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

FEATURES

- **No Direction-Control**
- **Data Rates 100Mbps**
- **1.2V to 3.6V on A ports 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**
- **OE Input Circuit Referenced to V_{CCA}**
- **Low Power Consumption,10uA 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**

APPLICATIONS

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

DESCRIPTION

This 8-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 1.2V to 3.6V while it tracks the V_{CCA} supply, and the B ports 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}.

When the output-enable (OE) input is low, all outputs are placed in the high-impedance state, which significantly reduces the power-supply quiescent current consumption.
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.
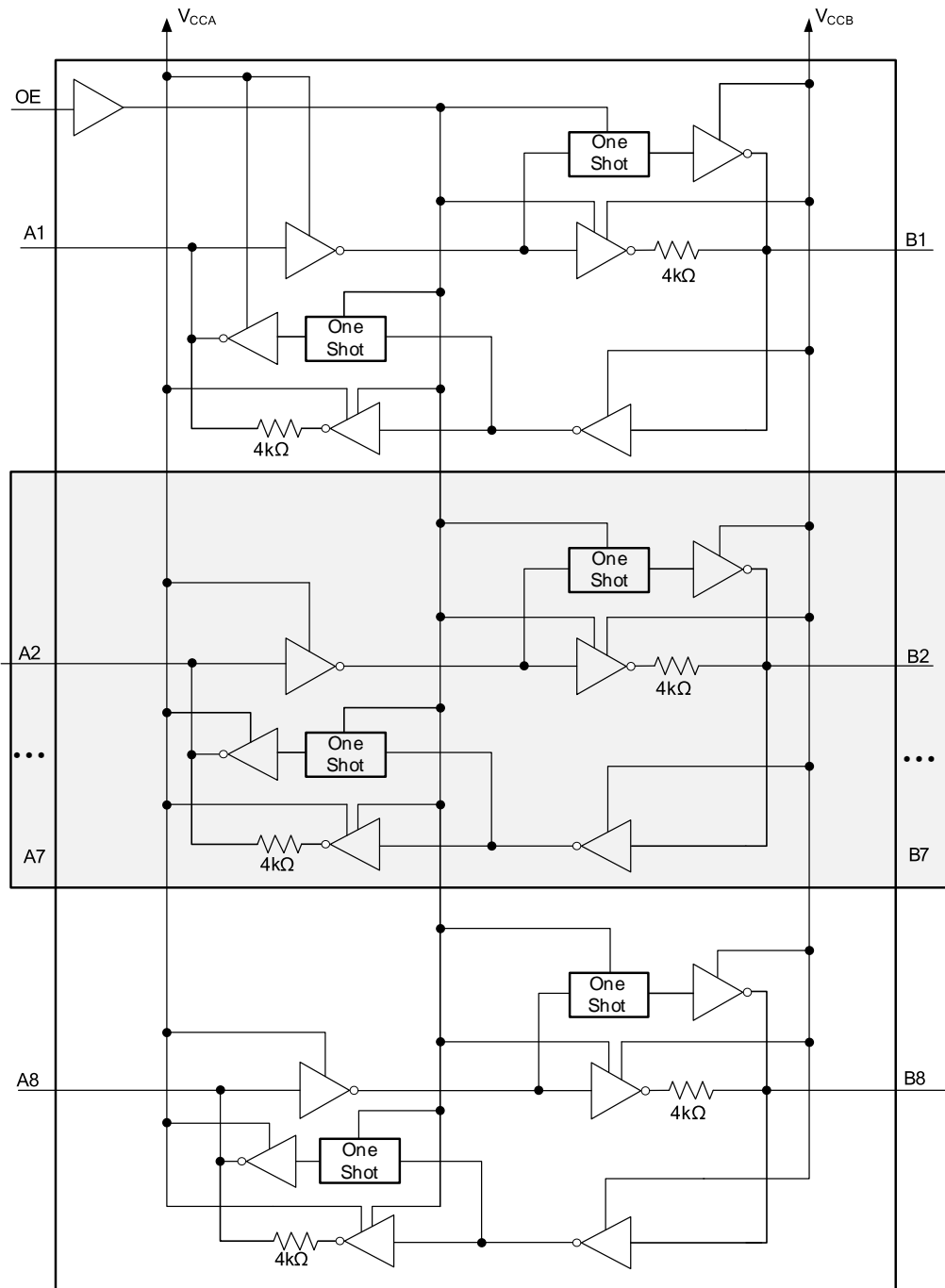
The RS0208 is available in Green QFN3*3-20L and TSSOP20 packages. It operates over an ambient temperature range of -40°C to +85°C.

Device Information [1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS0208	TSSOP20(20)	6.50mm×4.40mm
	QFN3*3-20L(20)	3.00mm×3.00mm

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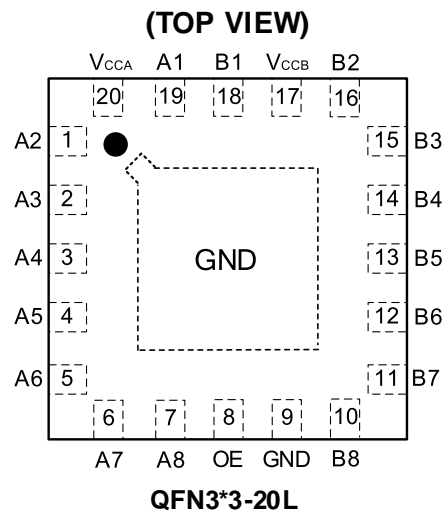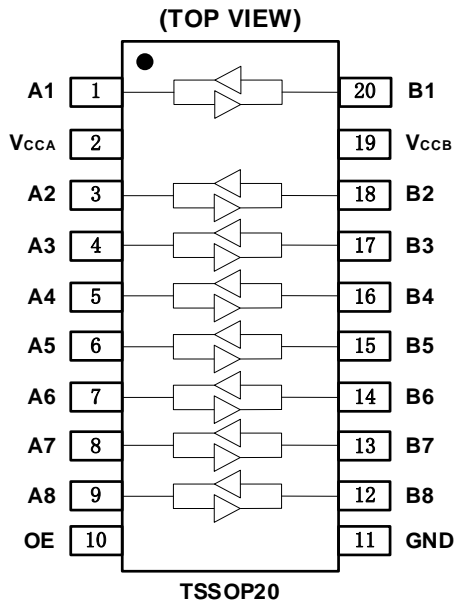
Functional Block Diagram

Revision History

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

VERSION	Change Date	Change Item
A.0	2021/1/20	Preview version completed
A.1	2021/4/25	Initial version completed

PIN CONFIGURATIONS

(TOP VIEW)

TSSOP20

QFN3*3-20L

PIN DESCRIPTION

PIN		NAME	TYPE [1]	FUNCTION
TSSOP20	QFN3*3-20L			
1	19	A1	I/O	Input/output A1. Reference to V_{CCA}.
2	20	V_{CCA}	P	A Port Supply Voltage.1.2V ≤ V_{CCA} ≤ 3.6V and V_{CCA} ≤ $V_{CCB.}$
3	1	A2	I/O	Input/output A2. Reference to V_{CCA}.
4	2	A3	I/O	Input/output A3. Reference to V_{CCA}.
5	3	A4	I/O	Input/output A4. Reference to V_{CCA}.
6	4	A5	I/O	Input/output A5. Reference to V_{CCA}.
7	5	A6	I/O	Input/output A6. Reference to V_{CCA}.
8	6	A7	I/O	Input/output A7. Reference to V_{CCA}.
9	7	A8	I/O	Input/output A8. Reference to V_{CCA}.
10	8	OE	I	Output Enable (Active High). Pull OE low to place all outputs in 3-state mode. Referenced to V_{CCA}.
11	9	GND	–	Ground.
12	10	B8	I/O	Input/output B8. Reference to V_{CCB}.
13	11	B7	I/O	Input/output B7. Reference to V_{CCB}.
14	12	B6	I/O	Input/output B6. Reference to V_{CCB}.
15	13	B5	I/O	Input/output B5. Reference to V_{CCB}.
16	14	B4	I/O	Input/output B4. Reference to V_{CCB}.
17	15	B3	I/O	Input/output B3. Reference to V_{CCB}.
18	16	B2	I/O	Input/output B2. Reference to V_{CCB}.
19	17	V_{CCB}	P	B Ports Supply Voltage.1.65V ≤ V_{CCB} ≤ 5.5V.
20	18	B1	I/O	Input/output B1. Reference to V_{CCB}.
-	Exposed Pad	GND	-	Exposed pad should be soldered to PCB board and connected to GND or left floating.

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

SPECIFICATIONS

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
T_J	Junction Temperature			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.

ESD Ratings

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

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 inputs	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 inputs	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 inputs	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 inputs	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($\Delta t/\Delta v$)	A-port inputs	V_{CCA} = 1.2 V to 3.6 V V_{CCB} = 1.65 V to 5.5 V			40	ns/V
	B-port inputs	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.

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING [1]	MSL[2]	PACKAGE OPTION
RS0208	RS0208YTQC20	-40°C ~+85°C	QFN3*3-20L	RS0208	MSL3	Tape and Reel,5000
	RS0208YTSS20	-40°C ~+85°C	TSSOP20	RS0208	MSL3	Tape and Reel,4000

NOTE:

(1) 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.

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

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		+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 Ports V$_I$ or Vo=0 to 3.6V	0V	0V to 5.5V	+25°C			±1	µA
					Full			±2	
		B Ports V$_I$ or Vo=0 to 5.5V	0V to 3.6V	0V	+25°C			±1	µA
					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°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$_{CCB}$.

Timing Requirements:

$V_{CCA}=1.2V$

$T_A=25^\circ C$, $V_{CCA}=1.2V$

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

$V_{CCA}=1.5V\pm0.1$ V

over recommended operating free-air temperature range, $V_{CCA}=1.5V\pm0.1V$(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

$V_{CCA}=1.8V\pm0.15$ V

over recommended operating free-air temperature range, $V_{CCA}=1.8V\pm0.15V$(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	25	25	25	25	ns

$V_{CCA}=2.5V\pm0.2$ V

over recommended operating free-air temperature range, $V_{CCA}=2.5V\pm0.2V$(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

$V_{CCA}=3.3V\pm0.3$ V

over recommended operating free-air temperature range, $V_{CCA}=3.3V\pm0.3V$(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

Switching Characteristics: V_{CCA}=1.2V

T_A=25°C, V_{CCA}=1.2V

PARAMETER		CONDITIONS	V_{CCB}=1.8V TYP	V_{CCB}=2.5V TYP	V_{CCB}=3.3V TYP	V_{CCB}=5V TYP	UNIT
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	ns
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

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 TYP	V_{CCB}=2.5V ±0.2V TYP	V_{CCB}=3.3V ±0.3V TYP	V_{CCB}=5V ±0.5V TYP	UNIT
t_{PHL}	Propagation delay time high-to-low output	A-to-B	15.1	15.7	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	14.3	15.3	15.7	21	ns
t_{en}	Enable time	OE-to-A or B	225	218	215	216	ns
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	2.5	2.0	1.8	1.4	ns
Maximum data rate			40	40	40	40	Mbps

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	6.5	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	8.3	8.6	8	ns
t_{en}	Enable time	OE-to-A or B	185	178	183	167	ns
t_{dis}	Disable time	OE-to-A or B	18.3	13	12.1	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

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	6.5	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	8.3	8.6	8	ns
t_{en}	Enable time	OE-to-A or B	185	178	183	167	ns
t_{dis}	Disable time	OE-to-A or B	18.3	13	12.1	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

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	1.9	4.3	4.2	ns
t_{en}	Enable time	OE-to-A or B	157	147	138	ns
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

Switching Characteristics: V$_{CCA}$=3.3V ± 0.3V

over recommended operating free-air temperature range, V$_{CCA}$=3.3V$\pm$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	3.8	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	ns
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	2.3	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

Operating Characteristics

T$_A$=25ºC

PARAMETER		CONDITIONS		V$_{CCA}$							UNIT
				1.2V	1.2V	1.5V	1.8V	2.5V	2.5V	3.3V	
				V$_{CCB}$							
				5V	1.8V	1.8V	1.8V	2.5V	5V	3.3V to 5V	
				TYP	TYP	TYP	TYP	TYP	TYP	TYP	
C$_{pdA}$	Power dissipation capacitance	C$_L$=0 f=10MHz t$_r$=t$_f$=1ns OE=V$_{CCA}$ (outputs enabled)	A-port input B-port output	9	8	7	8	7	8	7	pF
			B-port input A-port output	12	11	12	11	11	11	11	
C$_{pdB}$	Power dissipation capacitance		A-port input B-port output	35	26	27	27	27	27	27	
			B-port input A-port output	25	18	19	19	18	19	20	
C$_{pdA}$	Power dissipation capacitance	C$_L$=0 f=10MHz t$_r$=t$_f$=1ns OE=GND (outputs enabled)	A-port input B-port output	0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF
			B-port input A-port output	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
C$_{pdB}$	Power dissipation capacitance		A-port input B-port output	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
			B-port input A-port output	0.01	0.01	0.01	0.01	0.01	0.01	0.01	

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

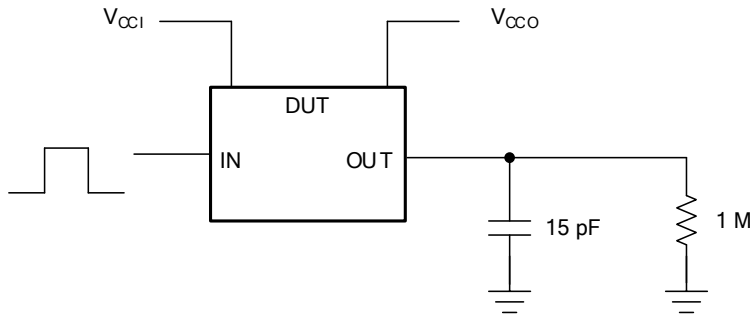Note: All input pulses are measured one at a time, with one transition per measurement.

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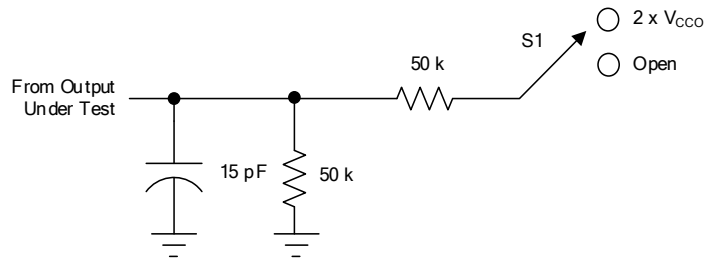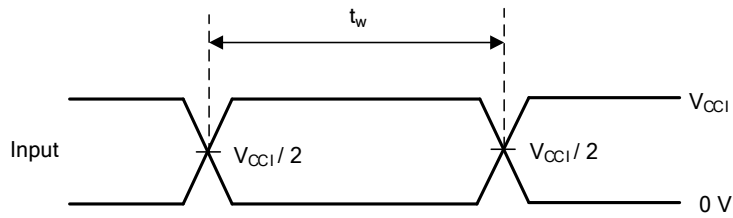And Fall Time Measurement Using A Push-Pull Driver**

Figure 2. 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 t_{en}.

(2) t_{PLZ} and t_{PHZ} are the same as t_{dis}.

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

Figure 3. Voltage Waveforms Pulse Duration
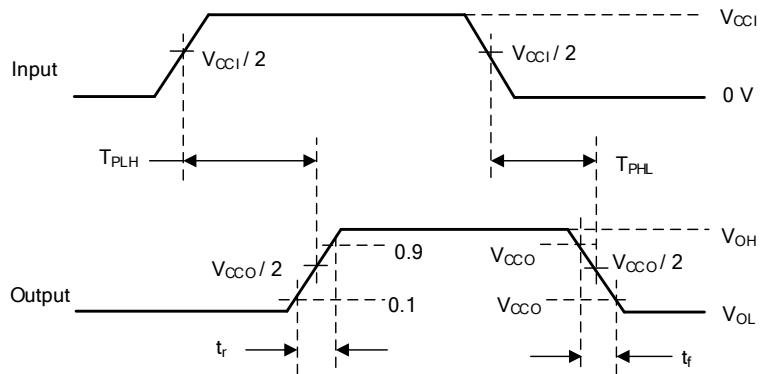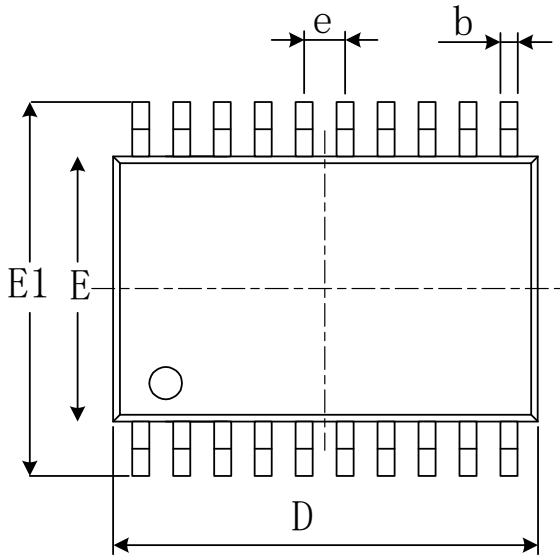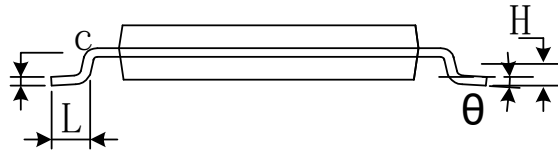

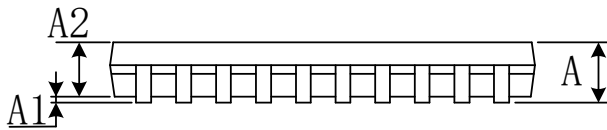
Figure 4. Voltage Waveforms Propagation Delay Times
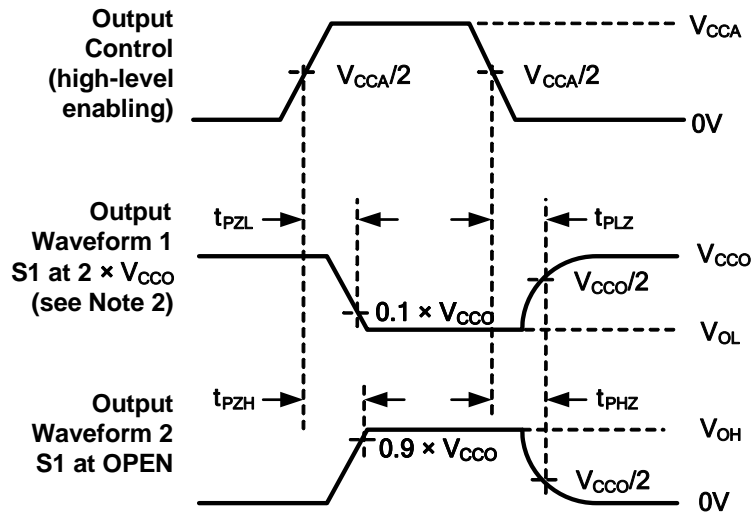
**Figure 5. Voltage Waveforms Enable And Disable**

PACKAGE OUTLINE DIMENSIONS
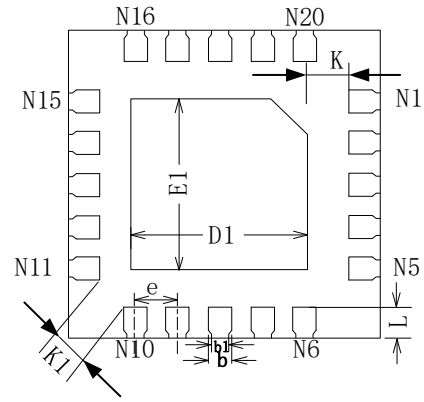## TSSOP20
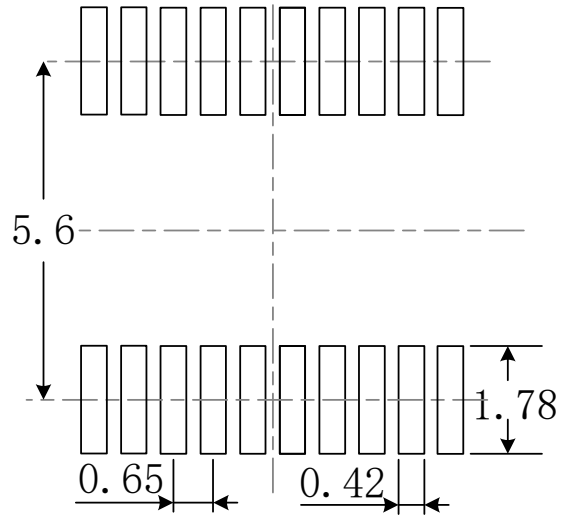
RECOMMENDED LAND PATTERN (Unit: mm)

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	0.650(BSC)		0.026(BSC)	
L	0.450	0.750	0.018	0.030
H	0.250(TYP)		0.010(TYP)	
θ	0°	8°	0°	8°

QFN3*3-20L
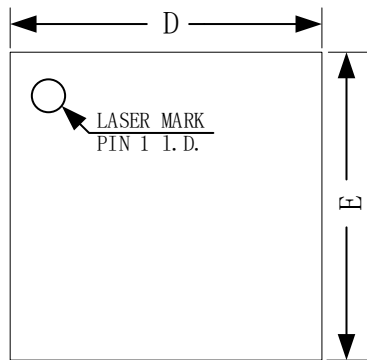
TOP VIEW

BOTTOM VIEW
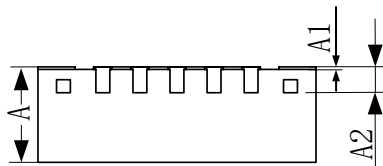
SIDE VIEW

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		0.008 REF	
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