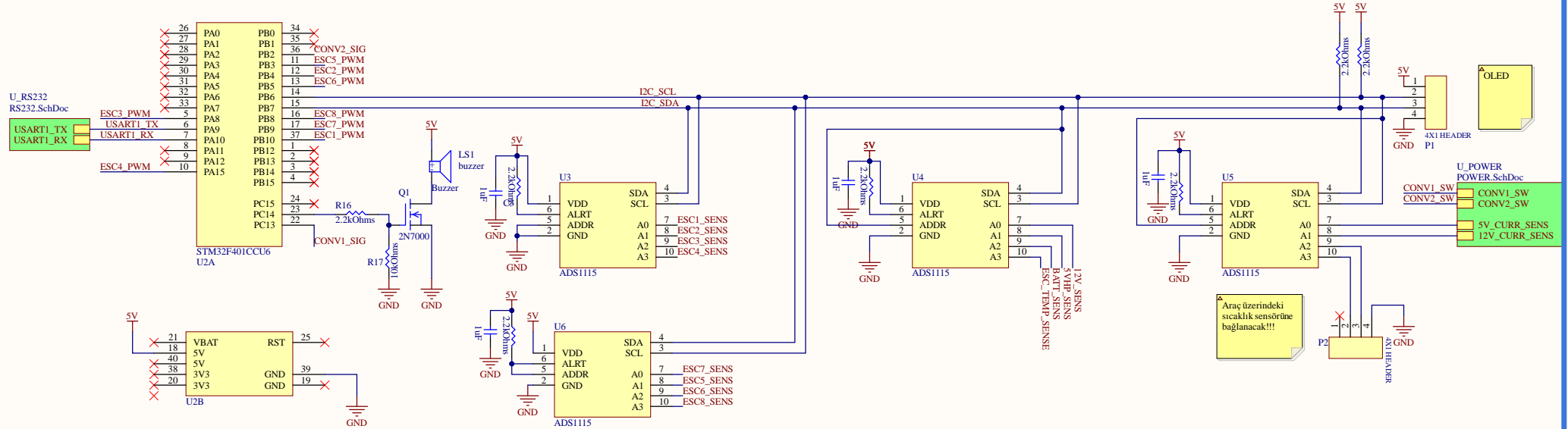
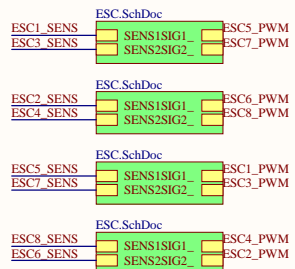


WARP

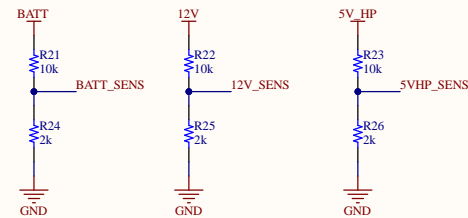
Microcontroller/ADS Connections



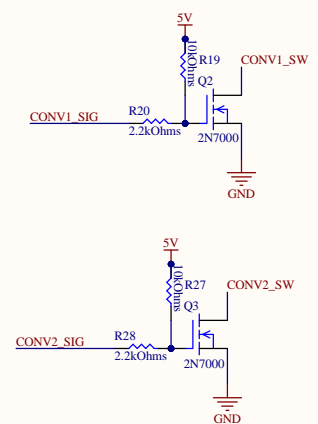
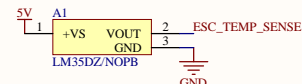
ESC Connections



Voltage Sense (0-30V)

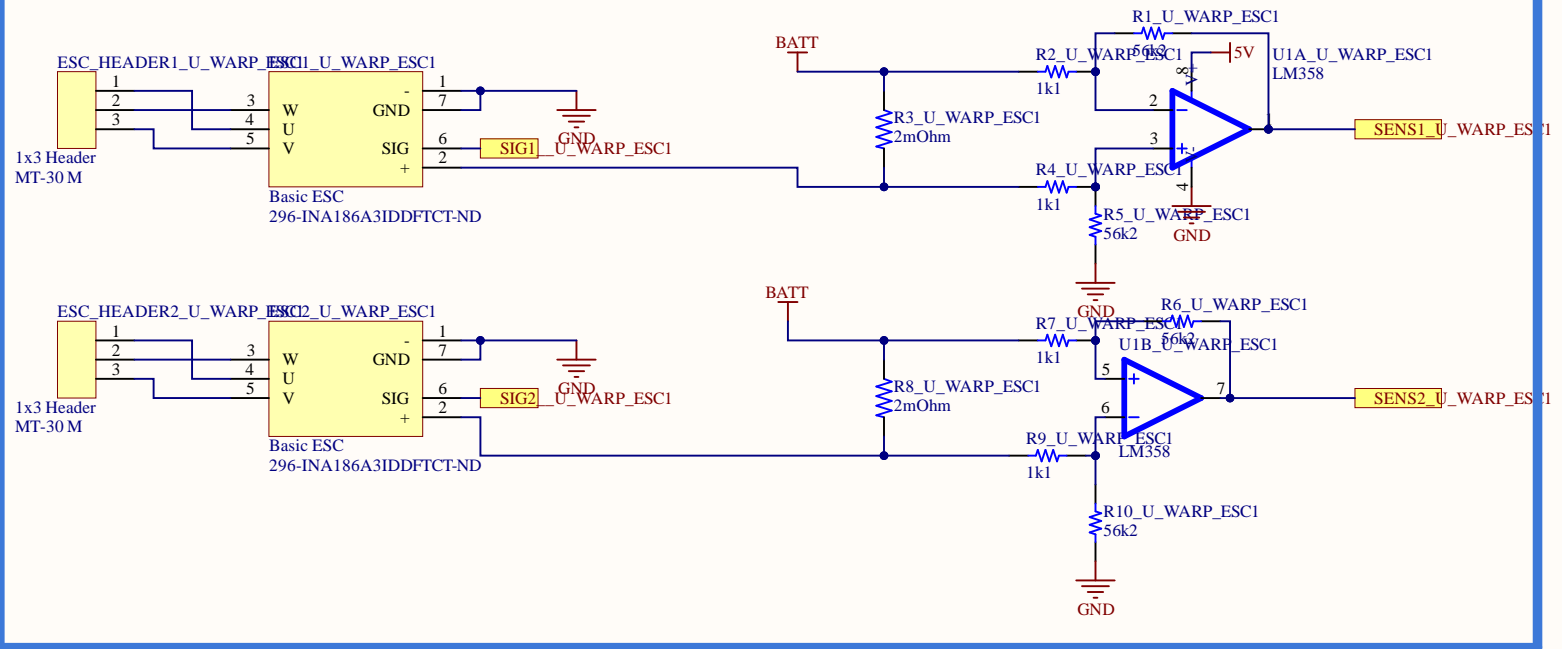


Tempature Sensor



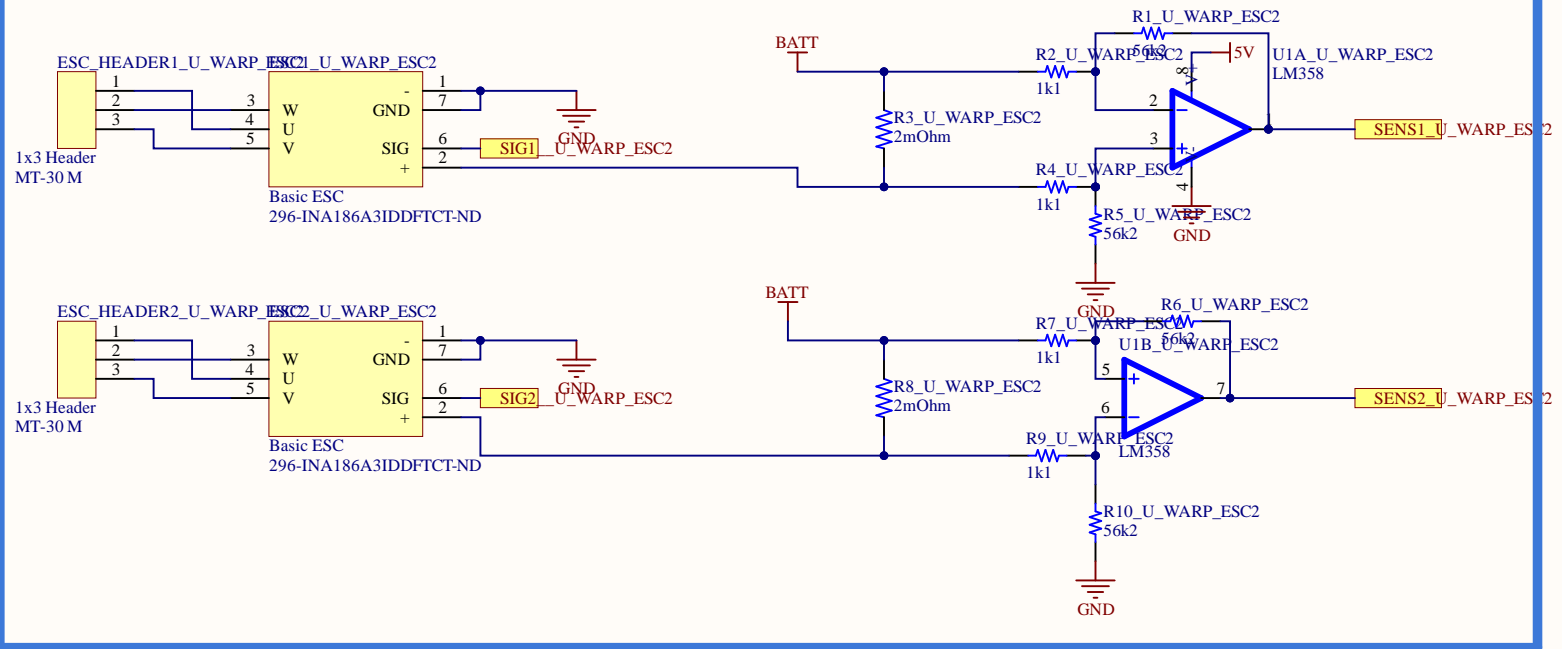
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File:	C:\Users\MAIN\SchDoc	Drawn By:

ESC / Shunt Resistors (Current Measurement)



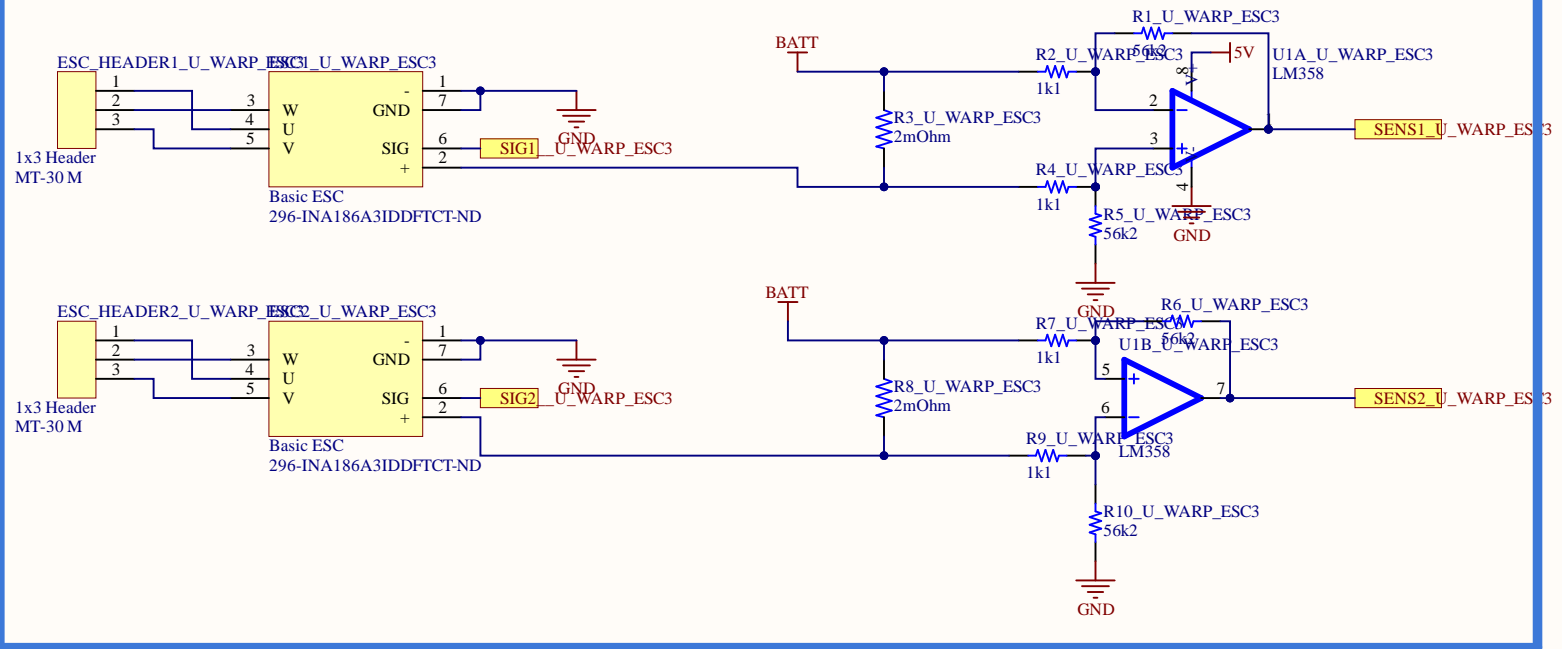
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ESC / Shunt Resistors (Current Measurement)



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ESC / Shunt Resistors (Current Measurement)



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Date:	8.16.2022	Sheet of
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ESC / Shunt Resistors (Current Measurement)

The diagram illustrates a circuit for measuring current using ESCs (Electronic Speed Controllers) and shunt resistors. It shows two identical channels, each consisting of an ESC, a shunt resistor, and an op-amp configured as a differential amplifier.

Channel 1 (Top):

- ESC:** Basic ESC 296-INA186A3IDDFTCT-ND. It has a 1x3 Header MT-30 M connected to pins 1, 2, and 3. The ESC is connected to a 5V supply and GND.
- Shunt Resistor:** R3_U_WARP_ESC4 (2mOhm) is connected in series with the ESC's output (pin 6) and GND.
- Op-Amp:** U1A_U_WARP_ESC4 (LM358) is configured as a differential amplifier. The non-inverting input (+) is connected to the shunt resistor's output (pin 2) and GND. The inverting input (-) is connected to the ESC's output (pin 6) and GND. The output (pin 7) is connected to SENS1_U_WARP_ESC4.

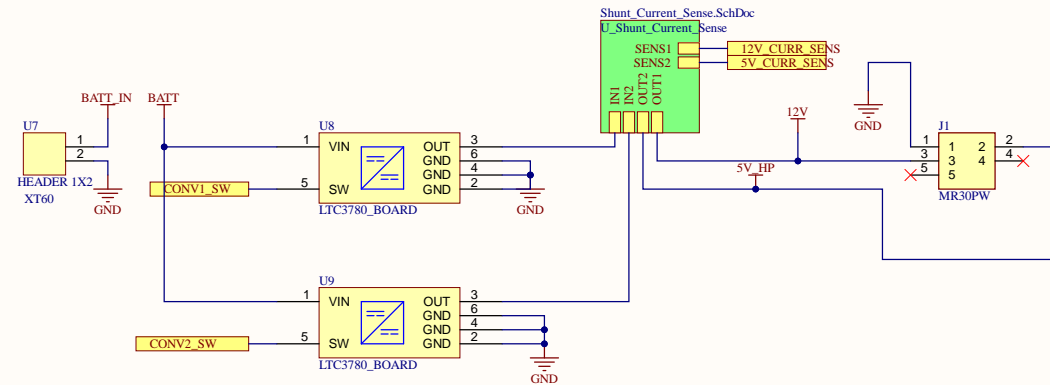
Channel 2 (Bottom):

- ESC:** Basic ESC 296-INA186A3IDDFTCT-ND. It has a 1x3 Header MT-30 M connected to pins 1, 2, and 3. The ESC is connected to a 5V supply and GND.
- Shunt Resistor:** R8_U_WARP_ESC4 (2mOhm) is connected in series with the ESC's output (pin 6) and GND.
- Op-Amp:** U1B_U_WARP_ESC4 (LM358) is configured as a differential amplifier. The non-inverting input (+) is connected to the shunt resistor's output (pin 2) and GND. The inverting input (-) is connected to the ESC's output (pin 6) and GND. The output (pin 7) is connected to SENS2_U_WARP_ESC4.

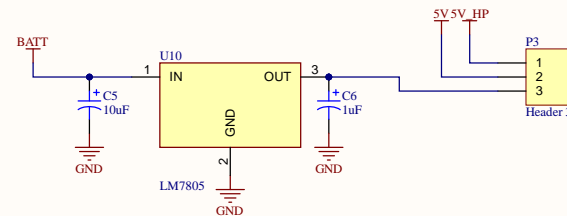
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POWER

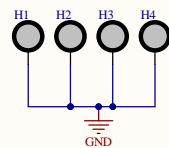
Converters



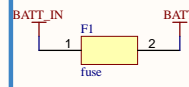
Voltage Regulator



Mounting Holes

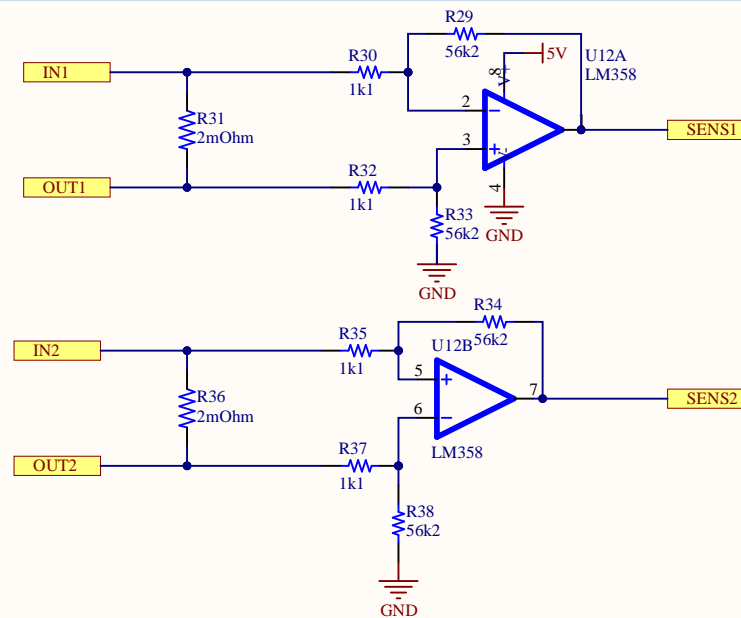


Fuse



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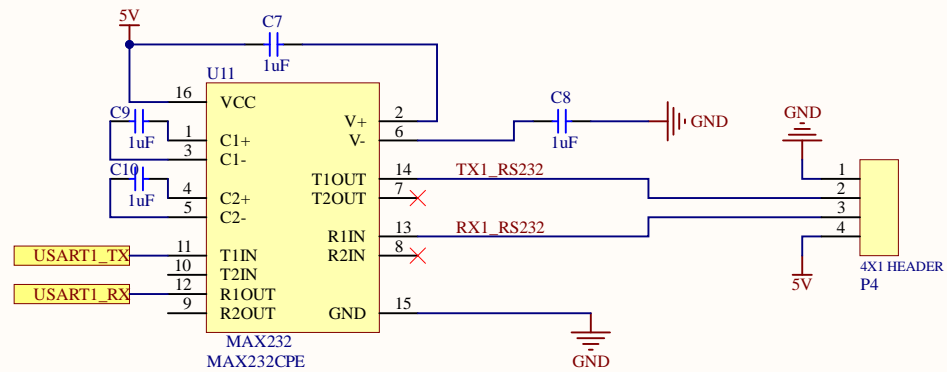
Shunt Current Sense



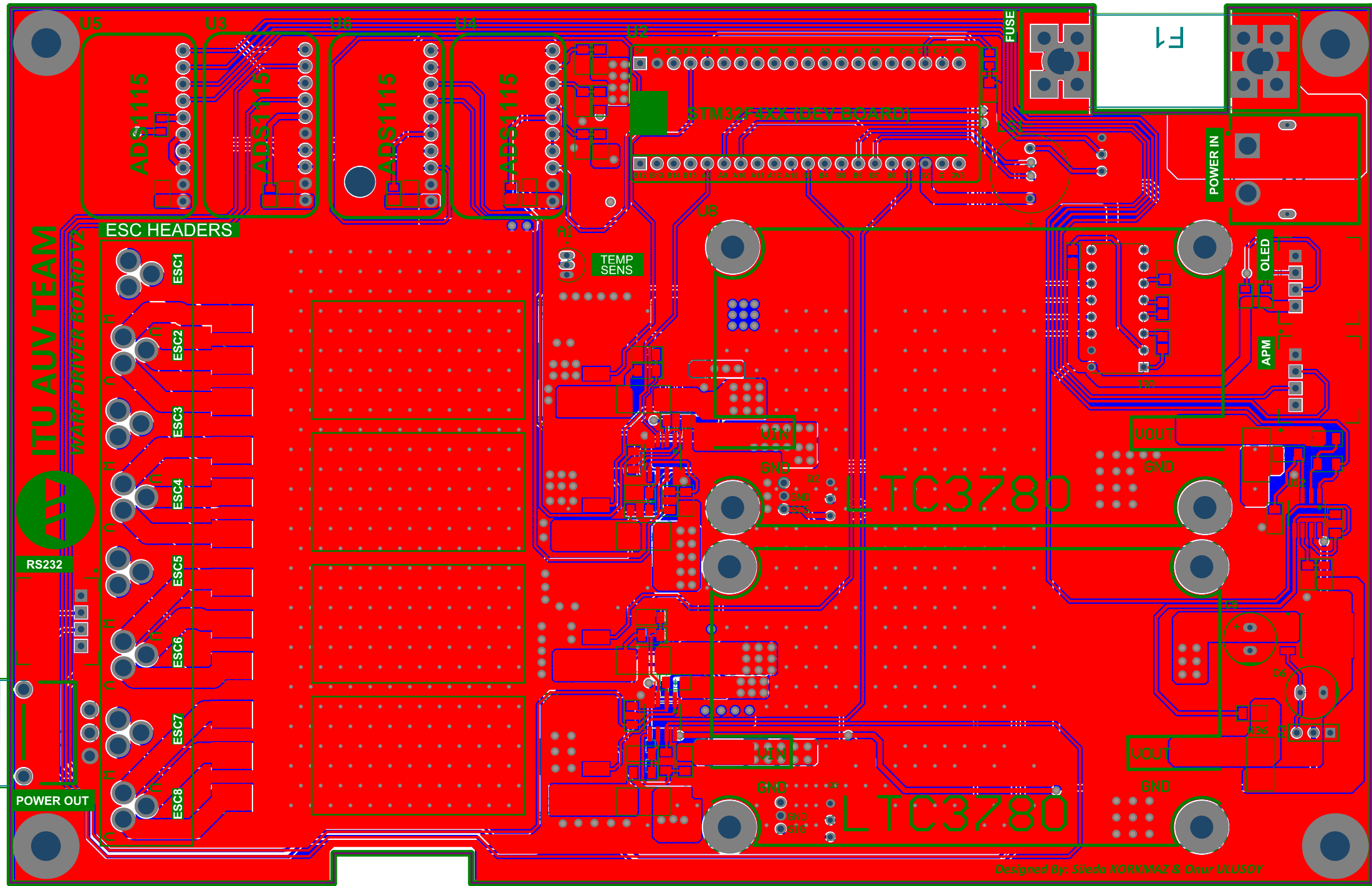
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RS232

The diagram illustrates the wiring for a MAX232CPE RS232 driver module. The module is a yellow rectangle with pins 1 through 15. It is powered by a 5V supply through a 1uF capacitor (C7) connected to pin 16 (VCC). Pins 1, 3, 4, and 5 are connected to ground through capacitors C9, C10, and C11 respectively. The module's output pins are connected to a 4X1 header P4. Pin 2 (V+) is connected to pin 1 of the header. Pin 6 (V-) is connected to pin 2 of the header. Pin 14 (TX1OUT) is connected to pin 3 of the header. Pin 13 (RX1IN) is connected to pin 4 of the header. Pin 15 (GND) is connected to ground. The module is labeled 'MAX232' and 'MAX232CPE'.



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ITU AUV TEAM
WAMP DRIVER BOARD V2

RS232

POWER OUT

ESC HEADERS

ADS1115

ADS1115

ADS1115

ADS1115

STM32F4XX (DEV BOARD)

TEMP SENS

VIN

GND

VIN

GND

LTC3780

LTC3780

POWER IN

APM

OLED

VOUT

GND

VOUT

GND

Designed By: Süeda KORKMAZ & Onur ULUSOY

Comment	Description	Designator	Footprint	LibRef	Quantity
LM35DZ/NOPB		A1	T092127P521H735-3	LM35DZ/NOPB	1
CAP CER 1uF 25V X7R 0805	Cap Ceramic Tuf 25V X7R 5% SMD 0805 125C Plastic T/R	C1, C2, C3, C4, C7, C8, C9, C10	C0805C105J3RAC7800	C0805C105J3RAC7800	8
10uF	CAP ALUM 33UF 20% 35V RADIAL	C5	CAP TH ALUM ELEC D8.00mm S3.50mm H12.50mm	UVP1V330MPD	1
1uF	CAP ALUM 33UF 20% 35V RADIAL	C6	CAP TH ALUM ELEC D8.00mm S3.50mm H12.50mm	UVP1V330MPD	1
Basic ESC	40V, bi-directional, high-precision current sense amplifier w/ picoamp IB & ENABLE 8-SOT-23-THIN -40 to 125	ESC1_U_WARP_ESC1, ESC1_U_WARP_ESC2, ESC1_U_WARP_ESC3, ESC1_U_WARP_ESC4, ESC2_U_WARP_ESC1, ESC2_U_WARP_ESC2, ESC2_U_WARP_ESC3, ESC2_U_WARP_ESC4	BLUE ESC TOP	Basic ESC	8
MT-30 M		ESC_HEADER1_U_WARP_ESC1, ESC_HEADER1_U_WARP_ESC2, ESC_HEADER1_U_WARP_ESC3, ESC_HEADER1_U_WARP_ESC4, ESC_HEADER2_U_WARP_ESC1, ESC_HEADER2_U_WARP_ESC2, ESC_HEADER2_U_WARP_ESC3, ESC_HEADER2_U_WARP_ESC4	MT30-M	MT-30 M	8
fuse		F1	fuse	fuse	1
Mounting Holes		H1, H2, H3, H4	Mounting Holes	Mounting Holes	4
MB30PW	Connector	J1	MB30PW	MB30PW	1
buzzer		LS1	BUTZER	buzzer	1
WIRE-TO BOARD HEADER, 2.5MM, 4 C	Wire-to Board Header, 2.5MM, 4 C, Battery Power Module Input	P1, P2, P4	51125-04-0200-01	51125-04-0200-01	3
Header 3	WARP 5V Logic Selector Switch	P3	HDR1X3	Header 3	1
2N7000	MOSFET N-CH 60V 350MA TO-92	Q1, Q2, Q3	2N7000	2N7000	3
56k2	RES 0.1 OHM 1% 1/2W 1206	R1_U_WARP_ESC1, R1_U_WARP_ESC2, R1_U_WARP_ESC3, R1_U_WARP_ESC4, R5_U_WARP_ESC1, R5_U_WARP_ESC2, R5_U_WARP_ESC3, R5_U_WARP_ESC4, R6_U_WARP_ESC1, R6_U_WARP_ESC2, R6_U_WARP_ESC3, R6_U_WARP_ESC4, R10_U_WARP_ESC1, R10_U_WARP_ESC2, R10_U_WARP_ESC3, R10_U_WARP_ESC4, R29, R33, R34, R38	RES 1206_3216	RL1206FR-7W0R1L	20
1k1	RES 0.1 OHM 1% 1/2W 1206	R2_U_WARP_ESC1, R2_U_WARP_ESC2, R2_U_WARP_ESC3, R2_U_WARP_ESC4, R4_U_WARP_ESC1, R4_U_WARP_ESC2, R4_U_WARP_ESC3, R4_U_WARP_ESC4, R7_U_WARP_ESC1, R7_U_WARP_ESC2, R7_U_WARP_ESC3, R7_U_WARP_ESC4, R9_U_WARP_ESC1, R9_U_WARP_ESC2, R9_U_WARP_ESC3, R9_U_WARP_ESC4, R30, R32, R35, R37, R31, R36	RES 1206_3216	RL1206FR-7W0R1L	20
2mOhm	TL3A R002 1% 2K RL	R3_U_WARP_ESC1, R3_U_WARP_ESC2, R3_U_WARP_ESC3, R3_U_WARP_ESC4, R8_U_WARP_ESC1, R8_U_WARP_ESC2, R8_U_WARP_ESC3, R8_U_WARP_ESC4, R31, R36	Shunt	Shunt	10
RES 2.2K OHM 1% 1/8W 0805	2.2 KOhms ±1% 0.125W, 1/8W Chip Resistor 0805 (2012 Metric) Moisture Resistant Thick Film	R11, R12, R13, R14, R15, R16, R18, R20, R28	RC0805FR-072K2L	RC0805FR-072K2L	9
RES 10K OHM 1% 1/8W 0805	Res Thick Film 2.0 x 1.2 mm 10K Ohm 1% 0.125W(1/8W) 100ppm/°C Molded SMD Paper T/R	R17, R19, R27	RC0805FR-1310KL	RC0805FR-1310KL	3
10k	RES 0.1 OHM 1% 1/2W 1206	R21, R22, R23	RES 1206_3216	RL1206FR-7W0R1L	3
2k	RES 0.1 OHM 1% 1/2W 1206	R24, R25, R26	RES 1206_3216	RL1206FR-7W0R1L	3
LM358		U1_U_WARP_ESC1, U1_U_WARP_ESC2, U1_U_WARP_ESC3, U1_U_WARP_ESC4, U12	LM358	LM358	5
STM32F401CCU6		U2	STM32F401CCU6	STM32F401CCU6	1
ADS1115		U3, U4, U5, U6	ADS1115	ADS1115	4
HEADER 2X1		U7	XT68PW-M	XT68PW-M	1
1-1C-1780_BOARD		U8, U9	1-1C-1780_BOARD	1-1C-1780_BOARD	2
LM7805		U10	lm7805 smd	LM7805	1
MAX232CPE	MAX232 Series 120 kbps 5.5 V Through Hole RS-232 Transceiver - PDIP-16	U11	MAX232CPE	MAX232CPE	1