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Details

Product Status	Active
Core Processor	eZ8
Core Size	8-Bit
Speed	20MHz
Connectivity	-
Peripherals	Brown-out Detect/Reset, LED, POR, PWM, WDT
Number of I/O	23
Program Memory Size	4KB (4K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	256 x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 3.6V
Data Converters	A/D 8x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	28-VQFN
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/z8f0430qj020eg

Voltage Brown-Out Reset	24
Watchdog Timer Reset	25
External Reset Input	25
External Reset Indicator	26
On-Chip Debugger Initiated Reset	26
Stop Mode Recovery	26
Stop Mode Recovery using WDT Time-Out	27
Stop Mode Recovery using GPIO Port Pin Transition	27
Stop Mode Recovery Using the External RESET Pin	28
Debug Pin Driven Low	28
Reset Register Definitions	28
Low-Power Modes	30
STOP Mode	30
HALT Mode	31
Peripheral Level Power Control	31
Power Control Register Definitions	31
General Purpose Input/Output	33
GPIO Port Availability by Device	33
Architecture	34
GPIO Alternate Functions	34
Direct LED Drive	35
Shared Reset Pin	35
Crystal Oscillator Override	35
5V Tolerance	35
External Clock Setup	36
GPIO Interrupts	39
GPIO Control Register Definitions	39
Port A–D Address Registers	40
Port A–D Control Registers	41
Port A–D Data Direction Subregisters	41
Port A–D Alternate Function Subregisters	42
Port A–C Input Data Registers	49
Port A–D Output Data Register	50
LED Drive Enable Register	51
LED Drive Level High Register	51
LED Drive Level Low Register	52
Interrupt Controller	53
Interrupt Vector Listing	53
Architecture	55
Operation	55

Table 149. ADC Sample Settling Time (ADCSST)	215
Table 150. ADC Sample Time (ADCST)	215
Table 151. Power Control Register 0 (PWRCTL0)	216
Table 152. LED Drive Enable (LEDEN)	216
Table 153. LED Drive Level High Register (LEDLVLH)	217
Table 154. LED Drive Level Low Register (LEDLVL)	217
Table 155. Oscillator Control Register (OSCCTL)	217
Table 156. Comparator Control Register (CMP0)	218
Table 157. Interrupt Request 0 Register (IRQ0)	218
Table 158. IRQ0 Enable High Bit Register (IRQ0ENH)	219
Table 159. IRQ0 Enable Low Bit Register (IRQ0ENL)	219
Table 160. Interrupt Request 1 Register (IRQ1)	219
Table 161. IRQ1 Enable High Bit Register (IRQ1ENH)	219
Table 162. IRQ1 Enable Low Bit Register (IRQ1ENL)	220
Table 163. Interrupt Request 2 Register (IRQ2)	220
Table 164. IRQ2 Enable High Bit Register (IRQ2ENH)	220
Table 165. IRQ2 Enable Low Bit Register (IRQ2ENL)	220
Table 166. Interrupt Edge Select Register (IRQES)	221
Table 167. Shared Interrupt Select Register (IRQSS)	221
Table 168. Interrupt Control Register (IRQCTL)	221
Table 169. Port A GPIO Address Register (PAADDR)	222
Table 170. Port A Control Registers (PACTL)	222
Table 171. Port A Input Data Registers (PAIN)	222
Table 172. Port A Output Data Register (PAOUT)	223
Table 173. Port B GPIO Address Register (PBADDR)	223
Table 174. Port B Control Registers (PBCTL)	223
Table 175. Port B Input Data Registers (PBIN)	223
Table 176. Port B Output Data Register (PBOUT)	224
Table 177. Port C GPIO Address Register (PCADDR)	224
Table 178. Port C Control Registers (PCCTL)	224

Stop Mode Recovery Using the External $\overline{\text{RESET}}$ Pin

When the Z8 Encore! F0830 Series device is in STOP Mode and the external $\overline{\text{RESET}}$ pin is driven low, a system reset occurs. Because of a glitch filter operating on the $\overline{\text{RESET}}$ pin, the low pulse must be greater than the minimum width specified about 12 ns or it is ignored. The EXT bit in the Reset Status (RSTSTAT) Register is set.

Debug Pin Driven Low

Debug reset is initiated when the On-Chip Debugger detects any of the following error conditions on the DBG pin:

- Serial break (a minimum of nine continuous bits Low)
- Framing error (received STOP bit is Low)
- Transmit collision (simultaneous OCD and host transmission detected by the OCD)

When the Z8F0830 Series device is operating in STOP Mode, the debug reset will cause a system reset. The On-Chip Debugger block is not reset, but the remainder of the chip's operations go through a normal system reset. The POR bit in the Reset Status (RSTSTAT) Register is set to 1.

Reset Register Definitions

The following sections define the Reset registers.

Reset Status Register

The Reset Status (RSTSTAT) Register, shown in Table 12, is a read-only register that indicates the source of the most recent Reset event, Stop Mode Recovery event or Watchdog Timer time-out event. Reading this register resets the upper four bits to 0.

This register shares its address with the Watchdog Timer Control Register, which is write-only.

General Purpose Input/Output

The Z8 Encore! F0830 Series products support a maximum of 25 port pins (Ports A–D) for General Purpose Input/Output (GPIO) operations. Each port contains control and data registers. The GPIO control registers determine data direction, open-drain, output drive current, programmable pull-ups, Stop Mode Recovery functionality and alternate pin functions. Each port pin is individually programmable. In addition, the Port C pins are capable of direct LED drive at programmable drive strengths.

GPIO Port Availability by Device

Table 15 lists the port pins available with each device and package type.

Table 15. Port Availability by Device and Package Type

Devices	Package	10-Bit ADC	Port A	Port B	Port C	Port D	Total I/O
Z8F1232, Z8F0830, Z8F0430, Z8F0230, Z8F0130	20-pin	Yes	[7:0]	[3:0]	[3:0]	[0]	17
Z8F1233, Z8F0831 Z8F0431, Z8F0231 Z8F0131	20-pin	No	[7:0]	[3:0]	[3:0]	[0]	17
Z8F1232, Z8F0830, Z8F0430, Z8F0230, Z8F0130	28-pin	Yes	[7:0]	[5:0]	[7:0]	[0]	23
Z8F1233, Z8F0831 Z8F0431, Z8F0231 Z8F0131	28-pin	No	[7:0]	[7:0]	[7:0]	[0]	25

Note: 20-pin and 28-pin and 10-bit ADC Enabled or Disabled can be selected via the option bits.

Table 16. Port Alternate Function Mapping (Continued)

Port	Pin	Mnemonic	Alternate Function Description	Alternate Function Set Register AFS1
Port C³	PC0	Reserved		AFS1[0]: 0
		ANA4/CINP	ADC or comparator input	AFS1[0]: 1
	PC1	Reserved		AFS1[1]: 0
		ANA5/CINN	ADC or comparator input	AFS1[1]: 1
	PC2	Reserved		AFS1[2]: 0
		ANA6	ADC analog input	AFS1[2]: 1
	PC3	COUT	Comparator output	AFS1[3]: 0
		Reserved		AFS1[3]: 1
	PC4	Reserved		AFS1[4]: 0
				AFS1[4]: 1
	PC5	Reserved		AFS1[5]: 0
				AFS1[5]: 1
	PC6	Reserved		AFS1[6]: 0
				AFS1[6]: 1
	PC7	Reserved		AFS1[7]: 0
				AFS1[7]: 1
Port D¹	PD0	RESET	Default to be Reset function	N/A

Notes:

1. Because there is only a single alternate function for each Port A and Port D (PD0) pin, the Alternate Function Set registers are not implemented for Port A and Port D (PD0). Enabling alternate function selections (as described in the [Port A–D Alternate Function Subregisters](#) section on page 42) automatically enables the associated alternate function.
2. Because there are at most two choices of alternate functions for any Port B pin, the AFS2 Alternate Function Set Register is implemented but is not used to select the function. Additionally, alternate function selection (as described in the [Port A–D Alternate Function Subregisters](#) section on page 42) must also be enabled.
3. Because there are at most two choices of alternate functions for any Port C pin, the AFS2 Alternate Function Set Register is implemented but is not used to select the function. Additionally, alternate function selection (as described in the [Port A–D Alternate Function Subregisters](#) section on page 42) must also be enabled.

Port A–D Address Registers

The Port A–D Address registers select the GPIO port functionality accessible through the Port A–D Control registers. The Port A–D Address and Control registers combine to provide access to all GPIO port controls; see Tables 18 and 19.

Table 18. Port A–D GPIO Address Registers (PxADDR)

Bit	7	6	5	4	3	2	1	0
Field	PADDR[7:0]							
RESET	00H							
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FD0H, FD4H, FD8H, FDCH							

Bit	Description
[7:0]	Port Address
PADDR	The port address selects one of the subregisters accessible through the Port Control Register.

Table 19. Port Control Subregister Access

PADDR[7:0]	Port Control Subregister accessible using the Port A–D Control registers
00H	No function. Provides some protection against accidental port reconfiguration.
01H	Data Direction
02H	Alternate Function
03H	Output Control (open-drain)
04H	High Drive Enable
05H	Stop Mode Recovery Source Enable
06H	Pull-Up Enable
07H	Alternate Function Set 1
08H	Alternate Function Set 2
09H–FFH	No function

Port A–D Pull-up Enable Subregisters

The Port A–D Pull-Up Enable Subregister is accessed through the Port A–D Control Register by writing 06H to the Port A–D Address Register. See Table 26. Setting the bits in the Port A–D Pull-Up Enable subregisters enables a weak internal resistive pull-up on the specified port pins.

Table 26. Port A–D Pull-Up Enable Subregisters (PxPUE)

Bit	7	6	5	4	3	2	1	0
Field	PPUE7	PPUE6	PPUE5	PPUE4	PPUE3	PPUE2	PPUE1	PPUE0
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	If 06H in Port A–D Address Register, accessible through the Port A–D Control Register							

Bit	Description
[7:0]	Port Pull-Up Enable
PxPUE	0 = The weak pull-up on the port pin is disabled. 1 = The weak pull-up on the port pin is enabled.

Note: x indicates the specific GPIO port pin number (7–0).

ADC Data High Byte Register

The ADC Data High Byte Register, listed in Table 64, contains the upper eight bits of the ADC output. Access to the ADC Data High Byte Register is read-only. Reading the ADC Data High Byte Register latches data in the ADC Low Bits Register.

Table 64. ADC Data High Byte Register (ADCD_H)

Bit	7	6	5	4	3	2	1	0
Field	ADCDH							
RESET	X							
R/W	R							
Address	F72H							

Bit	Description
[7:0] ADCDH	ADC High Byte 00h–FFh = The last conversion output is held in the data registers until the next ADC conversion is completed.

ADC Data Low Bits Register

The ADC Data Low Bits Register, shown in Table 65, contains the lower bits of the ADC output. Access to the ADC Data Low Bits Register is read-only. Reading the ADC Data High Byte Register latches lower bits of the ADC in the ADC Data Low Bits Register.

Table 65. ADC Data Low Bits Register (ADCD_L)

Bit	7	6	5	4	3	2	1	0
Field	ADCDL		Reserved					
RESET	X		X					
R/W	R		R					
Address	F73H							

Bit	Description
[7:6] ADCDL	ADC Low Bits 00–11b = These bits are the two least-significant bits of the 10-bit ADC output. These bits are undefined after a reset. The low bits are latched into this register whenever the ADC Data High Byte Register is read.
[5:0]	Reserved These bits are reserved and must be programmed to 000000.

Flash Status Register

The Flash Status Register indicates the current state of the Flash Controller. This register can be read at any time. The read-only Flash Status Register shares its register file address with the write-only Flash Control Register.

Table 73. Flash Status Register (FSTAT)

Bit	7	6	5	4	3	2	1	0
Field	Reserved		FSTAT					
RESET	0	0	0	0	0	0	0	0
R/W	R	R	R	R	R	R	R	R
Address	FF8H							

Bit	Description
[7:6]	Reserved These bits are reserved and must be programmed to 00.
[5:0] FSTAT	Flash Controller Status 000000 = Flash Controller locked. 000001 = First unlock command received (73H written). 000010 = Second unlock command received (8CH written). 000011 = Flash Controller unlocked. 000100 = Sector protect register selected. 001xxx = Program operation in progress. 010xxx = Page Erase operation in progress. 100xxx = Mass Erase operation in progress.

Note: The bit values used in Table 87 are set at the factory; no calibration is required.

Table 88. VBO Trim Definition

VBO_TRIM	Trigger Voltage Level
000	1.7
001	1.6
101	2.2
110	2.0
100	2.4
111	1.8

On-chip Flash memory is only guaranteed to perform write operations when voltage supplies exceed 2.7V. Write operations at voltages below 2.7V will yield unpredictable results.

Table 89. Trim Option Bits at 0006H (TCLKFLT)

Bit	7	6	5	4	3	2	1	0
Field	DivBy4	Reserved	DlyCtl1	DlyCtl2	DlyCtl3	Reserved	FilterSel1	FilterSel0
RESET	0	1	0	0	0	1	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	Information Page Memory 0026H							
Note: U = Unchanged by Reset. R/W = Read/Write.								

Bit	Description
[7] DivBy4	Output Frequency Selection 0 = Output frequency is input frequency. 1 = Output frequency is 1/4 of the input frequency.
[6]	Reserved This bit is reserved and must be programmed to 1.
[5:3] DlyCtlx	Delay Control 3-bit selection for the pulse width that can be filtered. See Table 90 for Delay Control values at 3.3V operation voltage.
[2]	Reserved This bit is reserved and must be programmed to 1.

Notes: x indicates bit values 3–1; y indicates bit values 1–0.

Bit	Description (Continued)
[1:0]	Filter Select
FilterSely	2-bit selection for the clock filter mode. 00 = No filter. 01 = Filter low level noise on high level signal. 10 = Filter high level noise on low level signal. 11 = Filter both.
Notes: x indicates bit values 3–1; y indicates bit values 1–0.	

► **Note:** The bit values used in Table 89 are set at factory and no calibration is required.

Table 90. ClkFlt Delay Control Definition

DlyCtl3, DlyCtl2, DlyCtl1	Low Noise Pulse on High Signal (ns)	High Noise Pulse on Low Signal (ns)
000	5	5
001	7	7
010	9	9
011	11	11
100	13	13
101	17	17
110	20	20
111	25	25
Note: The variation is about 30%.		

Power Failure Protection

NVDS routines employ error-checking mechanisms to ensure that any power failure will only endanger the most recently written byte. Bytes previously written to the array are not perturbed. For this protection to function, the VBO must be enabled (see the [Low-Power Modes](#) chapter on page 30) and configured for a threshold voltage of 2.4V or greater (see the [Trim Bit Address Space](#) section on page 129).

A system reset (such as a pin reset or Watchdog Timer reset) that occurs during a write operation also perturbs the byte currently being written. All other bytes in the array are unperturbed.

Optimizing NVDS Memory Usage for Execution Speed

As indicated in Table 93, the NVDS read time varies drastically; this discrepancy being a trade-off for minimizing the frequency of writes that require post-write page erases. The NVDS read time of address N is a function of the number of writes to addresses other than N since the most recent write to address N as well as the number of writes since the most recent page erase. Neglecting the effects caused by page erases and results caused by the initial condition in which the NVDS is blank, a rule of thumb to consider is that every write since the most recent page erase causes read times of unwritten addresses to increase by 0.8 μ s up to a maximum of 258 μ s.

Table 93. NVDS Read Time

Operation	Minimum Latency (μ s)	Maximum Latency (μ s)
Read	71	258
Write	126	136
Illegal Read	6	6
Illegal Write	7	7

► **Note:** For every 200 writes, a maintenance operation is necessary. In this rare occurrence, the write takes up to 58ms to complete.

If NVDS read performance is critical to your software architecture, you can optimize your code for speed by using either of the two methods listed below.

1. Periodically refresh all addresses that are used; this is the more useful method. The optimal use of NVDS, in terms of speed, is to rotate the writes evenly among all addresses planned for use, thereby bringing all reads closer to the minimum read time.

Table 105. Arithmetic Instructions (Continued)

Mnemonic	Operands	Instruction
INCW	dst	Increment Word
MULT	dst	Multiply
SBC	dst, src	Subtract with Carry
SBCX	dst, src	Subtract with Carry using Extended Addressing
SUB	dst, src	Subtract
SUBX	dst, src	Subtract using Extended Addressing

Table 106. Bit Manipulation Instructions

Mnemonic	Operands	Instruction
BCLR	bit, dst	Bit Clear
BIT	p, bit, dst	Bit Set or Clear
BSET	bit, dst	Bit Set
BSWAP	dst	Bit Swap
CCF	—	Complement Carry Flag
RCF	—	Reset Carry Flag
SCF	—	Set Carry Flag
TCM	dst, src	Test Complement Under Mask
TCMX	dst, src	Test Complement Under Mask using Extended Addressing
TM	dst, src	Test Under Mask
TMX	dst, src	Test Under Mask using Extended Addressing

Table 107. Block Transfer Instructions

Mnemonic	Operands	Instruction
LDCI	dst, src	Load Constant to/from Program Memory and Auto-Increment Addresses
LDEI	dst, src	Load External Data to/from Data Memory and Auto-Increment Addresses

		Lower Nibble (Hex)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Upper Nibble (Hex)	0																
	1																
	2																
	3																
	4																
	5																
	6																
	7	3.2 PUS															
	8																
	9																
	A			3.3 CPC r1,r2	3.4 CPC r1,lr2	4.3 CPC R2,R1	4.4 CPC IR2,R1	4.3 CPC R1,IM	4.4 CPC IR1,IM	5.3 CPCX ER2,ER1	5.3 CPCX IM,ER1						
	B																
	C	3.2 SRL R1	3.3 SRL IR1														
	D																
	E									5, 4 LDWX ER2,ER1							
	F																

Figure 30. Second Op Code Map after 1FH

Packaging

Zilog's F0830 Series of MCUs includes the Z8F0130, Z8F0131, Z8F0230, Z8F0231, Z8F1232 and Z8F1233 devices, which are available in the following packages:

- 20-Pin Quad Flat No-Lead Package (QFN)
- 20-pin Small Outline Integrated Circuit Package (SOIC)
- 20-pin Plastic Dual-Inline Package (PDIP)
- 20-pin Small Shrink Outline Package (SSOP)
- 28-Pin Quad Flat No-Lead Package (QFN)
- 28-pin Small Outline Integrated Circuit Package (SOIC)
- 28-pin Plastic Dual-Inline Package (PDIP)
- 28-pin Small Shrink Outline Package (SSOP)

Current diagrams for each of these packages are published in Zilog's Packaging Product Specification (PS0072), which is available free for download from the Zilog website.

Ordering Information

Order your F0830 Series products from Zilog using the part numbers shown in Table 128. For more information about ordering, please consult your local Zilog sales office. The [Sales Location](#) page on the Zilog website lists all regional offices.

Table 128. Z8 Encore! XP F0830 Series Ordering Matrix

Part Number	Flash	RAM	NVDS	ADC Channels	Description
Z8 Encore! F0830 Series MCUs with 12KB Flash					
Standard Temperature: 0°C to 70°C					
Z8F1232SH020SG	12KB	256	No	7	SOIC 20-pin
Z8F1232HH020SG	12KB	256	No	7	SSOP 20-pin
Z8F1232PH020SG	12KB	256	No	7	PDIP 20-pin
Z8F1232QH020SG	12KB	256	No	7	QFN 20-pin
Z8F1233SH020SG	12KB	256	No	0	SOIC 20-pin
Z8F1233HH020SG	12KB	256	No	0	SSOP 20-pin
Z8F1233PH020SG	12KB	256	No	0	PDIP 20-pin
Z8F1233QH020SG	12KB	256	No	0	QFN 20-pin
Z8F1232SJ020SG	12KB	256	No	8	SOIC 28-pin
Z8F1232HJ020SG	12KB	256	No	8	SSOP 28-pin
Z8F1232PJ020SG	12KB	256	No	8	PDIP 28-pin
Z8F1232QJ020SG	12KB	256	No	8	QFN 28-pin
Z8F1233SJ020SG	12KB	256	No	0	SOIC 28-pin
Z8F1233HJ020SG	12KB	256	No	0	SSOP 28-pin
Z8F1233PJ020SG	12KB	256	No	0	PDIP 28-pin
Z8F1233QJ020SG	12KB	256	No	0	QFN 28-pin
Extended Temperature: –40°C to 105°C					
Z8F1232SH020EG	12KB	256	No	7	SOIC 20-pin
Z8F1232HH020EG	12KB	256	No	7	SSOP 20-pin
Z8F1232PH020EG	12KB	256	No	7	PDIP 20-pin
Z8F1232QH020EG	12KB	256	No	7	QFN 20-pin
Z8F1233SH020EG	12KB	256	No	0	SOIC 20-pin
Z8F1233HH020EG	12KB	256	No	0	SSOP 20-pin
Z8F1233PH020EG	12KB	256	No	0	PDIP 20-pin

Hex Address: F0D

Table 143. Timer 1 PWM Low Byte Register (T1PWML)

Bit	7	6	5	4	3	2	1	0
Field	PWML							
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	F0DH							

Hex Address: F0E

Table 144. Timer 1 Control Register 0 (T1CTL0)

Bit	7	6	5	4	3	2	1	0
Field	TMODEHI	TICONFIG		Reserved	PWMD			INPCAP
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	F0EH							

Hex Address: F0F

Table 145. Timer 1 Control Register 1 (T1CTL1)

Bit	7	6	5	4	3	2	1	0
Field	TEN	TPOL	PRES			TMODE		
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	F0FH							

Hex Addresses: F10–F6F

This address range is reserved.

Low Power Control

For more information about the Power Control Register, see the [Power Control Register Definitions](#) section on page 31.

Hex Address: F80

Table 151. Power Control Register 0 (PWRCTL0)

Bit	7	6	5	4	3	2	1	0
Field	Reserved			VBO	Reserved	Reserved	COMP	Reserved
RESET	1	0	0	0	1	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	F80H							

Hex Address: F81

This address range is reserved.

LED Controller

For more information about the LED Drive registers, see the [GPIO Control Register Definitions](#) section on page 39.

Hex Address: F82

Table 152. LED Drive Enable (LEDEN)

Bit	7	6	5	4	3	2	1	0
Field	LEDEN[7:0]							
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	F82H							

Hex Address: FD7

Table 176. Port B Output Data Register (PBOUT)

Bit	7	6	5	4	3	2	1	0
Field	POUT7	POUT6	POUT5	POUT4	POUT3	POUT2	POUT1	POUT0
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FD7H							

Hex Address: FD8

Table 177. Port C GPIO Address Register (PCADDR)

Bit	7	6	5	4	3	2	1	0
Field	PADDR[7:0]							
RESET	00H							
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FD8H							

Hex Address: FD9

Table 178. Port C Control Registers (PCCTL)

Bit	7	6	5	4	3	2	1	0
Field	PCTL							
RESET	00H							
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FD9H							

Hex Address: FDA

Table 179. Port C Input Data Registers (PCIN)

Bit	7	6	5	4	3	2	1	0
Field	PIN7	PIN6	PIN5	PIN4	PIN3	PIN2	PIN1	PIN0
RESET	X	X	X	X	X	X	X	X
R/W	R	R	R	R	R	R	R	R
Address	FDAH							

Trim Bit Control

For more information about the Trim Bit Control registers, see the [Flash Option Bit Control Register Definitions](#) section on page 126.

Hex Address: FF6

Table 189. Trim Bit Address Register (TRMADR)

Bit	7	6	5	4	3	2	1	0
Field	TRMADR - Trim Bit Address (00H to 1FH)							
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FF6H							

Hex Address: FF7

Table 190. Trim Bit Data Register (TRMDR)

Bit	7	6	5	4	3	2	1	0
Field	TRMDR - Trim Bit Data							
RESET	0	0	0	0	0	0	0	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Address	FF7H							

Flash Memory Controller

For more information about the Flash Control registers, see the [Flash Control Register Definitions](#) section on page 118.

Hex Address: FF8

Table 191. Flash Control Register (FCTL)

Bit	7	6	5	4	3	2	1	0
Field	FCMD							
RESET	0	0	0	0	0	0	0	0
R/W	W	W	W	W	W	W	W	W
Address	FF8H							