NCT5914W

Nuvoton

4-bit LVTTL to GTL transceiver

Date: June/14/2013 Revision: 1.0

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1. GENERAL DESCRIPTION

The NCT5914W is a 4-bit translating transceiver designed for 3.3V LVTTL system interface with a GTL-/GTL/GTL+ bus.

The direction pin allows the part to function as either a GTL voltage level to LVTTL voltage level or as a LVTTL voltage level to GTL voltage level.

The NCT5914W LVTTL input pins and direction pin are both tolerant up 5.5V allowing direction access to TTL or 5V CMOS voltage inputs. The LVTTL outputs are not 5.5V tolerant. NCT5914W GTL inputs and outputs operate up to 3.6V, allowing the device to be used in higher voltage open-dran output application.

NCT5914W's Vref tracks down to 0.5V for low voltage CPU and the propagation delays are about 5ns at output capacitance about 50pF for GTL to LVTTL, the propagation delays are more short for LVTTL to GTL.

2. FEATURES

- Operates as a 4-bit GTL-/GTL/GTL+ sample receiver or as a LVTTL to GTL-/GTL/GTL+ driver
- 3.0V to 3.6V operation with 5V tolerant LVTTL input
- GTL input and output 3.6V tolerant
- V_{ref} adjustable from 0.5V to $V_{CC}/2$
- ESD protection exceeds 2000V HBM and 1000V CDM
- Latch-up protection exceeds 500mA
- Package type: TSSOP14, Halogen free

3. FUNCTIONAL DIAGRAM

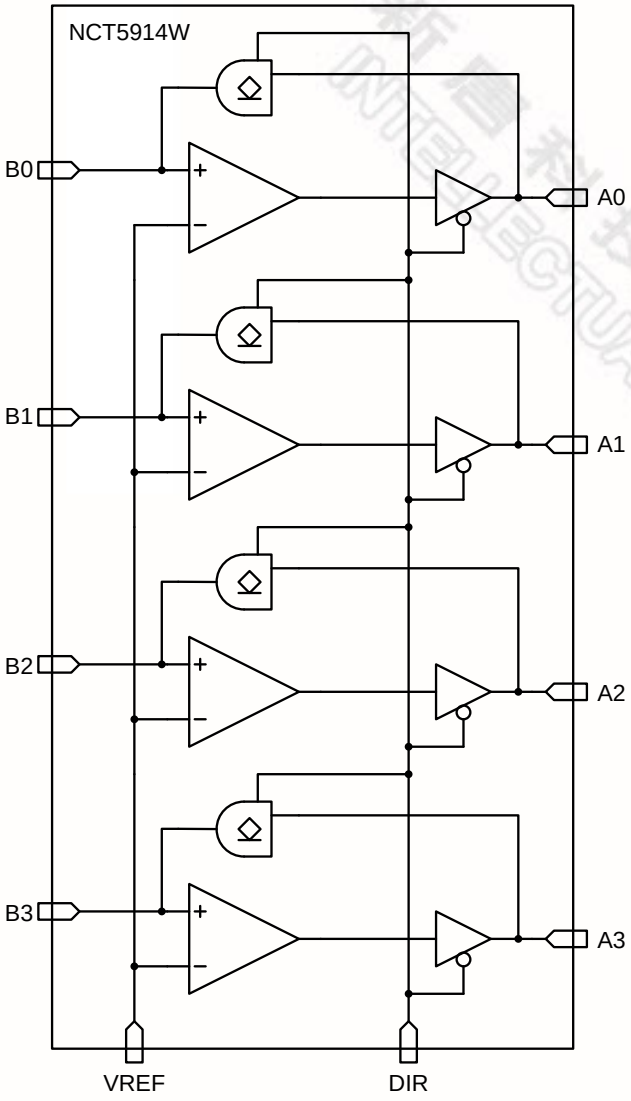
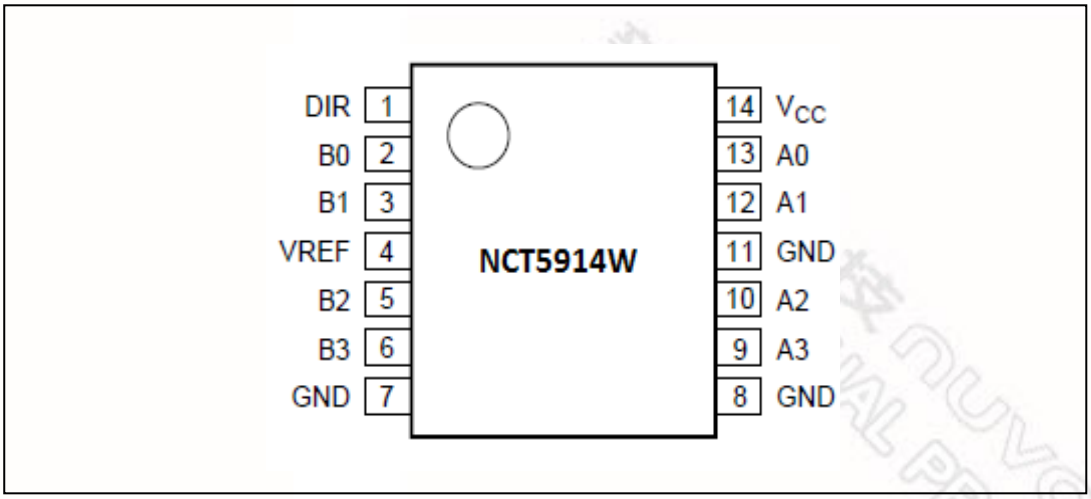


Fig1. Functional Diagram

4. PIN CONFIGURATION



4.1 PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	DIR	Direction control input (LVTTL)
2	B0	Data input/output (GTL)
3	B1	Data input/output (GTL)
4	VREF	GTL reference voltage
5	B2	Data input/output (GTL)
6	B3	Data input/output (GTL)
7	GND	Ground (0V)
8	GND	Ground (0V)
9	A3	Data input/output (LVTTL)
10	A2	Data input/output (LVTTL)
11	GND	Ground (0V)
12	A1	Data input/output (LVTTL)
13	A0	Data input/output (LVTTL)
14	VCC	Positive supply voltage

5. FUNCTIONAL DESCRIPTION

5.1 Function table

INPUT	INPUT/OUTPUT	
DIR	A (LVTTL)	B (GTL)
HIGH VOLTAGE	input	Bn = An
LOW VOLTAGE	An = Bn	input

6. LIMITING VALUES

Voltage are reference to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
V_{CC}	Supply voltage		-0.5	4	V
I_{IK}	Input clamping current	V_I<0	-	-50	mA
V_I	Input voltage	A port	-0.5	6	V
		B port	-0.5	4	V
I_{OK}	Output clamping current	A port; V_O < 0V	-	-50	mA
V_O	Output voltage	Output in OFF or High state			
		A port	-0.5	6	V
		B port	-0.5	4	V
I_{OL}	LOW-level output current	Current into anay output in the LOW state			
		A port	-	32	mA
		B port	-	80	mA
I_{OH}	HIGH-level output current	Current into any output in the HIGH state; A port	-	-32	mA
Tstg	Storage temperature		-50	150	°C

7. RECOMMENDED OPERATING CONDITIONS [1]

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply voltage		3.0	-	3.6	V
V_{TT}	Termination voltage[2]	GTL-	0.85	0.9	0.95	V
		GTL	1.14	1.2	1.26	V
		GTL+	1.35	1.5	1.65	V
V_{ref}	Reference voltage	Overall	0.5	$2/3V_{TT}$	$V_{CC}/2$	V
		GTL-	0.5	0.6	0.63	V
		GTL	0.76	0.8	0.84	V
		GTL+	0.87	1	1.1	V
V_I	Input voltage	B port	0	V_{TT}	3.6	V
		Except B port	0	3.3	5.5[3]	V
V_{IH}	HIGH-level input voltage	B port	V_{ref}+50m	-	-	V
		Except B port	2	-	-	V
V_{IL}	LOW-level input voltage	B port	-	-	V_{ref}+50m	V
		Except B port	-	-	0.8	V
I_{OH}	HIGH-level output current	A port	-	-	-16	mA
I_{OL}	LOW-level output current	B port	-	-	40	mA
		A port	-	-	16	mA
T_{amb}	Ambient temperature	Operating in free-air	-40	-	85	°C

[1]. Unused inputs must be held HIGH or LOW to prevent them from floating.

[2]. V_{TT} maximum of 3.6V with resistor size so IOL maximum is not exceeded.

[3]. A0, A1, A2, A3 $V_{I(max)}$ is 3.6V if configured as output (DIR=LOW).

8. STATIC CHARACTERISTICS

Typical value are measured at V_{CC}=3.3V and T_{amb} = 25°C.

All voltage are reference to GND (ground =0 V)

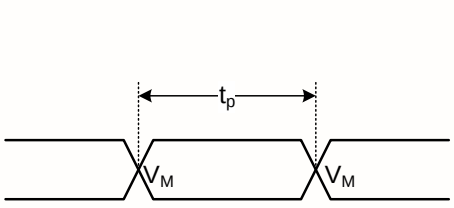
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OH}	HIGH-level output voltage	A port; V_{CC}=3.0V to 3.6V; I_{OH}=-100uA[1]	V_{CC} -0.2	-	5.5	V
		A port; V_{CC}=3.0V ; IOH=-16mA[1]	2	-	-	V
V_{OL}	LOW-level output voltage	B port; VCC=3.0V ; I_{OL}=40mA[1]	-	0.23	0.4	V
		A port; V_{CC}=3.0V ; I_{OL}=16mA[1]	-	0.55	0.8	V
I_I	Input current	Control inputs; V_{CC}=3.6V;V_I=V_{CC} or GND	-	-	±1	uA
		B port; V_{CC}=3.6; V_I=V_{TT} or GND	-	-	±1	uA
		A port; V_{CC}=0V or 3.6; V_I=5.5V	-	-	10	uA
		A port; V_{CC}=3.6V; $_{VI}$=V_{CC}	-	-	±1	uA
		A port; V_{CC}=3.6V; V_I=0V	-	-	-5	uA
I_{Oz}	OFF-state output current	A port; V_{CC}=0V; V_I or V_O=0V to 3.6V	-	-	±100	uA
I_{cc}	Quiescent supply current	A port; V_{CC}=3.6V; V_I=V_{CC} or GND; I_O=0mA	-	4	10	mA
		B port; V_{CC}=3.6V; V_I=VTT or GND; I_O=0mA	-	4	10	mA
ΔI_{CC}[3]	additional quescent current (per input)	Aport or control inputs; V_{CC}=3.6V; VI=V_{CC} -0.6V	-	-	500	uA
C_i	Input capacitance	Control inputs; V_I=3.0V or 0V	-	2	2.5	pF
C_O	Input/output capacitance	A port; Vo=3.0V or 0V	-	8	12	pF
		B port; Vo=V_{TT} or 0V	-	2	4	pF

[1] The input and output voltage rating may be exceeded if the input and output current rating are observed.
[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND

9. DYNAMIC CHARACTERISTICS

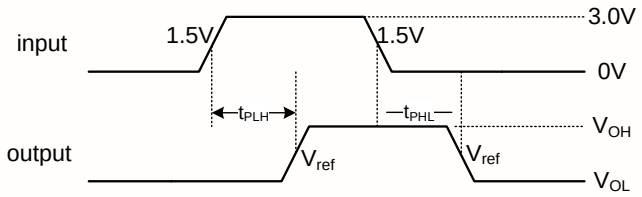
VCC = 3.3V ± 0.3

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GTL-; V_{ref} = 0.6V; V_{TT}=0.9V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn; see Fig2	-	2.8	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn; see Fig2	-	3.3	7	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An; see Fig3	-	5.3	8	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An; see Fig3	-	5.2	8	ns
GTL; V_{ref} = 0.8V; V_{TT}=1.2V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn; see Fig2	-	2.8	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn; see Fig2	-	3.4	7	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An; see Fig3	-	5.2	8	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An; see Fig3	-	4.9	7	ns
GTL; V_{ref} = 1.0V; V_{TT}=1.5V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn; see Fig2	-	2.8	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn; see Fig2	-	3.4	7	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An; see Fig3	-	5.1	8	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An; see Fig3	-	4.7	7	ns



V_M= 1.5V for A port and Vref for B port

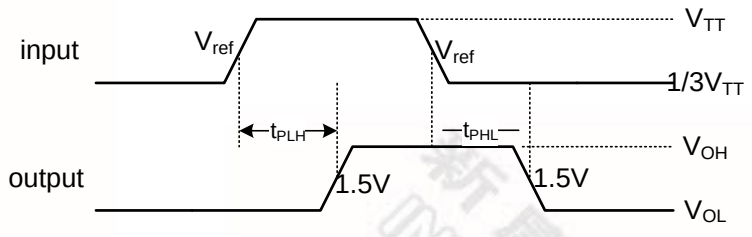
a. Pulse duration



B port to A port

b. Propagation delay times

Fig 2. Voltage waveforms



PRR≤10MHz; Z_o=50Ω; t_r ≤ 2.5ns; t_f ≤ 2.5ns

Fig 3. Propagation delay, Bn to An

9.1 Test Information

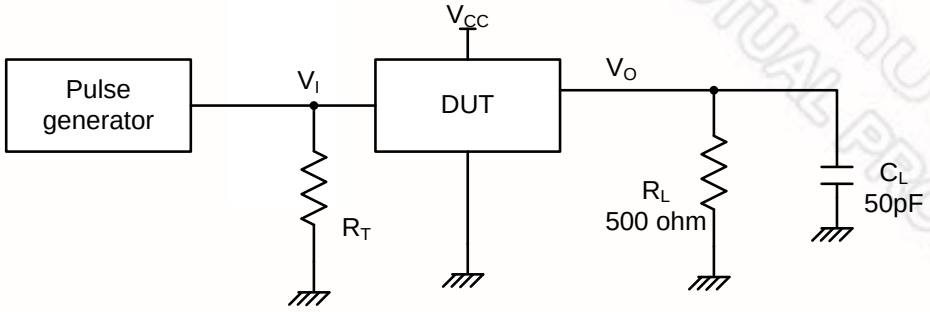


Figure 4. Load circuitry for A outputs

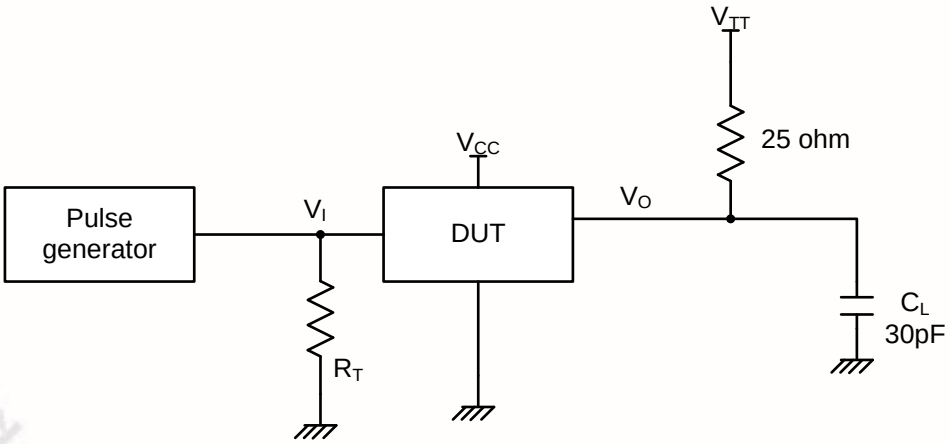


Figure 5. Load circuitry for B outputs

10. ORDER INSTRUCTION

PART NO.	PACKAGE	SUPPLIED AS
NCT5914W	TSSOP-14 Halogen free	E shape for Tube T shape for T& R

11. TOP MARKING SPECIFICATION

1st line : Nuvoton Logo

2nd line : Part number: NCT5914W

3rd line : Assembly tracking code

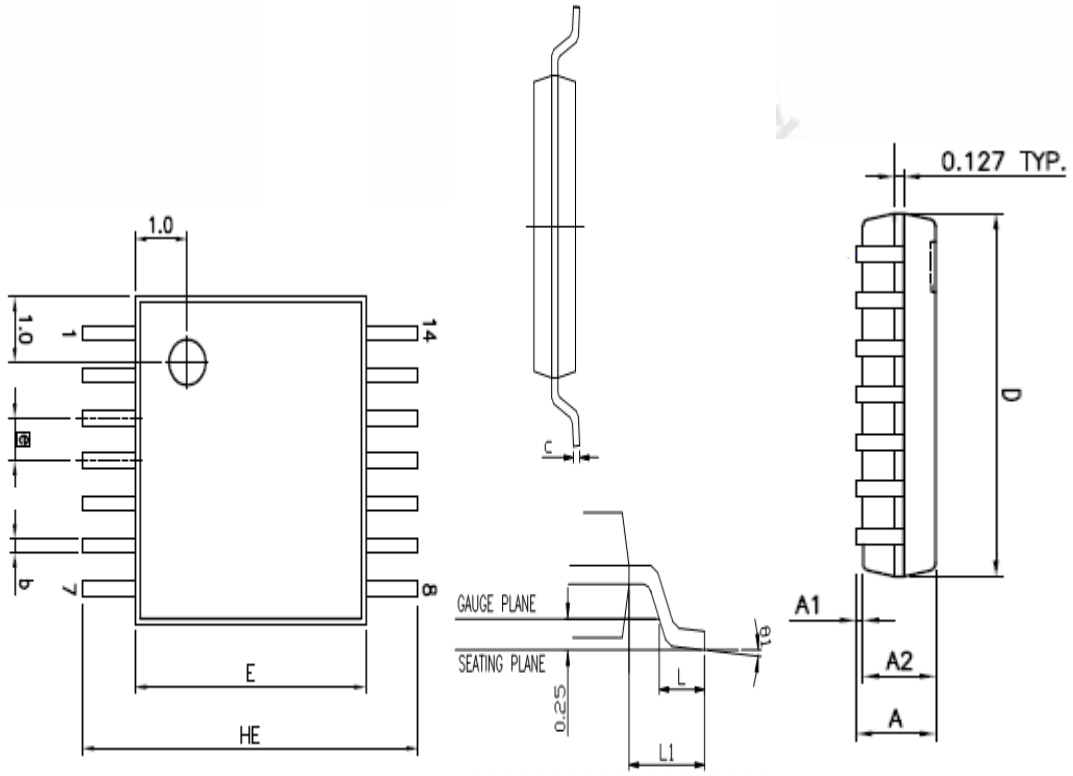
3 15 : packages made in year 2013, week 15

G : Assembly house code

xxx : Nuvoton internal use code

12. PACKAGE DRAWING AND DIMENSIONS

TSSOP 14L 4.4x5.0 mm^2



CONTROLLING DIMENSION: MILLMETERS						
SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM	MAX.	MIN.	NOM	MAX.
A	---	---	1.20	---	---	0.043
A1	0.05	---	0.15	0.02	---	0.006
A2	0.80	0.90	1.05	0.031	0.035	0.041
L	0.50	0.60	0.75	0.020	0.024	0.030
HE	6.40 BSC.			0.252 BSC.		
E	4.30	4.40	4.50	0.169	0.173	0.177
D	4.90	5.00	5.10	0.193	0.197	0.201
b	0.19	---	0.30	0.007	---	0.012
c	0.09	---	0.20	0.004	---	0.008
L1	1.0 REF.			0.039 REF.		
e	0.65 BSC.			0.026 BSC.		
θ1	0	---	8	0	---	8

13. DATASHEET REVISION HISTORY

	PAGES	DATES	VERSION	MAIN CONTENTS
1		2012/05/30	0.1	Draft version.
2		2012/06/05	0.2	1. Modify Fig1 2.Modify conditions and typical value in dynamic characteristics table 3. Insert Vref=0.5V and V_{TT}=0.75 dynamic characteristics
3	4	2012/07/01	0.3	Update the limiting values
4	All	2013/05/08	0.5	All versions before 0.5 are draft version Update the VOL spec and unit Update the Dynamic characteristics spec
5	3	2013/06/03	0.51	Updated the pin configuration (pin number typo)
		2013/06/14	1.0	Updated the version to V1.0

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