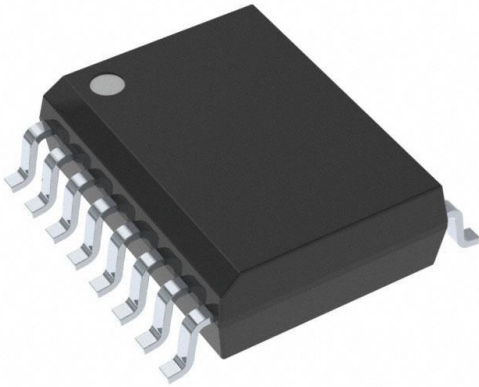


ISO7631FCDW Datasheet

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ISO7631FCDW

<https://www.DiGi-Electronics.com>

| | |
|------------------------------|--|
| DiGi Electronics Part Number | ISO7631FCDW-DG |
| Manufacturer | Texas Instruments |
| Manufacturer Product Number | ISO7631FCDW |
| Description | DGTL ISO 2500VRMS 3CH GP 16SOIC |
| Detailed Description | General Purpose Digital Isolator 2500Vrms 3 Channel 25Mbps 25kV/ μ s CMTI 16-SOIC (0.295", 7.50mm Width) |



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

ISO7631FCDW

Series:

-

Technology:

Capacitive Coupling

Isolated Power:

No

Inputs - Side 1/Side 2:

2/1

Voltage - Isolation:

2500Vrms

Data Rate:

25Mbps

Pulse Width Distortion (Max):

3ns

Voltage - Supply:

3V ~ 5.5V

Mounting Type:

Surface Mount

Supplier Device Package:

16-SOIC

Manufacturer:

Texas Instruments

Product Status:

Active

Type:

General Purpose

Number of Channels:

3

Channel Type:

Unidirectional

Common Mode Transient Immunity (Min):

25kV/ μ s

Propagation Delay tpLH / tpHL (Max):

28ns, 28ns

Rise / Fall Time (Typ):

2.8ns, 2.9ns

Operating Temperature:

-40°C ~ 125°C

Package / Case:

16-SOIC (0.295", 7.50mm Width)

Base Product Number:

ISO7631

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

3 (168 Hours)

ECCN:

EAR99

ISO76x1 Low-Power Triple and Quad-Channels Digital Isolators

1 Features

- Signaling Rate: 150 Mbps (M-Grade), 25 Mbps (C-Grade)
- Robust Design with Integrated Noise Filter (C-Grade)
- Low Power Consumption, Typical I_{CC} per Channel (3.3-V Supplies):
 - ISO7631FM: 2 mA at 10 Mbps
 - ISO7631FC: 1.5 mA at 10 Mbps
 - ISO7641FC: 1.3 mA at 10 Mbps
- Extremely-Low $I_{CC_disable}$ (C-Grade)
- Low Propagation Delay: 7 ns Typical (M-Grade)
- Output Defaults to Low-State in Fail-Safe Mode
- Wide Temperature Range: -40°C to 125°C
- 50 KV/ μs Transient Immunity, Typical
- Long Life With SiO_2 Isolation Barrier
- Operates From 2.7-V (M-Grade), 3.3-V and 5-V Supply and Logic Levels
- 2.7-V (M-Grade), 3.3-V and 5-V Level Translation
- Wide Body SOIC-16 Package
- Safety and Regulatory Approvals
 - 2500 V_{RMS} Isolation for 1 Minute per UL 1577
 - 4242 V_{PK} Basic Insulation per DIN V VDE V 0884-10 and DIN EN 61010-1
 - CSA Component Acceptance Notice 5A, IEC 60950-1 and IEC 61010-1 End Equipment Standards
 - CQC Certification per GB4943.1-2011
 - TUV 3000 V_{RMS} Reinforced Insulation according to EN/UL/CSA 60950-1 and EN/UL/CSA 61010-1

2 Applications

- Optocoupler Replacement in:
 - Industrial Fieldbus
 - Profibus
 - Modbus
 - DeviceNet™ Data Buses
 - Servo Control Interface
 - Motor Control
 - Power Supplies
 - Battery Packs

3 Description

The ISO7631F and ISO7641F devices provide galvanic isolation up to 4242 V_{PK} per VDE. The ISO7631F device has three channels, two of which operate in the forward direction and one which operates in the reverse direction. The ISO7641F device has 4 channels, three of which operate in the forward direction and one of which operates in the reverse direction. Suffix F indicates that output defaults to low-state in fail-safe conditions (see). M-Grade devices are high-speed isolators capable of up to 150-Mbps data rates with fast propagation delays, whereas C-Grade devices are capable of up to 25-Mbps data rates with low power consumption and integrated filters for noise-prone applications. C-Grade devices are recommended for lower-speed applications where input noise pulses of less than 6 ns duration must be suppressed, or when low-power consumption is critical.

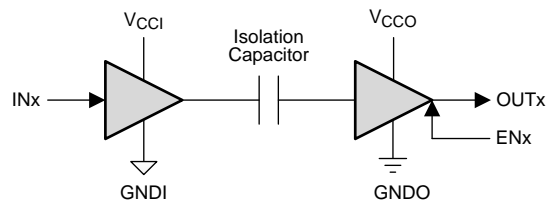
Each isolation channel has a logic input and output buffer separated by a silicon dioxide (SiO_2) insulation barrier. Used in conjunction with isolated power supplies, these devices prevent noise currents on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry. The devices have TTL input thresholds and can operate from 2.7-V (M-Grade), 3.3-V and 5-V supplies. All inputs are 5-V tolerant when supplied from 3.3-V or 2.7-V supplies.

Device Information⁽¹⁾

| PART NUMBER | PACKAGE | BODY SIZE (NOM) |
|-------------|-----------|--------------------|
| ISO7631FM | SOIC (16) | 10.30 mm x 7.50 mm |
| ISO7631FC | | |
| ISO7641FC | | |

(1) For all available packages, see the orderable addendum at the end of the datasheet.

Simplified Schematic



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- (1) V_{CCI} and $GNDI$ are supply and ground connections respectively for the input channels.
- (2) V_{CCO} and $GNDO$ are supply and ground connections respectively for the output channels.



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| 2 Applications | 1 | 7.18 Switching Characteristics: V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10% | 12 |
| 3 Description | 1 | 7.19 Switching Characteristics: V_{CC1} and V_{CC2} at 3.3 V \pm 10% | 12 |
| 4 Revision History | 2 | 7.20 Switching Characteristics: V_{CC1} and V_{CC2} at 2.7 V | 13 |
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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision E (August 2015) to Revision F Page

- Changed the ISO7631 pin image in the *Pin Configuration and Functions* section 4

Changes from Revision D (September 2013) to Revision E Page

- Added *Pin Configuration and Functions* section, *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section. 1
- Added 2.7-V (M-Grade), 3.3-V and 5-V Level Translation to *Features* section 1
- Deleted *marked as* column from *Available Options* table..... 4
- Added Footnote 3 to *Absolute Maximum Ratings* table..... 5
- Changed thermal metric values in the *Thermal Information* table. 6
- Changed V_{CCX} to V_{CC0} in *Electrical Characteristics: V_{CC1} and V_{CC2} at 5 V \pm 10%* table. 6
- Added cross-reference to $V_I = V_{CC1}$ in the *Electrical Characteristics: V_{CC1} and V_{CC2} at 5 V \pm 10%* table. 6
- Changed Footnote 1 of the *Electrical Characteristics: V_{CC1} and V_{CC2} at 5 V \pm 10%* table for clarification. 6

| | |
|--|----|
| • Added cross-reference to $V_I = V_{CCI}$ in the <i>Electrical Characteristics: VCC1 at 5 V ± 10% and VCC2 at 3.3 V ± 10%</i> table. | 6 |
| • Added footnote to the <i>Electrical Characteristics: VCC1 at 3.3 V ± 10% and VCC2 at 5 V ± 10%</i> table. | 7 |
| • Changed V_{CCX} to V_{CCO} in the <i>Electrical Characteristics: VCC1 and VCC2 at 3.3 V ± 10%</i> table. | 7 |
| • Changed footnote 1 in the <i>Electrical Characteristics: VCC1 and VCC2 at 3.3 V ± 10%</i> table for clarification. | 7 |
| • Changed V_{CCX} to V_{CCO} in the <i>Electrical Characteristics: VCC1 and VCC2 at 2.7 V</i> table. | 7 |
| • Deleted <i>IEC and for DW-16 Package</i> from <i>IEC Package Insulation and Safety-Related Specifications for DW-16 Package</i> section. | 20 |
| • Changed L(IO1) MIN from 8.3 mm to 8 mm, L(IO2) MIN from 8.1 mm to 8 mm, and DIN IEC 60112 / VDE 0303 Part 1 to DIN EN 60112 (VDE 0303-11); IEC 60112 in the <i>Package Insulation and Safety-Related Specifications</i> table. | 20 |
| • Deleted footnote 2 from <i>Package Insulation and Safety-Related Specifications IEC and for DW-16 Package</i> from <i>IEC Package Insulation and Safety-Related Specifications for DW-16 Package</i> section. | 20 |
| • Changed VDE Standard to DIN V VDE V 0884-10 (VDE V 0084-10): 2006-12. | 21 |
| • Changed the value for θ_{JA} from 72 °C/W to 77.5 °C/W for the Test Conditions and the values for Safety input, output, or supply current max from 316, 482, and 643 to 293, 448 and 597 in the <i>Safety Limiting Values</i> table. | 22 |
| • Changed <i>safety temperature</i> to <i>case temperature</i> in <i>Safety Limiting Values</i> | 22 |
| • Changed name of <i>DW-16 θ_{JC} Thermal Derating Curve per IEC 64747-5-2</i> to <i>Thermal Derating Curve for Safety Limiting Current per VDE</i> | 22 |
| • Changed Figure 22 in the <i>Safety Limiting Values</i> section. | 22 |
| • Changed I/O schematics figure in <i>Feature Description</i> section. | 23 |

Changes from Revision C (August 2013) to Revision D**Page**

| | |
|---|----|
| • Deleted 2500 V_{RMS} from Rated Isolation Data | 4 |
| • Changed the Table 3 , TUV column From: Certificate Number: U8V 13 07 77311 009 To: Certificate Number: U8V 13 09 77311 010..... | 21 |

Changes from Revision B (April 2013) to Revision C**Page**

| | |
|---|----|
| • Changed the Description | 1 |
| • Deleted ISO7640FC from the Available Options table..... | 4 |
| • Changed The ISO7631FC Rated Isolation values in the Available Options table | 4 |
| • Deleted Graph ISO7640FC Supply Current Per Channel vs Data Rate | 14 |
| • Deleted Graph ISO7640FC Supply Current For All Channels vs Data Rate | 14 |
| • Added the TUV column to Table 3 | 21 |
| • Deleted ISO7640FC from the TYPICAL SUPPLY CURRENT EQUATIONS section | 25 |
| • Deleted the ISO7640 circuit from the APPLICATION INFORMATION section..... | 27 |

Changes from Revision A (September 2012) to Revision B**Page**

| | |
|---|----|
| • Changed the V_{IOTM} SPECIFICATION From: 4000 V_{PEAK} to 4242 V_{PEAK} | 21 |
| • Changed Table 3 : 4242 V_{PK} To: 4000 V_{PK} | 21 |

Changes from Original (September 2012) to Revision A**Page**

| | |
|--|----|
| • Changed Description text From: "applications where input noise pulses of less than 10 ns duration..." To:"applications where input noise pulses of less than 6 ns duration..." | 1 |
| • Added note <i>Product Preview</i> to ISO7640FC in the Available Options table..... | 4 |
| • Changed Input PU in the Function table From: Z To: 'Undetermined' | 23 |

ISO7631FM, ISO7631FC, ISO7641FC

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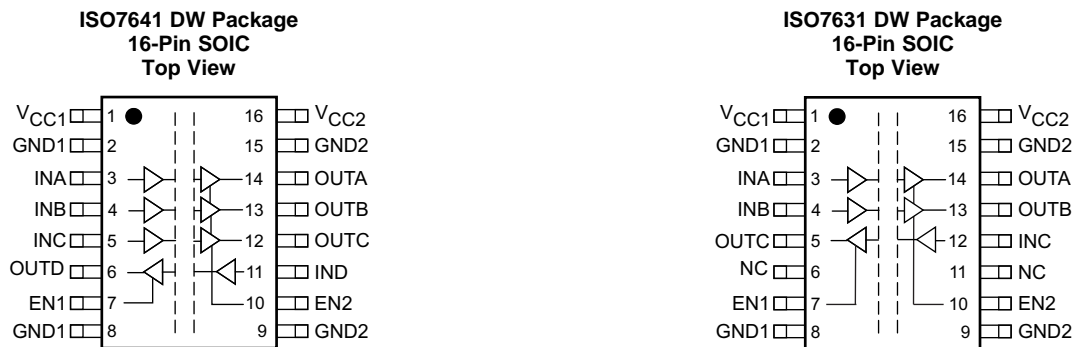
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5 Available Options

| PRODUCT | RATED ISOLATION ⁽¹⁾ | PACKAGE | INPUT THRESHOLD | DATA RATE | INTEGRATED NOISE FILTER | CHANNEL DIRECTION |
|-----------|--------------------------------|---------|-----------------|-----------|-------------------------|-------------------------|
| ISO631FM | 4242 V _{PK} | DW-16 | ~1.5 V TTL | 150 Mbps | No | 2 Forward, 1 Reverse |
| ISO7631FC | 4242 V _{PK} | DW-16 | ~1.5 V TTL | 25 Mbps | Yes | 2 Forward, 1 Reverse |
| ISO7641FC | 4242 V _{PK} | DW-16 | ~1.5 V TTL | 25 Mbps | Yes | 3 Forward, 1 Reverse |

(1) See the [Table 3](#) table for detailed isolation ratings.

6 Pin Configuration and Functions



Pin Functions

| NAME | PIN | | I/O | DESCRIPTION |
|------------------|---------|---------|-----|---|
| | ISO7641 | ISO7631 | | |
| EN1 | 7 | 7 | I | Enables (when input is High or Open) or Disables (when input is Low) OUTD of ISO7641 and OUTC of ISO7631 |
| EN2 | 10 | 10 | I | Enables (when input is High or Open) or Disables (when input is Low) OUTA, OUTB, and OUTC of ISO7641 Enables (when input is High or Open) or Disables (when input is Low) OUTA and OUTB of ISO7631 |
| GND1 | 2, 8 | 2, 8 | – | Ground connection for V _{CC1} |
| GND2 | 9, 15 | 9, 15 | – | Ground connection for V _{CC2} |
| INA | 3 | 3 | I | Input, channel A |
| INB | 4 | 4 | I | Input, channel B |
| INC | 5 | 12 | I | Input, channel C |
| IND | 11 | – | I | Input, channel D |
| NC | – | 6, 11 | – | No Connect pins are floating with no internal connection |
| OUTA | 14 | 14 | O | Output, channel A |
| OUTB | 13 | 13 | O | Output, channel B |
| OUTC | 12 | 5 | O | Output, channel C |
| OUTD | 6 | – | O | Output, channel D |
| V _{CC1} | 1 | 1 | – | Power supply, V _{CC1} |
| V _{CC2} | 16 | 16 | – | Power supply, V _{CC2} |

7 Specifications

7.1 Absolute Maximum Ratings

See ⁽¹⁾

| | | MIN | MAX | UNIT |
|---------------------------------------|------------------------------|----------------|------------------|------|
| V_{CC1} V_{CC2} ⁽²⁾ | Supply voltage | -0.5 | 6 | V |
| | Voltage | INx, OUTx, ENx | 6 ⁽³⁾ | V |
| I_O | Output current | | ±15 | mA |
| T_J | Maximum junction temperature | | 150 | °C |
| T_{STG} | Storage temperature | -65 | 150 | °C |

- (1) 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 under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values except differential I/O bus voltages are with respect to the local ground terminal (GND1 or GND2) and are peak voltage values.
- (3) Maximum voltage must not exceed 6 V.

7.2 ESD Ratings

| | | VALUE | UNIT |
|-------------|-------------------------|--|-------|
| $V_{(ESD)}$ | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±4000 |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | ±1500 |
| | | Machine model (MM), JEDEC JESD22-A115-A | ±200 |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

| | | MIN | NOM | MAX | UNIT |
|--------------------|---------------------------|-------------------------|------|-----|------|
| V_{CC1}, V_{CC2} | Supply voltage | M-Grade | 2.7 | 5.5 | V |
| | | C-Grade | 3 | 5.5 | |
| I_{OH} | High-level output current | -4 | | | mA |
| I_{OL} | Low-level output current | | | 4 | mA |
| V_{IH} | High-level input voltage | 2 | | 5.5 | V |
| V_{IL} | Low-level input voltage | 0 | | 0.8 | V |
| t_{ui} | Input pulse duration | M-Grade: ≥3-V Operation | 6.67 | | ns |
| | | M-Grade: <3-V Operation | 10 | | |
| | | C-Grade: ≥3-V Operation | 40 | | |
| $1 / t_{ui}$ | Signaling rate | M-Grade: ≥3-V Operation | 0 | 150 | Mbps |
| | | M-Grade: <3-V Operation | 0 | 100 | |
| | | C-Grade: ≥3-V Operation | 0 | 25 | |
| T_J | Junction temperature | -40 | | 136 | °C |
| T_A | Ambient temperature | -40 | 25 | 125 | °C |

ISO7631FM, ISO7631FC, ISO7641FC

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7.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | | ISO76x1Fx | UNIT |
|-------------------------------|--|-----------|------|
| | | DW (SOIC) | |
| | | 16 PINS | |
| R _{θJA} | Junction-to-ambient thermal resistance | 77.5 | °C/W |
| R _{θJC(top)} | Junction-to-case (top) thermal resistance | 40.4 | °C/W |
| R _{θJB} | Junction-to-board thermal resistance | 42.2 | °C/W |
| ψ _{JT} | Junction-to-top characterization parameter | 15 | °C/W |
| ψ _{JB} | Junction-to-board characterization parameter | 41.6 | °C/W |

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report, [SPRA953](#).

7.5 Electrical Characteristics: V_{CC1} and V_{CC2} at 5 V ± 10%V_{CC1} and V_{CC2} at 5 V ± 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|---------------------|--|---------------------------------------|-----|-----|------------------------|-----|-----|-------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V _{OH} | High-level output voltage I _{OH} = -4 mA; see Figure 16 I _{OH} = -20 μA; see Figure 16 | V _{CCO} ⁽¹⁾ - 0.8 | 4.8 | | V _{CCO} - 0.8 | 4.7 | | V |
| | | V _{CCO} - 0.1 | 5 | | V _{CCO} - 0.1 | 5 | | |
| V _{OL} | Low-level output voltage I _{OL} = 4 mA; see Figure 16 I _{OL} = 20 μA; see Figure 16 | | 0.2 | 0.4 | | 0.3 | 0.5 | V |
| | | | 0 | 0.1 | | 0 | 0.1 | |
| V _{I(HYS)} | Input threshold voltage hysteresis | | 450 | | | 450 | | mV |
| I _{IH} | High-level input current V _{IH} = V _{CC} at INx or ENx | | | 10 | | 10 | | μA |
| I _{IL} | Low-level input current V _{IL} = 0 V at INx or ENx | | -10 | | | -10 | | μA |
| CMTI | Common-mode transient immunity V _I = V _{CC1} ⁽¹⁾ or 0 V; see Figure 19 | | 25 | 75 | | 25 | 75 | kV/μs |

(1) V_{CC1} = Input-side supply voltage; V_{CCO} = Output-side supply voltage

7.6 Electrical Characteristics: V_{CC1} at 5 V ± 10% and V_{CC2} at 3.3 V ± 10%V_{CC1} at 5 V ± 10% and V_{CC2} at 3.3 V ± 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | M-Grade | | | C-Grade | | | UNIT |
|---------------------|--|---------------------------------------|------------------------|-----|-----|------------------------|-----|-----|-------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V _{OH} | High-level output voltage I _{OH} = -4 mA; see Figure 16 I _{OH} = -20 μA; see Figure 16 | OUTx on V _{CC1} (5 V) side | V _{CC1} - 0.8 | 4.8 | | V _{CC1} - 0.8 | 4.7 | | V |
| | | OUTx on V _{CC2} (3.3 V) side | V _{CC2} - 0.4 | 3 | | V _{CC2} - 0.6 | 2.9 | | |
| | | OUTx on V _{CC1} (5 V) side | V _{CC1} - 0.1 | 5 | | V _{CC1} - 0.1 | 5 | | |
| | | OUTx on V _{CC2} (3.3 V) side | V _{CC2} - 0.1 | 3.3 | | V _{CC2} - 0.1 | 3.3 | | |
| V _{OL} | Low-level output voltage I _{OL} = 4 mA; see Figure 16 I _{OL} = 20 μA; see Figure 16 | | | 0.2 | 0.4 | | 0.3 | 0.5 | V |
| | | | | 0 | 0.1 | | 0 | 0.1 | |
| V _{I(HYS)} | Input threshold voltage hysteresis | | | 430 | | | 430 | | mV |
| I _{IH} | High-level input current V _{IH} = V _{CC} at INx or ENx | | | | | | | 10 | μA |
| I _{IL} | Low-level input current V _{IL} = 0 V at INx or ENx | | -10 | | | -10 | | | μA |
| CMTI | Common-mode transient immunity V _I = V _{CC1} ⁽¹⁾ or 0 V; see Figure 19 | | 25 | 50 | | 25 | 50 | | kV/μs |

(1) V_{CC1} = Input-side supply voltage

7.7 Electrical Characteristics: V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10%

V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|---|---|--------------------------------|---------------|-----|---------|---------------|-----|-------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_{OH} High-level output voltage | $I_{OH} = -4$ mA; see Figure 16 | OUTx on V_{CC1} (3.3 V) side | $V_{CC1}-0.4$ | 3 | | $V_{CC1}-0.6$ | 2.9 | V |
| | | OUTx on V_{CC2} (5 V) side | $V_{CC2}-0.8$ | 4.8 | | $V_{CC2}-0.8$ | 4.7 | |
| | $I_{OH} = -20$ μ A; see Figure 16 | OUTx on V_{CC1} (3.3 V) side | $V_{CC1}-0.1$ | 3.3 | | $V_{CC1}-0.1$ | 3.3 | |
| | | OUTx on V_{CC2} (5 V) side | $V_{CC2}-0.1$ | 5 | | $V_{CC2}-0.1$ | 5 | |
| V_{OL} Low-level output voltage | $I_{OL} = 4$ mA; see Figure 16 | | 0.2 | 0.4 | | 0.3 | 0.5 | V |
| | $I_{OL} = 20$ μ A; see Figure 16 | | 0 | 0.1 | | 0 | 0.1 | |
| $V_{I(HYS)}$ Input threshold voltage hysteresis | | | 430 | | | 430 | | mV |
| I_{IH} High-level input current | $V_{IH} = V_{CC}$ at INx or ENx | | | 10 | | | 10 | μ A |
| I_{IL} Low-level input current | $V_{IL} = 0$ V at INx or ENx | | -10 | | | -10 | | μ A |
| CMTI Common-mode transient immunity | $V_I = V_{CCI}^{(1)}$ or 0 V; see Figure 19 | | 25 | 50 | | 25 | 50 | kV/ μ s |

(1) V_{CCI} = Input-side supply voltage

7.8 Electrical Characteristics: V_{CC1} and V_{CC2} at 3.3 V \pm 10%

V_{CC1} and V_{CC2} at 3.3 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|---|---|-----------------------|-----|-----|-----------------|-----|-----|-------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_{OH} High-level output voltage | $I_{OH} = -4$ mA; see Figure 16 | $V_{CCO}^{(1)} - 0.4$ | 3 | | $V_{CCO} - 0.6$ | 2.9 | | V |
| | $I_{OH} = -20$ μ A; see Figure 16 | $V_{CCO} - 0.1$ | 3.3 | | $V_{CCO} - 0.1$ | 3.3 | | |
| V_{OL} Low-level output voltage | $I_{OL} = 4$ mA; see Figure 16 | | 0.2 | 0.4 | | 0.3 | 0.5 | V |
| | $I_{OL} = 20$ μ A; see Figure 16 | | 0 | 0.1 | | 0 | 0.1 | |
| $V_{I(HYS)}$ Input threshold voltage hysteresis | | | 425 | | | 425 | | mV |
| I_{IH} High-level input current | $V_{IH} = V_{CC}$ at INx or ENx | | | 10 | | | 10 | μ A |
| I_{IL} Low-level input current | $V_{IL} = 0$ V at INx or ENx | | -10 | | | -10 | | μ A |
| CMTI Common-mode transient immunity | $V_I = V_{CCI}^{(1)}$ or 0 V; see Figure 19 | | 25 | 50 | | 25 | 50 | kV/ μ s |

(1) V_{CCI} = Input-side supply voltage; V_{CCO} = Output-side supply voltage

7.9 Electrical Characteristics: V_{CC1} and V_{CC2} at 2.7 V (ISO7631FM Only)

V_{CC1} and V_{CC2} at 2.7 V⁽¹⁾ (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|-----------------------|-----|-----|-------------|
| V_{OH} High-level output voltage | $I_{OH} = -4$ mA; see Figure 16 | $V_{CCO}^{(2)} - 0.5$ | 2.4 | | V |
| | $I_{OH} = -20$ μ A; see Figure 16 | $V_{CCO} - 0.1$ | 2.7 | | |
| V_{OL} Low-level output voltage | $I_{OL} = 4$ mA; see Figure 16 | | 0.2 | 0.4 | V |
| | $I_{OL} = 20$ μ A; see Figure 16 | | 0 | 0.1 | |
| $V_{I(HYS)}$ Input threshold voltage hysteresis | | | 350 | | mV |
| I_{IH} High-level input current | $V_{IH} = V_{CC}$ at INx or ENx | | | 10 | μ A |
| I_{IL} Low-level input current | $V_{IL} = 0$ V at INx or ENx | | -10 | | μ A |
| CMTI Common-mode transient immunity | $V_I = V_{CCI}^{(2)}$ or 0 V; see Figure 19 | | 25 | 50 | kV/ μ s |

(1) Only M-Grade devices are recommended for operation down to 2.7 V supplies. For 2.7 V-operation, max data rate is 100 Mbps.

(2) V_{CCI} = Input-side supply voltage; V_{CCO} = Output-side supply voltage

7.10 Power Dissipation Characteristics

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|---|-----|-----|-----|------|
| P_D Maximum Device Power Dissipation | $V_{CC1} = V_{CC2} = 5.5$ V, $T_J = 150^\circ\text{C}$, CL = 15 pF Input a 75 MHz 50% duty cycle square wave | | | 399 | mW |

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7.11 Supply Current Characteristics: V_{CC1} and V_{CC2} at $5\text{ V} \pm 10\%$ V_{CC1} and V_{CC2} at $5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|-----------------|-----------------|---|-----|------|----------------|-----|-----|------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| ISO7631F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | 2.5 | 4 | 1.1 | 1.9 | mA | |
| I_{CC2} | | | 3.7 | 5.4 | 1.5 | 2.6 | mA | |
| I_{CC1} | DC to 1 Mbps | | 2.6 | 4.1 | 1.8 | 2.7 | mA | |
| I_{CC2} | | | 3.8 | 5.5 | 2.6 | 3.9 | mA | |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15\text{ pF}$ | 3.3 | 4.5 | 2.7 | 3.7 | mA | |
| I_{CC2} | | | 4.9 | 6.6 | 3.9 | 5.3 | mA | |
| I_{CC1} | 25 Mbps | | 4.5 | 6 | 4.1 | 5.4 | mA | |
| I_{CC2} | | | 6.8 | 9 | 5.9 | 7.8 | mA | |
| I_{CC1} | 150 Mbps | | 15 | 19.5 | Not Applicable | | mA | |
| I_{CC2} | | | 22 | 30 | Not Applicable | | mA | |
| ISO7641F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | | | 1.2 | 2.1 | mA | |
| I_{CC2} | | | | | 1.6 | 2.6 | mA | |
| I_{CC1} | DC to 1 Mbps | | | | 1.8 | 2.8 | mA | |
| I_{CC2} | | | | | 3.1 | 4.2 | mA | |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V, AC Signal: All channels switching with square wave clock input; $C_L = 15\text{ pF}$ | | | 3 | 4 | mA | |
| I_{CC2} | | | | | 4.9 | 6.1 | mA | |
| I_{CC1} | 25 Mbps | | | | 4.8 | 6 | mA | |
| I_{CC2} | | | | | 7.7 | 9.5 | mA | |

7.12 Supply Current Characteristics: V_{CC1} at 5 V \pm 10% and V_{CC2} at 3.3 V \pm 10%
 V_{CC1} at 5 V \pm 10% and V_{CC2} at 3.3 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|-----------------|-----------------|--|------|------|---------|----------------|-----|------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| ISO7631F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | 2.5 | 4 | | 1.1 | 1.9 | mA |
| I_{CC2} | | | 2.7 | 3.7 | | 0.7 | 1.3 | mA |
| I_{CC1} | DC to 1 Mbps | | 2.6 | 4.1 | | 1.8 | 2.7 | mA |
| I_{CC2} | | | 2.8 | 3.8 | | 1.8 | 2.6 | mA |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 3.3 | 4.5 | | 2.7 | 3.7 | mA |
| I_{CC2} | | | 3.5 | 4.6 | | 2.6 | 3.5 | mA |
| I_{CC1} | 25 Mbps | | 4.5 | 6 | | 4.1 | 5.4 | mA |
| I_{CC2} | | | 4.7 | 5.9 | | 3.8 | 5 | mA |
| I_{CC1} | 150 Mbps | | 15 | 19.5 | | Not Applicable | | mA |
| I_{CC2} | | | 14.6 | 19 | | Not Applicable | | mA |
| ISO7641F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | | | | 1.2 | 2.1 | mA |
| I_{CC2} | | | | | | 0.8 | 1.3 | mA |
| I_{CC1} | DC to 1 Mbps | | | | | 1.8 | 2.8 | mA |
| I_{CC2} | | | | | | 2 | 2.9 | mA |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V, AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | | | | 3 | 4 | mA |
| I_{CC2} | | | | | | 3.2 | 4.1 | mA |
| I_{CC1} | 25 Mbps | | | | | 4.8 | 6 | mA |
| I_{CC2} | | | | | | 5.1 | 7 | mA |

7.13 Supply Current Characteristics: V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10%
 V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|-----------------|-----------------|--|-----|------|---------|----------------|-----|------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| ISO7631F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | 1.8 | 2.8 | | 0.6 | 1.1 | mA |
| I_{CC2} | | | 3.7 | 5.4 | | 1.5 | 2.6 | mA |
| I_{CC1} | DC to 1 Mbps | | 1.9 | 2.9 | | 1.2 | 1.8 | mA |
| I_{CC2} | | | 3.8 | 5.5 | | 2.6 | 3.9 | mA |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 2.4 | 3.4 | | 1.8 | 2.6 | mA |
| I_{CC2} | | | 4.9 | 6.6 | | 3.9 | 5.3 | mA |
| I_{CC1} | 25 Mbps | | 3.2 | 4.2 | | 2.7 | 3.6 | mA |
| I_{CC2} | | | 6.8 | 9 | | 5.9 | 7.8 | mA |
| I_{CC1} | 150 Mbps | | 9.3 | 12.5 | | Not Applicable | | mA |
| I_{CC2} | | | 22 | 30 | | Not Applicable | | mA |
| ISO7641F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | | | | 0.7 | 1.1 | mA |
| I_{CC2} | | | | | | 1.6 | 2.6 | mA |
| I_{CC1} | DC to 1 Mbps | | | | | 1.2 | 1.9 | mA |
| I_{CC2} | | | | | | 3.1 | 4.2 | mA |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V, AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | | | | 2 | 2.8 | mA |
| I_{CC2} | | | | | | 4.9 | 6.1 | mA |
| I_{CC1} | 25 Mbps | | | | | 3.1 | 4 | mA |
| I_{CC2} | | | | | | 7.7 | 9.5 | mA |

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7.14 Supply Current Characteristics: V_{CC1} and V_{CC2} at 3.3 V \pm 10% V_{CC1} and V_{CC2} at 3.3 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT |
|-----------------|-----------------|---|------|------|----------------|-----|-----|------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| ISO7631F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | 1.8 | 2.8 | 0.6 | 1.1 | mA | |
| I_{CC2} | | | 2.7 | 3.7 | 0.7 | 1.3 | mA | |
| I_{CC1} | DC to 1 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 1.9 | 2.9 | 1.2 | 1.8 | mA | |
| I_{CC2} | | | 2.8 | 3.8 | 1.8 | 2.6 | mA | |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 2.4 | 3.4 | 1.8 | 2.6 | mA | |
| I_{CC2} | | | 3.5 | 4.6 | 2.6 | 3.5 | mA | |
| I_{CC1} | 25 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 3.2 | 4.2 | 2.7 | 3.6 | mA | |
| I_{CC2} | | | 4.7 | 5.9 | 3.8 | 5 | mA | |
| I_{CC1} | 150 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 9.3 | 12.5 | Not Applicable | | mA | |
| I_{CC2} | | | 14.6 | 19 | Not Applicable | | mA | |
| ISO7641F | | | | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | | | 0.7 | 1.1 | mA | |
| I_{CC2} | | | | | 0.8 | 1.3 | mA | |
| I_{CC1} | DC to 1 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | | | 1.2 | 1.9 | mA | |
| I_{CC2} | | | | | 2 | 2.9 | mA | |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | | | 2 | 2.8 | mA | |
| I_{CC2} | | | | | 3.2 | 4.1 | mA | |
| I_{CC1} | 25 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | | | 3.1 | 4 | mA | |
| I_{CC2} | | | | | 5.1 | 7 | mA | |

7.15 Supply Current Characteristics: V_{CC1} and V_{CC2} at 2.7 V (ISO7631FM Only) ⁽¹⁾ V_{CC1} and V_{CC2} at 2.7 V (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | UNIT |
|-----------------|-----------------|---|-----|-----|------|
| | | MIN | TYP | MAX | |
| ISO7631F | | | | | |
| I_{CC1} | Disable | EN1 = EN2 = 0 V | 1.5 | 2.4 | mA |
| I_{CC2} | | | 2.2 | 3.2 | mA |
| I_{CC1} | DC to 1 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 1.6 | 2.5 | mA |
| I_{CC2} | | | 2.3 | 3.2 | mA |
| I_{CC1} | 10 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 2 | 2.9 | mA |
| I_{CC2} | | | 3 | 3.9 | mA |
| I_{CC1} | 25 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 2.7 | 3.7 | mA |
| I_{CC2} | | | 3.9 | 4.9 | mA |
| I_{CC1} | 100 Mbps | DC Signal: $V_I = V_{CC}$ or 0 V AC Signal: All channels switching with square wave clock input; $C_L = 15$ pF | 5.7 | 6.8 | mA |
| I_{CC2} | | | 8.6 | 12 | mA |

(1) Only M-Grade devices are recommended for operation down to 2.7 V supplies. For 2.7 V-operation, max data rate is 100 Mbps.

7.16 Switching Characteristics: V_{CC1} and V_{CC2} at $5\text{ V} \pm 10\%$

V_{CC1} and V_{CC2} at $5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT | | | |
|-----------------------------|---|-----------------------------|-----|-----|---------|-----|------|-------|----------------------|----|---------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | | | | |
| ISO7631F, ISO7641F | | | | | | | | | | | |
| t_{PLH} , t_{PHL} | Propagation delay time | See Figure 16 | | | 3.5 | 7 | 10.5 | 11 | 17 | 28 | ns |
| PWD ⁽¹⁾ | Pulse width distortion $ t_{PHL} - t_{PLH} $ | See Figure 16 | | | 2 | | | 3 | | | ns |
| $t_{sk(o)}$ ⁽²⁾ | Channel-to-channel output skew time | Same-direction Channels | | | 2 | | | 3 | | | ns |
| | | Opposite-direction Channels | | | 3 | | | 4 | | | |
| $t_{sk(pp)}$ ⁽³⁾ | Part-to-part skew time | | | | 4.5 | | | 13 | | | ns |
| t_r | Output signal rise time | See Figure 16 | | | 1.6 | | | 2.8 | | | ns |
| t_f | Output signal fall time | See Figure 16 | | | 1 | | | 2.9 | | | ns |
| t_{PHZ} | Disable Propagation Delay, high-to-high impedance output | See Figure 17 | | | 5 | 16 | | 8 | 20 | | ns |
| t_{PLZ} | Disable Propagation Delay, low-to-high impedance output | See Figure 17 | | | 5 | 16 | | 7 | 20 | | ns |
| t_{PZH} | Enable Propagation Delay, high impedance-to-high output | See Figure 17 | | | 4 | 16 | | 11000 | 22000 ⁽⁴⁾ | | ns |
| t_{PZL} | Enable Propagation Delay, high impedance-to-low output | See Figure 17 | | | 4 | 16 | | 8 | 20 | | ns |
| t_{fs} | Fail-safe output delay time from input data or power loss | See Figure 18 | | | 9.5 | | | 9 | | | μs |

- (1) Also known as Pulse Skew.
- (2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
- (3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.
- (4) The enable signal rate for C-grade devices should be $\leq 45\text{ Kbps}$.

7.17 Switching Characteristics: V_{CC1} at $5\text{ V} \pm 10\%$ and V_{CC2} at $3.3\text{ V} \pm 10\%$

V_{CC1} at $5\text{ V} \pm 10\%$ and V_{CC2} at $3.3\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT | | | |
|-----------------------------|---|-----------------------------|-----|-----|---------|-----|-----|-------|----------------------|----|---------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | | | | |
| ISO7631F, ISO7641F | | | | | | | | | | | |
| t_{PLH} , t_{PHL} | Propagation delay time | See Figure 16 | | | 4 | 8 | 13 | 11 | 18 | 32 | ns |
| PWD ⁽¹⁾ | Pulse width distortion $ t_{PHL} - t_{PLH} $ | See Figure 16 | | | 2 | | | 3.5 | | | ns |
| $t_{sk(o)}$ ⁽²⁾ | Channel-to-channel output skew time | Same-direction Channels | | | 2.5 | | | 4.5 | | | ns |
| | | Opposite-direction Channels | | | 3.5 | | | 5.5 | | | |
| $t_{sk(pp)}$ ⁽³⁾ | Part-to-part skew time | | | | 6 | | | 15 | | | ns |
| t_r | Output signal rise time | See Figure 16 | | | 2 | | | 3.6 | | | ns |
| t_f | Output signal fall time | See Figure 16 | | | 1.2 | | | 3.3 | | | ns |
| t_{PHZ} | Disable Propagation Delay, high-to-high impedance output | See Figure 17 | | | 6.5 | 17 | | 9 | 20 | | ns |
| t_{PLZ} | Disable Propagation Delay, low-to-high impedance output | See Figure 17 | | | 6.5 | 17 | | 8 | 20 | | ns |
| t_{PZH} | Enable Propagation Delay, high impedance-to-high output | See Figure 17 | | | 5.5 | 17 | | 11000 | 22000 ⁽⁴⁾ | | ns |
| t_{PZL} | Enable Propagation Delay, high impedance-to-low output | See Figure 17 | | | 5.5 | 17 | | 10 | 30 | | ns |
| t_{fs} | Fail-safe output delay time from input data or power loss | See Figure 18 | | | 9.5 | | | 8.5 | | | μs |

- (1) Also known as Pulse Skew.
- (2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
- (3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.
- (4) The enable signal rate for C-grade devices should be $\leq 45\text{ Kbps}$.

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7.18 Switching Characteristics: V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10% V_{CC1} at 3.3 V \pm 10% and V_{CC2} at 5 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT | | | |
|-----------------------------|---|-----------------------------|-----|-----|---------|-----|------|-------|----------------------|----|---------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | | | | |
| ISO7631F, ISO7641F | | | | | | | | | | | |
| t_{PLH} , t_{PHL} | Propagation delay time | See Figure 16 | | | 4 | 7.5 | 12.5 | 11 | 18.5 | 32 | ns |
| PWD ⁽¹⁾ | Pulse width distortion $ t_{PHL} - t_{PLH} $ | See Figure 16 | | | 2 | | | 2.5 | | | ns |
| $t_{sk(o)}$ ⁽²⁾ | Channel-to-channel output skew time | Same-direction Channels | | | 2.5 | | | 4.5 | | | ns |
| | | Opposite-direction Channels | | | 3.5 | | | 5.5 | | | |
| $t_{sk(pp)}$ ⁽³⁾ | Part-to-part skew time | | | | 6 | | | 15 | | | ns |
| t_r | Output signal rise time | See Figure 16 | | | 1.7 | | | 2.9 | | | ns |
| t_f | Output signal fall time | See Figure 16 | | | 1.1 | | | 2.9 | | | ns |
| t_{PHZ} | Disable Propagation Delay, high-to-high impedance output | See Figure 17 | | | 5.5 | 17 | | 8 | 20 | | ns |
| t_{PLZ} | Disable Propagation Delay, low-to-high impedance output | See Figure 17 | | | 5.5 | 17 | | 7 | 20 | | ns |
| t_{PZH} | Enable Propagation Delay, high impedance-to-high output | See Figure 17 | | | 4.5 | 17 | | 11000 | 22000 ⁽⁴⁾ | | ns |
| t_{PZL} | Enable Propagation Delay, high impedance-to-low output | See Figure 17 | | | 4.5 | 17 | | 8 | 30 | | ns |
| t_{fs} | Fail-safe output delay time from input data or power loss | See Figure 18 | | | 9.5 | | | 7.5 | | | μ s |

(1) Also known as Pulse Skew.

(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.(4) The enable signal rate for C-grade devices should be \leq 45 Kbps.**7.19 Switching Characteristics: V_{CC1} and V_{CC2} at 3.3 V \pm 10%** V_{CC1} and V_{CC2} at 3.3 V \pm 10% (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | C-Grade | | | UNIT | | |
|-----------------------------|---|-----------------------------|-----|-----|---------|-----|-----|-------|----------------------|----|
| | | MIN | TYP | MAX | MIN | TYP | MAX | | | |
| ISO7631F, ISO7641F | | | | | | | | | | |
| t_{PLH} , t_{PHL} | Propagation delay time | 4 | 8.5 | 14 | 12 | 23 | 35 | ns | | |
| PWD ⁽¹⁾ | Pulse width distortion $ t_{PHL} - t_{PLH} $ | See Figure 16 | | | 2 | | | 3 | ns | |
| $t_{sk(o)}$ ⁽²⁾ | Channel-to-channel output skew time | Same-direction Channels | | | 3 | | | 5 | ns | |
| | | Opposite-direction Channels | | | 4 | | | 6 | | |
| $t_{sk(pp)}$ ⁽³⁾ | Part-to-part skew time | | | | 6.5 | | | 16 | ns | |
| t_r | Output signal rise time | See Figure 16 | | | 2 | | | 3.7 | ns | |
| t_f | Output signal fall time | See Figure 16 | | | 1.3 | | | 3.4 | ns | |
| t_{PHZ} | Disable Propagation Delay, high-to-high impedance output | See Figure 17 | | | 6.5 | 17 | | 9 | 20 | ns |
| t_{PLZ} | Disable Propagation Delay, low-to-high impedance output | See Figure 17 | | | 6.5 | 17 | | 8 | 20 | ns |
| t_{PZH} | Enable Propagation Delay, high impedance-to-high output | See Figure 17 | | | 5.5 | 17 | | 11000 | 22000 ⁽⁴⁾ | ns |
| t_{PZL} | Enable Propagation Delay, high impedance-to-low output | See Figure 17 | | | 5.5 | 17 | | 10 | 30 | ns |
| t_{fs} | Fail-safe output delay time from input data or power loss | See Figure 18 | | | 9.2 | | | 7.5 | μ s | |

(1) Also known as Pulse Skew.

(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.(4) The enable signal rate for C-grade devices should be \leq 45 Kbps.

7.20 Switching Characteristics: V_{CC1} and V_{CC2} at 2.7 V ⁽¹⁾

V_{CC1} and V_{CC2} at 2.7 V (over recommended operating conditions unless otherwise noted)

| PARAMETER | TEST CONDITIONS | M-Grade | | | UNIT | |
|-----------------------------|---|-----------------------------|-----|-----|------|---------|
| | | MIN | TYP | MAX | | |
| ISO7631F, ISO7641F | | | | | | |
| t_{PLH} , t_{PHL} | Propagation delay time | See Figure 16 | 5 | 8 | 16 | ns |
| PWD ⁽²⁾ | Pulse width distortion $ t_{PHL} - t_{PLH} $ | See Figure 16 | | | 2.5 | ns |
| $t_{sk(o)}$ ⁽³⁾ | Channel-to-channel output skew time | Same-direction Channels | | | 4 | ns |
| | | Opposite-direction Channels | | | 5 | |
| $t_{sk(pp)}$ ⁽⁴⁾ | Part-to-part skew time | | | | 8 | ns |
| t_r | Output signal rise time | See Figure 16 | | 2.3 | | ns |
| t_f | Output signal fall time | See Figure 16 | | 1.8 | | ns |
| t_{PHZ} | Disable Propagation Delay, high-to-high impedance output | See Figure 17 | | 8 | 18 | ns |
| t_{PLZ} | Disable Propagation Delay, low-to-high impedance output | See Figure 17 | | 8 | 18 | ns |
| t_{PZH} | Enable Propagation Delay, high impedance-to-high output | See Figure 17 | | 7 | 18 | ns |
| t_{PZL} | Enable Propagation Delay, high impedance-to-low output | See Figure 17 | | 7 | 18 | ns |
| t_{fs} | Fail-safe output delay time from input data or power loss | See Figure 18 | | 8.5 | | μ s |

(1) Only M-Grade devices are recommended for operation down to 2.7 V supplies. For 2.7 V-operation, max data rate is 100 Mbps.

(2) Also known as Pulse Skew.

(3) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.

(4) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

ISO7631FM, ISO7631FC, ISO7641FC

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7.21 Typical Characteristics

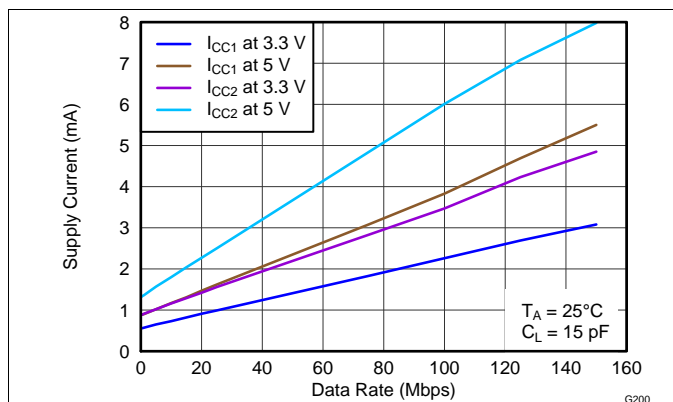


Figure 1. ISO7631FM Supply Current Per Channel vs Data Rate

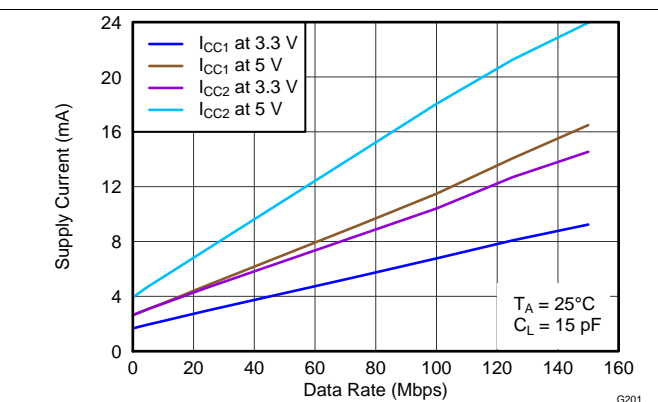


Figure 2. ISO7631FM Supply Current For All Channels vs Data Rate

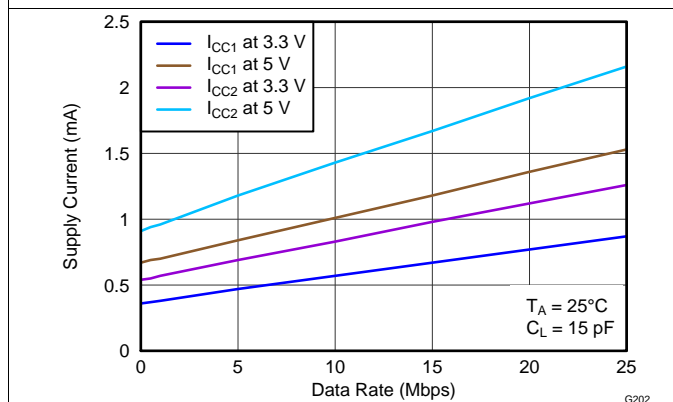


Figure 3. ISO7631FC Supply Current Per Channel vs Data Rate

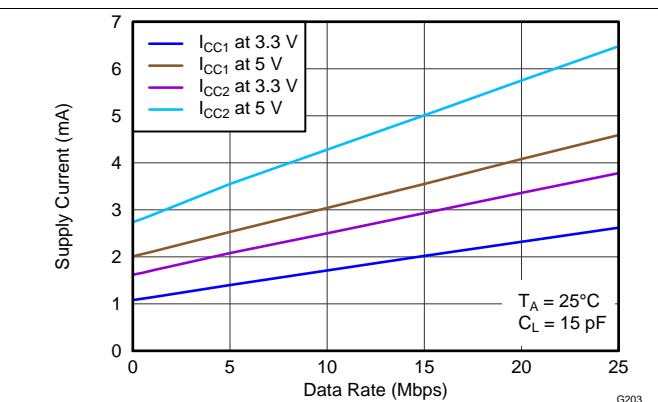


Figure 4. ISO7631FC Supply Current For All Channels vs Data Rate

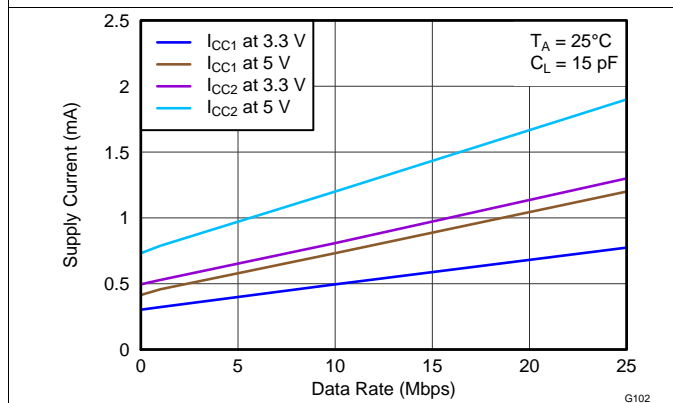


Figure 5. ISO7641FC Supply Current Per Channel vs Data Rate

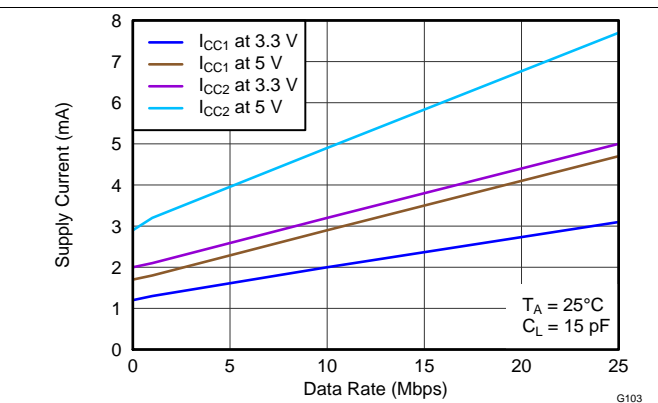


Figure 6. ISO7641FC Supply Current For All Channels vs Data Rate

Typical Characteristics (continued)

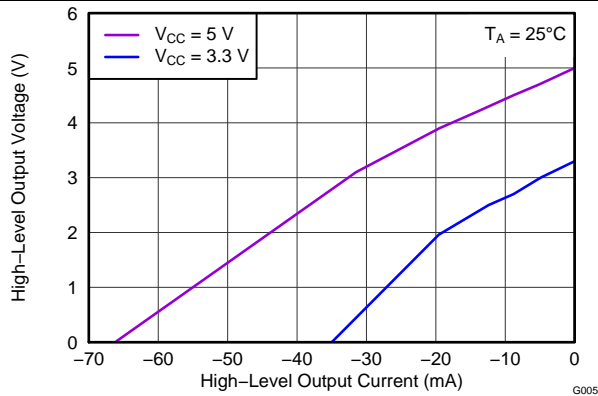


Figure 7. M-Grade High-Level Output Voltage vs High-Level Output Current

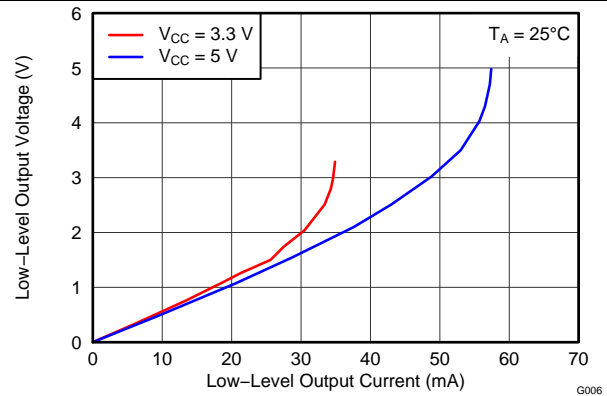


Figure 8. M-Grade Low-Level Output Voltage vs Low-Level Output Current

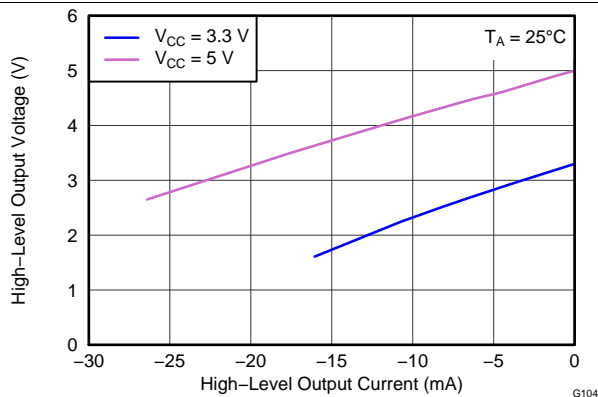


Figure 9. C-Grade High-Level Output Voltage vs High-Level Output Current

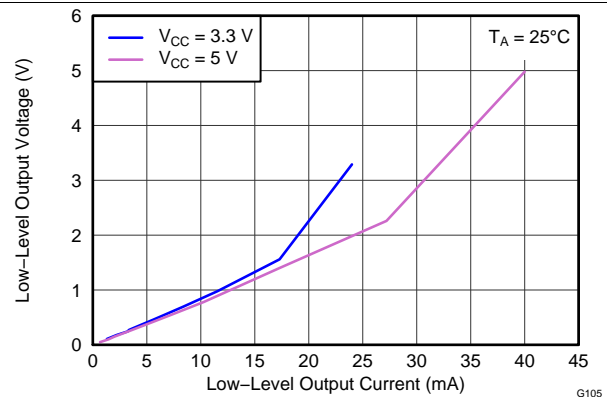


Figure 10. C-Grade Low-Level Output Voltage vs Low-Level Output Current

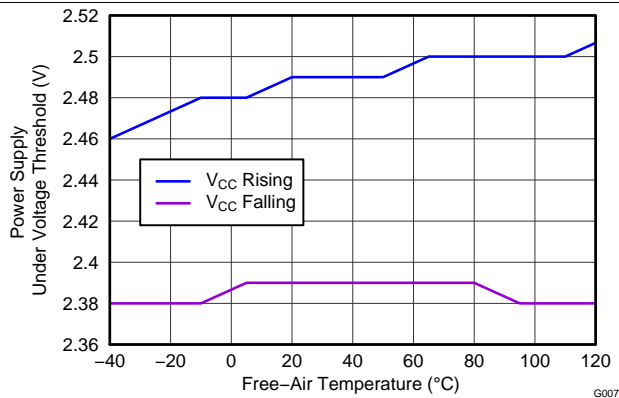


Figure 11. V_{CC} Undervoltage Threshold vs Free Air Temperature

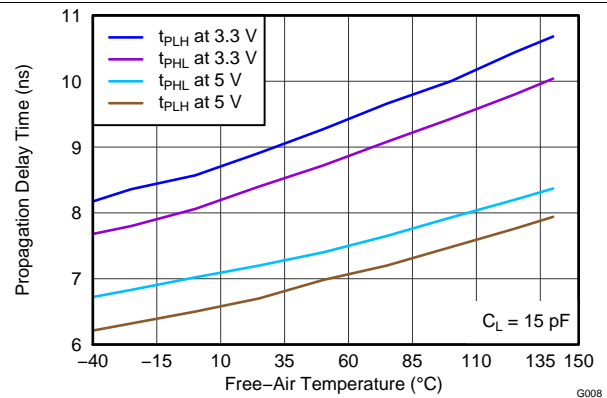


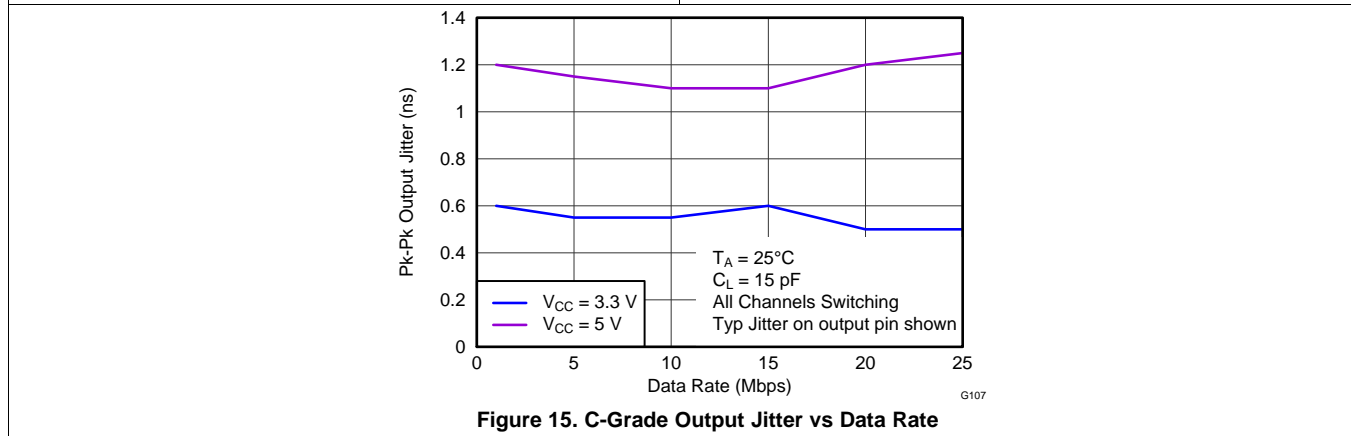
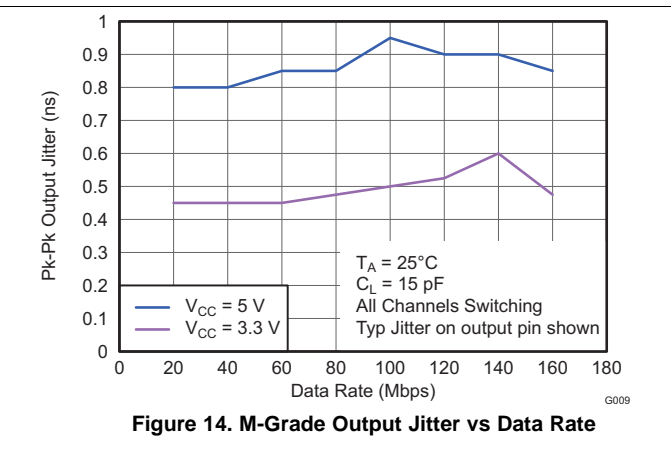
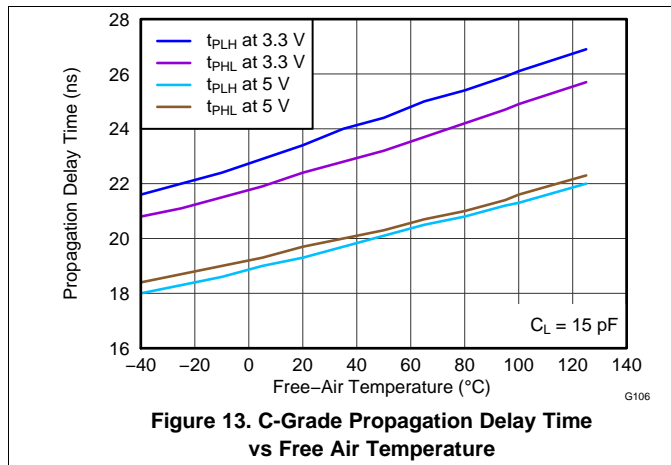
Figure 12. M-Grade Propagation Delay Time vs Free Air Temperature

ISO7631FM, ISO7631FC, ISO7641FC

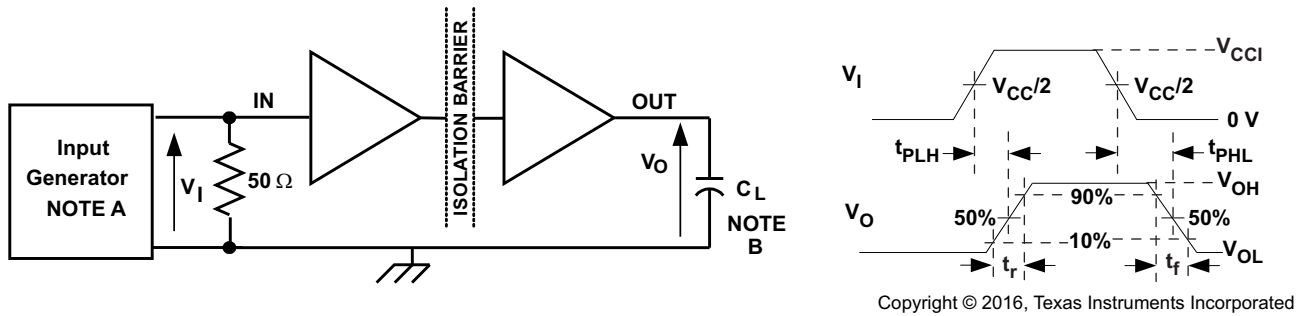
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Typical Characteristics (continued)

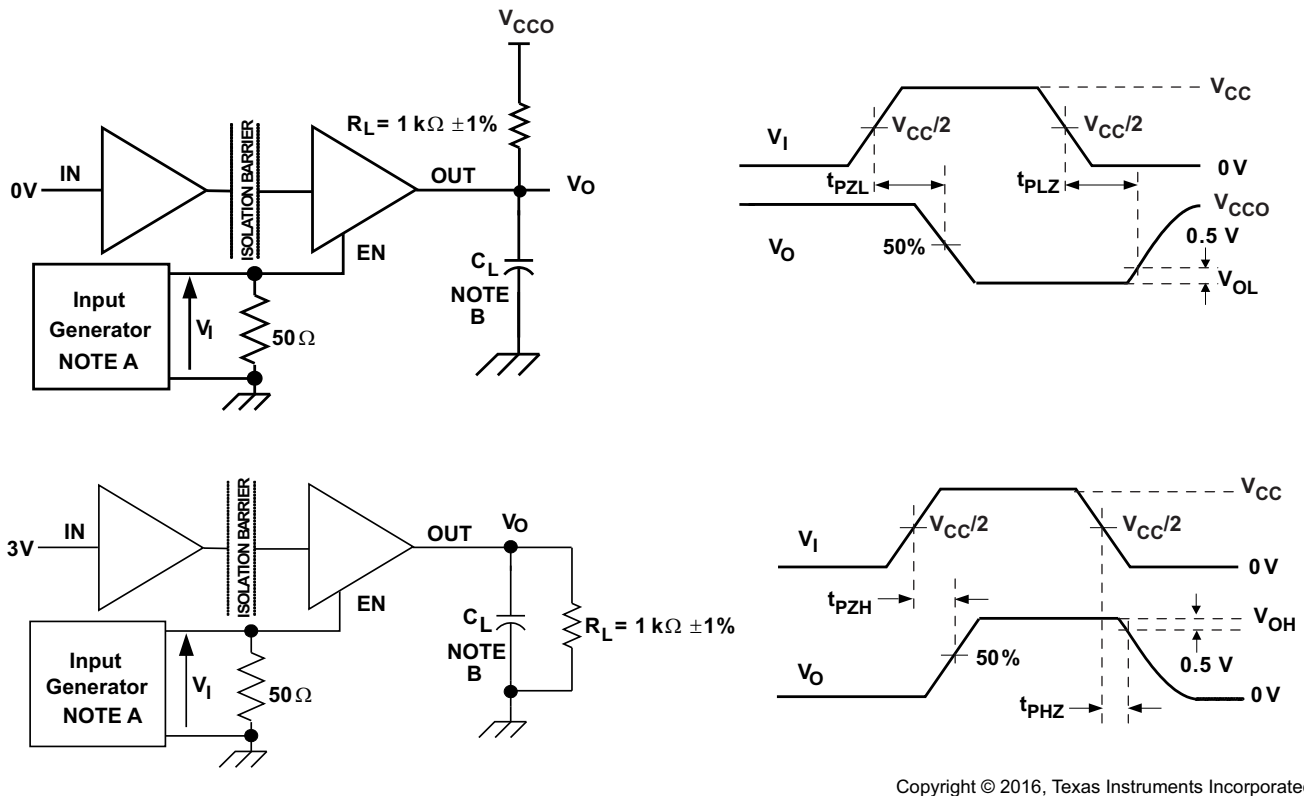


8 Parameter Measurement Information



- The input pulse is supplied by a generator having the following characteristics: PRR \leq 50 kHz, 50% duty cycle, $t_r \leq 3$ ns, $t_f \leq 3$ ns, $Z_O = 50 \Omega$. At the input, 50Ω resistor is required to terminate Input Generator signal. It is not needed in actual application.
- $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.

Figure 16. Switching Characteristics Test Circuit and Voltage Waveforms



- The input pulse is supplied by a generator having the following characteristics: PRR \leq 10 kHz, 50% duty cycle, $t_r \leq 3$ ns, $t_f \leq 3$ ns, $Z_O = 50 \Omega$.
- $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.

Figure 17. Enable/Disable Propagation Delay Time Test Circuit and Waveform

9 Detailed Description

9.1 Overview

The isolator in Figure 20 is based on a capacitive, isolation-barrier technique. The I/O channel of the device consists of two internal data channels, a high-frequency channel (HF) with a bandwidth from 100 kbps up to 150 Mbps, and a low-frequency channel (LF) covering the range from 100 kbps down to DC. In principle, a single-ended input signal entering the HF-channel is split into a differential signal via the inverter gate at the input. The following capacitor-resistor networks differentiate the signal into transients, which then are converted into differential pulses by two comparators. The comparator outputs drive a NOR-gate flip-flop whose output feeds an output multiplexer. A decision logic (DCL) at the driving output of the flip-flop measures the durations between signal transients. If the duration between two consecutive transients exceeds a certain time limit, (as in the case of a low-frequency signal), the DCL forces the output-multiplexer to switch from the high- to the low-frequency channel.

Because low-frequency input signals require the internal capacitors to assume prohibitively large values, these signals are pulse-width modulated (PWM) with the carrier frequency of an internal oscillator, thus creating a sufficiently high frequency signal, capable of passing the capacitive barrier. As the input is modulated, a low-pass filter (LPF) is needed to remove the high-frequency carrier from the actual data before passing it on to the output multiplexer.

9.2 Functional Block Diagram

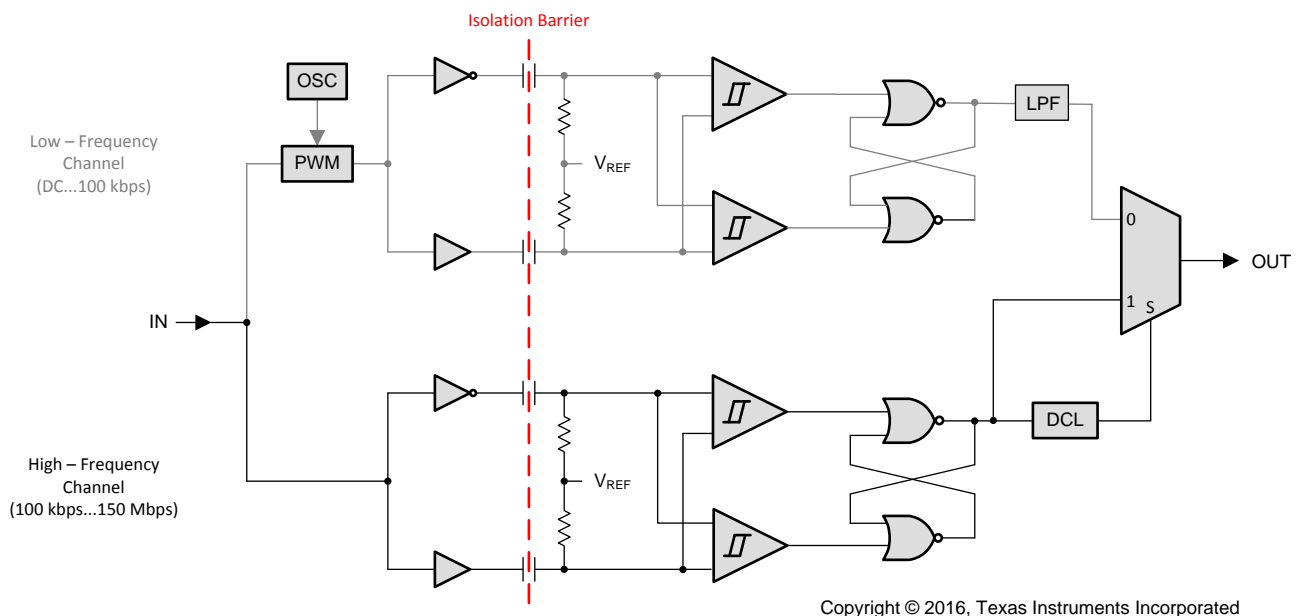


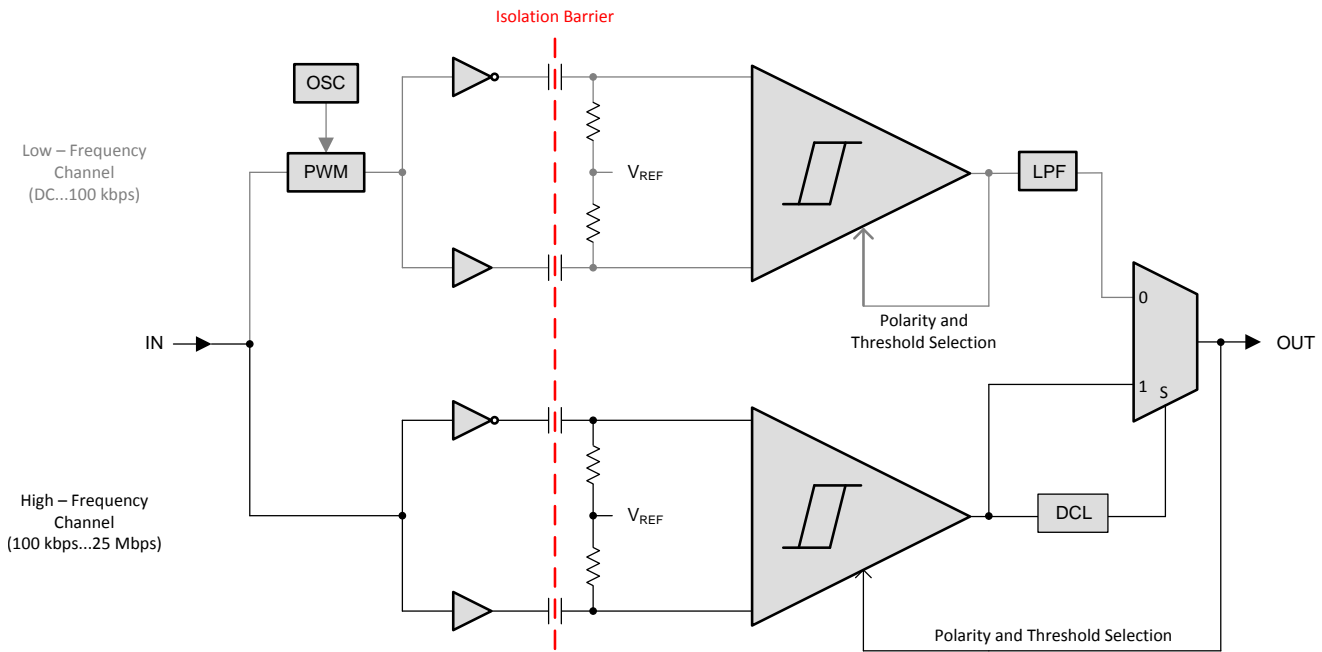
Figure 20. ISO7631FM Conceptual Block Diagram

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Functional Block Diagram (continued)



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Figure 21. ISO7631FC and ISO7641FC Conceptual Block Diagram

9.3 Feature Description

9.3.1 Package Insulation and Safety-Related Specifications

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|-------------------------------|--|---|-----|-----|-------|----|
| L(I01) | Minimum air gap (Clearance) | Shortest terminal to terminal distance through air | | | 8 | mm |
| L(I02) ⁽¹⁾ | Minimum external tracking (Creepage) | Shortest terminal to terminal distance across the package surface | | | 8 | mm |
| CTI | Tracking resistance (Comparative Tracking Index) | DIN EN 60112 (VDE 0303-11); IEC 60112 | | | ≥400 | V |
| DTI | Minimum Internal Gap (Internal Clearance) | Distance through the insulation | | | 0.014 | mm |
| C _i ⁽²⁾ | Input capacitance | $V_i = V_{CC}/2 + 0.4 \sin(2\pi ft)$, $f = 1\text{MHz}$, $V_{CC} = 5\text{V}$ | | | 2 | pF |

(1) Per JEDEC package dimensions.

(2) Measured from input pin to ground.

NOTE

Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care should be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed circuit board do not reduce this distance.

Creepage and clearance on a printed circuit board become equal according to the measurement techniques shown in the Isolation Glossary. Techniques such as inserting grooves and/or ribs on a printed circuit board are used to help increase these specifications.

Table 1. DIN V VDE V 0884-10 (VDE V 0884-10):2006-12 Insulation Characteristics⁽¹⁾

| PARAMETER | | TEST CONDITIONS | SPECIFICATION | UNIT |
|-------------------------|---------------------------------------|---|---------------|------------|
| V_{IORM} | Maximum working insulation voltage | | 1414 | V_{PEAK} |
| V_{PR} | Input-to-output test voltage | After Input/Output safety test subgroup 2/3, $V_{PR} = V_{IORM} \times 1.2$, $t = 10$ s, Partial discharge < 5 pC | 1697 | V_{PEAK} |
| | | Method a, After environmental tests subgroup 1, $V_{PR} = V_{IORM} \times 1.6$, $t = 10$ s, Partial Discharge < 5 pC | 2262 | |
| | | Method b1, 100% Production test $V_{PR} = V_{IORM} \times 1.875$, $t = 1$ s Partial discharge < 5 pC | 2652 | |
| V_{IOTM} | Maximum transient overvoltage | $V_{TEST} = V_{IOTM}$ $t = 60$ sec (Qualification) $t = 1$ sec (100% Production) | 4242 | V_{PEAK} |
| R_{IO} ⁽²⁾ | Isolation resistance, Input to Output | $V_{IO} = 500$ V, $T_A = 25^\circ\text{C}$ | $>10^{12}$ | Ω |
| | | $V_{IO} = 500$ V, $100^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ | $>10^{11}$ | |
| | | $V_{IO} = 500$ V at $T_S = 150^\circ\text{C}$ | $>10^9$ | |
| C_{IO} ⁽²⁾ | Barrier capacitance, Input to Output | $V_I = 0.4 \sin(2\pi ft)$, $f = 1$ MHz | 2 | pF |
| | Pollution degree | | 2 | |

(1) Climatic Classification 40/125/21

(2) All pins on each side of the barrier tied together creating a two-terminal device.

Table 2. IEC 60664-1 Ratings Table

| PARAMETER | TEST CONDITIONS | SPECIFICATION |
|---|---|---------------|
| Material Group | | II |
| Installation classification / Overvoltage category for basic insulation | Rated mains voltage $\leq 300 V_{RMS}$ | I–IV |
| | Rated mains voltage $\leq 600 V_{RMS}$ | I–III |
| | Rated mains voltage $\leq 1000 V_{RMS}$ | I–II |

Table 3. Regulatory Information

| VDE | TUV | CSA | UL | CQC |
|--|---|--|---|--|
| Certified according to DIN V VDE V 0884-10 (VDE V 0884-10):2006-12 and DIN EN 61010-1 (VDE 0411-1):2011-07 | Certified according to EN/UL/CSA 60950-1 and 61010-1 | Approved under CSA Component Acceptance Notice 5A, IEC 60950-1 and IEC 61010-1 | Recognized under 1577 Component Recognition Program | Certified according to GB4943.1-2011 |
| Basic Insulation Maximum Transient Overvoltage, 4242 V_{PK} Maximum Working Voltage, 1414 V_{PK} | 3000 V_{RMS} Reinforced Insulation, 400 V_{RMS} maximum working voltage 3000 V_{RMS} Basic Insulation, 600 V_{RMS} maximum working voltage | 3000 V_{RMS} Isolation Rating | Single Protection, 2500 V_{RMS} ⁽¹⁾ | Reinforced Insulation, Altitude ≤ 5000 m, Tropical Climate, 250 V_{RMS} Maximum Working Voltage |
| Certificate number: 40016131 | Certificate number: U8V 13 09 77311 010 | Master contract number: 220991 | File number: E181974 | Certificate number: CQC14001109542 |

 (1) Production tested $\geq 3000 V_{RMS}$ for 1 second in accordance with UL 1577.

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9.3.1.1 Safety Limiting Values

Safety limiting intends to prevent potential damage to the isolation barrier upon failure of input or output circuitry. A failure of the IO can allow low resistance to ground or the supply and, without current limiting, dissipate sufficient power to overheat the die and damage the isolation barrier potentially leading to secondary system failures.

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|---|---|-----|-----|---|------------------|
| I_S | Safety input, output, or supply current | DW-16 | | | $\theta_{JA} = 77.5\text{ }^\circ\text{C/W}$, $V_I = 5.5\text{V}$, $T_J = 150\text{ }^\circ\text{C}$, $T_A = 25\text{ }^\circ\text{C}$ | 293 |
| | | $\theta_{JA} = 77.5\text{ }^\circ\text{C/W}$, $V_I = 3.6\text{V}$, $T_J = 150\text{ }^\circ\text{C}$, $T_A = 25\text{ }^\circ\text{C}$ | | | 448 | |
| | | $\theta_{JA} = 77.5\text{ }^\circ\text{C/W}$, $V_I = 2.7\text{V}$, $T_J = 150\text{ }^\circ\text{C}$, $T_A = 25\text{ }^\circ\text{C}$ | | | 597 | |
| T_S | Maximum safety temperature | | | | 150 | $^\circ\text{C}$ |

The safety-limiting constraint is the absolute maximum junction temperature specified in the absolute maximum ratings table. The power dissipation and junction-to-air thermal impedance of the device installed in the application hardware determines the junction temperature. The assumed junction-to-air thermal resistance in the *Thermal Information* table is that of a device installed on a High-K Test Board for Leaded Surface Mount Packages. The power is the recommended maximum input voltage times the current. The junction temperature is then the ambient temperature plus the power times the junction-to-air thermal resistance.

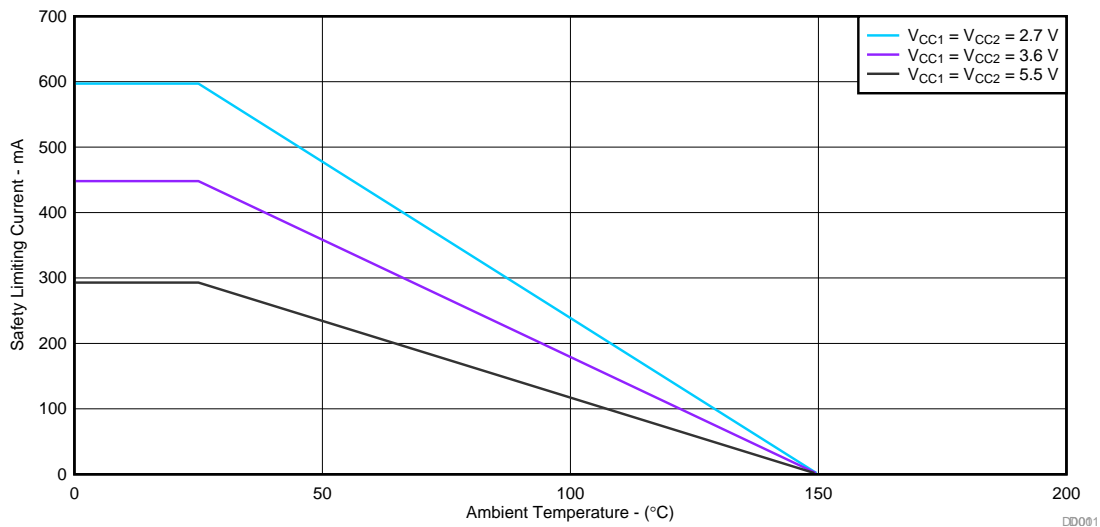


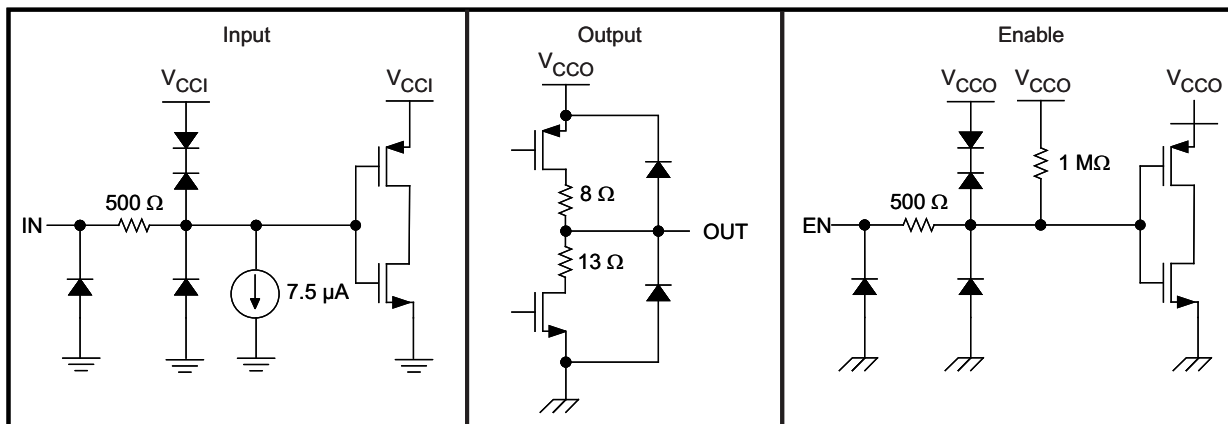
Figure 22. Thermal Derating Curve for Safety Limiting Current per VDE

9.4 Device Functional Modes

Table 4. Function Table⁽¹⁾

| INPUT V_{CC} | OUTPUT V_{CC} | INPUT (INx) | OUTPUT ENABLE (ENx) | OUTPUT (OUTx) |
|-------------------|--------------------|----------------|------------------------|------------------|
| PU | PU | H | H or Open | H |
| | | L | H or Open | L |
| | | X | L | Z |
| | | Open | H or Open | L |
| PD | PU | X | H or Open | L |
| PD | PU | X | L | Z |
| PU | PD | X | X | Undetermined |

(1) PU = Powered Up ($V_{CC} \geq 2.7$ V); PD = Powered Down ($V_{CC} \leq 2.1$ V); X = Irrelevant; H = High Level; L = Low Level; Z = High Impedance



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Figure 23. Device I/O Schematics

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10 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

10.1 Application Information

ISO7641FC uses single-ended TTL-logic switching technology. It has a supply voltage range from 3 V to 5.5 V for both supplies, V_{CC1} and V_{CC2} . When designing with digital isolators, it is important to note that due to the single-ended design structure, digital isolators do not conform to any specific interface standard and are only intended for isolating single-ended CMOS or TTL digital signal lines. The isolator is typically placed between the data controller (that is, μC or UART), and a data converter or a line transceiver, regardless of the interface type or standard.

10.2 Typical Application

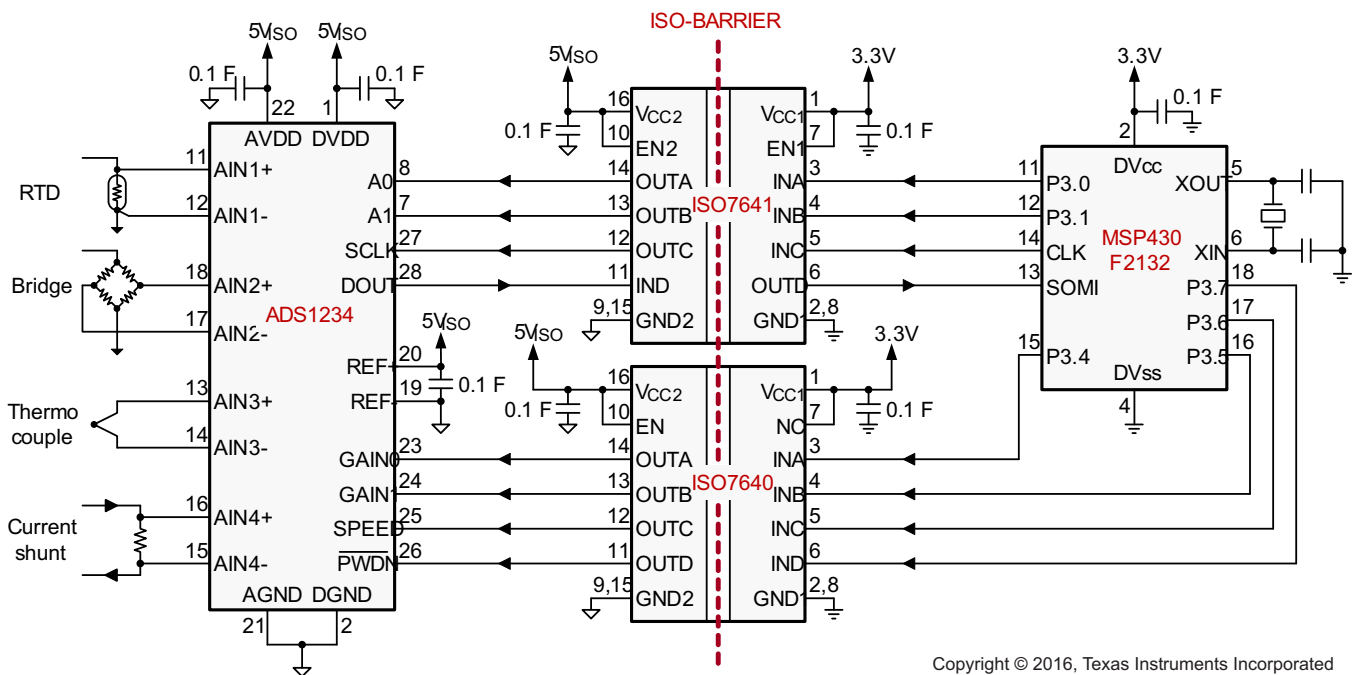


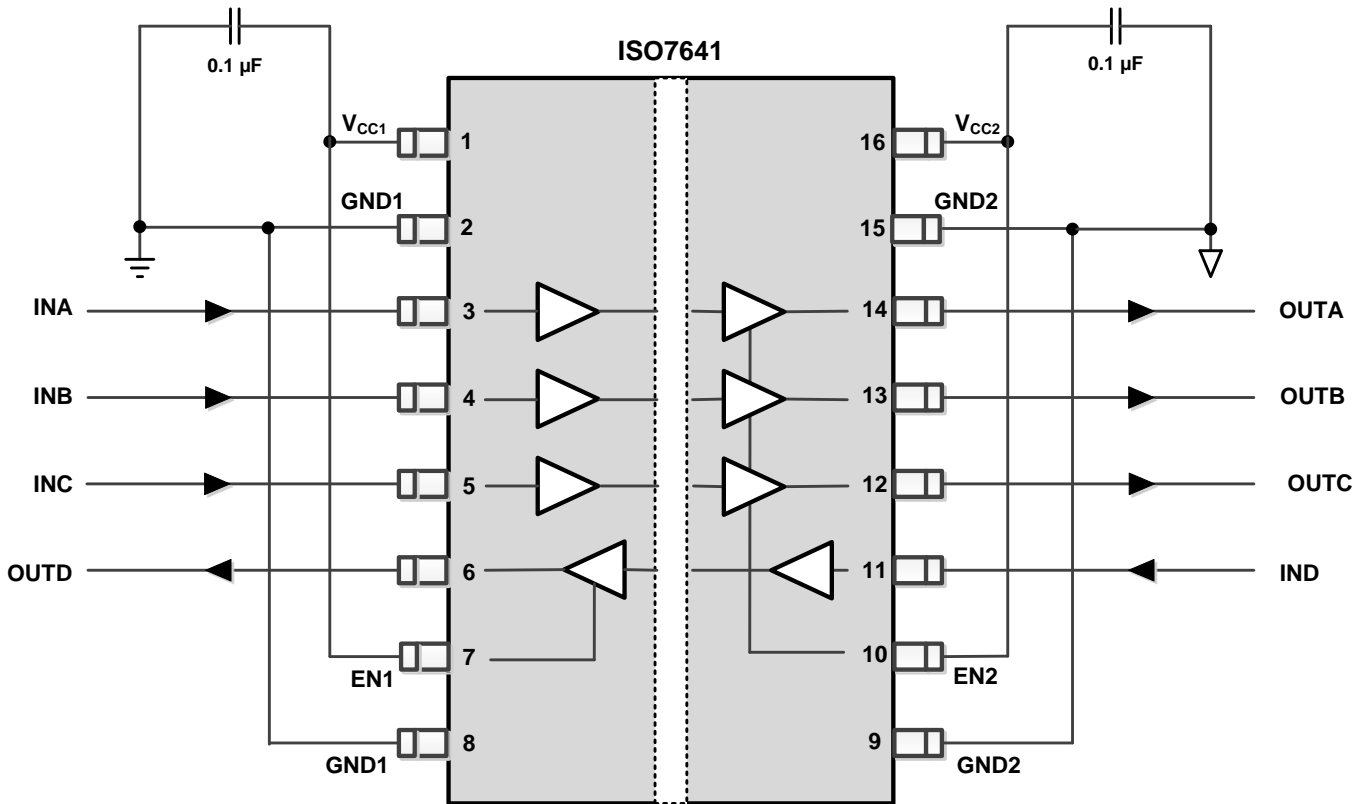
Figure 24. Isolated Data Acquisition System for Process Control

10.2.1 Design Requirements

Unlike optocouplers, which require external components to improve performance, provide bias, or limit current, the ISO76xx device only requires two external bypass capacitors to operate.

Typical Application (continued)

10.2.2 Detailed Design Procedure



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Figure 25. Typical ISO7641FC Circuit Hookup

10.2.2.1 Typical Supply Current Equations

(Calculated based on room temperature and typical Silicon process)

ISO7631FM:

At $V_{CC1} = V_{CC2} = 3.3\text{ V}$

$$I_{CC1} = 1.8072 + 0.0244 \times f + 0.0016 \times f \times C_L \quad (1)$$

$$I_{CC2} = 2.4625 + 0.0252 \times f + 0.0033 \times f \times C_L \quad (2)$$

At $V_{CC1} = V_{CC2} = 5\text{ V}$

$$I_{CC1} = 2.3183 + 0.04 \times f + 0.0025 \times f \times C_L \quad (3)$$

$$I_{CC2} = 3.2582 + 0.0403 \times f + 0.0049 \times f \times C_L \quad (4)$$

ISO7631FC:

At $V_{CC1} = V_{CC2} = 3.3\text{ V}$

$$I_{CC1} = 1.1762 + 0.0325 \times f + 0.0017 \times f \times C_L \quad (5)$$

$$I_{CC2} = 1.5285 + 0.0299 \times f + 0.0033 \times f \times C_L \quad (6)$$

At $V_{CC1} = V_{CC2} = 5\text{ V}$

$$I_{CC1} = 1.6001 + 0.0528 \times f + 0.0025 \times f \times C_L \quad (7)$$

$$I_{CC2} = 2.2032 + 0.0475 \times f + 0.005 \times f \times C_L \quad (8)$$

ISO7641FC:

At $V_{CC1} = V_{CC2} = 3.3\text{ V}$

$$I_{CC1} = 1.2162 + 0.0462 \times f + 0.0017 \times f \times C_L \quad (9)$$

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Typical Application (continued)

(Calculated based on room temperature and typical Silicon process)

$$I_{CC2} = 1.8054 + 0.0411 \times f + 0.005 \times f \times C_L \quad (10)$$

At $V_{CC1} = V_{CC2} = 5\text{ V}$

$$I_{CC1} = 1.6583 + 0.0757 \times f + 0.0025 \times f \times C_L \quad (11)$$

$$I_{CC2} = 2.5008 + 0.0655 \times f + 0.0076 \times f \times C_L \quad (12)$$

I_{CC1} and I_{CC2} are typical supply currents measured in mA; f is data rate measured in Mbps; C_L is the capacitive load on each channel measured in pF.

10.2.3 Application Curves

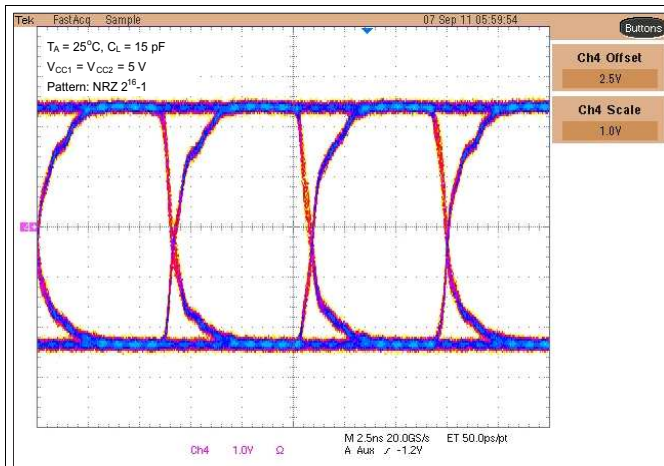


Figure 26. M-Grade Typical Eye Diagram at 150 Mbps, 5 V Operation

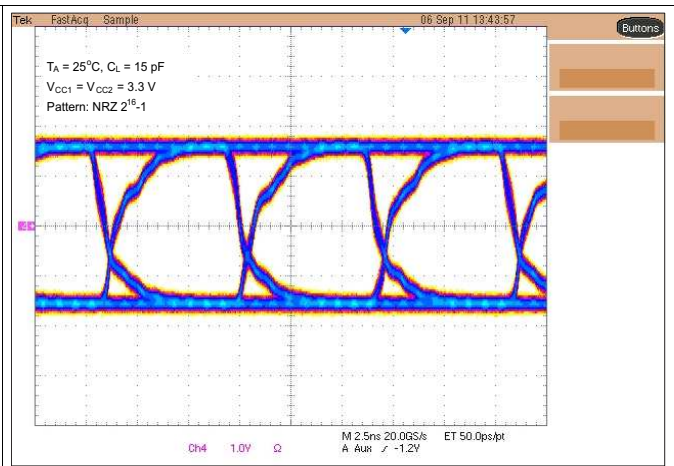


Figure 27. M-Grade Typical Eye Diagram at 150 Mbps, 3.3 V Operation

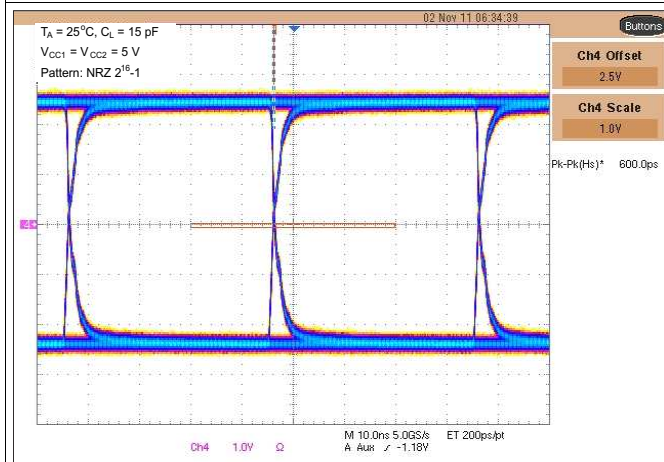


Figure 28. C-Grade Typical Eye Diagram at 25 Mbps, 5 V Operation

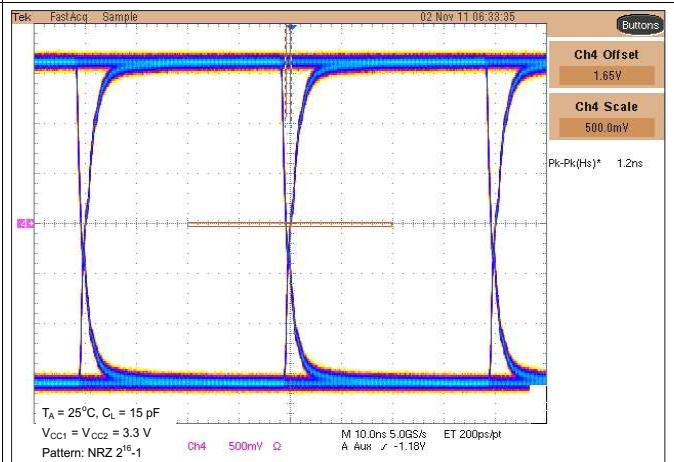


Figure 29. C-Grade Typical Eye Diagram at 25 Mbps, 3.3 V Operation

11 Power Supply Recommendations

To ensure reliable operation at all data rates and supply voltages, a 0.1- μ F bypass capacitor is recommended at input and output supply pins (V_{CC1} and V_{CC2}). The capacitors should be placed as close to the supply pins as possible. If only a single primary-side power supply is available in an application, isolated power can be generated for the secondary-side with the help of a transformer driver such as Texas Instruments' [SN6501](#). For such applications, detailed power supply design and transformer selection recommendations are available in [SN6501](#) data sheet ([SLLSEA0](#)).

12 Layout

12.1 Layout Guidelines

A minimum of four layers is required to accomplish a low EMI PCB design (see [Figure 30](#)). Layer stacking should be in the following order (top-to-bottom): high-speed signal layer, ground plane, power plane and low-frequency signal layer.

- Routing the high-speed traces on the top layer avoids the use of vias (and the introduction of their inductances) and allows for clean interconnects between the isolator and the transmitter and receiver circuits of the data link.
- Placing a solid ground plane next to the high-speed signal layer establishes controlled impedance for transmission line interconnects and provides an excellent low-inductance path for the return current flow.
- Placing the power plane next to the ground plane creates additional high-frequency bypass capacitance of approximately 100 pF/in².
- Routing the slower speed control signals on the bottom layer allows for greater flexibility as these signal links usually have margin to tolerate discontinuities such as vias.

If an additional supply voltage plane or signal layer is needed, add a second power and ground plane system to the stack to keep it symmetrical. This makes the stack mechanically stable and prevents it from warping. Also the power and ground plane of each power system can be placed closer together, thus increasing the high-frequency bypass capacitance significantly.

NOTE

For detailed layout recommendations, see *Digital Isolator Design Guide*, [SLLA284](#).

12.2 Layout Example

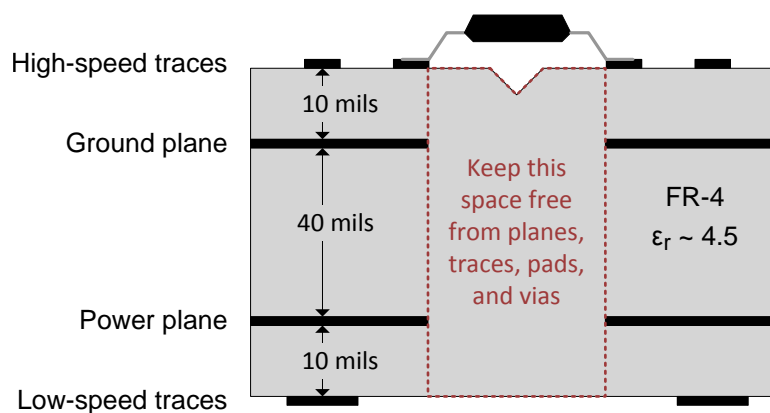


Figure 30. Recommended Layer Stack

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13 Device and Documentation Support

13.1 Documentation Support

13.1.1 Related Documentation

For related documentation, see the following:

- *Digital Isolator Design Guide*, [SLLA284](#)
- *Transformer Driver for Isolated Power Supplies*, [SLLSEAO](#)
- Isolation Glossary, [SLLA353](#)

13.2 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 5. Related Links

| PARTS | PRODUCT FOLDER | SAMPLE & BUY | TECHNICAL DOCUMENTS | TOOLS & SOFTWARE | SUPPORT & COMMUNITY |
|-----------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| ISO7631FM | Click here | Click here | Click here | Click here | Click here |
| ISO7631FC | Click here | Click here | Click here | Click here | Click here |
| ISO7641FC | Click here | Click here | Click here | Click here | Click here |

13.3 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At [e2e.ti.com](#), you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

13.4 Trademarks

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All other trademarks are the property of their respective owners.

13.5 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

13.6 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

14 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

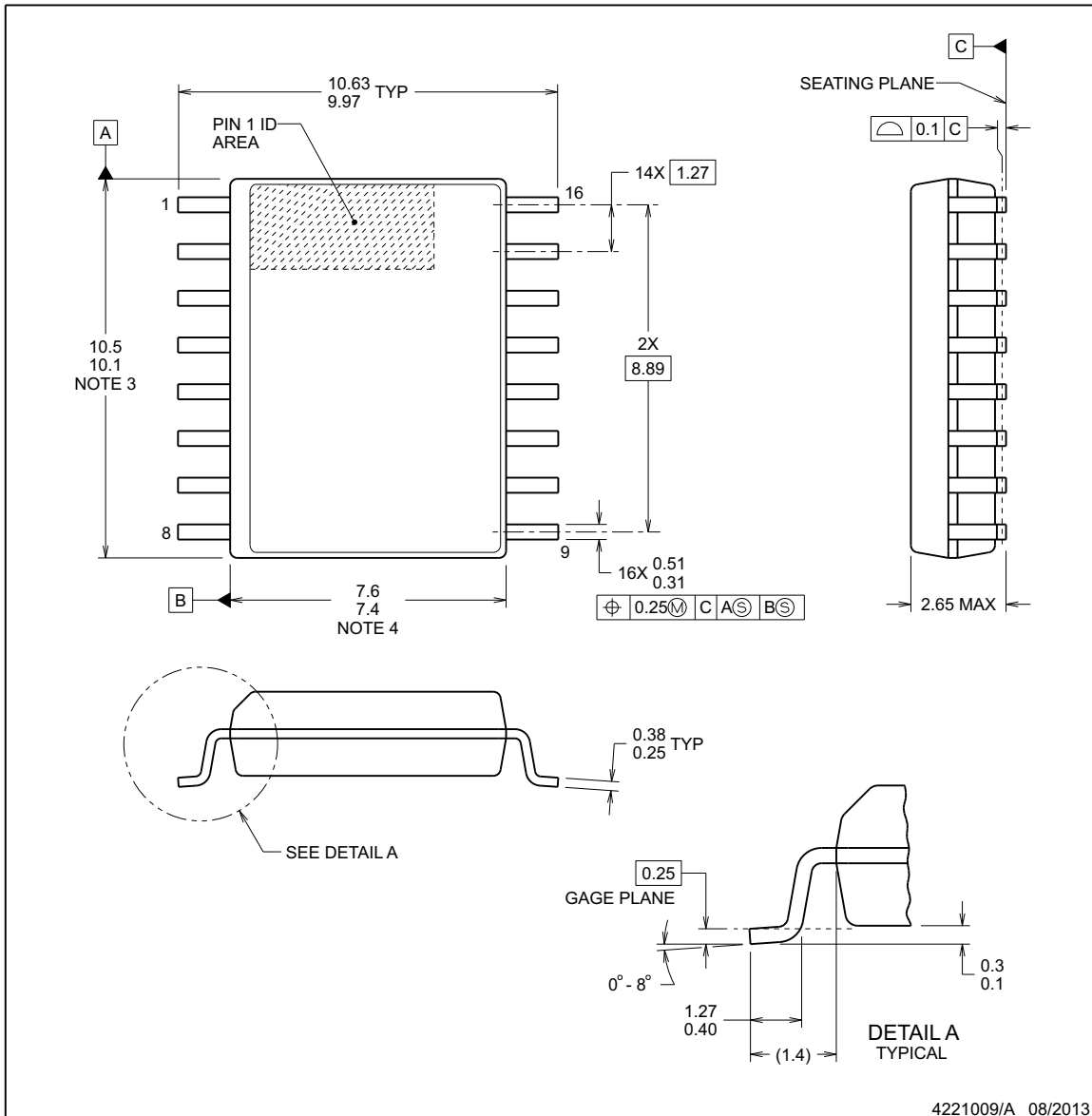
PACKAGE OUTLINE



DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MO-013, variation AA.

ISO7631FM, ISO7631FC, ISO7641FC

SLLSEC3F – SEPTEMBER 2012 – REVISED APRIL 2016

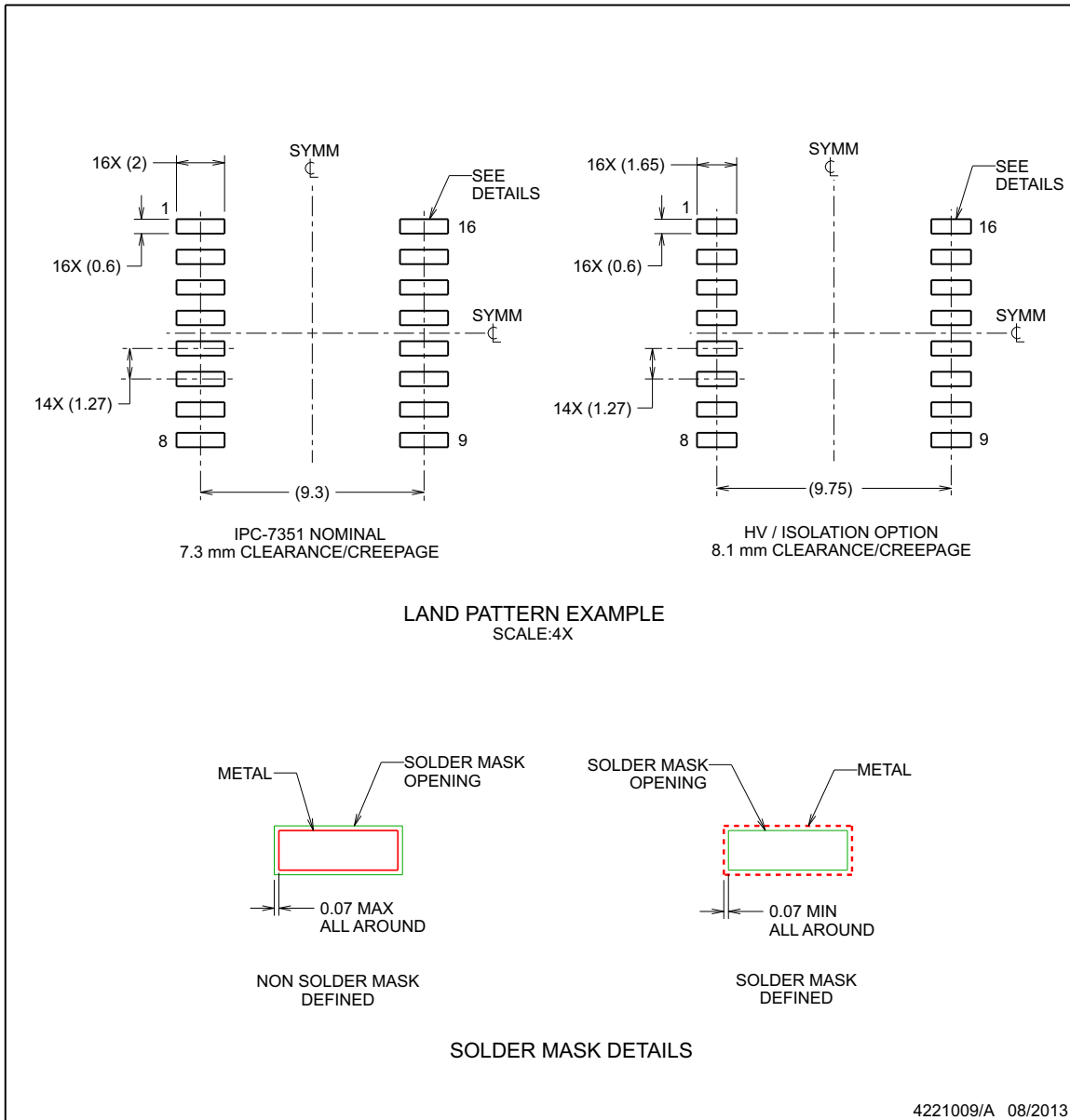
www.ti.com

EXAMPLE BOARD LAYOUT

DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

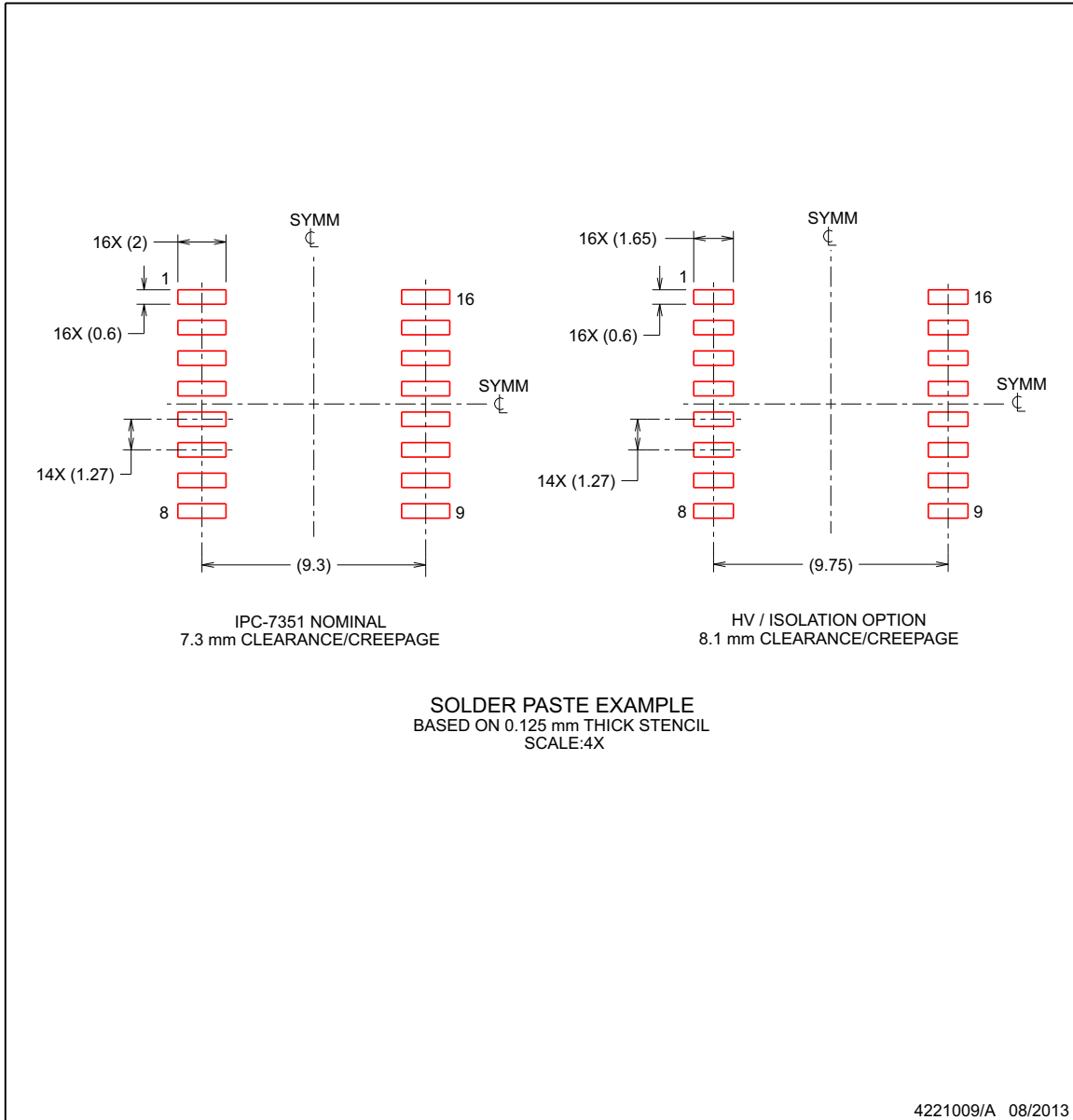
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0016B

SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| ISO7631FCDW | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FC |
| ISO7631FCDW.A | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FC |
| ISO7631FCDWR | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FC |
| ISO7631FCDWR.A | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FC |
| ISO7631FMDW | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FM |
| ISO7631FMDW.A | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FM |
| ISO7631FMDWR | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FM |
| ISO7631FMDWR.A | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7631FM |
| ISO7641FCDW | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7641FC |
| ISO7641FCDW.A | Active | Production | SOIC (DW) 16 | 40 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7641FC |
| ISO7641FCDWR | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7641FC |
| ISO7641FCDWR.A | Active | Production | SOIC (DW) 16 | 2000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 125 | ISO7641FC |

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

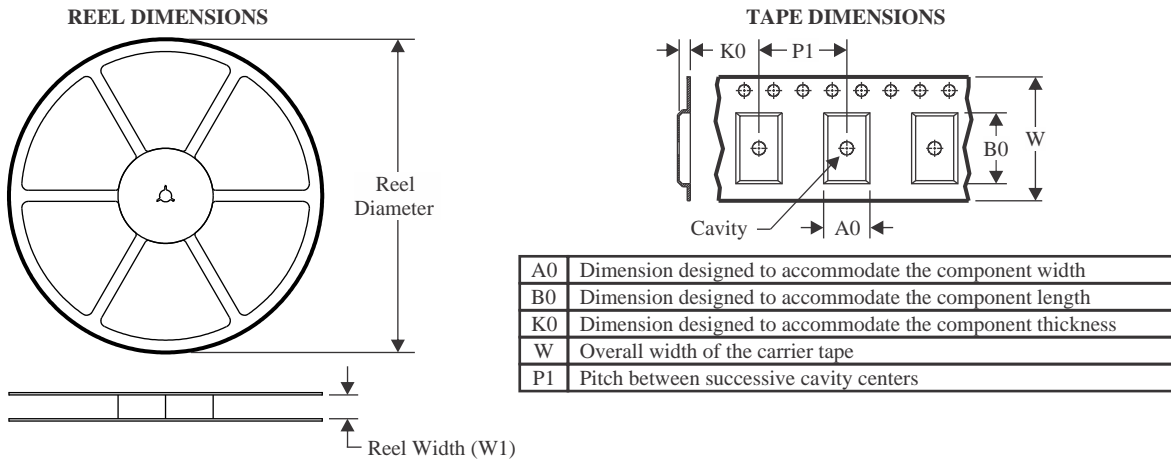
(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

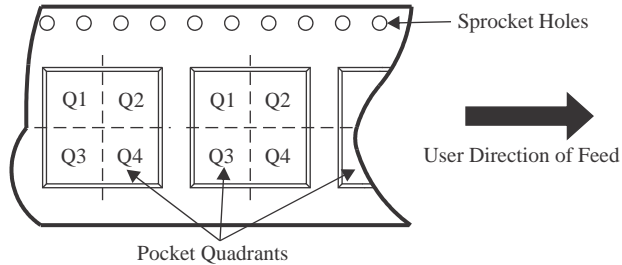
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TAPE AND REEL INFORMATION



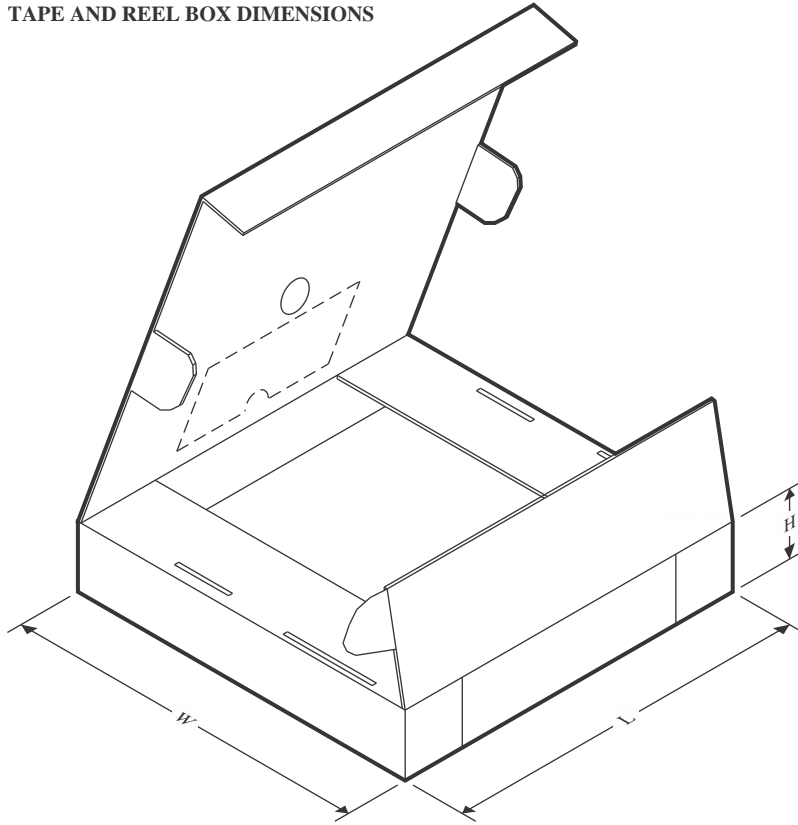
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| ISO7631FCDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |
| ISO7631FMDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |
| ISO7641FCDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |

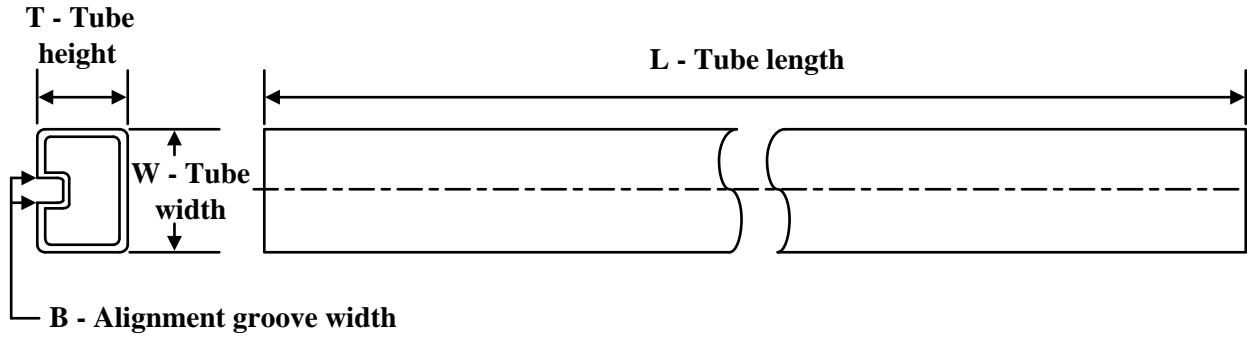
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| ISO7631FCDWR | SOIC | DW | 16 | 2000 | 350.0 | 350.0 | 43.0 |
| ISO7631FMDWR | SOIC | DW | 16 | 2000 | 350.0 | 350.0 | 43.0 |
| ISO7641FCDWR | SOIC | DW | 16 | 2000 | 350.0 | 350.0 | 43.0 |

TUBE



*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|---------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| ISO7631FCDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| ISO7631FCDW.A | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| ISO7631FMDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| ISO7631FMDW.A | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| ISO7641FCDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| ISO7641FCDW.A | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |

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