CAN BUS Power Rail

https://de.aliexpress.com/item/1005005829877910.html

DC Buck 80 V to 5V 1 A
(if we implement RGB strip, get 10A)

Never powered Down so that emergency signal keep blinking

Conn_01x04 CAN IN J1 — CANH, CANL

Conn_01x04 CAN OUT J2 — CANH, CANL

DC Buck 80 V to 12V 10 A

VBUS, +5V, +12V, GND

https://de.aliexpress.com/item/1005009210793105.html

lightning

5A MAX -> 60W light

+12V, 10K, NMOS, small sig 20 V 5A mosfet, 0.001 R

MOSFET_GATE_0 / R44 / J3 / Q19 / SENSE_0 / R45 size R for 20 mA or better of resolution

MOSFET_GATE_1 / R35 / J7 / Q18 / SENSE_1 / R38

MOSFET_GATE_2 / R37 / J8 / Q17 / SENSE_2 / R36

MOSFET_GATE_3 / R28 / J10 / Q12 / SENSE_3 / R27

MOSFET_GATE_4 / R29 / J9 / Q11 / SENSE_4 / R26

MOSFET_GATE_5 / R14 / J14 / Q6 / SENSE_5 / R13

MOSFET_GATE_6 / R16 / J13 / Q5 / SENSE_6 / R15

MOSFET_GATE_7 / R0 / J16 / Q0 / SENSE_7 / R1

keep power below 0.1 W ->
max 20 mV
max 0.004 mR

Compute

3v3 provided by internal LDO of ESP32 devboard

U1 ESP32-C3_SUPERMINI_TH

+3.3V, +5V, 3v3 come from ESP32-C internal regulator

ADC pins: ECHO_A, ECHO_B, ECHO_C

SDA, SCL

CAN_TX, CAN_RX

CAN_S, RGBLED_DIN

PIEZO_PWM_HALF_X, TRIG_A, PIEZO_PWM_HALF_Y, TRIG_B, TRIG_C

trig used only if we choose off the shelf module instead

proximity sensor

Gain : (1+39K/1K)=40 (echo at 6m+ in the mV range, ADC resolution of ~5mV)

SIG_A / C9 100nF / R30 1K / R32 100K / D10 RB551V-30-HF / R34 100K / D9 RB551V-30-HF / U10 MCP6L01x-xOT / R33 39K / R31 1K / ECHO_A

given 1M+ of input resistance + 100nF, we have a high pass with cutoff < 1.5 KHz, sig is at 40 Khz

Gain : (1+39K/1K)=40

SIG_B / C6 100nF / R17 1K / R24 100K / D7 RB551V-30-HF / R25 100K / D6 RB551V-30-HF / U7 MCP6L01x-xOT / R22 39K / R23 1K / ECHO_B

1K resistor to limit inrush current inside the AOP protection diode while the shottky diode polarize 50V/1K=50mA vs 50A+ during a ns can damage the diode over time

Gain : (1+39K/1K)=40

SIG_C / C0 100nF / R5 1K / R6 100K / D3 RB551V-30-HF / R11 100K / D2 RB551V-30-HF / U5 MCP6L01x-xOT / R8 39K / R12 1K / ECHO_C

J4, J11, J17 — 5V, TRIG, ECHO, GND — TRIG_A/ECHO_A, TRIG_B/ECHO_B, TRIG_C/ECHO_C — Conn_01x04

ADC for current sensing

this is mainly to detect fault in the lightning system (dead lamp) but it can also be used (crudely) if one choose to do PWM to dim the light and control the current

U14 ADS1115IDGS — C5 100nF — SENSE_3, SENSE_2, SENSE_1, SENSE_0 — SCL, SDA — I2C addr : 1001000-> 0x48

U6 ADS1115IDGS — C18 100nF — SENSE_7, SENSE_6, SENSE_5, SENSE_4 — SCL, SDA — I2C addr : 1001001-> 0x49

GPIO

U2 MCP23017_SO

SDA, SCL

MOSFET_GATE_7, MOSFET_GATE_6, MOSFET_GATE_5, MOSFET_GATE_4, MOSFET_GATE_3, MOSFET_GATE_2, MOSFET_GATE_1, MOSFET_GATE_0

EN_PIEZO_A, EN_PIEZO_B, EN_PIEZO_C

A2, A1, A0 = 0100000 = 0x20

daylight sensor

J12 — SDA, SCL, GND, 3V3 — Conn_01x04

RGB strip

RGBLED_DIN / D0 US1M / D1 WS2812B / DIN DOUT VDD VSS Rdd

diode -> little hack to drive the WS2812 using 3v3 logic

J15 Conn_01x03

https://hackaday.com/2017/01/20/cheating-at-5v-ws2812-control-to-use-a-3-3v-data-line/

CAN

U8 TJA1051T-3 — TXD, RXD, VIO, S, VCC, GND, CANH, CANL — C7 100nF — R39 120 R — C8 100nF — CAN_TX, CAN_RX, CAN_S

LM2104 boards

U12 LM2104DR — C14 100nF — D12 D — C16 100nF — R41 470R — R40 470R — Q14, Q13 BSS123-7-F — LS2 Speaker_Ultrasound — Q16, Q15 BSS123-7-F — R43 470R — R42 470R — C15 100nF — D13 D — C17 100nF — U13 LM2104DR

PIEZO_PWM_HALF_X, EN_PIEZO_A, SIG_A, PIEZO_PWM_HALF_Y, EN_PIEZO_A

classic bootstap capacitor setup

(100V reverse polarity minimum)

theses resistor are to limit EMI. samge logic for the resistor in serie with OpAmp

clamp to ground this mosfet while listenning for echo

U9 LM2104DR — C10 100nF — D8 D — C12 100nF — R18 470R — R21 470R — Q8, Q7 BSS123-7-F — LS3 Speaker_Ultrasound — Q10, Q9 BSS123-7-F — R19 470R — R20 470R — C11 100nF — D11 D — C13 100nF — U11 LM2104DR

PIEZO_PWM_HALF_X, EN_PIEZO_B, SIG_B, PIEZO_PWM_HALF_Y, EN_PIEZO_B

H bridge to double effective voltage , improve range. No transformer required since we have a main bus at 48V

HV mosfet (100V+) small current (100 mA)

U4 LM2104DR — C1 100nF — D4 D — C3 100nF — R7 470R — R4 470R — Q1, Q2 BSS123-7-F — LS1 Speaker_Ultrasound — Q3, Q4 BSS123-7-F — R9 470R — R10 470R — C4 100nF — D5 D — C2 100nF — U3 LM2104DR

PIEZO_PWM_HALF_X, EN_PIEZO_C, SIG_C, PIEZO_PWM_HALF_Y, EN_PIEZO_C

backup: if the driver dont work, we can use off the shelf module.

Sheet: /
File: velion_lightboard_pcb.kicad_sch

Title:

Size: A3 | Date: | **Rev:**
KiCad E.D.A. 9.0.6 | Id: 1/1