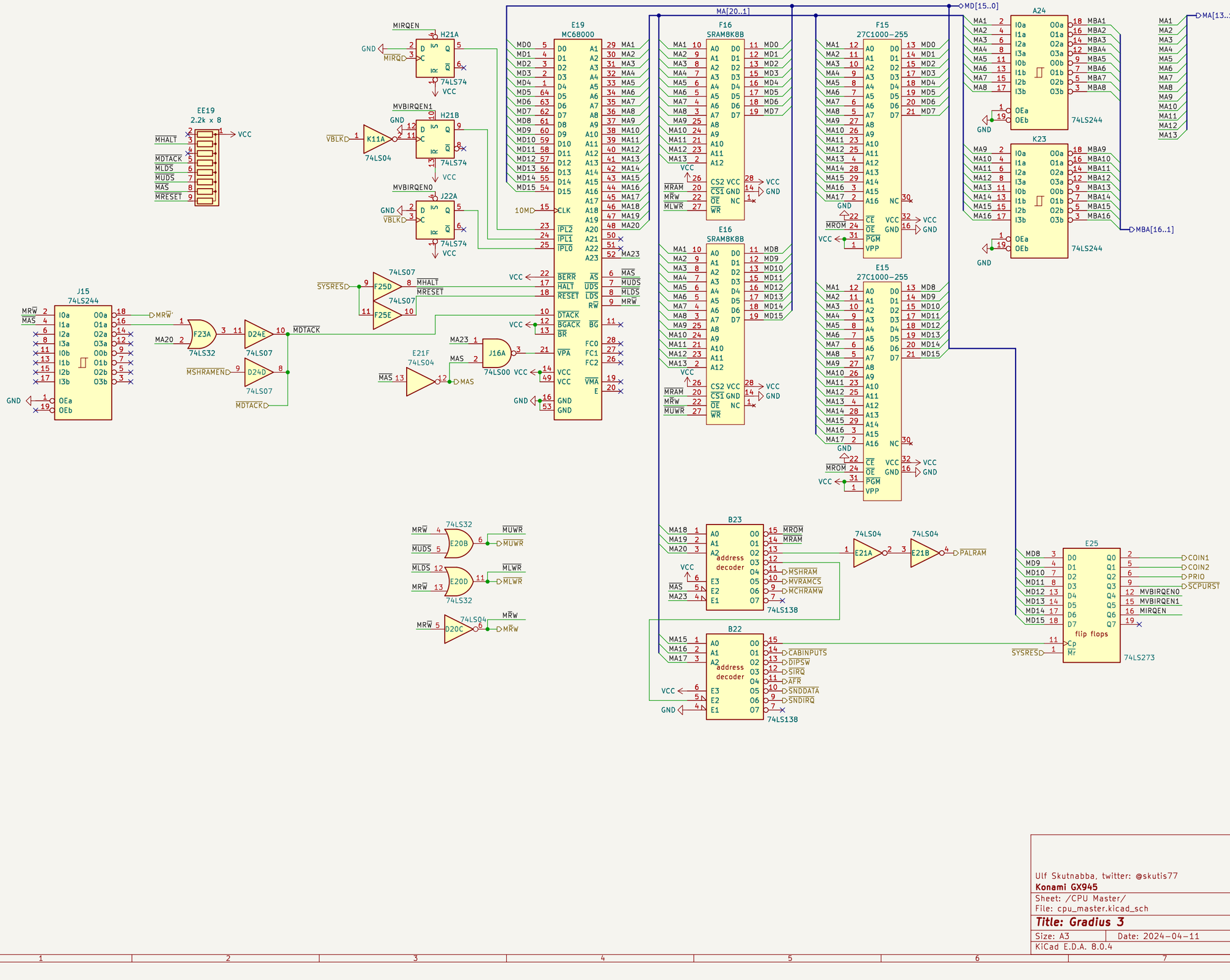
CPU Master
SYSRES
10M
SYSRES
10M
SNDIRQ
SNDDATA
PRIO
PALRAM
CABINPUTS
DIPSW
AFR
COIN1
COIN2
MCHRAMW
MVRAMCS
MAS
MLWR
MUWR
MRW'
MRW
MSHRAM
MBA[16..1]
MBA[16..1]
MD[15..0]
MA[13..1]
SCPURST
SIRQ
VBLK
MDTACK
MIRQ
MSHRAMEN
File: cpu_master.kicad_sch
Misc
SRW'
SYSRES'
10MD
10M'D
10M''D
CLK24MD
CLK24MD
CLK24M'D
CLK24M''D
CLK24M'''D
SRW
SAS
AFR
COIN1
COIN2
SAS'
CSYNC''
VSYNC
CSYNC
COINCOUNTER1
COINCOUNTER2
SYSRES
10M
10M'
10M''
CLK24M
CLK24M
CLK24M'
CLK24M''
CLK24M'''
File: misc.kicad_sch
Sound
REF4V
PCM
SYSRES
SNDIRQ
SNDDATA
MD[15..8]
MD[15..8]
SNDCLK
BANKSW
SNDA[3..0]
SNDD[7..0]
DACS
SPEAKER+
SPEAKER−
IORQ'
File: sound.kicad_sch
PCM
SYSRES
SYSRES
REF4VD
PCMD
SNDCLK
BANKSW
SNDA[3..0]
SNDD[7..0]
DACS
File: pcm.kicad_sch
IO
SPEAKER+
SPEAKER−
CSYNC''
COINCOUNTER1
COINCOUNTER2
CABINPUTS
DIPSW
MBA[2..1]
MBA[2..1]
MD[7..0]
MD[7..0]
RED
GREEN
BLUE
File: io.kicad_sch
Shared RAM
CLK24M'''
CLK24M
CLK24M'''
CLK24M
MLWR
MUWR
MRW'
MSHRAM
MD[15..0]
SLWR
SUWR
SRW'
SSHRAM
MA[13..1]
SA[13..1]
SD[15..0]
SD[15..0]
MSHRAMEN
SSHRAMEN
File: shram.kicad_sch
Object Layer
SYSRES
CLK24M
SYSRES
CLK24M
OBJROMRD
OBJCS
SBA[20..1]
SD[15..0]
SBA[20..1]
SD[15..0]
SRW
HVOT
VSYNCD
CSYNCD
CLK6MD
CBLKD
OBJD
OB[9..0]D
SHADOW'D
P1HD
VBLKD
File: object_layer.kicad_sch
Color Mixer
CLK6M
CBLK
OBJ
OB[9..0]
SHADOW'
FX
FX[6..0]
VA
VA[6..0]
VB
VB[6..0]
PRIO
PALRAM
MLWR
MUWR
MRW
MBA[11..1]
MD[15..0]
REDD
GREEND
BLUED
MBA[11..1]
MD[15..0]
File: color_mixer.kicad_sch
CPU Slave
SSHRAMEN
10M'
10M''
SCPURST
SIRQ
MIRQ
SLWRD
SUWRD
SSHRAMD
SRWD
SASD
OBJROMRD
OBJCS
SAS'
P1H
VBLK
SDTACK
SVRAMCS
SCHRAMW
SAS
SRW
SBA[20..1]
SD[15..0]
SA[13..1]
SBA[20..1]
SD[15..0]
File: cpu_slave.kicad_sch
Tile Logic
SYSRES
CLK24M
CLK24M'''
SYSRES
SCPURST
CLK24M
CLK24M'''
CLK6M
P1H'
P1H''
ABO
CHRAMWE
IORQ'
MCHRAMW
MVRAMCS
MAS
MRW'
MRW
MLWR
MUWR
SVRAMCS
SCHRAMW
SAS
SRW
SRW'
SUWR
SLWR
SCPUEN
TILEREAD
TILERAMCS
CHRAMWE[4..1]
CHRAMOE1
CHRAMOE2
MD[15..0]
SD[15..0]
DB[15..0]
MD[15..0]
SD[15..0]
DB[15..0]
MDTACKD
SDTACKD
File: tile_logic.kicad_sch
Tile Layers
SYSRES
CLK24M'
SYSRES
CLK24M'
SCPUEN
TILEREAD
TILERAMCS
CHRAMWE[4..1]
CHRAMOE1
CHRAMOE2
SBA[16..1]
MBA[16..1]
DB[15..0]
CLK6MD
P1H'D
P1H''D
ABOD
CHRAMWED
HVOTD
FXD
FX[6..0]
VAD
VA[6..0]
VBD
VB[6..0]
File: tile_layers.kicad_sch
74LS08
F10B
M13C
74LS04
B9F
74LS04
H24B
74LS32
H25D
74LS04
B9E
74LS04
H23C
74LS10
H25E
74LS04
D20E
74LS04
K13B
74LS08
Ulf Skutnabba, twitter: @skutis77
Konami GX945
Sheet: /
File: grad3.kicad_sch
Title: Gradius 3
Size: A3
Date: 2024-04-11
Rev:
KiCad E.D.A. 8.0.4
Id: 1/12



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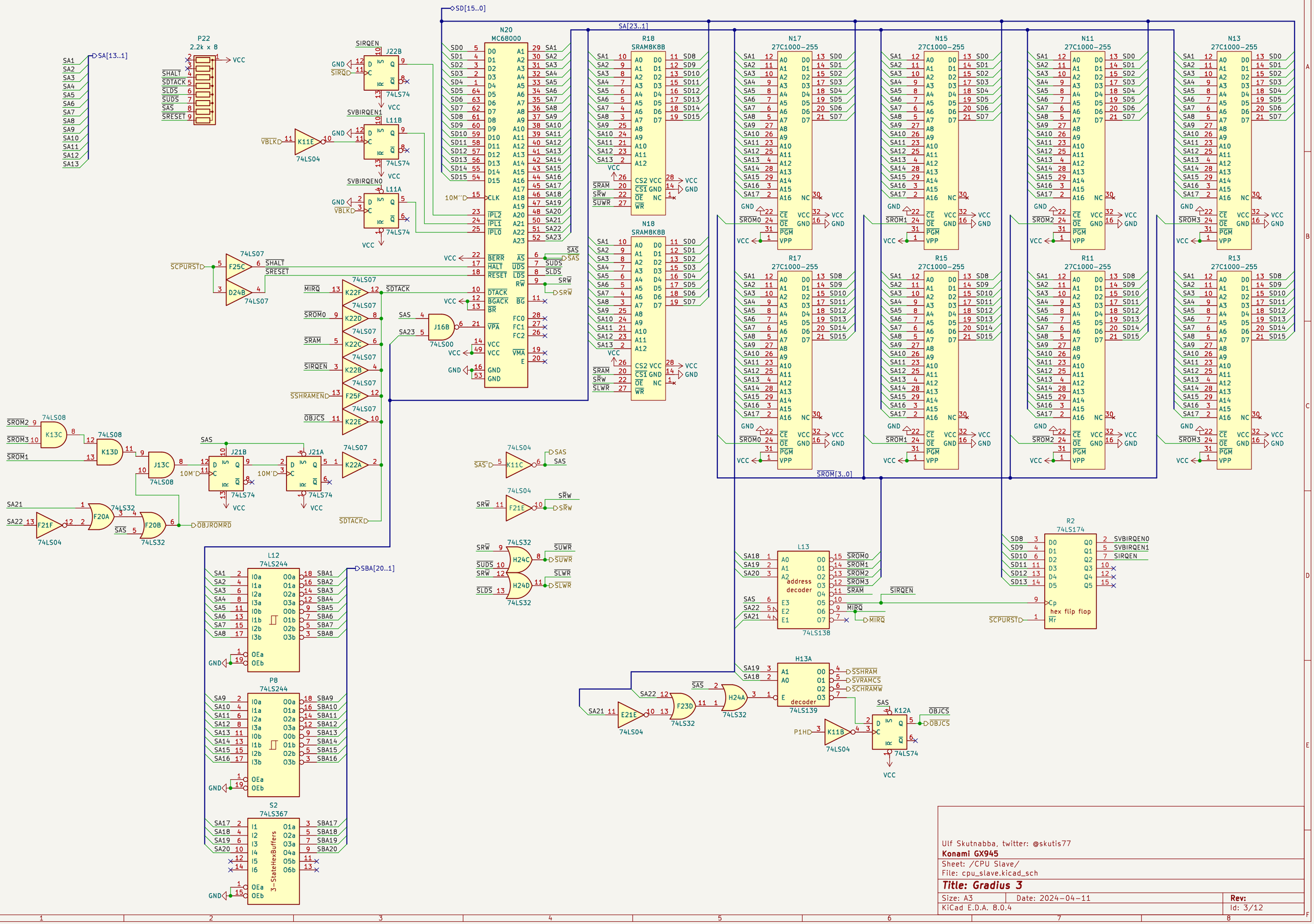
Konami GX945

Sheet: /CPU Master/

File: cpu_master.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 2/12


SD[15..0]
SA[23..1]
SA[13..1]
N20
MC68000
R18
SRAM8K8B
N18
SRAM8K8B
N17
27C1000-255
R17
27C1000-255
N15
27C1000-255
R15
27C1000-255
N11
27C1000-255
R11
27C1000-255
N13
27C1000-255
R13
27C1000-255
SROM[3..0]
P22
2.2k x 8
VCC
SHALT
SDTACK
SLDS
SUDS
SAS
SRESET
SIRQEN
J22B
74LS74
SVBIRQEN1
L11B
SVBIRQEN0
L11A
K11E
74LS04
VBLK
GND
10M'
74LS07
F25C
D24B
SCPURST
SHALT
SRESET
MIRQ
K22F
K22D
K22C
K22B
F25F
K22E
SROM0
SRAM
SIRQEN
SSHRAMEN
OBJCS
SDTACK
SAS
J16B
74LS00
SA23
BERR
HALT
RESET
DTACK
BGACK
BR
VPA
VCC
GND
AS
UDS
LDS
RW
BG
FC0
FC1
FC2
VMA
E
SRW
SUDS
SLDS
74LS08
K13C
K13D
J13C
SROM2
SROM3
SROM1
J21B
J21A
K22A
OBJROMRD
SA21
SA22
F21F
F20A
F20B
74LS32
L12
74LS244
P8
74LS244
S2
74LS367
3-StateHexBuffers
SBA[20..1]
SBA1
SBA2
SBA3
SBA4
SBA5
SBA6
SBA7
SBA8
SBA9
SBA10
SBA11
SBA12
SBA13
SBA14
SBA15
SBA16
SBA17
SBA18
SBA19
SBA20
K11C
F21E
H24C
H24D
SUWR
SLWR
L13
74LS138
address decoder
SROM0
SROM1
SROM2
SROM3
SRAM
MIRQ
R2
74LS174
hex flip flop
SVBIRQEN0
SVBIRQEN1
SIRQEN
H13A
74LS139
decoder
SSHRAM
SVRAMCS
SCHRAMW
E21E
F23D
H24A
K12A
P1HD
K11B
OBJCS
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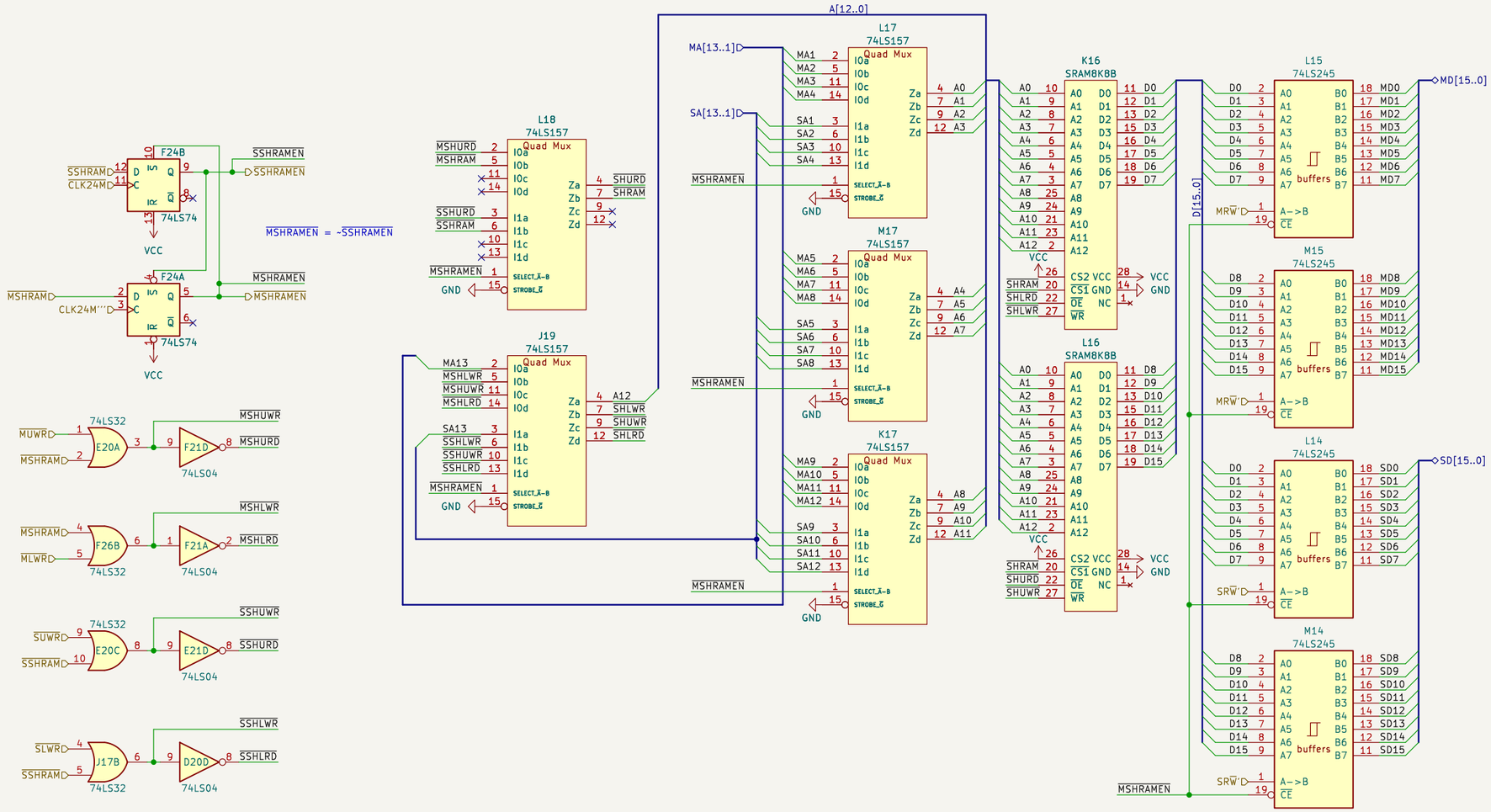
Konami GX945
Sheet: /CPU Slave/
File: cpu_slave.kicad_sch
Title: Gradius 3
Size: A3
Date: 2024-04-11
KiCad E.D.A. 8.0.4
Rev:
Id: 3/12



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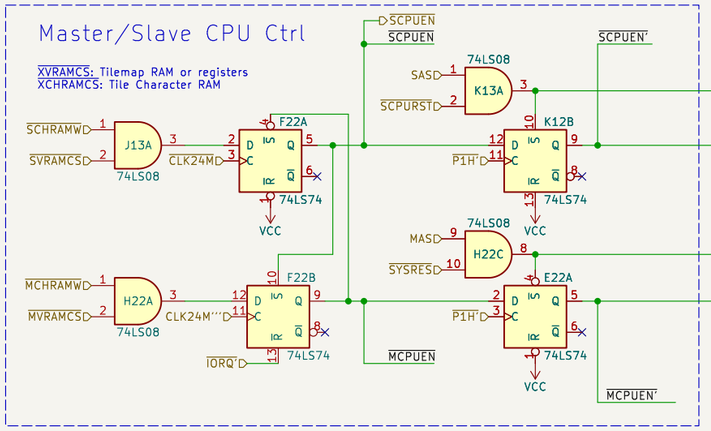
Sheet: /Shared RAM/
File: shram.kicad_sch

Title: Gradius 3

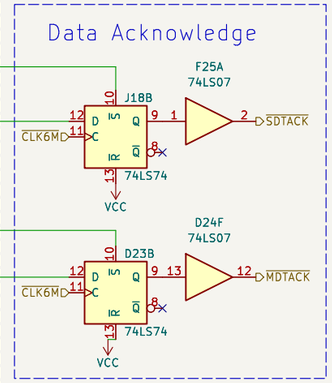
Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 4/12

Master/Slave CPU Ctrl

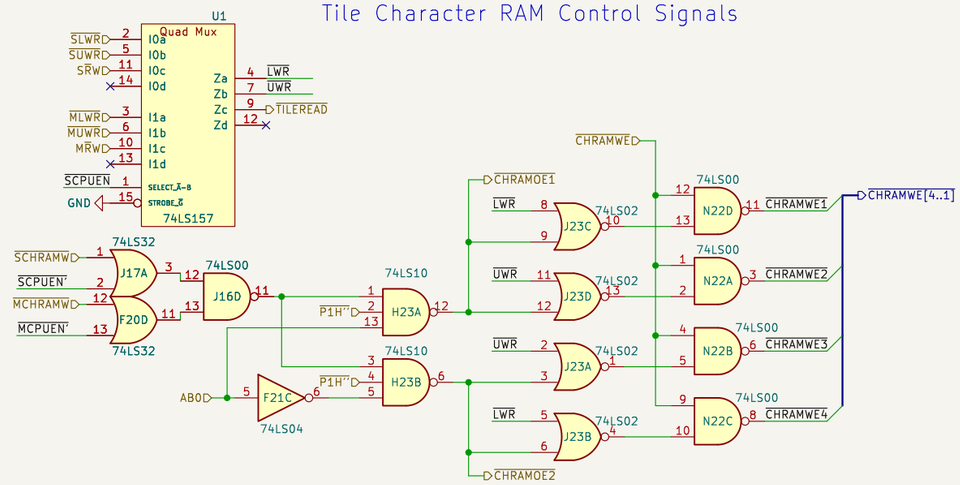
XVRAMCS: Tilemap RAM or registers
XCHRAMCS: Tile Character RAM



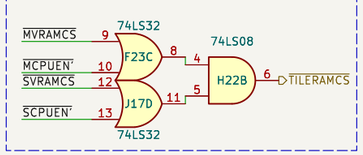
Data Acknowledge



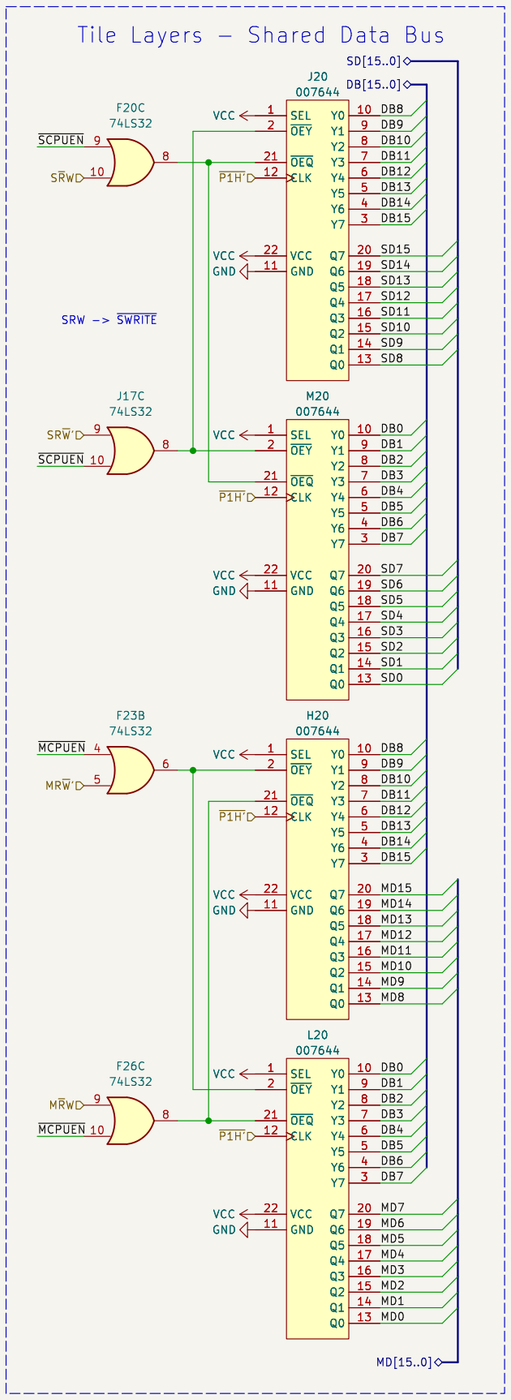
Tile Character RAM Control Signals



Tile RAM and Registers



Tile Layers — Shared Data Bus



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Sheet: /Tile Logic/
File: tile_logic.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 5/12

Character code RAM

TILERAMCS can write and read both to tilemap RAM and character RAM

Tilemaps RAM: Fix, Layer 1 and 2

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Sheet: /Tile Layers/

File: tile_layers.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	Rev:
KiCad E.D.A. 8.0.4		Id: 6/12

R7
051960
SBA[20..1]
CA[17..0]
OBJROMRD
OC[7..1]
HP[8..0]
OA[9..0]
OD[7..0]
{OBJCTRL}
P7
74LS157
Quad Mux
P5
74LS157
Quad Mux
P4
74LS157
Quad Mux
P3
74LS157
Quad Mux
P2
74LS157
Quad Mux
H6
K6
M6
E6
H8
K8
M8
E8
27C1000
R3
SRAM2K8B
H13B
74LS139
decoder
A[18..0]
OROM[1..0]
P6C
74LS32
P6D
74LS32
P6A
74LS32
P6B
74LS32
K11D
74LS04
SBA1
H10
74LS244
J10
74LS244
L10
74LS244
M10
74LS244
SD[15..0]
CD[37..0]
H3
23C4100
L3
23C4100
J13D
74LS08
J13B
74LS08
OROM0
OROM1
OROMH
OROML
D4
051937
OB[9..0]
Goes to optional
ROM Modules
F10C
74LS08
F10D
74LS08
Not used on gradius 3
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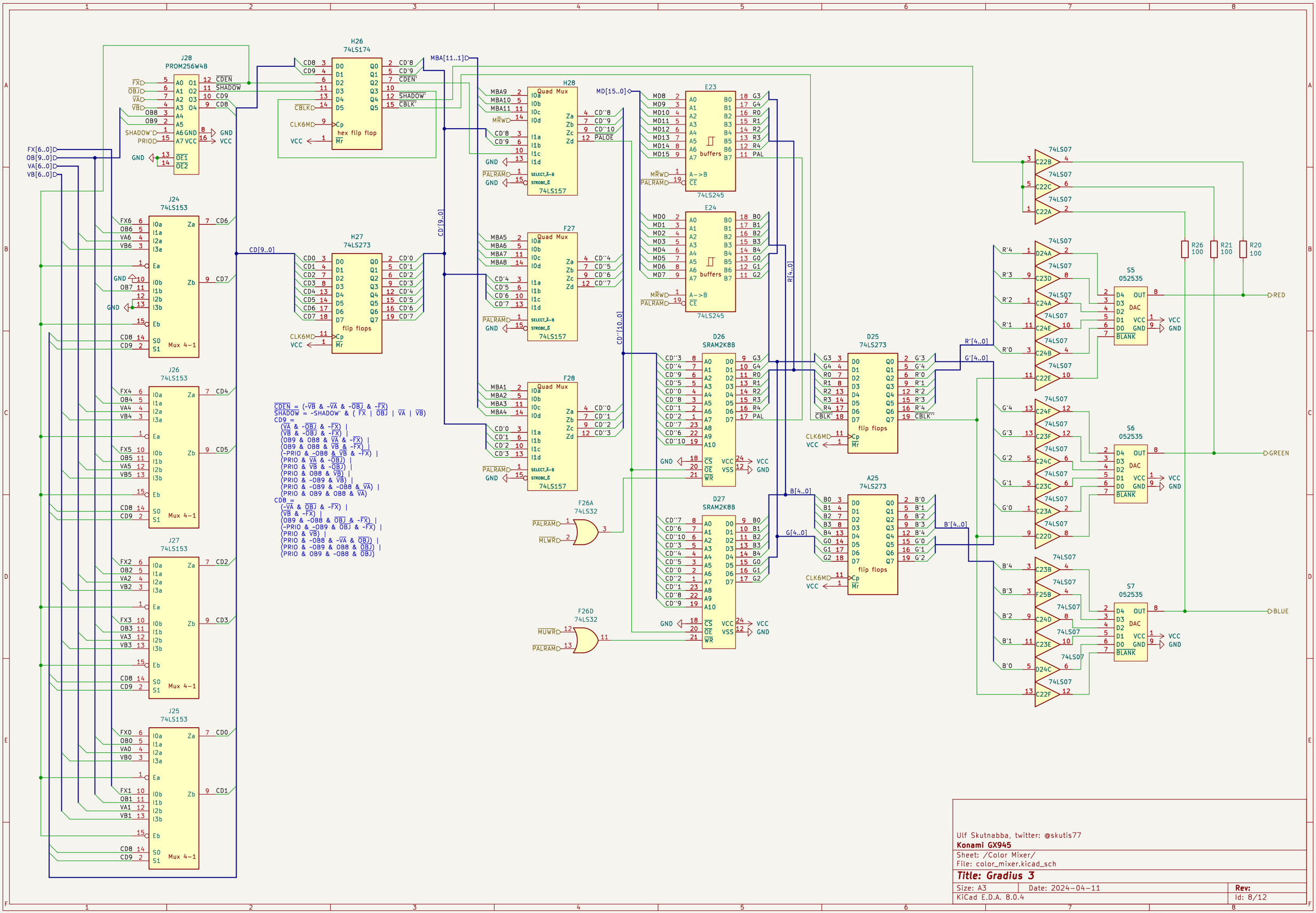
Konami GX945
Sheet: /Object Layer/
File: object_layer.kicad_sch
Title: Gradius 3
Size: A3
Date: 2024-04-11
KiCad E.D.A. 8.0.4
Rev:
Id: 7/12


J28
PROM256W4B
H26
74LS174
MBA[11..1]
H28
Quad Mux
H27
74LS273
F27
F28
F26A
74LS32
F26D
J24
74LS153
J26
J27
J25
Mux 4-1
E23
E24
74LS245
D26
SRAM2K8B
D27
D25
74LS273
A25
flip flops
S5
S6
S7
052535
DAC
74LS07
74LS157
R26 100
R21 100
R20 100
RED
GREEN
BLUE
FX[6..0]
OB[9..0]
VA[6..0]
VB[6..0]
CD[9..0]
CD''[9..0]
CD''[10..0]
MD[15..0]
R[4..0]
B[4..0]
G[4..0]
R'[4..0]
G'[4..0]
B'[4..0]
CDEN = (~VB & ~VA & ~OBJ & ~FX)
SHADOW = ~SHADOW' & (FX | OBJ | VA | VB)
CD9 =
(VA & ~OBJ & ~FX) |
(VB & ~OBJ & ~FX) |
(OB9 & OB8 & VA & ~FX) |
(OB9 & OB8 & VB & ~FX) |
(~PRIO & ~OB8 & VB & ~FX) |
(PRIO & VA & ~OBJ) |
(PRIO & VB & ~OBJ) |
(PRIO & OB8 & VB) |
(PRIO & ~OB9 & VB) |
(PRIO & ~OB9 & ~OB8 & VA) |
(PRIO & OB9 & OB8 & VA)
CD8 =
(~VA & OBJ & ~FX) |
(VB & ~FX) |
(OB9 & ~OB8 & OBJ & ~FX) |
(~PRIO & ~OB9 & OBJ & ~FX) |
(PRIO & VB) |
(PRIO & ~OB8 & ~VA & OBJ) |
(PRIO & ~OB9 & OB8 & OBJ) |
(PRIO & OB9 & ~OB8 & OBJ)
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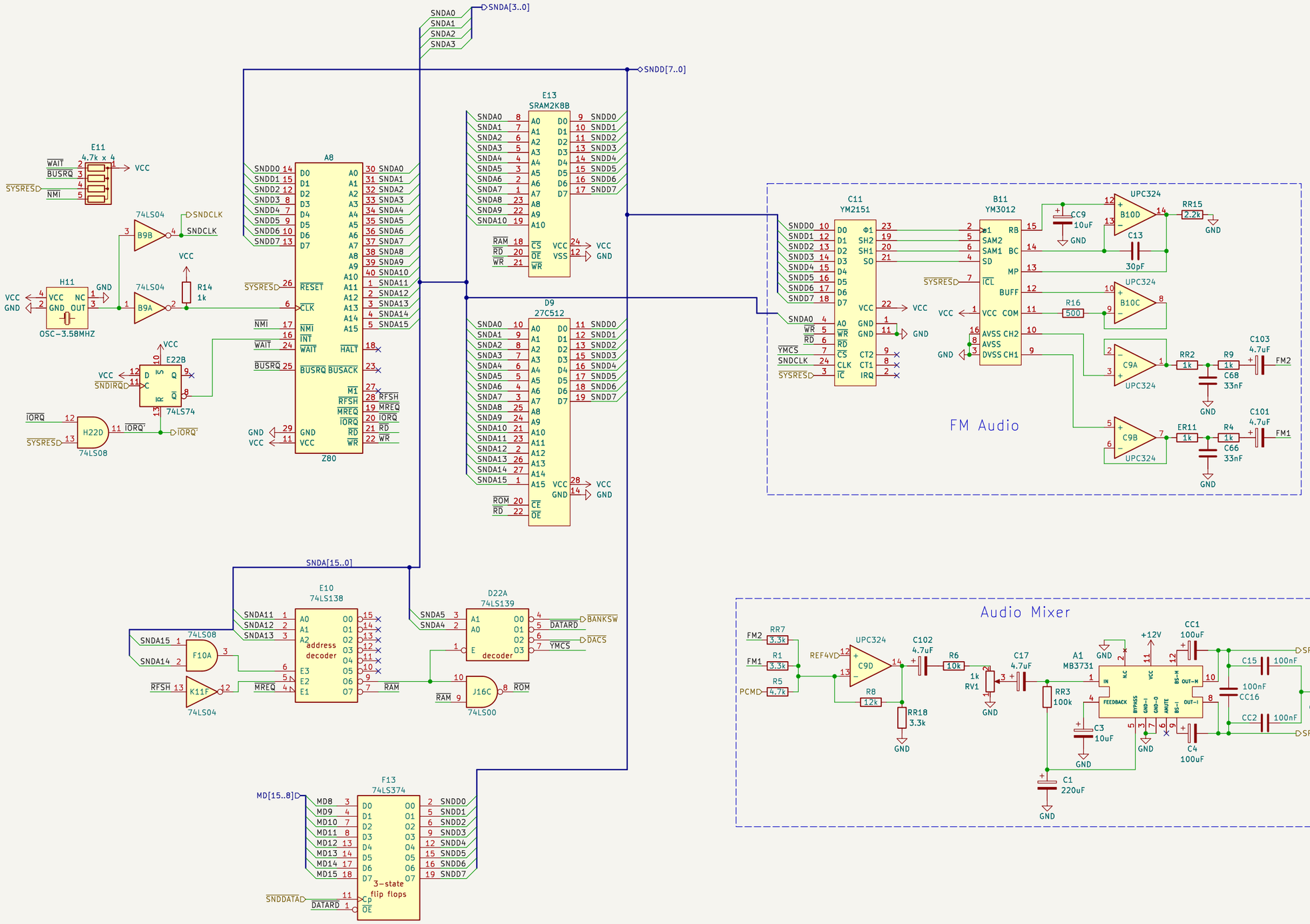
Konami GX945
Sheet: /Color Mixer/
File: color_mixer.kicad_sch
Title: Gradius 3
Size: A3
Date: 2024-04-11
Rev:
KiCad E.D.A. 8.0.4
Id: 8/12



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Konami GX945

Sheet: /Sound/

File: sound.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 9/12

B15 and B18 do not follow the standard Mask ROM behaviour. The BYTE mode select must be selected from factory and pin 31 is probably not connected.

BANK A

Mounted on all releases except (Japan, program code S, split)

B15
23C4100

Mounted on Gradius III (Japan, program code S, split)

C14
27C1000

C16
27C1000

BANK B

Not mounted on any releases

B18
23C4100

C18
27C1000

C20
27C1000

PCM ROM Data Bank Select

D21
74LS174
hex flip flop

B21
74LS157
Quad Mux

C21
74LS174
hex flip flop

74LS04

D22B
74LS139
decoder

SNDD[7..0]
AS[16..0]
DS[7..0]
SNDA[3..0]

C2
007232

B9D
74LS04

B9C
74LS04

D23A
74LS74

D7
74LS273
flip flops

D10
4.7k x 8

Q[0..7]

EE6
4066

D6
4066

D8
KONAMI_007341

DD7
KONAMI_007341

C9C
UPC324

C63
4.7uF

R10
10k

PCM

SNDCLK
SNDCLK2
SNDCLK4

3.579545MHz
1.789773MHz
0.894886MHz

007340
A3

RR13
20k

R12
20k

C10
470pF

C105
470pF

C104
4.7uF

C100
4.7uF

B7
4.7k x 4

B8
4.7k x 4

UPC324
B10B

UPC324
B10A

R19
3.3k

RR17
3.3k

CC21
4.7uF

CC14
4.7uF

C64
4.7uF

REF4V

+12V

VCC
GND

The values to the right are the capacitors on the PCB. C10X are not visible on the PCB. They are values set to ease debugging.

C104
C103
C102
C10
C101
C100
C65
C67
C105

B10E
UPC324

C9E
UPC324

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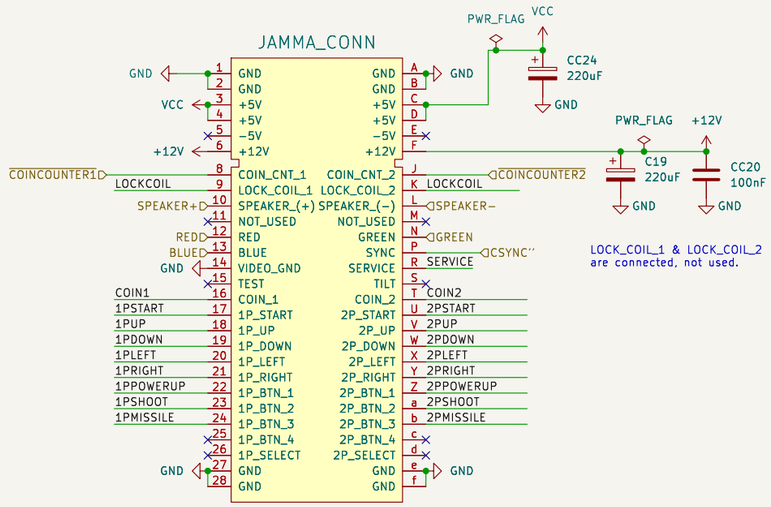
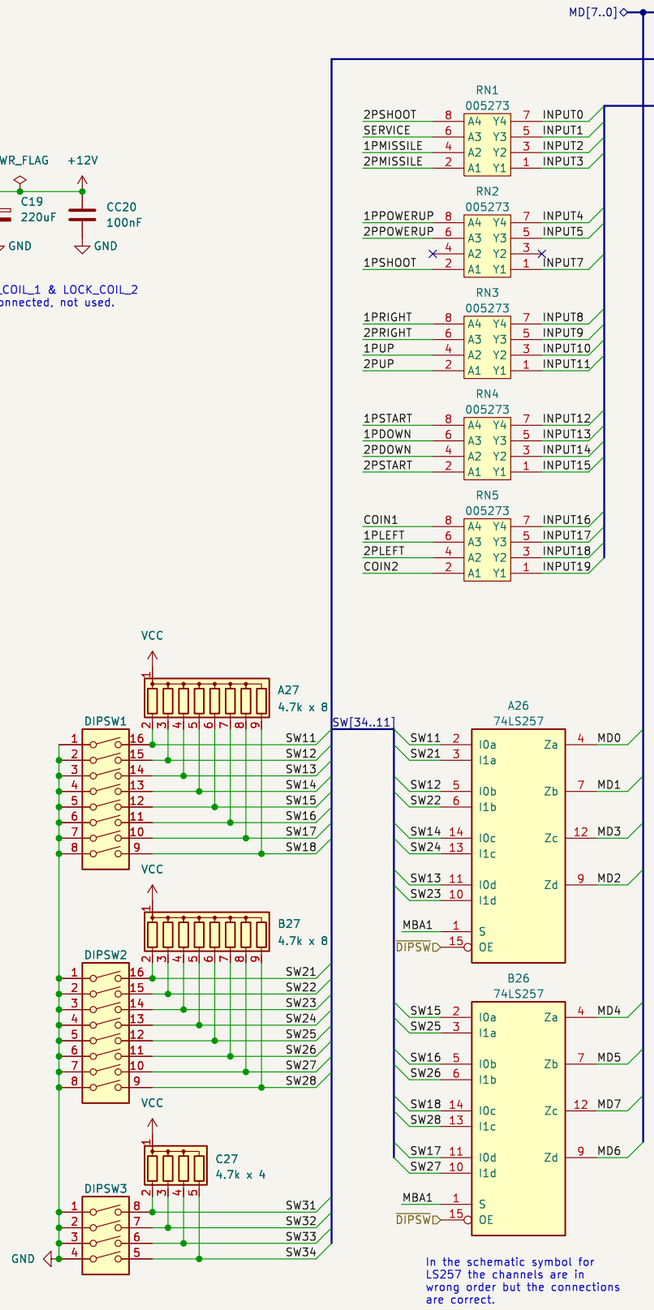
Konami GX945

Sheet: /PCM/
File: pcm.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 10/12





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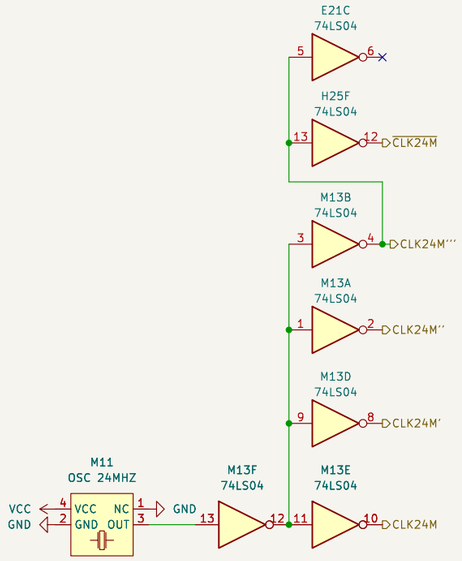
Konami GX945

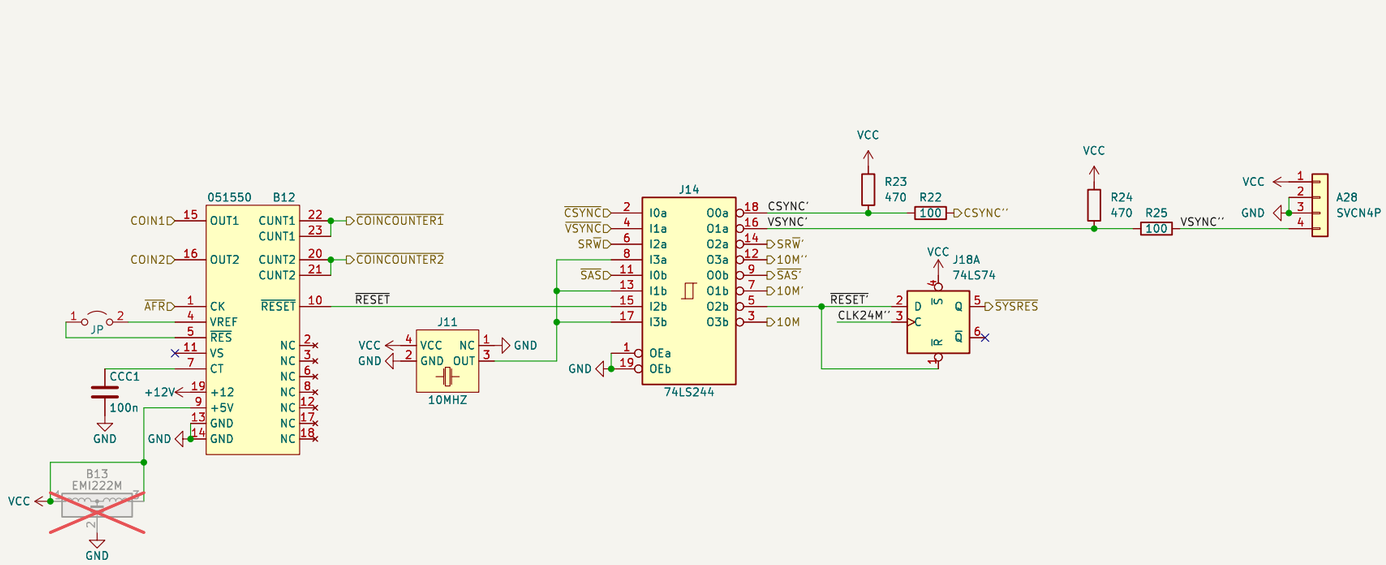
Sheet: /IO/

File: io.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 11/12





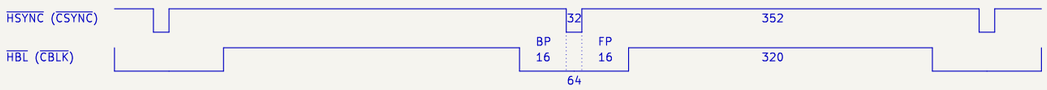
Horizontal and vertical synch timing diagrams

The pixel clock is derived from the 24MHz oscillator.
Pixel clock OVCK: f = 24MHz / 4 = 6MHz

The numbers in the HSYNC and HBL diagram are pixel clock cycles.
All edges are synchronised to the rising edge of the pixel clock.

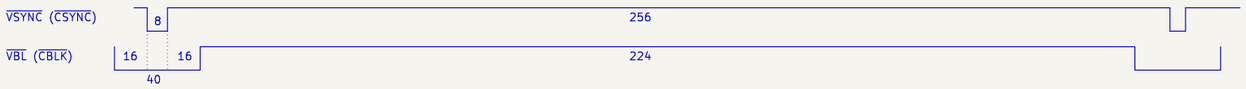
The signals have been measured at the output of the
graphic chips.

If horizontal blanking is measured at the RGB DACs, the blanking
is delayed 2 pixel clocks relative to composite sync. This
gives BP = 14 and FP = 18.



HSYNC and HBL
Frequency f = 6MHz / 384 = 15.625kHz.
Period T = 1/f = 64us.

The numbers in the VSYNC and VBL diagram are HSYNC cycles.
All edges are synchronised to the falling edge of HSYNC.



VSYNC and VBL:
Frequency f = 15.625kHz / 264 = 59.1856Hz
Period T = 1/f = 1 / 59.1856Hz = 16.896ms

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Konami GX945

Sheet: /Misc/
File: misc.kicad_sch

Title: Gradius 3

Size: A3	Date: 2024-04-11	**Rev:**
KiCad E.D.A. 8.0.4		Id: 12/12