

# ISO724xC-Q1 高速、クワッドチャネルデジタルアイソレータ

## 1 特長

- 25Mbps の信号速度オプション
  - 低いチャネル間の出力スキュー:  
最大値 1ns
  - 低いパルス幅歪み (PWD) :  
最大値 2ns
  - 低ジッタ成分: 25Mbps で標準値 1ns
- 選択可能なデフォルト出力 (ISO7240CF)
- 定格動作電圧での寿命 > 25 年 (「絶縁特性曲線」を参照)
- 4kV の ESD 保護
- 3.3V または 5V 電源で動作
- -40°C ~ +125°C の動作温度範囲
- 安全関連の認証:
  - DIN EN IEC 60747-17 (VDE 0884-17)
  - UL 1577 部品認定プログラム
  - IEC 61010-1 認定、IEC 62368-1 認定

## 2 アプリケーション

- ファクトリオートメーション
  - Modbus
  - Profibus™
  - DeviceNet™ データバス
- コンピュータペリフェラルインターフェイス
- サーボ制御インターフェイス
- データアキュイジション

## 3 概要

ISO7240CF-Q1、ISO7241C-Q1、ISO7242C-Q1 の各デバイスは、複数のチャネル構成と出力イネーブル機能を備えたクワッドチャネルデジタルアイソレータです。これらのデバイスは、テキサスインスツルメンツ独自の二酸化ケイ素 (SiO<sub>2</sub>) 絶縁バリアで分離されたロジック入出力バッファを備えています。これらのデバイスは、絶縁型電源と組み合わせて使用することで、高電圧を遮断し、グランドを絶縁し、ノイズ電流がローカルグランドに入り込んでノイズに敏感な回路に干渉したり損傷を与えたりすることを防止します。

ISO7240C-Q1 ファミリのデバイスは、同じ方向に 4 チャネルを備えています。ISO7241C-Q1 ファミリのデバイスは、同じ方向に 3 チャネル、反対方向に 1 チャネルを備えています。ISO7242C-Q1 ファミリのデバイスは、各方向に 2 チャネルを備えています。

接尾辞 C (C オプション) のデバイスには、TTL 入力スレッシュホールドと、遷移パルスがデバイスの出力に渡されるのを防ぐノイズフィルタが入力に備わっています。接尾辞 M (M オプション) のデバイスには、CMOS  $V_{CC}/2$  入力スレッシュホールドが備わっていますが、入力ノイズフィルタはなく、追加の伝搬遅延も発生しません。

ISO7240CF デバイスは、ピン 7 に入力ディセーブル機能を備え、CTRL ピン (ピン 10) に High または Low が選択可能なフェイルセーフ出力機能を備えています。フェイルセーフ出力は、CTRL ピンにロジック High が印加された場合、またはピンが未接続のままである場合、ロジック High になります。CTRL ピンにロジック Low 信号が印加されると、フェイルセーフ出力はロジック Low 出力状態になります。ISO7240CF デバイスの入力ディセーブル機能により、絶縁バリアを通過してデータが出力に渡されるのを防ぎます。入力がディセーブルされるか、 $V_{CC1}$  がパワーダウンスすると、出力は CTRL ピンによって設定されます。

これらのデバイスは、どちらの側でも 3.3V または 5V 電源から電力を供給でき、任意の組み合わせが可能です。信号入力ピンは、使用される電源電圧レベルに関係なく 5V 許容です。

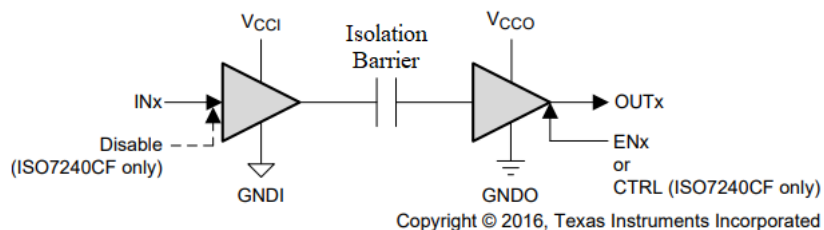
これらのデバイスは、-40°C ~ +125°C の周囲温度範囲で動作するように特性評価されています。



### パッケージ情報

| 部品番号         | パッケージ <sup>(1)</sup> | 本体サイズ (公称)       | パッケージ サイズ <sup>(2)</sup> |
|--------------|----------------------|------------------|--------------------------|
| ISO7240CF-Q1 | DW (SOIC, 16)        | 10.30mm × 7.50mm | 10.30mm × 10.30mm        |
| ISO7241C-Q1  |                      |                  |                          |
| ISO7242C-Q1  |                      |                  |                          |

- (1) 利用可能なすべてのパッケージについては、データシートの末尾にある注文情報を参照してください。  
(2) パッケージ サイズ (長さ × 幅) は公称値であり、該当する場合はピンも含まれます。



$V_{CCI}$  および  $GNDI$  は、それぞれ入力チャネルの電源およびグランド接続です。  
 $V_{CCO}$  および  $GNDO$  は、それぞれ出力チャネルの電源およびグランド接続です。

### 概略回路図

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## 4 Pin Configurations and Functions

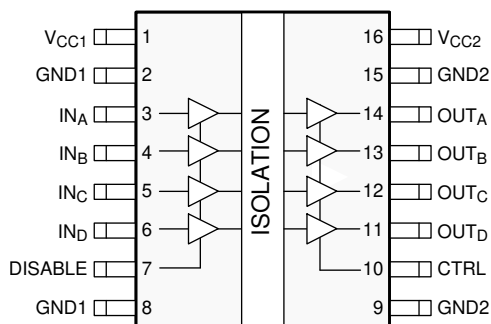


図 4-1. ISO7240CF-Q1 DW Package 16-Pin SOIC Top View

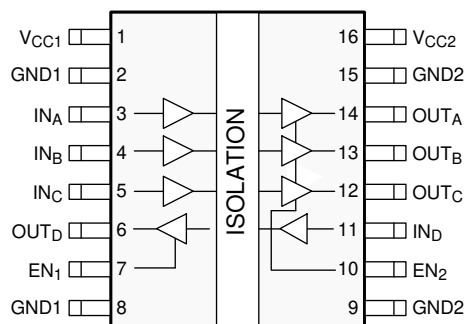


図 4-2. ISO7241C-Q1 DW Package 16-Pin SOIC Top View

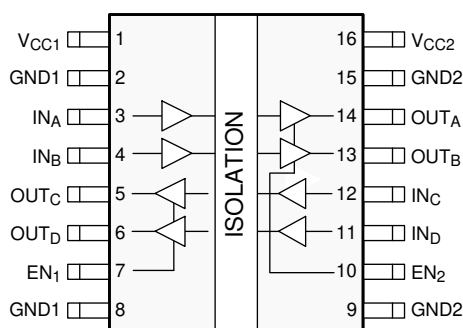


図 4-3. ISO7242C-Q1 DW Package 16-Pin SOIC Top View

表 4-1. Pin Functions

| NAME             | PIN          |             |             | Type <sup>(1)</sup> | DESCRIPTION                                                                                                                                                                                  |
|------------------|--------------|-------------|-------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | ISO7240CF-Q1 | ISO7241C-Q1 | ISO7242C-Q1 |                     |                                                                                                                                                                                              |
| CTRL             | 10           | —           | —           | I                   | Failsafe output control. Output state is determined by CTRL pin when DISABLE is high or V <sub>CC1</sub> is powered down. Output is high when CTRL is high or open and low when CTRL is low. |
| DISABLE          | 7            | —           | —           | I                   | Input disable. All input pins are disabled when DISABLE is high and enabled when DISABLE is low or open.                                                                                     |
| EN               | —            | —           | —           | I                   | Output enable. All output pins are enabled when EN is high or open and disabled when EN is low.                                                                                              |
| EN <sub>1</sub>  | —            | 7           | 7           | I                   | Output enable 1. Output pins on side 1 are enabled when EN <sub>1</sub> is high or open and disabled when EN <sub>1</sub> is low.                                                            |
| EN <sub>2</sub>  | —            | 10          | 10          | I                   | Output enable 2. Output pins on side-2 are enabled when EN <sub>2</sub> is high or open and disabled when EN <sub>2</sub> is low.                                                            |
| GND1             | 2, 8         | 2, 8        | 2, 8        | —                   | Ground connection for V <sub>CC1</sub>                                                                                                                                                       |
| GND2             | 9, 15        | 9, 15       | 9, 15       | —                   | Ground connection for V <sub>CC2</sub>                                                                                                                                                       |
| IN <sub>A</sub>  | 3            | 3           | 3           | I                   | Input, channel A                                                                                                                                                                             |
| IN <sub>B</sub>  | 4            | 4           | 4           | I                   | Input, channel B                                                                                                                                                                             |
| IN <sub>C</sub>  | 5            | 5           | 12          | I                   | Input, channel C                                                                                                                                                                             |
| IN <sub>D</sub>  | 6            | 11          | 11          | I                   | Input, channel D                                                                                                                                                                             |
| NC               | —            | —           | —           | —                   | No Connect pins are floating with no internal connection                                                                                                                                     |
| OUT <sub>A</sub> | 14           | 14          | 14          | O                   | Output, channel A                                                                                                                                                                            |
| OUT <sub>B</sub> | 13           | 13          | 13          | O                   | Output, channel B                                                                                                                                                                            |
| OUT <sub>C</sub> | 12           | 12          | 5           | O                   | Output, channel C                                                                                                                                                                            |
| OUT <sub>D</sub> | 11           | 6           | 6           | O                   | Output, channel D                                                                                                                                                                            |
| V <sub>CC1</sub> | 1            | 1           | 1           | —                   | Power supply, V <sub>CC1</sub>                                                                                                                                                               |
| V <sub>CC2</sub> | 16           | 16          | 16          | —                   | Power supply, V <sub>CC2</sub>                                                                                                                                                               |

(1) I = Input; O = Output

## 5 Specifications

### 5.1 Absolute Maximum Ratings

See<sup>(1)</sup>

|                 |                                                                     |                                    |          | VALUE     | UNIT |
|-----------------|---------------------------------------------------------------------|------------------------------------|----------|-----------|------|
| V <sub>CC</sub> | Supply voltage <sup>(2)</sup> , V <sub>CC1</sub> , V <sub>CC2</sub> |                                    |          | −0.5 to 6 | V    |
| V <sub>I</sub>  | Voltage at IN, OUT, EN, DISABLE, CTRL                               |                                    |          | −0.5 to 6 | V    |
| ESD             | Electrostatic discharge                                             | Human-Body Model                   | All pins | ±4        | kV   |
|                 |                                                                     | Field-Induced-Charged Device Model |          | ±1        |      |
| T <sub>J</sub>  | Maximum junction temperature                                        |                                    |          | 150       | °C   |

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- (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.

### 5.2 ESD Ratings

|                    |                         |                                                                                          | VALUE | UNIT |
|--------------------|-------------------------|------------------------------------------------------------------------------------------|-------|------|
| V <sub>(ESD)</sub> | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>              | 4000  | V    |
|                    |                         | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> | 1000  | V    |

- (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.

### 5.3 Recommended Operating Conditions

|                   |                                                                                             | MIN  | TYP               | MAX             | UNIT |
|-------------------|---------------------------------------------------------------------------------------------|------|-------------------|-----------------|------|
| V <sub>CC</sub>   | Supply voltage <sup>(2)</sup> , V <sub>CC1</sub> , V <sub>CC2</sub>                         | 3.15 |                   | 5.5             | V    |
| I <sub>OH</sub>   | High-level output current                                                                   |      |                   | 4               | mA   |
| I <sub>OL</sub>   | Low-level output current                                                                    | –4   |                   |                 | mA   |
| t <sub>ui</sub>   | Input pulse width                                                                           | 40   |                   |                 | ns   |
| 1/t <sub>ui</sub> | Signaling rate                                                                              | 0    | 30 <sup>(1)</sup> | 25              | Mbps |
| V <sub>IH</sub>   | High-level input voltage (IN, DISABLE, CTRL, EN)                                            | 2    |                   | V <sub>CC</sub> | V    |
| V <sub>IL</sub>   | Low-level input voltage (IN, DISABLE, CTRL, EN)                                             | 0    |                   | 0.8             | V    |
| T <sub>A</sub>    | Operating free-air temperature                                                              | –40  |                   | 125             | °C   |
| H                 | External magnetic field-strength immunity per IEC 61000-4-8 and IEC 61000-4-9 certification |      |                   | 1000            | A/m  |

- (1) Typical value at room temperature and well-regulated power supply.
- (2) For the 5-V operation, V<sub>CC1</sub> or V<sub>CC2</sub> is specified from 4.5 V to 5.5 V.  
For the 3-V operation, V<sub>CC1</sub> or V<sub>CC2</sub> is specified from 3.15 V to 3.6 V.

### 5.4 Thermal Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER       |                                      | TEST CONDITIONS                         | MIN | TYP  | MAX | UNIT |
|-----------------|--------------------------------------|-----------------------------------------|-----|------|-----|------|
| θ <sub>JA</sub> | Junction-to-air                      | Low-K Thermal Resistance <sup>(1)</sup> |     | 168  |     | °C/W |
|                 |                                      | High-K Thermal Resistance               |     | 68.6 |     |      |
| θ <sub>JB</sub> | Junction-to-Board Thermal Resistance |                                         |     | 33.5 |     | °C/W |
| θ <sub>JC</sub> | Junction-to-Case Thermal Resistance  |                                         |     | 33.9 |     | °C/W |

- (1) Tested in accordance with the Low-K or High-K thermal metric definitions of EIA/JESD51-3 for leaded surface mount packages.

## 5.5 Power Ratings

$V_{CC1} = V_{CC2} = 5.5\text{ V}$ ,  $T_J = 150^\circ\text{C}$ ,  $C_L = 15\text{ pF}$ , Input a 25-Mbps 50% duty cycle square wave

| PARAMETER | TEST CONDITIONS                    | MIN | TYP | MAX | UNIT |
|-----------|------------------------------------|-----|-----|-----|------|
| $P_D$     | Device power dissipation, ISO724xC |     |     | 220 | mW   |

## 5.6 Safety-Related Certifications

| VDE                                                            | CSA                                      | UL                                                                 |
|----------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| Plan to certify according to DIN EN IEC 60747-17 (VDE 0884-17) | Plan to certify according to IEC 62368-1 | Plan to certify according to UL 1577 Component Recognition Program |
| Certificate planned                                            | Certificate planned                      | Certificate planned                                                |

## 5.7 Safety Limiting Values

Safety limiting<sup>(1)</sup> intends to minimize potential damage to the isolation barrier upon failure of input or output circuitry. A failure of the I/O 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 <sub>S</sub> | Safety input, output, or supply current | R <sub>θJA</sub> = 212°C/W, V <sub>I</sub> = 5.5 V, T <sub>J</sub> = 170°C, T <sub>A</sub> = 25°C, see <a href="#">Thermal Characteristics</a> |     |     | 124 | mA   |
|                |                                         | R <sub>θJA</sub> = 212°C/W, V <sub>I</sub> = 3.6 V, T <sub>J</sub> = 170°C, T <sub>A</sub> = 25°C, see <a href="#">Thermal Characteristics</a> |     |     | 190 |      |
| T <sub>S</sub> | Safety temperature                      |                                                                                                                                                |     |     | 150 | °C   |

- (1) The safety-limiting constraint is the maximum junction temperature specified in the data sheet. 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 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.

## 5.8 Insulation Specifications

| PARAMETER                               |                                                     | TEST CONDITIONS                                                                                                                                                                              | VALUE | UNIT            |
|-----------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|
| GENERAL                                 |                                                     |                                                                                                                                                                                              |       |                 |
| CLR                                     | External clearance <sup>(1)</sup>                   | Shortest terminal-to-terminal distance through air                                                                                                                                           | 4     | mm              |
| CPG                                     | External creepage <sup>(1)</sup>                    | Shortest terminal-to-terminal distance across the package surface                                                                                                                            | 4     | mm              |
| DTI                                     | Distance through the insulation                     | Minimum internal gap (internal clearance)                                                                                                                                                    | 0.008 | mm              |
| CTI                                     | Comparative tracking index                          | DIN EN 60112 (VDE 0303-11); IEC 60112                                                                                                                                                        | 400   | V               |
|                                         | Material group                                      |                                                                                                                                                                                              | II    |                 |
|                                         | Overvoltage category                                | Rated mains voltage ≤150 V <sub>RMS</sub>                                                                                                                                                    | I-IV  |                 |
|                                         |                                                     | Rated mains voltage ≤300 V <sub>RMS</sub>                                                                                                                                                    | I-III |                 |
|                                         |                                                     | Rated mains voltage ≤400 V <sub>RMS</sub>                                                                                                                                                    | I-II  |                 |
| DIN EN IEC 60747-17 (VDE 0884-17):BASIC |                                                     |                                                                                                                                                                                              |       |                 |
| V <sub>IORM</sub>                       | Maximum repetitive peak isolation voltage           | AC voltage (bipolar)                                                                                                                                                                         | 560   | V <sub>PK</sub> |
| V <sub>IOTM</sub>                       | Maximum transient isolation voltage                 | V <sub>TEST</sub> = V <sub>IOTM</sub><br>t = 60 s (qualification), t = 1 s (100% production)                                                                                                 | 4000  | V <sub>PK</sub> |
| q <sub>pd</sub>                         | Apparent charge <sup>(3)</sup>                      | Method a: After I/O safety test subgroup 2/3.<br>V <sub>ini</sub> = V <sub>IOTM</sub> , t <sub>ini</sub> = 60 s;<br>V <sub>pd</sub> (m) = 1.2 × V <sub>IOR</sub>                             | ≤5    | pC              |
|                                         |                                                     | Method a: After environmental tests subgroup 1,<br>V <sub>ini</sub> = V <sub>IOTM</sub> , t <sub>ini</sub> = 60 s;<br>V <sub>pd</sub> (m) = 1.3 × V <sub>IORM</sub> , t <sub>m</sub> = 10 s, | ≤5    |                 |
|                                         |                                                     | Method b1: At routine test (100% production)<br>V <sub>ini</sub> = V <sub>IOTM</sub> , t <sub>ini</sub> = 1 s;<br>V <sub>pd</sub> (m) = 1.5 × V <sub>IORM</sub> , t <sub>m</sub> = 1 s,      | ≤5    |                 |
| C <sub>IO</sub>                         | Barrier capacitance, input to output <sup>(4)</sup> | VI = 0.4 sin (2πft), f = 1 MHz                                                                                                                                                               | 1     | pF              |

| PARAMETER        |                                                      | TEST CONDITIONS                                                                                                                                                                         | VALUE             | UNIT             |
|------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|
| R <sub>IO</sub>  | Isolation resistance, input to output <sup>(4)</sup> | V <sub>IO</sub> = 500 V, T <sub>A</sub> = 25°C                                                                                                                                          | >10 <sup>12</sup> | Ω                |
|                  |                                                      | V <sub>IO</sub> = 500 V, 100°C ≤ T <sub>A</sub> ≤ 125°C                                                                                                                                 | >10 <sup>11</sup> |                  |
|                  |                                                      | V <sub>IO</sub> = 500 V at T <sub>S</sub> = 150°C                                                                                                                                       | >10 <sup>9</sup>  |                  |
|                  | Pollution degree                                     |                                                                                                                                                                                         | 2                 |                  |
|                  | Climatic category                                    |                                                                                                                                                                                         | 40/125/21         |                  |
| <b>UL 1577</b>   |                                                      |                                                                                                                                                                                         |                   |                  |
| V <sub>ISO</sub> | Withstand isolation voltage                          | V <sub>TEST</sub> = V <sub>ISO</sub> = 2500 V <sub>RMS</sub> , t = 60 s (qualification); V <sub>TEST</sub> = 1.2 × V <sub>ISO</sub> = 3000 V <sub>RMS</sub> , t = 1 s (100% production) | 2500              | V <sub>RMS</sub> |

- (1) 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 in certain cases. Techniques such as inserting grooves and/or ribs on a printed circuit board are used to help increase these specifications.
- (2) This coupler is suitable for *basic electrical insulation* only within the maximum operating ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.
- (3) Apparent charge is electrical discharge caused by a partial discharge (pd).
- (4) All pins on each side of the barrier tied together creating a two-terminal device

## 5.9 Electrical Characteristics: V<sub>CC1</sub> and V<sub>CC2</sub> at 5-V Operation

, over recommended operating conditions (unless otherwise noted)<sup>(1)</sup>

| PARAMETER                  |                                |           | TEST CONDITIONS                                                                                                                  |  | MIN                   | TYP  | MAX | UNIT |       |
|----------------------------|--------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|------|-----|------|-------|
| SUPPLY CURRENT             |                                |           |                                                                                                                                  |  |                       |      |     |      |       |
| I <sub>CC1</sub>           | ISO7240CF                      | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                                           |  | 1                     | 3    | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 7                     | 10.5 |     |      |       |
|                            | ISO7241C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |  | 6.5                   | 11   | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 12                    | 18   |     |      |       |
|                            | ISO7242C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |  | 10                    | 16   | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 15                    | 24   |     |      |       |
| I <sub>CC2</sub>           | ISO7240CF                      | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                                           |  | 15                    | 22   | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 17                    | 25   |     |      |       |
|                            | ISO7241C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |  | 13                    | 20   | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 18                    | 28   |     |      |       |
|                            | ISO7242C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |  | 10                    | 16   | mA  |      |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |  | 15                    | 24   |     |      |       |
| ELECTRICAL CHARACTERISTICS |                                |           |                                                                                                                                  |  |                       |      |     |      |       |
| I <sub>OFF</sub>           | Sleep mode output current      |           | EN at 0 V, Single channel                                                                                                        |  | 0                     |      | μA  |      |       |
| V <sub>OH</sub>            | High-level output voltage      |           | I <sub>OH</sub> = -4 mA                                                                                                          |  | V <sub>CC</sub> - 0.8 |      | V   |      |       |
|                            |                                |           | I <sub>OH</sub> = -20 μA                                                                                                         |  | V <sub>CC</sub> - 0.1 |      |     |      |       |
| V <sub>OL</sub>            | Low-level output voltage       |           | I <sub>OL</sub> = 4 mA                                                                                                           |  | 0.4                   |      | V   |      |       |
|                            |                                |           | I <sub>OL</sub> = 20 μA                                                                                                          |  | 0.1                   |      |     |      |       |
| V <sub>I(HYS)</sub>        | Input voltage hysteresis       |           |                                                                                                                                  |  | 150                   |      | mV  |      |       |
| I <sub>IH</sub>            | High-level input current       |           | IN from 0 V to V <sub>CC</sub>                                                                                                   |  | 10                    |      | μA  |      |       |
| I <sub>IL</sub>            | Low-level input current        |           |                                                                                                                                  |  | -10                   |      |     |      |       |
| C <sub>I</sub>             | Input capacitance to ground    |           | IN at V <sub>CC</sub> , V <sub>I</sub> = 0.4 sin (2πft), f=2MHz                                                                  |  | 2                     |      | pF  |      |       |
| CMTI                       | Common-mode transient immunity |           | V <sub>I</sub> = V <sub>CC</sub> or 0 V;  6-5 |  | 25                    |      | 50  |      | kV/μs |

- (1) For the 5-V operation, V<sub>CC1</sub> or V<sub>CC2</sub> is specified from 4.5 V to 5.5 V.  
For the 3-V operation, V<sub>CC1</sub> or V<sub>CC2</sub> is specified from 3.15 V to 3.6 V.

## 5.10 Electrical Characteristics: $V_{CC1}$ and $V_{CC2}$ at 3.3 V Operation

over recommended operating conditions (unless otherwise noted)<sup>(1)</sup>

| PARAMETER                  |                                |           | TEST CONDITIONS                                                                                                                  | MIN | TYP                   | MAX | UNIT  |
|----------------------------|--------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------|-----|-------|
| SUPPLY CURRENT             |                                |           |                                                                                                                                  |     |                       |     |       |
| I <sub>CC1</sub>           | ISO7240CF                      | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>2</sub> at 3 V                                           |     | 0.5                   | 1.2 | mA    |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 3                     | 5   |       |
|                            | ISO7241C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |     | 4                     | 7   | mA    |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 6.5                   | 11  |       |
|                            | ISO7242C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |     | 6                     | 10  |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 9                     | 14  |       |
| I <sub>CC2</sub>           | ISO7240CF                      | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>2</sub> at 3 V                                           |     | 9.5                   | 15  | mA    |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 10.5                  | 17  |       |
|                            | ISO7241C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |     | 8                     | 13  | mA    |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 11.5                  | 18  |       |
|                            | ISO7242C                       | Quiescent | V <sub>I</sub> = V <sub>CC</sub> or 0 V, all channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V                   |     | 6                     | 10  |       |
|                            |                                | 25 Mbps   |                                                                                                                                  |     | 9                     | 14  |       |
| ELECTRICAL CHARACTERISTICS |                                |           |                                                                                                                                  |     |                       |     |       |
| I <sub>OFF</sub>           | Sleep mode output current      |           | EN at 0 V, single channel                                                                                                        |     | 0                     |     | μA    |
| V <sub>OH</sub>            | High-level output voltage      |           | I <sub>OH</sub> = −4 mA                                                                                                          |     | V <sub>CC</sub> − 0.4 |     | V     |
|                            |                                |           | I <sub>OH</sub> = −20 μA                                                                                                         |     | V <sub>CC</sub> − 0.1 |     |       |
| V <sub>OL</sub>            | Low-level output voltage       |           | I <sub>OL</sub> = 4 mA                                                                                                           |     |                       | 0.4 | V     |
|                            |                                |           | I <sub>OL</sub> = 20 μA                                                                                                          |     |                       | 0.1 |       |
| V <sub>I(HYS)</sub>        | Input voltage hysteresis       |           |                                                                                                                                  |     | 150                   |     | mV    |
| I <sub>IH</sub>            | High-level input current       |           | IN from 0 V or V <sub>CC</sub>                                                                                                   |     |                       | 10  | μA    |
| I <sub>IL</sub>            | Low-level input current        |           |                                                                                                                                  |     | −10                   |     |       |
| C <sub>I</sub>             | Input capacitance to ground    |           | IN at V <sub>CC</sub> , V <sub>I</sub> = 0.4 sin (2πft), f=2MHz                                                                  |     | 2                     |     | pF    |
| CMTI                       | Common-mode transient immunity |           | V <sub>I</sub> = V <sub>CC</sub> or 0 V;  6-5 |     | 25                    | 50  | kV/μs |

- (1) For the 5-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 4.5 V to 5.5 V.  
 For the 3-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 3.15 V to 3.6 V.

## 5.11 Electrical Characteristics: $V_{CC1}$ at 3.3-V, $V_{CC2}$ at 5-V Operation

over recommended operating conditions (unless otherwise noted)<sup>(1)</sup>

| PARAMETER                  |                                |                          | TEST CONDITIONS                                                                                                |                       | MIN | TYP | MAX | UNIT  |
|----------------------------|--------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------|-----|-----|-----|-------|
| SUPPLY CURRENT             |                                |                          |                                                                                                                |                       |     |     |     |       |
| I <sub>CC1</sub>           | ISO7240CF                      | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                         |                       |     | 0.5 | 1.2 | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 3   | 5   |       |
|                            | ISO7241C                       | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       |     | 4   | 7   | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 6.5 | 11  |       |
|                            | ISO7242C                       | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       |     | 6   | 10  | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 9   | 14  |       |
| I <sub>CC2</sub>           | ISO7240CF                      | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                         |                       |     | 15  | 22  | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 17  | 25  |       |
|                            | ISO7241C                       | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       |     | 13  | 20  | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 18  | 28  |       |
|                            | ISO7242C                       | Quiescent                | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       |     | 10  | 16  | mA    |
|                            |                                | 25 Mbps                  |                                                                                                                |                       |     | 15  | 24  |       |
| ELECTRICAL CHARACTERISTICS |                                |                          |                                                                                                                |                       |     |     |     |       |
| I <sub>OFF</sub>           | Sleep mode output current      |                          | EN at 0 V, Single channel                                                                                      |                       |     | 0   |     | μA    |
| V <sub>OH</sub>            | High-level output voltage      | I <sub>OH</sub> = −4 mA  | ISO7240                                                                                                        | V <sub>CC</sub> − 0.4 |     | V   |     |       |
|                            |                                |                          | ISO724x (5-V side)                                                                                             | V <sub>CC</sub> − 0.8 |     |     |     |       |
|                            |                                | I <sub>OH</sub> = −20 μA | V <sub>CC</sub> − 0.1                                                                                          |                       |     |     |     |       |
| V <sub>OL</sub>            | Low-level output voltage       | I <sub>OL</sub> = 4 mA   |                                                                                                                |                       | 0.4 |     | V   |       |
|                            |                                | I <sub>OL</sub> = 20 μA  |                                                                                                                |                       | 0.1 |     |     |       |
| V <sub>I(HYS)</sub>        | Input voltage hysteresis       |                          |                                                                                                                |                       |     | 150 |     | mV    |
| I <sub>IH</sub>            | High-level input current       |                          | IN from 0 V to V <sub>CC</sub>                                                                                 |                       |     | 10  |     | μA    |
| I <sub>IL</sub>            | Low-level input current        |                          |                                                                                                                |                       |     | −10 |     |       |
| C <sub>I</sub>             | Input capacitance to ground    |                          | IN at V <sub>CC</sub> , V <sub>I</sub> = 0.4 sin (2πft), f=2MHz                                                |                       |     | 2   |     | pF    |
| CMTI                       | Common-mode transient immunity |                          | V <sub>I</sub> = V <sub>CC</sub> or 0 V; 6-5                                                                   |                       |     | 25  | 50  | kV/μs |

- (1) For the 5-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 4.5 V to 5.5 V.  
For the 3-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 3.15 V to 3.6 V.

## 5.12 Electrical Characteristics: $V_{CC1}$ at 5-V, $V_{CC2}$ at 3.3-V Operation over recommended operating conditions (unless otherwise noted)<sup>(1)</sup>

| PARAMETER                  |                                |                                                                 | TEST CONDITIONS                                                                                                |                       | MIN  | TYP  | MAX   | UNIT |
|----------------------------|--------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------|------|------|-------|------|
| SUPPLY CURRENT             |                                |                                                                 |                                                                                                                |                       |      |      |       |      |
| I <sub>CC1</sub>           | ISO7240CF                      | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                         |                       | 1    | 3    | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 7    | 10.5 |       |      |
|                            | ISO7241C                       | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       | 6.5  | 11   | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 12   | 18   |       |      |
|                            | ISO7242C                       | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       | 10   | 16   | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 15   | 24   |       |      |
| I <sub>CC2</sub>           | ISO7240CF                      | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>2</sub> at 3 V                         |                       | 9.5  | 15   | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 10.5 | 17   |       |      |
|                            | ISO7241C                       | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       | 8    | 13   | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 11.5 | 18   |       |      |
|                            | ISO7242C                       | Quiescent                                                       | V <sub>I</sub> = V <sub>CC</sub> or 0 V, All channels, no load, EN <sub>1</sub> at 3 V, EN <sub>2</sub> at 3 V |                       | 6    | 10   | mA    |      |
|                            |                                | 25 Mbps                                                         |                                                                                                                |                       | 9    | 14   |       |      |
| ELECTRICAL CHARACTERISTICS |                                |                                                                 |                                                                                                                |                       |      |      |       |      |
| I <sub>OFF</sub>           | Sleep mode output current      | EN at 0 V, Single channel                                       |                                                                                                                |                       | 0    |      | μA    |      |
| V <sub>OH</sub>            | High-level output voltage      | I <sub>OH</sub> = −4 mA                                         | ISO7240                                                                                                        | V <sub>CC</sub> − 0.4 |      | V    |       |      |
|                            |                                |                                                                 | ISO724x (5-V side)                                                                                             | V <sub>CC</sub> − 0.8 |      |      |       |      |
|                            |                                | I <sub>OH</sub> = −20 μA                                        | V <sub>CC</sub> − 0.1                                                                                          |                       |      |      |       |      |
| V <sub>OL</sub>            | Low-level output voltage       | I <sub>OL</sub> = 4 mA                                          |                                                                                                                | 0.4                   |      | V    |       |      |
|                            |                                | I <sub>OL</sub> = 20 μA                                         |                                                                                                                | 0.1                   |      |      |       |      |
| V <sub>I(HYS)</sub>        | Input voltage hysteresis       |                                                                 |                                                                                                                |                       | 150  |      | mV    |      |
| I <sub>IH</sub>            | High-level input current       | IN from 0 V to V <sub>CC</sub>                                  |                                                                                                                |                       | 10   |      | μA    |      |
| I <sub>IL</sub>            | Low-level input current        |                                                                 |                                                                                                                |                       | −10  |      |       |      |
| C <sub>I</sub>             | Input capacitance to ground    | IN at V <sub>CC</sub> , V <sub>I</sub> = 0.4 sin (2πft), f=2MHz |                                                                                                                |                       | 2    |      | pF    |      |
| CMTI                       | Common-mode transient immunity | V <sub>I</sub> = V <sub>CC</sub> or 0 V; 6-5                    |                                                                                                                |                       | 25   | 50   | kV/μs |      |

- (1) For the 5-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 4.5 V to 5.5 V.  
For the 3-V operation,  $V_{CC1}$  or  $V_{CC2}$  is specified from 3.15 V to 3.6 V.

### 5.13 Switching Characteristics: $V_{CC1}$ and $V_{CC2}$ at 3.3-V Operation

over recommended operating conditions (unless otherwise noted)

| PARAMETER             |                                                        | TEST CONDITIONS         | MIN | TYP | MAX | UNIT    |
|-----------------------|--------------------------------------------------------|-------------------------|-----|-----|-----|---------|
| $t_{PLH}$ , $t_{PHL}$ | Propagation delay                                      | See <a href="#">6-1</a> | 25  |     | 56  | ns      |
| PWD                   | Pulse-width distortion $ t_{PHL} - t_{PLH} ^{(1)}$     |                         |     |     | 4   |         |
| $t_{sk(pp)}$          | Part-to-part skew <sup>(2)</sup>                       |                         |     |     | 10  | ns      |
| $t_{sk(o)}$           | Channel-to-channel output skew <sup>(3)</sup>          | ISO7240C, ISO7241C      |     |     | 3.5 | ns      |
|                       |                                                        | ISO7242C                |     |     | 4   |         |
| $t_r$                 | Output signal rise time                                | See <a href="#">6-1</a> |     | 2   |     | ns      |
| $t_f$                 | Output signal fall time                                |                         |     | 2   |     | ns      |
| $t_{PHZ}$             | Propagation delay, high-level-to-high-impedance output | See <a href="#">6-2</a> |     | 15  | 25  | ns      |
| $t_{PZH}$             | Propagation delay, high-impedance-to-high-level output |                         |     | 15  | 25  |         |
| $t_{PLZ}$             | Propagation delay, low-level-to-high-impedance output  |                         |     | 15  | 25  |         |
| $t_{PZL}$             | Propagation delay, high-impedance-to-low-level output  |                         |     | 15  | 25  |         |
| $t_{fs}$              | Failsafe output delay time from input power loss       | See <a href="#">6-3</a> |     | 18  |     | $\mu$ s |
| $t_{wake}$            | Wake time from input disable                           | See <a href="#">6-4</a> |     | 15  |     | $\mu$ s |

(1) Also referred to as pulse skew.

(2)  $t_{sk(pp)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.

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

### 5.14 Switching Characteristics: $V_{CC1}$ and $V_{CC2}$ at 5-V Operation

over recommended operating conditions (unless otherwise noted)

| PARAMETER             |                                                             | TEST CONDITIONS         | MIN | TYP | MAX | UNIT    |
|-----------------------|-------------------------------------------------------------|-------------------------|-----|-----|-----|---------|
| $t_{PLH}$ , $t_{PHL}$ | Propagation delay                                           | See <a href="#">6-1</a> | 18  |     | 45  | ns      |
| PWD                   | Pulse-width distortion <sup>(1)</sup> $ t_{PHL} - t_{PLH} $ |                         |     |     | 5   |         |
| $t_{sk(pp)}$          | Part-to-part skew <sup>(2)</sup>                            |                         |     |     | 8   | ns      |
| $t_{sk(o)}$           | Channel-to-channel output skew <sup>(3)</sup>               | ISO7240C, ISO7241C      |     |     | 3   | ns      |
|                       |                                                             | ISO7242C                |     |     | 4   |         |
| $t_r$                 | Output signal rise time                                     | See <a href="#">6-1</a> |     | 2.4 |     | ns      |
| $t_f$                 | Output signal fall time                                     |                         |     | 2.3 |     |         |
| $t_{PHZ}$             | Propagation delay, high-level-to-high-impedance output      | See <a href="#">6-2</a> |     | 15  | 25  | ns      |
| $t_{PZH}$             | Propagation delay, high-impedance-to-high-level output      |                         |     | 15  | 25  |         |
| $t_{PLZ}$             | Propagation delay, low-level-to-high-impedance output       |                         |     | 15  | 25  |         |
| $t_{PZL}$             | Propagation delay, high-impedance-to-low-level output       |                         |     | 15  | 25  |         |
| $t_{fs}$              | Failsafe output delay time from input power loss            | See <a href="#">6-3</a> |     | 12  |     | $\mu$ s |
| $t_{wake}$            | Wake time from input disable                                | See <a href="#">6-4</a> |     | 15  |     | $\mu$ s |

(1) Also referred to as pulse skew.

(2)  $t_{sk(pp)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.

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

## 5.15 Switching Characteristics: $V_{CC1}$ at 3.3-V and $V_{CC2}$ at 5-V Operation

over recommended operating conditions (unless otherwise noted)

| PARAMETER             |                                                             | TEST CONDITIONS         |                       | MIN | TYP | MAX | UNIT    |
|-----------------------|-------------------------------------------------------------|-------------------------|-----------------------|-----|-----|-----|---------|
| $t_{PLH}$ , $t_{PHL}$ | Propagation delay                                           | See <a href="#">6-1</a> |                       | 20  |     | 51  | ns      |
| PWD                   | Pulse-width distortion <sup>(1)</sup> $ t_{PHL} - t_{PLH} $ | See <a href="#">6-1</a> | ISO7240C,<br>ISO7241C |     |     | 3   |         |
|                       |                                                             |                         | ISO7242C              |     |     | 4   |         |
| $t_{sk(pp)}$          | Part-to-part skew <sup>(2)</sup>                            |                         |                       |     |     | 10  | ns      |
| $t_{sk(o)}$           | Channel-to-channel output skew <sup>(3)</sup>               | ISO7240C, ISO7241C      |                       |     |     | 3   | ns      |
|                       |                                                             | ISO7242C                |                       |     |     | 4   |         |
| $t_r$                 | Output signal rise time                                     | See <a href="#">6-1</a> |                       |     | 2.4 |     | ns      |
| $t_f$                 | Output signal fall time                                     |                         |                       |     | 2.3 |     |         |
| $t_{PHZ}$             | Propagation delay, high-level-to-high-impedance output      | See <a href="#">6-2</a> |                       |     | 15  | 25  | ns      |
| $t_{PZH}$             | Propagation delay, high-impedance-to-high-level output      |                         |                       |     | 15  | 25  |         |
| $t_{PLZ}$             | Propagation delay, low-level-to-high-impedance output       |                         |                       |     | 15  | 25  |         |
| $t_{PZL}$             | Propagation delay, high-impedance-to-low-level output       |                         |                       |     | 15  | 25  |         |
| $t_{fs}$              | Failsafe output delay time from input power loss            | See <a href="#">6-3</a> |                       |     | 12  |     | $\mu$ s |
| $t_{wake}$            | Wake time from input disable                                | See <a href="#">6-4</a> |                       |     | 15  |     | $\mu$ s |

- (1) Also known as pulse skew  
(2)  $t_{sk(pp)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.  
(3)  $t_{sk(o)}$  is the skew between specified outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical specified loads.

## 5.16 Switching Characteristics: $V_{CC1}$ at 5-V, $V_{CC2}$ at 3.3-V Operation

over recommended operating conditions (unless otherwise noted)

| PARAMETER             |                                                        | TEST CONDITIONS         |                    | MIN | TYP | MAX | UNIT    |
|-----------------------|--------------------------------------------------------|-------------------------|--------------------|-----|-----|-----|---------|
| $t_{PLH}$ , $t_{PHL}$ | Propagation delay                                      | See <a href="#">6-1</a> |                    | 20  |     | 50  | ns      |
| PWD <sup>(1)</sup>    | See <a href="#">6-1</a>                                |                         | ISO7240C, ISO7241C |     |     | 3   |         |
|                       |                                                        |                         | ISO7242C           |     |     | 4   |         |
| PWD                   | See <a href="#">6-1</a>                                |                         |                    |     |     | 3   | ns      |
| $t_{sk(pp)}$          | Part-to-part skew <sup>(2)</sup>                       |                         |                    |     |     | 10  | ns      |
| $t_r$                 | Output signal rise time                                | See <a href="#">6-1</a> |                    |     | 2.4 |     | ns      |
| $t_f$                 | Output signal fall time                                |                         |                    |     | 2.3 |     |         |
| $t_{PHZ}$             | Propagation delay, high-level-to-high-impedance output | See <a href="#">6-2</a> |                    |     | 15  | 25  | ns      |
| $t_{PZH}$             | Propagation delay, high-impedance-to-high-level output |                         |                    |     | 15  | 25  |         |
| $t_{PLZ}$             | Propagation delay, low-level-to-high-impedance output  |                         |                    |     | 15  | 25  |         |
| $t_{PZL}$             | Propagation delay, high-impedance-to-low-level output  |                         |                    |     | 15  | 25  |         |
| $t_{fs}$              | Failsafe output delay time from input power loss       | See <a href="#">6-3</a> |                    |     | 18  |     | $\mu$ s |
| $t_{wake}$            | Wake time from input disable                           | See <a href="#">6-4</a> |                    |     | 15  |     | $\mu$ s |

- (1) Also known as pulse skew  
(2)  $t_{sk(pp)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.

## 5.17 Insulation Characteristics Curves

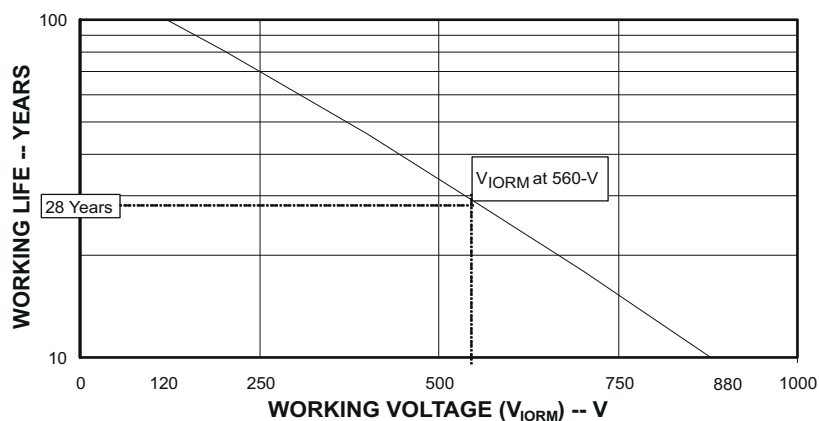


図 5-1. Time Dependent Dielectric Breakdown Testing Results

## 5.18 Typical Characteristic

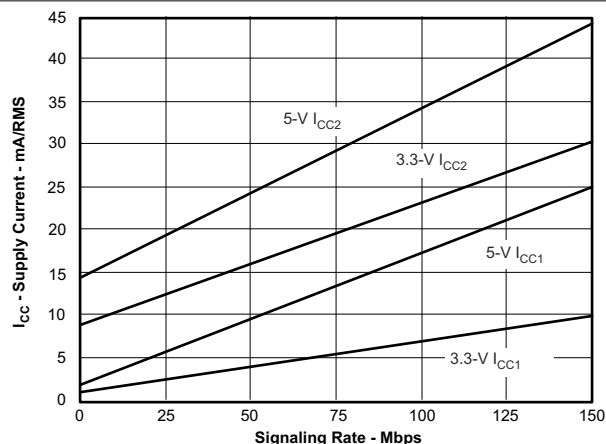


Figure 5-2. ISO7240C RMS Supply Current vs Signaling Rate

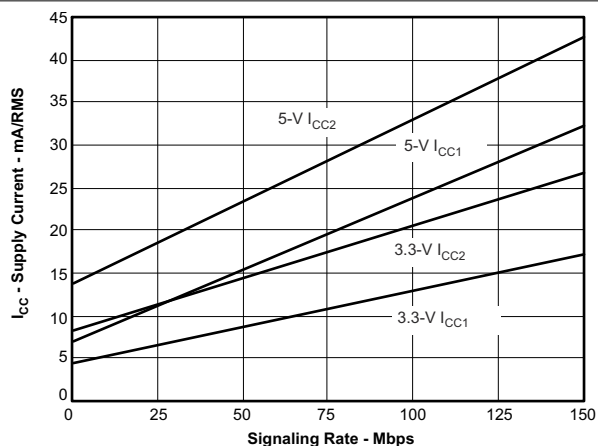


Figure 5-3. ISO7241C RMS Supply Current vs Signaling Rate

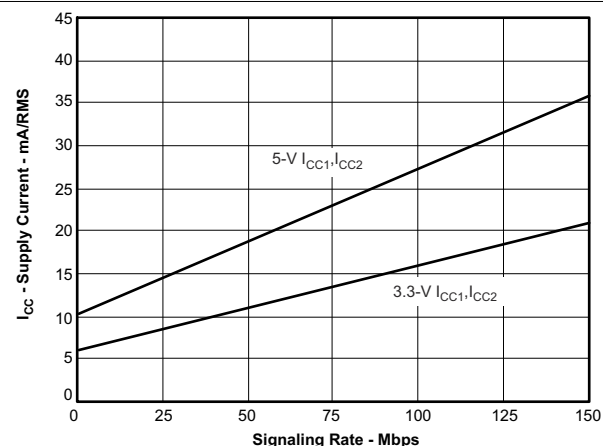


Figure 5-4. ISO7242C RMS Supply Current vs Signaling Rate

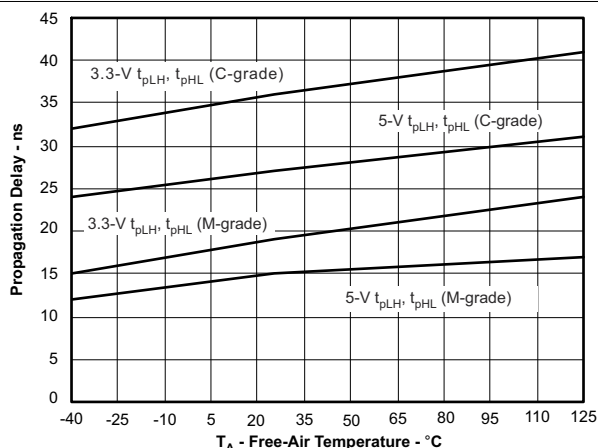


Figure 5-5. Propagation Delay vs Free-Air Temperature

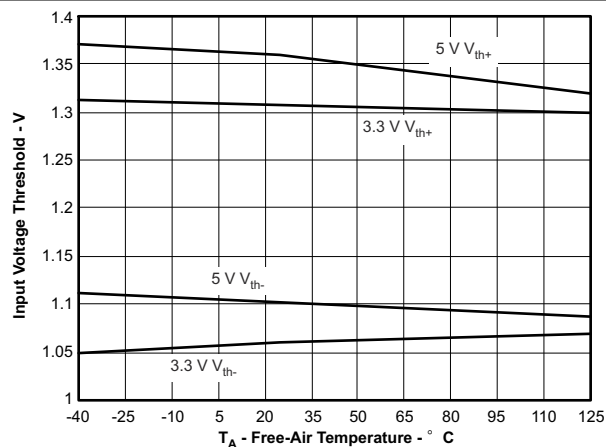


Figure 5-6. Input Voltage Threshold vs Free-Air Temperature

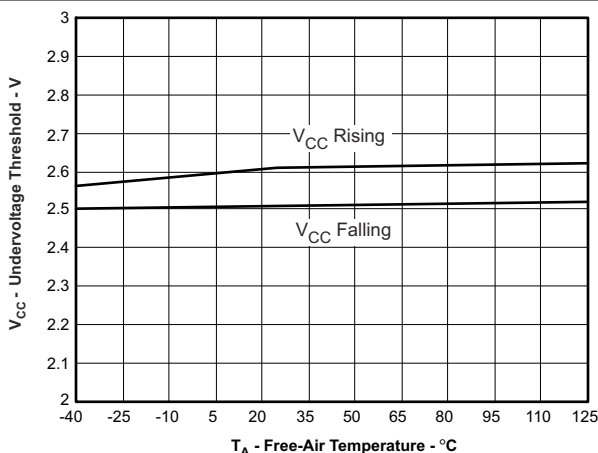


Figure 5-7.  $V_{CC1}$  Failsafe Threshold vs Free-Air Temperature

## 5.18 Typical Characteristic (continued)

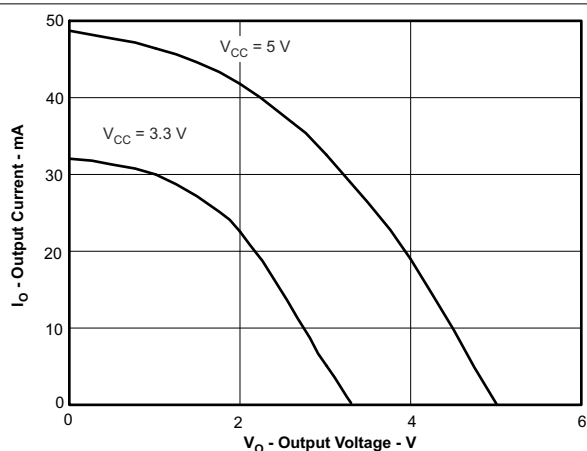


図 5-8. High-Level Output Current vs High-Level Output Voltage

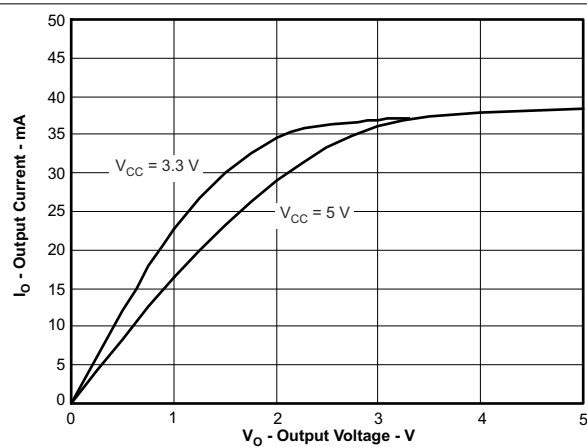
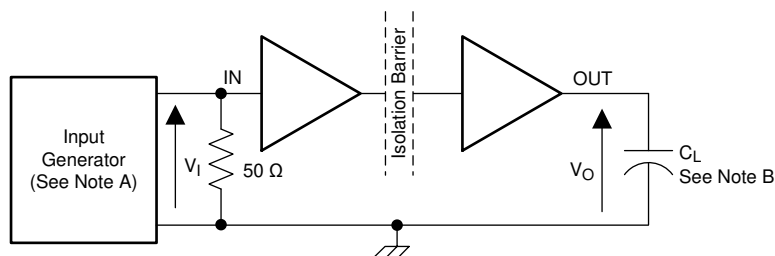


図 5-9. Low-Level Output Current vs Low-Level Output Voltage

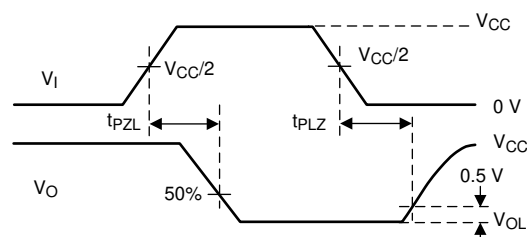
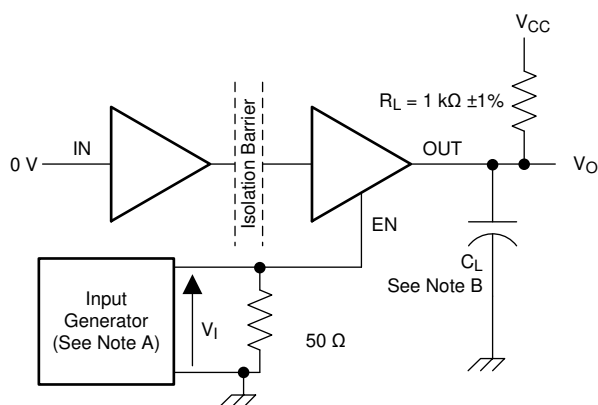
## 6 Parameter Measurement Information



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

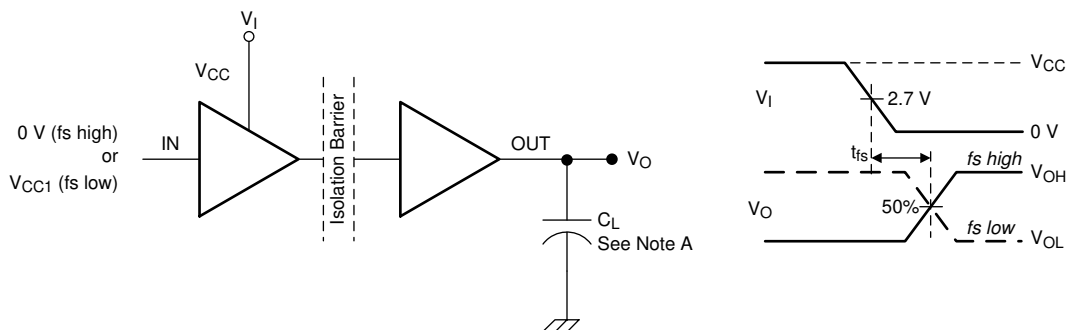
**6-1. Switching Characteristic Test Circuit and Voltage Waveforms**



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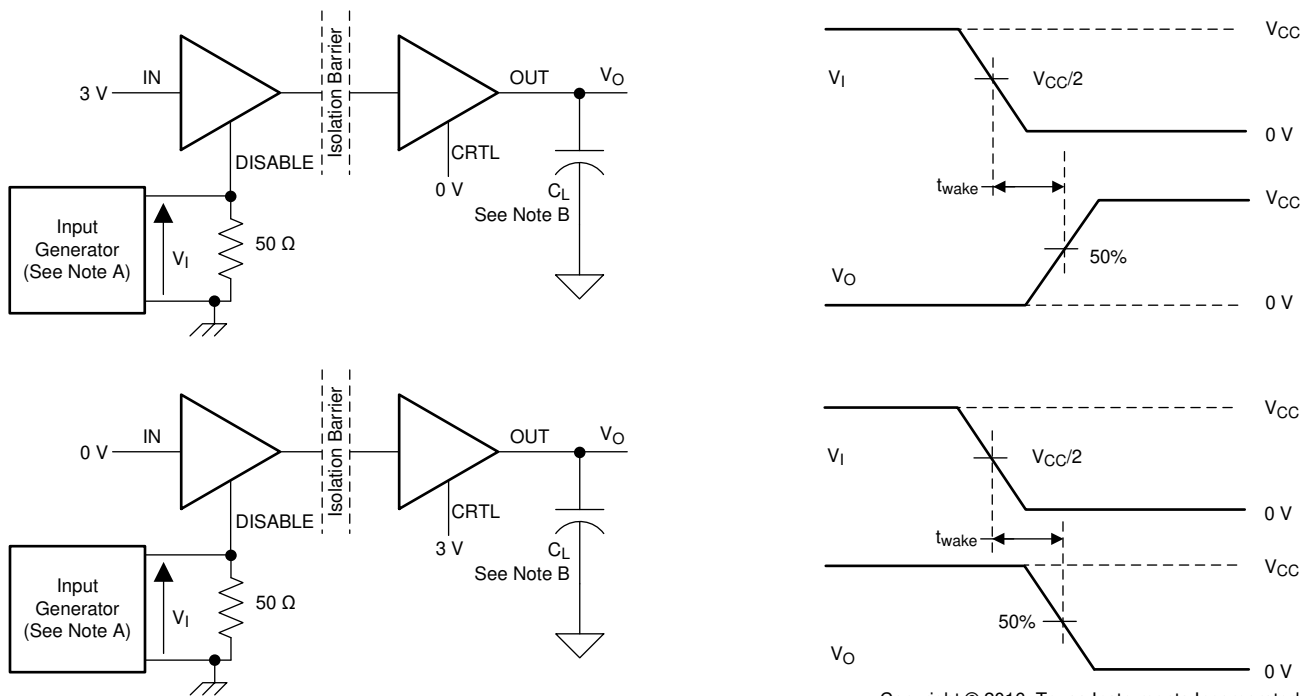
- A. The input pulse is supplied by a generator having the following characteristics: PRR  $\leq 50\text{ kHz}$ , 50% duty cycle,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ ,  $Z_O = 50\ \Omega$ .
- B.  $C_L = 15\text{ pF}$  and includes instrumentation and fixture capacitance within  $\pm 20\%$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

**6-2. Enable or Disable Propagation-Delay Time Test Circuit and Waveform**



A.  $C_L = 15$  pF and includes instrumentation and fixture capacitance within  $\pm 20\%$ .

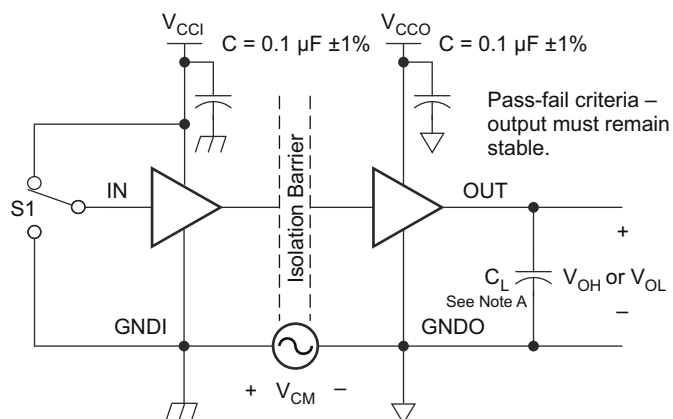
**6-3. Failsafe Delay Time Test Circuit and Voltage Waveforms**



The test that yields the longest time is used in this data sheet.

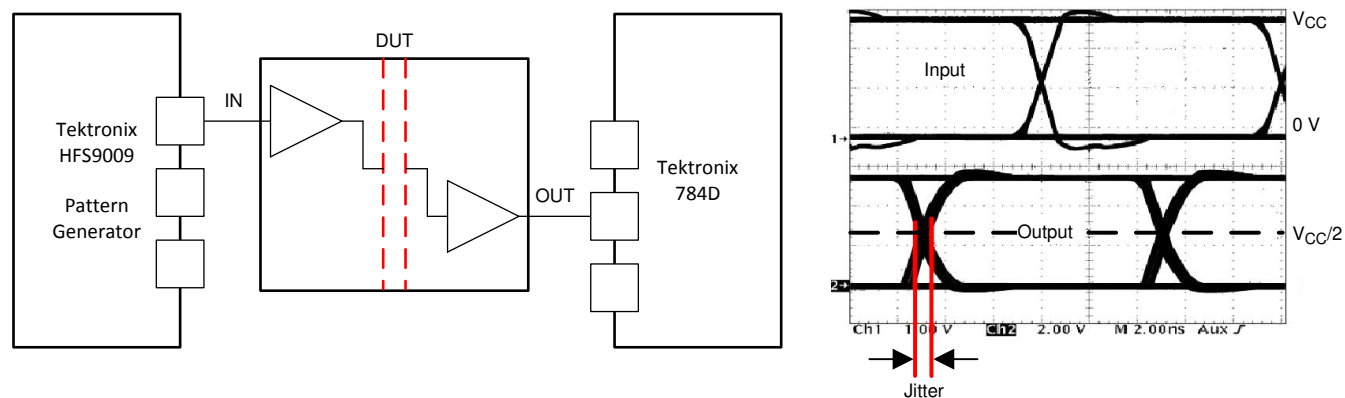
- A. The input pulse is supplied by a generator having the following characteristics:  $PRR \leq 50$  kHz, 50% duty cycle,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns,  $Z_O = 50\Omega$ .
- B.  $C_L = 15$  pF and includes instrumentation and fixture capacitance within  $\pm 20\%$ .

**6-4. Wake Time From Input Disable Test Circuit and Voltage Waveforms**



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

**6-5. Common-Mode Transient Immunity Test Circuit and Voltage Waveform**



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PRBS bit pattern run length is  $2^{16} - 1$ . Transition time is 800 ps. NRZ data input has no more than five consecutive 1s or 0s.

**6-6. Peak-to-Peak Eye-Pattern Jitter Test Circuit and Voltage Waveform**

## 7 Detailed Description

### 7.1 Overview

The ISO724x-Q1 family of devices transmit digital data across a silicon dioxide based isolation barrier. The digital input signal (IN) of the device is sampled by a transmitter and at every data edge the transmitter sends a corresponding differential signal across the isolation barrier. When the input signal is static, the refresh logic periodically sends the necessary differential signal from the transmitter. On the other side of the isolation barrier, the receiver converts the differential signal into a single-ended signal which is output on the OUT pin through a buffer. If the receiver does not receive a data or refresh signal, the timeout logic detects the loss of signal or power from the input side and drives the output to the default level.

### 7.2 Functional Block Diagram

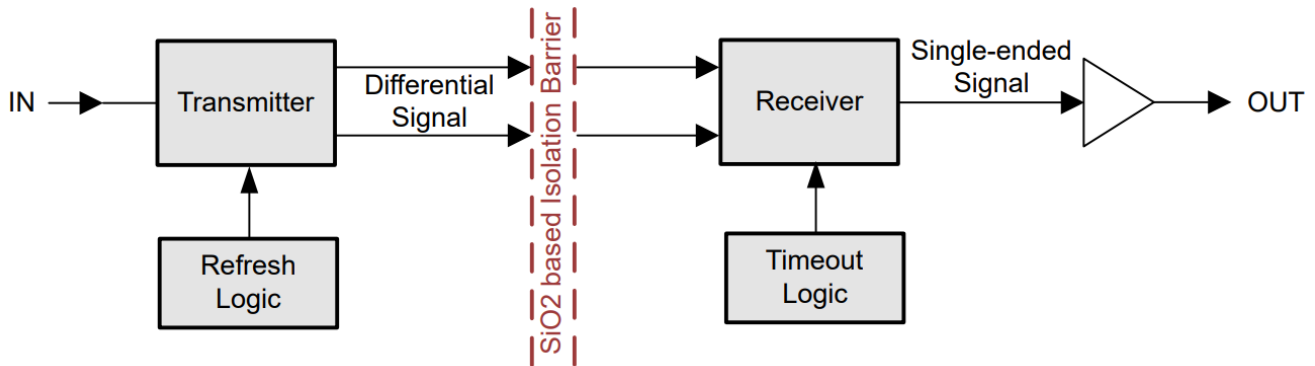


図 7-1. Conceptual Block Diagram of a Digital Isolator

## 7.3 Feature Description

The ISO724x-Q1 family of devices is available in multiple channel configurations and default output-state options to enable wide variety of application uses. 表 7-1 lists these device features.

表 7-1. Device Features

| PRODUCT <sup>(1)</sup> | SIGNALING RATE | INPUT THRESHOLD | CHANNEL CONFIGURATION |
|------------------------|----------------|-----------------|-----------------------|
| ISO7240CF              | 25 Mbps        | ≈1.5 V (TTL)    | 4/0                   |
| ISO7241C               | 25 Mbps        | ≈1.5 V (TTL)    | 3/1                   |
| ISO7242C               | 25 Mbps        | ≈1.5 V (TTL)    | 2/2                   |

(1) For the most current package and ordering information, see the セクション 11 section, or see the TI website at [www.ti.com](http://www.ti.com).

## 7.4 Device Functional Modes

List of ISO724x-Q1 functional modes.

表 7-2. Device Function Table ISO724x-Q1

| INPUT V <sub>CC</sub> | OUTPUT V <sub>CC</sub> | INPUT (IN) | OUTPUT ENABLE (EN) | OUTPUT (OUT) |
|-----------------------|------------------------|------------|--------------------|--------------|
| PU                    | PU                     | H          | H or Open          | H            |
|                       |                        | L          | H or Open          | L            |
|                       |                        | X          | L                  | Z            |
|                       |                        | Open       | H or Open          | H            |
| PD                    | PU                     | X          | H or Open          | H            |
| PD                    | PU                     | X          | L                  | Z            |
| X                     | PD                     | X          | X                  | Undetermined |

### 7.4.1 Device I/O Schematics

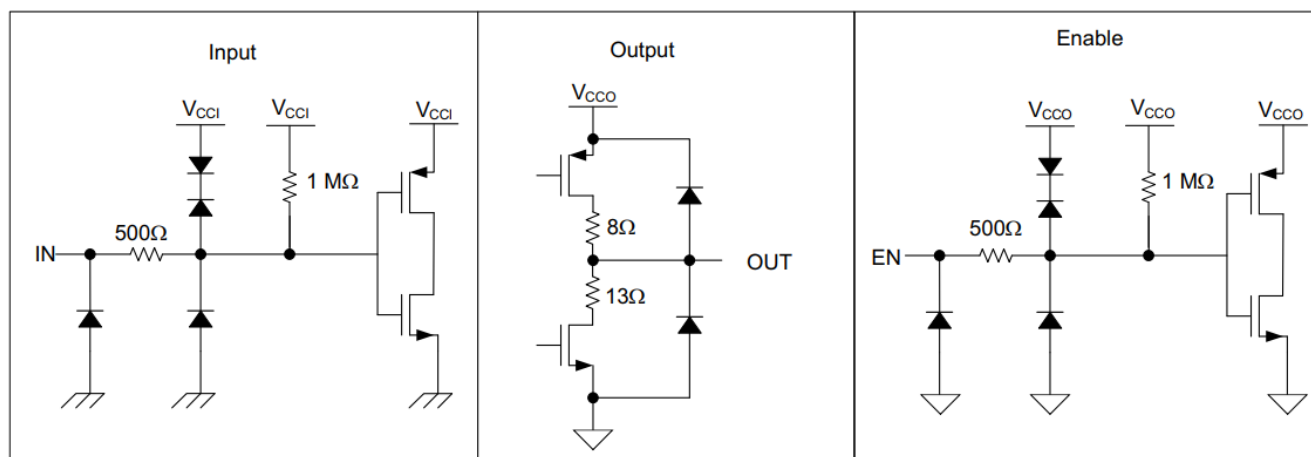


図 7-2. Device I/O Schematics

## 8 Application and Implementation

### 注

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, as well as validating and testing their design implementation to confirm system functionality.

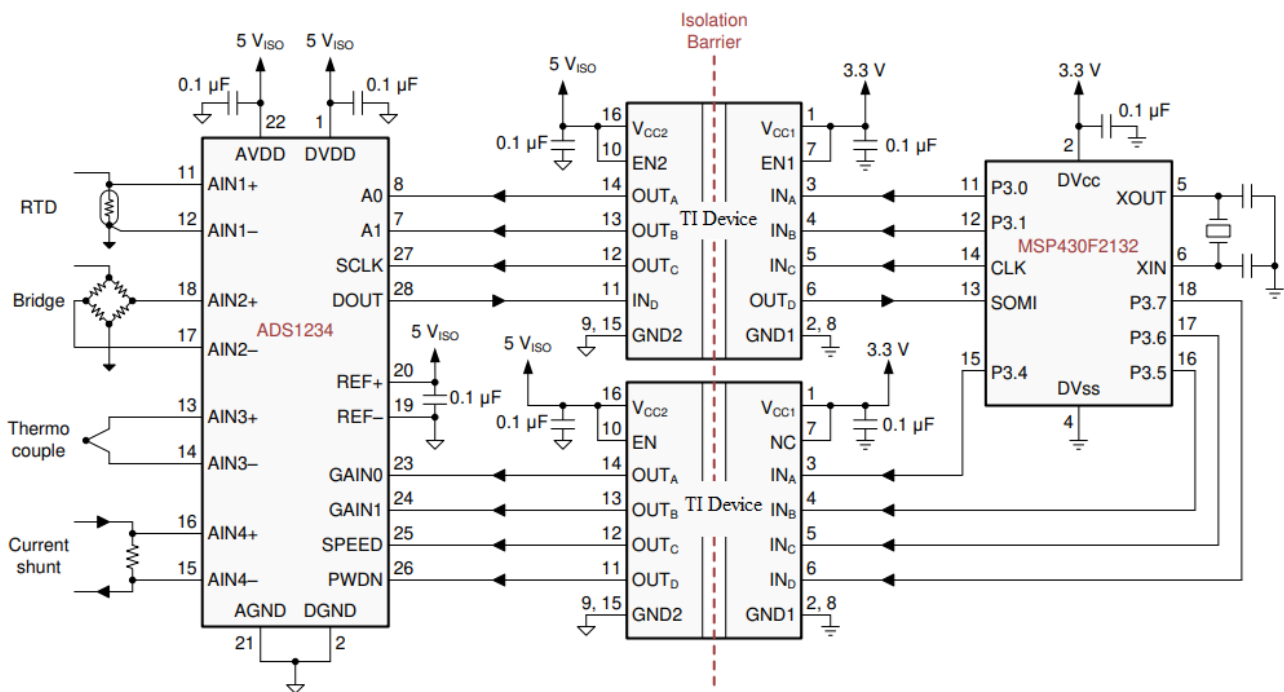
### 8.1 Application Information

The ISO724x-Q1 family of devices uses a single-ended TTL or CMOS-logic switching technology. The supply voltage range is from 3.15 V to 5.5 V for both supplies,  $V_{CC1}$  and  $V_{CC2}$ . When designing with digital isolators, keep in mind that because of 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,  $\mu$ C or UART), and a data converter or a line transceiver, regardless of the interface type or standard.

### 8.2 Typical Application

#### 8.2.1 Isolated Data Acquisition System for Process Control

The ISO724x-Q1 family of devices can be used with Texas Instruments' precision analog-to-digital converter and mixed signal microcontroller to create an advanced isolated data acquisition system as shown in 図 8-1.



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図 8-1. Isolated Data Acquisition System for Process Control

#### 8.2.1.1 Design Requirements

Unlike optocouplers, which require external components to improve performance, provide bias, or limit current, the ISO724x-Q1 family of devices only require two external bypass capacitors to operate.

### 8.2.1.2 Detailed Design Procedure

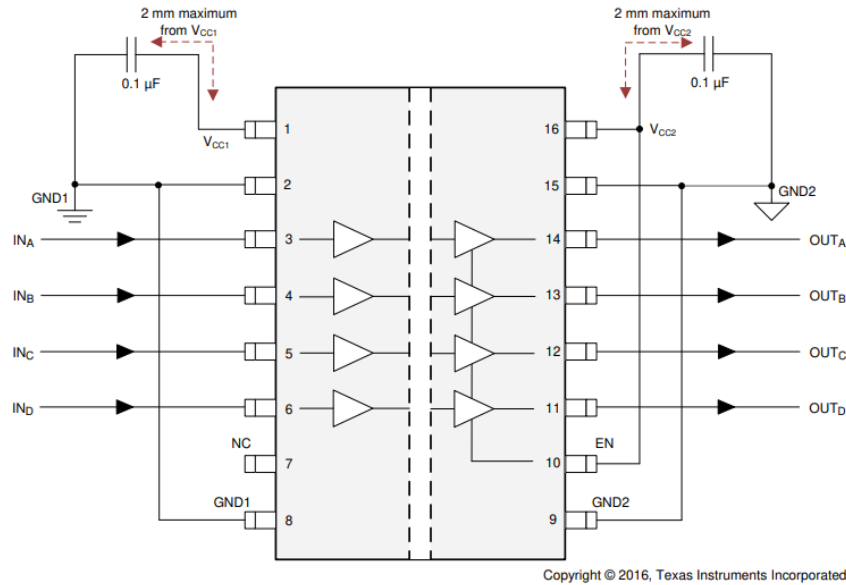


図 8-2. ISO7240x-Q1 Typical Circuit Hook-Up

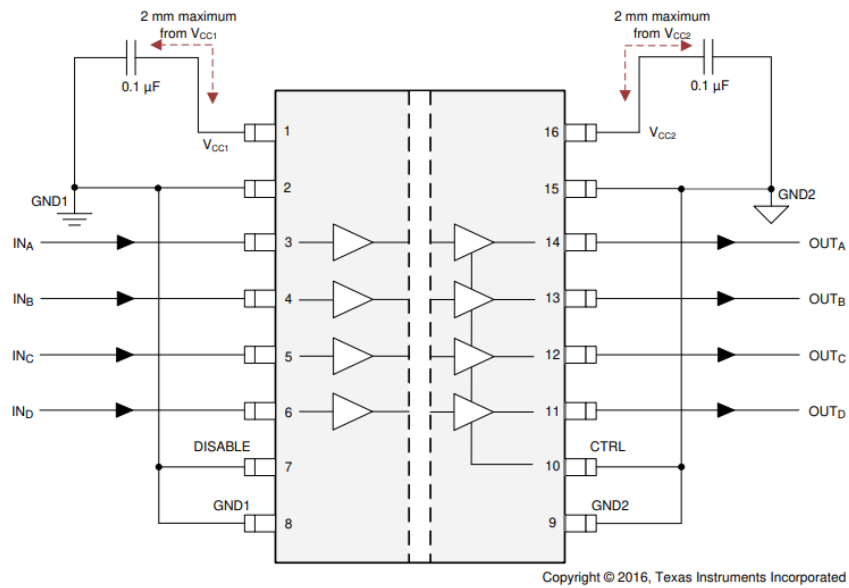
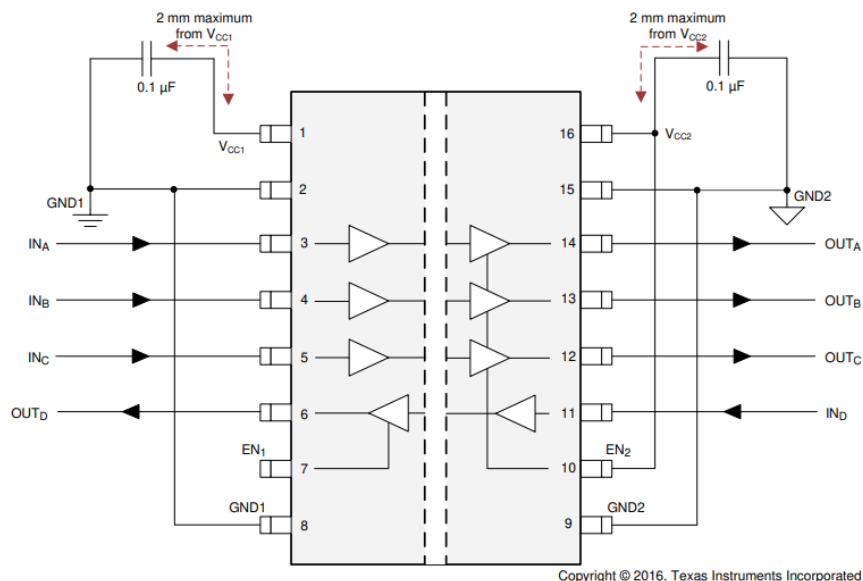
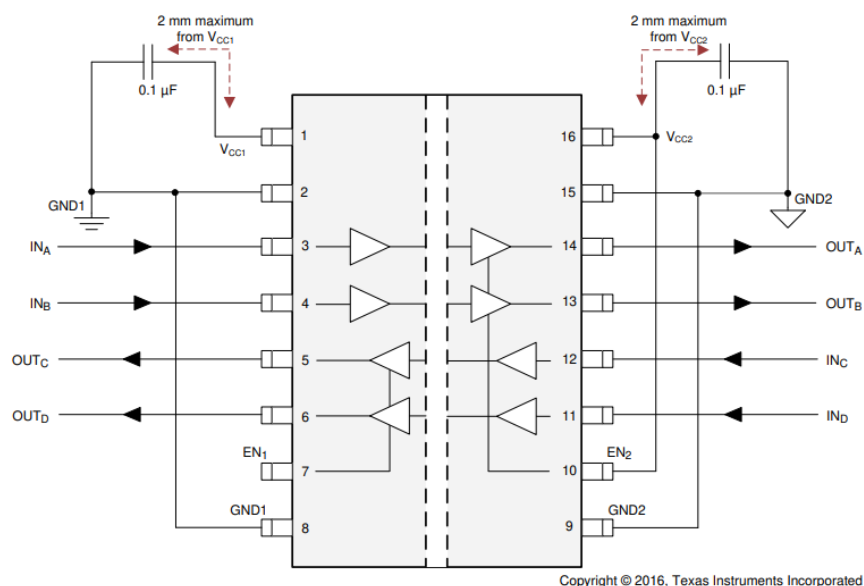


図 8-3. ISO7240CF-Q1 Typical Circuit Hook-Up



**図 8-4. ISO7241x-Q1 Typical Circuit Hook-Up**



**図 8-5. ISO7242x-Q1 Typical Circuit Hook-Up**

### 8.2.2 Isolated SPI for an Analog Input Module with 16 Inputs

The ISO7241x-Q1 family of devices and several other components from Texas Instruments can be used to create an isolated SPI for an input module with 16 inputs.

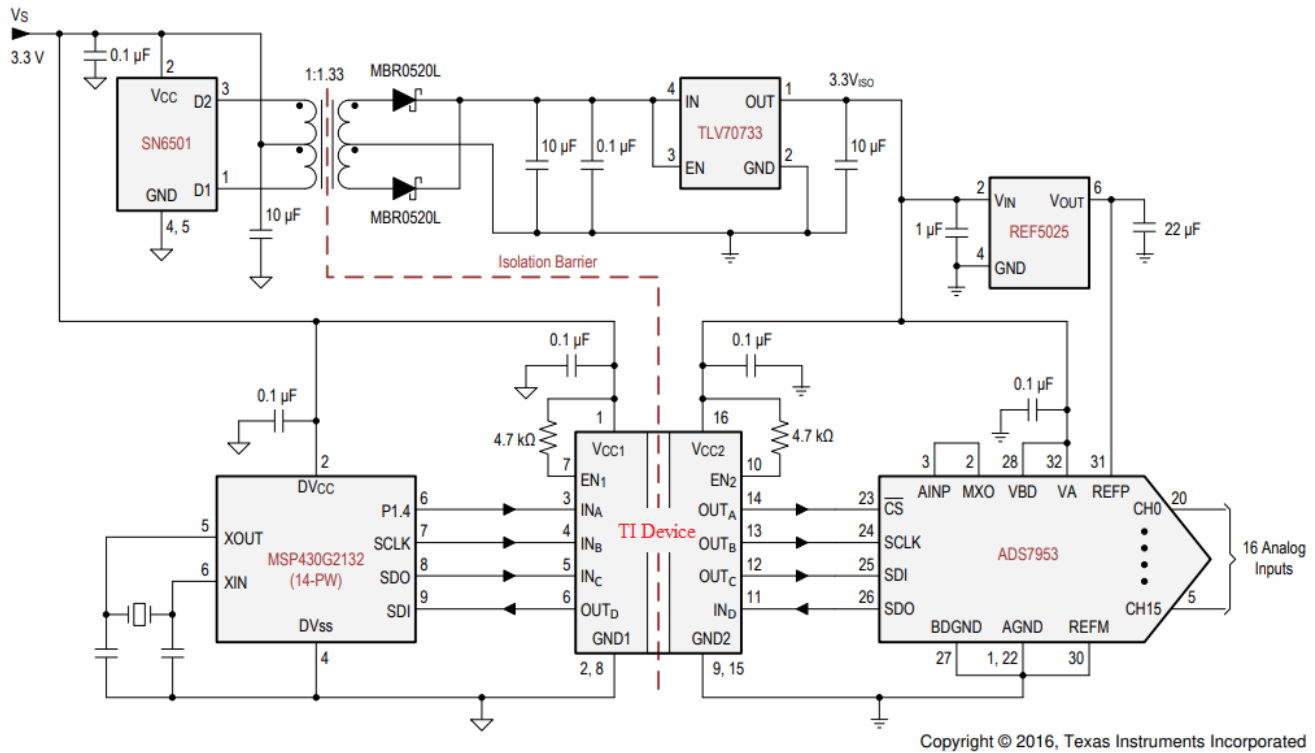


図 8-6. Isolated SPI for an Analog Input Module With 16 Inputs

### 8.2.2.1 Design Requirements

See the [Design Requirements](#) in セクション 8.2.1.

### 8.2.2.2 Detailed Design Procedure

See the [Detailed Design Procedure](#) in セクション 8.2.1.

### 8.2.3 Isolated RS-232 Interface

図 8-7 shows a typical isolated RS-232 interface implementation.



- Routing the high-speed traces on the top layer avoids the use of vias (and the introduction of the 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/in<sup>2</sup>.
- Routing the slower speed control signals on the bottom layer allows for greater flexibility as these signal links typically have margin to tolerate discontinuities such as vias.

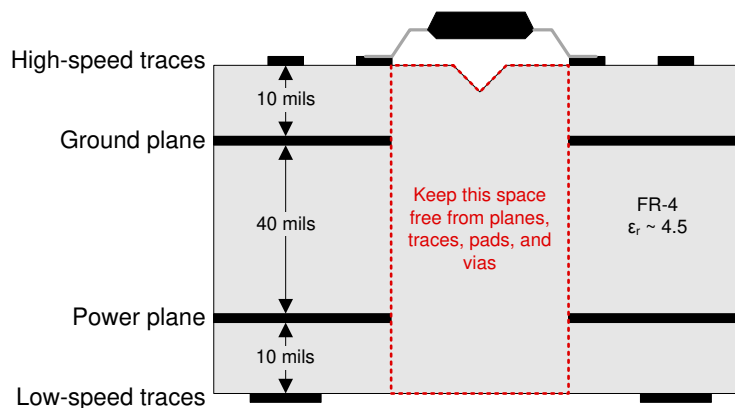
If an additional supply voltage plane or signal layer is needed, add a second power or ground plane system to the stack to keep the planes symmetrical. This makes the stack mechanically stable and prevents warping. Also the power and ground plane of each power system can be placed closer together, thus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

For detailed layout recommendations, refer to [Digital Isolator Design Guide](#).

#### 8.4.1.1 PCB Material

For digital circuit boards operating at less than 150 Mbps, (or rise and fall times greater than 1 ns), and trace lengths of up to 10 inches, use standard FR-4 UL94V-0 printed circuit board. This PCB is preferred over cheaper alternatives because of lower dielectric losses at high frequencies, less moisture absorption, greater strength and stiffness, and the self-extinguishing flammability-characteristics.

#### 8.4.2 Layout Example



✎ 8-8. Recommended Layer Stack

## 9 Device and Documentation Support

### 9.1 Documentation Support

#### 9.1.1 Related Documentation

For related documentation, see the following:

- [Digital Isolator Design Guide](#)
- [Isolation Glossary](#)

### 9.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、[www.tij.co.jp](http://www.tij.co.jp) のデバイス製品フォルダを開いてください。[通知] をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取ることができます。変更の詳細については、改訂されたドキュメントに含まれている改訂履歴をご覧ください。

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### 9.6 用語集

[テキサス・インスツルメンツ用語集](#) この用語集には、用語や略語の一覧および定義が記載されています。

## 10 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

### Changes from Revision B (November 2024) to Revision C (February 2025) Page

- |                                      |   |
|--------------------------------------|---|
| • ドキュメント全体にわたって表、図、相互参照の採番方法を更新..... | 1 |
|--------------------------------------|---|

### Changes from Revision A (September 2011) to Revision B (November 2024) Page

- |                                                                                                                                                        |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| • ドキュメント全体を通して容量性絶縁から絶縁バリアに参照を更新.....                                                                                                                  | 1 |
| • ドキュメント全体で VDE V 0884-11 を DIN VDE 0884-17 に更新.....                                                                                                   | 1 |
| • ドキュメント全体にわたって表、図、相互参照の採番方法を更新.....                                                                                                                   | 1 |
| • Updated Thermal Characteristics, Safety Limiting Values, and Thermal Derating Curves to provide more accurate system-level thermal calculations..... | 5 |

- Updated electrical and switching characteristics to match device performance.....7
  - Added the *Detailed Description*, *Overview*, *Feature Description*, *Functional Block Diagram*, and *Device Functional Modes* sections..... 19
  - Added the *Typical Application*, *Power Supply Recommendations*, and *Layout* sections..... 21
- 

## 11 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.

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## PACKAGING INFORMATION

| Orderable part number           | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|---------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">ISO7240CFQDWRQ1</a> | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7240CFQ          |
| ISO7240CFQDWRQ1.A               | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7240CFQ          |
| ISO7240CFQDWRQ1.B               | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7240CFQ          |
| <a href="#">ISO7241CQDWRQ1</a>  | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7241CQ           |
| ISO7241CQDWRQ1.A                | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7241CQ           |
| ISO7241CQDWRQ1.B                | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7241CQ           |
| <a href="#">ISO7242CQDWRQ1</a>  | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7242CQ           |
| ISO7242CQDWRQ1.A                | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7242CQ           |
| ISO7242CQDWRQ1.B                | Active        | Production           | SOIC (DW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-3-260C-168 HR               | -40 to 125   | ISO7242CQ           |

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

<sup>(2)</sup> **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.

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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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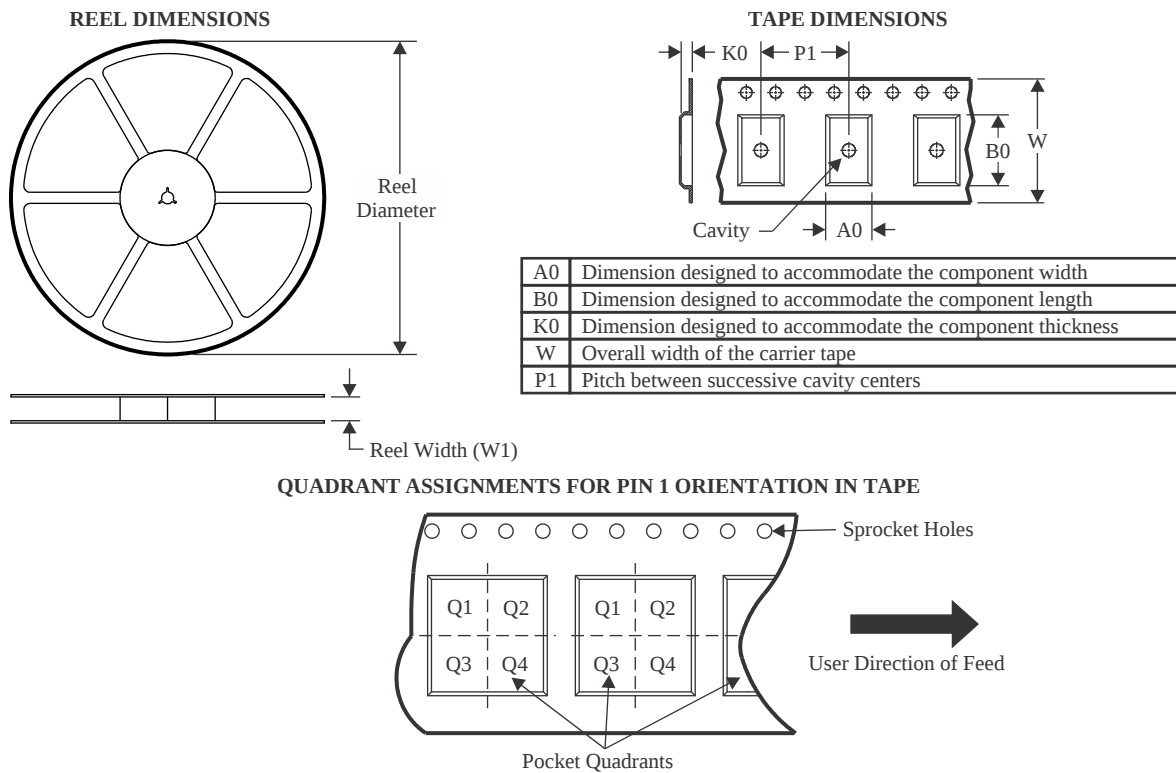
**OTHER QUALIFIED VERSIONS OF ISO7240CF-Q1, ISO7241C-Q1, ISO7242C-Q1 :**

- Catalog : [ISO7240CF](#), [ISO7241C](#), [ISO7242C](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

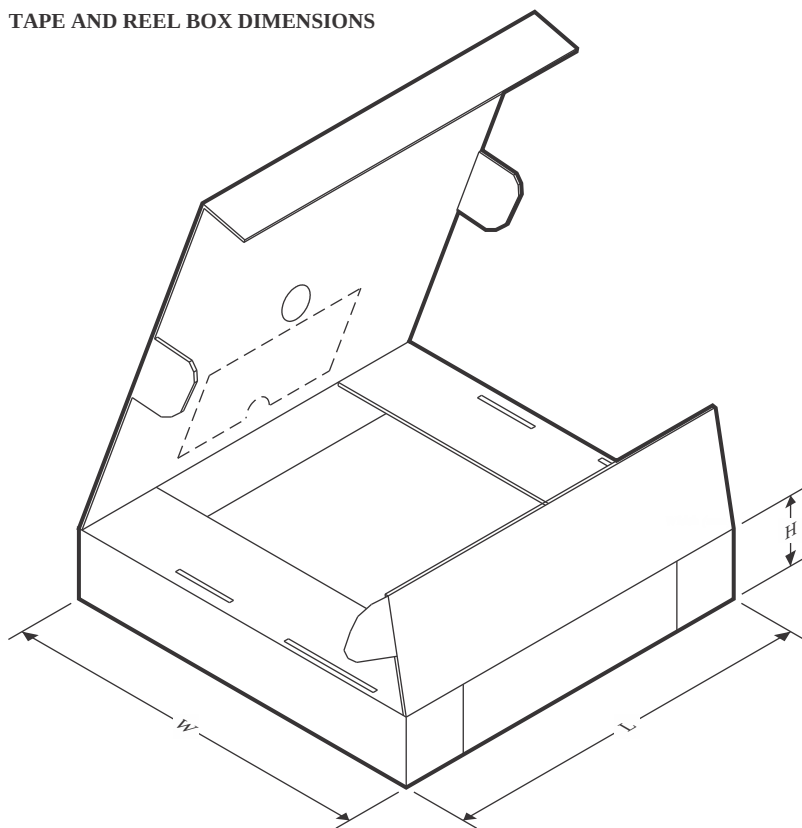
## TAPE AND REEL INFORMATION



\*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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| ISO7240CFQDWRQ1 | SOIC         | DW              | 16   | 2000 | 330.0              | 16.4               | 10.75   | 10.7    | 2.7     | 12.0    | 16.0   | Q1            |
| ISO7241CQDWRQ1  | SOIC         | DW              | 16   | 2000 | 330.0              | 16.4               | 10.75   | 10.7    | 2.7     | 12.0    | 16.0   | Q1            |
| ISO7242CQDWRQ1  | 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) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| ISO7240CFQDWRQ1 | SOIC         | DW              | 16   | 2000 | 350.0       | 350.0      | 43.0        |
| ISO7241CQDWRQ1  | SOIC         | DW              | 16   | 2000 | 350.0       | 350.0      | 43.0        |
| ISO7242CQDWRQ1  | SOIC         | DW              | 16   | 2000 | 350.0       | 350.0      | 43.0        |

## GENERIC PACKAGE VIEW

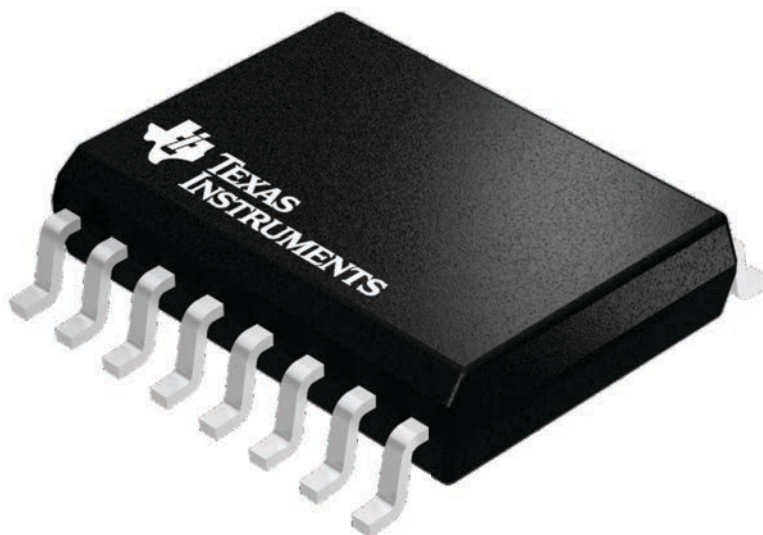
**DW 16**

**SOIC - 2.65 mm max height**

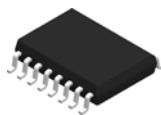
7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4224780/A

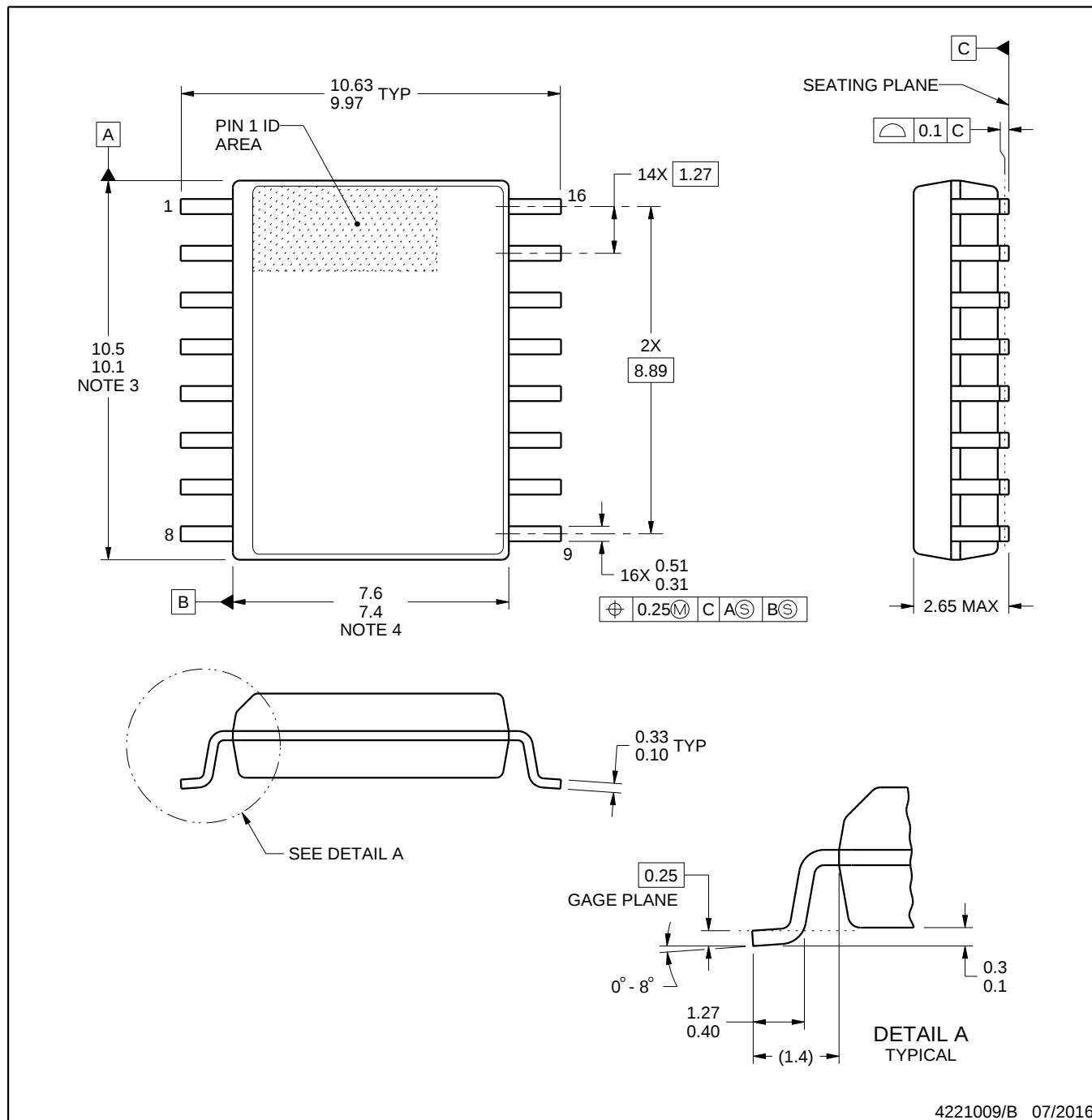


DW0016B

# PACKAGE OUTLINE

## SOIC - 2.65 mm max height

SOIC



4221009/B 07/2016

### NOTES:

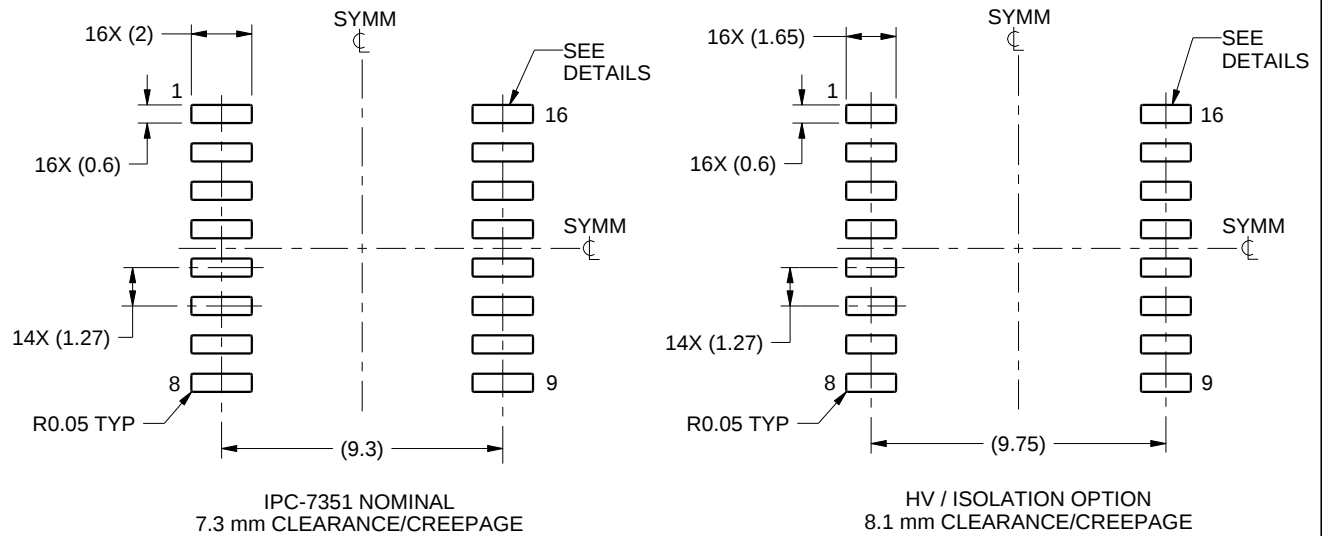
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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 MS-013.

# EXAMPLE BOARD LAYOUT

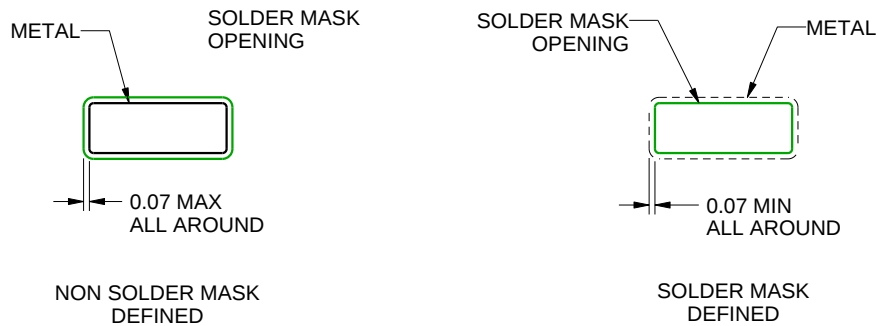
DW0016B

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:4X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

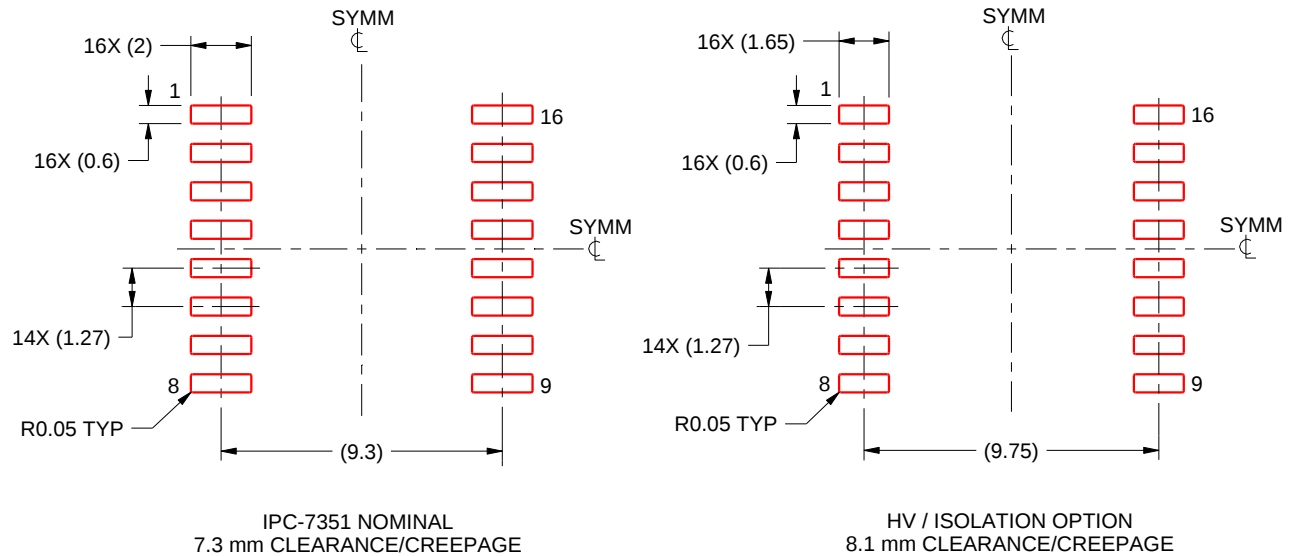
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DW0016B

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:4X

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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.

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