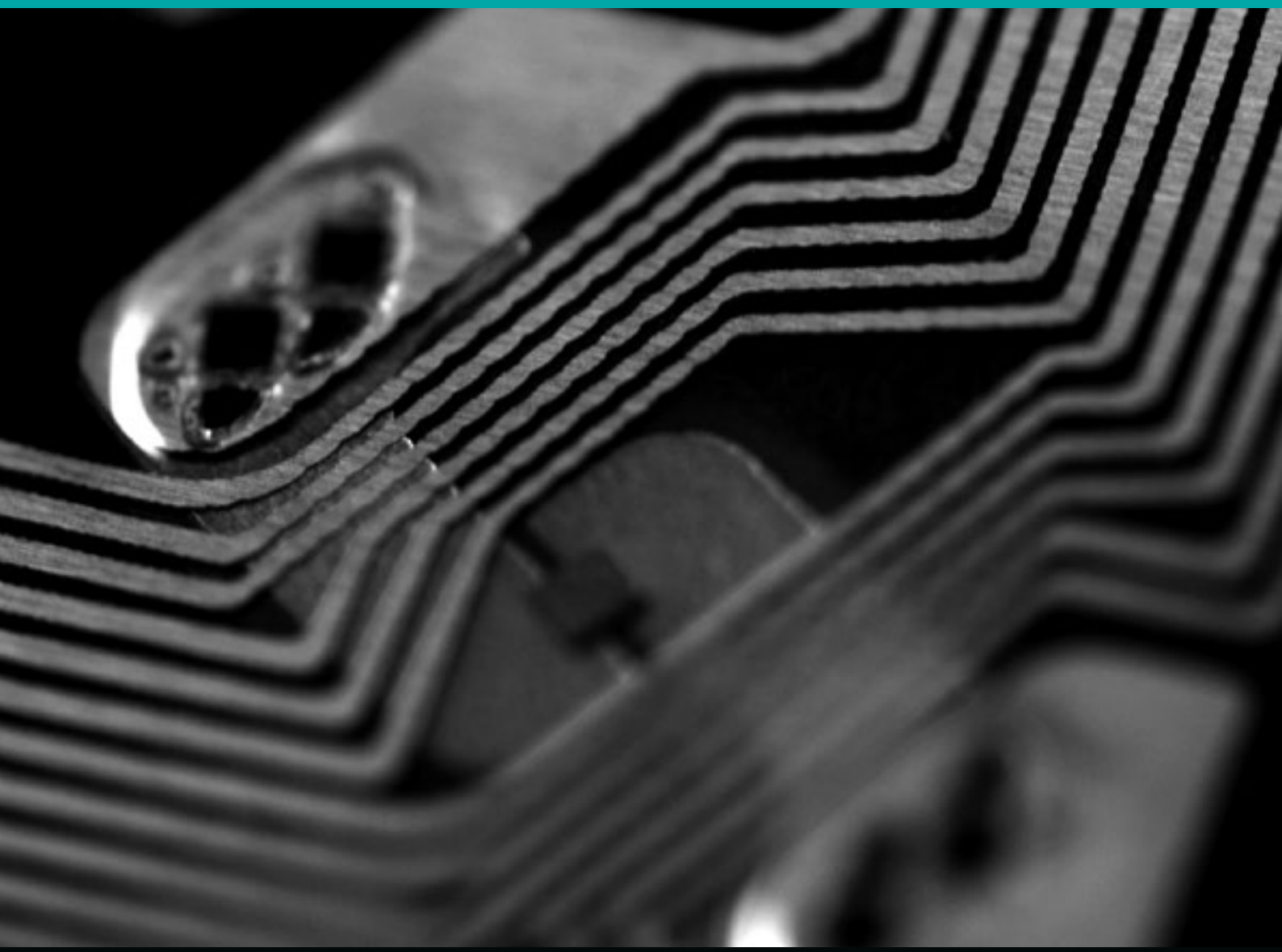
Aerospace & Defence | Lighting | Power Management | Internet of Things | Transportation

Components – EMEA

Antenna Guide



Five Years Out

arrow.com

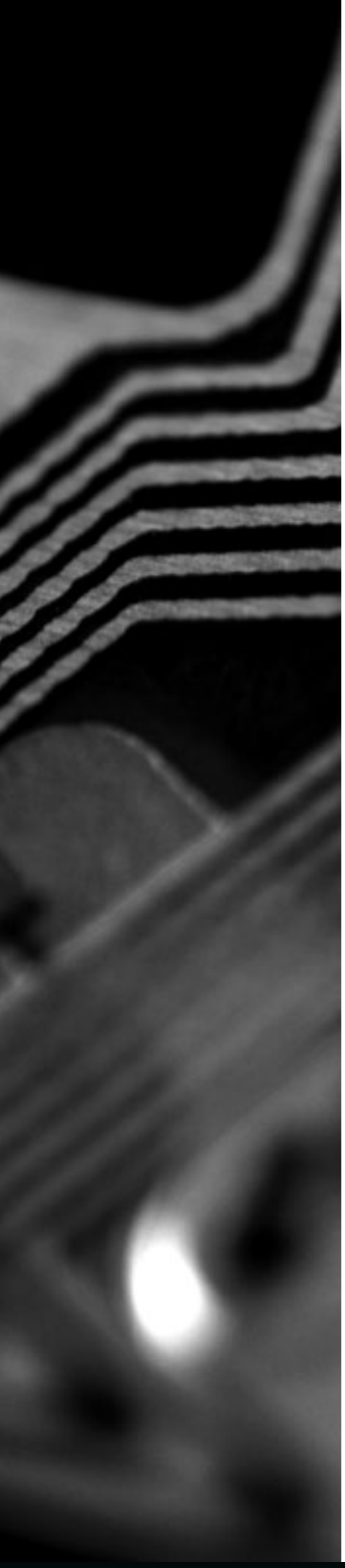


Table of Contents

Featured New Antenna Product Introductions

Integrate Antennas in Your Design

Get the best performance and speed up time to market. Contact the Arrow Field Application Engineer to understand how to integrate antenna in your design.

Antennas
An antenna has an arrangement of metallic conductors with an electrical connection to a receiver or transmitter. In a radio transmitter, current is forced through these conductors by the transmitter to create an alternating magnetic field. In a radio receiver, this field induces a voltage at the antenna terminals, which are connected to the receiver input. In remote transmission, the oscillating magnetic field is coupled with a similar oscillating electric field, which defines electromagnetic waves capable of propagating the signal for long distances. Radio waves are electromagnetic waves that carry signals through space at the speed of light without any transmission loss. Antennas can be omni-directional, directional or arbitrary.

Main Types of Antennas
In principle, the most common antennas are dipole or monopole antennas. A dipole antenna usually consists of two symmetrical conductors. The monopole antenna, also often called ground plane antenna, is asymmetrical. It consists of a conductor for receiving or transmitting the electromagnetic waves and a ground connection as reference potential on the other side. The many existing constructive designs of antennas are basically based on one of the two principles mentioned above.

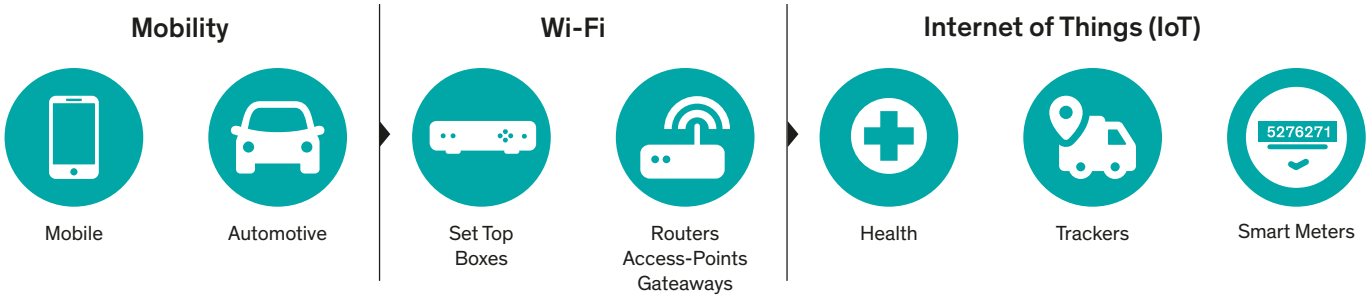
Trends in Wireless Applications
The rapidly growing number of clients and faster data rates as well as the demand for short latency times make antenna design a key factor for the success of new devices.

Why are There Different Antennas?
Antenna performance depends on proper implementation and the environment.

Challenges
The coexistence of different standards within the system and their standard implementation; miniaturization, interference, and noise are challenging. System costs require a close look at the respective application.

Nothing worse than your design fails in the test house at the measurement conditions and you end up with a new design.

Passive & Active Antennas



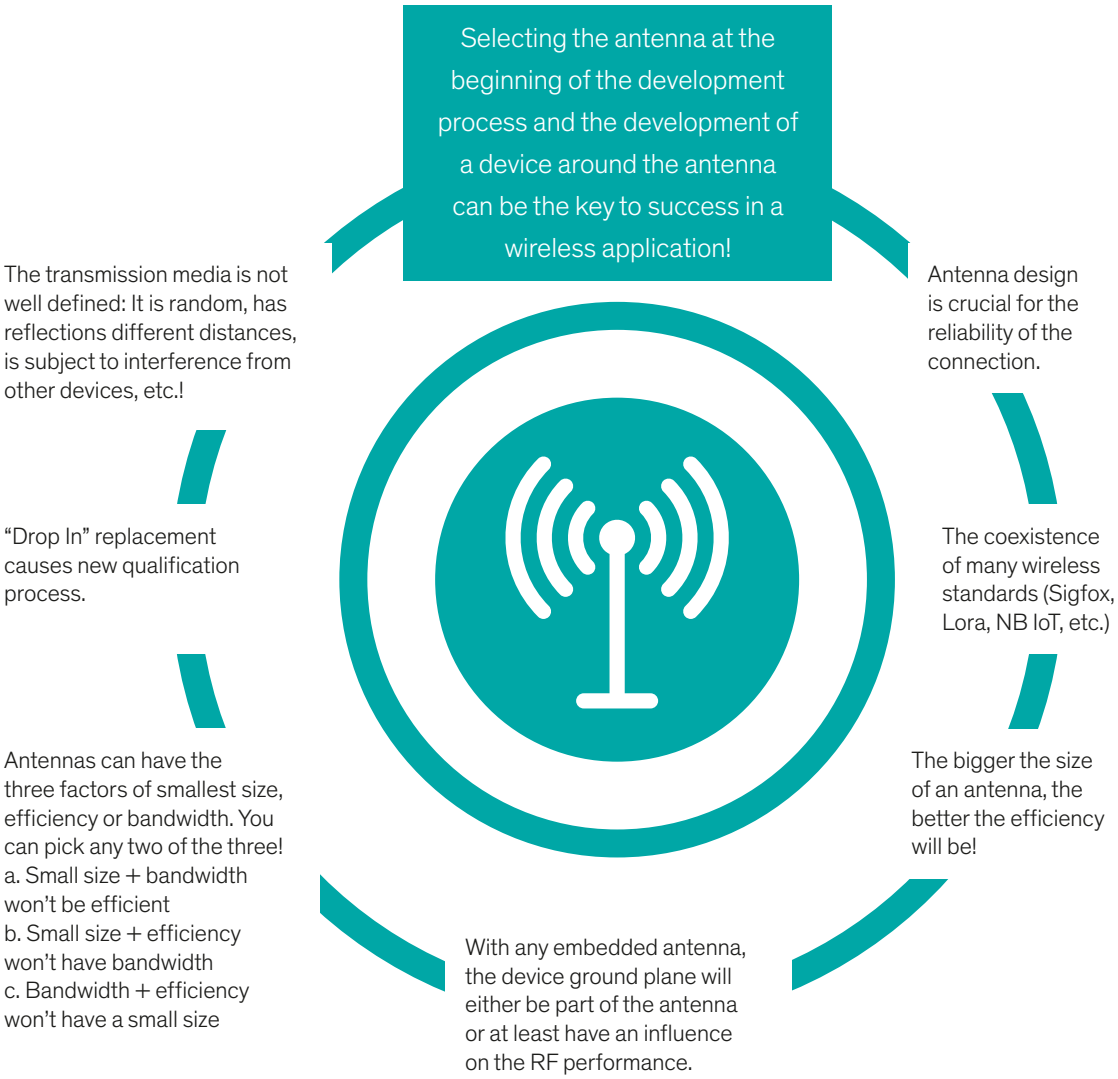
Successful Integration of Antennas

The primary antenna performance goal must be efficiency. Antenna tuning and impedance issues can usually be adjusted to some degree during development. However, an antenna design with inherent low efficiency, most often because of size constraints imposed by the industrial design, will often require substantial product re-design for improvement.

Antenna design requires suitable test equipment and know-how to obtain optimal performance. It is strongly recommended to use the professional services of firms specializing in the design and placement of antennas. Arrow and our partners can help in the design process.

To support Arrow's customers with the right partner, product and services, we have developed this Antenna Guide. This brochure is intended to help solve problems before they appear and speed up the time to market for new end products in very fast-developing market conditions.

Fixing antenna problems at the end or after prototyping at a testing facility is difficult, time consuming, and expensive.



Successful integration of an antenna into a wireless device depends on the understanding that the entire device is part of the antenna. The antenna cannot be added at the end of the design phase; it must be designed in from the very beginning of the product concept.

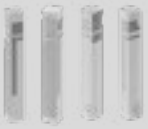
Wireless Communication Standards

Technology	Frequency	Typical Data Rate	Distance
Cellular Mobile Communication	GSM: 850, 900, 1800, 1900 MHz	GPRS up to 80 kbps	Few km
	UMTS: 850, 1900, 2100 MHz	EDGE up to 1.6 Mbps	
	LTE: 800, 900, 1800, 2600 MHz	UMTS up to 384 kbps	
	5G: 600–6000 MHz, 24–40 GHz	HSDPA up to 7.2 Mbps	
		HSDPA+ up to 42 Mbps	
		LTE up to 1.2 Gbps (CAT18)	
		5G up to 10 Gbps	
Sigfox	868 MHz Europe	Sigfox up to 100 bps	Sigfox up to 15,000 m
LoRa	915 MHz North America	LoRa up to 50 kbps	LoRa up to 15,000 m
GNSS Global Navigation Satellite System (GPS, Glonass, Galileo, Compass; Beidou)	Between 1.1 – 1.6 GHz depending on System	-	-
WLAN/Wi-Fi Wireless Local Area Network	802.11a – 5.0 GHz	802.11a up to 54 Mbps	Up to 250 m
	802.11b – 2.4 GHz; Wi-Fi 2	802.11b up to 11 Mbps	
	802.11g – 2.4 GHz; Wi-Fi 3	802.11g up to 54 Mbps	
	802.11n – 2.4 / 5.0 GHz; Wi-Fi 4	802.11n up to 600 Mbps	
	802.11ac – 5 GHz; Wi-Fi 5	802.11ac up to 6933 Mbps (with MiMo)	
	802.11ax – 2.4 / 5.0 GHz; Wi-Fi 6	802.11ax up to 9608 Mbps (with MiMo)	
	802.11ad – 60 GHz	802.11ad up to 7 Gbps (with MiMo)	
	802.11ah – Sub-GHz	802.11ah up to 8,67 Mbps	
Bluetooth Wireless data exchange over short distances	2.4 GHz	Version 2.1 up to 3 Mbps,	BT Class 1 up to 100 m, until 600 m possible
		Version 3 up to 24 Mbps,	BT Class 2 up to 10 m
			BT Class 3 up to 1 m
		Low Energy (LE) up to 2 Mbps (BT 5.0)	Low Energy (LE) up to 50 m; good devices until 600 m
Low Rate WPAN IEEE 802.15.4, ZigBee, wireless HART, MiWi, 6LoWPAN, Thread	433 MHz: Europe	Up to 250 kbps	Depending on network topology and protocol standard
	863.0–868.6 MHz: Europe		Point to point 802.15.4 ranging up to 600 m
	902–928 MHz: North America		ZigBeePro up to 600 m
	2400–2483.5 MHz: Worldwide use		High power Sub GHz up to 6,000 m
Wireless M-Bus & KNX-RF	169 MHz, 868 MHz 868 MHz Europe Standard only	Up to 100 kbps	Up to 6000 m urban environment
RFID (passive)		125 kHz few kbps	125 kHz up to 1 m (with DSP Reader)
125kHz (LF)	125 – 134 kHz	NFC up to 848 kbps	NFC up to 10 cm
NFC (HF)	NFC ISO 14443: 13.56 MHz	NFC 15693 up to 26,48 kbps	NFC 15693 up to 1.0 m
860-870 MHz (UHF)	NFC ISO 15693: 13.56 MHz	UHF 40kbps	UHF up to 7 m
TransferJet	4.48 GHz	Up to 560 Mbit/s	A few cm

Wireless & Connectivity | Suppliers by Technology

	GNSS	Cellular	Sigfox/LoRa	DECT	WLAN	Bluetooth	Combo BT/WLAN	802.15.4/ZigBee	Sub GHz	6LowPAN	Thread	Wireless M-Bus/KNX-RF	RF Amplifiers	RFID/NFC	TransferJet	Discretes	SOM w WiFi/BT	Design Services	Antennas/Balun
Modules																			
Analog Devices								•		•						•		•	
Anaren						•			•										
Azurewave					•	•	•												
Digi International		•			•			•	•	•	•						•	•	
DH Electronics																	•	•	
Embedded Artists							•											•	
EnOcean						•		•	•									•	
GNS	•																		•
H&D wireless					•		•											•	
IMST			•					•	•	•		•						•	
Infineon (incl. Cypress)						•												•	
InnoComm	•	•	•			•	•										•		
Intel							•										•		
iWave																	•		
Lantronix	•	•			•		•											•	•
Laird Technology		•	•		•	•	•	•	•	•	•						•	•	•
Microchip			•		•	•	•	•	•	•	•						•	•	
Murata		•	•		•	•	•	•	•	•				•				•	•
NXP Semiconductors						•		•		•	•							•	
ON Semiconductor			•			•		•		•	•	•		•				•	
Quectel	•	•					•										•	•	•
Panasonic					•	•	•	•		•								•	•
R3COMM					•														
Sensiedge			•			•			•										
Silex					•		•											•	•
Silicon Labs (incl. Redpine)					•	•	•	•		•	•							•	•
Siretta		•																•	•
SolidRun																	•		
STMicroelectronics	•		•			•		•	•	•	•	•						•	
tatwah						•								•				•	
TDK-EPC						•													
Telit	•	•			•		•											•	
Variscite																	•		
Weptech			•			•		•		•	•	•							
Chipset/Components																			
Analog Devices			•					•	•	•		•	•			•		•	
Austria Micro System														•				•	
Infineon (incl. Cypress)					•	•	•		•				•	•		•		•	
Intel					•	•	•												
Microchip			•		•	•	•	•	•	•	•		•	•		•		•	
NXP (incl. Marvel)			•		•	•	•	•	•	•	•	•	•	•		•		•	
ON Semiconductor			•		•	•		•	•	•	•	•	•	•				•	
Qualcomm					•	•	•										•		
Silicon Labs			•		•	•	•	•	•	•	•	•						•	
STMicroelectronics	•		•			•		•	•	•	•	•	•	•		•		•	•
Toshiba						•								•	•				

Internal Antennas – Common Technologies

Off the Shelf / Standard		
Flex-Antenna		Antenna structure on a thin plastic film. Usually connected with a piece of coaxial cable. Available in many variants and for many frequency bands. Slight changes (cable length) possible. This type of antenna can be easily placed inside devices with an adhesive tape on their backside.
PCB-Antenna		Antenna structure on PCB base material, usually FR4. Some variants can be soldered directly onto the PCB, others are connected with cables. Available in many variants and for many frequency bands.
Ceramic Antenna		Antenna structure built in or on a ceramic base material. Many variants available. Soldered directly onto the PCB. The application requires considerations regarding the layout of the board (ground planes, traces,…) and the placement of the antenna.

Customized		
Integrated PCB-Antenna		Antenna structure integrated on customers PCB. Needs a sound knowledge in RF-design specially if a customer will use more than one antenna.
LDS/MID-Antenna		Mostly for customized of antennas. LDS means Laser Direct Structuring. The antenna structure is applied directly to a plastic material using a laser and subsequent galvanic processes. Three-dimensional structures are easy to realize. Not every plastic material is suitable. This requires a very close coordination with the manufacturer. MID means Molded Interconnect Device. Antenna conductors made from LDS compatible plastics or metal are molded into a standard plastics structures. Often the manufacturer produces the complete plastic part. Some standard parts available.
Ink-Antenna		Customized antennas. The antenna structure is printed directly onto different material using a conductive ink. Three-dimensional structures possible. Unlike LDS, there are very few restrictions on the choice of base material and also lower initial costs.
Stamped Antenna		Mostly for customized of antennas. Antenna is made of stamped and bent metal. Only suitable for large quantities or for very special applications. Investments in production tools are very high. Some standard parts available.

Antenna | Suppliers by Technology

Supplier	Mechanical							Frequency Range (GHz)							
	Ceramic	Flexible	PCB	Stamped	Active Antennas (i.e. GNSS)	MID/LDS/Ink	External (cabled, swivel, ...)	0	1	2	3	4	5	6	>6
Abracon LLC	•	•			•		•								
AdamTech			•				•								
AVX (Ethertronics)	•	•	•	•	•	•	•								
Johanson	•														
Molex	•	•	•	•	•	•	•								
Murata			•												
Pulse	•	•	•	•	•	•	•								
Quectel	•	•	•	•	•	•	•	from 600 MHz to 6 GHz							
Radiall					•		•								
Siretta	•	•	•		•		•	from 433 MHz and up to 5.8 GHz							
NEW Taoglas	•	•	•	•	•	•	•								
TDK	•														
TE Connectivity	•	•	•	•	•	•	•								
Vishay	•							from 1,5 up to 5 GHz							
Walsin Technology	•	•	•	•			•								

Supplier	Wireless Standard																	Design Support				
	5G	Cellular (GSM, UMTS, LTE, WWAN)	NB-IoT	GNSS (GPS, Glonas, Beidou, Galileo)	Tetra	DECT	ISM	Sub GHz	Wireless M-Bus/KNX-RF	Sigfox/LoRa/Z-Wave	Bluetooth/BLE	802.15.4/ZigBee/MiWi	6LowPAN	Thread	WiFi (WLAN)	RF ID/NFC	RF ID/UHF	Customization	Full Custom Design	Application Support	Test Facilities	Design Services, Test Facilities
Abracon LLC		•		•	•		•				•				•	•		•				?
AdamTech		•		•					•	•	•	•			•			•	•	•	•	Yes
AVX (Ethertronics)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Yes
Johanson	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Yes
Molex	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Yes
Murata																•						
Pulse	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Yes
Quectel	•	•	•	•			•	•		•	•	•		•	•	•	•	•	•	•	•	Yes
Radiall	•	•		•	•		•	•		•	•				•			•	•	•	•	Yes
Siretta		•	•	•			•			•	•	•		•	•			•				Yes
NEW Taoglas	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Yes
TDK		•		•				•			•				•			•	•	•	•	Yes
TE Connectivity	•	•	•	•			•	•		•	•	•	•	•	•	•		•				Yes
Vishay							•				•				•							Yes
Walsin Technology	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•		•	Yes

Arrow Engineering Solution Center – ESC

> **ESC (Engineering Solution Center) – EMEA**
Embedded HW/SW, Linux, IoT, FPGA, Power, Analog, Sensor, Memory, Security, Lighting, RF, PEMCO, Mechanical Design, Project Management
Locations: Budapest (HU); Neu-Isenburg (GE); Gdansk (PL)

> **ESC (Engineering Solution Center) – NA**
IoT, ACES & ASIC, Connectivity, Mechanical & Industrial Design, Embedded HW/SW, Timing, FPGA, Analog, Power, PEMCO, Project Management

> **ESC (Engineering Solution Center) – APAC**
Embedded, Connectivity, Motor Drives, Power, Sensor, etc. + Lab

Arrow's 3rd Party Network and ESC

> **More than 50 existing Arrow 3rd Party Partner**
Arrow has an extensive 3rd party company network to extend Arrow services and custom support.

> **Multiple of technologies**
Arrow's 3rd party partners are exprienced and in different kind of technologies and engineering services including the RF technologies.

> **Connections**
Arrow can provide support in different technologies, covering custom applications 100 %.

> **Countinously growing partner network**

Benefits

Faster time to market

Cost saving

Customer relationship

Wider support

RF Antennas: WiFi/WLAN and LTE

Adam Tech's RF Antennas are an optimal solution for any application transmitting or receiving electromagnetic waves. This series is headlined by WiFi/WLAN and LTE antennas, offered as either embedded or external. Our antennas are designed with versatility in mind as they are available in a variety of lengths, as well as in both vertical and horizontal mounting orientation. Adam Tech is committed to providing reliable solutions to the wide world of wireless communication.

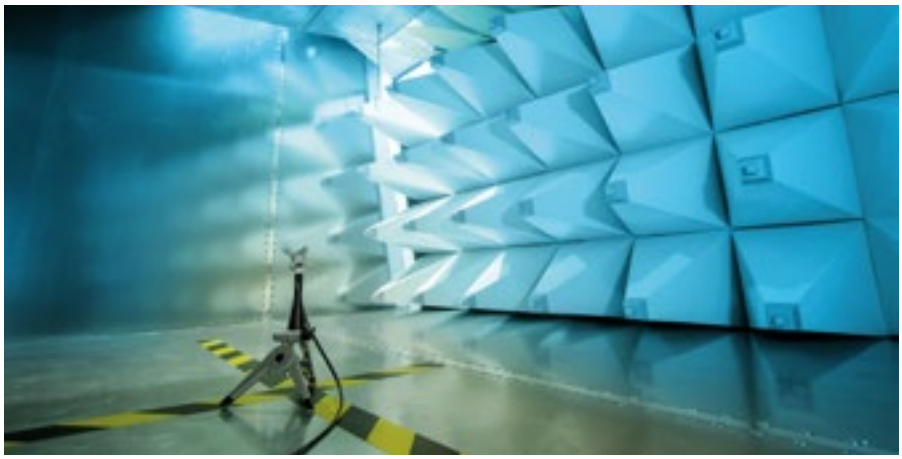
Features & Benefits

- Embedded and external antennas
- Variety of lengths
- Horizontal and vertical mounting orientation
- Enable high speed wireless communication
- Frequency Range:
  - WiFi / WLAN: 2.4~2.5 GHz / 4.9~5.8 GHz
  - LTE: 704~960 MHz / 1710~2690 MHz

Please find more information on **www.arrow.com/en/manufacturers/adam-tech/connectors**

How to know that the antenna works properly

To understand if an antenna design works properly it is not enough just to send or receive some test signals. It might be the case that a design works in test environment but it fails in the field or within some different use cases which were not tested within the simulation because nobody expected the user to do so or nobody described the use case in detail. Therefore it is important to understand the use case, the possible installation of the devices, and the environemt where the application will be used.



To really understand if the design works as expected/required it is highly recomended to do a simulation test or network analyzer test. This is the only way to understand if the antenna works properly and shows the right performance.

Antennas for every Frequency and Application

AVX (Ethertronics) antennas are available in standard and custom configurations to ease antenna integration and maximize performance. AVX's passive antennas establish benchmarks for speed, range, efficiency and reliability across a wide variety of applications, from mobile phones to Wi-Fi, Automotive, and the Internet of Things (IoT) and covering standard industry frequency bands, including: Cellular, LTE, 5G, WiFi, BLE, NB-IoT, LTE-M, LoRa, ISM, GNSS, V2X and UWB.

AVX supports customers in their design development of wireless devices to enhance connectivity by offering technical support as well as testing and design services. AVX also offers active technologies, as RF Band Switching, ideal for meeting harsh specifications when the environment reduces the original bandwidth, or the unique Plug&Play LoRa module with embedded Impedance Matching and Active Steering, which maximize the power transfer between the radio and antenna and optimize the communication link.

Orderable Part Numbers at arrow.com

- 1004795
- EC686-3
- X9001248-4GMSMB1000R
- M620720
- 1000146
- 1002649

Passive Standard Antennas

PCB	Ceramic	PCB + Cable	External	FPC + Cable	Patch	Metal stamped
						

Custom Antennas & Services

LDS	FPC	Carrier + Stamping	Automotive Chamber	mmWave Chamber
				

Active Antennas & Module

RF Switches	External	FPC + Cable	Ceramic Patch + Cable	LoRa Module
				

Scan the QR code to visit AVX Online Search Filter for passive antennas

Wi-Fi 6/6E Antennas from Molex

Wi-Fi 6 or 802.11ax is the latest generation of 802.11 wireless networking standard. With all the new technologies, like OFDMA, MU-MIMO (on both up- and down-link), QAM 1024, Wi-Fi 6 is reported to be 30% faster than Wi-Fi 5, also it brings the benefit of lower latency, higher capacity for multiple devices, and lower power consumption. Other than supporting the frequency bands at 2.4GHz and 5GHz, FCC extended Wi-Fi 6 to 6E in early 2020, by opening a new band from 5.925GHz to 7.125GHz. This built an extra 1.2GHz highway for Wi-Fi 6E for wider channel and less interference from legacy Wi-Fi 4/5 devices.

But, to enjoy all the benefits, you will need to consider if your chipset and antenna can support the new standard. On the antenna side, Molex offers you a full portfolio of internal antennas to ease your design.

Advantages

> Off the shelf antennas for quick time to market
> Triple frequency bands at 2.4GHz, 5GHz, 6GHz, fully support Wi-Fi 6/6E and legacy Wi-Fi 4 and 5 standards
> 1×1, 2×2, 4×4 MIMO antennas for your devices to support MU-MIMO on up- and down-link, for higher speed and lower latency
> Different form factors, customizable cable length/connector, and “peel and stick” mounting enable the maxim design flexibility

Orderable Series at arrow.com

> 146153
> 146187
> 204281
> 206994
> 208482
> 212330

Mount-on-metal Antennas from Molex

Metal shielding/housing is widely used in home appliance, automotive and industrial applications, due to reasons of low cost, durability and protection of to the inner device. As more and more of these devices are being “Smart” and connected to wireless network, engineers are facing the challenge of optimizing RF performance with the constraint of metal detuning effect.

In the lately released mount-on-metal antennas, Molex deployed special technologies to avoid the detuning effect, even the antenna is directly mounted on a metal surface or enclosure.

Advantages

> Can be mounted on a full metal surface, without detuning the resonance frequency
> Two series of antennas supporting 2.4 GHz and 2.4/5 GHz bands, cover the needs in Wi-Fi, Bluetooth, Zigbee standards in the IoT space
> Small form factor of 20.2×20.2×3.5 mm makes it possible to directly mounted anywhere on either inner or outer side of the enclosure, without impact to the industrial design
> Customizable cable length/connector, and “peel and stick” mounting enable the maxim design flexibility

Orderable Series at arrow.com

> 212498
> 214061

Stacked Patch Antenna from Molex for GNSS Systems

Most legacy GPS devices can only support low positioning accuracy with L1 C/A signal from satellites. As there are many applications booming in recent years, like autonomous vehicles, drones, transportation and aviation, request higher accuracy, faster signal acquisition, higher reliability, and greater operating range, the devices have to be upgraded to support newly released L2 and/or L5 frequencies.

Molex off-the-shelf stacked GNSS patch antennas are designed to support dual frequency bands for high precision positioning at centimeter level, and real time kinematic (RTK) systems.

Orderable Series at arrow.com
> 211624
> 212203
> 213602

Advantages
> Dual frequency at L1/L2 and L1/L5 within a compact form factor
> Stacked patch with single feed, eliminate the need for separate base stations
> High gain and radiation efficiency for the most demanding applications

Ready-to-Use RF Antennas – Overview

Product	Description	Applications
Internet of Things (IoT) Antennas: Wi-Fi, Bluetooth, Zigbee 	2.4/5- Ghz and 900- Mhz ultra-thin Ceramic and LDS/MID Antennas offer cabled, flex and PCB formats to enable fast and easy RF integration into connected systems and are ideal for embedding high-performing internet and data connectivity in compact devices	> Automotive > Consumer > Telecommunications
LTE Cellular Antennas 	Molex provides best-in-class compact, high-gain 3G and 4G/LTE Cellular Antennas for connected smart devices and today's high-performance LTE networks	> Automotive > Smart Phones and Mobile Devices > Consumer > Industrial > Telecommunications/ Networking
GNSS/GPS Antennas 	Providing superior RF performance for US and global satellite systems (e.g., GLONASS, Baideo, Galileo), LDS/MID and Ceramic GNSS/GPS Antennas combine ease of integration with reduced cost of implementation over a variety of wireless navigation device applications. External GNSS Antennas provide full-band position coverage and offer high RF performance and reliability.	> Commercial Vehicle > Consumer > Industrial
Combo Antennas 	Molex Combo Antennas offer expanded frequency ranges to handle a combination of multiple wireless communication protocols, while also delivering long-range connectivity, high-power efficiency, a compact form factor and easy integration	> Automotive > Consumer > Industrial
Near Field Communication (NFC) Antennas 	NFC Antennas maximize quick, 2-way read/write operations over a range of detection distances from metallic and nonmetallic substrates, making them ideal for payment systems, RFID and device-pairing applications	> Automotive > Consumer > Industrial
Ultra-Wideband (UWB) PCB Antenna with Balanced Transmission 	UWB Antennas offer high-radiation efficiency for optimal performance making them ideal for data transmission due to the high bandwidth of frequencies	> Automotive > Consumer > Industrial > Medical
Industrial, Scientific and Medical (ISM) Antennas 	ISM Standalone Antennas combine high RF performance with ease of integration over 433, 868 and 915 Mhz bands for advanced industrial, scientific and medical devices	> Industrial > Medical

	Protocols		Molex Antenna Products
Bluetooth	Standard: Bluetooth 4.2 core specification Frequency: 2.4 GHz (ISM) Range: 50–150 m (Smart/BLE) Data Rates: 1 Mbps (Smart/BLE)		**Cabled Flex/PCB Antenna** • 146153: 2.4/5 GHz Balance Flexible Antenna • 146187: 2.4/5 GHz Balance PCB Antenna • 204281: 2.4/5 GHz Flexible Antenna side-fed cable • 206994: 2.4/5 GHz Flexible Antenna (half small size than 146153, 204281) • 206995: 2.4/5 GHz PCB Antenna (for mounting on metal) • 208482: 2.4/5 GHz Flexible Antenna 2×2 MIMO • 146186: 2.4/5 GHz & GPS combo Flexible Antenna • 146220: 2.4/5 GHz & GPS combo PCB Antenna • 212330: 2.4/5 GHz Flexible 4×4 MIMO
zigbee	Standard: ZigBee 3.0 based on IEEE802.15.4 Frequency: 2.4 GHz Range: 10–100 m Data Rates: 250 kbps		
	Standard: Thread, based on IEEE802.15.4 and 6LowPAN Frequency: 2.4 GHz (ISM) Range: N/A Data Rates: N/A		
Wi Fi	Standard: Based on 802.11n (most common usage in homes today) Frequencies: 2.4 GHz and 5 GHz bands Range: Approximately 50 m Data Rates: 600 Mbps maximum, but 150–200 Mbps is more typical, depending on channel frequency used and number of Antennas (latest 802.11-ac standard should offer 500 Mbps to 1 Gbps)		**Embedded SMT Antenna** • 47948: 2.4 GHz SMT MID Chip Antenna • 206513: Ceramic 2.4 GHz Antenna • 146175: 2.4/5 GHz SMT MID Chip Antenna • 211964: 2.4 GHz ceramic SMT Antenna • 201932: 900 MHz & 2.4/5 GHz Triple-band ceramic Antenna • 206514: Ceramic 2.4/5 GHz Antenna
6LowPAN	Standard: RFC6282 Frequency: (adapted and used over a variety of other networking media including Bluetooth Smart (2.4 GHz) or ZigBee or low-power RF (sub-1 GHz) Range: N/A Data Rates: N/A		
Z-WAVE	Standard: Z-Wave Alliance ZAD12837/ITU-T G.9959 Frequency: 900 MHz (ISM) Range: 30 m Data Rates: 9.6/40/100 kbit/s		• 105262: 868/915 MHz flexible Antenna • 206764: 868/915 MHz dipole flexible Antenna • 211140: 868/915 MHz monopole flexible Antenna (38×10 mm, half size of 105262) • 204774: 790–2700 MHz ceramic Antenna • 204287: 433 MHz Ceramic Antenna
sigfox	Standard: Sigfox Frequency: 900 MHz Range: 30–50 km (rural environments), 3–10 km (urban environments) Data Rates: 10–1000 bps		
neul	Standard: Neul Frequency: 900 MHz (ISM), 458 MHz (UK), 470–790 MHz (White Space) Range: 10 km Data Rates: Few bps up to 100 kbps		
CELLULAR	Standard: GSM/GPRS/EDGE (2G), UMTS/HSPA (3G), LTE (4G) Frequencies: 900/1800/1900/2100 MHz Range: 35 km max for GSM; 200 km max for HSPA Data Rates (typical download): 35–170 kps (GPRS), 120–384 kbps (EDGE), 384 kbps–2 Mbps (UMTS), 600 kbps–10 Mbps (HSPA), 3–10 Mbps (LTE)		**Cabled Flex/PCB Antenna** • 105263: Cellular 824~2700 MHz Flexible Antenna (size 106×13 mm) • 146185: Cellular 824~2700 MHz Flexible Antenna (size 84×15 mm) • 207235: Cellular 824~2170 MHz Flexible Antenna (size 40×15 mm) • 146234: Cellular 698~6000 MHz Flexible Antenna (size 140×20 mm) • 209142: Cellular 698~4000 MHz Flexible Antenna (size 85×14.5 mm) • 207901: Cellular 600~6000 MHz Flexible Antenna (size 147×25 mm) • 212570: 824-2170 MHz Flexible antenna **Embedded SMT Antenna** • 146200 (202519): 698~2700 MHz Ceramic Antenna (size 40×5×5 mm) • 206760: 698~2700 MHz Ceramic Antenna (size 38×8×3 mm) • 204774: 790–2700 MHz Ceramic Antenna (size 33×6×3 mm) • 206649: 698~960 MHz Ceramic Antenna(size 20×10×1.2 mm) • 208485: 600~4000 MHz Ceramic Antenna (size 38×8×3 mm)
LoRa	Standard: LoRaWAN Frequency: Various Range: 2–5 km (urban environment), 15 km (suburban environment) Data Rates: 0.3–50 kbps		
NB-IoT	NarrowBand-Internet of Things (NB-IoT) is a standards-based low power wide area (LPWA) technology developed to enable a wide range of new IoT devices and services. NB-IoT significantly improves the power consumption of user devices, system capacity and spectrum efficiency, especially in deep coverage. Battery life of more than 10 years can be supported for a wide range of use cases. Supported by all major mobile equipment, chipset and module manufacturers, NB-IoT can co-exist with 2G, 3G, and 4G mobile networks.		
	Standard: ISO/IEC 18000-3 Frequency: 13.56 MHz (ISM) Range: 10 cm Data Rates: 100–420 kbps		146236: NFC rectangular Antenna
GNSS (Global Navigation Satellite System)	**Beidou (China)** **GPS (US)** **GLONASS (Russia)** **Gallieo (EU)** **NAVIC (India)** **QZSS (Japan)**		**Stacked Patch Antennas:** • 211624: GPS L1/L5 & GLONASS, 36 mm • 212203: GPS L1/L5, 25 mm • 213602: GPS L1/L2, 36 mm **Passive Ceramic Patch Antenna** • 146168: GPS 25×25 mm • 204286: GNSS 25×25 mm • 208890: GPS 18×18 mm **Passive chip Antenna** • 146216: GPS RHCP MID Antenna • 146235: GPS Helix MID Antenna **Passive cabled Flex Antenna** • 213499: External GNSS Antenna • 213353: LTE & GPS Combo • 206560: GNSS Flexible Antenna • 146186: 2.4/5 GHz & GPS combo Flexible Antenna • 146220: 2.4/5 GHz & GPS combo PCB Antenna **Active Antenna module** • 206640: GNSS 28dB Antenna cabled pigtail

Apex TG.30

The patented Apex TG.30 Dipole LTE Antenna is designed for use with 4G LTE modules and devices that require the highest possible efficiency and peak gain to deliver best in class throughput on all major cellular (4G/3G/2G) bands worldwide for access points, terminals and routers.

An omnidirectional, ground plane independent antenna with an SMA (M) connector and swivel mechanism that allows the antenna part to be rotated around the connector. The Apex exhibits high efficiency across the ultra-wideband and is compatible with 2G/3G cellular applications - it even has GPS included.

It has IP67 UV resistant housing for use with wireless terminals. The swivel mechanism allows the antenna part itself to be orientated in different directions and can help avoid touching off other antennas or objects close by as well as helping with isolation by orientating the antenna in different directions in MIMO systems or when other TG.30 antennas are present on the same device.

Orderable Part Number at arrow.com
> TG.30.8111

The Taoglas Warrior PA.710.A is a wideband 4G/3G/2G SMD PIFA Antenna

The Warrior, is a revolutionary patent-pending, high-efficiency SMD ceramic antenna. This mighty, but small (40×5×6 mm) wideband 4G/3G/2G antenna, operates at 698MHz to 960MHz and 1710MHz to 2690MHz. The exceptional wide-band response means it's the ideal antenna for all LTE applications that also need high-efficiency and backward compatibility for 3G and 2G globally on all lower and upper bands.

It uses high-grade custom ceramic material and new design techniques to deliver the highest efficiencies on all bands when mounted on the device's main PCB. The Warrior is delivered on tape and reel and mounted securely during the device PCB reflow process.

Orderable Part Number at arrow.com
> PA.710A

Maximus FXUB66

The patent-pending Maximus FXUB66 flexible wideband antenna is an IoT antenna with 70-80% 5G/4G efficiency. It covers all working frequencies in the 650-6000 MHz spectrum, including all Cellular, Wi-Fi, ISM and GNSS bands. It has high-efficiencies, ground-plane independent and a peak gain of 5dBi. Using it in a device substantially improves the radiated power and sensitivity, alongside enabling the highest throughput rates of today's broadband devices.

Orderable Part Number at arrow.com
> FXUB66.07.0150C

Made of durable flexible polymer and designed to be mounted directly onto a plastic or glass enclosure, by a simple "peel and stick" process, it has a flexible body and is ultra-thin (120.4×50.4×.2mm)

It enables designers to use only one antenna that covers all frequencies and has future-proofed device design for 5G and 4G globally. It's the ideal antenna to fit in devices that are being retrofitted with wireless functionality, as it will cover non-cellular applications such as 868, 915MHz or Zigbee applications.

Guardian X 17-in-1

The Taoglas Guardian X is a feat of engineering which combines 17 antenna elements in one heavy-duty, IP67 rated waterproof, wall mount external enclosure.
This is an ideal solution for first response vehicles and heavy equipment applications, where a low profile, non-destructive installation is needed and space is at a premium (dimensions without bracket: 360×160×-20.5mm). It comes with 1* Active GPS/GLONASS/Galileo, 8* 5G/4G Cellular MIMO (600-6000MHz), 8* Wi-Fi 6 MIMO (2.4/5.1- 7.125GHz), as standard and also operates at Band 71, the newly established 5G band at 600MHz.

Orderable Part Number at arrow.com
> MA9917.A.001.wm

Applications

> Passenger bus, rail, air applications
> Automotive and heavy equipment vehicle tracking and telematics
> HD video over 5G/4G - first responder and emergency services
> M2M applications/IoT
> Cable type and length, and connector types are fully customizable and the Guardian X can be customized for any variation of antennas below 17-in-1.

TE Antennas for 5G-IoT

AUTHORIZED DISTRIBUTOR

TE 20+ years of experience in mainly cellular, but also non cellular Antenna development and production enables quick and efficient solutions for cellular and non cellular market:

- **Antennas for wireless servers**
  Base stations, small cells, access points, data collection centres, gateways
- **Antennas for wireless clients**
  IoT across all industries, Automotive, Infotainment, Transportation, Mobile and Asset Tracking, Machine to Machine applications, Smart Cities, -Home, -Industry, Energy, Healthcare
- **TE Antenna implementation service**
  Holistic approach, Innovative, Efficient, Competent, Metaspan® inside

TE Antennas Service Model

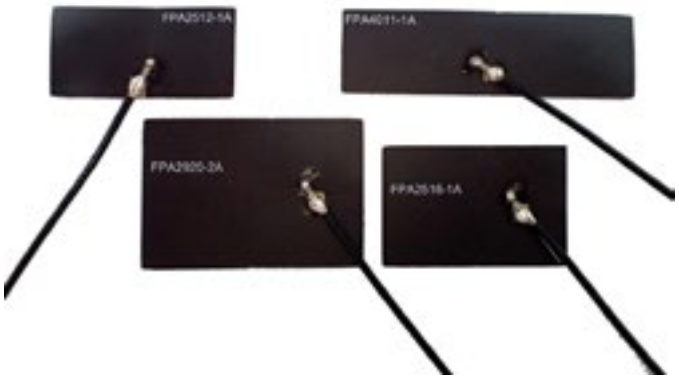
Antenna Design	**System Design**	**OTA Optimization**
RF Engineering	**RF Engineering**	**Benchmarking**
Prototyping	**Quality of Service**	**Throughput Optimization**
Verification	**Verification**	**Maximum Battery life**

Application	Assembly method	P/N	Frequency range	Dimensions	Notes
Device Internal Antennas Cellular					
LTE/allCAT/ 3G/2G; NB-IoT 	Adhesive	2118308-1	698–894 MHz; 1710–2170 MHz; 2496–2700 MHz	110×14×1.3 mm	Cable and Connector customized, Metaspan®
LTE/all CAT/ 3G/2G; NB-IoT 	PCB through hole	2118310-1	698–894 MHz; 1710–2170 MHz; 2496–2700 MHz	74×1.6×11 mm	Metaspan® technology
2G-5G; NB-IoT/ Cat-M; GNSS; Wi-Fi, ISM 	PCB through hole	2195728-1	698 - 2700 MHz	50×1.6×20mm	Metaspan® technology
5G/4G/3G/2G, NB-IoT, Cat-M, GNSS 	PCB SMD	2108784-1	698-960, 1575-1608, 1710-2690, 3300-6000 MHz	38×7.5×3.2mm	5G World Band Antenna
LTE/all CAT/ 3G/2G; NB-IoT 	PCB SMD	2108994-1	698–960 MHz; 1710–2170 MHz; 2300–2700 MHz	40×10×3.2 mm	
Device Internal Antennas non Cellular					
ISM; IoT; IIoT 	PCB SMD	2108991-1	698–960 MHz	18×9×1.6 mm	Flexible GND plane conditions
WLAN Dual Band 	PCB SMD on GND	1513164-1	2.4 Ghz, 5 GHz	d 16×h 6 mm	Best omnidirectional Antenna, Patented Design
WLAN trible band 	Adhesive	2118909-1	2400-2500 and 5150-7125GHz	40×8×1 mm	Wifi 6E band included
WLAN Dual Band 	Adhesive	2344654-2	2,4 GHz, 5 GHz	30×9.5×1 mm	Also availible in FPC
WLAN Dual Band 	Chassis mount	1513472-5	2.4 Ghz, 5 GHz	29×12×10 mm	Cable and Connector customized
Bluetooth; BLE 	PCB SMD	1513797-1	2.4 GHz	9×7×0.8 mm	
GNSS 	PCB SMD	2118900-1	1558-1615 MHz	8×11×0.8 mm	
External Antennas Combo					
2G-5G; NB-IoT/ Cat-M; GNSS 	SMA mount	2195729-1	617-6000MHz	135×20mm	5G, small size, Dipole antenna
MIMO LTE/ GNSS/WLAN 	Panel mount	2332157-4	698–3800 MHz; 1562–1612 MHz; 2.4 Ghz; 5.8 GHz	170×60×50 mm	For options see catalogue
4G/3G/2G/ GNSS/WLAN 	Screw mount on metallic or non metallic ground	920-630-001	698–2690 MHz; 1575–1615 MHz; 2.4 Ghz; 5.8 GHz	124×80×31 mm	For options see catalogue

WiFi 2G/5-7G Flexible PCB Solution – WiFi 6E

Walsin's RFFPA is the best choice for Bluetooth, WiFi and ZigBee applications.

- Frequency Sub 6GHz, WiFi 6 and LTE
- Flexible PCB Antenna – 2400–2500 MHz/5150–7125 MHz
- Flexible enough to be used in a curved housing.
- 2G/5-7G Flexible PCB antenna deliver marked improvements in efficiency and gain across all common frequencies.



LoRa, SigFox, Z-Wave and Zigbee Solution

WALSIN's RGRFA1204 series provide the best choice for design with Smart Grid, Smart City and Smart Factory applications.

- Wide Transmit and Receive Range – 855~885 Mhz/900~930 Mhz
- Small Package – 12 x 4 x 1.6 mm
- Low profile and fully SMD compatible

Customized Antenna Products

WALSIN provides various customized Antenna solutions which cover different market design applications and trends such as UHF, WIFI, Bluetooth, Cellular, GPS, NFC, WPC, Sub-G, etc.

- External Dipole Antenna
- NFC/WPC Antenna
- PCB/Flexible PCB Antenna
- Metal Stamping Antenna
- Antenna Cable Assemble/Connector

Sub-6G Solution

WALSIN's new DPA series support LTE full band and Sub-6G design for Enterprise Small Cells and Residential Femtocells application.

77G Solution

WALSIN has strong design capability and materials to support 77G Automotive Radar Systems application and also for 5G NR standard such as 28G and 38G solutions.

Glossary

2G
Second generation mobile communication. See GSM, will run out → go to LPWA LTE Technologies like NB-IoT, CAT-M1.

3G
Third generation mobile communication. See UMTS.

4G
Fourth generation mobile communication. See LTE.

5G
Fifth generation mobile communication. Uses several frequencies from 600MHz to 6GHz and 24GHz to 40 GHz.

A-MIMO
Is a scheme to enhance the MIMO technology by employing adaptive coding and modulation techniques for the purpose of improving channel capacity, diversity, and robustness of wireless communications. In an adaptive MIMO system, the system parameters are jointly optimised to adapt to the changing channel conditions through link adaptation techniques that can track the time-varying characteristics of the wireless channel. The goal is to maximise the resources available in multiple antenna channels by using optimal schemes at all times.

Angle Diversity
Angle diversity is a technique using multiple antenna beams to receive multipath signals arriving at different angles.

Antenna
A metallic device used in the transmission and reception of electromagnetic waves.

Antenna Diversity
The use of two or more antennas to improve signal quality and the reliability of the wireless connection.

Antenna Power Gain
The ratio of the antenna's maximum radiation intensity in a stated direction to the maximum radiation intensity of a reference antenna (dipole, isotropic antenna) with identical power applied to both.

Attenuation
The loss in power of electromagnetic signals between transmission and reception points.

Bandwidth
A range of consecutive frequencies comprised of a band over which an antenna shall perform without the need of any adjustment.

Beamwidth
The angle of signal coverage provided by an antenna. Beamwidth typically decreases as antenna gain increases.

BeiDou
Chinese operated global navigation satellite system. Transmission frequencies are 1561.098 MHz, 1575.42 MHz, 1207.14 MHz, 1176.45 MHz, 1268.52MHz

BLE
Acronym for Bluetooth Low Energy.

Bluetooth
2.4 GHz Wireless communication standard with frequency hopping.

Cable Loss
A numeric value describing the amount or signal loss from one point on a length of cable to another. This is measured in decibels (dB).

Center Fed
Transmission line connection at the electrical center of an antenna radiator.

Ceramic Antenna
Antenna structure built in or on a ceramic base materials.

Coaxial Cable
Cable consisting of a single copper conductor in the center surrounded by a plastic layer for insulation and a braided metal outer shield. Coax is used to transfer radio frequency energy from the transmitter to the antenna.

dBd
Quantification of the gain for an antenna in comparison with the gain of a dipole.

dBi
The power in dB relative to an isotropic source.

dBm
A measure of power based upon the decibel scale, but referenced to milliWatt, i.e. 1dBm = 0.001 Watt. dBm is often used to describe absolute power level where the point of reference is 1 milliWatt. In high power applications the dBW is often used with a reference of 1 Watt.

dBW
The ratio of the power referenced to one Watt expressed in decibels.

DC Ground
An antenna which is a dead short to a DC current, and has a shunt fed design. To RF it is not seen as a short.

DECT
Digital European cordless telecommunications. Is a communication standard for cordless telephones and digital devices. Uses frequencies from 1786 MHz to 1930 MHz or in 900MHz band and 2.4 GHz.

Dipole
An antenna — usually a half wavelength long — split at the exact center for connection to a feed line.

Directional Antenna
An antenna having the property of radiating or receiving electromagnetic waves more effectively in some directions than others

Directivity
The theoretical characteristic of an antenna to concentrate power in only one direction, whether transmitting or receiving.

Effective Isotropic Radiated Power (EIRP)
Effective Isotropic Radiated Power (EIRP), also known as Equivalent Isotropically Radiated Power, is the amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions and is a theoretical construct) to produce the peak power density observed in the direction of maximum antenna gain. EIRP can take into account the losses in transmission line and connectors and includes the gain of the antenna. The EIRP is often stated in terms of decibels over a reference power level, that would be the power emitted by an isotropic radiator with an equivalent signal strength. The EIRP allows comparisons between different emitters regardless of type, size or form. From the EIRP, and with knowledge of a real antenna's gain, it is possible to calculate real power and field strength values.

Efficiency
The ratio of useful output to input power, determined in antenna systems by losses in the system including losses in nearby objects. This is a decisive factor in achieving high data rates and ranges. It contributes to the efficiency of the overall system, for example the battery life in mobile devices.

Elevated Feed
Raises the radiating element above a roof level.

ERP
Effective Radiated Power.

Field Strength
An absolute measure in one direction of the electromagnetic wave field generated by an antenna at some distance away from the antenna.

Field Tunable
Antennas identified as Field Tunable are shipped with a cutting chart which the installer uses to select a desired operating frequency by tuning the antenna to resonate.

Flex Antenna
Antenna structure on a thin plastic film.

Frequency
The number of cycles per second of a wave.

Front-To-Back Ratio
The ratio of radiated power off the front to the back of a directive antenna.

Gain
Gain is the practical value of the directivity of an antenna.

Galileo
European operated global navigation satellite system. Transmission frequencies are 1575.42 MHz, 1191.795 MHz, 1176.45 MHz, 1207.14 MHz, 1278.75 MHz.

GLONASS
Russian operated global navigation satellite system. Transmission frequencies are 1.246 GHz, 1.602 GHz, 1.600995 GHz, 1.24806 GHz and 1.202025 GHz.

GNSS
General term for global navigation satellite systems.

GPS
Global Positioning System from US. First available satellite-based navigation system. Transmission frequencies are at 1.57542 GHz, 1.2276 GHz, 1.379913 GHz and 1.17645 GHz.

Ground Plane
A conductor placed below an antenna to serve as an earth ground.

GSM (2G)
Global System for Mobile Communications. Legacy system. Uses several frequencies from 380MHz to 1989.9MHz.

Helical Antenna
An antenna with a spiral conductor wound around a cross section. An antenna that has the form of a helix.

High-Gain Antenna
High-gain Antenna is a type of antenna that significantly increases signal strength.

IEEE 802.11
IEEE 802.11 is part of the IEEE 802 set of LAN protocols, especially for implementing wireless local area networks.

Impedance
The Ohmic value of an antenna feed point, matching section or transmission line at radio frequency.

IPEX MHF
Other brand name of U.FL-connectors.

ISM-Band
Frequency band that reserved for industrial, scientific and medical (ISM) purposes other than telecommunications.

Link Budget
Link budget is a calculation involving the gain and loss factors associated with the antennas, transmitters, transmission lines and propagation environment. It is used to determine the maximum distance at which a transmitter and receiver can successfully operate.

Loop Antenna
Antenna consisting of a loop of conductive material.

LoRaWAN
Communication standard for long range communication. Frequencies bands are are 433MHz, 868MHz (EU), 915MHz (US).

LPWA(N)
Low-power wide-area network. Communication standards for long range communication.

LTE (4G)
Long-Term Evolution, telecommunication standard. Uses several frequencies from 600MHz to 3800MHz.

MCX
RF-connector. Often used to connect GPS antennas.

MHF
Other brand name of U.FL-connectors.

MIMO
Multiple Input Multiple Output (MIMO) refers to the use of multiple antennas in a Wi-Fi device to improve performance and throughput. The MIMO technology takes advantage of a characteristic called multipath, which occurs when a radio transmission starts out at point A and then reflects off or passes through surfaces or objects before arriving, via multiple paths, at point B. MIMO technology uses multiple antennas to collect and organise signals arriving via these paths.

MISO
A soup. Or: Multiple Input Single Output (MISO) is a smart antenna technology that uses multiple transmitters and a single receiver on a wireless device to improve the transmission distance. MISO technology can be applied in areas such as Digital TeleVision (DTV), Wireless Local Area Networks (WLANs), Metropolitan Area Networks (MANs), and mobile communications. The implementation of MISO would include multiple antennas at the source or transmitter, and the destination or receiver has only one antenna. The antennas are combined to minimise errors and optimise data speed.

MMCX
Smaller version of the MCX connector.

Monopole
Literally, one pole, such as a vertical radiator operated against the earth or a ground plane. A handheld rubber duck type of antenna will most likely be a monopole.

Multipath Propagation
The result of interference from reflections off surfaces surrounding the antenna. This interference changes the target's return signal strength. Sometimes it is stronger and sometimes weaker than expected. The degree of multipath propagation depends on the type of reflective surface; flat metal, towers and buildings cause the strongest effects.

N
Big size RF-connector. Often used to connect high-power antennas.

NB-IoT
Communication standard for long range communication (LPWA) for small datarates. Uses LTE-Technology.

NFC
Near Field Communication standard, uses 13.56 MHz.

NMO
RF-connector. Typically used for vehicle roof antennas.

Omnidirectional
An antenna providing a 360-degree transmission pattern.

Panel Antenna
Panel Antenna is an antenna type that radiates in only a specific direction. Panel antennas are commonly used for point-to-point situations.

Patch Antenna
A type of radio antenna with a low profile, flat surface. It consists of a flat rectangular sheet or "patch" of metal, mounted over a larger sheet of metal called a ground plane.

PCB Antenna
Antenna structure on a PCB. Stand alone or integrated in the application.

Pentaband Antenna
An antenna that combines 4-band GSM and W-CDMA 2100 to receive and transmit signals in all cellular bands.

PIFA
Planar Inverted F-Antenna: special geometry of an antenna. Often used to achieve a high bandwidth with small size.

Planar Array
An antenna in which all of the elements, both active and parasitic, are in one plane.

Polarization
The sense of the wave radiated by an antenna. Typically horizontal, vertical or circular (left or right hand circularity).

Propagation Channel
Propagation channel is the physical medium electromagnetic wave propagation between the transmit and receive antennas, and includes everything that influences the propagation between the two antennas.

Radiation Pattern
The graphical representation of the relative field strength radiated from an antenna in a given plane, plotted against the angular distance from a given reference.

Relative Antenna Power Gain
The ratio of the average radiation intensity of the test antenna to the average radiation of a reference antenna with all other conditions remaining equal.

RFID
Radio-frequency identification. RF based technology to identify and track tags. Typical frequencies are 120–150 kHz (LF), 13.56 MHz (HF), 433MHz (UHF), 865–868 MHz (UHF), 902–928 MHz (UHF), 2450–5800 MHz (Microwave), 3.1-10GHz (Microwave).

Rubber Ducky
Common term for portable radio antennas consists of an electrically short wire helix.

Shield Effectiveness
A measurement of how well the shielding material (braid, solid tape, etc.) protects the external environment from radiation produced by the central conductor.

SigFox
Communication standard for long range communication. Typical frequencies are 868MHz, 915MHz.

SMA
RF-connector. Very often used to connect external antennas.

SMA-RP
SMA connector with reversed polarity. A female SMA connector housing equipped with a signal (male) pin. Used to comply with specific national regulations, to prevent users from connecting antennas that are not compliant with the regulations.

U.FL
Small RF-connector. Very often used to connect embedded antennas.

UMTS (3G)
Universal Mobile Telecommunications System. Uses several frequencies from 700MHz to 3500MHz.

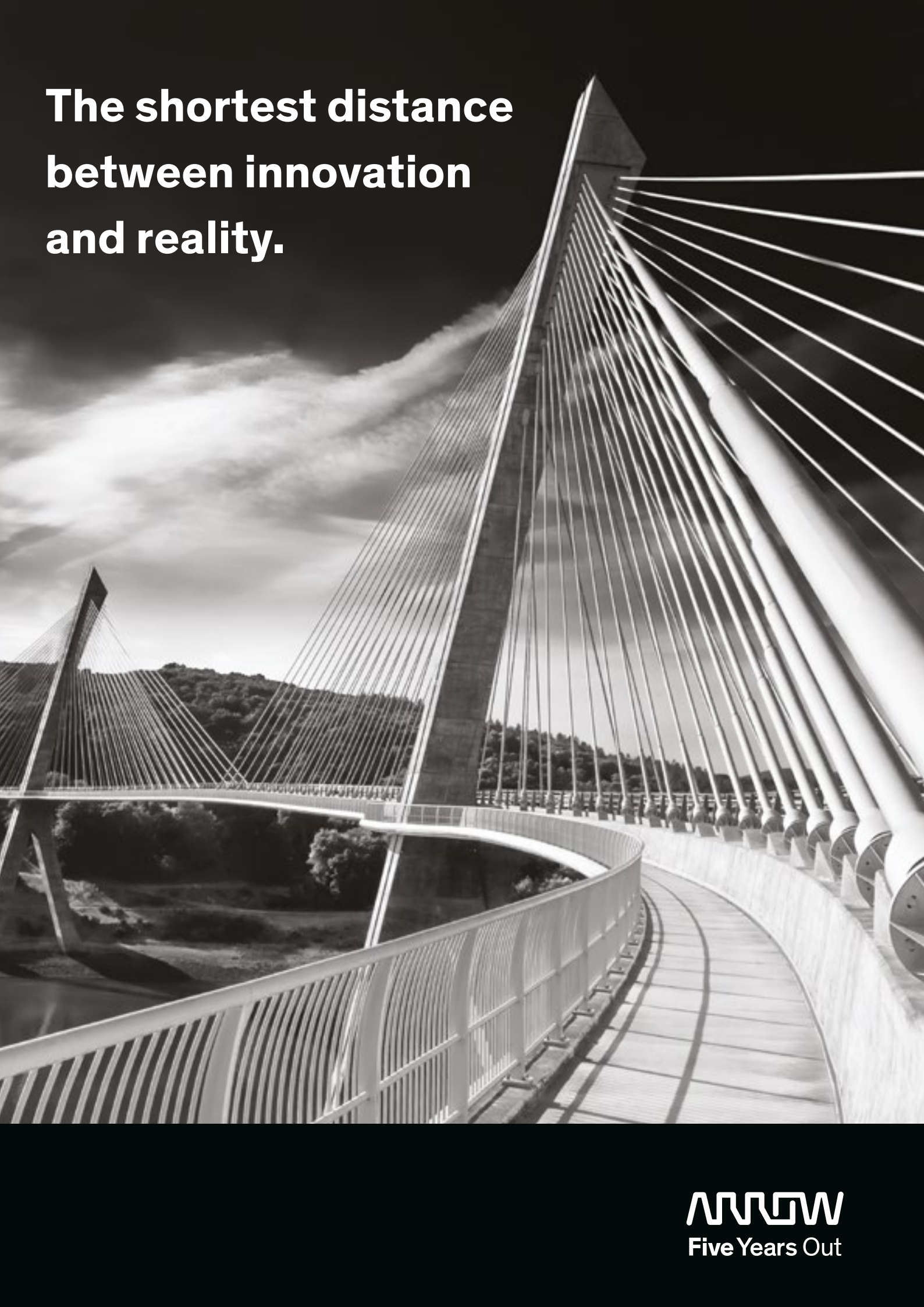
Voltage Standing Wave Ratio
Is the ratio of the maximum to minimum values of voltage in the standing wave pattern appearing along a lossless 50 Ohms transmission line with an antenna as the load.

VSWR
Voltage Standing Wave Ratio.

W.FL
Smaller version of U.FL connector.

Wavelength
Wavelength is the length of one complete wave of an alternating or vibrating phenomenon, generally measured from crest to crest or from trough to trough of successive waves.

WiFi
Common term of ethernet based data communication. Typical frequencies are 2.4 GHz, 5 GHz or 60GHz.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Sensor Guide

Sensors are a critical element in today's electronic systems, and an enabling technology for Internet of Things and Artificial Intelligence solutions. Arrow's portfolio of sensors addresses all market segments and applications, with technologies ranging from environmental, through image and optical sensors to inertial and position sensors. Our internationally recognised and trusted suppliers, value-added services and close co-operation with exclusive partners enable us to bring you the optimal solution for your needs.
Key markets addressed:

- > Automotive
- > Healthcare
- > Retail
- > Smart buildings
- > Industry 4.0
- > Logistics
- > Smart agriculture
- > Aerospace

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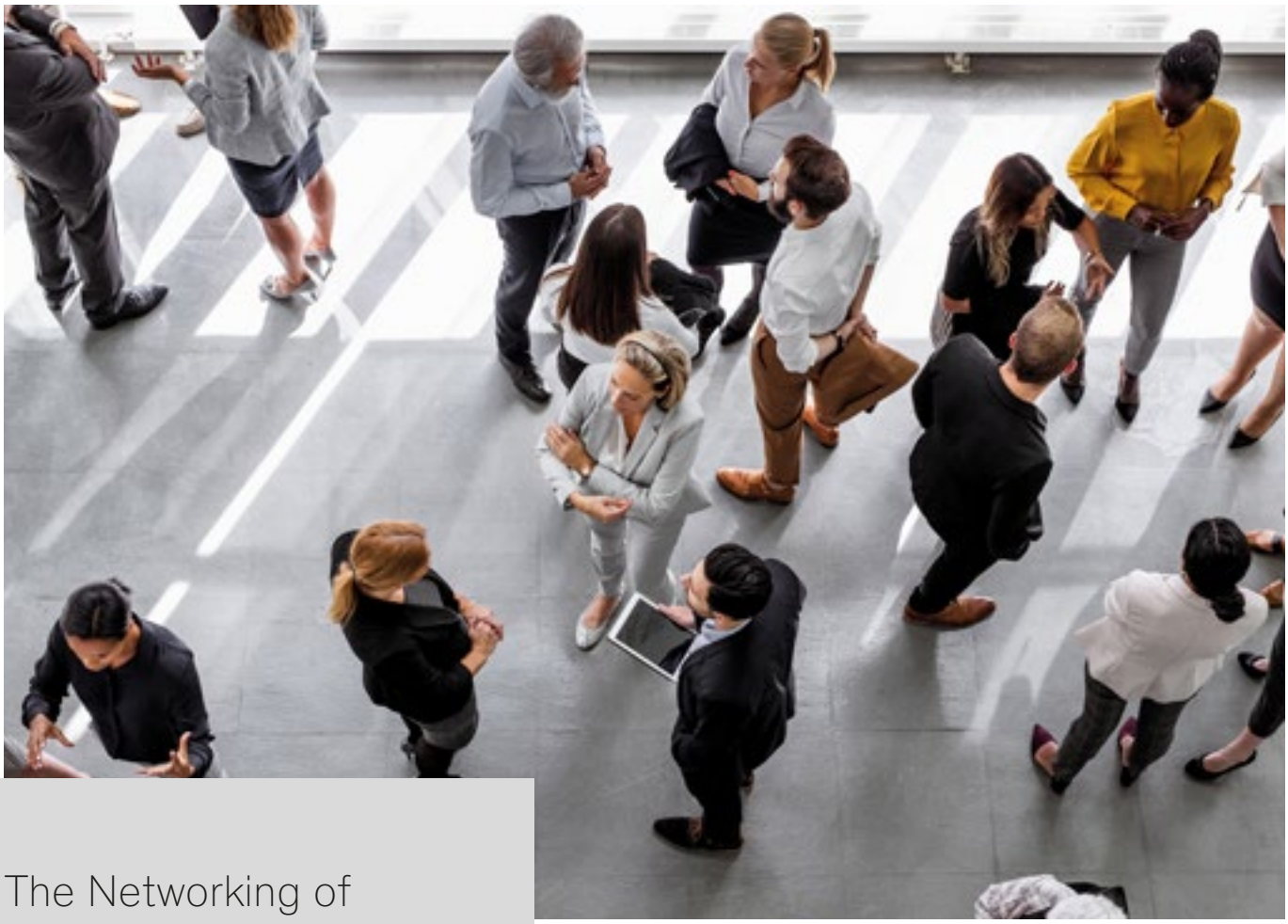

The Networking of all Areas of Life is Progressing at Breathtaking Speed

Design of wireless network devices is becoming more demanding.

A few years ago such networking was limited to a few standard and frequency bands, today we are confronted with multiple different frequencies and countless regulations and standards.

Start your Antenna Design

The first step in designing wireless network application is the antenna. It has to meet a wide range of conditions.

On the one hand, it should provide maximum performance, and on the other hand, it must meet design and commercial requirements.

In addition to these tasks, which can be solved in a more or less manageable time frame, one is faced with the challenge of making one's development conform to national and international regulations.

Start the Design for an Antenna

Questionnaire

1. What wireless standards and frequencies will be used?

☐ Sigfox ☐ LoRa ☐ 4G ☐ 5G ☐ Bluetooth ☐ GPS ☐ NB-IoT ☐ WiFi ☐ GNSS ☐ Other: _____

2. How will you build your design?

- ☐ Discrete RF IC's
- ☐ Pre-certified Modules **with** integrated Antenna
- ☐ Pre-certified Modules **without** integrated Antenna

3. What kind of Antenna does your design require?

- ☐ External antenna
  - which connector: _____
  - cable type/length: _____
- ☐ Outdoor usage

4. Do you have any additional requirements?

- ☐ Antenna dimensions: _____
- ☐ Where will the antenna be placed: _____
- ☐ Distance to the box, metal, water, human body: _____
- ☐ Data rates: _____
- ☐ Max. antenna gain: _____ dBi

5. What is the housing made off?

- ☐ Metal
- ☐ Plastic/Rubber
- ☐ Contains Displays

6. What is your main target market?

- ☐ Consumer
- ☐ Industrial
- ☐ Automotive
- ☐ Medical
- ☐ MIL/Aero

7. What is the use case?

Your application is:

_____

_____

_____

Quantity per year: _____

Lifetime: _____

8. What are the target markets?

- ☐ Europe
- ☐ North America
- ☐ South America (please specify) Region: _____
- ☐ Asia (please specify) Region: _____

Contact Information

Company _____ Name _____

Adress _____ Email _____

Are You Five Years Out?

Most people live in the present. The world of now. But a handful of us work in a unique world that doesn't quite exist yet – the world of Five Years Out.

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Five Years Out

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