A119-2-1

One-Chip Active Whips

Mark Connelly - WA1ION - 6 MAY 1991

Buffer amplifier integrated circuits are commonly used in the test equipment industry for active probes used to observe the waveform on a circuit point in a "non-intrusive" manner. Such amplifiers typically have an input impedance of greater than 100K and an output impedance of 50 ohms or lower (5 ohms is typical). Amplifier gain is in terms of current; the voltage at the low-impedance output is approximately the same as at the high-impedance input. Active probes, by providing the impedance transformation, have little effect on the circuit point being observed while providing an output suitable to be switched through coaxial switch matrices to 50-ohm measurement instrument inputs. Performance to at least 30 MHz is typical. The semiconductor makers of the world offer many of these important buffer amplifier IC "building blocks". National Semiconductors LH0033 & LH0063, Analog Devices AD9630, Burr-Brown 3553AM, and VTC VA033 are examples of these.

Such chips are well suited to the function of an active whip antenna amplifier. The whip rod acts as a high-impedance voltage source (with minimal current-delivering ability) that must be converted to a 50-ohm impedance for input to a receiver. Active whips can fill an important niche in the DXer's antenna "arsenal" - especially for DXers with little available land for wire antennas and for those not inclined to use loops. Some of the buffer amplifier devices can deliver in excess of 10 volts peak-to-peak (Vp-p) of relatively undistorted output; therefore, strong-signal handling is generally not a problem.

The devices are usually operated with two equal-amplitude, opposite-polarity power supplies. Doing this allows operation down to DC. If RF-only operation is desired, a single supply and capacitive input/output coupling may be used. Figure 1 illustrates the generic version of buffer card that forms the heart of this active whip design. Table 1 gives a list of commercially-available buffer amplifier chips and information regarding device pin-outs. The manufacturers can provide device data sheets, prices, and the names of regional distributors. Figure 2 shows the schematic of a typical broadband active whip built around the buffer card of Figure 1. Figure 3 shows how this whip can be mated to an RTU-1 Remote Tuning Unit and a controller to provide remotely-tuned operation offering substantially greater gain and dynamic range.

The intention of this article is to stimulate DXers to try this alternative design approach to active whips. Many good articles have been written about constructing active whips with discrete transistors (usually FET input to FET or bipolar output). The whips I've built from "canned buffers" have performed as well, or better than, most of the conventional two-transistor models.

FIGURE 1: GENERIC BUFFER CARD SCHEMATIC

(U1 = BUFFER CHIP; SEE TABLE 1)

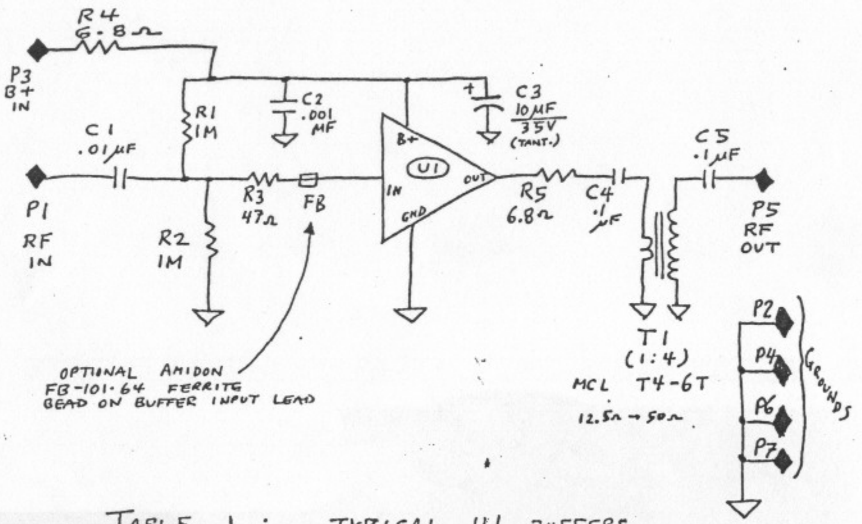
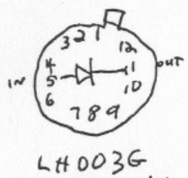


TABLE 1: TYPICAL U1 BUFFERS

DEVICE	PACKAGE	RECOMMENDED B+ SUPPLY	PINS: IN	OUT	B+	GND	OTHER
NATIONAL LH0033J, LH0033CJ	DIP (8-PIN)	12 TO 38 VDC	1	4	7,8	5,6	CONNECT 2 TO 3
NATIONAL LH0033G, LH0033CG; ÉLANTEC ELH0033G	ROUND (12-PIN)	12 TO 38 VDC	5	11	1,12	9,10	CONNECT 6 TO 7
ANALOG DEVICES AD9630AN; VTC VA033PJ	DIP (8-PIN)	8 TO 13 VDC	4	8	1	5	—
NATIONAL LH0063CK, LH0063K	ROUND (8-PIN)	12 TO 38 VDC	4	3	1,2	7,8	CONNECT 5 TO 6
BURR-BROWN 3553AM	ROUND (8-PIN)	12 TO 38 VDC	4	3	2	7	—



LH003G
TOP VIEW
(case is isolated)

LH0063K
TOP VIEW
(case is isolated)

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FIGURE 2: ACTIVE WHIP WITH GENERIC BUFFER CARD

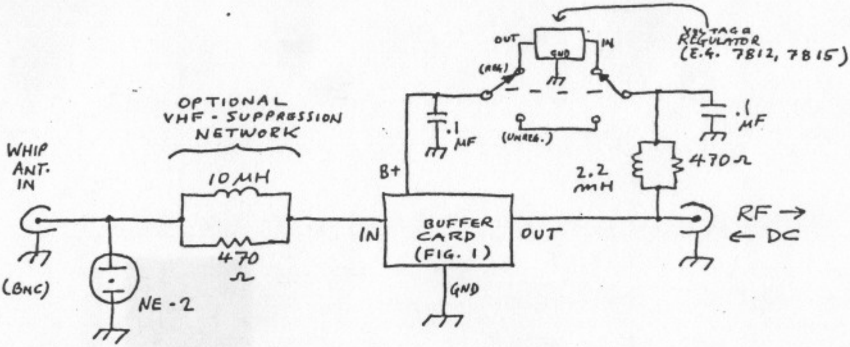

FIGURE 3: TUNED ACTIVE WHIP

(FOR RTU-1 AND CONTROLLER / COUPLER INFORMATION: SEE ARTICLES ON RTU-1, RTL-1, RTL-1A, DCP-1, AND MWT-2 OPTION 5.)