Atari TIA Chip Synthesizer Features

The TIA (Television Interface Adaptor) is a 40 pin DIP developed in the mid 1970s that controlled the video output, sound output, and controller input scanning in the Atari 2600 game system. It features two audio channels, each of which has 4 bits controlling attenuation and 5 bits controlling frequency (yes, 5.) Both channels can generate a square wave, a slightly narrower pulse wave, and many different polynomial pulses.

- MIDI Plug and Play USB Device
- Intelligent "Last Note" Pull Off: (Keeps track of the order notes are held down and always defaults to the most recently played note.)
- Glide/Glissando Legato: When a note is played while another note is held down, the pitch will glide to the new note. (Pitch will also glide linearly with respect to musical notes, not frequency.) With adjustable glide speed. (Given how incredibly few pitches this chip is able to generate, this is much more of a glissando than a portamento.) Note, the portamento speed (CC20) is configured opposite my other synthesizer projects. Low CC values produce the longest glissando, so that a value of 0 matches the default value.
- Pitch Bend, mapped linearly with respect to musical notes, not frequency. Adjustable pitch bend range, from +/-1 semitones to +/-12 semitones. (In "smart" modes, the semitones will be as previously stated, in "dumb" modes, a value of 12 for bendRange will cycle through all 32 possible tones of that polynomial/waveform, landing on the starting tone.)
- Arpeggiator with adjustable speed. Ability to switch arpeggiator on and off while playing without affecting the intelligent pull off.
- Controllable volume on monophonic modes.
- Adjustable decay (from continuous sustain to almost inaudible blips) using 4 bit onboard attenuation controls.
- Polyphonic mode, utilizing both channels at once. Velocity sensitive, which can be toggled on or off globally. (I like it off on this synth.) Polyphonic mode also replaces oldest notes with newer notes when polyphony limit is reached.
- Tremolo feature available on polyphonic mode, although on this chip it doesn't sound that great.
- "Smart" modes in both polyphonic and monophonic versions. In any given waveform, this chip is only capable of outputting 32 different notes, not mapped linearly with respect to musical notes, and spread across the entire range of its output. The chance that any of those notes will land on a degree of the even tempered chromatic scale is sort of slim. So, I made a mode that switches waveforms and divisions with each key you press so that you ultimately hear the closest thing the chip is capable of making to your desired note. There are a number of awkward octave and timbre jumps, so I've also provided the natural behavior of the chip in designated "dumb" modes.
- Onboard LED shows MIDI commands received (excluding note-off commands).

- Polynomial/Waveform selection. There are 16 noises/tones/divisions available, although some are repeats of others and two of them (#1 and #11) are just a DC output (which gets filtered by the DC blocking cap) and just make a click sound. I left them all in for the sake of authenticity. They are all essentially 1 bit waveforms (output either on or off). They are (zero indexed):

    0. DC High
    1. Saw-sound pulse
    2. Idle tank sound (not really pitched)
    3. Engine (somewhat pitched)
    4. Square
    5. Square
    6. Pulse, slightly narrower than square.
    7. Pitfall
    8. Noise
    9. Pitfall
    10. Pulse, slightly narrower than square.
    11. DC High
    12. Square
    13. Square
    14. Pulse, slightly narrower than square.
    15. Buzz

Atari TIA Chip Synthesizer Channel / CC Guide

CH	1	2	3	4	5	6
	"Dumb" Polyphonic Mode	"Smart" Polyphonic Mode	"Dumb" Channel 1 Legato	"Smart" Channel 1 Legato	"Dumb" Channel 2 Legato	"Smart" Channel 2 Legato
CC#						
1	Tremolo	Tremolo	Volume	Volume	Volume	Volume
2	N/A	N/A	Bend Range	Bend Range	Bend Range	Bend Range
3	Decay Mode	Decay Mode	Decay Mode	Decay Mode	Decay Mode	Decay Mode
4	N/A	N/A	Arpeggiator On/Off	Arpeggiator On/Off	Arpeggiator On/Off	Arpeggiator On/Off
5	N/A	N/A	Arpeggiator Speed	Arpeggiator Speed	Arpeggiator Speed	Arpeggiator Speed
6	Polynomial Select	N/A	Polynomial Select	N/A	Polynomial Select	N/A
20			Portamento Speed	Portamento Speed	Portamento Speed	Portamento Speed
Pitch Bend	N/A	N/A	Glissando Bend	Glissando Bend	Glissando Bend	Glissando Bend