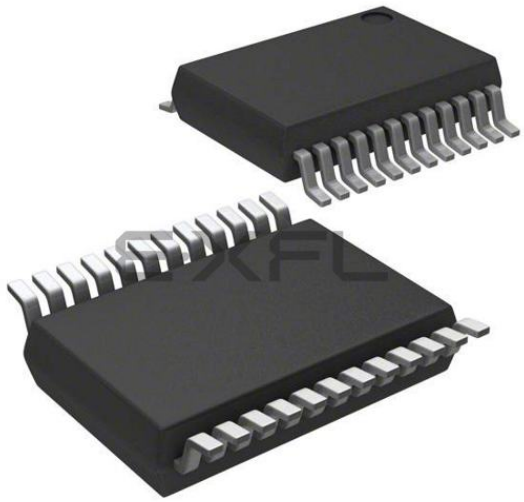

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Last Time Buy
Core Processor	8051
Core Size	8-Bit
Speed	25MHz
Connectivity	SMBus (2-Wire/I²C), SPI, UART/USART
Peripherals	Cap Sense, POR, PWM, Temp Sensor, WDT
Number of I/O	17
Program Memory Size	16KB (16K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	512 x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 3.6V
Data Converters	A/D 16x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	24-SSOP (0.154", 3.90mm Width)
Supplier Device Package	24-QSOP
Purchase URL	https://www.e-xfl.com/product-detail/silicon-labs/c8051f800-gu

5. QSOP-24 Package Specifications

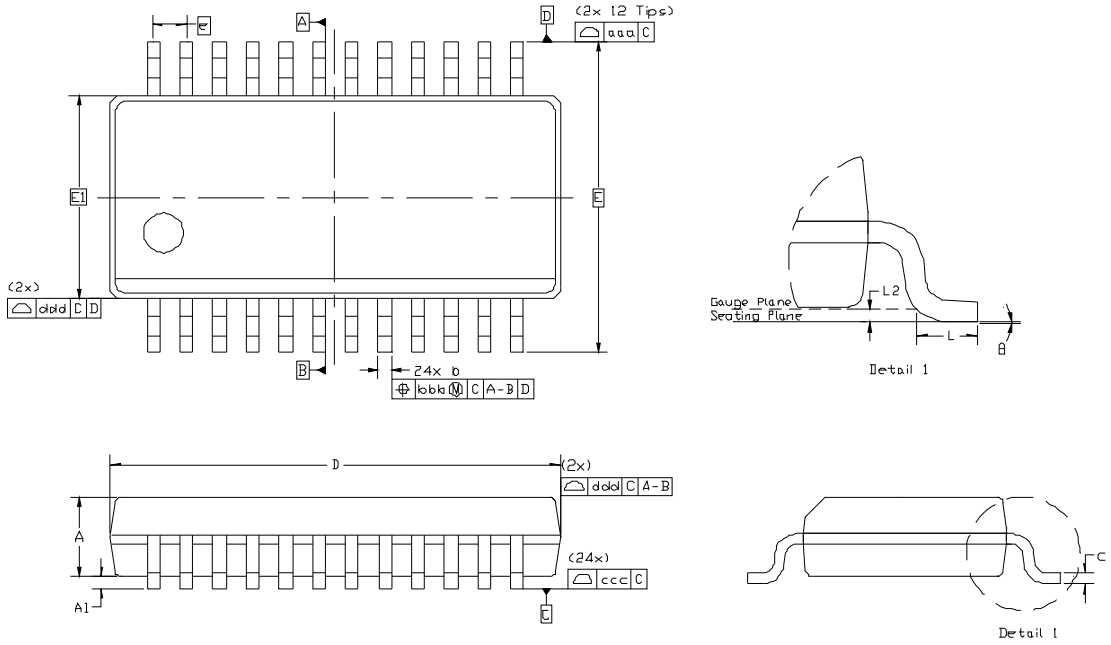


Figure 5.1. QSOP-24 Package Drawing

Table 5.1. QSOP-24 Package Dimensions

Dimension	Min	Nom	Max
A	—	—	1.75
A1	0.10	—	0.25
b	0.20	—	0.30
c	0.10	—	0.25
D	8.65 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	0.635 BSC		

Dimension	Min	Nom	Max
L	0.40	—	1.27
L2	0.25 BSC		
θ	0º	—	8º
aaa	0.20		
bbb	0.18		
ccc	0.10		
ddd	0.10		

Notes:

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.
3. This drawing conforms to JEDEC outline MO-137, variation AE.
4. Recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

7.2. Electrical Characteristics

Table 7.2. Global Electrical Characteristics

–40 to +85 °C, 25 MHz system clock unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		1.8	3.0	3.6	V
Digital Supply Current with CPU Active (Normal Mode[1])	V_{DD} = 1.8 V, Clock = 25 MHz V_{DD} = 1.8 V, Clock = 1 MHz V_{DD} = 1.8 V, Clock = 32 kHz V_{DD} = 3.0 V, Clock = 25 MHz V_{DD} = 3.0 V, Clock = 1 MHz V_{DD} = 3.0 V, Clock = 32 kHz	— — — — — —	4.6 1.2 135 5.5 1.3 150	6.0 — — 6.5 — —	mA mA µA mA mA µA
Digital Supply Current with CPU Inactive (Idle Mode[1])	V_{DD} = 1.8 V, Clock = 25 MHz V_{DD} = 1.8 V, Clock = 1 MHz V_{DD} = 1.8 V, Clock = 32 kHz V_{DD} = 3.0 V, Clock = 25 MHz V_{DD} = 3.0 V, Clock = 1 MHz V_{DD} = 3.0 V, Clock = 32 kHz	— — — — — —	2 190 100 2.3 335 115	2.6 — — 2.8 — —	mA µA µA mA µA µA
Digital Supply Current (shutdown)	Oscillator not running (stop mode), Internal Regulator Off, 25 °C	—	0.5	2	µA
	Oscillator not running (stop or suspend mode), Internal Regulator On, 25 °C	—	105	140	µA
Digital Supply RAM Data Retention Voltage		—	1.3	—	V
Specified Operating Temperature Range		–40	—	+85	°C
SYSCLK (system clock frequency)	See Note 2	0	—	25	MHz
Tsysl (SYSCLK low time)		18	—	—	ns
Tsysh (SYSCLK high time)		18	—	—	ns

Notes:
1. Includes bias current for internal voltage regulator.
2. SYSCLK must be at least 32 kHz to enable debugging.

SFR Definition 8.7. ADC0LTH: ADC0 Less-Than Data High Byte

Bit	7	6	5	4	3	2	1	0
Name	ADC0LTH[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xC6

Bit	Name	Function
7:0	ADC0LTH[7:0]	**ADC0 Less-Than Data Word High-Order Bits.**

SFR Definition 8.8. ADC0LTL: ADC0 Less-Than Data Low Byte

Bit	7	6	5	4	3	2	1	0
Name	ADC0LTL[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xC5

Bit	Name	Function
7:0	ADC0LTL[7:0]	**ADC0 Less-Than Data Word Low-Order Bits.**

10.1. External Voltage References

To use an external voltage reference, REFSL[1:0] should be set to 00. Bypass capacitors should be added as recommended by the manufacturer of the external voltage reference.

10.2. Internal Voltage Reference Options

A 1.65 V high-speed reference is included on-chip. The high speed internal reference is selected by setting REFSL[1:0] to 11. When selected, the high speed internal reference will be automatically enabled on an as-needed basis by ADC0.

For applications with a non-varying power supply voltage, using the power supply as the voltage reference can provide ADC0 with added dynamic range at the cost of reduced power supply noise rejection. To use the 1.8 to 3.6 V power supply voltage (V_{DD}) or the 1.8 V regulated digital supply voltage as the reference source, REFSL[1:0] should be set to 01 or 10, respectively.

10.3. Analog Ground Reference

To prevent ground noise generated by switching digital logic from affecting sensitive analog measurements, a separate analog ground reference option is available. When enabled, the ground reference for ADC0 is taken from the P0.1/AGND pin. Any external sensors sampled by ADC0 should be referenced to the P0.1/AGND pin. The separate analog ground reference option is enabled by setting REFGND to 1. Note that when using this option, P0.1/AGND must be connected to the same potential as GND.

10.4. Temperature Sensor Enable

The TEMPE bit in register REF0CN enables the temperature sensor. While disabled, the temperature sensor defaults to a high impedance state and any ADC0 measurements performed on the sensor result in meaningless data.

SFR Definition 13.5. CS0SS: Capacitive Sense Auto-Scan Start Channel

Bit	7	6	5	4	3	2	1	0
Name				CS0SS[4:0]				
Type	R	R	R	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xB9

Bit	Name	Description
7:5	Unused	Read = 000b; Write = Don't care
4:0	CS0SS[4:0]	**Starting Channel for Auto-Scan.** Sets the first CS0 channel to be selected by the mux for Capacitive Sense conversion when auto-scan is enabled and active. When auto-scan is enabled, a write to CS0SS will also update CS0MX.

SFR Definition 13.6. CS0SE: Capacitive Sense Auto-Scan End Channel

Bit	7	6	5	4	3	2	1	0
Name				CS0SE[4:0]				
Type	R	R	R	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xBA

Bit	Name	Description
7:5	Unused	Read = 000b; Write = Don't care
4:0	CS0SE[4:0]	**Ending Channel for Auto-Scan.** Sets the last CS0 channel to be selected by the mux for Capacitive Sense conversion when auto-scan is enabled and active.

Table 14.1. CIP-51 Instruction Set Summary

Mnemonic	Description	Bytes	Clock Cycles
Arithmetic Operations			
ADD A, Rn	Add register to A	1	1
ADD A, direct	Add direct byte to A	2	2
ADD A, @Ri	Add indirect RAM to A	1	2
ADD A, #data	Add immediate to A	2	2
ADDC A, Rn	Add register to A with carry	1	1
ADDC A, direct	Add direct byte to A with carry	2	2
ADDC A, @Ri	Add indirect RAM to A with carry	1	2
ADDC A, #data	Add immediate to A with carry	2	2
SUBB A, Rn	Subtract register from A with borrow	1	1
SUBB A, direct	Subtract direct byte from A with borrow	2	2
SUBB A, @Ri	Subtract indirect RAM from A with borrow	1	2
SUBB A, #data	Subtract immediate from A with borrow	2	2
INC A	Increment A	1	1
INC Rn	Increment register	1	1
INC direct	Increment direct byte	2	2
INC @Ri	Increment indirect RAM	1	2
DEC A	Decrement A	1	1
DEC Rn	Decrement register	1	1
DEC direct	Decrement direct byte	2	2
DEC @Ri	Decrement indirect RAM	1	2
INC DPTR	Increment Data Pointer	1	1
MUL AB	Multiply A and B	1	4
DIV AB	Divide A by B	1	8
DA A	Decimal adjust A	1	1
Logical Operations			
ANL A, Rn	AND Register to A	1	1
ANL A, direct	AND direct byte to A	2	2
ANL A, @Ri	AND indirect RAM to A	1	2
ANL A, #data	AND immediate to A	2	2
ANL direct, A	AND A to direct byte	2	2
ANL direct, #data	AND immediate to direct byte	3	3
ORL A, Rn	OR Register to A	1	1
ORL A, direct	OR direct byte to A	2	2
ORL A, @Ri	OR indirect RAM to A	1	2
ORL A, #data	OR immediate to A	2	2
ORL direct, A	OR A to direct byte	2	2
ORL direct, #data	OR immediate to direct byte	3	3
XRL A, Rn	Exclusive-OR Register to A	1	1
XRL A, direct	Exclusive-OR direct byte to A	2	2
XRL A, @Ri	Exclusive-OR indirect RAM to A	1	2
XRL A, #data	Exclusive-OR immediate to A	2	2
XRL direct, A	Exclusive-OR A to direct byte	2	2

Table 17.2. Special Function Registers (Continued)

SFRs are listed in alphabetical order. All undefined SFR locations are reserved

Register	Address	Description	Page
CS0CF	0x9E	CS0 Configuration	76
CS0MX	0x9C	CS0 Mux	81
CS0SE	0xBA	Auto Scan End Channel	78
CS0SS	0xB9	Auto Scan Start Channel	78
DERIVID	0xAD	Derivative Identification	96
DPH	0x83	Data Pointer High	88
DPL	0x82	Data Pointer Low	88
EIE1	0xE6	Extended Interrupt Enable 1	107
EIE2	0xE7	Extended Interrupt Enable 2	108
EIP1	0xF3	Extended Interrupt Priority 1	109
EIP2	0xF4	Extended Interrupt Priority 2	110
FLKEY	0xB7	Flash Lock And Key	119
HWID	0xB5	Hardware Identification	95
IE	0xA8	Interrupt Enable	105
IP	0xB8	Interrupt Priority	106
IT01CF	0xE4	INT0/INT1 Configuration	112
OSCICL	0xB3	Internal Oscillator Calibration	131
OSCICN	0xB2	Internal Oscillator Control	132
OSCXCN	0xB1	External Oscillator Control	134
P0	0x80	Port 0 Latch	153
P0MASK	0xFE	Port 0 Mask	151
P0MAT	0xFD	Port 0 Match	151
P0MDIN	0xF1	Port 0 Input Mode Configuration	154
P0MDOUT	0xA4	Port 0 Output Mode Configuration	154
P0SKIP	0xD4	Port 0 Skip	155
P1	0x90	Port 1 Latch	155
P1MASK	0xEE	P0 Mask	152

SFR Definition 19.2. FLKEY: Flash Lock and Key

Bit	7	6	5	4	3	2	1	0
Name	FLKEY[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xB7

Bit	Name	Function
7:0	FLKEY[7:0]	**Flash Lock and Key Register.** Write: This register provides a lock and key function for Flash erasures and writes. Flash writes and erases are enabled by writing 0xA5 followed by 0xF1 to the FLKEY register. Flash writes and erases are automatically disabled after the next write or erase is complete. If any writes to FLKEY are performed incorrectly, or if a Flash write or erase operation is attempted while these operations are disabled, the Flash will be permanently locked from writes or erasures until the next device reset. If an application never writes to Flash, it can intentionally lock the Flash by writing a non-0xA5 value to FLKEY from software. Read: When read, bits 1–0 indicate the current Flash lock state. 00: Flash is write/erase locked. 01: The first key code has been written (0xA5). 10: Flash is unlocked (writes/erases allowed). 11: Flash writes/erases disabled until the next reset.

SFR Definition 22.3. OSCICN: Internal H-F Oscillator Control

Bit	7	6	5	4	3	2	1	0
Name	IOSCEN	IFRDY	SUSPEND	STSYNC	SSE		IFCN[1:0]	
Type	R/W	R	R/W	R	R/W	R	R/W	
Reset	1	1	0	0	0	0	0	0

SFR Address = 0xB2

Bit	Name	Function
7	IOSCEN	**Internal H-F Oscillator Enable Bit.** 0: Internal H-F Oscillator Disabled. 1: Internal H-F Oscillator Enabled.
6	IFRDY	**Internal H-F Oscillator Frequency Ready Flag.** 0: Internal H-F Oscillator is not running at programmed frequency. 1: Internal H-F Oscillator is running at programmed frequency.
5	SUSPEND	**Internal Oscillator Suspend Enable Bit.** Setting this bit to logic 1 places the internal oscillator in SUSPEND mode. The internal oscillator resumes operation when one of the SUSPEND mode awakening events occurs.
4	STSYNC	**Suspend Timer Synchronization Bit.** This bit is used to indicate when it is safe to read and write the registers associated with the suspend wake-up timer. If a suspend wake-up source other than Timer 2 has brought the oscillator out of suspend mode, it make take up to three timer clocks before the timer can be read or written. 0: Timer 2 registers can be read safely. 1: Timer 2 register reads and writes should not be performed.
3	SSE	**Spread Spectrum Enable.** Spread spectrum enable bit. 0: Spread Spectrum clock dithering disabled. 1: Spread Spectrum clock dithering enabled.
2	Unused	Read = 0b; Write = Don't Care
1:0	IFCN[1:0]	**Internal H-F Oscillator Frequency Divider Control Bits.** 00: SYSCLK derived from Internal H-F Oscillator divided by 8. 01: SYSCLK derived from Internal H-F Oscillator divided by 4. 10: SYSCLK derived from Internal H-F Oscillator divided by 2. 11: SYSCLK derived from Internal H-F Oscillator divided by 1.

SFR Definition 23.5. P1MASK: Port 1 Mask Register

Bit	7	6	5	4	3	2	1	0
Name	P1MASK[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xEE

Bit	Name	Function
7:0	P1MASK[7:0]	**Port 1 Mask Value.** Selects P1 pins to be compared to the corresponding bits in P1MAT. 0: P1.n pin logic value is ignored and cannot cause a Port Mismatch event. 1: P1.n pin logic value is compared to P1MAT.n. **Note:** P1.4–P1.7 are not available on 16-pin packages.

SFR Definition 23.6. P1MAT: Port 1 Match Register

Bit	7	6	5	4	3	2	1	0
Name	P1MAT[7:0]							
Type	R/W							
Reset	1	1	1	1	1	1	1	1

SFR Address = 0xED

Bit	Name	Function
7:0	P1MAT[7:0]	**Port 1 Match Value.** Match comparison value used on Port 1 for bits in P1MASK which are set to 1. 0: P1.n pin logic value is compared with logic LOW. 1: P1.n pin logic value is compared with logic HIGH. **Note:** P1.4–P1.7 are not available on 16-pin packages.

23.6. Special Function Registers for Accessing and Configuring Port I/O

All Port I/O are accessed through corresponding special function registers (SFRs) that are both byte addressable and bit addressable. When writing to a Port, the value written to the SFR is latched to maintain the output data value at each pin. When reading, the logic levels of the Port's input pins are returned regardless of the XBRn settings (i.e., even when the pin is assigned to another signal by the Crossbar, the Port register can always read its corresponding Port I/O pin). The exception to this is the execution of the read-modify-write instructions that target a Port Latch register as the destination. The read-modify-write instructions when operating on a Port SFR are the following: ANL, ORL, XRL, JBC, CPL, INC, DEC, DJNZ and MOV, CLR or SETB, when the destination is an individual bit in a Port SFR. For these instructions, the value of the latch register (not the pin) is read, modified, and written back to the SFR.

25.1. Signal Descriptions

The four signals used by SPI0 (MOSI, MISO, SCK, NSS) are described below.

25.1.1. Master Out, Slave In (MOSI)

The master-out, slave-in (MOSI) signal is an output from a master device and an input to slave devices. It is used to serially transfer data from the master to the slave. This signal is an output when SPI0 is operating as a master and an input when SPI0 is operating as a slave. Data is transferred most-significant bit first. When configured as a master, MOSI is driven by the MSB of the shift register in both 3- and 4-wire mode.

25.1.2. Master In, Slave Out (MISO)

The master-in, slave-out (MISO) signal is an output from a slave device and an input to the master device. It is used to serially transfer data from the slave to the master. This signal is an input when SPI0 is operating as a master and an output when SPI0 is operating as a slave. Data is transferred most-significant bit first. The MISO pin is placed in a high-impedance state when the SPI module is disabled and when the SPI operates in 4-wire mode as a slave that is not selected. When acting as a slave in 3-wire mode, MISO is always driven by the MSB of the shift register.

25.1.3. Serial Clock (SCK)

The serial clock (SCK) signal is an output from the master device and an input to slave devices. It is used to synchronize the transfer of data between the master and slave on the MOSI and MISO lines. SPI0 generates this signal when operating as a master. The SCK signal is ignored by a SPI slave when the slave is not selected (NSS = 1) in 4-wire slave mode.

25.1.4. Slave Select (NSS)

The function of the slave-select (NSS) signal is dependent on the setting of the NSSMD1 and NSSMD0 bits in the SPI0CN register. There are three possible modes that can be selected with these bits:

1. NSSMD[1:0] = 00: 3-Wire Master or 3-Wire Slave Mode: SPI0 operates in 3-wire mode, and NSS is disabled. When operating as a slave device, SPI0 is always selected in 3-wire mode. Since no select signal is present, SPI0 must be the only slave on the bus in 3-wire mode. This is intended for point-to-point communication between a master and one slave.
2. NSSMD[1:0] = 01: 4-Wire Slave or Multi-Master Mode: SPI0 operates in 4-wire mode, and NSS is enabled as an input. When operating as a slave, NSS selects the SPI0 device. When operating as a master, a 1-to-0 transition of the NSS signal disables the master function of SPI0 so that multiple master devices can be used on the same SPI bus.
3. NSSMD[1:0] = 1x: 4-Wire Master Mode: SPI0 operates in 4-wire mode, and NSS is enabled as an output. The setting of NSSMD0 determines what logic level the NSS pin will output. This configuration should only be used when operating SPI0 as a master device.

See Figure 25.2, Figure 25.3, and Figure 25.4 for typical connection diagrams of the various operational modes. **Note that the setting of NSSMD bits affects the pinout of the device.** When in 3-wire master or 3-wire slave mode, the NSS pin will not be mapped by the crossbar. In all other modes, the NSS signal will be mapped to a pin on the device. See Section “23. Port Input/Output” on page 138 for general purpose port I/O and crossbar information.

25.2. SPI0 Master Mode Operation

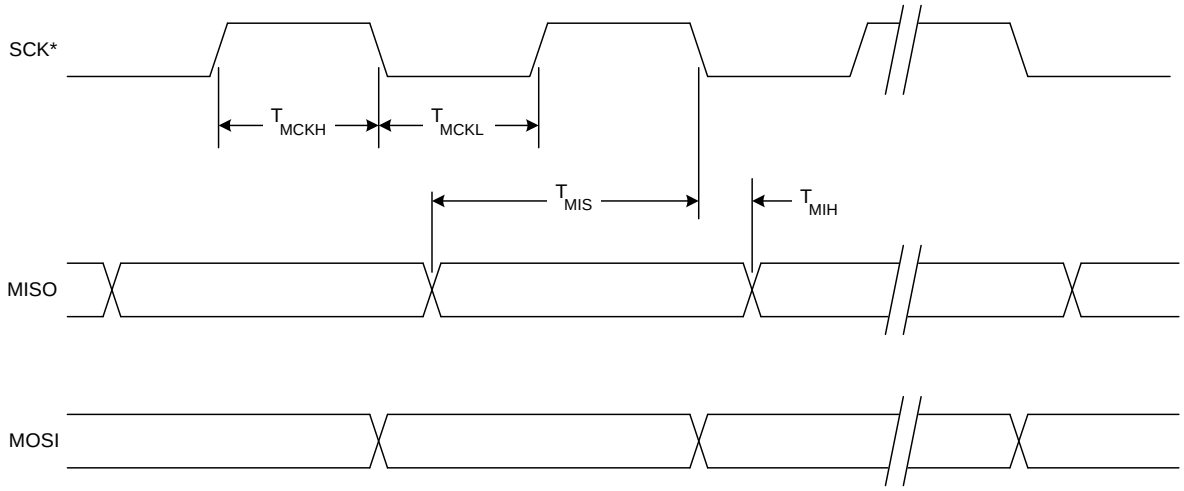
A SPI master device initiates all data transfers on a SPI bus. SPI0 is placed in master mode by setting the Master Enable flag (MSTEN, SPI0CN.6). Writing a byte of data to the SPI0 data register (SPI0DAT) when in master mode writes to the transmit buffer. If the SPI shift register is empty, the byte in the transmit buffer is moved to the shift register, and a data transfer begins. The SPI0 master immediately shifts out the data serially on the MOSI line while providing the serial clock on SCK. The SPIF (SPI0CN.7) flag is set to logic 1 at the end of the transfer. If interrupts are enabled, an interrupt request is generated when the SPIF flag

SFR Definition 25.2. SPI0CN: SPI0 Control

Bit	7	6	5	4	3	2	1	0
Name	SPIF	WCOL	MODF	RXOVRN	NSSMD[1:0]		TXBMT	SPIEN
Type	R/W	R/W	R/W	R/W	R/W		R	R/W
Reset	0	0	0	0	0	1	1	0

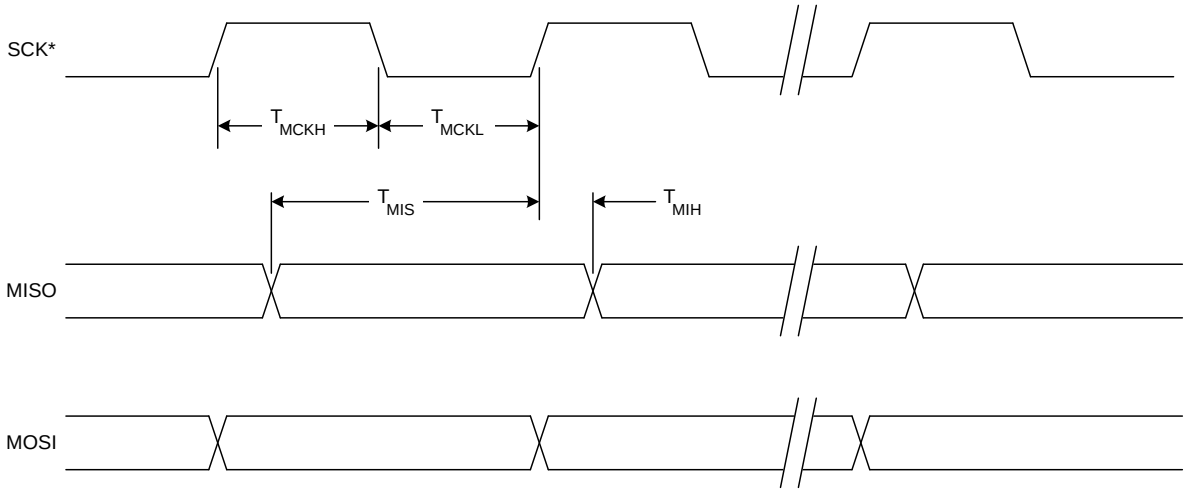
SFR Address = 0xF8; Bit-Addressable

Bit	Name	Function
7	SPIF	**SPI0 Interrupt Flag.** This bit is set to logic 1 by hardware at the end of a data transfer. If SPI interrupts are enabled, an interrupt will be generated. This bit is not automatically cleared by hardware, and must be cleared by software.
6	WCOL	**Write Collision Flag.** This bit is set to logic 1 if a write to SPI0DAT is attempted when TXBMT is 0. When this occurs, the write to SPI0DAT will be ignored, and the transmit buffer will not be written. If SPI interrupts are enabled, an interrupt will be generated. This bit is not automatically cleared by hardware, and must be cleared by software.
5	MODF	**Mode Fault Flag.** This bit is set to logic 1 by hardware when a master mode collision is detected (NSS is low, MSTEN = 1, and NSSMD[1:0] = 01). If SPI interrupts are enabled, an interrupt will be generated. This bit is not automatically cleared by hardware, and must be cleared by software.
4	RXOVRN	**Receive Overrun Flag (valid in slave mode only).** This bit is set to logic 1 by hardware when the receive buffer still holds unread data from a previous transfer and the last bit of the current transfer is shifted into the SPI0 shift register. If SPI interrupts are enabled, an interrupt will be generated. This bit is not automatically cleared by hardware, and must be cleared by software.
3:2	NSSMD[1:0]	**Slave Select Mode.** Selects between the following NSS operation modes: (See Section 25.2 and Section 25.3). 00: 3-Wire Slave or 3-Wire Master Mode. NSS signal is not routed to a port pin. 01: 4-Wire Slave or Multi-Master Mode (Default). NSS is an input to the device. 1x: 4-Wire Single-Master Mode. NSS signal is mapped as an output from the device and will assume the value of NSSMD0.
1	TXBMT	**Transmit Buffer Empty.** This bit will be set to logic 0 when new data has been written to the transmit buffer. When data in the transmit buffer is transferred to the SPI shift register, this bit will be set to logic 1, indicating that it is safe to write a new byte to the transmit buffer.
0	SPIEN	**SPI0 Enable.** 0: SPI disabled. 1: SPI enabled.



* SCK is shown for CKPOL = 0. SCK is the opposite polarity for CKPOL = 1.

Figure 25.8. SPI Master Timing (CKPHA = 0)



* SCK is shown for CKPOL = 0. SCK is the opposite polarity for CKPOL = 1.

Figure 25.9. SPI Master Timing (CKPHA = 1)

Table 26.1. SMBus Clock Source Selection

SMBCS1	SMBCS0	SMBus Clock Source
0	0	Timer 0 Overflow
0	1	Timer 1 Overflow
1	0	Timer 2 High Byte Overflow
1	1	Timer 2 Low Byte Overflow

The SMBCS1–0 bits select the SMBus clock source, which is used only when operating as a master or when the Free Timeout detection is enabled. When operating as a master, overflows from the selected source determine the absolute minimum SCL low and high times as defined in Equation 26.1. Note that the selected clock source may be shared by other peripherals so long as the timer is left running at all times. For example, Timer 1 overflows may generate the SMBus and UART baud rates simultaneously. Timer configuration is covered in Section “28. Timers” on page 209.

$$T_{HighMin} = T_{LowMin} = \frac{1}{f_{ClockSourceOverflow}}$$

Equation 26.1. Minimum SCL High and Low Times

The selected clock source should be configured to establish the minimum SCL High and Low times as per Equation 26.1. When the interface is operating as a master (and SCL is not driven or extended by any other devices on the bus), the typical SMBus bit rate is approximated by Equation 26.2.

$$BitRate = \frac{f_{ClockSourceOverflow}}{3}$$

Equation 26.2. Typical SMBus Bit Rate

Figure 26.4 shows the typical SCL generation described by Equation 26.2. Notice that T_{HIGH} is typically twice as large as T_{LOW}. The actual SCL output may vary due to other devices on the bus (SCL may be extended low by slower slave devices, or driven low by contending master devices). The bit rate when operating as a master will never exceed the limits defined by equation Equation 26.1.

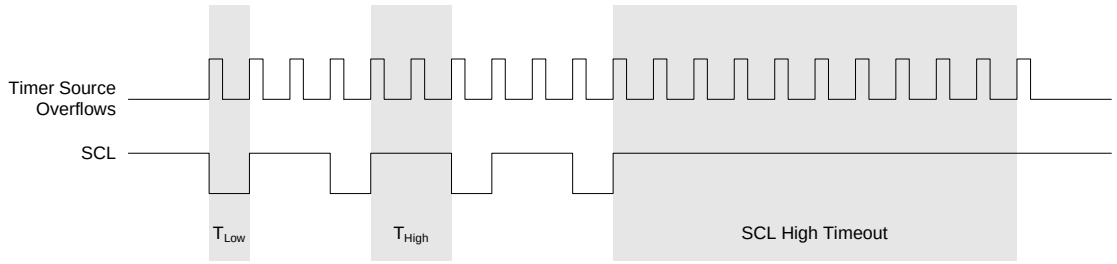


Figure 26.4. Typical SMBus SCL Generation

Setting the EXTHOLD bit extends the minimum setup and hold times for the SDA line. The minimum SDA setup time defines the absolute minimum time that SDA is stable before SCL transitions from low-to-high. The minimum SDA hold time defines the absolute minimum time that the current SDA value remains stable after SCL transitions from high-to-low. EXTHOLD should be set so that the minimum setup and hold times meet the SMBus Specification requirements of 250 ns and 300 ns, respectively. Table 26.2 shows the min-

SFR Definition 28.9. TMR2RLL: Timer 2 Reload Register Low Byte

Bit	7	6	5	4	3	2	1	0
Name	TMR2RLL[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xCA

Bit	Name	Function
7:0	TMR2RLL[7:0]	**Timer 2 Reload Register Low Byte.** TMR2RLL holds the low byte of the reload value for Timer 2.

SFR Definition 28.10. TMR2RLH: Timer 2 Reload Register High Byte

Bit	7	6	5	4	3	2	1	0
Name	TMR2RLH[7:0]							
Type	R/W							
Reset	0	0	0	0	0	0	0	0

SFR Address = 0xCB

Bit	Name	Function
7:0	TMR2RLH[7:0]	**Timer 2 Reload Register High Byte.** TMR2RLH holds the high byte of the reload value for Timer 2.

29.2. PCA0 Interrupt Sources

Figure 29.3 shows a diagram of the PCA interrupt tree. There are five independent event flags that can be used to generate a PCA0 interrupt. They are: the main PCA counter overflow flag (CF), which is set upon a 16-bit overflow of the PCA0 counter, an intermediate overflow flag (COVF), which can be set on an overflow from the 8th through 15th bit of the PCA0 counter, and the individual flags for each PCA channel (CCF0, CCF1, and CCF2), which are set according to the operation mode of that module. These event flags are always set when the trigger condition occurs. Each of these flags can be individually selected to generate a PCA0 interrupt, using the corresponding interrupt enable flag (ECF for CF, ECOV for COVF, and ECCFn for each CCFn). PCA0 interrupts must be globally enabled before any individual interrupt sources are recognized by the processor. PCA0 interrupts are globally enabled by setting the EA bit in the IE register and the EPCA0 bit in the EIE1 register to logic 1.

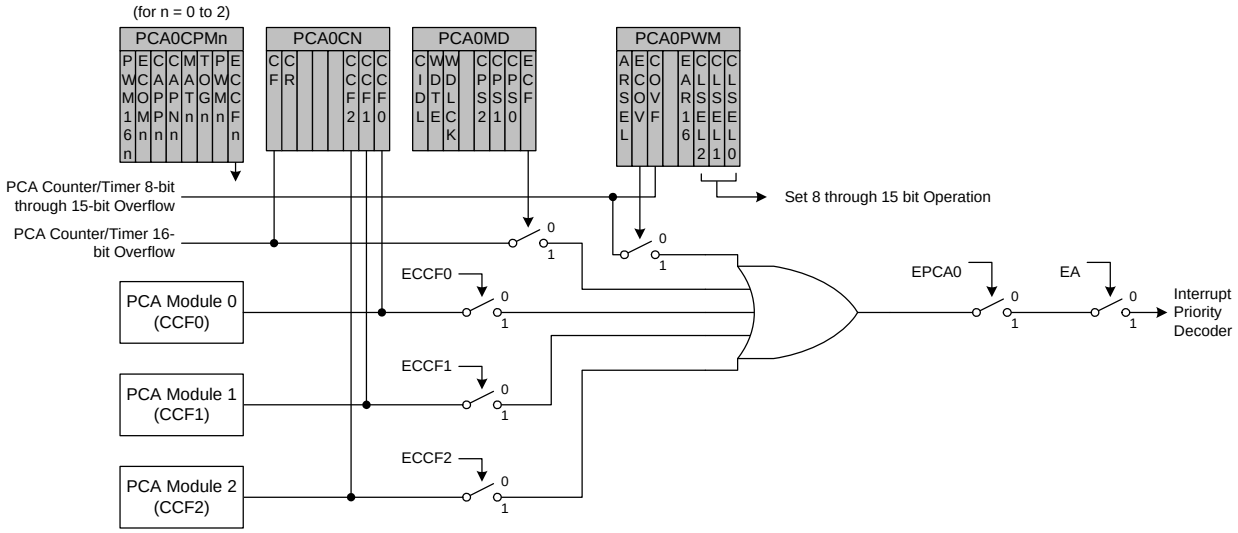


Figure 29.3. PCA Interrupt Block Diagram

29.3.3. High-Speed Output Mode

In high-speed output mode, a module's associated CEXn pin is toggled each time a match occurs between the PCA Counter and the module's 16-bit capture/compare register (PCA0CPHn and PCA0CPLn). When a match occurs, the Capture/Compare Flag (CCFn) in PCA0CN is set to logic 1. An interrupt request is generated if the CCFn interrupt for that module is enabled. The CCFn bit is not automatically cleared by hardware when the CPU vectors to the interrupt service routine, and must be cleared by software. Setting the TOGn, MATn, and ECOMn bits in the PCA0CPMn register enables the high-speed output mode. If ECOMn is cleared, the associated pin will retain its state, and not toggle on the next match event.

Important Note About Capture/Compare Registers: When writing a 16-bit value to the PCA0 Capture/Compare registers, the low byte should always be written first. Writing to PCA0CPLn clears the ECOMn bit to 0; writing to PCA0CPHn sets ECOMn to 1.

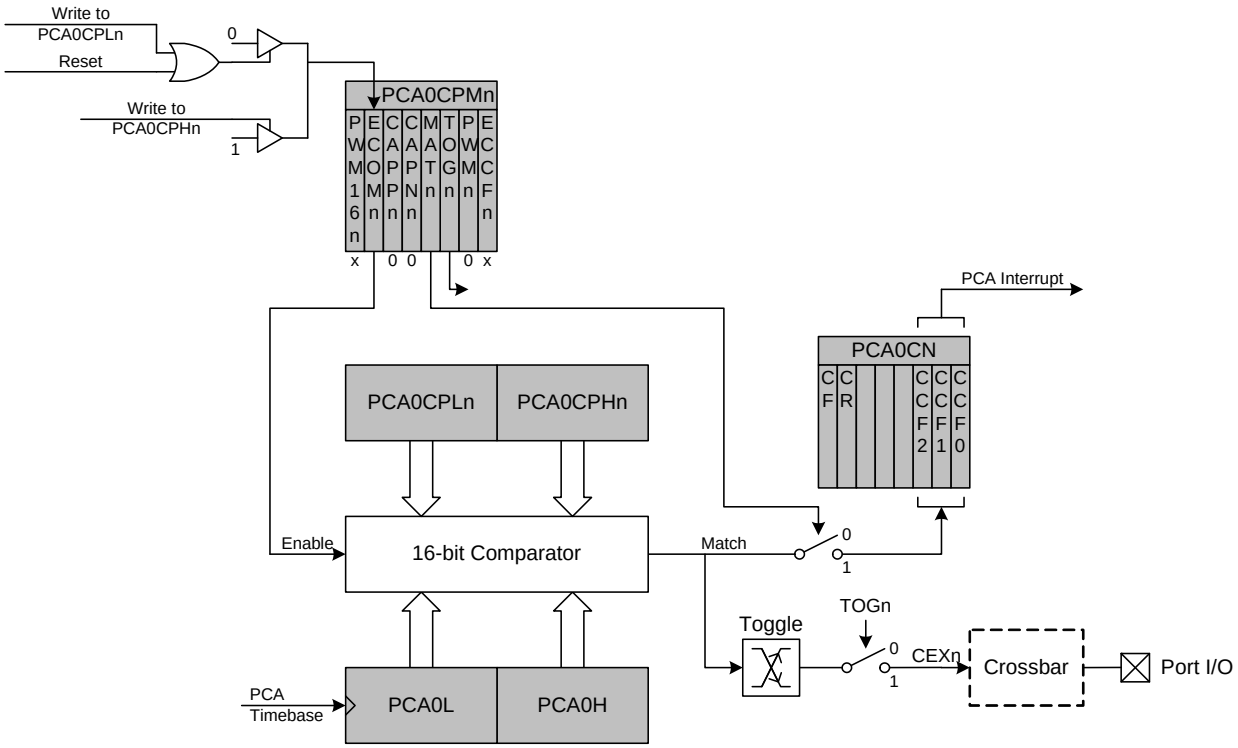


Figure 29.6. PCA High-Speed Output Mode Diagram

SFR Definition 29.2. PCA0MD: PCA0 Mode

Bit	7	6	5	4	3	2	1	0
Name	CIDL	WDTE	WDLCK		CPS2	CPS1	CPS0	ECF
Type	R/W	R/W	R/W	R	R/W	R/W	R/W	R/W
Reset	0	1	0	0	0	0	0	0

SFR Address = 0xD9

Bit	Name	Function
7	CIDL	**PCA Counter/Timer Idle Control.** Specifies PCA behavior when CPU is in idle mode. 0: PCA continues to function normally while the system controller is in Idle mode. 1: PCA operation is suspended while the system controller is in idle mode.
6	WDTE	**Watchdog Timer Enable.** If this bit is set, PCA Module 2 is used as the watchdog timer. 0: Watchdog Timer disabled. 1: PCA Module 2 enabled as Watchdog Timer.
5	WDLCK	**Watchdog Timer Lock.** This bit locks/unlocks the Watchdog Timer Enable. When WDLCK is set, the Watchdog Timer may not be disabled until the next system reset. 0: Watchdog Timer Enable unlocked. 1: Watchdog Timer Enable locked.
4	Unused	Read = 0b, Write = Don't care.
3:1	CPS[2:0]	**PCA Counter/Timer Pulse Select.** These bits select the timebase source for the PCA counter 000: System clock divided by 12 001: System clock divided by 4 010: Timer 0 overflow 011: High-to-low transitions on ECI (max rate = system clock divided by 4) 100: System clock 101: External clock divided by 8 (synchronized with the system clock) 11x: Reserved
0	ECF	**PCA Counter/Timer Overflow Interrupt Enable.** This bit sets the masking of the PCA Counter/Timer Overflow (CF) interrupt. 0: Disable the CF interrupt. 1: Enable a PCA Counter/Timer Overflow interrupt request when CF (PCA0CN.7) is set.
Note: When the WDTE bit is set to 1, the other bits in the PCA0MD register cannot be modified. To change the contents of the PCA0MD register, the Watchdog Timer must first be disabled.		

DOCUMENT CHANGE LIST

Revision 0.2 to Revision 1.0

- Updated Electrical Specification Tables to reflect production characterization data.
- Added Minimum SYSCLK specification for writing or erasing Flash.
- Added caution for going into suspend with wake source active (Section 20.3)
- Corrected VDM0CN reset values to "Varies".
- Removed mention of IDAC in Pinout table.