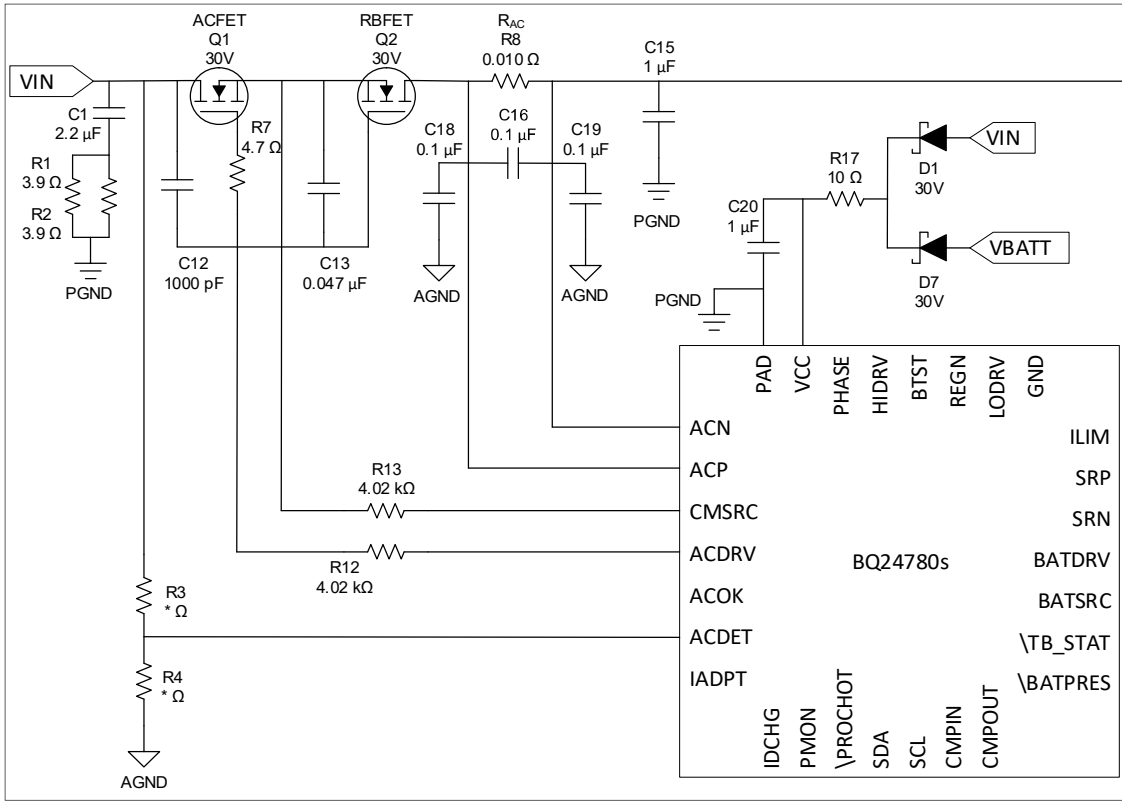
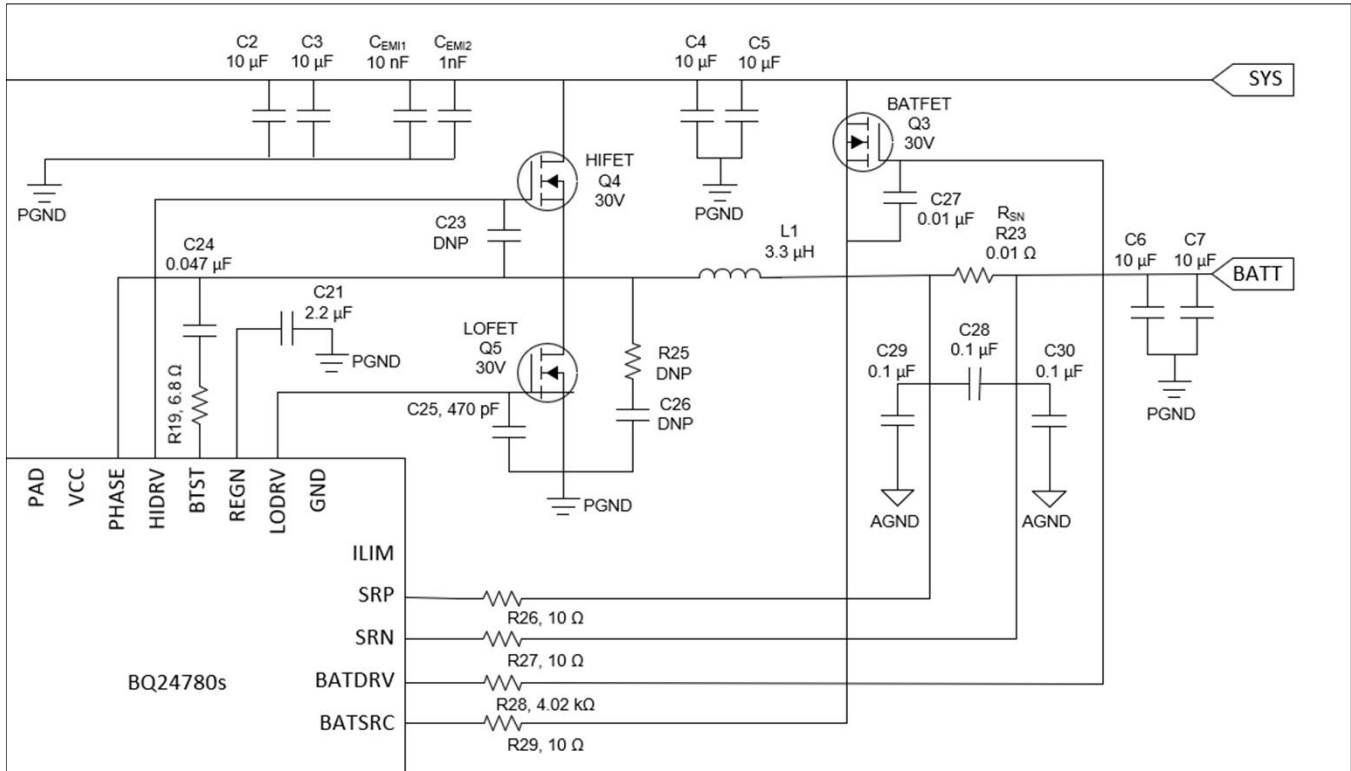






| INPUT POWER - DESIGN CHECKLIST |     |                   |                       |     |          |     |                                                               |                                                                                                                                                                                                                   |
|--------------------------------|-----|-------------------|-----------------------|-----|----------|-----|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PIN NAME                       |     | REQUIREMENT       | COMPONENT             | MIN | TYP      | MAX | DESCRIPTION                                                   | COMMENTS AND RELEVANT EQUATIONS                                                                                                                                                                                   |
| ADAPTER+ / ADAPTER-            | -   |                   |                       |     |          |     | <a href="#">Input source to the charger</a>                   |                                                                                                                                                                                                                   |
|                                |     | Recommended       | Q1                    |     | -        |     | Back-to-back input protection N-Channel MOSFETs               | Used to isolate the battery and adapter. This blocks reverse current from the battery back the input. If Q1/Q2 unused, tie CMSRC to Adapter Input after R0/C0 snubber with 4.02 kOhm resistor R4 and float ACDRV. |
|                                |     |                   | Q2                    |     | -        |     |                                                               |                                                                                                                                                                                                                   |
|                                |     | Required if Q1/Q2 | R12                   |     | 4.02 kΩ  |     | Current-limiting resistors                                    |                                                                                                                                                                                                                   |
|                                |     |                   | R13                   |     | 4.02 kΩ  |     |                                                               |                                                                                                                                                                                                                   |
|                                |     | Recommended       | R1 /R2                |     | 2 Ω      |     | Input hot-plug snubber circuit                                | Used to dampen the ringing due to input inrush current                                                                                                                                                            |
|                                |     |                   | C1                    |     | 2.2 uF   |     |                                                               |                                                                                                                                                                                                                   |
|                                |     | Recommended       | R7                    |     | 4.7 Ω    |     | Input MOSFETs turn-on/turn-off delay                          |                                                                                                                                                                                                                   |
|                                |     |                   | C12                   |     | 1000 pF  |     |                                                               |                                                                                                                                                                                                                   |
|                                |     |                   | C13                   |     | 0.047 uF |     |                                                               |                                                                                                                                                                                                                   |
| ACP-ACN                        | 1-2 |                   |                       |     |          |     | <a href="#">Differential input current sensing</a>            |                                                                                                                                                                                                                   |
|                                |     | Required          | R9 (R <sub>ac</sub> ) |     | 10 mΩ    |     | Input current sensing resistor                                |                                                                                                                                                                                                                   |
|                                |     | Recommended       | C15                   |     | 1 uF     |     | Switching noise filtering                                     |                                                                                                                                                                                                                   |
|                                |     | Recommended       | C16                   |     | 0.1 uF   |     | Differential mode noise filtering                             |                                                                                                                                                                                                                   |
|                                |     | Recommended       | C18                   |     | 0.1 uF   |     | Common mode noise filtering                                   |                                                                                                                                                                                                                   |
|                                |     | Recommended       | C19                   |     | 0.1 uF   |     |                                                               |                                                                                                                                                                                                                   |
| ACDET                          | 6   |                   |                       |     |          |     | <a href="#">AC Detect Resistor-Divider</a>                    |                                                                                                                                                                                                                   |
|                                |     | Required          | R3                    |     | * kΩ     |     | High side of resistor-divider for adapter detection threshold | $V_{th} = 2.4V \frac{R_3 + R_4}{R_3}$<br>$R_3 + R_4 \approx 1 M\Omega$                                                                                                                                            |
|                                |     | Required          | R4                    |     | * kΩ     |     | Low side of resistor-divider for adapter detection threshold  |                                                                                                                                                                                                                   |
| VCC                            | 28  |                   |                       |     |          |     | <a href="#">IC power positive supply</a>                      |                                                                                                                                                                                                                   |
|                                |     | Required          | R17                   |     | 10 Ω     |     | VCC inrush current limiting                                   |                                                                                                                                                                                                                   |
|                                |     | Required          | C20                   |     | 1.0 uF   |     | VCC decoupling capacitor                                      |                                                                                                                                                                                                                   |
|                                |     | Required          | D1                    |     | -        |     | Adapter/Battery Diode-OR                                      |                                                                                                                                                                                                                   |
|                                |     |                   | D7                    |     | -        |     | Adapter/Battery Diode-OR                                      |                                                                                                                                                                                                                   |

# BQ24780s - Output Power Design



| OUTPUT POWER - DESIGN CHECKLIST  |                |                        |     |          |     |                                                                                                            |
|----------------------------------|----------------|------------------------|-----|----------|-----|------------------------------------------------------------------------------------------------------------|
| PIN NAME                         | REQUIREMENT    | COMPONENT              | MIN | TYP      | MAX | DESCRIPTION                                                                                                |
| SYSTEM+                          |                |                        |     |          |     | <b>System output</b>                                                                                       |
|                                  | Required       | C2/C3                  |     | 20 uF    |     | High frequency converter input capacitor(s)                                                                |
|                                  | Required       | C4/C5                  |     | 20 uF    |     | Power path noise filtering capacitor(s)                                                                    |
| /BATDRV                          | Required       | C10                    |     | 22 uF    |     | System output noise filtering capacitor(s)                                                                 |
|                                  |                |                        |     |          |     | <b>P-Channel BATFET power path gate driver</b>                                                             |
|                                  | Required       | Q3                     |     | -        |     | External N-Channel BATFET for power path                                                                   |
| Switching Regulator Output Stage | Required       | R28                    |     | 4.02 kΩ  |     | BATDRV current limiting resistor                                                                           |
|                                  | Recommended    | C24                    |     | 0.1 uF   |     | BATFET turn on/off delay capacitor                                                                         |
|                                  |                |                        |     |          |     | <b>Switching Regulator Output Stage</b>                                                                    |
| SRP-SRN                          | Required       | L1                     |     | *uH      |     | Switching regulator inductor                                                                               |
|                                  | Required       | C6/C7                  |     | *uF      |     | Switching regulator output capacitor(s)                                                                    |
|                                  |                |                        |     |          |     | <b>Differential charge current sensing</b>                                                                 |
| REGN                             | Required       | R23 (R <sub>SN</sub> ) |     | 10 mΩ    |     | Charge current sensing resistor                                                                            |
|                                  | Optional       | C28                    |     | 0.1 uF   |     | Differential mode noise filtering                                                                          |
|                                  | Recommended    | C29                    |     | 0.1 uF   |     | Common mode noise filtering                                                                                |
| LODRV                            | Recommended    | C30                    |     | 0.1 uF   |     | Common mode noise filtering                                                                                |
|                                  |                |                        |     |          |     | <b>Internal LDO output</b>                                                                                 |
|                                  | Required       | C21                    |     | 2.2 uF   |     | Internal LDO output stabilizing capacitor                                                                  |
| PHASE & BTST                     | Recommended    | C25                    |     | 470 pF   |     | Low-side FET timing capacitor                                                                              |
|                                  | Required       | Q5                     |     | -        |     | Converter Low-Side N-Channel MOSFET                                                                        |
|                                  |                |                        |     |          |     | <b>High-Side N-Channel MOSFET driver</b>                                                                   |
| HIDRV                            | Required       | C24                    |     | 0.047 uF |     | Converter bootstrap capacitor                                                                              |
|                                  | Recommended    | R19                    |     | 6.8 Ω    |     | Bootstrap capacitor snubbing resistor                                                                      |
|                                  | Optional       | R25                    |     | * Ω      |     | Switching converter snubber circuit                                                                        |
| EMI Reduction                    | Optional (DNP) | C26                    |     | * uF     |     | Snubber circuit values empirically determined if required. Recommend unpopulated footprint on new designs. |
|                                  |                |                        |     |          |     | <b>EMI</b>                                                                                                 |
|                                  | Optional       | CEM12                  |     | 1 nF     |     | HI-side FET EMI Filter Caps                                                                                |
| HIFET                            | Optional       | CEM11                  |     | 10 nF    |     |                                                                                                            |
|                                  |                |                        |     |          |     |                                                                                                            |

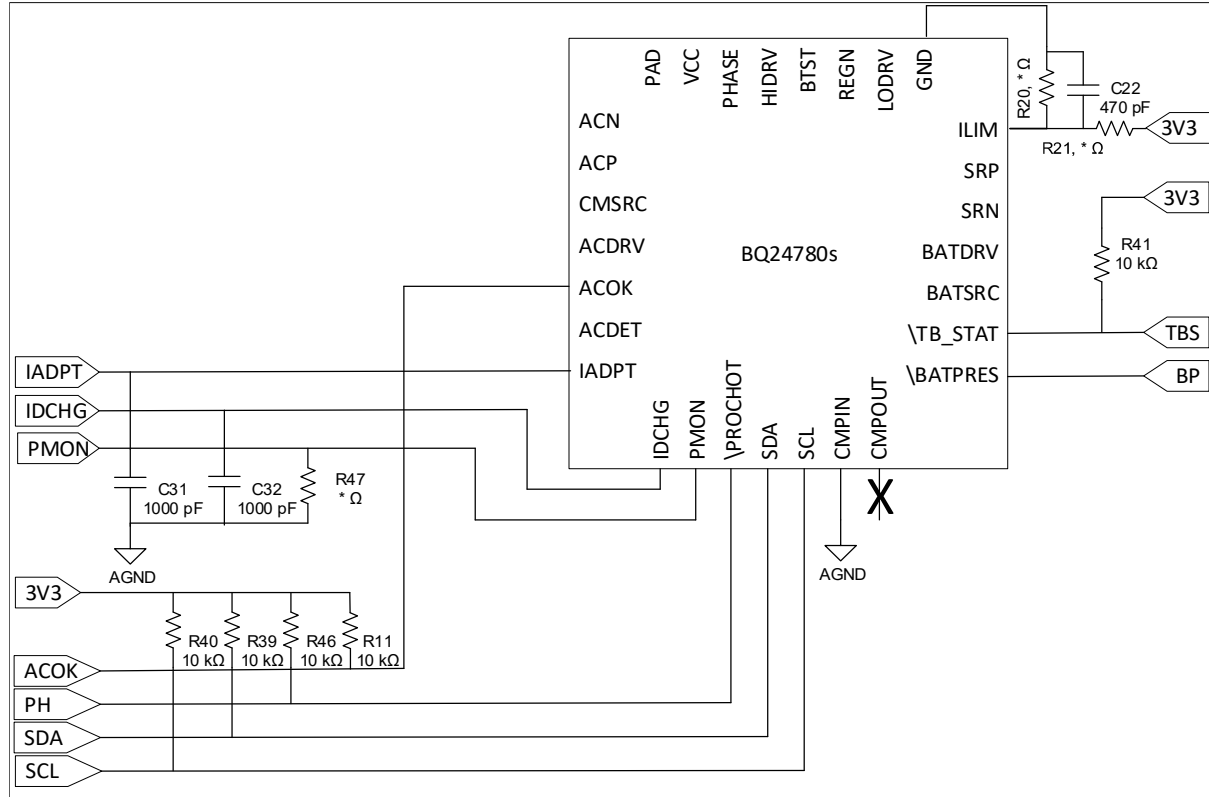
$$f_o = \frac{1}{2 \cdot \pi \cdot \sqrt{L_{out} \cdot C_{out}}}$$

Recommended: 10 kHz < f<sub>o</sub> < 20 kHz, typical L= 3.3 uH, C = 20 uF

$$f_o = \frac{1}{2 \cdot \pi \cdot \sqrt{L_{out} \cdot C_{out}}}$$

Slowing MOSFET turn-on/off reduces noise and EMI, but also reduces efficiency.

Slowing MOSFET turn-on/off reduces noise and EMI, but also reduces efficiency.



| Miscellaneous - DESIGN CHECKLIST |          |             |           |     |        |        |                                                        |                                                                                                                                                                                                           |                                                                                                   |
|----------------------------------|----------|-------------|-----------|-----|--------|--------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| PIN                              |          | REQUIREMENT | COMPONENT | MIN | TYP    | MAX    | DESCRIPTION                                            | COMMENTS AND RELEVANT EQUATIONS                                                                                                                                                                           |                                                                                                   |
| SDA/SCL                          | 19-20    | Required    | R39       |     | 10 kΩ  |        | I2C Pullups<br>Pull-up resistors to 3.3V               |                                                                                                                                                                                                           |                                                                                                   |
|                                  |          | Required    | R40       |     | 10 kΩ  |        |                                                        |                                                                                                                                                                                                           |                                                                                                   |
| ACOK                             | 5        | Required    | R11       |     | 10 kΩ  |        | ACOK Pullup<br>ACOK pull-up resistor to 3.3V           |                                                                                                                                                                                                           |                                                                                                   |
|                                  |          | Required    | R46       |     | 10 kΩ  |        | Prochot Pullup<br>\PROCHOT pull-up resistor to 3.3V    |                                                                                                                                                                                                           |                                                                                                   |
| PMON                             | 9        | Optional    | R47       |     | * Ω    |        | Power Monitor                                          | Float pin if unused                                                                                                                                                                                       | $R_{47} < \frac{3.3V}{P_{max} * \left(1 \frac{\mu A}{W} \text{ or } 0.25 \frac{\mu A}{W}\right)}$ |
|                                  |          | Optional    | C33       |     | 0      | 100 pF |                                                        |                                                                                                                                                                                                           |                                                                                                   |
| IDCHG                            | 8        | Optional    | C18       |     | 100 pF | 100 pF | Discharge Current                                      | Float pin if unused                                                                                                                                                                                       |                                                                                                   |
| IADPT                            | 7        | Optional    | C8        |     | 100 pF | 100 pF | Adapter Current                                        | Float pin if unused                                                                                                                                                                                       |                                                                                                   |
|                                  |          | Optional    | C8        |     | 100 pF | 100 pF | External Current Limit                                 | Float pin if unused                                                                                                                                                                                       |                                                                                                   |
| ILIM                             | 21       | Required    | R20       |     | * Ω    |        | ILIM Resistor divider                                  | $V_{ILIM} = 20 * R_{AC} * I_{ILIM}$                                                                                                                                                                       |                                                                                                   |
|                                  |          | Required    | R21       |     | * Ω    |        | ILIM Resistor divider                                  |                                                                                                                                                                                                           |                                                                                                   |
| TB_STAT                          | 7        | Optional    | C8        |     | 10 kΩ  |        | Turbo Boost Status<br>TB_STAT pull-up resistor to 3.3V | Float pin if unused                                                                                                                                                                                       |                                                                                                   |
| CMPIN/CMPOUT                     | 7        | Optional    |           |     | -      |        | Independent Comparator                                 | If unused, Ground CMPIN and float CMPOUT                                                                                                                                                                  |                                                                                                   |
| GND & PAD                        | 22 & PAD | Required    | -         |     | -      |        | IC Ground return                                       | Recommend separate analog and power ground. GND pin 22 connects to analog ground, PAD connects to power ground. Join analog and power ground at single point with 0-ohm resistor, net tie or 10 mil trace |                                                                                                   |