Specifications: Ferrites

Ferrite Cores are available in numerous and Several permeabilities. Their permeability range is from 20 to more than 15,000. They very useful for resonant circuit applications as well as wideband transformers and they are also commonly used for RFI attenuation. We can supply sizes from 0.23 inches to 2.4 inches in outer diameter directly from stock.

Ferrite toroidal cores are well suited for a variety of RF circuit applications and their relatively high perneability factors make them especially useful for high inductance values with a minimum number of turns, resulting in smaller component size.

There are two basic ferrite material groups: Those having a permeability range from 20 μi to 800 μi are of the Nickel Zinc class, and those having permeabilities above 800 pi are usually Manganese Zinc Class.

The Nickel Zinc ferrite cores exhibit volume resistivity, moderate temperature stability and high 'Q' factors for the 500 KHz 100 MHz frequency range. They are well suited for low power, high inductance resonant circuits. Their low permeability factors make them useful for wideband transformer applications as well.

The Manganese Zinc ferrites, having permeabilities above 800 μi, have fairly low volume resistivity and moderate saturation flux density. They can offer high 'Q' factors for the 1 KHz to 1 MHz frequency range. Cores from this group of materials are widely sed for switched mode power conversion transformers operating in the 20 KHz to 100 KHz frequency rnge. The cores are also very useful for the attenuation unwanted RF noise signals in the frequency range of 20 MHz to 400 MHz and above.

To improve voltage breakdown, coatings of ferrite cores are available for the F, J, W and H materials. Typical coatings are parylene C, Gray Coating and Black Lacquer. Paralene C coating has a thickness of 0. mils to 2 mils with a voltage breakdown of 75OV. Gray coating has a thickness of 4 mils to 8 mils wit voltage breakdown of 500V. Black Lacquer coating has a thickness of 0.5 mils to 2 mils with no increase in voltage breakdown.

A list of Ferrite toroids, including physical dimensions, A_L values, and magnetic properties can be found below. Use the given A_L value and the equation below to calculate a turn count for a specific inductance.

Material 33 (μi = 850):
A manganese-zinc material having low volume resistivity. Used for low frequency antennas in the 1 KHz to 1 MHz frequency range. Available in rod form only.

Material 43 (μi = 850)
High volume resistivity. For medium frequency inductors and wideband transformers up to 50 MHz. Optimum frequency attenuation from 40 MHz to 400 MHz. Available in toroidal cores, shield beads, multi-aperture cores and special shapes for RFI suppression.

Material 61 (μi = 125):
Offers moderate temperature stability and high 'Q' for frequencies 0.2 MHz to 15. MHz. Useful for wideband transformers to 200 MHz and frequency attenuation above 200 MHz. Available in toroids, rods, bobbins and multi-aperture cores.

Material 63 (μi = 40):
For high 'Q' inductors in the 15 MHz to 25 MHz frequency range. Available in toroidal form only.

Material 64 (μi = 250):
Primarily a bead material having high volume resistivity. Excellent temperature stability and very good shielding properties above 400 MHz.

Material 67 (μi = 40):
Similar to the 63 material. Has greater saturation flux density and very good temperature stability. For high 'Q' inductors, (10 MHz to 80 Mhz). Wideband transformers to 200 MHz. Toroids only.

Material 68 (μi = 20):
High volume resistivity and excellent temperature stability. For high Q' resonant circuits 80 MHz to 180 MHz. For high frequency inductors. Toroids only.

Material 73 (μi = 2500):
Primarily a ferrite bead material. Has good attenuation properties from 1 MHz through 50 MHz. Available in beads and some broadband multi-aperture cores.

Material 77 (μi = 2000):
Has high saturation flux density at high temperature. Low core loss in the 1 KHz to 1 MHz range. For low level power conversion and wideband transformers. Extensively used for frequency attenuation from 0.5 MHz to 50 MHz. Available in toroids, pot cores, E-cores, beads, broadband balun cores and sleeves. An upgrade of the former 72 material. The 72 material is still available in some sizes, but the 77 material should be used in all new design.

Material 'F' (μi = 3000):
High saturation flux density at high temperature. For power conversion transformers. Good frequency attenuation 0.5 MHz to 50 MHz. Toroids only.

Material 'J'/75 (μi = 5000):
Low volume resistivity and low core loss from 1 KHz to 1 MHz. Used for pulse transformers and low level wideband transformers. Excellent frequency attenuation from 0.5 MHz to 20 MHz. Available in toroidal form and ferrite beads as standard off the shelf in stock. Also available in pot cores, RM cores, E & U cores as custom ordered parts with lead time for delivery.

Material K (μi = 290):
Used primarily in transmission line transformers from 1.0 MHz to 50 MHz range. Available from stock in a few sizes in toroidal form only.

Material W (μi = 10,000)
High permeability material used for frequency attenuation from 100 KHz to 1 MHz in EMI/RFI filters. Also used in broadband transformers. Available in toroidal form from stock. As custom ordered parts for pot cores, EP cores, RM cores.

Material H (μi = 15,000):
High permeability material used for frequency attenuation under 200 KHz. Also used in broadband transformers. Available in toroidal form only.

All items in listed above are standard stock items and usually can be shipped immediately. Call for availability of non-stock items.

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Specifications: Magnetic Materials

Magnetic materials are used in applications such as power supply transformers, audio transformers, AC and RF filter inductors, broadband and narrow band transformers, damping network, EMI/RFI suppressors, etc. The basic characteristic of magnetic materials is the permeability (μ). It is a measure of how superior a specific material is than air as a path for magnetic line of force. Air has a μ of 1. Another characteristic of magnetic material is saturation. It is the maximum value of magnetic induction at a specified field strength. When a material saturates, it losses its linearity. Magnetic materials are available in many different types and sizes.

IRON POWDER CORES

These cores are composed of finely defined particles of iron which are insulated from each other but bound together with a binding compound. The iron powder and binding compound are mixed and compressed under heavy pressure, and baked at high temperature. The characteristics of the cores are determined by the size and density of the core, and the property of the iron powder. Powdered iron cores do not saturate easily, and have high core temperature stability and Q. However, it is only in low permeability (below $\mu_i = 75$). The high temperature stability makes it suitable for applications such as narrow band filter inductors, tuned transformers, oscillators and tank circuits.

FERRITES

Ferrites are ceramics materials that can be magnetized to a high degree. The basic component is iron oxide combined with binder compounds such as nickel, manganese, zinc or magnesium. Two major categories of ferrites are manganese zinc (MnZn), and nickel zinc (NiZn). Ferrites are manufactured by homogeneously mixing the iron oxide with the binder, and calcinated (heating mixture to 1000°c). This causes partial decomposition of the carbonates and oxides. The mixtures are dry pressed into a core configuration, and finally sintered. This is done by gradually raising the temperature up to 1500°C in a kiln. Typically the cores will shrink by 10 to 20% of its original size after sintering. Ferrites can be manufactured to permeability of over 15, 000 with little

eddy current losses. However, the high permeability of the ferrite makes it unstable at high temperatures, and saturates easily. It is suitable for applications such as DC to DC converters, magnetics amplifiers, etc. It must be noted that driving ferrites with excessive current may cause permanent damage to the core.

Ferrites are widely used as attenuators of unwanted high frequency signals. These ferrites are known as EMI/RFI suppressors. They are typically available as beads, split cores, flat ribbon core and toroidal cores. Ferrite tiles are also available for use in anechoic chambers.

Another application of ferrites are in transformers, inverters and inductors in the 5KHz to 100 KHz range. It is cheaper than tape wound cores and are used in applications where high flux density and high temperature stability are not critical.

Typical applications:

- Inverter power supplies: 5KHz to 500 KHz, and under 50 watts at 10 KHz. For high power application, use tape wound core as saturating core and ferrite core as output transformers.
- Fly back transformers
- High frequency power supplies (1 Kw)

Ferrite cores can be gapped to avoid saturation under DC bias conditions.

LAMINATED OR TAPE WOUND CORES
These cores are manufactured by using different steel grades with different widths and thickness, wound in circular manner. Tape wound cores have very high permeability and are used primarily in power transformers, reactors in 60 Hz to 400 Hz, DC to DC converters, and current transformers. It provides very high flux densities and good temperature stabilities. It is also the most costly core to manufacture.

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