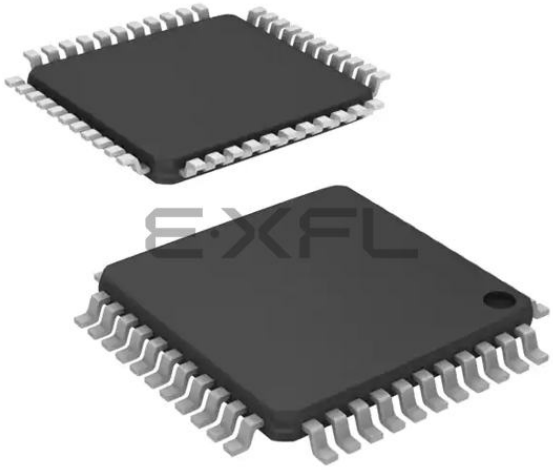

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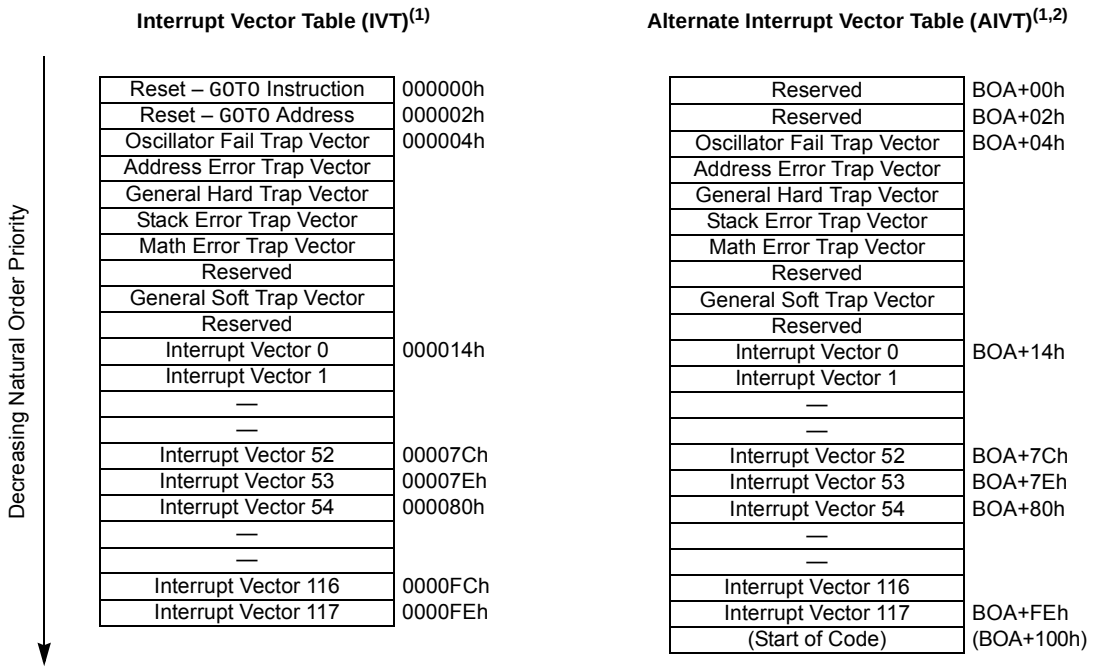
Details	
Product Status	Active
Core Processor	PIC
Core Size	16-Bit
Speed	32MHz
Connectivity	I²C, IrDA, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, I²S, LVD, POR, PWM, WDT
Number of I/O	36
Program Memory Size	256KB (85.5K x 24)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 3.6V
Data Converters	A/D 14x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	44-TQFP
Supplier Device Package	44-TQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic24fj256ga704-i-pt

TABLE 1-1: DEVICE FEATURES FOR THE PIC24FJXXXGA702: 28-PIN DEVICES

Features	PIC24FJ64GA702	PIC24FJ128GA702	PIC24FJ256GA702
Operating Frequency	DC – 32 MHz		
Program Memory (bytes)	64K	128K	256K
Program Memory (instruction words, 24 bits)	22,528	45,056	88,064
Data Memory (bytes)	16K		
Interrupt Sources (soft vectors/NMI traps)	124		
I/O Ports	Ports A, B		
Total I/O Pins	22		
Remappable Pins	18 (18 I/Os, 0 input only)		
DMA	1 6-channel		
16-Bit Timers	3(1)		
Real-Time Clock and Calendar (RTCC)	Yes		
Cyclic Redundancy Check (CRC)	Yes		
Input Capture Channels	3(1)		
Output Compare/PWM Channels	3(1)		
Input Change Notification Interrupt	21 (remappable pins)		
Serial Communications:			
UART	2(1)		
SPI (3-wire/4-wire)	3(1)		
I^2C	2		
Configurable Logic Cell (CLC)	2(1)		
Parallel Communications (EPMP/PSP)	No		
Capture/Compare/PWM/Timer Modules	4 Multiple CCPs 1 (6-output), 3 (2-output)		
JTAG Boundary Scan	Yes		
10/12-Bit Analog-to-Digital Converter (A/D) Module (input channels)	10		
Analog Comparators	3		
CTMU Interface	Yes		
Universal Serial Bus Controller	No		
Resets (and Delays)	Core POR, VDD POR, BOR, RESET Instruction, $\overline{MCLR}$, WDT, Illegal Opcode, REPEAT Instruction, Hardware Traps, Configuration Word Mismatch (OST, PLL Lock)		
Instruction Set	76 Base Instructions, Multiple Addressing Mode Variations		
Packages	28-Pin QFN, UQFN, SOIC, SSOP and SPDIP		

Note 1: Some peripherals are accessible through remappable pins.

FIGURE 8-1: PIC24F INTERRUPT VECTOR TABLES



Legend: BOA: Base Offset Address for AIVT, which is the starting address of the last page of the Boot Segment. All addresses are in hexadecimal.

Note 1: See Table 8-2 for the interrupt vector list.

2: AIVT is only available when a Boot Segment is implemented.

TABLE 8-1: TRAP VECTOR DETAILS

Vector Number	IVT Address	AIVT Address	Trap Source
0	000004h	BOA+04h	Oscillator Failure
1	000006h	BOA+06h	Address Error
2	000008h	BOA+08h	General Hardware Error
3	00000Ah	BOA+0Ah	Stack Error
4	00000Ch	BOA+0Ch	Math Error
5	00000Eh	BOA+0Eh	Reserved
6	000010h	BOA+10h	General Software Error
7	000012h	BOA+12h	Reserved

Legend: BOA = Base Offset Address for AIVT segment, which is the starting address of the last page of the Boot Segment.

REGISTER 8-2: CORCON: CPU CORE CONTROL REGISTER(1)

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	U-0	R/C-0	R/W-1	U-0	U-0
—	—	—	—	IPL3(2)	PSV	—	—
bit 7							bit 0

Legend:	C = Clearable bit		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1'= Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-4 **Unimplemented:** Read as '0'

bit 3 **IPL3:** CPU Interrupt Priority Level Status bit(2)
1 = CPU Interrupt Priority Level is greater than 7
0 = CPU Interrupt Priority Level is 7 or less

bit 2 **PSV:** Not used as part of the interrupt module

bit 1-0 **Unimplemented:** Read as '0'

Note 1: For complete register details, see Register 3-2.

2: The IPL<2:0> Status bits are concatenated with the IPL3 Status bit (CORCON<3>) to form the CPU Interrupt Priority Level (IPL). The value in parentheses indicates the IPL when IPL3 = 1. User interrupts are disabled when IPL3 = 1.

REGISTER 8-3: INTCON1: INTERRUPT CONTROL REGISTER 1

R/W-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
NSTDIS	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0
—	—	—	MATHERR	ADDRERR	STKERR	OSCFAIL	—
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as ‘0’	
-n = Value at POR	‘1’ = Bit is set	‘0’ = Bit is cleared	x = Bit is unknown

bit 15 **NSTDIS:** Interrupt Nesting Disable bit
1 = Interrupt nesting is disabled
0 = Interrupt nesting is enabled

bit 14-5 **Unimplemented:** Read as ‘0’

bit 4 **MATHERR:** Math Error Status bit
1 = Math error trap has occurred
0 = Math error trap has not occurred

bit 3 **ADDRERR:** Address Error Trap Status bit
1 = Address error trap has occurred
0 = Address error trap has not occurred

bit 2 **STKERR:** Stack Error Trap Status bit
1 = Stack error trap has occurred
0 = Stack error trap has not occurred

bit 1 **OSCFAIL:** Oscillator Failure Trap Status bit
1 = Oscillator failure trap has occurred
0 = Oscillator failure trap has not occurred

bit 0 **Unimplemented:** Read as ‘0’

REGISTER 10-1: PMD1: PERIPHERAL MODULE DISABLE REGISTER 1

U-0	U-0	R/W-0	R/W-0	R/W-0	U-0	U-0	U-0
—	—	T3MD	T2MD	T1MD	—	—	—
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0	U-0	R/W-0
I2C1MD	U2MD	U1MD	SPI2MD	SPI1MD	—	—	ADC1MD
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as '0'

bit 13 **T3MD:** Timer3 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 12 **T2MD:** Timer2 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 11 **T1MD:** Timer1 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 10-8 **Unimplemented:** Read as '0'

bit 7 **I2C1MD:** I2C1 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 6 **U2MD:** UART2 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 5 **U1MD:** UART1 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 4 **SPI2MD:** SPI2 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 3 **SPI1MD:** SPI1 Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

bit 2-1 **Unimplemented:** Read as '0'

bit 0 **ADC1MD:** A/D Converter Module Disable bit
1 = Module is disabled
0 = Module power and clock sources are enabled

REGISTER 11-10: IOCFx: INTERRUPT-ON-CHANGE FLAG x REGISTER(1,2)

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0
IOCFx<15:8>							
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
IOCFx<7:0>							
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-0 **IOCFx<15:0>:** Interrupt-on-Change Flag x bits

1 = An enabled change was detected on the associated pin; set when IOCPx = 1 and a positive edge was detected on the IOCx pin, or when IOCNx = 1 and a negative edge was detected on the IOCx pin

0 = No change was detected or the user cleared the detected change

Note 1: It is not possible to set the IOCFx register bits with software writes (as this would require the addition of significant logic). To test IOC interrupts, it is recommended to enable the IOC functionality on one or more GPIO pins and then use the corresponding LATx register bit(s) to trigger an IOC interrupt.

2: See Table 11-3, Table 11-4 and Table 11-5 for individual bit availability in this register.

REGISTER 11-11: IOCPUx: INTERRUPT-ON-CHANGE PULL-UP ENABLE x REGISTER(1)

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0
IOCPUx<15:8>							
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
IOCPUx<7:0>							
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-0 **IOCPUx<15:0>:** Interrupt-on-Change Pull-up Enable x bits

1 = Pull-up is enabled

0 = Pull-up is disabled

Note 1: See Table 11-3, Table 11-4 and Table 11-5 for individual bit availability in this register.

REGISTER 11-25: RPINR20: PERIPHERAL PIN SELECT INPUT REGISTER 20

U-0	U-0	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
—	—	SCK1R5	SCK1R4	SCK1R3	SCK1R2	SCK1R1	SCK1R0
bit 15							bit 8

U-0	U-0	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
—	—	SDI1R5	SDI1R4	SDI1R3	SDI1R2	SDI1R1	SDI1R0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as ‘0’	
-n = Value at POR	‘1’ = Bit is set	‘0’ = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as ‘0’

bit 13-8 **SCK1R<5:0>:** Assign SPI1 Clock Input (SCK1IN) to Corresponding RPn or RPIn Pin bits

bit 7-6 **Unimplemented:** Read as ‘0’

bit 5-0 **SDI1R<5:0>:** Assign SPI1 Data Input (SDI1) to Corresponding RPn or RPIn Pin bits

REGISTER 11-26: RPINR21: PERIPHERAL PIN SELECT INPUT REGISTER 21

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
—	—	SS1R5	SS1R4	SS1R3	SS1R2	SS1R1	SS1R0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as ‘0’	
-n = Value at POR	‘1’ = Bit is set	‘0’ = Bit is cleared	x = Bit is unknown

bit 15-6 **Unimplemented:** Read as ‘0’

bit 5-0 **SS1R<5:0>:** Assign SPI1 Slave Select Input (SS1IN) to Corresponding RPn or RPIn Pin bits

REGISTER 11-36: RPOR4: PERIPHERAL PIN SELECT OUTPUT REGISTER 4

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP9R5	RP9R4	RP9R3	RP9R2	RP9R1	RP9R0
bit 15							bit 8

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP8R5	RP8R4	RP8R3	RP8R2	RP8R1	RP8R0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as ‘0’	
-n = Value at POR	‘1’ = Bit is set	‘0’ = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as ‘0’

bit 13-8 **RP9R<5:0>:** RP9 Output Pin Mapping bits
Peripheral Output Number n is assigned to pin, RP9 (see Table 11-7 for peripheral function numbers).

bit 7-6 **Unimplemented:** Read as ‘0’

bit 5-0 **RP8R<5:0>:** RP8 Output Pin Mapping bits
Peripheral Output Number n is assigned to pin, RP8 (see Table 11-7 for peripheral function numbers).

REGISTER 11-37: RPOR5: PERIPHERAL PIN SELECT OUTPUT REGISTER 5

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP11R5	RP11R4	RP11R3	RP11R2	RP11R1	RP11R0
bit 15							bit 8

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP10R5	RP10R4	RP10R3	RP10R2	RP10R1	RP10R0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as ‘0’	
-n = Value at POR	‘1’ = Bit is set	‘0’ = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as ‘0’

bit 13-8 **RP11R<5:0>:** RP11 Output Pin Mapping bits
Peripheral Output Number n is assigned to pin, RP11 (see Table 11-7 for peripheral function numbers).

bit 7-6 **Unimplemented:** Read as ‘0’

bit 5-0 **RP10R<5:0>:** RP10 Output Pin Mapping bits
Peripheral Output Number n is assigned to pin, RP10 (see Table 11-7 for peripheral function numbers).

REGISTER 17-5: SPIxSTATH: SPIx STATUS REGISTER HIGH

U-0	U-0	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC
—	—	RXELM5(3)	RXELM4(2)	RXELM3(1)	RXELM2	RXELM1	RXELM0
bit 15							bit 8

U-0	U-0	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC	R-0, HSC
—	—	TXELM5(3)	TXELM4(2)	TXELM3(1)	TXELM2	TXELM1	TXELM0
bit 7							bit 0

Legend:	HSC = Hardware Settable/Clearable bit		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as '0'

bit 13-8 **RXELM<5:0>:** Receive Buffer Element Count bits (valid in Enhanced Buffer mode)(1,2,3)

bit 7-6 **Unimplemented:** Read as '0'

bit 5-0 **TXELM<5:0>:** Transmit Buffer Element Count bits (valid in Enhanced Buffer mode)(1,2,3)

Note 1: RXELM3 and TXELM3 bits are only present when FIFODEPTH = 8 or higher.

2: RXELM4 and TXELM4 bits are only present when FIFODEPTH = 16 or higher.

3: RXELM5 and TXELM5 bits are only present when FIFODEPTH = 32.

19.1 UARTx Baud Rate Generator (BRG)

The UARTx module includes a dedicated, 16-bit Baud Rate Generator. The UxBRG register controls the period of a free-running, 16-bit timer. Equation 19-1 shows the formula for computation of the baud rate when BRGH = 0.

EQUATION 19-1: UARTx BAUD RATE WITH BRGH = 0(1,2)

$$\text{Baud Rate} = \frac{F_{CY}}{16 \cdot (\text{UxBRG} + 1)}$$

$$\text{UxBRG} = \frac{F_{CY}}{16 \cdot \text{Baud Rate}} - 1$$

Note 1: FCY denotes the instruction cycle clock frequency (FOSC/2).

2: Based on FCY = FOSC/2; Doze mode and PLL are disabled.

Example 19-1 shows the calculation of the baud rate error for the following conditions:

- FCY = 4 MHz
- Desired Baud Rate = 9600

The maximum baud rate (BRGH = 0) possible is FCY/16 (for UxBRG = 0) and the minimum baud rate possible is FCY/(16 * 65536).

Equation 19-2 shows the formula for computation of the baud rate when BRGH = 1.

EQUATION 19-2: UARTx BAUD RATE WITH BRGH = 1(1,2)

$$\text{Baud Rate} = \frac{F_{CY}}{4 \cdot (\text{UxBRG} + 1)}$$

$$\text{UxBRG} = \frac{F_{CY}}{4 \cdot \text{Baud Rate}} - 1$$

Note 1: FCY denotes the instruction cycle clock frequency.

2: Based on FCY = FOSC/2; Doze mode and PLL are disabled.

The maximum baud rate (BRGH = 1) possible is FCY/4 (for UxBRG = 0) and the minimum baud rate possible is FCY/(4 * 65536).

Writing a new value to the UxBRG register causes the BRG timer to be reset (cleared). This ensures the BRG does not wait for a timer overflow before generating the new baud rate.

EXAMPLE 19-1: BAUD RATE ERROR CALCULATION (BRGH = 0)(1)

Desired Baud Rate = FCY/(16 (UxBRG + 1))

Solving for UxBRG Value:

UxBRG = ((FCY/Desired Baud Rate)/16) – 1
UxBRG = ((4000000/9600)/16) – 1
UxBRG = 25

Calculated Baud Rate = 4000000/(16 (25 + 1))
= 9615

Error = (Calculated Baud Rate – Desired Baud Rate) / Desired Baud Rate
= (9615 – 9600)/9600
= 0.16%

Note 1: Based on FCY = FOSC/2; Doze mode and PLL are disabled.

REGISTER 19-1: UxMODE: UARTx MODE REGISTER (CONTINUED)

bit 3 **BRGH:** High Baud Rate Enable bit
1 = High-Speed mode (4 BRG clock cycles per bit)
0 = Standard Speed mode (16 BRG clock cycles per bit)

bit 2-1 **PDSEL<1:0>:** Parity and Data Selection bits
11 = 9-bit data, no parity
10 = 8-bit data, odd parity
01 = 8-bit data, even parity
00 = 8-bit data, no parity

bit 0 **STSEL:** Stop Bit Selection bit
1 = Two Stop bits
0 = One Stop bit

Note 1: If UARTEN = 1, the peripheral inputs and outputs must be configured to an available RPn/RPIn pin. For more information, see **Section 11.5 "Peripheral Pin Select (PPS)"**.

2: This feature is only available for the 16x BRG mode (BRGH = 0).

REGISTER 20-9: PADCON: PAD CONFIGURATION CONTROL REGISTER

R/W-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
IOCON	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	U-0	U-0	U-0	U-0	R/W-0
—	—	—	—	—	—	—	PMPTTL
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15 **IOCON:** Used for Non-PMP functionality

bit 14-1 **Unimplemented:** Read as '0'

bit 0 **PMPTTL:** EPMP Module TTL Input Buffer Select bit

1 = EPMP module inputs (PMDx, PMCS1) use TTL input buffers

0 = EPMP module inputs use Schmitt Trigger input buffers

REGISTER 21-16: TSATIMEH: RTCC TIMESTAMP A TIME REGISTER (HIGH)(1)

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	HRTEN1	HRTEN0	HRONE3	HRONE2	HRONE1	HRONE0
bit 15							bit 8

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	MINTEN2	MINTEN1	MINTEN0	MINONE3	MINONE2	MINONE1	MINONE0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 15-14 **Unimplemented:** Read as '0'

bit 13-12 **HRTEN<1:0>:** Binary Coded Decimal Value of Hours '10' Digit bits
Contains a value from 0 to 2.

bit 11-8 **HRONE<3:0>:** Binary Coded Decimal Value of Hours '1' Digit bits
Contains a value from 0 to 9.

bit 7 **Unimplemented:** Read as '0'

bit 6-4 **MINTEN<2:0>:** Binary Coded Decimal Value of Minutes '10' Digit bits
Contains a value from 0 to 5.

bit 3-0 **MINONE<3:0>:** Binary Coded Decimal Value of Minutes '1' Digit bits
Contains a value from 0 to 9.

Note 1: If TSAEN = 0, bits<15:0> can be used for persistence storage throughout a non-Power-on Reset ($\overline{\text{MCLR}}$, WDT, etc.).

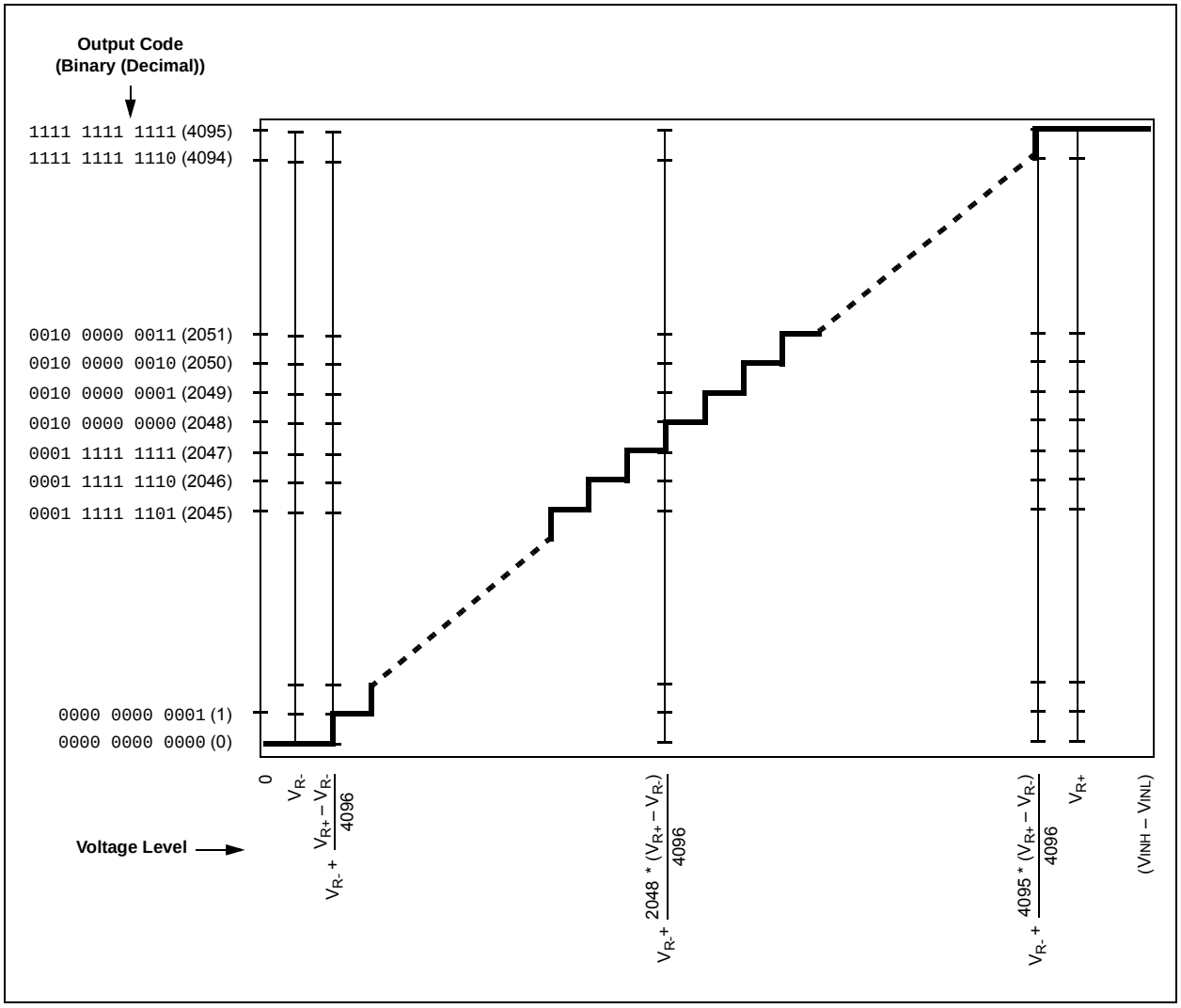
REGISTER 24-1: AD1CON1: A/D CONTROL REGISTER 1 (CONTINUED)

bit 1 **SAMP:** A/D Sample Enable bit
1 = A/D Sample-and-Hold amplifiers are sampling
0 = A/D Sample-and-Hold amplifiers are holding

bit 0 **DONE:** A/D Conversion Status bit
1 = A/D conversion cycle has completed
0 = A/D conversion cycle has not started or is in progress

Note 1: This bit is only available when Extended DMA and buffer features are available (DMAEN = 1).

FIGURE 24-4: 12-BIT A/D TRANSFER FUNCTION



26.0 COMPARATOR VOLTAGE REFERENCE

Note: This data sheet summarizes the features of this group of PIC24F devices. It is not intended to be a comprehensive reference source. For more information, refer to the *"dsPIC33/PIC24 Family Reference Manual"*, **"Dual Comparator Module"** (DS39710), which is available from the Microchip web site (www.microchip.com). The information in this data sheet supersedes the information in the FRM.

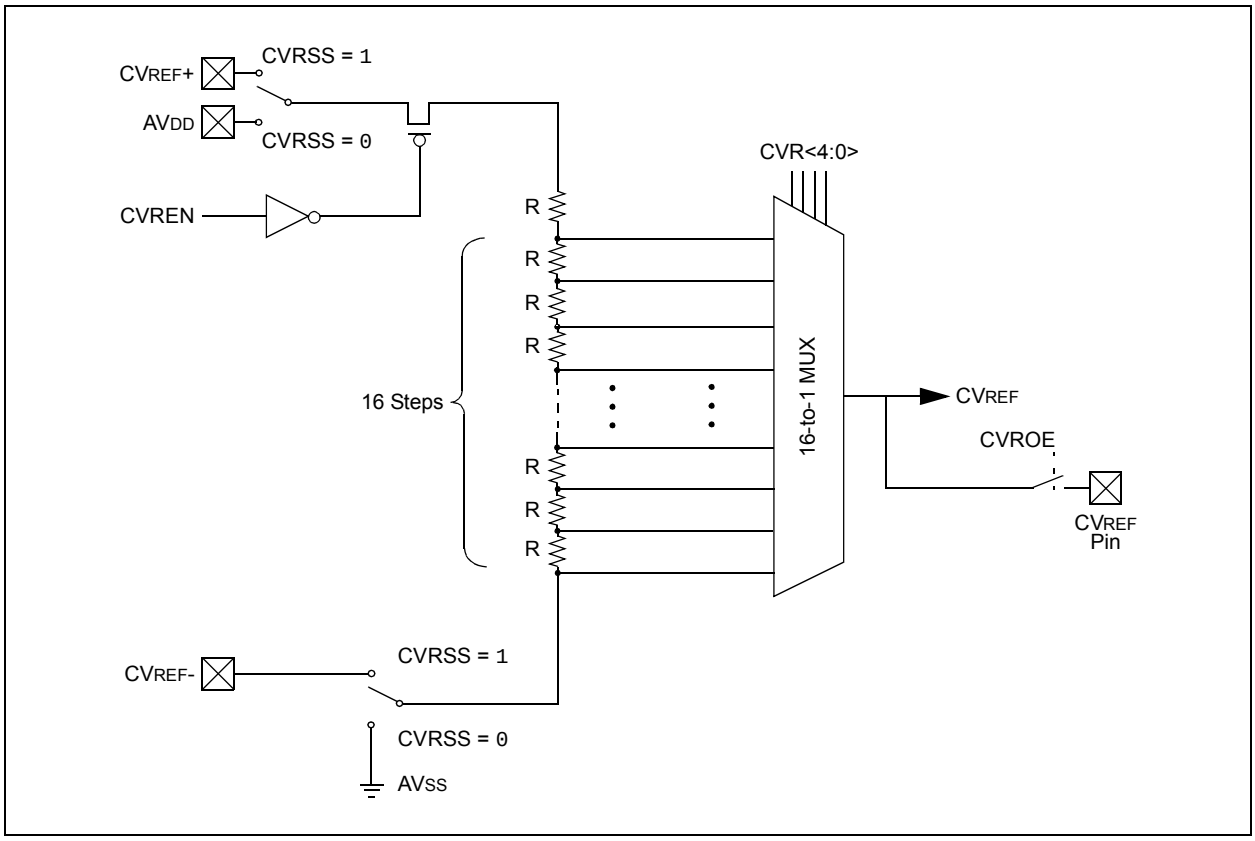
26.1 Configuring the Comparator Voltage Reference

The voltage reference module is controlled through the CVRCON register (Register 26-1). The comparator voltage reference provides two ranges of output voltage, each with 16 distinct levels. The primary difference between the ranges is the size of the steps selected by the CVREF Value Selection bits (CVR<4:0>), with one range offering finer resolution.

The comparator reference supply voltage can come from either VDD and VSS, or the external VREF+ and VREF-. The voltage source is selected by the CVRSS bit (CVRCON<5>).

The settling time of the comparator voltage reference must be considered when changing the CVREF output.

FIGURE 26-1: COMPARATOR VOLTAGE REFERENCE BLOCK DIAGRAM



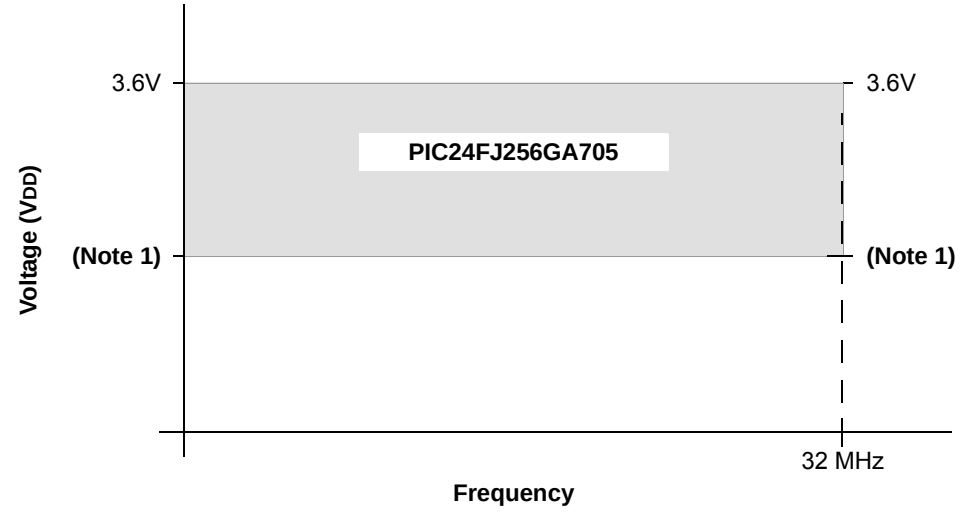
REGISTER 29-6: FWDT CONFIGURATION REGISTER (CONTINUED)

bit 3-0 **WDTPS<3:0>:** Watchdog Timer Postscale Select bits

1111 = 1:32,768
1110 = 1:16,384
1101 = 1:8,192
1100 = 1:4,096
1011 = 1:2,048
1010 = 1:1,024
1001 = 1:512
1000 = 1:256
0111 = 1:128
0110 = 1:64
0101 = 1:32
0100 = 1:16
0011 = 1:8
0010 = 1:4
0001 = 1:2
0000 = 1:1

32.1 DC Characteristics

FIGURE 32-1: PIC24FJ256GA705 FAMILY VOLTAGE-FREQUENCY GRAPH (INDUSTRIAL)



Note 1: Lower operating boundary is 2.0V or VBOR (when BOR is enabled), whichever is lower. For best analog performance, operate above 2.2V.

TABLE 32-1: THERMAL OPERATING CONDITIONS

Rating	Symbol	Min	Typ	Max	Unit
PIC24FJ256GA705:					
Operating Junction Temperature Range	TJ	-40	—	+85	°C
Operating Ambient Temperature Range	TA	-40	—	+85	°C
Power Dissipation: Internal Chip Power Dissipation: PINT = VDD x (IDD – Σ IOH) I/O Pin Power Dissipation: PI/O = Σ ({VDD – VOH} x IOH) + Σ (VOL x IOL)	PD	PINT + PI/O			W
Maximum Allowed Power Dissipation	PDMAX	(TJ – TA)/θJA			W

TABLE 32-2: THERMAL PACKAGING CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit	Notes
Package Thermal Resistance, 6x6 mm 28-Pin QFN	θJA		—	°C/W	**(Note 1)**
Package Thermal Resistance, 4x4x0.6 mm 28-Pin UQFN	θJA		—	°C/W	**(Note 1)**
Package Thermal Resistance, 7.50 mm 28-Pin SOIC	θJA		—	°C/W	**(Note 1)**
Package Thermal Resistance, 5.30 mm 28-Pin SSOP	θJA		—	°C/W	**(Note 1)**
Package Thermal Resistance, 300 mil 28-Pin SPDIP	θJA		—	°C/W	**(Note 1)**
Package Thermal Resistance, 6x6x0.5 mm 48-Pin UQFN	θJA	33.7	—	°C/W	**(Note 1)**
Package Thermal Resistance, 10x10x1 mm 44-Pin TQFP	θJA	28	—	°C/W	**(Note 1)**
Package Thermal Resistance, 7x7x1 mm 48-Pin TQFP	θJA	39.3	—	°C/W	**(Note 1)**

Note 1: Junction to ambient thermal resistance; Theta-JA (θJA) numbers are achieved by package simulations.

TABLE 32-24: A/D MODULE SPECIFICATIONS

AC CHARACTERISTICS			Standard Operating Conditions: 2.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial				
Param No.	**Symbol**	**Characteristic**	**Min.**	**Typ**	**Max.**	**Units**	**Conditions**
Device Supply							
AD01	AVDD	Module VDD Supply	Greater of: VDD – 0.3 or 2.2	—	Lesser of: VDD + 0.3 or 3.6	V	
AD02	AVSS	Module VSS Supply	VSS – 0.3	—	VSS + 0.3	V	
Reference Inputs							
AD05	VREFH	Reference Voltage High	AVSS + 1.7	—	AVDD	V	
AD06	VREFL	Reference Voltage Low	AVSS	—	AVDD – 1.7	V	
AD07	VREF	Absolute Reference Voltage	AVSS – 0.3	—	AVDD + 0.3	V	
Analog Inputs							
AD10	VINH-VINL	Full-Scale Input Span	VREFL	—	VREFH	V	**(Note 2)**
AD11	VIN	Absolute Input Voltage	AVSS – 0.3	—	AVDD + 0.3	V	
AD12	VINL	Absolute VINL Input Voltage	AVSS – 0.3	—	AVDD/3	V	
AD13		Leakage Current	—	±1.0	±610	nA	VINL = AVSS = VREFL = 0V, AVDD = VREFH = 3V, Source Impedance = 2.5 kΩ
AD17	RIN	Recommended Impedance of Analog Voltage Source	—	—	2.5K	Ω	10-bit
A/D Accuracy							
AD20B	Nr	Resolution	—	12	—	bits	
AD21B	INL	Integral Nonlinearity	—	±1	< ±2	LSb	VINL = AVSS = VREFL = 0V, AVDD = VREFH = 3V
AD22B	DNL	Differential Nonlinearity	—	—	< ±1	LSb	VINL = AVSS = VREFL = 0V, AVDD = VREFH = 3V
AD23B	GERR	Gain Error	—	±1	±4	LSb	VINL = AVSS = VREFL = 0V, AVDD = VREFH = 3V
AD24B	EOFF	Offset Error	—	±1	±2	LSb	VINL = AVSS = VREFL = 0V, AVDD = VREFH = 3V
AD25B		Monotonicity(1)	—	—	—	—	Guaranteed

Note 1: The A/D conversion result never decreases with an increase in the input voltage.

2: Measurements are taken with the external VREF+ and VREF- used as the A/D voltage reference.

APPENDIX A: REVISION HISTORY

Revision A (March 2016)

Original data sheet for the PIC24FJ256GA705 family of devices.

Revision B (October 2016)

This revision incorporates the following updates:

- Sections:
  - Removes **Section 9.5 “FRC Active Clock Tuning”**.
  - Updates the Absolute Maximum Ratings in **Section 32.0 “Electrical Characteristics”**.
  - Changes the 48-Lead QFN (7x7 mm) to 48-Lead UQFN (6x6 mm) in **Section 33.0 “Packaging Information”**.
- Registers:
  - Updates Register 9-1, Register 9-3, Register 9-6, Register 16-5 and Register 16-6.
- Tables:
  - Adds Table 11-3, Table 11-4 and Table 11-5.
  - Updates the GPIO column in the Peripheral Features table on Page 2.
  - Updates Table 1, Table 2, Table 3, Table 4, Table 5, Table 32-4, Table 32-5, Table 32-6, Table 32-7 and Table 32-25.
- Figures
  - Updates Figure 9-1.
- Changes to text and formatting were incorporated throughout the document.