



IMD Family of WLAN Internal Antennas

MPCI-8 Antenna Application Note

Product Line:

MPCI-8 “Mini-PCI” Antenna Module

WLAN Technologies:

WiFi (802.11 a/b/g) + Japan

Applications:

**Free Space – Notebooks – Desktops – Tablet PCs
Access Points – Printers**

REVISION HISTORY

Document	Date	Description	Author
MPCI08001-AP1	09/12/03	Original Release	Gregory Hill

RELATED DOCUMENTS

Document Title
MPCI-8 2.4/4.9/5.2/5.8 GHz Data Sheet

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Contact your local sales office or manufacturers' representative to obtain the latest specifications.

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1 PURPOSE

This document can be used as a reference for implementing Ethertronics' antenna into wireless products. Specifications, design recommendations, board layout, packaging and manufacturing recommendations are included.

2 OVERVIEW

The MPC1-8 model, part of the Isolated Magnetic Dipole™ (IMD) Family of WLAN Internal Antennas, is a single element internal (embedded) antenna module for worldwide WLAN applications. MPC1-8 supports 802.11a/b/g protocols throughout the world including the newly licensed 4.9 MHz Japanese spectrum. The MPC1-8 module is a complete solution consisting of one IMD antenna with a high performance cable and connector. The IMD antenna's small size and high isolation properties make the MPC1-8 easy to integrate into notebooks and other mobile devices, while offering the ability to be used in a diversity configuration.

Ethertronics' proprietary and patented IMD antenna technology offers three distinct advantages over traditional internal antennas:

High Performance

- High efficiency
- Up to 50% higher signal strength than other internal antennas

High Isolation/Selectivity

- Minimal coupling between antennas (isolation of 20-40 dB)
- Ideal for diversity applications
- Reduced EMI with surrounding components
- Makes integration easy

Shaping Technology

- Controls and redirects the near-field electromagnetic distribution of the antenna's wave
- Optimizes antenna performance by improving signal strength and data quality inside buildings, in noisy environments and in fringe network coverage areas
- Less interaction with surrounding objects

Ethertronics' MPC1-8 Antenna Module offers many advantages over competing antennas:

Worldwide WLAN Coverage

- Single internal antenna module covers worldwide frequency bands saving cost and valuable space
- Supports WLAN bands for today's standards allowing one configuration to support all markets

Spatial Diversity

- Individual MPC1-8 modules can be placed in close proximity to other IMD antennas with reduced risk of coupling from one to another

Better Performance

- Increased range/rate
- Improved sensitivity in low signal environments

Flexible Integration

- MPC1-8 module's high isolation offers consistent performance across multiple platforms and requires minimal space making placement easier
- Standard cables and connectors make for easy connection to MPC1 cards

Worldwide Support

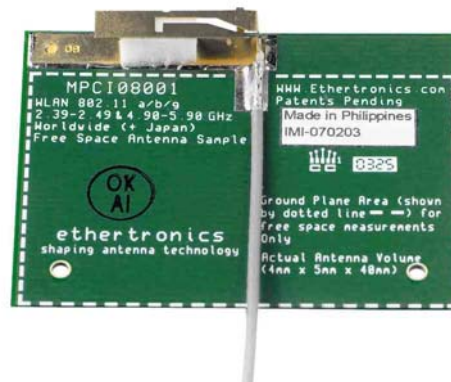
- Regional technical support and FAEs are available to help speed the integration process
- Manufacturing by Far East suppliers means quick turnaround and lower importation costs

The MPC8 antenna module is ideally suited for notebooks, where performance, size and system costs are critical. Standard antenna profiles are available or can be configured to suit individual OEM requirements.

TABLE 1 SUMMARY OF THE MPC8 SERIES PRODUCT LINE

Product	Applications	Frequency
MPC8001	Free Space Sample	2.4/4.9/5.2/5.8 GHz
MPC89001	Notebooks	2.4/4.9/5.2/5.8 GHz

FIGURE 1 MPC8 ANTENNA MODULE



Ground Plane Area (shown by dotted line --) for free space measurements only. Actual antenna volume (4 mm x 5 mm x 48 mm)

3 ANTENNA CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS

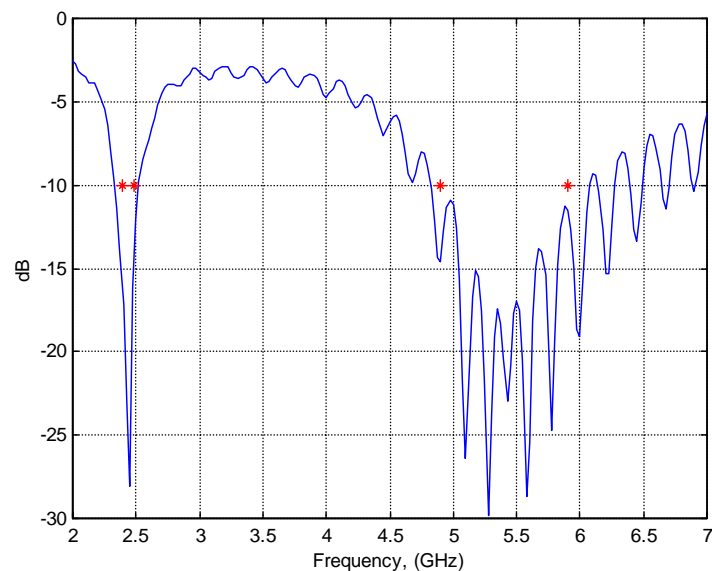
The data sheet, provided by Ethertronics, has all the specifications for the MPC1-8 and should be referenced along with the information in this document. Ethertronics has performed extensive testing in many products; more information is available detailing the tests and results with the antenna integrated in handheld and portable devices. For more details on the results of these tests, contact your local sales representative.

TABLE 2 ELECTRICAL SPECIFICATIONS (FREE SPACE)

Parameter	2.390 – 2.490 GHz	4.900 – 5.100 GHz	5.150 – 5.350 GHz	5.470 – 5.900 GHz
Peak Gain	3 dBi	3 dBi	5 dBi	5 dBi
Efficiency	75%	65%	65%	65%
VSWR Match	2.1 : 1	2.1 : 1	2.1 : 1	2.1 : 1
Front to Back Ratio	-2 dB	-10 Db	-10 dB	-10 dB
Feed Point Impedance	50 Ohms unbalanced (or other if required)			
Power Handling	2 Watt cw			
Polarization	Linear			
Shielding Ratio	6 to 1 (near field)			

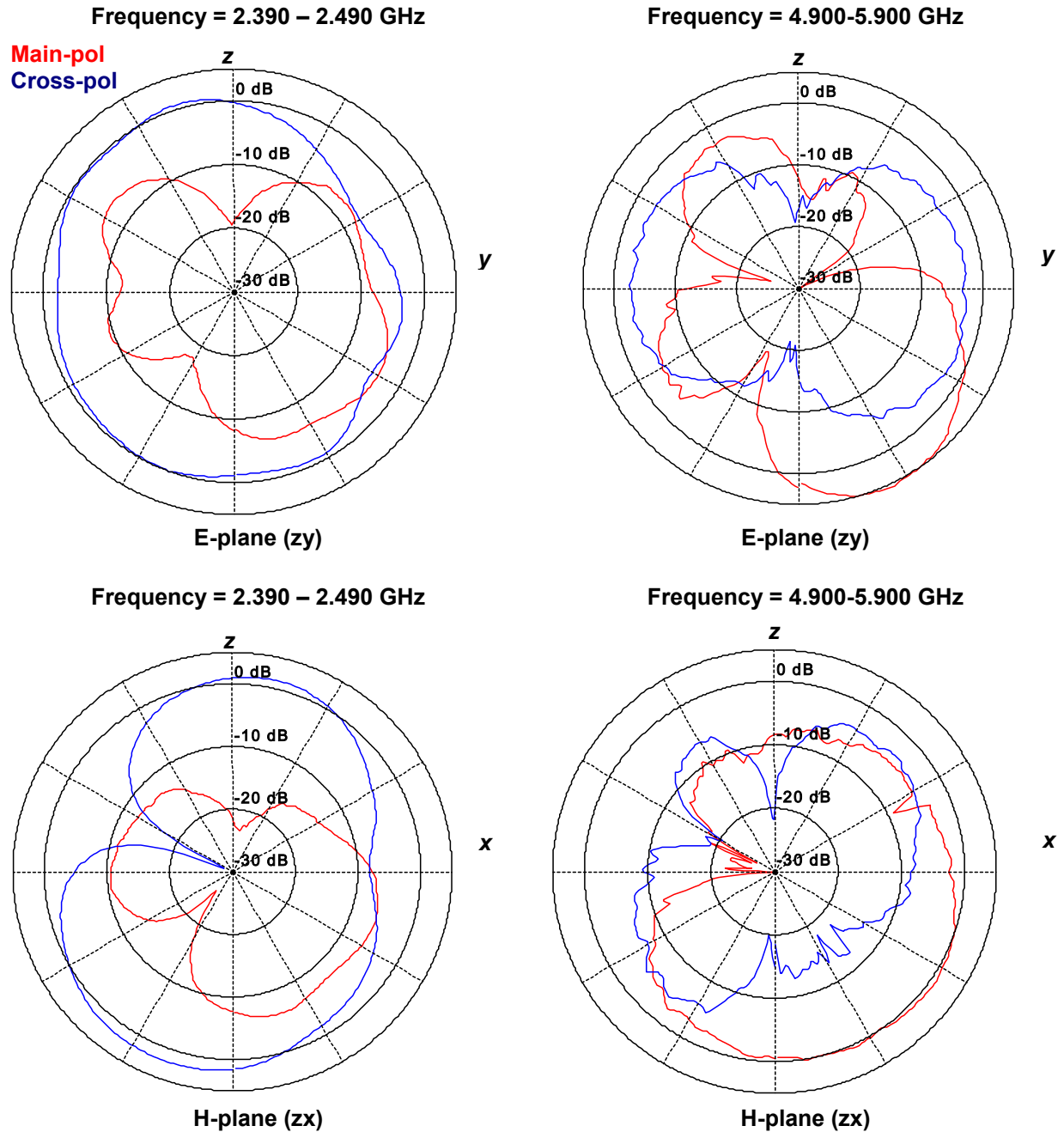
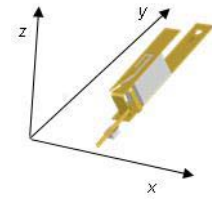
3.1.1 Return Loss

Figure 2 Typical Return Loss



3.1.2 Radiation Patterns

Figure 3 Typical Radiation Patterns for MPC1-8



4 MATERIAL SPECIFICATIONS

TABLE 3 MATERIAL SPECIFICATIONS

Item	Material
Metal Element	Phosphorous Bronze

5 PRODUCT TESTING

Ethertronics' antennas undergo component level and assembly qualification testing as part of the product development process. The following lists of tests are the core tests used to qualify the MPC1-8.

TABLE 4 COMPONENT LEVEL PRODUCT QUALIFICATION TESTS

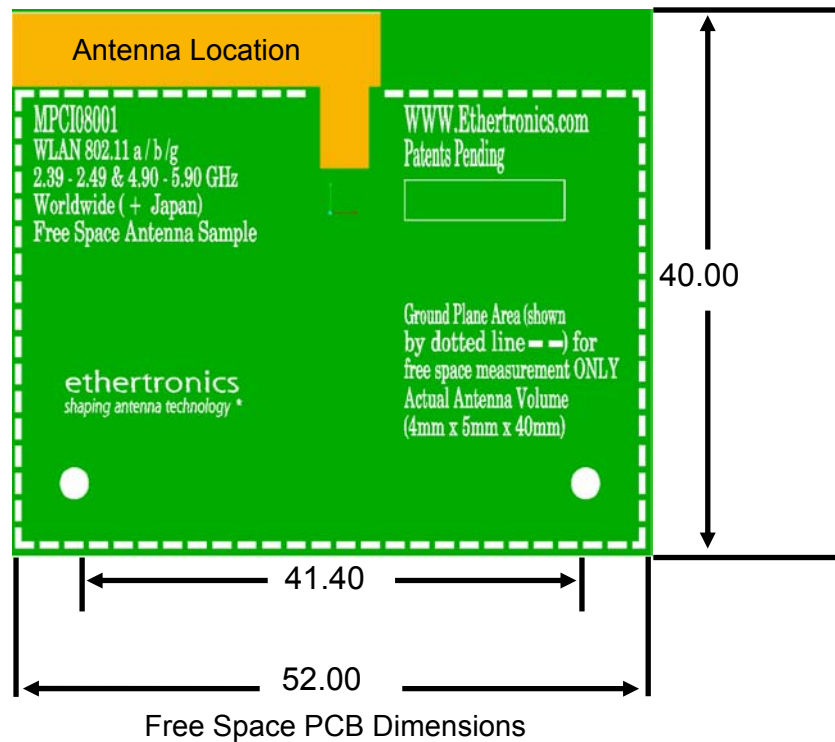
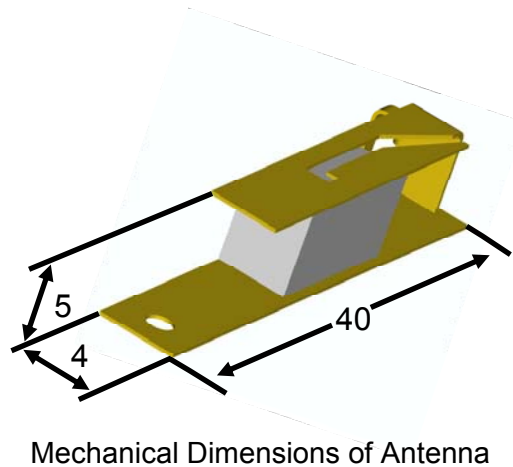
Test Description	Reference Standard	Test Condition
High Temp. Storage	EIA JESD22-A103-B	+125 deg. C for 500 Hrs. Inspect and electrically test for every 250 Hrs.
High Temp. High Humidity	EIA JESD22-A110-B	+85 deg. C / 85% Relative Humidity for 500 Hrs. Inspect and electrically test for every 250 Hrs.
Temperature Cycling	EIA JESD22-A104-B	-40 to +125 deg. C. 5 min. soak time, cycle rate < 2cph, ramp rate between 10-14 deg. C. / min. for 10 cycles.
Thermal Shock	EIA JESD22-A106-A	-40 to +85 deg. C. Load should reach temp. within 5 min., and with the dwell time > 2 min. for 15 cycles.
Vibration	EIA JESD22-B103-A	Vibration table with 1.5 mm double amplitude excursions or 20 G whichever is less. Frequency varied from 20-2,000 Hz within 4 min. To be performed 4 times on each axis.
Mechanical Shock (Drop)	EIA JESD22-B104-B	Units dropped from 59" (150 cm) on all three axis for total of 30 drops.
Composite Spacer Pull Force	Ethertronics PTS-0004	For those antennas with press fit spacers, use force gage to pull composite spacer from metal.

TABLE 5 ASSEMBLY (2ND LEVEL) PRODUCT QUALIFICATION TESTS

Test Description	Reference Standard	Test Condition
Operating Temperature	Ethertronics PTS-0002	Units assembled to PCB are placed in chamber at -20 deg. C for 24 Hrs Inspected and tested. Then stressed at +80 deg. C for 24 Hrs. Inspected and tested.
High Temp. High Humidity	EIA JESD22-A110-B	Units assembled to PCB are placed in chamber at +85 deg. C with 85% Relative Humidity for 500 Hrs. Inspect and electrically test for every 250 Hrs.
Temperature Cycling	EIA JESD22-A104-B	Units assembled to PCB. -40 to +125 deg. C. 5 min. soak time, cycle rate < 2cph, ramp rate between 10-14 deg. C. / min. for 1000 cycles. Inspect and electrically test after 500 cycles.
Thermal Shock	EIA JESD22-A106-A	Units assembled on PCB. -40 to +85 deg. C. Load should reach temp. within 5 min., and dwell time > 2 min. for 15 cycles.
Vibration	EIA JESD22-B103-A	Vibration table with 1.5 mm double amplitude excursions or 20 G whichever is less. Frequency varied from 20-2,000 Hz within 4 min. To be performed 4 times on each axis.
Subassembly Mechanical Shock (Drop)	EIA JESD22-B110	Units assembled on PCB, placed inside enclosure, and dropped from 59" (150 cm) on all three axis for total of 30 drops.
Antenna Shear	Ethertronics PTS-0003	Units assembled on PCB. Shear force is applied to antennas until solder joint failure.
Cable Shear	Ethertronics PTS-0005	Unit with RF cable (Hirose) assembled to PCB. Shear force is applied to RF cable solder joint failure.
RF Cable Flex and Twist	Ethertronics PTS-0006	Unit with RF cable (Hirose) assembled to PCB. Flex cables 20 cycles at 180 degrees in each direction. Twist cables 10 cycles at 180 degrees in each direction.
RF Connector shear force	Ethertronics PTS-0007	RF Connector (MMCX) assembled to PCB. Shear force is applied to antenna until solder joint failure occurs.

6 MECHANICAL CHARACTERISTICS

Figure 4 MPC1-8 Mechanical Dimensions (mm)

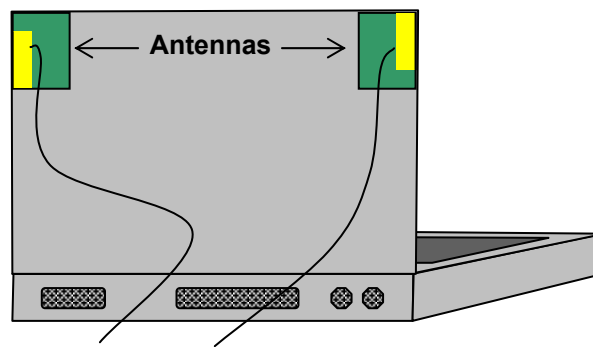


6.1 ANTENNA LOCATION

6.1.1 Outside the Enclosure

The MPC8-8 is for free space performance testing only. Mount the MPC8-8 with the top edges of each antenna aligned with the edge of the notebook lid or a ground plane as shown (see Figure 5). With proper set-up, the Return Loss measurement will equal -10 dB.

Figure 5 MPC8 LOCATION



6.1.2 Inside the Enclosure

Contact Ethertronics for optimal test results inside your enclosure.

6.1.3 Desktops, Tablet PCs, Access Points and Printers

Contact Ethertronics for optimal test results inside your enclosure.

7 PRODUCT PACKAGING

7.1 PACKAGING INFORMATION

Figure 6 Packaging Specifications



SHIPPING BOX

Order Quantity	Packing Unit	Box "L"	Box "H"	Box "D"
1	1 Box	160 mm	25 mm	160 mm
144	1 Master Carton	620 mm	270 mm	250 mm

The antennas are FOB, Ex Works.

8 MANUFACTURING AND ASSEMBLY GUIDELINES

MPCI antenna modules are designed for high volume manufacturing and easy assembly. The antenna modules are designed to be mounted to the enclosure or the host device using the tooling hole(s) provided in the PCB. All MPCI antenna modules come with Hirose Electric Co U.FL connectors for simple connections to MPCI cards or equivalent.

9 GLOSSARY OF TERMS

For a complete list of terms, refer to Ethertronics' Terms and Definitions document.

10 CONTACT INFORMATION

At Ethertronics, we are very proud of our technology. To learn more, visit the Ethertronics website at www.ethertronics.com or contact us at info@ethertronics.com. However, due to the technical nature of our products, the best source of information about our internal antennas is to contact us directly at:

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