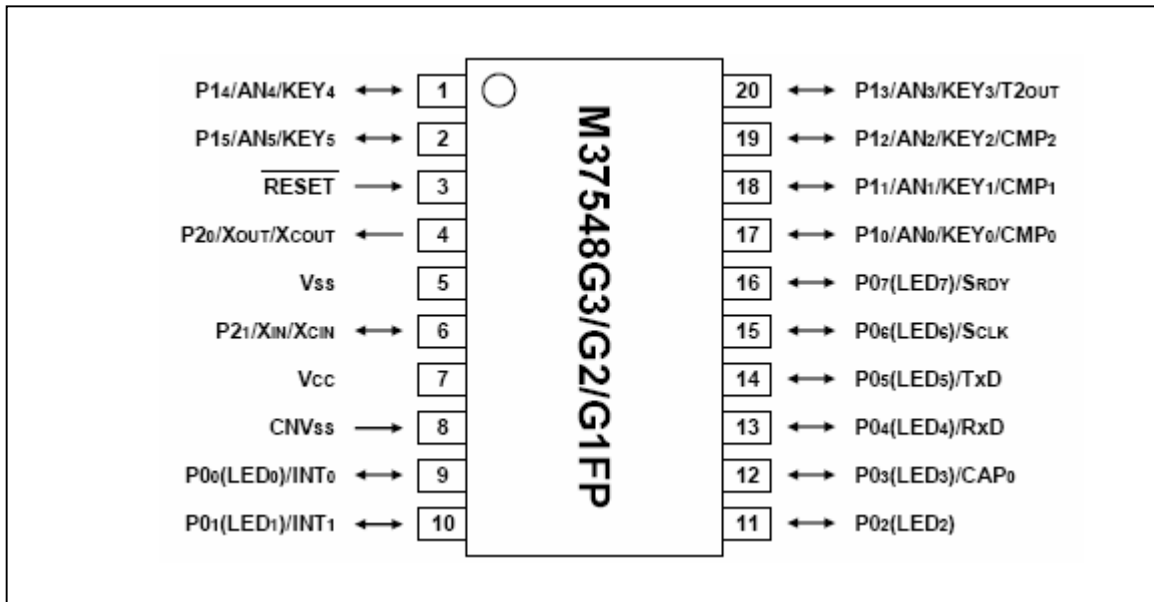


Package type: PRSP0036GA-A (36P2R-A)

7548/49 Group Pin Configuration & Package Type



Package type: PRSP0024GA-A (24P2Q-A)



Package type: PLSP0020JB-A (20P2F-A)

3. SFR of 7548/49 Group and 7546/47 Group

The differences of the SFRs between the 7548/49 Group and 7546/47 Group are indicated below.

	7546/47 Group	7548/49 Group
0000 ₁₆	Port P0 (P0)	Port P0 (P0)
0001 ₁₆	Port P0 direction register (P0D)	Port P0 direction register (P0D)
0002 ₁₆	Port P1 (P1)	Port P1 (P1)
0003 ₁₆	Port P1 direction register (P1D)	Port P1 direction register (P1D)
0004 ₁₆	Port P2 (P2)	Port P2 (P2)
0005 ₁₆	Port P2 direction register (P2D)	Port P2 direction register (P2D)
0006 ₁₆	Port P3 (P3)	Port P3 (P3) *only 7549
0007 ₁₆	Port P3 direction register (P3D)	Port P3 direction register (P3D) *only 7549
0008 ₁₆	Reserved	Reserved
0009 ₁₆	Reserved	Reserved
000A ₁₆	Interrupt source set register (INTSET)	Reserved
000B ₁₆	Interrupt source discrimination register (INTDIS)	Reserved
000C ₁₆	Capture register 0 (low-order) (CAP0L)	Port P0 drive capacity control register (DCCR)
000D ₁₆	Capture register 0 (high-order) (CAP0H)	Port P0 Pull-up control register (PULL0)
000E ₁₆	Capture register 1 (low-order) (CAP1L)	Port P1 Pull-up control register (PULL1)
000F ₁₆	Capture register 1 (high-order) (CAP1H)	Key-on wake-up input select register (KEYS)
0010 ₁₆	Compare register (low-order) (CMPL)	Capture/Compare register (low-order) (CRAL)
0011 ₁₆	Compare register (high-order) (CMPH)	Capture/Compare register (high-order) (CRAH)
0012 ₁₆	Capture/compare register R/W pointer (CCRP)	Capture/Compare register R/W pointer (CCRP)
0013 ₁₆	Capture software trigger register (CSTR)	Compare output mode register (CMOM)
0014 ₁₆	Compare register re-load register (CMPR)	Timer A (low-order) (TAL)
0015 ₁₆	Port P0P3 drive capacity control register (DCCR)	Timer A (high-order) (TAH)
0016 ₁₆	Pull-up control register (PULL)	Reserved
0017 ₁₆	Port P1P3 control register (P1P3C)	Reserved
0018 ₁₆	Transmit 1 /Receive 1 buffer register (TB1/RB1)	Transmit/Receive buffer register (TB/RB)
0019 ₁₆	Serial I/O1 status register (SIO1STS)	Serial I/O status register (SIOSTS)
001A ₁₆	Serial I/O1 control register (SIO1CON)	Serial I/O control register (SIOCON)
001B ₁₆	UART1 control register (UART1CON)	UART control register (UARTCON)
001C ₁₆	Baud rate generator 1 (BRG1)	Baud rate generator (BRG)
001D ₁₆	Timer A, B mode register (TABM)	Reserved
001E ₁₆	Capture/compare port register (CCPR)	Reserved
001F ₁₆	Timer source selection register (TMSR)	Reserved
0020 ₁₆	Capture mode register (CAPM)	Reserved
0021 ₁₆	Compare output mode register (CMOM)	Reserved
0022 ₁₆	Capture/compare status register (CCSR)	Reserved
0023 ₁₆	Compare interrupt source set register (CISR)	Reserved
0024 ₁₆	Timer A (low-order) (TAL)	Reserved
0025 ₁₆	Timer A (high-order) (TAH)	Reserved
0026 ₁₆	Timer B (low-order) (TBL)	Reserved
0027 ₁₆	Timer B (high-order) (TBH)	Reserved
0028 ₁₆	Prescaler 1 (PRE1)	Prescaler 12 (PRE12)
0029 ₁₆	Timer 1 (T1)	Timer 1 (T1)
002A ₁₆	Timer count source set register (TCSS)	Timer 2 (T2)
002B ₁₆	Timer X mode register (TXM)	Timer mode register (TM)
002C ₁₆	Prescaler X (PREX)	Timer count source set register (TCSS)
002D ₁₆	Timer X (TX)	Compare register re-load register (CMPR)

	7546/47 Group	7548/49 Group
002E ₁₆	Transmit 2 / Receive 2 buffer register (TB2/RB2)	Capture/compare port register (CCPR)
002F ₁₆	Serial I/O2 status register (SIO2STS)	Capture/compare status register (CCSR)
0030 ₁₆	Serial I/O2 control register (SIO2CON)	Compare interrupt source set register (CISR)
0031 ₁₆	UART2 control register (UART2CON)	Capture software trigger register (CSTR)
0032 ₁₆	Baud rate generator 2 (BRG2)	Capture mode register (CAPM)
0033 ₁₆	Reserved	Reserved
0034 ₁₆	A/D control register (ADCON)	A/D control register (ADCON)
0035 ₁₆	A/D conversion register (low-order) (ADL)	A/D conversion register (low-order) (ADL)
0036 ₁₆	A/D conversion register (high-order) (ADH)	A/D conversion register (high-order) (ADH)
0037 ₁₆	OSC division ratio selection register (RODR)	Clock mode register (CLKM)
0038 ₁₆	MISRG	Oscillation stop detection register (CLKSTP)
0039 ₁₆	Watchdog timer control register (WDTCN)	Watchdog timer control register (WDTCN)
003A ₁₆	Interrupt edge selection register (INTEDGE)	Interrupt edge selection register (INTEDGE)
003B ₁₆	CPU mode register (CPUM)	CPU mode register (CPUM)
003C ₁₆	Interrupt request register 1 (IREQ1)	Interrupt request register 1 (IREQ1)
003D ₁₆	Interrupt request register 2 (IREQ2)	Interrupt request register 2 (IREQ2)
003E ₁₆	Interrupt control register 1 (ICON1)	Interrupt control register 1 (ICON1)
003F ₁₆	Interrupt control register 2 (ICON2)	Interrupt control register 2 (ICON2)

Note : Do not access to the SFR reserved area.

- : New SFR in 7548/49
- : Changed in 7548/49
- : Only in 7546/47

4. Interrupt vector of 7548/49 Group and 7546/47 Group

Interrupt sources and interrupt vector addresses are changed to the 7548/49 Group with additional registers as indicated below. The bits in interrupt request registers and interrupt control registers are also changed. (Please refer to their datasheet for the detail information)

7546/47 Group and 7548/49 Group Difference =

Vector address		Priority	7546/47 Group Interrupt Source	7548/49 Group Interrupt Source
High-order	Low-order			
FFFD ₁₆	FFFC ₁₆	1	Reset	Reset
FFFB ₁₆	FFFA ₁₆	2	Serial I/O1 receive	Serial I/O receive
FFF9 ₁₆	FFF8 ₁₆	3	Serial I/O1 transmit	Serial I/O transmit
FFF7 ₁₆	FFF6 ₁₆	4	Serial I/O2 receive	INT ₀
FFF5 ₁₆	FFF4 ₁₆	5	Serial I/O2 transmit	INT ₁
FFF3 ₁₆	FFF2 ₁₆	6	INT ₀	Key-on wake-up
FFF1 ₁₆	FFF0 ₁₆	7	INT ₁	Capture
FFEF ₁₆	FFEE ₁₆	8	Key-on wake-up / UART1 bus collision detection	Compare
FFED ₁₆	FFEC ₁₆	9	CNTR ₀	Timer A
FFEB ₁₆	FFEA ₁₆	10	Capture 0	Timer 2
FFE9 ₁₆	FFE8 ₁₆	11	Capture 1	A/D conversion
FFE7 ₁₆	FFE6 ₁₆	12	Compare	Timer 1
FFE5 ₁₆	FFE4 ₁₆	13	Timer X	Reserved area
FFE3 ₁₆	FFE2 ₁₆	14	Timer A	Reserved area
FFE1 ₁₆	FFE0 ₁₆	15	Timer B	Reserved area
FFDF ₁₆	FFDE ₁₆	16	A/D conversion / Timer 1	Reserved area
FFDD ₁₆	FFDC ₁₆	17	BRK instruction	BRK instruction

5. Clock generating circuit of 7548/49 Group and 7546/47 Group

The differences of clock generating circuit between the 7548/49 Group and 7546/47 Group are indicated below.

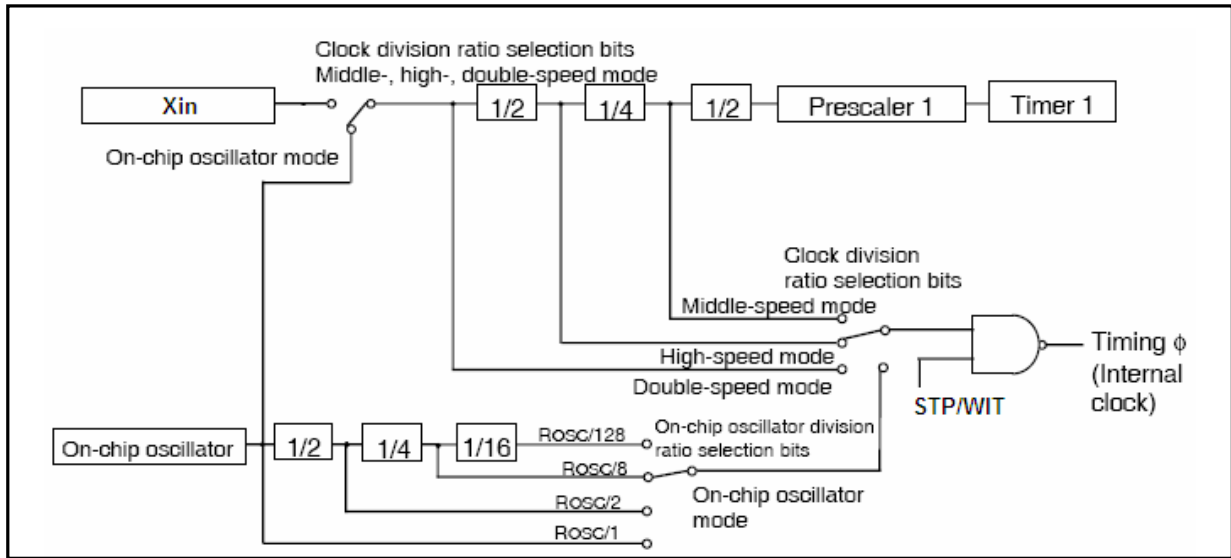


Figure 1 7546/47 Group Clock Generating Circuit Block Diagram

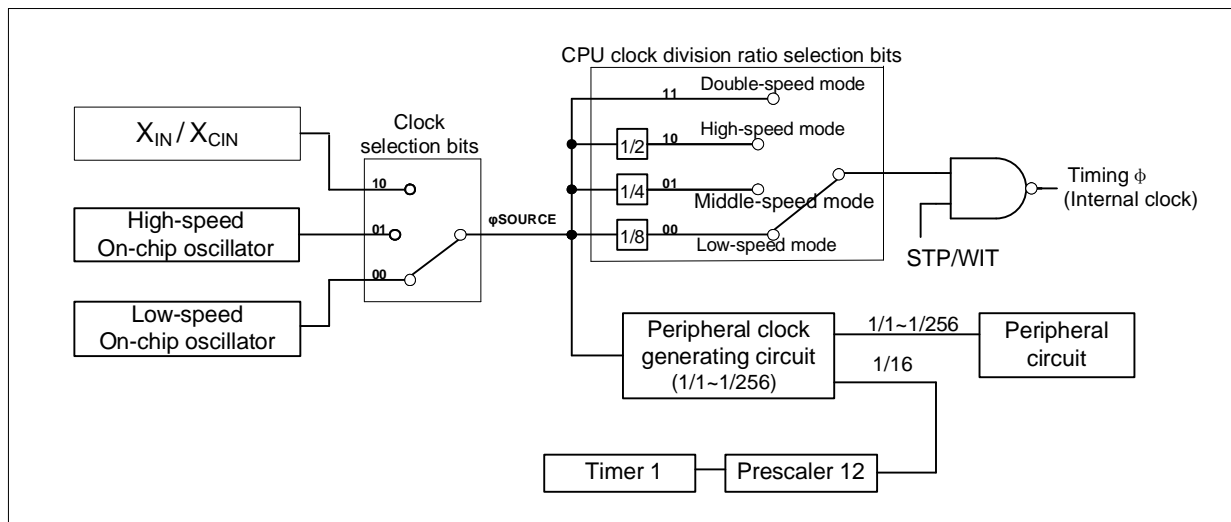


Figure 2 7548/49 Group Clock Generating Circuit Block Diagram

6. Timer of 7548/49 Group and 7546/47 Group

The differences of Timers between the 7548/49 Group and 7546/47 Group are indicated below. Compared with the 7546/47 Group, some functions of the timer 2 are reduced in the 7548/49 Group, and the compare modulation output function is also reduced in Timer A of the 7548/49 Group.

7546/47 Group Timer		7548/49 Group Timer	
Timer 1 (Prescaler 1)	Count source: $f(XIN)/16$ or $f(RING)/16$ (set using the CPUM register)	Timer 1 (Prescaler 12)	Count source: $f(\phi_{SOURCE})/16$, or $f(X_{CIN}):32kHz$ quartz crystal oscillation (set using the CLKM and TCSS register)
Timer X (Prescaler X)	Count source: $f(XIN)/16$, $f(XIN)/2$, $f(XIN)$ (set using the TCSS register)	Timer 2 (Prescaler 12)	Count source: $f(\phi_{SOURCE})/16$, $f(\phi_{SOURCE})/256$, Prescaler 12 output, Timer A underflow (set using the CLKM and TCSS register)
	Timer X has four operating modes: (set using the TXM register) (1) Timer mode (2) Pulse output mode (3) Event counter mode (4) Pulse width measurement mode		Timer 2 has two operating modes: (set using the TM register) (1) Timer mode (2) Pulse output mode
Timer A/B (16-bit)	Count source: $f(XIN)/16$, $f(XIN)/2$, $f(XIN)/32$, $f(XIN)/64$, $f(XIN)/128$, $f(XIN)/256$, or on-chip oscillator output(only timerA), timer A underflow(only timer B) (set using the TCSS register)	Timer A (16-bit)	Count source: $f(\phi_{SOURCE})/16$, $f(\phi_{SOURCE})/2$, $f(\phi_{SOURCE})/32$, $f(\phi_{SOURCE})/64$, $f(\phi_{SOURCE})/128$, $f(\phi_{SOURCE})/256$, $f(LSOCO)$, $f(X_{CIN})$ (set using the CLKM and TCSS register)
	Timers A/B have three operating modes: (set using the TABM register) (1) Timer mode (2) Output compare mode (Normal or Modulation output) (3) Input capture mode		Timer A has three operating modes: (1) Timer mode (2) Output compare mode (only Normal output) (3) Input capture mode

7. Notes

Each product has different oscillation circuit constants of X_{IN} - X_{OUT} and X_{CIN} - X_{COUT} . Consult with an oscillator manufacturer when deciding on an oscillator and oscillation circuit constants. For products used in mass production, make sure a stable operation clock is obtained from the user system and usage (especially when being used in wide voltage and temperature ranges). When designing a circuit, we recommend the user refer to the feedback resistor, dumping resistor, and load capacity trace routing. In addition, although compatibility in characteristics is fully considered when designing each device, actual values such as operating margin, A/D conversion accuracy, noise immunity, and noise radiation may be different within the range of electrical characteristics due to different manufacturing processes. Therefore, perform thorough system evaluations for each product before starting mass production.

8. Reference Document

Hardware manual

7546 Group datasheet (Rev.1.21)

7547 Group datasheet (Rev.1.21)

7548 Group datasheet (Rev.2.01)

7549 Group datasheet (Rev.2.01)

(Download the latest version from the Renesas Technology website.)

Technical update/Technical news

(Download the latest information from the Renesas Technology website.)

Website and Support

Renesas website

<http://www.renesas.com/>

Inquires

<http://www.renesas.com/inquiry>csc@renesas.com**Revision Record**

Rev.	Date	Description	
		Page	Summary
1.00	Aug.21.06	-	First edition issued
2.00	Oct.30.07	1	The content of "Function Set ROM Data" column in table deleted.
		7	The number of interrupts of 7548/49 group in table revised.
		8	The figure 2 updated.
		9	The table content of 7548/49 group updated.
			The part of "Notes" supplemented.
			The revision of the datasheets updated.

Keep safety first in your circuit designs!

1. Renesas Technology 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 nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corporation 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 Renesas Technology Corporation or a third party.
2. Renesas Technology 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.
3. 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 Renesas Technology Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor for the latest product information before purchasing a product listed herein.
The information described here may contain technical inaccuracies or typographical errors. Renesas Technology 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 Renesas Technology Corporation by various means, including the Renesas Technology Corporation Semiconductor home page (<http://www.renesas.com>).
4. 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. Renesas Technology Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology 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 Renesas Technology Corporation or an authorized Renesas Technology Corporation 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.
6. The prior written approval of Renesas Technology Corporation is necessary to reprint or reproduce in whole or in part these materials.
7. 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.
8. Please contact Renesas Technology Corporation for further details on these materials or the products contained therein.

© 2007. Renesas Technology Corp., All rights reserved.