

Introduction

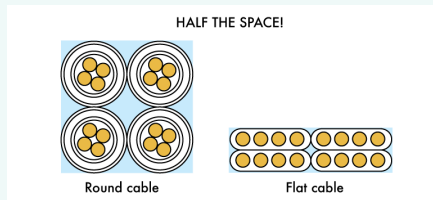
Electrical engineers regularly turn to ubiquitous round-profile cables and wires. They are common and what they know. Flat cables began development in the late 1950s to address the more demanding requirements arising in aerospace applications. Engineers looking for an edge to improve product performance, reliability, packaging, and manufacturing can benefit by adopting a wider use of flat cable.

Source: <https://www.machinedesign.com/cables-connectors-enclosures/advantages-flat-cables>

1. Reliability

The simplicity of flat cable with its parallel conductor geometry eliminates many of the sources of wiring errors and malfunctions. Conductors are registered one to one with the terminating connector or board so proper contact assignment is almost automatic.

2. Space



Electronics packaging continues to increase density. By nature of its shape, flat cable occupies roughly half the space of comparable round cable.

3. Weight Reduction

In addition to the reduction of unnecessary insulating, fillers and tapes, the composite flat-cable construction is so mechanically strong that it is not necessary to have large conductors for strength. The copper cross-section can thus be reduced to what's required to carry the current load or to satisfy voltage-drop requirements.

4. Consistent Electrical Characteristics

Because the conductor spacing is fixed and the geometry of the cable is constant, the electrical characteristics, such as impedance, capacitance, inductance, time delay, crosstalk, and attenuation are consistent.

5. Greater Current Carrying Capacity

Flat cables have greater surface-to-volume ratio than their round cable counterparts, consequently having higher efficiency in dissipating heat. This allows a higher current level for a given temperature rise and conductor cross-section.

6. Flexibility

Flexibility is a key for any application involving motion, such as robotics, axis-control manufacturing equipment, automated medical diagnostic equipment. Because conductors are aligned parallel in a flat plane, the bend radius of flat cable is a fraction of common round cables. Under repeated bending cycles, conductors in round cable can kink or "corkscrew" causing failure and reducing cycle life. Flat cable can provide 15-million flex-cycle life. For applications with small bend radii and heavy flex cycling occurs, flat cable can provide a better solution..

7. Reduced Skewing Effects

Due to the conductors having the exact physical and electrical length, along with a continuous and consistent dielectric, time delays between signals within a given flat cable are minimized.

8. High Density Connections

Flat cable has a high wire-to-cable cross-sectional density. So layers of flat cable pack more efficiently and provide higher conductor density than round cables.

9. Greater Strength

Flat cables have high strength because all conductors and insulators equally share tensile loads.

10. Organization and Handling

Flat cable has the ability to reduce the number of separate conductors that must be managed. Disparate conductor types, such as twisted pairs, single conductors, coax, shielded and non-shielded types—for power and signal—can be combined into a single flat cable.

A single flat cable containing a variety of conductor types can simplify design, assembly, and maintenance.

These benefits are inherent in flat cable and mostly unknown to the average design engineer. Flat cable is not always called for, but flat cable is more than just conductors in a different form factor. They provide a set of attributes that can solve many design challenges.