BOARD SPECIFICATIONS

- Dimensions: 8in by 8in, 0.093in thick, 2oz copper on all layers, ENIG, 6 layers

PRESS-FIT NOTES

- All other components should be 5mm from the center of the WolfPACK pins
- For the REDCUBE press-fit terminals, per the application notes, other components should be spaced at least 4mm away and the hole should be at least 3mm from the edge.

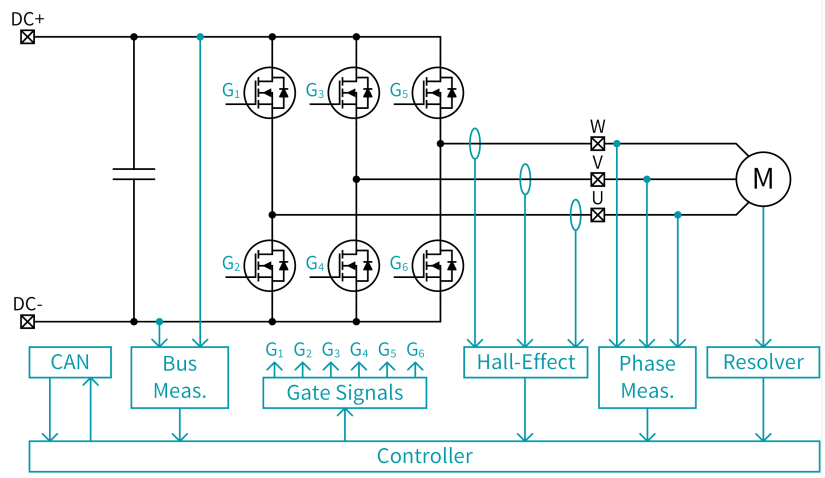
GENERAL NOTES

- The +5V_ALT power rail is required to avoid routing the +5V rail across the DC-link copper pours on the PCB. Only route the +12V rail across the DC-link.

Version History

Version	Date	Description
V1.0	2023/04	Initial release.
V1.1	2023/07	Added 10kΩ to gate-source, made Rg easier to access, added thermal relief, switched to 1.65V regulators, fixed inverted regulator outputs
V1.2	2024/01	RELAY1 controlled by GPIO44; GPIO57 routed to spare pin connector; Updated spare connector pinout to reflect GPIO changes; Moved DC-DC converters from controller for easier insert/remove; Reduced mounting hole annular ring; Moved components hidden by heat sink to topside; Silkscreen & copper pour clean up; Added option to float heatsink; Fixed resolver excitation circuit; Design rule improvements; Removed thermal relief from press-fit pins since no soldering; Improved pin notations in footprint silkscreens; Switched +/-15V regulation circuit to LM5157QRTERQ1; Added top layer copper islands to DC+/- terminals of module for improved thermals Reduced number of unique BOM items by changing the following: 1) LED resistors, 2) input power conditioning resistors & RETRY capacitor, 3) NTC isolated supply
V2.0	2024/09	Added: 1) ID pins, 2) CAN filter, 3) fan control, 4) CAN daisy-chain connector, 5) alternative NOPOP aux power connector (for powering from adapter board), 6) missing bias pin to -/+15V IC, 7) pull up/down resistors to spare GPIOs/ADCs, 8) creepage/clearange slots under gate drivers, 9) EPWM pins to the spare I/O connector, 10) ambient temperature measurement. NTC switched from isolated PWM using ECAP to isolated op amp using ADC. CAN upgraded to CAN FD functionality. Switched spare ADCs to have DAC capability. Changed voltage/current sense circuit gains to better use ADC dynamic range. Removed overcurrent hardware (performing overcurrent in software). Changed some of the ADC mapping to better utilize ADCB and ADCC. Changed fan connector to avoid crimping requirement in assembly.

BLOCK DIAGRAM



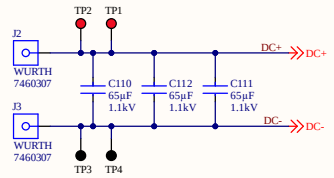
Wolfspeed® [No Variations]

Title: 25kW WolfPACK FM3 Six-Pack Inverter

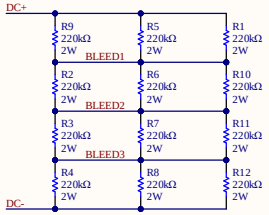
Drawing No: CRD25DA12N-FMC

Date: 09/2024 | Size: B | Revision: 2.0 | Sheet: 1 of 9

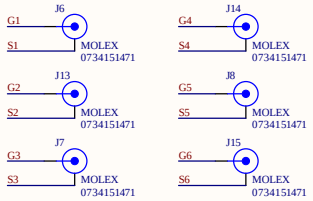
BULK CAPACITANCE



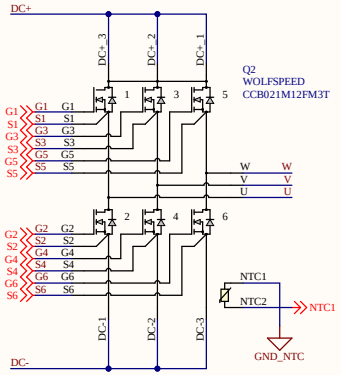
BLEED RESISTORS



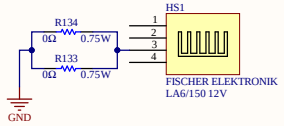
GATE METROLOGY



POWER MODULE



HEAT SINK

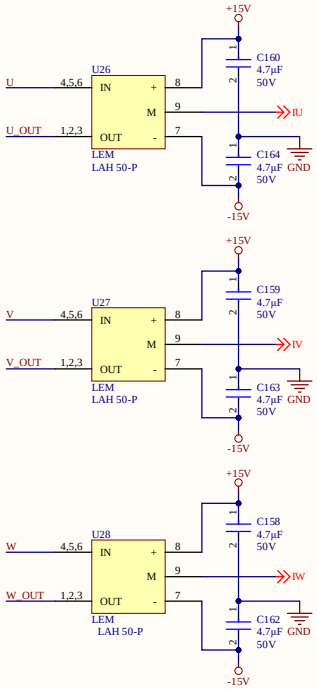


- Only ground in one location to prevent ground loops.
- Depopulate resistors to float heat sink (limited isolation)

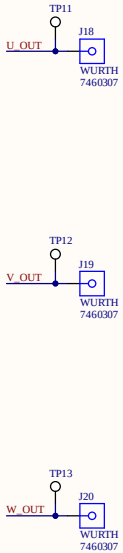
MOUNTING HOLES

- Floating to avoid ground loops or short circuits through mounting hardware.
- Attach using 12mm standoffs (McMaster-Carr 98952A143)

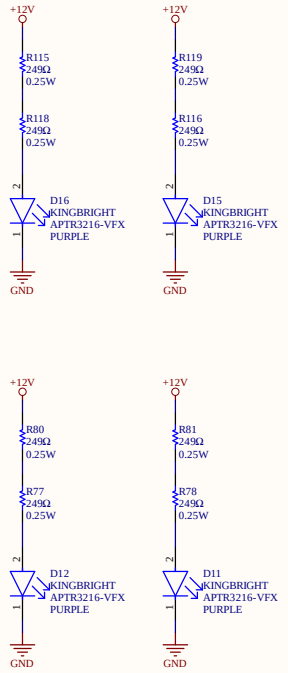
CURRENT MEASUREMENT



OUTPUT TERMINALS



UNDERGLOW

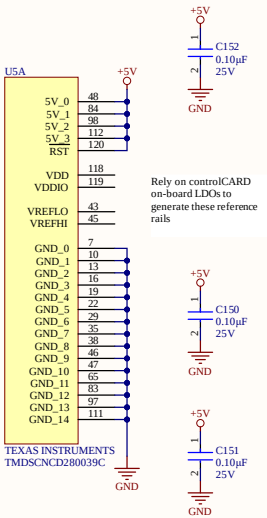


Vf = 3.3V
I = (12V-3.3V) / 498ohm = 17mA
P = 0.017^2 / 249ohm = 72mW

Wolfspeed				[No Variations]
Title: Power Stage - 25kW WolfPACK FM3 Six-Pack Inv.				
Drawing No: CRD25DA12N-FMC				
Date: 09/2024	Size: B	Revision: 2.0	Sheet: 2 of 9	

CONTROLLER

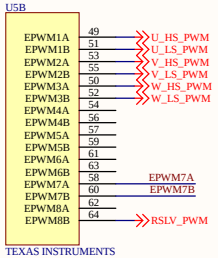
POWER



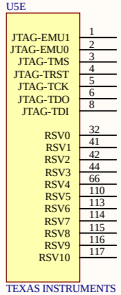
Rely on controlCARD on-board LDOs to generate these reference rails

CONNECTOR: SAMTEC HSEC8-160-01-L-DV-A-BL

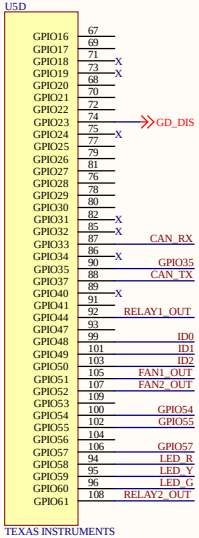
PWM



OTHER

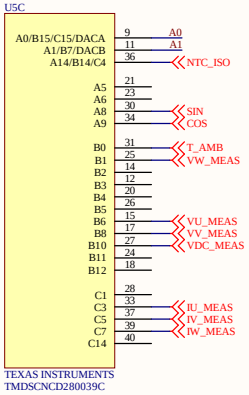


GPIO

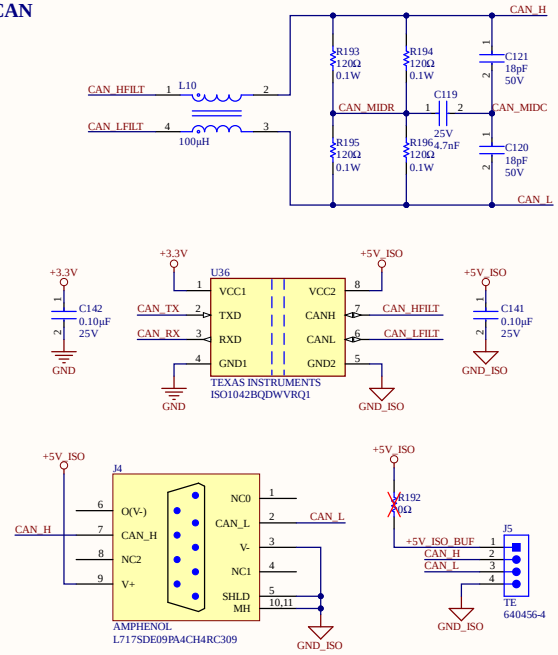


Signals labeled with "X" are preferred not to use due to pre-assigned functionality on the controller

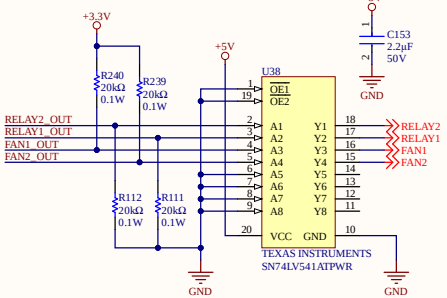
ANALOG



CAN

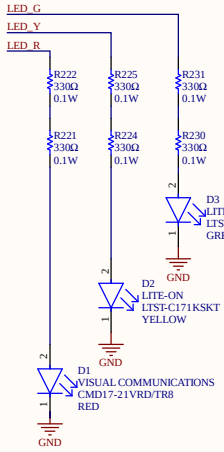


MOSFET CONTROL BUFFER

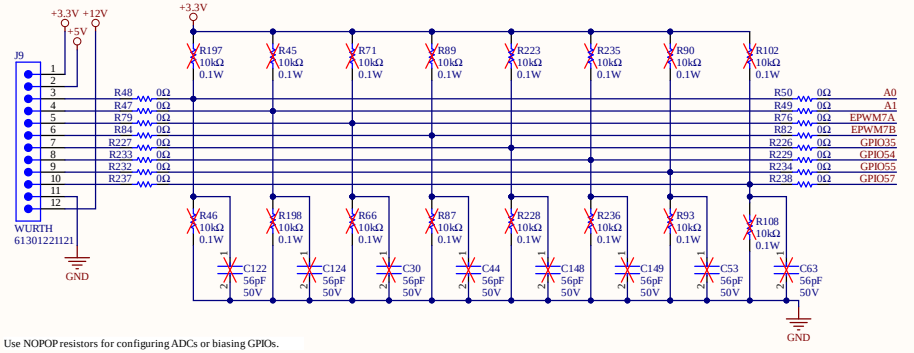


Fans default ON. Relays default OFF.

PROGRAMMABLE LEDS

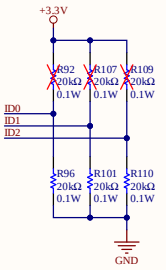


SPARE INPUTS/OUTPUTS



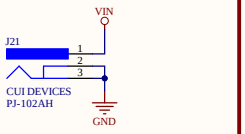
Use NOPOP resistors for configuring ADCs or biasing GPIOs.

IDENTIFICATION



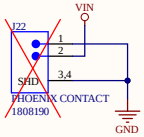
Wolfspeed			[No Variations]
Title: Controller - 25kW WolfPACK FM3 Six-Pack Inverter			
Drawing No: CRD25DA12N-FMC			
Date: 09/2024	Size: B	Revision: 2.0	Sheet: 3 of 9

INPUT AUX POWER



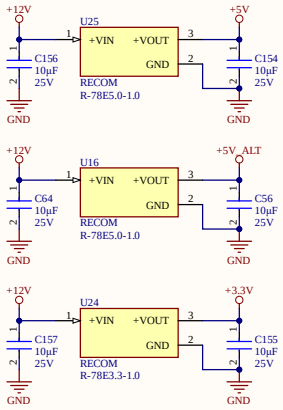
MATING: CUI DEVICES PP3-002A

ALT. AUX POWER

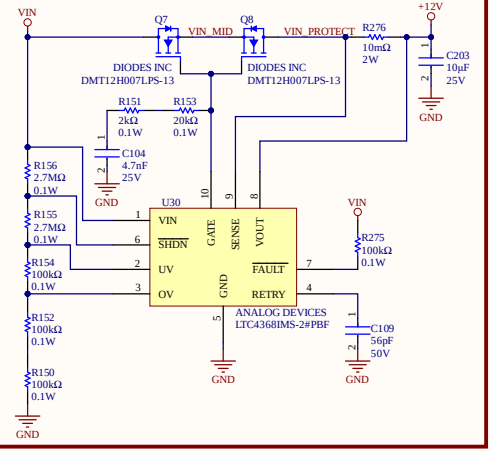


MATING: PHOENIX CONTACT 1808190
Use for receiving power from attachment board

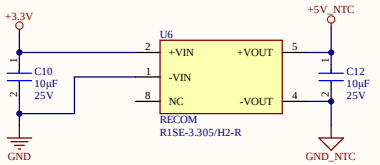
+3.3V AND +5V RAILS



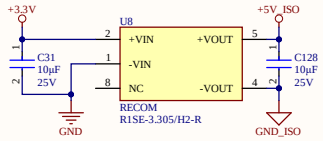
INPUT POWER CONDITIONING



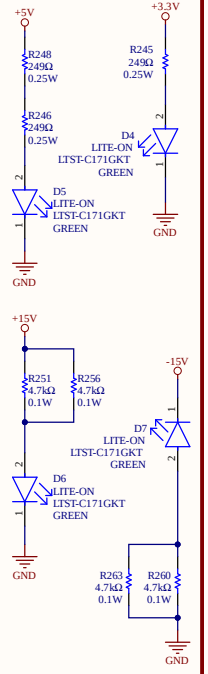
NTC ISOLATED +5V RAIL



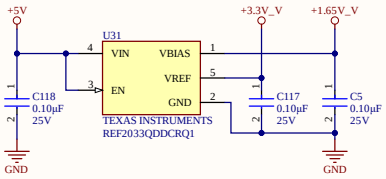
CAN ISOLATED +5V RAIL



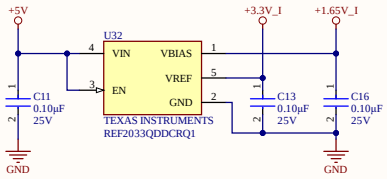
STATUS LEDS



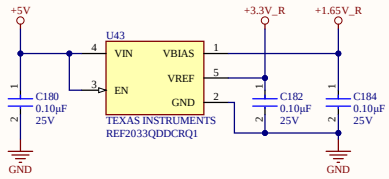
VOLTAGE REFERENCE RAILS



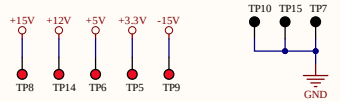
CURRENT REFERENCE RAILS



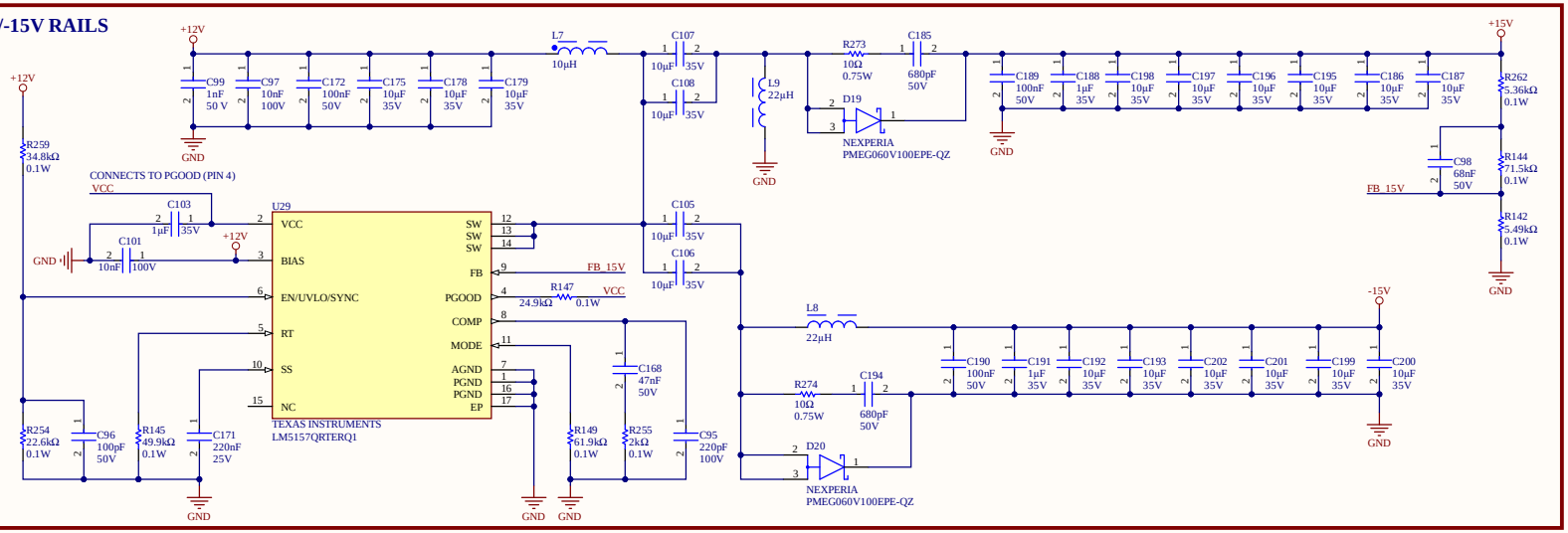
RESOLVER REFERENCE RAILS



TEST POINTS



+/-15V RAILS

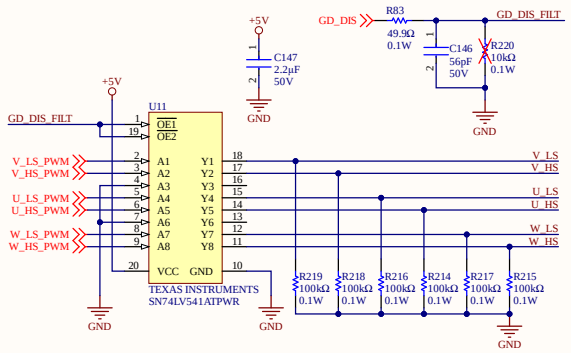


Wolfspeed

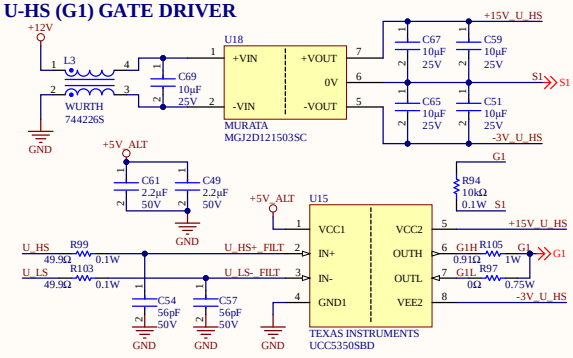
[No Variations]

Title:	Auxiliary Power - 25kW WolfPACK FM3 Six-Pack Inv.
Drawing No:	CRD25DA12N-FMC
Date: 09/2024	Size: B / Revision: 2.0 / Sheet: 4 of 9

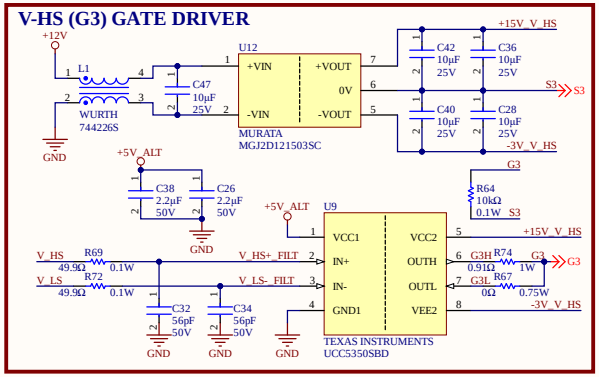
GATE DRIVER BUFFER



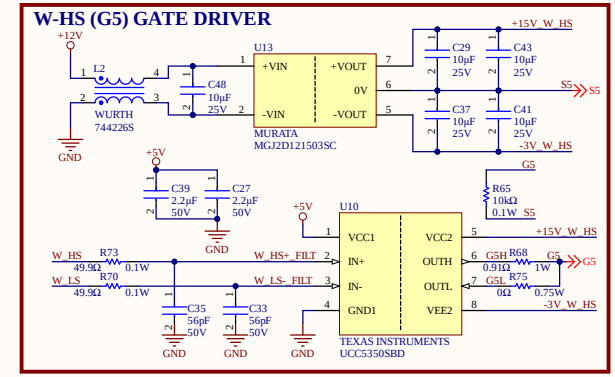
U-HS (G1) GATE DRIVER



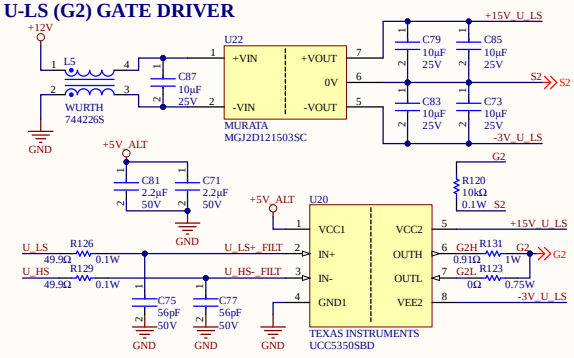
V-HS (G3) GATE DRIVER



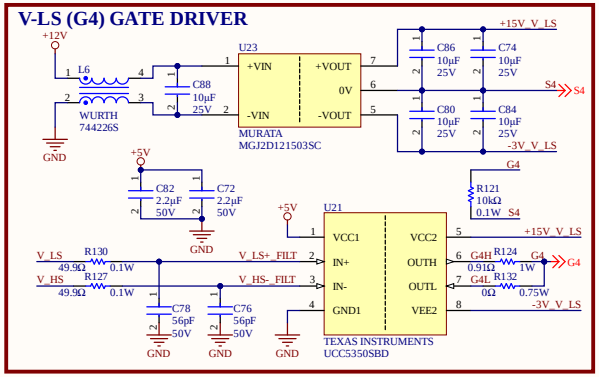
W-HS (G5) GATE DRIVER



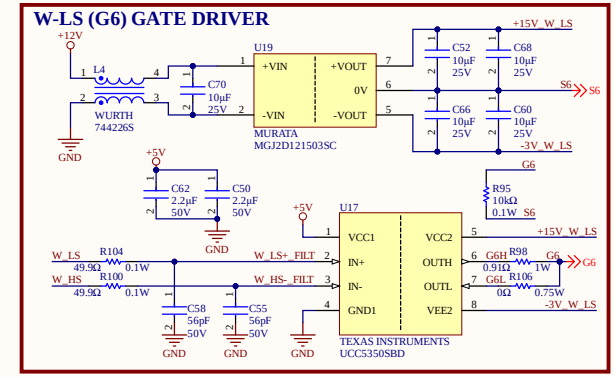
U-LS (G2) GATE DRIVER



V-LS (G4) GATE DRIVER



W-LS (G6) GATE DRIVER

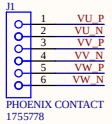


Wolfspeed

[No Variations]

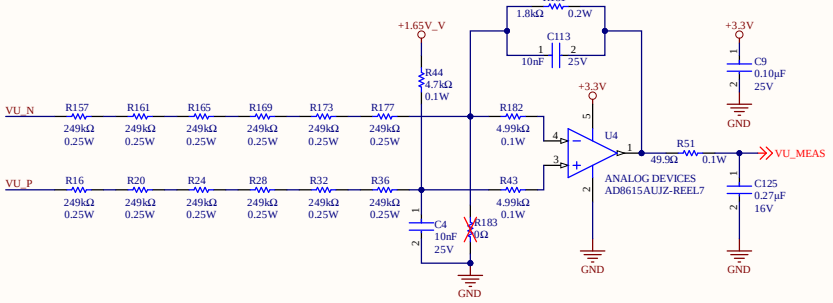
Title: Gate Drivers - 25kW WolfPACK FM3 Six-Pack Inv.				
Drawing No: CRD25DA12N-FMC				
Date: 09/2024	Size: B	Revision: 2.0	Sheet: 5 of 9	

AC VOLTAGE FEEDBACK

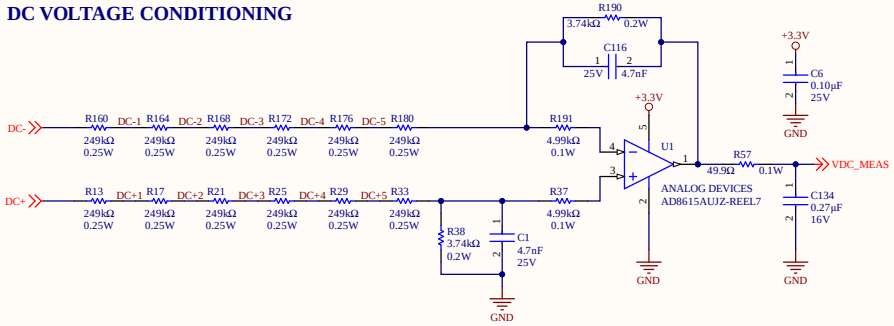


Mating Connectors:
- Connector with Wires Parallel to the PCB: Phoenix Contact 1792799
- Connector with Wires Perpendicular to the PCB: Phoenix Contact 1757051

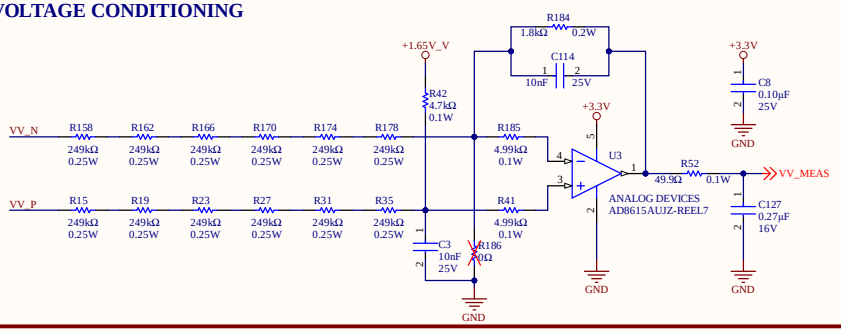
U VOLTAGE CONDITIONING



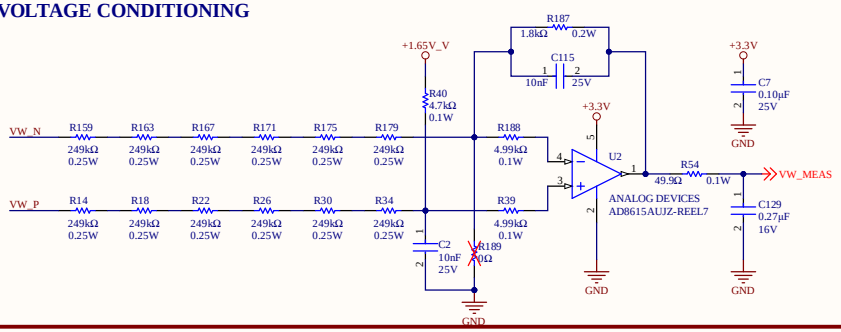
DC VOLTAGE CONDITIONING



V VOLTAGE CONDITIONING



W VOLTAGE CONDITIONING

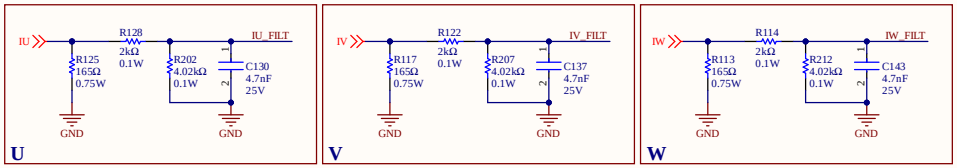


NOPOP0Ω used for Line-to-Neutral measurements referenced to ground.

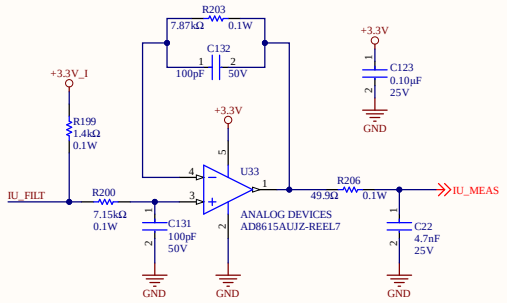
Wolfspeed® [No Variations]

Title:	Voltage Sense - 25kW WolfPACK FM3 Six-Pack Inv.
Drawing No:	CRD25DA12N-FMC
Date: 09/2024	Size: B Revision: 2.0 Sheet: 6 of 9

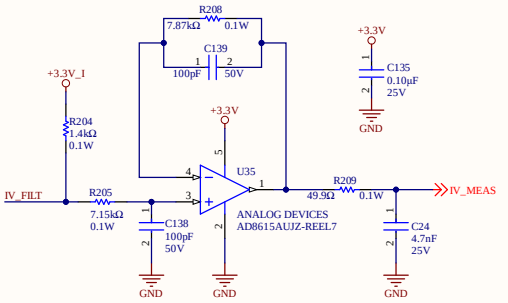
I-TO-V CONVERSION



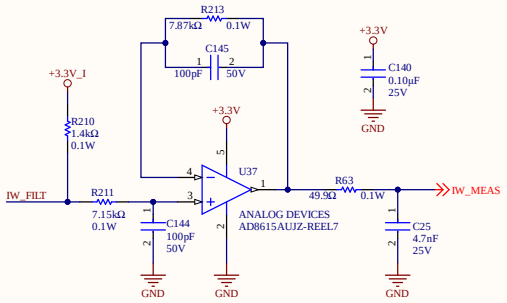
U CURRENT CONDITIONING



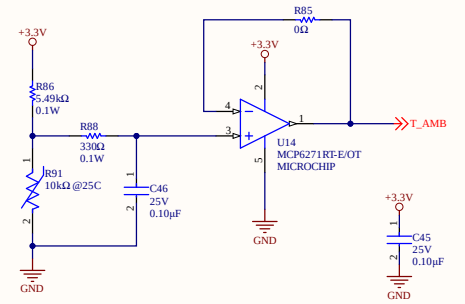
V CURRENT CONDITIONING



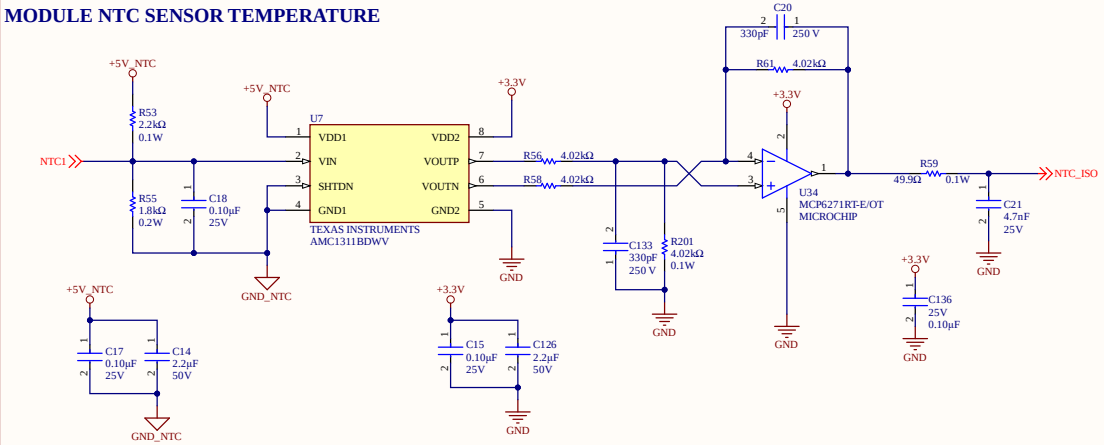
W CURRENT CONDITIONING



AMBIENT TEMPERATURE

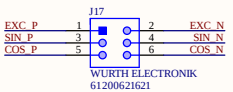


MODULE NTC SENSOR TEMPERATURE

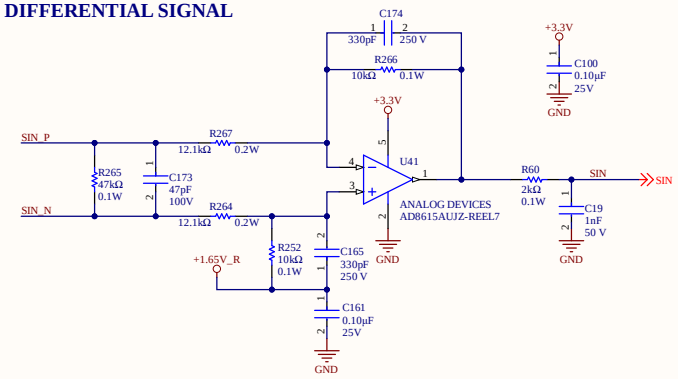


Wolfspeed				[No Variations]
Title: Current/Temp. - 25kW WolfPACK FM3 Six-Pack Inv.				
Drawing No: CRD25DA12N-FMC				
Date: 09/2024	Size: B	Revision: 2.0	Sheet: 7 of 9	

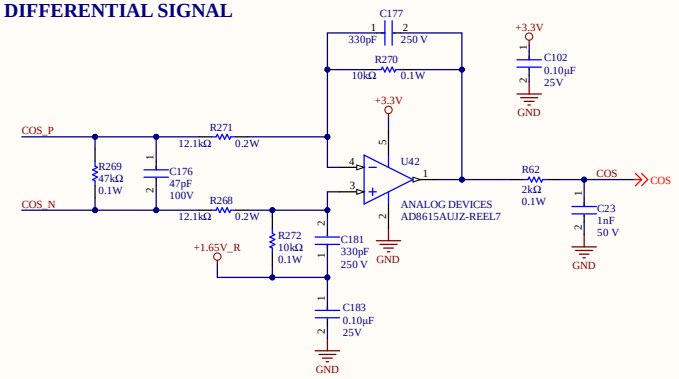
RESOLVER CONNECTOR



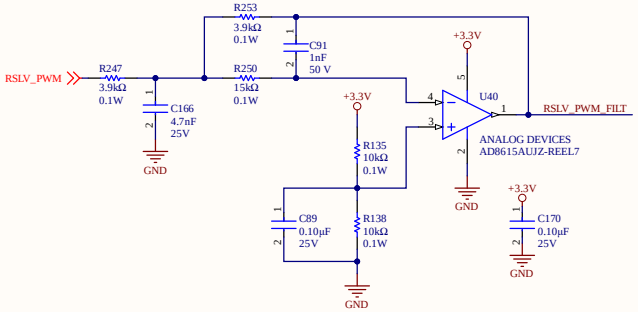
SINE DIFFERENTIAL SIGNAL



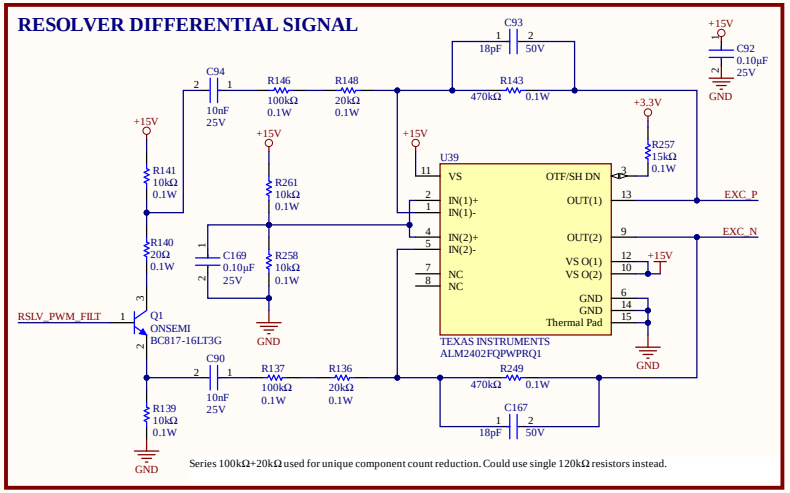
COSINE DIFFERENTIAL SIGNAL



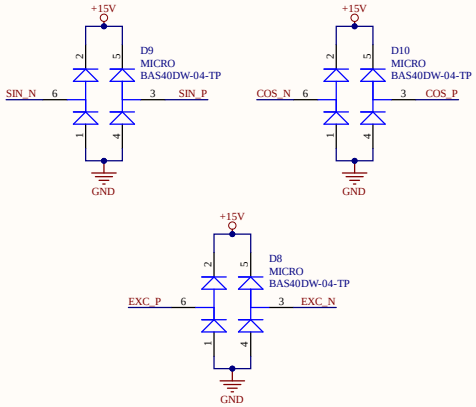
RESOLVER CONDITIONING



RESOLVER DIFFERENTIAL SIGNAL



PROTECTION



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[No Variations]

Title:	Resolver - 25kW WolfPACK FM3 Six-Pack Inverter
Drawing No:	CRD25DA12N-FMC
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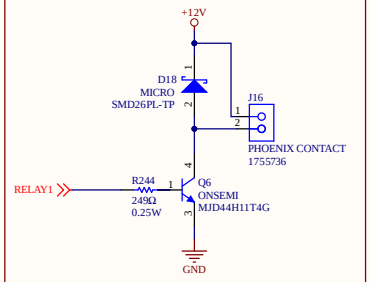
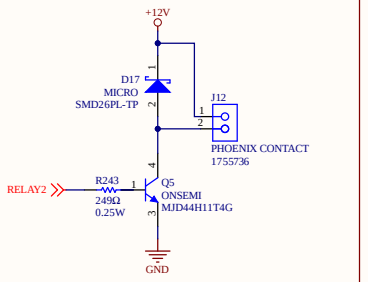
EXTERNAL RELAY CONTROL

RELAY #1



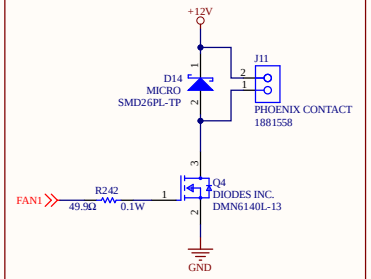
RELAY #2

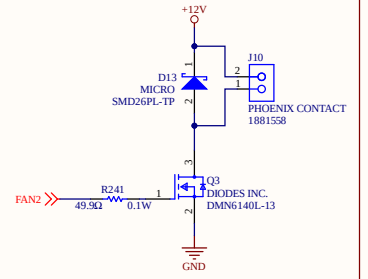


Mating Connectors:
- Connector with Wires Parallel to the PCB: Phoenix Contact 1792757
- Connector with Wires Perpendicular to the PCB: Phoenix Contact 1754449

EXTERNAL FAN POWER

RELAY #1





Mating Connectors: Phoenix Contact 1881325

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[No Variations]

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