

Octal D-type Transparent Latch with 3-State Output

1 FEATURES

- **Power-Supply Range: 1.65V to 5.5V**
- **Common 3-state Output Enable Input**
- **Balanced Propagation Delays**
- **Overvoltage Tolerant Inputs to 5.5V**
- **Low Power Consumption: 8 μ A(Max)**
- **Low Input Current: 1 μ A(Max)**
- **Extended Temperature: -40°C to +125°C**

2 APPLICATIONS

- **Power Sub-Station Controls**
- **Industrial**
- **Personal Electronics**
- **Test and Measurement Solutions**
- **Patient Monitoring**

3 DESCRIPTIONS

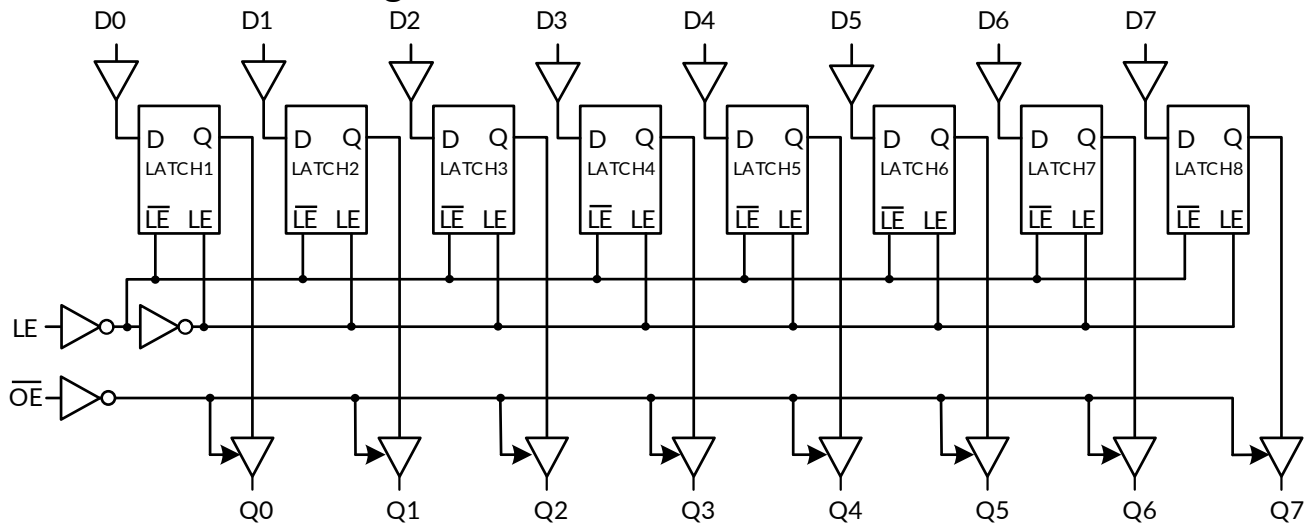
The RS573 is an 8-bit D-type transparent latch with 3-state outputs. The device features latch enable (LE) and output enable (\overline{OE}) inputs. When LE is high, data at the inputs enter the latches. In this condition the latches are transparent, a latch output will change each time its corresponding D-input changes. When LE is low the latches store the information that was present at the inputs a set-up time preceding the high-to-low transition of LE.

Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS573	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

INPUTS			Internal Latch	OUTPUT
\overline{OE}	LE	Dn		Qn
L	H	L	L	L
		H	H	H
L	L	l	L	L
		h	H	H
H	L	l	L	Z
		h	H	Z

NOTE:

- (1) H=High Voltage Level, h=High voltage level one set-up time prior to the High-to-Low LE transition
 L=Low Voltage Level, l=Low voltage level one set-up time prior to the High-to-Low LE transition
 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.1	2023/11/20	Initial version completed
A.1.1	2024/02/29	Modify packaging naming
A.2	2024/05/17	Update KEY PARAMETER LIST OF TAPE AND REEL

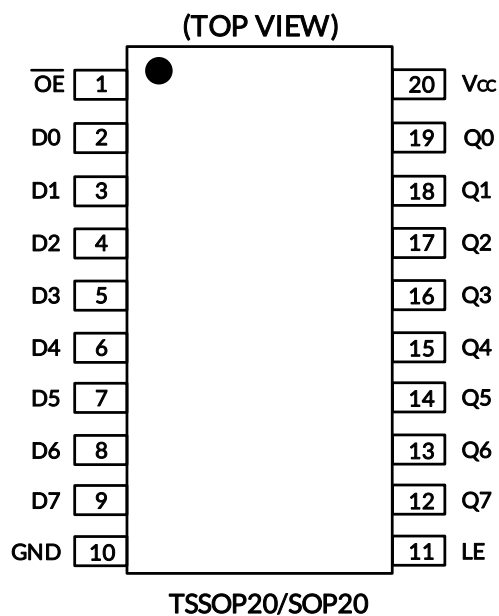
6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽²⁾	MSL ⁽³⁾	PACKAGE OPTION
RS573	RS573XTSS20	-40°C ~+125°C	TSSOP20	RS573	MSL3	Tape and Reel, 4000
	RS573XS20	-40°C ~+125°C	SOP20	RS573	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) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

7 PIN CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	TYPE ⁽¹⁾	FUNCTION
TSSOP20/SOP20			
1	\overline{OE}	I	3-State output enable input (Active Low)
2	D0	I	Data input
3	D1	I	Data input
4	D2	I	Data input
5	D3	I	Data input
6	D4	I	Data input
7	D5	I	Data input
8	D6	I	Data input
9	D7	I	Data input
10	GND	G	Ground.
11	LE	I	Latch enable input (Active High)
12	Q7	O	Data output
13	Q6	O	Data output
14	Q5	O	Data output
15	Q4	O	Data output
16	Q3	O	Data output
17	Q2	O	Data output
18	Q1	O	Data output
19	Q0	O	Data output
20	V _{cc}	P	Supply voltage

(1) I=input, O=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		-0.5	7	V
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	V _O = 0 to V _{CC}		±50	mA
	Continuous current through V _{CC} or GND			±100	mA
θ _{JA}	Package thermal impedance ⁽²⁾	TSSOP20		40	°C/W
		SOP20		40	
T _J	Junction Temperature ⁽³⁾		-40	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 package thermal impedance is calculated in accordance with JESD-51.

(3) 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), MIL-STD-883K METHOD 3015.9	±2000	V
		Charged-Device Model (CDM), ANSI/ESDA/JEDEC JS-002-2018	±1000	V
		Machine Model (MM), JESD22-A115	±200	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}		1.65		5.5	V
High-level input Voltage (V_{IH})	Inputs ⁽³⁾	1.65V to 1.95V	$V_{CC} \times 0.65$			V
		2.3V to 2.7V	1.7			
		3V to 3.6V	2			
		4.5V to 5.5V	$V_{CC} \times 0.7$			
Low-level input Voltage (V_{IL})	Inputs ⁽³⁾	1.65V to 1.95V			$V_{CC} \times 0.35$	V
		2.3V to 2.7V			0.7	
		3V to 3.6V			0.8	
		4.5V to 5.5V			$V_{CC} \times 0.3$	
Input voltage (V_i)	Input voltage		0		5.5	V
Output voltage (V_o)	Output voltage		0		V_{CC}	V
High-level output current (I_{OH})		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_{OL})		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($\Delta t/\Delta v$)	Data inputs	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	
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, $V_{IH} \text{ min} = V_{CC} \times 0.7 \text{ V}$, $V_{IL} \text{ max} = V_{CC} \times 0.3 \text{ V}$.

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} = -100μA V _I =V _{IH}	1.65V to 4.5V	+25°C	V _{CC} -0.1			V	
	I _{OH} = -4mA V _I =V _{IH}	1.65V		1.2				
	I _{OH} = -8mA V _I =V _{IH}	2.5V		1.9				
	I _{OH} = -24mA V _I =V _{IH}	3.3V		2.4				
	I _{OH} = -32mA V _I =V _{IH}	4.5V		3.8				
V _{OL}	I _{OL} = 100μA V _I =V _{IL}	1.65V to 4.5V					0.1	V
	I _{OL} = 4mA V _I =V _{IL}	1.65V					0.45	
	I _{OL} = 8mA V _I =V _{IL}	2.5V					0.3	
	I _{OL} = 24mA V _I =V _{IL}	3.3V					0.55	
	I _{OL} = 32mA V _I =V _{IL}	4.5V					0.55	
I _I All inputs	V _I = 5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA	
			Full			±5		
I _{off}	V _I or V _O = 5.5V	0V	+25°C		±0.1	±1	μA	
			Full			±10		
I _{OZ} ⁽³⁾	V _O = V _{CC} or GND	1.65V to 5.5V	+25°C		±0.1	±1	μA	
			Full			±10		
I _{CC} V _{CC} supply current	V _I = V _{CC} or GND ⁽⁴⁾ I _O = 0	1.65V to 5.5V	+25°C		0.1	8	μA	
			Full			80		
C _I	f=1MHZ	1.65V to 5.5V	+25°C		3		pF	
C _{PD}	f=1MHZ	no load	+25°C		13		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

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

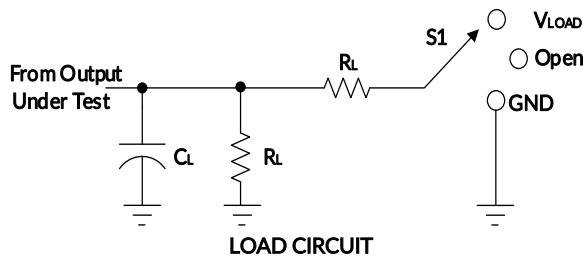
PARAMETER	TEST CONDITIONS	V _{CC} =1.8V ±0.15V			V _{CC} =2.5V ±0.2V			V _{CC} =3.3V ±0.3V			V _{CC} =5V ±0.5V			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t _{pd}	C _L =50pF, from D (input) to Q (output)		25			12			10			8		ns
	C _L =50pF, from LE (input) to Q (output)		37			23			18			14		ns
t _{en}	C _L =50pF, from \overline{OE} (input) to Q (output)		27			17			14			10		ns
t _{dis}	C _L =50pF, from \overline{OE} (input) to Q (output)		22			14			12			9		ns
t _t	C _L =50pF to any Q (output)		20			10			8			7		ns
t _{pd}	C _L =150pF, from D (input) to Q (output)		35			17			16			14		ns
	C _L =150pF, from LE (input) to Q (output)		46			26			21			17		ns
t _{en}	C _L =150pF, from \overline{OE} (input) to Q (output)		36			21			17			12		ns
t _{dis}	C _L =150pF, from \overline{OE} (input) to Q (output)		33			23			21			20		ns
t _t	C _L =150pF to any Q (output)		56			21			16			15		ns

8.6 Timing Requirements

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

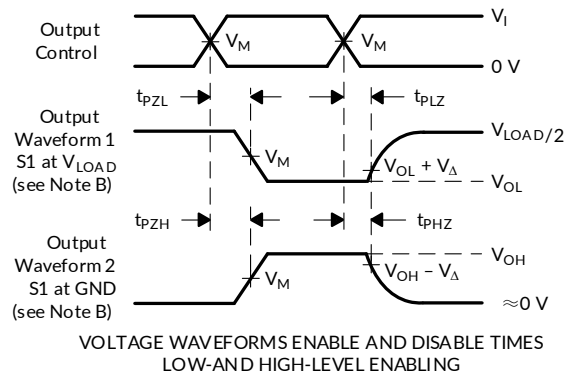
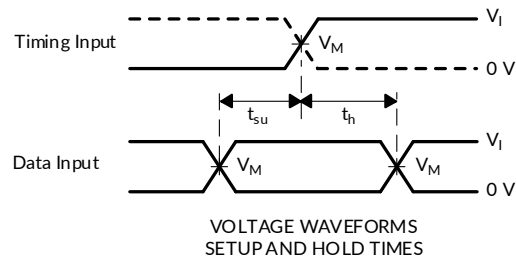
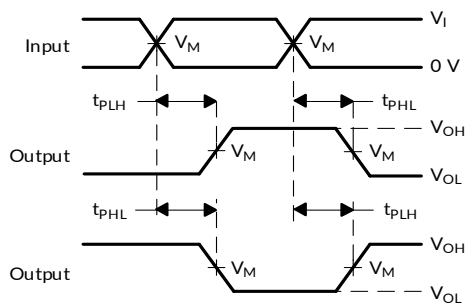
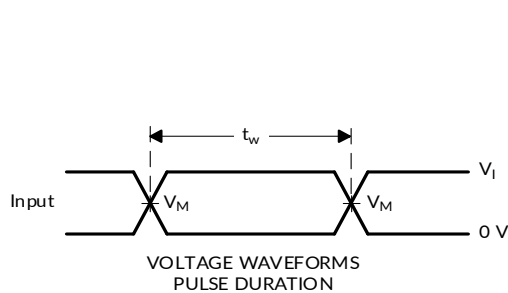
PARAMETER	TEST CONDITIONS	V _{CC} =1.8V ±0.15V			V _{CC} =2.5V ±0.2V			V _{CC} =3.3V ±0.3V			V _{CC} =5V ±0.5V			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t _w	Pulse duration, LE high		75			65			60			30		ns
t _{su}	Setup time, data before LE↓		16			16			16			16		ns
t _h	Hold time, data after LE↓		19			17			16			16		ns

9 Parameter Measurement Information



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

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{TP}
	V_I	tr/tf					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF or 150pF	2k Ω	0.15V
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF or 150pF	2k Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF or 150pF	2k Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF or 150pF	2k Ω	0.3V

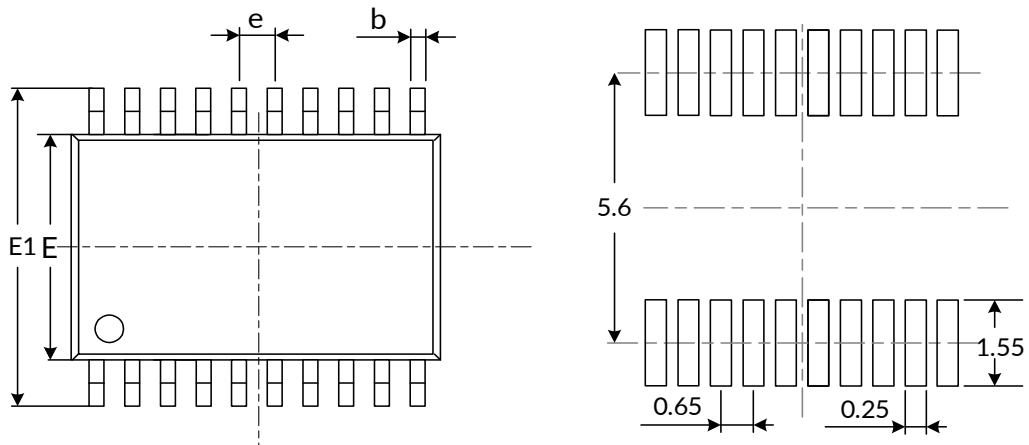
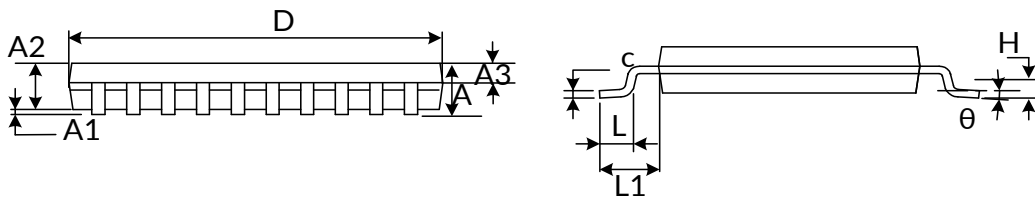


- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_0 = 50\Omega$.
 - 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 PACKAGE OUTLINE DIMENSIONS

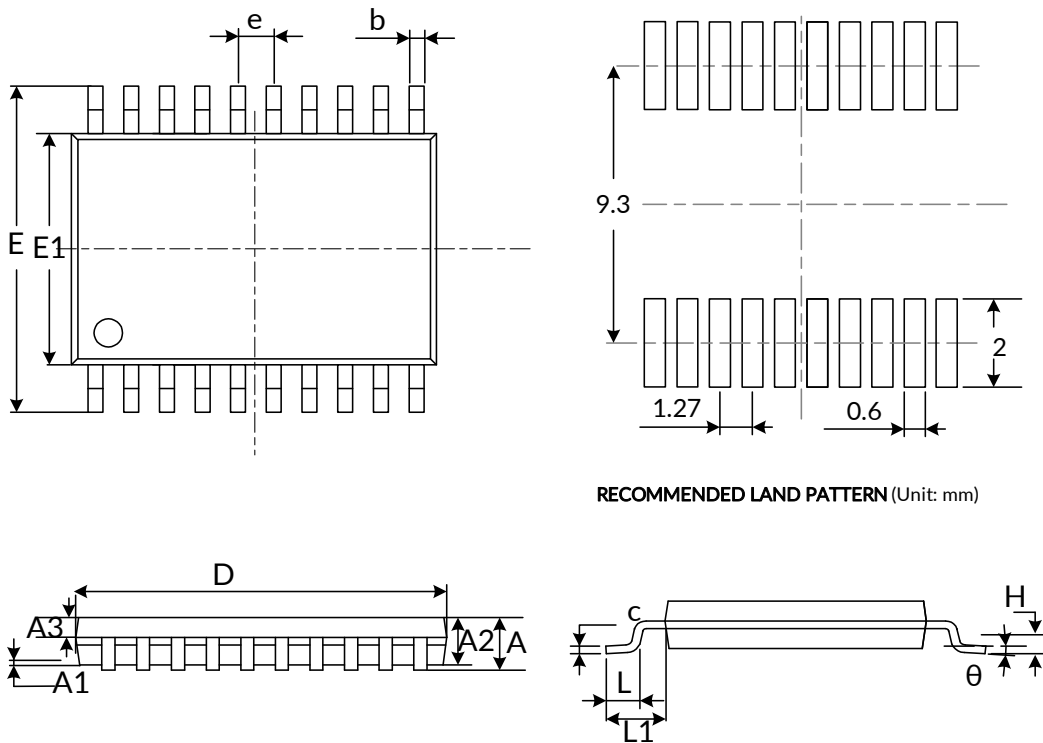
TSSOP20⁽⁴⁾


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⁾

RECOMMENDED LAND PATTERN (Unit: mm)

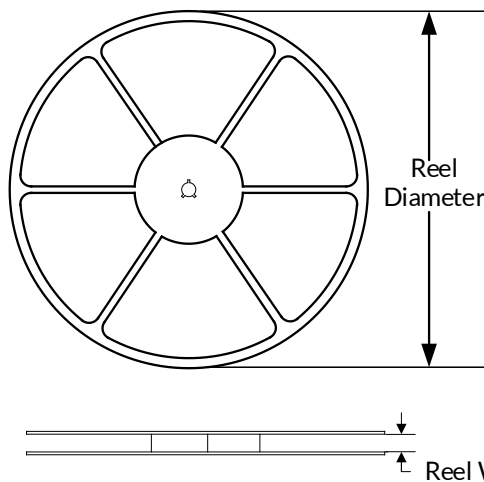
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾		2.650		0.104
A1	0.100	0.300	0.004	0.012
A2	2.250	2.350	0.089	0.093
A3	0.970	1.070	0.038	0.042
b	0.390	0.470	0.015	0.019
c	0.250	0.290	0.010	0.011
D ⁽¹⁾	12.700	12.900	0.500	0.508
E	10.100	10.500	0.398	0.413
E1 ⁽¹⁾	7.400	7.600	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:

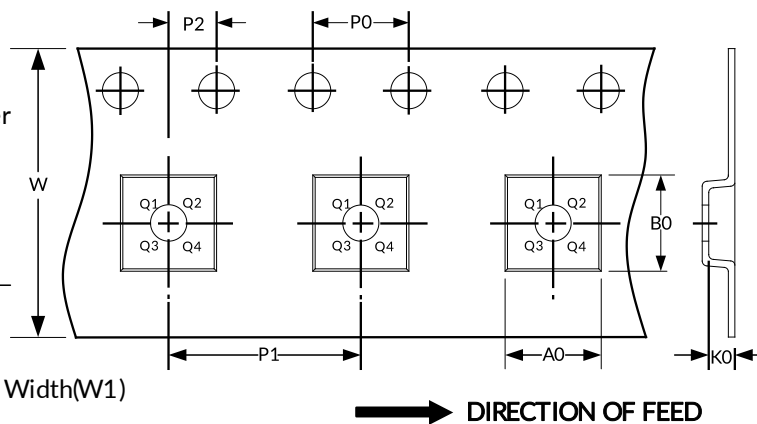
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4. This drawing is subject to change without notice.

11 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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