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

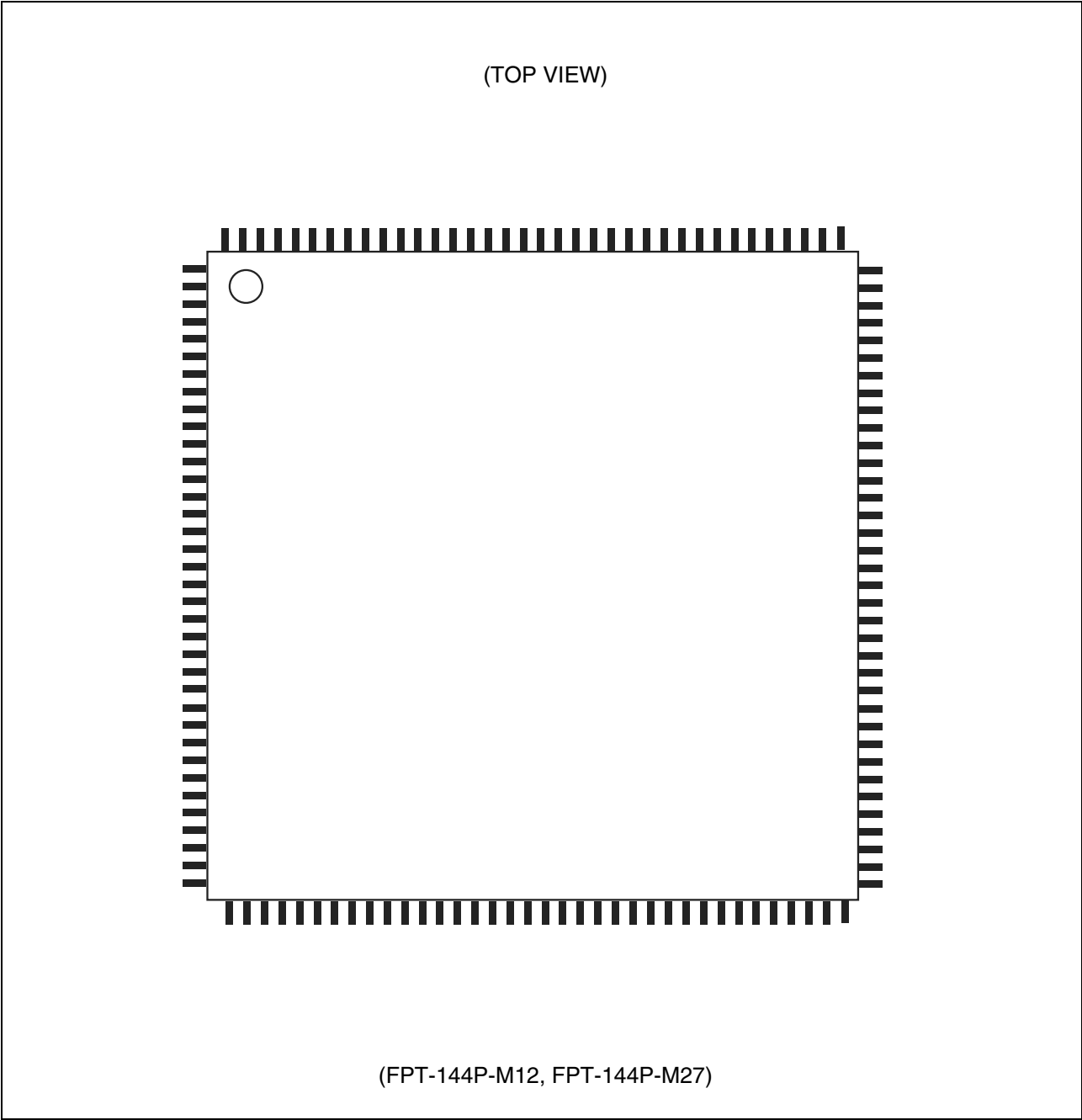
Details

Product Status	Obsolete
Core Processor	FR60 RISC
Core Size	32-Bit Single-Core
Speed	80MHz
Connectivity	EBI/EMI, I ² C, FIFO, SIO
Peripherals	DMA, PWM, WDT
Number of I/O	113
Program Memory Size	512KB (512K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	4V ~ 5.5V
Data Converters	A/D 12x8/10b, 4x12b
Oscillator Type	External
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LQFP
Supplier Device Package	144-LQFP (16x16)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/mb91f479pmc1-ge1

MB91470/480 Series

■ PIN ASSIGNMENT

• LQFP-144 (MB91470 series)



MB91470/480 Series

Pin no.				Pin name	I/O circuit type*5	Function
MB91470 series		MB91480 series				
LQFP-144*1	PFBGA-144*2	LQFP-100*3	QFP-100*4			
9	D3	—	—	RDY	C	External ready input
				P61		General-purpose I/O port
20	G2	94	97	INT0	D	External interrupt 0 input
				P80		General-purpose I/O port
21	G3	95	98	INT1	D	External interrupt 1 input
				P81		General-purpose I/O port
22	G4	96	99	INT2	D	External interrupt 2 input
				P82		General-purpose I/O port
23	H1	97	100	INT3	D	External interrupt 3 input
				P83		General-purpose I/O port
24	H2	98	1	INT4	D	External interrupt 4 input
				PPG4		Output of PPG timer 4
				P84		General-purpose I/O port
25	H3	99	2	INT5	D	External interrupt 5 input
				PPG5		Output of PPG timer 5
				P85		General-purpose I/O port
26	H4	2	5	INT6	D	External interrupt 6 input
				PPG6		Output of PPG timer 6
				P86		General-purpose I/O port
27	J1	3	6	INT7	D	External interrupt 7 input
				PPG7		Output of PPG timer 7
				P87		General-purpose I/O port
28	J2	4	7	INT8	D	External interrupt 8 input
				PPG8		Output of PPG timer 8
				P90		General-purpose I/O port
29	J3	5	8	INT9	D	External interrupt 9 input
				PPG9		Output of PPG timer 9
				P91		General-purpose I/O port
—	—	—	—	INT10	D	External interrupt 10 input
				PPG10		Output of PPG timer 10
				P92		General-purpose I/O port

(Continued)

MB91470/480 Series

Pin no.				Pin name	I/O circuit type*5	Function
MB91470 series		MB91480 series				
LQFP-144*1	PFBGA-144*2	LQFP-100*3	QFP-100*4			
—	—	—	—	INT11	D	External interrupt 11 input
				PPG11		Output of PPG timer 11
				P93		General-purpose I/O port
—	—	—	—	INT12	D	External interrupt 12 input
				PPG12		Output of PPG timer 12
				P94		General-purpose I/O port
—	—	—	—	INT13	D	External interrupt 13 input
				PPG13		Output of PPG timer 13
				P95		General-purpose I/O port
—	—	—	—	INT14	D	External interrupt 14 input
				PPG14		Output of PPG timer 14
				P96		General-purpose I/O port
—	—	—	—	INT15	D	External interrupt 15 input
				PPG15		Output of PPG timer 15
				P97		General-purpose I/O port
—	—	73	76	ADTG0	D	External trigger input of 8/10-bit A/D converter 0
				PA0		General-purpose I/O port
—	—	74	77	ADTG1	D	External trigger input of 8/10-bit A/D converter 1
				PA1		General-purpose I/O port
65	L9	49	52	ADTG2	D	External trigger input of 8/10-bit A/D converter 2
				PA2		General-purpose I/O port
66	K9	—	—	ADTG3	D	External trigger input of 12-bit A/D converter 3
				PA3		General-purpose I/O port
67	N10	—	—	ADTG4	D	External trigger input of 12-bit A/D converter 4
				PA4		General-purpose I/O port
—	—	65	68	AN0-0	G	Analog 0 input of 8/10-bit A/D converter 0
				PB0		General-purpose I/O port
—	—	66	69	AN0-1	G	Analog 1 input of 8/10-bit A/D converter 0
				PB1		General-purpose I/O port
—	—	67	70	AN0-2	G	Analog 2 input of 8/10-bit A/D converter 0
				PB2		General-purpose I/O port

(Continued)

MB91470/480 Series

Pin no.				Pin name	I/O circuit type*5	Function
MB91470 series		MB91480 series				
LQFP-144*1	PFBGA-144*2	LQFP-100*3	QFP-100*4			
38	M2	20	23	RTO0	J	Wave form generator output of multi-function timer 0
				PQ0		General-purpose I/O port
39	N3	21	24	RTO1	J	Wave form generator output of multi-function timer 0
				PQ1		General-purpose I/O port
40	M3	22	25	RTO2	J	Wave form generator output of multi-function timer 0
				PQ2		General-purpose I/O port
41	L2	23	26	RTO3	J	Wave form generator output of multi-function timer 0
				PQ3		General-purpose I/O port
42	M4	24	27	RTO4	J	Wave form generator output of multi-function timer 0
				PQ4		General-purpose I/O port
43	N4	25	28	RTO5	J	Wave form generator output of multi-function timer 0
				PQ5		General-purpose I/O port
—	—	36	39	IC4	D	Trigger input of input capture 4
				PR0		General-purpose I/O port
—	—	37	40	IC5	D	Trigger input of input capture 5
				PR1		General-purpose I/O port
—	—	38	41	IC6	D	Trigger input of input capture 6
				PR2		General-purpose I/O port
—	—	39	42	IC7	D	Trigger input of input capture 7
				PR3		General-purpose I/O port
—	—	40	43	CKI1	D	External clock input pin of free-run timer ch.3 to ch.5
				PR4		General-purpose I/O port
—	—	41	44	DTTI1	D	Input signal controlling wave form generator outputs RTO6 to RTO11 of multi-function timer 1
				PR5		General-purpose I/O port
—	—	26	29	RTO6	J	Wave form generator output of multi-function timer 1
				PS0		General-purpose I/O port
—	—	27	30	RTO7	J	Wave form generator output of multi-function timer 1
				PS1		General-purpose I/O port
—	—	28	31	RTO8	J	Wave form generator output of multi-function timer 1
				PS2		General-purpose I/O port

(Continued)

MB91470/480 Series

Power supply pins and GND pins

Pin number				Pin name	Function
MB91470 series		MB91480 series			
LQFP-144*1	PFBGA-144*2	LQFP-100*3	QFP-100*4		
1	B1	—	—	VCC	Power supply pins Connect all pins to the same potential.
18	F4	1	4		
35	M1	19	22		
37	N2	32	35		
44	L3	33	36		
60	M8	51	54		
81	K11	76	79		
126	D8	—	—		
19	A1	—	—	VSS	GND pins Connect all pins to the same potential.
36	G1	18	21		
45	N1	34	37		
55	L4	47	50		
59	N7	50	53		
80	N8	75	78		
125	L11	100	3		
144	C8	—	—		
58	K7	35	38	C	Capacitor coupling pin for internal regulator
94	G10	62	65	AVCC10	Analog power supply pin for 8/10-bit A/D converter 0/1/2
96	F12	64	67	AVSS10	Analog GND pin for 8/10-bit A/D converter
74	M12	—	—	AVCC12	Analog power supply pin for 12-bit A/D converter 3/4
72	N13	—	—	AVSS12	Analog GND pin for 12-bit A/D converter 3/4
—	—	—	—	AVRH0	Analog reference power supply pin for 8/10-bit A/D converter 0
—	—	—	—	AVRH1	Analog reference power supply pin for 8/10-bit A/D converter 1
95	F13	63	66	AVRH2	Analog reference power supply pin for 8/10-bit A/D converter 2
73	M13	—	—	AVRH3	Analog reference power supply pin for 12-bit A/D converter 3
75	L13	—	—	AVRH4	Analog reference power supply pin for 12-bit A/D converter 4

*1 : FPT-144P-M12, FPT-144P-M27

*2 : BGA-144P-M06

*3 : FPT-100P-M20

*4 : FPT-100P-M06

MB91470/480 Series

Type	Circuit	Remarks
G	Pull-up control Digital output Digital output Digital input Standby control Analog input	• Analog/CMOS level hysteresis I/O pin • CMOS level output • CMOS level hysteresis input (with standby control) • Analog input (Operates as an analog input when the corresponding AICR register bit is "1".) • With pull-up control
H	Digital input	• CMOS level hysteresis input • Without standby control
I	Digital input	• CMOS level hysteresis input • Without standby control • With pull-up resistance

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Type	Circuit	Remarks
J	Pull-up control P-ch Digital output P-ch Digital output N-ch Digital input Standby control	• CMOS level output • CMOS level hysteresis input • With standby control • With pull-up control
K	N-ch N-ch N-ch N-ch Control signal Mode input R	Flash memory product only • CMOS level input • High voltage control for testing Flash memory

MB91470/480 Series

[bit 17, bit 16] WTH1, WTH0 (Bus width specification bit)

These bits configure the bus width in external bus mode.

In external bus mode, this value is set to the DBW1 and DBW0 bits of AWR0 (CS0 area).

WTH1	WTH0	Function	Remarks
0	0	8-bit bus width	External bus mode
0	1	16-bit bus width	External bus mode
1	0	—	(Setting prohibited)
1	1	Single chip mode	Single chip mode

3. Note

The mode data set in the mode vector must be stored as byte data at 0x000FFFF8_H. The data should be located in the highest byte from bit 31 to bit 24 because the FR family uses big endian byte ordering.

		bit 31	24 23	16 15	8 7	0
Incorrect	0x000FFFF8 _H	XXXXXXXX	XXXXXXXX	XXXXXXXX	Mode data	
Correct	0x000FFFF8 _H	Mode data	XXXXXXXX	XXXXXXXX	XXXXXXXX	
	0x000FFFC _H	Reset vector				

MB91470/480 Series

Address	Register				Block
	+0	+1	+2	+3	
000100 _H	PRLH0 [R/W] B, H, W XXXXXXXXXX	PRLL0 [R/W] B, H, W XXXXXXXXXX	PRLH1 [R/W] B, H, W XXXXXXXXXX	PRLL1 [R/W] B, H, W XXXXXXXXXX	PPG
000104 _H	PRLH2 [R/W] B, H, W XXXXXXXXXX	PRLL2 [R/W] B, H, W XXXXXXXXXX	PRLH3 [R/W] B, H, W XXXXXXXXXX	PRLL3 [R/W] B, H, W XXXXXXXXXX	
000108 _H	PPGC0 [R/W] B, H, W 00000000	PPGC1 [R/W] B, H, W 00000000	PPGC2 [R/W] B, H, W 00000000	PPGC3 [R/W] B, H, W 00000000	
00010C _H	PRLH4 [R/W] B, H, W XXXXXXXXXX	PRLL4 [R/W] B, H, W XXXXXXXXXX	PRLH5 [R/W] B, H, W XXXXXXXXXX	PRLL5 [R/W] B, H, W XXXXXXXXXX	
000110 _H	PRLH6 [R/W] B, H, W XXXXXXXXXX	PRLL6 [R/W] B, H, W XXXXXXXXXX	PRLH7 [R/W] B, H, W XXXXXXXXXX	PRLL7 [R/W] B, H, W XXXXXXXXXX	
000114 _H	PPGC4 [R/W] B, H, W 00000000	PPGC5 [R/W] B, H, W 00000000	PPGC6 [R/W] B, H, W 00000000	PPGC7 [R/W] B, H, W 00000000	
000118 _H	PRLH8 [R/W] B, H, W XXXXXXXXXX	PRLL8 [R/W] B, H, W XXXXXXXXXX	PRLH9 [R/W] B, H, W XXXXXXXXXX	PRLL9 [R/W] B, H, W XXXXXXXXXX	
00011C _H	PRLH10 [R/W] B, H, W XXXXXXXXXX	PRLL10 [R/W] B, H, W XXXXXXXXXX	PRLH11 [R/W] B, H, W XXXXXXXXXX	PRLL11 [R/W] B, H, W XXXXXXXXXX	
000120 _H	PPGC8 [R/W] B, H, W 00000000	PPGC9 [R/W] B, H, W 00000000	PPGC10 [R/W] B, H, W 00000000	PPGC11 [R/W] B, H, W 00000000	
000124 _H	PRLH12 [R/W] B, H, W XXXXXXXXXX	PRLL12 [R/W] B, H, W XXXXXXXXXX	PRLH13 [R/W] B, H, W XXXXXXXXXX	PRLL13 [R/W] B, H, W XXXXXXXXXX	
000128 _H	PRLH14 [R/W] B, H, W XXXXXXXXXX	PRLL14 [R/W] B, H, W XXXXXXXXXX	PRLH15 [R/W] B, H, W XXXXXXXXXX	PRLL15 [R/W] B, H, W XXXXXXXXXX	
00012C _H	PPGC12 [R/W] B, H, W 00000000	PPGC13 [R/W] B, H, W 00000000	PPGC14 [R/W] B, H, W 00000000	PPGC15 [R/W] B, H, W 00000000	
000130 _H	TRG [R/W] B, H 00000000 00000000		—	GATEC0 [R/W] B --00--00	
000134 _H	REVC [R/W] B, H 00000000 00000000		—	GATEC4 [R/W] B -----00	
000138 _H	—			GATEC8 [R/W] B --00--00	

(Continued)

MB91470/480 Series

Address	Register				Block
	+0	+1	+2	+3	
000180 _H	ADCD042 [R] B, H, W 10----XX XXXXXXXXX		ADCD052 [R] B, H, W 10----XX XXXXXXXXX		8/10-bit A/D converter 2 (12 channels)
000184 _H	ADCD062 [R] B, H, W 10----XX XXXXXXXXX		ADCD072 [R] B, H, W 10----XX XXXXXXXXX		
000188 _H	ADCD082 [R] B, H, W 10----XX XXXXXXXXX		ADCD092 [R] B, H, W 10----XX XXXXXXXXX		
00018C _H	ADCD102 [R] B, H, W 10----XX XXXXXXXXX		ADCD112 [R] B, H, W 10----XX XXXXXXXXX		
000190 _H to 00019C _H	—				(Reserved)
0001A0 _H	OCCPBH6, OCCPBL6 [W]/ OCCPH6, OCCPL6 [R] H, W 00000000 00000000		OCCPBH7, OCCPBL7 [W]/ OCCPH7, OCCPL7 [R] H, W 00000000 00000000		OCU1
0001A4 _H	OCCPBH8, OCCPBL8 [W]/ OCCPH8, OCCPL8 [R] H, W 00000000 00000000		OCCPBH9, OCCPBL9 [W]/ OCCPH9, OCCPL9 [R] H, W 00000000 00000000		
0001A8 _H	OCCPBH10, OCCPBL10 [W]/ OCCPH10, OCCPL10 [R] H, W 00000000 00000000		OCCPBH11, OCCPBL11 [W]/ OCCPH11, OCCPL11 [R] H, W 00000000 00000000		
0001AC _H	OCSH7 [R/W] B, H, W -110--00	OCSL6 [R/W] B, H, W 00001100	OCSH9 [R/W] B, H, W -110--00	OCSL8 [R/W] B, H, W 00001100	
0001B0 _H	OCSH11 [R/W] B, H, W -110--00	OCSL10 [R/W] B, H, W 00001100	OCMOD1 [R/W] B, H, W --000000	—	
0001B4 _H	CPCLRBH3, CPCLRBL3 [W]/ CPCLRHH3, CPCLRL3 [R] H, W 11111111 11111111		TCDTH3, TCDTL3 [R/W] H, W 00000000 00000000		Free-run timer 3
0001B8 _H	TCCSH3 [R/W] B, H, W 00000000	TCCSL3 [R/W] B, H, W 01000000	TCCSM3 [R/W] B, H, W ----0000	ADTRGC3 [R/W] B, H, W -000-000	
0001BC _H	CPCLRBH4, CPCLRBL4 [W] / CPCLRHH4, CPCLRL4 [R] H, W 11111111 11111111		TCDTH4, TCDTL4 [R/W] H, W 00000000 00000000		Free-run timer 4
0001C0 _H	TCCSH4 [R/W] B, H, W 00000000	TCCSL4 [R/W] B, H, W 01000000	TCCSM4 [R/W] B, H, W ----0000	ADTRGC4 [R/W] B, H, W -000-000	

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MB91470/480 Series

Address	Register				Block
	+0	+1	+2	+3	
000414 _H	DDRP [R/W] B, H, W --000000	DDRQ [R/W] B, H, W --000000	DDRR [R/W] B, H, W --000000	DDRS [R/W] B, H, W --000000	Port direction register
000418 _H , 00041C _H	—				(Reserved)
000420 _H	PFR0 [R/W] B, H, W 11111111	PFR1 [R/W] B, H, W 11111111	PFR2 [R/W] B, H, W 11111111	PFR3 [R/W] B, H, W 11111111	Port function register
000424 _H	PFR5 [R/W] B, H, W -1111111	PFR6 [R/W] B, H, W -----11	PFR8 [R/W] B, H, W 0000----	PFR9 [R/W] B, H, W 00000000	
000428 _H	—		PFRC [R/W] B, H, W --0-00-0	—	
00042C _H	—	PFRF [R/W] B, H, W -----0	PFRG [R/W] B, H, W --0-00-0	PFRH [R/W] B, H, W --0-00-0	
000430 _H	PFRJ [R/W] B, H, W 0-0-0-0-	—		PFRM [R/W] B, H, W ----0000	
000434 _H	—	PFRQ [R/W] B, H, W --000000	—	PFRS [R/W] B, H, W --000000	
000438 _H , 00043C _H	—				(Reserved)
000440 _H	ICR00 [R/W, R] B, H, W ---11111	ICR01 [R/W, R] B, H, W ---11111	ICR02 [R/W, R] B, H, W ---11111	ICR03 [R/W, R] B, H, W ---11111	Interrupt controller
000444 _H	ICR04 [R/W, R] B, H, W ---11111	ICR05 [R/W, R] B, H, W ---11111	ICR06 [R/W, R] B, H, W ---11111	ICR07 [R/W, R] B, H, W ---11111	
000448 _H	ICR08 [R/W, R] B, H, W ---11111	ICR09 [R/W, R] B, H, W ---11111	ICR10 [R/W, R] B, H, W ---11111	ICR11 [R/W, R] B, H, W ---11111	
00044C _H	ICR12 [R/W, R] B, H, W ---11111	ICR13 [R/W, R] B, H, W ---11111	ICR14 [R/W, R] B, H, W ---11111	ICR15 [R/W, R] B, H, W ---11111	
000450 _H	ICR16 [R/W, R] B, H, W ---11111	ICR17 [R/W, R] B, H, W ---11111	ICR18 [R/W, R] B, H, W ---11111	ICR19 [R/W, R] B, H, W ---11111	
000454 _H	ICR20 [R/W, R] B, H, W ---11111	ICR21 [R/W, R] B, H, W ---11111	ICR22 [R/W, R] B, H, W ---11111	ICR23 [R/W, R] B, H, W ---11111	

(Continued)

MB91470/480 Series

Address	Register				Block
	+0	+1	+2	+3	
0005A0 _H	BT3TMR [R] B, H, W 00000000 00000000		BT3TMCR [R/W] B, H, W -0000000 00000000		Base timer 3
0005A4 _H	—	BT3STC [R/W] B 00000000	—		
0005A8 _H	BT3PCSR/BT3PRL [R/W] H, W XXXXXXXX XXXXXXXX		BT3PDUT/BT3PRLH/BT3DTBF [R/W] H, W XXXXXXXX XXXXXXXX		
0005AC _H	—				(Reserved)
0005B0 _H to 0005FC _H	—				(Reserved)
000600 _H	PCR0 [R/W] B, H, W 00000000	PCR1 [R/W] B, H, W 00000000	PCR2 [R/W] B, H, W 00000000	PCR3 [R/W] B, H, W 00000000	Pull-up resistor control register
000604 _H	PCR5 [R/W] B, H, W -0000000	PCR6 [R/W] B, H, W -----00	PCR8 [R/W] B, H, W 00000000	PCR9 [R/W] B, H, W 00000000	
000608 _H	PCRA [R/W] B, H, W ---00000	PCRB [R/W] B, H, W 00000000	PCRC [R/W] B, H, W 00000000	PCRD [R/W] B, H, W ---0000	
00060C _H	PCRE [R/W] B, H, W 00000000	PCRF [R/W] B, H, W 00000000	PCRG [R/W] B, H, W --000000	PCRH [R/W] B, H, W --000000	
000610 _H	PCRJ [R/W] B, H, W 00000000	—	PCRL [R/W] B, H, W ----000	PCRM [R/W] B, H, W ---0000	
000614 _H	PCRP [R/W] B, H, W --000000	PCRQ [R/W] B, H, W --000000	PCRR [R/W] B, H, W --000000	PCRS [R/W] B, H, W --000000	
000618 _H to 00063C _H	—				(Reserved)
000640 _H	ASR0 [R/W] H, W 00000000 00000000 *2		ACR0 [R/W] H, W 1111XX-- --000000 *2		External bus interface
000644 _H	ASR1 [R/W] H, W XXXXXXXX XXXXXXXX *2		ACR1 [R/W] H, W XXXXXX-- --XXXXXX *2		
000648 _H	ASR2 [R/W] H, W XXXXXXXX XXXXXXXX *2		ACR2 [R/W] H, W XXXXXX-- --XXXXXX *2		
00064C _H	—				

(Continued)

MB91470/480 Series

Address	Register				Block
	+0	+1	+2	+3	
000650 _H to 00065C _H	—				External bus interface
000660 _H	AWR0 [R/W] H, W 0111---- 1111-111 *2		AWR1 [R/W] H, W XXXX---- XXXX-XXX *2		
000664 _H	AWR2 [R/W] H, W XXXX---- XXXX-XXX *2		—		
000668 _H to 00067C _H	—				
000680 _H	CSER [R/W] B, H -----001	—			
000684 _H to 0007F8 _H	—				(Reserved)
0007FC _H	—	MODR [W] XXXXXXXX	—		Mode register
000800 _H to 000FFC _H	—				(Reserved)
001000 _H	DMASA0 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				DMAC
001004 _H	DMADA0 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
001008 _H	DMASA1 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
00100C _H	DMADA1 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
001010 _H	DMASA2 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
001014 _H	DMADA2 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				
001018 _H	DMASA3 [R/W] W XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX				

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MB91470/480 Series

Interrupt source	Interrupt number		Interrupt level	Offset	TBR default address
	Decimal	Hexa-decimal			
Base timer 2/3 (source 0/source 1) Up/down counter 0	30	1E	ICR14	384 _H	000FFF84 _H
DTTI0/DTTI1	31	1F	ICR15	380 _H	000FFF80 _H
DMAC0 (end/error)	32	20	ICR16	37C _H	000FFF7C _H
DMAC1 (end/error)	33	21	ICR17	378 _H	000FFF78 _H
DMAC2/3/4 (end/error)	34	22	ICR18	374 _H	000FFF74 _H
Multi-function serial interface 2 (UART transmission completed/reception completed/I ² C status)	35	23	ICR19	370 _H	000FFF70 _H
Multi-function serial interface 3 (UART transmission completed/reception completed/I ² C status)	36	24	ICR20	36C _H	000FFF6C _H
Multi-function serial interface 4 (UART transmission completed/reception completed/I ² C status)	37	25	ICR21	368 _H	000FFF68 _H
Multi-function serial interface 5 (UART transmission completed/reception completed/I ² C status)	38	26	ICR22	364 _H	000FFF64 _H
MAC	39	27	ICR23	360 _H	000FFF60 _H
PPG0/PPG1	40	28	ICR24	35C _H	000FFF5C _H
PPG2/PPG3/PPG8/PPG9	41	29	ICR25	358 _H	000FFF58 _H
PPG4/PPG5/PPG10/PPG11	42	2A	ICR26	354 _H	000FFF54 _H
PPG6/PPG7/PPG12/PPG13/PPG14/PPG15	43	2B	ICR27	350 _H	000FFF50 _H
Wave form generator 0/3 (underflow)	44	2C	ICR28	34C _H	000FFF4C _H
Wave form generator 1/4 (underflow)	45	2D	ICR29	348 _H	000FFF48 _H
Wave form generator 2/5 (underflow)	46	2E	ICR30	344 _H	000FFF44 _H
Timebase timer overflow	47	2F	ICR31	340 _H	000FFF40 _H
External interrupt 8/9/10/11/12/13/14/15	48	30	ICR32	33C _H	000FFF3C _H
Free-run timer 0/3 (compare clear)	49	31	ICR33	338 _H	000FFF38 _H
Free-run timer 0/3 (zero detection)	50	32	ICR34	334 _H	000FFF34 _H
Free-run timer 1/4 (compare clear)	51	33	ICR35	330 _H	000FFF30 _H
Free-run timer 1/4 (zero detection)	52	34	ICR36	32C _H	000FFF2C _H
Free-run timer 2/5 (compare clear)	53	35	ICR37	328 _H	000FFF28 _H
Free-run timer 2/5 (zero detection)	54	36	ICR38	324 _H	000FFF24 _H
8/10-bit A/D converter 2	55	37	ICR39	320 _H	000FFF20 _H
8/10-bit A/D converter 0/ 12-bit A/D converter 3	56	38	ICR40	31C _H	000FFF1C _H

(Continued)

2. Recommended Operating Conditions

($V_{SS} = AVSS10 = AVSS12 = 0.0\text{ V}$)

Parameter	Symbol	Value		Unit	Remarks
		Min	Max		
Power supply voltage	V_{CC}	4.0	5.5	V	
Analog power supply voltage	AVCC10	$V_{SS} + 4.0$	$V_{SS} + 5.5$	V	For all 8/10-bit A/D converter (common use)
	AVCC12	$V_{SS} + 4.0$	$V_{SS} + 5.5$	V	For all 12-bit A/D converter (common use)
Analog reference voltage	AVRH0	AVSS10	AVCC10	V	For 8/10-bit A/D converter 0
	AVRH1	AVSS10	AVCC10	V	For 8/10-bit A/D converter 1
	AVRH2	AVSS10	AVCC10	V	For 8/10-bit A/D converter 2
	AVRH3	AVSS12	AVCC12	V	For 12-bit A/D converter 3
	AVRH4	AVSS12	AVCC12	V	For 12-bit A/D converter 4
(-) Analog input signal voltage range	ANINN	AVSS12	AVCC12/2	V	For all 12-bit A/D converters (common use) (under differential mode)
(+) Analog input signal voltage range	ANINP	AVSS12	AVCC12	V	
ANINN-ANINP voltage difference	ANINN-ANINP	—	AVCC12/4	V	
Operating temperature	T_A	- 40	+ 70	°C	When mounted on single-layer PCB*
			+ 85		When mounted on four-layer PCB*

* : The remaining rating values assume four-layer PCB.

Note : During power-on, it takes approximately 600 μs for the internal power supply to stabilize after the V_{CC} power supply has stabilized. Continue to assert the INITX pin during this period.

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their representatives beforehand.

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3. DC Characteristics

($V_{CC} = 4.0\text{ V}$ to 5.5 V , $V_{SS} = AVSS10 = AVSS12 = 0.0\text{ V}$)

Parameter	Symbol	Pin Name	Condition	Value			Unit	Remarks
				Min	Typ	Max		
“H” level input voltage	V_{IH}	CMOS input pin	—	$V_{CC} \times 0.7$	—	V_{CC}	V	
	V_{IHS}	CMOS hysteresis input pin	—	$V_{CC} \times 0.8$	—	V_{CC}	V	
“L” level input voltage	V_{IL}	CMOS input pin	—	V_{SS}	—	$V_{CC} \times 0.3$	V	
	V_{ILS}	CMOS hysteresis input pin	—	V_{SS}	—	$V_{CC} \times 0.2$	V	
“H” level output voltage	V_{OH1}	Except port Q0 to Q5 and port S0 to S5	$V_{CC} = 5.0\text{ V}$, $I_{OH} = 4\text{ mA}$	$V_{CC} - 0.5$	—	—	V	
	V_{OH2}	Port Q0 to Q5 and port S0 to S5	$V_{CC} = 5.0\text{ V}$, $I_{OH} = 12\text{ mA}$	$V_{CC} - 0.5$	—	—	V	
“L” level output voltage	V_{OL1}	Except port Q0 to Q5 and port S0 to S5	$V_{CC} = 5.0\text{ V}$, $I_{OL} = 4\text{ mA}$	—	—	$V_{SS} + 0.4$	V	
	V_{OL2}	Port Q0 to Q5 and port S0 to S5	$V_{CC} = 5.0\text{ V}$, $I_{OL} = 12\text{ mA}$	—	—	$V_{SS} + 0.4$	V	
Input leak current	I_{LI}	—	$V_{CC} = 5.0\text{ V}$, $V_{SS} < V_I < V_{CC}$	- 5	—	—	μA	
Pull-up resistance	R_{PULL}	INITX, pull-up pin	—	—	50	—	k Ω	
Power supply current	I_{CC}	VCC	Flash memory $V_{CC} = 5.0\text{ V}$, $f_c = 20\text{ MHz}$, PLL $\times 4$, CLKB = 80 MHz CLKP = 40 MHz CLKT = 40 MHz	—	—	100	mA	When the multiply and accumulate unit is not used.
				—	—	140	mA	When the multiply and accumulate unit is used.

(Continued)

(2) Clock Output Timing

($V_{CC} = 4.0 \text{ V}$ to 5.5 V , $V_{SS} = AVSS10 = AVSS12 = 0.0 \text{ V}$, $T_A = -40 \text{ }^{\circ}\text{C}$ to $+85 \text{ }^{\circ}\text{C}$)

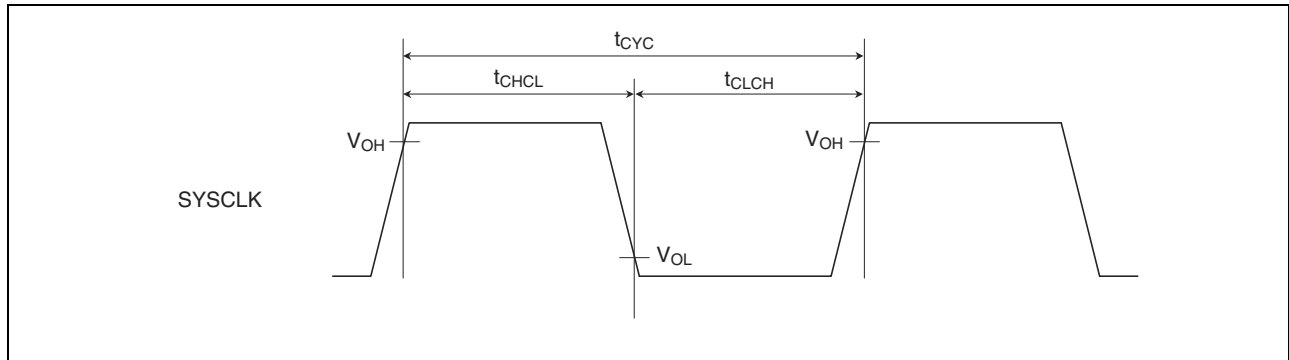
Parameter	Symbol	Pin Name	Condition	Value		Unit	Remarks
				Min	Max		
Cycle time	t_{CYC}	SYSCLK	—	t_{CPT}	—	ns	*1
SYSCLK $\uparrow \rightarrow$ SYCSCLK $\downarrow$	t_{CHCL}			$t_{CYC}/2 - 5$	$t_{CYC}/2 + 5$	ns	*2
SYSCLK $\downarrow \rightarrow$ SYCSCLK $\uparrow$	t_{CLCH}			$t_{CYC}/2 - 5$	$t_{CYC}/2 + 5$	ns	

*1 : t_{CYC} is the frequency of one clock cycle including the gear cycle.

*2 : The following ratings are for the gear ratio set to $\times 2$. For the ratings when the gear ratio is set to $1/4$ and $1/8$, can be calculated by substituting $1/4$ or $1/8$ for n respectively in the following equation.

$$(1/2 \times 1/n) \times t_{CYC} - 5$$

Note : For t_{CPT} (internal clock cycle time) , refer to “(1) Clock Timing”.



(3) PLL Oscillation stabilization time (LOCK UP TIME)

($V_{CC} = 4.0 \text{ V}$ to 5.5 V , $V_{SS} = AVSS10 = AVSS12 = 0.0 \text{ V}$, $T_A = -40 \text{ }^{\circ}\text{C}$ to $+85 \text{ }^{\circ}\text{C}$)

Parameter	Symbol	Pin Name	Condition	Value		Unit
				Min	Max	
PLL Oscillation stabilization wait time (LOCK UP TIME)	t_{LOCK}^*	—	—	600	—	μs

* : The length of time to wait for the PLL oscillations to stabilize.

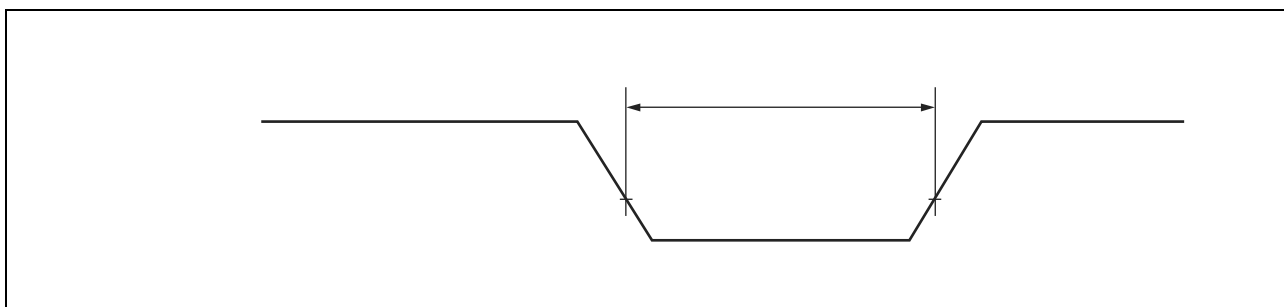
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(4) Reset Input Ratings

($V_{CC} = 4.0\text{ V}$ to 5.5 V , $V_{SS} = AVSS10 = AVSS12 = 0.0\text{ V}$, $T_A = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Pin Name	Condition	Value		Unit
				Min	Max	
INITX input time (at power-on and stop mode)	t_{INTL}	INITX	—	Oscillation time of oscillator + $t_c \times 10$	—	ns
INITX input time (other than the above)				$t_c \times 10$	—	ns

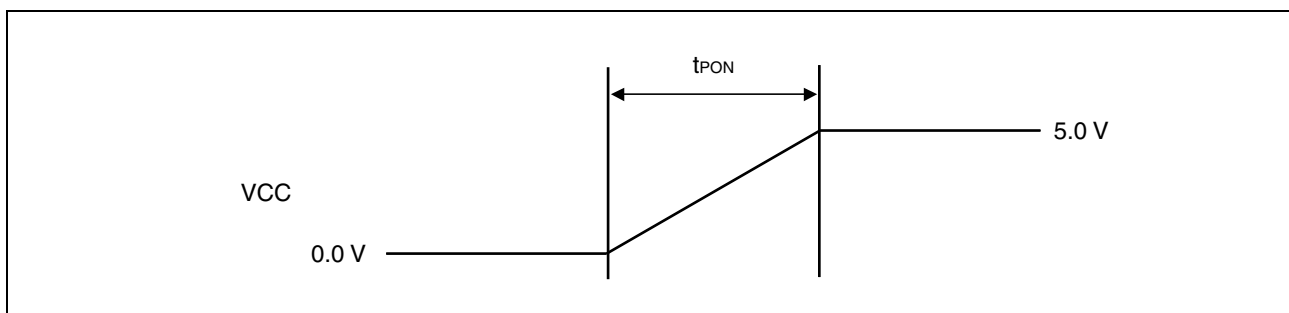
- Notes :
- It takes approximately $600\text{ }\mu\text{s}$ for the internal power to stabilize after the power supply has stabilized. Continue to input “L” level to the INITX pin during this period.
 - For t_{CPT} (internal clock cycle time) , refer to “(1) Clock Timing”.



(5) Power on Rise Time Ratings

($V_{CC} = 4.0\text{ V}$ to 5.5 V , $V_{SS} = AVSS10 = AVSS12 = 0.0\text{ V}$, $T_A = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$)

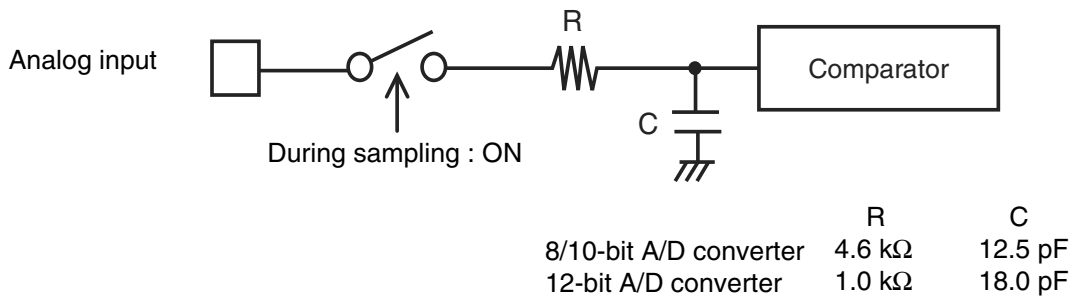
Parameter	Symbol	Pin Name	Condition	Value		Unit
				Min	Max	
Power on rise time	t_{PON}	VCC	—	600	—	μs



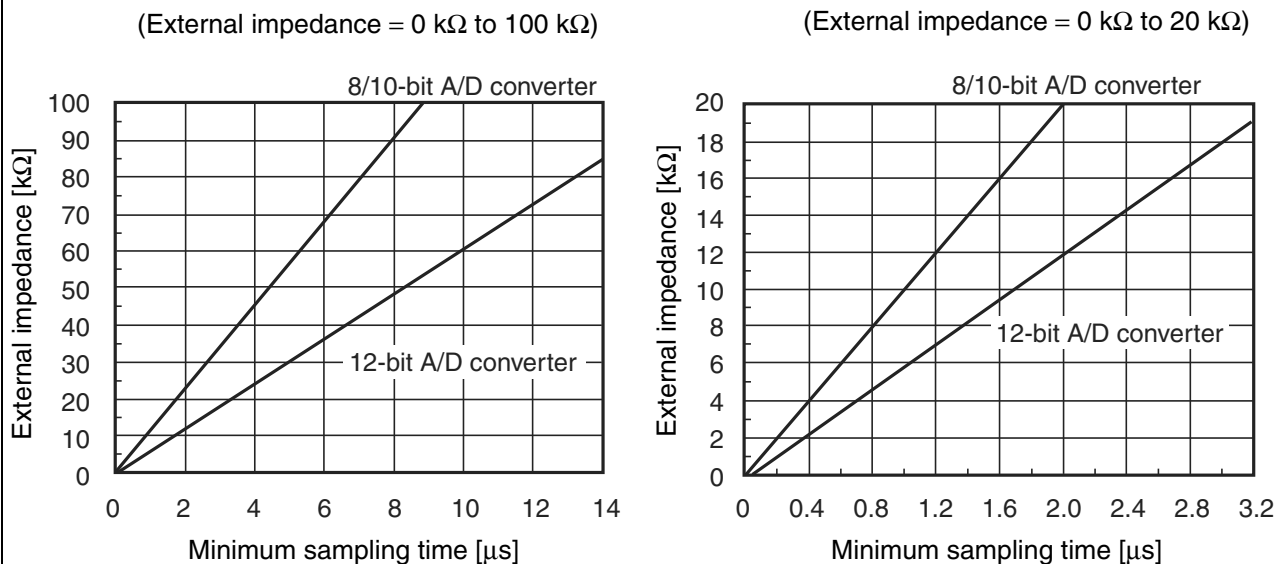
• External impedance and sampling time of analog inputs

- The A/D converter is fitted with a sample and hold circuit. If the external impedance is so high that there is not sufficient time for sampling, the internal sample and hold capacitor will not fully charge to the analog voltage, and the precision of the A/D conversion will be adversely affected. Therefore, in order to satisfy the A/D conversion precision specifications, either adjust the register values and operating frequency or reduce the external impedance so that the sampling time is greater than the minimum value as given by the relationship between external impedance and minimum sampling time. If you are still unable to hold enough sampling time, connect a capacitor of about 0.1 μF to the analog input pin.

• Analog input circuit schematic



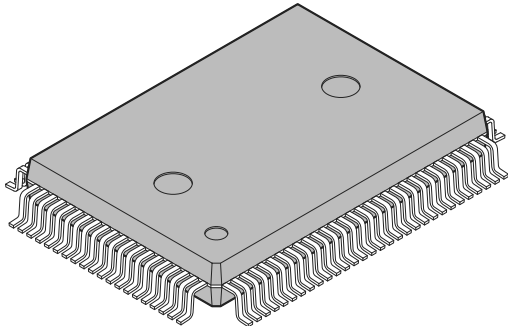
• The relationship between the external impedance and minimum sampling time

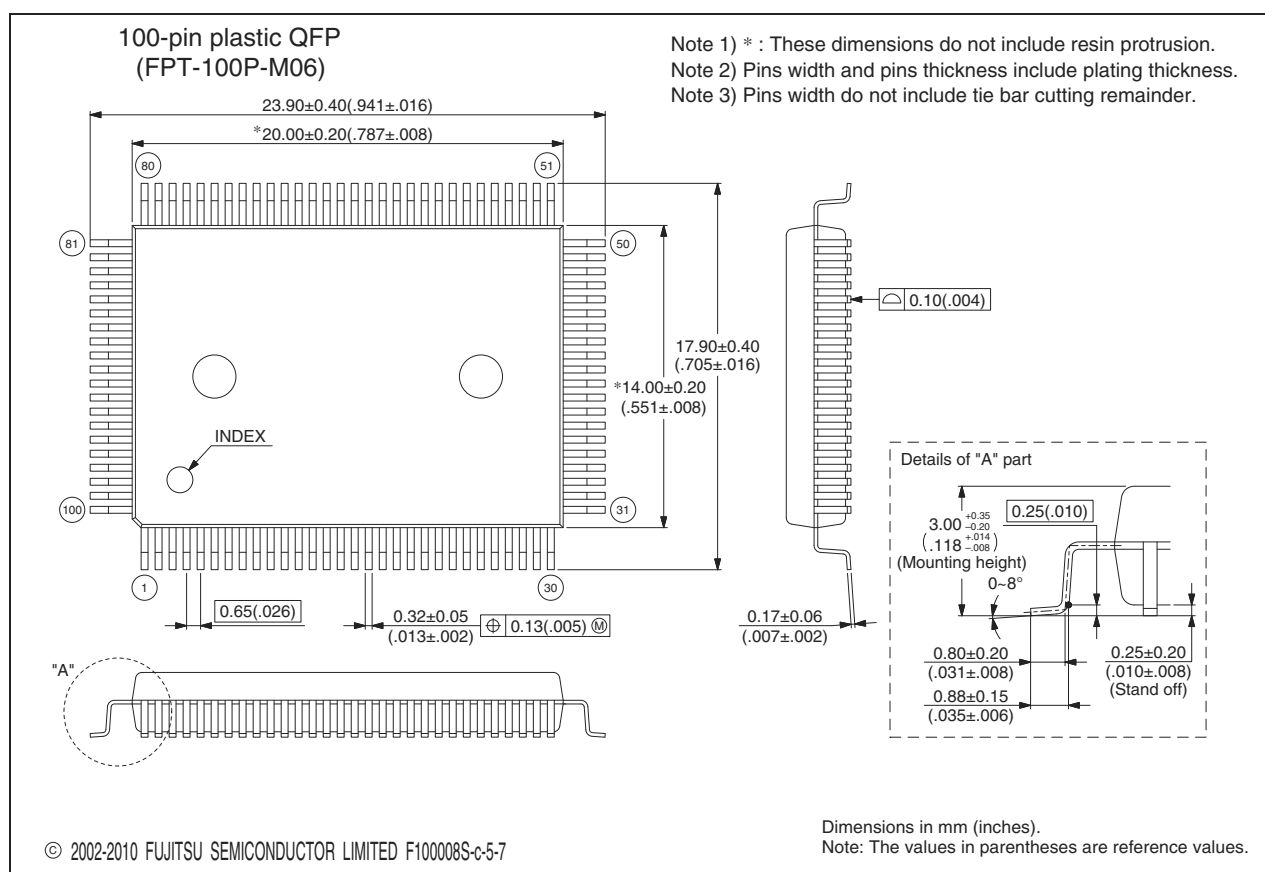


• About errors

- The relative error increases as the value of $|\text{AVRH} - \text{AVSS}|$ decreases.

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100-pin plastic QFP  (FPT-100P-M06)	Lead pitch	0.65 mm
	Package width × package length	14.00 × 20.00 mm
	Lead shape	Gullwing
	Sealing method	Plastic mold
	Mounting height	3.35 mm MAX
	Code (Reference)	P-QFP100-14×20-0.65



Please check the latest package dimension at the following URL.
<http://edevic.fujitsu.com/package/en-search/>

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