CHARACTER OF IRON POWDER CORES:

SYMBOL AND FORMULA

\[
\begin{align*}
A_e &= \frac{OD-ID}{2} \times Ht \\
L_e &= \frac{OD+ID}{2} \times \pi \\
L &= \frac{4\pi \mu \varepsilon A_e}{L_e} \times N^2 \\
N &= \sqrt{\frac{L}{A_L}} \\
A_L &= \frac{L}{N^2}
\end{align*}
\]

- \(A_e\) – Core cross section area (cm²)
- \(L_e\) – Effective magnetic path length (cm)
- \(N\) – Winding turns
- \(A_L\) – Inductance rated value (nH/N²) of one core, during frequency 10KHz and AC flux density 10 gauss (1mT)
- \(L\) – Inductance
- \(\mu\) – Effective Permeability
- \(\pi\) – 3.14
IRON POWDER CORES SERIES PRODUCTS

Property contrast
Sendust Core, MPP Core, High Flux Core

CHARACTER OF IRON POWDER CORES:

1. High saturated magnetic induction strength, it may work in large current, without saturation.
2. Stable and reliable properties, effective permeability has excellent frequency property.
3. Having good temperature property, apply to -65°C to +125°C temperature range.
4. Toroidal structure has minimum electromagnetic radiation, save shielded materials and reduce the requirement for shield work.
5. Iron powder cores have outstanding restrained and absorbed ability for noise. Its property is more than that of metal lamination and Ferrite core.

In light-adjusting circuit, adopt iron powder cores to restrict the climbing rate after set up an electric circuit and gain more ideal current rising curve, effectively remove harmful wave than metal lamination core (90°conducting angle).

In many using situation, to prevent magnetic saturation, it opens up a air-gap in Ferrite core and lamination core (Si–Fe, Ni–Fe ) magnetic path to use "cut-open effect", but it will cause additional loss and electromagnetic radiation in partial air-gap. Seeing that switch frequency to develop high frequency, strengthening sensitivity of circuit, that is not to be ignored. Using iron powder cores can avoid or greatly reduce this side effect and noise.
**Character of Iron Powder Cores:**

<table>
<thead>
<tr>
<th>Cores</th>
<th>Features</th>
<th>Applications</th>
</tr>
</thead>
</table>
| Iron Powder Cores  | • High Maximum Flux Density  
                     • Low Cost  
                     • Large Energy Storage Capacity                                           | • Output Chokes for Switching Power Supplies  
                     • Conducted EMI Noise Filters  
                     • Pulse Transformers  
                     • DC Output/Input Filters  
                     • Light Dimmer Chokes (PFC)  
                     • Power Factor Correction Inductors  
                     • Continuous-mode Fly-back Inductors                                     |
| Sendust Cores      | • Core Losses Significantly Lower than Iron Powder Cores  
                     • Good DC-Bias Characteristics  
                     • Cost between Powder Iron and MPP                                       | • Switching Regulator Inductors  
                     • In-line Noise Filters  
                     • Pulse Transformers, Fly-back Transformers  
                     • PFC Chokes                                                               |
| MPP Cores          | • High Resistivity  
                     • Low Hysteresis and Eddy Current Losses  
                     • Excellent Inductance Stability under High DC-Bias Condition  
                     • Good Temperature Stability                                               | • Inductors for High Q  
                     • Low Loss Filter Circuits  
                     • Loading Coils  
                     • Transformers, Chokes and Inductors  
                     • Out-put Filter  
                     • Storage Chokes                                                          |
| High Flux Cores     | • Excellent DC-Bias Characteristics  
                     • High Bmax of 15000 Gauss Compared to MPP or Ferrites  
                     • Core Losses Significantly Lower than Iron Cores  
                     • Large Energy Storage Capacity                                           | • In-line Noise Filters  
                     • Switching Regulator Inductors  
                     • Pulse transformers, Fly-back Transformers  
                     • PFC Chokes  
                     • Out-put Filter  
                     • Storage Chokes                                                          |
# Toroidal Cores

## MATERIAL PROPERTIES

<table>
<thead>
<tr>
<th>Material Mix number</th>
<th>Reference Permeability ($\mu_e$)</th>
<th>(+PPm/°C) Temp. Coef. of Perm</th>
<th>Permeability With DC Bias HDC=50 Oersteds @10kHz</th>
<th>Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(%) $\mu_0$</td>
<td>$\mu_{\text{effective}}$</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>20</td>
<td>280</td>
<td></td>
<td>Blue/Cyan</td>
</tr>
<tr>
<td>-2</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>Red/Gray</td>
</tr>
<tr>
<td>-2/93</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>Gray/Red</td>
</tr>
<tr>
<td>-3</td>
<td>35</td>
<td>370</td>
<td></td>
<td>Gray/Cyan</td>
</tr>
<tr>
<td>-6</td>
<td>8.5</td>
<td>35</td>
<td></td>
<td>Yellow/Cyan</td>
</tr>
<tr>
<td>-7</td>
<td>9.0</td>
<td>30</td>
<td></td>
<td>White/Cyan</td>
</tr>
<tr>
<td>-8</td>
<td>35</td>
<td>300</td>
<td>91</td>
<td>Yellow/Red</td>
</tr>
<tr>
<td>-8/93</td>
<td>35</td>
<td>300</td>
<td>91</td>
<td>Red/Yellow</td>
</tr>
<tr>
<td>-10</td>
<td>6.0</td>
<td>150</td>
<td></td>
<td>Black/Cyan</td>
</tr>
<tr>
<td>-15</td>
<td>25</td>
<td>190</td>
<td></td>
<td>Red/White</td>
</tr>
<tr>
<td>-18</td>
<td>55</td>
<td>385</td>
<td>74</td>
<td>Green/Red</td>
</tr>
<tr>
<td>-26</td>
<td>75</td>
<td>825</td>
<td>51</td>
<td>Yellow/White</td>
</tr>
<tr>
<td>-28</td>
<td>22</td>
<td>510</td>
<td>91</td>
<td>Gray/Green</td>
</tr>
<tr>
<td>-30</td>
<td>22</td>
<td>510</td>
<td>91</td>
<td>Green/Gray</td>
</tr>
<tr>
<td>-33</td>
<td>33</td>
<td>665</td>
<td>84</td>
<td>Gray/Yellow</td>
</tr>
<tr>
<td>-34</td>
<td>33</td>
<td>565</td>
<td>84</td>
<td>Gray/Blue</td>
</tr>
<tr>
<td>-35</td>
<td>33</td>
<td>665</td>
<td>84</td>
<td>Yellow/Gray</td>
</tr>
<tr>
<td>-38</td>
<td>85</td>
<td>955</td>
<td>51</td>
<td>Gray/Black</td>
</tr>
<tr>
<td>-40</td>
<td>60</td>
<td>950</td>
<td>62</td>
<td>Green/Yellow</td>
</tr>
<tr>
<td>-45</td>
<td>100</td>
<td>1040</td>
<td>46</td>
<td>Black/Black</td>
</tr>
<tr>
<td>-52</td>
<td>75</td>
<td>650</td>
<td>59</td>
<td>Green/Blue</td>
</tr>
<tr>
<td>MPP</td>
<td>14, 26, 60, 90, 125</td>
<td>60</td>
<td></td>
<td>Gray</td>
</tr>
<tr>
<td>HI-FLUX</td>
<td>14, 26, 60, 125</td>
<td>140</td>
<td></td>
<td>Blue</td>
</tr>
<tr>
<td>SENDUST</td>
<td>14, 26, 60, 75, 90, 125</td>
<td>400</td>
<td></td>
<td>Black</td>
</tr>
<tr>
<td>AMORPHOUS</td>
<td>26, 60, 75, 90</td>
<td>180</td>
<td></td>
<td>Blue</td>
</tr>
</tbody>
</table>
Iron Powder Cores are fitted for temperature range from -65°C to +125°C. When cores are placed in higher temperature over 150°C, it will make inductance and quality factor (Q) to perpetually decrease. Change in this character is depended on time, temperature, core size, frequency and flux density etc.

The cores are manufactured to the AL values listed; the permeability for each material is for reference only. In all cases, the AL values are based on a peak AC flux density of gauss (1mT) at a frequency of 10kHz.

Typical tolerance of magnetic character curve is ±10%, that of core loss curve is ±15%.

The toroidal cores are tested with a even separated single-layer winding in order to minimize leakage effects.

Toroidal iron powder cores, manufactured by this company, is well finished with protecting paint. The minimum dielectric strength of coating is 600Vrms under 50Hz. The dielectric strength also may be increased according to the needs of customer. The surface of E-shaped and I-shaped cores are treated with antirust material. We suggest the user to carefully store the untreated products to avoid moist and rain.

Except for the listed size in this manual, we can manufacture special products to meet the needs of customers. The listed materials in this manual can be made cores with different height, but not increase model tool. If you have any special requirements, please contact with this company.

Our normal packing box weight is 15 to 20kg/box.
CHARACTER OF IRON POWDER CORES:

B-H CURVES

Iron Powder Cores Series Products

Character of Iron Powder Cores:

B-H Curves

Core Loss vs Time

Core Loss (W) vs Time (Hours)

T106-52 80KHz 67G 150C

T106-26 80KHz 30G 100C
IRON POWDER CORES SERIES PRODUCTS

Magnetic Characteristics

CHARACTER OF IRON POWDER CORES:

Initial Permeability VS DC Magnetizing Force

Percent Initial Permeability VS DC Magnetizing Force
Magnetic Characteristics

**CHARACTER OF IRON POWDER CORES:**

### Effective Permeability VS Frequency

![Graph showing effective permeability vs frequency](image)

### Percent Initial Permeability VS Peak AC Flux Density

![Graph showing percent initial permeability vs peak AC flux density](image)
Magnetic Characteristics

CHARACTER OF IRON POWDER CORES:

![Graph showing magnetic characteristics of iron powder cores]

- 18 Material: $\mu = 55$
- Core Loss vs Peak AC Flux Density

- 26 Material: $\mu = 75$
- Core Loss vs Peak AC Flux Density

[Graphs showing core loss versus peak AC flux density for different materials and frequencies]
IRON POWDER CORES SERIES PRODUCTS

Magnetic Characteristics

CHARACTER OF IRON POWDER CORES:
Magnetic Characteristics

**CHARACTER OF IRON POWDER CORES:**

-28 Material $\mu = 22$
-33 Material $\mu = 33$

Core Loss $\triangle$ Peak AC Flux Density

---

**IRON POWDER CORES SERIES PRODUCTS**

TIANCHANG FUAN ELECTRONIC CO., LTD

Tel: 0086-550-7811988  Fax: 0086-550-7831133

Http://www.fuantronics.com
IRON POWDER CORES SERIES PRODUCTS

Magnetic Characteristics

CHARACTER OF IRON POWDER CORES:

Core Loss (mW/cm²) vs. Peak AC Flux Density (gauss)

- Material μ = 60
- Core Loss vs. Peak AC Flux Density

Core Loss (mW/cm²) vs. Peak AC Flux Density (gauss)

- Material μ = 10
- Core Loss vs. Peak AC Flux Density