GT0208
8-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing

1 Features

- **No direction-control**
- **Data rates: 100 Mbps (Push Pull)**
- **1.2 V to 3.6 V on A ports and 1.65 V to 5.5 V 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**
- **OE Input Circuit Referenced to V_{CCA}**
- **I_{off} supports partial-power-down mode operation**
- **Operating temperature range:-40℃ to +85℃**

2 Application

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

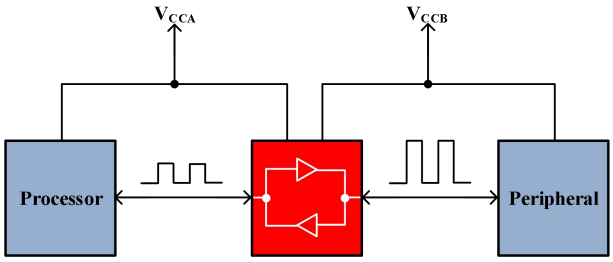
3 Description

This 8-bit non-inverting decoder is a bi-directional voltage level decoder that can be used to establish digital switching compatibility between mixed voltage systems. It uses two independent, configurable power rails, with port A supporting operating voltages from 1.2V to 3.6V while tracking the V_{CCA} supply, and port B supporting operating voltages from 1.65V to 5.5V while tracking the V_{CCB} supply. This supports both lower and higher logic signal levels and provides bi-directional switching between 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5V voltage nodes. V_{CCA} must not exceed V_{CCB}.

When the output enable (OE) input is low, all outputs are in a high impedance state, which greatly reduces power supply quiescent current consumption. OE has an internal pull-down current source as long as V_{CCA} is powered. The OE has an internal pull-down current source as long as V_{CCA} is powered.

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.

Circuit Diagram



4 Revision History

Revision	Date	Note
Rev. A0. 1	2025. 04. 17	Original Version

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

5 Device Summary, Pin and Packages

Table 5-1. Device Summary(1)

Serial Name	Part Name	Package	Body Size (Nom)	Marking(2)	MSL(3)	Package Qty
GT0208	GT0208TG	TSSOP20	6.50mm×4.40mm	GT0208 XXXXXXX	3	Tape and Reel,4000
	GT0208QSG	QFN3×3-20L	3.00mm×3.00mm	GT0208 XXXXX	3	Tape and Reel,5000

(1)For all available packages, please contact product sales.

(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.

(4)"XXXXX" in Marking will be appeared as the batch code.

5 Device Summary, Pin and Packages (Continued)

Top View

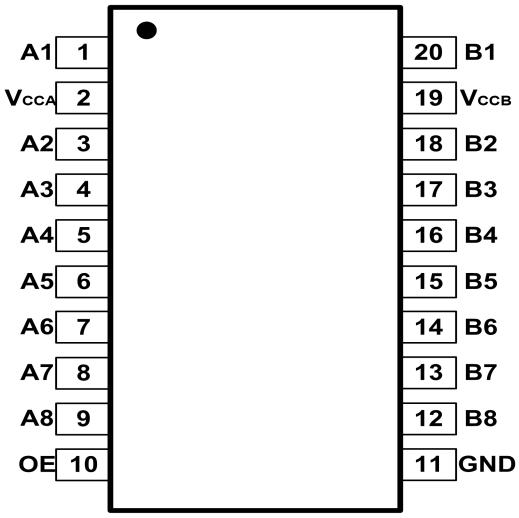


Fig.5-1. GT0208: TG (TSSOP20) Package

Top View

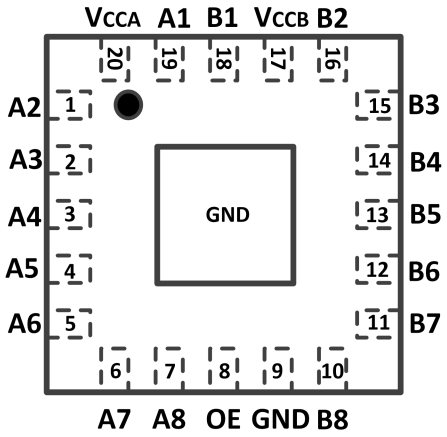


Fig.5-2. GT0208: QSG (QFN3×3-20L) Package

Table 5-2. Pin Definition

Pin			I/O	Function
Name	TG	QSG		
A1	1	19	I/O	Input/Output A1. Referenced to V_{CCA}.
V_{CCA}	2	20	-	A-Port power supply.
A2	3	1	I/O	Input/Output A2. Referenced to V_{CCA}.
A3	4	2	I/O	Input/Output A3. Referenced to V_{CCA}.
A4	5	3	I/O	Input/Output A4. Referenced to V_{CCA}.
A5	6	4	I/O	Input/Output A5. Referenced to V_{CCA}.
A6	7	5	I/O	Input/Output A6. Referenced to V_{CCA}.
A7	8	6	I/O	Input/Output A7. Referenced to V_{CCA}.
A8	9	7	I/O	Input/Output A8. Referenced to V_{CCA}.
OE	10	8	I	Tri-state output mode. Pull low put all outputs in tri-state. Referenced to V_{CCA}
GND	11	9	-	Ground
B8	12	10	I/O	Input/Output B8. Referenced to V_{CCB}
B7	13	11	I/O	Input/Output B7. Referenced to V_{CCB}
B6	14	12	I/O	Input/Output B6. Referenced to V_{CCB}
B5	15	13	I/O	Input/Output B5. Referenced to V_{CCB}
B4	16	14	I/O	Input/Output B4. Referenced to V_{CCB}
B3	17	15	I/O	Input/Output B3. Referenced to V_{CCB}
B2	18	16	I/O	Input/Output B2. Referenced to V_{CCB}
V_{CCB}	19	17	-	B-Port power supply
B1	20	18	I/O	Input/Output B1. Referenced to V_{CCB}

*It is suggested to leave the unconnected pins floating.

6 Voltage, Temperature, ESD and Thermal Ratings

6.1 Absolute Maximum Ratings(1)(2)(3)

Parameters		Min	Max	Unit
Supply voltage, V_{CCA}		-0.3	4.6	V
Supply voltage, V_{CCB}		-0.3	6.5	V
Input voltage range,V_I	A port	-0.3	4.6	V
	B port	-0.3	6.5	
Voltage range applied to any output in the high-impedance or power-off state, Vo	A port	-0.3	4.6	V
	B port	-0.3	6.5	
Voltage range applied to any output in the high or low state, Vo	A port	-0.3	V_{CCA}+0.3	V
	B port	-0.3	V_{CCA}+0.3	
Input clamp current,I_{IK}	V_I＜0		-50	mA
Output clamp current,I_{OK}	V_O＜0		-50	mA
Continuous output current,I_O			±50	mA
Continuous current through V_{CCA},V_{CCB} or GND			±100	mA
Maximum junction temperature			150	°C
Storage temperature range		-65	150	°C

(1)Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

(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

6.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM)(1)	±5K	V
		Charged-Device Model (CDM)(2)	±2K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

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6 Voltage, Temperature, ESD and Thermal Ratings(Continued)

6.3 Recommended Operating Conditions(3)

V_{CCI} is the supply voltage associated with the input port. V_{CCO} is the supply Voltage associated with the output port.

Parameter	Conditions		Min	Typ	Max	Unit
Supply voltage (1)	V_{CCA}		1.2		3.6	V
	V_{CCB}		1.65		5.5	
High-level input voltage (V_{IH})	A-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	V_{CCI}×0.65		V_{CCI}	V
	B-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	V_{CCI}×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}×0.65		5.5	
Low-level input voltage (V_{IL})(2)	A-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	0		V_{CCI}×0.35	V
	B-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	0		V_{CCI}×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}×0.35	V
Voltage applied to any output in the high-impedance or power-off state (Vo)	A-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	0		3.6	V
	B-port I/Os	V_{CCA}=1.2 V to 3.6 V V_{CCB}=1.65 V to 5.5 V	0		5.5	V
Input transition rise or fall rate(Δt/Δv)	A-port I/Os push-pull driving				10	ns/V
	B-port I/Os push-pull driving				10	
TA Operating free-air temperature			-40		85	°C

(1)V_{CCA} must be less than or equal to V_{CCB}.

(2)The maximum V_{IL} value is provided to ensure that a valid V_{OL} is maintained. The V_{OL} value is V_{IL} plus the voltage drop across the pass gate transistor.

7 Electrical Specifications

7.1 Electrical Characteristics

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

Parameter		Conditions	V_{CCA}	V_{CCB}	Temp	Min	Typ	Max	Unit
V_{OHA}	Port A Output High Voltage	I_{OH}=–20 μA	1.2V	1.65V to 5.5V	+25℃		1.1		V
			1.4V to 3.6V	1.65V to 5.5V	Full	V_{CCA}-0.4			V
V_{OLA}	Port A Output Low Voltage	I_{OL}=20μA	1.2V	1.65V to 5.5V	+25℃			0.3	V
			1.4V to 3.6V	1.65V to 5.5V	Full			0.4	
V_{OHB}	Port B Output High Voltage	I_{OH}=–20 μA	1.2V to 3.6V	1.65V to 5.5V	Full	V_{CCB}-0.4			V
V_{OLB}	Port B Output Low Voltage	I_{OL}=20μA	1.2V to 3.6V	1.65V to 5.5V	Full			0.4	V
I_I	Input Leakage Current	OE V_I=V_{CCI} or GND	1.2V to 3.6V	1.65V to 5.5V	+25℃			±1	μA
					Full			±2	
I_{off}	Partial Power Down Current	A Ports V_I or Vo=0 to 3.6V	0V	0V to 5.5V	+25℃			±1	μA
					Full			±2	
		B Ports V_I or Vo=0 to 3.6V	0V to 3.6V	0V	+25℃			±1	
					Full			±2	
I_{OZ}	High-impedance State Output Current	A or B port OE=GND	1.2V to 3.6V	1.65V to 5.5V	+25℃			±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℃		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℃		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℃		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 0V I_O=0, OE=0V	1.2V	1.65V to 5.5V	+25℃		0.05		
			1.4V to 3.6V	1.65V to 5.5V	Full			5	μA
I_{CCZB}	V_{CCB} Supply Current	V_I=V_{CCI} or 0V I_O=0, OE=0V	1.2V	1.65V to 5.5V			3.3		μA
			1.2V to 3.6V	1.65V to 5.5V	Full			5	

7 Electrical Specifications (Continued)

7.1 Electrical Characteristics

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

C_i	Input Capacitance	OE	1.2V to 3.6V	1.65V to 5.5V	+25℃		3.5		pF
C_{io}	Input-to-output Internal Capacitance	A Port	1.2V to 3.6V	1.65V to 5.5V	+25℃		2.3		pF
		B Port	1.2V to 3.6V	1.65V to 5.5V	+25℃		2.3		

(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}.

7 Electrical Specifications(Continued)

7.2 Timing Requirements

V_{CCA}=1.2V

T_A=25ºC, 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）	50	50	50	50	ns

V_{CCA}=1.5V±0.1V

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

	V_{CCB}=1.8±0.15V		V_{CCB}=2.5±0.2V		V_{CCB}=3.3±0.3V		V_{CCB}=5±0.5V		Unit
	Min	Max	Min	Max	Min	Max	Min	Max	
Data rate		50		50		50		50	Mbps
Pulse duration（t_w）	20		20		20		20		ns

V_{CCA}=1.8V±0.15V

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

	V_{CCB}=1.8±0.15V		V_{CCB}=2.5±0.2V		V_{CCB}=3.3±0.3V		V_{CCB}=5±0.5V		Unit
	Min	Max	Min	Max	Min	Max	Min	Max	
Data rate		52		60		60		60	Mbps
Pulse duration（t_w）	19		17		17		17		ns

V_{CCA}=2.5V±0.2V

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

	V_{CCB}=2.5±0.2V		V_{CCB}=3.3±0.3V		V_{CCB}=5±0.5V		Unit
	Min	Max	Min	Max	Min	Max	
Data rate		70		100		100	Mbps
Pulse duration（t_w）	14		10		10		ns

V_{CCA}=3.3V±0.3V

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

	V_{CCB}=3.3±0.3V		V_{CCB}=5±0.5V		Unit
	Min	Max	Min	Max	
Data rate		100		100	Mbps
Pulse duration（t_w）	10		10		ns

7 Electrical Specifications(Continued)

7.3 Switching Characteristics:

V_{CCA}=1.2V

TA=25ºC, V_{CCA}=1.2V

Parameter		Conditions	V_{CCB}=1.8V	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	Units
			Typ	Typ	Typ	Typ	
t_{PHL}	Propagation Delay Time High-to-low Output	A to B	6.88	5.84	6.53	8.14	ns
t_{PLH}	Propagation Delay Time low-to-high Output	A to B	9.40	7.33	7.56	13.23	ns
t_{PHL}	Propagation Delay Time High-to-low Output	B to A	16.03	15.86	15.57	14.95	ns
t_{PLH}	Propagation Delay Time low-to-high Output	B to A	19.30	18.54	18.03	17.54	ns
t_{en}	Enable Time	OE to A or B	63.37	60.22	56.79	62.72	ns
t_{dis}	Disable Time	OE to A or B	100.13	92.18	92.10	100.43	ns
t_{rA}	Input Rise Time	A port rise time	24.99	25.69	25.99	29.20	ns
t_{rB}	Input Rise Time	B port rise time	5.67	3.10	2.35	2.03	ns
t_{fA}	Input Fall Time	A port fall time	15.35	16.56	18.65	18.80	ns
t_{fB}	Input Fall Time	B port fall time	5.31	2.29	1.88	1.78	ns
Maximum Data Rate			20	20	20	20	Mbps

V_{CCA}=1.5V±0.1V

over recommended operating free-air temperature range, VCCA=1.5V±0.1V(unless otherwise noted)

Parameter		Conditions	V_{CCB}=1.8V	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	Units
			Typ	Typ	Typ	Typ	
t_{PHL}	Propagation Delay Time High-to-low Output	A to B	6.00	4.34	4.07	4.99	ns
t_{PLH}	Propagation Delay Time low-to-high Output	A to B	8.23	6.11	5.40	5.86	ns
t_{PHL}	Propagation Delay Time High-to-low Output	B to A	7.79	7.50	7.29	7.00	ns
t_{PLH}	Propagation Delay Time low-to-high Output	B to A	10.29	9.74	9.39	9.17	ns
t_{en}	Enable Time	OE to A or B	41.76	36.27	34.48	38.82	ns
t_{dis}	Disable Time	OE to A or B	86.05	88.03	87.06	89.61	ns
t_{rA}	Input Rise Time	A port rise time	8.77	9.19	9.04	9.63	ns
t_{rB}	Input Rise Time	B port rise time	6.52	3.16	2.40	1.91	ns
t_{fA}	Input Fall Time	A port fall time	6.66	6.79	6.79	8.20	ns
t_{fB}	Input Fall Time	B port fall time	5.74	2.36	1.92	1.76	ns
Maximum Data Rate			50	50	50	50	Mbps

7 Electrical Specifications(Continued)

V_{CCA}=1.8V±0.15V

over recommended operating free-air temperature range, VCCA=1.8V±0.15V(unless otherwise noted)

Parameter		Conditions	V_{CCB}=1.8V	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	Units
			Typ	Typ	Typ	Typ	
t_{PHL}	Propagation Delay Time High-to-low Output	A to B	5.48	3.85	3.36	3.39	ns
t_{PLH}	Propagation Delay Time low-to-high Output	A to B	7.78	5.63	4.75	4.40	ns
t_{PHL}	Propagation Delay Time High-to-low Output	B to A	5.78	5.42	5.39	5.49	ns
t_{PLH}	Propagation Delay Time low-to-high Output	B to A	7.95	7.52	7.34	7.37	ns
t_{en}	Enable Time	OE to A or B	37.11	31.19	29.66	33.53	ns
t_{dis}	Disable Time	OE to A or B	85.13	85.48	88.32	86.32	ns
t_{rA}	Input Rise Time	A port rise time	5.48	5.73	5.70	6.41	ns
t_{rB}	Input Rise Time	B port rise time	5.22	3.10	2.37	1.88	ns
t_{fA}	Input Fall Time	A port fall time	5.40	5.44	5.40	6.63	ns
t_{fB}	Input Fall Time	B port fall time	5.04	2.37	1.85	1.70	ns
Maximum Data Rate			52	60	60	60	Mbps

V_{CCA}=2.5V±0.2V

over recommended operating free-air temperature range, VCCA=3.3V±0.3V(unless otherwise noted)

Parameter		Conditions	V_{CCB}=2.5V	V_{CCB}=3.3V	V_{CCB}=5V	Units
			Typ	Typ	Typ	
t_{PHL}	Propagation Delay Time High-to-low Output	A to B	3.39	2.88	2.58	ns
t_{PLH}	Propagation Delay Time low-to-high Output	A to B	5.15	4.27	3.64	ns
t_{PHL}	Propagation Delay Time High-to-low Output	B to A	3.46	3.31	3.08	ns
t_{PLH}	Propagation Delay Time low-to-high Output	B to A	5.26	4.98	4.79	ns
t_{en}	Enable Time	OE to A or B	26.00	29.13	28.18	ns
t_{dis}	Disable Time	OE to A or B	81.14	80.15	80.24	ns
t_{rA}	Input Rise Time	A port rise time	3.17	3.27	3.34	ns
t_{rB}	Input Rise Time	B port rise time	3.25	2.41	1.87	ns
t_{fA}	Input Fall Time	A port fall time	2.72	2.94	3.67	ns
t_{fB}	Input Fall Time	B port fall time	2.44	1.87	1.72	ns
Maximum Data Rate			70	100	100	Mbps

V_{CCA}=3.3V±0.3V

7 Electrical Specifications(Continued)

over recommended operating free-air temperature range, VCCA=3.3V±0.3V(unless otherwise noted)

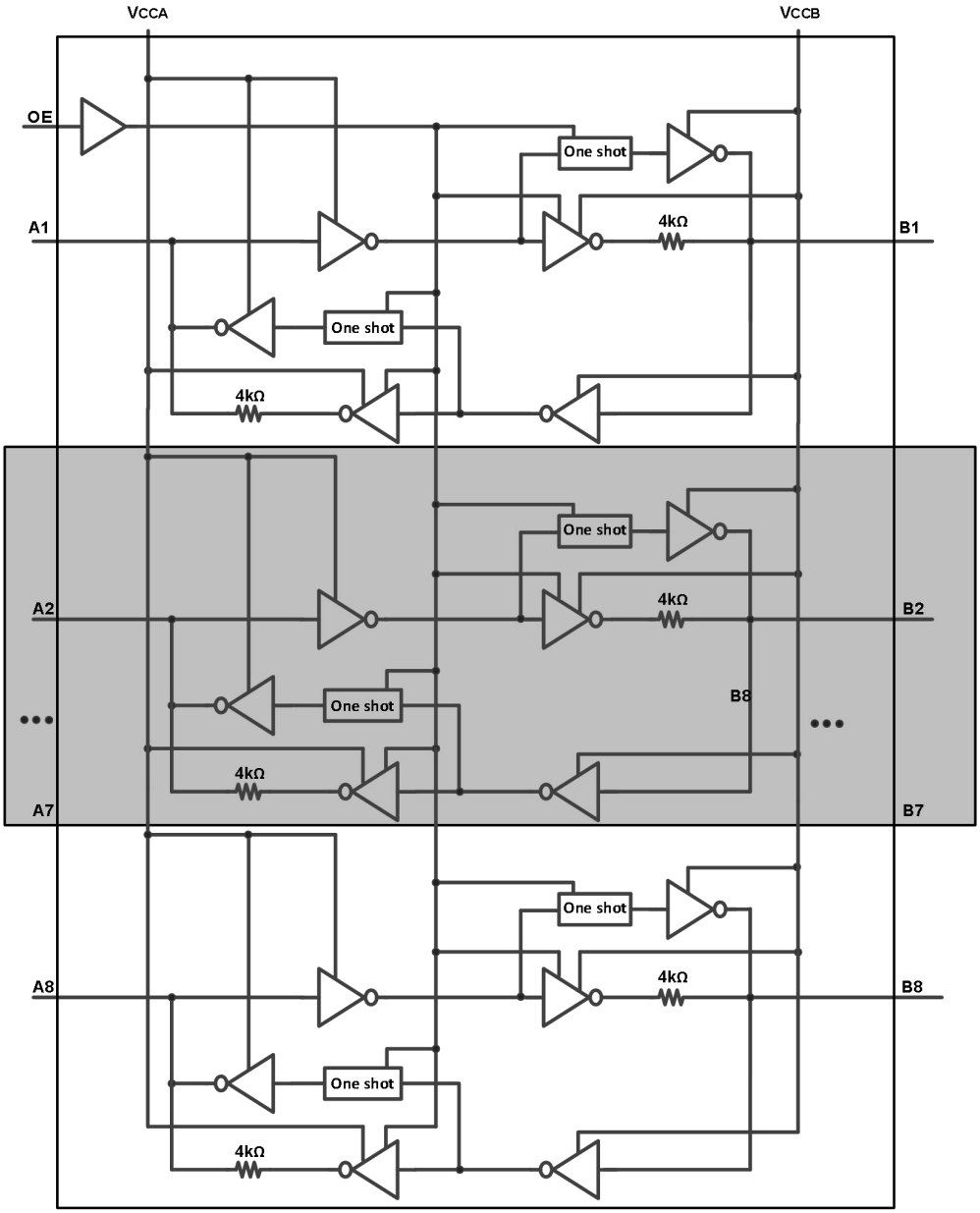
Parameter		Conditions	V_{CCB}=3.3V	V_{CCB}=5V	Units
			Typ	Typ	
t_{PHL}	Propagation Delay Time High-to-low Output	A to B	2.7	2.4	ns
t_{PLH}	Propagation Delay Time low-to-high Output	A to B	4.0	3.3	ns
t_{PHL}	Propagation Delay Time High-to-low Output	B to A	2.7	2.5	ns
t_{PLH}	Propagation Delay Time low-to-high Output	B to A	4.0	3.8	ns
t_{en}	Enable Time	OE to A or B	27.5	26.2	ns
t_{dis}	Disable Time	OE to A or B	73.9	83.1	ns
t_{rA}	Input Rise Time	A port rise time	2.4	2.4	ns
t_{rB}	Input Rise Time	B port rise time	2.4	1.9	ns
t_{fA}	Input Fall Time	A port fall time	2.1	2.4	ns
t_{fB}	Input Fall Time	B port fall time	1.9	1.8	ns
Maximum Data Rate			100	100	Mbps

8 Detailed Description

8.1 Overview

The GT0208 device is an 8-bit non-directional voltage level converter designed for converting logic voltage levels, with the A port capable of accepting I/O voltages ranging from 1.2V to 3.6V and the B port capable of accepting I/O voltages from 1.65V to 5.5V. This device is a buffered architecture with an edge rate accelerator (one-shots) to increase the overall data rate. This device can only convert push-pull CMOS logic outputs.

8.2 Functional Block Diagram



9 Parameter Measurement Information

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

- PSRR 10MHz
- Zo=50 Ω
- dv/dt ≧1V/ns

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

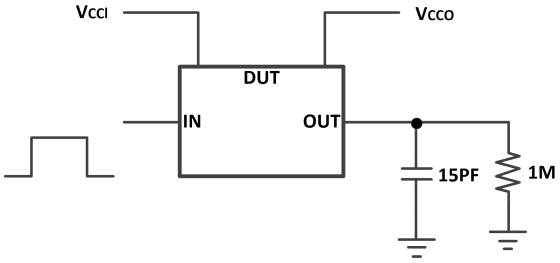


Fig.9-1. Data Rate, Pulse Duration, Propagation Delay, Output Rise and Fall Time Measurement Using a Push-Pull Driver

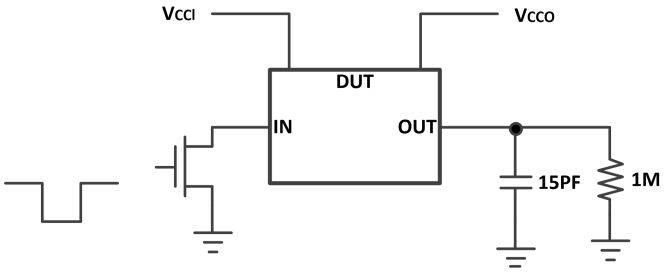


Fig.9-2. Data Rate, Pulse Duration, Propagation Delay, Output Rise and Fall Time Measurement Using an Open-Drain Driver

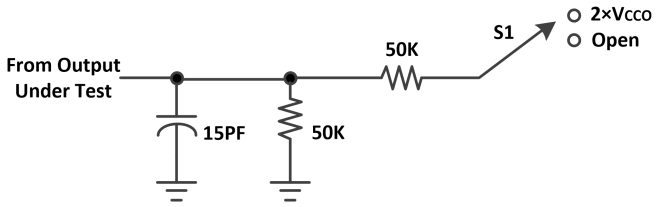


Fig.9-3. Load Circuit for Enable/Disable Time Measurement

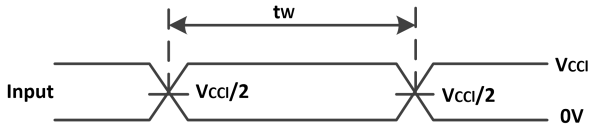
Table 9-1 Switch Configuration for Enable/Disable Timing

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.

9 Parameter Measurement Information(Continued)



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

Fig.9-4. Voltage Waveforms Pulse Duration

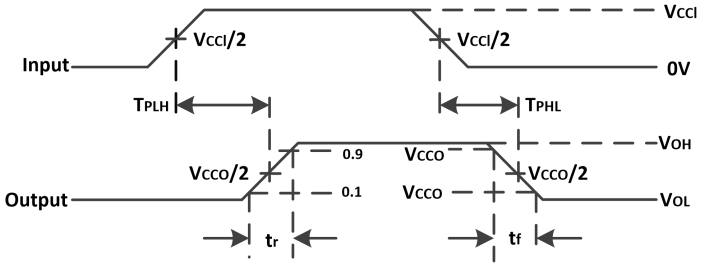


Fig.9-5. Voltage Waveforms Propagation Delay Times

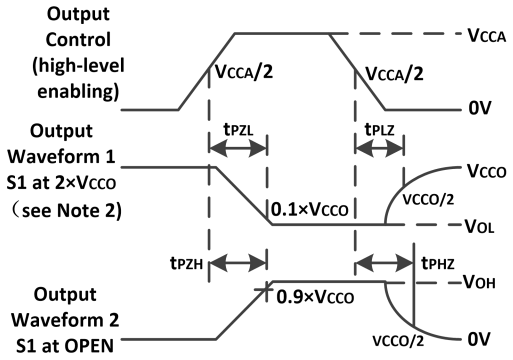


Fig.9-6. Voltage Waveforms Enable and Disable

10 Application Information

The GT0208 device can be used to bridge the digital-switching compatibility gap between two voltage nodes to successfully interface logic threshold levels found in electronic systems. It should be used in a point-to-point topology for interfacing devices or systems operating at different interface voltages with one another. The device can be used in applications where a push-pull driver is connected to the data I/Os.

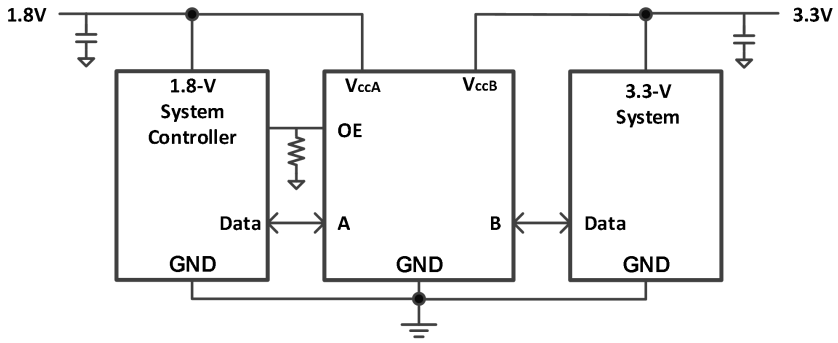
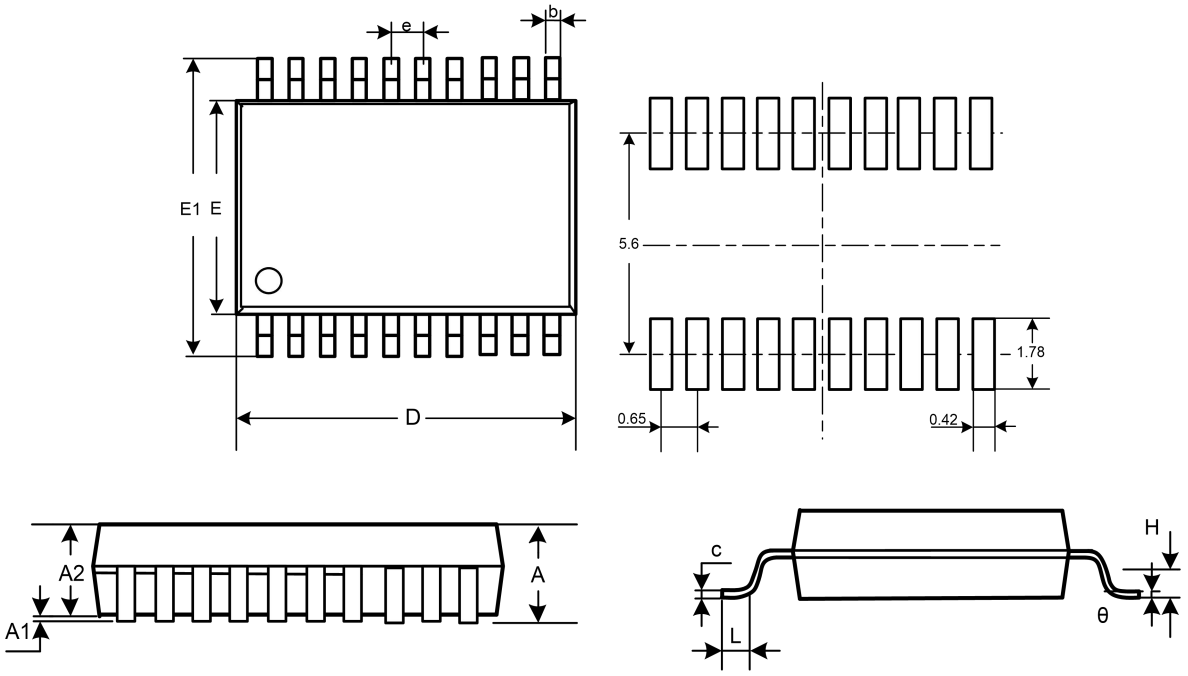


Fig.10-1. Typical Application Schematic

11 Package Outline Dimension

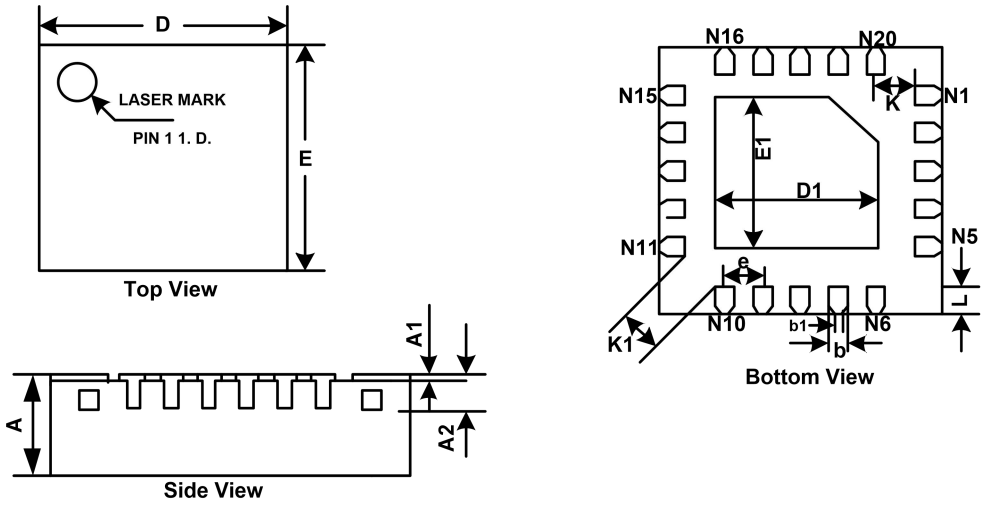
TSSOP20



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.200	0.280	0.008	0.011
c	0.130	0.170	0.005	0.007
D	6.400	6.600	0.252	0.260
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.65BSC		0.026BSC	
L	0.450	0.750	0.018	0.030
H	0.25TYP		0.01TYP	
θ	0°	8°	0°	8°

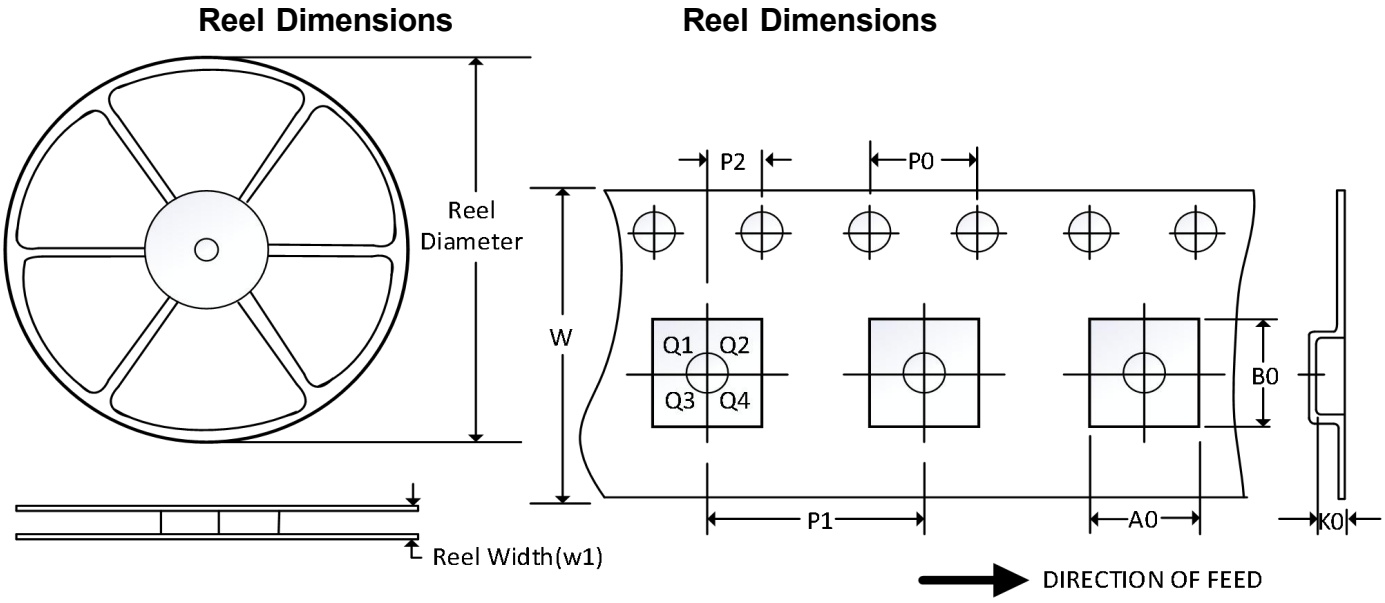
11 Package Outline Dimension(Continued)

QFN3×3-20L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203REF		0.008REF	
D	2.950	3.050	0.116	0.120
E	2.950	3.050	0.116	0.120
D1	1.550	1.650	0.061	0.065
E1	1.550	1.650	0.061	0.065
K	0.300REF		0.012REF	
K1	0.400REF		0.016REF	
b	0.150	0.250	0.006	0.010
b1	0.150REF		0.006REF	
e	0.400BSC		0.016BSC	
L	0.350	0.450	0.014	0.018

12 Tape and Reel Information



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
TSSOP20	13''	12.4	6.75	6.95	1.20	4.0	8.0	2.0	12.0	Q1
QFN3X3-20L	13''	12.4	3.35	3.35	1.13	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.