

# Welcome!

## Texas Instruments New Product Update

- This webinar will be recorded and available at [www.ti.com/npu](http://www.ti.com/npu)
- Phone lines will be muted
- Please post questions in the chat or contact your sales person or field applications engineer

# **New Product Update: Isolation**

**November 5<sup>th</sup>, 2020**

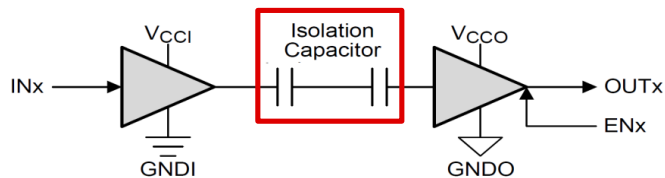
**Luke Trowbridge, Product Marketing Engineer, Texas Instruments**

# Agenda

- Capacitive SiO<sub>2</sub> isolation technology
- ISO67xx – Cost-effective digital isolators
- ISO1044 – Small footprint isolated CAN transceiver
- ISO1640 – Bidirectional, hot swappable I<sup>2</sup>C digital isolator
- ISO1500 – Small footprint isolated RS-485 transceiver

# TI's capacitive SiO<sub>2</sub> isolation technology

TI's reinforced isolators use a logic input and output buffer separated by a **double capacitive SiO<sub>2</sub> insulation barrier**



Manufactured and thoroughly tested in a controlled environment to ensure highest quality of isolation products

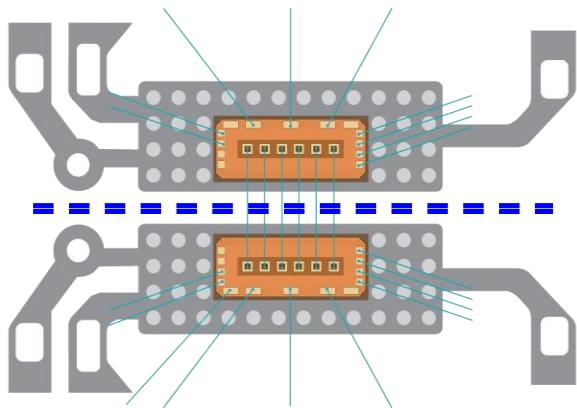
Silicon dioxide (SiO<sub>2</sub>) offers the **highest** dielectric strength in the industry

Insulator Materials	Dielectric Strength
Air	~1 Vrms/μm
Epoxies	~20 Vrms/μm
Silica filled Mold Compounds	~100 Vrms/μm
Polyimide	~300 Vrms/μm
SiO <sub>2</sub>	~500 Vrms/μm

Unlike polyimide and other polymer based insulators, the reliability of an SiO<sub>2</sub>-insulated capacitor does not degrade with exposure to ambient moisture.

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# Digital Isolators

# Isolated data solutions

## ISO67xx

### Cost effective isolation

- 50 Mbps
- 3.0 up to 5 kVrms
- 1.8 V – 5 V supply
- 2, 3, and 4 channels
- Narrow and Wide body packages



## ISO77xx

### High-speed, robust isolation for basic and reinforced applications

- 100 Mbps
- 3.0 up to 5 kVrms
- Up to 6 channels
- High CMTI
- Narrow and wide body packages
- -55°C to 125°C



## ISO78xx

### Industry's highest reliability reinforced isolation barrier

- 100 Mbps
- 5.7 kVrms
- 1 to 4 channels
- High CMTI
- Wide and extra-wide packages
- -55°C to 125°C

## ISO70xx

### Ultra Low Power Isolation

- 4 Mbps
- 0.13 mA/ch @ 1 Mbps
- 3.0 kVrms
- 1.8 V – 5 V supply
- 1, 2 and 4 channels
- Narrow body packages

## Series Capacitor Isolation Technology

# ISO67xx

Online now

## Cost-Optimized 5 kVrms and 3 kVrms Digital Isolators

### Features

#### • Isolation, immunity and certifications

- Integrated SiO<sub>2</sub> dielectric capacitors
- Reinforced and basic isolation (DIN V VDE V 0884-11)
- V<sub>ISO</sub> rating: up to 5,000 V<sub>RMS</sub>
- V<sub>IOSM</sub> surge: up to 10,000 V<sub>PK</sub>
- V<sub>IOWM</sub> working voltage: up to 1,000 V<sub>RMS</sub>
- CMTI: 75 kV/μs (typ) 50 kV/μs (min)

#### • Electrical characteristics

- Data rate: 50 Mbps (max)
- Propagation delay: 11 ns (typ)
- Wide supply range: 1.71 V to 5.5 V
- Low power: 1.9 mA / channel (typ) at 1 Mbps
- High and low default states available
- Operating temperature range: -40°C to 125°C

#### • Package

- SOIC-16: 8 mm creepage / clearance (4 and 3 channels)
- SOIC-8DWV: 8 mm creepage / clearance (2 channels)
- Small SOIC-8: 4 mm creepage / clearance (2 channels)

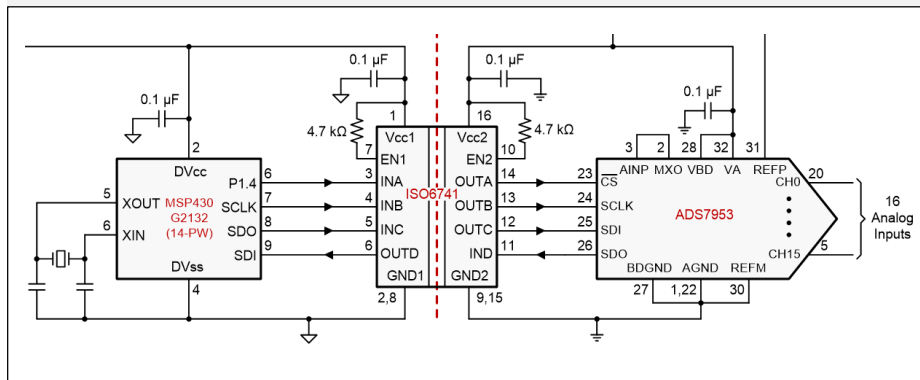
### Applications

- HEV/EV
- Power delivery
- Grid
- Factory automation
- Building automation
- Appliances

Q100 – Automotive Qualified

### Benefits

- Robust SiO<sub>2</sub> dielectric does not degrade with moisture or temperature, providing industry's longest isolation barrier lifetime
- Component level certifications → simplified system level certification
- High CMTI provides low voltage side protection from high switching transients in harsh environments
- Low propagation delay and tight skew improves data transfer efficiency
- Allows use with 1.8 V, 2.5 V, 3.3 V and 5.0 V FPGAs and MCUs
- Thoroughly tested in a controlled environment to ensure high quality
- Pin to pin compatible with TI and competitor parts for ease of upgrade

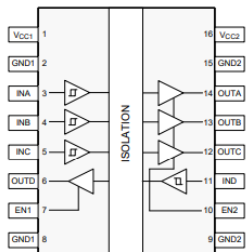




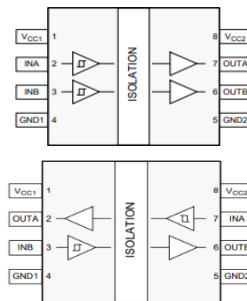
# ISO67xx: Specifications & package options

Commercial Part Number	Automotive Part Number	Channel counts	Working voltage	Transient voltage	Surge voltage capability	VDE V 0884-11	Creepage Clearance	Package
ISO67xxDW	ISO67xxQDWQ1	3, 4	1,000 $V_{RMS}$ (1,414 $V_{PK}$ )	5,000 $V_{RMS}$ (8,000 $V_{PK}$ )	10,000 $V_{PK}$	Reinforced	8 mm 8 mm	16-SOIC (DW)
ISO67xxBD	ISO67xxQBDQ1	2	450 $V_{RMS}$ (637 $V_{PK}$ )	3,000 $V_{RMS}$ (4,242 $V_{PK}$ )	6,500 $V_{PK}$	Basic	4 mm 4 mm	8-SOIC (D)
N/A	ISO67xxQDWVQ1	2	1,000 $V_{RMS}$ (1,414 $V_{PK}$ )	5,000 $V_{RMS}$ (8,000 $V_{PK}$ )	10,000 $V_{PK}$	Reinforced	8 mm 8 mm	8-SOIC (DWV)

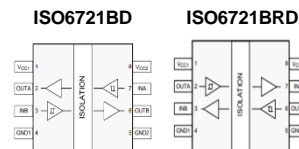
**16 DW package**  
Body - 10.3 mm X 7.50 mm  
10.3 mm X 10.3 mm



**8 DWV package**  
Body - 5.85 mm X 7.50 mm  
5.85 mm X 11.5 mm



**8 D package**  
Body - 4.90 mm X 3.91 mm  
4.90 mm X 6.0 mm



# Isolated CAN

# ISO1044:

## Smallest size, basic isolated CAN transceiver with flexible data (FD)

### Features

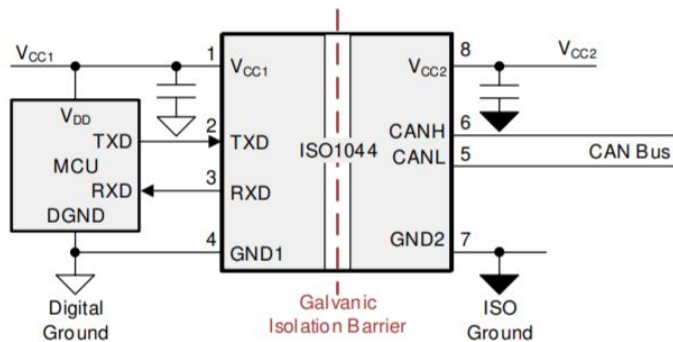
- **Isolation, immunity and certifications**
  - Integrated SiO<sub>2</sub> dielectric capacitors
  - Basic isolation (DIN V VDE V 0884-11)
  - V<sub>ISO</sub> rating: 3,000 V<sub>RMS</sub>
  - V<sub>IOSM</sub> surge: 5,000 V<sub>PK</sub>
  - V<sub>IOWM</sub> working voltage: 450 V<sub>RMS</sub>
  - CMTI: 100 kV/μs (typ) 85 kV/μs (min)
- **Electrical characteristics**
  - Data rate: 5 Mbps (max), supports CAN classic and FD (flexible data rate)
  - Fast loop times: 150 ns (typical), 225 ns (max)
  - IEC ESD on bus pins: ± 8kV, HBM ESD on bus pins: ± 10 kV
  - Bus standoff: ± 58 V, Common mode range: ± 12 V
  - Ideal passive – high impedance I/Os when unpowered
  - TXD dominant timeout protection
  - UVLO protection
  - Thermal shutdown
  - Wide supply range: 1.71 to 5.5 V logic side, 4.5 to 5.5 V bus side
  - Operating temperature range: -40°C to 125°C
- **Package**
  - Small SOIC-8D: 4 mm creepage / clearance

### Applications

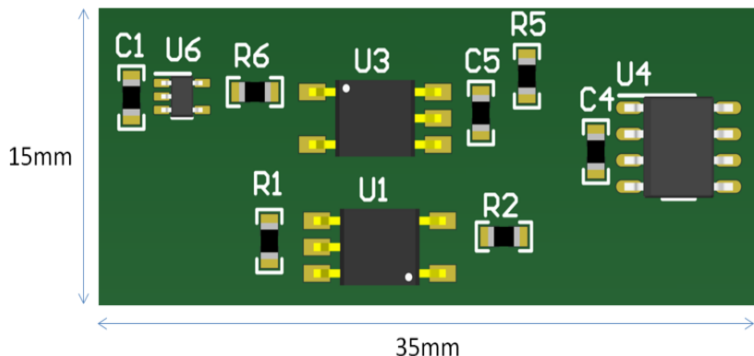
- Motor control
- Grid infrastructure
- Industrial automation
- Isolated power supplies
- Elevators
- Drones

### Benefits

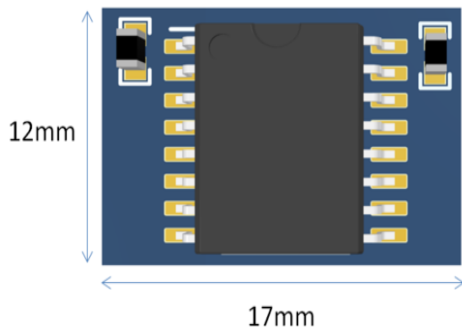
- Higher speed, faster loop times allow for increased communication throughput for higher bandwidth applications.
- Industry leading CMTI enables signal integrity in noisy environments
- Hot swap support with glitch free bus I/O on power-up / down
- Allows use of the device with 1.8 V, 2.5 V, 3.3 V, 5 V micro-controllers
- Wide V<sub>cc2</sub> range enables easy power supply design
- Integrated solution enables smaller BOM and reduces board space by up to 60% compared to industry standard 16-SOIC package



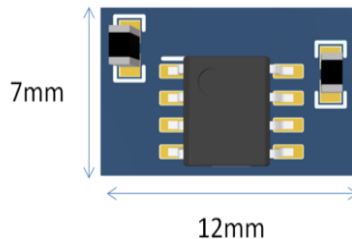
# Solution size comparison



**Optocoupler discrete solution**



**Industry standard 16-DW solution**



**ISO1044**

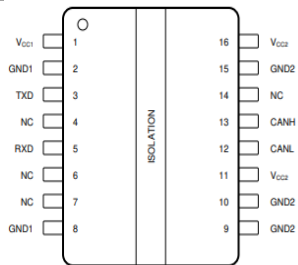
## ISO1044BD solution size:

- **84%** board space reduction compared to an optocoupler discrete solution
- **60%** board space reduction compared to a 16-DW solution

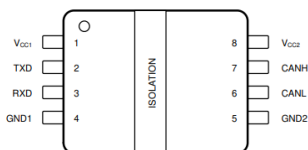
# ISO CAN: Specifications & package options

Commercial	Working voltage	Transient voltage	Surge voltage	Package
ISO1042DW	1 kVrms / 1.5 kVpk	5 kVrms / 7.07 kVpk	10 kVpk (Reinforced)	16-SOIC (DW)
ISO1042BDW	1 kVrms / 1.5 kVpk	5 kVrms / 7.07 kVpk	6 kVpk (Basic)	16-SOIC (DW)
ISO1042DWV	1 kVrms / 1.5 kVpk	5 kVrms / 7.07 kVpk	10 kVpk (Reinforced)	8-SOIC (DWV)
ISO1042BDWV	1 kVrms / 1.5 kVpk	5 kVrms / 7.07 kVpk	6 kVpk (Basic)	8-SOIC (DWV)
ISO1044BD	400 Vrms / 566 Vpk	3 kVrms / 4.24 kVpk	6 kVpk (Basic)	8-SOIC (D)

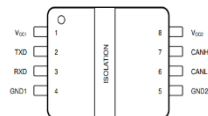
**16 DW package**  
Body - 10.3 mm X 7.50 mm  
10.3 mm X 10.3 mm



**8 DWV package**  
Body - 5.85 mm X 7.50 mm  
5.85 mm X 11.5 mm



**8 D package**  
Body - 4.9 0mm X 3.91 mm  
4.90 mm X 6.0 mm



# Isolated I<sup>2</sup>C

# ISO1640

## Robust bidirectional 3kVrms I2C digital isolators

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### Features

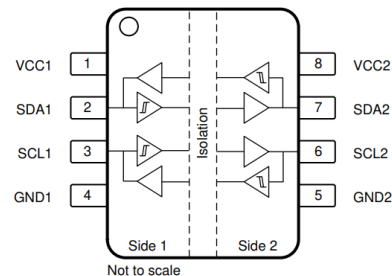
- **Isolation, immunity and certifications**
  - Integrated SiO<sub>2</sub> dielectric capacitors
  - Functional, basic, and reinforced isolation (DIN V VDE V 0884-11)
  - V<sub>ISO</sub> rating: 3,000 V<sub>RMS</sub>
  - V<sub>IOSM</sub> surge: up to 6,500 V<sub>PK</sub>
  - V<sub>IOWM</sub> working voltage: 450 V<sub>RMS</sub>
  - CMTI: 75 kV/μs (typ)
- **Electrical characteristics**
  - I2C isolators supporting Hot Swap
  - ISO1640: Bidirectional SDA and SCL
  - Data rate: Up to 1.7 MHz operation
  - Wide supply range: 2.25 V to 5.5 V
  - Low power: 2.4 mA / channel (typ) when channels high
  - Operating temperature range: -40°C to 125°C
- **Package**
  - Small SOIC-8: 4 mm creepage / clearance (3,000 V<sub>RMS</sub>)
  - EVM available

### Applications

- Isolated I2C, SMBus, PMBus Interfaces
- Open-drain Network Interfaces
- Power Over Ethernet
- Power Supplies
- Battery Management
- Motor Control Systems
- Level Shifting

### Benefits

- Plug or unplug the device into a system without disruption on the I2C bus.
- Reduces cost and board space by not requiring external logic devices to support bidirectional I2C support
- Single & multi-master applications enabling clock stretching
- High CMTI provides low voltage side protection from high switching transients in harsh environments
- Allows use with 2.5 V, 3.3 V and 5.0 V FPGAs and MCUs
- Industry Standard Footprint. Compatible with ISO1540 and other industry isolated I2C devices.



ISO1640BD Isolated I2C SOIC Pinout

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# Isolated RS-485



# ISO1500:

## 3kVrms basic isolated RS-485/RS-422 transceiver in ultra small package

[TI.com](#)  
[product folder](#)

### Features

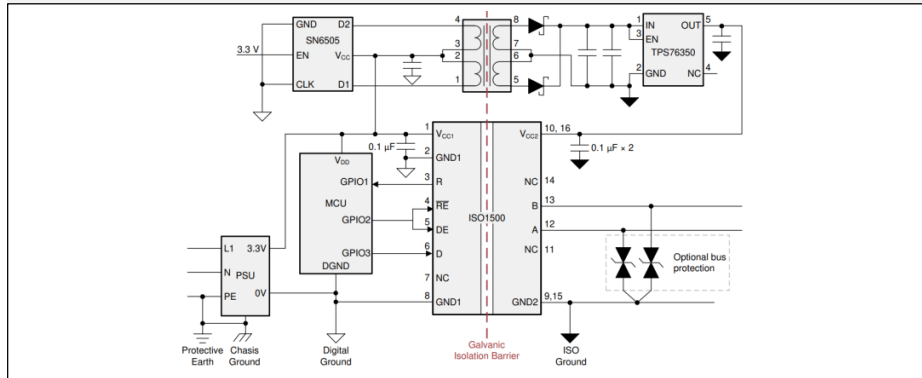
- **Isolation, immunity and certifications**
  - Integrated SiO<sub>2</sub> dielectric capacitors
  - Basic isolation (DIN V VDE V 0884-11)
  - V<sub>ISO</sub> rating: 3,000 V<sub>RMS</sub>
  - V<sub>IOSM</sub> surge: up to 6,000 V<sub>PK</sub>
  - V<sub>IOWM</sub> working voltage: 400 V<sub>RMS</sub>
- **Electrical characteristics**
  - Meets or exceeds TIA/EIA RS-485 standard
  - Data rate: 1Mbps
  - Half duplex transceiver
  - Wide supply range: 1.71 to 5.5 V logic side, 4.5 to 5.5 V bus side
  - Fail-safe receiver for bus open, short and idle
  - 1/8 unit load- up to 256 nodes on bus
  - Bus I/O protection (w.r.t. GND2)
    - ± 16kV HBM
    - >± 7kV IEC61000-4-2 contact discharge
    - ± 2kV IEC61000-4-4 fast transient burst
  - Operating temperature range: -40°C to 125°C
- **Package**
  - Small QSOP-16: 3.7 mm creepage / clearance

### Applications

- Motor drives
- Grid
- Power delivery
- Factory automation
- Building automation
- Lighting

### Benefits

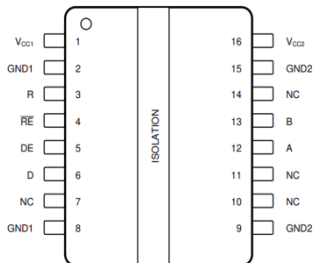
- Robust isolation barrier to withstand harsh industrial environment
- CMOS logic level support to interface with 1.8 V/3.3 V/5 V controllers and ASICs allows for reuse across multiple platforms
- 85% board space reduction compared to optocoupler discrete solutions
- 50% board space reduction compared to 16-SOIC industry standard isolated RS-485 footprint
- Industry leading CMTI of 85kV/us (min) enables signal integrity in noisy environments
- Integrated IEC ESD protection in ultra small QSOP package enables smallest solution size



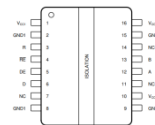
# ISO RS-485: Specifications & package options

Commercial	Data rate	Duplex	Working voltage	Transient voltage	Surge voltage	Package
ISO1500DBQ	1Mbps	Half	400 V <sub>RMS</sub> (566 V <sub>PK</sub> )	3,000 V <sub>RMS</sub> (4,242 V <sub>PK</sub> )	4,000 V <sub>PK</sub> (Basic)	16-QSOP (DBQ)
ISO14xxBDW	0.5Mbps / 12Mbps / 50Mbps	Half / Full	1,060 V <sub>RMS</sub> (1,500 V <sub>PK</sub> )	5,000 V <sub>RMS</sub> (8,000 V <sub>PK</sub> )	6,000 V <sub>PK</sub> (Basic)	16-SOIC (DW)
ISO14xxDW	0.5Mbps / 12Mbps / 50Mbps	Half / Full	1,060 V <sub>RMS</sub> (1,500 V <sub>PK</sub> )	5,000 V <sub>RMS</sub> (8,000 V <sub>PK</sub> )	10,000 V <sub>PK</sub> (Reinforced)	16-SOIC (DW)

**16 DW package**  
Body - 10.3mm X 7.50mm  
10.3mm X 10.3mm



**16 QSOP package**  
Body – 4.90mm X 3.90mm  
4.90mm X 6.0mm



# Resources

# Additional resources



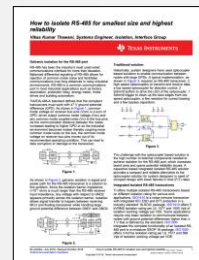
[Improve your system performance by replacing optocouplers with digital isolators](#)



[How to replace optocouplers with digital isolators in standard interface circuits](#)



[How to select the right digital isolator for your design](#)



[How to isolate RS-485 for smallest size and highest reliability](#)

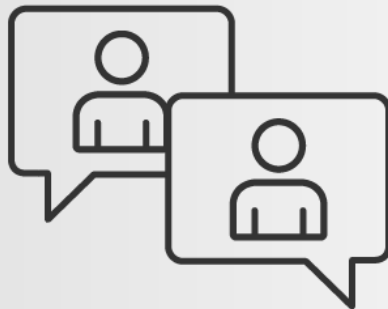


[How to design an isolated CAN port for space-constrained industrial applications](#)

[www.ti.com/isolation](http://www.ti.com/isolation)

# Q & A

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