Z86317

CMOS Z8® 8-BIT MICROCONTROLLER

FEATURES

Part Number	ROM (KB)	RAM* (Bytes)	Speed (MHz)	I/O	Package (18-Pin)
Z86317	2	124	4	13	DIP, SOIC

*General Purpose

- 4.5- to 5.5-Volt Operating Range
- 0°C to + 40°C Operating Temperature Range
- Low-Power Consumption: 33 mW (Typical)
- P24-P27 Can be Configured as a Voltage Divider During Input Mode
- On-Chip Precision RC Oscillator (Tolerance = ± 10%)
- Fast Instruction Pointer: 1.5 µs @ 4 MHz
- ESD Protection Circuitry
- Hardwired Watch-Dog Timer (WDT)

GENERAL DESCRIPTION

The Z86317 is a member of the Z8® family of CMOS microcontrollers architected to be used in mouse applications. These devices offer on-board pull-up and pull-down resistors, a scalable trip-point buffer to accommodate opto-transistor outputs, and high drive ports capable of up to 10 mA current sinking per pin (six pins maximum).

A permanently enabled Watch-Dog Timer ensures operational reliability across a broad range of mouse application environments. The precision RC oscillator filters out high-frequency noise from the oscillator input pin. When configured as inputs, P24-P27 are configured as voltage divider (25K pull-up / 7.5K pull-down). The input levels are adjusted for connection to the emitters of the opto-transistors and switch at a voltage level of 0.4 $V_{DD.}$

For applications requiring powerful I/O capabilities, the Z86317 provides dedicated input and output lines that are grouped into three ports. There are two basic address spaces available to support this configuration: Program Memory, and 124 bytes of general-purpose registers.

The Z86317 device provides two on-chip 8-bit programmable counter/timers with a large number of user-selectable modes. Each counter/timer is driven by its own 6-bit programmable prescaler. The Z86317 counter/timers offload system real-time tasks such as counting/timing and input/output data communications for increased system efficiency.

Notes:
All Signals with a preceding front slash, "/", are active Low, e.g.; B//W (WORD is active Low); /B/W (BYTE is active Low, only).

Power connections follow conventional descriptions below:

Connection	Circuit	Device
Power	V_{CC}	V_{DD}
Ground	GND	V_{SS}

GENERAL DESCRIPTION (Continued)

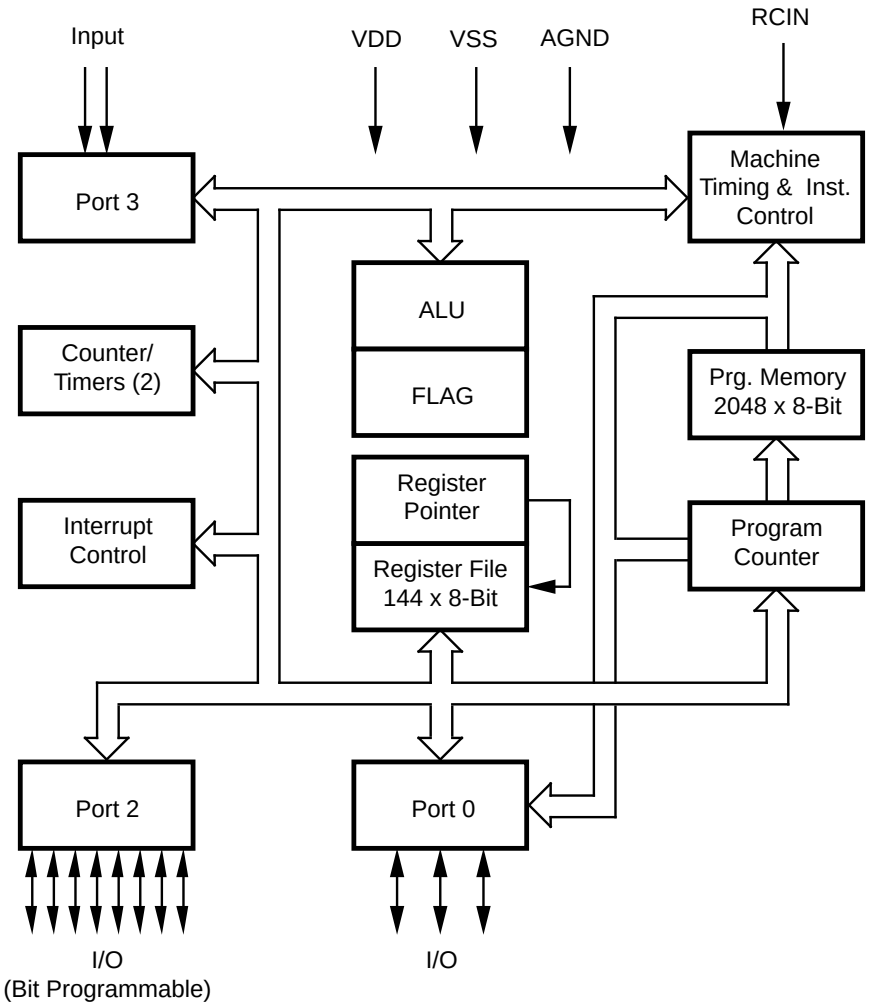


Figure 1. Z86317 Functional Block Diagram

PIN DESCRIPTIONS

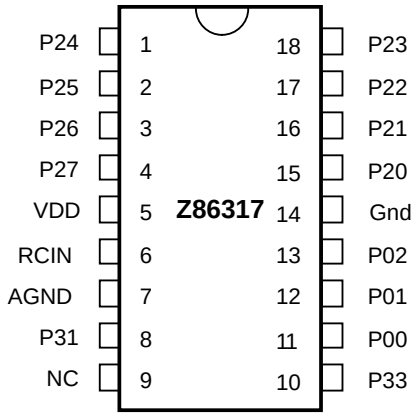


Figure 2. 18-Pin DIP/SOIC Pin Configuration

Table 1. 18-Pin DIP/SOIC Pin Identification

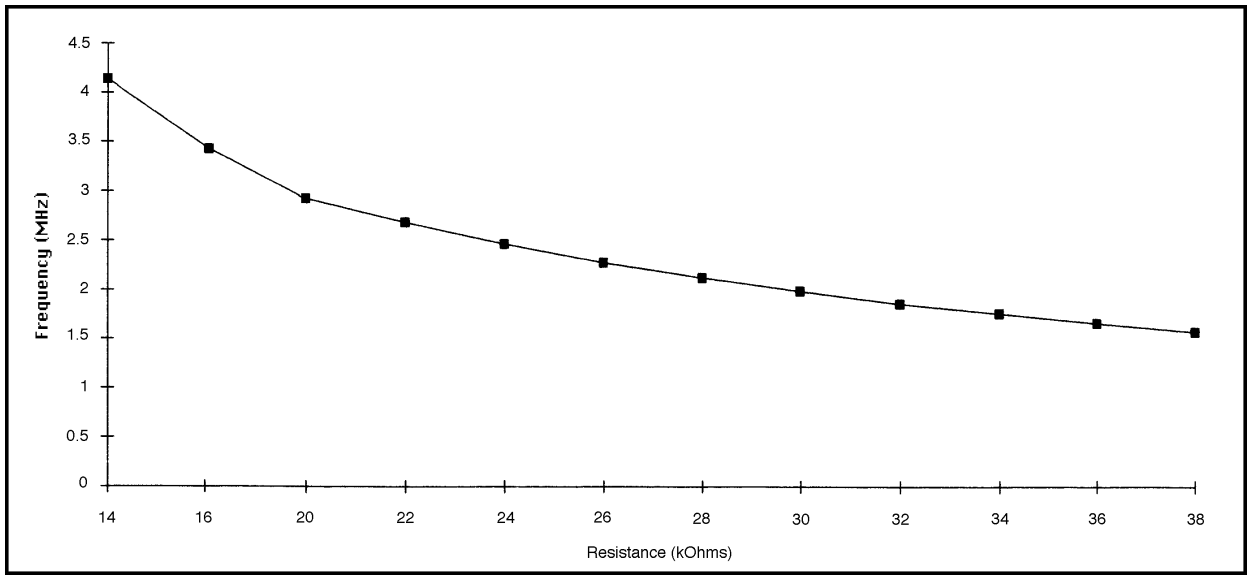
Pin #	Symbol	Function	Direction
1-4	P24-P27	Port 2, Pins 4,5,6,7	In/Output
5	V_{DD}	Power Supply	Input
6	RCIN	RC Oscillator	Input
7	AGND	Analog Ground	Input
8	P31	Port 3, Pin 1	Input
9	NC	Not Connected	
10	P33	Port 3, Pin 3,	Input
11-13	P00-P02	Port 0, Pins 0,1,2	In/Output
14	V_{SS}	Ground	Input
15-18	P20-P23	Port 2, Pins 0,1,2,3	In/Output

PIN FUNCTIONS

RCIN. A precision 1% resistor is connected to RCIN, generating oscillation with an internal capacitor. Resistor values and corresponding frequencies are shown in the following table and graph chart.

Table 2. Z86317 RC Frequency vs. External Precision Resistor

External Resistor	Average Frequency	External Resistor	Average Frequency
14K	4.140 MHz	28K	2.121 MHz
16K	3.627 MHz	30K	1.982 MHz
20K	2.925 MHz	32K	1.856 MHz
22K	2.681 MHz	34K	1.755 MHz
24K	2.462 MHz	36K	1.657 MHz
26K	2.273 MHz	38K	1.568 MHz



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 (Figure 3).

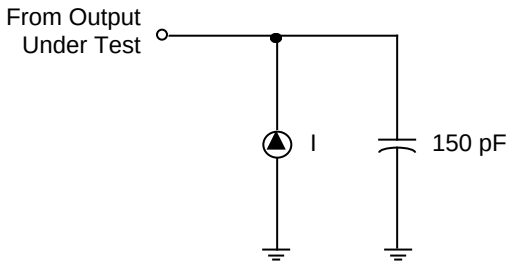


Figure 3. Test Load Diagram

ABSOLUTE MAXIMUM RATINGS

Sym	Parameter	Min	Max	Units
V_{DD}	Supply Voltage*	–0.3	+7	V
T_{STG}	Storage Temp	–65°	+150°	C
T_A	Oper Ambient Temp	†	†	C

Notes:
* Voltages on all pins with respect to Ground.
† See Ordering Information.

Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; 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 extended periods may affect device reliability.

CAPACITANCE

T_A = GND = 0V, f = 1.0 MHz, unmeasured pins returned to Ground.

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

V_{CC} SPECIFICATION

V_{CC} = 4.5V to 5.5V

When using the precision RC oscillator feature
f = 4.0 MHz ±10% under the following conditions:

- V_{CC} = 5.0V ± 10%
- Temp 0 to 40°C
- Application board capacitance: 2.0 pF max.
  0.5 pF min.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{DD}	T_A = 0°C to +40°C Min	Max	Typical @ 25°C	Units	Conditions
V_{CH}	Clock Input High Voltage	5.5V	0.7 V_{DD}	V_{DD} + 0.3	3.0	V	Driven by External Clock Generator
V_{CL}	Clock Input Low Voltage	5.5V	V_{SS} – 0.3	0.2 V_{DD}	1.5	V	Driven by External Clock Generator
V_{IH}	Input High Voltage Schmitt-Triggered	5.5V	0.7 V_{DD}	V_{DD} + 0.3	2.6	V	
V_{IH}	Input High Voltage CMOS Input	5.5V	0.7 V_{DD}	V_{DD} + 0.3	2.6	V	
V_{IL}	Input Low Voltage Schmitt-Triggered	5.5V	V_{SS} – 0.3	0.2 V_{DD}	1.5	V	
V_{IL}	Input Low Voltage CMOS Input	5.5V	V_{SS} – 0.3	0.2 V_{DD}	2.4	V	
V_{OH}	Output High Voltage	5.5V	V_{DD} – 0.4		5.5	V	I_{OH} = –2.0 mA
V_{OL1}	Output Low Voltage	5.5V		0.4	0.1	V	I_{OL} = +4.0 mA
V_{OL2}	Output Low Voltage	5.5V		0.8	0.3	V	I_{OL} = 10.0 mA, 6 Pin Max
V_{LV}	V_{CC} Low Voltage Protection		2.5	3	2.7	V	@ 2 MHz Max
V_{TP}	Trip Point Voltage	5.5V 4.5V	1.9 1.5	2.5 2.1	2.2 1.8	V V	P24-P27
I_{IL}	Input Leakage	5.5V	–1.0	1.0	0.4	µA	V_{IN} = 0V, V_{CC}
I_{OL}	Output Leakage	5.5V	–1.0	1.0	0.4	µA	V_{IN} = 0V, V_{CC}
I_{DD}	Supply Current	5.5V		3.0	1.44	mA	All Output and I/O Pins Floating @ 1 MHz
		5.5V		4.0	2.60	mA	All Output and I/O Pins Floating @ 2 MHz
		5.5V		6.0	4.28	mA	All Output and I/O Pins Floating @ 4 MHz
I_{DD1}	Standby Current	5.5V		1.3	0.70	mA	HALT mode V_{IN} = 0V, V_{CC} @ 1 MHz
		5.5V		1.5	0.80	mA	HALT mode V_{IN} = 0V, V_{CC} @ 2 MHz
		5.5V		2.0	1.0	mA	HALT mode V_{IN} = 0V, V_{CC} @ 4 MHz
I_{PU}	Pull-Up Current	4.5V	–20			µA	V_{IH} @ 3V
	P00-02	5.5		–85		µA	V_{IH} @ 4V
	P31, P33						
I_{PD}	Pull-Down Current	4.5V	+20			µA	V_{IL} @ 1V
	P00-02	5.5		+95		µA	V_{IL} @ 1V
	P31, P33						
I_{PU}	Pull-Up Current	4.5V	–450			µA	V_{IL} = 0V
	P20, P22	5.5		–85		µA	V_{IL} = 0V

Notes:
The device is functional to V_{LV} voltage. The minimum operational V_{DD} is determined by the value of the V_{LV} voltage at ambient temperature. The V_{LV} voltage increases as the temperature decreases.

AC ELECTRICAL CHARACTERISTICS
Timing Diagrams

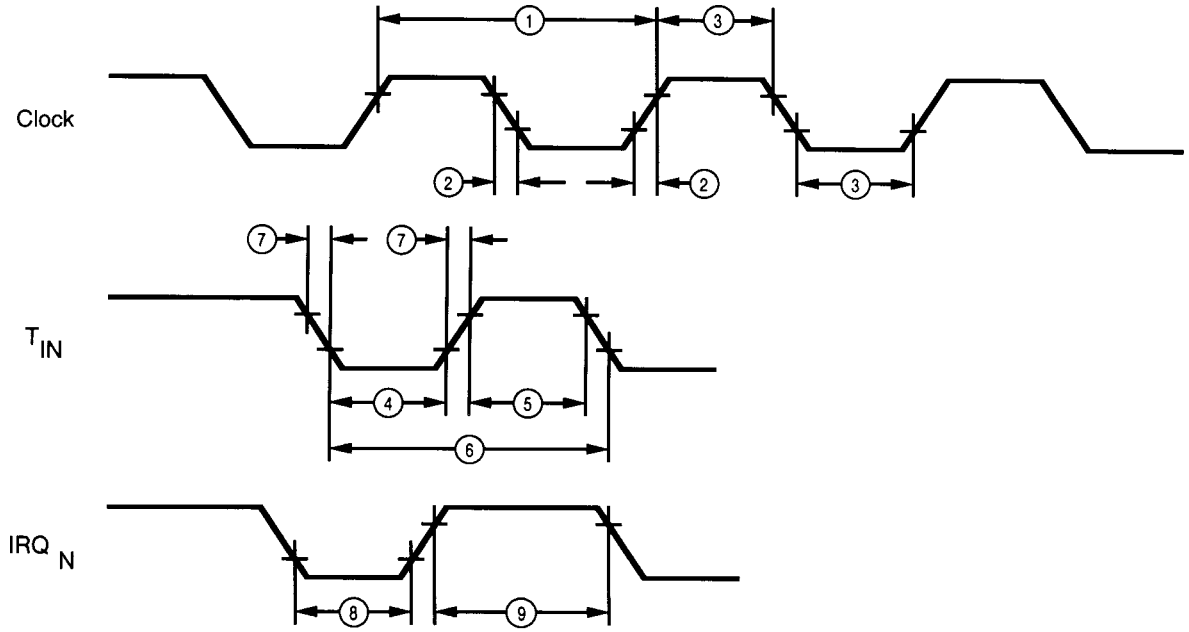


Figure 4. Electrical Timing Diagram

AC ELECTRICAL CHARACTERISTICS

				T_A = 0°C to +40°C					
				1 MHz		4 MHz			
No	Symbol	Parameter	V_{DD}	Min	Max	Min	Max	Units	Notes
1	TpC	Input Clock Period	5.5V	1,000	100,000	250	100,000	ns	[1]
2	TrC,TfC	Clock Input Rise and Fall Times	5.5V		25		25	ns	
3	TwC	Input Clock Width	5.5V		475		100	ns	[1]
4	TwTinL	Timer Input Low Width	5.5V		70		70	ns	[1]
5	TwTinH	Timer Input High Width	5.5V	2.5TpC		2.5TpC			[1]
6	TpTin	Timer Input Period	5.5V	4TpC		4TpC			[1]
7	TrTin, TtTin	Timer Input Rise and Fall Timer	5.5V		100		100	ns	[1]
8	TwIL	Int. Request Input Low Time	5.5V	70		70		ns	[1,2]
9	TwIH	Int. Request Input High Time	5.5V	2.5TpC		2.5TpC			[1,2]
10	Twdt	Watch-Dog Timer Time Out Timer	5.5V	10		10		ms	[1]
11	T_{POR}	Power-On Reset Time	5.5V	2		2		ms	[1]

Notes:
[1] Timing Reference uses 0.9 V_{DD} for a logic 1 and 0.1 V_{DD} for a logic 0.
[2] Interrupt request through Port 3 (P33-P31)

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