

**iMOTION™**

**μIPM™**

## Motor Drive Reference Board For Mid Power Applications

### Description

IRMD808 is a reference board including three half-bridge modules for motor drive application. The kit features and demonstrates International Rectifier's intelligent power module (IPM) technology in an innovative PQFN package.

### Features

#### μIPM™ - Intelligent Power Module (IPM)

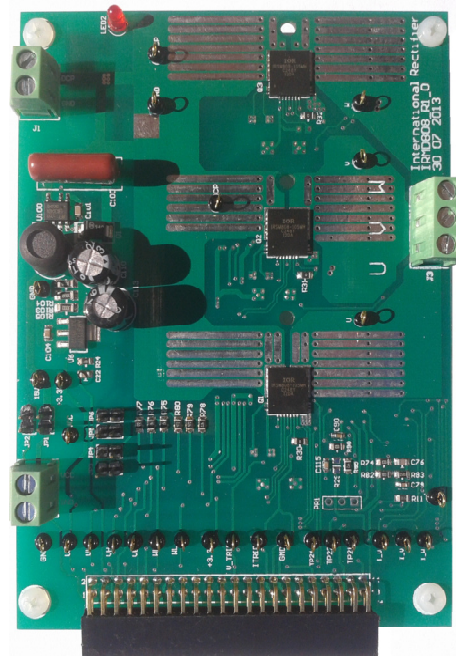
- Low RDS(on) Trench MOSFETs (500V)
- Integrated gate drivers and bootstrap functionality
- Overcurrent and under-voltage lockout protection
- Fault diagnostic output
- Optimized dV/dt for loss and EMI trade offs
- IPM Isolation 1500VRMS min

### Product Summary

- FR4 based 1oz copper two-layer PCB
- Up to 280W motor power range (Note1)
- Possibility to easy change between 3 Leg shunt to single shunt configuration
- Compatible with the following μIPM modules:
 

|               |                  |
|---------------|------------------|
| IRSM808-105MH | 10A / 0.8Ω, 500V |
| IRSM807-105MH | 10A / 0.8Ω, 500V |

**Note1:** Determined by rating of mounted μIPM



120 x 85 mm

## Safety Precautions

In addition to the precautions listed throughout this manual, please read and understand the following statements regarding hazards associated with development system.



**ATTENTION:** The **ground potential** of the IRMD808 system is biased to a negative DC bus voltage potential. When measuring voltage waveform by oscilloscope, the scope ground needs to be isolated. Failure to do so may result in personal injury or death. Darkened display LEDs is not an indication that capacitors have discharged to safe voltage levels.



**ATTENTION:** Only personnel familiar with the drive and associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.



**ATTENTION:** The surface temperatures of the drive may become hot, which may cause injury.



**ATTENTION:** IRMD808 system contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference applicable ESD protection handbook and guideline.



**ATTENTION:** An incorrectly applied or installed drive can result in component damage or reduction in product life. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.



**ATTENTION:** Remove and lock out power from the drive before you disconnect or reconnect wires or perform service. Wait three minutes after removing power to discharge the bus voltage. Do not attempt to service the drive until bus voltage has discharged to zero. Failure to do so may result in bodily injury or death.



**ATTENTION:** Do not connect power factor correction capacitors to output terminals U, V, and W. Doing so may result in equipment damage or bodily injury.



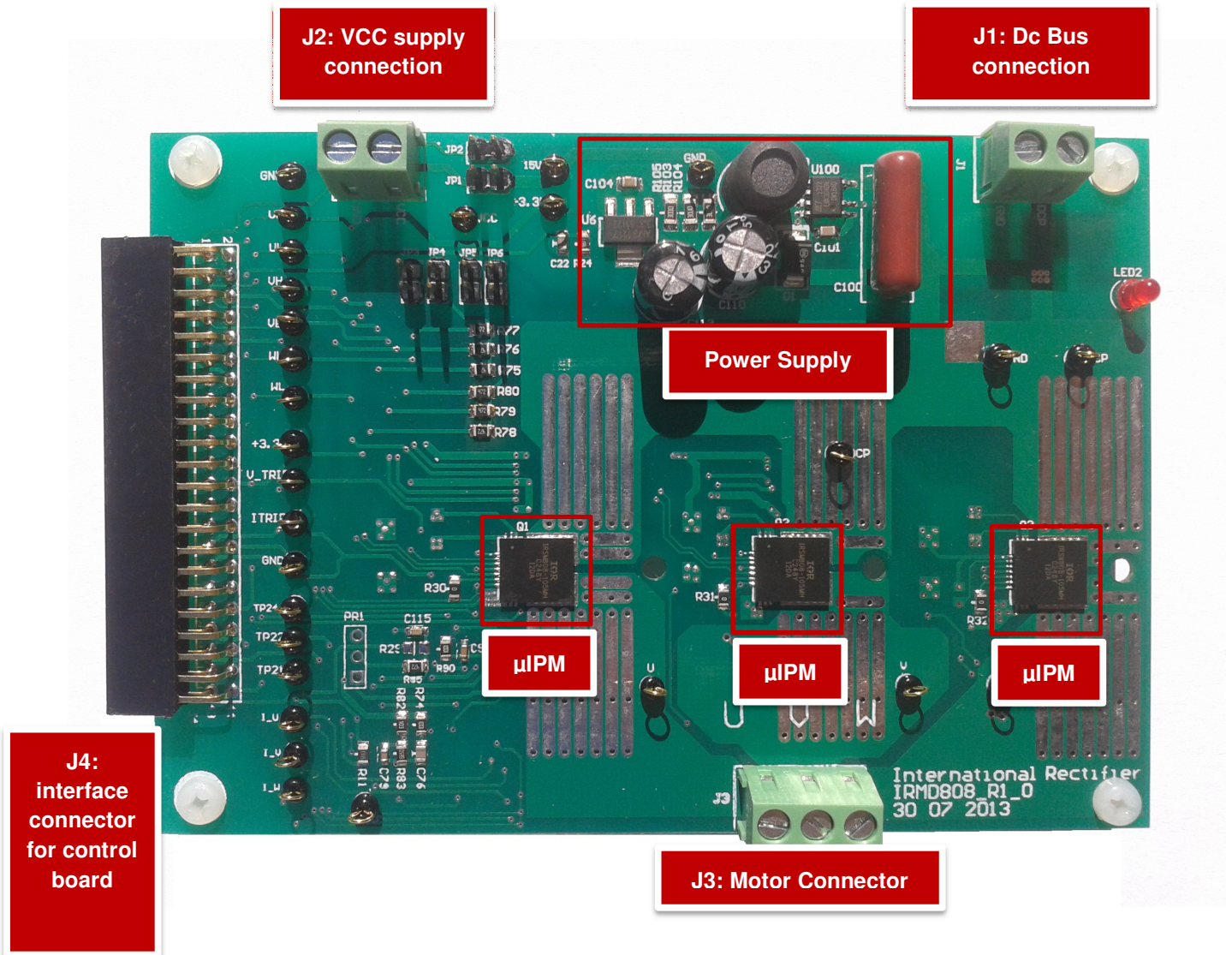
**ATTENTION:** Debris When Unpacking  
IRMD808 system is shipped with packing materials that need to be removed prior to installation. Failure to remove all debris and packing materials which are unnecessary for system installation may result in overheating or abnormal operating condition.



# IRMD808

## Hardware Description

A top view of the IRMD808 board is shown below.



**PCB**

The 120 x 85mm board has two layers with 1 oz (~35 $\mu$ m) copper each.

**Isolation Boundary**

Note that the ground potential of the IRMD808 system is biased to a negative DC bus voltage potential. The user should keep in mind that most parts of the hardware have negative DC bus ground and it may be necessary to isolate the scope when waveforms are measured. Refer to the IRMD808 schematics for more information.

**Connector definition**
**J1 – Dc Bus connection**

| Pin | Name | Description                          |
|-----|------|--------------------------------------|
| 1   | GND  | Connected to ground                  |
| 2   | DCP  | Connected to Dc Bus positive voltage |

**J2 – Vcc supply connection**

| Pin | Name | Description  |
|-----|------|--|
| 1   | VCC  | Connected to positive supply voltage to feed the uIPM – use only removing jumper JP1 (Note2) |
| 2   | GND  | Connected to ground  |

**Note2:** in order to feed the uIPMs with the 15V supply generated on the board, pins 1 and 2 of jumper JP1 must be shorted and no external supply has to be connected to Vcc

**J3 – Motor connector**

| Pin | Name            | Description                |
|-----|-----------------|----------------------------|
| U   | Phase U voltage | Connected to motor phase U |
| V   | Phase V voltage | Connected to motor phase V |
| W   | Phase W voltage | Connected to motor phase W |

**J4 – Interface connector for control board**

| Pin | Name  | Description   |
|-----|-------|---|
| 1   | PWMUH | PWM input signal for phase U high side Mosfet (Note3) |
| 2   | GND   | Ground  |
| 2   | PWMUL | PWM input signal for phase U low side Mosfet (Note3)  |
| 4   | GND   | Ground  |



|    |         |   |
|----|---------|---|
| 5  | PWMVH   | PWM input signal for phase V high side Mosfet (Note3)   |
| 6  | 3.3V    | On board 3.3V supply  |
| 7  | PWMVL   | PWM input signal for phase V low side Mosfet (Note3)  |
| 8  | 3.3V    | On board 3.3V supply  |
| 9  | PWMWH   | PWM input signal for phase W high side Mosfet (Note3)   |
| 10 | I_U     | Leg U shunt voltage in 3 leg shunt configuration / single shunt voltage in single shunt configuration |
| 11 | PWMW    | PWM input signal for phase W low side Mosfet (Note3)  |
| 12 | GND     | Ground  |
| 13 | FLT/EN  | Input/Output signal – active low  |
| 14 | DCPCONN | DcBus positive voltage, available on Pin14 only if jumper JP2 is inserted (Note4)                     |
| 15 | GND     | Ground  |
| 16 | N.C.    | Not Connected   |
| 17 | N.C.    | Not Connected   |
| 18 | GND     | Ground  |
| 19 | N.C.    | Not Connected   |
| 20 | DCP_FB  | DcBus positive voltage, scaled in 0-3.3V range by a voltage divider                                   |
| 21 | N.C.    | Not Connected   |
| 22 | N.C.    | Not Connected   |
| 23 | GND     | Ground  |
| 24 | 3.3V    | On board 3.3V supply  |
| 25 | N.C.    | Not Connected   |
| 26 | GND     | Ground  |



|    |          |   |
|----|----------|---|
| 27 | N.C.     | Not Connected   |
| 28 | GND      | Ground  |
| 29 | V TRIP   | Current comparator input signal for I_TRIP generation                       |
| 30 | GND      | Ground  |
| 31 | ITRIP    | Input signal from current comparator – active high                          |
| 32 | N.C.     | Not Connected   |
| 33 | USENSE   | Phase U voltage value scaled in 0-3.3V range by a voltage divider           |
| 34 | VSENSE   | Phase V voltage value scaled in 0-3.3V range by a voltage divider           |
| 35 | WSENSE   | Phase W voltage value scaled in 0-3.3V range by a voltage divider           |
| 36 | 3.3V     | On board 3.3V supply  |
| 37 | I_V      | Leg V shunt voltage in 3 leg shunt configuration                            |
| 38 | GND      | Ground  |
| 39 | N.C.     | Not Connected   |
| 40 | GND      | Ground  |
| 41 | I_W      | Leg W shunt voltage in 3 leg shunt configuration                            |
| 42 | GND      | Ground  |
| 43 | COMP_OUT | Comparator output for phase current shaping                                 |
| 44 | DIG_VTH  | Digital input signal for threshold generation on current shaping comparator |

**Note3:** can be active low/high depending on uIPM. Please refer to board schematics and use:

- pin1 and pin2 of jumpers JP3, JP4 must be shorted to pull up/down respectively high side inputs signals (PWMUH, PWMVH, PWMWH)
- pin1 and pin2 of jumpers JP5, JP6 must be shorted to pull up/down respectively low side inputs signals (PWMUL, PWMVL, PWMWL)

**Note4:** pin1 and pin2 of jumper JP2 must be shorted to have the DC bus positive voltage on Pin14. Please consider this is a high voltage pin (up to 500V, depending on rating of mounted uIPM)



**Specifications**

| Parameters                                     | Values  | Conditions  |
|--|---|---|
| <b>Output Power</b>                            |   |   |
| <b>Watts</b> (Note5)                           | 180W  | IRSM808-105MH<br>IRSM807-105MH  |
| <b>Current</b> (Note5)                         | 1.1A*   | IRSM808-105MH<br>IRSM807-105MH<br>*rms, Fc=16kHz, 2-phase PWM, ΔTca=70C,<br>Ta=25C  |
| <b>DC bus voltage</b>                          |   |   |
| <b>Maximum DC bus voltage</b>                  | 400V  | With 500V modules mounted   |
| <b>Minimum DC bus voltage</b>                  | 40V**   | **Only if on board generated 15V supply is used.  |
| <b>Current feedback</b>                        |   |   |
| <b>Current sensing device<br/>RS1,RS2, RS3</b> | 0.5 Ω   | Three leg shunt configuration is set. To<br>implement single shunt, remove RS2 and RS3<br>and include R99 and R98 resistors (0 Ω) |
| <b>Protection</b>                              |   |   |
| <b>Output current trip level</b>               | 1.2A <sub>pk</sub>                                  | Configure by changing shunt resistors, R82<br>and/or R83 as indicated on schematics   |
| <b>Critical over voltage trip</b>              | 380V  |   |
| <b>Over voltage trip</b>                       | 360V  |   |
| <b>Under voltage trip</b>                      | 120V  |   |
| <b>Power Device</b>                            |   |   |
| <b>IRSM807/808-xyMH</b>                        | 32L μIPM  | x = DC current rating<br>y = 4 for 250V, y = 5 for 500V   |
| <b>On board power supply</b>                   |   |   |
| <b>15V</b>                                     | 15V+/-5%, Max 20mA                                  | Used for μIPM gate drive power  |
| <b>3.3V</b>                                    | 3.3V+/-5%, Max 50mA                                 | Used for interface signals with control board and<br>alarm signal (I_TRIP)  |
| <b>PCB</b>                                     |   |   |
| <b>Material</b>                                | FR4, 1.6mm thickness<br>Copper thickness=1oz (35um) |   |
| <b>Dimension</b>                               | 120mm x 85mm  |   |
| <b>System environment</b>                      |   |   |
| <b>Ambient temperature</b>                     | 0 to 70°C   | 95% RH max. (Non-condensing)  |

**Note5:** please refer to IRSM808/807\_xyMH datasheet for data about maximum current and power, changing Fc, modulation, ΔTca, use of a heat sink.



Revision History

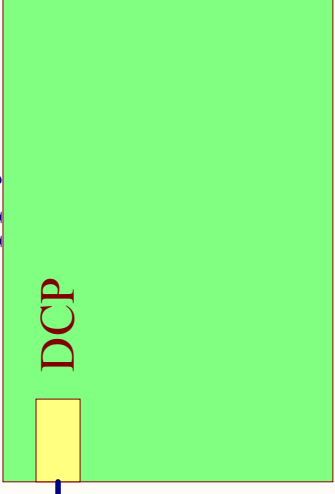
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**IOR** Rectifier

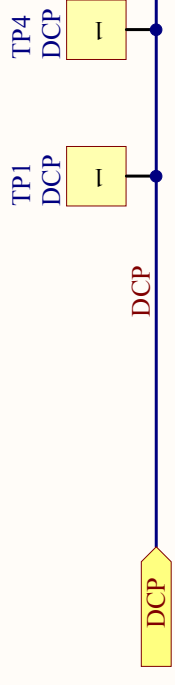
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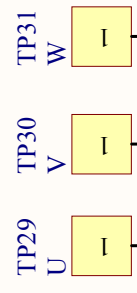
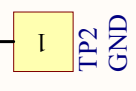
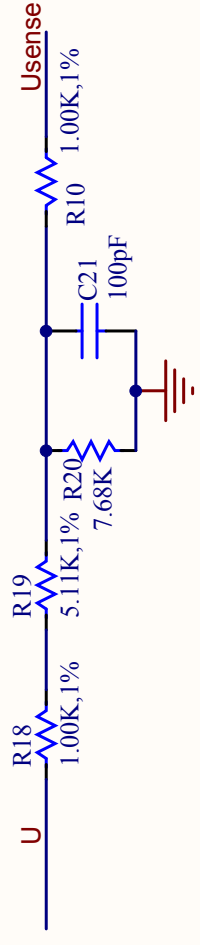
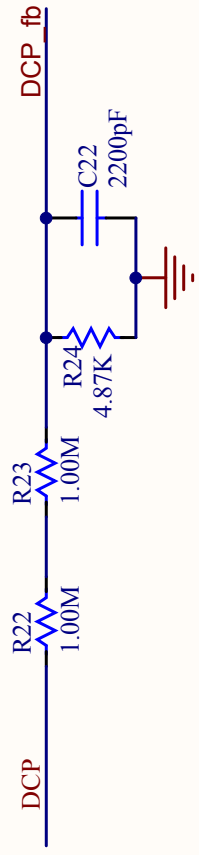
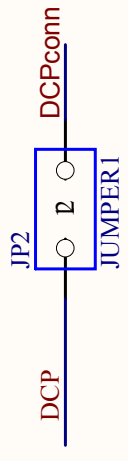
U\_2  
2. Power Supply IRMD8

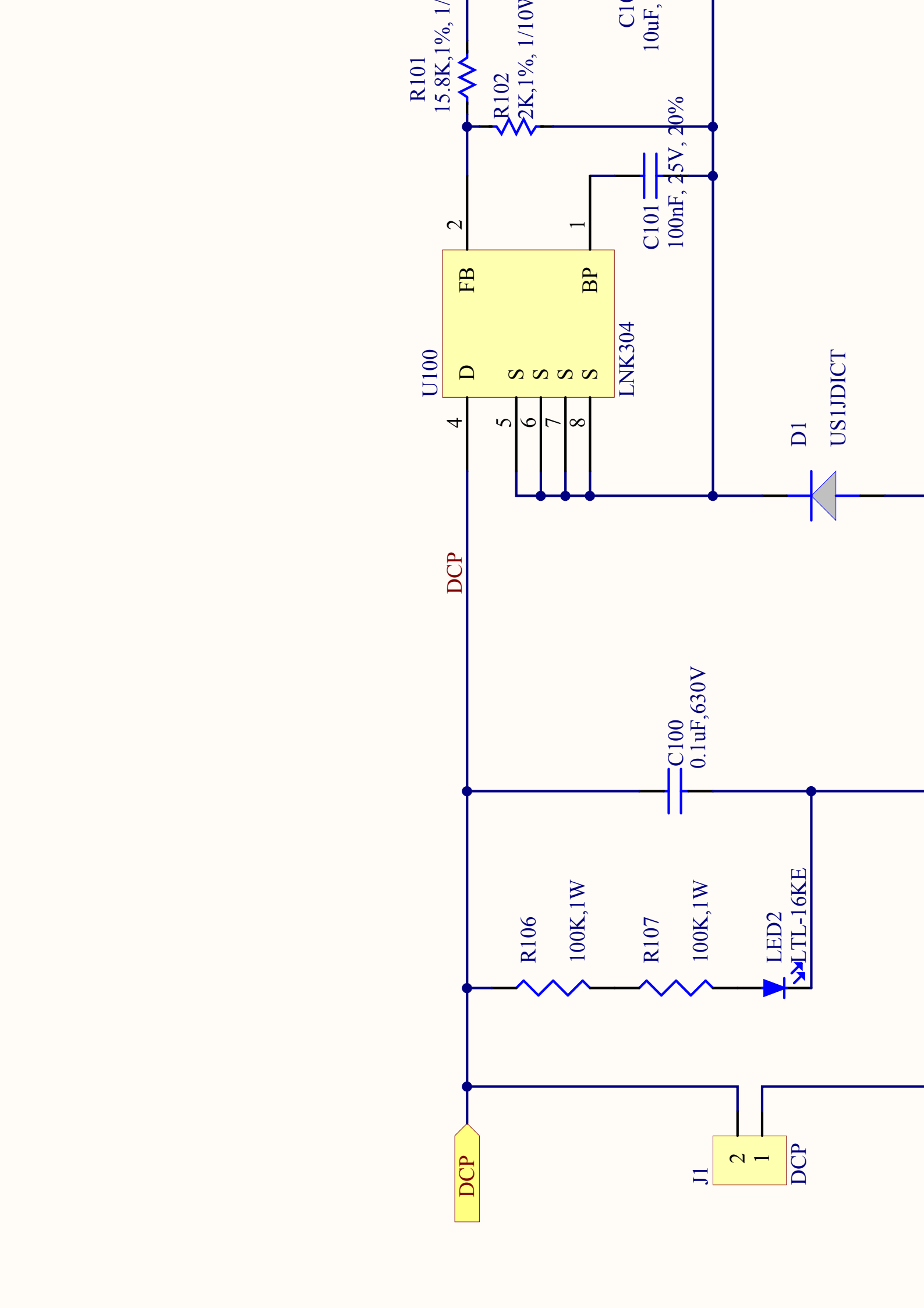
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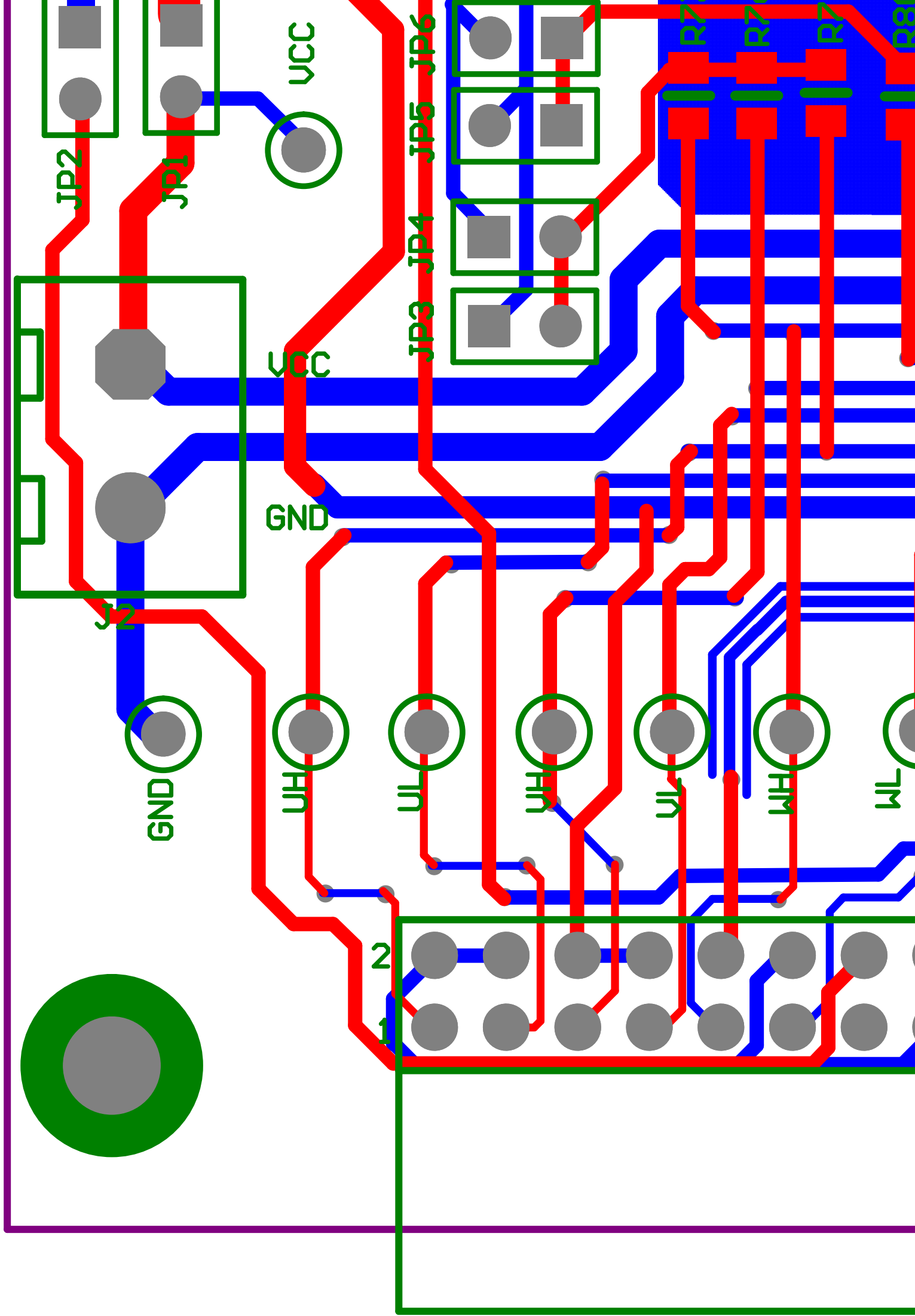




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