RS485 Raspberry PI Hat Project

USB and UART to RS485 converter Raspberry PI Hat

Status reading guide:

Draft: Early stage, ignore details.
Preliminary: Almost finished, could have some errors.
Checked: There shouldn't be any error, inform if that isn't the case.
Released: The schematic belongs to a board sent to production.

Comments reading guide:

Compatibility

Design

Layout

User info

Status: Released

Release date: 18/06/23 (DD/MM/YY)

Variation: No variations

Number of layers: 2

Micro/blind/buried vias: No

Related files: BOM, gerber files and pick and place data

Number of sheets: 1

Mark not fitted components as: R17 R

Index

Note: +3P3 This is a global scope label.

SWDIO This is a local (sheet) scope label.

Index:

Power block Diagram

Schematic top level

Signal block Diagram

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V5 — 2023—06—18 (YY/MM/DD)

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File: index.kicad_sch

Title: RS485 Raspberry PI Hat board — Index

Size: A4 | Date: 2023—06—18 | Rev: V5
KiCad E.D.A. kicad 7.0.2—1.fc38 | Id: 2/5

Micro USB
connector
(J1)

USB C
connector
(J5)

5V

LC filtering
and transient
suppresion

5V

RS485 connector
(J2)

CP2102 USB to
UART bridge (U1)

Timer comparator
LM393DR2G (U2A)

3.3V

Raspberry PI
connector (J3)

Arduino
connector (J4)

RS485 transciever
SP3485EN (U5)

Triple NAND
CD4023BM/TR (U6A)

Micro USB connector (J1)

USB C connector (J5)

USB

CP2102 USB to UART bridge (U1)

Timer comparator LM393DR2G (U2A)

UART TX

TXEN

UART RX

RS485 transciever SP3485EN (U5)

RS485

Raspberry PI connector (J3)

Arduino connector (J4)

RS485 connector (J2)

RS485 Raspberry PI Hat board – Signal block diagram
V5 – 2023-06-18 (YY/MM/DD)

USB

J1 USB-Micro
- 1 VCC — USB_VCC
- 2 D− — USB_D−
- 3 D+ — USB_D+
- 4 ID — CH ID
- 5 GND — GND
- 6 CH

R22 560R — D4 green

+3.3V

R1 10k — USB_SH
USB_GND

T1 CM_Choke_90R

D1 TVS_5V

C1 22pF/50V

L1 Bead_300R
L2 Bead_300R

C4 100nF/50V   C5 10uF/16V
+3.3V

C2 100nF/50V   C3 10uF/16V
+5V

R2 4k7
+3.3V

D2 CUS08F30-H3F
+3.3V   +5V

U1 CP2102
- 1 DCD
- 2 RI
- 3 GND
- 4 D+ — USB_DP
- 5 D− — USB_DM
- 6 VDD
- 7 REGIN — VBUS
- 8 VBUS
- 9 RST — RST
- 10 NC
- 11 SUSPEND
- 12 SUSPEND
- 13 NC
- 14 NC
- 28 DTR
- 27 DSR
- 26 TXD — TXDU
- 25 RXD — RXDU
- 24 RTS
- 23 CTS
- 22 NC
- 21 NC
- 20 NC
- 19 NC
- 18 NC/VPP
- 17 NC
- 16 NC
- 15 NC
- 29 GND

RS485 BUS

C7 100nF/50V
+3.3V

U5 SP3485EN
- 1 RO — RXD
- 2 RE
- 3 DE — TXEN
- 4 DI — TXD
- 8 VCC
- 5 GND
- 6 A — RS485A
- 7 B — RS485B

R3 10k
L3 Bead_300R

R13 560R
+3.3V

R5 220R

R4 10k
L4 Bead_300R
L5 Bead_300R

R18 560R

Stand by diff voltage: 0.55V
Diff input impedance: 123 Ohms

SM712 D3

J2 TSM-108-01-T-SH-A-P-TR
- 1
- 2 — A
- 3
- 4 — B
- 5
- 6
- 7 — +3.3V
- 8 — +5V

USB C

J5 USB_C_Receptacle
- A4 VBUS — USB_VCC
- A5 CC1 — R14 5.1k — USB_GND
- B5 CC2 — R15 5.1k
- A7 D− — USB_D−
- B7 D− — USB_D−
- A6 D+ — USB_D+
- B6 D+ — USB_D+
- A8 SBU1
- B8 SBU2
- S1 SHIELD
- A1 GND — USB_GND
- USB_SH

Raspberry Pi

J3 Raspberry-Pi_2x5-Pin_Header
- 1 5V
- 3 5V
- 5 GND
- 7 GPIO_14(TXD0) — TXDR
- 9 GPIO_15(RXD0) — RXDR
- 2 3.3V — +3.3V
- 4 GPIO_02(SDA1)
- 6 GPIO_03(SCL1)
- 8 GPIO_04(GPIO_GCLK)
- 10 GND

C8 100nF/50V

ARDUINO

J4 Conn_01x04
- 1
- 2 TXDA
- 3 RXDA
- 4

C9 100nF/50V
+3.3V

R6 10k
R7 10k — TXDU
R8 10k — TXDR / TXDA

R9 1k — RXDU
R10 1k — RXDR
R11 1k — RXDA — RXD

+3.3V

RS485 DIRECTION CONTROL

U6D CD4023BM/TR
- 14 VDD
- 7 VSS

U2B LM393DR2G — 5/6/7

C11 100nF/50V   C12 100nF/50V
+3.3V   +3.3V

U6A CD4023BM/TR
- 1 TXDU
- 2 TXDR
- 8 TXDA
- 9

U6B CD4023BM/TR
- 5 / 4 / 3
- 6 — TXD

U6C CD4023BM/TR
- 11
- 12
- 13
- 10 — TXEN

+3.3V

Q1 MMS9012-H-TP

R21 4.7k
+3.3V

R20 20k
+3.3V

U2A LM393DR2G
- 3 V+
- 2 V−
- 8 V+
- 4 V−
- 1

R12 1k
R16 10k
C15 1nF

R19 10k
C16 100nF/50V

T=1.1*R*C=1.1us