2-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing

1 FEATURES

- **No Direction-Control**
- **Data Rates**
  100Mbps
- **1.2V to 3.6V on A Port and 1.65V to 5.5V on B Ports ($V_{CCA} \leq V_{CCB}$)**
- **V_{CC} Isolation Feature: If Either V_{CC} Input is at GND, Both Ports are in the High-Impedance State**
- **Output Enable (OE) Input Circuit Referenced to V_{CCA}**
- **Low Power Consumption, 10μA Maximum I_{CC}**
- **No Power-Supply Sequencing Required: Either V_{CCA} or V_{CCB} can be Ramped First**
- **I_{OFF}: Supports Partial-Power-Down Mode Operation**
- **Extended Temperature: -40°C to +85°C**

2 APPLICATIONS

- **Handset**
- **Smartphone**
- **Tablet**
- **Desktop PC**

3 DESCRIPTIONS

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 port supporting operating voltages from 1.2V to 3.6V while it tracks the V_{CCA} supply, and the B port supporting operating voltages from 1.65V 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 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5V voltage nodes. V_{CCA} must not exceed V_{CCB}.

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.

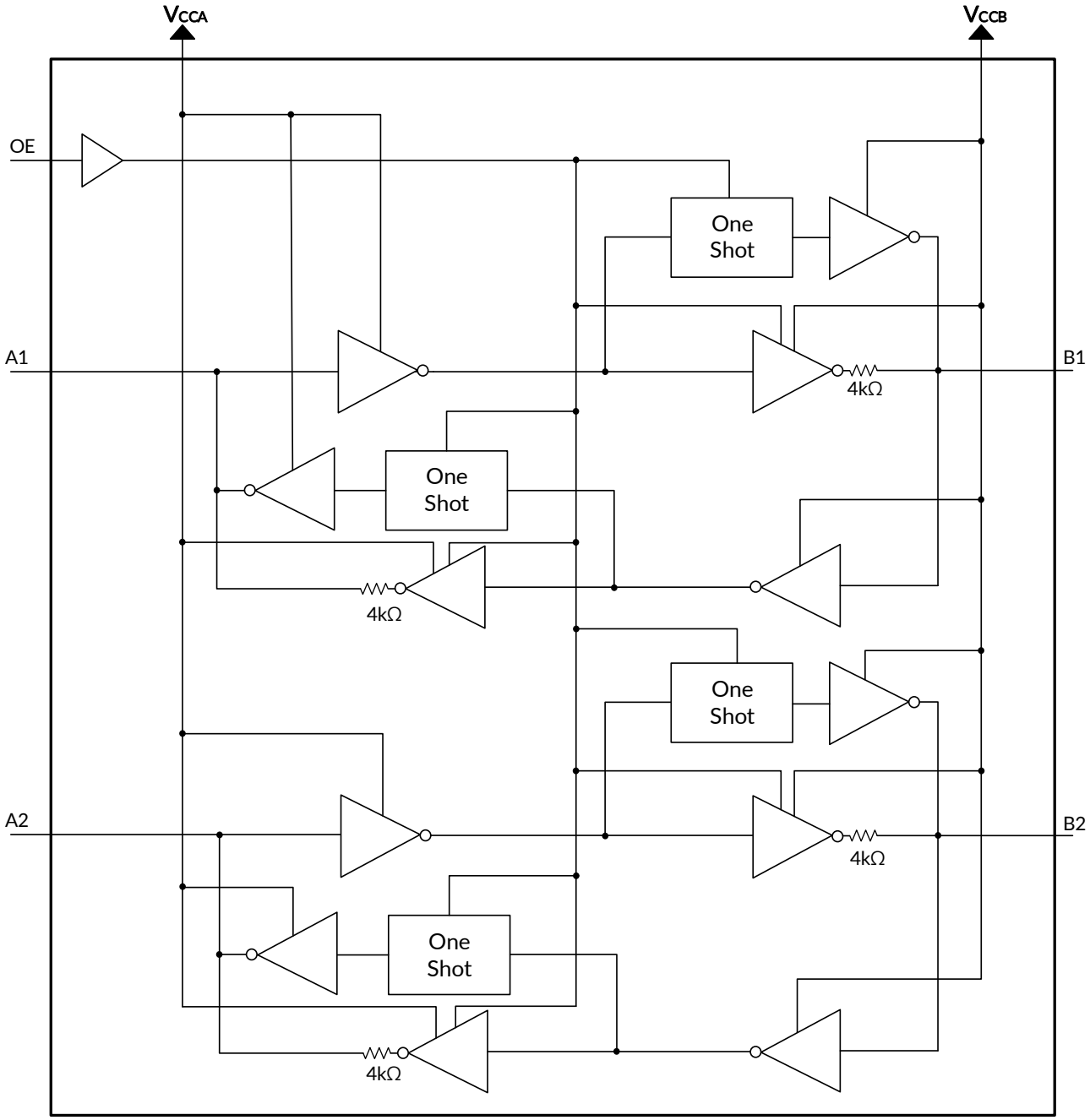
The RS0202 is available in Green DFN2X3-8 and MSOP8 packages. It operates over an ambient temperature range of -40°C to +85°C.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS0202	DFN2X3-8	2.00mm×3.00mm
	MSOP8	3.00mm×3.00mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

4 Functional Block Diagram



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5 Revision History

Note: Page numbers for previous revisions may different from page numbers in the current version.

VERSION	Change Date	Change Item
A.0	2021/03/03	Preview version completed
A.1	2021/09/09	Fix Device Information, PIN CONFIGURATIONS, PACKAGE/ORDERING INFORMATION and PACKAGE OUTLINE DIMENSIONS in Page 1, 4, 7, 18@A.0 Version.
A.2	2021/10/27	Add MSOP8 package
A.2.1	2024/02/23	1. Change the Voltage Waveforms Enable and Disable diagram in Page 16@ A.2 Version 2. Modify packaging naming
A.3	2024/04/18	1. Add Package thermal impedance on Page 7@RevA.2.1 2. Update PACKAGE note 3. Delete SOT23-8 Package

6 PACKAGE/ORDERING INFORMATION (1)

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING (2)	MSL(3)	PACKAGE OPTION
RS0202	RS0202YTDB8	-40°C ~+85°C	DFN2X3-8	0202	MSL3	Tape and Reel, 3000
	RS0202XM	-40°C ~+85°C	MSOP8	RS0202	MSL3	Tape and Reel, 4000

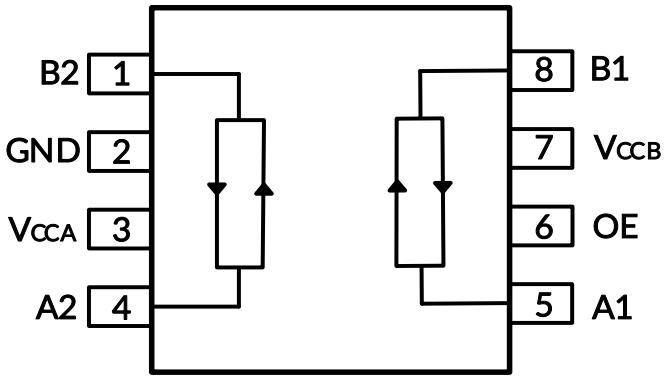
NOTE:

(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

(3) MSL, the Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

7 PIN CONFIGURATIONS (TOP VIEW)



DFN2X3-8/MSOP8

PIN DESCRIPTION

PIN	NAME	TYPE (1)	FUNCTION
DFN2X3-8/MSOP8			
7	V_{CCB}	P	B Ports Supply Voltage.1.65V ≤ V_{CCB} ≤ 5.5V.
8	B1	I/O	Input/output B1. Reference to V_{CCB}.
1	B2	I/O	Input/output B2. Reference to V_{CCB}.
6	OE	I	Output Enable (Active High). Pull OE low to place all outputs in 3-state mode. Referenced to V_{CCA}.
2	GND	–	Ground.
4	A2	I/O	Input/output A2. Reference to V_{CCA}.
5	A1	I/O	Input/output A1. Reference to V_{CCA}.
3	V_{CCA}	P	A Port Supply Voltage.1.2V ≤ V_{CCA} ≤ 3.6V and V_{CCA} ≤ V_{CCB}.

(1) I=input, O=output, I/O=input and output, P=power

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

SYMBOL	PARAMETER		MIN	MAX	UNIT
V_{CCA}	Supply Voltage Range		-0.3	4.6	V
V_{CCB}	Supply Voltage Range		-0.3	6.5	V
V_I (2)	Input Voltage Range	A port	-0.3	4.6	V
		B port	-0.3	6.5	
		OE	-0.3	4.6	
V_O (2)	Voltage range applied to any output in the high-impedance or power-off state	A port	-0.3	4.6	V
		B port	-0.3	6.5	
V_O (2)(3)	Voltage range applied to any output in the high or low state	A port	-0.3	V_{CCA}+0.3	V
		B port	-0.3	V_{CCB}+0.3	
I_{IK}	Input clamp current	V_I<0		-50	mA
I_{OK}	Output clamp current	Vo<0		-50	mA
I_O	Continuous output current			±50	mA
	Continuous current through V_{CCA}, V_{CCB} or GND			±100	mA
θ_{JA}	Package thermal impedance (4)	MSOP8		170	°C/W
T_J	Junction Temperature (5)		-40	150	°C
T_{stg}	Storage temperature		-65	+150	

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
(3) The value of V_{CCA} and V_{CCB} are provided in the recommended operating conditions table.
(4) The package thermal impedance is calculated in accordance with JESD-51.
(5) The maximum power dissipation is a function of $T_{J(MAX)}$, $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM)	±5000	V
		machine model (MM)	±300	V

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.3 Recommended Operating Conditions

V_{CCI} is the supply voltage associated with the input port. V_{CCO} is the supply voltage associated with the output port. (1)(2)

PARAMETER	CONDITIONS			MIN	TYP	MAX	UNIT
Supply voltage	V_{CCA}			1.2		3.6	V
	V_{CCB}			1.65		5.5	
High-level input voltage (V_{IH})	A-port input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		V_{CCI} x 0.65(3)		V_{CCI}	V
	B-port input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		V_{CCI} x 0.65		V_{CCI}	
	OE input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		V_{CCA} x 0.65		5.5	
Low-level input voltage (V_{IL})	A-port input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		0		V_{CCI} x 0.35(3)	V
	B-port input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		0		V_{CCI} x 0.35	
	OE input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		0		V_{CCA} x 0.35	
Voltage applied to any output in the high-impedance or power-off state (Vo)	A-port	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		0		3.6	V
	B-port	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V		0		5.5	
Input transition rise or fall rate(Δt/Δv)	A-port input	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V				40	ns/V
	B-port input	V_{CCA} = 1.2 V to 3.6 V	V_{CCB} = 1.65 V to 3.6 V			40	
			V_{CCB} = 4.5 V to 5.5 V			30	
T_A Operating free-air temperature				-40		85	°C

(1) The A and B sides of an unused data I/O pair must be held in the same state that is, both at V_{CCI} or both at GND.
(2) V_{CCA} must be less than or equal to V_{CCB} and must not exceed 3.6 V.
(3) V_{CCI} is the supply voltage associated with the input port.

8.4 ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted) (1) (2) (3)

PARAMETER		CONDITIONS	V_{CCA}	V_{CCB}	TEMP	MIN(4)	TYP(5)	MAX(4)	UNIT
V_{OHA}	Port A output high voltage	I_{OH} = −20 μA	1.2V		+25°C		1.1		V
			1.4V to 3.6V		Full	V_{CCA}-0.4			
V_{OLA}	Port A output low voltage	I_{OL} = 20 μA	1.2V		+25°C		0.3		
			1.4V to 3.6V		Full			0.4	
V_{OHB}	Port B output high voltage	I_{OH} = −20 μA		1.65V to 5.5V	Full	V_{CCB} - 0.4			
V_{OLB}	Port B output low voltage	I_{OL} = 20 μA		1.65V to 5.5V	Full			0.4	
I_I	Input leakage current	OE V_I=V_{CCI} or GND	1.2V to 3.6V	1.65V to 5.5V	+25°C			±1	μA
					Full			±2	
I_{off}	Partial power down current	A Port V_I or Vo=0 to 3.6V	0V	0V to 5.5V	+25°C			±1	μA
					Full			±2	
		B Port V_I or Vo=0 to 5.5V	0V to 3.6V	0V	+25°C			±1	μA
					Full			±2	
I_{OZ}(6)	High-impedance State output current	A or B port OE=GND	1.2V to 3.6V	1.65V to 5.5V	+25°C			±1	μA
					Full			±2	
I_{CCA}	V_{CCA} supply current	V_I=V_{CCI} or GND I_O = 0	1.2V	1.65V to 5.5V	+25°C		0.06		μA
			1.4V to 3.6V	1.65V to 5.5V	Full			5	
			3.6V	0V	Full			2	
			0V	5.5V	Full			-2	
I_{CCB}	V_{CCB} supply current	V_I=V_{CCI} or GND I_O = 0	1.2V	1.65V to 5.5V	+25°C		3.4		μA
			1.4V to 3.6V	1.65V to 5.5V	Full			5	
			3.6V	0V	Full			-2	
			0V	5.5V	Full			2	
I_{CCA} + I_{CCB}	Combined supply current	V_I = V_{CCI} or GND I_O = 0	1.2V	1.65V to 5.5V	+25°C		3.5		μA
			1.4V to 3.6V	1.65V to 5.5V	Full			10	
I_{CCZA}	V_{CCA} supply current	V_I = V_{CCI} or GND I_O = 0, OE=GND	1.2V	1.65V to 5.5V	+25°C		0.05		μA
			1.4V to 3.6V	1.65V to 5.5V	Full			5	
I_{CCZB}	V_{CCB} supply current	V_I = V_{CCI} or GND I_O = 0, OE=GND	1.2V	1.65V to 5.5V	+25°C		3.3		μA
			1.4V to 3.6V	1.65V to 5.5V	Full			5	
C_i	Input capacitance	OE	1.2V to 3.6V	1.65V to 5.5V	+25°C		4		pF
C_{io}	Input-to-output internal capacitance	A port	1.2V to 3.6V	1.65V to 5.5V	+25°C		5		pF
		B port	1.2V to 3.6V	1.65V to 5.5V	+25°C		9		

(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) V_{CCA} must be less than or equal to V_{CCB}.
(4) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.
(5) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.
(6) For I/O ports, the parameter I_{OZ} includes the input leakage current.

8.5 Operating Characteristics

T_A=25°C

PARAMETER		CONDITIONS		TYP	UNIT
C_{pdA}	A port input, B port output	C_L=0, f=10MHz t_r=t_f=1ns OE=V_{CCA} (outputs enabled)	V_{CCA}=1.2V, V_{CCB}=5V	9	pF
			V_{CCA}=1.2V, V_{CCB}=1.8V	8	
			V_{CCA}=1.5V, V_{CCB}=1.8V	7	
			V_{CCA}=1.8V, V_{CCB}=1.8V	8	
			V_{CCA}=2.5V, V_{CCB}=2.5V	7	
			V_{CCA}=2.5V, V_{CCB}=5V	8	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	7	
	B port input, A port output		V_{CCA}=1.2V, V_{CCB}=5V	12	
			V_{CCA}=1.2V, V_{CCB}=1.8V	11	
			V_{CCA}=1.5V, V_{CCB}=1.8V	12	
			V_{CCA}=1.8V, V_{CCB}=1.8V	11	
			V_{CCA}=2.5V, V_{CCB}=2.5V	11	
			V_{CCA}=2.5V, V_{CCB}=5V	11	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	11	
C_{pdB}	A port input, B port output		V_{CCA}=1.2V, V_{CCB}=5V	35	
			V_{CCA}=1.2V, V_{CCB}=1.8V	26	
			V_{CCA}=1.5V, V_{CCB}=1.8V	27	
			V_{CCA}=1.8V, V_{CCB}=1.8V	27	
			V_{CCA}=2.5V, V_{CCB}=2.5V	27	
			V_{CCA}=2.5V, V_{CCB}=5V	27	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	27	
	B port input, A port output		V_{CCA}=1.2V, V_{CCB}=5V	25	
			V_{CCA}=1.2V, V_{CCB}=1.8V	28	
			V_{CCA}=1.5V, V_{CCB}=1.8V	19	
			V_{CCA}=1.8V, V_{CCB}=1.8V	19	
			V_{CCA}=2.5V, V_{CCB}=2.5V	18	
			V_{CCA}=2.5V, V_{CCB}=5V	19	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	20	

Operating Characteristics (continued)

T_A=25°C

PARAMETER		CONDITIONS		TYP	UNIT
C_{pdA}	A port input, B port output	C_L=0, f=10MHz t_r=t_f=1ns OE=GND (outputs enabled)	V_{CCA}=1.2V, V_{CCB}=5V	0.01	pF
			V_{CCA}=1.2V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.5V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.8V, V_{CCB}=1.8V	0.01	
			V_{CCA}=2.5V, V_{CCB}=2.5V	0.01	
			V_{CCA}=2.5V, V_{CCB}=5V	0.01	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	0.01	
	B port input, A port output		V_{CCA}=1.2V, V_{CCB}=5V	0.01	
			V_{CCA}=1.2V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.5V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.8V, V_{CCB}=1.8V	0.01	
			V_{CCA}=2.5V, V_{CCB}=2.5V	0.01	
			V_{CCA}=2.5V, V_{CCB}=5V	0.01	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	0.01	
C_{pdB}	A port input, B port output		V_{CCA}=1.2V, V_{CCB}=5V	0.01	
			V_{CCA}=1.2V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.5V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.8V, V_{CCB}=1.8V	0.01	
			V_{CCA}=2.5V, V_{CCB}=2.5V	0.01	
			V_{CCA}=2.5V, V_{CCB}=5V	0.01	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	0.01	
	B port input, A port output		V_{CCA}=1.2V, V_{CCB}=5V	0.01	
			V_{CCA}=1.2V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.5V, V_{CCB}=1.8V	0.01	
			V_{CCA}=1.8V, V_{CCB}=1.8V	0.01	
			V_{CCA}=2.5V, V_{CCB}=2.5V	0.01	
			V_{CCA}=2.5V, V_{CCB}=5V	0.01	
			V_{CCA}=3.3V, V_{CCB}=3.3V to 5V	0.01	

8.6 Timing Requirements

8.6.1 V_{CCA}= 1.2V

T_A=25°C, V_{CCA}=1.2V

		V_{CCB}=1.8V	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	UNIT
		TYP	TYP	TYP	TYP	
Data rate		20	20	20	20	Mbps
Pulse duration(t_w)	data inputs	50	50	50	50	ns

8.6.2 V_{CCA}= 1.5V±0.1V

over recommended operating free-air temperature range, V_{CCA}=1.5V±0.1V (unless otherwise noted)

		V_{CCB}=1.8V ±0.15V	V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
		TYP	TYP	TYP	TYP	
Data rate		40	40	40	40	Mbps
Pulse duration(t_w)	data inputs	25	25	25	25	ns

8.6.3 V_{CCA}=1.8V±0.15V

over recommended operating free-air temperature range, V_{CCA}=1.8V±0.15V (unless otherwise noted)

		V_{CCB}=1.8V ±0.15V	V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
		TYP	TYP	TYP	TYP	
Data rate		50	50	50	50	Mbps
Pulse duration(t_w)	data inputs	20	20	20	20	ns

8.6.4 V_{CCA}=2.5V±0.2V

over recommended operating free-air temperature range, V_{CCA}=2.5V±0.2V (unless otherwise noted)

		V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
		TYP	TYP	TYP	
Data rate		70	80	80	Mbps
Pulse duration(t_w)	data inputs	14	12	12	ns

8.6.5 V_{CCA}=3.3V±0.3V

over recommended operating free-air temperature range, V_{CCA}=3.3V±0.3V (unless otherwise noted)

		V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
		TYP	TYP	
Data rate		80	100	Mbps
Pulse duration(t_w)	data inputs	12	10	ns

8.7 Switching Characteristics: V_{CCA}=1.2V

T_A=25°C, V_{CCA}=1.2V

PARAMETER		CONDITIONS	V_{CCB}=1.8V	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	UNIT
			TYP	TYP	TYP	TYP	
t_{PHL}	Propagation delay time high-to-low output	A-to-B	27.8	21.9	20.3	26.5	ns
t_{PLH}	Propagation delay time low-to-high output	A-to-B	26	19.1	18.6	22.1	ns
t_{PHL}	Propagation delay time high-to-low output	B-to-A	36.9	37.1	37.5	36.6	ns
t_{PLH}	Propagation delay time low-to-high output	B-to-A	34.5	34.4	32.8	33.2	ns
t_{en}	Enable time	OE-to-A or B	378	387	365	348	μs
t_{dis}	Disable time	OE-to-A or B	19	16	15	16	ns
t_{rA}, t_{fA}	Input rise time	A port rise and fall time	12.3	17.1	16.5	13.1	ns
t_{rB}, t_{fB}	Input rise time	B port rise and fall time	6.6	6.5	7.6	5.1	ns
$t_{sk(O)}$	Skew(time), output	Channel-to-Channel Skew	2.4	1.6	1.9	7.1	ns
Maximum data rate			20	20	20	20	Mbps

8.8 Switching Characteristics: V_{CCA}=1.5V ± 0.1V

over recommended operating free-air temperature range, V_{CCA}=1.5V±0.1V (unless otherwise noted)

PARAMETER		CONDITIONS	V_{CCB}=1.8V ±0.15V	V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
			TYP	TYP	TYP	TYP	
t_{PHL}	Propagation delay time high-to-low output	A-to-B	15.1	15.5	12.8	11.6	ns
t_{PLH}	Propagation delay time low-to-high output	A-to-B	17.9	15.2	11.5	9.8	ns
t_{PHL}	Propagation delay time high-to-low output	B-to-A	17.4	15.3	15.1	19.6	ns
t_{PLH}	Propagation delay time low-to-high output	B-to-A	14.5	15.3	15.7	21	ns
t_{en}	Enable time	OE-to-A or B	225	218	215	216	μs
t_{dis}	Disable time	OE-to-A or B	18.4	15.7	14.2	13.7	ns
t_{rA}, t_{fA}	Input rise time	A port rise and fall time	6.2	6.1	6.1	6.2	ns
t_{rB}, t_{fB}	Input rise time	B port rise and fall time	6.6	4.4	3.7	3.1	ns
$t_{sk(O)}$	Skew(time), output	Channel-to-Channel Skew	0.6	0.7	0.6	0.6	ns
Maximum data rate			40	40	40	40	Mbps

8.9 Switching Characteristics: V_{CCA}=1.8V ± 0.15V

over recommended operating free-air temperature range, V_{CCA}=1.8V±0.15V (unless otherwise noted)

PARAMETER		CONDITIONS	V_{CCB}=1.8V ±0.15V	V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
			TYP	TYP	TYP	TYP	
t_{PHL}	Propagation delay time high-to-low output	A-to-B	13.8	9.1	6.9	7	ns
t_{PLH}	Propagation delay time low-to-high output	A-to-B	16.4	9.5	7.7	7.5	ns
t_{PHL}	Propagation delay time high-to-low output	B-to-A	13.3	9.3	8.6	8.1	ns
t_{PLH}	Propagation delay time low-to-high output	B-to-A	10.2	9.3	8.6	8	ns
t_{en}	Enable time	OE-to-A or B	185	178	183	167	µs
t_{dis}	Disable time	OE-to-A or B	18.3	13	11.6	11.2	ns
t_{rA}, t_{fA}	Input rise time	A port rise and fall time	5.8	6.3	6.6	7.7	ns
t_{rB}, t_{fB}	Input rise time	B port rise and fall time	6.2	4.5	3.5	3.4	ns
$t_{sk(O)}$	Skew(time), output	Channel-to-Channel Skew	0.8	0.7	0.7	0.6	ns
Maximum data rate			50	50	50	50	Mbps

8.10 Switching Characteristics: V_{CCA}=2.5V ± 0.2V

over recommended operating free-air temperature range, V_{CCA}=2.5V±0.2V (unless otherwise noted)

PARAMETER		CONDITIONS	V_{CCB}=2.5V ±0.2V	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
			TYP	TYP	TYP	
t_{PHL}	Propagation delay time high-to-low output	A-to-B	6.9	5.3	4	ns
t_{PLH}	Propagation delay time low-to-high output	A-to-B	8.1	6.2	4.8	ns
t_{PHL}	Propagation delay time high-to-low output	B-to-A	5.5	4.6	4.2	ns
t_{PLH}	Propagation delay time low-to-high output	B-to-A	2.9	4.3	4.1	ns
t_{en}	Enable time	OE-to-A or B	157	147	138	µs
t_{dis}	Disable time	OE-to-A or B	13.1	9.7	8.7	ns
t_{rA}, t_{fA}	Input rise time	A port rise and fall time	3.5	2.9	3	ns
t_{rB}, t_{fB}	Input rise time	B port rise and fall time	4	2.8	2.5	ns
$t_{sk(O)}$	Skew(time), output	Channel-to-Channel Skew	0.4	0.4	0.3	ns
Maximum data rate			70	80	80	Mbps

8.11 Switching Characteristics: V_{CCA}=3.3V ± 0.3V

over recommended operating free-air temperature range, V_{CCA}=3.3V±0.3V (unless otherwise noted)

PARAMETER		CONDITIONS	V_{CCB}=3.3V ±0.3V	V_{CCB}=5V ±0.5V	UNIT
			TYP	TYP	
t_{PHL}	Propagation delay time high-to-low output	A-to-B	4.8	3.6	ns
t_{PLH}	Propagation delay time low-to-high output	A-to-B	4.9	3.5	ns
t_{PHL}	Propagation delay time high-to-low output	B-to-A	3.5	3.2	ns
t_{PLH}	Propagation delay time low-to-high output	B-to-A	3.9	3.1	ns
t_{en}	Enable time	OE-to-A or B	134	128	µs
t_{dis}	Disable time	OE-to-A or B	9.8	7.7	ns
t_{rA}	Input rise time	A port rise time	1.9	1.9	ns
t_{rB}	Input rise time	B port rise time	1.8	2.2	ns
t_{fA}	Input fall time	A port fall time	2.9	2.6	ns
t_{fB}	Input fall time	B port fall time	1.8	1.6	ns
$t_{sk(O)}$	Skew(time), output	Channel-to-Channel Skew	0.4	0.3	ns
Maximum data rate			80	100	Mbps

9 Parameter Measurement Information

Unless otherwise noted, all input pulses are supplied by generators having the following characteristics:

- PRR 10 MHz
- Z_O = 50 Ω
- dv/ dt ≥ 1 V/ns

Note: All input pulses are measured one at a time, with one transition per measurement.

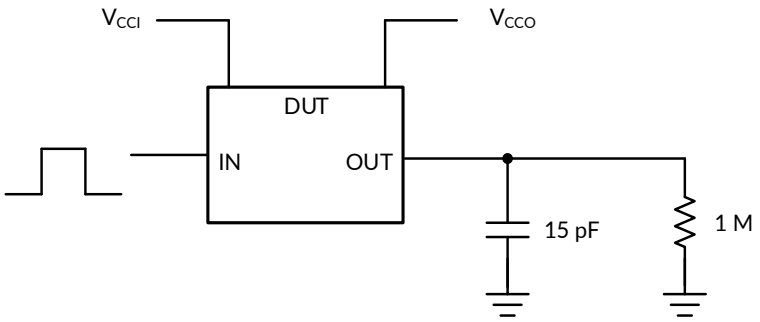


Figure 1. Data Rate, Pulse Duration, Propagation Delay, Output Rise And Fall Time Measurement Using A Push-Pull Driver

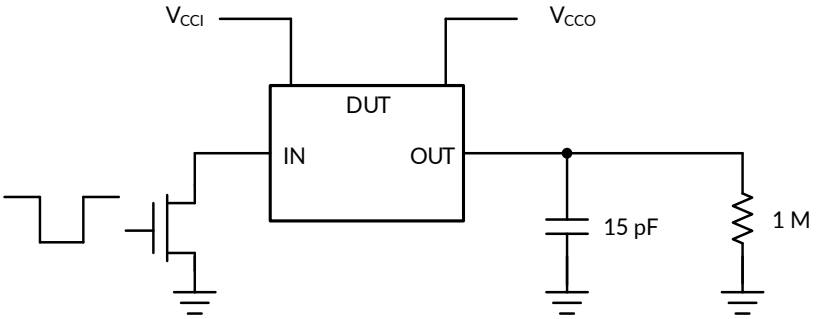


Figure 2. Data Rate, Pulse Duration, Propagation Delay, Output Rise And Fall Time Measurement Using an Open-Drain Driver

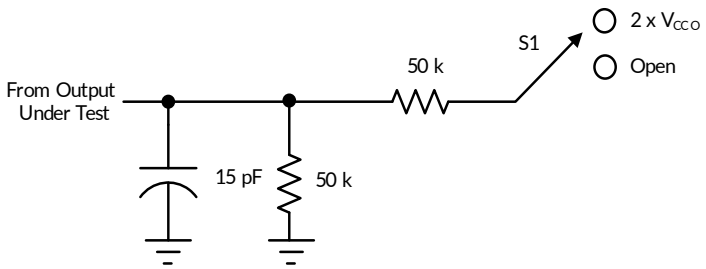


Figure 3. Load Circuit for Enable/ Disable Time Measurement

Table 1. Switch Configuration for Enable/Disable Timing

TEST	S1
t_{PZL}(1), t_{PLZ}(2)	2 × V_{CCO}
t_{PHZL}(1), t_{PZH}(2)	Open

(1) t_{PZL} and t_{PZH} are the same as ten.
(2) t_{PLZ} and t_{PHZ} are the same as tdis.

Parameter Measurement Information (continued)

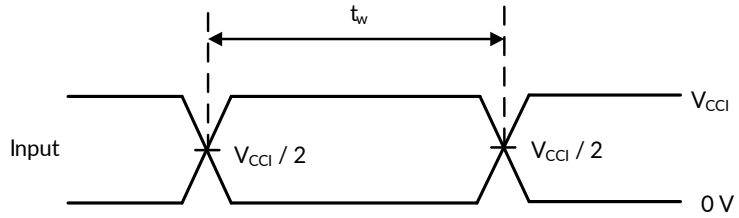


Figure 4. Voltage Waveforms Pulse Duration

(1) All input pulses are measured one at a time, with one transition per measurement.

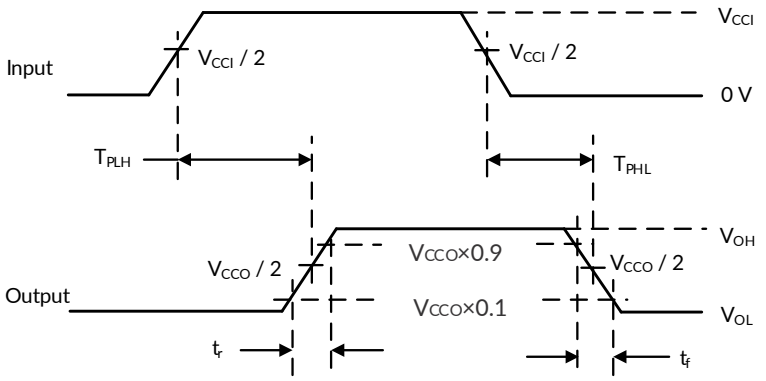


Figure 5. Voltage Waveforms Propagation Delay Times

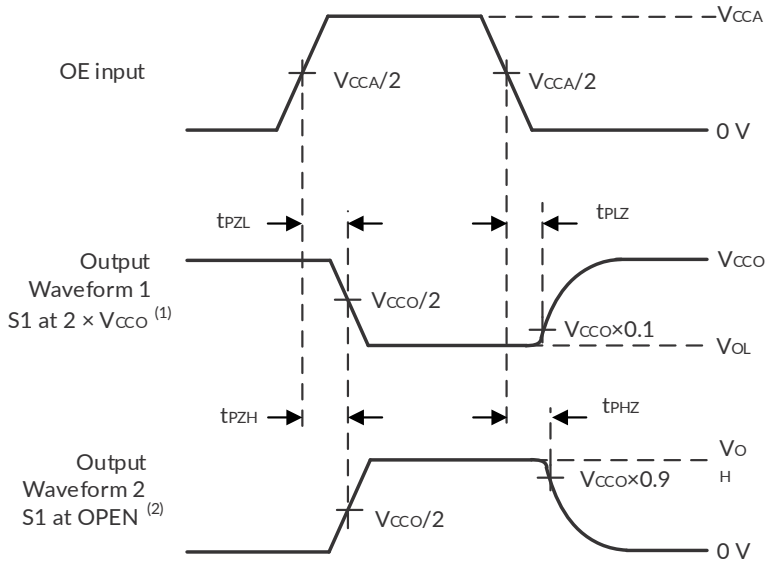
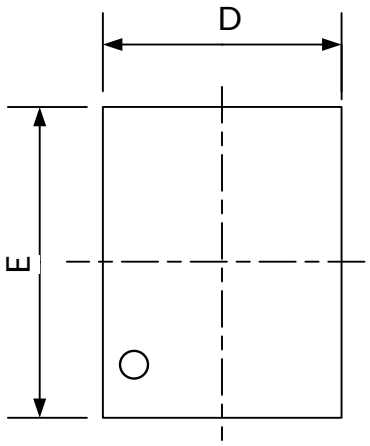


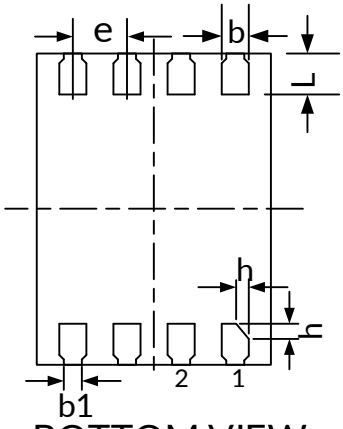
Figure 6. Voltage Waveforms Enable and Disable

10 PACKAGE OUTLINE DIMENSIONS

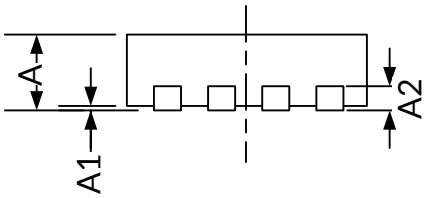
DFN2X3-8 (3)



TOP VIEW



BOTTOM VIEW



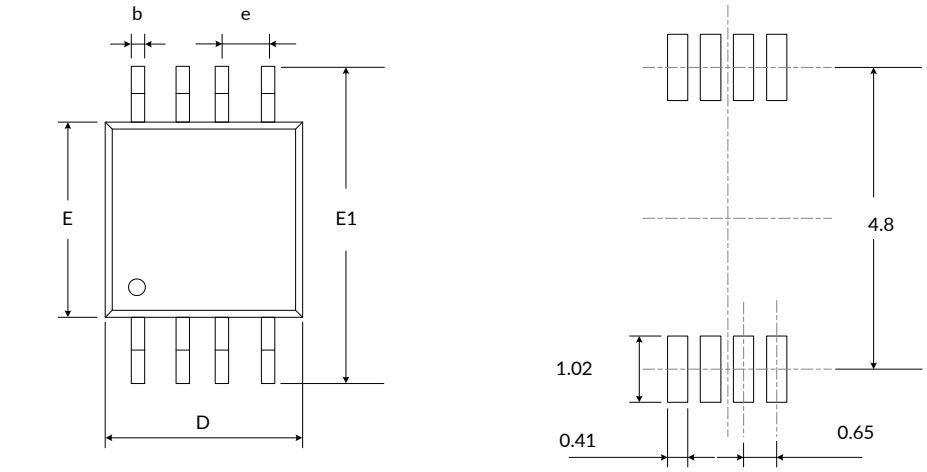
SIDE VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.180	0.250	0.007	0.010
b	0.180	0.300	0.007	0.012
b1	0.160 REF (2)		0.006 REF (2)	
D (1)	1.900	2.100	0.075	0.083
E (1)	2.900	3.100	0.114	0.122
e	0.500 TYP		0.019 TYP	
L	0.350	0.450	0.014	0.018
h	0.075	0.175	0.003	0.007

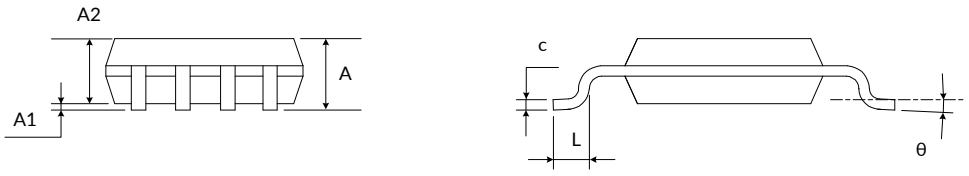
NOTE:

1. Plastic or metal protrusions of 0.075mm maximum per side are not included.
2. REF is the abbreviation for Reference.
3. This drawing is subject to change without notice.

MSOP8 (3)



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D (1)	2.900	3.100	0.114	0.122
e	0.650 (BSC) (2)		0.026 (BSC) (2)	
E (1)	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

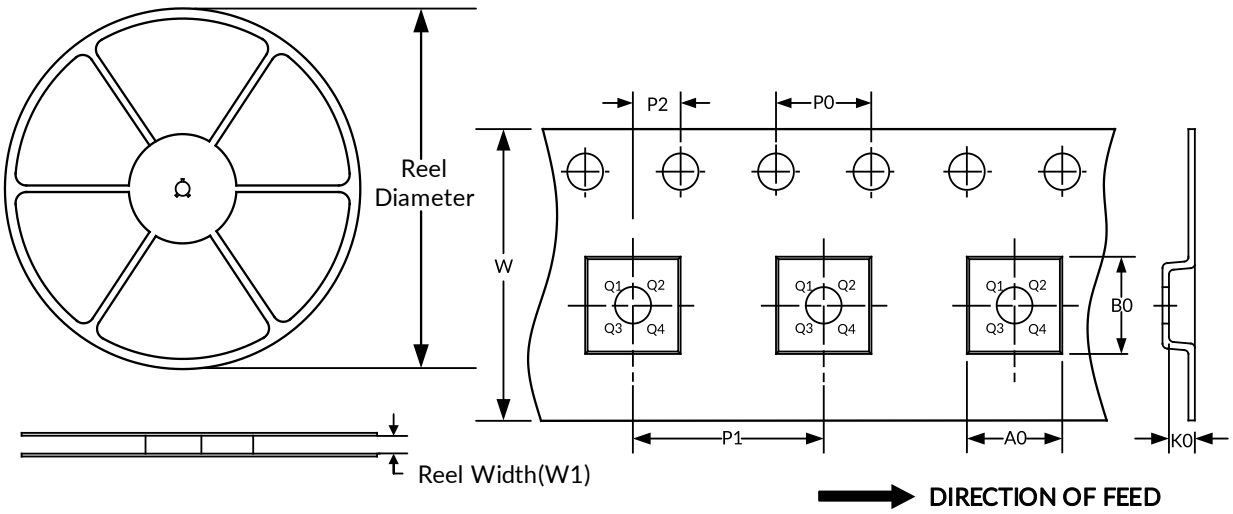
NOTE:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

11 TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
DFN2X3-8	7”	9.5	2.30	3.30	0.95	4.0	4.0	2.0	8.0	Q2
MSOP8	13”	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1

NOTE:
1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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