

Block Diagram

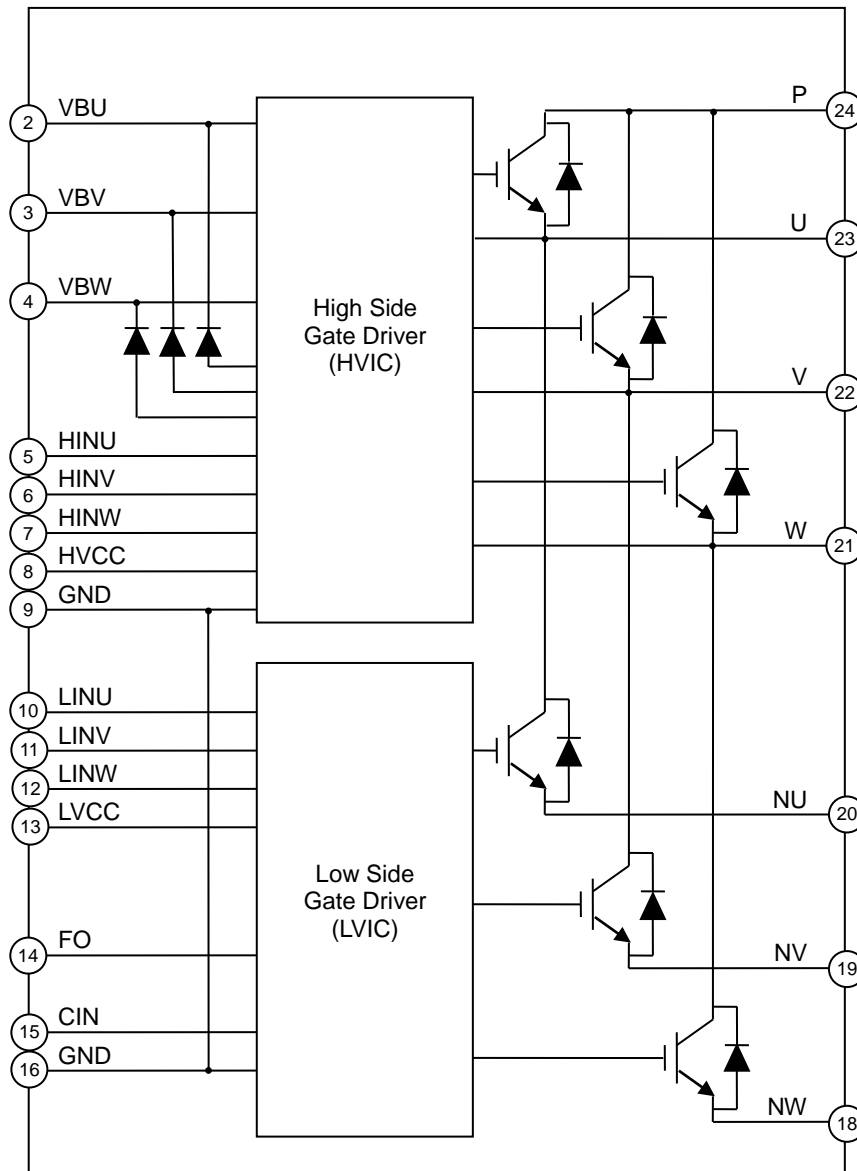


Figure 3. Block Diagram

Description of Block

1) High Side IGBT Drive (HVIC, Bootstrap Diode)

High voltage level shifting circuit drives high side IGBT.

Built-in bootstrap diode and current limit function for bootstrap diode enable HVIC to drive high side IGBT without external component (bootstrap diode, resistor). There is under-voltage-locked-out (UVLO) function for floating control power supply.

2) Low Side IGBT Drive (LVIC)

LVIC drives low side IGBT.

There is short circuit current protection (SCP), under-voltage locked out (UVLO) for control power supply LVCC, thermal shutdown (TSD) function. Alarm signal (FO) will output when these protection circuits work.

**Absolute Maximum Ratings (Unless otherwise specified, T<sub>j</sub>=25°C)**

**Inverter Part**

| Item                        | Symbol                | Ratings         | Unit         | Conditions                               |
|-----------------------------|-----------------------|-----------------|--------------|--|
| Supply Voltage              | V <sub>P</sub>        | 450             | V            | Applied between P-NU,NV,NW               |
| Supply Voltage(Surge)       | V <sub>P(surge)</sub> | 500             | V            | Applied between P-NU,NV,NW               |
| Collector-Emitter Voltage   | V <sub>CES</sub>      | 600             | V            |  |
| Collector Current           | DC                    | I <sub>C</sub>  | ±10 (Note 1) | A<br>T <sub>C</sub> =25°C                |
|                             | PEAK                  | I <sub>CP</sub> | ±30 (Note 1) | A<br>T <sub>C</sub> =25°C, less than 1ms |
| Collector Power Dissipation | P <sub>C</sub>        | 33              | W            | T <sub>C</sub> =25°C, per 1 chip         |
| Junction Temperature        | T <sub>jmax</sub>     | 150             | °C           |  |

(Note 1) Do not, however exceed P<sub>C</sub>, ASO.

**Control part**

| Item                          | Symbol           | Ratings                      | Unit | Conditions                               |
|-------------------------------|------------------|------------------------------|------|--|
| Control Power Supply          | V <sub>CC</sub>  | 20                           | V    | Applied between HVCC-GND, LVCC-GND       |
| Floating Control Power Supply | V <sub>BS</sub>  | 20                           | V    | Applied between VBU-U, VBV-V, VBW-W      |
| Control Input Voltage         | V <sub>IN</sub>  | -0.5 to V <sub>CC</sub> +0.5 | V    | Applied between HINX, LINX-GND (X=U,V,W) |
| Fault Output Supply Voltage   | V <sub>FO</sub>  | -0.5 to V <sub>CC</sub> +0.5 | V    | Applied between FO-GND                   |
| Fault Output Current          | I <sub>FO</sub>  | 1                            | mA   | Sink current at FO pin                   |
| Current Sensing Input Voltage | V <sub>CIN</sub> | -0.5 to +7.0                 | V    | Applied between CIN-GND                  |

**Bootstrap diode part**

| Item                 | Symbol             | Ratings | Unit | Conditions |
|----------------------|--------------------|---------|------|------------|
| Reverse Voltage      | V <sub>RB</sub>    | 600     | V    |            |
| Junction Temperature | T <sub>jmaxD</sub> | 150     | °C   |            |

**Total system**

| Item  | Symbol               | Ratings     | Unit             | Conditions  |
|---|----------------------|-------------|------------------|---|
| Self Protection Supply Voltage (SCP Capability) | V <sub>P(PROT)</sub> | 400         | V                | V <sub>CC</sub> =13.5 to 16.5V, Inverter part<br>T <sub>J</sub> =125°C, non-repetitive, less than 2μs |
| Module Case Temperature                         | T <sub>C</sub>       | -25 to +100 | °C               | Measurement point of T <sub>C</sub> is provided in Figure 2   |
| Storage Temperature                             | T <sub>stg</sub>     | -40 to +125 | °C               |   |
| Isolation Voltage                               | V <sub>iso</sub>     | 1500        | V <sub>rms</sub> | Sinusoidal, 60Hz, AC 1minute,<br>between connected all pins and heat sink plate                       |

**Thermal resistance**

| Item   | Symbol                    | Limit |     |     | Unit  | Conditions                |
|--|---------------------------|-------|-----|-----|-------|---------------------------|
|  |                           | Min   | Typ | Max |       |                           |
| Junction to Case Thermal Resistance (Note 2) | R <sub>th(j-c)_IGBT</sub> | -     | -   | 3.7 | °C /W | Inverter IGBT(1/6 module) |
|  | R <sub>th(j-c)_FWD</sub>  | -     | -   | 4.5 | °C /W | Inverter FWD(1/6 module)  |

(Note 2) Grease with good conductivity and high reliability should be applied evenly with +100 to +200μm on the contacting surface of IPM and heat sink. Use a torque wrench to fasten up to the specified torque rating. The contacting thermal resistance between IPM case and heat sink is determined by the thickness and the thermal conductivity of the applied grease.

**Caution:** Operating the IPM over the absolute maximum ratings may damage the IPM. The damage can either be a short circuit between pins or an open circuit between pins and the internal circuitry. Therefore, it is important to consider circuit protection measures, such as adding a fuse, in case the IPM is operated over the absolute maximum ratings.