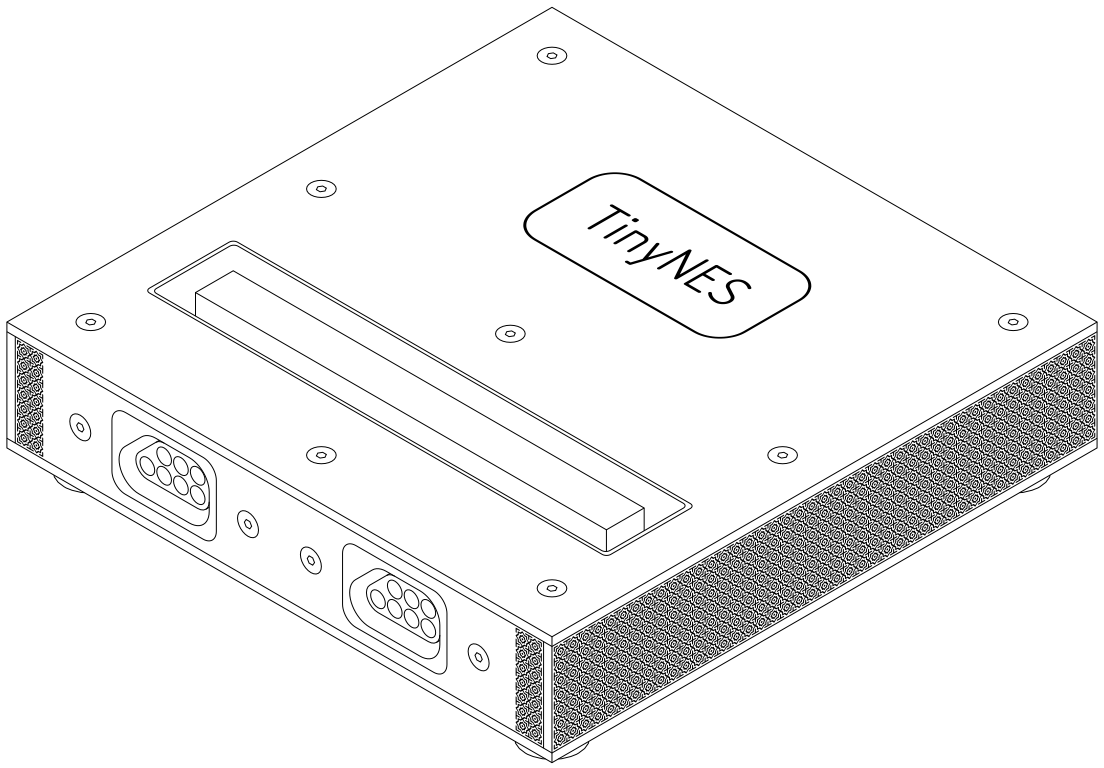
TinyNES

TD-TNES-CC
TD-TNES-GC



Enclosure TD-TNES-U
Main Board TD-TNES-Z-MB

tall-dog.com
Manual Revision 2023-06

Using the Console

(EN) Safety: Do not operate the TinyNES with the top cover removed. Do not expose the console to liquid. Do not touch any internal circuitry while the power cable is connected. Clean the enclosure with a damp cloth or isopropyl alcohol. Clean the cartridge connector with compressed air and/or contact deoxidizing solution.

(DE) Sicherheit: Betreiben Sie das TinyNES nicht, wenn die obere Abdeckung entfernt ist. Setzen Sie die Konsole keiner Flüssigkeit aus. Berühren Sie keine internen Schaltkreise, während das Netzkabel angeschlossen ist. Reinigen Sie das Gehäuse mit einem feuchten Tuch oder Isopropylalkohol. Reinigen Sie den Kartuschenanschluss mit Druckluft und/oder Kontakt-Desoxidationslösung.

Power Input: The TinyNES is powered by +5V DC which enters via the USB-C jack on the rear of the console. The device typically consumes less than 100 mA of current while in use, although this may vary somewhat depending on the power consumption of the cartridge being used. Use the provided USB-C power adapter and black-and-gold USB-C cable to power the unit. Note that the USB-C jack on the console is for power only; there is no USB data capability. Alternate USB-C adapters and cables may be used.

Video Output: By default, the TinyNES outputs an analog composite video signal from the yellow RCA jack on the rear of the console. The format of this signal depends on the chips that are installed in your TinyNES, but NTSC is the default format. Connect this signal to your television or projector using the provided yellow RCA cable. Most display devices have an analog video input in the form of a similar-looking yellow RCA jack. Note than if the TinyNES is configured for RGB video output, the yellow RCA jack will output only the combined horizontal and vertical sync (CSYNC) portions of the video signal, and additional cables must be connected to see an image.

Audio Output: The TinyNES outputs a line-level mono analog audio signal from the red RCA jack on the rear of the console. This signal is a mix of audio channels which closely resembles the levels found in original hardware. Connect this output to your television or receiver with the provided red RCA cable. Expansion audio from Famicom games (via the EXP6 pin) is included in this mix. Adjust the level of the expansion audio channel by turning the dial marked EXP on the bottom of the console with a cross-head screwdriver. The 3.5 mm TRRS jack on the rear of the console also outputs the three raw unmixed and unamplified audio channels. Use the provided TRRS-to-3×RCA splitter cable to access these individual channels. Reference **Table 1** for a listing of how the channels are broken out.

Table 1: TRRS Out

SIGNAL	TRRS	3×RCA
AUD1	TIP	YELLOW
AUD2	RING 1	WHITE
EXP6	RING 2	RED
GND	SLEEVE	N/A

Compatibility: At this time, there are no known hardware or software incompatibilities with any existing games, although not every game in existence has been tested, so unknown issues could still exist. If you discover a problem, please tell us. However, there is one known physical incompatibility. Occasionally, NES games were manufactured with their gold edge contacts significantly set back from the edge of the internal board. We've witnessed this phenomenon in less than 1% of tested cartridges. Unfortunately, these games are physically incompatible with the TinyNES because they cannot make electrical contact with the metal pins in the connector.

Controllers: The TinyNES is compatible with all known original and aftermarket NES input devices. Original Nintendo controllers are known to be high quality and reliable, while aftermarket ones may vary significantly in quality. The NES Four Score multitap device can be used with the TinyNES, but a pair of extension cables are required to make the connection. Note that the NES Zapper light gun typically requires a CRT monitor due to display latency, but this is true for all NES-compatible consoles, not just the TinyNES.

Lockout Chip: The TinyNES does not contain a CIC (Checking Integrated Circuit) lockout chip, which means that you can use cartridges from any region, as well as unauthorized and homebrew cartridges. Note that games intended for PAL systems are likely to run incorrectly (wrong speed, pitch-shifted audio, etc.) if they are played on systems configured for NTSC, and vice versa.

CPU/PPU Chips

There are two chips at the heart of the TinyNES: the CPU and the PPU. The CPU (Central Processing Unit) handles most gameplay operations while the PPU (Picture Processing Unit) handles most video output operations. The TinyNES relies on a pair of these original chips—most of which were originally manufactured between 1983 and 1993—to perform its core functions. Your TinyNES comes with a pair of NTSC chips (either genuine or clone ones) pre-installed, and you probably won't ever need to change them. Since these original chips are semi-precious, they're installed in sockets so they can be easily removed without damaging them (no soldering required).

The TinyNES supports the vast majority of genuine and clone chips that were made for NES and Famicom systems, as well as their derivatives and clones. Support is provided for three different video output formats: NTSC, PAL, and RGB. Note that regional PAL variants such as PAL-M and PAL-N are not supported, since they require unique clock timings. NTSC and PAL rely on different clock speeds, so games were usually released for one format or the other. Generally, games that were released in the United States and Japan are NTSC, while games released in Europe are PAL. The TinyNES console contains two different clock sources, and it must be configured to use the clock source that corresponds to the CPU/PPU pair installed in it. Note that RGB video output uses NTSC clock timings.

As indicated in **Table 2**, the installed CPU and PPU must be compatible with each other. Therefore, an NTSC CPU must be paired with an NTSC or RGB PPU, while a PAL CPU must be paired with a PAL PPU. **Table 3** lists supported CPU models, their formats, and the positions internal switches **S1** and **S2** must be set to for each model. **Table 4** lists supported PPU models, their formats, and the position internal switch **S5** (which is located underneath the PPU chip socket) must be set to for each model. Note that RIGHT and LEFT are indicated relative to the orientation of the large white "TinyNES" text printed on the main circuit board.

Table 2: Valid Pairs

OPTION	CPU	PPU
1	NTSC	NTSC
2	NTSC	RGB[1]
3	PAL	PAL

[1]You must provide your own RGB-format PPU chip. In addition, RGB video output also requires that you install the RGB Video Kit, which is available separately from Tall Dog Electronics.

RGB PPU chips were originally used in the Nintendo VS. System and PlayChoice-10 arcade machines, as well as the Famicom Titler released by Sharp in 1989. Unfortunately, these chips are rare and tend to be difficult to locate and expensive to purchase.

Table 3: Supported CPUs

CPU	FORMAT	S1	S2
RP2A03	NTSC	◄ LEFT	◄ LEFT
RP2A07	PAL	RIGHT ►	◄ LEFT
UA6527[2]	NTSC	◄ LEFT	◄ LEFT
UA6527P[2] (÷15)[3]	NTSC	◄ LEFT	RIGHT ►
UA6527P[2] (÷16)[3]	PAL	RIGHT ►	◄ LEFT
UA6540[2]	PAL	RIGHT ►	◄ LEFT

[2]Clone (UA) chips are known to produce audio that may sound somewhat different from genuine chips, since most versions have swapped pulse channel duty cycles. Also, some (if not all) UA chips use NTSC-based pitch tables, including chips intended for PAL operation, such as the UA6540. Different revisions may vary.

[3]UA6527P chips may have one of two possible clock divider values. Generally, date codes that have a dash in them (eg. "9017-BS" or "9245-BA") are equal to ÷15 and ones that don't (eg. "8841S" or "9032") are equal to ÷16.

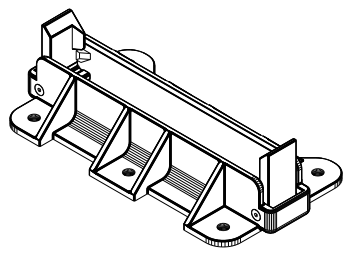
Table 4: Supported PPUs

PPU	FORMAT	S5
RP2C02, RC2C02	NTSC	◄ LEFT
RP2C03, RC2C03	RGB	◄ LEFT
RP2C04[4]	RGB	◄ LEFT
RC2C05-01, 02, 03, 04	RGB	RIGHT ►
RC2C05-99	RGB	◄ LEFT
RP2C07	PAL	◄ LEFT
UA6528[5]	NTSC	◄ LEFT
UA6541[5]	PAL	◄ LEFT

[4]RP2C04 chips come in one of four variants (0001, 0002, 0003, or 0004) and each one has a non-standard color palette, so most games will appear with severely incorrect colors.

[5]Clone (UA) chips have a subtly altered color palette, so certain colors may look slightly different from genuine chips.

TinyNES Accessories



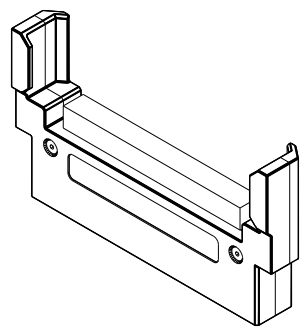
TD-TNES-CLA

Cartridge Latch

The Cartridge Latch is an accessory that securely attaches to the top of the TinyNES cartridge slot using six of the console's existing top cover screws. It provides additional support and security for the inserted game cartridge, as well as a pair of little levers that make it even easier to eject games from the system.

This optional latch also provides polarity protection so that any cartridges (or the Famicom Adapter) can't accidentally be inserted into the slot the wrong way.

A hex key (included) is the only thing needed to install or uninstall the latch. The TinyNES box and its foam inserts can accommodate the console whether or not the latch is installed, so there's no need to uninstall it before packing up the system in its original box for storage.



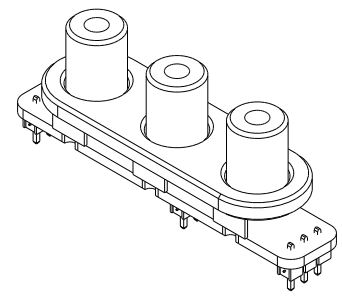
TD-TNES-FCA

Famicom Adapter

The Famicom Adapter allows cartridges designed to be used with the Family Computer (Famicom) system to be played on the TinyNES. The Famicom was released in Japan in 1983, and while its games are compatible with the NES architecture, its cartridges are not. Famicom games use a connector with 60 pins while NES games have 72 pins.

This adapter also supports Famicom expansion audio by routing any sound produced by the cartridge to the TinyNES console's EXP6 pin, where it will then be included in the master audio mix as well as output via the rear TRRS jack.

Please note that Famicom cartridges should have their artwork facing away from the front of the console, while the adapter's label should face forward.



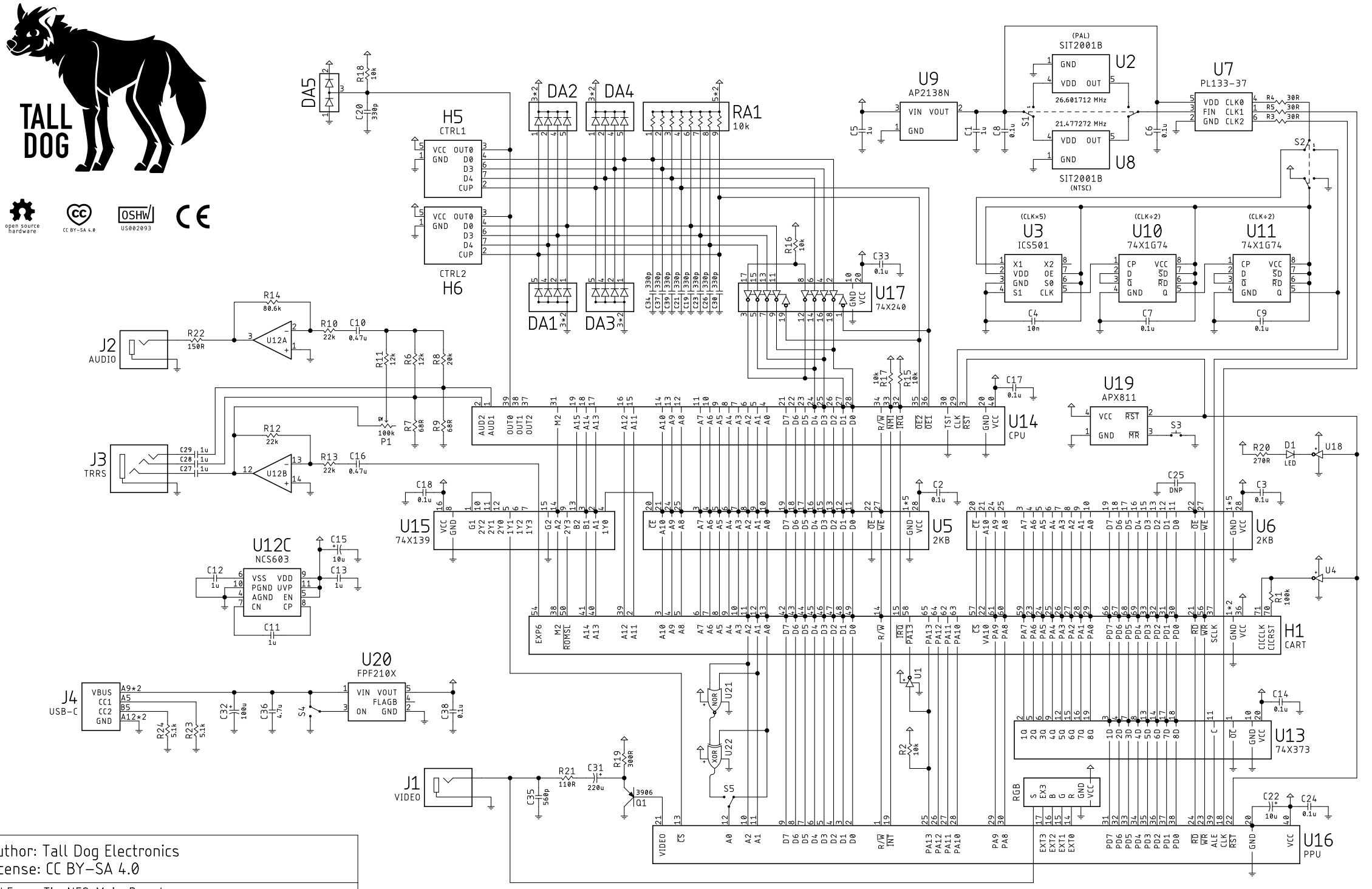
TD-TNES-RGB

RGB Video Kit

Installation of the RGB Video Kit allows you to use an original RGB PPU (chip not included) to generate true RGB video output from your TinyNES console. RGB video is significantly crisper than the default composite video that is generated by standard PPU chips.

The kit is easy to install with a hex key (included) and does not require any soldering. It includes a small board that sockets into headers on the TinyNES main board. The board provides three new RCA jacks for the red, green, and blue video signals. A small spacer and a replacement top panel are also provided.

Once the kit and a new RGB PPU are installed, it's important to note that the sync signal is output via the yellow RCA jack on the rear of the console.



Author: Tall Dog Electronics
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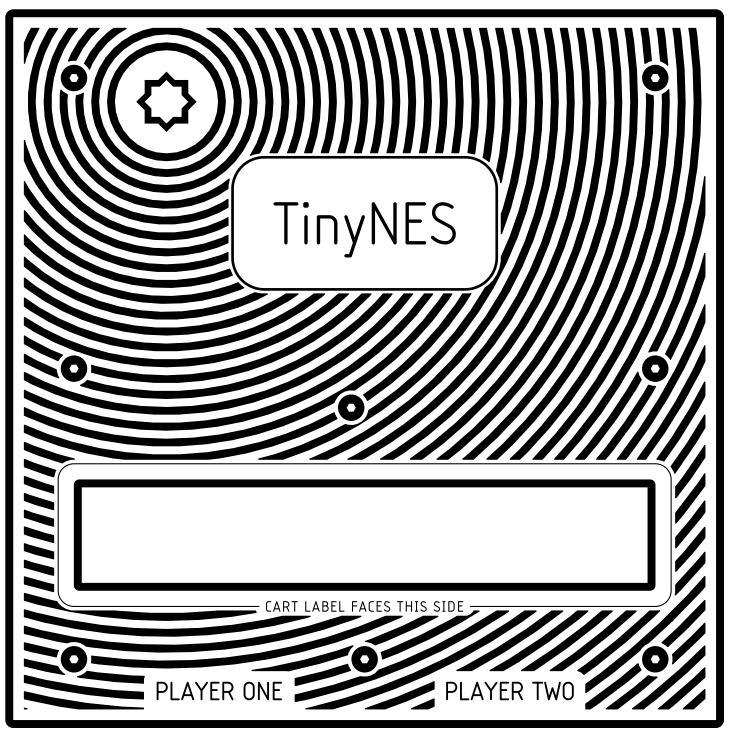
TITLE: TinyNES_Main_Board

Document Number: TD-TNES-Z-MB

Date: 3/2/23 Sheet: 1/1

Bill of Materials

Main Board Revision Z

Ref	Qty	Desc	Mfg	MPN
C1, C5, C11, C12, C13	5	CAP CER 1UF 10V X7R 0805	Samsung	CL21B105KPFNNNE
C2, C3, C6, C7, C8, C9, C14, C17, C18, C24, C33, C38	12	CAP CER 0.1UF 50V X7R 0805	Samsung	CL21B104KBCNNNC
C4	1	CAP CER 10000PF 50V X7R 0805	Samsung	CL21B103KBANNNC
C10, C16	2	CAP FILM 0.47UF 20% 16VDC 1206	Panasonic	ECP-U1C474MA5
C15	1	CAP ALUM 10UF 20% 16V SMD	Wurth	865080340001
C19, C20, C21, C23, C26, C30, C34, C37, C39	9	CAP CER 330PF 50V C0G/NP0 0805	Yageo	CC0805JRNP09BN331
C22	1	CAP TANT 10UF 10% 16V 1206	Kyocera	TAJA106K016RNJ
C25	1	**DO NOT POPULATE**		
C27, C28, C29	3	CAP FILM 1UF 20% 16VDC 1210	Panasonic	ECP-U1C105MA5
C31	1	CAP ALUM 220UF 20% 10V SMD	Nichicon	UWX1A221MCL1GB
C32	1	CAP ALUM 100UF 20% 10V SMD	Panasonic	EEE-HA1A101WP
C35	1	CAP CER 560PF 50V C0G/NP0 0805	Yageo	CC0805JRNP09BN561
C36	1	CAP CER 4.7UF 16V X7R 0805	Murata	GRM21BR71C475KE51L
D1	1	LED COOL WHITE CLEAR 5MM T/H	Cree	C535A-WJN-CU0W0231
DA1, DA3	2	DIODE ARRAY GP 80V 100MA UMD6	Rohm	UMP11NTN
DA2, DA4	2	DIODE ARRAY GP 80V 100MA UMD6	Rohm	UMN11NTN
DA5	1	DIODE ARRAY GP 180V 200MA SOT23	Micro Com.	MMBD1503-TP
H1	1	CONN CARDEDGE 72POS 2.50MM	Xunbeifang	GNI06700
H2, H3, H4	3	CONN RCPT 3POS 0.1 GOLD PCB	Samtec	SLW-103-01-F-S
H5, H6	2	CONN HEADER VERT 7POS 2MM	Adam Tech	2SH-C-07-TS
J1	1	CONN RCA JACK MONO 3.2MM R/A	CUI	RCJ-044
J2	1	CONN RCA JACK MONO 3.2MM R/A	CUI	RCJ-042
J3	1	CONN JACK 4COND 3.5MM R/A & SPACER	CUI	SJ-43514
J4	1	CONN RCPT TYPE C 6P SMD RA	GCT	USB4125-GF-A
P1	1	TRIM 100K OHM 0.5W GW TOP ADJ	Bourns	3361P-1-104GLF
Q1	1	TRANS PNP 40V 200MA TO236AB	Nexperia	PMBT3906,235
R1	1	RES 100K OHM 1% 1/8W 0805	Stackpole	RMCF0805FT100K
R2, R15, R16, R17, R18	5	RES 10K OHM 1% 1/8W 0805	Yageo	RC0805FR-0710KL
R3, R4, R5	3	RES 30 OHM 1% 1/8W 0805	Yageo	RC0805FR-0730RL
R6, R11	2	RES 12K OHM 0.5% 1/8W 0805	Panasonic	ERA-6AED123V
R7, R9	2	RES 68 OHM 1% 1/8W 0805	Yageo	RT0805FRE07680RL
R8	1	RES 20K OHM 1% 1/4W 0805	Stackpole	RNCP0805FTTD20K0
R10, R12, R13	3	RES 22K OHM 1% 1/8W 0805	Yageo	RT0805FRE0722KL
R14	1	RES 80.6K OHM 0.1% 1/8W 0805	Panasonic	ERA-6AEB8062V
R19	1	RES 300 OHM 1% 1/8W 0805	Yageo	RC0805FR-07300RL
R20	1	RES 270 OHM 1% 1/8W 0805	Yageo	RC0805FR-07270RL
R21	1	RES 110 OHM 5% 1/8W 0805	Panasonic	ERJ-6GEYJ111V
R22	1	RES 150 OHM 0.1% 1/8W 0805	Yageo	RT0805BRD07150RL
R23, R24	2	RES 5.1K OHM 1% 1/8W 0805	Yageo	RC0805FR-075K1L
RA1	1	RES ARRAY 8 RES 10K OHM 2512	Panasonic	EXB-A10P103J
S1, S2	2	SWITCH SLIDE DPDT 300MA 6V	C&K	JS202011JCQN
S3	1	SWITCH TACTILE SPST-NO 0.05A 50V	E-Switch	TL1105SF160R
S4	1	SWITCH SLIDE SPDT 200MA 30V	E-Switch	EG1213
S5	1	SWITCH SLIDE SPDT 300MA 4V	Nidec Copal	CUS-12TB
U1, U4, U18	3	IC BUFFER INVERT 5.5V SOT23-5	Texas Inst.	SN74LVC1G240DBVT
U2	1	IC MEMS OSC XO 26.601712MHZ SMD	SiTime	SIT2001BC-S2-33N-26.601712
U3	1	IC CLK MULTIPLIER PLL 8-SOIC	Renesas	501MLFT
U5, U6	2	IC SRAM 256KBIT PARALLEL 28SOP	ISSI	IS62C256AL-45ULI-TR
U7	1	IC CLK BUFFER 1:3 150MHZ 6SOT23	Microchip	PL133-37TC
U8	1	IC MEMS OSC XO 21.477270MHZ SMD	SiTime	SIT2001BC-S2-33N-21.477270
U9	1	IC REG LINEAR 3.3V 300MA SOT23	Diodes Inc.	AP2127N-3.3TRG1
U10, U11	2	IC FF D-TYPE SNGL 1BIT 8TSSOP	Nexperia	74LVC1G74DP,125
U12	1	IC LINE DRIVER 14TSSOP	Onsemi	NCS603DTBR2G
U13	1	IC LATCH TRANSP OCTAL D 20SO	Texas Inst.	SN74ALS373ANSR
U14, U16	2	IC DIP SOCKET 40POS TIN	Assmann	A 40-LC-TT
U15	1	IC DECODER/DEMUX 1X2:4 16SOIC	Texas Inst.	SN74LS139ADR
U17	1	IC BUFFER INVERT 5.5V 20SO	Texas Inst.	SN74AHC240NSR
U19	1	IC SUPERVISOR 1 CHANNEL SOT143	Diodes Inc.	APX811-46UG-7
U20	1	IC PWR SWITCH P-CHAN 1:1 SOT23-5	Microchip	MIC2004-1.2YM5-TR
U21	1	IC GATE NOR 1CH 2-INP 5TSOP	Onsemi	MC74VHC1G02DTT1G
U22	1	IC GATE XOR 1CH 2-INP 5TSOP	Onsemi	MC74VHC1G86DTT1G