LTC3336
15V/250mA Nanopower Buck DC/DC with Programmable Peak Input Current

DESCRIPTION

Demonstration circuit 2965A shows the LTC®3336 15V/250mA nanopower buck DC/DC with programmable peak input current operating with a configurable output voltage and peak current limit. The LTC3336 supports input voltages from 2.5V to 15V and a peak current up to 300mA with a typical quiescent current of 80nA. Output voltages are configurable from 1.2V to 5V.

The DC2965A demonstrates a simple layout for the highest power configuration of the LTC3336. The circuit can be reduced for lower I_{PEAK} levels.

Design files for this circuit board are available.

PERFORMANCE SUMMARY Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Voltage Range		2.5		15	V
V_{OUT}	Output Voltage Range		1.2		5	V
I_{OUT}	Output Current	I_{PK1} and I_{PK0} = 1			300	mA

BOARD PHOTO

QUICK START PROCEDURE

Refer to Figure 1 for the proper measurement equipment setup and jumper settings. Please follow the procedure below to familiarize yourself with the DC2965A.

1. Configure the VOUT and IPEAK jumpers for your chosen voltage and peak current as shown in Table 1 and Table 2.
2. Enable PS1 and observe the voltage on VM1 (scope voltage). Observe the sawtooth waveform as the unloaded output slowly discharges and periodically wakes up.
3. Choose a load value for LD1 that is approximately half of the peak current chosen in step 1. This load can be a resistor or an electronic load.
4. Apply LD1 and observe the voltage on VM1. The period of the sawtooth waveform will increase significantly as the load to the output is increased. On a DC voltmeter, this will average to a DC value.
5. Put the EN jumper into the OFF position to disable the LTC3336.

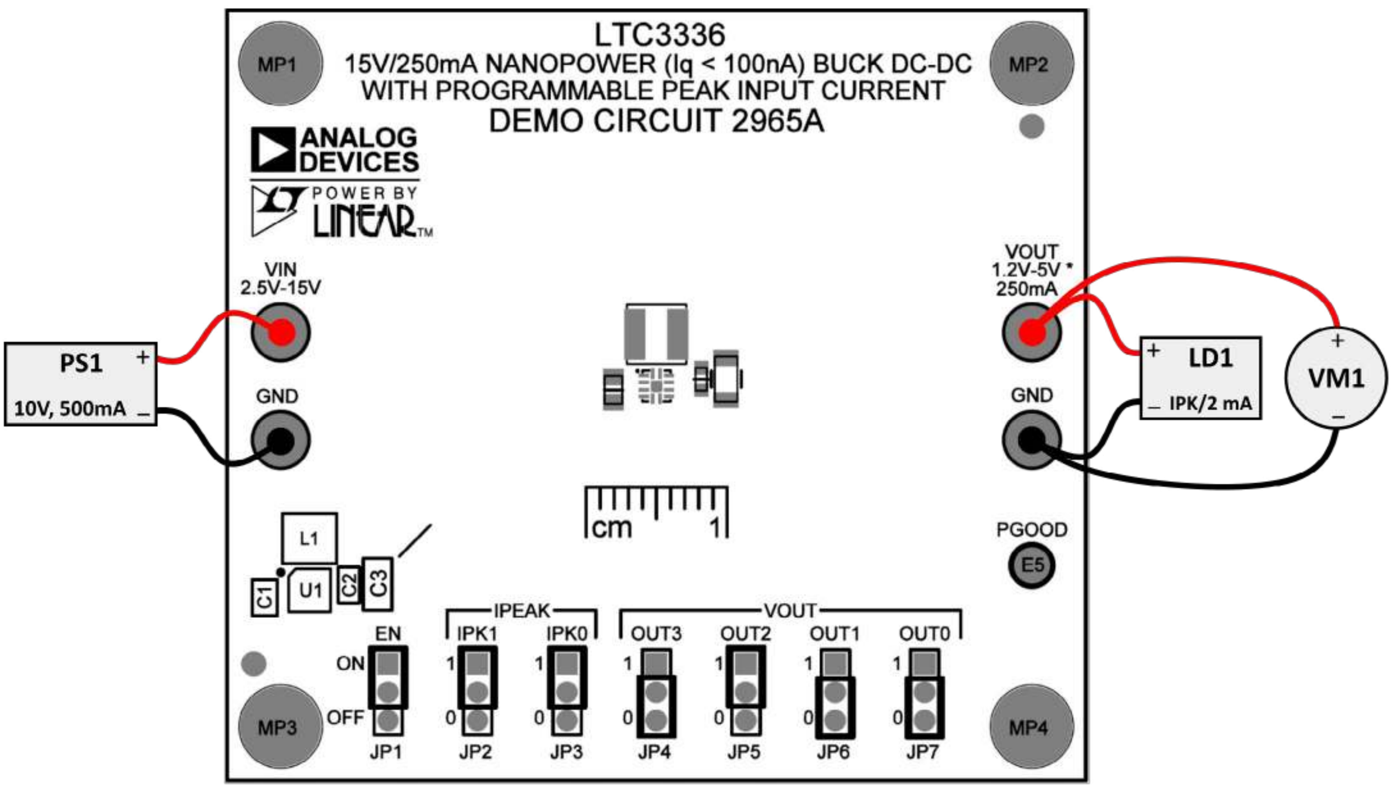


Figure 1. Quick Start Setup for the DC2965A Demo Circuit

CONFIGURING I_{PEAK} AND V_{OUT}

The peak current limit of the LTC3336 (I_{PEAK}) is configured by moving the JP2-JP3 shunts on the DC2965A demo board. The output voltage (V_{OUT}) can be configured using JP4-JP7.

Refer to Table 1 and Table 2 to configure these settings for your application. These tables are also shown on the back of the DC2965A PCB.

Table 1. IPEAK Configuration

JUMPER CONFIGURATION		I_{PEAK}
IPK1	IPK0	
0	0	10mA
0	1	30mA
1	0	100mA
1	1	300mA

Table 2. VOUT Configuration

JUMPER CONFIGURATION				V_{OUT}
OUT3	OUT2	OUT1	OUT0	
0	0	0	0	1.6V
0	0	0	1	1.2V
0	0	1	0	1.8V
0	0	1	1	1.5V
0	1	0	0	2.5V
0	1	0	1	2.4V
0	1	1	0	2.0V
0	1	1	1	2.8V
1	0	0	0	3.0V
1	0	0	1	3.3V
1	0	1	0	3.6V
1	0	1	1	3.7V
1	1	0	0	3.2V
1	1	0	1	4.1V
1	1	1	0	4.2V
1	1	1	1	5.0V

THEORY OF OPERATION

The LTC3336 is a compact high efficiency nanopower hysteretic buck DC/DC which can deliver up to 250mA of output current from a 2.5V to 15V input. As a hysteretic buck, the V_{OUT} voltage appears as a low-V_{P-P} sawtooth wave averaging the programmed V_{OUT} setting. See Figure 2. Operating in this way allows the LTC3336 to achieve its nanopower-level operating current with excellent efficiency.

The DC2965A demonstrates a simple LTC3336 application in a compact layout. The layout uses just one input capacitor and two output capacitors to allow operation in all possible configuration settings of the part. The capacitance and inductor size may be reduced for some configurations of the part. Refer to the data sheet for component requirement calculations.

THEORY OF OPERATION

The oversized inductor footprint allows users to test with their own inductors optimized for their own use cases. Larger inductors may be used for lower DCR in order to increase efficiency, or smaller inductor may be used to simply shrink the solution size.

Jumpers allow for custom configuration of the output voltage and peak current limit. Tables for these settings are shown on the back of the PCB for convenience. Jumpers should be installed at all times during operation in order to avoid floating inputs.

The EN jumper enables and disables the LTC3336.

The PGOOD turret gives access to the PGOOD signal which is high when the output is in regulation.

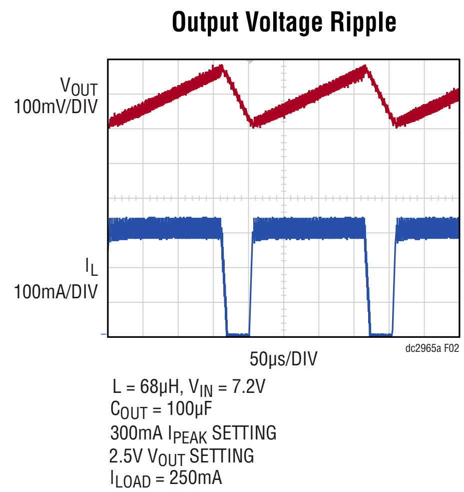


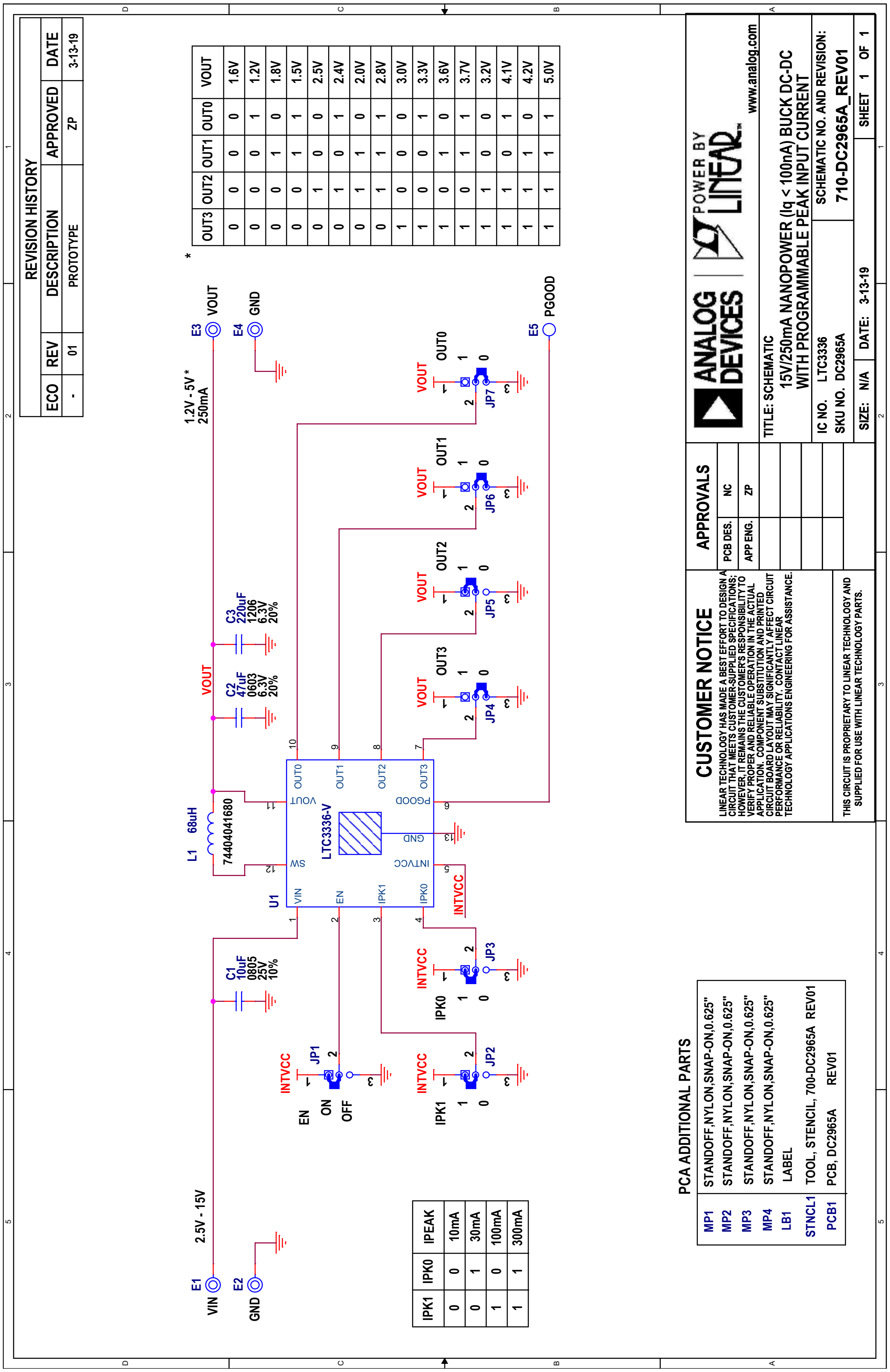
Figure 2. Output Voltage Ripple and Inductor Current

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., 10µF, X5R, 25V, 10%, 0805	SAMSUNG CL21A106KAFN3NE MURATA GRM21BR61E106KA73L
2	1	C2	CAP., 47µF, X5R, 6.3V, 20%, 0603, NO SUBS. ALLOWED	MURATA GRM188R60J476ME15D
3	1	C3	CAP., 220µF, X5R, 6.3V, 20%, 1206	MURATA GRM31CR60J227ME11L
4	4	E1, E2, E3, E4	TEST POINT, TURRET, 0.094" MTG. HOLE, PCB 0.062" THICK	MILL-MAX 2501-2-00-80-00-00-07-0
5	1	E5	TEST POINT, TURRET, 0.064" MTG. HOLE, PCB 0.062" THICK	MILL-MAX 2308-2-00-80-00-00-07-0
6	7	JP1, JP2, JP3, JP4, JP5, JP6, JP7	CONN., HDR, MALE, 1x3, 2mm, VERT, STR, THT, NO SUBS. ALLOWED	WURTH ELEKTRONIK 62000311121
7	1	L1	FIXED IND 68µH 450MA 1.495Ω	WURTH ELECTRONICS INC. 74404041680
8	1	LB1	LABEL SPEC, DEMO BOARD SERIAL NUMBER	BRADY THT-96-717-10
9	4	MP1, MP2, MP3, MP4	STANDOFF, NYLON, SNAP-ON, 0.625"	KEYSTONE 8834
10	1	PCB1	PCB, DC2965A	PHASE 3 TECHNOLOGIES INC. 600-DC2965A
11	1	STNCL1	TOOL, STENCIL, 700-DC2965A	ANALOG DEVICES 830-DC2965A
12	7	XJP1, XJP2, XJP3, XJP4, XJP5, XJP6, XJP7	CONN., SHUNT, FEMALE, 2 POS, 2mm	WURTH ELEKTRONIK 60800213421
13	1	LTC3336-LQFN	15V/250mA NANOPOWER (I_Q < 100nA) BUCK DC-DC WITH PROGRAMMABLE PEAK INPUT CURRENT	ANALOG DEVICES

Rev. 0

SCHEMATIC DIAGRAM



Rev. 0

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.