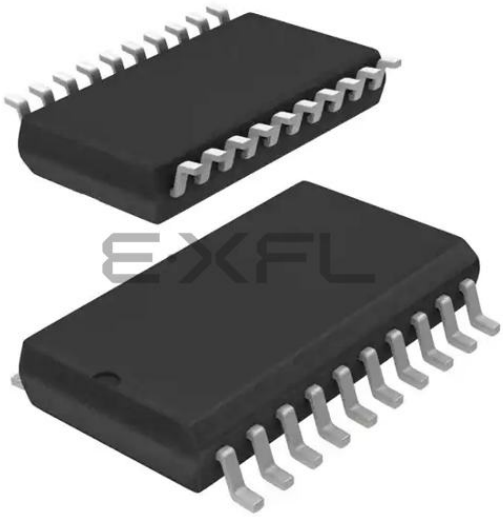

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Applications of "Embedded - Microcontrollers"

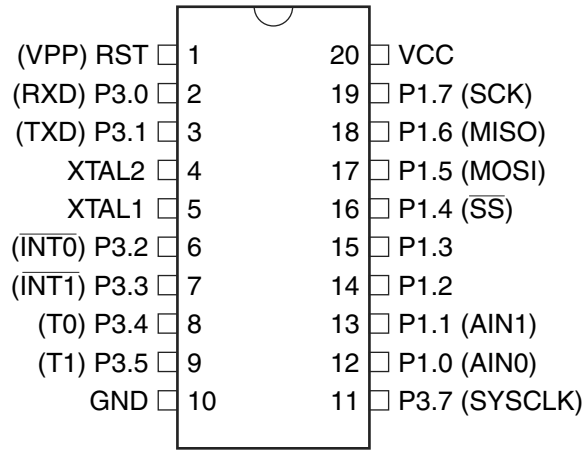
Details	
Product Status	Obsolete
Core Processor	8051
Core Size	8-Bit
Speed	16MHz
Connectivity	SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	15
Program Memory Size	4KB (4K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	256 x 8
Voltage - Supply (Vcc/Vdd)	2.4V ~ 5.5V
Data Converters	-
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	20-SOIC (0.295", 7.50mm Width)
Supplier Device Package	20-SOIC
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/at89lp4052-16si

The two timer/counters in the AT89LP2052/LP4052 are enhanced with two new modes. Mode 0 can be configured as a variable 9- to 16-bit timer/counter and Mode 1 can be configured as a 16-bit auto-reload timer/counter. In addition both timer/counters may be configured as 8-bit Pulse Width Modulators with 8-bit prescalers.

The I/O ports of the AT89LP2052/LP4052 can be independently configured in one of four operating modes. In quasi-bidirectional mode, the ports operate as in the classic 8051. In input mode, the ports are tri-stated. Push-pull output mode provides full CMOS drivers and open-drain mode provides just a pull-down.

2. Pin Configuration

2.1 20-lead PDIP/SOIC/TSSOP



3. Pin Description

Pin	Symbol	Type	Description
1	RST	I I	**RST**: External **Active-High** Reset input. **VPP**: Parallel Programming Voltage. Raise to 12V to enable programming.
2	P3.0	I/O I	**P3.0**: User-configurable I/O Port 3 bit 0. **RXD**: Serial Port Receiver input.
3	P3.1	I/O O	**P3.1**: User-configurable I/O Port 3 bit 1. **TXD**: Serial Port Transmitter output.
4	XTAL2	O	**XTAL2**: Output from inverting oscillator amplifier.
5	XTAL1	I	**XTAL1**: Input to the inverting oscillator amplifier and internal clock generation circuits.
6	P3.2	I/O I	**P3.2**: User-configurable I/O Port 3 bit 2. **INT0**: External Interrupt 0 input.
7	P3.3	I/O I	**P3.3**: User-configurable I/O Port 3 bit 3. **INT1**: External Interrupt 1input.
8	P3.4	I/O I/O	**P3.4**: User-configurable I/O Port 3 bit 4. **T0**: Timer 0 Counter input or PWM output
9	P3.5	I/O I/O	**P3.5**: User-configurable I/O Port 3 bit 5. **T1**: Timer 1 Counter input or PWM output
10	GND	I	Ground
11	P3.7	I/O O	**P3.7**: User-configurable I/O Port 3 bit 7. **SYSCLK**: System Clock Output when System Clock Fuse is enabled.
12	P1.0	I/O I	**P1.0**: User-configurable I/O Port 1 bit 0. **AIN0**: Analog Comparator Positive input.
13	P1.1	I/O I	**P1.1**: User-configurable I/O Port 1 bit 1. **AIN1**: Analog Comparator Negative input.
14	P1.2	I/O	**P1.2**: User-configurable I/O Port 1 bit 2.
15	P1.3	I/O	**P1.3**: User-configurable I/O Port 1 bit 3
16	P1.4	I/O I	**P1.4**: User-configurable I/O Port 1 bit 4. $\overline{\textbf{SS}}$: SPI slave select.
17	P1.5	I/O I/O	**P1.5**: User-configurable I/O Port 1 bit 5. **MOSI**: SPI master-out/slave-in. When configured as master, this pin is an output. When configured as slave, this pin is an input.
18	P1.6	I/O I/O	**P1.6**: User-configurable I/O Port 1 bit 6. **MISO**: SPI master-in/slave-out. When configured as master, this pin is an input. When configured as slave, this pin is an output.
19	P1.7	I/O I/O	**P1.7**: User-configurable I/O Port 1 bit 7. **SCK**: SPI Clock. When configured as master, this pin is an output. When configured as slave, this pin is an input.
20	VCC	I	Supply Voltage

Figure 8-2. Single-cycle ALU Operation (Example: INC R0)

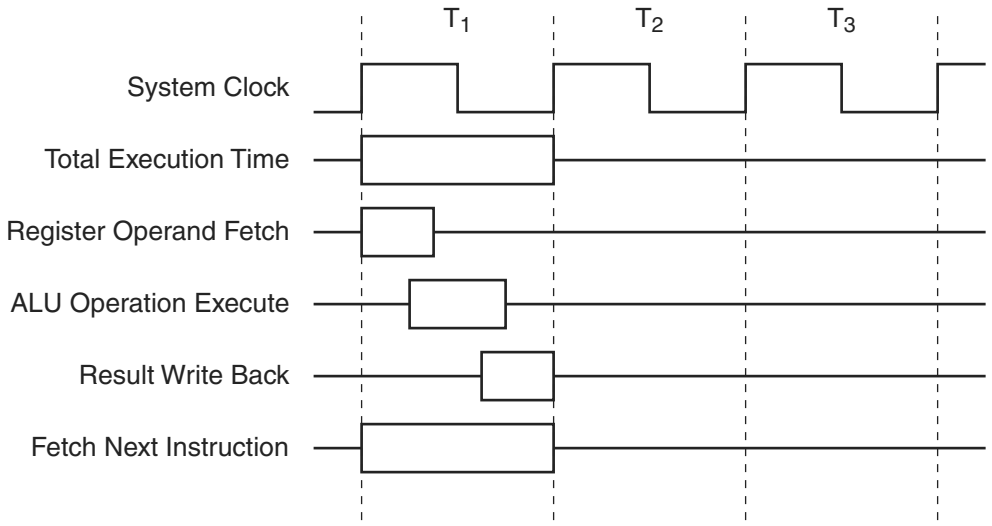
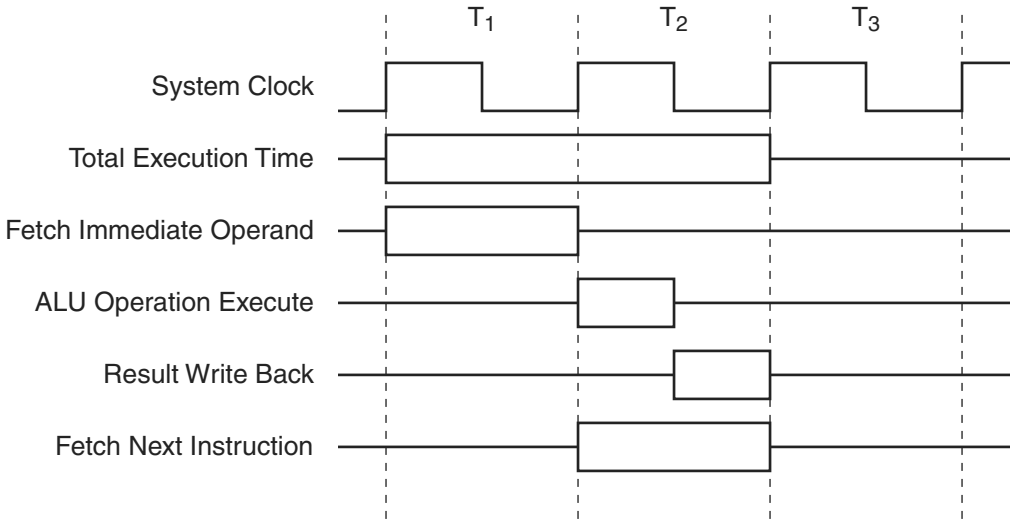


Figure 8-3. Two-Cycle ALU Operation (Example: ADD A, #data)



12. Reset

During reset, all I/O Registers are set to their initial values, the port pins are tri-stated, and the program starts execution from the Reset Vector, 0000H. The AT89LP2052/LP4052 has four sources of reset: power-on reset, brown-out reset, external reset, and watchdog reset.

12.1 Power-on Reset

A Power-on Reset (POR) is generated by an on-chip detection circuit. The detection level is nominally 1.4V. The POR is activated whenever V_{CC} is below the detection level. The POR circuit can be used to trigger the start-up reset or to detect a supply voltage failure in devices without a brown-out detector. The POR circuit ensures that the device is reset from power-on. When V_{CC} reaches the Power-on Reset threshold voltage, the POR delay counter determines how long the device is kept in POR after V_{CC} rise. The POR signal is activated again, without any delay, when V_{CC} falls below the POR threshold level. A Power-on Reset (i.e. a cold reset) will set the POF flag in PCON.

12.2 Brown-out Reset

The AT89LP2052/LP4052 has an on-chip Brown-out Detection (BOD) circuit for monitoring the V_{CC} level during operation by comparing it to a fixed trigger level. The trigger level for the BOD is nominally 2.2V. The purpose of the BOD is to ensure that if V_{CC} fails or dips while executing at speed, the system will gracefully enter reset without the possibility of errors induced by incorrect execution. When V_{CC} decreases to a value below the trigger level, the Brown-out Reset is immediately activated. When V_{CC} increases above the trigger level, the BOD delay counter starts the MCU after the time-out period has expired.

12.3 External Reset

The RST pin functions as an active-high reset input. The pin must be held high for at least two clock cycles to trigger the internal reset. RST also serves as the In-System Programming (ISP) enable. ISP is enabled when the external reset pin is held high and the ISP Enable fuse is enabled.

12.4 Watchdog Reset

When the Watchdog times out, it will generate an internal reset pulse lasting 16 clock cycles. Watchdog reset will also set the WDTOVF flag in WDTCON. To prevent a Watchdog reset, the watchdog reset sequence 1EH/E1H must be written to WDTRST before the Watchdog times out. A Watchdog reset will occur only if the Watchdog has been enabled. The Watchdog is disabled by default after any reset and must always be re-enabled if needed.

13. Power Saving Modes

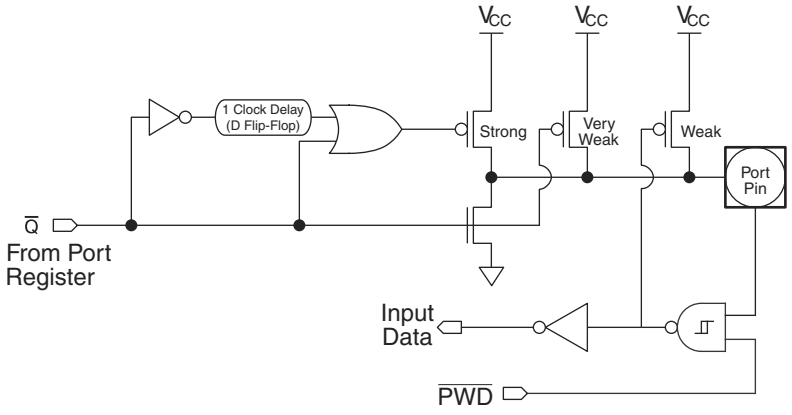
The AT89LP2052/LP4052 supports two different power-reducing modes: Idle and Power-down. These modes are accessed through the PCON register.

A second pull-up, called the “weak” pull-up, is turned on when the port register for the pin contains a logic “1” and the pin itself is also at a logic “1” level. This pull-up provides the primary source current for a quasi-bidirectional pin that is outputting a 1. If this pin is pulled low by an external device, this weak pull-up turns off, and only the very weak pull-up remains on. In order to pull the pin low under these conditions, the external device has to sink enough current to overpower the weak pull-up and pull the port pin below its input threshold voltage.

The third pull-up is referred to as the “strong” pull-up. This pull-up is used to speed up low-to-high transitions on a quasi-bidirectional port pin when the port register changes from a logic “0” to a logic “1”. When this occurs, the strong pull-up turns on for one CPU clock, quickly pulling the port pin high.

When in quasi-bidirectional mode the port pin will always output a “0” when corresponding bit in the port register is also “0”. When the port register is “1” the pin may be used either as an input or an output of “1”. The quasi-bidirectional port configuration is shown in Figure 15-1. The input circuitry of P3.2 and P3.3 is not disabled during Power-down (see Figure 15-3).

Figure 15-1. Quasi-bidirectional Output



15.2 Input-only Mode

The input port configuration is shown in Figure 15-2. It is a Schmitt-triggered input for improved input noise rejection.

Figure 15-2. Input Only

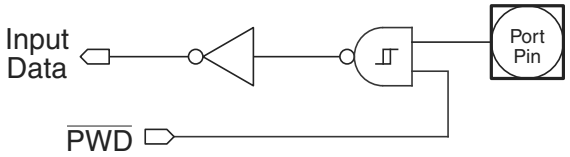


Figure 15-3. Input Only for P3.2 and P3.3

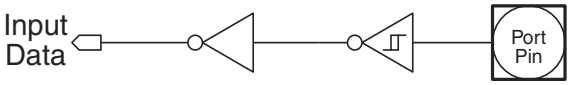


Table 15-4. Port Pin Alternate Functions

Port Pin	Configuration Bits		Alternate Function	Notes
	PxM0.y	PxM1.y		
P1.0	P1M0.0	P1M1.0	AIN0	Input-only
P1.1	P1M0.1	P1M1.1	AIN1	Input-only
P1.4	P1M0.4	P1M1.4	$\overline{SS}$	Refer to Section 19.4 “SPI Pin Configuration” on page 48
P1.5	P1M0.5	P1M1.5	MOSI	
P1.6	P1M0.6	P1M1.6	MISO	
P1.7	P1M0.7	P1M1.7	SCK	
P3.0	P3M0.0	P3M1.0	RXD	
P3.1	P3M0.1	P3M1.1	TXD	
P3.2	P3M0.2	P3M1.2	INT0	
P3.3	P3M0.3	P3M1.3	INT1	
P3.4	P3M0.4	P3M1.4	T0	Refer to Section 16.6 “Timer/Counter Pin Configuration” on page 30
P3.5	P3M0.5	P3M1.5	T1	
P3.6	Not configurable		CMPOUT	Pin is tied to comparator output

16. Enhanced Timer/Counters

The AT89LP2052/LP4052 has two 16-bit Timer/Counter registers: Timer 0 and Timer 1. As a Timer, the register is incremented every clock cycle. Thus, the register counts clock cycles. Since a clock cycle consists of one oscillator period, the count rate is equal to the oscillator frequency.

As a Counter, the register is incremented in response to a 1-to-0 transition at its corresponding input pin, T0 or T1. The external input is sampled every clock cycle. When the samples show a high in one cycle and a low in the next cycle, the count is incremented. The new count value appears in the register during the cycle following the one in which the transition was detected. Since 2 clock cycles are required to recognize a 1-to-0 transition, the maximum count rate is 1/2 of the oscillator frequency. There are no restrictions on the duty cycle of the input signal, but it should be held for at least one full clock cycle to ensure that a given level is sampled at least once before it changes.

Furthermore, the Timer or Counter functions for Timer 0 and Timer 1 have four operating modes: variable width timer/counter, 16 bit auto-reload timer/counter, 8 bit auto-reload timer/counter, and split timer/counter. The control bits C/$\overline{T}$ in the Special Function Register TMOD select the Timer or Counter function. The bit pairs (M1, M0) in TMOD select the operating modes.

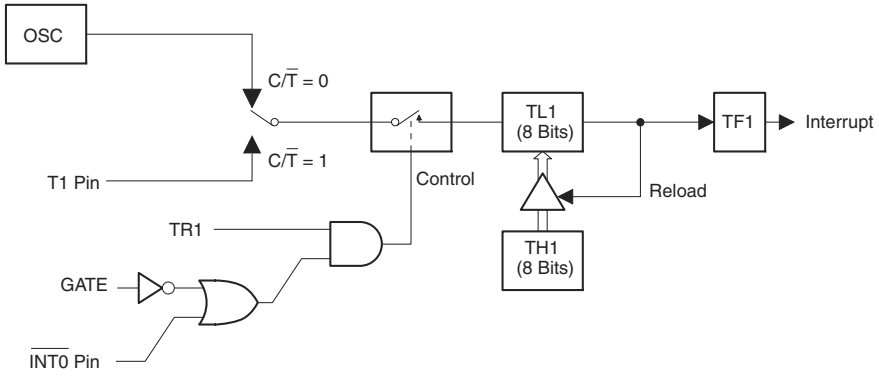
16.1 Mode 0

Both Timers in Mode 0 are 8-bit Counters with a variable prescaler. The prescaler may vary from 1 to 8 bits depending on the PSC bits in TCONB, giving the timer a range of 9 to 16 bits. By default the timer is configured as a 13-bit timer compatible to Mode 0 in the standard 8051. Figure 16-1 shows the Mode 0 operation as it applies to Timer 1 in 13-bit mode. As the count rolls over from all “1”s to all “0”s, it sets the Timer interrupt flag TF1. The counted input is enabled to the Timer when TR1 = 1 and either GATE = 0 or $\overline{INT1}$ = 1. Setting GATE = 1 allows the Timer to be controlled by external input $\overline{INT1}$, to facilitate pulse width measurements. TR1 is

16.3 Mode 2

Mode 2 configures the Timer register as an 8-bit Counter (TL1) with automatic reload, as shown in Figure 16-3. Overflow from TL1 not only sets TF1, but also reloads TL1 with the contents of TH1, which is preset by software. The reload leaves TH1 unchanged. Mode 2 operation is the same for Timer/Counter 0.

Figure 16-3. Timer/Counter 1 Mode 2: 8-bit Auto-Reload

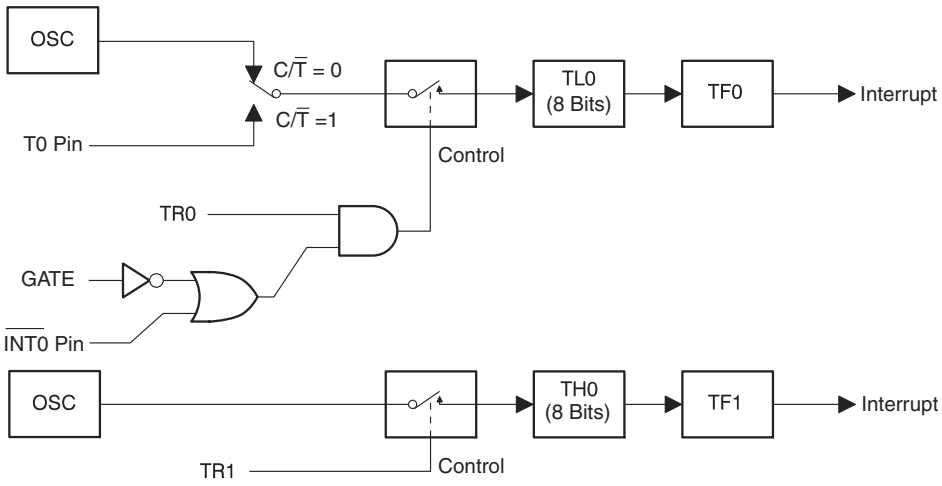


16.4 Mode 3

Timer 1 in Mode 3 simply holds its count. The effect is the same as setting TR1 = 0. Timer 0 in Mode 3 establishes TL0 and TH0 as two separate counters. The logic for Mode 3 on Timer 0 is shown in Figure 16-4. TL0 uses the Timer 0 control bits: C/T, GATE, TR0, INT0, and TF0. TH0 is locked into a timer function (counting machine cycles) and takes over the use of TR1 and TF1 from Timer 1. Thus, TH0 now controls the Timer 1 interrupt.

Mode 3 is for applications requiring an extra 8-bit timer or counter. With Timer 0 in Mode 3, the AT89LP2052/LP4052 can appear to have three Timer/Counters. When Timer 0 is in Mode 3, Timer 1 can be turned on and off by switching it out of and into its own Mode 3. In this case, Timer 1 can still be used by the serial port as a baud rate generator or in any application not requiring an interrupt.

Figure 16-4. Timer/Counter 0 Mode 3: Two 8-bit Counters



out an address byte that identifies the target slave. An address byte differs from a data byte in that the 9th bit is “1” in an address byte and “0” in a data byte. With SM2 = 1, no slave is interrupted by a data byte. An address byte, however, interrupts all slaves, so that each slave can examine the received byte and see if it is being addressed. The addressed slave clears its SM2 bit and prepares to receive the data bytes that follows. The slaves that are not addressed set their SM2 bits and ignore the data bytes.

The SM2 bit has no effect in Mode 0 but can be used to check the validity of the stop bit in Mode 1. In a Mode 1 reception, if SM2 = 1, the receive interrupt is not activated unless a valid stop bit is received.

Table 18-1. SCON – Serial Port Control Register

SCON Address = 98H — Reset Value = 0000 0000B

Bit Addressable

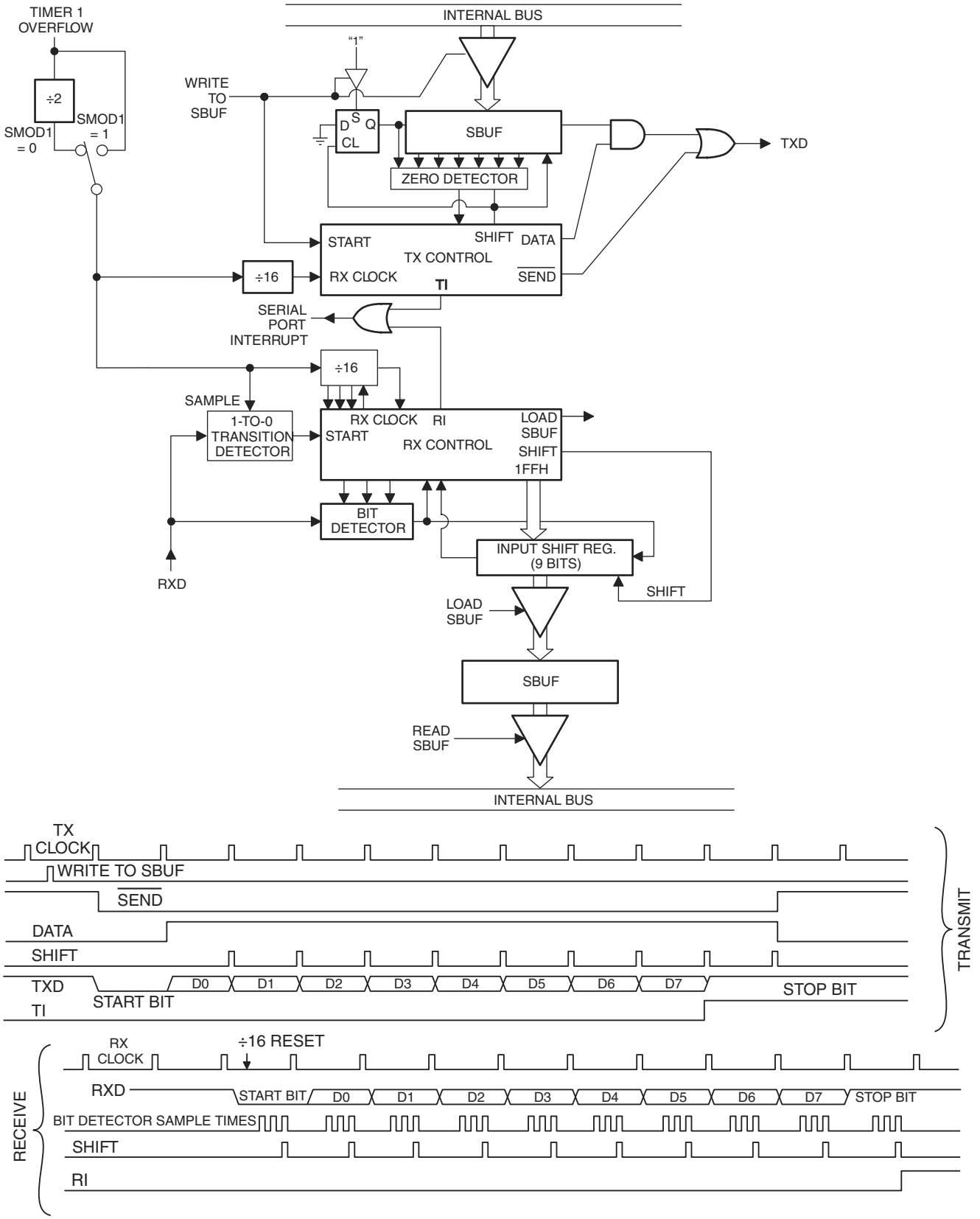
Bit	7	6	5	4	3	2	1	0
	SM0/FE	SM1	SM2	REN	TB8	RB8	T1	RI

(SMOD0 = 0/1)[1]

Symbol	Function
FE	Framing error bit. This bit is set by the receiver when an invalid stop bit is detected. The FE bit is not cleared by valid frames but should be cleared by software. The SMOD0 bit must be set to enable access to the FE bit. FE will be set regardless of the state of SMOD0.
SM0	Serial Port Mode Bit 0, (SMOD0 must = 0 to access bit SM0)
SM1	Serial Port Mode Bit 1 **SM0** **SM1** **Mode** **Description** **Baud Rate**[2] 0 0 0 shift register $f_{osc}/2$ 0 1 1 8-bit UART variable 1 0 2 9-bit UART $f_{osc}/32$ or $f_{osc}/16$ 1 1 3 9-bit UART variable
SM2	Enables the Automatic Address Recognition feature in Modes 2 or 3. If SM2 = 1 then RI will not be set unless the received 9th data bit (RB8) is 1, indicating an address, and the received byte is a Given or Broadcast Address. In Mode 1, if SM2 = 1 then RI will not be activated unless a valid stop bit was received, and the received byte is a Given or Broadcast Address. In Mode 0, SM2 should be 0.
REN	Enables serial reception. Set by software to enable reception. Clear by software to disable reception.
TB8	The 9th data bit that will be transmitted in Modes 2 and 3. Set or clear by software as desired.
RB8	In Modes 2 and 3, the 9th data bit that was received. In Mode 1, if SM2 = 0, RB8 is the stop bit that was received. In Mode 0, RB8 is not used.
TI	Transmit interrupt flag. Set by hardware at the end of the 8th bit time in Mode 0, or at the beginning of the stop bit in the other modes, in any serial transmission. Must be cleared by software.
RI	Receive interrupt flag. Set by hardware at the end of the 8th bit time in Mode 0, or halfway through the stop bit time in the other modes, in any serial reception (except see SM2). Must be cleared by software.

Notes: 1. SMOD0 is located at PCON.6.
2. f_{osc} = oscillator frequency.

Figure 18-2. Serial Port Mode 1



18.5 More About Modes 2 and 3

Eleven bits are transmitted (through TXD), or received (through RXD): a start bit (0), 8 data bits (LSB first), a programmable ninth data bit, and a stop bit (1). On transmit, the ninth data bit (TB8) can be assigned the value of “0” or “1”. On receive, the ninth data bit goes into RB8 in SCON. The baud rate is programmable to either 1/16 or 1/32 of the oscillator frequency in Mode 2. Mode 3 may have a variable baud rate generated from Timer 1.

Figures 18-3 and 18-4 show a functional diagram of the serial port in Modes 2 and 3. The receive portion is exactly the same as in Mode 1. The transmit portion differs from Mode 1 only in the ninth bit of the transmit shift register.

Transmission is initiated by any instruction that uses SBUF as a destination register. The “write to SBUF” signal also loads TB8 into the ninth bit position of the transmit shift register and flags the TX Control unit that a transmission is requested. Transmission commences at S1P1 of the machine cycle following the next rollover in the divide-by-16 counter. Thus, the bit times are synchronized to the divide-by-16 counter, not to the “write to SBUF” signal.

The transmission begins when $\overline{\text{SEND}}$ is activated, which puts the start bit at TXD. One bit time later, DATA is activated, which enables the output bit of the transmit shift register to TXD. The first shift pulse occurs one bit time after that. The first shift clocks a “1” (the stop bit) into the ninth bit position of the shift register. Thereafter, only “0”s are clocked in. Thus, as data bits shift out to the right, “0”s are clocked in from the left. When TB8 is at the output position of the shift register, then the stop bit is just to the left of TB8, and all positions to the left of that contain “0”s. This condition flags the TX Control unit to do one last shift, then deactivate SEND and set TI. This occurs at the 11th divide-by-16 rollover after “write to SBUF.”

Reception is initiated by a 1-to-0 transition detected at RXD. For this purpose, RXD is sampled at a rate of 16 times the established baud rate. When a transition is detected, the divide-by-16 counter is immediately reset, and 1FFH is written to the input shift register.

At the seventh, eighth and ninth counter states of each bit time, the bit detector samples the value of RXD. The value accepted is the value that was seen in at least 2 of the 3 samples. If the value accepted during the first bit time is not 0, the receive circuits are reset and the unit continues looking for another 1-to-0 transition. If the start bit proves valid, it is shifted into the input shift register, and reception of the rest of the frame proceeds.

As data bits come in from the right, “1”s shift out to the left. When the start bit arrives at the left most position in the shift register (which in Modes 2 and 3 is a 9-bit register), it flags the RX Control block to do one last shift, load SBUF and RB8, and set RI. The signal to load SBUF and RB8 and to set RI is generated if, and only if, the following conditions are met at the time the final shift pulse is generated:

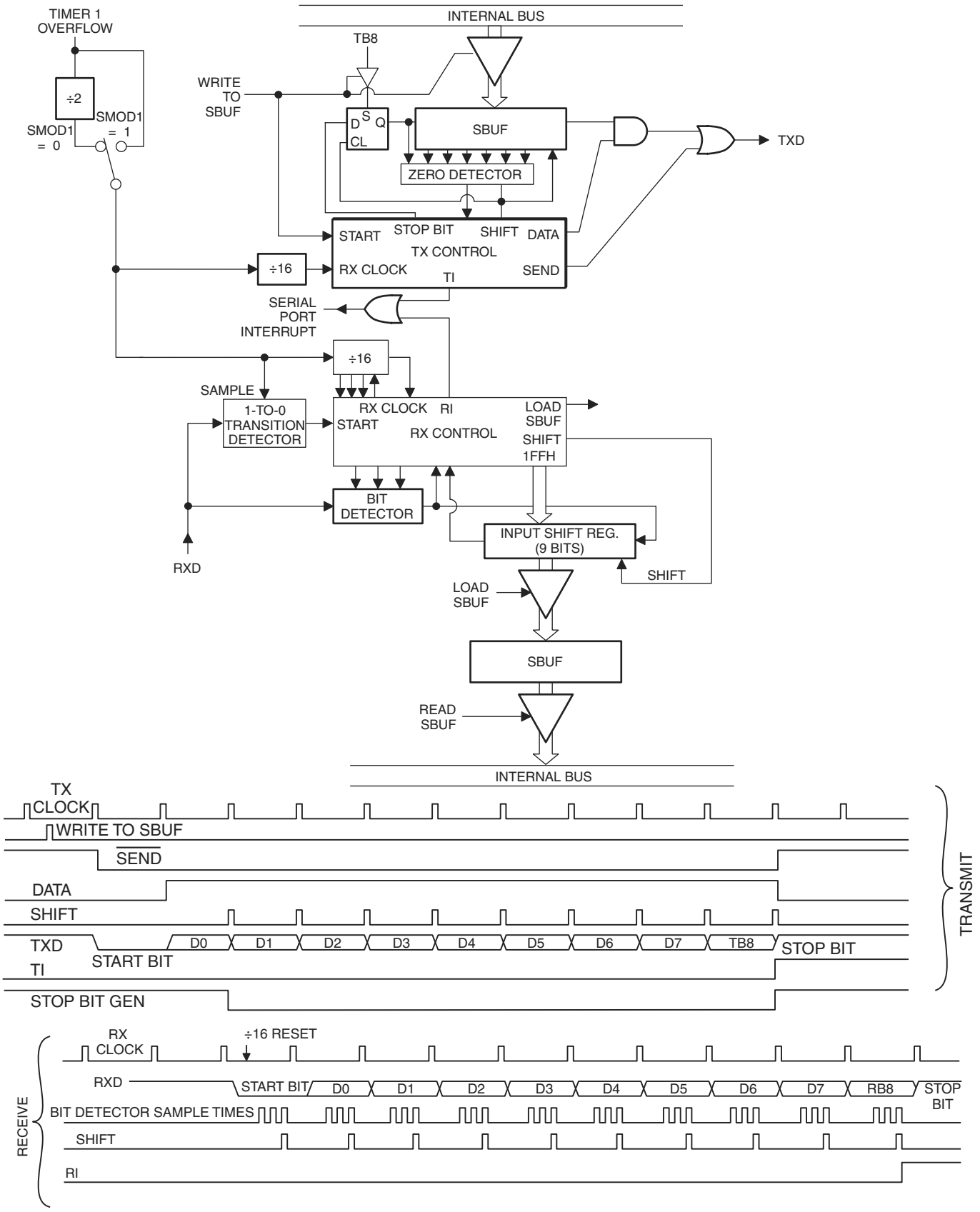
RI = 0, and

Either SM2 = 0 or the received 9th data bit = 1

If either of these conditions is not met, the received frame is irretrievably lost, and RI is not set. If both conditions are met, the received ninth data bit goes into RB8, and the first 8 data bits go into SBUF. One bit time later, whether the above conditions were met or not, the unit continues looking for a 1-to-0 transition at the RXD input.

Note that the value of the received stop bit is irrelevant to SBUF, RB8, or RI.

Figure 18-4. Serial Port Mode 3



In a more complex system the following could be used to select slaves 1 and 2 while excluding slave 0:

Slave 0 SADDR = 1100 0000

SADEN = 1111 1001

Given = 1100 0XX0

Slave 1 SADDR = 1110 0000

SADEN = 1111 1010

Given = 1110 0X0X

Slave 2 SADDR = 1110 0000

SADEN = 1111 1100

Given = 1110 00XX

In the above example the differentiation among the 3 slaves is in the lower 3 address bits. Slave 0 requires that bit 0 = 0 and it can be uniquely addressed by 1110 0110. Slave 1 requires that bit 1 = 0 and it can be uniquely addressed by 1110 and 0101. Slave 2 requires that bit 2 = 0 and its unique address is 1110 0011. To select Slaves 0 and 1 and exclude Slave 2, use address 1110 0100, since it is necessary to make bit 2 = 1 to exclude slave 2.

The Broadcast Address for each slave is created by taking the logic OR of SADDR and SADEN. Zeros in this result are treated as don't cares. In most cases, interpreting the don't cares as ones, the broadcast address will be FF hexadecimal.

Upon reset SADDR (SFR address 0A9H) and SADEN (SFR address 0B9H) are loaded with "0"s. This produces a given address of all "don't cares" as well as a Broadcast address of all "don't cares". This effectively disables the Automatic Addressing mode and allows the microcontroller to use standard 80C51-type UART drivers which do not make use of this feature.

19. Serial Peripheral Interface

The serial peripheral interface (SPI) allows high-speed synchronous data transfer between the AT89LP2052/LP4052 and peripheral devices or between multiple AT89LP2052/LP4052 devices. The AT89LP2052/LP4052 SPI features include the following:

- Full-duplex, 3-wire Synchronous Data Transfer
- Master or Slave Operation
- Maximum Bit Frequency = f/4
- LSB First or MSB First Data Transfer
- Four Programmable Bit Rates in Master Mode
- End of Transmission Interrupt Flag
- Write Collision Flag Protection
- Double-buffered Receive
- Double-buffered Transmit (Enhanced Mode Only)
- Wake up from Idle Mode (Slave Mode Only)

Table 19-2. SPSR – SPI Status Register

SPSR Address = AAH — Reset Value = 000X X000B

Not Bit Addressable

	SPIF	WCOL	LDEN	–	–	–	DISSO	ENH
Bit	7	6	5	4	3	2	1	0

Symbol	Function
SPIF	SP interrupt flag. When a serial transfer is complete, the SPIF bit is set and an interrupt is generated if SPIE = 1 and ES = 1. The SPIF bit is cleared by reading the SPI status register followed by reading/writing the SPI data register.
WCOL	When ENH = 0: Write collision flag. The WCOL bit is set if the SPI data register is written during a data transfer. During data transfer, the result of reading the SPDR register may be incorrect, and writing to it has no effect. The WCOL bit (and the SPIF bit) are cleared by reading the SPI status register followed by reading/writing the SPI data register. When ENH = 1: WCOL works in Enhanced mode as Tx Buffer Full. Writing during WCOL = 1 in enhanced mode will overwrite the waiting data already present in the Tx Buffer. In this mode, WCOL is no longer reset by the SPIF reset but is reset when the write buffer has been unloaded into the serial shift register.
LDEN	Load enable for the Tx buffer in enhanced SPI mode. When ENH is set, it is safe to load the Tx Buffer while LDEN = 1 and WCOL = 0. LDEN is high during bits 0 - 3 and is low during bits 4 - 7 of the SPI serial byte transmission time frame.
DISSO	Disable slave output bit. When set, this bit causes the MISO pin to be tri-stated so more than one slave device can share the same interface with a single master. Normally, the first byte in a transmission could be the slave address and only the selected slave should clear its DISSO bit.
ENH	Enhanced SPI mode select bit. When ENH = 0, SPI is in normal mode, i.e. without write double buffering. When ENH = 1, SPI is in enhanced mode with write double buffering. The Tx buffer shares the same address with the SPDR register.

Table 19-3. SPDR – SPI Data Register

SPDR Address = 86H — Reset Value = 00H (after cold reset), unchanged (after warm reset)

Not Bit Addressable

	SPD7	SPD6	SPD5	SPD4	SPD3	SPD2	SPD1	SPD0
Bit	7	6	5	4	3	2	1	0

Table 22-3. Detailed Logical Instruction Summary

Logical Instruction	Bytes	Clock Cycles		Hex Code
		8051	LP2052	
CLR A	1	12	1	E4
CPL A	1	12	1	F4
ANL A, Rn	1	12	1	58-5F
ANL A, direct	2	12	2	55
ANL A, @Ri	1	12	2	56-57
ANL A, #data	2	12	2	54
ANL direct, A	2	12	2	52
ANL direct, #data	3	24	3	53
ORL A, Rn	1	12	1	48-4F
ORL A, direct	2	12	2	45
ORL A, @Ri	1	12	2	46-47
ORL A, #data	2	12	2	44
ORL direct, A	2	12	2	42
ORL direct, #data	3	24	3	43
XRL A, Rn	1	12	1	68-6F
XRL A, direct	2	12	2	65
XRL A, @Ri	1	12	2	66-67
XRL A, #data	2	12	2	64
XRL direct, A	2	12	2	62
XRL direct, #data	3	24	3	63
RL A	1	12	1	23
RLC A	1	12	1	33
RR A	1	12	1	03
RRC A	1	12	1	13
SWAP A	1	12	1	C4

Figure 24-1. SPI Master Timing (CPHA = 0)

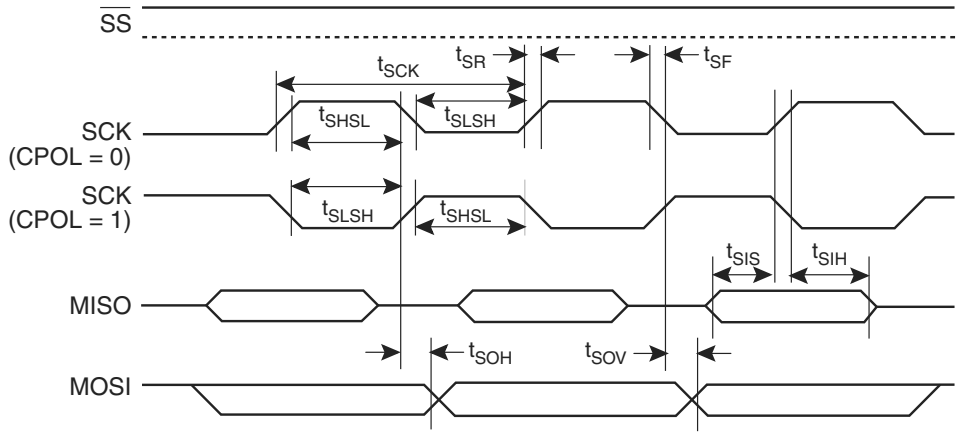


Figure 24-2. SPI Slave Timing (CPHA = 0)

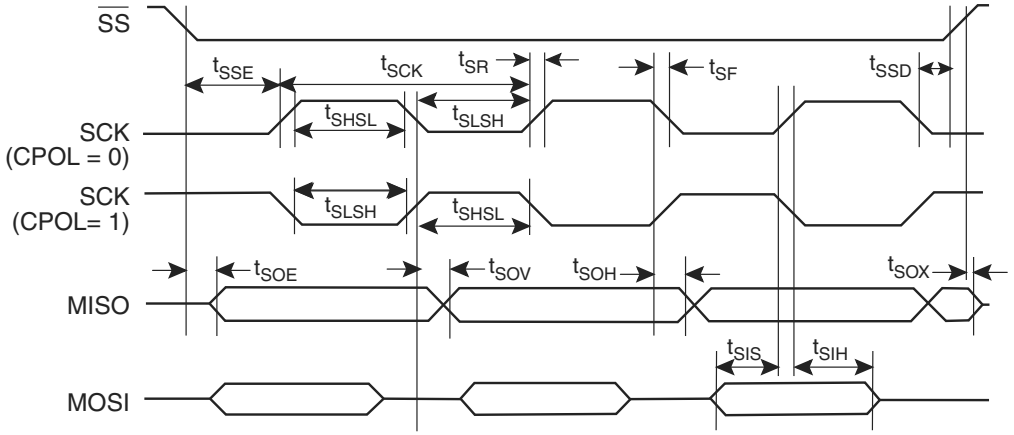
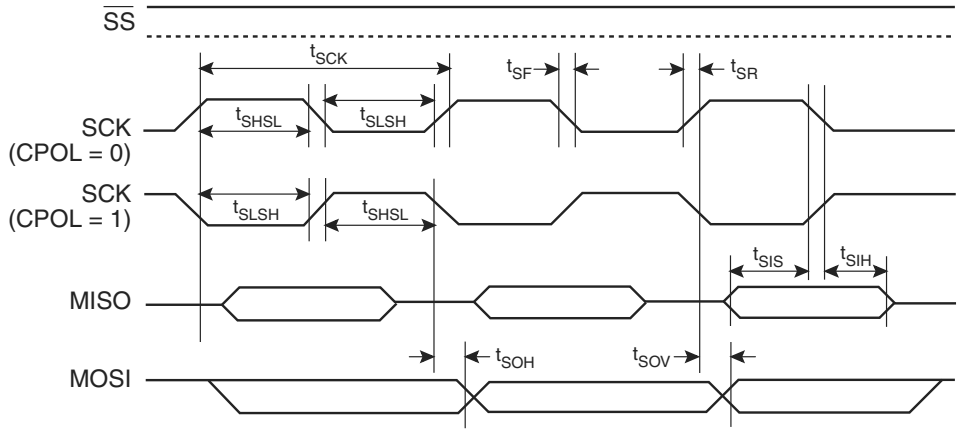
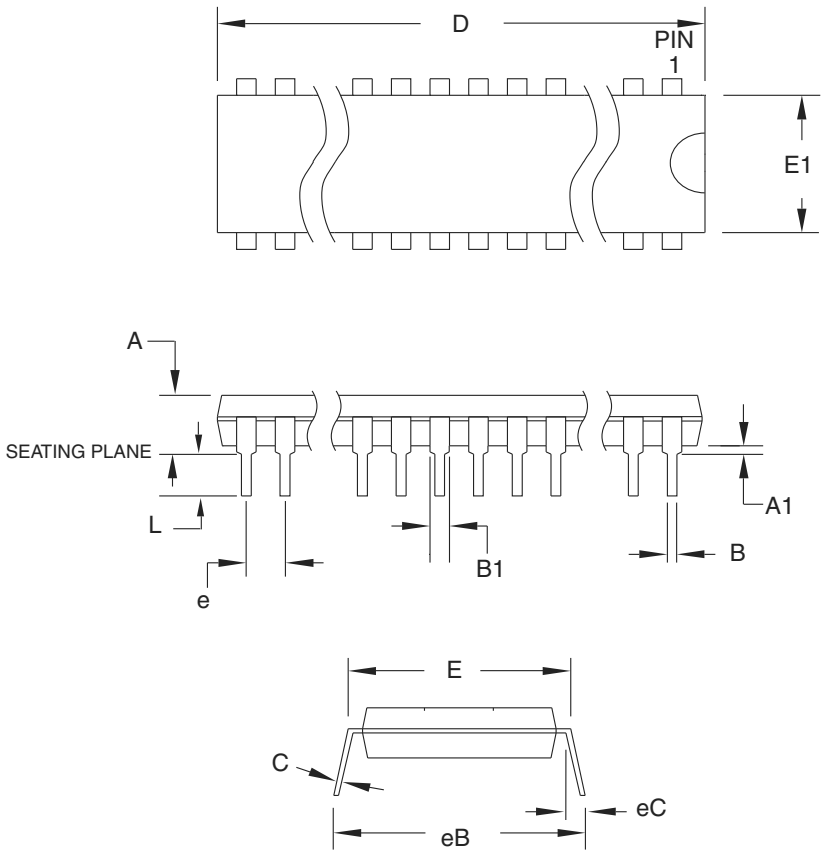


Figure 24-3. SPI Master Timing (CPHA = 1)



26. Packaging Information

26.1 20P3 – PDIP



COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	5.334	
A1	0.381	–	–	
D	24.892	–	26.924	Note 2
E	7.620	–	8.255	
E1	6.096	–	7.112	Note 2
B	0.356	–	0.559	
B1	1.270	–	1.551	
L	2.921	–	3.810	
C	0.203	–	0.356	
eB	–	–	10.922	
eC	0.000	–	1.524	
e	2.540 TYP			

Notes: 1. This package conforms to JEDEC reference MS-001, Variation AD.
2. Dimensions D and E1 do not include mold Flash or Protrusion. Mold Flash or Protrusion shall not exceed 0.25 mm (0.010").

1/23/04

	TITLE	DRAWING NO.	REV.
2325 Orchard Parkway San Jose, CA 95131	**20P3**, 20-lead (0.300"/7.62 mm Wide) Plastic Dual Inline Package (PDIP)	20P3	D

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