

Octal Bus Transceiver with 3-State Outputs

1 FEATURES

- **Power-Supply Range: 1V to 5.5V**
- **Low Power Consumption, 1 μ A Max I_{cc}**
- **Extended Temperature: -40°C to +125°C**

2 APPLICATIONS

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

3 DESCRIPTIONS

The RS245S is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable ($\overline{OE}$) input activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode.

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 on both A and B ports is always active and must have a logic HIGH or LOW level applied to prevent excess I_{cc}.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor, the minimum value of the resistor is determined by the current-sinking capability of the driver.

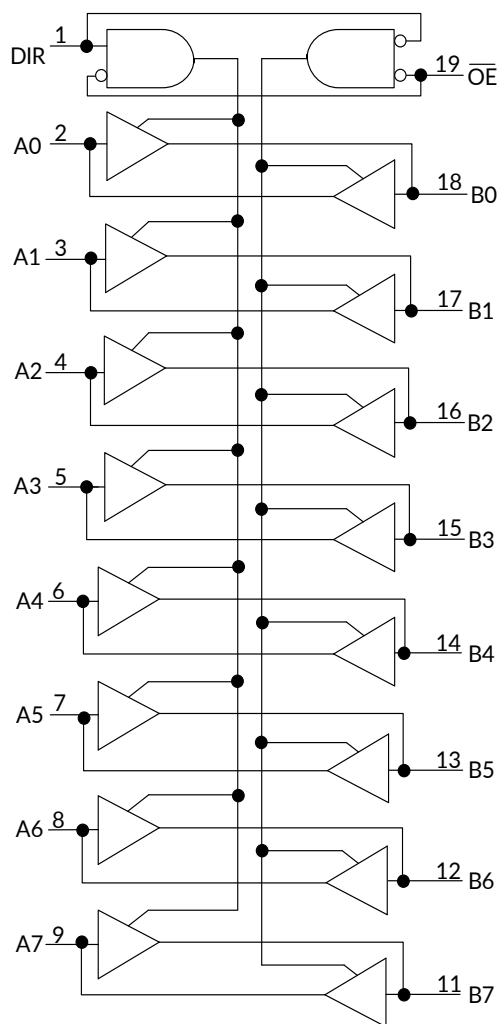
It operates over an ambient temperature range of -40°C to +125°C.

Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS245S	TSSOP20	6.50mm×4.40mm
	SOP20	12.80mm×7.50mm

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

4 FUNCTIONAL BLOCK DIAGRAM



Function Table

CONTROL INPUTS		OUTPUT CIRCUITS		OPERATION
OE	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A bus
L	H	Hi-Z	Enabled	A data to B bus
H	X	Hi-Z	Hi-Z	Isolation

NOTE:

H=HIGH voltage level

L=LOW voltage level

X=don't care

Z=high impedance OFF-state

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5 REVISION HISTORY

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

VERSION	Change Date	Change Item
A.0	2025/03/05	Preliminary version completed
A.1	2025/04/23	Initial version completed

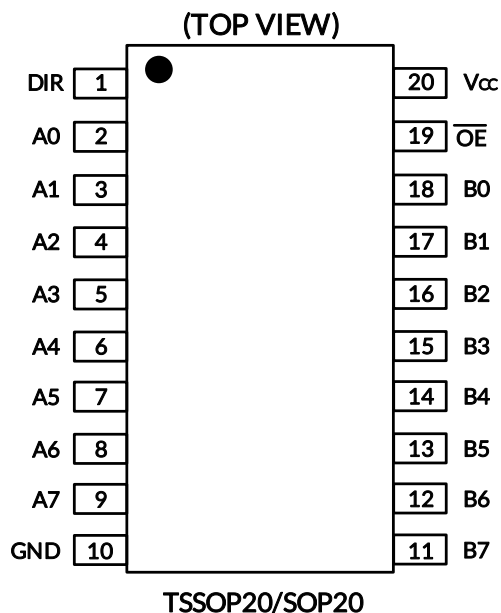
6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽²⁾	MSL ⁽³⁾	PACKAGE OPTION
RS245S	RS245SXTSS20	-40°C ~+125°C	TSSOP20	RS245S	MSL3	Tape and Reel,4000
	RS245SXS20	-40°C ~+125°C	SOP20	RS245S	MSL3	Tape and Reel,1500

NOTE:

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.
- (3) RUNIC classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F. Please align with RUNIC if your end application is quite critical to the preconditioning setting or if you have special requirement.

7 PIN CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	TYPE ⁽¹⁾	FUNCTION
TSSOP20/SOP20			
2	A0	I/O	Input/output
3	A1	I/O	Input/output
4	A2	I/O	Input/output
5	A3	I/O	Input/output
6	A4	I/O	Input/output
7	A5	I/O	Input/output
8	A6	I/O	Input/output
9	A7	I/O	Input/output
11	B7	I/O	Input/output
12	B6	I/O	Input/output
13	B5	I/O	Input/output
14	B4	I/O	Input/output
15	B3	I/O	Input/output
16	B2	I/O	Input/output
17	B1	I/O	Input/output
18	B0	I/O	Input/output
1	DIR	I	direction control
10	GND	G	Ground.
19	$\overline{OE}$	I	Output Enable (Active Low). Pull $\overline{OE}$ high to place all outputs in 3-state mode.
20	V _{CC}	P	supply voltage. $1V \leq V_{CC} \leq 5.5V$

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

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

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

SYMBOL	PARAMETER		MIN	MAX	UNIT
V _{CC}	Supply Voltage Range		-0.3	6.5	V
V _I ⁽²⁾	Input Voltage Range	A port	-0.3	6.5	V
		B port	-0.3	6.5	
		Control inputs	-0.3	6.5	
V _O ⁽²⁾	Voltage range applied to any output in the high-impedance or power-off state	A port	-0.3	6.5	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 _{CC} +0.5	V
		B port	-0.3	V _{CC} +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 _{CC} or GND			±100	mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	TSSOP20		40	°C/W
		SOP20		40	
T _J	Junction Temperature ⁽⁵⁾			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_{CC} are provided in the recommended operating conditions table.

(4) The package thermal impedance is calculated in accordance with JESD-51.

(5) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

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

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-Body Model (HBM), ANSI/ESDA/JEDEC JS001-2024	±2000	V
		Charged-Device Model (CDM), ANSI/ESDA/JEDEC JS-002-2022	±1000	V



ESD SENSITIVITY CAUTION

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

8.3 Recommended Operating Conditions

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

PARAMETER		V_{CC}	MIN	TYP	MAX	UNIT
Supply voltage	V_{CC}		1		5.5	V
High-level input Voltage (V_{IH})	Inputs ⁽³⁾	1V to 5.5V	$V_{CC} \times 0.7$			V
Low-level input Voltage (V_{IL})	Inputs ⁽³⁾	1V to 5.5V			$V_{CC} \times 0.3$	V
Input voltage (V_i)	Input voltage		0		5.5	V
Input/output voltage ($V_{I/O}$)	Active state		0		V_{CC}	V
	3-state		0		5.5	V
High-level output current (I_{OH})		1.2V			-0.1	mA
		1.65V to 1.95V			-1	
		2.3V to 2.7V			-4	
		3V to 3.6V			-6	
		4.5V to 5.5V			-10	
Low-level output current (I_{OL})		1.2V			0.1	mA
		1.65V to 1.95V			1	
		2.3V to 2.7V			4	
		3V to 3.6V			6	
		4.5V to 5.5V			10	
Input transition rise or fall rate ($\Delta t/\Delta v$)		1V to 2V			50	ns/V
		2.3V to 2.7V			20	
		3V to 3.6V			10	
		4.5V to 5.5V			5	
T_A Operating free-air temperature			-40		125	°C

(1) All unused or driven (floating) data inputs (I/Os) of the device must be held at logic HIGH or LOW (preferably V_{CC} or GND) to ensure proper device operation and minimize power.

(2) All unused control inputs must be held at V_{CC} or GND to ensure proper device operation and minimize power consumption.

(3) For V_{CC} values not specified in the data sheet, $V_{IH} \text{ min} = V_{CC} \times 0.7$, $V_{IL} \text{ max} = V_{CC} \times 0.3$ V.

8.4 Electrical Characteristics

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

PARAMETER		CONDITIONS	V _{CC}	TEMP	MIN ⁽¹⁾	TYP ⁽²⁾	MAX ⁽¹⁾	UNIT
V _{OH}		I _{OH} = -100 μ A V _I = V _{IH}	1V to 5.5V	Full	V _{CC} -0.1			V
		I _{OH} = -100 μ A V _I = V _{IH}	1.2V		1.1			
		I _{OH} = -1 mA V _I = V _{IH}	1.65V		1.3	1.5		
		I _{OH} = -4 mA V _I = V _{IH}	2.3V		1.8	2		
		I _{OH} = -6 mA V _I = V _{IH}	3V		2.2	2.6		
		I _{OH} = -10 mA V _I = V _{IH}	5V		3.6	4.4		
V _{OL}		I _{OL} = 100 μ A V _I = V _{IL}	1V to 5.5V				0.1	V
		I _{OL} = 100 μ A V _I = V _{IL}	1.2V				0.1	
		I _{OL} = 1 mA V _I = V _{IL}	1.65V			0.15	0.25	
		I _{OL} = 4 mA V _I = V _{IL}	2.3V			0.2	0.3	
		I _{OL} = 6 mA V _I = V _{IL}	3V			0.3	0.55	
		I _{OL} = 10 mA V _I = V _{IL}	5V			0.3	0.55	
I _I	DIR	V _I = V _{CC} or GND	1V to 5.5V	+25°C			±0.1	μ A
				Full			±1	
I _{OZ} ⁽³⁾	A or B Port	V _O = V _{CC} or GND, $\overline{OE}$ = V _{IH}	1V to 5.5V	+25°C			±0.1	μ A
				Full			±1	
I _{CC}	V _{CC} supply current	V _I = V _{CC} or GND ⁽⁴⁾ I _O = 0	1V to 5.5V	+25°C			±1	μ A
				Full			±2	
Δ I _{CC}	A port	One A port at V _{CC} - 0.6 V, DIR at GND, A port = open	3V to 5.5V	Full			±10	μ A
	B port	One B port at V _{CC} - 0.6 V, DIR at GND, A port = open		Full			±10	μ A
	DIR	DIR at V _{CC} - 0.6 V, B port = open A port at V _{CC} or GND		Full			±10	μ A
C _I	Control inputs	V _I = V _{CC} or GND		+25°C		4		pF
C _{IO}	A port			+25°C		9		pF
	B port			+25°C		9		
C _{PD}		No load		+25°C		6		pF

(1) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(2) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

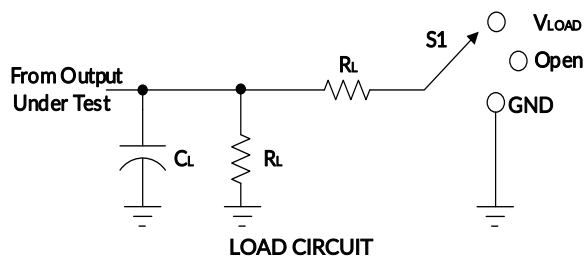
(3) For I/O ports, the parameter I_{OZ} includes the input leakage current.

(4) Hold all unused data inputs of the device at V_{CC} or GND to assure proper device operation.

8.5 Switching Characteristics

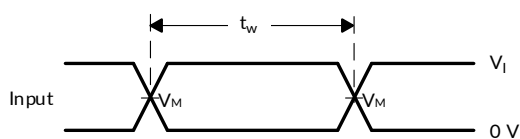
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} =1.2V	V _{CC} =1.8V ±0.15V			V _{CC} =2.5V ±0.2V			V _{CC} =3.3V ±0.3V			V _{CC} =5V ±0.5V			UNIT
			TYP	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t _{PLH}	An or Bn	Bn or An	63	5	20	30	3	10	15	3	7	13	1	5	8	ns
t _{PHL}																
t _{PHZ}	$\overline{OE}$	An or Bn	40	5	17	30	4	13	20	4	10	18	3	10	16	ns
t _{PLZ}																
t _{PZH}	$\overline{OE}$	An or Bn	152	9	40	50	5	19	32	5	15	27	3	10	16	ns
t _{PZL}																

9 PARAMETER MEASUREMENT INFORMATION

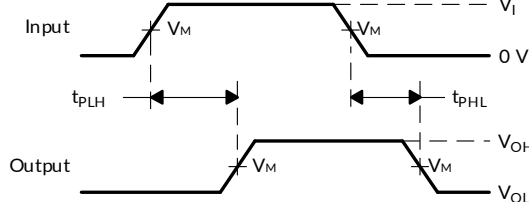


TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

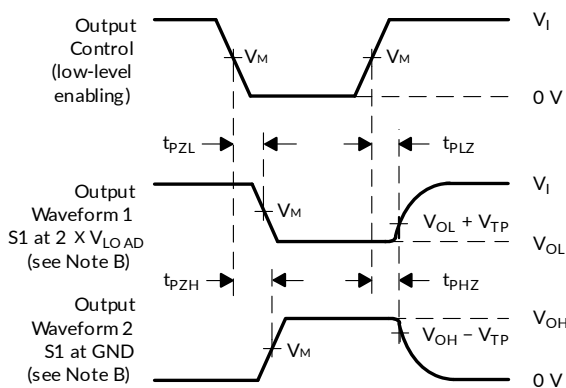
V_{CC}	V_I	V_M	C_L	R_L	V_{TP}
1.2V	V_{CC}	$V_{CC}/2$	15pF	2k Ω	0.1V
1.8V $\pm$ 0.15V	V_{CC}	$V_{CC}/2$	15pF	2k Ω	0.15V
2.5V $\pm$ 0.2V	V_{CC}	$V_{CC}/2$	15pF	2k Ω	0.15V
3.3V $\pm$ 0.3V	2.7V	1.5V	15pF	2k Ω	0.3V
5V $\pm$ 0.5V	2.7V	1.5V	15pF	2k Ω	0.3V



**VOLTAGE WAVEFORMS
PULSE DURATION**



**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**



**VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES**

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

Figure 1. Load Circuit and Voltage Waveforms

10 APPLICATION INFORMATION

RS245S is a high drive CMOS device that can be used for a multitude of bus interface type applications where output drive or PCB trace length is a concern. The inputs can accept voltages to 5.5 V at any valid V_{CC} making it ideal for down translation.

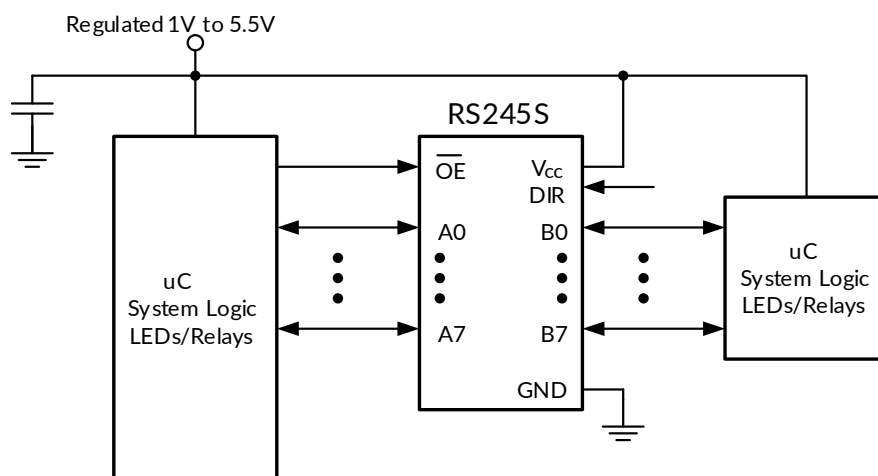
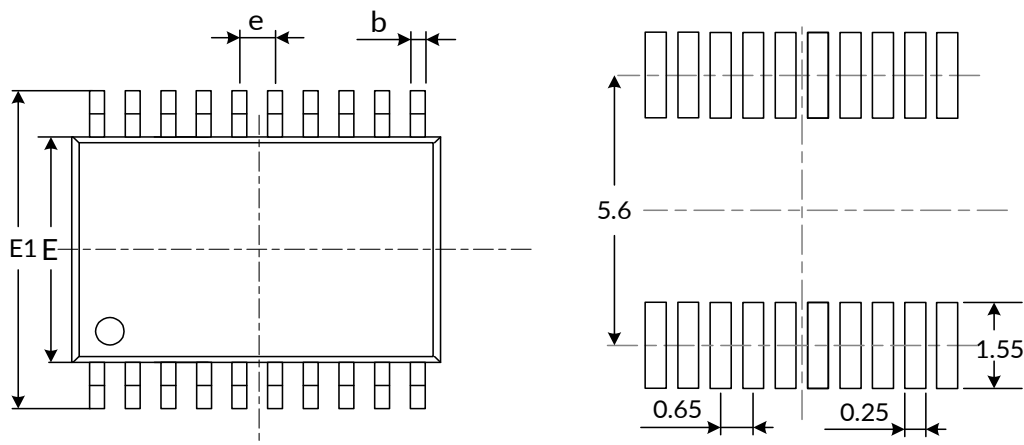


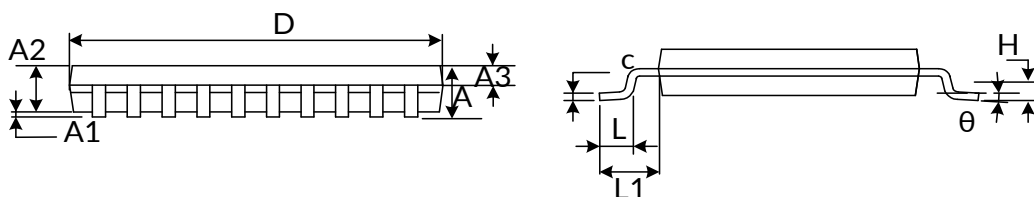
Figure 2. Typical Application Schematic

11 PACKAGE OUTLINE DIMENSIONS

TSSOP20⁽⁴⁾



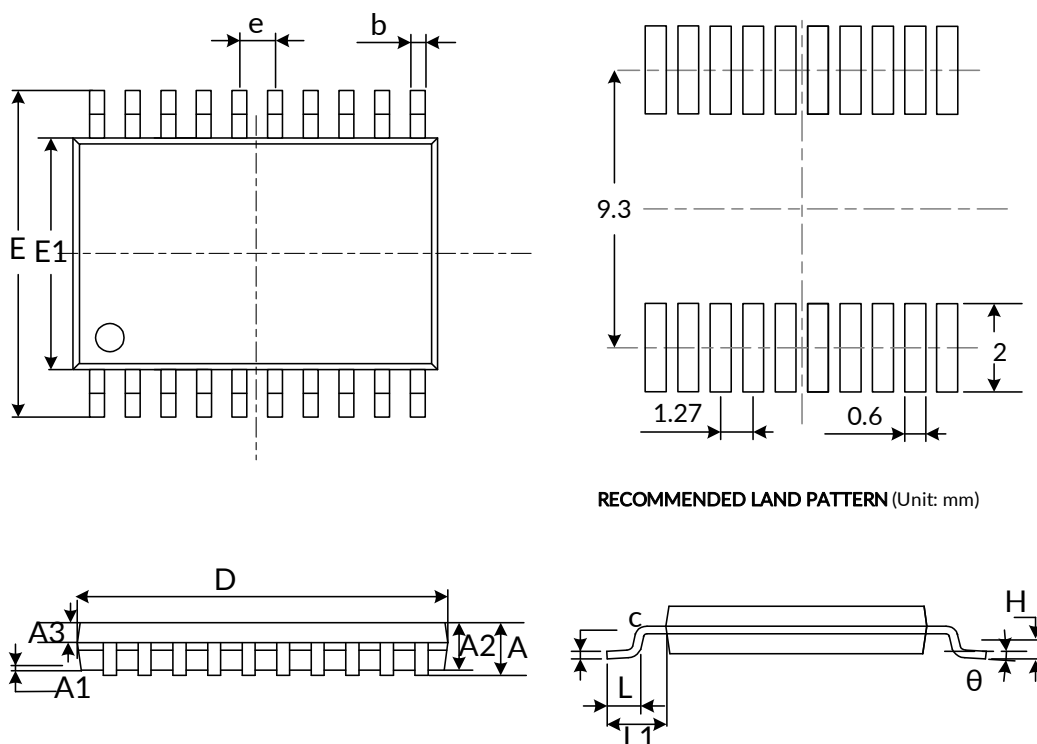
RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
A3	0.390	0.490	0.015	0.020
b	0.200	0.290	0.008	0.011
c	0.130	0.170	0.005	0.007
D ⁽¹⁾	6.400	6.600	0.252	0.260
E ⁽¹⁾	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650(BSC) ⁽²⁾		0.026(BSC) ⁽²⁾	
L	0.450	0.750	0.018	0.030
H	0.250(TYP)		0.010(TYP)	
θ	0°	8°	0°	8°
L1	1.00(REF) ⁽³⁾		0.039(REF) ⁽³⁾	

NOTE:

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

SOP20⁽⁴⁾


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾		2.650		0.104
A1	0.100	0.300	0.004	0.012
A2	2.250	2.350	0.089	0.093
A3	0.970	1.070	0.038	0.042
b	0.390	0.470	0.015	0.019
c	0.250	0.290	0.010	0.011
D ⁽¹⁾	12.700	12.900	0.500	0.508
E	10.100	10.500	0.398	0.413
E1 ⁽¹⁾	7.400	7.600	0.291	0.299
e	1.270(BSC) ⁽²⁾		0.050(BSC) ⁽²⁾	
L	0.700	1.000	0.028	0.039
H	0.250(TYP)		0.010(TYP)	
θ	0°	8°	0°	8°
L1	1.400(REF) ⁽³⁾		0.055(REF) ⁽³⁾	

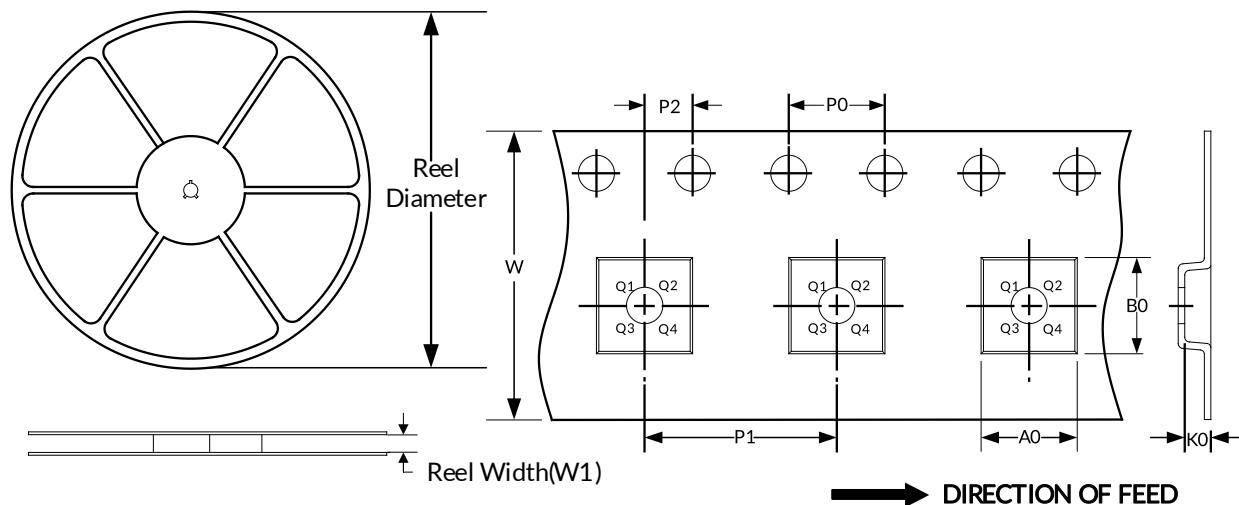
NOTE:

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2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. REF is the abbreviation for Reference.
4. This drawing is subject to change without notice.

12 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
TSSOP20	13"	12.4	6.75	6.95	1.20	4.0	8.0	2.0	16.0	Q1
SOP20	13"	24.4	10.75	13.55	2.65	4.0	12.0	2.0	24.0	Q1

NOTE:

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

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