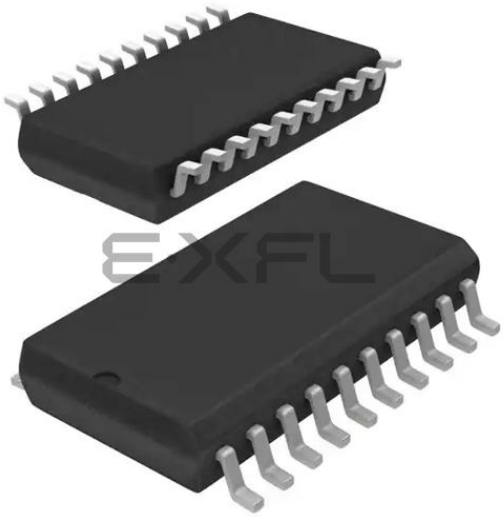

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What is "Embedded - Microcontrollers"?

"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	Active
Core Processor	Z8
Core Size	8-Bit
Speed	8MHz
Connectivity	-
Peripherals	POR, WDT
Number of I/O	14
Program Memory Size	512B (512 x 8)
Program Memory Type	OTP
EEPROM Size	-
RAM Size	61 x 8
Voltage - Supply (Vcc/Vdd)	3.5V ~ 5.5V
Data Converters	-
Oscillator Type	Internal
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SOIC (0.295", 7.50mm Width)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/z86e0208hsg1925

PIN DESCRIPTION

Pin diagrams and identification for the device are displayed in Figure 3 through Figure 6, and in Table 2 through Table 5.

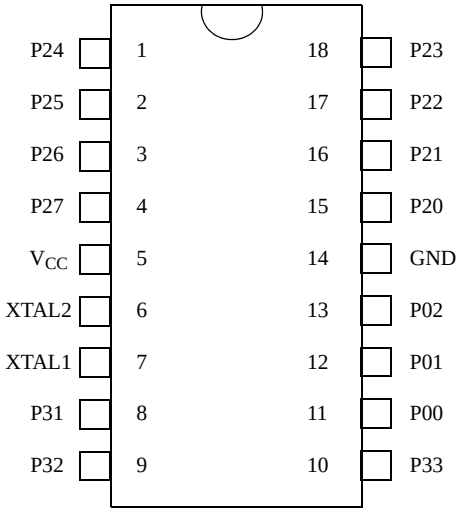

Figure 3. 18-Pin DIP/SOIC Configuration, STANDARD Mode

Table 2. 18-Pin DIP/SOIC Pin Identification, STANDARD Mode

Pin #	Symbol	Function	Direction
1-4	P24-P27	Port 2, Pins 4-7	Input/Output
5	V_{CC}	Power Supply	
6	XTAL2	Crystal Oscillator Clock	Output
7	XTAL1	Crystal Oscillator Clock	Input
8	P31	Port 3, Pin 1 AN1	Input
9	P32	Port 3, Pin 1 AN2	Input
10	P33	Port 3, Pin 3, REF	Input
11-13	P00-P02	Port 0, Pins 0-2	Input/Output
14	GND	Ground	
15-18	P20-P23	Port 2, Pins 0-3	Input/Output

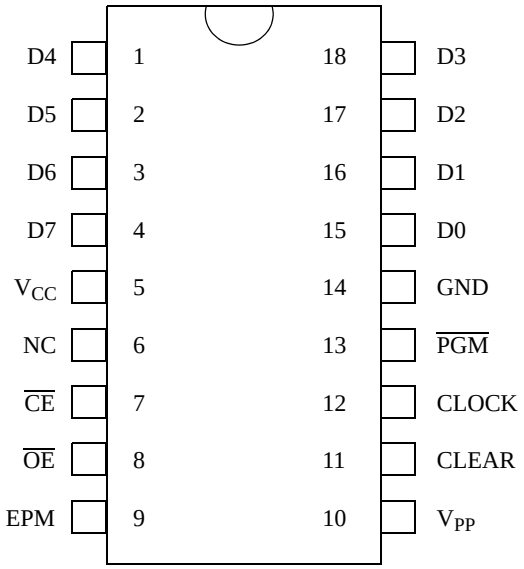

Figure 4. 18-Pin DIP/SOIC Configuration, EPROM Mode

Table 3. 18-Pin DIP/SOIC Pin Identification, EPROM Mode

Pin #	Symbol	Function	Direction
1-4	D4-D7	Data 4-7	Input/Output
5	V_{CC}	Power Supply	
6	NC	No Connection	
7	$\overline{CE}$	Chip Enable	Input
8	$\overline{OE}$	Output Enable	Input
9	EPM	EPROM Program Mode	Input
10	V_{PP}	Program Voltage	Input
11	CLEAR	Clear Clock	Input
12	CLOCK	Address	Input
13	$\overline{PGM}$	Program Mode	Input
14	GND	Ground	
15-18	D0-D3	Data 0-3	Input/Output

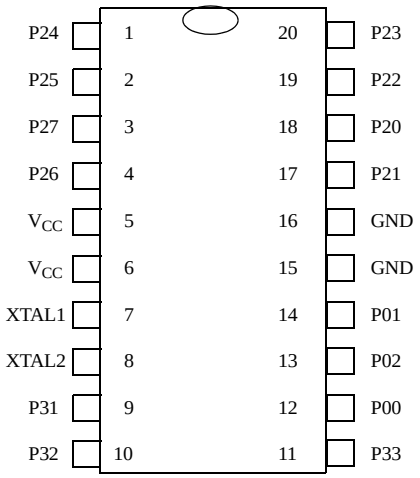

Figure 5. 20-Pin SSOP Pin C onfiguration, STANDARD Mode

Table 4. 20-Pin SSOP Pin Identification, STANDARD Mode

Pin #	Symbol	Function	Direction
1,2	P24-P25	Port 2, Pins 4-5	Input/Output
3	P27	Port 2, Pin 7	Input/Output
4	P26	Port 2, Pin 6	Input/Output
5	V_{CC}	Power Supply	
6	V_{CC}	Power Supply	
7	XTAL1	Crystal Oscillator Clock	Input
8	XTAL2	Crystal Oscillator Clock	Output
9	P31	Port 3, Pin 1, AN1	Input
10	P32	Port 3, Pin 2, AN2	Input
11	P33	Port 3, Pin 3, REF	Input
12	P00	Port 0, Pin 0	Input/Output
13	P02	Port 0, Pin 1	Input/Output
14	P01	Port 0, Pin 1	Input/Output
15	GND	Ground	
16	GND	Ground	
17	P21	Port 2, Pin 1	Input/Output
18	P20	Port 2, Pin 0	Input/Output
19-20	P22-P23	Port 2, Pins 2-3	Input/Output

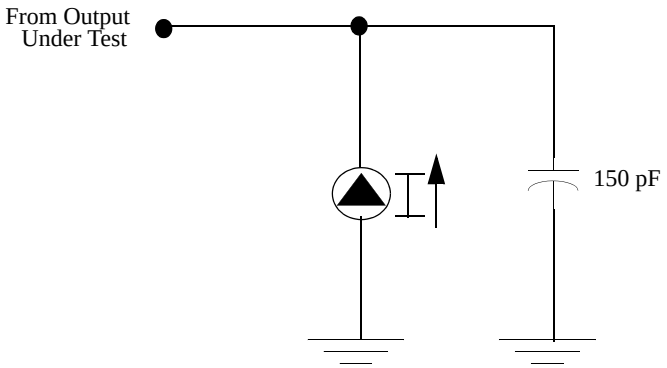

Figure 7. Test Load Diagram

Capacitance

T_A = 25°C, V_{CC} = GND = OV, f = 1.0 MHz, unmeasured pins returned to GND. See Table 7.

Table 7. Capacitance

Parameter	Min	Max
Input capacitance	0	10 pF
Output capacitance	0	20 pF
I/O capacitance	0	25 pF

DC Electrical Characteristics

Standard Temperature Range

Table 8 provides Direct Current characteristics for the Z86E02 SL1925 microcontroller, at a standard ambient temperature range of 0°C to 70°C.

Table 8. DC Characteristics, Standard Temperature Range

TA = 0°C to +70°C							
Sym	Parameter	V_{CC}	Min	Max	Typical @ 25°C[1] Units	Conditions	Notes
V_{INMAX}	Max Input Voltage	3.5V	-12	12	V	I_{IN} < 250 µA	2
		5.5V	-12	12	V	I_{IN} < 250 µA	2

Table 9. DC Characteristics, Extended Temperature Range (Continued)

			TA = -40°C to +105°C					
Sym	Parameter	V_{CC}	Min	Max	Typical @ 25°C[1]	Units	Conditions	Notes
I_{ALH}	Auto Latch High Current	4.5V		-20.0	-8.0	µA	$0V < V_{IN} < V_{CC}$	9
		5.5V		-20.0	-8.0	µA	$0V < V_{IN} < V_{CC}$	9

1. Typical values are read at a V_{CC} of 5.0V
2. Port 2, Port 3, and Port 0 only.
3. STANDARD mode (not Low EMI mode).
4. These values apply while operating in RUN mode or HALT mode
5. These values apply while operating in STOP mode
6. All outputs are unloaded and all inputs are at the V_{CC} or V_{SS} level.
7. If the analog comparator is selected, then the comparator inputs must be at the V_{CC} level.
8. A 10-MΩ pull-up resistor is required in the circuit between the XTAL1 pin to the V_{CC} pin.
9. Auto latches are enabled.
10. Low EMI Mode (not Standard Mode)

AC Electrical Timing Characteristics

Figure 8 illustrates Alternating Current timing for the Z86E02 SL1925 microcontroller.

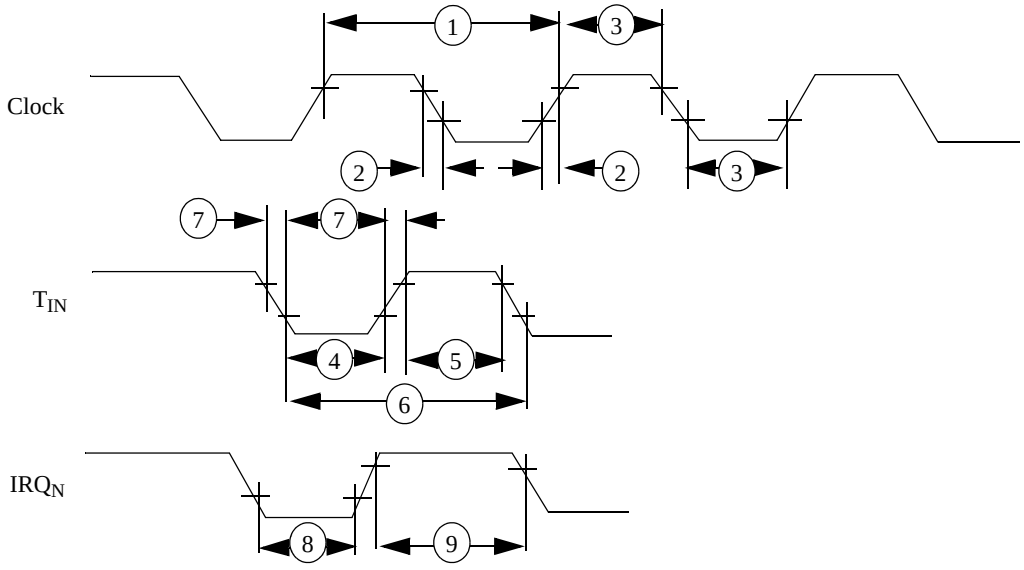

Figure 8. AC Electrical Timing

STANDARD Mode at St andard Temperature

Table 10 describes timing characteristics in STANDARD mode at standard temperature for the timing diagram noted in Figure 8.

Table 10. AC Electrical Characteristics, Standard Mode and Temperature

			TA = 0°C to +70°C				
				8MHz			
No	Symbol	Parameter	V_{CC}	Min	Max	Units	Notes
1	T_PC	Input Clock Period	3.5V	125	DC	ns	1
			5.5V	125	DC	ns	1
2	T_RC,T_FC	Clock Input Rise and Fall Times	3.5V		25	ns	1
			5.5V		25	ns	1
3	T_WC	Input Clock Width	3.5V	62		ns	1
			5.5V	62		ns	1

Table 10. AC Electrical Charac teristics, Standard Mode and Temperature (Continued)

			TA = 0°C to +70°C 8MHz				
No	Symbol	Parameter	V_{CC}	Min	Max	Units	Notes
4	$T_WT_{IN}L$	Timer Input Low Width	3.5V	100		ns	1
			5.5V	70		ns	1
5	$T_WT_{IN}H$	Timer Input High Width	3.5V	5TpC			1
			5.5V	5TpC			1
6	T_PT_{IN}	Timer Input Period	3.5V	8TpC			1
			5.5V	8TpC			1
7	T_RT_{IN}, T_TT_{IN}	Timer Input Rise and Fall Time	3.5V		100	ns	1
			5.5V		100	ns	1
8	T_WIL	Interrupt Request Input Low Time	3.5V	100		ns	1,2
			5.5V	70		ns	1,2
9	T_WIH	Interrupt Request Input High Time	3.5V	5TpC			1,2
			5.5V	5TpC			1,2
10	T_{WDT}	Watch-Dog Timer Delay Time before Time-out	3.5V	10		ms	
			5.5V	5		ms	
11	T_{POR}	Power-On Reset Time	3.5V	4	36	ms	
			5.5V	2	18	ms	

1. Timing reference is 0.7 V_{CC} for a logic 1 and 0.2 V_{CC} for a logic 0
2. Interrupt request through Port 3 (P33-P31)

STANDARD Mode at Ex tended Temperature

Table 11 describes timing characteristics in STANDARD mode at extended temperature for the timing diagram noted in Figure 8.

Table 11. AC Electrical Timing, Standard Mode at Extended Temperature

			TA = -40°C to +105°C				
				8MHz			
No	Symbol	Parameter	V_{CC}	Min	Max	Units	Notes
1	T_PC	Input Clock Period	4.5V	125	DC	ns	1
			5.5V	125	DC	ns	1
2	T_RC,T_FC	Clock Input Rise and Fall Times	4.5V		25	ns	1
			5.5V		25	ns	1
3	T_WC	Input Clock Width	4.5V		62	ns	1
			5.5V		62	ns	1
4	$T_WT_{IN}L$	Timer Input Low Width	4.5V	70		ns	1
			5.5V	70		ns	1
5	$T_WT_{IN}H$	Timer Input High Width	4.5V	5TpC			1
			5.5V	5TpC			1
6	T_PT_{IN}	Timer Input Period	4.5V	8TpC			1
			5.5V	8TpC			1
7	T_RT_{IN}, T_TT_{IN}	Timer Input Rise and Fall Time	4.5V		100	ns	1
			5.5V		100	ns	1
8	T_WIL	Interrupt Request Input Low Time	4.5V	70		ns	1,2
			5.5V	70		ns	1,2
9	T_WIH	Interrupt Request Input High Time	4.5V	5TpC			1,2
			5.5V	5TpC			1,2
10	T_{WDT}	Watch-Dog Timer Delay Time before Time-out	4.5V	5		ms	
			5.5V	5		ms	
11	T_{POR}	Power-On Reset Time	4.5V	1	20	ms	
			5.5V	1	20	ms	

1. Timing reference is 0.7 V_{CC} for a logic 1 and 0.2 V_{CC} for a logic 0
2. Interrupt request through Port 3 (P33-P31)

Location		Identifiers
255(FFh)	Stack Pointer (Bits 7-0)	SPL
254(FEh)	General-Purpose Register	GPR
253(FDh)	Register Pointer	RP
252(FCh)	Program Control Flags	Flags
251(FBh)	Interrupt Mask Register	IMR
250(FBh)	Interrupt Request Register	IRQ
249(FAh)	Interrupt Priority Register	IRP
248(F8h)	Ports 0-1 Mode	P01M
247(F7h)	Port 3 Mode	P3M
246(F6h)	Port 2 Mode	P2M
245(F5h)	Reserved	Reserved
244(F4h)	Reserved	Reserved
243(F3h)	T1 Prescaler	PRE1
242(F2h)	TimerCounter1	T1
241(F1h)	Timer Mode	TMR
240(F0h) 64(40h)	Not Implemented	
63(30h) 4(04h)	General-Purpose Registers	
3(03h)	Port 3	P3
2(02h)	Port 2	P2
1(01h)	Reserved	Reserved
0(00h)	Port 0	P0

Figure 14. Register File

The Z8® instructions can access registers directly or indirectly through an 8-bit address field, thereby allowing short 4-bit register addressing mode using the Register Pointer.

In the 4-bit address mode, the register file is divided into eight working register groups, each occupying 16 continuous locations. The Register Pointer (Figure 15) addresses the starting location of the active working-register group.

When more than one interrupt is pending, priorities are resolved by a programmable priority encoder that is controlled by the Interrupt Priority register. All Z8® interrupts are vectored through locations in program memory. When an interrupt machine cycle is activated, an Interrupt Request is granted, thus disabling all subsequent interrupts, saving the Program Counter and Status Flags, and then branching to the program memory vector location reserved for that interrupt. This memory location and the next byte contain the 16-bit starting 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 requires service.

Note: The rising edge interrupt is not supported. on the CCP emulator (a hardware/software work around must be employed).

Hardware Work Around on the on the Z86CCP01ZEM Emulator to P32 Rising Edge Digital Interrupt

To emulate the P32 rising edge digital interrupt the emulator must be modified in the following way:

1. Connect P32 by soldering a wire jumper from either emulation socket (P3, pin 17) or (P2, pin 12) to 74HCT04 U27 pin 1.
2. Connect 74HCT04 U27 pin 2 by soldering a wire jumper from U27 pin 2 to P30 on either emulator socket (P3, pin 25) or (P2, pin 18).

Hardware Work Around on the on the Z86CCP01ZEM Emulator to P32 Rising Edge Analog Interrupt

To emulate the P32 rising edge analog interrupt the emulator must be modified in the following way:

1. Connect P32 by soldering a wire jumper from either emulation socket (P2, pin 16) or (P1, pin 23) to 74HCT04 U27 pin 1.
2. Connect 74HCT04 U27 pin 2 by soldering a wire jumper from U27 pin 2 to P30 on either emulator socket (P3, pin 25) or (P2, pin 18).

The following routine must be added to the initialization of the device:

```
HSWP32AFIX      Push RP
                LD RP, #0Fh
                LD R0, #0FFh
                POP RP
```

Op Code WDT (5Fh)

The first time Op Code 5Fh is executed, the WDT is enabled; subsequent execution clears the WDT counter. This clearing of the counter must be performed at least every T_{WDT}; otherwise, the WDT times out and generates a reset. The generated reset is the same as a power-on reset of T_{POR}, plus 18 crystal clock cycles. The software enabled WDT does not run in STOP mode.

On the CCP emulator, a software workaround must be used to emulate the software WDT. This workaround follows.

```
SWFIXSWDT:   PUSH RP
             LD RP, #0Fh
             LD R15,#00000101B
             POP RP
```

Op Code WDH (4Fh)

When this instruction is executed it enables the WDT during HALT. If not, the WDT stops when entering HALT. This instruction does not clear the counters – it just makes it possible to operate the WDT during HALT mode. A WDH instruction executed without executing WDT (5Fh) yields no effect.

Note: On the CCP emulator, a software workaround must be used to enable the software in HALT Mode/STOP Mode or hardware-enabled WDT. This workaround follows.

Software Work Around on th e Z86CCP01ZEM Emulator to Emulate the Software WDT Running in HALT Mode

```
SWFIXSWDT:   PUSH RP
             LD RP, #0Fh
             LD R15,#00000101B
             POP RP
```

Permanent WDT

Selecting the hardware-enabled Permanent WDT option bit automatically enables the WDT upon exiting reset. The permanent WDT always runs in HALT mode and STOP mode, and it cannot be disabled.

Software Work Around on the Z86CCP01ZEM Emulator to Emulate the Hardware Enabled Permanent WDT in HALT Mode and Stop Mode

The following functions must be performed

1. The first instruction after reset at address 000Ch must be the WDT instruction or op code 5F. The following routine must be added in the initialization of the

```
HSWFIXHWDT:   PUSH RP
              LD RP, #0Fh
              LD R15,#00000101B
              POP RP
```

Auto Reset Voltage (V_{LV})

The Z8® features an auto-reset built-in. The auto-reset circuit resets the Z8® when it detects the V_{CC} below V_{LV}. Figure 19 shows the Auto Reset Voltage versus temperature. If the V_{CC} drops below the V_{CC} operating voltage range, the Z8® functions down to the V_{LV} unless the internal clock frequency is higher than the specified maximum V_{LV} frequency.

Customer Feedback Form

Z86E02 SL1925 Produc t Specification

If you experience any problems while operating this product, or if you note any inaccuracies while reading this Product Specification, please copy and complete this form, then mail or fax it to ZiLOG (see Return Information, below). We also welcome your suggestions!

Customer Information

Name	Country
Company	Phone
Address	Fax
City/State/Zip	E-Mail

Product Information

Serial # or Board Fab #/Rev. #
Software Version
Document Number
Host Computer Description/Type

Return Information

ZiLOG
532 Race Street
Campbell, CA 95126-3432
Fax: (408) 558-8536
www.zilog.com

Problem Description or Suggestion

Please provide a complete description of the problem or suggestion. If you are reporting a specific problem, include all steps leading up to the occurrence of the problem. Attach additional pages as necessary.