FPGA
MiSTer

Brahim HAMADI CHAREF

Hackware V5.3

FPGA MiSTer – MiST / MAME

MiST - FPGA retro gaming
https://github.com/mist-devel/mist-board
https://github.com/mist-devel/fpgagen
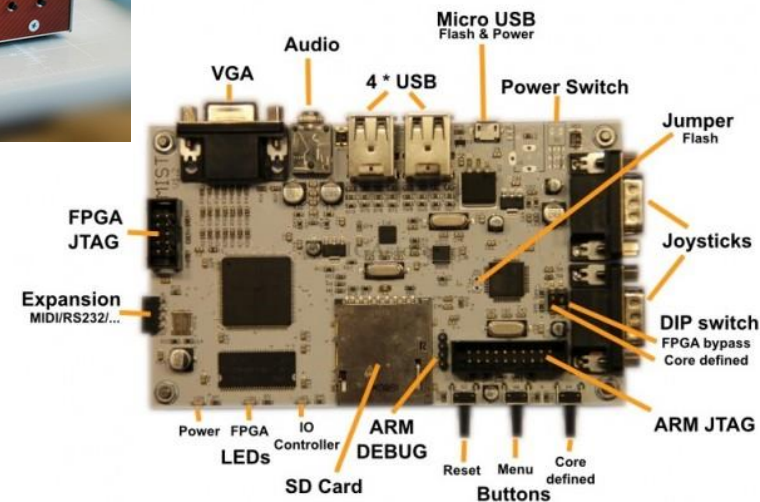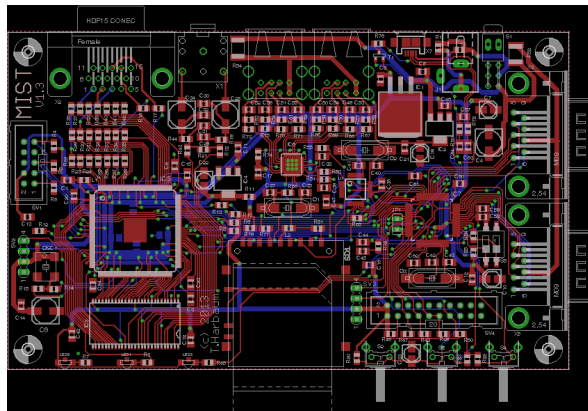
Multiple Arcade Machine Emulator
MAME 0.211 (26 June 2019)
https://www.mamedev.org

MAMEdev - MAME Developers
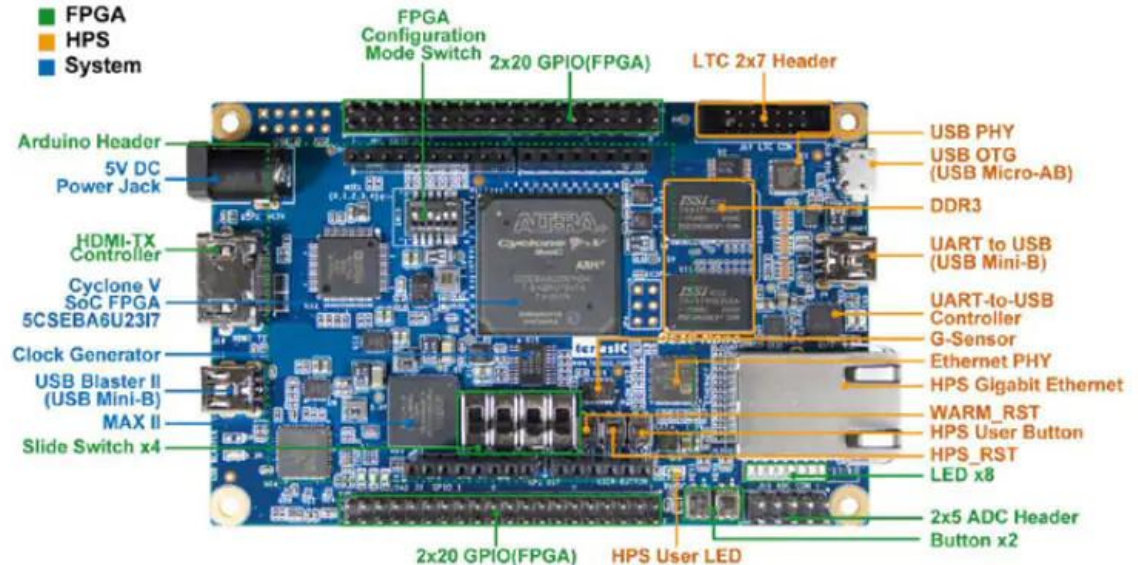https://github.com/mamedev
C++ / Macro
src / mame / audio/video/mcahine

FPGA MiSTer – Hardware

DE10-Nano Board (Front)

Terasic DE10-Nano

- Altera Cyclone V SE FPGA with 110,000LE (41,500ALM) and 5,570Kbit of Block RAM.
- ARM Cortex A9 dual-core CPU at 800MHz.
- HDMI video and audio allowing connect to any modern monitor/TV.
- DDR3 1GB available for both ARM and FPGA.
- High speed ARM<->FPGA interconnect due to both are in the same chip.
- Linux on ARM support for many I/O devices and file systems.
- Board is mass-produced by a large manufacturer and freely available for a relatively cheap price 130USD (99USD for students/professors).

FPGA MiSTer – Software

- **Cores**
  Boot Menu Acorn Archimedes Altair 8800 Amiga Amstrad CPC 6128 ao486 Apogee Apple II+ Apple Macintosh Plus Aquarius Atari 800XL BBC Micro B,Master BK0011M Commodore 16, Plus/4 Commodore 64, Ultimax Commodore PET Commodore VIC-20 DEC PDP-1 Jupiter Ace MSX MultiComp Orao SAM Coupe Sharp MZ Series Sinclair QL Specialist/MX TI-99/4A TSConf Vector 06C X68000 ZX Spectrum ZX81

- **Consoles Cores**
  Astrocade Atari 2600 Atari 5200 ColecoVision, SG-1000 Gameboy, Gameboy Color Genesis/Megadrive Master System, GameGear NES Odyssey2 SNES TurboGrafx 16 / PC Engine Vectrex

- **Arcade Cores**
  1942 1943 Alibaba and 40 Thieves Azurian Amidar Arkanoid Asteroids Asteroids Deluxe Bagman Berzerk Black Hole Bomb Jack Botanic Bubbles Burger Time Burning Rubber Canyon Bomber Catacomb Centipede Colony 7 Computer Space Cosmic Avenger Crazy Climber Crazy Kong Crush Roller Defender Dominos Donkey Kong Dorodon Dream Shopper Eeekk! Eyes Frenzy Frogger Galaga Galaxian Ghosts'n Goblins Gorkans Jin Joust Lady Bug Lizard Wizard Lunar Lander Mayday Moon Cresta Moon Patrol Mr.Do's Nightmare Mr.TNT Ms.Pacman Omega Orbitron Pacman Pacman Club Pacman Plus Pacmanic Miner Pengo Phoenix Pickin Pisces Pleiads Ponpoko Pooyan Robotron Scramble Sinistar Snap Jack Splat Sprint One Sprint Two Stargate Super Breakout Super Glob The End Time Pilot Traverse USA Van-Van Car War of the Bugs Woodpecker Xevious ZigZag

- **Memory test**

FPGA MiSTer – Add-Ons

- **SDRAM Board**
  Assembly (DIY) and Core support
- **IO Board**
  Assembly (DIY) and Secondary SD card
  e.g. MiSTer IO Board v5.5
- **RTC board**
  Assembly (DIY) and Core support
- **USB Hub**
  USB Hub Assembly (DIY)
- ADC-in (Audio/Tape input)
- **Cases**
  3D-printed (DIY) and Pi-Top (v1)

Vertical	Horizontal Outward	Horizontal Inward
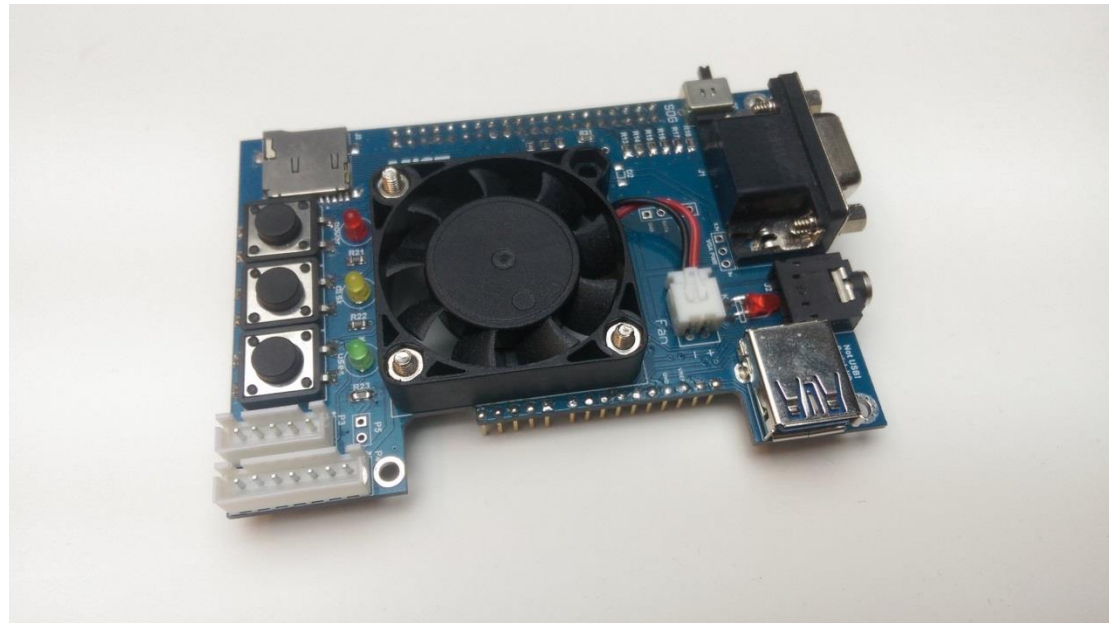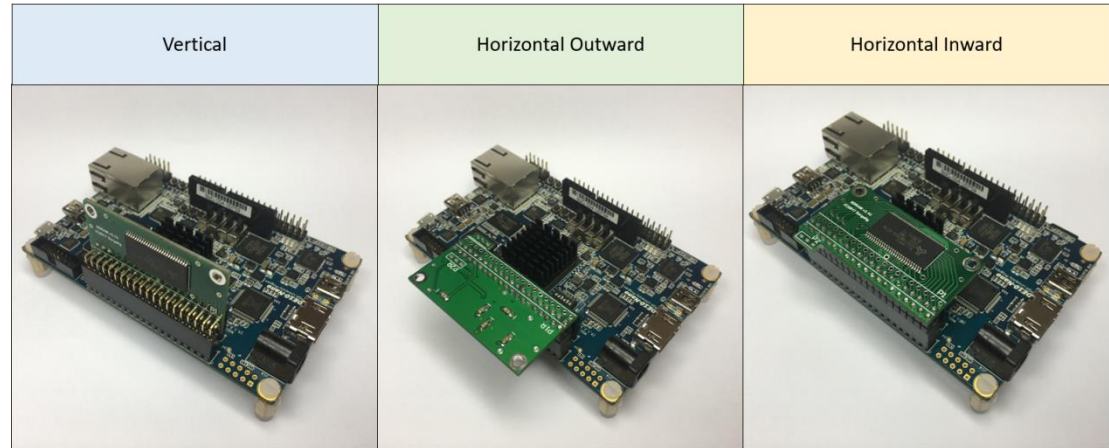
FPGA MiSTer – Wiki / github

- **MiSTer - Wiki**
  https://github.com/MiSTer-devel/Main_MiSTer/wiki

- **MiSTer - github**
  https://github.com/MiSTer-devel/

- **MiSTer - Linux Kernel**
  https://github.com/MiSTer-devel/Linux-Kernel_MiSTer

- **MiSTer – NES**
  https://github.com/MiSTer-devel/NES_MiSTer
  MiSTer – Genesis (Sega MD)
  https://github.com/MiSTer-devel/Genesis_MiSTer
  MiSTer – Gameboy
  https://github.com/MiSTer-devel/Gameboy_MiSTer
  MiSTer – NeoGeo
  https://github.com/furrtek/Neogeo_MiSTer/
  MiSTer – Arcade 1943
  https://github.com/MiSTer-devel/Arcade-1943_MiSTer

FPGA MiSTer – Developers

- **Alexey Melnikov** is creating MiSTer (FPGA project)
  https://www.patreon.com/FPGAMiSTer

- **Sorgelig main MiSTer developer**
  https://www.youtube.com/watch?v=s_p7hhpZBf4

- **Jose Tejada (jotego)**
  https://github.com/jotego?tab=repositories
  https://www.patreon.com/topapate

- **FurrTek (Woof woof I like low level code)**
  https://github.com/furrtek/Neogeo_MiSTer
  https://www.patreon.com/furrtek

- **Sergey Dvodnenko (srg320) (SNES core, special chips, SVP chip core.)**
  https://github.com/srg320

- **Gregory Estrade (Torlus) PC Engine, SEGA Megadrive/Genesis, Atari Jaguar**
  https://github.com/Torlus
  http://torlus.github.io/

- **Dar - Galaga**
  http://darfpga.blogspot.fr

FPGA MiSTer – YouTube

- **Introducing MiSTer FPGA Multi Console**
  https://www.youtube.com/watch?v=igiVHfBzX8w

- **MiSTer FPGA Cores Spectacular - Vol. 1**
  https://www.youtube.com/watch?v=NlBPoB3_2KQ

- **MiSTer New Arcade Cores + 1943**
  https://www.youtube.com/watch?v=s_p7hhpZBf4
  Jotego - FPGA_1943 - Verilog re-implementation of the arcade game
  https://github.com/jotego/fpga_1943

- **MiSTer NeoGeo core 2019-01-25**
  https://www.youtube.com/watch?v=LZOj3maMHVc

- **Preliminary NeoGeo core for MiSTer**
  https://www.youtube.com/watch?v=BmjuC47jTxE

FPGA MiSTer – Facebook

FPGA MiSTer – Twitter

FPGA MiSTer – Discord

FPGA MiSTer – Forum

FPGA MiSTer – SNK NeoGeo

- **Furrtek - NeoGeo**
  http://furrtek.free.fr/
  https://www.patreon.com/furrtek
  https://github.com/furrtek/

- **NeoGeo Development Wiki**
  https://wiki.neogeodev.org
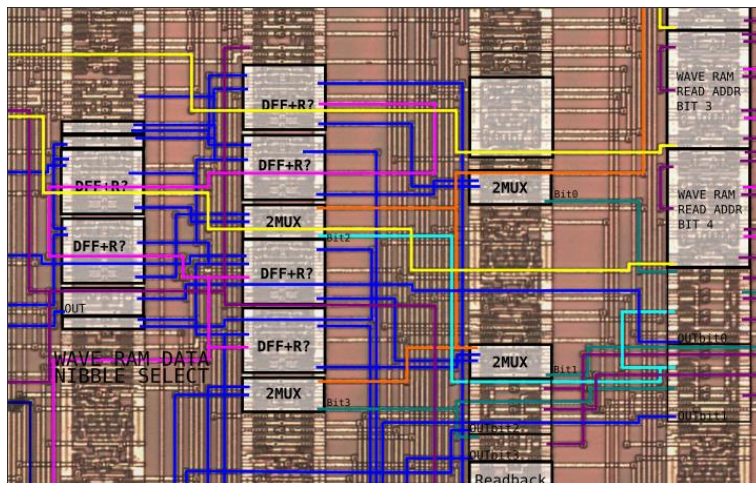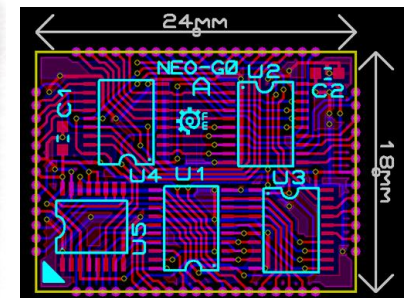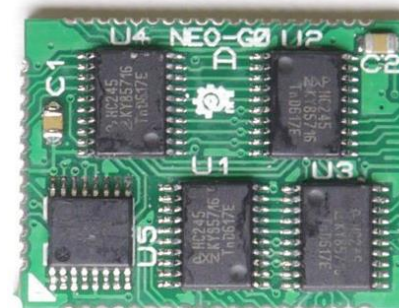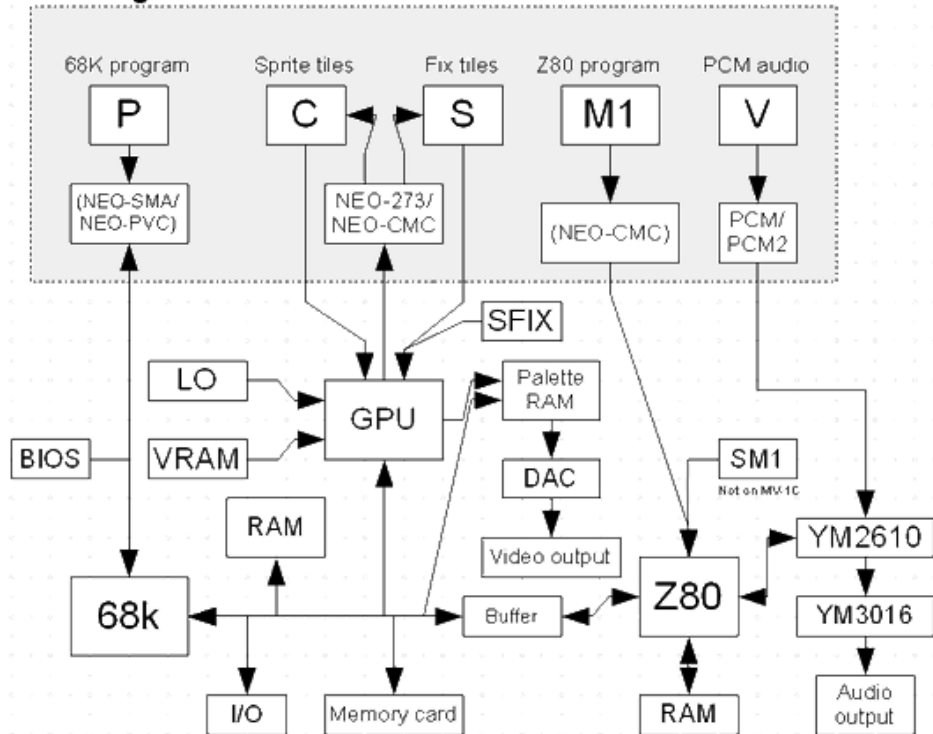
FPGA MiSTer – Midway Arcade 1943

- **Arcade system Capcom Commando Hardware**
  CPU Z80 @ 6 MHz + Sound CPU: Z80 @ 3 MHz
  Sound Chips: (2x) YM2203 @ 1.5 MHz
  Display Raster, 224 x 256 pixels (Vertical), 256 colors

- **Jose Tejada (jotego) - Professional IC design engineer**
  Interested in open source hardware development of
  retro computers, Valencia, Spain
  https://www.patreon.com/topapate
  https://github.com/jotego

- **Implementation**
  Uses the TV80 Z80 core
  Run 16-bit SDRAM running at 72 MHz
  Background 32x32 tile layer (16 colors)
  Foreground 32x32 tile layer (16 colors)
  8x8 character layer (4 colors)
  prite generator that handles 128 sprites (16 colors)
  Security chip is implemented
  Two upscaling schemes : Scale2X or CRT grid with blooming
  ROMs are not included with the core
  graphics ones must be translated in friendly format,
  Sound is missing :-(
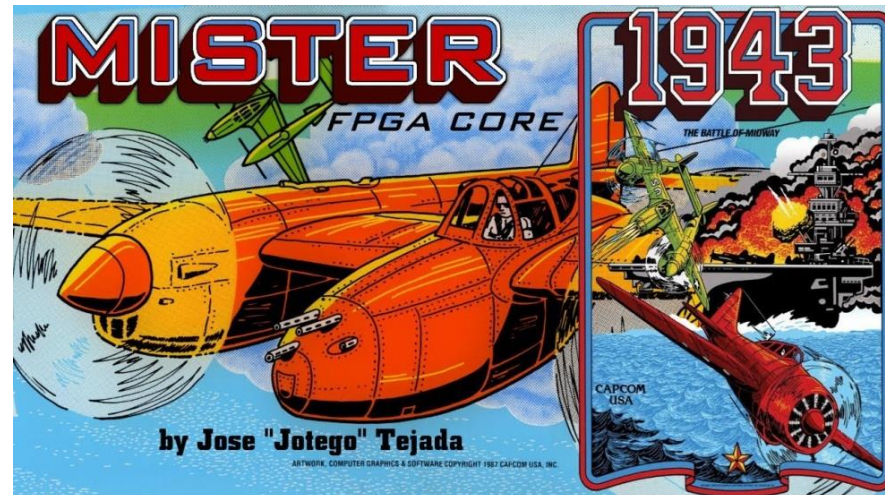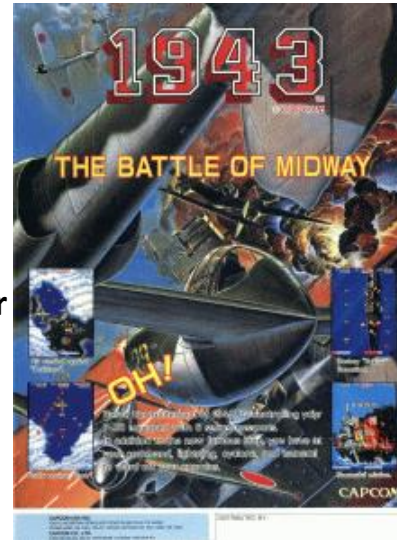
FPGA MiSTer – Retro Gaming …

Console prices, adjusted for inflation

$796
1977- Atari 2600
Original price: $200

$935
1979- Intellivision
Original price: $300

$410
1982- ColecoVision
Original price: $175

$412
1986- Master System
Original price: $200

$595
1995- Saturn
Original price: $400

$289
1996- Nintendo 64
Original price: $200

$272
1999- Dreamcast
Original price: $200

$395
2000- Playstation 2
Original price: $300

$412
1986- NES
Original price: $200

$346
1989- Genesis
Original price: $190

$365
1989- TurboGrafx 16
Original price: $200

$1,125
1990- NeoGeo
Original price: $650

$259
2001- Gamecube
Original price: $200

$389
2001- Xbox
Original price: $300

$348
2005- Xbox 360
Original price: $300

$567
2006- Playstation 3
Original price: $500

$332
1991- SNES
Original price: $200

$1,095
1993- 3DO
Original price: $700

$391
1993- Jaguar
Original price: $250

$446
1995- Playstation
Original price: $300

$284
2006- Wii
Original price: $250

$300
2012- Wii U
Original price: $300

$400
2013- Playstation 4
Original price: $400

$500
2013- Xbox One
Original price: $500

FPGA MiSTer – Trend Mini

SNK
NeoGeo

FPGA MiSTer – Trend Mini

Sega
MegaDrive

FPGA MiSTer – Arcade Cores

Arcade Cores

1942 - 1943 - Alibaba and 40 Thieves - Azurian - Amidar - Arkanoid - Asteroids - Asteroids Deluxe - Bagman - Berzerk - Black Hole - Bomb Jack - Botanic - Bubbles - Burger Time - Burning Rubber - Canyon Bomber - Catacomb - Centipede - Colony 7 - Computer Space - Cosmic Avenger - Crazy Climber - Crazy Kong - Crush Roller - Defender - Dominos - Donkey Kong - Dorodon - Dream Shopper - Eeekk! - Eyes - Frenzy - Frogger - Galaga - Galaxian - Ghosts'n Goblins - Gorkans - Jin - Joust - Lady Bug - Lizard Wizard - Lunar Lander - Mayday - Moon Cresta - Moon Patrol - Mr.Do's Nightmare - Mr.TNT - Ms.Pacman - Omega - Orbitron - Pacman - Pacman Club - Pacman Plus - Pacmanic Miner - Pengo - Phoenix - Pickin - Pisces - Pleiads - Ponpoko - Pooyan - Robotron - Scramble - Sinistar - Snap Jack - Splat - Sprint One - Sprint Two - Stargate - Super Breakout - Super Glob - The End - Time Pilot - Traverse USA - Van-Van Car - War of the Bugs - Woodpecker - Xevious - ZigZag