DEMO CIRCUIT 1063
QUICK START GUIDE

LT6559
Triple 300MHz Video Operational Amplifier

DESCRIPTION

Demonstration circuit 1063 features the LT6559 Triple 300MHz Video Operational Amplifier. The LT6559 is designed for RGB video cable-driver applications operating from a single 5V supply. As shown in Figure 1, the form-factor of this demo circuit allows a PC video port to serve as a high-speed signal source. Rapid video evaluation can be performed by simply inserting the board in-line with the RGB monitor cable and connecting a 5V power source to it.

Device characteristics that are demonstrated in the DC1063 are shown in the Performance Summary below.

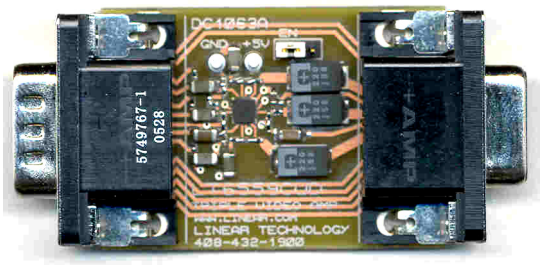


Figure 1. LT6559 on DC1063, Shown Actual Size

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

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V+	Input Supply Range	1.4V_{P-P} amplifier output swing	4.75	5	12	V
Z_{IN}	Input Impedance	ac-coupled		75		Ω
Z_{OUT}	Output Impedance	ac-coupled		75		Ω
A	Gain	Output terminated into 75Ω		0		dB
		Output terminated into hi-Z		+6		dB
BW	Bandwidth	-3dB, small-signal		300		MHz
SR	Slew Rate	V+= 5V		600		V/µs
V_{IN}	Input signal swing	V+= 5V, no output clipping			1.3	V_{P-P}
I_S	Power Supply Current	V+= 5V, no signal		15		mA

OPERATING PRINCIPLES

DC1063 simply inserts LT6559 amplifier stages in series with the Red, Green, and Blue video signals of a standard High-Density 15-contact D-subminature PC monitor connection (“VGA” port). All other standard connections are passed-through to allow normal monitor operation, as shown in the schematic diagram in Figure 5.

The amplifier sections terminate the incoming signal into 75Ω, then ac-couple to the non-inverting input of each amplifier with a 22µF capacitor. DC biasing of the ac-coupled signals is provided by resistor dividers that nominally divide the supply voltage in half. Gain of each section is set to two by equal-value feedback resistors (ac-coupled so that dc gain is unity for biasing

purposes). The selection of feedback resistor value is important to optimize the frequency response, since the LT6559 is a current-feedback topology op-amp. The amplifier outputs are then back-terminated in 75Ω and ac-coupled via 220µF capacitors to the video cable connection. The back-terminations inherently form a 2:1 voltage division at the destination loads, therefore the overall video insertion gain of the DC1063 is unity. This means that placing the DC1063 in-line with the normal monitor connection will result in only introducing artifacts associated with frequency response and linearity of the LT6559. For display formats with about 7ns or longer pixel times ("SXGA" resolutions, 1280x1024@75Hz for instance), no visual differentiation is normally discernable, verifying the suitability of the LT6559 for use in the actual application (note: a "phasing" tweak may be required with LCD displays to account for about 2ns delay through the video amplifiers vs. no delay for the syncs). Figure 2 shows the well-behaved time response of the LT6559 on DC1063 passing a nominal 7.5ns/700mV$_{P-P}$ video pulse (the display amplitude is scaled 42.3% due to a 75Ω/50Ω min-loss conversion adapter, thus nominally 296mV$_{P-P}$ at the instrument; note the actual voltage swing at the op-amp output is 1.4V$_{P-P}$).

In PC applications, like the DC1063 is designed to highlight, the RGB video swings are 700mV$_{P-P}$. For ac-coupling as used on the DC1063, varying picture conditions can expand the dynamic operational range to approximately 1.2V$_{P-P}$ at the input. Even this expanded range is readily handled by the LT6559 on a single 5V power supply.

An ENable jumper is provided, that when removed (or relocated to the alternate pin-pair) disables the LT6559 while power remains applied. The jumper does not disconnect the input biasing resistors however, so at 5V, about 2.3mA of residual resistor current will flow in the shutdown condition that is not attributable to the LT6559 itself.

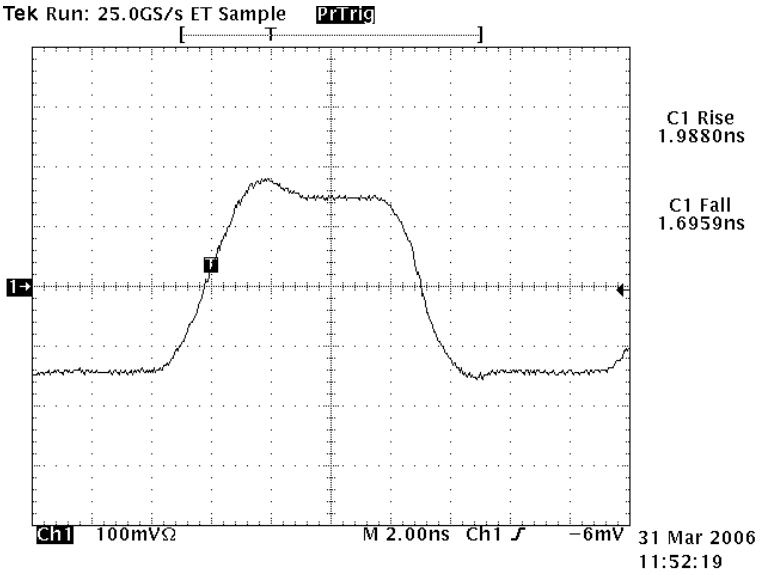


Figure 2. LT6559 Large-Signal Pulse Response in DC1063

QUICK START PROCEDURE

Demonstration circuit 1063 is easy to set up to evaluate the performance of the LT6559. Refer to Figure 3 for proper measurement equipment setup and follow the procedure below:

NOTE. Due to the Ultra High Frequencies (UHF) involved, RF measurement practices are required to accurately instrument the performance of the LT6559.

1. Place/verify jumper in the following position:

JP1 ENable position

2. While disconnected from the DC1063, set a power supply to 5V (or other voltage up to 12V, if desired), then de-energize.

3. Install DC1063 into PC monitor port. J1, the left-side connector (with pins) is the side to connect to the PC. A "VGA" extender cable may be used if circumstances don't permit convenient installation of DC1063 directly to the PC (note that such a cable may induce subtle settling anomalies in an oscilloscope presentation that are unrelated to the performance of the LT6559).

4. Attach the power clip-leads according to the silk-screened legends. Supply ground is tied to the turret closest to J1. Supply power (+5V normally) is tied to the turret nearest the ENable jumper. Use caution to avoid shorting clips together or to other points of the circuitry.

5. Connect the video monitor cable to J2. J2 is the right-side connector (with receptacles). The video cable may drive a video display or other instrumentation as desired in the evaluation.

6. Power up the DC1063 power source. A normal video presentation should be seen on a video monitor, or a specific signal at the test equipment being used. If an LCD video display is being used, re-tuning of the sync "phasing" may be required to optimize the internal waveform sampling times due to about 2ns sync shift through DC1063 (refer to the LCD display Operators' Manual for details). For instrumentation hookup, keep cable lengths as short as practicable. When 75Ω test equipment is not available, use quality 75Ω to 50Ω adapters (wideband "min-loss pads") and 50Ω instrument settings for best results.

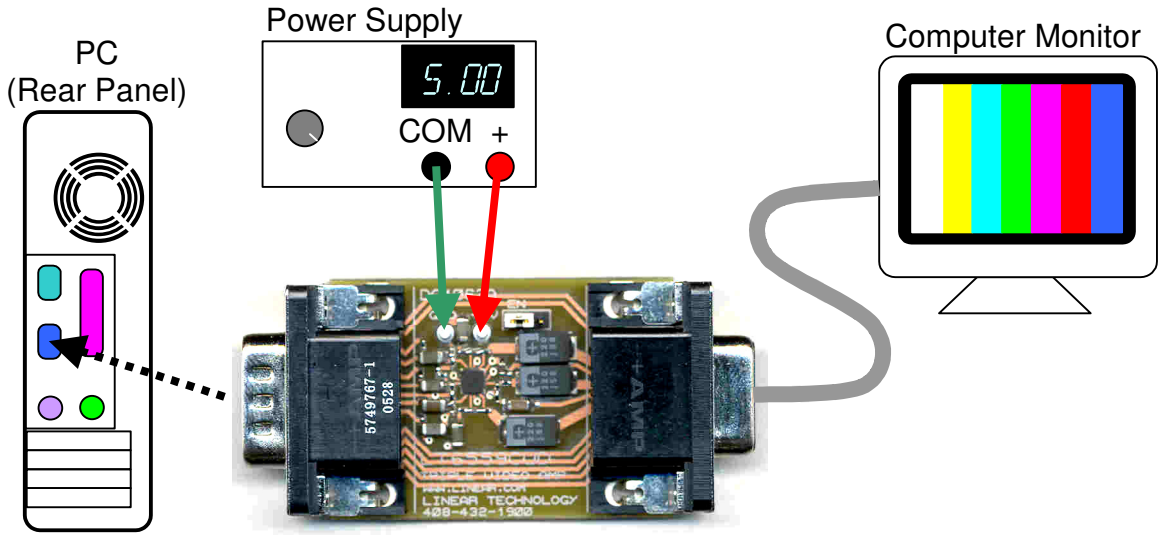


Figure 3. Proper Measurement Equipment Setup

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER / PART #
1	6	C1-C6	CAP., X5R, 22uF, 6.3V, 20%,1206	AVX, 12066D226MAT
2	3	C7-C9	CAP., POSCAP, 220uF, 6.3V, 2816	SANYO, 6TPE220MI
3	1	C10	CAP., X7R, 0.1uF,16V,5%,0603	AVX, 0603YC104JAT
4	1	C11	CAP., X5R, 4.7uF,16V,20%,1206	Taiyo Yuden EMK316BJ475ML-T
5	2	E1,E2	TESTPOINT, TURRET, 0.064	MILL-MAX 2308-2
6	1	J1	CONN,HD-15,MALE,HORZ-PCB	AMP 5749767-1
7	1	J2	CONN,HD-15,FEMALE,HORZ-PCB	AMP 1-1470250-3
8	1	JP1	0.079 SINGLE ROW HEADER, 3 PIN	SAMTEC, TMM103-02-L-S
9	1	SH1	SHUNT,	SAMTEC, 2SN-BK-G
10	3	R1-R3	RES.,CHIP, 78.7, 1%, 0402	VISHAY, CRCW040278R7FKED
11	6	R4-R9	RES.,CHIP, 3.32K, 1%, 0402	VISHAY, CRCW04023K32FKED
12	6	R10-R15	RES.,CHIP, 301, 1%, 0402	VISHAY, CRCW0402301RFKED
13	3	R16-R18	RES.,CHIP, 75, 1%,0402	VISHAY, CRCW040275R0FKED
14	1	U1	IC., LT6559CUD, QFN16	LINEAR TECH., LT6559CUD

Figure 4. Bill of Material (BOM) for DC1063

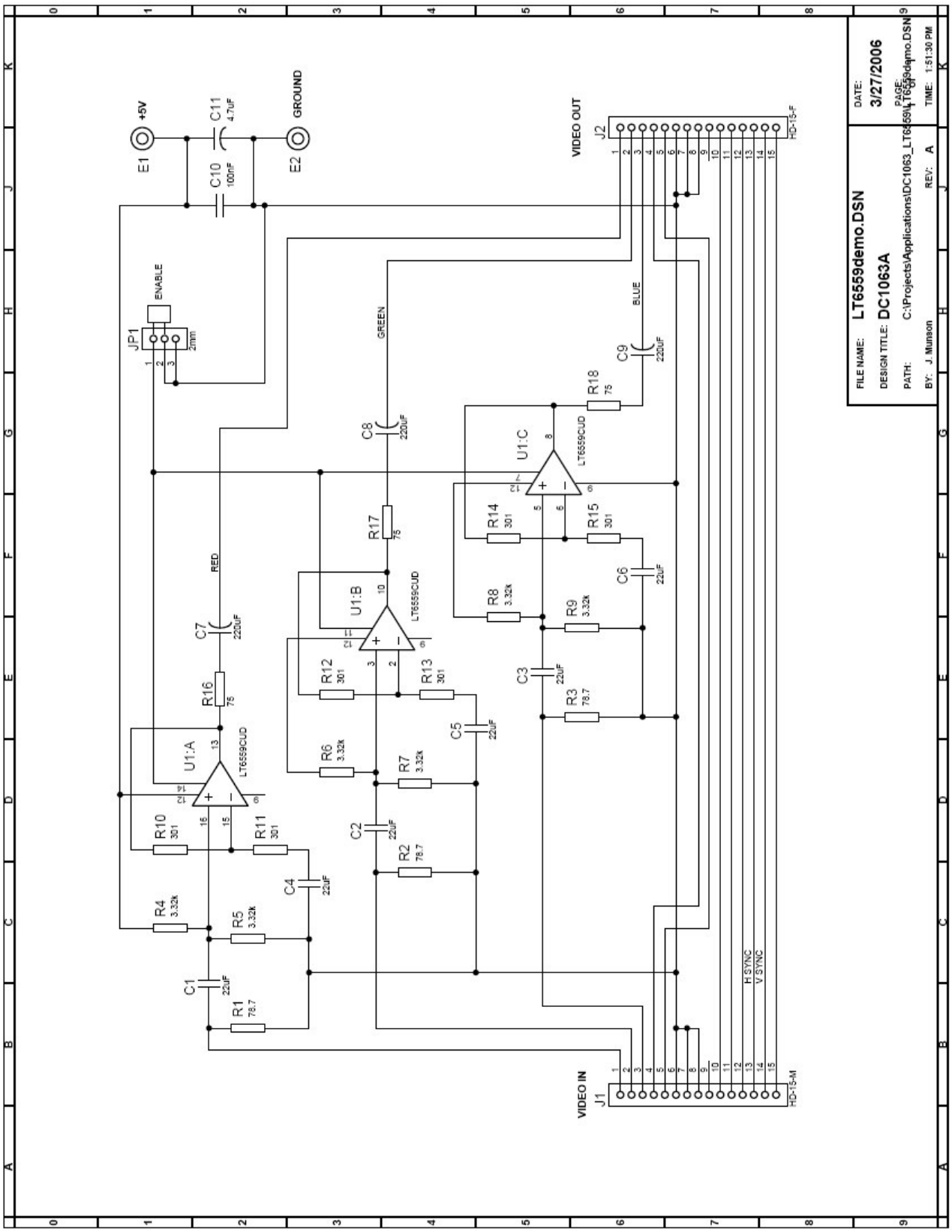


Figure 5. DC1063 Electrical Schematic Diagram