WiMAX 3.3-3.8GHz Mini-PCI Reference Design Series

Evolutive™ WiMAX DM256 Series

Introduction

The Evolutive™ WiMAX 3.3-3.8GHz Mini-PCI Reference Design series comprises a set of three modem cards covering the 3.3-3.8GHz frequency range. The series includes the reference design card for a 3.4-3.6GHz WiMAX-compliant wireless modem and two further models covering the 3.3-3.5GHz and 3.6-3.8GHz frequency bands. All designs use the Wavesat DM256 integrated circuit and the MC236-PCI MAC co-processor. The reference designs in the form of extended-length Mini-PCI cards facilitate system design by providing complete plug-and-play solutions for the lower-layer air interface and time-critical low-level MAC functionality. They allow the customer to tailor the motherboard, providing the higher layer application processor and peripherals according to their specific needs, thereby reducing development efforts. One motherboard design can fit all three frequency bands simply by changing the Mini-PCI card. The motherboard processor has access to and from the modem card through the Mini-PCI Interface.

Product Features

Each Mini-PCI card is an industrial modem card designed according to the IEEE Std. 802.16-2004 standard for Fixed Wireless Metropolitan Area Networks (WMAN). Specifically, due to its small footprint and low power consumption it is optimized for (but not restricted to) usage in Customer Premises Equipment (CPE). The air interface PHY layer protocol is implemented in the Wavesat DM256 ASIC (see inset below). For data transmission the DM256 encodes and modulates the digital data from the MAC into an OFDM analog signal which is sent to the RF circuitry. For data reception, the DM256 receives the OFDM analog signal from the RF chipset and demodulates and decodes it into digital data for the MAC.

Please consult Wavesat for ordering information
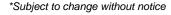
Product Specifications*

Mini-PCI Board Mechanical/Rating	
Form factor	59.75×80.00mm^2 (Extended Mini-PCI Type 3B), width 1mm
Operating Voltages	3.3, 5V (through Mini-PCI connector)
Average Power Consumption	4.5W (at 25% duty cycle)
Operating Temperature Rating	[-33 to +40]°C (indoor & outdoor)
Regulatory Compliance	RoHS, WiMAX, CE-Mark (ETSI), FCC

Evolutive™ WiMAX DM256 ASIC

The DM256 is a low-cost integrated circuit with low power consumption that implements the IEEE 802.16-2004 OFDM™ PHY layer protocol. It is designed to be the main component of an OFDM modem for Broadband Wireless Access (BWA).

The chip can be used in the Base Station as well as the CPE. The DM256 includes an analog front end, which provides a digital IF, analog IF (real or complex values) or analog Baseband I/Q interface. TDD, HFDD, and FDD duplexing modes are supported. Different bandwidths can be selected and the IF frequency is programmable.

Subject to change without notice

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Air Interface Specifications

Standard	IEEE 802.16-2004, HiperMAN/WiMAX Fixed Profile*
Modulation	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
RF Frequency	3.4 - 3.6GHz (**A**), 3.3 - 3.5GHz (**B**), 3.6 - 3.8GHz (**C**) in 250kHz steps
Tx Center Frequency Tolerance	< ±2% subcarrier spacing
Symbol Clock Frequency Tolerance	< ±5ppm
Frequency Control	Automatic Frequency Control (AFC)
Spectral Mask Requirements	ETSI-EN302326-2 (EqC-PET=O,EqC-EMO=6)**

Spectral Flatness Requirements	Spectral lines from –50 to –1 and +1 to +50	± 2dB from the measured energy averaged over all 200 active tones
	Spectral lines from –100 to –50 and +50 to +100	+2/– 4dB from the measured energy averaged over all 200 active tones

Adjacent Channel Rejection C/I [dB]	16-QAM 3/4	64-QAM $\frac{3}{4}$
	-11dB	-4dB
Nonadjacent Channel Rejection C/I [dB]	16-QAM 3/4	64-QAM $\frac{3}{4}$
	-30dB	-23dB

Bandwidth	Programmable, certified for 3.5 & 7MHz
Duplexing Method	TDD and HFDD
Spectral Efficiency	5 bits/sec/Hz (64-QAM unencoded)
Supported Frame Lengths	[2.5, 4, 5, 8, 10 & 20] ms
Supported Cyclic Prefix Lengths	¼, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$
Tx Maximum output Power (at antenna connector)	20dBm (**A**&**B**), 18.5dBm (**C**)
Tx Dynamic Range	30dB

Relative Tx Constellation Error (@ maximum output power)	Burst Type	IEEE Spec. [dB]	Typical [dB]
	BPSK ½	-13.0	-31.5
	QPSK ½	-16.0	-31.5
	QPSK $\frac{3}{4}$	-18.5	-31.5
	16-QAM ½	-21.5	-31.5
	16-QAM $\frac{3}{4}$	-25.0	-31.5
	64-QAM $\frac{2}{3}$	-29.0	-31.5
	64-QAM $\frac{3}{4}$	-30.0	-31.5

Maximum Rx Power (BER $<10^{-6}$)	-20dBm
Maximum tolerable Rx Power	0dBm

Maximum Rx Receiver Sensitivity (3.5MHz BW, BER $<10^{-6}$)	Burst Type	IEEE Spec. [dBm]	Typical [dBm]
	BPSK ½	-93.1,	-95.0
	QPSK ½	-90.1	-93.0
	QPSK $\frac{3}{4}$	-87.6	-89.5
	16-QAM ½	-84.6	-86.5
	16-QAM $\frac{3}{4}$	-81.1	-83.0
	64-QAM $\frac{2}{3}$	-77.1	-79.0
	64-QAM $\frac{3}{4}$	-75.1	-77.0

Rx Input Dynamic Range	30dB
Power Control	Automatic Gain Control (AGC), Automatic Link Control (ALC)

* Currently WiMAX has no RF profile defined for the 3.3-3.5GHz or 3.6-3.8GHz frequency bands. WiMAX compliancy applies to the PHY and MAC requirements only.
** New revision of ETSI specification document replacing Type-G mask ETSI-EN301021