500mA, 5.5V, Low Noise Low Dropout Regulator

General Description

The Evaluation Board user guide describes the operational use of the RTQ2531W evaluation board as a reference design for demonstration and evaluation of the RTQ2531W, a low-noise, high accuracy, low-dropout (LDO) linear regulator.

Included in this user guide are setup and operating instructions, thermal and layout guidelines, a printed circuit board (PCB) layout, a schematic diagram, and a bill of materials (BOM). For more detail information, please refer to the RTQ2531W datasheet

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Performance Specification Summary

Summary of the RTQ2531W Evaluation Board performance specificiaiton is provided in Table 1. The ambient temperature is 25°C.

Table 1. RTQ2531W Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range		1.7	3.8	5.5	V
Output Current		0	--	0.5	A
Output Voltage Range		0.6	3.3	5.3	V
Line Regulation	1.7V ≤ V_{IN} ≤ 5.5V for V_{OUT} ≤ 1.4V, V_{OUT} + 0.3V ≤ V_{IN} ≤ 5.5V for V_{OUT} ≥ 1.4V, I_{OUT} = 200mA	--	0.04	--	%/V
Load Regulation	0.1mA ≤ I_{OUT} ≤ 500mA	--	0.02	--	%/A
Load Transient Response	I_{OUT} = 50mA to 500mA to 50mA, t_{RISE} = t_{FALL} = 1µs	--	50	--	mV/P-P

Power-up Procedure

Suggestion Required Equipments

- RTQ2531W Evaluation Board
- DC power supply capable of at least 5.5V and 500mA
- Electronic load capable of 500mA
- Function Generator
- Oscilloscope

Quick Start Procedures

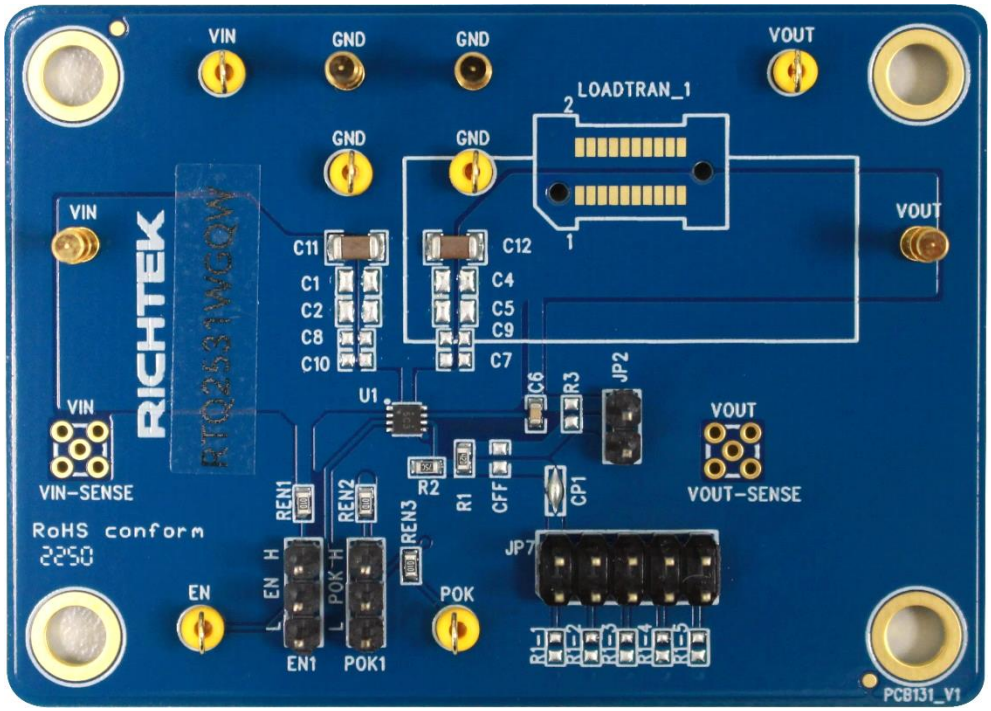
The Evaluation Board is fully assembled and tested. Follow the steps below to verify board operation. Do not turn on supplies until all connections are made. When measuring the output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip and groundring directly across the last output capacitor.

Proper measurement equipment setup and follow the procedure below.

1) With power off, connect the input power supply to VIN and GND pins.
2) With power off, connect the electronic load between the VOUT and nearest GND pins.
3) Turn on the power supply at the input. Make sure that the input voltage does not exceeds 6V on the Evaluation Board.
4) Check for the proper output voltage using a voltmeter.
5) Once the proper output voltage is established, adjust the load within the operating ranges and observe the output voltage regulation, quiescent current, dropout voltage, PSRR, noise and other performance.

Detailed Description of Hardware

Headers Description and Placement



Carefully inspect all the components used in the EVB according to the following Bill of Materials table, and then make sure all the components are undamaged and correctly installed. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at evb_service@richtek.com.

Test Points

The EVB is provided with the test points and pin names listed in the table below.

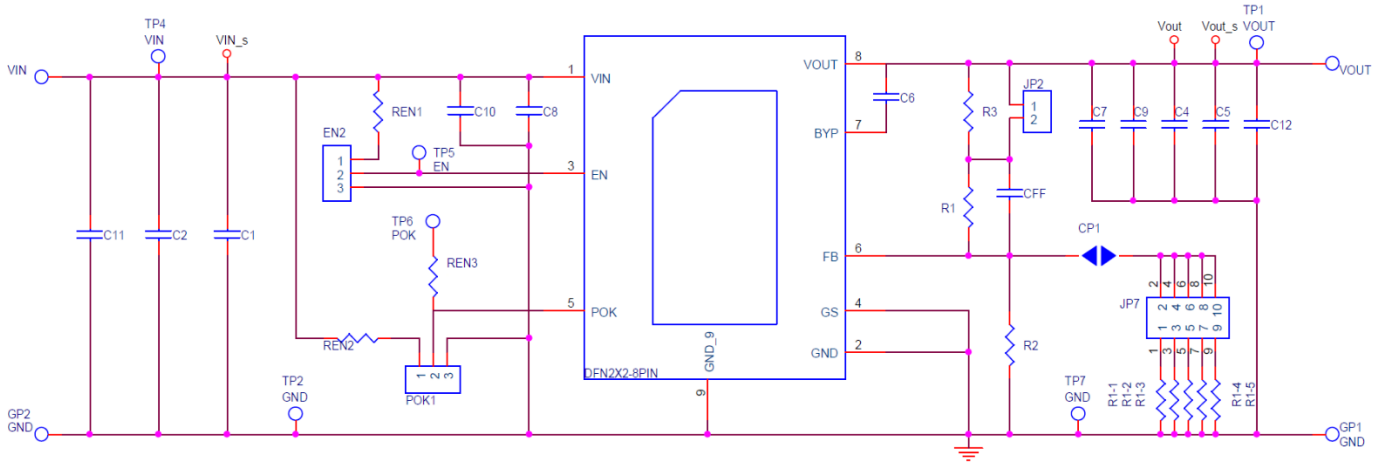
Test Point/ Pin Name	Function
VIN	Supply input pin.
GND	System ground pin.
EN	Enable sense pin.
POK	Power-OK sense pin.
VOUT	Output of the regulator.
EN1	User can decide EN pin connected to high or low.
POK1	User can decide POK pin connected to high or low.
JP2	Short to by-pass resistor R3.
JP7	Pins to change resistor divider.

Bill of Materials

V_{IN} = 1.7V to 5.5V, V_{OUT} = 0.6V to 5.3V, I_{OUT} = 500mA						
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U1	1	RTQ2531WGQW	RTQ2531W	LDO	WDFN-8SL 2x2	RICHTEK
C6	1	0603B103K500CT	10nF	Capacitor, ceramic, 50V, X7R	0603	WALSIN
C11, C12	2	GRM21BR71A106KE51L	10µF	Capacitor, ceramic, 10V, X7R	0805	MURATA
R1	1	WR06X2673FTL	267k	Resistor, chip	0603	WALSIN
R2	1	WR06X5902FTL	59k	Resistor, chip	0603	WALSIN
REN1, REN2, REN3	3	WR06X1003FTL	100k	Resistor, chip	0603	WALSIN

Typical Applications

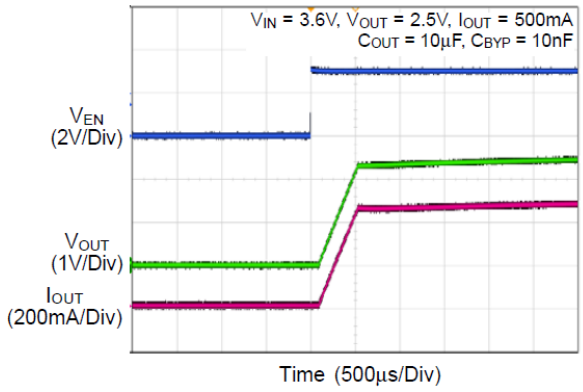
EVB Schematic Diagram



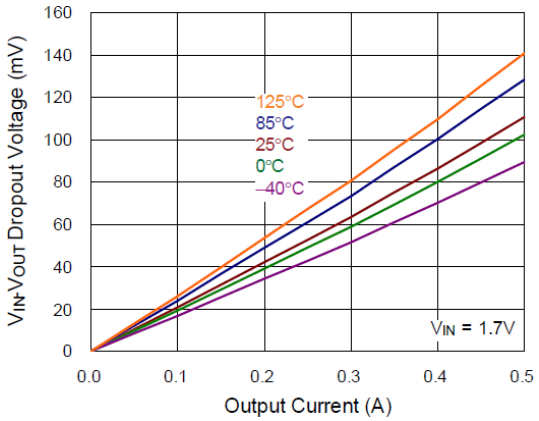
1. The capacitance values of the input and output capacitors will influence the input and output voltage ripple.
2. MLCC capacitors have degrading capacitance at DC bias voltage, and especially smaller size MLCC capacitors will have much lower capacitance.

Measure Result

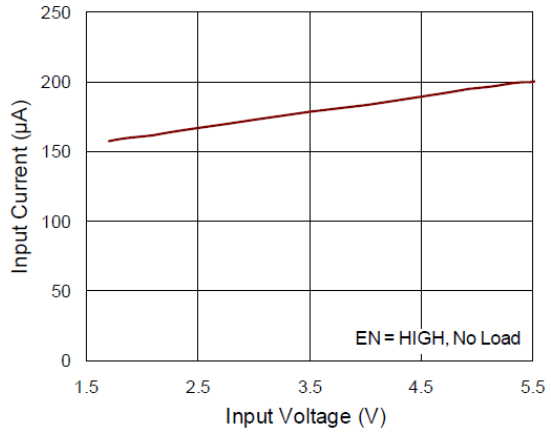
Power Up Response



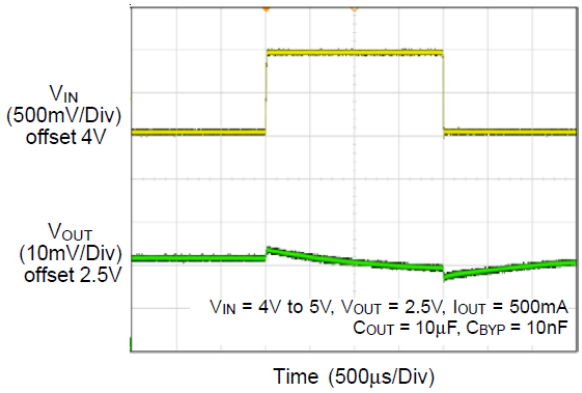
Dropout Voltage vs. Output Current



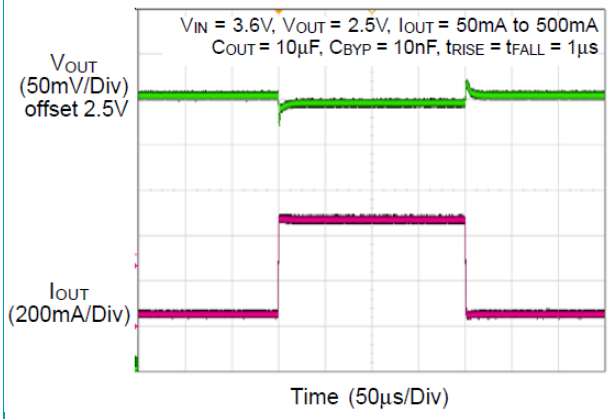
Quiescent Current



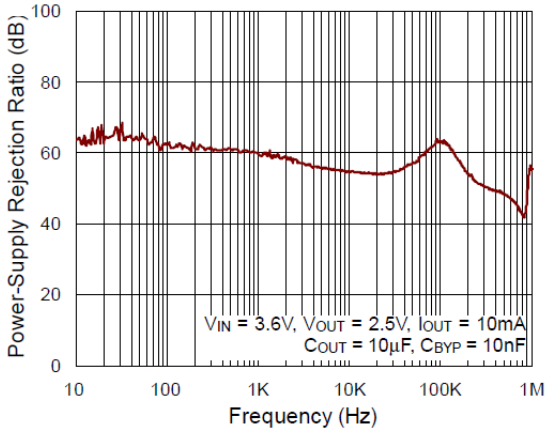
Line Transient Response



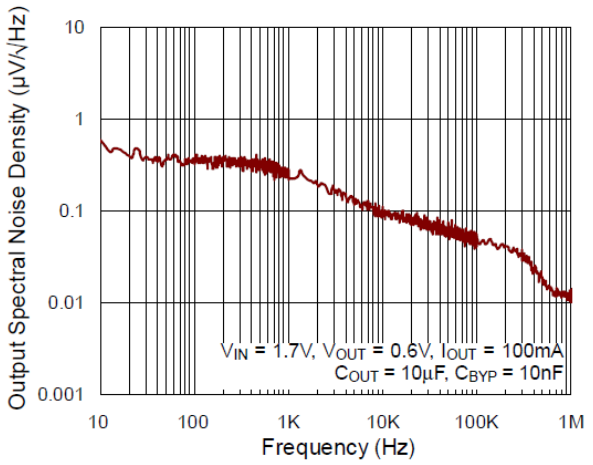
Load Transient Response



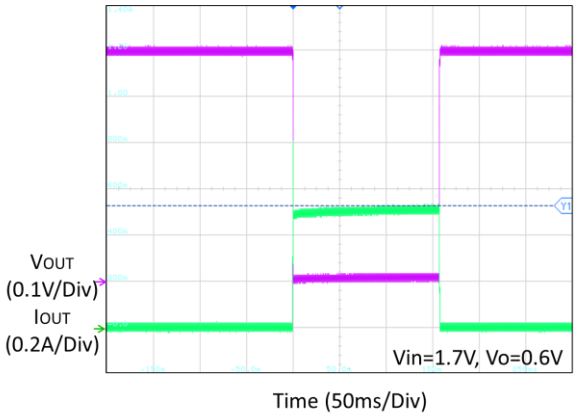
PSRR vs. Frequency



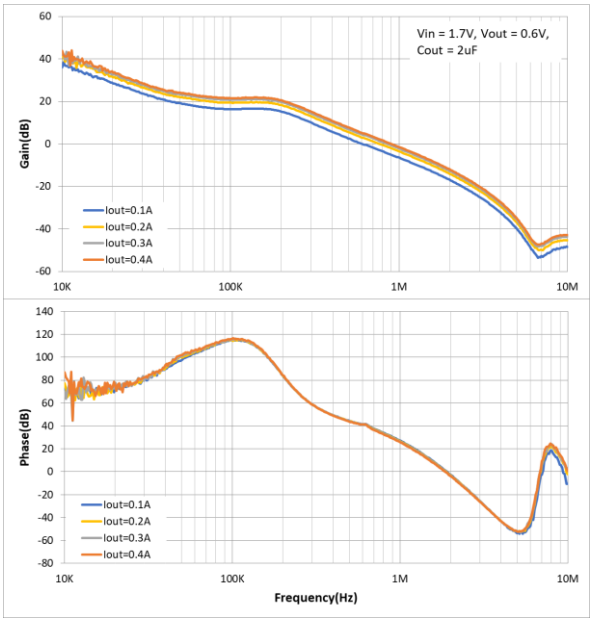
Output Noise vs. Frequency



OCP



Bode Plot



Note: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip directly across the output capacitor.

Evaluation Board Layout

Figure 1 and Figure 2 are RTQ2531W Evaluation Board layout. This board is constructed on two-layer PCB, outer layers with 1 oz. Cu and inner layers with 1 oz. Cu.

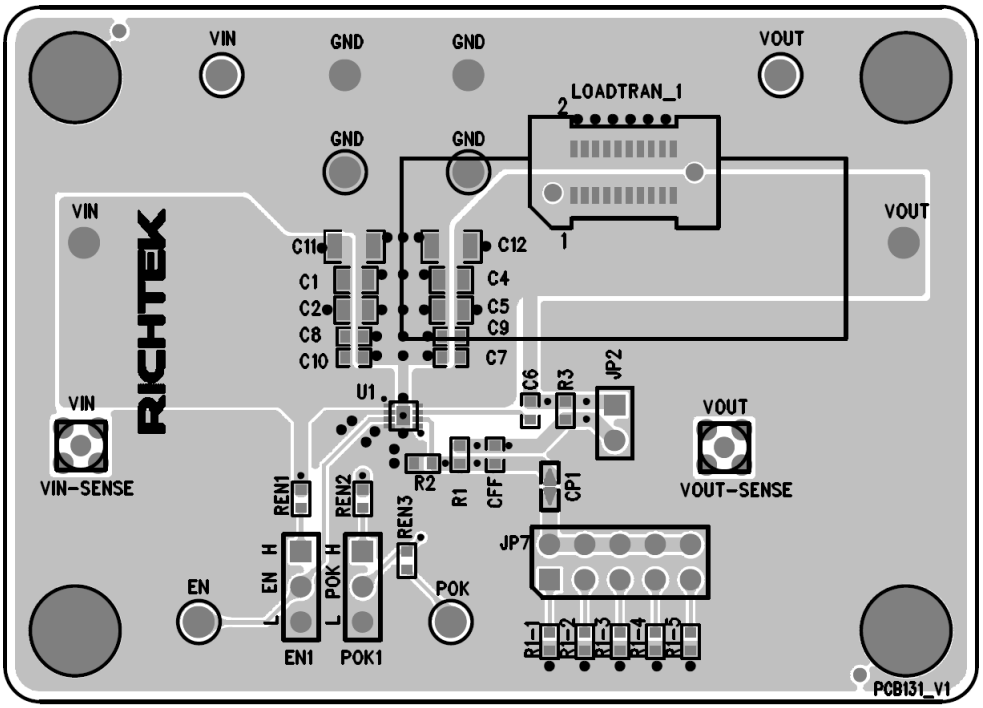


Figure 1. Top View (1st layer)

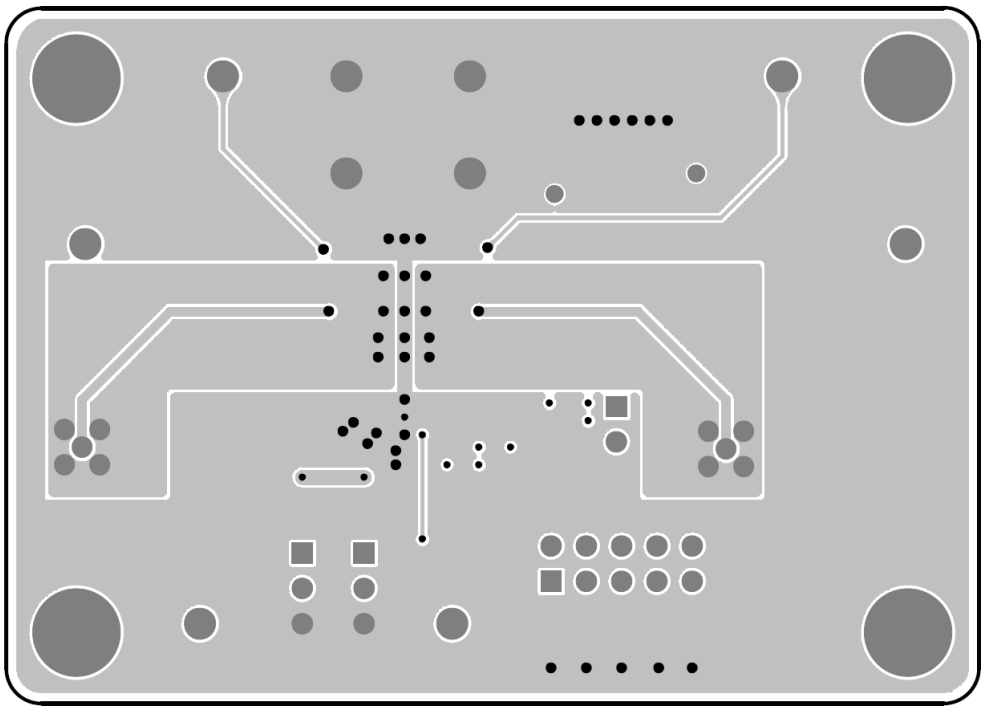


Figure 2. Bottom View (2nd Layer)

More Information

For more information, please find the related datasheet or application notes from Richtek website http://www.richtek.com.

Important Notice for Richtek Evaluation Board