

Data Sheet for PL2313 USB-to-Dual Serial Bridge

Features

- Full compliance with USB Specification v1.1
- Dual serial port interfaces
- Supports RS232 serial interface
- Supports RS232 automatic handshake mode
- Over 1Mbps RS232 transfer rate
- Supports various Japanese handy (cellular) phone interfaces including PDC, PHS-NTT, PHS-DDI, DoPa, IMODE, CDMA-one, etc
- Support remote wake-up and power management
- Dual data buffers for upstream and downstream data flow on each port
- Supports default ROM or external EEPROM for device configuration
- 5V/3.3V tolerant I/O interface.
- Twelve general-purpose I/O Pins.
- On chip USB transceiver
- On chip crystal oscillator running at 12M Hz
- 48 Pins SSOP package

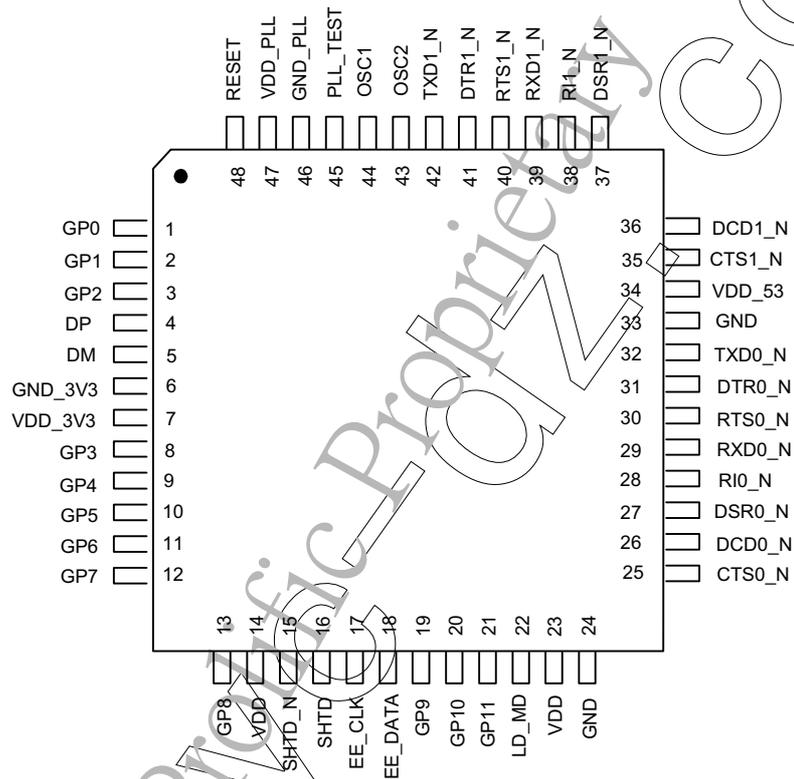


Figure 1. PL-2313 Connection Diagram of LQFP-48, Top View.

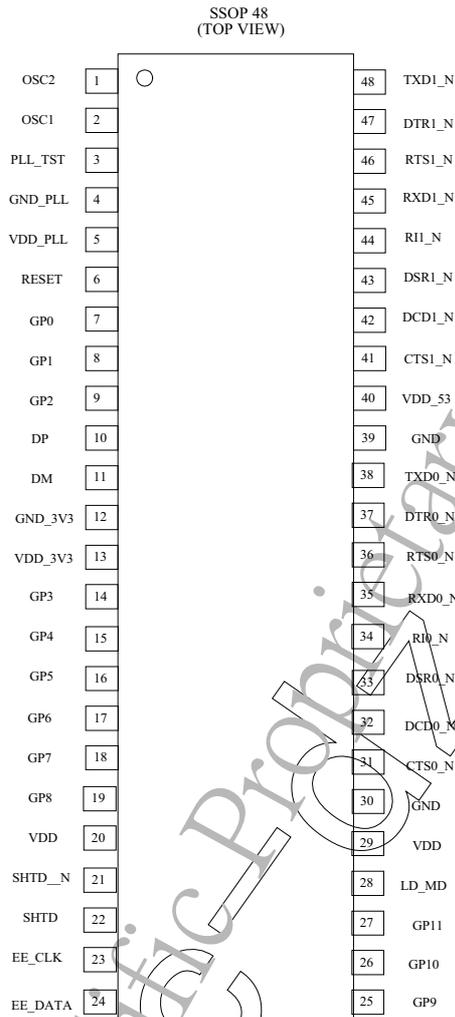


Figure 2. PL-2313 Connection Diagram of SSOP-48, Top View.

1. Introduction

The PL-2313 operates as a bridge between one USB port and two serial ports. The two serial ports could adapt with various serial interfaces: synchronous, asynchronous, standard RS-232, and any of Japanese handy phones. And, the supported systems include or will include: PDC, PHS-NTT, PHS-DDI, DoPa, IMODE, CDMA-one, WCDMA, and CDMA2000.

Figure 3 in the following page shows its interface and internal block diagram. Two large on-chip buffers on each port can accommodate full-duplex data flow more than 1Mbps on each stream. The USB bulk-type transfer is adopted for maximum data transfer. Automatic handshake is supported at the serial ports. PL2313 achieves a much higher baud rate compared with the legacy UART controller.

This device is also compliant with USB power management and remote wakeup scheme. Only minimum power is consumed from the host during suspend. By integrating all the functions into the SSOP-48 package, this chip is suitable for cable embedding.

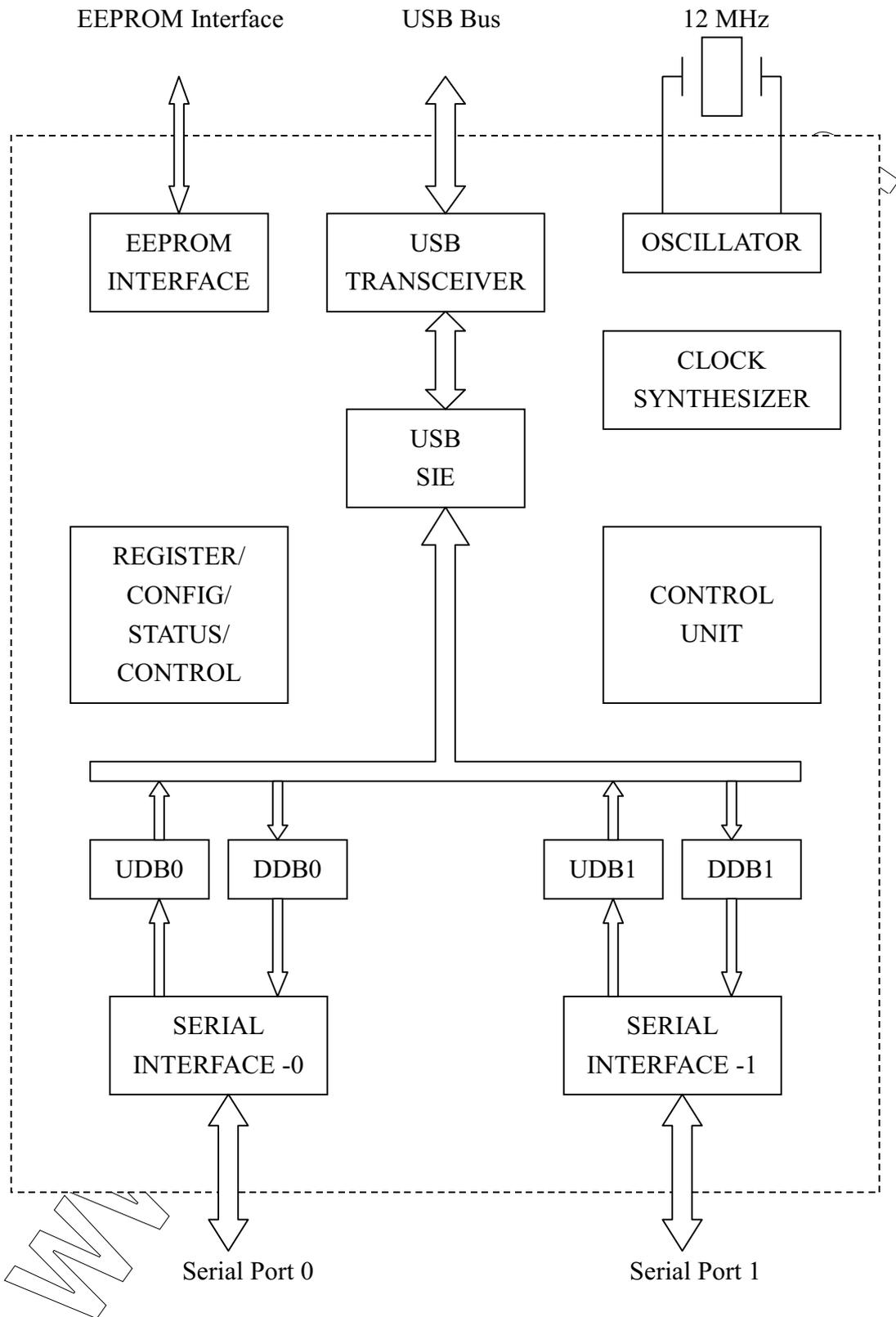


Figure 3. USB-Dual Serial Block Diagram

2. Pin Description

I – Input

O – Output

I/O – Bi-directional

I* – 5V TTL Schmitt Input

O* – Configurable output

P – Power/Ground

Table 1. Pins Description

Pin No. (LQFP-48)	Name	Type	Description	Pin No. (SSOP-48)
3:1	GPIO[2:0]	I/O	General Purpose I/O[2:0] Pins	9:7
4	DP	I/O	USB DPLUS signal	10
5	DM	I/O	USB DMINUS signal	11
6	GND_3V3	P	3.3V ground	12
7	VDD_3V3	O	3.3V power output from the internal voltage regulator.	13
13:8	GPIO[8:3]	I/O	General Purpose I/O[8:3] Pins	19:14
14	VDD	P	Power	20
15	SHTD_N	O	Low at the initial or during USB Suspend; High at the normal state.	21
16	SHTD	O	High at the initial or during USB Suspend; Low at the normal state.	22
17	EE_CLK	I/O	For input, it's only simulation purpose. During normal operation, this pin is Serial ROM clock.	23
18	EE_DATA	I/O	Serial ROM data signal	24
21:19	GPIO[11:9]	I/O	General Purpose I/O[11:9] Pins	27:25
22	LD_MD	I	Load Mode High: indicates this is a 500 mA device. Low: indicates this is a 100 mA device.	28
23	VDD	P	Power	29
24	GND	P	Ground	30
25	CTS0_N	I*	Clear To Send #0, active low	31
26	DCD0_N	I*	Data Carrier Detect #0, active low	32
27	DSR0_N	I*	Data Set Ready #0, active low	33
28	RI0_N	I*	Ring Indicator #0, active low	34
29	RXD0_N	I*	Data input from Serial port #0, low active	35
30	RTS0_N	O*	Request To Send #0, active low	36
31	DTR0_N	O*	Data Terminal Ready #0, active low	37
32	TXD0_N	O*	Data output to Serial port #0, active low	38
33	GND	P	Ground	39

34	VDD_53	P	Serial Port VDD. The serial port could be 5V or 3.3V interface. VDD_53 should be connected to the same power level of the serial interface.	40
35	CTS1_N	I*	Clear To Send #1, active low	41
36	DCD1_N	I*	Data Carrier Detect #1, active low	42
37	DSR1_N	I*	Data Set Ready #1, active low	43
38	RI1_N	I*	Ring Indicator #1, active low	44
39	RXD1_N	I	Data input from Serial port #1, low active	45
40	RTS1_N	O*	Request To Send #1, active low	46
41	DTR1_N	O*	Data Terminal Ready #1, active low	47
42	TXD1_N	O*	Data output to Serial port #1, active low	48
43	OSC2	O	Crystal oscillator output	1
44	OSC1	I	Crystal oscillator input	2
45	PLL_TEST	I	PLL test mode control	3
46	GND_PLL	P	Ground for PLL	4
47	VDD_PLL	P	5V power for PLL	5
48	RESET	I	System Reset	6

3. Supported Data Formats and Programmable Baud Rate Generator

Each serial port of PL2313 USB-to-Dual Serial bridge can be configured to interface with standard RS232 device or various Japanese handy (cellular) phones. When interfacing with standard RS232 device, PL2313 supports versatile data formats and has a programmable baud rate generator on each port. The supported data formats are shown on Table 2. The programmable baud rate generator supports baud rates up to 1.2M bps as shown in Table 3. When interfacing with Japanese handy phones, PL2313 supports various protocols including PDC, PHS-NTT, PHS-DDI, DoPa, IMODE, CDMA-one, etc.

Table 2. Supported RS232 Data Formats

	Description
Stop bits	1 1.5 2
Parity type	None Odd Even Mark Space
Data bits	5, 6, 7, 8, or 16

Table 3. RS232 Baud Rate Setting

dwDTERate	Baud Rate
0012C000h	1228800
000E1000h	921600
00096000h	614400
00070800h	460800
00038400h	230400
0001C200h	115200
0000E100h	57600
00009600h	38400
00007A12h	31250
00007080h	28800
00004B00h	19200
00003840h	14400
00002580h	9600
00001C20h	7200
000012C0h	4800
00000E10h	3600
00000960h	2400
00000708h	1800
000004B0h	1200
00000258h	600
0000012Ch	300
00000096h	150
0000004Bh	75

4. External EEPROM and Device Configuration

PL-2313 allows storing the configuration data in an external EEPROM. After reset, the first two bytes of EEPROM are checked. If their value is 067Bh, the EEPROM is valid and the contents of the EEPROM is loaded as the chip’s default parameters. Otherwise, the chip’s default setting is used. The content of EEPROM is shown in Table 4 below.

The Device Configuration Register is used to control some vendor-specific functions. The meaning of each bit in Device Configuration Register is shown in Table 5. Reserved and unused pins always set to the default value.

Table 4. EEPROM Content

Byte	Name	Description
1: 0	EECHK	When the EEPROM is programmed, these two bytes is configured as 067B. After reset, they will be checked for the value. If matched, the following information will be loaded as the default parameters.
3: 2	VID	USB Vendor ID.
5: 4	PID	Product ID.
7: 6	RN	Release number(BCD).
8	RESERVED	Reserved.
9	UCR	USB Configuration Register.
12: 10	SCR0	Serial Port 0 Configuration Register.
15:13	SCR1	Serial Port 1 Configuration Register.

Table 5. Serial Port0 and Port1 Configuration Registers

Bit	Name	Definition	Default
23:21	RESERVED	Reserved	0
20	RESERVED	Reserved	0
19:17	SMDS	Serial Mode Selection: 000 – RS-232 mode (CDMA); 001 – PDC; 010 – PHS NTT; 011 – PHS DDI; 100 – DoPa; 101 – IMODE; 110 – HDLC; 111 – Reserved.	0
16	RXSHFT	RXD Shifts by 4 bits: 0 – Don’t shift RXD; 1 – RXD shifts by 4 bits.	0
15:8	RESERVED	Reserved	0
7:6	SOM	Serial-Out Mode: 00 – Tri-state;	0

		01 – CMOS output; 10 – Open Drain; 11 – Open Source.	
5	RESERVED	Reserved	0
4	WURX	Enable Wake Up Trigger on RXD: 0 – Disabled; 1 – Enable Wake Up Trigger on RXD state changes.	0
3	WUDSR	Enable Wake Up Trigger on DSR: 0 – Disabled; 1 – Enable Wake Up Trigger on DSR state changes.	0
2	WURI	Enable Wake Up Trigger on RI: 0 – Disabled; 1 – Enable Wake Up Trigger on RI state changes.	0
1	WUDCD	Enable Wake Up Trigger on DCD: 0 – Disabled; 1 – Enable Wake Up Trigger on DCD state changes.	0
0	WUCTS	Enable Wake Up Trigger on CTS: 0 – Disabled; 1 – Enable Wake Up Trigger on CTS state changes.	0

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

Power Supply Voltage ----- -0.3 to 6.0 V
 Input Voltage ----- -0.3 to $V_{DD}+0.3$ V
 Output Voltage ----- -0.3 to $V_{DD}+0.3$ V
 Storage Temperature ----- -55 to 150 °C
 ESD ----- HBM 3KV

5.2 Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units
Operating Temperature	--	-25	--	85	°C
Operating Voltage Range	--	4.4	5	5.25	V
Junction Operation Temperature	T _J	0	25	115	°C

5.3 DC Characteristics

Parameter	Symbol	Min	Typ	Max	Units
Power Supply Current	I _{DD}	0.5	19	24	mA

Input Voltage					
Low	V_{IL}	--	--	$0.3 * V_{DD}$	V
High	V_{IH}	$0.7 * V_{DD}$	--	--	V
Output Voltage					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	3.5	--	--	V
Schmitt Trigger Threshold Voltage* ¹					
Negative going	V_{t-}	0.8	--	1.0	V
Positive going	V_{t+}	1.7	--	2.0	V
Output Voltage* ²					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	2.4	--	--	V
Input leakage current	I_L	-1	--	1	uA
Tri-state leakage current	I_{oz}	-10	--	10	uA
Output Driving	I_o	--	2	--	mA
Input Capacitance	C_{IN}	--	3	--	pf
Output Capacitance	C_{OUT}	--	3	--	pf
Bi-directional buffer Capacitance	C_{BID}	--	3	--	pf

*1. RS232 pins RXD_I, RI_I, DSR_I, DCD_I, CTS_I are 5V TTL Schmitt-Trigger inputs.

*2. RS232 pins TXD, DTR_N, RTS_N are configurable outputs, depending on power supply on pin 40.

5.4 USB Transceiver Characteristics

Parameter	Symbol	Min	Typ	Max	Units
Rise and Fall Times: (10%—90%)	T_R	4	8	15	ns
(90%—10%)	T_F	4	8	15	ns
Cross Point	V_{cr}	1.3	--	2.0	V
Output Impedance	R_D	23	28	33	ohm
High Level Output	V_{OH}	2.8	--	--	V
Low Level Output	V_{OL}	--	--	0.7	V
High Level Input	V_{IH}	2.0	--	--	V
Low Level Input	V_{IL}	--	--	0.8	V

- C_L :50pf

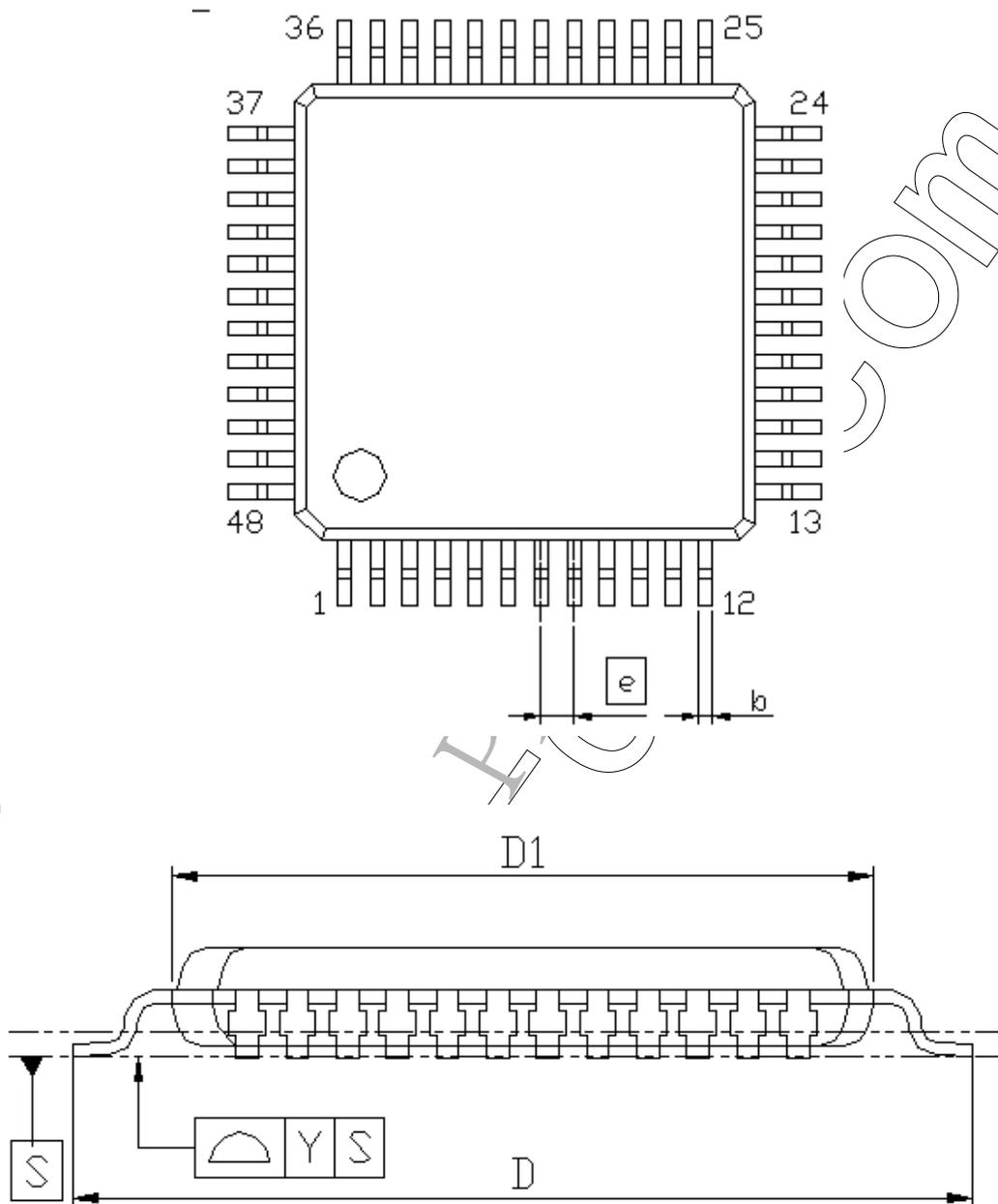
5.5 Clock Characteristics

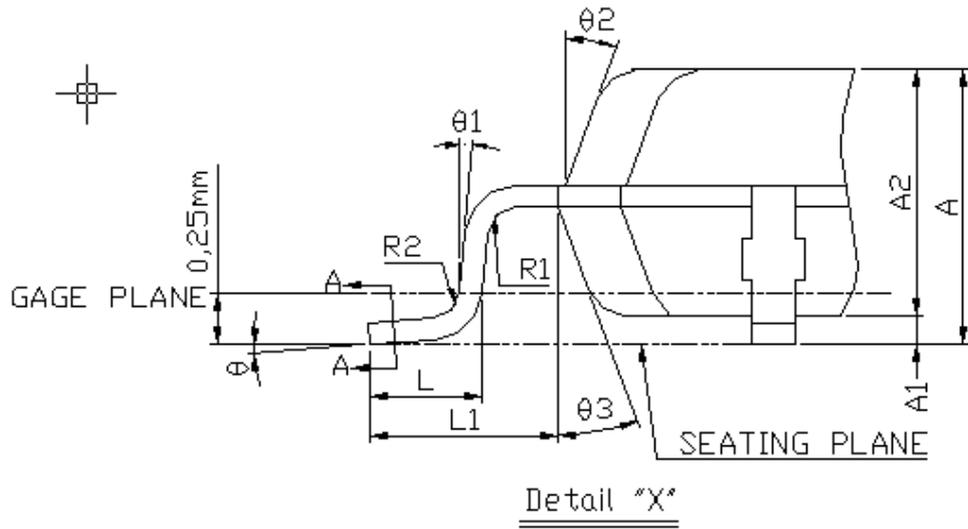
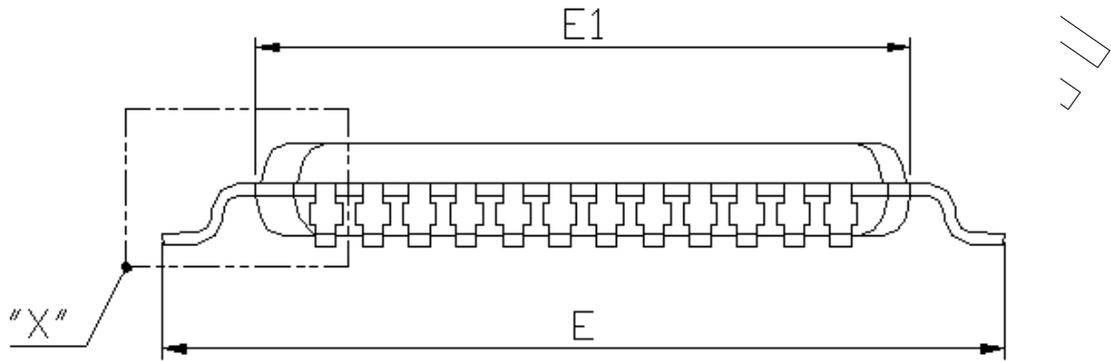
Parameter	Min	Typ	Max	Units
Frequency of Operation	11.976	12.000	12.024	MHz
Clock Period	83.1	83.3	83.5	ns
Duty Cycle	45	50	55	%

6. Package Dimensions

(48-Pin LQFP)

SYMBOL	DIMENSION (MM)			DIMENSION (MIL)		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A			1.60			63
A1	0.05		0.15	2		6
A2	1.35	1.40	1.45	53	55	57
b	0.17	0.22	0.27	7	9	11
b1	0.17	0.20	0.23	7	8	12
c	0.09		0.20	4		8
c1	0.09		0.16	4		6
D	9.00 BSC			354 BSC		
D1	7.00 BSC			276 BSC		
E	9.00 BSC			354 BSC		
E1	7.00 BSC			276 BSC		
	0.50 BSC			20 BSC		
L	0.45	0.60	0.75	18	24	30
L1	1.00 REF			39 REF		
R1	0.08			3		
R2	0.08		0.20	3		8
Y			0.075			3
θ	0°	3.5°	7°	0°	3.5°	7°
θ1	0°			0°		
θ2	11°	12°	13°	11°	12°	13°
θ3	11°	12°	13°	11°	12°	13°





(48-Pin SSOP)

SYMBOL	Dimension in inch			Dimension in mm		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.095	0.102	0.110	2.41	2.59	2.79
A ₁	0.008	0.012	0.016	0.20	0.30	0.41
A ₂	0.085	0.090	0.095	2.16	2.29	2.41
b	0.008	0.010	0.013	0.20	0.25	0.33
c	0.006	0.008	0.010	0.15	0.20	0.25
D	--	0.625	0.637	--	15.88	16.18
E	0.291	0.295	0.299	7.39	7.49	7.59
e	--	0.025	--	--	0.64	--
H _E	0.395	0.408	0.420	10.03	10.36	10.67
L	0.025	0.030	0.040	0.64	0.76	1.02
L ₁	0.049	0.057	0.063	1.24	1.45	1.60
S	--	--	0.035	--	--	0.69

