DEMO CIRCUIT 815
QUICK START GUIDE

LT6552
3.3V Single Supply Video Difference Amplifier

DESCRIPTION

Demonstration circuit 815 is a Video Line-Driver & Receiver featuring the LT6552. The driver and receiver sections of the board are scored to be separable by the user so that evaluation with an intermediate cable-run is readily accomplished. Figure 1 shows the general layout of the board and the usual connections used to perform evaluations.

The intermediate cable link may be either 75Ω coaxial-cable (such as RG-6) or twisted-pair (CAT-5 Ethernet cable). BNC connectors are provided for the coaxial connections, including those for the source and destination video gear. The twisted-pair option for the intermediate link uses RJ-45 connections and transports over contacts 7 & 8 (this pair is generally not used in Ethernet datacom applications and is always straight-through).

Jumpers are provided in the receive section that offer 4 levels of cable-loss equalization, sufficient for CAT-5 cable-runs up to 1000 feet (or 11dB max @ 4MHz).

The Performance Summary table below indicates the key electrical characteristics provided by this evaluation board.

Design files for this circuit board are available. Call the LTC factory.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_S	Power Supply Range	No clipping of ac-coupled video	4.0	5.0	12.6	V
I_S	Power Supply Current	5V, video active, TX & RX total		40		mA
Z_{INTX}	Video Input Impedance	V_{IN} = 1.0V_{P-P}		75		Ω
Z_{OUTRX}	Video Output Impedance	V_{OUT} = 1.0V_{P-P}		75		Ω
Z_{OUTTX}	Line-driver Output Impedance	V_{OUTTX} = 1.0V_{P-P} unbalanced coax V_{OUTTX} = 1.0V_{P-P} twisted-pair		75 110		Ω
Z_{INRX}	Line-Receiver Input Impedance	RX Zin jumper set to 75 ohm RX Zin jumper set to 110 ohm		75 110		Ω
f_{CU}	Frequency Response, upper –3dB	any EQ setting		10		MHz
f_{CL}	Frequency Response, lower –3dB			5.5		Hz
EQ	Line-Receiver Equalization, Set by Jumpers EQ1 & EQ2	EQ1=OFF, EQ2=OFF (none) EQ1=ON, EQ2=OFF, f=3.58MHz (≈300') EQ1=OFF, EQ2=ON, f=3.58MHz (≈800') EQ1=ON, EQ2=ON, f=3.58MHz (≈1000')		0 3.0 9.0 10.5		dB

OPERATING PRINCIPLES

The LT6552 in location U1 is used as a line-driver that accepts a differential input and generates a single-ended output in a gain-of-two configuration. The input provided is a 75Ω un-balanced connection that may contain substantial common-mode noise. The output is back-terminated to drive either a purely unbalanced 75Ω coaxial link, or a quasi-balanced 110Ω CAT-5 link. The simplified CAT-5 output as implemented here will produce a

video common-mode on the pair that may be undesirable in a productized realization, but helps demonstrate the capability of the receiver function of the DC815. U1 also demonstrates the compact DFN package.

The LT6552 in the U2 location (in the standard SO-8 package) is set up similarly, except that equalization networks are added to provide cable-loss correction. The input in this receiver circuit may be terminated in either 75 or 110 ohms, depending on the link media used. The output is an unbalanced 75Ω output, suitable for driving standard video equipment. The maximum equalization circuitry is optimized for 1000' (300m) CAT-5 cable, providing over 10dB of gain boost at the color sub-carrier frequency (i.e. 3.58MHz) as shown in Figure 2.

AC-coupling on the inputs and outputs allows the circuitry to operate from single supplies down to 4V (note that in dc-coupled video applications, the part is useful down to 3V). The supply and ground connections for the TX and RX sections are completely isolated so that common-mode ground-noise may be introduced during evaluation (up to $1.5V_{PP}$ with 5.0V supplies). The supply current for each section is typically 20mA with active video present. Bringing the Shutdown connection(s) to ground will bring the LT6552(s) into a low-power idle condition.

The Bill-of-Materials is shown in Figure 3 and the schematic diagram of the circuitry in Figure 4.

QUICK START PROCEDURE

Demonstration circuit 815 is easy to set up to evaluate the performance of the LT6552. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions:

   JP1 EQ2 "OFF" position
   JP2 EQ1 "OFF" position
   JP3 RX Zin "110 ohm" position

2. With power off, connect the power supply to +5V TX and +5V RX, and the supply return to GND TX and GND RX.

3. Connect a 75Ω video source to TX IN (J2), such as a camera or pattern generator, and assure that the signal source is powered and active.

4. Connect a 75Ω video monitor or signal analyzer to RX OUT (J6), assuring that the device is powered and ready to accept video.

5. Connect a CAT-5 patch cable from TX OUT (J1) to RX IN (J5).

6. Turn on the demo circuit power supply.

   Note. Make sure that the input voltage does not exceed 12V. All four board connections must be made to energize the entire circuitry.

7. Check for the proper RX OUT output signal. The output video waveform should be a high fidelity copy of the original input (ac-coupled however).

   Note. The output must be properly loaded with 75Ω, otherwise the signal will appear doubled in amplitude.

8. If longer CAT-5 cables are available, such as a full 1000' (300m) carton with RJ-45 connectors fitted, the EQ1 and EQ2 jumpers may be repositioned for best video reproduction.

9. Evaluation may also be performed with 75Ω coaxial-cable as the intermediate link instead of the CAT-5 twisted pair. To do this, remove the CAT-5 cable, move the JP3 jumper (RX Zin) to the "75 ohm" setting, and connect the coax link from TX OUT (J3) to RX IN (J4). Set the EQ1 and EQ2 jumpers for the best video reproduction.

10. In some instances, it may be desirable to locate the TX and RX sub-circuits remote from one another to test an actual link, such as in an elevator car. The DC815 is scored to allow breaking the board into two standalone sections in order to place them separately. For short-term tests, a 9V battery may be used as a power source for each individual section, should powering be inconvenient otherwise.

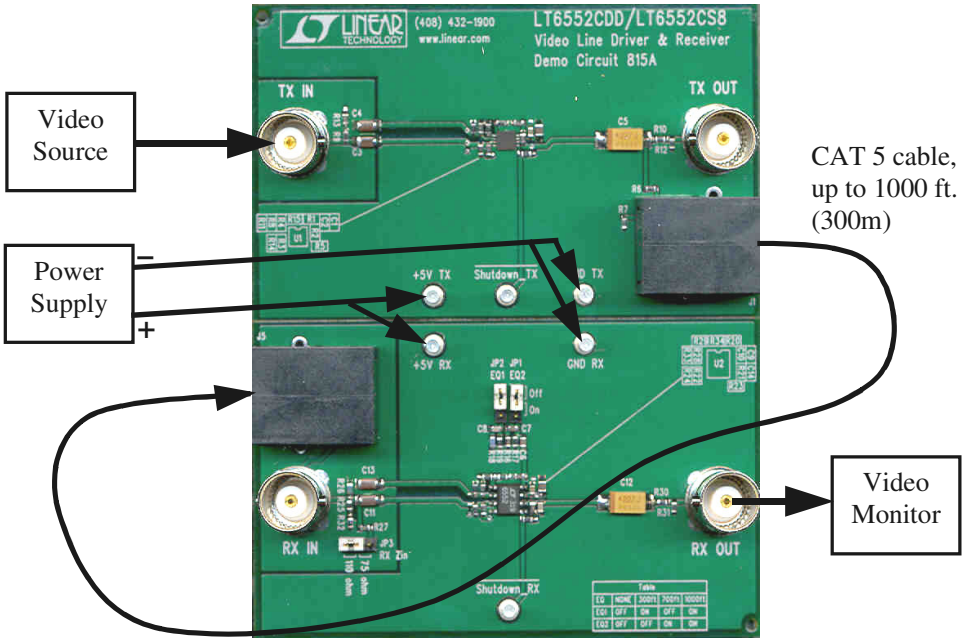

Figure 1. Proper Measurement Equipment Setup

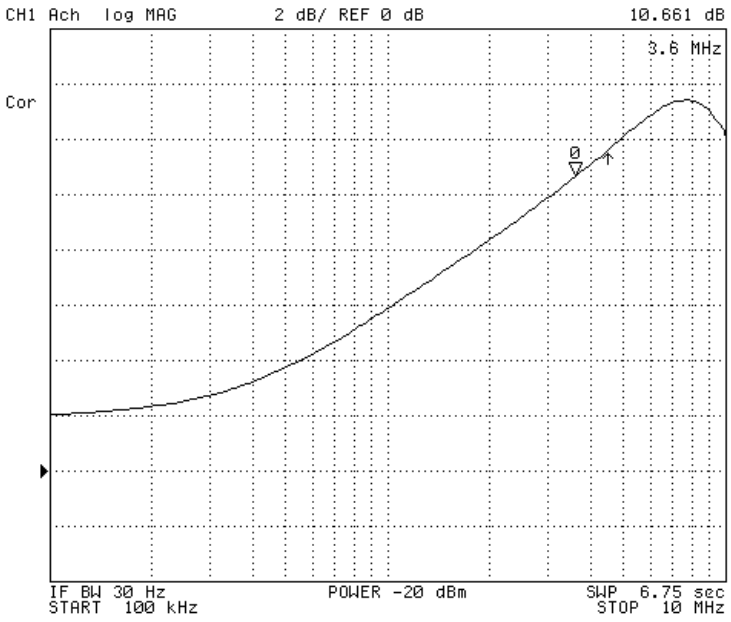

Figure 2. Receive Equalization Characteristic (max)

Item	Qty.	Ref.	Part	Mfr.	
1	1	C14	CAP., NPO 15pF 50V	AVX, 06035A150JAT1A	0603
2	1	C8	CAP., NPO 68pF 50V	AVX, 06035A680JAT1A	0603
3	1	C6	CAP., NPO 150pF 50V	AVX, 06035A151JAT1A	0603
4	1	C7	CAP., NPO 200pF 50V	AVX, 06035A201JAT1A	0603
5	2	C2,C10	CAP., X7R 0.01uF 50V	AVX, 06035C103MAT1A	0603
6	2	C9,C1	CAP., X7R 4.7uF 10V	TDK, C2012X7R1A475M	0805
7	4	C3,C4,C11,C13	CAP., X7R 10uF 16V	TDK, C3216X7R1C106M	1206
8	2	C12,C5	CAP., TANT 220uF 6.3V	AVX, TPSC227M006R0125	CASE C
9	6	D1,D2,D3,D4,D5,D6	DIODE, SCHOTTKY DIODE	DIODES INC. BAT54S-7	SOT-23
10	6	E1,E2,E3,E4,E5,E6	TESTPOINT, TURRET, .094"	MILL-MAX 2501-2	
11	3	JP1,JP2,JP3	HEADER, 3PIN 1 ROW .079CC	COMM-CON 2802S-03-G1	
12	3	JP1,JP2,JP3	SHUNT, .079" CENTER	COMM-CON CCIJ2MM-138G	
13	2	J1,J5	CONN, RJ-45 RIGHT ANGLE	STEWART CONN. SYS.,SS-6488-NF-K1	
14	4	J2,J3,J4,J6	CONN., VERT PC-MNT BNC 50-OHM	CONNEX 112404	
15	2	R6,R7	RES., CHIP 54.9 1/16W 1%	AAC, CR16-54R9FM	0603
16	3	R9,R10,R30	RES., CHIP 75 1/16W 5%	AAC, CR16-750JM	0603
17	1	R26	RES., CHIP 110 1/16W 1%	AAC, CR16-1100FM	0603
18	1	R27	RES., CHIP 243 1/16W 1%	AAC, CR16-2430FM	0603
19	2	R15,R34	RES., CHIP 604 1/16W 1%	AAC, CR16-6040FM	0603
20	1	R16	RES., CHIP 768 1/16W 1%	AAC, CR16-7680FM	0603
21	1	R18	RES., CHIP 909 1/16W 1%	AAC, CR16-9090FM	0603
22	5	R1,R2,R13,R20,R21	RES., CHIP 1K 1/16W 5%	AAC, CR16-102JM	0603
23	2	R4,R29	RES., CHIP 2.74K 1/16W 1%	AAC, CR16-2741FM	0603
24	7	R5,R11,R14,R19,R23,R24,R33	RES., CHIP 10K 1/16W 5%	AAC, CR16-103JM	0603
25	4	R3,R8,R22,R28	RES., CHIP 23.2K 1/16W 1%	AAC, CR16-2322FM	0603
26	2	R12,R31	RES., CHIP 47K 1/16W 5%	AAC, CR16-473JM	0603
27	2	R32,R25	RES., CHIP 100K 1/16W 5%	AAC, CR16-104JM	0603
28	1	R17	RES., CHIP 2.32K 1/16W 1%	AAC, CR16-2321FM	0603
29	1	U1	I.C., 3.3V Single Supply Video Difference Amplifier	Linear Tech. LT6552CDD	DFN
30	1	U2	I.C., 3.3V Single Supply Video Difference Amplifier	Linear Tech. LT6552CS8	SO8

Figure 3. DC815 Bill-of-Material

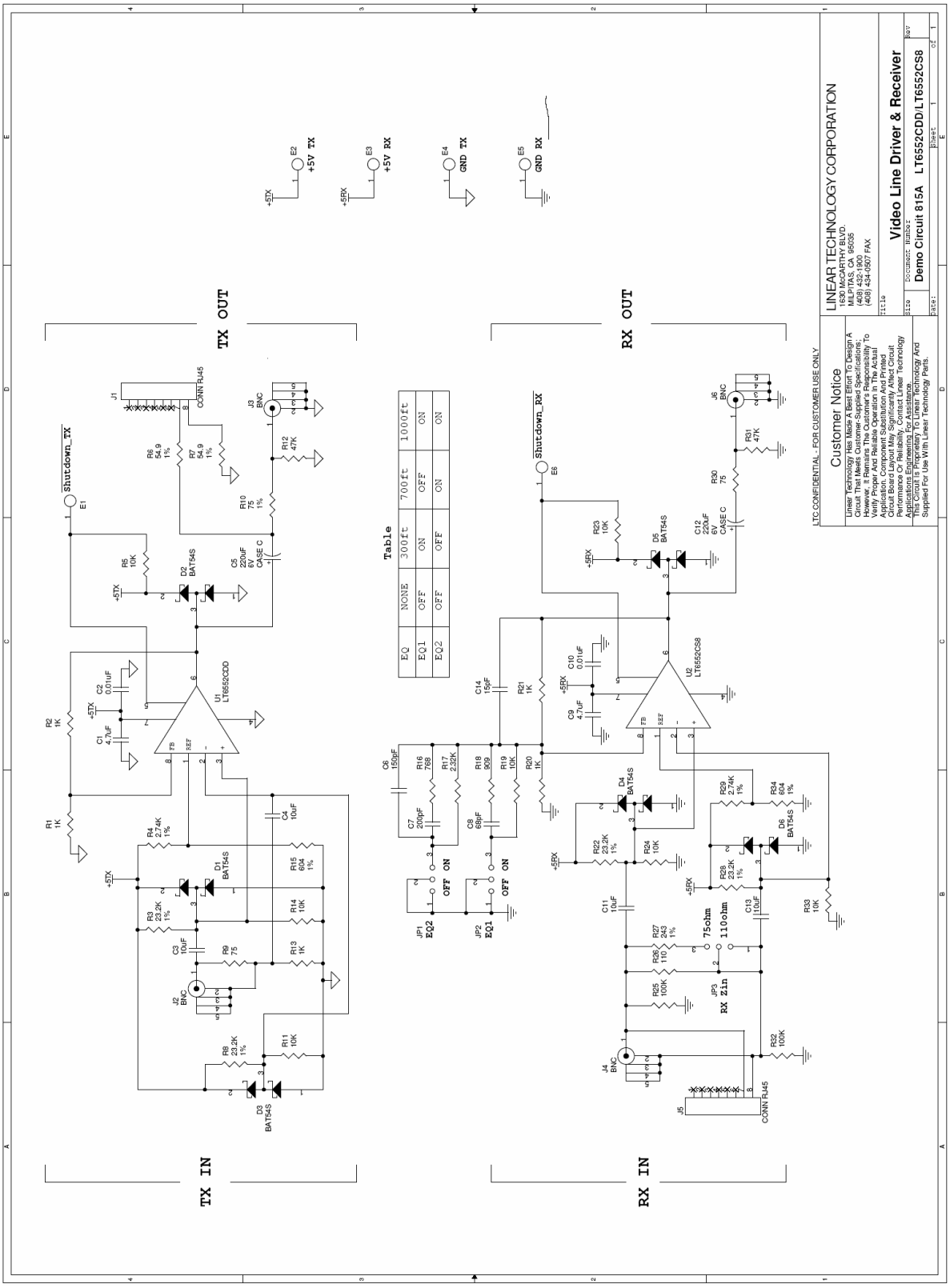

Figure 4. DC815 Electrical Schematic Diagram