RS485 / ModbusRTU

RS485
M8 4pole female

+Battery

+3V3

TX485
FC-DA1608BK-470H10

RX485
FC-D1608UGK-520D10

C36
1uF

D4
B5819W_C8598

R67
1K

R66
1K

U8
KY3485LEEN

R37
1K

D10 D11
B5819W_C8598

prot+

TxD_SC
Dir485
RxD_SC

1 RO   VCC 8
2 RE#   B   7
3 DE   A   6
4 DI   GND 5

R30
10K

R38
1K

D19 D18

prot-

B_RS485
A_RS485

e.g.: http://www.amazon.de/dp/B08JV9J36T/

I2C external

IMU
M8 4pole female

+5V   5Vfused

D9   D20
B5819W_C8598

A4/SDA

A5/SCL

D8   D7
B5819W_C8598

CAN & Opto | Wheel Sensor

FC-D1608HOK-600H

U1
+B1357N(B)(TA)-G

D23
B5819W_C8598

CAN
M8 4pole female

R17
1K

OUT1

D5/AuxOut

optional optocoupler output

nAux/0V   Aux/5V   5Vfused

Shield

0V

CAN_PWR
A2541WV-2P

CAN_PWR1
A2541WV-2P

wheel sensor: close jumpers

+3V3

+5V   C42
1uF

TXCAN2

RXCAN2

+5V
D12
ZMM5V6

prot+

R27 R56
10K 1K

U19
TJA1051T/3/1J

D17 D16

CAN_TX

CAN_RX

1 TXD   S   8
2 GND   CANH 7
3 VCC   CANL 6
4 RXD   VIO 5

+3V3

CANH/B
CANL/A

R69
1K
A1/Ch_B
D2/Ch_A

FC-DA1608BK-470H10
FC-D1608UGK-520D10

D15 D14
B5819W_C8598

1K
R71

CAN

C41
100nF

prot-

D13
ZMM5V6

Main connector

Main connector

P1

A5/SCL	1	2	A4/SDA
CANH/B	3	4	CANL/A
A_RS485	5	6	B_RS485
nAux/0V	7	8	5Vfused
WorkSwitch	9	10	SteerSwitch
WAS	11	12	5Vfused
WAS_N	13	14	
Aux/5V	15	16	whatever
+Battery	17	18	
+SupplyOutput'	19	20	-SupplyOutput'
6/2Out	21	22	-SupplyOutput'
MA	23	24	MB

KT-0603R
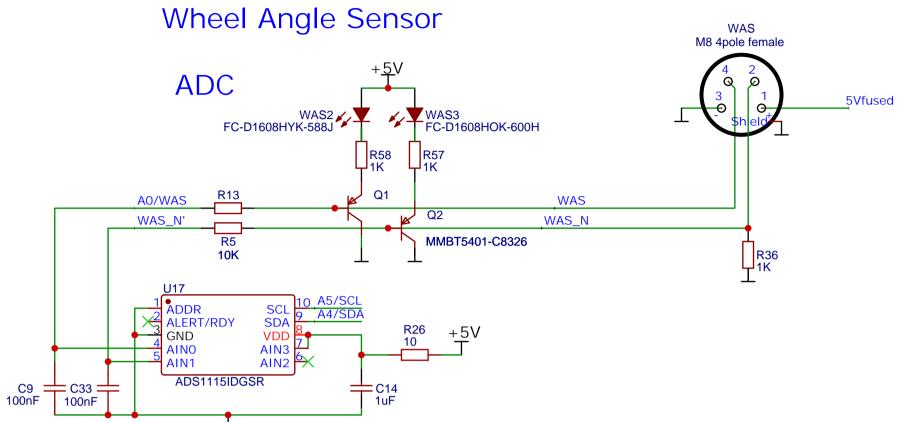BSMD0603-050-6V

R84
10K

+5V

F+5V

F5

S2C-SMT 3.50/24/90LF 3.2SN BK BX

P1: Weidmuller 1289550000 + 1372870000
S2C-SMT 3.50/24/90LF 3.2SN BK BX + B2CF 3.50/24/180LH SN BK BX

Wheel Angle Sensor

WAS
M8 4pole female

5Vfused

ADC

+5V

WAS2
FC-D1608HYK-588J
WAS3
FC-D1608HOK-600H

R58
1K
R57
1K

A0/WAS
R13
Q1
WAS
WAS_N'
R5
10K
Q2
WAS_N
MMBT5401-C8326

R36
1K

U17
ADDR
ALERT/RDY
GND
AIN0
AIN1
SCL
SDA
VDD
AIN3
AIN2
A5/SCL
A4/SDA

R26
10
+5V

C9
100nF
C33
100nF
ADS1115IDGSR
C14
1uF

U300
BNO085

R303
10K
R302
10K
+3V3
C303
100nF

R301
10K
C304
100nF
+3V3

R300
10K

PS0/WAKE
RESV_NC_2
RESV_NC_3
CAP
CLKSEL0
NRST
RESV_NC_4
RESV_NC_5
H_INTN
ENV_SCL

PS1
BOOTN
VDD
GND_1

RESV_NC_1
VDDIO
XIN32
XOUT32/CLKSEL1
GND_2
RESV_NC_9
RESV_NC_8
RESV_NC_7
RESV_NC_6
H_SDA/H_MISO/TX

+3V3
C302
100nF
X300
32.768KHz
C300
22pF
C301
22pF

SDA3.3

ENV_SDA
SA0/H_MOSI
H_CSN
H_SCL/SCK/RX

SCL3.3

R304
10K
R305
10K
+3V3

QWIIC

Sparkfunk part PRT-14417
SMO4B-SRSS-TB(LF)(SN)
QWIIC SMD JST

0V
+3V3

NC2
GND
3.3V
SDA
SCL
NC1
QWIIC1

SDA3.3
SCL3.3

0V
0V

U3
Ardfruit BNO085

Vin
3v3
GND
SCL
SDA
INT
CS
DI
RST
P1
P0
BT

+5V

A5/SCL
A4/SDA

BNO085

IMU

U15
CMPS14

3.3v-5v
SDA/TX
SCL/RX
Mode
Factory Use
GND

+5V

A4/SDA
A5/SCL

Nano

U27
ATMEGA328P-AU

PRGBOOT
A2541WV-7P

+3V3

D13/SCK
D12/MISO
D11/MOSI
D10/nCS
_Reset_Steer

D22
B5819W_C8598

USBoff

C80 1uF
C79 1uF
+3V3

X4 16MHz

C82 22pF
C81 22pF

D3/PWM0 — 1 (PCINT19/OC2B/INT1)PD3
D4/INH — 2 (PCINT20/XCK/T0)PD4
GND — 3
VCC — 4
GND — 5
VCC — 6
— 7 (PCINT6/XTAL1/TOSC1)PB6
— 8 (PCINT7/XTAL2/TOSC2)PB7
D5/AuxOut — 9 (PCINT21/OC0B/T1)PD5
D6/StSw — 10 (PCINT22/OC0A/AIN0)PD6
D7/WkSw — 11 (PCINT23/AIN1)PD7
D8/_Off — 12 (PCINT0/CLKO/ICP1)PB0
D9/PWM1 — 13 (PCINT1/OC1A)PB1
D10/nCS — 14 (PCINT2/SS#/OC1B)PB2
D11/MOSI — 15 (PCINT3/OC2A/MOSI)PB3
D12/MISO — 16 (PCINT4/MISO)PB4

PD2(INT0/PCINT18) — 32 — D2/Ch_A
PD1(TXD/PCINT17) — 31 — D1/TX
PD0(RXD/PCINT16) — 30 — D0/RX
PC6(RESET#/PCINT14) — 29 — _Reset_Steer
PC5(ADC5/SCL/PCINT13) — 28 — SCL3.3
PC4(ADC4/SDA/PCINT12) — 27 — SDA3.3
PC3(ADC3/PCINT11) — 26 — A3
PC2(ADC2/PCINT10) — 25 — A2/whatever
PC1(ADC1/PCINT9) — 24 — A1/Ch_B
PC0(ADC0/PCINT8) — 23 — A0/Current
ADC7 — 22 — A7/WorkAnalog
GND — 21
AVCC — 20 — AVCC
AREF — 19 — A6/SafeSense
ADC6 — 18 — AVCC
PB5(SCK/PCINT5) — 17 — D13/SCK

+3V3

R103 1K
R101 1K

TXD3
FC-DA1608BK-470H10
RXD3
FC-D1608UGK-520D10

R105 1K
R104

TxD_Steer
RxD_Steer

PT1 Testpoint
1

+3V3
R98 10
C78 100nF

Protected General Propose Inputs

+3V3

R39 1K

WORKINP
FC-D1608HOK-600H
D7/WkSw

WorkSwitch

R6 5.1K
R15 1K

WorkAnalog

Q3 2N7002

R9 1K
C1 100nF

Annotation: ISO 11786, pin 5 is inverted = active-low

INPUTS
+5V

WorkSwitch

SteerSwitch

whatever

R7
R16
R33
1K

M12A 5pole female
Shield

+5V +5V

D5
SMCJ5.0A
R1 22
D2
SS34_C8678
C2 100uF

+3V3

R34 1K

STEERINP
19-213/Y2C-CQ2R2L/3T(CY)
D6/StSw

SteerSwitch

R23 1K
Q5 2N7002

R10 10K
C5 100nF

LED colors:
white: power
green/blue: serial data RxD/TxD
yellow/orange: I/O
red: error

LED colors:
white: power
green/blue: serial data RxD/TxD
yellow/orange: I/O
red: error

to Section Control board

+5V

R89
1K
R106
1K

RXD2
FC-D1608UGK-520D10
FC-DA1608BK-470H10
TXD2

R108
1K

+5V H10
A2541WV-2X4P

1	2	WorkSwitch
3	4	SteerSwitch
5	6	DTR_SC
7	8	RTS_SC

_TxD_SC
_RxD_SC
R107

GPIO, e. g. Serial

USB A/F 90° Outside the buckle straight foot

+5V USB2

VCC
D-
D+
GND

+5V

U23 CH340B

C57
1uF
C21
R4
10K

1uF

GND	VCC	16
TXD	TNOW	15	Dir485
RXD	RTS#	14	RTS_SC
V3	DTR#	13	DTR_SC
UD+	DCD#	12	R42
UD-	RI#	11	1K
RST#	DSR#	10
NC.	CTS#	9

_RxD_SC
_TxD_SC

USB_SC
_USBoff2
A2541WV-2P

4 Port USB Hub

FC-D1608UGK-520D10 ACT
FC-DA1608BK-470H10 PORT
FC-D1608UGK-520D10 SCTRL
FC-DA1608BK-470H10 GNSS
FC-D1608UGK-520D10 STEER

U18 FE1.1S

R80 10K
R75 1K
R77 1K
R76 1K

X2
12MHz

C22   C23
33pF 33pF

28	VD18	VSS	1
27	TESTJ	XOUT	2
26	OVCJ	XIN	3
25	PWRJ	DM4	4	USB_Ext_N
24	LED2	DP4	5	USB_Ext_P
23	LED1	DM3	6	USB_SC_N
22	DRV	DP3	7	USB_SC_P
21	VD33_O	DM2	8	USB_RTK_N
20	VDD5	DP2	9	USB_RTK_P
19	BUSJ	DM1	10	USB_Steer_N
18	VBUSM	DP1	11	USB_Steer_P
17	XRSTJ	VD18_O	12
16	DPU	VD33	13
15	DMU	REXT	14

USB-C PC/Tablet

USBC1
TYPE-C-31-M-12

USB-B
A2541WV-5P

+5V

C28
10uF

R74 10K
USB_Up_P
USB_Up_N

_URES

A12	GND	GND	B1
A9	VBUS	VBUS	B4
A8	SBU1	CC2	B5
A7	DN1	DP2	B6
A6	DP1	DN2	B7
A5	CC1	SBU2	B8
A4	VBUS	VBUS	B9
A1	GND	GND	B12

R46
5.1K

R43
5.1K

3V3Hub
1V8Hub

C29   C31
10uF   10uF

R81
2.7k

+5V USB1

VCC
D-
D+
GND

U5 CH340B

C10
1uF
C19
R2
10K

1uF

GND	VCC	16
TXD	TNOW	15
RXD	RTS#	14	RTS
V3	DTR#	13	DTR
UD+	DCD#	12
UD-	RI#	11
RST#	DSR#	10
NC.	CTS#	9

_RxD_RTK
_TxD_RTK

RSTb

EN_RTK

R40 10K
Q10
BC846AMTF

BC846AMTF
Q13

R41 10K
D8/_Off

Close J1 1-2, J2 1-2 and J3 if only
steering is used (no USB hub)

Close J1 2-3, J2 2-3 and J3 if only
dual-RTK is used (no USB hub)

A2541WV-2P A2541WV-3P_C609572

J3   J1   J2

URES
USB_Steer_P
USB_Up_P
USB_RTK_P
USB_Steer_N
USB_Up_N
USB_RTK_N

USB A/F 90° Outside the buckle straight foot +5V

+3V3

U22 CH340B

C54
1uF
C56
100nF

R64
1K

C55
100nF

GND	VCC	16
TXD	TNOW	15
RXD	RTS#	14
V3	DTR#	13
UD+	DCD#	12
UD-	RI#	11
RST#	DSR#	10
NC.	CTS#	9

_RxD_Steer
_TxD_Steer

_Reset_Steer

USB_STEER
_USBoff
A2541WV-2P

Ardusimple Onboard Module(s)

H5
A2541WV-5P

Ardu1RxD
Ardu1TxD

X   Y

H11
A2541WV-5P

TX1 RX1 TX2

RX2

GND

ARDUSIMPLE1

GND GND 5V_IN

IOREF

H3
A2541WV-5P

CAN_RX
CAN_TX

+5V   +3V3

H2
A2541WV-5P

Ardu2RxD
Ardu2TxD

Y   X

H12
A2541WV-5P

TX1 RX1 TX2

RX2

GND

ARDUSIMPLE2

GND GND 5V_IN

IOREF

+5V   +3V3

H4
A2541WV-5P

Interface I² C 3.3V <-> 5V

+3V3   +5V

R63   R65   R60   R68
10K   10K   1.8K 1.8K

SDA3.3   A4/SDA

SCL3.3   Q15   A5/SCL

Q14   2N7002
2N7002

+3V3

R3
10K

EN_RTK

C20
100nF

+5V

C70   C69
1uF   1uF

+3V3

ESP32-WROOM-32U(16MB)

Pin	Signal		Signal	Pin
1	GND	GND	39	
2	VDD33	GND	38	
3	EN	IO23	37	D11/MOSI
	D2/Ch_A	IO22	36	SCL3.3
4	SENSOR_VP	TXD0	35	
	A6/SafeSense			
5	SENSOR_VN	RXD0	34	
	A7/WorkAnalog		33	SDA3.3
6	IO34	IO21	32	
	D6/StSw	NC	31	D12/MISO
7	IO35	IO19	30	D13/SCK
	D5/AuxOut	IO18	29	D10/nCS
8	IO32	IO5	28	Ardu2TxD
	A2/whatever	IO17	27	Ardu1TxD
9	IO33	IO16	26	RTS_SC
	Ardu2RxD	IO4	25	D8/_Off
10	IO25	IO0	24	D4/INH
	Ardu1RxD	IO2	23	
11	IO26	IO15	22	
	CAN_TX	SD1	21	
12	IO27	SD0	20	
	D3/PWM0	CLK	19	
13	IO14			
14	IO12			
	D9/PWM1			
15	GND			
16	IO13			
17	SD2			
18	SD3			
19	CMD			

Bootstrap

+3V3

R52
1K

WIFI
FC-DA1608BK-470H10

+5V

Q11
2N7002

Option: RS232/Speed Pulse DIN9684

FC-D1608UGK-520D10
FC-DA1608BK-470H10

B5819W_C8598

Fit resistors R49, R50 only if
ESP32 is UDP-to-SC interface

+3V3   +3V3   +3V3

R88   R87
1K   1K

R49 _TxD_Steer   D25   TXD1   RXD1
1K
R50 _RxD_Steer   R91
1K

R31 __RxD_SC   _TxD_RTK
R32 __TxD_SC   R90 1K   _RxD_RTK

Fit resistors R31, R32 only if ESP32
is connected via RS485, e. g. in a separate dual-RT-only box

RS232 e.g.: https://de.aliexpress.com/item/2054995985.html

SERIAL1
A2541WV-4P

Ardu2TxD   +5V

Danfoss (no H Bridge needed)

+SupplyOutput

R800 10K
R802 47
C4 10uF
U800 LM2904DR2G
MB
R803 47
MA

OUT/A — VCC
-IN/A — OUT/B
PWM0' +IN/A — -IN/B — PWM1'
VEE/GND — +IN/B

R801 1K

INH
R22 1.8K
Q9 2N7002
1.8K R35
Q12 2N7002
-SupplyOutput'

acc. ISO13850

H Bridge

+3V3

R48 10K

A6/SafeSense
R53 10K
+SupplyOutput
R19 750
C30 10uF
C6 180uF
C7 180uF
C12 180uF
C13 180uF

R61 10K
R8 10K
Q6 MMBT5401-C8326
M3 FC-D1608HOK-600H
-SupplyOutput'
Q8 SED4060G
D21
BZT52C18_C266571

D4/INH
R109 10K
Q4 BC846AMTF
R44 1K
D S
S S
S S
S G
S
R96 10K
Q7 SED4060G
C16 180uF
C15 180uF
R82 10K
R62 10K

R72 10K
R55 10K
Q19 MMBT5401-C8326
U9 BTN8982TAAUMA1
U10 BTN8982TAA
MMBT5401-C8326
Q20

D3/PWM0
R113 10K
Q18 BC846AMTF
GND
PWM0' IN
INH INH
R29 1.8K
R24 1.8K
M1
19-213/Y2C-CQ2R2L/3T(CY)
GND
PWM1' IN
INH INH
R21 1K
U2 U14
EP
GND OUT
IN OUT
DEN OUT
IS NC
BTS50301EJAXUMA1
Q21 BC846AMTF
R114 10K
D9/PWM1

R73 10K
R11 1K
OUT OUT 8
OUT OUT 8
M2
D26 ZMM5V6
R92 10K

R51 10K
SR
IS
1K R12
VS
MB
C17 100pF
FC-D1608HOK-600H
MA
SR
IS
1K R20
VS
Option to control a 6/2 valve

R54 10K
-SupplyOutput

R25 2k2
R18 10K
A0/Current

+5V +5V +3V3
R94 10K
R95 10K
R78 1K
_OFF FC-D1608HOK-600H
Q22 Q23
R28 value
D8/_Off

Steering Out

STEERING

+3V3
C8 1uF

D3
R59 1K
whatever
6/2Out
-SupplyOutput'
Q24 BC846AMTF

A2/whatever
D39 B5819W_C8598
Option for engangment sensor or servo
1 5 3
2
4 Shield
M12A 5pole female
C18 100pF
MMBT5401-C8326
Steering wheel motor: Detection of manual interaction

(or valves)

Power Input Connector / ISO 11786 plug (Amphenol C016 30H006 110 12)

Socket DIN 9681-1 ISO 11786 e. g. Fendt X007 plug / Steyr, etc:
pin 4 => WorkSwitch digital (low = lower end, high = higher end pos)
pin 5 (Fendt, if connected) => WorkSwitch analog instead of pin 4 (0V = lower end, 10/14V = upper end pos)
pin 6 (Fendt) => +Battery and via Stopp switch (5A max for ISO plug!)
pin 7 (Fendt) => -Battery

POWER M12A 5pole male

-SupplyOutput'
D1 SMCJ33CA
C27 100nF
WorkSwitch
+SupplyOutput
2
3 5 1
4 Shield
C11 100nF
0V

+Battery
or

Option: Ethernet

+3V3 · L200 22nH · 3.3VA

C206 100nF · C207 100nF · C208 100nF · C209 100nF · C210 100nF · C211 100nF · C212 100nF · C213 100nF

RJ200
HR913550A

R200 1K · Y_LED · +3V3
R201 1K · G_LED

11
12
10
9
8
GND
7
NC
2KV 1000pF
4X75 ohms

R202 51 · R203 1K · R204 51

TX+ J1 · TX- J2 · RX+ J3 · J4 · J5 · RX- J6 · J7 · J8

TD+ 1 · TXP
TD- 4 · 2 · TXN
RD+ 3 · 5 · RXP
RD- 6 · RXN

R205 51 · C200 10nF · R206 51 · C201 10nF · C214 10nF

3.3VA

1 TXN
2 TXP
3 AGND
4 AVDD
5 RXN
6 RXP
7 DNC
8 AVDD
9 AGND
10 EXRES1
11 AVDD
12 NC

R207 2.2K

R212 10K

U200 · W5500

48 47 46 45 44 43 42 41 40 39 38 37
AGND NC NC PMODE0 PMODE1 PMODE2 RSVD RSVD RSVD RSVD RSVD RSTn

INTn 36 · D11/MOSI
MOSI 35 · D12/MISO
MISO 34 · D13/SCK
SCLK 33 · D10/nCS
SCSn 32
XO 31 · XO
XI/CLKIN 30 · XI
GND 29
VDD 28
ACTLED 27 · G_LED
DUPLED 26 · Y_LED
LINKLED 25

R208 10K · +3V3
R209 10K

R210 1M

X1 25MHz

C204 18pF · C205 18pF

13 14 15 16 17 18 19 20 21 22 23 24
NC AGND AVDD AGND AVDD VBG AGND TOCAP AVDD 1V2O RSVD SPDLED

C202 · C203 100nF · R211 1K

TITLE:

W5500 Ethernet driver

REV: 2.0

Company: https://discourse.agopengps.com
Sheet: 7/8

Date: 2021-09-18   Drawn By: buithehao1512
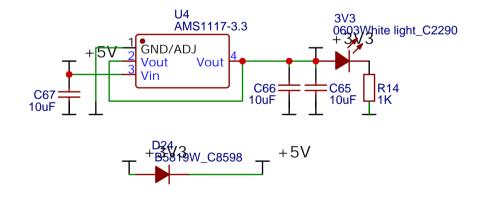
Switch Mode Power Supply Batt => 5V
(needed for Ethernet and Wifi only)

BZT52C18_C266571

R260
1K

Inrush current
limitation

D250

ON1
A2541WV-2P

Q250
AO3400A

R263

R251
51

12V

0603White light_C2290

U250
TPS54331DR

+Vin

SW!
C254
100nF

L250
6.8uH

+5V

+Battery

R259
1K

D6

R261
10K

+Vin

VIN   PH   8

R256
10K

5V
0603White light_C2290

B5819W_C8598

REV
KT-0603R

C258
180uF

C250
22uF

R252
R262
1M

EN_1.24

EN   BOOT   1

SS   VSENSE   5

D251
SS34_C8678

C255
22uF

C256
22uF

C257
22uF

SS

R253
100k

R254
100k
R255

COMP   GND   7

R257
1.8K

R258
1.8K

R250
1.8K

C3
1uF

C251
4.7nF

C252
4.7nF

C253
33pF

FB_.8V

Power Supply 5V => 3V3

U4
AMS1117-3.3

3V3
0603White light_C2290

+3V3

+5V

GND/ADJ

Vout   Vout   4

C66
10uF

C65
10uF

R14
1K

C67
10uF

Vin

D24/3
B5819W_C8598

+3V3

+5V