

General Description



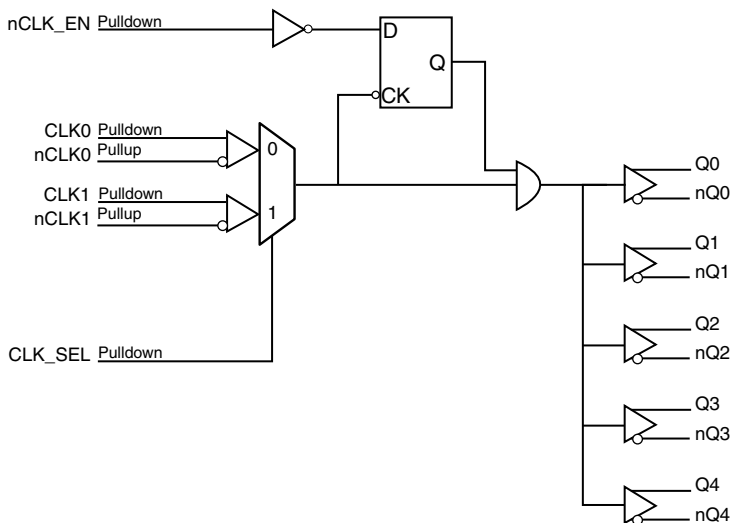
The ICS85314I-11 is a low skew, high performance 1-to-5 Differential-to-2.5V/3.3V LVPECL fanout buffer. The ICS85314I-11 has two selectable differential clock inputs. The CLK0, nCLK0 and CLK1, nCLK1 pairs can accept most standard differential input levels. The clock enable is internally synchronized to eliminate runt clock pulses on the outputs during asynchronous assertion/deassertion of the clock enable pin.

Guaranteed output and part-to-part skew characteristics make the ICS85314I-11 ideal for those applications demanding well defined performance and repeatability.

Features

- Five differential 2.5V/3.3V LVPECL outputs
- Selectable differential CLKx, nCLKx inputs
- CLK0, nCLK0 and CLK1, nCLK1 pairs can accept the following differential input levels: LVPECL, LVDS, LVHSTL, HCSL, SSTL
- Maximum output frequency: 700MHz
- Translates any single-ended input signal to 3.3V LVPECL levels with resistor bias on nCLK input
- Output skew: 30ps (maximum)
- Propagation delay: 1.8ns (maximum)
- RMS phase jitter @ 155.52MHz (12kHz - 20MHz): 0.05ps (typical)
- LVPECL mode operating voltage supply range: $V_{CC} = 2.375V$ to $3.8V$, $V_{EE} = 0V$
- $-40^{\circ}C$ to $85^{\circ}C$ ambient operating temperature
- Available in both standard (RoHS 5) and lead-free (RoHS 6) packages

Block Diagram



Pin Assignment

Q0	1	20	Vcc
nQ0	2	19	nCLK_EN
Q1	3	18	Vcc
nQ1	4	17	nCLK1
Q2	5	16	CLK1
nQ2	6	15	RESERVED
Q3	7	14	nCLK0
nQ3	8	13	CLK0
Q4	9	12	CLK_SEL
nQ4	10	11	VEE

ICS85314I-11

20-Lead TSSOP

6.5mm x 4.4mm x 0.92mm package body

G Package

Top View

ICS85314I-11

20-Lead SOIC

7.5mm x 12.8mm x 2.3mm package body

M Package

Top View

Table 1. Pin Descriptions

Number	Name	Type		Description
1, 2	Q0, nQ0	Output		Differential output pair. LVPECL interface levels.
3, 4	Q1, nQ1	Output		Differential output pair. LVPECL interface levels.
5, 6	Q2, nQ2	Output		Differential output pair. LVPECL interface levels.
7, 8	Q3, nQ3	Output		Differential output pair. LVPECL interface levels.
9, 10	Q4, nQ4	Output		Differential output pair. LVPECL interface levels.
11	V _{EE}	Power		Negative supply pin.
12	CLK_SEL	Input	Pulldown	Clock select input. When HIGH, selects CLK1, nCLK1 inputs. When LOW, selects CLK0, nCLK0 inputs. LVTTTL / LVCMOS interface levels.
13	CLK0	Input	Pulldown	Non-inverting differential clock input.
14	nCLK0	Input	Pullup	Inverting differential clock input.
15	RESERVED	Reserve		Reserved pin.
16	CLK1	Input	Pulldown	Non-inverting differential clock input.
17	nCLK1	Input	Pullup	Inverting differential clock input.
18, 20	V _{CC}	Power		Positive supply pins.
19	nCLK_EN	Input	Pulldown	Synchronizing clock enable. When LOW, clock outputs follow clock input. When HIGH, Q outputs are forced low, nQ outputs are forced high. LVTTTL / LVCMOS interface levels.

NOTE: *Pullup* and *Pulldown* refer to internal input resistors. See Table 2, *Pin Characteristics*, for typical values.

Table 2. Pin Characteristics

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
C _{IN}	Input Capacitance			4		pF
R _{PULLUP}	Input Pullup Resistor			51		kΩ
R _{PULLDOWN}	Input Pulldown Resistor			51		kΩ

Function Tables

Table 3A. Control Input Function Table

Inputs			Outputs	
nCLK_EN	CLK_SEL	Selected Source	Q[0:4]	nQ[0:4]
0	0	CLK0, nCLK0	Enabled	Enabled
0	1	CLK1, nCLK1	Enabled	Enabled
1	0	CLK0, nCLK0	Disabled; LOW	Disabled; HIGH
1	1	CLK1, nCLK1	Disabled; LOW	Disabled; HIGH

After nCLK_EN switches, the clock outputs are disabled or enabled following a falling input clock edge as shown in Figure 1. In the active mode, the state of the outputs are a function of the CLK0, nCLK0 and CLK1, nCLK1 inputs as described in Table 3B.

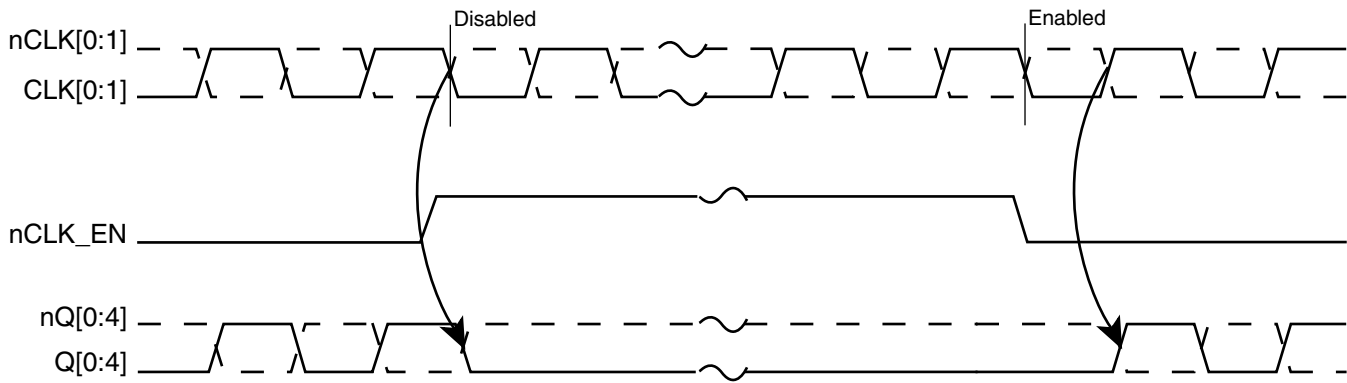


Figure 1. nCLK_EN Timing Diagram

Table 3B. Clock Input Function Table

Inputs		Outputs		Input to Output Mode	Polarity
CLK0 or CLK1	nCLK0 or nCLK1	Q[0:4]	nQ[0:4]		
0	1	LOW	HIGH	Differential-to-Differential	Non-Inverting
1	0	HIGH	LOW	Differential-to-Differential	Non-Inverting

Absolute Maximum Ratings

NOTE: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the *DC Characteristics* or *AC Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Item	Rating
Supply Voltage, V_{CC}	4.6V
Inputs, V_I	-0.5V to $V_{CC} + 0.5V$
Outputs, I_O Continuos Current Surge Current	50mA 100mA
Package Thermal Impedance, θ_{JA} 20 Lead SOIC 20 Lead TSSOP	46.2°C/W (0 lfpm) 73.2°C/W (0 lfpm)
Storage Temperature, T_{STG}	-65°C to 150°C

DC Electrical Characteristics

Table 4A. Power Supply DC Characteristics, $V_{CC} = 2.375V$ to $3.8V$; $V_{EE} = 0V$, $T_A = -40^\circ C$ to $85^\circ C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
V_{CC}	Positive Supply Voltage		2.375	3.3	3.8	V
I_{EE}	Power Supply Current				80	mA

Table 4B. LVCMOS/LVTTL DC Characteristics, $V_{CC} = 2.375V$ to $3.8V$; $V_{EE} = 0V$, $T_A = -40^\circ C$ to $85^\circ C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
V_{IH}	Input High Voltage		2		$V_{CC} + 0.3$	V
V_{IL}	Input Low Voltage		-0.3		0.8	V
I_{IH}	Input High Current	nCLK_EN, CLK_SEL $V_{CC} = V_{IN} = 3.8V$			150	μA
I_{IL}	Input Low Current	nCLK_EN, CLK_SEL $V_{CC} = 3.8V$, $V_{IN} = 0V$	-5			μA

Table 4C. Differential DC Characteristics, $V_{CC} = 2.375V$ to $3.8V$; $V_{EE} = 0V$, $T_A = -40^\circ C$ to $85^\circ C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
I_{IH}	Input High Current	CLK0, CLK1 $V_{CC} = V_{IN} = 3.8V$			150	μA
		nCLK0, nCLK1 $V_{CC} = V_{IN} = 3.8V$			5	μA
I_{IL}	Input Low Current	CLK0, CLK1 $V_{CC} = 3.8V$, $V_{IN} = 0V$	-5			μA
		nCLK0, nCLK1 $V_{CC} = 3.8V$, $V_{IN} = 0V$	-150			μA
V_{PP}	Peak-to-Peak Voltage; NOTE 1		0.15		1.3	V
V_{CMR}	Common Mode Range; NOTE 1, 2		0.5		$V_{CC} - 0.85$	V

NOTE 1: V_{IL} should not be less than -0.3V

NOTE 2: Common mode voltage is defined as V_{IH} .

Table 4D. LVPECL DC Characteristics, $V_{CC} = 2.375V$ to $3.8V$; $V_{EE} = 0V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
V_{OH}	Output High Voltage; NOTE 1		$V_{CC} - 1.4$		$V_{CC} - 0.9$	V
V_{OL}	Output Low Voltage; NOTE 1		$V_{CC} - 2.0$		$V_{CC} - 1.7$	V
V_{SWING}	Peak-to-Peak Output Voltage Swing		0.6		1.0	V

NOTE 1: Outputs termination with 50Ω to $V_{CC} - 2V$.

AC Electrical Characteristics

Table 5. AC Characteristics, $V_{CC} = 2.375V$ to $3.8V$; $V_{EE} = 0V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{MAX}	Output Frequency				700	MHz
t_{PLH}	Propagation Delay, Low to High; NOTE 1	$f \leq 700MHz$	1.0	1.4	1.8	ns
$t_{sk(o)}$	Output Skew; NOTE 2, 3				30	ps
$f_{jit}(\theta)$	RMS Phase Jitter (Random); NOTE 4	155.52MHz, Integration Range: 12kHz - 20MHz		0.05		ps
$t_{sk(pp)}$	Part-to-Part Skew; NOTE 3, 5				350	ps
t_S	Setup Time	nCLK_EN to CLK	50			ps
t_H	Hold Time	nCLK_EN to CLK	50			ps
t_R / t_F	Output Rise/Fall Time	20% to 80%	200		700	ps
odc	Output Duty Cycle Skew	$f \leq 700MHz$	45		55	%

NOTE: All parameters measured at f_{max} unless otherwise noted.

NOTE: The cycle-to-cycle jitter on the input will equal the jitter on the output. The part does not add jitter.

NOTE: Electrical parameters are guaranteed over the specified ambient operating temperature range, which is established when the device is mounted in a test socket with maintained transverse airflow greater than 500 lfm. The device will meet specifications after thermal equilibrium has been reached under these conditions.

NOTE 1: Measured from the differential input crossing point to the differential output crossing point.

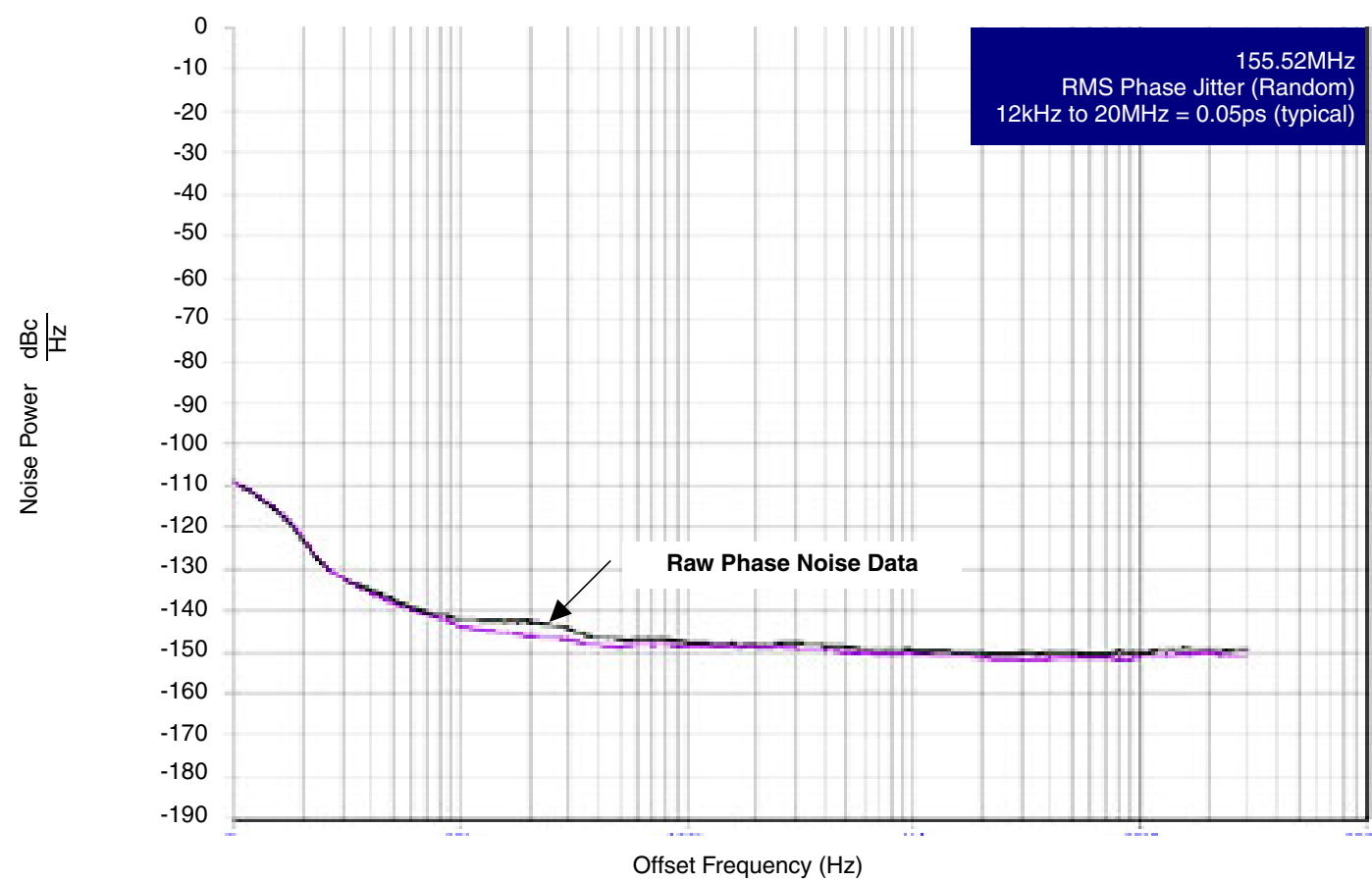
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions.

NOTE 3: This parameter is defined in accordance with JEDEC Standard 65.

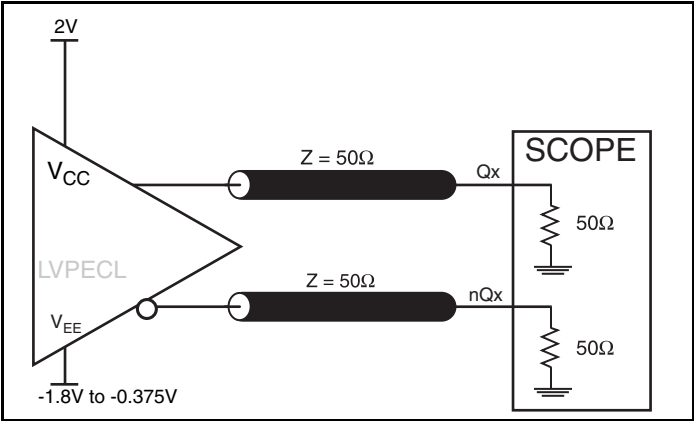
NOTE 4: Refer to Phase Noise Plot.

NOTE 5: Defined as skew between outputs on different devices operating at the same supply voltage, same temperature, same frequency and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at the differential cross points.

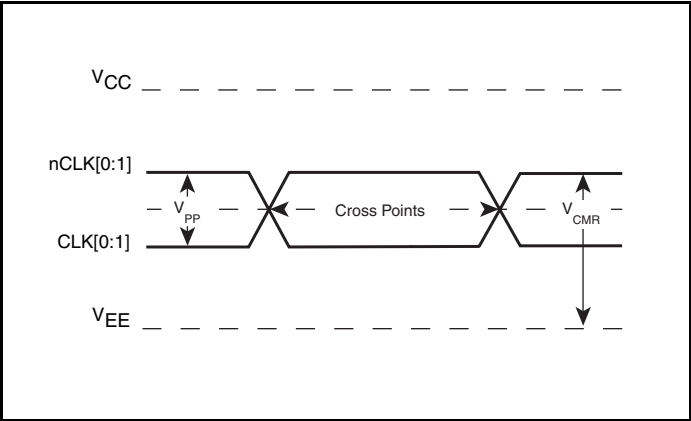
Typical Phase Noise at 155.52MHz



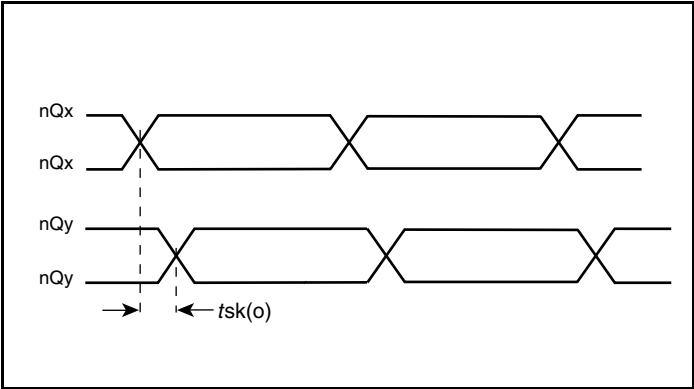
Parameter Measurement Information



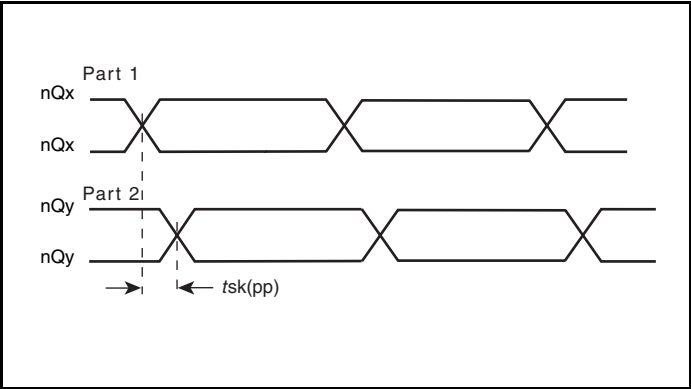
LVPECL Output Load AC Test Circuit



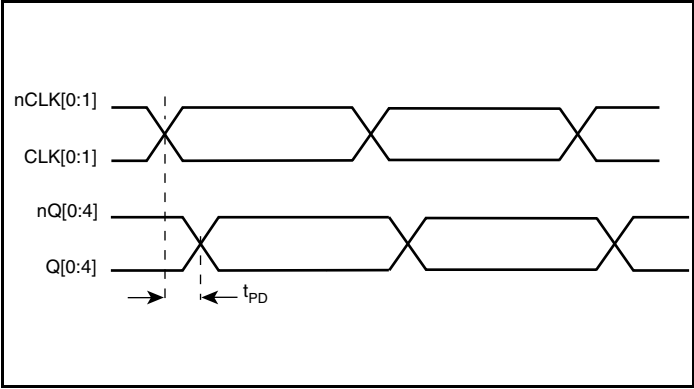
Differential Input Level



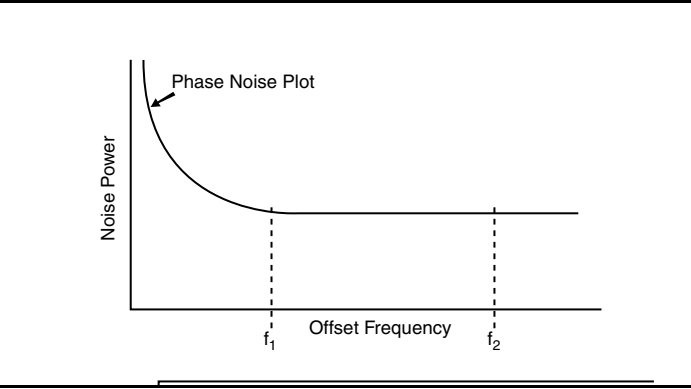
Output Skew



Part-to-Part Skew

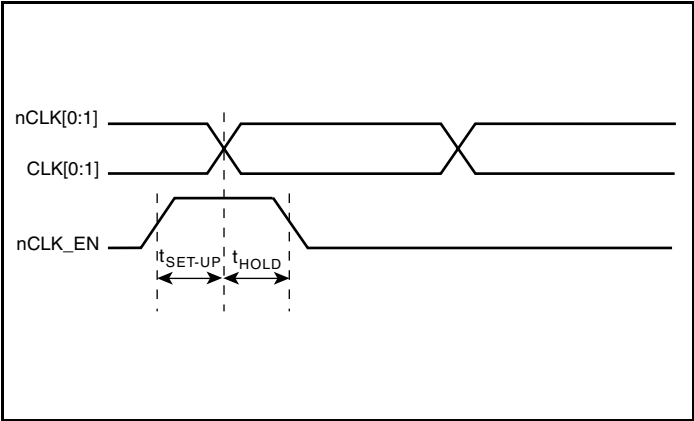


Propagation Delay

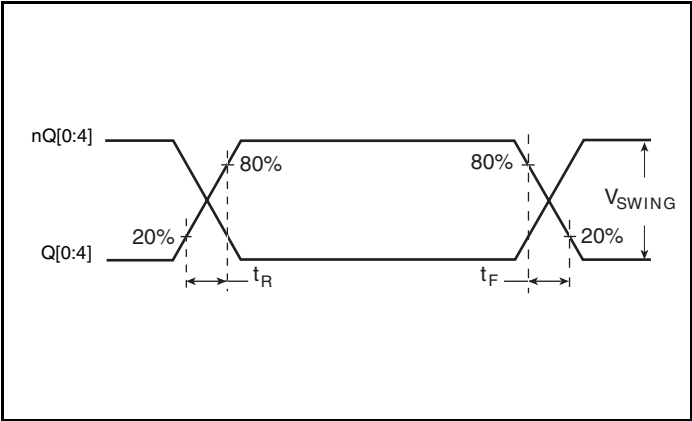


RMS Phase Jitter

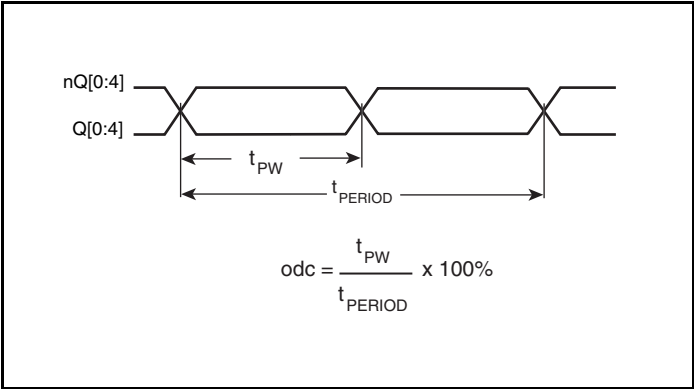
Parameter Measurement Information



Setup & Hold Time



Output Rise/Fall Time



Output Duty Cycle

Application Information

Wiring the Differential Input to Accept Single-Ended Levels

Figure 2 shows how a differential input can be wired to accept single ended levels. The reference voltage $V_{REF} = V_{CC}/2$ is generated by the bias resistors R1 and R2. The bypass capacitor (C1) is used to help filter noise on the DC bias. This bias circuit should be located as close to the input pin as possible. The ratio of R1 and R2 might need to be adjusted to position the V_{REF} in the center of the input voltage swing. For example, if the input clock swing is 2.5V and $V_{CC} = 3.3V$, R1 and R2 value should be adjusted to set V_{REF} at 1.25V. The values below are for when both the single ended swing and V_{CC} are at the same voltage. This configuration requires that the sum of the output impedance of the driver (R_o) and the series resistance (R_s) equals the transmission line impedance. In addition, matched termination at the input will attenuate the signal in half. This can be done in one of two ways. First, R3 and R4 in parallel should equal the transmission

line impedance. For most 50Ω applications, R3 and R4 can be 100Ω. The values of the resistors can be increased to reduce the loading for slower and weaker LVCMOS driver. When using single-ended signaling, the noise rejection benefits of differential signaling are reduced. Even though the differential input can handle full rail LVCMOS signaling, it is recommended that the amplitude be reduced. The datasheet specifies a lower differential amplitude, however this only applies to differential signals. For single-ended applications, the swing can be larger, however V_{IL} cannot be less than -0.3V and V_{IH} cannot be more than $V_{CC} + 0.3V$. Though some of the recommended components might not be used, the pads should be placed in the layout. They can be utilized for debugging purposes. The datasheet specifications are characterized and guaranteed by using a differential signal.

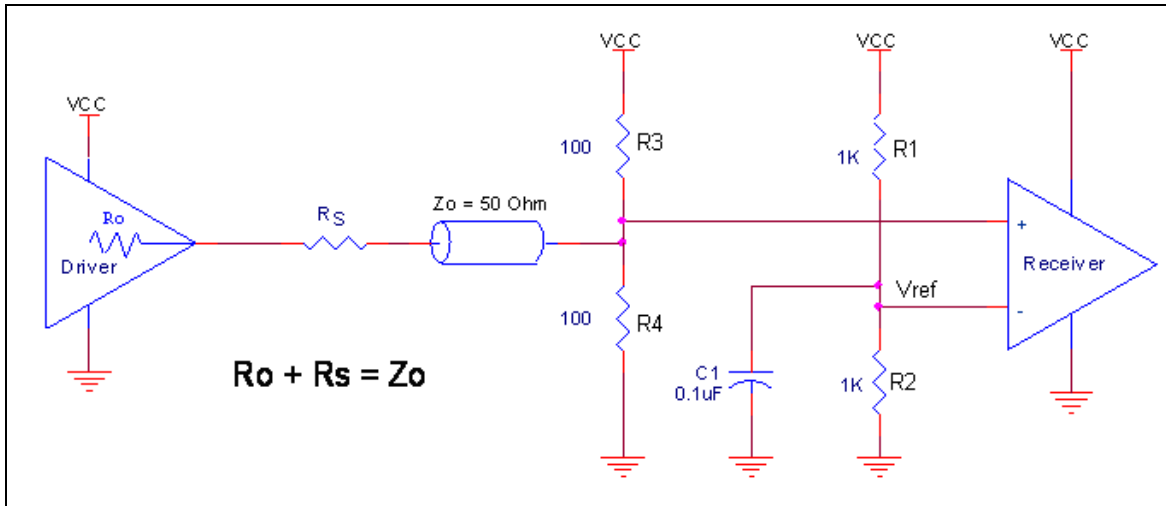


Figure 2. Recommended Schematic for Wiring a Differential Input to Accept Single-ended Levels

Recommendations for Unused Input and Output Pins

Inputs:

CLK/nCLK Inputs

For applications not requiring the use of the differential input, both CLK and nCLK can be left floating. Though not required, but for additional protection, a 1kΩ resistor can be tied from CLK to ground.

Control Pins

All control pins have internal pull-ups or pull-downs; additional resistance is not required but can be added for additional protection. A 1kΩ resistor can be used.

Outputs:

LVPECL Outputs

All unused LVPECL outputs can be left floating. We recommend that there is no trace attached. Both sides of the differential output pair should either be left floating or terminated.

Differential Clock Input Interface

The CLK /nCLK accepts LVDS, LVPECL, LVHSTL, SSTL, HCSL and other differential signals. Both V_{SWING} and V_{OH} must meet the V_{PP} and V_{CMR} input requirements. Figures 3A to 3F show interface examples for the CLK/nCLK input driven by the most common driver types. The input interfaces suggested here are examples only. Please consult

with the vendor of the driver component to confirm the driver termination requirements. For example in *Figure 3A*, the input termination applies for IDT LVHSTL drivers. If you are using an LVHSTL driver from another vendor, use their termination recommendation.

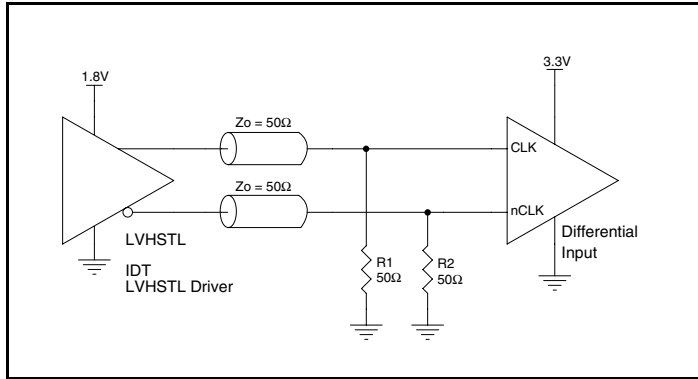


Figure 3A. CLK/nCLK Input Driven by an IDT LVHSTL Driver

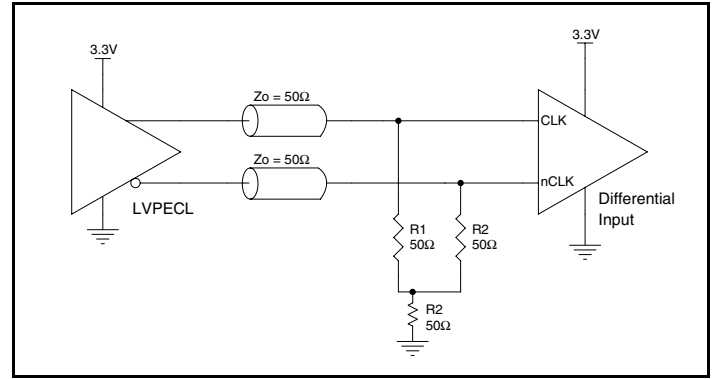


Figure 3B. CLK/nCLK Input Driven by a 3.3V LVPECL Driver

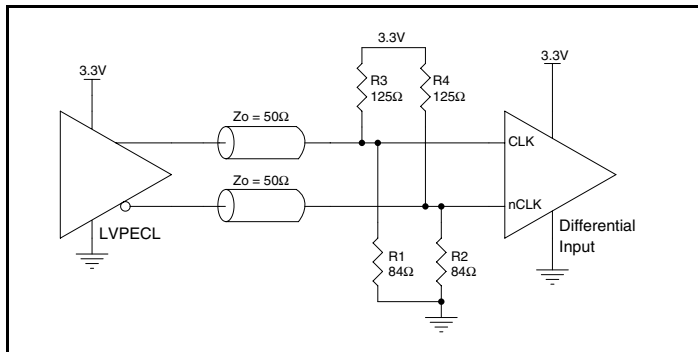


Figure 3C. CLK/nCLK Input Driven by a 3.3V LVPECL Driver

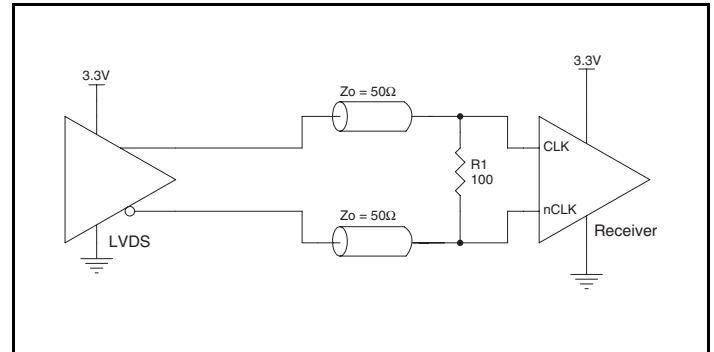


Figure 3D. CLK/nCLK Input Driven by a 3.3V LVDS Driver

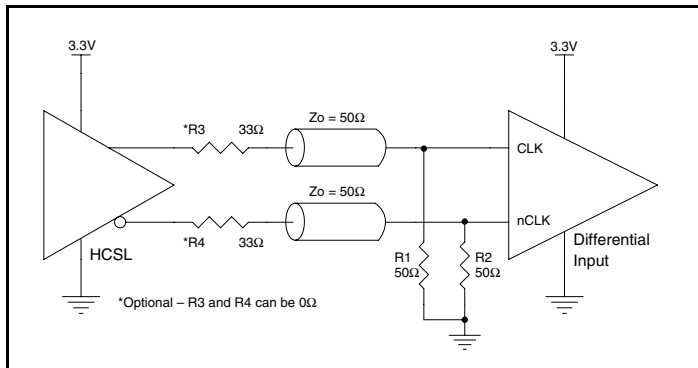


Figure 3E. CLK/nCLK Input Driven by a 3.3V HCSL Driver

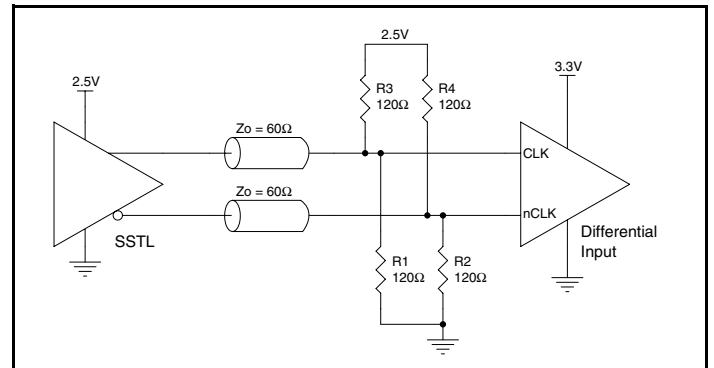


Figure 3F. CLK/nCLK Input Driven by a 2.5V SSTL Driver

Termination for 3.3V LVPECL Outputs

The clock layout topology shown below is a typical termination for LVPECL outputs. The two different layouts mentioned are recommended only as guidelines.

The differential outputs are low impedance follower outputs that generate ECL/LVPECL compatible outputs. Therefore, terminating resistors (DC current path to ground) or current sources must be used for functionality. These outputs are designed to drive 50Ω

transmission lines. Matched impedance techniques should be used to maximize operating frequency and minimize signal distortion.

Figures 4A and 4B show two different layouts which are recommended only as guidelines. Other suitable clock layouts may exist and it would be recommended that the board designers simulate to guarantee compatibility across all printed circuit and clock component process variations.

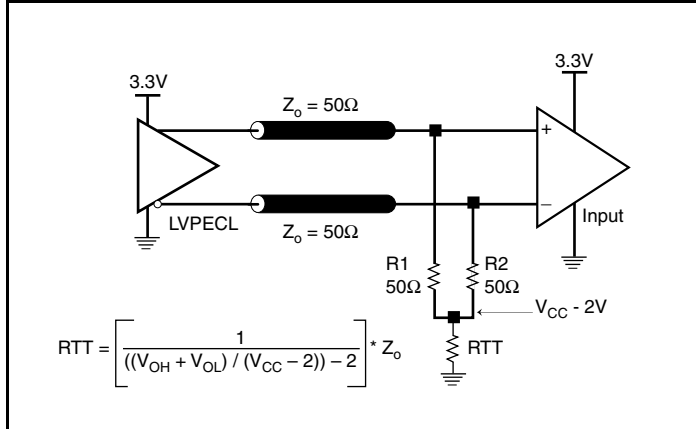


Figure 4A. 3.3V LVPECL Output Termination

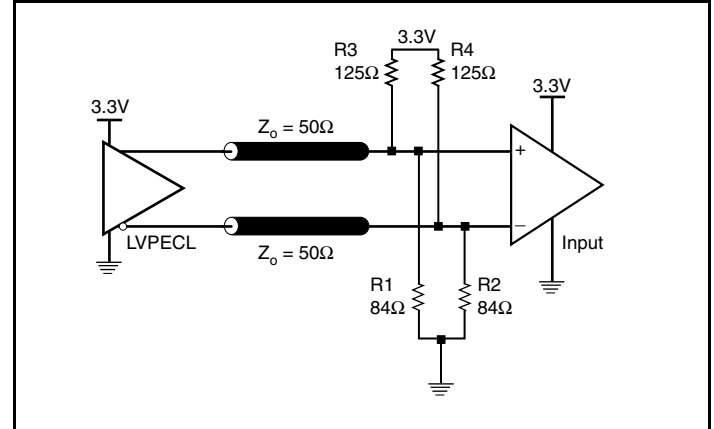


Figure 4B. 3.3V LVPECL Output Termination

Termination for 2.5V LVPECL Outputs

Figure 5A and Figure 5B show examples of termination for 2.5V LVPECL driver. These terminations are equivalent to terminating 50Ω to $V_{CC} - 2V$. For $V_{CC} = 2.5V$, the $V_{CC} - 2V$ is very close to

ground level. The R3 in Figure 5B can be eliminated and the termination is shown in Figure 5C.

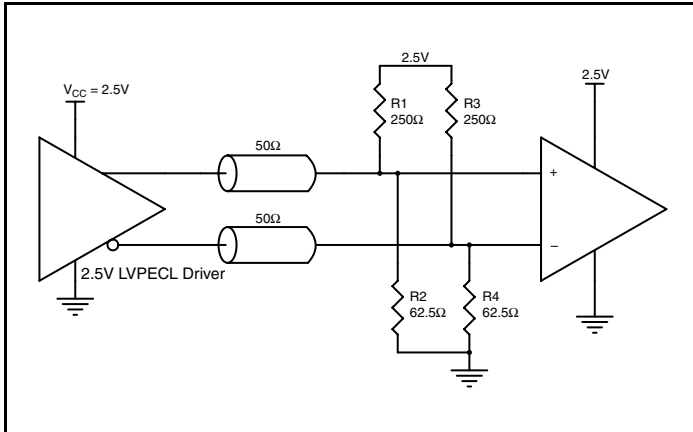


Figure 5A. 2.5V LVPECL Driver Termination Example

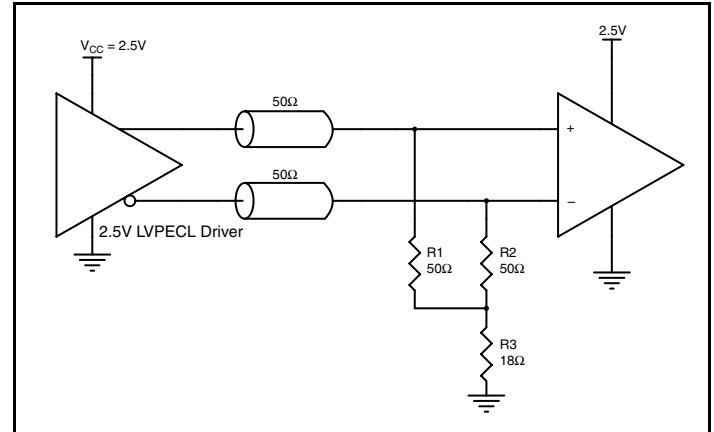


Figure 5B. 2.5V LVPECL Driver Termination Example

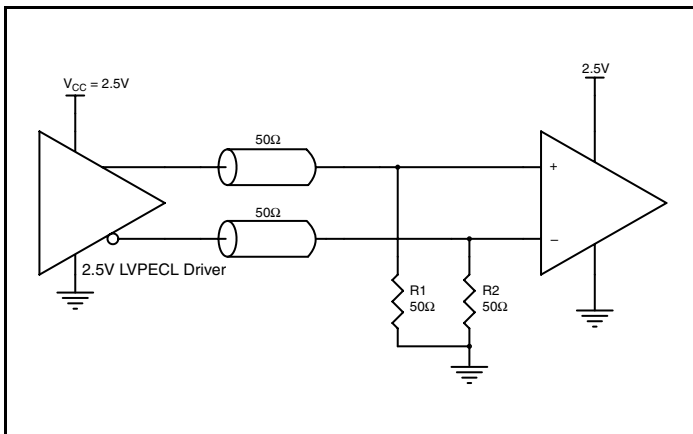


Figure 5C. 2.5V LVPECL Driver Termination Example

Power Considerations

This section provides information on power dissipation and junction temperature for the ICS85314I-11. Equations and example calculations are also provided.

1. Power Dissipation.

The total power dissipation for the ICS85314I-11 is the sum of the core power plus the power dissipated in the load(s). The following is the power dissipation for $V_{CC} = 3.8V$, which gives worst case results.

NOTE: Please refer to Section 3 for details on calculating power dissipated in the load.

- Power (core)_{MAX} = $V_{CC_MAX} * I_{EE_MAX} = 3.8V * 80mA = 304mW$
- Power (outputs)_{MAX} = **30mW/Loaded Output pair**
If all outputs are loaded, the total power is $5 * 30mW = 150mW$

Total Power_{MAX} (3.6V, with all outputs switching) = $304mW + 150mW = 454mW$

2. Junction Temperature.

Junction temperature, T_j , is the temperature at the junction of the bond wire and bond pad and it directly affects the reliability of the device. The maximum recommended junction temperature is 125°C. Limiting the internal transistor junction temperature, T_j , to 125°C ensures that the bond wire and bond pad temperature remains below 125°C.

The equation for T_j is as follows: $T_j = \theta_{JA} * Pd_{total} + T_A$

T_j = Junction Temperature

θ_{JA} = Junction-to-Ambient Thermal Resistance

Pd_{total} = Total Device Power Dissipation (example calculation is in section 1 above)

T_A = Ambient Temperature

In order to calculate junction temperature, the appropriate junction-to-ambient thermal resistance θ_{JA} must be used. Assuming a moderate air flow or 200 linear feet per minute and a multi-layer board, the appropriate value is 66.6°C/W per Table 6B below.

Therefore, T_j for an ambient temperature of 85°C with all outputs switching is:

$$85^\circ C + 0.454W * 66.6^\circ C/W = 115^\circ C. \text{ This is well below the limit of } 125^\circ C.$$

This calculation is only an example. T_j will obviously vary depending on the number of loaded outputs, supply voltage, air flow and the type of board (multi-layer).

Table 6A. Thermal Resistance θ_{JA} for 20 Lead SOIC, Forced Convection

θ_{JA} by Velocity			
Linear Feet per Minute	0	200	500
Single-Layer PCB, JEDEC Standard Test Boards	83.2°C/W	65.7°C/W	57.5°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	46.2°C/W	39.7°C/W	36.8°C/W

NOTE: Most modern PCB design use multi-layered boards. The data in the second row pertains to most designs.

Table 6B. Thermal Resistance θ_{JA} for 20 Lead TSSOP, Forced Convection

θ_{JA} by Velocity			
Linear Feet per Minute	0	200	500
Single-Layer PCB, JEDEC Standard Test Boards	114.5°C/W	98.0°C/W	88.0°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	73.2°C/W	66.6°C/W	63.5°C/W

NOTE: Most modern PCB design use multi-layered boards. The data in the second row pertains to most designs.

3. Calculations and Equations.

The purpose of this section is to calculate the power dissipation for the LVPECL output pairs.

LVPECL output driver circuit and termination are shown in *Figure 6*.

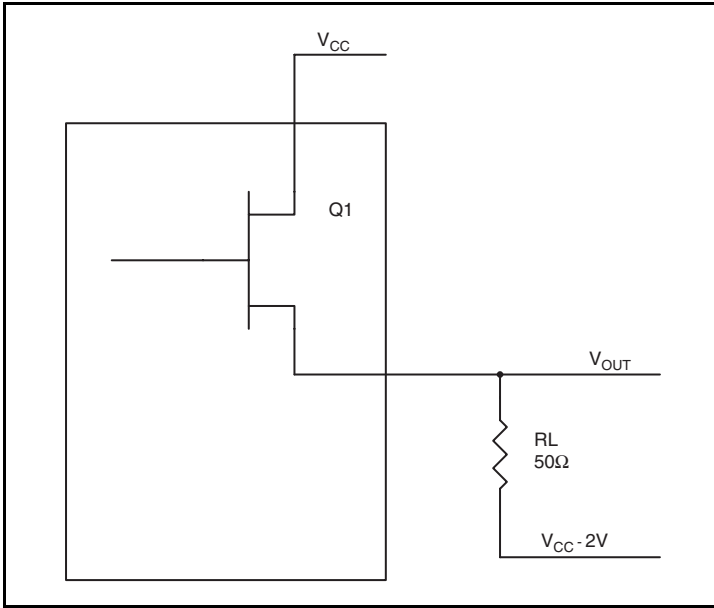


Figure 6. LVPECL Driver Circuit and Termination

To calculate worst case power dissipation into the load, use the following equations which assume a 50Ω load, and a termination voltage of $V_{CC} - 2V$.

- For logic high, $V_{OUT} = V_{OH_MAX} = V_{CC_MAX} - 0.9V$
 $(V_{CC_MAX} - V_{OH_MAX}) = 0.9V$
- For logic low, $V_{OUT} = V_{OL_MAX} = V_{CC_MAX} - 1.7V$
 $(V_{CC_MAX} - V_{OL_MAX}) = 1.7V$

Pd_H is power dissipation when the output drives high.

Pd_L is the power dissipation when the output drives low.

$$Pd_H = [(V_{OH_MAX} - (V_{CC_MAX} - 2V))/R_L] * (V_{CC_MAX} - V_{OH_MAX}) = [(2V - (V_{CC_MAX} - V_{OH_MAX}))/R_L] * (V_{CC_MAX} - V_{OH_MAX}) = [(2V - 0.9V)/50\Omega] * 0.9V = \mathbf{19.8mW}$$

$$Pd_L = [(V_{OL_MAX} - (V_{CC_MAX} - 2V))/R_L] * (V_{CC_MAX} - V_{OL_MAX}) = [(2V - (V_{CC_MAX} - V_{OL_MAX}))/R_L] * (V_{CC_MAX} - V_{OL_MAX}) = [(2V - 1.7V)/50\Omega] * 1.7V = \mathbf{10.2mW}$$

$$\text{Total Power Dissipation per output pair} = Pd_H + Pd_L = \mathbf{30mW}$$

Reliability Information

Table 7A. θ_{JA} vs. Air Flow Table for a 20 Lead SOIC, Forced Convection

θ_{JA} by Velocity			
Linear Feet per Minute	0	200	500
Single-Layer PCB, JEDEC Standard Test Boards	83.2°C/W	65.7°C/W	57.5°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	46.2°C/W	39.7°C/W	36.8°C/W

NOTE: Most modern PCB design use multi-layered boards. The data in the second row pertains to most designs.

Table 7B. θ_{JA} vs. Air Flow Table for a 20 Lead TSSOP, Forced Convection

θ_{JA} by Velocity			
Linear Feet per Minute	0	200	500
Single-Layer PCB, JEDEC Standard Test Boards	114.5°C/W	98.0°C/W	88.0°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	73.2°C/W	66.6°C/W	63.5°C/W

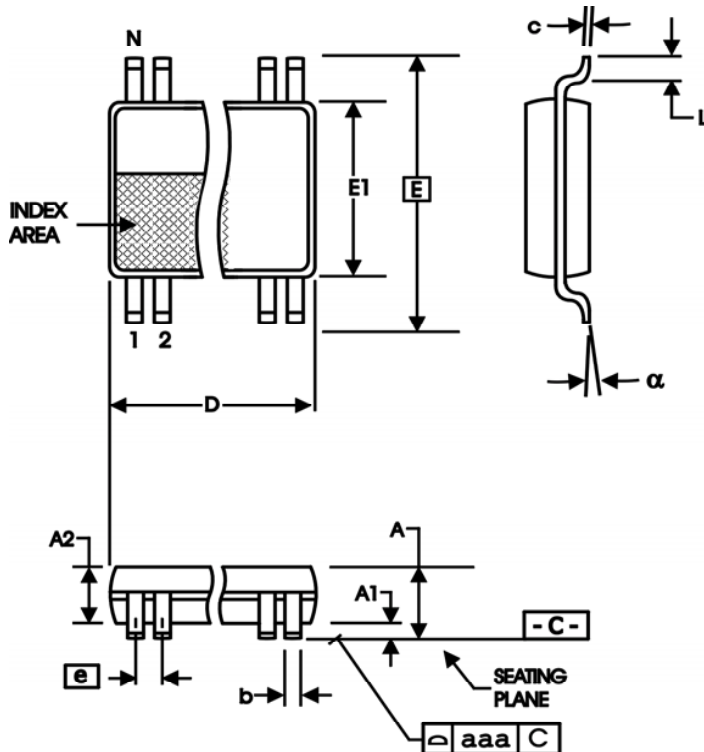
NOTE: Most modern PCB design use multi-layered boards. The data in the second row pertains to most designs.

Transistor Count

The transistor count for ICS85314I-11 is: 674

Package Outlines and Package Dimensions

Package Outline - G Suffix for 20 Lead TSSOP



Package Outline - M Suffix for 20 Lead SOIC

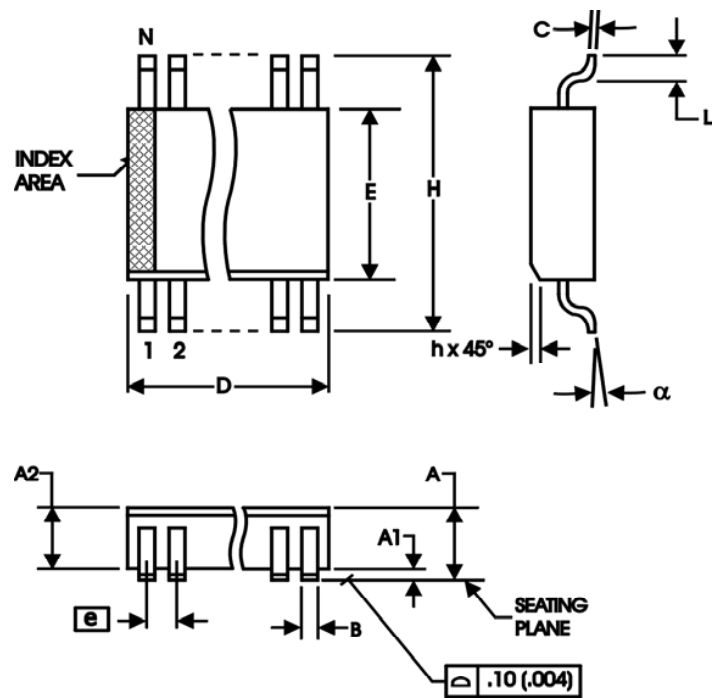


Table 8A. Package Dimensions

All Dimensions in Millimeters		
Symbol	Minimum	Maximum
N	20	
A		1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	6.40	6.60
E	6.40 Basic	
E1	4.30	4.50
e	0.65 Basic	
L	0.45	0.75
α	0°	8°
aaa		0.10

Reference Document: JEDEC Publication 95, MO-153

Table 8B. Package Dimensions for 20 Lead SOIC

300 Millimeters All Dimensions in Millimeters		
Symbol	Minimum	Maximum
N	20	
A		2.65
A1	0.10	
A2	2.05	2.55
B	0.33	0.51
C	0.18	0.32
D	12.60	13.00
E	7.40	7.60
e	1.27 Basic	
H	10.00	10.65
h	0.25	0.75
L	0.40	1.27
α	0°	7°

Reference Document: JEDEC Publication 95, MS-013, MS-119

Ordering Information

Table 9. Ordering Information

Part/Order Number	Marking	Package	Shipping Packaging	Temperature
85314AGI-11	ICS85314AI11	20 lead TSSOP	Tube	-40°C to 85°C
85314AGI-11T	ICS85314AI11	20 lead TSSOP	2500 Tape & Reel	-40°C to 85°C
85314AGI-11LF	ICS5314AI11L	"Lead-Free" 20 Lead TSSOP	Tube	-40°C to 85°C
85314AGI-11LFT	ICS5314AI11L	"Lead-Free" 20 Lead TSSOP	2500 Tape & Reel	-40°C to 85°C
85314AMI-11	ICS85314AI-11	20 Lead SOIC	Tube	-40°C to 85°C
85314AMI-11T	ICS85314AI-11	20 Lead SOIC	1000 Tape & Reel	-40°C to 85°C
85314AMI-11LF	ICS85314AMI-11LF	"Lead-Free" 20 Lead SOIC	Tube	-40°C to 85°C
85314AMI-11LFT	ICS85314AMI-11LF	"Lead-Free" 20 Lead SOIC	1000 Tape & Reel	-40°C to 85°C

NOTE: Parts that are ordered with an "LF" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

While the information presented herein has been checked for both accuracy and reliability, Integrated Device Technology (IDT) assumes no responsibility for either its use or for the infringement of any patents or other rights of third parties, which would result from its use. No other circuits, patents, or licenses are implied. This product is intended for use in normal commercial and industrial applications. Any other applications, such as those requiring high reliability or other extraordinary environmental requirements are not recommended without additional processing by IDT. IDT reserves the right to change any circuitry or specifications without notice. IDT does not authorize or warrant any IDT product for use in life support devices or critical medical instruments.

Revision History Sheet

Rev	Table	Page	Description of Change	Date
A	T1	2	Pin Description Table - Pin 14 & 17, nCLKx, deleted partial description and added Pullup in the "Type" column.	6/11/03
	T2	2	Pin Characteristics Table - CIN changed 4pF max. to 4pF typical.	
		4	AMR - corrected Output rating.	
		7	Added Wiring the Differential Input to Accept Single Ended Levels section.	
		8	Added Differential Clock Input Interface section.	
B	T5	1	Added Phase Noise bullet in Features section.	8/11/04
		5	AC Characteristics Table - added RMS Phase Jitter.	
		6	Added Phase Jitter Plot.	
		8	Updated Termination for 3.3V LVPECL Output diagrams.	
		9	Added Termination for 2.5V LVPECL Output section.	
B	T1	1	Features section - added Lead-Free bullet.	3/22/05
		2	Pin Description Table - corrected CLK_SEL description.	
	T9	16	Ordering Information Table - added ""Lead-Free"" part number for TSSOP package.	
C	T5	1	Features section - changed Part-to-Part Skew from 250ps max. to 350ps max.	5/24/05
		5	AC Characteristics table - changed Part-to-Part Skew from 250ps max. to 350ps max.	
D	T4D	5	LVPECL DC Characteristics Table - changed V_{OH} max from $V_{CC} - 1.0V$ to $V_{CC} - 0.9V$.	9/23/05
		8	Application Information Section - added Recommendations for Unused Input and Output Pins.	
E	T4C	4	Differential DC Characteristics Table - corrected typo in I_{IH} row, nCLKx to 5uA from 150uA.	4/16/10
	T5	5	Added thermal note to AC Characteristics Table.	
		9	Updated "Wiring the Differential Input to Accept Single-ended Levels" section.	
	T9	17	Ordering Information Table - added LF marking for SOIC package. Converted datasheet format.	
E	T9	17	Ordering Information Table - corrected package in the Package Column.	5/4/10



www.IDT.com

6024 Silver Creek Valley Road
San Jose, California 95138

Sales

800-345-7015 (inside USA)
+408-284-8200 (outside USA)
Fax: 408-284-2775
www.IDT.com/go/contactIDT

Technical Support

netcom@idt.com
+480-763-2056

DISCLAIMER Integrated Device Technology, Inc. (IDT) and its subsidiaries reserve the right to modify the products and/or specifications described herein at any time and at IDT's sole discretion. All information in this document, including descriptions of product features and performance, is subject to change without notice. Performance specifications and the operating parameters of the described products are determined in the independent state and are not guaranteed to perform the same way when installed in customer products. The information contained herein is provided without representation or warranty of any kind, whether express or implied, including, but not limited to, the suitability of IDT's products for any particular purpose, an implied warranty of merchantability, or non-infringement of the intellectual property rights of others. This document is presented only as a guide and does not convey any license under intellectual property rights of IDT or any third parties.

IDT's products are not intended for use in life support systems or similar devices where the failure or malfunction of an IDT product can be reasonably expected to significantly affect the health or safety of users. Anyone using an IDT product in such a manner does so at their own risk, absent an express, written agreement by IDT.

Integrated Device Technology, IDT and the IDT logo are registered trademarks of IDT. Other trademarks and service marks used herein, including protected names, logos and designs, are the property of IDT or their respective third party owners.

Copyright 2009. All rights reserved.