



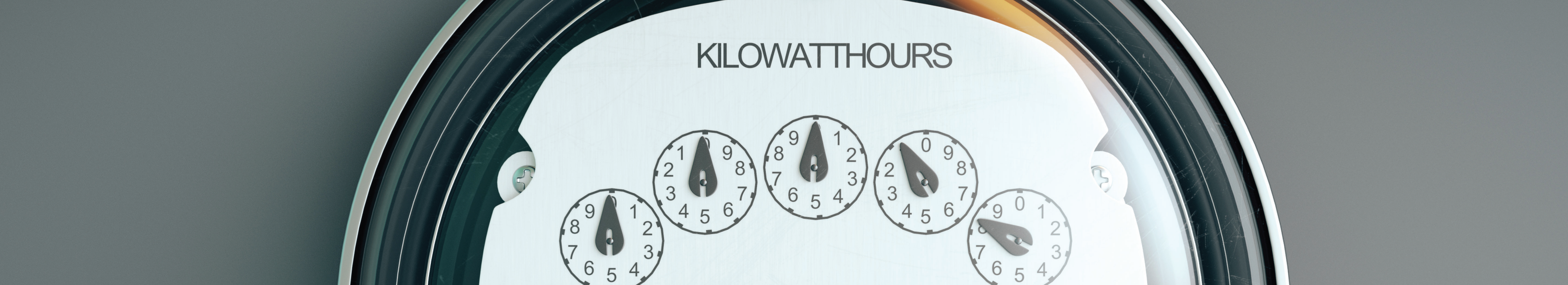
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*Antennas*  
**Smart Metering**



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- Radome Omni
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- Anti Vandalism
- Mast Mounted, Wall Mounted
- 169MHz, 868MHz, 915MHz, 3G, GPS



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EMBEDDED SOLUTIONS FOR ISM NETWORKS

| App.                        | Type         | Pulse Part number | RF Performance       |              |                 |            |                |            | ME requirement          |                    |                                  | Note                                      |
|-----------------------------|--------------|-------------------|----------------------|--------------|-----------------|------------|----------------|------------|-------------------------|--------------------|----------------------------------|-------------------------------------------|
|                             |              |                   | Freuency range (MHz) | RL Min. (dB) | Peak Gain (dBi) |            | Efficiency (%) |            | Antenna DIM. (LxWxH,mm) | GC-area (L x W,mm) | Evaluation Board Size (L x W,mm) |                                           |
|                             |              |                   |                      |              | Peak            | Band edges | Peak           | Band edges |                         |                    |                                  |                                           |
| 868MHz (868MHz-870MHz)      | Ceramic chip | W3000             | 868-870              | -15          | -1.4            | -1.5       | 30             | 29         | 7 x 1.6 x 1.6           | 20 x 9.50          | 40 x 20                          | Vertical, tuned by stripline on PCB       |
|                             |              | W3013             | 868-870              | -11          | 1.5             | 1.4        | 65             | 64         | 10 x 3.2 x 4.0          | 10.80 x 8.25       | 80 x 37                          | Center edge                               |
|                             |              | W3016             | 868-870              | -19          | -2.2            | -2.5       | 25             | 23         | 10 x 3.2 x 4.0          | 11,50 x 7          | 25 x 25                          | Corner, Small GC-area and PCB             |
|                             | Helical      | W3117             | 869-894              | -9           | 0               | -1.3       | 56             | 40         | 12.4 x 8 x 2.5          | 8 x 40             | 100 x 40                         | Horizontal, Center top                    |
|                             |              | W3118A            | 869-894              | -9           | 0               | -1.4       | 52             | 38         | 2.5 x 8 x 8             | 6 x 11             | 100 x 40                         | Vertical, Corner                          |
| 915MHz (902MHz-928MHz)      | Ceramic chip | W3012             | 902-928              | -6           | 2               | 0.5        | 70             | 50         | 10 x 3.2 x 4            | 10.80 x 8.25       | 100 x 37                         | Center edge                               |
|                             |              | W3014             | 880-960              | -7           | -0.5            |            | 45             | 40         | 10 x 3.2 x 1.5          | 40 x 16            | 96 x 40                          | Center Top                                |
|                             | Helical      | W3112A            | 902-928              | -10          | 0.9             | -0.3       | 67             | 50         | 2.5 x 8 x 8             | 6 x 11             | 100 x 40                         | Vertical, Corner                          |
|                             |              | W3113             | 902-928              | -10          | 0.8             | -0.3       | 66             | 51         | 12.4 x 8 x 2.5          | 8 x 40             | 100 x 40                         | Horizontal, Center top                    |
| Combo 868/915MHz and 2.4GHz | Direct PCB   | W3331             | 863-928              | -6           | 1.7             | 0.9        | 64             | 53         | 45 x 10 x 0.8           | 45 x 4.5           | 119 x 102                        | Corner, Small GC-area and PCB, Dual feeds |
|                             |              |                   | 2400-2500            | -12          | 4               | 1.5        | 85             | 69         |                         |                    |                                  |                                           |
|                             | Direct PCB   | W3333             | 863-928              | -8           | 2.4             | 1.8        | 75             | -          | 40 x 15 x 0.8           | 40 x 4.5           | 119 x 102                        | Corner, Small GC-area and PCB, Dual feeds |
|                             |              |                   | 2400-2500            | -12          | 4.5             | 3.0        | 85             | 66         |                         |                    |                                  |                                           |
| 433MHz                      | Ceramic chip | W3015L            | 433 +/- 1            | -10          | -2.5            | -          | 35             | -          | 10 x 3.2 x 4.0          | 10.80 x 14         | 200 x 37                         | Center edge                               |
|                             | Helical      | W3127             | 433-435              | -15          | -2.9            | -          | -              | -          | 35.35 x 9.90            | 8 x 40             | 100 x 40                         | Center Top                                |
| 315 MHz                     | Helical      | W3126             | 315                  | -10          | -5              | -          | -              | -          | 35.35 x 9.90            | 8 x 40             | 100 x 40                         | Center Top                                |
| 169 MHz                     | Helical      | W3100             | 169MHz               | -10          | -4              | -          | 55             | -          | 91 x 9.8                | -                  | 95 x 45                          | coil on free space                        |

Note: 1. ISM application for 902MHz-928MHz band (center frequency 915MHz). 2. Applications from ECA chart for 862MHz-890MHz. (a) Alarms: 868.6-869.7MHz, (b) RFID: 865-868MHz, (c) Tracking, tracing, and data acquisition: 870-875.6MHz, and (d) Wireless audio/ multimedia: 863-865MHz. 3. "Stock" Stocked parts are typically available from Pulse distribution partners immediately.







EMBEDDED SOLUTIONS FOR 2.4 GHZ COMBINATIONS

| App.                                 | Type         | Pulse Part Number | RF Performance            |              |                 |            |                |            |  | ME requirement          |                        |                                  | Note                                         |
|--------------------------------------|--------------|-------------------|---------------------------|--------------|-----------------|------------|----------------|------------|--|-------------------------|------------------------|----------------------------------|----------------------------------------------|
|                                      |              |                   | Operating Frequency (MHz) | RL Min. (dB) | Peak Gain (dBi) |            | Efficiency (%) |            |  | Antenna DIM. (LxWxH,mm) | GC-area (L x W,mm)     | Evaluation Board Size (L x W,mm) |                                              |
|                                      |              |                   |                           |              | Peak            | Band edges | Peak           | Band Edges |  |                         |                        |                                  |                                              |
| Single WiFi, BT, Zigbee              | Ceramic chip | W3000             | 2400-2483.5               | -18          | 2.5             | 2.1        | 65             | 55         |  | 7 x 1.6 x 1.6           | 6.00 x 11.00           | 40 x11                           | 3 Matching components Horiz. mount           |
|                                      |              |                   |                           | -12          | 2.2             | 1.5        | 53             | 45         |  |                         | 6.00 x 20.00           | 30 x 20                          |                                              |
|                                      |              | W3001             |                           | -6           | 1.5             | 0.5        | 75             | 60         |  | 10 x 3.2 x 4.0          | 10.80 x 6.25           | 80 x 37                          | On Ground soluton                            |
|                                      |              | W3008             |                           | -8           | 1.7             | 0.7        | 70             | 55         |  | 3.2 x 1.6 x 1.1         | 4.00 x 4.25            | 80 x 37                          |                                              |
|                                      |              | W3008C            |                           | -11          | 2.2             | 1.9        | 75             | 70         |  | 3.2 x 1.6 x 1.1         | 4.00 x 6.25            | 80 x 37                          |                                              |
|                                      |              | W3043             |                           | -12          | 4               |            | 70             |            |  | 3.2 x 1.6 x 1.1         | 5.60 x 20              | 37 x 20                          | Small PCB size                               |
|                                      |              | W3092             |                           | -6           | 2               | 0          | 60             | 43         |  | 2 x 1.2 x 0.55          | 8 x 2.5                | 110 x 55                         | small antenna size                           |
|                                      | Helical      | W3108             |                           | -8           | 1.5             |            | 50             |            |  | 5.0 x 2.5 x 5.5         | 7.50 x 5.50            | 100 x 40                         | Vertical SMD @ Corner                        |
| Dual WiFi                            | Ceramic chip | W3006             | 2400-2483.5               | -8           | 3.2             | 2.7        | 70             | 65         |  | 10 x 3.2 x 1.5          | 11.60 x 6.00           | 80 x 37                          |                                              |
|                                      |              |                   | 5150-5850                 | -10          | 4.2             | 3.0        | 80             | 70         |  |                         |                        |                                  |                                              |
|                                      |              | W3078             | 2400-2483.5               | -10          | 1.7             | 1.0        | 65             | 55         |  | 3.2 x 1.6 x 1.1         | 11.15 x 6.40           | 80 x 37                          | @ Corner                                     |
|                                      |              |                   | 4950-5850                 | -6           | 4.3             | 3.7        | 80             | 55         |  |                         |                        |                                  |                                              |
|                                      |              | W3079             | 2400-2483.5               | -13          | 2.5             | 1.3        | 72             | 60         |  | 3.2 x 1.6 x 1.1         | 11 x 6                 | 80 x 37                          | Center                                       |
|                                      |              |                   | 4950-5850                 | -8           | 5.7             | 3.3        | 78             | 55         |  |                         |                        |                                  |                                              |
| Combo GPS+WiFi or ISM 868/915 + WiFi | Ceramic chip | W3056             | 2400-2483.5               | -8           | 3.2             | 2.5        | 80             | 70         |  | 10 x 3.2 x 1.5          | 10.80 x 6.25 (Notch)   | 100 x 40                         | Single feed and 2.4GHz WiFi                  |
|                                      |              |                   | 1575.42 + 1.023           | -10          | 2.5             | 1.5        | 75             | 65         |  |                         |                        |                                  |                                              |
|                                      |              | W3064C            | 2400-2483.5               | -11          | -0.7            | -1.7       | 80             | 70         |  | 10 x 3.2 x 1.5          | 10.80 x 6.40 (Divided) | 96 x 45                          | Dual feed and 2.4GHz WiFi                    |
|                                      |              |                   | 1575.42 + 1.023           | -15          |                 | -2.0       | 70             | 60         |  |                         |                        |                                  |                                              |
|                                      |              | W3095             | 2400-2483.5               | -11          | 2.5             | 1.5        | 85             | 80         |  | 10 x 3.2 x 1.5          | 17.80 x 6.45           | 70 x 35                          | Dual feed and Dual WiFi + GPS/Glonass/Beidou |
|                                      |              |                   | 4950-5850                 | -6           | 3.5             | 1.0        | 70             | 50         |  |                         |                        |                                  |                                              |
|                                      |              |                   | 1575-1610                 | -10          | 1.5             | 0.8        | 75             | 60         |  |                         |                        |                                  |                                              |
|                                      |              | W3320             | 863-928                   | -8           | 1.5             | 0.8        | 67             | 55         |  | 10 x 3.2 x 2            | 12 x 9.5               | 120 x 50                         | Center, Dual feed                            |
| 2400-2500                            | -6           |                   | 3.4                       | 1.4          | 61              | 45         | 4.6 x 3.95     |            |  |                         |                        |                                  |                                              |

\* NOTE: 1. Recommended minimum GND dimensions of PIFA type and Monopole's are roughly 40x20mm and 30x20mm (or 40x11mm), respectively. Need to construct matching values to optimize antenna performance on surrounding mechanics and materials. 2. Pulse offers very unique GPS+WiFi combo antennas on single ceramic chip (10x3.2x1.5mm). There are three different types of combo antennas. W3056 (2.4G Wifi +GPS, single feed), W3064C (2.4G WiFi+GPS, dual feed), and W3095 (2.4G and 5G Wifi +GPS/Glonass/Beidou, dual feed). 3. "Stock" Stocked parts are typically available from Pulse distribution partners immediately.



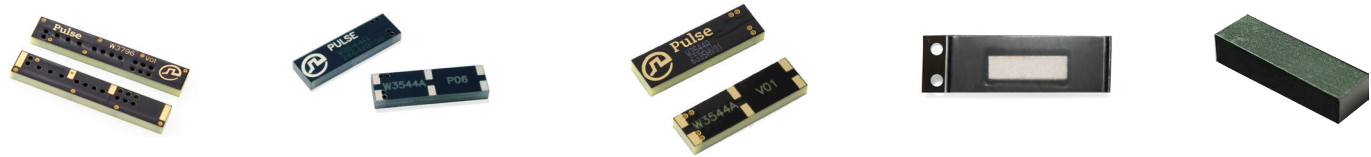




EMBEDDED SOLUTIONS FOR 2G/3G/4G

| App.           | Type      | Pulse Part number | RF Performance        |              |                      |            |                       |            | ME requirement          |                    |                                  | Note                                                             |
|----------------|-----------|-------------------|-----------------------|--------------|----------------------|------------|-----------------------|------------|-------------------------|--------------------|----------------------------------|------------------------------------------------------------------|
|                |           |                   | Frequency range (MHz) | RL Min. (dB) | Peak Gain (dBi)      |            | Efficiency (%) / (dB) |            | Antenna DIM. (LxWxH,mm) | GC-area (L x W,mm) | Evaluation Board Size (L x W,mm) |                                                                  |
|                |           |                   |                       |              | Peak                 | Band edges | Peak                  | Band edges |                         |                    |                                  |                                                                  |
| LTE            | Composite | W3796             | 698-960               | -6           | 1.5 (Avg. peak gain) |            | 65 (Avg.)             |            | 40 x 7 x 3              | 40.6 x 15          | 120 x 40.6                       | - Top mount: Horizontal<br>- Matching: SE3.3nH+SH0.7pF; SH6.8nH  |
|                |           |                   | 1427.9-1660.9         | -5.5         | 2 (Avg. peak gain)   |            | 55 (Avg.)             |            |                         |                    |                                  |                                                                  |
|                |           |                   | 1695-2200             | -6           | 5.5 (Avg. peak gain) |            | 75 (Avg.)             |            |                         |                    |                                  |                                                                  |
|                |           |                   | 2300-2700             | -6           | 5 (Avg. peak gain)   |            | 70 (Avg.)             |            |                         |                    |                                  |                                                                  |
| Penta Band     |           | W3544A            | 824-960               | -3.7         | 0.5                  | 1.8        | 65                    | 44         | 7.65 x 26 x 3           | 21 x 33.5 (W3544A) | 110 x 50                         | 1. Corner mount (vertical).<br>2.matching: *SE12nH               |
|                |           |                   | 1710-1880             | -4.6         | 2.9                  | 2.3        | 74                    | 45         |                         |                    |                                  |                                                                  |
|                |           |                   | 1850-1990             | -8.6         | 2.4                  | 1.7        | 74                    | 64         |                         |                    |                                  |                                                                  |
|                |           |                   | 1920-2170             | -5.6         | 2.2                  | 1.1        | 68                    | 60         |                         |                    |                                  |                                                                  |
|                |           | W3544B            | 824-960               | -6.5         | 1                    | -0.7       | 70                    | 53         | 7.65 x 26 x 3           | 50 x 18 (W3544B)   | 110 x 50                         | 1. Top mount (Horizontal)<br>2.matching: 10nH                    |
|                |           |                   | 1710-1880             | -5.7         | 2.7                  | 1.7        | 77                    | 59         |                         |                    |                                  |                                                                  |
|                |           |                   | 1850-1990             | -9.3         | 2                    | 1          | 77                    | 69         |                         |                    |                                  |                                                                  |
|                |           |                   | 1920-2170             | -5           | 1.8                  | 0.2        | 71                    | 58         |                         |                    |                                  |                                                                  |
| Quad band (US) | Ceramic   | W3073             | 824-894               | -4.7         | 0.4                  | -2.6       | 51                    | 28         | 10 x 3.2 x 4            | 40 x 10            | 105 x 40                         | 1. Matching: SE10nH+SE12nH+SH12nH.<br>2.Tuning strip on PCB.     |
|                |           |                   | 1710-1880             | -3.5         | 2.3                  | 0.7        | 59                    | 40         |                         |                    |                                  |                                                                  |
|                |           |                   | 1850-1990             | -5.9         | 2.5                  | 1.6        | 59                    | 54         |                         |                    |                                  |                                                                  |
|                |           |                   | 1920-2170             | -3.3         | 2.2                  | 0.9        | 58                    | 46         |                         |                    |                                  |                                                                  |
| Quad band (EU) |           | W3073             | 880-960               | -3.8         | 1                    | -1.8       | 60                    | 34         | 10 x 3.2 x 4            | 40 x 10            | 105 x 40                         | 1. Matching: *SE10nH+*SE10nH+*SH-15nH.<br>2.Tuning strip on PCB. |
|                |           |                   | 1710-1880             | -4.9         | 2.9                  | 2          | 70                    | 54         |                         |                    |                                  |                                                                  |
|                |           |                   | 1850-1990             | -8           | 2.9                  | 2.5        | 71                    | 62         |                         |                    |                                  |                                                                  |
|                |           |                   | 1920-2170             | -4.4         | 2.8                  | 2.3        | 67                    | 59         |                         |                    |                                  |                                                                  |
| Dual band (EU) |           | W3070             | 880-960               | -5.1         | 1.2                  | -0.4       | 65                    | 47         | 10 x 3.2 x 2            | 40 x 10            | 95 x 40                          | Matching: *SE18nH+ *SE10nH                                       |
|                |           |                   | 1710-1880             | -5.7         | 2.5                  | 1.5        | 60                    | 50         |                         |                    |                                  |                                                                  |

NOTE: 1. “Stock” Stocked parts are typically available from Pulse distribution partners immediately.  
2. \* SE = Series and \*SH = Shunt



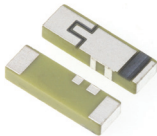




EMBEDDED SATCOM ANTENNA SOLUTIONS

| App.                   | Type         | Pulse Part number | RF Performance                         |              |                  |            |                   |            |                       |                 | ME requirement          |                        |                                  | Note                                          |
|------------------------|--------------|-------------------|----------------------------------------|--------------|------------------|------------|-------------------|------------|-----------------------|-----------------|-------------------------|------------------------|----------------------------------|-----------------------------------------------|
|                        |              |                   | Operating Freuency (MHz)               | RL Min. (dB) | RHCP Gain (dBic) |            | Linear Gain (dBi) |            | Efficiency (%) / (dB) |                 | Antenna DIM. (LxWxH,mm) | GC-area (L x W,mm)     | Evaluation Board Size (L x W,mm) |                                               |
|                        |              |                   |                                        |              | Peak             | Band edges | Peak              | Band edges | Peak                  | Band edges      |                         |                        |                                  |                                               |
| GPS Only               | Ceramic chip | W3000             | 1575.42+1.023                          | -15          | -3.9             | -4.1       | 0.3               | 0          | 50/-3                 | 45/-3.5         | 7 x 1.6 x 1.6           | 6 x 20                 | 30 x 20                          | 3 Matching components                         |
|                        |              | -12               |                                        | -3.5         | -3.9             | 0.1        | -0.2              | 50/-3      | 45/-3.5               | 6 x 11          |                         | 40 x 11                |                                  |                                               |
|                        |              | W3009             |                                        | -11          | 0.2              | -0.6       | 3                 | 2.3        | 83/-0.8               | 70/-1.5         | 10 x 3.2 x 4.0          | 10.80 x 6.25           | 80 x 37                          | On Ground shunt 3.3pF                         |
|                        | W3011        | -12               |                                        | 0.85         | 0.5              | 3.4        | 3                 | 85/-0.7    | 80/-1                 | 3.2 x 1.6 x 1.1 | 4.00 x 4.25             | 80 x 37                | w/o matching                     |                                               |
|                        | Patch        | W3213             |                                        | -13          | -1.5             | -          | -                 | -          | -                     | -               | 13 x 13 x 4             | -                      | 30 x 30                          |                                               |
|                        |              | W3099             |                                        | -14          | 3.5              | -          | -                 | -          | -                     | -               | 25 x 25 x 4             | -                      | 70 x 70                          |                                               |
|                        | Helical      | W3110             |                                        | -16          | -2.1             | -2.4       | 1.3               | 0.7        | 47/-3.3               | 43/-3.7         | 5.0 x 2.5 x 5.5         | 7.50 x 5.50            | 100 x 40                         | Vertical SMD, @ Corner                        |
| GPS, Glonass, & Beidou | Ceramic chip | W3000             | 1561+2/<br>1575.42+1.023/<br>1602.56+4 | -18          | -0.2             |            | 2.4               | 1.5        | 70/-1.55              | 65/-1.9         | 7 x 1.6 x 1.6           | 6 x 10                 | 80 x 37                          | 3 Matching components, Horiz. Mount + @Corner |
|                        |              | W3010             |                                        | -12          | 1                | 0          | 3                 | 2.2        | 75/-1.25              | 70/-1.5         | 10 x 3.2 x 2            | 10.80 x 6.25           | 80 x 37                          | @ Position1 shunt 3.3pF                       |
|                        |              | W3011A            |                                        | -12          | 1.5              | 0.4        | 3                 | 1.8        | 70/-1.55              | 50/-3.0         |                         |                        | 80 x 37                          | @ Position2 shunt 2.2pF                       |
|                        |              | W3011A            |                                        | -16          | 1                | -0.4       | 3.7               | 2.5        | 88/-0.6               | 70/-1.5         | 3.2 x 1.6 x 1.1         | 4.00 x 6.25            | 80 x 37                          | Shunt 1.8pF                                   |
|                        |              | W3062A            |                                        | -10          | 0                | -0.5       | 2.5               | 2.0        | 80/-1                 | 60/-2.1         | 7 x 1.6 x 1.6           | 7.80 x 5.25            | 80 x 37                          | Shunt 2.2pF                                   |
|                        | Patch        | W3216             | 1575.42+1.023/<br>1602.56+4            | -7           | -2               | -          | -                 | -          | 60                    | 50              | 13 x 13 x 5             | -                      | 50 x 50                          |                                               |
|                        |              | W3223             |                                        | -10          | 4                | 3.5        | -                 | -          | 97/-0.2               | 93/-0.6         | 25 x 25 x 4             | -                      | 70 x 70                          | TS 16949                                      |
|                        |              | W3224             |                                        | -10          | 2.5              | 2.0        | -                 | -          | 95/-0.5               | 79/-2           | 18 x 18 x 4             | -                      | 70 x 70                          | SMD                                           |
|                        |              | W3225             |                                        | -10          | 3                | -          | -                 | -          | 96/-0.3               | 92/-0.7         | 25 x 25 x 4             | -                      | 70 x 70                          | SMD                                           |
| WiFi and GPS Combo     | Ceramic chip | W3056             | 2400-2483.5                            | -8           | -                | -          | 3.2               | 2.5        | 80                    | 70              | 10 x 3.2 x 1.5          | 10.80 x 6.25 (Notch)   | 100 x 40                         | Single feed and 2.4GHz+GPS                    |
|                        |              | 1575.42 + 1.023   | -10                                    |              |                  | 2.5        | 1.5               | 75         | 65                    |                 |                         |                        |                                  |                                               |
|                        |              | W3064C            | 2400-2483.5                            | -11          | -                | -          | -0.7              | -1.7       | 80                    | 70              | 10 x 3.2 x 1.5          | 10.80 x 6.40 (Divided) | 96 x 45                          | Dual feed and 2.4GHz+GPS                      |
|                        |              | 1575.42 + 1.023   | -15                                    |              |                  |            | -2.0              | 70         | 60                    |                 |                         |                        |                                  |                                               |
|                        |              | W3095             | 2400-2483.5                            | -10          | -                | -          | 2.7               | 1.5        | 85                    | 80              | 10 x 3.2 x 1.5          | 17.80 x 6.45           | 80 x 50                          | Dual feed and Dual WiFi+GPS/Glonass           |
|                        |              | 4950-5850         | -6                                     | -            | -                | 3.7        | 1.0               | 73         | 53                    |                 |                         |                        |                                  |                                               |
|                        |              | 1575-1610         | -8                                     |              |                  | 1.7        | 0.7               | 75         | 62                    |                 |                         |                        |                                  |                                               |

NOTE: 1. Recommended minimum GND dimensions of PIFA type and Monopole are roughly 40x20mm and 30x20mm (or 40x11mm), respectively. Need to construct matching values to optimize antenna performance on surrounding mechanics and materials. 2. Pulse offers very unique GPS+WiFi combo antennas on single ceramic chip (10x3.2x1.5mm). There are three different types of combo antennas. W3056 (2.4G Wifi +GPS, single feed), W3064C (2.4G WiFi+GPS, dual feed), and W3095 (2.4G and 5G Wifi +GPS/Glonass/Beidou, dual feed). 3. “Stock” Stocked parts are typically available from Pulse distribution partners immediately.







EMBEDDED ACTIVE SATCOM ANTENNA SOLUTIONS

| App.                                        | Type                   | Pulse Part Number | RF Performance                                             |                 |                  |           |         |              |             | ME requirement         |                        |                |                                  |
|---------------------------------------------|------------------------|-------------------|------------------------------------------------------------|-----------------|------------------|-----------|---------|--------------|-------------|------------------------|------------------------|----------------|----------------------------------|
|                                             |                        |                   | Operating Frequency (MHz)                                  | Antenna Element |                  | LNA       |         |              |             | Antenna Dimension (mm) | Overall Dimension (mm) | Connector type | Coaxial Cable (Length; Diameter) |
|                                             |                        |                   |                                                            | VSWR            | RHCP Gain (dBic) | Gain (dB) | NF (dB) | Current (mA) | VCC (Vdc)   |                        |                        |                |                                  |
| GNSS<br>(GPS, Glonass, BeiDou, and Galileo) | Ceramic patch with LNA | GPSGB1315         | 1561 +/- 2.046, 1575.42 +/- 10.23, and 1602.5625 +/- 4 MHz | 2               | -1 + 1           | 15 + 2    | < 2.4   | < 6          | 3.3-5 + 0.5 | 13x13x5                | 16x17x8.15             | IPEX MHF 20278 | L:100; D:1.13                    |
|                                             |                        | GPSGB1330         |                                                            | 2               | -1 + 1           | 30 + 2    | < 2.4   | < 6          | 3.3-5 + 0.5 | 13x13x5                | 16x17x8.15             | IPEX MHF 20278 | L:100; D:1.13                    |
|                                             |                        | GPSGB2515         |                                                            | 2               | 1 + 1            | 15 + 2    | < 2.4   | < 6          | 3.3-5 + 0.5 | 25x25x4                | 30x30x8                | IPEX MHF 20278 | L:100; D:1.13                    |
|                                             |                        | GPSGB2530         |                                                            | 2               | 1 + 1            | 30 + 2    | < 2.4   | < 6          | 3.3-5 + 0.5 | 25x25x4                | 30x30x8                | IPEX MHF 20278 | L:100; D:1.13                    |

Note: 1. Further detailed specs such as ‘Out of band rejection’ of LNA can be found on a datasheet.

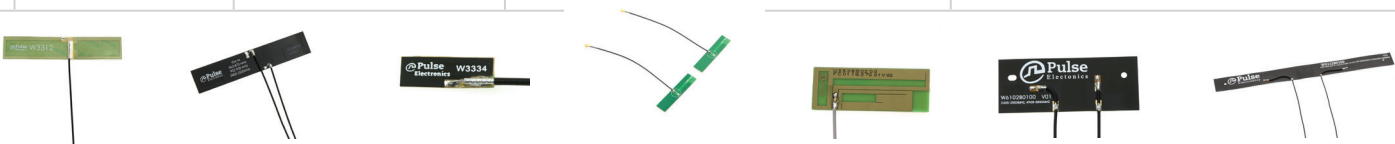




INTERNAL FLEXIBLE ANTENNA SOLUTIONS

| App.                 | Type | Pulse Part Number | RF Performance            |              |                     |                |                   |        | ME requirement          |                                      |                 |                            | Note                                                                                            |
|----------------------|------|-------------------|---------------------------|--------------|---------------------|----------------|-------------------|--------|-------------------------|--------------------------------------|-----------------|----------------------------|-------------------------------------------------------------------------------------------------|
|                      |      |                   | Operating Frequency (MHz) | RL Min. (dB) | Peak Gain (dBi)     |                | Efficiency (%)    |        | Antenna DIM. (LxWxH,mm) | Cable Length from edge/ Diameter, mm | Connector Type  | Cable Alignment w/ Antenna |                                                                                                 |
|                      |      |                   |                           |              | Max.                | Min.           | Max.              | Min.   |                         |                                      |                 |                            |                                                                                                 |
| ISM                  | FPC  | W3312B0100        | 860-930                   | -8           | 2.3                 | -              | 50 (Avg.)         |        | 75 x 15                 | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Alternative: W3502, W3538 , W3501                                                               |
| ISM + WiFi Combo     | PCB  | W3332B0150        | 863-928                   | -5           | 0.2                 | -              | 55 (Avg.)         |        | 82 x 15 x 0.56          | L:150 / D:1.13                       | U.FL compatible | Perpendicular              | ISM 868/915 and 2.4GHz WiFi (two feed cables). Isolation: <-11dB.                               |
|                      |      |                   | 2400-2500                 | -10          | 4.1                 | -              | 64 (Avg.)         |        |                         |                                      |                 |                            |                                                                                                 |
| GNSS                 | FPC  | W3908B0100        | 1560-1610                 | -12          | 0.3                 | -0.2           | 36                | 33     | 20 x 26.80 x 0.1        | L:93 / D:1.13                        | U.FL compatible | Parallel                   |                                                                                                 |
| WiFi, BT, Zigbee     | PCB  | W3525B039         | 2400-2483.5               | -10          | 2                   | 0.6            | 65                | 55     | 48 x 11 x 0.8           | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | w/ adhesive: W3525BTWxxx                                                                        |
|                      |      | W3593B0100        | 4900-5850                 | -10          | 2                   | 0.5            | 70                | 50     | 45 x 7 x 0.8            | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | No adhesive                                                                                     |
|                      |      | W3513B0212        | 2400-2500; 4900-5850      | -13; -10     | 2;2.7               | 1.4; 0.4       | 70; 67            | 68; 52 | 16 x 70 x 0.9           | L:212 / D:1.13                       | U.FL compatible | Parallel                   | No adhesive                                                                                     |
|                      |      | W3919B0050        | 4900-5925                 | -10          | 3.7                 | 2.5            | 72                | 50     | 15.9 x 7.6 x 0.45       | L: 50 / D: 1.13                      | U.FL compatible | Perpendicular              | W3919XXXXX (for custom cable length)                                                            |
|                      | FPC  | W3921B0100        | 2400-2500                 | -13          | 1.8                 | 1              | 57                | 50     | 33 x 7.7 x 0.1          | L: 100/ D:1.13                       | U.FL compatible | Perpendicular              | W3921XXXXX (for custom cable length)                                                            |
|                      |      | W3920B0050        | 4900-5925                 | -10          | 3.7                 | 2.2            | 75                | 55     | 12.5 x 7.6 x 0.15       | L: 50 / D: 1.13                      | U.FL compatible | Perpendicular              | W3920XXXXX (for custom cable length)                                                            |
|                      |      | W3315B0100MHF1    | 2400-2500                 | -10          | 2                   | 1              | 75                | 65     | 45 x 6 x 0.1            | L:100 / D:1.13                       | U.FL compatible | Parallel                   | W3315B0100 (MHF-A13)<br>W3315B0100MHFIII (MHFIII 20367 or equivalent))<br>W3315B0100MHF4 (MHF4) |
|                      |      |                   | 4900-5875                 | -10          | 5.5                 | 4              | 85                | 62     |                         |                                      |                 |                            |                                                                                                 |
|                      |      | W3334B0150        | 2400-2500                 | -10          | 4.8                 | 3.4            | 53                | 49     | 14 x 5 x 0.1            | L:150 / D:1.13                       | U.FL compatible | Parallel                   | W3334XXXXXX (for custom cable length)                                                           |
|                      |      |                   | 4900-5900                 | -10          | 5.5                 | 3.5            | 90                | 65     |                         |                                      |                 |                            |                                                                                                 |
|                      |      | W3917B0050        | 2400-2500                 | -10          | 2.7                 | 1.8            | 62                | 53     | 42.6 x 8.6 x 0.15       | L:50 / D:1.13                        | U.FL compatible | Parallel                   | W3917XXXX (for custom cable length)                                                             |
|                      |      |                   | 4900-5925                 | -10          | 4.9                 | 3              | 89                | 69     |                         |                                      |                 |                            |                                                                                                 |
|                      |      | W3918B0050        | 2400-2500                 | -10          | 3.8                 | 3.4            | 73                | 60     | 35.2 x 8.5 x 0.15       | L:50 / D:1.13                        | U.FL compatible | Perpendicular              | W3918XXXX (for custom cable length)                                                             |
|                      |      |                   | 4900-5925                 | -10          | 5.3                 | 3.3            | 90                | 70     |                         |                                      |                 |                            |                                                                                                 |
| MIMO WiFi            | FPC  | W6102B0100        | 2400-2500                 | -10          | isolation: -20      | 2 (Avg.)       | 45 (Avg.)         |        | 50 x 20 x 0.1           | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Two cables (2x Dual WiFi)                                                                       |
|                      |      |                   | 4900-5900                 | -10          | isolation: -20      | 5 (Avg.)       | 75 (Avg.)         |        |                         |                                      |                 |                            |                                                                                                 |
|                      |      | W6103B0100        | 2400-2500                 | -10          | isolation: -15      | 4.5 (Avg.)     | 70 (Avg.)         |        | 80 x 20 x 0.1           | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Three cables (3x Dual WiFi)                                                                     |
|                      |      |                   | 4900-5900                 | -10          | isolation: -15      | 5 (Avg.)       | 75 (Avg.)         |        |                         |                                      |                 |                            |                                                                                                 |
| 3G                   | PCB  | W3502B0020        | 824-960; 1710-1990        | -6; -4       | 2; 2.4              | 0.8; -0.4      | 78; 80            | 55; 70 | 43 x 17 x 0.5           | L:20 / D:1.13                        | U.FL compatible | Perpendicular              | 80mm ground plane with 5mm gap                                                                  |
|                      |      | W3538B0200        | 824-960; 1710-2170        | -6; -6       | -                   | -              | 57; 71            | 41; 50 | 40 x 15 x 0.7           | L:200 / D:1.13                       | U.FL compatible | Perpendicular              |                                                                                                 |
|                      | FPC  | W3501B0140        | 824-960; 1710-1990        | -7; -8       | 1.5; 4.2            | 0.8; 2.8       | 61; 71            | 50; 50 | 87 x 25 x 0.2           | L:140 / D:1.13                       | U.FL compatible | Perpendicular              | W/ adhesive: W3571B0140.                                                                        |
| 3G + GNSS Combo      | FPC  | W3915             | 880-960; 1710-2170        | -6; -8       | 3; 3.5              | 1; 2.8         | 73; 87            | 51; 75 | 74 x 19 x 0.2           | L:100/ D:1.13                        | U.FL compatible | Perpendicular              | Two cables (1x GSM900, 1x GPS/Glonass)                                                          |
|                      |      |                   | 1565-1605                 | -6           | 2                   | 0.5            | 68                | 55     |                         |                                      |                 |                            |                                                                                                 |
| 4G (LTE)             |      | W3554B0140        | 698-960; 1710-2690        | -5; -8       | 1.5; 3.9            | -0.6; 1.9      | 75; 86            | 50; 65 | 120 x 30 x 0.2          | L:140 / D:1.13                       | U.FL compatible | Perpendicular              | W/ adhesive: W3554B0140T                                                                        |
|                      |      | W3907B0100        | 698-960; 1427-1610        | -8; -7       | 2.2; 1.8            | -0.5; 0        | 70; 65            | 50;50  | 115.7 x 20 x 0.1        | L:100 / D:1.13                       | U.FL compatible | Perpendicular              |                                                                                                 |
|                      |      |                   | 1695-2700; 3400-3600      | -7; -10      | 3.5; 4              | 1; 2.5         | 72; 80            | 52; 78 |                         |                                      |                 |                            |                                                                                                 |
| 4G + GNSS Combo      |      | W3906B0100        | 698-960; 1427-1610        | -13; -8      | 2.6; 2.2            | -0.6; 1.2      | 70; 60            | 50;50  | 120.4 x 26.8 x 0.1      | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Two cables (1x LTE, 1x GNSS)                                                                    |
|                      |      |                   | 1695-2700; 3400-3600      | -7; -10      | 3.6; 4              | 1.8; 3.5       | 76; 85            | 52; 80 |                         |                                      |                 |                            |                                                                                                 |
|                      |      |                   | 1550-1625                 | -10          | 2                   | 0.5            | 37                | 30     |                         |                                      |                 |                            |                                                                                                 |
| MIMO 4G (LTE)        |      | W6112B0100        | 698-960; 1428-2170        | -6; -7.5     | isolation: -10; -15 | 4.3; 3.8 (Avg) | 55; 68 (Avg.)     |        | 224 x 20 x 0.1          | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Two cables (2x LTE)                                                                             |
|                      |      |                   | 2300-3600                 | -10          | isolation: -15      | 4 (Avg.)       | 65 (Avg.)         |        |                         |                                      |                 |                            |                                                                                                 |
| MIMO 4G + GNSS Combo |      | W6113B0100        | 698-960; 1428-2200        | -6; -7.5     | isolation: -10; -13 | 2.9; 1.7; 3.4  | 55; 60; 65 (Avg.) |        | 224 x 20 x 0.1          | L:100 / D:1.13                       | U.FL compatible | Perpendicular              | Three cables (2x LTE, 1x GNSS)                                                                  |
|                      |      |                   | 2300-3600                 | -7.5         | isolation: -13      | 3.8; 4.2       | 70; 65 (Avg.)     |        |                         |                                      |                 |                            |                                                                                                 |
|                      |      |                   | 1570-1610                 | -10          | isolation: -13      | 0.8            | 35 (Avg.)         |        |                         |                                      |                 |                            |                                                                                                 |

Note: 1. FPC antenna is measured on the 2mm PC plate. 2.Connector: Equivalent of I-PEX MHF 20278-11R-13 or compatible with U.FL connector. 3. Receptacle: Equivalent of I-PEX MHF 20279-001E (3pad), 20441-001E-01(4pad) or compatible with U.FL receptacles. 4.Cable length is a distance between the edge of PCB and the center of connector. 5. See datasheets for details. 6. Contact sales for available or custom cable lengths. Email: [antennas.us@pulseelectronics.com](mailto:antennas.us@pulseelectronics.com). Phone: 800-ANTENNA (268-3662) or 360-944-7551.







EXTERNAL MULTI-BAND ANTENNA SOLUTIONS

| App.                 | Type              | Pulse Part Number    | RF Performance                           |              |                 | Mechanical requirement |              |              |                               |         | Note                             |
|----------------------|-------------------|----------------------|------------------------------------------|--------------|-----------------|------------------------|--------------|--------------|-------------------------------|---------|----------------------------------|
|                      |                   |                      | Frequency Range (MHz)                    | RL Min. (dB) | Peak Gain (dBi) | Height (mm)            | Diameter(mm) | Package type | Connector                     | IP-rate |                                  |
|                      |                   |                      |                                          |              |                 | Straight (Bent)        | Max (Min)    |              |                               |         |                                  |
| ISM                  | Stick/Swivel      | W1063                | 868-928                                  | -8           | 3               | 195 (172)              | 13 (6)       | B            | RP-SMA                        |         | See W1063 datasheet              |
|                      |                   | W1063M               | 902-928                                  | -8           | 3               | 195 (172)              | 13 (6)       | B            | SMA (m)                       |         |                                  |
|                      | Stick/ no Swivel  | W5012                | 868-928                                  | -8           | 2               | 179                    | 10           | A            | RP-SMA                        | IP65    |                                  |
|                      |                   | W5017                | 868-928                                  | -8           | 2               | 179                    | 10           | A            | SMA (m)                       |         |                                  |
|                      |                   | W5021                | 868-928                                  | -8           | 2               | 171                    | 10           | G            | RP-SMA (Right angle)          |         |                                  |
| WiFi (2.4GHz)        | Stick/Swivel      | W1010                | 2400-2500                                | -10          | 2               | 108 (86)               | 10 (7.8)     | B            | SMA(m)                        |         | W1030W (White)                   |
|                      |                   | W1030                | 2400-2500                                | -10          | 2               | 108 (86)               | 10 (7.8)     | B            | RP-SMA                        |         |                                  |
|                      |                   | W1027                | 2400-2500                                | -11          | 3.2             | 136 (110)              | 10 (6)       | C            | RP-SMA                        |         |                                  |
|                      |                   | W1037                | 2400-2500                                | -10          | 3.2             | 197 (170)              | 13.2 (7.4)   | C            | RP-SMA                        |         | Color option (Grey)              |
|                      |                   | W1038                | 2400-2500                                | -10          | 3.2             | 197 (170)              | 13.2 (7.4)   | C            | RP-SMA                        |         |                                  |
|                      |                   | W1059                | 2400-2500                                | -10          | 5               | 195 (154)              | 13 (6)       | C            | SMA (m)                       |         |                                  |
|                      | Stick/ no Swivel  | W5001                | 2400-2500                                | -10          | 1.5             | 128                    | 10 (6)       | G            | RP-SMA (Right angle)          | IP65    |                                  |
|                      |                   | W5010                | 2400-2500                                | -10          | 1.5             | 130                    | 10 (6)       | A            | RP-SMA                        |         |                                  |
|                      |                   | W5011                | 2400-2500                                | -10          | 1.5             | 130                    | 10 (6)       | A            | SMA (m)                       |         |                                  |
|                      |                   | W5039                | 2400-2500                                | -10          | 1.3             | 94                     | 10 (6)       | F            | RP-SMA                        | IP67    |                                  |
| WiFi (5GHz)          | Stick/Swivel      | W1028B               | 5150-5850                                | -9           | 2               | 136 (114)              | 9.2 (6)      | C            | RP-SMA                        |         |                                  |
| Dual WiFi (2.4/5GHz) | Blade/ Swivel     | W1043                | 2400-2500; 5150-5850                     | -10          | 2               | 157 (130)              | 17.6 (13)    | E            | RP-SMA                        |         | See W1043 datasheet              |
|                      |                   | W1044                | 2400-2500; 5150-5850                     | -10          | 2               | 157 (126)              | 17.6 (13)    | E            | SMA (m)                       |         |                                  |
|                      | SPDA17RP2400/5900 | 2400-2500; 4900-5900 | -10                                      | 0.8; 5.9     | 175 (150)       | 21.8 (13.7)            | H            | RP-TNC       |                               |         |                                  |
|                      | Stick/ no Swivel  | W5028                | 2400-2500; 5150-5850                     | -10          | 0               | 128                    | 10 (6)       | G            | RP-SMA (Right angle)          | IP65    |                                  |
| 2G                   | Blade/ Swivel     | SPDA24850/1900       | 824-894; 1850-1990                       | -7.5         | 0; 1.5          | 176 (147)              | 21.8 (13.7)  | H            | SMA (m)                       |         |                                  |
|                      |                   | SPDA17850/1900       | 824-894; 1850-1990                       | -10          | 0; 1.2          | 176 (147)              | 21.8 (13.7)  | H            | TNC                           |         |                                  |
| 3G                   | Stick/ no Swivel  | W1900                | 824-960, 1710-2170                       | -4;-6        | 0.5; 2.5        | 49                     | 8            | D            | SMA (m) (Right angle)         |         | Tested on ground plane (70x50mm) |
|                      |                   | W1902                | 824-960, 1710-2170                       | -4;-6        | 0.5; 2.5        | 49                     | 8            | D            | RP-SMA (Right angle)          |         |                                  |
|                      |                   | W1910                | 824-960, 1710-2170                       | -4;-6        | 0.5; 2.5        | 49                     | 10.4         | F            | SMA (m)                       |         |                                  |
|                      |                   | W1911                | 824-960, 1710-2170                       | -4;-6        | 0.5; 2.5        | 49                     | 10.4         | F            | RP-SMA                        |         |                                  |
|                      | Blade/ Swivel     | SPDA17806/2170       | 806-960; 1710-2170                       | -7.5         | 0.5; 0.5        | 192 (159)              | 23.8 (15.7)  | H            | TNC                           |         | Medium Grey                      |
| 4G                   | Blade/ Swivel     | SPDA24700/2700       | 698-960; 1710-2170; 2500-2700            | -7.5         | 0.6; 1.5; 3.4   | 223 (192)              | 23.8 (15.6)  | H            | SMA (m)                       |         |                                  |
|                      |                   | W5095X               | 698-960; 1447-1510; 1710-2170; 2500-2700 | -7.5         | 1.5; 2.5        | 229 (198)              | 29 (15.5)    | H            | SMA (m): W5095K<br>TNC: W5095 | IP65    |                                  |
|                      |                   | W5084X               |                                          | -7.5         | 2.0; 4.0        | 229 (198)              | 44 (15.5)    | H            | SMA (m): W5084K<br>TNC: W5084 | IP65    |                                  |





OUTDOOR ANTENNA SOLUTIONS

| Style                    | App.                   | Type               | Pulse Part Number | Frequency range (MHz) | RL, Min. (dB) | Gain, Peak (dBi) | Efficiency, Avg. (%) | Height (mm),  | Diameter (mm), Max [Min] | Cable Type, Length (mm) | Connector type         | Note                        |
|--------------------------|------------------------|--------------------|-------------------|-----------------------|---------------|------------------|----------------------|---------------|--------------------------|-------------------------|------------------------|-----------------------------|
| Outdoor (IP 65 or IP 67) | ISM 868/915            | Stick / no Swivel  | W5012             | 868-928               | -8            | 2                | -                    | 179           | 10                       | -                       | RP-SMA (m)             | IP65                        |
|                          |                        |                    | W5017             | 868-928               | -8            | 2                | -                    | 179           | 10                       | -                       | SMA (m)                | IP65                        |
|                          |                        |                    | W5021             | 868-928               | -10           | 2.2              | 70                   | 179           | 10                       | -                       | Right Angle RP-SMA (m) | IP65                        |
|                          |                        | LP                 | LP800             | 806-960               | -13           | 3                | -                    | 31            | 143 [95]                 | RG58, L: 914            | SMA (m)                | Tested on 12x12" GND        |
|                          |                        | LPT                | LPT698/2700DMN    | 860-930 (698-960)     | -10           | 3                | 80                   | 77            | 41                       | -                       | N (f)                  | Tested on 12x12" GND        |
|                          |                        | SLPT               | SLPT698/2170DMN   | 860-930 (698-960)     | -10           | 4                | 90                   | 79            | 38                       | -                       | N (f)                  | Tested on 19" DIA. GND      |
|                          |                        | Radome Omni        | RO8061/21702NF    | 860-930 (824-960)     | -10           | 1                | -                    | 215           | 26 [22]                  | -                       | N (f) or N (m)         | N (m): W5005                |
|                          |                        |                    | W5063             | 863-928               | -10           | 1.5              | -                    | 196           | 26 [22]                  | -                       | N (m)                  |                             |
|                          |                        |                    | RO8063/21704NF    | 860-930 (806-960)     | -10           | 3                | -                    | 388           | 37 [33]                  | -                       | N (f) or N (m)         | N (m): RO8063/2170NM        |
|                          |                        |                    | RO8605NF          | 860-930               | -10           | 5                | 65                   | 795           | 25 [22]                  | -                       | N (f)                  | Sigfox approved             |
|                          |                        |                    | RO3ISMNM          | 430-440 / 860-930     | -10           | 3 / 3            | 90 / 65              | 541           | 37 [33]                  |                         | N (f) or N (m)         | Public safety               |
|                          | ISM 868                | Magnetic mount     | MS3E800SMA        | 806-896               | -10           | 4                | -                    | 330           | -                        | RG58, L: 914            | SMA (m)                |                             |
|                          | ISM 915                |                    | MS3E900SMA        | 890-960               | -10           | 4                | -                    | 330           | -                        | RG58, L: 914            | SMA (m)                |                             |
|                          | ISM 169                | 1 λ 2 Radome Omni  | RO1692NFKIT       | 168-170               | -10           | 1.6              | 85                   | 983           | -                        | N/A                     | NCBI                   | IP67 / Conical shape radome |
|                          |                        | 1 λ 2 with Bracket | WHIP1692NFKIT     | 168-170               | -12           | 1.3              | 85                   | 410           | -                        | N/A                     | NCBI                   | IP67                        |
|                          |                        | 1 λ 2 Loaded       | KDNF169HWKIT      | 168-170               | -10           | 1.6              | 85                   | 830 + Bracket |                          | N/A                     | NCBI                   | IP67                        |
|                          | GPS L1 & L2 band combo |                    | GNSSDML1L2        | L1 & L2               | -12           | 30               | 65                   |               | 100                      | RG174, L:400            | SMA(m)                 | IP67                        |
|                          | 3G/4G                  |                    | W1960NF           | 3G/4G 824-2170MHz     | -10           | 2.8 / 3.5        | 65                   | 77.2          | 40.9 to 32.2             | RG174, L:419            | SMA(m)                 | IP67                        |

Note: 1. See datasheets for details. 2. Sales/FAE contact. Email: [antennas.us@pulseelectronics.com](mailto:antennas.us@pulseelectronics.com).  
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