Промышленные интерфейсы

Компэл
www.compel.ru

Почему бы не одно универсальное решение?

- **Историческая – сети создавались под различные устройства исходя из их особенностей**
- **Защитная – каждый вендор пытался создать наиболее защищённую сеть**
- **Техническая – каждая сеть имеет свои сильные и слабые стороны в зависимости от применения**

Выбор стандартов промавтоматики

- 4-20 мА
  - Аналоговая токовая петля
  - < 20 Hz пропускной способности
- HART
  - Модулированный 4-20 мА
  - 1200 бит/сек
- Foundation H1
  - 31.25 бит/сек
- RS-232
- CompoNet
- CC-Link

- RS-485
- CAN
  - CAN-Open
  - DeviceNet
- Interbus
  - RS-485-based
- Modbus
  - RS-232-based
  - RS-485-based
- ProfiBus
  - RS-485-based
  - IEC 1158-2-based
  - Fiber-based

- ControlNet
- Ethernet
  - Ethernet/IP
  - ProfiNet
  - EtherCAT
  - Foundation HSE
  - Ethernet Powerlink
  - Modbus TCP
  - DriveCliq
  - Sercos III

Критерии выбора

Совместимость
- Существующие сети
- Доступные компоненты
- Будущие разработки

Скорость
- Скорость передачи сигналов
- Скорость передачи данных

Помехи
- устойчивость
- генерация

Длина сети

Количество узлов

Питание
- Потери мощности
- Режимы низкого энергопотребления
- Необходимость источника питания

Стоимость
- Электронных компонентов
- Стоимость внедрения
- Кабель и разъёмы

Надёжность
- Температура
- ESD (статика) защита
- Возможности гальванической развязки
- Диагностика

Электрические характеристики

Standard	Driver Output	Receiver Sensitivity	Signal Margin	Typical Cable Attenuation	Media-loss cable length limit (typical)	Protocol network length limit
RS-485	1.5 V	200 mV	17.5 dB	2.5 dB/100m @ 0.5 MHz	700 m@ < 0.5 Mbps	None
				10 dB/100m @ 10 MHz	175m @ 10 Mbps	
Interbus	Same as RS-485					200m per loop @ 0.5 Mbps
Profibus DP	2.1 V	200 mV	20.4 dB	6 dB/100m @ 12 MHz	340m @ 12 Mbps	100m @ 12 Mbps
						1200m @ <94 kbps
ControlNet (Coax)	8.2 Vpp	510 mVpp	24 dB	2 dB/100m @ 10 MHz	1200m @ 5 Mbps	< 1000m
DeviceNet	1.5 V	400 mV	11.5 dB	1.2 dB/100m @ 1 MHz	950m @ < 0.5 Mbps	500m @ 125 kbps
						250m @ 250 kbps
						100m @ 500 kbps
Ethernet 10Base-T	2.2 V	585 mV	11.5 dB	10 dB/100m @ 10 MHz	115m @ 10 Mbps	Typically 100m
Ethernet 100Base-TX	1.0 V	1 Vpp	6 dB	15 dB/100m @ 10 MHz	40m @ 100 Mbps	Typically 100m

Промышленные сети

Standard	4-20 mA	HART	Device Net	Control Net	Profibus	RS-485
Data Rate	Limited by analog components, less than 30 Hz (typical)	1.2 kbps	125 kbps, 250 kbps, 500kbps	5Mbps	Up to 12Mbps	0-50Mbps
Minimum message	None	11 bits	41 bits	56 bits	140 bits	1 bits
Protocol latency	None	> 9000 us	> 81 us	> 11 us	> 12 us	> 0.02 us Protocol dependent
Network Length limit	None	< 100m	500m @ 125kbps	< 1000m	1200m @ 94kbps	None
Max allowable # nodes	P2P protocol	P2P protocol	64 nodes	48 nodes	32 deivces / segment	256 nodes

Решения TI для DeviceNet

SN65HVD252

- 5В питание
- соответствует всем спецификациям DeviceNet
- Drop-in with industry standard footprint

SN65HVD253

- 5В питание
- соответствует всем спецификациям DeviceNet
- Специальная функция диагностики

SN65HVD1050,ISO1050

Все имеют защиту от КЗ выводы питания 24В DeviceNet, а также защиту от бросков напряжения ±200В

Решения TI для Interbus

SN65LBC179

- Применяется в референс дизайне Interbus
- Старо, как мир (1994)
- 5В питание, 2КВ ESD

SN65HVD179

- 5В питание, 16кВ ESD

SN65HVD379

- 3.3В питание, 16кВ ESD

Решения TI для Profibus

SN65HVD1176

- Лучший Profibus приемопередатчик по мнению одного из наших крупнейших клиентов

ISO1176

- Profibus изолированный приёмопередатчик

ISO1176T

- Profibus изолированный приёмопередатчик с драйвером трансформатора для обеспечения питания на вторичной стороне

Физический уровень Ethernet 10/100

TLK100

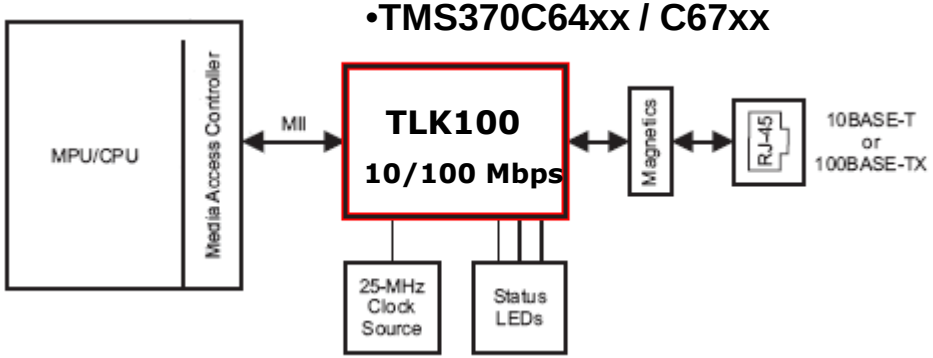
- Low and deterministic channel latency
- Extended cable reach to 200 m
- 16kV ESD protection on Bus pins
- IEEE802.3 Compliance
- Industry-standard MII interface to MAC
- Auto-MDIX / Auto-Negotiation / Auto-Polarity
- Flexible supply options:
  3.3V or 3.3V & 1.8V & 1.1V
- Cable Diagnostics (breaks/damage/length)
- IEEE 1149.1 JTAG
- 48-pin TQFP Package

-40 to 85C

- Predictable and precise for time-critical apps
- Reliable operation over long cables
- Harsh Industrial Environments
- Communicate with all 10/100 TX Ethernet
- Easy design-in to available MACs
- Robust and reliable
- 3.3V only for simple power solution or Separate power for low power consumption
- Finds Cable faults / length within ±1m
  - Operates offline or with live traffic

- Compatible with 50+ TI Processers with 10/100 MAC
  - OMAP-L138 / 118 / 108
  - TMS370C64xx / C67xx

- Factory automation
- Motion Control
- Industrial Networks
- IEEE1588
- EtherCAT™
- ProfiNET™
- AVB – Audio Visual Bus



PHYTER®: The Industrial PHY Standard
Generation Comparison: TLK110 & DP83848I

		TLK110	DP83848I
General	IEEE 802.3u dual speed 10BaseT/100BaseTX	√	√
	Auto MDI/MDIX crossover	√	√
	Auto-Negotiation (AN) and parallel detection	√	√
	Power save modes and WOL options	√	√
	Polarity Correction	√	√
	MAC-PHY Interface (**M**)MII / (**R**)RMII	M, R	M, R
	ESD [HBM]	16KV	4KV
	Error free cable reach	150m	150m
	BIST – Packets generation/detection	√ Enhanced	√ Minimal
	LEDs Support	3	3
	Package	48LQFP	48LQFP
	Supply Voltages (core voltage, internal supply or external)	3.3V (1.5V)	3.3V (1.8V)
	Power @100BT (3.3V supply) w / Magnetics	<280mW	290mW
	JTAG Support	√	√
Industrial Specific	Link status monitoring	√	√
	Software Strapping option	√	X
	Cable Diagnostics – Active (TDR) and Passive (ALCD)	√	X
	Data-path **external** loop delay (MII)	242nS	290nS
	Deterministic data path delay	√	√
	Enhanced receive mode (shortest RX delay)	√ 202nS	X
	Short Link loss detection (programmable)	<10µSec	X
	Port Mirroring	√	X
	Short Link-up time **Force 100BT AMDIX**	√	X
	Short Link-up time **Auto-Negotiation**	√	X
	Fixed TX_CLK to XI phase	√	√
	Programmable TX_CLK phase control	√	X
	Transmission power base on cable length	√	X
	Enhanced FD mode	√	X
	IPG Error detection (Enhanced Link Detection)	√	X
	Short Preamble Mode	√	?
	Auto MDI/MDIX in Parallel Detection (Robust AMDX)	√	X

TLK105 / 106 32QFN

- **TLK1xx family derivative**
  - **Electrical Characterization in 32QFN on going**
- **Pin (I/O) Functionality Given Up in 32QFN Package vs 48QFP (TLK110) package:**
  - **No JTAG**
  - **1 LED**
  - **No CLKOUT Pin**
  - **No S/W Strap Pin – pin allowed some s/w strap configuration registers to be held through s/w resets.**
  - **Less pin strap options due to reduced pins vs 48LQFP**
- **Future 32QFN derivatives will allow for additional features & pin strap / digital I/O muxing options.**

TLK105/106 Industrial 10/100 EPHY

PRODUCT PREVIEW

Features

- IEEE802.3 Compliance
- Lowest and Deterministic Channel Latency
  - •Fast RX_DV mode: saves 40 ns more
- Extended cable reach to 130 m
- Multiple Fast link up configurations
  - •Fast ANEG, Fast Force AMDIX
- Programmable Fast Link loss detection time < 10µs
- Industry-standard MII or RMII to MAC
- Cable Diagnostics (TLK106)
- IEEE 1149.1 JTAG
- 32-pin QFN Package (5mm x 5mm)
  - •-40 to 105C and -40 to 85C options

Applications

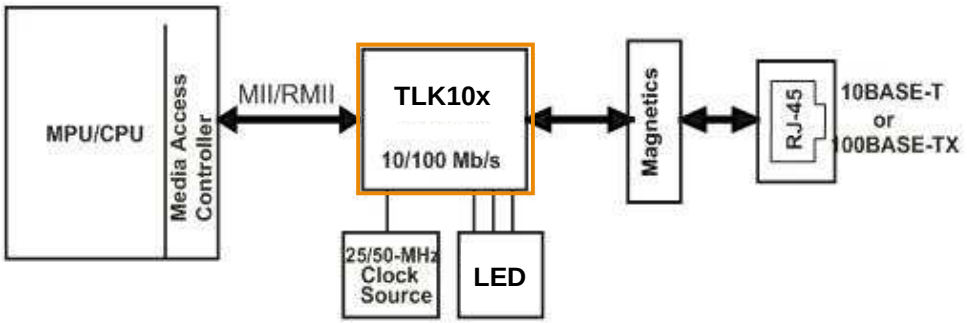
- Factory automation, Motion Control
- Industrial Networks, Power electronics
- Security
- IEEE1588
- EtherCAT™ , ProfiNET™, SERCOSIII™ .....
- AVB – Audio & Video

Benefits

- Predictable, precise & fast for real time apps
- Reliable operation over long cables
- Communicate with all 10/100 TX Ethernet
- Compatible to available MACs (MII / RMII)
- Robust and reliable: Designed for Real Time Industrial Applications, High Temp option available
- Finds Cable faults / length within ±1m (TLK106): offline (no link) or with live networks (active transmission)

Compatible with 50+ TI µP/MCU/DSP with 10/100 MAC

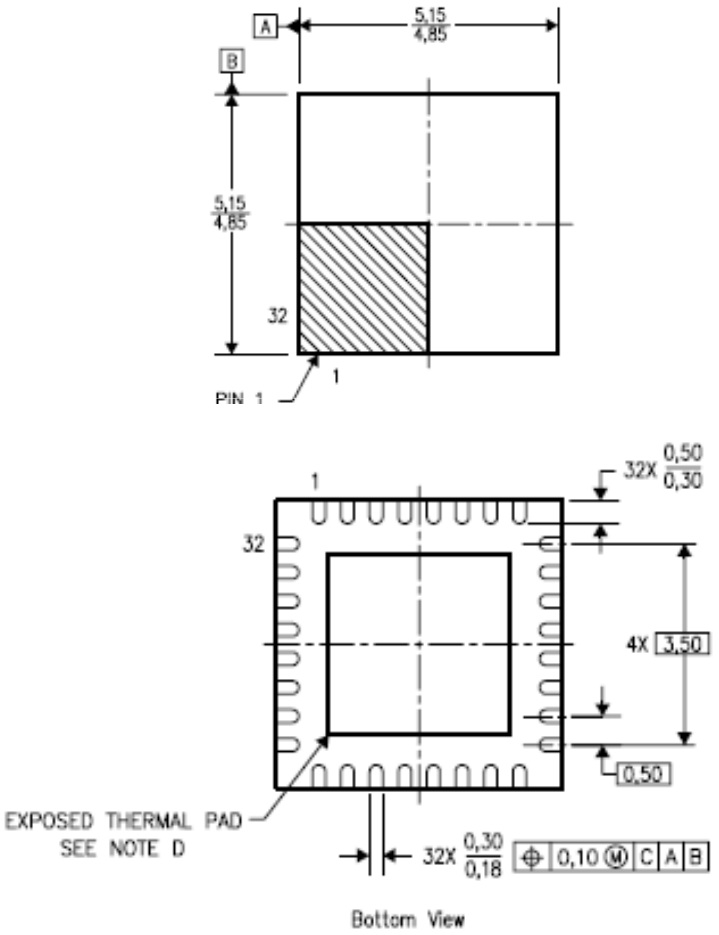
- •OMAP
- •Sitara
- •Stellaris
- •Hercules
- •C6000

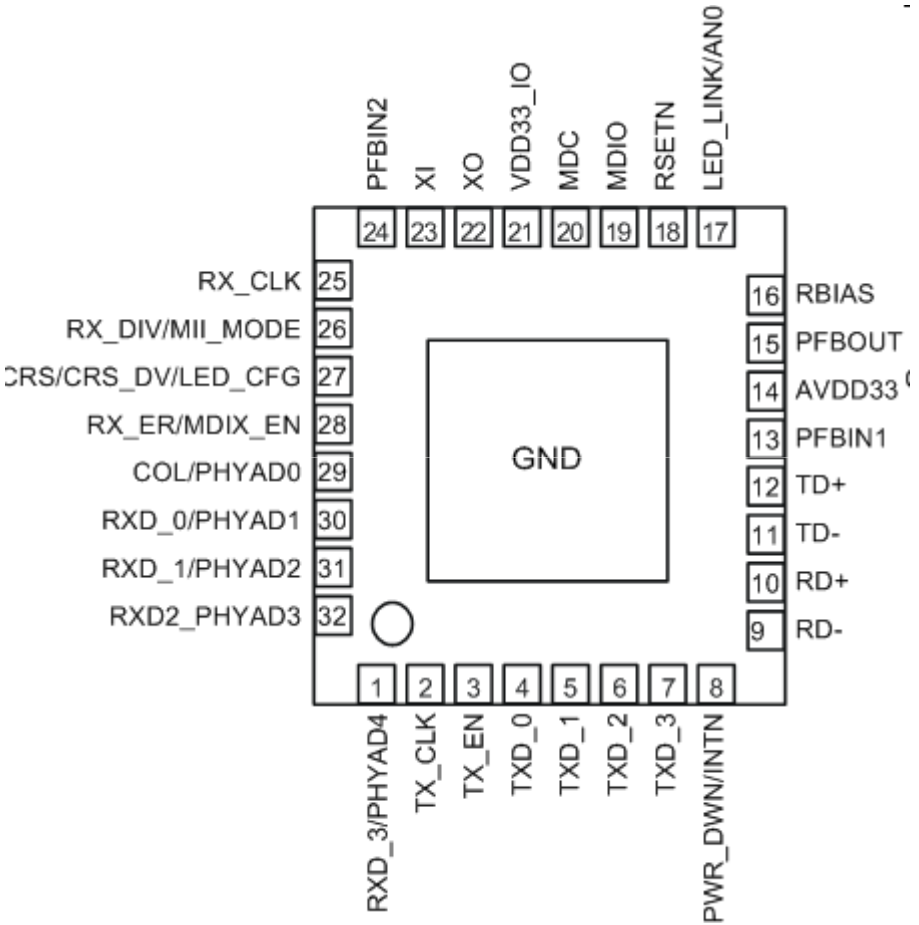


TLK105 / 106 in 32 QFN: Pinout & Package

PRODUCT PREVIEW

5mm x 5mm 32 QFN





Comparison Table – TLK110 / 105 / 106

		TLK110	TLK105*	TLK106*
General	IEEE 802.3u dual speed 10BaseT/100BaseTX	√	√	√
	Auto MDI/MDIX crossover	√	√	√
	Auto-Negotiation (AN) and parallel detection	√	√	√
	Power save modes and WOL options	√	√	√
	Polarity Correction	√	√	√
	MAC-PHY Interface (**M**)MII / (**R**)RMII	M, R	M, R	M, R
	ESD [HBM]	16KV	16KV*	16KV*
	Error free cable reach	150m	TBD*	TBD*
	BIST – Packets generation/detection	√ Enhanced	--	√ Enhanced
	LEDs Support	3	1	1
	Package	48LQFP (7x7mm)	32QFN (5x5mm)	32QFN (5x5mm)
	Supply Voltages (core voltage, internal supply or external)	3.3V (1.5V)	3.3V (1.5V)	3.3V (1.5V)
	I/O Voltages	3.3V**	1.8V (MII), 2.5V, 3.3V	1.8V (MII), 2.5V, 3.3V
	Power Consumption @100BT (3.3V supply) w/ Magnetics	<280mW	<280mW	<280mW
	JTAG Support	√	--	--
Industrial Specific	Link status monitoring	√	√	√
	Software Strapping option	√	√ (fewer pins vs TLK110)	√ (fewer pins vs TLK110)
	Cable Diagnostics – Active (TDR) and Passive (ALCD)	√	--	√
	Data-path **external** loop delay (MII)	242nS	242nS	242nS
	Deterministic data path delay	√	√	√
	Enhanced receive mode (shortest RX delay)	√ 202nS	√ 202nS	√ 202nS
	Short Link loss detection (programmable)	<10µSec	<10µSec	<10µSec
	Port Mirroring	√	√	√
	Short Link-up time **Force 100BT AMDIX**	√	√	√
	Short Link-up time **Auto-Negotiation**	√	√	√
	Fixed TX_CLK to XI phase	√	√	√
	Programmable TX_CLK phase control	√	√	√
	Transmission power base on cable length	√	√	√
	Enhanced FD mode	√	√	√
	IPG Error detection (Enhanced Link Detection)	√	√	√
	Short Preamble Mode	√	√	√
	Auto MDI/MDIX in Parallel Detection (Robust AMDX)	√	√	√

Интерфейсы датчиков

- 4..20мА / 0..20мА
- 0..10В / -10..10В
- HART

Решения TI для 4-20mA

- **XTR1xx семейство приёмопередатчиков**
- **RCV420 прецизионный приёмник**
- **XTR300 универсальный 4..20мА/+/-10В**

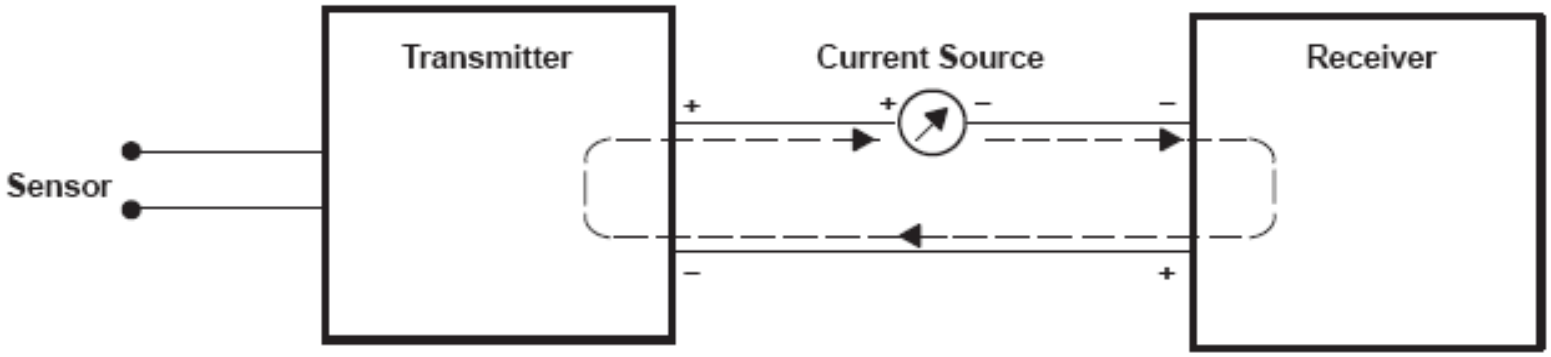


Figure 1. Example of a Current Loop

XTR108

4-20mA,“Smart” Signal Conditioning

Features

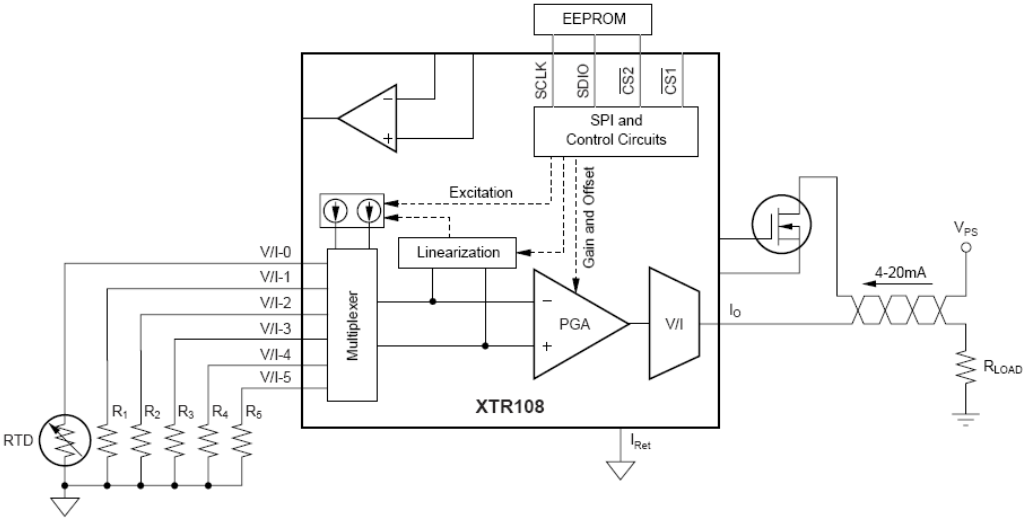
- Complete transmitter + RTD Linearization
- Eliminated potentiometers and trimming
- Digitally calibrated

Benefits

- It is a “smart,” programmable, 4-20mA, two-wire transmitter.
- Zero, span, and linearization errors in the analog signal path can be calibrated via a standard digital serial interface, eliminating manual trimming and store in external EEPROM.

Applications

- Remote RTD transmitter
- Pressure Bridge transmitter
- Strain gauge transmitters
- SCADA remote data acquisition
- Weighing systems
- Industrial process control



XTR117
4 – 20 mA Current-Loop Transmitter

Features

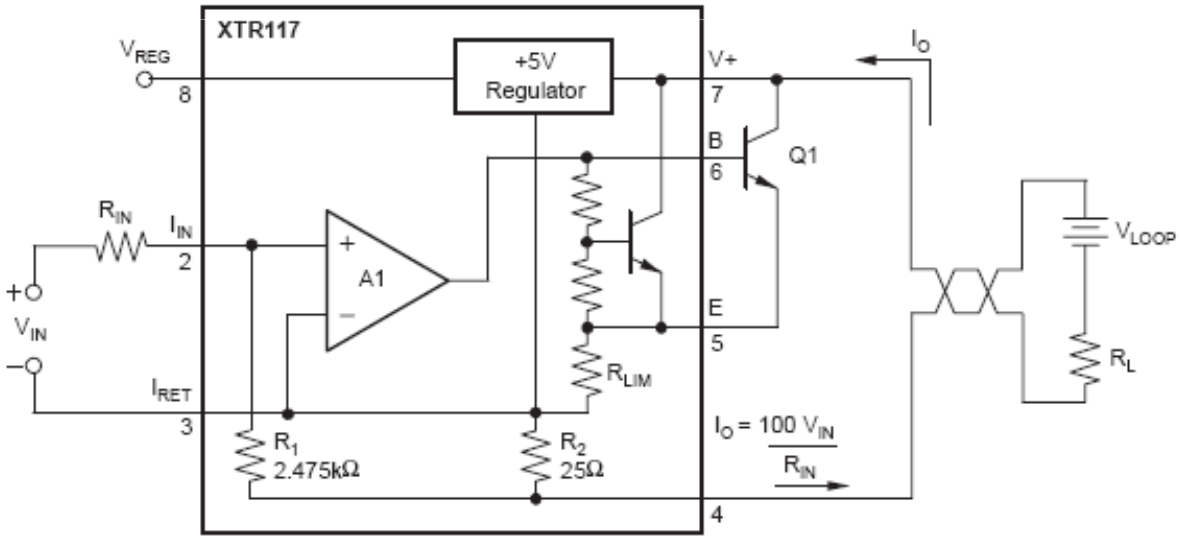
- 5V regulator
- High accuracy:
  - Span error: 0.05%
  - Nonlinearity error: 0.003%
- Low quiescent current: 130 µA
- Current return pin

Benefits

- Can by used to power external circuitry
- Ensures quality performance
- Ideal for maximum power efficiency
- Assures an accurate control of the output current

Applications

- 2-wire, 4-20mA current loop transmitter
- Smart transmitter
- Industrial process control
- Test systems
- Current amplifier
- Voltage-to-current amplifier



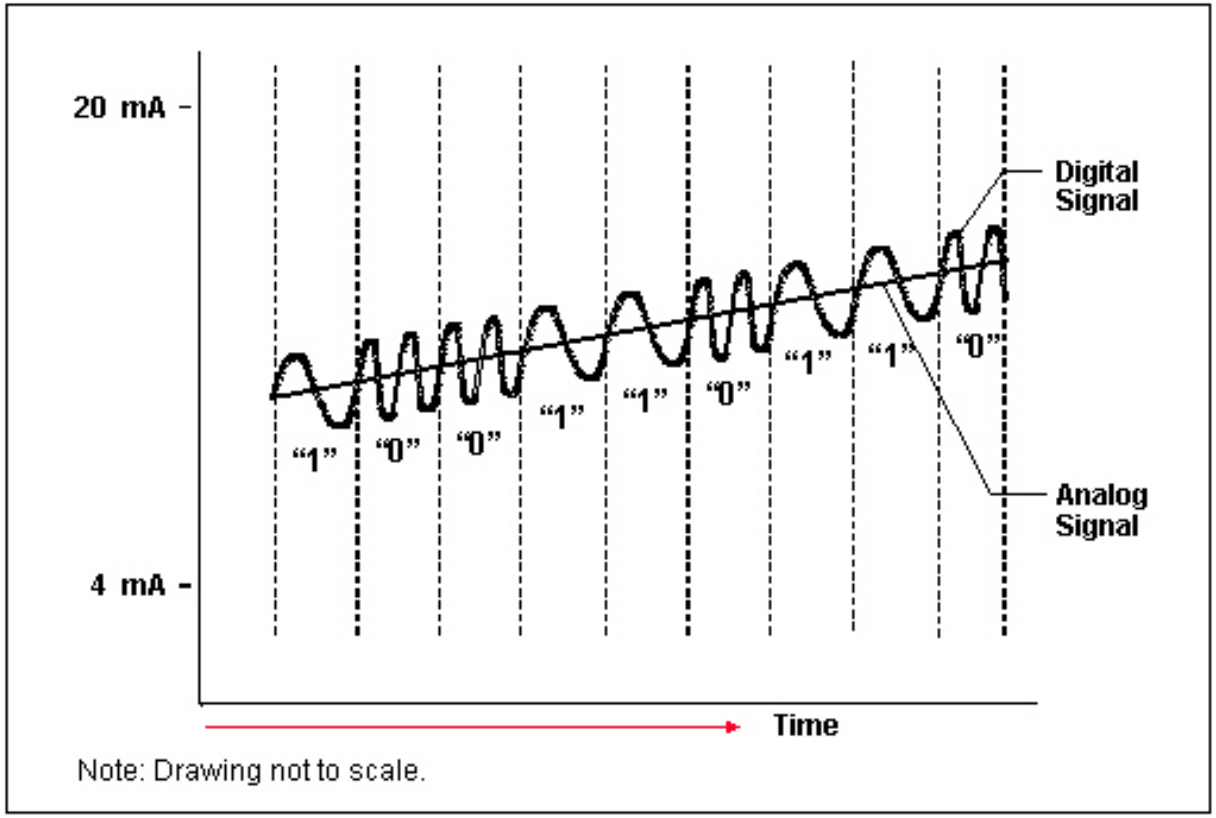
Packages: QFN and MSOP

HART
(Highway-Addressable Remote Transducer)

- Разработчик /поддержка : HART Communication Foundation (HCF)
- Используется : более 14 миллионов HART-устройств
- Топология: точка-точка и многоточечная конфигурация сети
- Физические носители: те же проводки 4-20 мА, терминаторы не нужны
- Максимальное количество устройств : рекомендуется точка-точка, но для некоторых приложений может быть многоточечной, до 15 устройств
- Максимальное расстояние: 3000 метров, но могут понадобиться ретрансляторы
- Типы подключения : аналоговый 4-20 мА, а также цифровой master/ slave
- Скорость передачи данных: аналоговый 4-20 мА, который является мгновенным, всегда присутствует, без каких-либо транспортных задержек и синхронизации времени
- Время цикла: 500 мс для цифрового сигнала

Технология HART

- **Цифровая модуляция поверх аналогового сигнала (FM on 4-20mA)**



DAC161P997

16bit DAC with Single Wire Interface and “4-20mA” current loop drive

Features

- 16 bit DAC
- Low Power
- Single Wire Interface (SWI), with handshake
- Programmable start up condition
- Self adjusts over wide baud rate range
- Error detection and reporting
- Programmable output Error Level
- Auxiliary HART input
- Internal Reference

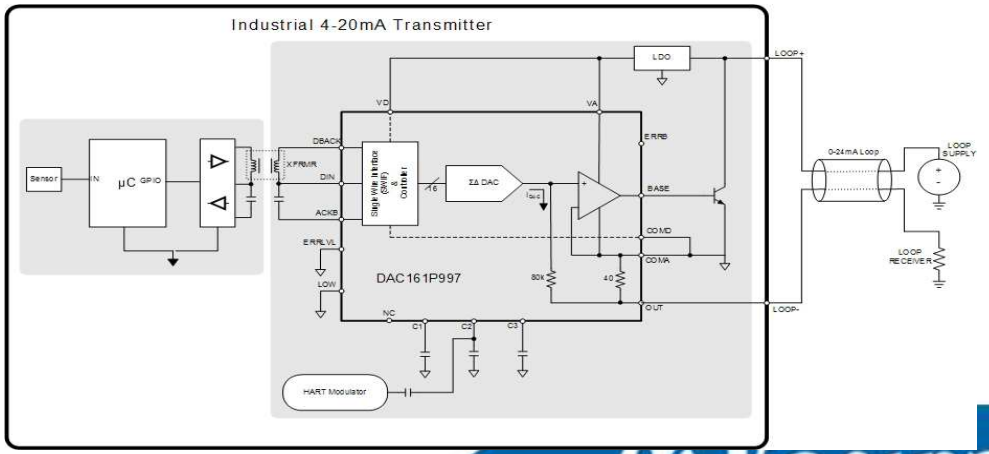
Applications

- 4 -20mA loop transmitter platforms
- 2-wire sensor systems
- Process Control
- Factory automation
- Building automation

EVM PART # (July 30th 2011)

Benefits

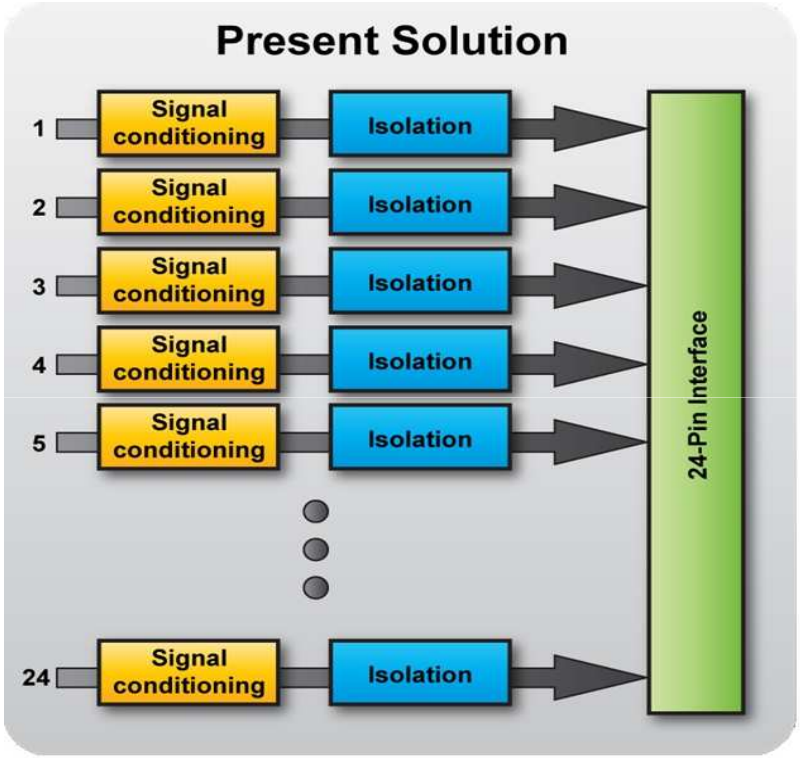
- Fully Integrated Solution
  - Reduces design complexity as no additional high accuracy components need to be selected.
- Total power consumption below 30mW
- SWIF digital interface makes possible lowest-cost transformer coupled operation.
- Defined Start-Up Condition 3.375mA or 21.75mA & pin programmable
- Can trade off update-rate vs power consumption for different systems or even during operation
- Automatic detection of various error conditions

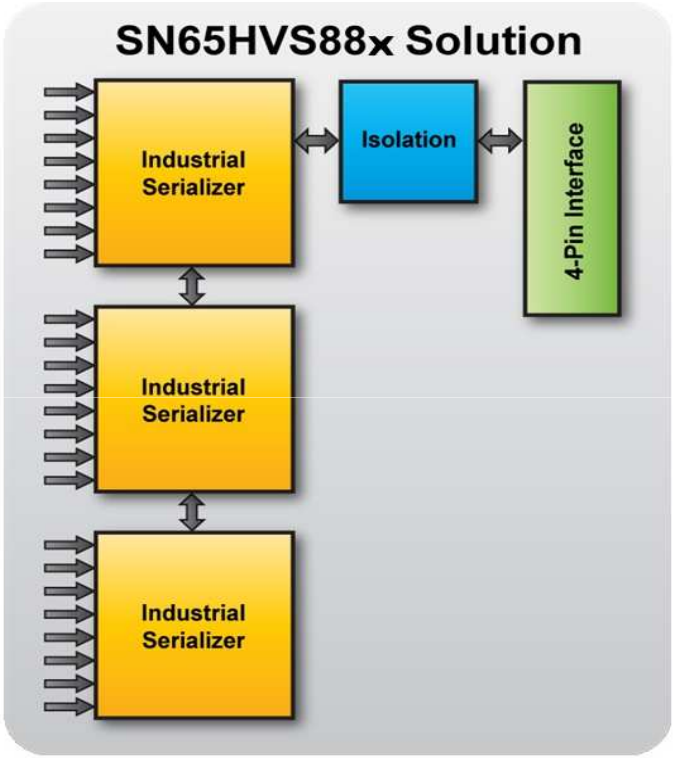


Входы сухих контактов : SN65HVS88x

HVS88x Industry's most compact serializer solution

Higher integration, saves 60% more board space





- **The SN65HVS88x converts eight digital inputs, ranging from 0 V to 34 V, into a single data stream on SPI interface.**
- **Several serializers can be cascaded together on a single 4-wire SPI interface for over 160 inputs.**

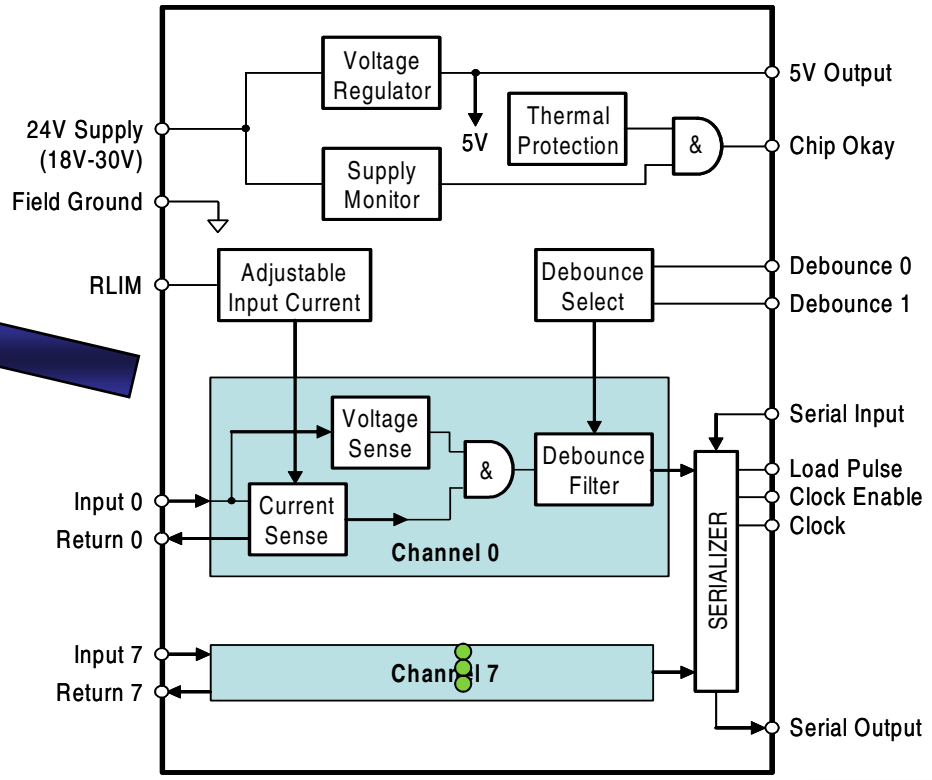
SN65HVS880

18V – 30V Industrial 8 channel Digital Input Serializer

- Eight Digital 0-30V Inputs
- Operating Voltage from 18V to 30V
- -40 to 85ºC Operating Temperature
- Selectable Debounce glitch Filter 0 to 3ms
- Adjustable Current-Limited Inputs
- 15kV ESD protection
- Status LED outputs
- Cascade HVS880 for >160 inputs
- SPI Interface
- Regulated 5V @ 50mA Power Output
- Under Voltage Detect

- Highest Input Density -
  - Lowest Board Space – 60% less typ
  - Fewer µController I/O
- Lowest System Power – 75% less typ
- Highest level of Integration

All this in
6.4mm x 9.7mm



- PLC Digital Input Modules
- Sensor Inputs for Industrial Automation
- Motion Control Systems
- HVAC, Elevators
- Assembly and Test

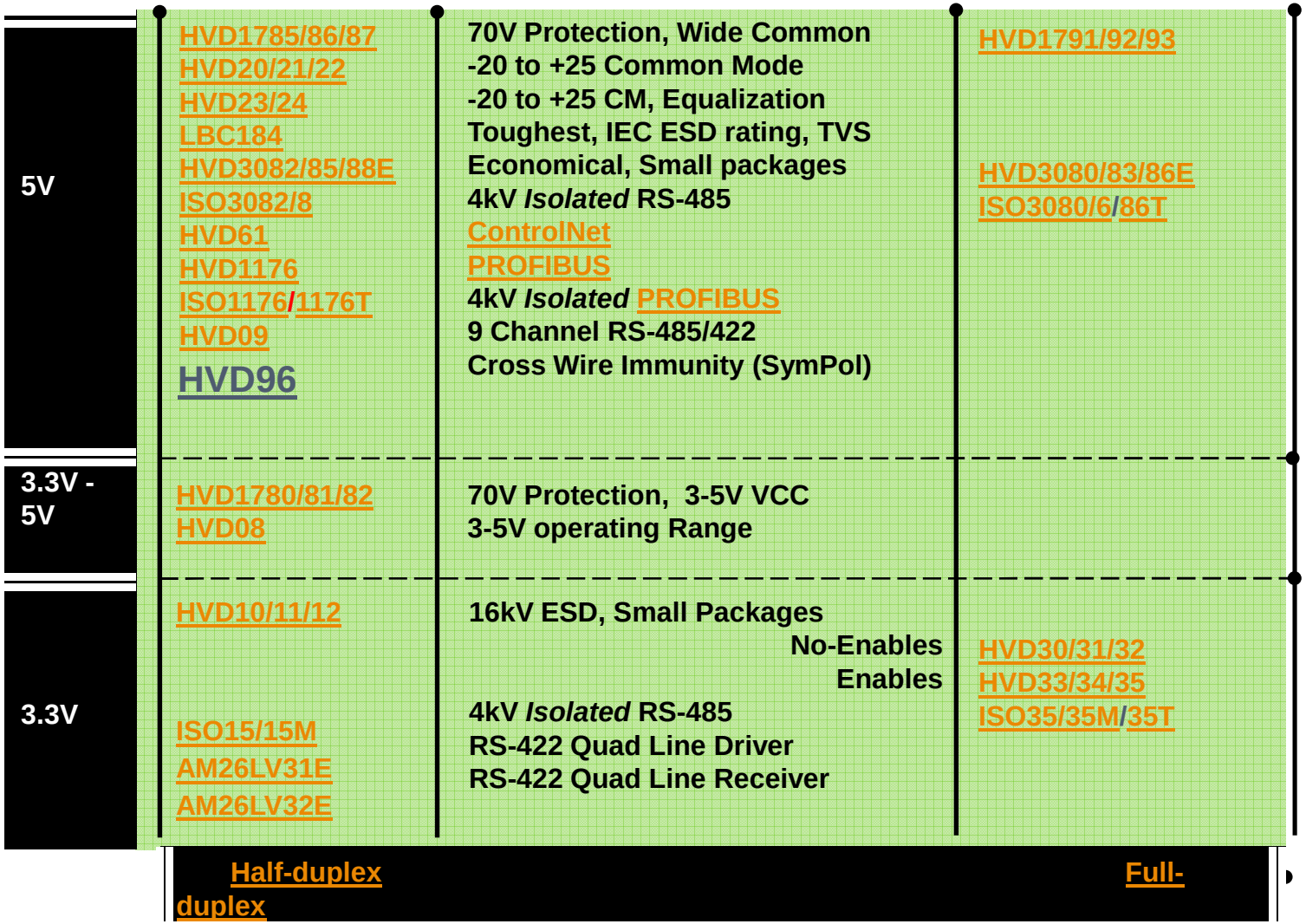
EVM

ISO EVM – ISO880EVM

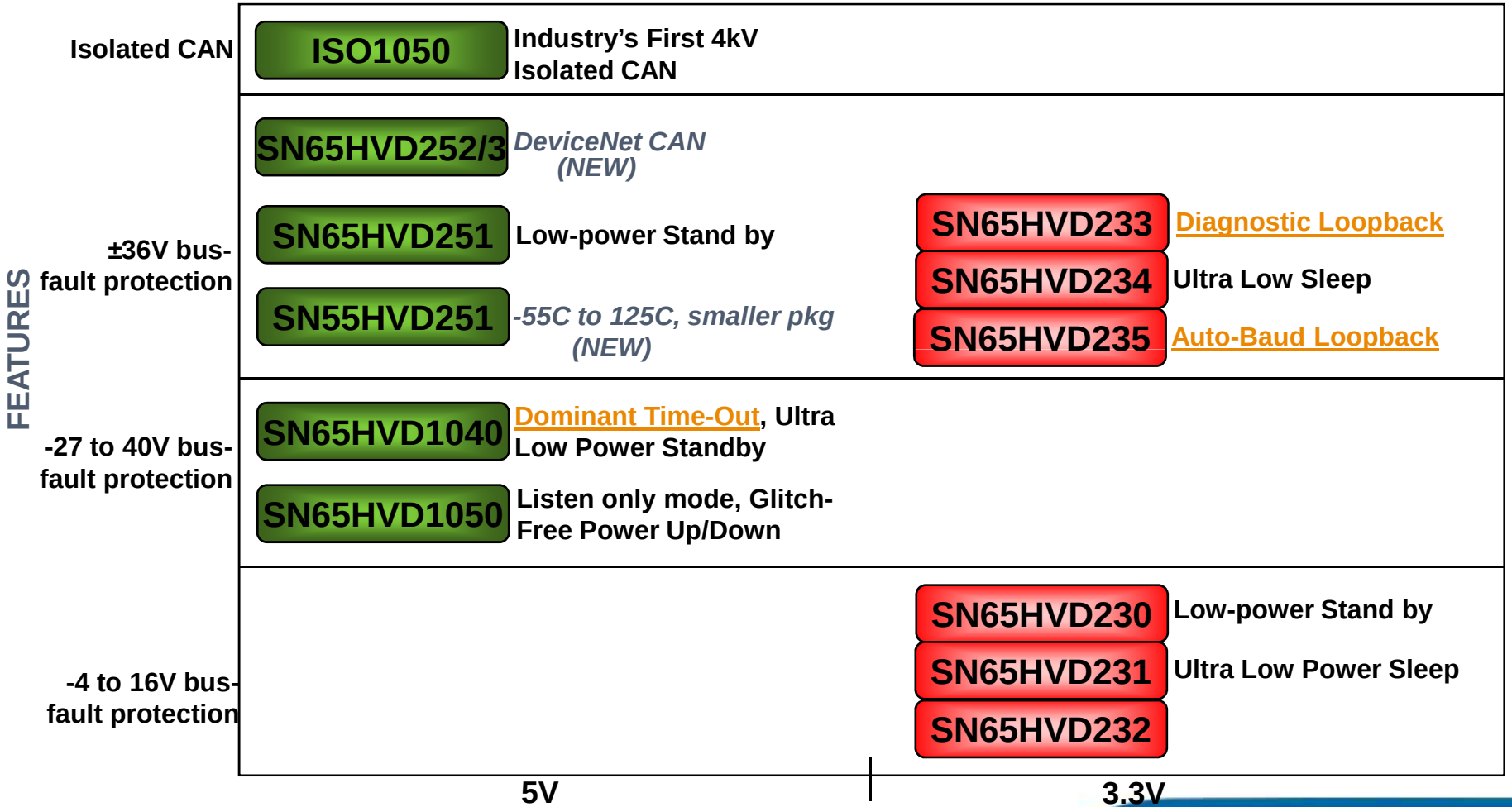
Сериалайзеры от TI

	SN65HVS880	SN65HVS881	SN65HVS882	SN65HVS885
Operating VCC Voltage(V)	18V - 30V	10V – 34V	10V – 34V	4.5V - 5.5V
I/O Vol	0-30	0-34		
Interface	SPI			
No. of Inputs	8			
I/O max rate(kbps)	1000			
Debounce times(MS)	0,1,3			
IO Current (mA)	0.2-5.2			
Low Voltage Monitor	Yes	No		
Parity	No	Yes	No	No
Over temperature	Yes			
Pin/Package	28HTSSOP			
Operating Temp Range(C)	-40 to 85	-40 to 125		
Price	$2.75	$3.10	$3.00	$2.70
	PLC Voltage range	Parity Bit - Error Check	General purpose	Applications with 5V VCC

Решение TI для RS-485



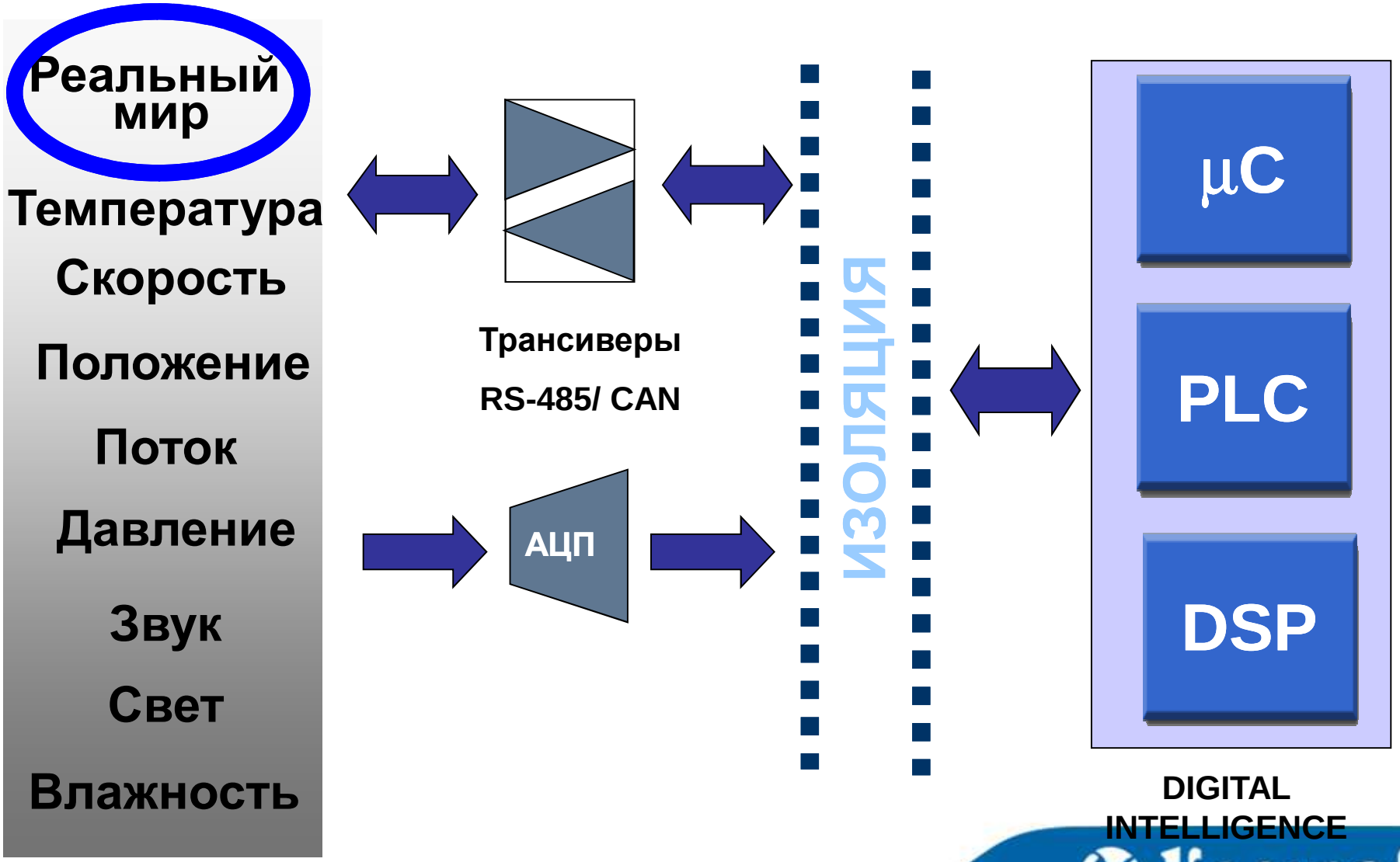
Решение TI для CAN



Микросхемы для гальванической развязки цифровых сигналов и интерфейсов

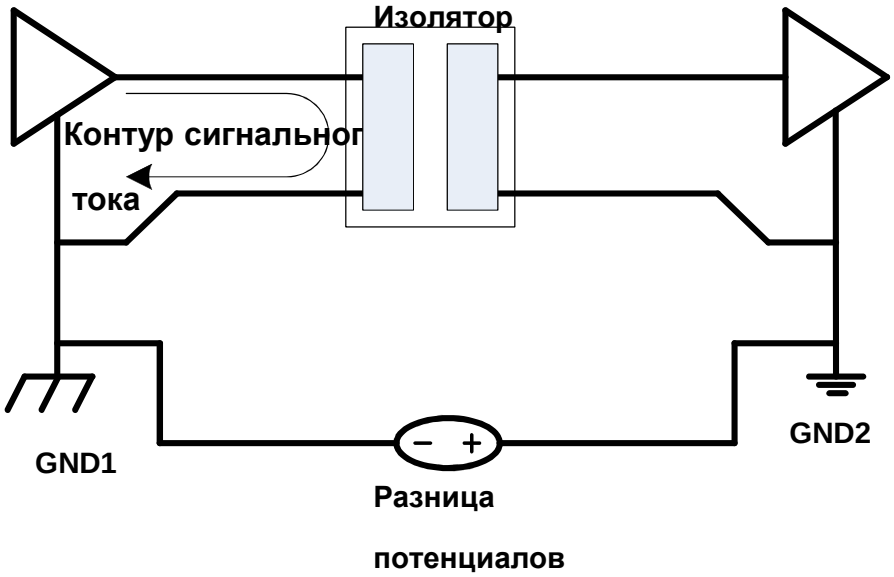
Компэл
www.compel.ru

Гальваническая развязка



Зачем развязывать? Земляные петли

- При существовании более одного пути тока возникает эффект «земляной петли»
- Многократные пути тока могут привести к возникновению непредсказуемых уравнительных токов создающих помехи

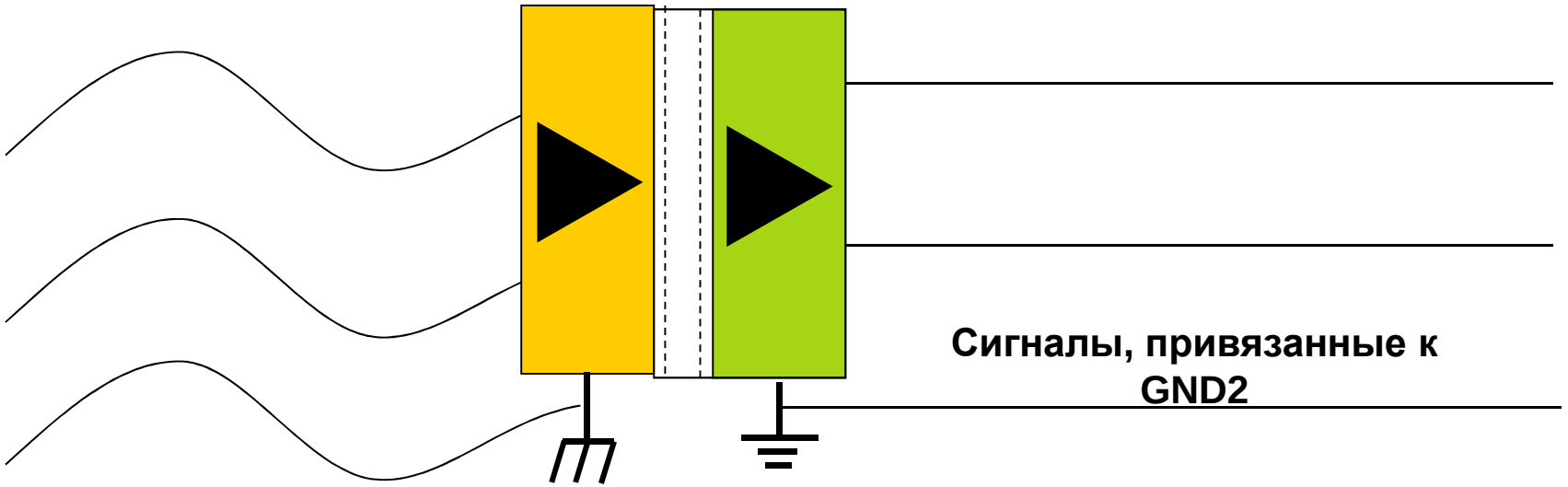


Для решения этой проблемы можно прибегнуть к:

- Размыканию земляного контура
- Применению синфазных дросселей
- Использованию дифференциальных усилителей
- Использованию гальванической изоляции

- Из всех предложенных вариантов только изоляторы позволяют обеспечить защиту при возникающей большой разности потенциалов

Зачем развязывать?
Синфазная помеха



Сигналы, привязанные к GND1

Условные обозначения / Определения

- **Рабочее напряжение :**

Напряжение которое изоляционный барьер может держать постоянно, обычно 560В или 890В

- **Напряжение изоляции:**

Напряжение которое держит изолятор в течении определённого времени, тестируется в течении 1 минуты, обычно 2,5кВ или 5кВ RMS или 4кВ и 6кВ амплитудного соответственно

- **Импульсное напряжение**

Единичный импульсный выброс напряжения, при условии восстановления после предыдущих скачков, обычно 10кВ.

Условные обозначения / Определения

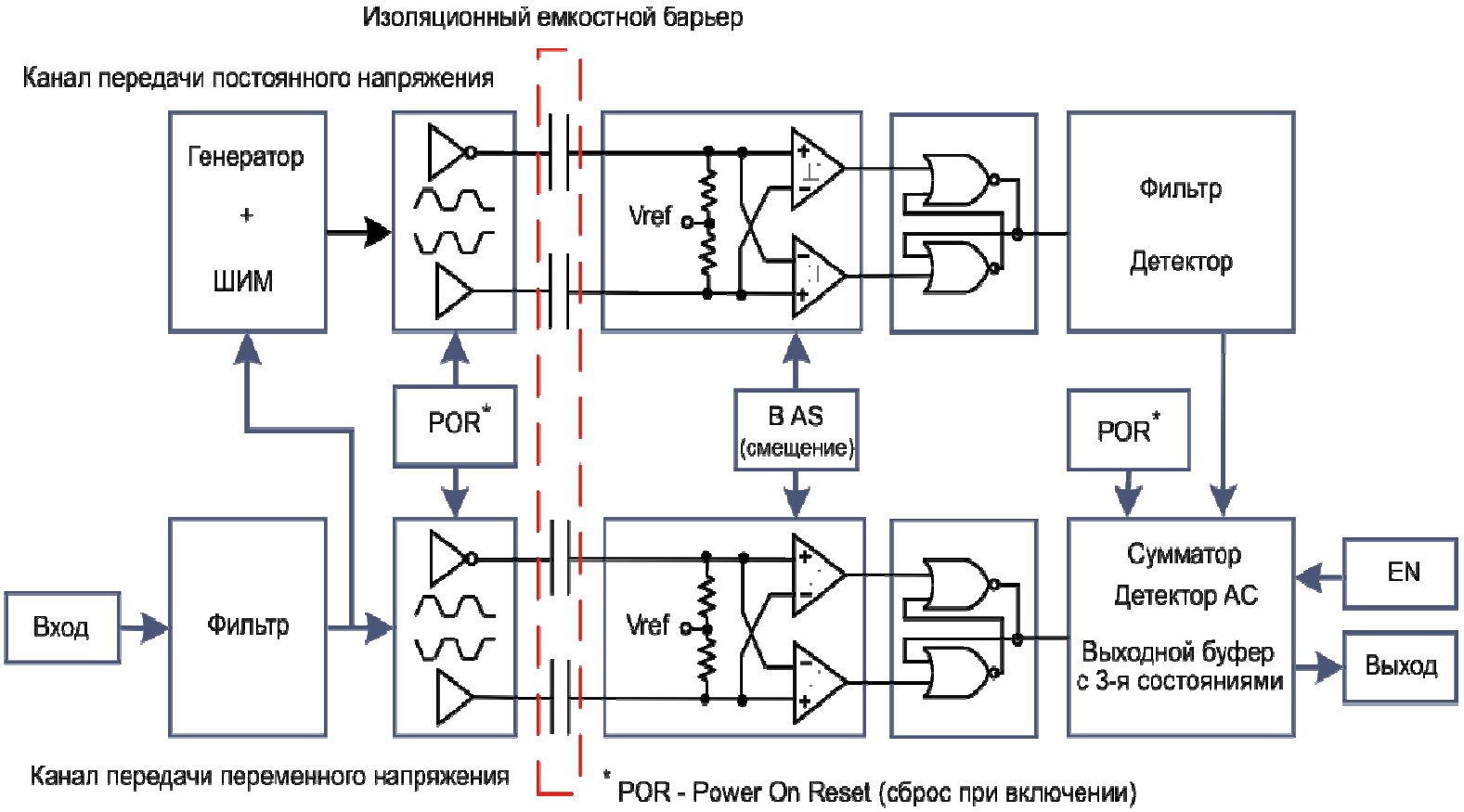
- **Подавление переходных процессов Синфазного сигнала:**

При быстром изменении первичного напряжения ко вторичному (dU/dt), не должно быть никаких ложный срабатываний или дребезга (например 35кВ/мксек).

- Утечка по поверхности, зазор

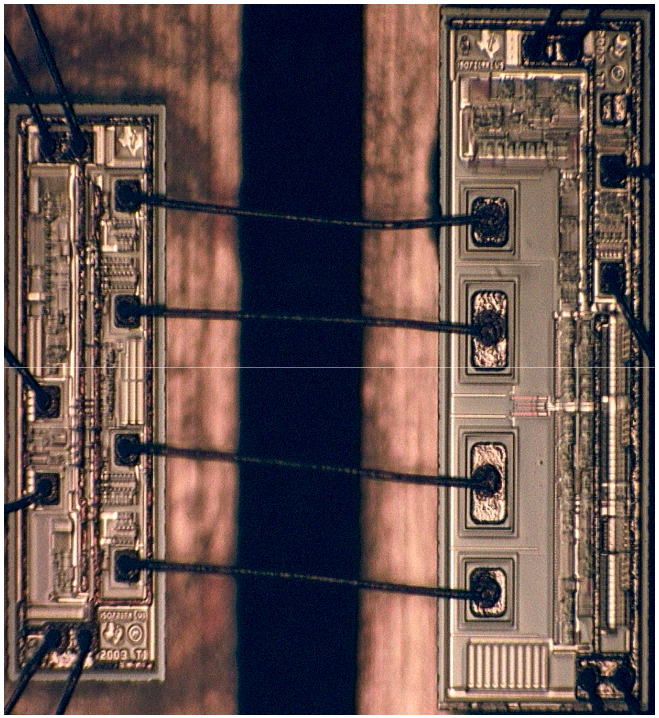
Поверхностное расстояние, которое может проводить при повышении уровня влажности или загрязнении на плате, и зазор по воздуху.. Для 560В/4кВ обычно 5мм достаточно, для 890В/6кВ обычно необходимо 8мм.

Технология емкостной изоляции



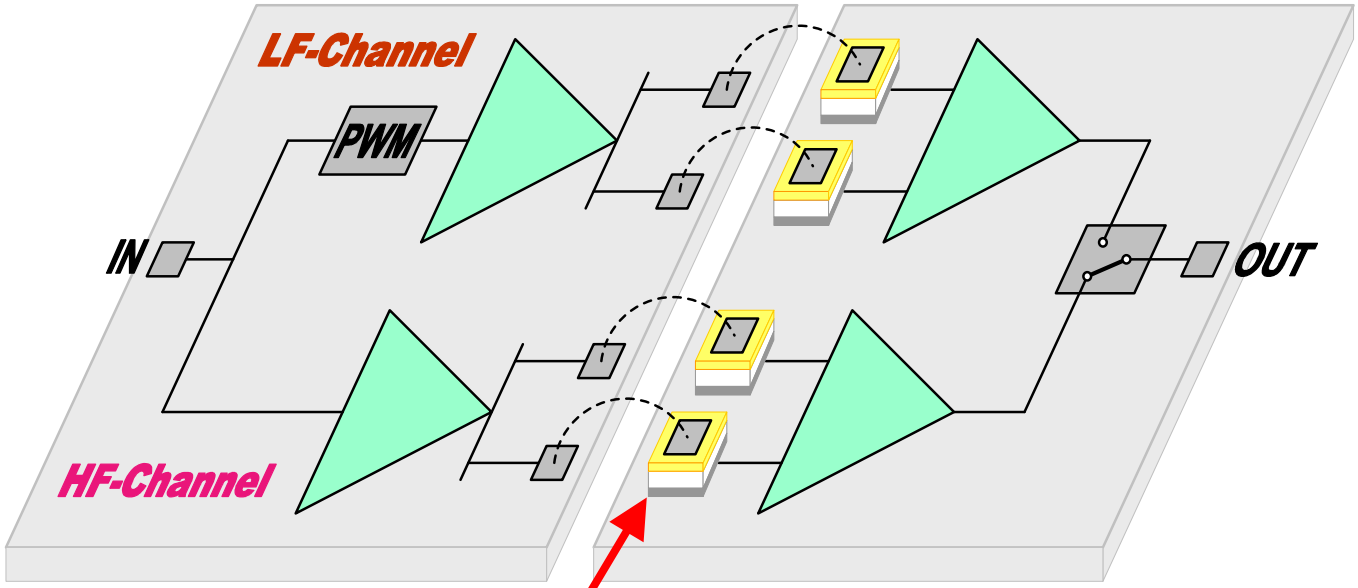
Устройство емкостного барьера

Структура ёмкостного изолятора (один конденсатор).



Внешний вид внутренних соединений между двумя подложками ИС ISO721

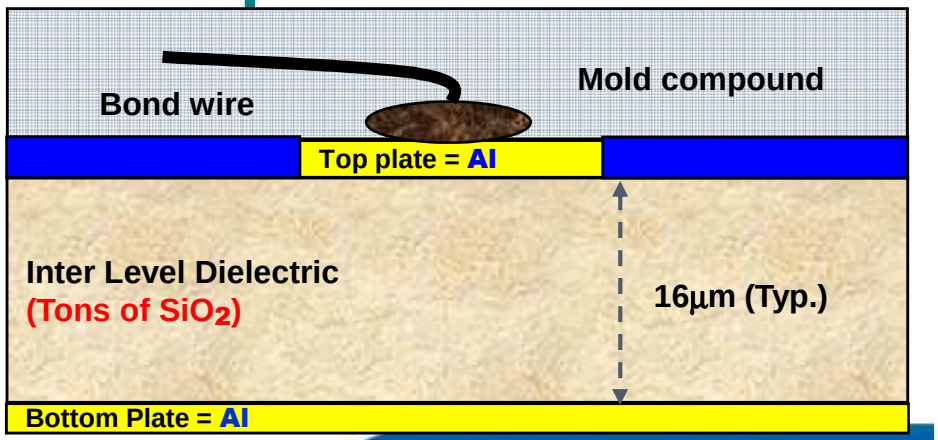
Устройство емкостного барьера



Transmit - Chip Receiver - Chip

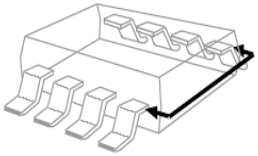
HV-Cap

High Voltage Capacitor Detail

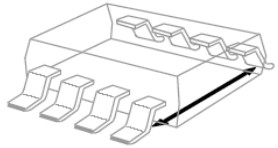


Устройство емкостного барьера

Расстояние по корпусу

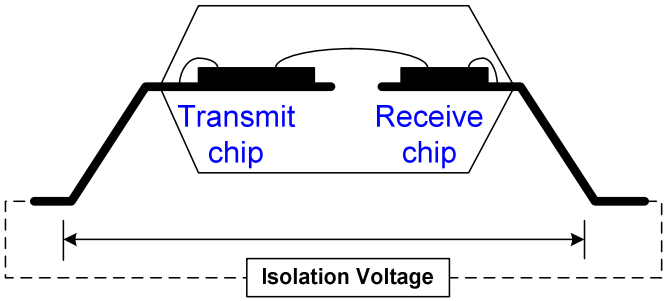


Расстояние по пинам



Корпус/обозначение	По корпусу мм	По пинам мм
Narrow body SOIC/ D	4.8	4.3
Gull wing / DUB	6.8	6.1
Wide body SOIC/ DW	8.1	8.3

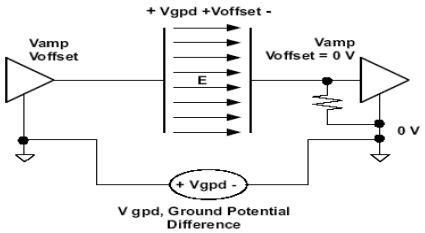
Cross Sectional View



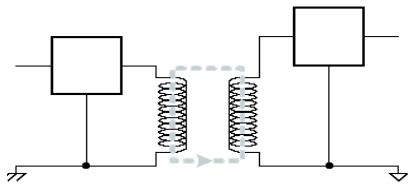
Это всё ёмкости

Source: TI App note SLLA198 www.ti.com/iso721

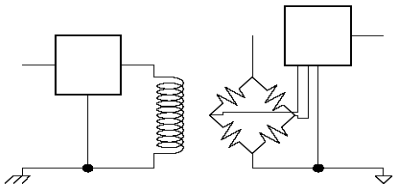
Емкостная



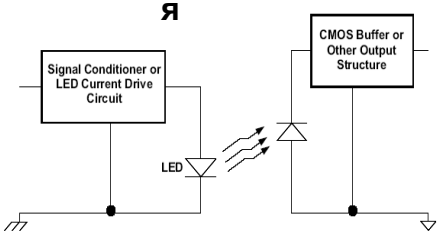
Индуктивная

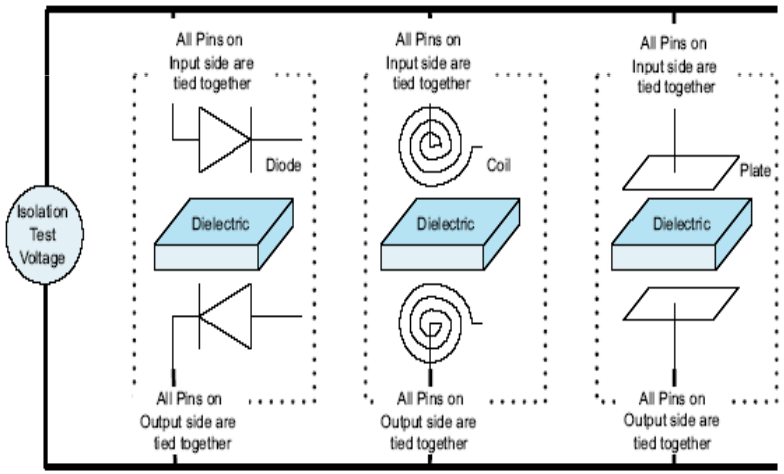


GMR



Оптическая





	Емкостная ISO72X	Индуктивная ADuM1xxx	GMR IL7xx	Оптическая HCPL-07xx
C_{IO}	1 pF	1 pF	1.1 pF	0.6 pF
ε_r, материала	SiO_2=4.5	Polyimide=2.8	Polyimide=2.8	Mold comp.e=3.6

Все внутренние соединения изоляторов могут быть смоделированы и все имеют в своём составе ёмкости , активные или паразитные

Временные параметры

	Дешевая оптическая развязка	Высоко произв. Оптическая развязка	Магнитная	Емкостная
Скорость передачи	Ед.Мбит/сек	50Мбит/сек	90Мбит/сек	200Мбит/сек
Время задержки передачи	100нсек	20нсек	32нсек	12нсек
Широтно-импульсные искажения	35нсек	2нсек	2нсек	1.5нсек
Сдвиг Канал-Канал	40нсек	16нсек	2нсек	1.6нсек
Сдвиг от микросхемы к микросхеме	40нсек	20нсек	10нсек	2нсек

Параметры надёжности

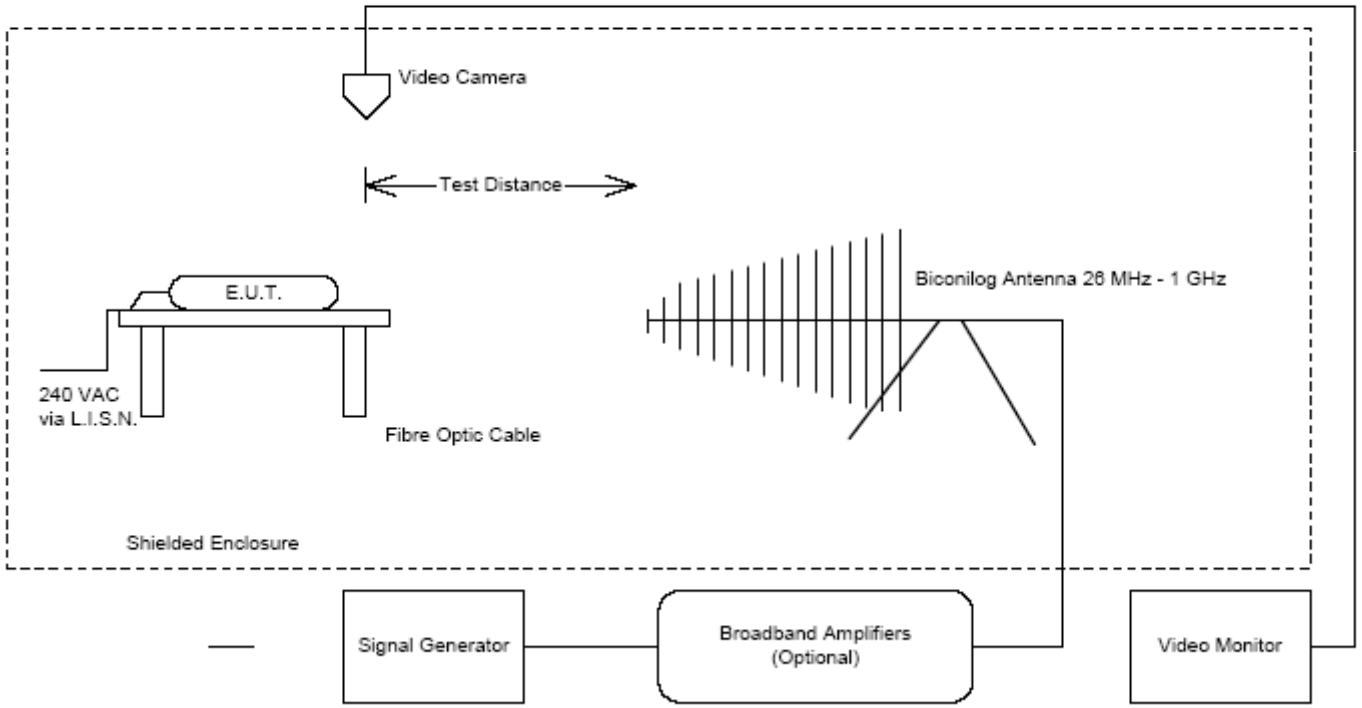
	Дешевая оптика	Высоко произв. оптика	Магнитн.	Емкостная
ESD защита для всех выводов	Нет данных	Нет данных	Нет данных	±4kV
Устойчивость к переходным процессам	5кВ/мкс	20кВ/мкс	25кВ/мкс	25кВ/мкс
Темп. диапазон	-40..85°C	-40..105°C	-40..125°C	-55..125°C
FIT (10^9 hours)	Нет данных	12	Нет данных	0.3

Независимые тесты

Nemko

EN55024
REPORT NO.8289EEU1Rev1
EQUIPMENT: 7221C, 1201CRZ

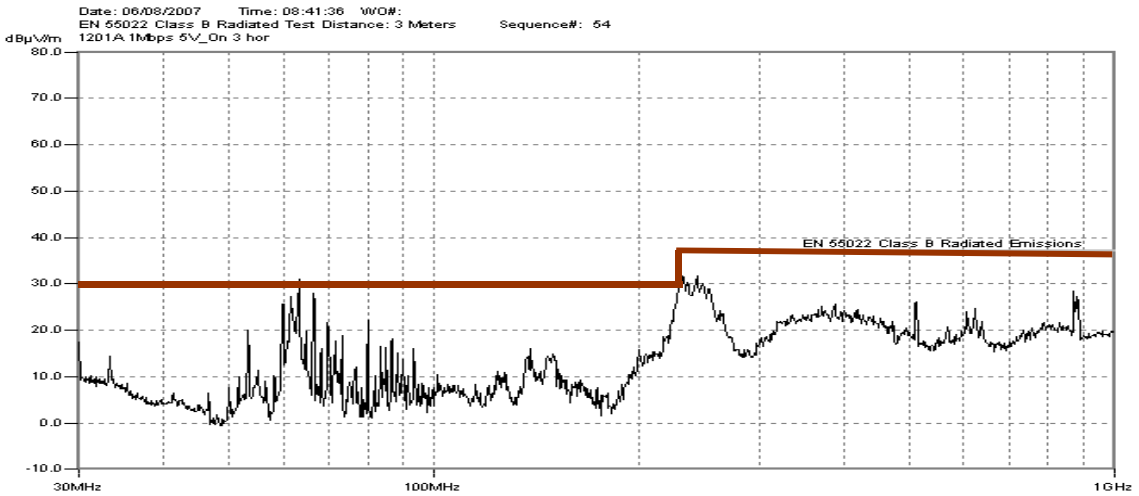
Test Configuration - Radiated Electromagnetic Immunity (Shielded Room)



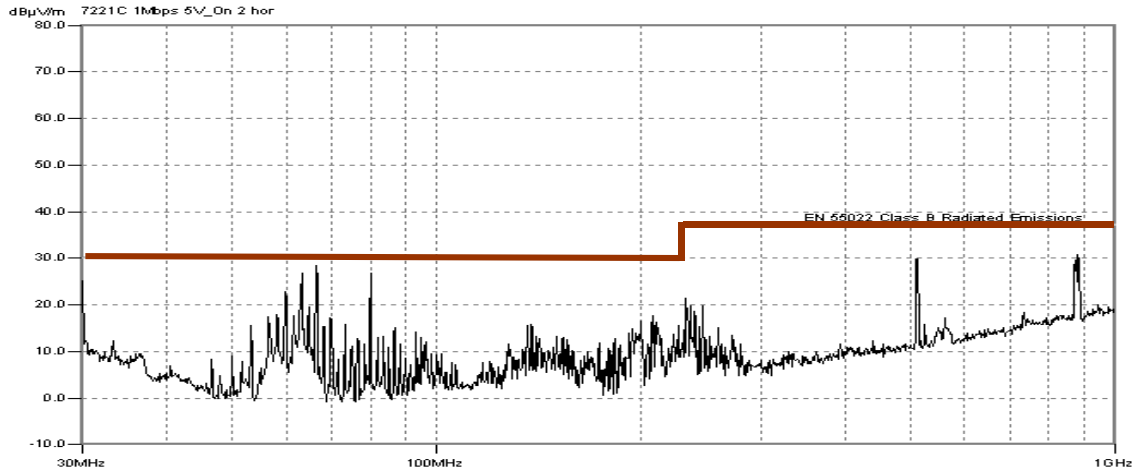
EN55022 Class B тест радиопомех

1Mbps: Comparison of Radiated Noise Spectrum – Antenna Horizontal

Индуктивная @ 5V Vcc



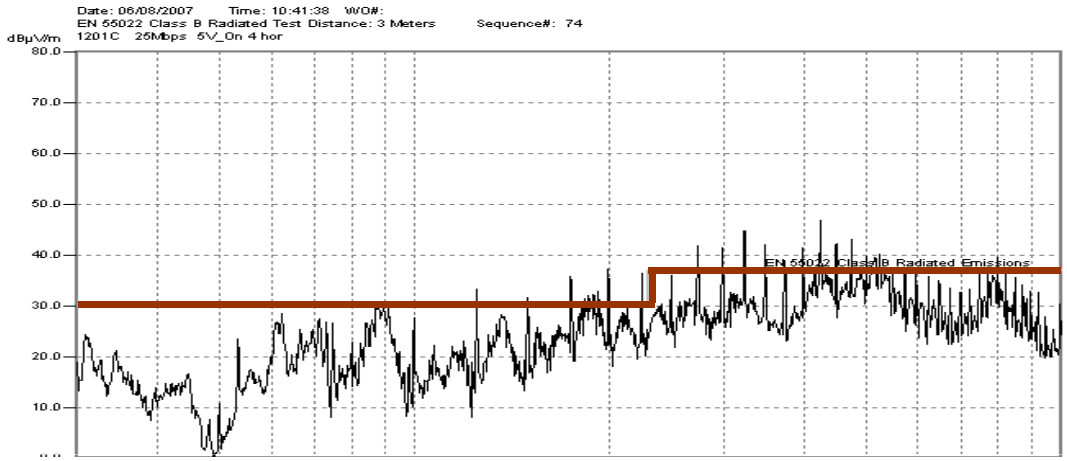
ISO7221: 1Mbps operation @ 5V Vcc



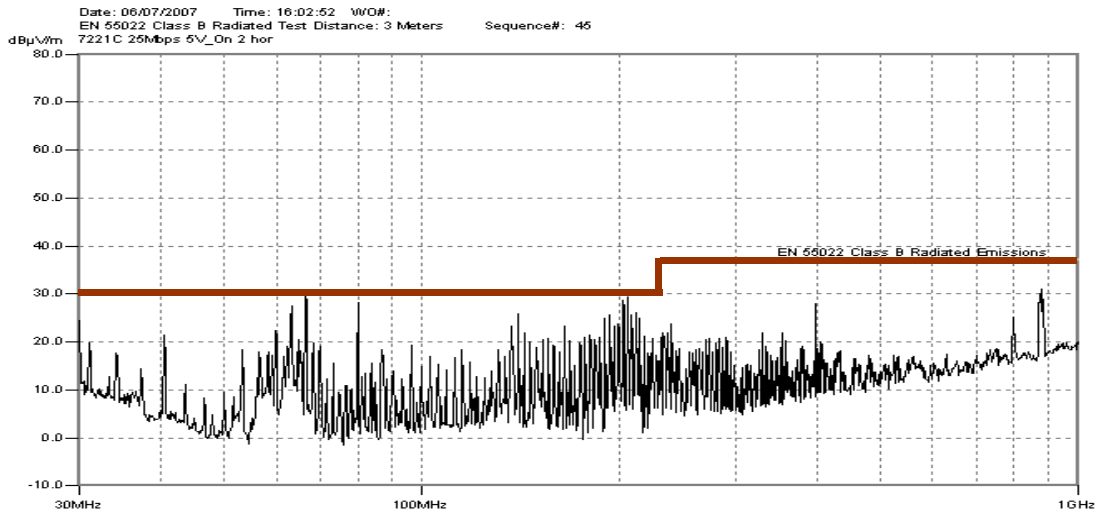
EN55022 Class B тест радиопомех

25Mbps: Comparison of Radiated Noise Spectrum – Antenna Horizontal

Индуктивная



ISO7221: 25Mbps operation @ 5V Vcc



Test Report
по устойчивости к электромагнитным полям

Nemko

EN55024
REPORT NO.8289EEU1Rev1
EQUIPMENT: 7221C, 1201CRZ

Abstract: Immunities:
EUT X7221C

Name of Test	Basic Standard	Test Specification	Results
Radiated Electro-magnetic Field	IEC61000-4-3: 1995	80MHz to 1000 MHz 80% AM @ 1 kHz Level X 100 V/M	Complies
Radiated Electro-magnetic Field RS103	MIL-STD 461E RS103	2MHz to 30 MHz 50% AM @ 1 kHz 200 V/M	Complies
Radiated Electro-magnetic Field RS103	MIL-STD 461E RS103	30MHz to 1000 MHz 50% AM @ 1 kHz 100 V/M	Complies

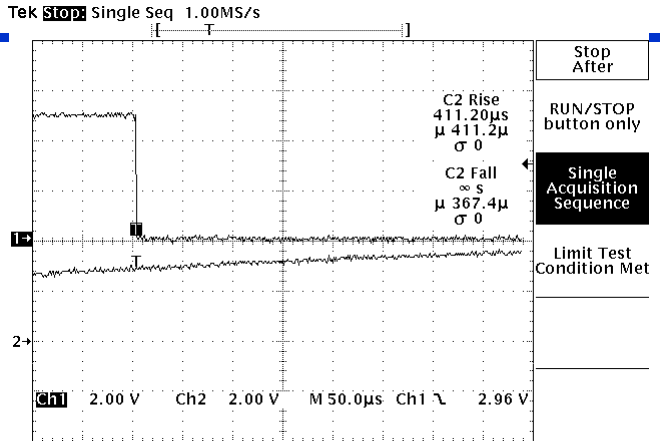
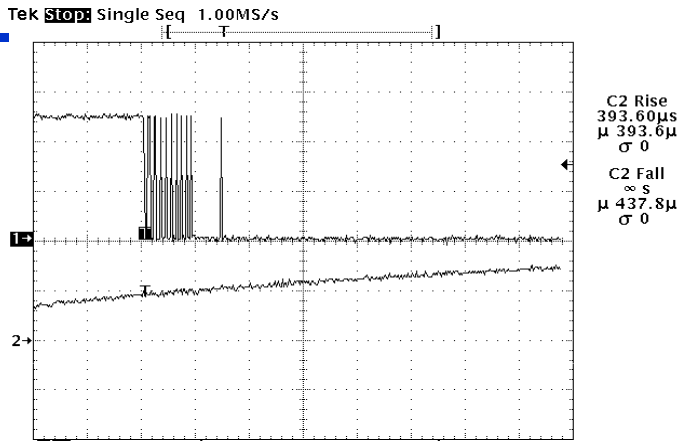
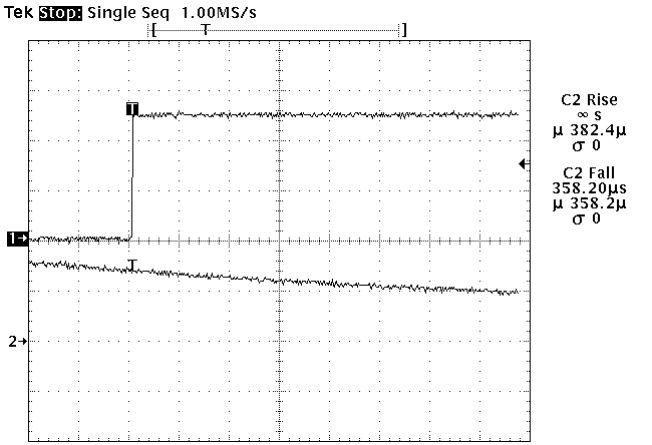
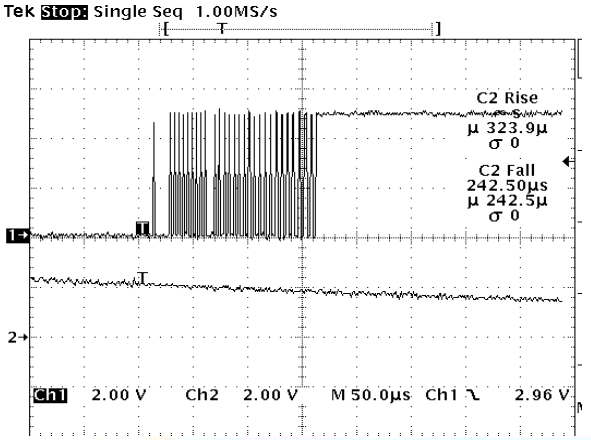
TI Isolator

Abstract: Immunities:
EUT 1201CRZ

Name of Test	Basic Standard	Test Specification	Results
Radiated Electro-magnetic Field	IEC61000-4-3: 1995	80MHz to 1000 MHz 80% AM @ 1 kHz Level X 100 V/M	Fails
Radiated Electro-magnetic Field RS103	MIL-STD 461E RS103	2MHz to 30 MHz 50% AM @ 1 kHz 200 V/M	Complies
Radiated Electro-magnetic Field RS103	MIL-STD 461E RS103	30MHz to 1000 MHz 50% AM @ 1 kHz 100 V/M	Fails

Индуктивный изолятор

Сравнительный анализ при подаче и сбросе питания

	ISO721	Индуктивная развязка
Power up behavior: Vcc2 power supply is on Input state is L Ch 1 is Output: Transition from failsafe H to L Ch2 is Vcc1 being turned on, typical turn on time is in milli sec.		
Power down behavior: Vcc2 power supply is on Input state is L Ch 1 is Output: Transition from L to failsafe H Ch2 is Vcc1 being turned off, typical turn off time is in milli sec.		

Продукция конкурентов

ADI

- ADuM1100
- ADuM3100
- ADuM120x
- ADuM121x
- ADuM320x
- ADuM3210
- ADuM220x
- ADuM130x
- ADuM131x
- ADuM330x
- ADuM140x
- ADuM141x

Si Labs

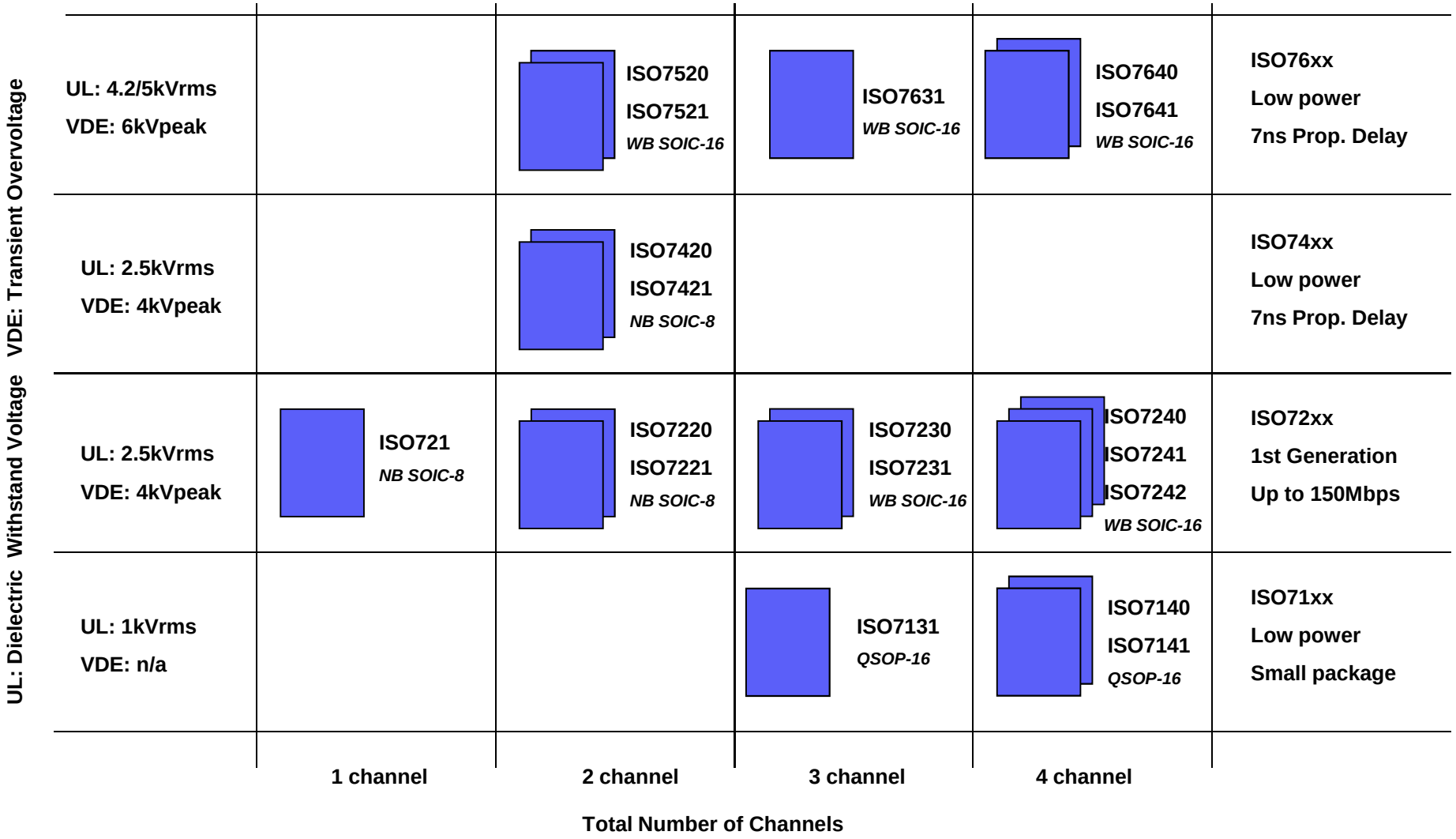
- Si8410
- Si842X
- Si843X
- Si844X

Avago

- HCPL–9000
- HCPL–0900
- HCPL–903x
- HCPL–093x
- HCPL-90xJ
- HCPL-09xJ

S =Прямая замена	P = функциональная замена
Q = Одинаковая функциональность и выводы	F =Схожая функциональность
	Нет доступной замены

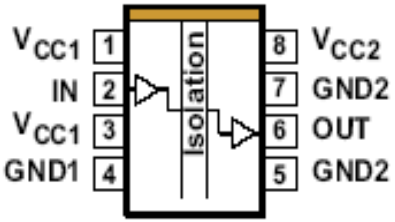
Изоляторы Texas Instruments



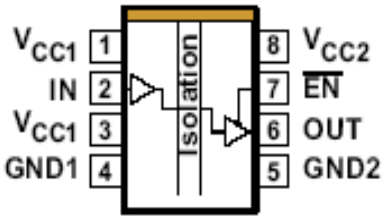
Single Channel Signal Isolators: ISO72x

- 4000Vpeak Isolation
- 560Vpeak continuous
- Signaling Rate Options
  (ISO721B: 5Mbps, ISO721: 100Mbps, ISO721M: 150 Mbps)
- UL 1577, IEC 60747-5-2 (VDE 0884, Rev. 2),
  IEC 61010-1 and CSA Approved
- 3.3V/5V Operation (any combination)
- 25 kV/µs Transient Immunity and
  High Electromagnetic Immunity
- Failsafe Output and High Impedance at Input and Output with Low Vcc

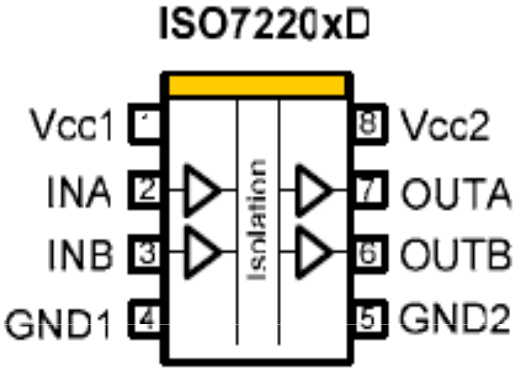
PACKAGE PIN ASSIGMENTS
ISO721D, ISO721MD
(TOP VIEW)

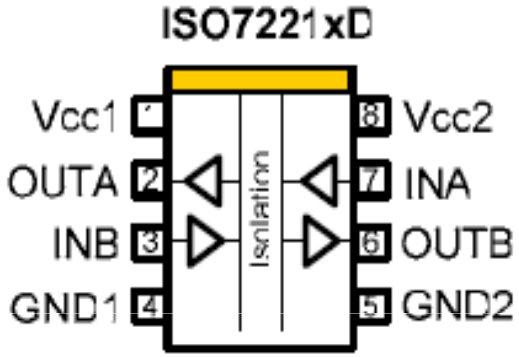


PACKAGE PIN ASSIGMENTS
ISO722D, ISO722MD
(TOP VIEW)



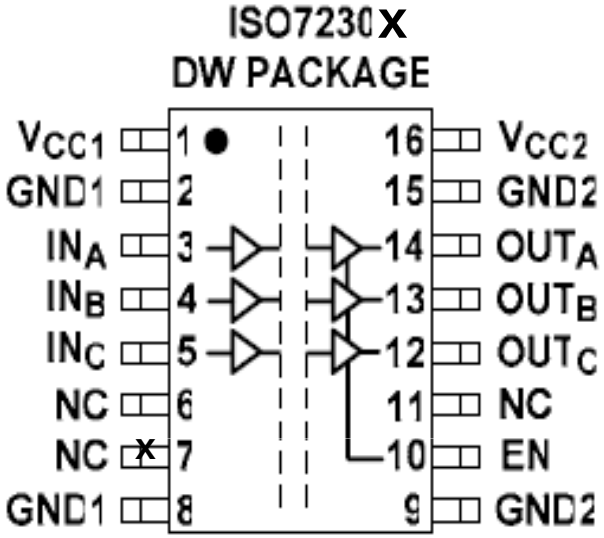
Multi-Channel
Stand-alone Isolators: Duals

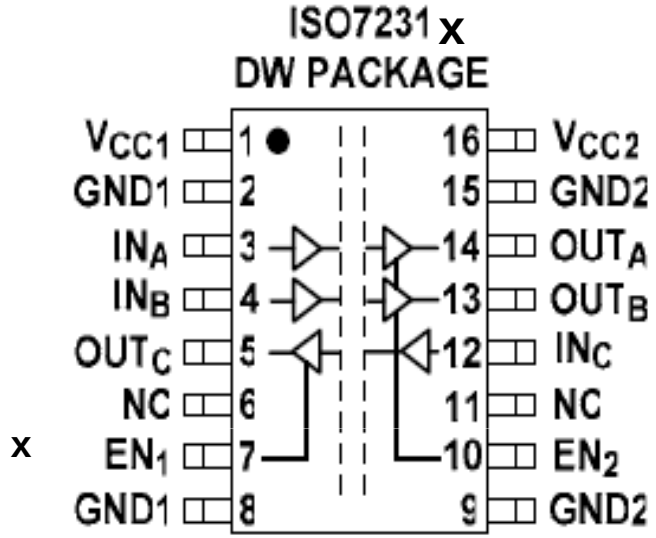




x designates speed option: A = 1Mbps; B = 5Mbps; C = 25Mbps; M = 150Mbps

Multi-Channel
Stand-alone Isolators: Triples

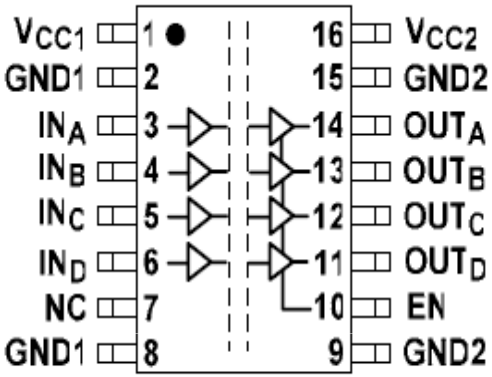




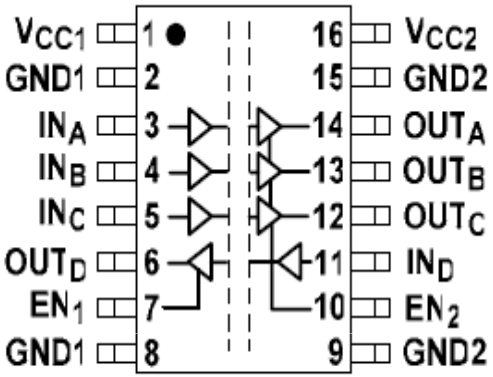
x designates speed option: A = 1Mbps; C = 25Mbps; M = 150Mbps
All in DW package

Multi-Channel Stand-alone Isolators: Quad-channel

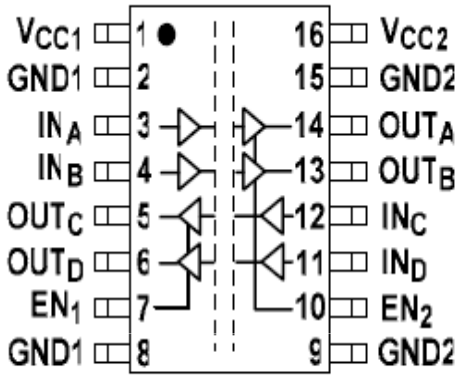
ISO7240x



ISO7241x

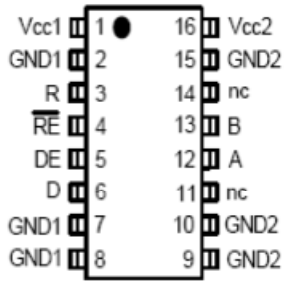


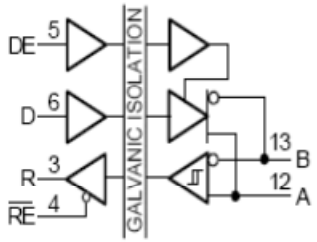
ISO7242x

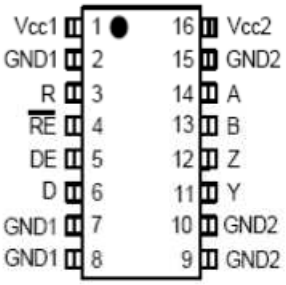


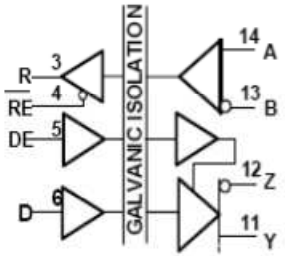
x designates speed option: A = 1Mbps; C = 25Mbps; M = 150Mbps
All in DW package

Isolated 485 Transceivers





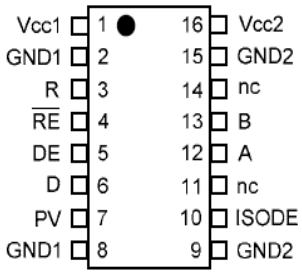




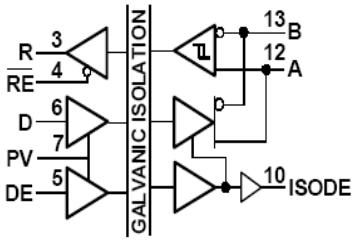
ISO308x, ISO1x, ISO3x “Standard RS-485”

- 3.3V and 5V
- half-duplex and full-duplex (‘176 and ‘180 configuration)
- 1Mbps and 25Mbps
- no IDODE output

DW PACKAGE



function diagram



ISO1176 : Isolated RS/485 ProfiBus

- 5V
- half-duplex
- 25Mbps
- optimized for Profibus-Applications
- ISODE available

ISO721 & ISO722
Single High Speed Digital Isolators

- Silicon Integrated SiO_2 Dielectric Capacitor
- 0–150MHz and DC Signal Pass with Fail Safe
- 4kVpk / 2500Vrms Isolation, 560V working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved
- Input Threshold, Noise Filter
- 3.3V and 5V Supply Supported
- Footprint compatible with Optos and ADI
- ISO722 has Enable / Low Power Sleep<0.2mA
- Available in 6.8mm wide body DUB package

- Proven Reliability of SiO_2 Dielectric, Stable over Temperature & Moisture
  - Life Span > 25 years
- High Magnetic Immunity (1E6 > Inductive)
- High Speed, Low Noise
- Lower Power than Optos
- Filters Noisy Signals before Entering System
- Flexibility with Power Supplies
- Drop in Upgrade for Optos and Inductive

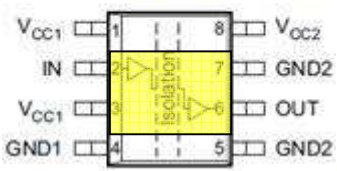
Part #	Data Rate	Inputs (NF=Noise filter)	Output Enable	Package
ISO721	100Mbps	TTL + NF	No	SOIC-8 / SOP-8
ISO722	100Mbps	TTL + NF	Yes	SOIC-8
ISO721M	150Mbps	CMOS	No	SOIC-8
ISO722M	150Mbps	CMOS	Yes	SOIC-8

- Consumer: PDP, Computer peripherals
- Industrial Controls
  - PLC, Servo, Motor Control, Sensors
- Industrial Automation
  - Fieldbus – Modbus, Profibus, Device Net Data Buses, Smart Distributed Systems (SDS), CAN, RS485
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles

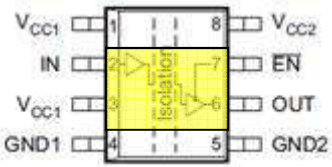
EVM

ISO EVM - ISO72XEVM

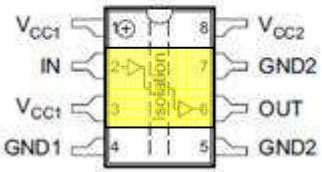
ISO721, ISO721M
D Package
(Top View)



ISO722, ISO722M
D Package
(Top View)



ISO721
DUB Package
(Top View)



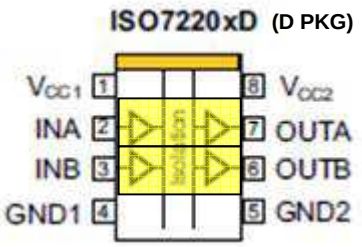
ISO722x
Dual High Speed Digital Isolators

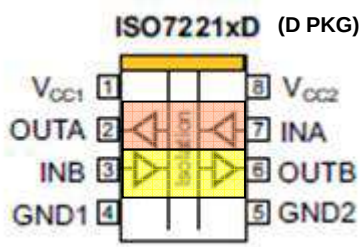
- Silicon Integrated SiO_2 Dielectric Capacitor
- 0–150Mbps and DC Signal Pass with Fail Safe
- 1ns Skew, 1ns Jitter, 1ns Pulse Distortion
- Input Threshold, Noise Filter
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved

- Proven Reliability of SiO_2 Dielectric, Stable over Temperature & Moisture
  - Life Span > 25 years
- Lowest Skew, Jitter, & Pulse Width Distortion
- Filters Noisy Signals before Entering System
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies

Part #	Data Rate	Inputs (NF=Noise filter)	Package
ISO72xA	1Mbps	TTL + NF	SOIC-8
ISO72xB	5Mbps	TTL + NF	SOIC-8
ISO72xC	25Mbps	TTL + NF	SOIC-8
ISO72xM	150Mbps	CMOS	SOIC-8

- Consumer: PDP, Computer peripherals
- Industrial Controls
  - PLC, Servo, Motor Control, Sensors
- Industrial Automation
  - Fieldbus – Modbus, Profibus, Device Net Data Buses, Smart Distributed Systems (SDS), CAN, RS485
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles





EVM

ISO EVM - ISO72XEVM

ISO150

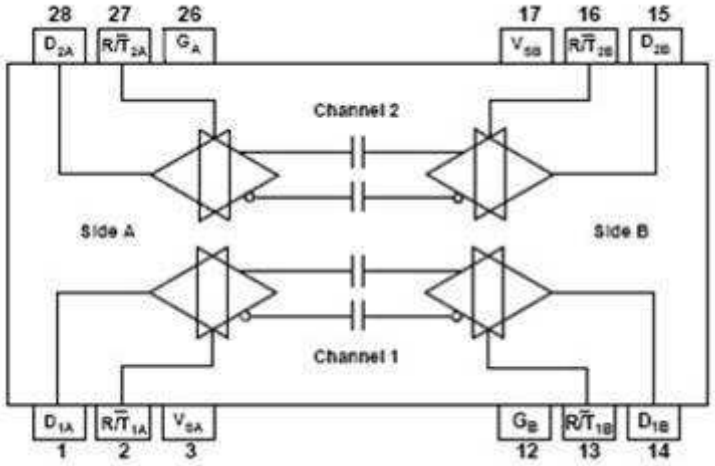
Dual Bi-Directional Digital Isolator

- Capable of data rates of 80M Baud
- 2-channel, galvanically-isolated data coupler
- Each channel is individually programmable
- Built in capacitors with Faraday shielding

- Suitable for wide range of applications
- Isolation adds safety
- Will transmit data in either direction
- Protected against false triggering by external electrostatic fields

- Digital Isolation for A/D, D/A Conversion
- Isolated RS-485 Interface
- Multiplexed Data Transmission
- Test Equipment
- Isolated Line Receiver
- Ground Loop Elimination

SOP-12 (DVB PKG)



ISO752xC

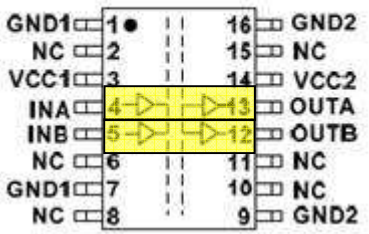
Dual Low Power, 5KVrms Digital Isolators

- Silicon Integrated SiO_2 Dielectric Capacitor
- Up to 1Mbps and DC Signal Pass with Fail Safe
- 4ns Skew, 300ps Pulse Distortion, 9ns Delay
- Low Power – 1.5mA per channel typical (3.3V)
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 5000V rms max Isolation
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA pending

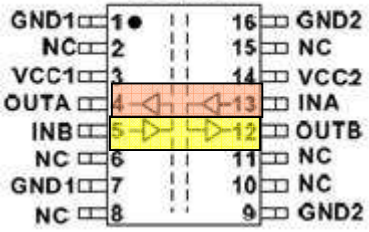
- Proven Reliability of SiO_2 Dielectric,
  - Life Span > 25 years
- Lowest Skew, & Pulse Width Distortion
- Enabling low power application
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies
- Certified by all 3 World Wide agencies

Part #	Inputs	Temp (C)	Package
ISO7520C	TTL	-40 to 105	SOIC–16
ISO7521C	TTL	-40 to 105	SOIC–16

ISO7520C (DW PKG)

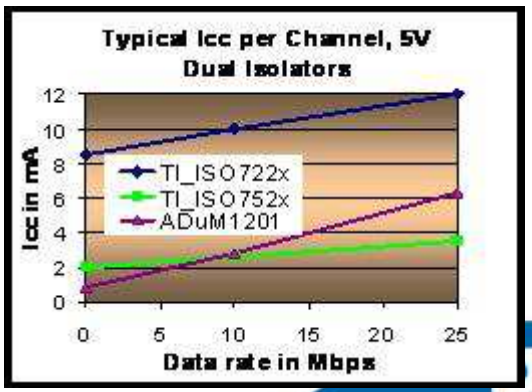


ISO7521C (DW PKG)



- **Medical**
- Consumer: Computer peripherals
- Industrial Controls
  - PLC, Servo, Motor Control, Sensors
- Industrial Automation
  - Fieldbus – Modbus, Profibus, DeviceNet Data Buses, Smart Distributed Systems (SDS), CAN, RS485
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles

ISO EVM - ISO742XEVM



ISO742x

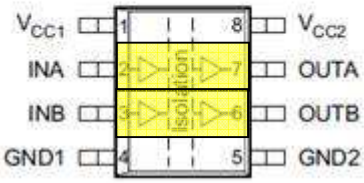
Dual Low Power Digital Isolators

- Silicon Integrated SiO_2 Dielectric Capacitor
- Up to 1Mbps and DC Signal Pass with Fail Safe
- 2ns Skew, 300ps Pulse Distortion, 9ns Delay
- Low Power – 1.5mA per channel typical (3.3V)
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA pending

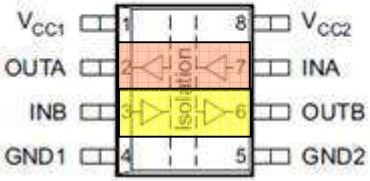
- Proven Reliability of SiO_2 Dielectric,
  - Life Span > 25 years
- Lowest Skew, & Pulse Width Distortion
- Enabling low power application
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies
- Certified by all 3 World Wide agencies

Part #	Inputs	Temp (C)	Package
ISO7420	TTL	-40 to 105	SOIC-8
ISO7420M	TTL	-40 to 125	SOIC-8
ISO7421	TTL	-40 to 105	SOIC-8

ISO7420
D Package
(Top View)



ISO7421
D Package
(Top View)



- Consumer: Computer peripherals
- Industrial Controls
  - PLC, Servo, Motor Control, Sensors
- Industrial Automation
  - Fieldbus – Modbus, Profibus, DeviceNet Data Buses, Smart Distributed Systems (SDS), CAN, RS485
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles

EVM

ISO EVM - ISO742XEVM

ISO723x
Triple High Speed Digital Isolators

Datasheet
ISO723XA

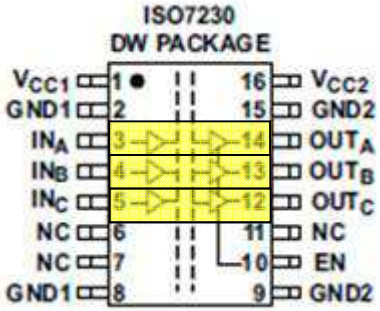
Datasheet
ISO723XC
ISO723XM

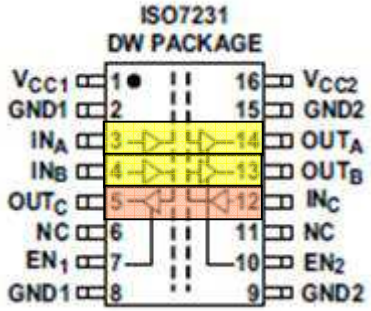
- Silicon Integrated SiO_2 Dielectric Capacitor
- 0–150Mbps and DC Signal Pass with Fail Safe
- 2ns - Skew, 1ns - Pulse Distortion, 1ns Jitter
- Input Threshold, Noise Filter
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved

- Proven Reliability of SiO_2 Dielectric, Stable over Temperature & Moisture
  - Life Span > 25 years
- Low Skew & Pulse Width Distortion
- Filters Noisy Signals before Entering System
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies

Part #	Data Rate	Inputs (NF=Noise filter)	Package
ISO723xA	1Mbps	TTL + NF	SOIC-16
ISO723xC	25Mbps	TTL + NF	SOIC-16
ISO723xM	150Mbps	CMOS	SOIC-16

- Industrial Controls
  - PLC, Servo, Motor Control
- Industrial Automation
  - Fieldbus – CC-Link, RS485
- SPI Isolation
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles





EVM

ISO EVM - ISO72XEVM

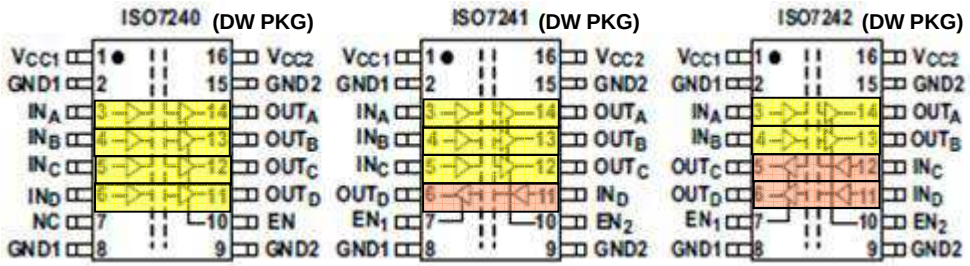
ISO724x
Quad High Speed Digital Isolators

- Silicon Integrated SiO_2 Dielectric Capacitor
- 0–150Mbps and DC Signal Pass with Fail Safe
- 2ns - Skew, 1ns - Pulse Distortion, 1ns Jitter
- Input Threshold, Noise Filter
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved

- Proven Reliability of SiO_2 Dielectric, Stable over Temperature & Moisture
  - Life Span > 25 years
- Low Skew & Pulse Width Distortion
- Filters Noisy Signals before Entering System
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies

Part #	Data Rate	Inputs (NF=Noise filter)	Package
ISO723xA	1Mbps	TTL + NF	SOIC-16
ISO723xC	25Mbps	TTL + NF	SOIC-16
ISO723xM	150Mbps	CMOS	SOIC-16

- Industrial Controls
  - PLC, Servo, Motor Control
- Industrial Automation
  - Fieldbus – CC-Link, RS485
- SPI Isolation
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles



EVM

ISO EVM - ISO72XEVM

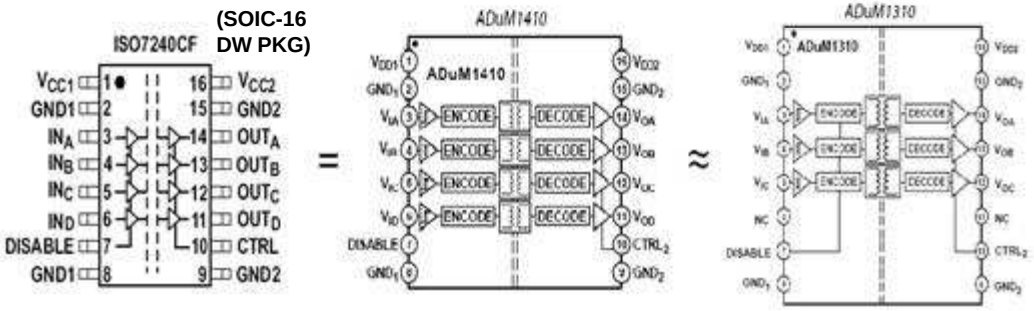
ISO7240CF selectable Failsafe Output Control

ISO7240CF

Quad High Speed Digital Isolators with Selectable Failsafe Output

- Silicon Integrated SiO_2 Dielectric Capacitor
- 0–25Mbps and DC Signal Pass with Fail Safe
- 2ns Skew, 2.5ns - Pulse Distortion
- Input Threshold, Noise Filter
- High Magnetic Immunity (1E6 > Inductive)
- 4KV ESD on All Pins
- 3.3V and 5V Supply Supported
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved

- Proven Reliability of SiO_2 Dielectric, Stable over Temperature & Moisture
  - Life Span > 25 years
- Low Skew & Pulse Width Distortion
- Filters Noisy Signals before Entering System
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies



- Consumer: Plasma Displays PDP
- Industrial Controls
  - PLC, Servo, Motor Control, Sensors
- Industrial Automation
  - Fieldbus – Modbus, Profibus, Device Net Data Buses, CC-Link, CAN, RS485
- Power Supply/Regulation Systems
- Automotive Electronics & Hybrid Vehicles

EVM

ISO EVM - ISO72XEVM

ISO7240CF Function Table

V_{CC1}	V_{CC2}	DATA INPUT (IN)	DISABLE INPUT (DISABLE)	FAILSAFE CONTROL INPUT (CTRL)	DATA OUTPUT (OUT)
PU	PU	H	L or Open	X	H
PU	PU	L	L or Open	X	L
X	PU	X	H	H or Open	H
X	PU	X	H	L	L
PD	PU	X	X	H or Open	H
PD	PU	X	X	L	L

ISO308x

4kV Isolated - Full & Half Duplex 5V RS-485

- Meets or Exceeds TIA/EIA RS-485
- Bus-Pin ESD Protection 16kV GND2 & 6kV GND1
- 200kbps and 20Mbps
- 1/8 Unit load – 256 nodes on a bus
- Glitch-Free & Failsafe (Open, Shorted, Idle)
- Silicon Integrated SiO_2 Insulator
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA approved

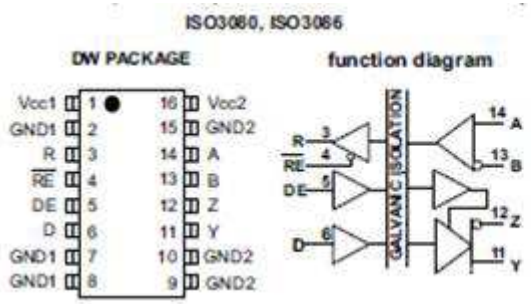
- Fully compliant to RS-485 Standard
- High Reliability in Harsh Environments
- Optimized for Long Cables Or High Speed
- Large buses
- Hot pluggable & Protected in all situations
- Proven Reliability of SiO_2 Insulation, Stable over Time, Temperature & Moisture
  - Life Span > 25 years @ 125°C

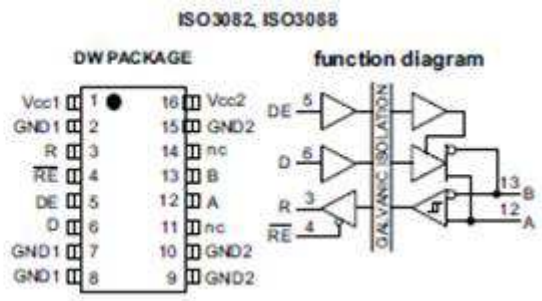
Part #	Duplex	Speed	Package
ISO3080	Full	200kbps	SOIC-16
ISO3086	Full	20Mbps	SOIC-16
ISO3082	Half	200kbps	SOIC-16
ISO3088	Half	20Mbps	SOIC-16

- Energy Meter Networks
- Power Inverters
- Industrial Automation
- Building Automation Networks
- Motor Control
- HVAC

EVM

ISO EVM – ISO485EVM





ISO15/15M & ISO35/35M

4kV Isolated - Full & Half Duplex 3.3V RS-485

- Meets or Exceeds TIA/EIA RS-485
- Bus-Pin ESD Protection 16kV GND2 & 6kV GND1
- 1Mbps
- 1/8 Unit load – 256 nodes on a bus
- Glitch-Free & Failsafe (Open, Shorted, Idle)
- Silicon Integrated SiO_2 Insulator
- 4kVpk / 2500-Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2), IEC 61010-1 & CSA approved

- Fully compliant to RS-485 Standard
- High Reliability in Harsh Environments
- Optimized for Long Cables
- Large buses
- Hot pluggable & Protected in all situations
- Proven Reliability of SiO_2 Insulation, Stable over Time, Temperature & Moisture
  - Life Span > 25 years @ 125°C

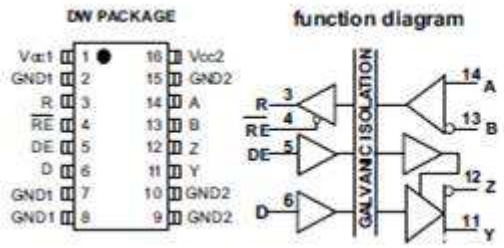
Part #	Duplex	Speed	Temp (C)	Package
ISO35	Full	1Mbps	-40 to 85	SOIC-16
ISO35M	Full	1Mbps	-55 to 125	SOIC-16
ISO15	Half	1Mbps	-40 to 85	SOIC-16
ISO15M	Half	1Mbps	-55 to 125	SOIC-16

- Energy Meter Networks
- Power Inverters
- Industrial Automation
- Building Automation Networks
- Motor Control
- HVAC

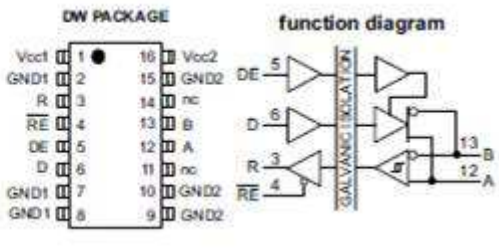
EVM

ISO EVM – ISO485EVM

ISO35



ISO15



ISO1176

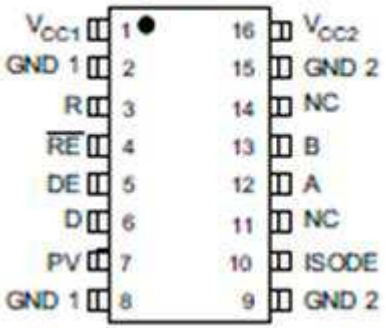
4kV Isolated - PROFIBUS

- Meets - EN-50170 (Profibus), RS-422, RS-485
- Bus-Pin ESD Protection 16kV GND2 & 6kV GND1
- Data Rates up to 40 Mbps
- Bus Capacitance 10 pF, 160 Nodes
- Glitch-Free Power-Up / Power-Down Protection
- Failsafe Receiver for Bus Open, Short, Idle
- Silicon Integrated SiO_2 Insulator
- 4kVpk / 2500Vrms Isolation, 560V Working

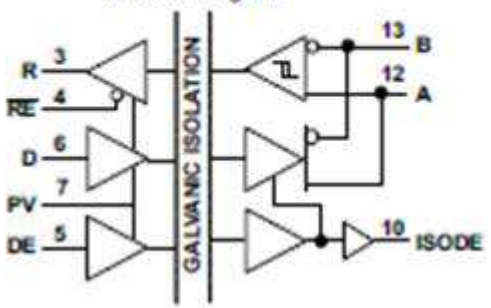
- UL1577, IEC 60747-5-2 (VDE 0884, rev. 2), IEC 61010-1 & CSA approved

- Fully compliant to PROFIBUS and RS-485
- High Reliability in Harsh Environments
- High Speed operation
- Large buses
- Hot pluggable without data Corruption
- Protected in all situations
- Proven Reliability of SiO_2 Insulation, Stable over Time, Temperature & Moisture
  - Life Span > 25 years @ 125°C

SOIC-16
DW PACKAGE
(TOP VIEW)



ISO1176
function diagram



- Energy Meter Networks
- Power Inverters
- Industrial Automation
- Building Automation Networks
- Motor Control

EVM

ISO EVM – ISO1176EVM

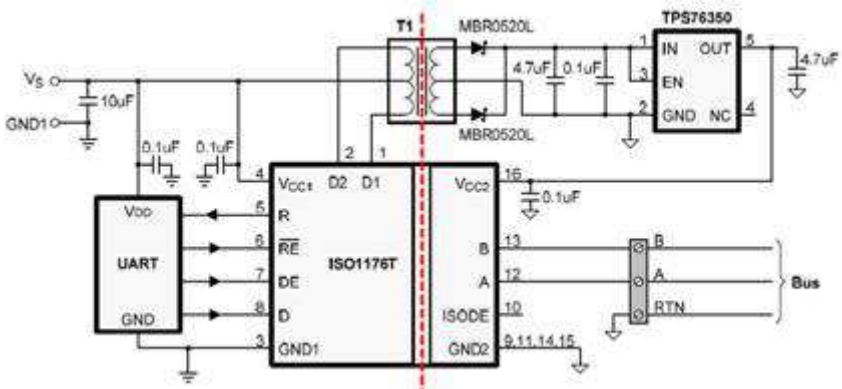
ISO RS-485 с Драйвером трансформатора

- Integrated transformer driver
- Meets or Exceeds TIA/EIA RS-485
- Bus-Pin ESD Protection 16kV GND2 & 6kV GND1
- 1Mbps / 20Mbps / 40Mbps
- 1/8 Unit load – 256 nodes on a bus
- Glitch-Free & Failsafe (Open, Shorted, Idle)
- Silicon Integrated SiO_2 Insulator
- 4kVpk / 2500Vrms Isolation, 560V Working
  - UL1577, IEC 60747-5-2 (VDE 0884, rev. 2) , IEC 61010-1 & CSA pending

- Ease of isolated power design
- Fully compliant to RS-485 Standard
- High Reliability in Harsh Environments
- Optimized for Long Cables Or High Speed
- Large buses
- Hot pluggable & Protected in all situations
- Proven Reliability of SiO_2 Insulation, Stable over Time, Temperature & Moisture
  - Life Span > 25 years @ 125°C

Part #	Duplex	Function	Speed	Package
ISO1176T	Half	Profibus	40Mbps	SOIC-16 (DW)
ISO35T	Full	3.3V RS485	1Mbps	SOIC-16 (DW)
ISO3086T	Full	5V RS485	20Mbps	SOIC-16 (DW)

- Energy Meter Networks
- Power Inverters
- Industrial Automation
- Building Automation Networks
- Motor Control
- HVAC

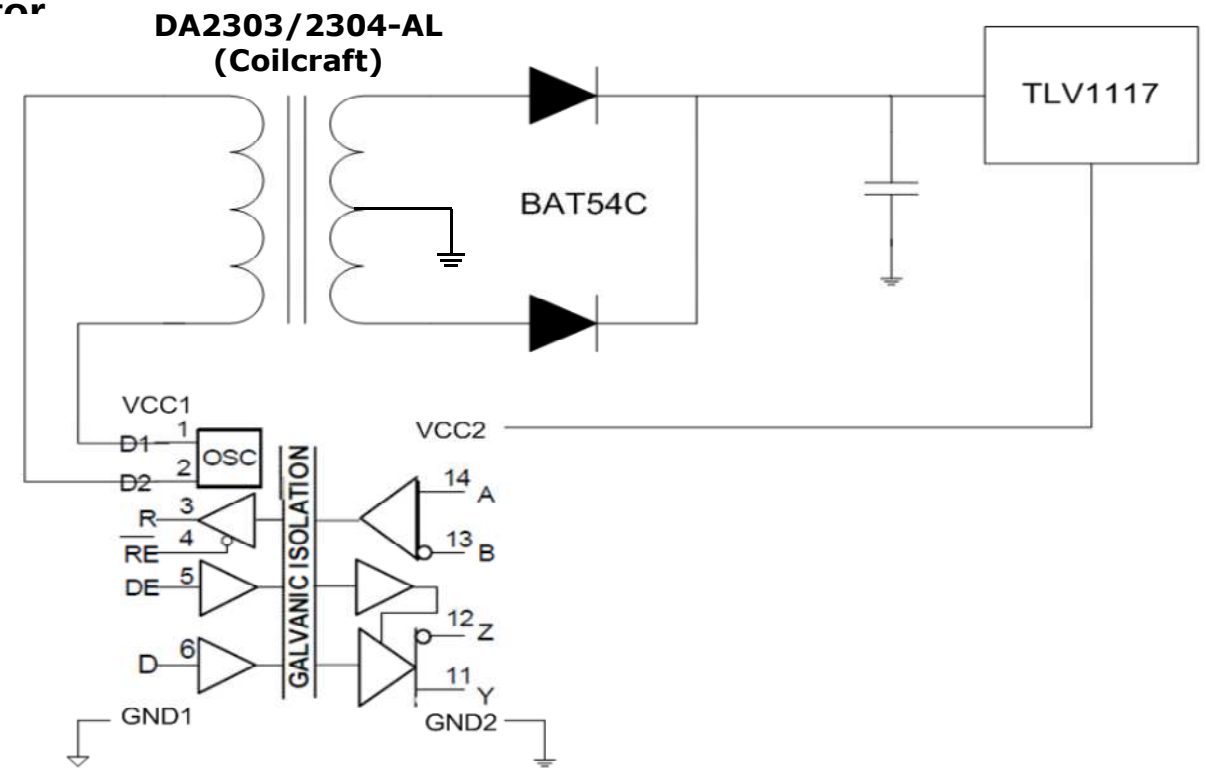


EVM – ISO1176TEVM / ISO35TEVM / ISO3086TEVM

ISO – 485 with Transformer Driver

Simple Complete Solution - ISO1176 / ISO35 / ISO3086

- 1Mbps / 20Mbps /40Mbps
- 1/8 Unit load – 256 nodes on a bus
- Glitch-Free
- Failsafe (Open, Shorted, Idle)
- Silicon Integrated SiO_2 Insulator
- 4kVpk / 2500Vrms Isolation, 560V working / operating
- UL1577,
  IEC 60747-5-2 (VDE 0884, rev
  IEC 61010-1 & CSA pending



EVM – ISO1177EVM /
ISO37EVM / ISO3088EVM

Сравнительный анализ

КПД

У решений с интегрированным трансформатором КПД порядка 34%.
TI выигрывает ~2x.

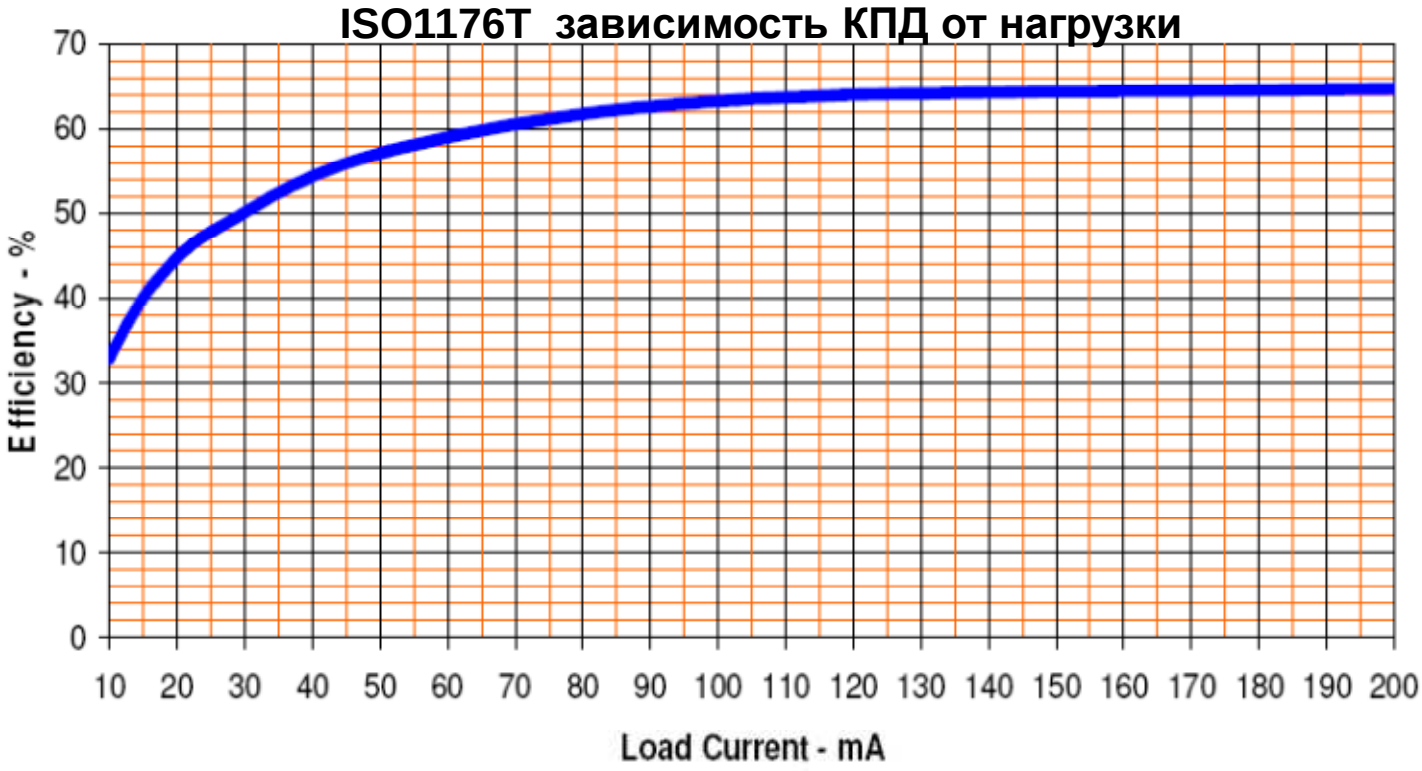


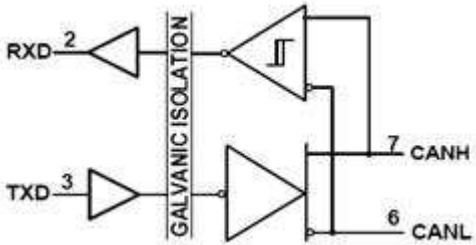
Figure 4: Efficiency over load current

ISO1050 DUB / DW
4kV / 7kV Isolated - 5V CAN

- Industry's first Isolated CAN transceiver
- Meets or Exceeds ISO 11898
- Isolated CAN with Ultra low loop time
- Very Low EME (Electro-Magnetic Emissions)
- Silicon Integrated SiO_2 Insulation
  - 4kVpk / 2.5kVrms - DUB
  - 7kVpk / 5kVrms - DW
  - 6.1mm and 8.3mm Clearance packages
  - UL1577 ; IEC ; CSA Approval Pending

- Reduce Components and Board Space - 30%
- Meets DeviceNet and CAN timing requirements
- High Speed Isolation allows longer buses – 34%
- Reduces interference with other devices
- Proven Reliability of SiO_2 Insulation, Stable over Time, Temperature & Moisture
  - Life Span > 25 years @ 105°C

Part #	Isolation	Temp (C)	Package
ISO1050DUB	4kVpk/2.5kVrms	-55 to 105	SOP-8
ISO1050DW	7kVpk/5kVrms	-55 to 105	SOIC-16



- Medical – ISO1050DW
- Motor Control
- Industrial Automation
- DeviceNet™ Data Buses
- SAE J1939 Standard Data Bus Interface
- ISO 11783 Standard Data Bus Interface
- NMEA 2000 Standard Data Bus Interface

EVM

ISO1050EVM

- Compatible with 75+ TI Processers with CAN controllers
  - •C2000
  - •TMS470 ARM
  - •LM3Sxxxx ARM3 Cortex - M3
  - •OMAP3505/3517

ISO55xx Family

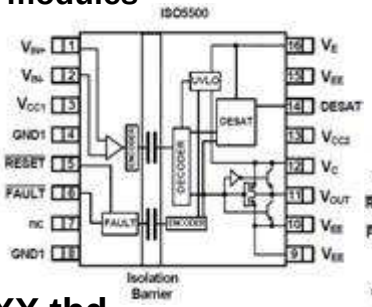
IGBT Drivers with integrated safety features and adjustability

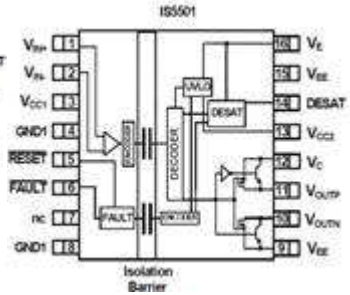
- Silicon Integrated SiO_2 Dielectric Capacitor
- DESAT protection - fault feedback, soft turn off, UVLO
- Adjustable DESAT level & blanking time, soft turn off option, UVLO options
- 200ns typ prop delay, 20ns typ pulse skew
- 4KV ESD on All Pins
- 3.3V and 5V Vcc1 Supported
- 5000Vrms Max/ 1200V working voltage
  - Wide SOIC Packages
  - UL1577, IEC 60747-5-2 IEC 61010-1 & CSA pending

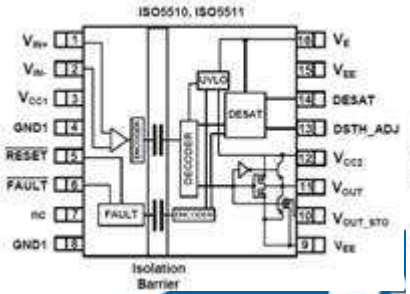
- Proven Reliability of SiO_2 Dielectric,
  - Life Span > 25 years
- Improved safety & system performance
- Unique fine tuning ability without discretes
- Enabling low power application
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies
- Certified by all 3 World Wide agencies

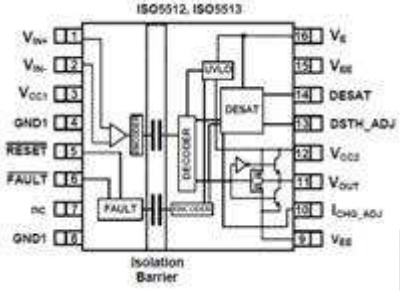
Part #	Voltage Range	Features	Package
ISO5500	15V to 30V	P2P compatible with HCPL316J	Wide SOIC-16
ISO5501	15V to 30V	Separate P and N channel outputs for slope control	Wide SOIC-16
ISO5510	15V to 30V	DESAT adjust, Soft turn off option, UVLO = 14V	Wide SOIC-16
ISO5511	10V to 30V	DESAT adjust, Soft turn off option, UVLO = 9V	Wide SOIC-16
ISO5512	15V to 30V	DESAT adjust, Blanking time adjust, UVLO = 14V	Wide SOIC-16
ISO5513	10V to 30V	DESAT adjust, Blanking time adjust, UVLO = 9V	Wide SOIC-16

- Industrial Motor Control
- Industrial Power Supplies/ Inverters
- HEV & EV power modules









EVM

ISO EVM - ISO55XX tbd

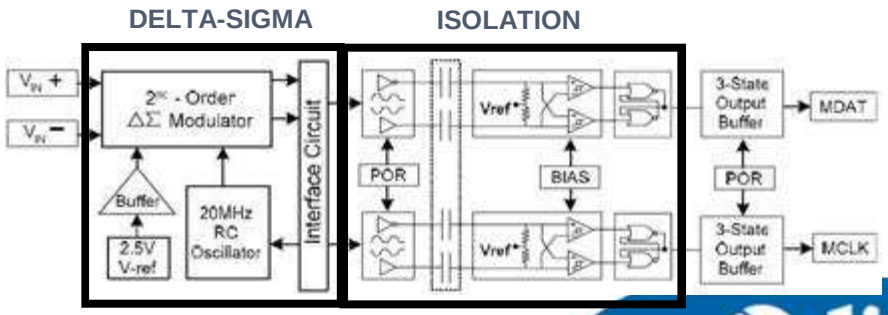
AMC1203

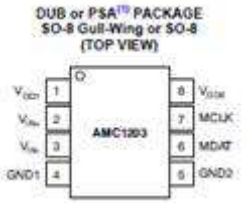
1-Bit, 10MHz, 2nd Order, Isolated Delta-Sigma Modulator

- 10MHz 2nd Order Delta-Sigma Modulator
  - 16 bit resolution
  - +/- 6 LSB Max INL
  - +/- 1 LSB Max DNL
  - 85db SNR
- Integrated Capacitive Digital Isolation
  - 560V Maximum Working Isolation Voltage
  - 4000V Maximum Transient Over Voltage
  - 15kV/µS Transient Immunity
- Available In Several Standard Package Options
  - DUB-8
  - SOIC-16 Under Development

- Stand Alone Modulator Allows For Flexible Designs Using Custom Digital Filter or TI's AMC1210 IC Solution
- Single Chip Solution Simplifies System Design And Has Excellent Magnetic Immunity
- Simple Drop-In Upgrade For Competing Isolated Modulators
  - AD7400
  - HCPL7860

- Current Measurement
- Process Control
- Chromatography
- Portable Instrumentation
- Motor Control





(1) – Package Preview

ISO122/ISO124

Low Cost Isolation Amplifiers

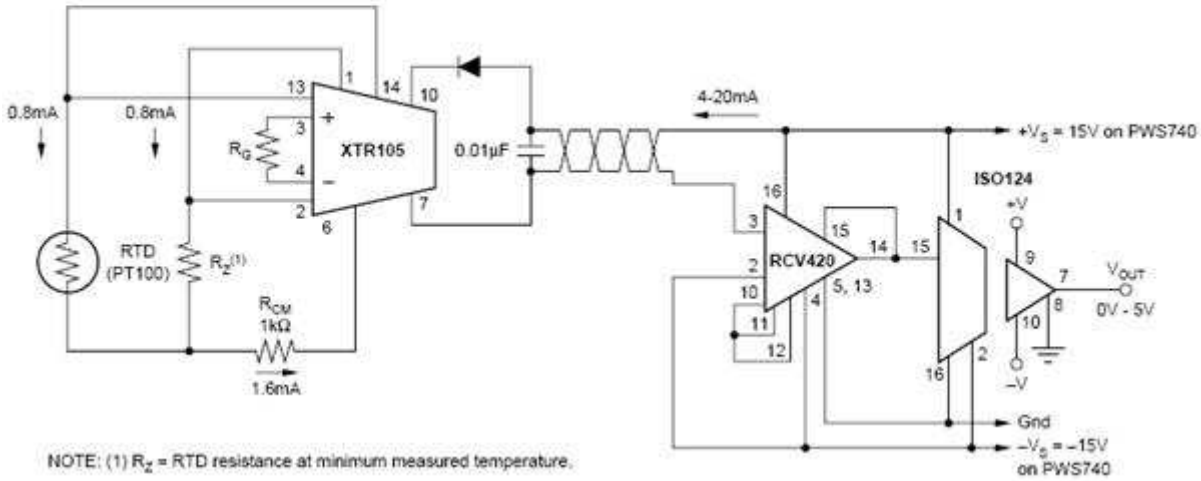
Datasheet ISO122

Datasheet ISO124

- Digital modulation
- Rated 1500Vrms
- 50 kHz signal bandwidth
- Offset drift: 200 uV/℃
- Excellent nonlinearity
  - ISO122: 0.02% max
  - ISO124: 0.01% max

- Barrier characteristics will not affect signal integrity
- High continuous isolation voltage for maximum protection
- Ideal for a wide variety of applications
- Provides stability over temperature
- Ensures quality performance and accuracy

- Industrial process control
- Ground loop elimination
- Motor and SCR Control
- Power monitoring
- PC-based data acquisition
- Test Equipment



Packages: PDIP-8, SOIC-8

ISO7631F/ 7640F/ 7641F

$6KV_{PK}$ / $5KV_{RMS}$ High Speed & Low Power 3 & 4-Ch Isolators

Features

- Silicon Integrated SiO_2 Dielectric Capacitor
- C-grade →25 Mb/s, Integrated Noise Filter
- M-grade →150 Mb/s, Fast Prop Delays
- DC Signal Pass with Fail Safe Output-Low
- 2ns Skew, 200ps Pulse Distortion, 7ns Delay
- Low Power ~ 0.8 mA/Ch typical (3.3 V)
- High Magnetic Immunity (1E6 > Inductive)
- CMTI > 25 kV/µs; ESD > 4 kV on All Pins
- 2.7V (M-grade), 3.3V and 5V Supply Support
- $6kV_{PK}$ Withstand, 1414VPK Working Voltage
- Safety Certifications
  - $6\ kV_{PK}$ per UL1577, DIN EN 60747-5-2
  - $5\ kV_{RMS}$ per EN 61010-1/ 60950-1
  - CSA & 60601-1 (Medical)

Applications

Industrial Controls

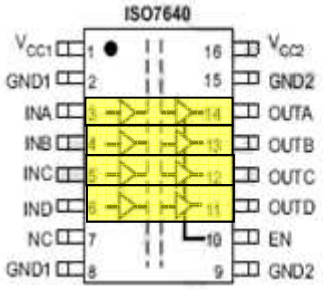
- PLC, Motor Control, Inverters
- Industrial Automation
- Fieldbus – Modbus, Profibus, DeviceNet, CAN, RS485

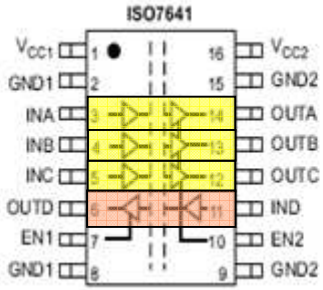
- Power Supply/Regulation Systems
- Automotive – E-Car Batteries

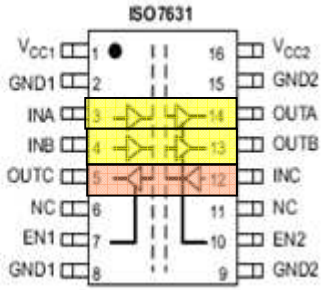
Benefits

- Proven Reliability of SiO_2 Dielectric,
  - Life Span > 25 years
- Lowest Skew, & Pulse Width Distortion
- Enabling low power applications
- High Immunity for Noisy Environments
- High Reliability in Harsh Environments
- Flexibility with Power Supplies
- Certified by all 3 World Wide agencies

PART #	CH	DEFAULTO UTPUT	TEMP °C	DATA RATE	PACKAGE	RTM
ISO7631FC	2/1	Low	-40 to 125	25 Mbps	WB SOIC - 16	Dec
ISO7640FC	4/0	Low	-40 to 125	25 Mbps	WB SOIC - 16	Nov
ISO7641FC	3/1	Low	-40 to 125	25 Mbps	WB SOIC - 16	Nov
ISO7631FM	2/1	Low	-40 to 125	150 Mbps	WB SOIC - 16	Dec
ISO7640FM	4/0	Low	-40 to 125	150 Mbps	WB SOIC - 16	Y
ISO7641FM	3/1	Low	-40 to 125	150 Mbps	WB SOIC - 16	Y







ISO1540 / ISO1541

Low-Power Bidirectional I^2C Isolators

Features

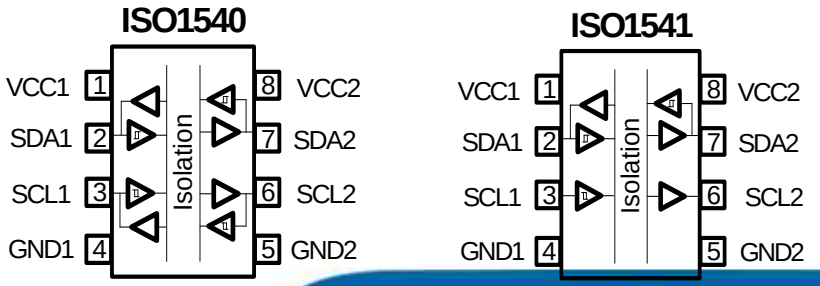
- Isolated Bidirectional I2C Communication
- $2.5kV_{RMS}$ / $4kV_{PK}$ Isolation Rating
  - IEC, UL, CSA certification
- Uni- & Bidirectional Clock Options
- Fast Mode Plus (1 MHz) Operation
- Hot Swappable, 3-V to 5.5-V Operation
- ± 50 kV/µs Typical Transient Immunity
- 4 kV ESD Protection on All Pins & Extended Temp Range -40C to 125C
- 8-pin Narrow-body SOIC package

Benefits

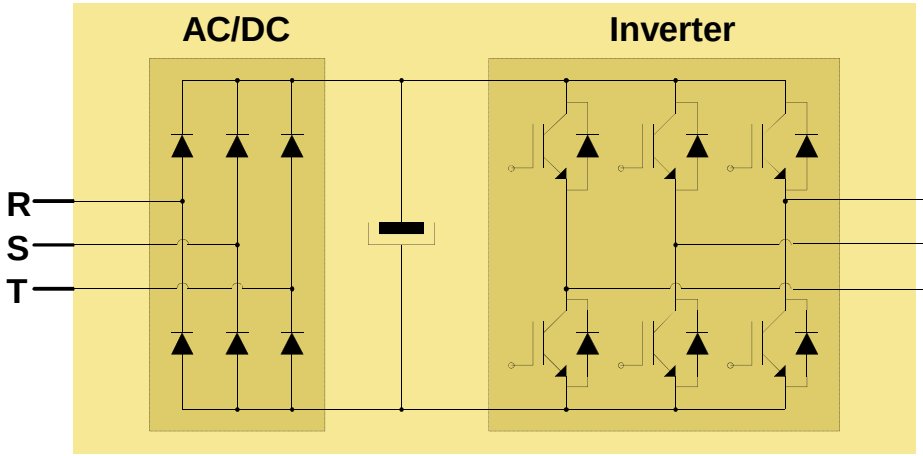
- Reduces Cost and Board Space
- Proven Reliability of SiO2 Dielectric, Stable over Temperature & Moisture – Isolation Life Span > 25 years
- Single & Multi-Master Applications
- Usable in Vast Majority of Applications
- Ease of Use
- Better reliability, immunity than competition
- Suitable for harsh Industrial Environments
- Industry Standard Footprint. Compatible with ADuM1250/1 & Si8400/1

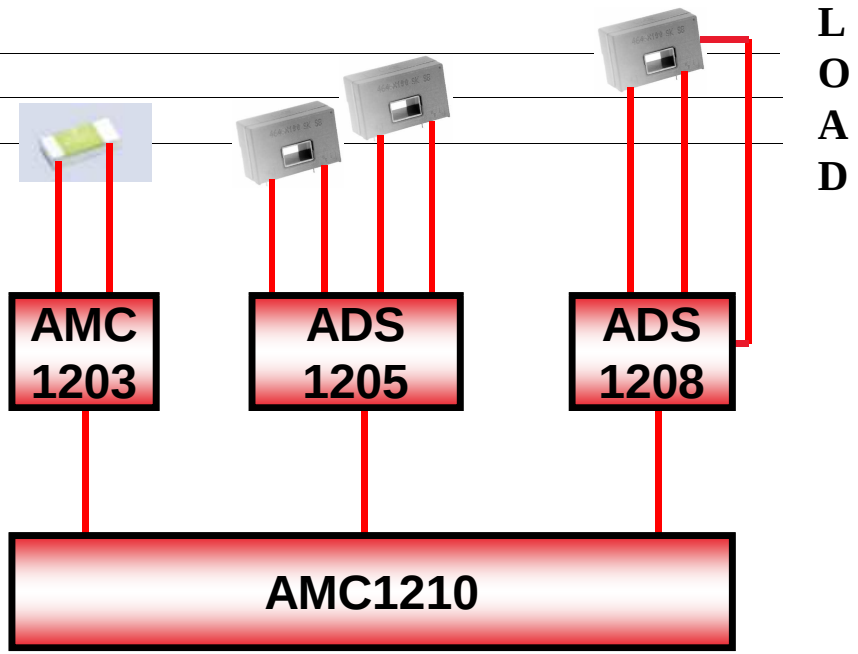
Applications

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



Current Measurement Applications





- AMC1203: single isolated ΔΣ modulator for shunt resistors
- ADS1204/5: dual/quad non-isolated ΔΣ modulator for magnetic sensors
- ADS1208: single non-isolated ΔΣ modulator with excitation for Hall sensors
- AMC1210: quad programmable digital filter for ΔΣ modulators

AMC1100

4kV$_{PEAK}$ Isolated Amplifier *for e-metering*

Features	Benefits

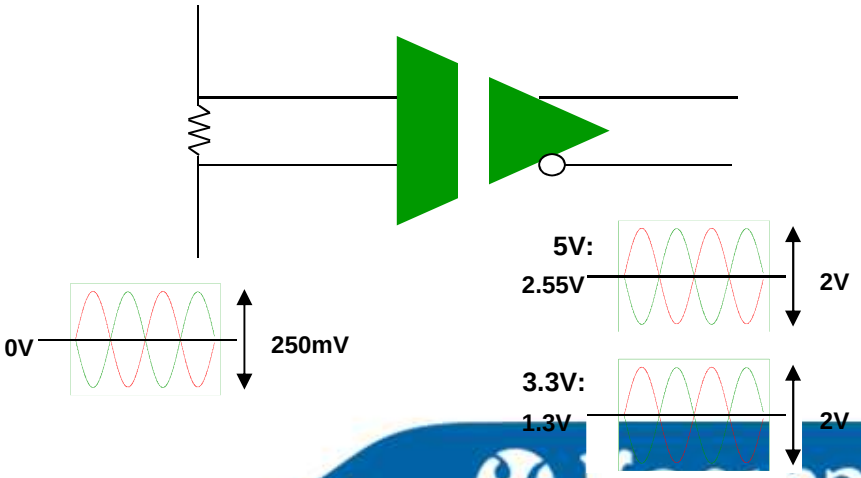
• Certified Galvanic Isolation Barrier
  • 4 kVpeak isolation voltage
  • UL1577 and IEC60747-5-2 approved
  • **2.5kV/µS Transient Immunity**
	• Galvanic barrier provides EMI immunity and robust isolation barrier lifetime and ***relaxed CMTI specs*** for cost competitive e-metering market

• ±250mV input voltage range	• Optimized for direct connection to shunt resistors or other low voltage level signal sources
• Specified Temperature range: -40 to 105°C	• Over 90% more linear, 80% less gain drift, at 50% of the power
• Pin-to-pin performance upgrade for HCPL7800 & HCPL7840	• Extended industrial range offers additional 20°C of fully specified performance

Applications

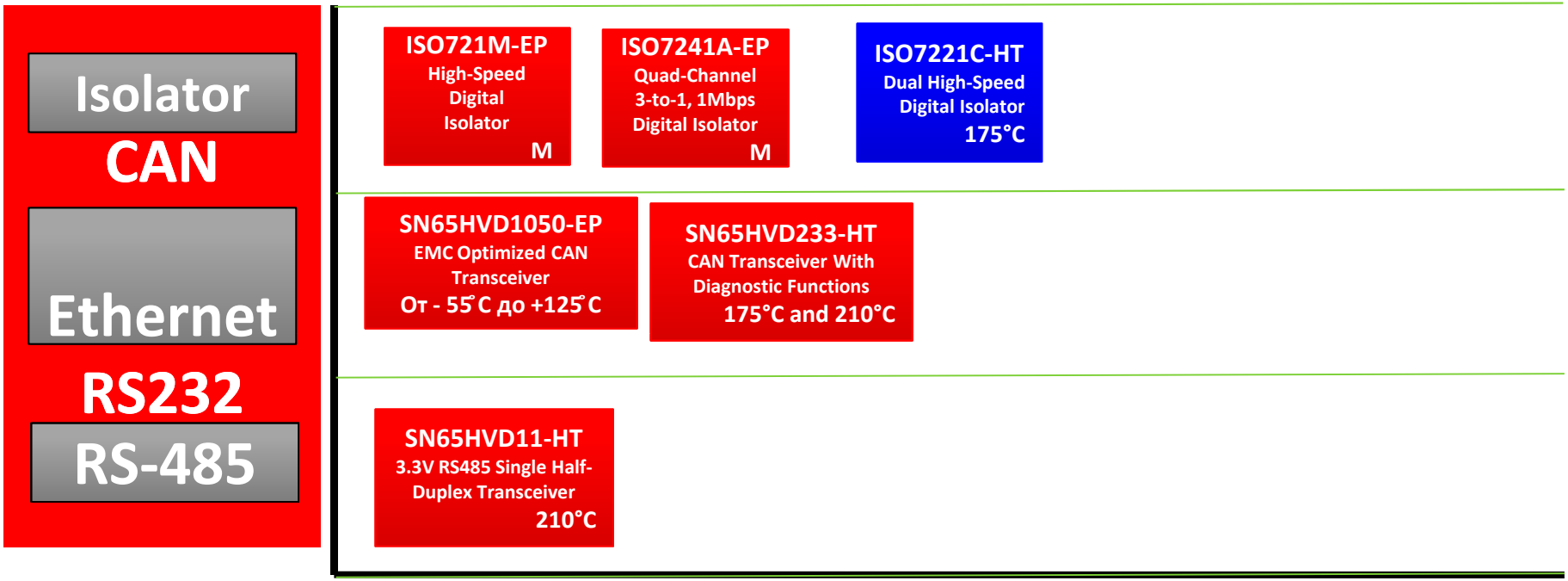
Shunt-based Current measurement in:

- Motor Control
- Green Energy
- Frequency Inverter Applications
- Uninterruptible Power Supplies
- Energy Metering



AMC1100 EVM Available

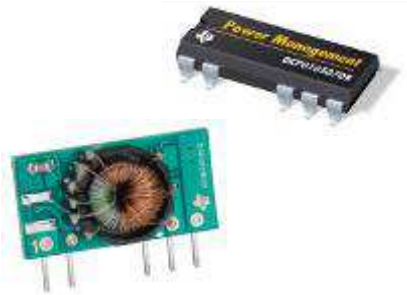
Высокотемпературные решения TI



Power Management Products

by Texas Instruments

Power	Model	Isolation Voltage	Input Voltage	Output Voltage	Output Regulation
1W	DCP01B	1000V	5V, 15V, 24V	5V, ±5V, ±7V, 12V, ±12V, 15V, ±15V	No
1W	DCV01	1500V	5V, 15V, 24V	5V, ±5V, 12V, ±12V, 15V, ±15V	No
1W	DCR01	1000V	5V, 15V, 24V	3.3V, 5V	Yes
1W	DCH01	3000V	5V	5V, ±5V, 12V, ±12V, 15V, ±15V	No
2W	DCP02	1000V	5V, 12V, 15V, 24V	3.3V, 5V, ±5V, 7V, 9V, 12V, ±12V, ±15V, ±18V	No
2W	DCR02	1000V	12V, 24V	5V	Yes



- Single and dual outputs
- Dual-in-line, gull-wing, small-outline (SO), and SIP packaging
- Up to 3000V isolation
- Short-circuit protection
- Thermal protection
- Device-to-device synchronization
- -40 to +85 ℃ temp range
- Surface-mount devices in tape and reel

TPS55010

2.95V to 6V Input, 2W Isolated DC/DC SWIFT™ Converter

Features

- Fly-Buck™ Topology with Integrated Half-Bridge at 45 mΩ Each
- Primary Side Feedback
- Programmable Primary Side Voltage with Resistor Divider
- Synchronizes to External Clock
- Adjustable Slow Start

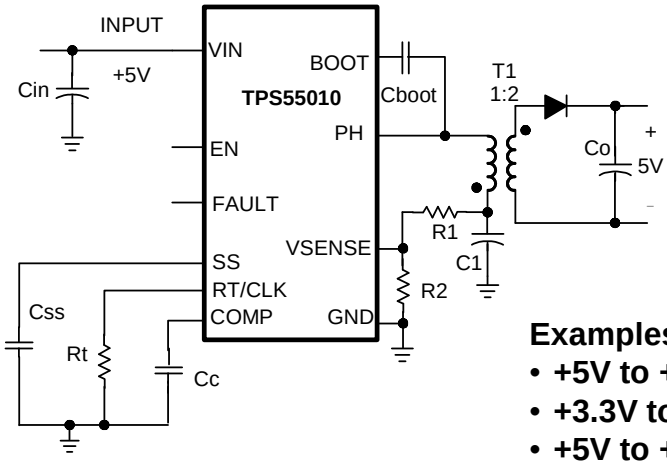
Benefits

- 85% Efficiency at 5V/200mA; 15% Higher Full Load Efficiency than Competition
- No Optocoupler required
- Vary Input to Output Voltage Combinations with Same Transformer
- Eliminates Beat Noise
- Low Inrush Current

3x3mm 16QFN

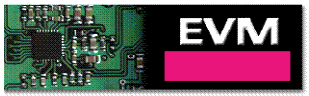
Applications

- Noise Immunity for PLCs, Industrial Control, & Measurement
- RS232/485/Fieldbus Communication
- Power for Line Drivers, ISO Amplifiers, CAN Transceivers
- Floating Supplies for IGBT Gate Drivers



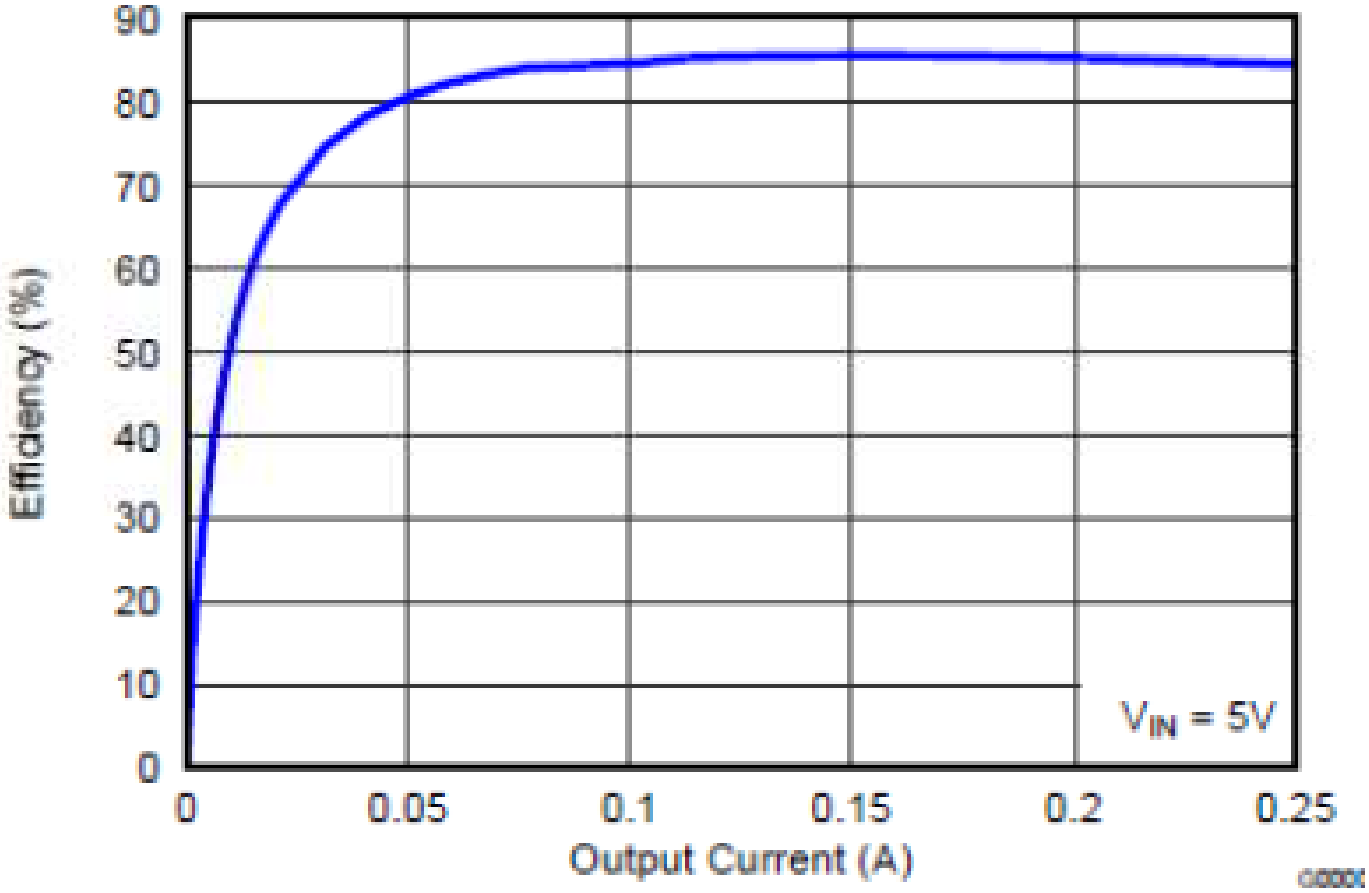
Examples

- +5V to +5V at 200mA
- +3.3V to +5V at 200mA
- +5V to +/-15V at 25mA



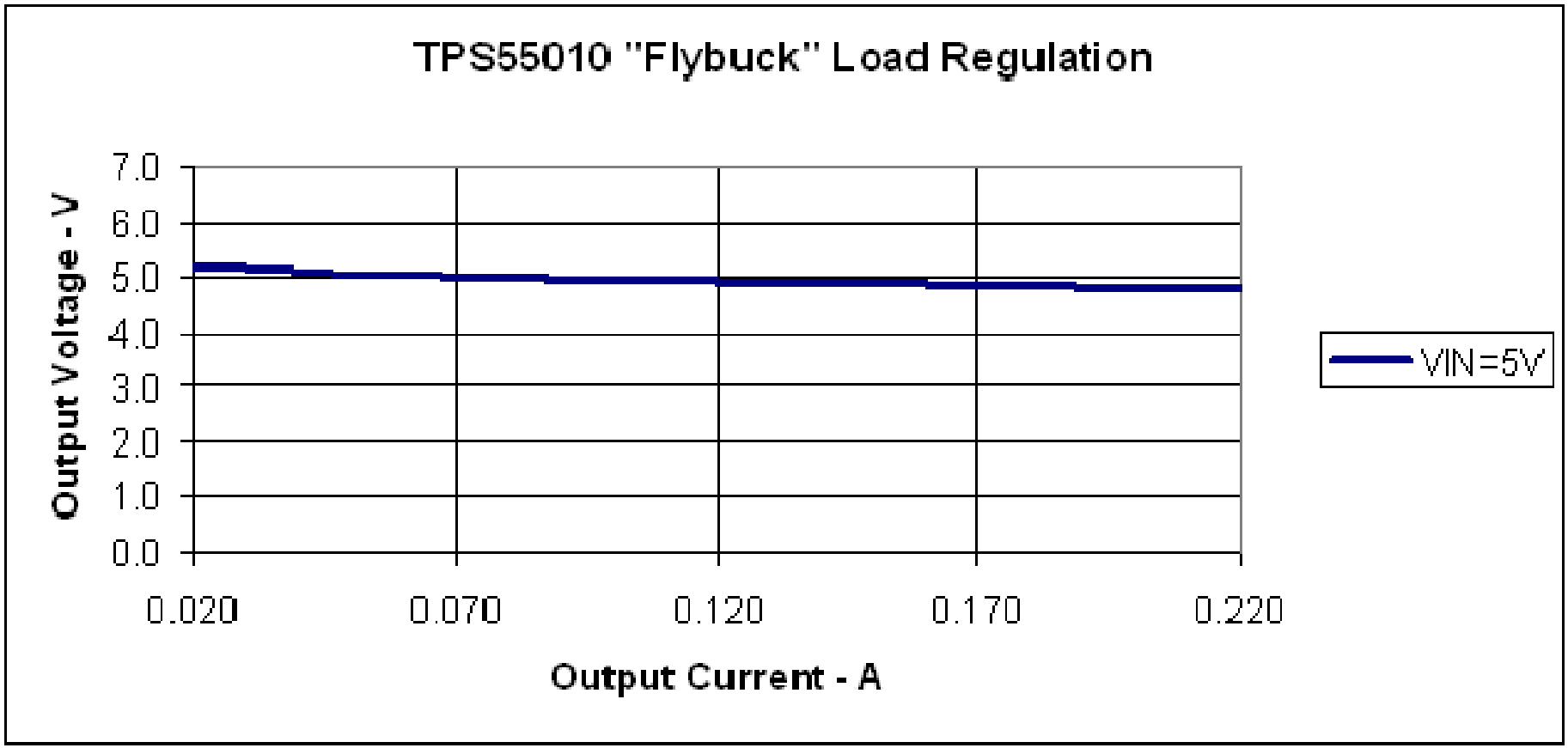
- TPS55010EVM-009
- Design Calculator on Web

TPS55010 КПД: из 5В в 5В



КПД выше чем у модульных решений

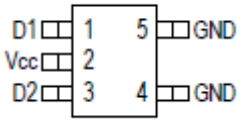
TPS55010
нагрузочная характеристика



SN6501:
Драйвер трансформатора для изолированных ИП

Features

- Transformer Driver for Small transformers
- Single 3.3V or 5V Supply
- High Current Drive: 350mA max (5V)
- Low Output Ripple
- Small 5-pin DBV Package

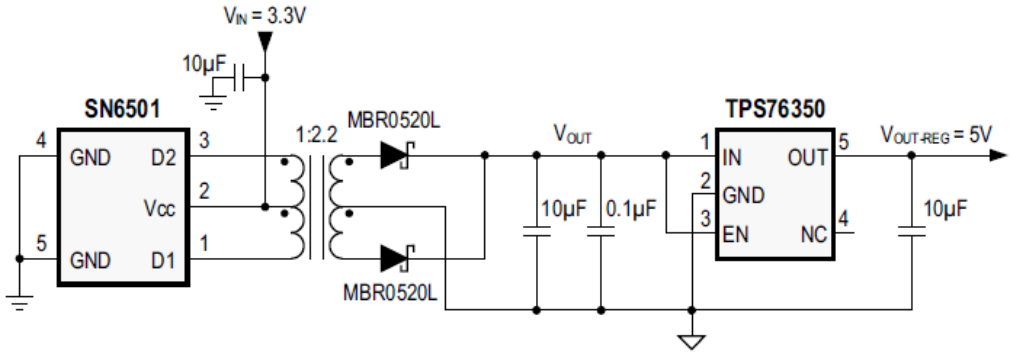


Applications

- Interface Power Supply for CAN, RS-485, RS-422, RS-232, SPI, I2C, Low-Power LAN
- Industrial Automation
- Process Control
- Medical Equipment

Benefits

- Provides the primary voltage for an isolation transformer and enables a small form factor, low EMI, high efficiency isolated power path
- Reuse of the same device irrespective of supply
- Ability to connect multiple devices to the secondary power supply
- Permits Small Output Capacitors, space savings
- Savings in board space: 40% smaller than competition



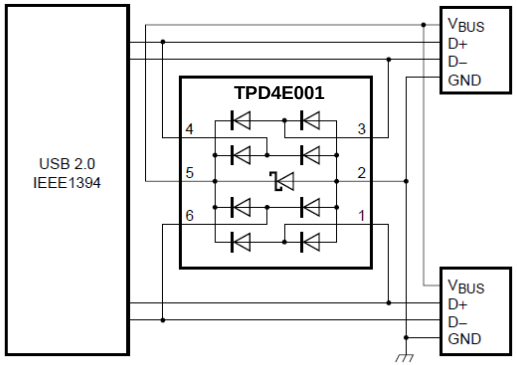
SN6501
Сравнительный анализ

Parameters	SN6501	MAX253	MAX845
Max Switch On-Resistance (ohm)	2	4	4
Switch Frequency (kHz)	300 - 620	250 – 500	500 – 1000
Max Operating Supply Current (mA)	0.7	5	5
Packages	SOT23	8-Pin DIP, SO, µMAX	8-Pin SO, µMAX
Temperature	-40 to 125C	-40 to 85C	-40 to 85C
Price (1ku)	$0.90	$1.36	$2.00

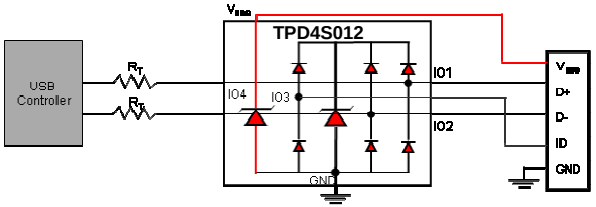
Защита от статики
ESD protection

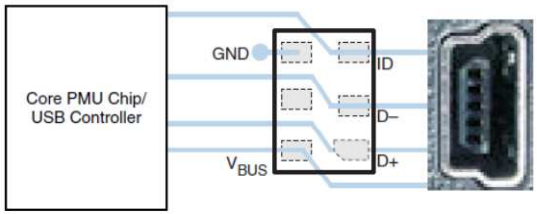
If there is USB on board, we can protect it!

USB2.0 Low Cost – TPD4E001

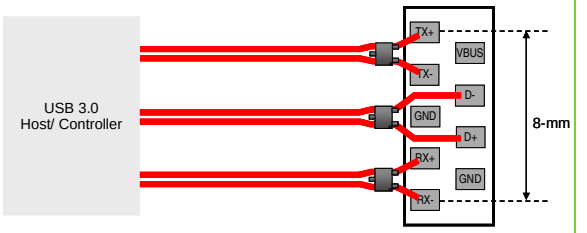


USB2.0 w/ HV Vbus– TPD4S012

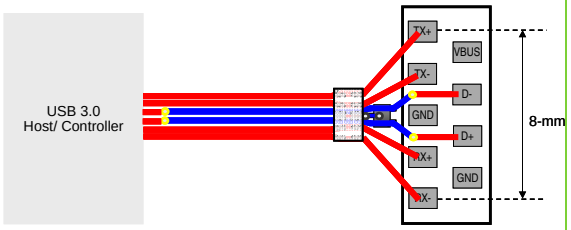




USB3.0 ESD – TPD2EUSB30 TPD4EUSB30

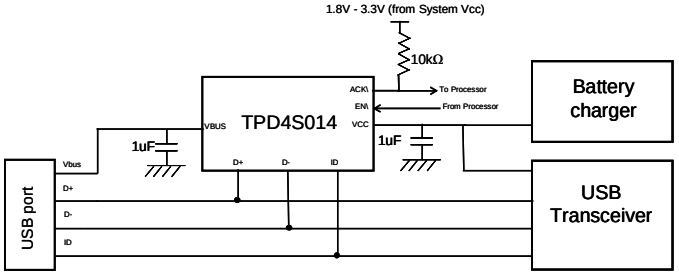


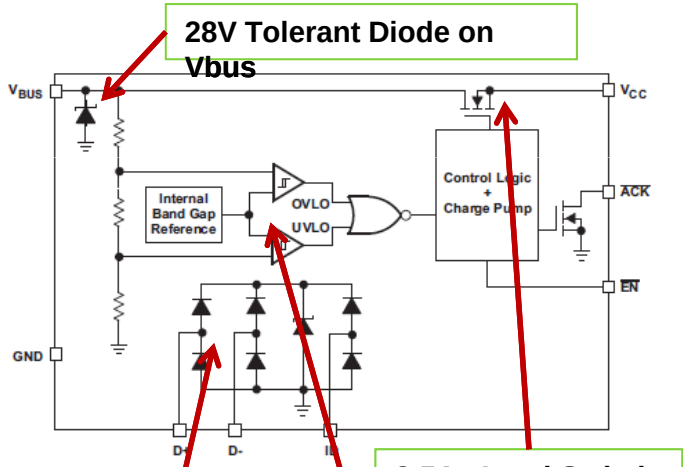
3 TPD2EUSB30 Class A Connector (single layer routing)



TPD4EUSB30 + TPD2EUSB30 Class A Connector
Smallest footprint (Dual layer routing)

Complete USB Charger Protection – TPD4S014





USB Roadmap and Comparison

	High Vbus Tolerance For Charger	OVLO & Short Ckt Protection	Reverse Current Blocking	Current Limiting	Charging	USB3.0 Support
TPD4E001	No	No	No	No	No	No
TPD2EUSB30/A TPD4EUSB30	No	No	No	No	No	**YES**
TPD4S012	**20V**	No	No	No	No	No
TPD4S014	30V (listed as 28V on datasheet)	**YES**	No	No	**USB**	No
TPD4S114*	30V	YES	**YES**	**YES**	USB	No
TPD4S214*	30V	YES	YES	YES	**OTG**	No
TPD4S314*	30V	YES	YES	YES	**USB, OTG, Cradle**	No

* Unreleased Device

Вопросы?

Спасибо за внимание!

По любым техническим вопросам по продукции Texas Instruments
ti@compel.ru