

0.3 μA I_{Q} Ultra-low Quiescent Current 300 mA Buck DC/DC Converter Evaluation Board

No. EEV-400-Z181D-191021

RP512Z181D-EV is the evaluation board for RP512 which has the below features, benefits and specifications.

OVERVIEW

RP512Z is a DC/DC converter featuring 0.3 μA ultra-low operating quiescent current. It is suitable for use in wearable and IoT devices that require miniaturization and long-lifetime of battery.

KEY BENEFITS

- VFM (f_{sw} up to 1 MHz) control achieves 0.3 μA ultra-low operating quiescent current.
- The wide range of V_{IN} from 2.0 V to 5.5 V allows operation from coin cell to USB port.
- Total mount area including C_{IN} , C_{OUT} , and inductor is 10.6 mm^2 .
- 0.4 mm-thickness WLCSP package adaptable to IC cards.

KEY SPECIFICATIONS

- Output Current: 300 mA
- Output Voltage Range: 1.0 V to 4.0 V (Settable in 0.1 V step)
- Output Voltage Accuracy: $\pm 1.5\%$ ($V_{\text{SET}} \geq 1.2 \text{ V}$), $\pm 18 \text{ mV}$ ($V_{\text{SET}} < 1.2 \text{ V}$)
- Built-in Driver On-resistance ($V_{\text{IN}} = 3.6 \text{ V}$): Typ. PMOS 0.15 Ω , NMOS 0.15 Ω (RP512Z)
- Standby Current: 0.01 μA
- Package: WLCSP-8-P1
- For more details on RP512 IC, please refer to <https://www.e-devices.ricoh.co.jp/en/products/power/dcdc/rp512/rp512-ea.pdf>.

PART NUMBER INFORMATION

| Product Name | Package |
|--------------|------------|
| RP512Z181D | WLCSP-8-P1 |

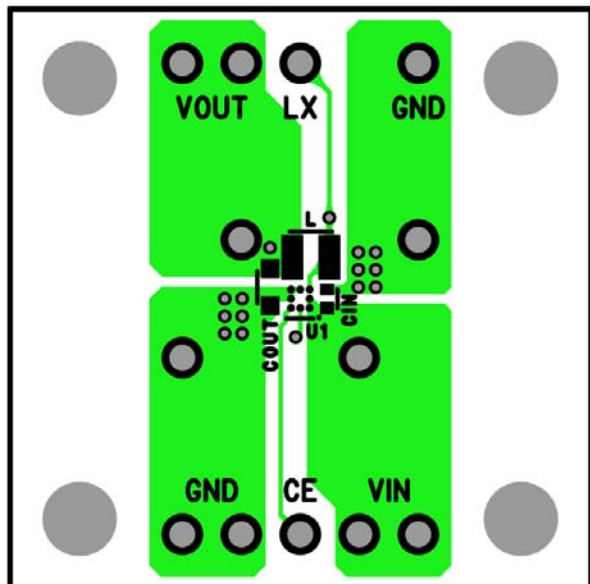
181: Specify the set output voltage (V_{SET}): 1.8 V.

D: Specify with auto-discharge function.

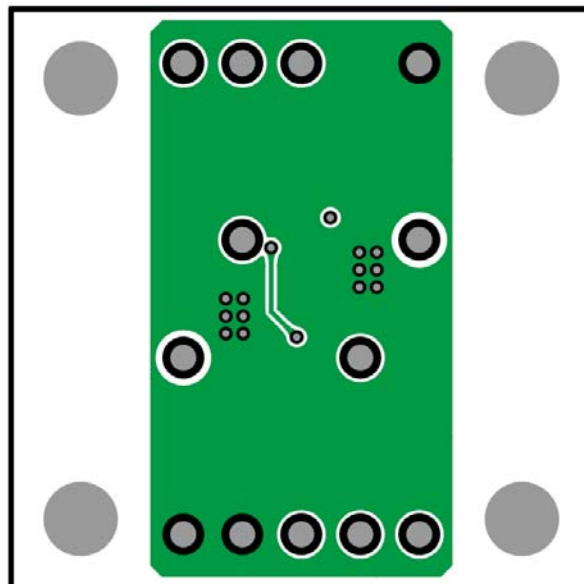
PCB LAYOUT

RP512Z (WLCSP-8-P1)

Top Layer



Bottom Layer



ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

(GND = 0 V)

| Symbol | Parameter | Rating | Unit | |
|------------|----------------------------------|-----------------------------|------|----|
| V_{IN} | Input Voltage | -0.3 to 6.5 | V | |
| V_{LX} | LX Pin Voltage | -0.3 to $V_{IN} + 0.3$ | V | |
| V_{CE} | CE Pin Voltage | -0.3 to 6.5 | V | |
| V_{MODE} | MODE Pin Voltage | -0.3 to 6.5 | V | |
| V_{OUT} | VOUT Pin Voltage | -0.3 to 6.5 | V | |
| I_{LX} | LX Pin Output Current | 650 | mA | |
| P_D | Power Dissipation ⁽¹⁾ | WLCSP-8-P1, JEDEC STD. 51-9 | 1140 | mW |
| T_j | Junction Temperature Range | -40 to 125 | °C | |
| T_{stg} | Storage Temperature Range | -55 to 125 | °C | |

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING CONDITIONS

Recommended Operating Conditions

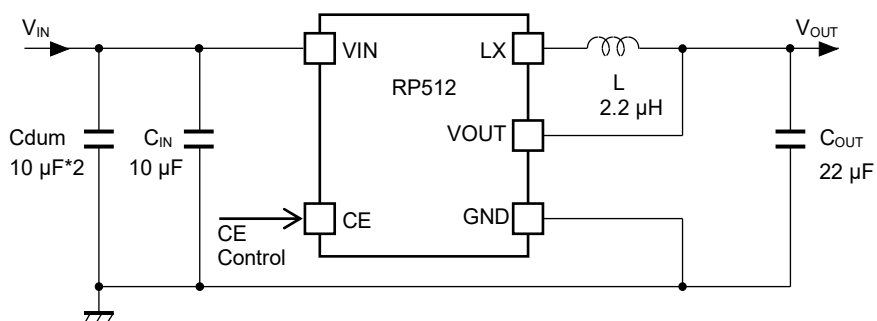
| Symbol | Parameter | Rating | Unit |
|----------|-----------------------------|------------|------|
| V_{IN} | Input Voltage | 2.0 to 5.5 | V |
| T_a | Operating Temperature Range | -40 to 85 | °C |

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

⁽¹⁾ Refer to *POWER DISSIPATION* in the product data sheet.

TYPICAL APPLICATION



RP512 Typical Application Circuit

※Testing with this EV board, an external attachment might be necessary for evaluation of the correct performance of the RP512 and already has been attached as Cdum.

For evaluation, wiring for power supply or GND will be used. Considering the voltage drop or noise by the wiring, Cdum has been mounted on the EV board to obtain the right performance of the RP512.

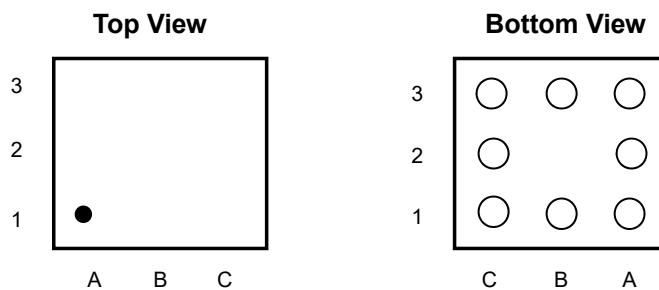
In the actual PCB layout or measurement unit's wire is very short, and Cdum will be unnecessary.

Recommended External Components*1

| Symbol | Value |
|------------------|-----------|
| C _{IN} | 10 μF |
| C _{OUT} | 22 μF |
| C _{dum} | 10 μF x 2 |
| L | 2.2 μH |

*1 The bill of materials will be attached on the shipment of each purchased evaluation board.

PIN DESCRIPTION



RP512Z (WLCSP-8-P1) Pin Configuration

RP512Z [WLCSP-8-P1] Pin Description

| Pin No. | Symbol | Description |
|---------|--------|-------------------------------|
| A1 | VIN | Input Pin |
| B1 | VIN | Input Pin |
| C1 | LX | Switching Pin |
| A2 | VOUT | Output voltage Pin |
| C2 | GND | Ground Pin |
| A3 | CE | Chip Enable Pin (Active-high) |
| B3 | GND | Ground Pin |
| C3 | GND | Ground Pin |

TECHNICAL NOTES

The performance of a power source circuit using this device is highly dependent on the peripheral circuit. A peripheral component or the device mounted on PCB should not exceed a rated voltage, a rated current or a rated power. When designing a peripheral circuit, please be fully aware of the following points.

- When an intermediate voltage other than V_{IN} and GND is input to the CE pin, a supply current may be increased by a through current of a logic circuit in the IC. The CE pin is neither pulled up nor pulled down, therefore the operation is not stable at open.



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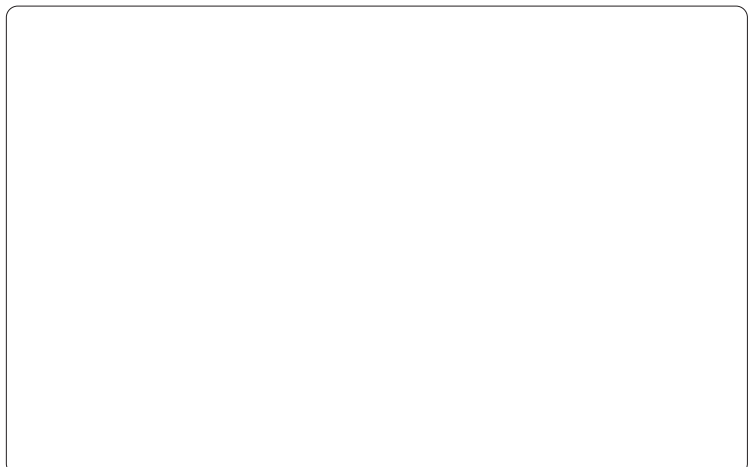
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