Danfoss (no H Bridge needed)

+SupplyOutput

R800 10K
MB
R802 47
U800 LM2904DR2G

2N7002 Q808   2N7002 Q807
-SupplyOutput   S   -SupplyOutput

R801 1K

1 OUT/A   VCC 8
2 -IN/A   OUT/B 7
3 +IN/A   -IN/B 6
4 VEE/GND +IN/B 5

PWM1'   PWM2'

R803 47
MA

acc. ISO13850

H Bridge

+3V3_IO

R48 10K

SafeSense
R53 8.2K
+SupplyOutput

R8 10K

Q8 SED4060G
R35 47K
R19 750
C30 10uF
C6 180uF
C7 180uF
C12 180uF
C13 180uF

EnableActors
R61 8.2K
Q6 MMBT5401-C8326
-SupplyOutput'

Q4 2N7002
GND

8 D S 1
7 D S 2
6 D S 3
5 D G 4

Q7 SED4060G

C16 180uF
C15 180uF

R54 8.2K

R25 2k2
GND

U9 BTN8982TAAUMA1
R44 10K M3
FC-D1608HOK-600H
19-213/Y2C-CQ2R2L/3T(CY)

U10 BTN8982TAA

PWM1
R55 8.2K
PWM1'

1 GND
2 IN
3 INH

R51 47K

R11 1K
4 OUT   OUT 8   MB
5 SR
6 IS
7 VS
R12 1K

C17 100pF

R24 2.7k M1

M2
FC-D1608HOK-600H

MA 8 OUT   OUT 4
1 GND
2 IN   PWM2'
3 INH
5 SR
6 IS
7 VS

R21 1K

R20 1K
D30 ZMM5V6

U2 U14
1 GND OUT 9 EP
2 IN OUT 8
3 DEN OUT 7
4 IS NC 6
5
BTS50301EJAXUMA1
Option to control a 6/2 valve

R62 8.2K
PWM2

-SupplyOutput

R18 8.2K
CurrentFeedback1

R28 8.2K
CurrentFeedback2

C8 100nF
GND

+3V3_IO
STEERING

C10 100nF
GND

AuxOut

whatever
D3
R59 1K
whatever'
-SupplyOutput'

Option for engangment sensor or servo
D39
B5819W_C8598
GND

2
1 5 3
4 Shield

C18 100pF

M12A 5pole female

(or valves)

Power Input Connector

POWER
M12A 5pole male

-SupplyOutput'
D1 SMCJ33CA
C27 100nF

+SupplyOutput

2
3 5 1   Pin5
4 Shield

+Battery

C11 100nF
D29 SMCJ15CA

GND

RS485 / ModbusRTU

+3V3_IO

TX485
FC-DA1608BK-470H10

RX485
FC-D1608UGK-520D10

R67 1K
R66 1K

+3V3_IO

C36 1uF
GND

+5V
SI2301CDS-T1-GE3
Q16

U8
KY3485LEEN
U8A
THV8000DDFR
RO VCC
Mode B
Diet A
DI GND

R37 1K

R83 1K
R30 10K
R38 1K

GND

RxD485
Dir485
RxD485
Dir485

TxD485
TxD485

D10 D11
B5819W_C8598

L1 100uH

C25 C24
100nF

L2 100uH

D19 D18
prot-

B_RS485
A_RS485

prot+

Either RS485
U8, D10, D11, D19, D18, R37, R38, R83
C24, C25 = 10R

or

PL modulation
U8A, L1, L1
C24, C25 = 100nF

RS485
M8 4pole female

J17
Solder Bridge

Pin5

+Battery

GND   GND   GND

(relay board image)

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

I2C external or WS2812 LED stripe

IMU
M8 4pole female

Sparkfunk part PRT-14417
SM04B-SRSS-TB(LF)(SN)
QWIIC SMD JST

+3V3_IO

R31 R32

D27 D26

externalSDA
externalSCL

GND   GND

1K

externalSDA
externalSCL

I2C+

D25 D24
B5819W_C8598

GND

R34 5.1K
R33

+3V3_IO

GND

NC2
GND
3.3V
SDA
SCL
NC1

QWIIC

internalSDA
internalSCL

GND

QWIIC

CAN

+3V3_IO +5V

TXCAN1

+3V3_IO

U902
74AHC1G08SE-7
A VCC
B Y
GND

TxCANBy
TxCAN1
TxCAN1

RxCAN1
RxCAN1

R29 R89
10K 1K

RXCAN1

R39 1K

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

GND

C40 1uF

U12
TJA1051T/3/1J
TXD S
GND CANH
VCC CANL
RXD VIO

GND

C45 100nF

D7 D4
B5819W_C8598

D9 D8

prot+

prot-

CAN
M8 4pole female

CANH1
CANL1
CANH2
CANL2

GND   GND

CAN

+3V3_IO +5V

TXCAN2

+3V3_IO +5V

C42 1uF

D12 ZMM5V6

R27 R56
10K 1K

RXCAN2

U19
TJA1051T/3/1J
TXD S
GND CANH
VCC CANL
RXD VIO

TxCAN2
TxCAN2

RxCAN2
RxCAN2

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

GND

C41 100nF

D17 D16
prot+

D15 D14
B5819W_C8598
prot-

D13 ZMM5V6

GND

+3V3_IO +5V

TXCAN3

+3V3_IO

C46 1uF

R22 R78
10K 1K

RXCAN3

U20
TJA1051T/3/1J
TXD S
GND CANH
VCC CANL
RXD VIO

TxCAN3
TxCAN3

RxCAN3
RxCAN3

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

GND

C43 100nF

WAS

+5V

H13

WAS_N

AuxOut

A2541WV-2X4P
Jumpers: CAN or Analog

D21 D20
prot+

D23 D22
prot-

B5819W_C8598

WAS/CAN
M8 4pole female

5Vfused

CANH/WAS
CANL/WAS_N

GND   GND

J20
Solder Bridge

U7
HT7533-1_C14289
GND
Vin
Vout

I2C+

C47 1uF

R79 10K

WASPWR

C49 1uF

0603White light_C2290

GND

D28
SS34_C8678
+5V

Main connector

(connector images)

P1			
CANH2	1	2	CANL2
CANH1	3	4	CANL1
A_RS485	5	6	B_RS485
RemoteSw	7	8	I2C+
WorkSw	9	10	SteerSw
CANH/WAS	11	12	5Vfused
CANL/WAS_N	13	14	
Pin5	15	16	whatever'
+Battery	17	18	
+SupplyOutput	19	20	SupplyOutput
AuxOut	21	22	
MA	23	24	MB

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

KT-0603R
BSMD0603-050-6V

R84 10K

+5V

F+5V

F5

GND

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

Ardusimple Onboard Module(s)

Wheel Angle Sensor

ADC

H5
A2541WV-5P

H11
A2541WV-5P

Ardu1RxD
Ardu1TxD

X   Y

TX1
RX1
TX2

RX2   GND

ARDUSIMPLE1

GND GND 5V_IN IOREF
+3V3_IO

+5V

GND

H3
A2541WV-5P

+5V

WAS2
FC-D1608HYK-588J

WAS3
FC-D1608HOK-600H

R58
1K

R57
1K

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

WAS
WAS_N

GND   GND   +3V3_IO
R36
1K

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

SCL5
SDA5

GND   internalSCL
       internalSDA

C9
100nF

C33
100nF

ADS1115IDGSR

AIN3   +5V
AIN2
        C14
        1uF

R14
5.1K

Q9

5.1K
R4

Q12
2N7002

GND

H2
A2541WV-5P

H12
A2541WV-5P

Ardu2RxD
Ardu2TxD

Y   X

TX1
RX1
TX2

RX2   GND

ARDUSIMPLE2

GND GND 5V_IN IOREF
+3V3_IO

+5V

GND

H4
A2541WV-5P

Option: Bynav-C1

MMBT5401-C8326
Q900

+5V

U901
MP1584EN

U900   Bynav_minimal

n.c.   VCC_3V3
Ant1//   MISO/RxD3
_Reset   Ant2/CANRX//
CANTX//   CAN2RX
TxD3   GND
TxD1   RxD1
GND   TxD2//
RxD2//   GND
SCLK//   GND
PPS   CAN2TX//
TD+   RD+
TD-   RD-

R904
10K

VIN
GND
VOUT
GND

+3V3_Bynav

C900
22uF

GND

RxCAN1

Ardu1TxD

Ardu1RxD

TxCANBy

R903
1K

R900
R901
R902

1K

FC-D1608UGK-520D10

ANT2
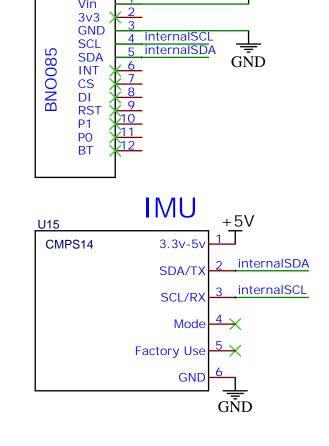ANT1   DIFF
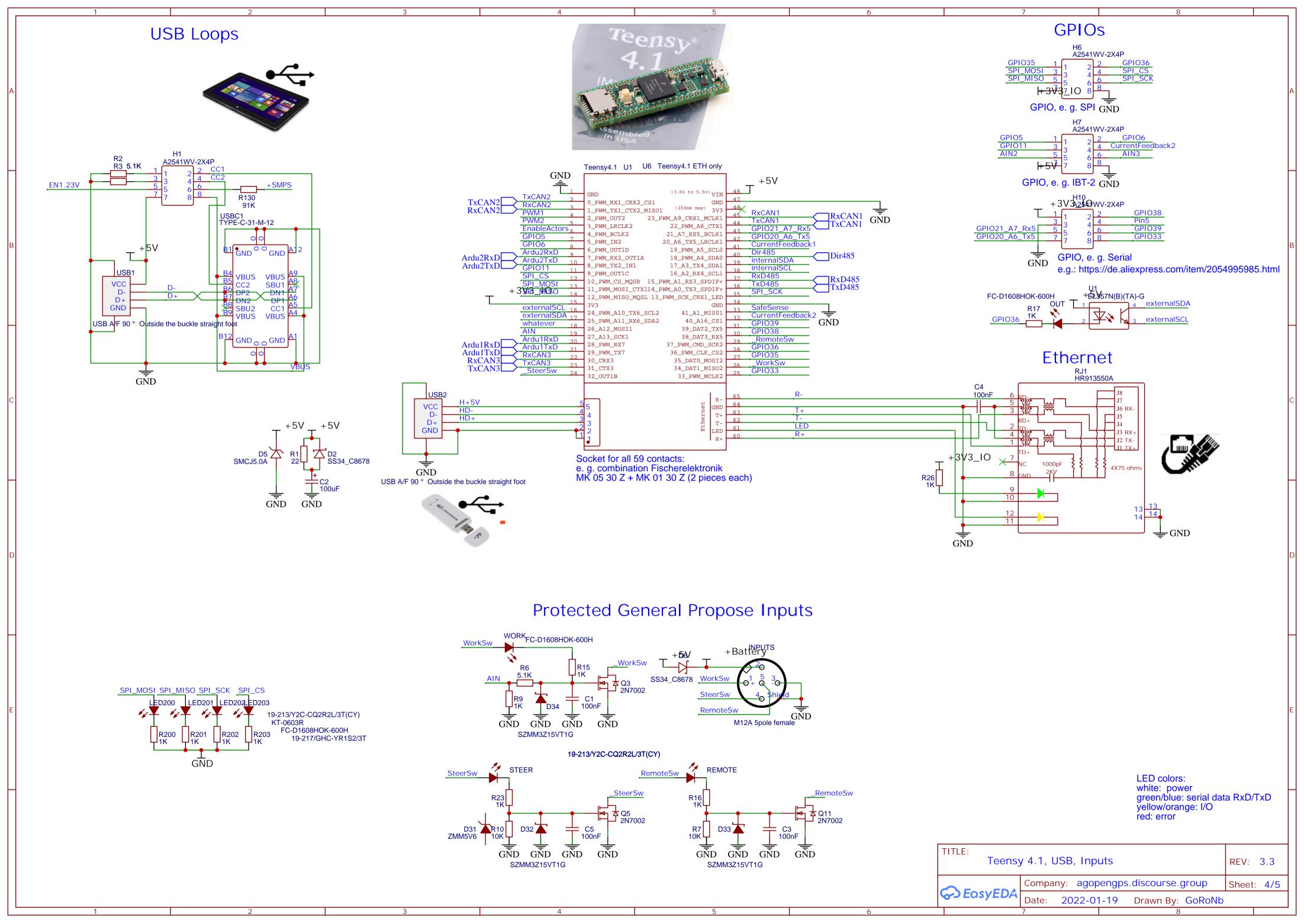
BYNAVETH
A2005WV-2X3P

TD-
TD+

2 (male)

RD+

RD-

0V_Bynav

LED_Bynav

Use Teensy Ethernet picktail to connect to Bynav Ethernet for configuration

---

U3
Ardfruit BNO085

+5V

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

internalSCL
internalSDA

GND

BNO085

IMU

U15
CMPS14

+5V

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

internalSDA
internalSCL

GND

USB Loops

R2
R3 5.1K
H1
A2541WV-2X4P
CC1
CC2
EN1.23V
R130
91K
+SMPS

USBC1
TYPE-C-31-M-12

+5V

USB1
VCC
D-
D+
GND
USB A/F 90° Outside the buckle straight foot

GND

VBUS
CC2
SBU1
DP2
DN1
DN2
DP1
SBU2
CC1
VBUS
VBUS

+3V3_IIGO

+5V   +5V
D5   D2
SMCJ5.0A   SS34_C8678
R1
22
C2
100uF
GND   GND   GND

USB2
VCC
D-
D+
GND
H+5V
HD-
HD+
GND
USB A/F 90° Outside the buckle straight foot

SPI_MOSI SPI_MISO SPI_SCK SPI_CS
LED200 LED201 LED202 LED203
R200 R201 R202 R203
1K   1K   1K   1K
GND
19-213/Y2C-CQ2R2L/3T(CY)
KT-0603R
FC-D1608HOK-600H
19-217/GHC-YR1S2/3T

Teensy 4.1, U1   U6 Teensy4.1 ETH only

GND
(3.6v to 5.5v)
TxCAN2
RxCAN2
PWM1
PWM2
EnableActors
GPIO5
GPIO6
Ardu2RxD
Ardu2TxD
GPIO11
SPI_CS
SPI_MOSI
SPI_MISO

1 GND
0_PWM_RX1_CRX2_CS1
1_PWM_TX1_CTX2_MISO1
2_PWM_OUT2
3_PWM_LRCLK2
4_PWM_BCLK2
5_PWM_IN2
6_PWM_OUT1D
7_PWM_RX2_OUT1A
8_PWM_TX2_IN1
9_PWM_OUT1C
10_PWM_CS_MQSR
11_PWM_MOSI_CTX114
12_PWM_MISO_MQSL
3V3

externalSCL
externalSDA
whatever
AIN
Ardu1RxD
Ardu1TxD
RxCAN3
TxCAN3
_SteerSw

24_PWM_A10_TX6_SCL2
25_PWM_A11_RX6_SDA2
26_A12_MOSI1
27_A13_SCK1
28_PWM_RX7
29_PWM_TX7
30_CRX3
31_CTX3
32_OUT1B

VIN 48
GND 47
3V3 46 (250mA max)
23_PWM_A9_CRX1_MCLK1
22_PWM_A8_CTX1
21_A7_RX5_BCLK1
20_A6_TX5_LRCLK1
19_PWM_A5_SCL0
18_PWM_A4_SDA0
17_A3_TX4_SDA1
16_A2_RX4_SCL1
15_PWM_A1_RX3_SPDIF<
14_PWM_A0_TX3_SPDIF>
13_PWM_SCK_CRX1_LED
GND

45 RxCAN1
44 TxCAN1
43 GPIO21_A7_Rx5
42 GPIO20_A6_Tx5
41 CurrentFeedback1
40 Dir485
39 internalSDA
38 internalSCL
37 RxD485
36 TxD485
35 SPI_SCK
34
41_A1_MISO1 33 SafeSense
40_A16_CS1   32 CurrentFeedback2
39_DAT2_TX5 31 GPIO39
38_DAT3_RX5 30 GPIO38
37_PWM_CMD_SCK2 29 _RemoteSw
36_PWM_CLK_CS2 28 GPIO36
35_DAT0_MOSI2 27 GPIO35
34_DAT1_MISO2 26 _WorkSw
33_PWM_MCLK2 25 GPIO33

RxCAN1
TxCAN1

Dir485

RxD485
TxD485

GND

+5V

GND

Socket for all 59 contacts:
e. g. combination Fischerelektronik
MK 05 30 Z + MK 01 30 Z (2 pieces each)

R- 65 R-
GND 64
T+ 63 T+
T- 62 T-
LED 61 LED
R+ 60 R+

GPIOs

H6
A2541WV-2X4P
GPIO35   GPIO36
SPI_MOSI   SPI_CS
SPI_MISO   SPI_SCK
+3V3_IO   GND
GPIO, e. g. SPI

H7
A2541WV-2X4P
GPIO5   GPIO6
GPIO11   CurrentFeedback2
AIN2   AIN3
+5V   GND
GPIO, e. g. IBT-2

H10
A2541WV-2X4P
+3V3_IO
GPIO38
GPIO21_A7_Rx5 Pin5
GPIO20_A6_Tx5 GPIO39
GPIO33
GND
GPIO, e. g. Serial
e.g.: https://de.aliexpress.com/item/2054995985.html

FC-D1608HOK-600H
U1
EL357N(B)(TA)-G
R17
1K
OUT
externalSDA
externalSCL
GPIO36

Ethernet

RJ1
HR913550A
C4
100nF

+3V3_IO
R26
1K

1000pF
2KV
4X75 ohms

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

GND

13 13
14 14
GND

Protected General Propose Inputs

WORK
WorkSw   FC-D1608HOK-600H
R6
5.1K
R15
1K
Q3
2N7002
_WorkSw
R9
1K
D34
C1
100nF
GND GND GND GND
SZMM3Z15VT1G

AIN

+5V
SS34_C8678
+Battery
INPUTS
WorkSw
SteerSw
RemoteSw
M12A 5pole female
Shield
GND

19-213/Y2C-CQ2R2L/3T(CY)

SteerSw   STEER
R23
1K
Q5
2N7002
_SteerSw
D31   R10   D32   C5
ZMM5V6 10K   100nF
GND GND GND GND
SZMM3Z15VT1G

RemoteSw   REMOTE
R16
1K
Q11
2N7002
_RemoteSw
R7   D33   C3
10K   100nF
GND GND GND GND
SZMM3Z15VT1G

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

USB-C Power Delivery Role Swap

+3V3_IO

U200 FUSB302BMPX

1	CC2		CC2	14
2	VBUS		VCONN	13
3	VDD		VCONN	12
4	VDD		CC1	11
5	INT_N		CC1	10
6	SCL		GND	9
7	SDA		GND	8
		EP		15

GPIO35
internalSCL
internalSDA

C200 1uF
C201 10uF
GND
GND

CC2 / VBUS / CC1
CC2 VBUS CC1 TESTPOINT

C202 220pF   C203 220pF
D200 D201 D202 PTVS26VS1UR,115
GND
MMSZ5231B

DC/DC 5V/9V/12/19.5V 3A

+Battery
Q104 SED4060G
R125 750
Source
R123 91K   C128 100nF   C101 180uF   C100 180uF
Q105 SED4060G
D100 B5819W_C8598   R102 10
+SMPS   EN1.23V   R122 10K   GPIO36
Vout
R124 1K   C127 22nF   D105 B5819W_C8598   D106 B5819W_C8598
SW!   Source

R126 12K
C102 100nF
R103 91K
C103 100nF
R104 91K
C104 100nF
C105 100pF   R105 10K
C106 22nF   R106 10K
100pF
FB0.8V

U100 LM5175PWPR
1	EN/UVLO	SW1	28
2	VIN	HDRV1	27
3	VISNS	BOOT1	26
4	MODE	LDRV1	25
5	DITH	BIAS	24
6	RT	VCC	23
7	SLOPE	PGND	22
8	SS	LDRV2	21
9	COMP	BOOT2	20
10	AGND	HDRV2	19
11	FB	SW2	18
12	VOSNS	PGOOD	17
13	ISNS(-)	CS	16
14	ISNS(+)	CSG	15
		EP	29

C113 C114 C115 10uF
C108 100nF
Q100 SED4060G
C109 100nF
D103 D104
B5819W_C8598
C110 1uF
C111 100nF
DCDC R115 10K   +5V
R116 47   R117 47
76/170mV
0603White light_C2290

C123 100pF
R118 10
D101 SS12/BKN
Q101 SED4060G
SW1!   L100 4.7uH   SW2!
Q102 SED4060G   C124 100pF   R119 10   D102   Q103 SED4060G
SS12/BKN

C116 C117 C118 C119 C120 10uF
R121 RTH06R010FTP
50mV
+V_DCDC
R120 RTH06R010FTP

R128 750
Q10 SED4060G   VBUS
C121 180uF   C122 180uF   R127 91K   C129 100nF   C125 10uF
GND
R129 1K   C126 22nF   D107 B5819W_C8598   D108 B5819W_C8598
SW!
+V_DCDC

Pin5
R109 R110 R111   +V_DCDC 9V / 15V / 20V
H15 A2541WV-2X4P
R208 R207 R209
GPIO38 9V
GPIO39 15V
GPIO33 20V
10
12K 7.5K 9.1K
C107 1uF   R107 47   R108 47
R112 56K
Jumpers: fixed power setting
GND

Switch Mode Power Supply 5V

H8 A2541WV-4P
+5V
VBUS
R300 10K
+Vin
+Battery   D300 SS34_C8678
C300 22uF
12V   0603White light_C2290
R301 10K   C301 4.7nF

U300 TPS54331DR
1	VIN	PH	8
3	EN	BOOT	
	SS	VSENSE	5
6	COMP	GND	7

EN_1.24
SS   R302 R303   91K
C302 4.7nF   C303 33pF

SW!   L300 6.8uH
C304 100nF   D301 SS34_C8678
C305 22uF   C306 22uF   C307 22uF
+5V
R304 10K   5V 0603White light_C2290
R305 1.8K   R42 1.8K
GND   FB_.8V

TITLE: DCDC_USB-PD   REV: 3.3
Company: agopengps.discourse.group   Sheet: 5/5
Date: 2022-01-19   Drawn By: GoRoNb
EasyEDA