

Si86S61x/S62x/SOx: Single and Dual Channel Digital Isolators

Industrial Applications

- Industrial automation systems
- Medical electronics
- Isolated switch mode supplies
- Isolated ADC, DAC
- Motor control
- Power inverters
- Communications systems

- AEC-Q100 qualification
- Wide temperature range
 - -40 to +125 °C
- RoHS-compliant packages
 - NB SOIC-8
 - SSO-8
- Automotive-grade OPNs available
 - AIAG compliant PPAP documentation support
 - IMDS and CAMDS listing support

Automotive Applications

- Onboard chargers
- Battery management systems
- Charging stations
- Traction inverters
- Hybrid electric vehicles
- Battery electric vehicles

Safety Regulatory Approvals (Pending)

- UL 1577 recognized
 - Up to 6000 V_{RMS} for 1 minute
- CSA certification conformity
 - 62368-1, 60601-1 (reinforced insulation)
- VDE certification conformity
 - 60747-17 (reinforced insulation)
- CQC certification approval, GB4943.1

Features

- High-speed operation: DC to 150 Mbps
- No start-up initialization required
- Wide supply voltage: 2.25 to 5.5 V
- Up to 6000 V_{RMS} isolation
- Reinforced IEC 60747-17 rating
- High electromagnetic immunity
- Schmitt trigger + CMOS threshold inputs
- Selectable fail-safe mode:
 - Default high or low output (ordering option)
- Precise timing (typical)
 - 10 ns propagation delay
 - 3.5 ns pulse width distortion
- Transient Immunity of 100 kV/μs (min)

Description

The Skyworks family of robust, low-power digital isolators are CMOS devices offering substantial data rate, propagation delay, power, size, reliability, and external BOM advantages over legacy isolation technologies. All versions have CMOS thresholds and Schmitt trigger inputs for high noise immunity and only require VDD bypass capacitors. Data rates up to 150 Mbps are supported, and all devices achieve typical propagation delays of 10 ns. This family includes inverted output product options. Options also include a choice of isolation ratings (3.75 and 6 kV_{RMS}) and options for fail-safe operating mode to control the default output state during power loss. All products are safety certified by UL, CSA, VDE, and CQC. Products in wide-body packages support voltages of 6.0 kV_{RMS} with 1 minute withstand capability per UL 1577. Automotive Grade is available. These products are built using automotive-specific flows at all steps in the manufacturing process to ensure the robustness and low defectivity required for automotive applications.



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

1. Pin Descriptions

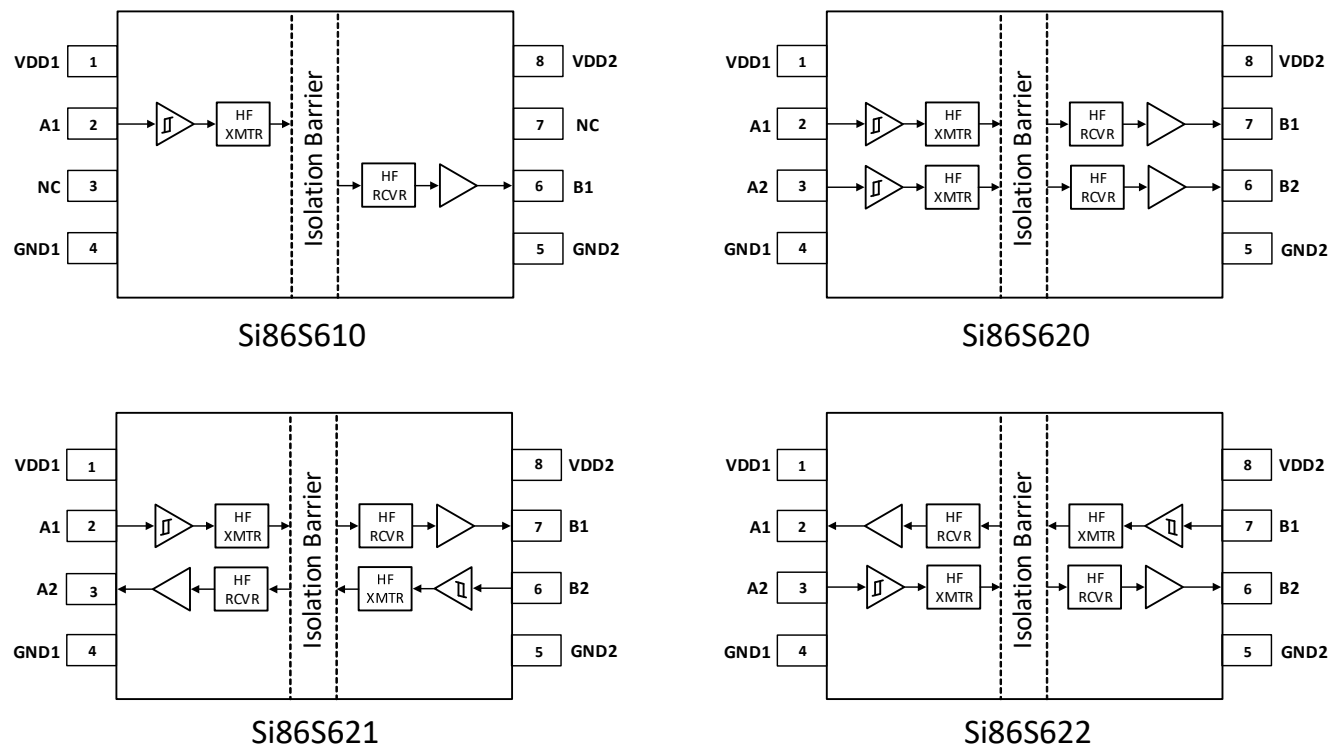


Figure 1. Si86S61x/2x/Ox Pinout

Table 1. Si86S61x/2x/Ox Pin Description

| Name | Type | Description |
|---------|-------------|---------------------|
| VDD1 | Supply | Side A power supply |
| GND1 | Ground | Side A ground |
| A1 – A2 | Digital I/O | Side A digital I/O |
| NC | No connect | Do not connect pin |
| GND2 | Ground | Side B ground |
| B1 – B2 | Digital I/O | Side B digital I/O |
| VDD2 | Supply | Side B power supply |

2. Technical Description

2.1. Theory of Operation

The operation of an Si86S61x/2x/Ox channel is analogous to an optocoupler, except an RF carrier is modulated instead of light. This simple architecture provides a robust isolated data path and requires no special considerations or initialization at start-up. A simplified block diagram for a single Si86S61x/2x/Ox channel is shown in Figure 2.

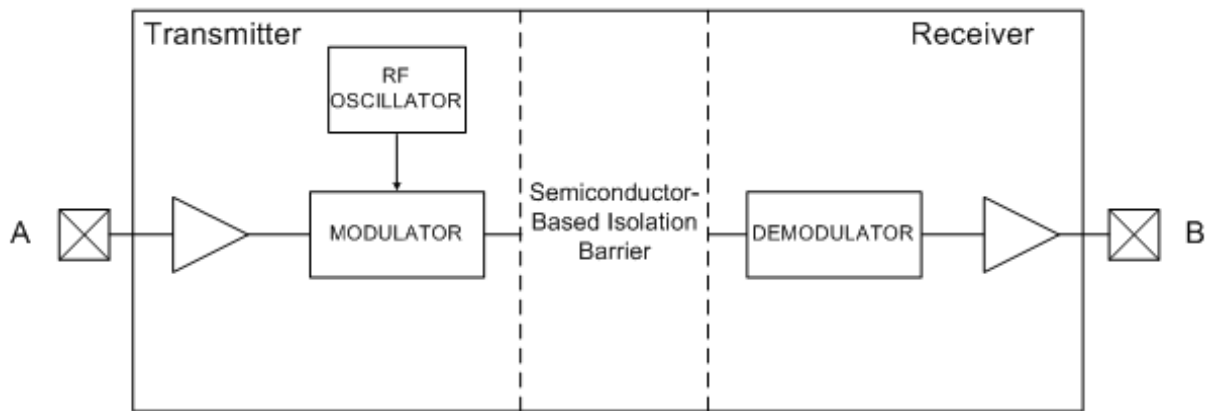


Figure 2. Simplified Channel Diagram

A channel consists of an RF Transmitter and RF Receiver separated by a semiconductor-based isolation barrier. Referring to the transmitter, input A modulates the carrier provided by an RF oscillator using on/off keying.

The Receiver contains a demodulator that decodes the input state according to its RF energy content and applies the result to output B via the output driver. This RF on/off keying scheme is superior to pulse code schemes as it provides best-in-class noise immunity, low power consumption, and improved immunity to magnetic fields, see Figure 3.

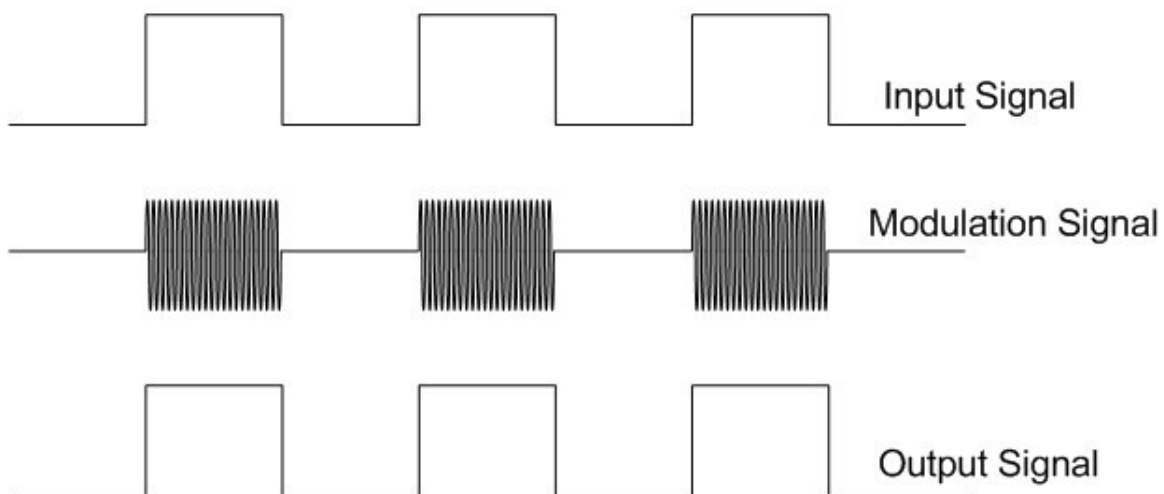


Figure 3. Modulation Scheme

3. Device Operation and System Overview

Device behavior during start-up, normal operation, and shutdown is shown below, where UVLO+ and UVLO– are the respective positive-going and negative-going thresholds. Refer to the following table to determine outputs when power supply (VDD) is not present.

Table 2. Si86S6x/Ox Logic Operation

| VI Input ^{1,2,3} | VDDI State ^{1,4,5} | VDDO State ^{1,4,5} | VO Output ^{1,2,3} | Comments |
|---------------------------|-----------------------------|-----------------------------|----------------------------|---|
| H | P | P | H/L | Normal operation for Si86S6x/SOx options. The Si86SOx options are inverting outputs. |
| L | P | P | L/H | |
| X | UP | P | L ⁶ | Default low options. |
| | | | H ⁶ | Default high options. |
| X | P | UP | UD ⁷ | Upon transition of VDDO from un-powered to powered, V _O returns to correct state. Refer to Note 7 below. |

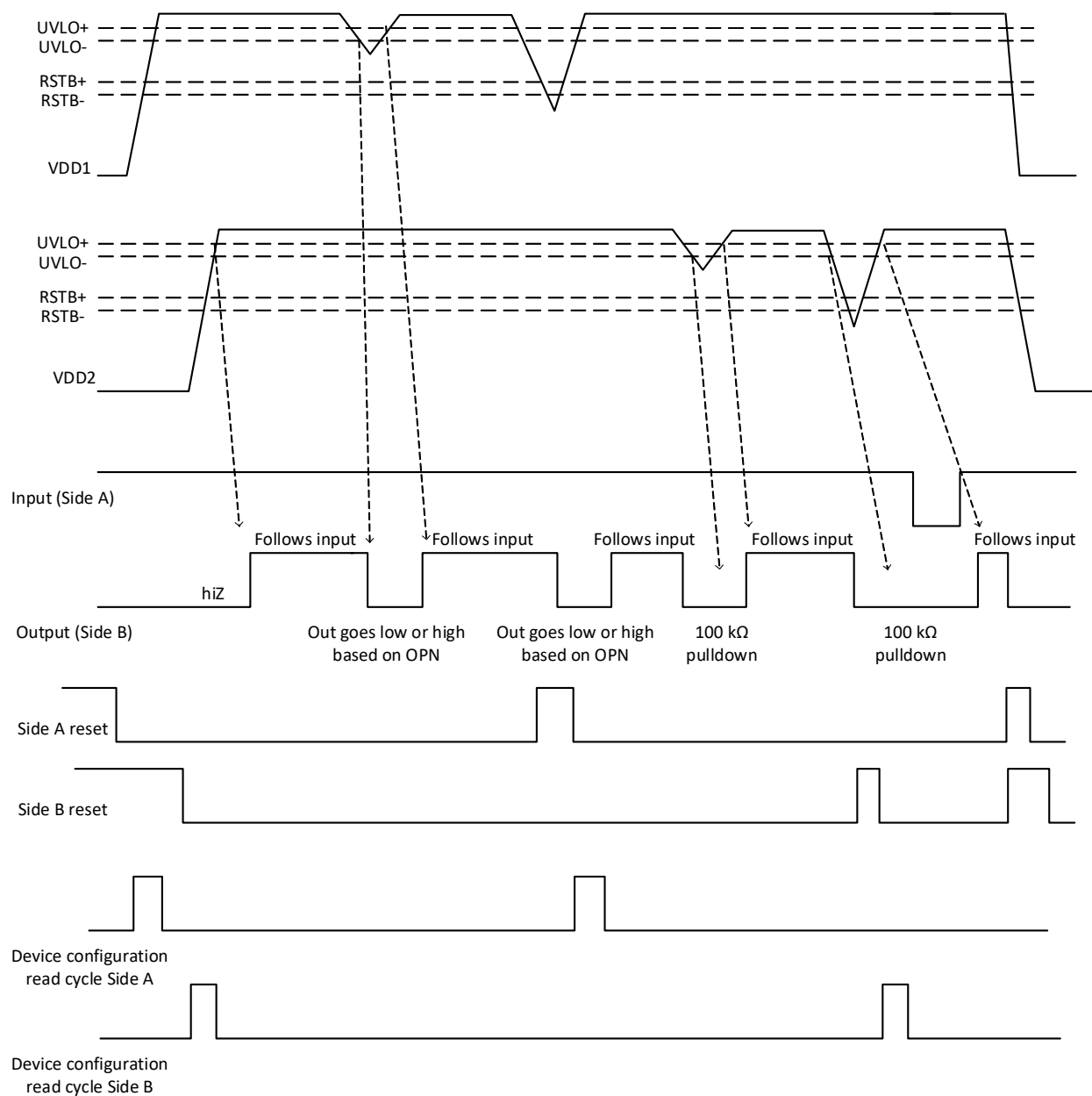
1. VI and VO are the input and output terminals of any one channel. VDDI and VDDO are the power supplies on the respective input and output sides.
2. X = not applicable; H = Logic High; L = Logic Low; Hi-Z = High Impedance.
3. Note that an I/O can power the die for a given side through an internal diode if its source has adequate current.
4. "Powered" state (P) is defined as $2.25\text{ V} < \text{VDD} < 5.5\text{ V}$.
5. "Unpowered" state (UP) is defined as $\text{VDD} < 2.25\text{ V}$.
6. This is the selectable fail-safe operating mode (ordering option). Some devices have default output state = H, and some have default output state = L. For default high devices, the data channels have pull-ups on inputs/outputs. For default low devices, the data channels have pull-downs on inputs/outputs.
7. UD = Undetermined. Refer to "Timing diagram for startup" below notes section, the start-up time from un-powered state, below 1.7 V (RSTB) threshold to powered state, is 0.3 ms. If VDDO only dips below 2.1 V but stays above RSTB level, the start-up time is 1 μs .

3.1. Device Startup, UVLO, and Reset Functionality

Outputs are held low during power-up until VDD is above the UVLO threshold for time period tSTART. Following this, the outputs follow the states of inputs. The start-up time of the device is estimated to be 0.3 ms due to the device initialization time. During this time, the outputs will have a 100 k Ω pulldown resistor that will pull the outputs low. After stabilization, the outputs will transition to the default output state indicated by the particular product option.

Undervoltage Lockout (UVLO) is provided to prevent erroneous operation during device startup and shutdown or when VDD is below its specified operating circuits range. Side A and Side B each have their own undervoltage lockout monitors. Each side can enter or exit UVLO independently. For example, referring to the figure below, Side A unconditionally enters UVLO when VDD1 falls below VDD1(UVLO–) and exits UVLO when VDD1 rises above VDD1(UVLO+). Side B operates the same as Side A with respect to its VDD2 supply.

Along with UVLO, each side has its own self biased circuitry that can detect supply going low enough and issue a complete reset of the part. This is done to avoid loss of device configuration for the particular product option. Referring to the figure below, Side A goes into reset as soon as VDD1 goes below RSTB– (~1.7 V) and comes out of reset when VDD1 goes above RSTB+. When the supply voltage is above RSTB+ the device configuration is re-loaded. Side B operates the same as Side A with respect to its VDD2 supply.



206552-004

Figure 4. Startup Device Behavior

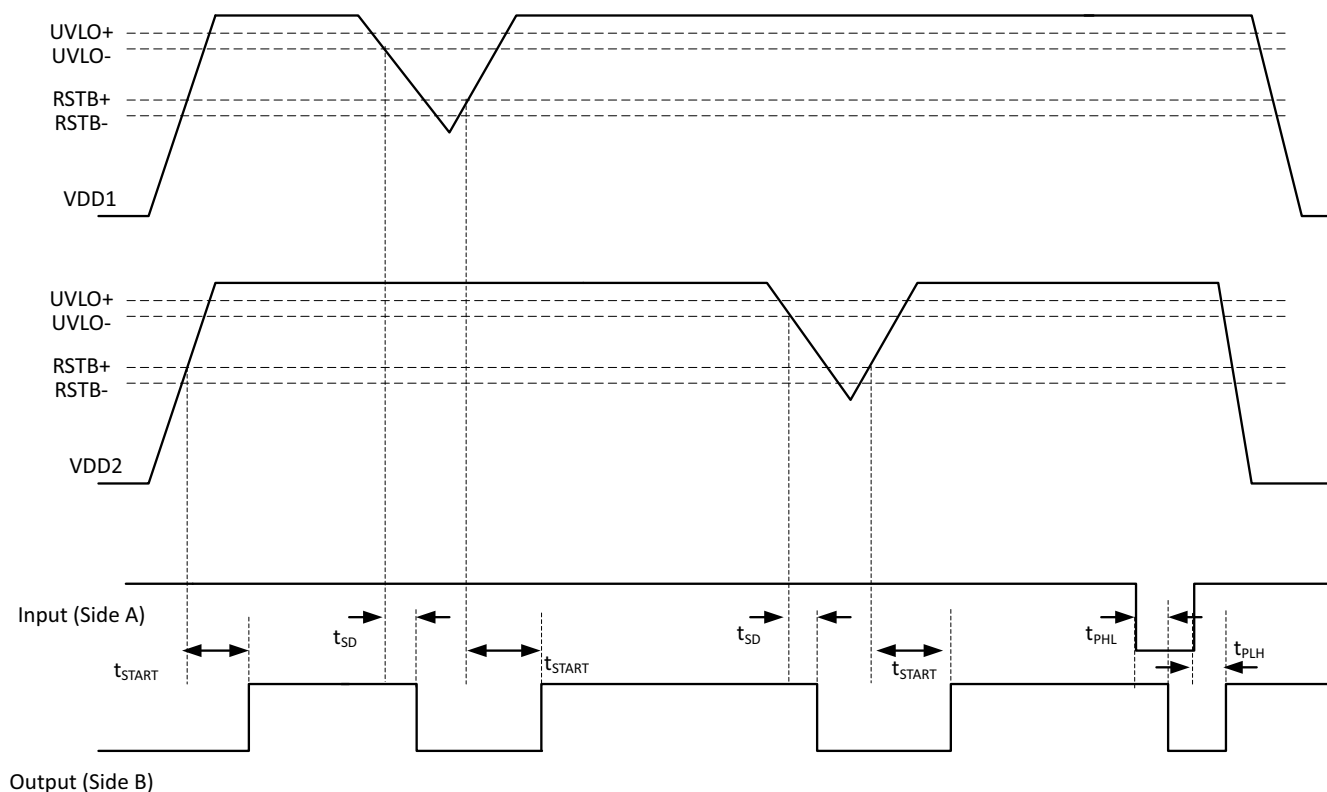


Figure 5. Device Behavior During Normal Operation

3.2. Layout Considerations

To ensure safety in the end-user application, high-voltage circuits (i.e., circuits with >30 VAC) must be physically separated from the safety extra-low-voltage circuits (SELV is a circuit with <30 VAC) by a certain distance (creepage/clearance). If a component, such as a digital isolator, straddles this isolation barrier, it must meet those creepage/clearance requirements and provide a sufficiently large high voltage breakdown protection rating (commonly referred to as working voltage protection). These requirements also detail the component standards (UL1577, IEC 60747-17), which are readily accepted by certification bodies to provide proof for end-system specifications requirements. Refer to the end-system specification (61010-1, 62368-1, 60601-1, etc.) requirements before starting any design that uses a digital isolator.

3.2.1. Supply Bypass

The Si86S61x/2x/Ox family requires 0.1 and 10 μ F bypass capacitors between VDD1 and GND1 and VDD2 and GND2. The capacitor should be placed as close as possible to the package. To enhance the robustness of a design, the user may also include resistors (50 to 300 Ω) in series with the inputs and outputs if the system is excessively noisy.

3.2.2. Output Pin Termination

The nominal output impedance of an isolator driver channel is approximately 50 Ω , $\pm 40\%$, which is a combination of the value of the on-chip series termination resistor and channel resistance of the output driver FET. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled-impedance PCB traces.

3.3. Fail-Safe Operating Mode

Si86S61x/2x/Ox devices feature a selectable (by ordering option) mode whereby the default output state (when the input supply is not powered) can either be a logic high or logic low when the output supply is powered. See Table 2 for more information.

3.4. Device Features and System Overview

3.4.1. Input Noise Filters with Deglitch Times of 36 ns

The Si86S62x family is orderable with input deglitch filters which have delay times of 36 ns. These filters remove undesirable noise pulses (glitches) from the input signal so that the isolator only produces an output for a valid input. Any input pulse which lasts less than the deglitch time will not be passed by the filter. Any other input pulse will be passed by the filter and delayed by the filter delay time, as shown below. Figure 6 shows a positive noise pulse, but negative pulses will also be filtered out.

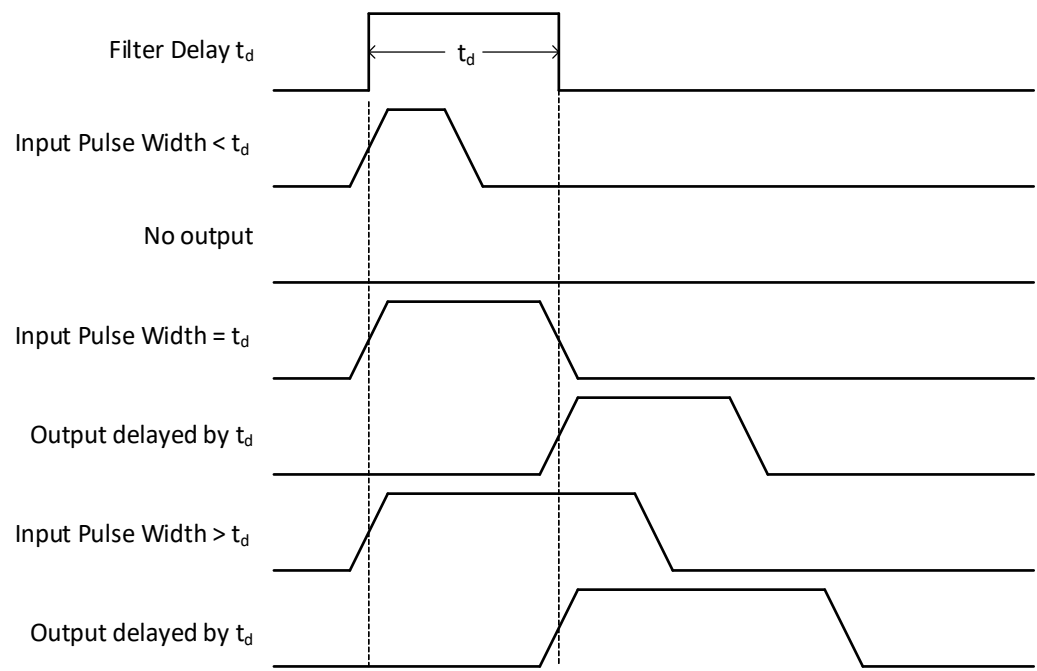


Figure 6. Input Noise Filter Functionality

4. Electrical Specifications

Table 3. Absolute Maximum Ratings¹

| Parameter | Symbol | Min | Max | Unit |
|--------------------------------|--|------|-----------|------------|
| Storage temperature | T_{STG} | -65 | 150 | °C |
| Operating temperature | T_A | -40 | 125 | °C |
| Junction temperature | T_J | — | 150 | °C |
| Supply voltage | VDD1, VDD2 | -0.5 | 7.0 | V |
| Supply voltage ramp-up | VDD1, VDD2 | — | 1 | V/ μ s |
| Input voltage | V_I | -0.5 | VDD + 0.5 | V |
| Output voltage | V_O | -0.5 | VDD + 0.5 | V |
| Output current drive | I_O | -10 | +10 | mA |
| ESD | HBM | — | 8 | kV |
| | CDM | — | 2 | kV |
| | IEC 61000-4-2 contact discharge ² | — | 8000 | V |
| Lead solder temperature (10 s) | | — | 260 | °C |

1. Exposure to maximum rating conditions for extended periods may reduce device reliability. Exceeding any of the limits listed here may result in permanent damage to the device.
2. This test is performed across the isolation barrier with device in a two terminal configuration, with pins on each side shorted together. Tested per IEC 61000-4-2 contact discharge.

ESD Handling: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

Table 4. Recommended Operating Conditions¹

| Parameter | Symbol | Min | Typ | Max | Unit |
|--------------------------------|------------|------|-----|-----|------|
| Junction operating temperature | T_J | — | — | 150 | °C |
| Ambient operating temperature | T_A | -40 | 25 | 125 | °C |
| Supply voltage | VDD1, VDD2 | 2.25 | — | 5.5 | V |

1. The maximum ambient temperature is dependent on data frequency, output loading, number of operating channels, and supply voltage. The maximum junction temperature is a limitation, and the maximum ambient temperature for any given condition can be calculated as shown in [6.1. Estimating Maximum Ambient Temperature](#)

Table 5. Electrical Characteristics (General)

$T_A = -40$ to 125 °C, VDD1, VDD2 as specified in Recommended Operating Conditions Table above.

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------------------------|--------------------|--------------------|----------------|------|------------|----------|
| VDD undervoltage threshold | VDD _{UV+} | VDD1, VDD2 rising | 2.10 | 2.18 | 2.25 | V |
| VDD undervoltage threshold | VDD _{UV-} | VDD1, VDD2 falling | 1.98 | 2.05 | 2.12 | V |
| VDD undervoltage hysteresis | VDD _{HYS} | | 105 | 131 | 160 | mV |
| Input hysteresis | V _{HYS} | | 0.15 x VDDx | — | — | V |
| High level input voltage | V _{IH} | | 0.7 x VDDx | — | — | V |
| Low level input voltage | V _{IL} | | — | — | 0.3 x VDDx | V |
| High level output voltage | V _{OH} | $I_{OH} = -4$ mA | VDD1, VDD2-0.4 | — | — | V |
| Low level output voltage | V _{OL} | $I_{OL} = 4$ mA | — | — | 0.4 | V |
| Output impedance | Z _O | | — | 50 | — | Ω |

Table 6. Electrical Characteristics (VDD = 5.0 V)
VDD1 = 5.0 ±10%, VDD2 = 5.0 V ±10%, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--|-------------------------------------|--|------|------------------------------|------------------------------|------|
| Si86S610Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.46 0.97 1.05 1.00 | 0.54 1.20 1.22 1.22 | mA |
| IDD1 IDD2 | | All inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 0.75 1.01 | 0.88 1.24 | mA |
| Si86S620/O20Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.52 1.54 1.69 1.60 | 0.62 1.93 1.97 1.97 | mA |
| IDD1 IDD2 | | All inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.16 1.61 | 1.28 2.00 | mA |
| Si86S621/O21Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.05 1.05 1.68 1.67 | 1.29 1.29 1.98 1.97 | mA |
| IDD1 IDD2 | | All inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.39 1.39 | 1.67 1.67 | mA |
| Si86S622Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.04 1.04 1.68 1.66 | 1.28 1.28 2.01 1.98 | mA |
| IDD1 IDD2 | | All inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.39 1.37 | 1.69 1.66 | mA |
| Timing Characteristics | | | | | | |
| Data rate Si86SxxxB/Ex | | | — | — | 150 | Mbps |
| Data rate Si86SxxxF/Hx | | | — | — | 10 | Mbps |
| Pulse width Si86SxxxB/Ex | | Minimum pulse width that is guaranteed to be transmitted to output. | 6.7 | — | — | ns |
| Pulse width Si86SxxxF/Hx | | Minimum pulse width that is guaranteed to be transmitted to output. | 100 | — | — | ns |
| Propagation delay Si86SxxxB/Ex | t _{PHL} , t _{PLH} | See Propagation Delay Timing, Figure 7 | 5 | 9 | 13.5 | ns |
| Pulse width distortion Si86SxxxB/Ex t _{PLH} - t _{PHL} | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxB/Ex | t _{PSK(P-P)} ¹ | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxB/Ex | t _{PSK} | | — | 0.8 | 3 | ns |
| Propagation delay Si86SxxxF/Hx | t _{PHL} , t _{PLH} | See Propagation Delay Timing, Figure 7 | 30.5 | 36 | 41.5 | ns |
| Pulse width distortion Si86SxxxF/Hx t _{PLH} - t _{PHL} | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxF/Hx | t _{PSK(P-P)} | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxF/Hx | t _{PSK} | | — | 0.7 | 3.5 | ns |
| Output rise time | t _r | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |
| Output fall time | t _f | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |

Table 6. Electrical Characteristics (VDD = 5.0 V) (Continued)VDD1 = 5.0 ±10%, VDD2 = 5.0 V ±10%, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|----------------------|---|------------|--------|--------|-------|
| Peak eye diagram jitter | t _{JIT(PK)} | | — | 350 | — | ps |
| Common mode Transient immunity Si86SxxxB/Ex Si86SxxxF/Hx | CMTI | See Figure 8. Common-Mode Transient Immunity Test Circuit VI = VDD or 0 V VCM = ±1500 V | 100 150 | — — | — — | kV/μs |
| Input power loss to valid default output | t _{SD} | See Device Behavior During Normal Operation, Figure 5 | — | 8.0 | 12 | ns |
| Start-up time ² | t _{START} | See Device Behavior During Normal Operation, Figure 5 | — | — | 300 | μs |
| Input leakage current | I _L | | -8 | — | +8 | μA |

1. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and f_n ambient temperature.
2. Start-up time is the time period from the application of power to the appearance of valid data at the output. The device initialization time is included in the 300 μs specification.

Table 7. Electrical Characteristics (VDD = 3.3 V)VDD1 = 3.3 V ±10%, VDD2 = 3.3 V ±10%, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|-------------------------------------|--|-----|------------------------------|------------------------------|------|
| Si86S610Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.43 0.94 1.02 0.97 | 0.50 1.17 1.19 1.19 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 0.72 0.75 | 0.84 0.88 | mA |
| Si86S620/O20Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.49 1.51 1.66 1.57 | 0.58 1.89 1.92 1.93 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.07 1.11 | 1.24 1.28 | mA |
| Si86S621/O21Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.00 1.00 1.63 1.63 | 1.23 1.23 1.93 1.93 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.34 1.34 | 1.61 1.61 | mA |
| Si86S622Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.03 1.03 1.65 1.63 | 1.26 1.26 1.97 1.97 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.35 1.35 | 1.62 1.62 | mA |
| Timing Characteristics | | | | | | |
| Data rate Si86SxxxB/Ex | | | — | — | 150 | Mbps |
| Data rate Si86SxxxF/Hx | | | — | — | 10 | Mbps |
| Pulse width Si86SxxxB/Ex | | Minimum pulse width that is guaranteed to be transmitted to output. | 6.7 | — | — | ns |
| Pulse width Si86SxxxF/Hx | | Minimum pulse width that is guaranteed to be transmitted to output. | 100 | — | — | ns |
| Propagation delay Si86SxxxB/Ex | t _{PHL} , t _{PLH} | See Propagation Delay Timing, Figure 7 | 5 | 9 | 14 | ns |

Table 7. Electrical Characteristics (VDD = 3.3 V) (Continued)VDD1 = 3.3 V $\pm 10\%$, VDD2 = 3.3 V $\pm 10\%$, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|--------------------|--|------------|--------|--------|-------------|
| Pulse width distortion Si86SxxxB/Ex $ t_{PLH} - t_{PHL} $ | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxB/Ex | $t_{PSK(P-P)}^1$ | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxB/Ex | t_{PSK} | | — | 0.7 | 4 | ns |
| Propagation delay Si86SxxxF/Hx | t_{PHL}, t_{PLH} | See Propagation Delay Timing, Figure 7 | 30.5 | 36 | 41.5 | ns |
| Pulse width distortion Si86SxxxF/Hx $ t_{PLH} - t_{PHL} $ | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxF/Hx | $t_{PSK(P-P)}$ | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxF/Hx | t_{PSK} | | — | 0.85 | 3.0 | ns |
| Output rise time | t_r | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |
| Output fall time | t_f | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |
| Peak eye diagram jitter | $t_{JIT(PK)}$ | | — | 350 | — | ps |
| Common-mode transient immunity Si86SxxxB/Ex Si86SxxxF/Hx | CMTI | See Common-Mode Transient Immunity Test Circuit, Figure 8 VI = VDD or 0 V VCM = ± 1500 V | 100 150 | — — | — — | kV/ μ s |
| Input power loss to valid default output | t_{SD} | See Device Behavior During Normal Operation, Figure 5 | — | 8.0 | 12 | ns |
| Start-up time ² | t_{START} | See Device Behavior During Normal Operation, Figure 5 | — | — | 300 | μ s |
| Input leakage current | I _L | | -7 | — | +7 | μ A |

- ¹ $t_{PSK(P-P)}$ is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and f_n ambient temperature.
- ² Start-up time is the time period from the application of power to the appearance of valid data at the output. The device initialization time is included in the 300 μ s specification.

Table 8. Electrical Characteristics (VDD = 2.5 V)IDD1 = 2.5 V $\pm 10\%$, IDD2 = 2.5 V $\pm 10\%$, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|--------|--|-----|------------------------------|------------------------------|------|
| Si86S610Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.41 0.92 1.00 0.95 | 0.49 1.15 1.17 1.17 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 0.71 0.95 | 0.83 1.17 | mA |
| Si86S620/O20Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 0.47 1.49 1.64 1.55 | 0.57 1.88 1.90 1.91 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.06 1.54 | 1.22 1.92 | mA |
| Si86S621/O21Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.00 1.00 1.63 1.63 | 1.23 1.22 1.92 1.92 | mA |

Table 8. Electrical Characteristics (VDD = 2.5 V) (Continued)

IDD1 = 2.5 V $\pm 10\%$, IDD2 = 2.5 V $\pm 10\%$, T_A = -40 to 125 °C

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|--|-------------------------------------|--|------------|------------------------------|------------------------------|-------------|
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.32 1.32 | 1.59 1.59 | mA |
| Si86S622Bx, Ex IDD1 IDD2 IDD1 IDD2 | | VI = 0(Bx), 1(Ex) VI = 0(Bx), 1(Ex) VI = 1(Bx), 0(Ex) VI = 1(Bx), 0(Ex) | — | 1.01 1.01 1.63 1.61 | 1.24 1.24 1.95 1.93 | mA |
| IDD1 IDD2 | | All Inputs = 500 kHz square wave, C _L = 15 pF on all outputs | — | 1.33 1.31 | 1.60 1.59 | mA |
| Timing Characteristics | | | | | | |
| Data rate Si86SxxxB/Ex | | | — | — | 150 | Mbps |
| Data rate Si86SxxxF/Hx | | | — | — | 10 | Mbps |
| Pulse width Si86SxxxB/Ex | | Minimum pulse width that is guaranteed to be transmitted to output. | 6.7 | — | — | ns |
| Pulse width Si86SxxxF/Hx | | Minimum pulse width that is guaranteed to be transmitted to output. | 100 | — | — | ns |
| Propagation delay Si86SxxxB/Ex | t _{PHL} , t _{PLH} | See Propagation Delay Timing, Figure 7 | 6.5 | 9.5 | 17 | ns |
| Pulse width distortion Si86SxxxB/Ex t _{PLH} - t _{PHL} | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxB/Ex | t _{PSK(P-P)} ¹ | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxB/Ex | t _{PSK} | | — | 0.65 | 3.5 | ns |
| Propagation delay Si86SxxxF/Hx | t _{PHL} , t _{PLH} | See Propagation Delay Timing, Figure 7 | 31.5 | 36.5 | 45 | ns |
| Pulse width distortion Si86SxxxF/Hx t _{PLH} - t _{PHL} | PWD | See Propagation Delay Timing, Figure 7 | — | — | 4.5 | ns |
| Propagation delay skew part-to-part Si86SxxxF/Hx | t _{PSK(P-P)} | | — | 2.0 | 4.5 | ns |
| Channel-channel skew Si86SxxxF/Hx | t _{PSK} | | — | 0.85 | 3 | ns |
| Output rise time | t _r | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |
| Output fall time | t _f | C _L = 15 pF See Propagation Delay Timing, Figure 7 | — | 2.5 | — | ns |
| Peak eye diagram jitter | t _{JIT(PK)} | | — | 350 | — | ps |
| Common mode transient immunity Si86SxxxB/Ex Si86SxxxF/Hx | CMTI | See Common-Mode Transient Immunity Test Circuit, Figure 8 VI = VDD or 0 V VCM = ± 1500 V | 100 150 | — — | — — | kV/ μ s |
| Input power loss to valid default out- put | t _{SD} | See Device Behavior During Normal Operation, Figure 5 | — | 8.0 | 12 | ns |
| Start-up time ² | t _{START} | See Device Behavior During Normal Operation, Figure 5 | — | — | 300 | μ s |
| Input leakage current | I _L | | -7 | — | +7 | μ A |

1. t_{PSK(P-P)} is the magnitude of the difference in propagation delay times measured between different units operating at the same supply voltages, load, and f_n ambient temperature.
2. Start-up time is the time period from the application of power to the appearance of valid data at the output. The device initialization time is included in the 300 μ s specification.

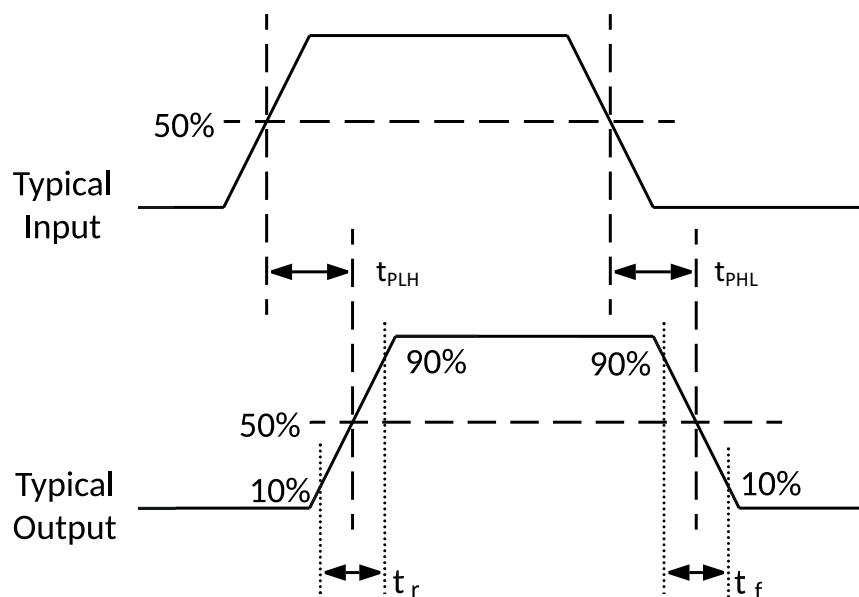


Figure 7. Propagation Delay Timing

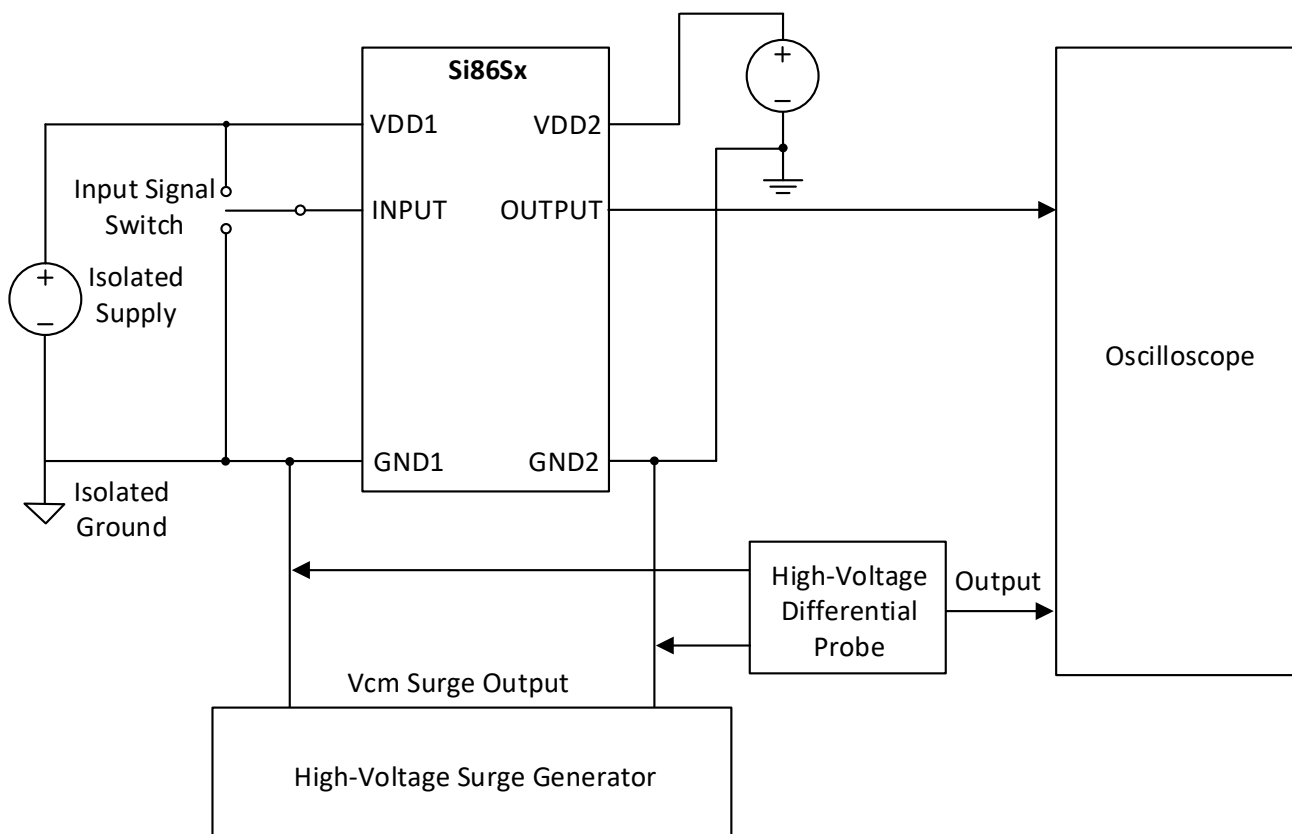


Figure 8. Common-Mode Transient Immunity Test Circuit

5. Safety Certifications and Specifications

Table 9. Regulatory Information (Pending)¹

| |
|--|
| CSA |
| The Si86S61x/2x/Ox is certified under CSA. For more details, see Master Contract Number 232873. |
| 62368-1: Up to 600 V _{RMS} reinforced insulation working voltage; up to 1000 V _{RMS} basic insulation working voltage. |
| 60601-1: Up to 250 V _{RMS} working voltage and 2 MOPP (Means of Patient Protection). |
| VDE |
| The Si86S61x/2x/Ox is certified under VDE. For more details, see File 5028467. |
| 60747-17: Up to 2121 V _{peak} for reinforced insulation working voltage. |
| UL |
| The Si86S61x/2x/Ox is certified under UL1577 component recognition program. For more details, see File E257455. |
| Rated up to 6.0 kV _{RMS} V _{ISO} isolation voltage for basic protection. |
| CQC |
| The Si86S61x/2x/Ox is certified under GB4943.1. |
| Rated up to 250 V _{RMS} reinforced insulation working voltage at 5000 meters tropical climate. |

1. For more information, see [11. Ordering Information](#).

Table 10. Insulation and Safety-Related Specifications

| Parameter | Symbol | Test Condition | Value | | Unit |
|---|-----------------|----------------------------------|------------------|------------------|------------------|
| | | | SSO-8 | NB SOIC-8 | |
| Nominal external air gap (clearance) | CLR | | 8.0 | 3.9 | mm |
| Nominal external tracking (creepage) | CRP | | 8.0 | 3.9 | mm |
| Minimum internal gap (internal clearance) | DTI | | 0.036 | 0.036 | mm |
| Tracking resistance | CTI or PTI | IEC60112 | 600 | 600 | V _{RMS} |
| Erosion depth | ED | | 0.019 | 0.04 | mm |
| Resistance (input-output) ¹ | R _{IO} | Test voltage = 500 V at 25 °C | 10 ¹² | 10 ¹² | Ω |
| Capacitance (Input-Output) ¹ | C _{IO} | f = 1 MHz | 1.0 | 1.0 | pF |
| Input capacitance ² | C _I | | 4.0 | 4.0 | pF |

1. To determine resistance and capacitance, the Si86Sx is converted into a 2-terminal device. Pins on Side A are shorted together to form the first terminal and pins on Side B are shorted together to form the second terminal. The parameters are then measured between these two terminals.
2. Measured from input pin to ground.

Table 11. IEC 60664-1 Ratings

| Parameter | Test Conditions | Specification | |
|----------------------|--|---------------|-----------|
| | | SSO-8 | NB SOIC-8 |
| Material group | | I | I |
| Overvoltage category | Rated mains voltage ≤150 V _{RMS} | I-IV | I-IV |
| | Rated mains voltage ≤300 V _{RMS} | I-IV | I-III |
| | Rated mains voltage ≤600 V _{RMS} | I-IV | I-II |
| | Rated mains voltage ≤1000 V _{RMS} | I-III | I |

Table 12. IEC 60747-17 Insulation Characteristics for Si86S61x/2x/Ox¹

| Parameter | Symbol | Test Condition | Characteristic | | Unit |
|--------------------------------------|-------------|---|----------------|-----------|------------|
| | | | SSO-8 | NB SOIC-8 | |
| Maximum working isolation voltage | V_{IOWM} | According to Time-Dependent Dielectric Breakdown (TDDB) Test | 1500 | 445 | V_{RMS} |
| Maximum repetitive isolation voltage | V_{IORM} | According to Time-Dependent Dielectric Breakdown (TDDB) Test | 2121 | 630 | V_{peak} |
| Apparent charge | q_{pd} | Method b: At routine test (100% production) and preconditioning (type test); $V_{ini} = 1.2 \times V_{IOTM}$, $t_{ini} = 1$ s; $V_{pd(m)} = 1.875 \times V_{IORM}$, $t_m = 1$ s (method b1) or $V_{pd(m)} = V_{ini}$, $t_m = t_{ini}$ (method b2) | ≤ 5 | ≤ 5 | pC |
| Maximum transient isolation voltage | V_{IOTM} | $V_{TEST} = V_{IOTM}$, $t = 60$ s (qualification); $V_{TEST} = 1.2 \times V_{IOTM}$, $t = 1$ s (100% production) | 8484 | 5302 | V_{peak} |
| Maximum surge isolation voltage | V_{IOSM} | Tested in oil with $1.3 \times V_{IMP}$ or 10 kV minimum and $1.2 \mu s/50 \mu s$ profile | 10400 | 10400 | V_{peak} |
| Maximum impulse voltage | V_{IMP} | Tested in air with $1.2 \mu s/50 \mu s$ profile | 8000 | 5000 | V_{peak} |
| Isolation resistance | R_{IO_S} | $T_{AMB} = T_S$, $V_{IO} = 500$ V | $>10^9$ | $>10^9$ | Ω |
| Pollution degree | | | 2 | 2 | |
| Climatic category | | | 40/125/21 | 40/125/21 | |

1. This coupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

Table 13. UL 1577 Insulation Characteristics

| Parameter | Symbol | Test Condition | Characteristic | | Unit |
|--|-----------|---|----------------|-----------|-----------|
| | | | SSO-8 | NB SOIC-8 | |
| Maximum withstanding isolation voltage | V_{ISO} | $V_{TEST} = V_{ISO}$, $t = 60$ s (qualification); $V_{TEST} = 1.2 \times V_{ISO}$, $t = 1$ s (100% production) | 6000 | 3750 | V_{RMS} |

Table 14. IEC 60747-17 Safety Limiting Values¹

| Parameter | Symbol | Test Condition | Max | | Unit |
|---|--------|--|-------|-----------|-------------|
| | | | SSO-8 | NB SOIC-8 | |
| Safety temperature | T_S | | 150 | 150 | $^{\circ}C$ |
| Safety input, output, or supply current | I_S | Refer to θ_{JA} in Table 15, Thermal Characteristics. | 253 | 221 | mA |
| Safety input, output, or total power | P_S | $V_{DD} = 5.5$ V, $T_J = 150$ $^{\circ}C$, $T_A = 25$ $^{\circ}C$. | 1389 | 1214 | mW |

1. Maximum value allowed in the event of a failure; also see the thermal derating curves in Figure 9 and Figure 10.

Table 15. Thermal Characteristics

| Parameter | Symbol | SSO-8 | NB SOIC-8 | Unit |
|--|---------------|-------|-----------|------|
| IC junction-to-air thermal resistance | θ_{JA} | 90 | 103 | °C/W |
| IC junction-to-board thermal resistance | θ_{JB} | 47 | 45 | |
| IC junction-to-case thermal resistance | θ_{JC} | 27 | 26 | |
| Thermal characterization parameter to report the difference between junction temperature and the temperature of the board measured at the top surface of the board | Ψ_{JB} | 43 | 42 | |

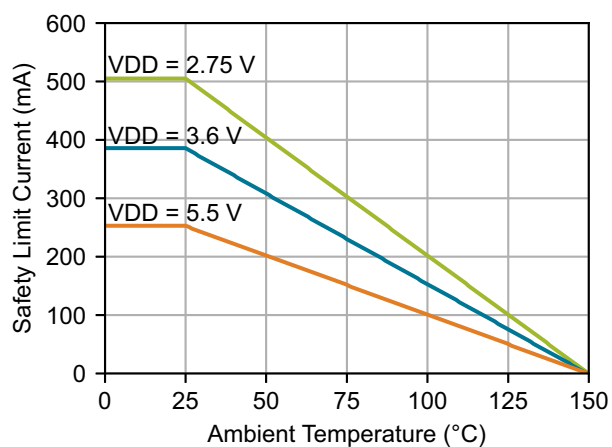


Figure 9. SSO-8 Thermal Derating Curve, Dependence of Safety Limiting Current

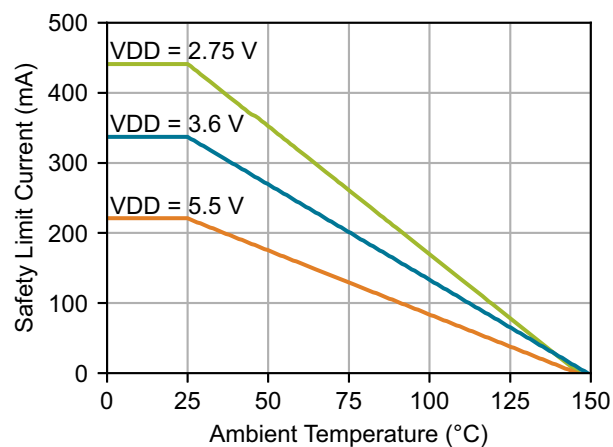


Figure 10. NB SOIC-8 Thermal Derating Curve, Dependence of Safety Limiting Current

6. Typical Performance Characteristics

The typical performance characteristics depicted in the following diagrams are for information purposes only. Refer to Electrical Characteristics tables for actual specification limits. All typical characteristics data is valid for nominal VDD and ambient temperature of 25 °C.

For typical IDD, refer to the [Isolator Power Consumption Calculator](#).

6.1. Estimating Maximum Ambient Temperature

$T_{A(max)} = T_{Jmax} - P \times \theta_{JA}$. θ_{JA} values are specified in [Table 15 on page 16](#).

P = total power dissipated by package in W. Values for any OPN and operating condition can be obtained using the [Isolator Power Consumption Calculator](#).

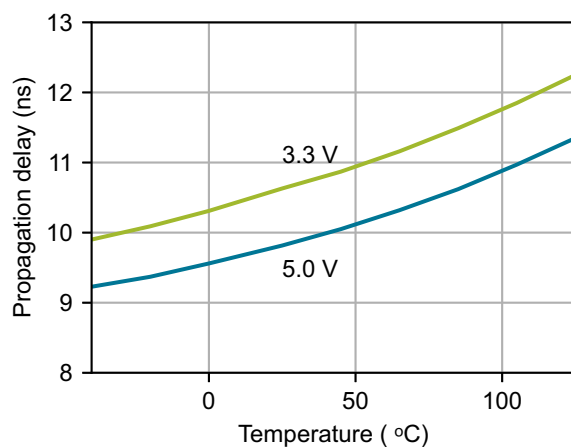


Figure 11. Si86Sx Propagation Delay vs. Temperature

7. Package Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The Si86S61x/S62x/SOx are rated to Moisture Sensitivity Level 2 (MSL2) for the NB SOIC-8 packages and MSL 2A (MSL2A) for the SSO-8 packages at 260 °C. They can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, “PCB Design & SMT Assembly/Rework Guidelines for MCM-L Packages,” document number 101752.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

8.2. Package Outline, Narrow Body SOIC-8

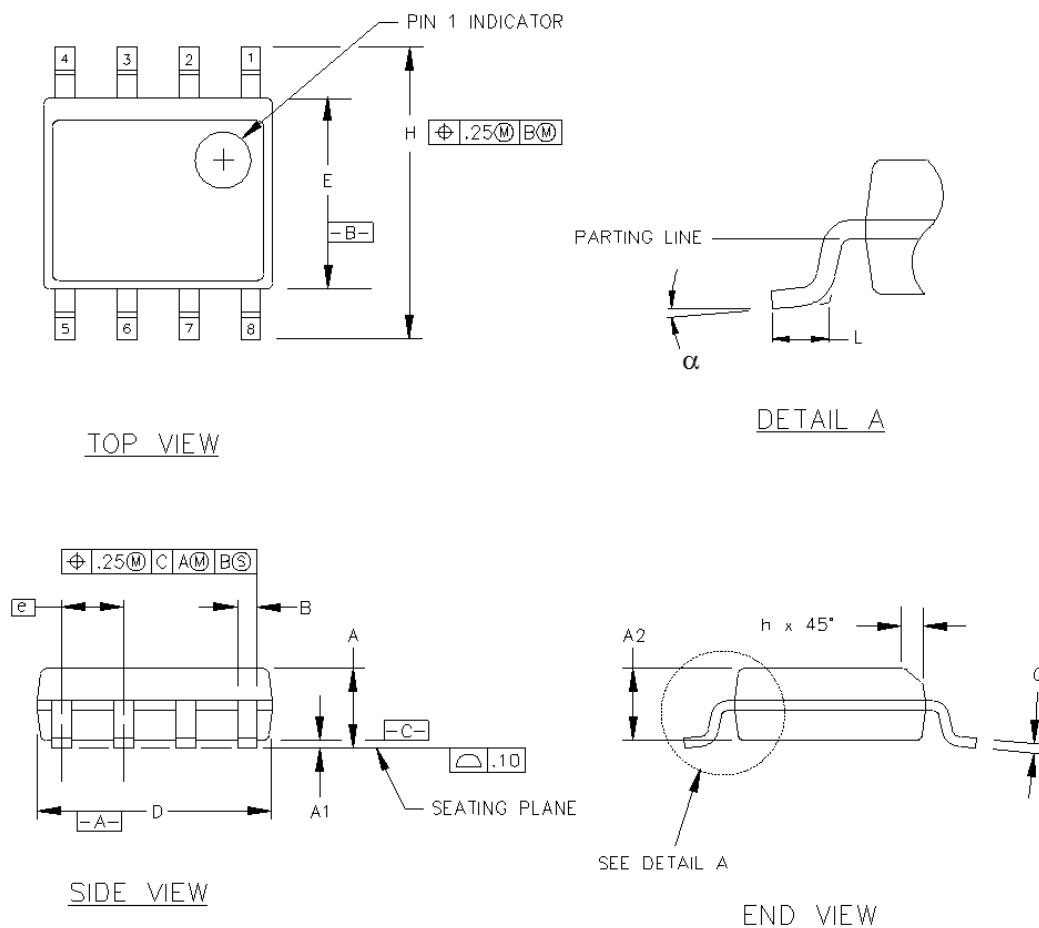


Figure 13. NB SOIC-8 Package

Table 17. NB SOIC-8 Package Diagram Dimensions¹

| Dimension | Min | Max |
|-----------|----------|----------|
| A | 1.35 | 1.75 |
| A1 | 0.10 | 0.25 |
| A2 | 1.40 REF | 1.55 REF |
| B | 0.33 | 0.51 |
| C | 0.19 | 0.25 |
| D | 4.80 | 5.00 |
| E | 3.80 | 4.00 |
| e | 1.27 BSC | |
| H | 5.80 | 6.20 |
| h | 0.25 | 0.50 |
| L | 0.40 | 1.27 |
| α | 0° | 8° |

1. All dimensions shown are in millimeters (mm) unless otherwise noted. Dimensioning and tolerancing per ANSI Y14.5M-1982. This drawing conforms to JEDEC Outline MS-102. Recommended card reflow profile is per the JEDEC/IPC J-STD-020B specification for small body components.

9. Land Pattern, SSO-8

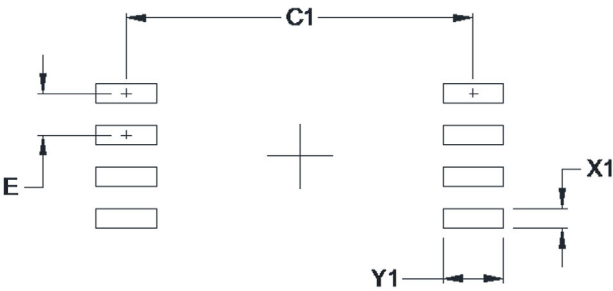


Figure 14. SSO-8 Land Pattern

Table 18. SSO-8 Land Pattern Dimensions¹

| Symbol | mm |
|--------|-------|
| C1 | 10.60 |
| E | 1.27 |
| X1 | 0.60 |
| Y1 | 1.85 |

1. **General**
All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a fabrication allowance of 0.05 mm.
This land pattern design is based on the IPC-7351 guidelines.
- Solder Mask Design**
All metal pads are to be non-solder mask defined (NSMD). Clearance between the solder mask and the metal pad is to be 60 μm minimum, all the way around the pad.
- Stencil Design**
A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.
The stencil thickness should be 0.125 mm (5 mils).
The ratio of stencil aperture to land pad size should be 1:1 for all perimeter pins.
- Card Assembly**
A no-clean, Type-3 solder paste is recommended.
The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for small body components.

9.1. Land Pattern, NB SOIC-8

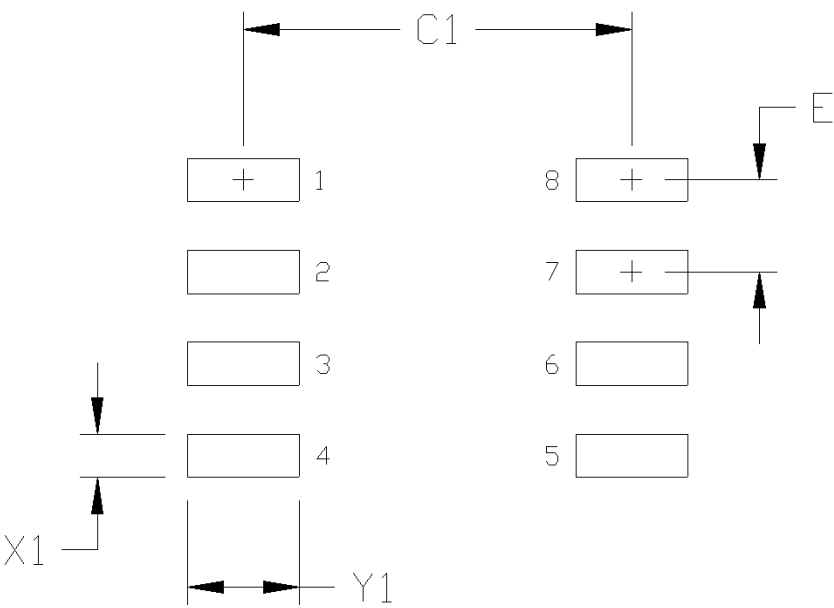


Figure 15. NB SOIC-8 Land Pattern

Table 19. NB SOIC-8 Land Pattern Dimensions¹

| Symbol | mm |
|--------|------|
| C1 | 5.40 |
| E | 1.27 |
| X1 | 0.60 |
| Y1 | 1.55 |

1. This land pattern design is based on IPC-7351 pattern SOIC127P600X173-8N for Density Level B (Median Land Protrusion). All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.

10. Top Marking

10.1. SSO-8 Typical Top Marking

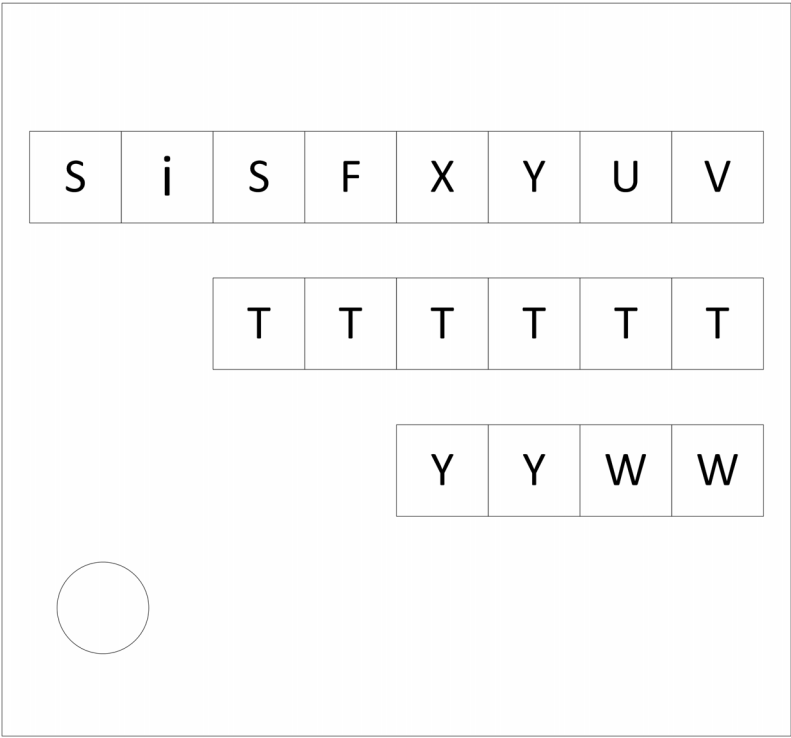


Figure 16. SSO-8 Top Marking

Table 20. SSO-8 Top Marking Explanation

| | | |
|--|--|---|
| Line 1 marking | Base part number ordering options (See Ordering Guide for more information) | Si86S = Isolator product series F = Product family 6 = Non-inverting outputs O = Inverting outputs X = Total number of channels Y = Total number of reverse channels (right to left) U = Default and deglitch option B = Output default low, no deglitch E = Output default high, no deglitch F = Output default low, 36 ns deglitch H = Output default high, 36 ns deglitch V = Isolation rating E = 6.0 kV _{RMS} |
| Line 2 marking | TTTTT | Manufacturing code from assembly house |
| Line 3 marking | YY | Year of manufacturing at assembly house |
| | WW | Work week of manufacturing at assembly house |
| Automotive-grade part numbers are indicated on the shipping label. | | |

10.2. Narrow Body (NB) SOIC-8 Top Marking

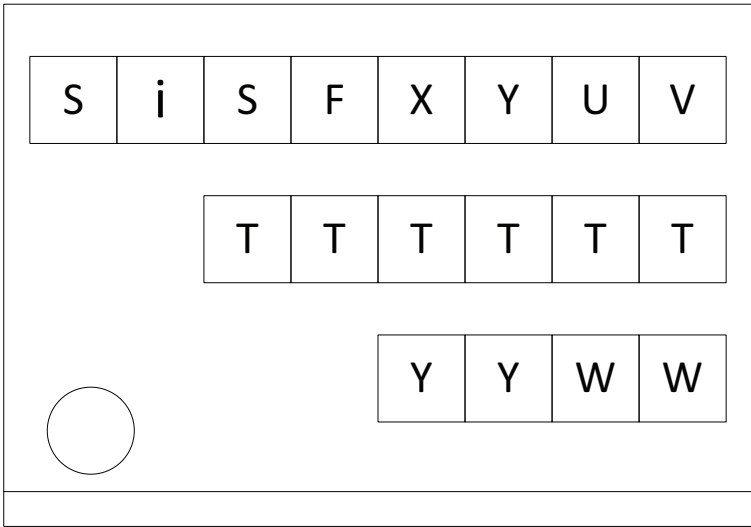


Figure 17. NB SOIC-8 Top Marking

Table 21. NB SOIC-8 Top Marking Explanation

| | | |
|--|---|--|
| Line 1 marking | Base part number ordering options (See 1. Ordering Guide for more information) | Si86S = Isolator product series F = Product family 6 = Non-inverting outputs O = Inverting outputs X = Total number of channels Y = Total number of reverse channels (right to left) U = Default and deglitch option B = Output default low, no deglitch E = Output default high, no deglitch F = Output default low, 36 ns deglitch H = Output default high, 36 ns deglitch V = Isolation rating C = 3.75 kV _{RMS} |
| Line 2 marking | TTTTTT | Manufacturing code from assembly house |
| Line 3 marking | YY | Year of manufacturing at assembly house |
| | WW | Work week of manufacturing at assembly house |
| Automotive-grade part numbers are indicated on the shipping label. | | |

11. Ordering Information

Industrial and Automotive Grade Ordering Part Numbers (OPNs)

Industrial-grade devices (part numbers having an “-I” in their suffix) are built using well controlled, high quality manufacturing flows to ensure robustness and reliability. Qualifications are compliant with JEDEC, and defect reduction methodologies are used throughout definition, design, evaluation, qualification, and mass production steps.

Automotive-grade devices (part numbers having an “-A” in their suffix) are built using automotive-specific flows and additional statistical process controls at all steps in the manufacturing process to ensure robustness and low defectivity. These devices are supported with AIAG-compliant Production Part Approval Process (PPAP) documentation, and feature International Material Data System (IMDS) and China Automotive Material Data System (CAMDS) listings. Automotive-Grade devices (with an “-A” suffix) are identical in construction materials, topside marking, and electrical parameters to their Industrial-Grade (with an “-I” suffix) version counterparts.

Qualifications are compliant with AEC-Q100, and a zero-defect methodology is maintained throughout definition, design, evaluation, qualification, and mass production steps.

Refer to Top Marking section for the product decoder.

Table 22. Ordering Guide^{1,2,3,4}

| Ordering Part Numbers (OPNs) | Automotive OPNs ⁵ | Number of Inputs VDD1 Side | Number of Inputs VDD2 Side | Deglintch Filter Delay (ns) | Default Output State | Isolation Rating (kV _{RMS}) | Package |
|------------------------------|------------------------------|----------------------------|----------------------------|-----------------------------|----------------------|---------------------------------------|-----------|
| Non-Inverting Output | | | | | | | |
| Si86S610BC-IS | Si86S610BC-AS | 1 | 0 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86S610BE-IS4 | Si86S610BE-AS4 | 1 | 0 | 0 | Low | 6 | SSO-8 |
| Si86S610EC-IS | Si86S610EC-AS | 1 | 0 | 0 | High | 3.75 | NB SOIC-8 |
| Si86S610EE-IS4 | Si86S610EE-AS4 | 1 | 0 | 0 | High | 6 | SSO-8 |
| Si86S620BC-IS | Si86S620BC-AS | 2 | 0 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86S620BE-IS4 | Si86S620BE-AS4 | 2 | 0 | 0 | Low | 6 | SSO-8 |
| Si86S620EC-IS | Si86S620EC-AS | 2 | 0 | 0 | High | 3.75 | NB SOIC-8 |
| Si86S620EE-IS4 | Si86S620EE-AS4 | 2 | 0 | 0 | High | 6 | SSO-8 |
| Si86S621BC-IS | Si86S621BC-AS | 1 | 1 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86S621BE-IS4 | Si86S621BE-AS4 | 1 | 1 | 0 | Low | 6 | SSO-8 |
| Si86S621EC-IS | Si86S621EC-AS | 1 | 1 | 0 | High | 3.75 | NB SOIC-8 |
| Si86S621EE-IS4 | Si86S621EE-AS4 | 1 | 1 | 0 | High | 6 | SSO-8 |
| Si86S622BC-IS | Si86S622BC-AS | 1 | 1 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86S622BE-IS4 | Si86S622BE-AS4 | 1 | 1 | 0 | Low | 6 | SSO-8 |
| Si86S622EC-IS | Si86S622EC-AS | 1 | 1 | 0 | High | 3.75 | NB SOIC-8 |
| Si86S622EE-IS4 | Si86S622EE-AS4 | 1 | 1 | 0 | High | 6 | SSO-8 |
| Si86S620FC-IS | Si86S620FC-AS | 2 | 0 | 36 | Low | 3.75 | NB SOIC-8 |
| Si86S620FE-IS4 | Si86S620FE-AS4 | 2 | 0 | 36 | Low | 6 | SSO-8 |
| Si86S620HC-IS | Si86S620HC-AS | 2 | 0 | 36 | High | 3.75 | NB SOIC-8 |
| Si86S620HE-IS4 | Si86S620HE-AS4 | 2 | 0 | 36 | High | 6 | SSO-8 |
| Si86S621FC-IS | Si86S621FC-AS | 1 | 1 | 36 | Low | 3.75 | NB SOIC-8 |
| Si86S621FE-IS4 | Si86S621FE-AS4 | 1 | 1 | 36 | Low | 6 | SSO-8 |
| Si86S621HC-IS | Si86S621HC-AS | 1 | 1 | 36 | High | 3.75 | NB SOIC-8 |
| Si86S621HE-IS4 | Si86S621HE-AS4 | 1 | 1 | 36 | High | 6 | SSO-8 |

Table 22. Ordering Guide^{1,2,3,4} (Continued)

| Ordering Part Numbers (OPNs) | Automotive OPNs ⁵ | Number of Inputs VDD1 Side | Number of Inputs VDD2 Side | Deglintch Filter Delay (ns) | Default Output State | Isolation Rating (kV _{RMS}) | Package |
|------------------------------|------------------------------|----------------------------|----------------------------|-----------------------------|----------------------|---------------------------------------|-----------|
| Inverting Output | | | | | | | |
| Si86SO20BC-IS | Si86SO20BC-AS | 2 | 0 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86SO20BE-IS4 | Si86SO20BE-AS4 | 2 | 0 | 0 | Low | 6 | SSO-8 |
| Si86SO20EC-IS | Si86SO20EC-AS | 2 | 0 | 0 | High | 3.75 | NB SOIC-8 |
| Si86SO20EE-IS4 | Si86SO20EE-AS4 | 2 | 0 | 0 | High | 6 | SSO-8 |
| Si86SO21BC-IS | Si86SO21BC-AS | 1 | 1 | 0 | Low | 3.75 | NB SOIC-8 |
| Si86SO21BE-IS4 | Si86SO21BE-AS4 | 1 | 1 | 0 | Low | 6 | SSO-8 |
| Si86SO21EC-IS | Si86SO21EC-AS | 1 | 1 | 0 | High | 3.75 | NB SOIC-8 |
| Si86SO21EE-IS4 | Si86SO21EE-AS4 | 1 | 1 | 0 | High | 6 | SSO-8 |

1. All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.
2. “Si” and “SI” are used interchangeably.
3. An “R” at the end of the part number denotes tape and reel packaging option.
4. Temperature range is –40 to 125 °C.
5. In the top markings of each device, the Manufacturing Code represented by “TTTTT” contains, as its first character, a letter in the range N through Z to indicate Automotive-Grade.

12. Revision History

| Revision | Date | Description |
|----------|--------------|---|
| B | August, 2023 | Corrected max PWD specifications in: "4. Electrical Specifications" on page 8. Added maximum ratings for output current in: Table 3, "Absolute Maximum Ratings," on page 8. Typo and formatting corrections made in: Table 12, "IEC 60747-17 Insulation Characteristics for Si86S61x/2x/Ox," on page 15 and Table 13, "UL 1577 Insulation Characteristics," on page 15. |
| A | April, 2023 | Initial release. |

Copyright © 2023, Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks' Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of Skyworks' published specifications or parameters.

Skyworks, the Skyworks symbol, Sky5®, SkyOne®, SkyBlue™, Skyworks Green™, ClockBuilder®, DSPLL®, ISOmodem®, ProSLIC®, SiPHY®, and RFelC® are trademarks or registered trademarks of Skyworks Solutions, Inc. or its subsidiaries in the United States and other countries. Third-party brands and names are for identification purposes only and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at www.skyworksin.com, are incorporated by reference.