Microchip Technology - DSPIC33EP128GS705T-I/PT Datasheet

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	dsPIC
Core Size	16-Bit
Speed	70 MIPs
Connectivity	I²C, IrDA, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, I²S, POR, PWM, WDT
Number of I/O	33
Program Memory Size	128KB (43K x 24)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	8K x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 3.6V
Data Converters	A/D 17x12b; D/A 1x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	48-TQFP
Supplier Device Package	48-TQFP (7x7)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/dspic33ep128gs705t-i-pt

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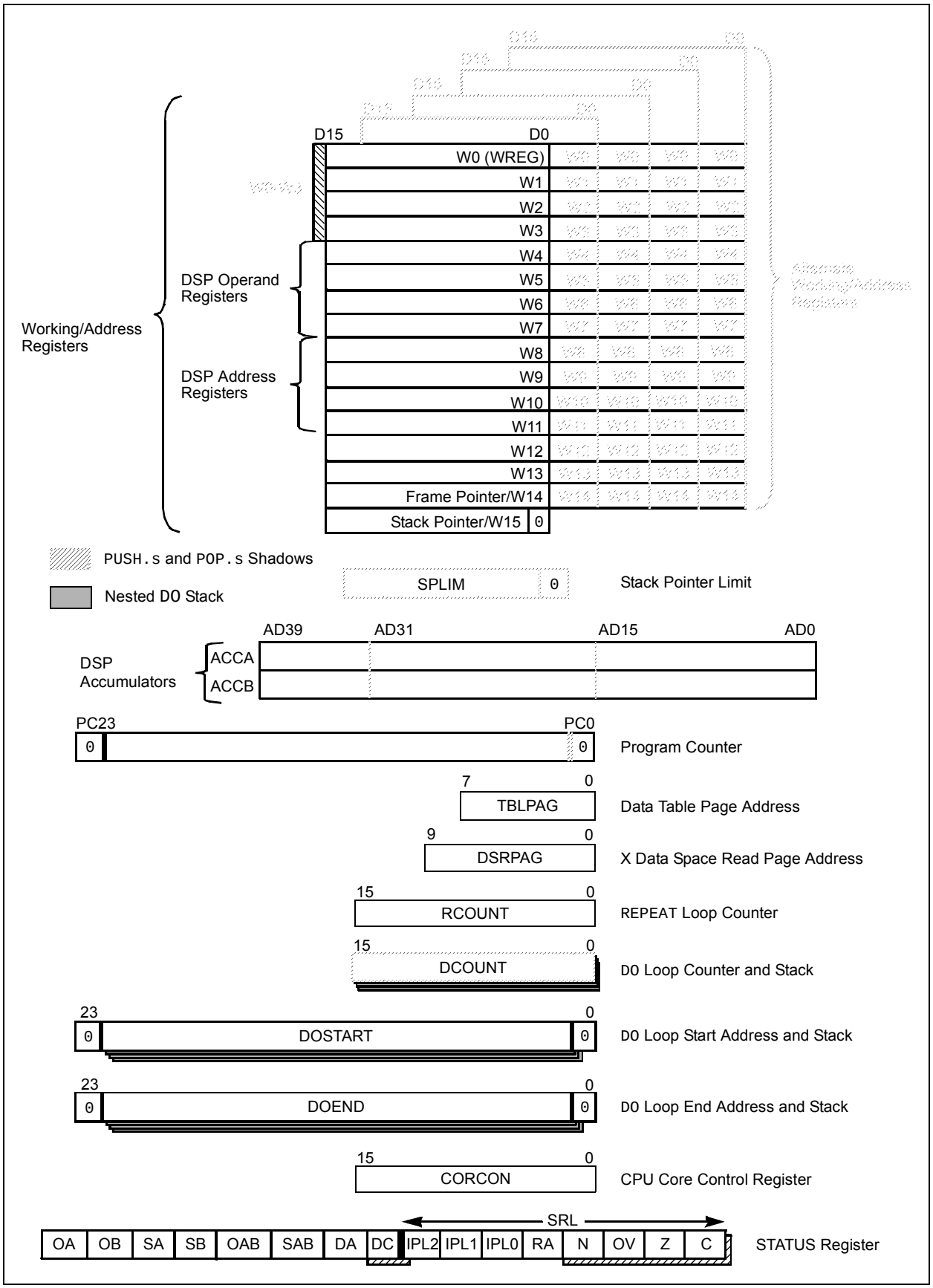
FIGURE 3-2: PROGRAMMER'S MODEL



3.6 CPU Resources

Many useful resources are provided on the main product page of the Microchip web site for the devices listed in this data sheet. This product page contains the latest updates and additional information.

3.6.1 KEY RESOURCES

- **"dsPIC33E Enhanced CPU"** (DS70005158) in the *"dsPIC33/PIC24 Family Reference Manual"*
- Code Samples
- Application Notes
- Software Libraries
- Webinars
- All related *"dsPIC33/PIC24 Family Reference Manual"* Sections
- Development Tools

9.0 OSCILLATOR CONFIGURATION

Note 1: This data sheet summarizes the features of the dsPIC33EPXXXGS70X/80X family of devices. It is not intended to be a comprehensive reference source. To complement the information in this data sheet, refer to **"Oscillator Module"** (DS70005131) in the *"dsPIC33/PIC24 Family Reference Manual"*, which is available from the Microchip web site (www.microchip.com).

2: Some registers and associated bits described in this section may not be available on all devices. Refer to **Section 4.0 "Memory Organization"** in this data sheet for device-specific register and bit information.

The dsPIC33EPXXXGS70X/80X family oscillator system provides:

- On-Chip Phase-Locked Loop (PLL) to Boost Internal Operating Frequency on Select Internal and External Oscillator Sources
- On-the-Fly Clock Switching between Various Clock Sources
- Doze mode for System Power Savings
- Fail-Safe Clock Monitor (FSCM) that Detects Clock Failure and Permits Safe Application Recovery or Shutdown
- Configuration Bits for Clock Source Selection
- Auxiliary PLL for ADC and PWM

A simplified diagram of the oscillator system is shown in Figure 9-1.

REGISTER 9-7: LFSR: LINEAR FEEDBACK SHIFT REGISTER

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	LFSR<14:8>						
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
LFSR<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 **Unimplemented:** Read as ‘0’

bit 14-0 **LFSR<14:0>:** Pseudorandom Data bits

TABLE 11-13: OUTPUT SELECTION FOR REMAPPABLE PINS (RPn)

Function	RPnR<6:0>	Output Name
Default PORT	0000000	RPn tied to Default Pin
U1TX	0000001	RPn tied to UART1 Transmit
$\overline{U1RTS}$	0000010	RPn tied to UART1 Request-to-Send
U2TX	0000011	RPn tied to UART2 Transmit
$\overline{U2RTS}$	0000100	RPn tied to UART2 Request-to-Send
SDO1	0000101	RPn tied to SPI1 Data Output
SCK1	0000110	RPn tied to SPI1 Clock Output
$\overline{SS1}$	0000111	RPn tied to SPI1 Slave Select
SDO2	0001000	RPn tied to SPI2 Data Output
SCK2	0001001	RPn tied to SPI2 Clock Output
$\overline{SS2}$	0001010	RPn tied to SPI2 Slave Select
C1TX	0001110	RPn tied to CAN1 Transmit
C2TX	0001111	RPn tied to CAN2 Transmit
OC1	0010000	RPn tied to Output Compare 1 Output
OC2	0010001	RPn tied to Output Compare 2 Output
OC3	0010010	RPn tied to Output Compare 3 Output
OC4	0010011	RPn tied to Output Compare 4 Output
ACMP1	0011000	RPn tied to Analog Comparator 1 Output
ACMP2	0011001	RPn tied to Analog Comparator 2 Output
ACMP3	0011010	RPn tied to Analog Comparator 3 Output
SDO3	0011111	RPn tied to SPI3 Data Output
SCK3	0100000	RPn tied to SPI3 Clock Output
$\overline{SS3}$	0100001	RPn tied to SPI3 Slave Select
SYNCO1	0101101	RPn tied to PWM Primary Master Time Base Sync Output
SYNCO2	0101110	RPn tied to PWM Secondary Master Time Base Sync Output
REFCLKO	0110001	RPn tied to Reference Clock Output
ACMP4	0110010	RPn tied to Analog Comparator 4 Output
PWM4H	0110011	RPn tied to PWM Output Pins Associated with PWM Generator 4
PWM4L	0110100	RPn tied to PWM Output Pins Associated with PWM Generator 4
PWM5H	0110101	RPn tied to PWM Output Pins Associated with PWM Generator 5
PWM5L	0110110	RPn tied to PWM Output Pins Associated with PWM Generator 5
PWM6H	0111001	RPn tied to PWM Output Pins Associated with PWM Generator 6
PWM6L	0111010	RPn tied to PWM Output Pins Associated with PWM Generator 6
PWM7H	0111011	RPn tied to PWM Output Pins Associated with PWM Generator 7
PWM7L	0111100	RPn tied to PWM Output Pins Associated with PWM Generator 7
PWM8H	0111101	RPn tied to PWM Output Pins Associated with PWM Generator 8
PWM8L	0111110	RPn tied to PWM Output Pins Associated with PWM Generator 8
CLC1OUT	0111111	RPn tied to CLC1 Output
CLC2OUT	1000000	RPn tied to CLC2 Output
CLC3OUT(1)	1000001	RPn tied to CLC3 Output
CLC4OUT(1)	1000010	RPn tied to CLC4 Output

Note 1: PPS outputs are only available on dsPIC33EPXXXGS702 (28-pin) devices.

REGISTER 11-59: RPOR26: PERIPHERAL PIN SELECT OUTPUT REGISTER 26

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	RP181R6	RP181R5	RP181R4	RP181R3	RP181R2	RP181R1	RP181R0
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
—	RP180R6	RP180R5	RP180R4	RP180R3	RP180R2	RP180R1	RP180R0
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 **Unimplemented:** Read as ‘0’

bit 14-8 **RP181R<6:0>:** Peripheral Output Function is Assigned to RP181 Output Pin bits (see Table 11-13 for peripheral function numbers)

bit 7 **Unimplemented:** Read as ‘0’

bit 6-0 **RP180R<6:0>:** Peripheral Output Function is Assigned to RP180 Output Pin bits (see Table 11-13 for peripheral function numbers)

REGISTER 14-2: ICxCON2: INPUT CAPTURE x CONTROL REGISTER 2

U-0	U-0	U-0	U-0	U-0	U-0	U-0	R/W-0
—	—	—	—	—	—	—	IC32
bit 15							bit 8

R/W-0	R/W-0, HS	U-0	R/W-0	R/W-1	R/W-1	R/W-0	R/W-1
ICTRIG(2)	TRIGSTAT(3)	—	SYNCSEL4(4)	SYNCSEL3(4)	SYNCSEL2(4)	SYNCSEL1(4)	SYNCSEL0(4)
bit 7							bit 0

Legend:	HS = Hardware Settable 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 15-9 **Unimplemented:** Read as '0'

bit 8 **IC32:** Input Capture x 32-Bit Timer Mode Select bit (Cascade mode)
- 1 = Odd ICx and even ICx form a single 32-bit input capture module(1)
- 0 = Cascade module operation is disabled

bit 7 **ICTRIG:** Input Capture x Trigger Operation Select bit(2)
- 1 = Input source is used to trigger the input capture timer (Trigger mode)
- 0 = Input source is used to synchronize the input capture timer to a timer of another module (Synchronization mode)

bit 6 **TRIGSTAT:** Timer Trigger Status bit(3)
- 1 = ICxTMR has been triggered and is running
- 0 = ICxTMR has not been triggered and is being held clear

bit 5 **Unimplemented:** Read as '0'

Note 1: The IC32 bit in both the odd and even ICx must be set to enable Cascade mode.

2: The input source is selected by the SYNCSEL<4:0> bits of the ICxCON2 register.

3: This bit is set by the selected input source (selected by SYNCSEL<4:0> bits); it can be read, set and cleared in software.

4: Do not use the ICx module as its own sync or trigger source.

5: This option should only be selected as a trigger source and not as a synchronization source.

17.2 PTG Control Registers

REGISTER 17-1: PTGCST: PTG CONTROL/STATUS REGISTER

R/W-0	U-0	R/W-0	R/W-0	U-0	R/W-0	R/W-0	R/W-0
PTGEN	—	PTGSIDL	PTGTOGL	—	PTGSWT(2)	PTGSSEN	PTGIVIS
bit 15							bit 8

R/W-0	HS-0	U-0	U-0	U-0	U-0	R/W-0	R/W-0
PTGSTRT	PTGWDTO	—	—	—	—	PTGITM1(1)	PTGITM0(1)
bit 7							bit 0

Legend:	HS = Hardware Settable 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 **PTGEN:** PTG Module Enable bit
1 = PTG module is enabled
0 = PTG module is disabled

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

bit 13 **PTGSIDL:** PTG Stop in Idle Mode bit
1 = Discontinues module operation when device enters Idle mode
0 = Continues module operation in Idle mode

bit 12 **PTGTOGL:** PTG TRIG Output Toggle Mode bit
1 = Toggles the state of the PTGOx for each execution of the PTGTRIG command
0 = Each execution of the PTGTRIG command will generate a single PTGOx pulse determined by the value in the PTGPWDx bits

bit 11 **Unimplemented:** Read as '0'

bit 10 **PTGSWT:** PTG Software Trigger bit(2)
1 = Triggers the PTG module
0 = No action (clearing this bit will have no effect)

bit 9 **PTGSSEN:** PTG Enable Single-Step bit
1 = Enables Single-Step mode
0 = Disables Single-Step mode

bit 8 **PTGIVIS:** PTG Counter/Timer Visibility Control bit
1 = Reads of the PTGSDLIM, PTGCxLIM or PTGTxLIM registers return the current values of their corresponding Counter/Timer registers (PTGSD, PTGCx, PTGTx)
0 = Reads of the PTGSDLIM, PTGCxLIM or PTGTxLIM registers return the value previously written to those PTG Limit registers

bit 7 **PTGSTRT:** Start PTG Sequencer bit
1 = Starts to sequentially execute commands (Continuous mode)
0 = Stops executing commands

bit 6 **PTGWDTO:** PTG Watchdog Timer Time-out Status bit
1 = PTG Watchdog Timer has timed out
0 = PTG Watchdog Timer has not timed out.

bit 5-2 **Unimplemented:** Read as '0'

Note 1: These bits apply to the PTGWHI and PTGWLO commands only.
2: This bit is only used with the PTGCTRL Step command software trigger option.

To set up the SPIx module for Audio mode:

1. Clear the SPIxBUFL and SPIxBUFH registers.
2. If using interrupts:
   a) Clear the interrupt flag bits in the respective IFSx register.
   b) Set the interrupt enable bits in the respective IECx register.
   a) Write the SPIxIP bits in the respective IPCx register to set the interrupt priority.
3. Write the desired settings to the SPIxCON1L, SPIxCON1H and SPIxCON2L registers with AUDEN (SPIxCON1H<15>) = 1.
4. Clear the SPIROV bit (SPIxSTATL<6>).
5. Enable SPIx operation by setting the SPIEN bit (SPIxCON1L<15>).
6. Write the data to be transmitted to the SPIxBUFL and SPIxBUFH registers. Transmission (and reception) will start as soon as data is written to the SPIxBUFL and SPIxBUFH registers.

REGISTER 18-1: SPIxCON1L: SPIx CONTROL REGISTER 1 LOW

R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
SPIEN	—	SPISIDL	DISSDO	MODE32(1,4)	MODE16(1,4)	SMP	CKE(1)
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
SSEN(2)	CKP	MSTEN	DISSDI	DISSCK	MCLKEN(3)	SPIFE	ENHBUF
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 **SPIEN:** SPIx On bit
1 = Enables module
0 = Turns off and resets module, disables clocks, disables interrupt event generation, allows SFR modifications

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

bit 13 **SPISIDL:** SPIx Stop in Idle Mode bit
1 = Halts in CPU Idle mode
0 = Continues to operate in CPU Idle mode

bit 12 **DISSDO:** Disable SDOx Output Port bit
1 = SDOx pin is not used by the module; pin is controlled by port function
0 = SDOx pin is controlled by the module

bit 11-10 **MODE32** and **MODE16:** Serial Word Length Select bits(1,4)

MODE32	MODE16	AUDEN	Communication
1	x	0	32-Bit
0	1		16-Bit
0	0		8-Bit
1	1	1	24-Bit Data, 32-Bit FIFO, 32-Bit Channel/64-Bit Frame
1	0		32-Bit Data, 32-Bit FIFO, 32-Bit Channel/64-Bit Frame
0	1		16-Bit Data, 16-Bit FIFO, 32-Bit Channel/64-Bit Frame
0	0		16-Bit FIFO, 16-Bit Channel/32-Bit Frame

Note 1: When AUDEN (SPIxCON1H<15>) = 1, this module functions as if CKE = 0, regardless of its actual value.
2: When FRMEN = 1, SSEN is not used.
3: MCLKEN can only be written when the SPIEN bit = 0.
4: This channel is not meaningful for DSP/PCM mode as LRC follows FRMSYPW.

REGISTER 18-5: 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.

REGISTER 22-26: ADTRIGxL: ADC CHANNEL TRIGGER x SELECTION REGISTER LOW (x = 0 to 5) (CONTINUED)

bit 4-0 **TRGSRC(4x)<4:0>:** Trigger Source Selection for Corresponding Analog Inputs bits

11111 = ADTRG31
11110 = PTG Trigger Output 30
11101 = PWM Generator 6 current-limit trigger
11100 = PWM Generator 5 current-limit trigger
11011 = PWM Generator 4 current-limit trigger
11010 = PWM Generator 3 current-limit trigger
11001 = PWM Generator 2 current-limit trigger
11000 = PWM Generator 1 current-limit trigger
10111 = Output Compare 2 trigger
10110 = Output Compare 1 trigger
10101 = CLC2 output
10100 = PWM Generator 6 secondary trigger
10011 = PWM Generator 5 secondary trigger
10010 = PWM Generator 4 secondary trigger
10001 = PWM Generator 3 secondary trigger
10000 = PWM Generator 2 secondary trigger
01111 = PWM Generator 1 secondary trigger
01110 = PWM secondary Special Event Trigger
01101 = Timer2 period match
01100 = Timer1 period match
01011 = CLC1 output
01010 = PWM Generator 6 primary trigger
01001 = PWM Generator 5 primary trigger
01000 = PWM Generator 4 primary trigger
00111 = PWM Generator 3 primary trigger
00110 = PWM Generator 2 primary trigger
00101 = PWM Generator 1 primary trigger
00100 = PWM Special Event Trigger
00011 = Reserved
00010 = Level software trigger
00001 = Common software trigger
00000 = No trigger is enabled

23.4 CAN Message Buffers

CAN Message Buffers are part of RAM memory. They are not CAN Special Function Registers. The user application must directly write into the RAM area that is configured for CAN Message Buffers. The location and size of the buffer area is defined by the user application.

BUFFER 21-1: CANx MESSAGE BUFFER WORD 0

U-0	U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
—	—	—	SID10	SID9	SID8	SID7	SID6
bit 15							bit 8

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
SID5	SID4	SID3	SID2	SID1	SID0	SRR	IDE
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 15-13 **Unimplemented:** Read as '0'

bit 12-2 **SID<10:0>:** Standard Identifier bits

bit 1 **SRR:** Substitute Remote Request bit

When IDE = 0:
1 = Message will request remote transmission
0 = Normal message

When IDE = 1:
The SRR bit must be set to '1'.

bit 0 **IDE:** Extended Identifier bit

1 = Message will transmit an Extended Identifier
0 = Message will transmit a Standard Identifier

BUFFER 21-2: CANx MESSAGE BUFFER WORD 1

U-0	U-0	U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x
—	—	—	—	EID<17:14>			
bit 15							bit 8

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
EID<13:6>							
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 15-12 **Unimplemented:** Read as '0'

bit 11-0 **EID<17:6>:** Extended Identifier bits

NOTES:

REGISTER 24-1: CMPxCON: COMPARATOR x CONTROL REGISTER

R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
CMPON	—	CMPSIDL	HYSSEL1	HYSSEL0	FLTREN	FCLKSEL	DACOE
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	HC-0, HS	R/W-0	R/W-0	R/W-0
INSEL1	INSEL0	EXTREF	HYSPOL	CMPSTAT	ALTINP	CMPPOL	RANGE
bit 7							bit 0

Legend:	HC = Hardware Clearable bit	HS = Hardware Settable 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 **CMPON:** Comparator Operating Mode bit
1 = Comparator module is enabled
0 = Comparator module is disabled (reduces power consumption)

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

bit 13 **CMPSIDL:** Comparator Stop in Idle Mode bit
1 = Discontinues module operation when device enters Idle mode.
0 = Continues module operation in Idle mode
If a device has multiple comparators, any CMPSIDL bit set to '1' disables all comparators while in Idle mode.

bit 12-11 **HYSSEL<1:0>:** Comparator Hysteresis Select bits
11 = 45 mV hysteresis
10 = 30 mV hysteresis
01 = 15 mV hysteresis
00 = No hysteresis is selected

bit 10 **FLTREN:** Digital Filter Enable bit
1 = Digital filter is enabled
0 = Digital filter is disabled

bit 9 **FCLKSEL:** Digital Filter and Pulse Stretcher Clock Select bit
1 = Digital filter and pulse stretcher operate with the PWM clock
0 = Digital filter and pulse stretcher operate with the system clock

bit 8 **DACOE:** DACx Output Enable bit
1 = DACx analog voltage is connected to the DACOUTx pin(1)
0 = DACx analog voltage is not connected to the DACOUTx pin

bit 7-6 **INSEL<1:0>:** Input Source Select for Comparator bits
If ALTINP = 0, Select from Comparator Inputs:
11 = Selects CMPxD input pin
10 = Selects CMPxC input pin
01 = Selects CMPxB input pin
00 = Selects CMPxA input pin
If ALTINP = 1, Select from Alternate Inputs:
11 = Reserved
10 = Reserved
01 = Selects PGA2 output
00 = Selects PGA1 output

Note 1: DACOUTx can be associated only with a single comparator at any given time. The software must ensure that multiple comparators do not enable the DACx output by setting their respective DACOE bit.

25.2 PGA Resources

Many useful resources are provided on the main product page of the Microchip website for the devices listed in this data sheet. This product page contains the latest updates and additional information.

25.2.1 KEY RESOURCES

- **"Programmable Gain Amplifier (PGA)"** (DS70005146) in the *"dsPIC33/PIC24 Family Reference Manual"*
- Code Samples
- Application Notes
- Software Libraries
- Webinars
- All Related *"dsPIC33/PIC24 Family Reference Manual"* Sections
- Development Tools

REGISTER 25-1: PGAxCON: PGAx CONTROL REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
PGAEN	PGAOEN	SELPI2	SELPI1	SELPI0	SELNI2	SELNI1	SELNI0
bit 15							bit 8

U-0	U-0	U-0	U-0	U-0	R/W-0	R/W-0	R/W-0
—	—	—	—	—	GAIN2	GAIN1	GAIN0
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 **PGAEN:** PGAx Enable bit
1 = PGAx module is enabled
0 = PGAx module is disabled (reduces power consumption)

bit 14 **PGAOEN:** PGAx Output Enable bit
1 = PGAx output is connected to the DACOUTx pin
0 = PGAx output is not connected to the DACOUTx pin

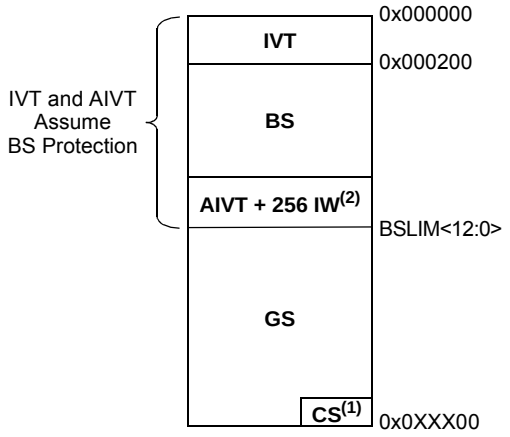
bit 13-11 **SELPI<2:0>:** PGAx Positive Input Selection bits
111 = Reserved
110 = Reserved
101 = Reserved
100 = Reserved
011 = PGAxP4
010 = PGAxP3
001 = PGAxP2
000 = PGAxP1

bit 10-8 **SELNI<2:0>:** PGAx Negative Input Selection bits
111 = Reserved
110 = Reserved
101 = Reserved
100 = Reserved
011 = Ground (Single-Ended mode)
010 = PGAxN3
001 = PGAxN2
000 = Ground (Single-Ended mode)

bit 7-3 **Unimplemented:** Read as '0'

The different device security segments are shown in Figure 27-3. Here, all three segments are shown but are not required. If only basic code protection is required, then GS can be enabled independently or combined with CS, if desired.

FIGURE 27-3: SECURITY SEGMENTS EXAMPLE FOR dsPIC33EPXXXGS70X/80X DEVICES



Note 1: If CS is write-protected, the last page (GS + CS) of program memory will be protected from an erase condition.

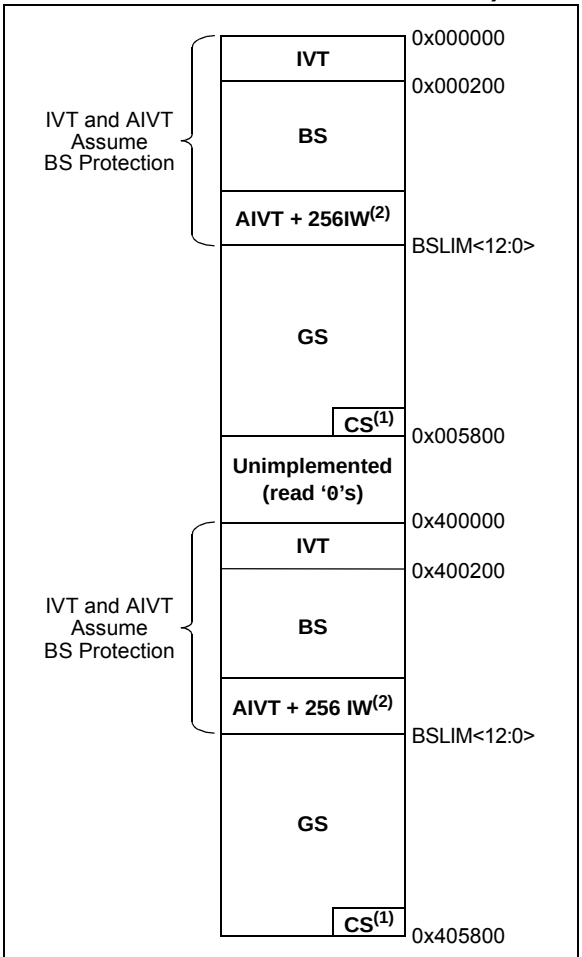
2: The last half (256 IW) of the last page of BS is unusable program memory.

dsPIC33EPXXXGS70X/80X family devices can be operated in Dual Partition mode, where security is required for each partition. When operating in Dual Partition mode, the Active and Inactive Partitions both contain unique copies of the Reset vector, Interrupt Vector Tables (IVT and AIVT, if enabled) and the Flash Configuration Words. Both partitions have the three security segments described previously. Code may not be executed from the Inactive Partition, but it may be programmed by, and read from, the Active Partition, subject to defined code protection. Figure 27-4 and Figure 27-5 show the different security segments for devices operating in Dual Partition mode.

The device may also operate in a Protected Dual Partition mode or in Privileged Dual Partition mode. In Protected Dual Partition mode, Partition 1 is permanently erase/write-protected. This implementation allows for a “Factory Default” mode, which provides a fail-safe backup image to be stored in Partition 1. For example, a fail-safe bootloader can be placed in Partition 1, along with a fail-safe backup code image, which can be used or rewritten into Partition 2 in the event of a failed Flash update to Partition 2.

Privileged Dual Partition mode performs the same function as Protected Dual Partition mode, except additional constraints are applied in an effort to prevent code in the Boot Segment and General Segment from being used against each other.

FIGURE 27-4: SECURITY SEGMENTS EXAMPLE FOR dsPIC33EP64GS70X/80X DEVICES (DUAL PARTITION MODES)



Note 1: If CS is write-protected, the last page (GS + CS) of program memory will be protected from an erase condition.

2: The last half (256 IW) of the last page of BS is unusable program memory.

FIGURE 30-25: SPI3 SLAVE MODE (FULL-DUPLEX, CKE = 0, CKP = 1, SMP = 0) TIMING CHARACTERISTICS(1,2)

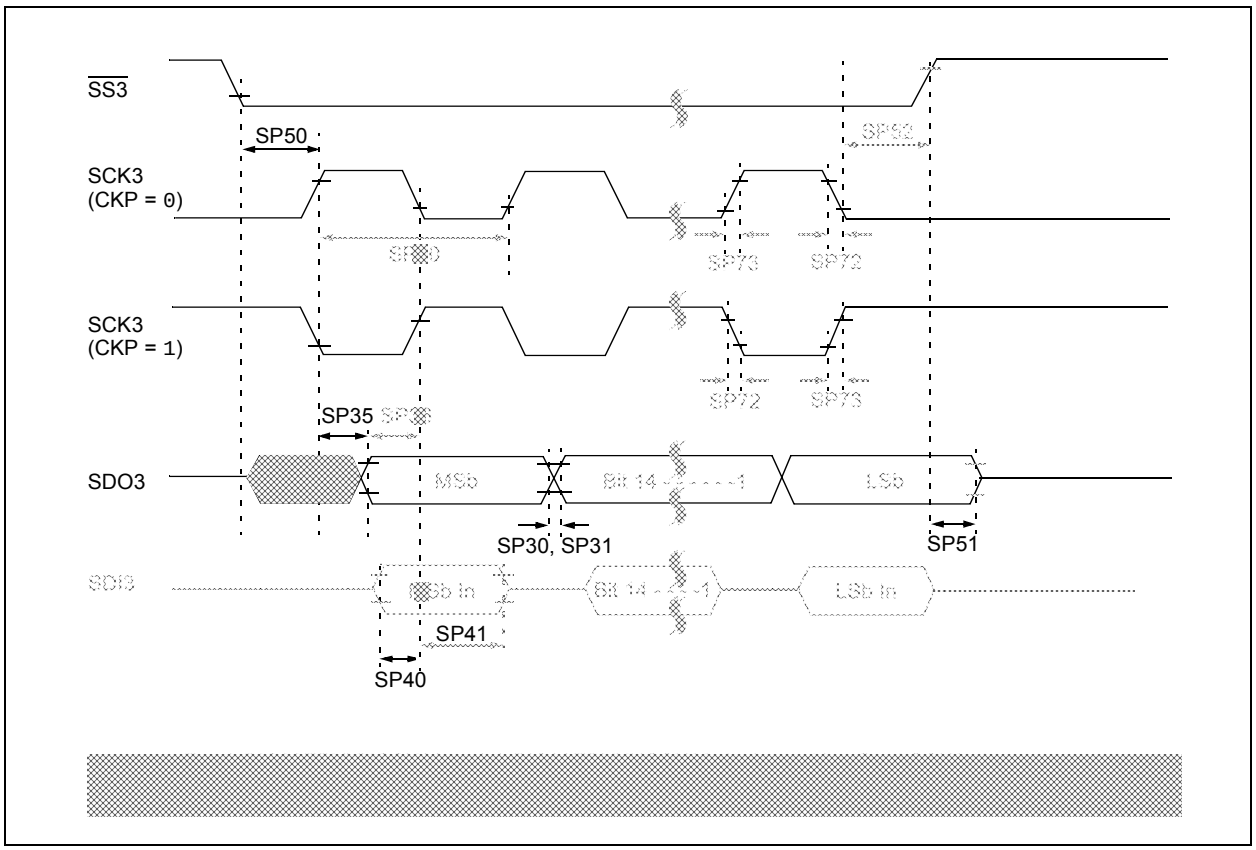
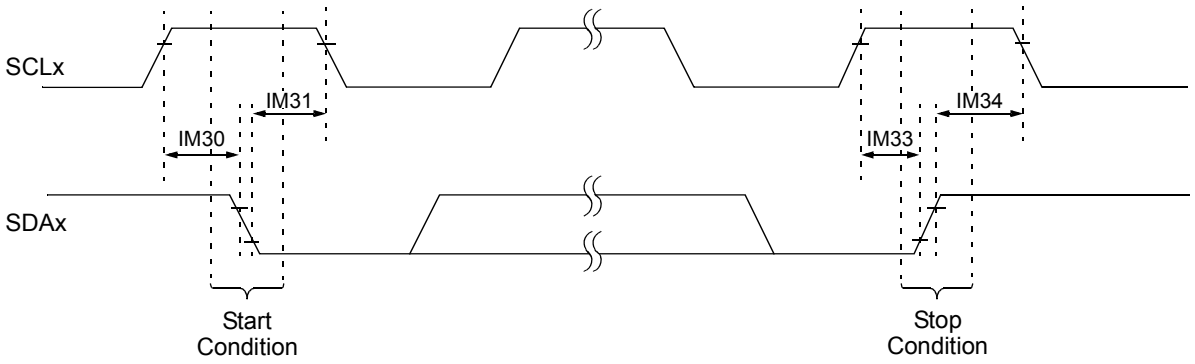


FIGURE 30-27: I2Cx BUS START/STOP BITS TIMING CHARACTERISTICS (MASTER MODE)



Note: Refer to Figure 30-1 for load conditions.

FIGURE 30-28: I2Cx BUS DATA TIMING CHARACTERISTICS (MASTER MODE)

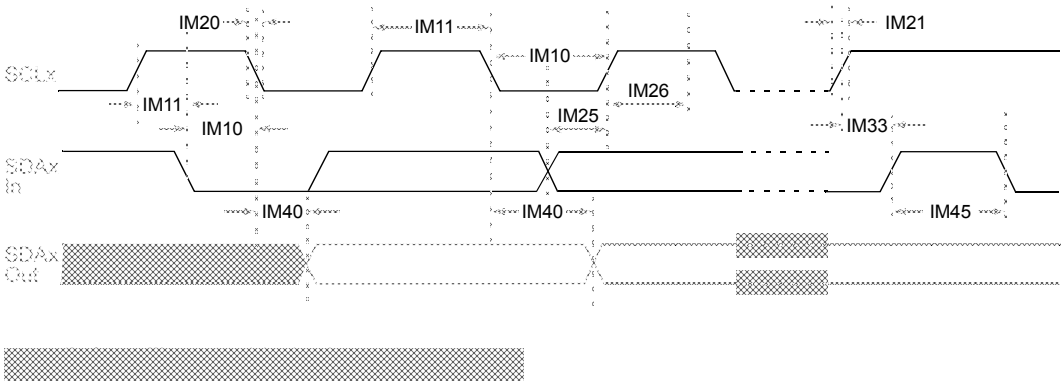


FIGURE 30-32: UARTx MODULE I/O TIMING CHARACTERISTICS

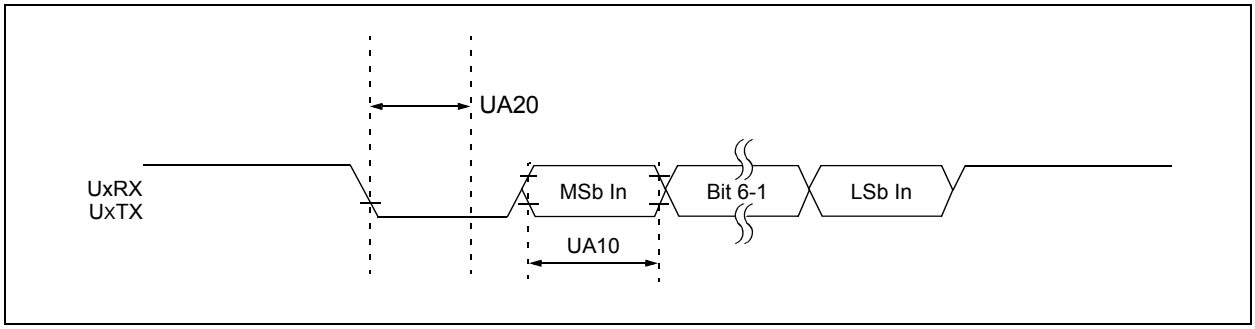


TABLE 30-50: UARTx MODULE I/O TIMING REQUIREMENTS

AC CHARACTERISTICS			Standard Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +125°C				
Param No.	Symbol	Characteristic(1)	Min.	Typ.(2)	Max.	Units	Conditions
UA10	TUABAUD	UARTx Baud Time	66.67	—	—	ns	
UA11	FBAUD	UARTx Baud Frequency	—	—	15	Mbps	
UA20	TCWF	Start Bit Pulse Width to Trigger UARTx Wake-up	500	—	—	ns	

Note 1: These parameters are characterized but not tested in manufacturing.

2: Data in "Typ." column is at 3.3V, +25°C unless otherwise stated. Parameters are for design guidance only and are not tested.

TABLE 30-51: ANALOG CURRENT SPECIFICATIONS

AC CHARACTERISTICS			Standard Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +125°C				
Param No.	Symbol	Characteristic(1)	Min.	Typ.(2)	Max.	Units	Conditions
AVD01	IDD	Analog Modules Current Consumption	—	9	—	mA	Characterized data with the following modules enabled: APLL, 5 ADC Cores, 2 PGAs and 4 Analog Comparators

Note 1: These parameters are characterized but not tested in manufacturing.

2: Data in "Typ." column is at 3.3V, +25°C unless otherwise stated. Parameters are for design guidance only and are not tested.