



Surface Mount Ceramic Chip Antennas for 400 MHz

RoHS
COMPLIANT**VJ5301M400MXBSR chip antenna product**

Vishay™ VJ5301M400MXBSR chip antennas are covered by one or more of the following patents:

WO2008250262 (A1), US2008303720 (A1),
US2008305750 (A1), WO2008154173 (A1).

Other patents are pending.

ELECTRICAL SPECIFICATIONS²

Operating Temperature: -40 °C to + 85 °C

Frequency Range (Transmission/Reception): 360 to 480 MHz

DESCRIPTION

The VJ5301M400MXBSR ceramic chip antenna is a small form-factor, high-performance, chip-antenna designed for operation at 400 MHz. It allows manufacturers to design high quality products that do not bear the penalty of a large external antenna, and is designed to be assembled onto a PC board using a standard reflow process.

The VJ5301M400 is the latest in a family of products developed by Vishay™, a world leader in manufacturing of discrete and passive components.

The VJ5301M400 series are small form-factor, high-performance chip-antennas optimized for industrial, automotive, and medical applications.

Utilizing unique Vishay™ materials and manufacturing technologies, these products when properly tuned also comply with the MBRAI standard for portable communication.

Features

- Small outline (35 mm x 5 mm x 1.2 mm)
- 50Ω unbalanced tuning interface (max. -8.7 dBi gain¹)
- Assembled onto a PCB in the standard reflow process
- 120 MHz half-power tuned bandwidth (360 to 480 MHz)
- High-reliability ceramic-oxide body construction
- Low-RF loss, high-Q ceramic
- Lead (Pb)-free / wet build process
- Reliable Noble Metal Electrode (NME) system
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free per IEC 61249-2-21
- Wide operating temperature range (-40 °C to + 85 °C)

Applications

- Medical Telemetry (internal/external)
- Two way radio communication
- Land mobile services
- Industrial and medical band applications

QUICK REFERENCE DATA

SERIES	FREQUENCY (MHz)	MAX. GAIN (dBi)	AVERAGE GAIN (dBi)	BANDWIDTH (- 10 dB) (MHz)	BANDWIDTH (- 3 dB) (MHz)
VJ5301M400MXBSR	400	- 8.7	- 11.7	48	120

CHIP ANTENNA PERFORMANCE

NOMINAL FREQUENCY (MHz)	NOMINAL IMPEDANCE (Ω)	400 MHZ AVERAGE GAIN (dBi)	400 MHZ PEAK GAIN (dBi)	REFLECTED POWER COEFFICIENT S11	400 MHZ REFLECTED POWER LOSS	- 3 dB BANDWIDTH 360 MHz to 480 MHz	- 3 dB REFLECTED POWER LOSS	- 10 dB BANDWIDTH 386 MHz to 431 MHz	- 10 dB REFLECTED POWER LOSS
400	50	-11.7	-8.7	< - 23 dB	< 0.5 %	120	50 %	45	10 %
				< 0.5 %	< 0.02 dB		3 dB		0.46 dB

Table 1 of quick reference data and chip antenna performance

¹ See Figures 1 through 6 for more details on the radiation pattern (antenna gain) at 400 MHz; the PCB board ground is shorted to earth ground for tuning.

² Electrical characteristics at +25 °C unless otherwise specified. Antenna performance is measured at 400 MHz and 50 Ohm impedance unless otherwise specified. The best results are obtained by mounting the chip following the layout guidelines application note for the evaluation kit.



VJ5301M400MXBSR Tuning

Final tuning configuration and component values for L_1 , L_2 , and C_1 depend on customer PCB layout. Optimal tuning is possible with just a few standard components. **The nominal values shown are for a tuned VJ5301M400MXBEK kit.**

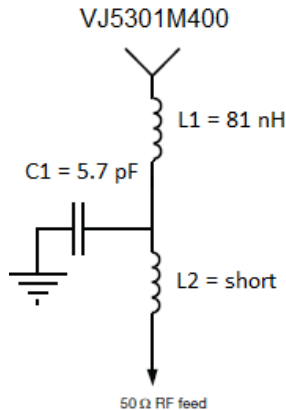


Figure 1 Tuning example with inductors L_1 , L_2 and capacitor C_1

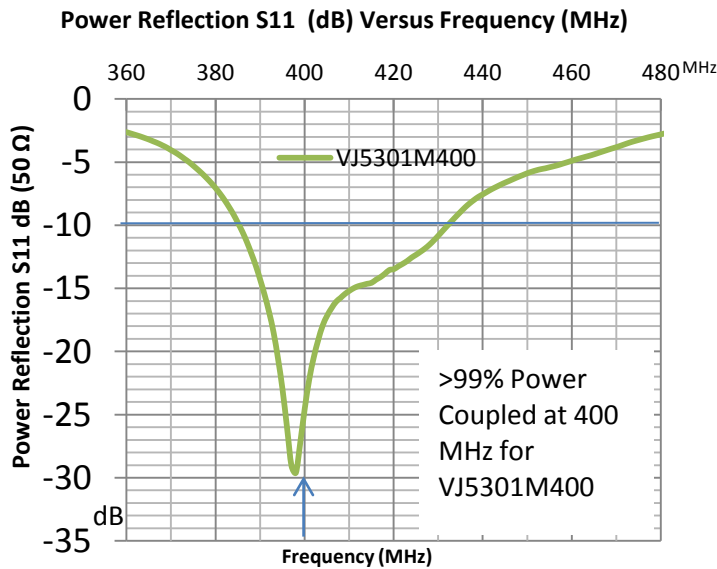
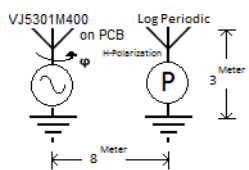


Figure 2 VJ5301M400 tuned to 400 MHz with > 99% power coupled



Rotation Plane	$\phi = 0^\circ$ Receiver Direction
XY	Y-axis
YZ	Z-axis
XZ	Z-axis

The radiation patterns reference the elevation θ that is perpendicular to the azimuth pole rotation in ϕ .

Figure 3 VJ5301M400 PCB mounting and coordinate directions

Figure 4 VJ5301M400MXBSR XY Radiation Pattern

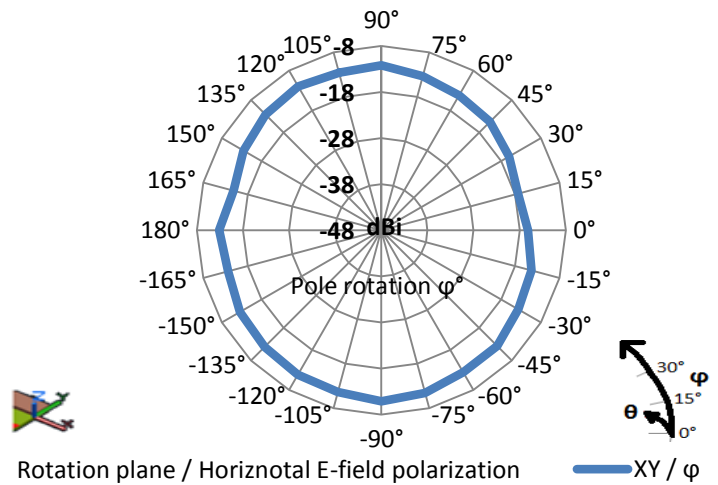


Figure 5 VJ5301M400MXBSR YZ Radiation Pattern

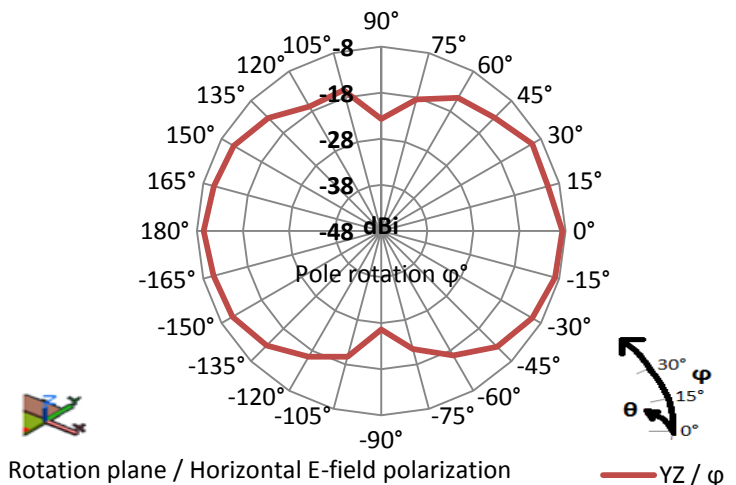
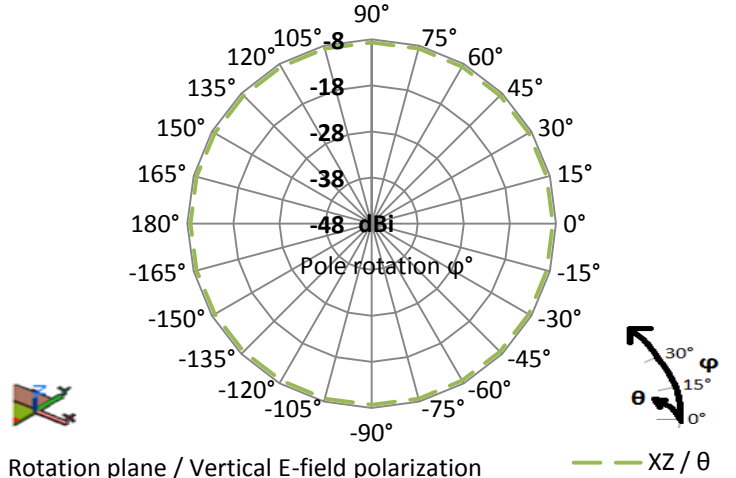


Figure 6 VJ5301M400MXBSR XZ Radiation Pattern





FOOTPRINT, MECHANICAL AND PCB DIMENSIONS

The antenna footprint and mechanical dimensions are presented in Figure 7. Optimal tuning is adjusted according to PCB layout.

For additional mechanical support, it is recommended to add one drop of heat curing epoxy glue.

- The glue dot should not overlap with any of the soldering pads.
- Apply the glue dot at the center of the antenna.
- The glue dot area secures the chip firmly to the PCB.

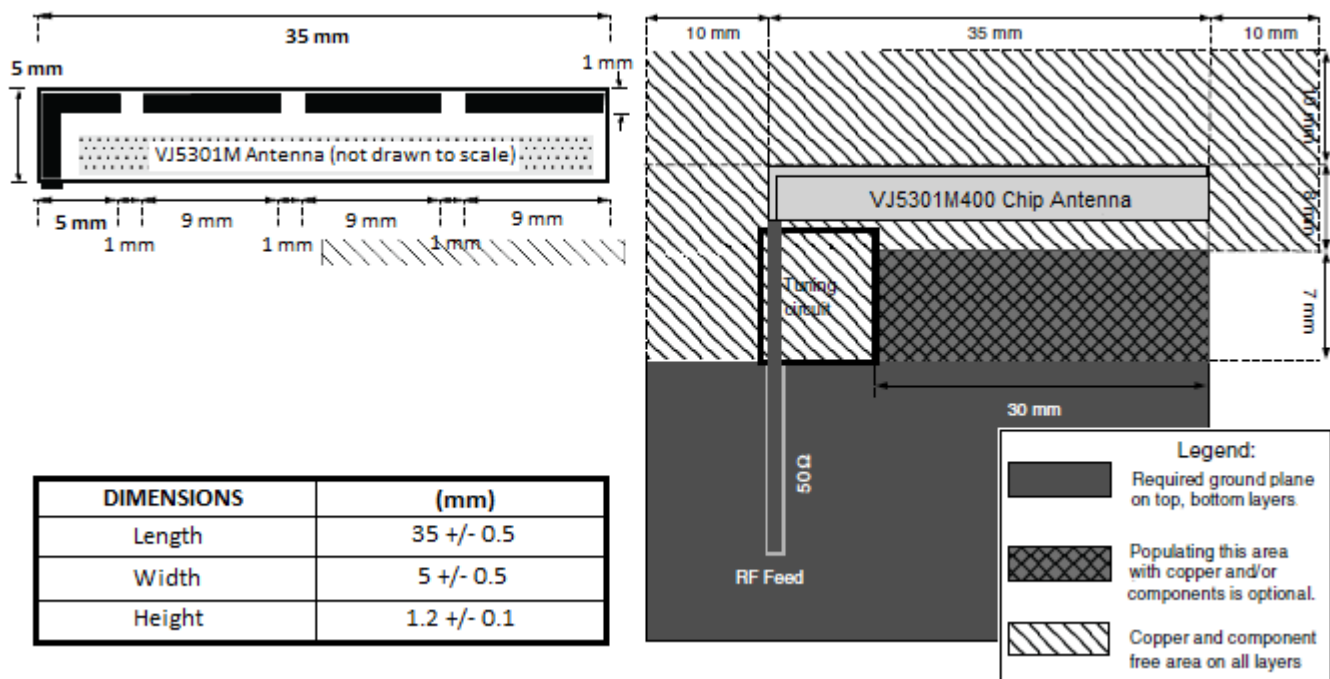


Figure 7 of VJ5301M400 footprint, chip antenna mechanical dimensions, and PCB layout dimensions

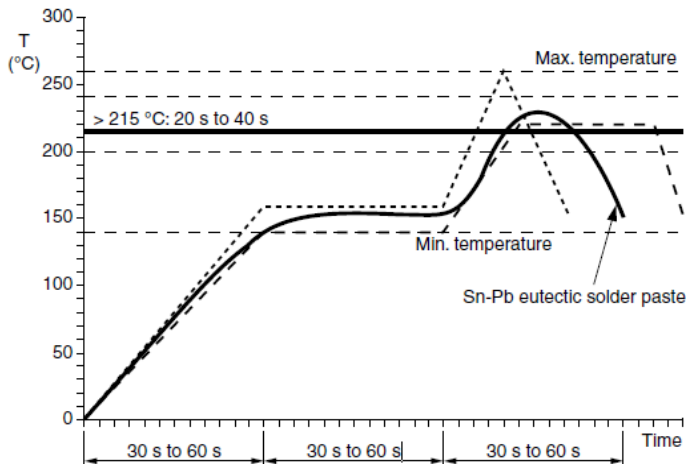


Figure 8 Soldering IR Reflow with SnPb Solder

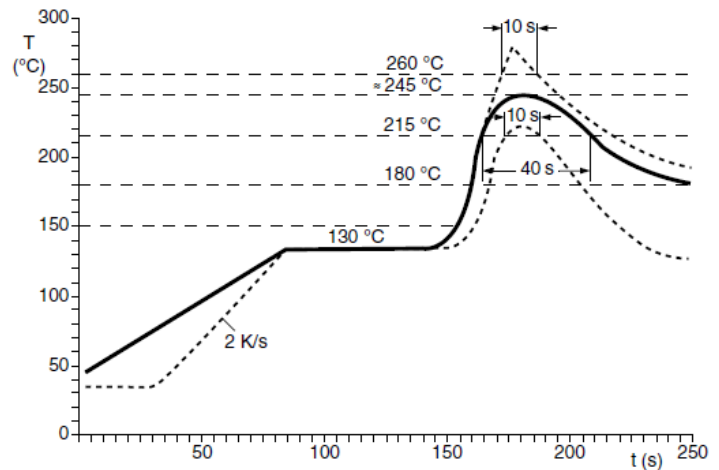


Figure 9 Soldering Reflow with Sn Solder

VJ5301M400 ASSEMBLY GUIDELINES

1. Mounting of antennas on a printed circuit board should be done by reflow soldering using the profiles shown (Figures 8, 9, and 10).
2. In order to provide the adequate strength between the antenna and the PCB apply of a dot of heat cured epoxy glue in the center of the footprint of the antenna prior to soldering the antenna to the board. An example for such glue is Heraeus PD 860002 SA. The weight of the dot should be 5 mg to 10 mg.

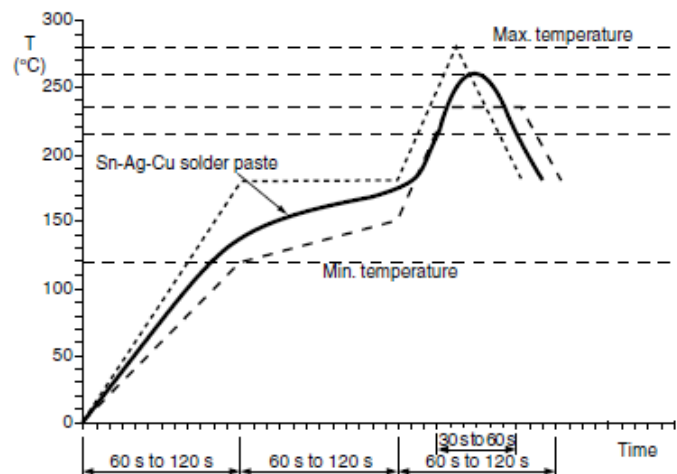


Figure 10 Soldering IR Reflow with SnAgCu Solder

ORDERING INFORMATION	VISHAY MATERIAL	PACKAGING QUANTITY
VJ5301M400 Chip Antenna	VJ5301M400MXBSR	1000 pieces
VJ5301M400 Evaluation Kit ³	VJ5301M400MXBEK	1 kit

³ The VJ5301M400 Kit is available for evaluation. For samples, please contact mlcc-samples@vishay.com.



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Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692
Email amall@ameya360.com
QQ 800077892
Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333
Email mkt@ameya360.com