

MAX14930–MAX14932

4-Channel, 2.75kV_{RMS} Digital Isolators

General Description

The MAX14930–MAX14932 are a family of 4-channel, 2.75kV digital isolators utilizing Maxim's proprietary process technology. For applications requiring 5kV of isolation, see the MAX14934–MAX14936. The MAX14930–MAX14932 family transfers digital signals between circuits with different power domains at ambient temperatures up to +125°C.

The MAX14930–MAX14932 family offers all three possible unidirectional channel configurations to accommodate any 4-channel design; including SPI, RS-232, RS-485, and digital I/O applications. For applications requiring bidirectional channels, such as I²C, see the MAX14933.

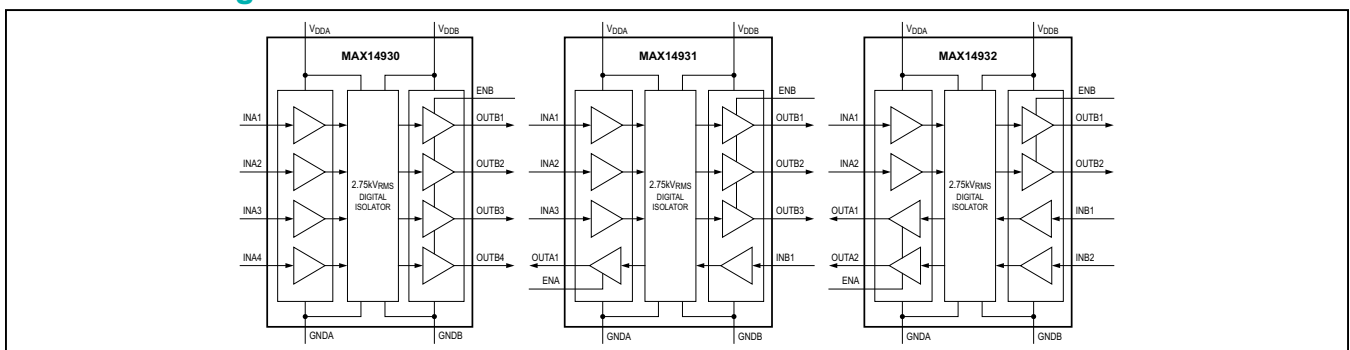
Devices are available with data rates from DC up to 1Mbps, 25Mbps, or 150Mbps. Each device is also available in either a default high or default low configuration. The default is the state an output goes to when its input is unpowered. See the [Ordering Information and Selector Guide](#) for the suffixes associated with each option.

Independent 1.71V to 5.5V supplies on each side of the isolator also make the devices suitable for use as level translators.

The MAX14930–MAX14932 are available in both a 16-pin wide body (10.3mm x 7.5mm) and narrow body (9.9mm x 3.9mm) SOIC package. All devices are rated for operation at ambient temperatures of -40°C to +125°C.

[Ordering Information and Selector Guide](#) appears at end of data sheet.

Functional Diagram



19-7066; Rev 3; 5/15

Benefits and Features

- Robust Galvanic Isolation of Digital Signals
 - Withstands 2.75kV_{RMS} for 60s (V_{ISO})
 - Continuously Withstands 443V_{RMS} (V_{IOWM})
 - 630V_p Repetitive Peak Voltage (V_{IORM})
 - Withstands ±10kV Surge per IEC 61000-4-5
- Interfaces Directly with Most Micros and FPGAs
 - Accepts 1.71V to 5.5V Supplies
- Many Options Support Broad Applications
 - 3 Data Rates (1Mbps, 25Mbps, 150Mbps)
 - 3 Channel Direction Configuration
 - 2 Output Default States (High or Low)
 - 2 Packages (4mm or 8mm Creepage and Clearance)
- Low Power Consumption at High Data Rates
 - At 1.8V:
 - 2.5mA per Channel Typical at 1Mbps
 - 5.25mA per Channel Typical at 100Mbps
 - At 3.3V:
 - 2.6mA per Channel Typical at 1Mbps
 - 7.1mA per Channel Typical at 100Mbps

Safety Regulatory Approvals

- UL According to UL1577
- cUL According to CSA Bulletin 5A
- VDE 0884-10 (Pending)
- TUV

Applications

- Fieldbus Communications for Industrial Automation
- Isolated SPI, RS-232, RS-485/RS-422
- General Multichannel Isolation Applications
- Battery Management
- Medical Systems

Absolute Maximum Ratings

V_{DDA} to GNDA, V_{DDB} to GNDB-0.3V to +6V
 INA_, ENA to GNDA-0.3V to +6V
 INB_, ENB to GNDB-0.3V to +6V
 OUTA_ to GNDA-0.3V to (V_{DDA} + 0.3V)
 OUTB_ to GNDB-0.3V to (V_{DDB} + 0.3V)
 Short-Circuit Duration
 (OUTA_ to GNDA, OUTB_ to GNDB) Continuous

Continuous Power Dissipation (T_A = +70°C)
 Wide SOIC (derate 14.1mW/°C above +70°C) 1126.8mW
 Narrow SOIC (derate 13.3mW/°C above +70°C) .. 1066.7mW
 Operating Temperature Range -40°C to +125°C
 Maximum Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (soldering, 10s) +300°C
 Soldering Temperature (reflow) +260°C

Package Thermal Characteristics (Note 1)

Wide SOIC
 Junction-to-Ambient Thermal Resistance (θ_{JA}) 71°C/W
 Junction-to-Case Thermal Resistance (θ_{JC}) 23°C/W

Narrow SOIC
 Junction-to-Ambient Thermal Resistance (θ_{JA}) 75°C/W
 Junction-to-Case Thermal Resistance (θ_{JC}) 24°C/W

Note 1: Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to www.maximintegrated.com/thermal-tutorial.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Electrical Characteristics

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|----------------------------|-------------------------|------|------|------|-------|
| POWER SUPPLY | | | | | | |
| Operating Supply Voltage | V _{DDA} | Relative to GNDA | 1.71 | | 5.5 | V |
| | V _{DDB} | Relative to GNDB | 1.71 | | 5.5 | V |
| Undervoltage Lockout Threshold | V _{UVLO_} | V _{DD_} rising | 1.45 | 1.58 | 1.71 | V |
| Undervoltage Lockout Threshold Hysteresis | V _{UVLO_} HYST | | | 50 | | mV |

DC Electrical Characteristics (continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|----------------------------|------------------|------------------------------|-------------------------|------|------|-------|
| Supply Current (MAX14930_) | I _{DDA} | 500kHz square wave | V _{DDA} = 5V | 1.2 | 1.9 | mA |
| | | | V _{DDA} = 3.3V | 1.2 | 1.9 | |
| | | | V _{DDA} = 2.5V | 1.2 | 1.9 | |
| | | | V _{DDA} = 1.8V | 1.1 | 1.9 | |
| | | 12.5MHz square wave (Note 3) | V _{DDA} = 5V | 2.1 | 2.7 | |
| | | | V _{DDA} = 3.3V | 2 | 2.7 | |
| | | | V _{DDA} = 2.5V | 2 | 2.7 | |
| | | | V _{DDA} = 1.8V | 2 | 2.6 | |
| | | 50MHz square wave (Note 3) | V _{DDA} = 5V | 5 | 6.6 | |
| | | | V _{DDA} = 3.3V | 4.6 | 6.1 | |
| | | | V _{DDA} = 2.5V | 4.5 | 6.0 | |
| | | | V _{DDA} = 1.8V | 4.5 | 6.0 | |
| | I _{DDB} | 500kHz square wave | V _{DDB} = 5V | 8.1 | 11.2 | |
| | | | V _{DDB} = 3.3V | 7.9 | 11.1 | |
| | | | V _{DDB} = 2.5V | 7.9 | 11.0 | |
| | | | V _{DDB} = 1.8V | 7.7 | 10.8 | |
| | | 12.5MHz square wave (Note 3) | V _{DDB} = 5V | 12.8 | 15.9 | |
| | | | V _{DDB} = 3.3V | 11.1 | 14.2 | |
| | | | V _{DDB} = 2.5V | 10.2 | 13.4 | |
| | | | V _{DDB} = 1.8V | 9.4 | 12.4 | |
| | | 50MHz square wave (Note 3) | V _{DDB} = 5V | 27.2 | 35.4 | |
| | | | V _{DDB} = 3.3V | 21.7 | 27.8 | |
| | | | V _{DDB} = 2.5V | 17.6 | 23.0 | |
| | | | V _{DDB} = 1.8V | 14.4 | 18.9 | |

DC Electrical Characteristics (continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|----------------------------|------------------|------------------------------|-------------------------|------|------|-------|
| Supply Current (MAX14931_) | I _{DDA} | 500kHz square wave | V _{DDA} = 5V | 3.4 | 5.3 | mA |
| | | | V _{DDA} = 3.3V | 3.3 | 5.3 | |
| | | | V _{DDA} = 2.5V | 3.3 | 5.3 | |
| | | | V _{DDA} = 1.8V | 3.2 | 5.1 | |
| | | 12.5MHz square wave (Note 3) | V _{DDA} = 5V | 5.6 | 7.1 | |
| | | | V _{DDA} = 3.3V | 5 | 6.6 | |
| | | | V _{DDA} = 2.5V | 4.7 | 6.4 | |
| | | | V _{DDA} = 1.8V | 4.5 | 6.1 | |
| | | 50MHz square wave (Note 3) | V _{DDA} = 5V | 12.4 | 16.0 | |
| | | | V _{DDA} = 3.3V | 10.1 | 13.0 | |
| | | | V _{DDA} = 2.5V | 9.1 | 11.6 | |
| | | | V _{DDA} = 1.8V | 8.2 | 10.4 | |
| | I _{DDB} | 500kHz square wave | V _{DDB} = 5V | 6.5 | 9.2 | |
| | | | V _{DDB} = 3.3V | 6.4 | 9.1 | |
| | | | V _{DDB} = 2.5V | 6.3 | 9.1 | |
| | | | V _{DDB} = 1.8V | 6.2 | 8.9 | |
| | | 12.5MHz square wave (Note 3) | V _{DDB} = 5V | 10.3 | 12.8 | |
| | | | V _{DDB} = 3.3V | 8.9 | 11.6 | |
| | | | V _{DDB} = 2.5V | 8.2 | 11.0 | |
| | | | V _{DDB} = 1.8V | 7.6 | 10.3 | |
| | | 50MHz square wave (Note 3) | V _{DDB} = 5V | 22.7 | 29.1 | |
| | | | V _{DDB} = 3.3V | 17.7 | 23.0 | |
| | | | V _{DDB} = 2.5V | 14.7 | 19.4 | |
| | | | V _{DDB} = 1.8V | 11.9 | 15.9 | |

DC Electrical Characteristics (continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|----------------------------|------------------|------------------------------|-------------------------|------|------|-------|
| Supply Current (MAX14932_) | I _{DDA} | 500kHz square wave | V _{DDA} = 5V | 5.2 | 7.2 | mA |
| | | | V _{DDA} = 3.3V | 5.2 | 7.2 | |
| | | | V _{DDA} = 2.5V | 5.2 | 7.2 | |
| | | | V _{DDA} = 1.8V | 5 | 7.0 | |
| | | 12.5MHz square wave (Note 3) | V _{DDA} = 5V | 8.2 | 10.0 | |
| | | | V _{DDA} = 3.3V | 7.2 | 9.1 | |
| | | | V _{DDA} = 2.5V | 6.7 | 8.7 | |
| | | | V _{DDA} = 1.8V | 6.3 | 8.2 | |
| | | 50MHz square wave (Note 3) | V _{DDA} = 5V | 18 | 18.6 | |
| | | | V _{DDA} = 3.3V | 14.2 | 15.1 | |
| | | | V _{DDA} = 2.5V | 12.3 | 13.6 | |
| | | | V _{DDA} = 1.8V | 10.5 | 12.1 | |
| | I _{DDB} | 500kHz square wave | V _{DDB} = 5V | 5.2 | 7.2 | |
| | | | V _{DDB} = 3.3V | 5.2 | 7.2 | |
| | | | V _{DDB} = 2.5V | 5.2 | 7.2 | |
| | | | V _{DDB} = 1.8V | 5 | 7.0 | |
| | | 12.5MHz square wave (Note 3) | V _{DDB} = 5V | 8.2 | 10.0 | |
| | | | V _{DDB} = 3.3V | 7.2 | 9.1 | |
| | | | V _{DDB} = 2.5V | 6.7 | 8.7 | |
| | | | V _{DDB} = 1.8V | 6.3 | 8.2 | |
| | | 50MHz square wave (Note 3) | V _{DDB} = 5V | 18 | 18.6 | |
| | | | V _{DDB} = 3.3V | 14.2 | 15.1 | |
| | | | V _{DDB} = 2.5V | 12.3 | 13.5 | |
| | | | V _{DDB} = 1.8V | 10.5 | 12.1 | |

DC Electrical Characteristics (continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Note 2)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------------|------------------|---|----------------------------------|------|-----|-------|
| LOGIC INPUTS AND OUTPUTS | | | | | | |
| Input High Voltage | V _{IH} | ENA, INA_ relative to GNDA | 0.7 x V _{DDA} | | | V |
| | | ENB, INB_ relative to GNDB | 0.7 x V _{DDB} | | | |
| Input Low Voltage | V _{IL} | ENA, INA_ relative to GNDA | 1.71V ≤ V _{DDA} ≤ 1.89V | 0.6 | | V |
| | | | 2.25V ≤ V _{DDA} ≤ 5.5V | 0.8 | | |
| | | ENB, INB_ relative to GNDB | 1.71V ≤ V _{DDB} ≤ 1.89V | 0.6 | | |
| | | | 2.25V ≤ V _{DDB} ≤ 5.5V | 0.8 | | |
| Input Hysteresis | V _{HYS} | V _{INA_} relative to GNDA or V _{INB_} relative to GNDB | MAX1493_A/D | 410 | | mV |
| | | | MAX1493_B/E | 410 | | |
| | | | MAX1493_C/F | 80 | | |
| Input Leakage Current | I _L | V _{INA_} = 0 or V _{DDA} , V _{INB_} = 0 or V _{DDB} | -1 | | +1 | μA |
| Input Capacitance | C _{IN} | INA_, INB_, f = 1MHz | | 2 | | pF |
| EN_ Pullup Current | I _{PU} | | -4 | -2.3 | -1 | μA |
| Output Voltage High | V _{OH} | V _{OUTA_} relative to GNDA, I _{OUTA_} = -4mA (Note 4) | V _{DDA} - 0.4 | | | V |
| | | V _{OUTB_} relative to GNDB, I _{OUTB_} = -4mA (Note 4) | V _{DDB} - 0.4 | | | |
| Output Voltage Low | V _{OL} | V _{OUTA_} relative to GNDA, I _{OUTA_} = 4mA (Note 4) | 0.4 | | | V |
| | | V _{OUTB_} relative to GNDB, I _{OUTB_} = 4mA (Note 4) | 0.4 | | | |

Dynamic Electrical Characteristics (MAX1493_A/D)

(V_{DDA} - V_{GND A} = +1.71V to +5.5V, V_{DDB} - V_{GND B} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GND A} = +3.3V, V_{DDB} - V_{GND B} = +3.3V, V_{GND A} = V_{GND B}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | | MIN | TYP | MAX | UNITS |
|--|--------------------|---|---|-----|------|------|-------|
| INPUT AND OUTPUT CHANNELS | | | | | | | |
| Common-Mode Transient Immunity | CMTI | IN__ = GND_ or VDD_ (Note 5) | | | 25 | | kV/μs |
| Maximum Data Rate | DR _{MAX} | | | 1 | | | Mbps |
| Minimum Pulse Width | PW _{MIN} | INA_ to OUTB_, INB_ to OUTA_ | | | | 1 | μs |
| Glitch Rejection | | INA_ to OUTB_, INB_ to OUTA_ | | | 32 | | ns |
| Propagation Delay (Figure 1) | t _{PLH} | INA_ to OUTB_, INB_ to OUTA_, C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 38.2 | 54.1 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 38.7 | 54.6 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 39.7 | 55.6 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 42.9 | 58.4 | |
| | t _{PHL} | INA_ to OUTB_, INB_ to OUTA_, C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 38.6 | 55.3 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 38.9 | 55.6 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 39.8 | 56.1 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 42.3 | 60.2 | |
| Pulse-Width Distortion | PWD | t _{PLH} - t _{PHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 0.4 | 4.5 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 0.2 | 4.3 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 0.1 | 3.9 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 0.6 | 4.7 | |
| Propagation Delay Skew Part-to-Part (Same Channel) | t _{SPLH} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | | 26.6 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | | 26.6 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | | 26.6 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | | 26.9 | |
| | t _{SPHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | | 27.9 | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | | 27.7 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | | 27.6 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | | 29.7 | |
| Propagation Delay Skew Channel-to-Channel (Same Direction) | t _{SCSLH} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | | 6.7 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | | 6.7 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | | 6.7 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | | 6.7 | |
| | t _{SCSHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | | 6.7 | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | | 6.7 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | | 6.7 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | | 6.7 | |

Dynamic Electrical Characteristics (MAX1493_A/D) (Continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------|---|-----|-----|------|-------|
| Propagation Delay Skew Channel-to-Channel (Opposing Direction) | t _{SCOLH} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 26.6 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 26.6 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 26.6 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 26.9 | |
| | t _{SCOHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 27.9 | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 27.7 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 27.6 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 29.7 | |
| Rise Time (Figure 1) | t _R | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Fall Time (Figure 1) | t _F | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Enable to Data Valid | t _{EN} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 5.1 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 5.5 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 6.7 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 16.3 | |
| Enable to Three-State | t _{TRI} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 2.7 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 4.4 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 7.0 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 11.7 | |

Dynamic Electrical Characteristics (MAX1493_B/E)

(V_{DDA} - V_{GND A} = +1.71V to +5.5V, V_{DDB} - V_{GND B} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GND A} = +3.3V, V_{DDB} - V_{GND B} = +3.3V, V_{GND A} = V_{GND B}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------|---|---|------|------|-------|
| INPUT AND OUTPUT CHANNELS | | | | | | |
| Common-Mode Transient Immunity | CMTI | IN _{__} = GND _{__} or V _{DD} _{__} (Note 5) | | 25 | | kV/μs |
| Maximum Data Rate | DR _{MAX} | | 25 | | | Mbps |
| Minimum Pulse Width | PW _{MIN} | INA _{__} to OUTB _{__} , INB _{__} to OUTA _{__} | | | 40 | ns |
| Glitch Rejection | | INA _{__} to OUTB _{__} , INB _{__} to OUTA _{__} | | 15 | | ns |
| Propagation Delay (Figure 1) | t _{PLH} | INA _{__} to OUTB _{__} , INB _{__} to OUTA _{__} , C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 20.9 | 27.5 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 21.4 | 28.7 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 22.4 | 31.2 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 25.7 | 36.9 | |
| | t _{PHL} | INA _{__} to OUTB _{__} , INB _{__} to OUTA _{__} , C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 21.1 | 28.8 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 21.5 | 29.8 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 22.3 | 31.9 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 24.9 | 37.4 | |
| Pulse-Width Distortion | PWD | t _{PLH} - t _{PHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 0.2 | 2.6 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 0.1 | 2.6 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 0.1 | 2.4 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 0.7 | 3.2 | |
| Propagation Delay Skew Part-to-Part (Same Channel) | t _{SPLH} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 11.7 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 11.5 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 11.3 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 13.6 | |
| | t _{SPHL} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 9.8 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 9.8 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 11.1 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 14.4 | |
| Propagation Delay Skew Channel-to-Channel (Same Direction) | t _{SCSLH} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 3 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 3 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 3 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 3 | |
| | t _{SCSHL} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 3 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 3 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 3 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 3 | |

Dynamic Electrical Characteristics (MAX1493_B/E) (Continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------|---|-----|-----|------|-------|
| Propagation Delay Skew Channel to Channel (Opposing Direction) | t _{SCOLH} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 11.7 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 11.5 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 11.3 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 13.6 | |
| | t _{SCOHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 9.8 | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 9.8 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 11.1 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 14.4 | |
| Rise Time (Figure 1) | t _R | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Fall Time (Figure 1) | t _F | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Enable to Data Valid | t _{EN} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 5.1 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 5.5 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 6.7 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 16.3 | |
| Enable to Three-State | t _{TRI} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 2.7 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 4.4 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 7.0 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 11.7 | |

Dynamic Electrical Characteristics (MAX1493_C/F)

(V_{DDA} - V_{GND A} = +1.71V to +5.5V, V_{DDB} - V_{GND B} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GND A} = +3.3V, V_{DDB} - V_{GND B} = +3.3V, V_{GND A} = V_{GND B}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------|---|---|-----|------|-------|
| INPUT AND OUTPUT CHANNELS | | | | | | |
| Common-Mode Transient Immunity | CMTI | IN__ = GND_ or V _{DD} _ (Note 5) | | 25 | | kV/μs |
| Maximum Data Rate | DR _{MAX} | | 150 | | | Mbps |
| Minimum Pulse Width | PW _{MIN} | INA_ to OUTB_, INB_ to OUTB_ | | | 6.67 | ns |
| Propagation Delay (Figure 1) | t _{PLH} | INA_ to OUTB_, INB_ to OUTA_, C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 5.1 | 7.5 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 5.2 | 8.1 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 5.8 | 9.7 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 8.1 | 14 | |
| | t _{PHL} | INA_ to OUTB_, INB_ to OUTA_, C _L = 15pF | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 4.9 | 7.4 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 5.3 | 8.3 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 5.9 | 10.2 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 8.2 | 14.9 | |
| Pulse-Width Distortion | PWD | t _{PLH} - t _{PHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | 0.2 | 1 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | 0.1 | 1 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | 0.1 | 1 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | 0.1 | 1 | |
| Propagation Delay Skew Part-to-Part (Same Channel) | t _{SPLH} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 3.0 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 3.3 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 4.3 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 7.1 | |
| | t _{SPHL} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2.8 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 3.4 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 4.6 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 7.9 | |
| Propagation Delay Skew Channel-to-Channel (Same Direction) | t _{SCSLH} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 0.9 | ns |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 1.2 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 1.4 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 1.6 | |
| | t _{SCSHL} | | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 0.9 | |
| | | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 1.2 | |
| | | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 1.4 | |
| | | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 1.6 | |

Dynamic Electrical Characteristics (MAX1493_C/F) (continued)

(V_{DDA} - V_{GNDA} = +1.71V to +5.5V, V_{DDB} - V_{GNDB} = +1.71V to +5.5V, C_L = 15pF, T_A = -40°C to +125°C, unless otherwise noted. Typical values are at V_{DDA} - V_{GNDA} = +3.3V, V_{DDB} - V_{GNDB} = +3.3V, V_{GNDA} = V_{GNDB}, T_A = +25°C, unless otherwise noted.) (Notes 2, 3)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|----------------------|---|-----|-----|------|-------|
| Propagation Delay Skew Channel-to-Channel (Opposing Direction) | t _{SCOLH} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 3 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 3.3 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 4.3 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 7.1 | |
| | t _{SCOHL} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 2.8 | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 3.4 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 4.6 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 7.9 | |
| Rise Time (Figure 1) | t _R | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Fall Time (Figure 1) | t _F | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | 2 | ns | |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | 2 | | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | 2 | | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | 2 | | |
| Enable to Data Valid | t _{EN} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 5.1 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 5.5 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 6.7 | |
| | | 1.71V ≤ V _{DDA} , V _{DDB} ≤ 1.89V | | | 16.3 | |
| Enable to Three-State | t _{TRI} | 4.5V ≤ V _{DDA} , V _{DDB} ≤ 5.5V | | | 2.7 | ns |
| | | 3.0V ≤ V _{DDA} , V _{DDB} ≤ 3.6V | | | 4.4 | |
| | | 2.25V ≤ V _{DDA} , V _{DDB} ≤ 2.75V | | | 7.0 | |
| | | V _{DDA} , V _{DDB} ≤ 1.89V | | | 11.7 | |
| Peak Eye Diagram Jitter | T _{JIT(PK)} | V _{DDA} , V _{DDB} = 5.0V | | | 140 | ps |
| | | V _{DDA} , V _{DDB} = 3.3V | | | 130 | |
| | | V _{DDA} , V _{DDB} = 2.5V | | | 140 | |
| | | V _{DDA} , V _{DDB} = 1.8V | | | 160 | |

ESD Protection

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|-----------|--------|----------------------------|-----|-----|-----|-------|
| ESD | | Human Body Model, all pins | | ±4 | | kV |

Note 2: All devices are 100% production tested at T_A = +125°C. Specifications over temperature are guaranteed by design.

Note 3: Not production tested. Guaranteed by design.

Note 4: All currents into the device are positive. All currents out of the device are negative.

Note 5: CMTI is the maximum sustainable common-mode voltage slew rate while maintaining the correct output. CMTI applies to both rising and falling common-mode voltage edges. Tested with the transient generator connected between GNDA and GNDB (V_{CM} = 1000V).

Safety Regulatory Approvals (Pending)

| |
|---|
| UL |
| The MAX14930–MAX14932 are certified under UL1577. For more details, refer to File E351759. |
| Rated up to 2750 V _{RMS} isolation voltage for single protection. |
| cUL (Equivalent to CSA notice 5A) |
| The MAX14930–MAX14932 are certified up to 2750V _{RMS} for single protection. For more details, refer to File 351759. |
| VDE |
| Pending |
| TUV |
| The MAX14930–MAX14932 are certified under TUV. For details, see Technical Report number 095-72100581-100. |
| IEC 69050-1: Up to 630V _P (443V _{RMS}) working voltage for basic insulation. |
| EC 61010-1 (ed. 3): Up to 443V _{RMS} working voltage for basic insulation. |
| IEC 60601-1 (ed. 3): Up to 630V _P (443V _{RMS}) working voltage for basic insulation. |
| Rated up to 2750V _{RMS} Withstand Isolation voltage for Basic Insulation (Overvoltage Category II, Pollution Degree 2, Material Group IIIb, ≤ 2000m) |

Insulation Characteristics

| PARAMETER | SYMBOL | CONDITIONS | VALUE | UNITS |
|---|------------------------------|---|-------------------|------------------|
| Partial Discharge Test Voltage | V _{PR} | Method B1 = V _{IORM} × 1.875 (t = 1s, partial discharge < 5pC) | 1182 | V _P |
| Maximum Repetitive Peak Isolation Voltage | V _{IORM} | | 630 | V _P |
| Maximum Working Isolation Voltage | V _{IOWM} | | 443 | V _{RMS} |
| Maximum Transient Isolation Voltage | V _{IO_{TM}} | t = 1s | 4600 | V _P |
| Maximum Withstand Isolation Voltage | V _{ISO} | f = 60Hz, duration = 60s | 2750 | V _{RMS} |
| Maximum Surge Isolation Voltage | V _{IOSM} | Basic insulation | 10 | kV |
| Insulation Resistance | R _S | T _A = +150°C V _{IO} = 500V | > 10 ⁹ | Ω |
| Barrier Capacitance Input to Output | C _{IO} | f = 1MHz | 2 | pF |
| Minimum Creepage Distance | CPG | Wide SOIC | 8 | mm |
| | | Narrow SOIC | 4 | |
| Minimum Clearance Distance | CLR | Wide SOIC | 8 | mm |
| | | Narrow SOIC | 4 | |
| Internal Clearance | | Distance through insulation | 0.015 | mm |
| Comparative Tracking Resistance Index | CTI | Material Group II (IEC 60112) | 575 | |
| Climatic Category | | | 40/125/21 | |
| Pollution Degree (DIN VDE 0110, Table 1) | | | 2 | |

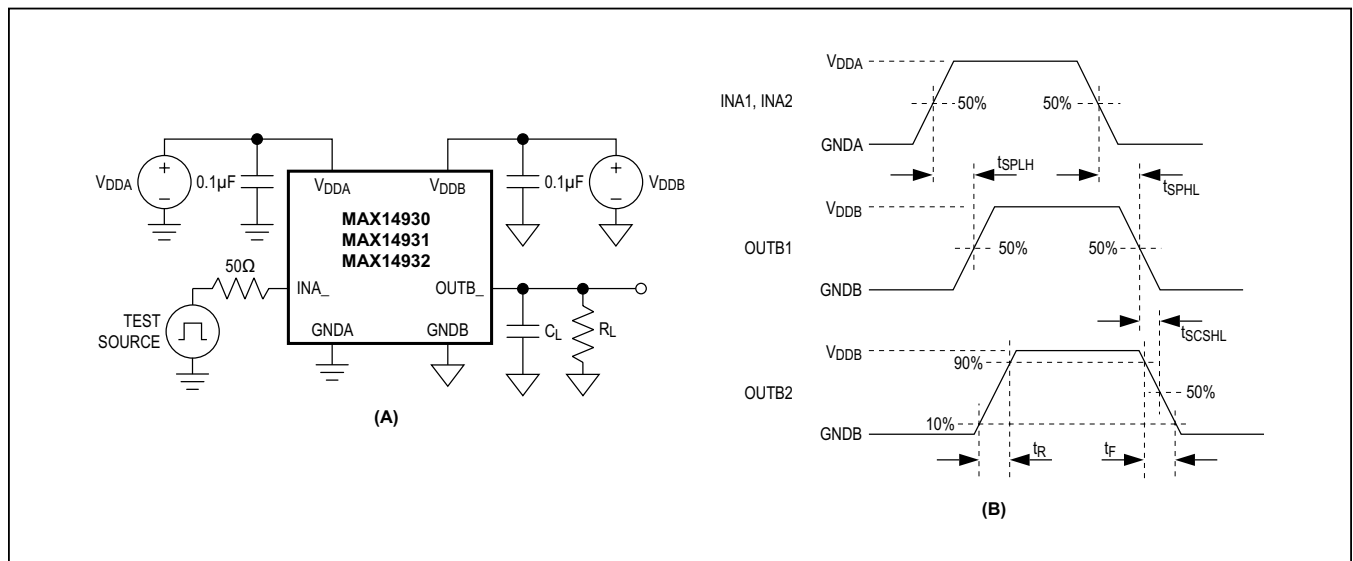
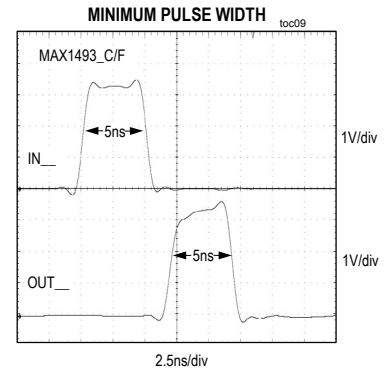
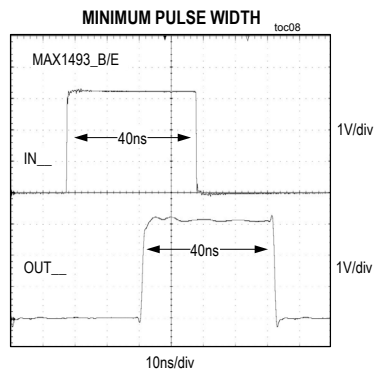
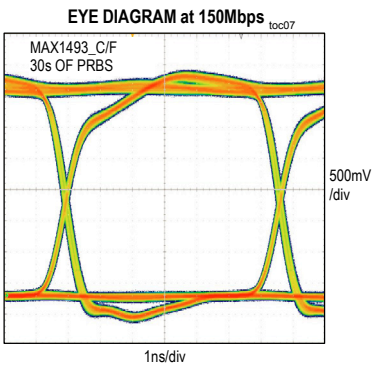
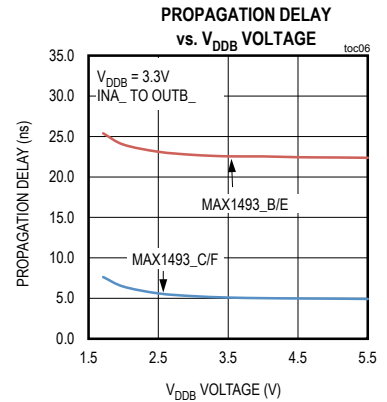
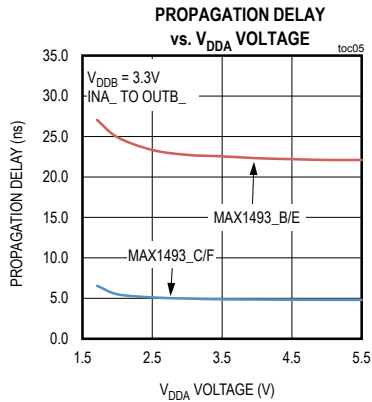
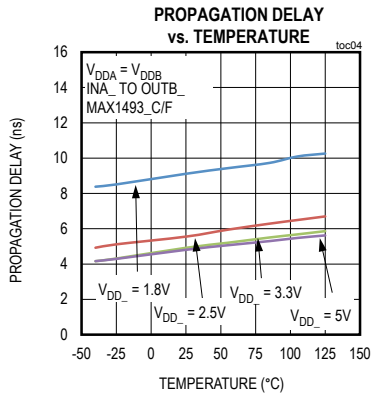
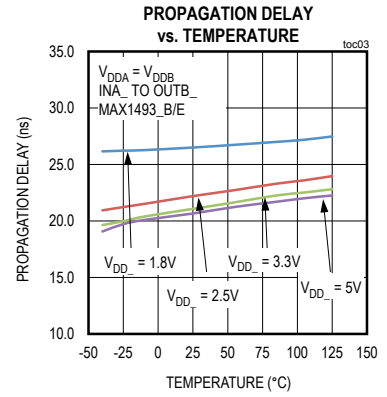
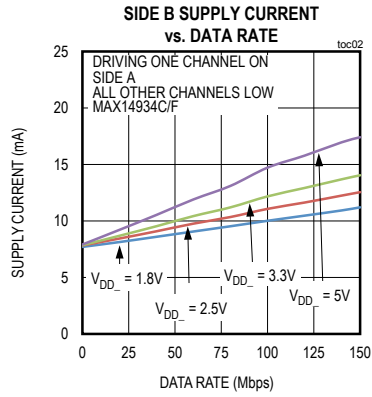
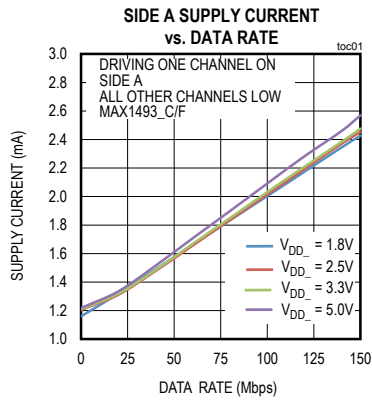


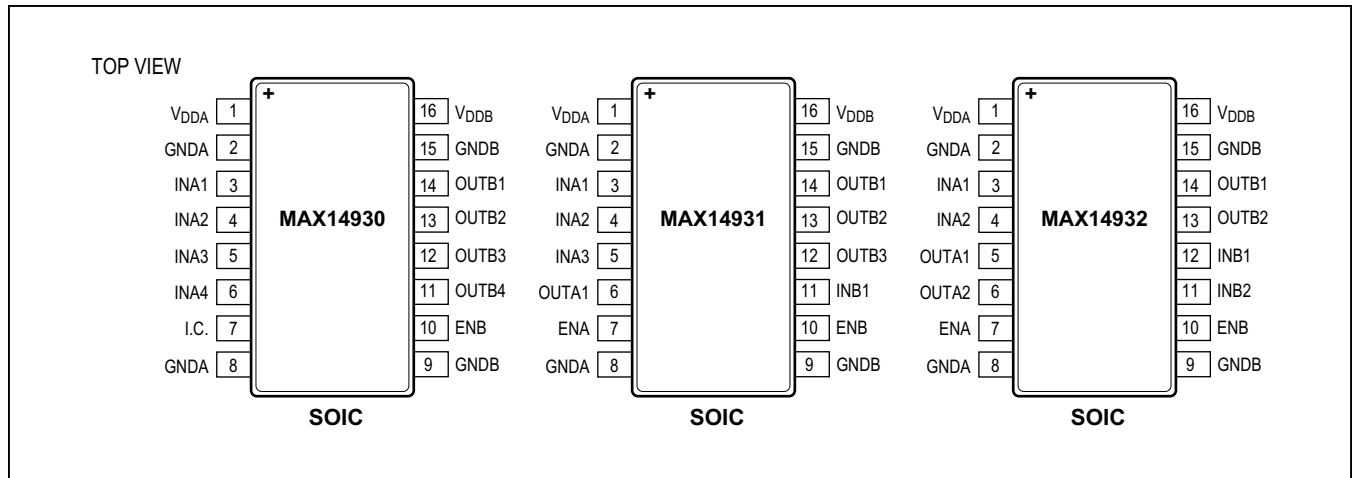
Figure 1. Test Circuit (A) and Timing Diagram (B)

Typical Operating Characteristics

($V_{DDA} - V_{GNDA} = +3.3V$, $V_{DDB} - V_{GNDB} = +3.3V$, $V_{GNDA} = V_{GNDB}$, $T_A = +25^\circ C$, unless otherwise noted.)



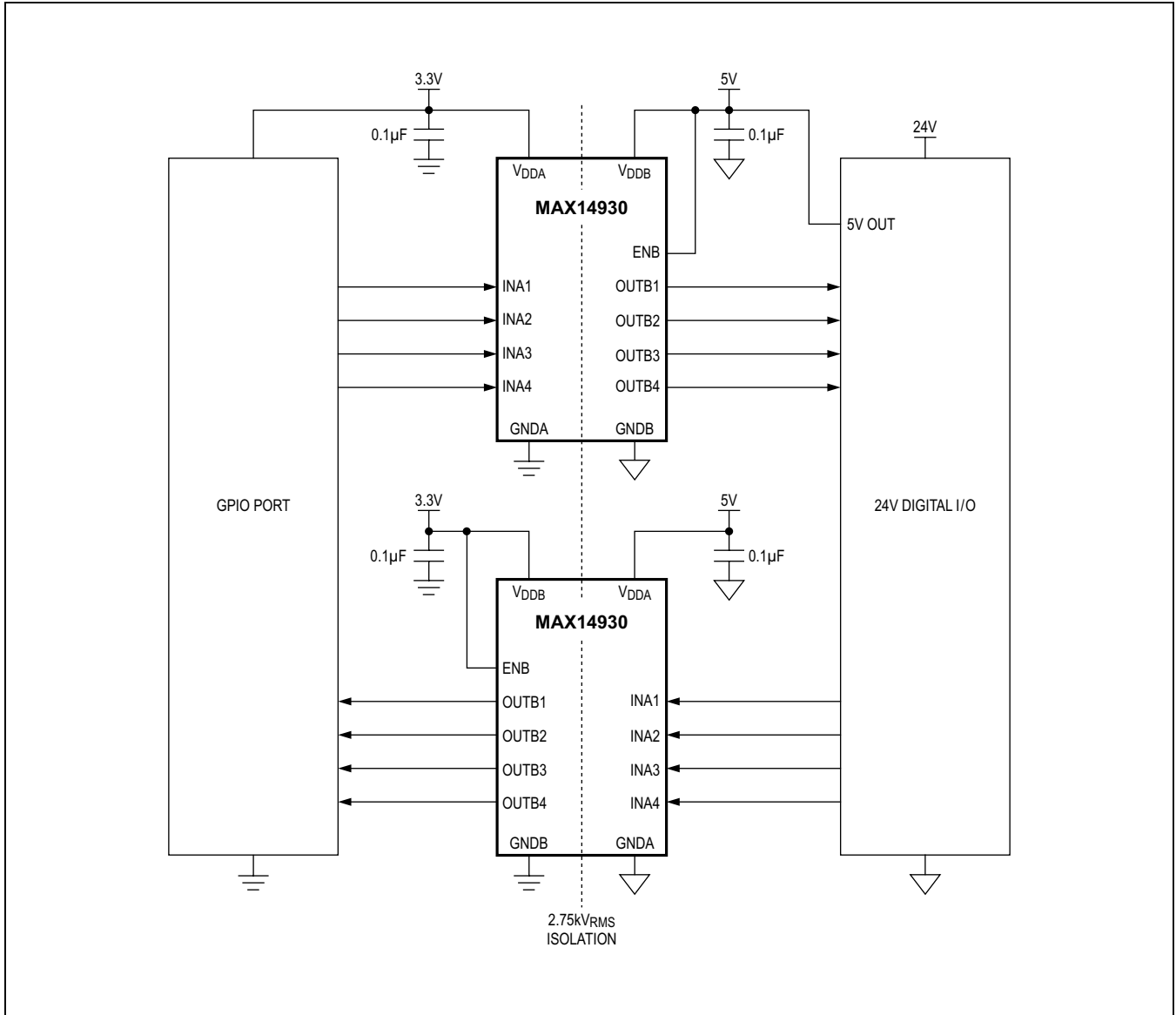
Pin Configurations



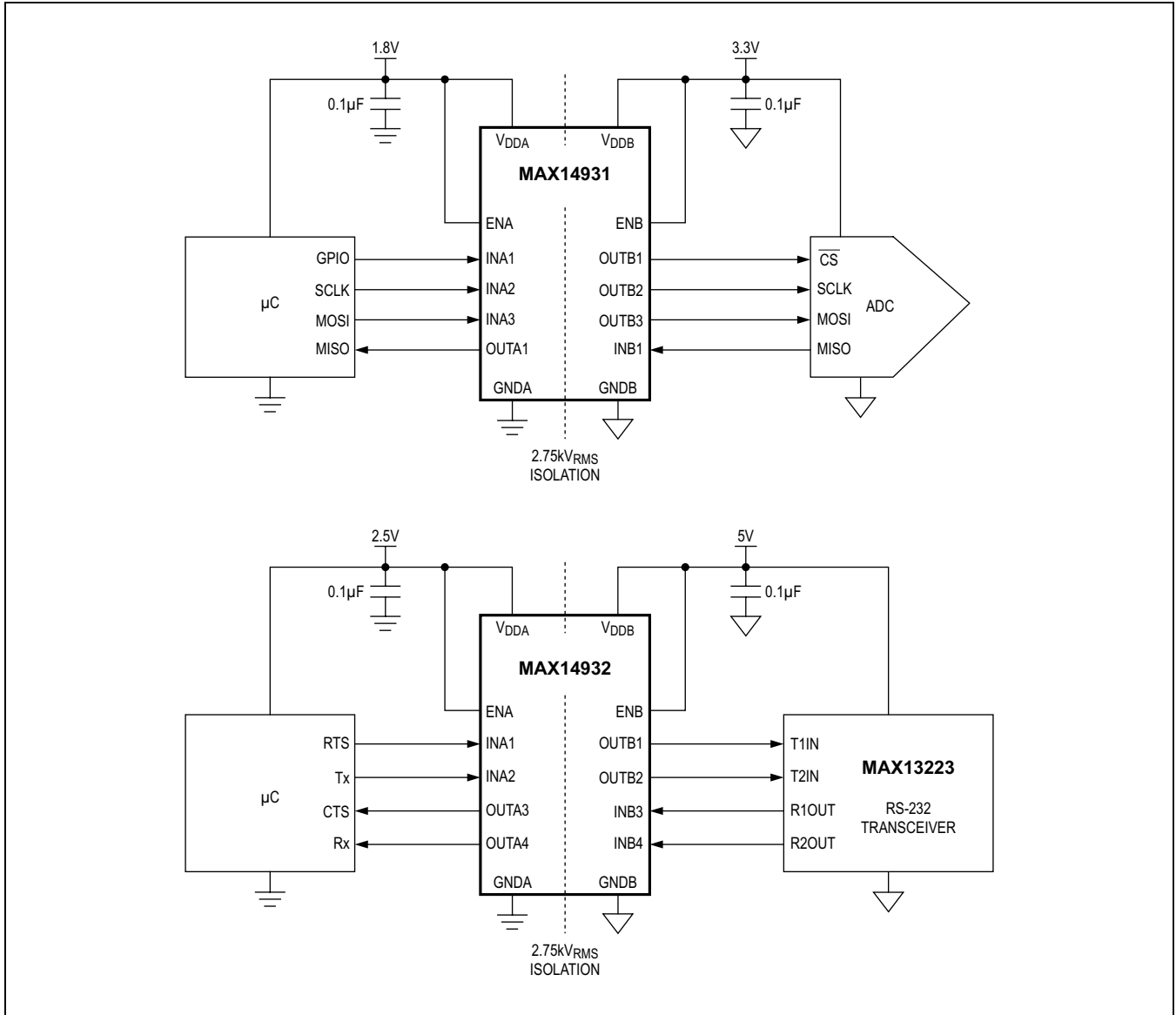
Pin Description

| PIN | | | NAME | FUNCTION | VOLTAGE RELATIVE TO |
|----------|----------|----------|-------|--|---------------------|
| MAX14930 | MAX14931 | MAX14932 | | | |
| 1 | 1 | 1 | VDDA | Power Supply. Bypass VDDA with a 0.1µF ceramic capacitor as close as possible to the pin. | GNDA |
| 2, 8 | 2, 8 | 2, 8 | GNDA | Ground Reference for Side A | — |
| 3 | 3 | 3 | INA1 | Logic Input 1 on Side A. INA1 corresponds to OUTB1. | GNDA |
| 4 | 4 | 4 | INA2 | Logic Input 2 on Side A. INA2 corresponds to OUTB2. | GNDA |
| 5 | 5 | — | INA3 | Logic Input 3 on Side A. INA3 corresponds to OUTB3. | GNDA |
| 6 | — | — | INA4 | Logic Input 4 on Side A. INA4 corresponds to OUTB4. | GNDA |
| 7 | — | — | I.C. | Internally Connected. Leave unconnected or connect to GNDA or VDDA. | — |
| — | 6 | 5 | OUTA1 | Logic Output 1 on Side A | GNDA |
| — | — | 6 | OUTA2 | Logic Output 2 on Side A | GNDA |
| — | 7 | 7 | ENA | Active-High Enable for Side A. ENA has an internal 2µA pullup to VDDA. | GNDA |
| 9, 15 | 9, 15 | 9, 15 | GNDB | Ground Reference for Side B | — |
| 10 | 10 | 10 | ENB | Active-High Enable for Side B. ENB has an internal 2µA pullup to VDDB. | GNDB |
| 11 | — | — | OUTB4 | Logic Output 4 on Side B | GNDB |
| — | 11 | 12 | INB1 | Logic Input 1 on Side B. INB1 corresponds to OUTA1. | GNDB |
| — | — | 11 | INB2 | Logic Input 2 on Side B. INB2 corresponds to OUTA2. | GNDB |
| 12 | 12 | — | OUTB3 | Logic Output 3 on Side B | GNDB |
| 13 | 13 | 13 | OUTB2 | Logic Output 2 on Side B | GNDB |
| 14 | 14 | 14 | OUTB1 | Logic Output 1 on Side B | GNDB |
| 16 | 16 | 16 | VDDDB | Power Supply. Bypass VDDDB with a 0.1µF ceramic capacitor as close as possible to the pin. | GNDB |

Typical Operating Circuit



Typical Operating Circuit (continued)



Detailed Description

The MAX14930–MAX14932 are a family of 4-channel digital isolators. The MAX14930–MAX14932 family transfers digital signals between circuits with different power domains. The devices are rated for 2.75kV_{RMS} isolation voltage for 60 seconds. This family of digital isolators offers low-power operation, high electromagnetic interference (EMI) immunity, and stable temperature performance through Maxim's proprietary process technology. The devices isolate different ground domains and block high-voltage/high-current transients from sensitive or human interface circuitry.

The MAX14930–MAX14932 family offers three unidirectional channel configurations for design convenience. The MAX14930 features four channels transferring digital signals in one direction for applications such as isolated digital I/O. The MAX14931 has three channels transmitting data in one direction and one channel transmitting in the opposite direction, making it ideal for applications such as isolated SPI and RS-485 communication. The MAX14932 provides further design flexibility with two channels in each direction for isolated RS-232 or other applications.

Devices are available with data rates from DC up to 1Mbps (A/D versions), 25Mbps (B/E versions), or 150Mbps (C/F versions). Each device can also be ordered with default-high or default-low outputs. This is the state an output will go to when the input side of the device is unpowered.

The devices have two supply inputs, V_{DDA} and V_{ddb}, that independently set the logic levels on either side of the device. V_{DDA} and V_{ddb} are referenced to GNDA and GNDB, respectively. The MAX14930–MAX14932 family also features a refresh circuit to ensure output accuracy when an input remains in the same state indefinitely.

Digital Isolation

The MAX14930–MAX14932 family provides galvanic isolation for digital signals that are transmitted between two ground domains. Up to 630V_{PEAK} of continuous isolation is supported, as well as transient differences of up to 2.75kV_{RMS} for up to 60 seconds.

Level Shifting

The wide supply voltage range of both V_{DDA} and V_{ddb} allows the MAX14930–MAX14932 family to be used for level translation in addition to isolation. V_{DDA} and V_{ddb} can be independently set to any voltage from 1.71V to 5.5V. The supply voltage sets the logic level on the corresponding side of the isolator.

Unidirectional Channels

Each channel of the MAX14930–MAX14932 is unidirectional; it only passes data in one direction, as indicated in the functional diagram. Each device features four unidirectional channels that operate independently with guaranteed data rates from DC up to 1Mbps (A/D versions), 25Mbps (B/E versions), or 150Mbps (C/F versions). The output driver of each channel is push-pull, eliminating the need for pullup resistors. The outputs are able to drive both TTL and CMOS logic inputs.

Startup and Undervoltage Lockout

The V_{DDA} and V_{ddb} supplies are both internally monitored for undervoltage conditions. Undervoltage events can occur during power-up, power-down, or during normal operation due to a sagging supply voltage. When an undervoltage condition is detected on either supply, all outputs go to their default states regardless of the status of the inputs (Table 1). Figures 2–5 show the behavior of the outputs during power-up and power-down.

Table 1. Output Behavior During Undervoltage Conditions

| V _{IN_} | V _{DDA} | V _{DDB} | V _{OUTA_} | V _{OUTB_} |
|------------------|------------------|------------------|--------------------|--------------------|
| 1 | Powered | Powered | 1 | 1 |
| 0 | Powered | Powered | 0 | 0 |
| X | Undervoltage | Powered | Default | Default |
| X | Powered | Undervoltage | Default | Default |

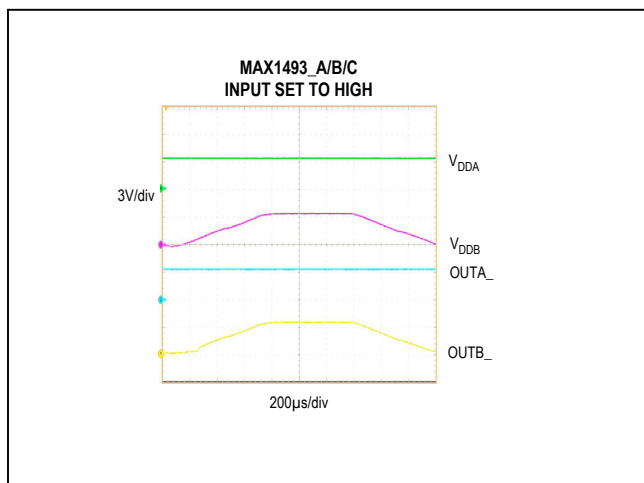


Figure 2. Undervoltage Lockout Behavior (MAX1493_ A/B/C High)

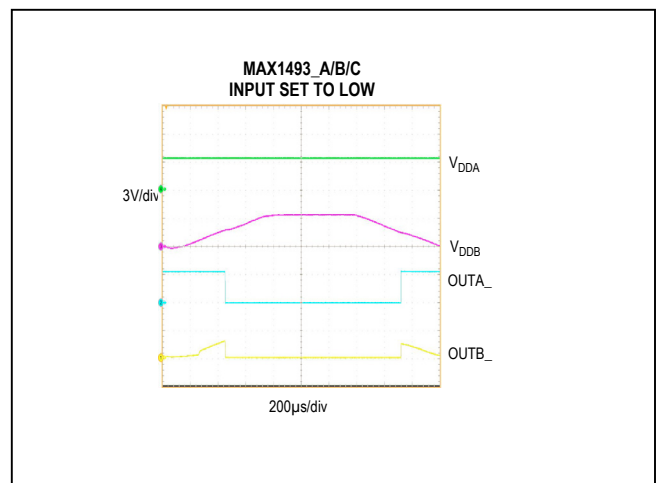


Figure 3. Undervoltage Lockout Behavior (MAX1493_ A/B/C Low)

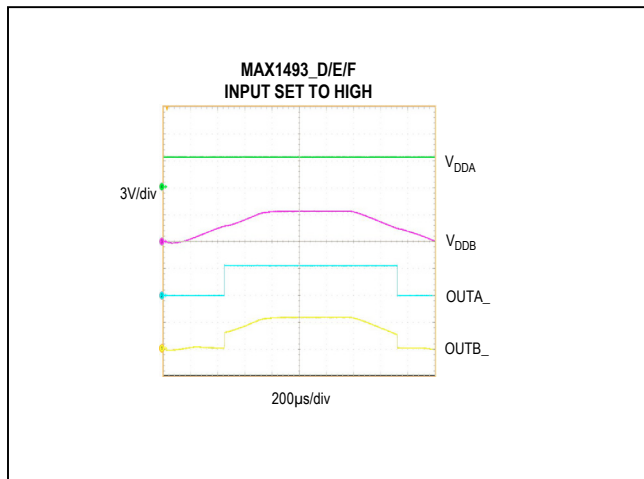


Figure 4. Undervoltage Lockout Behavior (MAX1493_ D/E/F High)

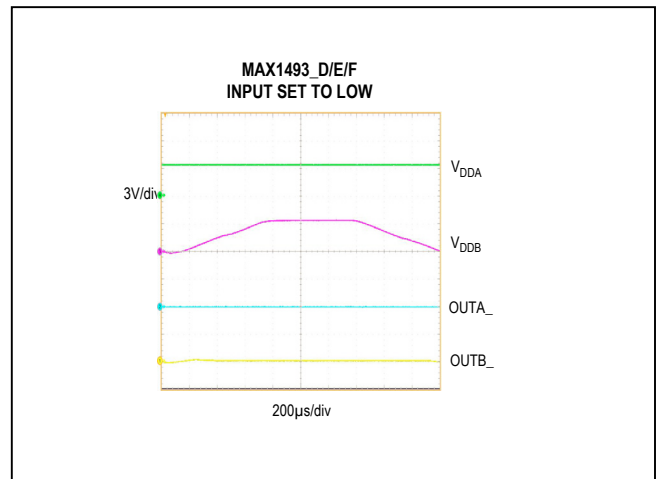


Figure 5. Undervoltage Lockout Behavior (MAX1493_ D/E/F Low)

Applications Information

Power-Supply Sequencing

The MAX14930–MAX14932 do not require special power-supply sequencing. The logic levels are set independently on either side by V_{DDA} and V_{DDB} . Each supply can be

present over the entire specified range regardless of the level or presence of the other supply.

Power-Supply Decoupling

To reduce ripple and the chance of introducing data errors, bypass V_{DDA} and V_{DDB} with 0.1 μ F ceramic capacitors to $GNDA$ and $GNDB$, respectively. Place the bypass capacitors as close to the power-supply input pins as possible.

Ordering Information and Selector Guide

| PART | CHANNEL CONFIGURATION | DATA RATE (Mbps) | OUTPUT | TEMP RANGE | PIN-PACKAGE |
|-----------------|-----------------------|------------------|--------------|-----------------|----------------|
| MAX14930AASE+** | 4/0 | 1 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930AAWE+** | 4/0 | 1 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14930BASE+ | 4/0 | 25 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930BAWE+ | 4/0 | 25 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14930CASE+ | 4/0 | 150 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930CAWE+ | 4/0 | 150 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14930DASE+ | 4/0 | 1 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930DAWE+** | 4/0 | 1 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14930EASE+ | 4/0 | 25 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930EAWWE+ | 4/0 | 25 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14930FASE+ | 4/0 | 150 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14930FAWE+ | 4/0 | 150 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14931AASE+** | 3/1 | 1 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931AAWE+** | 3/1 | 1 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14931BASE+ | 3/1 | 25 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931BAWE+ | 3/1 | 25 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14931CASE+ | 3/1 | 150 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931CAWE+ | 3/1 | 150 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14931DASE+ | 3/1 | 1 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931DAWE+ | 3/1 | 1 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14931EASE+ | 3/1 | 25 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931EAWWE+ | 3/1 | 25 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14931FASE+ | 3/1 | 150 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14931FAWE+ | 3/1 | 150 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14932AASE+** | 2/2 | 1 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932AAWE+ | 2/2 | 1 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14932BASE+ | 2/2 | 25 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932BAWE+** | 2/2 | 25 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14932CASE+** | 2/2 | 150 | Default High | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932CAWE+** | 2/2 | 150 | Default High | -40°C to +125°C | 16 Wide SOIC |
| MAX14932DASE+** | 2/2 | 1 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932DAWE+ | 2/2 | 1 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14932EASE+** | 2/2 | 25 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932EAWWE+ | 2/2 | 25 | Default Low | -40°C to +125°C | 16 Wide SOIC |
| MAX14932FASE+** | 2/2 | 150 | Default Low | -40°C to +125°C | 16 Narrow SOIC |
| MAX14932FAWE+ | 2/2 | 150 | Default Low | -40°C to +125°C | 16 Wide SOIC |

+Denotes a lead(Pb)-free/RoHS-compliant package.

**Future product—contact factory for availability.

Chip Information

PROCESS: BICMOS

Package Information

For the latest package outline information and land patterns (footprints), go to www.maximintegrated.com/packages. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

| PACKAGE TYPE | PACKAGE CODE | OUTLINE NO. | LAND PATTERN NO. |
|----------------|--------------|-------------------------|-------------------------|
| 16 Wide SOIC | W16M+8 | 21-0042 | 90-0107 |
| 16 Narrow SOIC | S16M+11 | 21-0041 | 90-0097 |

Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|-----------------|---------------|--|---------------|
| 0 | 9/14 | Initial release | — |
| 1 | 12/14 | Changed future product status on several parts in the <i>Ordering Information/Selector Guide</i> table. Changed “basic insulation” to “single protection” in <i>Safety Regulatory Approvals</i> table. | 13, 22 |
| 2 | 3/15 | Changed future product status for MAX14930FAWE+, MAX14931DASE+, MAX14932AAWE+, MAX14932BASE+, MAX14932DAWE+, MAX14932EAWWE+, and MAX14932FAWE+ | 22 |
| 3 | 5/15 | Added UL/cUL, and TUV certification information and fixed corresponding isolation parameters | 1, 13-14, 16 |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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