

Technical Note

LVDS Interface ICs 4bit LVDS Transceiver

BU90LV049A



No.09057EAT01

Description

LVDS Interface IC of ROHM "Serializer" "Deserializer" operate from 8MHz to 150MHz wide clock range, and number of bits range is from 35 to 70. Data is transmitted seven times (7X) stream and reduce cable number by 3(1/3) or less. The ROHM's LVDS has low swing mode to be able to expect further low EMI.

Driver and Receiver of 4 bits operate to 250MHz. It can be used for a variety of purposes, home appliances such as LCD-TV, business machines such as decoders, instruments, and medical equipment.

Features

- 1) >500 Mbps (250 MHz) switching rates
- 2) Flow-through pinout simplifies PCB layout.
- 3) 400 ps typical driver channel-to-channel skew
- 4) 150 ps typical receiver channel-to-channel skew
- 5) 3.3V single power supply design
- 6) ± 200 mV and ± 350 mV selectable differential signaling (driver)
- 7) 6mA and 8mA selectable output drive strength (receiver)
- 8) 3-STATE output control
- 9) Internal fail-safe biasing of receiver inputs
- 10) High impedance on LVDS outputs on power down
- 11) Conforms to TIA/EIA-644-A LVDS Standard
- 12) Industrial operating temperature range (-40°C to +85°C)

Applications

Car Navigation System Copier Digital TV (Signal System) FA equipment Medical equipment Vending machine, Ticket vending machine

Precaution

This chip is not designed to protect from radioactivity.

•Absolute maximum ratings

Itom	Symbol	Valu	11	
Item	Symbol	Min.	Max.	Unit
Supply voltage	V _{cc}	-0.3	4.0	V
Input voltage	V _{IN}	-0.3	V _{CC} +0.3	V
Output voltage	V _{OUT}	-0.3	V _{CC} +0.3	V
Storage temperature range	Tstg	-55	150	°C

Package Power

Package	PD(mW)	DERATING(mW/°C) ※1
SSOP-B16	400	4.0
	450 ^{*2}	4.5 ^{*2}

‰1 At temperature Ta $> 25^{\circ}$ C

 $\bigstar 2$ Package power when mounting on the PCB board.

The size of PCB board $:70 \times 70 \times 1.6 \text{ (mm}^3)$

The material of PCB board :The FR4 glass epoxy board.(3% or less copper foil area)

Operating conditions

ltom	Symbol	Value			Linit	Condition	
item	Symbol	Min.	Тур.	Max.	Unit	Condition	
Supply voltage	Vcc	3.0	3.3	3.6	V		
Operating temperature range	Topr	-40	25	85	°C		

•Electrical characteristics

Symbol	Parameter	Conditions	Pin	Min	Тур	Max	Units
LVCMOS	S Input DC Specification (Driver I	- nputs, ENABLE Pins)				-	
V _{IH}	Input High Voltage			$V_{cc} \times 0.8$	-	V _{cc}	V
V _{IL}	Input Low Voltage		D _{IN}		-	$V_{cc} \times 0.2$	V
I	Input Current	$V_{IN} = 0V$ or V_{CC}	EN SL	-10	_	+10	μA
V _{CL}	Input Clamp Voltage	V _{cL} = -18mA		-1.5	-0.8	-	V
LVDS O	utput DC Specification (Driver Ou	tput)					
V _{od1}	Differential Output Voltage	SL= GND, $R_L = 100 \Omega$ (Figure 4)		250	350	450	mV
V _{OD2}	Differential Output Voltage	SL= V_{cc} , R_{L} = 100 Ω (Figure 4)	D _{OUT+}	120	200	300	mV
ΔV _{od}	Change in Magnitude of V _{op} for Complementary Output States			_	1	35	mV
V _{os}	Offset Voltage	$SL = V_{CC}$ or GND, $P = 100 \Omega$ (Figure 4)		1.125	1.25	1.375	V
ΔV_{os}	Change in Magnitude of Vos for Complementary Output States			-	1	25	mV
I _{os}	Output Short Circuit Current	ENABLED, $D_{IN} = V_{CC}, D_{OUT+} = 0V \text{ or}$ $D_{IN} = GND, D_{OUT-} = 0V$		-	-5.4	-9.0	mA
I _{osd}	Differential Output Short Circuit Current	ENABLED, V _{OD} = 0V		-	-5.4	-9.0	mA
I _{oz}	Output 3-STATE Current	$EN = 0V$ and $SL = V_{cc}$ $V_{out} = 0V$ or V_{cc}		-10	1	+10	μA
LVDS In	put DC Specification (Receiver In	puts)					
V _{TH}	Differential Input High Threshold	V _{CM} = 1.2V, 0.05V, 2.35V		-	_	100	mV
V _{TL}	Differential Input Low Threshold		R_{IN-}	-100	_	_	mV
V _{CMR}	Common-Mode Voltage Range	$V_{ID} = 200 \text{mV} \text{ pk to pk}$		0.1	_	2.3	V
I _{IN}	Input Current	V _{IN} = 0 or Vcc		-20	-	+20	μA
LVCMOS	Output DC Specification (Recei	ver Outputs)					
V _{OH1}	Output High Voltage	$I_{OH} = -8 \text{ mA}, V_{ID} = +200 \text{ mV},$ SL=GND		V _{cc} - 0.4	_	-	V
V _{OH2}	Output High Voltage	$I_{OH} = -6 \text{ mA}, V_{ID} = +200 \text{ mV},$ SL = V _{CC}	$I_{OH} = -6 \text{ mA}, V_{ID} = +200 \text{ mV},$ SL = V _{CC}		-	-	
V _{OL1}	Output Low Voltage	I _{oL} = 8 mA, V _{ID} = -200 mV, SL=GND	R _{out}	-	-	0.4	V
V _{OL2}	Output Low Voltage	$I_{oL} = 6 \text{ mA}, V_{ID} = -200 \text{ mV},$ SL = V _{CC}		_	_	0.4	
I _{oz}	Output 3-STATE Current	Disabled, V _{OUT} = 0V or V _{CC}	1	-10	1	+10	μA
General	DC Specifications						
I _{cc}	Power Supply Current	EN = Vcc and SL = 0V	v	_	12	-	mA
I _{CCZ}	TRI-State Supply Current	EN = 0V and SL = 0V	• cc	-	2	-	mA

•Switching Characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Units
LVDS Out	puts (Driver Outputs)					
t _{PHLD}	Differential Propagation Delay High to Low	$R_L = 100 \Omega$, $C_L = 15 pF$	0.5	1.7	2.8	ns
t _{PLHD}	Differential Propagation Delay Low to High	(Figure 5 and Figure 6)	0.5	1.7	2.8	ns
t _{skD1}	Differential Pulse Skew t _{PHLD} - t _{PLHD}		0	0.3	0.4	ns
t _{skd2}	Differential Channel-to-Channel Skew		0	0.4	0.5	ns
t _{skD3}	Differential Part to Part Skew		0	-	1.0	ns
t _{TLH}	Rise Time		-	0.5	1.5	ns
t _{THL}	Fall Time		-	0.5	1.5	ns
t _{PHZ}	Disable Time High to Z	$R_{L} = 100 \Omega$, $C_{L} = 15 pF$	-	2	5	ns
t _{PLZ}	Disable Time Low to Z	(Figure 7 and Figure8)	-	2	5	ns
t _{PZH}	Enable Time Z to High		-	3	7	ns
t _{PZL}	Enable Time Z to Low		-	3	7	ns
f _{Max}	Maximum Operating Frequency		250	-	-	MHz
LVCMOS	Outputs (Receiver Outputs)		-			
t _{PHL}	Propagation Delay High to Low	$C_{L} = 15pF$ $V_{ID} = 200mV$	1.2	2.0	3.7	ns
t _{PLH}	Propagation Delay Low to High	(Figure 9 and Figure 10)	1.2	1.9	3.7	ns
t _{sK1}	Pulse Skew t _{PHLD} - t _{PLHD}		0	0.1	0.4	ns
t _{sk2}	Channel-to-Channel Skew		0	0.15	0.5	ns
t _{sk3}	Part to Part Skew		-	-	1.0	ns
t _{TLH}	Rise Time		-	0.5	1.5	ns
t _{THL}	Fall Time		-	0.5	1.5	ns
t _{PHZ}	Disable Time High to Z	$R_L = 2k \Omega$	-	8	14	ns
t _{PLZ}	Disable Time Low to Z	$C_L = 15pF$	-	8	14	ns
t _{PZH}	Enable Time Z to High	(Figure 11 and Figure 12)	-	3	14	ns
t _{PZL}	Enable Time Z to Low		-	9	14	ns
f _{Max}	Maximum Operating Frequency		250	-	-	MHz

Block diagram





SSOP-B16 Package Outline and Specification



(UNIT : mm)

Figure 2. SSOP-B16 Package Outline and Specification

Pin Configuration



Figure 3. Pin Diagram (Top View)

Pin Description

Pin Name	Pin No.	Туре	Descriptions	
DIN	10, 11	LVCMOS In	Driver input pin, LVCMOS levels.	
DOUT+	6, 7	LVDS Out	Non-inverting driver output pin, LVDS levels.	
DOUT-	5, 8	LVDS Out	Inverting driver output pin, LVDS levels.	
RIN+	2, 3	LVDS In	Non-inverting receiver input pin, LVDS levels.	
RIN-	1, 4	LVDS In	Inverting receiver input pin, LVDS levels.	
ROUT	14, 15	LVCMOS Out	Receiver output pin, LVCMOS levels.	
SL	9	LVCMOS In	Drive strength and Swing Level select pin : When SL is low or open, Rout set 8mA mode and the driver is normal swing level (350mV). When SL is high, Rout set 6mA mode and the driver is reduce swing level (200mV).	
EN	16	LVCMOS In	Enable pin: When EN is Low or open, the receiver and driver are disabled. When EN is high, the receiver and driver are enabled.	
VCC	12	Power	Power supply pin, +3.3V \pm 0.3V.	
GND	13	GND	Ground pin.	

Function Description

Driver Truth Table

		INPUT	OUTPUTS		SwingLovol	
EN	SL	Din	Dout+	Dout-	Swing Level	
Ц	L or Open	L	L	Н	350m\/	
11	L of Open	Н	Н	L	550117	
Ц			L	Н	200m\/	
		Н	Н	L	200111	
All other com EN, SL	binations of inputs	Х	Z	Z		

■Receiver Truth Table

		INPUT	OUTPUTS	Drive	
EN	SL	$R_{IN+} - R_{IN-}$	R _{OUT}	Strength	
		$VID \ge 0V$	Н		
		$VID \leq -0.1V$	L		
H L or Open		Full Fail-safe OPEN/SHORT or Terminated	Н	8mA	
		$VID \ge 0V$	Н		
		$VID \leq -0.1V$	Ц		
Н	Н	Full Fail-safe OPEN/SHORT or Terminated	Н	6mA	
All other combinations of EN, SL inputs		Х	Z		

Parameter Measurement Information



Figure 4. Driver VOD and VOS Test Circuit



Figure 5. Driver Propagation Delay and Transition Time Test Circuit



Figure 6. Driver Propagation Delay and Transition Time Waveforms



Figure 7. Driver 3-STATE Delay Test Circuit



Figure 8. Driver 3-STATE Delay Waveform



Figure 9. Receiver Propagation Delay and Transition Time Test Circuit



Figure 10. Receiver Propagation Delay and Transition Time Waveforms



Figure 11. Receiver 3-STATE Delay Test Circuit



Figure 12. Receiver 3-STATE Delay Waveforms

•Typical Application







Figure 14. Driver Output Levels

BU90LV049A

Ordering part number



SSOP-B16



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 - [f] Sealing or coating our Products with resin or other coating materials
 - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
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- 4. The Products are not subject to radiation-proof design.
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- 2. In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

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 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
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