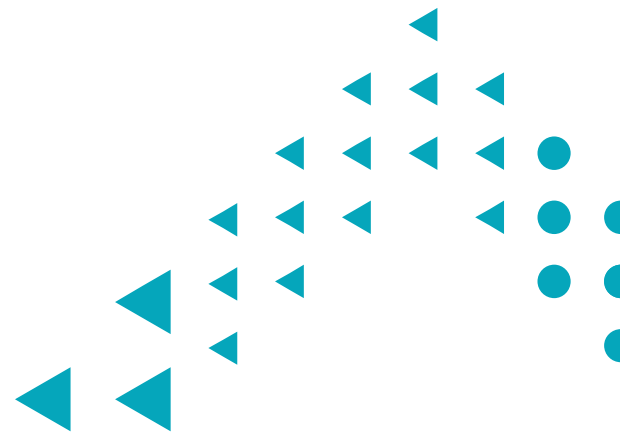
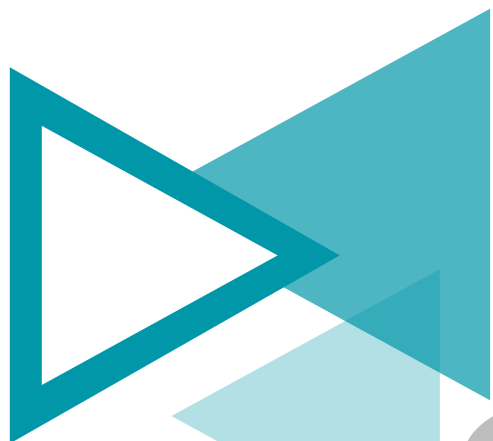


纳芯微工业电机驱动 解决方案

苏州纳芯微电子股份有限公司



目录



纳芯微隔离产品市场情况

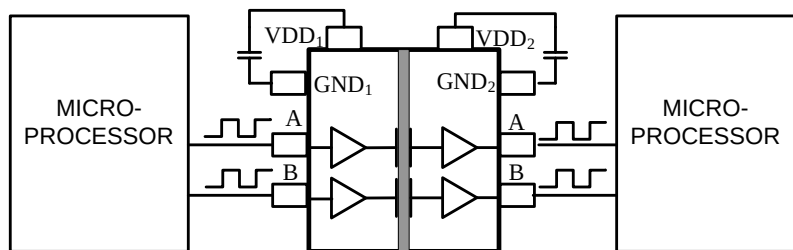
纳芯微隔离产品分类

工业电机驱动系统架构

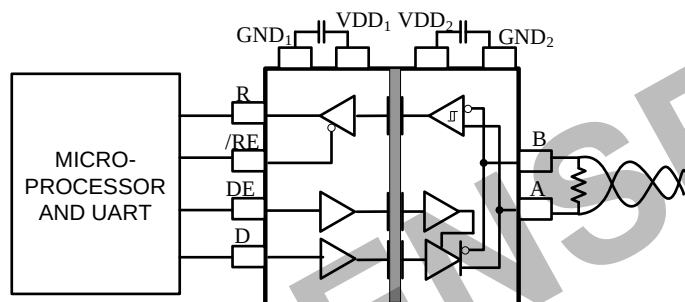
纳芯微解决方案

▶ 纳芯微隔离产品分类

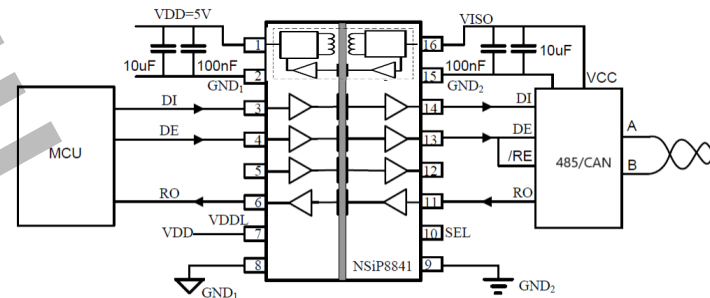
■ 标准数字隔离芯片1~6CH



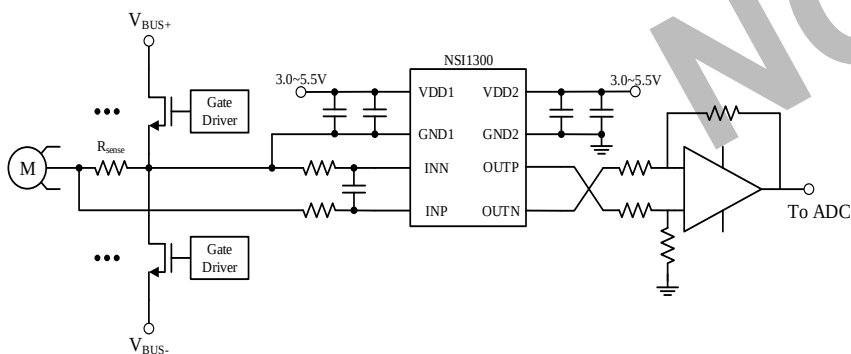
■ 隔离接口 I2C/485/CAN



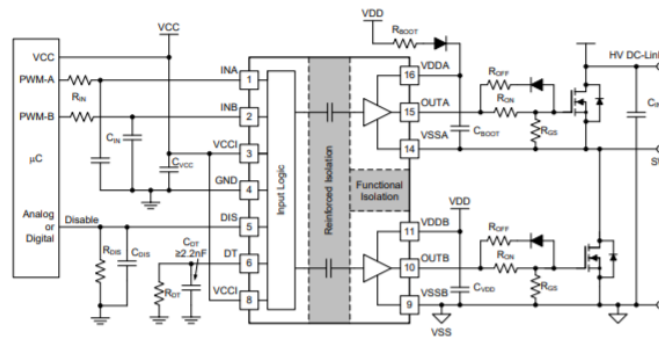
■ 隔离电源+2/4CH隔离



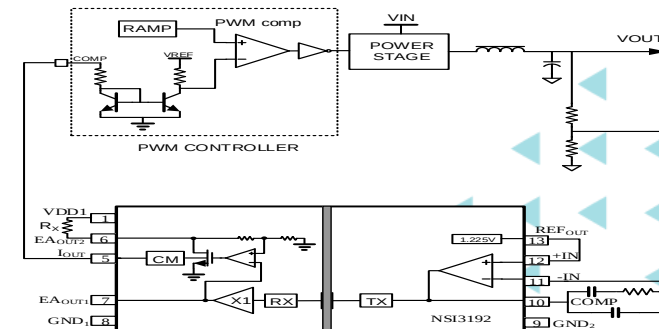
■ 隔离采样 ADC/放大器



■ 隔离驱动 半桥/单管



■ 隔离误差放大器

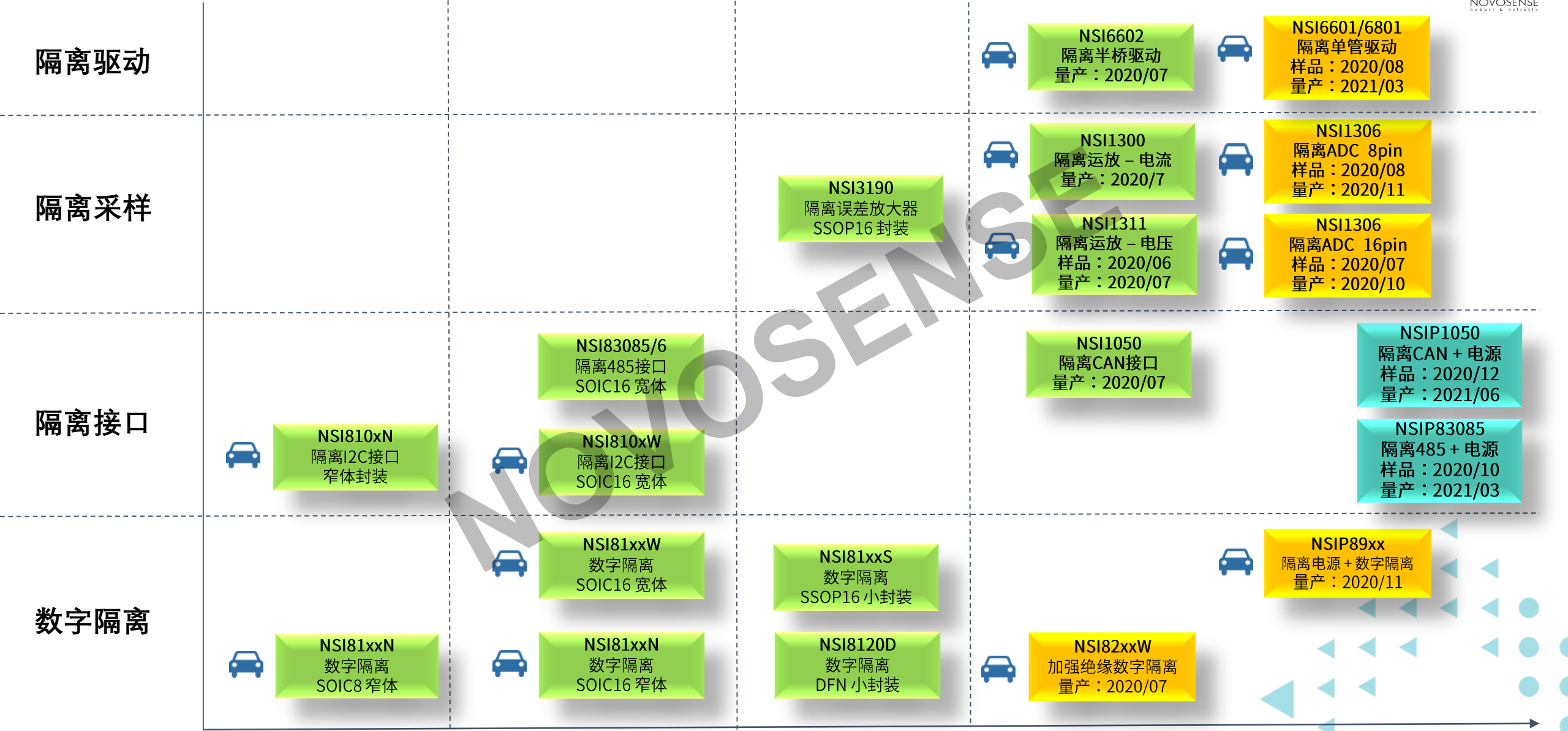


▶ 纳芯微隔离与接口产品路线图

研发中

样品

量产



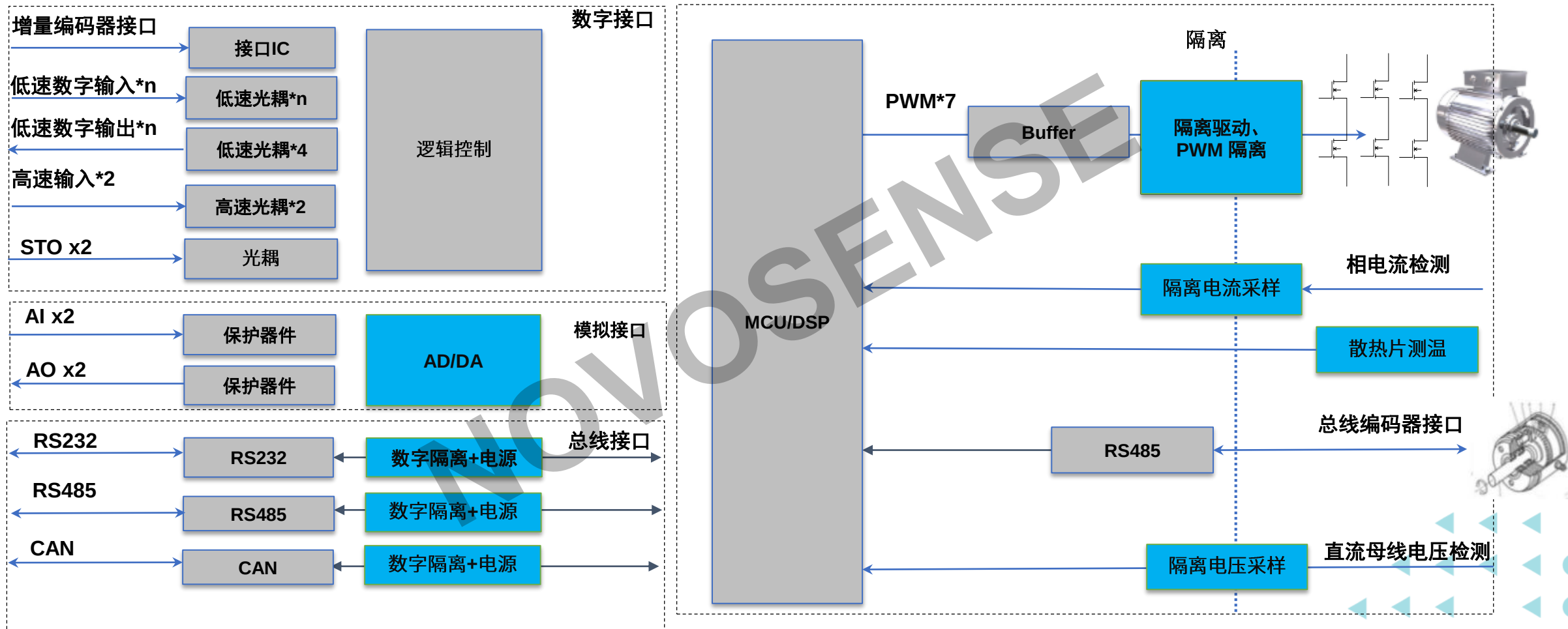
2017

2018

2019

2020

电机控制系统及纳芯微方案

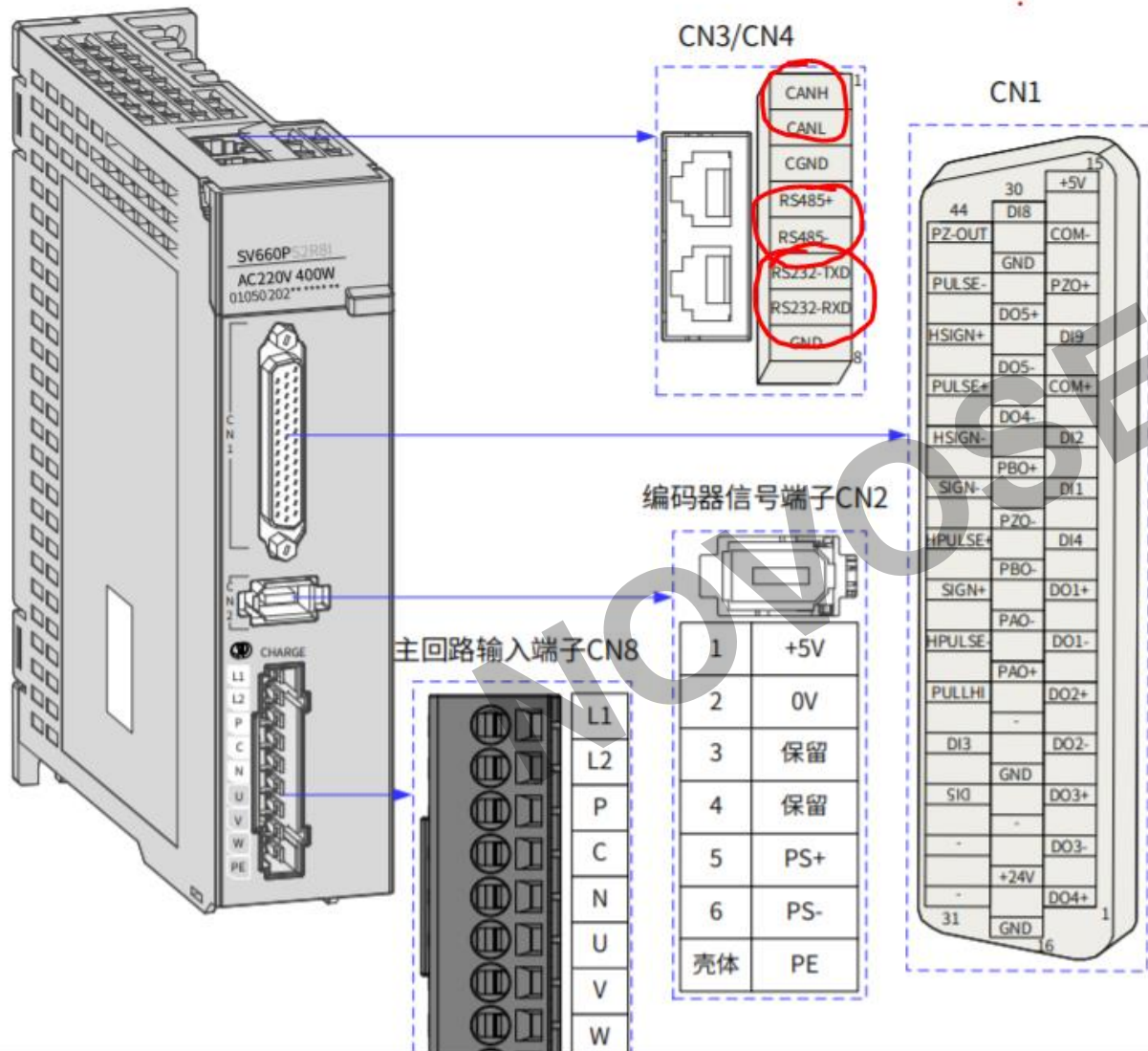


红色方框代表纳芯微有相关芯片方案

总线接口隔离解决方案

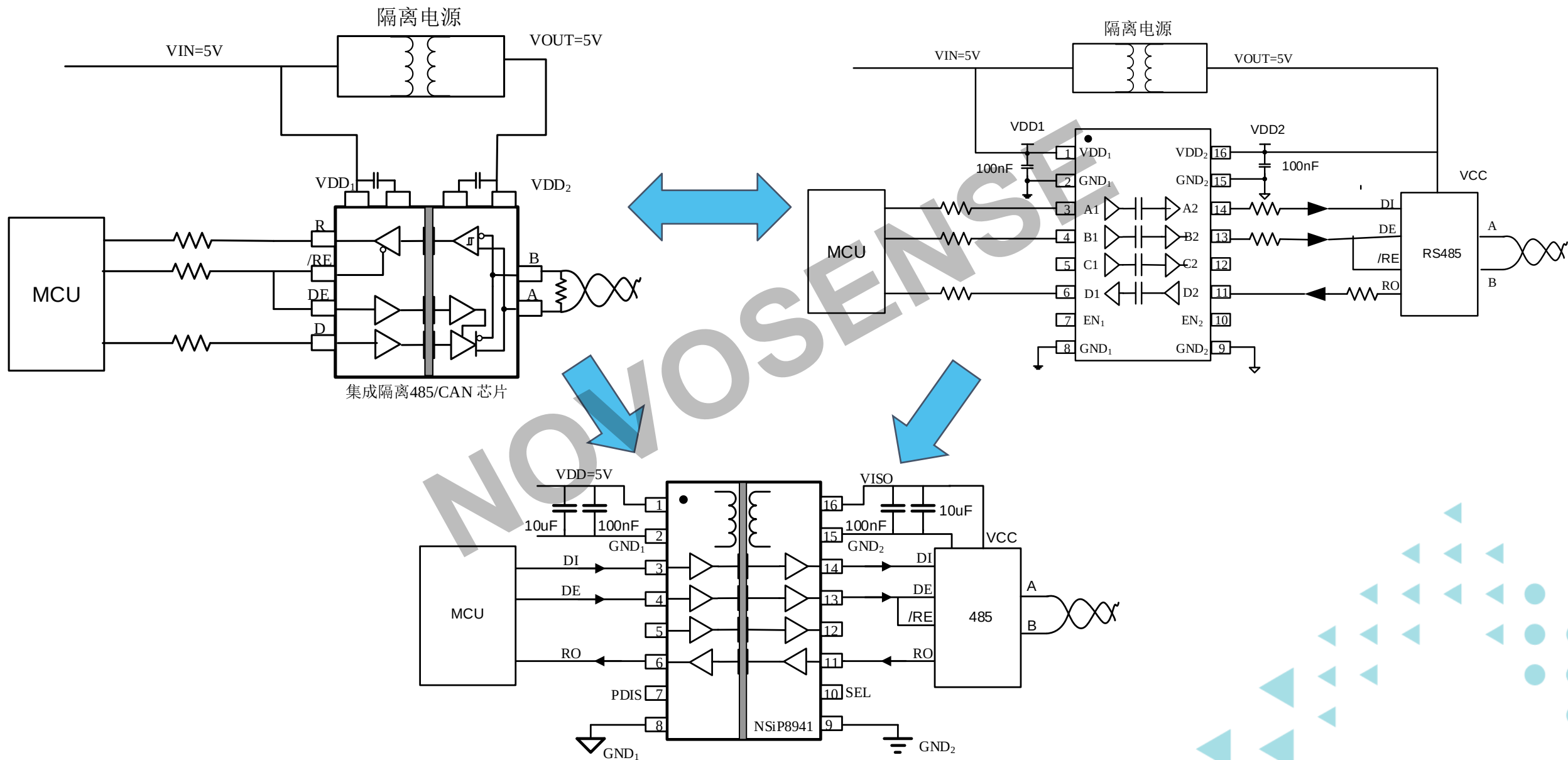
电机驱动主流总线接口类型

3.1 伺服驱动器端子引脚分布



以某国产大公司为例，其最新低端伺服驱动系统：
对外总线：CAN，RS485，
配置端口：RS232

► 电机驱动总线隔离方案演变



▶ 纳芯微方案-隔离接口

物料名称	物料简介	应用场景	产品状态	欧美P2P
NSI83085	高可靠性半双工500K隔离RS-485收发器	隔离485	量产	ISO3082 (TI) ISO1410 (TI) ADUM2483 (ADI) ADM2795E (ADI)
NSI83086	高可靠性全双工16M隔离RS-485收发器	隔离485	量产	ISO3086 (TI) ISO1412 (TI) ADUM2490E (ADI)
NSI1050	1Mbps隔离CAN收发器	隔离CAN	量产	ISO1050 (TI) ADM3050E (ADI) ADM3056E (ADI) ADM3054 (ADI)
NSIP884x/894x	0.5W隔离电源+4CH数字隔离器	隔离接口	样品, 2020年12月量产	ISOW78xx ADuM540x/640x
NSI814x	4CH数字隔离器	隔离485+CAN	量产	ISO774x (TI) Si864x (SiliconLab) ADuM14x(ADI)
NSI812x	2CH数字隔离器	隔离器+CAN	量产	ISO772x (TI) Si862x(SiliconLab) ADuM12x(ADI)

Features

- Bus side power supply voltage: 3.0V to 5.5V
 - VDD1 supply voltage: 2.5V to 5.5V
 - Speed: 500K for 085(Half) and 16M for 086(Full)
 - High CMTI: $\pm 150\text{kV/us}$
 - High system level EMC performance:
Bus Pins meet IEC61000-4-2 $\pm 16\text{kV}$ ESD
Other Pins meet $\pm 7\text{kV}$ contact ESD
 - Fail-safe protection receiver
 - Up to 256 transceivers on the bus
 - Isolation Barrier Life: >60 years
 - Operation temperature: $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
 - Certifications
5000Vrms or 1 minute per UL1577
CQC certification per GB4943.1-2011
CSA component notice 5A
DIN VDE V 0884-11:2017-01
 - RoHS-compliant packages:
SOIC-16 wide body
- Drop in replacement of :
- TI: ISO3082DW, ISO14XXDW
ADI: ADUM2483/2795E

Applications

- Industrial automation system
- Isolated RS-485 communication
- Smart electric meter and water meter
- Security and protection monitoring

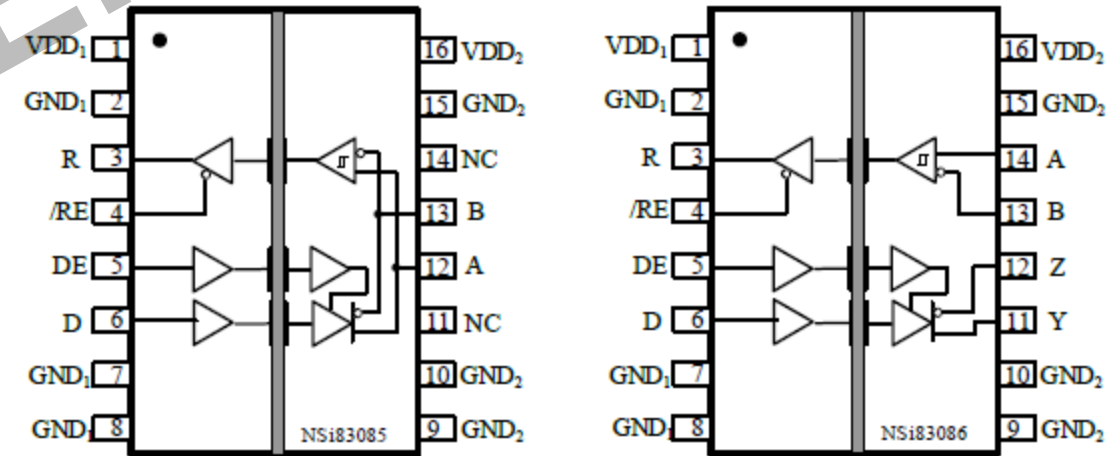


Figure 1. NSi83085 & NSi83086 Block Diagrams

► Competitive Comparisons

	ISO308x	NSi83086/5
Bus side supply	4.5 to 5.5V	3.0 to 5.5V
Logic side supply	3.15 to 5.5V	2.5 to 5.5V
Data rate (in bps)	200K/20M	500K/16M
Viso (rms)	2.5kVrms	5kVrms
min CMTI (kV/us)	25	150
HBM ESD bus pins	12kV	16kV
IEC ESD bus pins	6kV	16kV
Working voltage(pk)	560V	1131V
Duplex	Full/Half	Full/half
Reinforced	No	No
Ambient temp range	-40 to 85C	-40 to 105C
Package	16-DW	16-DW

► NSI1050

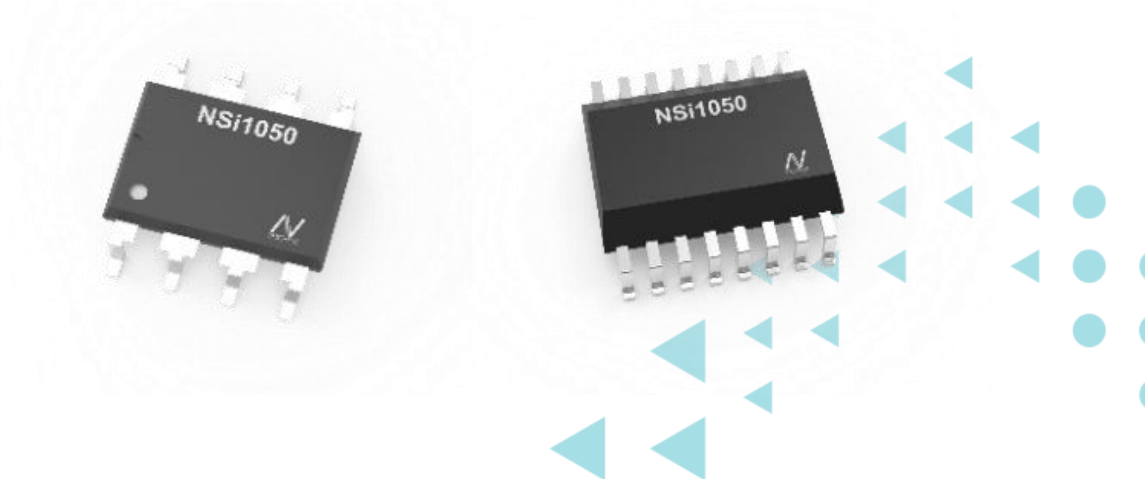
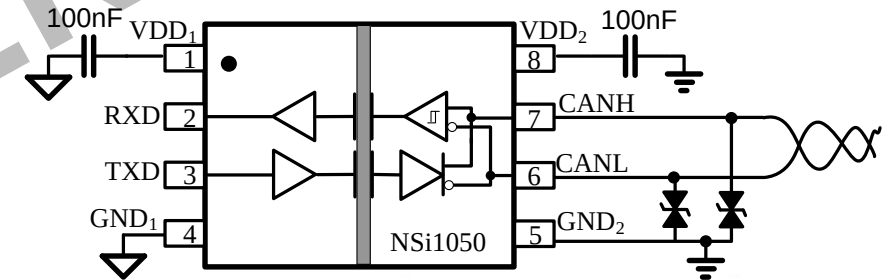
ISOLATED CAN TRANSCEIVER

Features

- Fully compatible with the ISO11898-2 standard
- 3000Vrms Insulation voltage in DUB8 package
- 5000Vrms Insulation voltage in WB SOIC-16 package
- Power supply voltage
 - VDD1: 2.5V to 5.5V
 - VDD2: 4.5V to 5.5V
- Bus fault protection of -40V to +40V
- Transmit data (TXD) dominant time out function
- Over current and over temperature protection
- Data rate: up to 1Mbps
- High CMTI: 80kV/us
- Low loop delay: <200ns
- High system level EMC performance:
- Enhanced system level ESD, EFT, Surge immunity
- Operation temperature: -40°C~125°C
- RoHS-compliant packages:
 - DUB-8
 - WB SOIC-16

Applications

- Industrial automation system
- Isolated CAN Bus
- Elevator System
- Telecom
- UPS



► NSi1050与TI ISO1050 对比

	TI ISO1050	纳芯微 NSi1050	影响
CAN总线供电范围	4.75 to 5.25V	4.5 to 5.5V	ISO1050要求 5V+/-5% 电源，纳芯微1050具有更好的电源适配性
逻辑测供电范围	3 to 5.5V	2.5 to 5.5V	
传输速率 (bps)	1M	1M	
隔离耐压(rms)	2.5kVrms/5kVrms	3kVrms/5kVrms	纳芯微产品具有更高的隔离性能
min CMTI (kV/us)	25	80	纳芯微产品具有更高的抗干扰性能
IEC ESD bus pins	+/-4kV	+/-6kV	纳芯微产品对外部ESD保护电路要求更低
工作电压(rms)	600V	>1000V	纳芯微产品在同等工作电压下具有更好的Life time
浪涌耐压 (Surge)	4kV	8kV	纳芯微产品更容易通过系统浪涌测试
Reinforced	No	Yes	纳芯微产品应用更加宽泛，满足增强隔离系统需求
共模电压范围	+/- 12V	+/- 12V	
总线保护电压	-27/+40V	+40/-40V	纳芯微产品具有更低的负压保护性能，更好支持24V直流系统
Ambient temp range	-55 to 105C	-40 to 125C	纳芯微产品具有更高的温度范围
.	DUB-8/SOW-16	DUB-8/SOW-16	

► NSiP88xx/89xx

QUAD-CHANNEL DIGITAL ISOLATORS WITH INTEGRATED ISOLATED DC-DC CONVERTER

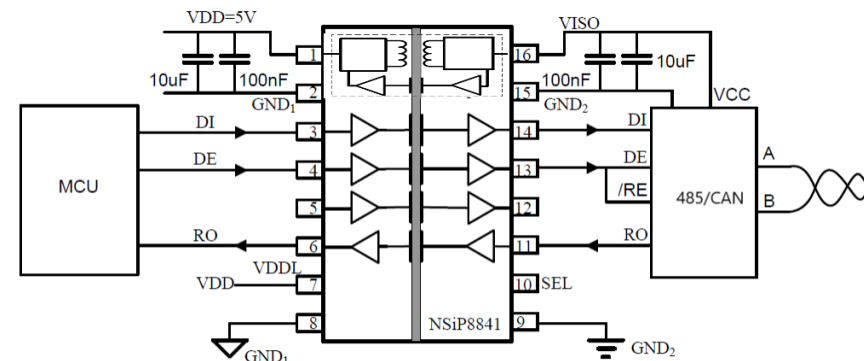
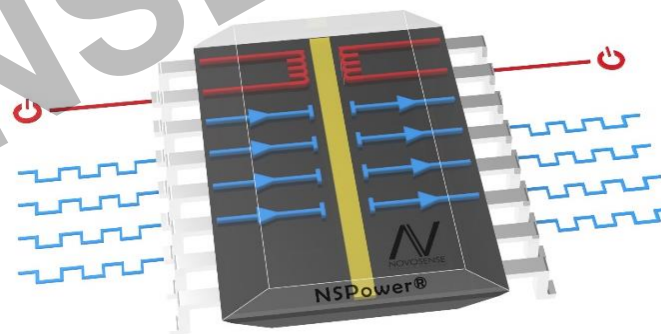


Features

- Power supply voltage: 3.3V to 5V
- 5V to 5V, 5V to 3.3V, support 100mA load current
- 3.3V to 3.3V, support 60mA load current
- Over current and over temperature protection
- Date rate: DC to 150Mbps
- High CMTI: 100kV/us
- Propagation delay: <15ns
- High system level EMC performance:
 - Enhanced system level ESD, EFT, Surge immunity
- Operation temperature: -40°C~125°C
- Certifications
 - 5000Vrms or 1 minute per UL1577
 - CQC certification per GB4943.1-2011
 - CSA component notice 5A
 - DIN VDE V 0884-11:2017-01
- RoHS-compliant packages:
 - SOIC-16 wide body
- Drop in replacement of :
 - TI: ISOW784XDW
 - ADI: ADUM5401,6401,5020

Applications

- Industrial automation system
- Isolated SPI, RS232, RS485
- General-purpose multichannel isolation



► NSIP88XX/89XX 可替代料对比

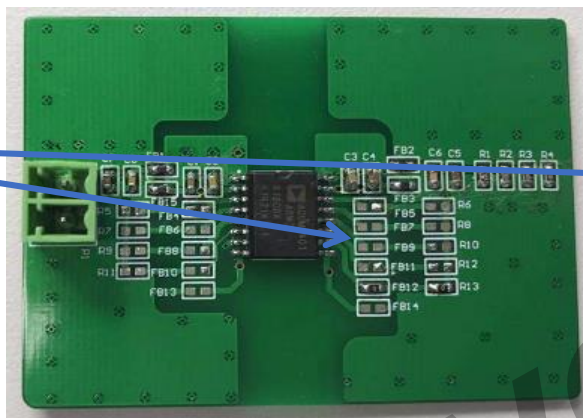


Specifications	Novosns NSiP88XX	ADI ADUM640x	ADI2 ADUM540x	ADI3 ADUM641x	ADI4 ADUM541x	Linear Tech LTM2883	TI ISOW784x
Package	16 SOIC	16 SOIC	16 SOIC	24 SSOP	24 SSOP	32 BGA	16 SOIC
Max Data Rate (Isolators)	150Mbps	25Mbps	25Mbps	150Mbps	150Mbps	20Mbps	100Mbps
VISO	5kVrms	5kVrms	2.5kVrms	3.75kVrms	2.5kVrms	2.5kVrms	5kVrms
VSURGE	10kVpk	10kVpk	10kVpk	10kVpk	10KVpk	?	10kVpk
VIORM	849Vpk	846Vpk	560Vpk	565Vpk	565Vpk	560Vpk	1414Vpk
Output Power	500mW	400mW	500mW	150mW	150mW	150mW	650mW
Max Available Output Current (5V in, 5V out)	100 mA	80mA	100mA	30mA	30mA	30mA	130 mA
Typ Efficiency at Max Load (5V/5V)	45%	34%	34%	29%	27%	45%	50%
Emissions	Meets CISPR22B	13dB > CISPR22B	13dB > CISPR22B	Na	Na	Na	Meets CISPR22B
EMC Immunity	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3
Input Supply Range	3V to 5.5V	3V to 5.5V	3V to 5.5V	3V to 5.5V	3V to 5.5V	3V to 5.5V	3V to 5.5V
CMTI	100kV/uS Min	25kV/us min	25kV/us min	75kV/us min	75kV/us min	30kV/us min	100kV/us min
Soft Start	Y	N	N	N	N	N	Y
Prop Delay (5V)	9nS typ	45ns typ	45ns typ	6.8ns typ	7.2ns typ	60ns typ	13ns typ
Temperature	-40 to 125 C	-40 to 105 C	-40 to 105 C	-40 to 105 C	-40 to 105 C	-40 to 105 C	-40 to 125 C
1k Pricing	\$2.50	\$7.94	\$6.34	\$4.79	\$3.45	\$14.51	\$5.50

► NSiP884x 温升性能:

效率对温升的影响

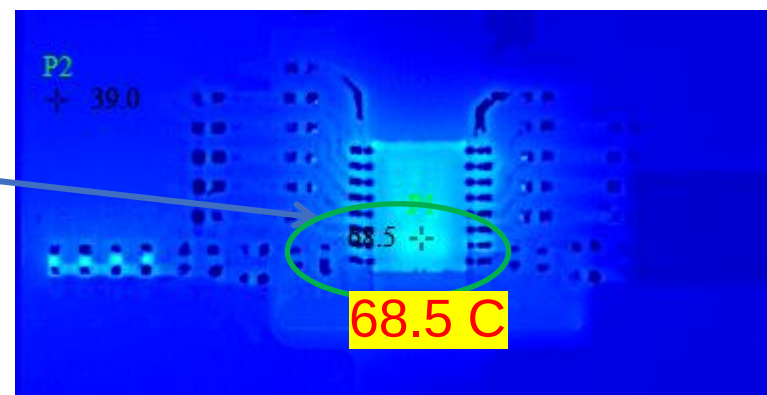
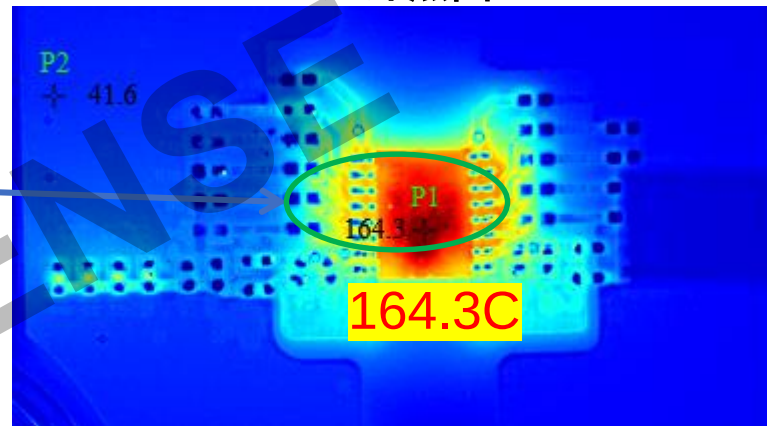
测试板卡



ADuM5401

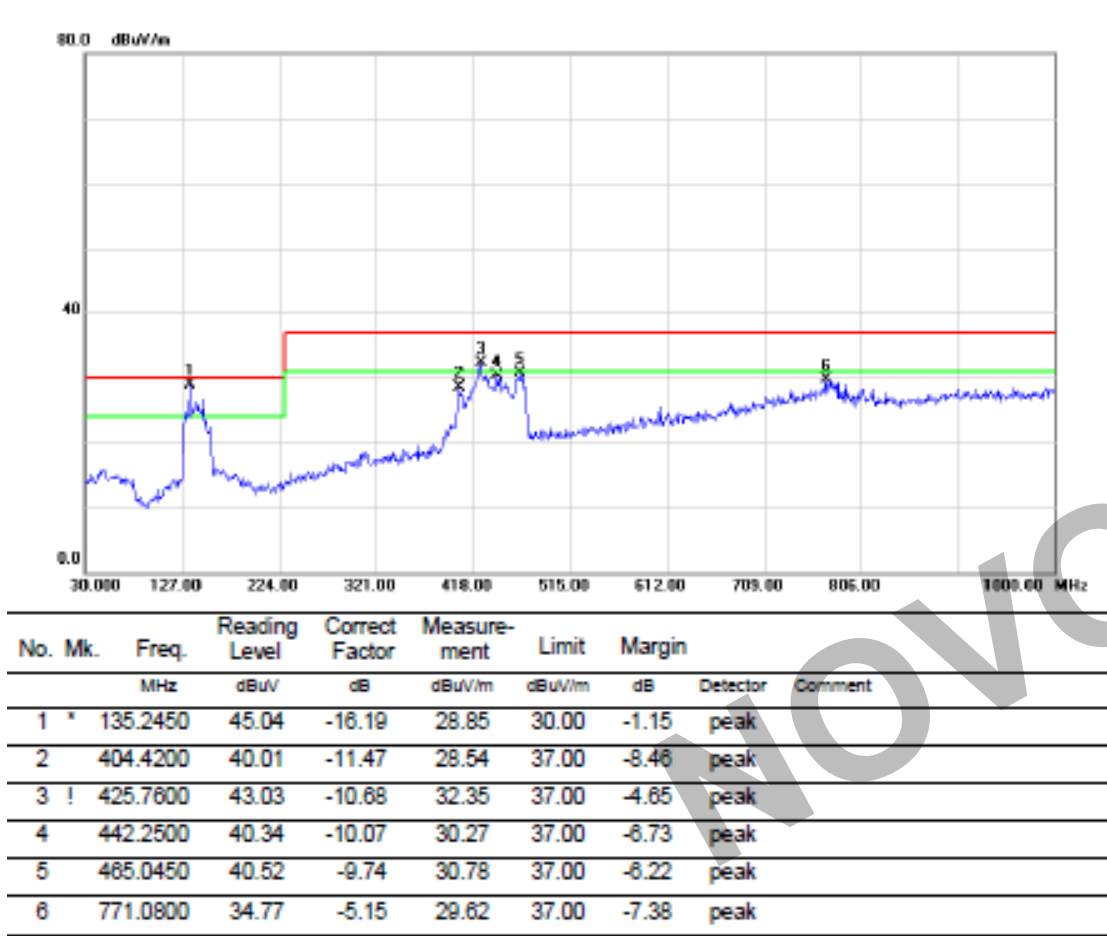
NSiP8841

红外热图

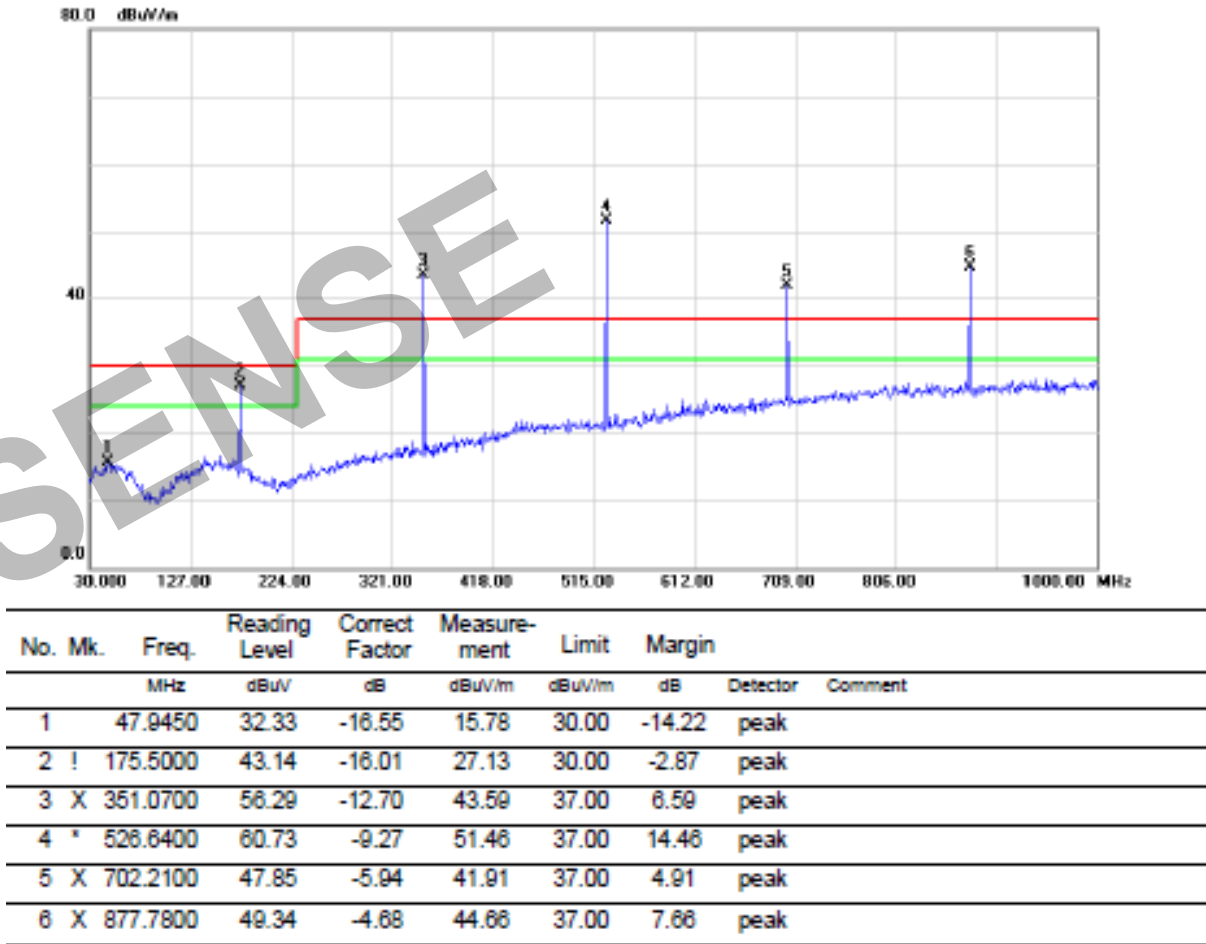


满负载下，NSiP884x温升比ADI低90 C

EMI 对比水平方向10M



NSiP8841

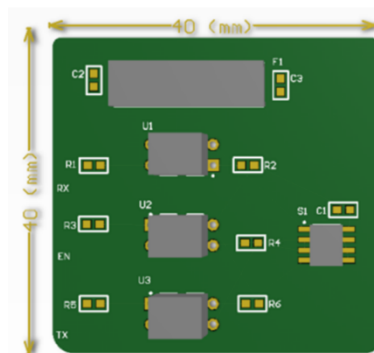
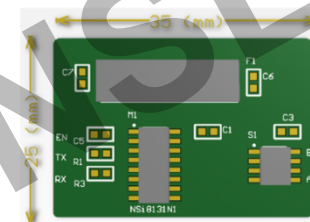
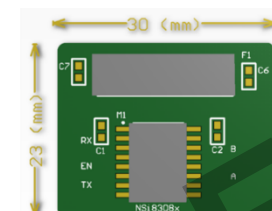


ADuM54xx

NSiP8841 is 15.6dB better than ADI

► 隔离485方案对比

项目	NSiP8xxx + 收发器	光耦+收发器+电源模块	数字隔离器+收发器+电源模块	隔离接口IC+电源模块
PCB面积	32*15mm ² = 480mm ²	40*40mm ² = 1600mm ²	35*25mm ² = 875mm ²	30*23mm ² = 690mm ²
成本	\$\$	\$\$	\$\$\$	\$\$\$\$
速率	取决于485芯片速率	<100kbps	取决于485芯片和数字隔离速率	取决于485芯片速率
隔离电压	5000V	3000V	3000V	3000V

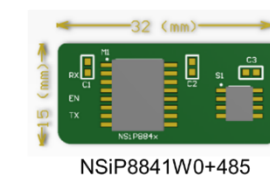


44%
smaller

F0505C-1W
+NSi83085

82%
smaller

F0505C-1W+
NSi8131N1+485



230%
smaller

F0505C-1W+
光耦隔离+485

采样隔离解决方案

▶ 纳芯微方案详解—隔离采样

• 电流、电压采样

产品料号	输入范围	输出类型	封装	竞品-TI	竞品-Avago	竞品ADI/Silabs	样品	量产
NSI1300D05	+/-50mV	模拟	SOIC8-WB	AMC1302	NA	Si8921AD	2020/4	2020/8
NSI1300D25	+/-250mV	模拟	SOIC8-WB	AMC1300B	ACPL-C79	Si8921BD	2020/4	2020/8
NSI1200	+/-250mV	模拟	DUB8	AMC1200	HCPL-7840	NA	2020/9	2020/11
NSI1311	0.1~2V	模拟	SOIC8-WB	AMC1311B	ACPL-C87	NA	2020/5	2020/8
NSI1306M05	+/-50mV	数字	SOIC8-WB	AMC1306M05	NA	NA	2020/8	2020/11
NSI1306M25	+/-250mV	数字	SOIC8-WB	AMC1306M25	NA	ADUM7701/7402	2020/8	2020/11
NSI1306M25	+/-250mV	数字	SOIC16-WB	AMC1305M25	ACPL-C796J/H	ADUM7701/7401	2020/8	2020/10

• 模拟量输入

物料名称	物料简介	是否量产	欧美P2P
NSA2862	超低功耗信号调理专用芯片	是	N/A

• PCB及扇热片测温

物料名称	物料简介	是否量产	欧美P2P
NST1001	高精度双引脚数字脉冲输出温度传感器	是	LMT01 (TI)

► NSI1300/1200

HIGH RELIABILITY ISOLATED CURRENT SENSE AMPLIFIER

Features

- $\pm 50\text{mV}$ or $\pm 250\text{mV}$ linear Input Voltage Range
- Fixed Gain: 8.2(8 for NSi1200)
- Low Offset Error and Drift:
 - $\pm 0.2\text{mV}$ (Max), $\pm 3\mu\text{V}/^\circ\text{C}$ (Max)
- Low Gain Error and Drift:
 - $\pm 0.3\%$ (Max), $\pm 50\text{ppm}/^\circ\text{C}$ (Max)
- Low Nonlinearity and Drift:
 - $\pm 0.03\%$ (Max), $\pm 1\text{ppm}/^\circ\text{C}$ (Typ)
- SNR: 85dB (Typ, BW=10kHz), 72dB (Typ, BW=100kHz)
- Wide bandwidth: 310kHz (Typ) (100kHz for NSi1200)
- High CMTI: 100kV/ μs (Typ)
- Operation Temperature: $-40^\circ\text{C}\sim 125^\circ\text{C}$
- AEC-Q100 qualified
- RoHS-Compliant Packages:
 - SOIC-8(WB)
 - DUB-8(NSi1200)
- Certifications

5000Vrms or 1 minute per UL1577

DIN VDE V 0884-11:2017-01

Drop in replacement of :

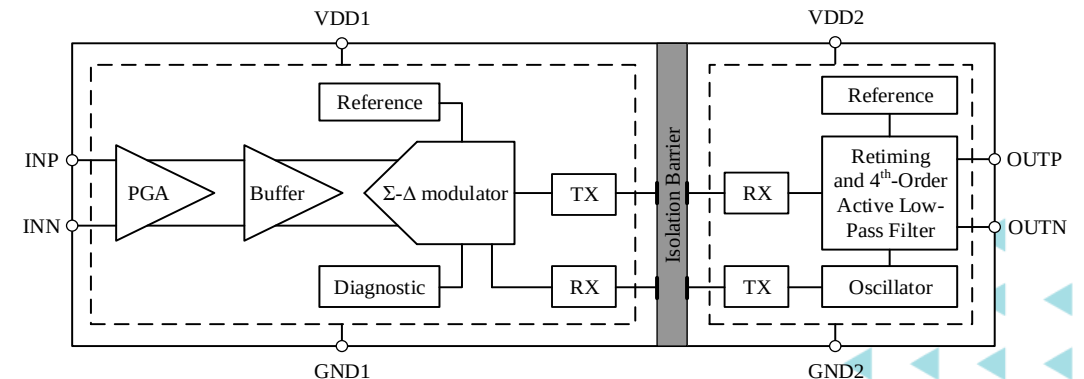
TI: AMC1200/1300/1301/1302

Avago: HCPL7840/ACPL-C78x/790x/C79x

Silabs: Si8921

Applications

- Shunt current monitoring
- AC motor controls
- Power and solar inverters
- Uninterruptible Power Suppliers
- Automotive onboard chargers



► NSI1300 VS TI & AVAGO

性能	Condition	AMC1301	AMC1300B	AMC1300	ACPL-C790	ACPL-C79A	NSI1300
带宽 (kHz)	(min / typ)	190 / 210	250 / 310	170 / 230	140 / 200	140 / 200	250 / 310
延时(μs)	(max)	3	3	3.3	3.3	3.3	3
线性输入范围(mV)	(max)	±250	±250	±250	±200	±200	±250
增益	(typ)	8.2	8.2	8.2	8.2	8.2	8.2
增益误差@ 25°C (%)	(max)	±0.3	±0.3	±1	±3	±1	±0.3
增益误差温漂(ppm/°C)	(typ)	±50	±50 (max)	±50	±410	±410	±50 (max)
初始输入偏置误差(mV)	(max)	±0.2	±0.2	±2	2	2	±0.2
误差温漂(μV/°C)	(max)	±3	±3	±4	±4	±4	±3
非线性度 (%)	(max) (over T _A)	±0.03	±0.03	±0.03	±0.13 (@ 25°C)	±0.13 (@ 25°C)	±0.03
非线性度温漂系数(ppm/°C)	(typ)	±1	±1	±1	±3	±3	±1
输出噪声@ BW = 100 kHz (mV _{RMS})	(typ)	220	230	220	not specified	not specified	200
SNR: f _{IN} = 10 kHz, BW = 100 kHz (dB)	(typ)	71	72	71	62 (@ 300 mV _{IN})	62 (@ 300 mV _{IN})	72
环境温度		-40°C to 125°C	-55°C to 125°C	-40°C to 105°C	-40°C to 105°C	-40°C to 105°C	-40°C to 125°C
工作电压(V _{AC, PEAK})		1414	2121	2,121	1,414	1,414	1414
共模瞬态抑制 (kV/μs)	(min)	15 / 30	75/140	15 / 30	10 / 15	10 / 15	100/150
封装		DWV-8	DWV-8	DWV-8	DWV-8	DWV-8	DWV-8



NSI1306

HIGH RELIABILITY ISOLATED CURRENT SENSE ADC

Features

- Input Clock frequency: 5MHz to 21MHz
- $\pm 50\text{mV}$ or $\pm 250\text{mV}$ Linear Input Voltage Range
- Excellent DC Performance:
 - Offset Error: $\pm 50\mu\text{V}$ or $\pm 100\mu\text{V}$ (Max)
 - Offset Drift: $1\mu\text{V}/^\circ\text{C}$ (Max)
 - Gain Error: $\pm 0.2\%$ (Max)
 - Gain Drift: $\pm 40\text{ppm}/^\circ\text{C}$ (Max)
- SNR: 82.5dB or 86dB (Typ)
- High CMTI: $100\text{kV}/\mu\text{s}$ (Typ)
- Operation Temperature: $-40^\circ\text{C} \sim 125^\circ\text{C}$
- AEC-Q100 qualified
- RoHS-Compliant Packages:
 - SOIC-8(WB)
 - SOIC-16(WB)
- Certifications

5000Vrms or 1 minute per UL1577

DIN VDE V 0884-11:2017-01

Drop in replacement of :

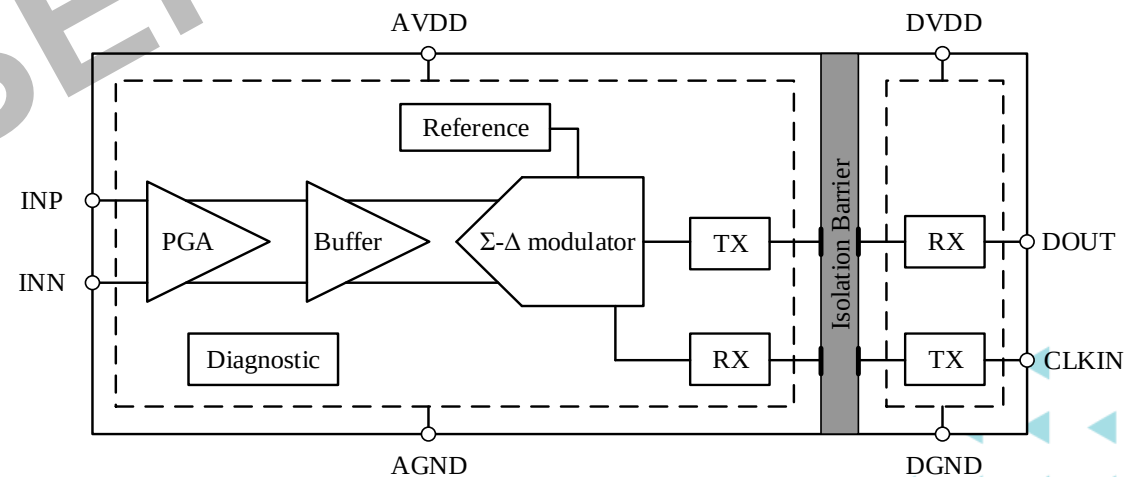
TI: AMC1305/1306

Avago: ACPL-C796J/H

ADI: AD7401/7402/ADuM7701

Applications

- Shunt current monitoring
- AC motor controls
- Power and solar inverters
- Uninterruptible Power Suppliers
- Automotive onboard chargers



► NSI1306 VS TI AMC1305

Parameter	AMC1305	AMC1306	NSI1306
Isolation Rating	Reinforced	Reinforced	Reinforced
Input Voltage Range	$\pm 50 \text{ mV}$ $\pm 250 \text{ mV}$	$\pm 50 \text{ mV}$ $\pm 250 \text{ mV}$	$\pm 50 \text{ mV}$ $\pm 250 \text{ mV}$
Clock Frequency (fCLKIN) (max) (MHz)	20	20	21
Offset Error (E_o) (max @ 25 °C) (μV)	150	± 50	± 50
Offset Error Drift (TCE_o) (max) ($\mu\text{V}/^\circ\text{C}$)	± 1.3	± 1	± 1
Gain Error (max) (%)	± 0.3	± 0.2	± 0.2
Gain Error Drift (max) (ppm/ $^\circ\text{C}$)	± 40	± 40	± 40
SNR (typ) (dB)	85	86	86
THD (typ) (dB)	-90	-98	-98
Isolation Working Voltage (V _{IOWM}) (V _{RMS})	1000	1500	1500
Isolation Transient Overvoltage (VIOTM) (V _{Peak})	7000	7000	8000
CMTI (min) (kV/ μs)	15/30	50/100	100/150
Operating Temperature Range (Ta) ($^\circ\text{C}$)	-40 to +125	-40 to +125	-40 to +125
Package	WB SOIC-16	WB SOIC-8	WB SOIC-16/ SOIC-8



NSI1311

HIGH RELIABILITY ISOLATED VOLTAGE SENSE AMPLIFIER

Features

- 0.1V ~2V linear Input Voltage Range
- Fixed Gain: 1
- Low Offset Error and Drift:
 - $\pm 1.5\text{mV}$ (Max), $\pm 15\mu\text{V}/^\circ\text{C}$ (Max)
- Low Gain Error and Drift:
 - $\pm 0.3\%$ (Max), $\pm 45\text{ppm}/^\circ\text{C}$ (Max)
- Low Nonlinearity and Drift:
 - $\pm 0.04\%$ (Max), $\pm 1\text{ppm}/^\circ\text{C}$ (Typ)
- SNR: 82.6dB (Typ, BW=10kHz), 71dB (Typ, BW=100kHz)
- Wide bandwidth: 310kHz (Typ)
- High CMTI: 100kV/ μs (Typ)
- Operation Temperature: $-40^\circ\text{C} \sim 125^\circ\text{C}$
- AEC-Q100 qualified
- RoHS-Compliant Packages:
 - SOIC-8(WB)
- Certifications

5000Vrms or 1 minute per UL1577
DIN VDE V 0884-11:2017-01

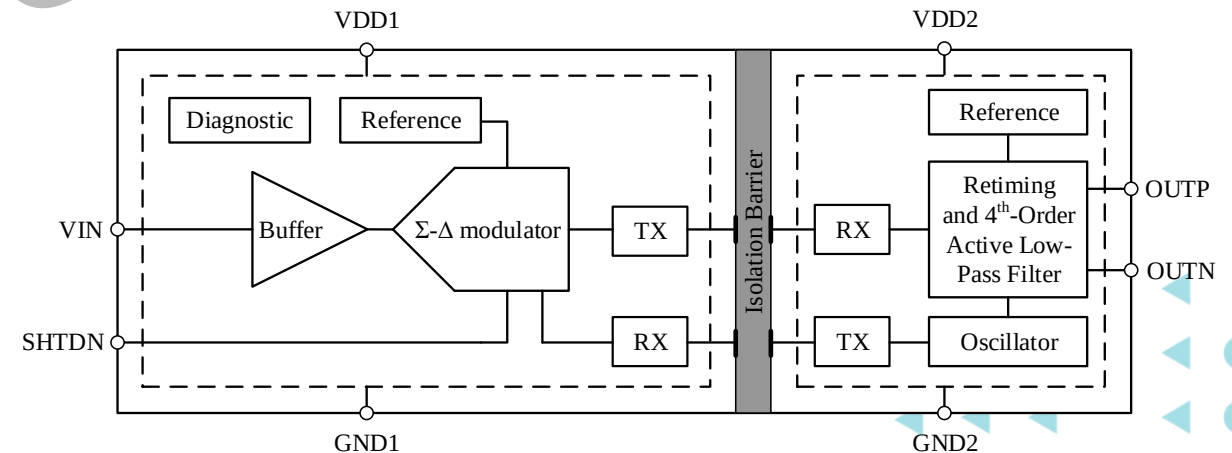
Drop in replacement of :

TI: AMC1311

Avago: ACPL-C87x

Applications

- Bus voltage monitoring
- AC motor controls
- Power and solar inverters
- Uninterruptible Power Suppliers
- EV/HEV



► NSI1311 VS TI AMC1311 & BROADCOM ACPL-C87

Units		Conditions	AMC1311	AMC1311B	ACPL-C87B / 87A / 870	NSI1311
带宽	kHz	(min / typ)	100 / 220	220 / 275	70 / 100	220 / 275
增益误差@ 25°C (%)	%	(max)	±1	±0.3	±0.5 / 1 / 3	±0.3
增益误差温漂(ppm/°C)	ppm/°C	(typ)	±30 (typ)	±5	-35 (typ)	±5
初始输入偏置误差(mV)	mV	(max)	±9.9	±1.5	±9.9	±1.5
误差温漂(μV/°C)	μV/°C	(typ)	±20	±3	±21 (typ)	±3
非线性度 (%)	%	(max) (over T _A)	±0.04	±0.04	±0.1 @ 25°C	±0.04
非线性度温漂系数(ppm/°C)	ppm/°C	(typ)	±1	±1	±200	±1
高边电源电压	V		4.5 to 5.5	3 to 5.5	4.5 to 5.5	3 to 5.5
低边电源电压	V		3 to 5.5	3 to 5.5	3 to 5.5	3 to 5.5
高边工作电流	mA	(typ)	9.7	8.4 / 9.7	15	11.5
低边工作电流	mA	(typ)	7.2	7.2 / 8.1	11 / 12	6.5
环境温度			-40°C to 125°C	-55°C to 125°C	-40°C to 105°C	-40°C to 125°C
工作电压	V _{RMS}	(min)	1,500	1,500	1,000	1,500
共模瞬态抑制	kV/μs	(min / typ)	15 / 30	75 / 140	10 / 15	100 / 150

驱动隔离解决方案

▶ 纳芯微方案详解—驱动模块



物料名称	物料简介	应用场景	产品状态	欧美P2P
NSi8260W0-DSWR	6CH增强隔离数字隔离器	小功率段 IPM驱动	3月样品，9月量产	Si8660 (SiliconLab) ISO7760 (TI)
NSi8266W0-DSWR	带互锁功能的6CH数字隔离器	小功率段 IPM驱动	3月样品，9月量产	ACPL-P480(Avago) 功能替代
NSi6601B-DSPR	5A/5A单管驱动-电压输入	中大功率段 IGBT驱动	8月样品，12月量产	1EDI40I12AF
NSi6801C-DSWFR	5A/5A单管驱动-电流输入 6脚宽 体封装	中大功率段 IGBT驱动	8月样品，2021年3 月量产	ACPL-W34x(Broadcom) ACPL-W314(Broadcom) TLP575x(Toshiba) TLP570x(Toshiba) UCC23513(TI)
NSi6801C-DDBR	5A/5A单管驱动-电流输入，8脚封	中大功率段 IGBT驱动	8月样品，12月量产	TLP350(Toshiba) FOD3120 (On) ACPL-T350(Broadcom)

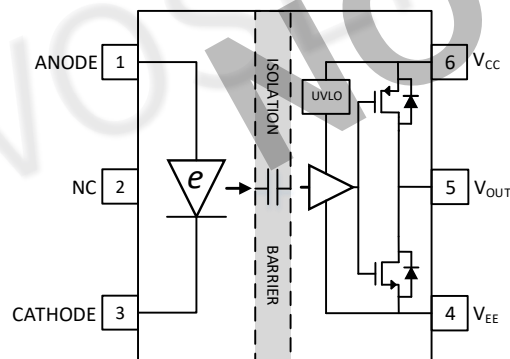


NSI6801

HIGH RELIABILITY ISOLATED SINGLE-CHANNEL GATE DRIVER

Features

- Isolated single-channel driver
- Pin compatible, drop in upgrade for opto isolated gate drivers
- Driver side supply voltage: up to 35V with 13V UVLO
- 5A peak source and 6A peak sink output current
- High CMTI: $\pm 150\text{kV/us}$
- 80ns typical propagation delay
- 35ns maximum pulse width distortion
- 25ns maximum part to part delay matching
- Accepts minimum input pulse width 30ns
- Operation ambient temperature: $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$
- RoHS-compliant packages:
 - SOIC-6 wide body
 - DUB-8

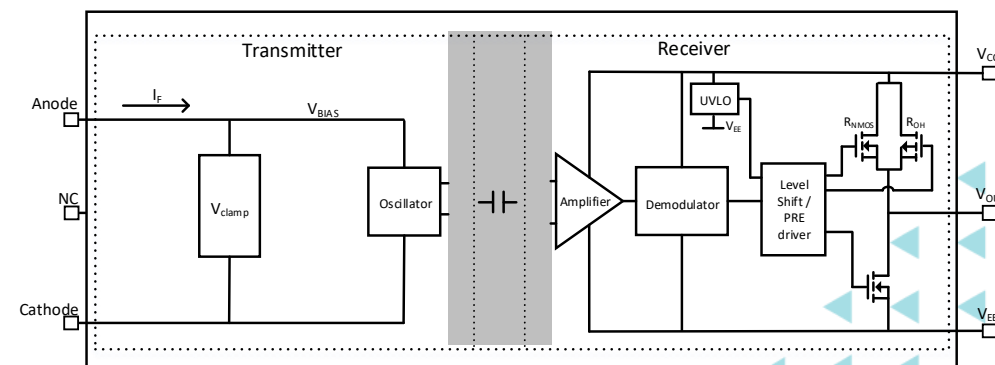


Applications

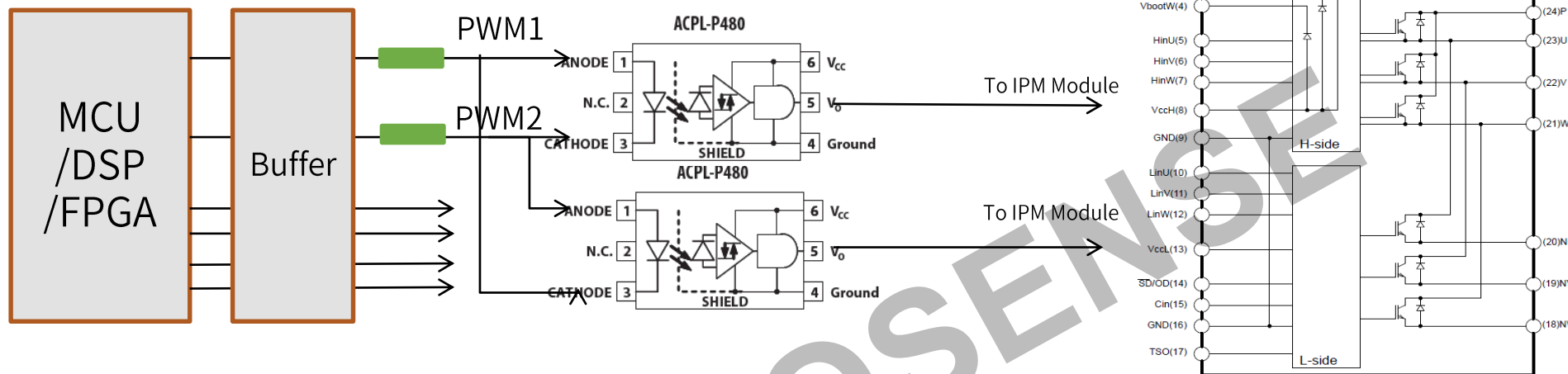
- DC-to-AC solar inverters
- Motor drives
- UPS and battery chargers

全国产供应链

- 晶圆: SMIC
- 封装: ASEN



► IPM驱动当前主流方案

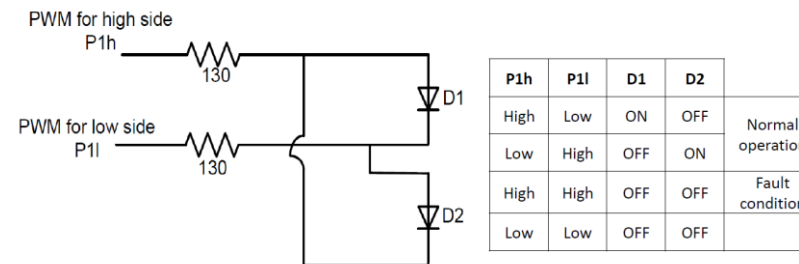


优点：该接法硬件互锁，可以防止以下情况的直通问题：

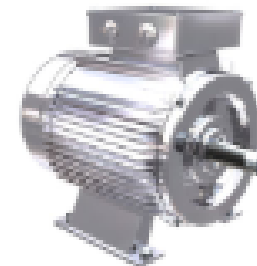
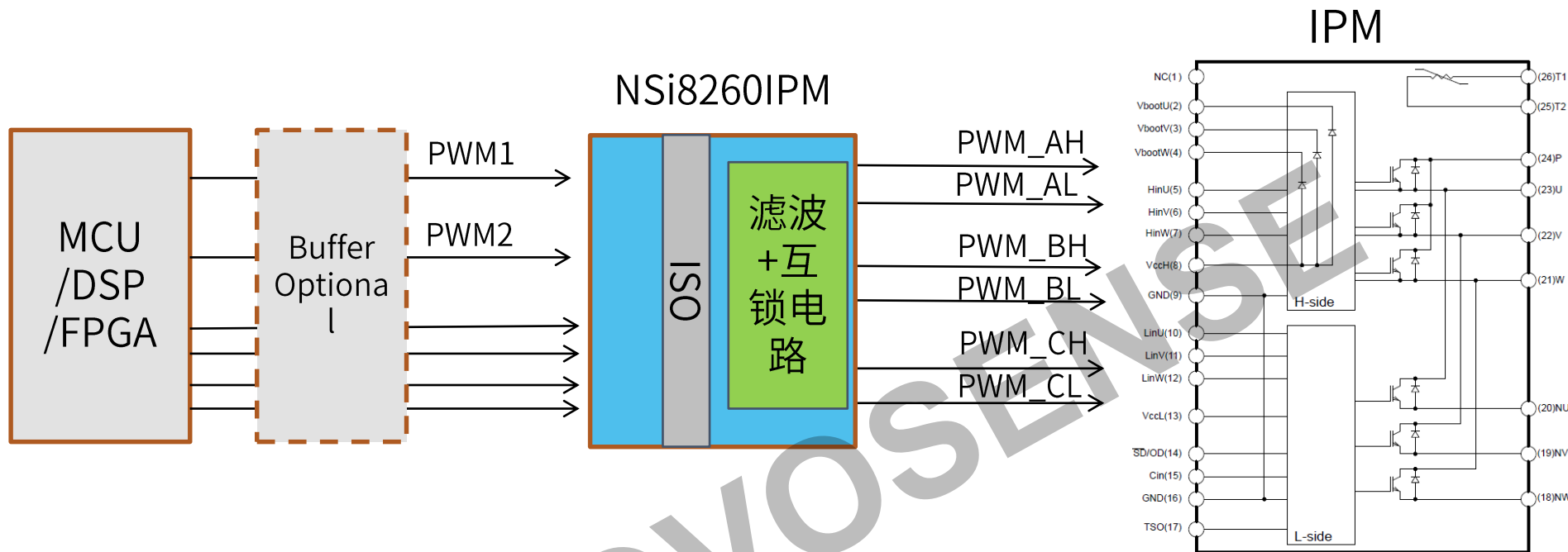
1. MCU/DSP 出错，导致高低边PWM信号同时为高；
2. 输入强共模干扰时，高低边输入出现同时为高的毛刺；

缺点：

1. 一般应用IPM系统PCB面积都比较小，该设计需要6个光耦，**体积大，成本高**（9~12人民币左右）
2. 光耦**一致性较差，延时时间长**，系统死区时间不好调



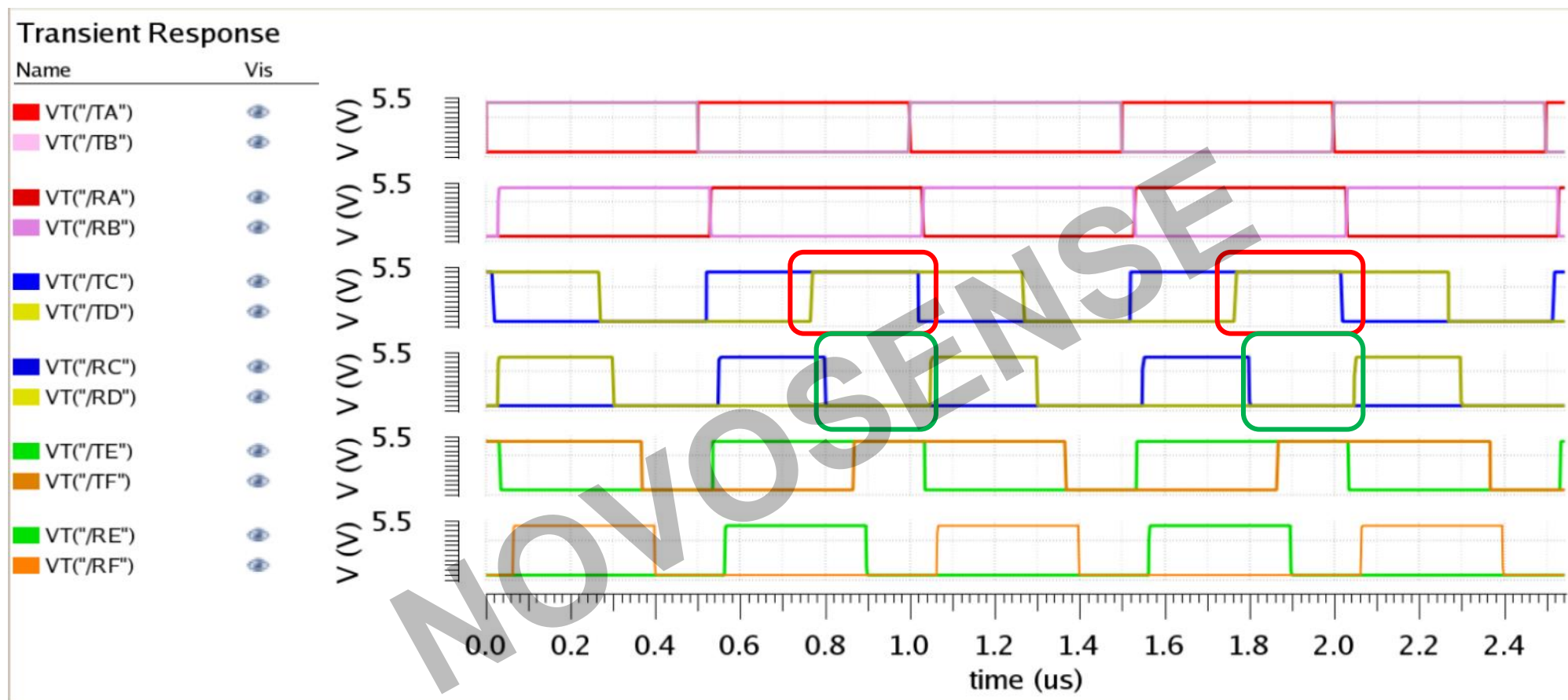
▶ 纳芯微解决方案



优点：

1. 硬件互锁，可以防止各种情况的直通问题；
2. 单芯片方案，体积小，成本低，可靠性高；
3. 高速隔离通道，延时小（10nS），通道间一致性高（~5nS）

► 应用波形

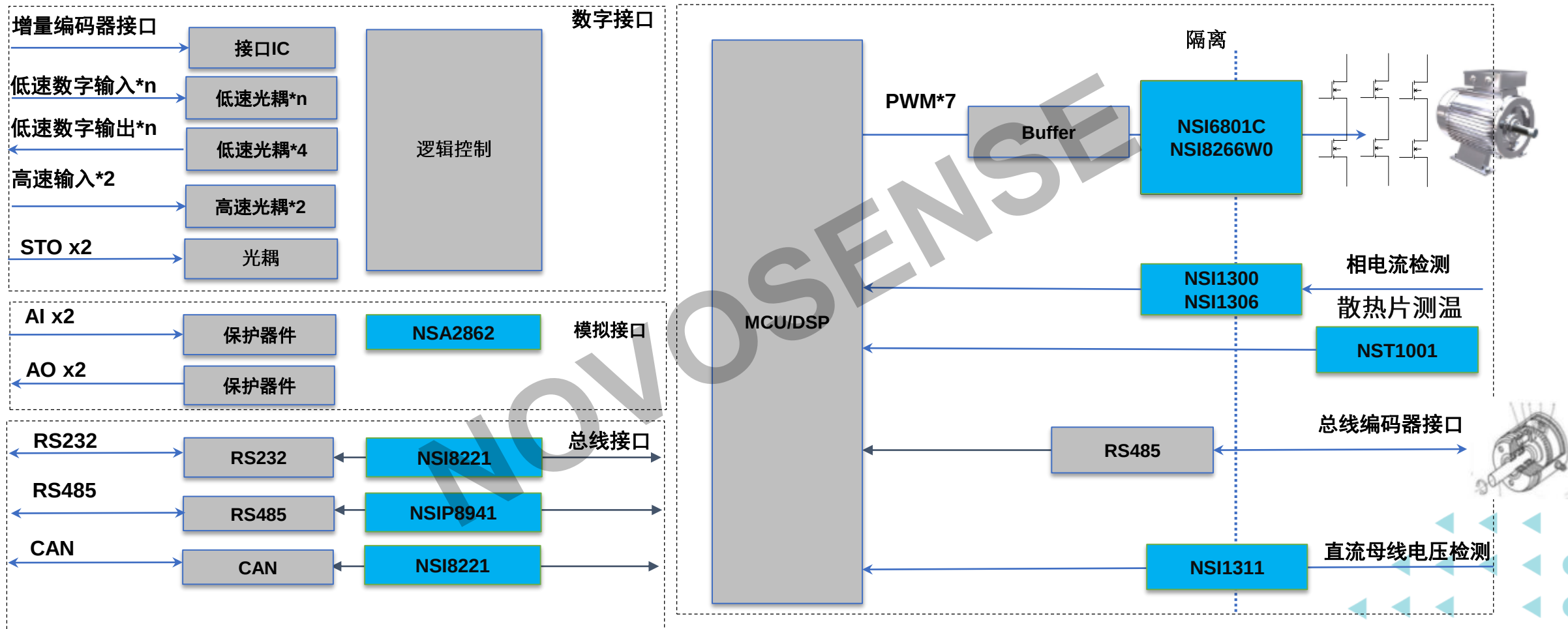


实验波形可以看出，当输入同时为高或同时为低时，输出始终为低电平

► 综合各方案对比

比较项	纳芯微 NSi8260IPM	TI ISO7760	Silicon Labs Si8660	Avago P480/W480
隔离认证	增强隔离	增强隔离	基本隔离	增强隔离
互锁功能	有	无	无	有
CMTI(KV/uS)	200	100	50	20
传输延时	10ns	11ns	10nS	350nS
延时误差	5nS	4.5nS	5nS	250nS
PCB面积 mm2	100 (10*10)	100 (10*10)	100 (10*10)	276(10*4.6*6)
成本	\$\$	\$\$\$	\$\$\$	\$\$\$\$

电机控制系统及纳芯微方案



红色方框代表纳芯微有相关芯片方案



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