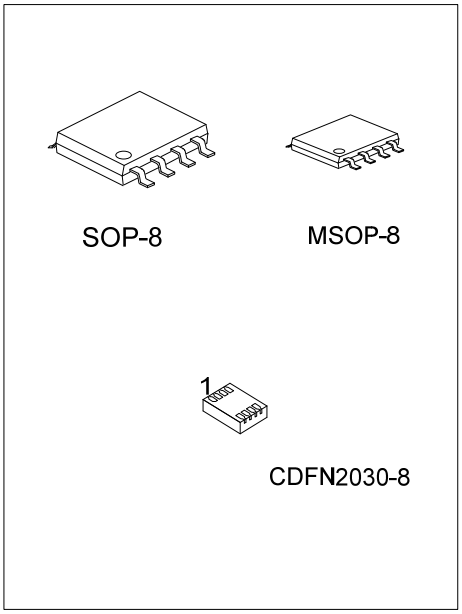
2-BIT BIDIRECTIONAL VOLTAGE-LEVEL TRANSLATOR FOR OPEN-DRAIN AND PUSH-PULL APPLICATION



■ DESCRIPTION

This 2-bit non-inverting translator is a bidirectional voltage-level translator and can be used to establish digital switching compatibility between mixed-voltage systems. It uses two separate configurable power supply rails, with the A ports supporting operating voltages from 1.65V to 3.6V while it tracks the V_{CCA} supply, and the B ports supporting operating voltages from 2.3V to 5.5V while it tracks the V_{CCB} supply.

This allows the support of both lower and higher logic signal levels while providing bidirectional translation capabilities between any of the 1.8V, 2.5V, 3.3V, and 5V voltage nodes.

When the output-enable (OE) input is low, all I/Os are placed in the high-impedance state, which significantly reduces the power-supply quiescent current consumption.

To ensure the high-impedance state during power-up or power -down, OE should be tied to GND through a pull-down resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

■ FEATURES

* 1.65V to 3.6V on A Port and 2.3V to 5.5V on B Port ($V_{CCA} \leq V_{CCB}$)
* No Direction-Control Signal Needed
* No Power-Supply Sequencing Required – Either V_{CCA} or V_{CCB} Can be Ramped First
* I_{OFF} Supports Partial-Power-Down Mode Operation

■ APPLICATION

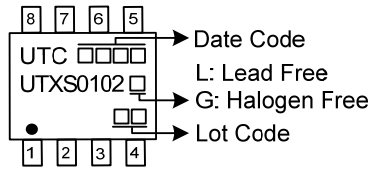
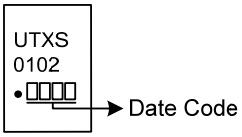
* Handset
* Smartphone
* Tablet
* Desktop PC

■ ORDERING INFORMATION

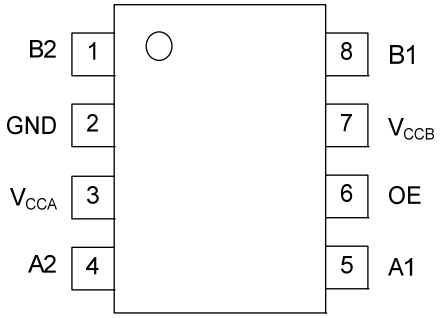
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UTXS0102L-S08-R	UTXS0102G-S08-R	SOP-8	Tape Reel
UTXS0102L-SM1-R	UTXS0102G-SM1-R	MSOP-8	Tape Reel
UTXS0102L-CK08-2030-R	UTXS0102G-CK08-2030-R	CDFN2030-8	Tape Reel

UTXS0102G-S08-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) S08: SOP-8, SM1: MSOP-8, CK08-2030: CDFN2030-8 (3) G: Halogen Free and Lead Free, L: Lead Free

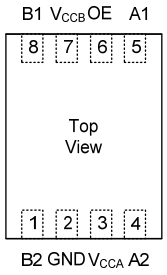
■ MARKING

SOP-8 / MSOP-8	CDFN2030-8
	

■ PIN CONFIGURATION



SOP-8/MSOP-8



CDFN2030-8

■ PIN DESCRIPTION

PIN NO.	PIN NAME	I/O	DESCRIPTION
1	B2	I/O	Input/output B2. Referenced to V_{CCB}
2	GND		Ground
3	V_{CCA}		A-Port supply voltage 1.65V ≤ V_{CCA} ≤ 3.6V, V_{CCA} ≤ V_{CCB}
4	A2	I/O	Input/output A2. Referenced to V_{CCA}
5	A1	I/O	Input/output A1. Referenced to V_{CCA}
6	OE	I	3-state output-mode enable. Pull OE low to place all outputs in 3-state mode. Referenced to V_{CCA}
7	V_{CCB}		B-Port supply voltage 2.3V ≤ V_{CCB} ≤ 5.5V
8	B1	I/O	Input/output B1. Referenced to V_{CCB}

Note: I=Input, O=Output, I/O=Input and Output.

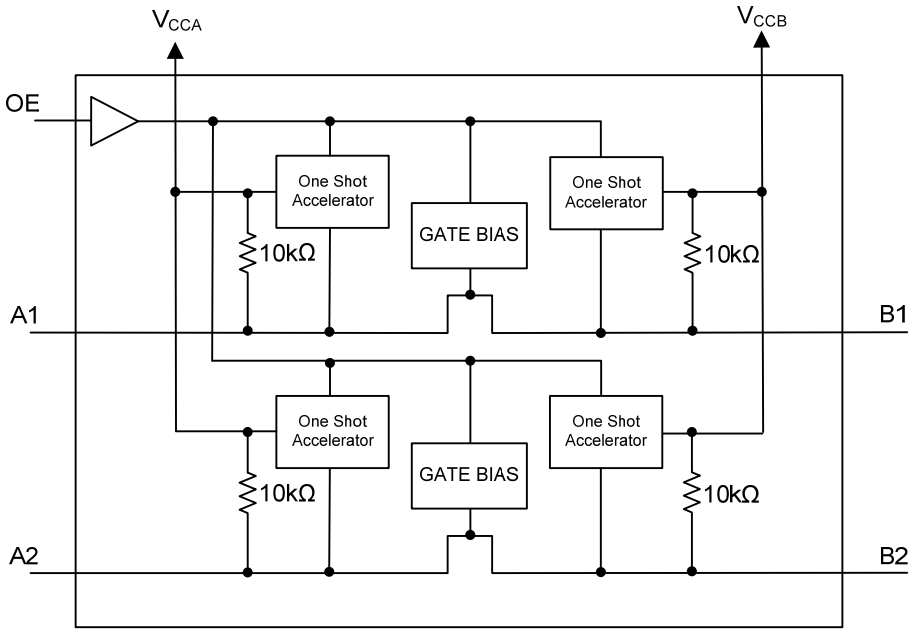
■ FUNCTION TABLE

SUPPLY VOLTAGE		INPUT	INPUT/OUTPUT	
V_{CCA}	V_{CCB}	OE	An	Bn
1.65V ~ V_{CCB}	2.3V ~ 5.5V	L	Z	Z
1.65V ~ V_{CCB}	2.3V ~ 5.5V	H	Input or Output	Output or Input
GND	GND	X	Z	Z

Notes: 1. H = High voltage level；L = Low voltage level；X = Don't care；Z = high-impedance OFF-state

2. When either V_{CCA} or V_{CCB} is at GND level, the device goes into power-down mode.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CCA}	-0.5 ~ 4.6	V
Supply Voltage		V_{CCB}	-0.5 ~ 6.5	V
Input Voltage	A Port	V_{IN}	-0.5 ~ 4.6	V
	B Port		-0.5 ~ 6.5	V
Voltage Range Applied to Any Output In the High-Impedance or Power-Off State	A Port	V_{OUT}	-0.5 ~ 4.6	V
	B Port		-0.5 ~ 6.5	V
Voltage Range Applied to Any Output In the High or Low State	A Port	V_{OUT}	-0.5 ~ V_{CCA}+0.5	V
	B Port		-0.5 ~ V_{CCB}+0.5	V
Input Clamp Current	V_{IN}<0	I_{IK}	-50	mA
Output Clamp Current	V_{OUT}<0	I_{OK}	-50	mA
Continuous Output Current		I_{OUT}	±50	mA
Continuous Current Through V_{CCA}, V_{CCB}, or GND		I_{CC} / I_{GND}	±100	mA
Storage Temperature		T_{STG}	-65 ~ +150	°C

Note: 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.

■ RECOMMENDED OPERATING CONDITIONS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage (Note 3)		V_{CCA}		1.65		3.6	V
Supply Voltage (Note 3)		V_{CCB}		2.3		5.5	V
Input Voltage		V_{IN}		0		V_{CCI}	V
Output Voltage	A Port I/Os	V_{OUT}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V	0		3.6	V
	B Port I/Os			0		5.5	V
High-Level Input Voltage	A Port I/Os	V_{IH}	V_{CCA}=1.65V~1.95V, V_{CCB}=2.3V~5.5V	V_{CCI}-0.2		V_{CCI}	V
			V_{CCA}=2.3V~3.6V, V_{CCB}=2.3V~5.5V	V_{CCI}-0.4		V_{CCI}	V
	B Port I/Os		V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V	V_{CCI}-0.4		V_{CCI}	V
	OE Input			V_{CCA} ×0.65		5.5	V
Low-Level Input Voltage	A Port I/Os	V_{IL}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V	0		0.15	V
	B Port I/Os			0		0.15	V
	OE Input			0		V_{CCA} ×0.35	V
Input Transition Rise or Fall Rate	A Port I/Os	Δt/Δv	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V			10	ns/V
	B Port I/Os					10	ns/V
	OE Input					10	ns/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. V_{CCA} must be less than or equal to V_{CCB}, and V_{CCA} must not exceed 3.6V.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Port A Output High Voltage		V_{OHA}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V, I_{OH}=-20μA, $V_{IB} \geq V_{CCB}$-0.4V		V_{CCA} ×0.67			V
Port A Output Low Voltage		V_{OLA}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V, I_{OL}=1mA, $V_{IB} \leq$ 0.15V				0.4	V
Port B Output High Voltage		V_{OHB}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V, I_{OH}=-20μA $V_{IA} \geq V_{CCA}$-0.2V		V_{CCB} ×0.67			V
Port B Output Low Voltage		V_{OLB}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V, I_{OL}=1mA, $V_{IA} \leq$ 0.15V				0.4	V
Input Leakage Current	OE	$I_{I(LEAK)}$	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V				±1	μA
Power OFF Leakage Current	A Port	I_{OFF}	V_{CCA}=0V, V_{CCB}=0V~5.5V				±1	μA
	B Port		V_{CCA}=0V~3.6V, V_{CCB}=0V				±1	μA
High-Impedance State Output Current	A or B Port	I_{OZ}	V_{CCA}=1.65V~3.6V, V_{CCB}=2.3V~5.5V, OE=GND				±1	μA
Supply Current		I_{CCA}	V_I=V_O=Open, I_O=0A	V_{CCA}=1.65V~V_{CCB}, V_{CCB}=2.3V~5.5V			2.4	μA
				V_{CCA}=3.6V, V_{CCB}=0V			2.2	μA
				V_{CCA}=0V, V_{CCB}=5.5V			-1	μA
		I_{CCB}		V_{CCA}=1.65V~V_{CCB}, V_{CCB}=2.3V~5.5V			12	μA
				V_{CCA}=3.6V, V_{CCB}=0V			-1	μA
				V_{CCA}=0V, V_{CCB}=5.5V			1	μA
		I_{CCA}+I_{CCB}	V_I=V_{CCI} or GND, I_O=0A	V_{CCA}=1.65V~V_{CCB}, V_{CCB}=2.3V~5.5V			14.4	μA
Input Capacitance	OE	C_{IN}	V_{CCA}=3.3V, V_{CCB}=3.3V			2.5		pF
Output Capacitance	A Port	C_{IO}	V_{CCA}=3.3V, V_{CCB}=3.3V			5		pF
	B Port					6		pF

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. V_{CCA} must be less than or equal to V_{CCB}, and V_{CCA} must not exceed 3.6V.

■ SWITCHING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation Delay From Input (A) to Output (B)	Push-Pull Driving	t_{PHL}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			5.3	ns
				V_{CCB}=3.3V±0.3V			5.4	ns
				V_{CCB}=5V±0.5V			6.8	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	2.3		8.8	ns
				V_{CCB}=3.3V±0.3V	2.4		9.6	ns
				V_{CCB}=5V±0.5V	2.6		10	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			3.2	ns
				V_{CCB}=3.3V±0.3V			3.7	ns
				V_{CCB}=5V±0.5V			3.8	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	1.7		6.3	ns
				V_{CCB}=3.3V±0.3V	2.0		6.0	ns
				V_{CCB}=5V±0.5V	2.1		5.8	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			2.4	ns
				V_{CCB}=5V±0.5V			3.1	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	1.3		4.2	ns
				V_{CCB}=5V±0.5V	1.4		4.6	ns
Propagation Delay From Input (B) to Output (A)	Push-Pull Driving		V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			4.4	ns
				V_{CCB}=3.3V±0.3V			4.5	ns
				V_{CCB}=5V±0.5V			4.7	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	1.9		5.3	ns
				V_{CCB}=3.3V±0.3V	1.1		4.4	ns
				V_{CCB}=5V±0.5V	1.2		4.0	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			3.0	ns
				V_{CCB}=3.3V±0.3V			3.6	ns
				V_{CCB}=5V±0.5V			4.3	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	1.8		4.7	ns
				V_{CCB}=3.3V±0.3V	2.6		4.2	ns
				V_{CCB}=5V±0.5V	1.2		4.0	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			2.5	ns
				V_{CCB}=5V±0.5V			3.3	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	1.0		124	ns
				V_{CCB}=5V±0.5V	1.0		97	ns
Propagation Delay From Input (A) to Output (B)	Push-Pull Driving	t_{PLH}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			6.8	ns
				V_{CCB}=3.3V±0.3V			7.1	ns
				V_{CCB}=5V±0.5V			7.5	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	45		260	ns
				V_{CCB}=3.3V±0.3V	36		208	ns
				V_{CCB}=5V±0.5V	27		198	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			3.5	ns
				V_{CCB}=3.3V±0.3V			4.1	ns
				V_{CCB}=5V±0.5V			4.4	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	43		250	ns
				V_{CCB}=3.3V±0.3V	36		206	ns
				V_{CCB}=5V±0.5V	27		190	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			4.2	ns
				V_{CCB}=5V±0.5V			4.4	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	36		204	ns
				V_{CCB}=5V±0.5V	28		165	ns

■ SWITCHING CHARACTERISTICS (Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation Delay From Input (B) to Output (A)	Push-Pull Driving	t_{PLH}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			5.3	ns
				V_{CCB}=3.3V±0.3V			4.5	ns
				V_{CCB}=5V±0.5V			0.5	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	45		175	ns
				V_{CCB}=3.3V±0.3V	36		140	ns
				V_{CCB}=5V±0.5V	27		102	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			2.5	ns
				V_{CCB}=3.3V±0.3V			1.6	ns
				V_{CCB}=5V±0.5V			1.0	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	44		170	ns
				V_{CCB}=3.3V±0.3V	37		140	ns
				V_{CCB}=5V±0.5V	27		103	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			2.5	ns
				V_{CCB}=5V±0.5V			2.6	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	3.0		139	ns
				V_{CCB}=5V±0.5V	3.0		105	ns
Enable Time From Input (OE) to Output (A or B)		t_{en}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			200	ns
				V_{CCB}=3.3V±0.3V			200	ns
				V_{CCB}=5V±0.5V			200	ns
			V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			200	ns
				V_{CCB}=3.3V±0.3V			200	ns
				V_{CCB}=5V±0.5V			200	ns
			V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			200	ns
				V_{CCB}=5V±0.5V			200	ns
Disable Time From Input (OE) to Output (A or B)		t_{dis}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			50	ns
				V_{CCB}=3.3V±0.3V			40	ns
				V_{CCB}=5V±0.5V			35	ns
			V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			50	ns
				V_{CCB}=3.3V±0.3V			40	ns
				V_{CCB}=5V±0.5V			35	ns
			V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			40	ns
				V_{CCB}=5V±0.5V			35	ns
Input Rise Time (A Port Rise Time)	Push-Pull Driving	t_{rA}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V	3.2		9.5	ns
				V_{CCB}=3.3V±0.3V	2.3		9.3	ns
				V_{CCB}=5V±0.5V	2.0		7.6	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	38		165	ns
				V_{CCB}=3.3V±0.3V	30		132	ns
				V_{CCB}=5V±0.5V	22		95	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V	2.8		7.4	ns
				V_{CCB}=3.3V±0.3V	2.6		6.6	ns
				V_{CCB}=5V±0.5V	1.8		5.6	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	3.0		149	ns
				V_{CCB}=3.3V±0.3V	28		121	ns
				V_{CCB}=5V±0.5V	24		89	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V	2.3		5.6	ns
				V_{CCB}=5V±0.5V	1.9		4.8	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	25		116	ns
				V_{CCB}=5V±0.5V	19		85	ns

■ SWITCHING CHARACTERISTICS (Cont.)

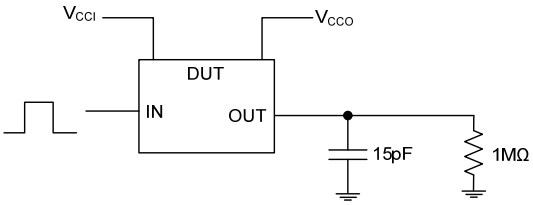
PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Rise Time (B Port Rise Time)	Push-Pull Driving	t_{rB}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V	4.0		10.8	ns
				V_{CCB}=3.3V±0.3V	2.7		9.1	ns
				V_{CCB}=5V±0.5V	2.7		7.6	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	34		145	ns
				V_{CCB}=3.3V±0.3V	23		106	ns
				V_{CCB}=5V±0.5V	10		58	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V	3.2		8.3	ns
				V_{CCB}=3.3V±0.3V	2.9		7.2	ns
				V_{CCB}=5V±0.5V	2.4		6.1	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	35		151	ns
				V_{CCB}=3.3V±0.3V	24		112	ns
				V_{CCB}=5V±0.5V	12		64	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V	2.5		6.4	ns
				V_{CCB}=5V±0.5V	2.1		7.4	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	26		116	ns
				V_{CCB}=5V±0.5V	14		72	ns
Input Fall Time (A Port Fall Time)	Push-Pull Driving	t_{fA}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V	2.0		5.9	ns
				V_{CCB}=3.3V±0.3V	1.9		6.0	ns
				V_{CCB}=5V±0.5V	1.7		13.3	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	4.4		6.9	ns
				V_{CCB}=3.3V±0.3V	4.3		6.4	ns
				V_{CCB}=5V±0.5V	4.2		6.1	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V	1.9		5.7	ns
				V_{CCB}=3.3V±0.3V	1.9		5.5	ns
				V_{CCB}=5V±0.5V	1.8		5.3	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	4.4		6.9	ns
				V_{CCB}=3.3V±0.3V	4.3		6.2	ns
				V_{CCB}=5V±0.5V	4.2		5.8	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V	2.0		5.4	ns
				V_{CCB}=5V±0.5V	1.9		5.0	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	4.3		6.1	ns
				V_{CCB}=5V±0.5V	4.2		5.7	ns
Input Fall Time (B Port Fall Time)	Push-Pull Driving	t_{fB}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V	2.9		13.8	ns
				V_{CCB}=3.3V±0.3V	2.8		16.2	ns
				V_{CCB}=5V±0.5V	2.8		16.2	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	6.9		13.8	ns
				V_{CCB}=3.3V±0.3V	7.5		16.2	ns
				V_{CCB}=5V±0.5V	7.0		16.2	ns
	Push-Pull Driving		V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V	2.2		7.8	ns
				V_{CCB}=3.3V±0.3V	2.4		6.7	ns
				V_{CCB}=5V±0.5V	2.6		6.6	ns
	Open-Drain Driving			V_{CCB}=2.5V±0.2V	5.1		8.8	ns
				V_{CCB}=3.3V±0.3V	5.4		9.4	ns
				V_{CCB}=5V±0.5V	5.4		10.4	ns
	Push-Pull Driving		V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V	2.3		7.4	ns
				V_{CCB}=5V±0.5V	2.4		7.6	ns
	Open-Drain Driving			V_{CCB}=3.3V±0.3V	5.0		7.6	ns
				V_{CCB}=5V±0.5V	4.8		8.3	ns

■ SWITCHING CHARACTERISTICS (Cont.)

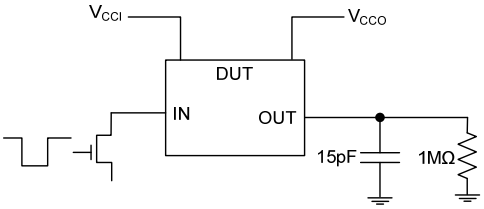
PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Data Rate	Push-Pull Driving	f_{data}	V_{CCA}=1.8V±0.15V	V_{CCB}=2.5V±0.2V			21	Mbps
				V_{CCB}=3.3V±0.3V			22	Mbps
				V_{CCB}=5V±0.5V			24	Mbps
	Open-drain Driving			V_{CCB}=2.5V±0.2V			2	Mbps
				V_{CCB}=3.3V±0.3V			2	Mbps
				V_{CCB}=5V±0.5V			2	Mbps
Pulse Duration	Push-Pull Driving	t_W		V_{CCB}=2.5V±0.2V	47			ns
				V_{CCB}=3.3V±0.3V	45			ns
				V_{CCB}=5V±0.5V	41			ns
	Open-drain Driving			V_{CCB}=2.5V±0.2V	500			ns
				V_{CCB}=3.3V±0.3V	500			ns
				V_{CCB}=5V±0.5V	500			ns
Data Rate	Push-Pull Driving	f_{data}	V_{CCA}=2.5V±0.2V	V_{CCB}=2.5V±0.2V			20	Mbps
				V_{CCB}=3.3V±0.3V			22	Mbps
				V_{CCB}=5V±0.5V			24	Mbps
	Open-drain Driving			V_{CCB}=2.5V±0.2V			2	Mbps
				V_{CCB}=3.3V±0.3V			2	Mbps
				V_{CCB}=5V±0.5V			2	Mbps
Pulse Duration	Push-Pull Driving	t_W		V_{CCB}=2.5V±0.2V	50			ns
				V_{CCB}=3.3V±0.3V	45			ns
				V_{CCB}=5V±0.5V	41			ns
	Open-drain Driving			V_{CCB}=2.5V±0.2V	500			ns
				V_{CCB}=3.3V±0.3V	500			ns
				V_{CCB}=5V±0.5V	500			ns
Data Rate	Push-Pull Driving	f_{data}	V_{CCA}=3.3V±0.3V	V_{CCB}=3.3V±0.3V			23	Mbps
				V_{CCB}=5V±0.5V			24	Mbps
	Open-drain Driving			V_{CCB}=3.3V±0.3V			2	Mbps
				V_{CCB}=5V±0.5V			2	Mbps
Pulse Duration	Push-Pull Driving	t_W		V_{CCB}=3.3V±0.3V	43			ns
				V_{CCB}=5V±0.5V	41			ns
	Open-drain Driving			V_{CCB}=3.3V±0.3V	500			ns
				V_{CCB}=5V±0.5V	500			ns

■ TEST CIRCUIT AND WAVEFORMS

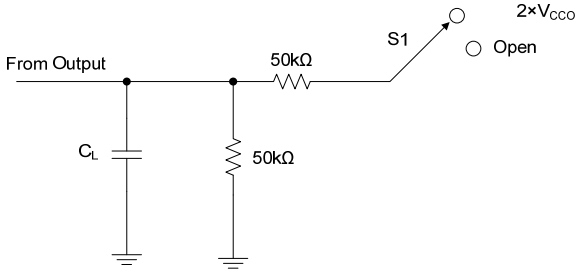
Load Circuits



Data Rate, Pulse Duration, Propagation Delay, Output Rise-Time and Fall-Time Measurement Using a Push-Pull Driver

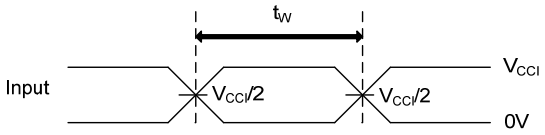


Data Rate, Pulse Duration, Propagation Delay, Output Rise-Time and Fall-Time Measurement Using an Open-Drain Driver

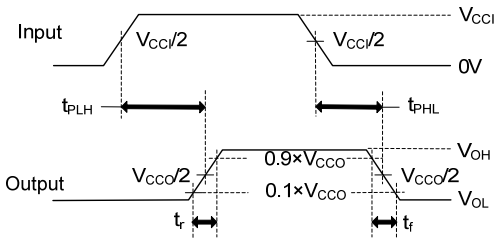


TEST	S1
t_{PLZ}/t_{PZL}	$2\times V_{CCO}$
t_{PHZ}/t_{PZH}	Open

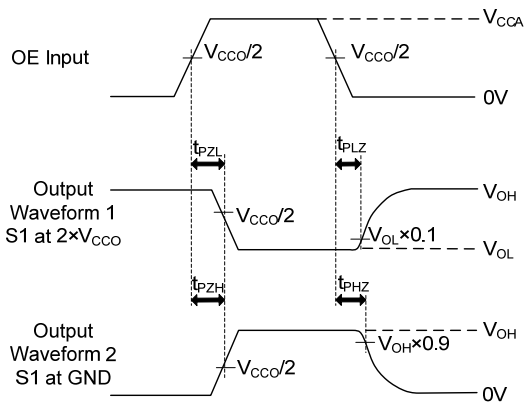
Notes: 1. C_L includes probe and jig capacitance.
2. t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.
3. V_{CCI} is the supply voltage associated with the input.
4. V_{CCO} is the supply voltage associated with the input.



PULSE DURATION



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

■ DETAILED DESCRIPTION

Overview

The **UTXS0102** device is a directionless voltage-level translator specifically designed for translating logic voltage levels. The A port is able to accept I/O voltages ranging from 1.65V to 3.6V, while the B port can accept I/O voltages from 2.3V to 5.5V. The device is a pass gate architecture with edge rate accelerators (one shots) to improve the overall data rate. 10kΩ pull-up resistors, commonly used in open-drain applications, have been conveniently integrated so that an external resistor is not needed. While this device is designed for open-drain applications, the device can also translate push-pull CMOS logic outputs.

Architecture

The **UTXS0102** architecture does not require a direction-control signal to control the direction of data flow from A to B or from B to A.

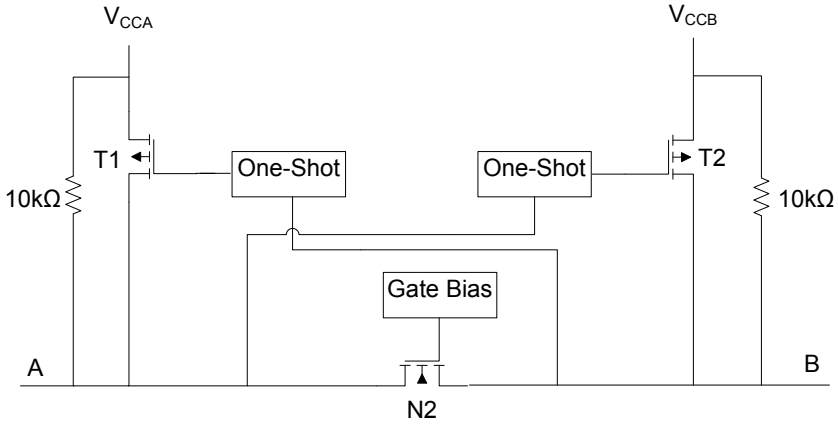


Figure 1. Architecture of UTXS0102 I/O Cell

Each A-port I/O has an internal 10kΩ pull up resistor to V_{CCA}, and each B-port I/O has an internal 10kΩ pull-up resistor to V_{CCB}. The output one-shots detect rising edges on the A or B ports. During a rising edge, the one-shot turns on the PMOS transistors (T1, T2) for a short duration, which speeds up the low-to-high transition.

Input Driver Requirements

The fall time (t_{fA}, t_{fB}) of a signal depends on the output impedance of the external device driving the data I/Os of the **UTXS0102**.Similarly,the t_{PHL} and max data rates also depend on the output impedance of the external driver. The values for t_{fA}, t_{fB}, t_{PHL}, and maximum data rates in the data sheet assume that the output impedance of the external driver is less than 50Ω.

Power-Up

During operation, ensure that $V_{CCA} \leq V_{CCB}$ at all times. During power-up sequencing, $V_{CCA} \geq V_{CCB}$ does not damage the device, so any power supply can be ramped up first.

Enable and Disable

The **UTXS0102** has an OE input that is used to disable the device by setting OE low, which places all I/Os in the Hi-Z state. The disable time (t_{dis}) indicates the delay between the time when OE goes low and when the outputs actually get disabled(Hi-Z). The enable time (t_{en}) indicates the amount of time the user must allow for the one-shot circuitry to become operational after OE is taken high.

Pull-up or Pull-down Resistors on I/O Lines

Each A-port I/O has an internal 10kΩ pull-up resistor to V_{CCA}, and each B-port I/O has an internal 10 kΩ pull-up resistor to V_{CCB}. If a smaller value of pull-up resistor is required, an external resistor must be added from the I/O to V_{CCA} or V_{CCB} (in parallel with the internal 10 kΩ resistors).

Device Functional Modes

The **UTXS0102** device has two functional modes, enabled and disabled. To disable the device set the OE input low, which places all I/Os in a high impedance state. Setting the OE input high will enable the device.

■ TYPICAL APPLICATION CIRCUIT