LT3905
Boost DC/DC Converter with APD Current Monitor

DESCRIPTION

Demonstration circuit 1956A features the LT®3905, a boost DC/DC Converter with APD current monitor that comes in a 3mm × 3mm QFN package. This demo board is designed to convert a 2.7V to 12V input to a 50V output at 2mA. The LT3905 is equipped with indicators for monitoring APD current, overload, and loss-of-signal (LOS) conditions, which can easily be changed with their respective resistors. In addition, the output voltage can be adjusted via the CTRL pin. DC1956A is designed for 1MHz operation but can also be programmed for 2MHz by moving jumper JP2.

For measuring fast transient response, use the installed Fast Monitor Response Circuit on the bottom of the demo board and install 0Ω resistors at R14 and R20. Also, remove R11 and any other capacitances or probes across the APD node. The transient response should be measured at the TIA turret. For further information, read the APD Current Monitor Transient Response section in the data sheet.

The internal LOS_MON comparator hysteresis is 20mV on the rising edge of the LOS_MON voltage. For additional hysteresis, use R6, R7, R15, and R21 as stated in the Loss of Signal Hysteresis section in the data sheet.

The LT3905 data sheet gives a complete description of the part, operation, and application information. The data sheet must be read in conjunction with this Quick Start Guide for the DC1956A.

Design files for this circuit board are available at http://www.linear.com/demo/DC1956A
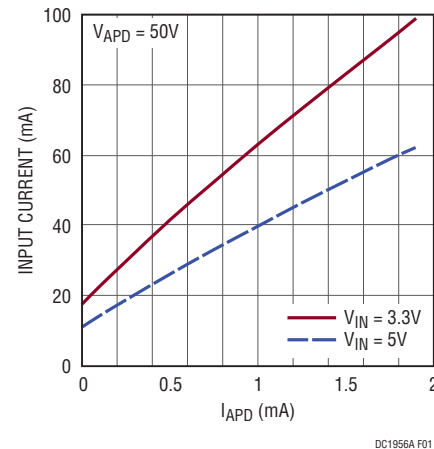
Figure 1. DC1956A Input Current vs APD Current

PERFORMANCE SUMMARY
Specifications are at $T_A = 25°C$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		2.7		12	V
V_{OUT}	Output Voltage Range	V_{IN} = 3.3V, I_{APD} = 1mA	48	50	52	V
f_{SW}	Switching Frequency	JP2: 1MHz	0.9	1	1.1	MHz
I_{LOS}	Loss-of-Signal APD Current	R10 = 1MΩ		12.5		µA
I_{LIM}	APD Current Limit	R8 = 12.4kΩ		2		mA
V_{MON}/I_{APD}	MON Voltage to APD Current Ratio	R11 = 4.99kΩ		1		mV/µA

QUICK START PROCEDURE

Demonstration circuit 1956 is easy to set up to evaluate the performance of the LT3905. Refer to Figure 2 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring the output voltage ripple, connect a BNC cable from the oscilloscope to J1. Make sure there are no other cables connected to the APD node.

1. Place jumpers in the following positions:

   JP1: Run

   JP2: 1MHz

2. With power off, connect the input power supply to V_{IN} and GND.

3. Turn on the power at the input.

   NOTE: Make sure that the input voltage does not exceed 16V.

4. Connect a 50K resistor from APD to GND and check for the proper output voltage. V_{OUT} = APD = 48V to 52V.

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.
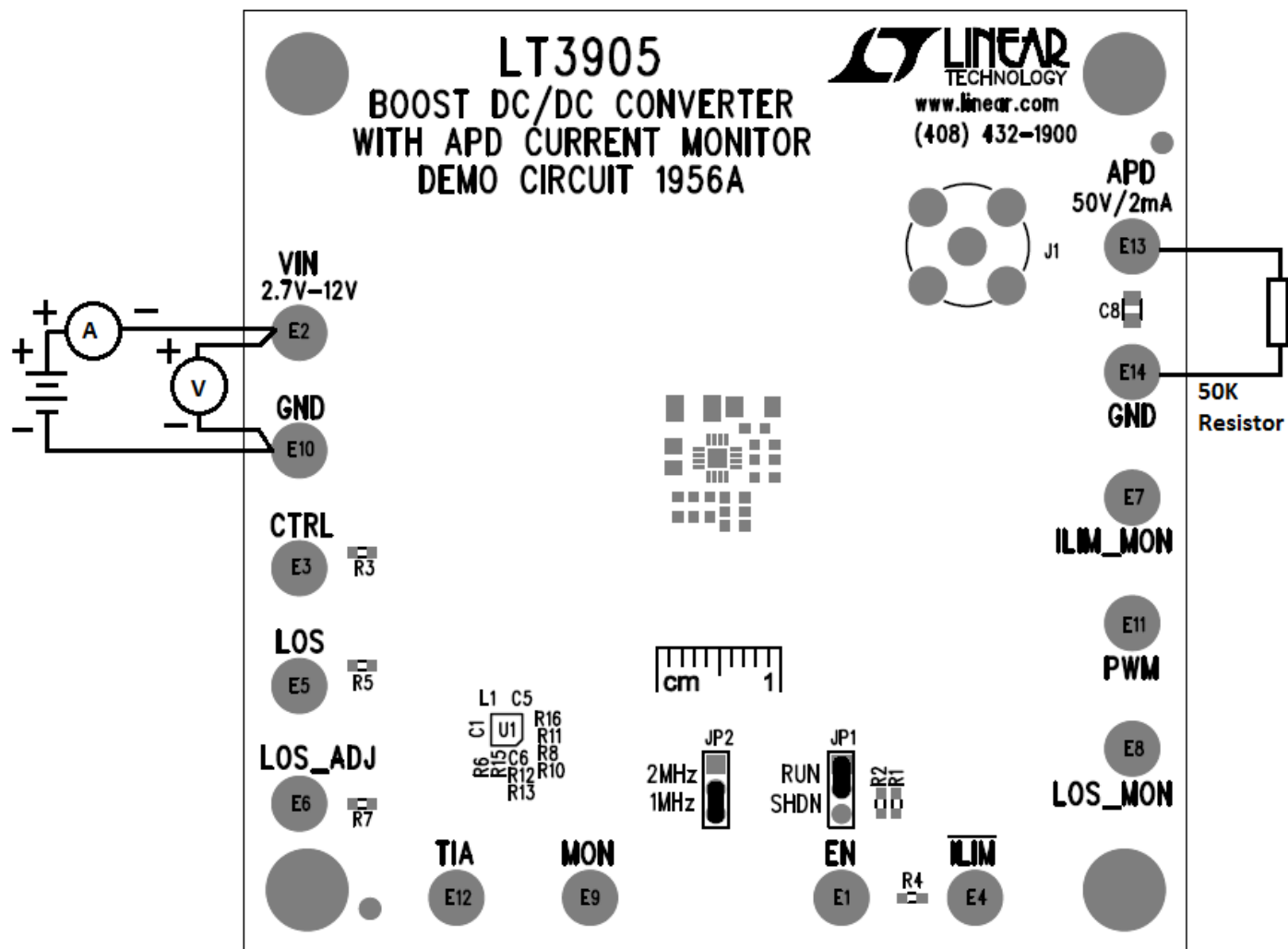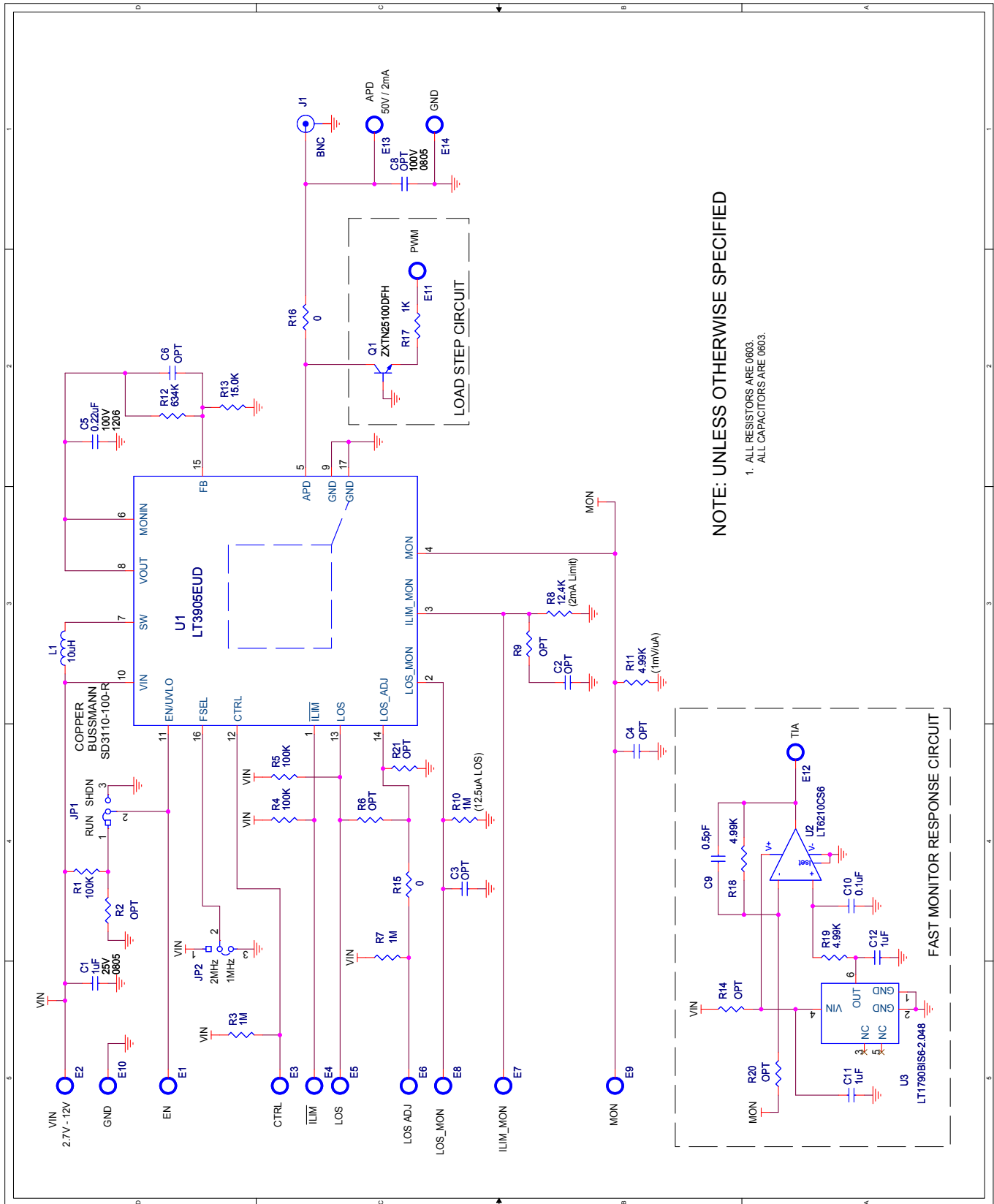
dc1956afa

2

QUICK START PROCEDURE

Figure 2. Proper Measurement Equipment Setup

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., X7R, 1µF, 25V, 10% 0805	AVX, 0805YC105KAT2A
2	1	C5	CAP., X7R, 0.22µF, 100V, 10% 1206	AVX, 12061C224KAT2A
3	1	L1	INDUCTOR, 10µH	COOPER Bussmann, SD3110-100-R
4	3	R1, R4, R5	RES., CHIP, 100k, 1/10W, 1% 0603	VISHAY, CRCW0603100KFKEA
5	3	R3, R7, R10	RES., CHIP, 1M, 1/10W, 1% 0603	VISHAY, CRCW06031M00FKEA
6	1	R8	RES., CHIP, 12.4k, 1/10W, 1% 0603	VISHAY, CRCW060312K4FKEA
7	1	R11	RES., CHIP, 4.99k, 1/10W, 1% 0603	VISHAY, CRCW0603604KFKEA
8	1	R12	RES., CHIP, 634k, 1/10W, 1% 0603	VISHAY, CRCW0603634KFKEA
9	1	R13	RES., CHIP, 15.0k, 1/10W, 1% 0603	VISHAY, CRCW060315K0FKEA
10	2	R15, R16	RES., CHIP, 0, 1/10W, 1% 0603	VISHAY, CRCW0603000Z0EA
11	1	U1	I.C. LT3905EUD, 16 PIN, 3×3mm	LINEAR TECH, LT3905EUD#PBF
Additional Demo Board Circuit Components				
1	0	C2, C3, C4, C6 (OPT)	CAP., 0603	
2	0	C8 (OPT)	CAP., 0805	
3	1	C9	CAP., C0G, 0.5pF, 50V, 5% 0603	AVX, 06035A0R5KJAT2A
4	1	C10	CAP., X7R, 0.1µF, 16V, 10% 0603	AVX, 0603YC104KAT2A
5	2	C11, C12	CAP., X7R, 1µF, 16V, 10% 0603	AVX, 0603YC105KAT2A
6	1	Q1	TRANS., NPN 100V 2.5A MED SOT23-3	DIODES / ZETEX, ZXTN25100DFHTA
7	0	R2, R6, R9, R14, R20, R21	RES., 0603	
8	2	R18, R19	RES., CHIP, 4.99k, 1/10W, 1% 0603	VISHAY, CRCW0603604KFKEA
9	1	R17	RES., CHIP, 1k, 1/10W, 1% 0603	VISHAY, CRCW06031K00FKEA
10	1	U2	I.C., LT6210CS6, TSOT23-6	LINEAR TECH, LT6210CS6#PBF
11	1	U3	I.C., LT1790BIS6-2.048, TSOT23	LINEAR TECH, LT1790BIS6-2.048
Hardware: For Demo Board Only				
1	14	E1-E14	TESTPOINT, TURRET, .094" pbf	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	3 PIN 0.079 SINGLE ROW HEADER	SULLINS, NRPN031PAEN-RC
3	2	XJP1, XJP2	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
4	1	J1	CONN, BNC, 5 PINS	CONNEX 112404
5	4	Stand-Off	STAND-OFF, NYLON 0.25"	KEYSTONE, 8831(SNAP ON)

dc1956afa

4

SCHEMATIC DIAGRAM

NOTE: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 0603.
   ALL CAPACITORS ARE 0603.

LOAD STEP CIRCUIT

FAST MONITOR RESPONSE CIRCUIT

dc1956afa

DEMONSTRATION BOARD IMPORTANT NOTICE

dc1956afa

6

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • www.linear.com

LT 0114 REV A • PRINTED IN USA

© LINEAR TECHNOLOGY CORPORATION 2013