NOVOSENSE
纳芯微电子

NCA8541
Octal Buffers and Line Drivers With 3-State Outputs
Datasheet (EN) 1.0

Product Overview

NCA8541 is an octal buffer/driver used for improving driver ability of bus-oriented receivers and transmitters, clock drivers etc. and ensuring the accuracy of signal timing. It provides eight channels with two output-enable(/OE) input that low active. When both /OE1 and /OE2 are active, NCA8541 transmits data from A to Y. When either output-enable is high, the outputs are in the high-impedance state. During power up and power down, /OE should be tied to VCC through a pull-up resistor to ensure the high impedance state.

NCA8541 can tolerate up to 5.5V input voltage and each channel supports maximum 24mA current drive. All unused inputs must be held at V_{CC} or GND to prevent excess supply current.

Key Features

- Qualified for Automotive applications:
  NCA8541-Q1TSTR
- Inputs are TTL compatible
- Power supply voltage: 4. 5V to 5.5V
- 5.5 V Tolerant Inputs
- ESD Protection Exceeds JESD 22
  - 4000V Human-Body Model (A114-A)
  - 2000V Charged-Device Model (C101)
- Operation temperature: -40℃~125℃
- RoHS-compliant packages: TSSOP20

Applications

- Motor driver
- Traction inverter
- I/O modules
- LED displays

Device Information

Part Number	*Package*	*Body Size*
NCA8541-DTSTR	TSSOP20	6.50mm × 4.50mm
NCA8541-Q1TSTR	TSSOP20	6.50mm × 4.50mm

Functional Block Diagrams

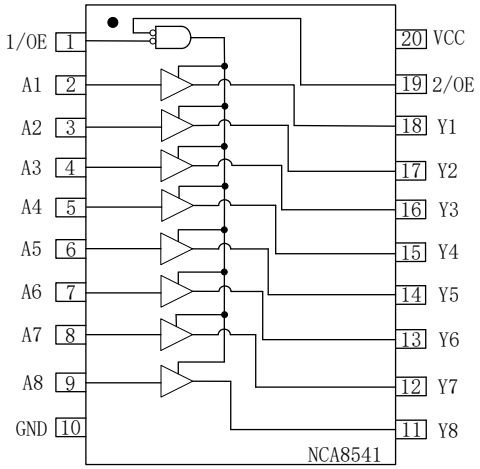

Figure 1. NCA8541 Block Diagram

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1. Pin Configuration and Functions

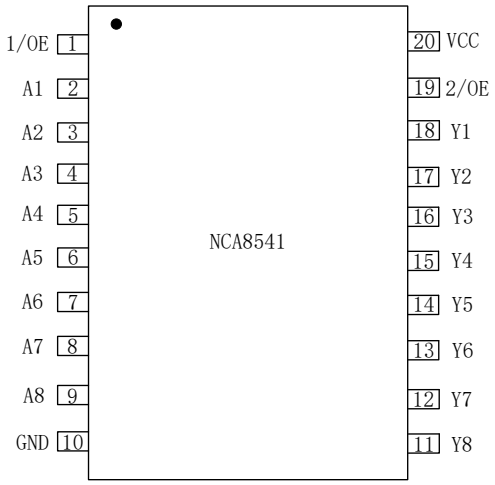


Figure 1.1 NCA8541 Package

Table 1.1 NCA8541 Pin Configuration and Description

NCA8541 PIN NO.	*SYMBOL*	*FUNCTION*
1	1/OE	Active low Output-enable 1
2	A1	Input of Y1
3	A2	Input of Y2
4	A3	Input of Y3
5	A4	Input of Y4
6	A5	Input of Y5
7	A6	Input of Y6
8	A7	Input of Y7
9	A8	Input of Y8
10	GND	Ground
11	Y8	Output of A8
12	Y7	Output of A7
13	Y6	Output of A6
14	Y5	Output of A5
15	Y4	Output of A4
16	Y3	Output of A3
17	Y2	Output of A2

18	Y1	Output of A1
19	2/OE	Active low Output-enable 2
20	V_{CC}	Power

2. Absolute Maximum Ratings

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Power Supply Voltage	V_{CC}	-0.5		7	V	
Maximum Input Voltage	V_I	-0.5		V_{CC} +0.5	V	The maximum voltage must not exceed 7V
Maximum Output Voltage	V_O	-0.5		V_{CC} +0.5	V	The maximum voltage must not exceed 7V
Input clamp current	I_{IK}	-20		20	mA	$V_I < 0$ or $V_I > V_{CC}$
Output clamp current	I_{OK}	-20		20	mA	$V_I < 0$ or $V_I > V_{CC}$
Continuous output current	I_O	-35		35	mA	V_O=0 to V_{CC}
Ambient Temperature	T_a	-40		125	℃	
Junction Temperature	T_J			150	℃	
Storage Temperature	T_{stg}	-65		150	℃	
Electrostatic discharge	HBM	-4000		4000	V	Per ANSI/ESDA/JEDEC JS-001
	CDM	-2000		2000	V	Per JEDEC specification JESD22- C101

3. Recommended Operating Conditions

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

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Power Supply Voltage	V_{CC}	4.5		5.5	V	
High-level output current	I_{OH}	-24			mA	
Low-level output current	I_{OL}			24	mA	
Input transition rise or fall rate	Δt/Δv			500	ns/V	
Operating free-air temperature	T_a	-40		125	℃	

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

4. Thermal Information

Parameters	Symbol	TSSOP20	Unit
Junction-to-ambient thermal resistance	$R_{\theta JA}$	103	°C/W
Junction-to-case(top) thermal resistance	$R_{\theta JC(top)}$	37.7	°C/W
Junction-to-board thermal resistance	$R_{\theta JB}$	54	°C/W
Junction-to- top characterization parameter	Ψ_{JT}	6.8	°C/W
Junction-to- board characterization parameter	Ψ_{JB}	65.1	°C/W

5. Specifications

5.1. Electrical Characteristics

T_a=-40℃ to 125℃. Unless otherwise noted, Typical values are at Ta = 25℃

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	I_{CC}			80	uA	V_{CC}=5.5V， V_I = V_{CC} or GND, I_O = 0
Increasing supply current(1)	ΔI_{CC}			3	mA	One input at 0.5V or 2.4V, Other inputs at GND or V_{CC}, V_{CC}=5.5V
High-level input voltage	V_{IH}	2			V	
Low-level input voltage	V_{IL}			0.8	V	
High-level output voltage	V_{OH}	4.4	4.49		V	V_{CC}=4.5V， I_{OH}=-20uA
		3.9	4.3		V	V_{CC}=4.5V， I_{OH}=-6mA
		3.9				V_{CC}=4.5V， I_{OH}=-24mA
Low-level output voltage	V_{OL}		0.001	0.1	V	V_{CC}=4.5V， I_{OL}=20uA
			0.17	0.5	V	V_{CC}=4.5V， I_{OL}=6mA
				0.55	V	V_{CC}=4.5V， I_{OL}=24mA
Three-state output current	I_{OZ}	-2.5		2.5	uA	V_{CC}=5.5V, V_O=0 to V_{CC}, V_I = V_{IH} or V_{IL}
Input current	I_I	-1		1	uA	V_{CC}=5.5V， V_I= V_{CC} or GND
Input capacitance	C_i		4		pF	
Output capacitance	C_O		8.5		pF	

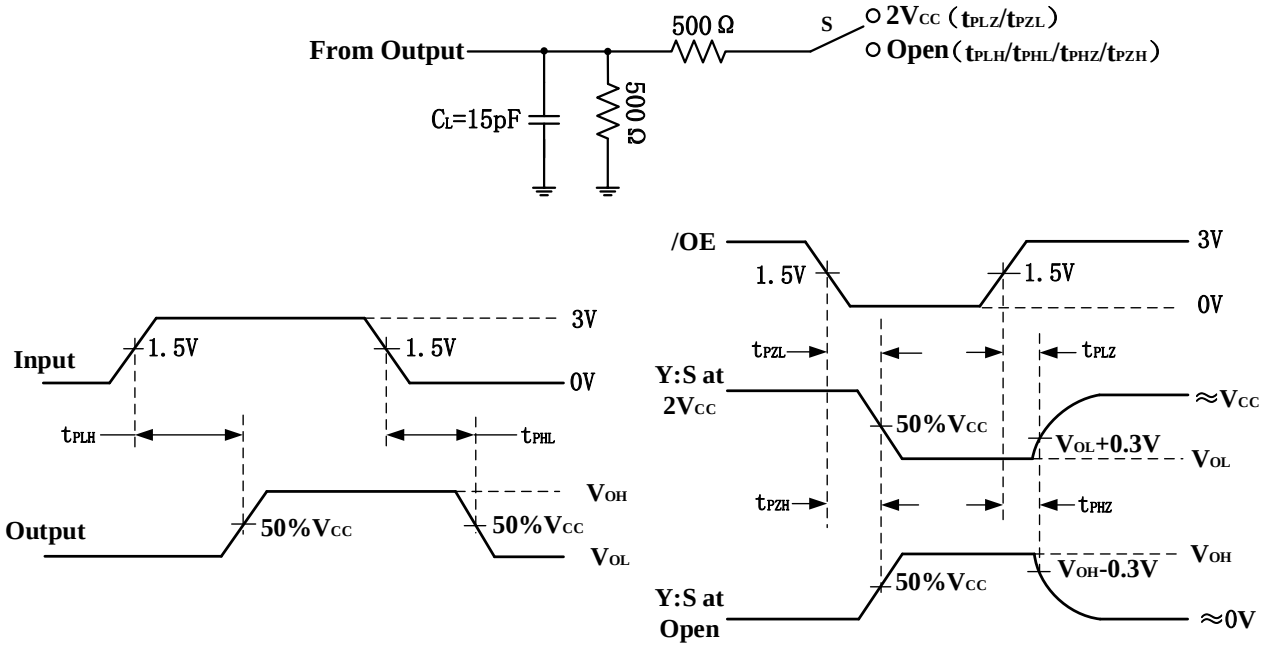
(1) The increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0V or V_{CC}.

5.2. Dynamic Characteristics

V_{CC}=4.5V~5.5V ,T_a=-40℃ to 125℃. Unless otherwise noted, Typical values are at T_a = 25℃, see figure1.

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Propagation Delay	t_{PLH}		8	15	ns	V_{CC}=4.5V
	t_{PHL}		7	15		V_{CC}=5.5V
Enable to Data Valid	t_{PZH}		7	15	ns	V_{CC}=4.5V
	t_{PZL}		7	15		V_{CC}=5.5V
Disable to tri-state	t_{PHZ}		8	15	ns	V_{CC}=4.5V
	t_{PLZ}		7.5	15		V_{CC}=5.5V

5.3. Parameter measurement information



Note:
1) All input pulses with the following characteristics: PRR ≤1MHz, ZO = 50 Ω, tr ≤ 2.5ns, tf ≤ 2.5ns;
2) C_L includes probe and test-fixture capacitance.

Figure 5.1 Load Circuit and Voltage Waveforms for NCA8541

6. Function Description

6.1. Overview

NCA8541 is an octal buffer used for improving driver ability of 3-state memory address, clock drivers, and bus-oriented receivers and transmitters and ensuring the accuracy of signal timing. It provides eight channels with two output-enable(/OE) input that low active. When both 1/OE and 2/OE are active, NCA8541 transmits data from A to Y. When either output-enable is high, the outputs are in the high-impedance state. During power up and power down, /OE should be tied to V_{CC} through a pull-up resistor to ensure the high impedance state. All unused inputs of NCA8541 must be held at V_{CC} or GND to prevent excess I_{CC}.

Table 6.1 Function Table

A_IN(1)	*1/OE status*	*2/OE status*	*VCC status*	*Y_OUT*	*Comment*
L	L	L	Ready	L	Normal operation.
H	L	L	Ready	H	
X	H	X	Ready	Z	Output Disabled, the output is high impedance.
X	X	H	Ready	Z	
X	X	X	Unready	Z	The output follows the same status with the input after V_{CC} is powered on and output is enabled.

(1) L=Logic low; H=Logic high; X=Logic low or logic high.

7. Application Note

7.1. Application Information

The NCA8541 can be used in motor driver, traction inverter, IO modules and LED displays. The maximum output current can be up to 24 mA.

7.2. Typical Application Circuit

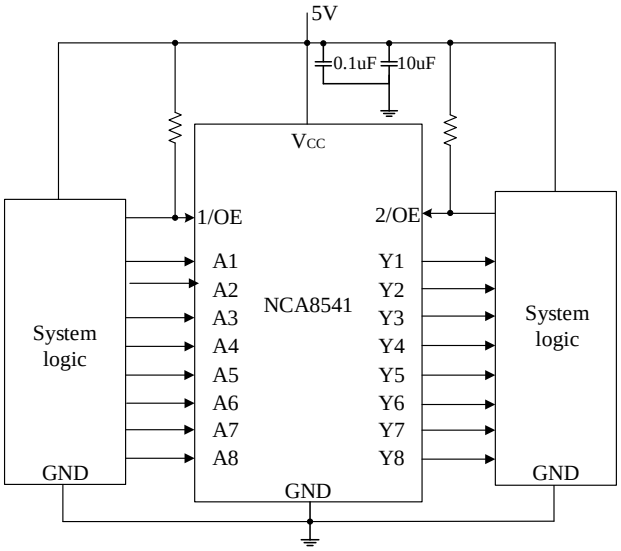
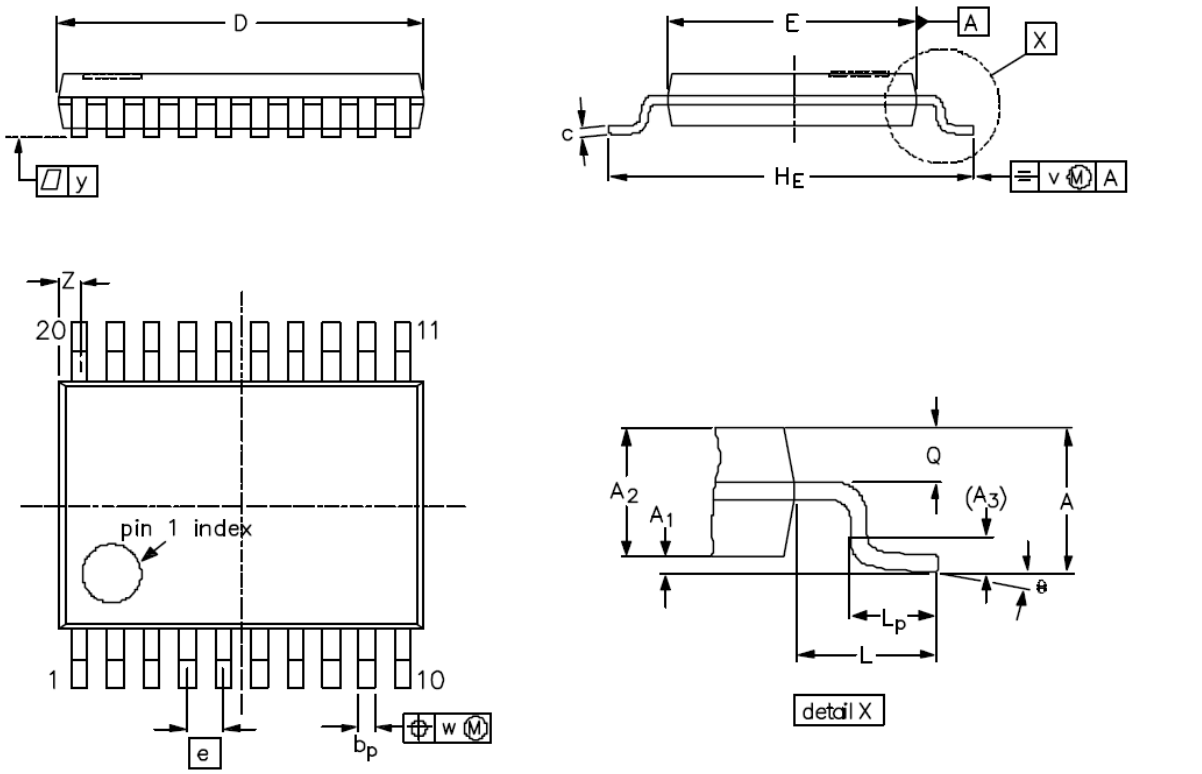


Figure 7.1 Typical application circuit for NCA8541

8. Package Information



DIMENSIONS (mm are the original dimensions)

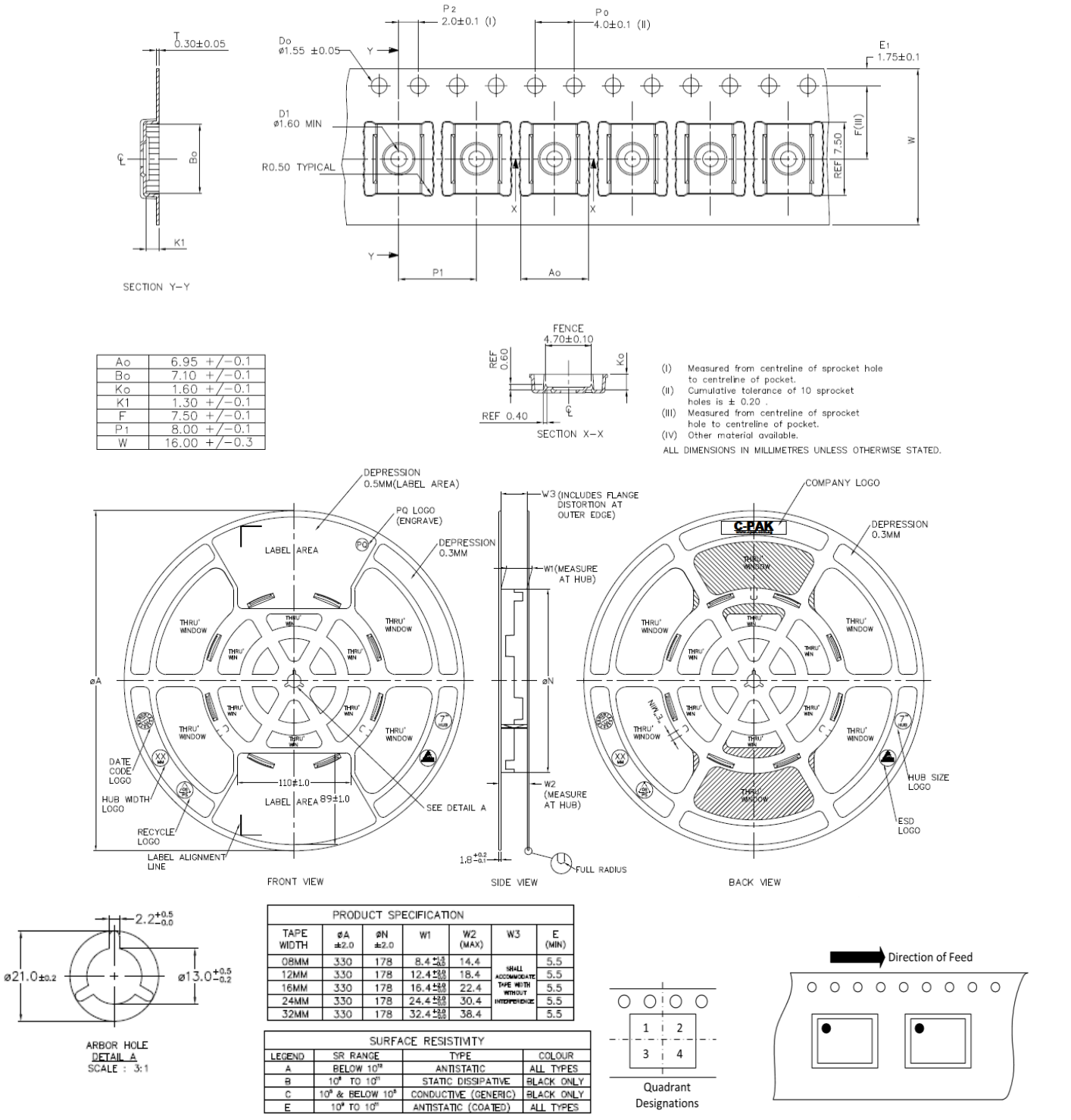
UNIT	A max.	A1	A2	A3	bp	c	D (1)	E (2)	e	HE	L	Lp	Q	v	w	y	Z (1)	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

Figure 8.1 TSSOP20 Package Shape and Dimension in millimeters

9. Ordering Information

Part Number	*PINS*	*Temperature*	*MSL*	*Package Type*	*Package Drawing*	*SPQ*
NCA8541-DTSTR	20	-40 to 125℃	1	TSSOP20	TSSOP20	2500
NCA8541-Q1TSTR	20	-40 to 125℃	1	TSSOP20	TSSOP20	2500
NOTE: All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.						

10. Tape and Reel Information



Ao	6.95 +/−0.1
Bo	7.10 +/−0.1
Ko	1.60 +/−0.1
K1	1.30 +/−0.1
F	7.50 +/−0.1
P1	8.00 +/−0.1
W	16.00 +/−0.3

PRODUCT SPECIFICATION

TAPE WIDTH	øA ±2.0	øN ±2.0	W1	W2 (MAX)	W3	E (MIN)
08MM	330	178	8.4	14.4	SHALL ACCOMMODATE TAPE WIDTH WITHOUT INTERFERENCE	5.5
12MM	330	178	12.4	18.4		5.5
16MM	330	178	16.4	22.4		5.5
24MM	330	178	24.4	30.4		5.5
32MM	330	178	32.4	38.4		5.5

SURFACE RESISTIVITY

LEGEND	SR RANGE	TYPE	COLOUR
A	BELOW 10^{12}	ANTISTATIC	ALL TYPES
B	10^{6} TO 10^{9}	STATIC DISSIPATIVE	BLACK ONLY
C	10^{5} & BELOW 10^{6}	CONDUCTIVE (GENERIC)	BLACK ONLY
E	10^{6} TO 10^{11}	ANTISTATIC (COATED)	ALL TYPES

Figure 10.1 Tape and Reel Information of TSSOP

11. Revision History

Revision	Description	Date
1.0	Initial Version.	2023/4/23

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