TIDA-00329 Test Report

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Abstract

TI design TIDA-00329 is suitable for low power wearable devices and incorporates a wireless power receiver (bq51003) or a wireless power charger (bq51050B for 4.20-V applications or bq51051B for 4.35-V applications).

It features an ultra-small size (5.23 mm x 5.48 mm) and is capable of up to 2-W power delivery. The included schematic illustrates that all 3 devices can be implemented with a single design. The difference is population of a single resistor.

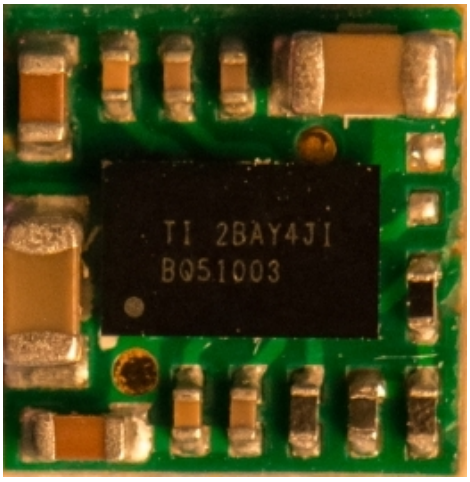

Figure 1. Board Photo

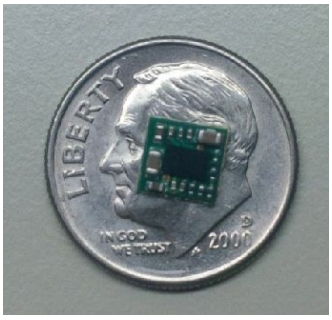

Figure 2. On U. S. Dime

Document History

Version	Date	Author	Notes
1.0	October 3, 2014	Dick Stacey	First release

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Bench Set up

- TIDA-00329 was tested on a bench setup with the bq500212AEVM550 transmitter, wireless receiver coils from TDK and Würth and a Keithley source meter to emulate the load. The test equipment is as follows:
  - Oscilloscope: Tektronix TDS3040, 300 MHz
  - Passive Voltage Probes (4) : Tektronix P6139A – 500 Mhz, 8 pF, 10 MΩ, 10x
  - Current Probe: Tektronix TCP202A Current Probe
  - Power Supply: Agilent E3648A, Keithley Source Meter 2430
  - Electronic Load: Keithley Source Meter 2420
  - Keysight Technology (HP/Agilent) Multi-meter 34401A
  - Wireless Power Transmitter: TI bq500212AEVM-550 PWR550

Receive Coils

- Testing was done with the following receiver coils:
  - TDK WR222230-26M8-G
  - Würth 760308101303

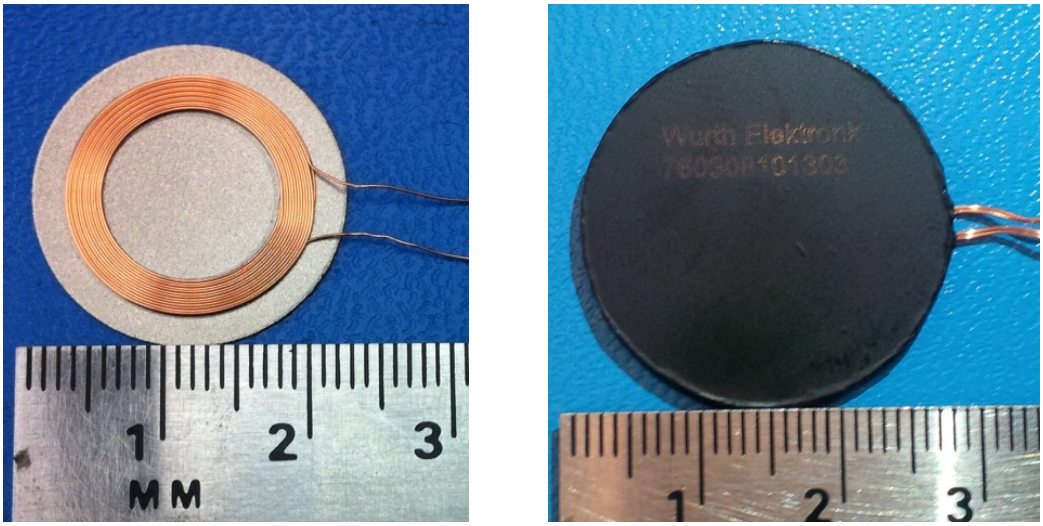


Figure 3. TDK (Left) and Würth (Right) Receiver Coils

Block Diagram

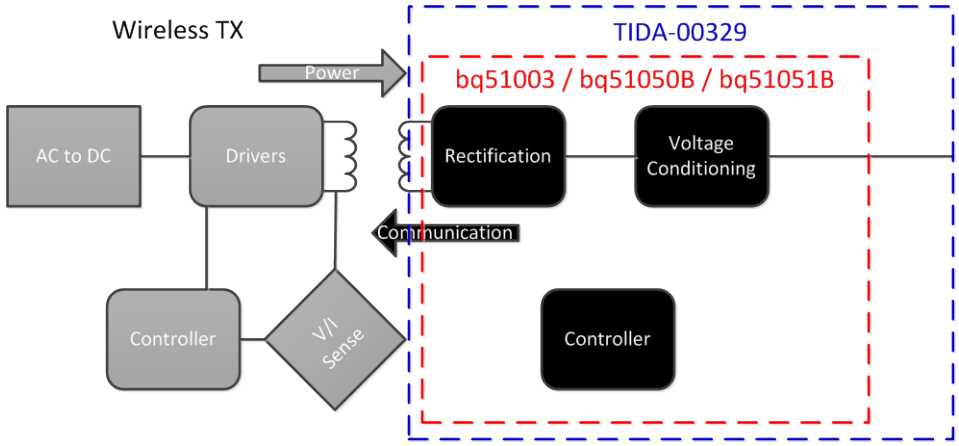


Figure 4. Block Diagram

Schematic

- The schematic shown in Figure 5 illustrates the implementation of a single design allowing the bq51003, bq51050B or the bq51051B with no changes required.

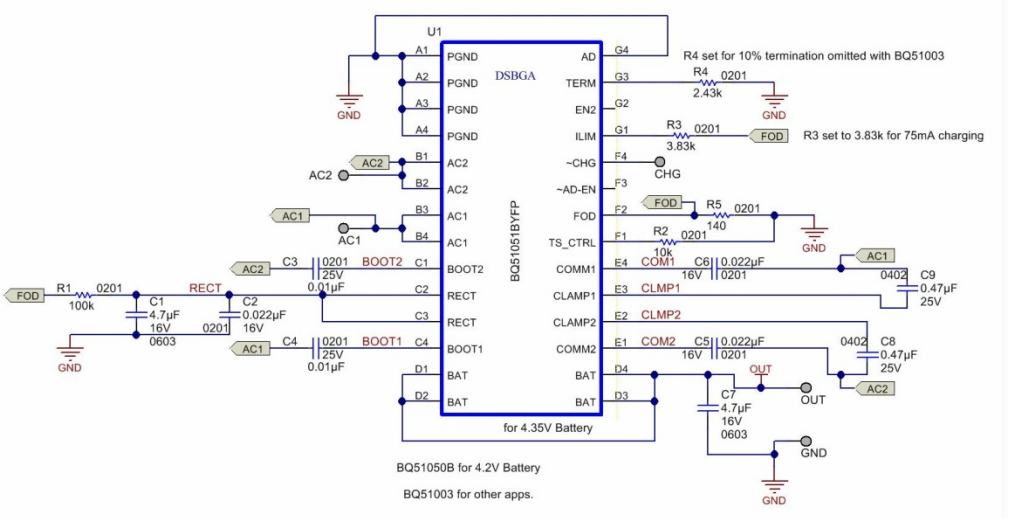


Figure 5. bq51051 Schematic

- Configuration between devices is quite simple as shown in Table 1.

Table 1. Device Configuration

Variant	Device (U1)	Function	Pin G3	R4	R3
001	bq51051B	4.20-V Battery Charger	TERM	Sets termination current	Sets charge current
002	bq51050B	4.35-V Battery Charger	TERM	Sets termination current	Sets charge current
003	bq51003	Power Supply	EN1	Do no populate	Sets maximum current

Efficiency

- Figure 6 shows the efficiency across the power range with the bq51003. This is the total DC/DC system efficiency including the transmitter, coils and receiver. Testing was done with a standard bq500212AEVM-550 transmitter (5-V input) and the TDK coil mentioned above.

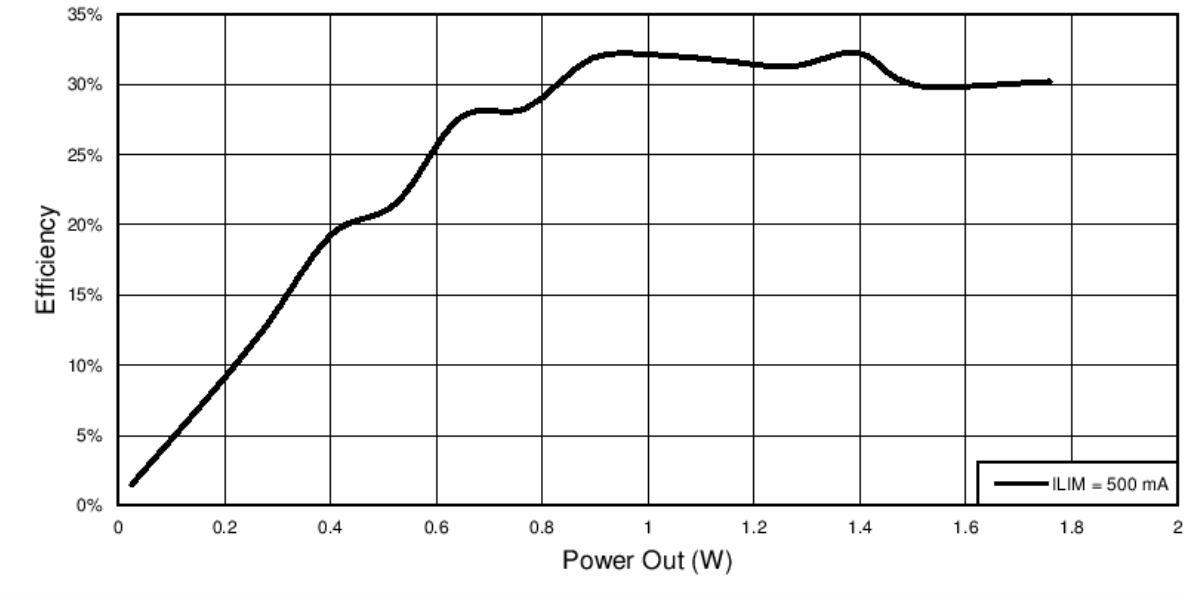
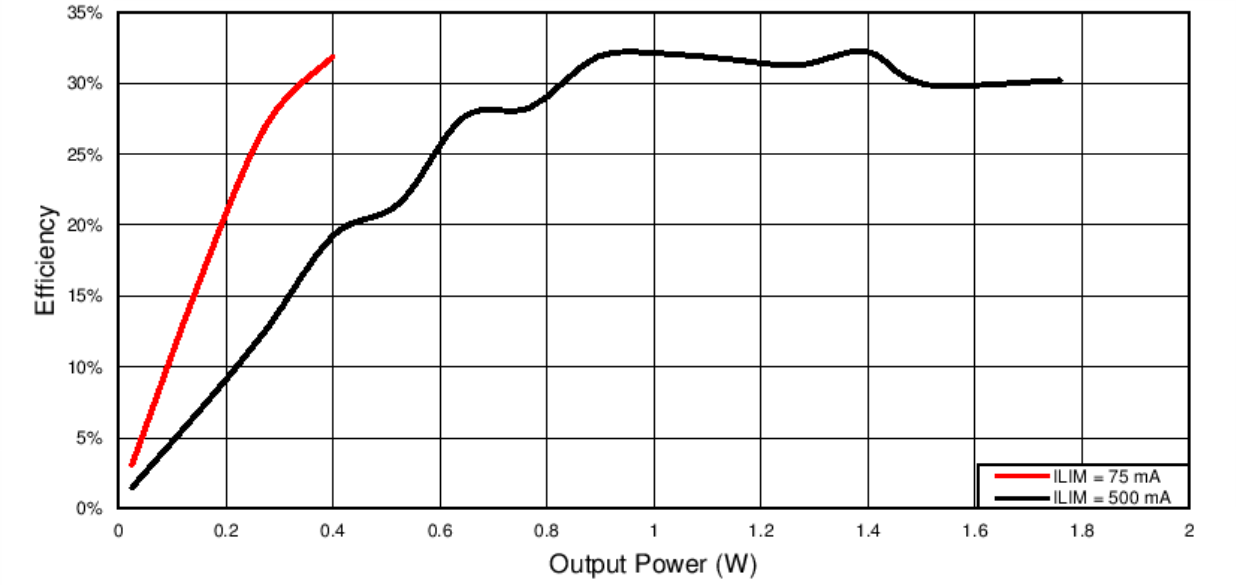


Figure 6 TIDA-00329 Efficiency with bq51003

- Figure 7 shows impact of setting the ILIM on efficiency. This illustrates that setting the current limit appropriately will impact the efficiency. At 75 mA (about 0.4 W) the lower ILIM gives over 10% better efficiency.



Firure 7 TIDA-00329 Efficiency versus Current Limit Setting (ILIM)

Load Step Testing

- The bq51003 configured board was used for load step testing. Figure 6 show a 100-mA load added / removed with a standard bq500212AEVM-550 transmitter (5-V input) and the TDK coil mentioned above.

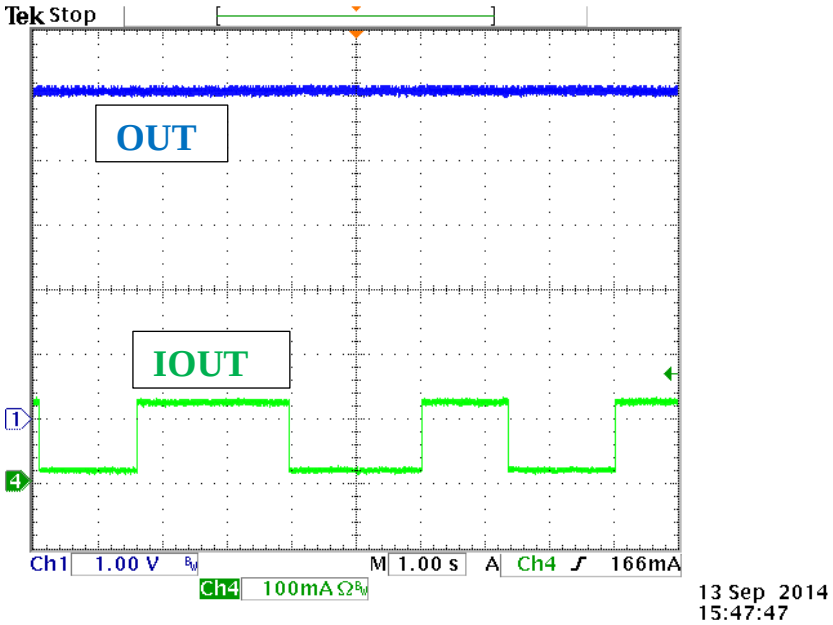


Figure 8 100-mA Load Step

Thermal Measurements

- The following figures show thermal images of the bq51003 configuration at different power levels.

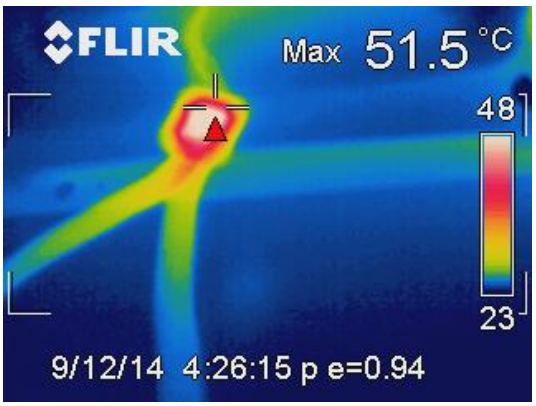


Figure 9a 0.5 W

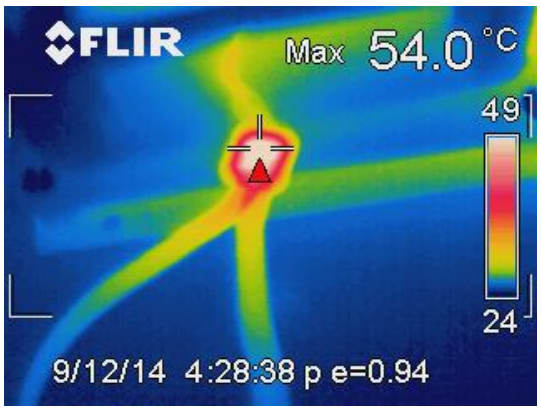


Figure 9b 2.0 W

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