

## Antenna Reference Trace Designs

RF traces from OSDI module pads W10 and W16 to the antenna must be made using micro-strip traces. This micro-strip trace must respect the design of the Gerber files associated with the following designs in order to obtain a uniform transmission line with a characteristic impedance of 50 ohms. The reference trace designs are shown in the following sections.

### Layout and parts for M antenna

The reference trace for this antenna is the green traces along with the side copper filled with vias on the left side of Figure 1 where components G8, G9, G11 and G12 are not installed. As preliminary information the traces width of all sections are 0.27mm and the length of each section, starting from the LGA pad to the M antenna are: LGA pad to G7: 15.38mm; G7 to G10: 12.37mm; G10 to R50: 2.3mm; R50 to M antenna: 4.85mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 1 shows the parts used in this reference trace design.

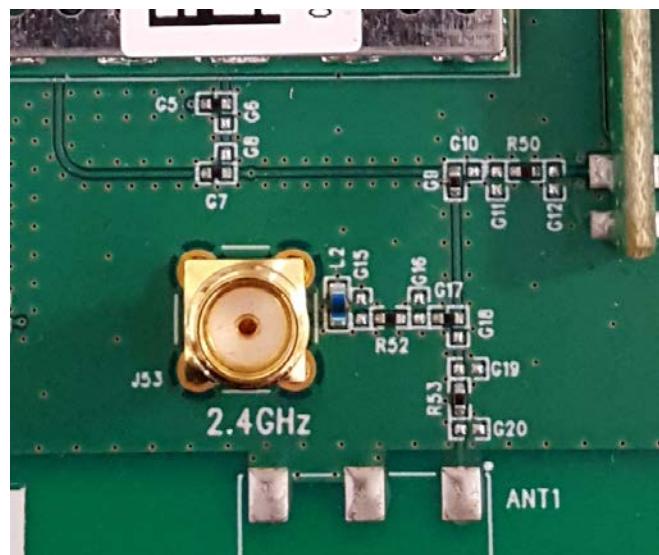
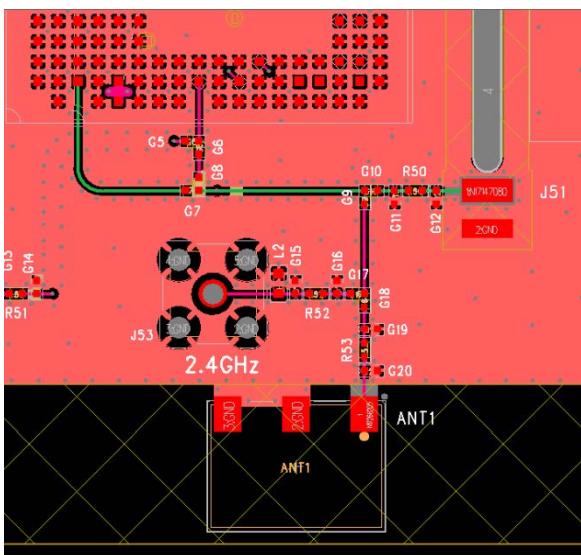


Figure 1 FCC and IC approved trace design layout and picture for the M antenna

Table 1 Antenna micro-strip trace parts for M antenna

Part Number	Designator	Description	Manufacturer
N/A	G8, G9, G11, G12	Not installed	N/A
RK73Z1ETTP	G7, G10, R50	RESISTOR 0.0 OHMS 1/16W 5% 0402 SMT	KOA Speer Electronics
CP-0299A	J51	Trilliant M antenna	Trilliant

### Layout and parts for uSplash antenna

The reference trace for this antenna is the green traces along with the side copper filled with vias on the left side of Figure 2 where components G8, G10, G17, G19 and G20 are not installed. As preliminary information the traces width of all sections are 0.27mm and the length of each section, starting from the LGA pad to the uSplash are: LGA pad to G7: 15.38mm; G7 to G9: 12.37mm; G9 to G17: 6.7mm; G17 to R53: 2.1mm and R53 to uSplash antenna: 7.2mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 2 shows the parts used in this reference trace design.

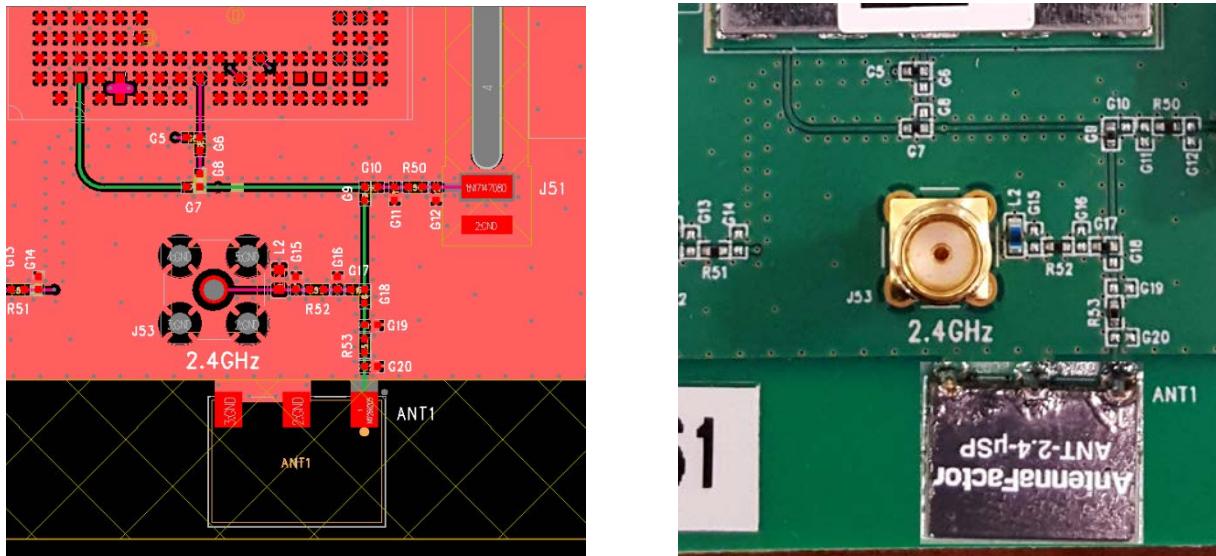


Figure 2 FCC and IC approved trace design layout and picture for the uSplash antenna

Table 2 Antenna micro-strip trace parts for M antenna

Part Number	Designator	Description	Manufacturer
N/A	G8, G9, G11, G12	Not installed	N/A
RK73Z1ETTP	G7, G9, G18, R53	RESISTOR 0.0 OHMS 1/16W 5% 0402 SMT	KOA Speer Electronics
ANT-2.4-uSP	ANT1	PC mount quarter-wave antenna	Linx

### Layout and parts for external antennas

The reference traces for these antennas are the green traces along with the side copper filled with vias on the left side of Figure 3 where components G8, G10, G15, G16 and G18 are not installed and the left side of Figure 4 where G4 is not installed.

As preliminary information for Figure 3 the traces width of all sections are 0.27mm and the length of each section, starting from the LGA pad to J53 connector are: LGA pad to G7: 15.38mm; G7 to G9: 12.37mm; G9 to G17: 6.7mm; G17 to R52: 2.1mm; R52 to J53: 7.2mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 3 shows the parts used in the reference trace design.

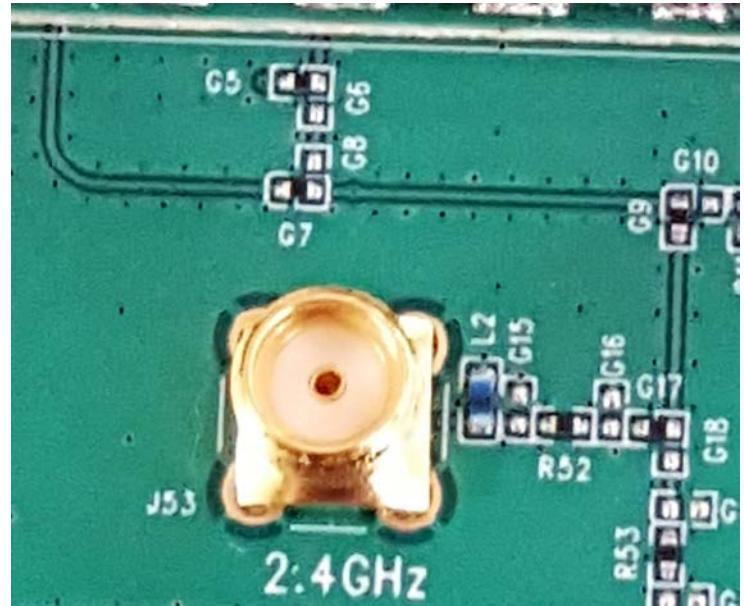
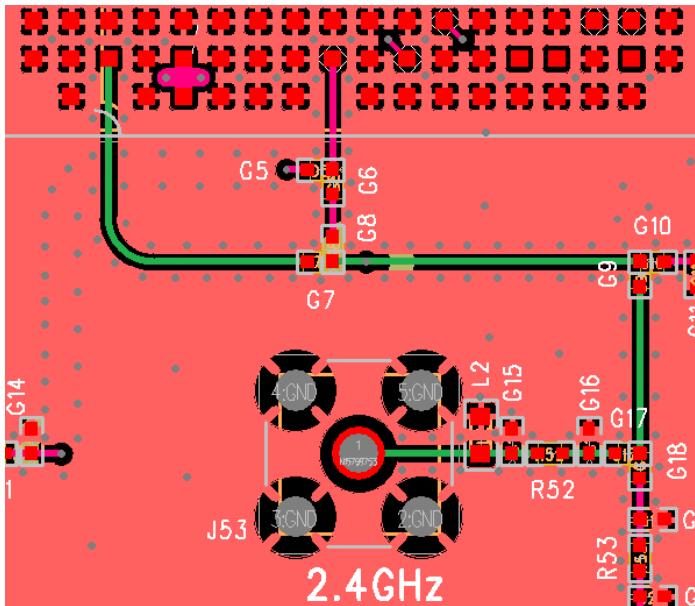


Figure 3 FCC and IC approved trace design layout and picture for external antennas

Table 3 Antenna micro-strip trace parts for external antennas

Part Number	Designator	Description	Manufacturer
N/A	G8, G10, G15, G16, G18	Not installed	N/A
RK73Z1ETTP	G7, G9, G17, R52	RESISTOR 0.0 OHMS 1/16W 5% 0402 SMT	KOA Speer Electronics
LQW18AN75NG00D	L2	INDUCTOR 75nH, 2%, 270mA 560mΩ, 0603 SMT	Murata Manufacturing
1-1478979-0	J53	SMA JACK CONNECTOR (FEMALE) PCB Mount 4 legs, SS/Gold pl.	TE Connectivity

As preliminary information for Figure 4, the traces width of all sections are 1mm and the length of each section, starting from the LGA pad to J5 connector are: LGA pad to G3: 14.18mm; G3 to J5: 5.05mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 4 shows the parts used in the reference trace design.

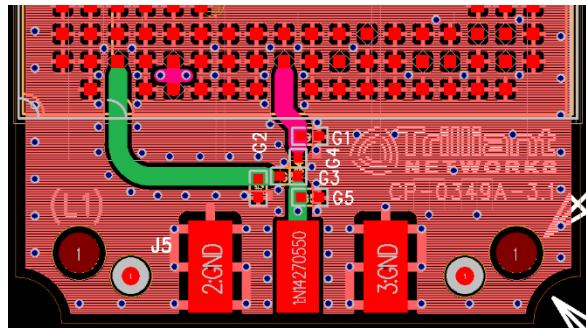


Figure 4 FCC and IC approved trace design layout and picture for external antennas

Table 4 Antenna micro-strip trace parts for external antennas

Part Number	Designator	Description	Manufacturer
N/A	G4	Not installed	N/A
RK73Z1ETTP	G3	RESISTOR 0.0 OHMS 1/16W 5% 0402 SMT	KOA Speer Electronics
142-0701-801	J5	SMA End Launch Jack receptacle (FEMALE) Round Contact, Gold pl.	Johnson Components

As preliminary information for Figure 5, the traces width of all sections is 0.6mm and the length of each section, starting from the LGA pad to J4 connector are: LGA pad to R14: 14.7mm; R14 to J4: 2.1mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 5 shows the parts used in the reference trace design.

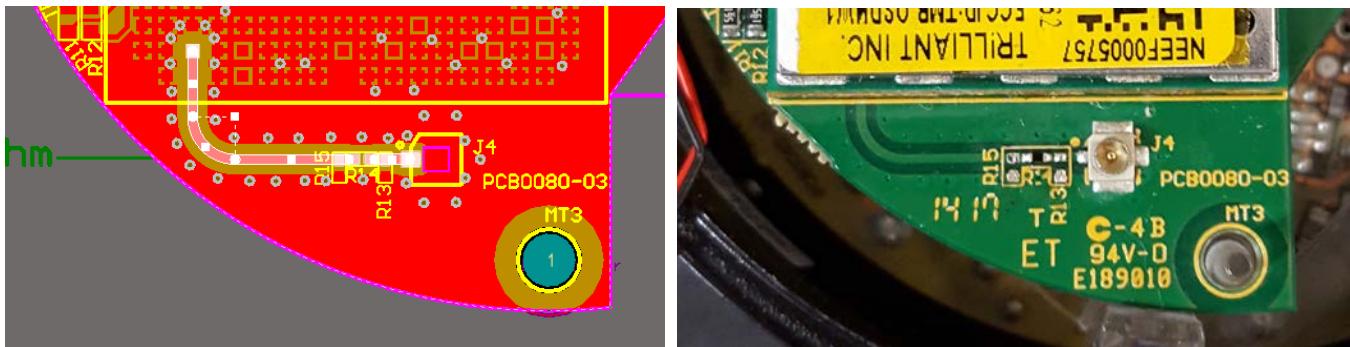


Figure 5 FCC and IC approved trace design layout and picture for external antennas

Table 5 Antenna micro-strip trace parts for external antennas

Part Number	Designator	Description	Manufacturer
ESR01M2PJ391	R13, R15	RES SMD 390 OHM 5% 1/5W 0402	Rohm Semiconductor
CRCW040210R7FKEDHP	R14	RES SMD 10.7 OHM 1% 1/5W 0402	Vishay
73412-0110	J4	JACK, U.FL, Straight, PCB, SMT	Molex

As preliminary information for Figure 6, the traces width of all sections is 0.2mm and the length of each section, starting from the LGA pad to J7 connector are: LGA pad to R18: 11.82mm; R18 to J7: 5.2mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 6 shows the parts used in the reference trace design.

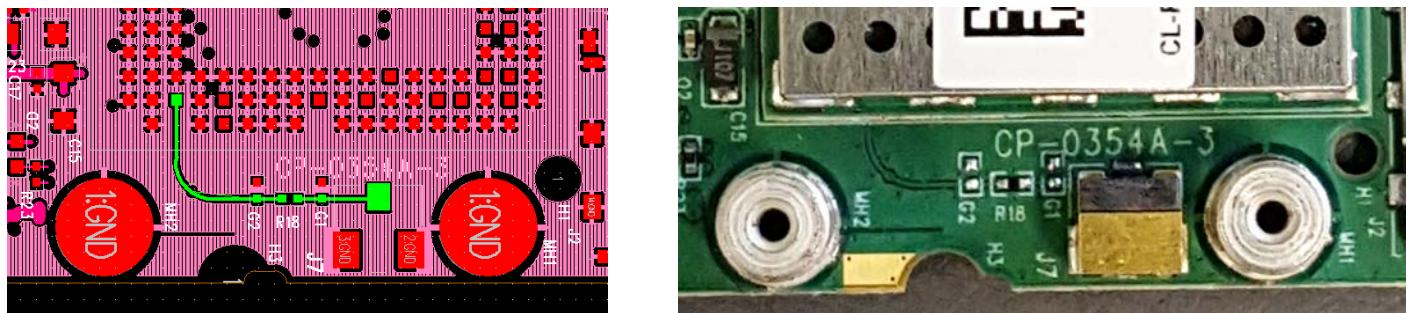


Figure 6 FCC and IC approved trace design layout and picture for external antennas

Table 6 Antenna micro-strip trace parts for external antennas

Part Number	Designator	Description	Manufacturer
N/A	G1, G2	Not installed	N/A
RK73Z1ETTP	R18	RESISTOR 0.0 OHMS 1/16W 5% 1005/0402 SMT	KOA Speer Electronics
6-1460820-2	J7	MMCX CONNECTOR RIGHT ANGLE JACK (female), Tin pl. SMT	TE Connectivity

As preliminary information for Figure 7, the traces width of all sections is 0.2mm and the length of each section, starting from the LGA pad to J1 connector are: LGA pad to G2: 5.65mm; G2 to J1: 7.35mm. However, refer to associated Gerber files for more accurate details on dimensions and refer to Trilliant Networks Inc for more details on the Gerber files. Table 7 shows the parts used in the reference trace design.

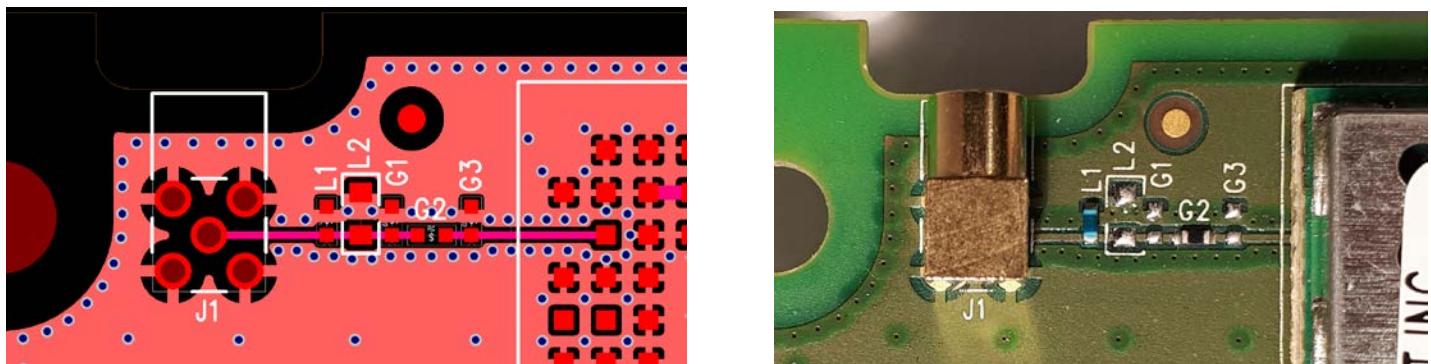


Figure 7 FCC and IC approved trace design layout and picture for external antennas

Table 7 Antenna micro-strip trace parts for external antennas

Part Number	Designator	Description	Manufacturer
N/A	L2, G1, G3	Not installed	N/A
RMC16S-000T	G2	RESISTOR 0.0 OHMS 1/16W 5% 1005/0402 SMT	Megastar Electroniques
LQW15AN75NG00D	L1	INDUCTOR 75nH 2% 135mA 2.1Ohm, Self-resonance 2.4GHz, 0402 SMT	MURATA
CONMMCX002	J1	MMCX CONNECTOR RIGHT ANGLE JACK RECEPTACLE TH, Brass Gold pl.	Linx Technologies

### Design validation & production procedures

To verify compliance of the reference trace, a coupon must be requested with every manufacturing panel form and for which the characteristics are described in the Gerber files. Part of these characteristics are shown in Figure 8. Then a network analyzer is used to measure the impedance of this coupon in order to validate the antenna trace.

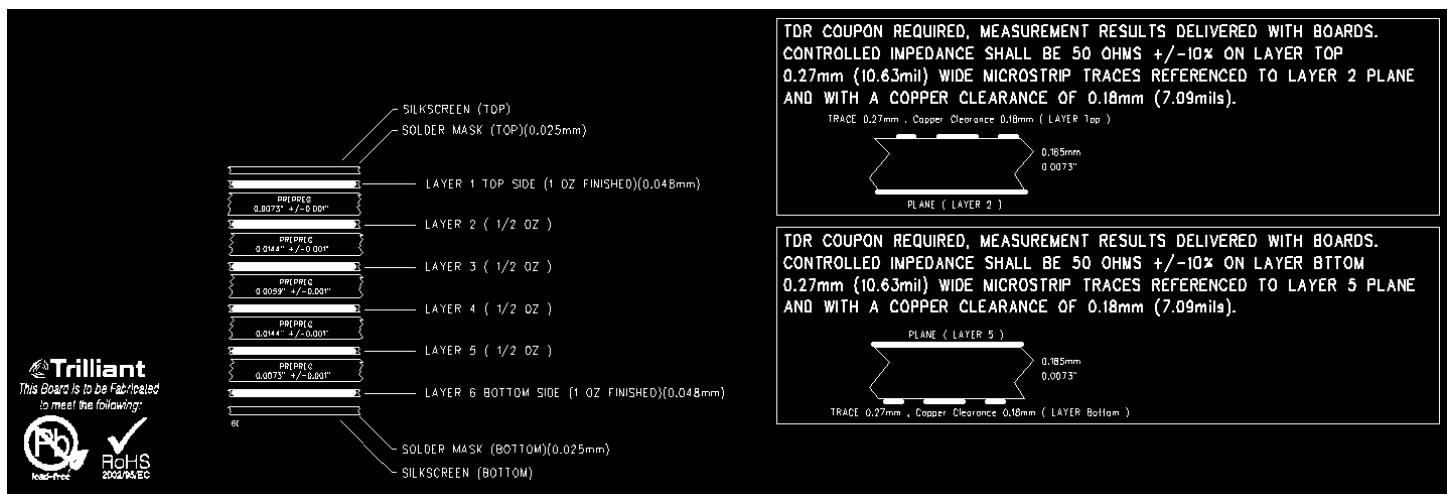


Figure 8 Coupon requirements to validate trace impedance

## Other considerations

The only antennas that can be used with the module using the reference trace design are the:

- Trilliant, CP-0299A, 4.8 dBi
- Linx, ANT-2.4-uSP, 3.8 dBi
- Larsen Antenna, RO2406NM, 6 dBi
- Mobile Mark, IMAG5-2400-3K-BLK-120, 5 dBi
- L-Com, HG2403RD-RTF, 3 dBi
- Mobile Mark, CVS-2400, 2.5 dBi
- Molex 1461530100, 3 dBi

The use of any other antenna or any changes to the reference trace designs are subject to additional testing and authorization through a Class II permissive change.