

56000080200_Design review

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Dear Support, my design (name: 56000080200) has this specification : $V_{in}=20-30V$, $V_{out}=24V$, $I_{out}=20A$, max ambient temperature $60^{\circ}C$ (based on LM5175 or LM5176). Typical operating condition (24/7/365, every day) is $V_{in}=24V$, $V_{out}=24V$, $I_{out}=8A$ but, in same conditions V_{in} can go down / up until $20V / 30V$ and I_{out} can become $20A$; so I design it for $I_{out}=20A$ and my target is to reduce LM517x power loss.

Project Description.

I used both "LM5175 Buck-Boost Quickstart Tool -- r9" and "Webench". I prefer to use Optional input to the VCC bias regulator. I suppose that VCC bias absorbs $190mA$ (so I powered VCC from an external regulator with $V_{in}=24V$, $V_{out}=9V$). I choose TPSM5601R5H. It power on at $V_{in}=12V$. I doubled every mosfet. I have placed gate resistors of $1\ \Omega$ to prevent ringing. I have placed TVS between BOOTx and SWx. I design C_{in} similar C_{out} (with equivalent ESR $0,009\ \Omega$). I separate GND from AGND. Routing target from EVB PMP21278.

Questions.

1. **Boot sequence.** TPSM5601R5H starts when $V_{in}=12V$, so $V_{bias} = 9V$; when $V_{in}=20V$ LM5175 starts, so when LM5175 starts V_{BIAS} is present. In reverse order power off sequence. Do you think it is right this power on/off sequence ?
2. **Rsense.** From "LM5175 Datasheet" formula R_{sense} @ $20\ \text{ampere}$ seems to be rated $9,9W$ while from "LM5175 Buck-Boost Quickstart Tool -- r9" seems $2,52W-2,86W$. Which is right power for R_{sense} ?
3. **Inductor selection.** Do you think it's a best choice an inductor for $I_{out}=10A$ typ ($1,3-1,8\mu H$) or $I_{out}=20A$ max ($0,7\mu H$)?
4. **Inductor polarity.** XAL1580-741ME has pin 1 (marked) that seems to indicate "direction of terminals and start (short) lead. Connect high dv/dt here for lowest EMI". Do you think I connect it in the right side ?
5. **Mode.** CCM, Hiccup Enabled is suitable for this application? In overload condition my target is reduce heating so Hiccup seems good. DCM mode (rather than CCM) could reduce power loss ?
6. **Snubbers.** Are there good snubbers connections?
7. **Diode_boot** (D4 and D5). Do you think BAS316 is a good choice ?
8. **Diode_FET** (D3 and D6). Do you think SK5C0A is a good choice ?
9. **Heatsink.** Do you think I should use an heatsink (for mosfets)?
10. **Design Review.** Do you suggest modifications? Can I prototipe my pcba?

Thanks in advance