Recommended Circuits and PCB Layout Considerations for IrMC Transceivers

ZHX1201/1203/1403/3403

The ZHX1201/1203/1403/3403 transceivers require layout considerations to maximize performance and to eliminate potential inductance problems. In mobile telephone layout, either single and separate voltage supplies are used. In applications where the distance from the supply voltage source to the IrDA module exceeds nine or ten inches, typical line inductance will be in the order of 300 to 400 ηH. With an optimum line matching resistor (see tables in Figure 1 and Figure 2), line inductance effects are minimized; further, the inclusion of this *vitally important resistor*, together with the decoupling capacitor provides superior supply line decoupling as demonstrated by Graphs 1 and 2. Many IrDA-compliant transceivers, when operating with the above recommended component mix, yield improved throughput and a virtual absence of "re-tries."

For small units, PDAs and so on, line lengths are shorter; therefore, a 51-ohm decoupling resistor together with a 1-µF ceramic capacitor between V_{CC} and ground, provide the necessary power supply decoupling for all data rates.

ZHX1201/1203/1403/3403 transceivers incorporate a current source that eliminates the need for an external resistor and makes a separate power supply unnecessary. However, if desired, a separate power supply can still be used.

For the ZHX1203/1403/3403 transceivers operating from a single supply, V_{CC} must use a regulated supply between 2.1 and 3.6 volts (2.1 volts is the minimum V_{LED} acceptable; will slightly reduce transmit range). If separate power supplies are used, V_{LED} (voltage applied to the LEDA Pin) can be unregulated between 2.1 and 4.2 volts. See Figure 1 for the recommended schematic.

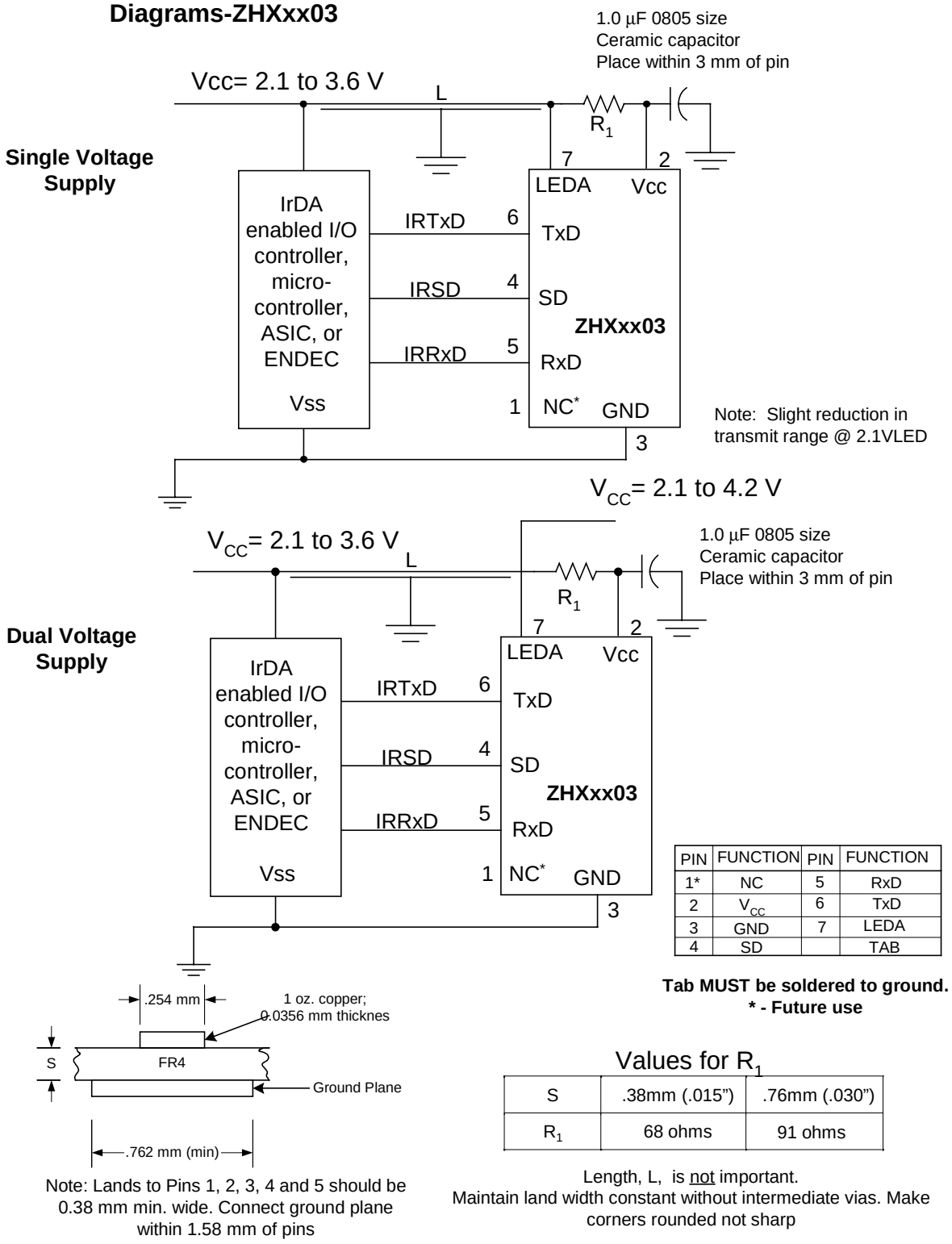
For the ZHX1201 using a single supply, V_{CC} must use a regulated supply between 2.4 and 3.6 volts (2.4 volts is the minimum V_{LED} acceptable). If separate power supplies are used, V_{LED} (voltage applied to the LEDA Pin) may be unregulated between 2.4 and 4.2 volts. See Figure 2 for the recommended schematic

The inputs (TxD and SD) and the output (RxD) should be directly (DC) coupled to the I/O circuit. Capacitive coupling is unnecessary and must be avoided because the ZHX1201/1203/1403/3403 will automatically switch off the LED if the TxD is accidentally kept active longer than approximately 180 µs.

Notes:

1. The shield tab must be soldered to ground, in one place only, for these devices to work properly. This avoids the formation of loop antennas.
2. The CMOS inputs TXD & SD. Logic to drive both these inputs must be low impedance and be either low (near GND) or high (near VCC).
3. If the device is driven by a tri-state source, or if the device pins experience high interference levels, it is recommended that 100K pull down resistors be used on either or both the TXD and SD pins.

Application Block Diagrams-ZHXxx03

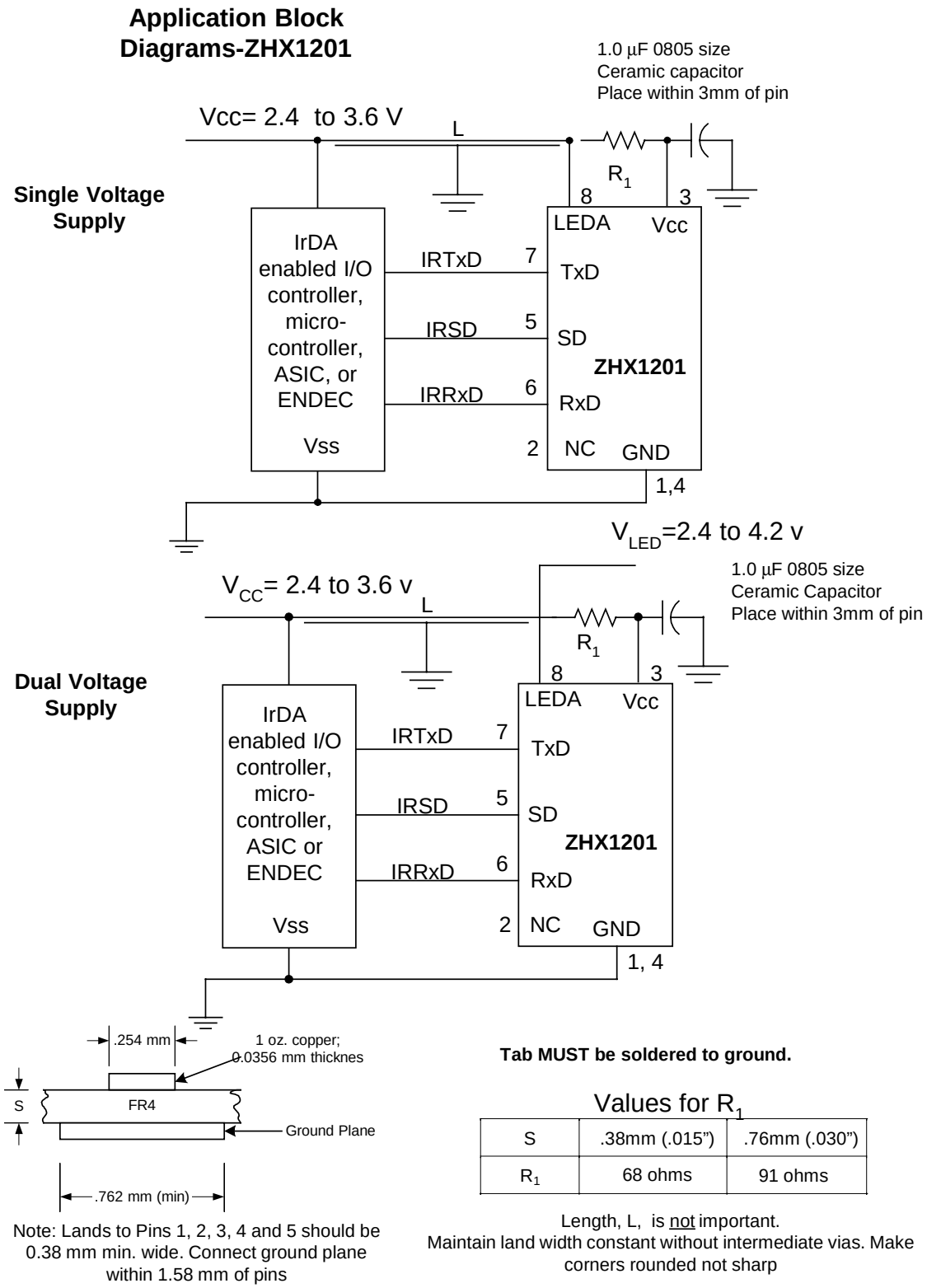


PIN	FUNCTION	PIN	FUNCTION
1*	NC	5	RxD
2	V_{CC}	6	TxD
3	GND	7	LEDA
4	SD		TAB

Tab MUST be soldered to ground.
*** - Future use**

S	.38mm (.015")	.76mm (.030")
R_1	68 ohms	91 ohms

Figure 1. ZHX1203/1403/3403 Application Block Diagrams



Values for R_1

S	.38mm (.015”)	.76mm (.030”)
R_1	68 ohms	91 ohms

Note: Lands to Pins 1, 2, 3, 4 and 5 should be 0.38 mm min. wide. Connect ground plane within 1.58 mm of pins

Length, L, is not important.
Maintain land width constant without intermediate vias. Make corners rounded not sharp

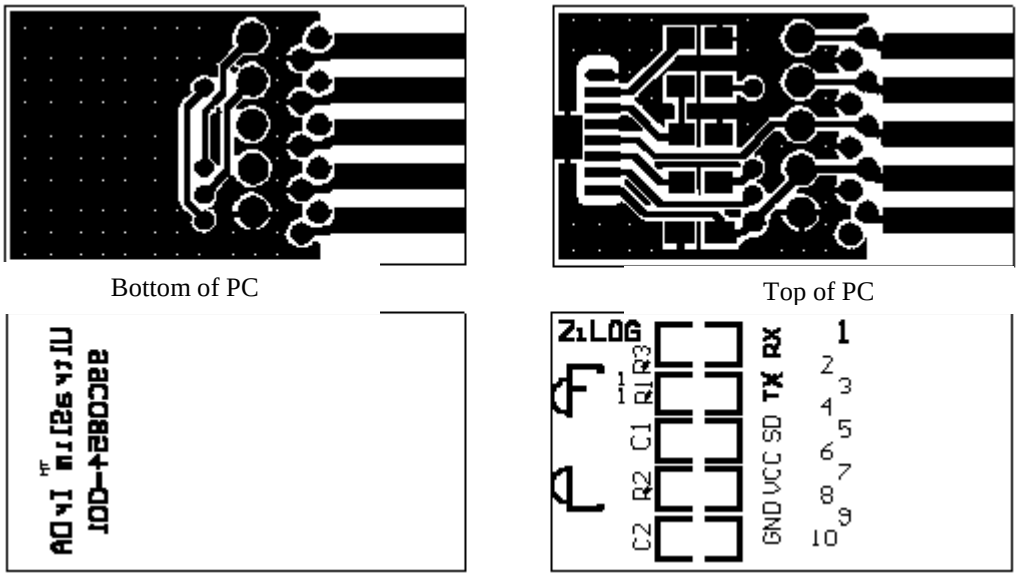
Figure 2. ZHX1201 Application Block Diagrams

Shutdown

The ZHX1201/1203/1403/3403 can be very efficiently shut down while keeping the IRED connected to the power supply by enabling SD. LEDA can be maintained as an unregulated power supply. V_{CC} can also remain connected to the regulated power supply. The voltage is limited at LEDA to 4.2 V and at V_{CC} to 3.6 V. The recovery time from shut down to full sensitivity is less than 500 µs.

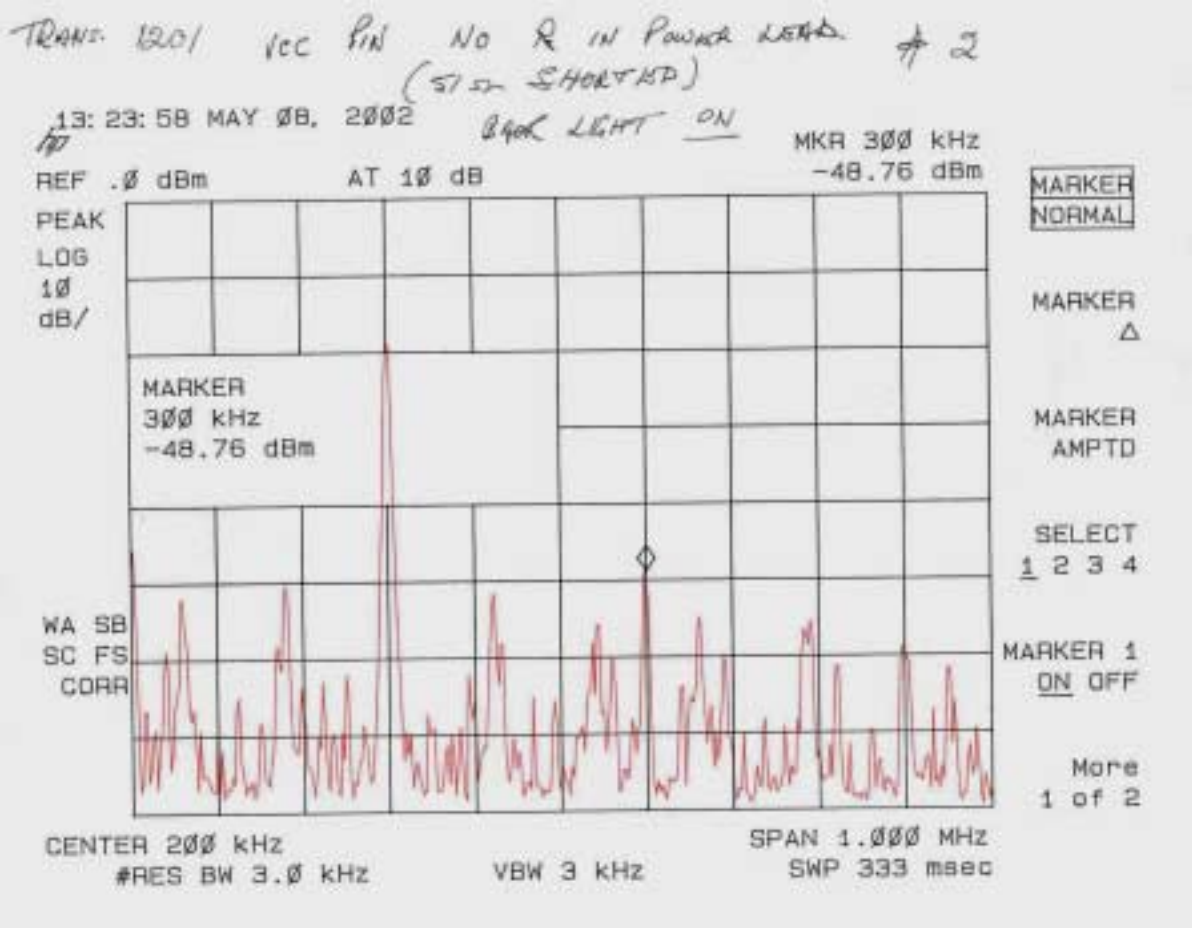
Board Layout

Board layout is a key aspect of the overall design. While ZiLOG transceivers are designed to minimize problems, care must be taken when laying out the PCB particularly in high RF environments such as mobile telephones. Thin- or long-resistive and inductive wiring and traces must be avoided. ZiLOG can provide Gerber plots and samples of the described boards. See the following layouts.



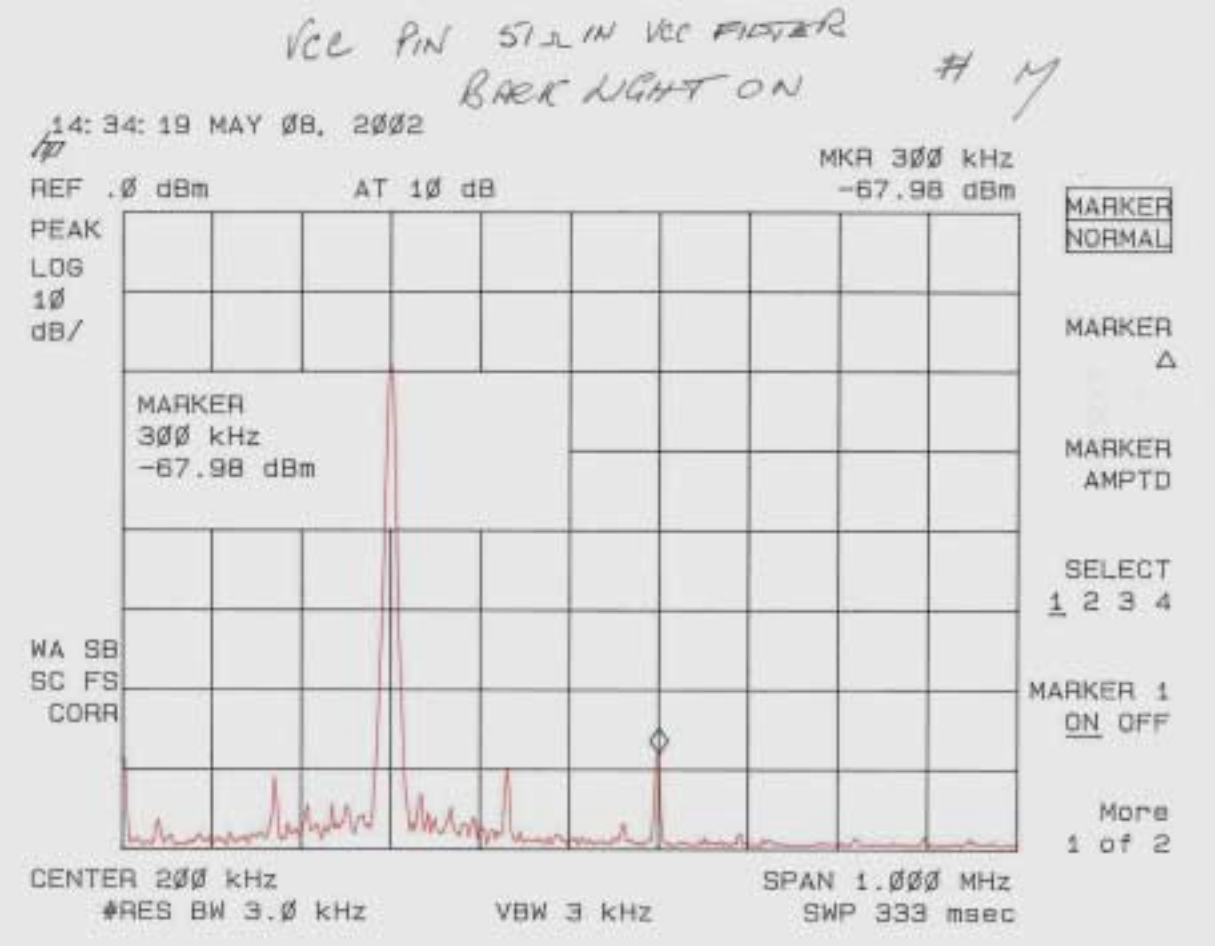
Silkscreen identification

Figure 3. Board Layouts



Graph 1. Spectrum Analyzer Printouts of the V_{CC} Pin to the Module, with Capacitor Decoupling Only, *No Series Resistor*

The peaks, which go out to 700 kHz, are generally about the –50 dbm level with a worst-case peak at –48.76 dbm, 2.48 mV peak-to-peak. The second peak, at approximately 120 kHz, is –52dbm, 1.41 mV peak-to-peak. Since the photo diode must be reverse biased from the V_{CC} source, assuming an impedance level of 15K, this represents a peak-to-peak input noise of 165 and 94 nanoamps, respectively. The 300-kHz noise will be rolled off slightly due to the input filter, but the 120-kHz noise will not. One-meter devices with smaller lenses need an IrDA threshold of around *50 nanoamps*.



Graph 2. Spectrum Analyzer Plots of V_{CC} Pin with the Addition of *a 51-Ohm Resistor* Added in the Lead from the Voltage Supply to the V_{CC} Pin

Notice the absence of noise from 300 kHz up and the value of the worst peak at –67.98 dbm. There is a difference of –20 dbm over the case above without a decoupling resistor. This gives an effective input noise (at one frequency) of 16.5 nanoamps; this noise, however, will be rolled off by the input filter by at least 6 dbs.

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