# Infineon Technologies - MB90347ESPMC-GS-511-ERE2 Datasheet

**Welcome to E-XFL.COM**

## What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

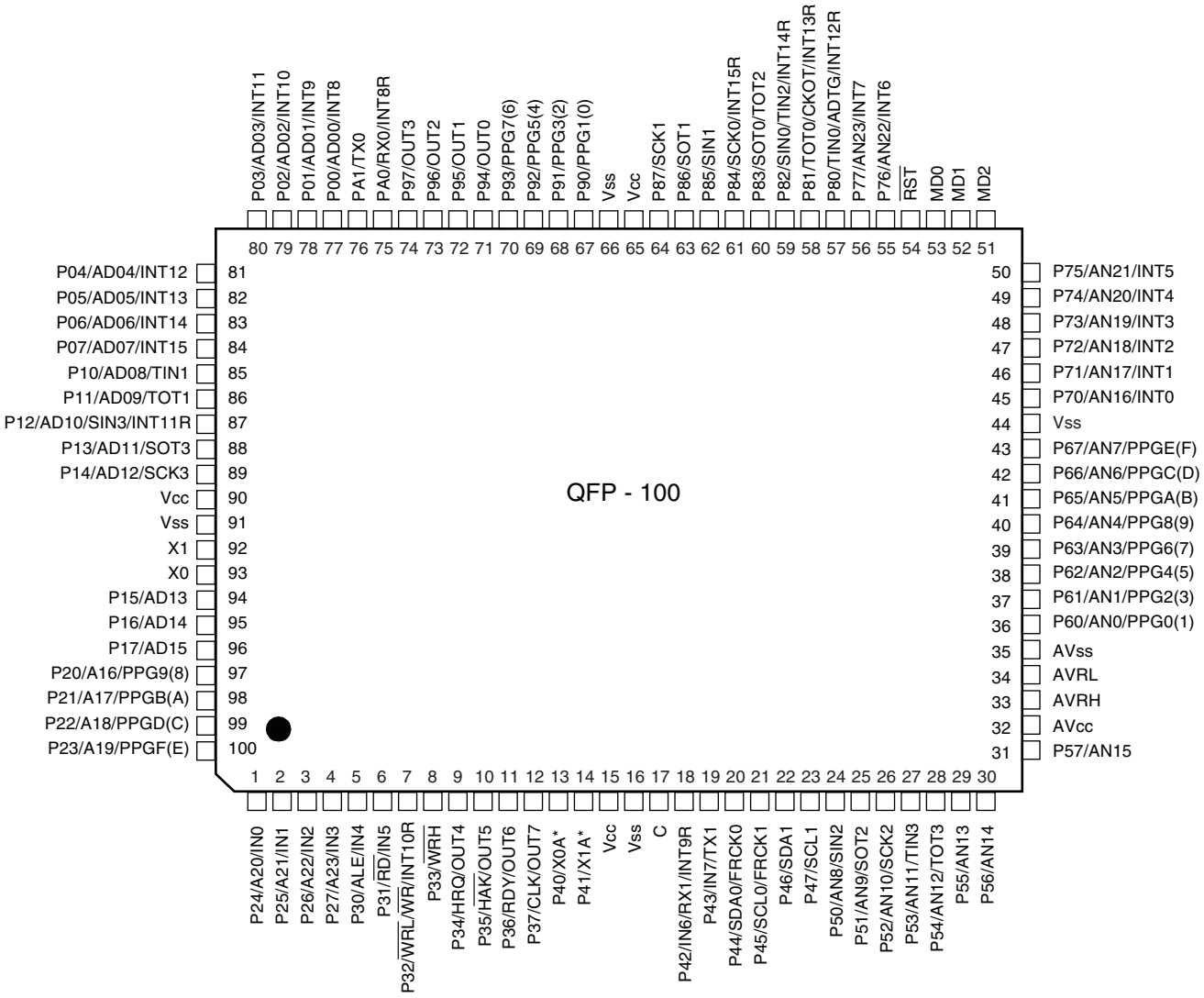
## Applications of "Embedded - Microcontrollers"

| Details | |
|---|---|
| Product Status | Obsolete |
| Core Processor | F²MC-16LX |
| Core Size | 16-Bit |
| Speed | 24MHz |
| Connectivity | CANbus, EBI/EMI, LINbus, SCI, UART/USART |
| Peripherals | DMA, POR, WDT |
| Number of I/O | 82 |
| Program Memory Size | 128KB (128K x 8) |
| Program Memory Type | Mask ROM |
| EEPROM Size | - |
| RAM Size | 6K x 8 |
| Voltage - Supply (Vcc/Vdd) | 3.5V ~ 5.5V |
| Data Converters | A/D 16x8/10b |
| Oscillator Type | External |
| Operating Temperature | -40°C ~ 105°C (TA) |
| Mounting Type | Surface Mount |
| Package / Case | 100-LQFP |
| Supplier Device Package | 100-LQFP (14x14) |
| Purchase URL | https://www.e-xfl.com/product-detail/infineon-technologies/mb90347espmc-gs-511-ere2 |

| Part Number / Parameter | MB90V340E-101, MB90V340E-102 | MB90F342E(S), MB90F342CE(S), MB90F345E(S), MB90F345CE(S), MB90F346E(S), MB90F346CE(S), MB90F347E(S), MB90F347CE(S), MB90F349E(S), MB90F349CE(S) | MB90341E(S), MB90341CE(S), MB90342E(S), MB90342CE(S), MB90346E(S), MB90346CE(S), MB90347E(S), MB90347CE(S), MB90348E(S), MB90348CE(S), MB90349E(S), MB90349CE(S) |
|---|---|---|---|
| A/D Converter | 24 input channels | Devices with a C suffix in the part number : 24 channels<br>Devices without a C suffix in the part number : 16 channels | |
| | 10-bit or 8-bit resolution<br>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)<br>Supports External Event Count function | | |
| 16-bit Free-run Timer (2 channels) | Generates an interrupt signal on overflow<br>Supports Timer Clear when the output compare finds a match<br>Operation clock freq. : fsys, fsys/$2^1$, fsys/$2^2$, fsys/$2^3$, fsys/$2^4$, fsys/$2^5$, fsys/$2^6$, fsys/$2^7$<br>(fsys = Machine clock freq.)<br>Free-run Timer 0 (clock input FRCK0) corresponds to ICU 0/1/2/3, OCU 0/1/2/3<br>Free-run Timer 1 (clock input FRCK1) corresponds to ICU 4/5/6/7, OCU 4/5/6/7 | | |
| 16-bit Output Compare (8 channels) | Generates an interrupt signal when one of the 16-bit free-run timer matches the output compare register<br>A pair of compare registers can be used to generate an output signal. | | |
| 16-bit Input Capture (8 channels) | Captures the value of the 16-bit free-run timer and generates an interrupt when triggered by a pin input (rising edge, falling edge, or both rising and falling edges). | | |
| 8/16-bit Programmable Pulse Generator | 8 channels (16-bit) /16 channels (8-bit)<br>Sixteen 8-bit reload counters<br>Sixteen 8-bit reload registers for L pulse width<br>Sixteen 8-bit reload registers for H pulse width | | |
| | Supports 8-bit and 16-bit operation modes<br>A pair of 8-bit reload counters can be configured as one 16-bit reload counter or as<br>8-bit prescaler plus 8-bit reload counter<br>Operating clock freq. : fsys, fsys/$2^1$, fsys/$2^2$, fsys/$2^3$, fsys/$2^4$ or 128 μs@fosc = 4 MHz<br>(fsys = Machine clock frequency, fosc = Oscillation clock frequency) | | |
| CAN Interface | 3 channels | 2 channels :<br>MB90F342E(S), MB90F342CE(S),<br>MB90F345E(S), MB90F345CE(S)<br>1 channel :<br>MB90F346E(S), MB90F346CE(S),<br>MB90F347E(S), MB90F347CE(S),<br>MB90F349E(S), MB90F349CE(S) | 2 channels :<br>MB90341E(S), MB90341CE(S),<br>MB90342E(S), MB90342CE(S)<br>1 channel :<br>MB90346E(S), MB90346CE(S),<br>MB90347E(S), MB90347CE(S),<br>MB90348E(S), MB90348CE(S),<br>MB90349E(S), MB90349CE(S) |
| | Conforms to CAN Specification Version 2.0 Part A and B<br>Automatic re-transmission in case of error<br>Automatic transmission in response to Remote Frames<br>Prioritized 16 message buffers for data and ID's<br>Supports multiple messages<br>Flexible configuration of acceptance filtering :<br>Full bit compare/Full bit mask/Two partial bit masks<br>Supports up to 1 Mbps | | |

■ MB90341CE(S), MB90342CE(S), MB90F342CE(S), MB90F345CE(S), MB90346CE(S), MB90F346CE(S), MB90347CE(S), MB90F347CE(S), MB90348CE(S), MB90349CE(S), MB90F349CE(S)

(TOP VIEW)




(FPT-100P-M06)

* : X0A, X1A : devices without an S suffix in the part number
P40, P41 : devices with an S suffix in the part number

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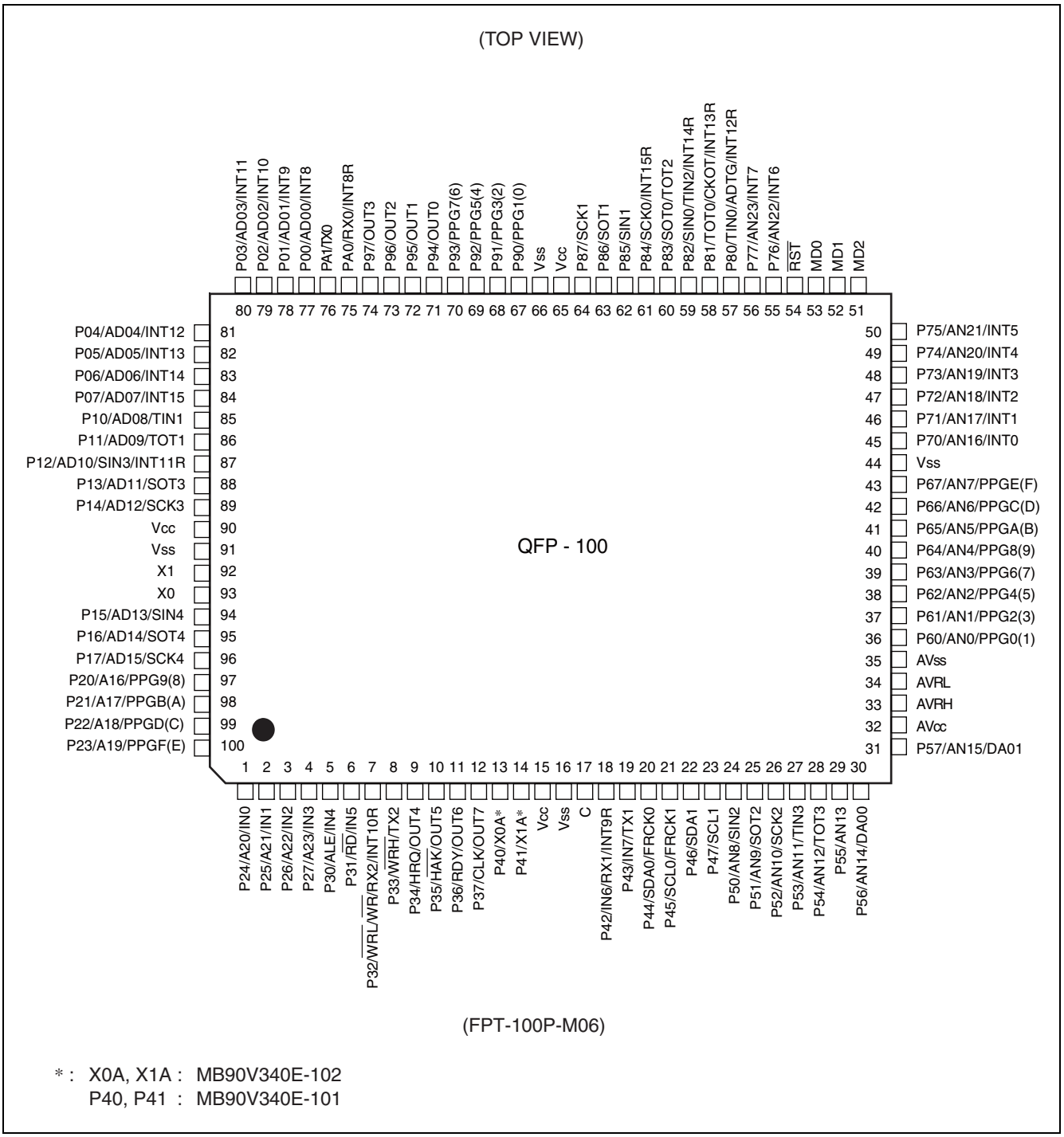
■ MB90V340E-101/MB90V340E-102




This pin assignment is for using MB90V340E-101/102 via probecable as MB90340E.

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| Pin No. | | Pin name | I/O Circuit type*3 | Function |
|---|---|---|---|---|
| QFP100*1 | LQFP100*2 | | | |
| 86 | 84 | P11 | G | General purpose I/O pin. 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 |
| 87 | 85 | P12 | N | General purpose I/O pin. 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 |
| 88 | 86 | P13 | G | General purpose I/O pin. 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 |
| 89 | 87 | P14 | G | General purpose I/O pin. 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 |
| 90 | 88 | $V_{CC}$ | — | Power (3.5 V to 5.5 V) input pin |
| 91 | 89 | $V_{SS}$ | — | GND pin |
| 92 | 90 | X1 | A | Main clock output pin |
| 93 | 91 | X0 | | Main clock input pin |
| 94 | 92 | P15 | G | General purpose I/O pin. 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. |
| 95 | 93 | P16 | G | General purpose I/O pin. 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. |

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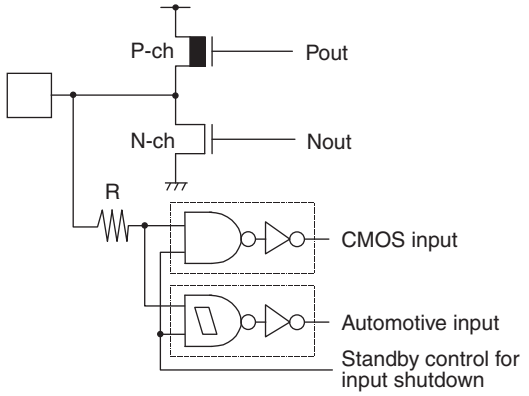
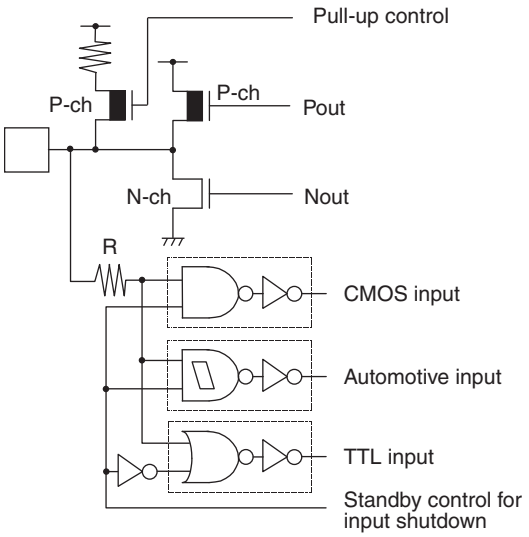
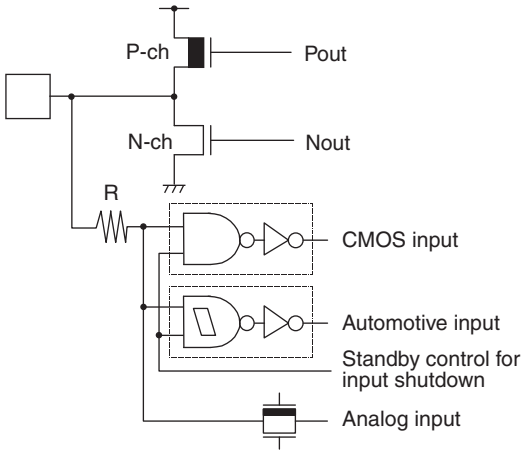
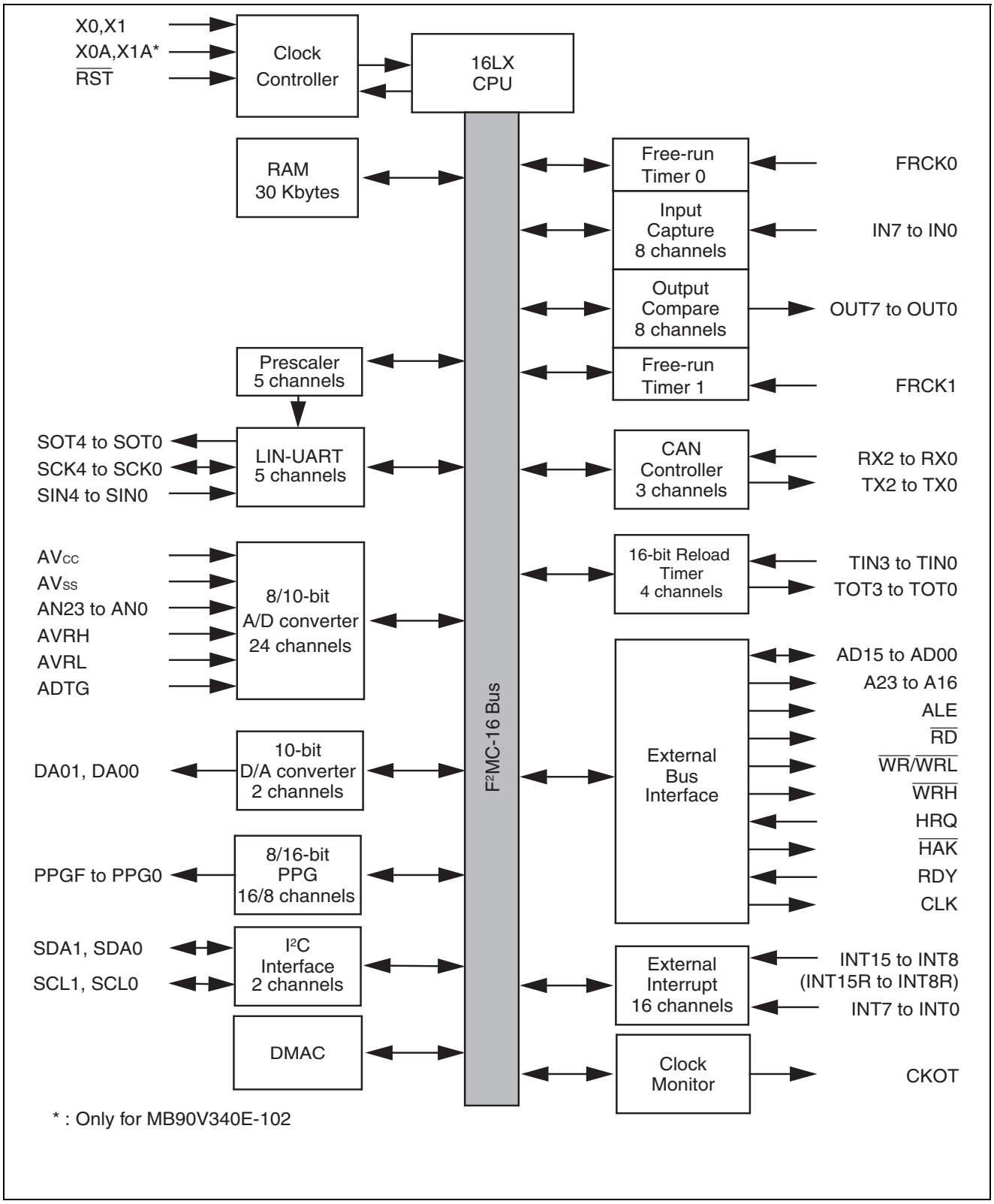
| Type | Circuit | Remarks |
|---|---|---|
| M |  | ■ CMOS level output ($I_{OL}$ = 4 mA, $I_{OH}$ = −4 mA)<br>■ CMOS input (with function to disconnect input during standby)<br>■ Automotive input (with function to disconnect input during standby) |
| N |  | ■ CMOS level output ($I_{OL}$ = 4 mA, $I_{OH}$ = −4 mA)<br>■ CMOS input (with function to disconnect input during standby)<br>■ Automotive input (with function to disconnect input during standby)<br>■ TTL input (with function to disconnect input during standby)<br>Programmable pull-up resistor: 50 kΩ approx |
| O |  | ■ CMOS level output ($I_{OL}$ = 4 mA, $I_{OH}$ = −4 mA)<br>■ CMOS input (with function to disconnect input during standby)<br>■ Automotive input (with function to disconnect input during standby)<br>■ A/D converter analog input |

## 6. Block Diagrams

- MB90V340E-101/102



| Address | Register | Abbreviation | Access | Resource name | Initial value |
|---|---|---|---|---|---|
| $007900_H$ | Reload Register L0 | PRLL0 | R/W | 16-bit PPG 0/1 | $XXXXXXXX_B$ |
| $007901_H$ | Reload Register H0 | PRLH0 | R/W | | $XXXXXXXX_B$ |
| $007902_H$ | Reload Register L1 | PRLL1 | R/W | | $XXXXXXXX_B$ |
| $007903_H$ | Reload Register H1 | PRLH1 | R/W | | $XXXXXXXX_B$ |
| $007904_H$ | Reload Register L2 | PRLL2 | R/W | 16-bit PPG 2/3 | $XXXXXXXX_B$ |
| $007905_H$ | Reload Register H2 | PRLH2 | R/W | | $XXXXXXXX_B$ |
| $007906_H$ | Reload Register L3 | PRLL3 | R/W | | $XXXXXXXX_B$ |
| $007907_H$ | Reload Register H3 | PRLH3 | R/W | | $XXXXXXXX_B$ |
| $007908_H$ | Reload Register L4 | PRLL4 | R/W | 16-bit PPG 4/5 | $XXXXXXXX_B$ |
| $007909_H$ | Reload Register H4 | PRLH4 | R/W | | $XXXXXXXX_B$ |
| $00790A_H$ | Reload Register L5 | PRLL5 | R/W | | $XXXXXXXX_B$ |
| $00790B_H$ | Reload Register H5 | PRLH5 | R/W | | $XXXXXXXX_B$ |
| $00790C_H$ | Reload Register L6 | PRLL6 | R/W | 16-bit PPG 6/7 | $XXXXXXXX_B$ |
| $00790D_H$ | Reload Register H6 | PRLH6 | R/W | | $XXXXXXXX_B$ |
| $00790E_H$ | Reload Register L7 | PRLL7 | R/W | | $XXXXXXXX_B$ |
| $00790F_H$ | Reload Register H7 | PRLH7 | R/W | | $XXXXXXXX_B$ |
| $007910_H$ | Reload Register L8 | PRLL8 | R/W | 16-bit PPG 8/9 | $XXXXXXXX_B$ |
| $007911_H$ | Reload Register H8 | PRLH8 | R/W | | $XXXXXXXX_B$ |
| $007912_H$ | Reload Register L9 | PRLL9 | R/W | | $XXXXXXXX_B$ |
| $007913_H$ | Reload Register H9 | PRLH9 | R/W | | $XXXXXXXX_B$ |
| $007914_H$ | Reload Register LA | PRLLA | R/W | 16-bit PPG A/B | $XXXXXXXX_B$ |
| $007915_H$ | Reload Register HA | PRLHA | R/W | | $XXXXXXXX_B$ |
| $007916_H$ | Reload Register LB | PRLLB | R/W | | $XXXXXXXX_B$ |
| $007917_H$ | Reload Register HB | PRLHB | R/W | | $XXXXXXXX_B$ |
| $007918_H$ | Reload Register LC | PRLLC | R/W | 16-bit PPG C/D | $XXXXXXXX_B$ |
| $007919_H$ | Reload Register HC | PRLHC | R/W | | $XXXXXXXX_B$ |
| $00791A_H$ | Reload Register LD | PRLLD | R/W | | $XXXXXXXX_B$ |
| $00791B_H$ | Reload Register HD | PRLHD | R/W | | $XXXXXXXX_B$ |
| $00791C_H$ | Reload Register LE | PRLLE | R/W | 16-bit PPG E/F | $XXXXXXXX_B$ |
| $00791D_H$ | Reload Register HE | PRLHE | R/W | | $XXXXXXXX_B$ |
| $00791E_H$ | Reload Register LF | PRLLF | R/W | | $XXXXXXXX_B$ |
| $00791F_H$ | Reload Register HF | PRLHF | R/W | | $XXXXXXXX_B$ |
| $007920_H$ | Input Capture 0 | IPCP0 | R | Input Capture 0/1 | $XXXXXXXX_B$ |
| $007921_H$ | Input Capture 0 | IPCP0 | R | | $XXXXXXXX_B$ |
| $007922_H$ | Input Capture 1 | IPCP1 | R | | $XXXXXXXX_B$ |
| $007923_H$ | Input Capture 1 | IPCP1 | R | | $XXXXXXXX_B$ |

*(Continued)*

| Address | Register | Abbreviation | Access | Resource name | Initial value |
|---|---|---|---|---|---|
| $007924_H$ | Input Capture 2 | IPCP2 | R | Input Capture 2/3 | $XXXXXXXX_B$ |
| $007925_H$ | Input Capture 2 | IPCP2 | R | | $XXXXXXXX_B$ |
| $007926_H$ | Input Capture 3 | IPCP3 | R | | $XXXXXXXX_B$ |
| $007927_H$ | Input Capture 3 | IPCP3 | R | | $XXXXXXXX_B$ |
| $007928_H$ | Input Capture 4 | IPCP4 | R | Input Capture 4/5 | $XXXXXXXX_B$ |
| $007929_H$ | Input Capture 4 | IPCP4 | R | | $XXXXXXXX_B$ |
| $00792A_H$ | Input Capture 5 | IPCP5 | R | | $XXXXXXXX_B$ |
| $00792B_H$ | Input Capture 5 | IPCP5 | R | | $XXXXXXXX_B$ |
| $00792C_H$ | Input Capture 6 | IPCP6 | R | Input Capture 6/7 | $XXXXXXXX_B$ |
| $00792D_H$ | Input Capture 6 | IPCP6 | R | | $XXXXXXXX_B$ |
| $00792E_H$ | Input Capture 7 | IPCP7 | R | | $XXXXXXXX_B$ |
| $00792F_H$ | Input Capture 7 | IPCP7 | R | | $XXXXXXXX_B$ |
| $007930_H$ | Output Compare 0 | OCCP0 | R/W | Output Compare 0/1 | $XXXXXXXX_B$ |
| $007931_H$ | Output Compare 0 | OCCP0 | R/W | | $XXXXXXXX_B$ |
| $007932_H$ | Output Compare 1 | OCCP1 | R/W | | $XXXXXXXX_B$ |
| $007933_H$ | Output Compare 1 | OCCP1 | R/W | | $XXXXXXXX_B$ |
| $007934_H$ | Output Compare 2 | OCCP2 | R/W | Output Compare 2/3 | $XXXXXXXX_B$ |
| $007935_H$ | Output Compare 2 | OCCP2 | R/W | | $XXXXXXXX_B$ |
| $007936_H$ | Output Compare 3 | OCCP3 | R/W | | $XXXXXXXX_B$ |
| $007937_H$ | Output Compare 3 | OCCP3 | R/W | | $XXXXXXXX_B$ |
| $007938_H$ | Output Compare 4 | OCCP4 | R/W | Output Compare 4/5 | $XXXXXXXX_B$ |
| $007939_H$ | Output Compare 4 | OCCP4 | R/W | | $XXXXXXXX_B$ |
| $00793A_H$ | Output Compare 5 | OCCP5 | R/W | | $XXXXXXXX_B$ |
| $00793B_H$ | Output Compare 5 | OCCP5 | R/W | | $XXXXXXXX_B$ |
| $00793C_H$ | Output Compare 6 | OCCP6 | R/W | Output Compare 6/7 | $XXXXXXXX_B$ |
| $00793D_H$ | Output Compare 6 | OCCP6 | R/W | | $XXXXXXXX_B$ |
| $00793E_H$ | Output Compare 7 | OCCP7 | R/W | | $XXXXXXXX_B$ |
| $00793F_H$ | Output Compare 7 | OCCP7 | R/W | | $XXXXXXXX_B$ |
| $007940_H$ | Timer Data 0 | TCDT0 | R/W | Free-run Timer 0 | $00000000_B$ |
| $007941_H$ | Timer Data 0 | TCDT0 | R/W | | $00000000_B$ |
| $007942_H$ | Timer Control Status 0 | TCCSL0 | R/W | | $00000000_B$ |
| $007943_H$ | Timer Control Status 0 | TCCSH0 | R/W | | $0XXXXXXX_B$ |
| $007944_H$ | Timer Data 1 | TCDT1 | R/W | Free-run Timer 1 | $00000000_B$ |
| $007945_H$ | Timer Data 1 | TCDT1 | R/W | | $00000000_B$ |
| $007946_H$ | Timer Control Status 1 | TCCSL1 | R/W | | $00000000_B$ |
| $007947_H$ | Timer Control Status 1 | TCCSH1 | R/W | | $0XXXXXXX_B$ |

*(Continued)*

*(Continued)*

| Interrupt cause | EI$^2$OS Support | DMA channel 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 EI$^2$OS stop function
N : Unusable

**Note:**
- 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.

## 11.3 DC Characteristics

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

| Parameter | Symbol | Pin | Condition | Value | | | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | | |
| Input H voltage (At $V_{CC}$ = 5 V ± 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, P85) |
| | $V_{IHA}$ | — | — | 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 V ± 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, P85) |
| | $V_{ILA}$ | — | — | $V_{SS}$ − 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 V, $I_{OH}$ = −4.0 mA | $V_{CC}$ − 0.5 | — | — | V | |
| Output H voltage | $V_{OHI}$ | $I^2C$ current outputs | $V_{CC}$ = 4.5 V, $I_{OH}$ = −3.0 mA | $V_{CC}$ − 0.5 | — | — | V | |
| Output L voltage | $V_{OL}$ | Normal outputs | $V_{CC}$ = 4.5 V, $I_{OL}$ = 4.0 mA | — | — | 0.4 | V | |
| Output L voltage | $V_{OLI}$ | $I^2C$ current outputs | $V_{CC}$ = 4.5 V, $I_{OL}$ = 3.0 mA | — | — | 0.4 | V | |

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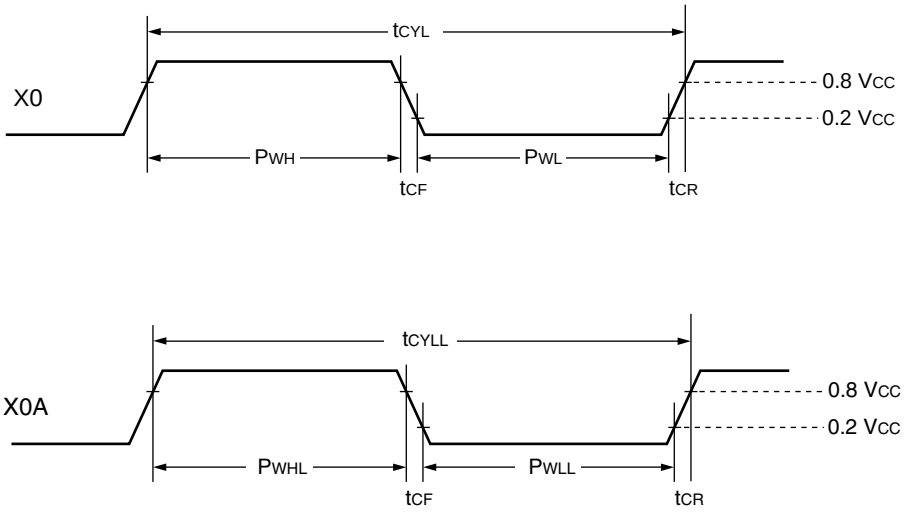
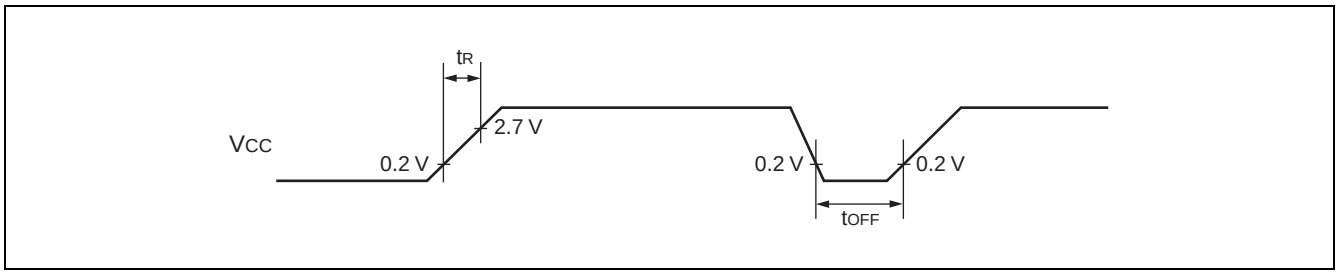
Clock Timing



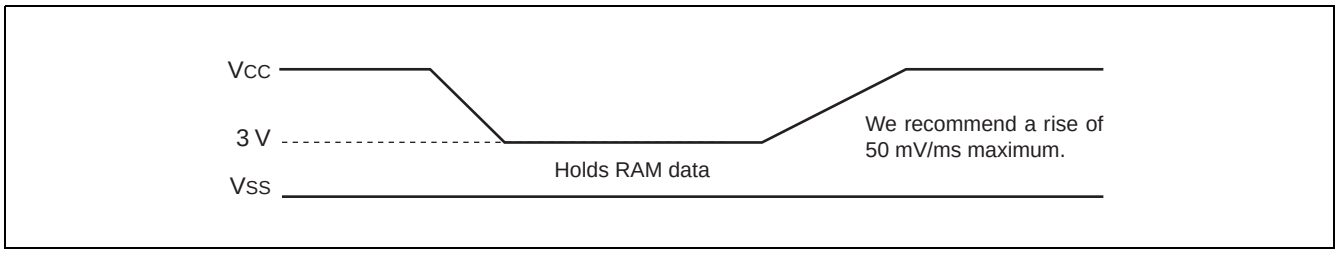
### 11.4.3 Power On Reset

($T_A$ = −40°C to +105°C, $V_{CC}$ = 5.0 V ± 10%, $f_{CP}$ ≤ 24 MHz, $V_{SS}$ = $AV_{SS}$ = 0.0 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 | Waiting time until power-on |




**Note:** : 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.




### 11.4.4 Clock Output Timing

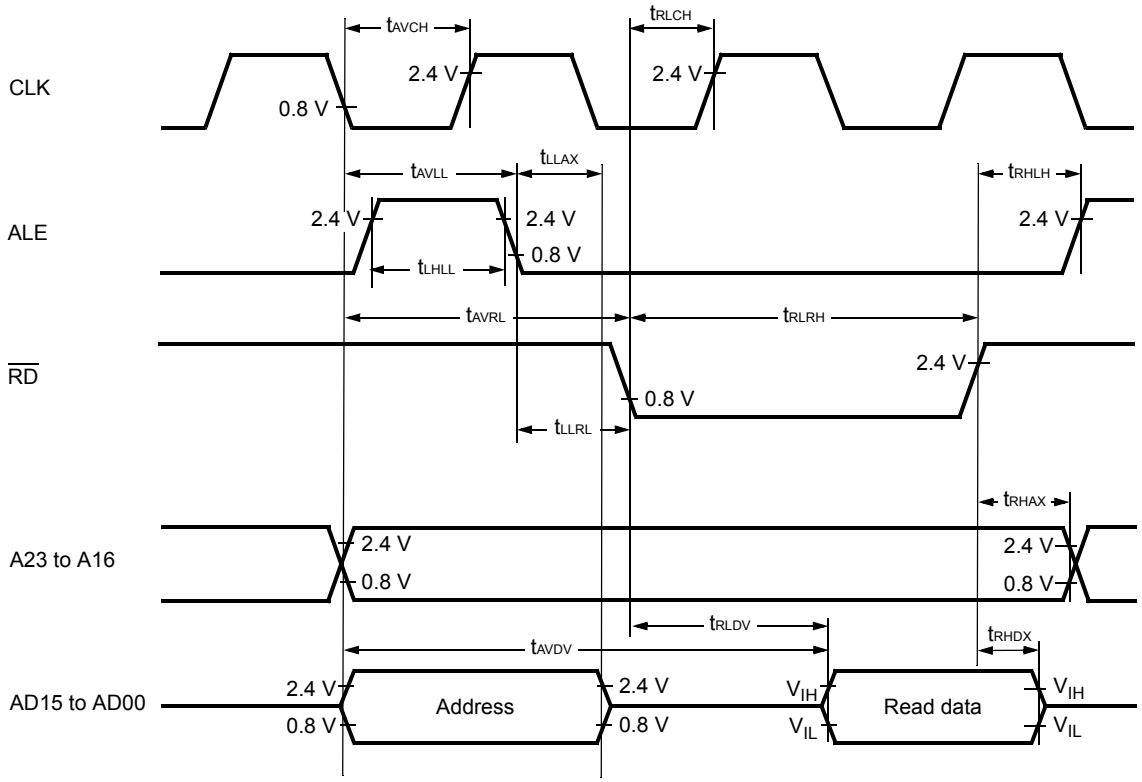
($T_A$ = −40°C to +105°C, $V_{CC}$ = 5.0 V ± 10%, $V_{SS}$ = 0.0 V, $f_{CP}$ ≤ 24 MHz)

| Parameter | Symbol | Pin | Condition | Value | | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | Min | Max | | |
| Cycle time | $t_{CYC}$ | CLK | — | 62.5 | — | ns | $f_{CP}$ = 16 MHz |
| | | | | 41.67 | — | ns | $f_{CP}$ = 24 MHz |
| CLK ↑ → CLK ↓ | $t_{CHCL}$ | CLK | — | 20 | — | ns | $f_{CP}$ = 16 MHz |
| | | | | 13 | — | ns | $f_{CP}$ = 24 MHz |

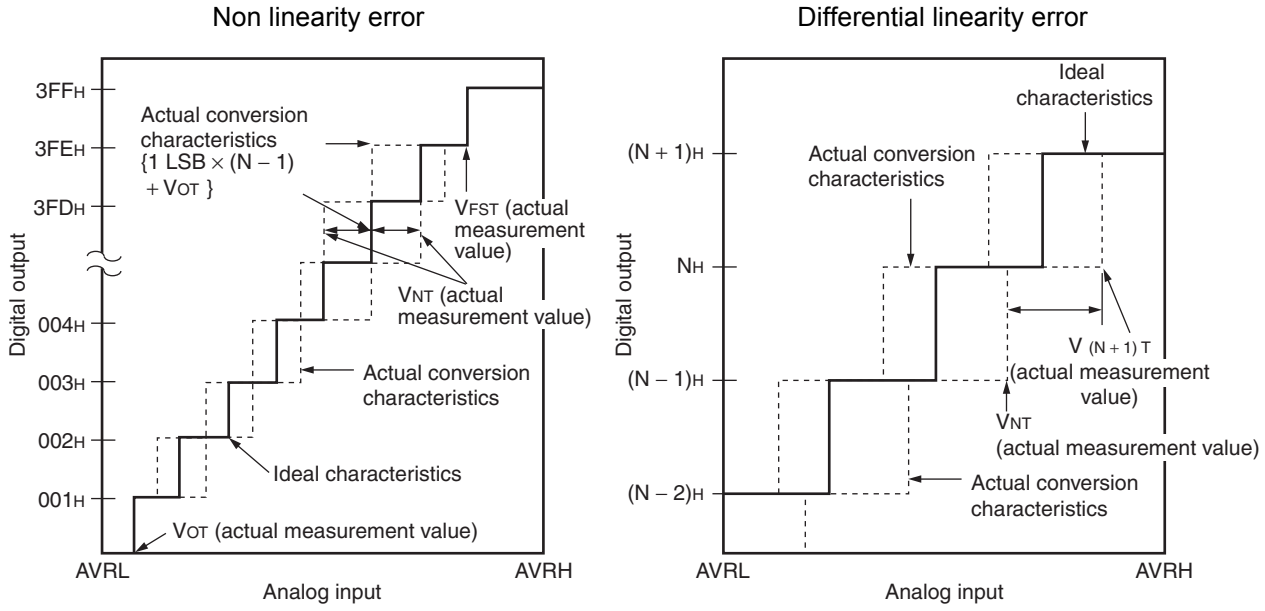
### 11.4.5 Bus Timing (Read)

($T_A$ = −40°C to +105°C, $V_{CC}$ = 5.0 V ± 10%, $V_{SS}$ = 0.0 V, $f_{CP}$ ≤ 24 MHz)

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



*(Continued)*




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

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

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

N : Value of the digital output from the A/D converter
$V_{OT}$ : Voltage at which digital output transits from "$000_H$" to "$001_H$."
$V_{FST}$ : Voltage at which digital output transits from "$3FE_H$" to "$3FF_H$."

## 11.7 Notes on A/D Converter Section

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

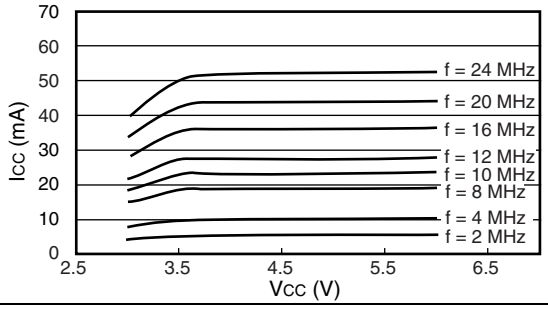
Recommended output impedance of external circuits are : Approx. 1.5 kΩ or lower (4.0 V≤ $AV_{CC}$≤ 5.5 V, sampling period = 0.5 µs)

If an external capacitor is used, in consideration of the capacitive voltage dividing effect between the external capacitor and the internal on-chip capacitor, it is recommended that the capacitance of the external capacitor be several thousand times greater than the capacitance of the internal capacitor.

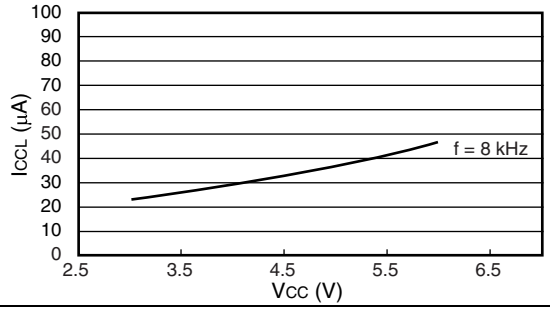
## 12. Example Characteristics

- MB90F346E, MB90F346ES, MB90F346CE, MB90F346CES

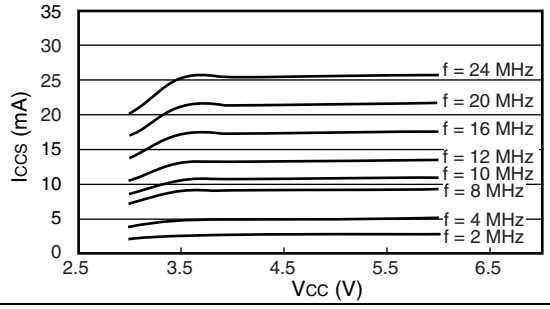
$I_{CC} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



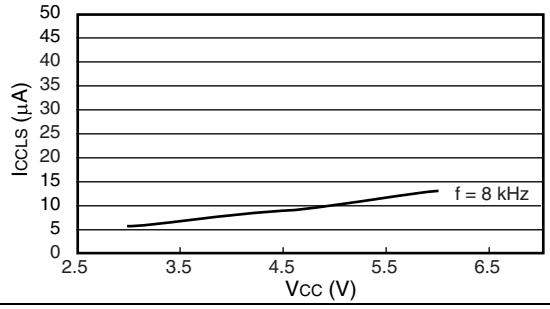

$I_{CCL} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



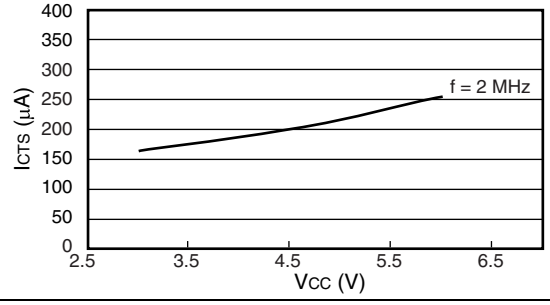

$I_{CCS} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



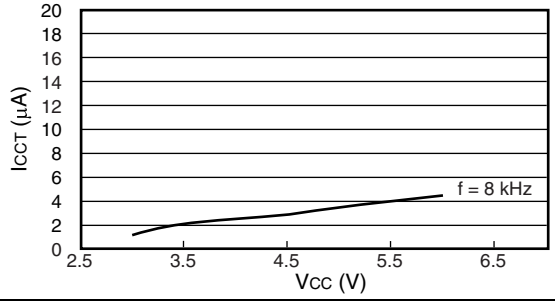

$I_{CCLS} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



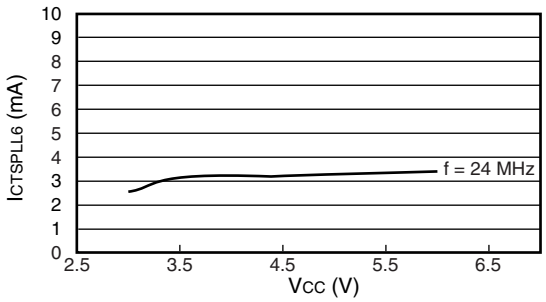

$I_{CTS} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



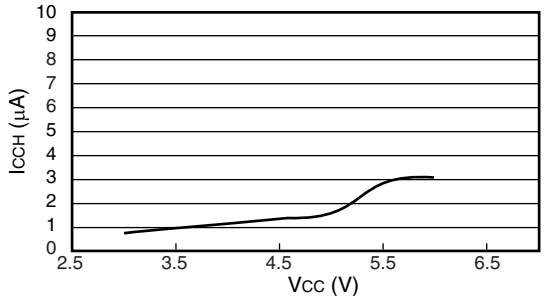

$I_{CCT} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency




$I_{CTSPLL6} - V_{CC}$
$T_A = +25°C$, external clock operation, f = Internal operation frequency



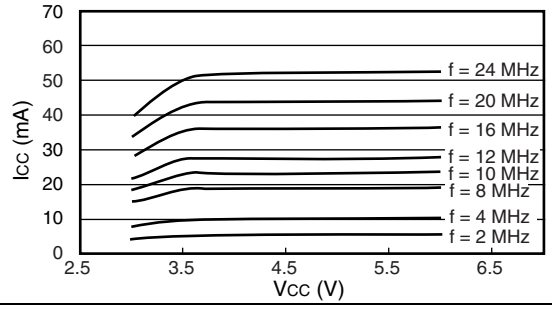

$I_{CCH} - V_{CC}$
$T_A = +25°C$, stopped



■ MB90F347E, MB90F347ES, MB90F347CE, MB90F347CES

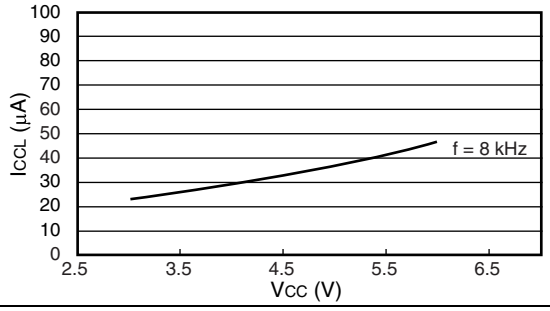
$I_{CC} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



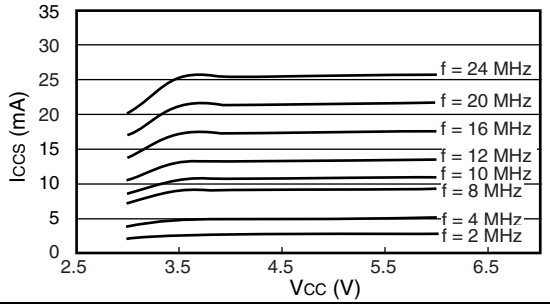

$I_{CCL} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



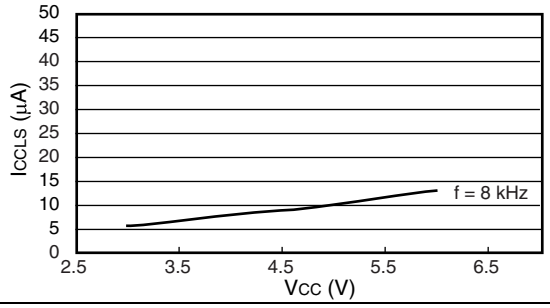

$I_{CCS} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



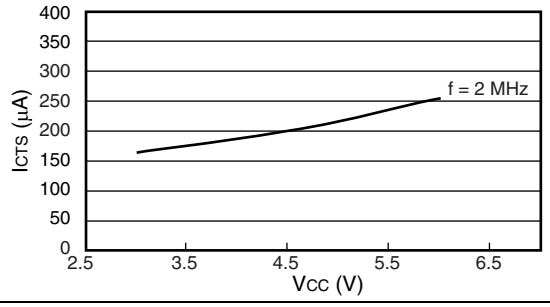

$I_{CCLS} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



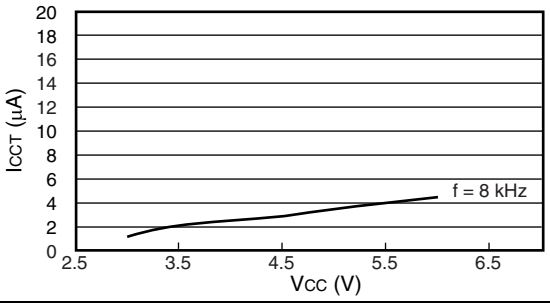

$I_{CTS} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



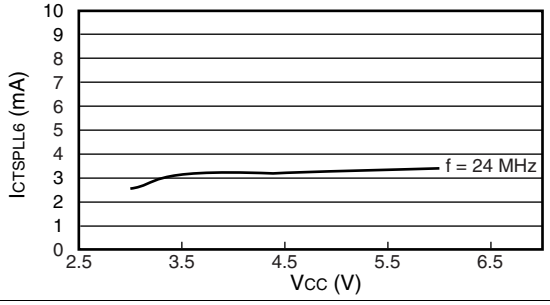

$I_{CCT} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



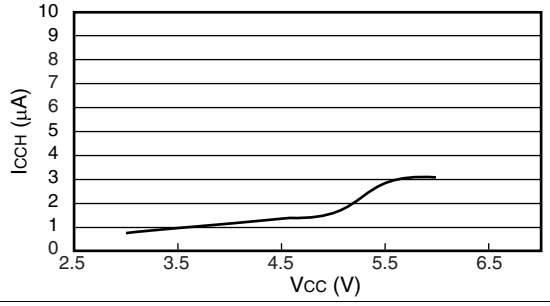

$I_{CTSPLL6} - V_{CC}$

$T_A = +25°C$, external clock operation f = Internal operation frequency



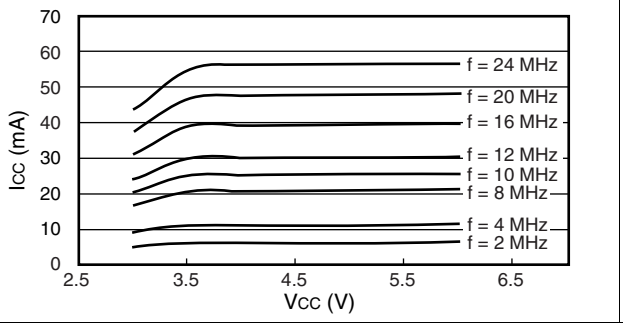

$I_{CCH} - V_{CC}$

$T_A = +25°C$, stopped

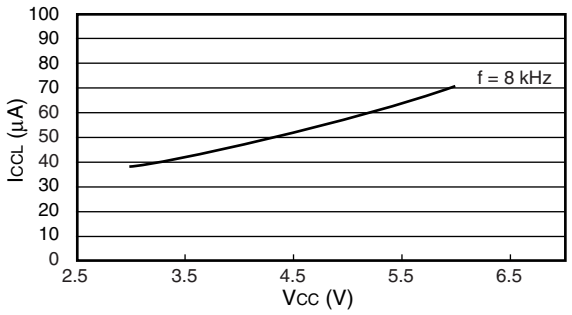


■ MB90F349E, MB90F349ES, MB90F349CE, MB90F349CES

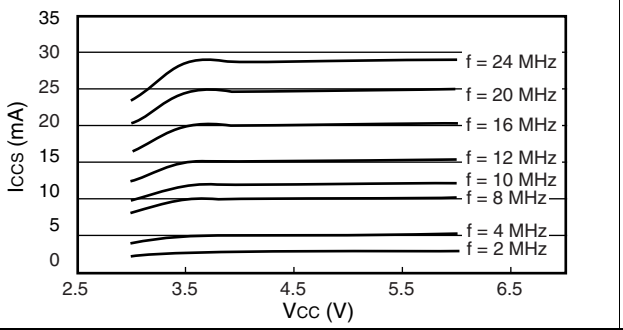
$I_{CC} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



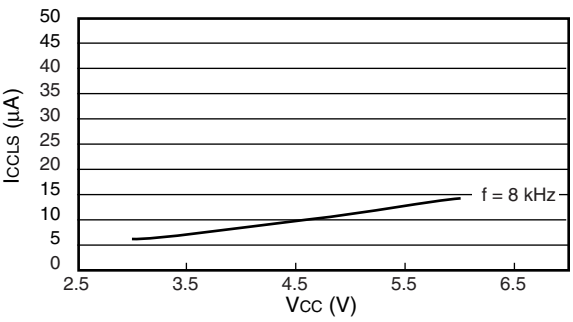

$I_{CCL} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



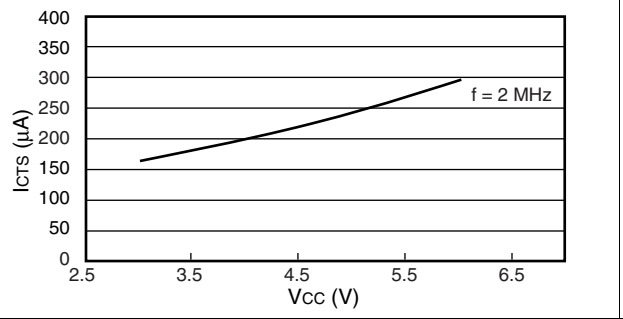

$I_{CCS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



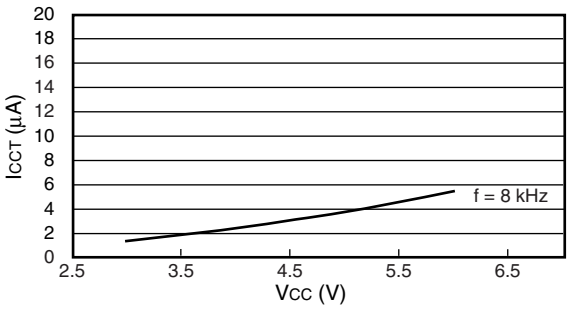

$I_{CCLS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



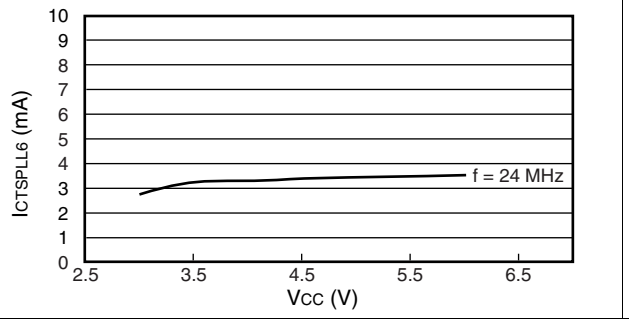

$I_{CTS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



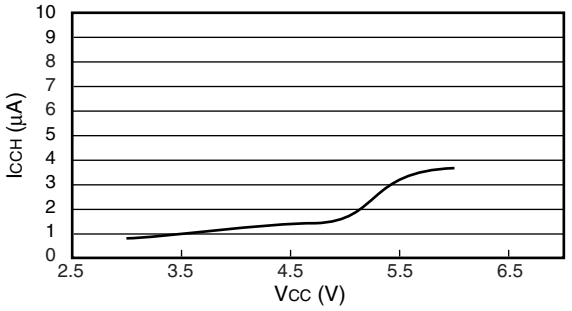

$I_{CCT} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency




$I_{CTSPLL6} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency

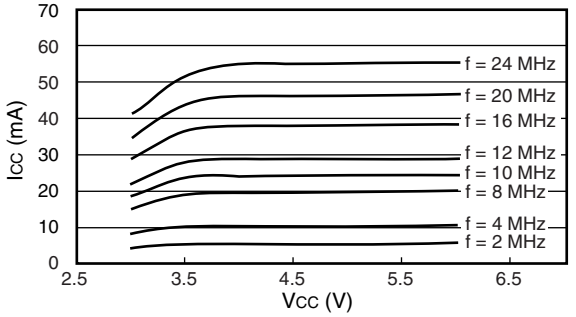



$I_{CCH} - V_{CC}$
$T_A = +25°C$, stopped

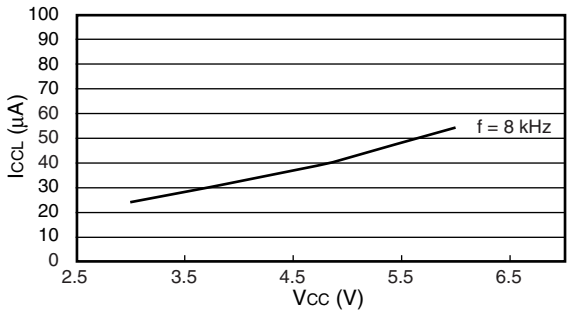


■ MB90346E, MB90346ES, MB90346CE, MB90346CES

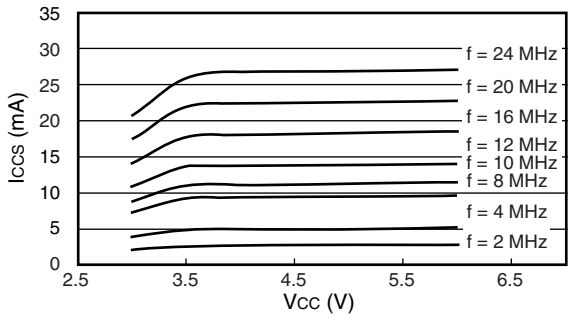
$I_{CC} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



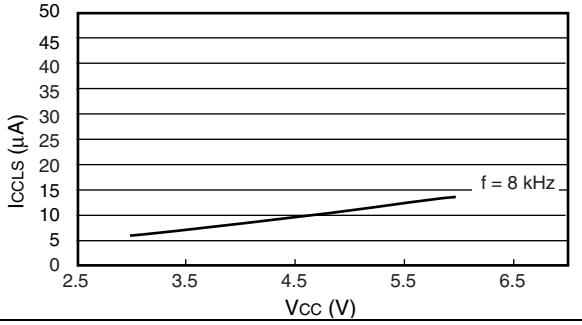

$I_{CCL} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



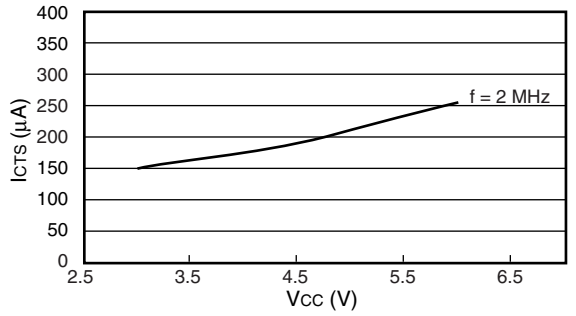

$I_{CCS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



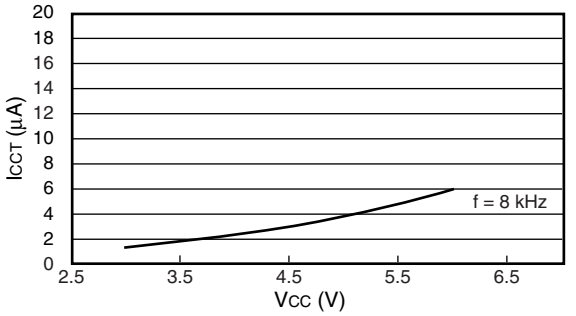

$I_{CCLS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



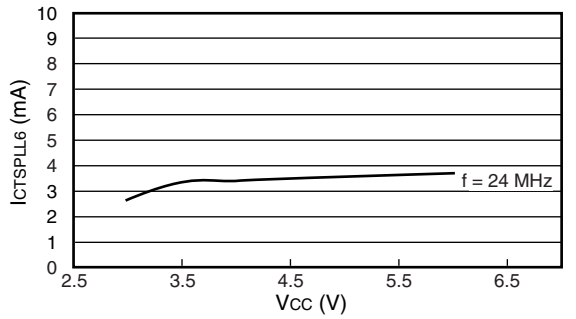

$I_{CTS} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency



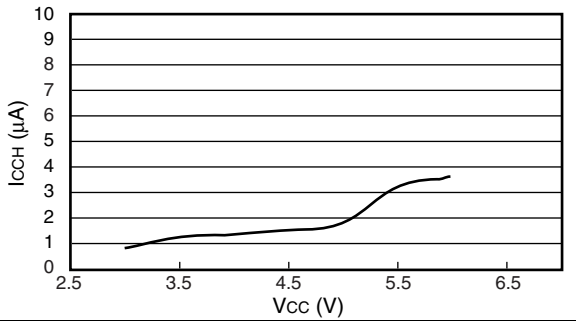

$I_{CCT} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency




$I_{CTSPLL6} - V_{CC}$
$T_A = +25°C$, external clock operation f = Internal operation frequency




$I_{CCH} - V_{CC}$
$T_A = +25°C$, stopped



## 13. Ordering Information

| Part number | Package | Remarks |
|---|---|---|
| MB90F342EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90F342ESPF | | |
| MB90F342CEPF | | |
| MB90F342CESPF | | |
| MB90F342EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90F342ESPMC | | |
| MB90F342CEPMC | | |
| MB90F342CESPMC | | |
| MB90F345EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90F345ESPF | | |
| MB90F345CEPF | | |
| MB90F345CESPF | | |
| MB90F345EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90F345ESPMC | | |
| MB90F345CEPMC | | |
| MB90F345CESPMC | | |
| MB90F346EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90F346ESPF | | |
| MB90F346CEPF | | |
| MB90F346CESPF | | |
| MB90F346EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90F346ESPMC | | |
| MB90F346CEPMC | | |
| MB90F346CESPMC | | |

*(Continued)*

| Part number | Package | Remarks |
|---|---|---|
| MB90F347EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90F347ESPF | | |
| MB90F347CEPF | | |
| MB90F347CESPF | | |
| MB90F347EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90F347ESPMC | | |
| MB90F347CEPMC | | |
| MB90F347CESPMC | | |
| MB90F349EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90F349ESPF | | |
| MB90F349CEPF | | |
| MB90F349CESPF | | |
| MB90F349EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90F349ESPMC | | |
| MB90F349CEPMC | | |
| MB90F349CESPMC | | |
| MB90341EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90341ESPF | | |
| MB90341CEPF | | |
| MB90341CESPF | | |
| MB90341EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90341ESPMC | | |
| MB90341CEPMC | | |
| MB90341CESPMC | | |
| MB90342EPF | 100-pin plastic QFP (FPT-100P-M06) | |
| MB90342ESPF | | |
| MB90342CEPF | | |
| MB90342CESPF | | |
| MB90342EPMC | 100-pin plastic LQFP (FPT-100P-M20) | |
| MB90342ESPMC | | |
| MB90342CEPMC | | |
| MB90342CESPMC | | |

*(Continued)*