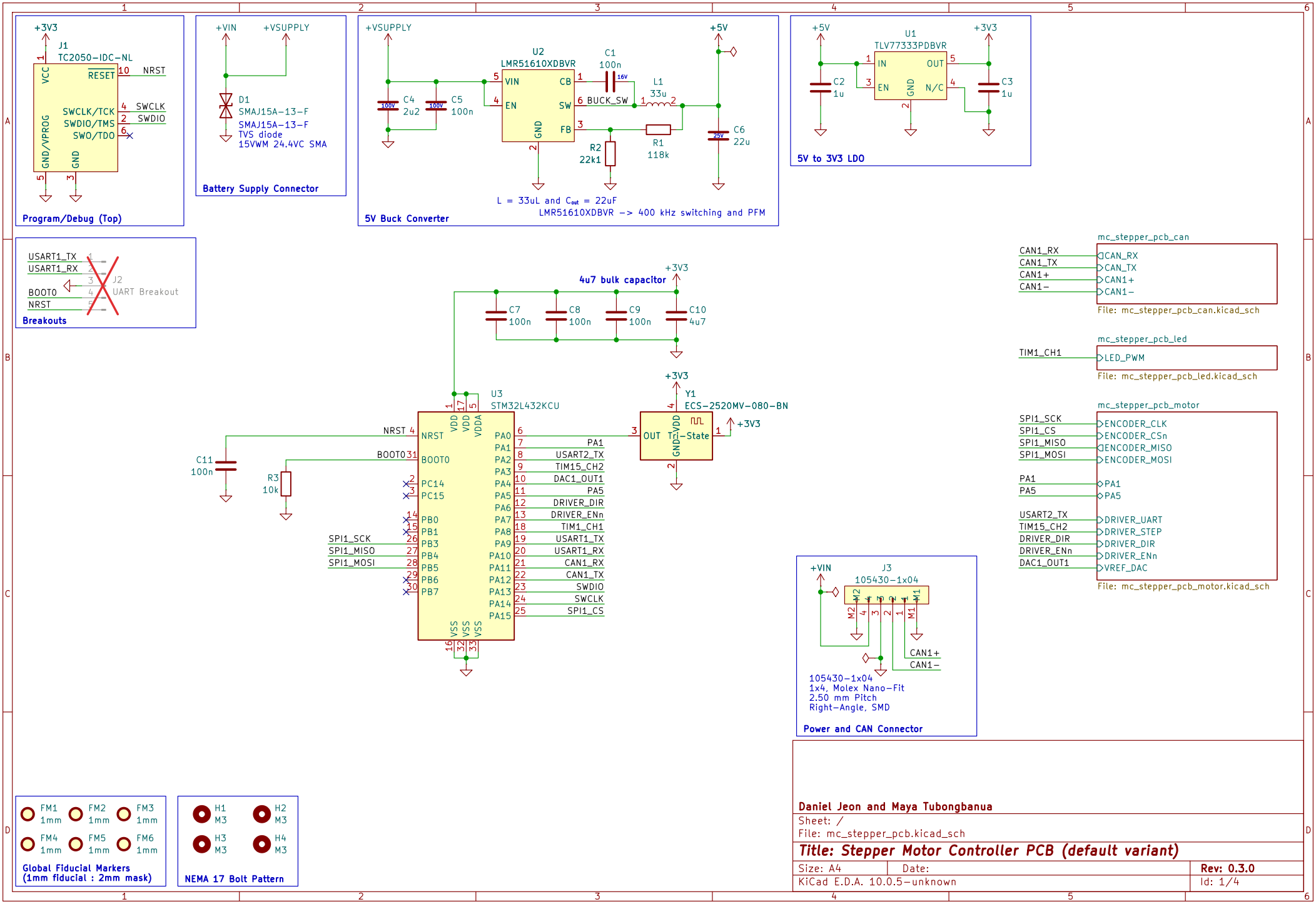
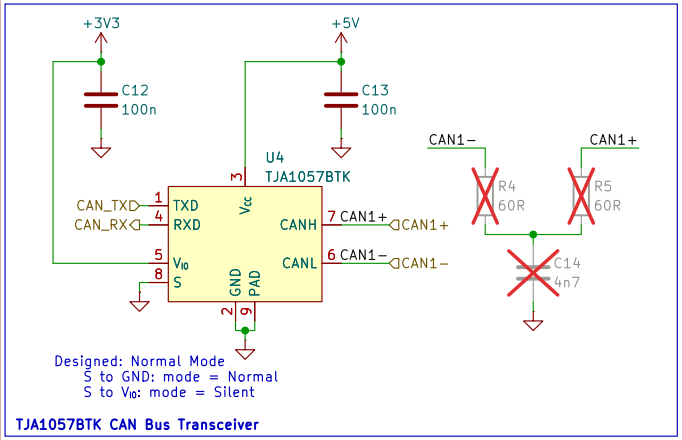

+3V3
J1
TC2050-IDC-NL
VCC
RESET
NRST
SWCLK/TCK
SWCLK
SWDIO/TMS
SWDIO
SWO/TDO
GND/VPROG
GND
Program/Debug (Top)
+VIN
+VSUPPLY
D1
SMAJ15A-13-F
SMAJ15A-13-F
TVS diode
15VWM 24.4VC SMA
Battery Supply Connector
+VSUPPLY
U2
LMR51610XDBVR
C1
100n
16V
C4
2u2
100V
C5
100n
VIN
CB
EN
SW
BUCK_SW
GND
FB
L1
33u
R2
22k1
R1
118k
+5V
C6
22u
25V
L = 33uL and Cout = 22uF
LMR51610XDBVR -> 400 kHz switching and PFM
5V Buck Converter
+5V
U1
TLV77333PDBVR
C2
1u
IN
OUT
EN
GND
N/C
+3V3
C3
1u
5V to 3V3 LDO
USART1_TX
USART1_RX
BOOT0
NRST
J2
UART Breakout
Breakouts
4u7 bulk capacitor
C7
100n
C8
100n
C9
100n
C10
4u7
U3
STM32L432KCU
NRST
BOOT0
PC14
PC15
PB0
PB1
PB3
PB4
PB5
PB6
PB7
VDD
VDDA
VSS
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
C11
100n
R3
10k
SPI1_SCK
SPI1_MISO
SPI1_MOSI
USART2_TX
TIM15_CH2
DAC1_OUT1
DRIVER_DIR
DRIVER_ENn
TIM1_CH1
CAN1_RX
CAN1_TX
SWDIO
SWCLK
Y1
ECS-2520MV-080-BN
OUT
Tri-State
GND
VDD
mc_stepper_pcb_can
CAN_RX
CAN_TX
CAN1+
CAN1-
File: mc_stepper_pcb_can.kicad_sch
mc_stepper_pcb_led
LED_PWM
File: mc_stepper_pcb_led.kicad_sch
mc_stepper_pcb_motor
ENCODER_CLK
ENCODER_CSn
ENCODER_MISO
ENCODER_MOSI
PA1
PA5
DRIVER_UART
DRIVER_STEP
DRIVER_DIR
DRIVER_ENn
VREF_DAC
File: mc_stepper_pcb_motor.kicad_sch
+VIN
J3
105430-1x04
M2
M1
CAN1+
CAN1-
105430-1x04
1x4, Molex Nano-Fit
2.50 mm Pitch
Right-Angle, SMD
Power and CAN Connector
FM1 1mm
FM2 1mm
FM3 1mm
FM4 1mm
FM5 1mm
FM6 1mm
Global Fiducial Markers
(1mm fiducial : 2mm mask)
H1 M3
H2 M3
H3 M3
H4 M3
NEMA 17 Bolt Pattern
Daniel Jeon and Maya Tubongbanua
Sheet: /
File: mc_stepper_pcb.kicad_sch
Title: Stepper Motor Controller PCB (default variant)
Size: A4
Date:
Rev: 0.3.0
KiCad E.D.A. 10.0.5-unknown
Id: 1/4

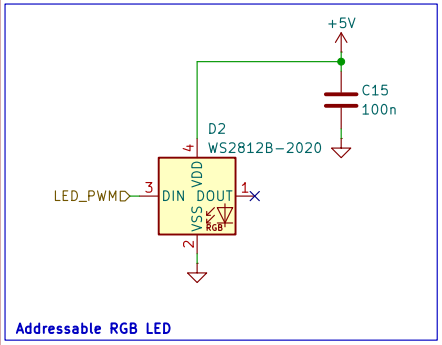


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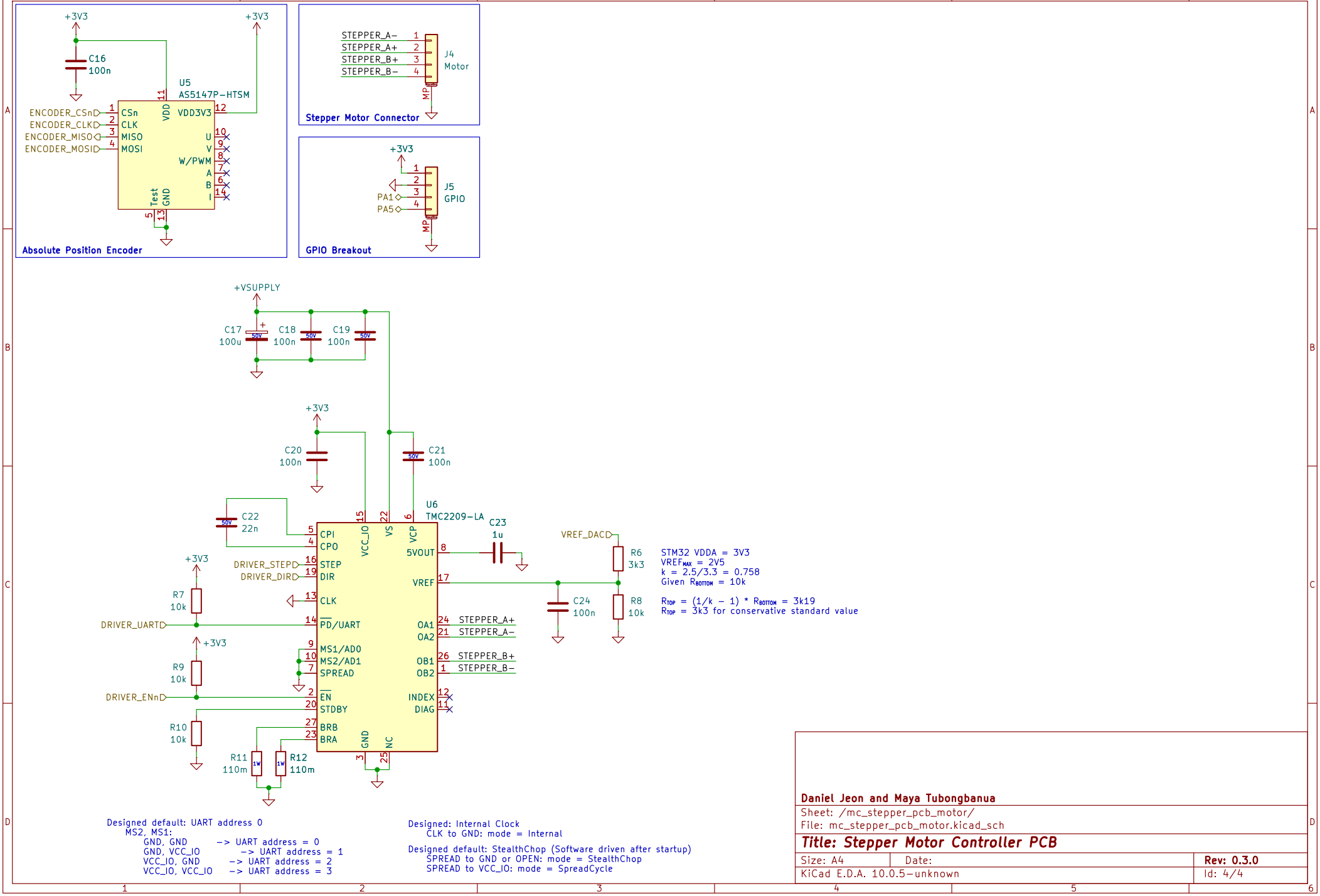
Sheet: /mc_stepper_pcb_can/
File: mc_stepper_pcb_can.kicad_sch

Title: Stepper Motor Controller PCB

Size: A4	Date:	**Rev: 0.3.0**
KiCad E.D.A. 10.0.5−unknown		Id: 2/4



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Sheet: /mc_stepper_pcb_led/		
File: mc_stepper_pcb_led.kicad_sch		
Title: Stepper Motor Controller PCB		
Size: A4	Date:	**Rev: 0.3.0**
KiCad E.D.A. 10.0.5-unknown		Id: 3/4


Absolute Position Encoder
+3V3
C16
100n
U5
AS5147P-HTSM
ENCODER_CSn
ENCODER_CLK
ENCODER_MISO
ENCODER_MOSI
CSn
CLK
MISO
MOSI
VDD
VDD3V3
U
V
W/PWM
A
B
I
Test
GND
Stepper Motor Connector
STEPPER_A-
STEPPER_A+
STEPPER_B+
STEPPER_B-
J4
Motor
MP
GPIO Breakout
J5
GPIO
PA1
PA5
+VSUPPLY
C17
100u
C18
100n
C19
100n
C20
100n
C21
100n
C22
22n
U6
TMC2209-LA
CPI
CPO
STEP
DIR
CLK
PD/UART
MS1/AD0
MS2/AD1
SPREAD
EN
STDBY
BRB
BRA
VCC_IO
VS
VCP
5VOUT
VREF
OA1
OA2
OB1
OB2
INDEX
DIAG
GND
NC
C23
1u
C24
100n
VREF_DAC
R6
3k3
R8
10k
STM32 VDDA = 3V3
VREF_MAX = 2V5
k = 2.5/3.3 = 0.758
Given R_BOTTOM = 10k
R_TOP = (1/k - 1) * R_BOTTOM = 3k19
R_TOP = 3k3 for conservative standard value
DRIVER_STEP
DRIVER_DIR
DRIVER_UART
DRIVER_ENn
R7
10k
R9
10k
R10
10k
R11
110m
R12
110m
1W
Designed default: UART address 0
MS2, MS1:
GND, GND -> UART address = 0
GND, VCC_IO -> UART address = 1
VCC_IO, GND -> UART address = 2
VCC_IO, VCC_IO -> UART address = 3
Designed: Internal Clock
CLK to GND: mode = Internal
Designed default: StealthChop (Software driven after startup)
SPREAD to GND or OPEN: mode = StealthChop
SPREAD to VCC_IO: mode = SpreadCycle
Daniel Jeon and Maya Tubongbanua
Sheet: /mc_stepper_pcb_motor/
File: mc_stepper_pcb_motor.kicad_sch
Title: Stepper Motor Controller PCB
Size: A4
Date:
Rev: 0.3.0
KiCad E.D.A. 10.0.5-unknown
Id: 4/4