



Fuji Small IPM (Intelligent Power Module)

P633A Series

6MBP**XS*060-50

Chapter 7 Cautions

Application Manual

Cautions

This Instruction contains the product specifications, characteristics, data, materials, and structures as of June 2021. The contents are subject to change without notice for specification changes or other reason. When using a product listed in this Instruction be sure to obtain the latest specifications.

The application examples in this note show the typical examples of using Fuji products and this note shall neither assure to enforce the industrial property including some other rights nor grant the license.

Although Fuji Electric Co., Ltd. continually strives to enhance product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, be sure to take adequate safety measures such as redundant, flame-retardant and fail-safe design in order to prevent a semiconductor product failure from leading to a physical injury, property damage or other problems.

The products described in this application manual are manufactured with the intention of being used in the following industrial electronic and electrical devices that require normal reliability.

- Compressor motor inverter
- Fan motor inverter for room air conditioner
- Compressor motor inverter for heat pump applications, etc.

If you need to use a semiconductor product in this application note for equipment requiring higher reliability than normal, such as listed below, be sure to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products, take adequate safety measures such as a backup system to prevent the equipment from malfunctioning when a Fuji Electric's product incorporated in the equipment becomes faulty.

- Transportation equipment (mounted on vehicles and ships)
- Trunk communications equipment
- Traffic-signal control equipment
- Gas leakage detectors with an auto-shutoff function
- Disaster prevention / security equipment
- Safety devices, etc.

Do not use a product in this application note for equipment requiring extremely high reliability such as:

- Space equipment • Airborne equipment • Atomic control equipment
- Submarine repeater equipment • Medical equipment

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Chapter 7 Cautions

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1. Precautions for use

- This product should be used within the absolute maximum rating (voltage, current, temperature, etc.). This product may be broken if used beyond the rating.
- Do not design and use the product in excess of the absolute maximum ratings (voltage, current and temperature). The product might be damaged if it is used in excess of the absolute maximum ratings.
- The equipment containing this product should have adequate fuses or circuit breakers to prevent the equipment from causing secondary destruction (ex. fire, explosion etc.).
- Please confirm the turn-off current and voltage are within the RBSOA.
- Consider the possible temperature rise not only for the junction and case, but also the terminals. Please confirm these temperatures are within the absolute maximum ratings.
- The product is made of incombustible material. However, if the product fails, it may emit smoke or flame. When operating the product near any flammable place or material may cause the product to emit smoke or flame in case the product become even hotter during operation. Please take measures to prevent the spread of fire.
- Do not touch the terminals or package of the product directly while power is supplied or during operation in order to avoid electric shock and burns.
- To prevent high-frequency noise such as switching noise from being directly applied to VCCH and VCCL terminals, connect a ceramic capacitor of appropriate capacity near to VCCH terminal between VCCH and ground terminals, and near to VCCL terminal between VCCL and ground terminals.
- The product might malfunction if noise is applied to the control terminals. Please use the product after checking that unstable operation or malfunction due to noise does not occur.
- The high side IGBTs might turn off if VB voltage drops below $V_{B(off)}$ due to noise, etc. Please connect ceramic capacitors of appropriate capacity between VB(U) - U terminals, VB(V) - V terminals, and VB(W) - W terminals respectively.
- The input signal voltage should be higher than the threshold voltage.
- Use this product within the reliability and lifetime under certain environments or conditions. The product may fail before the target lifetime of your system if used beyond the reliable lifetime of the product.
- The lifetime of the semiconductor products is not permanent. Please consider the thermal fatigue caused by temperature cycle due to self-generated heat. Please use the product within the ΔT_{vj} power cycle lifetime and ΔT_c power cycle lifetime. The ΔT_c power cycle depends on the case temperature (T_c) rise and fall, and T_c is affected by the cooling conditions of the system. Please consider the heat generation of the product and design the cooling condition to achieve target lifetime.
- The product should not used in an environment in the presence of acid, organic matter, or corrosive gas (hydrogen sulfide, sulfurous acid gas etc.)
- The product is not designed to be radiation-proof. Please avoid using it in an environment where it is exposed to radiation.
- It is recommended that any handling of the IPM is done on grounded electrically conductive floor and tablemats.

- Be careful of static electricity when handling the product.
- When handling the product, hold them by the case (package) and do not touch the terminals.
- Before touching the product, discharge any static electricity from your body and clothes by grounding out through a high impedance resistor (about 1MΩ)
- When soldering, insulate and ground the soldering iron and solder bus to prevent the leakage voltage from the soldering iron or solder bus from being applied to the product and damaging it.
- Do not apply mechanical stress that deform the terminals.
- During open short test, the internal of the product might explode instantaneously and the resin mold package might be blown off when high voltage is applied to the low voltage terminals. Make sure in your design that during open short test, high voltage will not be applied to the low voltage terminals. To avoid accidents and explosion damage if high voltage is applied, use fuses in your design.
- Do not use the product in parallel connection.

2. Precautions during transportation and storage

- The product should be stored at a normal temperature of 5 to 35°C and relative humidity of 45 to 75%, otherwise the product might be corroded or destructed, or it's lifetime might be shorter. If the storage area is very dry, a humidifier may be required. In such a case, use only deionized water or boiled water, since the chlorine in tap water may corrode the leads.
- In case of storage environment with rapid temperature changes, condensation will be occurred on the surface of the product. In order to avoid the condensation, the product shall be stored in steady temperature environment if possible.
- The product should not stored or used in an environment where it is exposed to acids, organic substances, or corrosive gas (hydrogen sulfide, sulfurous acid gas etc.) or in a dusty place.
- When stored, it is necessary to prevent external pressure to the product. Stacking that may deform the outer box shall be avoided even when it is packed in the outer box.
- Transport the cardboard box with the appropriate side facing up. This is to prevent unexpected stress being applied to the product, which may cause bending of the terminals or distortion in the resin package of the product. Throwing or dropping the product can cause significant damage to the product. Also, it is necessary to pay attention to rain and freezing to avoid wetting, as it may cause damage or destruction. The environmental conditions such as temperature and humidity during transportation described in the specifications shall be strictly observed.
- The product should be stored with the lead terminals remaining unprocessed. It is necessary to avoid rusting etc. due to scratches during processing, resulting in poor soldering.
- The containers and bags for storing the product should be non-static or conductive.
- Under the above storage condition, use the product within one year.