

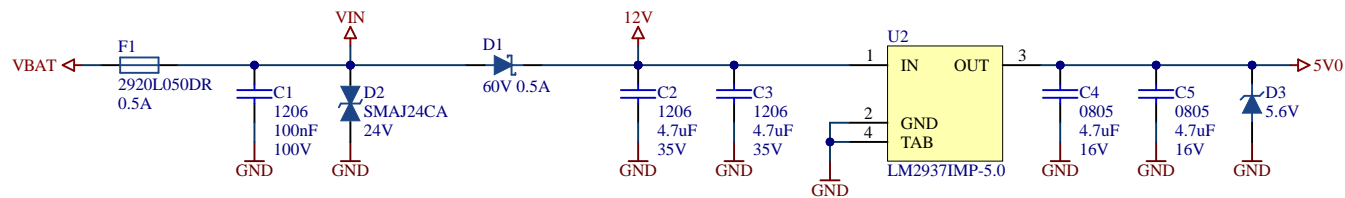
MicroRally

# Isolator Controller

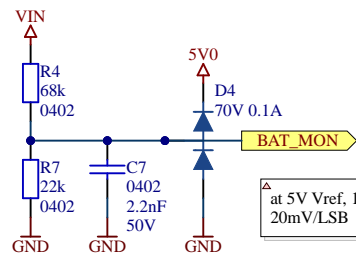
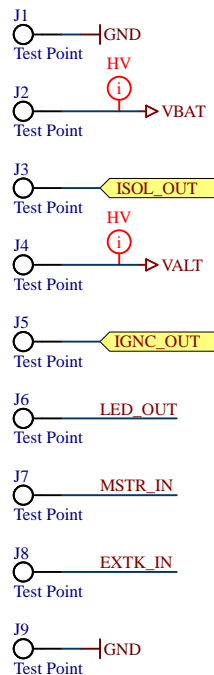
Revision 4

Battery isolator relay controller

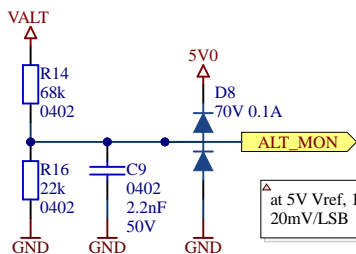
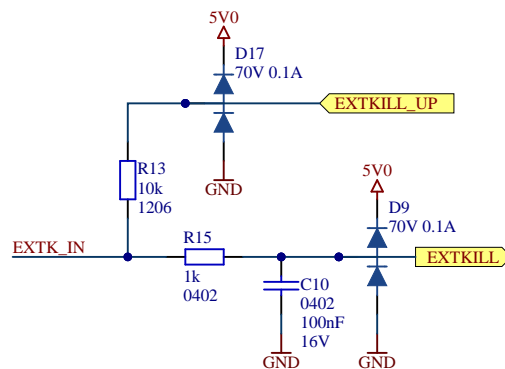
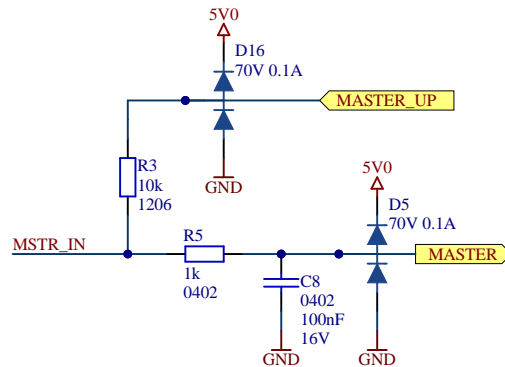
Title: Cover sheet	MicroRally
Project: Isolator Controller	Revision: 4
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Author: Andis Jargans	Date: 15.09.2021
File name: Title.SchDoc	



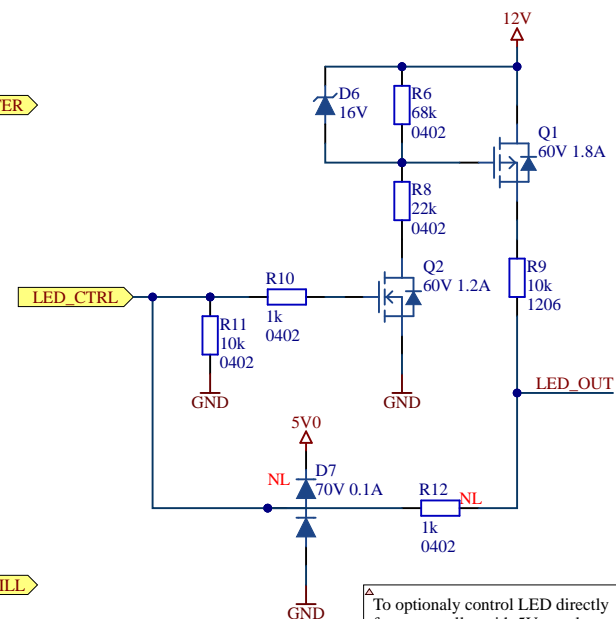
Option to supply outputs by bypassing PTC fuse



at 5V Vref, 10bit 20mV/LSB

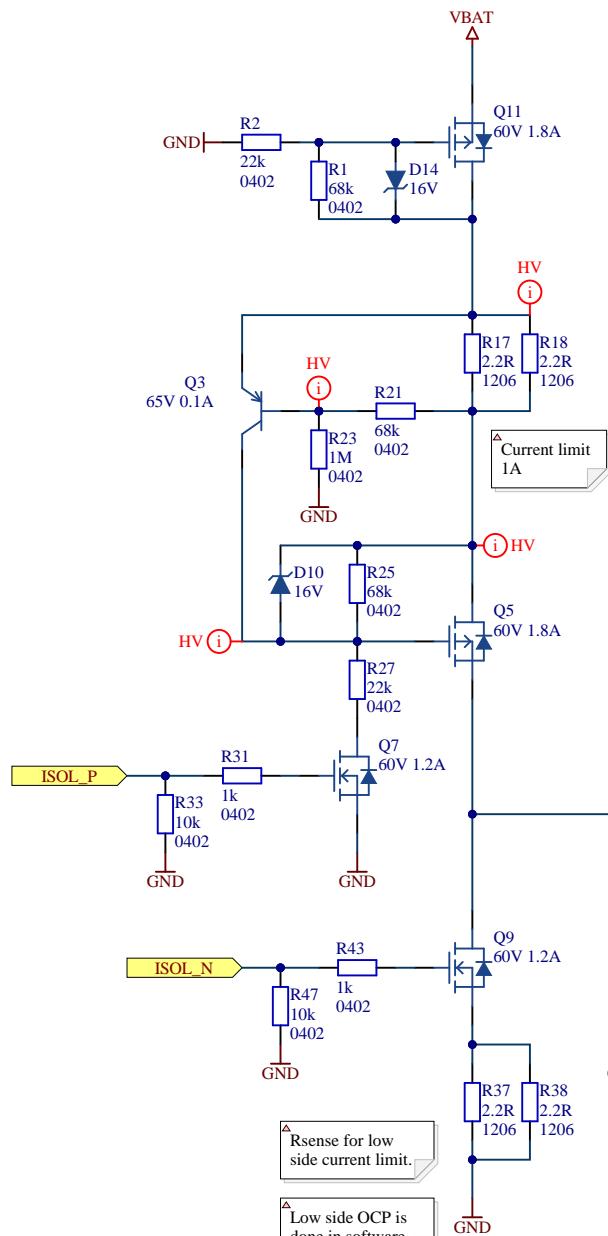


at 5V Vref, 10bit 20mV/LSB



To optionally control LED directly from controller with 5V supply

Title: User Inputs and Outputs	MicroRally
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File name: User_IO.SchDoc	



Monitor output voltage to protect high side mosfet in case of overcurrent. PNP doesn't fully turn off P-MOSFET, but just limits voltage drop across sense resistors to 600mV. When that happens P-MOSFET will enter linear region and generate a lot of heat. It can't be sustained for extended periods of time that is why, output voltage must be monitored and if output drop is too large, then it must be turned off !

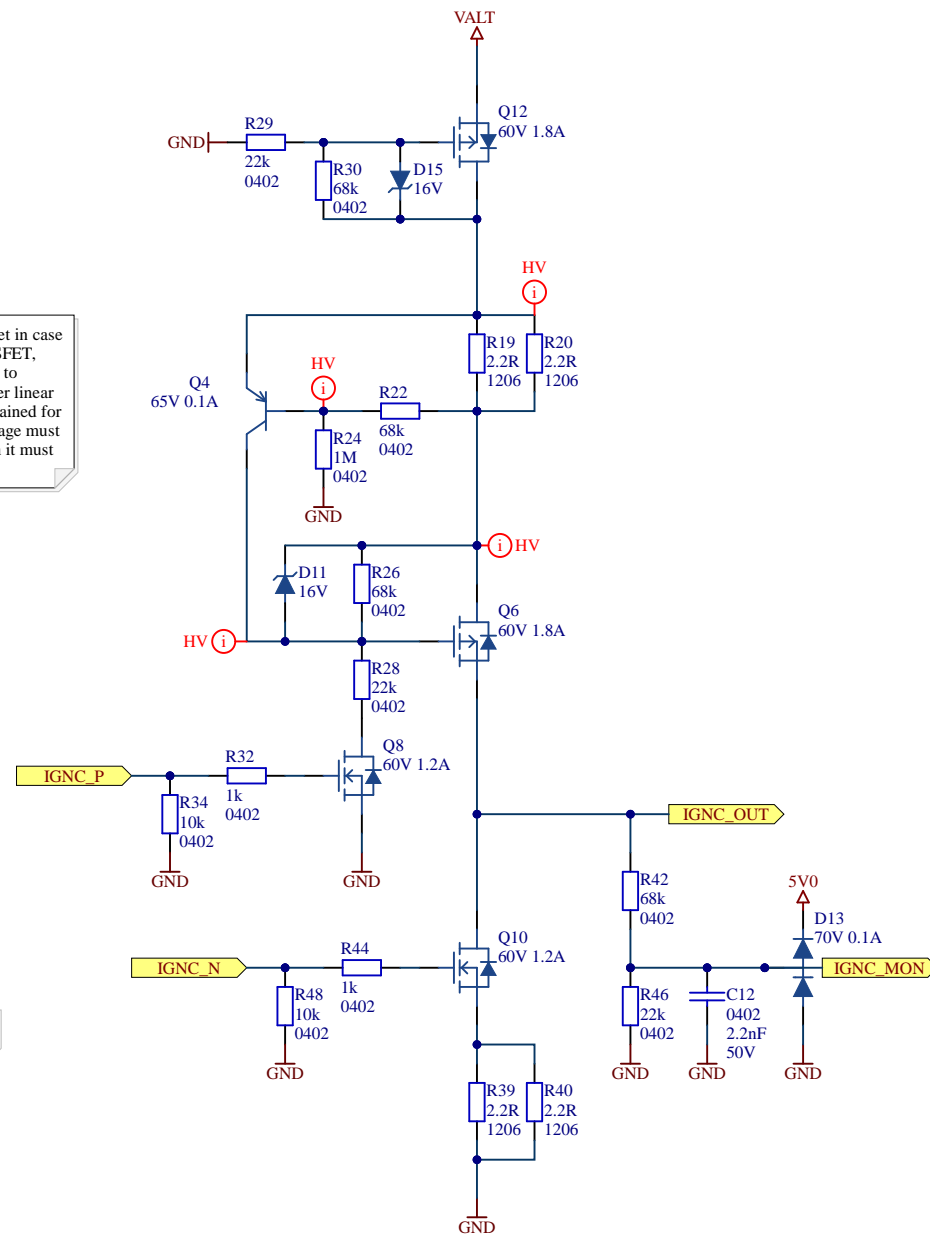
Optional pull-up

12  
0V 0.1A

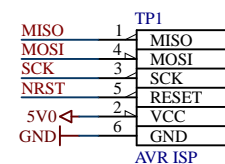
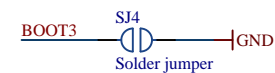
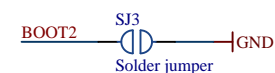
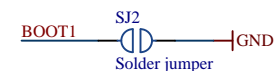
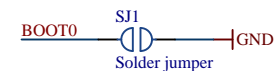
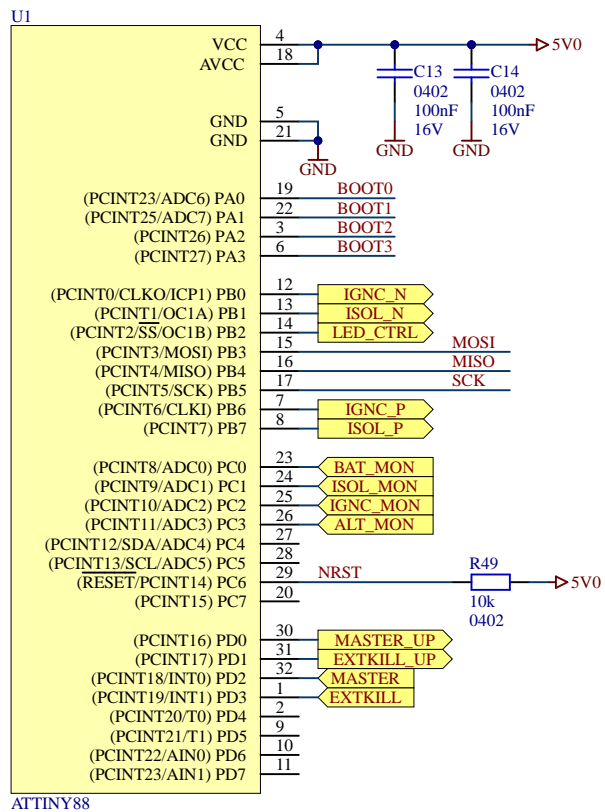
at 5V Vref, 10bit  
20mV/LSB

▲ Rsense for low side current limit.

▲ Low side OCP is done in software.



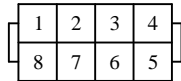
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### Panel mount connector

Connector front view



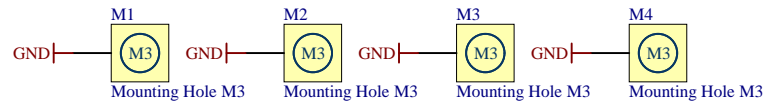
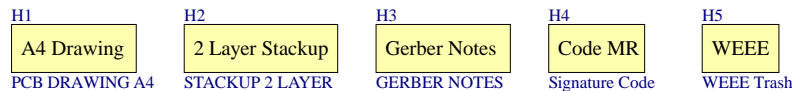
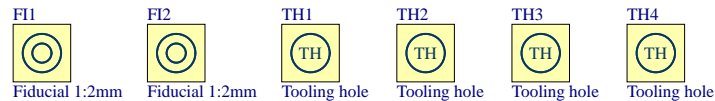
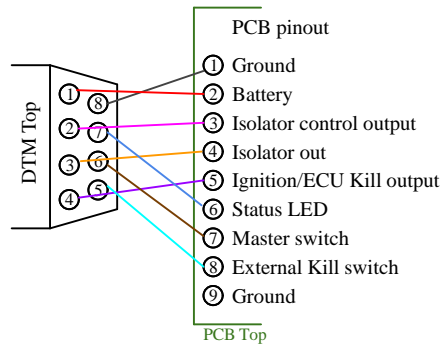
DTM connector pinout:

- 1 - Battery
- 2 - Isolator control
- 3 - Isolator out
- 4 - Ignition / ECU Kill control
- 5 - External Kill switch
- 6 - Master switch
- 7 - Status LED
- 8 - Ground

### Input and output signals

#	NET	DESCRIPTION
1	GND	Power ground. Connect to chasis ground or battery.
2	VBAT	Battery power input. Connect to battery positive terminal. External fuse is recommended. Power controller logic and isolotr output.
3	ISOL_OUT	Isolator control output.
4	VALT	Isolator output monitor. To measure alternator voltage and detect its shutdown, and to supply ignition control output.
5	IGNC_OUT	Ignition control output. High side is supplied from VALT input.
6	LED_OUT	LED indicator output. Active high. Can be either 12V or 5V. Has built-in resistor, so any generic LED can be used.
7	MSTR_IN	External kill button input. Connect to a latching switch that connects to chassis ground.
8	EXTK_IN	External kill button input. Connect to a momentary switch that connects to chassis ground.
9	GND	Power ground. Connect either one of GND to chassis ground. One option can be dedicated to user switches and LED.

### Internal wire connections



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	Revision history				
	Revision	Date	Fixed issue	Changes	
	r1	2020-07-21		Initial design.	
A	r2	2021-04-01		Bootstrap resistors changed to sloder jumpers.	A
			Cleaner routing.	U1 ISOL_MON and IGNC_MON pins swapped.	
			Option to bypass fuse to VIN supply.	Added R42, R43.	
B	r3	2021-06-01	Isolator and Ignition control outputs are not reverse polarity protected.	Added Ideal diodes (P-ch mosfets) in inputs.	B
			Ignition output relay in open-drain configuration could be activated in overvoltage scenario.	Ignition output stage voltage source changed to seperate source - isolator output supply.	
			Monitoring isolator ouput voltage could be useful.	Added isoaltor output voltage monitoring curcuit.	
			Add option to have combined master switch and LED indicator pin.	Added software controlable pull-up resistors for master switch and kill signals. LED cab be supplied through pull-up by changing pull-up to smaller value.	
			No fixed sense resistors for low side OCP.	Added low side sense resistors for easier software controlled low side OCP.	
			New layout and added functionality.	Changed controller pinout. NOT reverse compatable with older SW versions !	
			Increase distance between pads.	Changed PCB "connector" from 8pin 2.54mm pitch to 9 custom pads. Changed pinout.	
			Output combined current can exceed PTC fuse current.	Push-pull outputs changed to be supplied directly from supply pins. Removed option to supply through PTC fuse.	
	r4	2021-09-15	OCP detection isn't fast enough. LPF created form voltage dividers has too much capacitance.	Reduced voltage dividers capacitance to 2.2nF, creating step response in about 1ms.	
			MOSFET gates sometimes get damaged during short circuit.	Lowered zener diode voltage to 16V.	
			Bootstrap solder-jumper are too hard to solder.	Changed solder jumper pad shape.	
C					C
D					D
				<div><div>Title: Revision history</div><div>Project: Isolator Controller</div><div>Size: A4</div><div>Author: Andis Jargans</div><div>File name: History.SchDoc</div></div> <div><div>Revision history</div><div>Revision: 4</div><div>Page 6 of 6</div><div>Date: 15.09.2021</div></div> <div>MicroRally</div>	
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