



Wideband 5G Ceramic SMD Antenna

Part No:

PA.176.A

Description:

High-Band 5G Ceramic SMD Antenna covering 1.7-6GHz

Features:

Patent Pending Ceramic Antenna

Covering 1.7 - 6GHz

High Efficiency across all cellular High-Bands

Small Footprint

Dimensions: 20 x 10 x 3mm

Surface Mount Distribution (SMD) - Supplied on Tape & Ree

Manufactured in our IATF16949 Certified Facility

CE Certified, RoHS & REACH Compliant





1.	Introduction	3
2.	Specifications	4
3.	Antenna Characteristics	6
4.	Radiation Patterns	8
5.	Mechanical Drawing	10
6.	Integration Guide	11
7.	Solder Reflow Profile	19
8.	Packaging	20
	Changelog	21

Taoglas makes no warranties based on the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Taoglas reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permission is strictly prohibited.













1. Introduction



The PA.176.A is a patent-pending, 5G/4G high-band cellular SMD antenna designed especially for direct mount on a device's PCB. It provides very high efficiency across multiple cellular bands, operating between 1.7 - 6GHz, in an extremely small form factor. The shape and compact size of just 20*10*3mm, allows the PA.176.A to be easily integrated solution for mounting on the edge of the device's PCB. It is lightweight and is the perfect antenna for mounting on a PCB where space may be limited, as the keep out area for other electronic components, is minimal. Using SMD (on-board) antennas saves on assembly, cable, and connector costs. SMD antennas also lead to higher integration yield rates, higher transmit power and higher sensitivity.

Typical cellular applications include:

- Telematic Control and On-board Diagnostic Units
- Wireless Medical Devices
- First Responder and Public Safety Devices
- UAV's and Robotics
- Media and Smart Home

Care should be taken to the follow layout instructions provided in Section 6 of this datasheet and in placing antenna on the edge of board with adequate clearance to metal. Minimum ground-plane requirements must be met to achieve targeted efficiencies. The PA.176.A is manufactured in Taoglas' IATF16949 Certified Facility and is suitable for automotive applications.

Taoglas provides optimization services for matching, and active TRP, TIS and RSE testing. Integration files for the PA.176.A can be downloaded from the <u>product page</u> on the website. For further information or additional support please contact your regional Taoglas customer support team.



2. Specifications

Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	VSWR	Impedance	Polarization	Radiation Pattern
4G/3G Band 3,4,9,25,35,66	1710~1880	77	-1.5	3				
4G/3G Band 1,2,3,9,25,35,39	1850~1990	72	-1.6	3.3				
4G/3G Band 1,2,4,23,25	1920~2170	72	-1.4	3.8				
4G/3G Band 7,30,38,40,41	2300~2690	65	-1.6	4.5	<3:1	50 Ω	Linear	Omni
5G/4G Band 22,42,78	3300~3500	55	-2.5	3.7				
5G/4G Band 22,42,43,48,77,78,79	3200~4650	58	-2.4	3.6				
Greater than 5GHz	5150~5925	64	-2	2.8				

^{*}Results on 60mm EVB

Mechanical		
Dimension	20*10*3 mm	
Material	Ceramic	
Termination	Ag (environmental Pb free) - Solder Pad	
EVB Connector	SMA-Female	
Weight	1.8g	
	Environmental	
Temperature Range	-40°C to 85°C	
Moisture Sensitivity	Level 3	



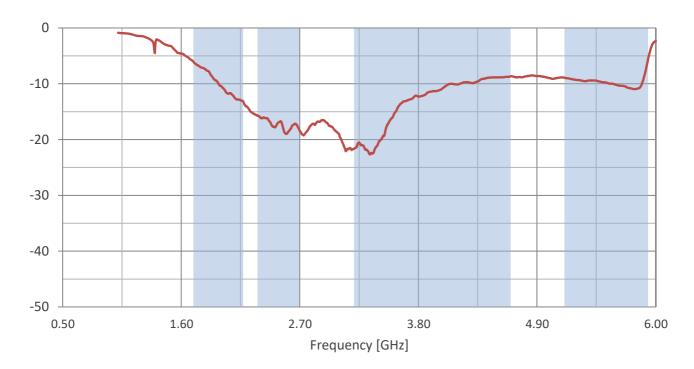
Band Number SGNR / FR1 / LTE / LTE - Advanced / WCDMA / HSPA + / TD-SCDMA Uplink		5G/4G Bands			
Uplink Downlink Covered 1 UI: 1920 to 1980 DI: 2110 to 2170 ✓ 2 UI: 1850 to 1910 DI: 1930 to 1990 ✓ 3 UI: 1710 to 1785 DI: 1805 to 1880 ✓ 4 UI: 1710 to 1755 DI: 2110 to 2155 ✓ 5 UI: 824 to 849 DI: 869 to 894 X 7 UI: 2500 to 2570 DI: 2620 to 2690 ✓ 8 UI: 880 to 915 DI: 925 to 960 X 9 UI: 1749 to 1744.9 DI: 1844.9 to 1879.9 ✓ 11 UI: 1427.9 to 1447.9 DI: 1844.9 to 1879.9 ✓ 12 UI: 699 to 716 DI: 729 to 746 X 13 UI: 777 to 787 DI: 746 to 756 X 14 UI: 788 to 798 DI: 758 to 768 X 17 UI: 704 to 716 DI: 734 to 746 X 18 UI: 815 to 830 DI: 860 to 875 X 19 UI: 830 to 845 DI: 875 to 890 X 20 UI: 832 to 862 DI: 791 to 8	Band Number	5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA			
2 UI: 1850 to 1910 DI: 1930 to 1990 3 UI: 1710 to 1785 DI: 1805 to 1880 4 UI: 1710 to 1755 DI: 2110 to 2155 5 UI: 824 to 849 DI: 869 to 894 X 7 UI: 2500 to 2570 DI: 2620 to 2690 4 UI: 1880 to 915 DI: 925 to 960 X 8 UI: 880 to 915 DI: 925 to 960 X 9 UI: 1749.9 to 1784.9 DI: 1844.9 to 1879.9 11 UI: 1427.9 to 1447.9 DI: 1475.9 to 1495.9 12 UI: 699 to 716 DI: 729 to 746 X 13 UI: 777 to 787 DI: 785 to 768 X 14 UI: 788 to 798 DI: 788 to 768 X 17 UI: 704 to 716 DI: 734 to 746 X 18 UI: 815 to 830 DI: 860 to 875 X 19 UI: 830 to 845 DI: 875 to 890 X 20 UI: 832 to 862 DI: 791 to 821 X 21 UI: 447.9 to 1462.9 DI: 1495.9 to 150.9 42 UI: 3410 to 3490 DI: 3510 to 3590 4 23 UI: 2000 to 2020 DI: 2180 to 2200 4 24 UI: 1625.5 to 1660.5 DI: 1525 to 1559 4 27 UI: 807 to 824 DI: 852 to 869 X 28 UI: 703 to 748 DI: 758 to 803 X 29 UI: - UI: 703 to 748 DI: 758 to 803 X 30 UI: 2305 to 2315 DI: 2350 to 2350 4 31 UI: 452.5 to 457.5 DI: 462.5 to 467.5 X 32 UI: - UI: 4850 to 1910 4 38 E2570 to 2620 4 39 1880 to 1920 4					
3 UI: 1710 to 1785 DI: 1805 to 1880 4 UI: 1710 to 1755 DI: 2110 to 2155 5 UI: 824 to 849 DI: 869 to 894 7 UI: 2500 to 2570 DI: 2620 to 2690 8 UI: 880 to 915 DI: 925 to 960 9 UI: 1749.9 to 1784.9 DI: 1844.9 to 1879.9 11 UI: 1427.9 to 1447.9 DI: 1475.9 to 1495.9 12 UI: 699 to 716 DI: 722 to 746 13 UI: 777 to 787 DI: 746 to 756 14 UI: 788 to 798 DI: 758 to 768 17 UI: 704 to 716 DI: 734 to 746 18 UI: 815 to 830 DI: 860 to 875 19 UI: 830 to 845 DI: 875 to 890 20 UI: 832 to 862 DI: 791 to 821 21 UI: 447.9 to 1462.9 DI: 1495.9 to 1510.9 22 UI: 3410 to 3490 DI: 3510 to 3590 23 UI: 2000 to 2020 DI: 2180 to 2200 24 UI: 1625.5 to 1660.5 DI: 1525 to 1559 25 UI: 1850 to 1915 DI: 859 to 894 27 UI: 807 to 824 DI: 859 to 894 28 UI: 703 to 748 DI: 758 to 803 29 UI: - DI: 717 to 728 30 UI: 2305 to 2315 DI: 3550 to 1950 31 UI: 452.5 to 457.5 DI: 462.5 to 467.5 32 UII: 4850 to 1910 √ 38 1850 to 1920 √ 4801 1850 to 1920 √ 4901 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1450 to 1920 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1452 - 1496 √ 4001 1450 1450 1450 1450 1450 1450 1450	1	UL: 1920 to 1980	DL: 2110 to 2170	✓	
4 UL: 1710 to 1755 DL: 2110 to 2155 5 UL: 824 to 849 DL: 869 to 894 7 UL: 2500 to 2570 DL: 2620 to 2690 8 UL: 880 to 915 DL: 925 to 960 9 UL: 1749.9 to 1784.9 DL: 1844.9 to 1879.9 11 UL: 1427.9 to 1447.9 DL: 1475.9 to 1495.9 12 UL: 699 to 716 DL: 729 to 746 13 UL: 777 to 787 DL: 746 to 756 14 UL: 788 to 798 DL: 758 to 768 17 UL: 704 to 716 DL: 734 to 746 18 UL: 815 to 830 DL: 860 to 875 20 UL: 832 to 862 DL: 791 to 821 21 UL: 1447.9 to 1462.9 DL: 1495.9 to 1510.9 22 UL: 3410 to 3490 DL: 3510 to 3590 23 UL: 2000 to 2020 DL: 2180 to 2200 24 UL: 1625.5 to 1660.5 DL: 1525 to 1559 25 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 28 UL: 703 to 748 DL: 758 to 803 29 UL: 30 UL: 2305 to 2315 DL: 758 to 803 20 UL: 335 to 2315 DL: 758 to 803 31 UL: 452.5 to 457.5 DL: 1452.9 DL: 1455.9 to 3590 ✓ ✓ 34 UL: 807 to 824 35 IL: 1850 to 1910 ✓ ✓ 38 IL: 1452.5 to 467.5 X DL: 4850 to 1910 ✓ ✓ 38 IL: 450 to 1910 ✓ ✓ 38 IL: 450 to 1920 ✓ ✓ 39 IL: 455.5 to 457.5 IL: 1850 to 1910 ✓ ✓ 39 IL: 480 to 1920 ✓ ✓ 39 IL: 480 to 1920 ✓ ✓ 30 IL: 452.5 to 457.5 IL: 1850 to 1910 ✓ ✓ 38 IL: 5750 to 2620 ✓ ✓ 39 IL: 807 to 2620	2	UL: 1850 to 1910	DL: 1930 to 1990	✓	
5 UI: 824 to 849 DI: 869 to 894 ★ 7 UI: 2500 to 2570 DI: 2620 to 2690 ✓ 8 UI: 880 to 915 DI: 925 to 960 ★ 9 UI: 1749.9 to 1784.9 DI: 1844.9 to 1879.9 ✓ 11 UI: 427.9 to 1447.9 DI: 1475.9 to 1495.9 ✓ 12 UI: 699 to 716 DI: 729 to 746 ★ 13 UI: 777 to 787 DI: 766 to 756 ★ 14 UI: 788 to 798 DI: 758 to 768 ★ 17 UI: 704 to 716 DI: 758 to 768 ★ 18 UI: 815 to 830 DI: 860 to 875 ★ 19 UI: 830 to 845 DI: 875 to 890 ★ 20 UI: 832 to 862 DI: 791 to 821 ★ 21 UI: 1447.9 to 1462.9 DI: 1495.9 to 1510.9 ✓ 22 UI: 3410 to 3490 DI: 3510 to 3590 ✓ 23 UI: 2000 to 2020 DI: 1252 to 1559 ✓ 24 UI: 1625.5 to 1660.5 DI: 1525 to 1559 ✓ 25 UI: 1850 to 1915 DI: 1930 to 1995 ✓ 26 UI:	3	UL: 1710 to 1785	DL: 1805 to 1880	✓	
7 UI.: 2500 to 2570 DI.: 2620 to 2690 8 UI.: 880 to 915 DI.: 925 to 960	4	UL: 1710 to 1755	DL: 2110 to 2155	✓	
8 UL: 880 to 915 DL: 925 to 960	5	UL: 824 to 849	DL: 869 to 894	*	
9 UL: 1749.9 to 1784.9 11 UL: 1427.9 to 1447.9 12 UL: 699 to 716 13 UL: 777 to 787 14 UL: 788 to 798 15 UL: 776 to 716 16 UL: 788 to 798 17 UL: 704 to 716 18 UL: 815 to 830 19 UL: 830 to 845 19 UL: 832 to 862 20 UL: 832 to 862 21 UL: 447.9 to 1462.9 22 UL: 3410 to 3490 23 UL: 2000 to 2020 24 UL:1625.5 to 1660.5 25 UL: 1850 to 1915 26 UL: 844 to 849 27 UL: 807 to 824 28 UL: 703 to 748 29 UL: - 30 UL: 2305 to 2315 31 UL: 452.5 to 457.5 32 UL: 4550 to 1910 4 SE 1850 to 1910 4 SE 1850 to 1910 4 SE 2570 to 2620 4 UL: 452.9 to 452.0 5 UL: 1452. 1496 5 UL: 1452.7 to 2620	7	UL: 2500 to 2570	DL:2620 to 2690	✓	
11 UL: 1447.9 to 1447.9 12 UL: 699 to 716 DL: 729 to 746 X 13 UL: 777 to 787 DL: 746 to 756 X 14 UL: 788 to 798 DL: 758 to 768 X 17 UL: 704 to 716 DL: 734 to 746 X 18 UL: 815 to 830 DL: 860 to 875 X 19 UL: 830 to 845 DL: 875 to 890 X 20 UL: 832 to 862 DL: 791 to 821 X 21 UL: 1447.9 to 1462.9 DL: 3510 to 3590 ✓ 22 UL: 3410 to 3490 DL: 3520 to 2200 DL: 2180 to 2200 ✓ 24 UL: 1625.5 to 1660.5 DL: 1525 to 1559 ✓ UL: 814 to 849 DL: 859 to 894 X 27 UL: 807 to 824 DL: 758 to 869 X 28 UL: 703 to 748 DL: 758 to 803 X 29 UL: 1850 to 1915 DL: 2350 to 2360 ✓ 1850 to 1910 ✓ 1880 to 1920	8	UL: 880 to 915	DL: 925 to 960	×	
12 UL: 699 to 716 DL: 729 to 746	9	UL: 1749.9 to 1784.9	DL: 1844.9 to 1879.9	✓	
13 UI: 777 to 787 DI: 746 to 756 ★ 14 UI: 788 to 798 DI: 758 to 768 ★ 17 UI: 704 to 716 DI: 734 to 746 ★ 18 UI: 815 to 830 DI: 860 to 875 ★ 19 UI: 830 to 845 DI: 875 to 890 ★ 20 UI: 832 to 862 DI: 791 to 821 ★ 21 UI: 1447.9 to 1462.9 DI: 1495.9 to 1510.9 ✓ 22 UI: 3410 to 3490 DI: 3510 to 3590 ✓ 23 UI: 2000 to 2020 DI: 2180 to 2200 ✓ 24 UI: 1625.5 to 1660.5 DI: 1525 to 1559 ✓ 25 UI: 1850 to 1915 DI: 1930 to 1995 ✓ 26 UI: 814 to 849 DI: 859 to 894 ★ 27 UI: 807 to 824 DI: 852 to 869 ★ 28 UI: 703 to 748 DI: 717 to 728 ★ 30 UI: 2305 to 2315 DI: 2350 to 2360 ✓ 31 UI: 452.5 to 457.5 DI: 462.5 to 467.5 ★ 32 UI: - DI: 1452 - 1496 ✓ 35 1850 to 1910	11	UL: 1427.9 to 1447.9	DL: 1475.9 to 1495.9	✓	
14 UL: 788 to 798 DL: 758 to 768	12	UL: 699 to 716	DL: 729 to 746	×	
17 UL: 704 to 716 DL: 734 to 746	13	UL: 777 to 787	DL: 746 to 756	*	
18 UL: 815 to 830 DL: 860 to 875	14	UL: 788 to 798	DL: 758 to 768	*	
19 UL: 830 to 845 20 UL: 832 to 862 21 UL: 1447.9 to 1462.9 22 UL: 3410 to 3490 23 UL:2000 to 2020 24 UL:1625.5 to 1660.5 25 UL: 1850 to 1915 26 UL: 814 to 849 27 UL: 807 to 824 28 UL: 703 to 748 29 UL: - 30 UL: 2305 to 2315 31 UL: 2305 to 2315 32 UL: - 35 UL: 452.5 to 457.5 32 UL: - 38 2570 to 2620 39 UR: 852 to 869 ★ 257 UL: 452.5 to 457.5 4 CRITICAL STATE ST	17	UL: 704 to 716	DL: 734 to 746	*	
20 UL: 832 to 862 DL: 791 to 821 ★ 21 UL: 1447.9 to 1462.9 DL: 1495.9 to 1510.9 ✓ 22 UL: 3410 to 3490 DL: 3510 to 3590 ✓ 23 UL:2000 to 2020 DL: 2180 to 2200 ✓ 24 UL:1625.5 to 1660.5 DL: 1525 to 1559 ✓ 25 UL: 1850 to 1915 DL: 1930 to 1995 ✓ 26 UL: 814 to 849 DL: 859 to 894 ★ 27 UL: 807 to 824 DL: 852 to 869 ★ 28 UL: 703 to 748 DL: 758 to 803 ★ 29 UL: - DL: 717 to 728 ★ 30 UL: 2305 to 2315 DL: 2350 to 2360 ✓ 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 ★ 32 UL: - DL: 1452 - 1496 ✓ 35 1850 to 1910 ✓ 39 1880 to 1920 ✓	18	UL: 815 to 830	DL: 860 to 875	*	
21 UL: 1447.9 to 1462.9 DL: 1495.9 to 1510.9 22 UL: 3410 to 3490 DL: 3510 to 3590 23 UL: 2000 to 2020 DL: 2180 to 2200 24 UL:1625.5 to 1660.5 DL: 1525 to 1559 25 UL: 1850 to 1915 DL: 1930 to 1995 26 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 ✓ 38 2570 to 2620 ✓ 39 1880 to 1920 ✓	19	UL: 830 to 845	DL: 875 to 890		
22 UL: 3410 to 3490 DL: 3510 to 3590 23 UL: 2000 to 2020 DL: 2180 to 2200 24 UL: 1625.5 to 1660.5 DL: 1525 to 1559 25 UL: 1850 to 1915 DL: 1930 to 1995 26 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 38 2570 to 2620 39 1880 to 1920	20	UL: 832 to 862			
23 UL:2000 to 2020 DL: 2180 to 2200 24 UL:1625.5 to 1660.5 DL: 1525 to 1559 25 UL: 1850 to 1915 DL: 1930 to 1995 26 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 38 2570 to 2620 39 1880 to 1920		UL: 1447.9 to 1462.9	DL: 1495.9 to 1510.9		
24 UL:1625.5 to 1660.5 25 UL: 1850 to 1915 26 UL: 814 to 849 27 UL: 807 to 824 28 UL: 703 to 748 29 UL: - 30 UL: 2305 to 2315 31 UL: 452.5 to 457.5 32 UL: - 35 UL: - 36 UL: - 37 DL: 1525 to 1559 ✓ DL: 1930 to 1995 ✓ DL: 859 to 894 ✗ DL: 852 to 869 ✗ DL: 758 to 803 ✗ DL: 717 to 728 ✗ DL: 2350 to 2360 ✓ DL: 462.5 to 467.5 ✗ 1850 to 1910 ✓ 38 2570 to 2620 ✓ 1880 to 1920 ✓	22				
25 UL: 1850 to 1915 26 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 ✓ 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 ✓ 38 2570 to 2620 ✓ 39 1880 to 1920	23				
26 UL: 814 to 849 DL: 859 to 894 27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 ✓ 38 2570 to 2620 ✓ 39 1880 to 1920 ✓					
27 UL: 807 to 824 DL: 852 to 869 28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 ✓ 38 2570 to 2620 ✓ 39 1880 to 1920 ✓					
28 UL: 703 to 748 DL: 758 to 803 29 UL: - DL: 717 to 728 30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 38 2570 to 2620 39 1880 to 1920 ✓					
29 UL: - 30 UL: 2305 to 2315 DL: 2350 to 2360 ✓ 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 ✓ 35 1850 to 1910 ✓ 38 2570 to 2620 ✓ 39 1880 to 1920					
30 UL: 2305 to 2315 DL: 2350 to 2360 31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 √ 38 2570 to 2620 √ 39 1880 to 1920 ✓					
31 UL: 452.5 to 457.5 DL: 462.5 to 467.5 32 UL: - DL: 1452 - 1496 35 1850 to 1910 38 2570 to 2620 √ 39 1880 to 1920 √				_	
32 UL: - DL: 1452 - 1496 35 1850 to 1910 38 2570 to 2620 39 1880 to 1920 ✓					
35 1850 to 1910 38 2570 to 2620 √ 39 1880 to 1920 √					
38 2570 to 2620 ✓ 39 1880 to 1920 ✓					
39 1880 to 1920 ✓					
		,			
40 2300 to 2400 ✓		2300 to 2400 ✓			
,		2496 to 2690			
·-		2496 to 2690 ▼ 3400 to 3600 ▼			
48 3550 to 3700 ✓					
66 UL: 1710-1780 DL: 2110-2200 ✓				✓	
71 617 to 698				×	
74/75/76 1427 to 1518 *					
77 3300 to 4200 ✓				✓	
78 3300 to 3800 ✓		3300	0 to 3800	✓	
79 4400 to 5000 ✓		4400	0 to 5000	✓	
126 410 to 430 **	126	410	0 to 430	×	

^{*}Covered bands represent those with greater than 20% efficiency

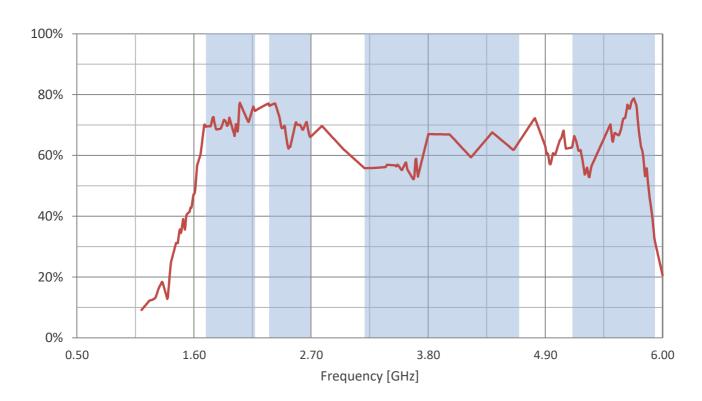


3. Antenna Characteristics

3.1 Return Loss

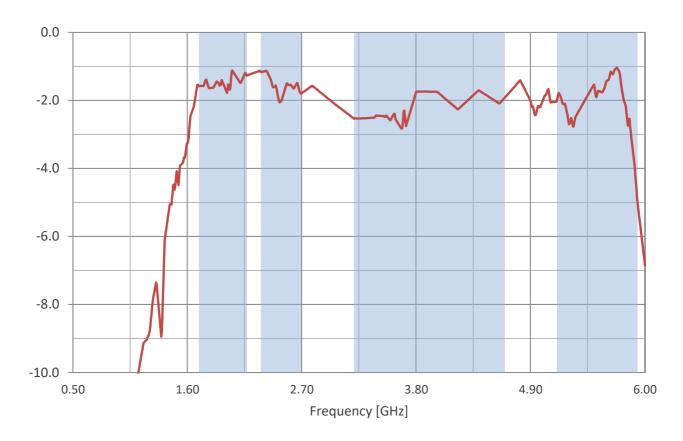


3.2 Efficiency

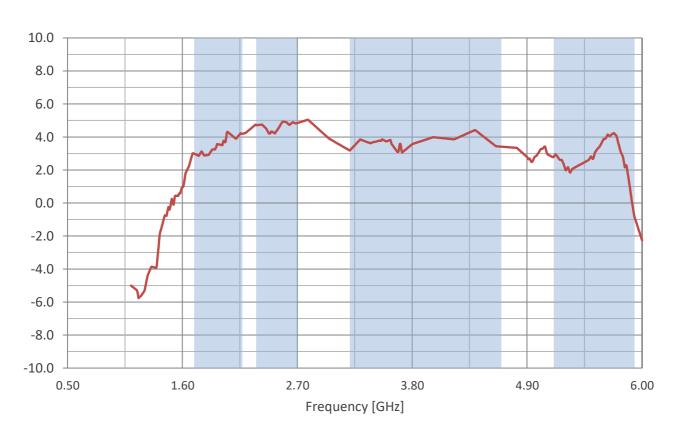




3.3 Average Gain



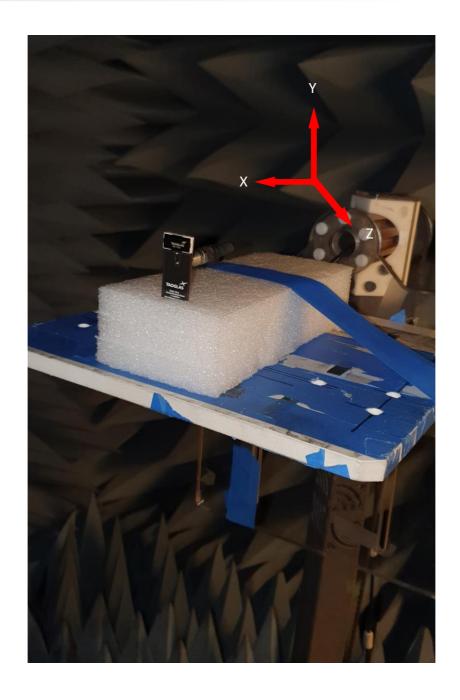
3.4 Peak Gain





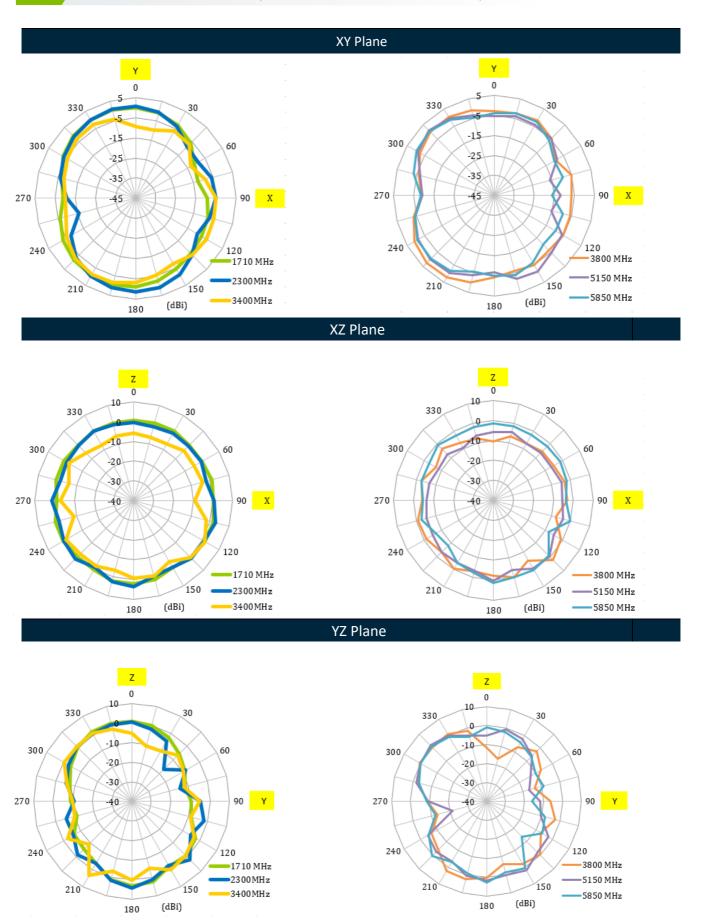
4. Radiation Patterns

4.1 Test Setup – On Evaluation Board PAD.176.A



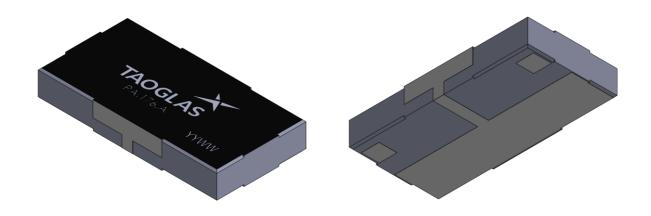


4.2 2D Radiation Patterns (Measured on 60*20mm EVB)

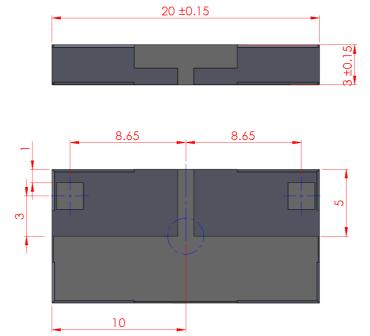




5. Mechanical Drawing (Units: mm)









6. Antenna Integration Guide



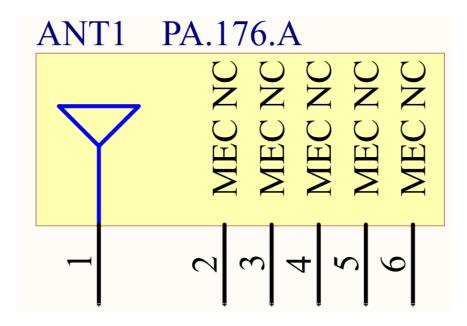


6.1

Schematic Symbol and Pin Definition

The circuit symbol for the antenna is shown below. The antenna has 6 pins with only one pin (Pin 1) as functional. Pins 2, 3, 4, 5 and 6 are for mechanical strength.

Pin	Description
1	RF Feed
2, 3, 4, 5, 6	Mechanical, Not Connected



Please note you can download the design files, 3D model, 2D drawings and CST simulation files from the website here:

https://www.taoglas.com/product/5g-4g-wideband-cellular-smd-antenna/



6.2

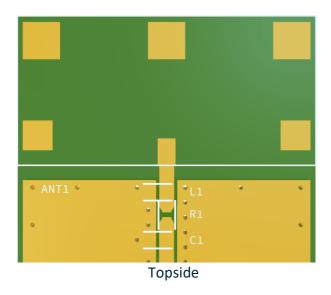
Antenna Integration

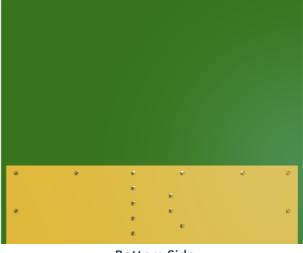
The antenna should ideally be placed on the PCB's shortest side to take advantage of the ground plane. Optimized matching components can be placed as shown.



6.3 PCB Layout

The footprint and clearance on the PCB must meet the antenna specification indicated below. An example of the PCB layout shows the antenna footprint with the recommended keep out area. Note the placement of the optimized components. The Pi-Matching network of L1 / R1 / C1 are placed within the ground plane. R1 and C1 are optional components but it is recommended to include these pads in case they are needed. For the evaluation board L1 is 5.6nH, R1 is 0 Ohm and C1 is Not Fitted. Please see Section 6.7 for further information. After the matching components the transmission line can be connected directly to the radio module.





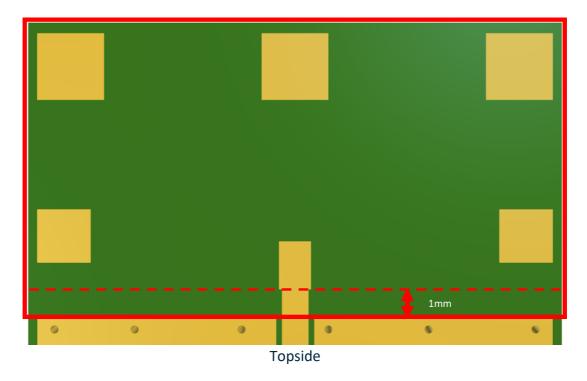
Bottom Side

13

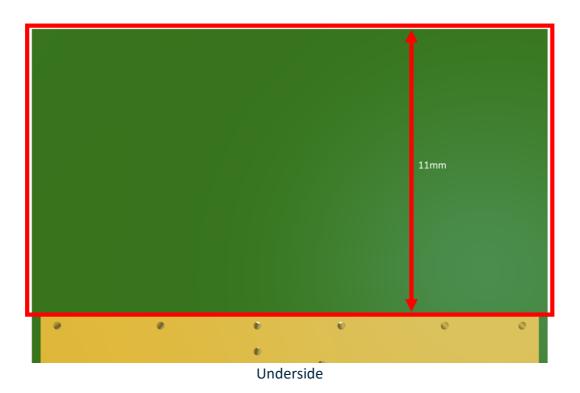


6.4 PCB Keep Out

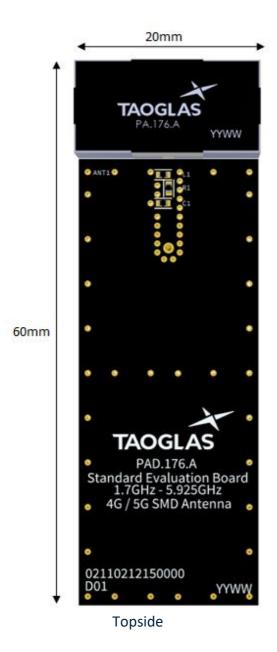
Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna mechanical pads and connections to feed are present within this keep out area (marked RED). The keep out area extends to 1mm from the antenna feed pad to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.

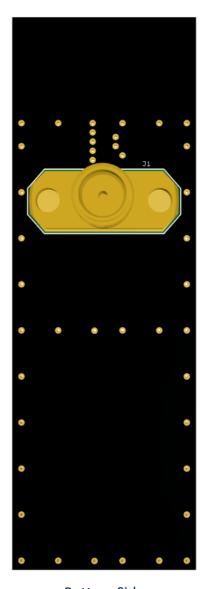


The image below, shows the underside of the PCB and the keep out area, indicated in RED. The keep out area extends to 11mm from the edge of the PCB covering the ground area. All layers must follow this clearance rule.



6.5 Evaluation Board





Bottom Side

This evaluation board is a 2-layer stack-up. Please ensure a 50 Ohm transmission line is used in the design.



6.6 Evaluation Board Ground Plane Length

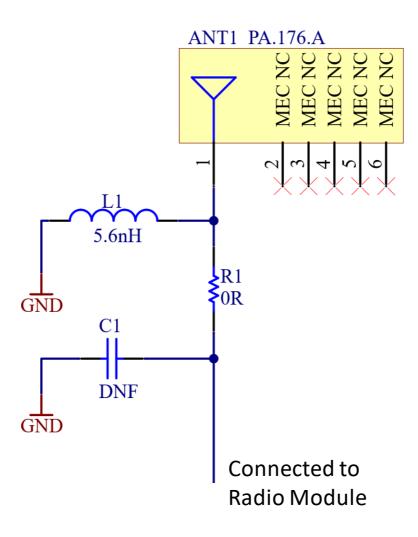


Ground Plane Length 49mm



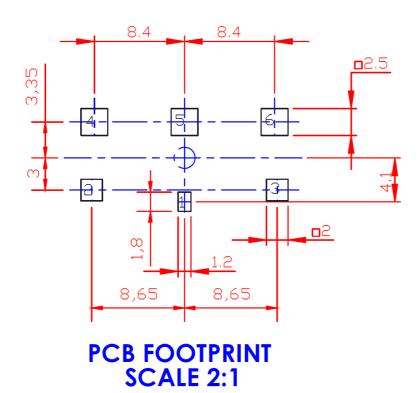
6.7 Evaluation Board Matching Circuit

A matching component (L1) in parallel with the PA.176.A is required for the antenna to have optimal performance on the evaluation board, located inside the ground plane in the space specified in the above images. Additional matching components may be necessary for your device, so we recommend incorporating extra component footprints, forming a "pi" network, between the radio module and the edge of the ground plane.



Designator	Туре	Value	Description
L1	Inductor	5.6nH	Murata LQG15HS series
R1	Resistor	0 Ohms	Yageo RC0402 series
C1	capacitor	Not Fitted	

PCB Footprint Information



<u>PIN:</u>	DESCRIPTION:
1	Feed (50 ohm)
2,3,4,5,6	NC

Notes:

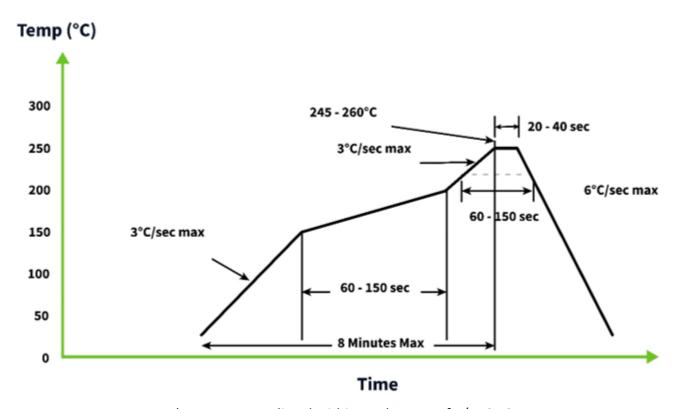
6.8

- 1. Pad 1 is connected to 50 ohm transmission line.
- 2. Pads 4,5 and 6 are the same size.
- 3. Pads 2 and 3 are the same size.
- 4. For PCB solder mark, allow for an area 0.1mm larger than the pads shown.
- 5. For PCB paste, allow for 90% coverage of the pad sizes shown.



7. Solder Reflow Profile

The PA.176.A can be assembled by following the recommended soldering temperatures are as follows:



*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the PA.176.A when placing larger components on the board during subsequent reflows.

Note: Soldering flux classified ROLO under IPC J-STD-004 is recommended.



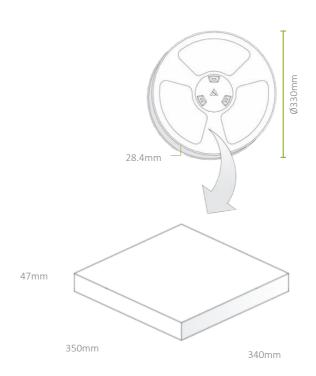
8. Packaging

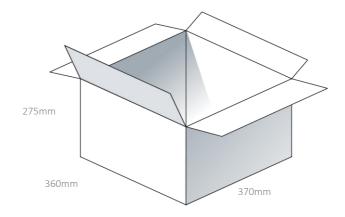
1000pcs PA.176.A per Tape & Reel Dimensions - Ø330*28.4 Weight - 1Kg

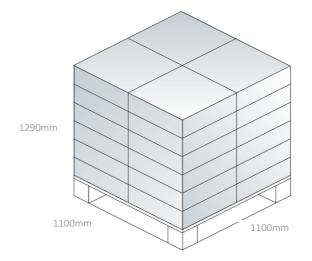
1000pcs PA.176.A per carton Dimensions - 350*340*47mm Weight - 1.2Kg

6000pcs PA.176.A per carton Dimensions - 360*370*275mm Weight - 6.8Kg

Pallet Dimensions: 1100*1100*1300mm 36 Cartons Per Pallet 9 Cartons Per Layer, 4 Layers







20



Changelog for the datasheet

SPE-20-8-041 - PA.176.A

Date:	2022 40 25
	2023-10-25
Changes:	Added Solder Reflow Profile
Changes Made by:	Cesar Sousa

Revision: B		
Date:	2020-11-05	
Changes:	Specifications table amended	
Changes Made by:	Dan Cantwell	

Revision: A (Original First Release)		
Date:	2020-06-12	
Notes:	Initial Release	
Author:	Jack Conroy	



www.taoglas.com



Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Taoglas:

PA.176.A