

1.8-V HIGH-SPEED DIFFERENTIAL LINE RECEIVER

Check for Samples: [SN65LVDS4](#)

FEATURES

- Designed for Signaling Rates up to:
 - 500-Mbps Receiver

The signaling rate of a line is the number of voltage transitions that are made per second expressed in the units bps (bits per second)

- Operates From a 1.8-V or 2.5-V Core Supply
- Available in 1.5-mm × 2-mm QFN Package
- Bus-Terminal ESD Exceeds 2 kV (HBM)
- Low-Voltage Differential Signaling With Typical Output Voltages of 350 mV Into a 100-Ω Load
- Propagation Delay Times
 - 2.1 ns Typical Receiver
- Power Dissipation at 250 MHz
 - 40 mW Typical
- Requires External Failsafe
- Differential Input Voltage Threshold Less Than 50 mV
- Can Provide Output Voltage Logic Level (3.3-V LVTTTL, 2.5-V LVCMOS, 1.8-V LVCMOS) Based on External VDD Pin, Thus Eliminating External Level Translation

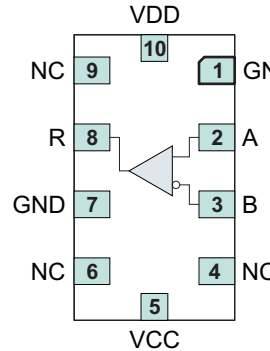
APPLICATIONS

- Clock Distribution
- Wireless Base Stations
- Newtwork Routers

DESCRIPTION

The SN65LVDS4 is a single, low-voltage, differential line receiver in a small-outline QFN package.

**SN65LVDS4 (Receiver)
LVDS4 in QFN Package
(BOTTOM VIEW)**



**SN65LVDS4 (Receiver)
LVDS4 in QFN Package
(TOP VIEW)**

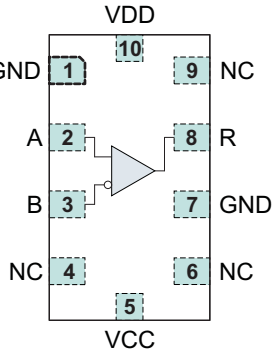


Table 1. Pin Description Table

PIN		I/O	DESCRIPTION
NAME	NO.		
A	2	I	LVDS input, positive
B	3	I	LVDS input, negative
GND	1, 7	–	Ground
NC	4, 6, 9	–	No connect
R	8	O	1.8/2.5 LVCMOS/3.3 LVTTTL output
VCC	5	–	Core supply voltage
VDD	10	–	Output drive voltage

AVAILABLE OPTIONS

PART NUMBER	INTEGRATED TERMINATION	PACKAGE	PACKAGE MARKING
SN65LVDS4RSE	No	QFN	QXB

The SN65LVDS4 is characterized for operation from –40°C to 85°C.

Table 2. FUNCTION TABLE

INPUTS	OUTPUT ⁽¹⁾
$V_{ID} = V_A - V_B$	R
$V_{ID} \geq 50 \text{ mV}$	H
$V_{ID} \leq -50 \text{ mV}$	L

(1) H = high level, L = low level, ? = indeterminate

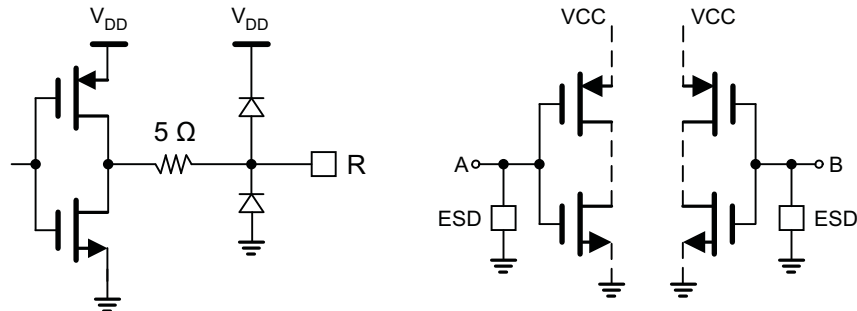


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

RECEIVER EQUIVALENT INPUT AND OUTPUT SCHEMATIC DIAGRAMS



ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

PARAMETER		Values		Units
		MIN	MAX	
Supply voltage range, V _{CC} ⁽²⁾		−0.5	4	V
Receiver output voltage logic level and driver input voltage logic level supply, V _{DD}		−0.5	4	V
Input voltage range, V _I	(A or B)	−0.5	V _{CC} + 0.3	V
Output voltage, V _O	(R)	−0.5	V _{DD} + 0.3	V
Differential input voltage magnitude, V _{ID}			1 V	
Receiver output current, I _O		−12	12	mA
Human-body model electrostatic discharge, HBM ESD ⁽³⁾				
	All pins		2000	V
	Bus pins (A, B, Y, Z)		2000	V
Field-induced-charge device model electrostatic discharge, FCDM ESD ⁽⁴⁾			500	V
Continuous total power dissipation, P _D		See the Thermal Information Table		
Storage Temperature Range (non operating)		−65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* 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.

(2) All voltage values, except differential I/O bus voltages, are with respect to network ground terminal.

(3) Test method based upon JEDEC Standard 22, Test Method A114-A. Bus pins stressed with respect to GND and V_{CC} separately.

(4) Test method based upon EIA-JEDEC JESD22-C101C.

THERMAL INFORMATION

THERMAL METRIC ⁽¹⁾		SN65LVDS4	UNIT
		RSE	
		10 PINS	
θ_{JA}	Junction-to-ambient thermal resistance ⁽²⁾	171.2	°C/W
θ_{JCTop}	Junction-to-case (top) thermal resistance ⁽³⁾	60.7	°C/W
θ_{JB}	Junction-to-board thermal resistance ⁽⁴⁾	71.4	°C/W
ψ_{JT}	Junction-to-top characterization parameter ⁽⁵⁾	0.8	°C/W
ψ_{JB}	Junction-to-board characterization parameter ⁽⁶⁾	64.7	°C/W
θ_{JCbott}	Junction-to-case (bottom) thermal resistance ⁽⁷⁾	N/A	°C/W

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).
- (2) The junction-to-ambient thermal resistance under natural convection is obtained in a simulation on a JEDEC-standard, high-K board, as specified in JESD51-7, in an environment described in JESD51-2a.
- (3) The junction-to-case (top) thermal resistance is obtained by simulating a cold plate test on the package top. No specific JEDEC-standard test exists, but a close description can be found in the ANSI SEMI standard G30-88.
- (4) The junction-to-board thermal resistance is obtained by simulating in an environment with a ring cold plate fixture to control the PCB temperature, as described in JESD51-8.
- (5) The junction-to-top characterization parameter, ψ_{JT} , estimates the junction temperature of a device in a real system and is extracted from the simulation data for obtaining θ_{JA} , using a procedure described in JESD51-2a (sections 6 and 7).
- (6) The junction-to-board characterization parameter, ψ_{JB} , estimates the junction temperature of a device in a real system and is extracted from the simulation data for obtaining θ_{JA} , using a procedure described in JESD51-2a (sections 6 and 7).
- (7) The junction-to-case (bottom) thermal resistance is obtained by simulating a cold plate test on the exposed (power) pad. No specific JEDEC standard test exists, but a close description can be found in the ANSI SEMI standard G30-88.

RECOMMENDED OPERATING CONDITIONS

PARAMETER		TEST CONDITION	MIN	NOM	MAX	UNIT
$V_{CC1.8}$	Core supply voltage		1.62	1.8	1.98	V
$V_{CC2.5}$	Core supply voltage		2.25	2.5	2.75	V
$V_{DD1.8}$	Output drive voltage		1.62	1.8	1.98	V
$V_{DD2.5}$	Output drive voltage		2.25	2.5	2.75	V
$V_{DD3.3}$	Output drive voltage		3	3.3	3.6	V
T_A	Operating free-air temperature		–40		85	°C
$ V_{ID} $	Magnitude of differential input voltage		0.15		0.6	V
f_{op}	Operating frequency range		10		250	MHz
$ V_{INMAX} $	Input voltage (any combination of input or common-mode voltage) ⁽¹⁾ See V_{INMAX} .		0		V_{CC}	V

- (1) Any combination of input or common-mode voltage should not be below 0 V or above V_{CC} .

RECEIVER ELECTRICAL CHARACTERISTICS

over recommended operating conditions, $V_{CC} = 2.5\text{ V}$, $V_{ID} = 150\text{ mV}$ – 600 mV , $V_{CM} = V_{ID}/2$ to $V_{CC} - V_{ID}/2\text{ V}$, 10 pF load (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN ⁽¹⁾	TYP ⁽²⁾	MAX	UNIT
V_{ITH+} Positive-going differential input voltage threshold	See Figure 1, $V_{CC1.8}$, $V_{CC2.5}$			50	mV
V_{ITH-} Negative-going differential input voltage threshold		–50			
V_{OH} High-level output voltage	$V_{DD} = 3.3\text{ V}$, $I_{OH} = -8\text{ mA}$	$V_{DD} - 0.25$			V
	$V_{DD} = 2.5\text{ V}$, $I_{OH} = -6\text{ mA}$	$V_{DD} - 0.25$			
	$V_{DD} = 1.8\text{ V}$, $I_{OH} = -4\text{ mA}$	$V_{DD} - 0.25$			
V_{OL} Low-level output voltage	$V_{DD} = 3.3\text{ V}$, $I_{OL} = 8\text{ mA}$	0.25			V
	$V_{DD} = 2.5\text{ V}$, $I_{OL} = 6\text{ mA}$	0.25			
	$V_{DD} = 1.8\text{ V}$, $I_{OL} = 4\text{ mA}$	0.25			
P_{static} Static power	No load, steady state, $V_{DD} = 3.3\text{ V}$, V_{ID+}		22	28	mW
	No load, steady state, $V_{DD} = 2.5\text{ V}$, V_{ID+}		20	25	
C_I Input capacitance	$V_I = 0.4 \sin(4E6\pi t) + 0.5\text{ V}$		4		pF
C_O Output capacitance	$V_I = 0.4 \sin(4E6\pi t) + 0.5\text{ V}$		4		pF

(1) The algebraic convention, in which the least positive (most negative) limit is designated as a minimum, is used in this data sheet.

(2) All typical values are at 25°C .

RECEIVER ELECTRICAL CHARACTERISTICS

over recommended operating conditions, $V_{CC} = 1.8\text{ V}$, $V_{ID} = 150\text{ mV}$ – 600 mV , $V_{CM} = V_{ID}/2$ to $V_{CC} - V_{ID}/2\text{ V}$, 10 pF load (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN ⁽¹⁾	TYP ⁽²⁾	MAX	UNIT
V_{ITH+} Positive-going differential input voltage threshold	See Figure 1, $V_{CC1.8}$, $V_{CC2.5}$			50	mV
V_{ITH-} Negative-going differential input voltage threshold		–50			
V_{OH} High-level output voltage	$V_{DD} = 3.3\text{ V}$, $I_{OH} = -8\text{ mA}$	$V_{DD} - 0.25$			V
	$V_{DD} = 2.5\text{ V}$, $I_{OH} = -6\text{ mA}$	$V_{DD} - 0.25$			
	$V_{DD} = 1.8\text{ V}$, $I_{OH} = -4\text{ mA}$	$V_{DD} - 0.25$			
V_{OL} Low-level output voltage	$V_{DD} = 3.3\text{ V}$, $I_{OL} = 8\text{ mA}$	0.25			V
	$V_{DD} = 2.5\text{ V}$, $I_{OL} = 6\text{ mA}$	0.25			
	$V_{DD} = 1.8\text{ V}$, $I_{OL} = 4\text{ mA}$	0.25			
P_{static} Static power	No load, steady state, $V_{DD} = 3.3\text{ V}$, V_{ID+}		18	21	mW
	No load, steady state, $V_{DD} = 2.5\text{ V}$, V_{ID+}		16	19	
	No load, steady state, $V_{DD} = 1.8\text{ V}$, V_{ID+}		13	16	
C_I Input capacitance	$V_I = 0.4 \sin(4E6\pi t) + 0.5\text{ V}$		4		pF
C_O Output capacitance	$V_I = 0.4 \sin(4E6\pi t) + 0.5\text{ V}$		4		pF

(1) The algebraic convention, in which the least positive (most negative) limit is designated as a minimum, is used in this data sheet.

(2) All typical values are at 25°C .

RECEIVER SWITCHING CHARACTERISTICS

over recommended operating conditions, $V_{CC} = 2.5\text{ V}$, $V_{ID} = 150\text{ mV}$ – 600 mV , $V_{CM} = V_{ID}/2$ to $V_{CC} - V_{ID}/2\text{ V}$, 10 pF load (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽¹⁾	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 10\text{ pF}$, See Figure 3		2.5	3.3	ns
t_{PHL} Propagation delay time, high-to-low-level output			2.5	3.3	ns
$t_{sk(p)}$ Pulse skew ($ t_{pHL} - t_{pLH} $) ⁽²⁾				240	ps
t_r Output signal rise time		$V_{DD} = 3.3\text{ V}$		550	ps
		$V_{DD} = 2.5\text{ V}$		600	
t_f Output signal fall time		$V_{DD} = 3.3\text{ V}$		550	ps
		$V_{DD} = 2.5\text{ V}$		600	
t_{jit} Residual jitter added	Carrier frequency = 122.8 MHz, input signal amplitude = 500 mVpp sine wave, integration bandwidth for rms jitter = 20 khz-20 MHz, VDD = 2.5 V		370		fs

(1) All typical values are at 25°C.

(2) $t_{sk(p)}$ is the magnitude of the time difference between the high-to-low and low-to-high propagation delay times at an output.

RECEIVER SWITCHING CHARACTERISTICS

over recommended operating conditions, $V_{CC} = 1.8\text{ V}$, $V_{ID} = 150\text{ mV}$ – 600 mV , $V_{CM} = V_{ID}/2$ to $V_{CC} - V_{ID}/2\text{ V}$, 10 pF load (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP ⁽¹⁾	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 10\text{ pF}$, See Figure 3		3.2	3.8	ns
t_{PHL} Propagation delay time, high-to-low-level output			3.2	3.8	ns
$t_{sk(p)}$ Pulse skew ($ t_{pHL} - t_{pLH} $) ⁽²⁾				240	ps
t_r Output signal rise time		$V_{DD} = 3.3\text{ V}$		550	ps
		$V_{DD} = 2.5\text{ V}$		600	
		$V_{DD} = 1.8\text{ V}$		750	ps
t_f Output signal fall time	$V_{DD} = 3.3\text{ V}$		550		
		$V_{DD} = 2.5\text{ V}$		600	
		$V_{DD} = 1.8\text{ V}$		750	
t_{jit} Residual jitter added	Carrier frequency = 122.8 MHz, input signal amplitude = 500 mVpp sine wave, integration bandwidth for rms jitter = 20 khz-20 MHz, VDD = 1.8 V		370		fs

(1) All typical values are at 25°C.

(2) $t_{sk(p)}$ is the magnitude of the time difference between the high-to-low and low-to-high propagation delay times at an output.

PARAMETER MEASUREMENT INFORMATION

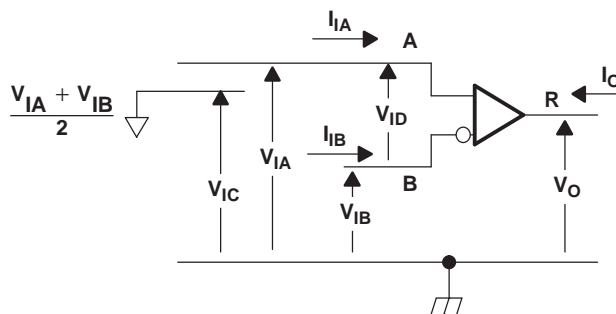
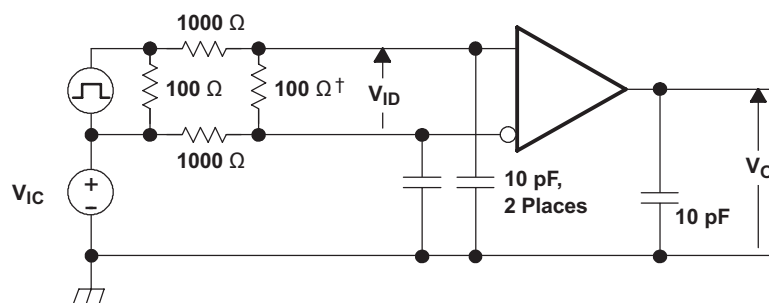
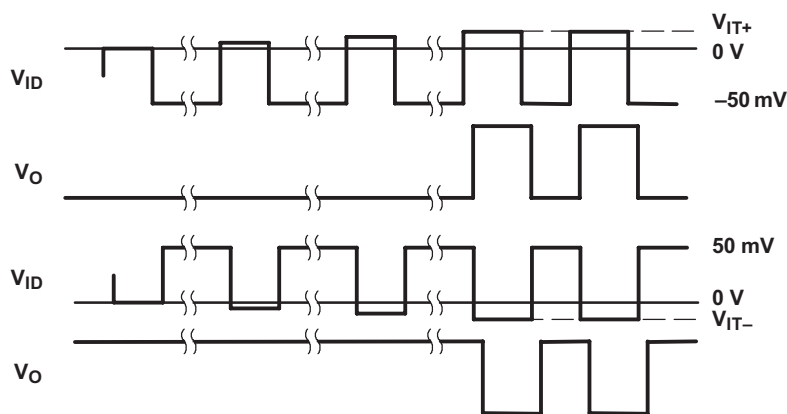


Figure 1. Receiver Voltage and Current Definitions



† Remove for testing LVDT device.

NOTE: Input signal of 3 Mpps, duration of 167 ns, and transition time of <1 ns.

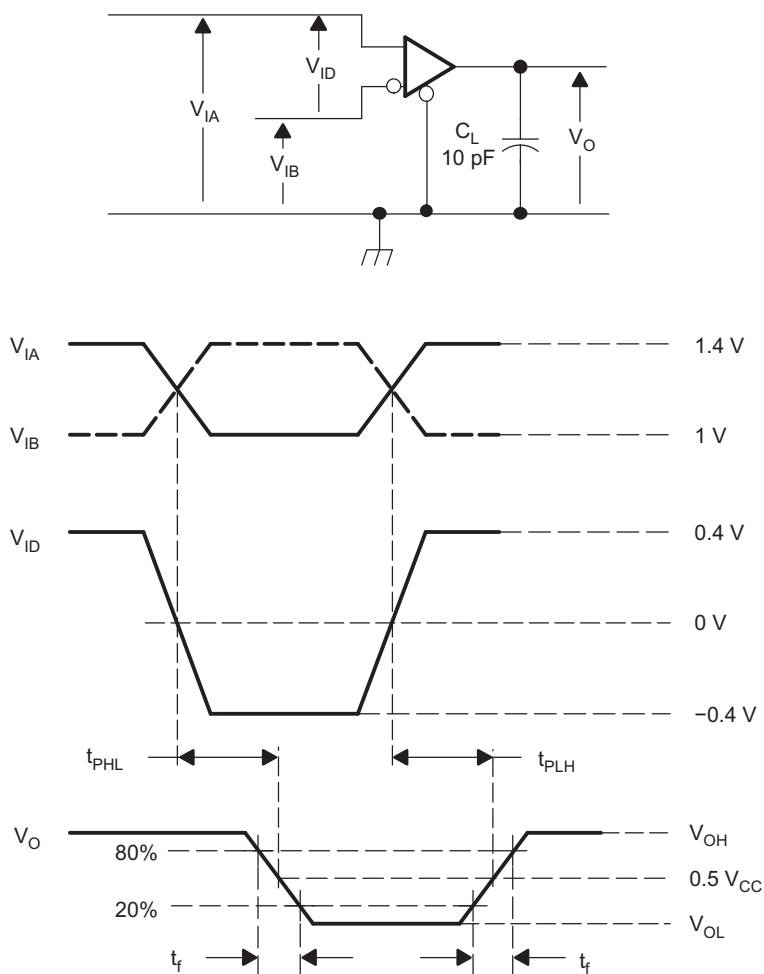


NOTE: Input signal of 3 Mpps, duration of 167 ns, and transition time of <1 ns.

S0481-01

Figure 2. V_{IT+} and V_{IT-} . Input Voltage Threshold Test Circuit and Definitions

PARAMETER MEASUREMENT INFORMATION (continued)



- A. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 1 \text{ ns}$, pulse repetition rate (PRR) = 50 Mpps, pulse width = $10 \pm 0.2 \text{ ns}$. C_L includes instrumentation and fixture capacitance within 0,06 m of the D.U.T.

Figure 3. Receiver Timing Test Circuit and Waveforms

TYPICAL CHARACTERISTICS

$V_{ICM} = 1.2\text{ V}$, $V_{ID} = 300\text{ mV}$, $C_L = 10\text{ pF}$, input rise time and fall time = 1 ns , input frequency = 250 MHz , 50% duty cycle, $T_A = 25^\circ\text{C}$, unless otherwise noted

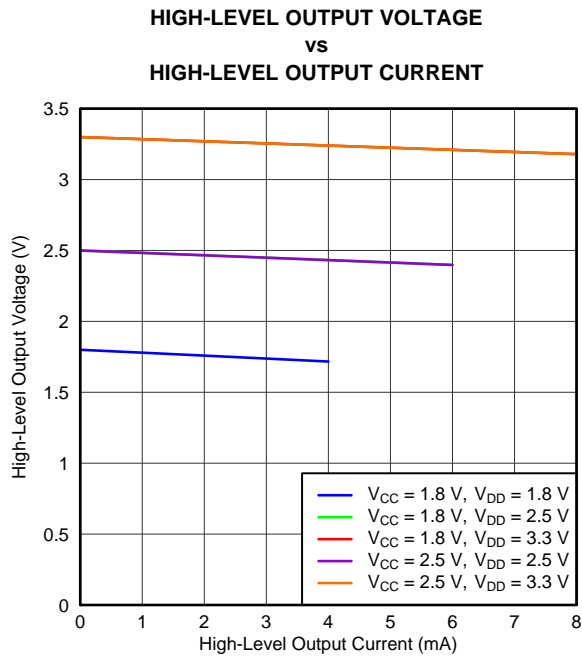


Figure 4.

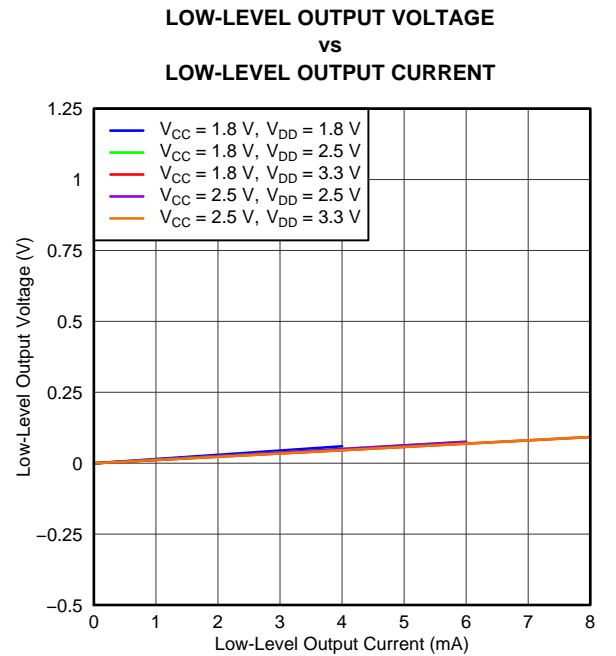


Figure 5.

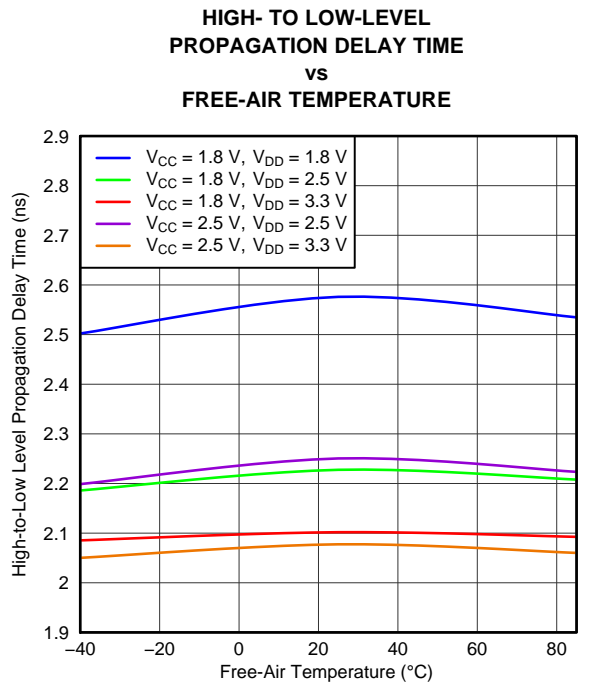


Figure 6.

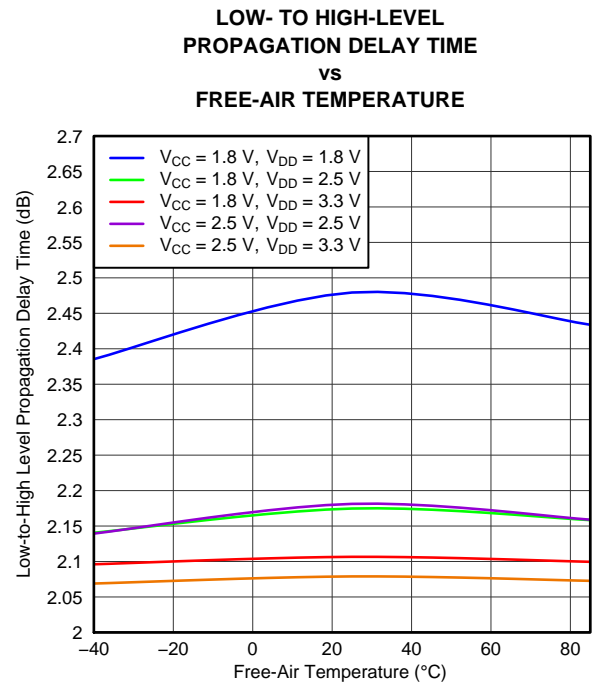


Figure 7.

TYPICAL CHARACTERISTICS (continued)

VICM = 1.2 V, VID = 300 mV, C_L = 10 pF, input rise time and fall time = 1 ns, input frequency = 250 MHz, 50% duty cycle, T_A = 25°C, unless otherwise noted

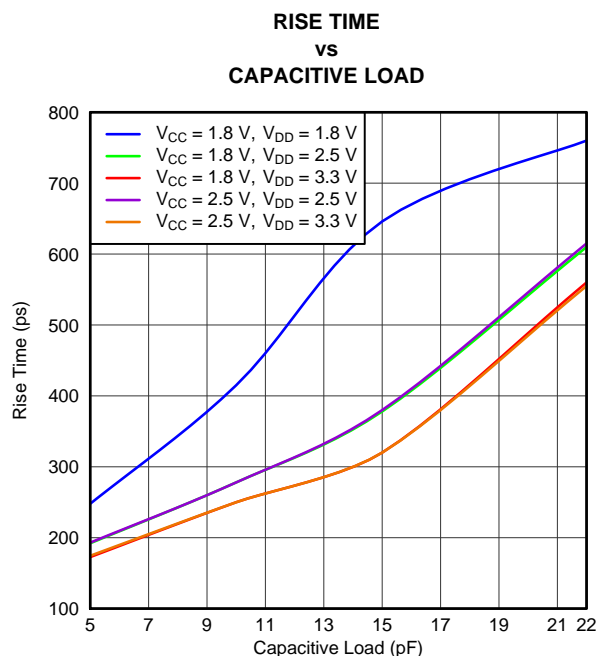


Figure 8.

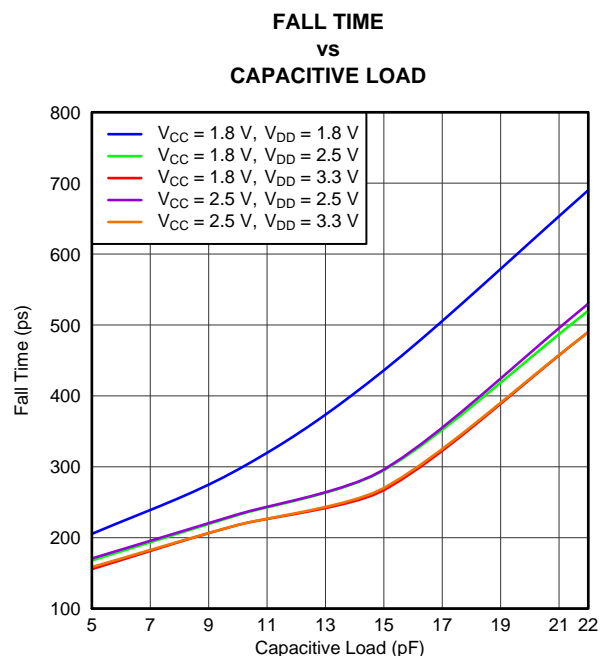


Figure 9.

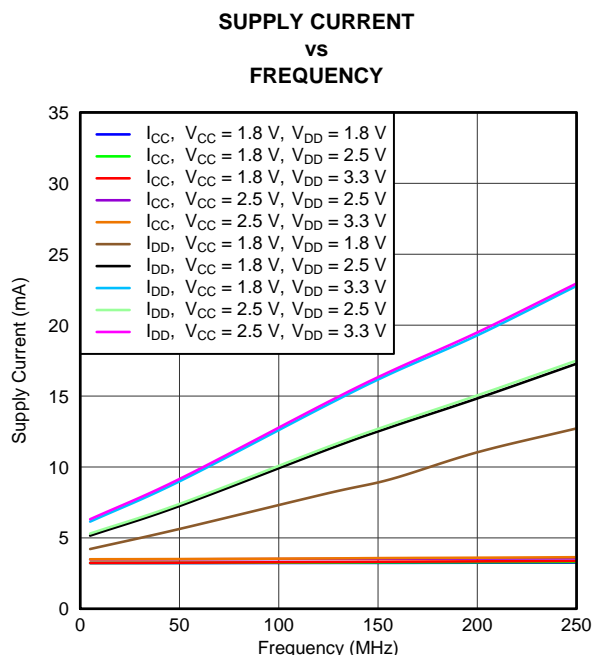


Figure 10.

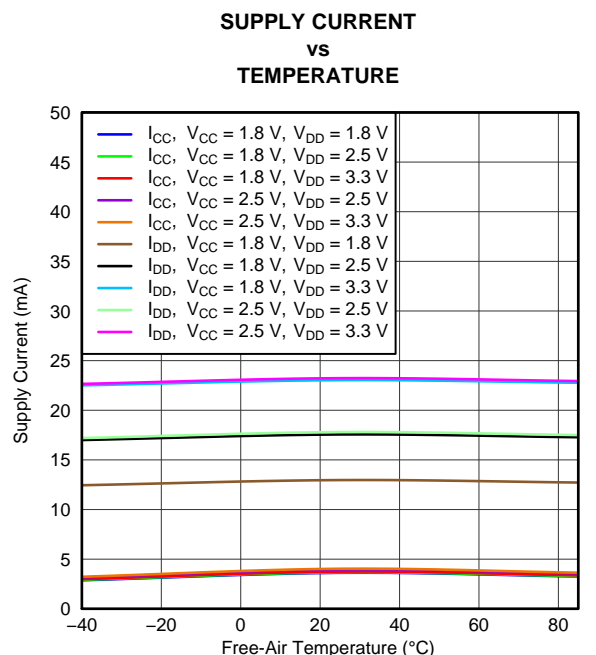


Figure 11.

TYPICAL CHARACTERISTICS (continued)

V_{ICM} = 1.2 V, V_{ID} = 300 mV, C_L = 10 pF, input rise time and fall time = 1 ns, input frequency = 250 MHz, 50% duty cycle, T_A = 25°C, unless otherwise noted

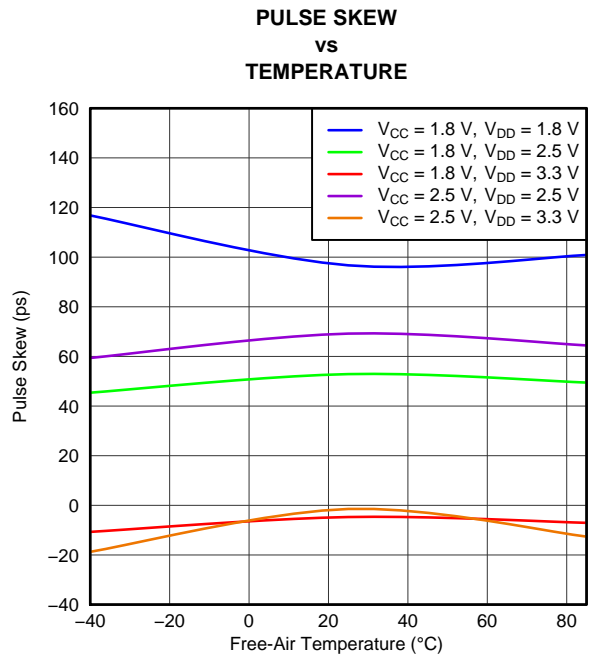


Figure 12.

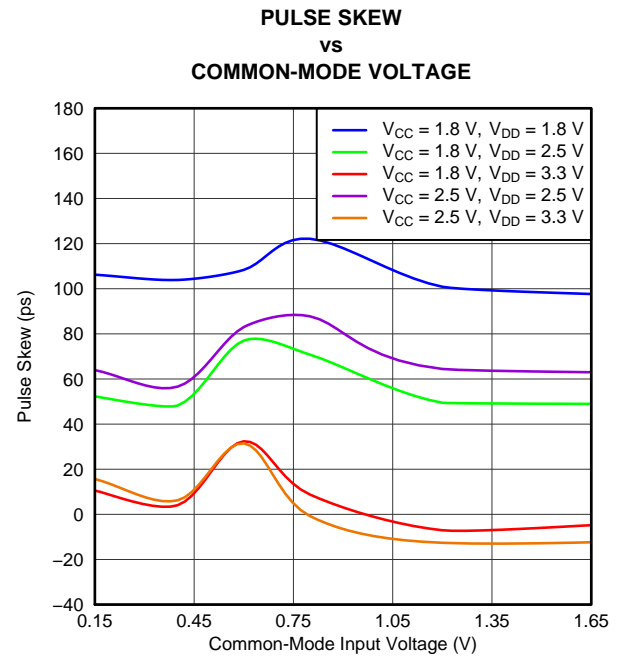


Figure 13.

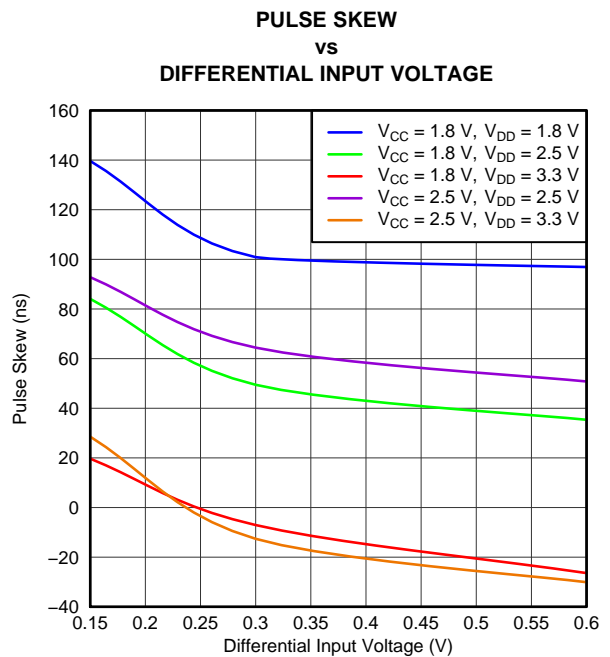


Figure 14.

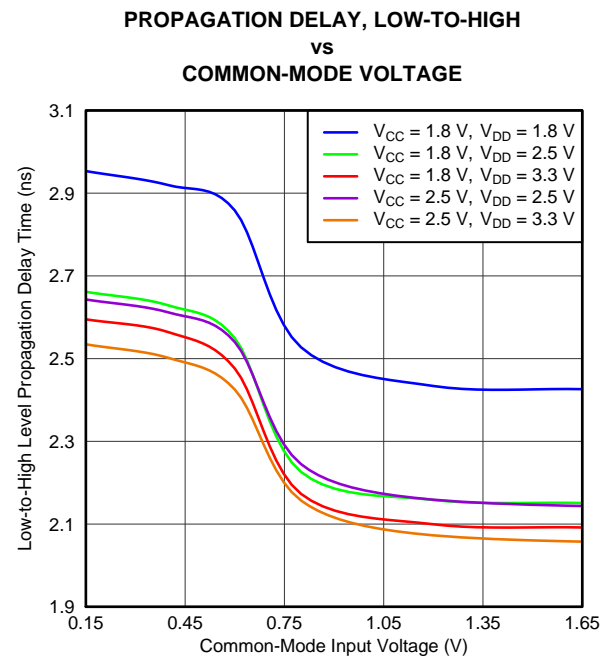


Figure 15.

TYPICAL CHARACTERISTICS (continued)

VICM = 1.2 V, VID = 300 mV, C_L = 10 pF, input rise time and fall time = 1 ns, input frequency = 250 MHz, 50% duty cycle, T_A = 25°C, unless otherwise noted

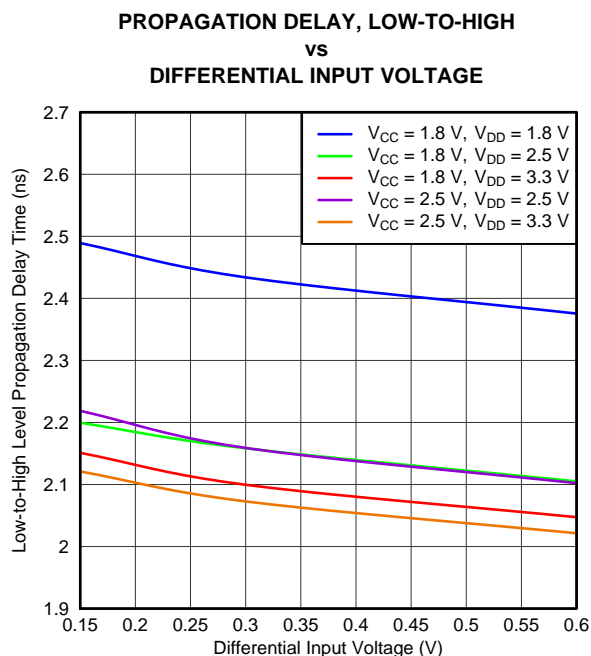


Figure 16.

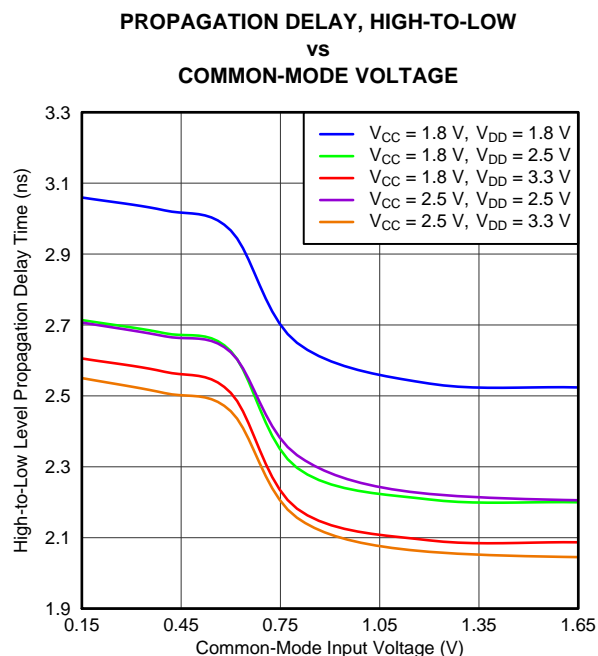


Figure 17.

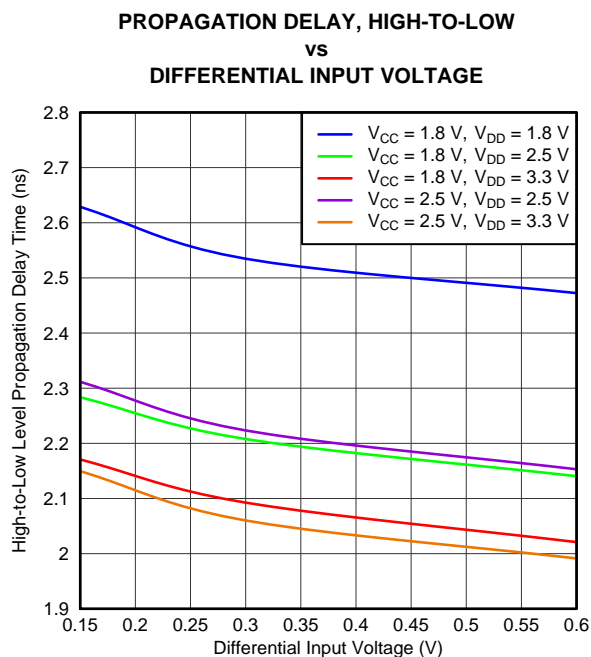


Figure 18.

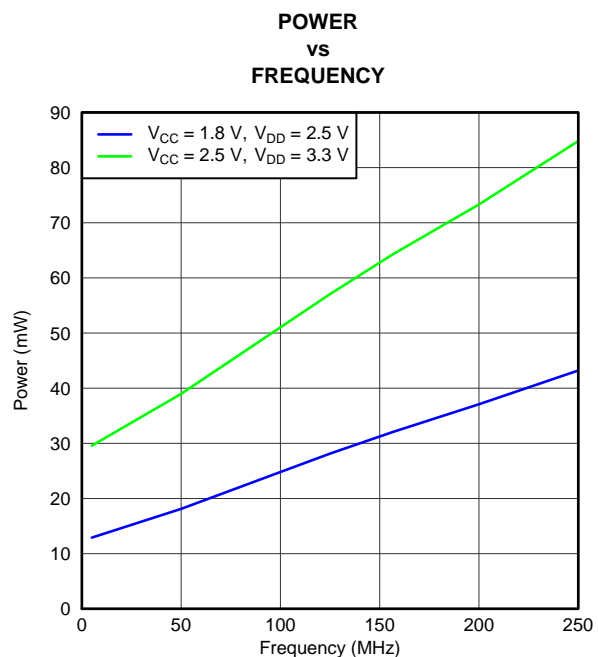
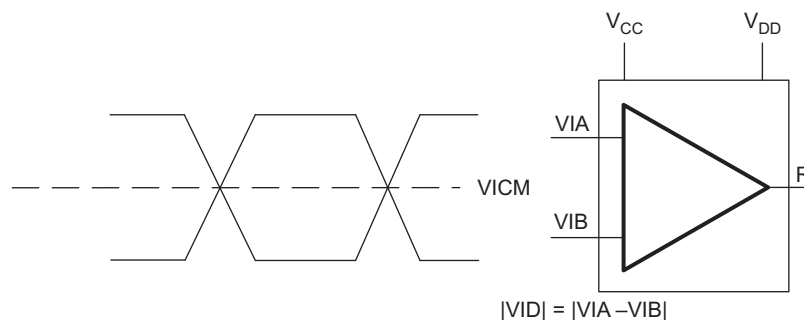


Figure 19.

APPLICATION INFORMATION

 $V_{IN_{MAX}}$  $V_{CC2.5}$ (Note: Worst-Case VCC = 2.5 – 10% = 2.25 V)

VIA (V)	VIB (V)	VID (mV)	VICM (V)
1.25	1.2	50	1.225
1.2	1.25	50	1.225
2.2	2.25	50	2.225
2.25	2.2	50	2.225
0.05	0	50	0.025
0	0.05	50	0.025

 $V_{CC2.5}$ (Note: Worst-Case VCC = 2.5 – 10% = 2.25 V)

VIA (V)	VIB (V)	VID (mV)	VICM (V)
1.5	0.9	600	1.2
0.9	1.5	600	1.2
1.65	2.25	600	1.95
2.25	1.65	600	1.95
0.6	0	600	0.3
0	0.6	600	0.3

 $V_{CC1.8}$ (Note: Worst-Case VCC = 1.8 – 10% = 1.62 V)

VIA (V)	VIB (V)	VID (mV)	VICM (V)
1.25	1.2	50	1.225
1.2	1.25	50	1.225
1.57	1.62	50	1.595
1.62	1.57	50	1.595
0.05	0	50	0.025
0	0.05	50	0.025

 $V_{CC1.8}$ (Note: Worst-Case VCC = 1.8 – 10% = 1.62 V)

VIA (V)	VIB (V)	VID (mV)	VICM (V)
1.5	0.9	600	1.2
0.9	1.5	600	1.2
1.02	1.62	600	1.32
1.62	1.02	600	1.32
0.6	0	600	0.3
0	0.6	600	0.3

Figure 20. Maximum Input Voltage Combination Allowed

POWER SUPPLY

There are two power supplies in SN65LVDS4, VCC which is the core power supply and VDD which is the output drive power supply. For proper device operation it is recommended that VCC should be powered up first and then VDD or VCC applied at the same time as VDD (VCC and VDD tied together). It is also recommended that VCC should be equal to or less than VDD as shown in [Table 3](#).

Table 3. Power Supply Acceptable Combinations

VCC (V)	VDD (V)	Recommended
1.8	1.8	yes
1.8	2.5	yes
1.8	3.3	yes
2.5	1.8	no
2.5	2.5	yes
2.5	3.3	yes

FAILSAFE

One of the most common problems with differential signaling applications is how the system responds when no differential voltage is present on the signal pair. The LVDS receiver is like most differential line receivers, in that its output logic state can be indeterminate when the differential input voltage is between -50 mV and 50 mV and within its recommended input common-mode voltage range.

Open circuit means that there is little or no input current to the receiver from the data line itself. This could be when the driver is in a high-impedance state or the cable is disconnected. When this occurs, it is recommended to have an external failsafe solution as shown in Figure 21. In the external failsafe solution, the A side is pulled to V_{CC} via a weak pullup resistor and the B side is pulled down via a weak pulldown resistor. This creates a voltage offset and prevents the receiver from switching based on noise.

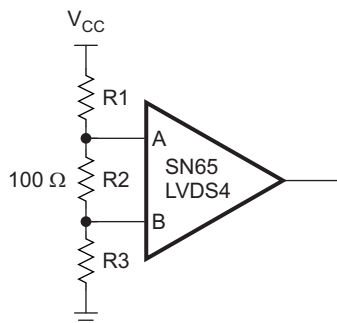


Figure 21. Open-Circuit Failsafe of the LVDS Receiver

R1 and R3 Calculation With $V_{CC} = 1.8\text{ V}$

Assume that an external failsafe bias of 25 mV is desired

Bias current in this case is $= 25\text{ mV}/100\ \Omega = 250\ \mu\text{A}$

Next, determine the total resistance from V_{CC} to ground $= 1.8\text{ V}/250\ \mu\text{A} = 7.2\text{ k}\Omega$

Keeping the common mode bias of 1.25 V to the receiver, the value of $R3 = 1.25\text{ V}/250\ \mu\text{A} = 5\text{ k}\Omega$

Thus, $R1 = 2.2\text{ k}\Omega$

R1 and R3 Calculation With $V_{CC} = 2.5\text{ V}$

Assume that an external failsafe bias of 25 mV is desired

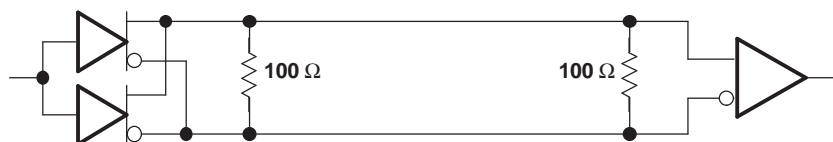
Bias current in this case is $= 25\text{ mV}/100\ \Omega = 250\ \mu\text{A}$

Next, determine the total resistance from V_{CC} to ground $= 2.5\text{ V}/250\ \mu\text{A} = 10\text{ k}\Omega$

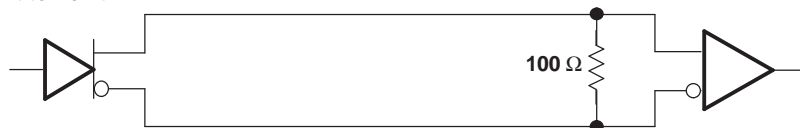
Keeping the common mode bias of 1.25 V to the receiver, the value of $R3 = 1.25\text{ V}/250\ \mu\text{A} = 5\text{ k}\Omega$

Thus, $R1 = 5\text{ k}\Omega$

Parallel Terminated



Point to Point



Multidrop

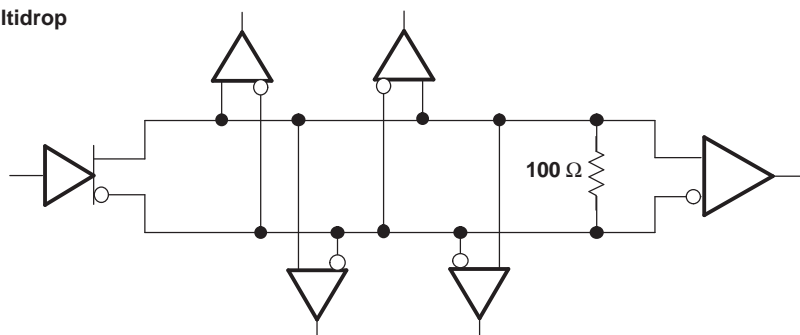


Figure 22. Typical Application Circuits

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
SN65LVDS4RSER	ACTIVE	UQFN	RSE	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	QXB	Samples
SN65LVDS4RSET	ACTIVE	UQFN	RSE	10	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	QXB	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

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TAPE AND REEL INFORMATION


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN65LVDS4RSER	UQFN	RSE	10	3000	180.0	8.4	1.68	2.13	0.76	4.0	8.0	Q1
SN65LVDS4RSET	UQFN	RSE	10	250	180.0	8.4	1.68	2.13	0.76	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

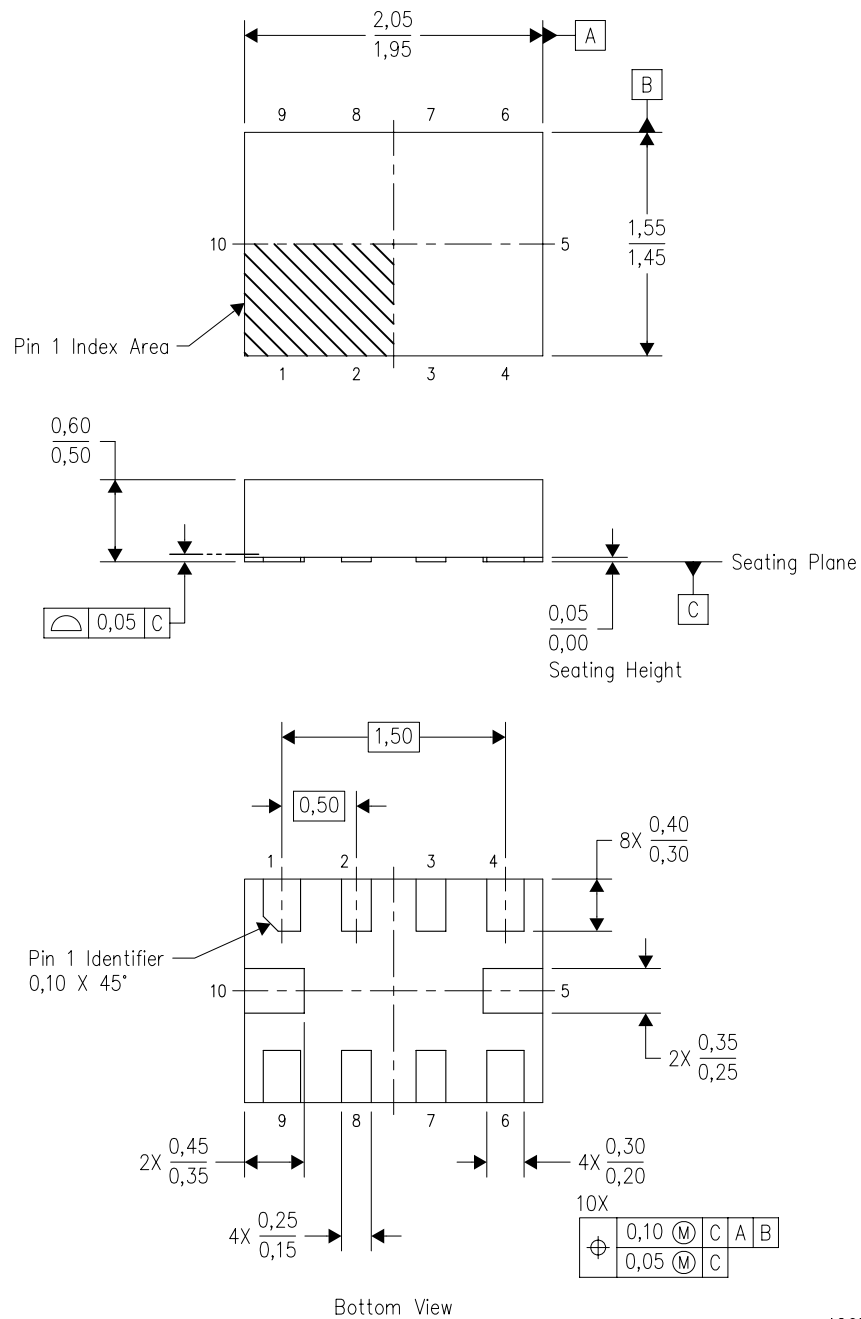


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65LVDS4RSE	UQFN	RSE	10	3000	202.0	201.0	28.0
SN65LVDS4RSET	UQFN	RSE	10	250	202.0	201.0	28.0

RSE (R-PUQFN-N10)

PLASTIC QUAD FLATPACK NO-LEAD

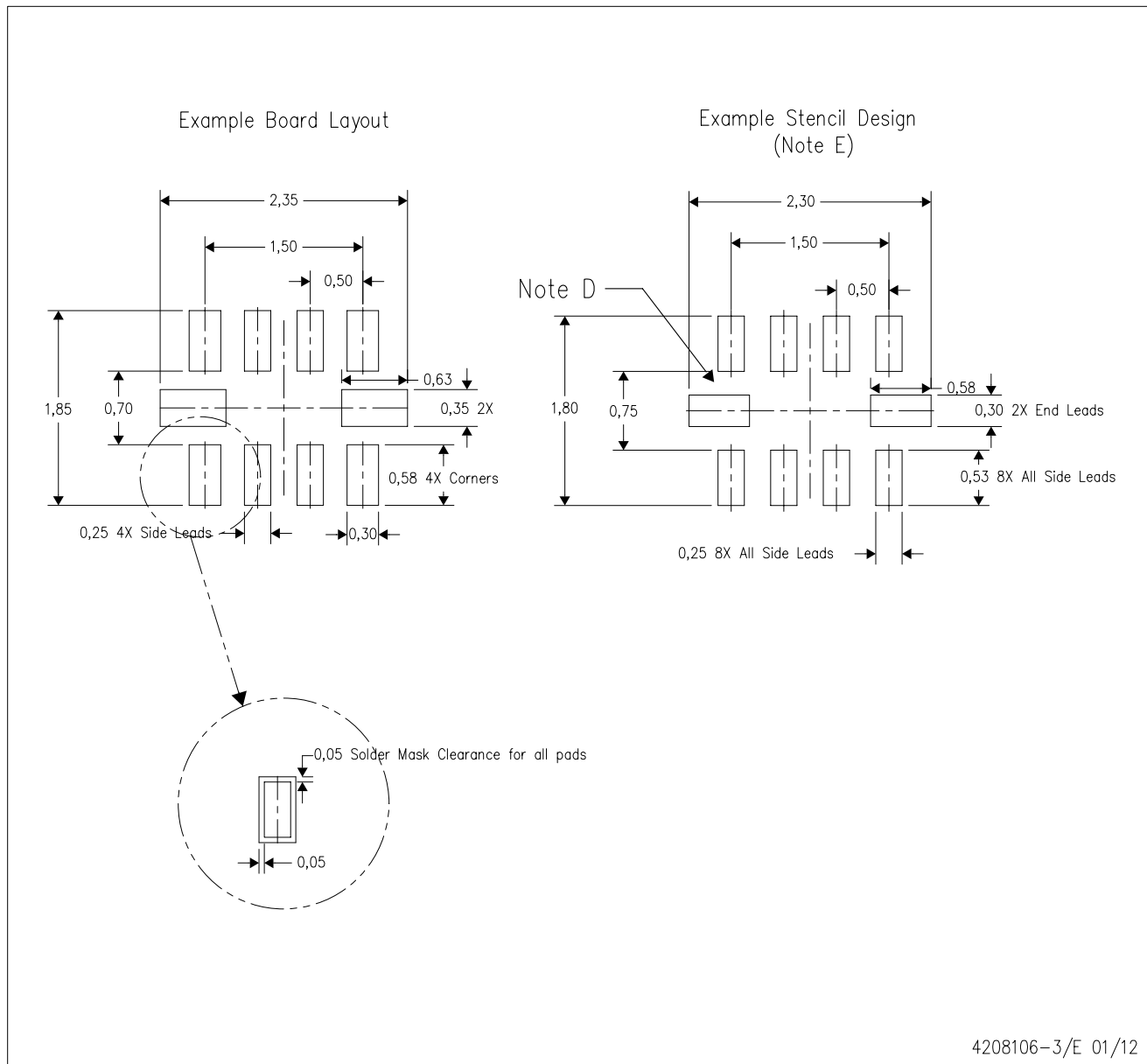


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- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - D. This package complies to JEDEC MO-288 variation UEFD.

RSE (R-PUQFN-N10)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
 - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
 - F. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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