

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  $0\Omega$  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

**Δ7**, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.



Figure 1. DC1956A Input Current vs APD Current

#### **PERFORMANCE SUMMARY** Specifications are at T<sub>A</sub> = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	ТҮР	MAX	UNITS
V <sub>IN</sub>	Input Supply Range		2.7		12	V
V <sub>OUT</sub>	Output Voltage Range	V <sub>IN</sub> = 3.3V, I <sub>APD</sub> = 1mA	48	50	52	V
f <sub>SW</sub>	Switching Frequency	JP2: 1MHz	0.9	1	1.1	MHz
ILOS	Loss-of-Signal APD Current	R10 = 1MΩ		12.5		μA
I <sub>LIM</sub>	APD Current Limit	R8 = 12.4kΩ		2		
V <sub>MON</sub> /I <sub>APD</sub>	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  $V_{\mbox{\scriptsize IN}}$  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.





#### **QUICK START PROCEDURE**



Figure 2. Proper Measurement Equipment Setup



#### PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER	
Required C	ircuit Com	iponents		·	
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	
dditional	Demo Boa	rd Circuit Components	· ·	·	
1	0	C2, C3, C4, C6 (OPT)	CAP., 0603		
2	0	C8 (OPT)	CAP., 0805		
3	1	C9	CAP., COG, 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, TS0T23-6	LINEAR TECH, LT6210CS6#PBF	
11	1	U3	I.C., LT1790BIS6-2.048, TS0T23	LINEAR TECH, LT1790BIS6-2.048	
lardware:	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)	





#### SCHEMATIC DIAGRAM





Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of its circuits as described herein will not infringe on existing patent rights.

5

#### DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following AS IS conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.

LTC currently services a variety of customers for products around the world, and therefore this transaction is not exclusive.

**Please read the DEMO BOARD manual prior to handling the product**. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged**.

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology 1630 McCarthy Blvd. Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation

dc1956afa