

## Motor Drive Reference Board For Low Power Applications

### Description

IRMD836 is a reference board including a three-phase module 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)

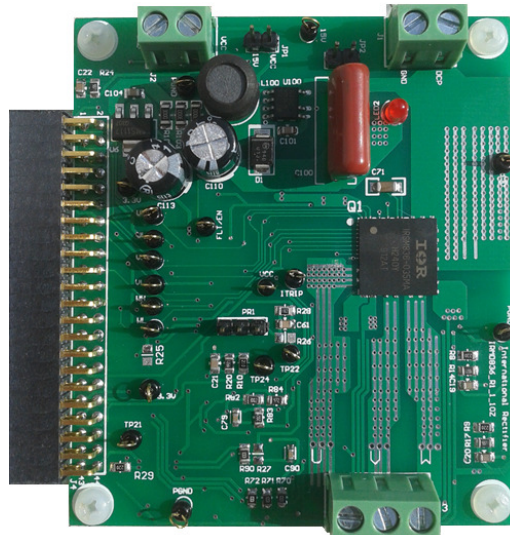
- Low RDS(on) Trench MOSFETs (250V or 500V)
- Integrated gate drivers and bootstrap functionality
- Overcurrent and under-voltage lockout protection
- Fault diagnostic output
- Optimized dV/dt for loss and EMI trade offs
- IPM Isolation 1500VRMS min

### Product Summary

- FR4 based 1oz copper two-layer PCB
- 20 – 100W motor power range (Note1)
- Possibility to easy change between 3 Leg shunt to single shunt configuration
- Compatible with the following μIPM modules:
 

IRSM836-024MA	2A / 2.2Ω, 250V
IRSM836-044MA	4A / 1.1Ω, 250V
IRSM836-025MA	2A / 4Ω, 500V
IRSM836-035MA	3A / 2.2Ω, 500V

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



70 x 87mm

## 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 IRMD836 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:** IRMD836 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.



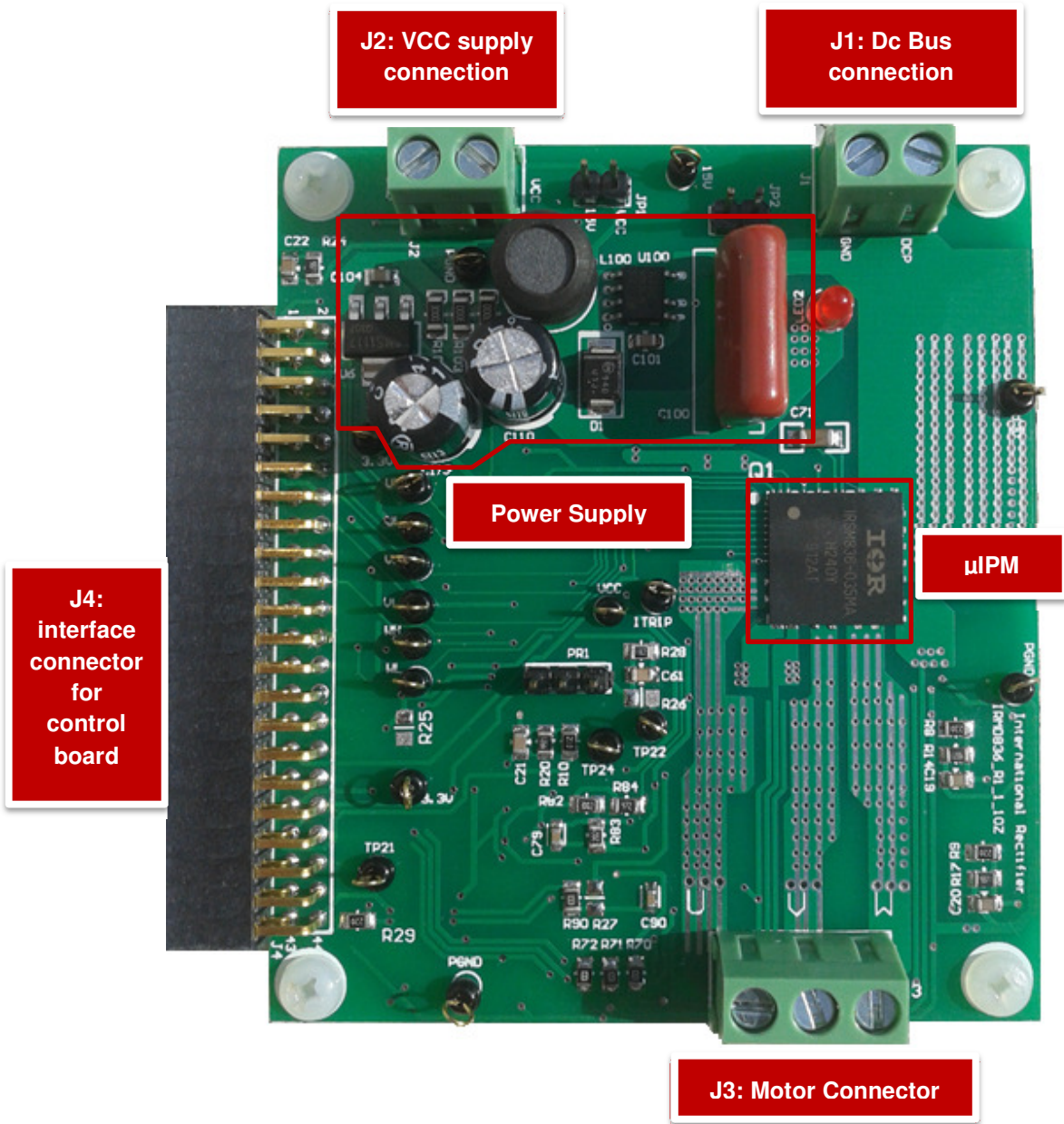
**ATTENTION:** Do not connect power factor correction capacitors to output terminals U, V, and W. Doing so may result in equipment damage or bodily injury.



**ATTENTION: Debris When Unpacking**  
 IRMD836 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.

**Hardware Description**

A top view of the IRMD836 board is shown below.



**PCB**

The 70 x 80mm board has two layers with 1 oz (~35 $\mu$ m) copper each.

**Isolation Boundary**

Note that the ground potential of the IRMD836 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 IRMD836 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, active high
2	GND	Ground
2	PWMUL	PWM input signal for phase U low side Mosfet, active high
4	GND	Ground



5	PWMVH	PWM input signal for phase V high side Mosfet, active high
6	3.3V	On board 3.3V supply
7	PWMVL	PWM input signal for phase V low side Mosfet, active high
8	3.3V	On board 3.3V supply
9	PWMWH	PWM input signal for phase W high side Mosfet, active high
10	I_U	Leg U shunt voltage in 3 leg shunt configuration / shunt voltage in single shunt configuration
11	PWMW	PWM input signal for phase W low side Mosfet, active high
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 (Note3)
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:** in order to have the DC bus positive voltage on Pin14, pins 1 and 2 of jumper JP2 must be shorted. Please consider this is a high voltage pin (up to 250V/500V, depending on rating of mounted uIPM)





## Specifications

Parameters	Values	Conditions
<b>Output Power</b>		
<b>Watts (Note4)</b>	90W 100W 60W 95W	IRSM836-025MA IRSM836-035MA IRMS836-024MA IRMS836-044MA
<b>Current (Note4)</b>	360mA* 420mA* 470mA* 750mA*	IRSM836-025MA IRSM836-035MA IRMS836-024MA IRMS836-044MA
		*rms, Fc=16kHz, 2-phase PWM, ΔTca=70C, Ta=25C
<b>DC bus voltage</b>		
<b>Maximum DC bus voltage</b>	400V 200V	With 500V modules mounted With 250V 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 RS1,RS2,RS3</b>	0.5 Ω	Three leg shunt configuration is set. To implement single shunt, RS2 and RS3 has to be removed, while R99 and R98 resistors (0 Ω) has to be inserted
<b>Protection</b>		
<b>Output current trip level</b>	1.2Apk	Configure by changing shunt resistors, R82 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>IRSM836-0xyMA</b>	36L μIPM	x = DC current rating 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 signal with control board and alarm signals as I_TRIP, FLT/EN
<b>PCB</b>		
<b>Material</b>	FR4, 1.6mm thickness Copper thickness=1oz (35um)	
<b>Dimension</b>	70mm x 80mm	
<b>System environment</b>		
<b>Ambient temperature</b>	0 to 70°C	95% RH max. (Non-condensing)

**Note4:** please refer to IRSM836\_xyMA datasheet for data about maximum current and power, changing Fc, modulation, ΔTca, use of a heat sink.



**Revision History**

International  
**IOR** Rectifier

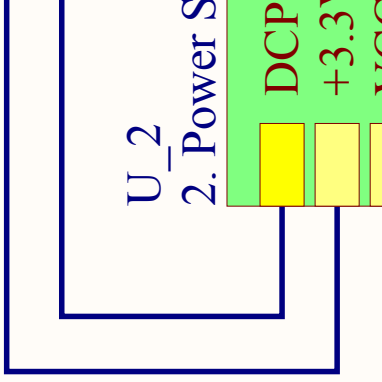
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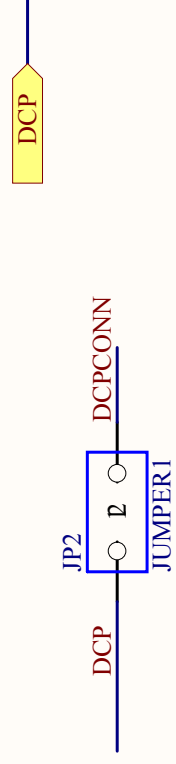


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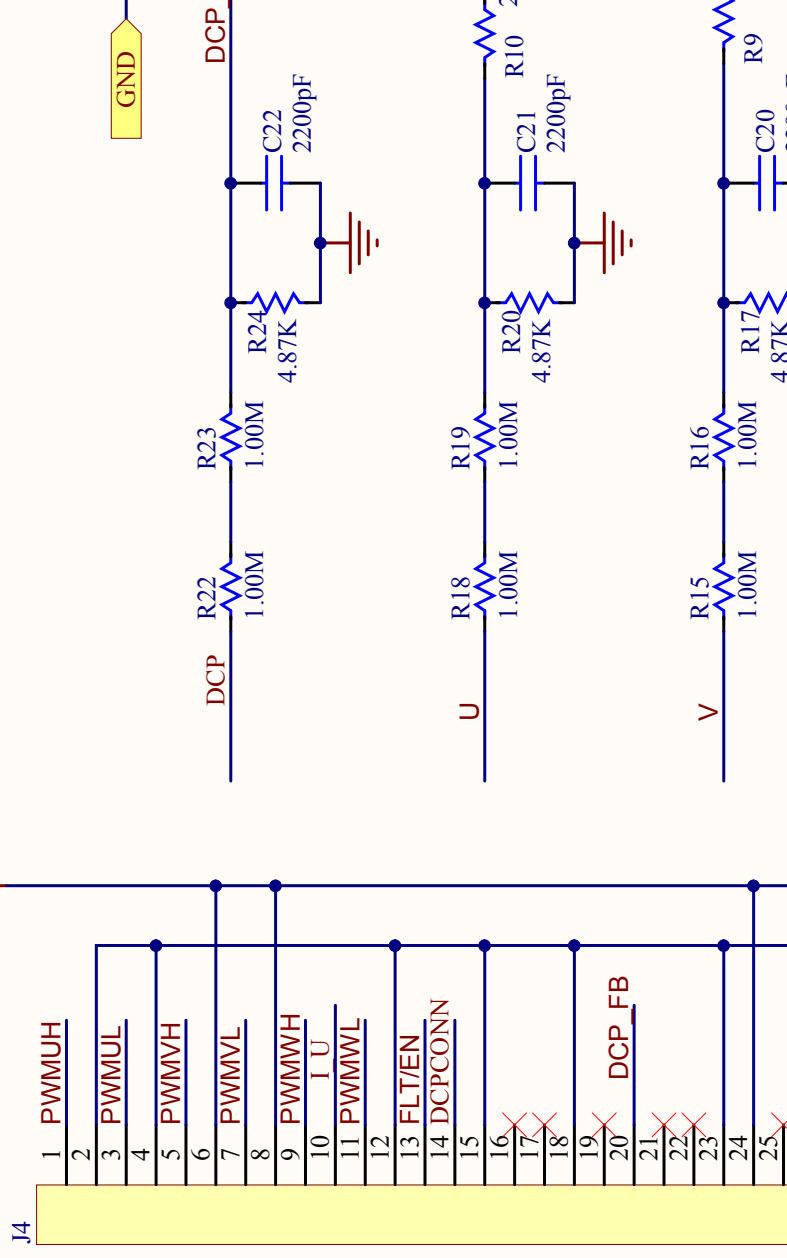
U<sub>2</sub>  
2. Power S

DCP  
+3.3  
VCC

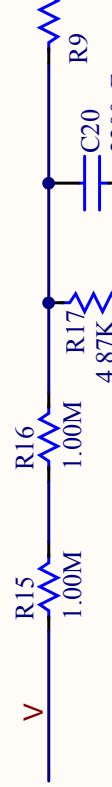
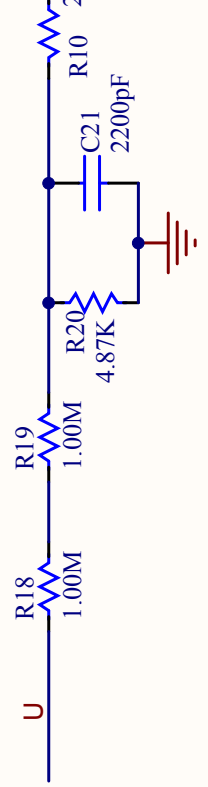
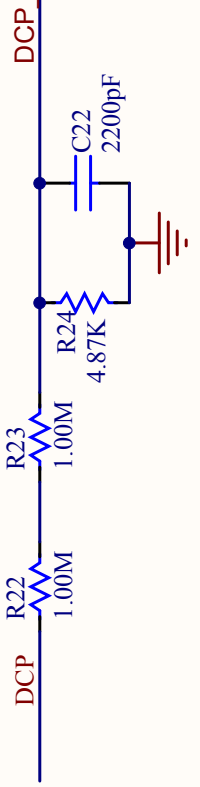


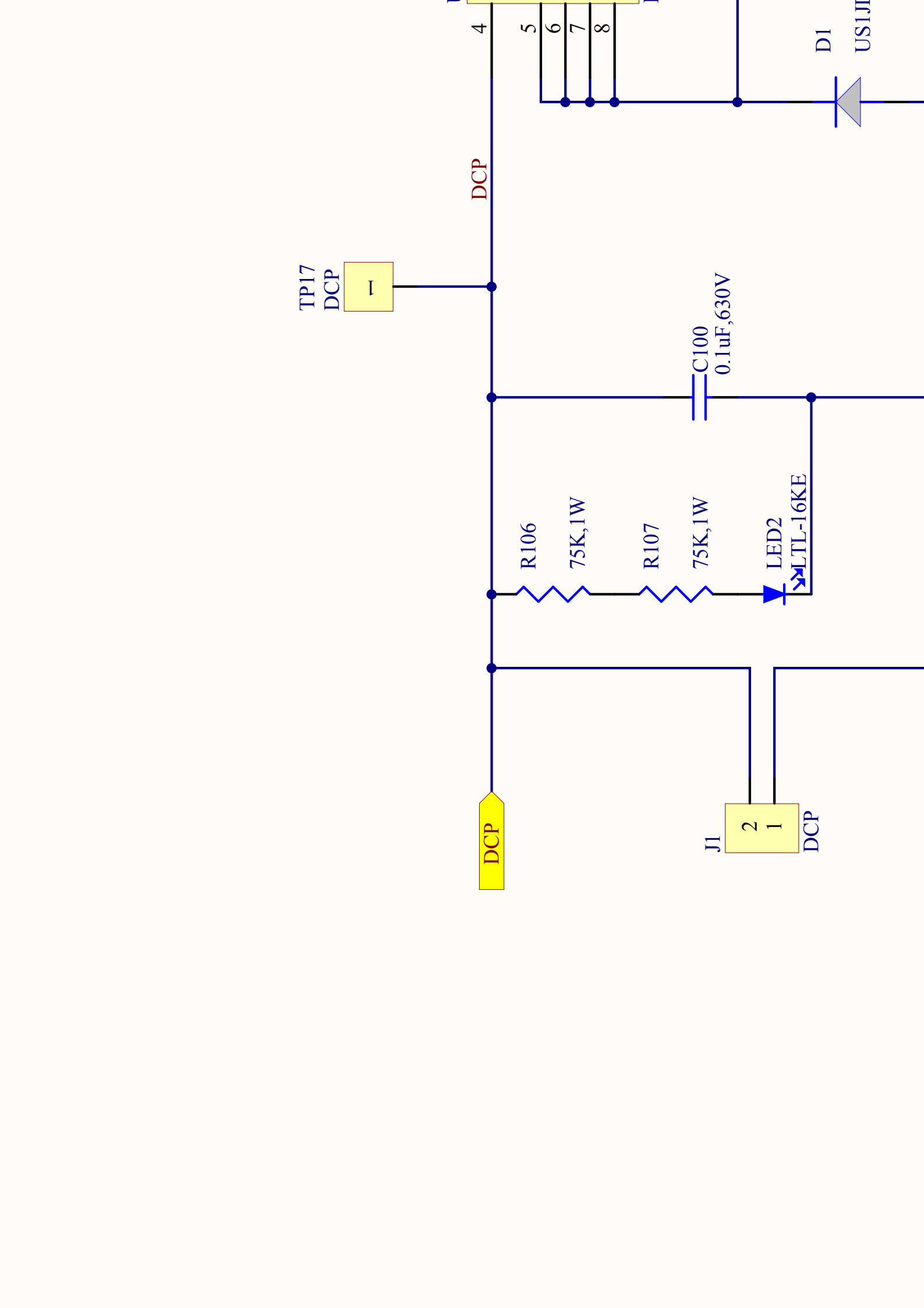


+3.3V



GND







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