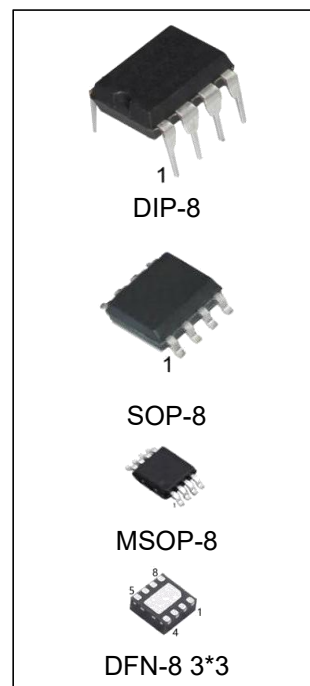


Feature

- Fail-safe circuitry
- Low power consumption
- Up to 128 transceivers can be attached to the bus
- Maximum transmission rate: 10Mbps
- ESD: $\geq \pm 15\text{kV}$
- DIP-8, SOP-8, MSOP-8, DFN-8 Package

Applications

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



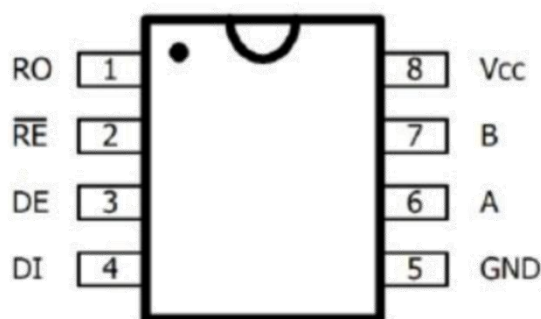
Ordering Information

| DEVICE | Package Type | MARKING | Packing | Packing Qty |
|---------------|--------------|---------|---------|--------------|
| SN65176BN | DIP-8 | 65176B | TUBE | 2000pcs/reel |
| SN65176BM/TR | SOP-8 | 65176B | REEL | 2500pcs/reel |
| SN65176BMM/TR | MSOP-8 | 65176B | REEL | 3000pcs/reel |
| SN65176BDQ/TR | DFN-8 3*3 | 65176B | REEL | 5000pcs/reel |
| SN75176BN | DIP-8 | 75176B | TUBE | 2000pcs/reel |
| SN75176BM/TR | SOP-8 | 75176B | REEL | 2500pcs/reel |
| SN75176BMM/TR | MSOP-8 | 75176B | REEL | 3000pcs/reel |
| SN75176BDQ/TR | DFN-8 3*3 | 75176B | REEL | 5000pcs/reel |

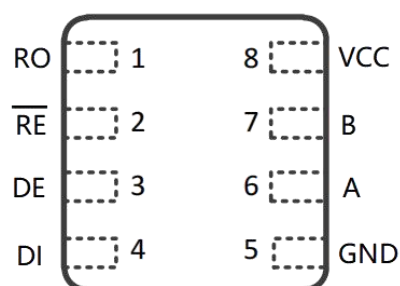
General Description

The SN65176B/75176B is high-speed transceivers for RS-485 communication, which contain one driver and one receiver. The SN65176B/75176B 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 SN65176B/75176B 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

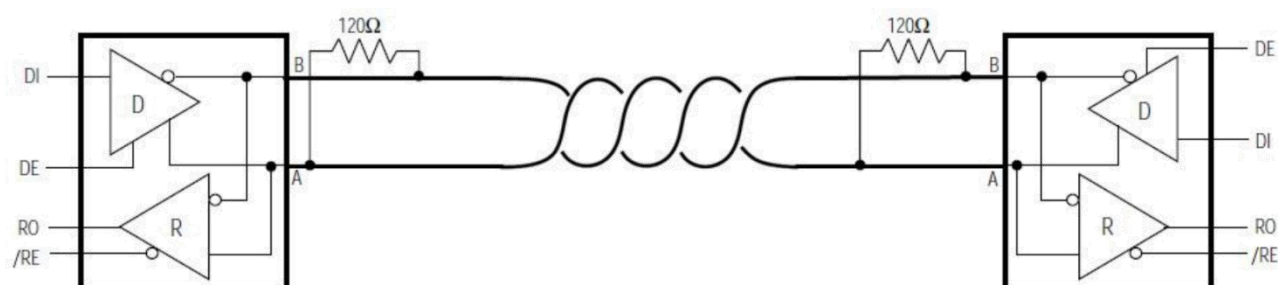


DFN-8 3*3

Pin Description

| PIN | NAME | FUNCTION |
|-----|------|---|
| 1 | RO | Receiver Output, When RE is low and if $A - B \geq -50\text{mV}$, RO will be high; if $A - B \leq -200\text{mV}$, 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°C)

| PARAMETER | | MIN | MAX | UNITS |
|---|----------|------|-----------------------|-------|
| Supply Voltage (V _{CC}) | | - | +7V | V |
| Control Input Voltage (/RE, DE) | | -0.3 | V _{CC} +0.3V | V |
| Driver Input Voltage (DI) | | -0.3 | V _{CC} +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 | V _{CC} +0.3V | V |
| Operating Temperature (T _{OPR}) | SN75176B | 0 | +70 | °C |
| | SN65176B | -40 | +85 | °C |
| Storage Temperature (T _{STG}) | | -65 | +150 | °C |
| Lead Temperature (Soldering, 10 seconds) | | - | +245 | °C |

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 ($V_{CC}=5V$, $T_A=25^{\circ}C$) ⁽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 | ΔV _{OD} | | | - | - | 0.2 | V |
| Driver Common-Mode Output Voltage | V _{OC} | | | 1.0 | - | 3.0 | V |
| Change in Magnitude of Common-Mode Voltage ⁽²⁾ | ΔV _{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≤V _{CM} ≤12V | | -200 | -125 | -50 | mV |
| Receiver Input Hysteresis | ΔV _{TH} | - | | - | 40 | - | mV |
| Receiver Output High Voltage | V _{OH} | IO=-4mA, V _{ID} =-50mV | | VCC-1 | - | - | V |
| Receiver Output Low Voltage | V _{OL} | IO=4mA, V _{ID} =-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≤V _{CM} ≤12V | | 96 | - | - | KΩ |
| Receiver Output Short -Circuit Current | I _{OSR} | 0V≤V _{RO} ≤VCC | | ±7 | - | ±100 | mA |
| Supply Current | I _{CC} | DE=VCC | No Load /RE=DI=VCC/GND | - | 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: ΔV_{OD} and ΔV_{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°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------------|--|-----|-----|-----|-------|
| Driver Input to Output | t_{DPLH} | Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$ | - | 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} \geq 2.0V$, rise and fall time of $V_{ID} \leq 15ns$ | - | 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 | $\geq -0.05V$ | 1 |
| 0 | X | $\leq -0.2V$ | 0 |
| 0 | X | Open/shorted | 1 |
| 1 | 1 | X | High-Z |
| 1 | 0 | X | Shutdown |

Test circuit

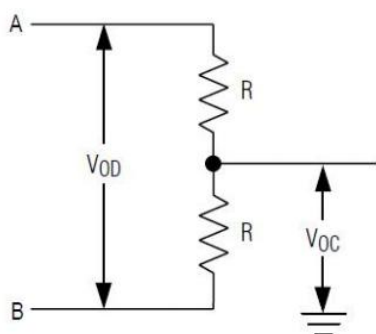


Figure 1. Driver DC Test Load

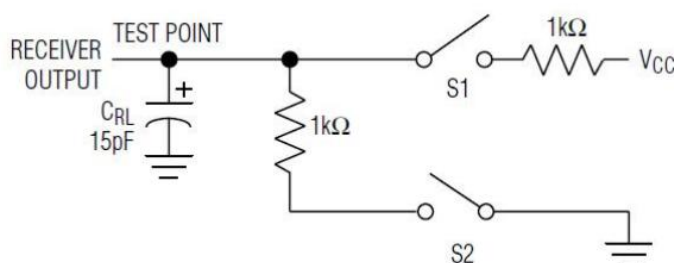


Figure 2. Receiver Enable/Disable Timing Test Load

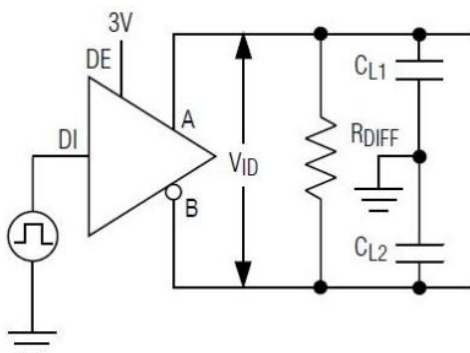


Figure 3. Driver Timing Test Circuit

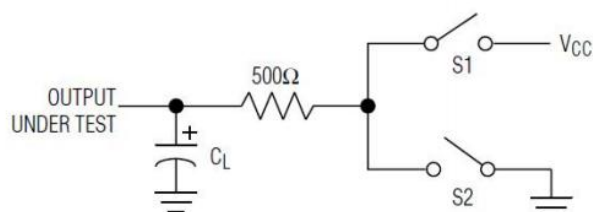


Figure 4. Driver Enable/Disable Timing Test Load

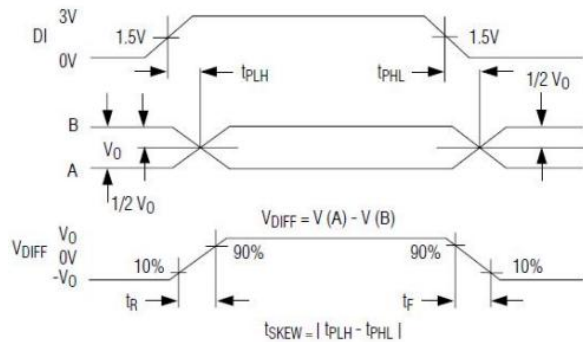


Figure 5. Driver Propagation Delays

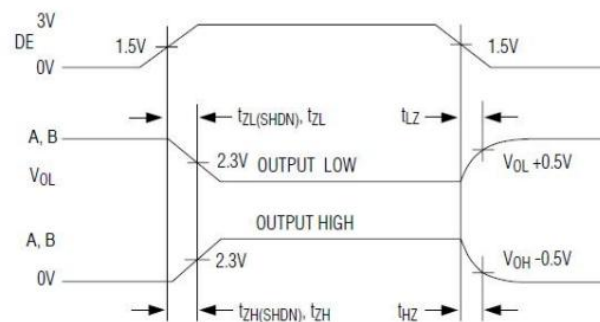


Figure 6. Driver Enable and Disable Times

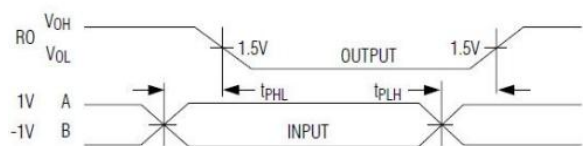


Figure 7. Receiver Propagation Delays

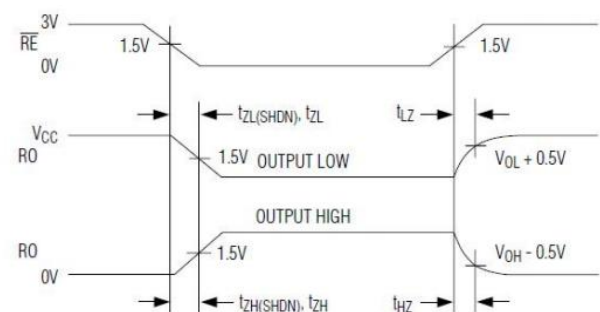
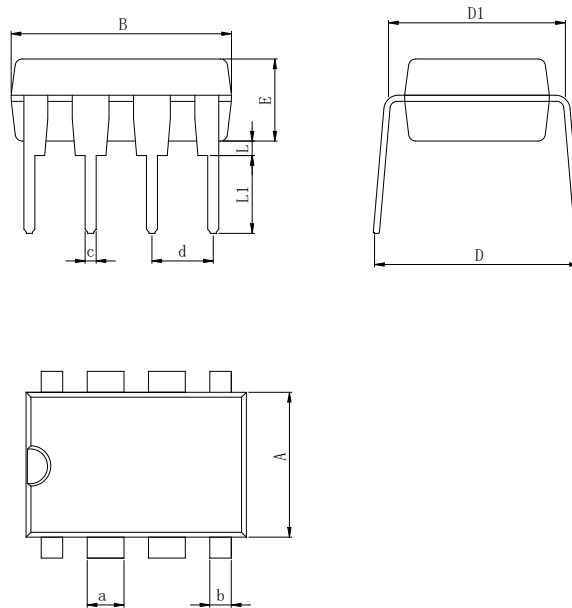


Figure 8. Receiver Enable and Disable Times

Physical Dimensions

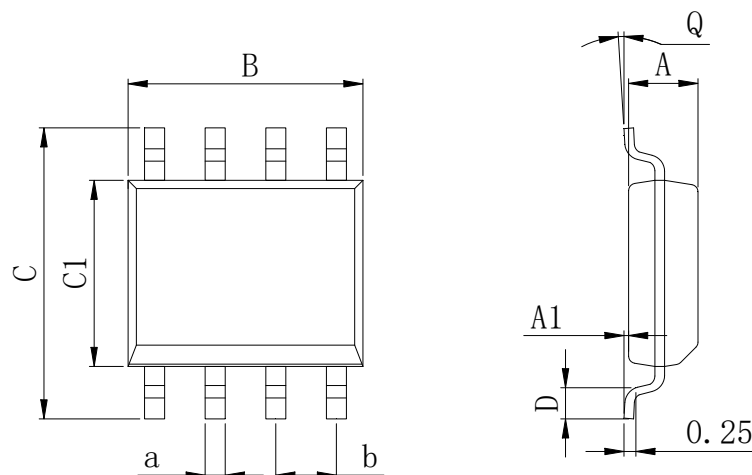
DIP-8



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 (150mil)

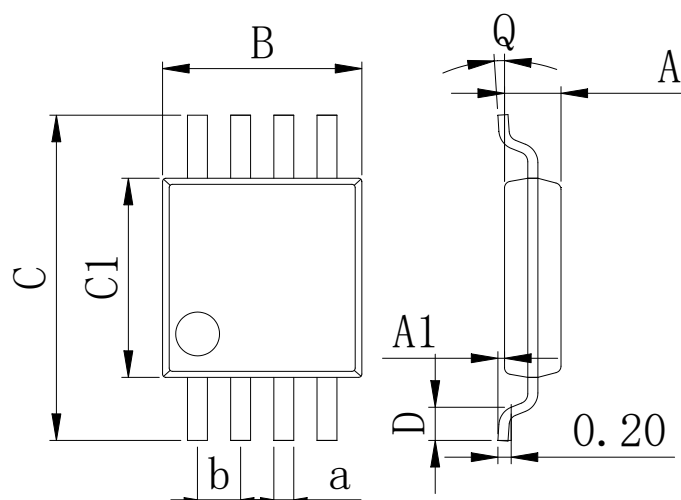


Dimensions In Millimeters(SOP-8)

| 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 | |

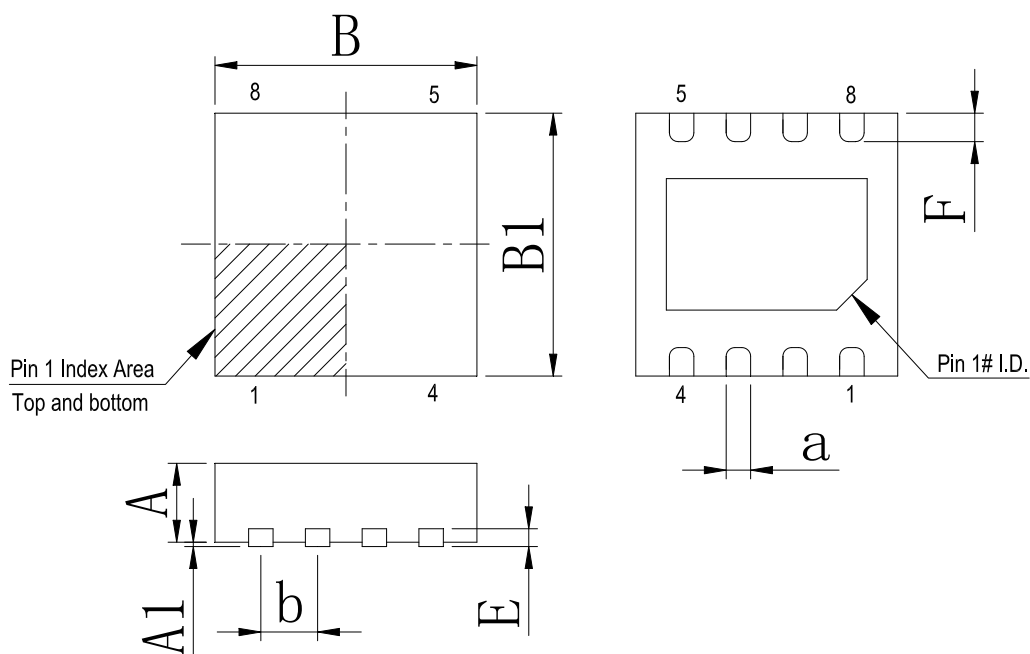
Physical Dimensions

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



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

Revision History

| DATE | REVISION | PAGE |
|----------|---|------|
| 2014-1-5 | New | 1-11 |
| 2024-8-8 | Document Reformatting, Add the DFN-8 package device | 1-11 |

IMPORTANT STATEMENT:

Huaguan Semiconductor reserves the right to change its products and services without notice. Before ordering, the customer shall obtain the latest relevant information and verify whether the information is up to date and complete. Huaguan Semiconductor does not assume any responsibility or obligation for the altered documents.

Customers are responsible for complying with safety standards and taking safety measures when using Huaguan Semiconductor products for system design and machine manufacturing. You will bear all the following responsibilities: Select the appropriate Huaguan Semiconductor products for your application; Design, validate and test your application; Ensure that your application meets the appropriate standards and any other safety, security or other requirements. To avoid the occurrence of potential risks that may lead to personal injury or property loss.

Huaguan Semiconductor products have not been approved for applications in life support, military, aerospace and other fields, and Huaguan Semiconductor will not bear the consequences caused by the application of products in these fields. All problems, responsibilities and losses arising from the user's use beyond the applicable area of the product shall be borne by the user and have nothing to do with Huaguan Semiconductor, and the user shall not claim any compensation liability against Huaguan Semiconductor by the terms of this Agreement.

The technical and reliability data (including data sheets), design resources (including reference designs), application or other design suggestions, network tools, safety information and other resources provided for the performance of semiconductor products produced by Huaguan Semiconductor are not guaranteed to be free from defects and no warranty, express or implied, is made. The use of testing and other quality control technologies is limited to the quality assurance scope of Huaguan Semiconductor. Not all parameters of each device need to be tested.

The documentation of Huaguan Semiconductor authorizes you to use these resources only for developing the application of the product described in this document. You have no right to use any other Huaguan Semiconductor intellectual property rights or any third party intellectual property rights. It is strictly forbidden to make other copies or displays of these resources. You should fully compensate Huaguan Semiconductor and its agents for any claims, damages, costs, losses and debts caused by the use of these resources. Huaguan Semiconductor accepts no liability for any loss or damage caused by infringement.