



EZ6301QI Triple Output Module

1.5A DC-DC Buck Module with 2 x 300mA LDOs

EVALUATION BOARD OVERVIEW

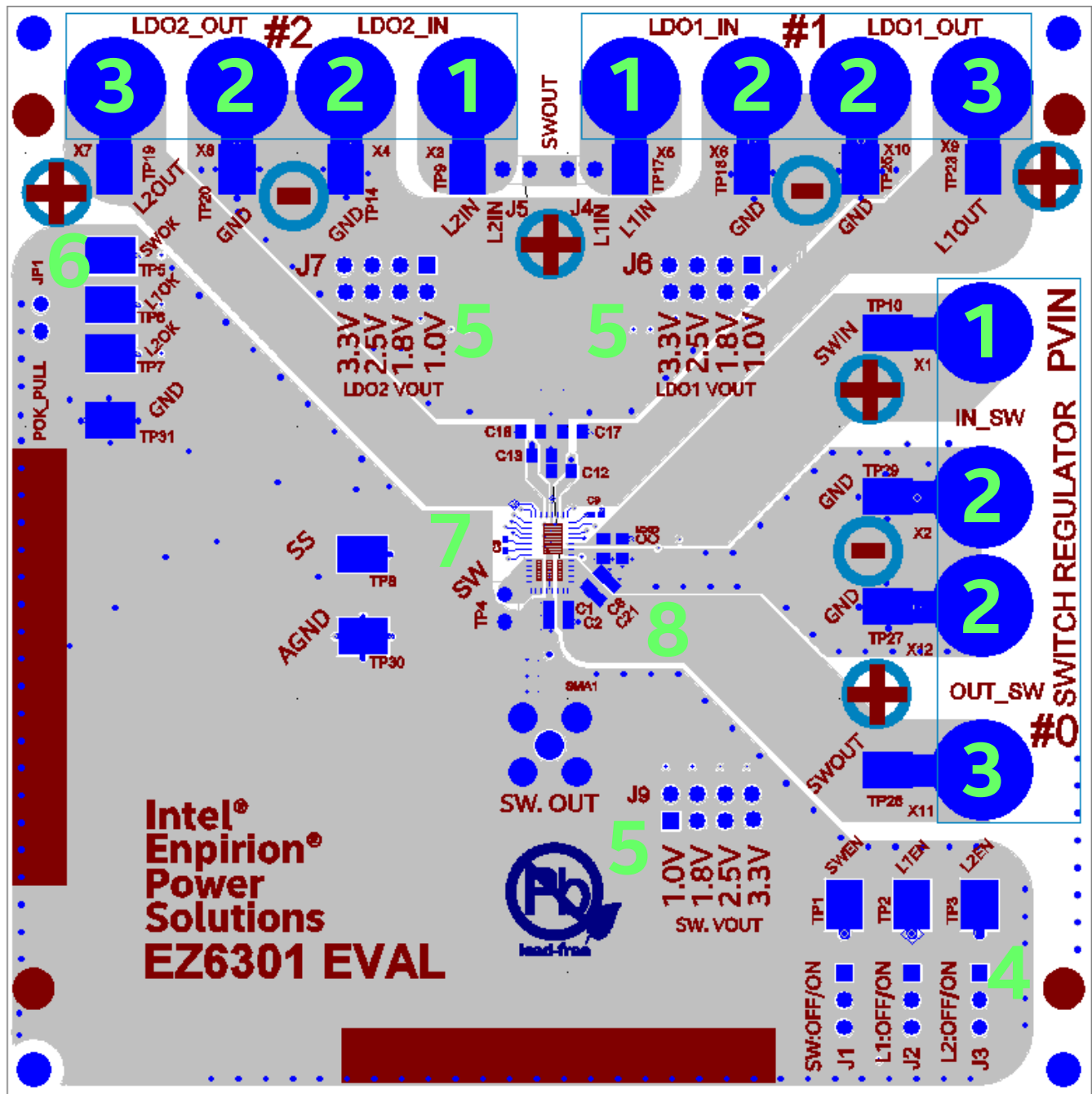


Figure 1: Evaluation Board (EVB) Features (Top View)

NOTE A: The EZ6301QI Evaluation Board is shown in Figure 1 with the important features numbered.

NOTE B: The following instructions will directly correlate with the numbers shown in Figure 1.

EVALUATION BOARD INSTRUCTIONS

1) Input Voltage (PVIN, L1IN, L2IN) - Connect 2.7V to 6.6V supply on the DC-DC Regulator input supply (PVIN). Connect 1.8V to 5.5V on the LDO input supplies (LDO1_IN and LDO2_IN). The LDO input supplies may be jumpered together with J5. Pay attention to input polarity and do not turn on until everything is connected correctly.

2) Ground (GND) - Connect the input and output ground to GND for each rail, respectively.

3) Output Voltage (OUT_SW, L1OUT, L2OUT) - Connect the load to the buck output (OUT_SW), the LDO1 output (L1OUT) and the LDO2 output (L2OUT). If the instructions were followed up to this point, the device may be powered on.

4) Enable (SWENk, L1EN, L2EN) - The ENABLE is internally pulled low to ground. The jumpers J1, J2 and J3 may be used to enable or disable each rail, respectively. An external signal may be applied to the J1, J2 or J3 pins to enable or disable each corresponding rail.

5) Output Voltage Settings - The output voltage of each rail may be adjusted quickly by placing a jumper on the jumper sets J6, J7 and J9. The voltages available for the buck regulator are 0.6V, 1V, 1.8V, 2.5 and 3.3V. The voltages available for the LDOs are 0.9V, 1V, 1.8V, 2.5V and 3.3V. The compensation CA may be adjusted according to Table 1 for best results. The output voltage may also be adjusted to any voltage as indicated by the equation for RB shown in Figure 2 and Figure 3.

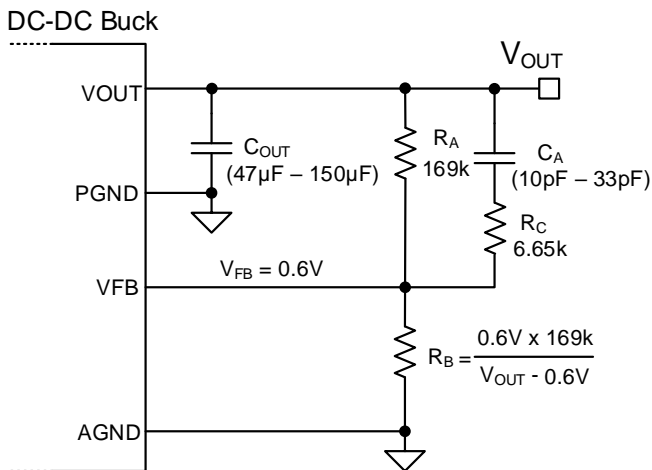


Figure 2: DC-DC VOUT Resistor Divider & Compensation Capacitor

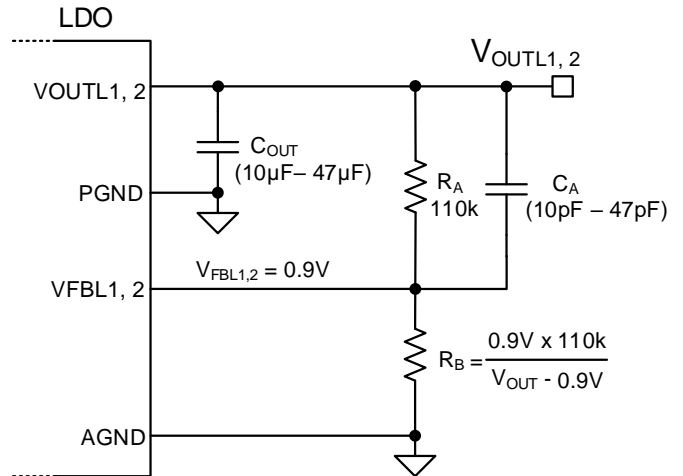


Figure 3: LDO VOUT Resistor Divider & Compensation Capacitor

Table 1: External Compensation Recommendations

| Rail | V _{OUT} | R _B | C _A | R _A | R _C | C _{OUT} |
|-------|------------------|----------------|----------------|----------------|----------------|------------------------|
| DC-DC | 0.6V | OPEN | 33pF | 169kΩ | 6.65kΩ | 47μF or 2 x 22μF |
| | 0.9V | 590kΩ | 33pF | | | |
| | 1.0V | 374kΩ | 33pF | | | |
| | 1.2V | 249kΩ | 33pF | | | |
| | 1.5V | 165kΩ | 27pF | | | |
| | 1.8V | 124kΩ | 27pF | | | |
| | 2.5V | 78.7kΩ | 27pF | | | |
| | 3.3V | 37.4kΩ | 27pF | | | |
| LDO | 1.0V | 1MΩ | 33pF | 110kΩ | 0 | 47μF or 2 x 22μF |
| | 1.2V | 332kΩ | 33pF | | | |
| | 1.5V | 165kΩ | 27pF | | | |
| | 1.8V | 110kΩ | 27pF | | | |
| | 2.5V | 61.9kΩ | 27pF | | | |
| | 3.3V | 41.2kΩ | 27pF | | | |

6) Power OK (SWOK, L1OK, L2OK) - The power OK is an open drain flag. When output voltage is within ±10% of regulation, the power OK flag will be pulled high to PVIN through a 100k resistance for each rail. Be sure there is a jumper on JP1 to connect the POKs to PVIN.

7) Soft Start Capacitor (C9) – The soft start capacitor (C9) is 15nF by default and can be between 10nF to 100nF. The output rise time is controlled by C9. The voltage rise time calculation is shown:

$$\text{Rise Time} \rightarrow t_{\text{RISE}} [\text{ms}] = C_{\text{SS}} [\text{nF}] \times 0.065$$

$$C_{\text{SS}} = 10\text{nF} \rightarrow t_{\text{RISE}} \approx 0.65\text{ms}$$

$$C_{\text{SS}} = 100\text{nF} \rightarrow t_{\text{RISE}} \approx 6.5\text{ms}$$

8) Bulk Capacitors – The EZ6301QI DC-DC buck regulator may support up to 150μF on the output, but

the compensation should be adjusted accordingly. Using Table 1 as the reference for C_A , if C_{OUT} is increased, then the C_A should also be increased. The relationship is linearly shown below:

$$\Delta C_{\text{OUT}} \approx +50\mu\text{F} \rightarrow \Delta C_A \approx +5\text{pF}$$

The recommended maximum output capacitance ($C_{\text{OUT_MAX}}$) is 150μF and phase-lead capacitance (C_{A_MAX}) is 47pF. The LDO output capacitance range should be between 10μF to 47μF.

BILL OF MATERIALS (B.O.M.)

| Quantity | Reference | Description | Manufacturer | Part Number |
|----------|----------------------------|---|-----------------------|--------------------|
| 2 | C10,C11 | CAP CER 47PF 50V 5% NPO 0603 | AVX | O6035A470JAT2A |
| 1 | C1 | CAP CER 47UF 4V X6S 0805 | Murata | GRM21BC80G476ME15L |
| 1 | C9 | 15NF X7R 0402 25V 10% CERAMIC CAPACITOR | Murata | GRM155R71E153KA61D |
| 7 | C5,C12,C13,C16,C17,C18,C19 | CAP, 10UF 0805 X7R 10% 10V CERAMIC | Murata | GRM21BR71A106KE51L |
| 1 | R20 | RES - 255K OHM, 1/16W, +/- 1%, 0402 SMD | Panasonic | ERJ-2RKF2553X |
| 3 | R2,R3,R4 | RES 100K OHM 1/16W 1% 0402 SMD | Panasonic | ERJ-2RKF1003X |
| 1 | R25 | RES ZERO OHM 1/10W 5% 0603 SMD | Panasonic | ERJ-3GEY0R00V |
| 1 | R24 | RES ZERO 6.65k OHM 1/10W 1% 0603 SMD | Panasonic | ERJ-3GEY6651V |
| 1 | R1 | RESISTOR ZERO OHM 1/10W 5% 0402 SMD | Panasonic | ERJ-2GE0R00X |
| 1 | R18 | RESISTOR 169K OHM 1/16W 1% 0402 SMD | Panasonic | ERJ-2RKF1693X |
| 2 | R11,R14 | RES 110K OHM 1% 1/16W 0402 SMD | Panasonic | ERJ-2RKF1103X |
| 2 | R6,R9 | RES SMD 110K OHM 1% 1/10W 0603 | Vishay Dale | CRCW0603110KFKEA |
| 1 | R5 | RES, 10 OHM,, 1/16W, 0402, 1%, SMD | Yageo | RC0402FR-0710RL |
| 2 | R7,R8 | RES, 976K, 1/16W, 0402, 1%, SMD | Vishay Dale | CRCW0402976KFKED |
| 1 | R23 | RES - 38.3K OHM, 1/16W, 1%, 0402 SMD | Panasonic | ERJ-2RKF3832X |
| 2 | R13,R16 | RES - 41.2K OHM, 1/16W, 1%, 0402 SMD | Vishay | CRCW040241K2FKED |
| 2 | R12,R15 | RES - 61.9K OHM, 1%, 1/16W, 0402 SMD | Panasonic | ERJ-2RKF6192x |
| 1 | R22 | RES - 53.6K OHM, 1/16W, 1%, 0402 SMD | Yageo America/Phycomp | RC0402FR-0753K6L |
| 1 | R21 | RES - 84.5K OHM, 1/10W, 1%, 0402 SMD | Panasonic | ERJ-2RKF8452X |
| 1 | C7 | CAP - CER, 10NF, 50V, +/-10%, X7R, 0402 SMD | Murata | GRM155R71H103KA88D |

Evaluation Board User Guide | Intel Enpirion® Power Solutions: EZ6301QI

| | | | | |
|---|---------|---|----------------------------------|--------------------|
| 1 | C20 | CAP - CER, 27PF, 50V, +/-5%, COG, 0603 SMD | Murata | GCM1885C1H270JA16D |
| 2 | C14,C15 | CAP - POLY TANT, 47UF, 35V, 20%, ESR 0.070 OHM, SMD 7343-43 | Kemet Corporation | T521X476M035ATE070 |
| 1 | C4 | CAP - TANT POLYMER, 150UF, 16V, 50MOHM ESR20%, 7343*1.8MM | Panasonic | 16TQC150MYF |
| 1 | CHF1 | CAP CER 0.47UF 25V 20% X7R 0612 | Murata | LLL31MR71E474MA01L |
| 1 | L1 | 1000 NH 3.2MM X 2.5MM X 1.2MM INDUCTOR | FDK | MIPSAZ3225D1R0 |
| 1 | C1 | CAP CER 2200PF 16V X7R 0201 | MURATA ELECTRONICS NORTH AMERICA | GRM033R71C222KA88D |
| 1 | U1 | EZ6301QI TRIPLE OUTPUT BUCK MODULE W/ 2XLDO 7X4MM | Intel | EZ6301QI-GTP-02 |

WHERE TO GET MORE INFORMATION

For more information about Intel and Intel Enpirion PowerSoCs, visit:

<https://www.altera.com/products/power/overview.html>

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