Nanocrystalline soft magnetic cores are manufactured by **casting the molten metal into a thin solid ribbon and then rapidly cooling it**. A highly controlled annealing process is then employed to create a uniform and very fine nanocrystalline microstructure with grain sizes of ~10 nm.

What are the advantages of nanocrystals?

Compared to ferrite cores, the impedance of nanocrystalline cores is extremely high and the effective frequency band is very wide. This allows components to be made smaller and saves engineering time that otherwise would be needed to design and test other EMI countermeasures. Nanocrystal cores are, therefore, ideal for designs with complex EMI noise scenarios – high energy noise and/or noise at multiple different frequencies. In simple scenarios, where the noise energy is small or localized at one frequency, inexpensive ferrite cores are usually sufficient.

The following table summarizes the benefits of nanocrystalline soft magnetic material.

High permeability / high saturation flux density	Nanocrystalline materials have a high saturation magnetic flux density and a high permeability. They combine the best characteristics of Fe-based and Co-based amorphous metals, respectively.
Low core loss	Nanocrystalline materials have 20% of the core loss of Fe-based amorphous metals and approximately the same core loss as Co-based amorphous metals.
Excellent temperature characteristics	Nanocrystalline materials operate over a temperature range of -50°C~150°C, with very little permeability variation (less than ±10%) at. They also exhibit very little aging effects, unlike Co-based amorphous metals.
Low magnetostriction	Nanocrystalline materials exhibit low magnetostriction, so they are less affected by mechanical stress. This also means they do not emit much audible noise.
Excellent frequency performance	The high permeability and low core loss, over a wide frequency range, exhibited by nanocrystalline materials is very good, and equivalent to Co-based amorphous metal.
Magnetic properties control	The shape of the B-H curve in nanocrystalline materials can be controlled during the annealing process. Three types of B-H curve squareness, for high, middle and low remanence ratios, can be realized for various applications.