

Why You Can't Ignore Category 6A Anymore

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Overview

Category 6A twisted-pair copper solutions received much attention when they first hit the marketplace in 2005, and again when the ANSI/TIA-568-B.2-10 Category 6A standard was published in April of 2008. However, the past decade has witnessed a slow adoption of Category 6A in the enterprise environment, especially in the LAN. Early implementations were relatively expensive due to installation, field testing and power consumption.

But times are changing. Data rates continue to climb and more devices than ever are connected to the network. Emerging applications are demanding the higher performance and faster speeds supported by Category 6A cabling. For these reasons, industry standards that previously only recommended Category 6A cabling for data centers now also recommend it for most LAN installations.

Emerging Applications Now Demand It

We are seeing a greater need for bandwidth-intensive applications that require speeds beyond 1000 Mb/s in today's LAN. Backbone speeds in the data center are migrating to 25, 40 and even 100 Gb/s speeds; horizontal LANs need to keep up or risk being a bottleneck to productivity. The need to quickly transfer larger files, such as medical imaging, high-definition streaming video, high-end graphics and surveillance video are starting to task Category 5e and Category 6 networks running 100BASE-TX and even 1000BASE-T. For example, in the healthcare environment a set of medical images for a single patient totaling 9000 MB takes about a minute to download over a 1000 Mb/s network, but only seven seconds over a 10 Gb/s network. In an emergency situation, the time difference can be critical.

Several emerging applications will either require or optimally perform over Category 6A cabling.



Next-Generation Wi-Fi: The next-generation IEEE 802.11ac wireless standard approved in December 2013 includes Wave 1 and Wave 2 devices. While Wave 1 devices can be supported by Category 6 or high-end



4-Pair PoE: The IEEE 802.3bt task group is currently developing the next-generation Power-over-Ethernet standard (4PPoE) to deliver power more efficiently using all four pairs in a cable. This consumes less power in the cable because the current is divided over all four pairs. It can also deliver higher power levels to devices with a smaller temperature rise inside a cable bundle, avoiding poor transmission performance.



HDBaseT: Introduced in 2010 as specification 1.0, HDBaseT networking technology enables transmitting uncompressed full HD video, audio, Ethernet, control and power up to 100 m over balanced twisted-pair cabling with modular RJ-45 connectors. HDBaseT is uniquely positioned to reduce the cost and complexity of delivering HD video, and will drive adoption of next-generation 4K resolution at roughly four times the resolution of 1080p. In bundled cable

configurations, Category 5e UTP cables can only support HDBaseT for distances of up to 10 m; Category 6 UTP can only support HDBaseT to 40 m. To achieve the full 100 m distance benefit over UTP, Category 6A UTP is required. The HDBaseT specification 2.0 released in 2013 also enables up to 100W of power delivery over 4-pair cables for powering HDTVs and displays at distances up to 100 m. The application has the same aforementioned 4PPoE temperature rise considerations. Both

HDBaseT 1.0 and 2.0 specifications were recently approved by the IEEE to eventually become IEEE 1911.1 and IEEE 1911.2.

In addition, IP convergence is taking hold in the enterprise, with everything from security and life-safety systems to lighting and building automation systems connecting to the network. Category 6A has the performance to transmit the increased amount of information for these systems.

More Standards Recommend It

In response to new emerging applications and growing bandwidth-intensive applications, industry standards are now recommending Category 6A cabling for all new installations.



Data Center: The ANSI/TIA-942-A Telecommunications Infrastructure Standard for Data Centers recommends Category 6A to support 10GBASE-T applications.



Healthcare: The ANSI/TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard recommends that any new cabling infrastructure at a healthcare facility be designed with Category 6A cabling.



Education: The ANSI/TIA-4496 Telecommunications Infrastructure Standard for Educational Facilities also recommends Category 6A for any new installation.



Commercial Buildings: TIA is in the process of creating its fourth revision of ANSI/TIA-568 cabling standards for commercial buildings. The current draft standard of what will eventually be ANSI/TIA-568.0-D also recommends that Category 6A cabling may be required to support a wide range of applications. It is highly likely that this recommendation will remain between now and the publishing of the standard, expected in 2016.

3 Reasons for Non-Adoption That Are No Longer Valid



Physical: The first Category 6A cables were up to 50 percent larger than their Category 6 predecessors, but newer small-diameter Category 6A cables are only about 15% larger. This eliminates added size and weight, which impacts how many cables can fit into a cable tray or conduit. Reduced bend radius also improves ease of installation, termination, and handling. These improvements make Category 6A a viable, cost-effective cable option – especially in retrofit installations.



Application: Applications in the horizontal LAN haven't typically required speeds beyond 1000 Mb/s (or even 100 Mb/s). Many believed that 10 Gb/s speeds wouldn't be needed in the LAN over the life of Category 6 cable. But times have changed and now there is an increasing demand for 10GBASE-T in both the LAN and data center markets. As shown in Figure 1, the growth of 10GBASE-T is largely because of the need to support fiber backbone speeds beyond 10 Gb/s, large hyperscale computing environments (25 gigabit, 40 gigabit or 100 gigabit speeds), and enterprise

data centers deploying 10GBASE-T for switch-to-server connections. Category 6A cable supports 10GBASE-T up to 100m, and operates at frequencies of up to 500 MHz – twice that of Category 6.



Financial: Installers previously had to budget more time and money to test for the new parameters, including alien attenuation crosstalk ratio far-end (AACRF), alien near-end crosstalk (ANEXT) and power sum alien crosstalk parameters (i.e., PSAACRF and PSANEXT). Today however, many of the Category 6A cost obstacles have been offset or eliminated thanks to manufacturing advancements and improvements in 10GBASE-T physical layer device (PHYs) design. Dramatic improvements to 10GBASE-T active equipment have also decreased cost and power consumption per port (1.5 to 3 Watts per port vs. 12 Watts per port for first-generation 10GBASE-T PHYs). In fact, today's fourth generation 10GBASE-T provides a much lower price per gigabit (less than 30%) than 1000BASE-T at a power level that is quite acceptable.

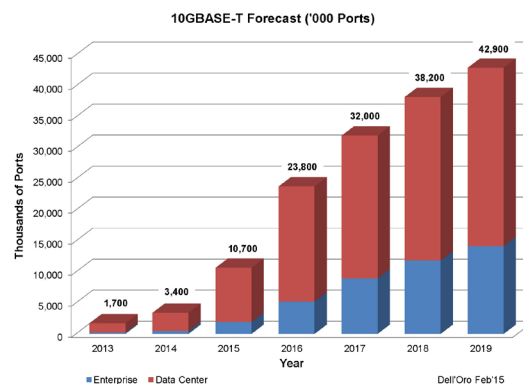


Figure 1: 10GBASE-T will continue to grow in both the enterprise and data center space.

7 Things to Look For When Choosing the Right Category 6A Cable

1 Size and Weight: Controlling noise and crosstalk at higher frequencies has required Category 6A cables up to 50% larger than their Category 6 predecessors. While many available Category 6A options remain significantly larger and heavier, the newest Category 6A cables are only about 15% larger than Category 6.

2 Bend Radius: The cable is easier to route and install. It also allows cable routing for maximum airflow within racks.

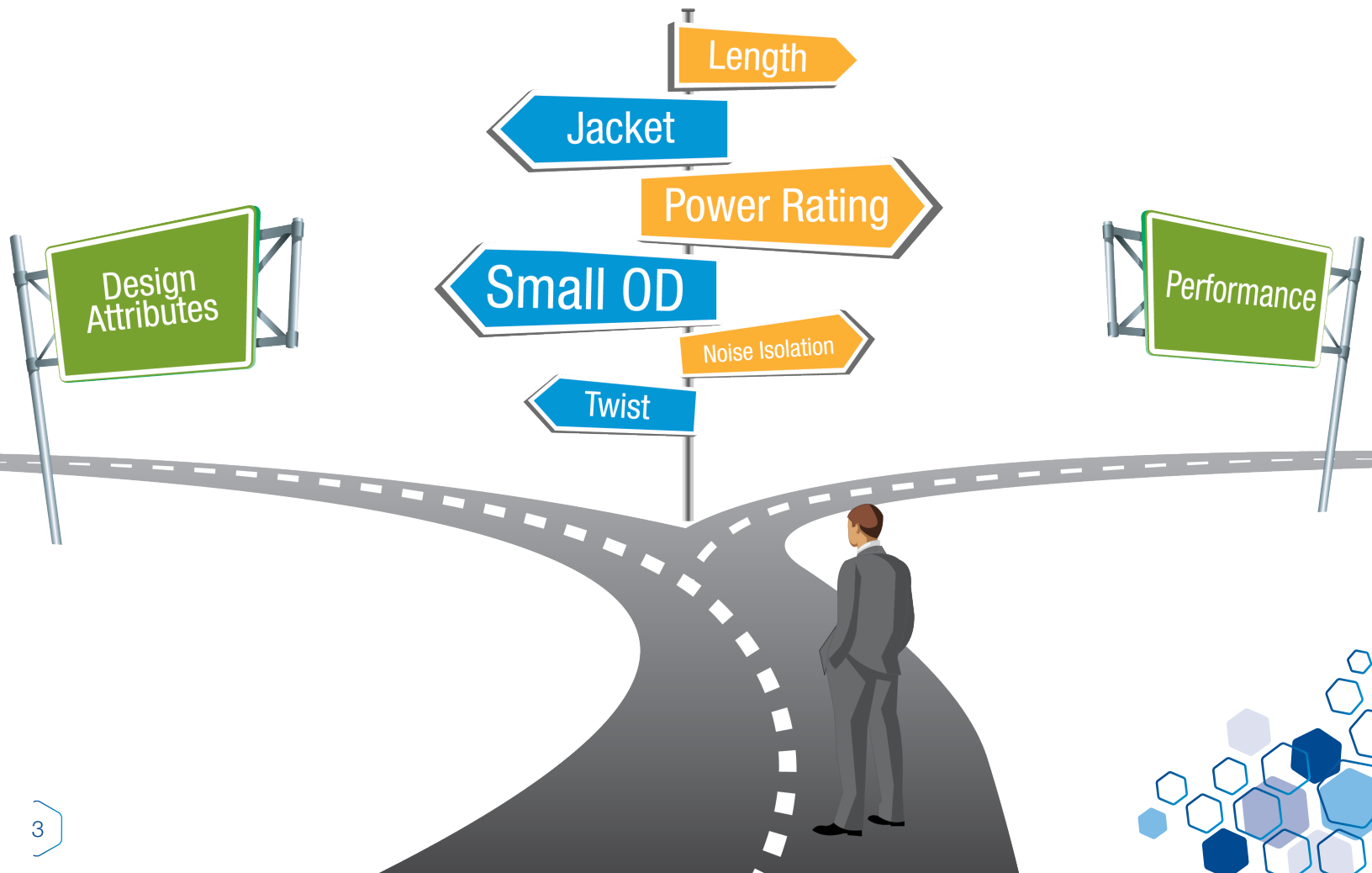
3 Installation Complexity: Most Category 6A cables are larger because of their material: more twists in the copper pairs, larger splines separating the pairs, and thicker outer jackets. This adds up to cables that take longer to prepare and terminate. Smaller and more round cables take less time to install.

4 Power Delivery: In a conventionally designed cable, the spline and jacket surrounding each copper pair create an insulated compartment that is prone to over heating when delivered PoE. Newer thermal-dissipation designs distribute heat around the circumference of the cable, eliminating hotspots. Some are capable of delivering up to 100W PoE while keeping thermal rise within acceptable limits.

5 Channel Length: Some small-diameter Category 6A cables may not support the full 100 m distance per channel, and need to be de-rated to less than full length. A cable that can handle the full 100 m not only provides an extra margin of performance, but supports full length LAN channels and a wider range of data center configurations, including top-of-rack, end-of-row and middle-of-row configurations.

6 Ground Loops: When a shielded cable is terminated at both ends to a local ground and a remote ground, the ground potential difference can cause stray currents to flow in the shield and couple noise into the conductors, interfering with signals and causing transmission errors.

7 EMI Shielding: There is no doubt that a shielded cable provides better noise immunity when grounded at both ends with a low impedance ground connection at high frequencies. The effectiveness of the shield depends on the quality and reliability of the shield termination and the quality of the local and remote ground connections. Sometimes a low impedance ground connection is difficult to achieve. Cable designs that symmetrically surround well balanced twisted pairs with a Faraday cage can provide an effective electromagnetic barrier without the need and potential drawbacks of grounding.



Belden 10GXS High-Performance, Small-Diameter Category 6A Cables

Belden's advanced engineering expertise and precision manufacturing have resulted in yet another innovation—10GXS Cables.

With an effective diameter of just 0.265" (6.7 mm), enhanced flexibility and proven performance that exceeds Category 6A requirements for 100 m channels, Belden 10GXS Cables are ideal for LANs and enterprise data centers that require high-density and high-bandwidth connections for current and emerging network applications, including 10GBASE-T, 2.5/5GBASE-T, 4PPoE, IEEE 802.11ac Wave 1 and Wave 2 Wi-Fi, HDBaseT 2.0 (future IEEE 1192.2) and more.

The uniform heat dissipation and improved heat transfer of 10GXS Cables offers a 25% decrease in temperature rise for both 2-pair PoE Plus and 4-pair PoE applications compared with conventional Category 6A UTP cable designs.

A low level of alien crosstalk is one of the most important parameters to support 10GBASE-T applications in both LAN and enterprise data center applications.

10GXS provides a minimum 8 dB margin for PSANEXT and 10 dB margin for PSAACRF above the TIA 568-C.2 standard. (See Figure 2 and Figure 3)

10GXS Cable also reduces electromagnetic interference (EMI) found in noisy environments, and provides additional performance margin for internal parameters, such as insertion loss, PSNEXT and PSACRF. The 10GXS Cables' enabling technologies are combined with Belden's existing patented connector technologies, including Matrix IDC, FlexPoint PCB and X-Bar, to further optimize system performance.

With the smallest diameter and best mechanical and electrical characteristics in the industry, 10GXS Cables offer improved space and weight savings with beyond-standards performance to meet all current and emerging applications.

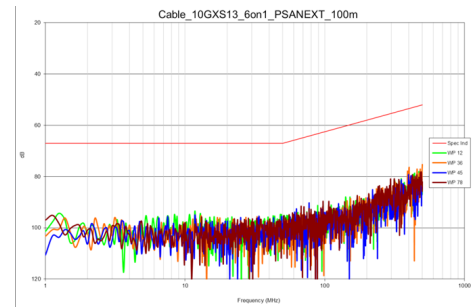


Figure 2: PSANEXT on a 100 m "six-around-one" 10GXS bundled cable configuration

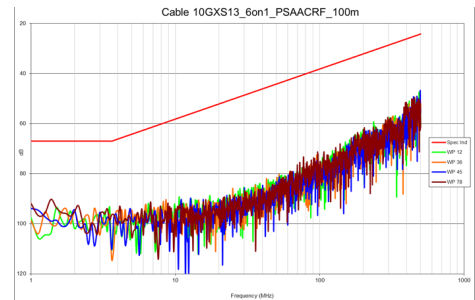
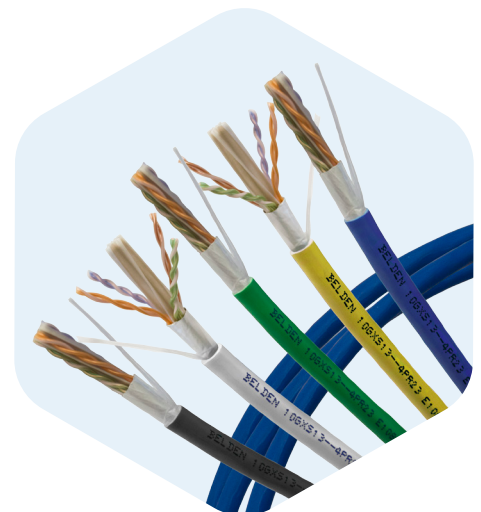
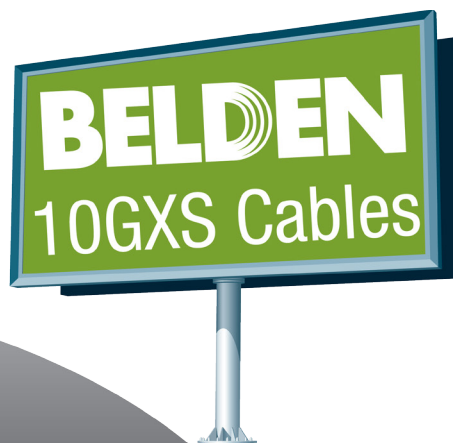


Figure 3: PSAACRF on a 100 m "six-around-one" 10GXS bundled cable configuration

Belden 10GXS Cables
Where Design and Performance Come Together

For more information on 10GXS Cables call **1.800.BELDEN.1** (1.800.235.3361) or visit our web site at info.belden.com/10GXS.



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