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	24
Program Memory Size	4KB (4K 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-SOIC (0.295", 7.50mm Width)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/zgp323les2804g

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Figure 13. Port 3 Counter/Timer Output Configuration
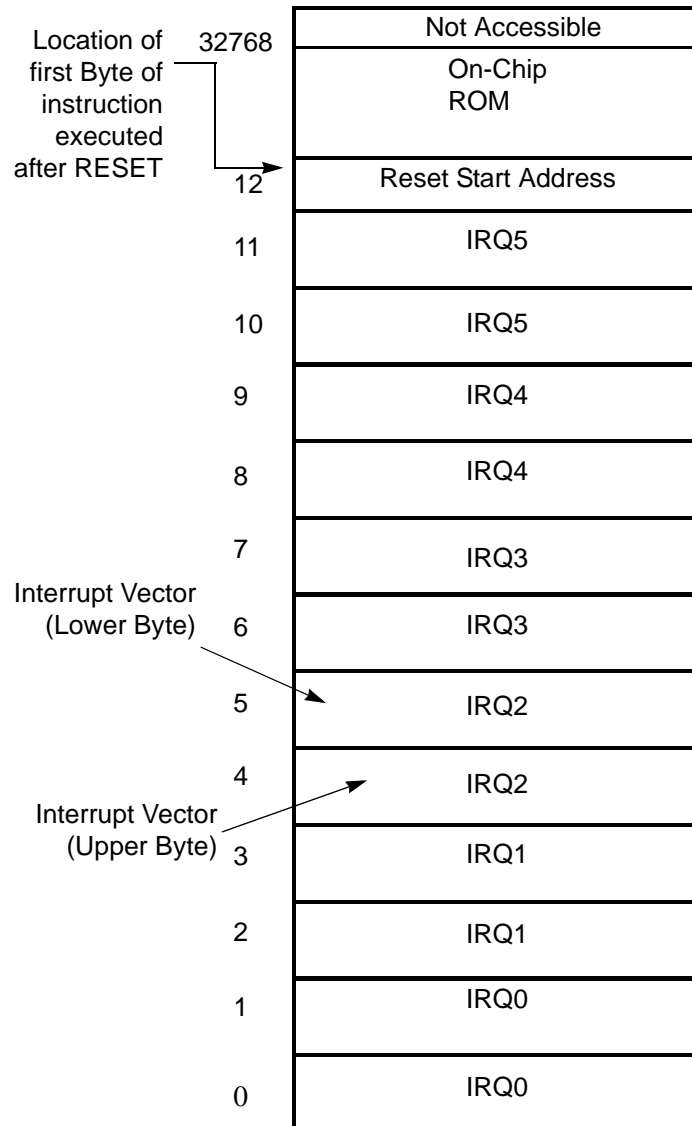
Figure 14. Program Memory Map (32K OTP)

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

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
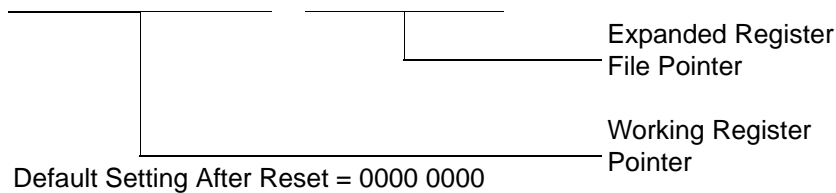
Figure 16. Register Pointer

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

Field	Bit Position		Value	Description
Transmit_Submode/ Glitch_Filter	----32--	R/W		Transmit Mode
			00*	Normal Operation
			01	Ping-Pong Mode
			10	T16_Out = 0
			11	T16_Out = 1
				Demodulation Mode
			00*	No Filter
			01	4 SCLK Cycle
			10	8 SCLK Cycle
			11	Reserved
Initial_T8_Out/ Rising Edge	------1-			Transmit Mode
		R/W	0*	T8_OUT is 0 Initially
			1	T8_OUT is 1 Initially
				Demodulation Mode
		R	0*	No Rising Edge
			1	Rising Edge Detected
		W	0	No Effect
			1	Reset Flag to 0
Initial_T16_Out/ Falling_Edge	-------0			Transmit Mode
		R/W	0*	T16_OUT is 0 Initially
			1	T16_OUT is 1 Initially
				Demodulation Mode
		R	0*	No Falling Edge
			1	Falling Edge Detected
		W	0	No Effect
			1	Reset Flag to 0

Note:
*Default at Power-On Reset.
**Default at Power-On Reset.Not reset with Stop Mode recovery.

Mode

If the result is 0, the counter/timers are in TRANSMIT mode; otherwise, they are in DEMODULATION mode.

P36_Out/Demodulator_Input

In TRANSMIT Mode, this bit defines whether P36 is used as a normal output pin or the combined output of T8 and T16.

In DEMODULATION Mode, this bit defines whether the input signal to the Counter/Timers is from P20 or P31.

If the input signal is from Port 31, a capture event may also generate an IRQ2 interrupt. To prevent generating an IRQ2, either disable the IRQ2 interrupt by clearing its IMR bit D2 or use P20 as the input.

▶ **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.
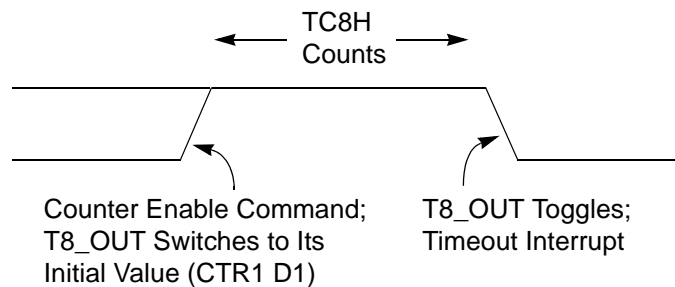
Figure 21. T8_OUT in Single-Pass Mode
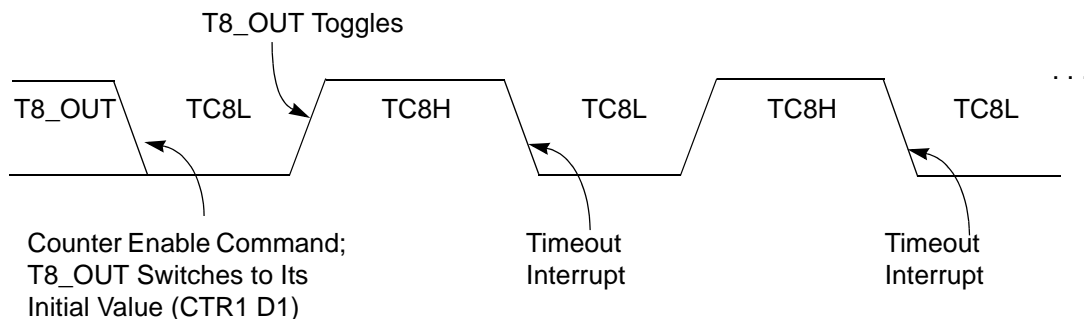
Figure 22. T8_OUT in Modulo-N Mode

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 comple-mented and put into one of the capture registers. If it is a positive edge, data is put
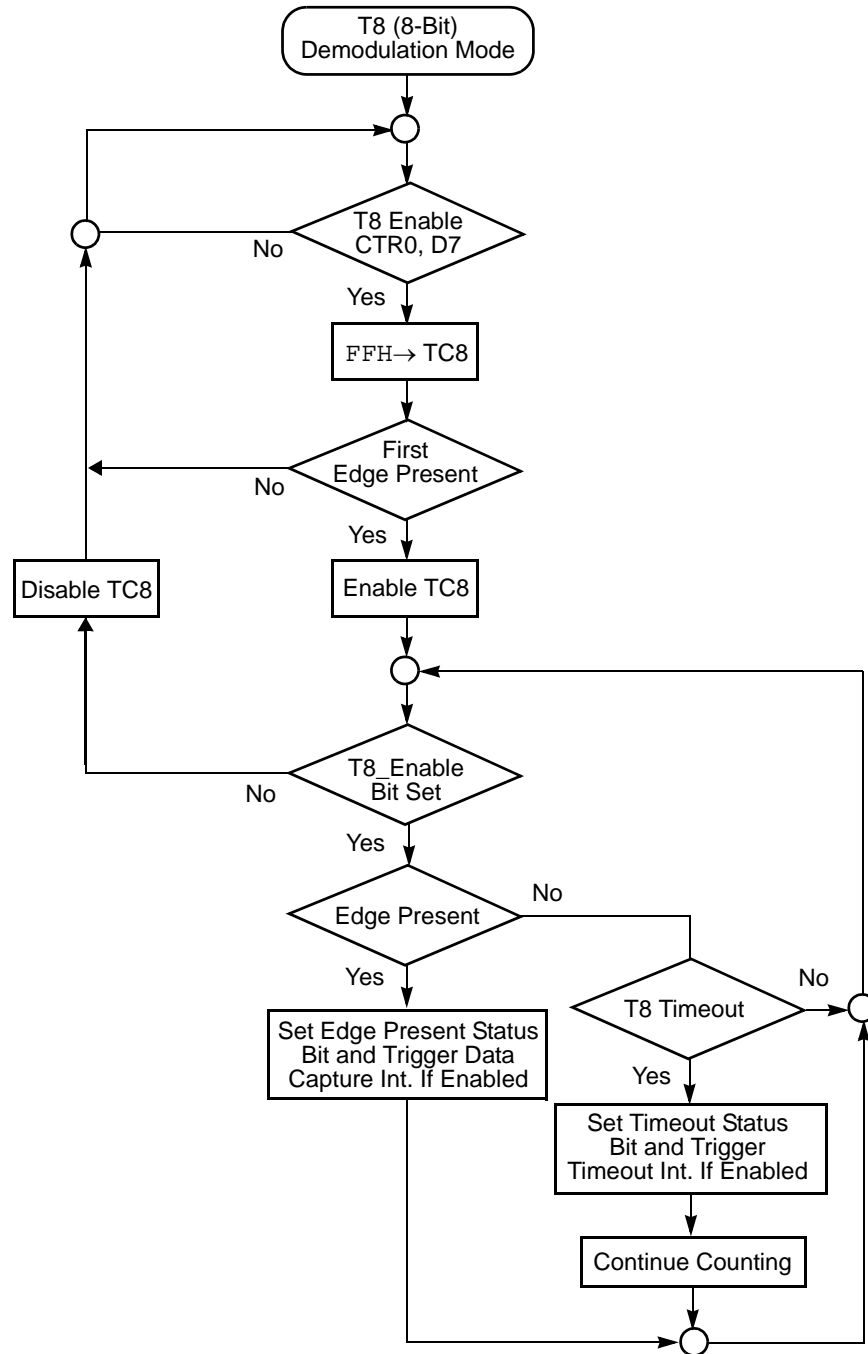
Figure 24. Demodulation Mode Flowchart

⚠️ **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 FFFEH. Transition from 0 to FFFFH is not a timeout condition.
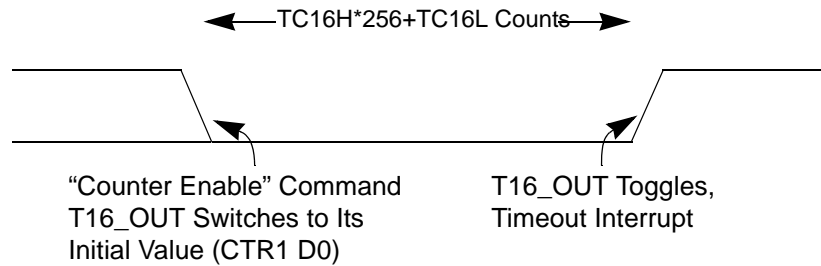
Figure 26. T16_OUT in Single-Pass Mode
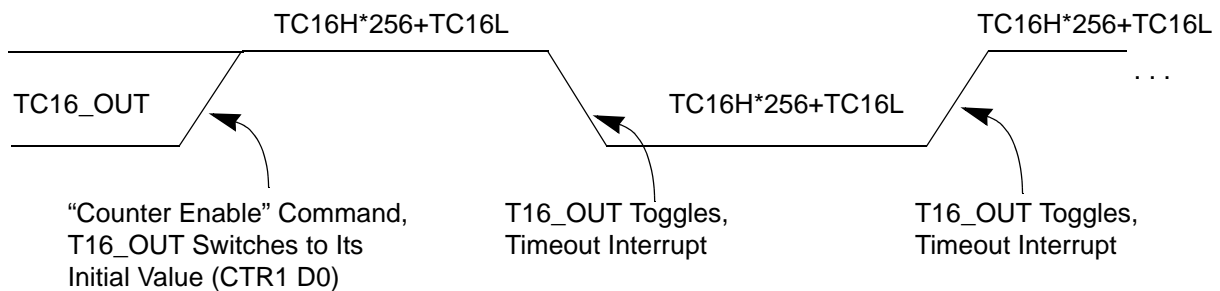
Figure 27. T16_OUT in Modulo-N Mode

T16 DEMODULATION Mode

The user must program TC16L and TC16H to FFH. 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 FFFFH and starts again.

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

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.

Crystal
C1, C2 = 33pF TYP *
f = 8 MHz

* Preliminary value including pin parasitics

External Clock

Ceramic Resonator f = 8MHz
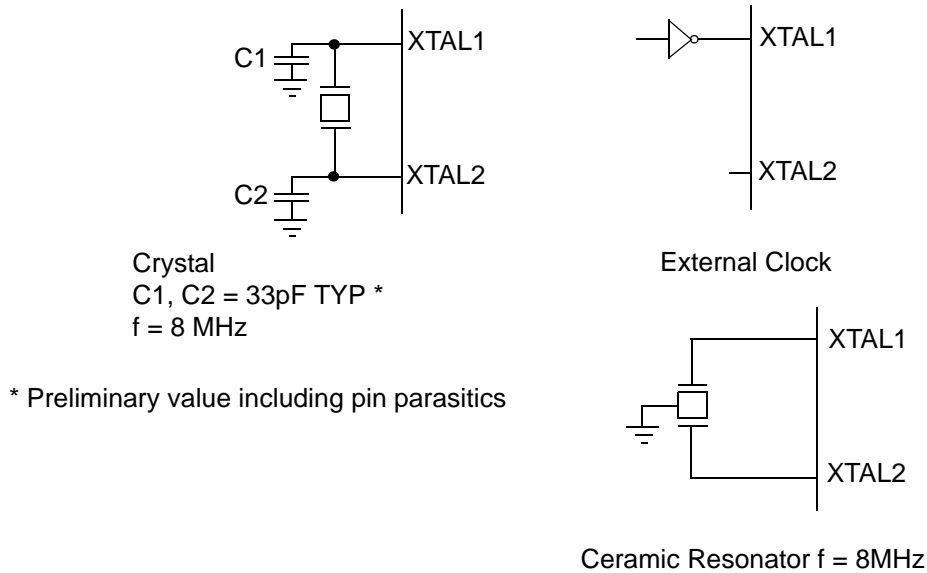
Figure 31. Oscillator Configuration

```
    FF          NOP         ; clear the pipeline
    6F          Stop        ; enter Stop Mode
```

or

```
    FF          NOP         ; clear the pipeline
    7F          HALT        ; enter HALT Mode
```

Port Configuration Register

The Port Configuration (PCON) register (Figure 32) configures the comparator
output on Port 3. It is located in the expanded register 2 at Bank F, location 00.

 PCON(FH)00H

D7	D6	D5	D4	D3	D2	D1	D0

Comparator Output Port 3
0 P34, P37 Standard Output*
1 P34, P37 Comparator Output

Port 1
0: Open-Drain
1: Push-Pull*

Port 0
0: Open-Drain
1: Push-Pull*

Reserved (Must be 1)
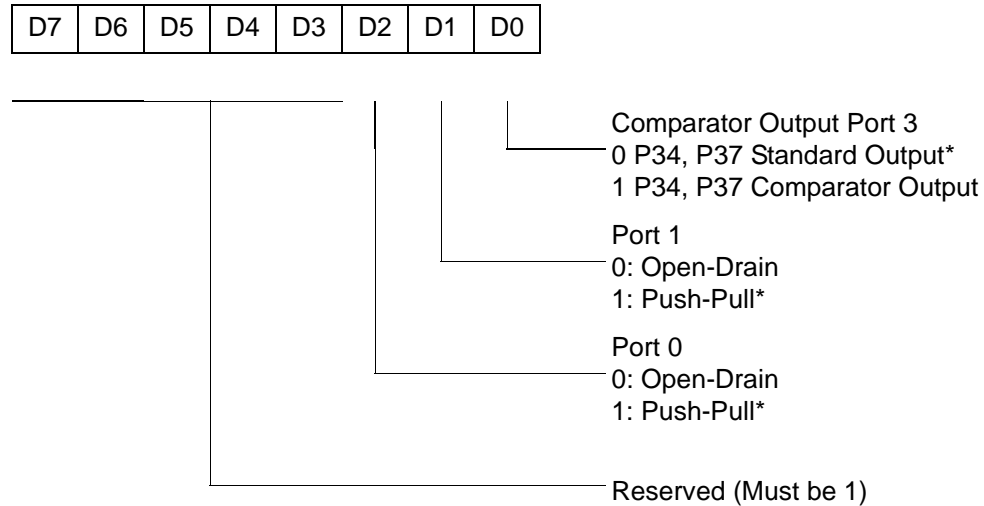
 * Default setting after reset

Figure 32. Port Configuration Register (PCON) (Write Only)

Comparator Output Port 3 (D0)

Bit 0 controls the comparator used in Port 3. A 1 in this location brings the compar-
ator outputs to P34 and P37, and a 0 releases the Port to its standard I/O configu-
ration.

Port 1 Output Mode (D1)

Bit 1 controls the output mode of port 1. A 1 in this location sets the output to
push-pull, and a 0 sets the output to open-drain.
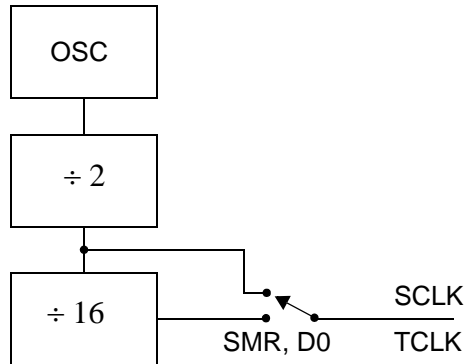
Figure 34. SCLK Circuit

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[†]	Low
			1	High
Reserved	--5-----		0	Reserved (Must be 0)
Source	---432--	W	000[†]	A. POR Only
			001	B. NAND of P23–P20
			010	C. NAND of P27–P20
			011	D. NOR of P33–P31
			100	E. NAND of P33–P31
			101	F. NOR of P33–P31, P00, P07
			110	G. NAND of P33–P31, P00, P07
			111	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

LVD(0D)0CH

D7	D6	D5	D4	D3	D2	D1	D0

Voltage Detection
0: Disable *
1: Enable

LVD Flag (Read only)
0: LVD flag reset *
1: LVD flag set

HVD Flag (Read only)
0: HVD flag reset *
1: HVD flag set

Reserved (Must be 0)
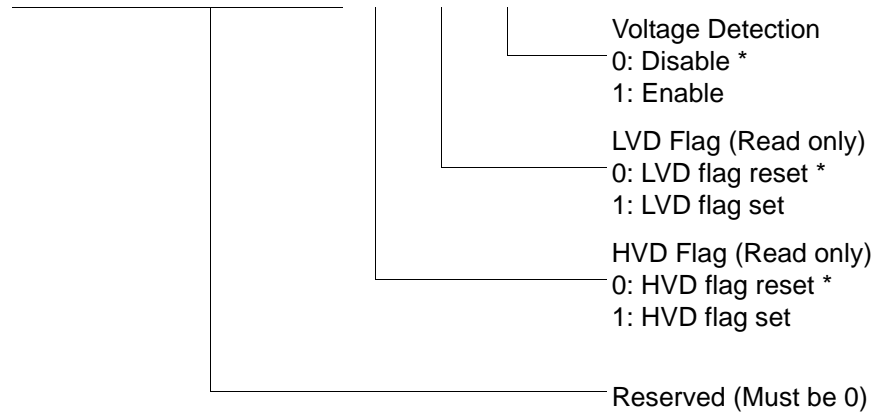
 * Default

Figure 43. Voltage Detection Register

> **Note:** Do not modify register P01M while checking a low-voltage condition. Switching noise of both ports 0 and 1 together might trigger the LVD flag.

Expanded Register File Control Registers (0F)

The expanded register file control registers (0F) are depicted in Figures 44 through Figure 57.

PCON(0F)00H

D7	D6	D5	D4	D3	D2	D1	D0

Comparator Output Port 3
0   P34, P37 Standard Output *
1   P34, P37 Comparator Output

Port 1
0: Open-Drain
1: Push-Pull*

Port 0
0: Open-Drain
1: Push-Pull *

Reserved (Must be 1)
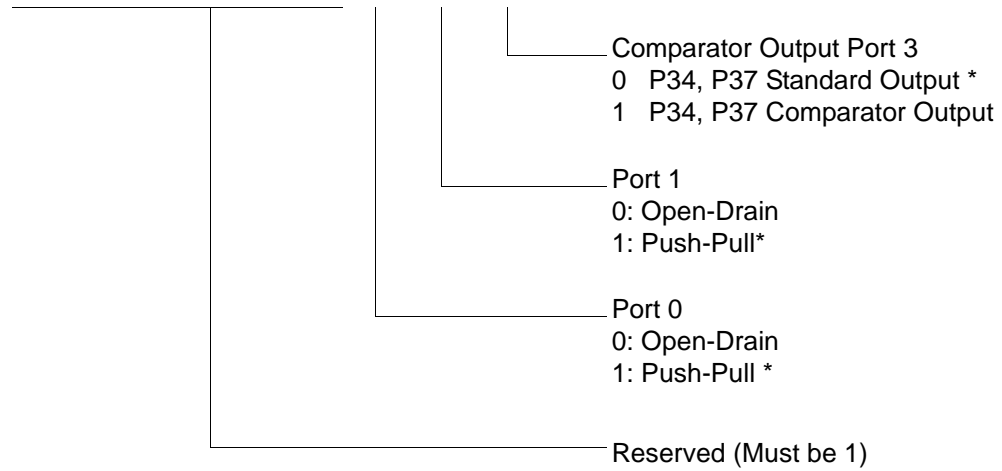
 * Default setting after reset

Figure 44. Port Configuration Register (PCON)(0F)00H: Write Only)

SMR2(0F)0DH

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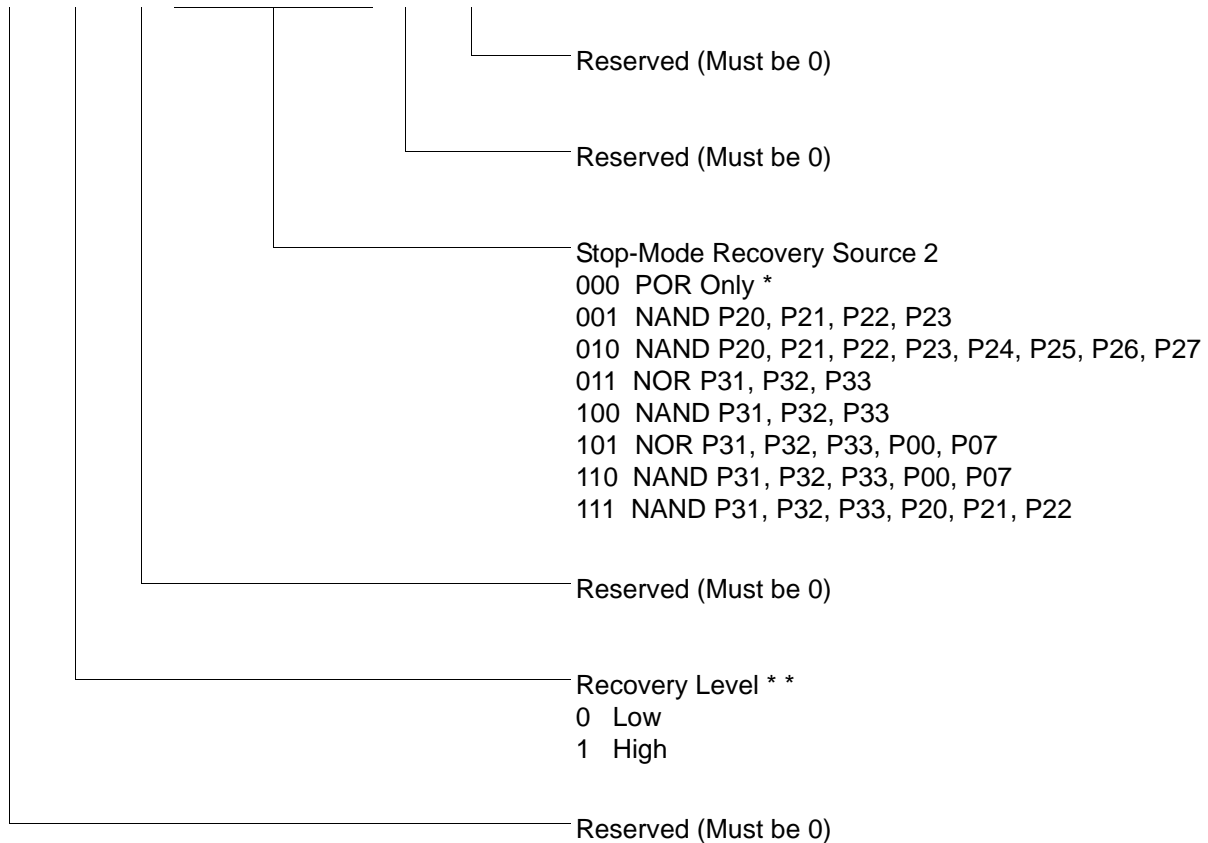
Note: If used in conjunction with SMR, either of the two specified events causes a Stop-Mode Recovery.
* Default setting after reset
* * At the XOR gate input

Figure 46. Stop Mode Recovery Register 2 ((0F)0DH:D2–D4, D6 Write Only)

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)
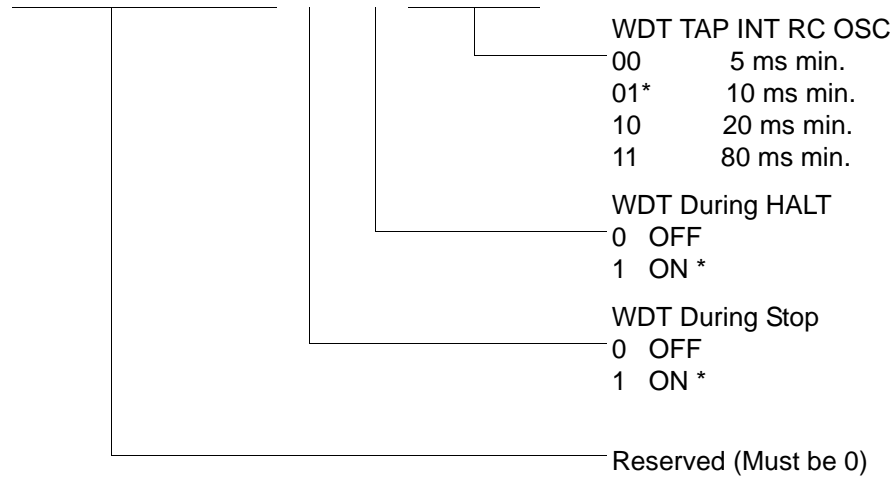
* Default setting after reset

Figure 47. Watch-Dog Timer Register ((0F) 0FH: Write Only)

Standard Control Registers

R246 P2M(F6H)

D7	D6	D5	D4	D3	D2	D1	D0

P27–P20 I/O Definition
0   Defines bit as OUTPUT
1   Defines bit as INPUT *
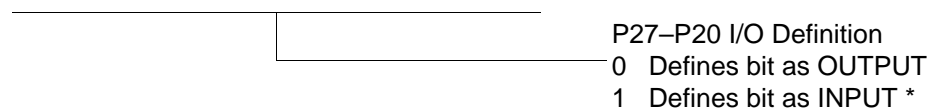
* Default setting after reset

Figure 48. Port 2 Mode Register (F6H: Write Only)

SYMBOL	MILLIMETER		INCH	
	MIN	MAX	MIN	MAX
A1	0.38	0.81	.015	.032
A2	3.25	3.68	.128	.145
B	0.41	0.51	.016	.020
B1	1.47	1.57	.058	.062
C	0.20	0.30	.008	.012
D	25.65	26.16	1.010	1.030
E	7.49	8.26	.295	.325
E1	6.10	6.65	.240	.262
e	2.54 BSC		.100 BSC	
eA	7.87	9.14	.310	.360
L	3.18	3.43	.125	.135
Q1	1.42	1.65	.056	.065
S	1.52	1.65	.060	.065

CONTROLLING DIMENSIONS : INCH
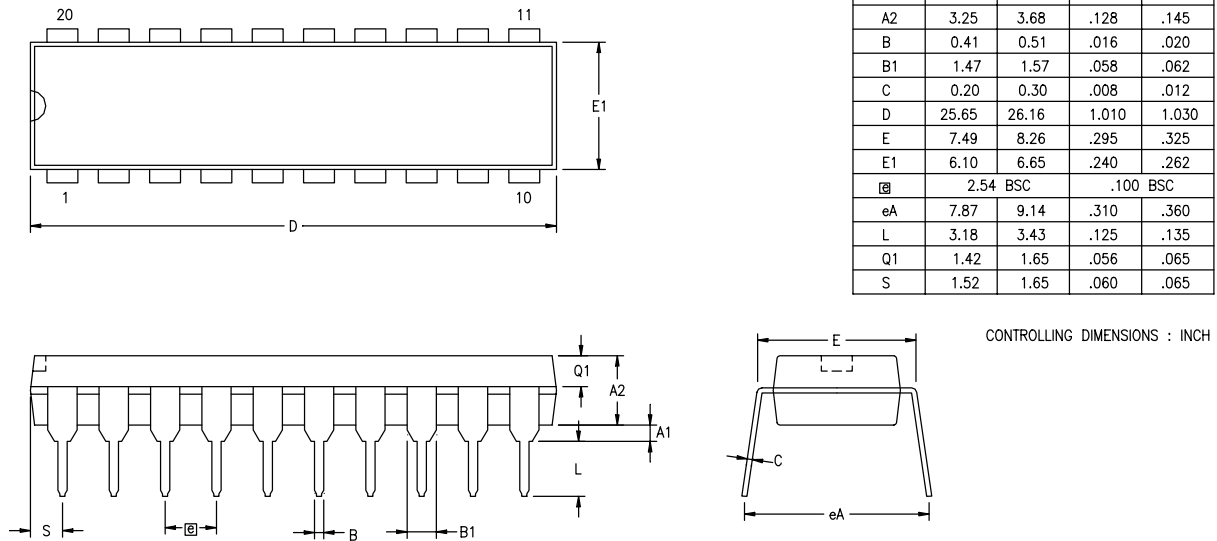
Figure 59. 20-Pin PDIP Package Diagram

SYMBOL	MILLIMETER		INCH	
	MIN	MAX	MIN	MAX
A	2.40	2.65	.094	.104
A1	0.10	0.30	.004	.012
A2	2.24	2.44	.088	.096
B	0.36	0.46	.014	.018
C	0.23	0.30	.009	.012
D	12.60	12.95	.496	.510
E	7.40	7.60	.291	.299
e	1.27 BSC		.050 BSC	
H	10.00	10.65	.394	.419
h	0.30	0.40	.012	.016
L	0.60	1.00	.024	.039
Q1	0.97	1.07	.038	.042

CONTROLLING DIMENSIONS : MM
LEADS ARE COPLANAR WITHIN .004 INCH.
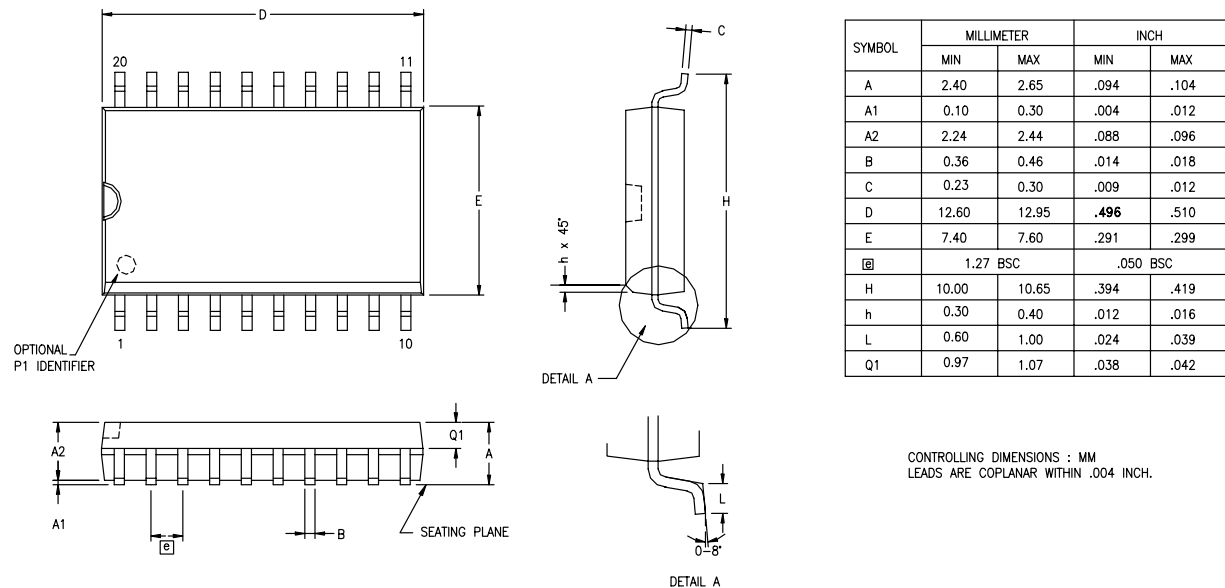
Figure 60. 20-Pin SOIC Package Diagram

SYMBOL	MILLIMETER			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.73	1.85	1.98	0.068	0.073	0.078
A1	0.05	0.13	0.21	0.002	0.005	0.008
A2	1.68	1.73	1.83	0.066	0.068	0.072
B	0.25	0.30	0.38	0.010	0.012	0.015
C	0.13	0.15	0.22	0.005	0.006	0.009
D	7.07	7.20	7.33	0.278	0.283	0.289
E	5.20	5.30	5.38	0.205	0.209	0.212
e	0.65 BSC			0.0256 BSC		
H	7.65	7.80	7.90	0.301	0.307	0.311
L	0.56	0.75	0.94	0.022	0.030	0.037
Q1	0.74	0.78	0.82	0.029	0.031	0.032

CONTROLLING DIMENSIONS : MM
LEADS ARE COPLANAR WITHIN .004 INCH.

DETAIL A

Figure 61. 20-Pin SSOP Package Diagram

SYMBOL	MILLIMETER			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.73	1.86	1.99	0.068	0.073	0.078
A1	0.05	0.13	0.21	0.002	0.005	0.008
A2	1.68	1.73	1.78	0.066	0.068	0.070
B	0.25		0.38	0.010		0.015
C	0.09	—	0.20	0.004	0.006	0.008
D	10.07	10.20	10.33	0.397	0.402	0.407
E	5.20	5.30	5.38	0.205	0.209	0.212
e	0.65 TYP			0.0256 TYP		
H	7.65	7.80	7.90	0.301	0.307	0.311
L	0.63	0.75	0.95	0.025	0.030	0.037

CONTROLLING DIMENSIONS: MM
LEADS ARE COPLANAR WITHIN .004 INCHES.
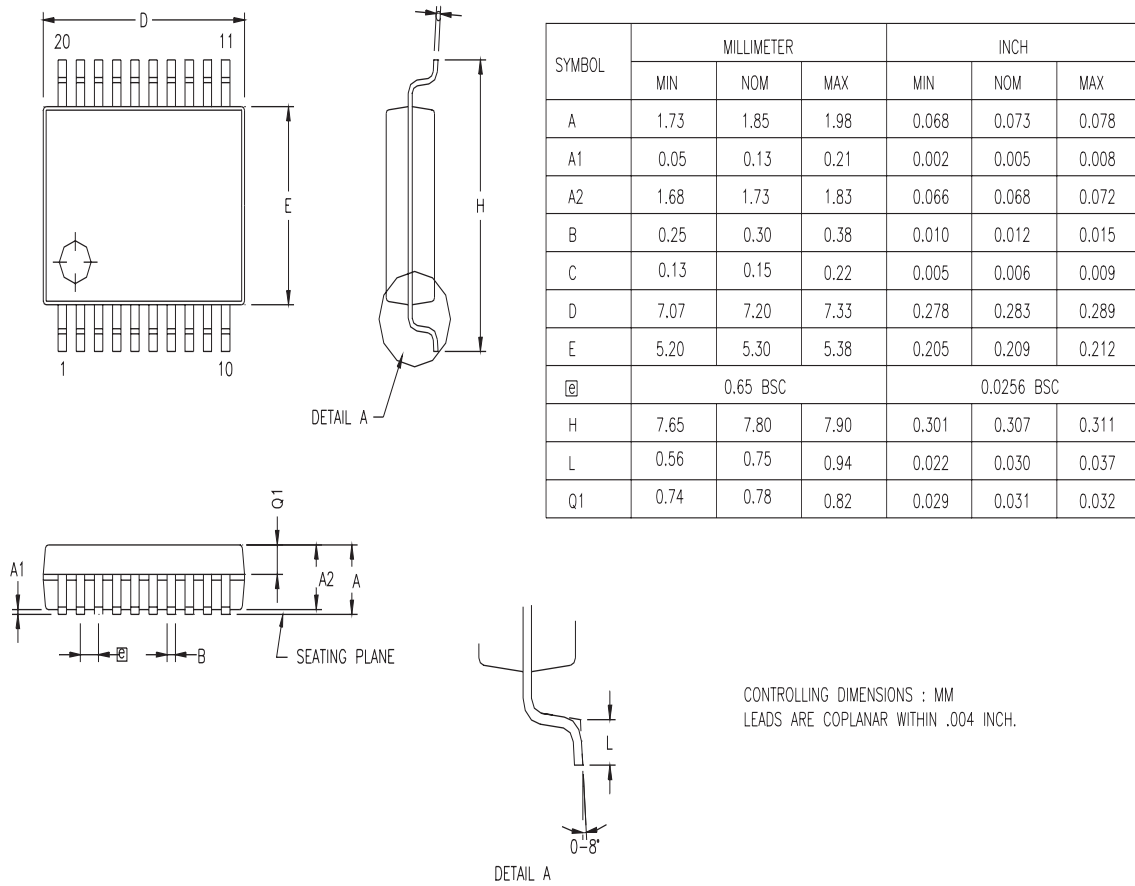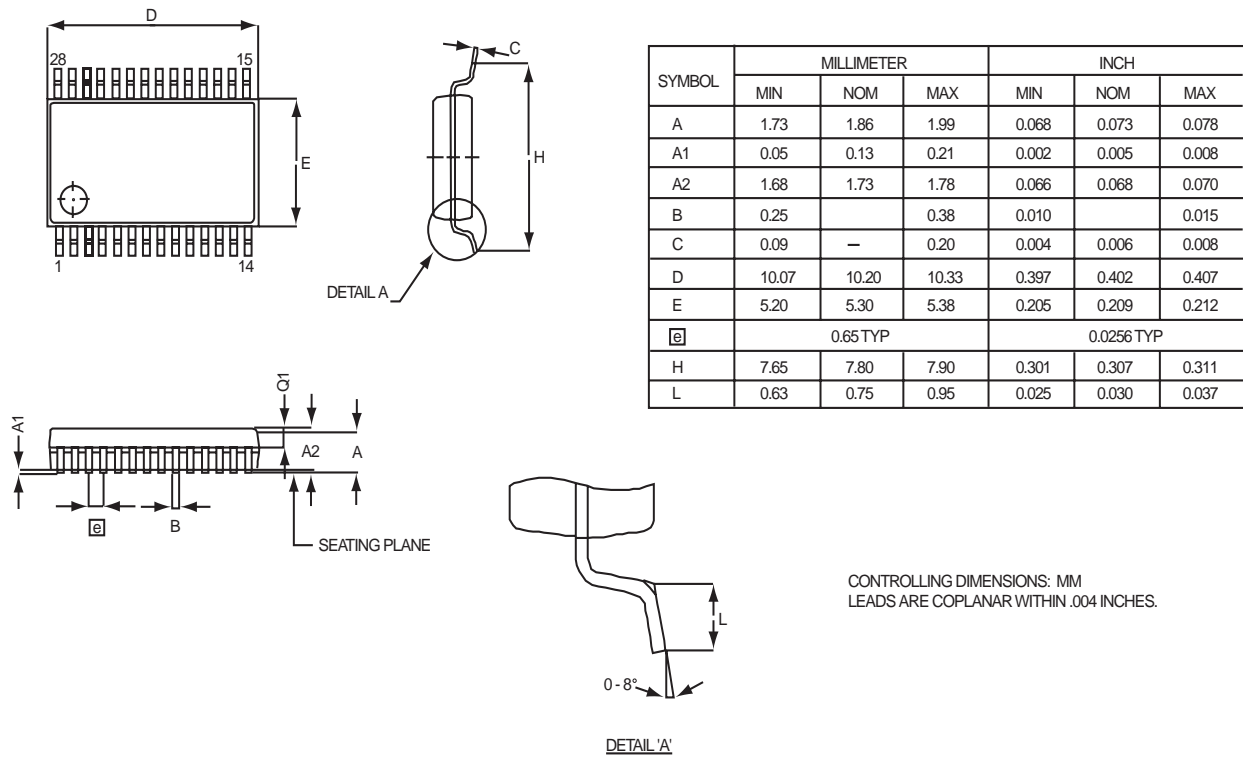
Figure 65. 28-Pin SSOP Package Diagram

For fast results, contact your local ZiLOG sales office for assistance in ordering the part desired.

Codes

ZG = ZiLOG General Purpose Family

P = OTP

323 = Family Designation

L = Voltage Range

   2V to 3.6V

T = Temperature Range:

   S = 0 to 70 degrees C (Standard)

   E = -40 to +105 degrees C (Extended)

   A = -40 to +125 degrees C (Automotive)

P = Package Type:

   K = Windowed Cerdip
   P = PDIP
   H = SSOP
   S = SOIC

= Number of Pins

CC = Memory Size

M = Packaging Options

   C = Non Lead-Free

   G = Lead-Free

   E = CDIP