## Product Overview

NCA3176 is a half-duplex RS-485 transceiver and NCA3492 is a full-duplex RS-485 transceiver, both with a power supply range of 3.0 to 5.5V. They exceed TIA-485-A specification and industrial applications.

The devices have a 1/8-unit-load receiver input impedance that allows up to 256 transceivers on the bus. The data rate of the device is up to 20Mbps. The devices are slew limited to reduce EMI and reflections with improperly terminated transmission line.

The Bus pins are protected from ±8kV system level ESD to GND. The devices feature fail-safe circuitry, which guarantee a logic-high receiver output when the receiver inputs are open or shorted.

## Key Features

- Power supply voltage: 3.0V to 5.5V

- Individual driver and receiver enable

- High system level EMC performance:

    Bus Pins meet IEC61000-4-2 ±8kV ESD

- Fail-safe protection receiver

- Up to 256 transceivers on the bus

- Operation temperature: -40℃~125℃

- RoHS-compliant packages:

    SOP8

    MSOP8

    SOP14

- Exceeds TIA-485-A Specifications

- Signaling Rate up to 20 Mbps

## Applications

- Industrial automation system

- RS-485 communication

- E-Metering Networks

- Motion Controllers

## Device Information

| Part Number | Package | Body Size |
|---|---|---|
| NCA3176-DSPR | SOP8 | 4.90mm × 3.90mm |
| NCA3176-DMSR | MSOP8 | 3.00mm × 3.00mm |
| NCA3492-DSPKR | SOP14 | 8.65mm × 3.90mm |

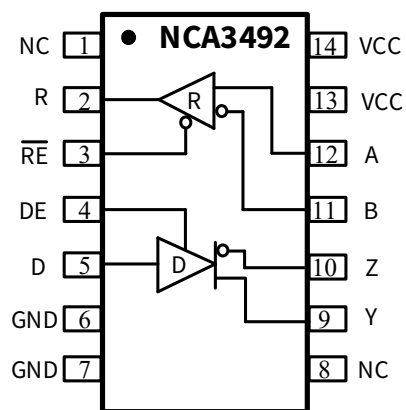## Functional Block Diagrams
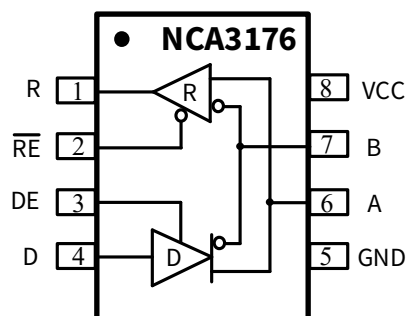


Figure 1. NCA3176 Block Diagram



Figure 2. NCA3492 Block Diagram

## INDEX

# 1. Pin Configuration and Functions



Figure 1.1 NCA3176 Package

Table 1.1 NCA3176 Pin Configuration and Description

| NCA3176 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|
| 1 | R | Receive output |
| 2 | /RE | Receive enable input. This is an active low input. |
| 3 | DE | Driver enable input. This is an active high input |
| 4 | D | Driver transmit data input. |
| 5 | GND | Ground. |
| 6 | A | Noninverting Driver Output/Receiver Input. When the driver is disabled, or when VDD is powered down, Pin A is put into a high impedance state to avoid overloading the bus. |
| 7 | B | Inverting Driver Output/Receiver Input. When the driver is disabled, or when VDD is powered down, Pin B is put into a high impedance state to avoid overloading the bus. |
| 8 | VCC | Power Supply. |



Figure 1.2 NCA3492 Package

Table 1.2 NCA3492 Pin Configuration and Description

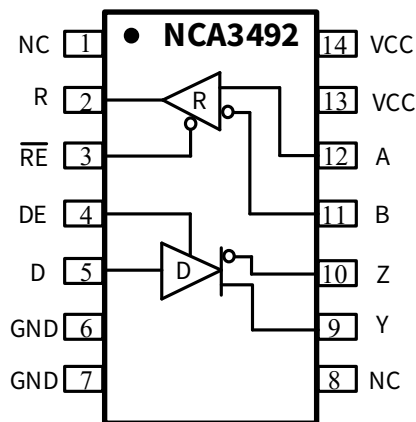| NCA3492 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|
| 1 | NC | No Connection. |
| 2 | R | Receive output |
| 3 | /RE | Receive enable input. This is an active low input. |
| 4 | DE | Driver enable input. This is an active high input |
| 5 | D | Driver transmit data input. |
| 6 | GND | Ground. |
| 7 | GND | Ground. |
| 8 | NC | No Connection. |
| 9 | Y | Noninverting Driver Output. When the driver is disabled, or when VCC is powered down, Pin Y is put into a high impedance state to avoid overloading the bus. |
| 10 | Z | Inverting Driver Output. When the driver is disabled, or when VCC is powered down, Pin Z is put into a high impedance state to avoid overloading the bus. |
| 11 | B | Inverting Receiver Input. |
| 12 | A | Noninverting Receiver Input. |
| 13 | VCC | Power Supply. |
| 14 | VCC | Power Supply. |

## 2. Absolute Maximum Ratings

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Power Supply Voltage | VCC | -0.5 | | 6 | V | |
| Maximum Input Voltage | /RE, DE, D | -0.4 | | VCC+0.4 | V | |
| Driver Output/Receiver Input Voltage | $V_A$, $V_B$, $V_Y$, $V_Z$ | -18 | | 18 | V | |
| Differential input voltage, A with repect to B | $V_{ID}$ | -18 | | 18 | V | |
| Receiver Output Current | $I_o$ | -15 | | 15 | mA | |
| Operating Temperature | $T_{opr}$ | -40 | | 125 | ℃ | |
| Storage Temperature | $T_{stg}$ | -40 | | 150 | ℃ | |
| Junction Temperature | $T_j$ | -40 | | 150 | ℃ | |

## 3. ESD Ratings

| | Ratings | Value | Unit |
|---|---|---|---|
| Electrostatic discharge | Human body model (HBM), per AEC-Q100-002-RevD<br>●    All pins | ±8.0 | kV |
| | Charged device model (CDM), per AEC-Q100-011-RevB<br>●    All pins | ±2.0 | kV |
| | IEC61000-4-2 (Bus pins) | ±8.0 | kV |

## 4. Recommended Operating Conditions

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Power Supply Voltage | VCC | 3 | | 5.5 | V | |
| High-level Input Voltage | $V_{IH}$ | 2 | | VCC | V | |
| Low-level Input Voltage | $V_{IL}$ | 0 | | 0.8 | V | |
| Voltage at any bus terminal (separately or common mode) | $V_I$ | -7 | | 12 | V | |
| Differential input voltage | $V_{ID}$ | -12 | | 12 | V | |
| High-level output current | $I_{OH}$ | -8 | | | mA | |
| Low-level output current | $I_{OL}$ | | | 8 | mA | |
| Ambient Temperature | $T_a$ | -40 | | 125 | ℃ | |

## 5. Thermal Information

| Parameters | Symbol | SOP8 | MSOP8 | SOP14 | Unit |
|---|---|---|---|---|---|
| Junction-to-ambient thermal resistance | $\theta_{JA}$ | 67.9 | 168.7 | 96.25 | °C/W |
| Junction-to-case(top) thermal resistance | $\theta_{JC(top)}$ | 27.7 | 62.2 | 50 | °C/W |
| Junction-to-board thermal resistance | $\theta_{JB}$ | 29.4 | 89.5 | 61 | °C/W |

# 6. Specifications

## 6.1. Electrical Characteristics

(VCC=3.0V~5.5V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VCC = 5.0V, Ta = 25℃)

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Power supply voltage | VCC | 3.0 | | 5.5 | V | |
| supply current | $I_{CC}$ | | 900 | 1800 | µA | DE=High, /RE=Low, no load |
| | | | 600 | 1000 | µA | DE=High, /RE=High, no load |
| | | | 630 | 1200 | µA | DE=Low, /RE=Low, no load |
| | | | 0.5 | 5 | µA | DE=Low, /RE=High, no load |
| Thermal-Shutdown Threshold | $T_{TS}$ | | 165 | | ℃ | |
| Thermal-Shutdown Hysteresis | $T_{TSH}$ | | 15 | | ℃ | |
| **Logic Side** | | | | | | |
| Input High Voltage | $V_{IH}$ | 2 | | | V | DE, D, /RE |
| Input Low Voltage | $V_{IL}$ | | | 0.8 | V | DE, D, /RE |
| Input Current | $I_{IN}$ | -2 | | 2 | µA | DE, D, /RE |
| Output Voltage High | $V_{OH}$ | VCC-0.5 | | | V | $I_{OH}$ = -8mA, R |
| Output Voltage Low | $V_{OL}$ | | | 0.5 | V | $I_{OL}$ = 8mA, R |
| Output Short-Circuit Current | $I_{OSR}$ | -95 | | 95 | mA | $0 \le V_R \le VCC$ |
| Three-State Output Current | $I_{OZR}$ | -15 | | 1 | µA | $0 \le V_R \le VCC$, /RE = High |
| **Driver** | | | | | | |
| Input clamp voltage | $V_{IK}$ | -1.5 | | | V | $I_I$ = −18 mA |
| Differential Output Voltage | $\lvert V_{OD} \rvert$ | | | VCC | V | No Load |
| | | 1.5 | 2 | | V | see Figure 6. 1, $R_L$=54Ω(RS-485) |
| | | 2 | 2.5 | | V | see Figure 6. 2, $R_L$=100Ω (RS-422), VCC≥3.2V, Tj ≥ 0℃ |
| | | 1.5 | 2 | | V | see Figure 6. 3, $R_L$=60Ω , 375Ω on each output to -7V to 12V |
| Change in magnitude of the differential output voltage | $\Delta\lvert V_{OD} \rvert$ | -200 | | 200 | mV | See Figure 6. 1, $R_L$=54Ω, $C_L$=50pF |
| Steady-state common-mode output voltage | $V_{OC}$ | 1 | VCC/2 | 3.5 | V | See Figure 6. 4 |
| Change in differential driver output common-mode voltage | $\Delta V_{OC(SS)}$ | -200 | | 200 | mV | See Figure 6. 4 |

| Peak-to-peak driver common-mode output voltage | $V_{OC(PP)}$ | | 450 | | mV | See Figure 6. 4 |
|---|---|---|---|---|---|---|
| Driver Short-Circuit Output Current | $I_{OSD}$ | -250 | | 250 | mA | $-7V \leq V_O \leq +12\ V$ |
| Output Leakage Current (Y and Z) Full-Duplex | $I_I$ | | | 200 | µA | $V_I = 12V$, DE=Low |
| | | -200 | | | | $V_I = -7V$, DE=Low |
| **Receiver** | | | | | | |
| Positive-going receiver differential input voltage threshold | $V_{TH+}$ | | | -10 | mV | DE=/RE=Low |
| Negative-going receiver differential input voltage threshold | $V_{TH-}$ | -200 | | | mV | DE=/RE=Low |
| Receiver differential input voltage threshold hysteresis | $V_{hys-}$ | | 30 | | mV | DE=/RE=Low |
| Bus input current (disabled driver) | $I_I$ | | | 200 | µA | $V_I = 12V$, DE=Low |
| | | -200 | | | µA | $V_I = -7V$, DE=Low |
| Receiver Input Resistance | $R_{IN}$ | 96 | | | kΩ | $-7V \leq V_I \leq 12V$, DE=Low |

## 6.2. Switching Electrical Characteristics

(VDD=3.0V~5.5V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VCC = 5V Ta = 25℃)

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| **Driver** | | | | | | |
| Maximum Data Rate | $f_{MAX}$ | | | 20 | Mbps | |
| Driver Propagation Delay | $t_{PLH}$ | | 6 | 15 | ns | see Figure 6. 5, $R_L$=54Ω, $C_L$=50pF |
| | $t_{PHL}$ | | 6 | 15 | ns | see Figure 6. 5, $R_L$=54Ω, $C_L$=50pF |
| Driver pulse skew, $\|t_{PHL} - t_{PLH}\|$ | | | 1 | 4 | ns | |
| Driver Output Falling Time or Rising time | $t_f$ | | 4.5 | 10 | ns | see Figure 6. 5, $R_L$=54Ω, $C_L$=50pF |
| | $t_r$ | | 4.5 | 10 | ns | see Figure 6. 5, $R_L$=54Ω, $C_L$=50pF |
| Driver-Output enable time to high level | $t_{PZH}$ | | | 40 | ns | See Figure 6. 6，/RE=Low |
| | | | 1.5 | 6 | µs | see Figure 6. 6，/RE=High |
| Driver-Output enable time to low level | $t_{PZL}$ | | | 40 | ns | see Figure 6. 7，/RE=Low |
| | | | 1.5 | 6 | µs | see Figure 6. 7，/RE=High |

| | | | | | | |
|---|---|---|---|---|---|---|
| Driver-Output disable time from high level | $t_{PHZ}$ | | | 50 | ns | See Figure 6. 6 |
| Driver-Output disable time from low level | $t_{PLZ}$ | | | 50 | ns | see Figure 6. 7 |
| **Receiver** | | | | | | |
| Receiver Propagation Delay | $t_{PLH}$ | | 70 | 130 | ns | See Figure 6. 8,$C_L$=15pF |
| | $t_{PHL}$ | | 70 | 130 | ns | See Figure 6. 8,$C_L$=15pF |
| Receiver pulse skew, $\|t_{PHL} - t_{PLH}\|$ | | | | 5 | ns | |
| Receiver Output Falling Time or Rising time | $t_f$ | | 2 | 5 | ns | see Figure 6. 8,$C_L$=15pF |
| | $t_r$ | | 2 | 5 | ns | see Figure 6. 8,$C_L$=15pF |
| Receiver Disable to Output High | $t_{PHZ}$ | | | 50 | ns | see Figure 6. 9 |
| Receiver Disable to Output Low | $t_{PLZ}$ | | | 50 | ns | see Figure 6. 9 |
| Receiver Enable to Output High | $t_{PZH(1)}$ | | | 145 | ns | see Figure 6. 9,DE=High |
| | $t_{PZH(2)}$ | | 1 | 6 | μs | see Figure 6. 10,DE=Low |
| Receiver Enable to Output Low | $t_{PZL(1)}$ | | | 115 | ns | see Figure 6. 9,DE=High |
| | $t_{PZL(2)}$ | | 1 | 6 | μs | see Figure 6. 10,DE=Low |

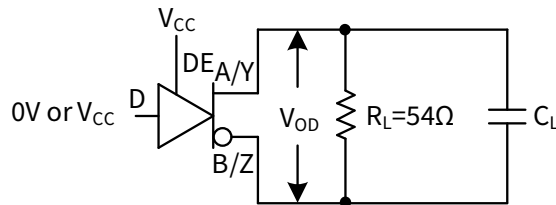## 6.3. Parameter Measurement Information



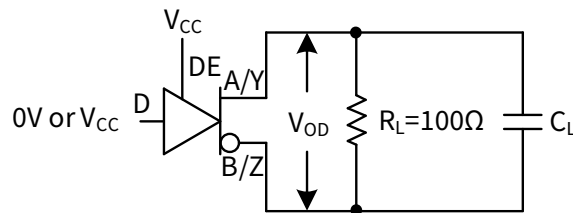Figure 6. 1 Measurement of Driver Differential Output Voltage With RS-485 Load



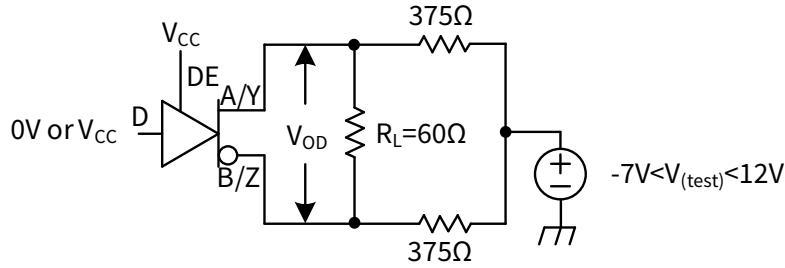Figure 6. 2 Measurement of Driver Differential Output Voltage With RS-422 Load

Figure 6. 3 Measurement of Driver Differential Output Voltage With Common-Mode Load
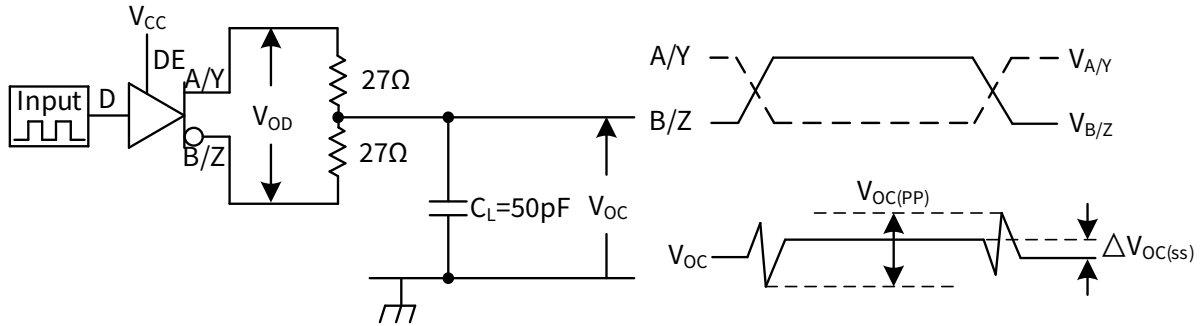
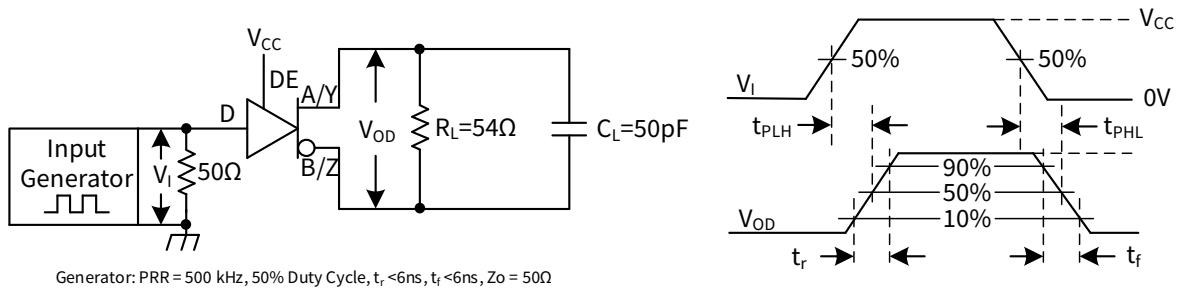Figure 6. 4 Measurement of Driver Common-Mode Output Voltage With RS-485 Load

Generator: PRR = 500 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω

Figure 6. 5 Measurement of Driver Differential Output Rise and Fall Times and Propagation Delays of NCA3176 and NCA3492

Generator: PRR = 100 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω
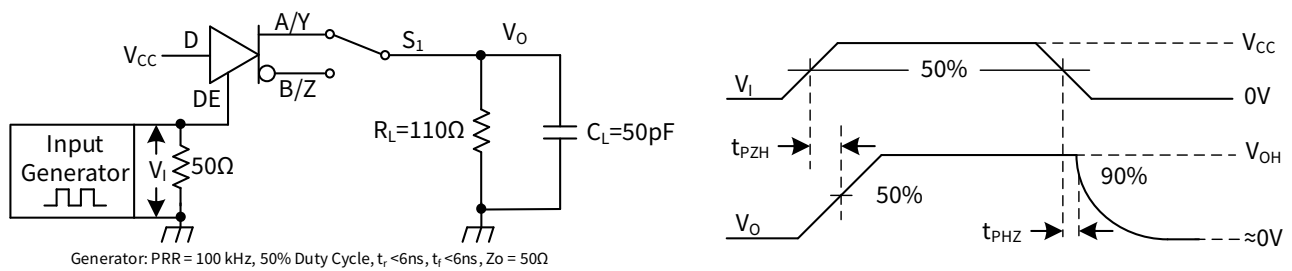
Figure 6. 6 Measurement of Driver Enable and Disable Times With Active High Output and Pull-Down Load of NCA3176 and NCA3492

Generator: PRR = 100 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω
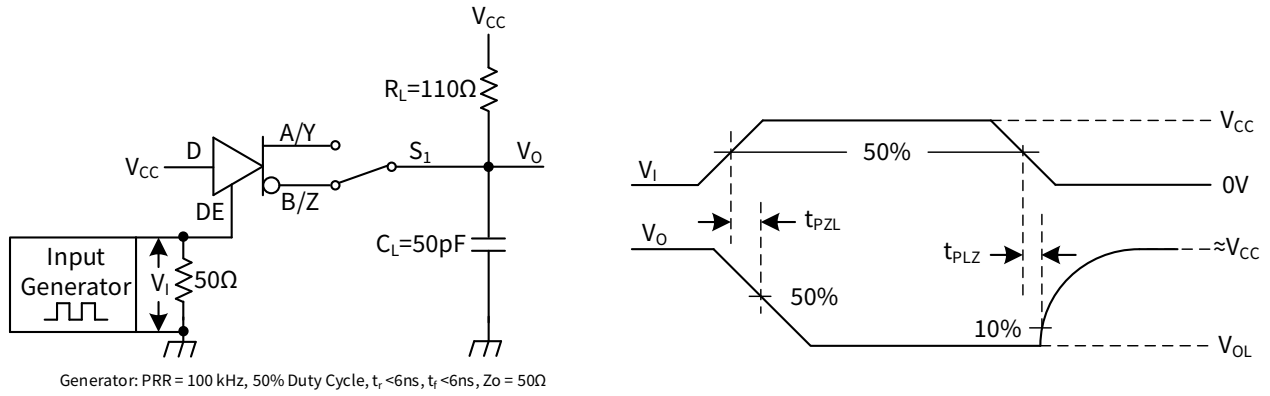
Figure 6. 7 Measurement of Driver Enable and Disable Times With Active Low Output and Pull-Up Load of NCA3176 and NCA3492

Generator: PRR = 500 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω
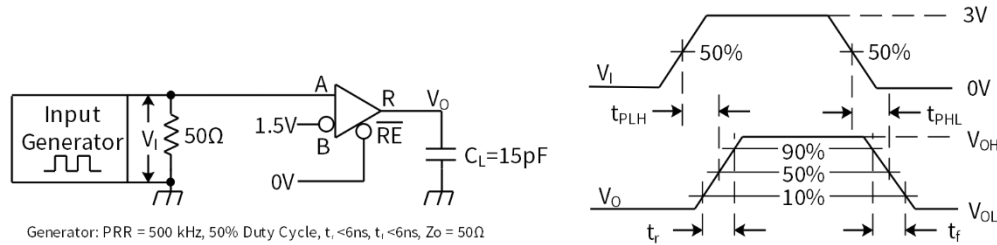
Figure 6. 8 Measurement of Receiver Output Rise and Fall Times and Propagation Delays of NCA3176 and NCA3492

Generator: PRR = 100 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω
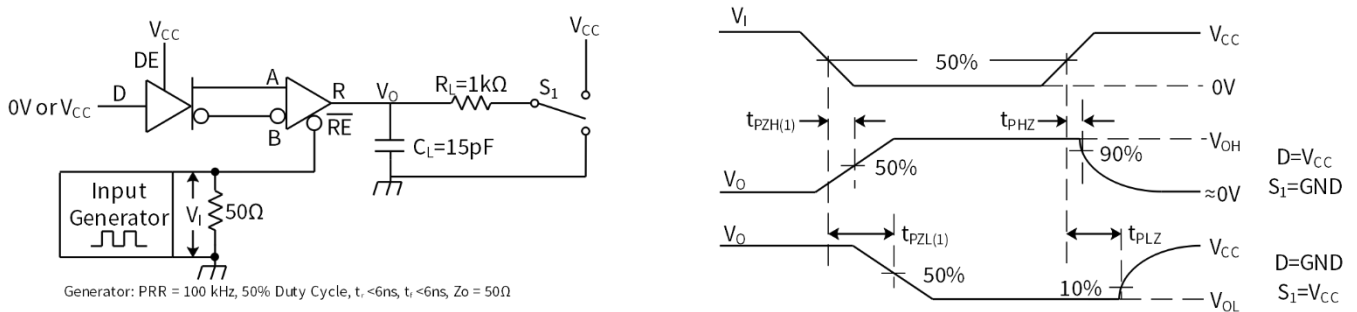
Figure 6. 9 Measurement of Receiver Enable/Disable Times With Driver Enabled of NCA3176 and NCA3492

Generator: PRR = 100 kHz, 50% Duty Cycle, $t_r$ <6ns, $t_f$ <6ns, Zo = 50Ω
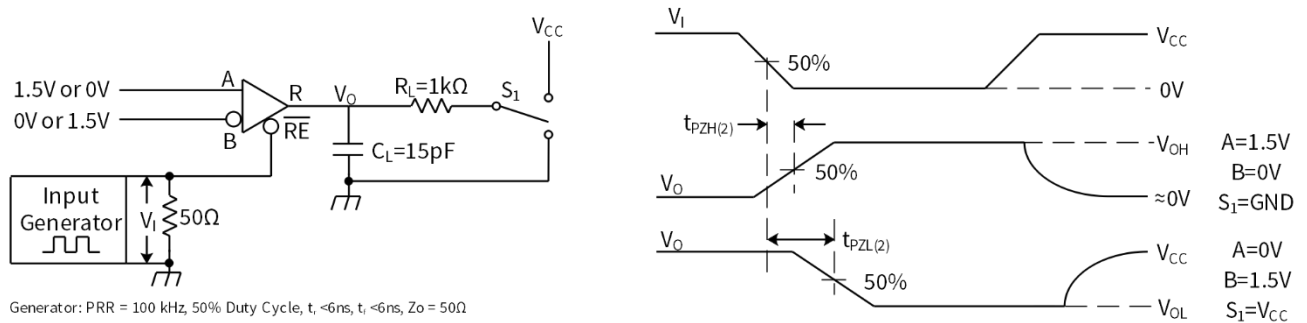
Figure 6. 10 Receiver Enable Time From Standby (Driver Disabled) of NCA3176 and NCA3492
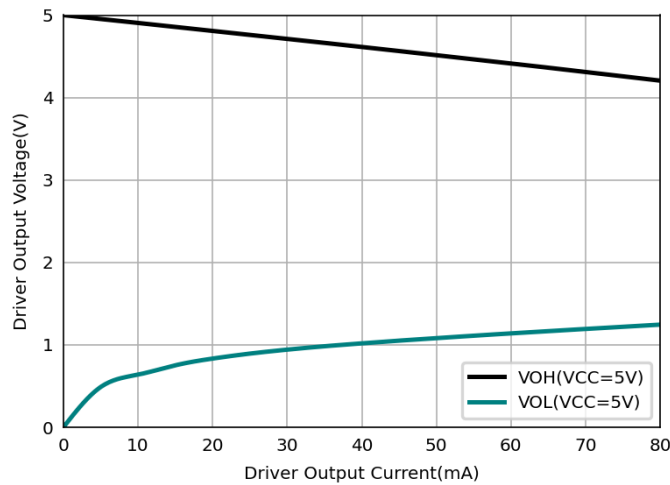
## 6.4. Typical Performance Characteristics



Figure 6.11 Relationship between driver voltage and current

# 7. Function Description

## 7.1. Overview

NCA3176 is a half-duplex RS-485 transceiver and NCA3492 is a full-duplex RS-485 transceiver, both with a power supply range of 3.0 to 5.5V. They exceed TIA-485-A specification and industrial applications. The devices have a 1/8-unit-load receiver input impedance that allows up to 256 transceivers on the bus. The data rate of the device is up to 20Mbps. The devices are slew limited to reduce EMI and reflections with improperly terminated transmission line. The Bus pins are protected from ±8kV system level ESD to GND. The devices feature fail-safe circuitry, which guarantee a logic-high receiver output when the receiver inputs are open or shorted.

## 7.2. Data rate

The data rate of NCA3176 and NCA3492 are 20Mbps. The devices are slew limited to reduce EMI and reflections with improperly terminated transmission line.
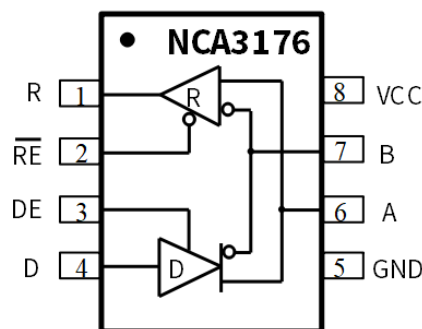
## 7.3. Functional Block Diagram



Figure 7. 1 NCA3176 Block Diagram
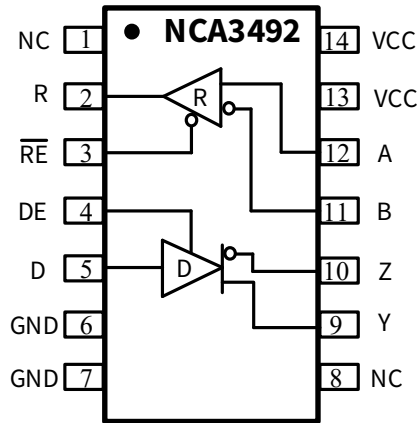
Figure 7.2 NCA3492 Block Diagram

## 7.4. True Fail-safe receiver inputs

The devices feature fail-safe circuitry, which guarantee a logic-high receiver output when the receiver inputs are open or shorted. The receiver threshold is fixed between -10mV and -200mV, which meets EIA/TIA-485 standard. If the differential input voltage ($V_A$-$V_B$) is greater than or equal to -10mV, receiver output R is logic high. In the case of a terminated bus with all transmitters disabled, the differential input voltage is pulled to zero by the termination resistors. Due to the receiver threshold, the receiver output R is logic high.

## 7.5. Truth tables

Table 7.1 Driver Function Table[1]

| Input (D) | Enable Input (DE) | Outputs[1] | |
|---|---|---|---|
| | | A | B |
| H | H | H | L |
| L | H | L | H |
| X | L | Z | Z |
| X | OPEN | Z | Z |
| OPEN | H | L | H |

H= Logic High; L= Logic Low; X= Irrelevant; Z= High Impedance.

Table 7.2 Receiver Function Table[1]

| Differential Input ($V_A$-$V_B$) | Enable Input (/RE) | Output (R) |
|---|---|---|
| ≥-10mV | L/Open | H |
| ≤-200mV | L/Open | L |
| Open/Short | L/Open | H |
| X | H | Z |
| Idle | L | H |

H= Logic High; L= Logic Low; X= Irrelevant; Z= High Impedance.

## 7.6. Thermal shutdown

The devices are protected from over temperature damage by integrated thermal shutdown circuitry. When the junction temperature ($T_j$) exceeds +165°C (typ), the driver outputs go high-impedance. The devices resume normal operation when $T_j$ falls below +145°C (typ).

# 8. Application Note

## 8.1. Typical Application Circuit
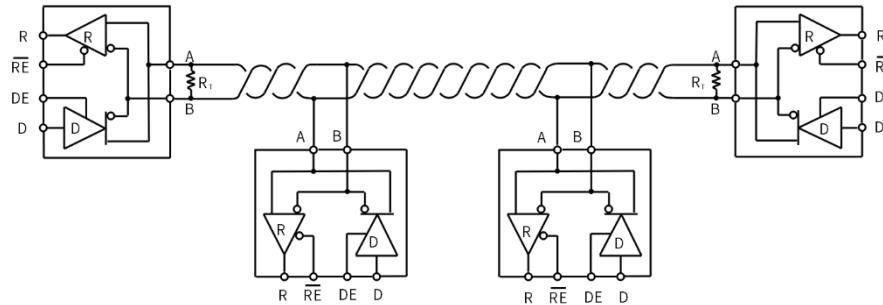
Figure 8.1 Typical RS-485 Network with Half-Duplex Transceivers
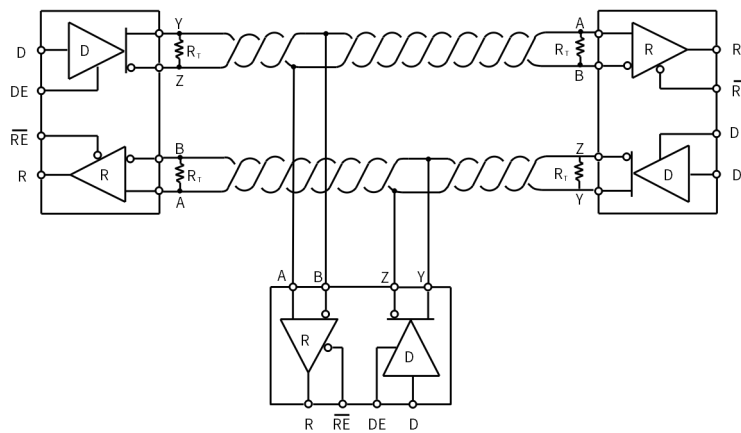
Figure 8.2 Typical RS-485 Network With Full-Duplex Transceivers

## 8.2. PCB Layout

The devices require a 0.1 μF bypass capacitor between VCC and GND. The capacitor should be placed as close as possible to the package. To eliminate line reflections, each cable end is terminated with a resistor, whose value matches the characteristic impedance of the cable. It's good practice to have the bus connectors and termination resistor as close as possible to the A and B Bus pins.
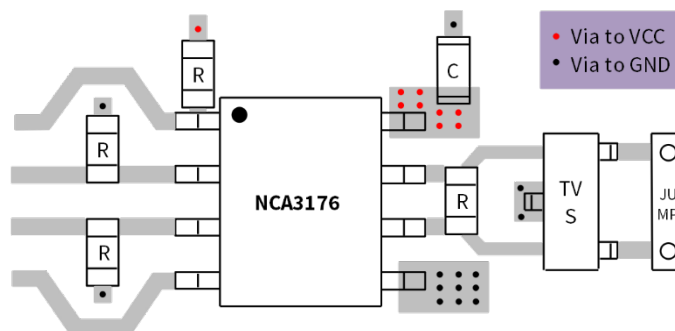
Figure 8.3 NCA3176 Layout Example

## 8.3. Nodes on the bus

The devices have a 1/8-unit-load receiver input impedance (96kΩ) that allows up to 256 transceivers on the bus. Connect any combination of these devices, and/or other RS-485 devices, for a maximum of 32 unit-loads to the line.

## 8.4. ESD protection

ESD protection structures are enhanced on all pins to protect against electrostatic discharge encountered during handing and assembly.

ESD protection can be tested in various ways. Below is the ESD spec of the devices.

Bus pins:

- ± 8kV HBM.
- ±8kV using the contact discharge method specified in IEC 61000-4-2

Other pins except bus pins:

- ±8kV HBM

## 8.5. Surge protection

If the surge is transient, the high energy content has the characteristics of long pulse duration and slow pulse power attenuation. The transient electrical energy injected into the protective unit inside the transceiver is converted to thermal energy, which heats up and destroys the protective unit, thus destroying the transceiver. Therefore, the following diagram shows a protection circuit against surge transients (IEC 61000-4-5). $R_1$ and $R_2$ are current limiting resistors.
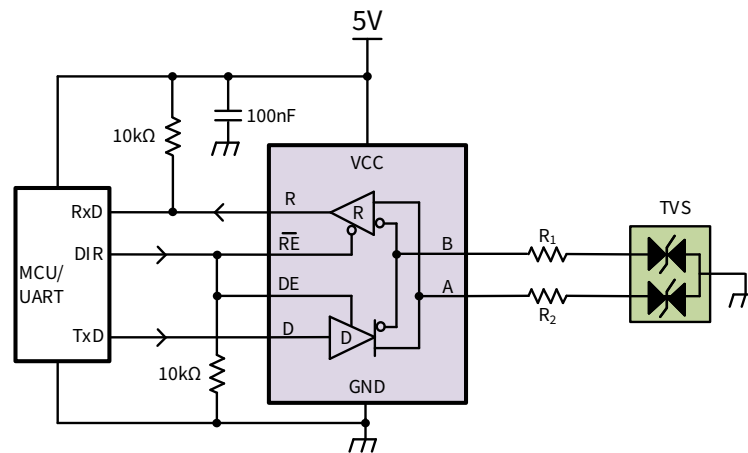


Figure 8.4 Transient protection against surge transients for half-duplex RS-485 transceiver

# 9. Package Information
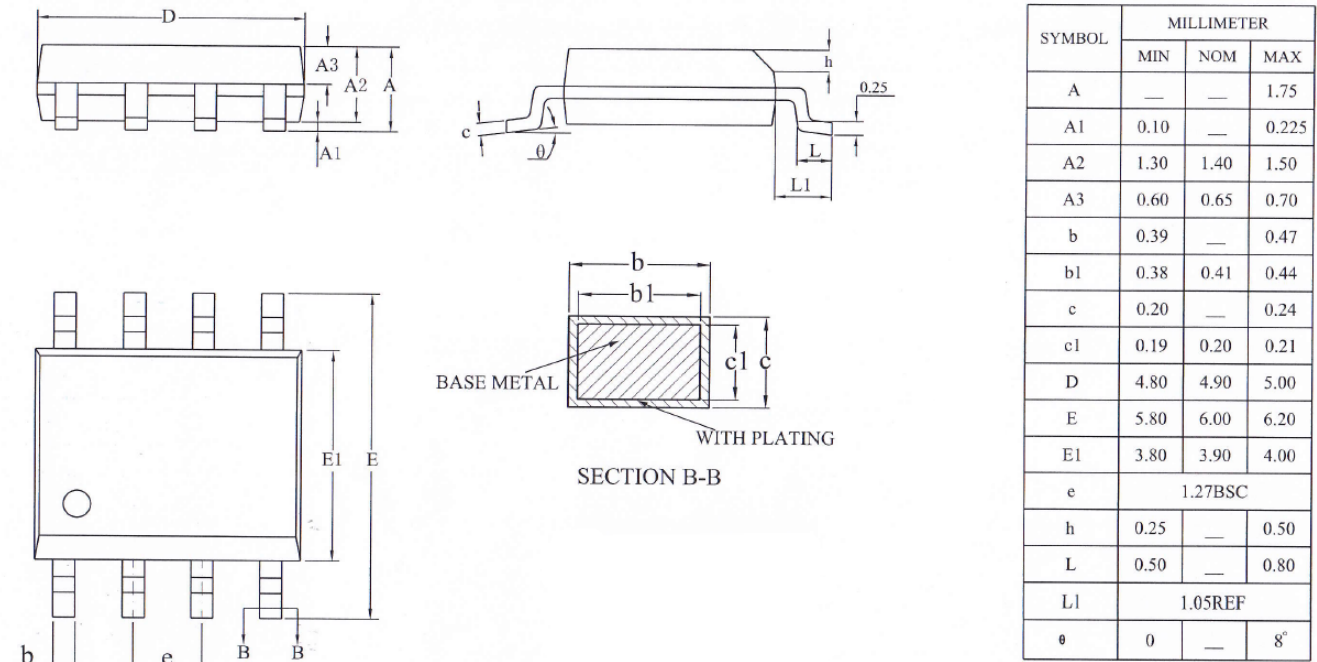


| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.75 |
| A1 | 0.10 | — | 0.225 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.39 | — | 0.47 |
| b1 | 0.38 | 0.41 | 0.44 |
| c | 0.20 | — | 0.24 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.27BSC | | |
| h | 0.25 | — | 0.50 |
| L | 0.50 | — | 0.80 |
| L1 | 1.05REF | | |
| θ | 0 | — | 8° |

NOTE：This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.

Figure 9.1 SOP8 Package Shape and Dimension in millimeters
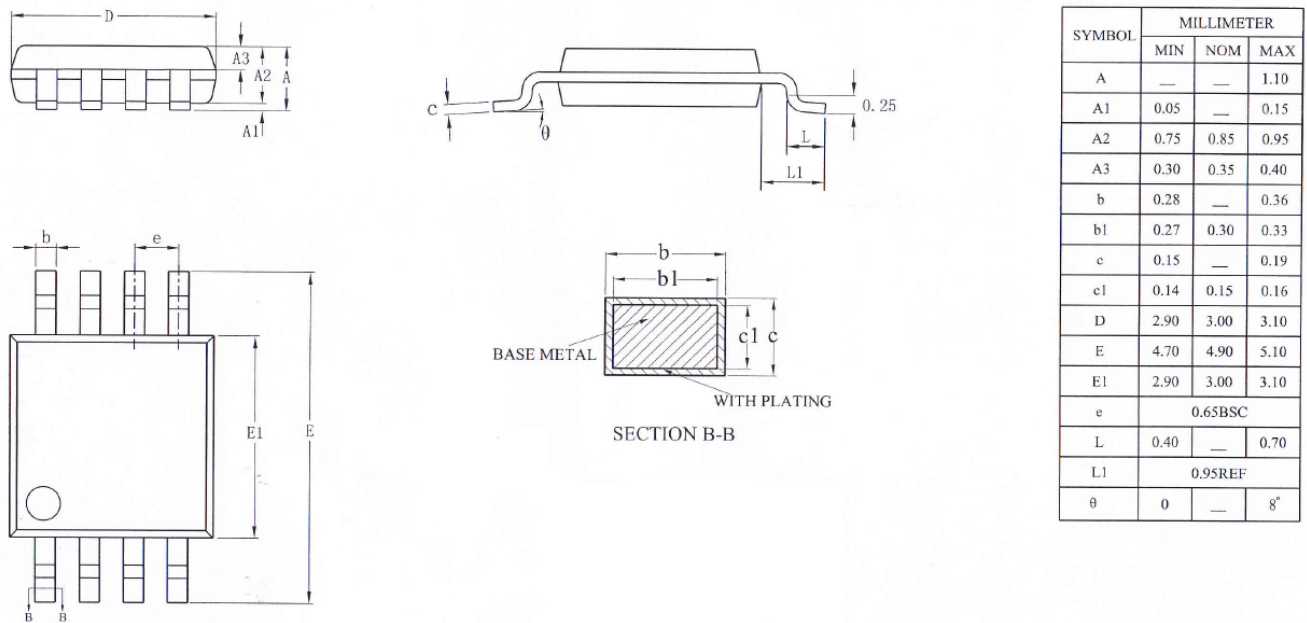


| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.10 |
| A1 | 0.05 | — | 0.15 |
| A2 | 0.75 | 0.85 | 0.95 |
| A3 | 0.30 | 0.35 | 0.40 |
| b | 0.28 | — | 0.36 |
| b1 | 0.27 | 0.30 | 0.33 |
| c | 0.15 | — | 0.19 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.90 | 3.00 | 3.10 |
| E | 4.70 | 4.90 | 5.10 |
| E1 | 2.90 | 3.00 | 3.10 |
| e | 0.65BSC | | |
| L | 0.40 | — | 0.70 |
| L1 | 0.95REF | | |
| θ | 0 | — | 8° |

NOTE：This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.

Figure 9.2 MSOP8 Package Shape and Dimension in millimeters

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.75 |
| A1 | 0.10 | — | 0.225 |
| A2 | 1.30 | 1.40 | 1.50 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.39 | — | 0.47 |
| b1 | 0.38 | 0.41 | 0.44 |
| c | 0.20 | — | 0.24 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 8.55 | 8.65 | 8.75 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.27BSC | | |
| h | 0.25 | — | 0.50 |
| L | 0.50 | — | 0.80 |
| L1 | 1.05REF | | |
| θ | 0 | — | 8° |

1

NOTE：This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.

Figure 9.3 SOP14 Package Shape and Dimension in millimeters

# 10. Ordering Information

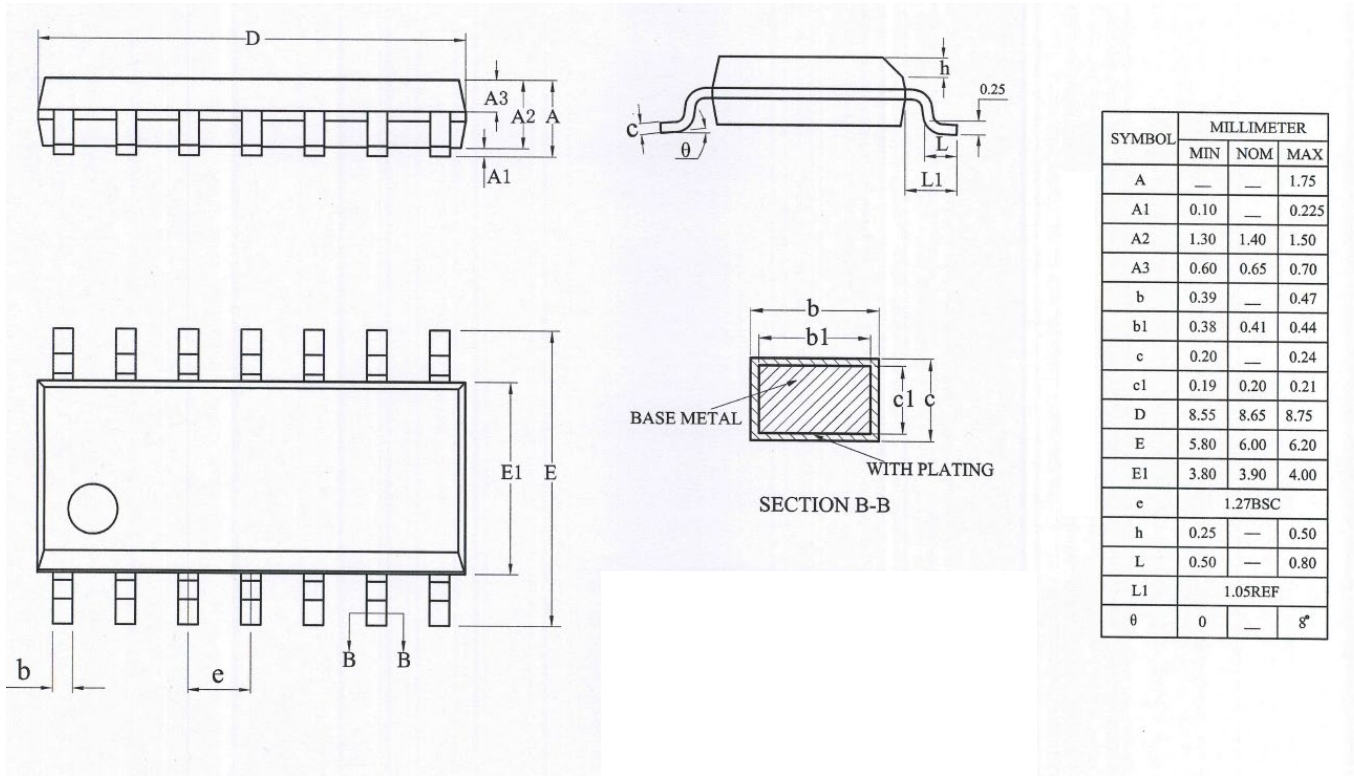| Part Number | Duplex | Max Data Rate (Mbps) | No. of Nodes | Temperature | MSL | Package Type | Package Drawing | SPQ |
|---|---|---|---|---|---|---|---|---|
| NCA3176-DSPR | Half | 20 | 256 | -40 to 125℃ | 3 | SOP8 | SOP8 | 4000 |
| NCA3176-DMSR | Half | 20 | 256 | -40 to 125℃ | 3 | MSOP8 | MSOP8 | 4000 |
| NCA3492-DSPKR | Full | 20 | 256 | -40 to 125℃ | 3 | SOP14 | SOP14 | 4000 |
| NOTE: All packages are RoHS-compliant with peak reflow temperatures of 260 ℃ according to the JEDEC industry standard classifications and peak solder temperatures. | | | | | | | | |

## 11. Tape and Reel Information



| 型号规格 | 匹配的载带宽度 | 基本尺寸(mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | W1 | W2Max | T | D |
| 13″ -12×100 | 12/12.2 | | | 12.4 | 18.4 | ⚠ | ⚠ |
| 13″ -16×100 | 16 | 330 | 100 | 16.4 | 22.4 | 1.5 | 270 |
| 13″ -24×100 | 24 | | | 24.4 | 30.4 | | |

共同尺寸

| 外观 | 尺 寸(mm) |
|---|---|
| E | 1.75±0.10 |
| F | 5.50±0.10 |
| P2 | 2.00±0.10 |
| D | $1.50^{+0.1}_{0}$ |
| D1 | 1.55±0.05 |
| P0 | 4.00±0.10 |
| 10P0 | 40.00±0.20 |

口袋尺寸

| 外观 | 尺 寸(mm) |
|---|---|
| W | 12.00±0.10 |
| P | 8.00±0.10 |
| A0 | 6.55±0.15 |
| B0 | 5.30±0.10 |
| K0 | 2.00±0.15 |
| t | 0.25±0.05 |
| θ | 3~5° TYP |

Direction of Feed

Quadrant Designations
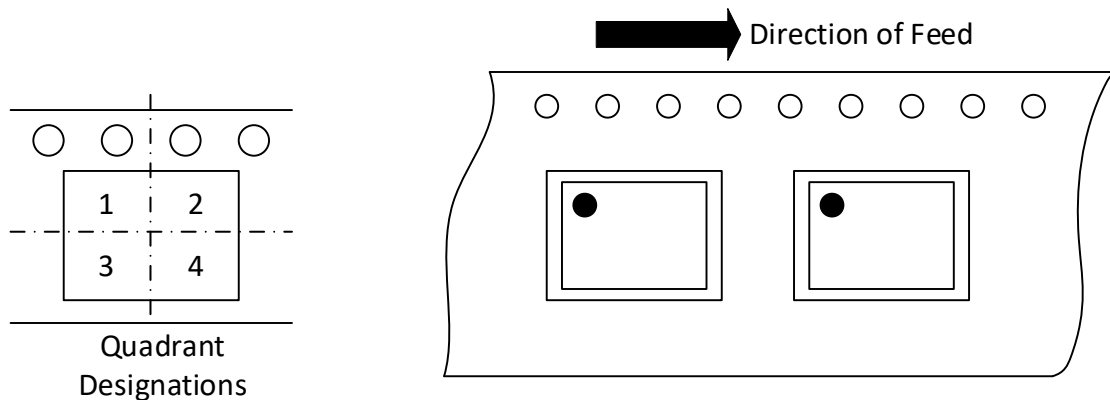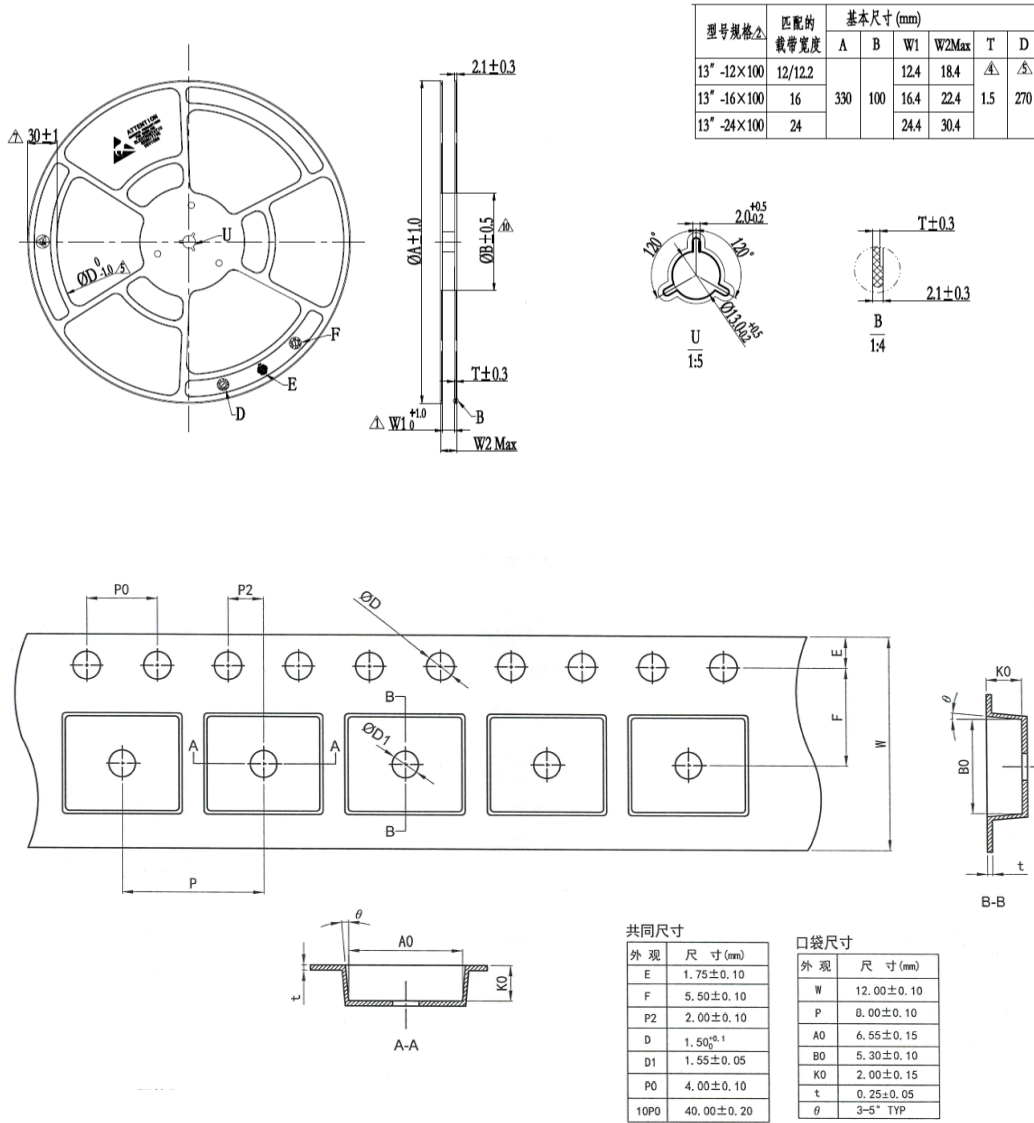
Figure 11.1 Tape and Reel Information of SOP8

| △ 型号规格 | 适合载带宽度 | 圆盘基本尺寸 | | | | |
|---|---|---|---|---|---|---|
| | | B(内径) | W1 | W2Max | △ T | △ D |
| 13"-12X180 | 12/12.2 | 180 | 12.4 | 20.4 | 1.5 | 275 |

**共同尺寸**

| 外 观 | 尺 寸(mm) |
|---|---|
| E | 1.75±0.10 |
| F | 5.50±0.10 |
| P2 | 2.00±0.10 |
| D | 1.55±0.05 |
| D1 | 1.55±0.05 |
| P0 | 4.00±0.10 |
| 10P0 | 40.00±0.20 |

**口袋尺寸**

| 外 观 | 尺 寸(mm) |
|---|---|
| W | 12.00±0.30 |
| P | 8.00±0.10 |
| A0 | 5.40±0.10 |
| B0 | 3.40±0.10 |
| K0 | 1.40±0.10 |
| t | 0.30±0.05 |
| θ | 3~5° TYP |

Direction of Feed

Quadrant Designations
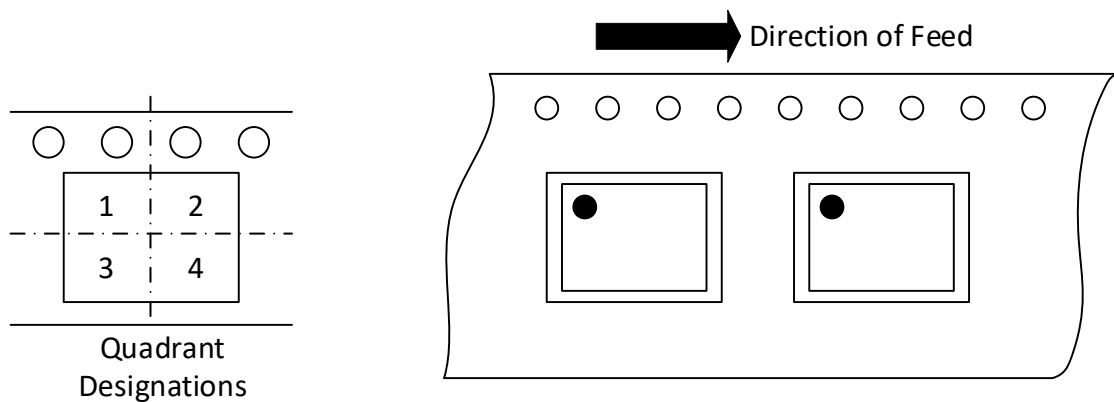
Figure 11.2 Tape and Reel Information of MSOP8

| 型号规格 | 匹配的载带宽度 | 基本尺寸 (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | W1 | W2Max | T | D |
| 13″ -12×100 | 12/12.2 | | | 12.4 | 18.4 | | |
| 13″ -16×100 | 16 | 330 | 100 | 16.4 | 22.4 | 1.5 | 270 |
| 13″ -24×100 | 24 | | | 24.4 | 30.4 | | |

| 共同尺寸 | |
|---|---|
| 外观 | 尺 寸 (mm) |
| E | 1.75±0.10 |
| F | 7.50±0.10 |
| P2 | 2.00±0.10 |
| D | 1.55±0.05 |
| D1 | 1.55±0.05 |
| P0 | 4.00±0.10 |
| 10P0 | 40.0±0.20 |

| 变动尺寸 | |
|---|---|
| 外观 | 尺 寸 (mm) |
| W | 16.00±0.10 |
| P | 8.00±0.10 |
| A0 | 6.60±0.10 |
| B0 | 9.15±0.10 |
| K0 | 1.80±0.10 |
| t | 0.24-0.32 |
| θ | 5° TYP |

Direction of Feed

Quadrant Designations
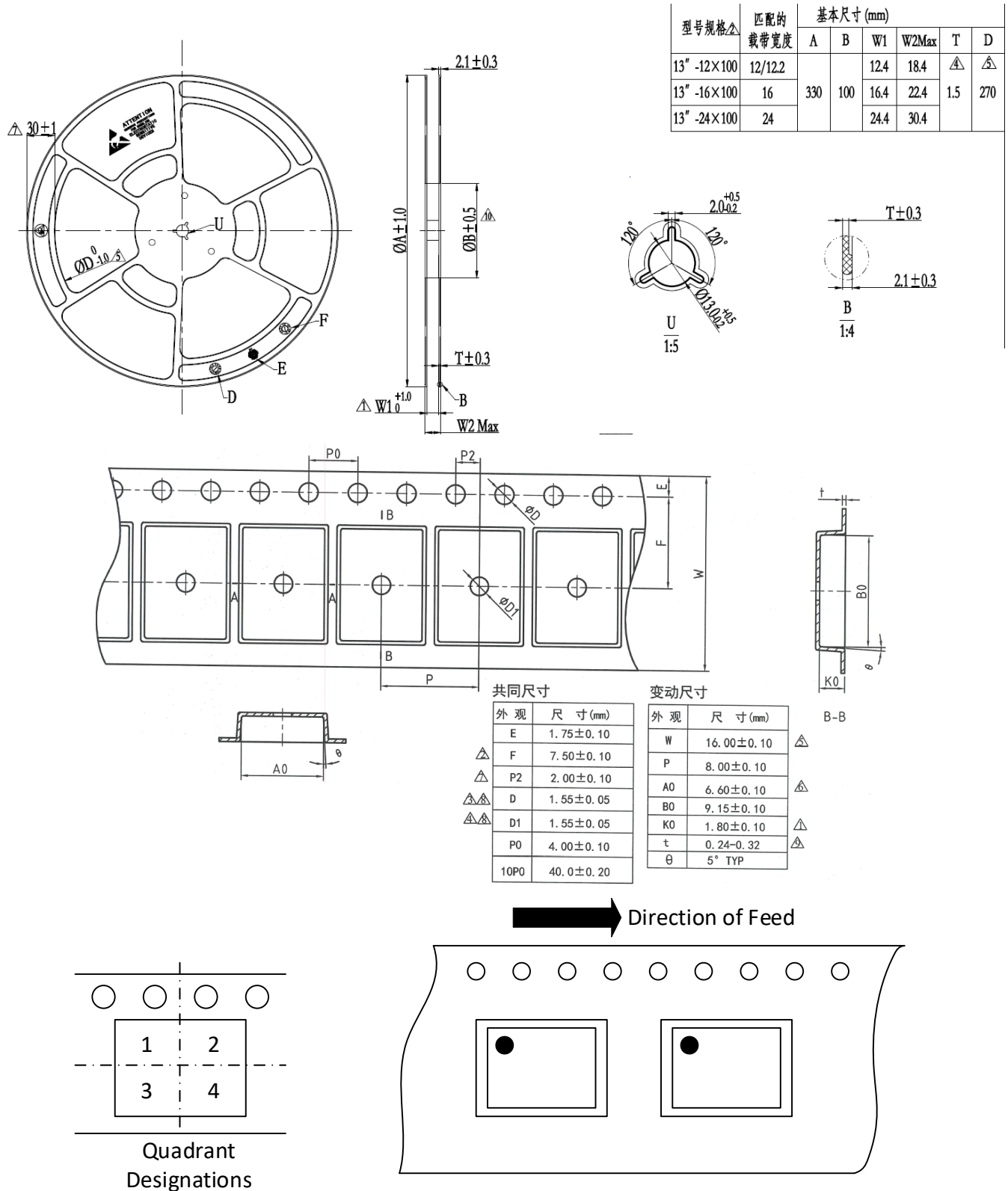
Figure 11.3 Tape and Reel Information of SOP14

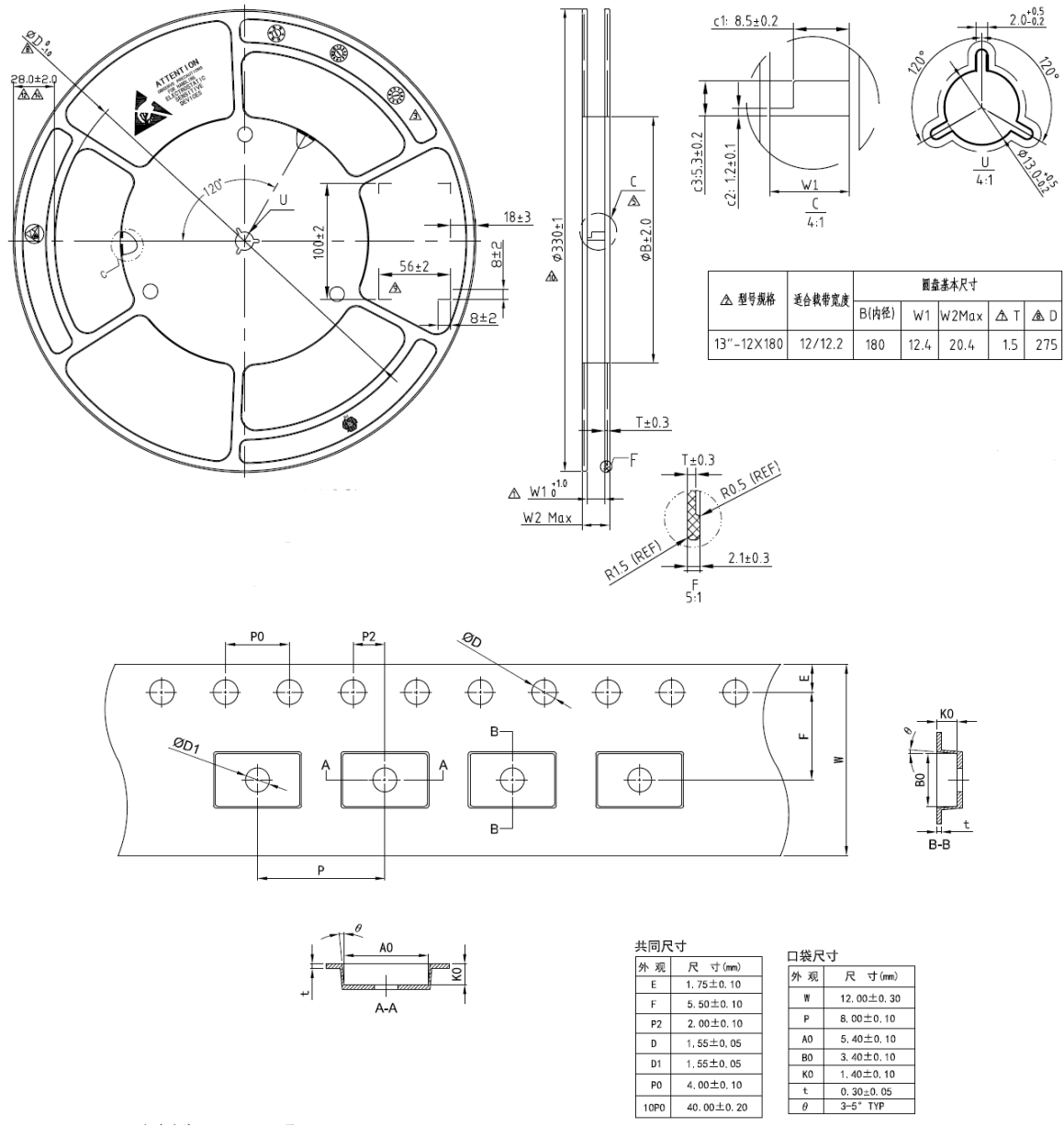## 12. Revision History

| Revision | Description | Date |
|----------|-------------|------|
| 1.0 | Initial Version. | 2024/8/15 |

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