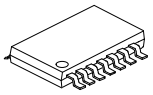
UTXU0304 *CMOS IC*

4-BIT FIXED DIRECTION VOLTAGE-LEVEL TRANSLATOR WITH SCHMITT-TRIGGER INPUTS AND 3-STATE OUTPUTS



TSSOP-14U

■ DESCRIPTION

UTC **UTXU0304** is a 4-bit, dual-supply noninverting fixed direction voltage level translation device with Schmitt-trigger inputs and 3-state outputs. Ax pins are referenced to V_{CCA} logic level, OE pin can be referenced to either V_{CCA} or V_{CCB} logic levels and Bx pins are referenced to V_{CCB} logic levels. The A port is able to accept input voltages ranging from 1.1V to 5.5V, while the B port can also accept input voltages from 1.1V to 5.5V. Fixed direction data transmission can occur from A to B or B to A when OE is set to high in reference to either supply. When OE is set to low, all output pins are in the high-impedance state.

This device ensures low static and dynamic power consumption across the entire supply range and is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry prevents potentially damaging backflow current through the device when it is powered down or if one of the power supplies is disconnected (floating).

■ FEATURES

* Fully configurable dual-rail design allows each port to operate from 1.1V to 5.5V
* Up to 200 Mbps support for 3.3V to 5.0V
* Schmitt-trigger inputs allows for slow and noisy inputs
* Inputs with integrated static pull-down resistors prevent channels from floating
* High drive strength (up to 12mA at 5V)
* Green & Pb Free

■ APPLICATION

* Eliminate slow or noisy input signals
* Driving indicator LEDs or buzzers
* Debouncing a mechanical switch
* General purpose I/O level shifting
* Push-pull level shifting (UART, SPI, JTAG, and so forth)

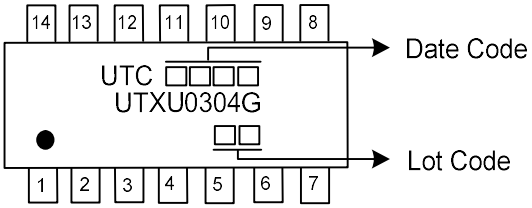
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■ ORDERING INFORMATION

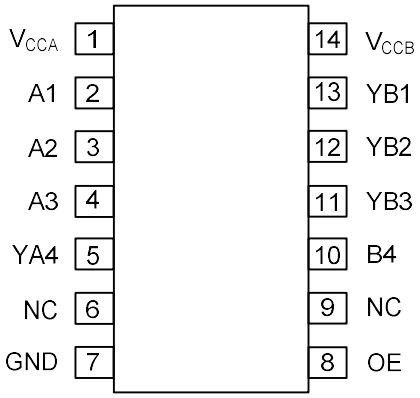
Ordering Number	Package	Packing
UTXU0304G-UEB-R	TSSOP-14U	Tape Reel

UTXU0304G-UEB-R (1) Packing Type (2) Package Type (3) Green Package	 (1) R: Tape Reel (2) UEB: TSSOP-14U (3) G: Halogen Free and Lead Free

■ MARKING



■ PIN CONFIGURATION



■ PIN DESCRIPTION

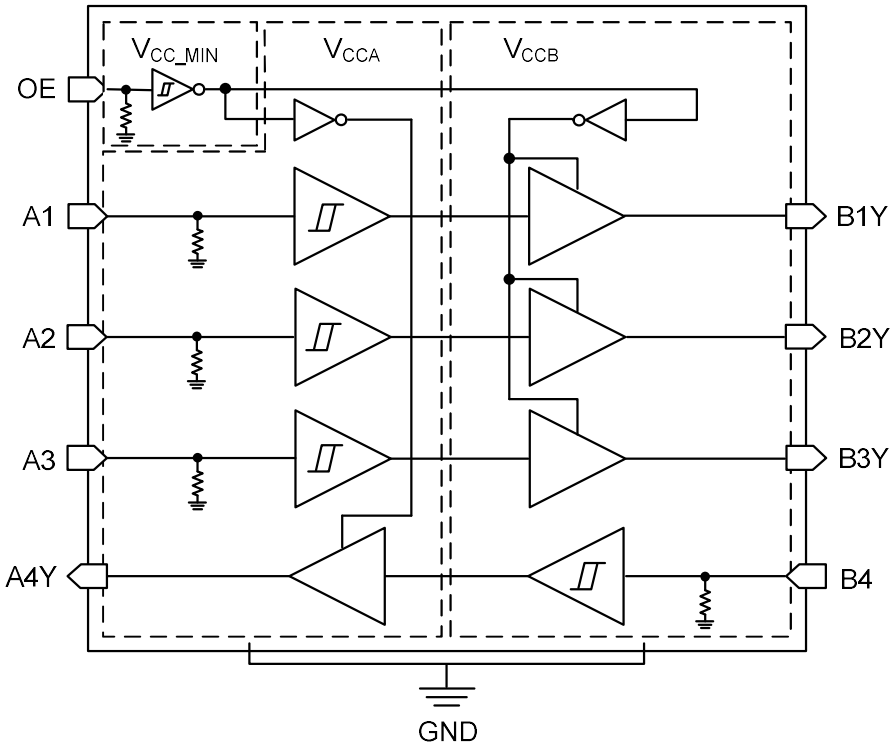
PIN NO.	PIN NAME	DESCRIPTION
1	V_{CCA}	A-port supply voltage. 1.1V ≤ V_{CCA} ≤ 5.5V
2, 3, 4	A1, A2, A3	Data input, Referenced to V_{CCA}
5	YA4	Data output, Referenced to V_{CCA}
6, 9	NC	Not connected
7	GND	Ground
8	OE	Output Enable. Pull to GND to place all outputs in high-impedance mode. Pull to V_{CCA} or V_{CCB} to enable all outputs.
10	B4	Data input, Referenced to V_{CCB}
11, 12, 13	YB3, YB2, YB1	Data output, Referenced to V_{CCB}
14	V_{CCB}	B-port supply voltage. 1.1V ≤ V_{CCA} ≤ 5.5V

■ FUNCTION TABLE (each gate)

CONTROL INPUT	PORT STATUS		OPERATION
OE	Input	Output	
H	L	L	Unidirectional non-inverting voltage translation
H	H	H	Unidirectional non-inverting voltage translation
L	X	Hi-Z	Isolation

Note: H = High voltage level；L = Low voltage level；Z : High impedance OFF-state；X = Don't care.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING ~~(Unless otherwise specified)~~ (Note 1、2)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CCA}		-0.5 ~ 6.5	V
Supply Voltage	V_{CCB}		-0.5 ~ 6.5	V
Input Voltage	V_{IN}	A Port	-0.5 ~ 6.5	V
		B Port	-0.5 ~ 6.5	V
		OE	-0.5 ~ 6.5	V
Voltage Applied to Any Output In The High-Impedance or Power-Off State	V_{OUT}	A Port	-0.5 ~ 6.5	V
		B Port	-0.5 ~ 6.5	V
Voltage Applied to Any Output In The High or Low State	V_{OUT}	A Port	-0.5 ~ V_{CCA}+0.5	V
		B Port	-0.5 ~ V_{CCB}+0.5	V
Input Clamp Current	I_{IK}	V_{IN} < 0	-20	mA
Output Clamp Current	I_{OK}	V_{OUT} < 0	-20	mA
Continuous Output Current	I_{OUT}		±25	mA
Continuous Current Through V_{CC} or GND	I_{CC} / I_{GND}		±100	mA
Storage Temperature	T_{STG}		-65 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. It's guarantee by design, the parameter is not production tested.

■ RECOMMENDED OPERATING CONDITIONS (NOTE 4)

PARAMETER		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage		V_{CCA}		1.08		5.5	V
Supply Voltage		V_{CCB}		1.08		5.5	V
Input Voltage (Note 3)		V_{IN}		0		5.5	V
Output Voltage	Active State	V_{OUT}		0		V_{CCO}	V
	Tri-State			0		5.5	V
Operating Temperature		T_A		-40		+125	°C

Notes: 1. V_{CCI} is the supply voltage associated with the input port.
2. V_{CCO} is the supply voltage associated with the output port.
3. All control inputs and data I/Os of this device have weak pulldowns to ensure the line is not floating when undefined external to the device. The input leakage from these weak pulldowns is defined by the II specification indicated under Electrical Characteristics.
4. It's guarantee by design, the parameter is not production tested.

■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified) (Note 6)

PARAMETER		SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Positive-Going Input Threshold Voltage	Data Inputs (An, B4) (Referenced to V_{CCI})	V_{T+}	V_{CCA}= V_{CCB}=1.1V	0.44		0.88	0.44		0.88	V
			V_{CCA}= V_{CCB}=1.4V	0.6		0.98	0.6		0.98	V
			V_{CCA}= V_{CCB}=1.6V	0.76		1.13	0.76		1.13	V
			V_{CCA}= V_{CCB}=2.3V	1.08		1.56	1.08		1.56	V
			V_{CCA}= V_{CCB}=3V	1.48		1.92	1.48		1.92	V
			V_{CCA}= V_{CCB}=4.5V	2.19		2.74	2.19		2.74	V
			V_{CCA}= V_{CCB}=5.5V	2.65		3.33	2.65		3.33	V
	OE (Referenced to V_{CCA} or V_{CCB})		V_{CCA}= V_{CCB}=1.1V	0.44		0.88	0.44		0.88	V
			V_{CCA}= V_{CCB}=1.4V	0.6		0.98	0.6		0.98	V
			V_{CCA}= V_{CCB}=1.6V	0.76		1.13	0.76		1.13	V
			V_{CCA}= V_{CCB}=2.3V	1.08		1.56	1.08		1.56	V
			V_{CCA}= V_{CCB}=3V	1.48		1.92	1.48		1.92	V
			V_{CCA}= V_{CCB}=4.5V	2.19		2.74	2.19		2.74	V
			V_{CCA}= V_{CCB}=5.5V	2.65		3.33	2.65		3.33	V
Negative-Going Input Threshold Voltage	Data Inputs (An, B4) (Referenced to V_{CCI})	V_{T-}	V_{CCA}= V_{CCB}=1.1V	0.17		0.48	0.17		0.48	V
			V_{CCA}= V_{CCB}=1.4V	0.28		0.59	0.28		0.59	V
			V_{CCA}= V_{CCB}=1.6V	0.35		0.69	0.35		0.69	V
			V_{CCA}= V_{CCB}=2.3V	0.56		0.97	0.56		0.97	V
			V_{CCA}= V_{CCB}=3V	0.89		1.5	0.89		1.5	V
			V_{CCA}= V_{CCB}=4.5V	1.51		1.97	1.51		1.97	V
			V_{CCA}= V_{CCB}=5.5V	1.88		2.4	1.88		2.4	V
	OE (Referenced to V_{CCA} or V_{CCB})		V_{CCA}= V_{CCB}=1.1V	0.17		0.48	0.17		0.48	V
			V_{CCA}= V_{CCB}=1.4V	0.28		0.59	0.28		0.59	V
			V_{CCA}= V_{CCB}=1.6V	0.35		0.69	0.35		0.69	V
			V_{CCA}= V_{CCB}=2.3V	0.56		0.97	0.56		0.97	V
			V_{CCA}= V_{CCB}=3V	0.89		1.5	0.89		1.5	V
			V_{CCA}= V_{CCB}=4.5V	1.51		1.97	1.51		1.97	V
			V_{CCA}= V_{CCB}=5.5V	1.88		2.46	1.88		2.46	V
Input Threshold Hysteresis (V_{T+} – V_{T-})	Data Inputs (An, B4) (Referenced to V_{CCI})	ΔV_T	V_{CCA}= V_{CCB}=1.1V	0.2		0.4	0.2		0.4	V
			V_{CCA}= V_{CCB}=1.4V	0.25		0.5	0.25		0.5	V
			V_{CCA}= V_{CCB}=1.6V	0.3		0.55	0.3		0.55	V
			V_{CCA}= V_{CCB}=2.3V	0.38		0.65	0.38		0.65	V
			V_{CCA}= V_{CCB}=3V	0.46		0.72	0.46		0.72	V
			V_{CCA}= V_{CCB}=4.5V	0.58		0.93	0.58		0.93	V
			V_{CCA}= V_{CCB}=5.5V	0.69		1.06	0.69		1.06	V
	OE (Referenced to V_{CCA} or V_{CCB})		V_{CCA}= V_{CCB}=1.1V	0.15		0.41	0.15		0.41	V
			V_{CCA}= V_{CCB}=1.4V	0.2		0.5	0.2		0.5	V
			V_{CCA}= V_{CCB}=1.6V	0.23		0.55	0.23		0.55	V
			V_{CCA}= V_{CCB}=2.3V	0.32		0.65	0.32		0.65	V
			V_{CCA}= V_{CCB}=3V	0.39		0.72	0.39		0.72	V
			V_{CCA}= V_{CCB}=4.5V	0.57		0.97	0.57		0.97	V
			V_{CCA}= V_{CCB}=5.5V	0.69		1.18	0.69		1.18	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
High-Level Output Voltage (Note 3)		V_{OH}	V_{CCA}= V_{CCB}=1.1V~5.5V I_{OH}=-0.1mA	V_{CCO} -0.1			V_{CCO} -0.1			V
			V_{CCA}= V_{CCB}=1.1V I_{OH}=-0.5mA	0.82			0.82			V
			V_{CCA}= V_{CCB}=1.4V I_{OH}=-3mA	1.05			1.05			V
			V_{CCA}= V_{CCB}=1.65V I_{OH}=-4.5mA	1.2			1.2			V
			V_{CCA}= V_{CCB}=2.3V I_{OH}=-8mA	1.7			1.7			V
			V_{CCA}= V_{CCB}=3V I_{OH}=-10mA	2.2			2.2			V
			V_{CCA}= V_{CCB}=4.5V I_{OH}=-12mA	3.7			3.7			V
Low-Level Output Voltage (Note 4)		V_{OL}	V_{CCA}= V_{CCB}=1.1V~5.5V I_{OL}=0.1mA			0.1			0.1	V
			V_{CCA}= V_{CCB}=1.1V I_{OL}=0.5mA			0.27			0.27	V
			V_{CCA}= V_{CCB}=1.4V I_{OL}=3mA			0.35			0.35	V
			V_{CCA}= V_{CCB}=1.65V I_{OL}=4.5mA			0.45			0.45	V
			V_{CCA}= V_{CCB}=2.3V I_{OL}=8mA			0.7			0.7	V
			V_{CCA}= V_{CCB}=3V I_{OL}=10mA			0.8			0.8	V
			V_{CCA}= V_{CCB}=4.5V I_{OL}=8mA			0.55			0.55	V
			V_{CCA}= V_{CCB}=4.5V I_{OL}=12mA			0.8			0.8	V
Input Leakage Current	OE	$I_{I(LEAK)}$	V_{CCA}= V_{CCB}=1.1V~5.5V V_I=V_{CC} or GND	-0.1		1.5	-0.1		2.0	μA
	Data Inputs (An, B4)		V_{CCA}= V_{CCB}=1.1V~5.5V V_I=V_{CC} or GND	-0.1		1.5	-2.0		2.0	μA
Partial Power Down Current	A Port or B Port	I_{OFF}	V_{CCA}=0V V_{CCB}=0V~5.5V V_I or V_O=0V~5.5V	-1.5		1.5	-2.5		2.5	μA
			V_{CCA}=0V~5.5V V_{CCB}=0V V_I or V_O=0V~5.5V	-1.5		1.5	-2.5		2.5	μA
Partial Power Down Current Floating Supply Partial Power Down Current	A Port or B Port	$I_{OFF-Fioat}$	V_{CCA}=Floating(Note 5) V_{CCB}=0V~5.5V V_I or V_O=GND	-1.5		1.5	-2.5		2.5	μA
			V_{CCA}=0V~5.5V V_{CCB}=Floating(Note 5) V_I or V_O=GND	-1.5		1.5	-2.5		2.5	μA

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
Tri-State Output Current	A Port or B Port OE=GND	I_{OZ}	V_{CCA}= V_{CCB}=1.1V~5.5V V_I=V_{CCI} or GND V_O=V_{CCO} or GND		-0.3		0.3	-2		2	μA
V_{CCB} Supply Current		I_{CCA}	V_I=V_{CCI} or GND I_O=0A	V_{CCA}= V_{CCB}=1.1V~5.5V			1.8			6.0	μA
				V_{CCA}=0V V_{CCB}=5.5V	-0.3			-1.0			μA
				V_{CCA}=5.5V V_{CCB}=0V			1.8			3.0	μA
			V_I=GND I_O=0A	V_{CCA}=5.5V V_{CCB}= Floating (Note 5)			1.5			15	μA
V_{CCB} Supply Current		I_{CCB}	V_I=V_{CCI} or GND I_O=0A	V_{CCA}= V_{CCB}=1.1V~5.5V			1.8			6.0	μA
				V_{CCA}=0V V_{CCB}=5.5V			1.8			3.0	μA
				V_{CCA}=5.5V V_{CCB}=0V	-0.3			-1.0			μA
			V_I=GND I_O=0A	V_{CCA}= Floating V_{CCB}=5.5V (Note 5)			1.5			15	μA
Combined Supply Current		I_{CCA}+I_{CCB}	V_{CCA}= V_{CCB}=1.1V~5.5V V_I=V_{CCI} or GND I_O=0A				3			6.0	μA
Control Input Capacitance		C_{IN}	V_{CCA}= V_{CCB}=3.3V V_I=3.3V or GND			2.75			3.5		pF
Data I/O Capacitance		C_{IO}	V_{CCA}= V_{CCB}=3.3V V_O=1.65V DC+1MHz-16 dBm Sine Wave OE=GND			3.0			4.0		pF

Notes: 1. V_{CCI} is the V_{CC} associated with the input port.
2. V_{CCO} is the V_{CC} associated with the output port.
3. Tested at V_I = $V_{T+(MAX)}$.
4. Tested at V_O = $V_{T-(MIN)}$.
5. Floating is defined as a node that is both not actively driven by an external device and has leakage not exeeding 10nA.
6. It's guarantee by design, the parameter is not production tested.

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS			T_A=25°C			T_A=-40~+125°C			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
Maximum Data Rate	f_{MAX}	50% Duty Cycle Input One Channel Switching 20% of Pulse > 0.7 × V_{CCO} 20% of Pulse < 0.3 × V_{CCO}	Up Translation	V_{CCI}=3V~3.6V V_{CCO}=4.5V~5.5V	200			200			Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=4.5V~5.5V	150			150			Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=4.5V~5.5V	30			30			Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=3V~3.6V	100			100			Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=3V~3.6V	30			30			Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=1.65V~1.95V	20			20			Mbps
			Down Translation	V_{CCI}=4.5V~5.5V V_{CCO}=3V~3.6V	125			125			Mbps
				V_{CCI}=4.5V~5.5V V_{CCO}=1.65V~1.95V	50			50			Mbps
				V_{CCI}=4.5V~5.5V V_{CCO}=1.1V~1.3V	10			10			Mbps
				V_{CCI}=3V~3.6V V_{CCO}=1.65V~1.95V	50			50			Mbps
				V_{CCI}=3V~3.6V V_{CCO}=1.1V~1.3V	10			10			Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=1.1V~1.3V	10			10			Mbps

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS			T_A=25°C			T_A=-40~+125°C			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
Output Skew	t_{SK}	Timing Skew Between any Switching Outputs on the Rising or Falling Edge	Up Translation	V_{CCI}=3V~3.6V V_{CCO}=4.5V~5.5V			3			3	Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=4.5V~5.5V			10			10	Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=4.5V~5.5V			42			42	Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=3V~3.6V			8			8	Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=3V~3.6V			42			42	Mbps
				V_{CCI}=1.1V~1.3V V_{CCO}=1.65V~1.95V			45			45	Mbps
			Down Translation	V_{CCI}=4.5V~5.5V V_{CCO}=3V~3.6V			3			3	Mbps
				V_{CCI}=4.5V~5.5V V_{CCO}=1.65V~1.95V			10			10	Mbps
				V_{CCI}=4.5V~5.5V V_{CCO}=1.1V~1.3V			42			42	Mbps
				V_{CCI}=3V~3.6V V_{CCO}=1.65V~1.95V			8			8	Mbps
				V_{CCI}=3V~3.6V V_{CCO}=1.1V~1.3V			42			42	Mbps
				V_{CCI}=1.65V~1.95V V_{CCO}=1.1V~1.3V			45			45	Mbps

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay From Input (An) to Output (nBn)	t_{PD}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			96			98	ns
			V_{CCB}=1.5V±0.1V			43			45	ns
			V_{CCB}=1.8V±0.15V			37			39	ns
			V_{CCB}=2.5V±0.2V			32			34	ns
			V_{CCB}=3.3V±0.3V			30			32	ns
			V_{CCB}=5V±0.5V			31			33	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			80			82	ns
			V_{CCB}=1.5V±0.1V			31			33	ns
			V_{CCB}=1.8V±0.15V			25			27	ns
			V_{CCB}=2.5V±0.2V			19			21	ns
			V_{CCB}=3.3V±0.3V			17			19	ns
			V_{CCB}=5V±0.5V			15			17	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			75			77	ns
			V_{CCB}=1.5V±0.1V			28			30	ns
			V_{CCB}=1.8V±0.15V			22			24	ns
			V_{CCB}=2.5V±0.2V			17			19	ns
			V_{CCB}=3.3V±0.3V			14			16	ns
			V_{CCB}=5V±0.5V			12			14	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			70			72	ns
			V_{CCB}=1.5V±0.1V			26			28	ns
			V_{CCB}=1.8V±0.15V			20			22	ns
			V_{CCB}=2.5V±0.2V			14			16	ns
			V_{CCB}=3.3V±0.3V			12			14	ns
			V_{CCB}=5V±0.5V			9			11	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			69			71	ns
			V_{CCB}=1.5V±0.1V			25			27	ns
			V_{CCB}=1.8V±0.15V			19			21	ns
			V_{CCB}=2.5V±0.2V			13			15	ns
			V_{CCB}=3.3V±0.3V			11			13	ns
			V_{CCB}=5V±0.5V			8			10	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			69			71	ns
			V_{CCB}=1.5V±0.1V			24			26	ns
			V_{CCB}=1.8V±0.15V			18			20	ns
			V_{CCB}=2.5V±0.2V			13			15	ns
			V_{CCB}=3.3V±0.3V			10			12	ns
			V_{CCB}=5V±0.5V			8			10	ns

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay From Input (B4) to Output (YA4)	t_{PD}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			95			97	ns
			V_{CCB}=1.5V±0.1V			80			82	ns
			V_{CCB}=1.8V±0.15V			75			77	ns
			V_{CCB}=2.5V±0.2V			70			72	ns
			V_{CCB}=3.3V±0.3V			69			71	ns
			V_{CCB}=5V±0.5V			69			71	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			43			45	ns
			V_{CCB}=1.5V±0.1V			31			33	ns
			V_{CCB}=1.8V±0.15V			28			30	ns
			V_{CCB}=2.5V±0.2V			26			28	ns
			V_{CCB}=3.3V±0.3V			25			27	ns
			V_{CCB}=5V±0.5V			24			26	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			37			39	ns
			V_{CCB}=1.5V±0.1V			25			27	ns
			V_{CCB}=1.8V±0.15V			22			24	ns
			V_{CCB}=2.5V±0.2V			19			21	ns
			V_{CCB}=3.3V±0.3V			19			21	ns
			V_{CCB}=5V±0.5V			18			20	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			32			34	ns
			V_{CCB}=1.5V±0.1V			19			21	ns
			V_{CCB}=1.8V±0.15V			17			19	ns
			V_{CCB}=2.5V±0.2V			14			16	ns
			V_{CCB}=3.3V±0.3V			13			15	ns
			V_{CCB}=5V±0.5V			13			15	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			30			32	ns
			V_{CCB}=1.5V±0.1V			7			9	ns
			V_{CCB}=1.8V±0.15V			14			16	ns
			V_{CCB}=2.5V±0.2V			12			14	ns
			V_{CCB}=3.3V±0.3V			11			13	ns
			V_{CCB}=5V±0.5V			10			12	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			31			33	ns
			V_{CCB}=1.5V±0.1V			15			17	ns
			V_{CCB}=1.8V±0.15V			12			14	ns
			V_{CCB}=2.5V±0.2V			9			11	ns
			V_{CCB}=3.3V±0.3V			8			10	ns
			V_{CCB}=5V±0.5V			8			10	ns

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Disable Time From Input (OE) to Output (YA4)	t_{dis}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			133			135	ns
			V_{CCB}=1.5V±0.1V			130			132	ns
			V_{CCB}=1.8V±0.15V			133			135	ns
			V_{CCB}=2.5V±0.2V			137			139	ns
			V_{CCB}=3.3V±0.3V			143			145	ns
			V_{CCB}=5V±0.5V			211			213	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			91			95	ns
			V_{CCB}=1.5V±0.1V			82			86	ns
			V_{CCB}=1.8V±0.15V			81			85	ns
			V_{CCB}=2.5V±0.2V			82			87	ns
			V_{CCB}=3.3V±0.3V			83			88	ns
			V_{CCB}=5V±0.5V			87			92	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			79			83	ns
			V_{CCB}=1.5V±0.1V			67			71	ns
			V_{CCB}=1.8V±0.15V			65			69	ns
			V_{CCB}=2.5V±0.2V			65			70	ns
			V_{CCB}=3.3V±0.3V			66			71	ns
			V_{CCB}=5V±0.5V			68			73	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			65			68	ns
			V_{CCB}=1.5V±0.1V			51			55	ns
			V_{CCB}=1.8V±0.15V			51			55	ns
			V_{CCB}=2.5V±0.2V			43			47	ns
			V_{CCB}=3.3V±0.3V			44			48	ns
			V_{CCB}=5V±0.5V			45			49	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			62			65	ns
			V_{CCB}=1.5V±0.1V			47			51	ns
			V_{CCB}=1.8V±0.15V			42			46	ns
			V_{CCB}=2.5V±0.2V			39			41	ns
			V_{CCB}=3.3V±0.3V			39			41	ns
			V_{CCB}=5V±0.5V			40			42	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			58			61	ns
			V_{CCB}=1.5V±0.1V			42			46	ns
			V_{CCB}=1.8V±0.15V			36			40	ns
			V_{CCB}=2.5V±0.2V			31			33	ns
			V_{CCB}=3.3V±0.3V			30			32	ns
			V_{CCB}=5V±0.5V			26			29	ns

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Disable Time From Input (OE) to Output (nBn)	t_{dis}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			150			152	ns
			V_{CCB}=1.5V±0.1V			117			120	ns
			V_{CCB}=1.8V±0.15V			110			113	ns
			V_{CCB}=2.5V±0.2V			104			106	ns
			V_{CCB}=3.3V±0.3V			112			114	ns
			V_{CCB}=5V±0.5V			181			183	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			127			130	ns
			V_{CCB}=1.5V±0.1V			91			95	ns
			V_{CCB}=1.8V±0.15V			82			86	ns
			V_{CCB}=2.5V±0.2V			71			75	ns
			V_{CCB}=3.3V±0.3V			71			75	ns
			V_{CCB}=5V±0.5V			70			74	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			121			123	ns
			V_{CCB}=1.5V±0.1V			81			86	ns
			V_{CCB}=1.8V±0.15V			71			76	ns
			V_{CCB}=2.5V±0.2V			60			64	ns
			V_{CCB}=3.3V±0.3V			58			62	ns
			V_{CCB}=5V±0.5V			55			59	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			112			115	ns
			V_{CCB}=1.5V±0.1V			74			79	ns
			V_{CCB}=1.8V±0.15V			61			66	ns
			V_{CCB}=2.5V±0.2V			46			51	ns
			V_{CCB}=3.3V±0.3V			44			48	ns
			V_{CCB}=5V±0.5V			39			43	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			109			111	ns
			V_{CCB}=1.5V±0.1V			71			75	ns
			V_{CCB}=1.8V±0.15V			59			63	ns
			V_{CCB}=2.5V±0.2V			42			46	ns
			V_{CCB}=3.3V±0.3V			38			42	ns
			V_{CCB}=5V±0.5V			34			36	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			109			111	ns
			V_{CCB}=1.5V±0.1V			69			73	ns
			V_{CCB}=1.8V±0.15V			56			60	ns
			V_{CCB}=2.5V±0.2V			40			43	ns
			V_{CCB}=3.3V±0.3V			36			39	ns
			V_{CCB}=5V±0.5V			29			31	ns

■ SWITCHING CHARACTERISTICS (Cont.)

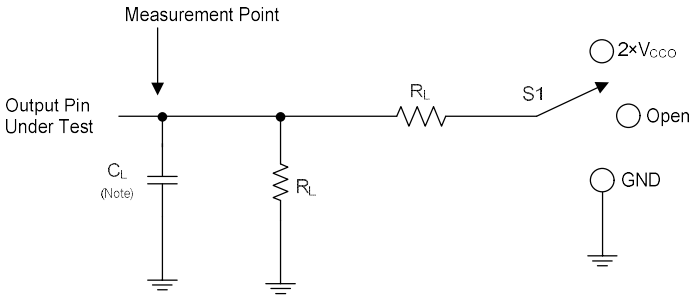
PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Enable Time From Input (OE) to Output (YA4)	t_{en}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			237			239	ns
			V_{CCB}=1.5V±0.1V			229			231	ns
			V_{CCB}=1.8V±0.15V			230			232	ns
			V_{CCB}=2.5V±0.2V			232			234	ns
			V_{CCB}=3.3V±0.3V			235			237	ns
			V_{CCB}=5V±0.5V			244			246	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			102			104	ns
			V_{CCB}=1.5V±0.1V			86			89	ns
			V_{CCB}=1.8V±0.15V			88			91	ns
			V_{CCB}=2.5V±0.2V			90			93	ns
			V_{CCB}=3.3V±0.3V			92			96	ns
			V_{CCB}=5V±0.5V			97			100	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			88			90	ns
			V_{CCB}=1.5V±0.1V			66			69	ns
			V_{CCB}=1.8V±0.15V			63			67	ns
			V_{CCB}=2.5V±0.2V			65			68	ns
			V_{CCB}=3.3V±0.3V			66			70	ns
			V_{CCB}=5V±0.5V			69			73	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			80			82	ns
			V_{CCB}=1.5V±0.1V			50			53	ns
			V_{CCB}=1.8V±0.15V			44			47	ns
			V_{CCB}=2.5V±0.2V			39			42	ns
			V_{CCB}=3.3V±0.3V			40			43	ns
			V_{CCB}=5V±0.5V			41			44	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			85			87	ns
			V_{CCB}=1.5V±0.1V			45			47	ns
			V_{CCB}=1.8V±0.15V			37			40	ns
			V_{CCB}=2.5V±0.2V			31			33	ns
			V_{CCB}=3.3V±0.3V			30			32	ns
			V_{CCB}=5V±0.5V			30			33	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			102			104	ns
			V_{CCB}=1.5V±0.1V			44			46	ns
			V_{CCB}=1.8V±0.15V			33			36	ns
			V_{CCB}=2.5V±0.2V			25			27	ns
			V_{CCB}=3.3V±0.3V			22			24	ns
			V_{CCB}=5V±0.5V			21			23	ns

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Enable Time From Input (OE) to Output (nBn)	t_{en}	V_{CCA}=1.2V±0.1V	V_{CCB}=1.2V±0.1V			237			239	ns
			V_{CCB}=1.5V±0.1V			152			154	ns
			V_{CCB}=1.8V±0.15V			140			142	ns
			V_{CCB}=2.5V±0.2V			130			132	ns
			V_{CCB}=3.3V±0.3V			130			132	ns
			V_{CCB}=5V±0.5V			132			134	ns
		V_{CCA}=1.5V±0.1V	V_{CCB}=1.2V±0.1V			175			177	ns
			V_{CCB}=1.5V±0.1V			80			82	ns
			V_{CCB}=1.8V±0.15V			69			71	ns
			V_{CCB}=2.5V±0.2V			57			60	ns
			V_{CCB}=3.3V±0.3V			53			56	ns
			V_{CCB}=5V±0.5V			54			57	ns
		V_{CCB}=1.8V±0.15V	V_{CCB}=1.2V±0.1V			177			179	ns
			V_{CCB}=1.5V±0.1V			75			77	ns
			V_{CCB}=1.8V±0.15V			58			60	ns
			V_{CCB}=2.5V±0.2V			46			49	ns
			V_{CCB}=3.3V±0.3V			42			44	ns
			V_{CCB}=5V±0.5V			39			42	ns
		V_{CCA}=2.5V±0.2V	V_{CCB}=1.2V±0.1V			183			185	ns
			V_{CCB}=1.5V±0.1V			74			76	ns
			V_{CCB}=1.8V±0.15V			54			57	ns
			V_{CCB}=2.5V±0.2V			36			38	ns
			V_{CCB}=3.3V±0.3V			31			33	ns
			V_{CCB}=5V±0.5V			27			29	ns
		V_{CCA}=3.3V±0.3V	V_{CCB}=1.2V±0.1V			192			194	ns
			V_{CCB}=1.5V±0.1V			76			78	ns
			V_{CCB}=1.8V±0.15V			55			57	ns
			V_{CCB}=2.5V±0.2V			34			36	ns
			V_{CCB}=3.3V±0.3V			27			29	ns
			V_{CCB}=5V±0.5V			22			24	ns
		V_{CCA}=5V±0.5V	V_{CCB}=1.2V±0.1V			212			214	ns
			V_{CCB}=1.5V±0.1V			82			84	ns
			V_{CCB}=1.8V±0.15V			58			60	ns
			V_{CCB}=2.5V±0.2V			35			37	ns
			V_{CCB}=3.3V±0.3V			26			28	ns
			V_{CCB}=5V±0.5V			19			21	ns

Note: It's guarantee by design, the parameter is not production tested.

■ TEST CIRCUIT AND WAVEFORMS

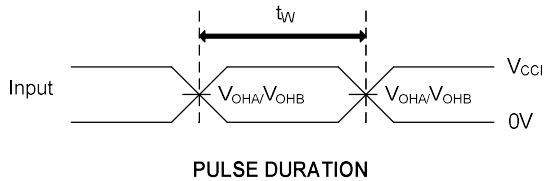


Note: C_L includes probe and jig capacitance.

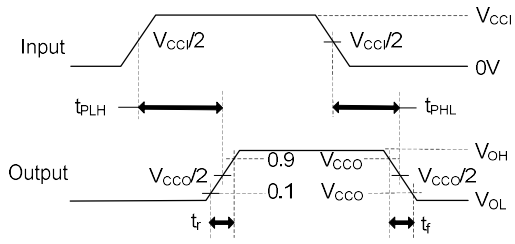
Load Circuits

Table 1. Load Circuit Conditions

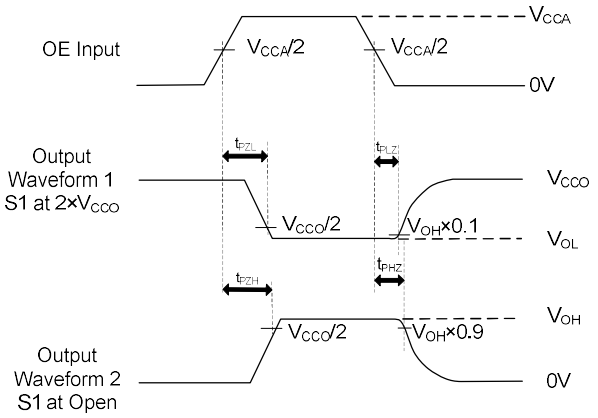
PARAMETER	SYMBOL	V_{CCO}	R_L	C_L	S1	V_{TP}
Propagation Delay	t_{PD}	1.1V~5.5V	10kΩ	5pF	Open	-
Enable Time Disable Time	t_{en}, t_{dis}	1.1V~1.6V	10kΩ	5pF	2×V_{CCO}	0.1V
		1.65V~2.7V	10kΩ	5pF	2×V_{CCO}	0.15V
		3V~5.5V	10kΩ	5pF	2×V_{CCO}	0.3V
Enable Time Disable Time	t_{en}, t_{dis}	1.1V~1.6V	10kΩ	5pF	GND	0.1V
		1.65V~2.7V	10kΩ	5pF	GND	0.15V
		3V~5.5V	10kΩ	5pF	GND	0.3V



PULSE DURATION



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

■ DETAILED DESCRIPTION

Overview

The UTC **UTXU0304** device is built for asynchronous communication some data buses, transmitting data in fixed direction from the A bus to the B bus on select channels and from the B bus to the A bus on the remaining channels. The output-enable input (OE) is used to disable the outputs so the buses are effectively isolated. The output-enable pin of the UTC **UTXU0304** (OE) can be referenced to either V_{CCA} or V_{CCB}. The OE pin can be left floating or externally pulled down to ground to ensure the high-impedance state of the level shifter outputs during power up or power down.

The UTC **UTXU0304** is a 4-bit translating transceiver that uses two individually configurable power-supply rails. The device is operational with V_{CCA} and V_{CCB} supplies as low as 1.1V and as high as 5.5V. Additionally, the device can be operated with $V_{CCA} = V_{CCB}$. The A port is designed to track V_{CCA}, and the B port is designed to track V_{CCB}.

Glitch-free power supply sequencing allows either supply rail to be powered on or off in any order while providing robust power sequencing performance.

This device is fully specified for partial-power-down applications using the Ioff current. The Ioff protection circuitry ensures that no excessive current is drawn from or sourced into an input or output while the device is powered down.

The V_{CC} isolation or V_{CC} disconnect feature ensures that if either V_{CC} is less than 100mV or disconnected with the complementary supply within recommended operating conditions, outputs are disabled and set to the high-impedance state while the supply current is maintained. The $I_{OFF-Float}$ circuitry ensures that no excessive current is drawn from or sourced into an input or output while the supply is floating.

Negative Clamping Diodes

Depicts the inputs and outputs to this device that have negative clamping diodes.

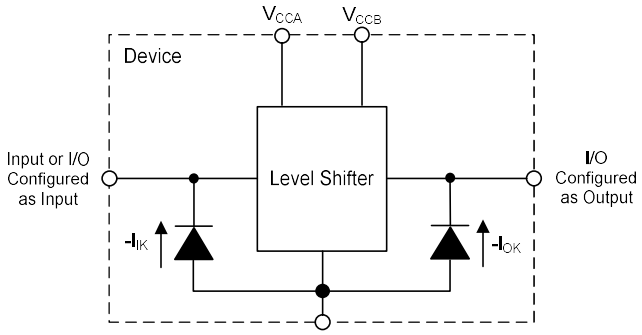


Figure 1. Electrical Placement of Clamping Diodes for Each Input and Output

Supports High-Speed Translation

The UTC **UTXU0304** device can support high data-rate applications. The translated signal data rate can be up to 200Mbps when the signal is translated from 3.3V to 5.0V.

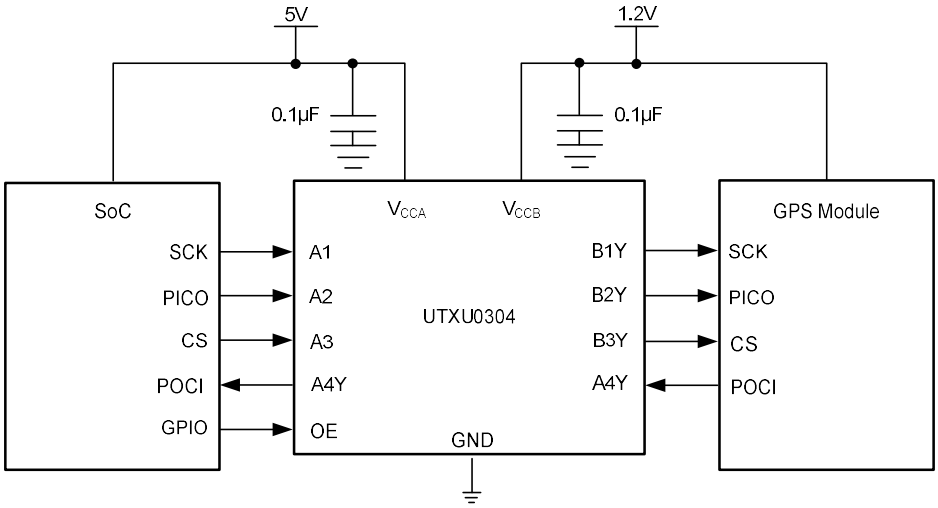
Fully Configurable Dual-Rail Design

The V_{CCA} and V_{CCB} pins can be supplied at any voltage from 1.1V to 5.5V, making the device suitable for translating between any of the voltage nodes (1.2V, 1.5V, 1.8V, 3.3V, and 5.0V).

Power Supply Recommendations

To ensure the high-impedance state of the outputs during power up or power down, the OE input pin must be tied to GND through a pulldown resistor and must not be enabled until V_{CCA} and V_{CCB} are fully ramped and stable. The minimum value of the pulldown resistor to ground is determined by the current-sourcing capability of the driver.

■ TYPICAL APPLICATION CIRCUIT



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