

ChipTune

- Author: Wallace Everest
- Description: Vintage 8-bit sound generator
- Language: Verilog

How it works

Chiptune implements an 8-bit Programmable Sound Generator. Input is from a serial UART interface. Output is PWM audio.

The ChipTune Project

This project is an audio device that replicates the square-wave sound generators of vintage video games.

TinyTapeout 4 Configuration

[Top Level Drawing]

Devices from the eFabless Multi-Project Wafer (MPW) shuttle are delivered in two package options, each with 64 pins. TinyTapeout 4 will be packaged in the QFN variant, mounted on a daughterboard for breakout.

Based on data from:

https://github.com/efabless/caravel_board/blob/main/hardware/breakout/caravel-M.2-card-QFN/caravel-M.2-card-QFN.pdf

<https://github.com/psychogenic/caravel-breakout-pcb/tree/main/breakout-qfn>

<https://github.com/TinyTapeout/tt-multiplexer/blob/main/docs/INFO.md>

Signal	Name	Dir	QFN	PCB
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MPRJ_IO Pin Assignments

Signal	Name	Dir	QFN	PCB
mprj_io[0]	jtag	in	31	
mprj_io[1]	sdo	out	32	
mprj_io[2]	sdi	in	33	
mprj_io[3]	csb	in	34	
mprj_io[4]	sck	in	35	
mprj_io[5]	user_clk	out	36	
mprj_io[6]	clk	in	37	
mprj_io[7]	rst_n	in	41	
mprj_io[8]	ui_in[0]	in	42	
mprj_io[9]	ui_in[1]	in	43	
mprj_io[10]	ui_in[2]	in	44	
mprj_io[11]	ui_in[3]	in	45	
mprj_io[12]	ui_in[4]	in	46	
mprj_io[13]	ui_in[5]	in	48	
mprj_io[14]	ui_in[6]	in	50	
mprj_io[15]	ui_in[7]	in	51	
mprj_io[16]	uo_out[0]	out	53	
mprj_io[17]	uo_out[1]	out	54	
mprj_io[18]	uo_out[2]	out	55	
mprj_io[19]	uo_out[3]	out	57	
mprj_io[20]	uo_out[4]	out	58	
mprj_io[21]	uo_out[5]	out	59	
mprj_io[22]	uo_out[6]	out	60	
mprj_io[23]	uo_out[7]	out	61	
mprj_io[24]	uio[0]	bid	62	
mprj_io[25]	uio[1]	bid	2	
mprj_io[26]	uio[2]	bid	3	
mprj_io[27]	uio[3]	bid	4	
mprj_io[28]	uio[4]	bid	5	
mprj_io[29]	uio[5]	bid	6	
mprj_io[30]	uio[6]	bid	7	
mprj_io[31]	uio[7]	bid	8	
mprj_io[32]	sel_ena	in	11	
mprj_io[33]	spare		12	

Signal	Name	Dir	QFN	PCB
mprj_io[34]	sel_inc	in	13	
mprj_io[35]	spare		14	
mprj_io[36]	sel_rst_n	in	15	
mprj_io[37]	spare		16	

ChipTune Operation

The audio portion of the project consists of two rectangular pulse generators. Each module is controlled by four 8-bit registers. Configurable parameters are the frequency, duty cycle, sweep, decay, and note duration.

ChipTune Pin Assignments

Signal	Name	Signal	Name
clk	12 MHz	ena	spare
rst_n	reset_n	uio_oe[7:0]	spare
ui_in[0]	spare	uo_out[0]	blink
ui_in[1]	spare	uo_out[1]	link
ui_in[2]	rx	uo_out[2]	tx
ui_in[3]	spare	uo_out[3]	pwm
ui_in[4]	spare	uo_out[4]	dac[0]
ui_in[5]	spare	uo_out[5]	dac[1]
ui_in[6]	spare	uo_out[6]	dac[2]
ui_in[7]	spare	uo_out[7]	dac[3]
uio_in[7:0]	spare	uio_out[7:0]	spare

Summary

An external serial port can play music through this TT04 project.

How to test

The ChipTune project can be interfaced to a computer COM port at 9600 baud.

#	Input	Output	Bidirectional
0	RX	PWM	none
1	none	BLINK LED	none
2	none	LINK LED	none
3	none	TX loopback	none
4	none	none	none
5	none	none	none
6	none	none	none
7	none	none	none