

## REP031: MAX3509 Upstream Amplifier Drives +68dBmV DOCSIS Cable Telephony

Rapid engineering prototypes are real circuits that Maxim application engineers have built and measured in our labs. They can provide a starting point for new RF designs.

Additional Information: [Wireless Product Line Page](#)  
[Quick View Data Sheet for the MAX3509](#)  
[Applications Technical Support](#)



*Objective: To modify the MAX3509 upstream CATV amplifier for higher output.*

Many producers of cable telephony require a high output upstream amplifier to overcome coupler loss. Manufacturers may need 67dBmV to 68dBmV at the amplifier output to overcome duplexer and coupler losses. By using a 1:2 (voltage) step-up output transformer and series output resistance of 35.5 ohms, the MAX3509 can offer good on state return loss and still meet DOCSIS off-state return loss after duplexer and coupler. A typical system can have a 1dB loss at the duplexer and a 6dB loss at the coupler for a total loss, after D.U.T., of 7dB.

The MAX3509 is a cable upstream amplifier which operates over a 5MHz to 65MHz frequency range. It features variable gain control (VGA) by a 3-wire digital serial bus in 1dB steps. It offers low-impedance op-amp outputs which permit flexibility in output match and drive levels. The MAX3509 can output up to 66dBmV QPSK through a 1:1 transformer. It also offers a transmit-disable mode and a power-down mode. It is available in a 20-pin TSSOP-EP package for the extended-industrial range (-40°C to +85°C).

[Test Conditions](#) (PDF, 60K)  
[Bench Test Equipment List](#) (PDF, 50K)  
[Circuit Modification Description](#) (PDF, 46K)  
[Performance Matrix](#) (PDF, 50K)  
[System Performance Matrix](#) (PDF, 73K)

Harmonics Performed at 22MHz:

[33dBmV](#) (PDF, 22K),  
[33pout](#) (PDF, 20K),  
[34dBmV](#) (PDF, 20K),  
[34pout](#) (PDF, 20K),  
[35dBmV](#) (PDF, 22K),  
[35pout](#) (PDF, 20K),  
[Sum](#) (PDF, 24K)

Harmonics Performed at 65MHz:

[33dBmV](#) (PDF, 19K),

[33pout](#) (PDF, 20K),

[34dBmV](#) (PDF, 20K),

[34pout](#) (PDF, 20K),

[35dBmV](#) (PDF, 22K),

[35pout](#) (PDF, 20K),

[Sum](#) (PDF, 24K)

PC04Q301, September 2001

**MORE INFORMATION**

MAX3509: [QuickView](#)

-- [Full \(PDF\) Data Sheet \(232k\)](#)

-- [Free Sample](#)