Motor RPM controller — Phase angle based

mains

J1 L_supply
F1 T 6 A / 250 V
K1 shutoff
TIC236N D7
R9 0.1 / 5 W
motor / load
J4 L_motor

R7 10 k
R8 47
trig
shunt_hi_raw
shunt_lo_raw
R10 100 / 2 W

TODO: shutoff relay
TODO REMOVE R7?

C1 47 nF / 400 V / X2

J2 N_supply
vsense_raw
C3 47 nF / 400 V / X2
snubber
J3 N_motor

power supply

L
N
R12 100 / 0.5 W
C6 680 nF / 400 V
D10 5.6 V
C8 470 µF 16 V
C9 470 µF 16 V
+5V
R13 220 k
R14 220 k
D11 BAT85
GND

speedometer signal filter

RV1 5 k
rpm_generator
speedo
D8 BAT85
D9 4.7 V
C7 470 nF
a
b
File: rpm_generator.kicad_sch
GND
GND
TODO: use a differential amplifier?

R1 470 k
R4 470 k
D1 1N4007
+5V
vsense_raw
vsense
1N4007 D2
GND

R2 470 k
R5 470 k
D3 1N4007
+5V
shunt_hi_raw
shunt_hi
1N4007 D4
GND

R3 470 k
R6 470 k
D5 1N4007
+5V
shunt_lo_raw
shunt_lo
1N4007 D6
GND

GND
C4 22 pF
Y1 16 MHz
C5 22 pF

ISP
MOSI
MISO
SCK
RST
+5V VTG
GND GND
File: isp.kicad_sch

RPM setpoint
RV2 100 k
+5V
setpoint
GND

WARNING:
Pot spindles reaching touchable surfaces
must be non-metal
and must be capable of insulating 400 V.

speedometer reference
RV3 500 k
+5V
speedoref
GND

U1 ATtiny26-16P

PA0 20
PA1 19
PA2 18
AREF/PA3 17
PA4 16
PA5 13
PA6 12
PA7 11
PB0 1
PB1 2
PB2 3
PB3 7
XTAL1/PB4 4
XTAL2/PB5 8
RESET/PB7 10
PB6 9
AVCC 15
VCC 5
GND 6

setpoint
vsense
shunt_lo
shunt_hi
speedo
speedoref
trig
debug
R11 10 k
+5V
+5V
GND
C2 100 nF
GND

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Sheet: /
File: phaseanglecontrol.kicad_sch
Title: Motor RPM controller — Phase angle based
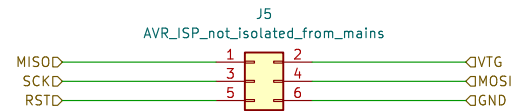Size: A4
Date: 2024-08-21
Rev: 1.0
KiCad E.D.A. 9.0.3
Id: 1/3

WARNING WARNING WARNING
This circuit is **NOT** electrically isolated from mains L and N!
NEVER connect an ISP programmer/computer directly!
WARNING WARNING WARNING

J5
AVR_ISP_not_isolated_from_mains

MISO	1	2	VTG
SCK	3	4	MOSI
RST	5	6	GND

4—pole rotating magnet
induces current into L

L1
10 mH

a

b

Title: RPM speedometer signal generator

Size: A4 | Date: 2024—08—21 | Rev: 1.0
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