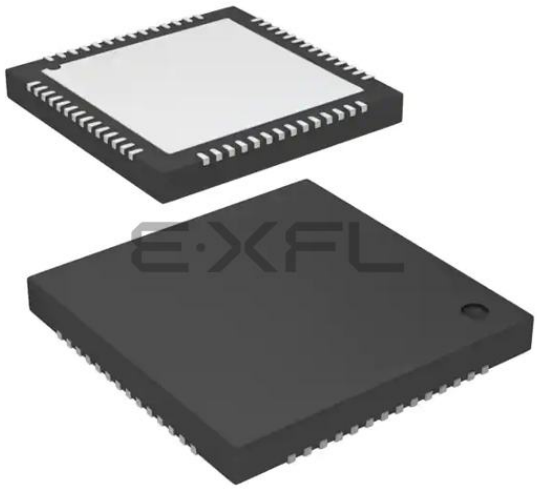

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Application-specific microcontrollers are engineered to

Details	
Product Status	Active
Applications	USB Microcontroller
Core Processor	8051
Program Memory Type	ROMless
Controller Series	CY7C680xx
RAM Size	16K x 8
Interface	I²C, USB, USART
Number of I/O	24
Voltage - Supply	3V ~ 3.6V
Operating Temperature	0°C ~ 70°C
Mounting Type	Surface Mount
Package / Case	56-VFQFN Exposed Pad
Supplier Device Package	56-QFN (8x8)
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/cy7c68013a-56ltxc

Contents

Applications

- Portable video recorder
- MPEG/TV conversion
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- ATA interface
- Memory card readers
- Legacy conversion devices
- Cameras
- Scanners
- Wireless LAN
- MP3 players
- Networking

The “Reference Designs” section of the Cypress web site provides additional tools for typical USB 2.0 applications. Each reference design comes complete with firmware source and object code, schematics, and documentation. Visit www.cypress.com for more information.

Functional Overview

USB Signaling Speed

FX2LP operates at two of the three rates defined in the USB Specification Revision 2.0, dated April 27, 2000:

- Full speed, with a signaling bit rate of 12 Mbps
- High speed, with a signaling bit rate of 480 Mbps

FX2LP does not support the Low Speed signaling mode of 1.5 Mbps.

8051 Microprocessor

The 8051 microprocessor embedded in the FX2LP family has 256 bytes of register RAM, an expanded interrupt system, three timer/counters, and two USARTs.

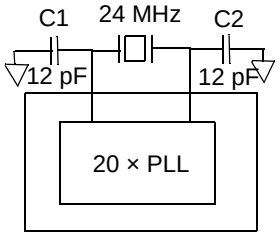
8051 Clock Frequency

FX2LP has an on-chip oscillator circuit that uses an external 24-MHz (±100 ppm) crystal with the following characteristics:

- Parallel resonant
- Fundamental mode
- 500-µW drive level
- 12-pF (5% tolerance) load capacitors

An on-chip PLL multiplies the 24-MHz oscillator up to 480 MHz, as required by the transceiver/PHY; internal counters divide it down for use as the 8051 clock. The default 8051 clock frequency is 12 MHz. The clock frequency of the 8051 can be changed by the 8051 through the CPUCS register, dynamically.

Figure 1. Crystal Configuration



12-pF capacitor values assume a trace capacitance of 3 pF per side on a four-layer FR4 PCA

The CLKOUT pin, which can be three-stated and inverted using internal control bits, outputs the 50% duty cycle 8051 clock, at the selected 8051 clock frequency: 48 MHz, 24 MHz, or 12 MHz.

USARTs

FX2LP contains two standard 8051 USARTs, addressed through Special Function Register (SFR) bits. The USART interface pins are available on separate I/O pins, and are not multiplexed with port pins.

UART0 and UART1 can operate using an internal clock at 230 KBaud with no more than 1% baud rate error. 230 KBaud operation is achieved by an internally derived clock source that generates overflow pulses at the appropriate time. The internal clock adjusts for the 8051 clock rate (48 MHz, 24 MHz, and 12 MHz) such that it always presents the correct frequency for the 230-KBaud operation.[1]

Special Function Registers

Certain 8051 SFR addresses are populated to provide fast access to critical FX2LP functions. These SFR additions are shown in Table 1 on page 6. Bold type indicates nonstandard, enhanced 8051 registers. The two SFR rows that end with “0” and “8” contain bit-addressable registers. The four I/O ports A to D use the SFR addresses used in the standard 8051 for ports 0 to 3, which are not implemented in FX2LP. Because of the faster and more efficient SFR addressing, the FX2LP I/O ports are not addressable in external RAM space (using the MOVX instruction).

I^2C Bus

FX2LP supports the I^2C bus as a master only at 100/400 kHz. SCL and SDA pins have open-drain outputs and hysteresis inputs. These signals must be pulled up to 3.3 V, even if no I^2C device is connected.

Buses

All packages, 8-bit or 16-bit “FIFO” bidirectional data bus, multiplexed on I/O ports B and D. 128-pin package: adds 16-bit output-only 8051 address bus, 8-bit bidirectional data bus.

Note
1. 115-KBaud operation is also possible by programming the 8051 SMOD0 or SMOD1 bits to a “1” for UART0, UART1, or both respectively.

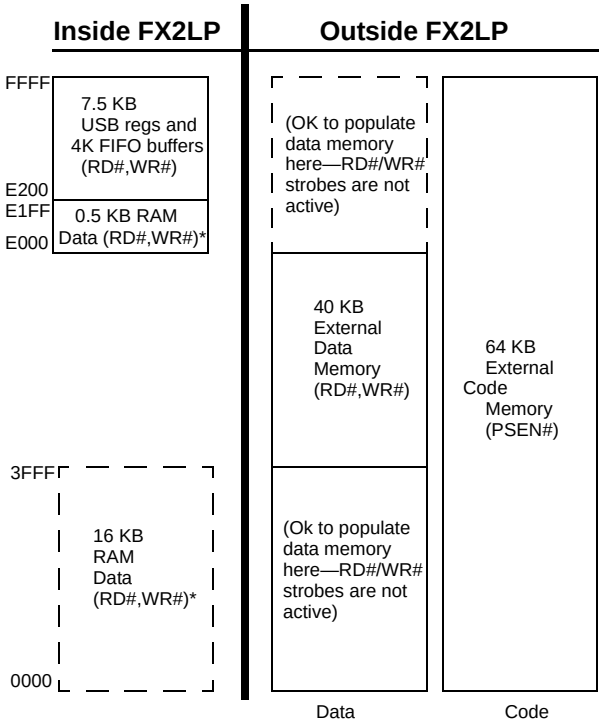
Table 4. Individual FIFO/GPIF Interrupt Sources

Priority	INT4VEC Value	Source	Notes
1	80	EP2PF	Endpoint 2 programmable flag
2	84	EP4PF	Endpoint 4 programmable flag
3	88	EP6PF	Endpoint 6 programmable flag
4	8C	EP8PF	Endpoint 8 programmable flag
5	90	EP2EF	Endpoint 2 empty flag [3]
6	94	EP4EF	Endpoint 4 empty flag
7	98	EP6EF	Endpoint 6 empty flag
8	9C	EP8EF	Endpoint 8 empty flag
9	A0	EP2FF	Endpoint 2 full flag
10	A4	EP4FF	Endpoint 4 full flag
11	A8	EP6FF	Endpoint 6 full flag
12	AC	EP8FF	Endpoint 8 full flag
13	B0	GPIFDONE	GPIF operation complete
14	B4	GPIFWF	GPIF waveform

If Autovectoring is enabled (AV4EN = 1 in the INTSET-UP register), the FX 2LP substitutes its INT4VEC byte. Therefore, if the high byte (“page”) of a jump-table address is preloaded at location 0x0054, the automatically inserted INT4VEC byte at 0x0055 directs the jump to the correct address out of the 14 addresses within the page. When the ISR occurs, the FX2LP pushes the program counter to its stack then jumps to address 0x0053, where it expects to find a “jump” instruction to the interrupt service routine (ISR).

Note
3. Errata: In Slave FIFO Asynchronous Word Wide mode, if a single word data is transferred from the USB host to EP2, configured as OUT Endpoint (EP) in the first transaction, then the Empty flag behaves incorrectly. This does not happen if the data size is more than one word in the first transaction. For more information, see the “Errata” on page 65.

Figure 4. External Code Memory, EA = 1



*SUDPTR, USB upload/download, I^2C interface boot access

Register Addresses

FFFF F000	4 KB EP2-EP8 buffers (8 x 512)
EFFF E800	2 KB RESERVED
E7FF E7C0	64 BEP1IN
E7BF E780	64 Bytes EP1OUT
E77F E740	64 Bytes EP0 IN/OUT
E73F E700	64 Bytes RESERVED
E6FF E500	8051 Addressable Registers (512)
E4FF E480	Reserved (128)
E47F E400	128 Bytes GPIF Waveforms
E3FF E200	Reserved (512)
E1FF E000	512 Bytes 8051 xdata RAM

Endpoint RAM

Size

- 3 × 64 bytes (Endpoints 0 and 1)
- 8 × 512 bytes (Endpoints 2, 4, 6, 8)

Organization

- EP0
- Bidirectional endpoint zero, 64-byte buffer
- EP1IN, EP1OUT
- 64 byte buffers, bulk or interrupt
- EP2, 4, 6, 8
- Eight 512-byte buffers, bulk, interrupt, or isochronous. EP4 and EP8 can be double buffered; EP2 and 6 can be either double, triple, or quad buffered. For Hi-Speed endpoint configuration options, see Figure 5.

Setup Data Buffer

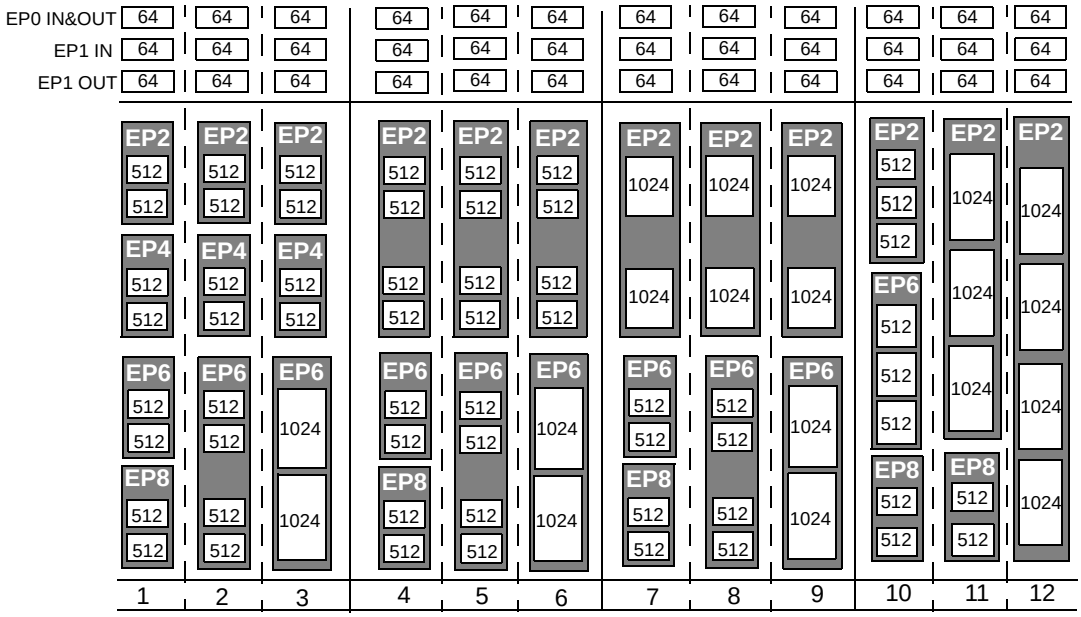
A separate 8-byte buffer at 0xE6B8-0xE6BF holds the setup data from a CONTROL transfer.

Endpoint Configurations (Hi-Speed Mode)

Endpoints 0 and 1 are the same for every configuration. Endpoint 0 is the only CONTROL endpoint, and endpoint 1 can be either BULK or INTERRUPT.

The endpoint buffers can be configured in any 1 of the 12 configurations shown in the vertical columns. When operating in the Full-Speed BULK mode, only the first 64 bytes of each buffer are used. For example, in Hi-Speed mode, the max packet size is 512 bytes, but in Full-Speed mode, it is 64 bytes. Even though a buffer is configured to a 512-byte buffer, in Full-Speed mode, only the first 64 bytes are used. The unused endpoint buffer space is not available for other operations. An example endpoint configuration is the EP2–1024 double-buffered; EP6–512 quad-buffered (column 8).

Figure 5. Endpoint Configuration



In the Slave (S) mode, FX2LP accepts either an internally derived clock or externally supplied clock (IFCLK, max frequency 48 MHz) and SLCS#, SLRD, SLWR, SLOE, PKTEND signals from external logic. When using an external IFCLK, the external clock must be present before switching to the external clock with the IFCLKSRC bit. Each endpoint can individually be selected for byte or word operation by an internal configuration bit and a Slave FIFO Output Enable signal (SLOE) that enables data of the selected width. External logic must ensure that the output enable signal is inactive when writing data to a slave FIFO. The slave interface can also operate asynchronously, where the SLRD and SLWR signals act directly as strobes, rather than a clock qualifier as in synchronous mode. The signals SLRD, SLWR, SLOE, and PKTEND are gated by the signal SLCS#.

GPIF and FIFO Clock Rates

An 8051 register bit selects one of two frequencies for the internally supplied interface clock: 30 MHz and 48 MHz. Alternatively, an externally supplied clock of 5 MHz–48 MHz feeding the IFCLK pin can be used as the interface clock. IFCLK can be configured to function as an output clock when the GPIF and FIFOs are internally clocked. An output enable bit in the IFCONFIG register turns this clock output off, if desired. Another bit within the IFCONFIG register inverts the IFCLK signal whether internally or externally sourced.

GPIF

The GPIF is a flexible 8-bit or 16-bit parallel interface driven by a user-programmable finite state machine. It enables the CY7C68013A/15A to perform local bus mastering and can implement a wide variety of protocols such as ATA interface, printer parallel port, and Utopia.

The GPIF has six programmable control outputs (CTL), nine address outputs (GPIFADRx), and six general-purpose ready inputs (RDY). The data bus width can be 8 or 16 bits. Each GPIF vector defines the state of the control outputs, and determines what state a ready input (or multiple inputs) must be before proceeding. The GPIF vector can be programmed to advance a FIFO to the next data value, advance an address, etc. A sequence of the GPIF vectors make up a single waveform that is executed to perform the desired data move between the FX2LP and the external device.

Six Control OUT Signals

The 100-pin and 128-pin packages bring out all six Control Output pins (CTL0-CTL5). The 8051 programs the GPIF unit to define the CTL waveforms. The 56-pin package brings out three of these signals, CTL0–CTL2. CTLx waveform edges can be programmed to make transitions as fast as once per clock (20.8 ns using a 48-MHz clock).

Six Ready IN Signals

The 100-pin and 128-pin packages bring out all six Ready inputs (RDY0–RDY5). The 8051 programs the GPIF unit to test the RDY pins for GPIF branching. The 56-pin package brings out two of these signals, RDY0–1.

Nine GPIF Address OUT Signals

Nine GPIF address lines are available in the 100-pin and 128-pin packages, GPIFADR[8..0]. The GPIF address lines enable indexing through up to a 512-byte block of RAM. If more address lines are needed, then I/O port pins are used.

Long Transfer Mode

In the master mode, the 8051 appropriately sets GPIF transaction count registers (GPIFTCB3, GPIFTCB2, GPIFTCB1, or GPIFTCB0) for unattended transfers of up to 2^{32} transactions. The GPIF automatically throttles data flow to prevent under or overflow until the full number of requested transactions complete. The GPIF decrements the value in these registers to represent the current status of the transaction.

ECC Generation[8]

The EZ-USB can calculate ECCs (Error Correcting Codes) on data that passes across its GPIF or Slave FIFO interfaces. There are two ECC configurations: Two ECCs, each calculated over 256 bytes (SmartMedia Standard); and one ECC calculated over 512 bytes.

The ECC can correct any one-bit error or detect any two-bit error.

ECC Implementation

The two ECC configurations are selected by the ECCM bit:

ECCM = 0

Two 3-byte ECCs, each calculated over a 256-byte block of data. This configuration conforms to the SmartMedia Standard.

Write any value to ECCRESET, then pass data across the GPIF or Slave FIFO interface. The ECC for the first 256 bytes of data is calculated and stored in ECC1. The ECC for the next 256 bytes is stored in ECC2. After the second ECC is calculated, the values in the ECCx registers do not change until ECCRESET is written again, even if more data is subsequently passed across the interface.

ECCM = 1

One 3-byte ECC calculated over a 512-byte block of data.

Write any value to ECCRESET then pass data across the GPIF or Slave FIFO interface. The ECC for the first 512 bytes of data is calculated and stored in ECC1; ECC2 is unused. After the ECC is calculated, the values in ECC1 do not change even if more data is subsequently passed across the interface, till ECCRESET is written again.

USB Uploads and Downloads

The core has the ability to directly edit the data contents of the internal 16-KB RAM and of the internal 512-byte scratch pad RAM via a vendor-specific command. This capability is normally used when soft downloading the user code and is available only to and from the internal RAM, only when the 8051 is held in reset. The available RAM spaces are 16 KB from 0x0000–0x3FFF (code/data) and 512 bytes from 0xE000–0xE1FF (scratch pad data RAM)[9].

Notes
8. To use the ECC logic, the GPIF or Slave FIFO interface must be configured for byte-wide operation.
9. After the data is downloaded from the host, a “loader” can execute from internal RAM to transfer downloaded data to external memory.

Figure 6. Signal

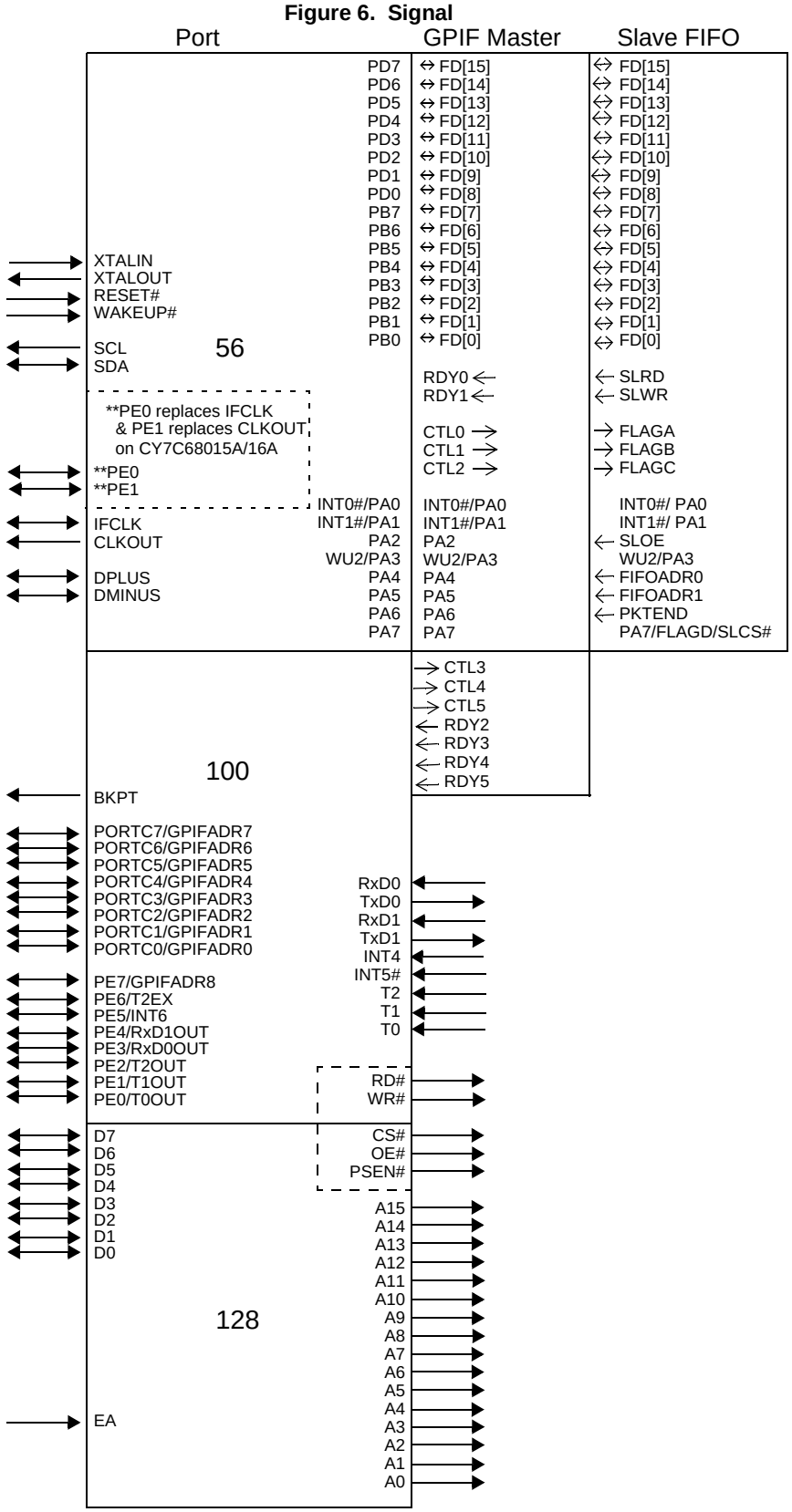


Table 12. FX2LP Register Summary (continued)

Hex	Size	Name	Description	b7	b6	b5	b4	b3	b2	b1	b0	Default	Access
E62B	1	ECC1B1	ECC1 Byte 1 Address	LINE7	LINE6	LINE5	LINE4	LINE3	LINE2	LINE1	LINE0	00000000	R
E62C	1	ECC1B2	ECC1 Byte 2 Address	COL5	COL4	COL3	COL2	COL1	COL0	LINE17	LINE16	00000000	R
E62D	1	ECC2B0	ECC2 Byte 0 Address	LINE15	LINE14	LINE13	LINE12	LINE11	LINE10	LINE9	LINE8	00000000	R
E62E	1	ECC2B1	ECC2 Byte 1 Address	LINE7	LINE6	LINE5	LINE4	LINE3	LINE2	LINE1	LINE0	00000000	R
E62F	1	ECC2B2	ECC2 Byte 2 Address	COL5	COL4	COL3	COL2	COL1	COL0	0	0	00000000	R
E630 H.S.	1	EP2FIFOPFH[13]	Endpoint 2 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	IN:PKTS[2] OUT:PFC12	IN:PKTS[1] OUT:PFC11	IN:PKTS[0] OUT:PFC10	0	PFC9	PFC8	10001000	bbbbbrbb
E630 F.S.	1	EP2FIFOPFH[13]	Endpoint 2 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	OUT:PFC12	OUT:PFC11	OUT:PFC10	0	PFC9	IN:PKTS[2] OUT:PFC8	10001000	bbbbbrbb
E631 H.S.	1	EP2FIFOPFL[13]	Endpoint 2 / slave FIFO Programmable Flag L	PFC7	PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E631 F.S	1	EP2FIFOPFL[13]	Endpoint 2 / slave FIFO Programmable Flag L	IN:PKTS[1] OUT:PFC7	IN:PKTS[0] OUT:PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E632 H.S.	1	EP4FIFOPFH[13]	Endpoint 4 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	0	IN: PKTS[1] OUT:PFC10	IN: PKTS[0] OUT:PFC9	0	0	PFC8	10001000	bbrbbrrb
E632 F.S	1	EP4FIFOPFH[13]	Endpoint 4 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	0	OUT:PFC10	OUT:PFC9	0	0	PFC8	10001000	bbrbbrrb
E633 H.S.	1	EP4FIFOPFL[13]	Endpoint 4 / slave FIFO Programmable Flag L	PFC7	PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E633 F.S	1	EP4FIFOPFL[13]	Endpoint 4 / slave FIFO Programmable Flag L	IN: PKTS[1] OUT:PFC7	IN: PKTS[0] OUT:PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E634 H.S.	1	EP6FIFOPFH[13]	Endpoint 6 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	IN:PKTS[2] OUT:PFC12	IN:PKTS[1] OUT:PFC11	IN:PKTS[0] OUT:PFC10	0	PFC9	PFC8	00001000	bbbbbrbb
E634 F.S	1	EP6FIFOPFH[13]	Endpoint 6 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	OUT:PFC12	OUT:PFC11	OUT:PFC10	0	PFC9	IN:PKTS[2] OUT:PFC8	00001000	bbbbbrbb
E635 H.S.	1	EP6FIFOPFL[13]	Endpoint 6 / slave FIFO Programmable Flag L	PFC7	PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E635 F.S	1	EP6FIFOPFL[13]	Endpoint 6 / slave FIFO Programmable Flag L	IN:PKTS[1] OUT:PFC7	IN:PKTS[0] OUT:PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E636 H.S.	1	EP8FIFOPFH[13]	Endpoint 8 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	0	IN: PKTS[1] OUT:PFC10	IN: PKTS[0] OUT:PFC9	0	0	PFC8	00001000	bbrbbrrb
E636 F.S	1	EP8FIFOPFH[13]	Endpoint 8 / slave FIFO Programmable Flag H	DECIS	PKTSTAT	0	OUT:PFC10	OUT:PFC9	0	0	PFC8	00001000	bbrbbrrb
E637 H.S.	1	EP8FIFOPFL[13]	Endpoint 8 / slave FIFO Programmable Flag L	PFC7	PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
E637 F.S	1	EP8FIFOPFL[13]	Endpoint 8 / slave FIFO Programmable Flag L	IN: PKTS[1] OUT:PFC7	IN: PKTS[0] OUT:PFC6	PFC5	PFC4	PFC3	PFC2	PFC1	PFC0	00000000	RW
	8	reserved											
E640	1	EP2ISOINPKTS	EP2 (if ISO) IN Packets per frame (1-3)	AADJ	0	0	0	0	0	INPPF1	INPPF0	00000001	brrrrrbb
E641	1	EP4ISOINPKTS	EP4 (if ISO) IN Packets per frame (1-3)	AADJ	0	0	0	0	0	INPPF1	INPPF0	00000001	brrrrrrr
E642	1	EP6ISOINPKTS	EP6 (if ISO) IN Packets per frame (1-3)	AADJ	0	0	0	0	0	INPPF1	INPPF0	00000001	brrrrrbb
E643	1	EP8ISOINPKTS	EP8 (if ISO) IN Packets per frame (1-3)	AADJ	0	0	0	0	0	INPPF1	INPPF0	00000001	brrrrrrr
E644	4	reserved											
E648	1	INPKTEND[13]	Force IN Packet End	Skip	0	0	0	EP3	EP2	EP1	EP0	xxxxxxxx	W
E649	7	OUTPKTEND[13]	Force OUT Packet End	Skip	0	0	0	EP3	EP2	EP1	EP0	xxxxxxxx	W
		INTERRUPTS											
E650	1	EP2FIFOIE[13]	Endpoint 2 slave FIFO Flag Interrupt Enable	0	0	0	0	EDGEPF	PF	EF	FF	00000000	RW
E651	1	EP2FIFOIRQ[13,14]	Endpoint 2 slave FIFO Flag Interrupt Request	0	0	0	0	0	PF	EF	FF	00000000	rrrrrbbb
E652	1	EP4FIFOIE[13]	Endpoint 4 slave FIFO Flag Interrupt Enable	0	0	0	0	EDGEPF	PF	EF	FF	00000000	RW
E653	1	EP4FIFOIRQ[13,14]	Endpoint 4 slave FIFO Flag Interrupt Request	0	0	0	0	0	PF	EF	FF	00000000	rrrrrbbb
E654	1	EP6FIFOIE[13]	Endpoint 6 slave FIFO Flag Interrupt Enable	0	0	0	0	EDGEPF	PF	EF	FF	00000000	RW
E655	1	EP6FIFOIRQ[13,14]	Endpoint 6 slave FIFO Flag Interrupt Request	0	0	0	0	0	PF	EF	FF	00000000	rrrrrbbb
E656	1	EP8FIFOIE[13]	Endpoint 8 slave FIFO Flag Interrupt Enable	0	0	0	0	EDGEPF	PF	EF	FF	00000000	RW
E657	1	EP8FIFOIRQ[13,14]	Endpoint 8 slave FIFO Flag Interrupt Request	0	0	0	0	0	PF	EF	FF	00000000	rrrrrbbb
E658	1	IBNIE	IN-BULK-NAK Interrupt Enable	0	0	EP8	EP6	EP4	EP2	EP1	EP0	00000000	RW
E659	1	IBNIRQ[14]	IN-BULK-NAK interrupt Request	0	0	EP8	EP6	EP4	EP2	EP1	EP0	00xxxxxx	rrbbbbbb
E65A	1	NAKIE	Endpoint Ping-NAK / IBN Interrupt Enable	EP8	EP6	EP4	EP2	EP1	EP0	0	IBN	00000000	RW
E65B	1	NAKIRQ[14]	Endpoint Ping-NAK / IBN Interrupt Request	EP8	EP6	EP4	EP2	EP1	EP0	0	IBN	xxxxxx0x	bbbbbbrb
E65C	1	USBIE	USB Int Enables	0	EP0ACK	HSGRANT	URES	SUSP	SUTOK	SOF	SUDAV	00000000	RW

Note
14. The register can only be reset; it cannot be set.

Table 12. FX2LP Register Summary (continued)

Hex	Size	Name	Description	b7	b6	b5	b4	b3	b2	b1	b0	Default	Access
E6CF	1	GPIFTCB2[13]	GPIF Transaction Count Byte 2	TC23	TC22	TC21	TC20	TC19	TC18	TC17	TC16	00000000	RW
E6D0	1	GPIFTCB1[13]	GPIF Transaction Count Byte 1	TC15	TC14	TC13	TC12	TC11	TC10	TC9	TC8	00000000	RW
E6D1	1	GPIFTCB0[13]	GPIF Transaction Count Byte 0	TC7	TC6	TC5	TC4	TC3	TC2	TC1	TC0	00000001	RW
	2	reserved										00000000	RW
		reserved											
		reserved											
E6D2	1	EP2GPIFFLGSEL[13]	Endpoint 2 GPIF Flag select	0	0	0	0	0	0	FS1	FS0	00000000	RW
E6D3	1	EP2GPIFPFSTOP	Endpoint 2 GPIF stop transaction on prog. flag	0	0	0	0	0	0	0	FIFO2FLAG	00000000	RW
E6D4	1	EP2GPIFTRIG[13]	Endpoint 2 GPIF Trigger	x	x	x	x	x	x	x	x	xxxxxxxx	W
	3	reserved											
		reserved											
		reserved											
E6DA	1	EP4GPIFFLGSEL[13]	Endpoint 4 GPIF Flag select	0	0	0	0	0	0	FS1	FS0	00000000	RW
E6DB	1	EP4GPIFPFSTOP	Endpoint 4 GPIF stop transaction on GPIF Flag	0	0	0	0	0	0	0	FIFO4FLAG	00000000	RW
E6DC	1	EP4GPIFTRIG[13]	Endpoint 4 GPIF Trigger	x	x	x	x	x	x	x	x	xxxxxxxx	W
	3	reserved											
		reserved											
		reserved											
E6E2	1	EP6GPIFFLGSEL[13]	Endpoint 6 GPIF Flag select	0	0	0	0	0	0	FS1	FS0	00000000	RW
E6E3	1	EP6GPIFPFSTOP	Endpoint 6 GPIF stop transaction on prog. flag	0	0	0	0	0	0	0	FIFO6FLAG	00000000	RW
E6E4	1	EP6GPIFTRIG[13]	Endpoint 6 GPIF Trigger	x	x	x	x	x	x	x	x	xxxxxxxx	W
	3	reserved											
		reserved											
		reserved											
E6EA	1	EP8GPIFFLGSEL[13]	Endpoint 8 GPIF Flag select	0	0	0	0	0	0	FS1	FS0	00000000	RW
E6EB	1	EP8GPIFPFSTOP	Endpoint 8 GPIF stop transaction on prog. flag	0	0	0	0	0	0	0	FIFO8FLAG	00000000	RW
E6EC	1	EP8GPIFTRIG[13]	Endpoint 8 GPIF Trigger	x	x	x	x	x	x	x	x	xxxxxxxx	W
	3	reserved											
E6F0	1	XGPIFSGLDATH	GPIF Data H (16-bit mode only)	D15	D14	D13	D12	D11	D10	D9	D8	xxxxxxxx	RW
E6F1	1	XGPIFSGLDATLX	Read/Write GPIF Data L & trigger transaction	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
E6F2	1	XGPIFSGLDATLNOX	Read GPIF Data L, no transaction trigger	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	R
E6F3	1	GPIFREADYCFG	Internal RDY, Sync/Async, RDY pin states	INTRDY	SAS	TCXRDY5	0	0	0	0	0	00000000	bbbrrrrr
E6F4	1	GPIFREADYSTAT	GPIF Ready Status	0	0	RDY5	RDY4	RDY3	RDY2	RDY1	RDY0	00xxxxxx	R
E6F5	1	GPIFABORT	Abort GPIF Waveforms	x	x	x	x	x	x	x	x	xxxxxxxx	W
E6F6	2	reserved											
		ENDPOINT BUFFERS											
E740	64	EP0BUF	EP0-IN/-OUT buffer	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
E780	64	EP10UTBUF	EP1-OUT buffer	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
E7C0	64	EP1INBUF	EP1-IN buffer	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
E800	2048	reserved											RW
F000	1024	EP2FIFOBUF	512/1024 byte EP 2 / slave FIFO buffer (IN or OUT)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
F400	512	EP4FIFOBUF	512 byte EP 4 / slave FIFO buffer (IN or OUT)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
F600	512	reserved											
F800	1024	EP6FIFOBUF	512/1024 byte EP 6 / slave FIFO buffer (IN or OUT)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
FC00	512	EP8FIFOBUF	512 byte EP 8 / slave FIFO buffer (IN or OUT)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
FE00	512	reserved											

Table 12. FX2LP Register Summary (continued)

Hex	Size	Name	Description	b7	b6	b5	b4	b3	b2	b1	b0	Default	Access
xxxx		I²C Configuration Byte		0	DISCON	0	0	0	0	0	400KHZ	xxxxxxxx [16]	n/a
		Special Function Registers (SFRs)											
80	1	IOA[15]	Port A (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
81	1	SP	Stack Pointer	D7	D6	D5	D4	D3	D2	D1	D0	00000111	RW
82	1	DPL0	Data Pointer 0 L	A7	A6	A5	A4	A3	A2	A1	A0	00000000	RW
83	1	DPH0	Data Pointer 0 H	A15	A14	A13	A12	A11	A10	A9	A8	00000000	RW
84	1	DPL1[15]	Data Pointer 1 L	A7	A6	A5	A4	A3	A2	A1	A0	00000000	RW
85	1	DPH1[15]	Data Pointer 1 H	A15	A14	A13	A12	A11	A10	A9	A8	00000000	RW
86	1	DPS[15]	Data Pointer 0/1 select	0	0	0	0	0	0	0	SEL	00000000	RW
87	1	PCON	Power Control	SMOD0	x	1	1	x	x	x	IDLE	00110000	RW
88	1	TCON	Timer/Counter Control (bit addressable)	TF1	TR1	TF0	TR0	IE1	IT1	IE0	IT0	00000000	RW
89	1	TMOD	Timer/Counter Mode Control	GATE	CT	M1	M0	GATE	CT	M1	M0	00000000	RW
8A	1	TL0	Timer 0 reload L	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
8B	1	TL1	Timer 1 reload L	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
8C	1	TH0	Timer 0 reload H	D15	D14	D13	D12	D11	D10	D9	D8	00000000	RW
8D	1	TH1	Timer 1 reload H	D15	D14	D13	D12	D11	D10	D9	D8	00000000	RW
8E	1	CKCON[15]	Clock Control	x	x	T2M	T1M	T0M	MD2	MD1	MD0	00000001	RW
8F	1	reserved											
90	1	IOB[15]	Port B (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
91	1	EXIF[15]	External Interrupt Flag(s)	IE5	IE4	I²CINT	USBNT	1	0	0	0	00001000	RW
92	1	MPAGE[15]	Upper Addr Byte of MOVX using @R0 / @R1	A15	A14	A13	A12	A11	A10	A9	A8	00000000	RW
93	5	reserved											
98	1	SCON0	Serial Port 0 Control (bit addressable)	SM0_0	SM1_0	SM2_0	REN_0	TB8_0	RB8_0	TI_0	RI_0	00000000	RW
99	1	SBUF0	Serial Port 0 Data Buffer	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
9A	1	AUTOPTRH1[15]	Autopointer 1 Address H	A15	A14	A13	A12	A11	A10	A9	A8	00000000	RW
9B	1	AUTOPTRL1[15]	Autopointer 1 Address L	A7	A6	A5	A4	A3	A2	A1	A0	00000000	RW
9C	1	reserved											
9D	1	AUTOPTRH2[15]	Autopointer 2 Address H	A15	A14	A13	A12	A11	A10	A9	A8	00000000	RW
9E	1	AUTOPTRL2[15]	Autopointer 2 Address L	A7	A6	A5	A4	A3	A2	A1	A0	00000000	RW
9F	1	reserved											
A0	1	IOC[15]	Port C (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
A1	1	INT2CLR[15]	Interrupt 2 clear	x	x	x	x	x	x	x	x	xxxxxxxx	W
A2	1	INT4CLR[15]	Interrupt 4 clear	x	x	x	x	x	x	x	x	xxxxxxxx	W
A3	5	reserved											
A8	1	IE	Interrupt Enable (bit addressable)	EA	ES1	ET2	ES0	ET1	EX1	ET0	EX0	00000000	RW
A9	1	reserved											
AA	1	EP2468STAT[15]	Endpoint 2,4,6,8 status flags	EP8F	EP8E	EP6F	EP6E	EP4F	EP4E	EP2F	EP2E	01011010	R
AB	1	EP24FIFOFLGS[15]	Endpoint 2,4 slave FIFO status flags	0	EP4PF	EP4EF	EP4FF	0	EP2PF	EP2EF	EP2FF	00100010	R
AC	1	EP68FIFOFLGS[15]	Endpoint 6,8 slave FIFO status flags	0	EP8PF	EP8EF	EP8FF	0	EP6PF	EP6EF	EP6FF	01100110	R
AD	2	reserved											
AF	1	AUTOPTRSETUP[15]	Autopointer 1&2 setup	0	0	0	0	0	APTR2INC	APTR1INC	APTREN	00000110	RW
B0	1	IOD[15]	Port D (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
B1	1	IOE[15]	Port E (NOT bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
B2	1	OEA[15]	Port A Output Enable	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
B3	1	OEB[15]	Port B Output Enable	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
B4	1	OEC[15]	Port C Output Enable	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
B5	1	OED[15]	Port D Output Enable	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
B6	1	OEE[15]	Port E Output Enable	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
B7	1	reserved											
B8	1	IP	Interrupt Priority (bit addressable)	1	PS1	PT2	PS0	PT1	PX1	PT0	PX0	10000000	RW
B9	1	reserved											
BA	1	EP01STAT[15]	Endpoint 0&1 Status	0	0	0	0	0	EP1INBSY	EP1OUTBSY	EP0BSY	00000000	R
BB	1	GPIFTRIG[15, 13]	Endpoint 2,4,6,8 GPIF slave FIFO Trigger	DONE	0	0	0	0	RW	EP1	EP0	10000xxx	brrrrbbb
BC	1	reserved											
BD	1	GPIFSGLDATH[15]	GPIF Data H (16-bit mode only)	D15	D14	D13	D12	D11	D10	D9	D8	xxxxxxxx	RW

Notes
15. SFRs not part of the standard 8051 architecture.
16. If no EEPROM is detected by the SIE then the default is 00000000.

Table 12. FX2LP Register Summary (continued)

Hex	Size	Name	Description	b7	b6	b5	b4	b3	b2	b1	b0	Default	Access
BE	1	GPIFSGLDATLX[15]	GPIF Data L w/ Trigger	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	RW
BF	1	GPIFSGLDATL-NOX[15]	GPIF Data L w/ No Trigger	D7	D6	D5	D4	D3	D2	D1	D0	xxxxxxxx	R
C0	1	SCON1[15]	Serial Port 1 Control (bit addressable)	SM0_1	SM1_1	SM2_1	REN_1	TB8_1	RB8_1	TI_1	RI_1	00000000	RW
C1	1	SBUF1[15]	Serial Port 1 Data Buffer	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
C2	6	reserved											
C8	1	T2CON	Timer/Counter 2 Control (bit addressable)	TF2	EXF2	RCLK	TCLK	EXEN2	TR2	CT2	CPRL2	00000000	RW
C9	1	reserved											
CA	1	RCAP2L	Capture for Timer 2, auto-reload, up-counter	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
CB	1	RCAP2H	Capture for Timer 2, auto-reload, up-counter	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
CC	1	TL2	Timer 2 reload L	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
CD	1	TH2	Timer 2 reload H	D15	D14	D13	D12	D11	D10	D9	D8	00000000	RW
CE	2	reserved											
D0	1	PSW	Program Status Word (bit addressable)	CY	AC	F0	RS1	RS0	OV	F1	P	00000000	RW
D1	7	reserved											
D8	1	EICON[15]	External Interrupt Control	SMOD1	1	ERESI	RESI	INT6	0	0	0	01000000	RW
D9	7	reserved											
E0	1	ACC	Accumulator (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
E1	7	reserved											
E8	1	EIE[15]	External Interrupt Enable(s)	1	1	1	EX6	EX5	EX4	EI²C	EUSB	11100000	RW
E9	7	reserved											
F0	1	B	B (bit addressable)	D7	D6	D5	D4	D3	D2	D1	D0	00000000	RW
F1	7	reserved											
F8	1	EIP[15]	External Interrupt Priority Control	1	1	1	PX6	PX5	PX4	PI²C	PUSB	11100000	RW
F9	7	reserved											

R = all bits read-only
W = all bits write-only
r = read-only bit
w = write-only bit
b = both read/write bit

AC Electrical Characteristics

USB Transceiver

USB 2.0 compliant in Full-Speed and Hi-Speed modes.

Program Memory Read

Figure 12. Program Memory Read Timing Diagram

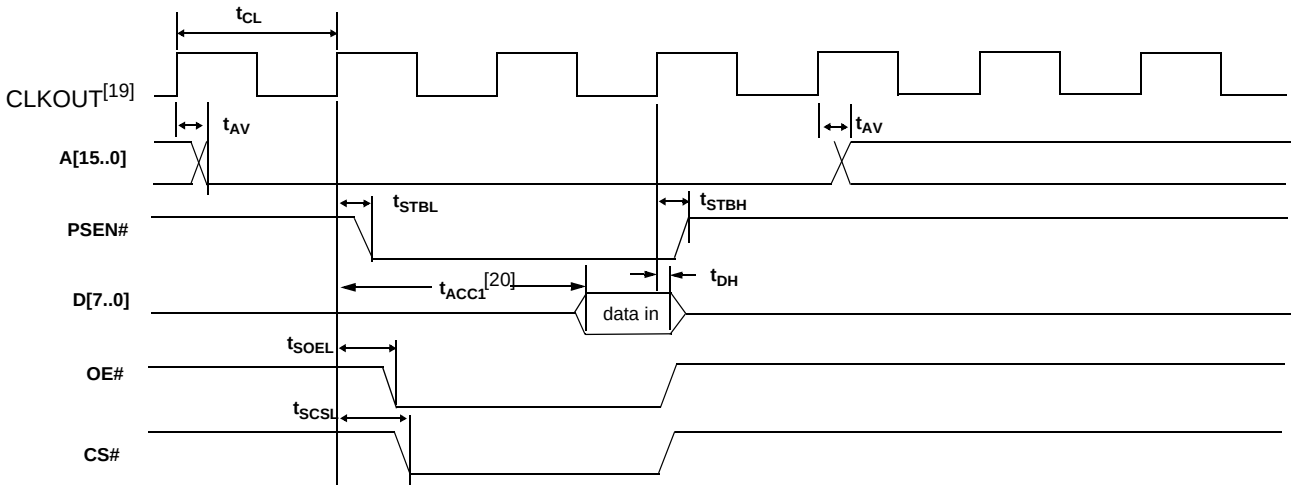


Table 15. Program Memory Read Parameters

Parameter	Description	Min	Typ	Max	Unit	Notes
t_{CL}	1/CLKOUT frequency	–	20.83	–	ns	48 MHz
		–	41.66	–	ns	24 MHz
		–	83.2	–	ns	12 MHz
t_{AV}	Delay from clock to valid address	0	–	10.7	ns	–
t_{STBL}	Clock to PSEN LOW	0	–	8	ns	–
t_{STBH}	Clock to PSEN HIGH	0	–	8	ns	–
t_{SOEL}	Clock to OE LOW	–	–	11.1	ns	–
t_{SCSL}	Clock to CS LOW	–	–	13	ns	–
t_{DSU}	Data setup to clock	9.6	–	–	ns	–
t_{DH}	Data hold time	0	–	–	ns	–

Notes
19. CLKOUT is shown with positive polarity.
20. t_{ACC1} is computed from these parameters as follows:
t_{ACC1}(24 MHz) = 3*t_{CL} – t_{AV} – t_{DSU} = 106 ns.
t_{ACC1}(48 MHz) = 3*t_{CL} – t_{AV} – t_{DSU} = 43 ns.

PORTC Strobe Feature Timings

The RD# and WR# are present in the 100-pin version and the 128-pin package. In these 100-pin and 128-pin versions, an 8051 control bit can be set to pulse the RD# and WR# pins when the 8051 reads from or writes to PORTC. This feature is enabled by setting PORTCSTB bit in CPUCS register.

The RD# and WR# strobes are asserted for two CLKOUT cycles when PORTC is accessed.

The WR# strobe is asserted two clock cycles after PORTC is updated and is active for two clock cycles after that, as shown in Figure 16.

As for read, the value of PORTC three clock cycles before the assertion of RD# is the value that the 8051 reads in. The RD# is pulsed for two clock cycles after three clock cycles from the point when the 8051 has performed a read function on PORTC.

The RD# signal prompts the external logic to prepare the next data byte. Nothing gets sampled internally on assertion of the RD# signal itself; it is just a prefetch type signal to get the next data byte prepared. So, using it with that in mind easily meets the setup time to the next read.

The purpose of this pulsing of RD# is to allow the external peripheral to know that the 8051 is done reading PORTC and the data was latched into PORTC three CLKOUT cycles before asserting the RD# signal. After the RD# is pulsed, the external logic can update the data on PORTC.

Following is the timing diagram of the read and write strobing function on accessing PORTC. Refer to Data Memory Read[21] and Data Memory Write[23] for details on propagation delay of RD# and WR# signals.

Figure 16. WR# Strobe Function when PORTC is Accessed by 8051

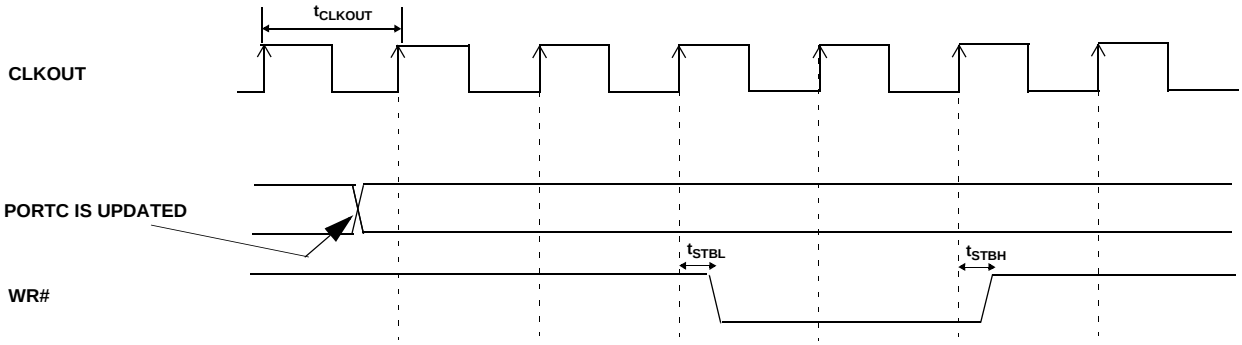


Figure 17. RD# Strobe Function when PORTC is Accessed by 8051

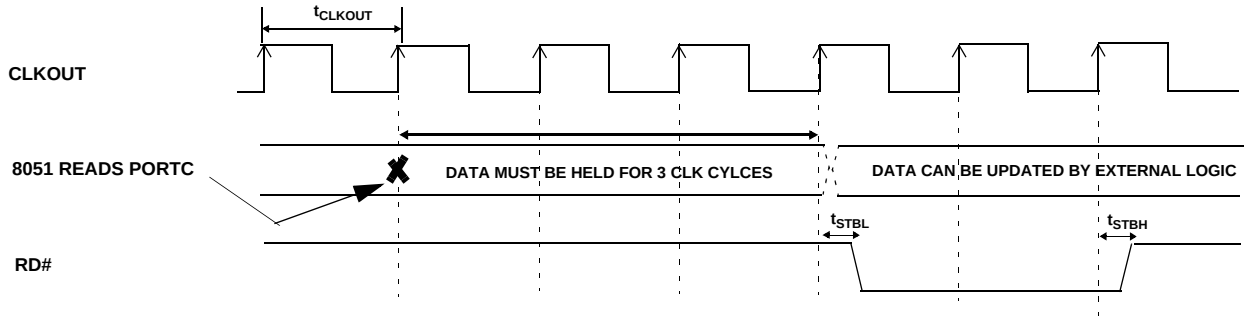


Table 21. Slave FIFO Synchronous Read Parameters with Externally Sourced IFCLK[25]

Parameter	Description	Min	Max	Unit
t_{IFCLK}	IFCLK period	20.83	200	ns
t_{SRD}	SLRD to clock setup time	12.7	–	ns
t_{RDH}	Clock to SLRD hold time	3.7	–	ns
t_{OEon}	SLOE turn on to FIFO data valid	–	10.5	ns
t_{OEoff}	SLOE turn off to FIFO data hold	–	10.5	ns
t_{XFLG}	Clock to FLAGS output propagation delay	–	13.5	ns
t_{XFD}	Clock to FIFO data output propagation delay	–	15	ns

Slave FIFO Asynchronous Read

Figure 20. Slave FIFO Asynchronous Read Timing Diagram[24]

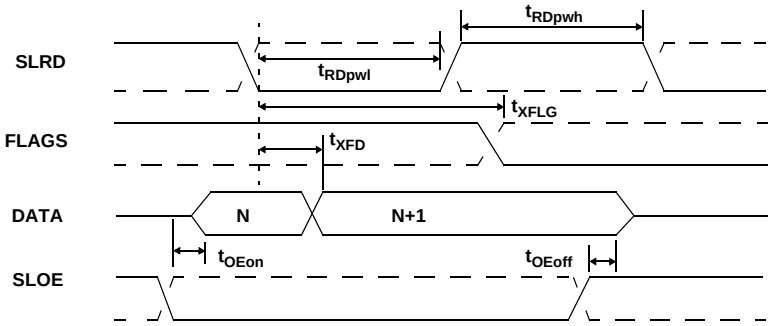


Table 22. Slave FIFO Asynchronous Read Parameters[27]

Parameter	Description	Min	Max	Unit
t_{RDpwl}	SLRD pulse width LOW	50	–	ns
t_{RDpwh}	SLRD pulse width HIGH	50	–	ns
t_{XFLG}	SLRD to FLAGS output propagation delay	–	70	ns
t_{XFD}	SLRD to FIFO data output propagation delay	–	15	ns
t_{OEon}	SLOE turn-on to FIFO data valid	–	10.5	ns
t_{OEoff}	SLOE turn-off to FIFO data hold	–	10.5	ns

Note
27. Slave FIFO asynchronous parameter values use internal IFCLK setting at 48 MHz.

Slave FIFO Synchronous Write

Figure 21. Slave FIFO Synchronous Write Timing Diagram[24]

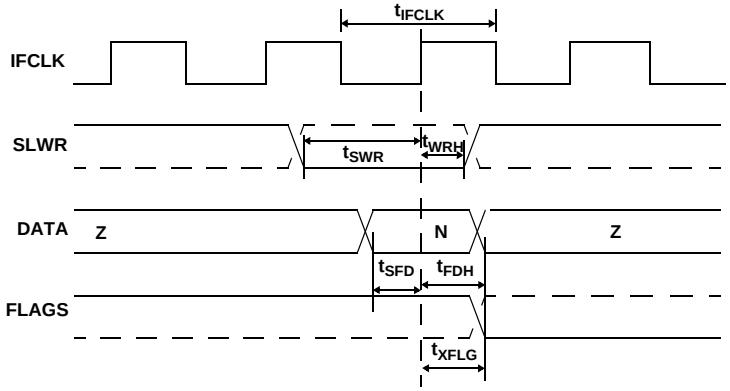


Table 23. Slave FIFO Synchronous Write Parameters with Internally Sourced IFCLK[25]

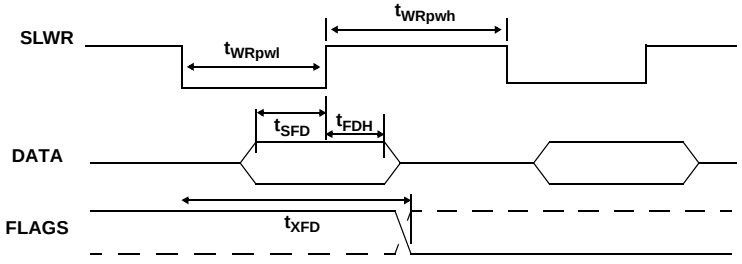
Parameter	Description	Min	Max	Unit
t_{IFCLK}	IFCLK period	20.83	–	ns
t_{SWR}	SLWR to clock setup time	10.4	–	ns
t_{WRH}	Clock to SLWR hold time	0	–	ns
t_{SFD}	FIFO data to clock setup time	9.2	–	ns
t_{FDH}	Clock to FIFO data hold time	0	–	ns
t_{XFLG}	Clock to FLAGS output propagation time	–	9.5	ns

Table 24. Slave FIFO Synchronous Write Parameters with Externally Sourced IFCLK[25]

Parameter	Description	Min	Max	Unit
t_{IFCLK}	IFCLK Period	20.83	200	ns
t_{SWR}	SLWR to clock setup time	12.1	–	ns
t_{WRH}	Clock to SLWR hold time	3.6	–	ns
t_{SFD}	FIFO data to clock setup time	3.2	–	ns
t_{FDH}	Clock to FIFO data hold time	4.5	–	ns
t_{XFLG}	Clock to FLAGS output propagation time	–	13.5	ns

Slave FIFO Asynchronous Write

Figure 22. Slave FIFO Asynchronous Write Timing Diagram[24]



Single and Burst Synchronous Write

Figure 32. Slave FIFO Synchronous Write Sequence and Timing Diagram[24]

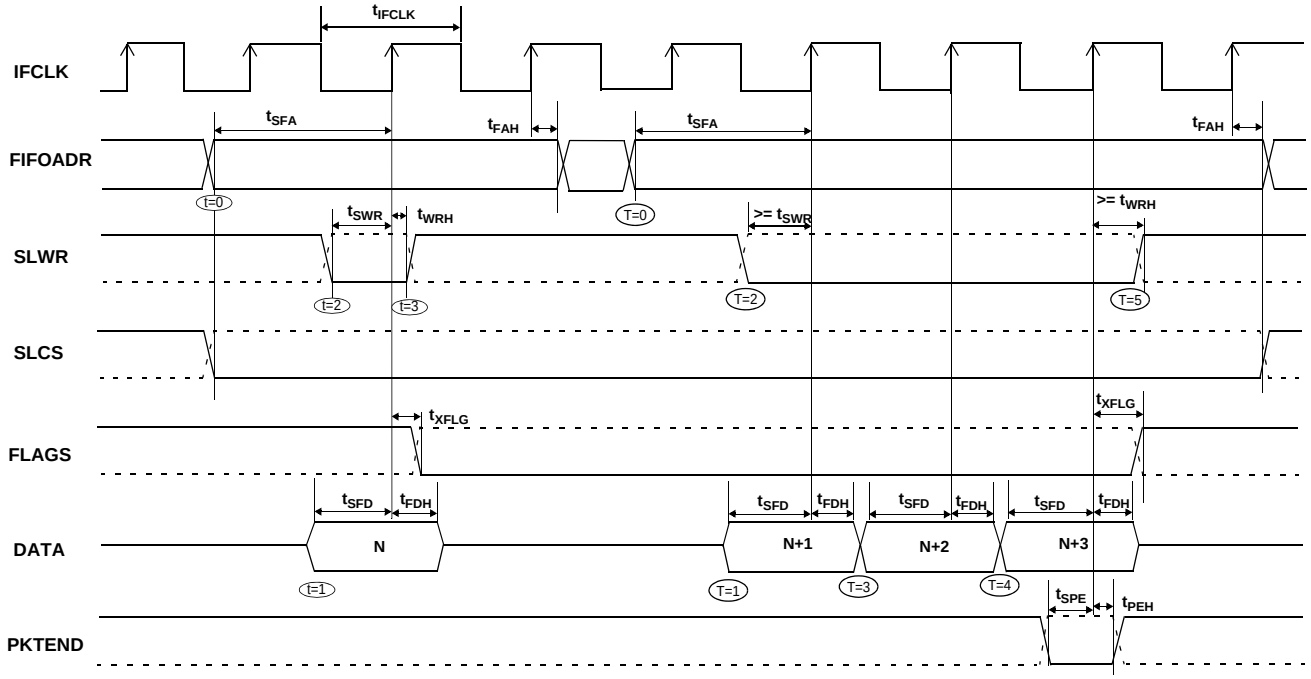


Figure 32 shows the timing relationship of the SLAVE FIFO signals during a synchronous write using IFCLK as the synchronizing clock. The diagram illustrates a single write followed by burst write of three bytes and committing all four bytes as a short packet using the PKTEND pin.

- At t = 0 the FIFO address is stable and the signal SLCS is asserted. (SLCS may be tied LOW in some applications) Note that t_{SFA} has a minimum of 25 ns. This means when IFCLK is running at 48 MHz, the FIFO address setup time is more than one IFCLK cycle.
- At t = 1, the external master/peripheral must outputs the data value onto the data bus with a minimum set up time of t_{SFD} before the rising edge of IFCLK.
- At t = 2, SLWR is asserted. The SLWR must meet the setup time of t_{SWR} (time from asserting the SLWR signal to the rising edge of IFCLK) and maintain a minimum hold time of t_{WRH} (time from the IFCLK edge to the deassertion of the SLWR signal). If the SLCS signal is used, it must be asserted with SLWR or before SLWR is asserted (The SLCS and SLWR signals must both be asserted to start a valid write condition).
- While the SLWR is asserted, data is written to the FIFO and on the rising edge of the IFCLK, the FIFO pointer is incremented. The FIFO flag is also updated after a delay of t_{XFLG} from the rising edge of the clock.

The same sequence of events are also shown for a burst write and are marked with the time indicators of T = 0 through 5.

Note For the burst mode, SLWR and SLCS are left asserted for the entire duration of writing all the required data values. In this burst write mode, after the SLWR is asserted, the data on the FIFO data bus is written to the FIFO on every rising edge of IFCLK. The FIFO pointer is updated on each rising edge of IFCLK. In Figure 32, after the four bytes are written to the FIFO, SLWR is deasserted. The short 4 byte packet can be committed to the host by asserting the PKTEND signal.

There is no specific timing requirement that should be met for asserting PKTEND signal with regards to asserting the SLWR signal. PKTEND can be asserted with the last data value or thereafter. The only requirement is that the setup time t_{SPE} and the hold time t_{PEH} must be met. In the scenario of Figure 32, the number of data values committed includes the last value written to the FIFO. In this example, both the data value and the PKTEND signal are clocked on the same rising edge of IFCLK. PKTEND can also be asserted in subsequent clock cycles. The FIFOADDR lines should be held constant during the PKTEND assertion.

Although there are no specific timing requirement for the PKTEND assertion, there is a specific corner-case condition that needs attention while using the PKTEND to commit a one byte/word packet. Additional timing requirements exist when the FIFO is configured to operate in auto mode and it is desired to send two packets: a full packet (‘full’ defined as the number of bytes in the FIFO meeting the level set in the AUTOINLEN register) committed automatically followed by a short one byte or word packet committed manually using the PKTEND pin.

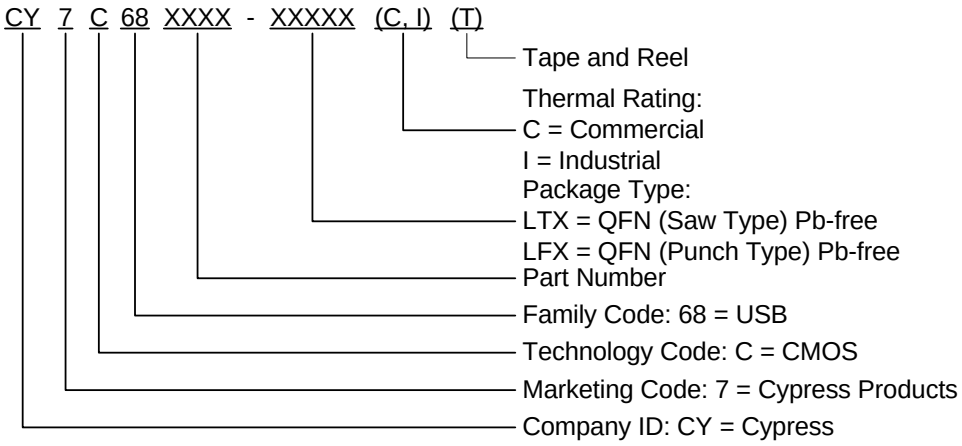
In this case, the external master must ensure to assert the PKTEND pin at least one clock cycle after the rising edge that caused the last byte or word that needs to be clocked into the previous auto committed packet (the packet with the number of bytes equal to what is set in the AUTOINLEN register). Refer to Figure 24 on page 50 for further details on this timing.

Ordering Information

Table 33. Ordering Information

Ordering Code	Package Type	RAM Size	# Prog I/Os	8051 Address /Data Bus	Serial Debug[28]
Ideal for Battery Powered Applications					
CY7C68014A-128AXC	128 TQFP – Pb-free	16 K	40	16-/8-bit	Y
CY7C68014A-100AXC	100 TQFP – Pb-free	16 K	40	–	Y
CY7C68014A-56PVXC	56 SSOP – Pb-free	16 K	24	–	N
CY7C68014A-56LTXC	56 QFN - Pb-free	16 K	24	–	N
CY7C68016A-56LTXC	56 QFN - Pb-free	16 K	26	–	N
CY7C68016A-56LTXCT	56 QFN - Pb-free	16 K	26	–	N
Ideal for Non Battery Powered Applications					
CY7C68013A-128AXC	128 TQFP – Pb-free	16 K	40	16-/8-bit	Y
CY7C68013A-128AXI	128 TQFP – Pb-free (Industrial)	16 K	40	16-/8-bit	Y
CY7C68013A-100AXC	100 TQFP – Pb-free	16 K	40	–	Y
CY7C68013A-100AXI	100 TQFP – Pb-free (Industrial)	16 K	40	–	Y
CY7C68013A-56PVXC	56 SSOP – Pb-free	16 K	24	–	N
CY7C68013A-56PVXCT	56 SSOP – Pb-free	16 K	24	–	N
CY7C68013A-56PVXI	56 SSOP – Pb-free (Industrial)	16 K	24	–	N
CY7C68013A-56BAXC	56 VFBGA – Pb-free	16 K	24	–	N
CY7C68013A-56BAXCT	56 VFBGA – Pb-free	16 K	24	–	N
CY7C68013A-56LTXC	56 QFN – Pb-free	16 K	24	–	N
CY7C68013A-56LTXCT	56 QFN – Pb-free	16 K	24	–	N
CY7C68013A-56LTXI	56 QFN – Pb-free (Industrial)	16 K	24	–	N
CY7C68015A-56LTXC	56 QFN – Pb-free	16 K	26	–	N
Development Tool Kit					
CY3684	EZ-USB FX2LP development kit				
Reference Design Kit					
CY4611B	USB 2.0 to ATA/ATAPI reference design using EZ-USB FX2LP				

Ordering Code Definitions



Note
28. As UART is not available in the 56-pin package of CY7C68013A, serial port debugging using Keil Monitor is not possible.

Document History Page (continued)

Document Title: CY7C68013A, CY7C68014A, CY7C68015A, CY7C68016A, EZ-USB® FX2LP™ USB Microcontroller High-Speed USB Peripheral Controller Document Number: 38-08032				
Rev.	**ECN No.**	**Orig. of Change**	**Submission Date**	**Description of Change**
*K	420505	MON	See ECN	Remove SLCS from figure in Section . Removed indications that SLRD can be asserted simultaneously with SLCS in Section and Section Added Absolute Maximum Temperature Rating for industrial packages in Section Changed number of packages stated in the description in Section to five. Added Table 13 on Thermal Coefficients for various packages
*L	2064406	CMCC/PYRS	See ECN	Changed TID number Removed T0OUT and T1OUT from CY7C68015A/16A Updated t_{SWR} Min value in Figure 21 Updated 56-lead QFN package diagram
*M	2710327	DPT	05/22/2009	Added 56-Pin QFN (8 X 8 mm) package diagram Updated ordering information for CY7C68013A-56LTXC, CY7C68013A-56LTXI, CY7C68014A-56LTXC, CY7C68015A-56LTXC, and CY7C68016A-56LTXC parts.
*N	2727334	ODC	07/01/09	Removed sentence on E-Pad size change from *F revision in the Document History Page Updated 56-Pin Sawn Package Diagram
*O	2756202	ODC	08/26/2009	Updated Ordering Information table and added note 24.
*P	2785207	ODC	10/12/2009	Added information on Pb-free parts in the Ordering information table.
*Q	2811890	ODC	11/20/2009	Updated Program I/Os for the CY7C68016A-56LTXC and CY7C68016A-56LTXCT parts in "Ordering Information" on page 56.
*R	2896281	ODC	03/19/10	Removed inactive parts from the ordering information table. Updated package diagrams.Updated links in Sales, Solutions and Legal Information.
*S	3035980	ODC	09/22/10	Updated template. Changed PPM requirement for the external crystal from +/- 10 ppm to +/- 100 ppm under Electrical specifications. Added table of contents, ordering code definitions, acronym table, and units of measure.
*T	3161410	AAE	02/03/2011	Replaced 56-Pin QFN 8 × 8 mm Punch Version Package Diagram (Figure 11.2) and 56-Pin QFN 8 × 8 mm Sawn Version Package Diagram (Figure 11.3). Updated Package Diagrams (Figure 11.4, Figure 11.5).
*U	3195232	ODC	03/14/2011	Updated table numbering. Added typical values to Table 18 on page 45 and Table 20 on page 46 based on data obtained from SHAK-63 and SHAK 69. Updated Table 13, "Thermal Characteristics," on page 39 (CDT 89510) Updated package diagram 001-03901 to *D.
*V	3512313	GAYA	02/01/2012	Removed obsolete part CY7C68014A-56BAXC Removed pruned part CY7C68016A-56LFXC Added parts CY7C68013A-56BAXCT and CY7C68013A-56PVXCT Updated Package Diagrams

Document History Page (continued)

Document Title: CY7C68013A, CY7C68014A, CY7C68015A, CY7C68016A, EZ-USB® FX2LP™ USB Microcontroller High-Speed USB Peripheral Controller Document Number: 38-08032				
Rev.	**ECN No.**	**Orig. of Change**	**Submission Date**	**Description of Change**
*W	3998554	GAYA	07/19/2013	Added Errata footnote (Note 3). Updated Functional Overview: Updated Interrupt System: Updated FIFO/GPIF Interrupt (INT4): Added Note 3 and referred the same note in “Endpoint 2 empty flag” in Table 4. Updated Package Diagrams: spec 51-85062 – Changed revision from *E to *F. spec 001-53450 – Changed revision from *B to *C. Added Errata. Updated in new template.
*X	4617527	GAYA	01/15/2015	Updated Figure 13 Added a note to sections Data Memory Read[21] and Data Memory Write[23] sections Updated template to include the More Information section Updated Figure 37, Figure 38, Figure 39 Updated Table 11 with Reset state information for pins Sunset Review
*Y	5317277	ODC	06/28/2016	Updated CY Logo and Sales Disclaimer.

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