

SCAS905C-OCTOBER 2010-REVISED DECEMBER 2010

Dual 1:8 Low Additive Jitter LVDS Buffer

Check for Samples: CDCLVD2108

FEATURES

- Dual 1:8 Differential Buffer
- Low Additive Jitter <300 fs RMS in 10 kHz to 20 MHz
- Low Within Bank Output Skew of 50 ps (Max)
- Universal Inputs Accept LVDS, LVPECL, LVCMOS
- One Input Dedicated for Eight Outputs
- Total of 16 LVDS Outputs, ANSI EIA/TIA-644A Standard Compatible
- Clock Frequency up to 800 MHz
- 2.375–2.625V Device Power Supply
- LVDS Reference Voltage, V_{AC_REF}, Available for Capacitive Coupled Inputs
- Industrial Temperature Range –40°C to 85°C
- Packaged in 7mm × 7mm 48-Pin QFN (RGZ)
- ESD Protection Exceeds 3 kV HBM, 1 kV CDM

APPLICATIONS

- Telecommunications/Networking
- Medical Imaging
- Test and Measurement Equipment
- Wireless Communications
- General Purpose Clocking

DESCRIPTION

The CDCLVD2108 clock buffer distributes two clock inputs (IN0, IN1) to a total of 16 pairs of differential LVDS clock outputs (OUT0, OUT15). Each buffer block consists of one input and 8 LVDS outputs. The inputs can either be LVDS, LVPECL, or LVCMOS.

The CDCLVD2108 is specifically designed for driving 50- Ω transmission lines. In case of driving the inputs in single ended mode, the appropriate bias voltage (V_{AC_REF}) should be applied to the unused negative input pin.

Using the control pin (EN) outputs can be either disabled or enabled. If the EN pin is left open all outputs are active, if switched to a logical '0' all outputs are disabled (static logical 0), if switched to a logical '1', OUT (8..15) are switched off and OUT (0..7) are active. The part supports a fail safe function. It incorporates an input hysteresis, which prevents random oscillation of the outputs in absence of an input signal.

The device operates in 2.5V supply environment and is characterized from -40°C to 85°C (ambient temperature). The CDCLVD2108 is packaged in small 48-pin, 7-mm x 7-mm QFN package.

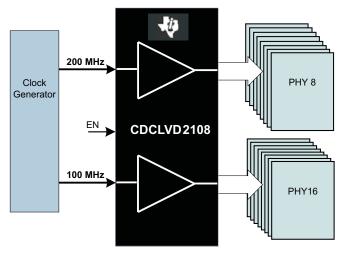


Figure 1. Application Example



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.

CDCLVD2108

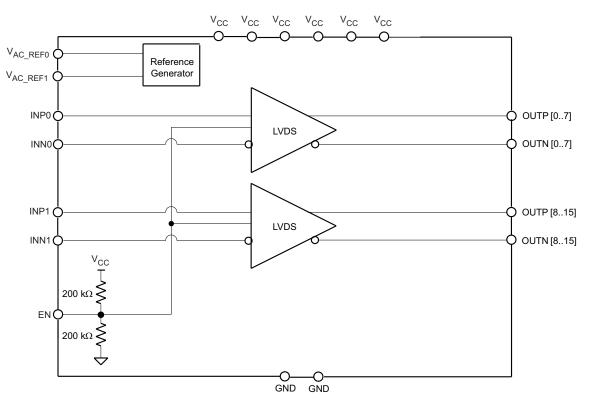


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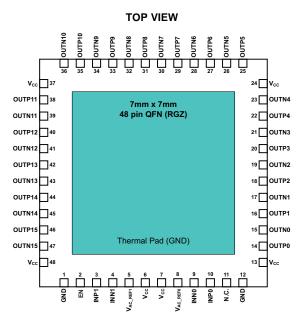
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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.







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PIN FUNCTIONS

PIN		TYDE	DESCRIPTION					
NAME	NO.	TYPE	DESCRIPTION					
V _{CC}	6, 7, 13, 24, 37, 48	Power	2.5V supplies for the device					
GND	1,12	Ground	Device ground					
INP0, INN0	10, 9	Input	Differential input pair or single ended input for bu	ffer 0				
INP1, INN1	3,4	Input	Differential input pair or single ended input for bu	ffer 1				
OUTP0, OUTN0	14, 15	Output	Differential LVDS output pair no. 0					
OUTP1, OUTN1	16,17	Output	Differential LVDS output pair no. 1	_				
OUTP2, OUTN2	18,19	Output	Differential LVDS output pair no. 2	_				
OUTP3, OUTN3	20, 21	Output	Differential LVDS output pair no. 3	INDO/INNO is the input				
OUTP4, OUTN4	22,23	Output	Differential LVDS output pair no. 4	INP0/INN0 is the input				
OUTP5, OUTN5	25, 26	Output	Differential LVDS output pair no. 5	_				
OUTP6, OUTN6	27, 28	Output	Differential LVDS output pair no. 6					
OUTP7, OUTN7	29, 30	Output	Differential LVDS output pair no. 7	_				
OUTP8,OUTN8	31, 32	Output	Differential LVDS output pair no. 8					
OUTP9,OUTN9	33, 34	Output	Differential LVDS output pair no. 9					
OUTP10,OUTN10	35, 36	Output	Differential LVDS output pair no. 10					
OUTP11,OUTN11	38, 39	Output	Differential LVDS output pair no. 11	IND4/INN14 is the input				
OUTP12,OUTN12	40, 41	Output	Differential LVDS output pair no. 12	INP1/INN1 is the input				
OUTP13,OUTN13	42, 43	Output	Differential LVDS output pair no. 13					
OUTP14,OUTN14	44, 45	Output	Differential LVDS output pair no. 14					
OUTP15,OUTN15	46, 47	Output	Differential LVDS output pair no. 15					
V _{AC_REF0}	8	Output	Bias voltage output for capacitive coupled inputs. a $0.1\mu F$ to GND on this pin.	If used, it is recommended to use				
V _{AC_REF1}	5	Output	Bias voltage output for capacitive coupled inputs. a 0.1µF to GND on this pin.	If used, it is recommended to use				
N.C.	11		No connect					
EN	2	Input with an internal 200kΩ pull-up and pull-down	Control pin – enables or disables the outputs (See Table 1)					
Thermal Pad		Ground	Device ground. Thermal Pad must be soldered to management recommendations.	ground. See thermal				

Table 1. Output Control Table

EN	CLOCK OUTPUTS
0	All outputs disabled (static "0")
OPEN	All outputs enabled
1	OUT0 to OUT7 enabled and OUT8 to OUT15 disabled (static "0")

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ABSOLUTE MAXIMUM RATINGS

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

		VALUE / UNIT
V_{CC}	Supply voltage range	–0.3 to 2.8 V
VI	Input voltage range	–0.2 to (V _{CC} + 0.2) V
Vo	Output voltage range	–0.2 to (V _{CC} + 0.2) V
I _{OSD}	Driver short circuit current	See Note ⁽²⁾
ESD	Electrostatic discharge (HBM, 1.5 kΩ, 100 pF)	>3000 V

(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) The outputs can handle permanent short.

RECOMMENDED OPERATING CONDITIONS

		MIN	TYP	MAX	UNITS
V _{CC}	Device supply voltage	2.375	2.5	2.625	V
T _A	Ambient temperature	-40		85	°C

THERMAL INFORMATION

	THERMAL METRIC ⁽¹⁾	CDCLVD2108	
		RGZ (48 PINS)	UNITS
θ_{JA}	Junction-to-ambient thermal resistance	30.6	
$\theta_{\text{JC(top)}}$	Junction-to-case(top) thermal resistance	28.5	
θ_{JB}	Junction-to-board thermal resistance	10.5	00 MM
ΨJT	Junction-to-top characterization parameter	0.4	°C/W
ΨЈВ	Junction-to-board characterization parameter	10.2	
$\theta_{\text{JC(bottom)}}$	Junction-to-case(bottom) thermal resistance	3.1	

(1) For more information about traditional and new thermal metrics, see the IC Package Thermal Metrics application report, SPRA953.

ELECTRICAL CHARACTERISTICS

At V_{CC} = 2.375 V to 2.625 V and T_A = -40°C to 85°C (unless otherwise noted).

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
EN CONTR	OL INPUT CHARACTERISTICS	•	-!		+	
V _{dl3}	3-State	Open		$0.5 \times V_{CC}$		V
V _{dIH}	Input high voltage		0.7×V _{CC}			V
V _{dIL}	Input low voltage				$0.2 \times V_{CC}$	V
I _{dIH}	Input high current	$V_{CC} = 2.625 \text{ V}, \text{ V}_{IH} = 2.625 \text{ V}$			30	μA
I _{dIL}	Input low current	$V_{CC} = 2.625 \text{ V}, \text{ V}_{IL} = 0 \text{ V}$			-30	μA
R _{pull(EN)}	Input pull-up/ pull-down resistor			200		kΩ
2.5V LVCN	IOS (see Figure 7) INPUT CHARACTE	RISTICS				
f _{IN}	Input frequency				200	MHz
V _{th}	Input threshold voltage	External threshold voltage applied to complementary input	1.1		1.5	V
VIH	Input high voltage		V _{th} + 0.1		V _{CC}	V
V _{IL}	Input low voltage		0		$V_{th} - 0.1$	V
I _{IH}	Input high current	$V_{CC} = 2.625 \text{ V}, \text{ V}_{IH} = 2.625 \text{ V}$			10	μA
IIL	Input low current	$V_{CC} = 2.625 \text{ V}, \text{ V}_{IL} = 0 \text{ V}$			-10	μA
$\Delta V / \Delta T$	Input edge rate	20% - 80%	1.5			V/ns
C _{IN}	Input capacitance			2.5		pF



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ELECTRICAL CHARACTERISTICS (continued)

At V_{CC} = 2.375 V to 2.625 V and T_A = -40°C to 85°C (unless otherwise noted).

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DIFFERENT	TAL INPUT CHARACTERISTICS					
f _{IN}	Input frequency	Clock input			800	MHz
V _{IN, DIFF}	Differential input voltage peak-to-peak	V _{ICM} = 1.25 V	0.3		1.6	V_{PP}
V _{ICM}	Input common-mode voltage range	V _{IN, DIFF, PP} > 0.4V	1.0		V _{CC} – 0.3	V
I _{IH}	Input high current	$V_{CC} = 2.625 \text{ V}, V_{IH} = 2.625 \text{ V}$			10	μA
I _{IL}	Input low current	$V_{CC} = 2.625 \text{ V}, \text{ V}_{IL} = 0 \text{ V}$			-10	μA
ΔV/ΔΤ	Input edge rate	20% to 80%	0.75			V/ns
C _{IN}	Input capacitance			2.5		pF
LVDS OUTF	PUT CHARACTERISTICS					
V _{OD}	Differential output voltage magnitude		250		450	mV
ΔV _{OD}	Change in differential output voltage magnitude	$V_{IN, DIFF, PP} = 0.3 V, R_L = 100 \Omega$	-15		15	mV
V _{OC(SS)}	Steady-state common mode output voltage		1.1		1.375	V
$\Delta V_{OC(SS)}$	Steady-state common mode output voltage	$V_{\text{IN, DIFF, PP}} = 0.6 \text{ V,R}_{\text{L}} = 100 \ \Omega$	-15		15	mV
V _{ring}	Output overshoot and undershoot	Percentage of output amplitude V _{OD}			10%	
V _{OS}	Output ac common mode	$V_{IN, DIFF, PP} = 0.6 \text{ V}, \text{ R}_{L} = 100 \Omega$		40	70	mV _{PP}
I _{OS}	Short-circuit output current	V _{OD} = 0 V			±24	mA
t _{PD}	Propagation delay	$V_{IN, DIFF, PP} = 0.3 V$		1.5	2.5	ns
t _{SK, PP}	Part-to-part skew				600	ps
t _{sк, o_wв}	Within bank output skew				50	ps
t _{SK,O_BB}	Bank-to-bank output skew	both inputs are phase aligned			80	ps
t _{SK,P}	Pulse skew(with 50% duty cycle input)	Crossing-point-to-crossing-point distortion	-50		50	ps
t _{RJIT}	Random additive jitter (with 50% duty cycle input)	Edge speed 0.75V/ns 10 kHz – 20 MHz			0.3	ps, RMS
t _R /t _F	Output rise/fall time	20% to 80%,100 Ω, 5 pF	50		300	ps
ICCSTAT	Static supply current	Outputs unterminated, f = 0 Hz		27	45	mA
I _{CC100}	Supply current	All outputs enabled, $R_L = 100 \Omega$, f = 100 MHz		119	158	mA
I _{CC800}	Supply current	All outputs enabled, $R_L = 100 \Omega$, $f = 800 \text{ MHz}$		168	211	mA
V _{AC_REF} CH	ARACTERISTICS	· I				
V _{AC_REF}	Reference output voltage	$V_{CC} = 2.5 \text{ V}, \text{ I}_{\text{load}} = 100 \mu\text{A}$	1.1	1.25	1.35	V

Typical Additive Phase Noise Characteristics for 100 MHz Clock

	PARAMETER	MIN	TYP	MAX	UNIT
phn ₁₀₀	Phase noise at 100 Hz offset		-132.9		dBc/Hz
phn _{1k}	Phase noise at 1 kHz offset		-138.8		dBc/Hz
phn _{10k}	Phase noise at 10 kHz offset		-147.4		dBc/Hz
phn _{100k}	Phase noise at 100 kHz offset		-153.6		dBc/Hz
phn _{1M}	Phase noise at 1 MHz offset		-155.2		dBc/Hz
phn _{10M}	Phase noise at 10 MHz offset		-156.2		dBc/Hz
phn _{20M}	Phase noise at 20 MHz offset		-156.6		dBc/Hz
t _{RJIT}	Random additive jitter from 10 kHz to 20 MHz		171		fs, RMS

Typical Additive Phase Noise Characteristics for 737.27 MHz Clock

	PARAMETER	MIN	ТҮР	MAX	UNIT
phn ₁₀₀	Phase noise at 100 Hz offset		-80.2		dBc/Hz
phn _{1k}	Phase noise at 1 kHz offset		-114.3		dBc/Hz
phn _{10k}	Phase noise at 10 kHz offset		-138		dBc/Hz
phn _{100k}	Phase noise at 100 kHz offset		-143.9		dBc/Hz
phn _{1M}	Phase noise at 1 MHz offset		-145.2		dBc/Hz
phn _{10M}	Phase noise at 10 MHz offset		-146.5		dBc/Hz
phn _{20M}	Phase noise at 20 MHz offset		-146.6		dBc/Hz
t _{RJIT}	Random additive jitter from 10 kHz to 20 MHz		65		fs, RMS

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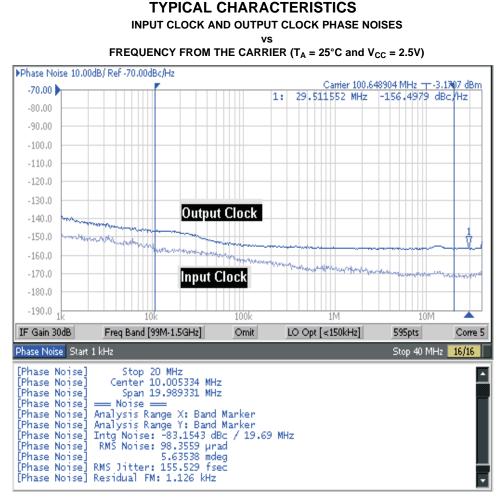
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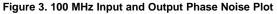


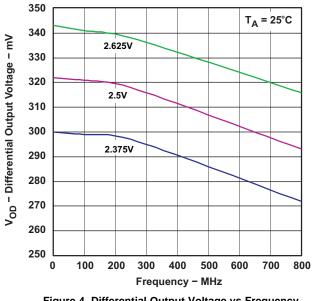
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Input clock RMS jitter is 32 fs from 10 kHz to 20 MHz and additive RMS jitter is 152 fs







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TEST CONFIGURATIONS

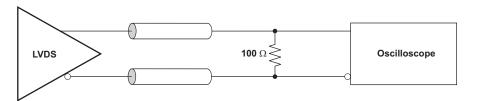


Figure 5. LVDS Output DC Configuration During Device Test

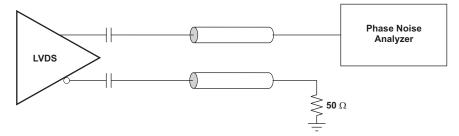


Figure 6. LVDS Output AC Configuration During Device Test

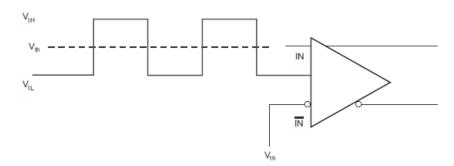
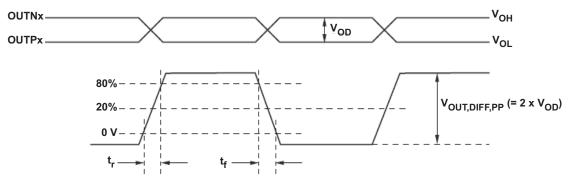


Figure 7. DC Coupled LVCMOS Input During Device Test



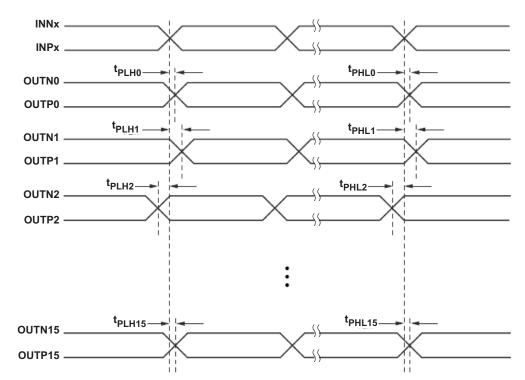


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RUMENTS

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- A. Output skew is calculated as the greater of the following: As the difference between the fastest and the slowest t_{PLHn} or the difference between the fastest and the slowest t_{PHLn} (n = 0, 1, 2, ...15).
- B. Part-to-part skew is calculated as the greater of the following: As the difference between the fastest and the slowest t_{PLHn} or the difference between the fastest and the slowest t_{PLLn} across multiple devices (n = 0, 1, 2, ...15).
- C. Both inputs (IN0 and IN1) are phase aligned.

Figure 9. Output Skew and Part-to-Part Skew

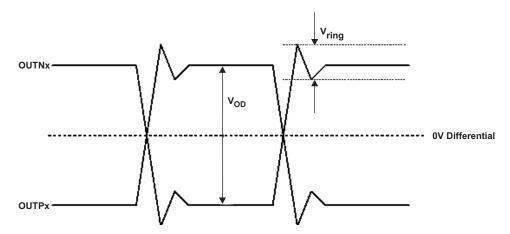


Figure 10. Output Overshoot and Undershoot

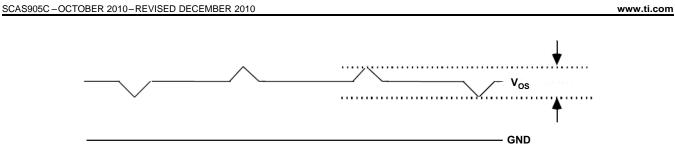


Figure 11. Output AC Common Mode

APPLICATION INFORMATION

THERMAL MANAGEMENT

For reliability and performance reasons, the die temperature should be limited to a maximum of 125°C.

The device package has an exposed pad that provides the primary heat removal path to the printed circuit board (PCB). To maximize the heat dissipation from the package, a thermal landing pattern including multiple vias to a ground plane must be incorporated into the PCB within the footprint of the package. The thermal pad must be soldered down to ensure adequate heat conduction to of the package. Check the mechanical data at the end of the data sheet for land and via pattern examples.

POWER-SUPPLY FILTERING

High-performance clock buffers are sensitive to noises on the power supply, which can dramatically increase the additive jitter of the buffer. Thus, it is essential to reduce noise from the system power supply, especially when jitter/phase noise is very critical to the application.

Filter capacitors are used to eliminate the low-frequency noise from the power supply, where the bypass capacitors provide the very low impedance path for high-frequency noise and guard the power-supply system against the induced fluctuations. These bypass capacitors also provide instantaneous current surges as required by the device and should have low equivalent series resistance (ESR). To properly use the bypass capacitors, they must be placed very close to the power-supply pins and laid out with short loops to minimize inductance. It is recommended to add as many high-frequency (for example, 0.1 μ F) bypass capacitors as there are supply pins in the package. It is recommended, but not required, to insert a ferrite bead between the board power supply and the chip power supply that isolates the high-frequency switching noises generated by the clock driver; these beads prevent the switching noise from leaking into the board supply. Choose an appropriate ferrite bead with very low dc resistance because it is imperative to provide adequate isolation between the board supply and the chip supply, as well as to maintain a voltage at the supply pins that is greater than the minimum voltage required for proper operation.

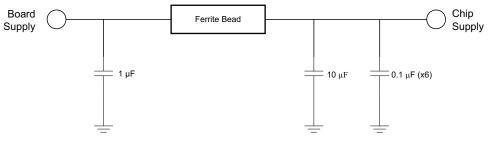


Figure 12. Power-Supply Filtering



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LVDS OUTPUT TERMINATION

The proper LVDS termination for signal integrity over two 50 Ω lines is 100 Ω between the outputs on the receiver end. Either dc-coupled termination or ac-coupled termination can be used for LVDS outputs. It is recommended to place termination resister close to the receiver. If the receiver is internally biased to a voltage different than the output common mode voltage of the CDCLVD2108, ac-coupling should be used. If the LVDS receiver has internal 100 Ω termination, external termination must be omitted.

Unused outputs can be left open without connecting any trace to the output pins.

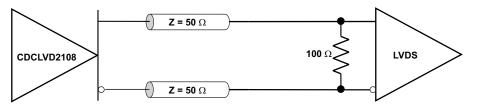


Figure 13. LVDS Output DC Termination

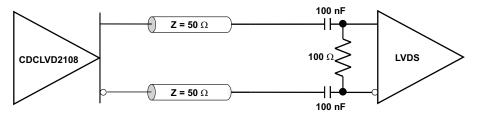


Figure 14. LVDS Output AC Termination With Receiver Internally Biased

INPUT TERMINATION

The CDCLVD2108 inputs can be interfaced with LVDS, LVPECL, or LVCMOS drivers.

LVDS Driver can be connected to CDCLVD2108 inputs with dc or ac coupling as shown Figure 15 and Figure 16, respectively.

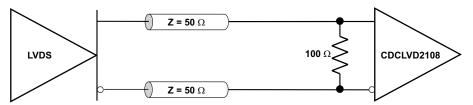


Figure 15. LVDS Clock Driver Connected to CDCLVD2108 Input (DC Coupled)

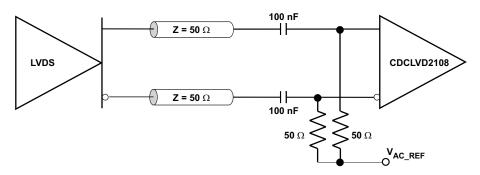


Figure 16. LVDS Clock Driver Connected to CDCLVD2108 Input (AC Coupled)

Figure 17 shows how to connect LVPECL inputs to the CDCLVD2108. The series resistors are required to reduce the LVPECL signal swing if the signal swing is >1.6 V_{PP} .

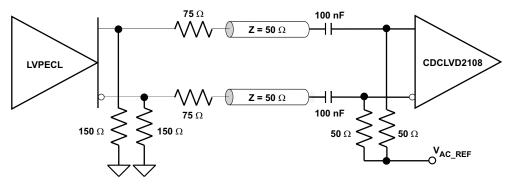


Figure 17. LVPECL Clock Driver Connected to CDCLVD2108 Input

Figure 18 illustrates how to couple a 2.5 V LVCMOS clock input to the CDCLVD2108 directly. The series resistance (R_S) should be placed close to the LVCMOS driver if needed. 3.3 V LVCMOS clock input swing needs to be limited to $V_{IH} \leq V_{CC}$.



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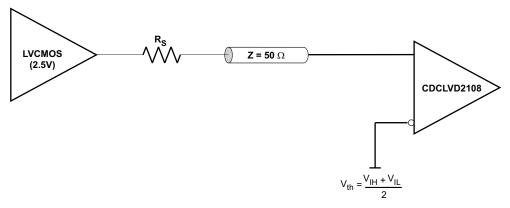


Figure 18. 2.5V LVCMOS Clock Driver Connected to CDCLVD2108 Input

If one of the input buffers is used, the other buffer should be disabled through the EN pin, and unused input pins should be grounded by 1 k Ω resistors.

REVISION HISTORY

CI	nanges from Original (October 2010) to Revision A	Page
	Feature - Low Within Bank Output Skew of 45 ps (Max) To: Low Within Bank Output Skew of 50 ps (Max)	1
•	Changed t _{SK. O WB} Within bank output skew From: 45 ps (Max) To: 50 ps (Max)	5
	Changed t _{SK, O_WB} Bank-to-bank output skew From: 100 ps (Max) To: 80 ps (Max)	5
•	Deleted the Recommended PCB Layout illustration	10
	nanges from Revision A (November 2010) to Revision B	Page
CI	nanges from Revision A (November 2010) to Revision B	Page
	nanges from Revision A (November 2010) to Revision B Changed the I _{CC100} , Supply current Typ value From: 97 To: 119 mA	
		5
CI •	Changed the I _{CC100} , Supply current Typ value From: 97 To: 119 mA	5
•	Changed the I _{CC100} , Supply current Typ value From: 97 To: 119 mA	5



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
CDCLVD2108RGZR	ACTIVE	VQFN	RGZ	48	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	Purchase Samples
CDCLVD2108RGZT	ACTIVE	VQFN	RGZ	48	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	Request Free 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.

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION

REEL DIMENSIONS

TEXAS INSTRUMENTS





TAPE AND REEL INFORMATION

TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

*	All dimensions are nominal												
	Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
	CDCLVD2108RGZR	VQFN	RGZ	48	2500	330.0	16.4	7.3	7.3	1.5	12.0	16.0	Q2
	CDCLVD2108RGZT	VQFN	RGZ	48	250	330.0	16.4	7.3	7.3	1.5	12.0	16.0	Q2

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

16-Feb-2012



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CDCLVD2108RGZR	VQFN	RGZ	48	2500	336.6	336.6	28.6
CDCLVD2108RGZT	VQFN	RGZ	48	250	336.6	336.6	28.6

MECHANICAL DATA



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. Quad Flatpack, No-leads (QFN) package configuration.

D. The package thermal pad must be soldered to the board for thermal and mechanical performance.

E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.

F. Falls within JEDEC MO-220.



RGZ (S-PVQFN-N48)

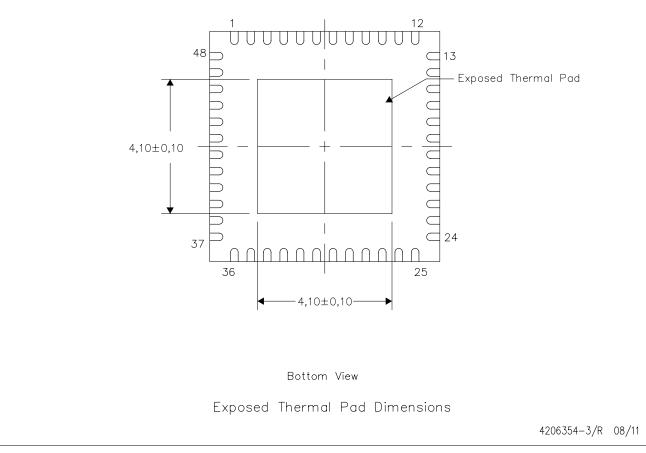
PLASTIC QUAD FLATPACK NO-LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

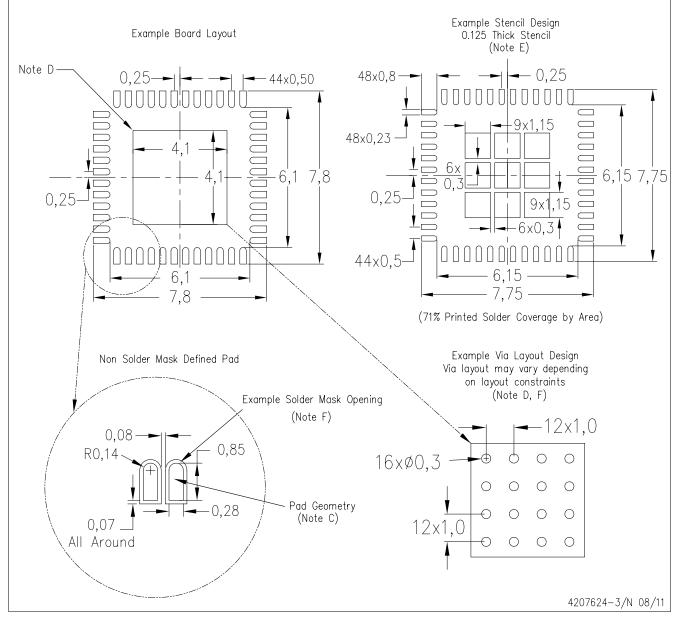


NOTE: All linear dimensions are in millimeters



RGZ (S-PVQFN-N48)

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. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack Packages, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>.
- E. 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.
- F. Customers should contact their board fabrication site for recommended solder mask tolerances and via tenting recommendations for vias placed in the thermal pad.



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