

WCI 4051 QAM Modulator Data Sheet

WCI 4051A QAM Modem Modulator

Features

- 140 MHz IF Standard (70 MHz IF Optional)
- All Digital Interpolator
- Less than 1dB From Theoretical Loss for 16-QAM and 64-QAM
- Programmable Digital Nyquist Filter with Optional Sin(x)/x Compensation
- Digital Upconversion to $F_s/4$
- Digital Complex to Real Conversion
- User Defined SAW Filters Standard (K&L Filters Optional)
- 1U Rack Mountable or Standalone Board Available
- Optional Reed-Solomon or Trellis FEC
- 8 Watts Typical
- Complete Software Control Package

Demodulator Data Rates. The WCI 4051A QAM modulator supports programmable constellations and symbols rates up to 20 Mbaud. The constellations and symbol rates supported are as follows:

Modulation	Data Rates	Bits Per Symbol
QPSK (4-QAM)	40 Mbps	2-Bits Per Symbol
8-PSK	60 Mbps	3-Bits Per Symbol
16-PSK	80 Mbps	4-Bits Per Symbol
8-QAM	60 Mbps	3-Bits Per Symbol
16-QAM	80 Mbps	4-Bits Per Symbol
32-QAM	100 Mbps	5-Bits Per Symbol
64-QAM	120 Mbps	6-Bits Per Symbol
128-QAM	140 Mbps	7-Bits Per Symbol
256-QAM	160 Mbps	8-Bits Per Symbol

Digital Interpolation. Depending on the symbol rate the QAM modulator interpolates the I and Q input symbols by 4x or 8x prior to Nyquist filtering by inserting zeros. The input signal to the digital interpolator is a buffered version of the I and Q FEC

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symbols with up to 5-bit samples. The digital interpolator outputs 10-bit samples as a minimum.

Nyquist Filters. The QAM modulator supports programmable coefficients, permitting excess bandwidths in a range of 10 - 90%. The number of taps is at least 63, with the Nyquist filters accepting as a minimum, 5-bit inputs. The Nyquist filter outputs are a minimum of 10-bits. The Nyquist filters optionally incorporate DAC compensation for the $\sin(x)/x$ response of the DAC.

Digital Up Conversion. The QAM modulator upconverts the interpolated, filtered, complex baseband signal to a digital IF equal to the 1x the symbol rate. The use of a digital up conversion prior to Digital-to-Analog eliminates any I & Q quadrature error or imbalance. The complex digital IF is converted to a real signal and output to the D/A converter. The digital up conversion outputs 10-bit samples as a minimum.

ALC. The QAM modulator provides a digital gain control via the host interface. The ALC accommodates ± 10 dB of output power.

Symbol Input Interface. The QAM modulator receives up to 8-bit I and Q symbols from the FEC block (optionally provided).

Control and Status Interface. The QAM modulator control and status is provided via an serial RS-232 host. All control and status values available are accessed via this interface. This interface is compatible with the selected host interface for the chip.

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Controls. The WCI 4051 QAM modulator controls and status include the following:

Controls	Status
ALC Nominal Value Modulation Format Nyquist Filter Values 4x or 8x Interpolation	Readout of All Configurable Values on Board

BER Performance. The WCI 4051 QAM modulator, when operated with the WCI 4051 QAM demodulator, is designed to achieve an implementation loss of less than 1 dB for QPSK, 16-QAM, 64-QAM and 256-QAM. The implementation loss can be demonstrated through simulations and field testing.

Modulator Data Interface. The QAM modulator accepts I and Q symbol values and clock from the FEC subsystem at TTL levels.

Power. Approximately 8 watts at 20 Mbaud operation.

Physical. The WCI 4051 QAM modulator can be delivered in a 1U rack mounted chassis or optionally as a stand-alone PCB board for lab use. The connector are as follows:

Connector	Connector Type	Description
IF	SMA	70 MHz or 140 MHz
DAC Output	SMA	Output of 10 Bit DAC
Synthesizer	7-Pin In Line	Connection to Synthesizer Board (Optional)
LO Input	SMA	Input for Local Oscillator
Host I/F	9-Pin Right Angle Din	RS-232
Data In	50-Pin R-Angle VME Din	TTL

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Power	(FEC Data Also) 8-Pin Molex (3 Used)	Approx. 8 Watts
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FEC Option. The WCI 4051 QAM modulator may be equipped with either Reed-Solomon or Trellis FEC encoders. The FEC accepts byte wide words and clock at TTL levels through the 50-pin right angle VME Din.

WCI 4051 QAM Modulator Block Diagram

