Power

File: Power.kicad_sch

Connectors

File: Connectors.kicad_sch

I2C

File: I2C.kicad_sch

DigitalInputs

File: Digin.kicad_sch

HighCurrentDrivers

File: HighCurrentDrivers.kicad_sch

LowCurrentDrivers

File: LowCurrentDrivers.kicad_sch

MCU

I2C1_SDA	I2C1_SDA	CAN_H	CAN_H
I2C1_SCL	I2C1_SCL	CAN_L	CAN_L
I2C2_SDA	I2C2_SDA	USB_DM	USB_D-
I2C2_SCL	I2C2_SCL	USB_DP	USB_D+
USB_VBUS	USB_VBUS	USB_PULLUP	USB_PULLUP
SYS_WKUP	SYS_WKUP2		
		PF_GPIO_RESET	PF_GPIO_RESET
CAN_TERM_RESISTOR	CAN_TERM_RESISTOR		
	BATT_SENSE		

File: MCU.kicad_sch

Microcontroller

+12V

R1
47k

R2
10k

C1
100nF

D1
3.3V

GND   GND   GND

BATT_SENSE

G1
DRT_Logo

G2
DingoFace

V5
-Changed ADS1015 to MAX11613EUA+T due to supply issues
-Changed PCB to match JLCPCB 2oz rules
-Changed ON_SW input to 12V switched
-Switched to TagConnect TC2030
-Changed pin positions of GND, IN1, IN2

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Sheet:
File: DingoPDM.kicad_sch
Title: Dingo_PDM
Size: US Letter Date: 2023-01-01
KiCad E.D.A. kicad 7.0.2

Rev: v5
Id: 1/16

TVS

Working 20V
Breakdown 24V
Clamp 33V

+12V

D29
SMCJ20CA

C35
100nF

GND

12V to 5V

+12V

U13
VXO780x-500-M

VIN   VOUT
1   3

EN   GND
4   2

C37
10uF
Min 35V

GND

C38
22uF
Min 16V

GND

D32
Schottky

+5V

TP13
5V

C40
100nF
Min 16V

GND

TP12
GND

GND

5V to 3.3V

U15
LD1117S33CTR

VIN   VOUT
3   2

GND   VOUT
1   4

GND

C41
10uF

TP14
3V3B

GND

3V3_BAT

Protection

U16
ISP752R

Vbb   ST
8   4

Vbb   OUT
7   3

Vbb
6

Vbb
5

IN   GND
2   1

GND

D33
RED
Power
Error

R50
120R

3V3_BAT

TP15   +3V3
3V3

R49
120R

D34
GRN   Power OK

GND

Supercapacitor

3V3_BAT

D30
Schottky

100R
R46

C34
0.47F/3.5V

GND

C36
100nF

GND

2
J6
1
SHORT

GND

VBAT

Charges to 3.3V − 0.45V = 2.85V in 47 seconds
Discharges 2.85V to 2.00V in 3.85 days

Sleep/Wakeup

+3V3

SW2
AlwaysOn

ON_SW

R108
10k

+3V3

D31
Schottky

R107
4.7k

GND

R47
470R

GND

TLP2710(TP,E

VCC
6

VO
5

GND
4

U14

R48
10k

SYS_WKUP

+3V3

C39
100nF

GND

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+12V

RedCubeTerminal
J1

Battery Lug

Mounting Holes

H1
M3
H3
M3
H2
M3

J3
1-776267-1

PF_OUT5	1	1
PF_OUT4	2	2
PF_OUT3	3	3
PF_OUT2	4	4
PF_OUT1	5	5
PF_OUT6	6	6
INPUT2	7	7

8	8	PF_OUT2
9	9	PF_OUT1
10	10	
11	11	INPUT1
12	12	INPUT3
13	13	INPUT4
14	14	ON_SW

GND

A

J4
1-776267-1

PF_OUT7	1	1
PF_OUT8	2	2
PF_OUT9	3	3
PF_OUT10	4	4
PF_OUT11	5	5
PF_OUT7	6	6
PF_OUT8	7	7

8	8	INPUT5
9	9	PF_OUT12
10	10	INPUT8
11	11	INPUT7
12	12	INPUT6
13	13	CAN_H
14	14	CAN_L

B

AMPSEAL Connector   AMPSEAL Connector

USB C Connector

4.7k
R3

USB_VBUS

4.7k
R4

GND

D2
Schottky

+5V

+3V3

Q1
BC817-40

R6
10k

R8
100R

USB_PULLUP

R7
47k

GND

J2
USB_C_Receptacle_USB2.0

VBUS	A4	
CC1	A5	
CC2	B5	
D−	A7	USB_D−
D−	B7	
D+	A6	USB_D+
D+	B6	
SBU1	A8	
SBU2	B8	

SHIELD   GND

1.5k
R5

S1
GND

A1
GND

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S1
RESET_SW
NRST
VBAT
+3V3

C24
100nF
GND

SW1
SW_SPDT
R41
10k
+3V3
GND

FB1
Ferrite_Bead_Small
STM32F303CCTx

VBAT
+3V3

C26
100nF
GND

C27
100nF
C28
100nF
C29
100nF
C30
4.7uF
C31
10nF
C32
1uF
VDDA
GND

U9
1 VBAT 24 36 48 VDD 9 VDDA

C20
27pF
GND
CL=18pF
Y1
8mHz
C21
27pF
GND
R38
0R

C22
15pF
GND
CL=12.5pF
Y2
32.768kHz
C23
15pF
GND
R39
0R

PF_GPIO_RESET
R40
10k
GND

7 NRST
44 BOOT0
5 PF0   HSE OSC IN
6 PF1   HSE OSC OUT
2 PC13   SYS_WKUP2
3 PC14   LSE OSC IN
4 PC15   LSE OSC OUT

TP5
EXTRA2
18 PB0
19 PB1
20 PB2
39 PB3   SWO
40 PB4
41 PB5
42 PB6   I2C1_SCL
43 PB7   I2C1_SDA
45 PB8   CAN_RX
46 PB9   CAN_TX
21 PB10   USB_VBUS
22 PB11   USB_PULLUP
25 PB12   BATT_SENSED
26 PB13
27 PB14
28 PB15

PA0 10
PA1 11
PA2 12   TP9 EXTRA1 /USART2TX
PA3 13
PA4 14   SPI1_CS
PA5 15   SPI1_SCK
PA6 16   SPI1_MISO
PA7 17   SPI1_MOSI
PA8 29   TP11 MCO
PA9 30   I2C2_SCL
PA10 31   I2C2_SDA
PA11 32   USB_DM
PA12 33   USB_DP
PA13 34   SWDIO
PA14 37   SWCLK TP10
PA15 38   EXTRA3 /USART2RX

23 35 47 VSS 8 VSSA
GND

32Mb FLASH
U12
SPI1_CS   1 CS
          3 WP
SPI1_MOSI 5 DI
SPI1_SCK 6 CLK
          7 RST
8 VCC
+3V3
2 DO SPI1_MISO
4 GND
W25Q32JVSSIQ_TR
GND

C33
100nF
+3V3
GND

SWD
+3V3
J5
TC
1 VCC
RESET 3 NRST
SWCLK 4 SWCLK
SWDIO 2 SWDIO
SWO   6 SWO
5 GND
GND

CAN Transceiver
CAN_TX
CAN_RX
CAN_TERM_RESISTOR
R43 R44
100R 100R
U11
TLP172AM
TP6   TP7
CAN_T CAN_R
R42
1k
+3V3
+5V
-TLP172AM 1ohm impedance
-Term. Resistor 120R
-TLP175A 25ohm impedance
-Term. Resistor 100R
GND

PCA82C250
U10
CAN_TX 1 TXD
CAN_RX 4 RXD
        3 VDD
+3V3   5 Vref
        8 Rs
7 CANH
6 CANL
2 VSS
GND

R45
120R 2W
CAN_H
CAN_L
D28
NUP2105LT1G
GND

C25
100nF
+3V3
GND

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Title: Dingo_PDM
Rev: v5

I2C1:
0x18 – MCP9808
0x20 – PCAL9554B
0x34 – MAX11613
0x74 – PCA9539

I2C2:
0x30 – PCA9635
0x34 – MAX11613
0x50 – MB85RC256V
0x74 – PCA9539

+3V3

R17 10k R18 10k R19 10k R20 10k

I2C1_SCL I2C1_SDA I2C2_SCL I2C2_SDA

TP1 I2C1_SCL TP2 I2C1_SDA TP3 I2C2_SCL TP4 I2C2_SDA

I2C1_SCL I2C1_SDA I2C2_SCL I2C2_SDA

Temperature Sensor

+3V3

R21 100R

D11 RED

Over Temp Fault

U6 MCP9808
I2C1_SDA — 1 SDA VDD 8
I2C1_SCL — 2 SCL A0 7
3 ALERT A1 6
4 GND A2 5

I2C1 ADDR 0X18

+3V3

C18 1uF

GND

C19 100nF
+3V3
GND

Profet Analog Signals

+3V3

U2 MAX11613
PF_IS5_6 — 1 AIN0 Vdd 8
PF_IS3_4 — 2 AIN1 SCL 5 — I2C1_SCL
PF_IS2 — 3 AIN2 SDA 6 — I2C1_SCL
PF_IS1 — 4 AIN3/REF GND 7

I2C1 ADDR 0x34

C15 100nF
+3V3
GND

U3 MAX11613
PF_IS7 — 1 AIN0 Vdd 8
PF_IS8 — 2 AIN1 SCL 5 — I2C2_SCL
PF_IS9_10 — 3 AIN2 SDA 6 — I2C2_SDA
PF_IS11_12 — 4 AIN3/REF GND 7

I2C2 ADDR 0x34

C14 100nF
+3V3
GND

Memory FRAM

+3V3

U5 MB85RC256V
I2C2_SDA — 5 SDA VDD 8
I2C2_SCL — 6 SCL
1 A0
2 A1
3 A2
7 WP VSS
4 GND

I2C2 ADDR 0X50

C17 100nF
+3V3
GND

Profet Driver Digital Output Control Signals

+3V3

C10 100nF
GND

U1 PCA9539
I2C1_SCL — 22 SCL VDD 24
I2C1_SDA — 23 SDA
IO0_0 4 — PF_DEN2
IO0_1 5 — PF_IN2
IO0_2 6
IO0_3 7
IO0_4 8
IO0_5 9 — PF_DEN1
IO0_6 10
IO0_7 11 — PF_IN1
1 INT
3 RESET
IO1_0 13 — PF_IN6
IO1_1 14 — PF_DSEL5_6
IO1_2 15 — PF_DEN5_6
IO1_3 16 — PF_IN5
IO1_4 17 — PF_IN4
IO1_5 18 — PF_DSEL3_4
IO1_6 19 — PF_DEN3_4
IO1_7 20 — PF_IN3
21 A0
2 A1
VSS 12

C11 100nF
PF_GPIO_RESET
GND

I2C1 ADDR 0X74

+3V3

C12 100nF
GND

U4 PCA9539
I2C2_SCL — 22 SCL VDD 24
I2C2_SDA — 23 SDA
IO0_0 4 — PF_DEN7
IO0_1 5 — PF_IN7
IO0_2 6 — PF_DEN8
IO0_3 7 — PF_IN8
IO0_4 8 — PF_IN9
IO0_5 9 — PF_DSEL9_10
IO0_6 10 — PF_DEN9_10
IO0_7 11 — PF_IN10
1 INT
3 RESET
IO1_0 13 — PF_IN11
IO1_1 14 — PF_DSEL11_12
IO1_2 15 — PF_DEN11_12
IO1_3 16 — PF_IN12
IO1_4 17
IO1_5 18
IO1_6 19
IO1_7 20 — CAN_TERM_RESISTOR
21 A0
2 A1
VSS 12

C13 100nF
PULLDOWN IN MCU
PF_GPIO_RESET
GND

I2C2 ADDR 0X74

Digital Inputs

+3V3

U7 PCAL9554B
I2C1_SCL — 14 SCL VDD 16
I2C1_SDA — 15 SDA
13 INT
P0 4 — IN_4
P1 5 — IN_3
P2 6 — IN_2
P3 7 — IN_1
P4 9 — IN_5
P5 10 — IN_6
P6 11 — IN_7
P7 12 — IN_8
1 A0
2 A1
3 A2
GND 8

I2C1 ADDR 0x20

C16 100nF
+3V3
GND

Status LEDs

+3V3

U8 PCA9635
I2C2_SCL — 26 SCL VDD 28
I2C2_SDA — 27 SDA
23 OE
LED0 6
LED1 7
LED2 8
LED3 9
LED4 10
LED5 11
LED6 12
LED7 13
LED8 15
LED9 16
LED10 17
LED11 18
LED12 19
LED13 20
LED14 21
LED15 22
1 A0
2 A1
3 A2
4 A3
5 A4
24 A5
25 A6
VSS 14

I2C2 ADDR 0X30

GND

D12 YEL R22 560R
D13 YEL R23 560R
D14 YEL R24 560R
D15 YEL R25 560R
D16 YEL R26 560R
D17 YEL R27 560R
D18 YEL R28 560R
D19 YEL R29 560R
D20 YEL R30 560R
D21 YEL R31 560R
D22 YEL R32 560R
D23 YEL R33 560R
D24 GRN R34 560R
D25 ORG R35 560R
D26 ORG R36 560R
D27 RED R37 560R

+5V

6mA each at 100%
96mA total

LED0-11 YEL = Output Channel States (Solid-OK, Flash-FAULT, Off-OFF)
LED12 GRN = Device State (Solid-RUN, Flash-TEST, Off-STOP/FAULT)
LED13 ORG = USB State (Solid-CONNECTED, Flash-COMMS, Off-DISCONNECTED)
LED14 ORG = CAN State (Solid-COMMS OK, Flash-NO COMMS, Off-DEACTIVE)
LED15 RED = Fault (Solid-MAJOR FAULT, Flashing-FAULT, Off-OK)

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Sheet:
File: I2C_xicad_scn
Title: Dinga_PDM
Size: US Letter Date: 2024-05-01
KiCad E.D.A. kicad 7.0.2
Rev: v5
Id: 5/16

Digital Input Protection

+12V

sheet5F5A40B9

BATT	OUTD	PF_OUT1
PF_IN1 > IN		
PF_DEN1 > DEN	ISD	PF_IS1

File: BTS700n_1EPP.kicad_sch

+12V sheet5F5A40BA

BATT	OUTD	PF_OUT2
PF_IN2 > IN		
PF_DEN2 > DEN	ISD	PF_IS2

File: BTS700n_1EPP.kicad_sch

+12V

sheet5F5A3599

BATT	OUTD	PF_OUT7
PF_IN7 > IN		
PF_DEN7 > DEN	ISD	PF_IS7

File: BTS700n_1EPP.kicad_sch

+12V sheet5F5A359A

BATT	OUTD	PF_OUT8
PF_IN8 > IN		
PF_DEN8 > DEN	ISD	PF_IS8

File: BTS700n_1EPP.kicad_sch

BATT

C45
47nF

C46
100nF

R62
47R 1/4W
GND

U18
BTS700n-1EPP

R59
4.7k

IN

DEND
4.7k
R60

15 | VS
2 | IN
3 | DEN
5 | NC1
6 | NC2
7 | NC3
11 | NC4

GND | 1
OUT1 | 8
OUT2 | 9
OUT3 | 10
OUT4 | 12
OUT5 | 13
OUT6 | 14
IS | 4

Flyback

D36
BYG23M
GND

DOUT

C47
10nF
GND

R61
1.2k
GND

R63
220k

D37
3.3V
GND

RC Filter

R64
4.7k

C48
220pF
GND

DIS

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BATT

U19
BTS700n-1EPP

Pin	Name		Name	Pin
15	VS		GND	1
2	IN		OUT1	8
3	DEN		OUT2	9
5	NC1		OUT3	10
6	NC2		OUT4	12
7	NC3		OUT5	13
11	NC4		OUT6	14
			IS	4

R65 4.7k
IN
DEN
R66 4.7k

C49 47nF
C50 100nF
R68 47R 1/4W
GND

Flyback
D38 BYG23M
GND

C51 10nF
GND
OUT

R67 1.2k
GND

R69 220k
D39 3.3V
GND

RC Filter
R70 4.7k
C52 220pF
GND
DIS

BATT

C53
47nF

C54
100nF

R74
47R 1/4W
GND

U20

15 VS   GND 1

R71
4.7k

IND 2 IN   OUT1 8
DEND 3 DEN   OUT2 9
                    OUT3 10
4.7k   OUT4 12
R72   OUT5 13
                    OUT6 14

5 NC1
6 NC2
7 NC3
11 NC4

IS 4

BTS700n-1EPP

Flyback

D40
BYG23M
GND

C55
10nF
GND

DOUT

R73
1.2k
GND

R75
220k

D41
3.3V
GND

R76
4.7k

C56
220pF
GND

RC Filter

DIS

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BATT

C57
47nF

C58
100nF

R80
47R 1/4W

GND

U21

15 VS   GND 1
2   IN   OUT1 8
3   DEN   OUT2 9
               OUT3 10
5   NC1   OUT4 12
6   NC2   OUT5 13
7   NC3   OUT6 14
11 NC4
               IS   4

BTS700n-1EPP

R77
4.7k

IND

DEND

4.7k
R78

R79
1.2k

GND

R81
220k

GND

Flyback

D42
BYG23M

GND

D43
3.3V

GND

R82
4.7k

DOUT

C59
10nF

GND

DIS

C60
220pF

GND

RC Filter

Cory Grant
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Sheet5F5A9674

+12V

BATT

PF_IN3 — DIN0   OUT0 — PF_OUT3
PF_IN4 — DIN1

PF_DSEL3_4 — DSEL   OUT1 — PF_OUT4
PF_DEN3_4 — DEN

         IS — PF_IS3_4

File: BTS7008_2EPA.kicad_sch

sheet5F5B190A

+12V

BATT

PF_IN10 — DIN0   OUT0 — PF_OUT10
PF_IN9 — DIN1

PF_DSEL9_10 — DSEL   OUT1 — PF_OUT9
PF_DEN9_10 — DEN

         IS — PF_IS9_10

File: BTS7008_2EPA.kicad_sch

sheet5F5B0A8D

+12V

BATT

PF_IN5 — DIN0   OUT0 — PF_OUT5
PF_IN6 — DIN1

PF_DSEL5_6 — DSEL   OUT1 — PF_OUT6
PF_DEN5_6 — DEN

         IS — PF_IS5_6

File: BTS7008_2EPA.kicad_sch

sheet5F5B1F8F

+12V

BATT

PF_IN12 — DIN0   OUT0 — PF_OUT12
PF_IN11 — DIN1

PF_DSEL11_12 — DSEL   OUT1 — PF_OUT11
PF_DEN11_12 — DEN

         IS — PF_IS11_12

File: BTS7008_2EPA.kicad_sch

BATT

U17
BTS7008-2EPA

C42
47nF

C43
100nF

R56
47R 1/4W
GND

15 VS
GND 1

R51
4.7k

INO
2 IN0
OUT0 14 DOUT0
OUT0 13
OUT0 12

DEN
3 DEN

R53
4.7k

DSEL
5 DSEL
OUT1 10 DOUT1
OUT1 9
OUT1 8

R52

IN1
6 IN1

R54
4.7k

7 NC3
11 NC4

IS 4

R55
1.2k
GND

R57
220k

D35
3.3V
GND

R58
4.7k

C44
220pF
GND

DIS

RC Filter

Cory Grant
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BATT

U22
BTS7008-2EPA

C61
47nF

C62
100nF

R88
47R 1/4W
GND

R83
4.7k

INO
DEN

R85
4.7k

4.7k

DSEL
IN1

R84
4.7k

R86

15 VS
2 IN0
3 DEN
5 DSEL
6 IN1
7 NC3
11 NC4

GND 1
OUT0 14
OUT0 13
OUT0 12
OUT1 10
OUT1 9
OUT1 8
IS 4

OUT0

OUT1

R87
1.2k
GND

R89
220k

D44
3.3V
GND

R90
4.7k

C63
220pF
GND

DIS

RC Filter

Cory Grant
github.com/corygrant

BATT

U23
BTS7008-2EPA

15 VS
C64
47nF
C65
100nF

R96
47R 1/4W
GND

GND 1

2 IN0   OUT0 14 ▷OUT0
3 DEN   OUT0 13
               OUT0 12

5 DSEL   OUT1 10 ▷OUT1
6 IN1   OUT1 9
               OUT1 8

R91
4.7k
R93
4.7k
R92
R94
4.7k
4.7k

IN0▷
DEN▷
DSEL▷
IN1▷

7 NC3
11 NC4

IS 4

R95
1.2k
GND

R97
220k

D45
3.3V
GND

R98
4.7k

C66
220pF
GND

▷DIS

RC Filter

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U24
BTS7008-2EPA

		Pin	Name		Pin	Name		

R99 4.7k

IN0 — 2 IN0
DEN — 3 DEN
DSEL — 5 DSEL
IN1 — 6 IN1
R101 4.7k
R100
R102 4.7k
4.7k

15 VS
GND 1
OUT0 14
OUT0 13
OUT0 12
OUT1 10
OUT1 9
OUT1 8
7 NC3
11 NC4
IS 4

BATT

C67 47nF
C68 100nF

R104 47R 1/4W GND

OUT0
OUT1

R103 1.2k GND
R105 220k
D46 3.3V GND
R106 4.7k
C69 220pF GND
DIS

RC Filter