

16-bit Proprietary Microcontroller

CMOS

F²MC-16LX MB90340 Series

MB90F342A(S), MB90F342CA(S), MB90F343A(S), MB90F343CA(S), MB90F345A(S), MB90F345CA(S), MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S), MB90341CA(S), MB90342A(S), MB90342CA(S), MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S), MB90348CA(S), MB90349A(S), MB90349CA(S), MB90V340A-101/102

■ DESCRIPTION

The MB90340-series with up to 2 FULL-CAN* interfaces and FLASH ROM is especially designed for automotive and other industrial applications. Its main feature are the on-board CAN Interfaces, which conform to V2.0 Part A and Part B, while supporting a very flexible message buffer scheme and so offering more functions than a normal full CAN approach. With the new 0.35 μ m CMOS technology, Fujitsu now offers on-chip FLASH-ROM program memory up to 512 Kbytes.

The power supply (3 V) is supplied to the internal MCU core from an internal regulator circuit. This creates a major advantage in terms of EMI and power consumption.

The internal PLL clock frequency multiplier provides an internal 42 ns instruction cycle time from an external 4 MHz clock.

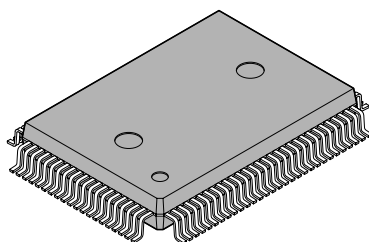
The unit features an 8 channel Output Compare Unit and 8 channel Input Capture Unit with 2 separate 16-bit free running timers. 4 UARTs constitute additional functionality for communication purposes.

* : Controller Area Network (CAN) - License of Robert Bosch GmbH

Note : F²MC stands for FUJITSU Flexible Microcontroller, a registered trademark of FUJITSU LIMITED.

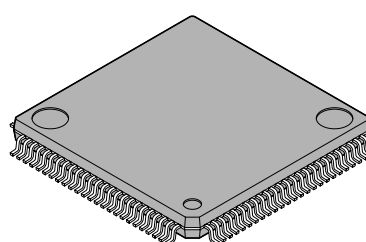
■ PACKAGES

100-pin Plastic QFP



(FPT-100P-M06)

100-pin Plastic LQFP



(FPT-100P-M05)

MB90340 Series

■ FEATURES

• Clock

- Built-in PLL clock frequency multiplication circuit
- Selection of machine clocks (PLL clocks) is allowed among frequency division by two on oscillation clock, and multiplication of 1 to 6 times of oscillation clock (for 4 MHz oscillation clock, 4 MHz to 24 MHz).
- Operation by sub-clock (up to 50 kHz : 100 kHz oscillation clock divided two) is allowed. (devices without S-suffix only)
- Minimum execution time of instruction : 42 ns (when operating with 4-MHz oscillation clock, and 6-time multiplied PLL clock).
- Built-in Clock Modulation circuit

• 16 Mbyte CPU memory space

- 24-bit internal addressing

• Instruction system best suited to controller

- Wide choice of data types (bit, byte, word, and long word)
- Wide choice of addressing modes(23 types)
- Enhanced multiply-divide instructions and RETI instructions
- Enhanced high-precision computing with 32-bit accumulator

• Instruction system compatible with high-level language (C language) and multitask

- Employing system stack pointer
- Enhanced various pointer indirect instructions
- Barrel shift instructions

• Increased processing speed

- 4-byte instruction queue

• Powerful interrupt function

- Powerful 8-level, 34-condition interrupt feature
- Up to 16 external interrupts are supported

• Automatic data transfer function independent of CPU

- Expanded intelligent I/O service function (EI²OS) : up to 16 channels
- DMA : up to 16 channels

• Low power consumption (standby) mode

- Sleep mode (a mode that halts CPU operating clock)
- Main timer mode (time-base timer mode that is transferred from main clock mode)
- PLL timer mode (time-base timer mode that is transferred from PLL clock mode)
- Watch mode (a mode that operates sub clock and clock timer only)
- Stop mode (a mode that stops oscillation clock and sub clock)
- CPU blocking operation mode

• Process

- CMOS technology

• I/O port

- General-purpose input/output port (CMOS output)
 - 80 ports (devices without S-suffix)
 - 82 ports (devices with S-suffix)

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- **Timer**

- Time-base timer, clock timer, watchdog timer : 1 channel
- 8/16-bit PPG timer : 8-bit X 16 channels, or 16-bit X 8 channels
- 16-bit reload timer : 4 channels
- 16-bit input/output timer
 - 16-bit free run timer : 2 channel (FRT0 : ICU 0/1/2/3, OCU 0/1/2/3, FRT1 : ICU 4/5/6/7, OCU 4/5/6/7)
 - 16-bit input capture: (ICU) : 8 channels
 - 16-bit output compare : (OCU) : 8 channels

- **Full-CAN interface : up to 2 channels**

- Compliant with Ver2.0A and Ver2.0B CAN specifications
- Flexible message buffering (mailbox and FIFO buffering can be mixed)
- CAN wake-up function

- **UART (LIN/SCI) : up to 4 channels**

- Equipped with full-duplex double buffer
- Clock-asynchronous or clock-synchronous serial transmission is available

- **I²C interface* : up to 2 channels (devices with C-suffix only)**

- Up to 400 Kbits/s transfer rate

- **DTP/External interrupt : up to 16 channels, CAN wakeup : up to 2 channels**

- Module for activation of expanded intelligent I/O service (EI²OS), DMA, and generation of external interrupt.

- **Delay interrupt generator module**

- Generates interrupt request for task switching.

- **8/10-bit A/D converter : 16/24 channels**

- Resolution is selectable between 8-bit and 10-bit.
- Activation by external trigger input is allowed.
- Conversion time : 3 μ s (at 24-MHz machine clock, including sampling time)

- **Program patch function**

- Address matching detection for 6 address pointers.

- **Internal voltage regulator**

- Supports 3 V MCU core, offering low EMI and low power consumption figures

- **Programmable input levels**

- Automotive/CMOS-Schmitt (initial level is Automotive in Single chip mode)
- TTL level (initial level for External bus mode)

- **FLASH memory security function**

- Protects the content of FLASH memory (FLASH memory device only)

- **External bus interface**

- **Clock monitor function**

* : I²C license :

Purchase of Fujitsu I²C components conveys a license under the Philips I²C Patent Rights to use, these components in an I²C system provided that the system conforms to the I²C Standard Specification as defined by Philips.

MB90340 Series

■ PRODUCT LINEUP

Part Number	MB90F342A(S), MB90F342CA(S), MB90F343A(S)* ¹ , MB90F343CA(S)* ¹ , MB90F345A(S), MB90F345CA(S), MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S)* ¹ , MB90341CA(S)* ¹ , MB90342A(S)* ¹ , MB90342CA(S)* ¹ , MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S)* ¹ , MB90348CA(S)* ¹ , MB90349A(S)* ¹ , MB90349CA(S)* ¹	MB90V340A-101/102
Parameter		
CPU	F ² MC-16LX CPU	
System clock	On-chip PLL clock multiplier (×1, ×2, ×3, ×4, ×6, 1/2 when PLL stops) Minimum instruction execution time : 42 ns (4 MHz osc. PLL × 6)	
ROM	MASK ROM, Flash memory 512 Kbytes : MB90F345A(S), MB90F345CA(S) 384 Kbytes : MB90F343A(S), MB90F343CA(S) 256 Kbytes : MB90F342A(S), MB90F342CA(S), MB90F349A(S), MB90F349CA(S), MB90342A(S), MB90342CA(S), MB90349A(S), MB90349CA(S) 128 Kbytes : MB90F347A(S), MB90F347CA(S), MB90341A(S), MB90341CA(S), MB90348A(S), MB90348CA(S), MB90347A(S), MB90347CA(S) 64 Kbytes : MB90F346A(S), MB90F346CA(S), MB90346A(S), MB90346CA(S)	External
RAM	20 Kbytes : MB90F343A(S), MB90F343CA(S), MB90F345A(S), MB90F345CA(S) 16 Kbytes : MB90F342A(S), MB90F342CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S), MB90341CA(S), MB90342A(S), MB90342CA(S), MB90348A(S), MB90348CA(S), MB90349A(S), MB90349CA(S) 6 Kbytes : MB90F347A(S), MB90F347CA(S), MB90347A(S), MB90347CA(S) 2 Kbytes : MB90F346A(S), MB90F346CA(S), MB90346A(S), MB90346CA(S)	30 Kbytes
Emulator-specific power supply* ²	—	Yes
Technology	0.35 μm CMOS with regulator for internal power supply + Flash memory with Charge pump for programming voltage	0.35 μm CMOS with regulator for internal power supply
Operating voltage range	3.5 V - 5.5 V : at normal operating (not using A/D converter) 4.0 V - 5.5 V : at using A/D converter/Flash programming 4.5 V - 5.5 V : at using external bus	5 V ± 10%
Temperature range	−40 °C to +105 °C	—
Package	QFP-100, LQFP-100	PGA-299
UART	4 channels	5 channels
	Wide range of baud rate settings using a dedicated reload timer Special synchronous options for adapting to different synchronous serial protocols LIN functionality working either as master or slave LIN device	
I ² C (400 Kbps)	devices with 'C'-suffix : 2ch devices without 'C'-suffix : —	2 channels

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MB90340 Series

Part Number Parameter	MB90F342A(S), MB90F342CA(S), MB90F343A(S)*1, MB90F343CA(S)*1, MB90F345A(S), MB90F345CA(S), MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S)*1, MB90341CA(S)*1, MB90342A(S)*1, MB90342CA(S)*1, MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S)*1, MB90348CA(S)*1, MB90349A(S)*1, MB90349CA(S)*1		MB90V340A-101/102	
A/D Converter	devices with 'C'-suffix : 24ch devices without 'C'-suffix : 16ch	24 input channels		
	10-bit or 8-bit resolution Conversion time : Min 3 μs include sample time (per one channel)			
16-bit Reload Timer (4 channels)	Operation clock frequency : fsys/2 ¹ , fsys/2 ³ , fsys/2 ⁵ (fsys = Machine clock frequency) Supports External Event Count function			
16-bit I/O Timer (2 channels)	Signals an interrupt when overflowing Supports Timer Clear when a match with Output Compare (Channel 0, 4) Operation clock freq. : fsys, fsys/2 ¹ , fsys/2 ² , fsys/2 ³ , fsys/2 ⁴ , fsys/2 ⁵ , fsys/2 ⁶ , fsys/2 ⁷ (fsys = Machine clock freq.) I/O Timer 0 (clock input FRCK0) corresponds to ICU 0/1/2/3, OCU 0/1/2/3 I/O Timer 1 (clock input FRCK1) corresponds to ICU 4/5/6/7, OCU 4/5/6/7			
16-bit Output Compare (8 channels)	Signals an interrupt when 16-bit I/O Timer match output compare registers. A pair of compare registers can be used to generate an output signal.			
16-bit Input Capture (8 channels)	Rising edge, falling edge or rising & falling edge sensitive Signals an interrupt upon external event			
8/16-bit Programmable Pulse Generator (8 channels)	Supports 8-bit and 16-bit operation modes Sixteen 8-bit reload counters Sixteen 8-bit reload registers for L pulse width Sixteen 8-bit reload registers for H pulse width A pair of 8-bit reload counters can be configured as one 16-bit reload counter or as 8-bit prescaler plus 8-bit reload counter Operation clock freq. : fsys, fsys/2 ¹ , fsys/2 ² , fsys/2 ³ , fsys/2 ⁴ or 128 μs@fosc = 4 MHz (fsys = Machine clock frequency, fosc = Oscillation clock frequency)			
CAN Interface	2 channels : MB90F342A(S), MB90F342CA(S), MB90F345A(S), MB90F345CA(S), MB90341A(S), MB90341CA(S), MB90342A(S), MB90342CA(S) 1 channel : MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S), MB90348CA(S), MB90349A(S), MB90349CA(S)		3 channels	
	Conforms to CAN Specification Version 2.0 Part A and B Automatic re-transmission in case of error Automatic transmission responding to Remote Frame Prioritized 16 message buffers for data and ID's Supports multiple messages Flexible configuration of acceptance filtering : Full bit compare/Full bit mask/Two partial bit masks Supports up to 1 Mbps			

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MB90340 Series

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Part Number Parameter	MB90F342A(S), MB90F342CA(S), MB90F343A(S)*1, MB90F343CA(S)*1, MB90F345A(S), MB90F345CA(S), MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S)*1, MB90341CA(S)*1, MB90342A(S)*1, MB90342CA(S)*1, MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S)*1, MB90348CA(S)*1, MB90349A(S)*1, MB90349CA(S)*1	MB90V340A-101/102
External Interrupt (16 channels)	Can be used rising edge, falling edge, starting up by H/L level input, external interrupt, expanded intelligent I/O services (EI ² OS) and DMA	
D/A converter	—	2 channels
Up to 100 kHz Subclock for low power operation	without subclock : devices with 'S'-suffix or MB90V340A-101 with subclock : devices without 'S'-suffix or MB90V340A-102	
I/O Ports	Virtually all external pins can be used as general purpose I/O port All push-pull outputs Bit-wise settable as input/output or peripheral signal Settable in pin-wise of 8 as CMOS schmitt trigger/ automotive inputs (default) TTL input level settable for external bus (32-pin only for external bus)	
Flash Memory	Supports automatic programming, Embedded Algorithm ^{TM*3} Write/Erase/Erase-Suspend/Resume commands A flag indicating completion of the algorithm Number of erase cycles : 10,000 times Data retention time : 20 years Boot block configuration Erase can be performed on each block Block protection with external programming voltage Flash Security Feature for protecting the content of the Flash (except for MB90F346A(S) and MB90F346CA (S))	—

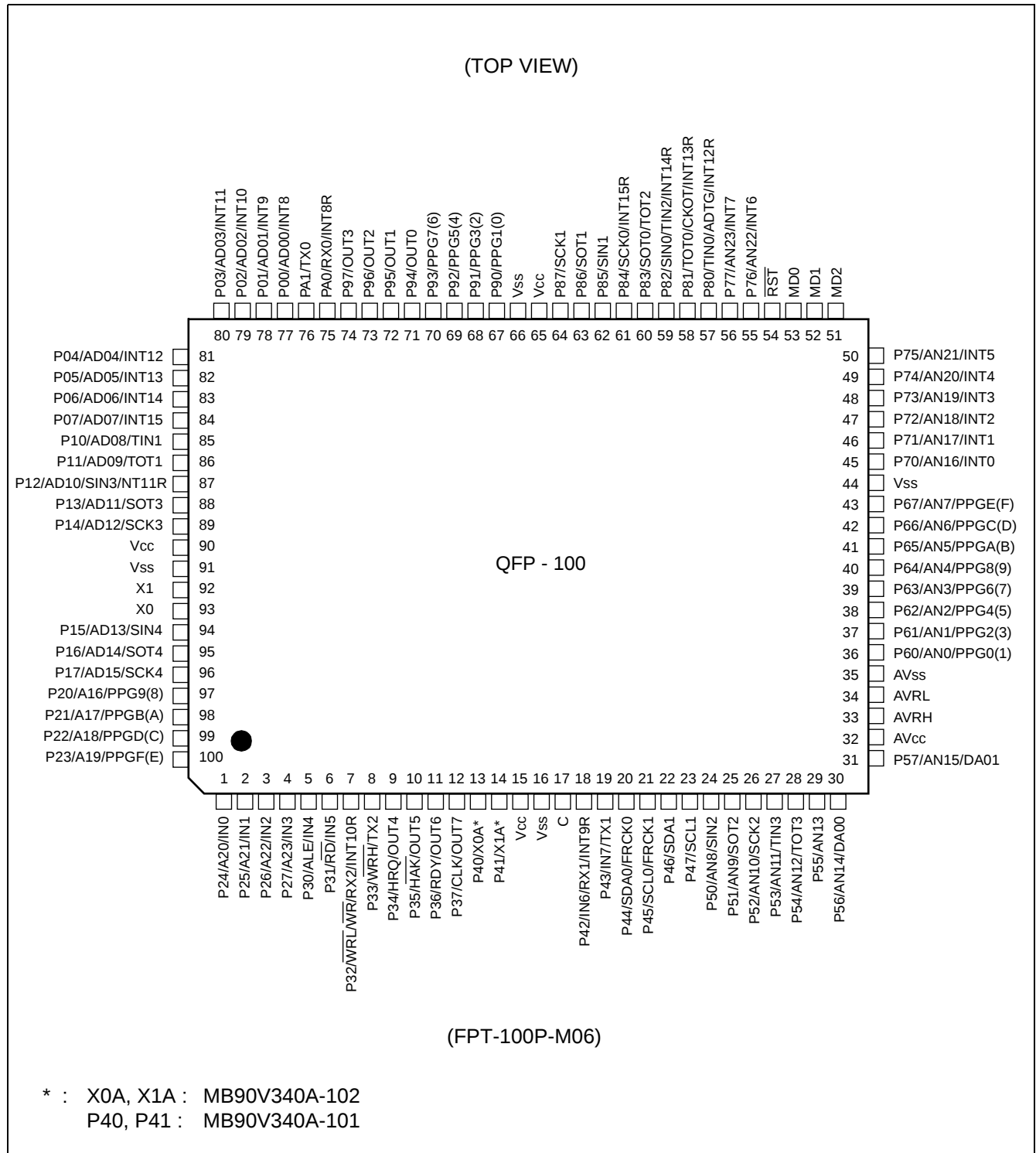
*1 : These devices are under development.

*2 : It is setting of Jumper switch (TOOL VCC) when Emulator (MB2147-01) is used.
Please refer to the Emulator hardware manual about details.

*3 : Embedded Algorithm is a trade mark of Advanced Micro Devices Inc.

PIN ASSIGNMENTS

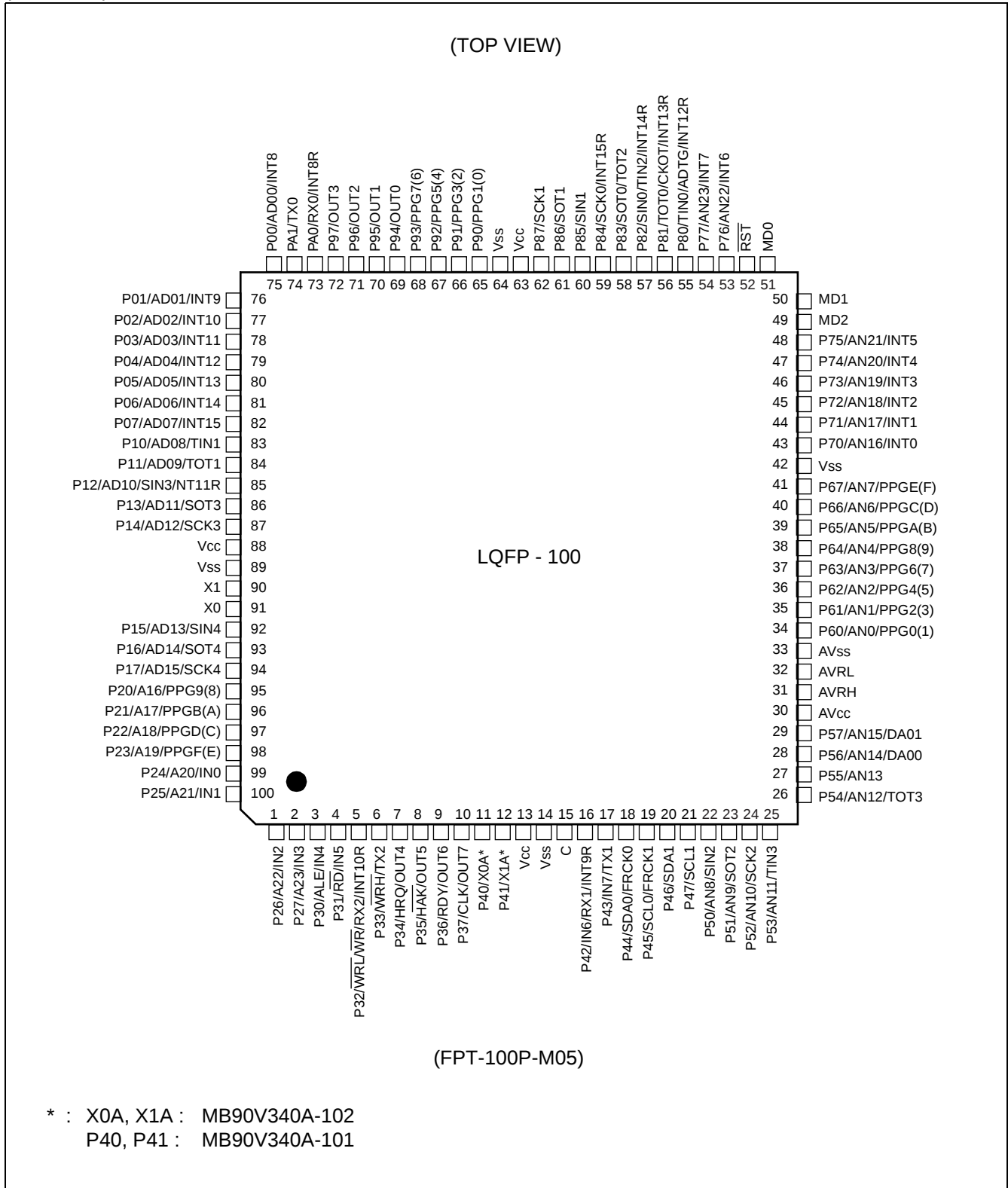
- MB90V340A-101/MB90V340A-102



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MB90340 Series

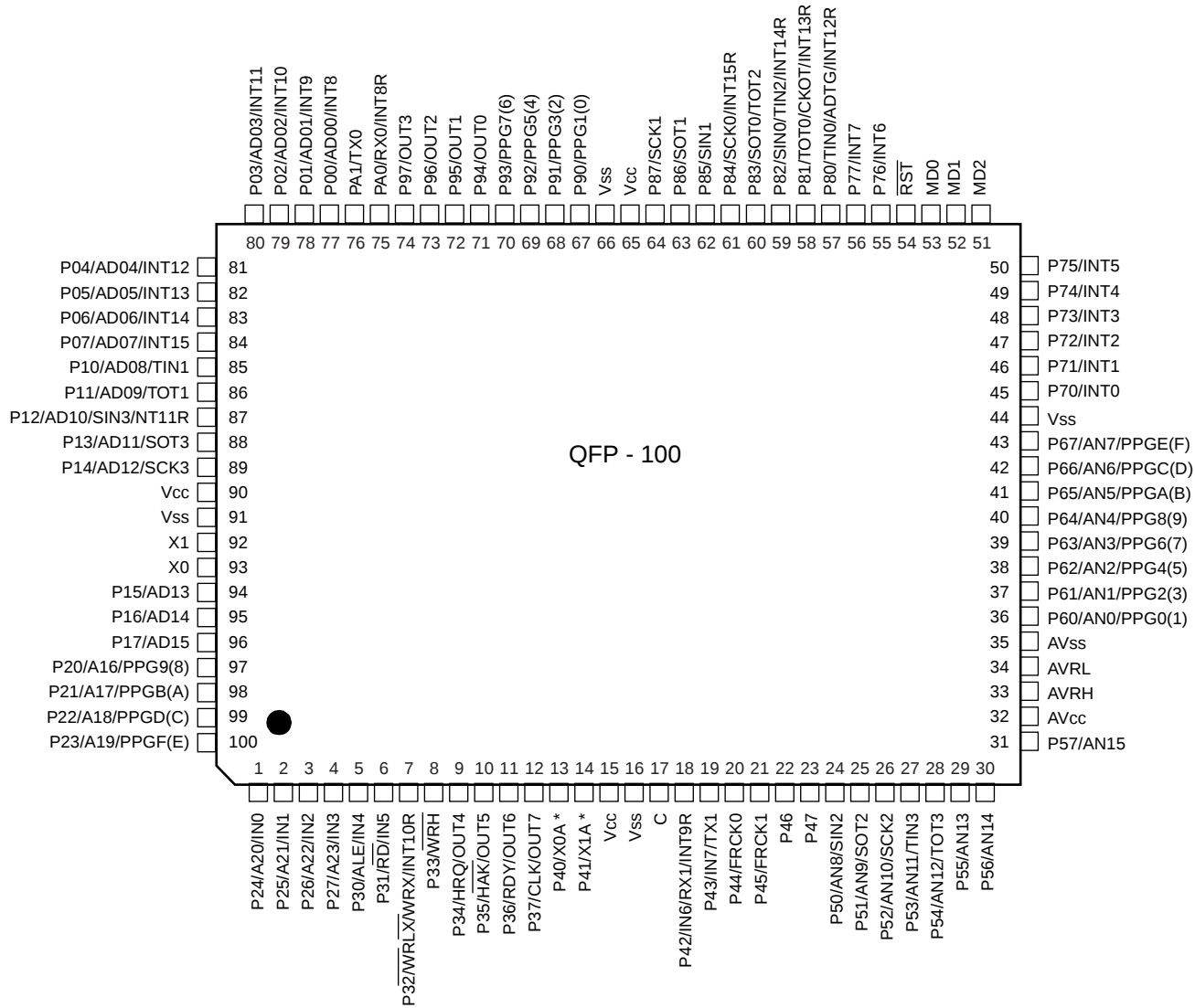
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MB90340 Series

- MB90F342A(S) / MB90F343A(S) / MB90F345A(S) / MB90F346A(S) / MB90F347A(S) / MB90F349A(S) / MB90341A(S) / MB90342A(S) / MB90346A(S) / MB90347A(S) / MB90348A(S) / MB90349A(S)

(TOP VIEW)



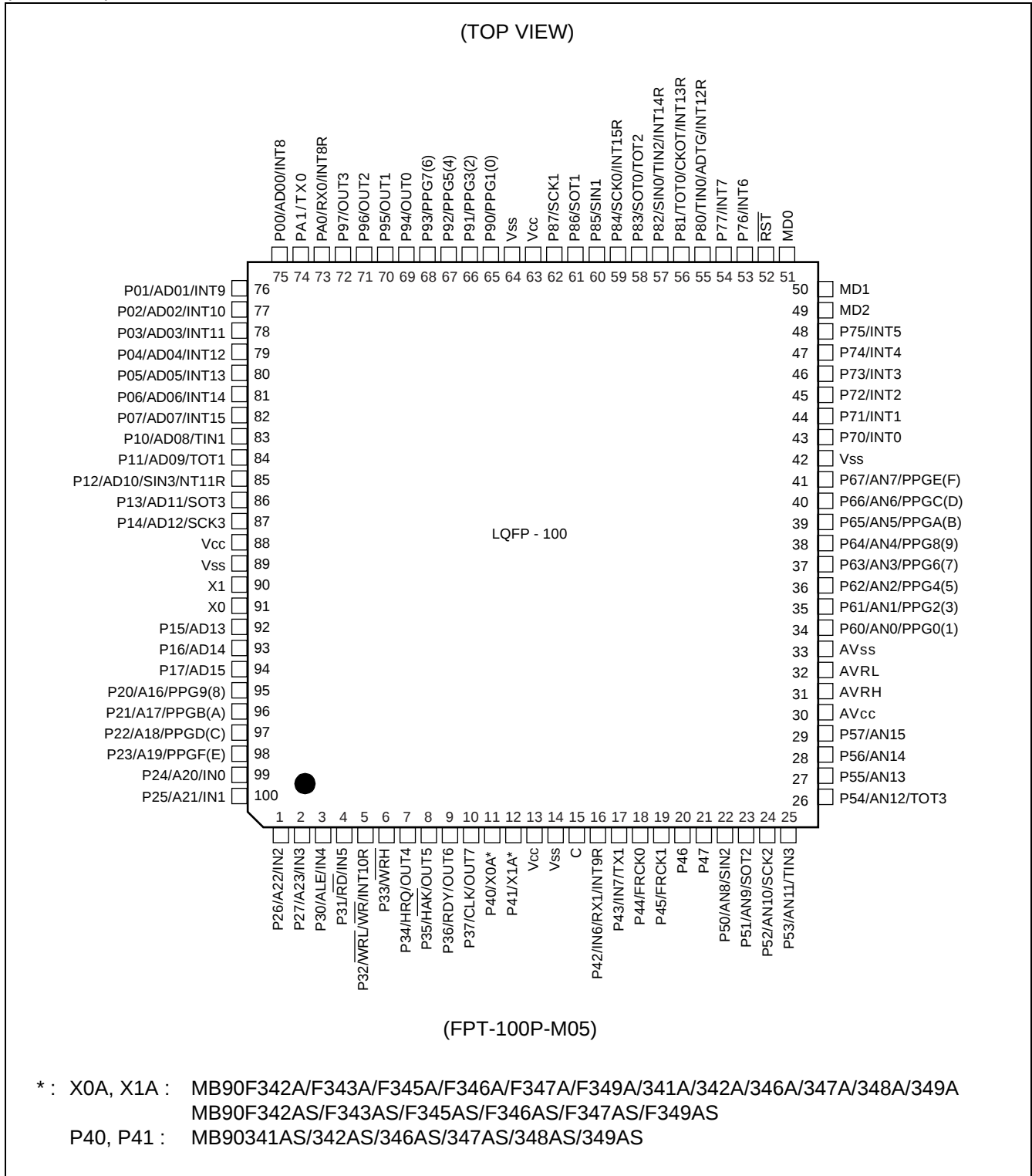
(FPT-100P-M06)

- *: X0A, X1A : MB90F342A/F343A/F345A/F346A/F347A/F349A/341A/342A/346A/347A/348A/349A
 MB90F342AS/F343AS/F345AS/F346AS/F347AS/F349AS
 P40, P41 : MB90341AS/342AS/346AS/347AS/348AS/349AS

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MB90340 Series

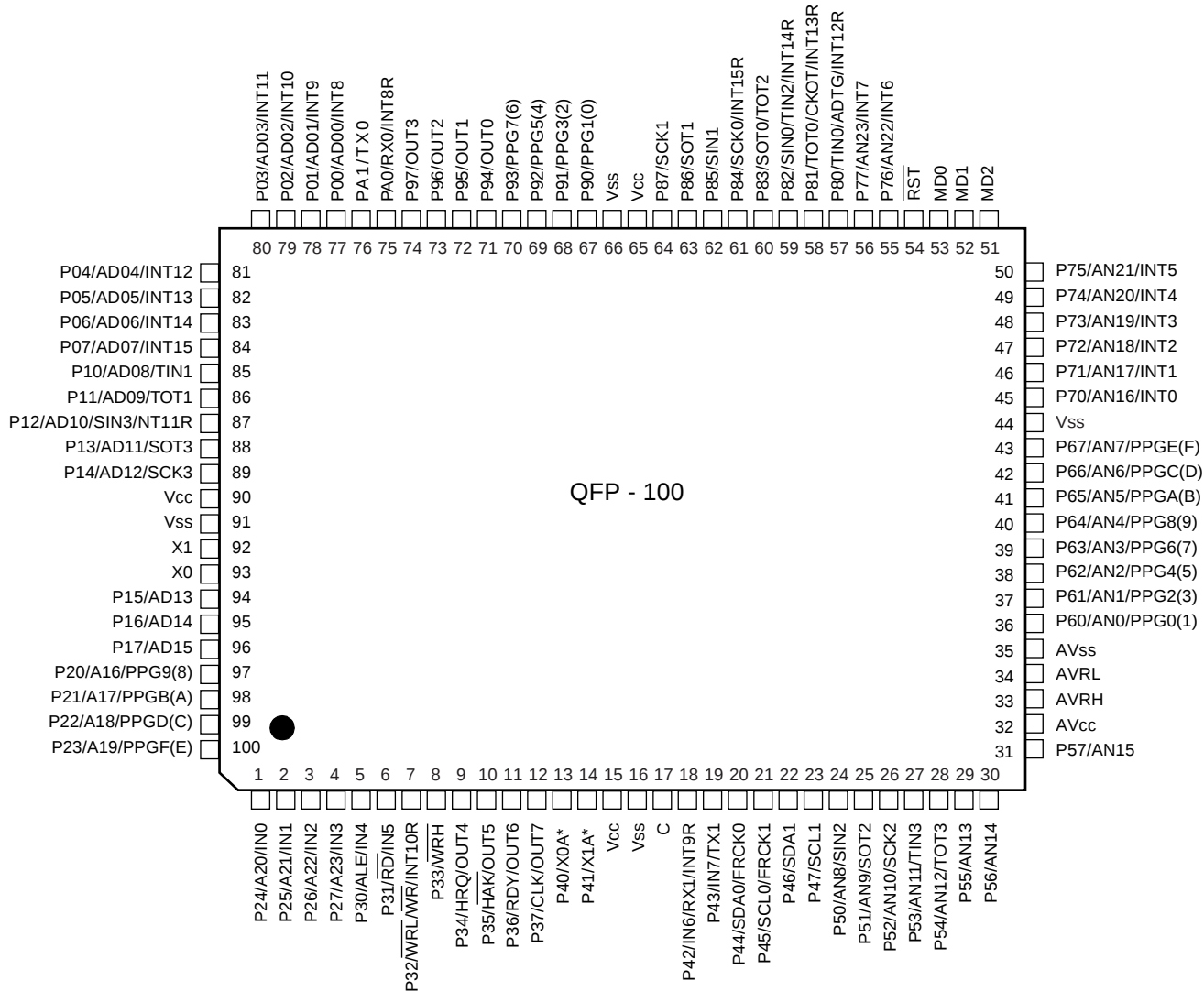
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MB90340 Series

- MB90F342CA(S) / MB90F343CA(S) / MB90F345CA(S) / MB90F346CA(S) / MB90F347CA(S) / MB90F349CA(S) / MB90341CA(S) / MB90342CA(S) / MB90346CA(S) / MB90347CA(S) / MB90348CA(S) / MB90349CA(S)

(TOP VIEW)



(FPT-100P-M06)

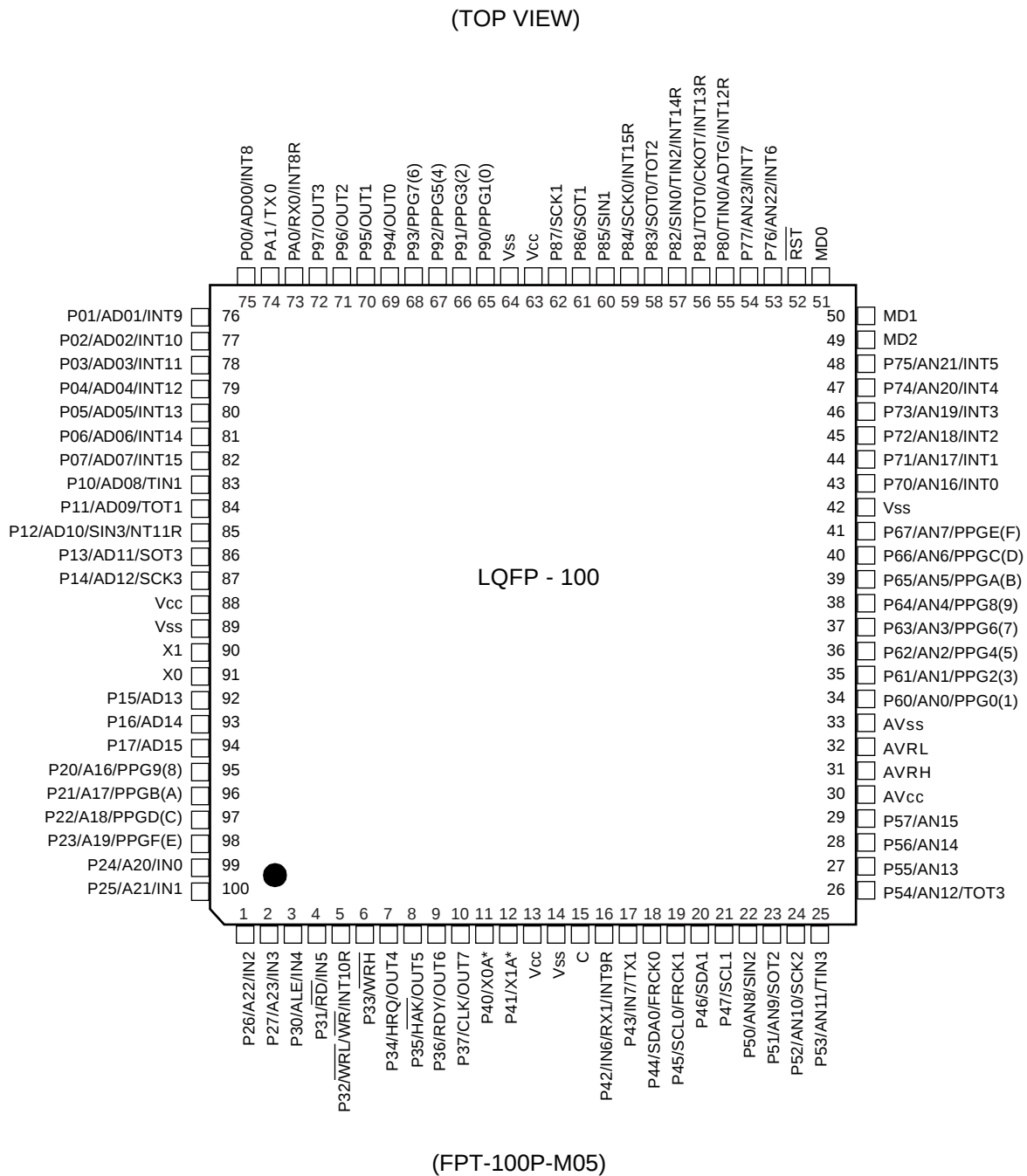
* : X0A, X1A : MB90F342CA/F343CA/F345CA/F346CA/F347CA/F349CA
MB90341CA/342CA/346CA/347CA/348CA/349CA

P40, P41 : MB90F342CAS/F343CAS/F345CAS/F346CAS/F347CAS/F349CAS
MB90341CAS/342CAS/346CAS/347CAS/348CAS/349CAS

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MB90340 Series

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* : X0A, X1A : MB90F342CA/F343CA/F345CA/F346CA/F347CA/F349CA
 MB90341CA/342CA/346CA/347CA/348CA/349CA
 P40, P41 : MB90F342CAS/F343CAS/F345CAS/F346CAS/F347CAS/F349CAS
 MB90341CAS/342CAS/346CAS/347CAS/348CAS/349CAS

■ PIN DESCRIPTION

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
90	92	X1	A	Oscillation output
91	93	X0		Oscillation input
52	54	$\overline{\text{RST}}$	E	Reset input
75 to 82	77 to 84	P00 to P07	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD00 to AD07		I/O pins for 8 lower bits of the external address/data bus. This function is enabled when the external bus is enabled.
		INT8 to INT15		External interrupt request input pins for INT8 to INT15.
83	85	P10	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD08		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		TIN1		Event input pin for the reload timer 1
84	86	P11	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD09		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		TOT1		Output pin for the reload timer 1
85	87	P12	N	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD10		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SIN3		Serial data input pin for UART3
		INT11R		External interrupt request input pin for INT11
86	88	P13	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD11		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SOT3		Serial data output pin for UART3
87	89	P14	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD12		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SCK3		Clock I/O pin for UART3

(Continued)

MB90340 Series

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
92	94	P15	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD13		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SIN4		Serial data input pin for UART4 (EVA devices)
93	95	P16	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD14		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SOT4		Serial data output pin for UART4 (EVA devices)
94	96	P17	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		AD15		I/O pin for the external address/data bus. This function is enabled when the external bus is enabled.
		SCK4		Clock I/O pin for UART4 (EVA devices only)
95 to 98	97 to 100	P20 to P23	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. In external bus mode, the pin is enabled as a general-purpose I/O port when the corresponding bit in the external address output control register (HACR) is 1.
		A16 to A19		Output pins for A16 to A19 of the external address bus. When the corresponding bit in the external address output control register (HACR) is 0, the pins are enabled as high address output pins (A16 to A19).
		PPG9,PPGB,PPGD,PPGF		Output pins for PPGs
99 to 2	1 to 4	P24 to P27	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. In external bus mode, the pin is enabled as a general-purpose I/O port when the corresponding bit in the external address output control register (HACR) is 1.
		A20 to A23		Output pins for A20 to A23 of the external address bus. When the corresponding bit in the external address output control register (HACR) is 0, the pins are enabled as high address output pins (A20 to A23).
		IN0 to IN3		Data sample input pins for input captures ICU0 to ICU3
3	5	P30	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		ALE		Address latch enable output pin. This function is enabled when the external bus is enabled.
		IN4		Data sample input pin for input capture ICU4

(Continued)

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
4	6	P31	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled in single-chip mode.
		$\overline{RD}$		Read strobe output pin for the data bus. This function is enabled when the external bus is enabled.
		IN5		Data sample input pin for input capture ICU5
5	7	P32	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the $\overline{WR}/\overline{WRL}$ pin output disabled.
		$\overline{WRL} / \overline{WR}$		Write strobe output pin for the data bus. This function is enabled when both the external bus and the $\overline{WR}/\overline{WRL}$ pin output are enabled. $\overline{WRL}$ is used to write-strobe 8 lower bits of the data bus in 16-bit access while $\overline{WR}$ is used to write-strobe 8 bits of the data bus in 8-bit access.
		RX2		RX input pin for CAN2 Interface (EVA devices)
		INT10R		External interrupt request input pin for INT10
6	8	P33	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the $\overline{WRH}$ pin output disabled.
		$\overline{WRH}$		Write strobe output pin for the 8 higher bits of the data bus. This function is enabled when the external bus is enabled, when the external bus 16-bit mode is selected, and when the $\overline{WRH}$ output pin is enabled.
		TX2		TX Output pin for CAN2 (EVA devices)
7	9	P34	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the hold function disabled.
		HRQ		Hold request input pin. This function is enabled when both the external bus and the hold function are enabled.
		OUT4		Waveform output pin for output compare OCU4
8	10	P35	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the hold function disabled.
		$\overline{HAK}$		Hold acknowledge output pin. This function is enabled when both the external bus and the hold function are enabled.
		OUT5		Waveform output pin for output compare OCU6
9	11	P36	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the external ready function disabled.
		RDY		Ready input pin. This function is enabled when both the external bus and the external ready function are enabled.
		OUT6		Waveform output pin for output compare OCU5

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MB90340 Series

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
10	12	P37	G	General purpose I/O. The register can be set to select whether to use a pull-up resistor. This function is enabled either in single-chip mode or with the CLK output disabled.
		CLK		CLK output pin. This function is enabled when both the external bus and CLK output are enabled.
		OUT7		Waveform output pin for output compare OCU7
11, 12	13, 14	P40, P41	F	General purpose I/O (devices with S-suffix or MB90V340A-101)
		X0A , X1A	B	Oscillator input pins for sub-clock (devices without S-suffix or MB90V340A-102)
16	18	P42	F	General purpose I/O
		IN6		Data sample input pin for input capture ICU6
		RX1		RX input pin for CAN1 Interface (MB90F342A/F343A/F345A/341A/342A only)
		INT9R		External interrupt request input pin for INT9
17	19	P43	F	General purpose I/O
		IN7		Data sample input pin for input capture ICU7
		TX1		TX Output pin for CAN1 (MB90F342A/F343A/F345A/341A/342A only)
18	20	P44	H	General purpose I/O
		SDA0		Serial data I/O pin for I ² C 0 (devices with C-suffix)
		FRCK0		Input for the 16-bit I/O Timer 0
19	21	P45	H	General purpose I/O
		SCL0		Serial clock I/O pin for I ² C 0 (devices with C-suffix)
		FRCK1		Input for the 16-bit I/O Timer 1
20	22	P46	H	General purpose I/O
		SDA1		Serial data I/O pin for I ² C 1 (devices with C-suffix)
21	23	P47	H	General purpose I/O
		SCL1		Serial clock I/O pin for I ² C 1 (devices with C-suffix)
22	24	P50	O	General purpose I/O
		AN8		Analog input pin for the A/D converter
		SIN2		Serial data input pin for UART2
23	25	P51	I	General purpose I/O
		AN9		Analog input pin for the A/D converter
		SOT2		Serial data output pin for UART2
24	26	P52	I	General purpose I/O
		AN10		Analog input pin for the A/D converter
		SCK2		Clock I/O pin for UART2

(Continued)

MB90340 Series

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
25	27	P53	I	General purpose I/O
		AN11		Analog input pin for the A/D converter
		TIN3		Event input pin for the reload timers 3
26	28	P54	I	General purpose I/O
		AN12		Analog input pin for the A/D converter
		TOT3		Output pin for the reload timer 3
27	29	P55	I	General purpose I/O
		AN13		Analog input pin for the A/D converter
28, 29	30, 31	P56 to P57	J	General purpose I/O
		AN14 to AN15		Analog input pin for the A/D converter
		DA00 to DA01		D/A converter analog output pins (MB90V340 only)
34 to 41	36 to 43	P60 to P67	I	General purpose I/O
		AN0 to AN7		Analog input pins for the A/D converter
		PPG0, 2, 4, 6, 8, A, C, E		Output pins for PPGs
43 to 48, 53, 54	45 to 50, 55, 56	P70 to P77	I	General purpose I/O
		AN16 to AN23		Analog input pins for the A/D converter (devices with C-suffix)
		INT0 to INT7		External interrupt request input pins for INT0 to INT7
55	57	P80	F	General purpose I/O
		TIN0		Event input pin for the reload timers 0
		ADTG		Trigger input pin for the A/D converter
		INT12R		External interrupt request input pin for INT12
56	58	P81	F	General purpose I/O
		TOT0		Output pin for the reload timer 0
		CKOT		Output pin for the clock monitor
		INT13R		External interrupt request input pin for INT13
57	59	P82	M	General purpose I/O
		SIN0		Serial data input pin for UART0
		TIN2		Event input pin for the reload timers 2
		INT14R		External interrupt request input pin for INT14
58	60	P83	F	General purpose I/O
		SOT0		Serial data output pin for UART0
		TOT2		Output pin for the reload timer 2
59	61	P84	F	General purpose I/O
		SCK0		Clock I/O pin for UART0
		INT15R		External interrupt request input pin for INT15

(Continued)

MB90340 Series

(Continued)

Pin No.		Pin name	Circuit type	Function
LQFP100*2	QFP100*1			
60	62	P85	M	General purpose I/O
		SIN1		Serial data input pin for UART1
61	63	P86	F	General purpose I/O
		SOT1		Serial data output pin for UART1
62	64	P87	F	General purpose I/O
		SCK1		Clock I/O pin for UART1
65 to 68	67 to 70	P90 to P93	F	General purpose I/O
		PPG1, 3, 5, 7		Output pins for PPGs
69 to 72	71 to 74	P94 to P97	F	General purpose I/O
		OUT0 to OUT3		Waveform output pins for output compares OCU0 to OCU3. This function is enabled when the OCU enables waveform output.
73	75	PA0	F	General purpose I/O
		RX0		RX input pin for CAN0 Interface
		INT8R		External interrupt request input pin for INT8
74	76	PA1	F	General purpose I/O
		TX0		TX Output pin for CAN0
30	32	AV _{CC}	K	V _{CC} power input pin for analog circuits
31	33	AVRH	L	Reference voltage input for the A/D Converter. This power supply must be turned on or off while a voltage higher than or equal to AVRH is applied to AV _{CC} .
32	34	AVRL	K	Lower reference voltage input for the A/D Converter
33	35	AV _{SS}	K	V _{SS} power input pin for analog circuits
50, 51	52, 53	MD1, MD0	C	Input pins for specifying the operating mode.
49	51	MD2	D	Input pin for specifying the operating mode.
13 63 88	15 65 90	V _{CC}	—	Power (3.5 V to 5.5 V) input pins
14 42 64 89	16 44 66 91	V _{SS}	—	Power (0V) input pins
15	17	C	K	This is the power supply stabilization capacitor pin. It should be connected to a higher than or equal to 0.1 μ F ceramic capacitor.

*1 : FPT-100P-M06

*2 : FPT-100P-M05

■ I/O CIRCUIT TYPE

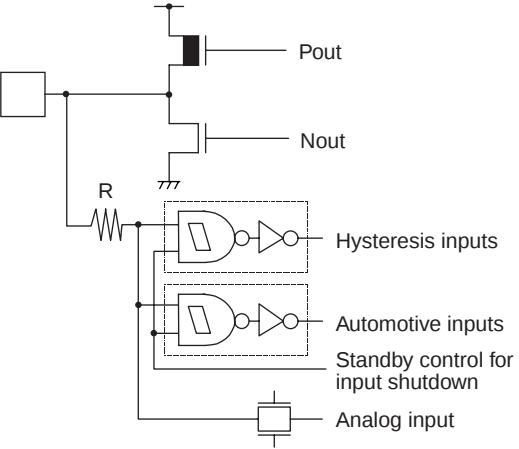
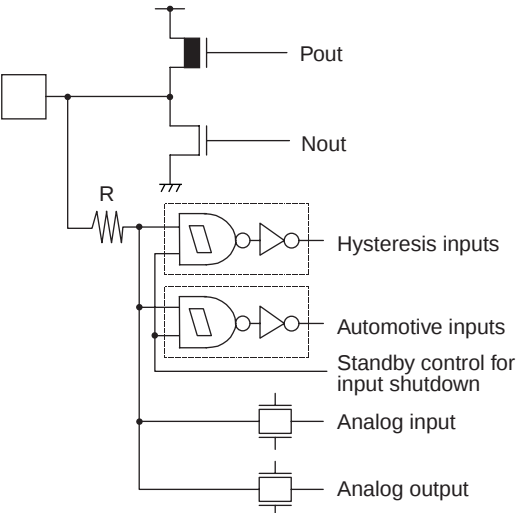
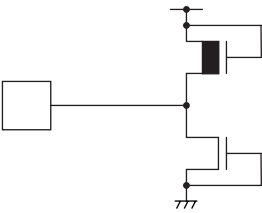
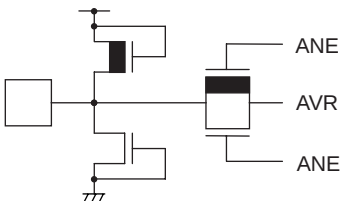
Type	Circuit	Remarks
A		Oscillation circuit High-speed oscillation feedback resistor = approx. 1 MΩ
B		Oscillation circuit Low-speed oscillation feedback resistor = approx. 10 MΩ
C		Mask ROM and EVA device: - CMOS Hysteresis input pin Flash device: - CMOS input pin
D		Mask ROM and EVA device: - CMOS Hysteresis input pin - Pull-down resistor value: approx. 50 kΩ Flash device: - CMOS input pin - No Pull-down
E		CMOS Hysteresis input pin Pull-up resistor value: approx. 50 kΩ

(Continued)

MB90340 Series

Type	Circuit	Remarks
F		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS hysteresis inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function)
G		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS hysteresis inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function) • TTL input (With the standby-time input shutdown function) • Programmable pullup resistor: $50 \text{ k}\Omega$ approx.
H		• CMOS level output ($I_{OL} = 3 \text{ mA}$, $I_{OH} = -3 \text{ mA}$) • CMOS hysteresis inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function)

(Continued)

Type	Circuit	Remarks
I		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS hysteresis inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function) • A/D analog input
J		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • D/A analog output • CMOS hysteresis inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function) • A/D analog input
K		• Power supply input protection circuit
L		• A/D converter reference voltage power supply input pin, with the protection circuit • Flash devices do not have a protection circuit against V_{CC} for pin AVRH

(Continued)

MB90340 Series

(Continued)

Type	Circuit	Remarks
M		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function)
N		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function) • TTL input (With the standby-time input shutdown function) Programmable pullup register: 50 kΩ approx
O		• CMOS level output ($I_{OL} = 4 \text{ mA}$, $I_{OH} = -4 \text{ mA}$) • CMOS inputs (With the standby-time input shutdown function) • Automotive input (With the standby-time input shutdown function) • A/D analog input

■ HANDLING DEVICES

Special care is required for the following when handling the device :

- Preventing latch-up
- Treatment of unused pins
- Using external clock
- Precautions for when not using a sub clock signal
- Notes on during operation of PLL clock mode
- Power supply pins (V_{CC}/V_{SS})
- Pull-up/down resistors
- Crystal Oscillator Circuit
- Turning-on Sequence of Power Supply to A/D Converter and Analog Inputs
- Connection of Unused Pins of A/D Converter
- Notes on Energization
- Stabilization of power supply voltage
- Initialization
- Port0 to port3 output during Power-on(**External-bus mode**)
- Notes on using CAN Function
- Flash security Function

1. Preventing latch-up

CMOS IC chips may suffer latch-up under the following conditions :

- A voltage higher than V_{CC} or lower than V_{SS} is applied to an input or output pin.
- A voltage higher than the rated voltage is applied between V_{CC} and V_{SS} .
- The AV_{CC} power supply is applied before the V_{CC} voltage.

Latch-up may increase the power supply current drastically, causing thermal damage to the device.

For the same reason, also be careful not to let the analog power-supply voltage (AV_{CC} , $AVRH$) exceed the digital power-supply voltage.

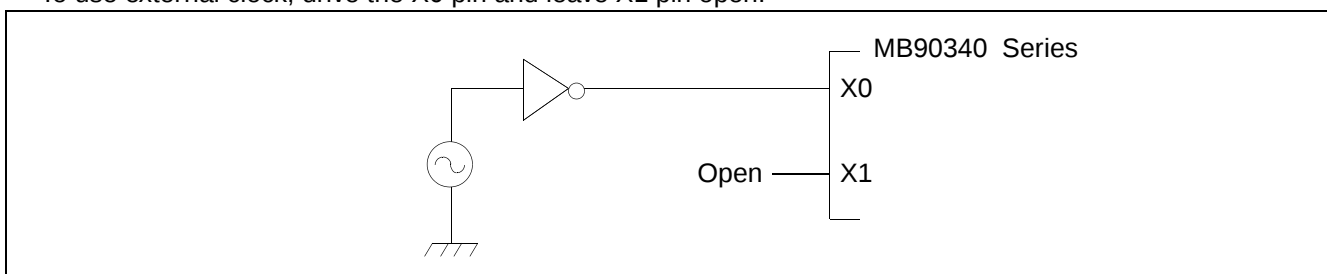
2. Handling unused pins

Leaving unused input pins open may result in misbehavior or latch up and possible permanent damage of the device. Therefore they must be pulled up or pulled down through resistors. In this case those resistors should be more than 2 k Ω .

Unused bidirectional pins should be set to the output state and can be left open, or the input state with the above described connection.

3. Using external clock

To use external clock, drive the X0 pin and leave X1 pin open.



4. Precautions for when not using a sub clock signal

If you do not connect pins X0A and X1A to an oscillator, use pull-down handling on the X0A pin, and leave the X1A pin open.

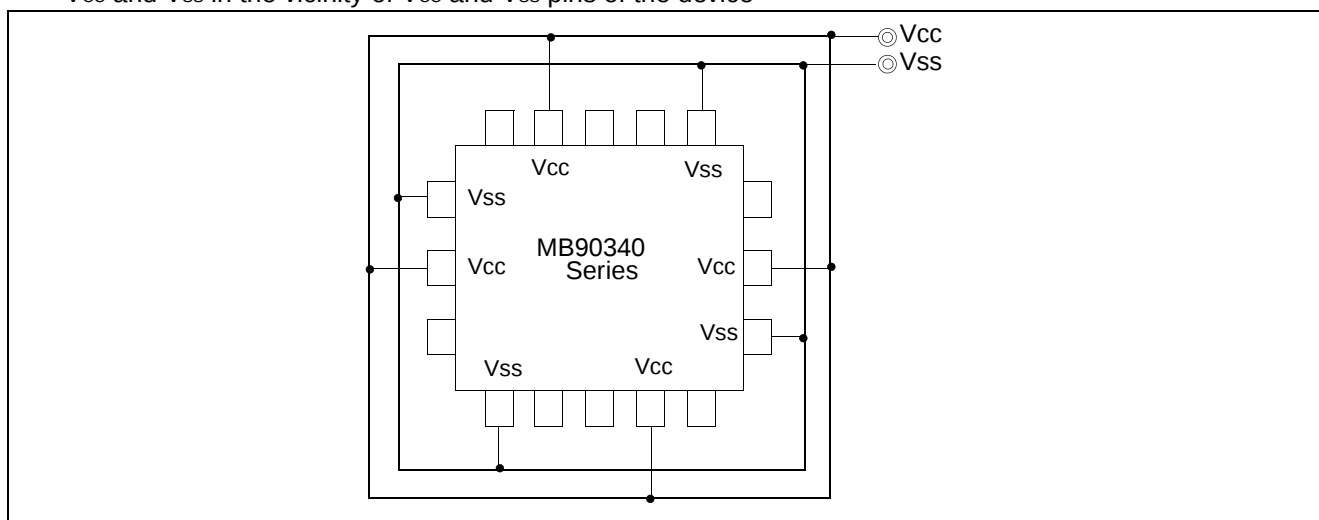
MB90340 Series

5. Notes on during operation of PLL clock mode

If the PLL clock mode is selected, the microcontroller attempt to be working with the self-oscillating circuit even when there is no external oscillator or external clock input is stopped. Performance of this operation, however, cannot be guaranteed.

6. Power supply pins (V_{CC}/V_{SS})

- If there are multiple V_{CC} and V_{SS} pins, from the point of view of device design, pins to be of the same potential are connected the inside of the device to prevent such malfunctioning as latch up.
To reduce unnecessary radiation, prevent malfunctioning of the strobe signal due to the rise of ground level, and observe the standard for total output current, be sure to connect the V_{CC} and V_{SS} pins to the power supply and ground externally.
- Connect V_{CC} and V_{SS} to the device from the current supply source at a low impedance.
- As a measure against power supply noise, connect a capacitor of about 0.1 μF as a bypass capacitor between V_{CC} and V_{SS} in the vicinity of V_{CC} and V_{SS} pins of the device



7. Pull-up/down resistors

The MB90340 Series does not support internal pull-up/down resistors (Port 0 to Port 3: built-in pull-up resistors). Use external components where needed.

8. Crystal Oscillator Circuit

Noises around X0 or X1 pins may be possible causes of abnormal operations. Make sure to provide bypass capacitors via shortest distance from X0, X1 pins, crystal oscillator (or ceramic resonator) and ground lines, and make sure, to the utmost effort, that lines of oscillation circuit not cross the lines of other circuits.

It is highly recommended to provide a printed circuit board art work surrounding X0 and X1 pins with a ground area for stabilizing the operation.

9. Turning-on Sequence of Power Supply to A/D Converter and Analog Inputs

Make sure to turn on the A/D converter power supply (AV_{CC} , AV_{RH} , AV_{RL}) and analog inputs ($AN0$ to $AN23$) after turning-on the digital power supply (V_{CC}).

Turn-off the digital power after turning off the A/D converter supply and analog inputs. In this case, make sure that the voltage not exceed AV_{RH} or AV_{CC} (turning on/off the analog and digital power supplies simultaneously is acceptable).

10. Connection of Unused Pins of A/D Converter if A/D Converter is used

Connect unused pins of A/D converter to $AV_{CC} = V_{CC}$, $AV_{SS} = AV_{RH} = AV_{RL} = V_{SS}$.

11. Notes on Energization

To prevent the internal regulator circuit from malfunctioning, set the voltage rise time during energization at 50 or more μs (0.2 V to 2.7 V)

12. Stabilization of power supply voltage

A sudden change in the supply voltage may cause the device to malfunction even within the specified V_{CC} supply voltage operating range. Therefore, the V_{CC} supply voltage should be stabilized.

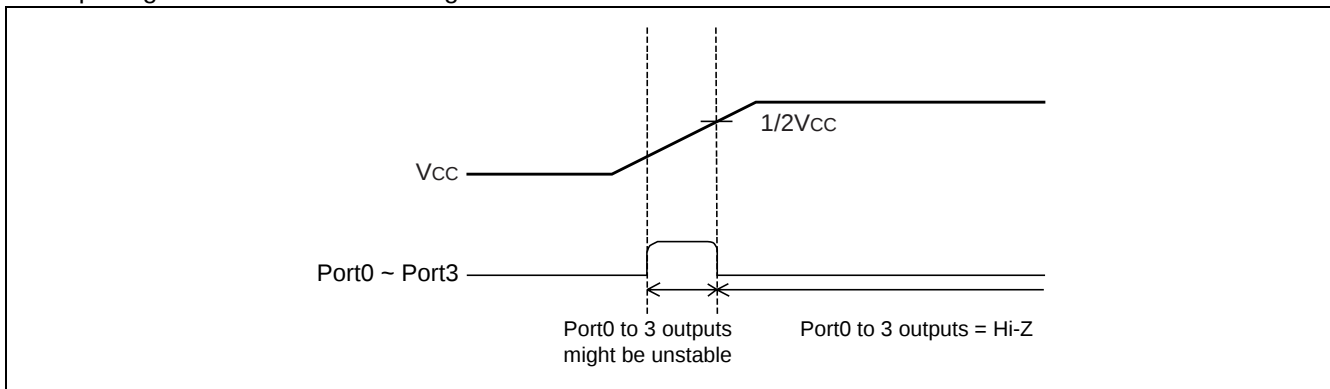
For reference, the supply voltage should be controlled so that V_{CC} ripple variations (peak-to-peak value) at commercial frequencies (50 Hz to 60 Hz) fall below 10% of the standard V_{CC} supply voltage and the coefficient of fluctuation does not exceed 0.1 V/ms at instantaneous power switching.

13. Initialization

In the device, there are internal registers which are initialized only by a power-on reset. To initialize these registers, turn on the power again.

14. Port 0 to port 3 output during Power-on (External-bus mode)

As shown below, when power is turned on in External-Bus mode, in spite of reset input, there is a possibility that output signal of Port 0 to Port 3 might be unstable.



15. Notes on using CAN Function

To use CAN function, please set '1' to DIRECT bit of CAN Direct Mode Register (CDMR).

If DIRECT bit is set to '0' (initial value), wait states will be performed when accessing CAN registers.

Please refer to Hardware Manual of MB90340 series for detail of CAN Direct Mode Register.

16. Flash security Function (except for MB90F346A)

The security bit is located in the area of the flash memory.

If protection code 01_H is written in the security bit, the flash memory is in the protected state by security.

Therefore please do not write 01_H in this address if you do not use the security function.

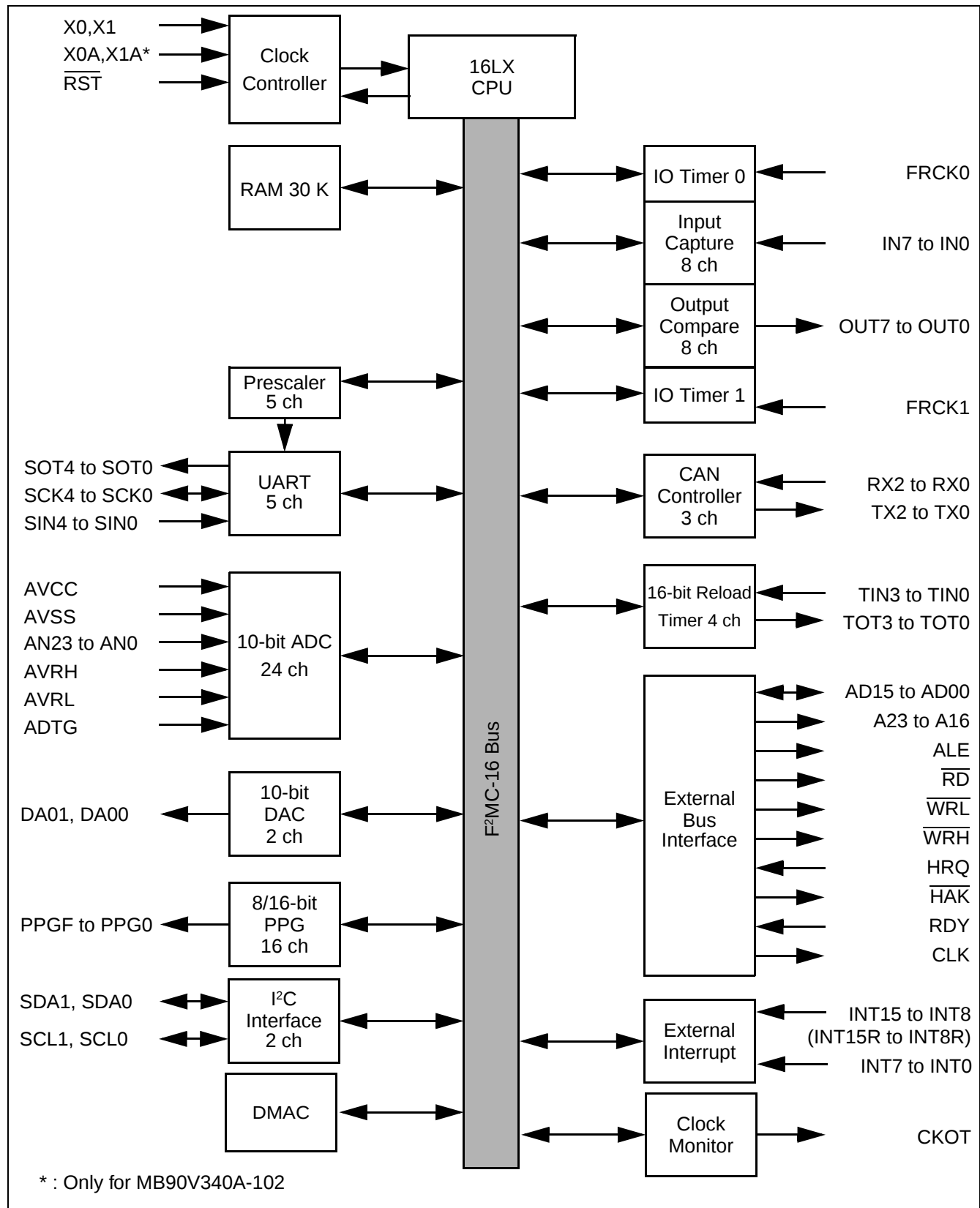
Please refer to following table for the address of the security bit.

	Flash memory size	Address for security bit
MB90F347 MMB90F347A	Embedded 1 Mbit Flash Memory	FE0001 _H
MB90F342A MB90F349A	Embedded 2 Mbit Flash Memory	FC0001 _H
MB90F343A	Embedded 3 Mbit Flash Memory	F90001 _H
MB90F345A	Embedded 4 Mbit Flash Memory	F80001 _H

MB90340 Series

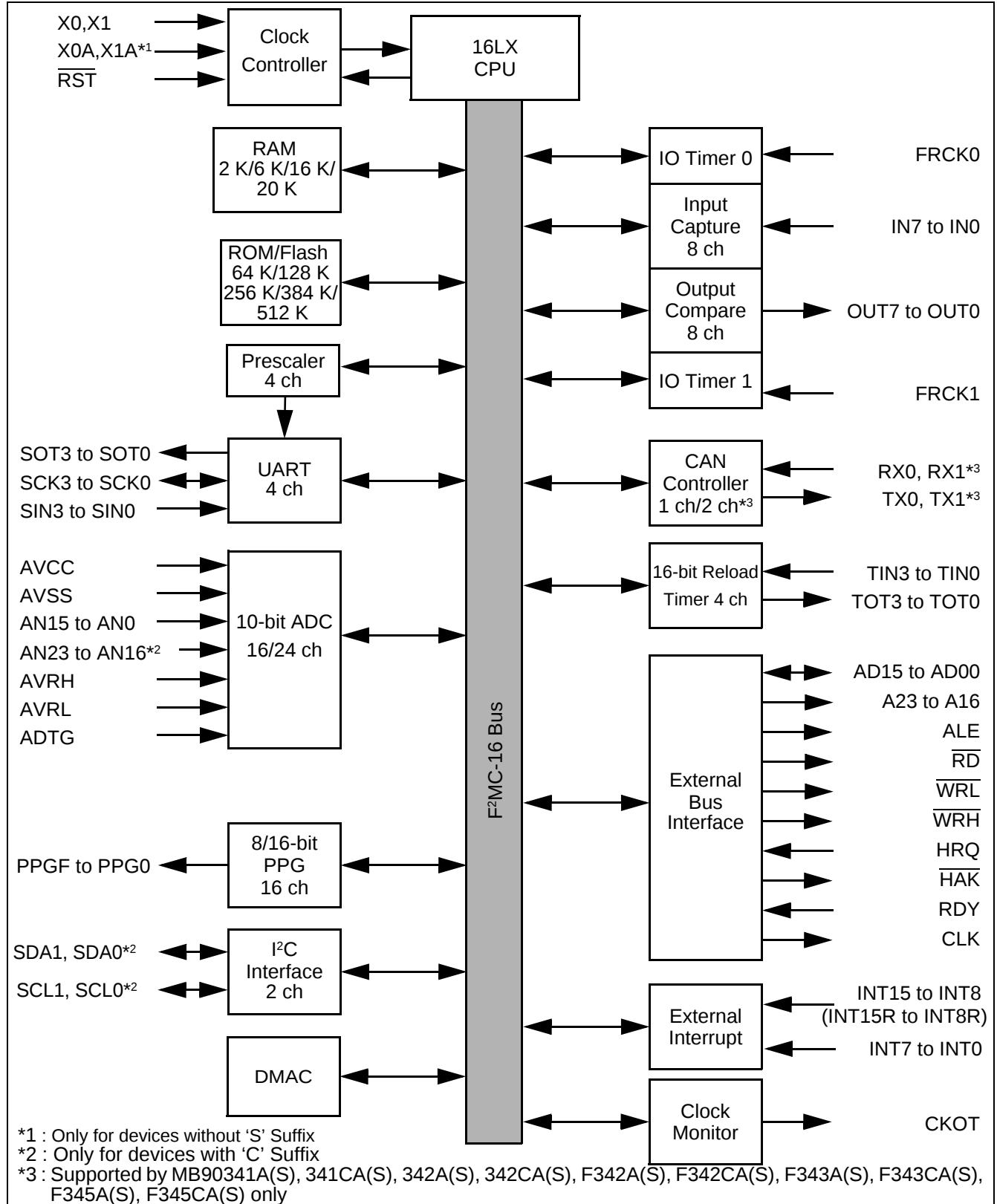
■ BLOCK DIAGRAMS

MB90V340A-101/102



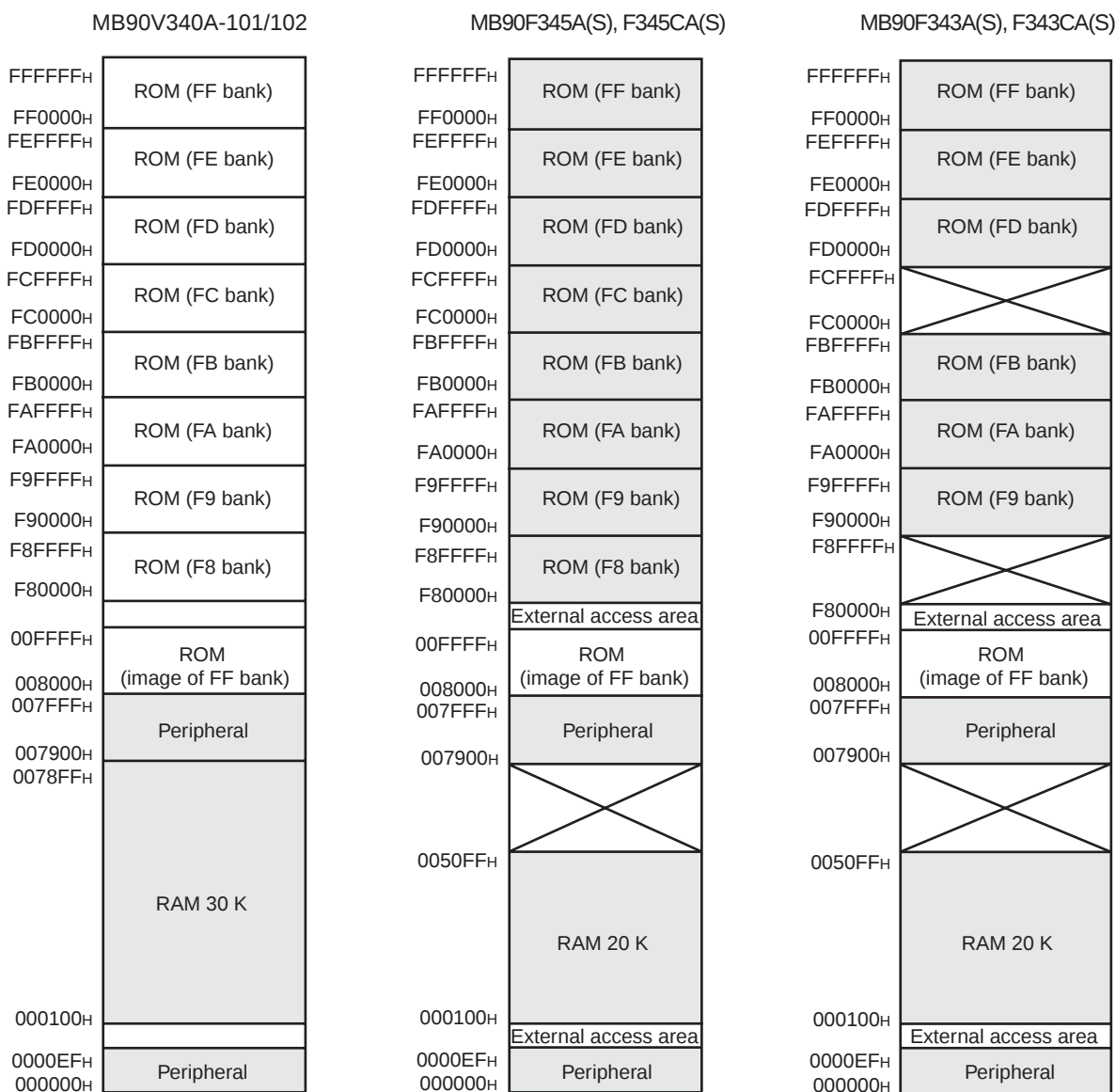
MB90340 Series

MB90F342A(S), MB90F342CA(S), MB90F343A(S), MB90F343CA(S), MB90F345A(S), MB90F345CA(S), , MB90F346A(S), MB90F346CA(S), MB90F347A(S), MB90F347CA(S), MB90F349A(S), MB90F349CA(S), MB90341A(S), MB90341CA(S), MB90342A(S), MB90342CA(S), MB90346A(S), MB90346CA(S), MB90347A(S), MB90347CA(S), MB90348A(S), MB90348CA(S), MB90349A(S), MB90349CA(S)



MB90340 Series

■ MEMORY MAP



 : No access

MB90340 Series

MB90349A(S), 349CA(S)
 MB90342A(S), 342CA(S)
 MB90F349A(S), F349CA(S)
 MB90F342A(S), F342CA(S)

MB90348A(S), 348CA(S)
 MB90341A(S), 341CA(S)

MB90347A(S), 347CA(S)
 MB90F347(S), F347C(S)
 MB90F347A(S), F347CA(S)

MB90346A(S), 346CA(S)
 MB90F346A(S), F346CA(S)

FFFFF _H	ROM (FF bank)	FFFFF _H	ROM (FF bank)	FFFFF _H	ROM (FF bank)	FFFFF _H	ROM (FF bank)
FF000 _H		FF000 _H		FF000 _H		FF000 _H	
FEFFF _H	ROM (FE bank)	FEFFF _H	ROM (FE bank)	FEFFF _H	ROM (FE bank)	FEFFF _H	
FE000 _H		FE000 _H		FE000 _H		FE000 _H	
FDFFF _H	ROM (FD bank)						
FD000 _H							
FCFFF _H	ROM (FC bank)						
FC000 _H							
	External access area		External access area		External access area		External access area
00FFF _H	ROM (image of FF bank)	00FFF _H	ROM (image of FF bank)	00FFF _H	ROM (image of FF bank)	00FFF _H	ROM (image of FF bank)
00800 _H		00800 _H		00800 _H		00800 _H	
007FFF _H	Peripheral	007FFF _H	Peripheral	007FFF _H	Peripheral	007FFF _H	Peripheral
007900 _H		007900 _H		007900 _H		007900 _H	
003FFF _H		003FFF _H					
	RAM 16 K		RAM 16 K				
000100 _H		000100 _H		0018FF _H	RAM 6 K	0008FF _H	RAM 2 K
	External access area		External access area	000100 _H	External access area	000100 _H	External access area
0000EF _H	Peripheral	0000EF _H	Peripheral	0000EF _H	Peripheral	0000EF _H	Peripheral
000000 _H		000000 _H		000000 _H		000000 _H	

 : No access

Note : The high-order portion of bank 00 gives the image of the FF bank ROM to make the small model of the C compiler effective. Since the low-order 16 bits are the same, the table in ROM can be referenced without using the far specification in the pointer declaration.

For example, an attempt to access 00C000_H accesses the value at FFC000_H in ROM.

The ROM area in bank FF exceeds 32 Kbytes, and its entire image cannot be shown in bank 00.

The image between FF8000_H and FFFFFF_H is visible in bank 00, while the image between FF0000_H and FF7FFF_H is visible only in bank FF.

MB90340 Series

■ I/O MAP

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
00 _H	Port 0 data register	PDR0	R/W	Port 0	XXXXXXXX
01 _H	Port 1 data register	PDR1	R/W	Port 1	XXXXXXXX
02 _H	Port 2 data register	PDR2	R/W	Port 2	XXXXXXXX
03 _H	Port 3 data register	PDR3	R/W	Port 3	XXXXXXXX
04 _H	Port 4 data register	PDR4	R/W	Port 4	XXXXXXXX
05 _H	Port 5 data register	PDR5	R/W	Port 5	XXXXXXXX
06 _H	Port 6 data register	PDR6	R/W	Port 6	XXXXXXXX
07 _H	Port 7 data register	PDR7	R/W	Port 7	XXXXXXXX
08 _H	Port 8 data register	PDR8	R/W	Port 8	XXXXXXXX
09 _H	Port 9 data register	PDR9	R/W	Port 9	XXXXXXXX
0A _H	Port A data register	PDRA	R/W	Port A	XXXXXXXX
0B _H	Port 5 Analog Input Enable Register	ADER5	R/W	Port 5, A/D	11111111
0C _H	Port 6 Analog Input Enable Register	ADER6	R/W	Port 6, A/D	11111111
0D _H	Port 7 Analog Input Enable Register	ADER7	R/W	Port 7, A/D	11111111
0E _H	Input level select register 0	ILSR0	R/W	Ports	XXXXXXXX
0F _H	Input level select register 1	ILSR1	R/W	Ports	XXXX0XXX
10 _H	Port 0 direction register	DDR0	R/W	Port 0	00000000
11 _H	Port 1 direction register	DDR1	R/W	Port 1	00000000
12 _H	Port 2 direction register	DDR2	R/W	Port 2	00000000
13 _H	Port 3 direction register	DDR3	R/W	Port 3	00000000
14 _H	Port 4 direction register	DDR4	R/W	Port 4	00000000
15 _H	Port 5 direction register	DDR5	R/W	Port 5	00000000
16 _H	Port 6 direction register	DDR6	R/W	Port 6	00000000
17 _H	Port 7 direction register	DDR7	R/W	Port 7	00000000
18 _H	Port 8 direction register	DDR8	R/W	Port 8	00000000
19 _H	Port 9 direction register	DDR9	R/W	Port 9	00000000
1A _H	Port A direction register	DDRA	R/W	Port A	00000100
1B _H	Reserved				
1C _H	Port 0 Pullup control register	PUCR0	R/W	Port 0	00000000
1D _H	Port 1 Pullup control register	PUCR1	R/W	Port 1	00000000
1E _H	Port 2 Pullup control register	PUCR2	R/W	Port 2	00000000
1F _H	Port 3 Pullup control register	PUCR3	W, R/W	Port 3	00000000

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
20 _H	Serial Mode Register 0	SMR0	W,R/W	UART0	00000000
21 _H	Serial Control Register 0	SCR0	W,R/W		00000000
22 _H	Reception/Transmission Data Register 0	RDR0/ TDR0	R/W		00000000
23 _H	Serial Status Register 0	SSR0	R,R/W		00001000
24 _H	Extended Communication Control Register 0	ECCR0	R,W,R/ W		000000XX
25 _H	Extended Status/Control Register 0	ESCR0	R/W		00000100
26 _H	Baud Rate generator Register 00	BGR00	R/W		00000000
27 _H	Baud Rate generator Register 01	BGR01	R/W		00000000
28 _H	Serial Mode Register 1	SMR1	W,R/W	UART1	00000000
29 _H	Serial Control Register 1	SCR1	W,R/W		00000000
2A _H	Reception/Transmission Data Register 1	RDR1/ TDR1	R/W		00000000
2B _H	Serial Status Register 1	SSR1	R,R/W		00001000
2C _H	Extended Communication Control Register 1	ECCR1	R,W, R/W		000000XX
2D _H	Extended Status/Control Register 1	ESCR1	R/W		00000100
2E _H	Baud Rate generator Register 10	BGR10	R/W		00000000
2F _H	Baud Rate generator Register 11	BGR11	R/W		00000000
30 _H	PPG 0 operation mode control register	PPGC0	W,R/W	16-bit PPG 0/1	0X000XX1
31 _H	PPG 1 operation mode control register	PPGC1	W,R/W		0X000001
32 _H	PPG 0/PPG 1 count clock select register	PPG01	R/W		000000X0
33 _H	Reserved				
34 _H	PPG 2 operation mode control register	PPGC2	W,R/W	16-bit PPG 2/3	0X000XX1
35 _H	PPG 3 operation mode control register	PPGC3	W,R/W		0X000001
36 _H	PPG 2/PPG 3 count clock select register	PPG23	R/W		000000X0
37 _H	Reserved				
38 _H	PPG 4 operation mode control register	PPGC4	W,R/W	16-bit PPG 4/5	0X000XX1
39 _H	PPG 5 operation mode control register	PPGC5	W,R/W		0X000001
3A _H	PPG 4/PPG 5 clock select register	PPG45	R/W		000000X0
3B _H	Address detect control register 1	PACSR1	R/W	Address Match Detection 1	00000000
3C _H	PPG 6 operation mode control register	PPGC6	W,R/W	16-bit PPG 6/7	0X000XX1
3D _H	PPG 7 operation mode control register	PPGC7	W,R/W		0X000001
3E _H	PPG 6/PPG 7 count clock control register	PPG67	R/W		000000X0
3F _H	Reserved				

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
40 _H	PPG 8 operation mode control register	PPGC8	W,R/W	16-bit PPG 8/9	0X000XX1
41 _H	PPG 9 operation mode control register	PPGC9	W,R/W		0X000001
42 _H	PPG 8/PPG 9 count clock control register	PPG89	R/W		000000X0
43 _H	Reserved				
44 _H	PPG A operation mode control register	PPGCA	W,R/W	16-bit PPG A/B	0X000XX1
45 _H	PPG B operation mode control register	PPGCB	W,R/W		0X000001
46 _H	PPG A/PPG B count clock select register	PPGAB	R/W		000000X0
47 _H	Reserved				
48 _H	PPG C operation mode control register	PPGCC	W,R/W	16-bit PPG C/D	0X000XX1
49 _H	PPG D operation mode control register	PPGCD	W,R/W		0X000001
4A _H	PPG C/PPG D count clock select register	PPGCD	R/W		000000X0
4B _H	Reserved				
4C _H	PPG E operation mode control register	PPGCE	W,R/W	16-bit PPG E/F	0X000XX1
4D _H	PPG F operation mode control register	PPGCF	W,R/W		0X000001
4E _H	PPG E/PPG F count clock select register	PPGEF	R/W		000000X0
4F _H	Reserved				
50 _H	Input Capture Control Status 0/1	ICS01	R/W	Input Capture 0/1	00000000
51 _H	Input Capture Edge 0/1	ICE01	R/W, R		XXX0X0XX
52 _H	Input Capture Control Status 2/3	ICS23	R/W	Input Capture 2/3	00000000
53 _H	Input Capture Edge 2/3	ICE23	R		XXXXXXXXXX
54 _H	Input Capture Control Status 4/5	ICS45	R/W	Input Capture 4/5	00000000
55 _H	Input Capture Edge 4/5	ICE45	R		XXXXXXXXXX
56 _H	Input Capture Control Status 6/7	ICS67	R/W	Input Capture 6/7	00000000
57 _H	Input Capture Edge 6/7	ICE67	R/W, R		XXX000XX
58 _H	Output Compare Control Status 0	OCS0	R/W	Output Compare 0/1	0000XX00
59 _H	Output Compare Control Status 1	OCS1	R/W		0XX00000
5A _H	Output Compare Control Status 2	OCS2	R/W	Output Compare 2/3	0000XX00
5B _H	Output Compare Control Status 3	OCS3	R/W		0XX00000
5C _H	Output Compare Control Status 4	OCS4	R/W	Output Compare 4/5	0000XX00
5D _H	Output Compare Control Status 5	OCS5	R/W		0XX00000
5E _H	Output Compare Control Status 6	OCS6	R/W	Output Compare 6/7	0000XX00
5F _H	Output Compare Control Status 7	OCS7	R/W		0XX00000

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
60 _H	Timer Control Status 0	TMCSR0	R/W	16-bit Reload Timer 0	00000000
61 _H	Timer Control Status 0	TMCSR0	R/W		XXXX0000
62 _H	Timer Control Status 1	TMCSR1	R/W	16-bit Reload Timer 1	00000000
63 _H	Timer Control Status 1	TMCSR1	R/W		XXXX0000
64 _H	Timer Control Status 2	TMCSR2	R/W	16-bit Reload Timer 2	00000000
65 _H	Timer Control Status 2	TMCSR2	R/W		XXXX0000
66 _H	Timer Control Status 3	TMCSR3	R/W	16-bit Reload Timer 3	00000000
67 _H	Timer Control Status 3	TMCSR3	R/W		XXXX0000
68 _H	A/D Control Status 0	ADCS0	R/W	A/D Converter	000XXXX0
69 _H	A/D Control Status 1	ADCS1	R/W		0000000X
6A _H	A/D Data 0	ADCR0	R		00000000
6B _H	A/D Data 1	ADCR1	R		XXXXXX00
6C _H	ADC Setting 0	ADSR0	R/W		00000000
6D _H	ADC Setting 1	ADSR1	R/W		00000000
6E _H	Reserved				
6F _H	ROM Mirror Function Select	ROMM	W	ROM Mirror	XXXXXXXX1
70 _H to 8F _H	Reserved for CAN Interface 0/1. Refer to “■ CAN CONTROLLERS”				
90 _H to 9A _H	Reserved				
9B _H	DMA Descriptor Channel Specified	DCSR	R/W	DMA	00000000
9C _H	DMA Status L	DSRL	R/W		00000000
9D _H	DMA Status H	DSRH	R/W		00000000
9E _H	Address Detect Control Register 0	PACSR0	R/W	Address Match Detection 0	00000000
9F _H	Delayed Interrupt/release	DIRR	R/W	Delayed Interrupt	XXXXXXXX0
A0 _H	Low-power Mode Control Register	LPMCR	W,R/W	Low Power Control Circuit	00011000
A1 _H	Clock Selection Register	CKSCR	R,R/W	Low Power Control Circuit	11111100
A2 _H , A3 _H	Reserved				
A4 _H	DMA Stop Status	DSSR	R/W	DMA	00000000
A5 _H	Automatic ready function select reg.	ARSR	W	External Memory Access	0011XX00
A6 _H	External address output control reg.	HACR	W		00000000
A7 _H	Bus control signal selection register	ECSR	W		0000000X
A8 _H	Watchdog Control Register	WDTC	R,W	Watchdog Timer	XXXXX111
A9 _H	Time Base Timer Control Register	TBTC	W,R/W	Time Base Timer	1XX00100

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
AA _H	Watch Timer Control register	WTC	R,R/W	Watch Timer	1X001000
AB _H	Reserved				
AC _H	DMA Enable L	DERL	R/W	DMA	00000000
AD _H	DMA Enable H	DERH	R/W		00000000
AE _H	Flash Control Status (FlashDevices only. Otherwise reserved)	FMCS	R,R/W	Flash Memory	000X0000
AF _H	Reserved				
B0 _H	Interrupt control register 00	ICR00	W,R/W	Interrupt Control	00000111
B1 _H	Interrupt control register 01	ICR01	W,R/W		00000111
B2 _H	Interrupt control register 02	ICR02	W,R/W		00000111
B3 _H	Interrupt control register 03	ICR03	W,R/W		00000111
B4 _H	Interrupt control register 04	ICR04	W,R/W		00000111
B5 _H	Interrupt control register 05	ICR05	W,R/W		00000111
B6 _H	Interrupt control register 06	ICR06	W,R/W		00000111
B7 _H	Interrupt control register 07	ICR07	W,R/W		00000111
B8 _H	Interrupt control register 08	ICR08	W,R/W		00000111
B9 _H	Interrupt control register 09	ICR09	W,R/W		00000111
BA _H	Interrupt control register 10	ICR10	W,R/W		00000111
BB _H	Interrupt control register 11	ICR11	W,R/W		00000111
BC _H	Interrupt control register 12	ICR12	W,R/W		00000111
BD _H	Interrupt control register 13	ICR13	W,R/W		00000111
BE _H	Interrupt control register 14	ICR14	W,R/W		00000111
BF _H	Interrupt control register 15	ICR15	W,R/W		00000111
C0 _H	D/A Converter data 0	DAT0	R/W	D/A Converter	XXXXXXXX
C1 _H	D/A Converter data 1	DAT1	R/W		XXXXXXXX
C2 _H	D/A Control 0	DACR0	R/W		XXXXXXXX0
C3 _H	D/A Control 1	DACR1	R/W		XXXXXXXX0
C4 _H , C5 _H	Reserved				
C6 _H	External Interrupt Enable 0	ENIR0	R/W	External Interrupt 0	00000000
C7 _H	External Interrupt Source 0	EIRR0	R/W		XXXXXXXX
C8 _H	External Interrupt Level Setting 0	ELVR0	R/W		00000000
C9 _H	External Interrupt Level Setting 0	ELVR0	R/W		00000000

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
CA _H	External Interrupt Enable 1	ENIR1	R/W	External Interrupt 1	00000000
CB _H	External Interrupt Source 1	EIRR1	R/W		XXXXXXXXXX
CC _H	External Interrupt Level Setting 1	ELVR1	R/W		00000000
CD _H	External Interrupt Level Setting 1	ELVR1	R/W		00000000
CE _H	External Interrupt Source Select	EISSR	R/W		00000000
CF _H	PLL/Subclock Control register	PSCCR	W	PLL	XXXX0000
D0 _H	DMA Buffer Addrss Pointer L	BAPL	R/W	DMA	XXXXXXXXXX
D1 _H	DMA Buffer Addrss Pointer M	BAPM	R/W		XXXXXXXXXX
D2 _H	DMA Buffer Addrss Pointer H	BAPH	R/W		XXXXXXXXXX
D3 _H	DMA Control	DMACS	R/W		XXXXXXXXXX
D4 _H	I/O Register Address Pointer L	IOAL	R/W		XXXXXXXXXX
D5 _H	I/O Register Address Pointer H	IOAH	R/W		XXXXXXXXXX
D6 _H	Data Counter L	DCTL	R/W		XXXXXXXXXX
D7 _H	Data Counter H	DCTH	R/W		XXXXXXXXXX
D8 _H	Serial Mode Register 2	SMR2	W,R/W	UART2	00000000
D9 _H	Serial Control Register 2	SCR2	W,R/W		00000000
DA _H	Reception/Transmission Data Register 2	RDR2/ TDR2	R/W		00000000
DB _H	Serial Status Register 2	SSR2	R,R/W		00001000
DC _H	Extended Communication Control Register 2	ECCR2	R,W, R/W		000000XX
DD _H	Extended Status Control Register 2	ESCR2	R/W		00000100
DE _H	Baud Rate Generator Register 20	BGR20	R/W		00000000
DF _H	Baud Rate Generator Register 21	BGR21	R/W		00000000
E0 _H to EF _H	Reserved for CAN Interface 2. Refer to “  CAN CONTROLLERS”				
F0 _H to FF _H	External				

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
7900 _H	Reload Register L0	PRL0	R/W	16-bit PPG 0/1	XXXXXXXX
7901 _H	Reload Register H0	PRLH0	R/W		XXXXXXXX
7902 _H	Reload Register L1	PRL1	R/W		XXXXXXXX
7903 _H	Reload Register H1	PRLH1	R/W		XXXXXXXX
7904 _H	Reload Register L2	PRL2	R/W	16-bit PPG 2/3	XXXXXXXX
7905 _H	Reload Register H2	PRLH2	R/W		XXXXXXXX
7906 _H	Reload Register L3	PRL3	R/W		XXXXXXXX
7907 _H	Reload Register H3	PRLH3	R/W		XXXXXXXX
7908 _H	Reload Register L4	PRL4	R/W	16-bit PPG 4/5	XXXXXXXX
7909 _H	Reload Register H4	PRLH4	R/W		XXXXXXXX
790A _H	Reload Register L5	PRL5	R/W		XXXXXXXX
790B _H	Reload Register H5	PRLH5	R/W		XXXXXXXX
790C _H	Reload Register L6	PRL6	R/W	16-bit PPG 6/7	XXXXXXXX
790D _H	Reload Register H6	PRLH6	R/W		XXXXXXXX
790E _H	Reload Register L7	PRL7	R/W		XXXXXXXX
790F _H	Reload Register H7	PRLH7	R/W		XXXXXXXX
7910 _H	Reload Register L8	PRL8	R/W	16-bit PPG 8/9	XXXXXXXX
7911 _H	Reload Register H8	PRLH8	R/W		XXXXXXXX
7912 _H	Reload Register L9	PRL9	R/W		XXXXXXXX
7913 _H	Reload Register H9	PRLH9	R/W		XXXXXXXX
7914 _H	Reload Register LA	PRLA	R/W	16-bit PPG A/B	XXXXXXXX
7915 _H	Reload Register HA	PRLHA	R/W		XXXXXXXX
7916 _H	Reload Register LB	PRLB	R/W		XXXXXXXX
7917 _H	Reload Register HB	PRLHB	R/W		XXXXXXXX
7918 _H	Reload Register LC	PRLC	R/W	16-bit PPG C/D	XXXXXXXX
7919 _H	Reload Register HC	PRLHC	R/W		XXXXXXXX
791A _H	Reload Register LD	PRLD	R/W		XXXXXXXX
791B _H	Reload Register HD	PRLHD	R/W		XXXXXXXX
791C _H	Reload Register LE	PRLLE	R/W	16-bit PPG E/F	XXXXXXXX
791D _H	Reload Register HE	PRLHE	R/W		XXXXXXXX
791E _H	Reload Register LF	PRLLE	R/W		XXXXXXXX
791F _H	Reload Register HF	PRLHF	R/W		XXXXXXXX
7920 _H	Input Capture 0	IPCP0	R	Input Capture 0/1	XXXXXXXX
7921 _H	Input Capture 0	IPCP0	R		XXXXXXXX
7922 _H	Input Capture 1	IPCP1	R		XXXXXXXX
7923 _H	Input Capture 1	IPCP1	R		XXXXXXXX

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
7924 _H	Input Capture 2	IPCP2	R	Input Capture 2/3	XXXXXXXXXX
7925 _H	Input Capture 2	IPCP2	R		XXXXXXXXXX
7926 _H	Input Capture 3	IPCP3	R		XXXXXXXXXX
7927 _H	Input Capture 3	IPCP3	R		XXXXXXXXXX
7928 _H	Input Capture 4	IPCP4	R	Input Capture 4/5	XXXXXXXXXX
7929 _H	Input Capture 4	IPCP4	R		XXXXXXXXXX
792A _H	Input Capture 5	IPCP5	R		XXXXXXXXXX
792B _H	Input Capture 5	IPCP5	R		XXXXXXXXXX
792C _H	Input Capture 6	IPCP6	R	Input Capture 6/7	XXXXXXXXXX
792D _H	Input Capture 6	IPCP6	R		XXXXXXXXXX
792E _H	Input Capture 7	IPCP7	R		XXXXXXXXXX
792F _H	Input Capture 7	IPCP7	R		XXXXXXXXXX
7930 _H	Output Compare 0	OCCP0	R/W	Output Compare 0/1	XXXXXXXXXX
7931 _H	Output Compare 0	OCCP0	R/W		XXXXXXXXXX
7932 _H	Output Compare 1	OCCP1	R/W		XXXXXXXXXX
7933 _H	Output Compare 1	OCCP1	R/W		XXXXXXXXXX
7934 _H	Output Compare 2	OCCP2	R/W	Output Compare 2/3	XXXXXXXXXX
7935 _H	Output Compare 2	OCCP2	R/W		XXXXXXXXXX
7936 _H	Output Compare 3	OCCP3	R/W		XXXXXXXXXX
7937 _H	Output Compare 3	OCCP3	R/W		XXXXXXXXXX
7938 _H	Output Compare 4	OCCP4	R/W	Output Compare 4/5	XXXXXXXXXX
7939 _H	Output Compare 4	OCCP4	R/W		XXXXXXXXXX
793A _H	Output Compare 5	OCCP5	R/W		XXXXXXXXXX
793B _H	Output Compare 5	OCCP5	R/W		XXXXXXXXXX
793C _H	Output Compare 6	OCCP6	R/W	Output Compare 6/7	XXXXXXXXXX
793D _H	Output Compare 6	OCCP6	R/W		XXXXXXXXXX
793E _H	Output Compare 7	OCCP7	R/W		XXXXXXXXXX
793F _H	Output Compare 7	OCCP7	R/W		XXXXXXXXXX
7940 _H	Timer Data 0	TCDT0	R/W	I/O Timer 0	00000000
7941 _H	Timer Data 0	TCDT0	R/W		00000000
7942 _H	Timer Control Status 0	TCCSL0	R/W		00000000
7943 _H	Timer Control Status 0	TCCSH0	R/W		0XXXXXXXXX
7944 _H	Timer Data 1	TCDT1	R/W	I/O Timer 1	00000000
7945 _H	Timer Data 1	TCDT1	R/W		00000000
7946 _H	Timer Control Status 1	TCCSL1	R/W		00000000
7947 _H	Timer Control Status 1	TCCSH1	R/W		0XXXXXXXXX

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MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
7948 _H	Timer 0/Reload 0	TMR0/ TMRLR0	R/W	16-bit Reload Timer 0	XXXXXXXX
7949 _H			R/W		XXXXXXXX
794A _H	Timer 1/Reload 1	TMR1/ TMRLR1	R/W	16-bit Reload Timer 1	XXXXXXXX
794B _H			R/W		XXXXXXXX
794C _H	Timer 2/Reload 2	TMR2/ TMRLR2	R/W	16-bit Reload Timer 2	XXXXXXXX
794D _H			R/W		XXXXXXXX
794E _H	Timer 3/Reload 3	TMR3/ TMRLR3	R/W	16-bit Reload Timer 3	XXXXXXXX
794F _H			R/W		XXXXXXXX
7950 _H	Serial Mode Register 3	SMR3	W,R/W	UART3	00000000
7951 _H	Serial Control Register 3	SCR3	W,R/W		00000000
7952 _H	Reception/Transmission Data Register 3	RDR3/ TDR3	R/W		00000000
7953 _H	Serial Status Register 3	SSR3	R,R/W		00001000
7954 _H	Extended Communication Control Register 3	ECCR3	R,W, R/W		000000XX
7955 _H	Extended Status Control Register	ESCR3	R/W		00000100
7956 _H	Baud Rate Generator Register 30	BGR30	R/W		00000000
7957 _H	Baud Rate Generator Register 31	BGR31	R/W		00000000
7958 _H	Serial Mode Register 4	SMR4	W,R/W	UART4	00000000
7959 _H	Serial Control Register 4	SCR4	W,R/W		00000000
795A _H	Reception/Transmission Data Register 4	RDR4/ TDR4	R/W		00000000
795B _H	Serial Status Register 4	SSR4	R,R/W		00001000
795C _H	Extended Communication Control Register 4	ECCR4	R,W, R/W		000000XX
795D _H	Extended Status Control Register	ESCR4	R/W		00000100
795E _H	Baud Rate Generator Register 40	BGR40	R/W		00000000
795F _H	Baud Rate generator Register 41	BGR41	R/W		00000000
7960 _H to 796B _H	Reserved				
796C _H	Clock output enable register	CLKR	R/W	Clock Monitor	XXXX0000
796D _H	Reserved				
796E _H	CAN Direct Mode Register	CDMR	R/W	CAN clock sync	XXXXXXXX0
796F _H	CAN switch register	CANSWR	R/W	CAN 0/1	XXXXXXXX00

(Continued)

MB90340 Series

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
7970 _H	I ² C bus status register 0	IBSR0	R	I ² C Interface 0	00000000
7971 _H	I ² C bus control register 0	IBCR0	W,R/W		00000000
7972 _H	I ² C 10 bit slave address register 0	ITBAL0	R/W		00000000
7973 _H		ITBAH0	R/W		00000000
7974 _H	I ² C 10 bit slave address mask register 0	ITMKL0	R/W		11111111
7975 _H		ITMKH0	R/W		00111111
7976 _H	I ² C 7 bit slave address register 0	ISBA0	R/W		00000000
7977 _H	I ² C 7 bit slave address mask register 0	ISMK0	R/W		01111111
7978 _H	I ² C data register 0	IDAR0	R/W		00000000
7979 _H , 797A _H	Reserved				
797B _H	I ² C clock control register 0	ICCR0	R/W	I ² C Interface 0	00011111
797C _H to 797F _H	Reserved				
7980 _H	I ² C bus status register 1	IBSR1	R	I ² C Interface 1	00000000
7981 _H	I ² C bus control register 1	IBCR1	W,R/W		00000000
7982 _H	I ² C 10 bit slave address register 1	ITBAL1	R/W		00000000
7983 _H		ITBAH1	R/W		00000000
7984 _H	I ² C 10 bit slave address mask register 1	ITMKL1	R/W		11111111
7985 _H		ITMKH1	R/W		00111111
7986 _H	I ² C 7 bit slave address register 1	ISBA1	R/W		00000000
7987 _H	I ² C 7 bit slave address mask register 1	ISMK1	R/W		01111111
7988 _H	I ² C data register 1	IDAR1	R/W		00000000
7989 _H , 798A _H	Reserved				
798B _H	I ² C clock control register 1	ICCR1	R/W	I ² C Interface 1	00011111
798C _H to 79C1 _H	Reserved				
79C2 _H	Clock Modulator Control Register	CMCR	R,R/W	Clock Modulator	0001X000
79C3 _H to 79DF _H	Reserved				

(Continued)

MB90340 Series

(Continued)

Address	Register	Abbrevia- tion	Access	Resource name	Initial value
79E0 _H	Detect Address Setting 0	PADR0	R/W	Address Match Detection 0	XXXXXXXX
79E1 _H	Detect Address Setting 0	PADR0	R/W		XXXXXXXX
79E2 _H	Detect Address Setting 0	PADR0	R/W		XXXXXXXX
79E3 _H	Detect Address Setting 1	PADR1	R/W		XXXXXXXX
79E4 _H	Detect Address Setting 1	PADR1	R/W		XXXXXXXX
79E5 _H	Detect Address Setting 1	PADR1	R/W		XXXXXXXX
79E6 _H	Detect Address Setting 2	PADR2	R/W		XXXXXXXX
79E7 _H	Detect Address Setting 2	PADR2	R/W		XXXXXXXX
79E8 _H	Detect Address Setting 2	PADR2	R/W		XXXXXXXX
79E9 _H to 79EF _H	Reserved				
79F0 _H	Detect Address Setting 3	PADR3	R/W	Address Match Detection 1	XXXXXXXX
79F1 _H	Detect Address Setting 3	PADR3	R/W		XXXXXXXX
79F2 _H	Detect Address Setting 3	PADR3	R/W		XXXXXXXX
79F3 _H	Detect Address Setting 4	PADR4	R/W		XXXXXXXX
79F4 _H	Detect Address Setting 4	PADR4	R/W		XXXXXXXX
79F5 _H	Detect Address Setting 4	PADR4	R/W		XXXXXXXX
79F6 _H	Detect Address Setting 5	PADR5	R/W		XXXXXXXX
79F7 _H	Detect Address Setting 5	PADR5	R/W		XXXXXXXX
79F8 _H	Detect Address Setting 5	PADR5	R/W		XXXXXXXX
79F9 _H to 79FF _H	Reserved				
7A00 _H to 7AFF _H	Reserved for CAN Interface 0. Refer to “  CAN CONTROLLERS”				
7B00 _H to 7BFF _H	Reserved for CAN Interface 0. Refer to “  CAN CONTROLLERS”				
7C00 _H to 7CFF _H	Reserved for CAN Interface 1. Refer to “  CAN CONTROLLERS”				
7D00 _H to 7DFF _H	Reserved for CAN Interface 1. Refer to “  CAN CONTROLLERS”				
7E00 _H to 7EFF _H	Reserved for CAN Interface 2. Refer to “  CAN CONTROLLERS”				
7F00 _H to 7FFF _H	Reserved for CAN Interface 2. Refer to “  CAN CONTROLLERS”				

Notes : • Initial value of “X” represents unknown value.

- Any write access to reserved addresses in I/O map should not be performed. A read access to reserved addresses results in reading “X”.

■ CAN CONTROLLERS

The CAN controller has the following features :

- Conforms to CAN Specification Version 2.0 Part A and B
 - Supports transmission/reception in standard frame and extended frame formats
- Supports transmitting of data frames by receiving remote frames
- 16 transmitting/receiving message buffers
 - 29-bit ID and 8-byte data
 - Multi-level message buffer configuration
- Provides full-bit comparison, full-bit mask, acceptance register 0/acceptance register 1 for each message buffer as ID acceptance mask
 - Two acceptance mask registers in either standard frame format or extended frame formats
- Bit rate programmable from 10 Kbits/s to 2 Mbits/s (when input clock is at 16 MHz)

List of Control Registers (1)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
000070 _H	000080 _H	0000E0 _H	Message buffer valid register	BVALR	R/W	00000000 00000000
000071 _H	000081 _H	0000E1 _H				
000072 _H	000082 _H	0000E2 _H	Transmit request register	TREQR	R/W	00000000 00000000
000073 _H	000083 _H	0000E3 _H				
000074 _H	000084 _H	0000E4 _H	Transmit cancel register	TCANR	W	00000000 00000000
000075 _H	000085 _H	0000E5 _H				
000076 _H	000086 _H	0000E6 _H	Transmission complete register	TCR	R/W	00000000 00000000
000077 _H	000087 _H	0000E7 _H				
000078 _H	000088 _H	0000E8 _H	Receive complete register	RCR	R/W	00000000 00000000
000079 _H	000089 _H	0000E9 _H				
00007A _H	00008A _H	0000EA _H	Remote request receiving register	RRTRR	R/W	00000000 00000000
00007B _H	00008B _H	0000EB _H				
00007C _H	00008C _H	0000EC _H	Receive overrun register	ROVRR	R/W	00000000 00000000
00007D _H	00008D _H	0000ED _H				
00007E _H	00008E _H	0000EE _H	Reception interrupt enable register	RIER	R/W	00000000 00000000
00007F _H	00008F _H	0000EF _H				

MB90340 Series

List of Control Registers (2)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007B00 _H	007D00 _H	007F00 _H	Control status register	CSR	R/W, W R/W, R	0XXXX0X1 00XXXX000
007B01 _H	007D01 _H	007F01 _H				
007B02 _H	007D02 _H	007F02 _H	Last event indicator register	LEIR	R/W	000X0000 XXXXXXXXXX
007B03 _H	007D03 _H	007F03 _H				
007B04 _H	007D04 _H	007F04 _H	Receive and transmit error counter	RTEC	R	00000000 00000000
007B05 _H	007D05 _H	007F05 _H				
007B06 _H	007D06 _H	007F06 _H	Bit timing register	BTR	R/W	11111111 X1111111
007B07 _H	007D07 _H	007F07 _H				
007B08 _H	007D08 _H	007F08 _H	IDE register	IDER	R/W	XXXXXXXXXX XXXXXXXXXX
007B09 _H	007D09 _H	007F09 _H				
007B0A _H	007D0A _H	007F0A _H	Transmit RTR register	TRTRR	R/W	00000000 00000000
007B0B _H	007D0B _H	007F0B _H				
007B0C _H	007D0C _H	007F0C _H	Remote frame receive waiting register	RFWTR	R/W	XXXXXXXXXX XXXXXXXXXX
007B0D _H	007D0D _H	007F0D _H				
007B0E _H	007D0E _H	007F0E _H	Transmit interrupt enable register	TIER	R/W	00000000 00000000
007B0F _H	007D0F _H	007F0F _H				
007B10 _H	007D10 _H	007F10 _H	Acceptance mask select register	AMSR	R/W	XXXXXXXXXX
007B11 _H	007D11 _H	007F11 _H				XXXXXXXXXX
007B12 _H	007D12 _H	007F12 _H				XXXXXXXXXX
007B13 _H	007D13 _H	007F13 _H				XXXXXXXXXX
007B14 _H	007D14 _H	007F14 _H	Acceptance mask register 0	AMR0	R/W	XXXXXXXXXX
007B15 _H	007D15 _H	007F15 _H				XXXXXXXXXX
007B16 _H	007D16 _H	007F16 _H				XXXXXXXXXX
007B17 _H	007D17 _H	007F17 _H				XXXXXXXXXX
007B18 _H	007D18 _H	007F18 _H	Acceptance mask register 1	AMR1	R/W	XXXXXXXXXX
007B19 _H	007D19 _H	007F19 _H				XXXXXXXXXX
007B1A _H	007D1A _H	007F1A _H				XXXXXXXXXX
007B1B _H	007D1B _H	007F1B _H				XXXXXXXXXX

List of Message Buffers (ID Registers) (1)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007A00 _H to 007A1F _H	007C00 _H to 007C1F _H	007E00 _H to 007E1F _H	General- purpose RAM	—	R/W	XXXXXXXX to XXXXXXXX
007A20 _H	007C20 _H	007E20 _H	ID register 0	IDR0	R/W	XXXXXXXX XXXXXXXX
007A21 _H	007C21 _H	007E21 _H				XXXXXXXX XXXXXXXX
007A22 _H	007C22 _H	007E22 _H				
007A23 _H	007C23 _H	007E23 _H				XXXXXXXX XXXXXXXX
007A24 _H	007C24 _H	007E24 _H	ID register 1	IDR1	R/W	XXXXXXXX XXXXXXXX
007A25 _H	007C25 _H	007E25 _H				XXXXXXXX XXXXXXXX
007A26 _H	007C26 _H	007E26 _H				
007A27 _H	007C27 _H	007E27 _H				XXXXXXXX XXXXXXXX
007A28 _H	007C28 _H	007E28 _H	ID register 2	IDR2	R/W	XXXXXXXX XXXXXXXX
007A29 _H	007C29 _H	007E29 _H				XXXXXXXX XXXXXXXX
007A2A _H	007C2A _H	007E2A _H				
007A2B _H	007C2B _H	007E2B _H				XXXXXXXX XXXXXXXX
007A2C _H	007C2C _H	007E2C _H	ID register 3	IDR3	R/W	XXXXXXXX XXXXXXXX
007A2D _H	007C2D _H	007E2D _H				XXXXXXXX XXXXXXXX
007A2E _H	007C2E _H	007E2E _H				
007A2F _H	007C2F _H	007E2F _H				XXXXXXXX XXXXXXXX
007A30 _H	007C30 _H	007E30 _H	ID register 4	IDR4	R/W	XXXXXXXX XXXXXXXX
007A31 _H	007C31 _H	007E31 _H				XXXXXXXX XXXXXXXX
007A32 _H	007C32 _H	007E32 _H				
007A33 _H	007C33 _H	007E33 _H				XXXXXXXX XXXXXXXX
007A34 _H	007C34 _H	007E34 _H	ID register 5	IDR5	R/W	XXXXXXXX XXXXXXXX
007A35 _H	007C35 _H	007E35 _H				XXXXXXXX XXXXXXXX
007A36 _H	007C36 _H	007E36 _H				
007A37 _H	007C37 _H	007E37 _H				XXXXXXXX XXXXXXXX
007A38 _H	007C38 _H	007E38 _H	ID register 6	IDR6	R/W	XXXXXXXX XXXXXXXX
007A39 _H	007C39 _H	007E39 _H				XXXXXXXX XXXXXXXX
007A3A _H	007C3A _H	007E3A _H				
007A3B _H	007C3B _H	007E3B _H				XXXXXXXX XXXXXXXX
007A3C _H	007C3C _H	007E3C _H	ID register 7	IDR7	R/W	XXXXXXXX XXXXXXXX
007A3D _H	007C3D _H	007E3D _H				XXXXXXXX XXXXXXXX
007A3E _H	007C3E _H	007E3E _H				
007A3F _H	007C3F _H	007E3F _H				XXXXXXXX XXXXXXXX

MB90340 Series

List of Message Buffers (ID Registers) (2)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007A40 _H	007C40 _H	007E40 _H	ID register 8	IDR8	R/W	XXXXXXXX XXXXXXXX
007A41 _H	007C41 _H	007E41 _H				XXXXXXXX XXXXXXXX
007A42 _H	007C42 _H	007E42 _H				
007A43 _H	007C43 _H	007E43 _H				XXXXXXXX XXXXXXXX
007A44 _H	007C44 _H	007E44 _H	ID register 9	IDR9	R/W	XXXXXXXX XXXXXXXX
007A45 _H	007C45 _H	007E45 _H				XXXXXXXX XXXXXXXX
007A46 _H	007C46 _H	007E46 _H				
007A47 _H	007C47 _H	007E47 _H				XXXXXXXX XXXXXXXX
007A48 _H	007C48 _H	007E48 _H	ID register 10	IDR10	R/W	XXXXXXXX XXXXXXXX
007A49 _H	007C49 _H	007E49 _H				XXXXXXXX XXXXXXXX
007A4A _H	007C4A _H	007E4A _H				
007A4B _H	007C4B _H	007E4B _H				XXXXXXXX XXXXXXXX
007A4C _H	007C4C _H	007E4C _H	ID register 11	IDR11	R/W	XXXXXXXX XXXXXXXX
007A4D _H	007C4D _H	007E4D _H				XXXXXXXX XXXXXXXX
007A4E _H	007C4E _H	007E4E _H				
007A4F _H	007C4F _H	007E4F _H				XXXXXXXX XXXXXXXX
007A50 _H	007C50 _H	007E50 _H	ID register 12	IDR12	R/W	XXXXXXXX XXXXXXXX
007A51 _H	007C51 _H	007E51 _H				XXXXXXXX XXXXXXXX
007A52 _H	007C52 _H	007E52 _H				
007A53 _H	007C53 _H	007E53 _H				XXXXXXXX XXXXXXXX
007A54 _H	007C54 _H	007E54 _H	ID register 13	IDR13	R/W	XXXXXXXX XXXXXXXX
007A55 _H	007C55 _H	007E55 _H				XXXXXXXX XXXXXXXX
007A56 _H	007C56 _H	007E56 _H				
007A57 _H	007C57 _H	007E57 _H				XXXXXXXX XXXXXXXX
007A58 _H	007C58 _H	007E58 _H	ID register 14	IDR14	R/W	XXXXXXXX XXXXXXXX
007A59 _H	007C59 _H	007E59 _H				XXXXXXXX XXXXXXXX
007A5A _H	007C5A _H	007E5A _H				
007A5B _H	007C5B _H	007E5B _H				XXXXXXXX XXXXXXXX
007A5C _H	007C5C _H	007E5C _H	ID register 15	IDR15	R/W	XXXXXXXX XXXXXXXX
007A5D _H	007C5D _H	007E5D _H				XXXXXXXX XXXXXXXX
007A5E _H	007C5E _H	007E5E _H				
007A5F _H	007C5F _H	007E5F _H				XXXXXXXX XXXXXXXX

List of Message Buffers (DLC Registers and Data Registers) (1)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007A60 _H	007C60 _H	007E60 _H	DLC register 0	DLCR0	R/W	XXXXXXXX
007A61 _H	007C61 _H	007E61 _H				
007A62 _H	007C62 _H	007E62 _H	DLC register 1	DLCR1	R/W	XXXXXXXX
007A63 _H	007C63 _H	007E63 _H				
007A64 _H	007C64 _H	007E64 _H	DLC register 2	DLCR2	R/W	XXXXXXXX
007A65 _H	007C65 _H	007E65 _H				
007A66 _H	007C66 _H	007E66 _H	DLC register 3	DLCR3	R/W	XXXXXXXX
007A67 _H	007C67 _H	007E67 _H				
007A68 _H	007C68 _H	007E68 _H	DLC register 4	DLCR4	R/W	XXXXXXXX
007A69 _H	007C69 _H	007E69 _H				
007A6A _H	007C6A _H	007E6A _H	DLC register 5	DLCR5	R/W	XXXXXXXX
007A6B _H	007C6B _H	007E6B _H				
007A6C _H	007C6C _H	007E6C _H	DLC register 6	DLCR6	R/W	XXXXXXXX
007A6D _H	007C6D _H	007E6D _H				
007A6E _H	007C6E _H	007E6E _H	DLC register 7	DLCR7	R/W	XXXXXXXX
007A6F _H	007C6F _H	007E6F _H				
007A70 _H	007C70 _H	007E70 _H	DLC register 8	DLCR8	R/W	XXXXXXXX
007A71 _H	007C71 _H	007E71 _H				
007A72 _H	007C72 _H	007E72 _H	DLC register 9	DLCR9	R/W	XXXXXXXX
007A73 _H	007C73 _H	007E73 _H				
007A74 _H	007C74 _H	007E74 _H	DLC register 10	DLCR10	R/W	XXXXXXXX
007A75 _H	007C75 _H	007E75 _H				
007A76 _H	007C76 _H	007E76 _H	DLC register 11	DLCR11	R/W	XXXXXXXX
007A77 _H	007C77 _H	007E77 _H				
007A78 _H	007C78 _H	007E78 _H	DLC register 12	DLCR12	R/W	XXXXXXXX
007A79 _H	007C79 _H	007E79 _H				
007A7A _H	007C7A _H	007E7A _H	DLC register 13	DLCR13	R/W	XXXXXXXX
007A7B _H	007C7B _H	007E7B _H				
007A7C _H	007C7C _H	007E7C _H	DLC register 14	DLCR14	R/W	XXXXXXXX
007A7D _H	007C7D _H	007E7D _H				
007A7E _H	007C7E _H	007E7E _H	DLC register 15	DLCR15	R/W	XXXXXXXX
007A7F _H	007C7F _H	007E7F _H				

MB90340 Series

List of Message Buffers (DLC Registers and Data Registers) (2)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007A80 _H to 007A87 _H	007C80 _H to 007C87 _H	007E80 _H to 007E87 _H	Data register 0 (8 bytes)	DTR0	R/W	XXXXXXXX to XXXXXXXX
007A88 _H to 007A8F _H	007C88 _H to 007C8F _H	007E88 _H to 007E8F _H	Data register 1 (8 bytes)	DTR1	R/W	XXXXXXXX to XXXXXXXX
007A90 _H to 007A97 _H	007C90 _H to 007C97 _H	007E90 _H to 007E97 _H	Data register 2 (8 bytes)	DTR2	R/W	XXXXXXXX to XXXXXXXX
007A98 _H to 007A9F _H	007C98 _H to 007C9F _H	007E98 _H to 007E9F _H	Data register 3 (8 bytes)	DTR3	R/W	XXXXXXXX to XXXXXXXX
007AA0 _H to 007AA7 _H	007CA0 _H to 007CA7 _H	007EA0 _H to 007EA7 _H	Data register 4 (8 bytes)	DTR4	R/W	XXXXXXXX to XXXXXXXX
007AA8 _H to 007AAF _H	007CA8 _H to 007CAF _H	007EA8 _H to 007EAF _H	Data register 5 (8 bytes)	DTR5	R/W	XXXXXXXX to XXXXXXXX
007AB0 _H to 007AB7 _H	007CB0 _H to 007CB7 _H	007EB0 _H to 007EB7 _H	Data register 6 (8 bytes)	DTR6	R/W	XXXXXXXX to XXXXXXXX
007AB8 _H to 007ABF _H	007CB8 _H to 007CBF _H	007EB8 _H to 007EBF _H	Data register 7 (8 bytes)	DTR7	R/W	XXXXXXXX to XXXXXXXX
007AC0 _H to 007AC7 _H	007CC0 _H to 007CC7 _H	007EC0 _H to 007EC7 _H	Data register 8 (8 bytes)	DTR8	R/W	XXXXXXXX to XXXXXXXX
007AC8 _H to 007ACF _H	007CC8 _H to 007CCF _H	007EC8 _H to 007ECF _H	Data register 9 (8 bytes)	DTR9	R/W	XXXXXXXX to XXXXXXXX
007AD0 _H to 007AD7 _H	007CD0 _H to 007CD7 _H	007ED0 _H to 007ED7 _H	Data register 10 (8 bytes)	DTR10	R/W	XXXXXXXX to XXXXXXXX
007AD8 _H to 007ADF _H	007CD8 _H to 007CDF _H	007ED8 _H to 007EDF _H	Data register 11 (8 bytes)	DTR11	R/W	XXXXXXXX to XXXXXXXX
007AE0 _H to 007AE7 _H	007CE0 _H to 007CE7 _H	007EE0 _H to 007EE7 _H	Data register 12 (8 bytes)	DTR12	R/W	XXXXXXXX to XXXXXXXX
007AE8 _H to 007AEF _H	007CE8 _H to 007CEF _H	007EE8 _H to 007EEF _H	Data register 13 (8 bytes)	DTR13	R/W	XXXXXXXX to XXXXXXXX

List of Message Buffers (DLC Registers and Data Registers) (3)

Address			Register	Abbreviation	Access	Initial Value
CAN0	CAN1	CAN2				
007AF0 _H to 007AF7 _H	007CF0 _H to 007CF7 _H	007EF0 _H to 007EF7 _H	Data register 14 (8 bytes)	DTR14	R/W	XXXXXXXX to XXXXXXXX
007AF8 _H to 007AFF _H	007CF8 _H to 007CFF _H	007EF8 _H to 007EFF _H	Data register 15 (8 bytes)	DTR15	R/W	XXXXXXXX to XXXXXXXX

MB90340 Series

■ INTERRUPT FACTORS, INTERRUPT VECTORS, INTERRUPT CONTROL REGISTER

Interrupt cause	EI ² OS clear	DMA ch number	Interrupt vector		Interrupt control register	
			Number	Address	Number	Address
Reset	N	—	#08	FFFFDC _H	—	—
INT9 instruction	N	—	#09	FFFFD8 _H	—	—
Exception	N	—	#10	FFFFD4 _H	—	—
CAN 0 RX	N	—	#11	FFFFD0 _H	ICR00	0000B0 _H
CAN 0 TX/NS	N	—	#12	FFFFCC _H		
CAN 1 RX / Input Capture 6	Y1	—	#13	FFFFC8 _H	ICR01	0000B1 _H
CAN 1 TX/NS / Input Capture 7	Y1	—	#14	FFFFC4 _H		
CAN 2 RX / I ² C0	N	—	#15	FFFFC0 _H	ICR02	0000B2 _H
CAN 2 TX/NS	N	—	#16	FFFFBC _H		
16-bit Reload Timer 0	Y1	0	#17	FFFFB8 _H	ICR03	0000B3 _H
16-bit Reload Timer 1	Y1	1	#18	FFFFB4 _H		
16-bit Reload Timer 2	Y1	2	#19	FFFFB0 _H	ICR04	0000B4 _H
16-bit Reload Timer 3	Y1	—	#20	FFFFAC _H		
PPG 0/1/4/5	N	—	#21	FFFFA8 _H	ICR05	0000B5 _H
PPG 2/3/6/7	N	—	#22	FFFFA4 _H		
PPG 8/9/C/D	N	—	#23	FFFFA0 _H	ICR06	0000B6 _H
PPG A/B/E/F	N	—	#24	FFFF9C _H		
Time Base Timer	N	—	#25	FFFF98 _H	ICR07	0000B7 _H
External Interrupt 0 to 3, 8 to 11	Y1	3	#26	FFFF94 _H		
Watch Timer	N	—	#27	FFFF90 _H	ICR08	0000B8 _H
External Interrupt 4 to 7, 12 to 15	Y1	4	#28	FFFF8C _H		
A/D Converter	Y1	5	#29	FFFF88 _H	ICR09	0000B9 _H
I/O Timer 0 / I/O Timer 1	N	—	#30	FFFF84 _H		
Input Capture 4/5 / I ² C1	Y1	6	#31	FFFF80 _H	ICR10	0000BA _H
Output Compare 0/1/4/5	Y1	7	#32	FFFF7C _H		
Input Capture 0 to 3	Y1	8	#33	FFFF78 _H	ICR11	0000BB _H
Output Compare 2/3/6/7	Y1	9	#34	FFFF74 _H		
UART 0 RX	Y2	10	#35	FFFF70 _H	ICR12	0000BC _H
UART 0 TX	Y1	11	#36	FFFF6C _H		
UART 1 RX / UART 3 RX	Y2	12	#37	FFFF68 _H	ICR13	0000BD _H
UART 1 TX / UART 3 TX	Y1	13	#38	FFFF64 _H		

(Continued)

(Continued)

Interrupt cause	EI ² OS clear	DMA ch number	Interrupt vector		Interrupt control register	
			Number	Address	Number	Address
UART 2 RX / UART 4 RX	Y2	14	#39	FFFF60 _H	ICR14	0000BE _H
UART 2 TX / UART 4 TX	Y1	15	#40	FFFF5C _H		
Flash Memory	N	—	#41	FFFF58 _H	ICR15	0000BF _H
Delayed interrupt	N	—	#42	FFFF54 _H		

Y1 : Usable

Y2 : Usable, with EI²OS stop function

N : Unusable

- Notes :
- The peripheral resources sharing the ICR register have the same interrupt level.
 - When two peripheral resources share the ICR register, only one can use Extended Intelligent I/O Service at a time.
 - When either of the two peripheral resources sharing the ICR register specifies Extended Intelligent I/O Service, the other one cannot use interrupts.

MB90340 Series

■ ELECTRICAL CHARACTERISTICS

1. Absolute Maximum Ratings

($V_{SS} = AV_{SS} = 0\text{ V}$)

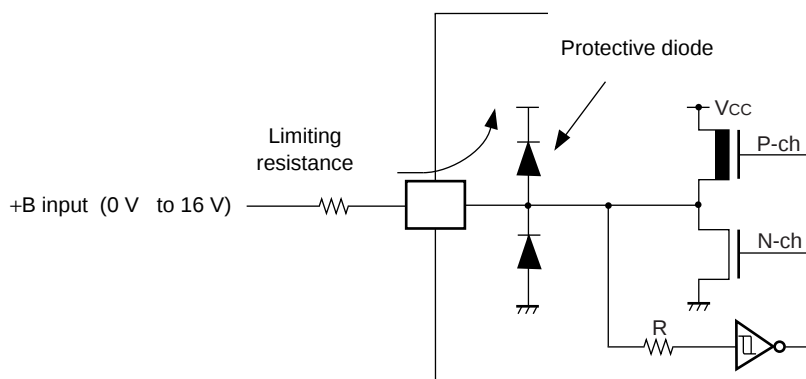
Parameter	Symbol	Rating		Unit	Remarks
		Min	Max		
Power supply voltage	V_{CC}	$V_{SS} - 0.3$	$V_{SS} + 6.0$	V	
	AV_{CC}	$V_{SS} - 0.3$	$V_{SS} + 6.0$	V	$V_{CC} = AV_{CC} \times 1$
	AVRH, AVRL	$V_{SS} - 0.3$	$V_{SS} + 6.0$	V	$AV_{CC} \geq AVRH$, $AV_{CC} \geq AVRL$, $AVRH \geq AVRL$
Input voltage	V_I	$V_{SS} - 0.3$	$V_{SS} + 6.0$	V	*2
Output voltage	V_O	$V_{SS} - 0.3$	$V_{SS} + 6.0$	V	*2
Maximum Clamp Current	I_{CLAMP}	-4.0	+4.0	mA	*4
Total Maximum Clamp Current	$\Sigma I_{CLAMP} $	—	40	mA	*4
"L" level maximum output current	I_{OL}	—	15	mA	*3
"L" level average output current	I_{OLAV}	—	4	mA	*3
"L" level maximum overall output current	ΣI_{OL}	—	100	mA	*3
"L" level average overall output current	ΣI_{OLAV}	—	50	mA	*3
"H" level maximum output current	I_{OH}	—	-15	mA	*3
"H" level average output current	I_{OHAV}	—	-4	mA	*3
"H" level maximum overall output current	ΣI_{OH}	—	-100	mA	*3
"H" level average overall output current	ΣI_{OHAV}	—	-50	mA	*3
Power consumption	P_D	—	340	mW	MB90F347
Operating temperature	T_A	-40	+105	°C	
Storage temperature	T_{STG}	-55	+150	°C	

(Continued)

(Continued)

- *1: Set AV_{CC} and V_{CC} to the same voltage. Make sure that AV_{CC} does not exceed V_{CC} and that the voltage at the analog inputs does not exceed AV_{CC} when the power is switched on.
- *2: V_i and V_o should not exceed $V_{CC} + 0.3$ V. V_i should not exceed the specified ratings. However if the maximum current to/from an input is limited by some means with external components, the I_{CLAMP} rating supercedes the V_i rating.
- *3: Applicable to pins : P00 to P07, P10 to P17, P20 to P27, P30 to P37, P40 to P47, P50 to P57, P60 to P67, P70 to P77, P80 to P87, P90 to P97, PA0 to PA1
- *4: • Applicable to pins: P00 to P07, P10 to P17, P20 to P27, P30 to P37, P40 to P47, P50 to P57 (EVA device : P50 to P55) , P60 to P67, P70 to P77, P80 to P87, P90 to P97, PA0 to PA1
 - Use within recommended operating conditions.
 - Use at DC voltage (current)
 - The +B signal should always be applied a limiting resistance placed between the +B signal and the microcontroller.
 - The value of the limiting resistance should be set so that when the +B signal is applied the input current to the microcontroller pin does not exceed rated values, either instantaneously or for prolonged periods.
 - Note that when the microcontroller drive current is low, such as in the power saving modes, the +B input potential may pass through the protective diode and increase the potential at the V_{CC} pin, and this may affect other devices.
 - Note that if a +B signal is input when the microcontroller power supply is off (not fixed at 0 V) , the power supply is provided from the pins, so that incomplete operation may result.
 - Note that if the +B input is applied during power-on, the power supply is provided from the pins and the resulting supply voltage may not be sufficient to operate the power-on reset.
 - Care must be taken not to leave the +B input pin open.
 - Sample recommended circuits:

- Input/output equivalent circuits



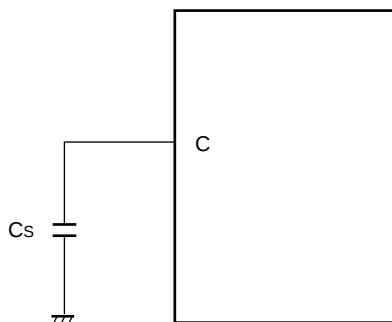
WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

MB90340 Series

2. Recommended Conditions

($V_{SS} = AV_{SS} = 0\text{ V}$)

Parameter	Symbol	Value			Unit	Remarks
		Min	Typ	Max		
Power supply voltage	V_{CC}, AV_{CC}	4.0	5.0	5.5	V	Under normal operation
		3.5	5.0	5.5	V	Under normal operation, when not using the A/D converter and not Flash programming.
		4.5	5.0	5.5	V	When External bus is used.
		3.0	—	5.5	V	Maintains RAM data in stop mode
Smooth capacitor	C_S	0.1	—	1.0	μF	Use a ceramic capacitor or capacitor of better AC characteristics. Capacitor at the V_{CC} should be greater than this capacitor.
Operating temperature	T_A	-40	—	+105	$^{\circ}\text{C}$	



C Pin Connection Diagram

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 FUJITSU representatives beforehand.

3. DC Characteristics

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = AV_{SS} = 0\text{ V}$)

Parameter	Symbol	Pin	Condition	Value			Unit	Remarks
				Min	Typ	Max		
Input H voltage (At $V_{CC} = 5\text{ V} \pm 10\%$)	V_{IHS}	—	—	$0.8 V_{CC}$	—	$V_{CC} + 0.3$	V	Port inputs if CMOS hysteresis input levels are selected (except P12, P44, P45, P46, P47, P50, P82, P83)
	V_{IHA}	—	—	$0.8 V_{CC}$	—	$V_{CC} + 0.3$	V	Port inputs if AUTOMOTIVE input levels are selected
	V_{IHT}	—	—	2.0	—	$V_{CC} + 0.3$	V	Port inputs if TTL input levels are selected
	V_{IHS}	—	—	$0.7 V_{CC}$	—	$V_{CC} + 0.3$	V	P12, P50, P82, P85 inputs if CMOS input levels are selected
	V_{IHI}	—	—	$0.7 V_{CC}$	—	$V_{CC} + 0.3$	V	P44, P45, P46, P47 inputs if CMOS hysteresis input levels are selected
	V_{IHR}	—	—	$0.8 V_{CC}$	—	$V_{CC} + 0.3$	V	$\overline{RST}$ input pin (CMOS hysteresis)
	V_{IHM}	—	—	$V_{CC} - 0.3$	—	$V_{CC} + 0.3$	V	MD input pin
Input L voltage (At $V_{CC} = 5\text{ V} \pm 10\%$)	V_{ILS}	—	—	$V_{SS} - 0.3$	—	$0.2 V_{CC}$	V	Port inputs if CMOS hysteresis input levels are selected (except P12, P44, P45, P46, P47, P50, P82, P83)
	V_{ILA}	—	—	$V_{SS} - 0.3$	—	$0.5 V_{CC}$	V	Port inputs if AUTOMOTIVE input levels are selected
	V_{ILT}	—	—	$V_{SS} - 0.3$	—	0.8	V	Port inputs if TTL input levels are selected
	V_{ILS}	—	—	$V_{SS} - 0.3$	—	$0.3 V_{CC}$	V	P12, P50, P82, P85 inputs if CMOS input levels are selected
	V_{ILI}	—	—	$V_{SS} - 0.3$	—	$0.3 V_{CC}$	V	P44, P45, P46, P47 inputs if CMOS hysteresis input levels are selected
	V_{ILR}	—	—	$V_{SS} - 0.3$	—	$0.2 V_{CC}$	V	$\overline{RST}$ input pin (CMOS hysteresis)
	V_{ILM}	—	—	$V_{SS} - 0.3$	—	$V_{SS} + 0.3$	V	MD input pin
Output H voltage	V_{OH}	Normal outputs	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -4.0\text{ mA}$	$V_{CC} - 0.5$	—	—	V	
Output H voltage	V_{OHI}	I ² C current outputs	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -3.0\text{ mA}$	$V_{CC} - 0.5$	—	—	V	
Output L voltage	V_{OL}	Normal outputs	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 4.0\text{ mA}$	—	—	0.4	V	
Output L voltage	V_{OLI}	I ² C current outputs	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 3.0\text{ mA}$	—	—	0.4	V	

(Continued)

MB90340 Series

(Continued)

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = AV_{SS} = 0\text{ V}$)

Parameter	Symbol	Pin	Condition	Value			Unit	Remarks
				Min	Typ	Max		
Input leak current	I_{IL}	—	$V_{CC} = 5.5\text{ V}$, $V_{SS} < V_i < V_{CC}$	-1	—	1	μA	
Pull-up resistance	R_{UP}	P00 to P07, P10 to P17, P20 to P27, P30 to P37, RST	—	25	50	100	$\text{k}\Omega$	
Pull-down resistance	R_{DOWN}	MD2	—	25	50	100	$\text{k}\Omega$	Except Flash devices
Power supply current*	I_{CC}	V_{CC}	$V_{CC} = 5.0\text{ V}$, Internal frequency : 24 MHz, At normal operation.	—	55	70	mA	
			$V_{CC} = 5.0\text{ V}$, Internal frequency : 24 MHz, At writing FLASH memory.	—	70	85	mA	Flash devices
			$V_{CC} = 5.0\text{ V}$, Internal frequency : 24 MHz, At erasing FLASH memory.	—	75	90	mA	Flash devices
	I_{CCS}		$V_{CC} = 5.0\text{ V}$, Internal frequency : 24 MHz, At Sleep mode.	—	25	35	mA	
	I_{CTS}		$V_{CC} = 5.0\text{ V}$, Internal frequency : 2 MHz, At Main Timer mode	—	0.3	0.8	mA	
	$I_{CTSPLL6}$		$V_{CC} = 5.0\text{ V}$, Internal frequency : 24 MHz, At PLL Timer mode, external frequency = 4 MHz	—	4	7	mA	
	I_{CCL}		$V_{CC} = 5.0\text{ V}$ Internal frequency: 8 kHz, At sub operation $T_A = +25^{\circ}\text{C}$	—	70	140	μA	
	I_{CCLS}		$V_{CC} = 5.0\text{ V}$ Internal frequency: 8 kHz, At sub sleep $T_A = +25^{\circ}\text{C}$	—	20	50	μA	
	I_{CCT}		$V_{CC} = 5.0\text{ V}$ Internal frequency: 8 kHz, At watch mode $T_A = +25^{\circ}\text{C}$	—	10	35	μA	
	I_{CCH}		$V_{CC} = 5.0\text{ V}$, At Stop mode, $T_A = +25^{\circ}\text{C}$	—	7	25	μA	
Input capacity	C_{IN}	Other than C, AV_{CC} , AV_{SS} , $AVRH$, $AVRL$, V_{CC} , V_{SS} ,	—	—	5	15	pF	

* : The power supply current is measured with an external clock.

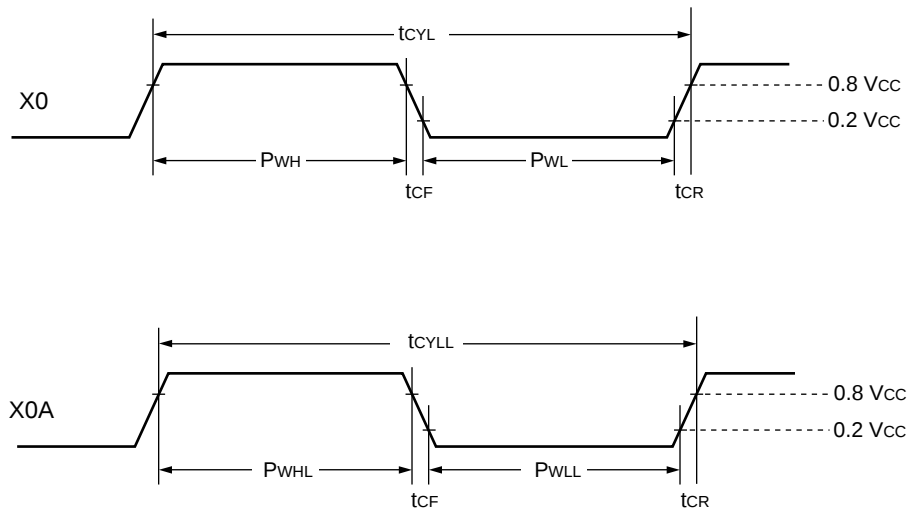
4. AC Characteristics

(1) Clock Timing

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = AV_{SS} = 0\text{ V}$)

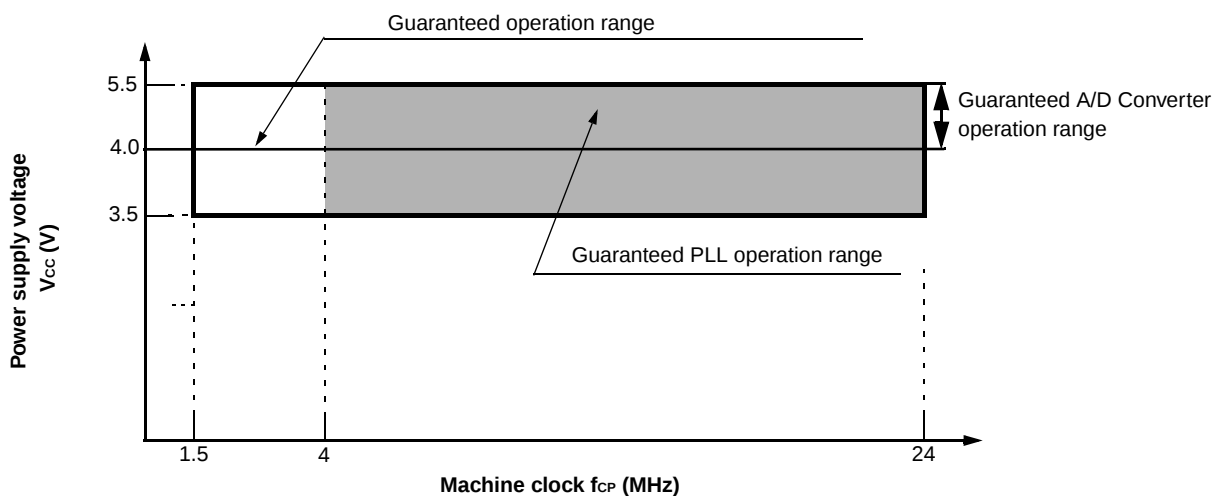
Parameter	Symbol	Pin	Value			Unit	Remarks
			Min	Typ	Max		
Clock frequency	f_c	X0, X1	3	—	16	MHz	When using an oscillation circuit
		X0, X1	3	—	24	MHz	When using an external clock*
	f_{CL}	X0A, X1A	—	32.768	100	kHz	
Clock cycle time	t_{CYL}	X0, X1	62.5	—	333	ns	When using an oscillation circuit
		X0, X1	41.67	—	333	ns	When using an external clock
	t_{CYLL}	X0A, X1A	10	30.5	—	μs	
Input clock pulse width	P_{WH}, P_{WL}	X0	10	—	—	ns	Duty ratio is about 30% to 70%.
	P_{WHL}, P_{WLL}	X0A	5	15.2	—	μs	
Input clock rise and fall time	t_{CR}, t_{CF}	X0	—	—	5	ns	When using external clock
Internal operating clock frequency (machine clock)	f_{CP}	—	1.5	—	24	MHz	When using main clock
	f_{CPL}	—	—	8.192	50	kHz	When using sub clock
Internal operating clock cycle time (machine clock)	t_{CP}	—	41.67	—	666	ns	When using main clock
	t_{CPL}	—	20	122.1	—	μs	When using sub clock

* : When selecting the PLL clock, the range of clock frequency is limited. Use this product within range as mentioned in "Relation among external clock frequency and machine clock frequency".

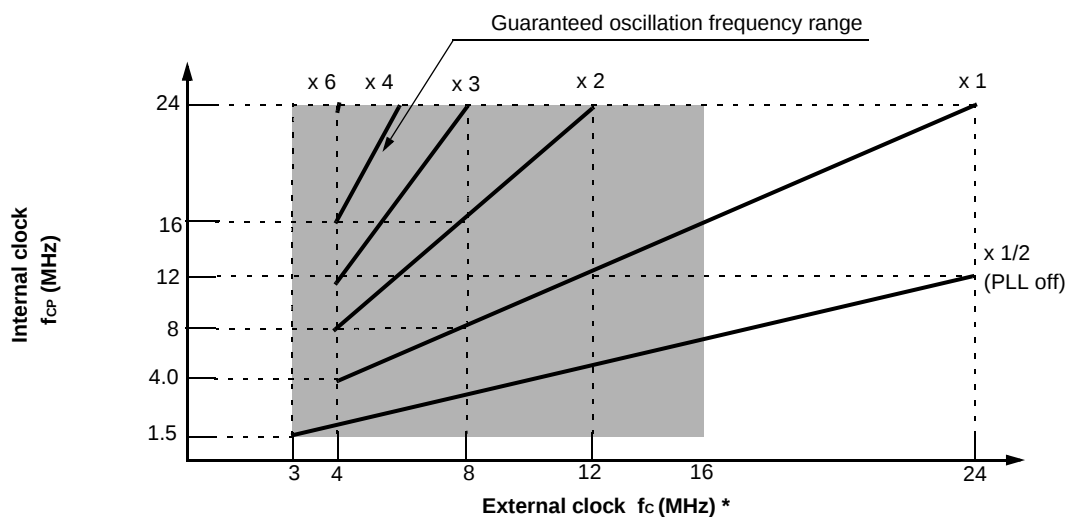


Clock Timing

MB90340 Series



Guaranteed operation range of MB90340 series



* : When using the oscillation circuit, the maximum oscillation clock frequency is 16 MHz

External clock frequency and Machine clock frequency

(2) Reset Standby Input

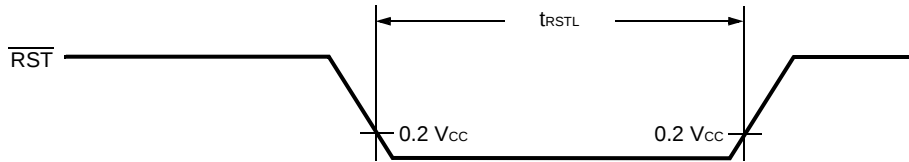
($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$)

Parameter	Symbol	Pin	Value		Unit	Remarks
			Min	Max		
Reset input time	t_{RSTL}	$\overline{RST}$	500	—	ns	Under normal operation
			Oscillation time of oscillator* + 100 μs	—	ns	In Stop mode, Sub Clock mode, Sub Sleep mode and Watch mode
			100	—	μs	In Time Timer mode

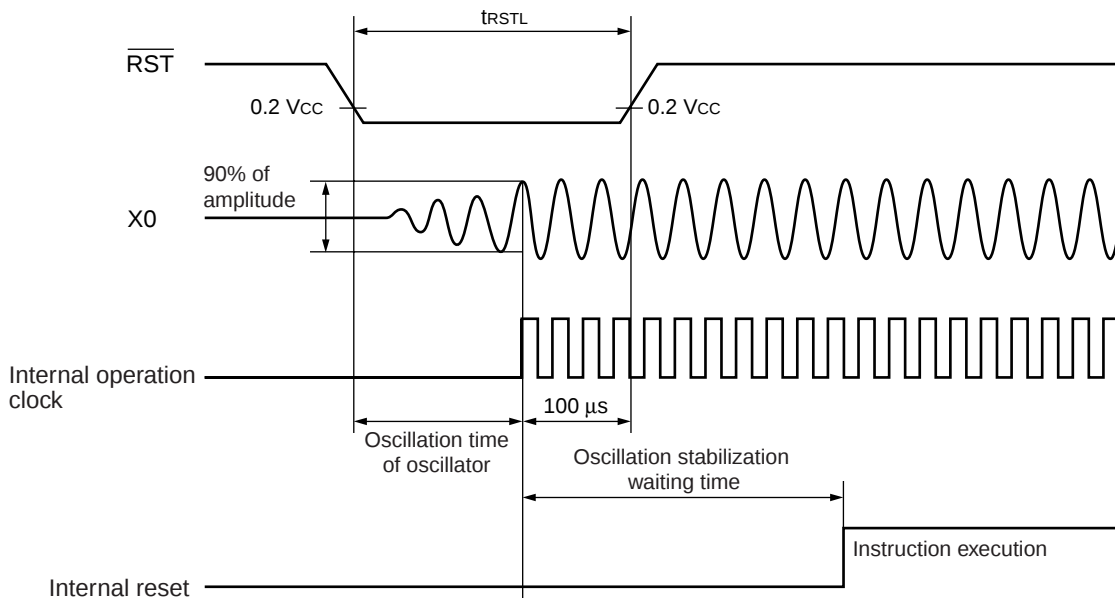
* : Oscillation time of oscillator is the time that the amplitude reaches 90%.

In the crystal oscillator, the oscillation time is between several ms and to tens of ms. In FAR / ceramic oscillators, the oscillation time is between hundreds of μs to several ms. With an external clock, the oscillation time is 0 ms.

Under normal operation:



In Stop mode, Sub Clock mode, Sub Sleep mode, Watch mode:

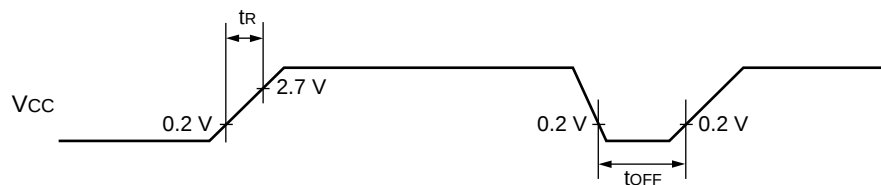


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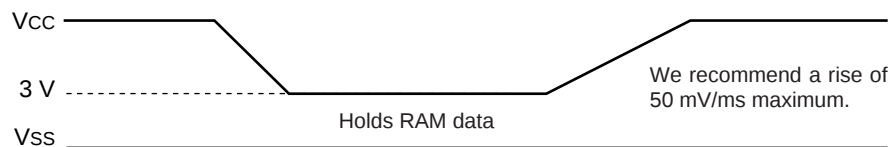
(3) Power On Reset

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Power on rise time	t_R	V_{CC}	—	0.05	30	ms	
Power off time	t_{OFF}	V_{CC}		1	—	ms	Due to repetitive operation



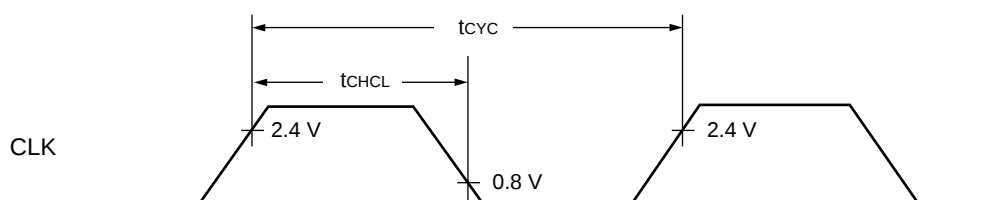
If you change the power supply voltage too rapidly, a power on reset may occur. We recommend that you startup smoothly by restraining voltages when changing the power supply voltage during operation, as shown in the figure below. Perform while not using the PLL clock. However, if voltage drops are within 1 V/s, you can operate while using the PLL clock.



(4) Clock Output Timing

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

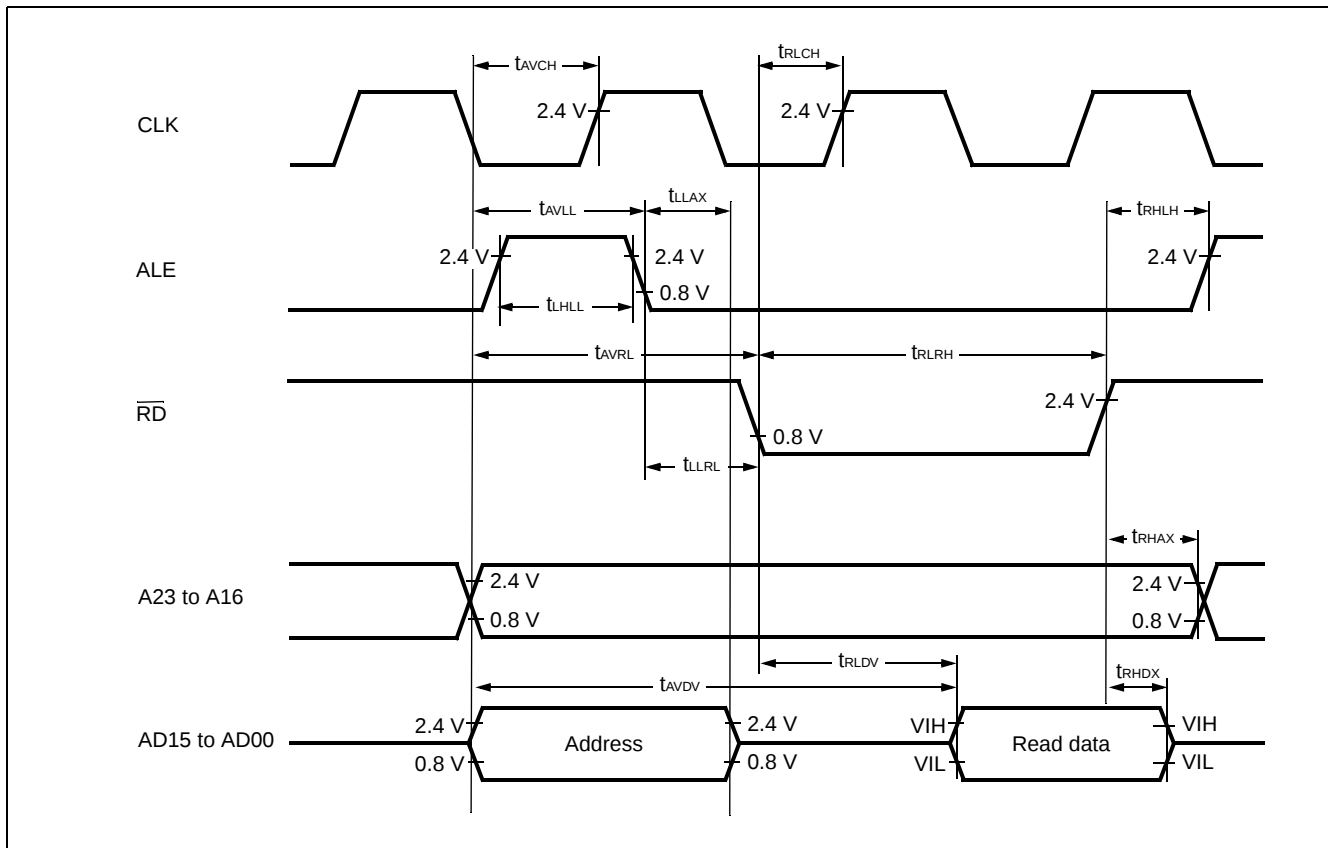
Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Cycle time	t_{CYC}	CLK	—	62.5	—	ns	$f_{CP} = 16\text{ MHz}$
				41.76	—	ns	$f_{CP} = 24\text{ MHz}$
CLK $\uparrow \rightarrow$ CLK $\downarrow$	t_{CHCL}	CLK	—	20	—	ns	$f_{CP} = 16\text{ MHz}$
				13	—	ns	$f_{CP} = 24\text{ MHz}$



(5) Bus Timing (Read)

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
ALE pulse width	t_{LHLL}	ALE	—	$t_{CP}/2 - 10$	—	ns	
Valid address $\Rightarrow$ ALE $\downarrow$ time	t_{AVLL}	ALE, A23 to A16, AD15 to AD00		$t_{CP}/2 - 20$	—	ns	
ALE $\downarrow \Rightarrow$ Address valid time	t_{LLAX}	ALE, AD15 to AD00		$t_{CP}/2 - 15$	—	ns	
Valid address $\Rightarrow \overline{RD} \downarrow$ time	t_{AVRL}	A23 to A16, AD15 to AD00, $\overline{RD}$		$t_{CP} - 15$	—	ns	
Valid address $\Rightarrow$ Valid data input	t_{AVDV}	A23 to A16, AD15 to AD00		—	$5 t_{CP}/2 - 60$	ns	
$\overline{RD}$ pulse width	t_{RLRH}	$\overline{RD}$		$3 t_{CP}/2 - 20$	—	ns	
$\overline{RD} \downarrow \Rightarrow$ Valid data input	t_{RLDV}	$\overline{RD}$, AD15 to AD00		—	$3 t_{CP}/2 - 50$	ns	
$\overline{RD} \uparrow \Rightarrow$ Data hold time	t_{RHDX}	$\overline{RD}$, AD15 to AD00		0	—	ns	
$\overline{RD} \downarrow \Rightarrow$ ALE $\uparrow$ time	t_{RHLH}	$\overline{RD}$, ALE		$t_{CP}/2 - 15$	—	ns	
$\overline{RD} \uparrow \Rightarrow$ Address valid time	t_{RHAX}	$\overline{RD}$, A23 to A16		$t_{CP}/2 - 10$	—	ns	
Valid address $\Rightarrow$ CLK $\uparrow$ time	t_{AVCH}	A23 to A16, AD15 to AD00, CLK		$t_{CP}/2 - 16$	—	ns	
$\overline{RD} \downarrow \Rightarrow$ CLK $\uparrow$ time	t_{RLCH}	$\overline{RD}$, CLK		$t_{CP}/2 - 15$	—	ns	
ALE $\downarrow \Rightarrow \overline{RD} \downarrow$ time	t_{LLRL}	ALE, $\overline{RD}$		$t_{CP}/2 - 15$	—	ns	

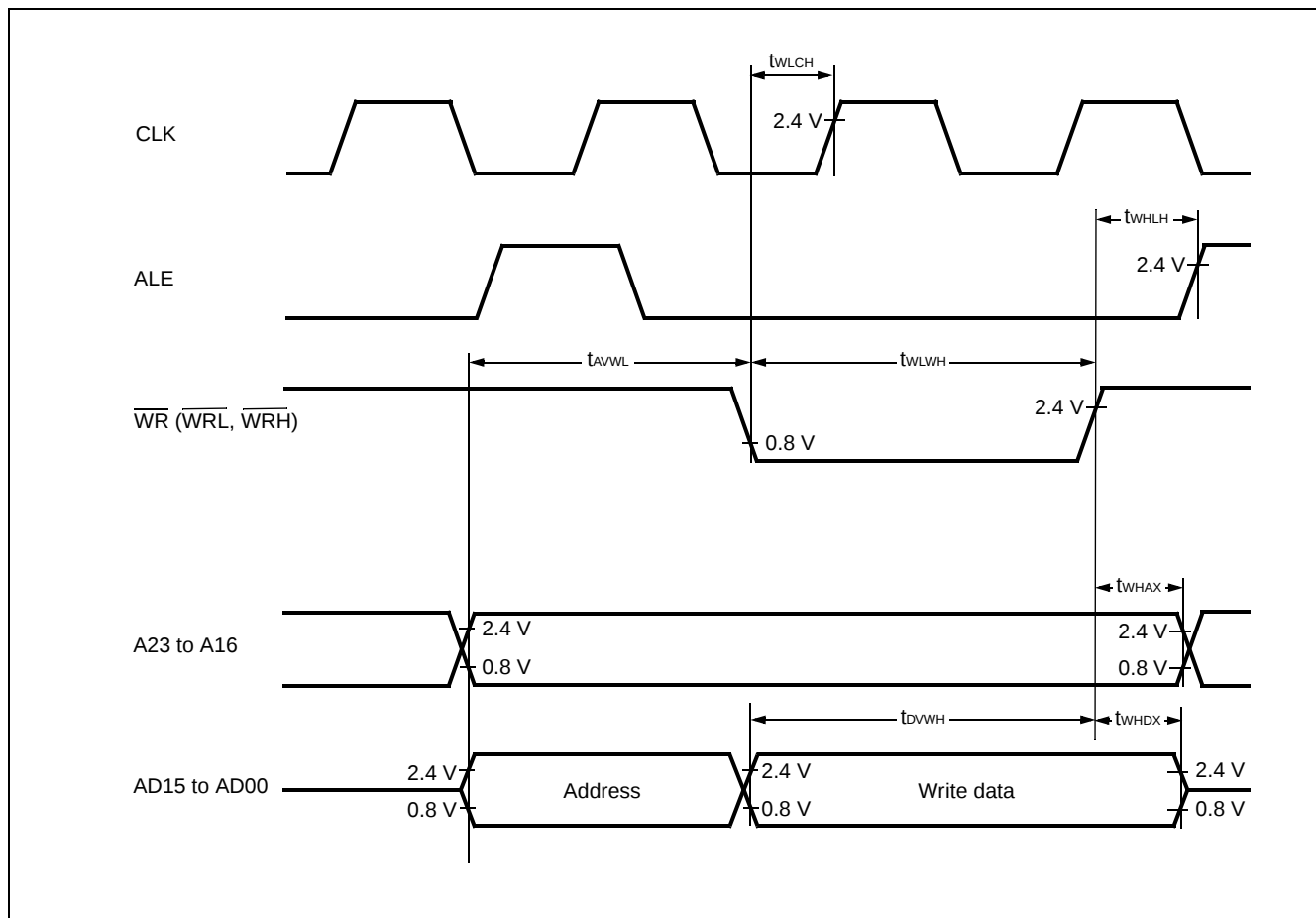


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(6) Bus Timing (Write)

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Valid address $\Rightarrow \overline{WR} \downarrow$ time	t_{AVWL}	A23 to A16, AD15 to AD00, $\overline{WR}$	—	$t_{CP}-15$	—	ns	
$\overline{WR}$ pulse width	t_{WLWH}	$\overline{WR}$		$3 t_{CP}/2 - 20$	—	ns	
Valid data output $\Rightarrow \overline{WR} \uparrow$ time	t_{DVWH}	AD15 to AD00, $\overline{WR}$		$3 t_{CP}/2 - 20$	—	ns	
$\overline{WR} \uparrow \Rightarrow$ Data hold time	t_{WHDX}	AD15 to AD00, $\overline{WR}$		15	—	ns	
$\overline{WR} \uparrow \Rightarrow$ Address valid time	t_{WHAX}	A23 to A16, $\overline{WR}$		$t_{CP}/2 - 10$	—	ns	
$\overline{WR} \uparrow \Rightarrow$ ALE $\uparrow$ time	t_{WHLH}	$\overline{WR}$, ALE		$t_{CP}/2 - 15$	—	ns	
$\overline{WR} \downarrow \Rightarrow$ CLK $\uparrow$ time	t_{WLCH}	$\overline{WR}$, CLK		$t_{CP}/2 - 15$	—	ns	

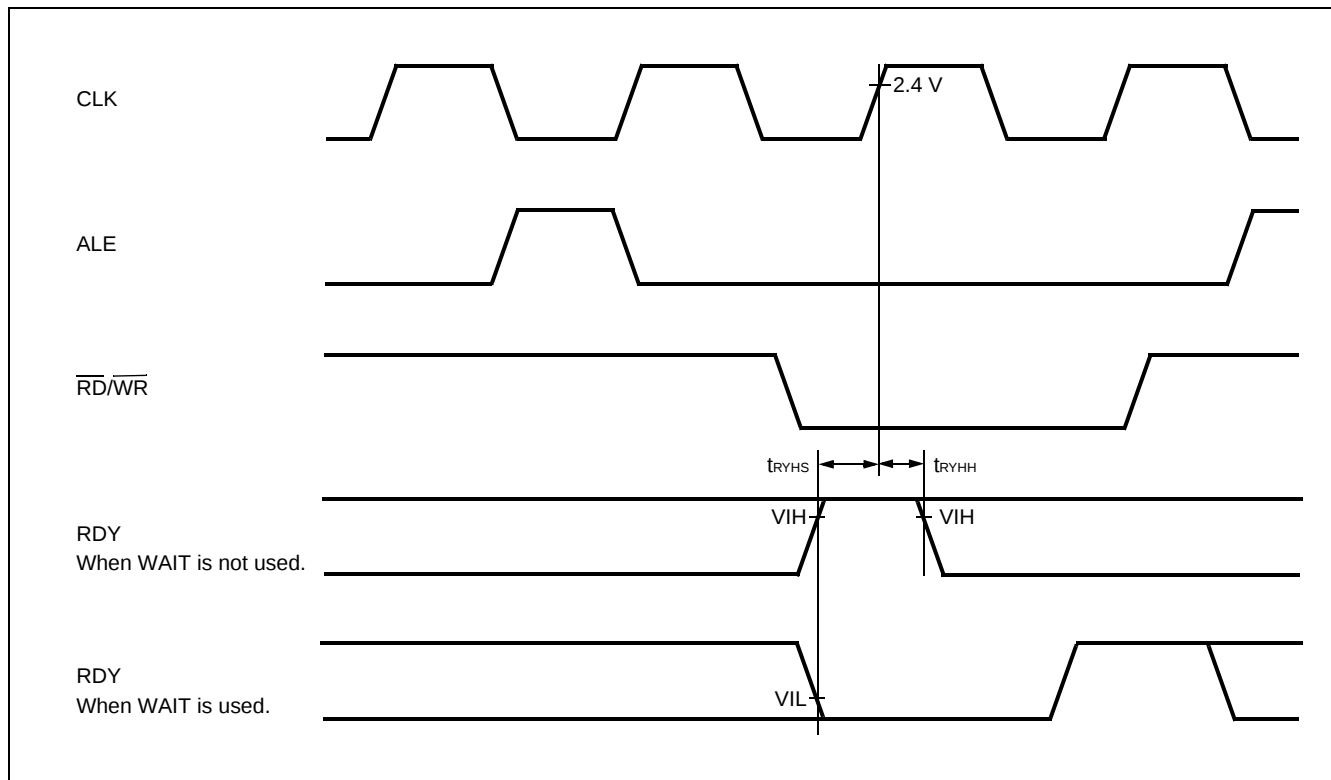


(7) Ready Input Timing

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

Parameter	Symbol	Pin	Test Condition	Rated Value		Units	Remarks
				Min	Max		
RDY setup time	t_{RYHS}	RDY	—	45	—	ns	$f_{CP} = 16\text{ MHz}$
				32	—	ns	$f_{CP} = 24\text{ MHz}$
RDY hold time	t_{RYHH}	RDY		0	—	ns	

Note : If the RDY setup time is insufficient, use the auto-ready function.



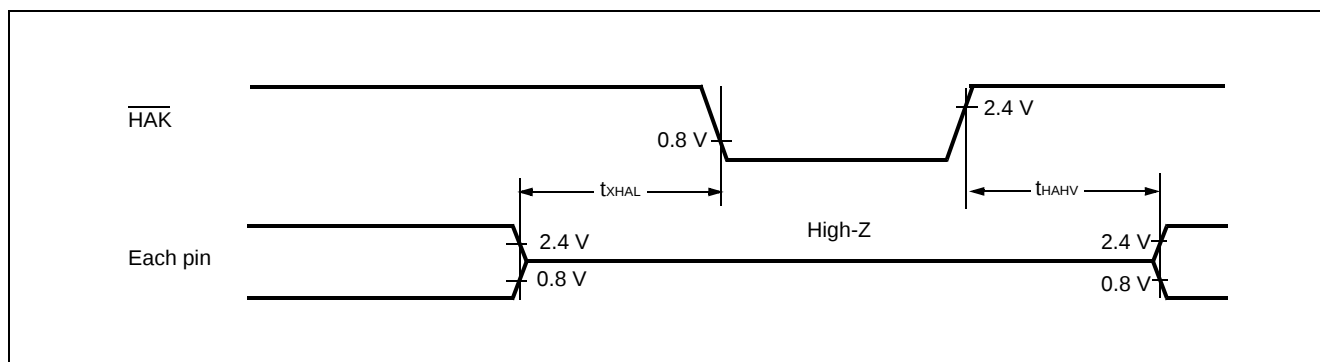
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(8) Hold Timing

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

Parameter	Symbol	Pin	Condition	Value		Units	Remarks
				Min	Max		
Pin floating $\Rightarrow \overline{\text{HAK}} \downarrow$ time	t_{XHAL}	$\overline{\text{HAK}}$	—	30	t_{CP}	ns	
$\overline{\text{HAK}} \uparrow$ time $\Rightarrow$ Pin valid time	t_{HAHV}	$\overline{\text{HAK}}$		t_{CP}	$2 t_{CP}$	ns	

Note : There is more than 1 cycle from when HRQ reads in until the $\overline{\text{HAK}}$ is changed.

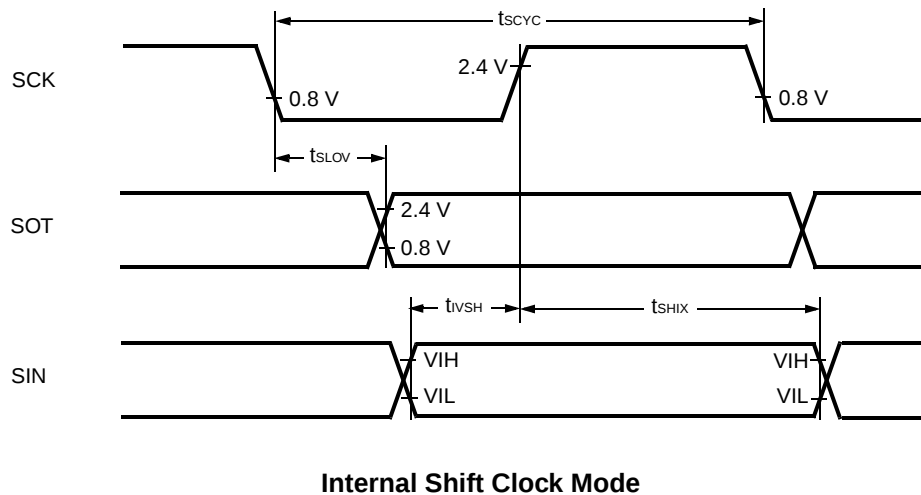


(9) UART0/1/2/3/4

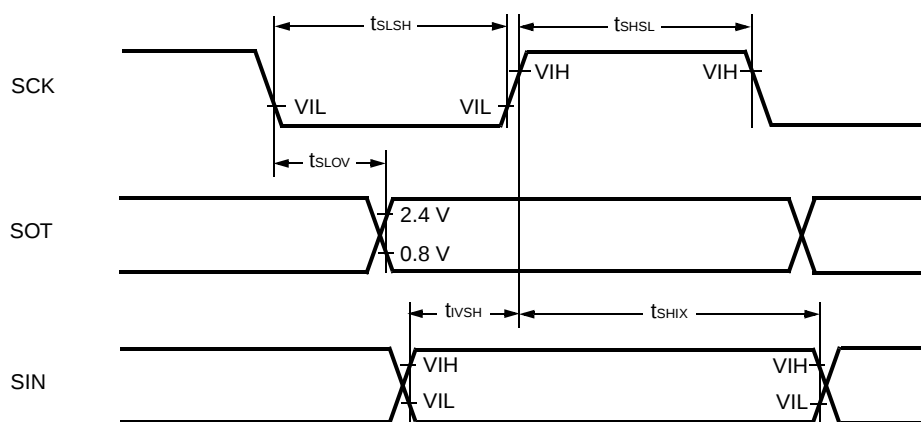
($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $V_{SS} = 0.0\text{ V}$, $f_{CP} \leq 24\text{ MHz}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Serial clock cycle time	t_{SCYC}	SCK0 to SCK4	Internal clock operation output pins are $C_L = 80\text{ pF} + 1\text{ TTL}$.	$8\text{ }t_{CP}$	—	ns	
SCK $\downarrow \rightarrow$ SOT delay time	t_{SLOV}	SCK0 to SCK4, SOT0 to SOT4		-80	+80	ns	
Valid SIN $\rightarrow$ SCK $\uparrow$	t_{IVSH}	SCK0 to SCK4, SIN0 to SIN4		100	—	ns	
SCK $\uparrow \rightarrow$ Valid SIN hold time	t_{SHIX}	SCK0 to SCK4, SIN0 to SIN4		60	—	ns	
Serial clock "H" pulse width	t_{SHSL}	SCK0 to SCK4	External clock operation output pins are $C_L = 80\text{ pF} + 1\text{ TTL}$.	$4\text{ }t_{CP}$	—	ns	
Serial clock "L" pulse width	t_{SLSH}	SCK0 to SCK4		$4\text{ }t_{CP}$	—	ns	
SCK $\downarrow \rightarrow$ SOT delay time	t_{SLOV}	SCK0 to SCK4, SOT0 to SOT4		—	150	ns	
Valid SIN $\rightarrow$ SCK $\uparrow$	t_{IVSH}	SCK0 to SCK4, SIN0 to SIN4		60	—	ns	
SCK $\uparrow \rightarrow$ Valid SIN hold time	t_{SHIX}	SCK0 to SCK4, SIN0 to SIN4		60	—	ns	

- Notes :
- AC characteristic in CLK synchronized mode.
 - C_L is load capacity value of pins when testing.
 - t_{CP} is the machine cycle (Unit : ns)



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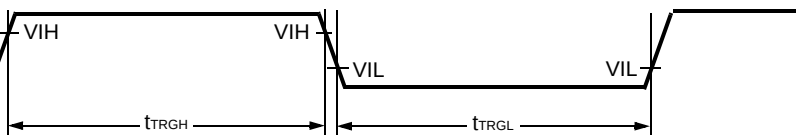
External Shift Clock Mode

(10) Trigger Input Timing

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = 0.0\text{ V}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Input pulse width	t_{TRGH} t_{TRGL}	INT0 to INT15, INT0R to INT15R, ADTG	—	$5\ t_{CP}$	—	ns	

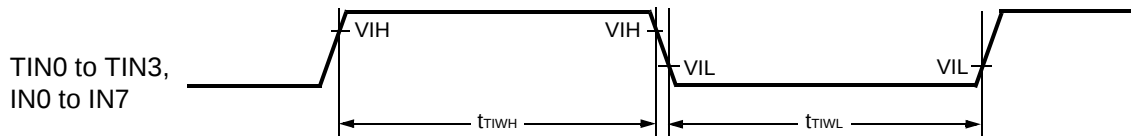
INT0 to INT15,
INT0R to INT15R,
ADTG



(11) Timer Related Resource Input Timing

($T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = 0\text{ V}$)

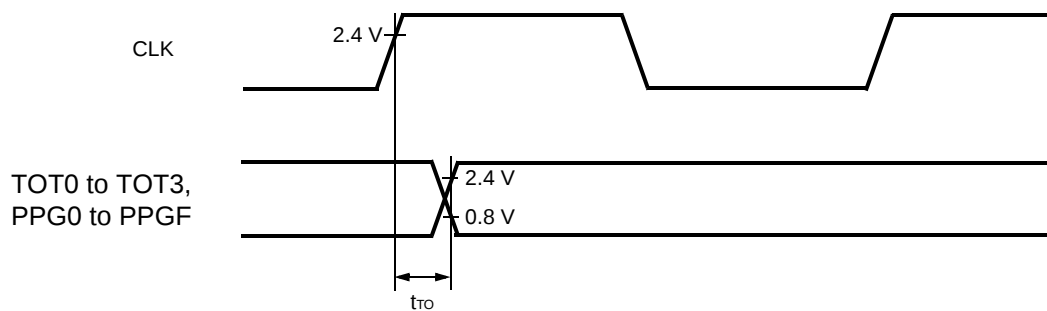
Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
Input pulse width	t_{TIWH}	TIN0 to TIN3, IN0 to IN7	—	$4 t_{CP}$	—	ns	
	t_{TIWL}						



(12) Timer Related Resource Output Timing

($T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $V_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = 0.0\text{ V}$)

Parameter	Symbol	Pin	Condition	Value		Unit	Remarks
				Min	Max		
CLK $\uparrow \Rightarrow T_{OUT}$ change time	t_{TO}	TOT0 to TOT3, PPG0 to PPGF	—	30	—	ns	



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(13) I²C Timing

(T_A = -40°C to +105°C, V_{CC} = 5.0 V ± 10%, V_{SS} = 0.0 V)

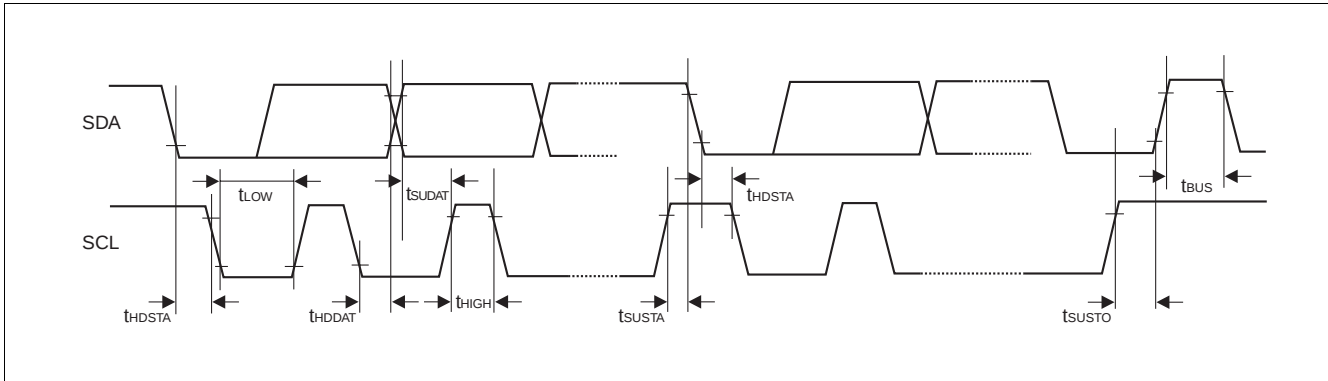
Parameter	Symbol	Condition	Standard-mode		Fast-mode* ⁴		Unit
			Min	Max	Min	Max	
SCL clock frequency	f _{SCL}	R = 1.7 kΩ, C = 50 pF* ¹	0	100	0	400	kHz
Hold time (repeated) START condition SDA↓→SCL↓	t _{HDSTA}		4.0	—	0.6	—	μs
"L" width of the SCL clock	t _{LOW}		4.7	—	1.3	—	μs
"H" width of the SCL clock	t _{HIGH}		4.0	—	0.6	—	μs
Set-up time for a repeated START condition SCL↑→SDA↓	t _{SUSTA}		4.7	—	0.6	—	μs
Data hold time SCL↓→SDA↓↑	t _{HDDAT}		0	3.45* ²	0	0.9* ³	μs
Data set-up time SDA↓↑→SCL↑	t _{SUDAT}		250	—	100	—	ns
Set-up time for STOP condition SCL↑→SDA↑	t _{SUSTO}		4.0	—	0.6	—	μs
Bus free time between a STOP and START condition	t _{BUS}		4.7	—	1.3	—	μs

*1 : R,C : Pull-up resistor and load capacitor of the SCL and SDA lines.

*2 : The maximum t_{HDDAT} have only to be met if the device does not stretch the "L" width (t_{LOW}) of the SCL signal.

*3 : A Fast-mode I²C-bus device can be used in a Standard-mode I²C-bus system, but the requirement t_{SUDAT} ≥ 250 ns must then be met.

*4 : For use at over 100 kHz, set the machine clock to at least 6 MHz.



5. A/D Converter

($T_A = -40\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$, $3.0\text{ V} \leq \text{AVRH} - \text{AVRL}$, $V_{CC} = \text{AV}_{CC} = 5.0\text{ V} \pm 10\%$, $f_{CP} \leq 24\text{ MHz}$, $V_{SS} = \text{AV}_{SS} = 0\text{ V}$)

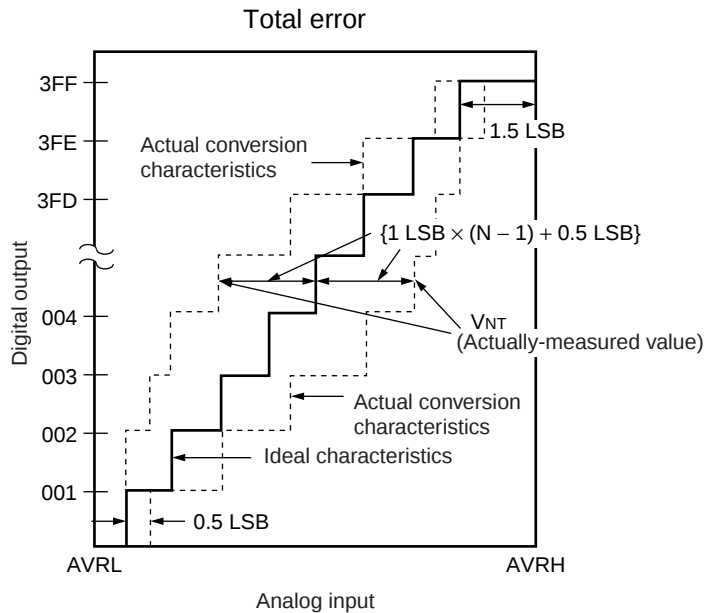
Parameter	Symbol	Pin	Value			Unit	Remarks
			Min	Typ	Max		
Resolution	—	—	—	—	10	bit	
Total error	—	—	—	—	± 3.0	LSB	
Nonlinearity error	—	—	—	—	± 2.5	LSB	
Differential nonlinearity error	—	—	—	—	± 1.9	LSB	
Zero reading voltage	V_{OT}	AN0 to AN23	$\text{AVRL} - 1.5$	$\text{AVRL} + 0.5$	$\text{AVRL} + 2.5$	LSB	
Full scale reading voltage	V_{FST}	AN0 to AN23	$\text{AVRH} - 3.5$	$\text{AVRH} - 1.5$	$\text{AVRH} + 0.5$	LSB	
Compare time	—	—	1.0	—	16,500	μs	$4.5\text{ V} \leq \text{AV}_{CC} \leq 5.5\text{ V}$
			2.0				$4.0\text{ V} \leq \text{AV}_{CC} < 4.5\text{ V}$
Sampling time	—	—	0.5	—	∞	μs	$4.5\text{ V} \leq \text{AV}_{CC} \leq 5.5\text{ V}$
			1.2				$4.0\text{ V} \leq \text{AV}_{CC} < 4.5\text{ V}$
Analog port input current	I_{AIN}	AN0 to AN23	-0.3	—	+0.3	μA	
Analog input voltage range	V_{AIN}	AN0 to AN23	AVRL	—	AVRH	V	
Reference voltage range	—	AVRH	$\text{AVRL} + 2.7$	—	AV_{CC}	V	
	—	AVRL	0	—	$\text{AVRH} - 2.7$	V	
Power supply current	I_A	AV_{CC}	—	3.5	7.5	mA	
	I_{AH}	AV_{CC}	—	—	5	μA	*
Reference voltage current	I_R	AVRH	—	600	900	μA	
	I_{RH}	AVRH	—	—	5	μA	*
Offset between input channels	—	AN0 to AN23	—	—	4	LSB	

* : IF A/D convertor is not operating, a current when CPU is stopped is applicable ($V_{CC} = \text{AV}_{CC} = \text{AVRH} = 5.0\text{ V}$) .

Note : The accuracy gets worse as $\text{AVRH} - \text{AVRL}$ becomes smaller.

6. Definition of A/D Converter Terms

Resolution	: Analog variation that is recognized by an A/D converter.
Non linearity error	: Deviation between a line across zero-transition line ("00 0000 0000" $\leftarrow \rightarrow$ "00 0000 0001") and full-scale transition line ("11 1111 1110" $\leftarrow \rightarrow$ "11 1111 1111") and actual conversion characteristics.
Differential linearity error	: Deviation of input voltage, which is required for changing output code by 1 LSB, from an ideal value.
Total error	: Difference between an actual value and an ideal value. A total error includes zero transition error, full-scale transition error, and linear error.
Zero reading voltage	: Input voltage which results in the minimum conversion value.
Full scale reading voltage	: Input voltage which results in the maximum conversion value.



$$\text{Total error of digital output "N"} = \frac{V_{NT} - \{1 \text{ LSB} \times (N - 1) + 0.5 \text{ LSB}\}}{1 \text{ LSB}} \quad [\text{LSB}]$$

$$1 \text{ LSB} = (\text{Ideal value}) \frac{AVRH - AVRL}{1024} \quad [\text{V}]$$

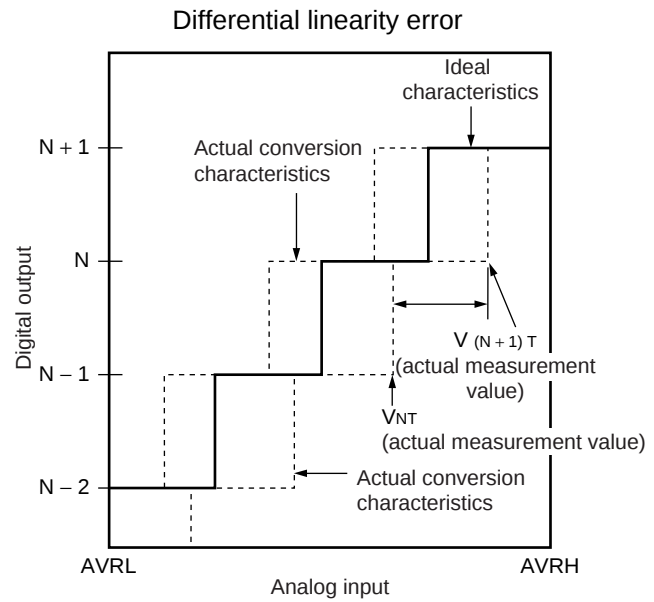
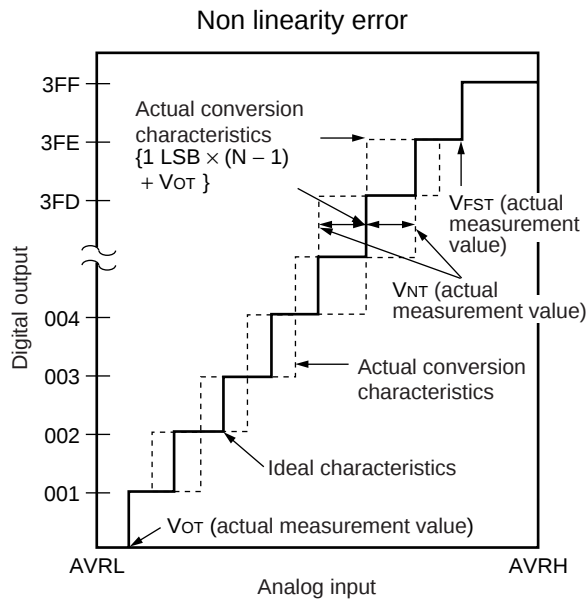
$$V_{OT} (\text{Ideal value}) = AVRL + 0.5 \text{ LSB} \quad [\text{V}]$$

$$V_{FST} (\text{Ideal value}) = AVRH - 1.5 \text{ LSB} \quad [\text{V}]$$

V_{NT} : A voltage at which digital output transitions from (N - 1) to N.

(Continued)

(Continued)



$$\text{Non linearity error of digital output } N = \frac{V_{NT} - \{1 \text{ LSB} \times (N - 1) + V_{OT}\}}{1 \text{ LSB}} [\text{LSB}]$$

$$\text{Differential linearity error of digital output } N = \frac{V_{(N+1)T} - V_{NT}}{1 \text{ LSB}} - 1 \text{ LSB} [\text{LSB}]$$

$$1 \text{ LSB} = \frac{V_{FST} - V_{OT}}{1022} [\text{V}]$$

V_{OT} : Voltage at which digital output transits from “000_H” to “001_H.”

V_{FST} : Voltage at which digital output transits from “3FE_H” to “3FF_H.”

MB90340 Series

7. Notes on A/D Converter Section

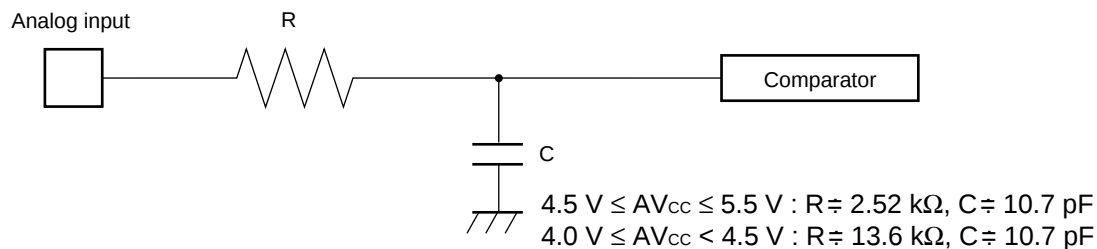
Use the device with external circuits of the following output impedance for analog inputs :

Recommended output impedance of external circuits are : Approx. 1.5 k Ω or lower (4.0 V $\leq$ AV_{CC} $\leq$ 5.5 V, sampling period $\leq$ 0.5 μ s)

If an external capacitor is used, in consideration of the effect by tap capacitance caused by external capacitors and on-chip capacitors, capacitance of the external one is recommended to be several thousand times as high as internal capacitor.

If output impedance of an external circuit is too high, a sampling period for an analog voltage may be insufficient.

• Analog input circuit model



Note : Use the values in the figure only as a guideline.

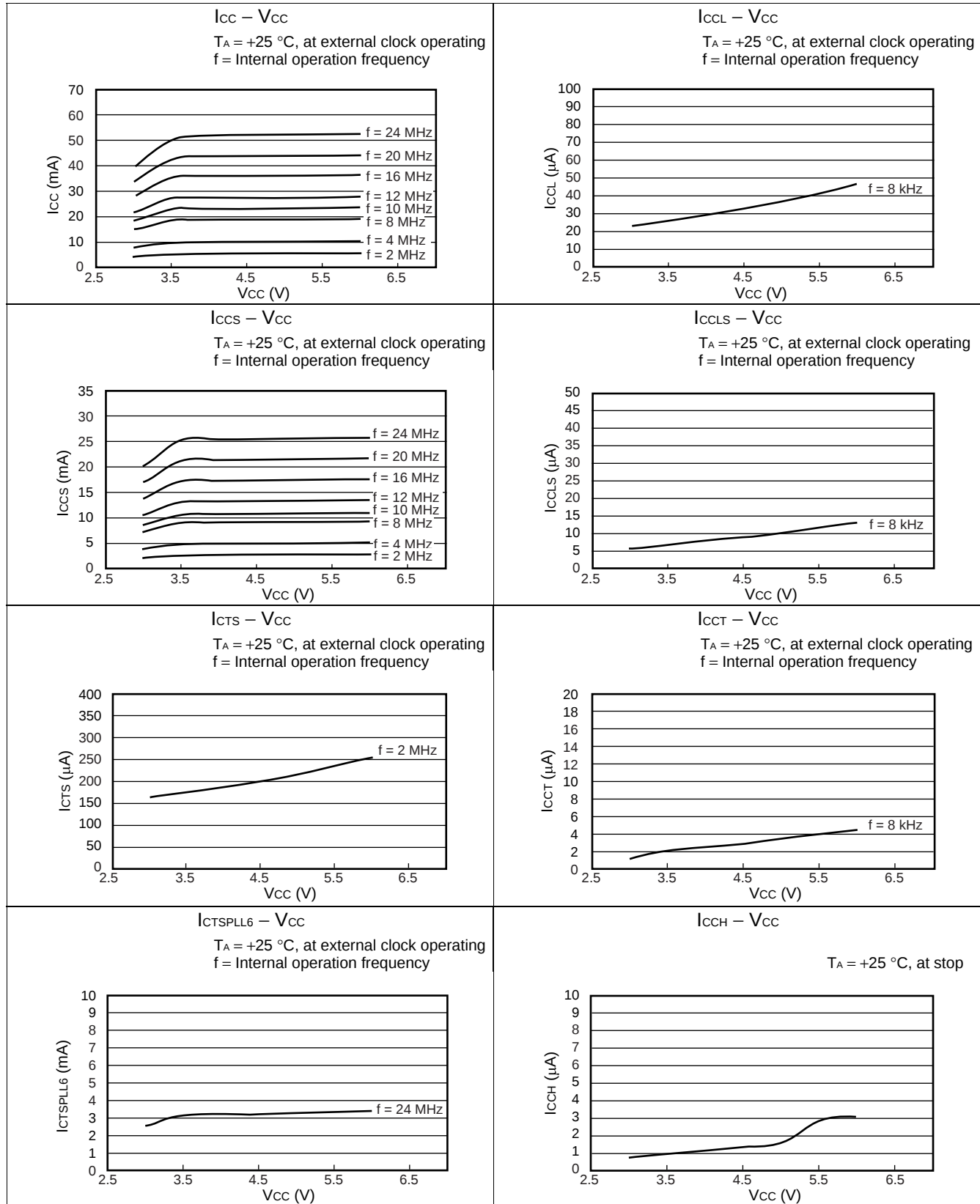
8. Flash Memory Program/Erase Characteristics

Parameter	Conditions	Value			Unit	Remarks
		Min	Typ	Max		
Sector erase time	T _A = +25 °C V _{CC} = 5.0 V	—	1	15	s	Excludes programming prior to erasure
Chip erase time		—	9	—	s	Excludes programming prior to erasure
Word (16 bit width) programming time		—	16	3,600	μ s	Except for the over head time of the system
Programs/Erase cycle	—	10,000	—	—	cycle	
Flash Data Retention Time	Average T _A = +85 °C	20	—	—	Year	*

* : This value comes from the technology qualification (using Arrhenius equation to translate high temperature measurements into normalized value at +85 °C) .

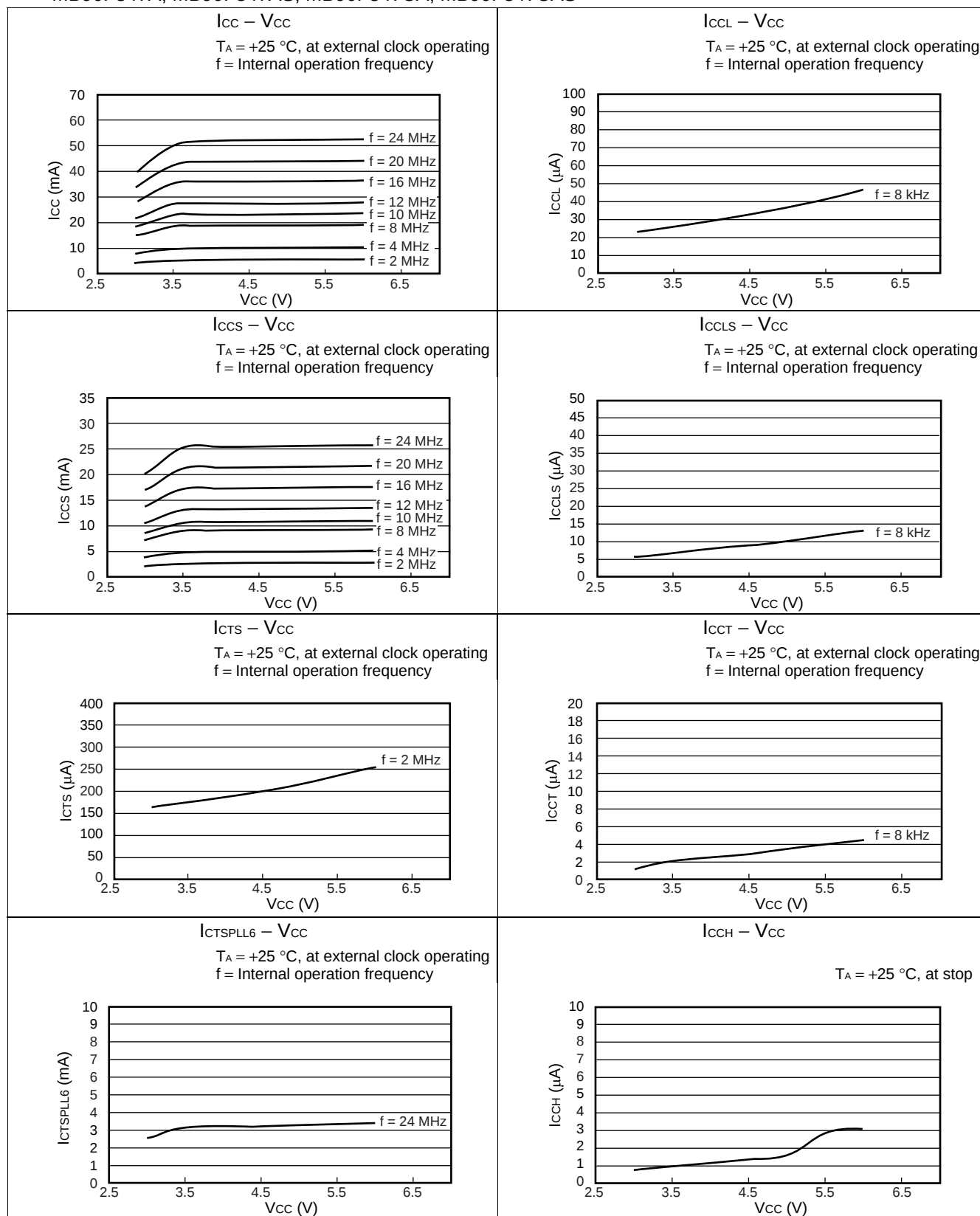
EXAMPLE CHARACTERISTICS

- MB90F346A, MB90F346AS, MB90F346CA, MB90F346CAS



MB90340 Series

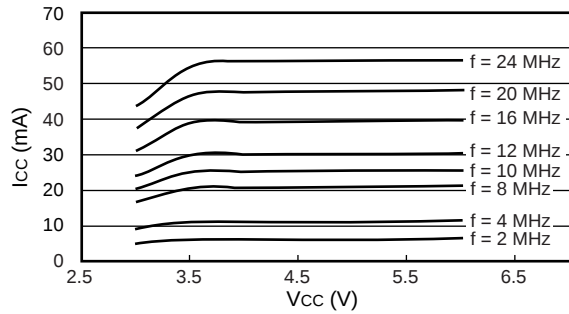
- MB90F347A, MB90F347AS, MB90F347CA, MB90F347CAS



- MB90F349A, MB90F349AS, MB90F349CA, MB90F349CAS

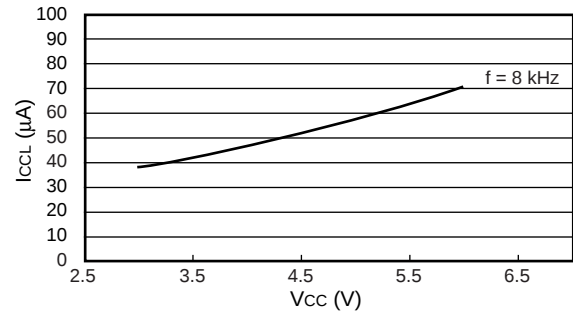
$I_{CC} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



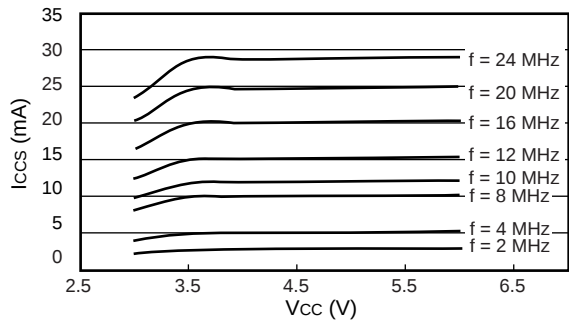
$I_{CCL} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



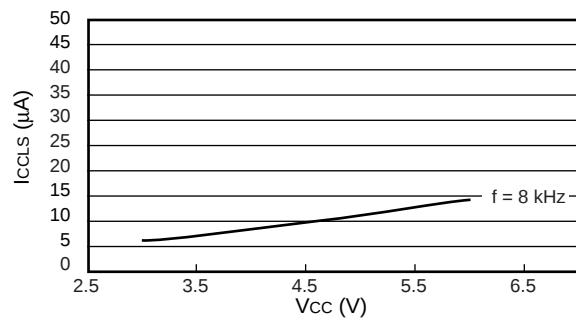
$I_{CCS} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



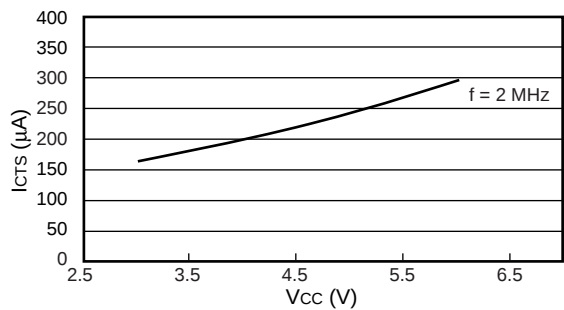
$I_{CCLS} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



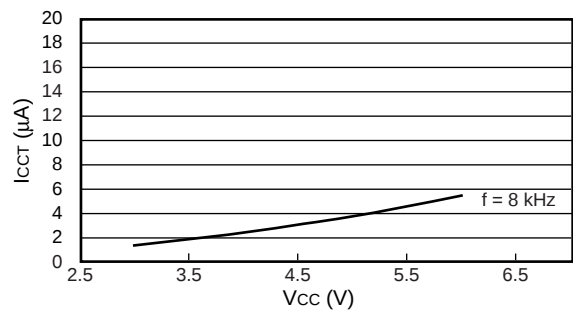
$I_{CTS} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



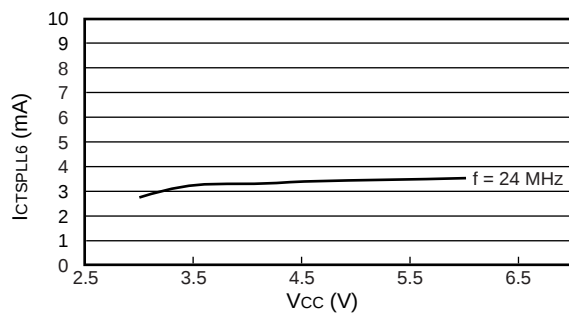
$I_{CCT} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



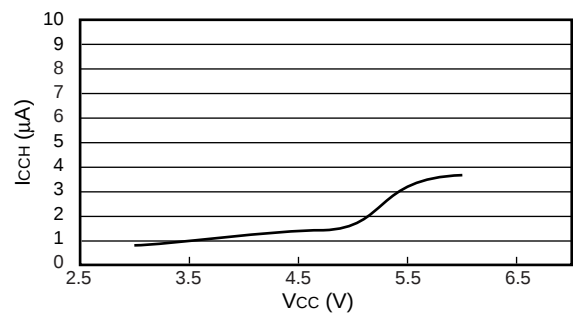
$I_{CTSPLL6} - V_{CC}$

$T_A = +25^\circ\text{C}$, at external clock operating
 f = Internal operation frequency



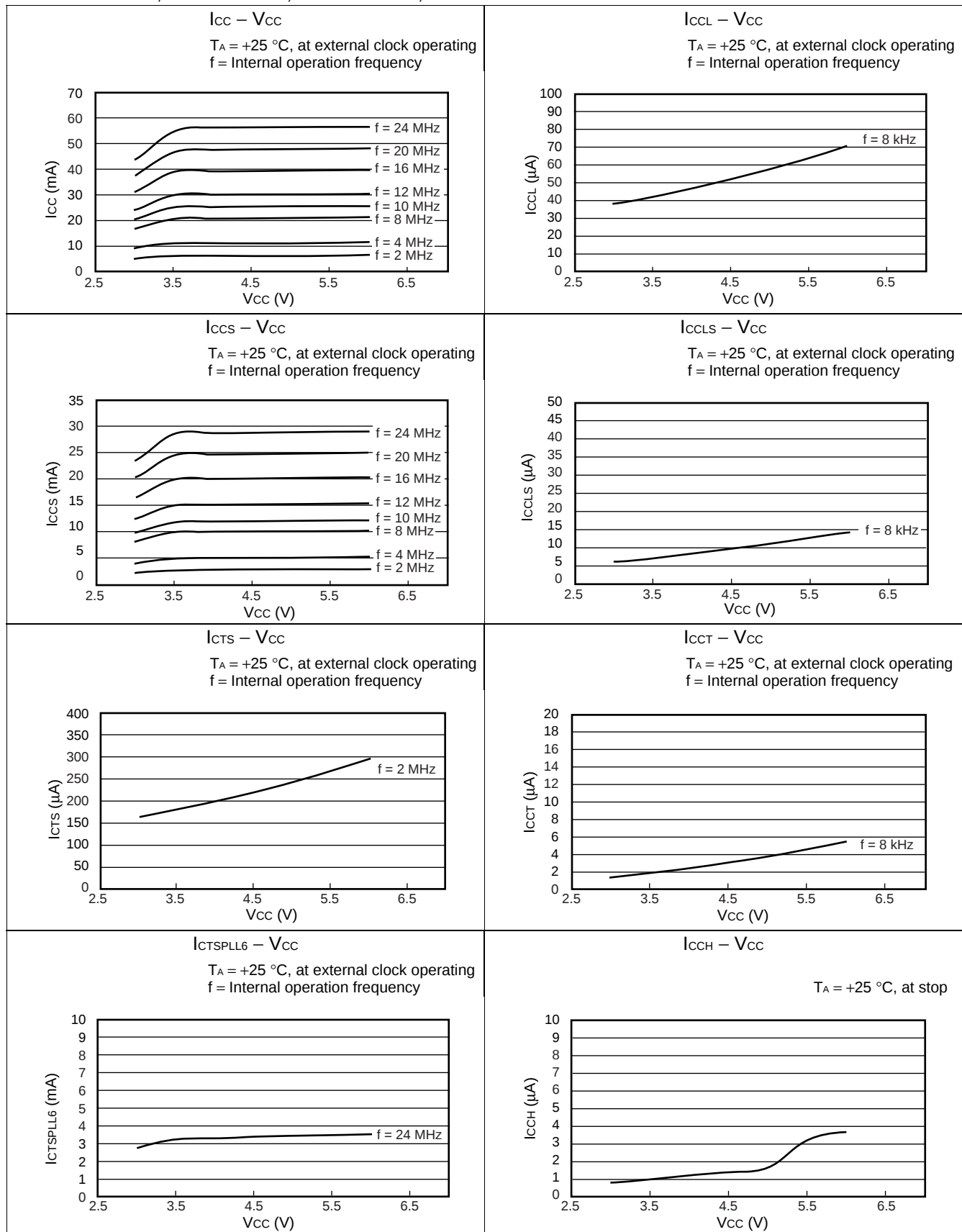
$I_{CCH} - V_{CC}$

$T_A = +25^\circ\text{C}$, at stop

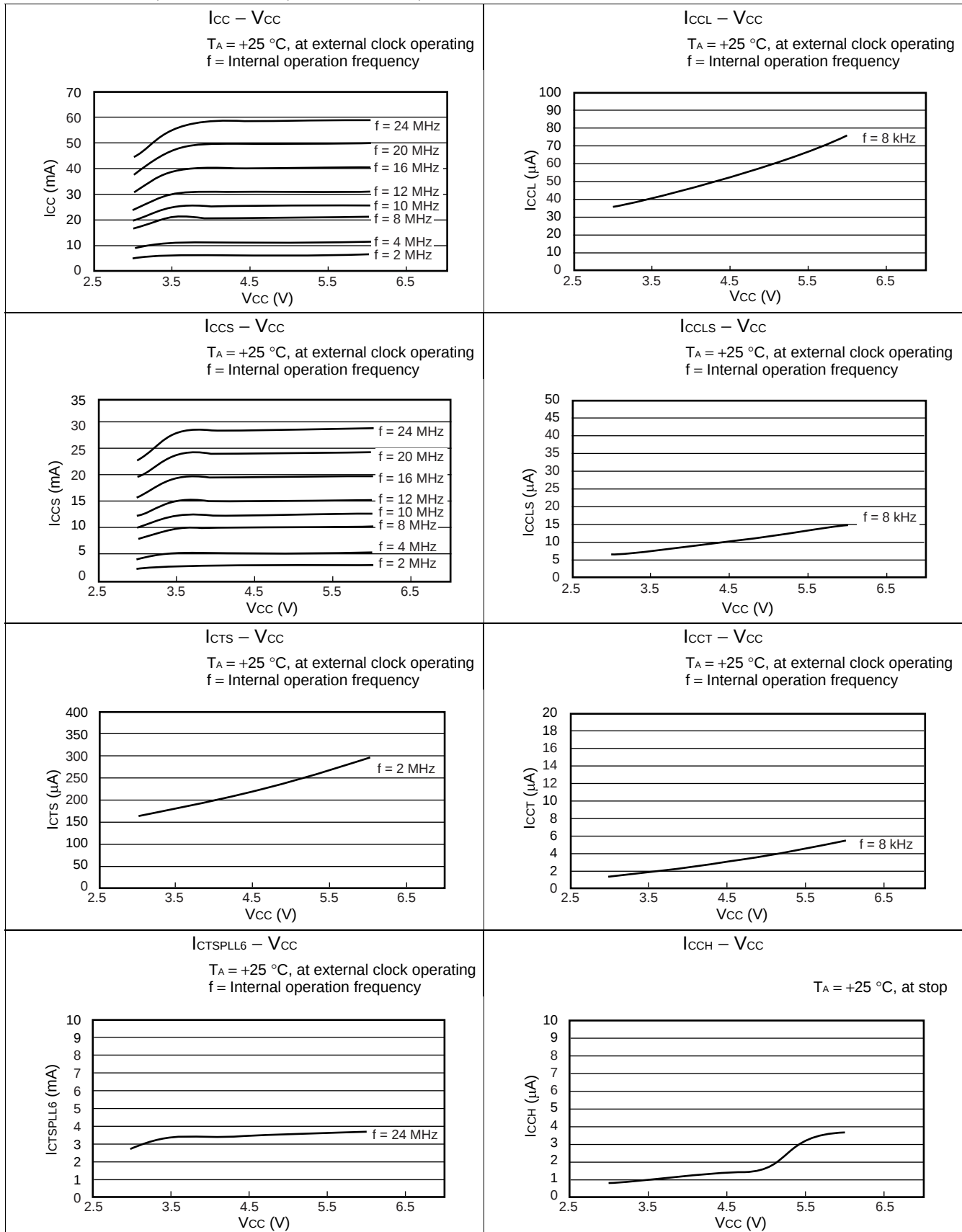


MB90340 Series

- MB90F342A, MB90F342AS, MB90F342CA, MB90F342CAS

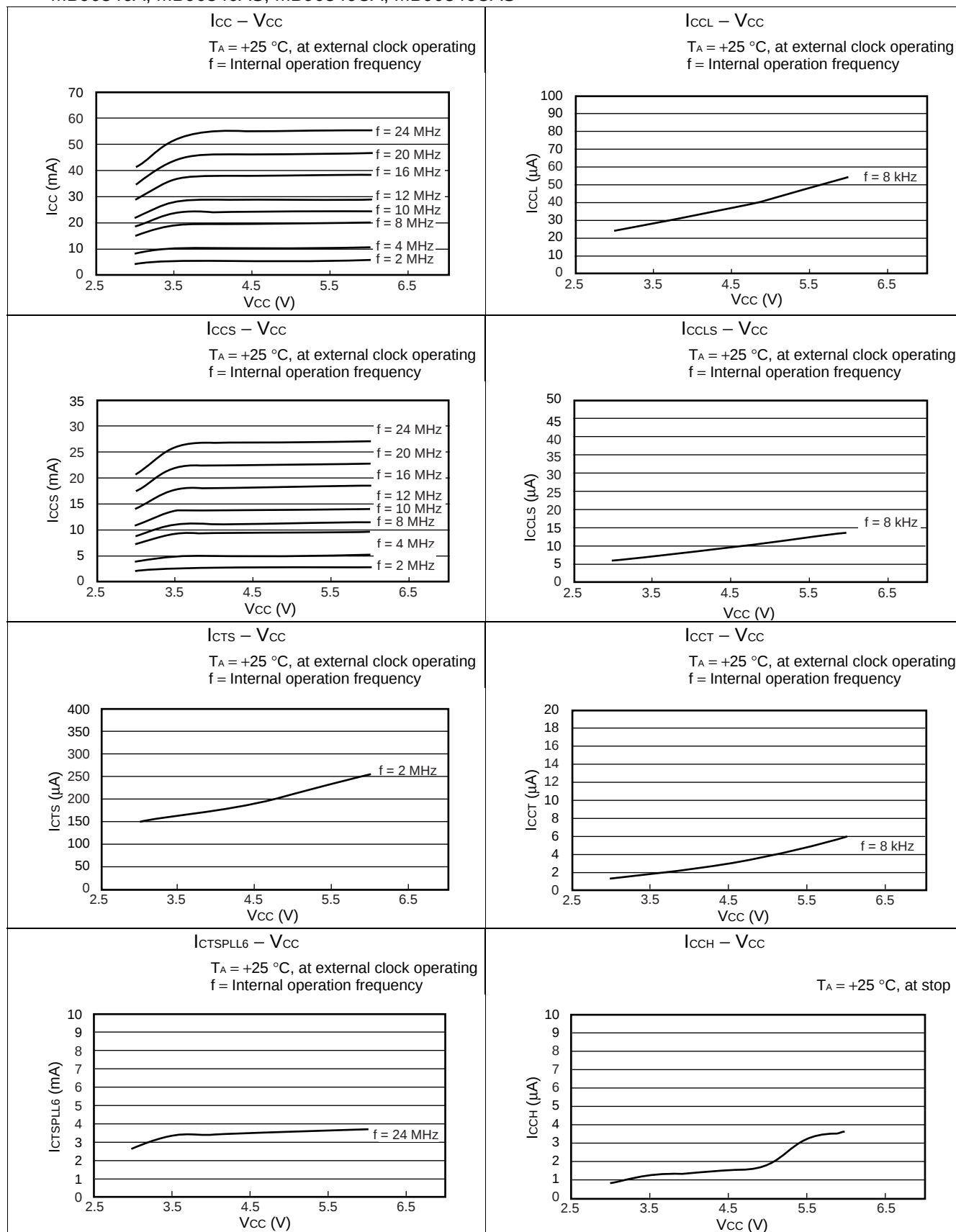


- MB90F345A, MB90F345AS, MB90F345CA, MB90F345CAS

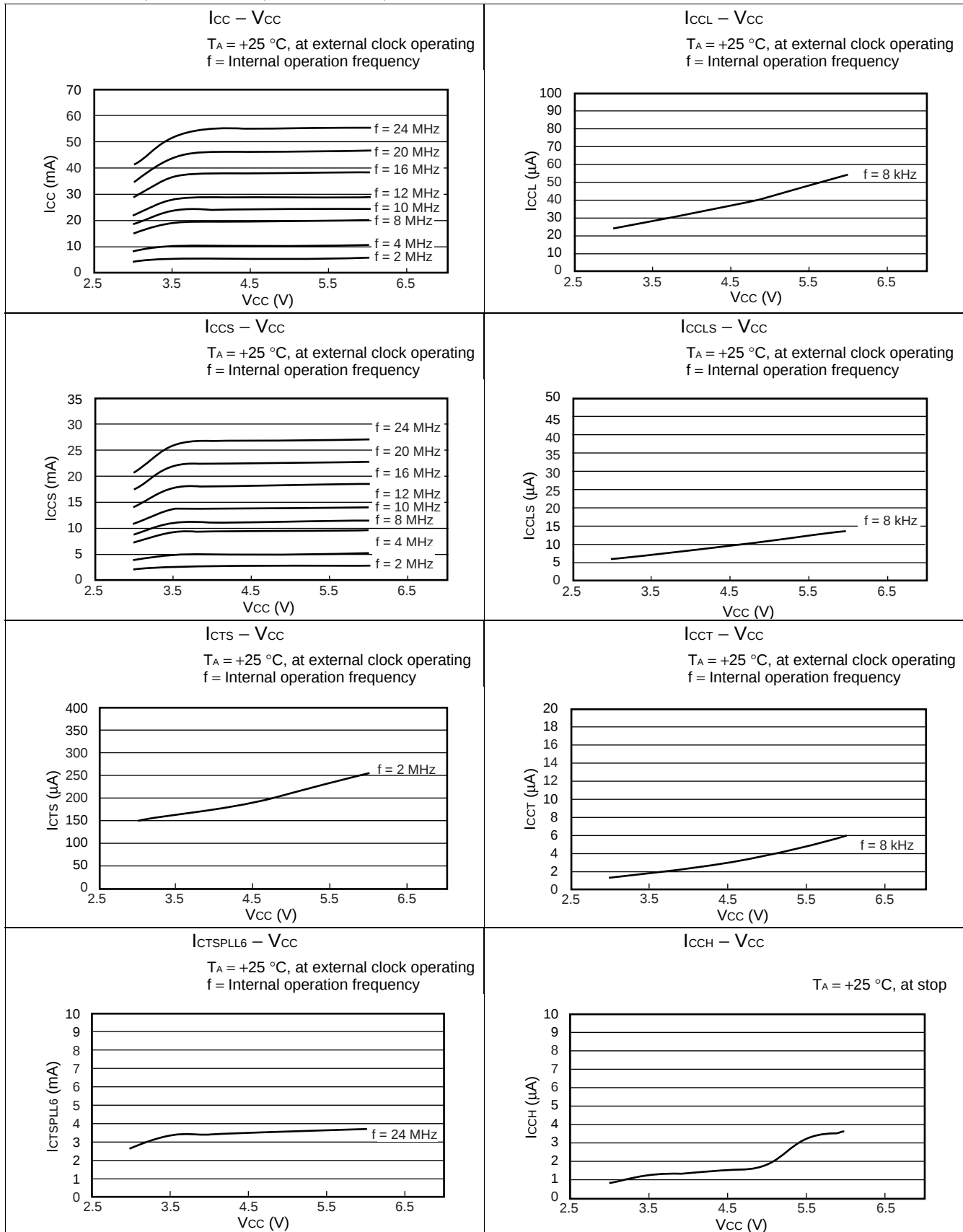


MB90340 Series

- MB90346A, MB90346AS, MB90346CA, MB90346CAS



- MB90347A, MB90347AS, MB90347CA, MB90347CAS

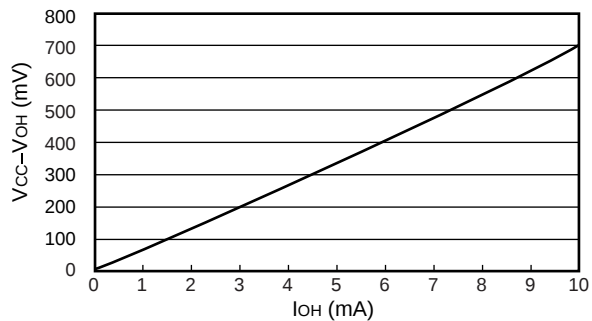


MB90340 Series

• I/O characteristics

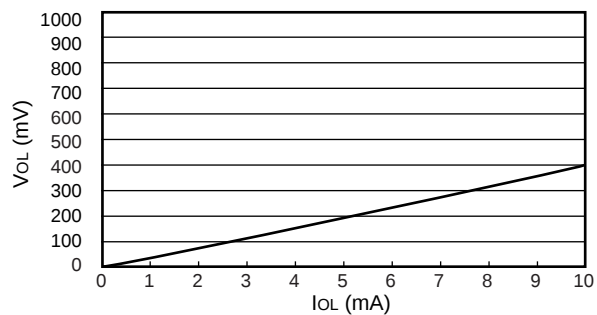
$(V_{CC}-V_{OH}) - I_{OH}$

$T_A = +25\text{ }^{\circ}\text{C}$, $V_{CC} = 4.5\text{ V}$



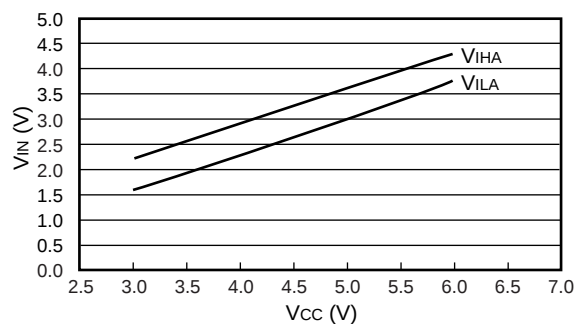
$V_{OL} - I_{OL}$

$T_A = +25\text{ }^{\circ}\text{C}$, $V_{CC} = 4.5\text{ V}$



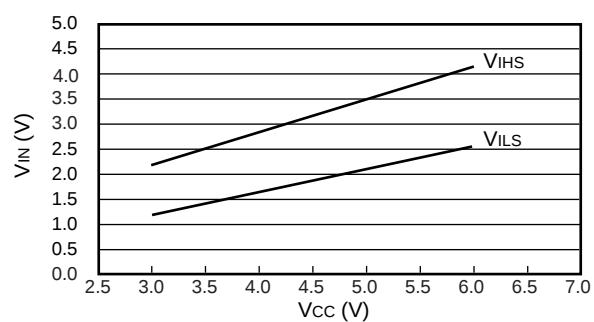
Automotive $V_{IN} - V_{CC}$

$T_A = +25\text{ }^{\circ}\text{C}$



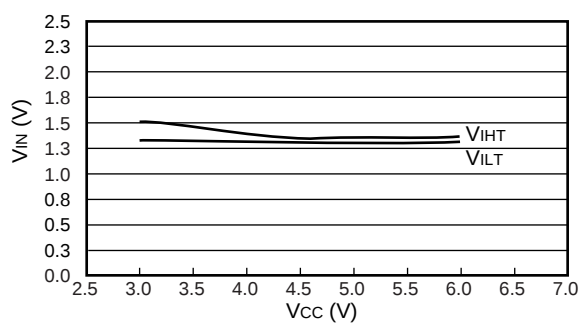
CMOS $V_{IN} - V_{CC}$

UART-SIN pin, other than I²C pin
 $T_A = +25\text{ }^{\circ}\text{C}$



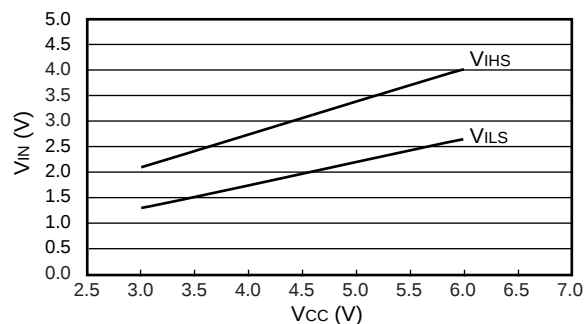
TTL $V_{IN} - V_{CC}$

$T_A = +25\text{ }^{\circ}\text{C}$



CMOS $V_{IN} - V_{CC}$

UART-SIN pin, I²C pin
 $T_A = +25\text{ }^{\circ}\text{C}$



■ ORDERING INFORMATION

Part number	Package	Remarks
MB90F342APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F342ASPF		
MB90F342CAPF		
MB90F342CASPF		
MB90F342APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F342ASPFV		
MB90F342CAPFV		
MB90F342CASPFV		
MB90F343APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F343ASPF		
MB90F343CAPF		
MB90F343CASPF		
MB90F343APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F343ASPFV		
MB90F343CAPFV		
MB90F343CASPFV		
MB90F345APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F345ASPF		
MB90F345CAPF		
MB90F345CASPF		
MB90F345APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F345ASPFV		
MB90F345CAPFV		
MB90F345CASPFV		
MB90F346APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F346ASPF		
MB90F346CAPF		
MB90F346CASPF		
MB90F346APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F346ASPFV		
MB90F346CAPFV		
MB90F346CASPFV		

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MB90340 Series

Part number	Package	Remarks
MB90F347APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F347ASPF		
MB90F347CAPF		
MB90F347CASPF		
MB90F347APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F347ASPFV		
MB90F347CAPFV		
MB90F347CASPFV		
MB90F349APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90F349ASPF		
MB90F349CAPF		
MB90F349CASPF		
MB90F349APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90F349ASPFV		
MB90F349CAPFV		
MB90F349CASPFV		
MB90341APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90341ASPF		
MB90341CAPF		
MB90341CASPF		
MB90341APFV	100-pin Plastic LQFP (FPT-100P-M05)	
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MB90341CAPFV		
MB90341CASPFV		
MB90342APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90342ASPF		
MB90342CAPF		
MB90342CASPF		
MB90342APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90342ASPFV		
MB90342CAPFV		
MB90342CASPFV		

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MB90340 Series

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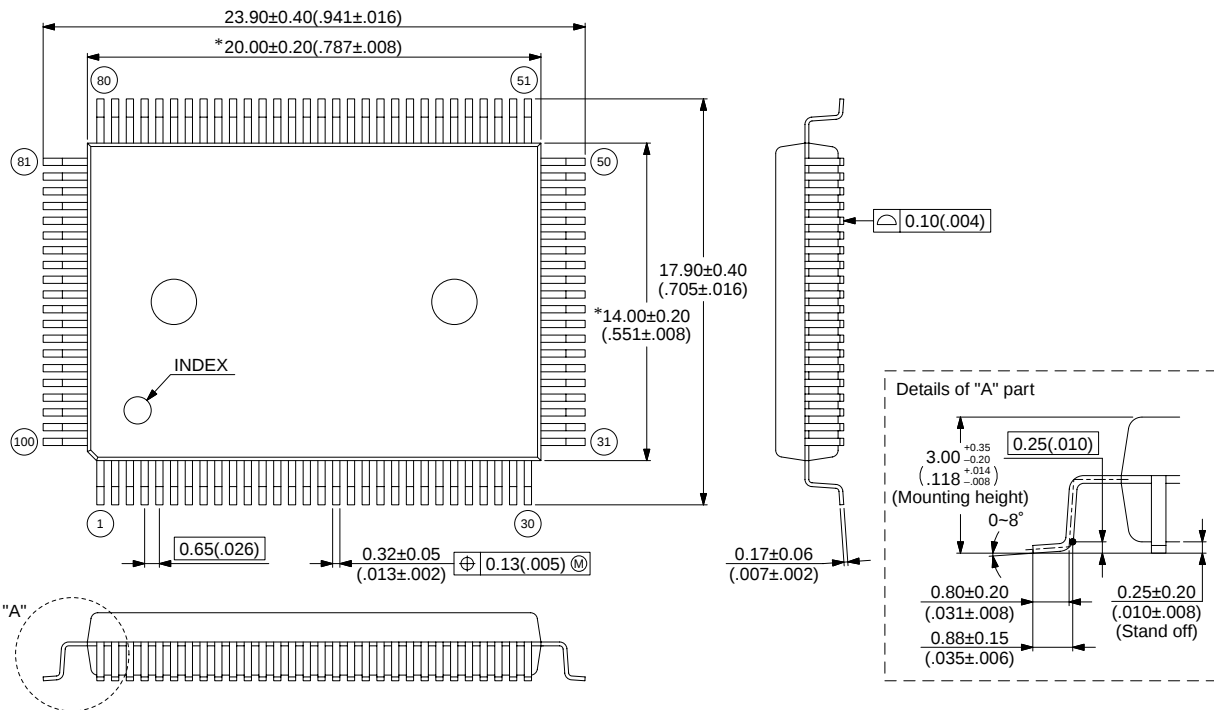
Part number	Package	Remarks
MB90346APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90346ASPF		
MB90346CAPF		
MB90346CASPF		
MB90346APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90346ASPFV		
MB90346CAPFV		
MB90346CASPFV		
MB90347APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90347ASPF		
MB90347CAPF		
MB90347CASPF		
MB90347APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90347ASPFV		
MB90347CAPFV		
MB90347CASPFV		
MB90348APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90348ASPF		
MB90348CAPF		
MB90348CASPF		
MB90348APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90348ASPFV		
MB90348CAPFV		
MB90348CASPFV		
MB90349APF	100-pin Plastic QFP (FPT-100P-M06)	
MB90349ASPF		
MB90349CAPF		
MB90349CASPF		
MB90349APFV	100-pin Plastic LQFP (FPT-100P-M05)	
MB90349ASPFV		
MB90349CAPFV		
MB90349CASPFV		
MB90V340A-101	299-pin Ceramic PGA (PGA-299C-A01)	For evaluation
MB90V340A-102		

MB90340 Series

■ PACKAGE DIMENSIONS

100-pin Plastic QFP
(FPT-100P-M06)

Note 1) * : These dimensions do not include resin protrusion.
Note 2) Pins width and pins thickness including plating thickness.
Note 3) Pins width do not include tie bar cutting remainder.



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Dimensions in mm (inches)

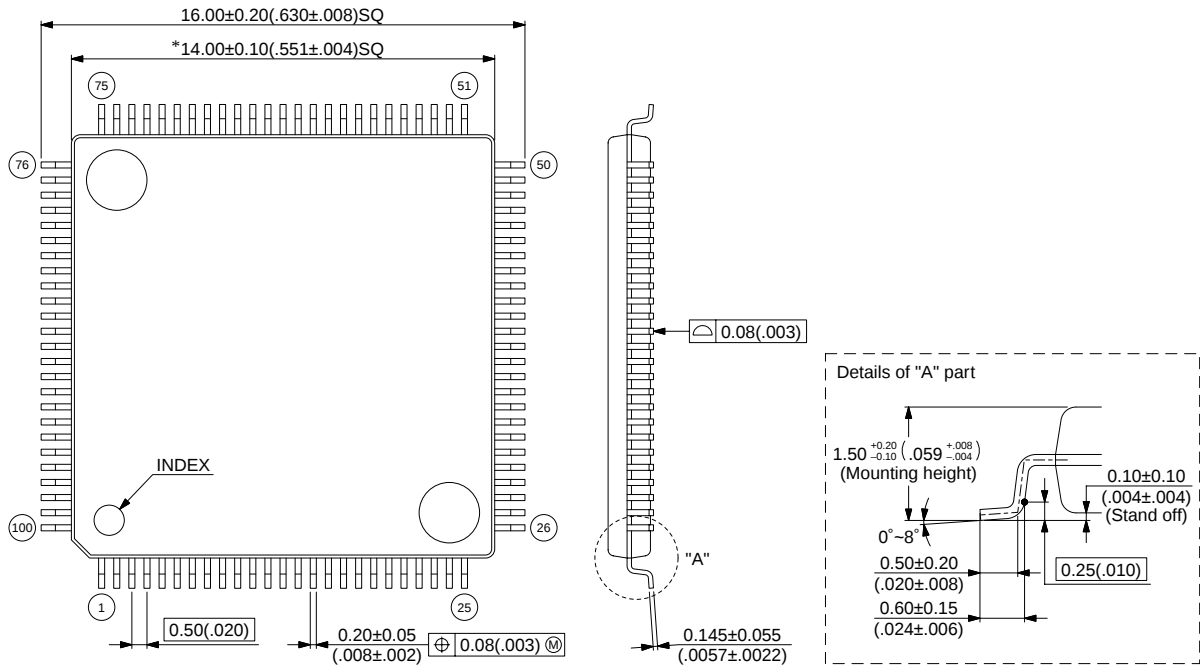
Note : The values in parentheses are reference values.

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100-pin Plastic LQFP
(FPT-100P-M05)

Note 1) * : These dimensions do not include resin protrusion.
Note 2) Pins width and pins thickness include plating thickness.
Note 3) Pins width do not include tie bar cutting remainder.



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Dimensions in mm (inches)

Note : The values in parentheses are reference values.

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