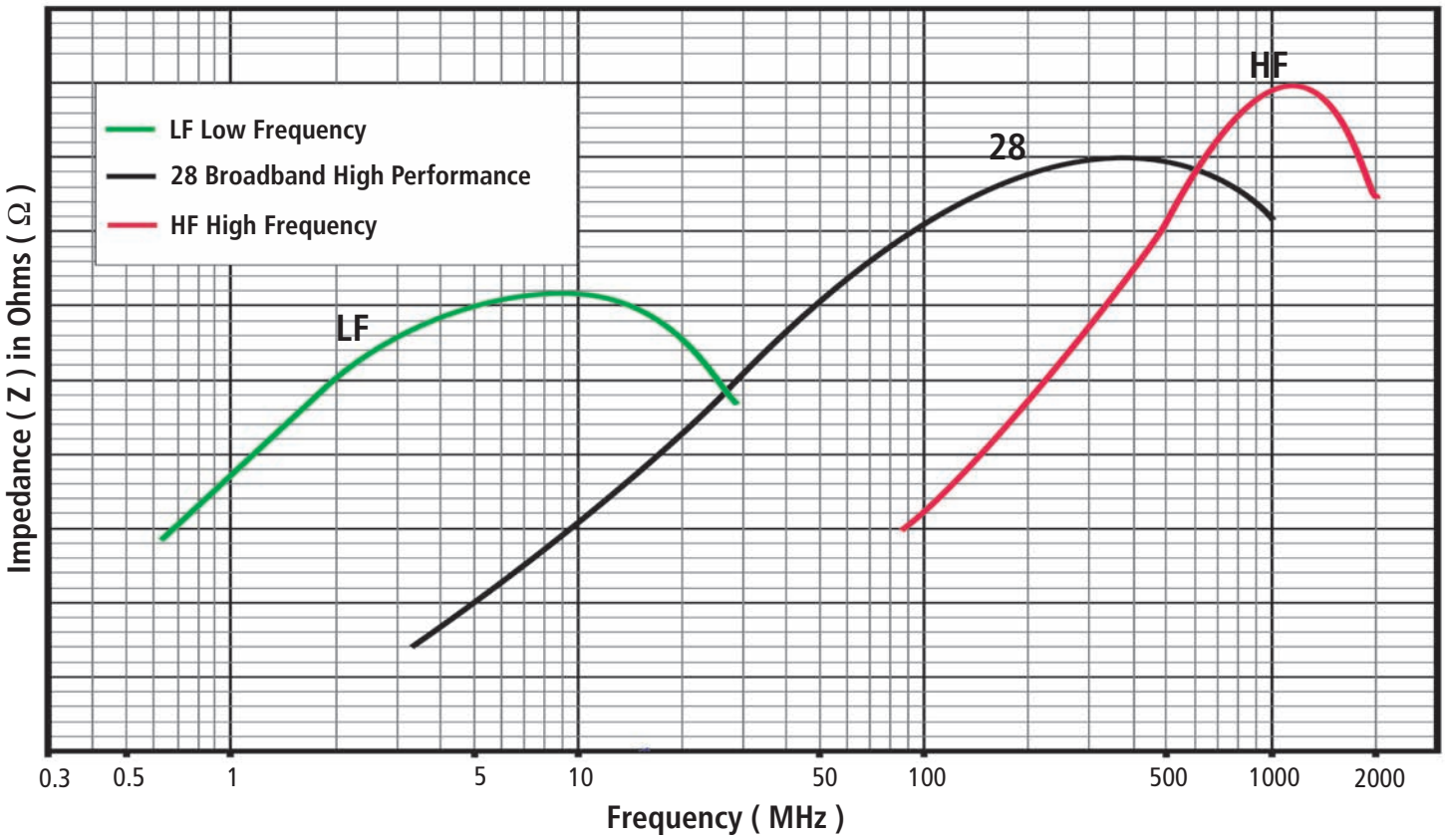
FERRITE MATERIAL COMPARISON

LF, 28, HF Material Impedance vs Frequency (300 KHz - 2 GHz)

Impedance Materials for Cable & Wiring Harness Cores

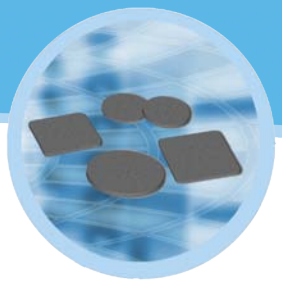


DESIGN & SELECTION "RULES OF THUMB"

- **Select the appropriate ferrite material** for the EMI frequency range to be attenuated (refer to cable core material impedance vs. frequency chart above).
- **Ferrite material composition affects core performance most.** High performance material is best. Cheap, low performance materials require the use of larger, heavier cores.
- **Shape (design) and mass of the ferrite core significantly affect impedance.**
- **Don't over size.** Use high performance ferrite material and select the smallest core that will do the job. High performance material allows the use of smaller, lighter and lower cost cores.
- **Select a ferrite core that fits** over the cable's outside dimensions. Core should slide easily over the cable during installation.
- **When possible, install a cable core over wires in a common-mode configuration** (out and back lines inside the same ferrite cable core). A differential cable pair inside the same core will make the ferrite core a common mode choke that is not susceptible to saturation from very high currents.
- **Install the ferrite core near the noise source**
- **Additional turns through a core will provide multiple amounts of peak impedance.**
  Example: Two wire turns provide 4 times the impedance of one turn (pass through) the ferrite core. Also, with each added turn, the peak impedance shifts to a slightly lower frequency.
- **Two piece split cores are available.** One-piece cylindrical or flat ribbon ferrite core shapes are usually preferable but, split cores can be used in applications where cores cannot slide over cable ends and connectors. Some split cores are available with snap-on plastic cases or metal clips.
- **Side by side impedance testing of ferrite cores is the best way to compare performance of different cores.**
  Ferrite core impedance measurement equipment and test methods are not standardized in the industry. Every ferrite company has their own test methods. Catalog (web site) impedance data cannot be accurately compared.

Optimized, high performance, low cost custom part designs are available.

Ferrite EMI Disks and Plates



Ferrite Disks and Plates provide a simple, cost-effective solution for radiated and inductively-coupled electromagnetic interference. After the PC board soldering process, a ferrite disk or plate can be installed directly on the source of EMI (such as active devices or unwanted antennas).

Features:

• Easy installation • Each part for volume production is provided with permanent, double sided 3,5 mil acrylic adhesive with 218 oz./inch^2 adhesion. • Samples and sample kits are available with removable and reusable adhesive for "trial and error" testing • Variety of sizes offered • For frequencies above 250 MHz, H series material is generally better than M series material • Custom parts also available.

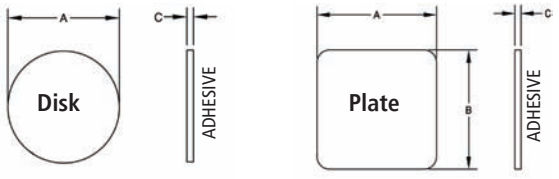
Applications:

• Ferrite disks and plates can be utilized either as inductively-coupled components or EMI shields on PC board components and traces. (Inductive coupling occurs when the ferrite affects the conducted wave form leaving the active component. The rise time of the wave form is effectively slowed by the ferrite, and the overshoot and associated ringing are attenuated. EMI shielding occurs when the ferrite absorbs the radiated emissions from active components, effectively protecting other boards or components in the vicinity from radiated contamination). • Can be used to locate unwanted EMI antennas. • Flat Flex & Ribbon cables. • Can also provide retrofit, auxiliary EMI attenuation.

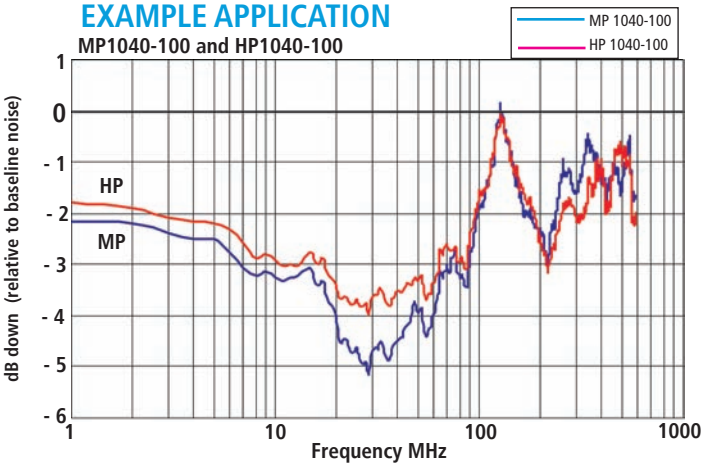
PART NUMBER	A mm (inches)	B mm (inches)	C mm (inches)
HM0787-100	19.99 (0.787)		1.27 (0.050)
HM0787-200	19.99 (0.787)		1.91 (0.075)
HM1400-200	35.56 (1.400)		1.91 (0.075)
HM1400-300	35.56 (1.400)		2.54 (0.100)
MM0650-100	16.51 (0.650)		1.27 (0.050)
MM0787-100	20.00 (0.787)		1.27 (0.050)
MM0787-200	20.00 (0.787)		1.91 (0.075)
MM1400-200	35.56 (1.400)		1.91 (0.075)
MM1400-300	35.56 (1.400)		2.54 (0.100)
HP1040-100	26.42 (1.040)	26.42 (1.040)	1.27 (0.050)
HP1040-200	26.42 (1.040)	26.42 (1.040)	1.91 (0.075)
MP0315-200	8.00 (0.315)	8.00 (0.315)	2.00 (0.079)
MP0350-000	26.42 (1.040)	8.89 (0.350)	1.27 (0.050)
MP0433-000	11.00 (0.433)	11.00 (0.433)	1.96 (0.077)
MP0512-200	13.00 (0.512)	13.00 (0.512)	2.00 (0.079)
MP0590-200	21.00 (0.827)	15.00 (0.591)	2.00 (0.079)
MP0591-200	15.00 (0.591)	15.00 (0.591)	2.00 (0.079)
MP0760-100	19.30 (0.760)	19.30 (0.760)	1.27 (0.050)
MP1040-100	26.42 (1.040)	26.42 (1.040)	1.27 (0.050)
MP1040-200	26.42 (1.040)	26.42 (1.040)	1.91 (0.075)
MP1040-300	26.42 (1.040)	26.42 (1.040)	2.25 (0.089)
MP1496-000	38.00 (1.496)	38.00 (1.496)	2.00 (0.079)

PART NUMBER SYSTEM EXAMPLE

H	M	0787	100
H - Material M - Material	M - Disk P - Plate	Part Size Indentification	Thickness Code



EXAMPLE APPLICATION



Example Application Graph Explanation:

The zero line on the graph represents the base line noise recorded for an unprotected microprocessor. The curves (dB down) represent the performance of the Steward ferrite plates relative to the baseline. The addition of the ferrite plates to the top of the processor in this specific application exhibits up to a 5 dB EMI reduction relative to the unprotected part. In the example application graph above, the ferrite plate MP1040-100 exhibits up to a 1 dB advantage over the HP1040-100 from 1-100 MHz, while the HP1040-100 exhibits a 0,5 dB advantage between 200 and 400 MHz. Performance can vary with different sizes, materials, processors and applications.