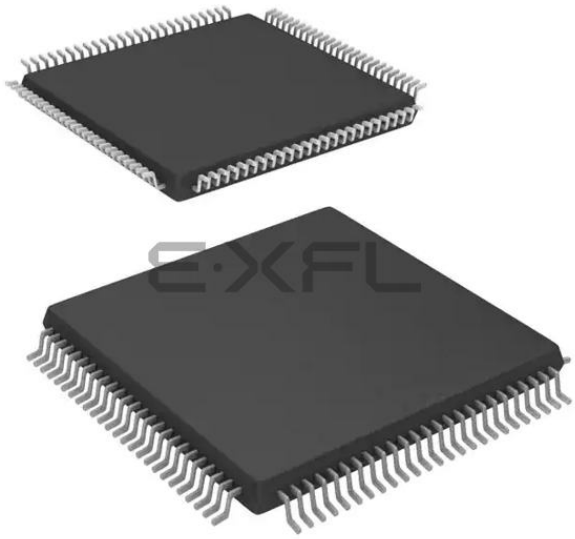

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Details	
Product Status	Not For New Designs
Core Processor	8051
Core Size	8-Bit
Speed	25MHz
Connectivity	EBI/EMI, SMBus (2-Wire/I²C), SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	59
Program Memory Size	64KB (64K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	4.25K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 2x16b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-TQFP
Supplier Device Package	100-TQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/silicon-labs/c8051f064-gqr

Table 4.1. Pin Definitions (Continued)

Name	Pin Numbers				Type	Description
	F060	F061	F064	F065		
	F062	F063	F066	F067		
P5.2/A10	86		86		D I/O	Port 5.2. See Port Input/Output section for complete description.
P5.3/A11	85		85		D I/O	Port 5.3. See Port Input/Output section for complete description.
P5.4/A12	84		84		D I/O	Port 5.4. See Port Input/Output section for complete description.
P5.5/A13	83		83		D I/O	Port 5.5. See Port Input/Output section for complete description.
P5.6/A14	82		82		D I/O	Port 5.6. See Port Input/Output section for complete description.
P5.7/A15	81		81		D I/O	Port 5.7. See Port Input/Output section for complete description.
P6.0/A8m/A0	80		80		D I/O	Port 6.0. See Port Input/Output section for complete description. Bit 8 External Memory Address Bus (Multiplexed mode). Bit 0 External Memory Address Bus (Non-multiplexed mode).
P6.1/A9m/A1	79		79		D I/O	Port 6.1. See Port Input/Output section for complete description.
P6.2/A10m/A2	78		78		D I/O	Port 6.2. See Port Input/Output section for complete description.
P6.3/A11m/A3	77		77		D I/O	Port 6.3. See Port Input/Output section for complete description.
P6.4/A12m/A4	76		76		D I/O	Port 6.4. See Port Input/Output section for complete description.
P6.5/A13m/A5	75		75		D I/O	Port 6.5. See Port Input/Output section for complete description.
P6.6/A14m/A6	74		74		D I/O	Port 6.6. See Port Input/Output section for complete description.
P6.7/A15m/A7	73		73		D I/O	Port 6.7. See Port Input/Output section for complete description.
P7.0/AD0m/D0	72		72		D I/O	Port 7.0. See Port Input/Output section for complete description. Bit 0 External Memory Address/Data Bus (Multiplexed mode). Bit 0 External Memory Data Bus (Non-multiplexed mode).
P7.1/AD1m/D1	71		71		D I/O	Port 7.1. See Port Input/Output section for complete description.

6.2. DMA0 Instruction Format

DMA instructions can request single-ended data from both ADC0 and ADC1, as well as the differential combination of the two ADC inputs. The instruction format is identical to the DMA0IDT register, shown in Figure 6.7. Depending on which bits are set to ‘1’ in the instruction word, either 2 or 4 bytes of data will be written to XRAM for each DMA instruction cycle (excluding End-Of-Operation instructions). Table 6.1 details all of the valid DMA instructions. Instructions not listed in the table are not valid DMA instructions, and should not be used. Note that the ADCs can be independently controlled by the microcontroller when their outputs are not requested by the DMA.

Table 6.1. DMA0 Instruction Set

Instruction Word	Description	First Data Written to XRAM (2 bytes)	Second Data Written to XRAM (2 bytes)
00000000b	End-Of-Operation	none	none
10000000b	End-Of-Operation with Continuous Conversion	none	none
x0010000b	Retrieve ADC0 Data	ADC0H:ADC0L	none
x0100000b	Retrieve ADC1 Data	ADC1H:ADC1L	none
x0110000b	Retrieve ADC0 and ADC1 Data	ADC0H:ADC0L	ADC1H:ADC1L
x10x0000b	Retrieve Differential Data	ADC0H:ADC0L (differential result from both ADCs)	none
x11x0000b	Retrieve Differential and ADC1 Data	ADC0H:ADC0L (differential result from both ADCs)	ADC1H:ADC1L

6.3. XRAM Addressing and Setup

The DMA Interface can be configured to access either on-chip or off-chip XRAM. Any writes to on-chip XRAM by the DMA Control Logic occur when the processor core is not accessing the on-chip XRAM. This ensures that the DMA will not interfere with processor instruction timing.

Off-chip XRAM access (only available on the C8051F060/2/4/6) is controlled by the DMA0HLT bit in DMA0CF (DMA Configuration Register, Figure 6.5). The DMA will have full access to off-chip XRAM when this bit is ‘0’, and the processor core will have full access to off-chip XRAM when this bit is ‘1’. The DMA0HLT bit should be controlled in software when both the processor core and the DMA Interface require access to off-chip XRAM data space. Before setting DMA0HLT to ‘1’, the software should check the DMA0XBY bit to ensure that the DMA is not currently accessing off-chip XRAM. The processor core cannot access off-chip XRAM while DMA0HLT is ‘0’. The processor will continue as though it was able to perform the desired memory access, but the data will not be written to or read from off-chip XRAM. When the processor core is finished accessing off-chip XRAM, DMA0HLT should be set back to ‘0’in software to return control to the DMA Interface. The DMA Control Logic will wait until DMA0HLT is ‘0’ before writing data to off-chip XRAM. If new data becomes available to the DMA Interface before the previous data has been written, an overflow condition will occur, and the new data word may be lost.

The Data Address Pointer Registers (DMA0DSH and DMA0DSL) contain the 16-bit XRAM address location where the DMA interface will write data. When the DMA is initially enabled, the DMA Data Address

Pointer Registers are initialized to the values contained in the DMA Data Address Beginning Registers (DMA0DAH and DMA0DAL). The Data Address Pointer Registers are automatically incremented by 2 or 4 after each data write by the DMA interface.

6.4. Instruction Execution in Mode 0

When the DMA interface begins an operation cycle, the DMA Instruction Status Register (DMA0ISW, Figure 6.9) is loaded with the address contained in the DMA Instruction Boundary Register (DMA0BND, Figure 6.8). The instruction is fetched from the Instruction Buffer, and the DMA Control Logic waits for data from the appropriate ADC(s). The DMA will execute each instruction once, and then increment DMA0ISW to the next instruction address. When the current DMA instruction is an End of Operation instruction, the Instruction Status Register is reset to the Instruction Boundary Register. If the Continuous Conversion bit (bit 7, CCNV) in the End of Operation instruction word is set to '1', the Repeat Counter is ignored, and the DMA will continue to execute instructions indefinitely. When CCNV is set to '0', the Repeat Counter (registers DMA0CSH and DMA0CSL) is decremented, and the DMA will continue to execute instructions until the Repeat Counter reaches 0x0000. The Repeat Counter is initialized with the Repeat Counter Limit value (registers DMA0CTH and DMA0CTL) at the beginning of the DMA operation. An example of Mode 0 operation is shown in Figure 6.2.

Figure 6.2. DMA Mode 0 Operation

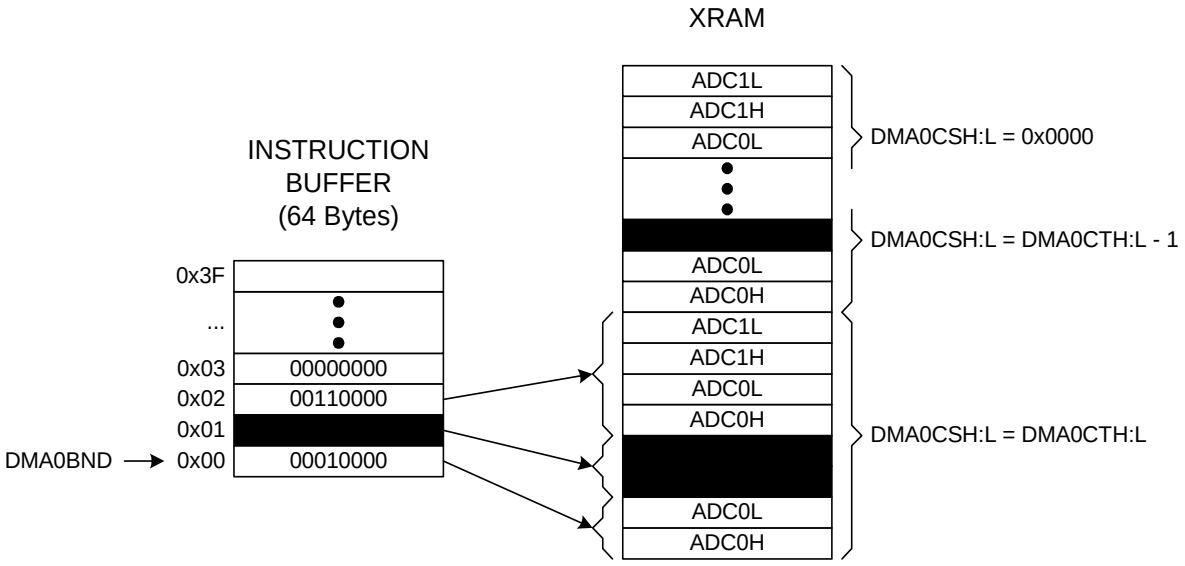


Figure 7.8. ADC2H: ADC2 Data Word MSB Register

SFR Page: 2
SFR Address: 0xBF

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
								00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

Bits7-0: ADC2 Data Word High-Order Bits.
For AD2LJST = 0: Bits 7-2 are the sign extension of Bit 1. Bits 1-0 are the upper 2 bits of the 10-bit ADC2 Data Word.
For AD2LJST = 1: Bits 7-0 are the most-significant bits of the 10-bit ADC2 Data Word.

Figure 7.9. ADC2L: ADC2 Data Word LSB Register

SFR Page: 2
SFR Address: 0xBE

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
								00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

Bits7-0: ADC2 Data Word Low-Order Bits.
For AD2LJST = 0: Bits 7-0 are the lower 8 bits of the 10-bit Data Word.
For AD2LJST = 1: Bits 7-6 are the lower 2 bits of the 10-bit Data Word. Bits 5-0 will always read ‘0’.

7.3.1. Window Detector In Single-Ended Mode

Figure 7.15 shows two example window comparisons for right-justified, single-ended data, with ADC2LTH:ADC2LTL = 0x0080 (128d) and ADC2GTH:ADC2GTL = 0x0040 (64d). In single-ended mode, the input voltage can range from '0' to VREF * (1023/1024) with respect to AGND, and is represented by a 10-bit unsigned integer value. In the left example, an AD2WINT interrupt will be generated if the ADC2 conversion word (ADC2H:ADC2L) is within the range defined by ADC2GTH:ADC2GTL and ADC2LTH:ADC2LTL (if 0x0040 < ADC2H:ADC2L < 0x0080). In the right example, and AD2WINT interrupt will be generated if the ADC2 conversion word is outside of the range defined by the ADC2GT and ADC2LT registers (if ADC2H:ADC2L < 0x0040 or ADC2H:ADC2L > 0x0080). Figure 7.16 shows an example using left-justified data with the same comparison values.

Figure 7.15. ADC Window Compare Example: Right-Justified Single-Ended Data

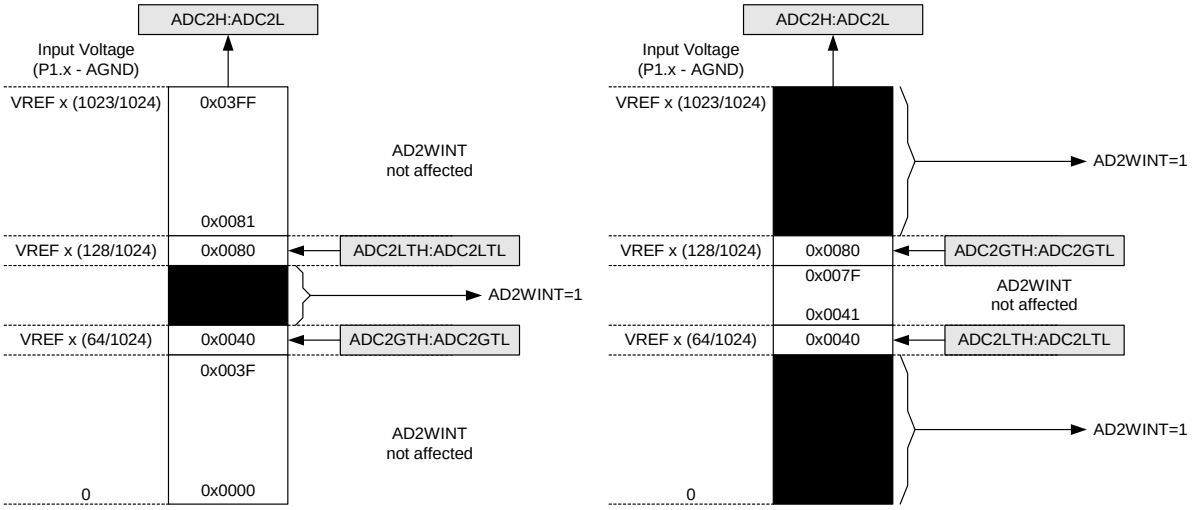
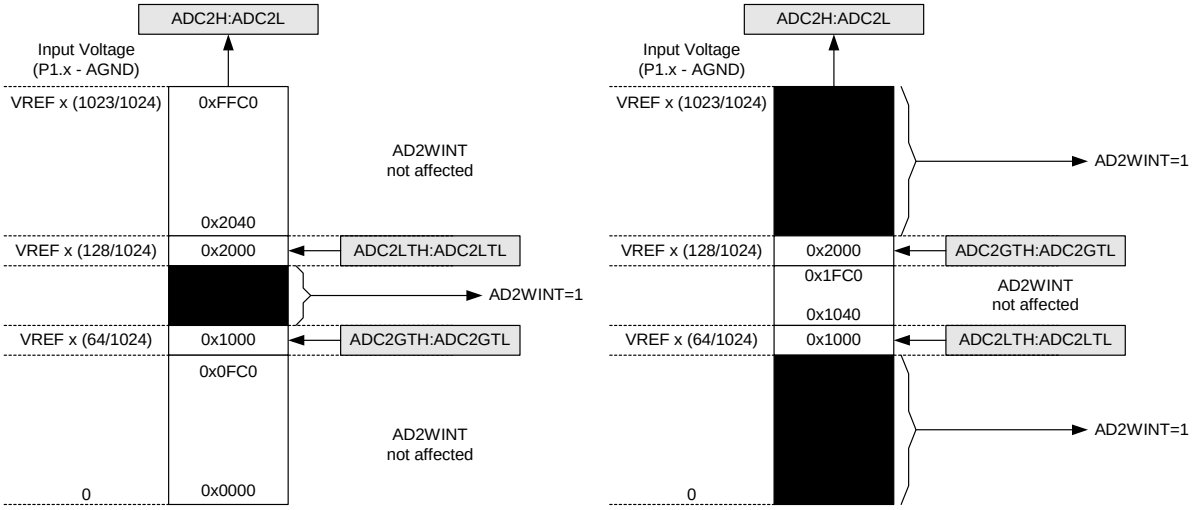


Figure 7.16. ADC Window Compare Example: Left-Justified Single-Ended Data



10. Voltage Reference 2 (C8051F061/3)

The internal voltage reference circuit consists of a 1.2 V, temperature stable bandgap voltage reference generator and a gain-of-two output buffer amplifier. The internal reference may be routed via the VREF pin to external system components or to the VREF2 input pin shown in Figure 10.1. The maximum load seen by the VREF pin must be less than 200 µA to AGND. Bypass capacitors of 0.1 µF and 4.7 µF are recommended from the VREF pin to AGND, as shown in Figure 10.1.

The VREF2 pin provides a voltage reference input for ADC2 and the DACs. ADC2 may also reference the analog power supply voltage, via the VREF multiplexers shown in Figure 10.1.

The Reference Control Register 2, REF2CN (defined in Figure 10.2) enables/disables the internal reference generator and selects the reference input for ADC2. The BIASE bit in REF2CN enables the on-board reference generator while the REFBE bit enables the gain-of-two buffer amplifier which drives the VREF pin. When disabled, the supply current drawn by the bandgap and buffer amplifier falls to less than 1 µA (typical) and the output of the buffer amplifier enters a high impedance state. If the internal bandgap is used as the reference voltage generator, BIASE and REFBE must both be set to logic 1. If the internal reference is not used, REFBE may be set to logic 0. Note that the BIASE bit must be set to logic 1 if ADC2 or either DAC is used, regardless of the voltage reference used. If neither ADC2 nor the DACs are being used, both of these bits can be set to logic 0 to conserve power. Bit AD2VRS selects between VREF2 and AV+ for the ADC2 voltage reference source. The electrical specifications for the Voltage Reference are given in Table 10.1.

Figure 10.1. Voltage Reference Functional Block Diagram

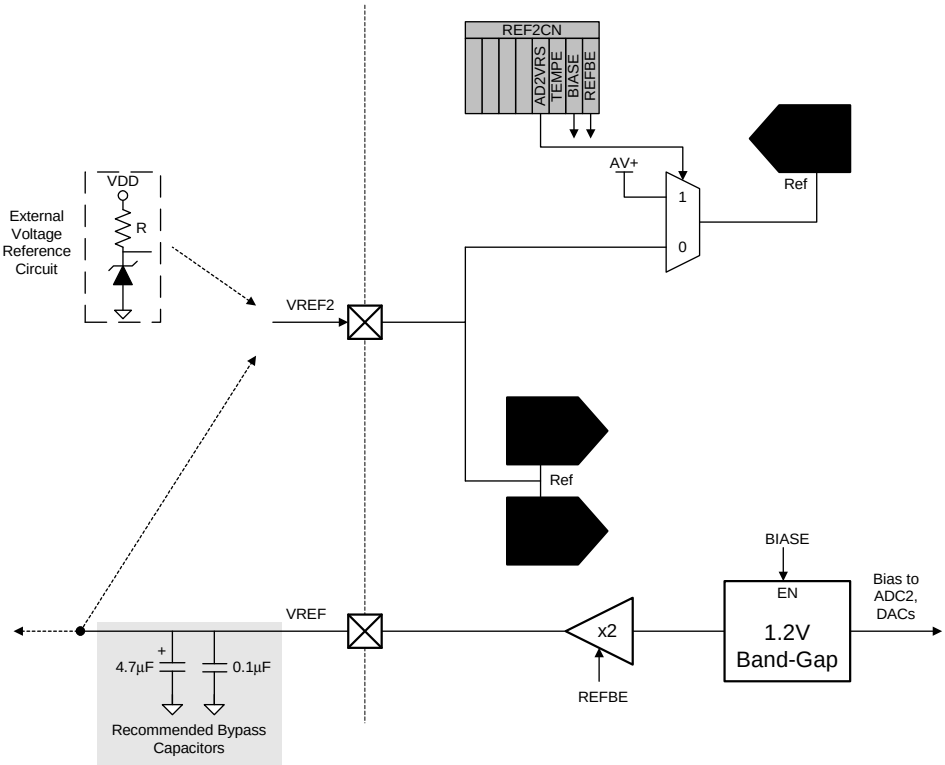


Figure 13.17. ACC: Accumulator

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
ACC.7	ACC.6	ACC.5	ACC.4	ACC.3	ACC.2	ACC.1	ACC.0	00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Bit Addressable

SFR Address: 0xE0
SFR Page: All Pages

Bits7-0: ACC: Accumulator.
This register is the accumulator for arithmetic operations.

Figure 13.18. B: B Register

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
B.7	B.6	B.5	B.4	B.3	B.2	B.1	B.0	00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Bit Addressable

SFR Address: 0xF0
SFR Page: All Pages

Bits7-0: B: B Register.
This register serves as a second accumulator for certain arithmetic operations.

Figure 13.24. EIP2: Extended Interrupt Priority 2

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
PDMA0	PS1	PCAN0	PADC2	PWADC2	PT4	PADC1	PT3	00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0xF7
SFR Page: All Pages

Bit7: PDMA0: DMA0 Interrupt Priority Control.
This bit sets the priority of the DMA0 interrupt.
0: DMA0 interrupt set to low priority.
1: DMA0 interrupt set to high priority.

Bit6: PS1: UART1 Interrupt Priority Control.
This bit sets the priority of the UART1 interrupt.
0: UART1 interrupt set to low priority.
1: UART1 interrupt set to high priority.

Bit5: PCAN0: CAN Interrupt Priority Control.
This bit sets the priority of the CAN Interrupt.
0: CAN Interrupt set to low priority level.
1: CAN Interrupt set to high priority level.

Bit4: PADC2: ADC2 End Of Conversion Interrupt Priority Control.
This bit sets the priority of the ADC2 End of Conversion interrupt.
0: ADC2 End of Conversion interrupt set to low priority.
1: ADC2 End of Conversion interrupt set to high priority.

Bit3: PWADC2: ADC2 Window Comparator Interrupt Priority Control.
0: ADC2 Window interrupt set to low priority.
1: ADC2 Window interrupt set to high priority.

Bit2: PT4: Timer 4 Interrupt Priority Control.
This bit sets the priority of the Timer 4 interrupt.
0: Timer 4 interrupt set to low priority.
1: Timer 4 interrupt set to high priority.

Bit1: PADC1: ADC End of Conversion Interrupt Priority Control.
This bit sets the priority of the ADC1 End of Conversion Interrupt.
0: ADC1 End of Conversion interrupt set to low priority level.
1: ADC1 End of Conversion interrupt set to high priority level.

Bit0: PT3: Timer 3 Interrupt Priority Control.
This bit sets the priority of the Timer 3 interrupts.
0: Timer 3 interrupt set to low priority level.
1: Timer 3 interrupt set to high priority level.

reset until at least 12 clock cycles after the active-low /RST signal is removed. The PINRSF flag (RSTSRC.0) is set on exit from an external reset.

14.4. Missing Clock Detector Reset

The Missing Clock Detector is essentially a one-shot circuit that is triggered by the MCU system clock. If the system clock goes away for more than 100 µs, the one-shot will time out and generate a reset. After a Missing Clock Detector reset, the MCDRSF flag (RSTSRC.2) will be set, signifying the MSD as the reset source; otherwise, this bit reads ‘0’. The state of the /RST pin is unaffected by this reset. Setting the MCDRSF bit, RSTSRC.2 (see Section “15. Oscillators” on page 171) enables the Missing Clock Detector.

14.5. Comparator0 Reset

Comparator0 can be configured as a reset input by writing a ‘1’ to the C0RSEF flag (RSTSRC.5). Comparator0 should be enabled using CPT0CN.7 (see Section “12. Comparators” on page 117) prior to writing to C0RSEF to prevent any turn-on chatter on the output from generating an unwanted reset. The Comparator0 reset is active-low: if the non-inverting input voltage (CP0+ pin) is less than the inverting input voltage (CP0- pin), the MCU is put into the reset state. After a Comparator0 Reset, the C0RSEF flag (RSTSRC.5) will read ‘1’ signifying Comparator0 as the reset source; otherwise, this bit reads ‘0’. The state of the /RST pin is unaffected by this reset.

14.6. External CNVSTR2 Pin Reset

The external CNVSTR2 signal can be configured as a reset input by writing a ‘1’ to the CNVRSEF flag (RSTSRC.6). The CNVSTR2 signal can appear on any of the P0, P1, P2 or P3 I/O pins as described in Section “18.1. Ports 0 through 3 and the Priority Crossbar Decoder” on page 205. Note that the Crossbar must be configured for the CNVSTR2 signal to be routed to the appropriate Port I/O. The Crossbar should be configured and enabled before the CNVRSEF is set. CNVSTR2 cannot be used to start ADC2 conversions when it is configured as a reset source. When configured as a reset, CNVSTR2 is active-low and level sensitive. After a CNVSTR2 reset, the CNVRSEF flag (RSTSRC.6) will read ‘1’ signifying CNVSTR2 as the reset source; otherwise, this bit reads ‘0’. The state of the /RST pin is unaffected by this reset.

14.7. Watchdog Timer Reset

The MCU includes a programmable Watchdog Timer (WDT) running off the system clock. A WDT overflow will force the MCU into the reset state. To prevent the reset, the WDT must be restarted by application software before overflow. If the system experiences a software or hardware malfunction preventing the software from restarting the WDT, the WDT will overflow and cause a reset. This should prevent the system from running out of control.

Following a reset the WDT is automatically enabled and running with the default maximum time interval. If desired the WDT can be disabled by system software or locked on to prevent accidental disabling. Once locked, the WDT cannot be disabled until the next system reset. The state of the /RST pin is unaffected by this reset.

The WDT consists of a 21-bit timer running from the programmed system clock. The timer measures the period between specific writes to its control register. If this period exceeds the programmed limit, a WDT reset is generated. The WDT can be enabled and disabled as needed in software, or can be permanently enabled if desired. Watchdog features are controlled via the Watchdog Timer Control Register (WDTCN) shown in Figure 14.3.

For a 3 MHz system clock, this provides an interval range of 0.021 ms to 349.5 ms. WDTCN.7 must be logic 0 when setting this interval. Reading WDTCN returns the programmed interval. WDTCN.[2:0] reads 111b after a system reset.

Figure 14.3. WDTCN: Watchdog Timer Control Register

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
								xxxxx111
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0xFF
SFR Page: All Pages

Bits7-0: WDT Control.
Writing 0xA5 both enables and reloads the WDT.
Writing 0xDE followed within 4 system clocks by 0xAD disables the WDT.
Writing 0xFF locks out the disable feature.

Bit4: Watchdog Status Bit (when Read).
Reading the WDTCN.[4] bit indicates the Watchdog Timer Status.
0: WDT is inactive.
1: WDT is active.

Bits2-0: Watchdog Timeout Interval Bits.
The WDTCN.[2:0] bits set the Watchdog Timeout Interval. When writing these bits, WDTCN.7 must be set to 0.

Figure 14.4. RSTSRC: Reset Source Register

R	R/W	R/W	R/W	R	R/W	R/W	R/W	Reset Value
-	CNVRSEF	C0RSEF	SWRSEF	WDTRSF	MCDRSF	PORSF	PINRSF	00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0xEF
SFR Page: 0

Bit7: Reserved.

Bit6: CNVRSEF: Convert Start Reset Source Enable and Flag
Write: 0: CNVSTR2 is not a reset source.
1: CNVSTR2 is a reset source (active low).
Read: 0: Source of prior reset was not CNVSTR2.
1: Source of prior reset was CNVSTR2.

Bit5: C0RSEF: Comparator0 Reset Enable and Flag.
Write: 0: Comparator0 is not a reset source.
1: Comparator0 is a reset source (active low).
Read: 0: Source of last reset was not Comparator0.
1: Source of last reset was Comparator0.

Bit4: SWRSF: Software Reset Force and Flag.
Write: 0: No effect.
1: Forces an internal reset. /RST pin is not effected.
Read: 0: Source of last reset was not a write to the SWRSF bit.
1: Source of last reset was a write to the SWRSF bit.

Bit3: WDTRSF: Watchdog Timer Reset Flag.
0: Source of last reset was not WDT timeout.
1: Source of last reset was WDT timeout.

Bit2: MCDRSF: Missing Clock Detector Flag.
Write: 0: Missing Clock Detector disabled.
1: Missing Clock Detector enabled; triggers a reset if a missing clock condition is detected.
Read: 0: Source of last reset was not a Missing Clock Detector timeout.
1: Source of last reset was a Missing Clock Detector timeout.

Bit1: PORSF: Power-On Reset Flag.
Write: If the VDD monitor circuitry is enabled (by tying the MONEN pin to a logic high state), this bit can be written to select or de-select the VDD monitor as a reset source.
0: De-select the VDD monitor as a reset source.
1: Select the VDD monitor as a reset source.
Important: At power-on, the VDD monitor is enabled/disabled using the external VDD monitor enable pin (MONEN). The PORSF bit does not disable or enable the VDD monitor circuit. It simply selects the VDD monitor as a reset source.
Read: This bit is set whenever a power-on reset occurs. This may be due to a true power-on reset or a VDD monitor reset. In either case, data memory should be considered indeterminate following the reset.
0: Source of last reset was not a power-on or VDD monitor reset.
1: Source of last reset was a power-on or VDD monitor reset.
Note: When this flag is read as '1', all other reset flags are indeterminate.

Bit0: PINRSF: HW Pin Reset Flag.
Write: 0: No effect.
1: Forces a Power-On Reset. /RST is driven low.
Read: 0: Source of prior reset was not /RST pin.
1: Source of prior reset was /RST pin.

17.6. Timing

The timing parameters of the External Memory Interface can be configured to enable connection to devices having different setup and hold time requirements. The Address Setup time, Address Hold time, /RD and /WR strobe widths, and in multiplexed mode, the width of the ALE pulse are all programmable in units of SYSCLK periods through EMI0TC, shown in Figure 17.6, and EMI0CF[1:0].

The timing for an off-chip MOVX instruction can be calculated by adding 4 SYSCLK cycles to the timing parameters defined by the EMI0TC register. Assuming non-multiplexed operation, the minimum execution time for an off-chip XRAM operation is 5 SYSCLK cycles (1 SYSCLK for /RD or /WR pulse + 4 SYSCLKs). For multiplexed operations, the Address Latch Enable signal will require a minimum of 2 additional SYSCLK cycles. Therefore, the minimum execution time for an off-chip XRAM operation in multiplexed mode is 7 SYSCLK cycles (2 for /ALE + 1 for /RD or /WR + 4). The programmable setup and hold times default to the maximum delay settings after a reset.

Figure 17.6. EMI0TC: External Memory Timing Control

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
EAS1	EAS0	ERW3	EWR2	EWR1	EWR0	EAH1	EAH0	11111111
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0xA1
SFR Page: 0

Bits7-6: EAS1-0: EMIF Address Setup Time Bits.
00: Address setup time = 0 SYSCLK cycles.
01: Address setup time = 1 SYSCLK cycle.
10: Address setup time = 2 SYSCLK cycles.
11: Address setup time = 3 SYSCLK cycles.

Bits5-2: EWR3-0: EMIF /WR and /RD Pulse-Width Control Bits.
0000: /WR and /RD pulse width = 1 SYSCLK cycle.
0001: /WR and /RD pulse width = 2 SYSCLK cycles.
0010: /WR and /RD pulse width = 3 SYSCLK cycles.
0011: /WR and /RD pulse width = 4 SYSCLK cycles.
0100: /WR and /RD pulse width = 5 SYSCLK cycles.
0101: /WR and /RD pulse width = 6 SYSCLK cycles.
0110: /WR and /RD pulse width = 7 SYSCLK cycles.
0111: /WR and /RD pulse width = 8 SYSCLK cycles.
1000: /WR and /RD pulse width = 9 SYSCLK cycles.
1001: /WR and /RD pulse width = 10 SYSCLK cycles.
1010: /WR and /RD pulse width = 11 SYSCLK cycles.
1011: /WR and /RD pulse width = 12 SYSCLK cycles.
1100: /WR and /RD pulse width = 13 SYSCLK cycles.
1101: /WR and /RD pulse width = 14 SYSCLK cycles.
1110: /WR and /RD pulse width = 15 SYSCLK cycles.
1111: /WR and /RD pulse width = 16 SYSCLK cycles.

Bits1-0: EAH1-0: EMIF Address Hold Time Bits.
00: Address hold time = 0 SYSCLK cycles.
01: Address hold time = 1 SYSCLK cycle.
10: Address hold time = 2 SYSCLK cycles.
11: Address hold time = 3 SYSCLK cycles.

Figure 18.23. P6: Port6 Data Register

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
P6.7	P6.6	P6.5	P6.4	P6.3	P6.2	P6.1	P6.0	11111111
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Bit Addressable

SFR Address: 0xE8
SFR Page: F

Bits7-0: P6.[7:0]: Port6 Output Latch Bits.
Write - Output appears on I/O pins.
0: Logic Low Output.
1: Logic High Output (open, if corresponding P6MDOUT bit = 0). See Figure 18.24.
Read - Returns states of I/O pins.
0: P6.n pin is logic low.
1: P6.n pin is logic high.

Note: P6.[7:0] can be driven by the External Data Memory Interface (as Address[15:8] in Multiplexed mode, or as Address[7:0] in Non-multiplexed mode). See Section “17. External Data Memory Interface and On-Chip XRAM” on page 187 for more information about the External Memory Interface.

Figure 18.24. P6MDOUT: Port6 Output Mode Register

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
								00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0x9E
SFR Page: F

Bits7-0: P6MDOUT.[7:0]: Port6 Output Mode Bits.
0: Port Pin output mode is configured as Open-Drain.
1: Port Pin output mode is configured as Push-Pull.

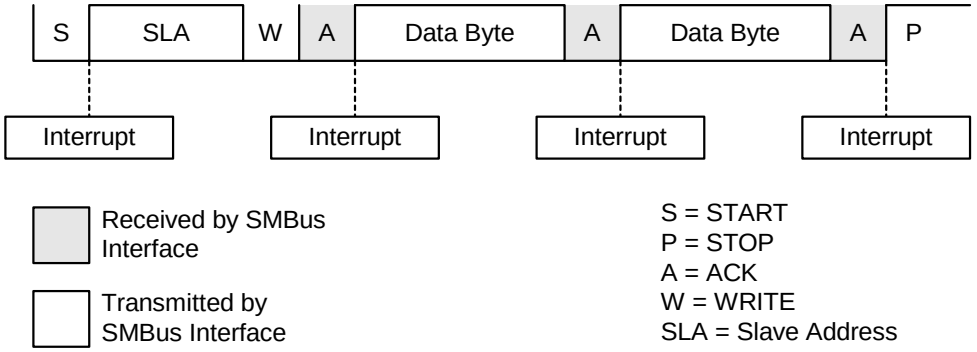
20.3. SMBus Transfer Modes

The SMBus0 interface may be configured to operate as a master and/or a slave. At any particular time, the interface will be operating in one of the following modes: Master Transmitter, Master Receiver, Slave Transmitter, or Slave Receiver. See Table 20.1 for transfer mode status decoding using the SMB0STA status register. The following mode descriptions illustrate an interrupt-driven SMBus0 application; SMBus0 may alternatively be operated in polled mode.

20.3.1. Master Transmitter Mode

Serial data is transmitted on SDA while the serial clock is output on SCL. SMBus0 generates a START condition and then transmits the first byte containing the address of the target slave device and the data direction bit. In this case the data direction bit (R/W) will be logic 0 to indicate a "WRITE" operation. The SMBus0 interface transmits one or more bytes of serial data, waiting for an acknowledge (ACK) from the slave after each byte. To indicate the end of the serial transfer, SMBus0 generates a STOP condition.

Figure 20.4. Typical Master Transmitter Sequence



20.3.2. Master Receiver Mode

Serial data is received on SDA while the serial clock is output on SCL. The SMBus0 interface generates a START followed by the first data byte containing the address of the target slave and the data direction bit. In this case the data direction bit (R/W) will be logic 1 to indicate a "READ" operation. The SMBus0 interface receives serial data from the slave and generates the clock on SCL. After each byte is received, SMBus0 generates an ACK or NACK depending on the state of the AA bit in register SMB0CN. SMBus0 generates a STOP condition to indicate the end of the serial transfer.

Figure 20.5. Typical Master Receiver Sequence

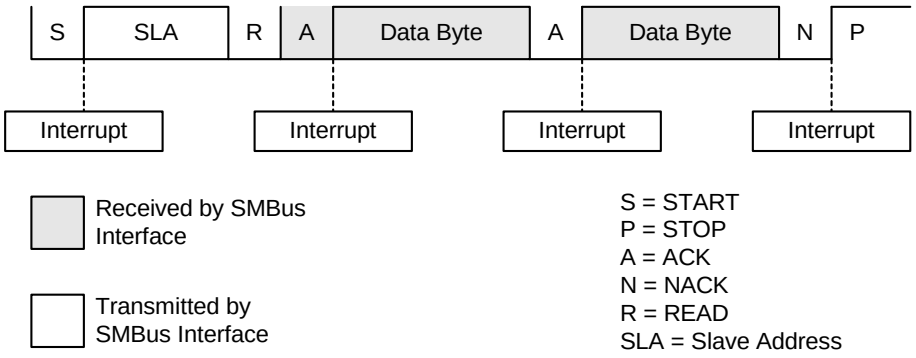


Figure 22.9. SSTA0: UART0 Status and Clock Selection Register

R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	Reset Value
FE0	RXOV0	TXCOL0	SMOD0	S0TCLK1	S0TCLK0	S0RCLK1	S0RCLK0	00000000
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	

SFR Address: 0x91
SFR Page: 0

Bit7: FE0: Frame Error Flag.†
This flag indicates if an invalid (low) STOP bit is detected.
0: Frame Error has not been detected.
1: Frame Error has been detected.

Bit6: RXOV0: Receive Overrun Flag.†
This flag indicates new data has been latched into the receive buffer before software has read the previous byte.
0: Receive overrun has not been detected.
1: Receive Overrun has been detected.

Bit5: TXCOL0: Transmit Collision Flag.†
This flag indicates user software has written to the SBUF0 register while a transmission is in progress.
0: Transmission Collision has not been detected.
1: Transmission Collision has been detected.

Bit4: SMOD0: UART0 Baud Rate Doubler Enable.
This bit enables/disables the divide-by-two function of the UART0 baud rate logic for configurations described in the UART0 section.
0: UART0 baud rate divide-by-two enabled.
1: UART0 baud rate divide-by-two disabled.

Bits3-2: UART0 Transmit Baud Rate Clock Selection Bits.

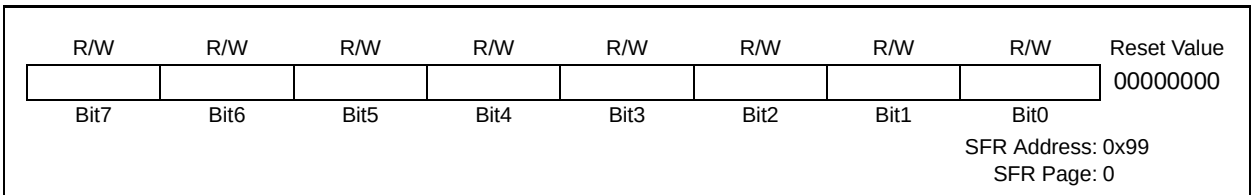
S0TCLK1	S0TCLK0	**Serial Transmit Baud Rate Clock Source**
0	0	Timer 1 generates UART0 TX Baud Rate
0	1	Timer 2 Overflow generates UART0 TX baud rate
1	0	Timer 3 Overflow generates UART0 TX baud rate
1	1	Timer 4 Overflow generates UART0 TX baud rate

Bits1-0: UART0 Receive Baud Rate Clock Selection Bits.

S0RCLK1	S0RCLK0	**Serial Receive Baud Rate Clock Source**
0	0	Timer 1 generates UART0 RX Baud Rate
0	1	Timer 2 Overflow generates UART0 RX baud rate
1	0	Timer 3 Overflow generates UART0 RX baud rate
1	1	Timer 4 Overflow generates UART0 RX baud rate

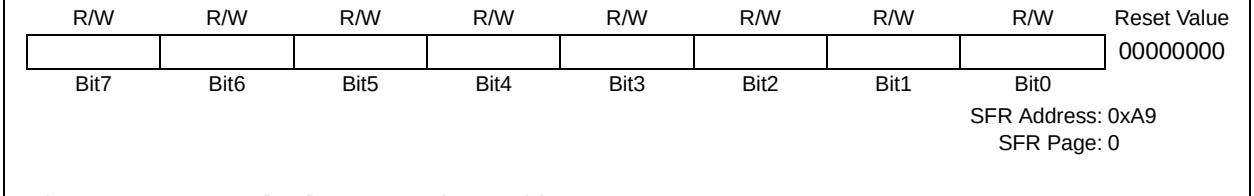
† Note: FE0, RXOV0, and TXCOL0 are flags only, and no interrupt is generated by these conditions.

Figure 22.10. SBUF0: UART0 Data Buffer Register



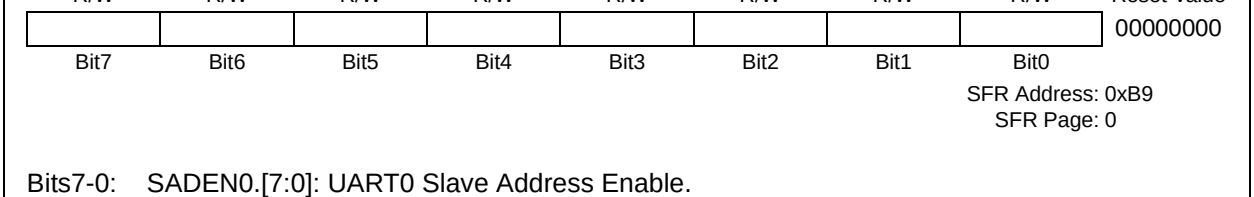
Bits7-0: SBUF0.[7:0]: UART0 Buffer Bits 7-0 (MSB-LSB).
This is actually two registers; a transmit and a receive buffer register. When data is moved to SBUF0, it goes to the transmit buffer and is held for serial transmission. Moving a byte to SBUF0 is what initiates the transmission. When data is moved from SBUF0, it comes from the receive buffer.

Figure 22.11. SADDR0: UART0 Slave Address Register



Bits7-0: SADDR0.[7:0]: UART0 Slave Address.
The contents of this register are used to define the UART0 slave address. Register SADEN0 is a bit mask to determine which bits of SADDR0 are checked against a received address: corresponding bits set to logic 1 in SADEN0 are checked; corresponding bits set to logic 0 are “don’t cares”.

Figure 22.12. SADEN0: UART0 Slave Address Enable Register



Bits7-0: SADEN0.[7:0]: UART0 Slave Address Enable.
Bits in this register enable corresponding bits in register SADDR0 to determine the UART0 slave address.
0: Corresponding bit in SADDR0 is a “don’t care”.
1: Corresponding bit in SADDR0 is checked against a received address.

24.2.2. Capture Mode

In Capture Mode, Timer 2, 3, and 4 will operate as a 16-bit counter/timer with capture facility. When the Timer External Enable bit (found in the TMRnCN register) is set to ‘1’, a high-to-low transition on the TnEX input pin causes the 16-bit value in the associated timer (THn, TLn) to be loaded into the capture registers (RCAPnH, RCAPnL). If a capture is triggered in the counter/timer, the Timer External Flag (TMRnCN.6) will be set to ‘1’ and an interrupt will occur if the interrupt is enabled. See Section “13.3. Interrupt Handler” on page 151 for further information concerning the configuration of interrupt sources.

As the 16-bit timer register increments and overflows TMRnH:TMRnL, the TFn Timer Overflow/Underflow Flag (TMRnCN.7) is set to ‘1’ and an interrupt will occur if the interrupt is enabled. The timer can be configured to count down by setting the Decrement Enable Bit (TMRnCF.0) to ‘1’. This will cause the timer to decrement with every timer clock/count event and underflow when the timer transitions from 0x0000 to 0xFFFF. Just as in overflows, the Overflow/Underflow Flag (TFn) will be set to ‘1’, and an interrupt will occur if enabled.

Counter/Timer with Capture mode is selected by setting the Capture/Reload Select bit CP/RLn (TMRnCN.0) and the Timer 2, 3, and 4 Run Control bit TRn (TnCON.2) to logic 1. The Timer 2, 3, and 4 respective External Enable EXENn (TnCON.3) must also be set to logic 1 to enable a captures. If EXENn is cleared, transitions on TnEX will be ignored.

Figure 24.11. T2, 3, and 4 Capture Mode Block Diagram