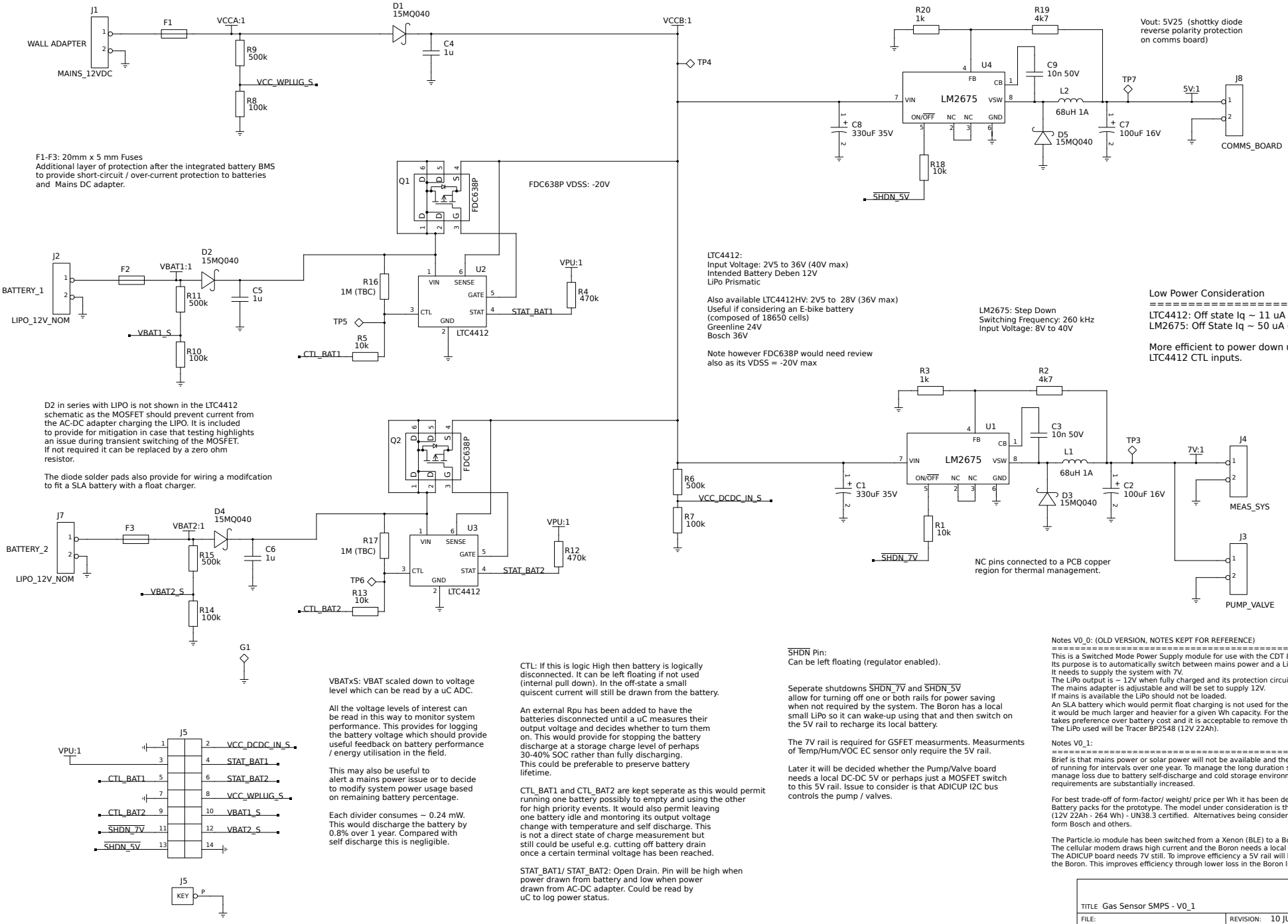

VBATxS: VBAT scaled down to voltage level which can be read by a uC ADC.

All the voltage levels of interest can be read in this way to monitor system performance. This provides for logging the battery voltage which should provide useful feedback on battery performance / energy utilisation in the field.

This may also be useful to alert a mains power issue or to decide to modify system power usage based on remaining battery percentage.

Each divider consumes ~ 0.24 mW. This would discharge the battery by 0.8% over 1 year. Compared with self discharge this is negligible.

CTL: If this is logic High then battery is logically disconnected. It can be left floating if not used (internal pull down). In the off-state a small quiscent current will still be drawn from the battery.

An external Rpu has been added to have the batteries disconnected until a uC measures their output voltage and decides whether to turn them on. This would provide for stopping the battery discharge at a storage charge level of perhaps 30-40% SOC rather than fully discharging. This could be preferable to preserve battery lifetime.

CTL_BAT1 and CTL_BAT2 are kept seperate as this would permit running one battery possibly to empty and using the other for high priority events. It would also permit leaving one battery idle and montoring its output voltage change with temperature and self discharge. This is not a direct state of charge measurement but still could be useful e.g. cutting off battery drain once a certain terminal voltage has been reached.

STAT_BAT1/ STAT_BAT2: Open Drain. Pin will be high when power drawn from battery and low when power drawn from AC-DC adapter. Could be read by uC to log power status.

$\overline{\text{SHDN}}$ Pin:
Can be left floating (regulator enabled).

Seperate shutdowns $\overline{\text{SHDN\_7V}}$ and $\overline{\text{SHDN\_5V}}$ allow for turning off one or both rails for power saving when not required by the system. The Boron has a local small LiPo so it can wake-up using that and then switch on the 5V rail to recharge its local battery.

The 7V rail is required for GSFET measurments. Measurments of Temp/Hum/VOC EC sensor only require the 5V rail.

Later it will be decided whether the Pump/Valve board needs a local DC-DC 5V or perhaps just a MOSFET switch to this 5V rail. Issue to consider is that ADICUP I2C bus controls the pump / valves.

Notes V0_0: (OLD VERSION, NOTES KEPT FOR REFERENCE)
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This is a Switched Mode Power Supply module for use with the CDT 8CH Gas Sensor System.
Its purpose is to automatically switch between mains power and a LiPo backup battery.
It needs to supply the system with 7V.
The LiPo output is ~ 12V when fully charged and its protection circuitry cuts out at 8V25.
The mains adapter is adjustable and will be set to supply 12V.
If mains is available the LiPo should not be loaded.
An SLA battery which would permit float charging is not used for the prototype as
it would be much larger and heavier for a given Wh capacity. For the first prototype portability
takes preference over battery cost and it is acceptable to remove the LiPo to recharge it.
The LiPo used will be Tracer BP2548 (12V 22Ah).

Notes V0_1:
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Brief is that mains power or solar power will not be available and the kit must run be capable of running for intervals over one year. To manage the long duration standby time and manage loss due to battery self-discharge and cold storage environment the power requirements are substantially increased.

For best trade-off of form-factor/ weight/ price per Wh it has been decided to use 2x LiPo Battery packs for the prototype. The model under consideration is the Tracer BP2548 (12V 22Ah - 264 Wh) - UN38.3 certified. Alternatives being considered include Ebike batteries form Bosch and others.

The Particle.io module has been switched from a Xenon (BLE) to a Boron (CAT-M1 + BLE). The cellular modem draws high current and the Boron needs a local LiPo battery attached. The ADICUP board needs 7V still. To improve efficiency a 5V rail will be generated to supply the Boron. This improves efficiency through lower loss in the Boron linear regulator.

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