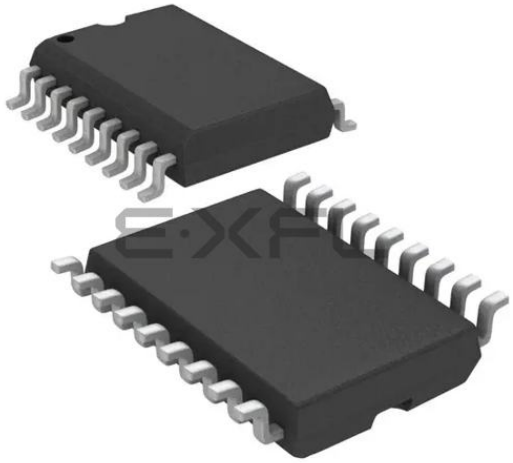

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Applications of "Embedded - Microcontrollers"

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	18-SOIC (0.295", 7.50mm Width)
Supplier Device Package	-
Purchase URL	https://www.e-xfl.com/product-detail/zilog/z86e0208ssg1925

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Document Disclaimer

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Architectural Overview

ZiLOG's Z86E02 SL1925 Microcontroller (MCU) is a One-Time Programmable (OTP) member of ZiLOG's single-chip Z8® MCU family that allows easy software development, debug, prototyping, and small production runs not economically desirable with masked ROM versions.

For applications demanding powerful I/O capabilities, the Z86E02 SL1925's dedicated input and output lines are grouped into three ports, and are configurable under software control to provide timing, status signals, or parallel I/O. One on-chip counter/timer, with a large number of user-selectable modes, offload the system of administering real-time tasks such as counting/timing and I/O data communications.

Z86E02 SL1925 Features

Table 1. Z86E02 SL1925 Features

Device	OTP (KB)	RAM* (Bytes)	Speed (MHz)
Z86E02 SL1925	0.5	61	8

Note: *General-Purpose.

- 3.5V to 5.5V Operating Range @ 0°C to +70°C
- 4.5V to 5.5V Operating Range @ -40°C to +105°C
- 14 Input/Output Lines
- Six Vectored, Prioritized Interrupts (3 falling edge, 1 rising edge, 1 timer, 1 software)
- Program Options:
  - Low Noise
  - ROM Protect
  - Auto Latch
  - Watch-Dog Timer (WDT)
  - RC Oscillator
- One Programmable 8-Bit Counter/Timer, with 6-bit Programmable Prescaler
- WDT/Power-On Reset (POR)
- On-Chip Oscillator that accepts XTAL, Ceramic Resonance, LC, RC, or External Clock
- Clock-Free WDT Reset

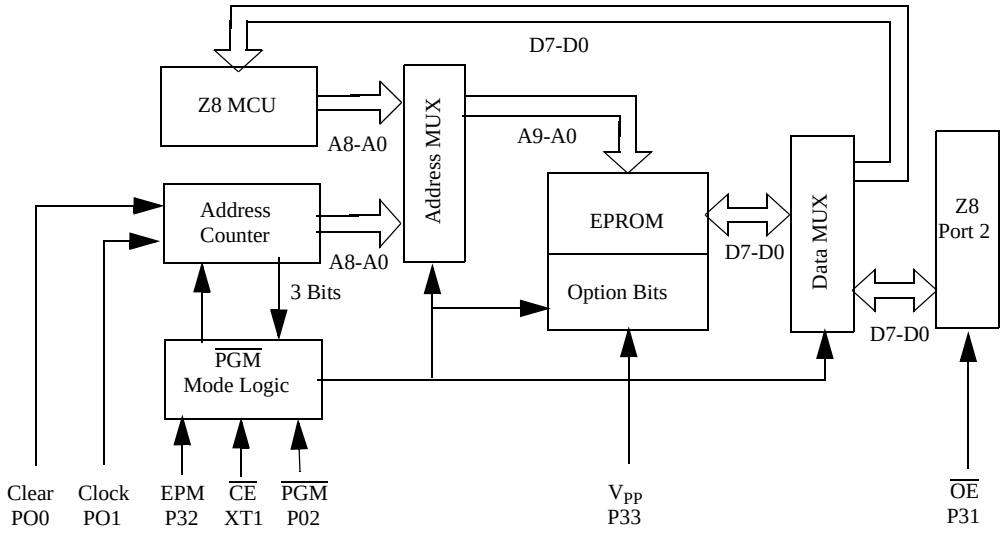


Figure 2. EPROM Programming Mode Block Diagram

PIN DESCRIPTION

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

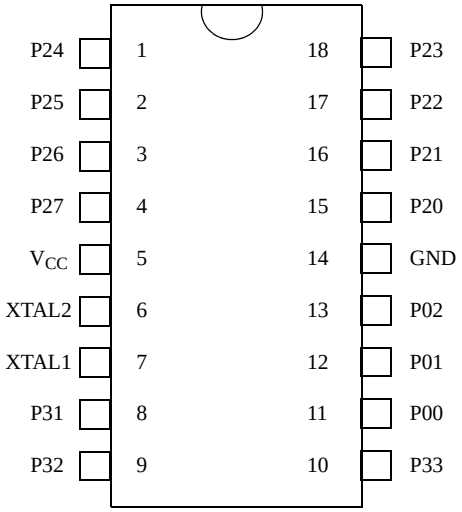


Figure 3. 18-Pin DIP/SOIC Configuration, STANDARD Mode

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

Electrical Characteristics

Absolute Maximum Ratings

Stresses greater than those listed on Table 6 may 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 may affect device reliability. Total power dissipation should not exceed 462 mΩ for the package. See Table 6. Power dissipation is calculated as follows:

Total Power Dissipation = V_{CC} X [I_{CC}–(sum of I_{OH})]
+sum of [(V_{CC}–V_{OH}) X I_{OH}]
+ sum of (V_{OL} X I_{OL})

Table 6. Absolute Maximum Ratings

Parameter	Min	Max	Units	Note
Ambient Temperature under Bias	-40	+105	C	
Storage Temperature	-65	+150	C	
Voltage on any Pin with Respect to V_{SS}	-0.7	+12	V	1
Voltage on V_{DD} Pin with Respect to V_{SS}	-0.3	+7	V	
Voltage on XTAL1, P31, P32, P33 with respect to V_{SS}	-0.6	V_{DD}+1	V	3
Total Power Dissipation		462	mΩ	
Maximum Allowable Current out of V_{SS}		300	mA	
Maximum Allowable Current into V_{DD}		270	mA	
Maximum Allowable Current into an Input Pin	-600	+600	µA	4
Maximum Allowable Current into an Open-Drain Pin	-600	+600	µA	2
Maximum Allowable Output Current Linked by any I/O Pin		20	mA	
Maximum Allowable Output Current Sourced by any I/O Pin		20 mA		

1. Applies to all pins except where otherwise noted. Maximum current into or out of pin must be ±600 µA.
2. Device pin is not at an output Low state.
3. There is no input protection diode from pin to V_{DD}.
4. This excludes XTAL1 and XTAL2.

Standard Test Conditions

The characteristics listed below apply for standard test conditions as noted. All voltages are referenced to Ground. Positive current flows into the referenced pin See Figure 7.

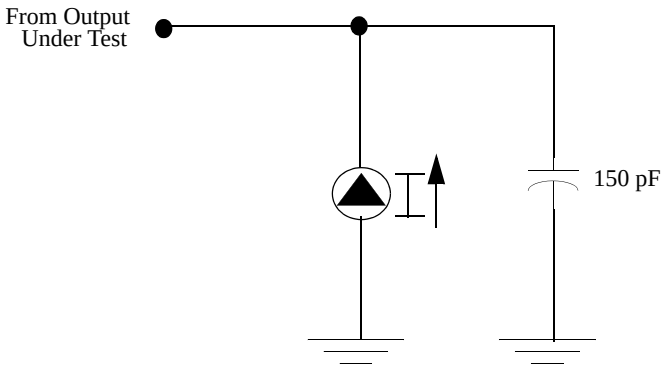


Figure 7. Test Load Diagram

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 8. DC Characteristics, Standard Temperature Range (Continued)

TA = 0°C to +70°C								
Sym	**Parameter**	**V_{CC}**	**Min**	**Max**	**Typical @ 25°C[1]**	**Units**	**Conditions**	**Notes**
I_{ALH}	Auto Latch High Current	3.5V	-8.0		-1.5	µA	$0V < V_{IN} < V_{CC}$	9
		5.5V	-16.0		-8.0	µA	$0V < V_{IN} < V_{CC}$	9

1. Typical values are read at a V_{CC} of 5.0V and V_{CC} of 3.5V.
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-M pull-up resistor is required in the circuit between the X_{IN} pin to the V_{CC} pin.
9. Auto latches are enabled.
10. Low EMI Mode (not Standard Mode)

Extended Temperature Range

Table 9 provides Direct Current characteristics for the Z86E02 SL1925 microcontroller, at an extended ambient temperature range of -40°C to 105°C.

Table 9. DC Characteristics, Extended Temperature Range

			TA = -40°C to +105°C					
Sym	**Parameter**	**V_{CC}**	**Min**	**Max**	**Typical @ 25°C[1]**	**Units**	**Conditions**	**Notes**
V_{INMAX}	Max Input Voltage	4.5V		12.0		V	$I_{IN} < 250$ µA	2
		5.5V		12.0		V	$I_{IN} < 250$ µA	2
V_{CH}	Clock Input High Voltage	4.5V	0.8 V_{CC}	V_{CC}+0.3	2.8	V	Driven by External Clock Generator	
		5.5V	0.8 V_{CC}	V_{CC}+0.3	2.8	V	Driven by External Clock Generator	
V_{CL}	Clock Input Low Voltage	4.5V	V_{SS}-0.3	0.2 V_{CC}	1.7	V	Driven by External Clock Generator	
		5.5V	V_{SS}-0.3	0.2 V_{CC}	1.7	V	Driven by External Clock Generator	

Table 10. AC Electrical Characteristics, 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)

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.

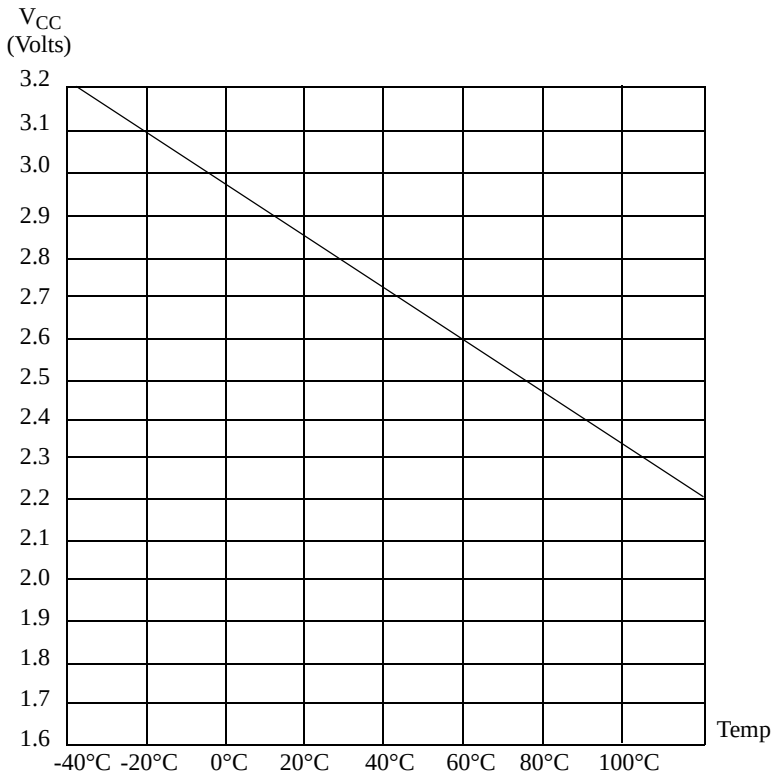


Figure 19. Typical Auto Reset Voltage (V_{LV}) vs. Temperature

OTP Option Bit Description

One-Time Programmable EPROM option bits for the device are described in this section. The Z86E02 SL1925 must be power-cycled to fully implement the selected option after programming.

Low-EMI Emission. The Low EMI option bit, when programmed, enables the Z8 to operate in a low-EMI emission (low-noise) mode. Use of this feature results in:

- All pre-driver slew rates are typically reduced to 10 ns
- Internal SCLK /TCLK operation limited to a maximum of 4 MHz–250 ns cycle time
- Output drivers typically exhibit resistances of 200 ohms
- Oscillator divide-by-two circuitry eliminated

RC Oscillator. The RC Oscillator option bit, when programmed, enables the internal RC oscillator to connect to the XTAL2 and XTAL1 pins while disabling the internal crystal oscillator to XTAL2 and XTAL1.

Table 19. Prescaler 1 Register, R243 PRE1 F3h Bank 0h: WRITE ONLY

Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	X	X	X	X	X	X	X	X
Note: R = Read, W = Write, X = Indeterminate								

Bit Position	Bit Field	R/W	Reset Value	Description
7-2	Prescaler	W	X	**Prescaler Modulo** Range = 1-64 decimal; 01h-00h
1	Clock	W	0	**Clock Source** 0: T1 External Timing Input (T_{IN}) Mode 1: Internal
0	Count	W	0	**TI Count Mode** 0: Single Pass 1: Modulo N

Table 20. Port 2 Mode Register, R246 P2M F6h Bank 0h: WRITE ONLY

Bit	7	6	5	4	3	2	1	0
R/W	W	W	W	W	W	W	W	W
Reset	1	1	1	1	1	1	1	1
Note: W = Write,								

Bit Position	Bit Field	R/W	Reset Value	Description
7-0	P20-P27	W	1	**P20-P27 I/O Definition** 0: Defines bit as Output 1: Defines bit as Input

Table 23. Interrupt Priority Register, R249 IPR F9h Bank 0h: WRITE ONLY

Bit	7	6	5	4	3	2	1	0
R/W	W	W	W	W	W	W	W	W
Reset	X	X	X	X	X	X	X	X

Note: W = Write, X = Indeterminate

Bit Position	Bit Field	R/W	Reset Value	Description
7-6	Reserved	W	X	Reserved-must be 0
5	IRQ3, IRQ5	W	X	**IRQ3, IRQ5 Priority (Group A)** 0: IRQ5 > IRQ3 1: IRQ3 < IRQ5
4, 3, 0	Interrupt	W	X	**Interrupt Group Priority** 000: Reserved* 001: C>A>B 010: A>B>C 011: A>C>B 100: B>C>A 101: C>B>A 110: B>A>C 111: Reserved
2	IRQ0, IRQ2	W	X	**IRQ0, IRQ2 Priority (Group B)** 0: IRQ2 > IRQ0 1: IRQ0 < IRQ2
1	IRQ1, IRQ4	W	X	**IRQ1, IRQ4 Priority (Group C)** 0: IRQ1 > IRQ4 1: IRQ4 < IRQ1

Note: *Selecting a Reserved mode causes an undefined operation.

Table 24. Interrupt Request Register, R250 IPR FAh Bank 0h: READ/WRITE

Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0
Note: R = Read, W = Write								

Bit Position	Bit Field	R/W	Reset Value	Description
7-6	Reserved	R/W	00	Reserved-must be 0
5	IRQ5	R/W	0	**Interrupt** IRQ5 = T1 0: No interrupt pending 1: Interrupt pending
4	IRQ4	R/W	**0**	**Interrupt** RQ4 = Software generated 0: No interrupt pending 1: Interrupt pending
3	IRQ3	R/W	**0**	**Interrupt** RQ3 = P32 Input (rising edge) 0: No interrupt pending 1: Interrupt pending
2	IRQ2	R/W	**0**	**Interrupt** RQ2 = P31 Input 0: No interrupt pending 1: Interrupt pending
1	IRQ1,	R/W	**0**	**Interrupt** RQ1 = P33 Input 0: No interrupt pending 1: Interrupt pending
0	IRQ0	R/W	**0**	**Interrupt** RQ0 = P32 Input 0: No interrupt pending 1: Interrupt pending
Note: *Selecting a Reserved mode causes an undefined operation.				

Table 25. Interrupt Mask Register, R251 IMR FBh Bank 0h: READ/WRITE

Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0
Note: R = Read, W = Write								

Bit Position	Bit Field	R/W	Reset Value	Description
7	Master Interrupt Enable	R/W	0	0: Disables global interrupts* 1: Enables global interrupts*
6	Reserved	R/W	X	Reserved-must be 0
5-0	IRQ0-IRQ5	R/W	X	1: Enables IRQ0-IRQ5 (D0 = IRQ0)
Note: *Must use Ei/Di instruction to set/reset this bit.				

Table 26. Flag Register, R252 FCh Bank 0h: READ/WRITE

Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	X	X	X	X	X	X	X
Note: R = Read, X= Indeterminate								

Bit Position	Bit Field	R/W	Reset Value	Description
7	Carry	R/W	X	Carry Flag
6	Zero	R/W	X	Zero Flag
5	Sign	R/W	X	Sign Flag
4	Overflow	R/W	X	Overflow Flag
3	Decimal Adjust	R/W	X	Decimal Adjust Flag
2	Half Carry	R/W	X	Half Carry Flag
1	User	R/W	X	User Flag F2*
0	User	R/W	X	User Flag F1*
Note: *Not affected by RESET.				

Table 27. Register Pointer, R253 RP FDh Bank 0h: READ/WRITE

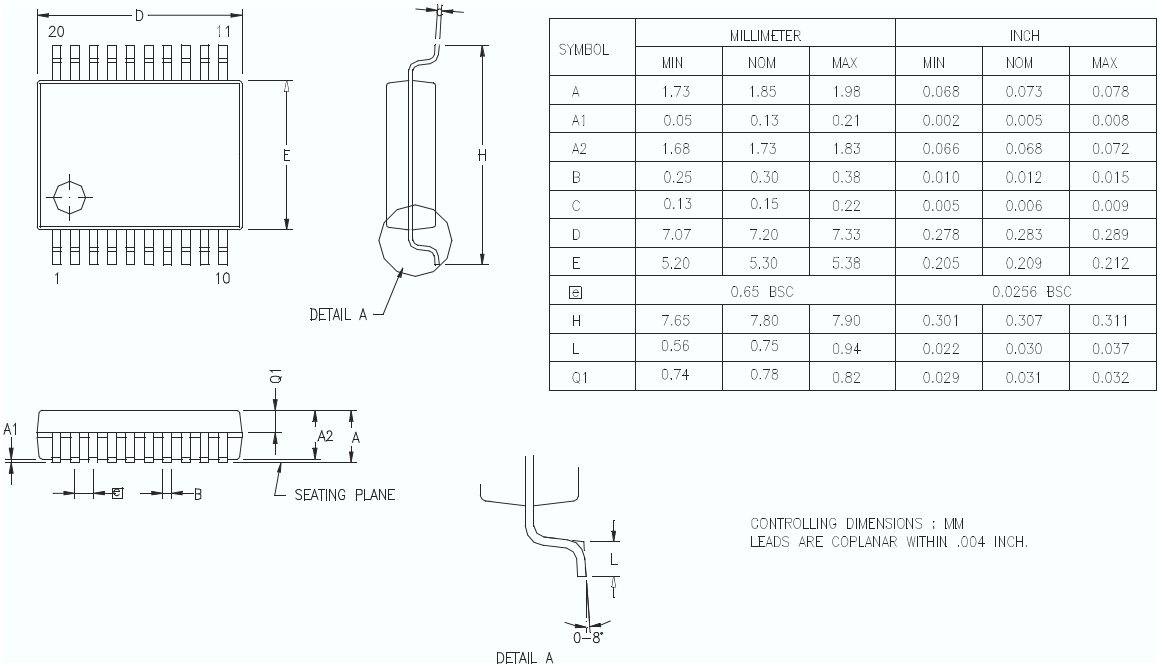
Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0
Note: R = Read, W= Write								

Bit Position	Bit Field	R/W	Reset Value	Description
7-4	Working Register Pointer	R/W	0	Working Register Pointer
3-0	Reserved	R/W	X	Reserved-must be 0

Table 28. General-Purpose Register, R254 GPR FEh Bank 0h: READ/WRITE

Bit	7	6	5	4	3	2	1	0
R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0
Note: R = Read, W= Write								

Bit Position	Bit Field	R/W	Reset Value	Description
7-0	Stack	R/W	0	General-Purpose Register



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

Figure 22. 20-Pin SSOP Package Diagram

Ordering Information

Table 30. Ordering Information

Pin Count	Package	Size (KB)	Description
18	DIP	0.5	Z86E0208PSC1925
			Z86E0208PEC1925
	SOIC	0.5	Z86E0208SSC1925
			Z86E0208SEC1925
20	SSOP	0.5	Z86E0208HSC1925
			Z86E0208HEC1925

Note: The Standard temperature range is 0°C to 70°C. For parts that operate in the Extended temperature range of -40°C to 105°C, substitute the letter E for the letter S. For example, the PSI number for an 18-pin DIP operating at 8 MHz in the extended temperature range is Z86E0208PEC

For fast results, contact your local ZiLOG Sales offices for assistance in ordering the part(s) required. Contact your local ZiLOG Sales office by navigating to Sales Office on

Part Number Description

ZiLOG part numbers consist of a number of components. For example, part number Z86E0208PSC1925 is a 8-MHz 18-pin DIP that operates in the -0°C to +70°C temperature range, with Plastic Standard Flow. The Z86E0208PSC1925 part number corresponds to the code segments indicated in the following table.

Z	ZiLOG Prefix
86	Z8 Product
E	OTP Product
02	Product Number
08	Speed (MHz)
P	Dual In-line Processor
S	Standard Temperature
C	Environmental Flow

Document Information

Document Number Description

The Document Control Number that appears in the footer of each page of this document contains unique identifying attributes, as indicated in the following table:

PS	Product Specification
0148	Unique Document Number
02	Revision Number
0903	Month and Year Published