

Mornsun Provides State-of-the-Art Smart Grid Solutions

Smart grids are a necessity in the modern world with their ability to react to changes in both supply and demand of electrical power - and along the evolution of smart grids, there is a high demand for power electronic solutions that are efficient, effective, and reliable.



Smart grids use a mix of energy sources (many of which are renewable) to provide an environmentally responsible, reliable solution to electrical power needs. Smart grids are efficient, compatible with smart devices and smart homes, and support the growing use of electric and hybrid vehicles. They also lead to economic savings and better management of energy consumption.

Within a smart grid, the major actions that take place are power generation, transmission, transformation, distribution, and consumption. The image below shows a typical block diagram for a smart grid. Power is routinely generated by multiple sources, such as wind turbines that include a wind-solar complementary controller, a nuclear power plant with oxygen quantity analyzers, and solar panels with a heliostat solar tracker and PV tracker systems.

Once the power has been generated, there is often a need to convert or invert the electricity to its right form and at the right voltage for transmission. This may include distributed inverters, DC-AC converters, and DC-DC converters. Energy routers ensure the electricity goes to the right place within a generation system. Another key aspect within a smart grid system is a DC distribution cabinet, which includes a combiner box and centralized inverters. From there, the DC power heads to the power lines for transmission to end users.

The diagram illustrates a hybrid power system architecture. At the top center is a large orange box labeled "Generation". To the left, a "Combiner box" feeds into a "Centralized inverter", which then connects to a "DC distribution cabinet". Below the combiner box, a vertical stack of three solar panel icons is shown, with the bottom one labeled "Unmanned cleaning robot". To the right of the DC distribution cabinet is a power line with a transformer icon, labeled "AC/DC". Below this line are four green solar panel icons, with the bottom one labeled "PID control box". Further right is another power line with a transformer icon, labeled "DC/AC". Below this line are four green solar panel icons, with the bottom one labeled "PV tracking system". To the right of the DC/AC line is a power line with a transformer icon, labeled "DC/DC". Below this line are four green solar panel icons, with the bottom one labeled "Distributed inverter". To the right of the DC/DC line is a power line with a transformer icon, labeled "Energy router". Below this line are four green solar panel icons, with the bottom one labeled "Heliostat Solar Tracker". At the top right, a "Wind-solar complementary controller" is shown, connected to a wind turbine icon and a "Nuclear power plant" icon. Below the wind turbine is an "Oxygen quantity analyzer".

Power Generation

Power Transmission

Power Transformation

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such as monitoring and control of the current and voltage, as well as other parameters, with the goal of ensuring equipment safety and power quality. A robot for overhead power line inspection is an interesting example of such an application.

Power Distribution

Power distribution is another key aspect in a smart grid, and that includes the power supply unit of the DTU/FTU. It focuses on system continuity power supply requirements, EMC protection, and the high isolation power supply of the telemetry system. One example of an application that benefits from Mornsun components is the fault monitoring terminal in a power distribution system.

Industrial and Commercial Power Consumption

The final destination on the path of power through a smart grid is end-user consumption. One of the latest developments in this area is smart meter technology, which requires higher levels of communication interfaces, large-capacity memory and microprocessors, ultra-wide voltage input, low power consumption, ultra-small size and high-level EMC protection for the power supply. Mornsun has the power electronics that meet the specifications for these kinds of applications.

Real-World Solar Inverter Power Solution

The block diagram circuit below shows a more detailed look at a real-world smart grid solution: a solar inverter. This inverter design includes many components from Mornsun's power solution line.

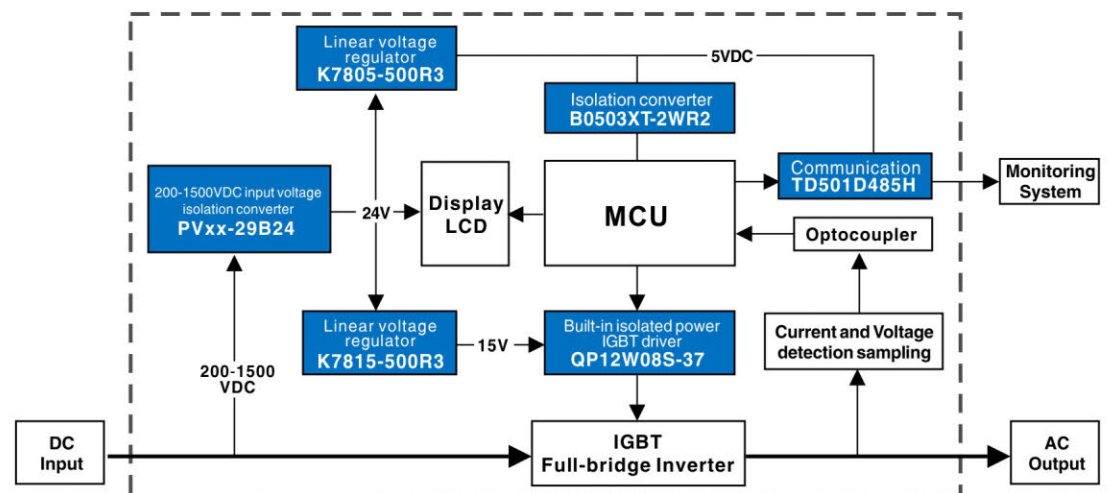


Figure 2.
Block diagram of a solar
inverter

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The Mornsun [QP12W08S-37](#) is an excellent choice for the IGBT driver with its built-in isolated DC-DC power supply, a high isolation voltage of 3750VAC, input signal frequency of up to 20kHz, a built-in fault circuit with a pin for fault feedback, and a protective soft cut-off time.

Communication with the monitoring system is facilitated by a Mornsun industrial bus from the [TDx01D485H Series](#), which itself utilizes special integrated IC technology that allows it to achieve isolation between the power supply and the signal line, as well as communicate and protect the bus all in the same module. This series of products can be easily embedded in end-user equipment to achieve a fully functional RS485 network connection.

The isolation converter used in this design is from the Mornsun series of DC-DC converters, specifically the Mornsun [B0503XT-2WR2](#). With its efficiency of up to 84%, high power density, and wide operating ambient temperature range, this converter is an excellent choice for use in a solar inverter, as well as a host of other applications. The block diagram also shows the use of two linear regulators, including the [K7805-500R3](#) model, which offers efficiency of up to 95%, a no-load input current as low as 0.2 mA, and output short-circuit protection.

The design requires a 200 to 1500VDC input voltage isolation converter and Mornsun's [PVxx-29B24](#) series is ideal for this application. This line of isolation converters feature high efficiency and high reliability, along with a high level of safety.

Mornsun: Your One-Stop-Shop for Smart Grid Solutions

Smart grids are extremely common in today's world, which is why Mornsun works to provide you with comprehensive power electronics solutions for all of your energy needs. These include massive smart grids, battery management systems, combiner boxes, inverters, and grid monitoring units, as well as end-user applications such as EV/HEV charging stations. Our line of power electronic products will give you the efficient, reliable, power-dense solutions needed for all your smart grid solutions.