

# DATA SHEET

## **PDIUSBP11A** Universal Serial Bus Transceiver

Product specification  
Supersedes data of 1997 Aug 01

1999 Jun 04

# Universal Serial Bus transceiver

# PDIUSBP11A

## FEATURES

- Complies with Universal Serial Bus specification 1.1
- Utilizes digital inputs and outputs to transmit and receive USB cable data
- Supports 12Mbit/s "Full Speed" and 1.5Mbit/s "Low Speed" serial data transmission
- Compatible with the VHDL "Serial Interface Engine" from USB Implementers' Forum
- Supports single-ended data interface
- Single 3.3V supply
- Available in SO-14, SSOP-14 and TSSOP-14 packages

## DESCRIPTION

The PDIUSBP11A is a one chip generic USB transceiver. It is designed to allow 5.0V or 3.3V programmable and standard logic to interface with the physical layer of the Universal Serial Bus. It is capable of transmitting and receiving serial data at both full speed (12Mbit/s) and low speed (1.5Mbit/s) data rates.

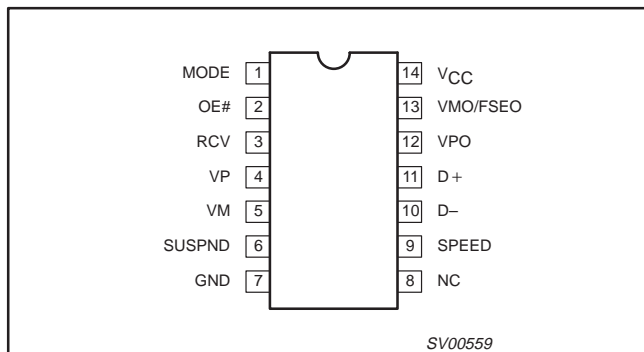
The pinout conforms with the "Serial Interface Engine". Implementation of the Serial Interface Engine along with the USB transceiver allows the designer to make USB compatible devices with off-the-shelf logic and easily modify and update the application.

The PDIUSBP11A is backward compatible to the PDIUSBP11 and allows for single-ended data interfacing.

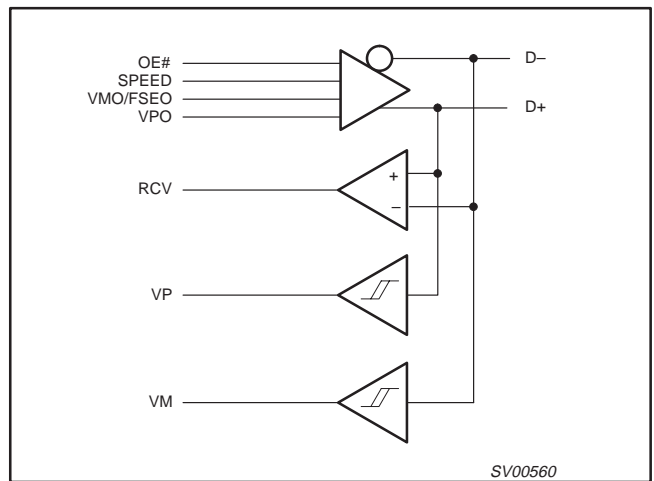
## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
14-pin plastic SO	-40°C to +85°C	PDIUSBP11A D	PDIUSBP11A D	SOT108-1
14-pin plastic SSOP	-40°C to +85°C	PDIUSBP11A DB	PDIUSBP11A DB	SOT337-1
14-pin plastic TSSOP	-40°C to +85°C	PDIUSBP11APW	PDUSBP11APW DH	SOT402-1

## PIN CONFIGURATION



## FUNCTIONAL DIAGRAM



# Universal Serial Bus transceiver

# PDIUSBP11A

## PIN DESCRIPTION

PIN No.	PIN SYMBOL	I/O	NAME AND FUNCTION																											
3	RCV	O	Receive data. CMOS level output for USB differential input																											
2	OE#	I	Output Enable. Active LOW, enables the transceiver to transmit data on the bus. When not active the transceiver is in receive mode																											
1	MODE	I	Mode. When left unconnected, a weak pull-up transistor pulls it to V <sub>CC</sub> and in this mode, the PDIUSBP11A is backward compatible to PDIUSBP11. When connected to GND, the VMO/FSEO pin takes the function of FSEO (Force SEO).																											
12, 13	V <sub>PO</sub> , V <sub>MO</sub> /F <sub>SEO</sub>	I	Inputs to differential driver. (Outputs from SIE).																											
			<table border="1"> <thead> <tr> <th>MODE</th> <th>VPO</th> <th>VMO/FSEO</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td rowspan="4">0</td> <td>0</td> <td>0</td> <td>Logic "0"</td> </tr> <tr> <td>0</td> <td>1</td> <td>SEO#</td> </tr> <tr> <td>1</td> <td>0</td> <td>Logic "1"</td> </tr> <tr> <td>1</td> <td>1</td> <td>SEO#</td> </tr> <tr> <td rowspan="4">1</td> <td>0</td> <td>0</td> <td>SEO#</td> </tr> <tr> <td>0</td> <td>1</td> <td>Logic "0"</td> </tr> <tr> <td>1</td> <td>0</td> <td>Logic "1"</td> </tr> <tr> <td>1</td> <td>1</td> <td>Illegal code</td> </tr> </tbody> </table>	MODE	VPO	VMO/FSEO	RESULT	0	0	0	Logic "0"	0	1	SEO#	1	0	Logic "1"	1	1	SEO#	1	0	0	SEO#	0	1	Logic "0"	1	0	Logic "1"
MODE	VPO	VMO/FSEO	RESULT																											
0	0	0	Logic "0"																											
	0	1	SEO#																											
	1	0	Logic "1"																											
	1	1	SEO#																											
1	0	0	SEO#																											
	0	1	Logic "0"																											
	1	0	Logic "1"																											
	1	1	Illegal code																											
4, 5	V <sub>P</sub> , V <sub>M</sub>	O	Gated version of D- and D+. Outputs are logic "0" and logic "1". Used to detect single ended zero (SEO#), error conditions, and interconnect speed. (Inputs to SIE).																											
			<table border="1"> <thead> <tr> <th>VP</th> <th>VM</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>SEO#</td> </tr> <tr> <td>0</td> <td>1</td> <td>Low Speed</td> </tr> <tr> <td>1</td> <td>0</td> <td>Full Speed</td> </tr> <tr> <td>1</td> <td>1</td> <td>Error</td> </tr> </tbody> </table>	VP	VM	RESULT	0	0	SEO#	0	1	Low Speed	1	0	Full Speed	1	1	Error												
VP	VM	RESULT																												
0	0	SEO#																												
0	1	Low Speed																												
1	0	Full Speed																												
1	1	Error																												
11, 10	D+, D-	AI/O	Data+, Data-. Differential data bus conforming to the Universal Serial Bus standard.																											
6	SUSPND	I	Suspend. Enables a low power state while the USB bus is inactive. While the suspnd pin is active it will drive the RCV pin to a logic "0" state. Both D+ and D- are tri-stated.																											
9	SPEED	I	Edge rate control. Logic "1" operates at edge rates for "full speed". Logic "0" operates edge rates for "low speed".																											
14	V <sub>CC</sub>		3.0V to 3.6V power supply																											
7	GND		Ground reference																											

## Universal Serial Bus transceiver

## PDIUSBP11A

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN.	MAX.	
$V_{CC}$	DC supply voltage		3.0	3.6	V
$V_I$	DC Input voltage range		0	5.5	V
$V_{AI/O}$	DC input range for AI/O's		0	$V_{CC}$	V
$V_O$	DC output voltage range		0	$V_{CC}$	V
$T_{amb}$	Operating ambient temperature range in free air	See DC and AC characteristics per device	-40	+85	°C

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>**

In accordance with the Absolute Maximum Rating System (IEC 134) Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
$V_{CC}$	DC supply voltage		-0.5	+6.5	V
$I_{latchup}$	Latchup current	$V_I < 0$ or $V_I > V_{CC}$	-	200	mA
$V_I$	DC input voltage	Note 2	-0.5	+5.5	V
$V_{I/O}$	DC input voltage range for I/O's		-0.5	$V_{CC} + 0.5$	V
$V_O$	DC output voltage	Note 2	-0.5	$V_{CC} + 0.5$	V
$I_{CC}, I_{GND}$	DC $V_{CC}$ or GND current		-	$\pm 100$	mA
$T_{STO}$	Storage temperature range		-60	+150	°C
$P_{TOT}$	Power dissipation per package				mW

**NOTES:**

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.

## Universal Serial Bus transceiver

## PDIUSBP11A

## DC CHARACTERISTICS (DIGITAL PINS)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP	MAX	
<b>INPUT LEVELS</b>						
V <sub>IL</sub>	LOW level input voltage				0.8	V
V <sub>IH</sub>	HIGH level input voltage		2.0			V
<b>OUTPUT LEVELS</b>						
V <sub>OL</sub>	LOW level output voltage	I <sub>OL</sub> = 4mA			0.4	V
		I <sub>OL</sub> = 20μA			0.1	
V <sub>OH</sub>	HIGH level output voltage	I <sub>OH</sub> = 4mA	2.4			V
		I <sub>OH</sub> = 20μA	V <sub>CC</sub> -0.1			
<b>LEAKAGE CURRENT</b>						
I <sub>L</sub>	Input leakage current				±5	μA
I <sub>CCS</sub>	Supply current in Suspend			-	5	μA
<b>SUPPLY CURRENT</b>						
I <sub>CC</sub>	Operating supply current		-	6	-	mA

## DC CHARACTERISTICS (A/I/O PINS)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS		UNIT
			Temp = -40°C to +85°C		
			MIN	MAX	
<b>INPUT LEVELS</b>					
V <sub>DI</sub>	Differential input sensitivity	(D+) - (D-)	0.2		V
V <sub>CM</sub>	Differential common mode range	Includes V <sub>DI</sub> range	0.8	2.5	V
V <sub>SE</sub>	Single ended receiver threshold		0.8	2.0	V
<b>OUTPUT LEVELS</b>					
V <sub>OL</sub>	Static output LOW voltage	R <sub>L</sub> of 1.5 kΩ to 3.6V		0.3	V
V <sub>OH</sub>	Static output HIGH voltage	R <sub>L</sub> of 15 kΩ to GND	2.8	3.6	V
<b>LEAKAGE CURRENT</b>					
I <sub>LO</sub>	Hi-Z State data line leakage current	0V < V <sub>IN</sub> < 3.3V		±10	μA
<b>CAPACITANCE</b>					
C <sub>IN</sub>	Transceiver capacitance	Pin to GND		20	pF
<b>OUTPUT RESISTANCE</b>					
Z <sub>DRV</sub> <sup>1</sup>	Driver output resistance	Steady state drive	6	18	Ω

## NOTE:

- Excludes external resistor. In order to comply with USB Specifications 1.1, external series resistors of 24Ω ±1% each on D+ and D- are recommended.

## Universal Serial Bus transceiver

## PDIUSBP11A

## AC CHARACTERISTICS (A/I/O PINS. FULL SPEED)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			$T_{amb} = -40^{\circ}\text{C to } +85^{\circ}\text{C}$			
			MIN	TYP	MAX	
<b>Driver Characteristics</b>		$C_L = 50\text{pF}$ ; $R_{pu} = 1.5\text{k}\Omega$ on D+ to $V_{CC}$				
$t_R$	Transition Time: Rise time	Between 10% and 90% Waveform 1	41		20	ns
$t_F$	Fall time	Waveform 1	41		20	ns
$t_{RFM}$	Rise / Fall time matching	$(t_R/t_F)$	90		111.1	%
$V_{CRS}$	Output signal crossover voltage		1.3		2.0	V
<b>Driver Timings</b>						
$tp_{LH}$	Driver propagation delay	Waveform 2			18	ns
$tp_{HL}$	(VPO, VMO/FSEO to D+/D-)	Waveform 2			19	ns
$tp_{HZ}$	Driver disable delay	Waveform 4			13	ns
$tp_{LZ}$	(OE# to D+/D-)	Waveform 4			13	ns
$tp_{ZH}$	Driver enable delay	Waveform 4			17	ns
$tp_{ZL}$	(OE# to D+/D-)	Waveform 4			17	ns
<b>Receiver Timings</b>						
$tp_{LH}$	Receiver propagation delay	Waveform 3			16	ns
$tp_{HL}$	(D+, D- to RCV)	Waveform 3			19	ns
$tp_{LH}$	Single-ended receiver delay	Waveform 3			8	ns
$tp_{HL}$	(D+, D- to VP, VM)	Waveform 3			8	ns

## NOTE:

- The 4ns specification is only for  $0^{\circ}\text{C to } +85^{\circ}\text{C}$ .

## AC CHARACTERISTICS (A/I/O PINS. LOW SPEED)

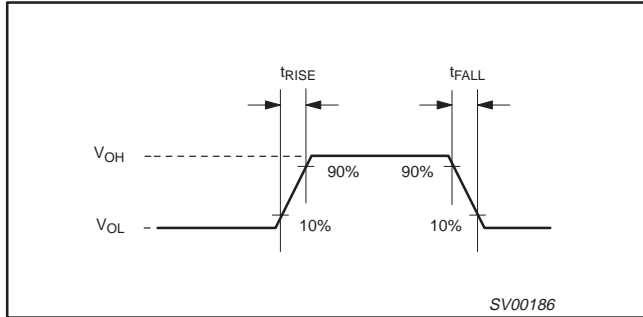
SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			$T_{amb} = -40^{\circ}\text{C to } +85^{\circ}\text{C}$			
			MIN	TYP	MAX	
<b>Driver Characteristics</b>		$C_L = 200\text{pF}$ and $600\text{pF}$ ; $R_{pu} = 1.5\text{k}\Omega$ on D- to $V_{CC}$				
$t_{LR}$	Transition Time: Rise time	Between 10% and 90% $C_L = 200\text{pF}$ . Waveform 1	75		300	ns
$t_{LF}$	Fall time	$C_L = 600\text{pF}$ . Waveform 1 $C_L = 200\text{pF}$ . Waveform 1 $C_L = 600\text{pF}$ . Waveform 1	75		300	ns
$t_{LRFM}$	Rise / Fall time matching	$(t_{LR}/t_{LF})$	80		125	%
$V_{LCRS}$	Output signal crossover voltage		1.3		2.0	V
<b>Driver Timings</b>						
$tp_{LH}$	Driver propagation delay	Waveform 2			300	ns
$tp_{HL}$	(VPO, VMO/FSEO to D+/D-)	Waveform 2			300	ns
$tp_{HZ}$	Driver disable delay	Waveform 4			13	ns
$tp_{LZ}$	(OE# to D+/D-)	Waveform 4			13	ns
$tp_{ZH}$	Driver enable delay	Waveform 4			205	ns
$tp_{ZL}$	(OE# to D+/D-)	Waveform 4			205	ns
<b>Receiver Timings</b>						
$tp_{LH}$	Receiver propagation delay	Waveform 3			18	ns
$tp_{HL}$	(D+, D- to RCV)	Waveform 3			18	ns
$tp_{LH}$	Single-ended receiver delay	Waveform 3			28	ns
$tp_{HL}$	(D+, D- to VP, VM)	Waveform 3			28	ns

# Universal Serial Bus transceiver

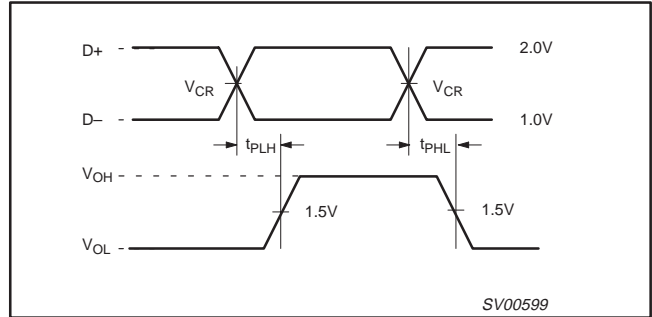
# PDIUSBP11A

## AC WAVEFORMS

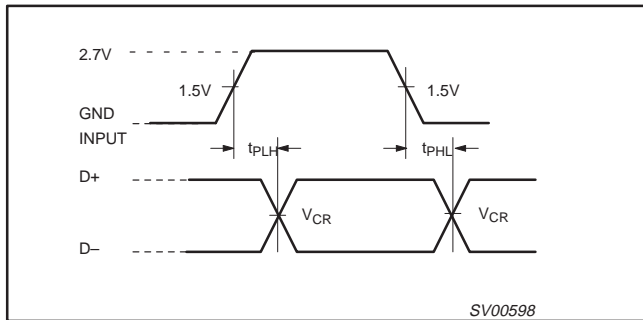
$V_{OL}$  and  $V_{OH}$  are the typical output voltage drops that occur with the output load. ( $V_{CC}$  never goes below 3.0V).



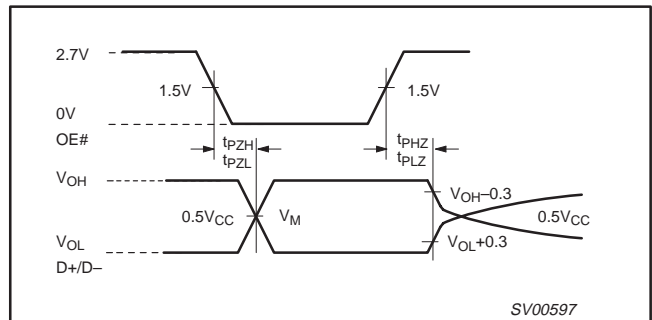
Waveform 1. Rise and Fall Times



Waveform 3. D+/D- to RCV, VP/VM

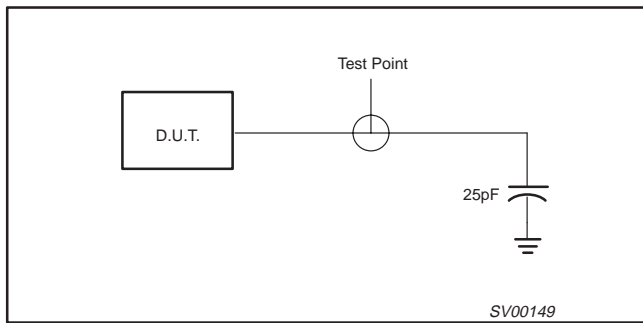


Waveform 2. VPO, VMO/FSEO to D+/D-

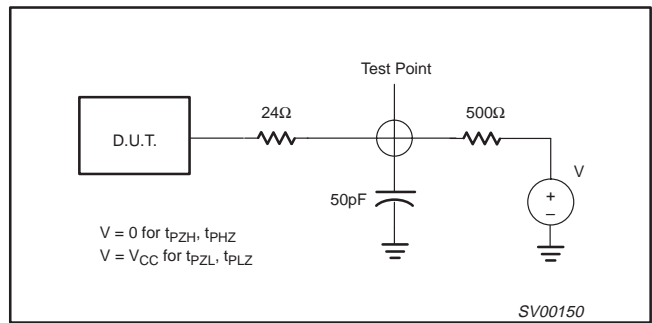


Waveform 4. OE# to D+/D-

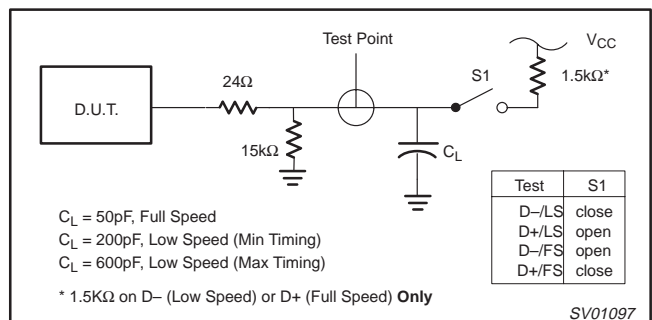
## TEST CIRCUITS AND WAVEFORMS



Load for VM/VP and RCV



Load for Enable and Disable Times



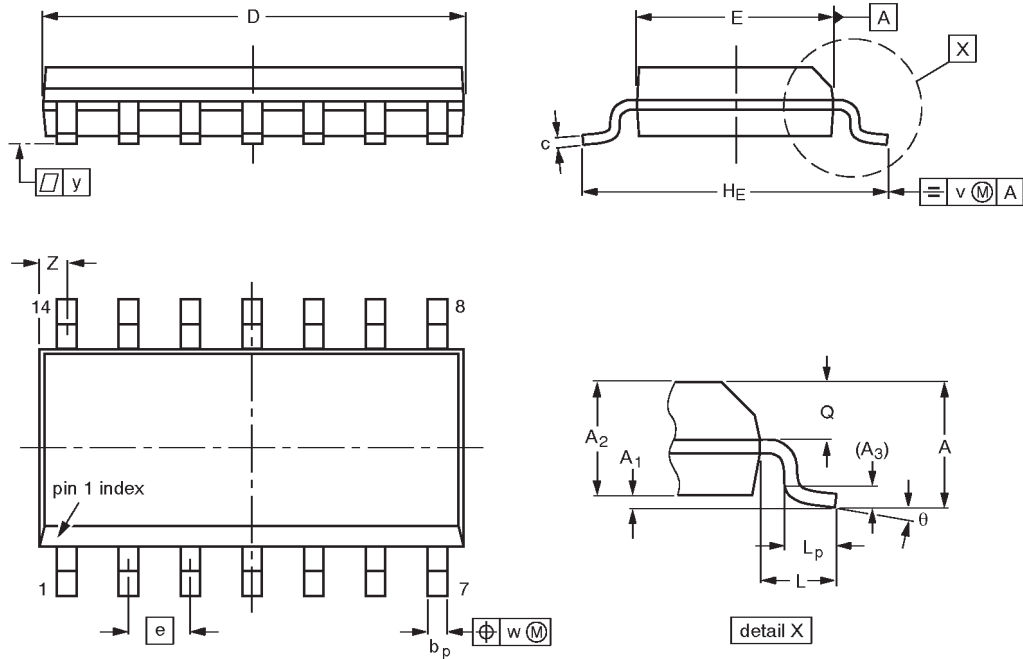
Load for D+/D-

# Universal Serial Bus Transceiver

# PDIUSBP11A

**SO14: plastic small outline package; 14 leads; body width 3.9 mm**

**SOT108-1**



**DIMENSIONS** (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.35 0.34	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06S	MS-012AB				91-08-13 95-01-23

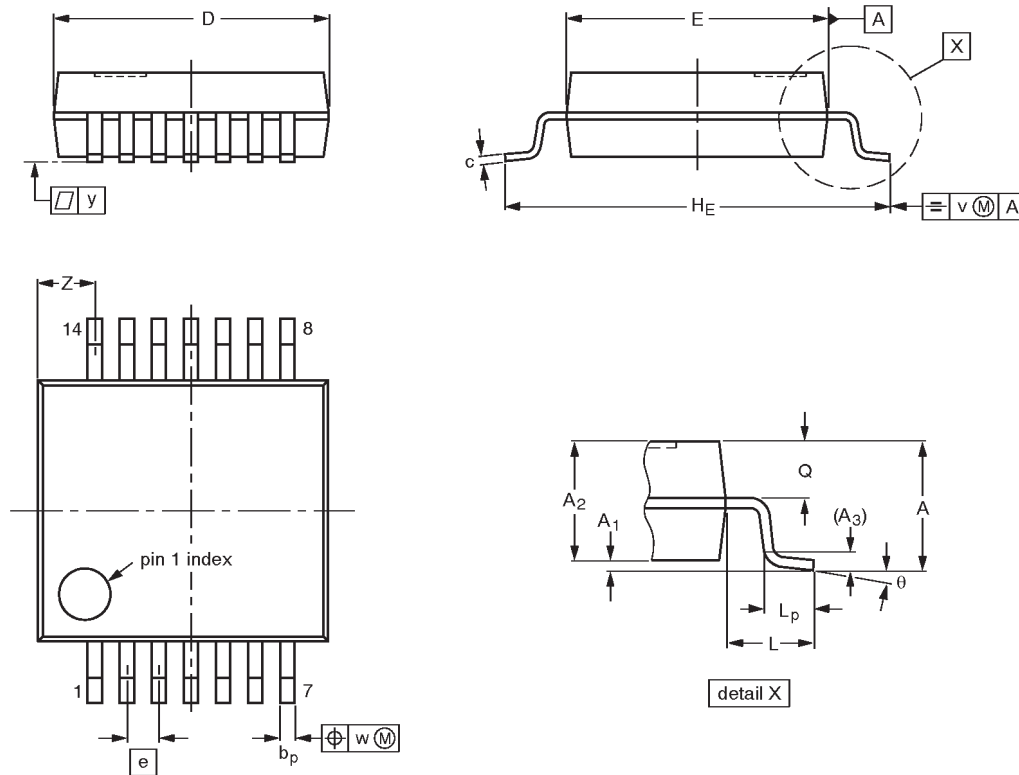


# Universal Serial Bus Transceiver

# PDIUSBP11A

**SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm**

**SOT337-1**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.4 0.9	8° 0°

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

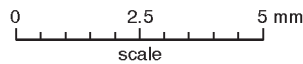
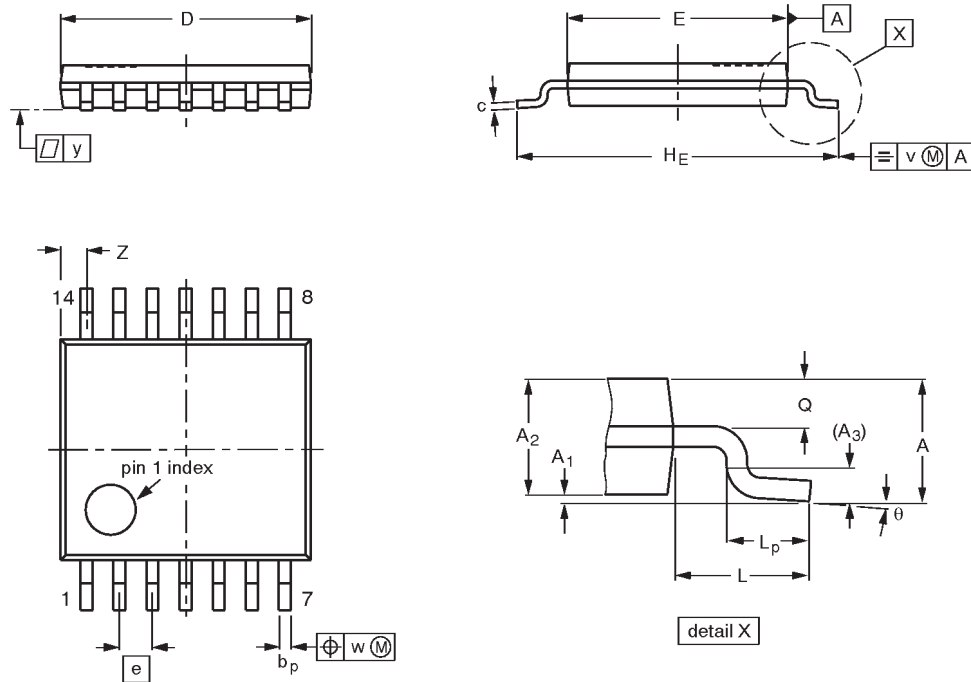
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT337-1		MO-150AB				<del>95-02-04</del> 96-01-18

# Universal Serial Bus Transceiver

# PDIUSBP11A

**TSSOP14:** plastic thin shrink small outline package; 14 leads; body width 4.4 mm

**SOT402-1**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT402-1		MO-153				-94-07-12- 95-04-04

---

# Universal Serial Bus Transceiver

# PDIUSBP11A

---

## NOTES

## Universal Serial Bus Transceiver

## PDIUSBP11A

## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

## Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

## Disclaimers

**Life support** — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Philips Semiconductors  
811 East Arques Avenue  
P.O. Box 3409  
Sunnyvale, California 94088-3409  
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 1999  
All rights reserved. Printed in U.S.A.

Date of release: 06-99

Document order number:

9397 750 06063

*Let's make things better.*

SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:[szss20@163.com](mailto:szss20@163.com) QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL: 029-81022619 13072977981 FAX:029-88789382