Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

"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	32
Program Memory Size	16KB (16K 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	40-DIP (0.620", 15.75mm)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/zgp323lap4016g

Table of Contents

AC Characteristics

Figure 8 and Table 10 describe the Alternating Current (AC) characteristics.
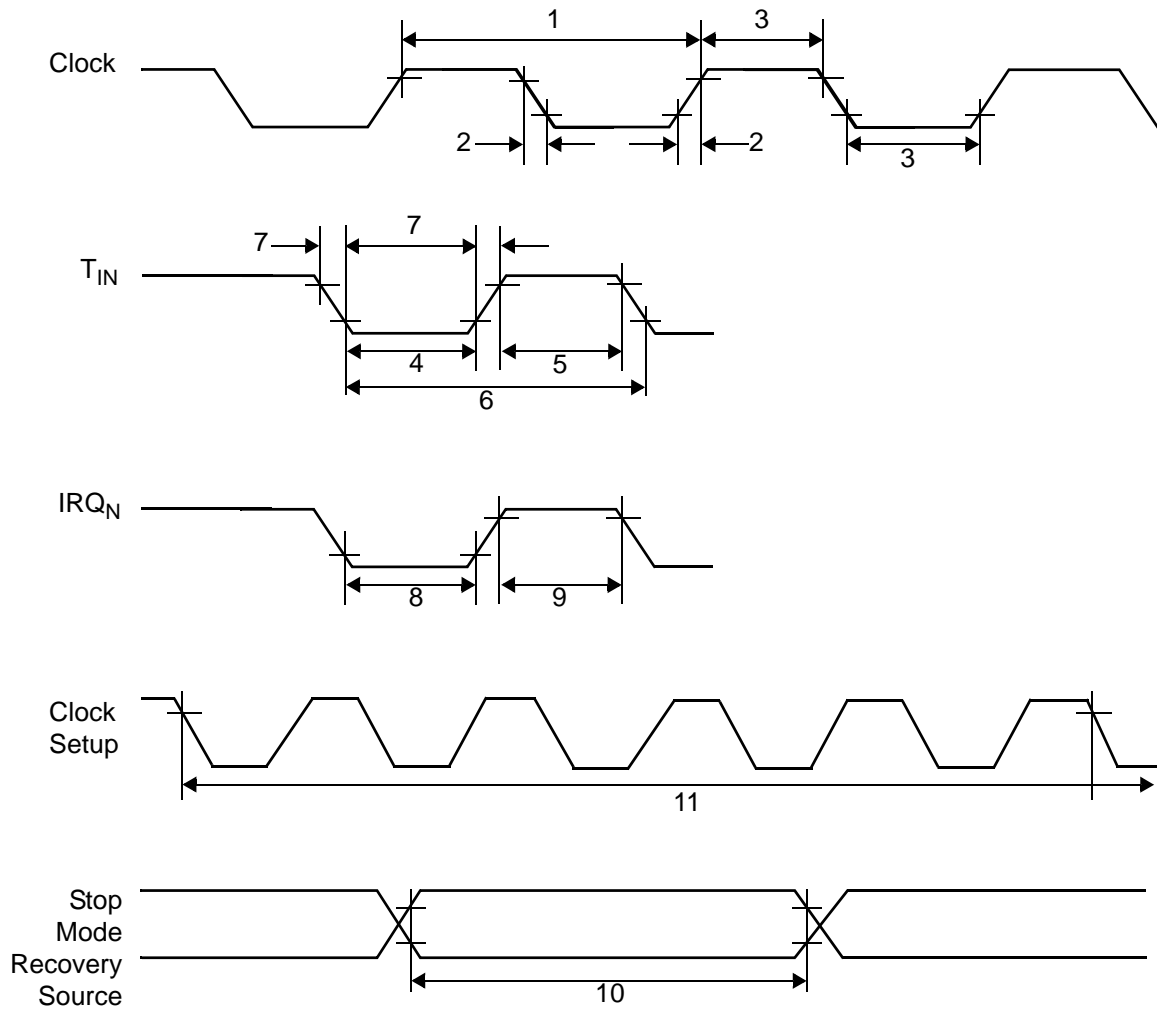
Figure 8.   AC Timing Diagram
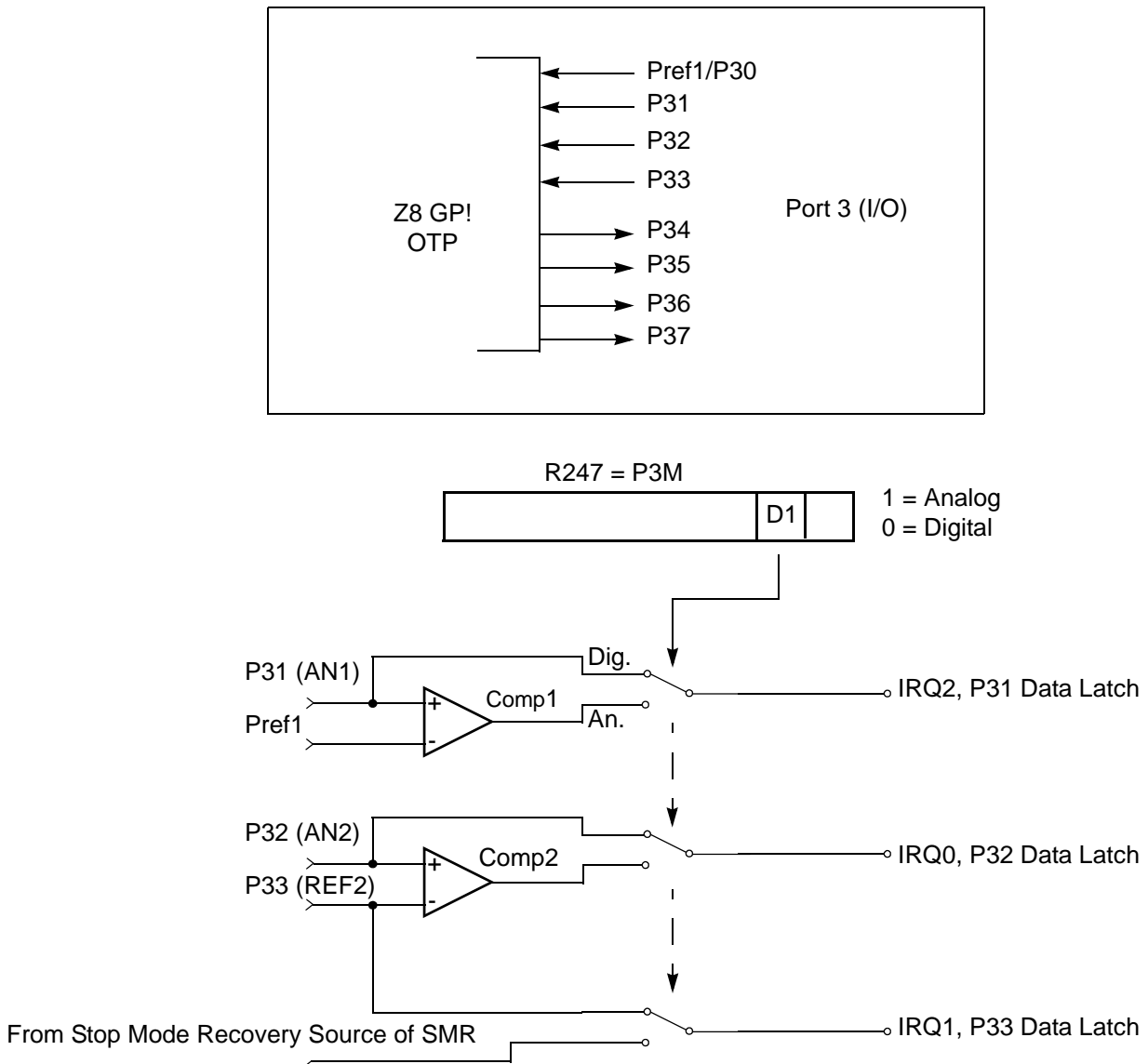
Figure 12. Port 3 Configuration

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—

ERF (Expanded Register File). Bits 7–4 of register RP select the working register group. Bits 3–0 of register RP select the expanded register file bank.

▶ **Note:** An expanded register bank is also referred to as an expanded register group (see Figure 15).

The upper nibble of the register pointer (see Figure 16) selects which working register group, of 16 bytes in the register file, is accessed out of the possible 256. The lower nibble selects the expanded register file bank and, in the case of the Z8 GP family, banks 0, F, and D are implemented. A 0H in the lower nibble allows the normal register file (bank 0) to be addressed. Any other value from 1H to FH exchanges the lower 16 registers to an expanded register bank.

R253 RP

D7	D6	D5	D4	D3	D2	D1	D0

Expanded Register
File Pointer

Working Register
Pointer

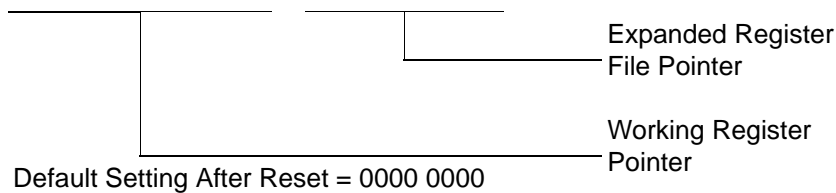Default Setting After Reset = 0000 0000

Figure 16. Register Pointer

Example: Z8 GP: (See Figure 15 on page 26)

R253 RP = 00h
R0 = Port 0
R1 = Port 1
R2 = Port 2
R3 = Port 3

But if:

R253 RP = 0Dh
R0 = CTRL0
R1 = CTRL1
R2 = CTRL2
R3 = Reserved

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

Field	Bit Position		Value	Description
Counter_INT_Mask	------1-	R/W	0	Disable Time-Out Interrupt
			1	Enable Time-Out Interrupt
P34_Out	-------0	R/W	0*	P34 as Port Output
			1	T8 Output on P34

Note:
*Indicates the value upon Power-On Reset.

T8 Enable

This field enables T8 when set (written) to 1.

Single/Modulo-N

When set to 0 (Modulo-N), the counter reloads the initial value when the terminal count is reached. When set to 1 (single-pass), the counter stops when the terminal count is reached.

Timeout

This bit is set when T8 times out (terminal count reached). To reset this bit, write a 1 to its location.

⚠ **Caution:**   Writing a 1 is the only way to reset the Terminal Count status condition. Reset this bit before using/enabling the counter/timers.

The first clock of T8 might not have complete clock width and can occur any time when enabled.

▶ **Note:**   Take care when using the OR or AND commands to manipulate CTR0, bit 5 and CTR1, bits 0 and 1 (Demodulation Mode). These instructions use a Read-Modify-Write sequence in which the current status from the CTR0 and CTR1 registers is ORed or ANDed with the designated value and then written back into the registers.

T8 Clock

This bit defines the frequency of the input signal to T8.

Capture_INT_Mask

Set this bit to allow an interrupt when data is captured into either LO8 or HI8 upon a positive or negative edge detection in demodulation mode.

Counter_INT_Mask

Set this bit to allow an interrupt when T8 has a timeout.

P34_Out

This bit defines whether P34 is used as a normal output pin or the T8 output.

T8 and T16 Common Functions—CTR1(0D)01H

This register controls the functions in common with the T8 and T16.

Table 13 lists and briefly describes the fields for this register.

Table 13. CTR1(0D)01H T8 and T16 Common Functions

Field	Bit Position		Value	Description
Mode	7 - - - - - - -	R/W	0*	Transmit Mode
				Demodulation Mode
P36_Out/	- 6 - - - - - -	R/W		Transmit Mode
Demodulator_Input			0*	Port Output
			1	T8/T16 Output
				Demodulation Mode
			0	P31
			1	P20
T8/T16_Logic/	- - 5 4 - - - -	R/W		Transmit Mode
Edge _Detect			00**	AND
			01	OR
			10	NOR
			11	NAND
				Demodulation Mode
			00**	Falling Edge
			01	Rising Edge
			10	Both Edges
			11	Reserved

Table 14. CTR2(D)02H: Counter/Timer16 Control Register

Field	Bit Position		Value	Description
T16_Enable	7-------	R	0*	Counter Disabled
			1	Counter Enabled
		W	0	Stop Counter
			1	Enable Counter
Single/Modulo-N	-6------	R/W		Transmit Mode
			0*	Modulo-N
			1	Single Pass
				Demodulation Mode
			0	T16 Recognizes Edge
			1	T16 Does Not Recognize Edge
Time_Out	--5-----	R	0*	No Counter Timeout
			1	Counter Timeout Occurred
		W	0	No Effect
			1	Reset Flag to 0
T16 _Clock	---43---	R/W	00**	SCLK
			01	SCLK/2
			10	SCLK/4
			11	SCLK/8
Capture_INT_Mask	-----2--	R/W	0**	Disable Data Capture Int.
			1	Enable Data Capture Int.
Counter_INT_Mask	------1-	R/W	0	Disable Timeout Int.
			1	Enable Timeout Int.
P35_Out	-------0	R/W	0*	P35 as Port Output
			1	T16 Output on P35

Note:
*Indicates the value upon Power-On Reset.
**Indicates the value upon Power-On Reset. Not reset with Stop Mode recovery.

T16_Enable

This field enables T16 when set to 1.

Single/Modulo-N

In TRANSMIT Mode, when set to 0, the counter reloads the initial value when it reaches the terminal count. When set to 1, the counter stops when the terminal count is reached.

▶ **Note:** The letter `h` denotes hexadecimal values.

Transition from 0 to `FFh` 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.
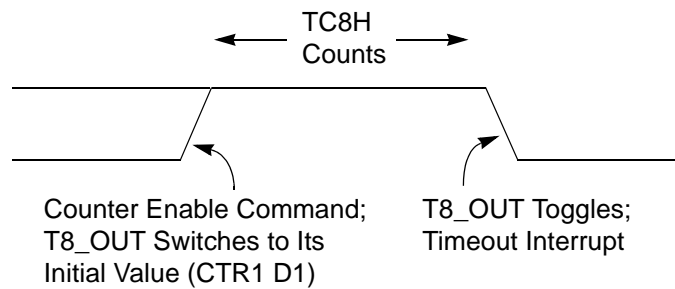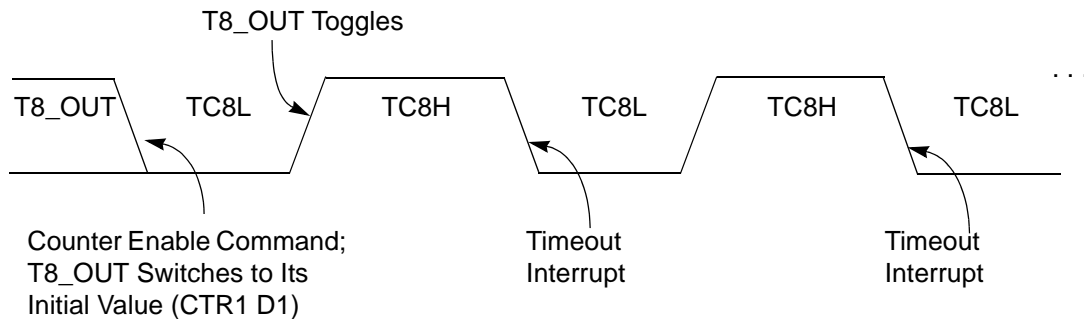

Figure 21. T8_OUT in Single-Pass Mode

Figure 22. T8_OUT in Modulo-N Mode

T8 Demodulation Mode

The user must program TC8L and TC8H to `FFH`. 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
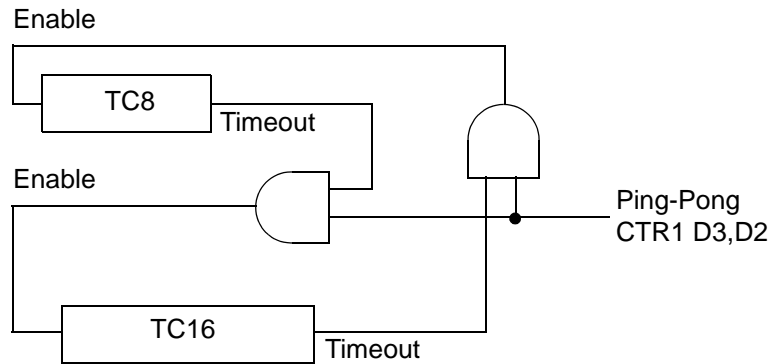
Figure 28. Ping-Pong Mode Diagram

Initiating PING-PONG Mode

First, make sure both counter/timers are not running. Set T8 into Single-Pass mode (CTR0, D6), set T16 into SINGLE-PASS mode (CTR2, D6), and set the Ping-Pong mode (CTR1, D2; D3). These instructions can be in random order. Finally, start PING-PONG mode by enabling either T8 (CTR0, D7) or T16 (CTR2, D7). See Figure 29.
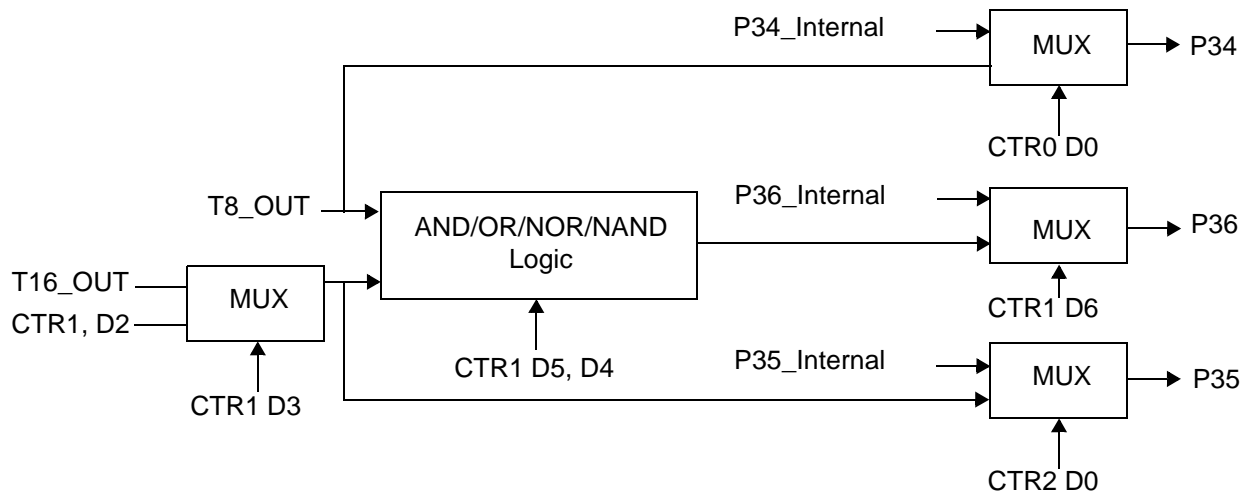

Figure 29. Output Circuit

The initial value of T8 or T16 must not be 1. Stopping the timer and restarting the timer reloads the initial value to avoid an unknown previous value.
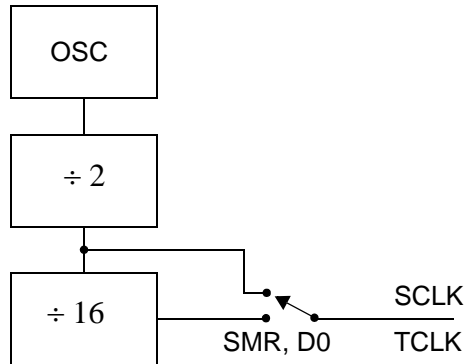
Figure 34. SCLK Circuit

Stop-Mode Recovery Source (D2, D3, and D4)

These three bits of the SMR specify the wake-up source of the Stop recovery (Figure 35 and Table 19).

Stop-Mode Recovery Register 2—SMR2(F)0DH

Table 18 lists and briefly describes the fields for this register.

Table 18. SMR2(F)0DH:Stop Mode Recovery Register 2*

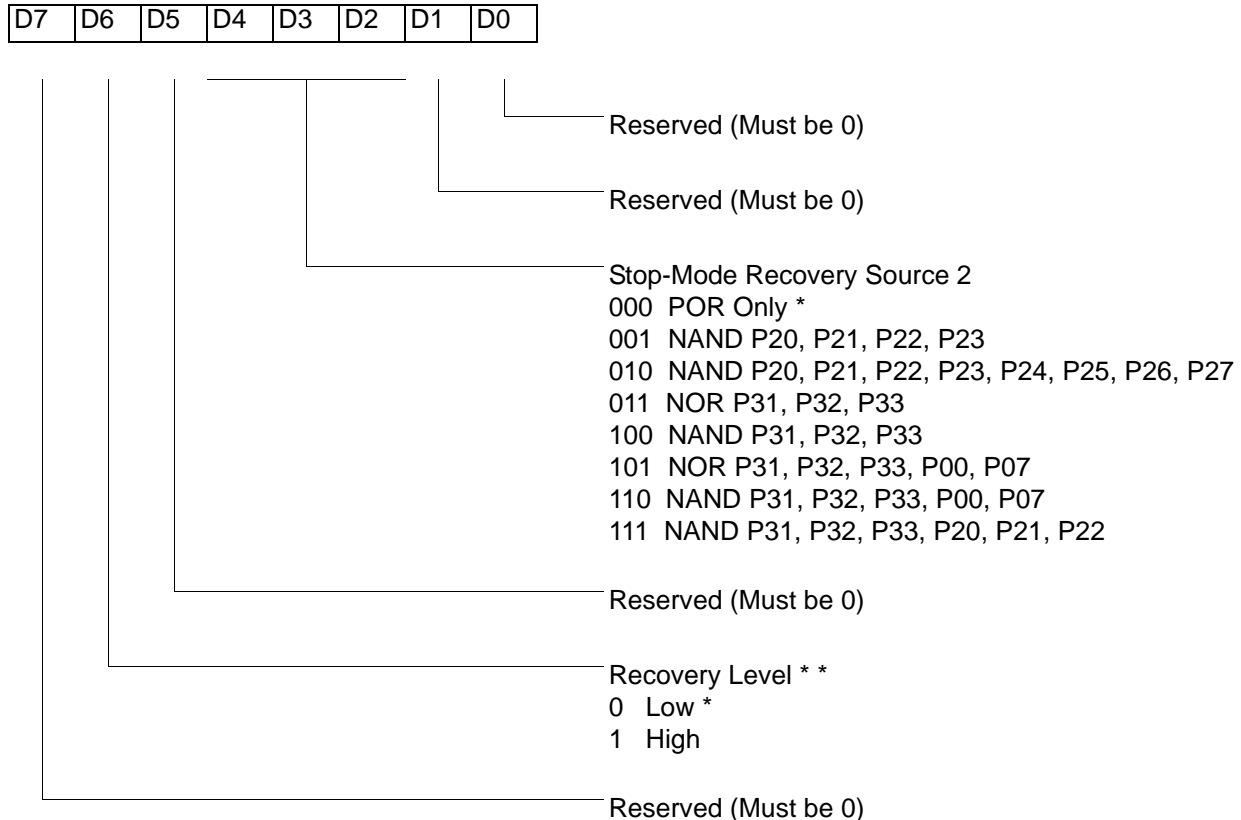| Field	Bit Position		Value	Description
Reserved	`7-------`		0	Reserved (Must be 0)
Recovery Level	`-6------`	W	0† 1	Low High
Reserved	`--5-----`		0	Reserved (Must be 0)
Source	`---432--`	W	000† 001 010 011 100 101 110 111	A. POR Only B. NAND of P23–P20 C. NAND of P27–P20 D. NOR of P33–P31 E. NAND of P33–P31 F. NOR of P33–P31, P00, P07 G. NAND of P33–P31, P00, P07 H. NAND of P33–P31, P22–P20
Reserved	`------10`		00	Reserved (Must be 0)

Notes:
* Port pins configured as outputs are ignored as a SMR recovery source.
† Indicates the value upon Power-On Reset

Stop Mode Recovery Register 2 (SMR2)

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

SMR2(0F)DH

D7	D6	D5	D4	D3	D2	D1	D0

Reserved (Must be 0)

Reserved (Must be 0)

Stop-Mode Recovery Source 2
000 POR Only *
001 NAND P20, P21, P22, P23
010 NAND P20, P21, P22, P23, P24, P25, P26, P27
011 NOR P31, P32, P33
100 NAND P31, P32, P33
101 NOR P31, P32, P33, P00, P07
110 NAND P31, P32, P33, P00, P07
111 NAND P31, P32, P33, P20, P21, P22

Reserved (Must be 0)

Recovery Level * *
0 Low *
1 High

Reserved (Must be 0)

Note: If used in conjunction with SMR, either of the two specified events causes a Stop-Mode Recovery.
* Default setting after reset
* * At the XOR gate input

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

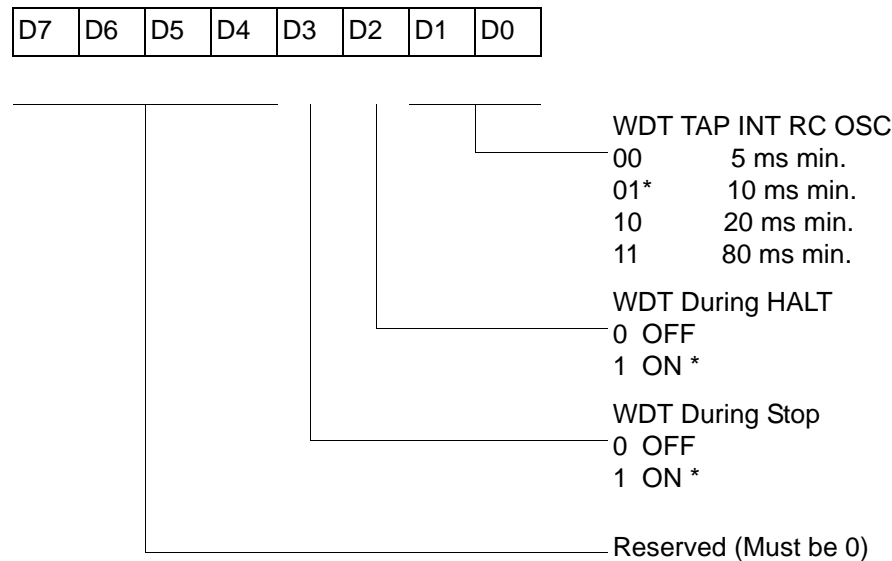If SMR2 is used in conjunction with SMR, either of the specified events causes a Stop Mode Recovery.

▶ **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.

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 `0Fh`. It is organized as shown in Figure 37.

WDTMR(0F)0Fh

D7	D6	D5	D4	D3	D2	D1	D0

WDT TAP INT RC OSC
00   5 ms min.
01*   10 ms min.
10   20 ms min.
11   80 ms min.

WDT During HALT
0 OFF
1 ON *

WDT During Stop
0 OFF
1 ON *

Reserved (Must be 0)

 * 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

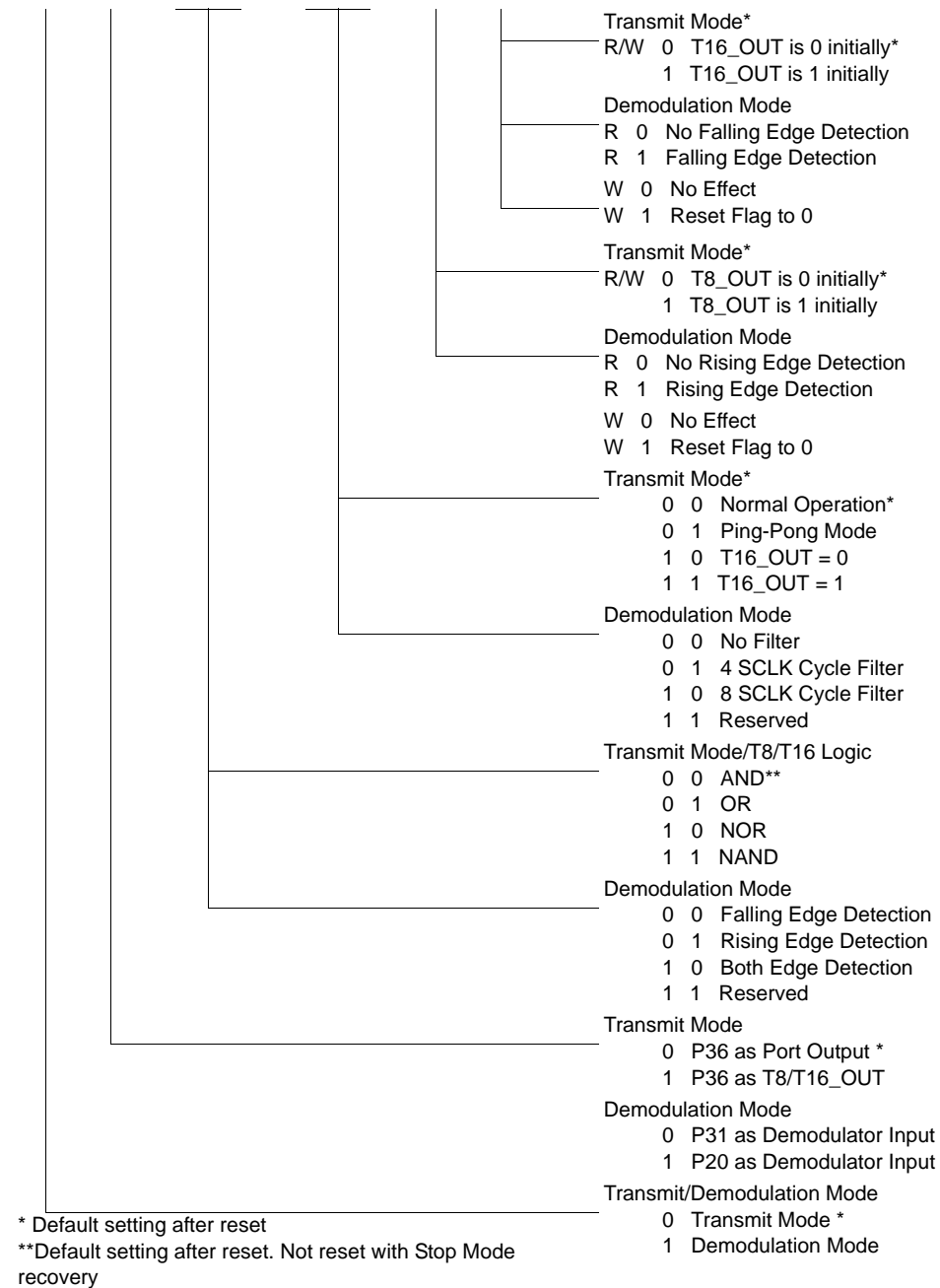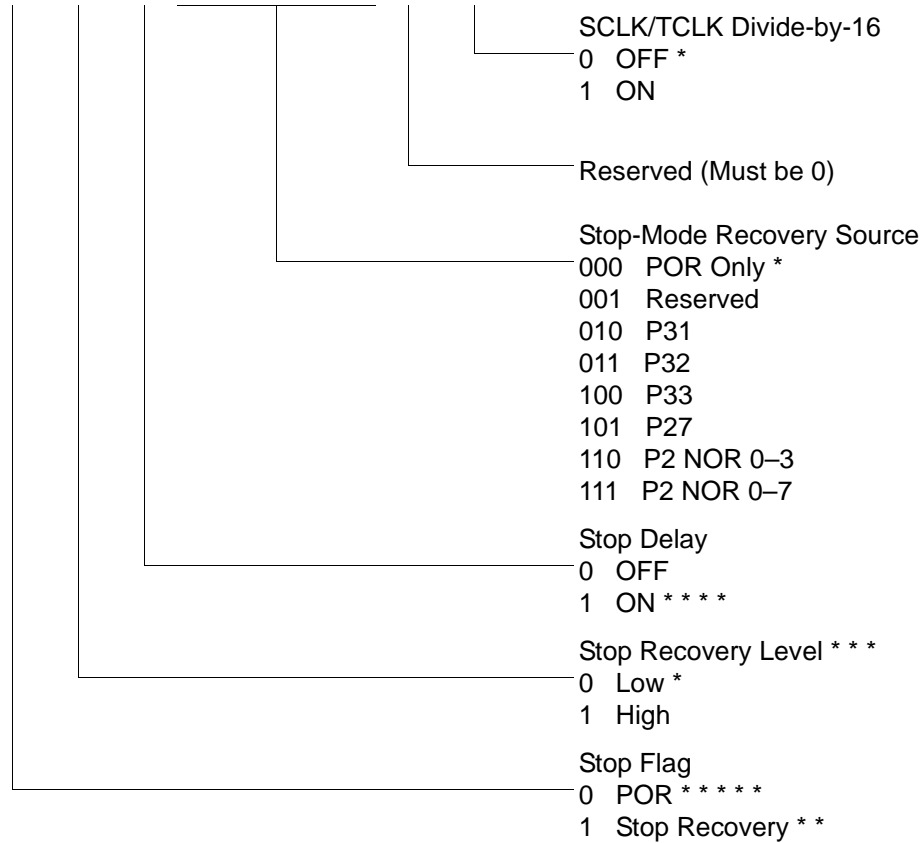| D7	D6	D5	D4	D3	D2	D1	D0

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 *
1   Demodulation Mode

* Default setting after reset
**Default setting after reset. Not reset with Stop Mode
recovery

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

SMR(0F)0BH

D7	D6	D5	D4	D3	D2	D1	D0

SCLK/TCLK Divide-by-16
0   OFF *
1   ON

Reserved (Must be 0)

Stop-Mode Recovery Source
000   POR Only *
001   Reserved
010   P31
011   P32
100   P33
101   P27
110   P2 NOR 0–3
111   P2 NOR 0–7

Stop Delay
0   OFF
1   ON * * * *

Stop Recovery Level * * *
0   Low *
1   High

Stop Flag
0   POR * * * * *
1   Stop Recovery * *

* Default setting after Reset
* * Set after STOP Mode Recovery
* * * At the XOR gate input
* * * * Default setting after Reset. Must be 1 if using a crystal or resonator clock source.
* * * * * Default setting after Power On Reset. Not Reset with a Stop Mode recovery.

Figure 45. Stop Mode Recovery Register ((0F)0BH: D6–D0=Write Only, D7=Read Only)

SYMBOL	OPT #	MILLIMETER		INCH	
		MIN	MAX	MIN	MAX
A1		0.38	1.02	.015	.040
A2		3.18	4.19	.125	.165
B		0.38	0.53	.015	.021
B1	01	1.40	1.65	.055	.065
	02	1.14	1.40	.045	.055
C		0.23	0.38	.009	.015
D	01	36.58	37.34	1.440	1.470
	02	35.31	35.94	1.390	1.415
E		15.24	15.75	.600	.620
E1	01	13.59	14.10	.535	.555
	02	12.83	13.08	.505	.515
e		2.54 TYP		.100 BSC	
eA		15.49	16.76	.610	.660
L		3.05	3.81	.120	.150
Q1	01	1.40	1.91	.055	.075
	02	1.40	1.78	.055	.070
S	01	1.52	2.29	.060	.090
	02	1.02	1.52	.040	.060

CONTROLLING DIMENSIONS : INCH

OPTION TABLE	
OPTION #	PACKAGE
01	STANDARD
02	IDF

Note: ZILOG supplies both options for production. Component layout
      PCB design should cover bigger option 01.

Figure 64. 28-Pin PDIP Package Diagram

4KB Standard Temperature: 0° to +70°C

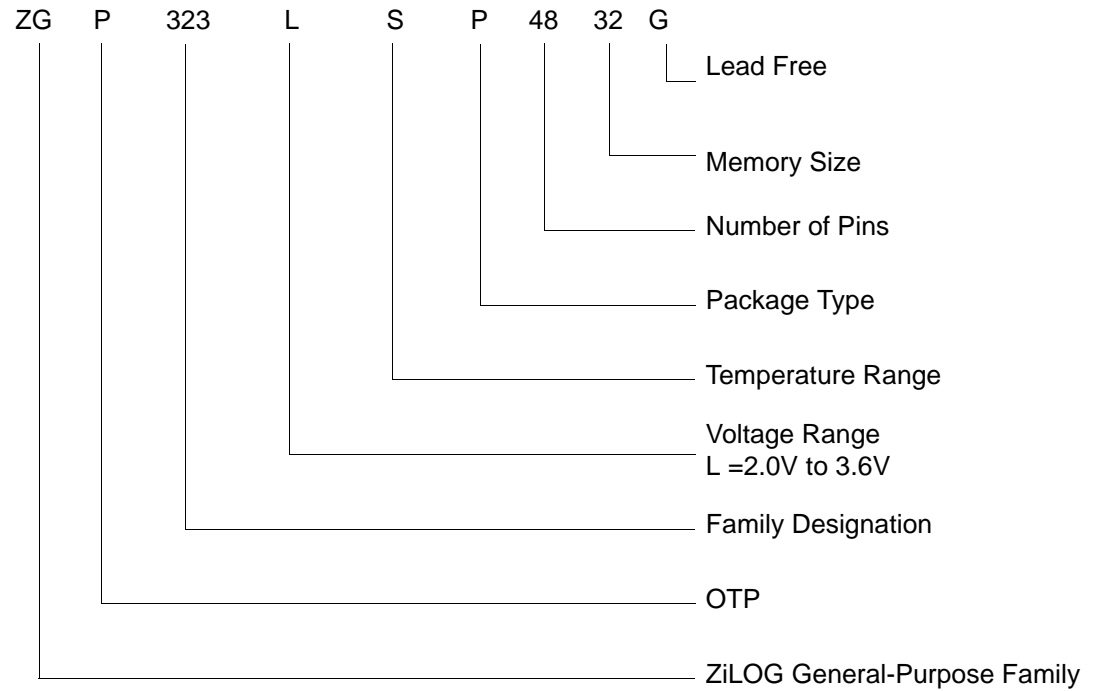| Part Number	Description	Part Number	Description
ZGP323LSH4804C	48-pin SSOP 4K OTP	ZGP323LSS2804C	28-pin SOIC 4K OTP
ZGP323LSP4004C	40-pin PDIP 4K OTP	ZGP323LSH2004C	20-pin SSOP 4K OTP
ZGP323LSH2804C	28-pin SSOP 4K OTP	ZGP323LSP2004C	20-pin PDIP 4K OTP
ZGP323LSP2804C	28-pin PDIP 4K OTP	ZGP323LSS2004C	20-pin SOIC 4K OTP

4KB Extended Temperature: -40° to +105°C

Part Number	Description	Part Number	Description
ZGP323LEH4804C	48-pin SSOP 4K OTP	ZGP323LES2804C	28-pin SOIC 4K OTP
ZGP323LEP4004C	40-pin PDIP 4K OTP	ZGP323LEH2004C	20-pin SSOP 4K OTP
ZGP323LEH2804C	28-pin SSOP 4K OTP	ZGP323LEP2004C	20-pin PDIP 4K OTP
ZGP323LEP2804C	28-pin PDIP 4K OTP	ZGP323LES2004C	20-pin SOIC 4K OTP

4KB Automotive Temperature: -40° to +125°C

Part Number	Description	Part Number	Description
ZGP323LAH4804C	48-pin SSOP 4K OTP	ZGP323LAS2804C	28-pin SOIC 4K OTP
ZGP323LAP4004C	40-pin PDIP 4K OTP	ZGP323LAH2004C	20-pin SSOP 4K OTP
ZGP323LAH2804C	28-pin SSOP 4K OTP	ZGP323LAP2004C	20-pin PDIP 4K OTP
ZGP323LAP2804C	28-pin PDIP 4K OTP	ZGP323LAS2004C	20-pin SOIC 4K OTP

Note: Replace C with G for Lead-Free Packaging

Additional Components

Part Number	Description	Part Number	Description
ZGP323ICE01ZEM	Emulator/programmer	ZGP32300100ZPR	Programming System

Example

```
ZG   P   323   L   S   P   48   32   G
```
─ Lead Free

─ Memory Size

─ Number of Pins

─ Package Type

─ Temperature Range

─ Voltage Range
L =2.0V to 3.6V

─ Family Designation

─ OTP

─ ZiLOG General-Purpose Family

Precharacterization Product

The product represented by this document is newly introduced and ZiLOG has not completed the full characterization of the product. The document states what ZiLOG knows about this product at this time, but additional features or nonconformance with some aspects of the document might be found, either by ZiLOG or its customers in the course of further application and characterization work. In addition, ZiLOG cautions that delivery might be uncertain at times, due to start-up yield issues.

ZiLOG, Inc.

532 Race Street

San Jose, CA 95126-3432

Telephone: (408) 558-8500

FAX: 408 558-8300

Internet: http://www.ZiLOG.com

Index

Numerics

A

B

C