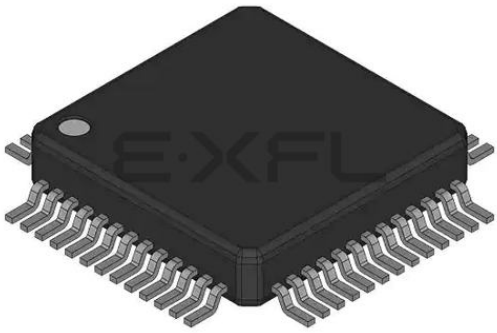

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Product Status	Active
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Connectivity	CANbus, EBI/EMI, SCI, SPI
Peripherals	POR, PWM, WDT
Number of I/O	35
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Program Memory Type	FLASH
EEPROM Size	-
RAM Size	4K x 8
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Chapter 20
96 Kbyte Flash Module (S12FTS96KV1)

Chapter 21
128 Kbyte Flash Module (S12FTS128K1V1)

1.3.4.27 PS[3:2] — Port S I/O Pins [3:2]

PS3 and PS2 are general purpose input or output pins. These pins are not available in the 48- / 52-pin package versions.

1.3.4.28 PS1 / TXD — Port S I/O Pin 1

PS1 is a general purpose input or output pin and the transmit pin, TXD, of serial communication interface (SCI).

1.3.4.29 PS0 / RXD — Port S I/O Pin 0

PS0 is a general purpose input or output pin and the receive pin, RXD, of serial communication interface (SCI).

1.3.4.30 PT[7:5] / IOC[7:5] — Port T I/O Pins [7:5]

PT7–PT5 are general purpose input or output pins. They can also be configured as the timer system input capture or output compare pins IOC7-IOC5.

1.3.4.31 PT[4:0] / IOC[4:0] / PW[4:0]— Port T I/O Pins [4:0]

PT4–PT0 are general purpose input or output pins. They can also be configured as the timer system input capture or output compare pins IOC[n] or as the PWM outputs PW[n].

1.3.5 Power Supply Pins

1.3.5.1 V_{DDX},V_{SSX} — Power and Ground Pins for I/O Drivers

External power and ground for I/O drivers. Bypass requirements depend on how heavily the MCU pins are loaded.

1.3.5.2 V_{DDR}, V_{SSR} — Power and Ground Pins for I/O Drivers and for Internal Voltage Regulator

External power and ground for the internal voltage regulator. Connecting V_{DDR} to ground disables the internal voltage regulator.

1.3.5.3 V_{DD1}, V_{DD2}, V_{SS1}, V_{SS2} — Internal Logic Power Pins

Power is supplied to the MCU through V_{DD} and V_{SS}. This 2.5V supply is derived from the internal voltage regulator. There is no static load on those pins allowed. The internal voltage regulator is turned off, if V_{DDR} is tied to ground.

Address	Name		Bit 7	6	5	4	3	2	1	Bit 0
0x0006	Reserved	R	0	0	0	0	0	0	0	0
		W								
0x0007	MODRR	R	0	0	0	MODRR4	MODRR3	MODRR2	MODRR1	MODRR0
		W								
0x0008	PTS	R	0	0	0	0	PTS3	PTS2	PTS1	PTS0
		W								
		SCI	—	—	—	—	—	—	TXD	RXD
0x0009	PTIS	R	0	0	0	0	PTIS3	PTIS2	PTIS1	PTIS0
		W								
0x000A	DDRS	R	0	0	0	0	DDRS3	DDRS2	DDRS1	DDRS0
		W								
0x000B	RDRS	R	0	0	0	0	RDRS3	RDRS2	RDRS1	RDRS0
		W								
0x000C	PERS	R	0	0	0	0	PERS3	PERS2	PERS1	PERS0
		W								
0x000D	PPSS	R	0	0	0	0	PPSS3	PPSS2	PPSS1	PPSS0
		W								
0x000E	WOMS	R	0	0	0	0	WOMS3	WOMS2	WOMS1	WOMS0
		W								
0x000F	Reserved	R	0	0	0	0	0	0	0	0
		W								
0x0010	PTM	R	0	0	PTM5	PTM4	PTM3	PTM2	PTM1	PTM0
		W								
		MSCAN / SPI	—	—	SCK	MOSI	$\overline{SS}$	MISO	TXCAN	RXCAN
0x0011	PTIM	R	0	0	PTIM5	PTIM4	PTIM3	PTIM2	PTIM1	PTIM0
		W								
0x0012	DDRM	R	0	0	DDRM5	DDRM4	DDRM3	DDRM2	DDRM1	DDRM0
		W								
0x0013	RDRM	R	0	0	RDRM5	RDRM4	RDRM3	RDRM2	RDRM1	RDRM0
		W								
0x0014	PERM	R	0	0	PERM5	PERM4	PERM3	PERM2	PERM1	PERM0
		W								
0x0015	PPSM	R	0	0	PPSM5	PPSM4	PPSM3	PPSM2	PPSM1	PPSM0
		W								
0x0016	WOMM	R	0	0	WOMM5	WOMM4	WOMM3	WOMM2	WOMM1	WOMM0
		W								
0x0017	Reserved	R	0	0	0	0	0	0	0	0
		W								
0x0018	PTP	R	PTP7	PTP6	PTP5	PTP4	PTP3	PTP2	PTP1	PTP0
		W								
		PWM	—	—	PWM5	PWM4	PWM3	PWM2	PWM1	PWM0
0x0019	PTIP	R	PTIP7	PTIP6	PTIP5	PTIP4	PTIP3	PTIP2	PTIP1	PTIP0
		W								

= Unimplemented or Reserved

Figure 2-2. Quick Reference to PIM Registers (Sheet 2 of 3)

2.3.2.1.6 Port T Polarity Select Register (PTTST)

Module Base + 0x0005

	7	6	5	4	3	2	1	0
R W	PPST7	PPST6	PPST5	PPST4	PPST3	PPST2	PPST1	PPST0
Reset	0	0	0	0	0	0	0	0

Figure 2-8. Port T Polarity Select Register (PPST)

Read: Anytime.

Write: Anytime.

Table 2-8. PPST Field Descriptions

Field	Description
7–0 PPST[7:0]	**Pull Select Port T** — This register selects whether a pull-down or a pull-up device is connected to the pin. 0 A pull-up device is connected to the associated port T pin, if enabled by the associated bit in register PERT and if the port is used as input. 1 A pull-down device is connected to the associated port T pin, if enabled by the associated bit in register PERT and if the port is used as input.

2.3.2.1.7 Port T Module Routing Register (MODRR)

Module Base + 0x0007

	7	6	5	4	3	2	1	0
R	0	0	0	MODRR4	MODRR3	MODRR2	MODRR1	MODRR0
W								
Reset	—	—	—	0	0	0	0	0

= Unimplemented or Reserved

Figure 2-9. Port T Module Routing Register (MODRR)

Read: Anytime.

Write: Anytime.

NOTE

MODRR[4] must be kept clear on devices featuring a 4 channel PWM.

Table 2-9. MODRR Field Descriptions

Field	Description
4–0 MODRR[4:0]	**Module Routing Register Port T** — This register selects the module connected to port T. 0 Associated pin is connected to TIM module 1 Associated pin is connected to PWM module

8.3.2.5 ATD Control Register 4 (ATDCTL4)

This register selects the conversion clock frequency, the length of the second phase of the sample time and the resolution of the A/D conversion (i.e.: 8-bits or 10-bits). Writes to this register will abort current conversion sequence but will not start a new sequence.

Module Base + 0x0004

	7	6	5	4	3	2	1	0
R W	SRES8	SMP1	SMP0	PRS4	PRS3	PRS2	PRS1	PRS0
Reset	0	0	0	0	0	1	0	1

Figure 8-7. ATD Control Register 4 (ATDCTL4)

Read: Anytime

Write: Anytime

Table 8-6. ATDCTL4 Field Descriptions

Field	Description
7 SRES8	**A/D Resolution Select** — This bit selects the resolution of A/D conversion results as either 8 or 10 bits. The A/D converter has an accuracy of 10 bits; however, if low resolution is required, the conversion can be speeded up by selecting 8-bit resolution. 0 10-bit resolution 1 8-bit resolution
6–5 SMP[1:0]	**Sample Time Select** — These two bits select the length of the second phase of the sample time in units of ATD conversion clock cycles. Note that the ATD conversion clock period is itself a function of the prescaler value (bits PRS4-0). The sample time consists of two phases. The first phase is two ATD conversion clock cycles long and transfers the sample quickly (via the buffer amplifier) onto the A/D machine's storage node. The second phase attaches the external analog signal directly to the storage node for final charging and high accuracy. Table 8-7 lists the lengths available for the second sample phase.
4–0 PRS[4:0}	**ATD Clock Prescaler** — These 5 bits are the binary value prescaler value PRS. The ATD conversion clock frequency is calculated as follows: $$ATDclock = \frac{[BusClock]}{[PRS + 1]} \times 0.5$$ **Note:** The maximum ATD conversion clock frequency is half the Bus Clock. The default (after reset) prescaler value is 5 which results in a default ATD conversion clock frequency that is Bus Clock divided by 12. Table 8-8 illustrates the divide-by operation and the appropriate range of the Bus Clock.

Table 8-7. Sample Time Select

SMP1	SMP0	Length of 2nd Phase of Sample Time
0	0	2 A/D conversion clock periods
0	1	4 A/D conversion clock periods
1	0	8 A/D conversion clock periods
1	1	16 A/D conversion clock periods

The internal reset of the MCU remains asserted while the reset generator completes the 192 SYSCLK long reset sequence. The reset generator circuitry always makes sure the internal reset is deasserted synchronously after completion of the 192 SYSCLK cycles. In case the RESET pin is externally driven low for more than these 192 SYSCLK cycles (external reset), the internal reset remains asserted too.

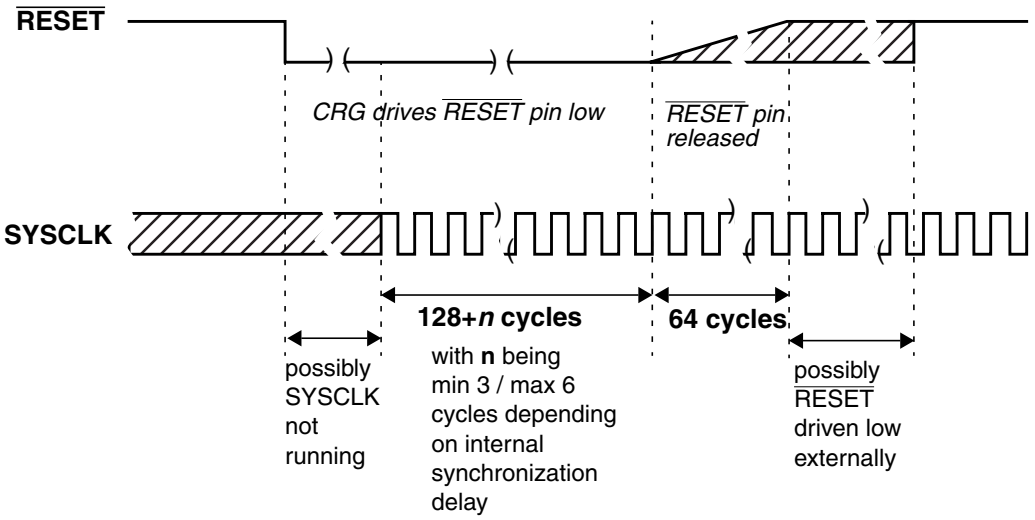

Figure 9-25. RESET Timing

9.5.1 Clock Monitor Reset

The CRGV4 generates a clock monitor reset in case all of the following conditions are true:

- Clock monitor is enabled (CME=1)
- Loss of clock is detected
- Self-clock mode is disabled (SCME=0)

The reset event asynchronously forces the configuration registers to their default settings (see Section 9.3, “Memory Map and Register Definition”). In detail the CME and the SCME are reset to logical ‘1’ (which doesn’t change the state of the CME bit, because it has already been set). As a consequence, the CRG immediately enters self-clock mode and starts its internal reset sequence. In parallel the clock quality check starts. As soon as clock quality check indicates a valid oscillator clock the CRG switches to OSCCLK and leaves self-clock mode. Because the clock quality checker is running in parallel to the reset generator, the CRG may leave self-clock mode while completing the internal reset sequence. When the reset sequence is finished the CRG checks the internally latched state of the clock monitor fail circuit. If a clock monitor fail is indicated processing begins by fetching the clock monitor reset vector.

9.5.2 Computer Operating Properly Watchdog (COP) Reset

When COP is enabled, the CRG expects sequential write of 0x0055 and 0x00AA (in this order) to the ARMCOP register during the selected time-out period. As soon as this is done, the COP time-out period restarts. If the program fails to do this the CRG will generate a reset. Also, if any value other than 0x0055 or 0x00AA is written, the CRG immediately generates a reset. In case windowed COP operation is enabled

12.3.2.11 Reserved Registers (PWMSCNTx)

The registers PWMSCNTA and PWMSCNTB are reserved for factory testing of the PWM module and are not available in normal modes.

Module Base + 0x000A

	7	6	5	4	3	2	1	0
R	0	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

= Unimplemented or Reserved

Figure 12-13. Reserved Register (PWMSCNTA)

Module Base + 0x000B

	7	6	5	4	3	2	1	0
R	0	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

= Unimplemented or Reserved

Figure 12-14. Reserved Register (PWMSCNTB)

Read: always read 0x0000 in normal modes

Write: unimplemented in normal modes

NOTE

Writing to these registers when in special modes can alter the PWM functionality.

12.4.1.2 Clock Scale

The scaled A clock uses clock A as an input and divides it further with a user programmable value and then divides this by 2. The scaled B clock uses clock B as an input and divides it further with a user programmable value and then divides this by 2. The rates available for clock SA are software selectable to be clock A divided by 2, 4, 6, 8, ..., or 512 in increments of divide by 2. Similar rates are available for clock SB.

Clock A is used as an input to an 8-bit down counter. This down counter loads a user programmable scale value from the scale register (PWMSCLA). When the down counter reaches 1, two things happen; a pulse is output and the 8-bit counter is re-loaded. The output signal from this circuit is further divided by two.

This gives a greater range with only a slight reduction in granularity. Clock SA equals clock A divided by two times the value in the PWMSCLA register.

NOTE

Clock SA = Clock A / (2 * PWMSCLA)

When PWMSCLA = 0x0000, PWMSCLA value is considered a full scale value of 256. Clock A is thus divided by 512.

Similarly, clock B is used as an input to an 8-bit down counter followed by a divide by two producing clock SB. Thus, clock SB equals clock B divided by two times the value in the PWMSCLB register.

NOTE

Clock SB = Clock B / (2 * PWMSCLB)

When PWMSCLB = 0x0000, PWMSCLB value is considered a full scale value of 256. Clock B is thus divided by 512.

As an example, consider the case in which the user writes 0x00FF into the PWMSCLA register. Clock A for this case will be bus clock divided by 4. A pulse will occur at a rate of once every 255 x 4 bus cycles. Passing this through the divide by two circuit produces a clock signal at a bus clock divided by 2040 rate. Similarly, a value of 0x0001 in the PWMSCLA register when clock A is bus clock divided by 4 will produce a bus clock divided by 8 rate.

Writing to PWMSCLA or PWMSCLB causes the associated 8-bit down counter to be re-loaded. Otherwise, when changing rates the counter would have to count down to 0x0001 before counting at the proper rate. Forcing the associated counter to re-load the scale register value every time PWMSCLA or PWMSCLB is written prevents this.

NOTE

Writing to the scale registers while channels are operating can cause irregularities in the PWM outputs.

14.2.2 MISO — Master In/Slave Out Pin

This pin is used to transmit data out of the SPI module when it is configured as a slave and receive data when it is configured as master.

14.2.3 $\overline{SS}$ — Slave Select Pin

This pin is used to output the select signal from the SPI module to another peripheral with which a data transfer is to take place when its configured as a master and its used as an input to receive the slave select signal when the SPI is configured as slave.

14.2.4 SCK — Serial Clock Pin

This pin is used to output the clock with respect to which the SPI transfers data or receive clock in case of slave.

14.3 Memory Map and Register Definition

This section provides a detailed description of address space and registers used by the SPI.

The memory map for the SPIV3 is given below in Table 14-1. The address listed for each register is the sum of a base address and an address offset. The base address is defined at the SoC level and the address offset is defined at the module level. Reads from the reserved bits return zeros and writes to the reserved bits have no effect.

14.3.1 Module Memory Map

Table 14-1. SPIV3 Memory Map

Address	Use	Access
0x0000	SPI Control Register 1 (SPICR1)	R/W
0x0001	SPI Control Register 2 (SPICR2)	R/W(1)
0x0002	SPI Baud Rate Register (SPIBR)	R/W1
0x0003	SPI Status Register (SPISR)	R(2)
0x0004	Reserved	— 2,(3)
0x0005	SPI Data Register (SPIDR)	R/W
0x0006	Reserved	— 2,3
0x0007	Reserved	— 2,3

1. Certain bits are non-writable.
2. Writes to this register are ignored.
3. Reading from this register returns all zeros.

Table 14-2. SPICR1 Field Descriptions

Field	Description
7 SPIE	**SPI Interrupt Enable Bit** — This bit enables SPI interrupt requests, if SPIF or MODF status flag is set. 0 SPI interrupts disabled. 1 SPI interrupts enabled.
6 SPE	**SPI System Enable Bit** — This bit enables the SPI system and dedicates the SPI port pins to SPI system functions. If SPE is cleared, SPI is disabled and forced into idle state, status bits in SPISR register are reset. 0 SPI disabled (lower power consumption). 1 SPI enabled, port pins are dedicated to SPI functions.
5 SPTIE	**SPI Transmit Interrupt Enable** — This bit enables SPI interrupt requests, if SPTEF flag is set. 0 SPTEF interrupt disabled. 1 SPTEF interrupt enabled.
4 MSTR	**SPI Master/Slave Mode Select Bit** — This bit selects, if the SPI operates in master or slave mode. Switching the SPI from master to slave or vice versa forces the SPI system into idle state. 0 SPI is in slave mode 1 SPI is in master mode
3 CPOL	**SPI Clock Polarity Bit** — This bit selects an inverted or non-inverted SPI clock. To transmit data between SPI modules, the SPI modules must have identical CPOL values. In master mode, a change of this bit will abort a transmission in progress and force the SPI system into idle state. 0 Active-high clocks selected. In idle state SCK is low. 1 Active-low clocks selected. In idle state SCK is high.
2 CPHA	**SPI Clock Phase Bit** — This bit is used to select the SPI clock format. In master mode, a change of this bit will abort a transmission in progress and force the SPI system into idle state. 0 Sampling of data occurs at odd edges (1,3,5,...,15) of the SCK clock 1 Sampling of data occurs at even edges (2,4,6,...,16) of the SCK clock
1 SSOE	**Slave Select Output Enable** — The $\overline{SS}$ output feature is enabled only in master mode, if MODFEN is set, by asserting the SSOE as shown in Table 14-3. In master mode, a change of this bit will abort a transmission in progress and force the SPI system into idle state.
0 LSBFE	**LSB-First Enable** — This bit does not affect the position of the MSB and LSB in the data register. Reads and writes of the data register always have the MSB in bit 7. In master mode, a change of this bit will abort a transmission in progress and force the SPI system into idle state. 0 Data is transferred most significant bit first. 1 Data is transferred least significant bit first.

Table 14-3. $\overline{SS}$ Input / Output Selection

MODFEN	SSOE	Master Mode	Slave Mode
0	0	$\overline{SS}$ not used by SPI	$\overline{SS}$ input
0	1	$\overline{SS}$ not used by SPI	$\overline{SS}$ input
1	0	$\overline{SS}$ input with MODF feature	$\overline{SS}$ input
1	1	$\overline{SS}$ is slave select output	$\overline{SS}$ input

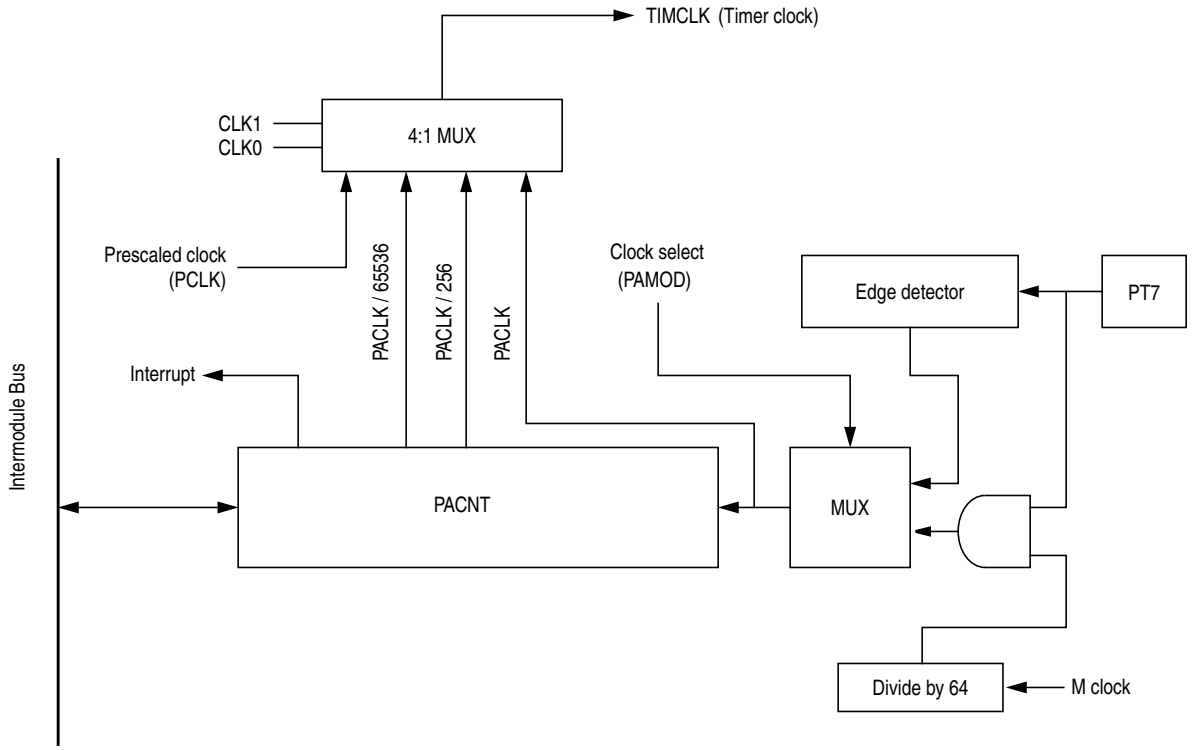

Figure 15-2. 16-Bit Pulse Accumulator Block Diagram

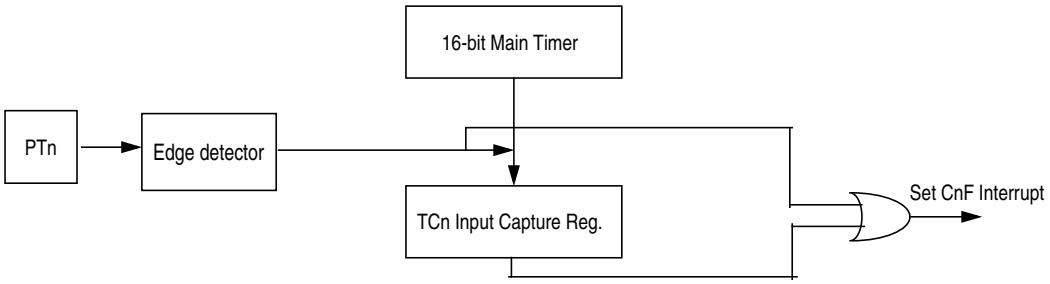

Figure 15-3. Interrupt Flag Setting

15.3.2 Register Descriptions

This section consists of register descriptions in address order. Each description includes a standard register diagram with an associated figure number. Details of register bit and field function follow the register diagrams, in bit order.

Register Name		Bit 7	6	5	4	3	2	1	Bit 0
0x0000 TIOS	R	IOS7	IOS6	IOS5	IOS4	IOS3	IOS2	IOS1	IOS0
	W								
0x0001 CFORC	R	0	0	0	0	0	0	0	0
	W	FOC7	FOC6	FOC5	FOC4	FOC3	FOC2	FOC1	FOC0
0x0002 OC7M	R	OC7M7	OC7M6	OC7M5	OC7M4	OC7M3	OC7M2	OC7M1	OC7M0
	W								
0x0003 OC7D	R	OC7D7	OC7D6	OC7D5	OC7D4	OC7D3	OC7D2	OC7D1	OC7D0
	W								
0x0004 TCNTH	R	TCNT15	TCNT14	TCNT13	TCNT12	TCNT11	TCNT10	TCNT9	TCNT8
	W								
0x0005 TCNTL	R	TCNT7	TCNT6	TCNT5	TCNT4	TCNT3	TCNT2	TCNT1	TCNT0
	W								
0x0006 TSCR1	R	TEN	TSWAI	TSFRZ	TFFCA	0	0	0	0
	W								
0x0007 TTOV	R	TOV7	TOV6	TOV5	TOV4	TOV3	TOV2	TOV1	TOV0
	W								
0x0008 TCTL1	R	OM7	OL7	OM6	OL6	OM5	OL5	OM4	OL4
	W								
0x0009 TCTL2	R	OM3	OL3	OM2	OL2	OM1	OL1	OM0	OL0
	W								
0x000A TCTL3	R	EDG7B	EDG7A	EDG6B	EDG6A	EDG5B	EDG5A	EDG4B	EDG4A
	W								
0x000B TCTL4	R	EDG3B	EDG3A	EDG2B	EDG2A	EDG1B	EDG1A	EDG0B	EDG0A
	W								
0x000C TIE	R	C7I	C6I	C5I	C4I	C3I	C2I	C1I	C0I
	W								

= Unimplemented or Reserved

Figure 15-5. TIM16B8CV1 Register Summary

Write: Used in the clearing mechanism (set bits cause corresponding bits to be cleared). Writing a zero will not affect current status of the bit.

Table 15-17. TRLG1 Field Descriptions

Field	Description
7:0 C[7:0]F	**Input Capture/Output Compare Channel "x" Flag** — These flags are set when an input capture or output compare event occurs. Clearing requires writing a one to the corresponding flag bit when TEN is set to one. When TFFCA bit in TSCR register is set, a read from an input capture or a write into an output compare channel (0x0010–0x001F) will cause the corresponding channel flag CxF to be cleared.

15.3.2.13 Main Timer Interrupt Flag 2 (TFLG2)

Module Base + 0x000F

	7	6	5	4	3	2	1	0
R	TOF	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

Unimplemented or Reserved

Figure 15-21. Main Timer Interrupt Flag 2 (TFLG2)

TFLG2 indicates when interrupt conditions have occurred. To clear a bit in the flag register, write the bit to one while TEN of TSCR1 is set to one.

Read: Anytime

Write: Used in clearing mechanism (set bits cause corresponding bits to be cleared).

Any access to TCNT will clear TFLG2 register if the TFFCA bit in TSCR register is set.

Table 15-18. TRLG2 Field Descriptions

Field	Description
7 TOF	**Timer Overflow Flag** — Set when 16-bit free-running timer overflows from 0xFFFF to 0x0000. Clearing this bit requires writing a one to bit 7 of TFLG2 register while TEN bit of TSCR1 is set to one. (See also TCRE control bit explanation.)

Figure 17-9 illustrates all possible protection scenarios. Although the protection scheme is loaded from the Flash array after reset, it is allowed to change in normal modes. This protection scheme can be used by applications requiring re-programming in single chip mode while providing as much protection as possible if no re-programming is required.

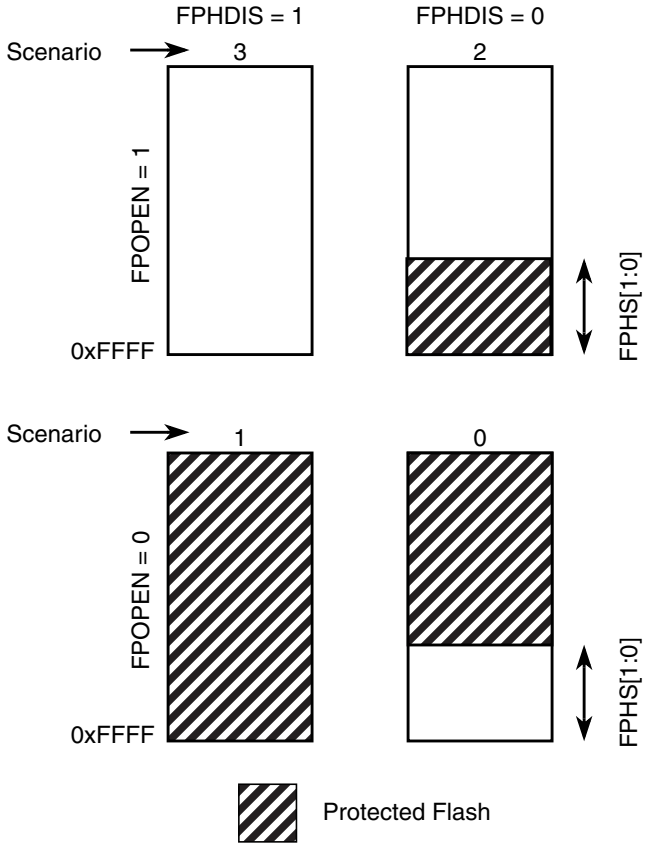

Figure 17-9. Flash Protection Scenarios

17.3.2.5.1 Flash Protection Restrictions

The general guideline is that protection can only be added, not removed. All valid transitions between Flash protection scenarios are specified in Table 17-11. Any attempt to write an invalid scenario to the FPROT register will be ignored and the FPROT register will remain unchanged. The contents of the FPROT register reflect the active protection scenario.

Table 17-11. Flash Protection Scenario Transitions

From Protection Scenario	To Protection Scenario[1]			
	0	1	2	3
0	X	X		
1		X		
2		X	X	

FPHDIS is cleared. The FPROT register is loaded from Flash address 0xFF0D during the reset sequence, indicated by F in Figure 20-10.

To change the Flash protection that will be loaded on reset, the upper sector of the Flash array must be unprotected, then the Flash protection byte located at Flash address 0xFF0D must be written to.

A protected Flash sector is disabled by FPHDIS and FPLDIS while the size of the protected sector is defined by FPHS[1:0] and FPLS[1:0] in the FPROT register.

Trying to alter any of the protected areas will result in a protect violation error and the PVIOL flag will be set in the FSTAT register (see Section 20.3.2.6). A mass erase of the whole Flash array is only possible when protection is fully disabled by setting the FPOPEN, FPLDIS, and FPHDIS bits. An attempt to mass erase a Flash array while protection is enabled will set the PVIOL flag in the FSTAT register.

Table 20-9. FPROT Field Descriptions

Field	Description
7 FPOPEN	**Protection Function for Program or Erase** — It is possible using the FPOPEN bit to either select address ranges to be protected using FPHDIS, FPLDIS, FPHS[1:0] and FPLS[1:0] or to select the same ranges to be unprotected. When FPOPEN is set, FPxDIS enables the ranges to be protected, whereby clearing FPxDIS enables protection for the range specified by the corresponding FPxS[1:0] bits. When FPOPEN is cleared, FPxDIS defines unprotected ranges as specified by the corresponding FPxS[1:0] bits. In this case, setting FPxDIS enables protection. Thus the effective polarity of the FPxDIS bits is swapped by the FPOPEN bit as shown in Table 20-10. This function allows the main part of the Flash array to be protected while a small range can remain unprotected for EEPROM emulation. 0 The FPHDIS and FPLDIS bits define Flash address ranges to be unprotected 1 The FPHDIS and FPLDIS bits define Flash address ranges to be protected
6 NV6	**Nonvolatile Flag Bit** — The NV6 bit should remain in the erased state for future enhancements.
5 FPHDIS	**Flash Protection Higher Address Range Disable** — The FPHDIS bit determines whether there is a protected/unprotected area in the higher space of the Flash address map. 0 Protection/unprotection enabled 1 Protection/unprotection disabled
4–3 FPHS[1:0]	**Flash Protection Higher Address Size** — The FPHS[1:0] bits determine the size of the protected/unprotected sector as shown in Table 20-11. The FPHS[1:0] bits can only be written to while the FPHDIS bit is set.
2 FPLDIS	**Flash Protection Lower Address Range Disable** — The FPLDIS bit determines whether there is a protected/unprotected sector in the lower space of the Flash address map. 0 Protection/unprotection enabled 1 Protection/unprotection disabled
1–0 FPLS[1:0]	**Flash Protection Lower Address Size** — The FPLS[1:0] bits determine the size of the protected/unprotected sector as shown in Table 20-12. The FPLS[1:0] bits can only be written to while the FPLDIS bit is set.

Module Base + 0x000C

	7	6	5	4	3	2	1	0
R	0	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

= Unimplemented or Reserved

Figure 21-17. RESERVED3

All bits read 0 and are not writable.

21.3.2.12 RESERVED4

This register is reserved for factory testing and is not accessible to the user.

Module Base + 0x000D

	7	6	5	4	3	2	1	0
R	0	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

= Unimplemented or Reserved

Figure 21-18. RESERVED4

All bits read 0 and are not writable.

21.3.2.13 RESERVED5

This register is reserved for factory testing and is not accessible to the user.

Module Base + 0x000E

	7	6	5	4	3	2	1	0
R	0	0	0	0	0	0	0	0
W								
Reset	0	0	0	0	0	0	0	0

= Unimplemented or Reserved

Figure 21-19. RESERVED5

All bits read 0 and are not writable.

21.3.2.14 RESERVED6

This register is reserved for factory testing and is not accessible to the user.

21.4.1.3.4 Mass Erase Command

The mass erase operation will erase all addresses in a Flash array using an embedded algorithm.

An example flow to execute the mass erase operation is shown in Figure 21-25. The mass erase command write sequence is as follows:

1. Write to a Flash array address to start the command write sequence for the mass erase command. The address and data written will be ignored.
2. Write the mass erase command, 0x41, to the FCMD register.
3. Clear the CBEIF flag in the FSTAT register by writing a 1 to CBEIF to launch the mass erase command.

If a Flash array to be erased contains any protected area, the PVIOL flag in the FSTAT register will set and the mass erase command will not launch. Once the mass erase command has successfully launched, the CCIF flag in the FSTAT register will set after the mass erase operation has completed unless a new command write sequence has been buffered.

Table A-7. 3.3V I/O Characteristics

Conditions are V_{DDX}=3.3V +/-10%, Temperature from –40˚C to +140˚C, unless otherwise noted							
Num	**C**	**Rating**	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
1	P	Input High Voltage	V_{IH}	0.65*V_{DD5}	—	—	V
	T	Input High Voltage	V_{IH}	—	—	V_{DD5} + 0.3	V
2	P	Input Low Voltage	V_{IL}	—	—	0.35*V_{DD5}	V
	T	Input Low Voltage	V_{IL}	V_{SS5} – 0.3	—	—	V
3	C	Input Hysteresis	V_{HYS}	—	250	—	mV
4	P	Input Leakage Current (pins in high ohmic input mode)(1) V_{in} = V_{DD5} or V_{SS5}	I_{in}	–1	—	1	µA
5	C	Output High Voltage (pins in output mode) Partial Drive I_{OH} = –0.75mA	V_{OH}	V_{DD5} – 0.4	—	—	V
6	P	Output High Voltage (pins in output mode) Full Drive I_{OH} = –4mA	V_{OH}	V_{DD5} – 0.4	—	—	V
7	C	Output Low Voltage (pins in output mode) Partial Drive I_{OL} = +0.9mA	V_{OL}	—	—	0.4	V
8	P	Output Low Voltage (pins in output mode) Full Drive I_{OL} = +4.75mA	V_{OL}	—	—	0.4	V
9	P	Internal Pull Up Device Current, tested at V_{IL} Max.	I_{PUL}	—	—	–60	µA
10	C	Internal Pull Up Device Current, tested at V_{IH} Min.	I_{PUH}	-6	—	—	µA
11	P	Internal Pull Down Device Current, tested at V_{IH} Min.	I_{PDH}	—	—	60	µA
12	C	Internal Pull Down Device Current, tested at V_{IL} Max.	I_{PDL}	6	—	—	µA
11	D	Input Capacitance	C_{in}	—	7	—	πΦ
12	T	Injection current(2) Single Pin limit Total Device Limit. Sum of all injected currents	I_{ICS} I_{ICP}	–2.5 –25	—	2.5 25	µA
13	P	Port P, J Interrupt Input Pulse filtered(3)	t_{PIGN}	—	—	3	µs
14	P	Port P, J Interrupt Input Pulse passed3	t_{PVAL}	10	—	—	µs

1. Maximum leakage current occurs at maximum operating temperature. Current decreases by approximately one-half for each 8 C to 12 C in the temperature range from 50 C to 125 C
2. Refer to Section A.1.4, “Current Injection”, for more details
3. Parameter only applies in STOP or Pseudo STOP mode.

A.1.10 Supply Currents

This section describes the current consumption characteristics of the device as well as the conditions for the measurements.

A.1.10.1 Measurement Conditions

All measurements are without output loads. Unless otherwise noted the currents are measured in single chip mode, internal voltage regulator enabled and at 25MHz bus frequency using a 4MHz oscillator.

Appendix C
Package Information

C.1 General

This section provides the physical dimensions of the packages 48LQFP, 52LQFP, 80QFP.