8-Bit Bidirectional Voltage Level Translator with Direction Sensing

Features

- Wide supply voltage range:
  - 1.08 V to 3.6 V on A port
  - 1.65 V to 5.5 V on B port ($V_{CCA} \leq V_{CCB}$)
- Maximum data rates: 110 Mbps (Push pull)
- Low supply current: $I_{CCA} + I_{CCB}$ = 2 μA
- VCC isolation feature: If either VCCA or VCCB input is at GND, all outputs are in the high-impedance state
- OE input circuit referenced to V_{CCA}
- No power-supply sequencing required. V_{CCA} or V_{CCB} can be ramped first
- I_{OFF} supports partial power-down mode operation
- ESD protection exceeds
  - ±8000 V Human-body model(JS001)
  - ±2000 V Charged-device model(JS002)
- Operating temperature range: -40°C to 85°C

Applications

- Desktop PC
- Handset
- Smartphone
- Tablet

Package Information

Part Number	Package	Body Size
DIO7B108	TSSOP-20	6.5 mm × 4.4 mm

Description

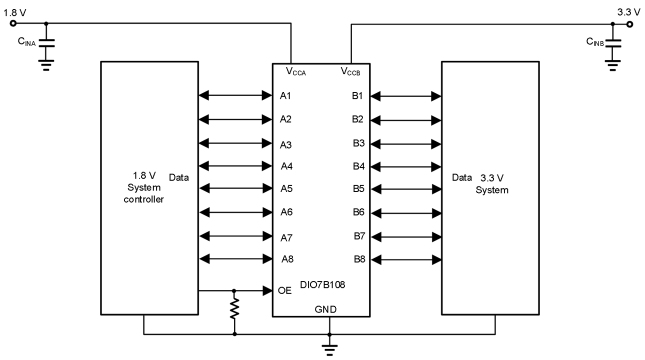
The DIO7B108 is a 8-bit bidirectional voltage level translator with output enable (OE) pin. The device uses two separate configurable power-supply rails. The A port is designed to track V_{CCA} and the VCCA supplies voltage from 1.08 V to 3.6 V, so DIO7B108 meets the requirement of low voltage system application. The B port is designed to track V_{CCB} and VCCB supply voltage from 1.65 V to 5.5 V. V_{CCA} should not exceed V_{CCB}. This allows for universal low-voltage bidirectional translation between any of the 1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V and 5 V voltage system.

The DIO7B108 has an output enable pin which control the output status. When the OE input is low, all I/Os are placed in the high-impedance state. Pins of A port and OE are referenced to V_{CCA} and pins of B port are referenced to V_{CCB}.

This device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

The DIO7B108 is available in TSSOP-20 package. It is specified over ambient temperature range of -40°C to 85°C, which meets the requirements of industry and consumer applications.

Simplified Schematic



Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO7B108CT20	DIOB1VH	3	Green	-40 to 85°C	TSSOP-20	Tape & Reel, 2500

If you encounter any issue in the process of using the device, please contact our customer service at marketing@dioo.com or phone us at (+86)-21-62116882. If you have any improvement suggestions regarding the datasheet, we encourage you to contact our technical writing team at docs@dioo.com. Your feedback is invaluable for us to provide a better user experience.

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1. Pin Assignment and Functions

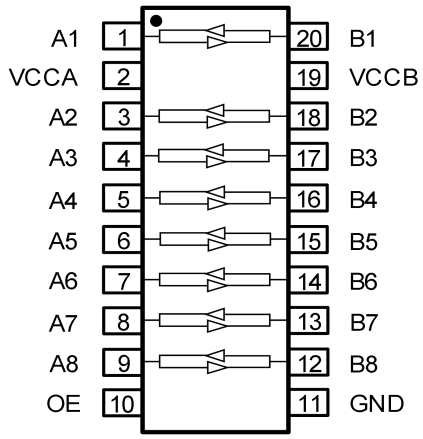


Figure 1. TSSOP-20 (Top view)

Table 1. Pin description

Pin Name	I/O	Description
VCCA	-	A port supply voltage 1.08 V ≤ V_{CCA} ≤ 3.6 V and V_{CCA} ≤ V_{CCB}.
A1	I/O	Input/output 1. Referenced to V_{CCA}.
A2	I/O	Input/output 2. Referenced to V_{CCA}.
A3	I/O	Input/output 3. Referenced to V_{CCA}.
A4	I/O	Input/output 4. Referenced to V_{CCA}.
A5	I/O	Input/output 5. Referenced to V_{CCA}.
A6	I/O	Input/output 6. Referenced to V_{CCA}.
A7	I/O	Input/output 7. Referenced to V_{CCA}.
A8	I/O	Input/output 8. Referenced to V_{CCA}.
GND	-	Ground
OE	I	3-state output-mode enable. Pull OE low to place all outputs in 3-state mode. Referenced to V_{CCA}.
B8	I/O	Input/output 8. Referenced to V_{CCB}.
B7	I/O	Input/output 7. Referenced to V_{CCB}.
B6	I/O	Input/output 6. Referenced to V_{CCB}.
B5	I/O	Input/output 5. Referenced to V_{CCB}.
B4	I/O	Input/output 4. Referenced to V_{CCB}.
B3	I/O	Input/output 3. Referenced to V_{CCB}.
B2	I/O	Input/output 2. Referenced to V_{CCB}.
B1	I/O	Input/output 1. Referenced to V_{CCB}.
VCCB	-	B port supply voltage 1.65 V ≤ V_{CCB} ≤ 5.5 V.

2. Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter		Ratings	Unit
V_{CCA}	Supply voltage		-0.5 ~ 4.6	V
V_{CCB}	Supply voltage		-0.5 ~ 6.5	V
V_I	Input voltage range	A port	-0.5 ~ 4.6	V
		B port	-0.5 ~ 6.5	
V_O	Voltage range applied to any output in the high-impedance or power-off state	A port	-0.5 ~ 4.6	V
		B port	-0.5 ~ 6.5	
V_O	Voltage range applied to any output in the high or low state	A port	-0.5 ~ V_{CCA} + 0.5	V
		B port	-0.5 ~ V_{CCB} + 0.5	
I_{IK}	Input clamp current	V_I < 0	-50	mA
I_{OK}	Output clamp current	V_O < 0	-50	mA
I_O	Continuous output current		±50	mA
	Continuous current through V_{CCA}, V_{CCB}, or GND		±100	mA
T_{STG}	Storage temperature		-65 ~ 150	°C

3. Recommended Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter		V_{CCA}	V_{CCB}	Min	Max	Unit
V_{CCA}	Supply voltage				1.08	3.6	V
V_{CCB}	Supply voltage				1.65	5.5	V
V_{IH}	High-level input voltage	Data inputs	1.08 V to 3.6 V	1.65 V to 5.5 V	V_{CCI} × 0.65	V_{CCI}	V
		OE	1.08 V to 3.6 V	1.65 V to 5.5 V	V_{CCA} × 0.65	5.5	
V_{IL}	Low-level input voltage	Data inputs	1.08 V to 3.6 V	1.65 V to 5.5 V	0	V_{CCI} × 0.35	V
		OE	1.08 V to 3.6 V	1.65 V to 5.5 V	0	V_{CCA} × 0.35	
V_O	Voltage range applied to any output in the high or low state	A port	1.08 V to 3.6 V	1.65 V to 5.5 V	0	3.6	V
		B port	1.08 V to 3.6 V	1.65 V to 5.5 V	0	5.5	V
Δt/ΔV	Input transition rise or fall rate	A port inputs	1.08 V to 3.6 V	1.65 V to 5.5 V		40	ns/V
		B port inputs	1.08 V to 3.6 V	1.65 V to 3.6 V		40	
			1.08 V to 3.6 V	4.5 V to 5.5 V		30	
T_A	Operating free-air temperature				-40	85	°C

4. ESD Ratings

When a statically-charged person or object touches an electrostatic discharge sensitive device, the electrostatic charge might be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage might occur to the device due to localized overheating.

Model	Metric	Value	Unit
Human-body model	ANSI/ESDA/JEDECJS-001	±8000	V
Charged-device model	ANSI/ESDA/JEDECJS-002	±2000	V

5. Thermal Considerations

The thermal resistance determines the heat insulation property of a material. The higher the thermal resistance is, the lower the heat loss. Accumulation of heat energy degrades the performance of semiconductor components.

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	102	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	36	°C/W

6. Electrical Characteristics

6.1. General electrical characteristics

T_A = -40°C to 85°C, unless otherwise specified.

Symbol	Parameter	Conditions		V_{CCA}	V_{CCB}	Min	Typ	Max	Unit
V_{OHA}	High state voltage at each A port	T_A = 25°C	I_{OH} = -20 μA	1.08 V			0.95		V
V_{OLA}	Low state voltage at each A port		I_{OL} = 20 μA				0.12		V
V_{OHA}	High state voltage at each A port	T_A = -40 ~ 85°C	I_{OH} = -20 μA	1.4 V to 3.6 V		V_{CCA} - 0.4			V
V_{OLA}	Low state voltage at each A port		I_{OL} = 20 μA					0.4	V
V_{OHB}	High state voltage at each B port		I_{OH} = -20 μA		1.65 V to 5.5 V	V_{CCB} - 0.4			V
V_{OLB}	Low state voltage at each B port		I_{OL} = 20 μA					0.4	V
I_I	Leakage current at OE pin	V_I = V_{CCI} or GND, T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.01		μA
		V_I = V_{CCI} or GND, T_A = -40 ~ 85°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.01		μA
I_{OFF}	Leakage current at each A port	T_A = 25°C	V_I or V_O = 0 to 3.6 V	0 V	0 V to 5.5 V		0.1		μA
	Leakage current at each B port		V_I or V_O = 0 to 5.5 V	0 V to 3.6 V	0 V		0.1		μA
	Leakage current at each A port	T_A = -40 ~ 85°C	V_I or V_O = 0 to 3.6 V	0 V	0 V to 5.5 V		0.5		μA
	Leakage current at each B port		V_I or V_O = 0 to 5.5 V	0 V to 3.6 V	0 V		0.5		μA
I_{OZ}	Leakage current at each A or B port	OE = GND, T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.1		μA
		OE = GND, T_A = -40 ~ 85°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.5		μA
I_{CCA}	Supply current	V_I = V_{CCI} or GND, I_O = 0, T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.2		μA
I_{CCB}	Supply current	V_I = V_{CCI} or GND, I_O = 0, T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		2		μA
I_{CCA} + I_{CCB}		V_I = V_{CCI} or GND, I_O = 0, T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		2		μA
I_{CCZA}	Leakage of supply current	V_I = V_{CCI} or GND, I_O = 0, OE = GND,T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		0.2		μA
I_{CCZB}	Leakage of supply current	V_I = V_{CCI} or GND, I_O = 0, OE = GND,T_A = 25°C		1.08 V to 3.6 V	1.65 V to 5.5 V		2		μA

C_I	Input capacitance	OE	1.08 V to 3.6 V	1.65 V to 5.5 V		6		pF
C_{io}	Input-to-output internal capacitance	A port	1.08 V to 3.6 V	1.65 V to 5.5 V		4		pF
		B port	1.08 V to 3.6 V	1.65 V to 5.5 V		4		pF
t_W(1)	Data rate	T_A = 25°C Data inputs	1.2 ± 0.12 V	1.8 V		20		Mbps
				2.5 V		20		Mbps
				3.3 V		20		Mbps
				5 V		20		Mbps
	Pulse duration			1.8 V		50		ns
				2.5 V		50		ns
				3.3 V		50		ns
				5 V		50		ns
	Data rate	T_A = -40 ~ 85°C Data inputs	1.5 V ± 0.1 V	1.8 ± 0.15 V			40	Mbps
				2.5 ± 0.2 V			40	Mbps
				3.3 ± 0.3 V			40	Mbps
				5 ± 0.5 V			40	Mbps
	Pulse duration			1.8 ± 0.15 V	25			ns
				2.5 ± 0.2 V	25			ns
				3.3 ± 0.3 V	25			ns
				5 ± 0.5 V	25			ns
	Data rate	T_A = -40 ~ 85°C Data inputs	1.8 ± 0.15 V	1.8 ± 0.15 V			55	Mbps
				2.5 ± 0.2 V			55	Mbps
				3.3 ± 0.3 V			55	Mbps
				5 ± 0.5 V			55	Mbps
	Pulse duration			1.8 ± 0.15 V	18			ns
				2.5 ± 0.2 V	18			ns
				3.3 ± 0.3 V	18			ns
				5 ± 0.5 V	18			ns
	Data rate	T_A = -40 ~ 85°C Data inputs	2.5 ± 0.2 V	2.5 ± 0.2 V			75	Mbps
				3.3 ± 0.3 V			80	Mbps
				5 ± 0.5 V			100	Mbps
	Pulse duration			2.5 ± 0.2 V	13			ns
				3.3 ± 0.3 V	12			ns
				5 ± 0.5 V	11			ns

	Data rate	T_A = -40 ~ 85°C Data inputs	3.3 ± 0.3 V	3.3 ± 0.3 V			110	Mbps
				5 ± 0.5 V			110	Mbps
	Pulse duration			3.3 ± 0.3 V	9			ns
				5 ± 0.5 V	9			ns

Note:

(1) Guaranteed by characterization. The performance is guaranteed by the physical characterization of the devices, based on a certain number of chips tested in the laboratory.

(2) Specifications subject to change without notice.

6.2. Switching characteristics

T_A = -40°C to 85°C, unless otherwise specified.

Symbol	Parameter	Conditions	V_{CCA}	V_{CCB}	Min	Typ	Max	Unit
t_{pd}	Propagation delay	From port A to port B, T_A = 25°C	1.2 ± 0.12 V	1.8 V		8		ns
				2.5 V		7.5		
				3.3 V		7		
				5 V		7.3		
		From port A to port B, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		6.6		ns
				2.5 ± 0.2 V		6		
				3.3 ± 0.3 V		5.6		
				5 ± 0.5 V		5.5		
			1.8 ± 0.15 V	1.8 ± 0.15 V		6		ns
				2.5 ± 0.2 V		5		
				3.3 ± 0.3 V		4.7		
				5 ± 0.5 V		4.5		
			2.5 ± 0.2 V	2.5 ± 0.2 V		4.2		ns
				3.3 ± 0.3 V		3.8		
				5 ± 0.5 V		3.5		
			3.3 ± 0.3 V	3.3 ± 0.3 V		3.5		ns
				5 ± 0.5 V		3		
		From port B to port A, T_A = 25°C	1.2 ± 0.12 V	1.8 V		9		ns
				2.5 V		8.5		
				3.3 V		8		
				5 V		8		
		From port B to port A, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		6.9		ns
				2.5 ± 0.2 V		6.2		
				3.3 ± 0.3 V		6.0		
				5 ± 0.5 V		5.6		

			1.8 ± 0.15 V	1.8 ± 0.15 V		5.9		ns
				2.5 ± 0.2 V		5.2		
				3.3 ± 0.3 V		4.9		
				5 ± 0.5 V		4.7		
			2.5 ± 0.2 V	2.5 ± 0.2 V		4.2		ns
				3.3 ± 0.3 V		3.8		
				5 ± 0.5 V		3.6		
			3.3 ± 0.3 V	3.3 ± 0.3 V		3.4		ns
				5 ± 0.5 V		3.2		
t_{en}	Delay of enable on	From OE to port A or B, T_A = 25°C	1.2 ± 0.12 V	1.8 V		1		µs
				2.5 V		1		
				3.3 V		1		
				5 V		1		
		From OE to port A or B, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V			1(1)	µs
				2.5 ± 0.2 V			1(1)	
				3.3 ± 0.3 V			1(1)	
				5 ± 0.5 V			1(1)	
			1.8 ± 0.15 V	1.8 ± 0.15 V			1(1)	µs
				2.5 ± 0.2 V			1(1)	
				3.3 ± 0.3 V			1(1)	
				5 ± 0.5 V			1(1)	
			2.5 ± 0.2 V	2.5 ± 0.2 V			1(1)	µs
				3.3 ± 0.3 V			1(1)	
				5 ± 0.5 V			1(1)	
			3.3 ± 0.3 V	3.3 ± 0.3 V			1(1)	µs
				5 ± 0.5 V			1(1)	
t_{dis}	Delay of enable off	From OE to port A, T_A = 25°C	1.2 ± 0.12 V	1.8 V		320		ns
				2.5 V		320		
				3.3 V		320		
				5 V		330		
		From OE to port A, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		340(1)		ns
				2.5 ± 0.2 V		280(1)		
				3.3 ± 0.3 V		280(1)		
				5 ± 0.5 V		300(1)		

			1.8 ± 0.15 V	1.8 ± 0.15 V		280(1)		ns
				2.5 ± 0.2 V		250(1)		
				3.3 ± 0.3 V		250(1)		
				5 ± 0.5 V		250(1)		
			2.5 ± 0.2 V	2.5 ± 0.2 V		220(1)		ns
				3.3 ± 0.3 V		220(1)		
				5 ± 0.5 V		220(1)		
			3.3 ± 0.3 V	3.3 ± 0.3 V		280(1)		ns
				5 ± 0.5 V		280(1)		
		From OE to port B, T_A = 25°C	1.2 ± 0.12 V	1.8 V		150		ns
				2.5 V		110		
				3.3 V		150		
				5 V		110		
		From OE to port B, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		220(1)		ns
				2.5 ± 0.2 V		220(1)		
				3.3 ± 0.3 V		220(1)		
				5 ± 0.5 V		220(1)		
			1.8 ± 0.15 V	1.8 ± 0.15 V		220(1)		ns
				2.5 ± 0.2 V		220(1)		
				3.3 ± 0.3 V		220(1)		
				5 ± 0.5 V		220(1)		
			2.5 ± 0.2 V	2.5 ± 0.2 V		220(1)		ns
				3.3 ± 0.3 V		220(1)		
				5 ± 0.5 V		220(1)		
			3.3 ± 0.3 V	3.3 ± 0.3 V		220(1)		ns
				5 ± 0.5 V		220(1)		
t_{rA}, t_{fA}	A-port rise and fall times	A-port rise and fall times, T_A = 25°C	1.2 ± 0.12 V	1.8 V		6		ns
				2.5 V		6		
				3.3 V		6		
				5 V		6		
		A-port rise and fall times, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		4		ns
				2.5 ± 0.2 V		4		
				3.3 ± 0.3 V		4		
				5 ± 0.5 V		4		

			1.8 ± 0.15 V	1.8 ± 0.15 V		3		ns
				2.5 ± 0.2 V		3		
				3.3 ± 0.3 V		3		
				5 ± 0.5 V		3		
			2.5 ± 0.2 V	2.5 ± 0.2 V		2		ns
				3.3 ± 0.3 V		2		
				5 ± 0.5 V		2		
			3.3 ± 0.3 V	3.3 ± 0.3 V		1.7		ns
				5 ± 0.5 V		1.7		
t_{rB}, t_{fB}	B-port rise and fall times	B-port rise and fall times, T_A = 25°C	1.2 ± 0.12 V	1.8 V		2.6		ns
				2.5 V		2		
				3.3 V		1.65		
				5 V		1.45		
		B-port rise and fall times, T_A = -40 ~ 85°C	1.5 V ± 0.1 V	1.8 ± 0.15 V		2.8		ns
				2.5 ± 0.2 V		1.8		
				3.3 ± 0.3 V		1.7		
				5 ± 0.5 V		1.4		
			1.8 ± 0.15 V	1.8 ± 0.15 V		2.6		ns
				2.5 ± 0.2 V		1.9		
				3.3 ± 0.3 V		1.7		
				5 ± 0.5 V		1.4		
			2.5 ± 0.2 V	2.5 ± 0.2 V		2.0		ns
				3.3 ± 0.3 V		1.7		
				5 ± 0.5 V		1.4		
			3.3 ± 0.3 V	3.3 ± 0.3 V		1.7		ns
				5 ± 0.5 V		1.5		

Note:

(1) Guaranteed by design.

(2) Specifications subject to change without notice.

6.3. Operating characteristics

T_A = 25°C, unless otherwise specified.

Symbol	Parameter	Conditions	V_{CCA}	V_{CCB}	Min	Typ	Max	Unit
C_{pdA}	Equivalent capacitance for dynamic power dissipation. From port A to port B	C_L = 0, f = 10 MHz, t_r = t_f = 4 ns, OE = V_{CCA}, (outputs enabled)	1.08 V	5 V		12		pF
				1.8 V		11		pF
			1.5 V	1.8 V		11		pF
			1.8 V	1.8 V		11		pF
			2.5 V	2.5 V		12		pF
				5 V		12		pF
			3.3 V	3.3 V to 5 V		13		pF
		C_L = 0, f = 10 MHz, t_r = t_f = 4 ns, OE = GND, (outputs enabled)	1.08 V	5 V		0.01		pF
				1.8 V		0.01		pF
			1.5 V	1.8 V		0.01		pF
			1.8 V	1.8 V		0.01		pF
			2.5 V	2.5 V		0.01		pF
				5 V		0.01		pF
			3.3 V	3.3 V to 5 V		0.01		pF
C_{pdA}	Equivalent capacitance for dynamic power dissipation. From port B to port A	C_L = 0, f = 10 MHz, t_r = t_f = 4 ns, OE = V_{CCA}, (outputs enabled)	1.08 V	5 V		27		pF
				1.8 V		27		pF
			1.5 V	1.8 V		27		pF
			1.8 V	1.8 V		27		pF
			2.5 V	2.5 V		27		pF
				5 V		27		pF
			3.3 V	3.3 V to 5 V		27		pF
		C_L = 0, f = 10 MHz, t_r = t_f = 4 ns, OE = GND, (outputs enabled)	1.08 V	5 V		0.01		pF
				1.8 V		0.01		pF
			1.5 V	1.8 V		0.01		pF
			1.8 V	1.8 V		0.01		pF
			2.5 V	2.5 V		0.01		pF
				5 V		0.01		pF
			3.3 V	3.3 V to 5 V		0.01		pF
C_{pdB}	Equivalent capacitance for dynamic power dissipation	C_L = 0, f = 10 MHz, t_r = t_f = 4 ns, OE = V_{CCA}, (outputs enabled)	1.08 V	5 V		39		pF
				1.8 V		32		pF
			1.5 V	1.8 V		32		pF
			1.8 V	1.8 V		32		pF

			2.5 V	2.5 V		32		pF
				5 V		37		pF
			3.3 V	3.3 V to 5 V		35		pF
		C_L = 0, f = 10 MHz, $t_r = t_f$ = 4 ns, OE = GND, (outputs enabled)	1.08 V	5 V		0.01		pF
				1.8 V		0.01		pF
			1.5 V	1.8 V		0.01		pF
			1.8 V	1.8 V		0.01		pF
			2.5 V	2.5 V		0.01		pF
				5 V		0.01		pF
			3.3 V	3.3 V to 5 V		0.01		pF
C_{pdB}	Equivalent capacitance for dynamic power dissipation. From port B to port A	C_L = 0, f = 10 MHz, $t_r = t_f$ = 4 ns, OE = V_{CCA}, (outputs enabled)	1.08 V	5 V		25		pF
				1.8 V		19		pF
			1.5 V	1.8 V		18		pF
			1.8 V	1.8 V		15		pF
			2.5 V	2.5 V		20		pF
				5 V		25		pF
			3.3 V	3.3 V to 5 V		21		pF
		C_L = 0, f = 10 MHz, $t_r = t_f$ = 4 ns, OE = GND, (outputs enabled)	1.08 V	5 V		0.01		pF
				1.8 V		0.01		pF
			1.5 V	1.8 V		0.01		pF
			1.8 V	1.8 V		0.01		pF
			2.5 V	2.5 V		0.01		pF
				5 V		0.01		pF
			3.3 V	3.3 V to 5 V		0.01		pF

Note:

(1) C_{pd} parameter is the capacitance used to determine the no-load dynamic power dissipation per logic function for CMOS devices as per the formula: $P_D = C_{pd} \times (V_{CC})^2 + I_{CC} \times V_{CC}$.

(2) Specifications subject to change without notice.

7. Typical Characteristics

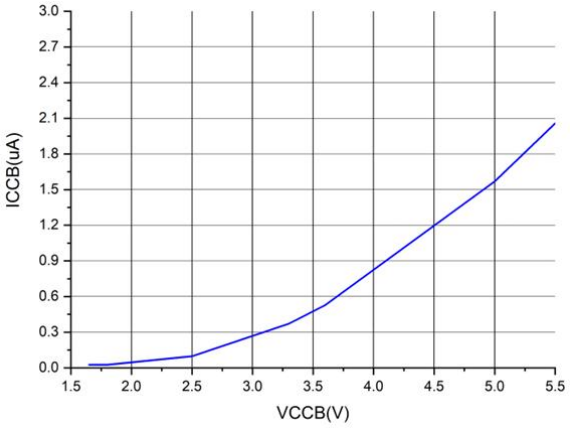


Figure 2. I_{CCB} vs. V_{CCB}

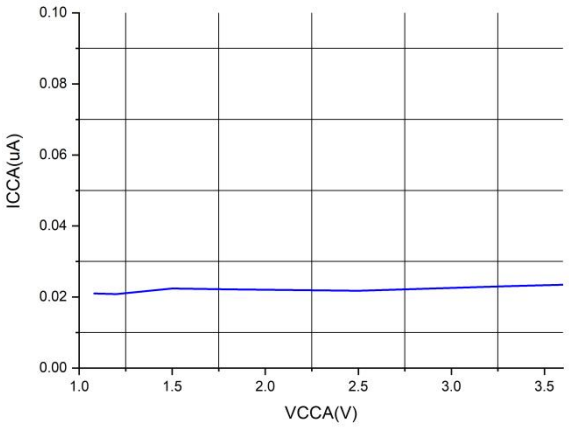
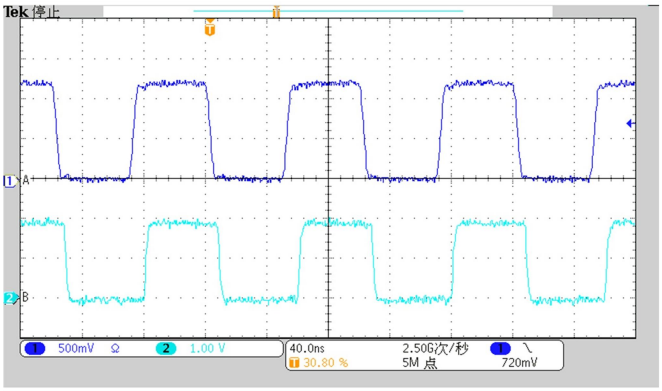


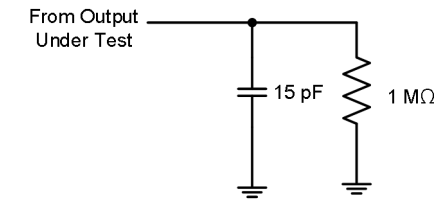
Figure 3. I_{CCA} vs. V_{CCA}



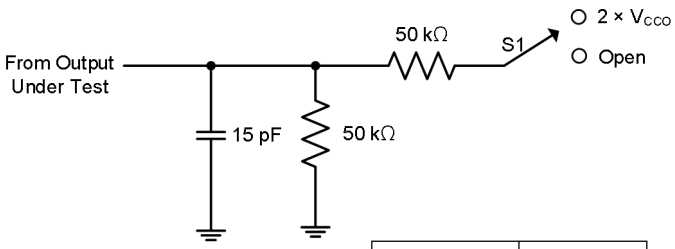
10 MHz, V_{CCA} = 1.2 V, V_{CCB} = 1.8 V, OE = H

Figure 4. Push-pull driver, signal is translated from A Port to B Port

8. Parameter Measurement Information

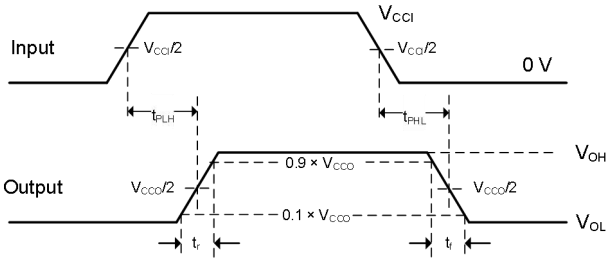


Load circuit for max data rate, pulse duration propagation delay output rise and fall time measurement

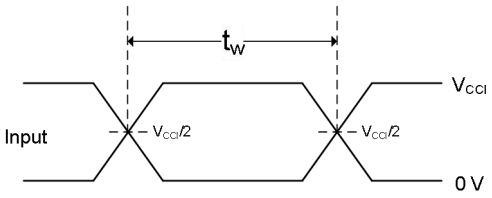


Load circuit for enable/disable time measurement

TEST	S1
t_{PZL} / t_{PLZ}	2 × V_{CCO}
t_{PZH} / t_{PHZ}	Open



Voltage waveforms propagation delay times

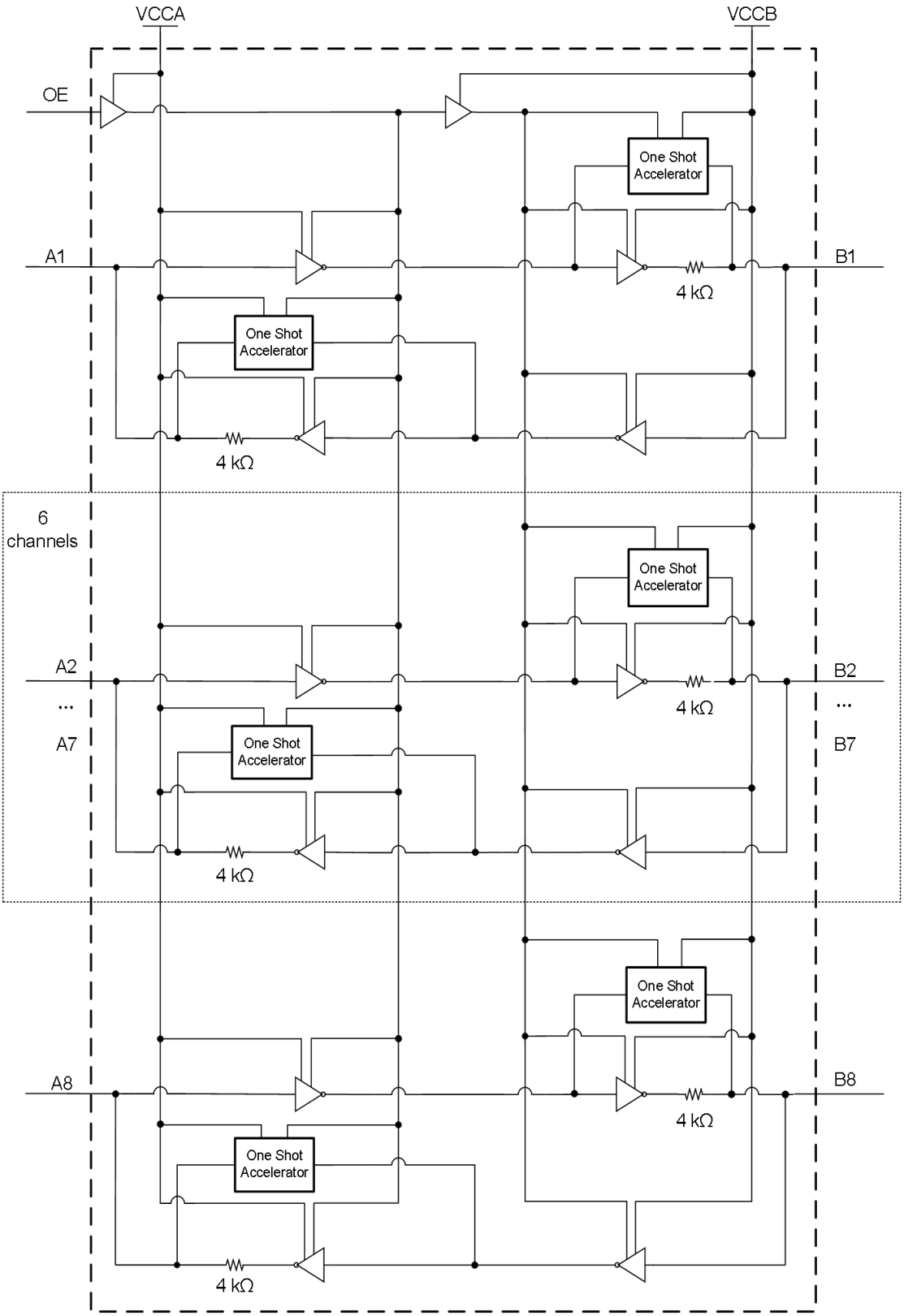


Voltage waveforms pulse duration

(1). t_{PZL} and t_{PZH} are the same as t_{en}
(2). t_{PLZ} and t_{PHZ} are the same as t_{dis}
(3). t_{PHL} and t_{PLH} are the same as t_{pd}
(4). V_{CCI} is the V_{CC} associated with the input port
(5). V_{CCO} is the V_{CC} associated with the output port
(6). C_L includes probe and jig capacitance
(7). All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, dv / dt ≥ 1 V / ns.

Figure 5. Load circuits and voltage waveforms

9. Block Diagram



10. Function Description

10.1. Architecture

The DIO7B108 architecture (See Figure 6) does not require a direction-control signal to regulate the direction of data flow from A to B or from B to A. The output drivers of the device maintain high or low, but are designed to be weak, in a DC state. As a result, when data on the bus flows to the opposite direction, an external driver can overdrive the output drivers.

The output one-shots on the A or B ports detect rising or falling edges. During a rising edge, the one-shot turns on the PMOS transistors (T1, T3) for a short duration, which speeds up the low-to-high transition. During a falling edge, the one-shot turns on the NMOS transistors (T2, T4) for a short duration, which speeds up the high-to-low transition. 70 Ω at V_{CCO} = 1.2 V to 1.8 V, 50 Ω at V_{CCO} = 1.8 V to 3.3 V, and 40 Ω at V_{CCO} = 3.3 V to 5 V is the normal output impedance during output transition.

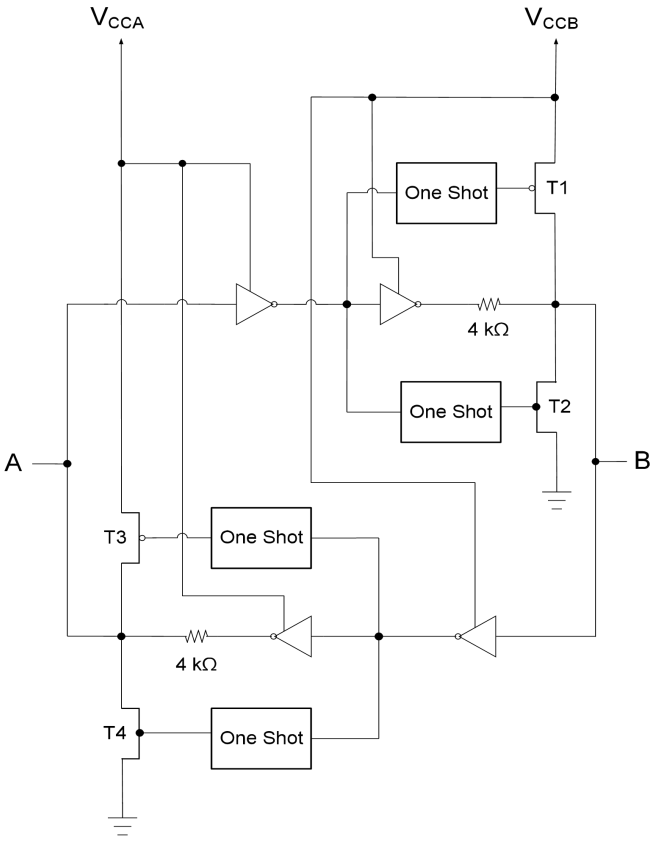


Figure 6. Architecture of DIO7B108 device I/O cell

10.2. Enable and disable

The DIO7B108 device has an OE input that disables the device by setting OE low, which places all I/Os in the high-impedance (Hi-Z) state. The disable time (t_{dis}) represents the delay between OE going low and the outputs getting disabled (Hi-Z). The enable time (t_{en}) represents the amount of time that the user must allow a one-shot circuit to operate after EN is high.

10.3. Pullup or pulldown resistors on I/O lines

The device is designed to drive capacitive loads up to 70 pF. The device's output drivers have a low DC drive strength. Pullup and pulldown resistors that are externally linked to the data I/Os must have values greater than 50 kΩ in order to avoid interfering with the device's output drivers.

For the same reason, the device must not be used in applications like 1-Wire or I^2C where an open-drain driver is connected on the bidirectional data I/O.

10.4. Device functional modes

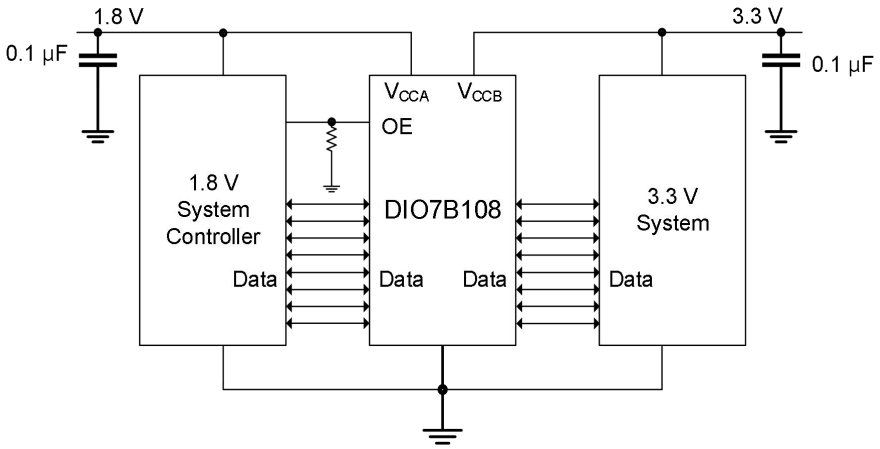
There are two functional modes for the device: enabled and disabled. The device can be enabled by setting the OE input high. To disable the device, set the OE input low, which places all I/Os in a high impedance state.

11. Application Information

Important notice: Validation and testing are the most reliable ways to confirm system functionality. The application information is not part of the specification and is for reference purposes only.

In level-translation applications, the DIO7B108 device can be used to interface devices or systems operating at different interface voltages with one another. It can only translate push-pull CMOS logic outputs. It is advised to use external pulldown or pullup resistors larger than 50 kΩ.

11.1. Typical application



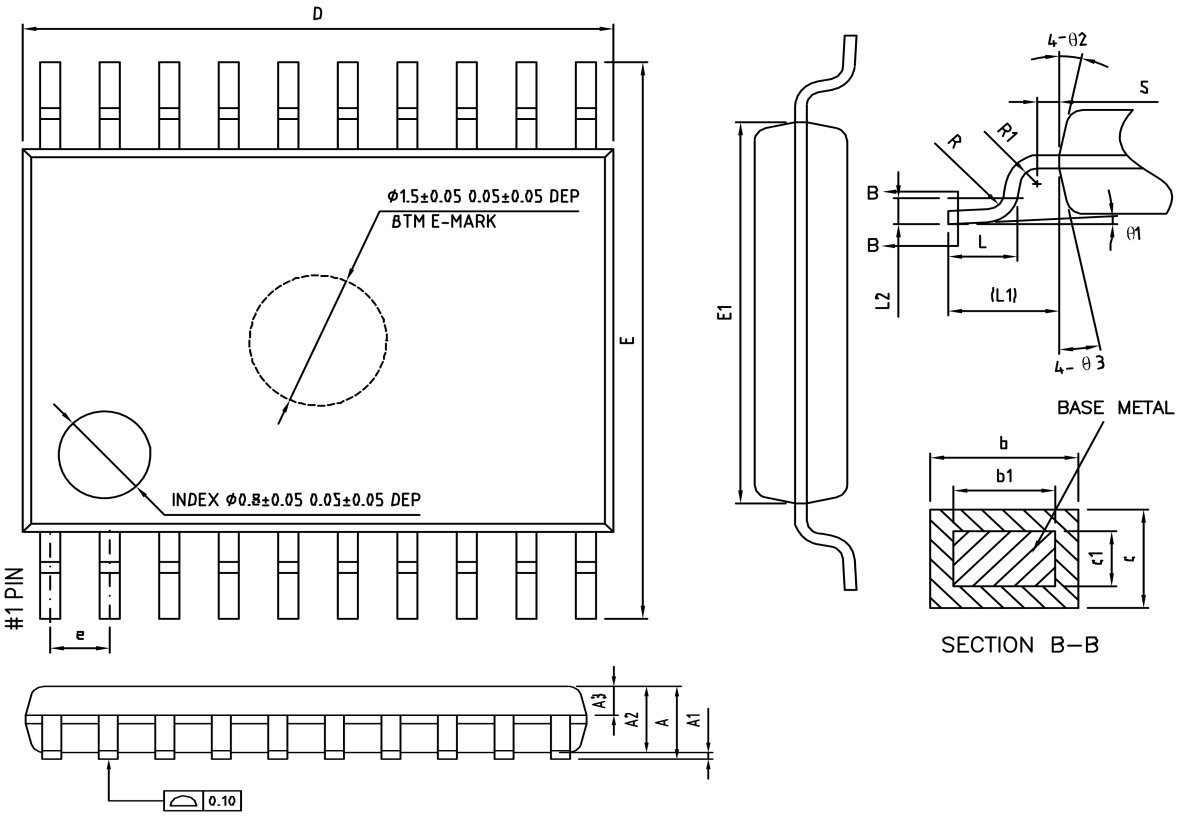
11.2. Desigin requirements

For this design example, use the parameters list in table 2, and make sure the $V_{CCA} \leq V_{CCB}$.

Table 2. Design parameters

Design Parameters	Value
V_{CCA} voltage range	1.08 V to 3.6 V
V_{CCB} voltage range	1.65 V to 5.5 V

12. Physical Dimensions：TSSOP-20



Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	-	-	1.20
A1	0.05	-	0.15
A2	0.90	1.00	1.05
A3	0.34	0.44	0.54
b	0.20	-	0.28
b1	0.20	0.22	0.24
c	0.10	-	0.19
c1	0.10	0.13	0.15
D	6.40	6.50	6.60
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
S	0.20	-	-
θ1	0°	-	8°
θ2	10°	12°	14°
θ3	10°	12°	14°

Disclaimer

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