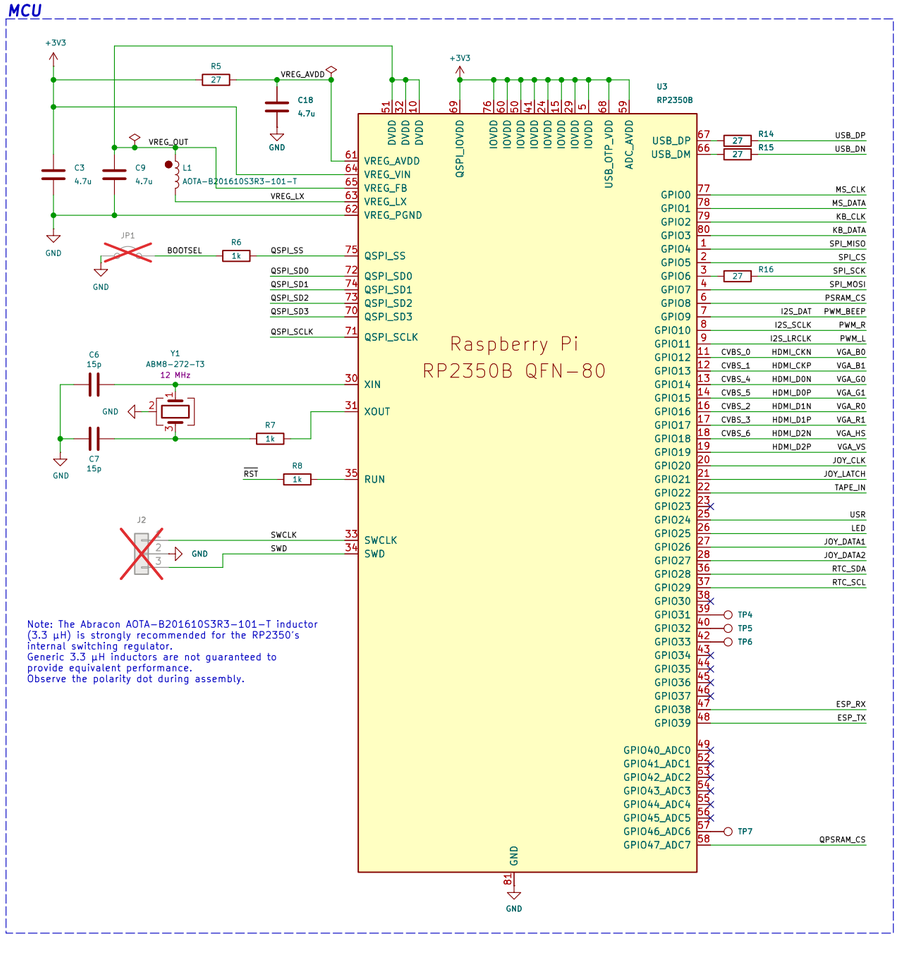
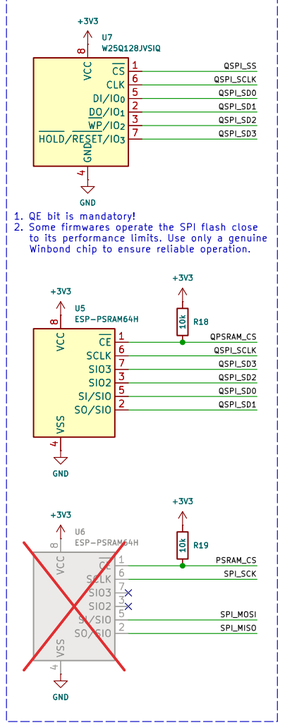
MCU

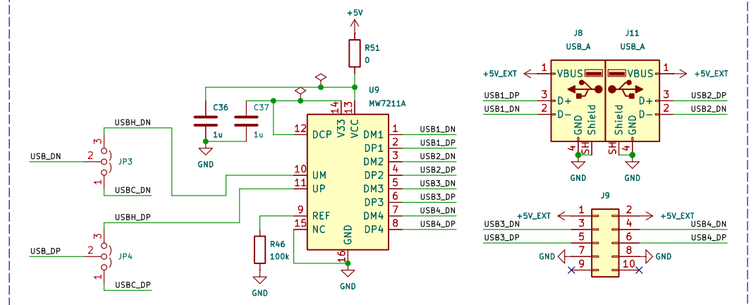


FLASH & RAM

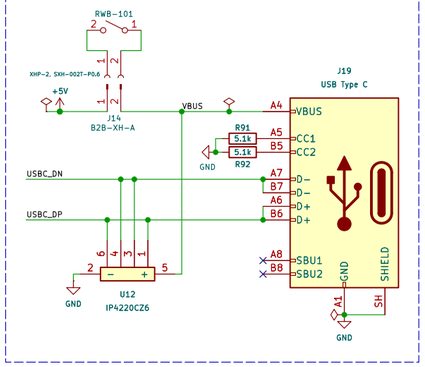


1. QE bit is mandatory!
2. Some firmwares operate the SPI flash close to its performance limits. Use only a genuine Winbond chip to ensure reliable operation.

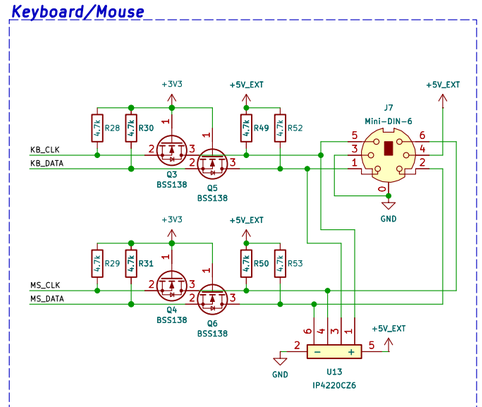
USB hub



Power in / USB device

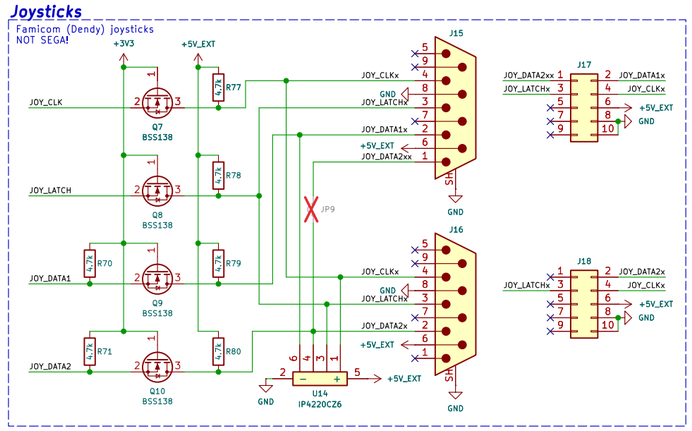


Keyboard/Mouse

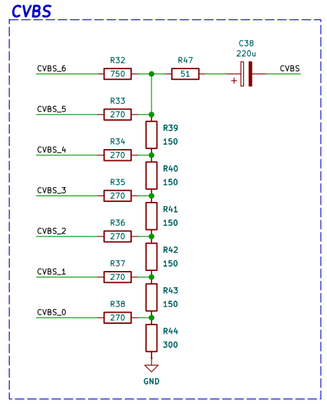


Joysticks

Famicom (Dendy) joysticks
NOT SEGA!

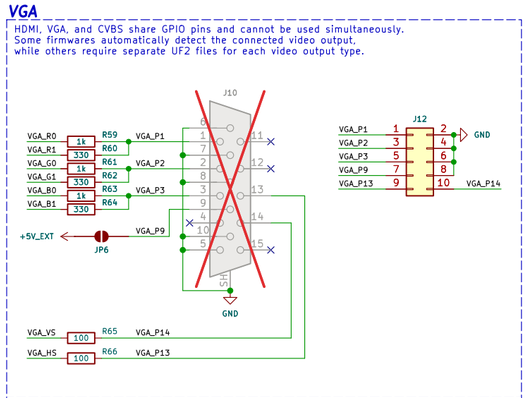


CVBS

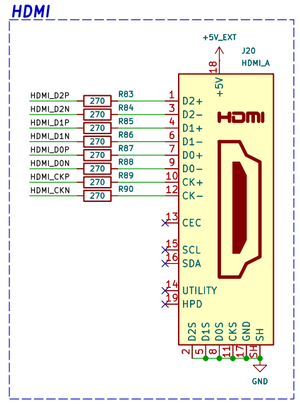


VGA

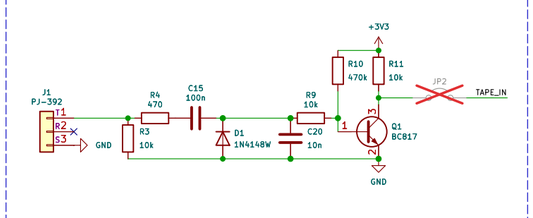
HDMI, VGA, and CVBS share GPIO pins and cannot be used simultaneously.
Some firmwares automatically detect the connected video output,
while others require separate UF2 files for each video output type.



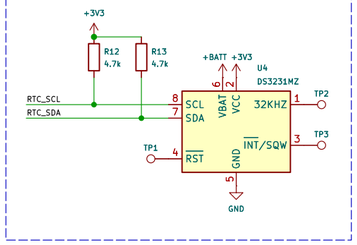
HDMI



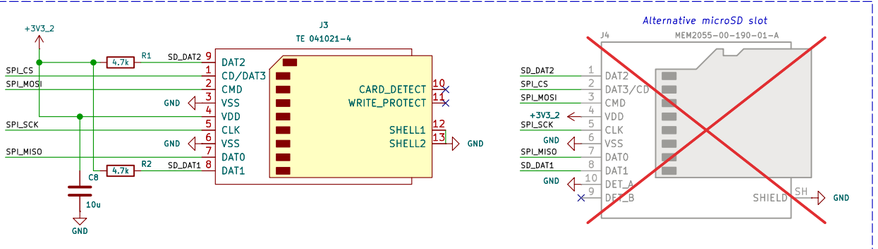
Tape



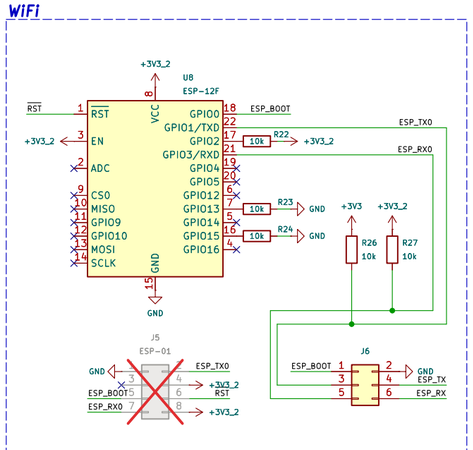
RTC



SD card

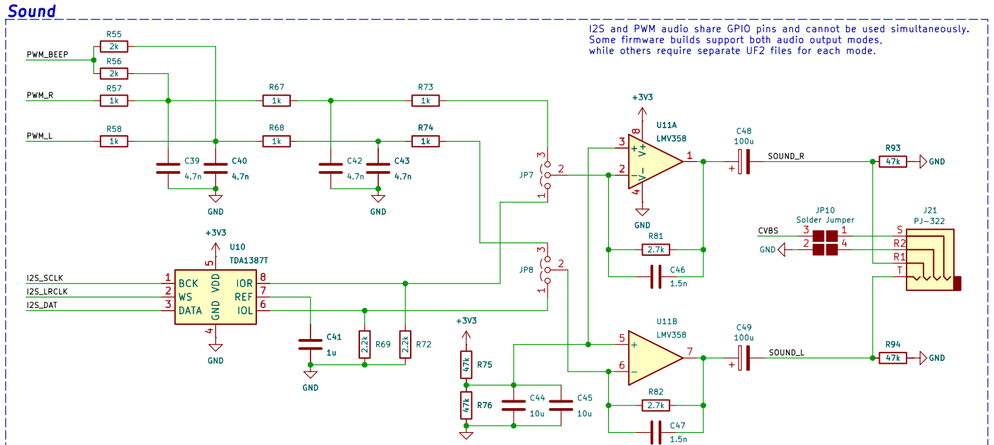


WiFi

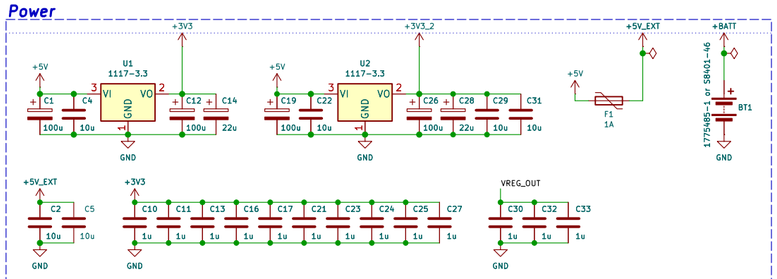


Sound

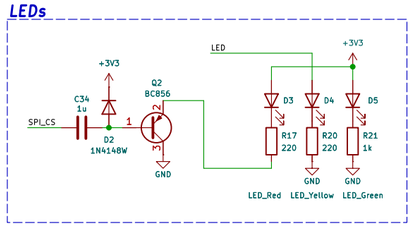
I2S and PWM audio share GPIO pins and cannot be used simultaneously.
Some firmware builds support both audio output modes,
while others require separate UF2 files for each mode.



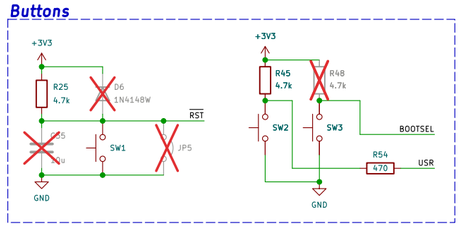
Power



LEDs



Buttons



H1 Screw M3 dk=5mm L=4mm
H2 Screw M3 dk=5mm L=4mm
H3 Screw M3 dk=5mm L=4mm
H4 Screw M3 dk=5mm L=4mm

G738 or G706

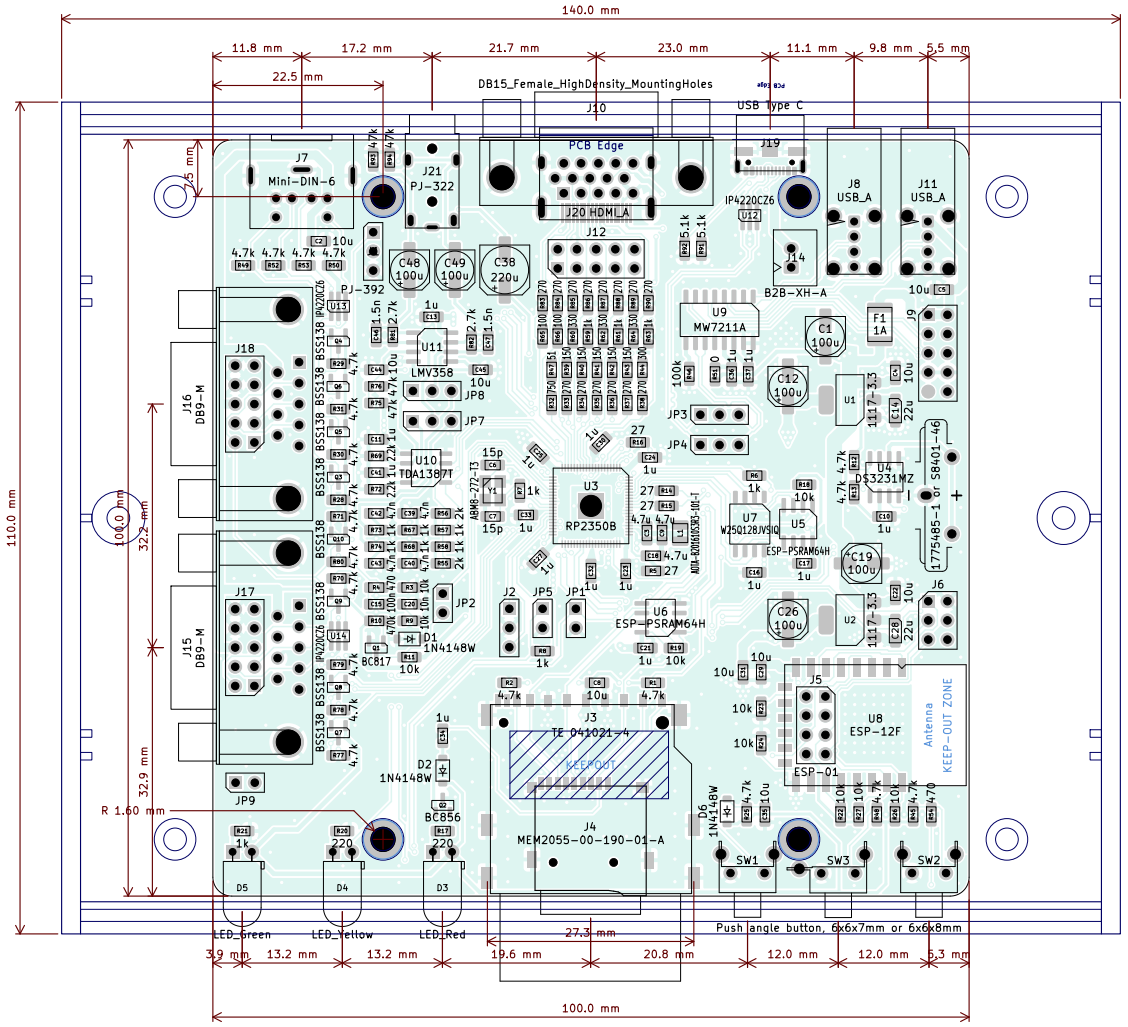
10x10 PCB variant of Murmulator (M2P2) project with some ideas from FrankPGA
https://murmulator.ru
https://frank.rh1.tech

Eugene Lozovoy

Sheet: /
File: murmulator1010.kicad_sch

Title: Murmulator.1010

Size: User	Date: 2026-11-11	Rev: A1
KiCad E.D.A. 10.0.7		Id: 1/1



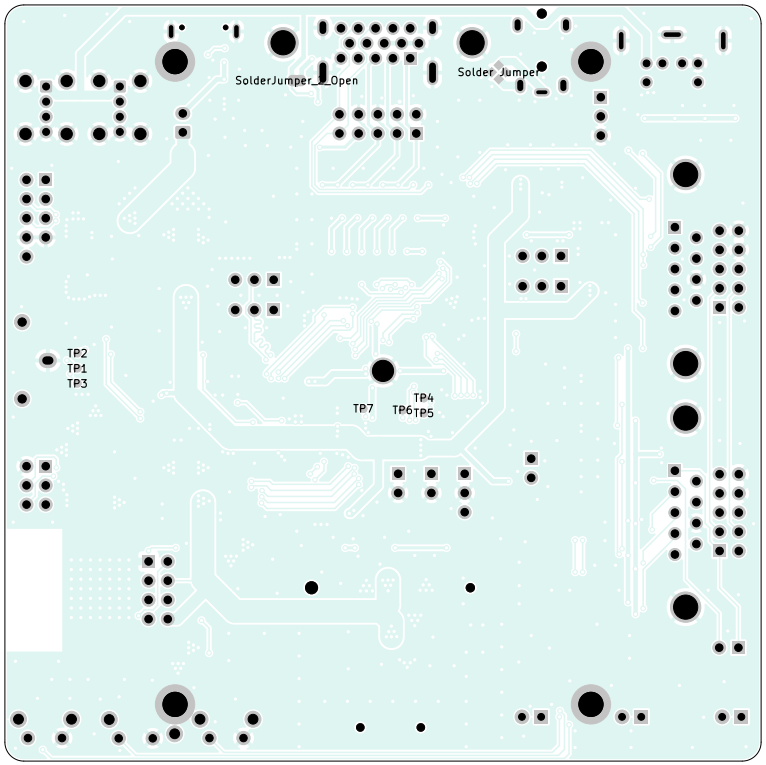
Dimensions: 100x100mm	Min clearance: 0.2mm
Layers: 2	Min track: 0.2mm
Thickness: 1.6mm	Min hole: 0.3mm
	Min annular ring: 0.15mm

Eugene Lozovoy

Sheet:
File: murmulator1010.kicad_pcb

Title: Murmulator.1010

Size: A4	Date: 2026-11-11	**Rev: A1**
KiCad E.D.A. 10.0.7		Id: 1/1



Dimensions: 100x100mm	Min clearance: 0.2mm
Layers: 2	Min track: 0.2mm
Thickness: 1.6mm	Min hole: 0.3mm
	Min annular ring: 0.15mm

Eugene Lozovoy

Sheet:
File: murmulator1010.kicad_pcb

Title: Murmulator.1010

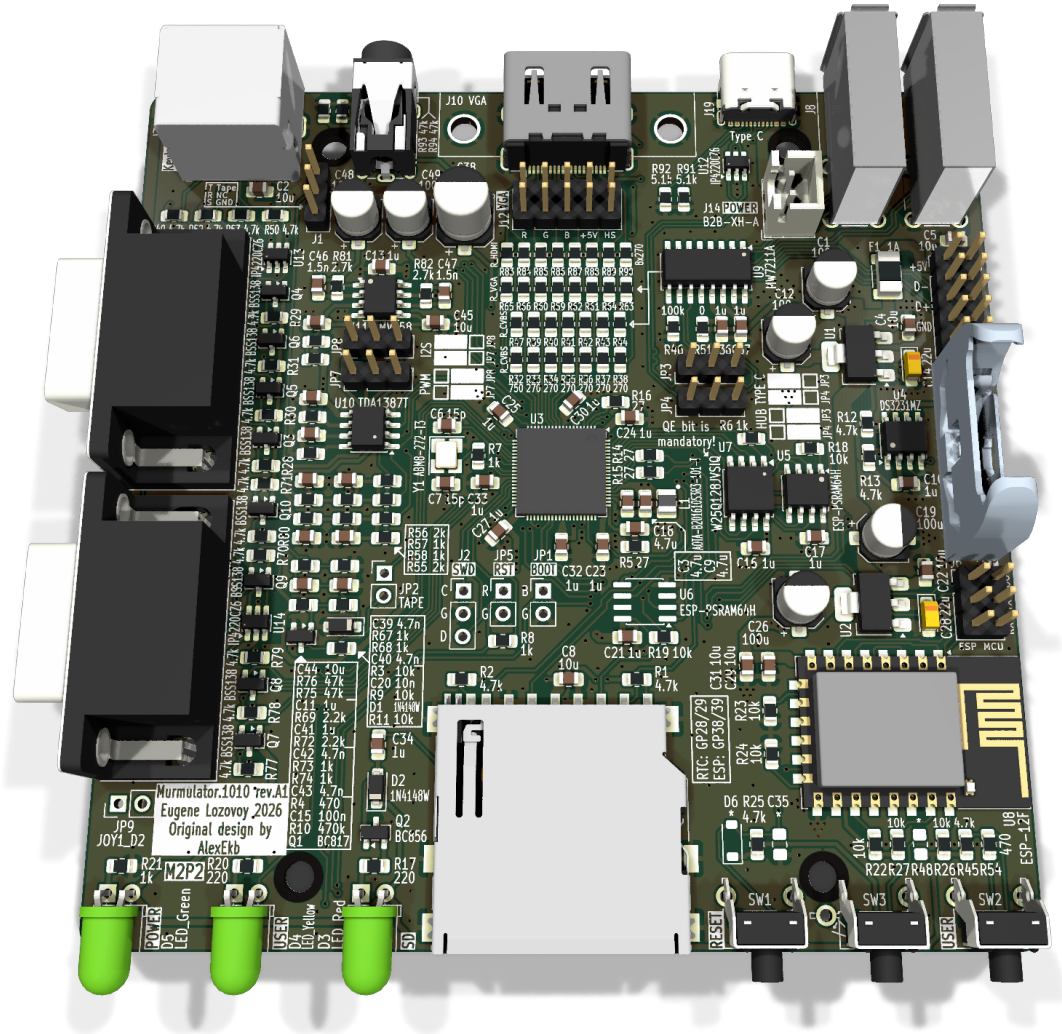
Size: A4	Date: 2026-11-11	**Rev: A1**
KiCad E.D.A. 10.0.7		Id: 1/1

Bill Of Materials

Refs	Value	Footprint	Qty
BT1	1775485-1 or S8401-46	CR2032V	1
C1 C12 C19 C26 C48 C49	100u	CP_Elec_5x5.9	6
C2 C4 C5 C8 C22 C29 C31 C44 C45	10u	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	9
C3 C9 C18	4.7u	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	3
C6 C7	15p	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	2
C10 C11 C13 C16 C17 C21 C23 C24 C25 C27 C30 C32 C33 C34 C36 C37 C41	1u	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	17
C14 C28	22u	CP_EIA-3216-18_Kemet-A_HandSolder	2
C15	100n	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	1
C20	10n	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	1
C38	220u	CP_Elec_6.3x7.7	1
C39 C40 C42 C43	4.7n	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	4
C46 C47	1.5n	C_0805_2012Metric_Pad1.18x1.45mm_HandSolder	2
D1 D2	1N4148W	D_SOD-123	2
D3	LED_Red	LED_D5.0mm_Horizontal_O1.27mm_Z3.0mm	1
D4	LED_Yellow	LED_D5.0mm_Horizontal_O1.27mm_Z3.0mm	1
D5	LED_Green	LED_D5.0mm_Horizontal_O1.27mm_Z3.0mm	1
F1	1A	Fuse_1812_4532Metric_Pad1.30x3.40mm_HandSolder	1
H1 H2 H3 H4	Screw M3 dk=5mm L=4mm	MountingHole_3.2mm_M3_dk5.2mm_Mask	4
J1	PJ-392	PinHeader_1x03_P2.54mm_Vertical	1
J3	TE 041021-4	SD_TE_2041021-mod	1
J6	Conn_02x03_Odd_Even	PinHeader_2x03_P2.54mm_Vertical	1
J7	Mini-DIN-6	minidin-6	1
J8 J11	USB_A	USB_A_Wuerth_614004134726_Horizontal	2
J9 J12 J17 J18	Conn_02x05_Odd_Even	PinHeader_2x05_P2.54mm_Vertical	4
J13	XHP-2 SXH-002T-P0.6		1
J14	B2B-XH-A	JST_XH_B2B-XH-A_1x02_P2.50mm_Vertical	1
J15 J16	DB9-M	DSUB-9_Pins_Horizontal_P2.77x2.84mm_EdgePinOffset7.70mm_Housed_MountingHolesOffset9.12mm	2

J19	USB Type C	USB_C_Receptacle_HRO_TYPE-C-31-M-12_dangling	1
J20	HDMI_A	HDMI_A_Molex_208658-1001_Horizontal	1
J21	PJ-322	PJ-322	1
L1	AOTA-B201610S3R3-101-T	L_1008_2520Metric	1
N1	G738 or G706	g738-g706	1
Q1	BC817	SOT-23	1
Q2	BC856	SOT-23	1
Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10	BSS138	SOT-23	8
R1 R2 R12 R13 R25 R28 R29 R30 R31 R45 R49 R50 R52 R53 R70 R71 R77 R78 R79 R80	4.7k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	20
R3 R9 R11 R18 R19 R22 R23 R24 R26 R27	10k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	10
R4 R54	470	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
R5 R14 R15 R16	27	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	4
R6 R7 R8 R21 R57 R58 R59 R61 R63 R67 R68 R73 R74	1k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	13
R10	470k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R17 R20	220	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
R32	750	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R33 R34 R35 R36 R37 R38 R83 R84 R85 R86 R87 R88 R89 R90	270	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	14
R39 R40 R41 R42 R43	150	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	5
R44	300	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R46	100k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R47	51	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R51	0	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	1
R55 R56	2k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
R60 R62 R64	330	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	3
R65 R66	100	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
R69 R72	2.2k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
R75 R76 R93 R94	47k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	4
R81 R82	2.7k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2

R91 R92	5.1k	R_0805_2012Metric_Pad1.20x1.40mm_HandSolder	2
SW1 SW2 SW3	Push angle button 6x6x7mm or 6x6x8mm	SW_Tactile_SPST_Angled_PTS645Vx58-2LFS	3
SW4	RWB-101		1
U1 U2	1117-3.3	SOT-223-3_TabPin2	2
U3	RP2350B	QFN-80-1EP_10x10mm_P0.4mm_EP3.4x3.4mm	1
U4	DS3231MZ	SOIC-8_3.9x4.9mm_P1.27mm	1
U5	ESP-PSRAM64H	SOIC-8_3.9x4.9mm_P1.27mm	1
U7	W25Q128JVSIQ	SOIC-8_5.3x5.3mm_P1.27mm	1
U8	ESP-12F ESP-12E	ESP-12E	1
U9	MW7211A	SOP-16_4.4x10.4mm_P1.27mm	1
U10	TDA1387T	SO-8_3.9x4.9mm_P1.27mm	1
U11	LMV358	SOIC-8_3.9x4.9mm_P1.27mm	1
U12 U13 U14	IP4220CZ6	SC-74-6_1.55x2.9mm_P0.95mm	3
Y1	ABM8-272-T3	Crystal_SMD_3225-4Pin_3.2x2.5mm_HandSoldering	1


Murmulator.1010 rev.A1
Eugene Lozovoy 2026
Original design by
. AlexEkb
M2P2
J10 VGA
Type C
J14 POWER
B2B-XH-A
QE bit is mandatory!
ESP-PSRAM64H
W25Q128JVSIQ
TUSB320LAI
TPA1387T
DS3231MZ
ESP-12F
FSP MCU
RTC: GP28/29
ESP: GP38/39
JP9
JOY1_D2
POWER
D5
LED_Green
USER
D4
LED_Yellow
D3
LED_Red
SD
RESET
SW1
SW3
SW2
USER


JP6
+5 <-> VGA Pin 9
JP10
Recommended
Video GND GND
GND Video GND
Right Right Right
Left Left Left
TP2
TP1
TP3
TP4
TP5
TP7
TP6
Famicom (Dendy) joysticks
NOT SEGA!