
Open Hardware
Needs
Open Standards
Chris Chronopoulos
OHS 2021


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Needs
Open (Safety) Standards
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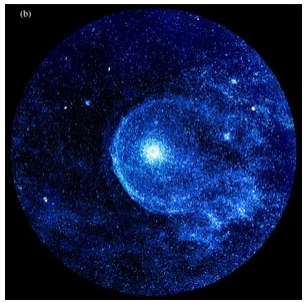
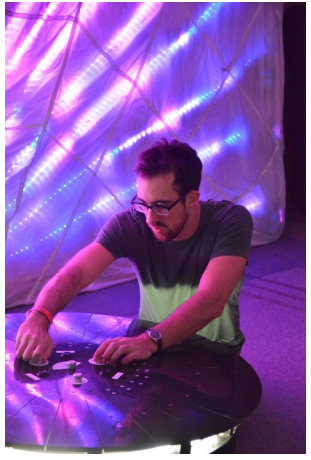
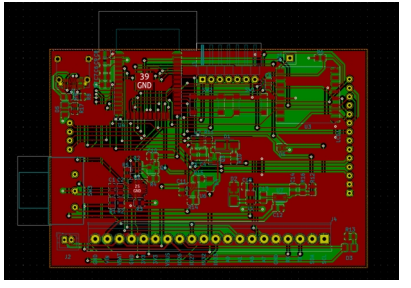
Background



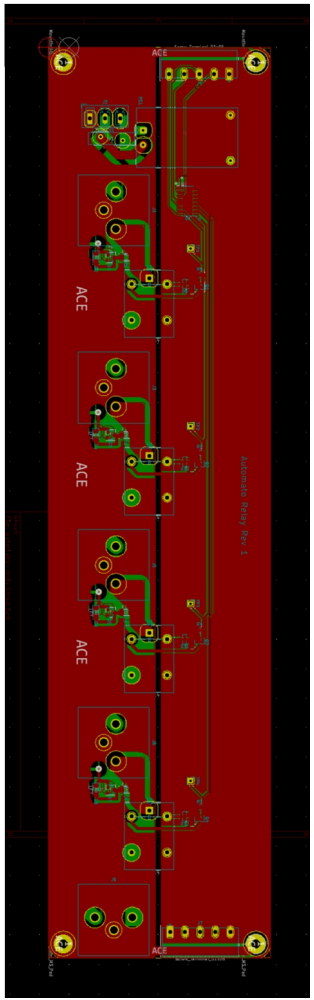




www.chronopoulos.net

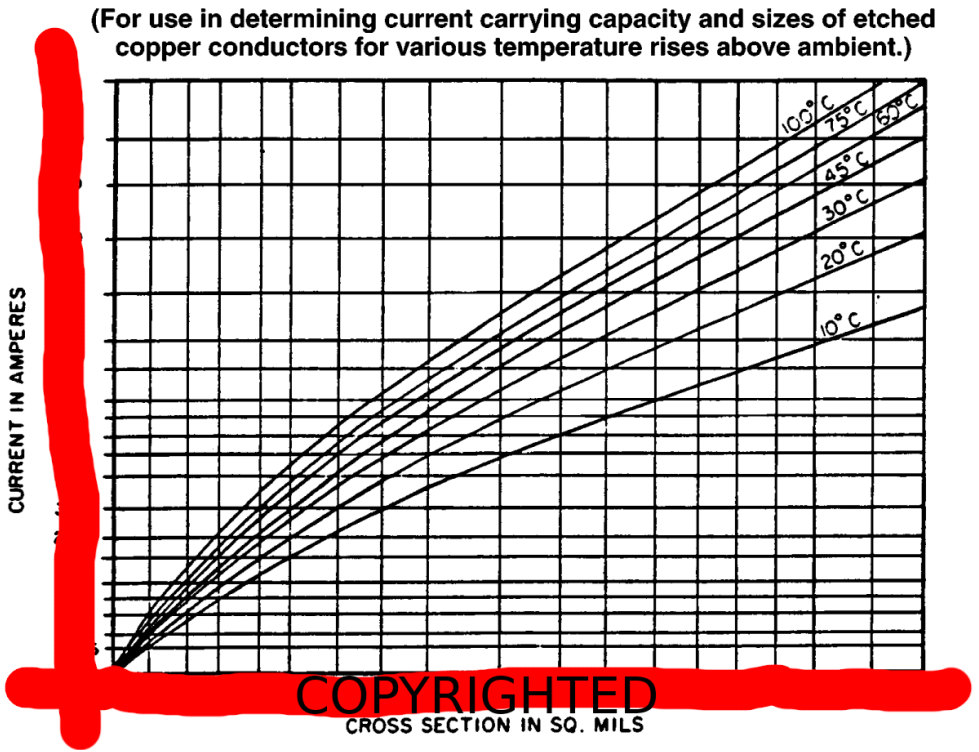
- Open Source Consultancy
- Worker Cooperative
- Public Benefit Corporation
- https://interstitial.coop/

Storytime: Automato



- Open Hardware PCB: Smart Power Strip
- AC Mains Power! Risk of electric shock
- Trace Width, Clearance, Creepage, Grounding
- Relevant standards:
  - IEC/UL/CSA-60950-1: “Information Technology Equipment – Safety”
    - USD $1026-$2566
  - IPC-2221: “Generic Standard on Printed Board Design”
    - USD $168 + $136 + $168 + ...
- Non-Disclosure Agreement (NDA): not free to share

Contraband Science!



CLEARANCES in mm

PEAK WORKING VOLTAGE [a] up to and including V	MAINS TRANSIENT VOLTAGE														
	Pollution degree														
	1 and 2 [b]			3			1 and 2 [b]			3			1, 2 [b] and 3		
	F	B/S	R	F	B/S	R	F	B/S	R	F	B/S	R	F	B/S	R
	0,4	1,0 (0,5)	2,0 (1,0)	0,8	1,3 (0,8)	2,6 (1,6)	1,0	2,0 (1,5)	4,0 (3,0)	1,3	2,0 (1,5)	4,0 (3,0)	2,0	3,2 (3,0)	6,4 (6,0)
	0,5	1,0 (0,5)	2,0 (1,0)	0,8	1,3 (0,8)	2,6 (1,6)	1,4	2,0 (1,5)	4,0 (3,0)	1,5	2,0 (1,5)	4,0 (3,0)	2,0	3,2 (3,0)	6,4 (6,0)
	F 1,5 B/S 2,0 (1,5) R 4,0 (3,0)												2,5	3,2 (3,0)	6,4 (6,0)
	F 3,0 B/S 3,2 (3,0) R 6,4 (6,0)														
	F/B/S 4,2 R 6,4														
	F/B/S/R 8,4														
	F/B/S/R 17,5														
	F/B/S/R 25														
	F/B/S/R 37														
	F/B/S/R 80														
	F/B/S/R 130														

The values in the table are applicable to FUNCTIONAL INSULATION (F) if required by 5.3.4 a) (see 2.10.1.3), BASIC INSULATION (B), SUPPLEMENTARY INSULATION (S) and REINFORCED INSULATION (R).

Options…

Purchase

Trust 3rd Party

Pirate

There’s got to be a better way!

Software Open Standards

- Internet Protocol: IP, TCP/UDP, HTTP/S, SMTP
  - Open: ISOC, IETF, IRTF, IAB
  - https://www.rfc-editor.org/standards
- Web Standards: HTML, CSS, Javascript, SVG
  - Open: W3C/ECMA
- Cryptography: AES, RSA
  - Open: NIST
  - FIPS-197, FIPS-186
- Document Format: ODF
  - Open: OASIS

What makes a standard “open”?

- Depends who you ask... but generally:
  - **Open Access** (preferably *gratis*)
  - **Free to Implement**
  - **Free To Share** (no NDA)
  - **No Dependencies** (e.g. patents, other closed standards)
- Bonus points:
  - Open **Participation, Consensus, Transparency**
    - e.g. Request for Comments

Types of Standards

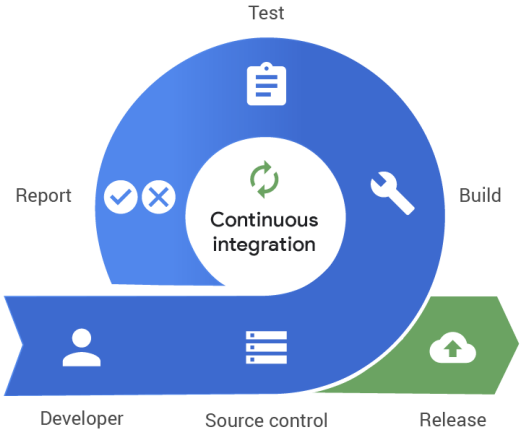
- Technical vs. Procedural
- Scope:
  - Safety
    - Electrical, Thermal, Fire, Mechanical, Radiation, Chemical
  - Interoperability
    - Data Formats, Communications Protocols
  - Environmental
    - Materials, Energy Usage, Emissions (sound, radio, gas)
  - Medical
    - Technical, Procedural, Quality Control

Aside: Standards in Regulations

- Closed Standards become “incorporated by reference” into public law
  - Building codes, electrical codes, energy standards
- Huge parts of the law are unreadable!
- Public.Resource.Org is fighting back

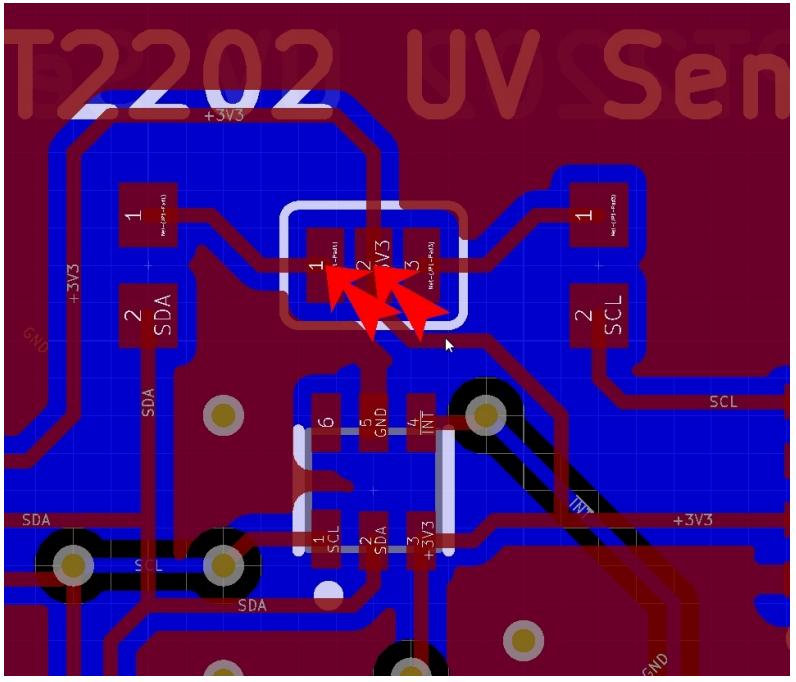
Still Need Testing

- UL/CSA/CE provide testing + certification
  - Required for many retailers
  - Works on end product
- Some testing can be implemented at the design phase!
- Take note of software testing
  - https://www.w3.org/testing/



Next Steps

- PCB Safety Standard
  - Implement DRC
  - KiCad 6: Netclass Constraint Matrix
- Working Group?
  - Open Consortium
  - Request for Comments



Thank You!

chrono@interstitial.coop