

ALRIGHT, nerds. what do you know about chips? chips are an integral feature of our technocapitalist hellscape of a society. with the end of the chip shortage upon us, it's important that all first-years be educated on the distinction between different types of chips.

there are many kinds of chips: from greasy potatoes, to sweet choc-o-late morsels, to poker companions, to the Caltech Hi-res Imaging Program. sometimes, first-years are just a chip off the old jaded junior block. but we're not going to talk about those chips today, no sir-ee bob.

no, my dearest first-years, today we are talking about (つ〇〇〇)つ ♥ [C][H][I][P][S] ♥! the RAMs and ROMs! the bits and bytes! the little semiconducting electron parkour courses which define our very existence. yes, my fellow ASTRO-MAJORS DOUBLE-E's, we are talking about the microcontroller flavour of chips.

we can classify each and every little cookie cutter silicon boi on three axes ↴:

1. cutie vs. smartie

- the cutest chips are the most basic; the simplest; the dumbest. oh, to have such a blissful yet mindful, results-oriented yet minimalistic vocation. and yet, their inner machinations are still complex enough to drive a Caltech soph to the brink of insanity.
- the smartie pants chippos tend to have a bit more of an ego. all those extra bits, bells, and whistles go straight to their heads. granted, sometimes it's warranted — the number of GPIO ports on these bois makes the old metric of munchy/crunchy vs. slippery/slimy basically obsolete.

2. grubby vs. spic-n-span

- the grubbiness of a chip is an objective measure of how much it has personally wronged me. if i haven't interacted with the chip before, i just vibecheck it.
- spic-n-span fellas play nice with everybody. no compilation errors in sight. nothing cursed or hacked together; just pure, elegant harmony.

3. he vs. HAMPTER

- he* is simply *him*. as in "my pronouns are he, but not him, because i'll never be *him*." *he* is just a dapper little mans. *he's* just vibing.
- HAMPTERs are not that. they are a force to be reckoned with. if you want to talk to God, the closest you can get is by opening a few tabs of silence occasionally interrupted by HAMPTER and meditating.

this leaves us with a Hilbert space of chip flavours into which we can project every little byte of mass-produced human ingenuity. let's go through some examples.

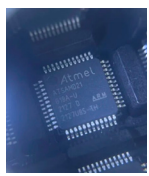
1. ATmega328P

- this iconic 8-bit fella is such a cutie. with a 28-pin package, he's more he than HAMPTER but fairly close to the middle. my instinct is to place him firmly in the grubby category, but in this case given that it's basically a cornerstone of the hobby electronics world, i think it's more likely to be a skill issue on my part. 32 kB of flash is a lot bigger on the inside than it is on the outside! (#unoWhatTimeItIs)



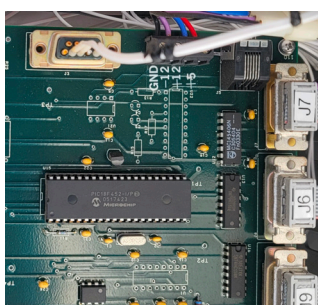
2. ATSAMd21

- this is not only a *he*, but this is also lowkey a bit of a smartie pants. this 32-bit Arm® Cortex®-M0+ processor, featuring 256 KB Flash and 32 KB of SRAM, occupies exceptionally small silicor area, low power, and minimal code footprint, enabling developers to bypass the step to 16-bit devices and achieve 32-bit performance at an 8-bit price point. yes, this absolutely TIDY, spic-n-span duderino is *all that*. something something instant gratification you kids have it easy WHEN I WAS A FROSH it took an entire term just to get to 'hello world' with goddam ASSEMBLY. my ide was a CHALKBOARD. alan turing (the original CS gay) would recoil in disgust if he saw actual children programming microcontrollers in PYTHON abomination 32-bit is here, get with the times old man.



3. PIC18F

- i don't really know much about this guy but he seems based; it takes a real HAMPTER to sit in a box on a roof for like 20 years and then still work perfectly. does get a little grubby when you mess up the order of CR/LF in serial communications, but hey, we all have our quirks.



4. MSP430

- released on Valentine's Day 1992, this texan instrument is smart enough to perfectly toast waffles, yet cute enough to command a CubeSat — life in 16 bits is fantastic! our radiation-hardened friend here is the HAMPTER

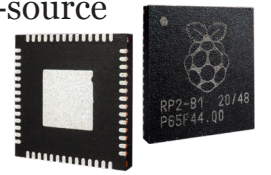
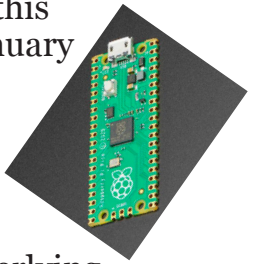
Smart Toaster Oven For The Future



on whose shoulders many a mission-critical subsystem stand. you can't just fake your way to Technology Readiness Level 9. i vibecheck this mans as mildly grubby, but that's less his fault than the proprietary TI development ecosystem that courses through his veins.

5. RP2040

- i remember there was a lot of hype when this chip was released in like (*quik google*) january 2021 but i was rather underwhelmed that it was 'just a microcontroller'. ah, i was young and foolish — though i still think it was misleading to name the devboard 'Raspberry Pi Pico'. to his credit, despite looking like a simple little *he* with no underlying complexity, he's actually packing not one but TWO Cortex®-M0+ cores! what a smartie! with every part hand-picked for maximum spic-n-spanity, and the entire hobby electronics community rallying around him to build a robust open-source infrastructure, this bright-eyed chip may prove to be the foothold technology-literate consumers needed into the 32-bit era.



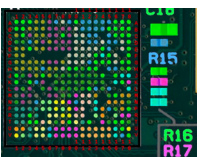
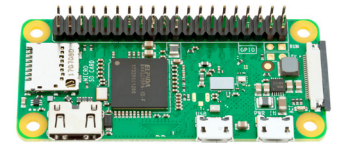
6. Apollo3 BLUE

- i learned about this fella while window shopping on sparkfun, and i knew instantly that this little *he* was something special. and it wasn't just the AI/IoT buzzwords plastered everywhere on the website! packing a Cortex®-M4, an entire megabyte of flash, a Floating Point Unit (the M0 could never!), and built-in Bluetooth, this is easily the smartiest boi on our list. normally he would be completely out of the consumer's league, but once again, open-source saves the day! sparkfun's artemis module tames the beast, providing a spic-n-span interface to an otherwise n-th degree grubby grub. (though, if you *want* to run TensorFlow or the proprietary Ambiq SDK for some reason... pop off i guess. i'll stick to Arduino C++.)



7. BCM2835/ARM1176JZF

- famously encountered on the raspberry pi zero, i can only adequately describe this chip as... confused. *he* is such a silly, grubby little mans. he boots into a full linux distro, yet he lacks the clock speed to open a web browser in less than 120 seconds, and his ARMv6 architecture (virtually identical to M0 chips!) isn't even supported by several major software ecosystems. looking at you, Node.js. it's not cute and it's not smart. maybe he just feels left out from all the fun of his positive-integral brethren. but tbh he'd be better off sticking to microcontroller stuff like RP2040. (i saw a youtube video of some guy doing bare metal raspberry pi development with Rust, that seems based.)

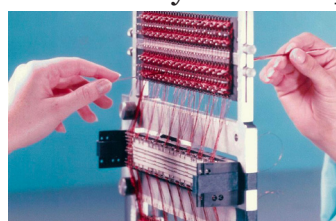
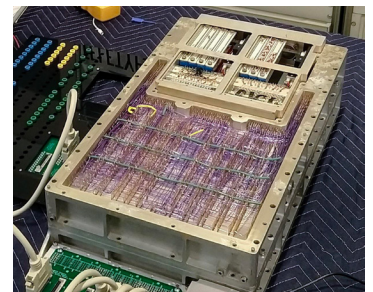


sigh

i love him. and yet i do not care for his nonsense.

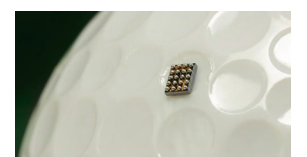
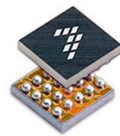
8. Apollo 11 Guidance Computer

- ok, this one is admittedly very far past the HAMPTER end of the spectrum — i mean, it's more like a macrocontroller than a microcontroller — but i had to include him because HE'S SO DANG CUTE! all 69 kB of his programming were literally hand-woven into ROM way back in 1966. purebred spic-n-span; no bit-flips from stray cosmic rays, just a cursed 15-bit (?) instruction set and 5,600 three-terminal NOR gates welded (not soldered, welded) into place. now THAT'S how you make a chip.



9. Honorable Mention: Kinetis KL03

- world's smallest microcontroller based on ARM® Cortex-M0+ technology!



now that you have become enlightened, you are doubtlessly bright-eyed and bushy-tailed. but a word of warning: always remember who is in charge. And it's not us. go forth, my dearest first-years; you have the means by which to navigate this arcane reality. share your knowledge with the world. if you listen carefully, it might share some of its wisdom in return.