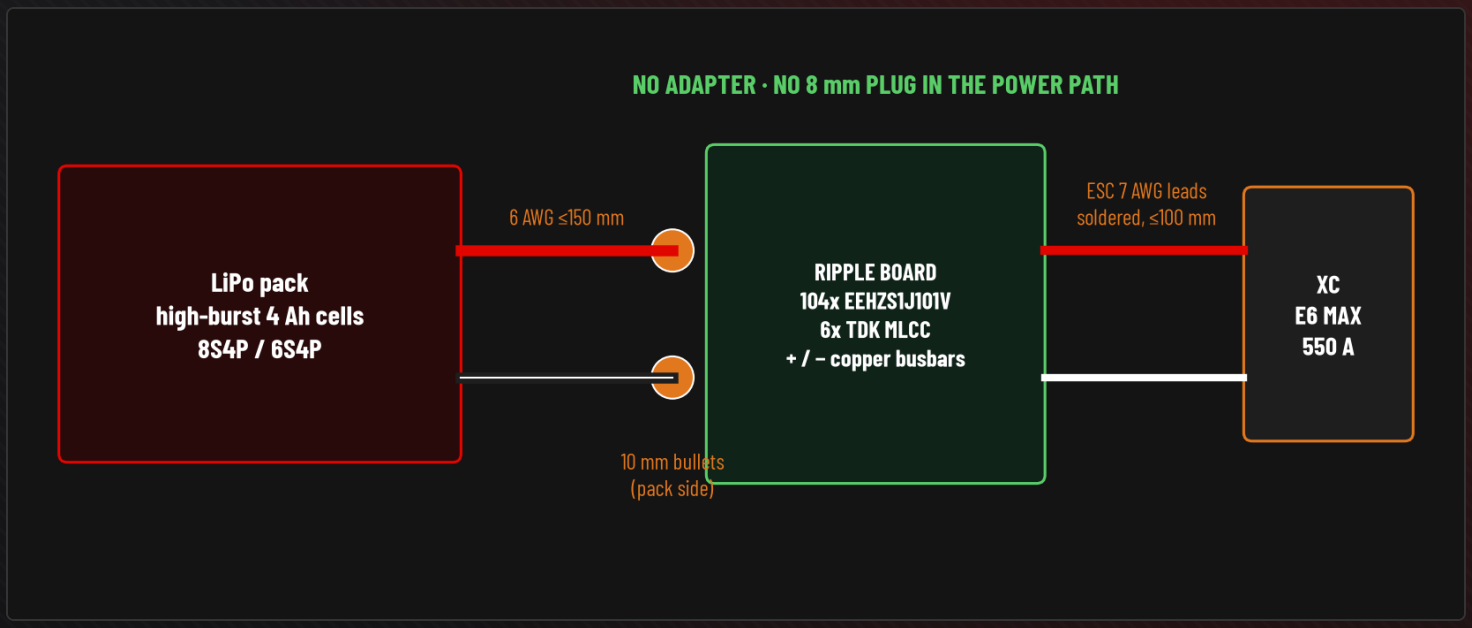
RIPPLE PACK BUILD GUIDE

v2 board · 104 polymer caps · soldered right at the ESC leads · 6S or 8S · up to the E6 MAX 550 A limit



0.76 V
ripple p-p at 550 A, 20 kHz, duty 0.5 EST

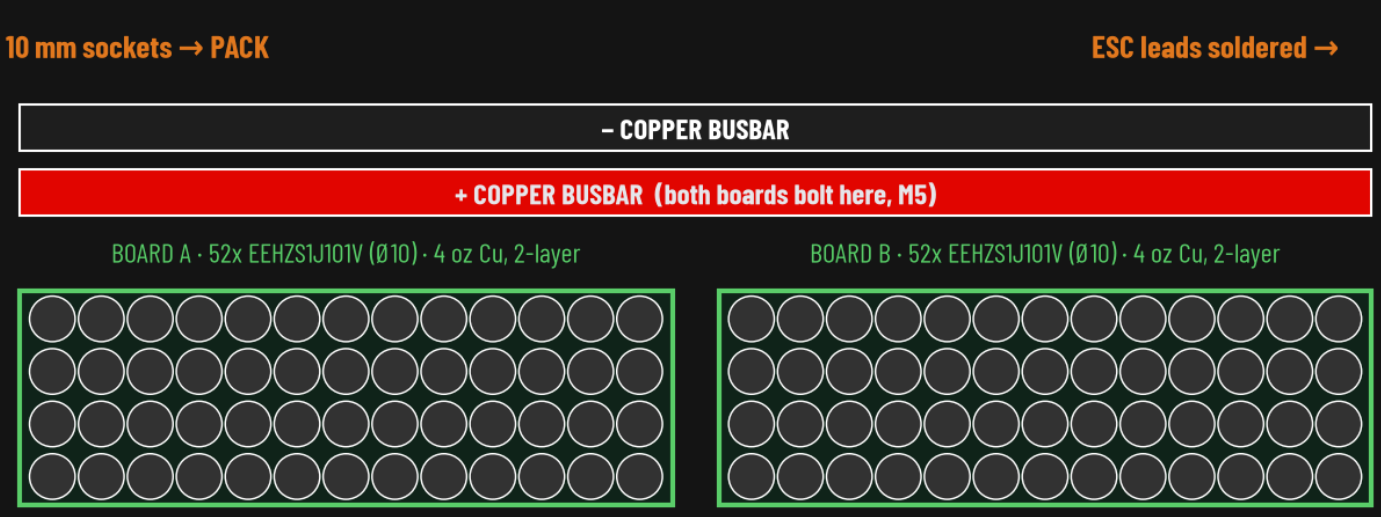
88%
of each cap's rated ripple current (2.64 A vs 3.0 A RATED)

194 G
104 × 1.87 g caps RATED; PCB, copper and wire extra EST

WHAT IT DOES: the ESC chops the battery current thousands of times a second. The ripple board feeds those pulses from right next to the ESC so the pack wiring doesn't have to. It does **not** fix sag; that's the battery's job (see the Sag: Battery First guide).

V2 BILL OF MATERIALS

QTY	PART	WHAT / RATING	MASS
104	Panasonic **EEHZS1J101V** polymer hybrid	100 µF · 63 V · 19 mΩ · 3.0 A rms RATED → 10,400 µF · 0.18 mΩ board EST	194 g RATED
6	TDK **C5750X7S2A106K230KB** MLCC	10 µF · 100 V · X7S, at the ESC lead pads RATED	not published
2	Ripple PCB 140 × 46 mm, 2-layer, 4 oz copper	52 caps each, 4 × 13 grid at 10.5 mm pitch EST	≈50 g EST
2	Copper busbar 150 × 10 × 2 mm (+ and –)	M5 bolts to both boards; 10 mm sockets on the pack end EST	≈54 g EST
2	10 mm bullet pairs	pack ↔ ripple board	–
–	6 AWG silicone wire	pack leads, keep them short	–
–	XC E6 MAX 7 AWG leads	8 mm plugs cut off, soldered to the board pads, ≤100 mm EST	–
–	Kapton tape, heat-shrink, foam tape	between the busbars, over the joints, under the board	–

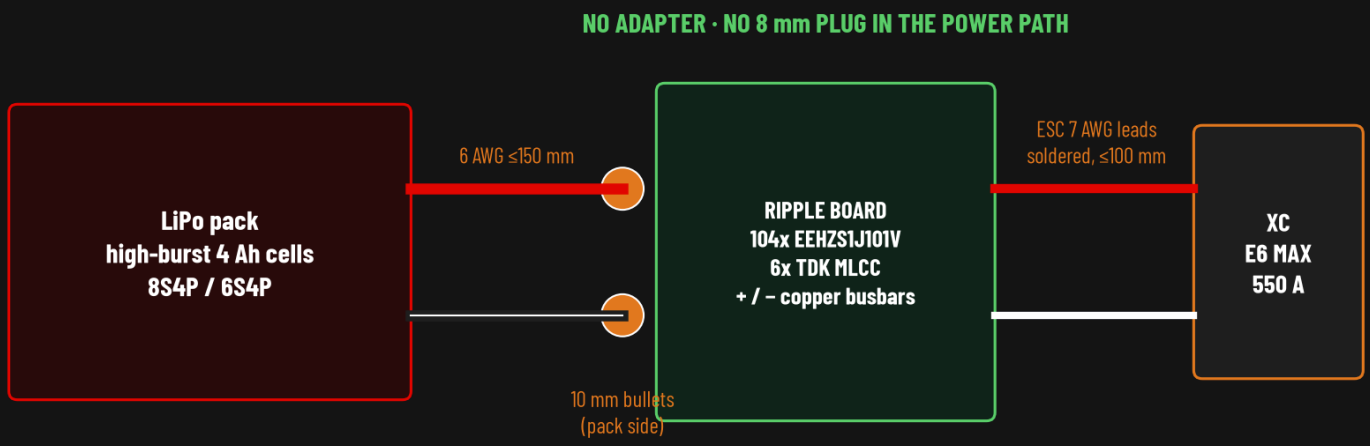


6x TDK C5750X7S2A106K230KB MLCC across the busbars right at the ESC lead pads · boards stack or sit side by side · 140 x 46 mm each EST

63 V parts on a 33.6 V (8S) or 25.2 V (6S) pack RATED. The E6 MAX's switching frequency and its own input caps aren't published by XC, so ripple numbers in this guide are shown at 10, 20 and 40 kHz EST.

LAYOUT THAT WORKS

Ripple current lives in the loop between the caps and the ESC's switches. Make that loop short, flat and wide.

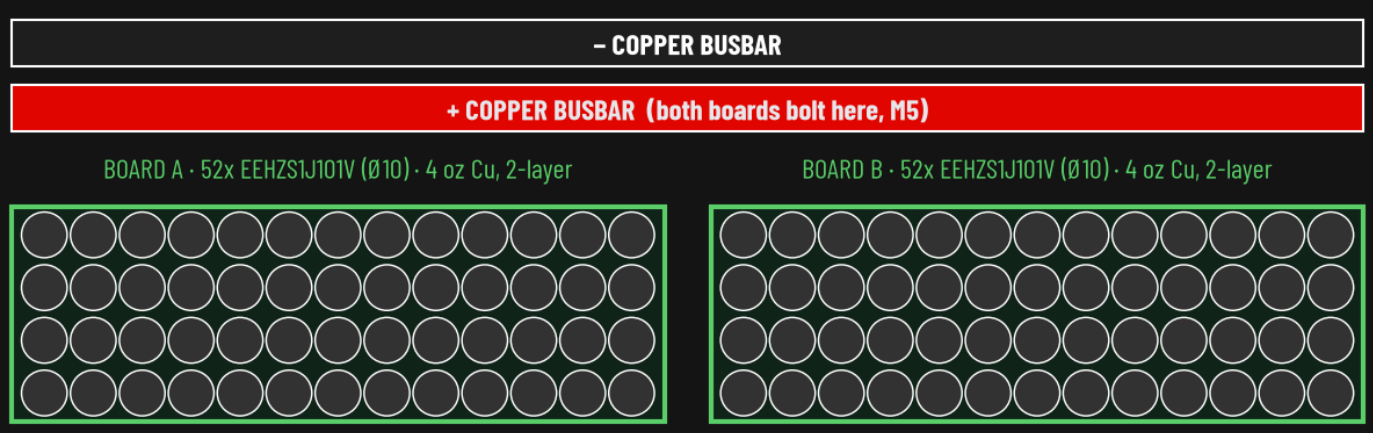


DO

- Mount the board within 100 mm of the ESC EST.
- Stack + over – busbars with Kapton between them.
- Put the 6 MLCCs right at the ESC lead pads.
- Bolt both boards to the same busbars so they share evenly.
- Foam-mount the board against vibration.

DON'T

- No adapter or 8 mm plug between the board and the ESC.
- Don't mix big cans with small polymer caps on one board: the cans hog the current (page 5).
- Don't count the ripple board as sag help.
- Don't leave bare busbar edges: 550 A shorts weld tools.



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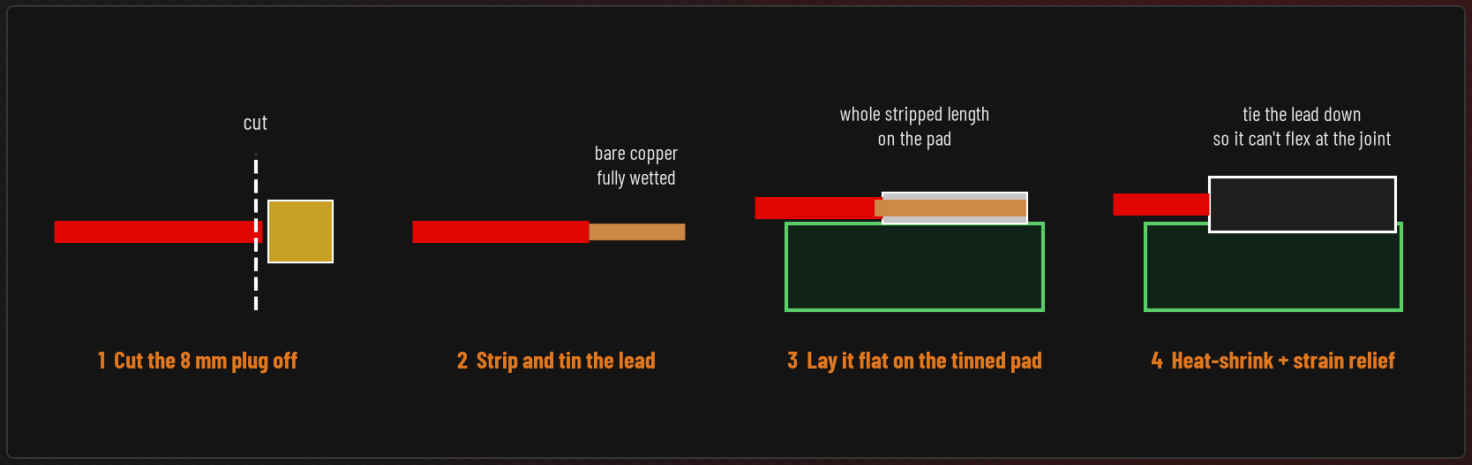
SOLDER TO THE ESC LEADS

The ESC's 7 AWG leads go straight onto the board pads. One less connector, less resistance, one less thing to come loose.



STEPS

1. Pack unplugged. ESC disconnected from everything.
2. Cut the 8 mm plugs off the ESC leads, leaving them as short as the layout allows.
3. Strip and tin each lead with a high-wattage iron or station big enough for 7 AWG.
4. Tin the board pad, lay the lead flat along it and flow solder until the whole joint is wetted.
5. Let it cool without moving. Heat-shrink, then tie the lead down so it can't flex at the joint.
6. Check polarity: ESC + to the + busbar side, − to −, before the pack ever goes on.

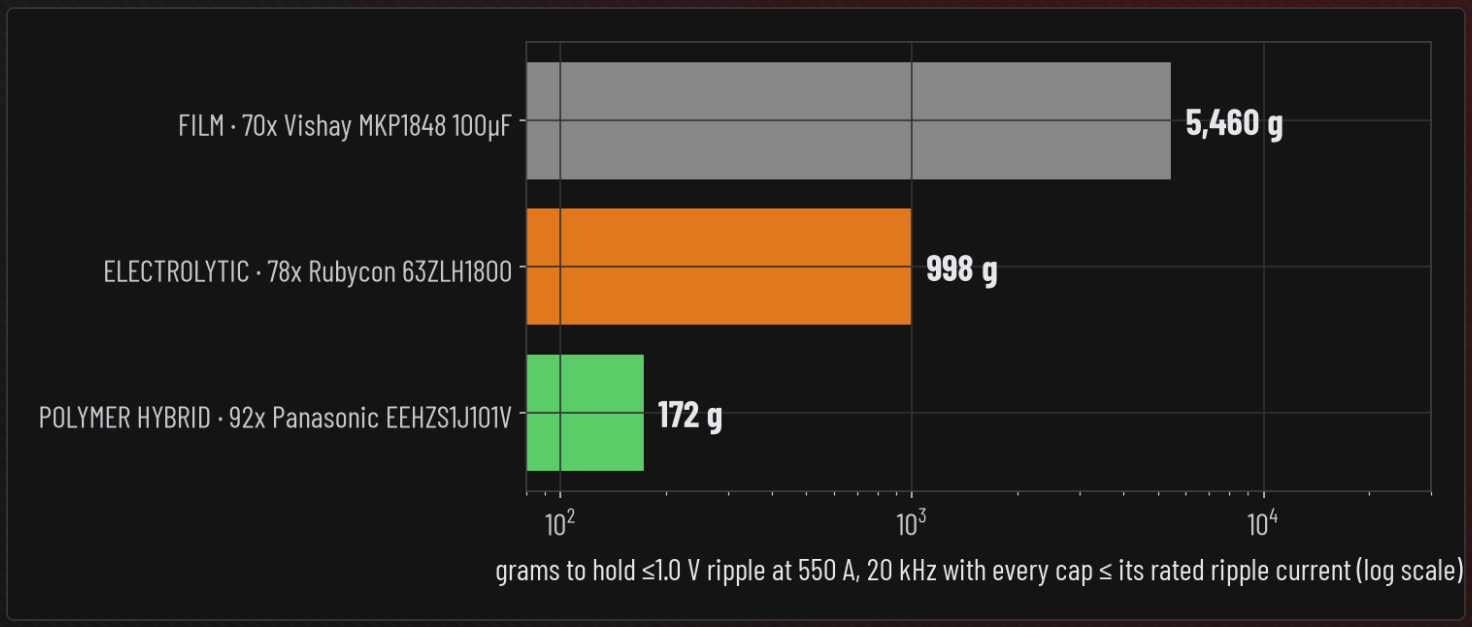
CHECK IT

- Joint shiny and smooth, solder flowed into the strands.
- No caps or MLCCs cooked near the pad (look for discoloured cases).
- Tug test each lead.
- Power up the first time on a current-limited supply if you have one.

WARRANTY: cutting the ESC's plugs is your call and may affect the ESC maker's warranty. Combos are competition gear with no warranty.

POLYMER BEATS FILM PER GRAM

What matters on a race car is how many grams it takes to hold the ripple with every cap inside its rating.



PER GRAM EST	µF/G	A RMS/G
Vishay MKP1848 film	1.3	0.28
KEMET C4AQ 15 µF film	0.5	–
Rubycon 63ZLH1800 (mass EST)	141	0.28
Panasonic EEHZS1J101V	54	1.60

Per gram = rated µF and rated ripple amps RATED ÷ mass. Film is built for 450–500 V, so it carries far less µF per gram. Big aluminium cans hold lots of µF but little ripple current per gram, and their low impedance makes them hog the current: the v1 mix (10 × 63ZLH820 + 10 × EEHZS1J101V) runs its cans at about 802% of rating at 550 A, 20 kHz EST.

1.42 / 0.76 / 0.43 V

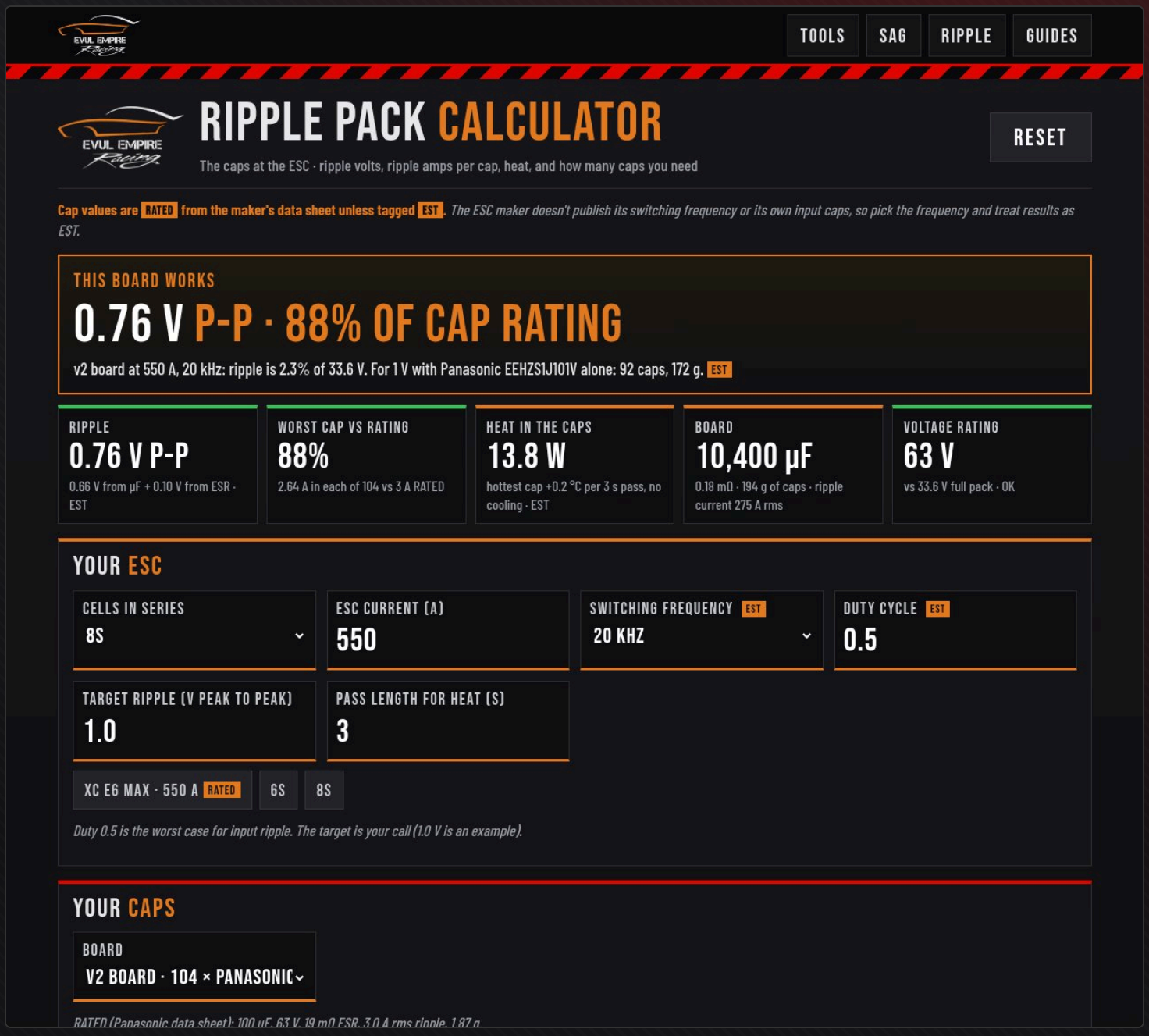
v2 ripple at 550 A, 10 / 20 / 40 kHz EST

+0.2 °C

per cap per 3 s pass at 550 A, 20 kHz, no cooling EST

CHECK IT IN THE RIPPLE CALCULATOR

evulempire.com/ripple/ · enter cells in series, ESC current, switching frequency and caps; it shows ripple volts, each cap's % of rating, heat, and how many caps hit your target.



CARE

- The board needs no charging; it follows the pack.
- Inspect joints and busbar bolts every race day.
- Replace any cap with a bulged or discoloured case.
- Plug the pack in last and unplug it first.

SAFETY

- Insulate the busbars; 550 A through a dropped tool welds it.
- Charge LiPo in a LiPo bag or box, never unattended.
- Competition gear, no warranty.

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