DIGITAL ANTENNA INC.

Technical Description
DA4000N Variable Gain RF Amplifier

Purpose:

The purpose of the DA4000N Variable Gain bi-directional RF Amplifier is to boost the output power of a 600mw handheld cellular phone to a maximum legal limit of 3 watts for the 800 MHz iDEN (QPSK) and E-GSM & GSM-900 bands.

Construction:

The DA4000N circuit board has been designed with exceptional RF shielding. RF signal path construction, trace thickness, width and turning radii, complies with widely accepted high frequency specifications. The DA4000N is mounted to an aluminum mounting plate that performs as additional grounding as well as media to dissipate heat. A second aluminum plate is attached to the assembly, which further dissipates heat and provides a mounting mechanism to the extruded aluminum case.

The extruded aluminum case is designed with top fins that provide appropriate surface area for heat dissipation. End plates close the assembly providing RFI shielding and a means to house connectors, switch and a power indicator. The function of the connectors, switch and power indicator is silk screened on the end plates for clarity.

Functional Description:

The DA4000N is a bi-directional variable gain RF amplifier. The direction of signal flow is described as Uplink (transmit to the antenna) and Downlink (receive from the antenna) for both 800 MHz iDEN band and E-GSM & GSM-900 bands. Uplink operating frequency is 806-821 MHz for the iDEN band, 880-890 MHz for the E-GSM band and 890-915 MHz for the GSM-900 band at 3 watts maximum output power. Uplink maximum gain is 8dB for the iDEN, E-GSM & GSM-900 bands. Downlink operating frequency is 851-866 MHz for iDEN, 925-935 MHz for E-GSM and 935-960 MHz for GSM-900 with a maximum gain of 15 dB. Signal protocol is iDEN (QPSK) and GSM. Use of the DA4000N is accomplished by connecting the antenna to the connector labeled “antenna” and the phone by way of a cell phone adapter cable to the connector labeled “phone”.

Circuit operation:

Uplink operation starts at the connector labeled J2 entering a diplexer (dip 2) with an input frequency range of 824-960 MHz. Two, 2 to 1 combiners separate uplink and downlink signal directions. An RF switch prevents Uplink from interfering with Downlink.

A 10 dB attenuator (IC8) is used on the uplink path to reduce the input power of (IC1) to the allowable maximum of 60mw. Another 2 to 1 combiner (IC6) is used to separate uplink frequencies from downlink frequencies. Next is a diplexer (Dip 1) that is used to match the antenna impedance of 50 ohms. An RF switch prevents Uplink from interfering with Downlink.

DC Power source:

The DC4000N is designed to accept 12 to 24 VDC as an input. The normal maximum input current is 1 A. Switch SW1 enables power for two voltage regulator circuits after passing thru a 3A fuse F1. A 5VDC, 1.5A regulator VR2 provides regulated power to the bias circuitry Vapc. A 10VDC, 2A regulator VR1 provides regulated power to the 3 watt PA (IC1) for Vdd and the bias circuitry Vapc as well as bias circuitry for the LNA (IC3).

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