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Applications of "<u>Embedded - Microcontrollers</u>"

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 ~ 125°C (TA)
Mounting Type	Through Hole
Package / Case	28-DIP (0.600", 15.24mm)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/zgp323lap2832g

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong

Z8 GPTM OTP MCU Family Product Specification



Figure 35.	Stop Mode Recovery Source	57
Figure 36.	Stop Mode Recovery Register 2 ((0F)DH:D2-D4, D6 Write Only) .	59
Figure 37.	Watch-Dog Timer Mode Register (Write Only)	60
Figure 38.	Resets and WDT	61
Figure 39.	TC8 Control Register ((0D)O0H: Read/Write Except Where Noted)	64
Figure 40.	T8 and T16 Common Control Functions ((0D)01H: Read/Write)	65
Figure 41.	T16 Control Register ((0D) 2H: Read/Write Except Where Noted) .	67
Figure 42.	T8/T16 Control Register (0D)03H: Read/Write (Except Where Noted)	68
Figure 43.	Voltage Detection Register	69
Figure 44.	Port Configuration Register (PCON)(0F)00H: Write Only)	70
Figure 45.	Stop Mode Recovery Register ((0F)0BH: D6–D0=Write Only, D7=Read Only)	71
Figure 46.	Stop Mode Recovery Register 2 ((0F)0DH:D2–D4, D6 Write Only)	72
Figure 47.	Watch-Dog Timer Register ((0F) 0FH: Write Only)	73
Figure 48.	Port 2 Mode Register (F6H: Write Only)	73
Figure 49.	Port 3 Mode Register (F7H: Write Only)	74
Figure 50.	Port 0 and 1 Mode Register (F8H: Write Only)	75
Figure 51.	Interrupt Priority Register (F9H: Write Only)	76
Figure 52.	Interrupt Request Register (FAH: Read/Write)	77
Figure 53.	Interrupt Mask Register (FBH: Read/Write)	77
Figure 54.	Flag Register (FCH: Read/Write)	78
Figure 55.	Register Pointer (FDH: Read/Write)	78
Figure 56.	Stack Pointer High (FEH: Read/Write)	79
Figure 57.	Stack Pointer Low (FFH: Read/Write)	79
Figure 58.	20-Pin CDIP Package	80
Figure 59.	20-Pin PDIP Package Diagram	81
Figure 60.	20-Pin SOIC Package Diagram	81
Figure 61.	20-Pin SSOP Package Diagram	82
Figure 62.	28-Pin CDIP Package	83
Figure 63.	28-Pin SOIC Package Diagram	84
Figure 64.	28-Pin PDIP Package Diagram	85
Figure 65.	28-Pin SSOP Package Diagram	86
Figure 66.	40-Pin CDIP Package	87
Figure 67.	40-Pin PDIP Package Diagram	87
Figure 68.	48-Pin SSOP Package Design	88



List of Tables

Table 1.	Features	. 1
Table 2.	Power Connections	. 3
Table 3.	20-Pin PDIP/SOIC/SSOP/CDIP* Pin Identification	. 5
Table 4.	28-Pin PDIP/SOIC/SSOP/CDIP* Pin Identification	. 6
Table 5.	40- and 48-Pin Configuration	. 8
Table 6.	Absolute Maximum Ratings	10
Table 7.	Capacitance	11
Table 8.	DC Characteristics	11
Table 9.	EPROM/OTP Characteristics	13
Table 10.	AC Characteristics	15
Table 11.	Port 3 Pin Function Summary	21
Table 12.	CTR0(D)00H Counter/Timer8 Control Register	31
Table 13.	CTR1(0D)01H T8 and T16 Common Functions	33
Table 14.	CTR2(D)02H: Counter/Timer16 Control Register	36
Table 15.	CTR3 (D)03H: T8/T16 Control Register	37
Table 16.	Interrupt Types, Sources, and Vectors	50
Table 17.	IRQ Register	50
Table 18.	SMR2(F)0DH:Stop Mode Recovery Register 2*	56
Table 19.	Stop Mode Recovery Source	58
Table 20.	Watch-Dog Timer Time Select	61
Table 21	EPROM Selectable Ontions	62



- Port 1: 0–3 pull-up transistors
- Port 1: 4–7 pull-up transistors
- Port 2: 0–7 pull-up transistors
- EPROM Protection
- WDT enabled at POR
- **Note:** The mask option pull-up transistor has a *typical* equivalent resistance of 200 K Ω ±50% at V_{CC}=3 V and 450 K Ω ±50% at V_{CC}=2 V.

General Description

The Z8 GPTM OTP MCU Family is an OTP-based member of the MCU family of infrared microcontrollers. With 237B of general-purpose RAM and up to 32KB of OTP, ZiLOG[®]'s CMOS microcontrollers offer fast-executing, efficient use of memory, sophisticated interrupts, input/output bit manipulation capabilities, automated pulse generation/reception, and internal key-scan pull-up transistors.

The Z8 GPTM OTP MCU Family architecture (Figure 1) is based on ZiLOG's 8-bit microcontroller core with an Expanded Register File allowing access to register-mapped peripherals, input/output (I/O) circuits, and powerful counter/timer circuitry. The Z8[®] offers a flexible I/O scheme, an efficient register and address space structure, and a number of ancillary features that are useful in many consumer, automotive, computer peripheral, and battery-operated hand-held applications.

There are three basic address spaces available to support a wide range of configurations: Program Memory, Register File and Expanded Register File. The register file is composed of 256 Bytes (B) of RAM. It includes 4 I/O port registers, 16 control and status registers, and 236 general-purpose registers. The Expanded Register File consists of two additional register groups (F and D).

To unburden the program from coping with such real-time problems as generating complex waveforms or receiving and demodulating complex waveform/pulses, the Z8 GP OTP MCU offers a new intelligent counter/timer architecture with 8-bit and 16-bit counter/timers (see Figure 2). Also included are a large number of user-selectable modes and two on-board comparators to process analog signals with separate reference voltages.

Note: All signals with an overline, " ", are active Low. For example, B/W, in which WORD is active Low, and B/W, in which BYTE is active Low.

Power connections use the conventional descriptions listed in Table 2.



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.

In Demodulation Mode, when set to 0, T16 captures and reloads on detection of all the edges. When set to 1, T16 captures and detects on the first edge but ignores the subsequent edges. For details, see the description of T16 Demodulation Mode on page 45.

Time Out

This bit is set when T16 times out (terminal count reached). To reset the bit, write a 1 to this location.

T16 Clock

This bit defines the frequency of the input signal to Counter/Timer16.

Capture_INT_Mask

This bit is set to allow an interrupt when data is captured into LO16 and HI16.

Counter_INT_Mask

Set this bit to allow an interrupt when T16 times out.

P35_Out

This bit defines whether P35 is used as a normal output pin or T16 output.

CTR3 T8/T16 Control Register—CTR3(D)03H

Table 15 lists and briefly describes the fields for this register. This register allows the T_8 and T_{16} counters to be synchronized.

Table 15. CTR3 (D)03H: T8/T16 Control Register

Field	Bit Position		Value	Description
T ₁₆ Enable	7	R	0*	Counter Disabled
		R	1	Counter Enabled
		W	0	Stop Counter
		W	1	Enable Counter
T ₈ Enable	-6	R	0*	Counter Disabled
-		R	1	Counter Enabled
		W	0	Stop Counter
		W	1	Enable Counter
Sync Mode	5	R/W	0**	Disable Sync Mode
-			1	Enable Sync Mode

40

When T8 is enabled, the output T8_OUT switches to the initial value (CTR1, D1). If the initial value (CTR1, D1) is 0, TC8L is loaded; otherwise, TC8H is loaded into the counter. In SINGLE-PASS Mode (CTR0, D6), T8 counts down to 0 and stops, T8_OUT toggles, the timeout status bit (CTR0, D5) is set, and a timeout interrupt can be generated if it is enabled (CTR0, D1). In Modulo-N Mode, upon reaching terminal count, T8_OUT is toggled, but no interrupt is generated. From that point, T8 loads a new count (if the T8_OUT level now is 0), TC8L is loaded; if it is 1, TC8H is loaded. T8 counts down to 0, toggles T8_OUT, and sets the timeout status bit (CTR0, D5), thereby generating an interrupt if enabled (CTR0, D1). One cycle is thus completed. T8 then loads from TC8H or TC8L according to the T8_OUT level and repeats the cycle. See Figure 20.

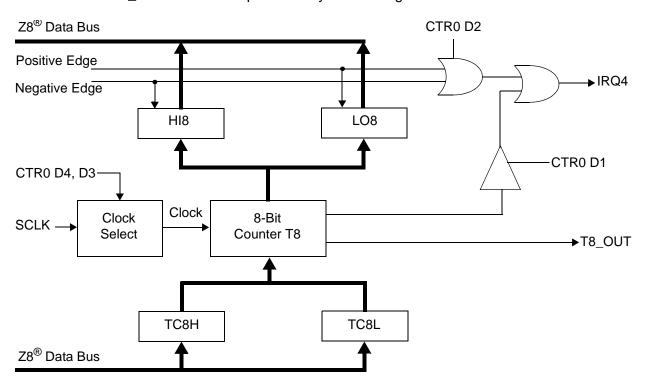


Figure 20. 8-Bit Counter/Timer Circuits

You can modify the values in TC8H or TC8L at any time. The new values take effect when they are loaded.

<u>^</u>

Caution:

To ensure known operation do not write these registers at the time the values are to be loaded into the counter/timer. *An initial count of 1 is not allowed (a non-function occurs).* An initial count of 0 causes TC8 to count from 0 to FFH to FEH.

T16 Transmit Mode

In NORMAL or PING-PONG mode, the output of T16 when not enabled, is dependent on CTR1, D0. If it is a 0, T16_OUT is a 1; if it is a 1, T16_OUT is 0. You can force the output of T16 to either a 0 or 1 whether it is enabled or not by programming CTR1 D3; D2 to a 10 or 11.

When T16 is enabled, TC16H * 256 + TC16L is loaded, and T16_OUT is switched to its initial value (CTR1, D0). When T16 counts down to 0, T16_OUT is toggled (in NORMAL or PING-PONG mode), an interrupt (CTR2, D1) is generated (if enabled), and a status bit (CTR2, D5) is set. See Figure 25.

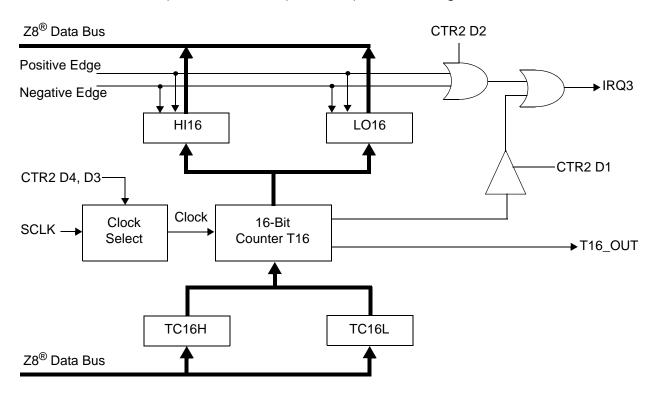


Figure 25. 16-Bit Counter/Timer Circuits

Note: Global interrupts override this function as described in "Interrupts" on page 48.

If T16 is in SINGLE-PASS mode, it is stopped at this point (see Figure 26). If it is in Modulo-N Mode, it is loaded with TC16H * 256 + TC16L, and the counting continues (see Figure 27).

You can modify the values in TC16H and TC16L at any time. The new values take effect when they are loaded.

Table 16. Interrupt Types, Sources, and Vectors

Name	Source	Vector Location	Comments
IRQ0	P32	0,1	External (P32), Rising, Falling Edge Triggered
IRQ1	P33	2,3	External (P33), Falling Edge Triggered
IRQ2	P31, T _{IN}	4,5	External (P31), Rising, Falling Edge Triggered
IRQ3	T16	6,7	Internal
IRQ4	T8	8,9	Internal
IRQ5	LVD	10,11	Internal

When more than one interrupt is pending, priorities are resolved by a programmable priority encoder controlled by the Interrupt Priority Register. An interrupt machine cycle activates when an interrupt request is granted. As a result, all subsequent interrupts are disabled, and the Program Counter and Status Flags are saved. The cycle then branches to the program memory vector location reserved for that interrupt. All Z8 GPTM OTP MCU Family interrupts are vectored through locations in the program memory. This memory location and the next byte contain the 16-bit address of the interrupt service routine for that particular interrupt request. To accommodate polled interrupt systems, interrupt inputs are masked, and the Interrupt Request register is polled to determine which of the interrupt requests require service.

An interrupt resulting from AN1 is mapped into IRQ2, and an interrupt from AN2 is mapped into IRQ0. Interrupts IRQ2 and IRQ0 can be rising, falling, or both edge triggered. These interrupts are programmable by the user. The software can poll to identify the state of the pin.

Programming bits for the Interrupt Edge Select are located in the IRQ Register (R250), bits D7 and D6. The configuration is indicated in Table 17.

Table 17. IRQ Register

I	RQ	Interr	Interrupt Edge		
D7	D6	IRQ2 (P31) IRQ0 (P32)			
0	0	F	F		
0	1	F	R		
1	0	R	F		
1	1	R/F	R/F		
Note	: F = Fa	ılling Edge; R = R	tising Edge		

PS023702-1004 Preliminary Functional Description

Table 19. Stop Mode Recovery Source

SMR:432 Operation		Operation	
D4	D3	D2	Description of Action
0	0	0	POR and/or external reset recovery
0	0	1	Reserved
0	1	0	P31 transition
0	1	1	P32 transition
1	0	0	P33 transition
1	0	1	P27 transition
1	1	0	Logical NOR of P20 through P23
1	1	1	Logical NOR of P20 through P27

Note: Any Port 2 bit defined as an output drives the corresponding input to the default state. For example, if the NOR of P23-P20 is selected as the recovery source and P20 is configured as an output, the remaining SMR pins (P23-P21) form the NOR equation. This condition allows the remaining inputs to control the AND/OR function. Refer to SMR2 register on page 59 for other recover sources.

Stop Mode Recovery Delay Select (D5)

This bit, if Low, disables the T_{POR} delay after Stop Mode Recovery. The default configuration of this bit is 1. If the "fast" wake up is selected, the Stop Mode Recovery source must be kept active for at least 5 TpC.

Note: It is recommended that this bit be set to 1 if using a crystal or resonator clock source. The T_{POR} delay allows the clock source to stabilize before executing instructions.

Stop Mode Recovery Edge Select (D6)

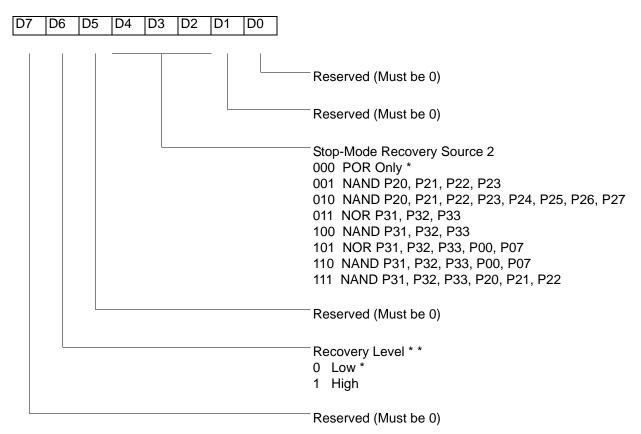
A 1 in this bit position indicates that a High level on any one of the recovery sources wakes the device from Stop Mode. A 0 indicates Low level recovery. The default is 0 on POR.

Cold or Warm Start (D7)

This bit is read only. It is set to 1 when the device is recovered from Stop Mode. The bit is set to 0 when the device reset is other than Stop Mode Recovery (SMR).

Stop Mode Recovery Register 2 (SMR2)

This register determines the mode of Stop Mode Recovery for SMR2 (Figure 36). SMR2(0F)DH



Note: If used in conjunction with SMR, either of the two specified events causes a Stop-Mode Recovery.

Figure 36. Stop Mode Recovery Register 2 ((0F)DH:D2-D4, D6 Write Only)

If SMR2 is used in conjunction with SMR, either of the specified events causes a Stop Mode Recovery.

Note: Port pins configured as outputs are ignored as an SMR or SMR2 recovery source. For example, if the NAND or P23–P20 is selected as the recovery source and P20 is configured as an output, the remaining SMR pins (P23–P21) form the NAND equation.

^{*} Default setting after reset

^{* *} At the XOR gate input



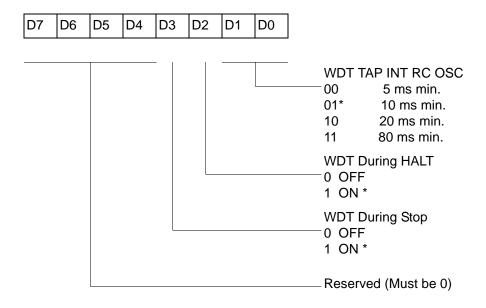
60

Watch-Dog Timer Mode Register (WDTMR)

The Watch-Dog Timer (WDT) is a retriggerable one-shot timer that resets the Z8[®] CPU if it reaches its terminal count. The WDT must initially be enabled by executing the WDT instruction. On subsequent executions of the WDT instruction, the WDT is refreshed. The WDT circuit is driven by an on-board RC-oscillator. The WDT instruction affects the Zero (Z), Sign (S), and Overflow (V) flags.

The POR clock source the internal RC-oscillator. Bits 0 and 1 of the WDT register control a tap circuit that determines the minimum timeout period. Bit 2 determines whether the WDT is active during HALT, and Bit 3 determines WDT activity during Stop. Bits 4 through 7 are reserved (Figure 37). This register is accessible only during the first 60 processor cycles (120 XTAL clocks) from the execution of the first instruction after Power-On-Reset, Watch-Dog Reset, or a Stop-Mode Recovery (Figure 36). After this point, the register cannot be modified by any means (intentional or otherwise). The WDTMR cannot be read. The register is located in Bank F of the Expanded Register Group at address location <code>0Fh</code>. It is organized as shown in Figure 37.

WDTMR(0F)0Fh



^{*} Default setting after reset

Figure 37. Watch-Dog Timer Mode Register (Write Only)

WDT Time Select (D0, D1)

This bit selects the WDT time period. It is configured as indicated in Table 20.

CTR1(0D)01H D7 D6 D5 D3 D1 D0 D4 D2 Transmit Mode* R/W 0 T16_OUT is 0 initially* 1 T16_OUT is 1 initially **Demodulation Mode** R 0 No Falling Edge Detection R 1 Falling Edge Detection W 0 No Effect W 1 Reset Flag to 0 Transmit Mode* R/W 0 T8_OUT is 0 initially* 1 T8_OUT is 1 initially **Demodulation Mode** R 0 No Rising Edge Detection R 1 Rising Edge Detection W 0 No Effect W 1 Reset Flag to 0 Transmit Mode* 0 0 Normal Operation* 0 1 Ping-Pong Mode 1 0 T16_OUT = 0 1 1 T16_OUT = 1 **Demodulation Mode** 0 0 No Filter 0 1 4 SCLK Cycle Filter 1 0 8 SCLK Cycle Filter 1 1 Reserved Transmit Mode/T8/T16 Logic 0 0 AND** 0 1 OR 1 0 NOR 1 1 NAND **Demodulation Mode** 0 0 Falling Edge Detection 0 1 Rising Edge Detection 1 0 Both Edge Detection 1 1 Reserved Transmit Mode 0 P36 as Port Output * 1 P36 as T8/T16_OUT **Demodulation Mode** 0 P31 as Demodulator Input 1 P20 as Demodulator Input Transmit/Demodulation Mode 0 Transmit Mode * * Default setting after reset **Default setting after reset. Not reset with Stop Mode 1 Demodulation Mode

Figure 40. T8 and T16 Common Control Functions ((0D)01H: Read/Write)

recovery

Notes: Take care in differentiating the Transmit Mode from Demodulation Mode. Depending on which of these two modes is operating, the CTR1 bit has different functions.

> Changing from one mode to another cannot be performed without disabling the counter/timers.

CTR2(0D)02H

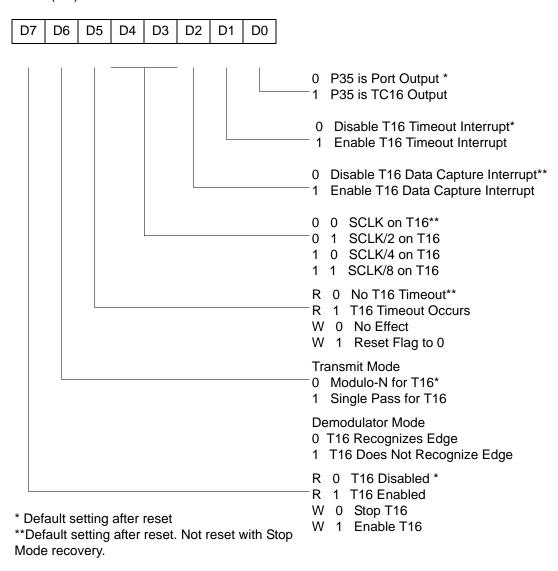
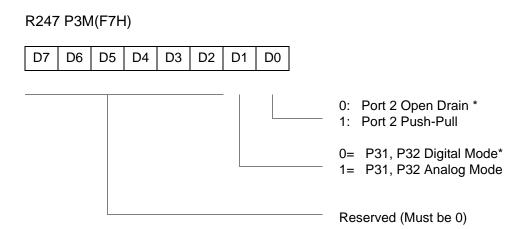


Figure 41. T16 Control Register ((0D) 2H: Read/Write Except Where Noted)



^{*} Default setting after reset. Not reset with Stop Mode recovery.

Figure 49. Port 3 Mode Register (F7H: Write Only)



R249 IPR(F9H)

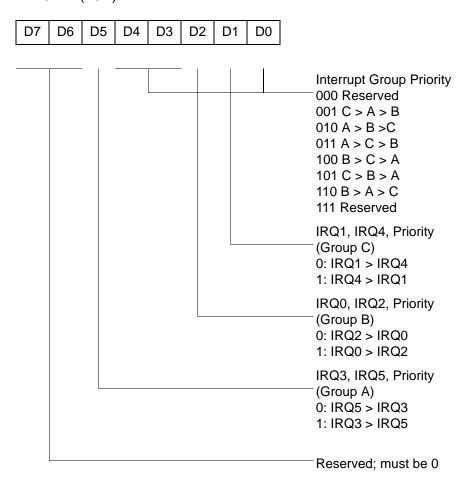


Figure 51. Interrupt Priority Register (F9H: Write Only)

R252 Flags(FCH)

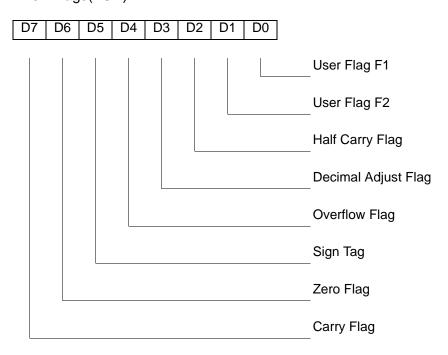
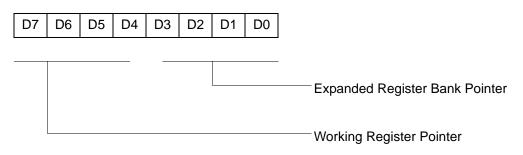


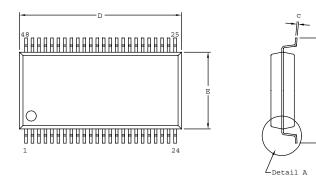
Figure 54. Flag Register (FCH: Read/Write)

R253 RP(FDH)



Default setting after reset = 0000 0000

Figure 55. Register Pointer (FDH: Read/Write)



SYMBOL	MILLIMETER		INCH	
SIMBOL	MIN	MAX	MIN	MAX
A	2.41	2.79	0.095	0.110
A1	0.23	0.38	0.009	0.015
A2	2.18	2.39	0.086	0.094
ь	0.20	0.34	0.008	0.0135
С	0.13	0.25	0.005	0.010
D	15.75	16.00	0.620	0.630
E	7.39	7.59	0.291	0.299
e	0.635 BSC		0.0	25 BSC
Н	10.16	10.41	0.400	0.410
L	0.51	1.016	0.020	0.040

CONTROLLING DIMENSIONS : MM LEADS ARE COPLANAR WITHIN .004 INCH

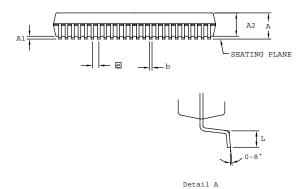


Figure 68. 48-Pin SSOP Package Design

Note: Check with ZiLOG on the actual bonding diagram and coordinate for chip-on-board assembly.



91

8KB Standard Temperature: 0° to +70°C					
Part Number	Description	Part Number	Description		
ZGP323LSH4808C	48-pin SSOP 8K OTP	ZGP323LSS2808C	28-pin SOIC 8K OTP		
ZGP323LSP4008C	40-pin PDIP 8K OTP	ZGP323LSH2008C	20-pin SSOP 8K OTP		
ZGP323LSH2808C	28-pin SSOP 8K OTP	ZGP323LSP2008C	20-pin PDIP 8K OTP		
ZGP323LSP2808C	28-pin PDIP 8K OTP	ZGP323LSS2008C	20-pin SOIC 8K OTP		

8KB Extended Temperature: -40° to +105°C					
Part Number	Description	Part Number	Description		
ZGP323LEH4808C	48-pin SSOP 8K OTP	ZGP323LES2808C	28-pin SOIC 8K OTP		
ZGP323LEP4008C	40-pin PDIP 8K OTP	ZGP323LEH2008C	20-pin SSOP 8K OTP		
ZGP323LEH2808C	28-pin SSOP 8K OTP	ZGP323LEP2008C	20-pin PDIP 8K OTP		
ZGP323LEP2808C	28-pin PDIP 8K OTP	ZGP323LES2008C	20-pin SOIC 8K OTP		

8KB Automotive Temperature: -40° to +125°C				
Part Number	Description	Part Number	Description	
ZGP323LAH4808C	48-pin SSOP 8K OTP	ZGP323LAS2808C	28-pin SOIC 8K OTP	
ZGP323LAP4008C	40-pin PDIP 8K OTP	ZGP323LAH2008C	20-pin SSOP 8K OTP	
ZGP323LAH2808C	28-pin SSOP 8K OTP	ZGP323LAP2008C	20-pin PDIP 8K OTP	
ZGP323LAP2808C	28-pin PDIP 8K OTP	ZGP323LAS2008C	20-pin SOIC 8K OTP	

Note: Replace C with G for Lead-Free Packaging



D	functional description
DC characteristics 11	counter/timer functional blocks 38
demodulation mode	CTR(D)01h register 33
count capture flowchart 42	CTR0(D)00h register 31
flowchart 43	CTR2(D)02h register 35
T16 45	CTR3(D)03h register 37
T8 41	expanded register file 24
description	expanded register file architecture 26
functional 23	HI16(D)09h register 30
general 2	HI8(D)0Bh register 30
pin 4	L08(D)0Ah register 30
'	L0I6(D)08h register 30
	program memory map 24
E	RAM 23
EPROM	register description 63
selectable options 62	register file 28
expanded register file 24	register pointer 27
expanded register file architecture 26	register pointer detail 29
expanded register file control registers 69	SMR2(F)0D1h register 38
flag 78	stack 29
interrupt mask register 77	TC16H(D)07h register 30
interrupt priority register 76	TC16L(D)06h register 31
interrupt request register 77	TC8H(D)05h register 31
port 0 and 1 mode register 75	TC8L(D)04h register 31
port 2 configuration register 73	
port 3 mode register 74	C
port configuration register 73	G
register pointer 78	glitch filter circuitry 38
stack pointer high register 79	
stack pointer low register 79	
stop-mode recovery register 71	Н
stop-mode recovery register 2 72	halt instruction, counter/timer 52
T16 control register 67	
T8 and T16 common control functions reg-	
ister 65	
T8/T16 control register 68	input circuit 38
TC8 control register 64	interrupt block diagram, counter/timer 49
watch-dog timer register 73	interrupt types, sources and vectors 50
F	ı
features	low-voltage detection register 63
standby modes 1	iow-voilage detection register to
cta.raby inicaco i	