NCA84245

Octal Bus Transceiver and 3.3V to 5V Shifter with 3-State Outputs

Datasheet (EN) 1.0

Product Overview

NCA84245 is an 8-bit bus transceiver with two separate configurable power-supply. The A port tracks V_{CCA} which ranges from 4.5V to 5.5V and B port tracks V_{CCB} which ranges from 2.7V to 3.6V, so it supports bidirectional translation between the two voltage ranges.

NCA84245 is mainly used for asynchronous communication between two data buses. The device provides a direction-control (DIR) input for transmitting data bidirectionally. When DIR is logic high, it transmits data from A to B, and from B to A when DIR is logic low. The output-enable /OE tracks V_{CCA} and is low active, When /OE 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.

Each channel of NCA84245 supports maximum 24 mA current drive. All unused inputs must be held at V_{CC} or GND to prevent excess supply current.

Key Features

- Qualified for Automotive applications:
  NCA84245-Q1TSXR
- Control inputs are referenced to V_{CCA}
- Power supply voltage:
  V_{CCA}: 4.5V to 5.5V
  V_{CCB}: 2.7V to 3.6V
- ESD Protection Exceeds JESD 22
  — 4000V Human-Body Model
  — 2000V Charged-Device Model
- Operation temperature: -40℃~125℃
- RoHS-compliant package: TSSOP24

Applications

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

Device Information

Part Number	Package	Body Size
NCA84245-DTSXR	TSSOP24	7.80mm × 4.40mm
NCA84245-Q1TSXR	TSSOP24	7.80mm × 4.40mm

Functional Block Diagrams

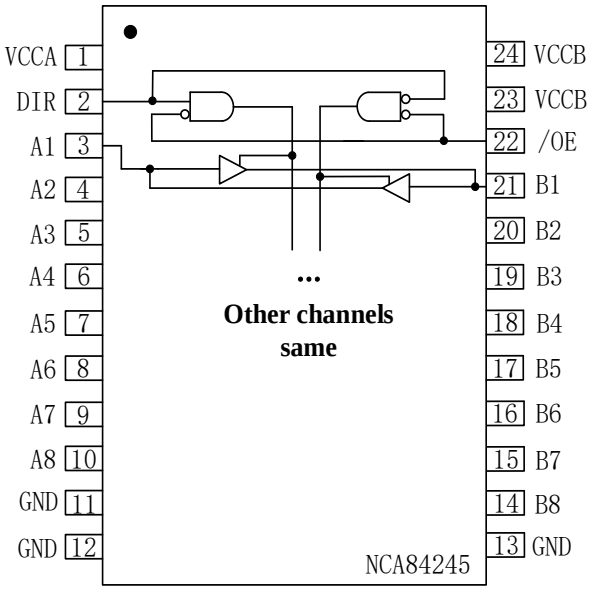


Figure 1. NCA84245 Block Diagram

INDEX

1. PIN CONFIGURATION AND FUNCTIONS 3
2. ABSOLUTE MAXIMUM RATINGS 4
3. RECOMMENDED OPERATING CONDITIONS 5
4. THERMAL INFORMATION 5
5. SPECIFICATIONS 5
5.1. ELECTRICAL CHARACTERISTICS 5
5.2. DYNAMIC CHARACTERISTICS 7
5.3. PARAMETER MEASUREMENT INFORMATION 7
5.3.1. A port 7
5.3.2. B port 8
6. FUNCTION DESCRIPTION 8
6.1. OVERVIEW 8
7. APPLICATION NOTE 9
7.1. APPLICATION INFORMATION 9
7.2. TYPICAL APPLICATION CIRCUIT 9
8. PACKAGE INFORMATION 9
9. ORDERING INFORMATION 10
10. TAPE AND REEL INFORMATION 10
11. REVISION HISTORY 11

1. Pin Configuration and Functions

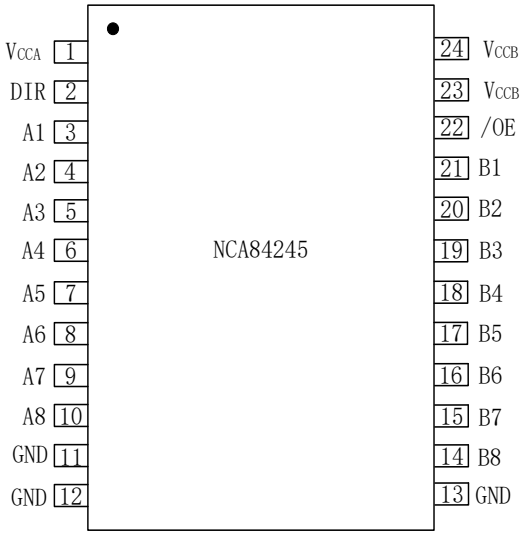


Figure 1.1 NCA84245 Package

Table 1.1 NCA84245 Pin Configuration and Description

NCA84245 PIN NO.	*SYMBOL*	*FUNCTION*
1	V_{CCA}	Power supply
2	DIR	Direction control, referenced to V_{CCA}. DIR is logic high, direction is from A to B and DIR is logic low, transmission is from B to A.
3	A1	Input/Output, referenced to V_{CCA}
4	A2	Input/Output, referenced to V_{CCA}
5	A3	Input/Output, referenced to V_{CCA}
6	A4	Input/Output, referenced to V_{CCA}
7	A5	Input/Output, referenced to V_{CCA}
8	A6	Input/Output, referenced to V_{CCA}
9	A7	Input/Output, referenced to V_{CCA}
10	A8	Input/Output, referenced to V_{CCA}
11	GND	Ground
12	GND	Ground
13	GND	Ground
14	B8	Input/Output, referenced to V_{CCB}
15	B7	Input/Output, referenced to V_{CCB}

16	B6	Input/Output, referenced to V_{CCB}
17	B5	Input/Output, referenced to V_{CCB}
18	B4	Input/Output, referenced to V_{CCB}
19	B3	Input/Output, referenced to V_{CCB}
20	B2	Input/Output, referenced to V_{CCB}
21	B1	Input/Output, referenced to V_{CCB}
22	/OE	Active low output enable, referenced to V_{CCA}
23	V_{CCB}	Power supply
24	V_{CCB}	Power supply

2. Absolute Maximum Ratings

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Power Supply Voltage	V_{CCA}	-0.5		7	V	
	V_{CCB}	-0.5		5.5	V	
Input Voltage	V_I	-0.5		V_{CCA}+0.5	V	A port, Maximum≤7V
		-0.5		5.5	V	Control inputs
		-0.5		V_{CCB}+0.5	V	B port, Maximum≤5.5V
Output Voltage	V_O	-0.5		V_{CCA}+0.5	V	A port, Maximum≤5.5V
		-0.5		V_{CCB}+0.5	V	B port, Maximum≤5.5V
Input clamp current	I_{IK}			-50	mA	$V_I < 0$
Output clamp current	I_{OK}			-50	mA	$V_O < 0$
Continuous output current	I_O	-50		50	mA	V_O=0 to V_{CC}
		-100		100	mA	V_{CCA}, V_{CCB}, GND
Absolute Maximum 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

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Power Supply Voltage	V_{CCA}	4.5		5.5	V	
	V_{CCB}	2.7		3.6	V	
High-level input voltage	V_{IH}	2			V	
Low-level input voltage	V_{IL}			0.8	V	
Input/Output Voltage	$V_{I/O}$	0		V_{CCA}	V	A port
		0		V_{CCB}		B port
High-level output current	I_{OH}			-24	mA	A port
				-12	mA	B port, V_{CCB}=2.7V
				-24	mA	B port, V_{CCB}=3.6V
Low-level output current	I_{OL}			24	mA	A port
				12		B port, V_{CCB}=2.7V
				24		B port, V_{CCB}=3.6V
Input transition rise or fall rate	Δt/Δv			20	ns/V	V_{CCI}:1.65V to 1.95V
				20		V_{CCI}:2.3V to 2.7V
				10		V_{CCI}:3V to 3.6V
				5		V_{CCI}:4.5V to 5.5V
Operating free-air temperature	T_A	-40		125	℃	

4. Thermal Information

Parameters	Symbol	TSSOP24	Unit
Junction-to-ambient thermal resistance	θ_{JA}	90.6	°C/W
Junction-to-case(top) thermal resistance	$\theta_{JC(top)}$	27.6	°C/W
Junction-to-board thermal resistance	θ_{JB}	45.3	°C/W
Junction-to-top characterization parameter	Ψ_{JT}	1.3	°C/W
Junction-to-board characterization parameter	Ψ_{JB}	44.8	°C/W

5. Specifications

5.1. Electrical Characteristics

(V_{CCA}=4.5V to 5.5V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at V_{CCA}=5V, V_{CCB}=3.3V, Ta = 25℃)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
High-level output voltage	V_{OH}	V_{CC}-0.2			V	I_{OH}=-100uA V_{CCA}=4.5V to 4.5V, V_{CCB}=2.7V to 3.6V
		3.9				I_{OH}=-24mA，V_{CCA} =4.5V
		4.9				I_{OH}=-24mA，V_{CCA} =5.5V
		2.2				I_{OH}=-12mA， V_{CCB}=2.7V
		2.4				I_{OH}=-12mA， V_{CCB}=3V
		2			V	I_{OH}=-24mA，V_{CCB} =3V
Low-level output voltage	V_{OL}			0.2	V	I_{OL}=100uA， V_{CCA}=4.5V to 4.5V, V_{CCB}=2.7V to 3.6V
				0.55		I_{OL}=24mA，V_{CCA}=4.5V
				0.55		I_{OL}=24mA， V_{CCA}=5.5V
				0.4		I_{OL}=12mA， V_{CCB}=2.7V
				0.55		I_{OL}=24mA，V_{CCB} =3V
Input current	I_I	-1		1	uA	DIR, /OE pin V_I=V_{CCA} or GND, V_{CCA}= 5.5V
Three-state output current	I_{OZ}	-2		2	uA	V_O = V_{CCA} or GND, /OE = V_{IH} V_{CCA}= 5.5V
		-5		5		V_O = V_{CCB} or GND, /OE = V_{IH} V_{CCA}= 3.6V
Supply current	I_{CCA}			80	uA	V_I= V_{CCA} or GND, I_O = 0 V_{CCA}= 5.5V
	I_{CCB}			50	uA	V_I= V_{CCB} or GND, I_O = 0 V_{CCB}=3.6V
Increasing supply current(1)	ΔI_{CCA}			1.5	mA	One input at 3.4V, Other inputs at V_{CCA}or GND, V_{CCA}= 5.5V
	ΔI_{CCB}			0.5	mA	One input at V_{CCB} -0.6V, Other inputs at V_{CCB} or GND, V_{CCB}= 2.7V to 3.6V
Input capacitance	C_i		5		pF	Control inputs
Output capacitance	C_O		11		pF	

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

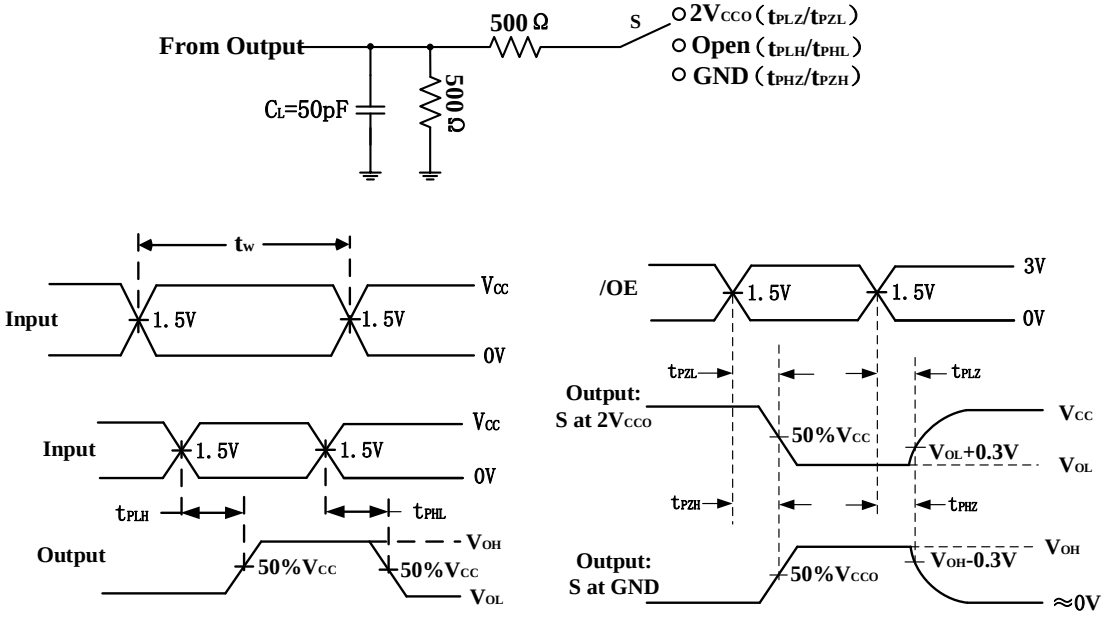
5.2. Dynamic Characteristics

(V_{CCA}=4.5V to 5.5V, V_{CCB}=2.7V to 3.6V,Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at V_{CCA}=5V, V_{CCB}=3.3V, Ta = 25℃)
(See figure 1 and figure 2)

Parameters	Symbol	MIN	TYP	MAX	Unit	Comments
Propagation Delay	t_{PLH}		6.5	10	ns	A to B
	t_{PHL}		7.2	10		
	t_{PLH}		5.5	10	ns	B to A
	t_{PHL}		6.2	10		
Enable to Data high Valid	t_{PZH}			15	ns	/OE to A
Enable to Data Low Valid	t_{PZL}			15		
Enable to Data high Valid	t_{PZH}			15	ns	/OE to B
Enable to Data Low Valid	t_{PZL}			15		
Disable high to tri-state	t_{PHZ}			15	ns	/OE to A
Disable low to tri-state	t_{PLZ}			15		
Disable high to tri-state	t_{PHZ}			15	ns	/OE to B
Disable low to tri-state	t_{PLZ}			15		

5.3. Parameter measurement information

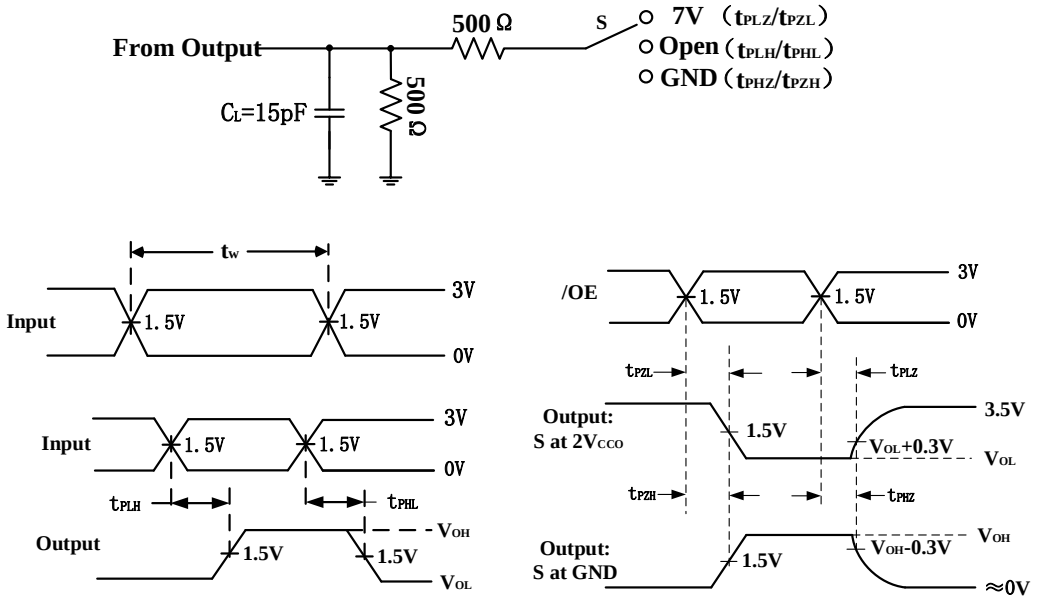
5.3.1. A port



Note: All input pulses with the following characteristics: PRR ≤10MHz, ZO = 50 Ω, t_r≤ 2.5ns, t_f≤ 2.5ns.

Figure 5.1. Load Circuit and Voltage Waveforms

5.3.2. B port



Note: All input pulses with the following characteristics: PRR ≤10MHz, ZO = 50 Ω, tr ≤ 2.5ns, tf ≤ 2.5ns.

Figure 5.2. Load Circuit and Voltage Waveforms

6. Function Description

6.1. Overview

NCA84245 is an 8-bit bus transceiver with two separate configurable power-supply. The A port tracks V_{CCA} which ranges from 4.5V to 5.5V and B port tracks V_{CCB} which ranges from 2.7V to 3.6V, so it supports bidirectional translation between the two voltage ranges. NCA84245 is mainly used for asynchronous communication between two data buses. The device provides a direction-control (DIR) input for transmitting data bidirectionally. When DIR is logic high, it transmits data from A to B, and from B to A when DIR is logic low. The output-enable /OE tracks V_{CCA} and is low active, When /OE 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. All unused inputs must be held at V_{CC} or GND to prevent excess supply current.

Table 6.1 Function Table

DIR	/OE	A	B	VCCA	VCCB	Comment
L(1)	L	L	L	Ready	Ready	Normal operation. Transmission from B to A
L	L	H	H	Ready	Ready	
H	L	L	L	Ready	Ready	Normal operation. Transmission from A to B
H	L	H	H	Ready	Ready	
L	H	Z	X	Ready	Ready	Output Disabled, the output is high impedance.
H	H	X	Z	Ready	Ready	
X	X	Z	Z	Ready	Unready	The output follows the same status with the input after V_{CC} is powered on and output is enabled.
X	X	Z	Z	Unready	Ready	
X	X	Z	Z	Unready	Unready	

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

7. Application Note

7.1. Application Information

The NCA84245 can be used in voltage level-translation applications for interface device or systems requiring different voltages. The maximum output current can be up to 24 mA at 3V supply.

7.2. Typical Application Circuit

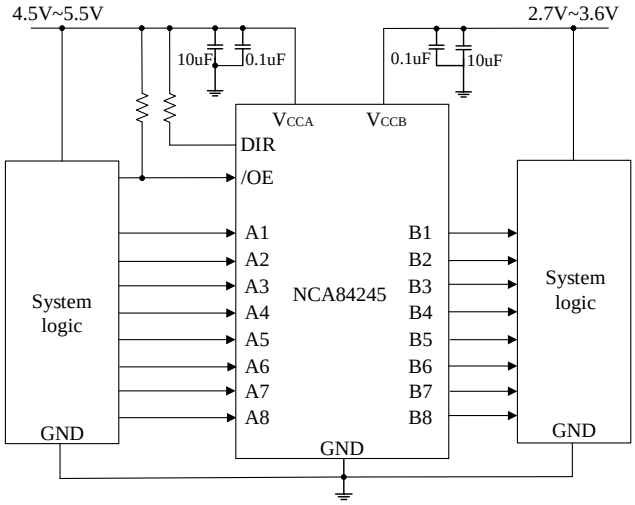
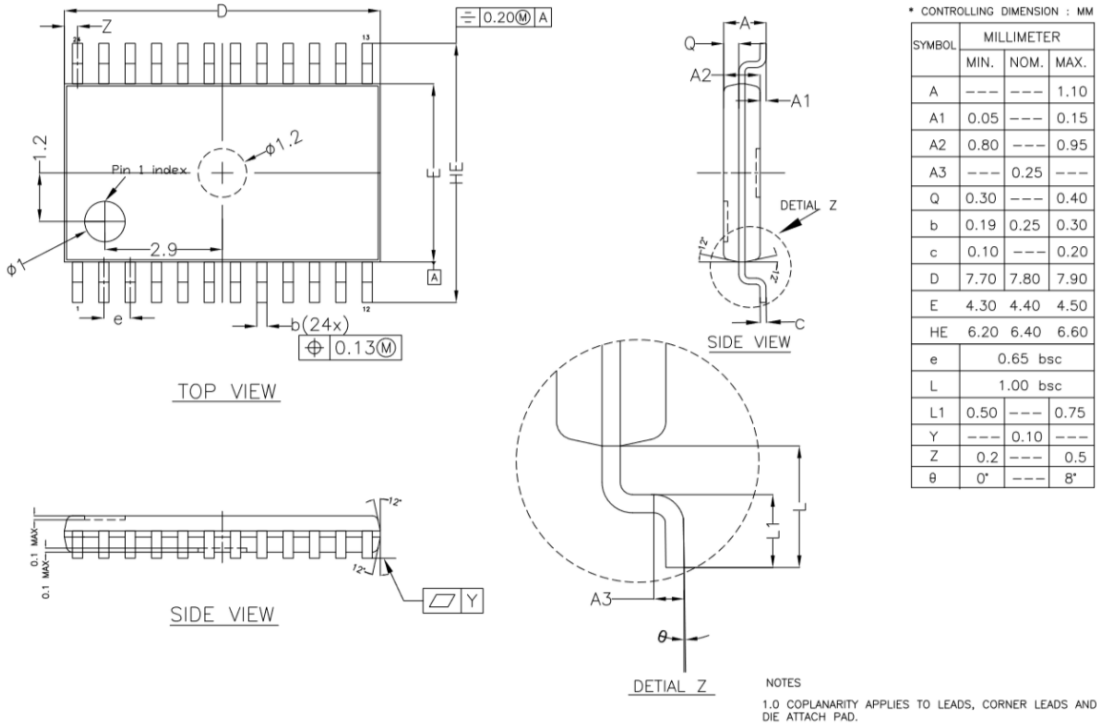


Figure 7.1 Typical application circuit for NCA84245

8. Package Information



* CONTROLLING DIMENSION : MM

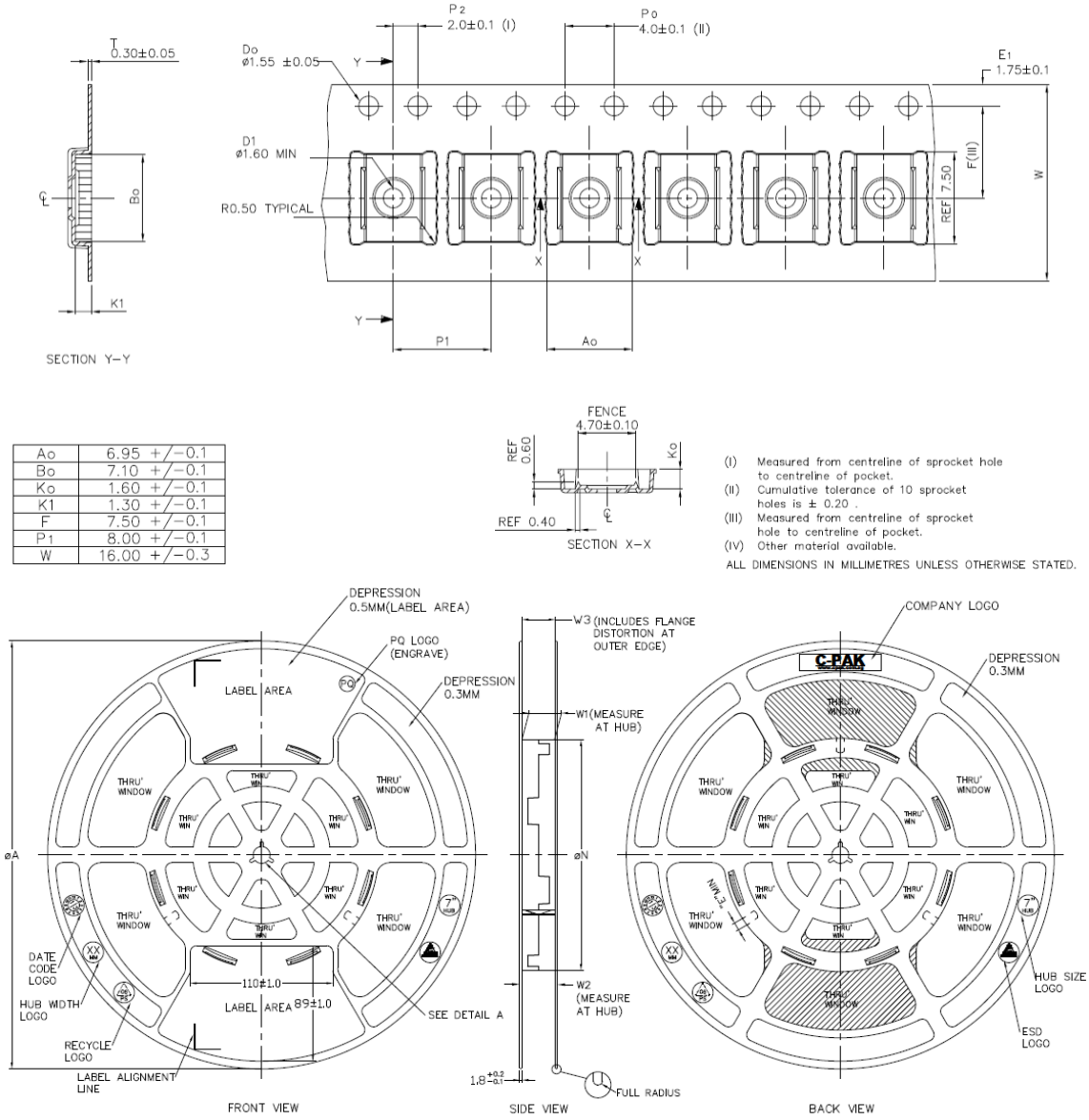
SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	---	---	1.10
A1	0.05	---	0.15
A2	0.80	---	0.95
A3	---	0.25	---
Q	0.30	---	0.40
b	0.19	0.25	0.30
c	0.10	---	0.20
D	7.70	7.80	7.90
E	4.30	4.40	4.50
HE	6.20	6.40	6.60
e	0.65 bsc		
L	1.00 bsc		
L1	0.50	---	0.75
Y	---	0.10	---
Z	0.2	---	0.5
θ	0°	---	8°

Figure 8.1 TSSOP24 Package Shape and Dimension in millimeters

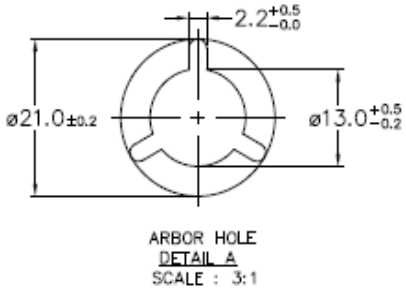
9. Ordering Information

Part Number	PINS	Temperature	MSL	Package Type	Package Drawing	SPQ
NCA84245-DTSXR	24	-40 to 125℃	1	TSSOP24	TSSOP24	2500
NCA84245-Q1TSXR	24	-40 to 125℃	1	TSSOP24	TSSOP24	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 +1.5 −0.0	14.4	SHALL ACCOMMODATE TAPE WIDTH WITHOUT INTERFERENCE	5.5
12MM	330	178	12.4 +2.0 −0.0	18.4		5.5
16MM	330	178	16.4 +2.0 −0.0	22.4		5.5
24MM	330	178	24.4 +2.0 −0.0	30.4		5.5
32MM	330	178	32.4 +2.0 −0.0	38.4		5.5

SURFACE RESISTIVITY			
LEGEND	SR RANGE	TYPE	COLOUR
A	BELOW 10^{12}	ANTISTATIC	ALL TYPES
B	10^{8} TO 10^{11}	STATIC DISSIPATIVE	BLACK ONLY
C	10^{5} & BELOW 10^{8}	CONDUCTIVE (GENERIC)	BLACK ONLY
E	10^{9} TO 10^{11}	ANTISTATIC (COATED)	ALL TYPES

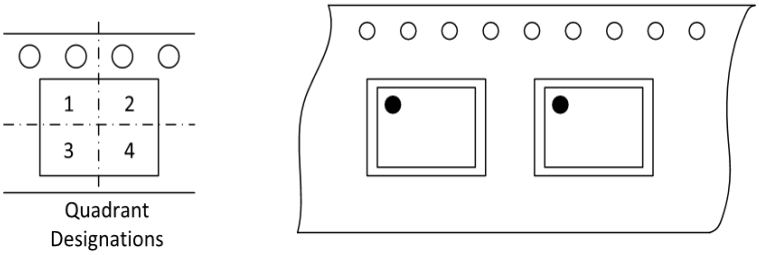


Figure 10.1 Tape and Reel Information of TSSOP

11. Revision History

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

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as any warranty or authorization of, express or implied, including but not limited to accuracy, completeness, merchantability, fitness for a particular purpose or infringement of any third party's intellectual property rights.

You are solely responsible for your use of Novosense' products and applications, and for the safety thereof. You shall comply with all laws, regulations and requirements related to Novosense's products and applications, although information or support related to any application may still be provided by Novosense.

The resources are intended only for skilled developers designing with Novosense' products. Novosense reserves the rights to make corrections, modifications, enhancements, improvements or other changes to the products and services provided. Novosense authorizes you to use these resources exclusively for the development of relevant applications designed to integrate Novosense's products. Using these resources for any other purpose, or any unauthorized reproduction or display of these resources is strictly prohibited. Novosense shall not be liable for any claims, damages, costs, losses or liabilities arising out of the use of these resources.

For further information on applications, products and technologies, please contact Novosense (www.novosns.com).

Suzhou Novosense Microelectronics Co., Ltd