UM11228

NTS0304E evaluation board OM13543

Rev. 1.0 — 11 July 2019 **User manual**

Document information

Information	Content
Keywords	NTS0304E, OM13543, voltage translator, level translator, level shift, passive voltage translator, passive level translator, passive level shift, I2C-bus, SMBus, SPI
Abstract	Installation guide and User Manual for the OM13543 - NTS0304E evaluation board. NTS0304E is a 4-bit, dual supply translating transceiver family with auto direction sensing, that enables bidirectional voltage level translation.

Revision history

Rev	Date	Description
v.1	20190711	Initial version

1 Introduction

NTS0304E evaluation board (OM13543) is designed to evaluate NTS0304E, which is a 4-bit, dual supply translating transceiver with auto direction sensing that enables bidirectional voltage level translation. It features eight 1-bit input-output ports (A and B), one output enable input (OE) and two supply pins (VCC(A) and CC(B)). VCC(A) can be supplied at any voltage between 0.95 V and 3.6 V. VCC(B) can be supplied at any voltage between 1.65 V and 5.5 V. This flexibility makes the device suitable for translating between any of the voltage nodes (0.95 V, 1.2 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V). Pins A and OE are referenced to VCC(A) and pin B is referenced to VCC(B). A LOW level at pin OE causes the outputs to assume a high-impedance OFF-state

Table 1 lists the supported devices.

OM13543 is shipped with NTS0304EPW (TSSOP14) soldered on the board.

There are two package footprints for NTS0304E: NTS0304EUK (WLCSP12), and NTS0304EPW (TSSOP14).

Table 1. NTS0304E Package

Part Number	Package Number	Package Description
NTS0304EUK	SPT1390-10	WLCSP12
NTS0304EPW	SOT402-1	TSSOP14

Please refer to NTS0304E data sheet for more detailed information.

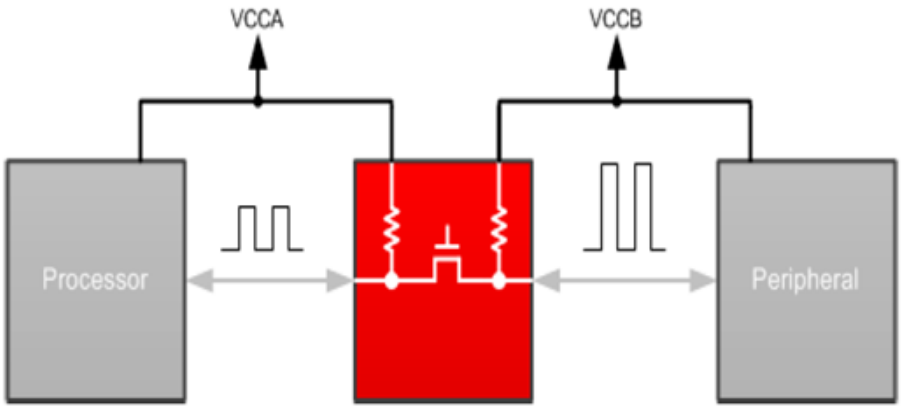

Figure 1. NTS0304E system application diagram

2 Hardware description

2.1 OM13543 board view and components placement

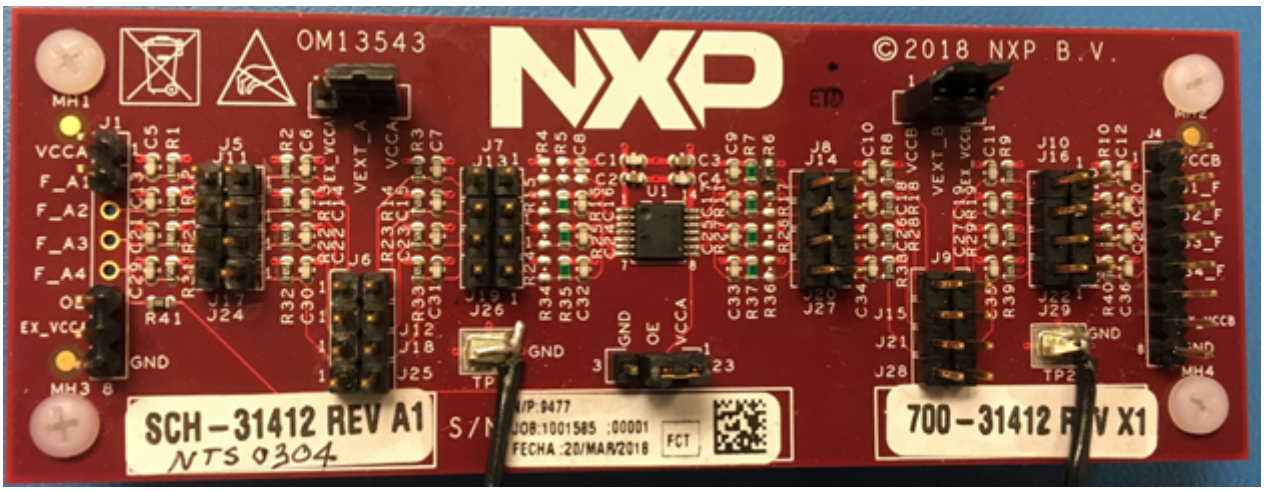

Figure 2. OM13543 board view

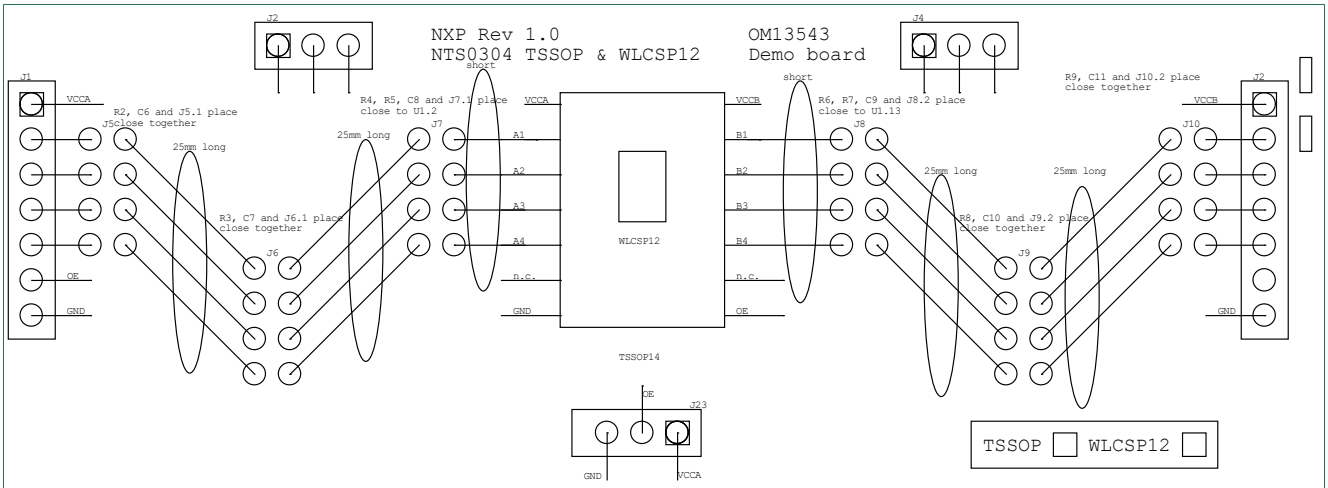

Figure 3. OM13543 connector/component placement

2.2 OM13543 board jumper location and configuration

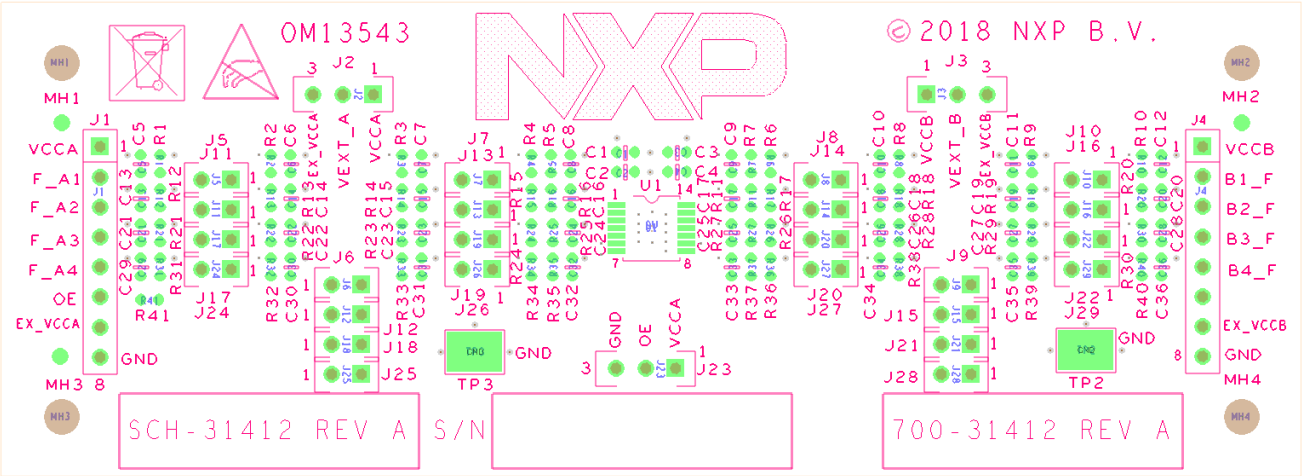

Figure 4. OM13543 board jumper location

Table 2. J1 header functions

J1 header	Function	Notes
J1-1	VCCA	Supply voltage for A port
J1-2	A1_F	Signal for A1 input or output port
J1-3	A2_F	Signal for A2 input or output port
J1-4	A3_F	Signal for A3 input or output port
J1-5	A4_F	Signal for A4 input or output port
J1-6	OE	Output enable input port
J1-7	EX-VCCA	Second supply voltage for A port
J1-8	GND	Ground

Table 3. J2 header functions

J2 header	Function	Notes
Pin 1-2 shorted (default)	VEXT_A = VCCA	Use VCCA for A port pull-up voltage
Pin 2-3 shorted	VEXT_A = EX-VCCA	Use EX-VCCA for A port pull-up voltage

Table 4. J3 header functions

J3 header	Function	Notes
Pin 1-2 shorted (default)	VEXT_B = VCCB	Use VCCB for B port pull-up voltage
Pin 2-3 shorted	VEXT_B = EX-VCCB	Use EX-VCCB for B port pull-up voltage

Table 5. J4 header functions

J4 header	Function	Notes
J4-1	VCCB	Supply voltage for B port
J4-2	B1_F	Signal for B1 input or output port
J4-3	B2_F	Signal for B2 input or output port
J4-4	B3_F	Signal for B3 input or output port
J4-5	B4_F	Signal for B4 input or output port
J4-6	NC	No connect
J4-7	EX-VCCB	Second supply voltage for B port
J4-8	GND	Ground

Table 6. J5-J29 header functions

J5-J29 header	Function	Notes
J5-J7	A->B B->A	J5-J7 are used to select pull-up resistors for A1 port J5-J7 are used to select load capacitors for A1 port
J8-J10	A->B B->A	J8-J10 are used to select load capacitors for B1 port J8-J10 are used to select pull-up resistors for B1 port
J11-J13	A->B B->A	J11-J13 are used to select pull-up resistors for A2 port J11-J13 are used to select load capacitors for A2 port
J14-J16	A->B B->A	J14-J16 are used to select load capacitors for B2 port J14-J16 are used to select pull-up resistors for B2 port
J17-J19	A->B B->A	J17-J19 are used to select pull-up resistors for A3 port J17-J19 are used to select load capacitors for A3 port
J20-J22	A->B B->A	J20-J22 are used to select load capacitors for B3 port J20-J22 are used to select pull-up resistors for B3 port
J24-26	A->B B->A	J24-J26 are used to select pull-up resistors for A4 port J24-J26 are used to select load capacitors for A4 port
J27-J29	A->B B->A	J27-J29 are used to select load capacitors for B4 port J27-J29 are used to select pull-up resistors for B4 port

Table 7. J23 header functions

J23 header	Function	Notes
Open	OE = J-6	OE is controlled by J1-6
Pin 1-2 shorted (default)	OE = VCCA	Output port is enabled
Pin 2-3 shorted	OE = GND	Output port is disabled

3 Test Setup

3.1 A -> B test setup

1. Provide power supply to (0.9V-3.6V) to NTS0304E VCCA pin through J1 (J1-1 or J1-7) and J2.
2. Provide power supply to (1.6V-5.5V) to NTS0304E VCCB pin through J4 (J4-1 or J4-7) and J3.
3. Set J23 pin 1-2 shorted to enable output port
4. Use J5-J7 to select pull-up resistors for A1 port.
   - Connect signal A1_F to J1-2 (A1_F) and short J5-J7, A1 port has R1-R3 pull-up resistors in parallel, or
   - Connect signal A1_F to J5-1 and short J6-J7, A1port has R2/R3 pull-up resistors in parallel, or
   - Connect signal A1_F to J6-1 and short J7, A1port has R3 pull-up resistors, or
   - Connect signal A1_F to J7-1, A1port has no pull-up resistor.
5. Use J8-J10 to select load capacitors for B1 port.
   - Connect signal B1_F to J4-2 (B1_F) and short J8-J10, B1 port has C9-12 load capacitors in parallel, or
   - Connect signal B1_F to J10-2 and short J8-J9, B1 port has C9-11 load capacitors in parallel, or
   - Connect signal B1_F to J9-2 and short J8, B1 port has C9-10 load capacitors in parallel, or
   - Connect signal A1_F to J8-2, B1 port has C9 load capacitor.
6. Use J11-J13 for signal A2_F pull-up resistors selection.
7. Use J14-J16 for signal B2_F load capacitors selection.
8. Use J17-J19 for signal A3_F pull-up resistors selection.
9. Use J20-J22 for signal B3_F load capacitors selection.
10. Use J24-J26 for signal A4_F pull-up resistors selection.
11. Use J27-J29 for signal B4_F load capacitors selection.
12. Input signals to A1_F-A4_F ports and receive level translating signals from B1_F-B4_F ports.

3.2 B -> A test setup

1. Provide power supply to (0.9V-3.6V) to NTS0304E VCCA pin through J1 (J1-1 or J1-7) and J2.
2. Provide power supply to (1.6V-5.5V) to NTS0304E VCCB pin through J4 (J4-1 or J4-7) and J3.
3. Set J23 pin 1-2 shorted to enable output port
4. Use J8-10 to select pull-up resistors for B1 port.
   - Connect signal B1_F to J4-2 (B1_F) and short J8-J10, B1 port has R8-R10 pull-up resistors in parallel, or
   - Connect signal B1_F to J10-2 and short J8-J9, B1 port has R8-R9 pull-up resistors in parallel, or
   - Connect signal B1_F to J9-2 and short J8, B1 port has R8 pull-up resistors, or
   - Connect signal B1_F to J8-2, B1 port has no pull-up resistor.
5. Use J5-J7 to select load capacitors for A1 port.

- Connect signal A1_F to J1-2 (A1_F) and short J5-J7, A1 port has C5-8 load capacitors in parallel, or
- Connect signal A1_F to J5-1 and short J6-J7, A1 port has C6-8 load capacitors in parallel, or
- Connect signal A1_F to J6-1 and short J7, A1 port has C7-8 load capacitors in parallel, or
- Connect signal A1_F to J7-1, A1 port has C8 load capacitor.

6. Use J14-J16 for signal B2_F pull-up resistors selection.
7. Use J11-J13 for signal A2_F load capacitors selection.
8. Use J20-J22 for signal B3_F pull-up resistors selection.
9. Use J17-J19 for signal A3_F load capacitors selection.
10. Use J27-J29 for signal B4_F pull-up resistors selection.
11. Use J24-J26 for signal A4_F load capacitors selection.
12. Input signals to B1_F-B4_F ports and receive level translating signals from A1_F-A4_F ports.

4 Schematic

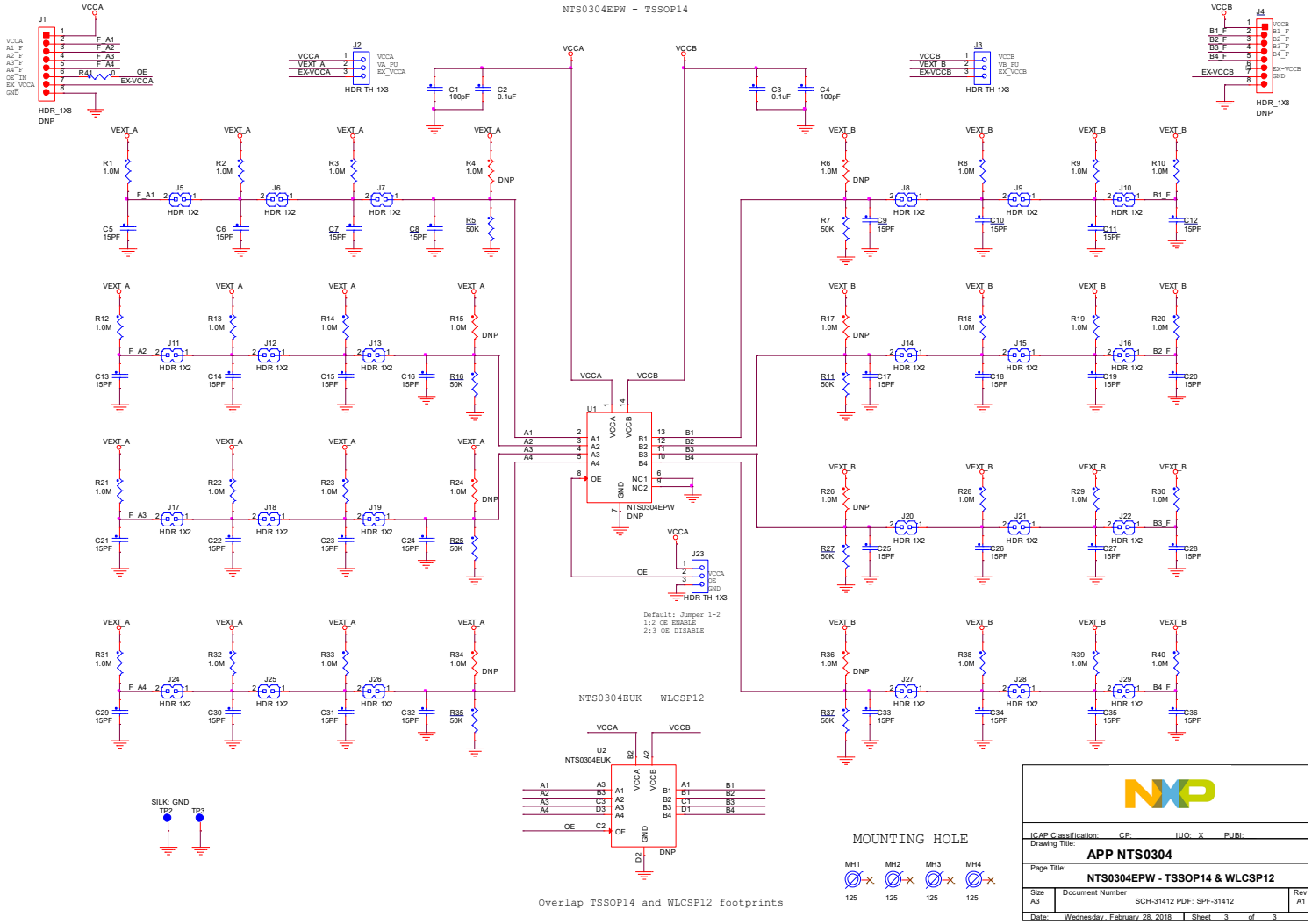

Figure 5. OM13543 board schematic

5 Notes

6 Legal information

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Date of release: 11 July 2019
Document identifier: UM11228