RS485 / ModbusRTU

TX485
FC-DA1608BK-470H10
RX485
FC-D1608UGK-520D10

D4
B5819W_C8598
R67 1K
R66 1K

U8 KY3485LEEN
U8A THV8000DDFR

_TxD_SC
Dir485
_RxD_SC

R83 1K
R30 10K

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

Mode
/RE
DE

+3V3

C36 1uF

R37 1K
R38 1K

C25 C24
100nF

+5V
SI2301CDS-T1-GE3
Q16

L1 100uH
L2 100uH

prot+
prot-

D10 D11
B5819W_C8598
D19 D18

RS485
M8 4pole female

4 2
3 1
Shield

+Battery

B_RS485
A_RS485

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

or

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

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

I2C external

IMU
M8 4pole female

4 2
3 1
Shield

+5V
5Vfused

D9 D20
B5819W_C8598

A4/SDA
A5/SCL

D8 D7
B5819W_C8598

CAN & Opto | Wheel Sensor

FC-D1608HOK-600H
R17 1K
OUT1

U1
+BAV57N(B)(TA)-G

1   4
2   3

D23
B5819W_C8598

D5/AuxOut

optional optocoupler output

CAN
M8 4pole female

4 2
3 1
Shield

nAux/0V   Aux/5V 5Vfused

CAN_PWR
A2541WV-2P
CAN_PWR1
A2541WV-2P

0V

wheel sensor: close jumpers

+3V3
TXCAN2
+5V C42 1uF
RXCAN2

R27 10K R56 1K

U19 TJA1051T/3/1J

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

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

CAN_TX
CAN_RX

C41 100nF

CAN

+5V
D12 ZMM5V6
D17 D16
prot+

+3V3

D15 D14
B5819W_C8598
prot-
D13 ZMM5V6

CANH/B
CANL/A

R69 1K
1K R71

A1/Ch_B
D2/Ch_A

Main connector

A5/SCL	P1		A4/SDA	KT-0603R
CANH/B	1	2	CANL/A	BSMD0603-050-6V
A_RS485	3	4	B_RS485	
nAux/0V	5	6	5Vfused	
WorkSwitch	7	8	SteerSwitch	
WAS	9	10	5Vfused	
WAS_N	11	12		
Aux/5V	13	14	whatever	
+Battery	15	16	-SupplyOutput'	
+SupplyOutput	17	18	-SupplyOutput'	
6/2Out	19	20		
MA	21	22	MB	
	23	24		

+5V
R84 10K
F5
F+5V

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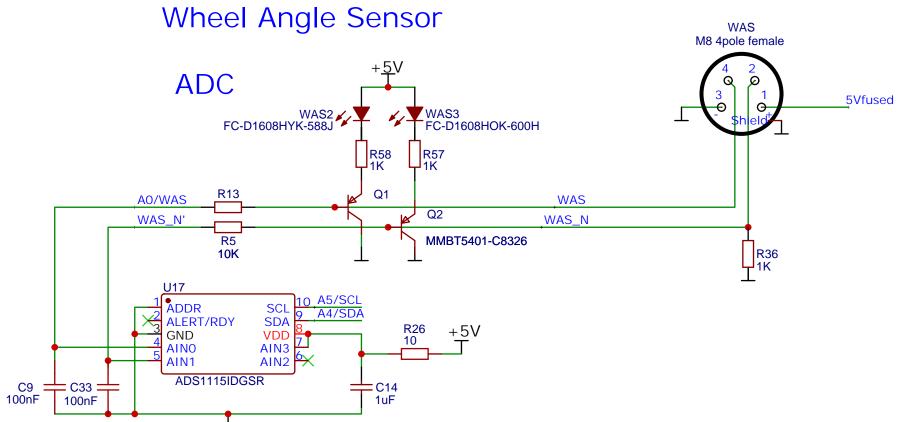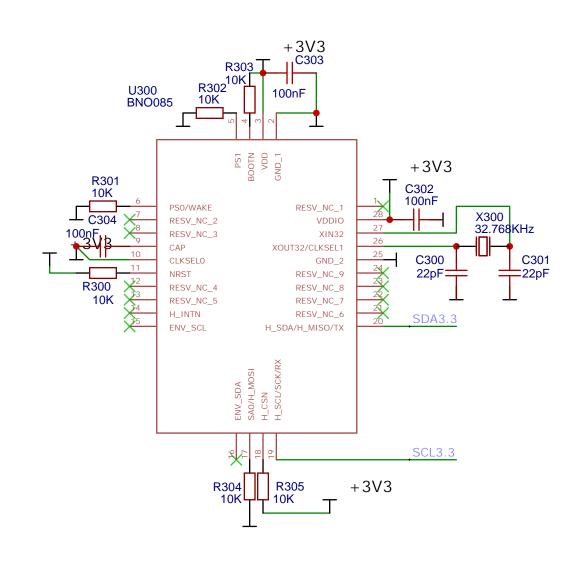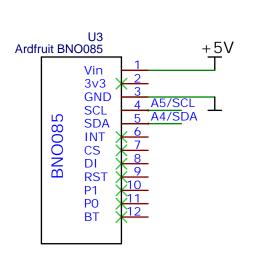
P1: Weidmuller 1289550000 + 1372870000
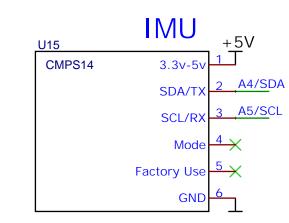S2C-SMT 3.50/24/90LF 3.2SN BK BX + B2CF 3.50/24/180LH SN BK BX

TITLE: Serial Communication, PushIn Connector

REV: 2.2

Company: https://discourse.agopengps.com

Sheet: 1/8

Date: 2021-09-18   Drawn By: GoRoNb

EasyEDA

Wheel Angle Sensor

ADC

+5V

WAS2
FC-D1608HYK-588J

WAS3
FC-D1608HOK-600H

R58
1K

R57
1K

WAS
M8 4pole female

4 2
3 1
Shield

5Vfused

A0/WAS   R13
WAS_N'   R5   10K

Q1

Q2
MMBT5401-C8326

WAS

WAS_N

R36
1K

U17
1 ADDR   SCL 10 A5/SCL
2 ALERT/RDY   SDA 9   A4/SDA
3 GND   VDD 8
4 AIN0   AIN3 7   R26
5 AIN1   AIN2 6   10   +5V

C9   C33
100nF   100nF

ADS1115IDGSR

C14
1uF

+3V3
C303
100nF

R303
10K
R302
10K

U300
BNO085

R301
10K

C304
100nF
3Vb

6 PS0/WAKE
7 RESV_NC_2
8 RESV_NC_3
9 CAP
10 CLKSEL0
11 NRST
12 RESV_NC_4
13 RESV_NC_5
14 H_INTN
15 ENV_SCL

PS1 BOOTN VDD GND_1

+3V3
C302
100nF

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

X300
32.768KHz

C300   C301
22pF   22pF

SDA3.3

R300
10K

ENV_SDA SA0/H_MOSI H_CSN H_SCL/SCK/RX

SCL3.3

R304   R305
10K   10K   +3V3

IMU

U3
Ardfruit BNO085

1 Vin   +5V
2 3v3
3 GND
4 SCL   A5/SCL
5 SDA   A4/SDA
6 INT
7 CS
8 DI
9 RST
10 P1
11 P0
12 BT

BNO085

U15
CMPS14

1 3.3v-5v   +5V
2 SDA/TX   A4/SDA
3 SCL/RX   A5/SCL
4 Mode
5 Factory Use
6 GND

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

+3V3

0V
6 NC2

1 GND
2 3.3V
SDA3.3 3 SDA
SCL3.3 4 SCL

QWIIC1

5 NC1

0V   0V   0V

QWIIC

Nano

U27
ATMEGA328P-AU

D3/PWM1 — (PCINT19/OC2B/INT1)PD3
D4/INH — (PCINT20/XCK/T0)PD4
GND
VCC
GND
VCC
(PCINT6/XTAL1/TOSC1)PB6
(PCINT7/XTAL2/TOSC2)PB7
D5/AuxOut — (PCINT21/OC0B/T1)PD5
D6/StSw — (PCINT22/OC0A/AIN0)PD6
D7/WkSw — (PCINT23/AIN1)PD7
D8/_Off — (PCINT0/CLKO/ICP1)PB0
D9/PWM2 — (PCINT1/OC1A)PB1
D10/nCS — (PCINT2/SS#/OC1B)PB2
D11/MOSI — (PCINT3/OC2A/MOSI)PB3
D12/MISO — (PCINT4/MISO)PB4

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

X4 16MHz
C80 1uF
C79 1uF
C82 22pF
C81 22pF

PRGBOOT
A2541WV-7P
+3V3
1 D13/SCK
2 D12/MISO
3 D11/MOSI
4 D10/nCS
5 _Reset_Steer
6
7
D22
D27 ZMM3V3
B5819W_C8598
_USBoff

+3V3
R103 1K
R101 1K
FC-DA1608BK-470H10
TXD3
RXD3
FC-D1608UGK-520D10
R105 1K
R104
_TxD_Steer
_RxD_Steer
PT1 Testpoint
1 1
+3V3
R98 10
C78 100nF

Protected General Propose Inputs

+3V3
R39 1K
WORKINP
FC-D1608HOK-600H
D7/WkSw
WorkSwitch
WorkAnalog
R6 5.1K
R15 1K
R9 1K
C1 100nF
Q3 2N7002
D28
BZT52C18_C266571

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

INPUTS
+5V
whatever
WorkSwitch
SteerSwitch
Shield
R7
R16
R33 1K
M12A 5pole female

+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
R10 10K
C5 100nF
Q5 2N7002
D29 ZMM5V6

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

to Section Control board

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

+5V

R89 1K
R106 1K
FC-DA1608BK-470H10

RXD2
FC-D1608UGK-520D10
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

C57 1uF
C21
1uF
R4 10K

U23 CH340B

1 GND   VCC 16
2 TXD   TNOW 15 Dir485
3 RXD   RTS# 14
4 V3   DTR# 13
5 UD+   DCD# 12
6 UD-   RI# 11
7 RST#   DSR# 10
8 NC.   CTS# 9

_RxD_SC
_TxD_SC

+5V

R42 1K
RTS_SC
DTR_SC

USBoff
USB_SC
A2541WV-2P

X2
12MHz

4 Port USB Hub

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

R80 10K
R75 1K
R77 1K

DRV

R76 1K

USB-C PC/Tablet

USBC1
TYPE-C-31-M-12

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

R43 5.1K

USB-B
A2541WV-5P

R46 5.1K

C28 10uF

+5V

_URES

R74 10K
USB_Up_P
USB_Up_N

U18 FE1.1S

28 VD18   VSS
27 TESTJ   XOUT
26 OVCJ   XIN
25 PWRJ   DM4
24 LED2   DP4
23 LED1   DP3
22 DRV   DM3
21 VD33_O   DP3
20 VDD5   DM2
19 BUSJ   DP2
18 VBUSM   DM1
17 XRSTJ   DP1
16 DPU   VD18_O
15 DMU   VD33
              REXT

C22 C23
33pF 33pF

USB_Ext_N
USB_Ext_P
USB_SC_N
USB_SC_P
USB_RTK_N
USB_RTK_P
USB_Steer_N
USB_Steer_P

C29 10uF   C31 10uF

R81 2.7k

3V3Hub
1V8Hub

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
1 2 1 2 3 1 2 3

URES
USB_Steer_P
USB_Up_P
USB_RTK_P
USB_Steer_N
USB_Up_N
USB_RTK_N

+5V

C10 1uF
C19
1uF
R2 10K

U5 CH340B

1 GND   VCC 16
2 TXD   TNOW 15
3 RXD   RTS# 14 RTS
4 V3   DTR# 13 DTR
5 UD+   DCD# 12
6 UD-   RI# 11
7 RST#   DSR# 10
8 NC.   CTS# 9

_RxD_RTK
_TxD_RTK

RSTb

+5V

R40 10K   Q10 BC846AMTF
EN_RTK

BC846AMTF Q13
R41 10K
D8/_Off

+5V USB1
VCC
D-
D+
GND

USB A/F 90° Outside the buckle straight foot

+5V

C54 1uF
C56
100nF

U22 CH340B

1 GND   VCC 16
2 TXD   TNOW 15
3 RXD   RTS# 14
4 V3   DTR# 13
5 UD+   DCD# 12
6 UD-   RI# 11
7 RST#   DSR# 10
8 NC.   CTS# 9

_RxD_Steer
_TxD_Steer

+3V3

R64 1K
C55 100nF
_Reset_Steer

USBoff
USB_STEER
A2541WV-2P

Ardusimple Onboard Module(s)

H5
A2541WV-5P

Ardu1RxD
Ardu1TxD

H11
A2541WV-5P

X   Y

TX1 RX1 TX2   RX2   GND

Holes only
U10

ARDUSIMPLE1

GND GND 5V_IN   IOREF

+5V   +3V3

H3
A2541WV-5P

CAN_RX
CAN_TX

H2
A2541WV-5P

Ardu2RxD
Ardu2TxD

H12
A2541WV-5P

Y   X

TX1 RX1 TX2   RX2   GND

Holes only
U11

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   A5/SCL

Q15
2N7002

Q14
2N7002

+3V3   +3V6

R3
10K

EN_RTK

C20
100nF

+5V

C70   C69
1uF   1uF

ESP32-WROOM-32U(16MB)

1 GND	GND 39
2 VDD33	GND 38
3 EN	IO23 37 D11/MOSI
D2/Ch_A 4 SENSOR_VP	IO22 36
A6/SafeSense 5 SENSOR_VN	TXD0 35 SCL3.3
A7/WorkAnalog 6 IO34	RXD0 34
D6/StSw 7 IO35	IO21 33 SDA3.3
D5/AuxOut 8 IO32	NC 32
A2/whatever 9 IO33	IO19 31 D12/MISO
Ardu2RxD 10 IO25	IO18 30 D13/SCK
CAN_RX 11 IO26	IO5 29 D10/nCS
Ardu1RxD 12 IO27	IO17 28 Ardu2TxD
CAN_TX 13 IO14	IO16 27 Ardu1TxD
D3/PWM1 14 IO12	IO4 26 RTS_SC
15 GND	IO0 25 D8/_Off
D9/PWM2 16 IO13	IO2 24 D4/INH
17 SD2	IO15 23
18 SD3	SD1 22
19 CMD	SD0 21
	CLK 20

B5819W_C8598

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

R49 TxD_Steer   D25   TXD1
1K
R50 RxD_Steer

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

+3V3   +3V3   +3V3

R88   R87
1K   1K

R91
1K
RXD1

_TxD_RTK
_RxD_RTK

R31 _RxD_SC
R32 _TxD_SC
1K

R90 1K

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

WIFI
FC-DA1608BK-470H10

R52   +5V
1K

Q11
2N7002

Option: RS232/Speed Pulse DIN9684

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

SERIAL1
A2541WV-4P

Ardu2TxD   +5V

Danfoss (no H Bridge needed)

+SupplyOutput

R800 10K
R801 1K
R802 47
C4 10uF
MB
PWM1'

U800 LM2904DR2G
1 OUT/A   VCC 8
2 -IN/A   OUT/B 7
3 +IN/A   -IN/B 6
4 VEE/GND +IN/B 5

R803 47
MA
PWM2'

R22 10K
INH
10K R35
Q9 2N7002
Q12 2N7002
-SupplyOutput'

acc. ISO13850

H Bridge

+3V3
R48 10K

A6/SafeSense
R53 10K
R61 10K
R8 10K
Q6 MMBT5401-C8326

D4/INH
R109 10K
Q4 BC846AMTF

+SupplyOutput
-SupplyOutput'

Q8 SED4060G
8 D S 1
7 D S 2
6 D S 3
5 D G 4
S
D21
R96 10K

R19 750
Q7 SED4060G
1 S D
2 S D
3 S D
4 G D
BZT52C18_C266571

C30 10uF
C6 180uF
C7 180uF
C12 180uF
C13 180uF

C16 180uF
C15 180uF
R82 47K
R62 47K

R72 47K
R55 47K
Q19 MMBT5401-C8326

D3/PWM1
R113 10K
Q18 BC846AMTF

R73 47K
R51 47K

10K R44
M3

U9 BTN8982TAAUMA1
1 GND
2 IN   PWM1'
3 INH INH
4 OUT OUT 8
5 SR
6 IS
7 VS

R11 1K
1K R12

R29 1.8K
R24 1.8K
M1
M2

FC-D1608HOK-600H
19-213/Y2C-CQ2R2L/3T(CY)
FC-D1608HOK-600H

U10 BTN8982TAA
1 GND
2 IN   PWM2'
3 INH INH
4 OUT OUT 8
5 SR
6 IS
7 VS

R21 1K
1K R20

D26 ZMM5V6

MMBT5401-C8326
Q20
Q21 BC846AMTF
R114 10K D9/PWM2
R92 47K

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

MB C17 100pF MA

R54 10K

-SupplyOutput

R25 2k2

R18 10K
C8 1uF
A0/Current

Steering Out

+3V3
STEERING

D3
R59 1K
A2/whatever
whatever
D39 B5819W_C8598
Option for engangment sensor or servo

1 +
5
2
3
4 Shield

6/2Out
-SupplyOutput'
C18 100pF

M12A 5pole female

(or valves)

+5V +5V +3V3
R94 10K R95 10K R78 1K
Q22 Q23
R28 value
_OFF FC-D1608HOK-600H
D8/_Off
Q24 BC846AMTF
MMBT5401-C8326
Steering wheel motor: Detection of manual interaction

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
+SupplyOutput

2
3
5
4 Shield
1

WorkSwitch
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

14
13

R200 1K — Y_LED — +3V3
11
12

R201 1K — G_LED
10
9

8
GND
7
NC

4X75 ohms

2KV 1000pF

TX+ J1 — TXP — 1 — TD+
TX- J2 — TXN — 4
RX+ J3 — 2 — TD-
J4
J5
RX- J6 — RXP — 3 — RD+
J7 — 5
J8 — RXN — 6 — RD-

R202 51 | R203 10 | R204 51

3.3VA

C215 10nF
C216 10nF

R205 51 | R206 51 | C201 10nF | C214 10nF

C200 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

C202 4.7uF | C203 100nF | R211 1K

U200 **W5500**

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

C217 10nF

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

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

R208 10K — +3V3
R209 10K

R210 1M

X1 25MHz

C204 18pF | C205 18pF

TITLE: W5500 Ethernet driver

REV: 2.2

Company: https://discourse.agopengps.com

Sheet: 7/8

Date: 2021-09-18   Drawn By: buithehao1512

EasyEDA

Switch Mode Power Supply Batt => 5V
(needed for Ethernet and Wifi only)

BZT52C18_C266571

Inrush current
limitation

R263 1

Q250
AO3400A

D250

ON1
A2541WV-2P

R260
1K

+Battery

D6

R259
1K

R251
51

12V

0603White light_C2290

+Vin

U250
TPS54331DR

SW!

L250
6.8uH

+5V

REV
B5819W_C8598
KT-0603R

R250
1.8K

C258
180uF

C250
22uF

R252
R262
1M

10K
R261

C3
1uF

R253
100k

R254
100k
R255

C251
4.7nF

C252
4.7nF

C253
33pF

+Vin

+Vin

EN_1.24

SS

2 VIN

3 EN

4 SS

6 COMP

PH 8

BOOT 1

VSENSE 5

GND 7

C254
100nF

D251
SS34_C8678

C255
22uF

C256
22uF

C257
22uF

R256
10K

R257
1.8K

5V
0603White light_C2290

R258
1.8K

FB_.8V

Power Supply 5V => 3V3

U4
AMS1117-3.3

3V3
0603White light_C2290

+5V

1 GND/ADJ

2 Vout

3 Vin

Vout 4

+3V3

+5V

C67
10uF

C66
10uF

C65
10uF

R14
1K

D24/3
B5819W_C8598

+3V3

+5V