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Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Discontinued at Digi-Key
Core Processor	RX
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, EBI/EMI, I ² C, LINbus, SCI, SPI, USB
Peripherals	DMA, LVD, POR, PWM, WDT
Number of I/O	78
Program Memory Size	1.5MB (1.5M x 8)
Program Memory Type	FLASH
EEPROM Size	32K x 8
RAM Size	128K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 8x10b, 14x12b; D/A 1x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-LQFP
Supplier Device Package	100-LFQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/r5f5631dddfp-v0

1. Overview

1.1 Outline of Specifications

Table 1.1 lists the specifications in outline, and table 1.2 gives a comparison of the functions of products in different packages.

Table 1.1 is for products with the greatest number of functions, so numbers of peripheral modules and channels will differ in accord with the package. For details, see Table 1.2, Comparison of Functions for Different Packages in the RX63N/RX631 Group.

Table 1.1 Outline of Specifications (1/6)

Classification	Module/Function	Description
CPU	CPU	- Maximum operating frequency: 100 MHz 32-bit RX CPU - Minimum instruction execution time: One instruction per state (cycle of the system clock) - Address space: 4-Gbyte linear - Register set of the CPU - General purpose: Sixteen 32-bit registers - Control: Nine 32-bit registers - Accumulator: One 64-bit register - Basic instructions: 73 - Floating-point instructions: 8 - DSP instructions: 9 - Addressing modes: 10 - Data arrangement - Instructions: Little endian - Data: Selectable as little endian or big endian - On-chip 32-bit multiplier: 32 x 32 → 64 bits - On-chip divider: 32 / 32 → 32 bits - Barrel shifter: 32 bits - Memory protection unit (MPU)
	FPU	- Single precision (32-bit) floating point - Data types and floating-point exceptions in conformance with the IEEE754 standard
Memory	ROM	- Capacity: ROMless, 256 Kbytes, 384 Kbytes, 512 Kbytes, 768 Kbytes, 1 Mbyte, 1.5 Mbytes, 2 Mbytes 100 MHz, no-wait access - On-board programming: Four types - Off-board programming (parallel programmer mode) (for products with 100 pins or more)
	RAM	- Capacity: 64 Kbytes, 128 Kbytes, 192 Kbytes, 256 Kbytes 100 MHz, no-wait access
	E2 data flash	Capacity: 32 Kbytes Programming/erasing: 100,000 times
MCU operating modes		Single-chip mode, on-chip ROM enabled expansion mode, and on-chip ROM disabled expansion mode (software switching)
Clock	Clock generation circuit	- Main clock oscillator, subclock oscillator, low-speed/high-speed on-chip oscillator, PLL frequency synthesizer, and IWDG-dedicated on-chip oscillator - Main-clock oscillation stoppage detection - Separate frequency-division and multiplication settings for the system clock (ICLK), peripheral module clock (PCLK), FlashIF clock (FCLK) and external bus clock (BCLK) The CPU and other bus masters run in synchronization with the system clock (ICLK): Up to 100 MHz Peripheral modules run in synchronization with the peripheral module clock (PCLK): Up to 50 MHz Flash IF run in synchronization with the flashIF clock (FCLK): Up to 50 MHz Devices connected to the external bus run in synchronization with the external bus clock (BCLK): Up to 50 MHz
Reset		RES# pin reset, power-on reset, voltage-monitoring reset, independent watchdog timer reset, watchdog timer reset, deep software standby reset, and software reset
Voltage detection circuit		When the voltage on VCC passes the voltage detection level (Vdet), an internal reset or internal interrupt is generated.

Table 1.2 Comparison of Functions for Different Packages in the RX63N/RX631 Group

Functions		RX63N Group				RX631 Group				
Package		177-pin 176-pin	145-pin 144-pin	100-pin	177-pin 176-pin	145-pin 144-pin	100-pin	64-pin LQFP	64-pin TFLGA	48-pin
External bus width	External bus width	32 bits	16 bits		32 bits	16 bits				Not available
	SDRAM area controller	Available		Not available	Available					Not available
DMA	DMA controller	Ch. 0 to 3						Ch. 0 to 3		
	EXDMA controller	Ch. 0 and 1			Ch. 0 and 1			Not available		
	Data transfer controller	Available						Available		
Timers	16-bit timer pulse unit	Ch. 0 to 11	Ch. 0 to 5		Ch. 0 to 11			Ch. 0 to 5		
	Multi-function timer pulse unit 2	Ch. 0 to 5						Ch. 0 to 5		
	Port output enable 2	Available						Available		
	Programmable pulse generator	Ch. 0 and 1						Ch. 0 and 1		
	8-bit timers	Ch. 0 to 3						Ch. 0 to 3		
	Compare match timer	Ch. 0 to 3						Ch. 0 to 3		
	Realtime clock	Available						Available		Not available
	Watchdog timer	Available						Available		
	Independent watchdog timer	Available						Available		
	Communicatio n function	Ethernet controller	Available						Not available	
DMA controller for Ethernet controller		Available						Not available		
USB 2.0 host/function module		Ch. 0 and 1	Ch.0		Ch. 0 and 1		Ch.0	Ch. 0 and 1	Ch.0	
Serial communications interfaces (SClc)		Ch. 0 to 11	Ch. 0 to 3, 5, 6, 8 and 9		Ch. 0 to 11		Ch. 0 to 3, 5, 6, 8 and 9	Ch. 1, 5, 6, 8 and 9	Ch. 1, 5, 6, and 8	
Serial communications interfaces (SCld)		Ch. 12						Ch. 12		
I ² C bus interfaces		Ch. 0 to 3	Ch.0 and 2		Ch. 0 to 3		Ch.0 and 2	Ch.2		
IEBus		Available						Available		
Serial peripheral interfaces		Ch.0 to 2	Ch. 0 and 1		Ch.0 to 2			Ch. 0 and 1		
CAN module		For 1.5 M or more: Ch. 0 to 2, For 1 M or less: Ch. 0 and 1	Ch. 0 and 1		For 1.5 M or more: Ch. 0 to 2, For 1 M or less: Ch. 0 and 1		Ch. 0 and 1	Ch.1		
Parallel data capture unit (PDC)		Not available			Available			Not available		
12-bit A/D converter (channel)		AN000 to 020		AN000 to 013	AN000 to 020		AN000 to 013	AN000 to 004, 006, 008 to 013		AN000 to 002, 006, 009 to 012
10-bit A/D converter (channel)		AN0 to 7			AN0 to 7			Not available		
D/A converter		Ch. 0 and 1	Ch.1		Ch. 0 and 1	Ch.1		Ch.1		Not available
Temperature sensor		Available						Available		
CRC calculator		Available						Available		
Unique ID		Available (only for the G version)								
Off-board programming (parallel programmer mode)				Available			Not available			
Sub-clock oscillator (for low clock loads)				Available			Not available			
Sub-clock oscillator (for standard clock loads)				Available			Not available			
Battery backup function				Available			Not available			
I/O port switching function		Not available			Not available			Available		

Table 1.3 List of Products (2/8)

Group	Part No.	Package	ROM Capacity	RAM Capacity	E2 Data Flash	Operating Frequency (Max.)	Operating Temp. Range
RX63N (D version)	R5F563NDDDLK	PTLG0145KA-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBCDLK	PTLG0145KA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBDDLK	PTLG0145KA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NACDLK	PTLG0145KA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NADDLK	PTLG0145KA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NFHDFB	PLQP0144KA-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NFDDFB	PLQP0144KA-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NKHDFB	PLQP0144KA-A*1	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NKDDFB	PLQP0144KA-A	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NECDFB	PLQP0144KA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NEDDFB	PLQP0144KA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NJHDFB	PLQP0144KA-A*1	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NJDDFB	PLQP0144KA-A*1	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NGHDFB	PLQP0144KA-A*1	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NGDDFB	PLQP0144KA-A*1	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDCDFB	PLQP0144KA-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDDDFB	PLQP0144KA-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NYHDFB	PLQP0144KA-A	1 Mbyte	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NYDDFB	PLQP0144KA-A	1 Mbyte	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NWHDFB	PLQP0144KA-A	1 Mbyte	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NWDDFB	PLQP0144KA-A	1 Mbyte	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBCDFB	PLQP0144KA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBDDFB	PLQP0144KA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NACDFB	PLQP0144KA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NADDFB	PLQP0144KA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NECDLJ	PTLG0100JA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NEDDLJ	PTLG0100JA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDCDLJ	PTLG0100JA-A*1	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDDDLJ	PTLG0100JA-A*1	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBCDLJ	PTLG0100JA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NBDDLJ	PTLG0100JA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NACDLJ	PTLG0100JA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NADDLJ	PTLG0100JA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NFHDFP	PLQP0100KB-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NFDDFP	PLQP0100KB-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NKHDFP	PLQP0100KB-A*1	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NKDDFP	PLQP0100KB-A	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NECDFP	PLQP0100KB-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NEDDFP	PLQP0100KB-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NJHDFP	PLQP0100KB-A*1	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NJDDFP	PLQP0100KB-A*1	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NGHDFP	PLQP0100KB-A*1	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NGDDFP	PLQP0100KB-A*1	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDCDFP	PLQP0100KB-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F563NDDDFP	PLQP0100KB-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C

Table 1.3 List of Products (6/8)

Group	Part No.	Package	ROM Capacity	RAM Capacity	E2 Data Flash	Operating Frequency (Max.)	Operating Temp. Range
RX631 (D version)	R5F56317CDFB	PLQP0144KA-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56317DDFB	PLQP0144KA-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ECDLJ	PTLG0100JA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631EDDLJ	PTLG0100JA-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631DCDLJ	PTLG0100JA-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631DDDLJ	PTLG0100JA-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631BCDLJ	PTLG0100JA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631BDDLJ	PTLG0100JA-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ACDLJ	PTLG0100JA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ADDLJ	PTLG0100JA-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56318CDLJ	PTLG0100JA-A	512 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56318DDLJ	PTLG0100JA-A	512 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56317CDLJ	PTLG0100JA-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56317DDLJ	PTLG0100JA-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56316CDLJ	PTLG0100JA-A	256 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56316DDLJ	PTLG0100JA-A	256 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631FHDFP	PLQP0100KB-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631FDDFP	PLQP0100KB-A	2 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631KHDFP	PLQP0100KB-A*1	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631KDDFP	PLQP0100KB-A	2 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ECDFP	PLQP0100KB-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631EDDFP	PLQP0100KB-A	2 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631JHDFP	PLQP0100KB-A*1	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631JDDFP	PLQP0100KB-A	1.5 Mbytes	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631GHDFP	PLQP0100KB-A*1	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631GDDFP	PLQP0100KB-A	1.5 Mbytes	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631DCDFP	PLQP0100KB-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631DDDFP	PLQP0100KB-A	1.5 Mbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631YHDFP	PLQP0100KB-A	1 Mbyte	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631YDDFP	PLQP0100KB-A	1 Mbyte	256 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631WHDFP	PLQP0100KB-A	1 Mbyte	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631WDDFP	PLQP0100KB-A	1 Mbyte	192 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631BCDFP	PLQP0100KB-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631BDDFP	PLQP0100KB-A	1 Mbyte	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ACDFP	PLQP0100KB-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631ADDFP	PLQP0100KB-A	768 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56318CDFP	PLQP0100KB-A	512 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56318DDFP	PLQP0100KB-A	512 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56317CDFP	PLQP0100KB-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56317DDFP	PLQP0100KB-A	384 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56316CDFP	PLQP0100KB-A	256 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F56316DDFP	PLQP0100KB-A	256 Kbytes	128 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631PCDFM	PLQP0064KB-A	512 Kbytes	64 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631PDDFM	PLQP0064KB-A	512 Kbytes	64 Kbytes	32 Kbytes	100 MHz	-40 to +85°C
	R5F5631NCDFM	PLQP0064KB-A	384 Kbytes	64 Kbytes	32 Kbytes	100 MHz	-40 to +85°C

Table 1.4 Pin Functions (6/6)

Classifications	Pin Name	I/O	Description
Analog power supply	AVCC0	Input	Analog voltage supply pin for the 12-bit A/D converter. Connect this pin to VCC if the 12-bit A/D converter is not to be used.
	AVSS0	Input	Analog ground pin for the 12-bit A/D converter. Connect this pin to VSS if the 12-bit A/D converter is not to be used.
	VREFH0	Input	Analog reference voltage supply pin for the 12-bit A/D converter. Connect this pin to VCC if the 12-bit A/D converter is not to be used.
	VREFL0	Input	Analog reference ground pin for the 12-bit A/D converter. Connect this pin to VSS if the 12-bit A/D converter is not to be used.
	VREFH	Input	Reference voltage input pin for the 10-bit A/D converter and D/A converter. This is used as the analog power supply for the respective modules. Connect this pin to VCC if neither the 10-bit A/D converter nor the D/A converter is in use.
	VREFL	Input	Reference ground pin for the 10-bit A/D converter and D/A converter. This is used as the analog ground for the respective modules. Set this pin to the same potential as the VSS pin.
I/O ports	P00 to P03, P05, P07	I/O	6-bit input/output pins.
	P10 to P17	I/O	8-bit input/output pins.
	P20 to P27	I/O	8-bit input/output pins.
	P30 to P37	I/O	8-bit input/output pins. (P35 is an input pin)
	P40 to P47	I/O	8-bit input/output pins.
	P50 to P57	I/O	8-bit input/output pins.
	P60 to P67	I/O	8-bit input/output pins.
	P70 to P77	I/O	8-bit input/output pins.
	P80 to P87	I/O	8-bit input/output pins.
	P90 to P97	I/O	8-bit input/output pins.
	PA0 to PA7	I/O	8-bit input/output pins.
	PB0 to PB7	I/O	8-bit input/output pins.
	PC0 to PC7	I/O	8-bit input/output pins.
	PD0 to PD7	I/O	8-bit input/output pins.
	PE0 to PE7	I/O	8-bit input/output pins.
	PF0 to PF5	I/O	6-bit input/output pins.
	PG0 to PG7	I/O	8-bit input/output pins.
	PJ3, PJ5	I/O	2-bit input/output pins.

Table 1.5 List of Pin and Pin Functions (177-Pin TFLGA, 176-Pin LFBGA) (5/5)

Pin Number 177-Pin TFLGA 176-Pin LFBGA	Power Supply Clock System Control	I/O Port	Bus EXDMAC SDRAMC	Timer (MTU, TPU, TMR, PPG, RTC, POE)	Communications (ETHERC, SCIC, SCID, RSPI, RIIC, CAN, IEB, USB, and PDC)	Interrupt	S12AD, AD, DA
P1	VSS						
P2		P17		MTIOC3A/MTIOC3B/ TIOCB0/TCLKD/TMO1/ PO15/POE8#	SCK1/TXD3/SMOSI3/ SSDA3/MISOA/SDA2-DS/ IETXD/USB1_VBUS/ PIXD3	IRQ7	ADTRG#
P3		P87		TIOCA2	PIXD2		
P4		P14		MTIOC3A/MTCLKA/ TIOCB5/TCLKA/TMRI2/ PO15	CTS1#/RTS1#/SS1#/ CTX1/USB0_DPUPE/ USB0_OVRCURA	IRQ4	
P5		P10		MTIC5W/TMRI3		IRQ0	
P6	VCC_USB						
P7	VSS_USB						
P8					USB1_DP		
P9		P52	RD#		RXD2/SMISO2/SSCL2/ SSLB3		
P10		P83	EDACK1	MTIOC4C	ET_CRS/RMII_CRS_DV/ CTS10#/RTS10#/SS10#		
P11		PC6	A22/CS1#	MTIOC3C/MTCLKA/ TIOCA6/TMC12/PO30	ET_ETXD3/RXD8/ SMISO8/SSCL8/MOSIA	IRQ13	
P12		PC4	A20/CS3#	MTIOC3D/MTCLKC/ TIOCC6/TCLKE/TMC11/ PO25/POE0#	ET_TX_CLK/SCK5/ CTS8#/RTS8#/SS8#/ SSLA0		
P13		PC2	A18	MTIOC4B/TCLKA/PO21	ET_RX_DV/RXD5/ SMISO5/SSCL5/SSLA3/ IERXD		
P14		P75	CS5#	PO20	ET_ERXD0/RMII_RXD0/ SCK11		
P15	VCC						
R1		P21		MTIOC1B/TIOCA3/ TMC10/PO1	RXD0/SMISO0/SSCL0/ SCL1/USB0_EXICEN/ PIXD5	IRQ9	
R2		P20		MTIOC1A/TIOCB3/ TMRI0/PO0	TXD0/SMOSI0/SSDA0/ SDA1/USB0_ID/PIXD4	IRQ8	
R3		P16		MTIOC3C/MTIOC3D/ TIOCB1/TCLKC/TMO2/ PO14/RTCOU	TXD1/RXD3/SMOSI1/ SMISO3/SSDA1/SSCL3/ MOSIA/SCL2-DS/IERXD/ USB0_VBUS/ USB0_VBUSEN/ USB0_OVRCURB	IRQ6	ADTRG0#
R4		P85					
R5		P11		MTIC5V/TMC13	SCK2	IRQ1	
R6					USB0_DM		
R7					USB0_DP		
R8					USB1_DM		
R9		P84					
R10	VSS						
R11	VCC						
R12		P80	EDREQ0	MTIOC3B/PO26	ET_TX_EN/ RMII_TXD_EN/SCK10		
R13		P76	CS6#	PO22	ET_RX_CLK/REF50CK/ RXD11/SMISO11/SSCL11		
R14		P74	CS4#	PO19	ET_ERXD1/RMII_RXD1/ CTS11#/RTS11#/SS11#		
R15		PC1	A17	MTIOC3A/TCLKD/PO18	ET_ERXD2/SCK5/SSLA2/ SDA3	IRQ12	

Note 1. 176-pin LFBGA does not have E5 pin

Note 2. The BCLK function is multiplexed with the I/O port function for pin P53, so the port function is not available if the external bus is enabled.

Table 1.11 List of Pins and Pin Functions (64-Pin TFLGA) (2/2)

Pin No. 64-pin TFLGA	Power Supply Clock System Control	I/O Port	Timers (MTU2a, TPUa, TMR, PPG, RTCa, POE2a)	Communications (SClC, SClD, RSPI, RIIC, CAN, IEB, USB)	Interrupt	S12ADa, DAa
E4	TMS	P16	MTIOC3C/MTIOC3D/ TIOCB1/TCLKC/TMO2/ RTCOUT	TXD1/SMOSI1/SSDA1/ MOSIA/SCL2-DS/IERXD/ USB0_VBUS/ USB0_VBUSEN/ USB0_OVRCURB	IRQ6	ADTRG0#
E5		PC4	MTIOC3D/MTCLKC/TMC1/ PO25/POE0#	SCK5/SSLA0/ USB0_DPRPD		
E6	VCC					
E7	VSS					
E8		PB0	MTIC5W/TIOCA3/PO24	RXD6/SMISO6/SSCL6/ RSPCKA	IRQ12	
F1	VCC					
F2		P35			NMI	
F3		P31	MTIOC4D/TMC12/RTCIC1	CTS1#/RTS1#/SS1#/ SSLB0/USB0_DPUPE	IRQ1-DS	
F4		PC5	MTIOC3B/MTCLKD/TMR12/ PO29	RSPCKA/USB0_ID		
F5		P15	MTIOC0B/MTCLKB/ TIOCB2/TCLKB/TMC12	RXD1/SMISO1/SSCL1/ CRX1-DS/USB1_DPUPE	IRQ5	
F6		PB1	MTIOC0C/MTIOC4C/ TIOCB3/TMC10/PO25	TXD6/SMOSI6/SSDA6	IRQ4-DS	
F7		PB5	MTIOC2A/MTIOC1B/ TIOCB4/TMR11/PO29/ POE1#	SCK9		
F8		PB3	MTIOC0A/MTIOC4A/ TIOC3D/TCLKD/TMO0/ PO27/POE3#	SCK6		
G1	EXTAL	P36				
G2	TDO	P26	MTIOC2A/TMO1	TXD1/SMOSI1/SSDA1/ MOSIB/USB0_VBUSEN		
G3	VCC_USB					
G4	VSS_USB					
G5	VCC_USB					
G6		PC6	MTIOC3C/MTCLKA/TMC12/ PO30	MOSIA/USB0_EXICEN	IRQ13	
G7		PC3	MTIOC4D/TCLKB/PO24	TXD5/SMOSI5/SSDA5/ SDA2/IETXD		
G8		PB6	MTIOC3D/TIOCA5/PO30	RXD9/SMISO9/SSCL9		
H1	XTAL	P37				
H2	TRST#	P17	MTIOC3A/MTIOC3B/ TIOCB0/TCLKD/TMO1/ POE8#	SCK1/MISOA/SDA2-DS/ IETXD/USB1_VBUS	IRQ7	
H3				USB0_DM		
H4				USB0_DP		
H5				USB1_DM		
H6				USB1_DP		
H7		PC2	MTIOC4B/TCLKA/PO21	RXD5/SMISO5/SSCL5/ SSLA3/SCL2/IERXD		
H8		PB7	MTIOC3B/TIOCB5/PO31	TXD9/SMOSI9/SSDA9		

4.1 I/O Register Addresses (Address Order)

Table 4.1 List of I/O Registers (Address Order) (1/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 0000h	SYSTEM	Mode monitor register	MDMONR	16	16	3 ICLK		Operating Modes
0008 0002h	SYSTEM	Mode status register	MDSR	16	16	3 ICLK		
0008 0006h	SYSTEM	System control register 0	SYSCR0	16	16	3 ICLK		
0008 0008h	SYSTEM	System control register 1	SYSCR1	16	16	3 ICLK		
0008 000Ch	SYSTEM	Standby control register	SBYCR	16	16	3 ICLK		Low Power Consumption
0008 0010h	SYSTEM	Module stop control register A	MSTPCRA	32	32	3 ICLK		
0008 0014h	SYSTEM	Module stop control register B	MSTPCRB	32	32	3 ICLK		
0008 0018h	SYSTEM	Module stop control register C	MSTPCRC	32	32	3 ICLK		
0008 001Ch	SYSTEM	Module stop control register D	MSTPCRD	32	32	3 ICLK		Clock Generation Circuit
0008 0020h	SYSTEM	System clock control register	SCKCR	32	32	3 ICLK		
0008 0024h	SYSTEM	System clock control register 2	SCKCR2	16	16	3 ICLK		
0008 0026h	SYSTEM	System clock control register 3	SCKCR3	16	16	3 ICLK		
0008 0028h	SYSTEM	PLL control register	PLLCR	16	16	3 ICLK		
0008 002Ah	SYSTEM	PLL control register 2	PLLCR2	8	8	3 ICLK		
0008 0030h	SYSTEM	External bus clock control register	BCKCR	8	8	3 ICLK		
0008 0032h	SYSTEM	Main clock oscillator control register	MOSCCR	8	8	3 ICLK		
0008 0033h	SYSTEM	Sub-clock oscillator control register	SOSCCR	8	8	3 ICLK		
0008 0034h	SYSTEM	Low-speed on-chip oscillator control register	LOCOCR	8	8	3 ICLK		
0008 0035h	SYSTEM	IWDT-dedicated on-chip oscillator control register	ILOCOCR	8	8	3 ICLK		
0008 0036h	SYSTEM	High-speed on-chip oscillator control register	HOCOCR	8	8	3 ICLK		
0008 0040h	SYSTEM	Oscillation stop detection control register	OSTDCR	8	8	3 ICLK		
0008 0041h	SYSTEM	Oscillation stop detection status register	OSTDSR	8	8	3 ICLK		
0008 00A0h	SYSTEM	Operating power control register	OPCCR	8	8	3 ICLK		Low Power Consumption
0008 00A1h	SYSTEM	Sleep mode return clock source switching register	RSTCKCR	8	8	3 ICLK		
0008 00A2h	SYSTEM	Main clock oscillator wait control register	MOSCWTCR	8	8	3 ICLK		
0008 00A3h	SYSTEM	Sub-clock oscillator wait control register	SOSCWTCR	8	8	3 ICLK		
0008 00A6h	SYSTEM	PLL wait control register	PLLWTCR	8	8	3 ICLK		Resets
0008 00C0h	SYSTEM	Reset status register 2	RSTS2	8	8	3 ICLK		
0008 00C2h	SYSTEM	Software reset register	SWRR	16	16	3 ICLK		LVDA
0008 00E0h	SYSTEM	Voltage monitoring 1 circuit control register 1	LVD1CR1	8	8	3 ICLK		
0008 00E1h	SYSTEM	Voltage monitoring 1 circuit status register	LVD1SR	8	8	3 ICLK		
0008 00E2h	SYSTEM	Voltage monitoring 2 circuit control register 1	LVD2CR1	8	8	3 ICLK		
0008 00E3h	SYSTEM	Voltage monitoring 2 circuit status register	LVD2SR	8	8	3 ICLK		Register Write Protection Function
0008 03FEh	SYSTEM	Protect register	PRCR	16	16	3 ICLK		
0008 1300h	BSC	Bus error status clear register	BERCLR	8	8	2 ICLK		Buses
0008 1304h	BSC	Bus error monitoring enable register	BEREN	8	8	2 ICLK		
0008 1308h	BSC	Bus error status register 1	BERSR1	8	8	2 ICLK		
0008 130Ah	BSC	Bus error status register 2	BERSR2	16	16	2 ICLK		
0008 1310h	BSC	Bus priority control register	BUSPRI	16	16	2 ICLK		
0008 2000h	DMAC0	DMA source address register	DMSAR	32	32	2 ICLK		DMACA
0008 2004h	DMAC0	DMA destination address register	DMDAR	32	32	2 ICLK		
0008 2008h	DMAC0	DMA transfer count register	DMCRA	32	32	2 ICLK		
0008 200Ch	DMAC0	DMA block transfer count register	DMCRB	16	16	2 ICLK		
0008 2010h	DMAC0	DMA transfer mode register	DMTMD	16	16	2 ICLK		
0008 2013h	DMAC0	DMA interrupt setting register	DMINT	8	8	2 ICLK		
0008 2014h	DMAC0	DMA address mode register	DMAMD	16	16	2 ICLK		
0008 2018h	DMAC0	DMA offset register	DMOFR	32	32	2 ICLK		

Table 4.1 List of I/O Registers (Address Order) (15/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 8036h	IWDT	IWDT reset control register	IWDTRCR	8	8	2, 3 PCLKB	2 ICLK	IWDTa
0008 8038h	IWDT	IWDT count stop control register	IWDTCSTPR	8	8	2, 3 PCLKB	2 ICLK	
0008 80C0h	DA	D/A data register 0	DADR0	16	16	2, 3 PCLKB	2 ICLK	DAa
0008 80C2h	DA	D/A data register 1	DADR1	16	16	2, 3 PCLKB	2 ICLK	
0008 80C4h	DA	D/A control register	DACR	8	8	2, 3 PCLKB	2 ICLK	
0008 80C5h	DA	DADRM format select register	DADPR	8	8	2, 3 PCLKB	2 ICLK	
0008 80C6h	DA	D/A A/D synchronous start control register	DAADSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8100h	TPUA	Timer start register	TSTR	8	8	2, 3 PCLKB	2 ICLK	TPUa
0008 8101h	TPUA	Timer synchronous register	TSYR	8	8	2, 3 PCLKB	2 ICLK	
0008 8108h	TPU0	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8109h	TPU1	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 810Ah	TPU2	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 810Bh	TPU3	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 810Ch	TPU4	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 810Dh	TPU5	Noise filter control register	NFCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8110h	TPU0	Timer control register	TCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8111h	TPU0	Timer mode register	TMDR	8	8	2, 3 PCLKB	2 ICLK	
0008 8112h	TPU0	Timer I/O control register H	TIORH	8	8	2, 3 PCLKB	2 ICLK	
0008 8113h	TPU0	Timer I/O control register L	TIORL	8	8	2, 3 PCLKB	2 ICLK	
0008 8114h	TPU0	Timer interrupt enable register	TIER	8	8	2, 3 PCLKB	2 ICLK	
0008 8115h	TPU0	Timer status register	TSR	8	8	2, 3 PCLKB	2 ICLK	
0008 8116h	TPU0	Timer counter	TCNT	16	16	2, 3 PCLKB	2 ICLK	
0008 8118h	TPU0	Timer general register A	TGRA	16	16	2, 3 PCLKB	2 ICLK	
0008 811Ah	TPU0	Timer general register B	TGRB	16	16	2, 3 PCLKB	2 ICLK	
0008 811Ch	TPU0	Timer general register C	TGRC	16	16	2, 3 PCLKB	2 ICLK	
0008 811Eh	TPU0	Timer general register D	TGRD	16	16	2, 3 PCLKB	2 ICLK	
0008 8120h	TPU1	Timer control register	TCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8121h	TPU1	Timer mode register	TMDR	8	8	2, 3 PCLKB	2 ICLK	
0008 8122h	TPU1	Timer I/O control register	TIOR	8	8	2, 3 PCLKB	2 ICLK	
0008 8124h	TPU1	Timer interrupt enable register	TIER	8	8	2, 3 PCLKB	2 ICLK	
0008 8125h	TPU1	Timer status register	TSR	8	8	2, 3 PCLKB	2 ICLK	
0008 8126h	TPU1	Timer counter	TCNT	16	16	2, 3 PCLKB	2 ICLK	
0008 8128h	TPU1	Timer general register A	TGRA	16	16	2, 3 PCLKB	2 ICLK	
0008 812Ah	TPU1	Timer general register B	TGRB	16	16	2, 3 PCLKB	2 ICLK	
0008 8130h	TPU2	Timer control register	TCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8131h	TPU2	Timer mode register	TMDR	8	8	2, 3 PCLKB	2 ICLK	
0008 8132h	TPU2	Timer I/O control register	TIOR	8	8	2, 3 PCLKB	2 ICLK	
0008 8134h	TPU2	Timer interrupt enable register	TIER	8	8	2, 3 PCLKB	2 ICLK	
0008 8135h	TPU2	Timer status register	TSR	8	8	2, 3 PCLKB	2 ICLK	
0008 8136h	TPU2	Timer counter	TCNT	16	16	2, 3 PCLKB	2 ICLK	
0008 8138h	TPU2	Timer general register A	TGRA	16	16	2, 3 PCLKB	2 ICLK	
0008 813Ah	TPU2	Timer general register B	TGRB	16	16	2, 3 PCLKB	2 ICLK	
0008 8140h	TPU3	Timer control register	TCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8141h	TPU3	Timer mode register	TMDR	8	8	2, 3 PCLKB	2 ICLK	
0008 8142h	TPU3	Timer I/O control register H	TIORH	8	8	2, 3 PCLKB	2 ICLK	
0008 8143h	TPU3	Timer I/O control register L	TIORL	8	8	2, 3 PCLKB	2 ICLK	
0008 8144h	TPU3	Timer interrupt enable register	TIER	8	8	2, 3 PCLKB	2 ICLK	
0008 8145h	TPU3	Timer status register	TSR	8	8	2, 3 PCLKB	2 ICLK	
0008 8146h	TPU3	Timer counter	TCNT	16	16	2, 3 PCLKB	2 ICLK	
0008 8148h	TPU3	Timer general register A	TGRA	16	16	2, 3 PCLKB	2 ICLK	
0008 814Ah	TPU3	Timer general register B	TGRB	16	16	2, 3 PCLKB	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (20/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 8368h	RIIC3	I ² C bus status register 1	ICSR1	8	8	2, 3 PCLKB	2 ICLK	RSPI
0008 8369h	RIIC3	I ² C bus status register 2	ICSR2	8	8	2, 3 PCLKB	2 ICLK	
0008 836Ah	RIIC3	Slave address register L0	SARL0	8	8	2, 3 PCLKB	2 ICLK	
0008 836Bh	RIIC3	Slave address register U0	SARU0	8	8	2, 3 PCLKB	2 ICLK	
0008 836Ch	RIIC3	Slave address register L1	SARL1	8	8	2, 3 PCLKB	2 ICLK	
0008 836Dh	RIIC3	Slave address register U1	SARU1	8	8	2, 3 PCLKB	2 ICLK	
0008 836Eh	RIIC3	Slave address register L2	SARL2	8	8	2, 3 PCLKB	2 ICLK	
0008 836Fh	RIIC3	Slave address register U2	SARU2	8	8	2, 3 PCLKB	2 ICLK	
0008 8370h	RIIC3	I ² C bus bit rate low-level register	ICBRL	8	8	2, 3 PCLKB	2 ICLK	
0008 8371h	RIIC3	I ² C bus bit rate high-level register	ICBRH	8	8	2, 3 PCLKB	2 ICLK	
0008 8372h	RIIC3	I ² C bus transmit data register	ICDRT	8	8	2, 3 PCLKB	2 ICLK	
0008 8373h	RIIC3	I ² C bus receive data register	ICDRR	8	8	2, 3 PCLKB	2 ICLK	
0008 8380h	RSPI0	RSPI control register	SPCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8381h	RSPI0	RSPI slave select polarity register	SSLP	8	8	2, 3 PCLKB	2 ICLK	
0008 8382h	RSPI0	RSPI pin control register	SPPCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8383h	RSPI0	RSPI status register	SPSR	8	8	2, 3 PCLKB	2 ICLK	
0008 8384h	RSPI0	RSPI data register	SPDR	32	16, 32	2, 3 PCLKB	2 ICLK	
0008 8388h	RSPI0	RSPI sequence control register	SPSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 8389h	RSPI0	RSPI sequence status register	SPSSR	8	8	2, 3 PCLKB	2 ICLK	
0008 838Ah	RSPI0	RSPI bit rate register	SPBR	8	8	2, 3 PCLKB	2 ICLK	
0008 838Bh	RSPI0	RSPI data control register	SPDCR	8	8	2, 3 PCLKB	2 ICLK	
0008 838Ch	RSPI0	RSPI clock delay register	SPCKD	8	8	2, 3 PCLKB	2 ICLK	
0008 838Dh	RSPI0	RSPI slave select negation delay register	SSLND	8	8	2, 3 PCLKB	2 ICLK	
0008 838Eh	RSPI0	RSPI next-access delay register	SPND	8	8	2, 3 PCLKB	2 ICLK	
0008 838Fh	RSPI0	RSPI control register 2	SPCR2	8	8	2, 3 PCLKB	2 ICLK	
0008 8390h	RSPI0	RSPI command register 0	SPCMD0	16	16	2, 3 PCLKB	2 ICLK	
0008 8392h	RSPI0	RSPI command register 1	SPCMD1	16	16	2, 3 PCLKB	2 ICLK	
0008 8394h	RSPI0	RSPI command register 2	SPCMD2	16	16	2, 3 PCLKB	2 ICLK	
0008 8396h	RSPI0	RSPI command register 3	SPCMD3	16	16	2, 3 PCLKB	2 ICLK	
0008 8398h	RSPI0	RSPI command register 4	SPCMD4	16	16	2, 3 PCLKB	2 ICLK	
0008 839Ah	RSPI0	RSPI command register 5	SPCMD5	16	16	2, 3 PCLKB	2 ICLK	RSPI
0008 839Ch	RSPI0	RSPI command register 6	SPCMD6	16	16	2, 3 PCLKB	2 ICLK	
0008 839Eh	RSPI0	RSPI command register 7	SPCMD7	16	16	2, 3 PCLKB	2 ICLK	
0008 83A0h	RSPI1	RSPI control register	SPCR	8	8	2, 3 PCLKB	2 ICLK	
0008 83A1h	RSPI1	RSPI slave select polarity register	SSLP	8	8	2, 3 PCLKB	2 ICLK	
0008 83A2h	RSPI1	RSPI pin control register	SPPCR	8	8	2, 3 PCLKB	2 ICLK	
0008 83A3h	RSPI1	RSPI status register	SPSR	8	8	2, 3 PCLKB	2 ICLK	
0008 83A4h	RSPI1	RSPI data register	SPDR	32	16, 32	2, 3 PCLKB	2 ICLK	
0008 83A8h	RSPI1	RSPI sequence control register	SPSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 83A9h	RSPI1	RSPI sequence status register	SPSSR	8	8	2, 3 PCLKB	2 ICLK	
0008 83AAh	RSPI1	RSPI bit rate register	SPBR	8	8	2, 3 PCLKB	2 ICLK	
0008 83ABh	RSPI1	RSPI data control register	SPDCR	8	8	2, 3 PCLKB	2 ICLK	
0008 83ACh	RSPI1	RSPI clock delay register	SPCKD	8	8	2, 3 PCLKB	2 ICLK	
0008 83ADh	RSPI1	RSPI slave select negation delay register	SSLND	8	8	2, 3 PCLKB	2 ICLK	
0008 83AEh	RSPI1	RSPI next-access delay register	SPND	8	8	2, 3 PCLKB	2 ICLK	
0008 83AFh	RSPI1	RSPI control register 2	SPCR2	8	8	2, 3 PCLKB	2 ICLK	
0008 83B0h	RSPI1	RSPI command register 0	SPCMD0	16	16	2, 3 PCLKB	2 ICLK	
0008 83B2h	RSPI1	RSPI command register 1	SPCMD1	16	16	2, 3 PCLKB	2 ICLK	
0008 83B4h	RSPI1	RSPI command register 2	SPCMD2	16	16	2, 3 PCLKB	2 ICLK	
0008 83B6h	RSPI1	RSPI command register 3	SPCMD3	16	16	2, 3 PCLKB	2 ICLK	
0008 83B8h	RSPI1	RSPI command register 4	SPCMD4	16	16	2, 3 PCLKB	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (31/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 C095h	PORTA	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	I/O Ports
0008 C096h	PORTB	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C097h	PORTB	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C098h	PORTC	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C099h	PORTC	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Ah	PORTD	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Bh	PORTD	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Ch	PORTE	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Dh	PORTE	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Eh	PORTF	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C09Fh	PORTF	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C0A0h	PORTG	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C0A1h	PORTG	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C0A4h	PORTJ	Open drain control register 0	ODR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C0A5h	PORTJ	Open drain control register 1	ODR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C0C0h	PORT0	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C1h	PORT1	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C2h	PORT2	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C3h	PORT3	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C4h	PORT4	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C5h	PORT5	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C6h	PORT6	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C7h	PORT7	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C8h	PORT8	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0C9h	PORT9	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CAh	PORTA	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CBh	PORTB	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CCh	PORTC	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CDh	PORTD	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CEh	PORTE	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0CFh	PORTF	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0D0h	PORTG	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0D2h	PORTJ	Pull-up control register	PCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0E0h	PORT0	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	MPC
0008 C0E2h	PORT2	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0E5h	PORT5	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0E9h	PORT9	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0EAh	PORTA	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0EBh	PORTB	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0ECh	PORTC	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0EDh	PORTD	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0EEh	PORTE	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C0F0h	PORTG	Drive ability control register	DSCR	8	8	2, 3 PCLKB	2 ICLK	
0008 C100h	MPC	CS output enable register	PFCSE	8	8	2, 3 PCLKB	2 ICLK	
0008 C102h	MPC	CS output pin select register 0	PFCSS0	8	8	2, 3 PCLKB	2 ICLK	
0008 C103h	MPC	CS output pin select register 1	PFCSS1	8	8	2, 3 PCLKB	2 ICLK	
0008 C104h	MPC	Address output enable register 0	PFAOE0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C105h	MPC	Address output enable register 1	PFAOE1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C106h	MPC	External bus control register 0	PFBCR0	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C107h	MPC	External bus control register 1	PFBCR1	8	8, 16	2, 3 PCLKB	2 ICLK	
0008 C10Eh	MPC	Ethernet control register 1	PFENET	8	8	2, 3 PCLKB	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (33/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
0008 C178h	MPC	P70 pin function control register	P70PFS	8	8	2, 3 PCLKB	2 ICLK	MPC
0008 C179h	MPC	P71 pin function control register	P71PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Ah	MPC	P72 pin function control register	P72PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Bh	MPC	P73 pin function control register	P73PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Ch	MPC	P74 pin function control register	P74PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Dh	MPC	P75 pin function control register	P75PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Eh	MPC	P76 pin function control register	P76PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C17Fh	MPC	P77 pin function control register	P77PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C180h	MPC	P80 pin function control register	P80PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C181h	MPC	P81 pin function control register	P81PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C182h	MPC	P82 pin function control register	P82PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C183h	MPC	P83 pin function control register	P83PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C186h	MPC	P86 pin function control register	P86PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C187h	MPC	P87 pin function control register	P87PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C188h	MPC	P90 pin function control register	P90PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C189h	MPC	P91 pin function control register	P91PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C18Ah	MPC	P92 pin function control register	P92PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C18Bh	MPC	P93 pin function control register	P93PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C190h	MPC	PA0 pin function control register	PA0PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C191h	MPC	PA1 pin function control register	PA1PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C192h	MPC	PA2 pin function control register	PA2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C193h	MPC	PA3 pin function control register	PA3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C194h	MPC	PA4 pin function control register	PA4PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C195h	MPC	PA5 pin function control register	PA5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C196h	MPC	PA6 pin function control register	PA6PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C197h	MPC	PA7 pin function control register	PA7PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C198h	MPC	PB0 pin function control register	PB0PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C199h	MPC	PB1 pin function control register	PB1PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Ah	MPC	PB2 pin function control register	PB2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Bh	MPC	PB3 pin function control register	PB3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Ch	MPC	PB4 pin function control register	PB4PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Dh	MPC	PB5 pin function control register	PB5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Eh	MPC	PB6 pin function control register	PB6PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C19Fh	MPC	PB7 pin function control register	PB7PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A0h	MPC	PC0 pin function control register	PC0PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A1h	MPC	PC1 pin function control register	PC1PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A2h	MPC	PC2 pin function control register	PC2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A3h	MPC	PC3 pin function control register	PC3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A4h	MPC	PC4 pin function control register	PC4PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A5h	MPC	PC5 pin function control register	PC5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A6h	MPC	PC6 pin function control register	PC6PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A7h	MPC	PC7 pin function control register	PC7PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A8h	MPC	PD0 pin function control register	PD0PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1A9h	MPC	PD1 pin function control register	PD1PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1AAh	MPC	PD2 pin function control register	PD2PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1ABh	MPC	PD3 pin function control register	PD3PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1ACh	MPC	PD4 pin function control register	PD4PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1ADh	MPC	PD5 pin function control register	PD5PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1AEh	MPC	PD6 pin function control register	PD6PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1AFh	MPC	PD7 pin function control register	PD7PFS	8	8	2, 3 PCLKB	2 ICLK	
0008 C1B0h	MPC	PE0 pin function control register	PE0PFS	8	8	2, 3 PCLKB	2 ICLK	

Table 4.1 List of I/O Registers (Address Order) (44/50)

Address	Module Symbol	Register Name	Register Symbol	Number of Bits	Access Size	Number of Access States		Related Function
						ICLK≥PCLK	ICLK<PCLK	
000A 0230h	USB1	Interrupt enable register 0	INTENB0	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 0236h	USB1	BRDY interrupt enable register	BRDYENB	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 0238h	USB1	NRDY interrupt enable register	NRDYENB	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 023Ah	USB1	BEMP interrupt enable register	BEMPENB	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 023Ch	USB1	SOF output configuration register	SOFCFG	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 0240h	USB1	Interrupt status register 0	INTSTS0	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 0246h	USB1	BRDY interrupt status register	BRDYSTS	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 0248h	USB1	NRDY interrupt status register	NRDYSTS	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	USBa
000A 024Ah	USB1	BEMP interrupt status register	BEMPSTS	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	
000A 024Ch	USB1	Frame number register	FRMNUM	16	16	9 PCLKB or more	Rounded up to the nearest integer greater than 1 + 9/ (frequency ratio of ICLK/ PCLKB) ^{*6}	

Table 5.4 DC Characteristics (3) (for D and G Versions (-40 ≤ Ta ≤ +85°C))

Conditions: VCC = AVCC0 = VREFH = VCC_USB = V_{BATT} = 2.7 to 3.6 V, VREFH0 = 2.7 V to AVCC0,
VSS = AVSS0 = VREFL/VREFL0 = VSS_USB = 0 V, T_a = T_{opr}

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
RAM standby voltage	V _{RAM}	2.7	—	—	V	
VCC rising gradient	SrVCC	8.4	—	20000	μs/V	
VCC falling gradient*8	SfVCC	8.4	—	—	μs/V	

Note 1. Supply current values are with all output pins unloaded and all input pull-up MOSs in the off state.

Note 2. Measured with clocks supplied to the peripheral functions. This does not include the BGO operation.

Note 3. I_{CC} depends on f (ICLK) as follows. (ICLK:PCLK:BCLK:BCLK pin = 8:4:4:2)

I_{CC} Max. = 0.87 × f + 13 (max. operation in high-speed operating mode)

I_{CC} Typ. = 0.35 × f + 5 (normal operation in high-speed operating mode)

I_{CC} Typ. = 1.0 × f + 3 (low-speed operating mode 1)

I_{CC} Max. = 0.53 × f + 12 (sleep mode)

Note 4. This does not include the BGO operation.

Note 5. This is the increase for programming or erasure of the ROM or flash memory for data storage during program execution.

Note 6. Supply of the clock signal to peripherals is stopped in this state. This does not include the BGO operation.

Note 7. The reference power supply current is included in the power supply current value for 10-bit A/D conversion and D/A conversion.

Note 8. When V_{BATT} is used

Note 9. The current values for 10-bit A/D converter and 10-bit D/A converter are included in the current from the VREFH pin.

Note 10. The values are the sum of I_{AVCC0} and I_{VREFH}.

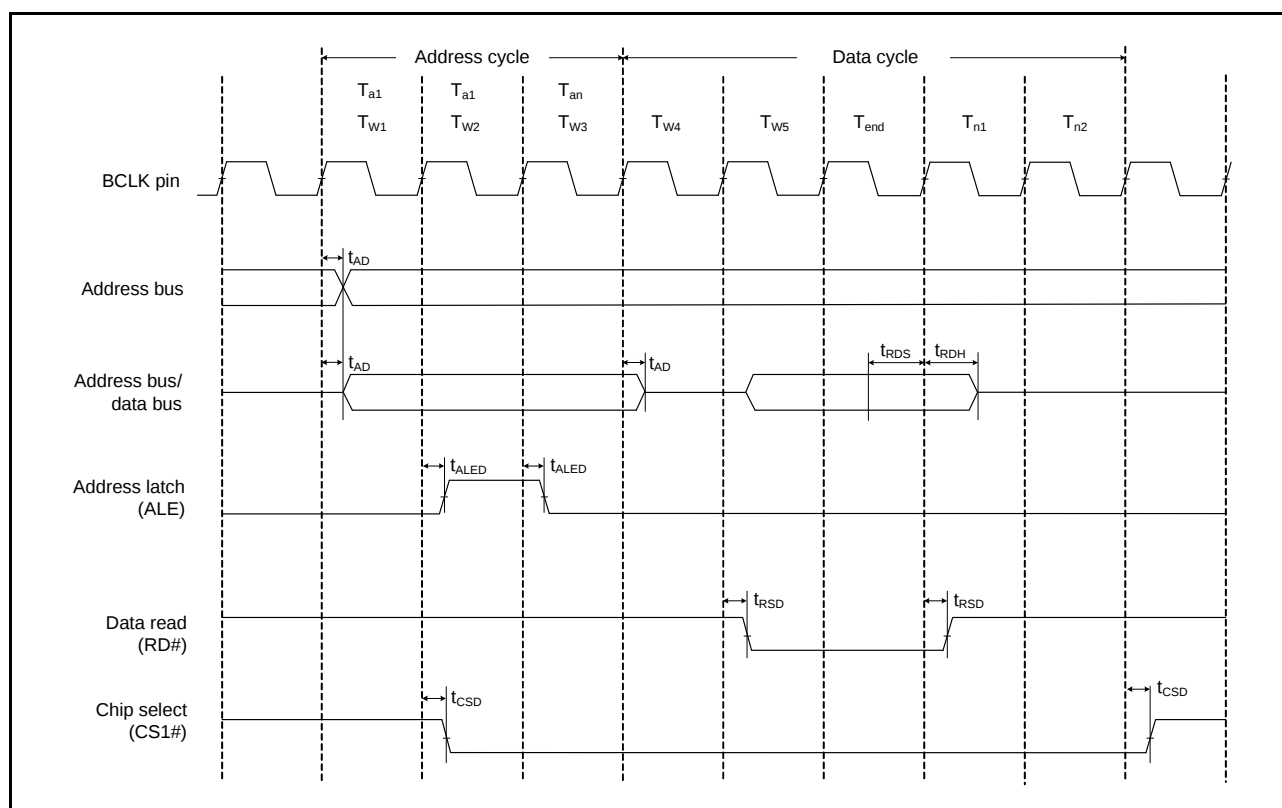


Figure 5.17 Address/Data Multiplexed Bus Read Access Timing

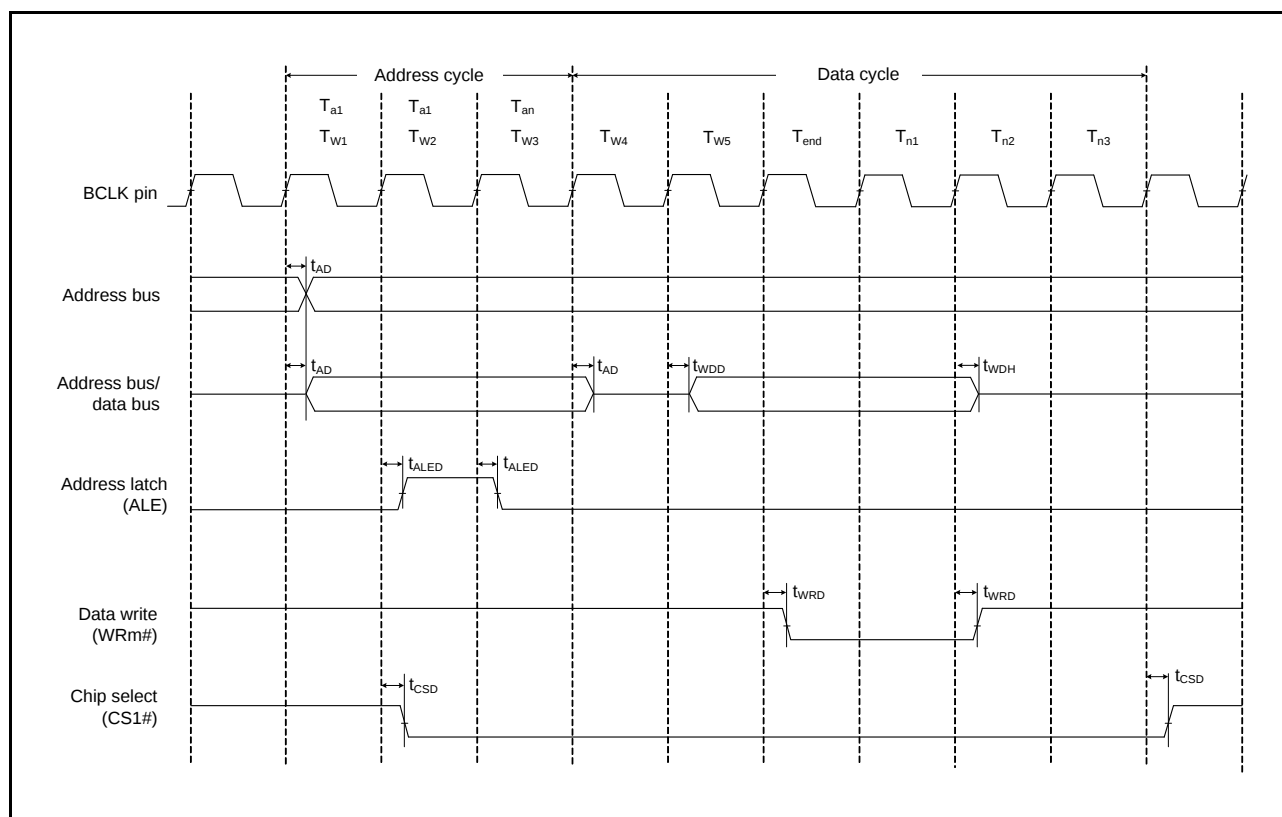


Figure 5.18 Address/Data Multiplexed Bus Write Access Timing

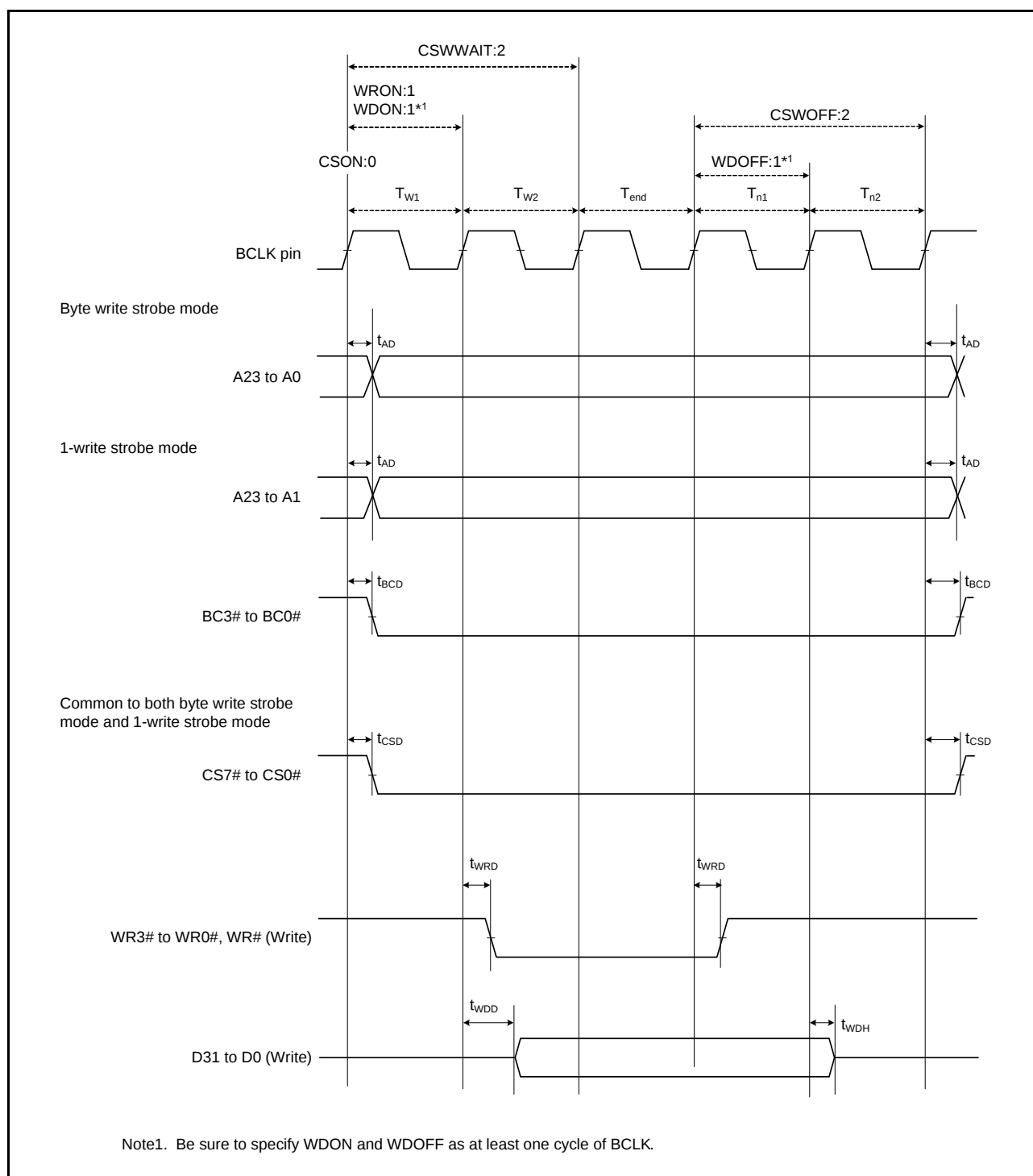


Figure 5.20 External Bus Timing/Normal Write Cycle (Bus Clock Synchronized)

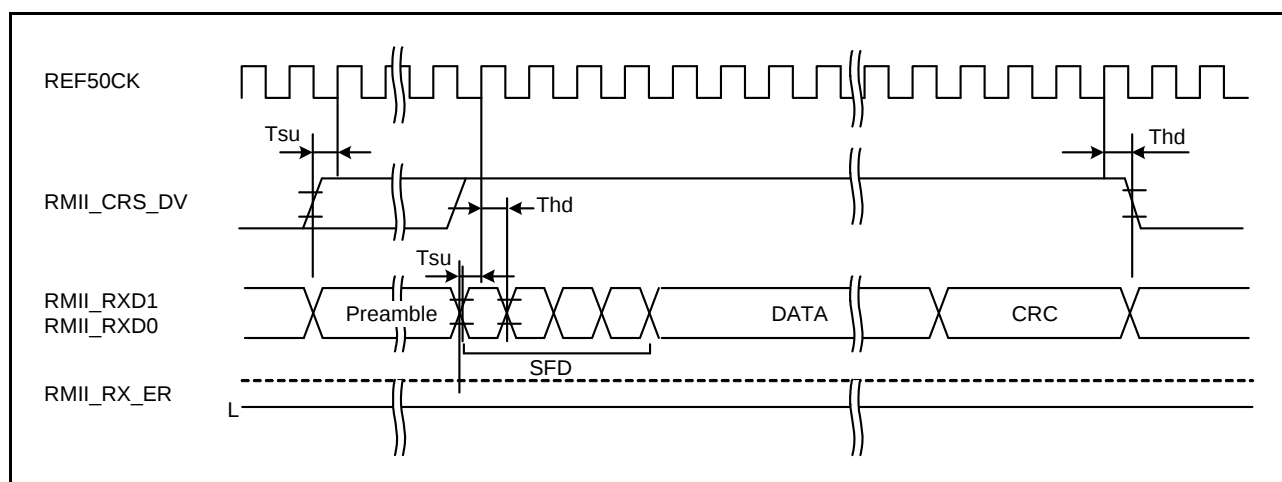


Figure 5.50 RMI Reception Timing (Normal Operation)

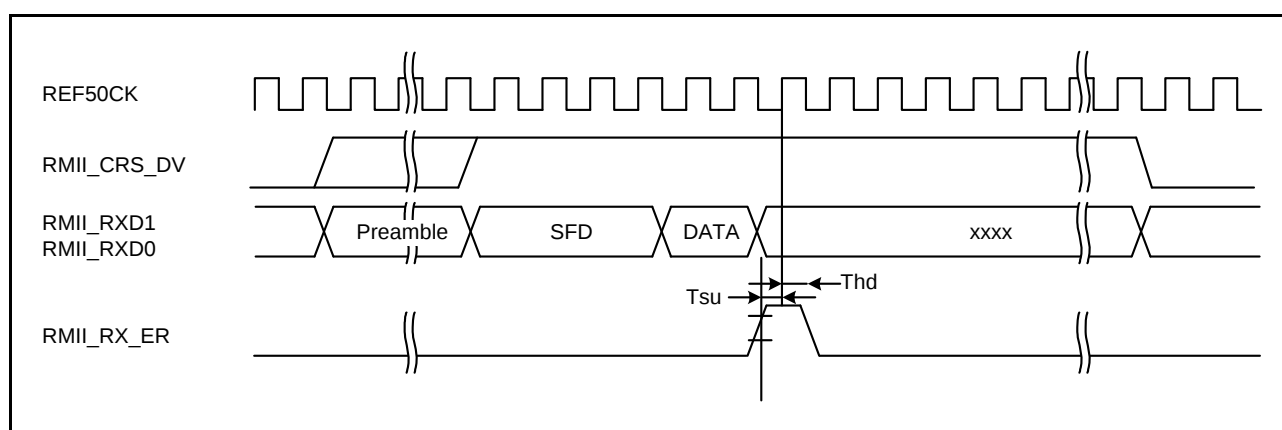


Figure 5.51 RMI Reception Timing (Error Occurrence)

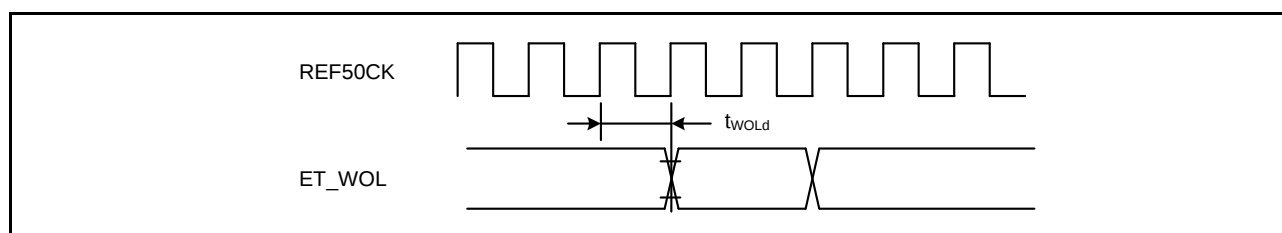


Figure 5.52 WOL Output Timing (RMI)

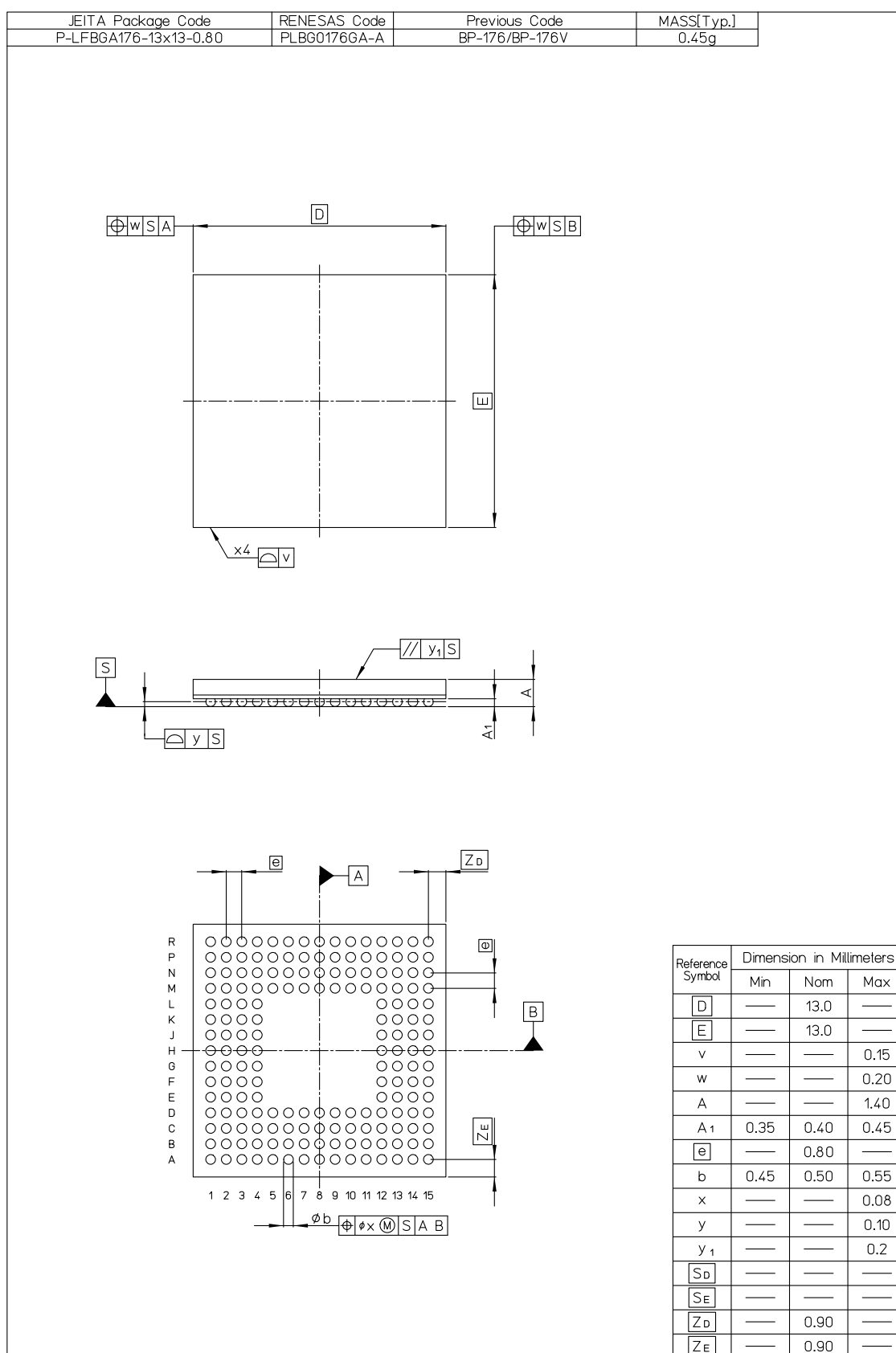


Figure B 176-pin LFBGA (PLBG0176GA-A)

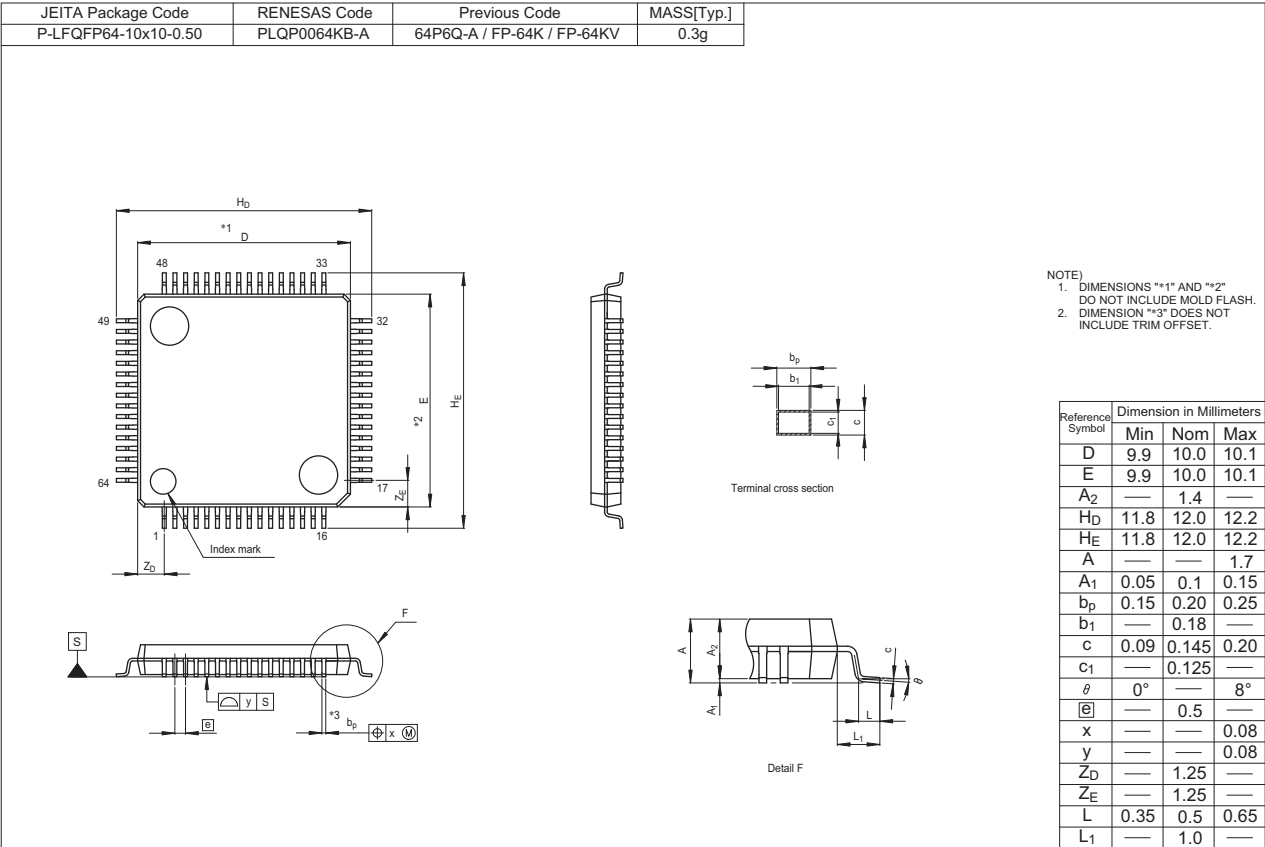


Figure I 64-pin LQFP (PLQP0064KB-A)

Rev.	Date	Description	
		Page	Summary
1.70	Oct 08. 2013	80 to 127	Table 4.1 List of I/O Registers (Address Order), changed
		5. Electrical Characteristics	
		131, 132	Table 5.4 DC Characteristics (3), changed, Note. 9, Note. 10, added
		133	Table 5.6 Permissible Output Currents, changed
		139	Table 5.12 Clock Timing (Sub-Clock Related), Note 3, added
		167	Table 5.25 Timing of On-Chip Peripheral Modules (8), added
		175	Figure 5.58 PDC Timing, added
		175	Figure 5.59 PDC Input Clock Characteristic, added
		176	Figure 5.60 PDC Output Clock Characteristic, added
		178	Table 5.27 10-Bit A/D Conversion Characteristics, changed
		179	Table 5.28 12-Bit A/D Conversion Characteristics, changed
		185	Table 5.35 ROM (Flash Memory for Code Storage) Characteristics (1), added
		185	Table 5.36 ROM (Flash Memory for Code Storage) Characteristics (2), changed
		186	Table 5.37 E2 Flash Characteristics (1), added
		186	Table 5.38 E2 Flash Characteristics (2), changed
		Appendix 1.Package Dimensions	
		197	Figure H 64-pin TFLGA (PTLG0064JA-A), added