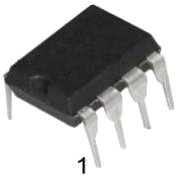
## Feature

- Fail-safe circuitry
- Low power consumption
- Up to 128 transceivers can be attached to the bus
- Maximum transmission rate： 10Mbps
- ESD： ≥±15kV
- DIP-8,SOP-8,MSOP-8,DFN-8, Package



DIP-8

SOP-8

MSOP-8

DFN-8 3*3

## Applications

- RS-485 Communications
- Level Translators
- Security Equipment
- Industrial Control Equipment
- Watt-hour meter

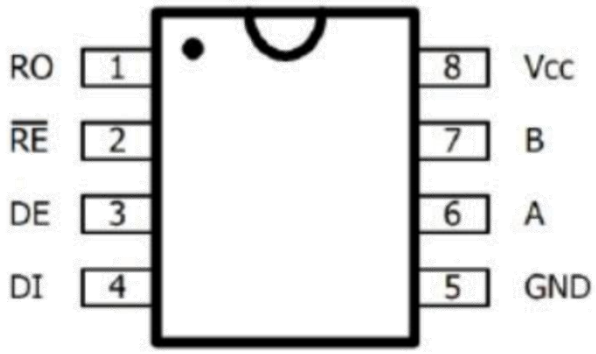
## Ordering Information

| DEVICE | Package Type | MARKING | Packing | Packing Qty |
|---|---|---|---|---|
| H485EIN | DIP-8 | H485EI | TUBE | 2000pcs/reel |
| H485EIM/TR | SOP-8 | H485EI | REEL | 2500pcs/reel |
| H485EIMM/TR | MSOP-8 | H485EI | REEL | 3000pcs/reel |
| H485EIDQ/TR<br>H485EIDQ3/TR | DFN-8 3*3 | H485EI | REEL | 5000pcs/reel |
| H485ECN | DIP-8 | H485EC | TUBE | 2000pcs/reel |
| H485ECM/TR | SOP-8 | H485EC | REEL | 2500pcs/reel |
| H485ECMM/TR | MSOP-8 | H485EC | REEL | 3000pcs/reel |
| H485ECDQ/TR<br>H485ECDQ3/TR | DFN-8 3*3 | H485EC | REEL | 5000pcs/reel |

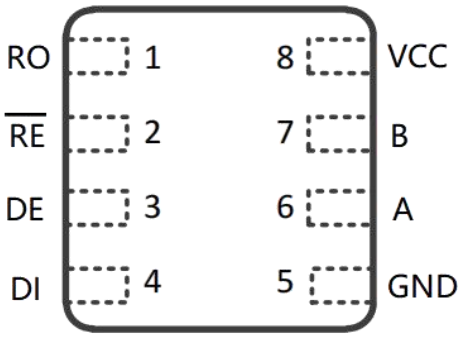
## General Description

The H485E is high-speed transceivers for RS-485 communication, which contain one driver and one receiver. The H485E feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be a logic high if all transmitters on a terminated bus are disabled (high impedance). The H485E driver slew rates are not limited, making transmit speeds up to 10Mbps possible.. And this device has a 1/8-unit-load receiver input impedance that allows up to 128 transceivers on the bus.

## Pin Assignment




DIP-8/SOP-8/MSOP-8

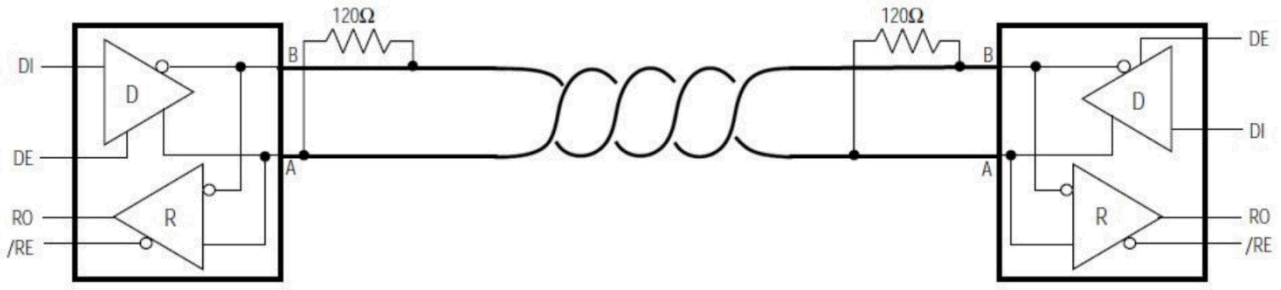



DFN-8 3*3

## Pin Description

| PIN | NAME | FUNCTION |
|---|---|---|
| 1 | RO | Receiver Output, When RE is low and if A - B ≥ -50mV, RO will be high; if A - B ≤ -200mV, RO will below. |
| 2 | /RE | Receiver Output Enable. Drive RE low to enable RO; RO is high impedance when RE is high. Drive RE high and DE low to enter low-power shutdown mode. |
| 3 | DE | Driver Output Enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low. Drive RE high and DE low to enter low-power shutdown mode. |
| 4 | DI | Driver Input. With DE high, a low on DI forces noninverting output low and inverting output high. |
| 5 | GND | Ground |
| 6 | A | Noninverting Receiver Input and Noninverting Driver Output |
| 7 | B | Inverting Receiver Input and Inverting Driver Output |
| 8 | VCC | Positive Supply |

## Typical application circuit




## Absolute Maximum Ratings（TA=25℃）

| PARAMETER | | MIN | MAX | UNITS |
|---|---|---|---|---|
| Supply Voltage（$V_{CC}$） | | - | +7V | V |
| Control Input Voltage（/RE, DE） | | -0.3 | Vcc+0.3V | V |
| Driver Input Voltage（DI） | | -0.3 | Vcc+0.3V | V |
| Driver Output Voltage（A,B） | | -13V | +13V | V |
| Receiver Input Voltage（A,B） | | -13V | +13V | V |
| Receiver Output Voltage（$R_O$） | | -0.3 | Vcc+0.3V | V |
| Operating Temperature（$T_{OPR}$） | H485EC | 0 | +70 | ℃ |
| | H485EI | -40 | +85 | ℃ |
| Storage Temperature（$T_{STG}$） | | -65 | +150 | ℃ |
| Lead Temperature (Soldering, 10 seconds) | | - | +260 | ℃ |

Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

## DC ELECTRICAL CHARACTERISTICS (VCC=5V，TA=25℃) (1)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Differential Driver Output (no load) | $V_{OD1}$ | R=27Ω, Figure 1 | | - | - | VCC | V |
| Differential Driver Output | $V_{OD2}$ | | | 1.8 | - | - | V |
| Change in Magnitude of Differential Output Voltage | $\Delta V_{OD}$ | | | - | - | 0.2 | V |
| Driver Common-Mode Output Voltage | $V_{OC}$ | | | 1.0 | - | 3.0 | V |
| Change in Magnitude of Common-Mode Voltage (2) | $\Delta V_{OC}$ | | | - | - | 0.2 | V |
| Input High Voltage | $V_{IH}$ | DE, DI, /RE | | 2.0 | - | - | V |
| Input Low Voltage | $V_{IL}$ | DE, DI, /RE | | - | - | 0.8 | V |
| DI Input Hysteresis | $V_{HYS}$ | - | | - | 100 | - | mV |
| Driver Input Current（A And B） | $I_{IN1}$ | VIN=12V | DE=0V, Vcc=0V/5.25V | - | - | 150 | uA |
| | | VIN=-7V | | -150 | - | - | uA |
| Driver Short-Circuit Output Current (3) | $I_{OSD}$ | A and B Short-Circuit | | -100 | - | 100 | mA |
| Receiver Differential Threshold Voltage | $V_{TH}$ | -7V≤VCM≤12V | | -200 | -125 | -50 | mV |
| Receiver Input Hysteresis | $\triangle V_{TH}$ | - | | - | 40 | - | mV |
| Receiver Output High Voltage | $V_{OH}$ | IO=-4mA, VID=-50mV | | VCC-1 | - | - | V |
| Receiver Output Low Voltage | $V_{OL}$ | IO=4mA, VID=-200mV | | - | - | 0.4 | V |
| Three-State Output Current at Receiver | $I_{OZR}$ | 0.4V≤Vo≤2.4V | | - | - | ±1 | μA |
| Receiver Input Resistance | $R_{IN}$ | -7V≤VCM≤12V | | 96 | - | - | KΩ |
| Receiver Output Short -Circuit Current | $I_{OSR}$ | 0V≤VRO≤VCC | | ±7 | - | ±100 | mA |
| Supply Current | $I_{CC}$ | DE=VCC | No Load/ RE=DI =VCC/G ND | - | 450 | 900 | μA |
| | | DE=GND | | - | 450 | 600 | μA |
| Supply Current in Shutdown Mode | $I_{SHDN}$ | DE=GND, /RE=VCC, DI=VCC/GND | | - | - | 10 | μA |

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.

Note 2: $\Delta V_{OD}$ and $\Delta V_{OC}$ are the changes in $V_{OD}$ and $V_{OC}$, respectively, when the DI input changes state.

Note 3: Maximum current level applies to peak current just prior to foldback-current limiting; minimum current level applies during current limiting.

## Switching Characteristics（VCC=5V，TA=25℃）

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Driver Input to Output | $t_{DPLH}$ | Figure 3 and 5，RDIFF=54Ω $C_{L1}$=$C_{L2}$=100pF | - | 30 | 60 | ns |
| | $t_{DPHL}$ | | - | 30 | 60 | ns |
| Driver Output Skew $\|T_{DPLH} - T_{DPHL}\|$ | $t_{DSKEW}$ | | - | - | 20 | ns |
| Driver Rise or Fall Time | $t_{DR}$, $t_{DF}$ | | - | 30 | | ns |
| Maximum Data Rate | $F_{MAX}$ | - | 10 | - | - | Mbps |
| Driver Enable to Output High | $t_{DZH}$ | Figure 4 and 6，$C_L$=100pF S2 closed | - | - | 70 | ns |
| Driver Disable Time from High | $t_{DHZ}$ | | - | - | 70 | ns |
| Driver Enable to Output Low | $t_{DZL}$ | Figure 4 and 6，$C_L$=100pF S1 closed | - | - | 70 | ns |
| Driver Disable Time from Low | $t_{DLZ}$ | | - | - | 70 | ns |
| Receiver Input to Output | $t_{RPLH}$ $t_{RPHL}$ | Figure 7 and 9，$\|V_{ID}\|$ ≥ 2.0V, rise and fall time of $V_{ID}$≦15ns | - | 90 | 250 | ns |
| $\|T_{RPLH}–T_{RPHL}\|$ Differential Receiver Skew | $t_{RSKD}$ | | - | 30 | - | ns |
| Receiver Enable to Output Low | $t_{RZL}$ | Figure 2 and 8，$C_{RL}$=15pF S1 closed | - | 30 | 70 | ns |
| Receiver Disable Time from Low | $t_{RLZ}$ | | - | 30 | 70 | ns |
| Receiver Enable to Output High | $t_{RZH}$ | Figure 2 and 8，$C_{RL}$=15pF S2 closed | - | 30 | 70 | ns |
| Receiver Disable Time from High | $t_{RHZ}$ | | - | 30 | 70 | ns |
| Time to Shutdown | $t_{SHDN}$ | - | - | 200 | 600 | ns |

## Function Tables

### Transmitting

| INPUTS | | | OUTPUTS | |
|---|---|---|---|---|
| /RE | DE | DI | A | B |
| X | 1 | 1 | 1 | 0 |
| X | 1 | 0 | 0 | 1 |
| 0 | 0 | X | High-Z | High-Z |
| 1 | 0 | X | Shutdown | |

### Receiving

| INPUTS | | | OUTPUT |
|---|---|---|---|
| /RE | DE | A-B | RO |
| 0 | X | ≥-0.05V | 1 |
| 0 | X | ≤-0.2V | 0 |
| 0 | X | Open/shorted | 1 |
| 1 | 1 | X | High-Z |
| 1 | 0 | X | Shutdown |

## Test circuit

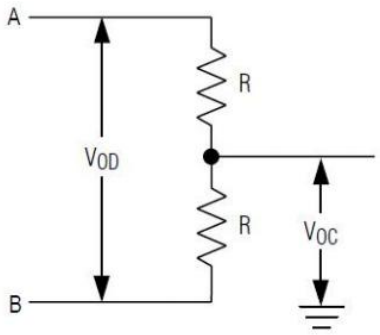



Figure 1. Driver DC Test Load

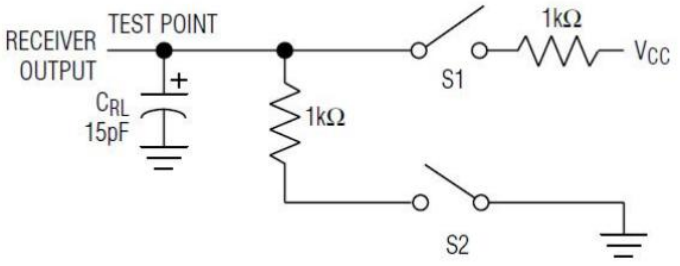



Figure 2. Receiver Enable/Disable Timing Test Load

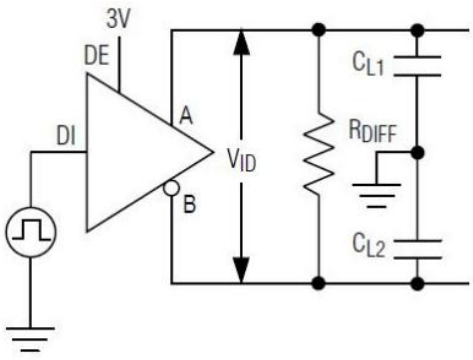



Figure 3. Driver Timing Test Circuit

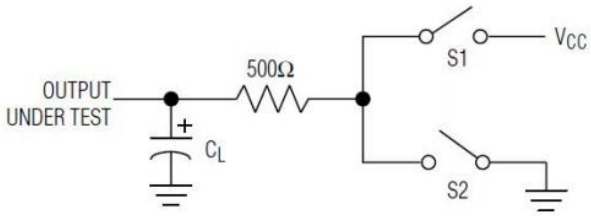



Figure 4. Driver Enable/Disable Timing Test Load

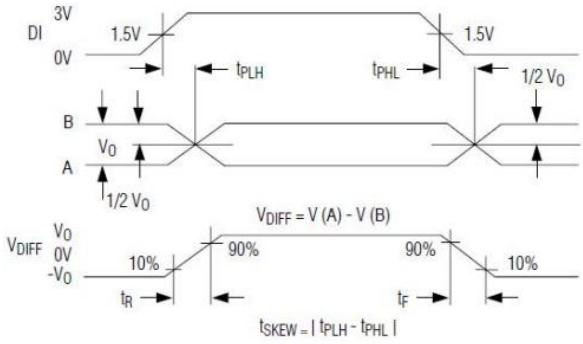



Figure 5. Driver Propagation Delays

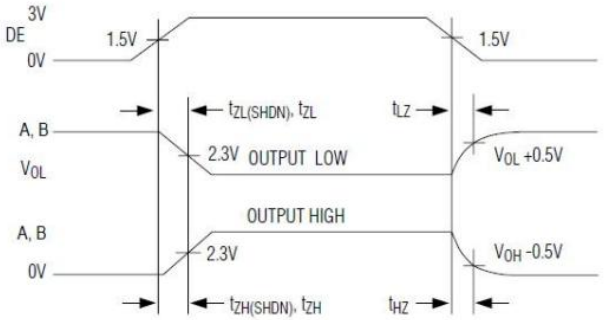



Figure 6. Driver Enable and Disable Times

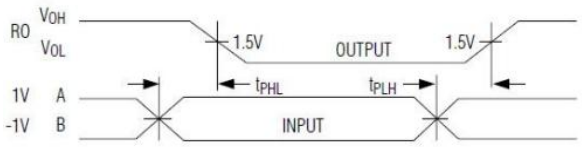



Figure 7. Receiver Propagation Delays

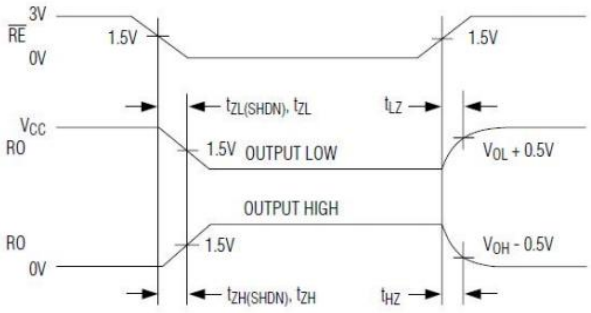
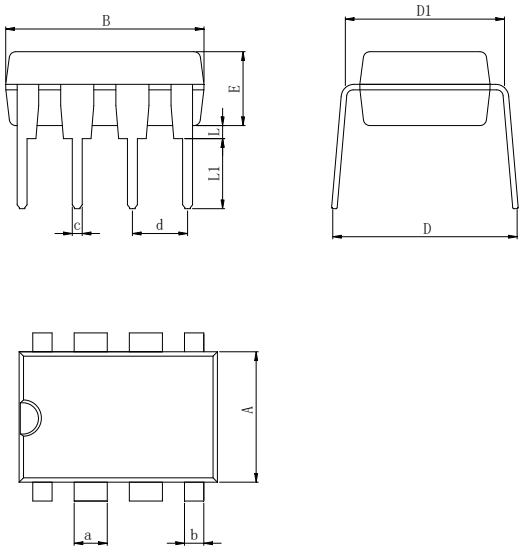



Figure 8. Receiver Enable and Disable Times

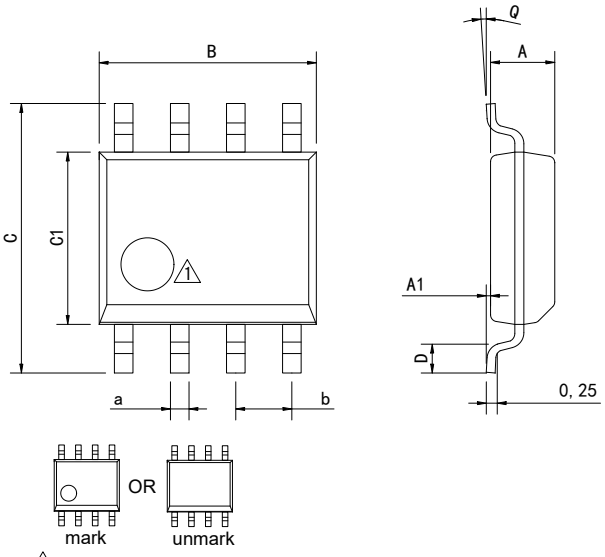
## Physical Dimensions

### DIP-8




| Dimensions In Millimeters(DIP-8) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | B | D | D1 | E | L | L1 | a | b | c | d |
| **Min:** | 6.10 | 9.00 | 8.10 | 7.42 | 3.10 | 0.50 | 3.00 | 1.50 | 0.85 | 0.40 | 2.54 BSC |
| **Max:** | 6.68 | 9.50 | 10.9 | 7.82 | 3.55 | 0.70 | 3.60 | 1.55 | 0.90 | 0.50 | |

### SOP-8

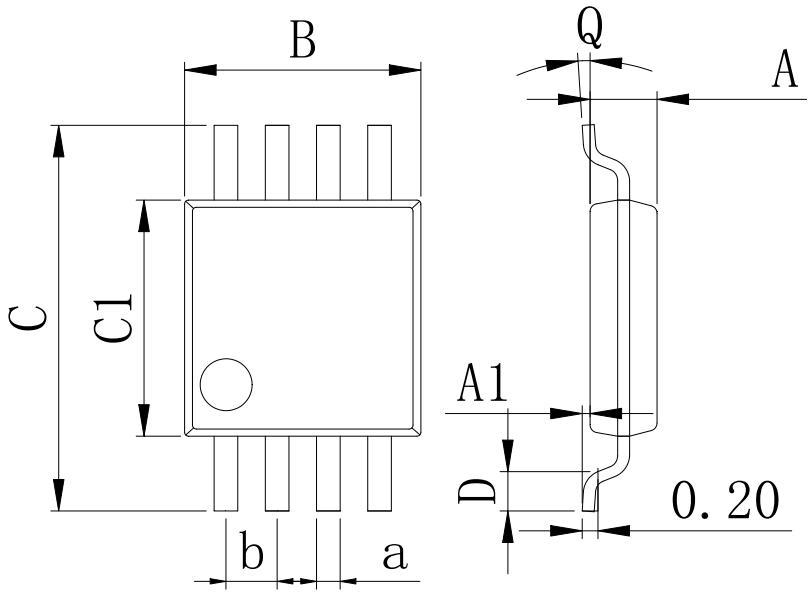



1 Package top mark may be in lower left corner or unmark

| Dimensions In Millimeters(SOP-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 1.35 | 0.05 | 4.90 | 5.80 | 3.80 | 0.40 | 0° | 0.35 | 1.27 BSC |
| **Max:** | 1.55 | 0.20 | 5.10 | 6.20 | 4.00 | 0.80 | 8° | 0.45 | |

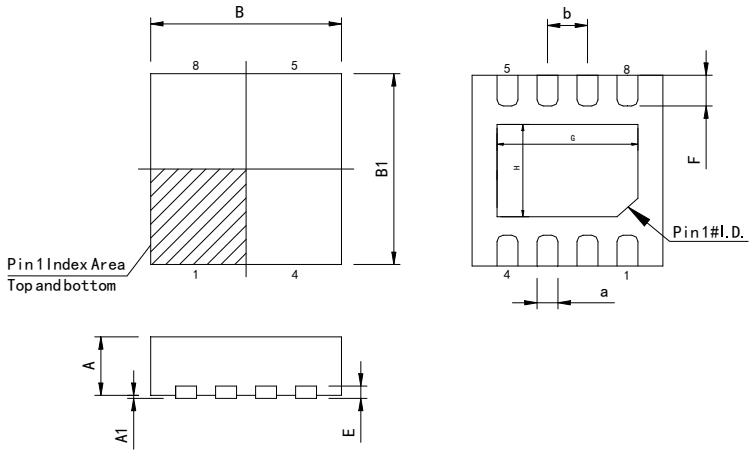
## Physical Dimensions

MSOP-8




| Dimensions In Millimeters(MSOP-8) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | A | A1 | B | C | C1 | D | Q | a | b |
| **Min:** | 0.80 | 0.05 | 2.90 | 4.75 | 2.90 | 0.35 | 0° | 0.25 | 0.65 BSC |
| **Max:** | 0.90 | 0.20 | 3.10 | 5.05 | 3.10 | 0.75 | 8° | 0.35 | |

DFN-8 3*3_0.65 Pin spacing




| Dimensions In Millimeters(DFN-8 3*3) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol:** | **A** | **A1** | **B** | **B1** | **E** | **F** | **G** | **H** | **a** | **b** |
| **Min:** | 0.85 | 0.00 | 2.90 | 2.90 | 0.20 | 0.30 | 2.1 | 1.3 | 0.20 | 0.65 BSC |
| **Max:** | 0.95 | 0.05 | 3.10 | 3.10 | 0.25 | 0.50 | 2.5 | 1.7 | 0.34 | |

## Revision History

| REVISION NUMBER | DATE | REVISION | PAGE |
|---|---|---|---|
| V1.0 | 2014-10 | New | 1-11 |
| V1.1 | 2020-9 | Updated DIP-8 dimension、Add annotation for Maximum Ratings. | 3、8 |
| V1.2 | 2024-11 | Add the DFN-8 package device、Update Lead Temperature | 1、3 |
| V1.3 | 2025-11 | Update important statements、Update SOP-8 Dimension drawing | 8、11 |
| V1.4 | 2026-9 | Update DFN-8 Dimension drawing | 9 |

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