

REVISION	DESCRIPTION	DATE	APPROVED

Root

DRAFT

Quadcopter

SCHEMATIC STATUS: DRAFT

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9	MECHANICAL PARTS
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TEMPLATE NOTES

Set Project Parameters

- 1- Go to View -> Pge Preview Setting
- 2- Set Parameters based on the following Info
COMMENT 1: Project Version
COMMENT 2: Document Status
COMMENT 3: Doc. Approval Eng.
COMMENT 4: BOM Ref. DOC.
COMMENT 5: PCB Ref. DOC.
COMMENT 6: GBR Ref. DOC.
COMMENT 7: ASM Ref. DOC.
COMMENT 8: Variant Name
COMMENT 9: Revision Description

Symbols and Labels

Mark Not Fitted Components as --> DNF
Differential Signal Example
Net Class Example

SCHEMATIC STATUS:

- | | |
|-------------|---|
| DRAFT | – Very Early Stage of Schematic |
| PRELIMINARY | – Close to Final Schematic |
| CHECKED | – There Should Not Be Any Mistakes |
| RELEASED | – A Board with This Schematic Has Been Produced |

DESIGN CONSIDERATION

INFO:	Example text for informational design notes.
CAUTIONARY:	Example text for cautionary design notes.
DESIGN NOTE:	Example text for critical design notes.
LAYOUT NOTE:	Example text for critical layout guidelines.

3D Preview TOP

3D Preview BOTTOM

Board Statistics
Stackup Info

SHOULD BE ADDED
AFTER RELEASE

SHOULD BE ADDED
AFTER RELEASE

SHOULD BE ADDED
AFTER RELEASE

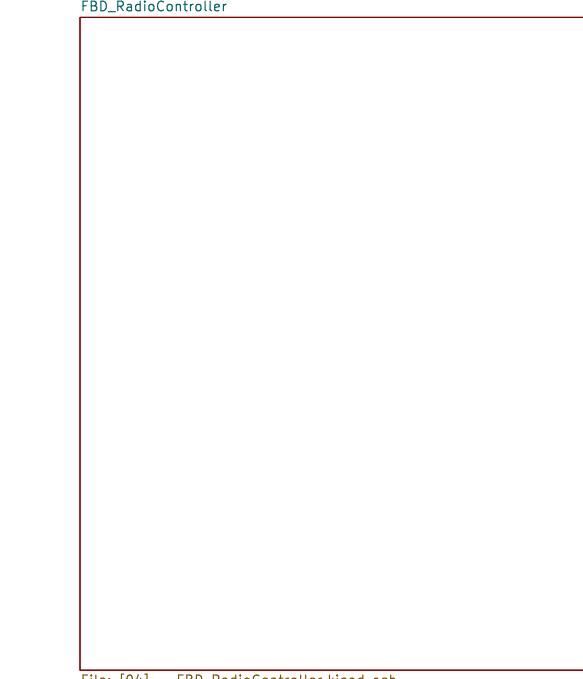
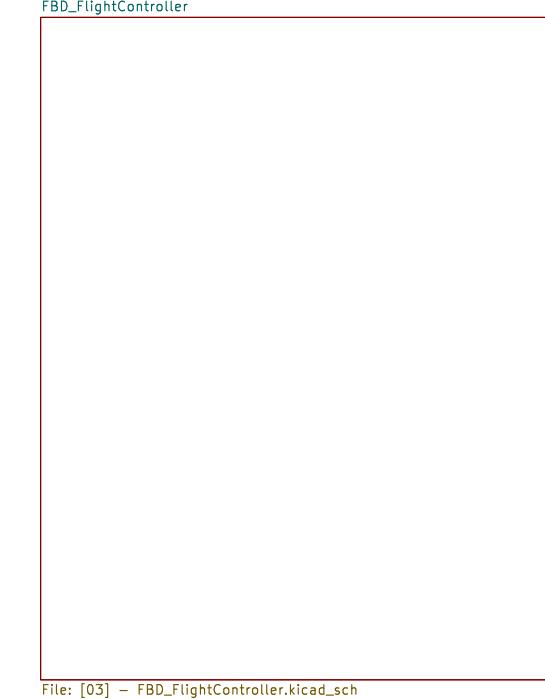
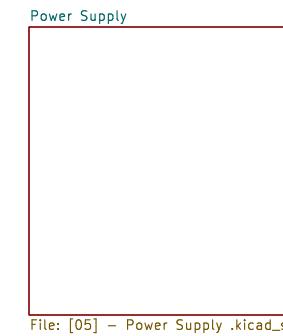
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ENG: Siavash Taher Parvar			PRJ VER:	DOC VER:	DOC REV:
DSN: Siavash Taher Parvar					
CHK: Siavash Taher Parvar			TITLE:		
REFERENCE DOCUMENTS			Root		
SCH Ref. DOC.: Sub_HW_Qcopter.sch					
BOM Ref. DOC.:					
PCB Ref. DOC.:					
GBR Ref. DOC.:					
ASM Ref. DOC.:					
FILE NAME: Sub_HW_Qcopter.kicad_sch					
SHEET 1 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:		

THIS DOCUMENT AND THE DATA DISCLOSED
HEREIN OR HEREWITH ARE ALL OPEN-SOURCE
AND THERE IS NO RESPONSIBILITY FOR
PROBABLE FAILURE OR INJURY

REVISION	DESCRIPTION	DATE	APPROVED

FBD_Quadcopter

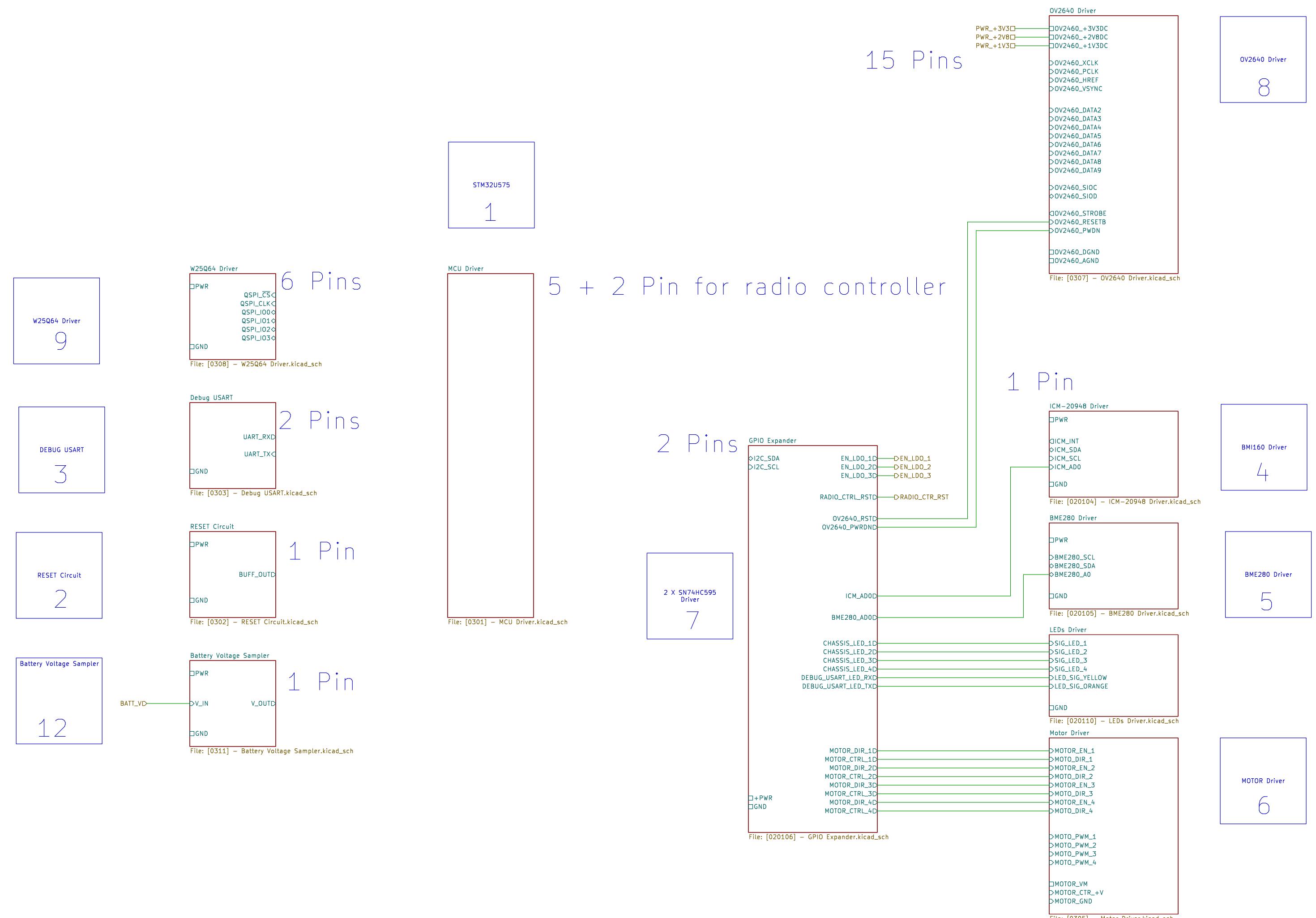
DRAFT



APPROVALS	DATE	PROJECT:			 MendOzo
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DSN: Siavash Taher Parvar		REFERENCE DOCUMENTS			PRJ VER: DOC VER: DOC REV:
CHK: Siavash Taher Parvar		SCH Ref. DOC.: [00] - FBD_Quadcopter.kicad_sch	TITLE: FBD_Quadcopter		
PCB Ref. DOC.:		BOM Ref. DOC.:	FILE NAME: [02] - FBD_Quadcopter.kicad_sch		
GBR Ref. DOC.:		PCB Ref. DOC.:	SHEET 2 OF 40 SIZE: C SCALE: 1:1 VARIANT NAME:		
ASM Ref. DOC.:		GBR Ref. DOC.:			

FBD_FlightController

DRAFT



APPROVALS		DATE	PROJECT:			Mendozo		
ENG:	Sivash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:			
DSN:	Sivash Taher Parvar		TITLE:					
CHK:	Sivash Taher Parvar		FBD_FlightController					
REFERENCE DOCUMENTS								
SCH Ref. DOC.: [03] - FBD_FlightController.kicad_sch								
PCB Ref. DOC.: [03] - FBD_FlightController.kicad_pcb								
GBR Ref. DOC.: [03] - FBD_FlightController.kicad_gbr								
ASM Ref. DOC.: [03] - FBD_FlightController.kicad_asm								
FILE NAME: [03] - FBD_FlightController.kicad_sch			SHEET 3 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:		

REVISION	DESCRIPTION	DATE	APPROVED

FBD_RadioController

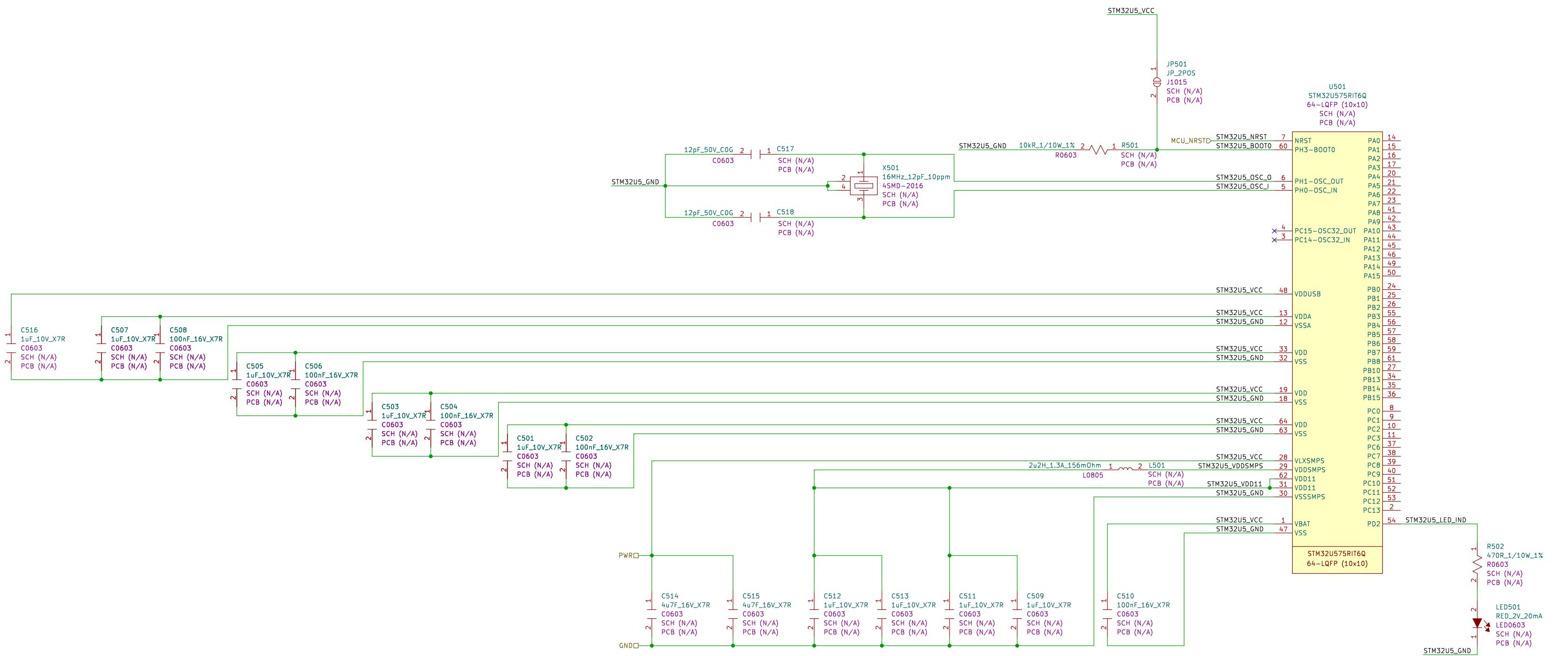
DRAFT



APPROVALS		DATE	PROJECT:			 MendOzo		
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BOM Ref. DOC.:			GBR Ref. DOC.:					
PCB Ref. DOC.:			ASW Ref. DOC.:					

MCU Driver

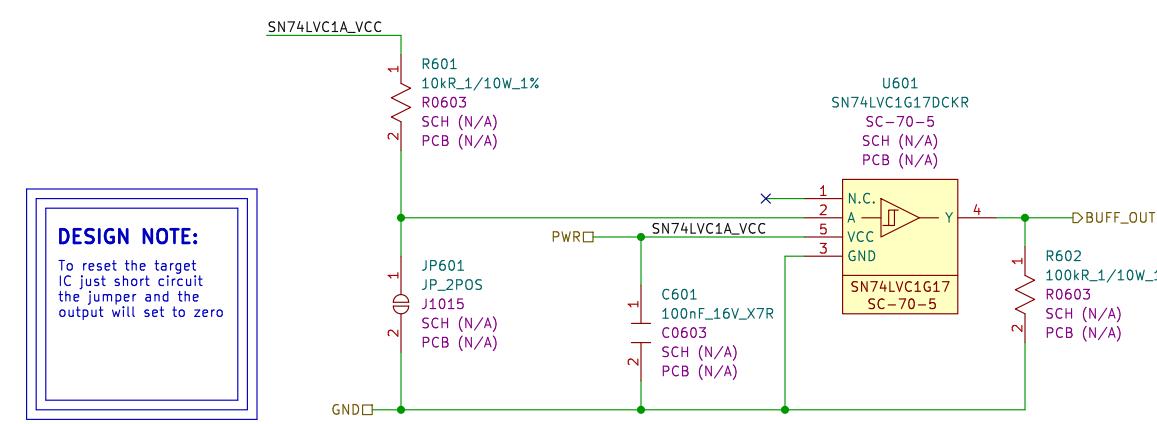
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ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:				
DSN:	Siavash Taher Parvar		TITLE: MCU Driver						
CHK:	Siavash Taher Parvar		FILE NAME: [0301] - MCU Driver.kicad_sch						
REFERENCE DOCUMENTS						OPEN-SOURCE DOCUMENT			
SCH Ref. DOC.:	[0301] - MCU Driver.kicad_sch								
PCB Ref. DOC.:									
GBR Ref. DOC.:									
ASM Ref. DOC.:			SHEET 5 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:			

RESET Circuit

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INFO:

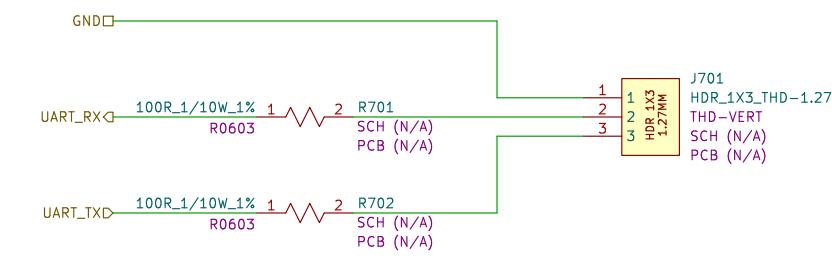
Table 8-1. Function Table

INPUT A	OUTPUT Y
H	H
L	L

APPROVALS	DATE	PROJECT:	Mendozo
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CHK: Siavash Taher Parvar		PCB Ref. DOC.:	
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BOM Ref. DOC.:			
PCB Ref. DOC.:			
GBR Ref. DOC.:			
ASM Ref. DOC.:			
TITLE: RESET Circuit			
FILE NAME: [0302] - RESET Circuit.kicad_sch			
SHEET 6 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:

Debug USART

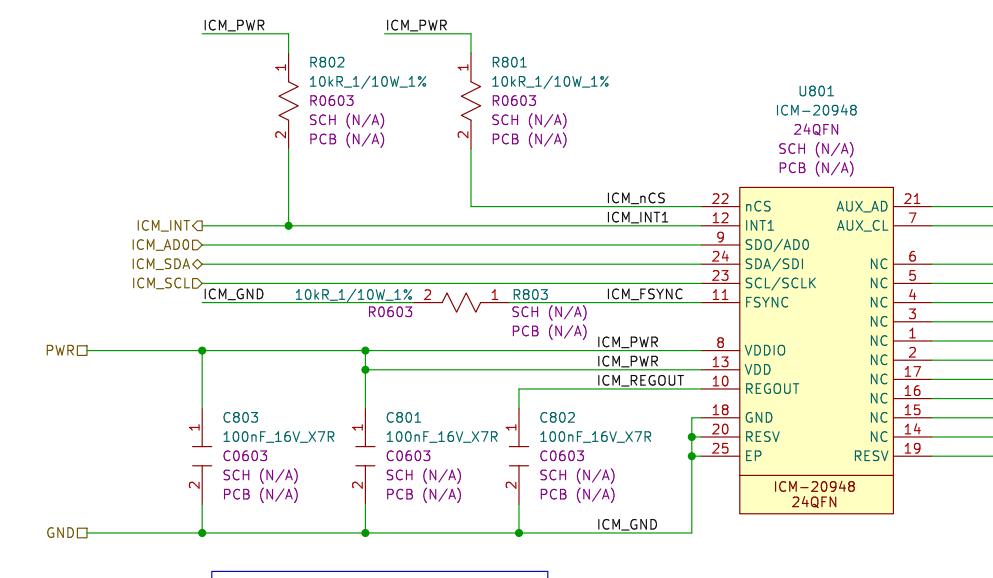
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APPROVALS		DATE	PROJECT:			 MendOzo OPEN-SOURCE DOCUMENT	
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN:	Siavash Taher Parvar		TITLE: Debug USART				
CHK:	Siavash Taher Parvar		FILE NAME: [0303] - Debug USART.kicad_sch				
REFERENCE DOCUMENTS	SCH Ref. DOC.: [000] - Debug USART.kicad_sch	BOM Ref. DOC.:	PCB Ref. DOC.:	GBR Ref. DOC.:	ASM Ref. DOC.:		

ICM-20948 Driver

DRAFT



CAUTIONARY:
Power up with SDA_SCLK and nCS pins held high by a supported user device. In case this power up approach is used, software reset is required using the PWR_MGMT_1 register, prior to initialization.

INFO:

The slave address of the ICM-20948 is b110100X which is 7 bits long. The LSB bit of the 7-bit address is determined by the logic level on pin ADO. This allows two ICM-20948 devices to connect to the same I2C bus. When used in this configuration, the address of the one of the devices should be b1101000 (pin ADO is logic low) and the address of the other should be b1101001 (pin ADO is logic high).

INFO:

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
ACCELEROMETER SENSITIVITY						
Full-Scale Range	ACCEL_FS=0	±2		G	1	
	ACCEL_FS=1	±4		G	1	
	ACCEL_FS=2	±8		G	1	
	ACCEL_FS=3	±16		G	1	
ADC Word Length	Output in two's complement format	16		Bits	1	
Sensitivity Scale Factor	ACCEL_FS=0	16,384		LSB/g	1	
	ACCEL_FS=1	8,192		LSB/g	1	
	ACCEL_FS=2	4,096		LSB/g	1	
	ACCEL_FS=3	2,048		LSB/g	1	
Initial Tolerance	Component-level	±0.5		%	2	
Sensitivity Change vs. Temperature	-40°C to +85°C ACCEL_FS=0	±0.026		%/°C	2	
Nonlinearity	Best Fit Straight Line	±0.5		%	2, 3	
Cross-Axis Sensitivity		±2		%	2, 3	
ZERO-G OUTPUT						
Initial Tolerance	Component-level, all axes	±25		mg	2	
Initial Tolerance	Board-level, all axes	±50		mg	2	
Zero-G Level Change vs. Temperature	0°C to +85°C	±0.80		mg/°C	2	
ACCELEROMETER NOISE PERFORMANCE						
Noise Spectral Density	Based on Noise Bandwidth = 10 Hz	230		µg/√Hz	2	
LOW PASS FILTER RESPONSE	Programmable Range	5.7	246	Hz	1, 3	
ACCELEROMETER STARTUP TIME	From Sleep mode	20	ms	2, 3		
	From Cold Start, 1 ms VDD ramp	30	ms	2, 3		
OUTPUT DATA RATE	Low-Power Mode	0.27	562.5	Hz		
	Low-Noise Mode ACCEL_FCHOICE=1; ACCEL_DLPCFG=x	4.5	1.125k	Hz		1
	Low-Noise Mode ACCEL_FCHOICE=0; ACCEL_DLPCFG=x			4.5k	Hz	

Table 2. Accelerometer Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
GYROSCOPE SENSITIVITY						
Full-Scale Range	GYRO_FS_SEL=0	±250		dps	1	
	GYRO_FS_SEL=1	±500		dps	1	
	GYRO_FS_SEL=2	±1000		dps	1	
	GYRO_FS_SEL=3	±2000		dps	1	
Gyroscope ADC Word Length		16		bits	1	
Sensitivity Scale Factor	GYRO_FS_SEL=0	131		LSB/dps	1	
	GYRO_FS_SEL=1	65.5		LSB/dps	1	
	GYRO_FS_SEL=2	32.8		LSB/dps	1	
	GYRO_FS_SEL=3	16.4		LSB/dps	1	
Sensitivity Scale Factor Tolerance	25°C	±1.5		%	2	
Sensitivity Scale Factor Variation Over Temperature	-40°C to +85°C	±3		%	2	
Nonlinearity	Best fit straight line; 25°C	±0.1		%	2, 3	
Cross-Axis Sensitivity		±2		%	2, 3	
ZERO-RATE OUTPUT (ZRO)						
Initial ZRO Tolerance	25°C (Component-level)	±5		dps	2	
ZRO Variation Over Temperature	-40°C to +85°C	±0.05		dps/°C	2	
GYROSCOPE NOISE PERFORMANCE (GYRO_FS_SEL=0)						
Noise Spectral Density	Based on Noise Bandwidth = 10 Hz	0.015		dps/√Hz	2	
GYROSCOPE MECHANICAL FREQUENCIES		25	27	29	kHz	2
LOW PASS FILTER RESPONSE	Programmable Range	5.7	197	Hz	1, 3	
GYROSCOPE START-UP TIME	From Full-Chip Sleep mode	35	ms	2, 3		
OUTPUT DATA RATE	Low-Power Mode	4.4	562.5	Hz		
	Low-Noise Mode GYRO_FCHOICE=1; GYRO_DLPCFG=x	4.4	1.125k	Hz		1
	Low-Noise Mode GYRO_FCHOICE=0; GYRO_DLPCFG=x			9k	Hz	

Table 1. Gyroscope Specifications

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	NOTES
MAGNETOMETER SENSITIVITY						
Full-Scale Range		±4900		µT	1	
Output Resolution		16		bits	1	
Sensitivity Scale Factor		0.15		µT / LSB	1	
ZERO-FIELD OUTPUT						
Initial Calibration Tolerance		-2000		+2000	LSB	2
OTHER						
Output Data Rate				100	Hz	1

Table 3. Magnetometer Specifications

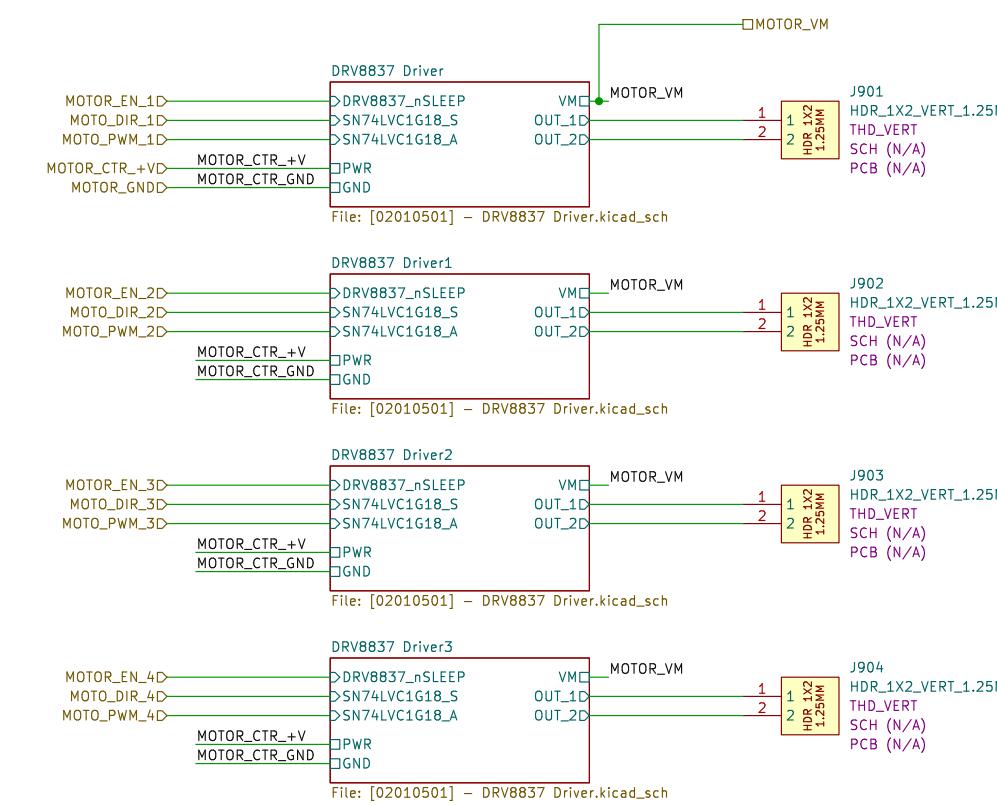
PARAMETERS	CONDITIONS	MIN	TYPICAL	MAX	UNITS	NOTES
I²C TIMING						
f_{SCL} , SCL Clock Frequency				400	kHz	1, 2
$t_{HD STA}$, (Repeated) START Condition Hold Time		0.6			µs	1, 2
t_{LOW} , SCL Low Period		1.3			µs	1, 2
t_{HIGH} , SCL High Period		0.6			µs	1, 2
$t_{SU STA}$, Repeated START Condition Setup Time		0.6			µs	1, 2
$t_{HD DAT}$, SDA Data Hold Time		0			µs	1, 2
$t_{SU DAT}$, SDA Data Setup Time		100			ns	1, 2
t_r , SDA and SCL Rise Time	C_b bus cap. from 10 to 400 pF	20+0.1C _b		300	ns	1, 2
t_f , SDA and SCL Fall Time	C_b bus cap. from 10 to 400 pF	20+0.1C _b		300	ns	1, 2
$t_{SU STOP}$, STOP Condition Setup Time		0.6			µs	1, 2
t_{FB} , Bus Free Time Between STOP and START Condition		1.3			µs	1, 2
C_b , Capacitive Load for each Bus Line				< 400	pF	1, 2
$t_{VD DAT}$, Data Valid Time				0.9	µs	1, 2
$t_{VD ACK}$, Data Valid Acknowledge Time				0.9	µs	1, 2

Table 7. I²C Timing Characteristics

APPROVALS	DATE	PROJECT:	Mendozo OPEN-SOURCE DOCUMENT
ENG: Siavash Taher Parvar			
DSN: Siavash Taher Parvar			
CHK: Siavash Taher Parvar			
REFERENCE DOCUMENTS		TITLE: ICM-20948 Driver	
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BOM Ref. Doc.:			
PCB Ref. Doc.:			
GBR Ref. Doc.:			
ASM Ref. Doc.:			
SHEET 8 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:

Motor Driver

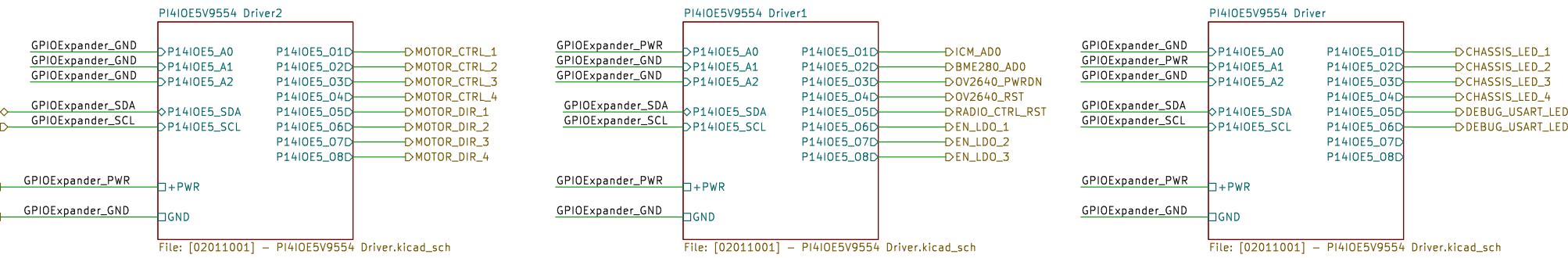
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APPROVALS		DATE	PROJECT:			 MendOzo
ENG:	Siavash Taher Parvar					
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar					
REFERENCE DOCUMENTS			TITLE:	Motor Driver		
SCH Ref. DOC.: [009]	Motor Driver.kicad_sch			PRJ VER:	DOC VER:	DOC REV:
BOM Ref. DOC.:				FILE NAME:	[0305] - Motor Driver.kicad_sch	
PCB Ref. DOC.:				SHEET	9 OF 40	SIZE: C
GBR Ref. DOC.:				SCALE:	1:1	VARIANT NAME:
ASM Ref. DOC.:				10		

GPIO Expander

DRAFT



INFO:	
MOTOR CTRL 1	GROUP 1
MOTOR CTRL 2	
MOTOR CTRL 3	
MOTOR CTRL 4	
MOTOR DIR 1	
MOTOR DIR 2	
MOTOR DIR 3	
MOTOR DIR 4	
IMU CS	GROUP 2
BME250 CS	
CAMERA PWRDN	
CAMERA RST	
RADIO CONTROLLER RST	
LD01 RST	
LD02 RST	
LD03 RST	
CHASSIS LED 1	GROUP 3
CHASSIS LED 2	
CHASSIS LED 3	
CHASSIS LED 4	
DEBUG USART LED TX	
DEBUG USART LED RX	

APPROVALS	DATE	PROJECT:			 MendOzo
ENG: Siavash Taher Parvar					
DSN: Siavash Taher Parvar					
CHK: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:	
REFERENCE DOCUMENTS		TITLE:			
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PCB Ref. DOC.:		FILE NAME:			
PCB Ref. DOC.:		[020106] - GPIO_Expander.kicad_sch			
GBR Ref. DOC.:		SHEET 10 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:
ASM Ref. DOC.:					

OV2640 Driver

DRAFT

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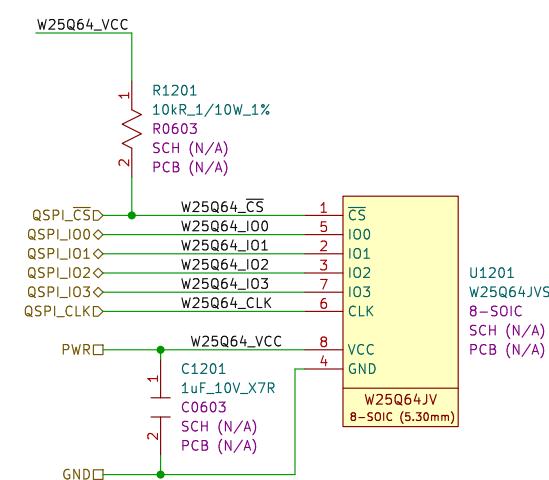
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W25Q64 Driver

DRAFT



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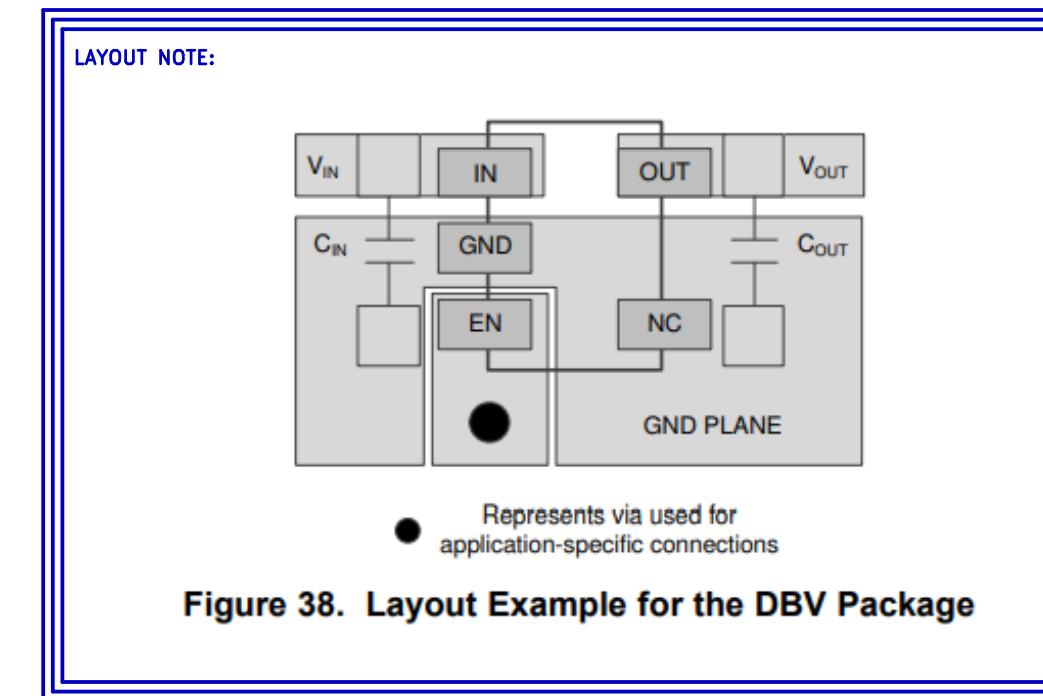
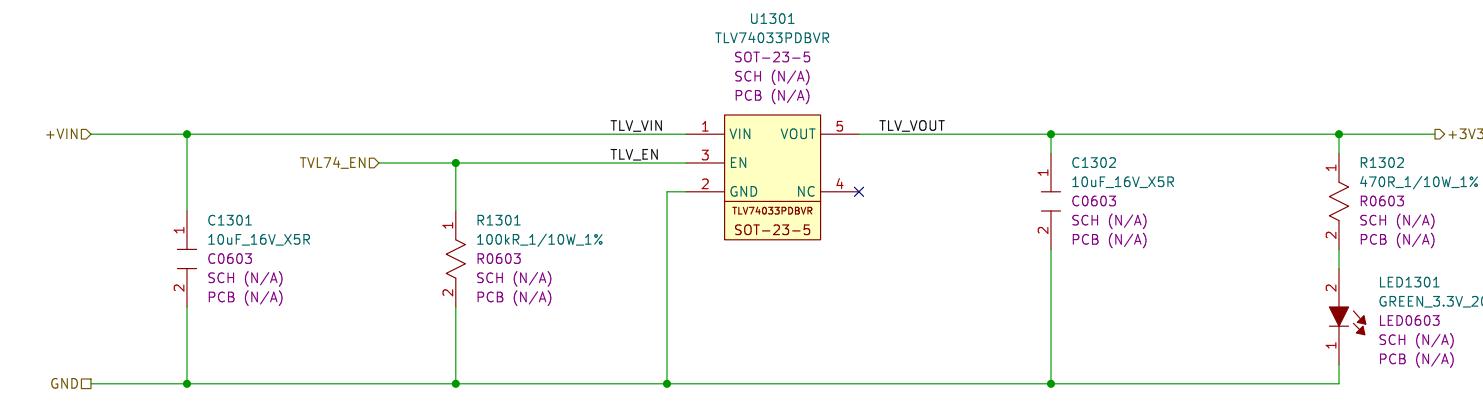
9.6 AC Electrical Characteristics⁽⁶⁾

DESCRIPTION	SYMBOL	ALT	SPEC			UNIT
			MIN	TYP	MAX	
Clock frequency except for Read Data (03h) instructions (3.0V-3.6V)	f_R	f_{C1}	D.C.		133	MHz
Clock frequency except for Read Data (03h) instructions(2.7V-3.0V)	f_R	f_{C2}	D.C.		104	MHz
Clock frequency for Read Data instruction (03h)	f_R		D.C.		50	MHz
Clock High, Low Time for all instructions except for Read Data (03h)	$t_{CLH}, t_{CLL}^{(1)}$		45% PC			ns
Clock High, Low Time for Read Data (03h) instruction	$t_{CRLH}, t_{CRLL}^{(1)}$		45% PC			ns
Clock Rise Time peak to peak	$t_{CLCH}^{(2)}$		0.1			V/ns
Clock Fall Time peak to peak	$t_{CHCL}^{(2)}$		0.1			V/ns
/CS Active Setup Time relative to CLK	t_{SLCH}	t_{CSS}	3			ns
/CS Not Active Hold Time relative to CLK	t_{CHSL}		3			ns
Data In Setup Time	t_{DVCH}	t_{DSU}	1			ns
Data In Hold Time	t_{CHDX}	t_{DH}	2			ns
/CS Active Hold Time relative to CLK	t_{CHSH}		3			ns
/CS Not Active Setup Time relative to CLK	t_{SHCH}		3			ns
/CS Deselect Time (for Read)	t_{SHSL1}	t_{CSH}	10			ns
/CS Deselect Time (for Erase or Program or Write)	t_{SHSL2}	t_{CSH}	50			ns
Output Disable Time	$t_{HQZ}^{(2)}$	t_{DIS}		7		ns
Clock Low to Output Valid 2.7V-3.6V	t_{CLOV}	t_V		6		ns
Output Hold Time	t_{CLOX}	t_{HO}	1.5			ns

APPROVALS		DATE	PROJECT:			Mendozo
ENG:	Sivash Taher Parvar					
DSN:	Sivash Taher Parvar					
CHK:	Sivash Taher Parvar					
REFERENCE DOCUMENTS			PRJ VER:	DOC VER:	DOC REV:	
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BOM Ref. DOC.:						
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:						
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SHEET 12 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:			

LDO +3V3

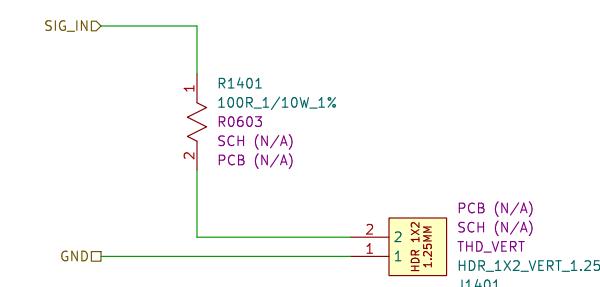
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APPROVALS		DATE	PROJECT:			 Mendozo
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DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar					
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SCH Ref. DOC.:	[020303] - LDO +3V3.kicad_sch					
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:						
FILE NAME:	[020303] - LDO +3V3.kicad_sch					
SHEET	13	OF	40	SIZE: C	SCALE: 1:1	VARIANT NAME:

CHASSIS LED Driver1

DRAFT



APPROVALS	DATE	PROJECT:			 MendOzo	
ENG: Siavash Taher Parvar						
DSN: Siavash Taher Parvar						
CHK: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
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BOM Ref. DOC.:						
PCB Ref. DOC.:		FILE NAME: [02011001] - CHASSIS LED Driver.kicad_sch				
GBR Ref. DOC.:						
ASM Ref. DOC.:		SHEET 14 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:	

A

B

C

D

A

B

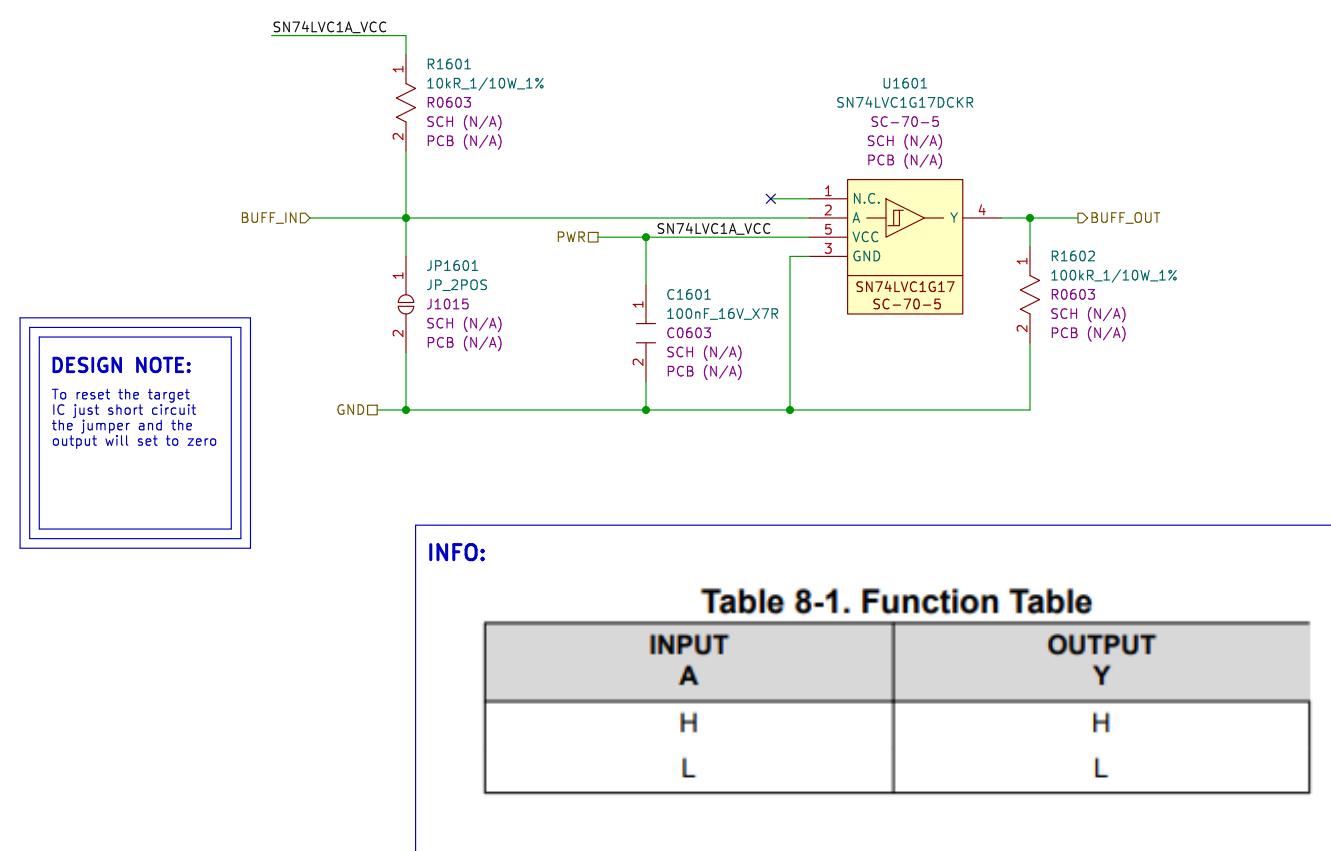
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D

APPROVALS	DATE	PROJECT:			 Mendozo	
ENG: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN: Siavash Taher Parvar	TITLE: STM32WLE5 Driver					
CHK: Siavash Taher Parvar	FILE NAME: [0401] – STM32WLE5 Driver.kicad_sch					
REFERENCE DOCUMENTS		SHEET 15 OF 40	SIZE: A4	SCALE: 1:1	VARIANT NAME:	
SCH Ref. DOC.: [0401] – STM32WLE5 Driver.kicad_sch						
BOM Ref. DOC.:						
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:						

RESET Circuit

DRAFT



APPROVALS		DATE	PROJECT:			Mendozo
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:	
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar					
REFERENCE DOCUMENTS			TITLE:			
SCH Ref. DOC.: [0402] - RESET_Circuit.kicad_sch			RESET Circuit			
BOM Ref. DOC.:						
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:			FILE NAME:	[0402] - RESET Circuit.kicad_sch		
			SHEET	16	OF	40
			SIZE:	C		
			SCALE:	1:1		
			VARIANT NAME:			

A

B

C

D

A

B

C

D

APPROVALS	DATE	PROJECT:			 Mend0zo	
ENG: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN: Siavash Taher Parvar	TITLE: USB Connector					
CHK: Siavash Taher Parvar	FILE NAME: [0403] – USB Connector.kicad_sch					
REFERENCE DOCUMENTS		SHEET 17 OF 40	SIZE: A4	SCALE: 1:1	VARIANT NAME:	
SCH Ref. DOC.: [0403] – USB Connector.kicad_sch						
BOM Ref. DOC.						
PCB Ref. DOC.						
GBR Ref. DOC.						
ASM Ref. DOC.						

A

B

C

D

A

B

C

D

APPROVALS	DATE	PROJECT:			 Mend0zo	
ENG: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN: Siavash Taher Parvar	TITLE: Antenna Driver					
CHK: Siavash Taher Parvar	FILE NAME: [0404] – Antenna Driver.kicad_sch					
REFERENCE DOCUMENTS		OPEN-SOURCE DOCUMENT				
SCH Ref. DOC.: [0404] – Antenna Driver.kicad_sch	BOM Ref. DOC.: PCB Ref. DOC.: GBR Ref. DOC.: ASM Ref. DOC.:	D				
		SHEET 18 OF 40	SIZE: A4	SCALE: 1:1	VARIANT NAME:	

A

B

C

D

A

B

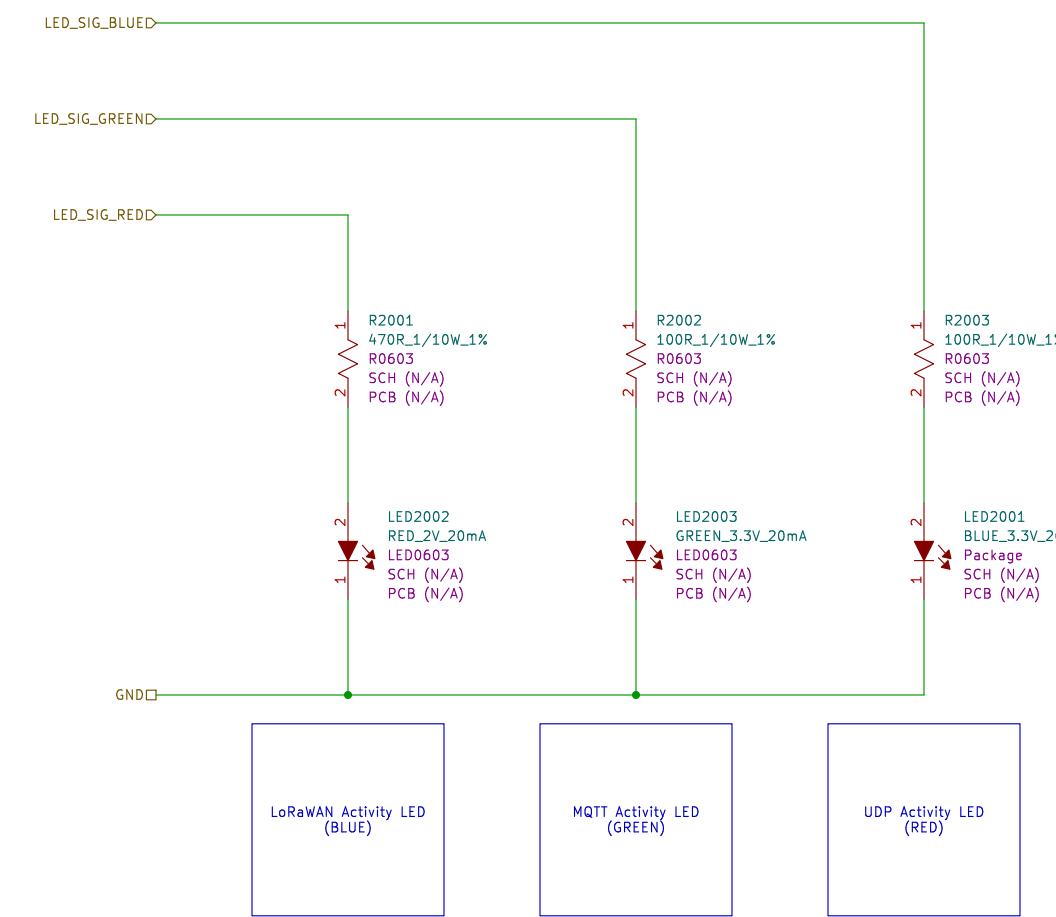
C

D

APPROVALS	DATE	PROJECT:			 Mend0zo	
ENG: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN: Siavash Taher Parvar	TITLE:					
CHK: Siavash Taher Parvar	ATWIL1000C Driver					
REFERENCE DOCUMENTS	FILE NAME: [0405] – ATWIL1000C Driver.kicad_sch					
SCH Ref. DOC.: [0405] – ATWIL1000C Driver.kicad_sch						
BOM Ref. DOC.						
PCB Ref. DOC.						
GBR Ref. DOC.						
ASM Ref. DOC.	SHEET 19 OF 40	SIZE: A4	SCALE: 1:1	VARIANT NAME:		

Activity LEDs Driver

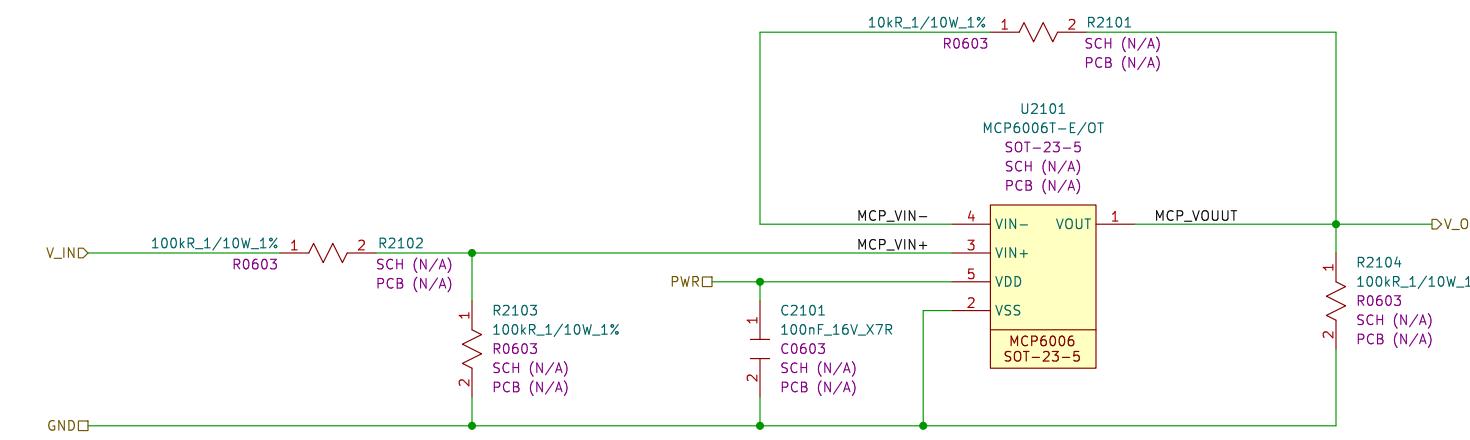
DRAFT



APPROVALS		PROJECT:			Mend0zo
ENG:	DATE				
DSN:	Siavash Taher Parvar				
CHK:	Siavash Taher Parvar				
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SCH Ref. DOC.:	(0406) - Activity LEDs Driver.kicad_sch	TITLE:			
PCB Ref. DOC.:		Activity LEDs Driver			
GBR Ref. DOC.:		FILE NAME: [0406] - Activity LEDs Driver.kicad_sch			
ASM Ref. DOC.:		SHEET 20 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:

Battery Voltage Sampler

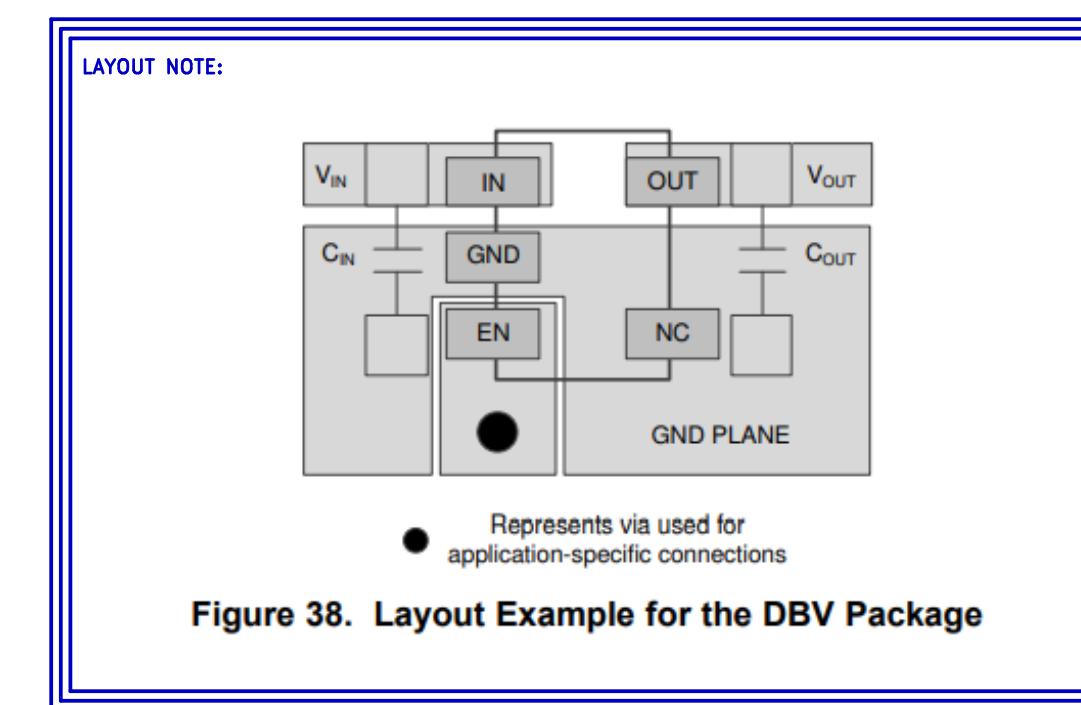
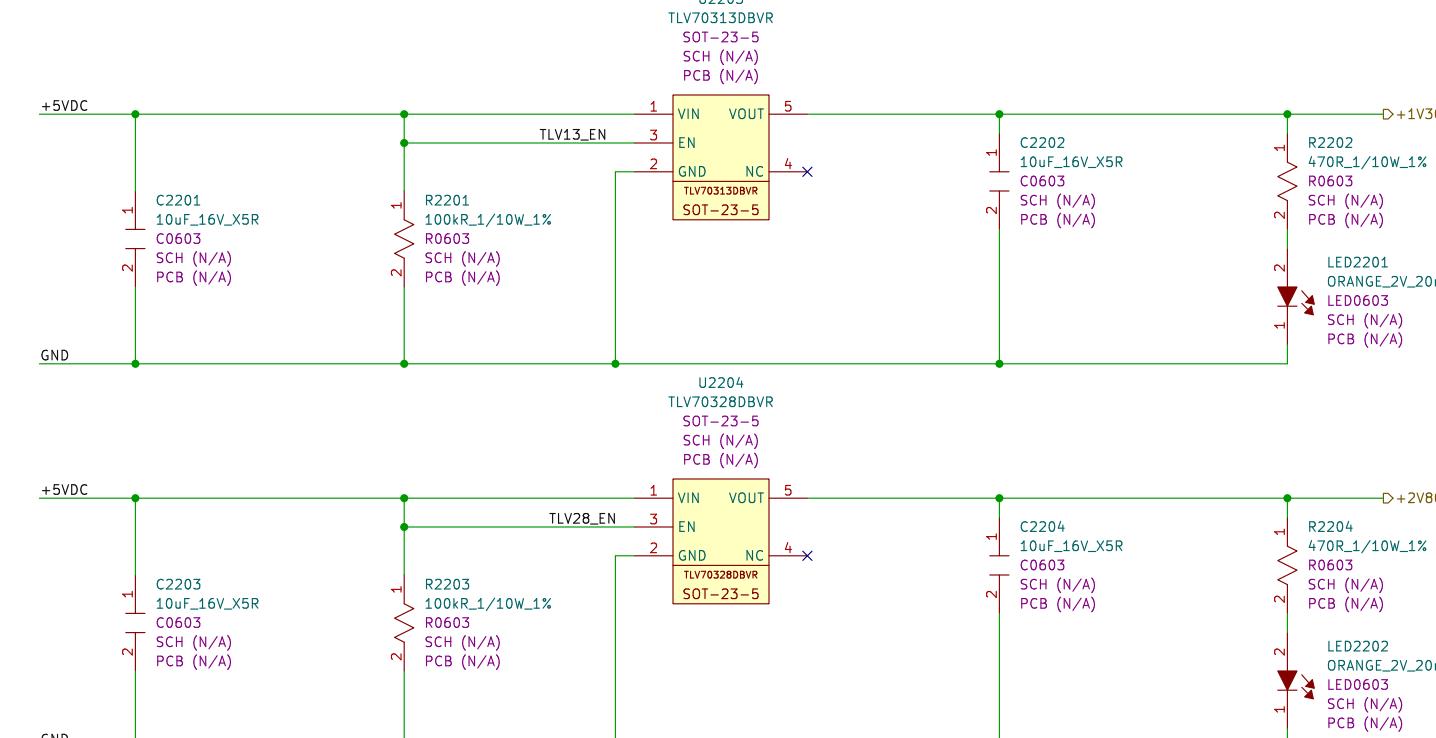
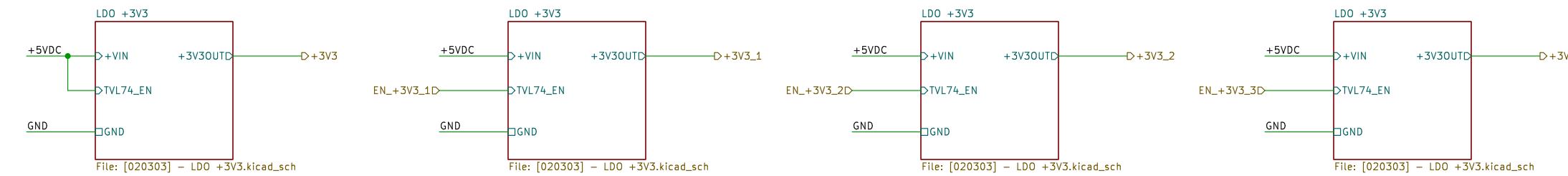
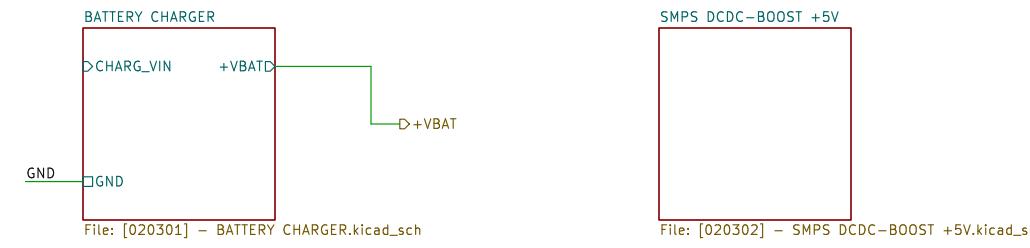
DRAFT



APPROVALS		DATE	PROJECT:			Mendozo
ENG:	Siavash Taher Parvar					
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:	
REFERENCE DOCUMENTS			TITLE:			
SCH Ref. DOC.: [0311] - Battery Voltage Sampler.kicad_sch			Battery Voltage Sampler			OPEN-SOURCE DOCUMENT
PCB Ref. DOC.:			FILE NAME: [0311] - Battery Voltage Sampler.kicad_sch			
GBR Ref. DOC.:			SHEET 21 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:
ASM Ref. DOC.:						

Power Supply

DRAFT

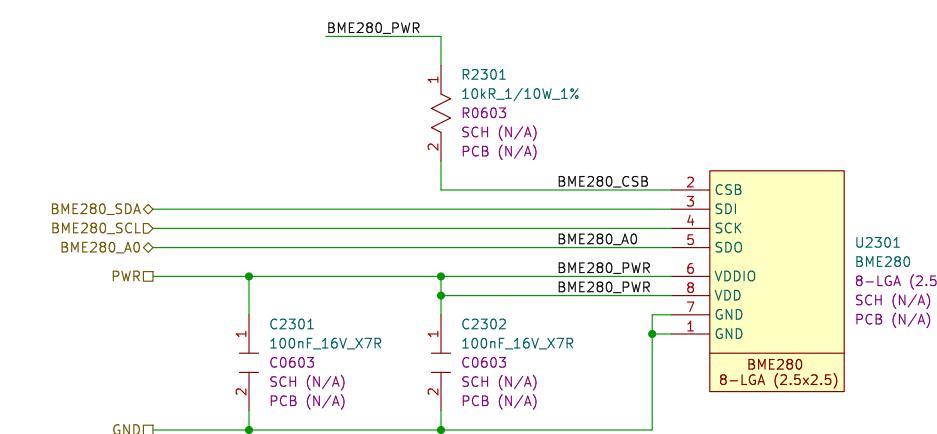


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DSN:	Sivash Taher Parvar				
CHK:	Sivash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:
REFERENCE DOCUMENTS			TITLE: Power Supply		
SCH Ref. DOC.: [05] - Power Supply.kicad_sch					
PCB Ref. DOC.: [05] - Power Supply.kicad_pcb					
GBR Ref. DOC.: [05] - Power Supply.kicad_gbr					
ASM Ref. DOC.: [05] - Power Supply.kicad_asm					
SHEET 22 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:		

Mendozo
OPEN-SOURCE
DOCUMENT

BME280 Driver

DRAFT



INFO:

The 7-bit address is 111011x. The 6 MSB bits are fixed. The last bit is changeable by SDO value and can be changed during operation. Connecting SDO to ground results in slave address 1110110 (0x76); connecting it to VDDIO results in slave address 1110111 (0x77), which is the same as BMP280's I²C address.

CAUTIONARY:

The SDO pin cannot be left floating; if left floating, the I²C address will be undefined.

INFO:

Table 35: Pin description

Pin	Name	I/O Type	Description	Connect to		
				SPI 4W	SPI 3W	I ² C
1	GND	Supply	Ground			GND
2	CSB	In	Chip select	CSB	CSB	V _{DDIO}
3	SDI	In/Out	Serial data input	SDI	SDI/SDO	SDA
4	SCK	In	Serial clock input	SCK	SCK	SCL
5	SDO	In/Out	Serial data output	SDO	DNC	GND for default address
6	V _{DDIO}	Supply	Digital / Interface supply			V _{DDIO}
7	GND	Supply	Ground			GND
8	V _{DD}	Supply	Analog supply			V _{DD}

Table 33: I²C timings

Parameter	Symbol	Condition	Min	Typ	Max	Unit
SDI setup time	t _{SDI;DAT}	S&F Mode HS mode	160			ns
			30			ns
SDI hold time	t _{HD;DAT}	S&F Mode, C _b ≤100 pF	80			ns
		S&F Mode, C _b ≤400 pF	90			ns
		HS mode, C _b ≤100 pF	18		115	ns
		HS mode, C _b ≤400 pF	24		150	ns
SCK low pulse	t _{LOW}	HS mode, C _b ≤100 pF	160			ns
		V _{DDIO} = 1.62 V				
SCK low pulse	t _{LOW}	HS mode, C _b ≤100 pF	210			ns
		V _{DDIO} = 1.2 V				

The above-mentioned I²C specific timings correspond to the following internal added delays:

- Input delay between SDI and SCK inputs: SDI is more delayed than SCK by typically 100 ns in Standard and Fast Modes and by typically 20 ns in High Speed Mode.
- Output delay from SCK falling edge to SDI output propagation is typically 140 ns in Standard and Fast Modes and typically 70 ns in High Speed Mode.

APPROVALS	DATE	PROJECT:	Mendozo
ENG: Siavash Taher Parvar			
DSN: Siavash Taher Parvar			
CHK: Siavash Taher Parvar			
REFERENCE DOCUMENTS		TITLE:	
SCH Ref. DOC.: [020105] - BME280 Driver.kicad_sch		BME280 Driver	OPEN-SOURCE DOCUMENT
BOM Ref. DOC.:			
PCB Ref. DOC.:			
GBR Ref. DOC.:			
ASM Ref. DOC.:			
FILE NAME: [020105] - BME280 Driver.kicad_sch			
SHEET 23 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:

MECHANICAL PARTS

DRAFT

4xLED 5MM BLUE
4xLED HOLDER BLACK 5MM

1 m WIRE
4xJST 1.27mm FEMALE HEADER

1xBATTERY 3.7V

1xFRAME
4xCORELESS MOTORS 0716
4xM3x3MM STAND OFF
4xM3 PHILLIPS SCREW
4xM3 NUTS

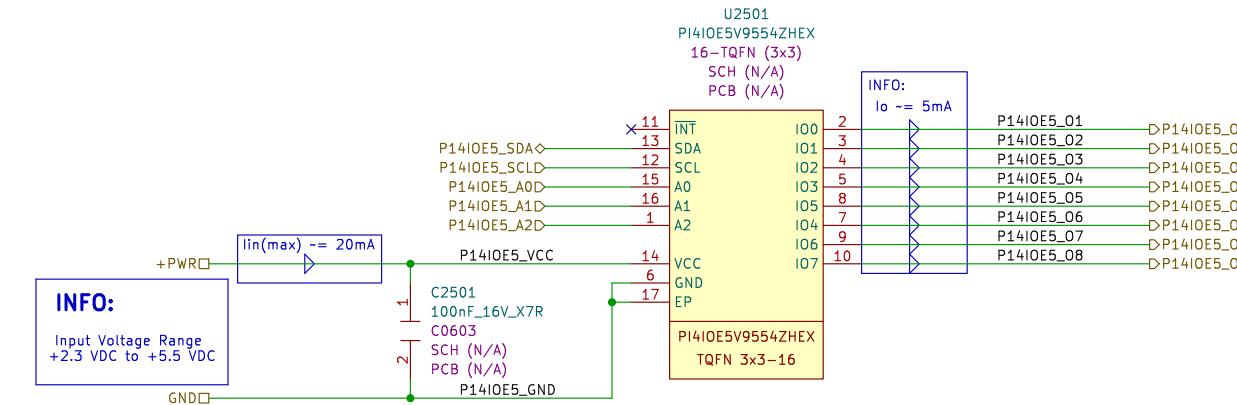
1xPCB 50x50 MM2 4LAYERs IMPEDANCE CONTROLLED

1x OV2640 CAMERA MODULE

APPROVALS		DATE	PROJECT:			 MendOzo			
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:				
DSN:	Siavash Taher Parvar		TITLE:						
CHK:	Siavash Taher Parvar		MECHANICAL PARTS						
REFERENCE DOCUMENTS			FILE NAME: [03] - MECHANICAL PARTS.kicad_sch						
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BOM Ref. DOC.:									
PCB Ref. DOC.:									
GBR Ref. DOC.:									
ASM Ref. DOC.:			SHEET	24	OF	40	SIZE: C	SCALE: 1:1	VARIANT NAME:

PI410E5V9554 Driver

DRAFT



INFO:						
Dynamic Characteristics						
Table 3: Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Standard Mode I ² C		Fast Mode I ² C	
			Min	Max	Min	Max
t _{SCL}	SCL Clock Frequency	—	0	100	0	400
t _{BUF}	Bus Free Time Between a STOP and START Condition	—	4.7	—	1.3	—
t _{H,D STA}	Hold Time (Repeated) START Condition	—	4.0	—	0.6	—
t _{SU,STA}	Setup Time for a Repeated START Condition	—	4.7	—	0.6	—
t _{SU,STO}	Setup Time for STOP Condition	—	4.0	—	0.6	—
t _{V,D,ACK^[1]}	Data Valid Acknowledge Time	—	—	3.45	—	0.9
t _{H,D,DAT^[2]}	Data Hold Time	—	0	—	0	—
t _{V,D,DAT}	Data Valid Time	—	—	3.45	—	0.9
t _{SU,DAT}	Data Setup Time	—	250	—	100	—
t _{LOW}	LOW Period of the SCL Clock	—	4.7	—	1.3	—
t _{HIGH}	HIGH Period of the SCL Clock	—	4.0	—	0.6	—
t _r	Fall Time of Both SDA and SCL Signals	—	—	300	—	300
t _r	Rise Time of Both SDA and SCL Signals	—	—	1000	—	300
t _{SP}	Pulse Width of Spikes that must be Suppressed by the Input Filter	—	—	50	—	50
Port Timing						
t _{v(Q)}	Data Output Valid Time ^[3]	—	—	200	—	200
t _{su(D)}	Data Input Setup Time	—	100	—	100	—
t _{hi(D)}	Data Input Hold Time	—	1	—	1	—
Interrupt Timing						
t _{v(INT)}	Valid Time on pin INT	—	—	4	—	4
t _{rec(INT)}	Reset Time on pin INT	—	—	4	—	4

INFO:

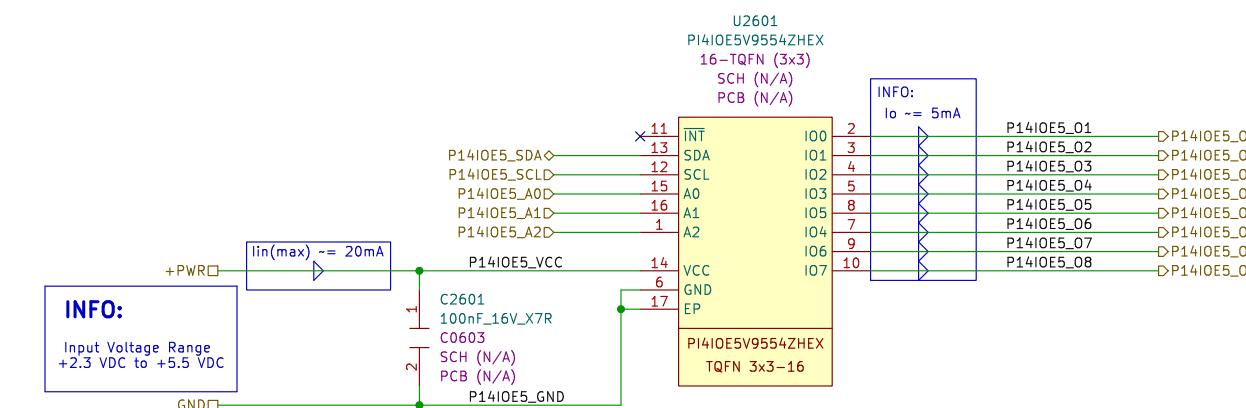
Table 4: Device Address Byte								
	b7(MSB)	b6	b5	b4	b3	b2	b1	b0
PI4IOE5V9554	0	1	0	0	A2	A1	A0	R/W
PI4IOE5V9554A	0	1	1	1	A2	A1	A0	R/W

Note: Read “1”, Write “0”

APPROVALS	DATE	PROJECT:			 MendOzo	
ENG: Siavash Taher Parvar						
DSN: Siavash Taher Parvar						
CHK: Siavash Taher Parvar						
REFERENCE DOCUMENTS		PRJ VER:	DOC VER:	DOC REV:	OPEN-SOURCE DOCUMENT	
SCH Ref. DOC.: [02011001] - PI410E5V9554.Driver.kicad_sch		TITLE: PI410E5V9554 Driver			 OPEN-SOURCE DOCUMENT	
BOM Ref. DOC.:						
PCB Ref. DOC.:		FILE NAME: [02011001] - PI410E5V9554.Driver.kicad_sch				
GBR Ref. DOC.:						
ASM Ref. DOC.:		SHEET 25 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:	

Pi4IOE5V9554 Driver1

DRAFT



INFO:								
Dynamic Characteristics								
Table 3: Dynamic Characteristics								
Symbol	Parameter	Test Conditions	Standard Mode f°C	Fast Mode f°C	Unit			
f_{SCL}	SCL Clock Frequency	—	0	100	0	400	kHz	
t_{HFS}	Free Run Time Between a STOP and START Condition	—	4.7	—	1.3	—	μs	
t_{HISTA}	Hold Time (Repeated) START Condition	—	4.0	—	0.6	—	μs	
t_{SUSTA}	Setup Time for a Repeated START Condition	—	4.7	—	0.6	—	μs	
t_{VDACK} ^[1]	Data Valid Acknowledge Time	—	—	3.45	—	0.9	μs	
t_{DHDT} ^[2]	Data Hold Time	—	0	—	0	—	ns	
t_{VDAT}	Data Valid Time	—	—	3.45	—	0.9	μs	
t_{SDAT}	Data Setup Time	—	250	—	100	—	ns	
t_{LOW}	LOW Period of the SCL Clock	—	4.7	—	1.3	—	μs	
t_{HIGH}	HIGH Period of the SCL Clock	—	4.0	—	0.6	—	μs	
t_r	Rise Time of Both SDA and SCL Signals	—	—	300	—	300	ns	
t_{tp}	Pulse Width of Spikes that must be Suppressed by the Input Filter	—	—	50	—	50	ns	
Port Timing								
t_{dQ}	Data Output Valid Time ^[3]	—	—	200	—	200	ns	
t_{idt}	Data Input Setup Time	—	100	—	100	—	ns	
t_{iht}	Data Input Hold Time	—	1	—	1	—	μs	
Interrupt Timing								
t_{INT}	Valid Time on pin INT	—	—	4	—	4	μs	
t_{resINT}	Reset Time on pin INT	—	—	4	—	4	μs	

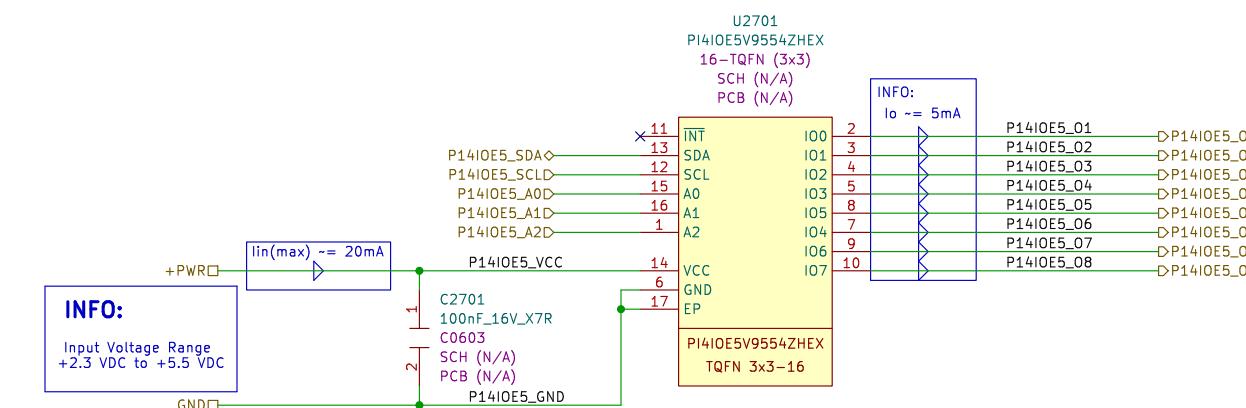
INFO:								
Table 4: Device Address Byte								
	b7(MSB)	b6	b5	b4	b3	b2	b1	b0
Pi4IOE5V9554	0	1	0	0	A2	A1	A0	R/W
Pi4IOE5V9554A	0	1	1	1	A2	A1	A0	R/W

Note: Read "1", Write "0"

APPROVALS	DATE	PROJECT:		
ENG: Siavash Taher Parvar				
DSN: Siavash Taher Parvar				
CHK: Siavash Taher Parvar				
REFERENCE DOCUMENTS				
SCH Ref. Doc.: [02011001] - Pi4IOE5V9554 Driver.kicad_sch				
BOM Ref. Doc.:				
PCB Ref. Doc.:				
GBR Ref. Doc.:				
ASM Ref. Doc.:				
FILE NAME: [02011001] - Pi4IOE5V9554 Driver.kicad_sch				
SHEET 26 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:	
Mendozo	OPEN-SOURCE DOCUMENT			

Pi4IOE5V9554 Driver2

DRAFT



INFO:								
Dynamic Characteristics								
Table 3: Dynamic Characteristics								
Symbol	Parameter	Test Conditions	Standard Mode °C	Fast Mode °C	Unit			
f_{SCL}	SCL Clock Frequency	—	0	100	0	400	kHz	
t_{HFS}	Free Run Time Between a STOP and START Condition	—	4.7	—	1.3	—	μs	
t_{HSTA}	Hold Time (Repeated) START Condition	—	4.0	—	0.6	—	μs	
t_{USTA}	Setup Time for a Repeated START Condition	—	4.7	—	0.6	—	μs	
t_{VDAck} ^[1]	Data Valid Acknowledge Time	—	—	3.45	—	0.9	μs	
t_{HDDA} ^[2]	Data Hold Time	—	0	—	0	—	ns	
t_{VDDA}	Data Valid Time	—	—	3.45	—	0.9	μs	
t_{SUDAT}	Data Setup Time	—	250	—	100	—	ns	
t_{LOW}	LOW Period of the SCL Clock	—	4.7	—	1.3	—	μs	
t_{HIGH}	HIGH Period of the SCL Clock	—	4.0	—	0.6	—	μs	
t_r	Rise Time of Both SDA and SCL Signals	—	—	300	—	300	ns	
t_{sp}	Pulse Width of Spikes that must be Suppressed by the Input Filter	—	—	50	—	50	ns	
Port Timing								
t_{dQ}	Data Output Valid Time ^[3]	—	—	200	—	200	ns	
t_{dIb}	Data Input Setup Time	—	100	—	100	—	ns	
t_{dIh}	Data Input Hold Time	—	1	—	1	—	μs	
Interrupt Timing								
t_{INT}	Valid Time on pin INT	—	—	4	—	4	μs	
t_{RINT}	Reset Time on pin INT	—	—	4	—	4	μs	

INFO:								
Table 4: Device Address Byte								
	b7(MSB)	b6	b5	b4	b3	b2	b1	b0
Pi4IOE5V9554	0	1	0	0	A2	A1	A0	R/W
Pi4IOE5V9554A	0	1	1	1	A2	A1	A0	R/W

Note: Read "1", Write "0"

APPROVALS		DATE	PROJECT:		
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:
DSN:	Siavash Taher Parvar				
CHK:	Siavash Taher Parvar				
REFERENCE DOCUMENTS		TITLE:	Mendozo		
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PCB Ref. Doc.:					
GBR Ref. Doc.:					
ASM Ref. Doc.:					
FILE NAME: [02011001] - Pi4IOE5V9554_Driver.kicad_sch					
SHEET 27 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:		

DRV8837 Driver

DRAFT

INFO:			
Table 1. Function Table			
INPUTS	OUTPUTS	Y0	Y1
L	L	L	Z
L	H	H	Z
H	L	Z	L
H	H	Z	H

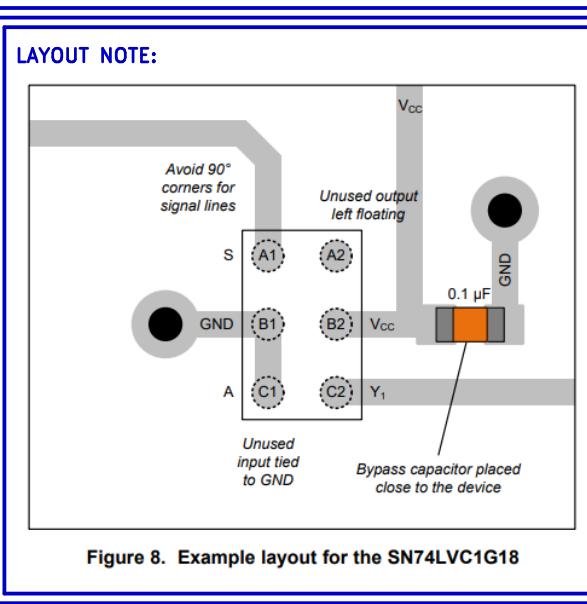
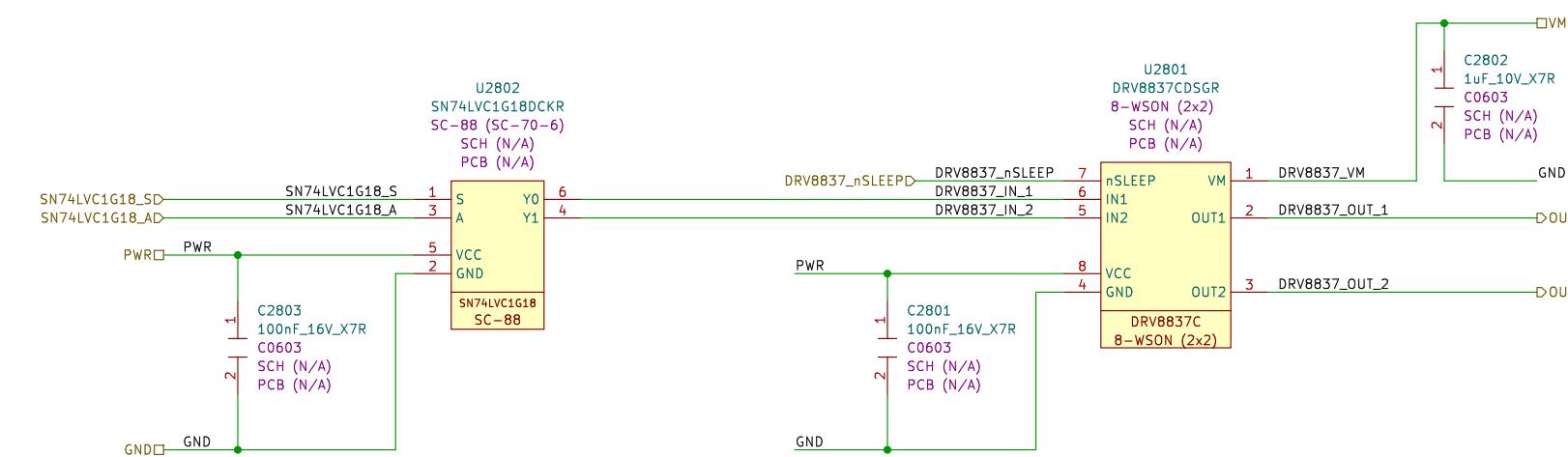


Figure 8. Example layout for the SN74LVC1G18

INFO:					
Table 1. DRV8837C Device Logic					
nSLEEP	IN1	IN2	OUT1	OUT2	FUNCTION (DC MOTOR)
0	X	X	Z	Z	Coast
1	0	0	Z	Z	Coast
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake

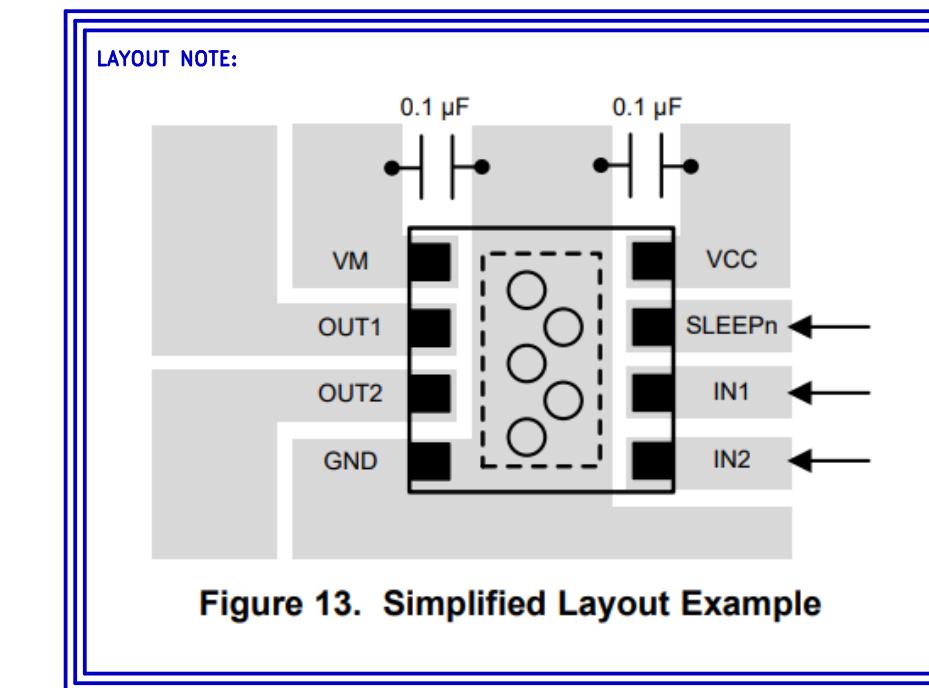
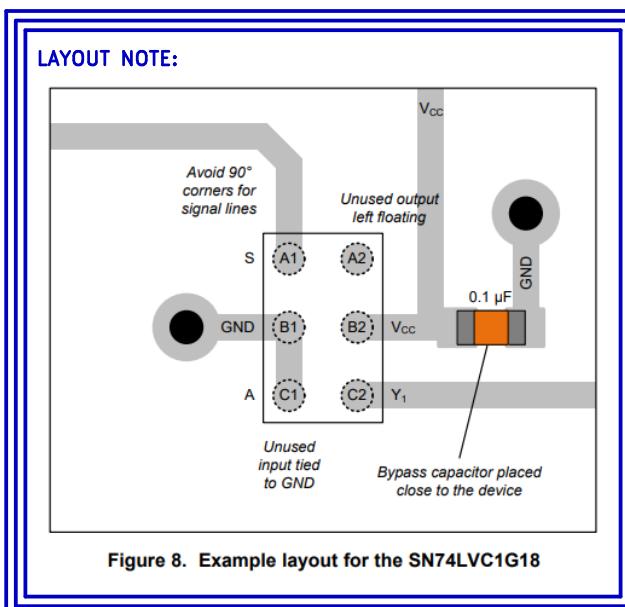
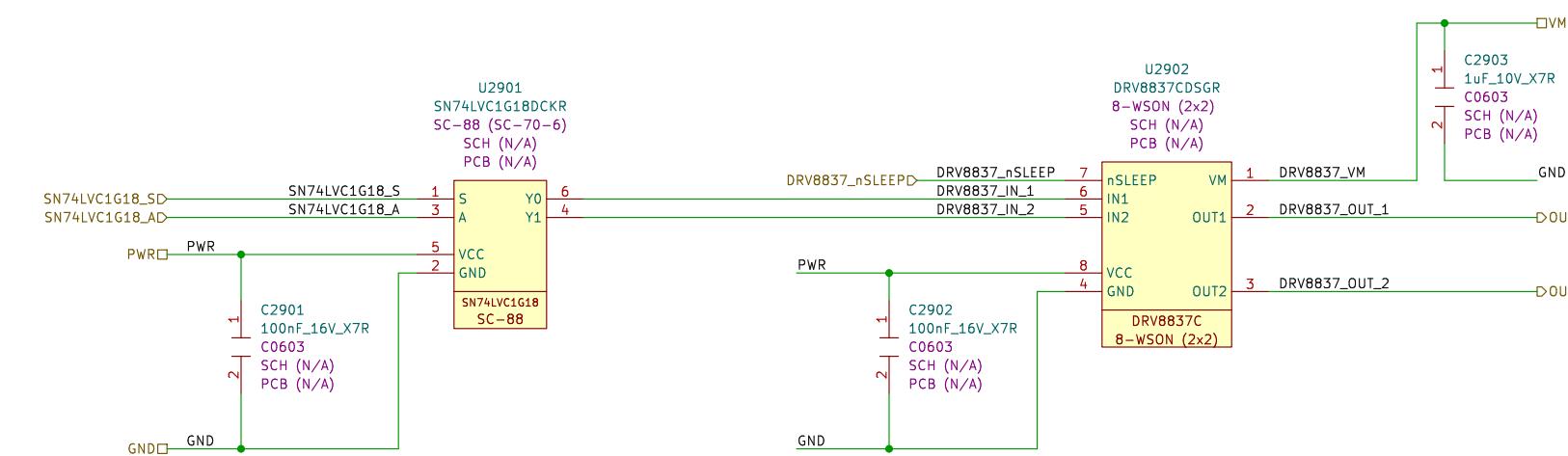


Figure 13. Simplified Layout Example

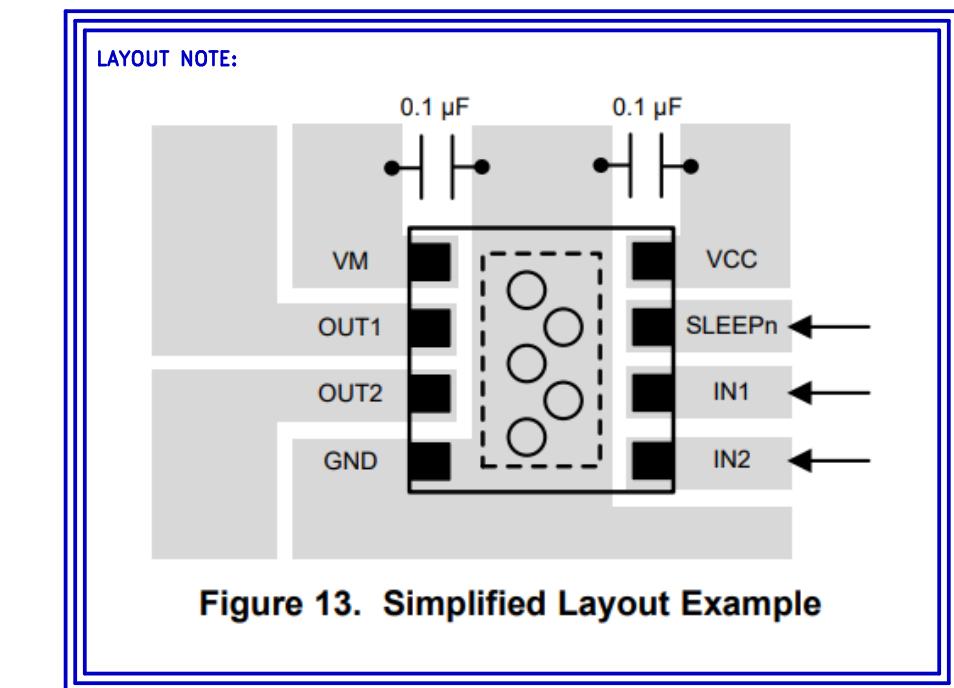
DRV8837 Driver1

DRAFT

INFO:			
Table 1. Function Table			
INPUTS	OUTPUTS	Y0	Y1
L	L	L	Z
L	H	H	Z
H	L	Z	L
H	H	Z	H



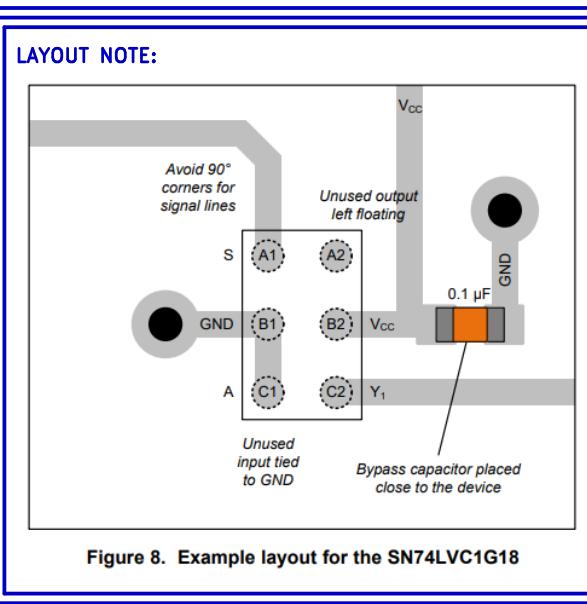
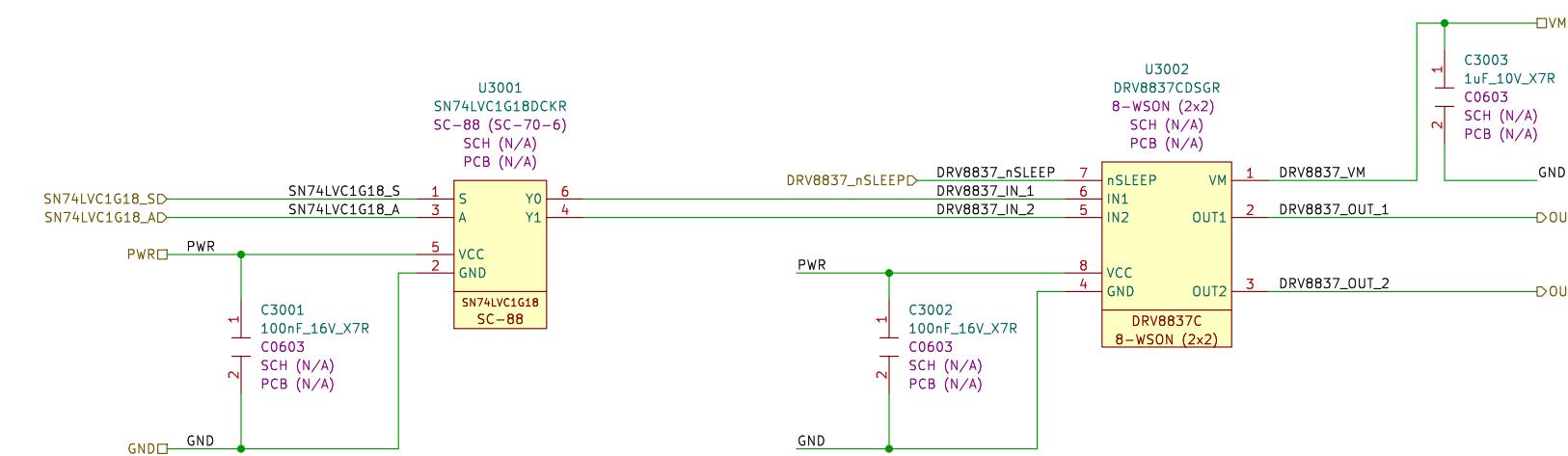
INFO:					
Table 1. DRV8837C Device Logic					
nSLEEP	IN1	IN2	OUT1	OUT2	FUNCTION (DC MOTOR)
0	X	X	Z	Z	Coast
1	0	0	Z	Z	Coast
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake



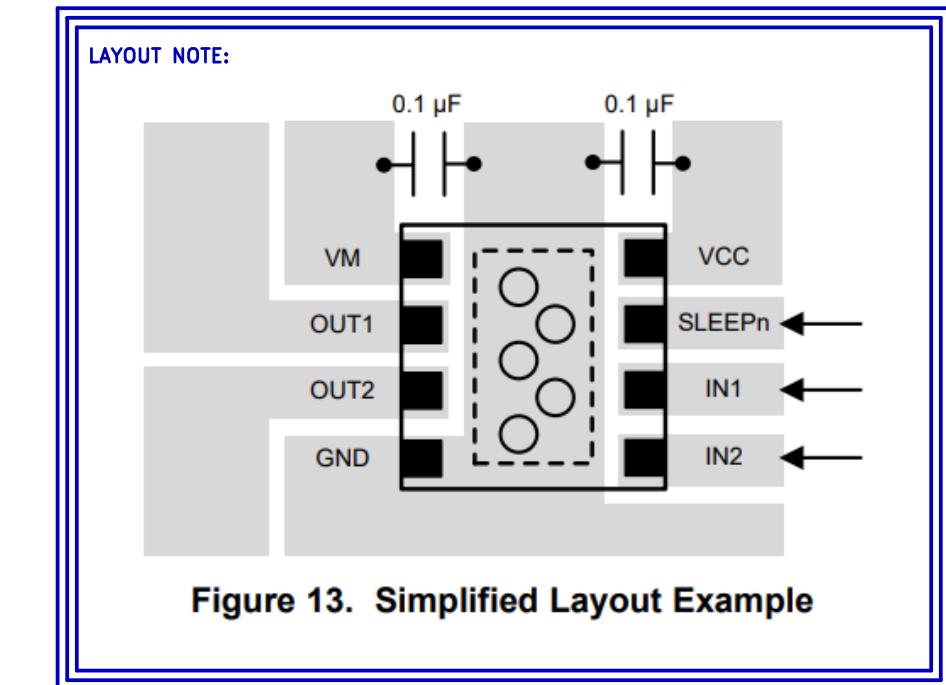
DRV8837 Driver2

DRAFT

INFO:			
Table 1. Function Table			
INPUTS	OUTPUTS	Y0	Y1
L	L	L	Z
L	H	H	Z
H	L	Z	L
H	H	Z	H

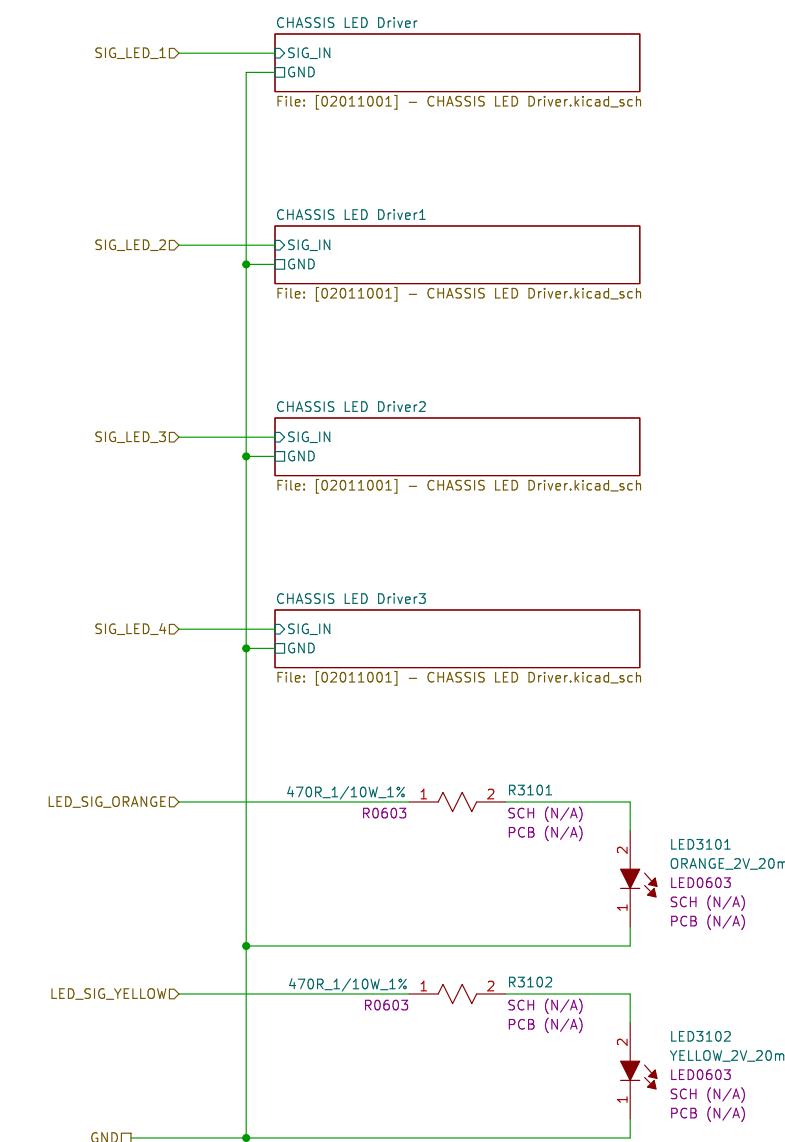


INFO:					
Table 1. DRV8837C Device Logic					
nSLEEP	IN1	IN2	OUT1	OUT2	FUNCTION (DC MOTOR)
0	X	X	Z	Z	Coast
1	0	0	Z	Z	Coast
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake



LEDs Driver

DRAFT

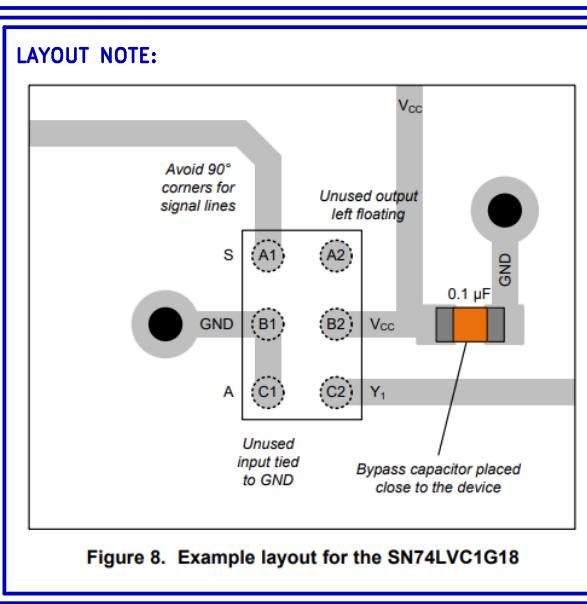
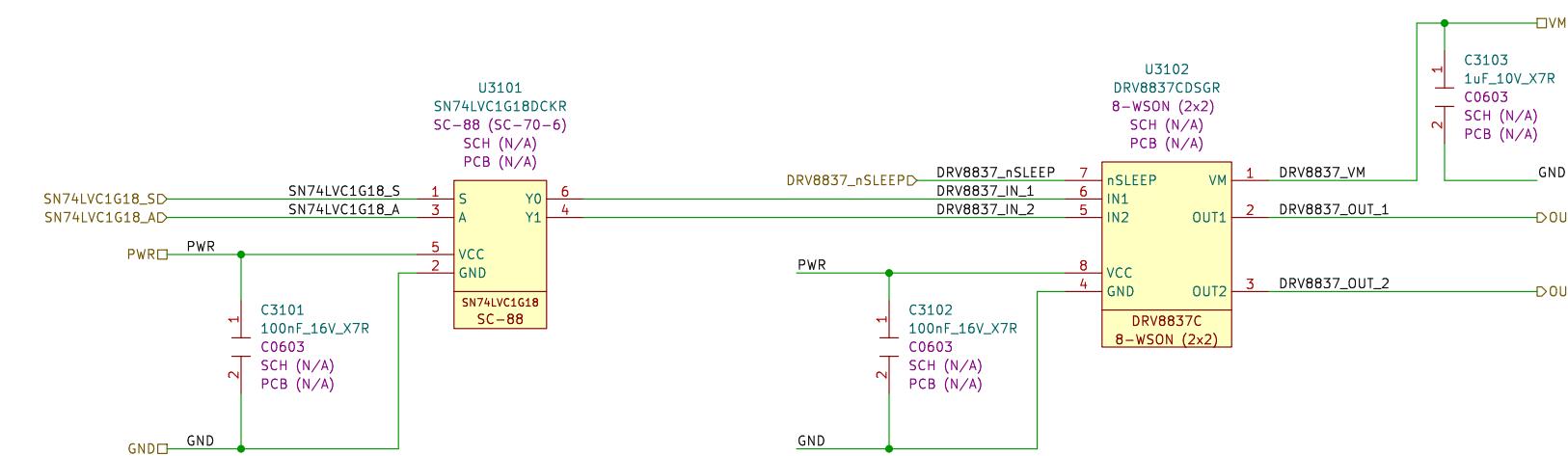


APPROVALS		DATE	PROJECT:			Mendozo	
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN:	Siavash Taher Parvar		TITLE:	LEDs Driver			
CHK:	Siavash Taher Parvar		FILE NAME:	[020110] - LEDs Driver.kicad_sch			
REFERENCE DOCUMENTS	SCH Ref. DOC.: [020110] - LEDs Driver.kicad_sch		GBR Ref. DOC.:				
PCB Ref. DOC.:	BOM Ref. DOC.:		ASM Ref. DOC.:				
GER Ref. DOC.:							
OPEN-SOURCE DOCUMENT							

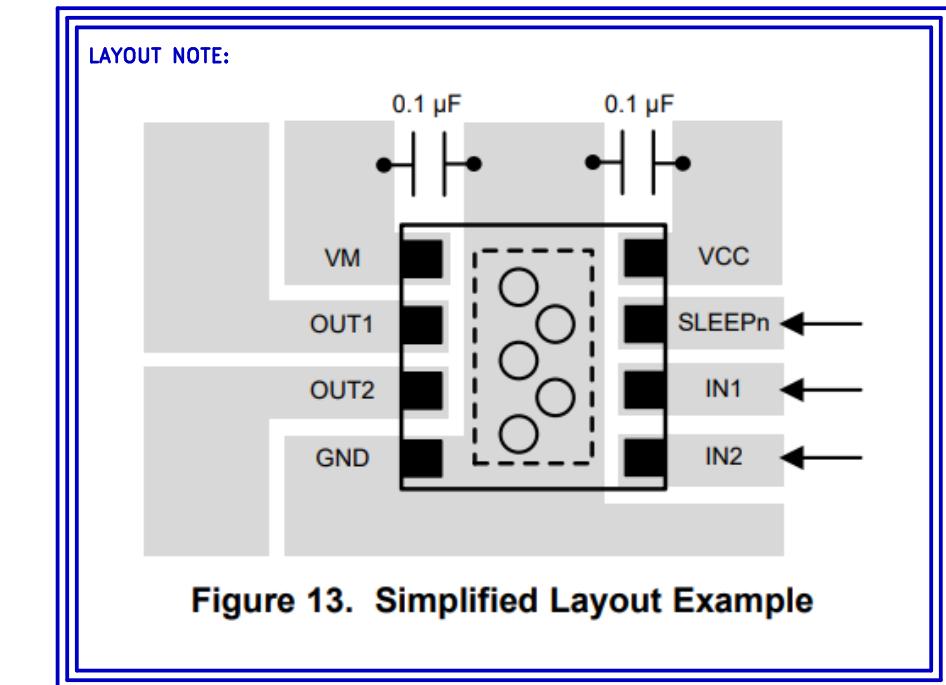
DRV8837 Driver3

DRAFT

INFO:			
Table 1. Function Table			
INPUTS	OUTPUTS	Y0	Y1
L	L	L	Z
L	H	H	Z
H	L	Z	L
H	H	Z	H

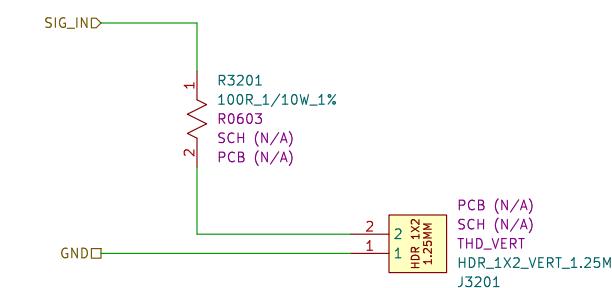


INFO:					
Table 1. DRV8837C Device Logic					
nSLEEP	IN1	IN2	OUT1	OUT2	FUNCTION (DC MOTOR)
0	X	X	Z	Z	Coast
1	0	0	Z	Z	Coast
1	0	1	L	H	Reverse
1	1	0	H	L	Forward
1	1	1	L	L	Brake



CHASSIS LED Driver

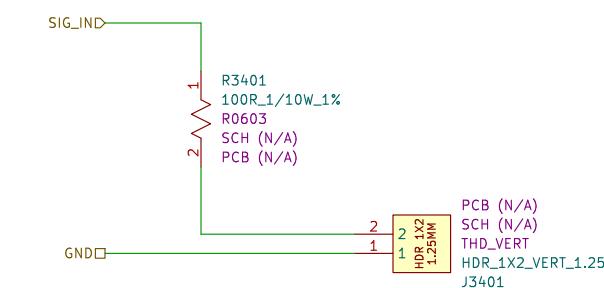
DRAFT



APPROVALS		DATE	PROJECT:			Mendozo	
ENG:	DSN:	CHK:	PRJ VER:	DOC VER:	DOC REV:		
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SCH Ref. DOC.: [02011001] - CHASSIS LED Driver.kicad_sch							
BOM Ref. DOC.:							
PCB Ref. DOC.:							
GBR Ref. DOC.:							
ASM Ref. DOC.:							
FILE NAME: [02011001] - CHASSIS LED Driver.kicad_sch			OPEN-SOURCE DOCUMENT				
SHEET 32 OF 40			SIZE: C	SCALE: 1:1	VARIANT NAME:		

CHASSIS LED Driver2

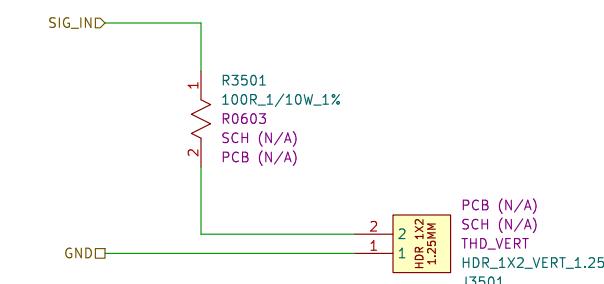
DRAFT



APPROVALS		DATE	PROJECT:			 MendOzo
ENG:	Siavash Taher Parvar					
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar		PRJ VER: DOC VER: DOC REV:			
REFERENCE DOCUMENTS			TITLE: CHASSIS LED Driver2			
SCH Ref. DOC.:	FILE NAME: [02011001] - CHASSIS LED Driver.kicad_sch			OPEN-SOURCE DOCUMENT		
BOM Ref. DOC.:						
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:	FILE NAME: [02011001] - CHASSIS LED Driver.kicad_pcb					
	SHEET 33 OF 40 SIZE: C			SCALE: 1:1 VARIANT NAME:		

CHASSIS LED Driver3

DRAFT

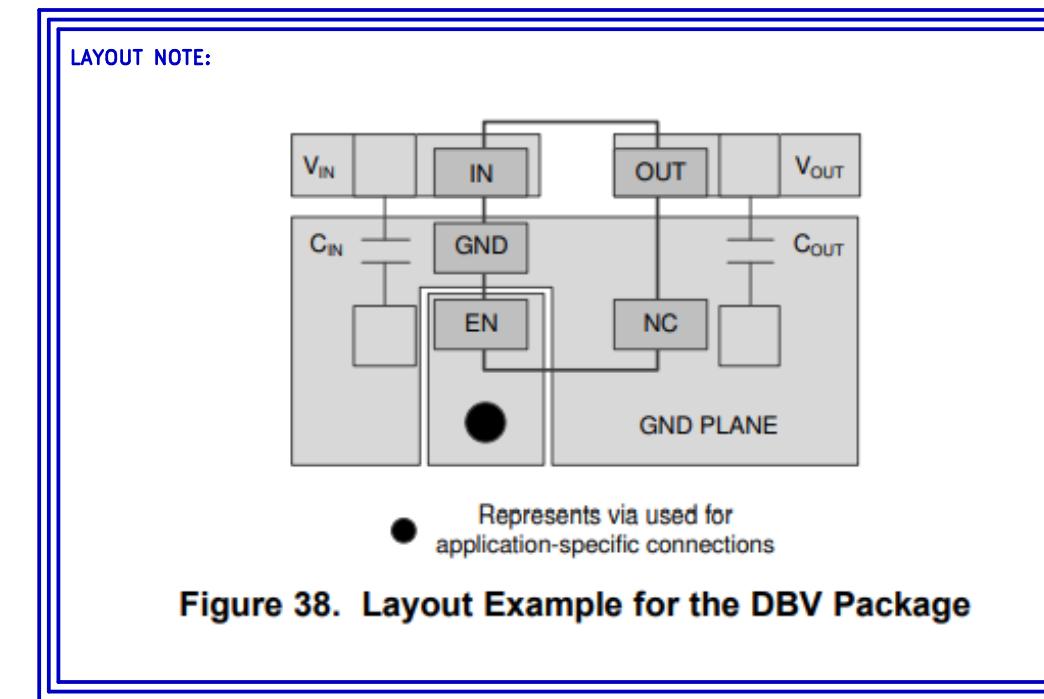
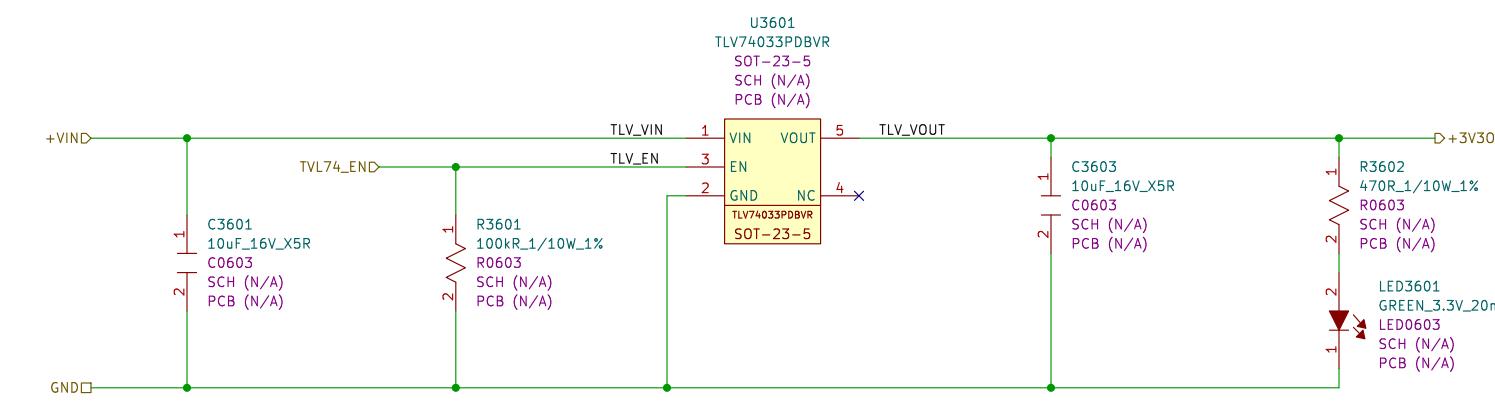


APPROVALS		DATE	PROJECT:			 MendOzo <small>OPEN-SOURCE DOCUMENT</small>	
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN:	Siavash Taher Parvar		TITLE: CHASSIS LED Driver3				
CHK:	Siavash Taher Parvar		FILE NAME: [02011001] - CHASSIS LED Driver.kicad_sch				
REFERENCE DOCUMENTS			PCB Ref. DOC.: [02011001] - CHASSIS LED Driver.kicad_pcb	BOM Ref. DOC.: [02011001] - CHASSIS LED Driver.bom	GBR Ref. DOC.: [02011001] - CHASSIS LED Driver.gbr		
SCH Ref. DOC.: [02011001] - CHASSIS LED Driver.kicad_sch			ASW Ref. DOC.: [02011001] - CHASSIS LED Driver.asw				
PCB Ref. DOC.: [02011001] - CHASSIS LED Driver.kicad_pcb							
BOM Ref. DOC.: [02011001] - CHASSIS LED Driver.bom							
GBR Ref. DOC.: [02011001] - CHASSIS LED Driver.gbr							
ASW Ref. DOC.: [02011001] - CHASSIS LED Driver.asw							

SHEET 34 OF 40 SIZE: C SCALE: 1:1 VARIANT NAME:

LDO +3V3

DRAFT



APPROVALS		PROJECT:		 Mendozo OPEN-SOURCE DOCUMENT	
ENG:	DATE				
DSN:	DATE				
CHK:	DATE				
REFERENCE DOCUMENTS		PRJ VER: DOC VER: DOC REV:			
SCH Ref. DOC.: [020303] - LDO +3V3.kicad_sch		TITLE: LDO +3V3			
PCB Ref. DOC.:		FILE NAME: [020303] - LDO +3V3.kicad_pcb			
GBR Ref. DOC.:		SHEET 35 OF 40			
ASM Ref. DOC.:		SIZE: C	SCALE: 1:1		

LDO +3V3

DRAFT

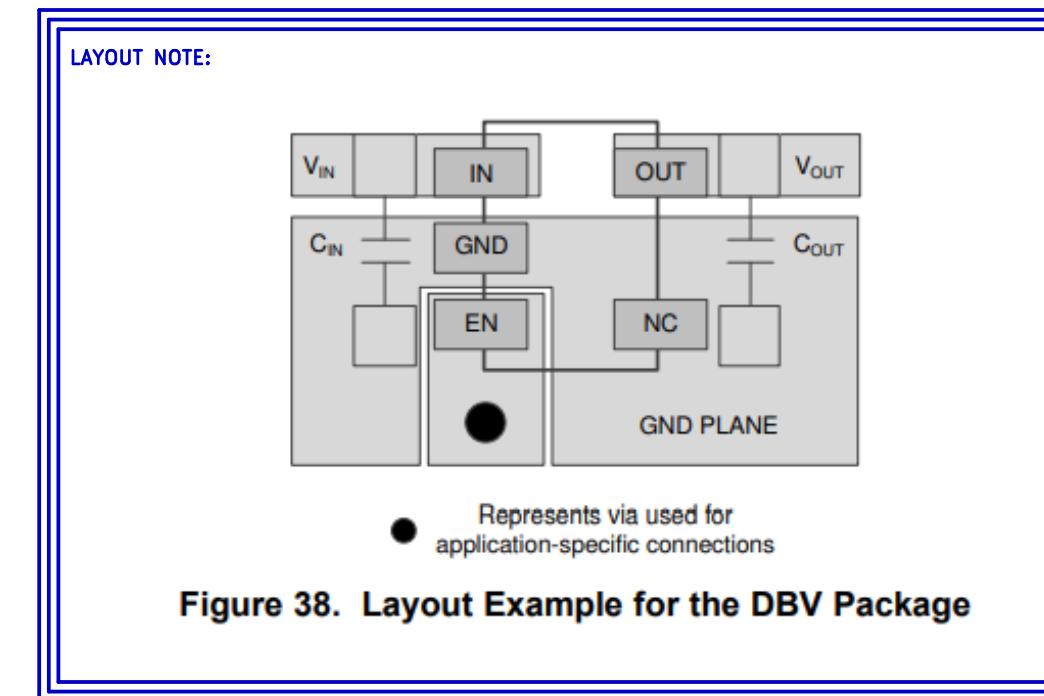
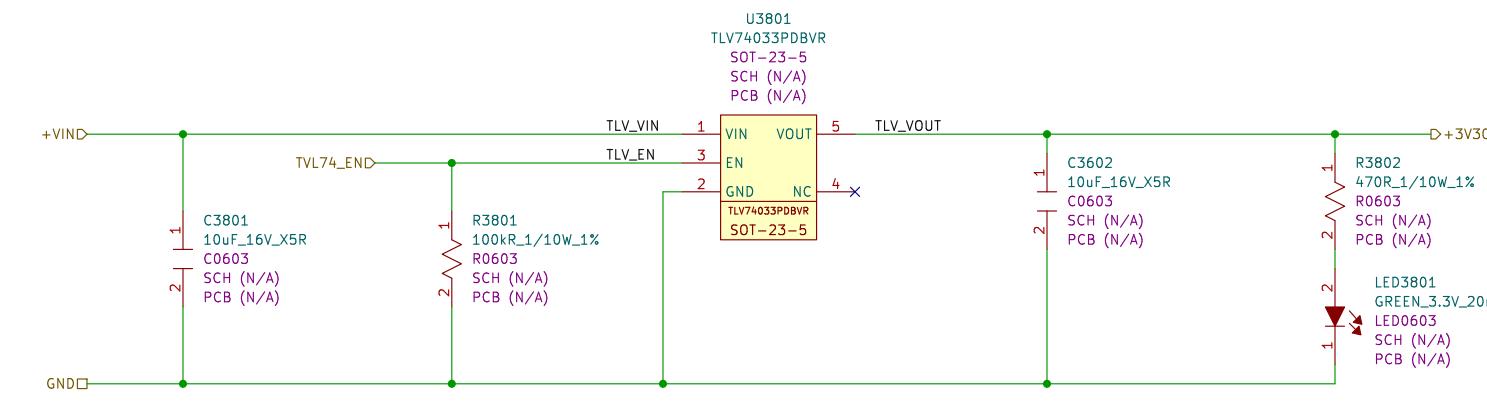
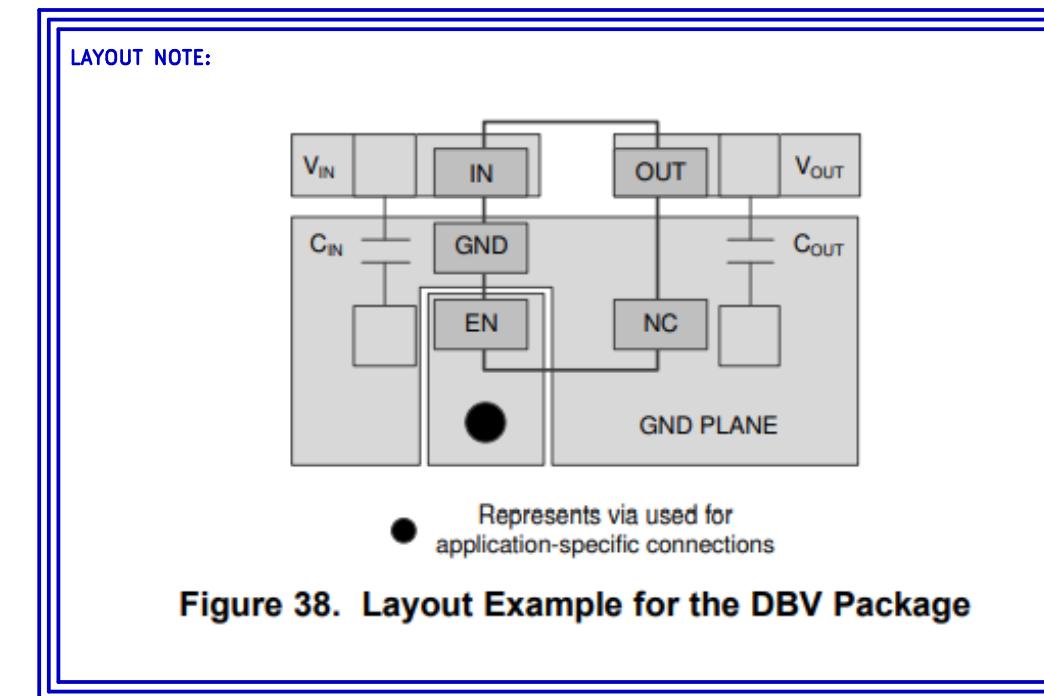
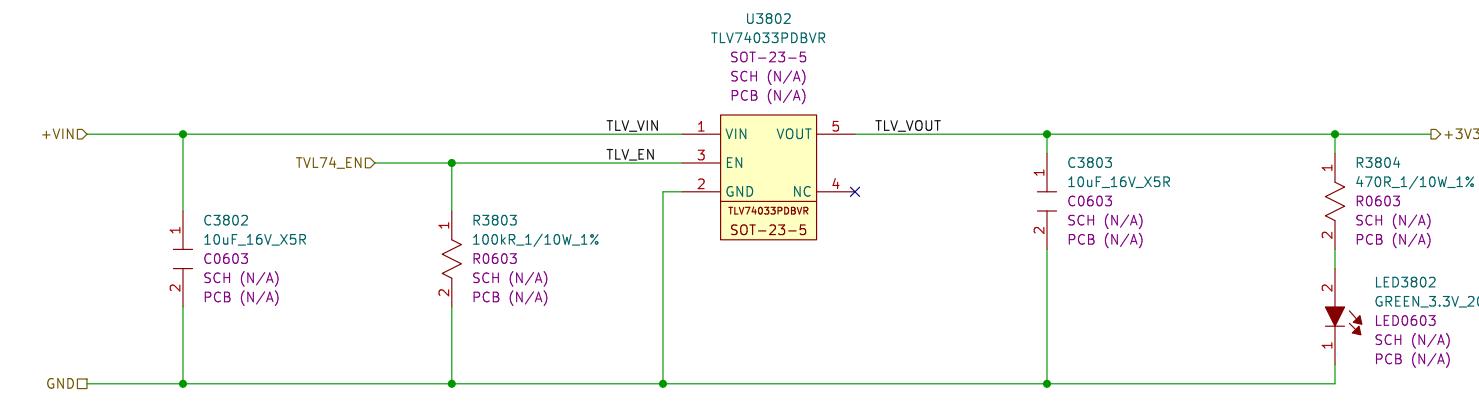


Figure 38. Layout Example for the DBV Package

APPROVALS		DATE	PROJECT:			Mendozo
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:	
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar					
REFERENCE DOCUMENTS			TITLE:			
SCH Ref. DOC.: [020303] - LDO +3V3.kicad_sch			LDO +3V3			
BOM Ref. DOC.:						
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:						
FILE NAME: [020303] - LDO +3V3.kicad_sch						
SHEET 36 OF 40	SIZE: C		SCALE: 1:1	VARIANT NAME:		

LDO +3V3

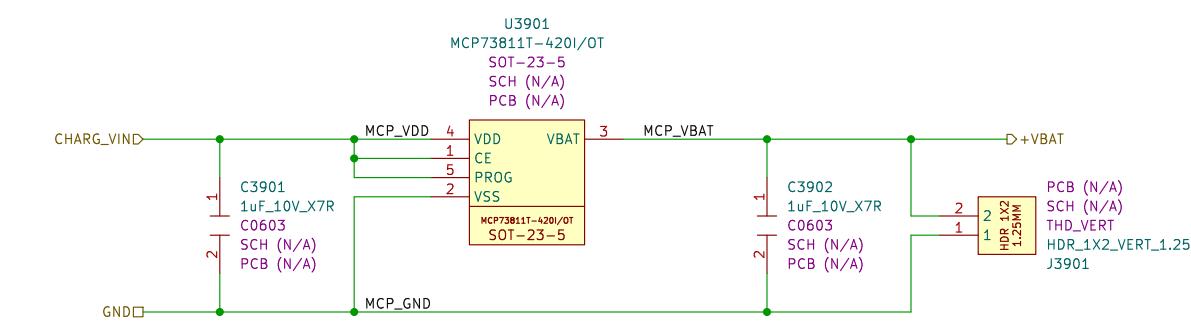
DRAFT



APPROVALS		DATE	PROJECT:			 Mendozo OPEN-SOURCE DOCUMENT
ENG:	Siavash Taher Parvar					
DSN:	Siavash Taher Parvar					
CHK:	Siavash Taher Parvar					
REFERENCE DOCUMENTS						
SCH Ref. DOC.:	[020303] - LDO +3V3.kicad_sch					
PCB Ref. DOC.:						
GBR Ref. DOC.:						
ASM Ref. DOC.:						
FILE NAME:	[020303] - LDO +3V3.kicad_sch					
SHEET	37	OF	40	SIZE: C	SCALE: 1:1	VARIANT NAME:

BATTERY CHARGER

DRAFT



INFO:

For the MCP73811, the current regulation is set to 450 mA. This function is a digital input selection. A logic Low selects a 85 mA charge current; a logic High selects a 450 mA charge current.

INFO:

A logic High enables battery charging. A logic Low disables battery charging. The charge enable input is compatible with 1.0V logic.

APPROVALS		DATE	PROJECT:			 Mend0zo
ENG:	Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:	
DSN:	Siavash Taher Parvar		TITLE: BATTERY CHARGER			
CHK:	Siavash Taher Parvar		FILE NAME: [020301] - BATTERY CHARGER.kicad_sch			
REFERENCE DOCUMENTS	SCH Ref. DOC.: [020301] - BATTERY CHARGER.kicad_sch		GBR Ref. DOC.:			
PCB Ref. DOC.:	BOM Ref. DOC.:		ASM Ref. DOC.:			
GBR Ref. DOC.:			FILE NAME: [020301] - BATTERY CHARGER.kicad_sch			
ASM Ref. DOC.:			SHEET 39 OF 40	SIZE: C	SCALE: 1:1	VARIANT NAME:

1 2 3 4 5 6

A

B

C

D

A

B

C

D

APPROVALS	DATE	PROJECT:			 MendOzo	
ENG: Siavash Taher Parvar		PRJ VER:	DOC VER:	DOC REV:		
DSN: Siavash Taher Parvar	TITLE: SMPS DCDC-BOOST +5V					
CHK: Siavash Taher Parvar	FILE NAME: [020302] - SMPS DCDC-BOOST +5V.kicad_sch					
REFERENCE DOCUMENTS		SHEET 40 OF 40	SIZE: A4	SCALE: 1:1	VARIANT NAME:	
SCH Ref. DOC.: [020302] - SMPS DCDC-BOOST +5V.kicad_sch						
BOM Ref. DOC.						
PCB Ref. DOC.						
GBR Ref. DOC.						
ASM Ref. DOC.						

1 2 3 4 5 6