Backplane Management

Provides +5V and +12V power and supervision for backplane, and audio output.

Overview

Unlike other expansion boards, this one is required to operate the backplane, primarily to power the system. To connect, it uses a smaller half height (48 position, 3 row) DIN 41612 connector with a unique pinout to interface to the backplane. Additionally, it exposes mixed audio from all expansion sources with volume control.

Rev1 backplane management board

Shown above is the Rev1 board backplane management board. This board is two layer, with 2oz copper.

Power

Primarily, the management card exists to provide power to the rest of the system. It accepts any voltage between 14V – 30V through a pluggable 5.08mm pitch terminal block (CUI TBP01R1W-508, but compatible with many other pluggable terminal blocks) as an input. The input features reverse polarity protection and inrush current limiting, and a 10A replaceable fuse. Input power then passes through a common mode choke to filter out noise.

Next, the main +12V power rail is generated via a LM25116 switching controller (U401) with discrete MOSFETs (Q401, Q402.) A maximum of roughly 10A at 12V can be supplied. The +12V rail then has significant bulk decoupling, since it provides both the system's +12V rail, and the input for the other regulators.

The system's +5V rail is generated by a PTH08T220 power module; it can provide up to 16A of power. A secondary +5V rail, used exclusively by the management board, is generated using a linear regulator (U301) from the +12V rail. The secondary rail powers the audio amplifier, as well as all active logic on the card.

Lastly, both the +5V and +12V rails pass through 3mΩ current shunts, which is measured by an INA209 current sense device (U303, U304.) These devices expose the voltage/current/power readings over the I^2C bus, which can be read out by the host. (There's also programmable upper/lower bounds and fault outputs, but these are not currently used.)

Both rails then have some further high frequency decoupling on the output, after the current shunt, followed by polyfuses: 13A on 5V, and 5A on 12V.

Audio

Additionally, the card buffers the mixed audio signals provided by the backplane. The audio is filtered by an active low-pass filter with a 16kHz cut-off frequency. A stereo potentiometer is used to control the volume of the output audio, which is provided on a 3.5mm jack.

Miscellaneous

Like all other expansion cards, the management card supports the I^2C bus for out-of-band management, and provides a configuration EEPROM (U203; it has an embedded serial number) at addresses `0b1010000` and `0b1011000`.

Indicators are provided for all power rails.

Revisions

This page lists any assembly remarks and issues with each revision of the board.

Rev 1

- 5V power module (U302) sync input should be grounded, to use internal sync.
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- Move capacitors out from under the 5V power module; it causes interference issues
- Annular rings on power module need to be wider (at least by .2mm;) they suck to solder to right now
- R201/R202 (100k pulldown on audio inputs) are redundant; they are already at the opamp (R105/R106)
- D401 sucks to hand solder (super tiny)
- Volume potentiometer RV101 should be logarithmic type