

# 2-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs

## FEATURES

- Control Input threshold Referenced to  $V_{CCA}$  Voltage
- Power-Supply Range:  $V_{CCA}$  and  $V_{CCB}$ : 1.65V to 5.5V
- $V_{CC}$  Isolation: If Either  $V_{CC}$  is at GND, Both Ports are in the High-Impedance State
- Low power consumption, 4uA Max
- Output drives up to  $\pm 24\text{mA}@3.0\text{V}$
- 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:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$

## APPLICATIONS

- Industrial
- Enterprise
- Telecom, such as VOIP
- Personal electronic

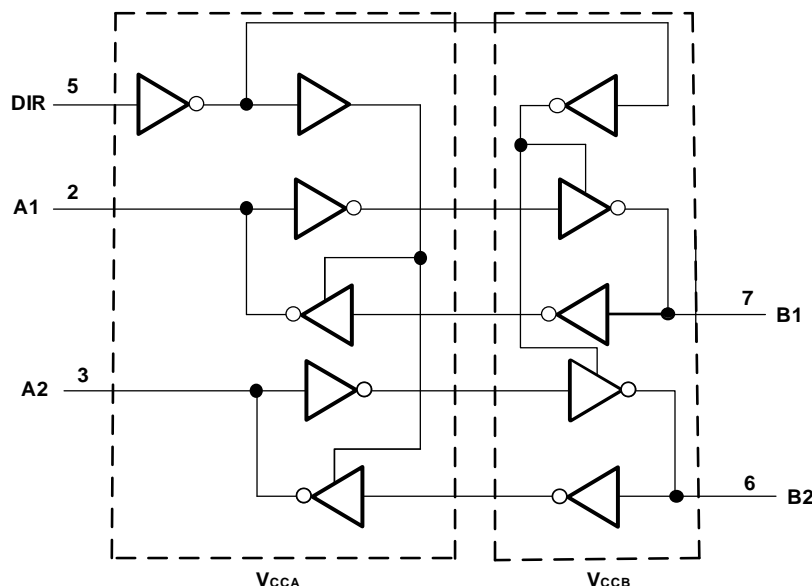
## DESCRIPTION

The RS2T45 is 2-bit non-inverting bus transceiver uses two separate configurable power supply rails. The A port and DIR are designed to track  $V_{CCA}$ , which supporting operating voltages from 1.65V to 5.5V, and the B port supporting operating voltages from 1.65V to 5.5V while it tracks the  $V_{CCB}$  supply. This allows for universal low-voltage bidirectional translation between any of the 1.8V, 2.5V, 3.3V and 5V voltage nodes.

The RS2T45 is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input activate either the B-port outputs or the A-port outputs. The device transmits data from the A bus to the B bus when the B-port outputs are activated and from the B bus to the A bus when the A-port outputs are activated. The input circuitry is always active on both A and B ports and must have a logic HIGH or LOW level applied to prevent excess  $I_{CC}$  and  $I_{CCZ}$ .

The RS2T45 is available in Green SOT23-8, MSOP-8 and VSSOP-8 packages. It operates over an ambient temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

## Functional Block Diagram

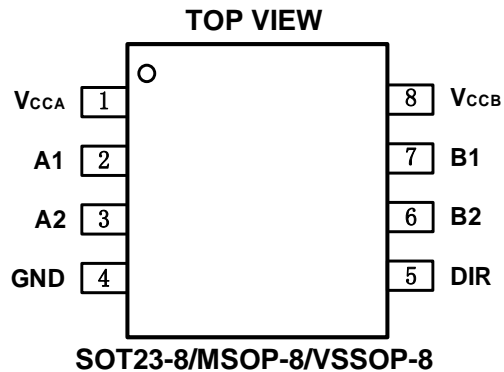


## Revision History

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

VERSION	Change Date	Change Item
A.1	2020/11/29	Initial version completed

## PIN CONFIGURATIONS



## PIN DESCRIPTION

PIN	NAME	TYPE <sup>(1)</sup>	FUNCTION
<b>SOT23-8/MSOP-8/VSSOP-8</b>			
1	V <sub>CCA</sub>	P	A Port Supply Voltage. $1.65V \leq V_{CCA} \leq 5.5V$
2	A1	I/O	Input/output A1. Reference to V <sub>CCA</sub> .
3	A2	I/O	Input/output A2. Reference to V <sub>CCA</sub> .
4	GND	–	Ground.
5	DIR	I	Direction control. Referenced to V <sub>CCA</sub> .
6	B2	I/O	Input/output B2. Reference to V <sub>CCB</sub> .
7	B1	I/O	Input/output B1. Reference to V <sub>CCB</sub> .
8	V <sub>CCB</sub>	P	B Port Supply Voltage. $1.65V \leq V_{CCB} \leq 5.5V$ .

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

## Function Table <sup>(2)</sup>

CONTROL INPUTS <sup>(1)</sup>	OUTPUT CIRCUITS		OPERATION
	A PORT	B PORT	
DIR <sup>(3)</sup>			
L	Enabled	Hi-Z	B data to A bus
H	Hi-Z	Enabled	A data to B bus

Note:

(1) The input circuit of the data I/O is always active.

(2) When either V<sub>CCA</sub> or V<sub>CCB</sub> is at GND level, the device goes into suspend mode.

(3) H=High voltage level, L=Low voltage level, X=don't care, Z=high-impedance OFF-state.

## SPECIFICATIONS

### Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) <sup>(1)</sup>

SYMBOL	PARAMETER	MIN	MAX	UNIT	
$V_{CCA}^{(3)}$	Supply Voltage Range	-0.5	6.5	V	
$V_{CCB}^{(3)}$	Supply Voltage Range	-0.5	6.5	V	
$V_I^{(2)}$	Input Voltage Range	A port	-0.5	6.5	V
		B port	-0.5	6.5	
$V_O^{(2)}$	Voltage range applied to any output in the high-impedance or power-off 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		$\pm 50$	mA	
	Continuous current through $V_{CCA}$ , $V_{CCB}$ or GND		$\pm 100$	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)	$\pm 3000$	V
		Machine Model (MM)	$\pm 400$	V

**PACKAGE/ORDERING INFORMATION**

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING <sup>(1)</sup>	MSL <sup>(2)</sup>	PACKAGE OPTION
RS2T45	RS2T45XH8	-40°C ~+125°C	SOT23-8	2T45	MSL3	Tape and Reel,3000
	RS2T45XM	-40°C ~+125°C	MSOP-8	RS2T45	MSL3	Tape and Reel,4000
	RS2T45XVS8	-40°C ~+125°C	VSSOP-8	2T45	MSL3	Tape and Reel,3000

## 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.

## Recommended Operating Conditions

V<sub>CCI</sub> is the supply voltage associated with the input port. V<sub>CCO</sub> is the supply voltage associated with the output port.

PARAMETER		V <sub>CCI</sub> <sup>(1)</sup>	V <sub>CCO</sub> <sup>(2)</sup>	MIN	TYP	MAX	UNIT
Supply voltage <sup>(1)</sup>	V <sub>CCA</sub>			1.65		5.5	V
	V <sub>CCB</sub>			1.65		5.5	
High-level input Voltage (V <sub>IH</sub> )	A&B-port I/Os <sup>(5)</sup>	1.65V to 1.95V		V <sub>CCI</sub> x0.65			V
		2.3V to 2.7V		1.7			
		3V to 3.6V		2			
		4.5V to 5.5V		V <sub>CCI</sub> x0.7			
Low-level input Voltage (V <sub>IL</sub> )	A&B-port I/Os <sup>(5)</sup>	1.65V to 1.95V				V <sub>CCI</sub> x0.35	V
		2.3V to 2.7V				0.7	
		3V to 3.6V				0.8	
		4.5V to 5.5V				V <sub>CCI</sub> x0.3	
High-level input Voltage (V <sub>IH</sub> )	DIR (referenced to V <sub>CCA</sub> ) <sup>(6)</sup>	1.65V to 1.95V		V <sub>CCA</sub> x0.65			V
		2.3V to 2.7V		1.7			
		3V to 3.6V		2			
		4.5V to 5.5V		V <sub>CCA</sub> x0.7			
Low-level input Voltage (V <sub>IL</sub> )	DIR (referenced to V <sub>CCA</sub> ) <sup>(6)</sup>	1.65V to 1.95V				V <sub>CCA</sub> x0.35	V
		2.3V to 2.7V				0.7	
		3V to 3.6V				0.8	
		4.5V to 5.5V				V <sub>CCA</sub> x0.3	
V <sub>I</sub>	Input voltage			0		5.5	V
V <sub>O</sub>	Output voltage			0		V <sub>CCO</sub>	V
High-level output current (I <sub>OH</sub> )		1.65V to 1.95V				-4	mA
		2.3V to 2.7V				-8	
		3V to 3.6V				-24	
		4.5V to 5.5V				-32	
Low-level output current (I <sub>OL</sub> )		1.65V to 1.95V				4	mA
		2.3V to 2.7V				8	
		3V to 3.6V				24	
		4.5V to 5.5V				32	
Input transition rise or fall rate(Δt/Δv)	Data inputs <sup>(3)</sup>	1.65V to 1.95V				20	ns/V
		2.3V to 2.7V				20	
		3V to 3.6V				10	
		4.5V to 5.5V				5	
	Control input	1.65 V to 5.5 V				5	
T <sub>A</sub> Operating free-air temperature				-40		125	°C

(1) V<sub>CCI</sub> is the V<sub>CC</sub> associated with the data input port.

(2) V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.

(3) All unused or driven (floating) data inputs (I/Os) of the device must be held at logic HIGH or LOW (preferably V<sub>CCI</sub> or GND) to ensure proper device operation and minimize power.

(4) All unused control inputs must be held at V<sub>CCA</sub> or GND to ensure proper device operation and minimize power consumption.

(5) For V<sub>CCI</sub> values not specified in the data sheet, V<sub>IH</sub> min = V<sub>CCI</sub> × 0.7 V, V<sub>IL</sub> max = V<sub>CCI</sub> × 0.3 V.

(6) For V<sub>CCA</sub> values not specified in the data sheet, V<sub>IH</sub> min = V<sub>CCA</sub> × 0.7 V, V<sub>IL</sub> max = V<sub>CCA</sub> × 0.3 V.

## Electrical Characteristics

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

PARAMETER		CONDITIONS	V <sub>CCA</sub>	V <sub>CCB</sub>	TEMP	MIN	TYP	MAX	UNIT
V <sub>OH</sub>		I <sub>OH</sub> = -100 μA V <sub>I</sub> = V <sub>IH</sub>	1.65V to 4.5V	1.65V to 4.5V	Full	V <sub>CCO</sub> - 0.1			V
		I <sub>OH</sub> = -4mA V <sub>I</sub> = V <sub>IH</sub>	1.65V	1.65V		1.2			
		I <sub>OH</sub> = -8mA V <sub>I</sub> = V <sub>IH</sub>	2.3V	2.3V		1.9			
		I <sub>OH</sub> = -24mA V <sub>I</sub> = V <sub>IH</sub>	3V	3V		2.4			
		I <sub>OH</sub> = -32mA V <sub>I</sub> = V <sub>IH</sub>	4.5V	4.5V		3.8			
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA V <sub>I</sub> = V <sub>IL</sub>	1.65V to 4.5V	1.65V to 4.5V				0.1	V
		I <sub>OL</sub> = 4mA V <sub>I</sub> = V <sub>IL</sub>	1.65V	1.65V				0.45	
		I <sub>OL</sub> = 8mA V <sub>I</sub> = V <sub>IL</sub>	2.3V	2.3V				0.3	
		I <sub>OL</sub> = 24mA V <sub>I</sub> = V <sub>IL</sub>	3V	3V				0.55	
		I <sub>OL</sub> = 32mA V <sub>I</sub> = V <sub>IL</sub>	4.5V	4.5V				0.55	
I <sub>i</sub>	DIR Input leakage current	V <sub>I</sub> = V <sub>CCA</sub> or GND	1.65V to 5.5V	1.65V to 5.5V	+25°C		±1	μA	
					Full		±2		
I <sub>off</sub>	A or B Port	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5V	0V	0V to 5.5V	+25°C		±1	μA	
			0V to 5.5V	0V	Full		±2		
I <sub>oz</sub>	A or B Port	V <sub>O</sub> = V <sub>CCO</sub> or GND	1.65V to 5.5V	1.65V to 5.5V	+25°C		±1	μA	
					Full		±2		
I <sub>CCA</sub>	V <sub>CCA</sub> supply current	V <sub>I</sub> = V <sub>CCi</sub> or GND I <sub>O</sub> = 0	1.65V to 5.5V	2.3V to 5.5V	Full		3	μA	
			5V	0V	Full		2		
			0V	5.5V	Full		-2		
I <sub>CCB</sub>	V <sub>CCB</sub> supply current	V <sub>I</sub> = V <sub>CCi</sub> or GND I <sub>O</sub> = 0	1.65V to 5.5V	1.65V to 5.5V	Full		3	μA	
			5V	0V	Full		-2		
			0V	5V	Full		2		
I <sub>CCA</sub> + I <sub>CCB</sub>	Combined supply current	V <sub>I</sub> = V <sub>CCi</sub> or GND I <sub>O</sub> = 0	1.65V to 5.5V	1.65V to 5.5V	Full		4	μA	
ΔI <sub>CCA</sub>	A port	One A port at V <sub>CCA</sub> - 0.6 V, DIR at V <sub>CCA</sub> , B port = open	3V to 5.5V	3V to 5.5V	Full		50	μA	
	DIR	DIR at V <sub>CCA</sub> - 0.6 V, B port = open A port at V <sub>CCA</sub> or GND			Full		50		
ΔI <sub>CCB</sub>	B port	One B port at V <sub>CCB</sub> - 0.6 V, DIR at GND, A port = open	3V to 5.5V	3V to 5.5V	Full		50	μA	
C <sub>i</sub>	Input capacitance	DIR input V <sub>I</sub> = V <sub>CCA</sub> or GND	3.3V	3.3V	+25°C		4	pF	
C <sub>io</sub>	Input-to-output internal capacitance	A port V <sub>O</sub> = V <sub>CCA</sub> or GND	3.3V	3.3V	+25°C		8.5	pF	
		B port V <sub>O</sub> = V <sub>CCB</sub> or GND	3.3V	3.3V	+25°C		8.5		

(1) V<sub>CCi</sub> is the V<sub>CC</sub> associated with the input port.

(2) V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.

## Timing Requirements

**V<sub>CCA</sub>=1.8V±0.15 V**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CCB</sub> =1.8V ±0.15V		V <sub>CCB</sub> =2.5V ±0.2V		V <sub>CCB</sub> =3.3V ±0.3V		V <sub>CCB</sub> =5V ±0.5V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	3	17.5	2	9.3	1.5	7.5	1.8	9.1	ns
t <sub>PHL</sub>			2	10.3	1.7	6.4	1.1	4.5	2.4	9.8	
t <sub>PLH</sub>	B	A	2.3	13.8	2	14.1	1.9	14	1.9	15.1	ns
t <sub>PHL</sub>			2.2	11	1.9	11.6	1.8	11.6	2.2	14.7	
t <sub>PHZ</sub>	DIR	A	4	14.7	3.8	14.8	4.6	17.9	6.6	22.2	ns
t <sub>PLZ</sub>			2.5	11.6	2.5	12.6	6.8	30.5	5.3	18.5	
t <sub>PHZ</sub>	DIR	B	5.6	16.6	3.9	9.2	4.5	10	3.6	10.7	ns
t <sub>PLZ</sub>			4.6	17.6	4.4	11	9.4	23.9	4.1	10.1	
t <sub>PZH</sub>	DIR	A		29.7		22.2		20.1		17.6	ns
t <sub>PZL</sub>				19.2		17.1		18.1		18.4	
t <sub>PZH</sub>	DIR	B		24.8		18.3		16		14.8	ns
t <sub>PZL</sub>				17.9		18.9		20.1		21.7	

**V<sub>CCA</sub>=2.5V±0.2 V**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CCB</sub> =1.8V ±0.15V		V <sub>CCB</sub> =2.5V ±0.2V		V <sub>CCB</sub> =3.3V ±0.3V		V <sub>CCB</sub> =5V ±0.5V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	2.2	15.2	1.3	7.6	1.4	7	1.1	5.1	ns
t <sub>PHL</sub>			1.7	10.5	1.4	7.3	1.4	5.9	0.9	4.5	
t <sub>PLH</sub>	B	A	1.8	8.2	1.4	7.7	1.4	8	0.9	6.8	ns
t <sub>PHL</sub>			2	7.7	1.6	8.8	2	10.5	1.3	8.7	
t <sub>PHZ</sub>	DIR	A	9.9	26.7	9.9	25.9	12.6	36.5	12.2	30.8	ns
t <sub>PLZ</sub>			7.5	33.9	7.4	33.6	6.5	29.5	3.8	21.8	
t <sub>PHZ</sub>	DIR	B	21.5	78.2	13	36.5	17.6	45.9	9.1	27	ns
t <sub>PLZ</sub>			22.4	108.7	18.2	54.7	14	42	6.8	20	
t <sub>PZH</sub>	DIR	A		29.2		16.3		14.3		10.2	ns
t <sub>PZL</sub>				16.1		13.2		13.8		12.9	
t <sub>PZH</sub>	DIR	B		21.9		13		10.7		8.7	ns
t <sub>PZL</sub>				10.5		11		10.8		12.3	



**$V_{CCA}=3.3V\pm 0.3V$** 

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V \pm 0.15V$		$V_{CCB}=2.5V \pm 0.2V$		$V_{CCB}=3.3V \pm 0.3V$		$V_{CCB}=5V \pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2.1	15.5	1.4	8	0.8	6.7	0.6	4.3	ns
$t_{PHL}$			1.9	11.8	1.3	7	0.9	5.9	0.9	5.2	
$t_{PLH}$	B	A	1.5	7.5	1	5.1	0.8	7	0.7	5.9	ns
$t_{PHL}$			1.6	6.4	1.8	7.6	0.8	5	1.4	9	
$t_{PHZ}$	DIR	A	3.5	8.8	3	7.3	3.6	9.5	5.8	12.4	ns
$t_{PLZ}$			2.7	8.4	1.6	5.6	3.5	9.1	2.6	6.8	
$t_{PHZ}$	DIR	B	6.8	25	3.8	10	3.8	11.4	4.1	11.6	ns
$t_{PLZ}$			5	21.8	2.9	7.8	3.8	11.4	2	5.9	
$t_{PZH}$	DIR	A		25.1		12.8		11.2		8.2	ns
$t_{PZL}$				12.7		10.1		10.4		10.1	
$t_{PZH}$	DIR	B		23.2		12.2		10		8.1	ns
$t_{PZL}$				9.2		9.3		9.2		10.2	

 **$V_{CCA}=5V\pm 0.5V$** 

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V \pm 0.15V$		$V_{CCB}=2.5V \pm 0.2V$		$V_{CCB}=3.3V \pm 0.3V$		$V_{CCB}=5V \pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2.1	16.6	1	7.4	0.6	5.2	0.7	5.1	ns
$t_{PHL}$			1.8	12.2	0.9	6.2	1.1	7.2	0.8	5.6	
$t_{PLH}$	B	A	1.4	7.2	1	5.1	0.8	5.3	0.7	5.5	ns
$t_{PHL}$			1.5	6.3	1.1	5.8	0.9	5.2	1	7	
$t_{PHZ}$	DIR	A	4.6	11.9	2.6	6.3	5.8	14.6	5.8	14.3	ns
$t_{PLZ}$			2.7	11.2	5.9	22.4	4.2	15.7	7.4	30.3	
$t_{PHZ}$	DIR	B	10.6	44.4	2.9	11.5	2.6	22.5	6.6	17.2	ns
$t_{PLZ}$			12.4	43.7	14.8	43.7	10.6	29.8	13.1	36.9	
$t_{PZH}$	DIR	A		24.2		6.3		8		6.7	ns
$t_{PZL}$				10.9		8.6		9.5		9	
$t_{PZH}$	DIR	B		20.8		5.5		6.4		6.1	ns
$t_{PZL}$				7		7		7.6		7.7	

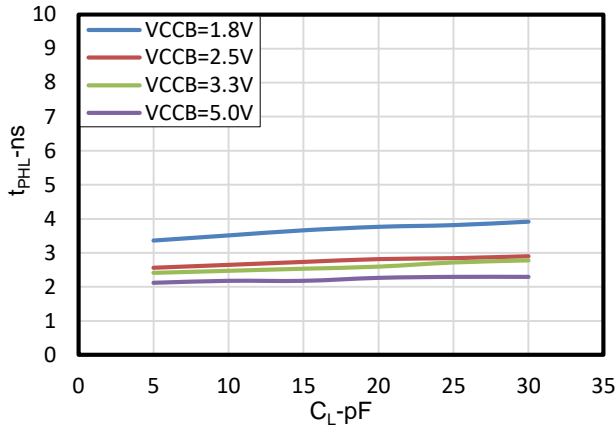
## Operating Characteristics

 $T_A=25^\circ C$ 

PARAMETER <sup>(1)</sup>		CONDITIONS	$V_{CCA}=V_{CCB}=1.8V$	$V_{CCA}=V_{CCB}=2.5V$	$V_{CCA}=V_{CCB}=3.3V$	$V_{CCA}=V_{CCB}=5V$	UNIT
			TYP	TYP	TYP	TYP	
$C_{pdA}$	A port input B port output	$C_L=0pF$ $f=10MHz$ $t_r=t_f=1ns$	2	2	2	3	pF
	B port input A port output		12	13	13	16	
$C_{pdB}$	A port input B port output	$C_L=0pF$ $f=10MHz$ $t_r=t_f=1ns$	13	13	14	16	pF
	B port input A port output		2	2	2	3	

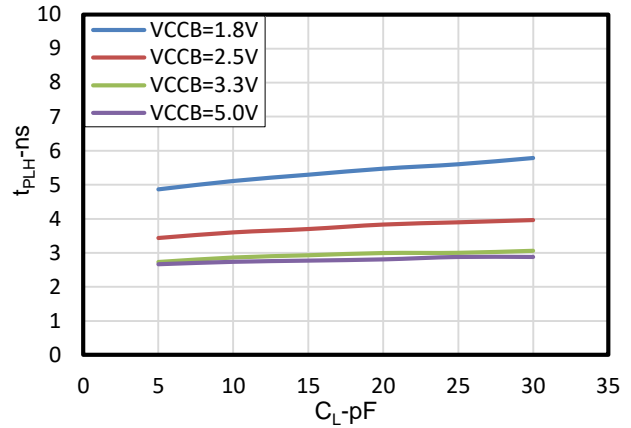
(1) Power dissipation capacitance per transceiver

## Typical Characteristics



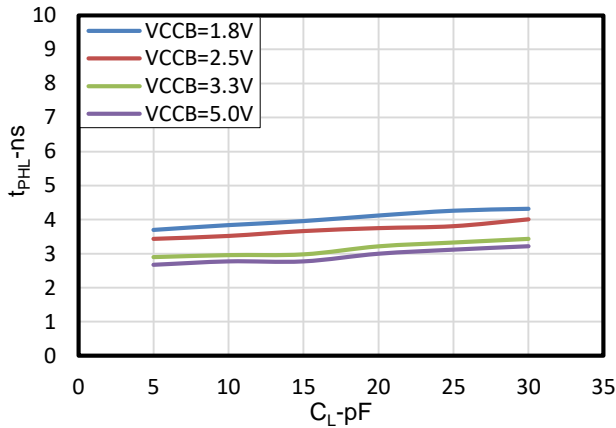
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 1.8\text{ V}$

**Figure 1. Typical Propagation Delay of High-to-Low (A to B) vs Load Capacitance**



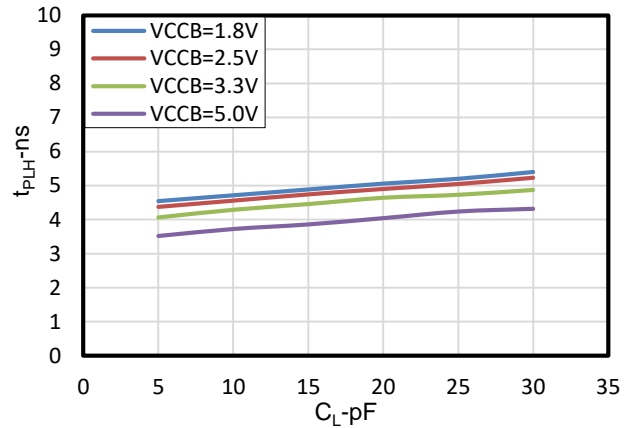
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 1.8\text{ V}$

**Figure 2. Typical Propagation Delay Low-to-High (B to A) vs Load Capacitance**



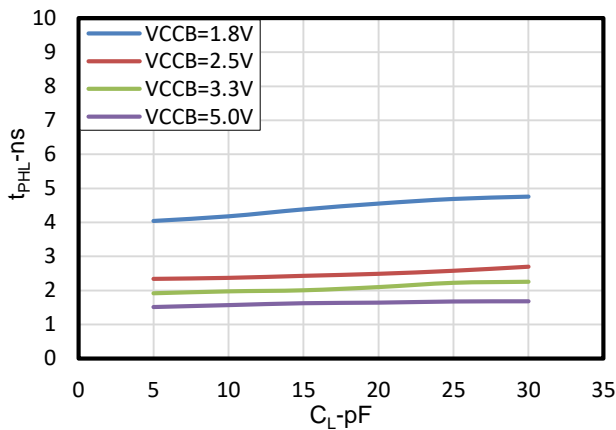
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V}$

**Figure 3. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance**



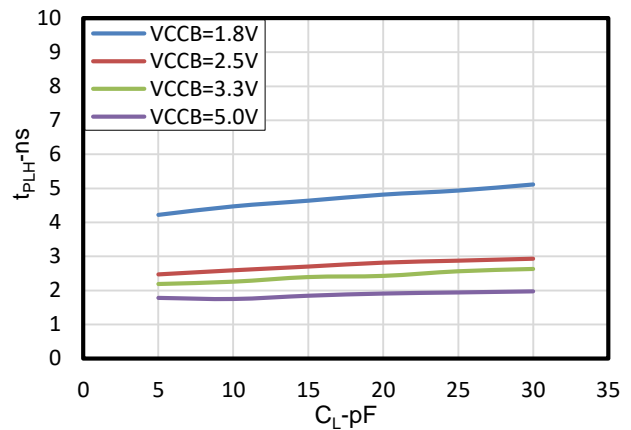
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V}$

**Figure 4. Typical Propagation Delay Low-to-High (B to A) vs Load Capacitance**



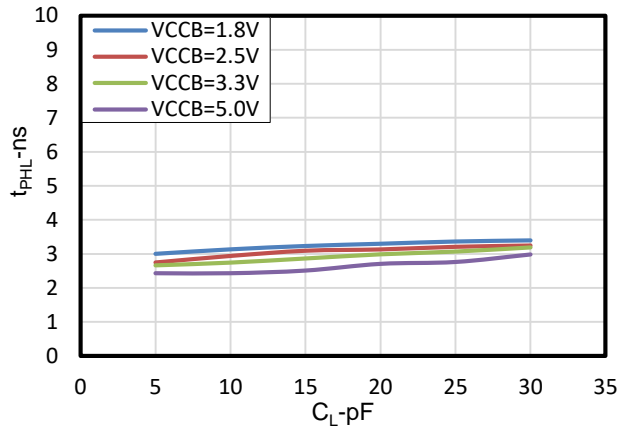
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 3.3\text{ V}$

**Figure 5. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance**

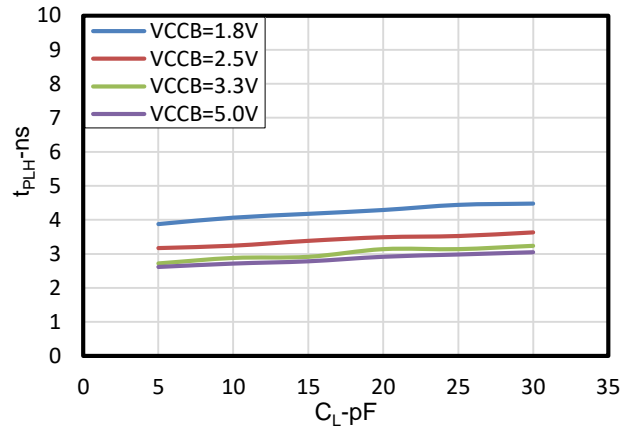


$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 3.3\text{ V}$

**Figure 6. Typical Propagation Delay Low-to-High (B to A) vs Load Capacitance**

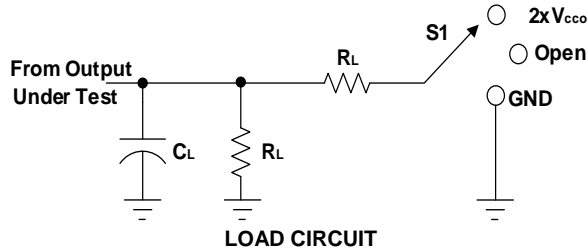


$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 5\text{ V}$   
**Figure 7. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance**



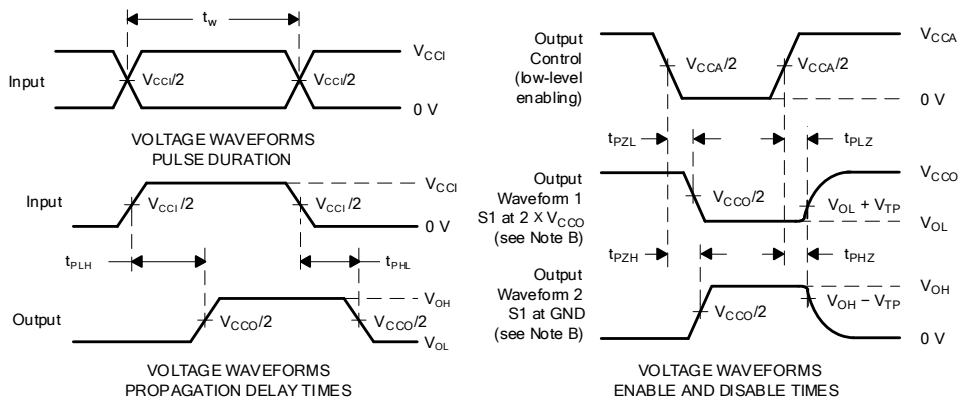
$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 5\text{ V}$   
**Figure 8. Typical Propagation Delay Low-to-High (B to A) vs Load Capacitance**

## Parameter Measurement Information



TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	2 X $V_{CCO}$
$t_{PHZ}/t_{PZH}$	GND

$V_{CC}$	$C_L$	$R_L$	$V_{TP}$
1.8V±0.15V	15pF	2kΩ	0.15V
2.5V±0.2V	15pF	2kΩ	0.15V
3.3V±0.3V	15pF	2kΩ	0.3V
5V±0.5V	15pF	2kΩ	0.3V



NOTES: A.  $C_L$  includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.

Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $Z_o = 50 \Omega$ ,  $dv/dt \geq 1V/ns$ .

D. The outputs are measured one at a time, with one transition per measurement.

E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

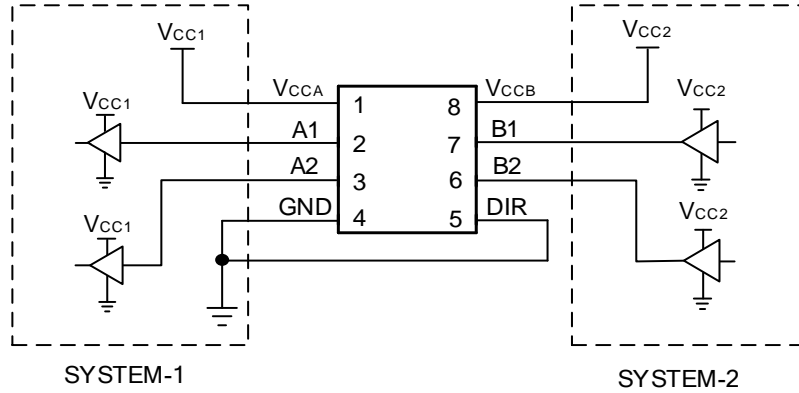
H.  $V_{CCi}$  is the  $V_{CC}$  associated with the input port.

I. All parameters and waveforms are not applicable to all devices.

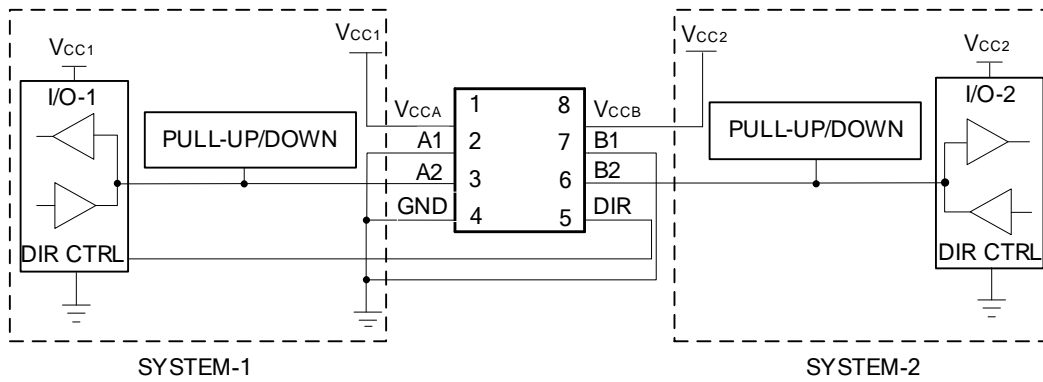
**Figure 9. Load Circuit and Voltage Waveforms**

## Application Information

The RS2T45 device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The maximum output current can be up to 32 mA when device is powered by 5 V.



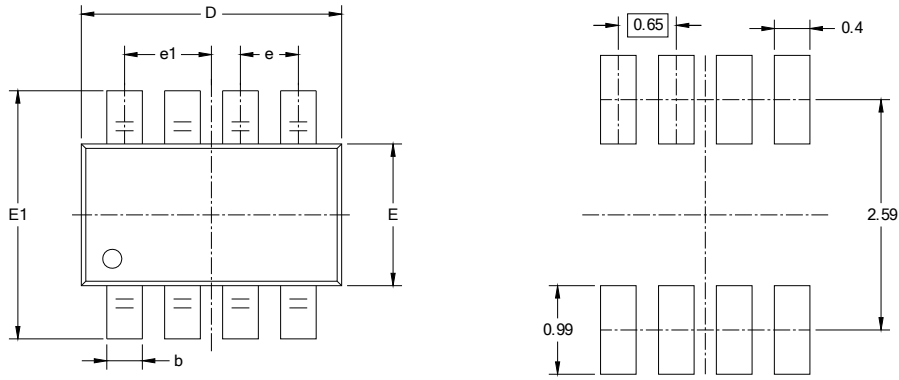
**Figure 10. Unidirectional Logic Level-Shifting Application (B to A)**



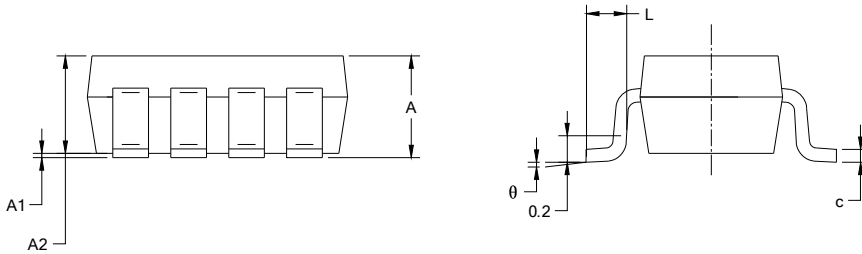
**Figure 11. Bidirectional Logic Level-Shifting Application (B to A or A to B)**

# PACKAGE OUTLINE DIMENSIONS

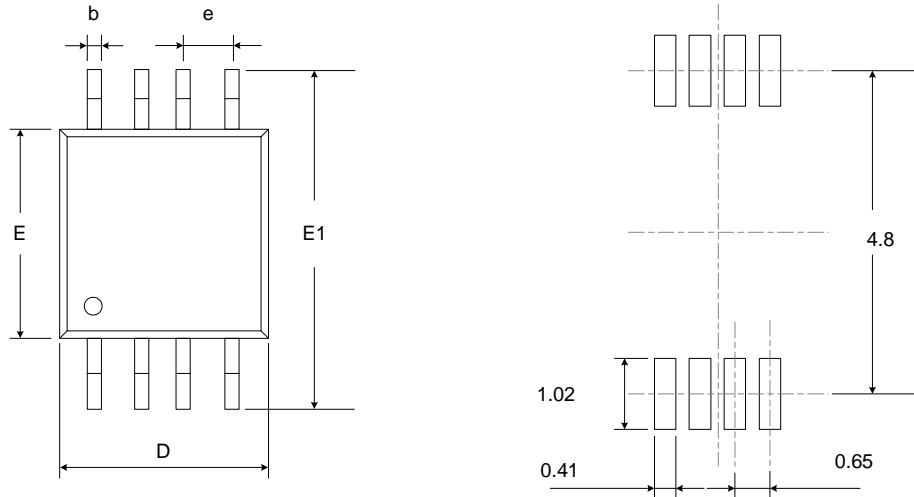
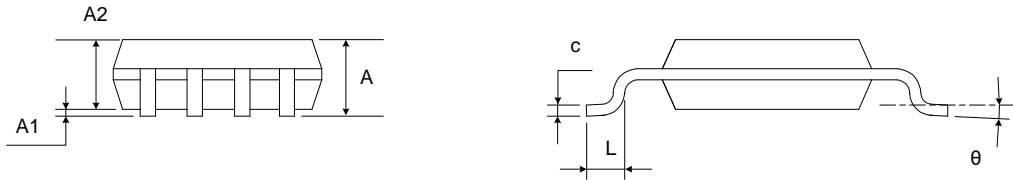
## SOT23-8



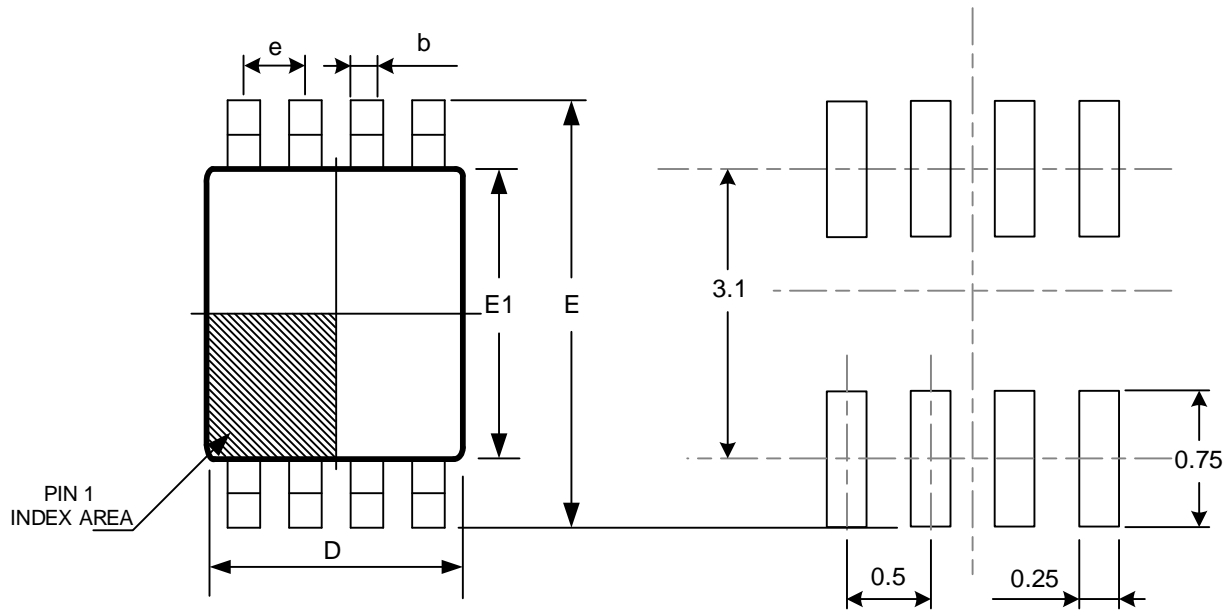
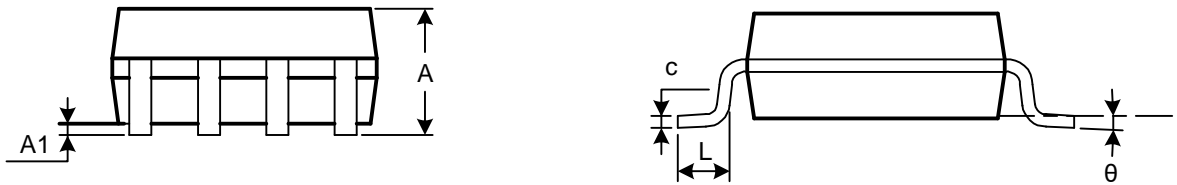
RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.650(BSC)		0.026(BSC)	
e1	0.975(BSC)		0.038(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

**MSOP-8**

**RECOMMENDED LAND PATTERN (Unit: mm)**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	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	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	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°

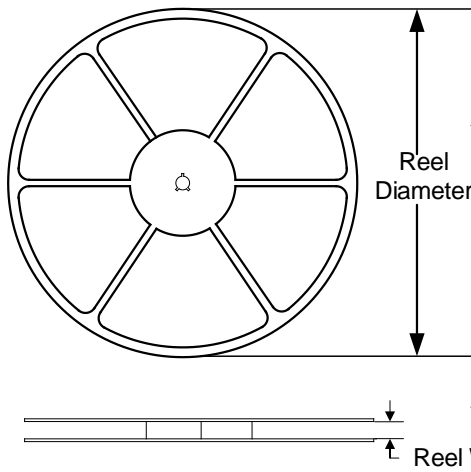
**VSSOP-8**

**RECOMMENDED LAND PATTERN (Unit: mm)**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.600	0.900	0.024	0.085
A1	0.000	0.100	0.000	0.004
b	0.170	0.250	0.007	0.010
c	0.100	0.200	0.004	0.008
D	1.900	2.100	0.075	0.083
e	0.500 (BSC)		0.020 (BSC)	
E	3.000	3.200	0.118	0.126
E1	2.200	2.400	0.087	0.095
L	0.200	0.350	0.008	0.014
$\theta$	0°	6°	0°	6°

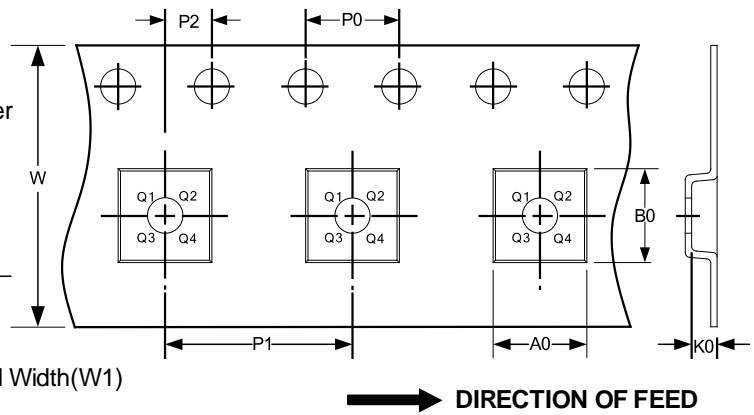


## TAPE AND REEL INFORMATION

### 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
SOT23-8	7"	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
VSSOP-8	7"	9.5	2.25	3.35	1.40	4.0	4.0	2.0	8.0	Q3

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[74LVC1G86Z-7](#) [NLV74HC14ADR2G](#) [NLV74HC20ADR2G](#) [NLVVHC1G09DFT1G](#) [NLX2G86MUTCG](#) [74LVC2G32RA3-7](#)  
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[NLVHCT132ADTR2G](#) [NL17SG86P5T5G](#) [NL17SZ05P5T5G](#) [NLV74VHC00DTR2G](#) [NLVVHC1G02DFT1G](#) [NLV74HC86ADR2G](#)  
[74LVC2G86RA3-7](#) [NL17SZ38DBVT1G](#) [NLV18SZ00DFT2G](#) [NLVVHC1G07DFT1G](#) [NLVVHC1G02DFT2G](#)