

*i*MOTION™

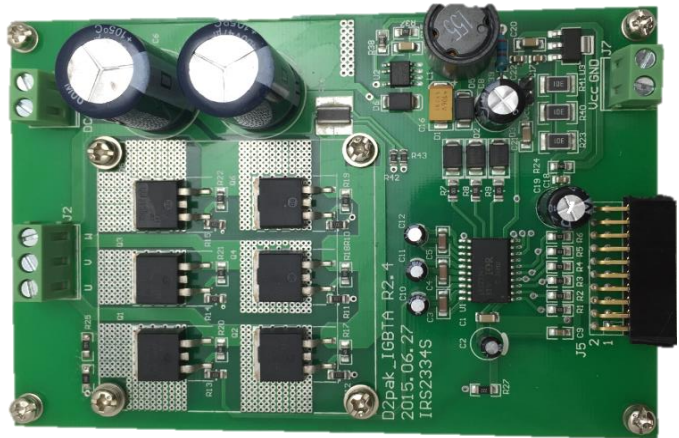
D2PAK IGBT Motor Drive Reference Design Kit

Description

The reference design power board is designed to showcase IR D2PAK IRGS4610DPBF IGBT in a motor drive application.

Product Summary

- IGBT inverter power stage for 3 phase motors
- FR4 based 1 oz copper two-layer PCB
- 100-240V AC input range
- 400W motor power range (with heatsink)
- Single shunt configuration



The 84 x 125 mm board has two layers with 2 oz (~35µm) copper each.

IRGR4610DPBF Features

Features	→	Benefits
Low $V_{CE(ON)}$ and switching losses		High efficiency in a wide range of applications and switching frequencies
Square RBSOA and maximum junction temperature of 175°C		Improved reliability due to rugged hard switching performance and high power capability
Positive $V_{CE(ON)}$ temperature coefficient and tight distribution of parameters		Excellent current sharing in parallel operation
5µs short circuit SOA		Enables short circuit protection scheme
Lead-free, RoHS compliant		Environmentally friendly

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 IRMDG62-1-D2 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: IRMDG62-1-D2 system contains dc bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait at least three minutes and until the capacitors have discharged to safe voltage levels. 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: IRMDG62-1-D2 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 under sizing 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.



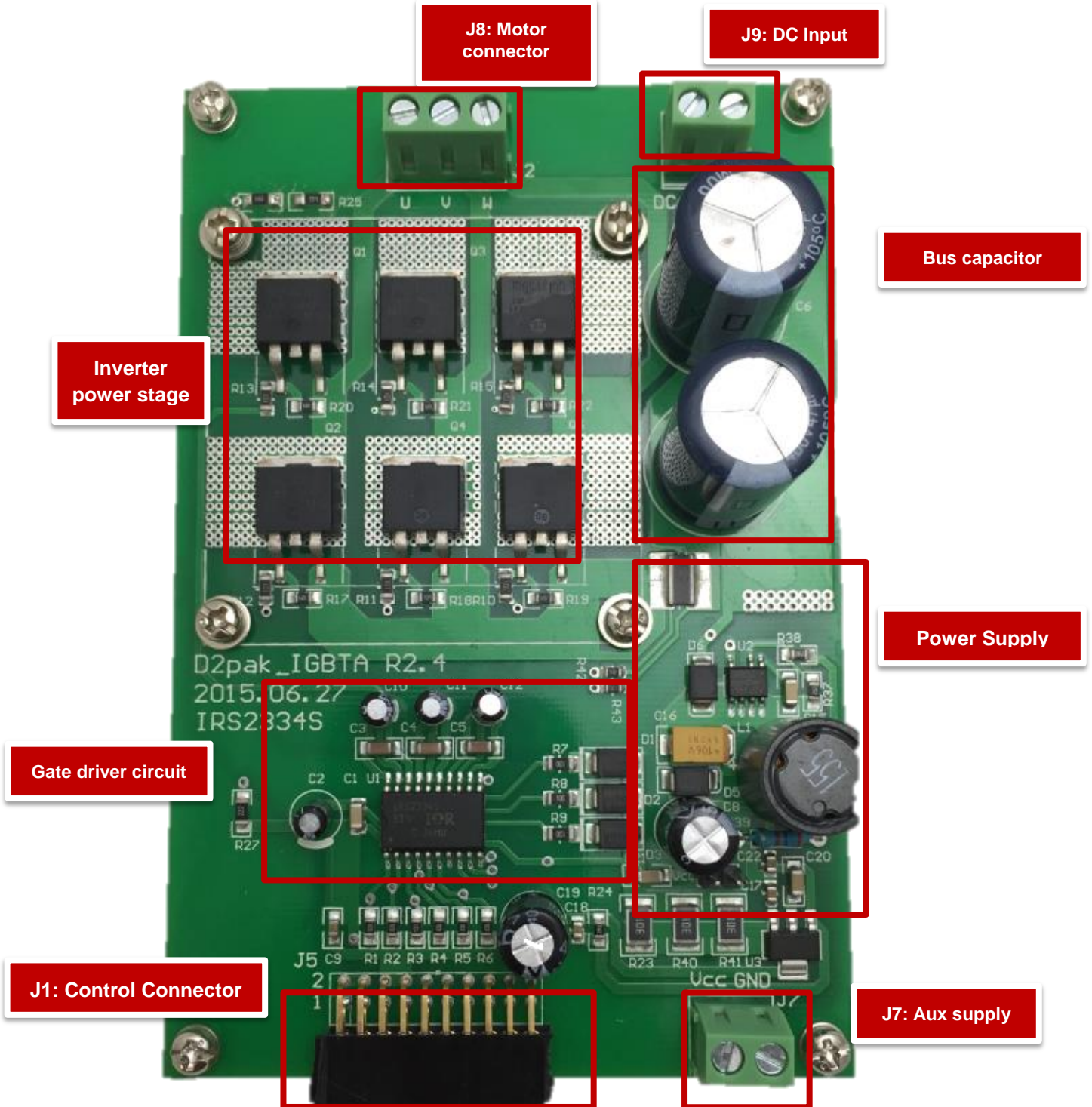
ATTENTION: Do not connect power factor correction capacitors to output terminals U, V, and W. Doing so may result in equipment damage or bodily injury.



ATTENTION: Debris When Unpacking
 IRMDG62-1-D2 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 IRMDG62-1-D2 board is shown below.



Connector definition

pin #	Controller connector pin out (20 pin)
1	PWМУH
2	GND
3	PWМУL
4	GND
5	PWМVH
6	3.3V input
7	PWМVL
8	3.3V input
9	PWМWH
10	IU+
11	PWМWL
12	IU- (GND)
13	GATEKILL
14	DCB+ (after R divider)
15	VTH
16	IV+/NC
17	IV-(GND)
18	IW+/NC
19	IW-(GND)
20	NC

Specifications

Parameters	Values	Conditions
Watts	400W	Vin=200VAC, f _{PWM} =10kHz, T _A =25°C, with heat-sink
Current	1.35 Arms	
Maximum DC bus voltage	400V	
Current sensing device	Single DC shunt	
Power device	IRGS4610DPBF	
15V	15V+/-5%, Max 20mA	Used for gate drive power supply
3.3V	3.3V+/-5%, Max 50mA	Available on J1
PCB Material	FR4, Copper thickness = 2oz (70um)	
Dimension	84mm x 125mm	
System environment		
Ambient temperature	0 to 70°C	95% RH max. (Non-condensing)

Running the system

1. Connect the system as in Figure 1
2. Power on the Vdc power supply (<400Vdc)
3. Start the control signal generator

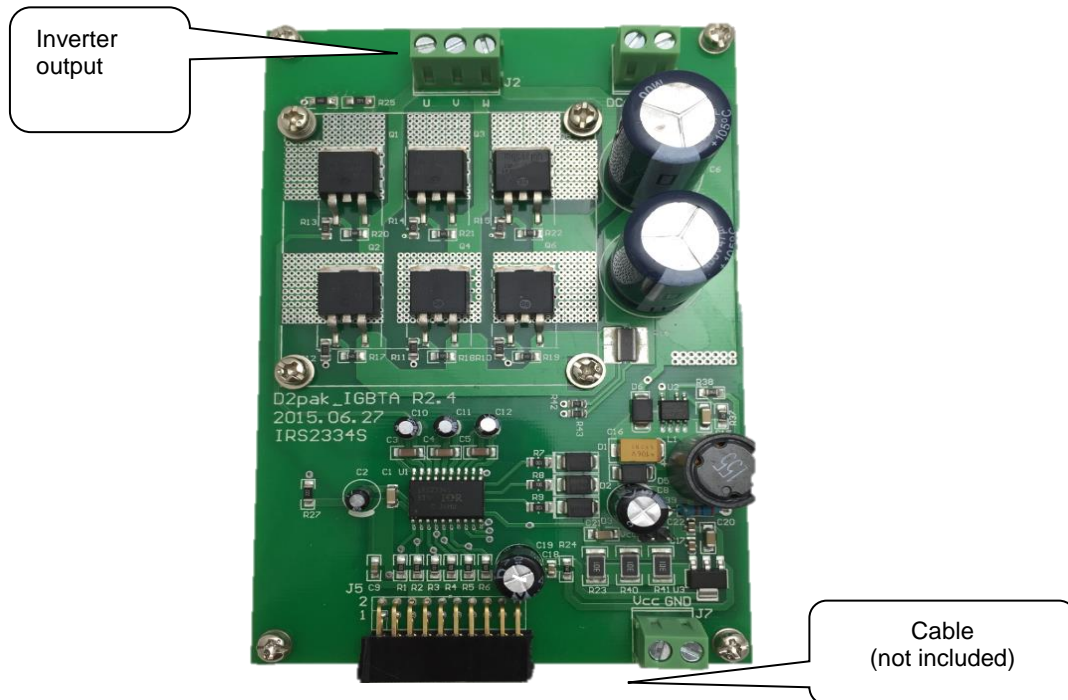


Figure 1 - Connection of control signals to the D2PAK board

Test condition example

- PWM: IRMC1183 control board. Carrier frequency: 10KHz
- Load: motor test bench
- Motor: GK6063-6AF31-WE(KE=63V/1000r/min, normal 1000rpm, I_o=2A)
- Power Board: IRMDG62-1-D2
- IGBT: IRGS4610DPBF

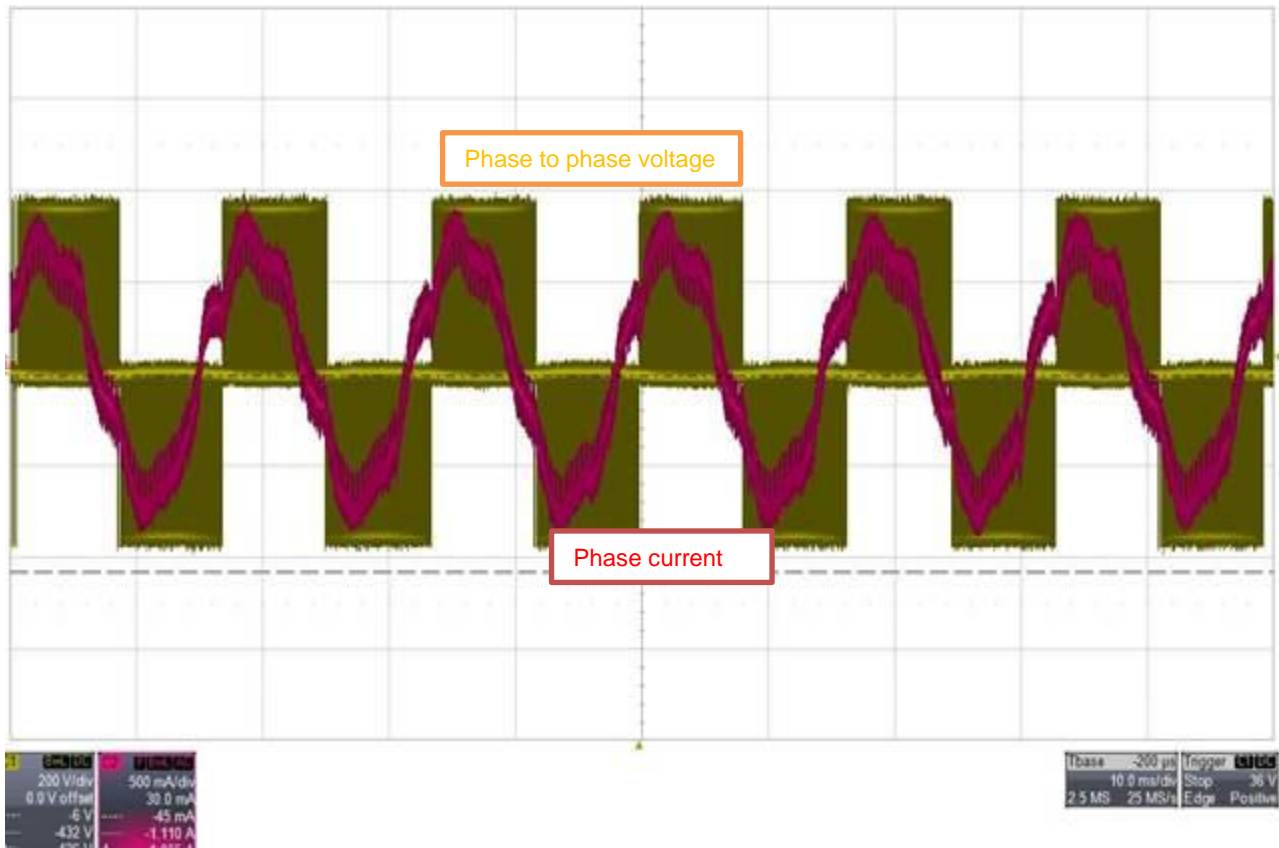


Figure 2 - Example of the inverter phase current and phase to phase voltage for sinusoidal motor

The board can drive up to a 400W motor with the heatsink under the PCB bottom (see Figure 3).

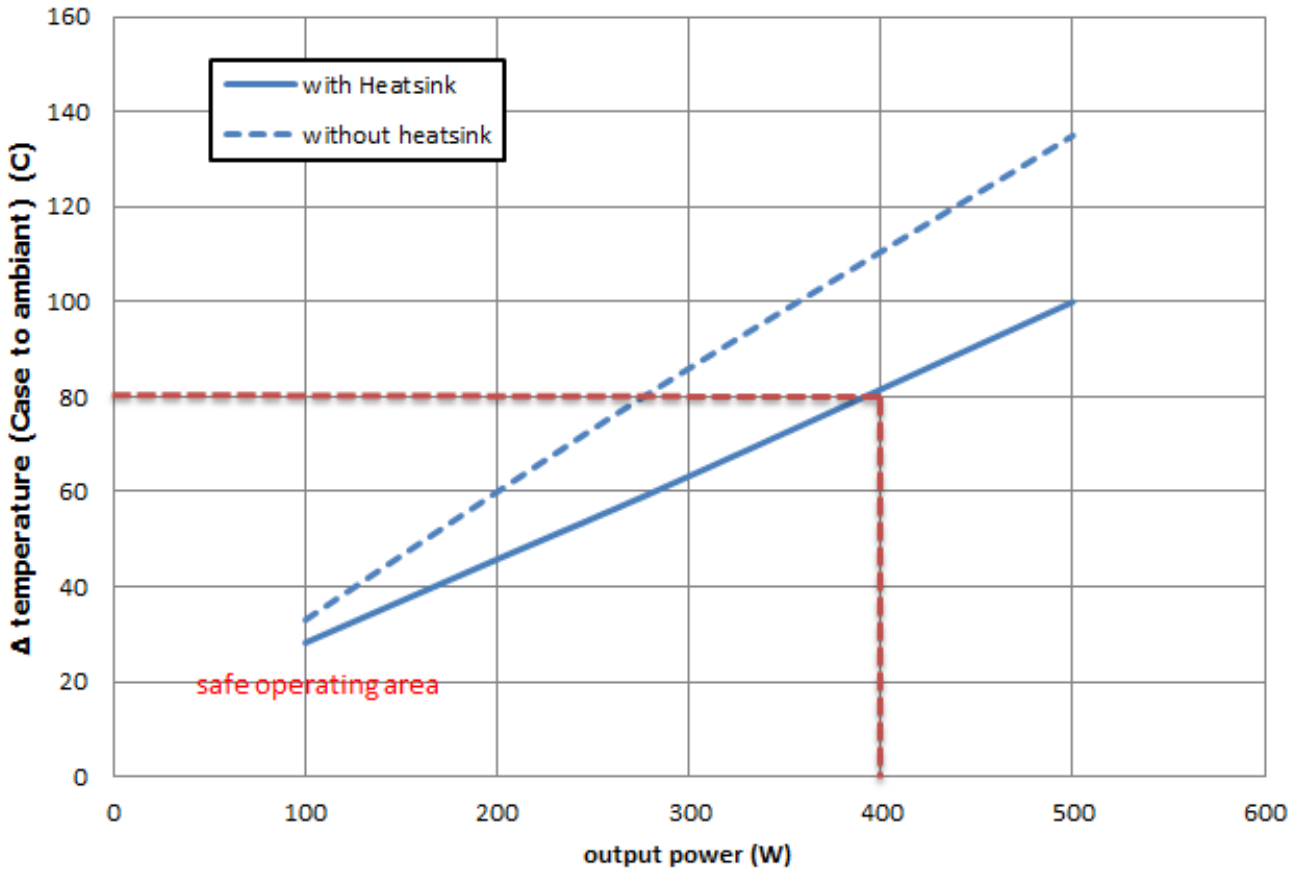
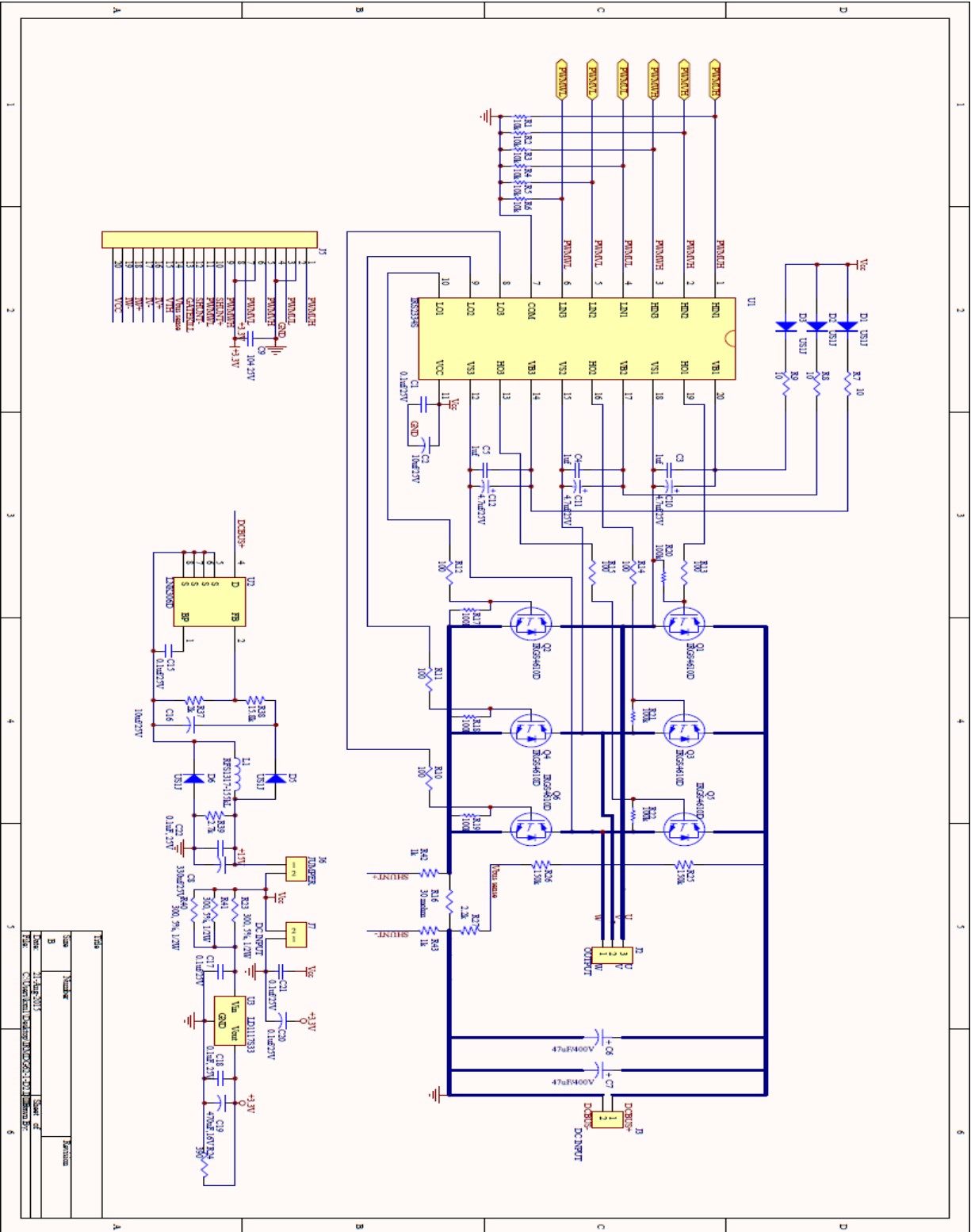


Figure 3 - Max PCB temperature vs Output power with heatsink Schematic

FR - 4 PCB material, max temperature define at 105°C for Safe Operating Area



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