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"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Obsolete
Core Processor	Z8
Core Size	8-Bit
Speed	8MHz
Connectivity	-
Peripherals	HLVD, POR, WDT
Number of I/O	24
Program Memory Size	32KB (32K x 8)
Program Memory Type	OTP
EEPROM Size	-
RAM Size	237 x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 3.6V
Data Converters	-
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	28-SSOP (0.209", 5.30mm Width)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/zgp323leh2832c



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Table of Contents

Development Features	1
General Description	2
Pin Description	4
Absolute Maximum Ratings	10
Standard Test Conditions	10
DC Characteristics	11
AC Characteristics	14
Pin Functions	16
XTAL1 Crystal 1 (Time-Based Input)	16
XTAL2 Crystal 2 (Time-Based Output)	16
Port 0 (P07–P00)	16
Port 1 (P17–P10)	17
Port 2 (P27–P20)	18
Port 3 (P37–P30)	19
RESET (Input, Active Low)	23
Functional Description	23
Program Memory	23
RAM	23
Expanded Register File	24
Register File	28
Stack	29
Timers	30
Counter/Timer Functional Blocks	38
Expanded Register File Control Registers (0D)	64
Expanded Register File Control Registers (0F)	69
Standard Control Registers	73
Package Information	80
Ordering Information	89
Precharacterization Product	95

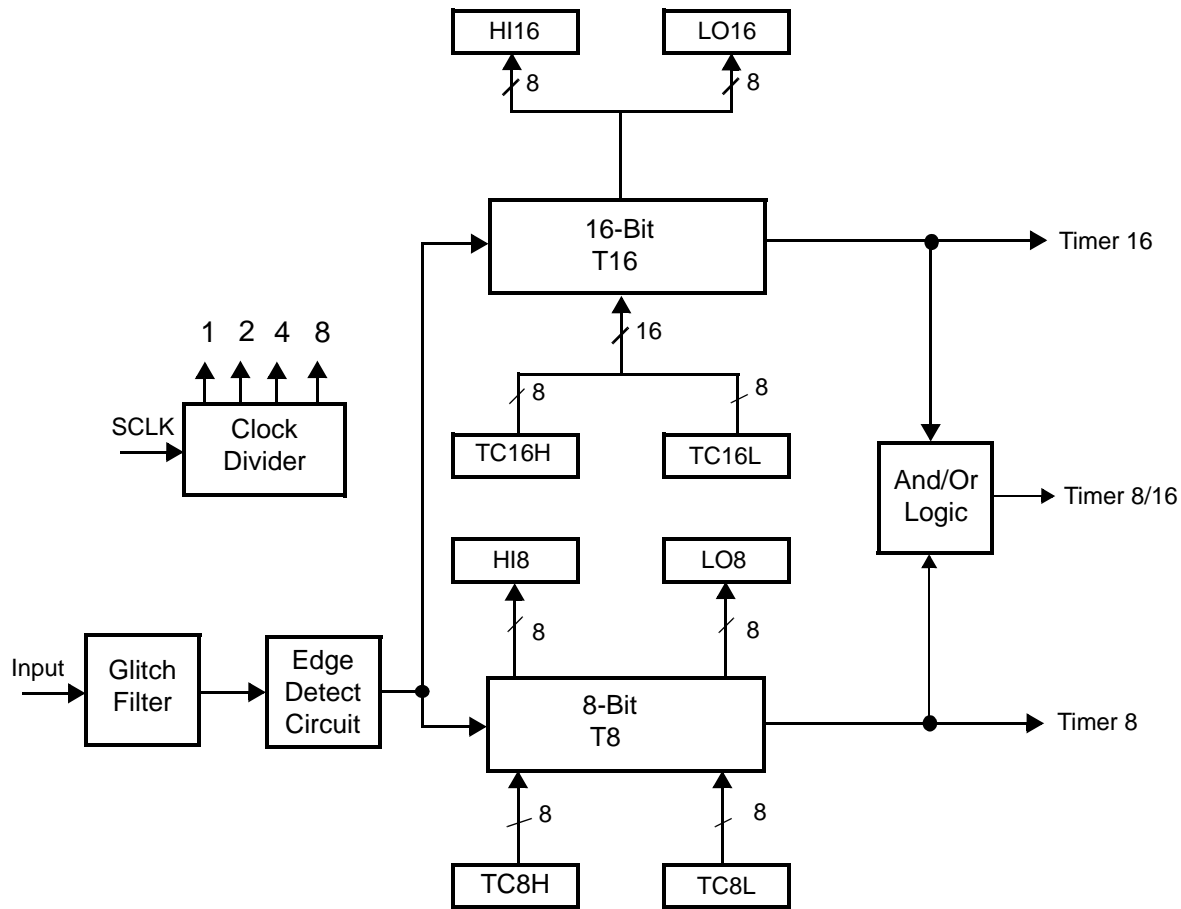


Figure 2. Counter/Timers Diagram

Pin Description

The pin configuration for the 20-pin PDIP/SOIC/SSOP is illustrated in Figure 3 and described in Table 3. The pin configuration for the 28-pin PDIP/SOIC/SSOP are depicted in Figure 4 and described in Table 4. The pin configurations for the 40-pin PDIP and 48-pin SSOP versions are illustrated in Figure 5, Figure 6, and described in Table 5.

For customer engineering code development, a UV eraseable windowed cerdip packaging is offered in 20-pin, 28-pin, and 40-pin configurations. ZiLOG does not recommend nor guarantee these packages for use in production.

Absolute Maximum Ratings

Stresses greater than those listed in Table 7 might cause permanent damage to the device. This rating is a stress rating only. Functional operation of the device at any condition above those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for an extended period might affect device reliability.

Table 6. Absolute Maximum Ratings

Parameter	Minimum	Maximum	Units	Notes
Ambient temperature under bias	0	+70	C	
Storage temperature	-65	+150	C	
Voltage on any pin with respect to V_{SS}	-0.3	+5.5	V	1
Voltage on V_{DD} pin with respect to V_{SS}	-0.3	+3.6	V	
Maximum current on input and/or inactive output pin	-5	+5	μ A	
Maximum output current from active output pin	-25	+25	mA	
Maximum current into V_{DD} or out of V_{SS}		75	mA	

Notes:
This voltage applies to all pins except the following: V_{DD} , P32, P33 and $\overline{\text{RESET}}$.

Standard Test Conditions

The characteristics listed in this product specification apply for standard test conditions as noted. All voltages are referenced to GND. Positive current flows into the referenced pin (see Figure 7).

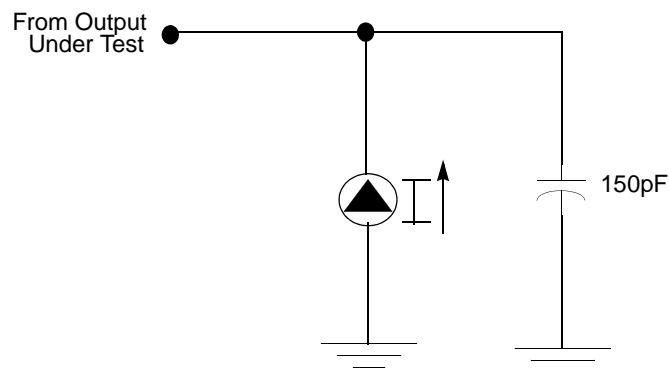


Figure 7. Test Load Diagram

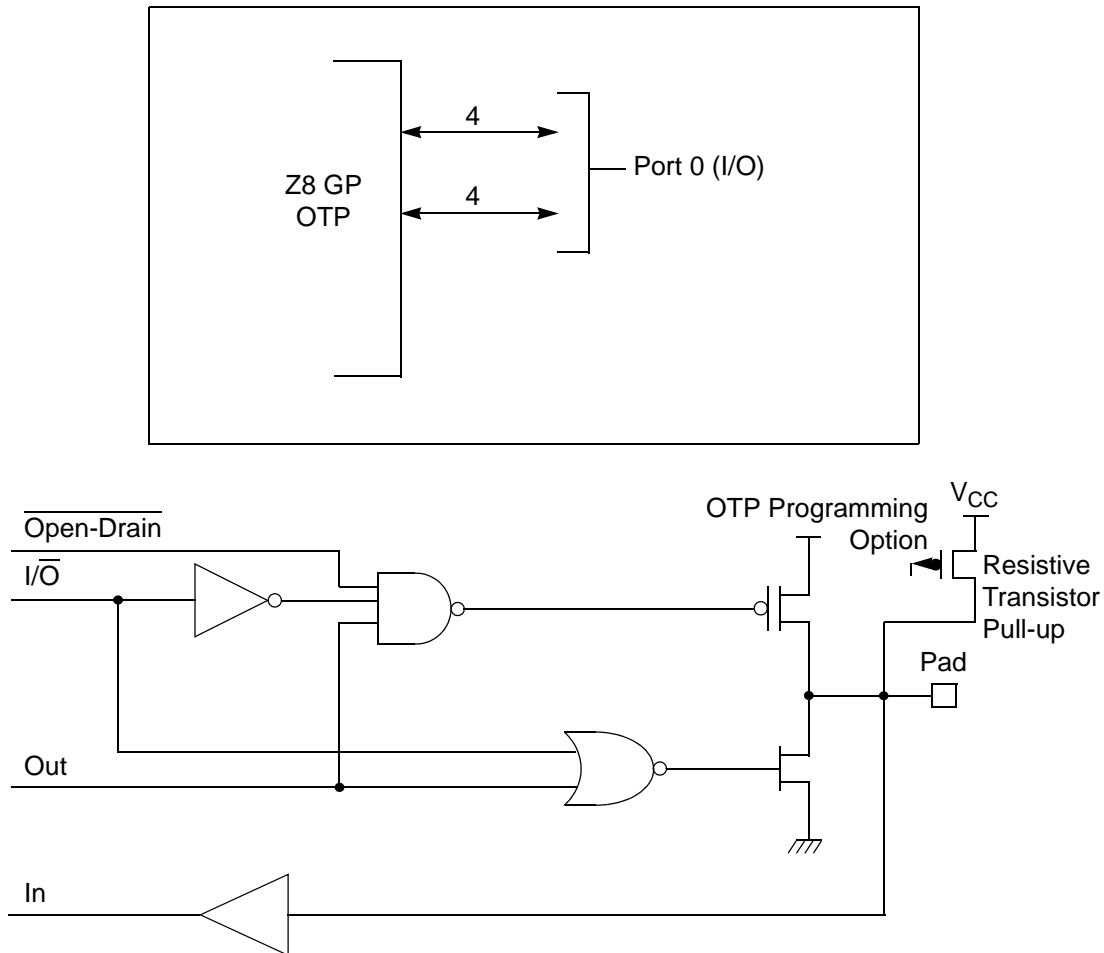


Figure 9. Port 0 Configuration

Port 1 (P17–P10)

Port 1 (see Figure 10) Port 1 can be configured for standard port input or output mode. After POR, Port 1 is configured as an input port. The output drivers are either push-pull or open-drain and are controlled by bit D1 in the PCON register.

► **Note:** The Port 1 direction is reset to be input following an SMR.

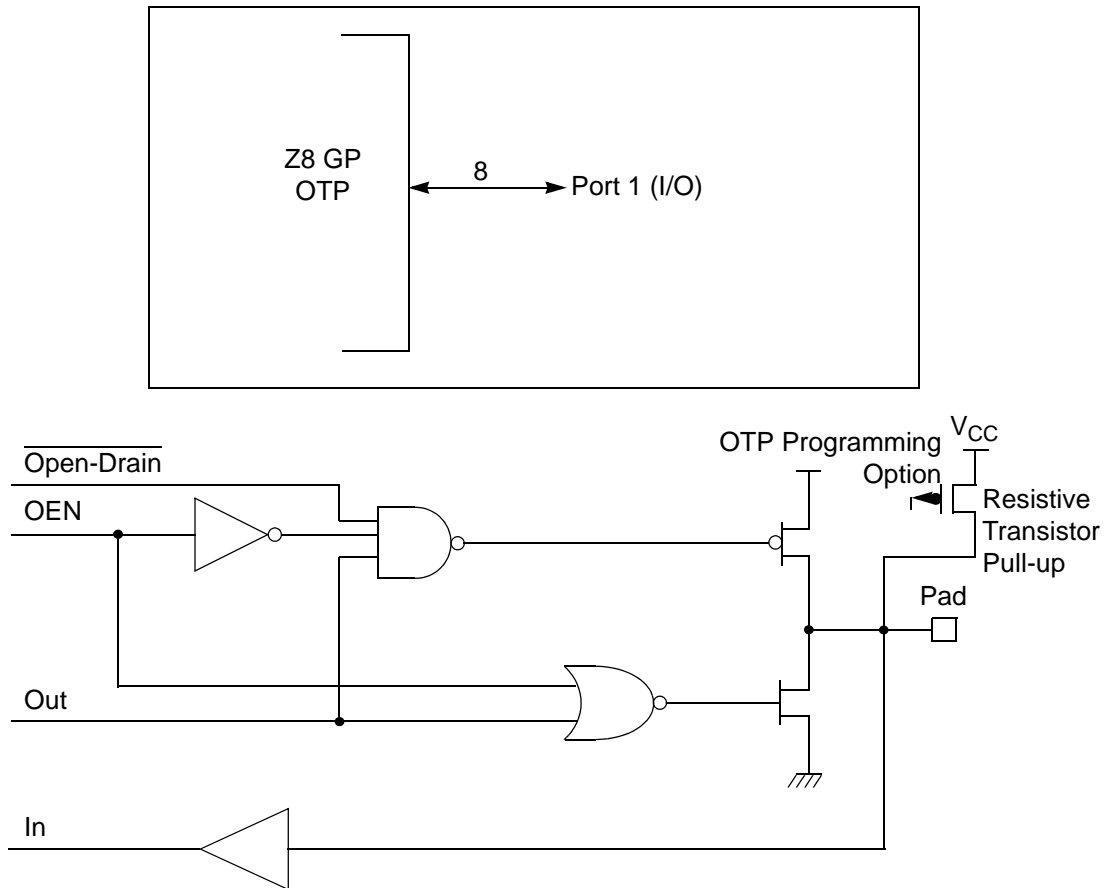


Figure 10. Port 1 Configuration

Port 2 (P27–P20)

Port 2 is an 8-bit, bidirectional, CMOS-compatible I/O port (see Figure 11). These eight I/O lines can be independently configured under software control as inputs or outputs. Port 2 is always available for I/O operation. A mask option is available to connect eight pull-up transistors on this port. Bits programmed as outputs are globally programmed as either push-pull or open-drain. The POR resets with the eight bits of Port 2 configured as inputs.

Port 2 also has an 8-bit input OR and AND gate, which can be used to wake up the part. P20 can be programmed to access the edge-detection circuitry in demodulation mode.

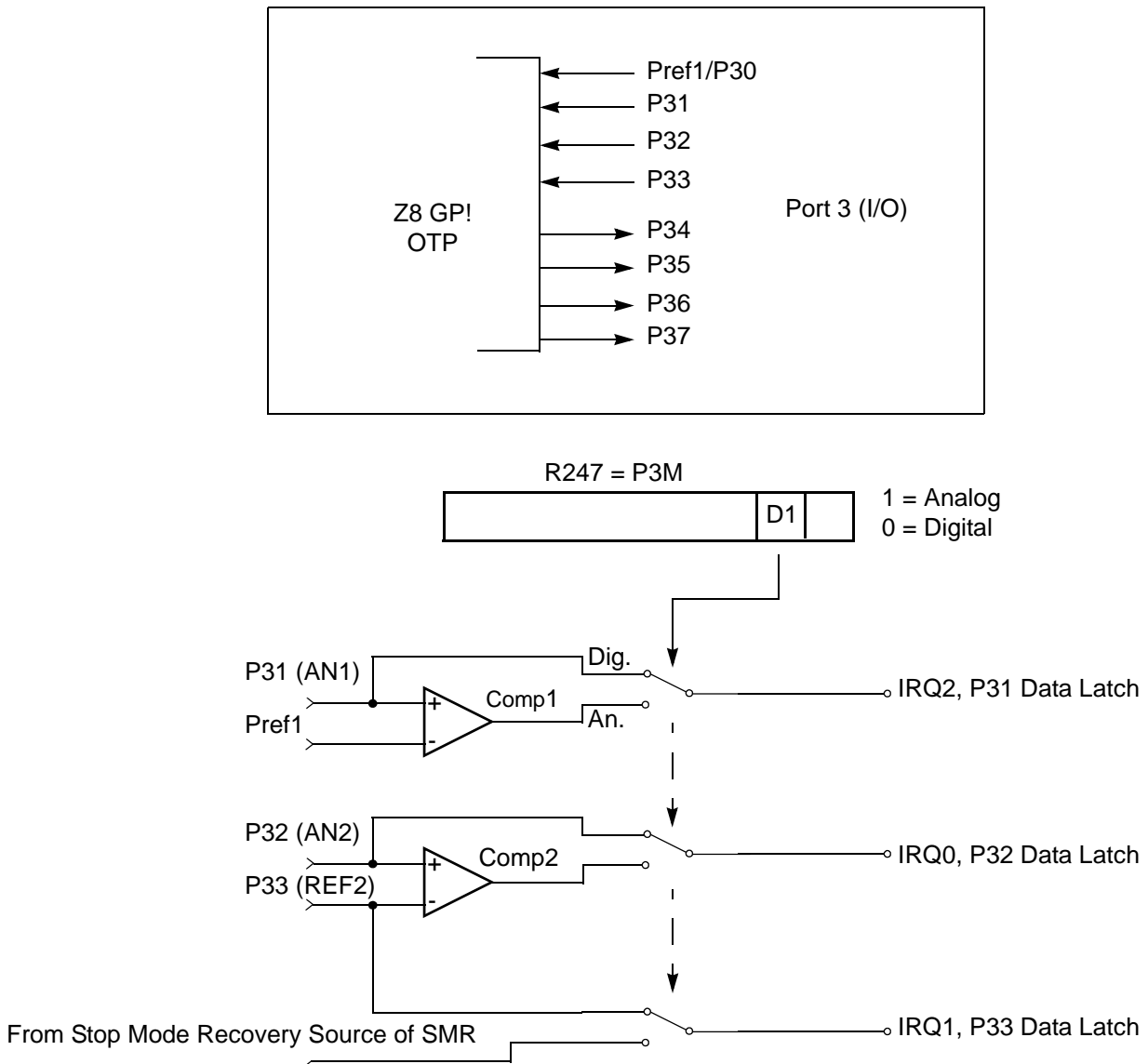


Figure 12. Port 3 Configuration

Two on-board comparators process analog signals on P31 and P32, with reference to the voltage on Pref1 and P33. The analog function is enabled by programming the Port 3 Mode Register (bit 1). P31 and P32 are programmable as rising, falling, or both edge triggered interrupts (IRQ register bits 6 and 7). Pref1 and P33 are the comparator reference voltage inputs. Access to the Counter Timer edge-detection circuit is through P31 or P20 (see “T8 and T16 Common Functions—

CTR1(0D)01H" on page 33). Other edge detect and IRQ modes are described in Table 11.

- **Note:** Comparators are powered down by entering Stop Mode. For P31–P33 to be used in a Stop Mode Recovery (SMR) source, these inputs must be placed into digital mode.

Table 11. Port 3 Pin Function Summary

Pin	I/O	Counter/Timers	Comparator	Interrupt
Pref1/P30	IN		RF1	
P31	IN	IN	AN1	IRQ2
P32	IN		AN2	IRQ0
P33	IN		RF2	IRQ1
P34	OUT	T8	AO1	
P35	OUT	T16		
P36	OUT	T8/16		
P37	OUT		AO2	
P20	I/O	IN		

Port 3 also provides output for each of the counter/timers and the AND/OR Logic (see Figure 13). Control is performed by programming bits D5–D4 of CTR1, bit 0 of CTR0, and bit 0 of CTR2.

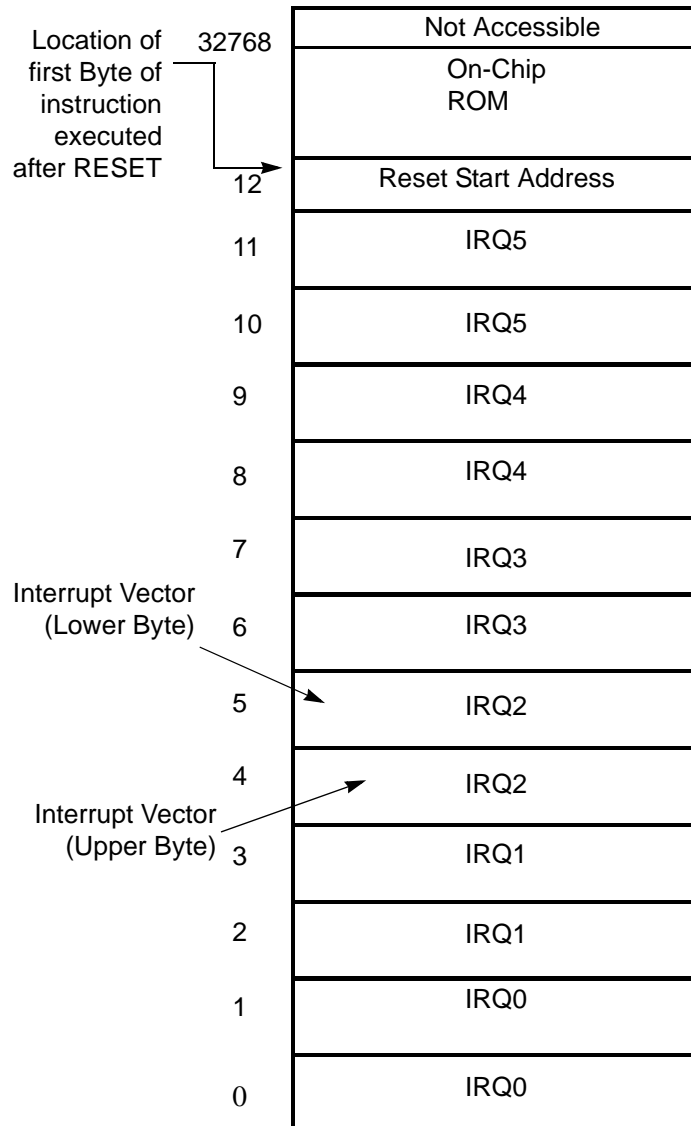


Figure 14. Program Memory Map (32K OTP)

Expanded Register File

The register file has been expanded to allow for additional system control registers and for mapping of additional peripheral devices into the register address area. The Z8® register address space (R0 through R15) has been implemented as 16 banks, with 16 registers per bank. These register groups are known as the

Counter/Timer2 LS-Byte Hold Register—TC16L(D)06H

Field	Bit Position	Description
T16_Data_LO	[7:0]	R/W Data

Counter/Timer8 High Hold Register—TC8H(D)05H

Field	Bit Position	Description
T8_Level_HI	[7:0]	R/W Data

Counter/Timer8 Low Hold Register—TC8L(D)04H

Field	Bit Position	Description
T8_Level_LO	[7:0]	R/W Data

CTR0 Counter/Timer8 Control Register—CTR0(D)00H

Table 12 lists and briefly describes the fields for this register.

Table 12. CTR0(D)00H Counter/Timer8 Control Register

Field	Bit Position		Value	Description
T8_Enable	7-----	R/W	0*	Counter Disabled
			1	Counter Enabled
			0	Stop Counter
			1	Enable Counter
Single/Modulo-N	-6-----	R/W	0	Modulo-N
			1	Single Pass
Time_Out	--5-----	R/W	0	No Counter Time-Out
			1	Counter Time-Out Occurred
			0	No Effect
			1	Reset Flag to 0
T8_Clock	---43---	R/W	0 0	SCLK
			0 1	SCLK/2
			1 0	SCLK/4
			1 1	SCLK/8
Capture_INT_Mask	----2--	R/W	0	Disable Data Capture Interrupt
			1	Enable Data Capture Interrupt

► **Note:** The letter *h* denotes hexadecimal values.

Transition from 0 to FF_h is not a timeout condition.



Caution: Using the same instructions for stopping the counter/timers and setting the status bits is not recommended.

Two successive commands are necessary. First, the counter/timers must be stopped. Second, the status bits must be reset. These commands are required because it takes one counter/timer clock interval for the initiated event to actually occur. See Figure 21 and Figure 22.

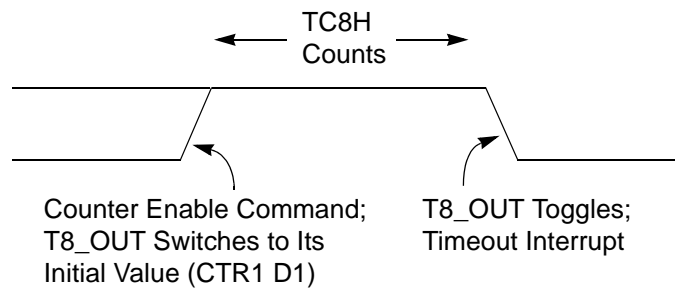


Figure 21. T8_OUT in Single-Pass Mode

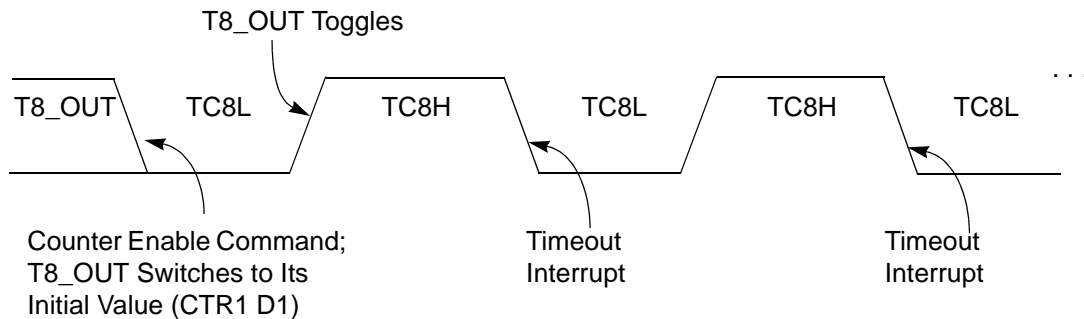


Figure 22. T8_OUT in Modulo-N Mode

T8 Demodulation Mode

The user must program TC8L and TC8H to FF_h. After T8 is enabled, when the first edge (rising, falling, or both depending on CTR1, D5; D4) is detected, it starts to count down. When a subsequent edge (rising, falling, or both depending on CTR1, D5; D4) is detected during counting, the current value of T8 is complemented and put into one of the capture registers. If it is a positive edge, data is put

into LO8; if it is a negative edge, data is put into HI8. From that point, one of the edge detect status bits (CTR1, D1; D0) is set, and an interrupt can be generated if enabled (CTR0, D2). Meanwhile, T8 is loaded with FFh and starts counting again. If T8 reaches 0, the timeout status bit (CTR0, D5) is set, and an interrupt can be generated if enabled (CTR0, D1). T8 then continues counting from FFh (see Figure 23 and Figure 24).

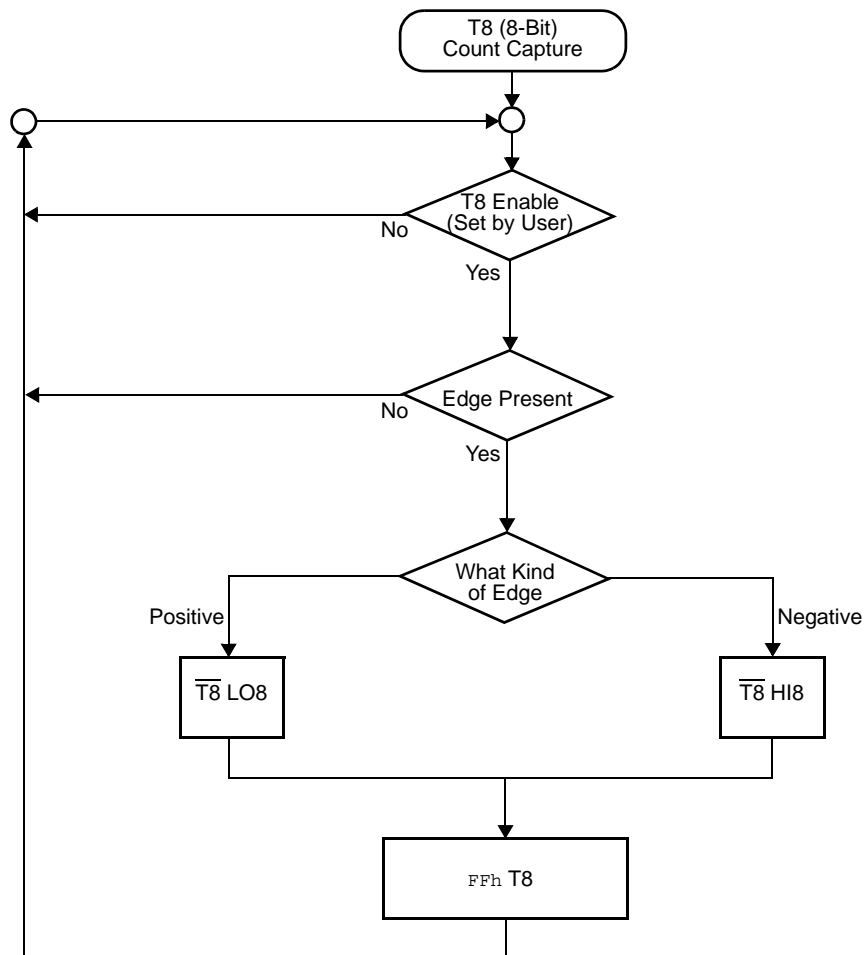


Figure 23. Demodulation Mode Count Capture Flowchart

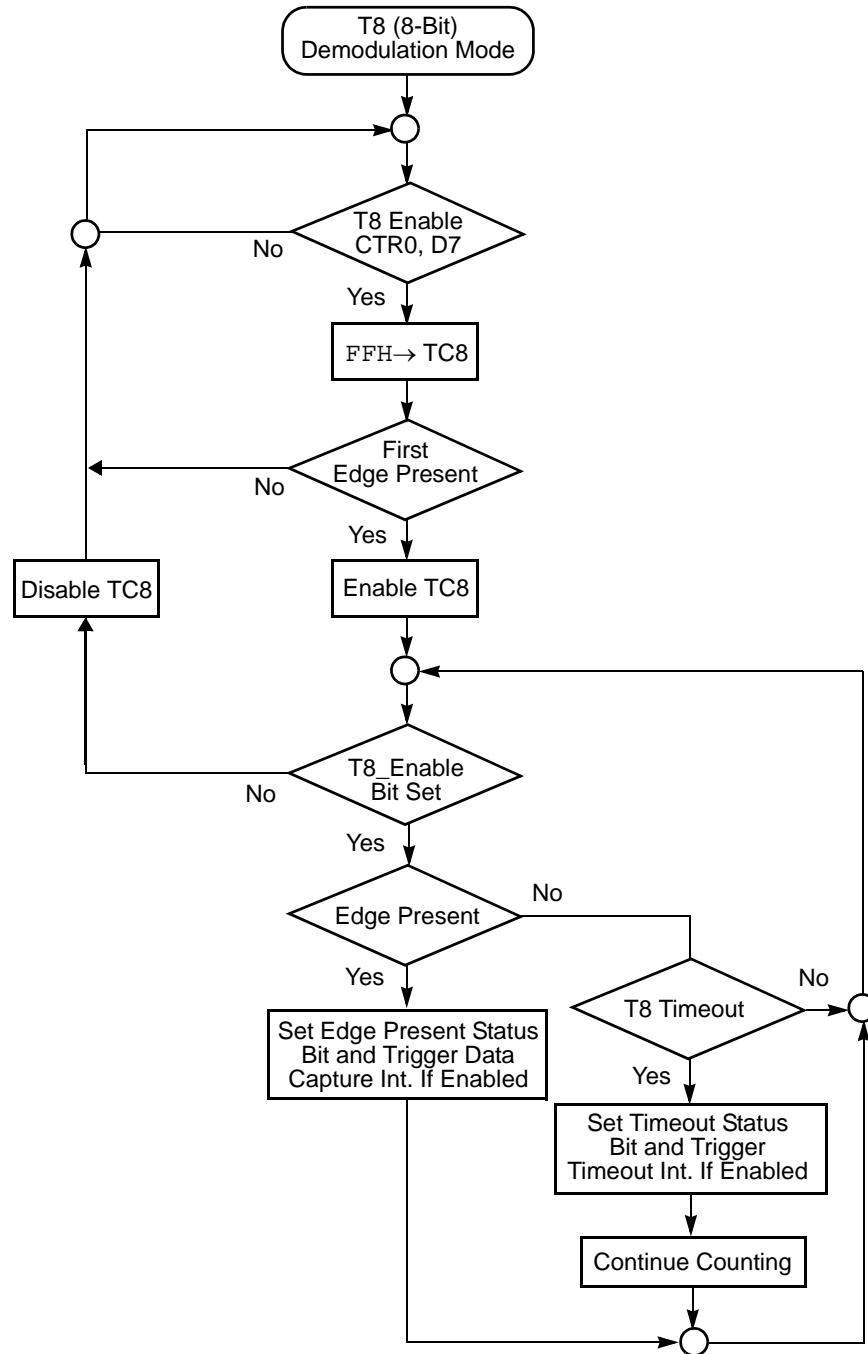


Figure 24. Demodulation Mode Flowchart



Caution:

Do not load these registers at the time the values are to be loaded into the counter/timer to ensure known operation. An initial count of 1 is not allowed. An initial count of 0 causes T16 to count from 0 to FFFFH to FFFE_H. Transition from 0 to FFFF_H is not a timeout condition.

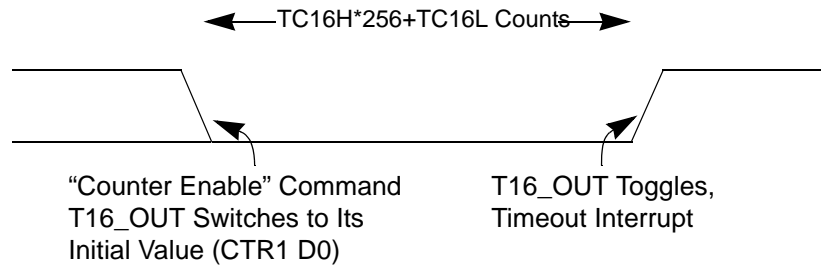


Figure 26. T16_OUT in Single-Pass Mode

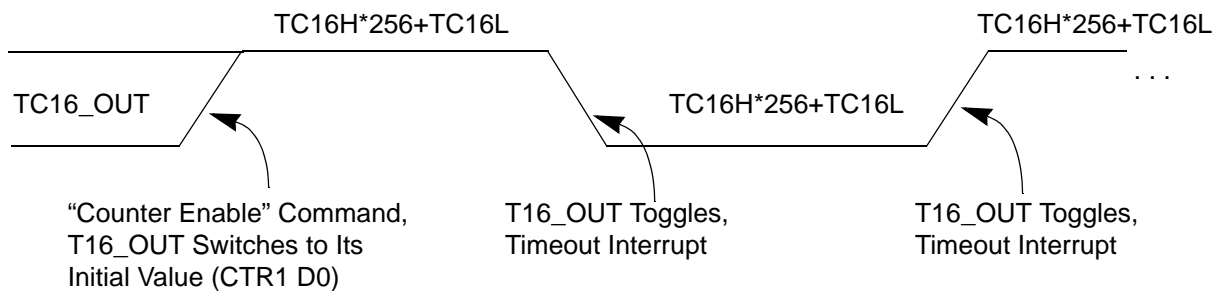


Figure 27. T16_OUT in Modulo-N Mode

T16 DEMODULATION Mode

The user must program TC16L and TC16H to FF_H. After T16 is enabled, and the first edge (rising, falling, or both depending on CTR1 D5; D4) is detected, T16 captures HI16 and LO16, reloads, and begins counting.

If D6 of CTR2 Is 0

When a subsequent edge (rising, falling, or both depending on CTR1, D5; D4) is detected during counting, the current count in T16 is complemented and put into HI16 and LO16. When data is captured, one of the edge detect status bits (CTR1, D1; D0) is set, and an interrupt is generated if enabled (CTR2, D2). T16 is loaded with FFFF_H and starts again.

This T16 mode is generally used to measure space time, the length of time between bursts of carrier signal (marks).

During PING-PONG Mode

The enable bits of T8 and T16 (CTR0, D7; CTR2, D7) are set and cleared alternately by hardware. The timeout bits (CTR0, D5; CTR2, D5) are set every time the counter/timers reach the terminal count.

Timer Output

The output logic for the timers is illustrated in Figure 29. P34 is used to output T8-OUT when D0 of CTR0 is set. P35 is used to output the value of T16-OUT when D0 of CTR2 is set. When D6 of CTR1 is set, P36 outputs the logic combination of T8-OUT and T16-OUT determined by D5 and D4 of CTR1.

Interrupts

The Z8 GP™ OTP MCU Family features six different interrupts (Table 16). The interrupts are maskable and prioritized (Figure 30). The six sources are divided as follows: three sources are claimed by Port 3 lines P33–P31, two by the counter/timers (Table 16) and one for low voltage detection. The Interrupt Mask Register (globally or individually) enables or disables the six interrupt requests.

The source for IRQ is determined by bit 1 of the Port 3 mode register (P3M). When in digital mode, Pin P33 is the source. When in analog mode the output of the Stop mode recovery source logic is used as the source for the interrupt. See Figure 35, Stop Mode Recovery Source, on page 57.

Clock

The device's on-chip oscillator has a high-gain, parallel-resonant amplifier, for connection to a crystal, ceramic resonator, or any suitable external clock source (XTAL1 = Input, XTAL2 = Output). The crystal must be AT cut, 1 MHz to 8 MHz maximum, with a series resistance (RS) less than or equal to 100 Ω . The on-chip oscillator can be driven with a suitable external clock source.

The crystal must be connected across XTAL1 and XTAL2 using the recommended capacitors (capacitance greater than or equal to 22 pF) from each pin to ground.

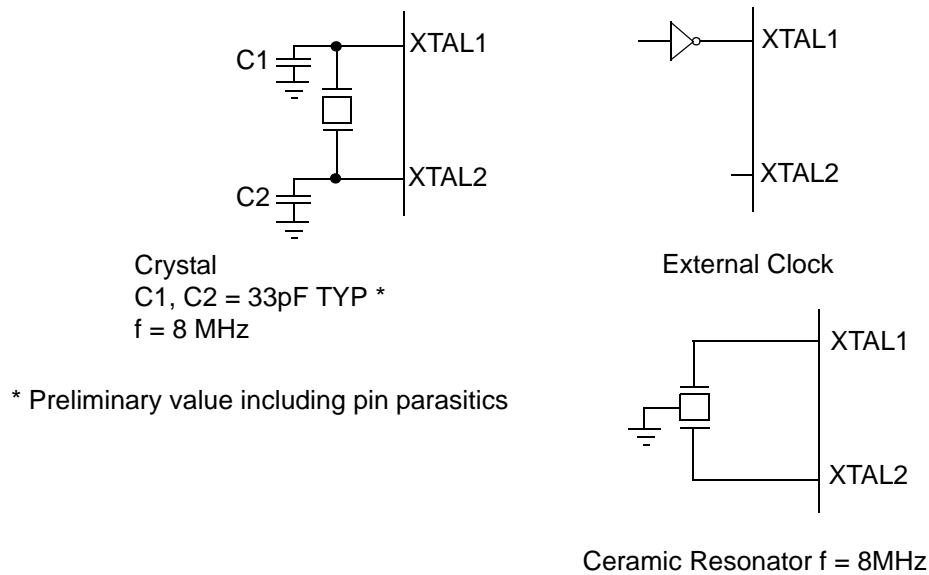


Figure 31. Oscillator Configuration

R249 IPR(F9H)

D7	D6	D5	D4	D3	D2	D1	D0
----	----	----	----	----	----	----	----

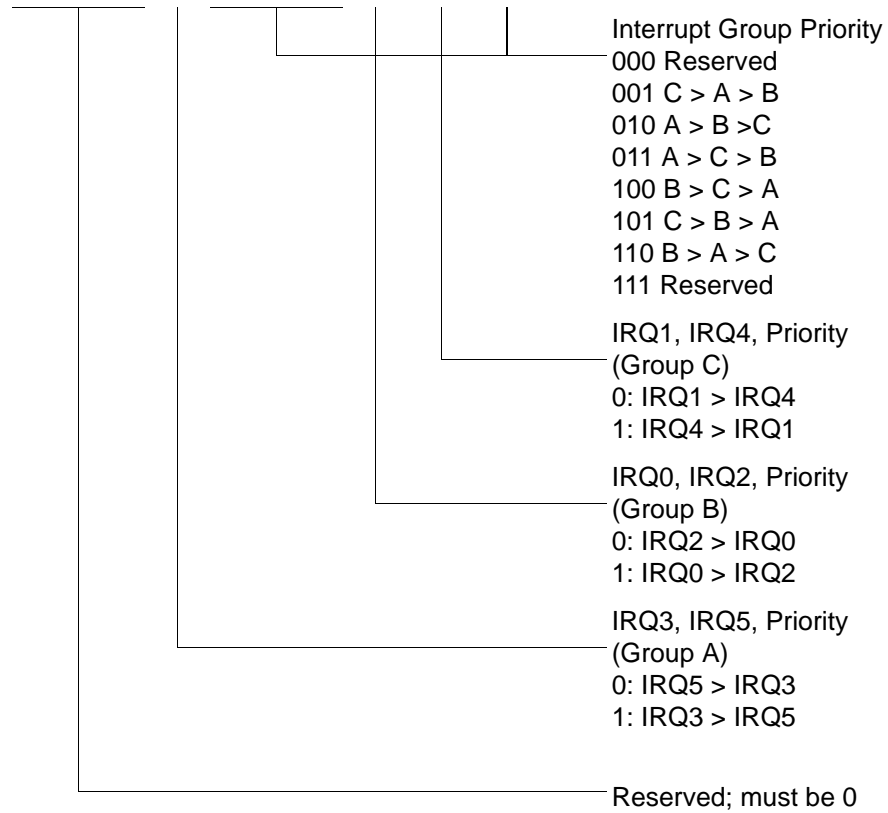


Figure 51. Interrupt Priority Register (F9H: Write Only)

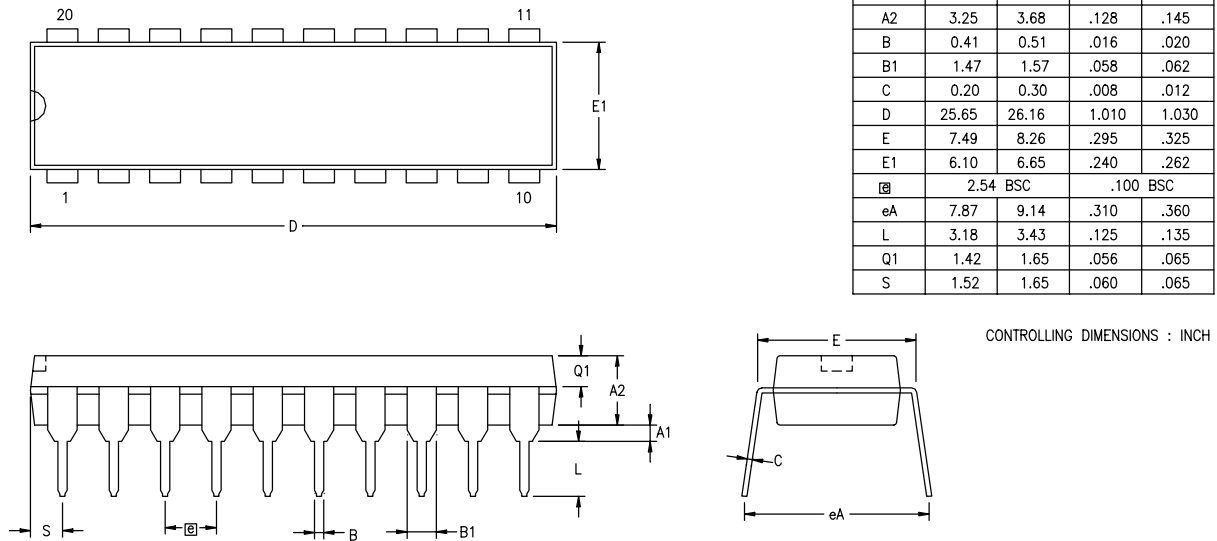


Figure 59. 20-Pin PDIP Package Diagram

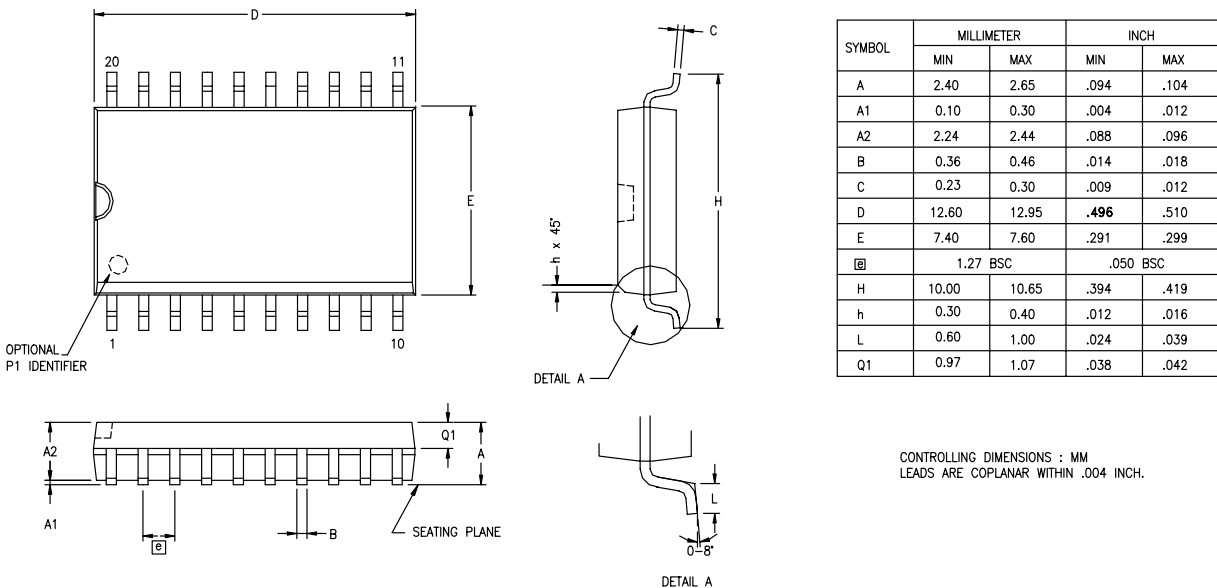


Figure 60. 20-Pin SOIC Package Diagram

Index

Numerics

- 16-bit counter/timer circuits 44
- 20-pin DIP package diagram 81
- 20-pin SSOP package diagram 82
- 28-pin DIP package diagram 85
- 28-pin SOIC package diagram 84
- 28-pin SSOP package diagram 86
- 40-pin DIP package diagram 87
- 48-pin SSOP package diagram 88
- 8-bit counter/timer circuits 40

A

- absolute maximum ratings 10
- AC
 - characteristics 14
 - timing diagram 14
- address spaces, basic 2
- architecture 2
 - expanded register file 26

B

- basic address spaces 2
- block diagram, ZLP32300 functional 3

C

- capacitance 11
- characteristics
 - AC 14
 - DC 11
- clock 51
- comparator inputs/outputs 23
- configuration
 - port 0 17
 - port 1 18
 - port 2 19
 - port 3 20
 - port 3 counter/timer 22

counter/timer

- 16-bit circuits 44
- 8-bit circuits 40
- brown-out voltage/standby 62
- clock 51
- demodulation mode count capture flow-chart 42
- demodulation mode flowchart 43
- EPROM selectable options 62
- glitch filter circuitry 38
- halt instruction 52
- input circuit 38
- interrupt block diagram 49
- interrupt types, sources and vectors 50
- oscillator configuration 51
- output circuit 47
- ping-pong mode 46
- port configuration register 53
- resets and WDT 61
- SCLK circuit 56
- stop instruction 52
- stop mode recovery register 55
- stop mode recovery register 2 59
- stop mode recovery source 57
- T16 demodulation mode 45
- T16 transmit mode 44
- T16_OUT in modulo-N mode 45
- T16_OUT in single-pass mode 45
- T8 demodulation mode 41
- T8 transmit mode 38
- T8_OUT in modulo-N mode 41
- T8_OUT in single-pass mode 41
- transmit mode flowchart 39
- voltage detection and flags 63
- watch-dog timer mode register 60
- watch-dog timer time select 61

CTR(D)01h T8 and T16 Common Functions 33

- T8 and T16 common control functions 65
- T8/T16 control 68
- TC16H(D)07h 30
- TC16L(D)06h 31
- TC8 control 64
- TC8H(D)05h 31
- TC8L(D)04h 31
- voltage detection 69
- watch-dog timer 73
- register description
 - Counter/Timer2 LS-Byte Hold 31
 - Counter/Timer2 MS-Byte Hold 30
 - Counter/Timer8 Control 31
 - Counter/Timer8 High Hold 31
 - Counter/Timer8 Low Hold 31
 - CTR2 Counter/Timer 16 Control 35
 - CTR3 T8/T16 Control 37
 - Stop Mode Recovery2 38
 - T16_Capture_LO 30
 - T8 and T16 Common functions 33
 - T8_Capture_HI 30
 - T8_Capture_LO 30
- register file 28
 - expanded 24
- register pointer 27
 - detail 29
- reset pin function 23
- resets and WDT 61

S

- SCLK circuit 56
- single-pass mode
 - T16_OUT 45
 - T8_OUT 41
- stack 29
- standard test conditions 10
- standby modes 1
- stop instruction, counter/timer 52
- stop mode recovery
 - 2 register 59
 - source 57
- stop mode recovery 2 59
- stop mode recovery register 55

T

- T16 transmit mode 44
- T16_Capture_HI 30
- T8 transmit mode 38
- T8_Capture_HI 30
- test conditions, standard 10
- test load diagram 10
- timing diagram, AC 14
- transmit mode flowchart 39

V

- VCC 5
- voltage
 - brown-out/standby 62
 - detection and flags 63
- voltage detection register 69

W

- watch-dog timer
 - mode registerwatch-dog timer mode register 60
 - time select 61

X

- XTAL1 5
- XTAL1 pin function 16
- XTAL2 5
- XTAL2 pin function 16