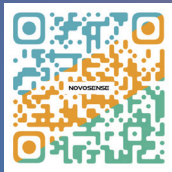


NOVOSENSE Gate Driver IC Guide Book

NOVOSENSE



NOVOSENSE
Company Brochure



NOVOSENSE
Product Selection Guide



NOVOSENSE
Automotive Solution



NOVOSENSE
Renewable Energy & Power
Supply Solution



NOVOSENSE
Industrial
Control Solution



NOVOSENSE
Home Appliance
Solution

NOVOSENSE Microelectronics

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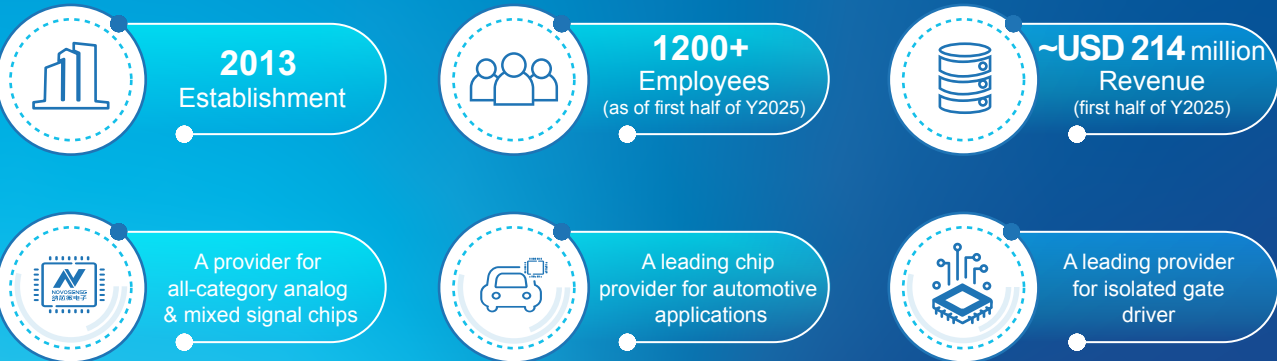
🌐 NOVOSENSE Microelectronics

📺 NOVOSENSE Microelectronics

Release Date: October, 2025



NOVOSENSE: Highly Robust and Reliable Analog and Mixed Signal Chip Company

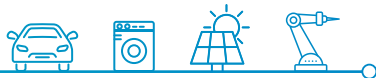


NOVOSENSE Microelectronics (NOVOSENSE, SSE Stock Code 688052) is a highly robust & reliable analog and mixed signal chip company. Since its establishment in 2013, the company has been focusing on sensor, signal chain, and power management, providing comprehensive semiconductor products and solutions, which are widely used in automotive, industrial, information communication and consumer electronics markets.

With the mission of “Sense & Drive the Future, Build a Green, Smart and Connected World with Semiconductors”, the company is committed to providing chip-level solutions to link the digital world and the real world.

For more information and sample application, please visit: www.novosns.com

CONTENTS

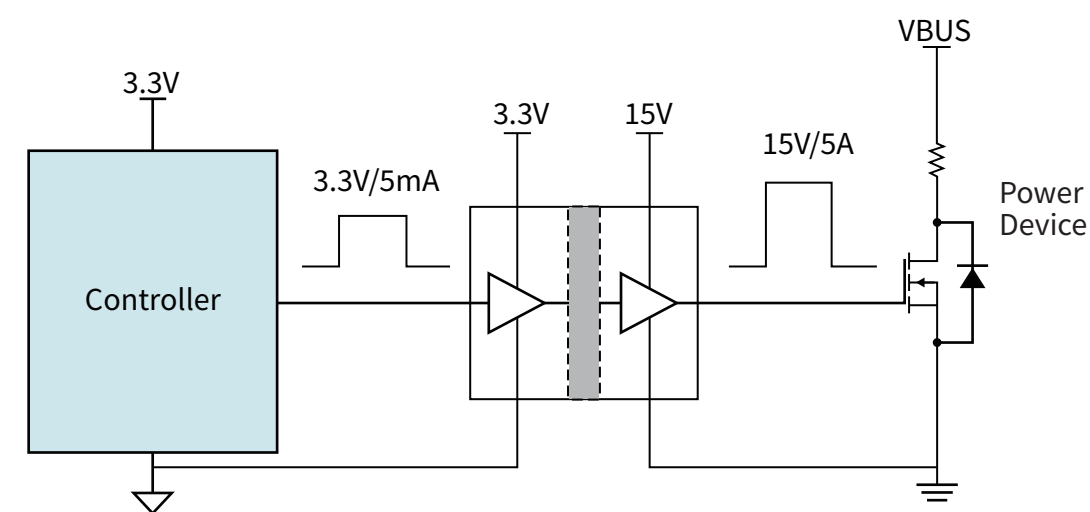


1	NOVOSENSE Gate Driver IC Products	
	Overview	2
	Key features	2
	Key parameters	3
	Categories of NOVOSENSE gate driver ICs	5
2	NOVESENSE Gate Driver Technologies	
	Enhanced capacitive isolation technology withstanding surge voltage exceeding 10 kV	9
	Signal modulation technology for high CMTI	10
	High-reliability half-bridge driver ICs: galvanic isolation or Level Shift technology	11
	Integration of comprehensive protection functions	12
	ASIL D functional safety	14
	GaN driver technology	16
3	Typical Applications	
	Automotive electronics	18
	Industrial automation	23
	Renewable energy and power supply	27
	White goods and consumer electronics	36
4	Overview of NOVOSENSE Gate Driver ICs Products	
	Name code for gate driver IC products	42
	Selection guide for NOVOSENSE gate drivers	41



Overview

Gate driver IC is designed to control and switch power devices such as MOSFETs, IGBTs, SiC MOSFETs, and GaN HEMTs. It amplifies control signals from a controller to provide sufficient current needed to rapidly charge and discharge the gate of a power device. This capability ensures precise timing control, high-speed switching operations, and minimizes switching losses, thereby enhancing overall system efficiency and reliability.



Block diagram of gate driver ICs

Key Features

1

Signal Amplification

Amplify the current of control signals from the microcontroller or driver circuit to a suitable level, to rapidly charge and discharge the gate capacitance of power devices.

2

Voltage Conversion

Convert the control signal voltage levels from the logic level to higher voltages required to drive the gates of power devices in order to ensure fast switching and low conduction losses.

3

Isolation

Ensure that the control signals from the input side are transmitted to the output side without direct electrical connection, thereby protecting sensitive control circuitry from high voltage spikes or transients that may occur in the power circuit.

4

Protection

Integrate protective functions such as undervoltage lockout (UVLO), Miller Clamp, and desaturation protection (DESAT) to ensure the reliability and safety of power devices.

Each power device requires a corresponding driver ICs. The appropriate driver ICs can simplify system design complexity and save R&D time. NOVOSENSE offers a wide range of gate driver ICs with different **voltage ratings, package options, isolation levels, and protective functions** for users to choose from as needed.

NOVOSENSE Gate Driver IC Products

Key parameters

Gate driver IC has many key parameters. A thorough understanding of these parameters can help engineers find the best fit for driver IC spec requirements in different application scenarios.

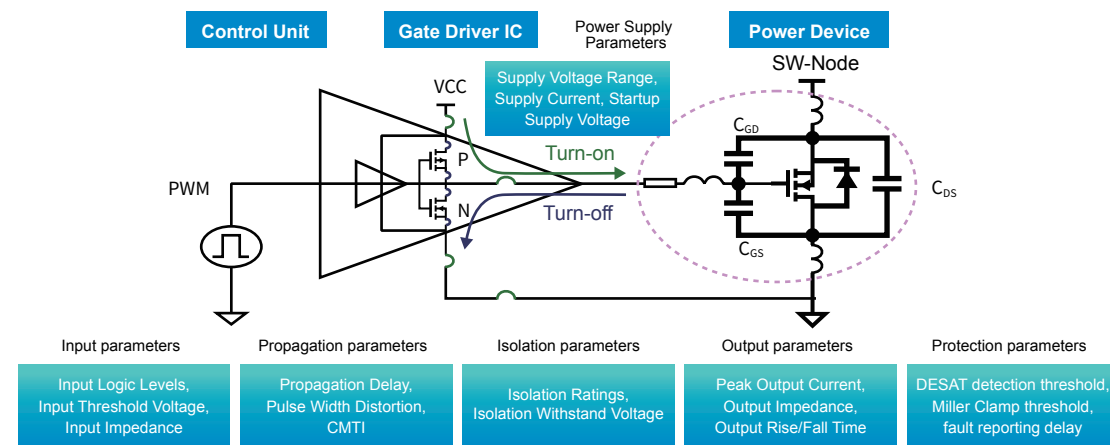


Diagram of gate driver IC's key parameters

Power supply parameters

- 1 Absolute Maximum Rating of Supply Voltage** indicates the highest positive or negative transient voltage that each driver ICs can withstand. Once the voltage goes beyond this range, irreversible damages may occur in the chip.
- 2 Recommended Operating Condition of Supply Voltage** indicates the voltage range that the driver ICs can withstand during long-time operation. Operation beyond the maximum voltage may shorten the expected lifetime of the chip.
- 3 Quiescent Supply Current (IQ)** consumed by the gate driver ICs when it is not switching any loads or performing any active functions.

Input parameters

- 1 Logic High Input Threshold** refers to the minimum voltage considered as a logic high level input.
- 2 Logic Low Input Threshold** refers to the maximum voltage considered as a logic low level input.
- 3 Input Impedance** refers to the impedance seen by the source providing the input signals to the gate driver ICs, influencing signal quality and transmission efficiency.

Output parameters

- 1 Peak Output Current** refers to the maximum peak current the driver can supply to or sink from the power device's gate.
- 2 Output Impedance** refers to the impedance of the gate driver IC's output when driving the gate of a power device, influencing signal integrity and stability.
- 3 Output Rise/Fall Time** refers to the time required for the output voltage to transition from a low to a high state(or from a high to a low state). These parameters characterize the switching speed of the gate driver ICs.

Isolation parameters

Safety certifications

VDE, UL, CQC certifications

Isolation ratings

VDE and CQC certifications typically classify isolation ratings into basic isolation and reinforced isolation. Meanwhile, UL certification categorizes isolation ratings into single isolation and double isolation.

Isolation withstand voltage

It typically includes maximum operating isolation voltage, maximum transient isolation voltage, maximum surge voltage, and maximum impulse voltage.



Transmission parameters

- 1 Propagation delay** refers to the time delay between the input signal switching and the corresponding output signal change, indicating how quickly the gate driver responds to control signals.
- 2 Power up delay** refers to the delay period during which the device initializes its internal circuits, stabilizes its operating parameters, and ensures all internal components are ready to function correctly.
- 3 Pulse width distortion** refers to the difference between the input pulse width and the output pulse width due to varying propagation delays or non-uniform response times within the device. Minimizing pulse width distortion is critical to ensuring precise and reliable operation of the overall system, especially in high-frequency switching applications where timing accuracy is crucial.
- 4 Common Mode Transient Immunity (CMTI)** indicates the maximum rate of change of the common-mode voltage that the device can tolerate while still maintaining specified performance levels. Common-mode noise refers to voltage fluctuations that occur simultaneously on both input terminals of the device relative to a common reference point, such as ground. CMTI is typically specified in volts per microsecond (V/ μ s) and is an important parameter to consider when designing gate driver circuits for applications requiring high noise immunity and robust performance in industrial, automotive, and power electronics systems.

Protection parameters

- 1** Key parameters in the DESAT protection function include desaturation detection threshold, leading edge blank time, and deglitch filter time, etc.
- 2** Key parameters in the Miller Clamp function include clamp threshold, and clamp delay, etc.
- 3** Key parameters for the fault reporting function include fault delay, fault mute time, fault output voltage, etc.

Categories of NOVOSENSE gate driver ICs

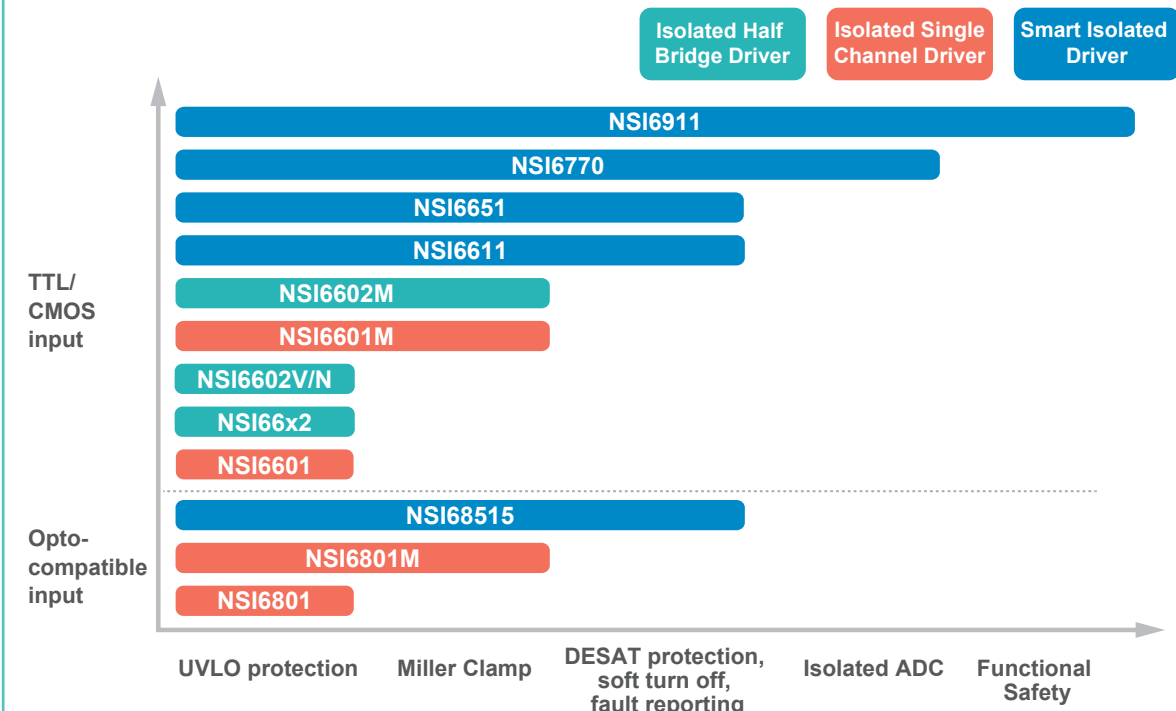
NOVOSENSE offers a comprehensive range of gate driver ICs products accommodating various power devices such as MOSFETs, IGBTs, SiC, GaN, and covering the majority of automotive and industrial applications including EVs, photovoltaics, energy storage, industrial automation, and power supplies, etc.



Classifications of NOVOSENSE gate driver ICs products

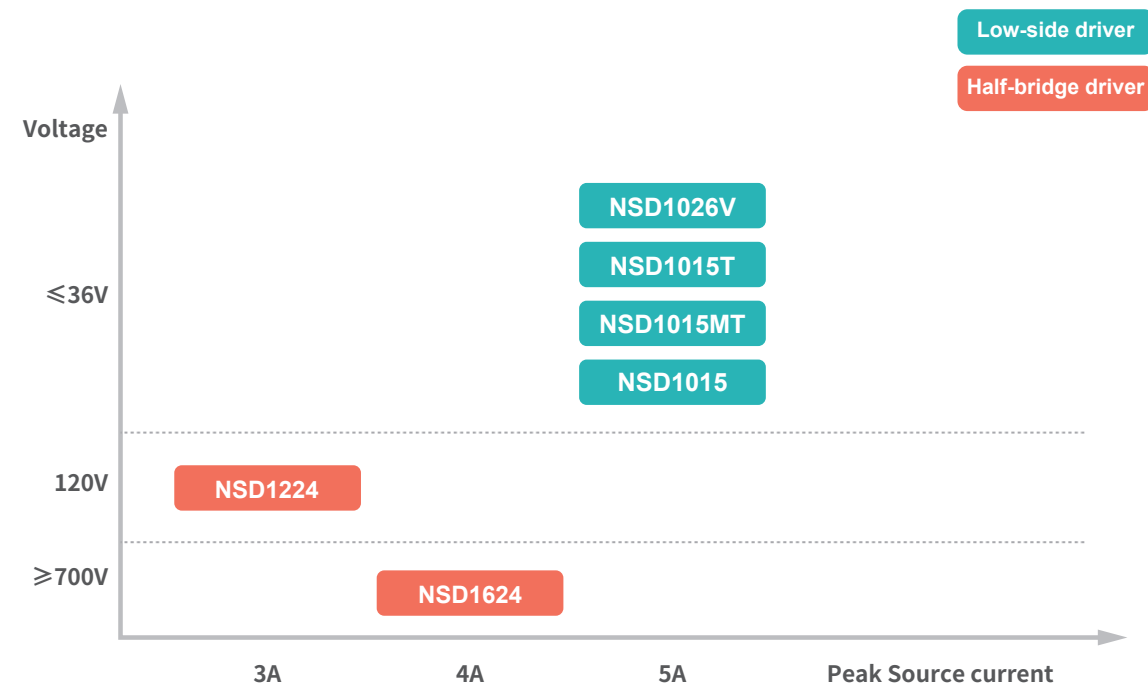
- 1 Isolation method**
By isolation methods, gate driver ICs products can be divided into galvanic isolated driver ICs and non-isolated driver ICs. Isolated driver ICs can meet the basic or reinforced isolation requirements, and have passed the isolation certifications such as VDE/UL/CQC. Non-isolated driver ICs do not have isolation safety certifications, but can meet functional isolation between high side and low side output by PN junction isolation or capacitive isolation technology.
- 2 Application architecture**
By the number of driver channels, gate driver ICs products can be divided into single-channel driver ICs and dual-channel driver ICs. By application architecture, they can be divided into low-side driver ICs and half-bridge driver ICs, etc. Especially, NOVOSENSE's 3rd generation semiconductor GaN series products cover not only gate driver ICs, but also integrated power stage ICs.
- 3 Protection function**
By protection functions, gate driver ICs products can be divided into general driver ICs and smart driver ICs. NOVOSENSE driver ICs integrate multiple optional protection functions. General gate driver ICs only provide UVLO function, and dead time protection, etc., while smart gate driver ICs integrate complicated protection functions such as DESAT protection, soft turn off, isolated ADC and fault reporting.

Isolated Driver

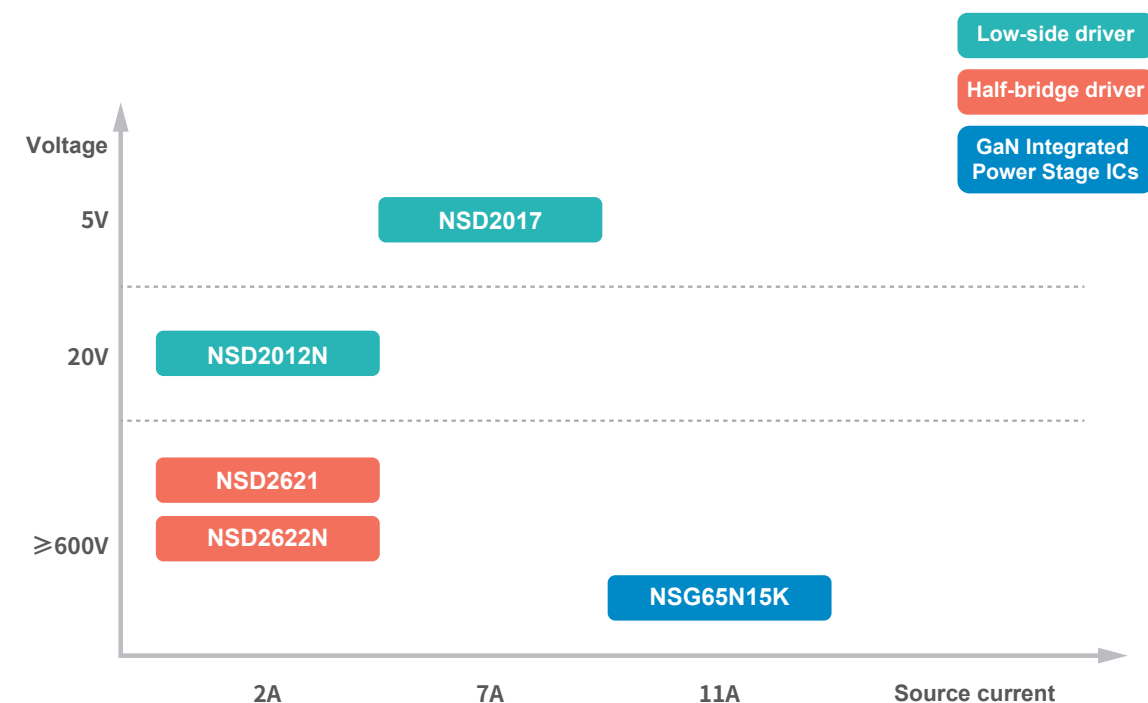




Non-isolated Driver



GaN Integrated Power Stage & Gate Driver



**NOVESENSE Gate
Driver Technologies**

Enhanced capacitive isolation technology withstanding surge voltage exceeding 10 kV

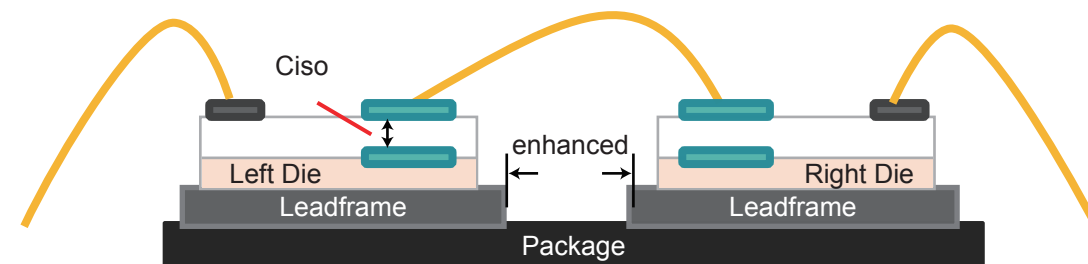
Currently, there are three mainstream isolation technologies in the market: opto-coupler isolation, magnetic coupling isolation, and capacitive coupling isolation. All isolated driver IC products from NOVOSENSE are designed with capacitive coupling isolation technology.



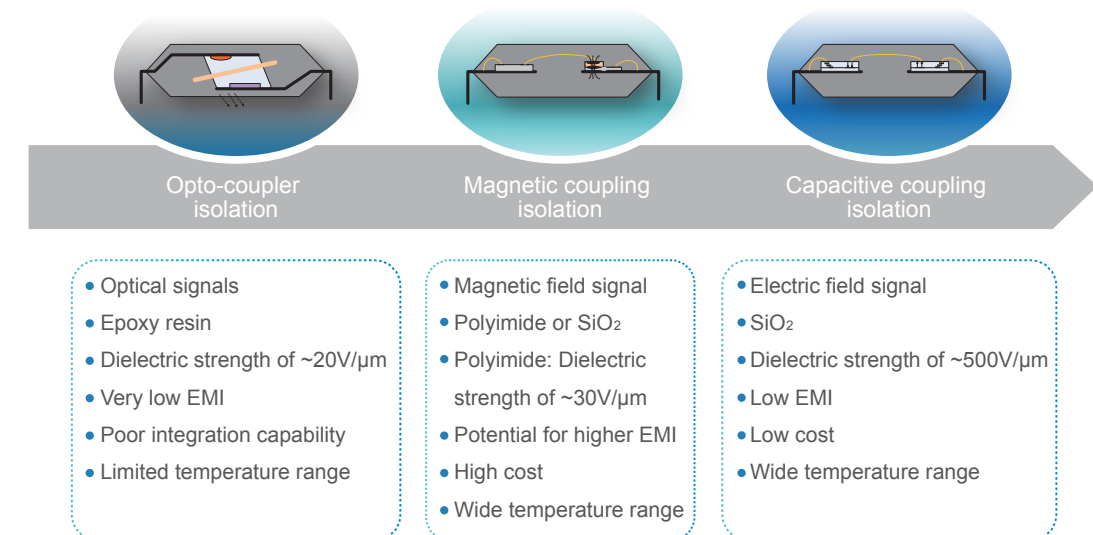
NOVOSENSE DIN VDE V 0884-11 reinforced isolation certificate

Series-connected SiO₂ isolation capacitors achieve reinforced insulation

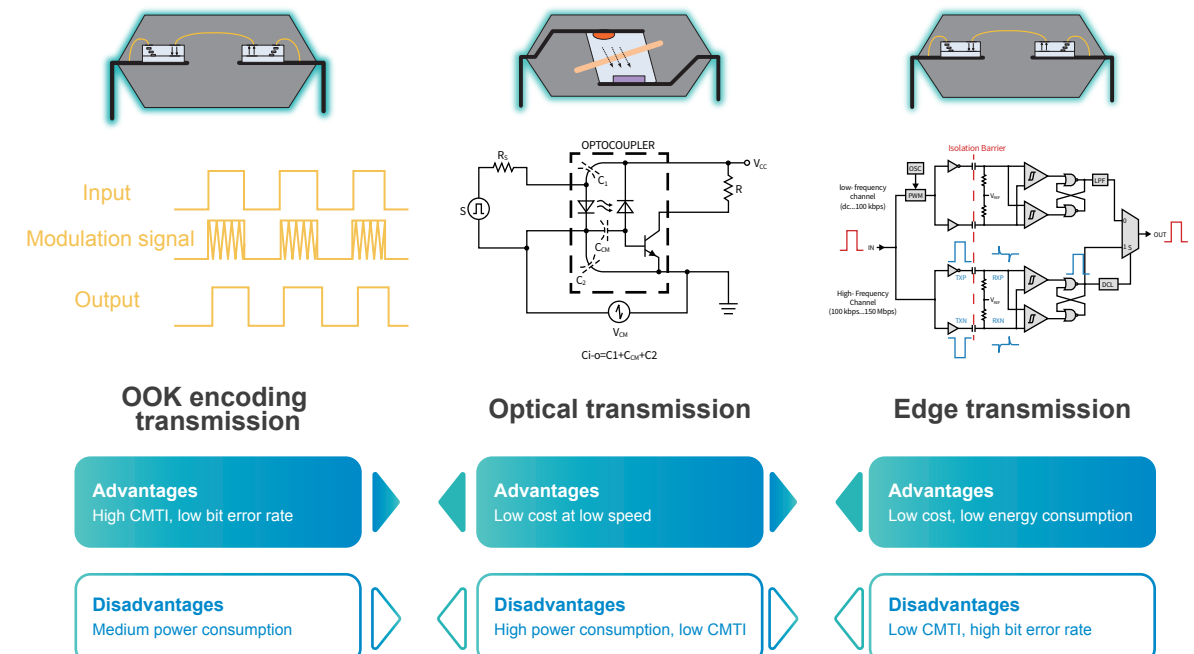
NOVOSENSE uses enhanced capacitive isolation technology. The isolation medium utilizes silicon dioxide (SiO₂), renowned for its high dielectric strength exceeding 400V per micron, surpassing epoxy resin typically used in optocouplers by 5-6 times.



Comparison of different isolation methods



Signal modulation technology for high CMTI



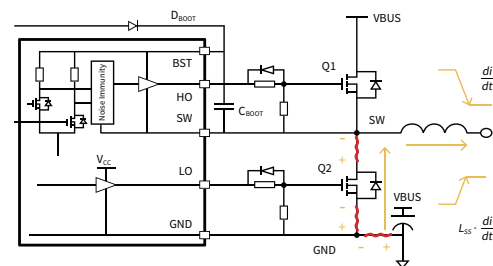


NOVOSENSE's Adaptive OOK® transmission technology

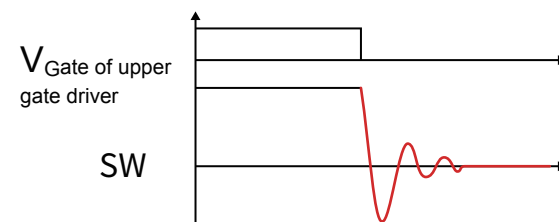
- 1 NOVOSENSE's patented Adaptive OOK® technology utilizes advanced signal modulation to bolster the anti-interference capability and stability of digital isolation chips, modulates the input signal onto a high-frequency carrier. This signal is then transmitted across the isolation barrier, significantly improving the driver's immunity to common-mode noise.
- 2 NOVOSENSE employs differential signal transmission per channel, which coupled with a dual-isolation capacitor architecture further suppresses the common-mode interference.
- 3 CMTI performance of NOVOSENSE isolated gate driver ICs: Typical CMTI >150kV/μs, and actual measurement up to 200kV/μs.

High-reliability half-bridge driver ICs: galvanic isolation or Level Shift technology

- 1 NOVOSENSE innovatively applies isolation technology to high-voltage half-bridge driver ICs, enabling the high-side to withstand up to 1200V DC voltage, while the SW pin meets the requirements of 150kV/μs dv/dt and high negative voltage spike tolerance. This solution addresses the pain points of high-voltage and high-frequency systems, therefore it is suitable for various high-voltage half-bridge, full-bridge, and LLC power supply topologies.
- 2 NOVOSENSE low-voltage half-bridge driver ICs employ the Level Shift technology, allowing the high-voltage output side to withstand up to 100V DC voltage. Additionally, to address the easy occurrence of negative voltage at the switching point of the half-bridge, the chip incorporates a unique internal circuit design to ensure that the SW pin can withstand negative voltage and operate reliably for a long time.



Effects of PCB trace parasitic inductance on switching behavior of SW pin



When the upper gate driver is turned off, SW will experience severe negative pressure

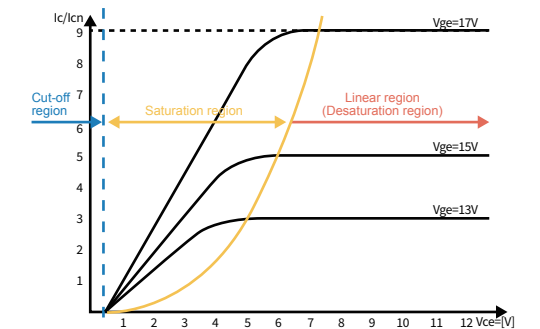


Integration of comprehensive protection functions

Selecting a right gate driver ICs can greatly enhance system reliability, simplify system design, and reduce R&D costs. NOVOSENSE smart gate drivers are integrated with a variety of protection functions to meet the specific requirements of different applications.

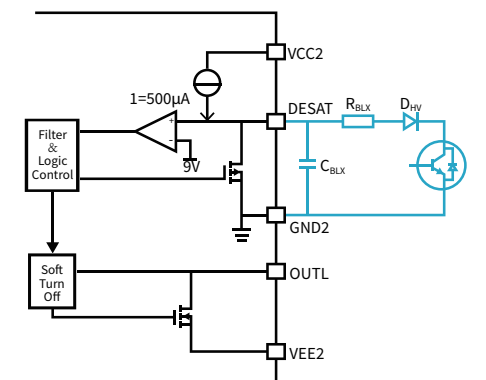
1 DESAT protection

Normally, the IGBT operates in the saturation region, where the collector-emitter voltage increases linearly with the collector current. However, when a short circuit occurs in the system, the collector-emitter voltage continues to rise without a corresponding increase of the collector current. This indicates that the IGBT has entered the linear region (also desaturation region). In the linear region, power dissipation in the IGBT increases significantly, leading to severe heating and a high risk of overheating failure.



Typical output characteristic curves of IGBT

Desaturation (DESAT) protection safeguards the IGBT by detecting the short-circuit faults through the voltage of DESAT pin and promptly turning off the gate voltage of the IGBT. The peripheral circuit of DESAT pin, as shown in the figure on the right, mainly comprises a capacitor, a resistor, and a high-voltage diode. Under normal operation of the IGBT, sources a 500μA current from inside circuit. This current will generate a relatively low voltage which clamped by collector-emitter voltage of the IGBT. As a short circuit fault occurs in the system, the VCE of the IGBT rises rapidly, then the high-voltage diode cuts off in reverse bias, and a 500μA constant current source starts charging the capacitor CBLX. When the capacitor voltage reaches to the DESAT threshold, the desaturation protection mechanism of the driver IC will be triggered, which turns off the gate voltage softly by a small sink current. At the same time, the FLT pin on the primary side is pulled low, signaling the short-circuit fault to the MCU. In addition, the internal MOSFET of the DESAT pin will be turned on to discharge the DESAT capacitor.

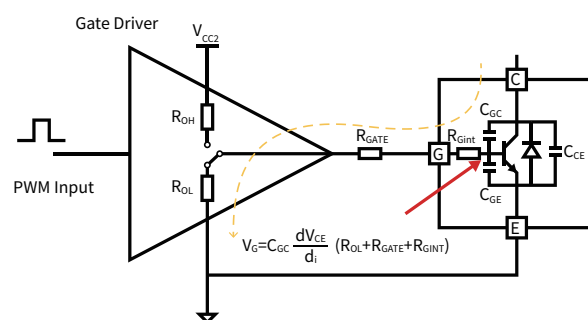


Description of the peripheral circuit of DESAT function



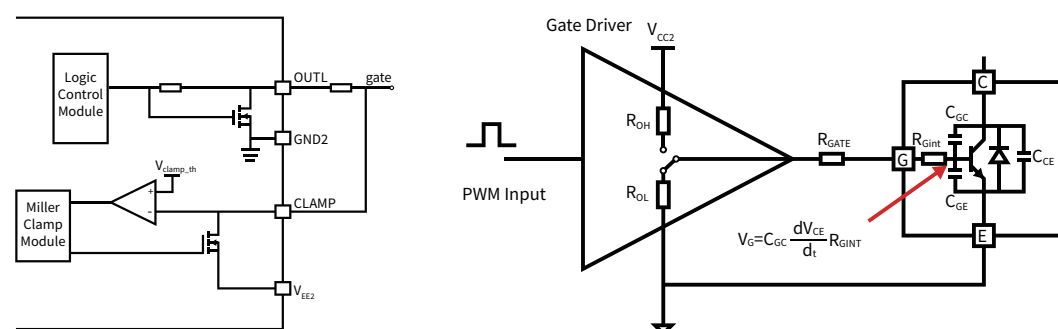
2 Miller Clamp

The Miller Clamp protection is designed to address a critical issue in half-bridge applications. When one power device turns on, the resulting high dv/dt transient at the switching node can inadvertently raise the gate voltage of the other, off-state power device. This can cause both devices to turn on simultaneously, leading to a short circuit. This phenomenon is known as the Miller effect. The figure below illustrates the path of the Miller-induced current and the theoretical formula for calculating this unintended gate voltage rise. If this voltage exceeds the power device's gate turn-on threshold, a spurious turn-on will occur. For example, SiC/IGBT devices have a typical gate turn-on threshold of 4-5V, while GaN devices have an even lower threshold, making them more susceptible to this effect.



Schematic diagram of Miller effect in power devices

This is how the Miller Clamp function of a driver ICs works: the gate voltage of the power device will be detected, and once the gate voltage drops below the threshold of the internal comparator, the gate voltage of the power device will be directly pulled down through a low-impedance path. In this way, the effect of the Miller current on the gate circuit will be reduced and the gate voltage of the power device will be clamped to V_{EE} .



Block diagram of CLAMP function in NSI6611



ASIL D functional safety

1 Technical principle

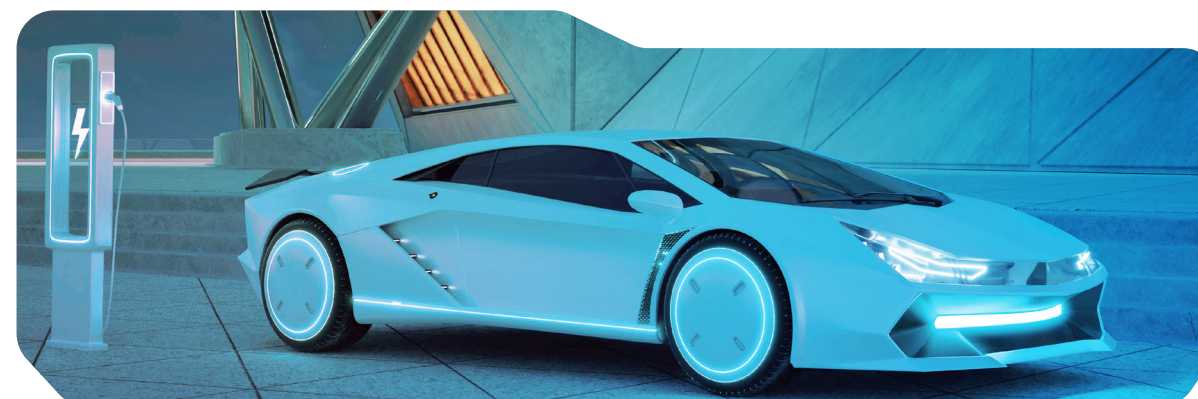
Functional safety gate drivers are applied in power module drive systems that require high-voltage isolation and safety requirements. Typical applications include IGBT/SiC power devices used in xEV traction inverters. The gate driver ICs identifies failure modes within the driver ICs itself, the power module, and the drive system. Working in tandem with the intrinsic safety mechanisms and the system-level safety control logic, the chip ensures the system to enter into a safe state within the fault tolerance time interval (FTTI), thereby preventing serious harm to personal safety caused by faults.

In the chip design and development process, methods such as project management, functional safety management, Change Control Board (CCB), configuration management, functional safety analysis (FTA, DFA, DFMEA, FMEDA), and functional safety verification measures have been adopted to reduce the probability of random hardware failures and avoid systemic failures.



2 System value

Using intelligent analog front-end (AFE) chips that meet the functional safety standards for development of functional safety components can greatly simplify the system development process, reduce the complexity of hardware and software design, lower the failure risks, and improve the reliability and robustness. Functional safety gate driver ICs from NOVOSENSE could not only achieve all the benefits as mentioned above but also support software-based intelligent configuration, enabling differentiated configuration development for various applications and power devices.



- **Rigorous development process:** NOVOSENSE's functional safety drivers follow the semiconductor functional safety product development process (with ISO26262 ASIL-D process system certification), and meet the ASIL-C or D system-level functional safety requirements based on SEooC (Safety Elements out of Context) at all stages of development and manufacturing, including definition, design, verification, and production.
- **Well-designed diagnostic mechanisms:** They have independent safety architecture and redundant design which can avoid common cause failures and cascading failures, and various self-check measures including voltage and current diagnostics, communication diagnostics, configuration diagnostics, gate status diagnostics, and ICs overheat alarm.
- **Robust fault protection:** They provide fault protection mechanisms, such as DESAT, overtemperature, overcurrent, short circuit, Miller Clamp, V_{CE} overshoot, and shoot-through protection, as well as two-level turnoff and soft turnoff protection actions.
- **Flexible parameter configuration:** They support configuring different parameters such as thresholds, gate voltage, filter time, and protection activation time by SPI. The chips can enter the ASC state through a separate fail-safe pin.
- **Reliable drive capability:** The low-voltage side supports 5-12V power supply, and 3.3/5V level logic; the high-voltage side supports positive and negative voltage supply, adjustable gate driver voltage, and drive current of over 15A; CMTI of more than 150kV/ μ s, and isolation withstand voltage Viso of more than 5kVrms.
- **Rich extended functions:** The high-voltage side integrates an LDO that can output 5V@20mA externally, a 12-bit high-precision isolated ADC, and functions such as temperature sampling and DC Link voltage sampling.



NOVOSENSE ISO26262 functional safety system certificate



GaN driver technology

1

Features of GaN drivers technology

GaN HEMT features low threshold voltage, low gate charge, high switching frequency, low on-resistance by driver side. Currently, GaN HEMTs are mainly classified into Depletion Mode (D-mode) and Enhancement Mode (E-mode). Specifically, D-mode GaN HEMT typically involves a Cascade (common source common gate) structure by cascading low-voltage Si MOSFET devices. E-mode GaN HEMT has a simple structure and lower switching losses, and can be turned off directly at zero voltage. Undoubtedly, E-mode GaN HEMT also has certain disadvantages, such as extreme sensitivity to parasitic parameters in high-frequency applications, which can easily cause gate oscillation and overvoltage during hard switching. In response to the characteristics of E-mode GaN HEMT, such as low gate voltage and sensitivity to parasitic parameters, NOVOSENSE GaN HEMT drivers use an LDO for stable voltage output, and employ segmented switches to regulate the turn-on and turn-off speed of GaN HEMT, thereby reducing the drain-source voltage stress and gate oscillation voltage of GaN HEMT.

2

Benefits of NOVOSENSE GaN drivers

- NOVOSENSE GaN HEMT driver employs an LDO for stable voltage output. This allows the ability to output stable driving voltage and avoid output voltage fluctuations caused by system noise or power supply voltage fluctuations, which otherwise can lead to gate overvoltage failure of the GaN HEMT.
- Segmented switches can effectively regulate the switching speed of GaN HEMT, reducing the drain-source voltage stress of GaN HEMT and gate oscillation, and improving EMI.
- Separate source and sink currents allow flexible configuration of drive resistance and easy system design.
- QFN package design results in smaller parasitic inductance.
- Based on capacitive isolation technology provides higher CMTI and ability to withstand voltage change rate of more than 150kV/ μ s.

Benefits of GaN HEMT driver

Short propagation delay

Segmented output current

Flexible dead time configuration

High CMTI

Performance of NOVOSENSE half-bridge GaN driver NSD2621x

Propagation delay: 30ns

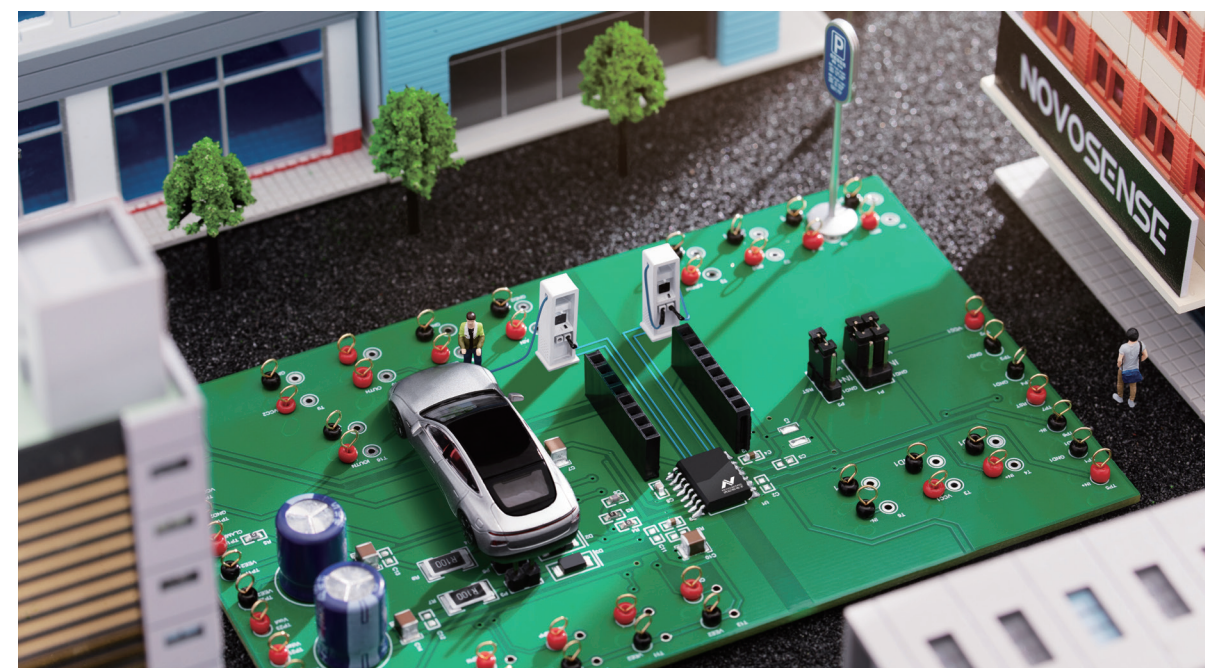
Peak source and sink current: 2A/4A

Dead time range: 20ns~100ns

CMTI: >150kV/ μ s



Automotive electronics



NOVOSENSE automotive-grade gate driver ICs are extensively utilized in the electric powertrain and thermal management system of xEVs. Certified under rigorous safety standards, these products offer a range of protection features and functional safety capabilities. They enable our customers to design more reliable and secure automotive systems.

Key considerations for product selection

xEV electric powertrain system is crucial for the performance and safety of automotives. The key considerations in selection of a gate driver are as follows:



Ensure safety and reliability by AEC-Q100 qualified



Appropriate UVLO and drive current parameters for power devices



Isolated driver IC meeting safety certification requirements



Intelligent driver IC integrating multiple protections



Compliance with functional safety requirements per ISO 26262

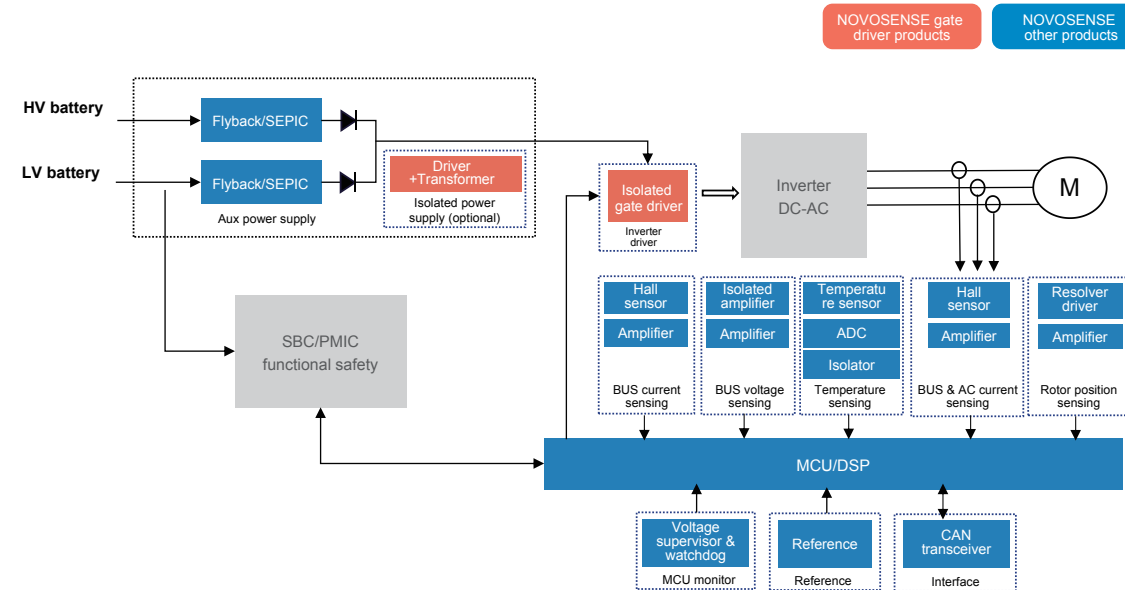
Typical Applications

Leveraging a deep understanding of application systems, NOVOSENSE gate driver IC products can provide comprehensive solutions and support for various applications.

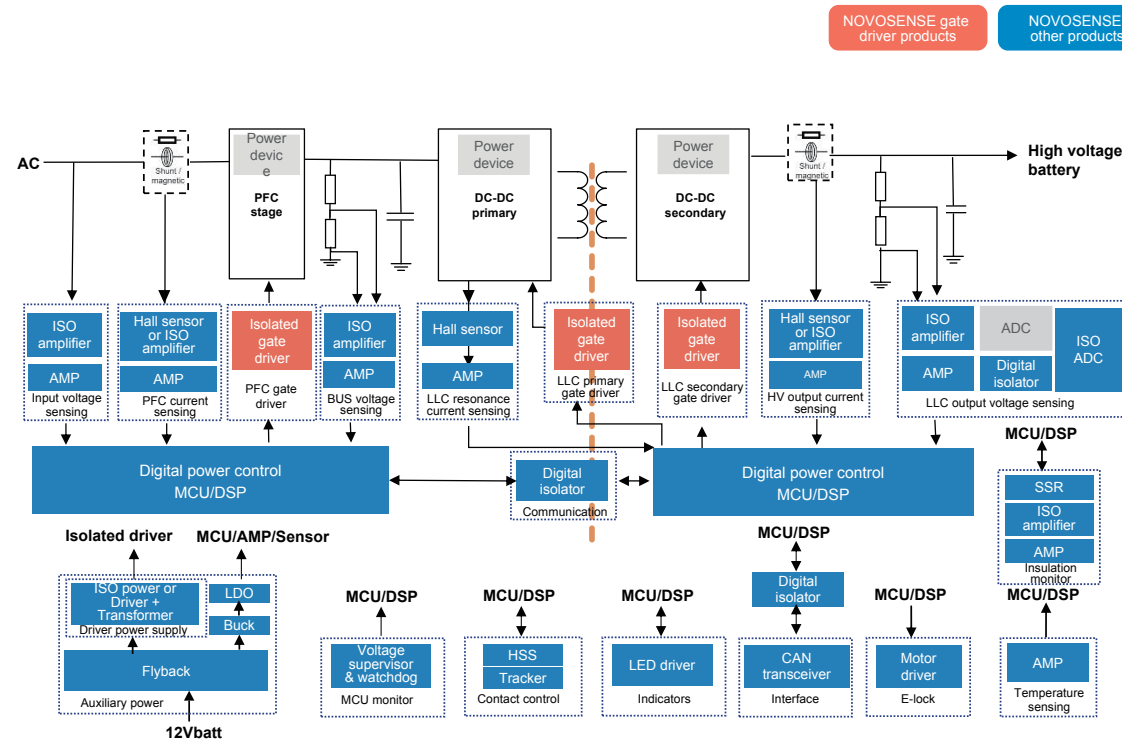


xEV automotive electric powertrain

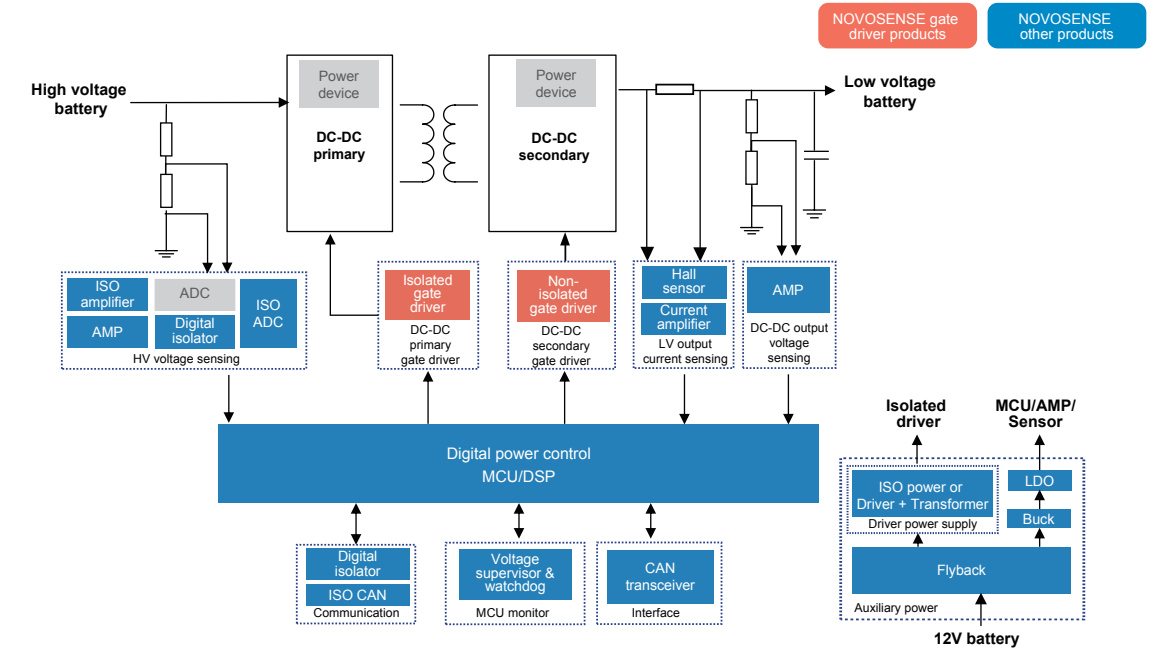
Traction Inverter



OBC



DC-DC Converter



Product recommendations

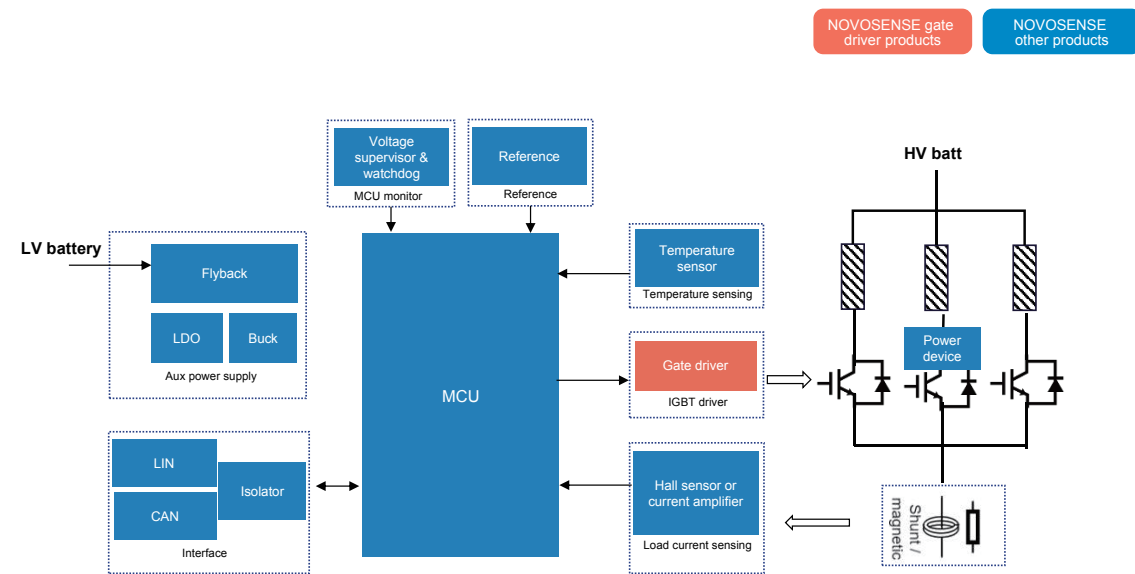
Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
Traction inverter	Functional safety driver	NSI6911-Q1	SSOW32	Single-channel isolated gate driver integrated with functional safety and multiple protective functions	Functional safety driver, supporting SiC/IGBT
	Smart isolated driver	NSI6611-Q1	SOW16	10A Single-channel isolated gate driver integrated with ASC and multiple protective functions	Non-functional safety driver, supporting SiC/IGBT
		NSI6651-Q1	SOW16	10A Single-channel isolated gate driver integrated with multiple protective functions	Non-functional safety driver, supporting SiC/IGBT
		NSI6770-Q1	SOW16	10A Single-channel isolated gate driver integrated with Isolated Analog Sensing and multiple protective functions	Non-functional safety driver, supporting SiC/IGBT
OBC/DC-DC	Low-side driver	NSD1026V-Q1	HSOP8/SOP8/HMSOP8	High-speed dual-channel low-side gate driver	Collaborate with transformer to provide power for the isolated driver
	Isolated single-channel driver	NSI6601-Q1	SOP8/SOW8	Single-channel isolated gate driver	OBC&DCDC primary-side driver, supporting SiC/IGBT/MOSFET
		NSI6601M-Q1	SOP8/SOW8	Single-channel isolated gate driver integrated with Miller Clamp	OBC&DCDC primary-side driver, supporting SiC/IGBT/MOSFET
		NSI68010-Q1	SOW6	Opto-compatible single-channel isolated gate driver	OBC&DCDC primary-side driver, supporting SiC/IGBT/MOSFET



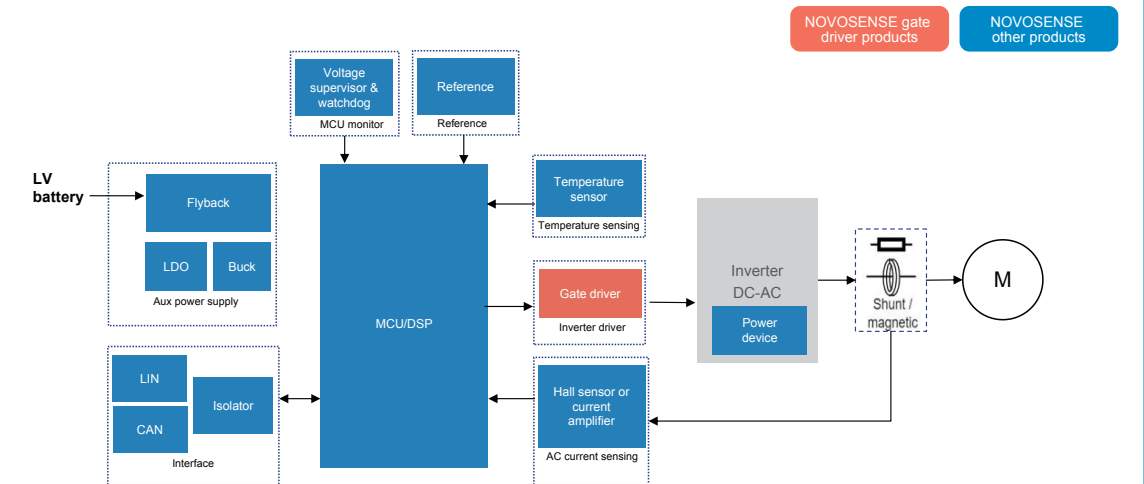
Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
OBC/DC-DC	Isolated half-bridge driver	NSI6602V-Q1	SOP16/SOW16/ SOP14/SOW14	High-performance dual-channel isolated gate driver	OBC&DC-DC primary-side driver, supporting SiC/IGBT/MOSFET
		NSI6622V-Q1	SOP16/SOW16/ SOP14/SOW14	Dual-channel isolated gate driver without dead time configuration	OBC&DC-DC primary-side driver, supporting SiC/IGBT/MOSFET
		NSI6602U-Q1	SOP16/SOW16/ SOP14/SOW14	Dual-channel isolated gate driver integrated with UVLO alarm	OBC&DC-DC primary-side driver, supporting SiC/IGBT/MOSFET
	Low-side driver	NSD1026V-Q1	HSOP8/SOP8/ HMSOP8	High-speed dual-channel low-side gate driver	DC-DC secondary-side synchronous rectification driver, collaborate with the transformer to provide power for the isolated driver

Automotive thermal management systems

PTC



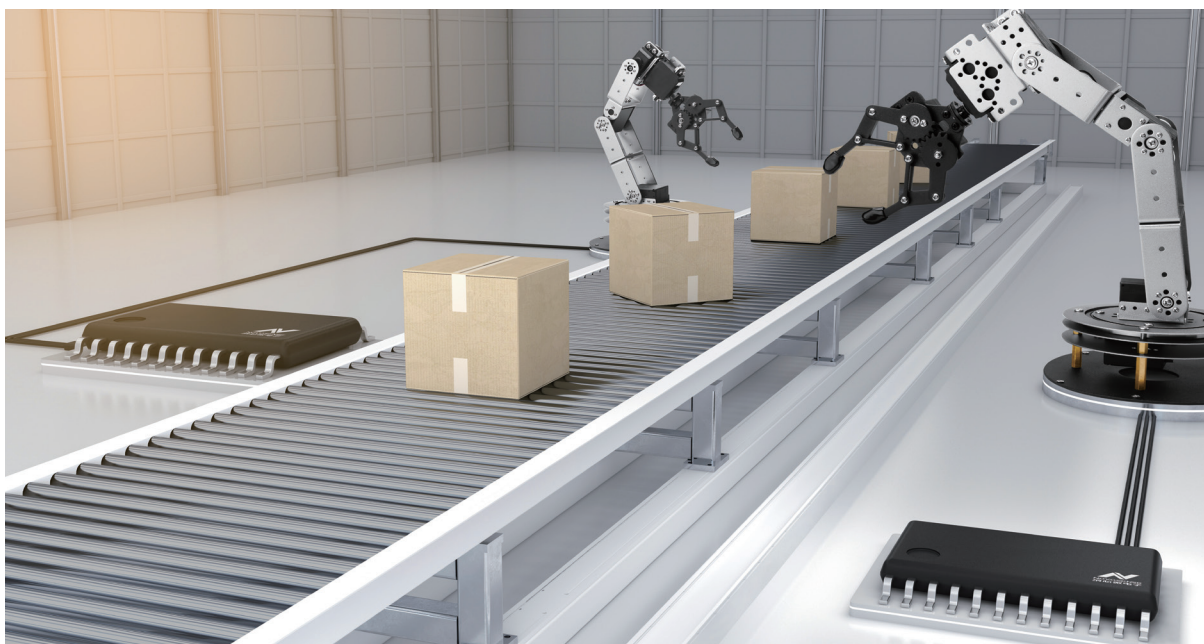
E-compressor



Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
PTC & E-compressor	Isolated single-channel driver	NSI6601-Q1	SOP8/SOW8	Single-channel isolated gate driver	Driver for PTC application, supporting SiC
		NSI6601M-Q1	SOP8/SOW8	Single-channel isolated gate driver integrated with Miller Clamp	Driver for PTC application, supporting SiC
	Isolated half-bridge driver	NSI6602V-Q1	SOP16/SOW16/ SOP14/SOW14	High-performance dual-channel isolated gate driver	Driver for E-Compressor, supporting SiC/IGBT
	>600V half-bridge driver	NSD1624-Q1	SOP8/ SOP14	Half-bridge gate driver supporting above +/-700V	Driver for E-Compressor, supporting SiC/IGBT
	Low-side driver	NSD10151-Q1	SOT23-6	High-speed single-channel low-side gate driver	Driver for PTC application, supporting SiC/IGBT
		NSD1015MT-Q1	SOP8	Single-channel low-side gate driver integrated with DESAT protection	Driver for PTC application, supporting SiC/IGBT
		NSD1026V-Q1	HSOP8/SOP8/ HMSOP8	High-speed dual-channel low-side gate driver	Driver for PTC application, supporting SiC/IGBT

Industrial automation



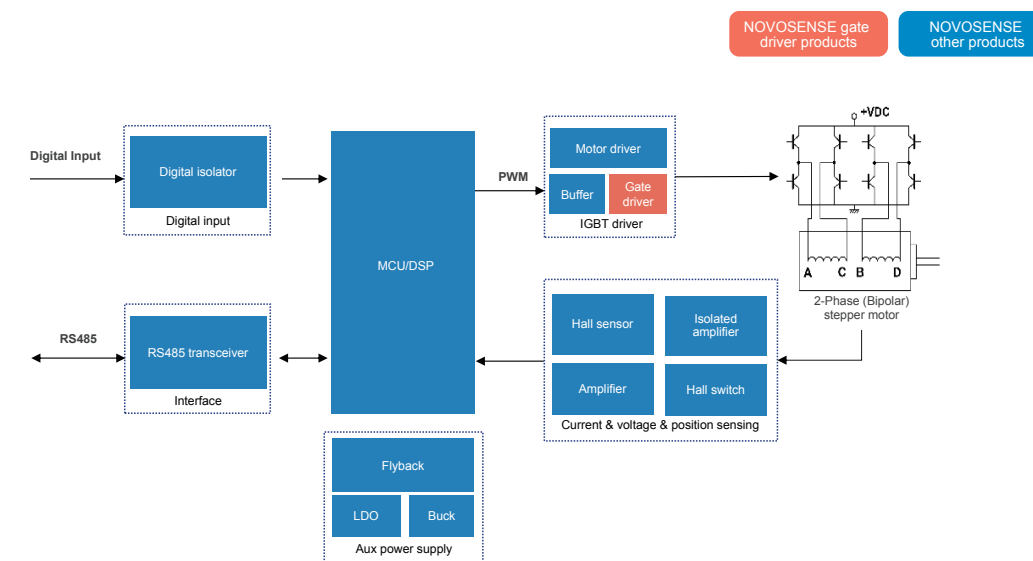
NOVOSENSE gate drivers are extensively used in industrial automation applications, such as industrial drives, stepper motor controllers, servo drives, and battery formation and capacity grading. The products equipped with NOVOSENSE gate driver ICs have achieved stable mass production in many leading customers in the industrial automation industry, and their reliability and stability have been well proved by the market and customers.

Key considerations for product selection

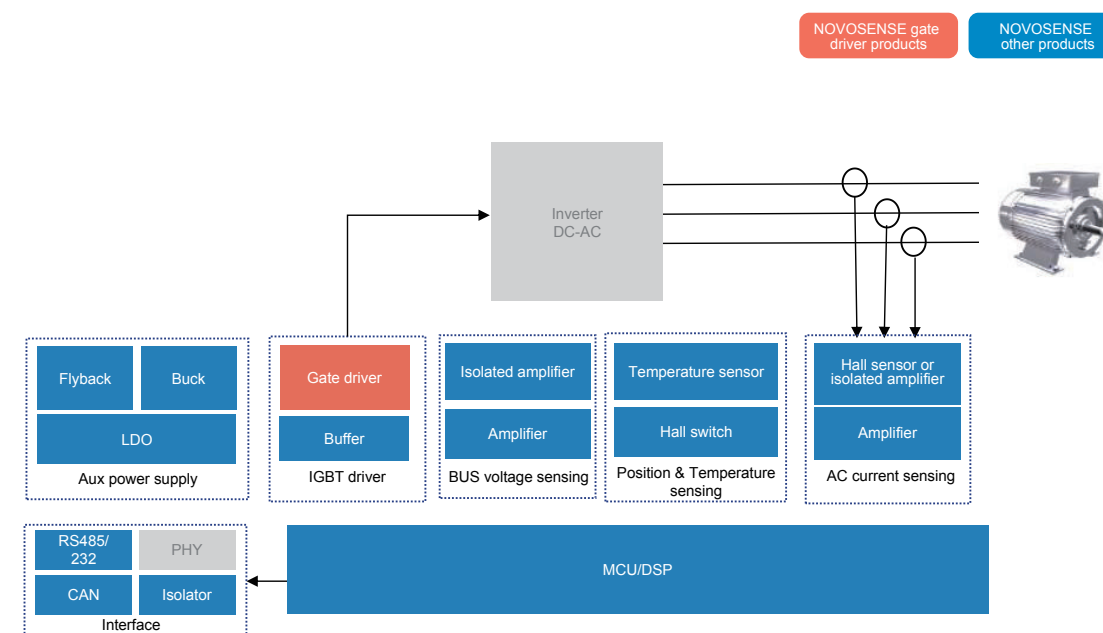
In the application scenario of industrial automation, it usually has the harsh electromagnetic compatibility (EMC) and high voltage conditions. To find the best fit gate driver, special considerations need to be taken into account:

- 1 Is it compatible with opto-coupler drivers?
- 2 Does it meet the requirements of safety standards?

- Stepper motor driver

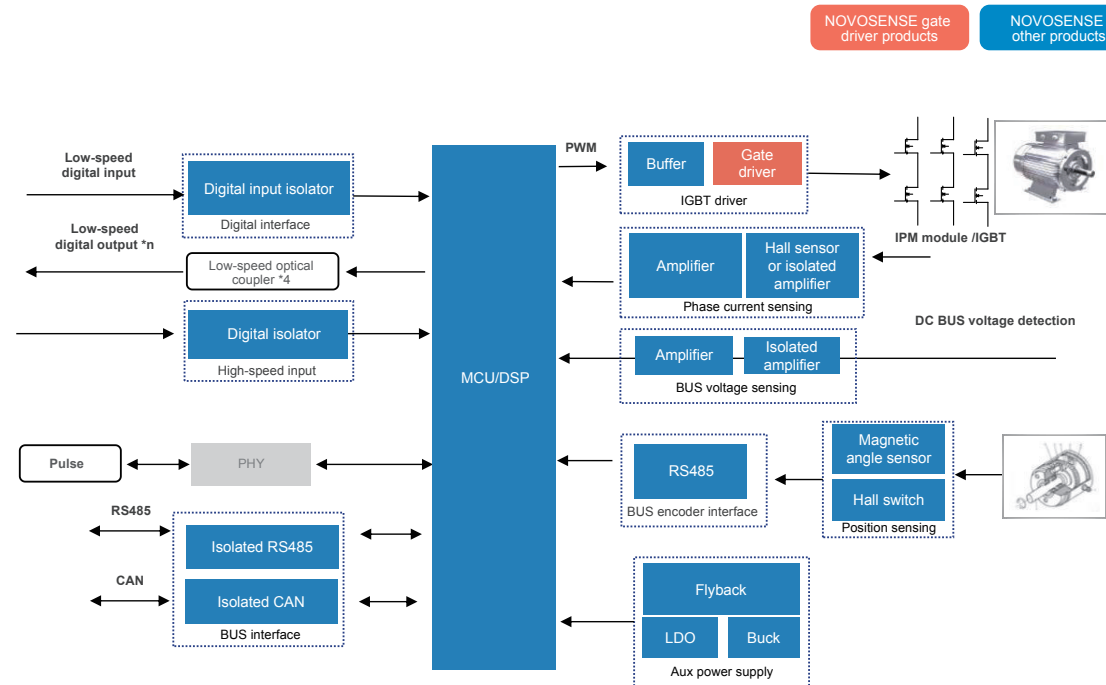


- Industrial frequency converter

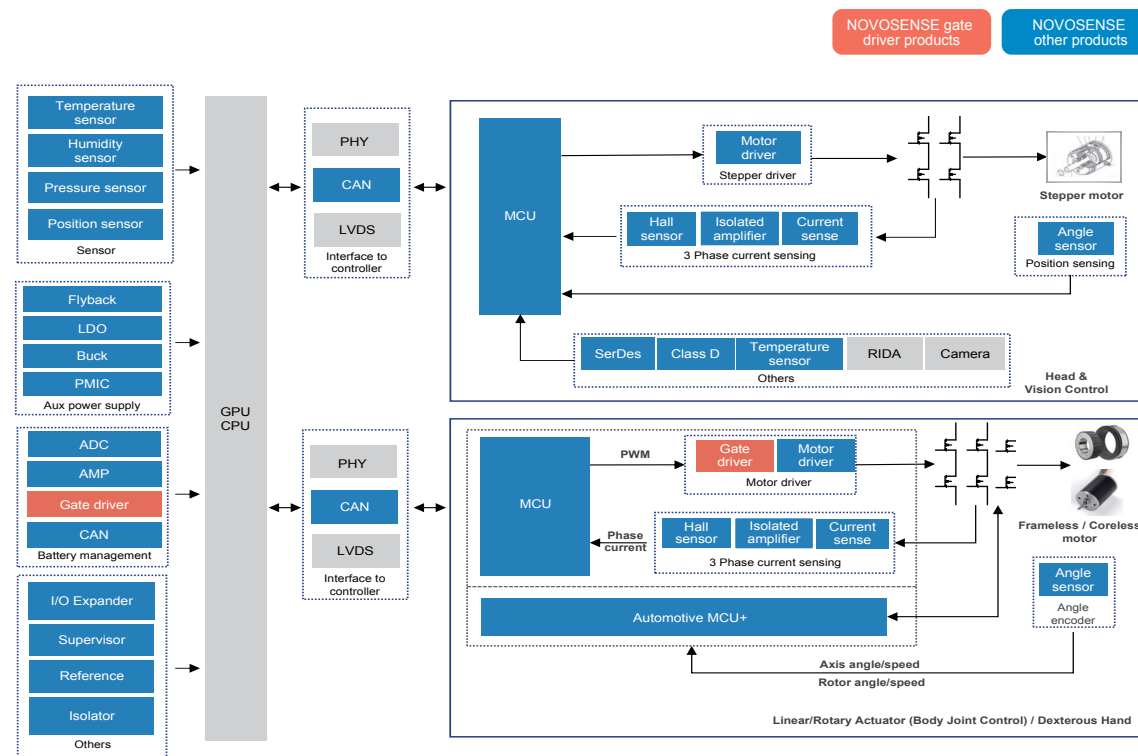




Servo driver



Humanoid Robot



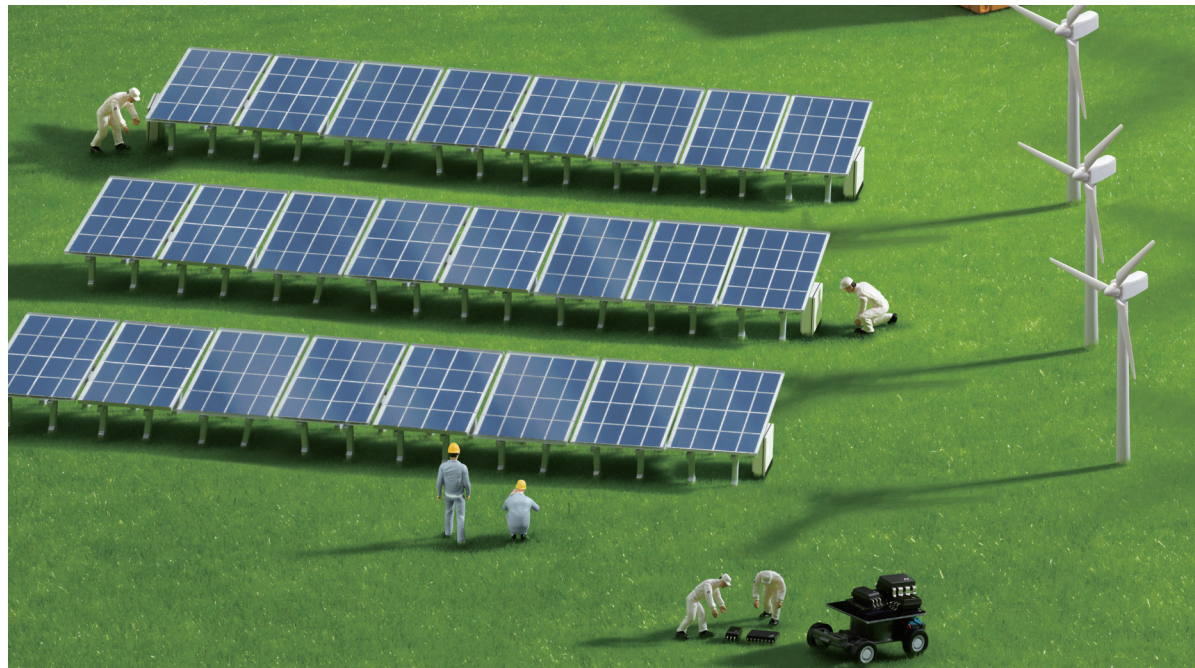
Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
Stepper motor driver & industrial frequency converter & servo driver & humanoid robot	Isolated single-channel driver	NSI6801E	SOW6/DUB8/SOL6/SOWW8	5A single-channel opto-compatible isolated gate driver	Motor driver
		NSI68010/1	SOW6	1A/2A single-channel opto-compatible isolated gate driver	Motor driver
		NSI6801M	SOP8/SOW8	5A single-channel opto-compatible isolated gate driver integrated with Miller Clamp	Motor driver, especially suitable for applications with high interference
	Smart isolated driver	NSI68515	SOW16	5A single-channel opto-compatible isolated gate driver integrated with multiple protection	Motor driver, especially suitable for upper gate drivers in high-power motors
	Low-side driver	NSD1015MT	SOP8	Single-channel low-side gate driver integrated with DESAT protection	Motor drive in non-isolated (hot-ground) systems, especially suitable for high-power motor driver
GaN half-bridge driver		NSD2621	QFN15	Half-bridge GaN gate driver supporting +/-700V and above	High-voltage LLC-stage GaN driver
		NSD2622N	QFN 5*7	Half-bridge GaN gate driver supporting +/-700V and above and integrated with negative voltage output	High-voltage LLC-stage GaN driver





Renewable energy and power supply



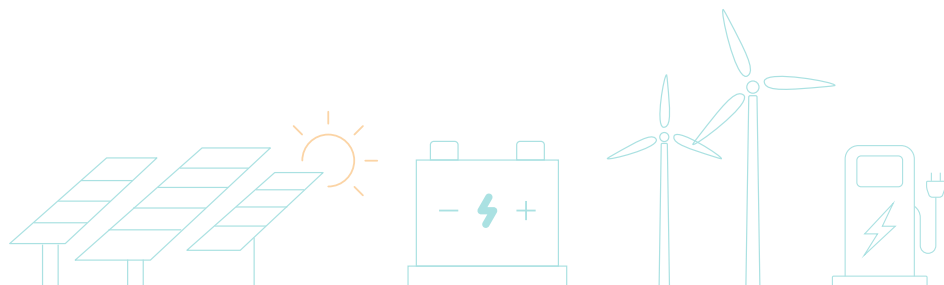
Power intensity and reliability represent consistent pursuits in the energy and power applications. NOVOSENSE can provide highly reliable gate driver solutions that provide enhanced interference immunity and protective functions to ensure system safety and stability.

Key considerations for product selection

- Isolated drivers meeting safety certification requirements:**
Meeting electrical isolation requirements and enhanced interference immunity

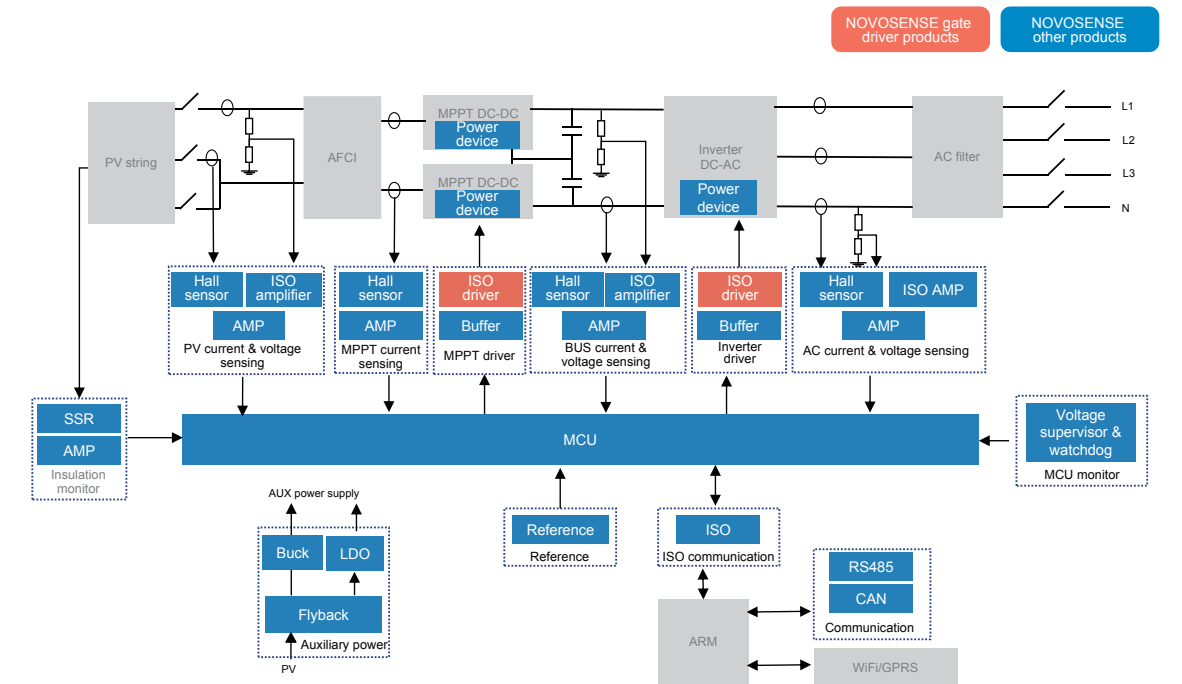
- Appropriate UVLO and drive current parameters:**
Suitable for characteristic parameters of power devices

- Package selection ensuring right creepage distance**

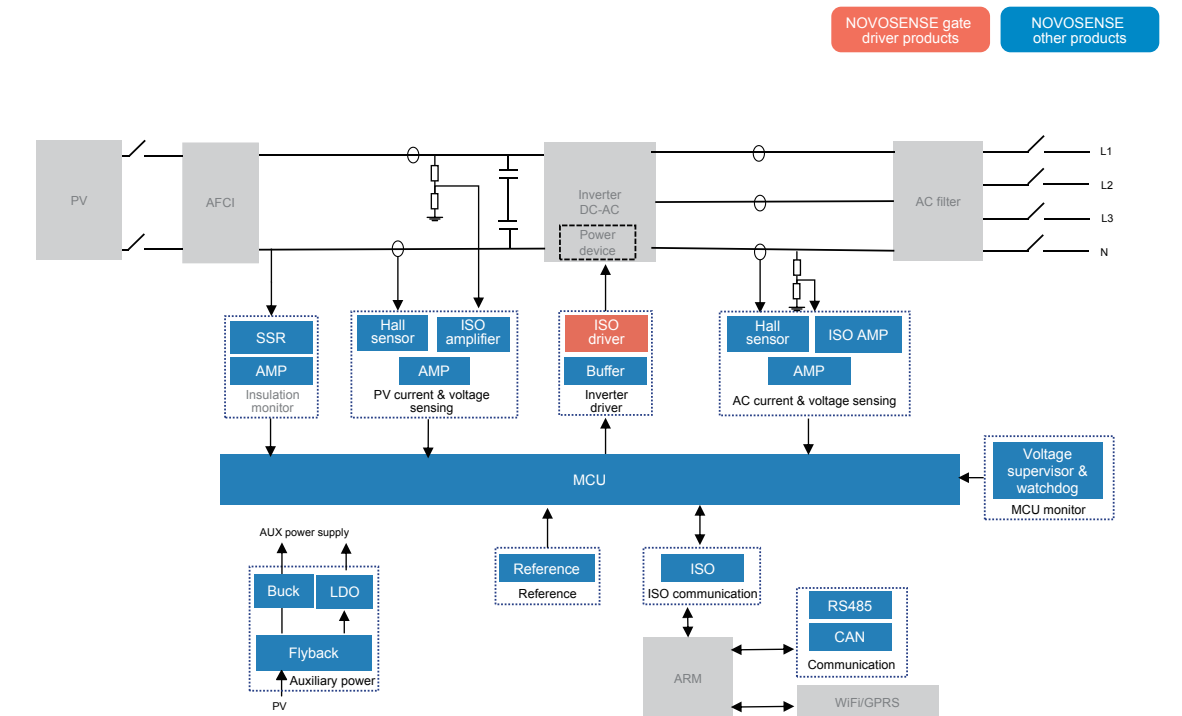


PV, energy storage and charging applications

String inverter



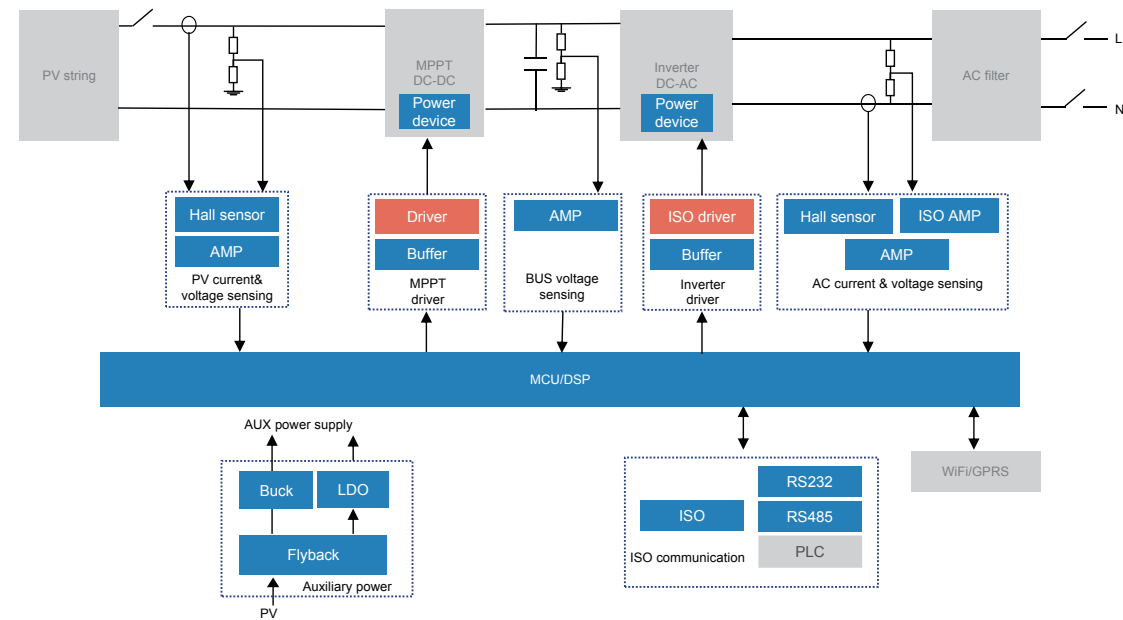
Centralized PV Inverter





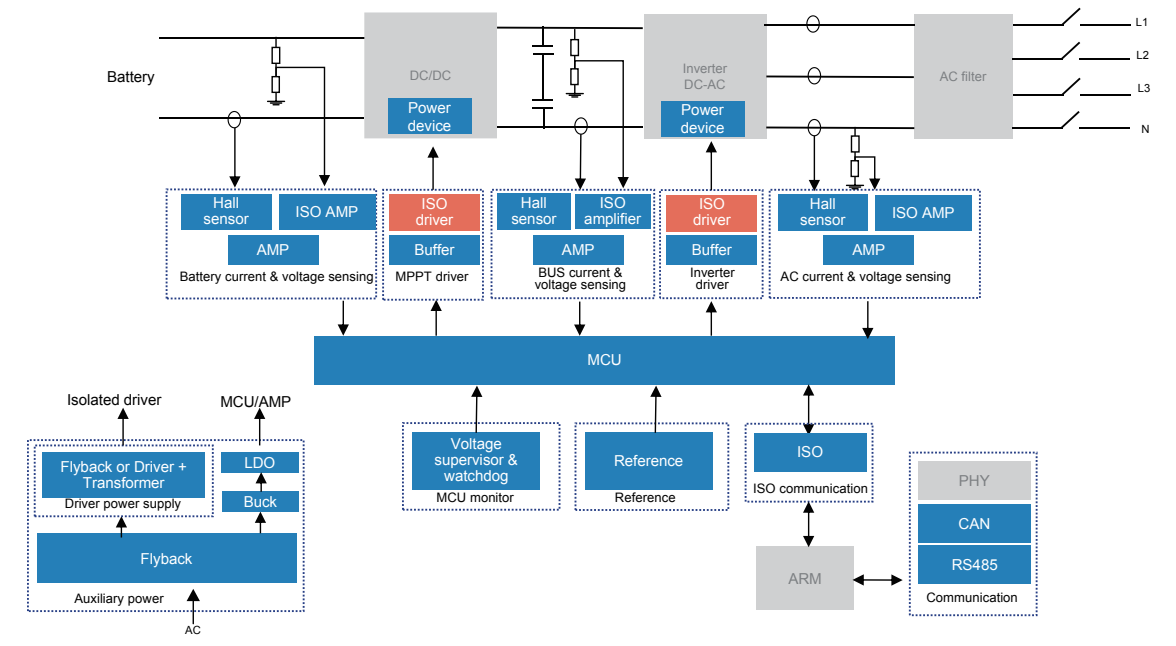
Micro inverter

NOVOSENSE gate driver products
NOVOSENSE other products



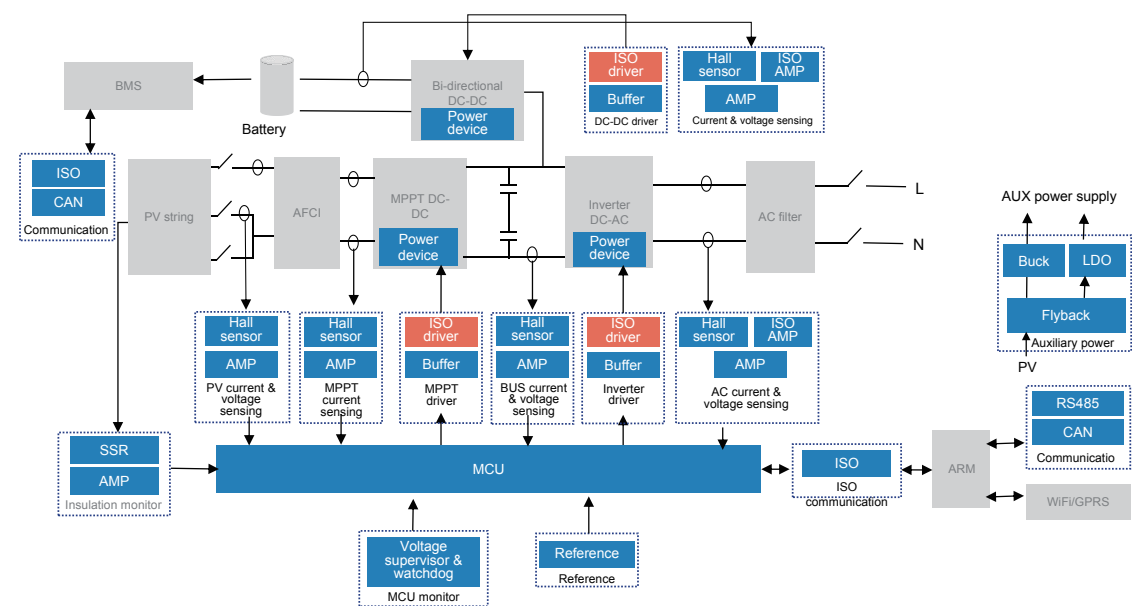
PCS

NOVOSENSE gate driver products
NOVOSENSE other products



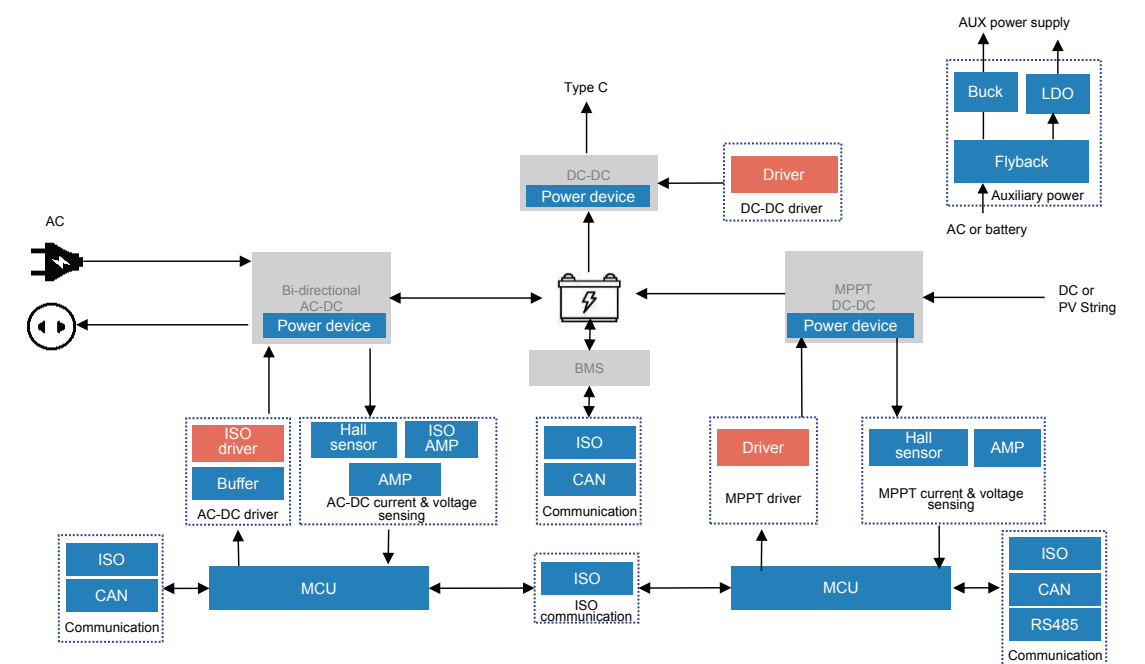
Residential storage inverter

NOVOSENSE gate driver products
NOVOSENSE other products



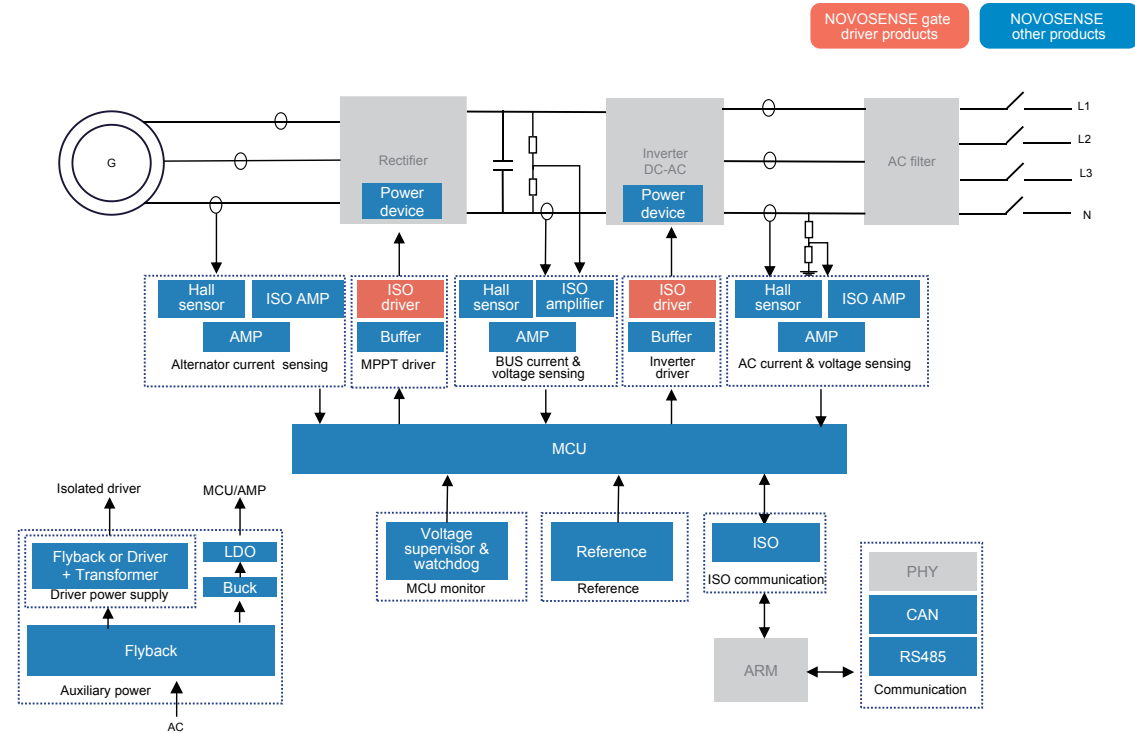
Portable Power Station

NOVOSENSE gate driver products
NOVOSENSE other products

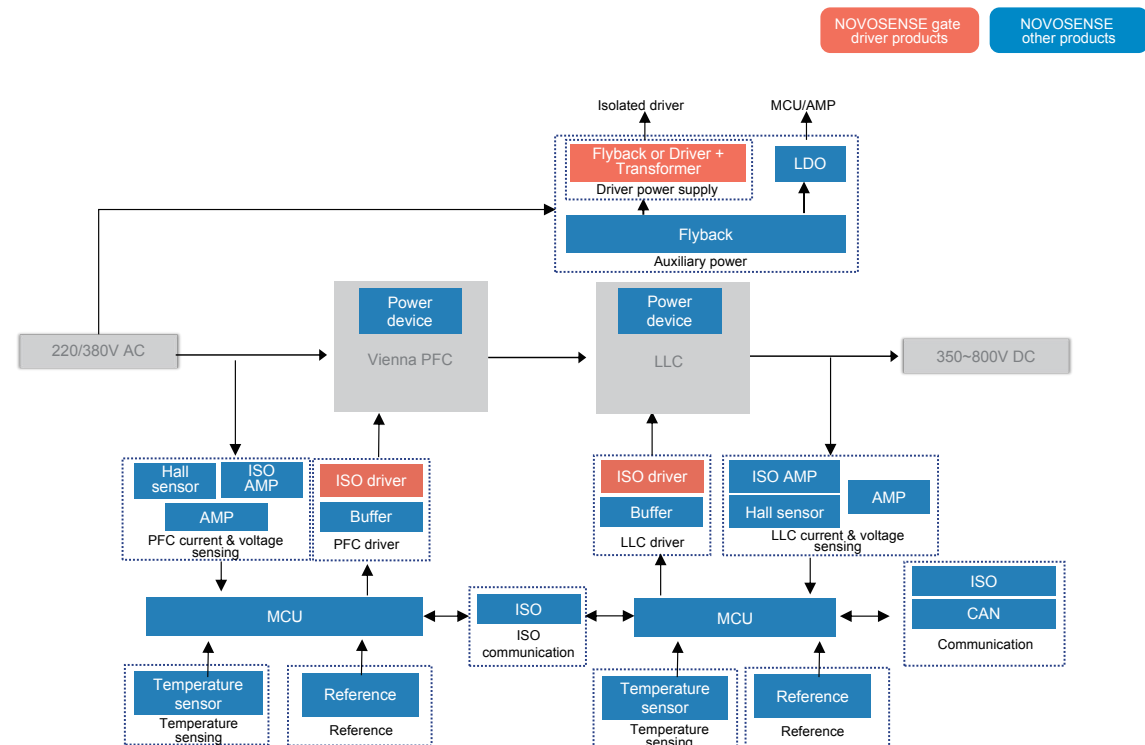




Wind Power Converter



Power Module



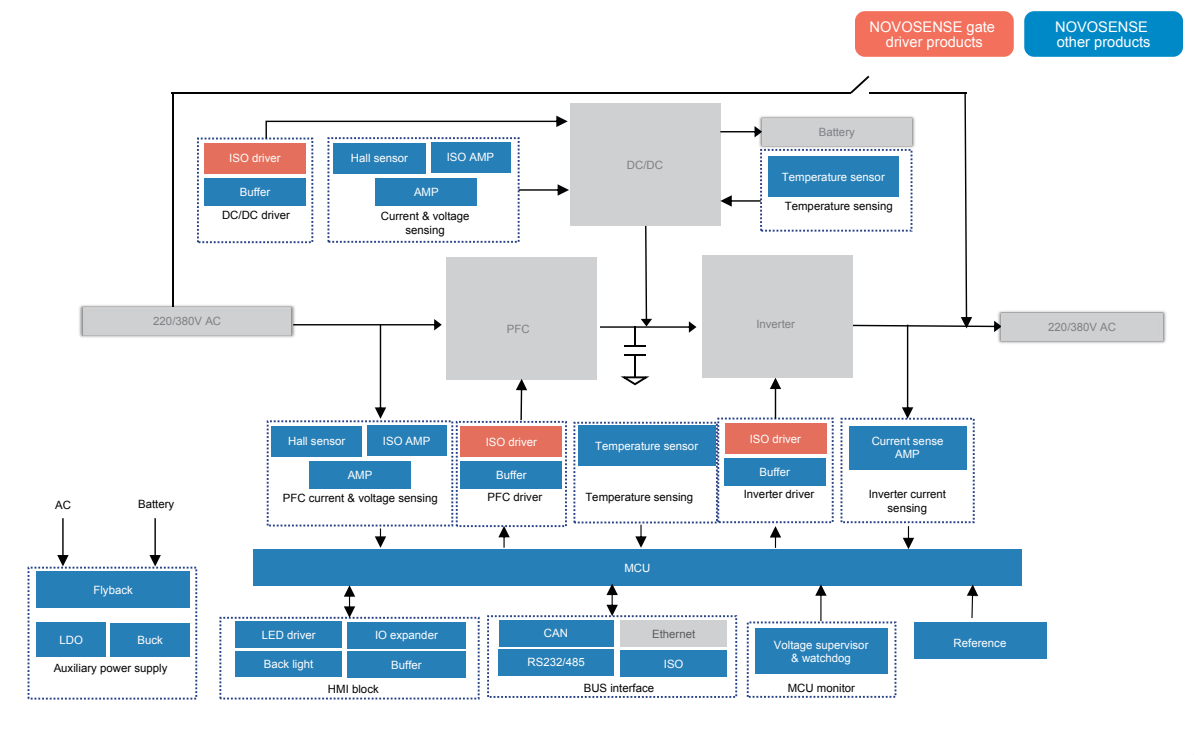
Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
String inverter & centralized PV inverter & micro inverter & residential storage inverter & PCS & portable power station & wind power converter & power module	Isolated single-channel driver	NSI6601	SOP8/SOW8	5A Single-channel isolated gate driver	MOSFET/IGBT/SiC driver
		NSI6801E	SOW6/DUB8/SOWW8/SOL6	5A single-channel opto-compatible isolated gate driver	MOSFET/IGBT/SiC driver
		NSI6601M	SOP8/SOW8	Single-channel isolated gate driver integrated with Miller Clamp	MOSFET/IGBT/SiC driver, especially suitable for applications with high interference
		NSI6801M	SOP8/SOW8	5A single-channel opto-compatible isolated gate driver integrated with Miller Clamp function	MOSFET/IGBT/SiC driver, especially suitable for applications with high interference
	Smart isolated driver	NSI6611	SOW16	10A Single-channel isolated gate driver integrated with ASC and multiple protective functions	MOSFET/IGBT/SiC driver, especially suitable for high-power applications
		NSI6651	SOW16	10A Single-channel isolated gate driver integrated with multiple protective functions	MOSFET/IGBT/SiC driver, especially suitable for high-power applications
		NSI6770	SOW16	10A Single-channel isolated gate driver integrated with Isolated Analog Sensing and multiple protective functions	MOSFET/IGBT/SiC driver, especially suitable for high-power applications
		NSI68515	SOW16	5A single-channel opto-compatible isolated gate driver integrated with multiple protective functions	MOSFET/IGBT/SiC driver, especially suitable for high-power applications
	Isolated half-bridge driver	NSI6602V	SOP16/SOW16/SOP14/SOW14	High-performance dual-channel isolated gate driver	Bidirectional DC-DC converter driver for energy storage, supporting MOSFET/IGBT/SiC
	<200V half-bridge driver	NSD1224	DFN10/SOP8/HSOP8/DFN8	Half-bridge gate driver supporting 100V and above	MOSFET driver for micro inverter
GaN half-bridge driver		NSD2621	QFN15	Half-bridge GaN gate driver supporting +/-700V and above	GaN driver for micro inverter and household energy storage inverter
		NSD2622N	QFN 5*7	Half-bridge GaN gate driver supporting +/-700V and above and integrated with negative voltage output	GaN driver for micro inverter and household energy storage inverter
Low-side driver		NSD1026V	SOP8/HMSOP8/DFN8	High-speed dual-channel low-side gate driver	Driver used in EV-charger

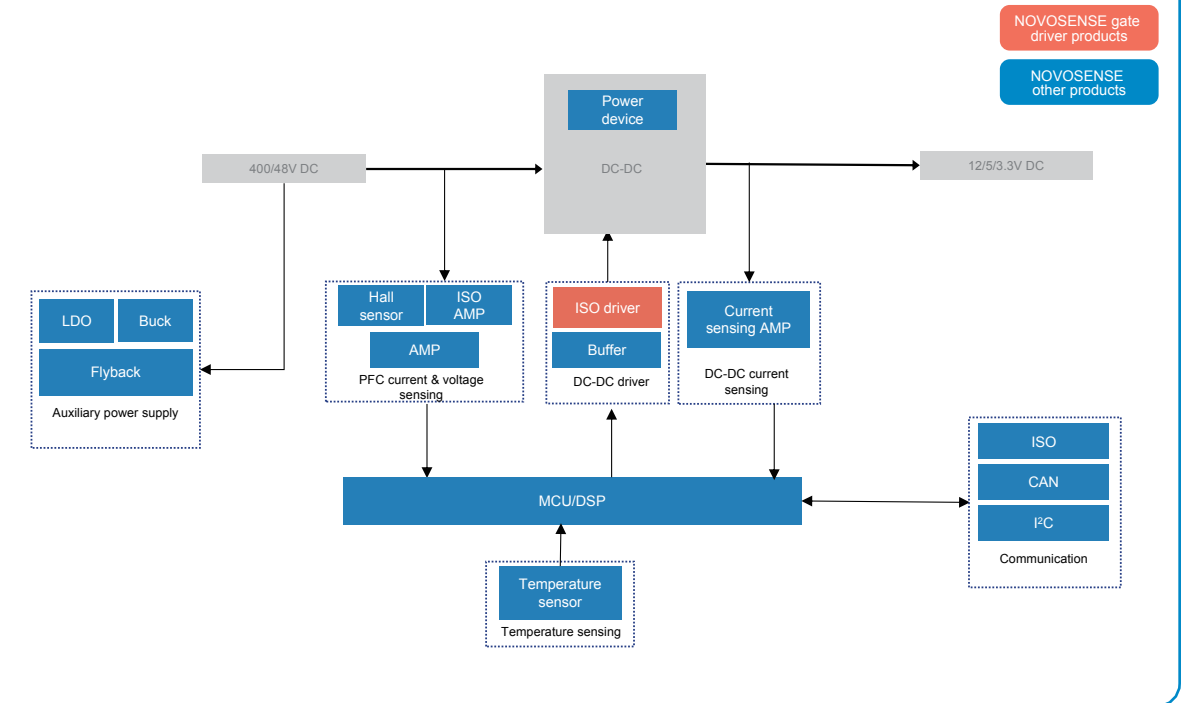


Power supply

UPS

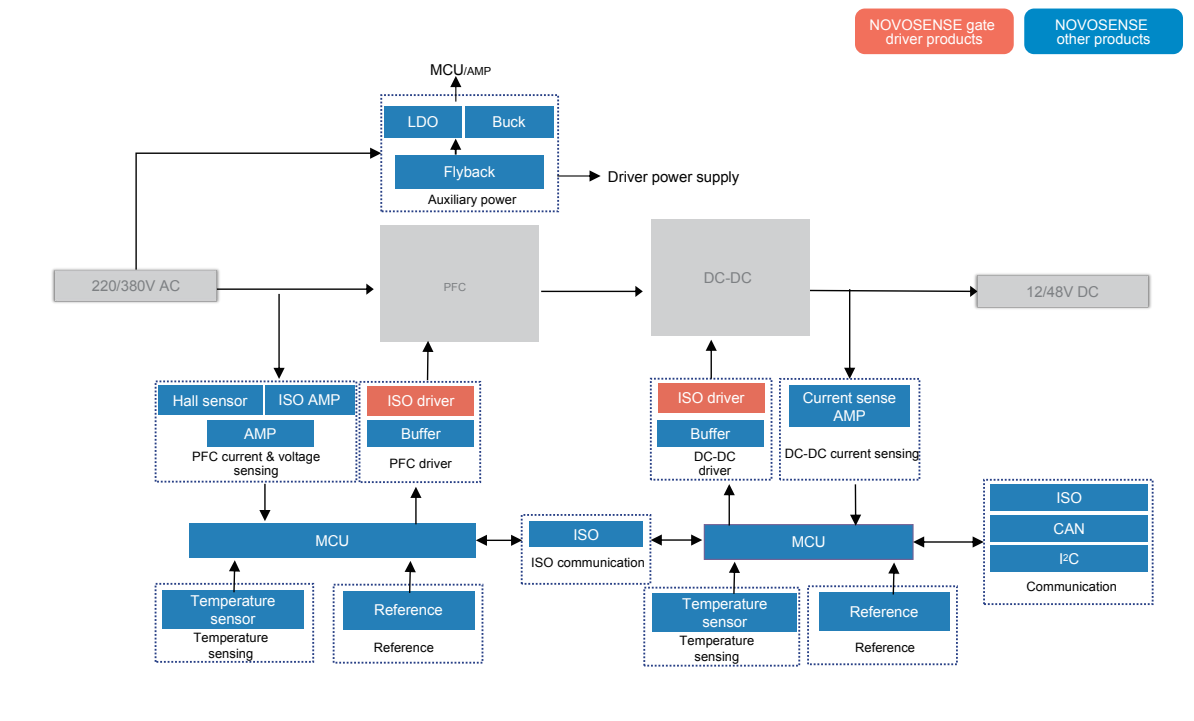


DC-DC Power Supply (Industrial Power Supply, Power Module)



Product recommendations

AC-DC Power Supply (Communication & Server Power Supply)



Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
UPS	Isolated single-channel driver	NSI6601	SOP8/SOW8	Single-channel isolated gate driver	MOSFET/IGBT/SiC driver
		NSI6601M	SOP8/SOW8	Single-channel isolated gate driver integrated with Miller Clamp	MOSFET/IGBT/SiC driver, especially suitable for applications with high interference
		NSI6801M	SOP8/SOW8	5A single-channel opto-compatible isolated gate driver integrated with Miller Clamp	IGBT driver, especially suitable for applications with high interference
		NSI6801E	SOW6/DUB8/SOL6/SOWW8	5A single-channel opto-compatible isolated gate driver	MOSFET/IGBT/SiC driver
	Isolated half-bridge driver	NSI6602V	SOP16/SOW16/SOP14/SOW14	High-performance dual-channel isolated gate driver	Driver suitable for mobile energy storage



Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
UPS	>600V half-bridge driver	NSD1624	LGA10/SOP8/SOP14	Half-bridge gate driver supporting +/-700V and above	Driver suitable for mobile energy storage
	<200V half-bridge driver	NSD1224	DFN10/SOP8/HSOP8/DFN8	Half-bridge gate driver supporting 100V and above	MOSFET driver for low-voltage Buck circuit
	GaN half-bridge driver	NSD2621	QFN15	Half-bridge GaN gate driver supporting +/-700V and above	GaN driver suitable for PFC totem-pole
		NSD2622N	QFN 5*7	Half-bridge GaN gate driver supporting +/-700V and above and integrated with negative voltage output	GaN driver suitable for PFC totem-pole
	Low-side driver	NSD1026V	SOP8/HMSOP8/DFN8	High-speed dual-channel low-side gate driver	MOSFET driver suitable for PFC BOOST circuit
AC-DC power supply & DC-DC power supply	Isolated single-channel driver	NSI6601	SOP8/SOW8	Single-channel isolated gate driver	Upper tube driver for totem-pole PFC, supporting MOSFET/IGBT/SiC
	Isolated half-bridge driver	NSI6602V	SOP16/SOW16/SOP14/SOW14	High-performance dual-channel isolated gate driver	Full-bridge driver suitable for totem-pole PFC, LLC and DC-DC, supporting MOSFET/GaN/IGBT/SiC
	>600V half-bridge driver	NSD1624	LGA10/SOP8/SOP14	Half-bridge gate driver supporting +/-700V and above	Driver suitable for totem-pole PFC, supporting MOSFET/IGBT/SiC
	GaN half-bridge driver	NSD2621	QFN15	Half-bridge GaN gate driver supporting +/-700V and above	Half-bridge GaN driver suitable for totem-pole PFC, LLC and DC-DC
		NSD2622N	QFN 5*7	Half-bridge GaN gate driver supporting +/-700V and above and integrated with negative voltage output	Half-bridge GaN driver suitable for totem-pole PFC, LLC and DC-DC
	<200V half-bridge driver	NSD1224	DFN10/SOP8/HSOP8	Half-bridge gate driver supporting 100V and above	Driver suitable for bridge rectifier
	Low-side driver	NSD1026V	SOP8/HMSOP8/DFN8	High-speed dual-channel low-side gate driver	Driver suitable for synchronous rectification



White goods and consumer electronics



NOVOSENSE gate driver IC products are extensively used in indoor and outdoor air conditioner units, washing machines, and food delivery robots, covering many different application scenarios.

Key considerations for product selection

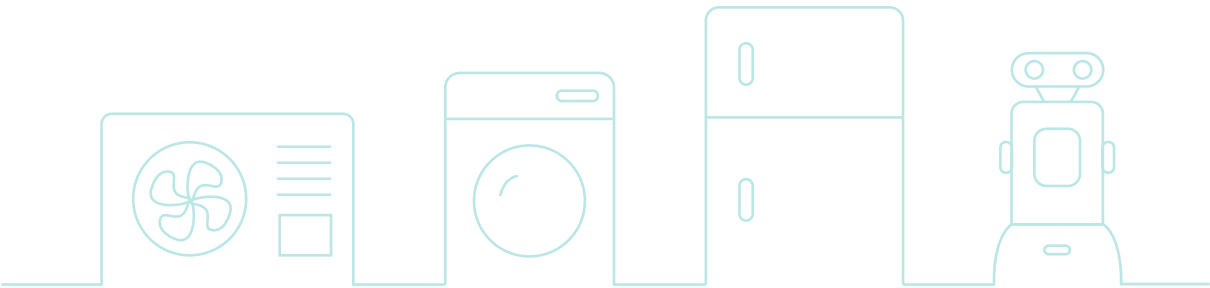


Isolated driver IC meeting safety certification requirements:

Meeting electrical isolation requirements and enhanced interference immunity

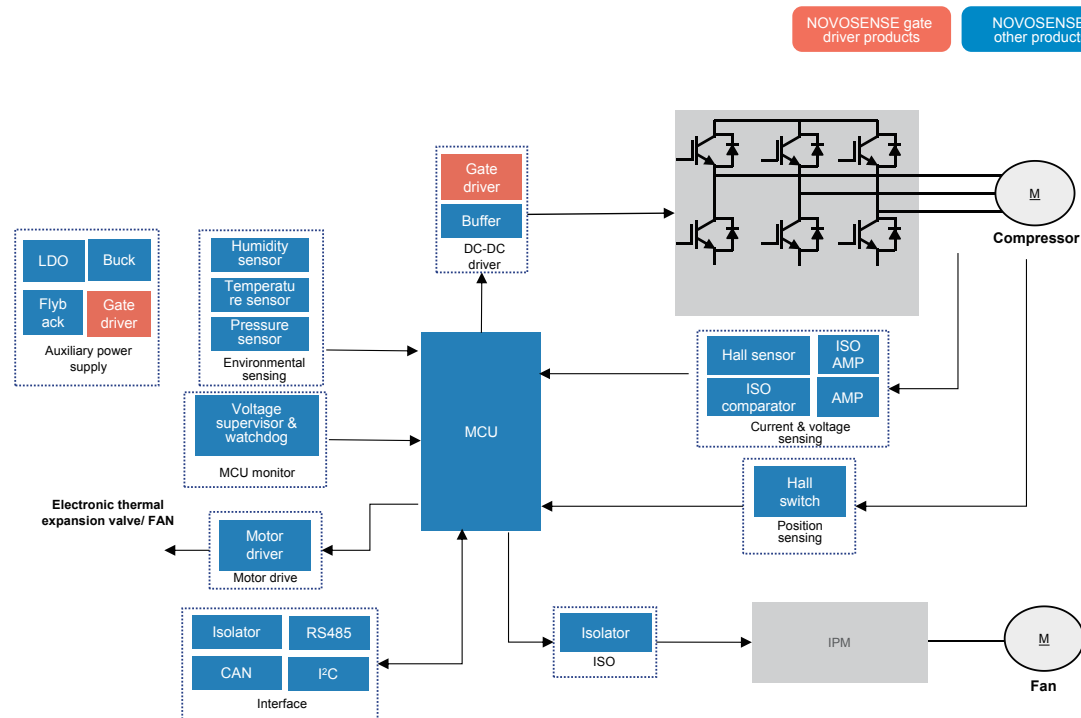


Suitable Package

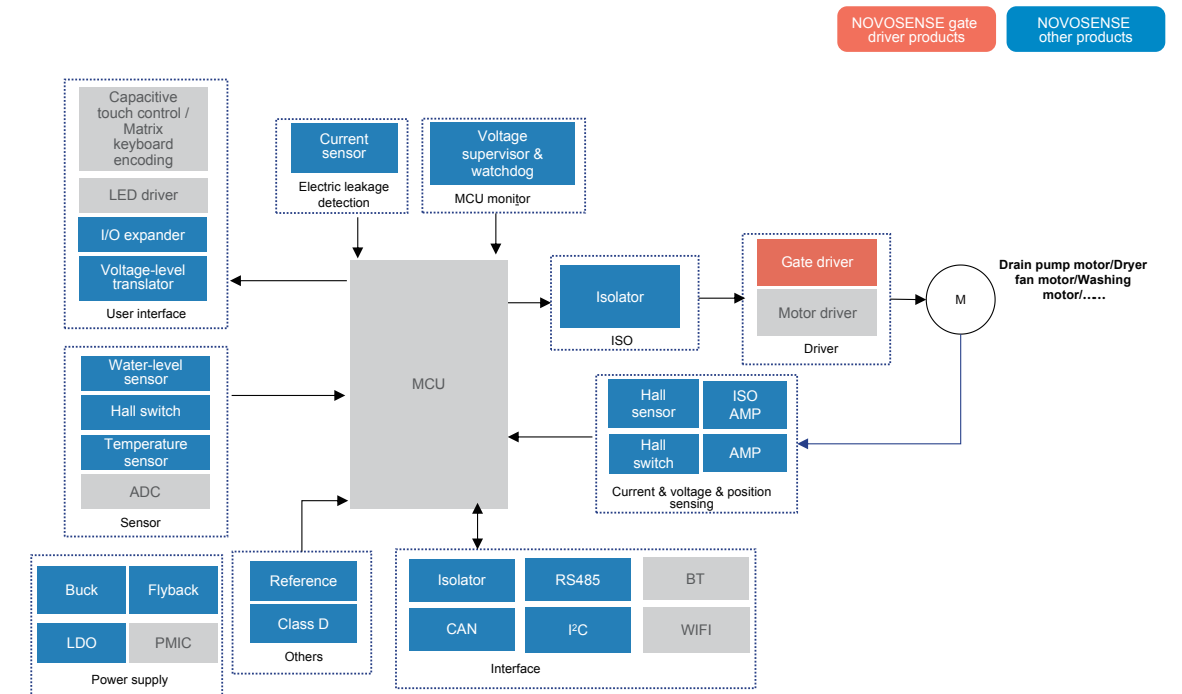




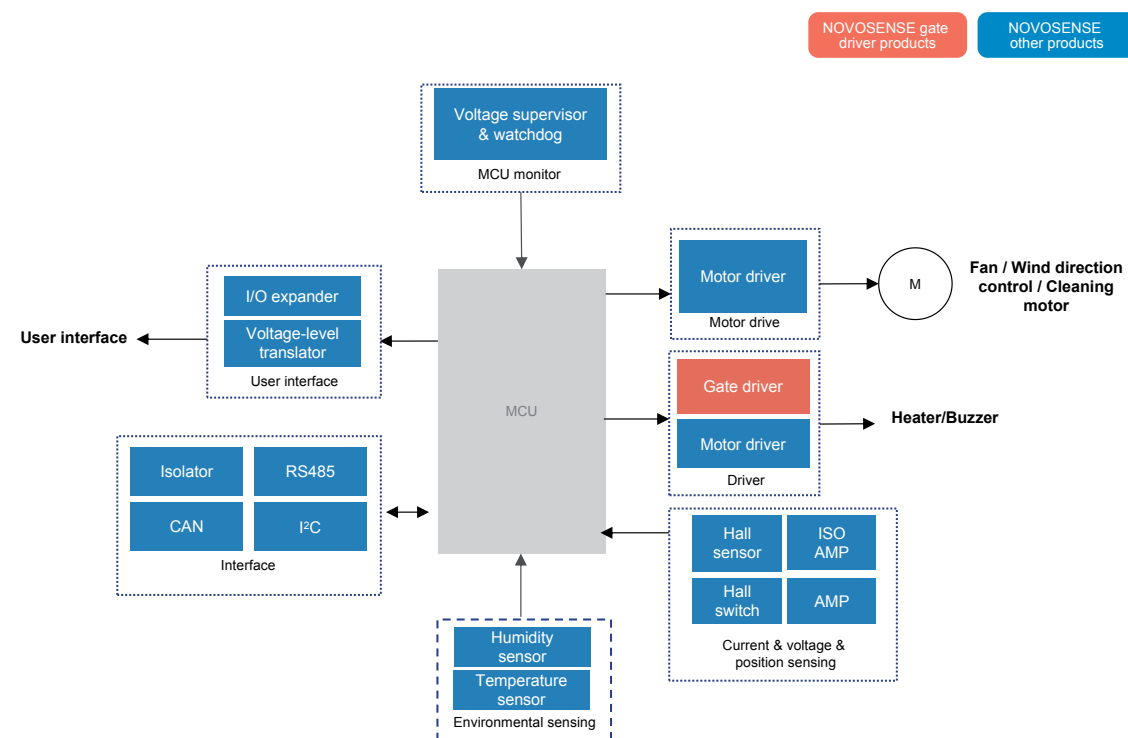
Air conditioning outdoor unit



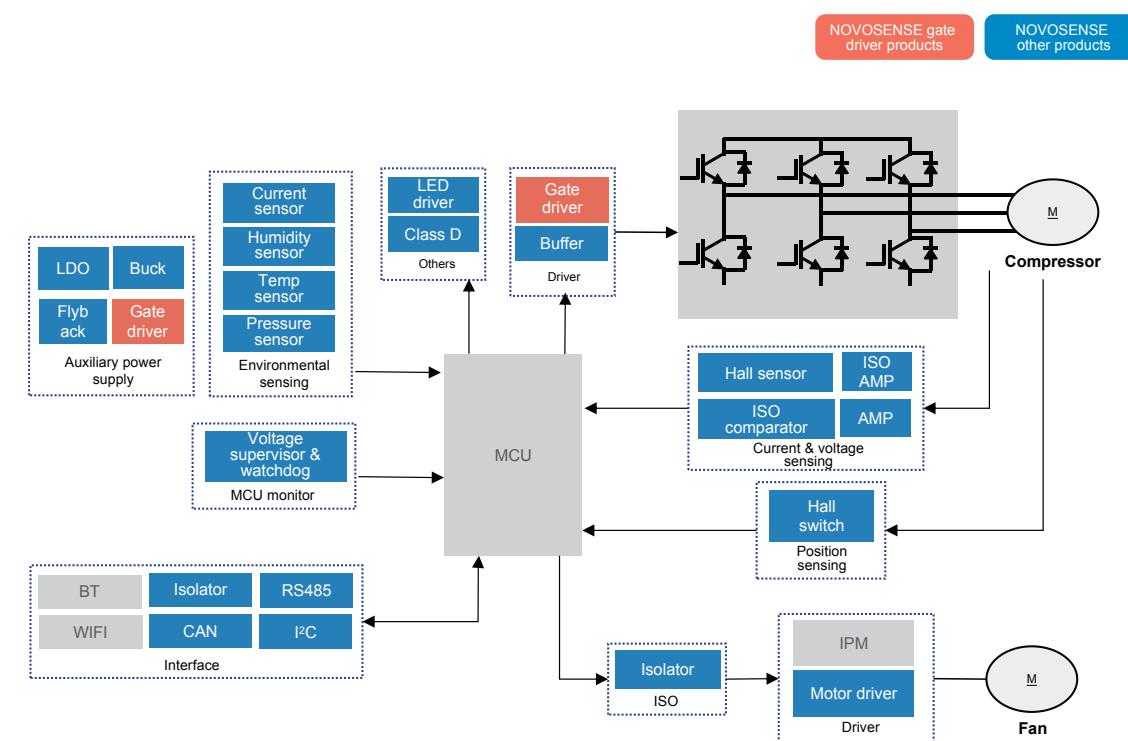
Washing machine



Air conditioning indoor unit

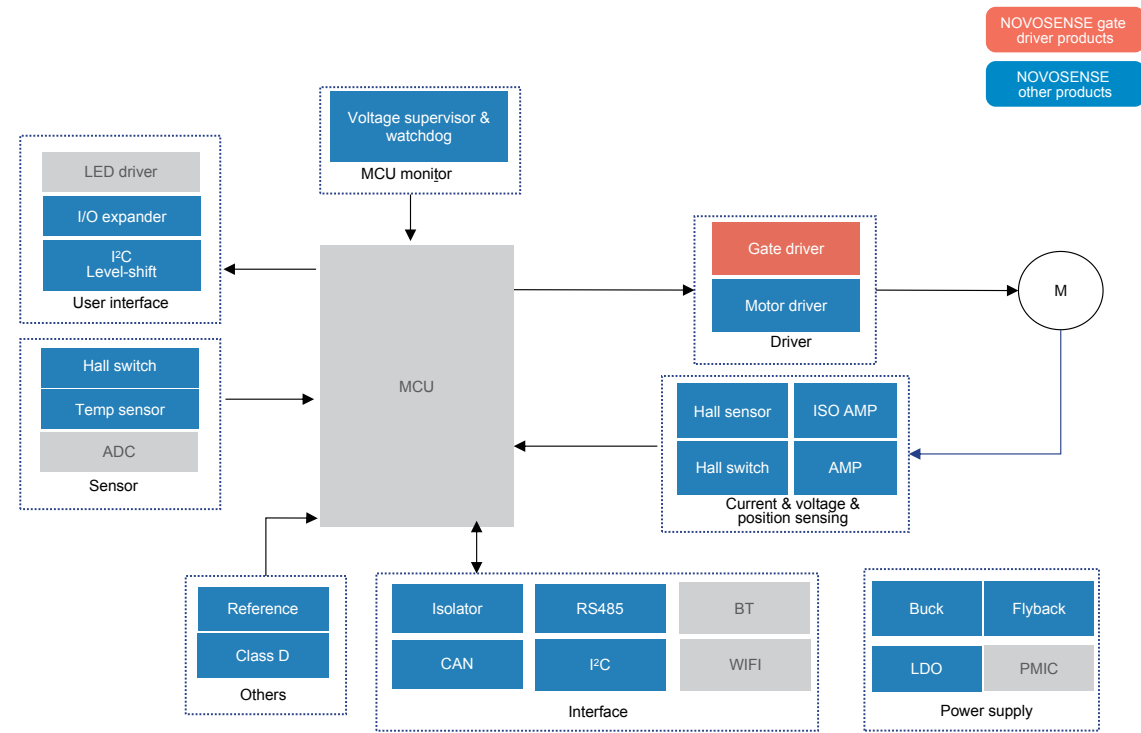


Refrigerator





Power Tools / Gardening Tools



Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
Air conditioning outdoor unit & air conditioning indoor unit & washing machine & refrigerator & power tools / gardening tools	Isolated single-channel driver	NSI6601	SOP8/SOW8	Single-channel isolated gate driver	Motor driver
		NSI6801E	SOW6/DUB8/SOL6	5A single-channel opto-compatible isolated gate driver	Motor driver
		NSI6601M	SOP8/SOW8	Single-channel isolated gate driver integrated with Miller Clamp	Motor driver, especially suitable for applications with high interference
		NSI6801M	SOP8/SOW8	5A single-channel opto-compatible isolated gate driver integrated with Miller Clamp	Motor driver, especially suitable for applications with high interference



Product recommendations

Application	Recommended product category	Part number of recommended product	Recommended package	Product description	Application description
Air conditioning outdoor unit & air conditioning indoor unit & washing machine & refrigerator & power tools / gardening tools	Smart isolated driver	NSI6611	SOW16	10A Single-channel isolated gate driver integrated with ASC and multiple protective functions	Motor driver, especially suitable for high-power applications
		NSI6651	SOW16	10A Single-channel isolated gate driver integrated with multiple protective functions	Motor driver, especially suitable for high-power applications
		NSI6770	SOW16	10A Single-channel isolated gate driver integrated with Isolated Analog Sensing and multiple protective functions	Motor driver, especially suitable for high-power applications
		NSI68515	SOW16	5A single-channel opto-compatible isolated gate driver integrated with multiple protective functions	Motor driver, especially suitable for high-power applications
	>600V half-bridge driver	NSD1624	LGA10/SOP8/SOP14	Half-bridge gate driver supporting +/-700V and above	Motor driver
	Low-side driver	NSD1015T	SOP8	Single-channel low-side gate driver integrated with DESAT protective function	Lower tube driver for motor, especially suitable for high-power applications
		NSD1026V	SOP8/HSOP8/DFN8	High-speed dual-channel low-side gate drive	Lower tube driver for motor

Overview of NOVOSENSE Gate Driver IC Products

Name Code for gate driver IC products

Isolated gate driver

66: Voltage Input
68: Current Input
69: Functional Safety

Current Output
Fault: +4A/-6A
0: <1A
1: 1A
2: 2A
5: 5A
6: 6A/8A
A: 10A

Special features
M: Miller clamp
N: EN
V: VCCI 24V max
U: With UVLO alarm function

N S I 66 0 1 XX A - D xxx

NOVOSENSE

Isolated

Input pin configuration

0: INA/INB input, with DT pin function
2: INA/INB input, without DT pin function
4: Single input (PWM)
1: ASC + DESAT
3: ASC + OCP
5: DESAT (PIN1 is VEE2)

1: Single Channel
2: Dual Channel

Qualification
Q1: Automotive
D: Industrial

UVLO level

A: 6V
B: 8V
C: 12V
D: 4V
G: 17V

Package

SWR: SOW16
SPNR: SOP16
SWKR: SOW14
SPOR: SOP14
LAR: LGA13 (5mmx5mm)
LAMR: LGA13 (4mmx4mm)
SWTR: SOW20

Smart isolated gate driver with APWM and protection features

Pin4 output
A: Split output
B: Single output

Soft turn-off current
S: 400mA
L: 130mA
H: 900mA

DESAT threshold
A: 0.7V (with overcurrent protection)
B: 6.5V
C: 9V

N S I 6 7 7 0 X Y Z (T) - Q1 xxx

NOVOSENSE

Isolated

Pin1 definition

1: Secondary ASC
3: AIN+Constant Current Source
5: VEE
7: AIN

Pin16 definition

0: APWM
1: GND1
3: Primary side ASC

Qualification
Q1: Automotive

Package

SWR: SOW16
SSWAR: SSOW20

Time parameters

Default: LEB 240ns, dead time 100ns
L: LEB 400ns, dead time 100ns
D: LEB 240ns, dead time 1000ns
T: LEB 400ns, dead time 1000ns



Non-isolated driver

The number of power device that single chip can drive

- 1: 1 power device
- 2: 2 power devices
- 6: 6 power devices

Maximum current output

- 4: 4A
- 5: 5A
- 10: 10A

NSD1624 (XX)

NOVOSENSE

D: Driver

G: GaN Power Stage IC

1: Non-isolated MOSFET driver

2: Non-isolated GaN driver

To distinguish between half-bridge and low-side drivers

- 0: Low-side driver;
- >0: Half-bridge driver
- 1: Vmax<100V
- 2: Vmax=100V-180V
- 6: Vmax>=600V

The first X represents the special functions

- V: Higher VCC withstand voltage, >30V, for example, NSD1026V
- F: Logic inverse output, for example, NSD1026VF
- T: DESAT, for example, NSD1015T
- M: Miller Clamp, for example, NSD1015MT
- L: Interlock, for example, NSD1224LA
- C: OC protection
- S: Split output
- N: Integrated with negative voltage output

The second X represents the UVLO level:

- Half-bridge: If this bit is vacant, the default is 8V
- Low side: If this bit is vacant, the default is 4V
- A: 4V
- B: 8V
- C: 13V

Selection guide for NOVOSENSE gate drivers

Category	Architecture	Input type	Voltage level	Output current	Protective functions	Part Number
Non-isolated driver	Low-side	CMOS/TTL	>30V	+3A/-4A	UVLO	NSD1015
			>30V	5A/-5A	UVLO/DESAT	NSD1015T
			>30V	5A/-5A	UVLO/Miller Clamp/DESAT	NSD1015MT
			>30V	5A/-5A	UVLO	NSD1026V
	Half-bridge		>100V	3A/-4A	UVLO	NSD1224
			>600V	4A/-6A	UVLO	NSD1624



Category	Architecture	Input type	Voltage level	Output current	Protective functions	Part Number
Isolated driver	Single-channel	CMOS	3~5.7KV	5A/-5A	UVLO	NSI6601
				5A/-5A	UVLO/Miller Clamp	NSI6601M
		Opto-compatible	3~5.7KV	5A/-5A	UVLO	NSI6801E
				1.5A/-2A	UVLO	NSI68010
	Half-bridge	CMOS/TTL	3~5.7KV	4A/-6A	UVLO	NSI66x2
				6A/-8A	UVLO	NSI66x2V
				10A/-10A	UVLO/Miller Clamp	NSI6602M
	Smart	CMOS	3~5.7KV	10A/-10A	UVLO/Miller Clamp/DESAT/Soft turn off	NSI6651
				10A/-10A	UVLO/Miller Clamp/DESAT/Soft turn off/ASC	NSI6611
				10A/-10A	UVLO/Miller Clamp/DESAT/Soft turn off/Isolated ADC	NSI6770
		Opto-compatible	3~5.7KV	5A/-5A	UVLO/Miller Clamp/DESAT/Soft turn off	NSI68515
		CMOS/TTL	3~5.7KV	20A/-20A	UVLO/Miller Clamp/DESAT/Soft turn off /Isolated ADC/Functional safety	NSI6911
GaN integrated power stage & gate driver	Half-bridge	CMOS/TTL	>600V	2A/-4A	UVLO/Miller Clamp	NSD2621
				2A/-4A	UVLO/Miller Clamp/Negative voltage output	NSD2622N
	Power stage ICs	CMOS/TTL	650V	11.5A	UVLO	NSG65N15K
	Low-side	CMOS/TTL	5V	7A/-5A	UVLO	NSD2017
			20V	2A/-4A	UVLO/Miller Clamp/Negative voltage output	NSD2012N