WCS1700 Hall Effect Sensor Calibration Monitoring

+12V
U1
MAX6107
C1
0.1uF 25V
C3
1uF 25V
R3
2.2K 0.1%
R4
2.2K 0.1%
+5V
C8
1uF 25V
GND
U4
MCP3208
Hall Effect Sensor Arrangement
HEF_1D
HEF_2D
HEF_3D
HEF_4D
HEF_5D
HEF_6D
File: HEf_Arrangement.kicad_sch
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
Vref
Vdd
ADC
MUX
CNTRL
CLK
Dout
Din
CS/SHDN
AGND
DGND
SPI_5V.SCLK
SPI_5V.MISO
SPI_5V.MOSI
SPI_5V.CS_WCS
R8
4.7K
+3V3
SPI Logic Level Shifter
C10
0.1uF 25V
C11
0.1uF 25V
U6
TXB0106PW
VCCB
VCCA
OE
B1
B2
B3
B4
B5
B6
A1
A2
A3
A4
A5
A6
SPI_5V.SCLK
SPI_5V.MISO
SPI_5V.MOSI
SPI_5V.CS_WCS
SPI_5V.CS_TAM
SPI_3V3.SCLK
SPI_3V3.MISO
SPI_3V3.MOSI
SPI_3V3.CS_WCS
SPI_3V3.CS_TAM
R14
4.7K
R15
4.7K
SPI_3V3{MOSI MISO SCLK CS_WCS CS_TAM}
SPI_5V{MOSI MISO SCLK CS_WCS CS_TAM}
For best results, solder JP1 and cut the trace connecting VIN to VUSB on the Teensy
U13
Teensy4.1
J4
Conn_01x03_Pin
SW1
1825910-6
CAPTURE_BUTTON
R18
4.7K
FORWARD
REVERSE
LOAD_1
LOAD_2
LOAD_3
VUSB
VIN
(3.6v to 5.5v)
3V3
(250mA max)
GND
0_RX1_CRX2_CS1
1_TX1_CTX2_MISO1
2_OUT2
3_LRCLK2
4_BCLK2
5_IN2
6_OUT1D
7_RX2_OUT1A
8_TX2_IN1
9_OUT1C
10_CS_MQSR
11_MOSI_CTX1
12_MISO_MQSL
13_SCK_LED
14_A0_TX3_SPDIF_OUT
15_A1_RX3_SPDIF_IN
16_A2_RX4_SCL1
17_A3_TX4_SDA1
18_A4_SDA
19_A5_SCL
20_A6_TX5_LRCLK1
21_A7_RX5_BCLK1
22_A8_CTX1
23_A9_CRX1_MCLK1
24_A10_TX6_SCL2
25_A11_RX6_SDA2
26_A12_MOSI1
27_A13_SCK1
28_RX7
29_TX7
30_CRX3
31_CTX3
32_OUT1B
33_MCLK2
34_RX8
35_TX8
36_CS
37_CS
38_CS1_IN1
39_MISO1_OUT1A
40_A16
41_A17
D−
D+
USB Device
USB Host
Ethernet
R−
T+
T−
LED
R+
VBAT
PROGRAM
ON_OFF
Tamura L01Z Comparison Sensor Monitoring
U2
MAX6107
C2
0.1uF 25V
C4
1uF 25V
R5
2.2K 0.1%
R6
2.2K 0.1%
C9
1uF 25V
U5
MCP3208
J2
560020-0330
MP
JP1
JP2
R25
10K
R9
4.7K
Plug routes to external Tamura L01Z Hall Effect sensor for use monitoring the current source during the test
Test Current Direction Control
U9
TLP241A(TP1,F
R12
500R
U7
R10
500R
U10
R13
500R
U8
R11
500R
J3
282834-8
Q1
AO3422
Q2
AO3422
REV_CHECK
FWD_CHECK
R16
4.7K
R17
4.7K
Contactor Action Protection Logic
C12
0.1uF 25V
C13
0.1uF 25V
U11C
SN74AUC2G08DCUR
U12C
74LVC2G240DC,125
U11A
U12A
U11B
U12B
Load Resistor Contact Control
U14
U15
U16
R22
500R
R23
500R
R24
500R
Q3
AO3422
Q4
AO3422
Q5
AO3422
R19
4.7K
R20
4.7K
R21
4.7K
J5
282834-6
LED Power Rail Indicators
R1
4.7K
R2
4.7K
R7
4.7K
D1
150060VS75000
D3
150060VS75000
D4
150060VS75000
5V LDO
J1
PJ-002B
TH1
0ZCJ0050AF2E
D2
B0520LW-7-F
JP3
U3
LT1962EMS8-5#TRPBF
IN
OUT
SENSE
SHDN
BYP
C5
1uF 25V
C6
0.01uF 10V
C7
10uF 10V
PWR_FLAG
Revision Notes
File: revnotes.kicad_sch
H1 MountingHole
H2 MountingHole
H3 MountingHole
H4 MountingHole

(PENDING REVIEW)
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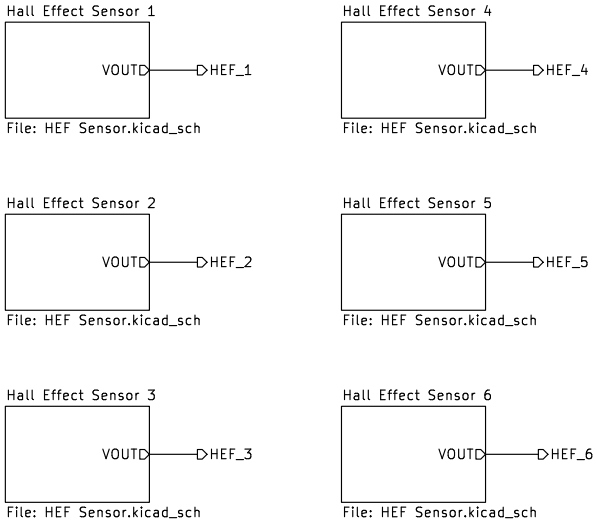
Sheet: /
File: WCS1700_Calibrator.kicad_sch

Title: WCS1700 Calibrator

Size: A3	Date: 2023-08-08	Rev: 2.0
KiCad E.D.A. kicad 7.0.6		Id: 1/9



(PENDING REVIEW)
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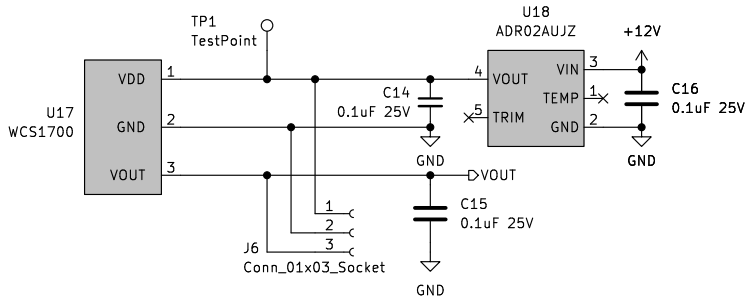
Sheet: /Hall Effect Sensor Arrangement/
File: HEf_Arrangement.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 2/9



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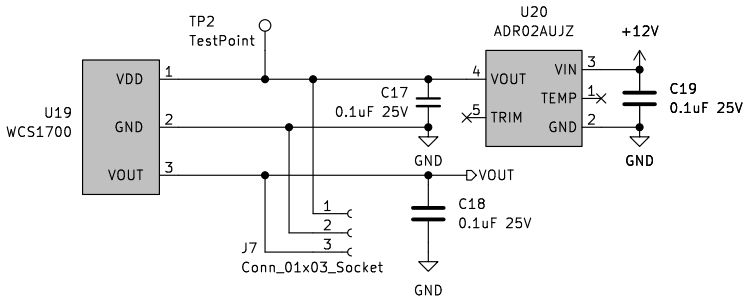
Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 2/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 3/9



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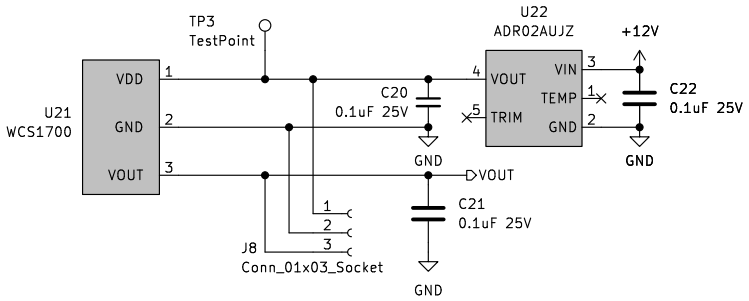
Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 1/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 4/9



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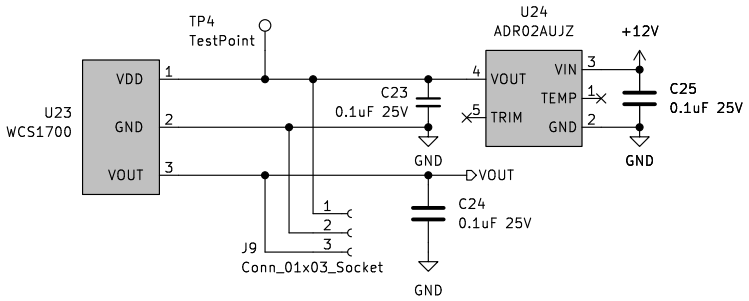
Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 5/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 5/9



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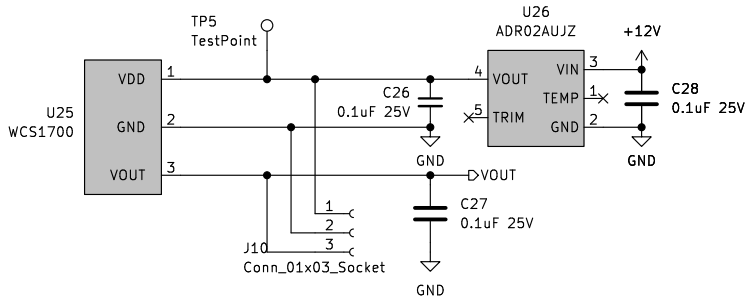
Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 3/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 6/9



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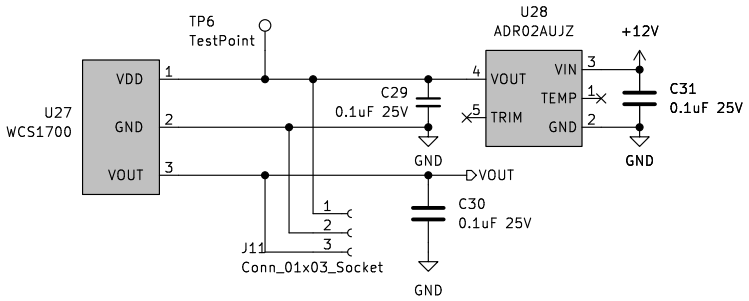
Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 6/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 7/9



(PENDING REVIEW)
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Sheet: /Hall Effect Sensor Arrangement/Hall Effect Sensor 4/
File: HEF Sensor.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 8/9

REVISION NOTES

2.0:
- Schematic rework for clarity and added revision notes.
- Changed +5V reference for hall effect sensors
- Added LED indicators and name/date placard in silkscreen
- Reduced the number of hall effect sensors supported per board
- Set up autocalibration resistors for MCP3208 ADC
- Switched to more convenient power connector
- Added second MCP3208 sensor to track a seperate Tamura L01Z hall effect sensor
- Mass positioning changes for legibility
- Added mounting holes
- Added reverse polarity protection diode on barrel jack power input
- Set up contacter interface for automatic load switching as well as protection logic
- Added input protection diode and PTC for use with +12V barrel jack input
- Switched to six channel level shifter to support second MCP3208 device
- Moved FETs to low side of relays to ensure proper control

1.1: Revised SPI bus layout to correct mistaken pin assignment.

1.0: Initial development.

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Ed Katynski

Sheet: /Revision Notes/
File: revnotes.kicad_sch

Title: WCS1700 Calibrator

Size: A4	Date: 2023-08-08	**Rev: 2.0**
KiCad E.D.A. kicad 7.0.6		Id: 9/9