Magnetics XFLUX® Cores

6.5% FeSi cores for high current applications

XFLUX® cores offer an economical high saturation (1.6 Tesla) solution for use in low and medium frequency inductors and chokes. High saturation is advantageous in applications where inductance under load is critical such as inverters for renewable energy and Uninterruptible Power Supplies (UPS).

XFLUX distributed air gap cores are made from 6.5% silicon iron powder. A true high temperature material with no thermal aging, XFLUX offers lower losses than powdered iron cores and superior DC bias performance. The soft saturation of XFLUX material creates a DC bias curve that does not have the traditional saturation point of a ferrite; rather, as the drive level increases, the permeability rolls off in a slow and predictable manner.

XFLUX can be a lower cost alternative to High Flux in situations where the higher core losses of XFLUX are acceptable.

Toroids DC Bias and Core Loss			
	26µ	40µ	60µ
DC Bias (A·T/cm)			
80% of μ_i	167	103	71
60% of μ_i	275	-	-
50% of μ_i	-	195	140
Core Loss (mW/cm³)			
0.1 T, 50 kHz	925	800	680

Shapes DC Bias and Core Loss			
	26µ	40µ	60µ
DC Bias (A·T/cm)			
80% of μ_i	171	87	68
Core Loss (mW/cm³)			
0.1 T, 50 kHz	700	600	600

Material	Alloy Composition	DC Bias	Core Loss	Relative Cost	Saturation Flux Density (Tesla)	Curie Temperature	Operating Temperature Range*	60 µ µ flat to...
XFLUX	**FeSi**	**Highest (Best)**	**High**	**Low**	**1.6**	**700°C**	**-55 to 200°C**	**500 kHz**
High Flux	FeNi	Highest (Best)	Moderate	Medium	1.5	500°C	-55 to 200°C	1 MHz
75-Series	FeSiAl	High	Moderate	Low	1.5	700°C	-55 to 200°C	500 kHz
MPP	FeNiMo	High	Very Low	High	0.8	460°C	-55 to 200°C	2 MHz
Kool Mµ	FeSiAl	Moderate	Low	Low	1.0	500°C	-55 to 200°C	900 kHz
Iron Powder	Fe	Moderate	Highest	Lowest	1.2 - 1.5	770°C	-30 to 75°C	500 kHz
Ferrite	Ceramic	Low	Lowest	Lowest	0.45	100 - 250°C	Variable	Variable

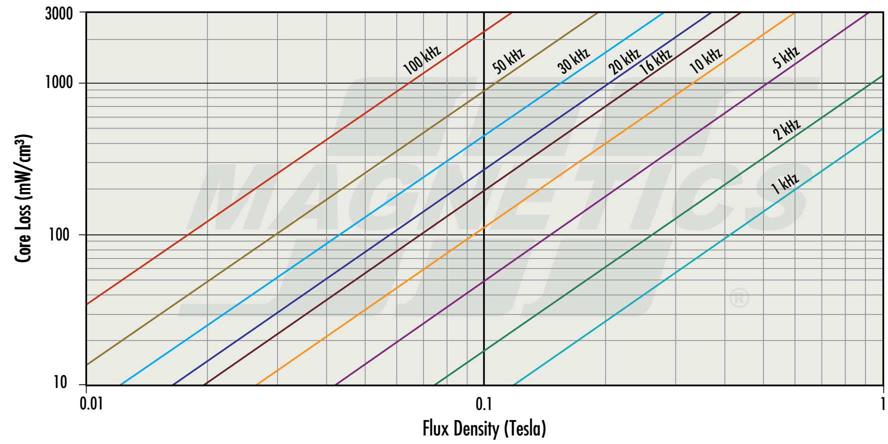
200°C limit applies only to coated cores. Uncoated or potted cores may be used at higher temperatures.

XFLUX® Core Loss Density

Toroids 26µ

1kHz - 20kHz $P_L = 510\ (B^{1.830})\ (f^{1.180})$

>20kHz $P_L = 335\ (B^{1.825})\ (f^{1.332})$

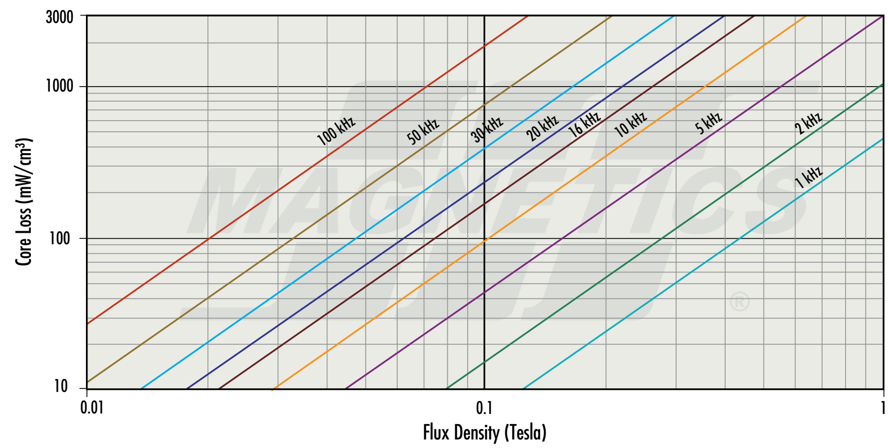


XFLUX® Core Loss Density

Toroids 40µ

1kHz - 20kHz $P_L = 475\ (B^{1.845})\ (f^{1.166})$

>20kHz $P_L = 332.5\ (B^{1.845})\ (f^{1.31})$

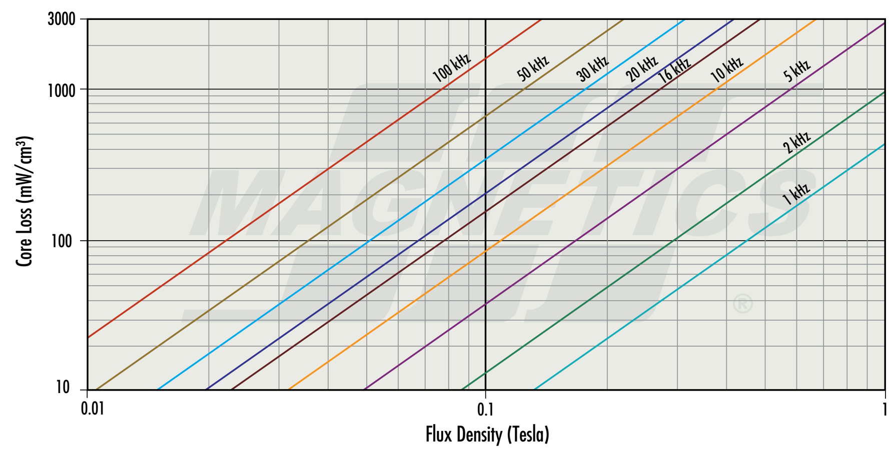


XFLUX® Core Loss Density

Toroids 60µ

1kHz - 10kHz $P_L = 440\ (B^{1.865})\ (f^{1.152})$

>10kHz $P_L = 330\ (B^{1.865})\ (f^{1.282})$

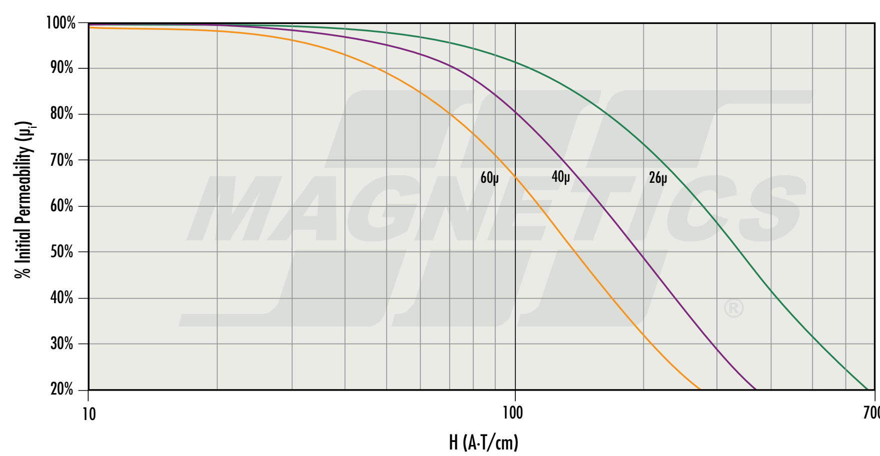


XFLUX® Permeability vs. DC Bias

Toroids 26µ, 40µ, 60µ

$$\text{\% Initial Permeability} = \frac{1}{(a + bH^c)}$$

	a	b	c
26µ	0.01	1.016E-07	1.976
40µ	0.01	9.808E-08	2.188
60µ	0.01	4.031E-07	2.050

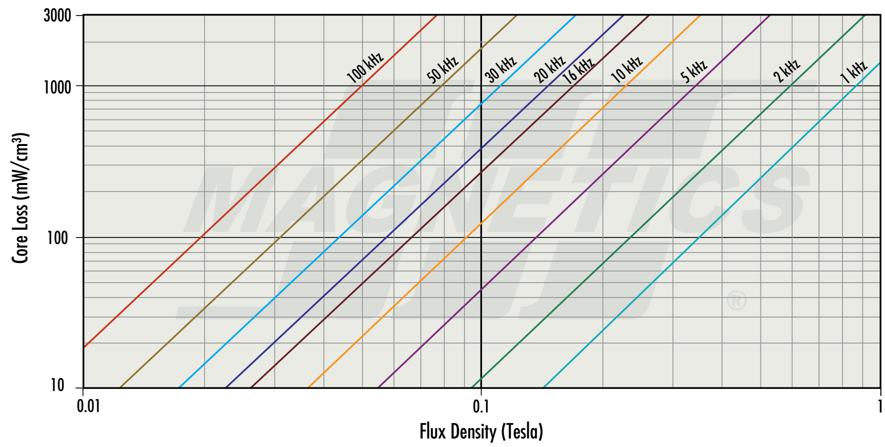


XFLUX® Core Loss Density

Shapes 26µ

1kHz - 10kHz $P_L = 545\ (B^{2.02})\ (f^{1.189})$

> 10kHz $P_L = 379\ (B^{1.995})\ (f^{1.330})$

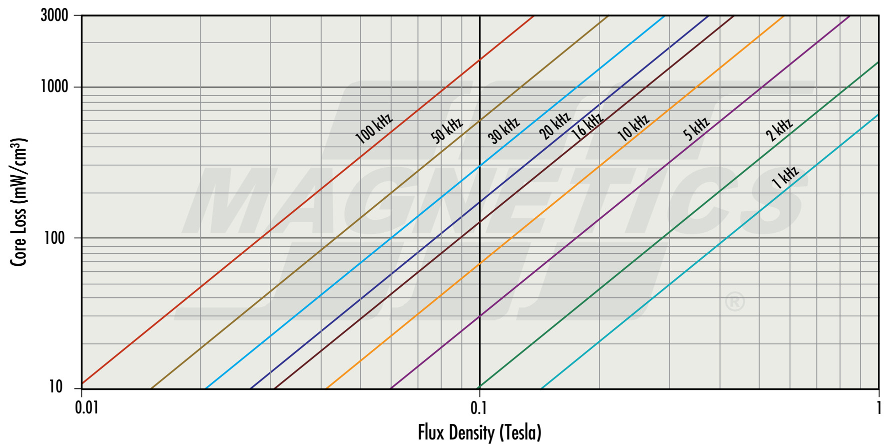


XFLUX® Core Loss Density

Shapes 40µ, 60µ

1kHz - 10kHz $P_L = 661\ (B^{2.15})\ (f^{1.16})$

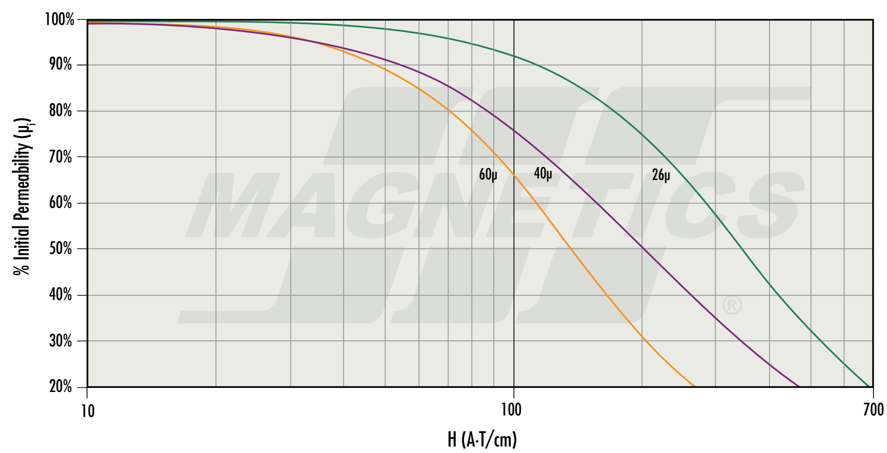
> 10kHz $P_L = 441\ (B^{2.16})\ (f^{1.35})$



XFLUX® Permeability vs. DC Bias

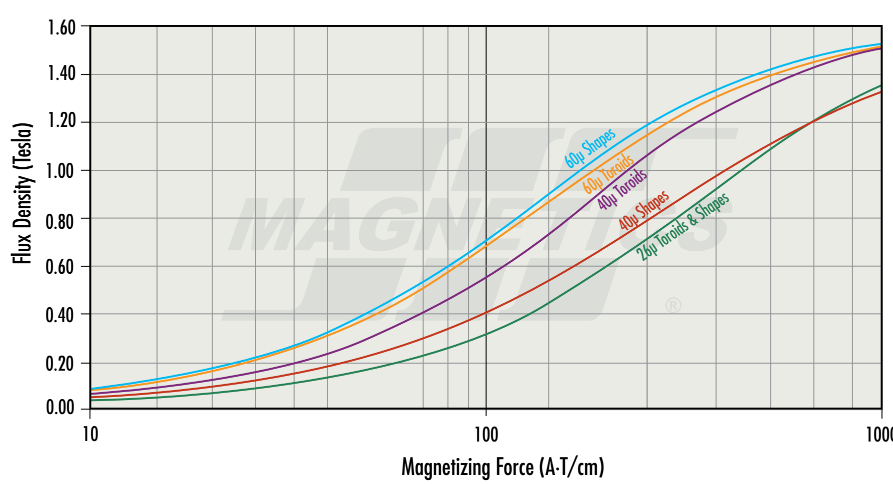
Shapes 26µ, 40µ, 60µ

% Initial Permeability = $\frac{1}{(a + bH^c)}$			
	a	**b**	**c**
26µ	0.01	8.395E-08	2.004
40µ	0.01	1.607E-06	1.646
60µ	0.01	3.115E-07	2.109



XFLUX® DC Magnetization Curves

$B = \left(\frac{a + bH + cH^2}{1 + dH + eH^2}\right)^2$					
	a	**b**	**c**	**d**	**e**
26µ Toroids	2.065E-02	3.751E-02	2.741E-03	9.915E-01	8.011E-04
40µ Toroids	4.606E-02	1.820E-02	1.939E-03	4.056E-01	9.658E-04
60µ Toroids	5.026E-02	2.501E-02	1.737E-03	3.038E-01	9.998E-04
26µ Shapes	2.512E-02	2.340E-02	1.746E-03	6.293E-01	5.125E-04
40µ Shapes	2.274E-02	4.002E-02	2.289E-03	6.763E-01	1.000E-03
60µ Shapes	5.564E-02	2.357E-02	1.714E-03	2.831E-01	1.000E-03

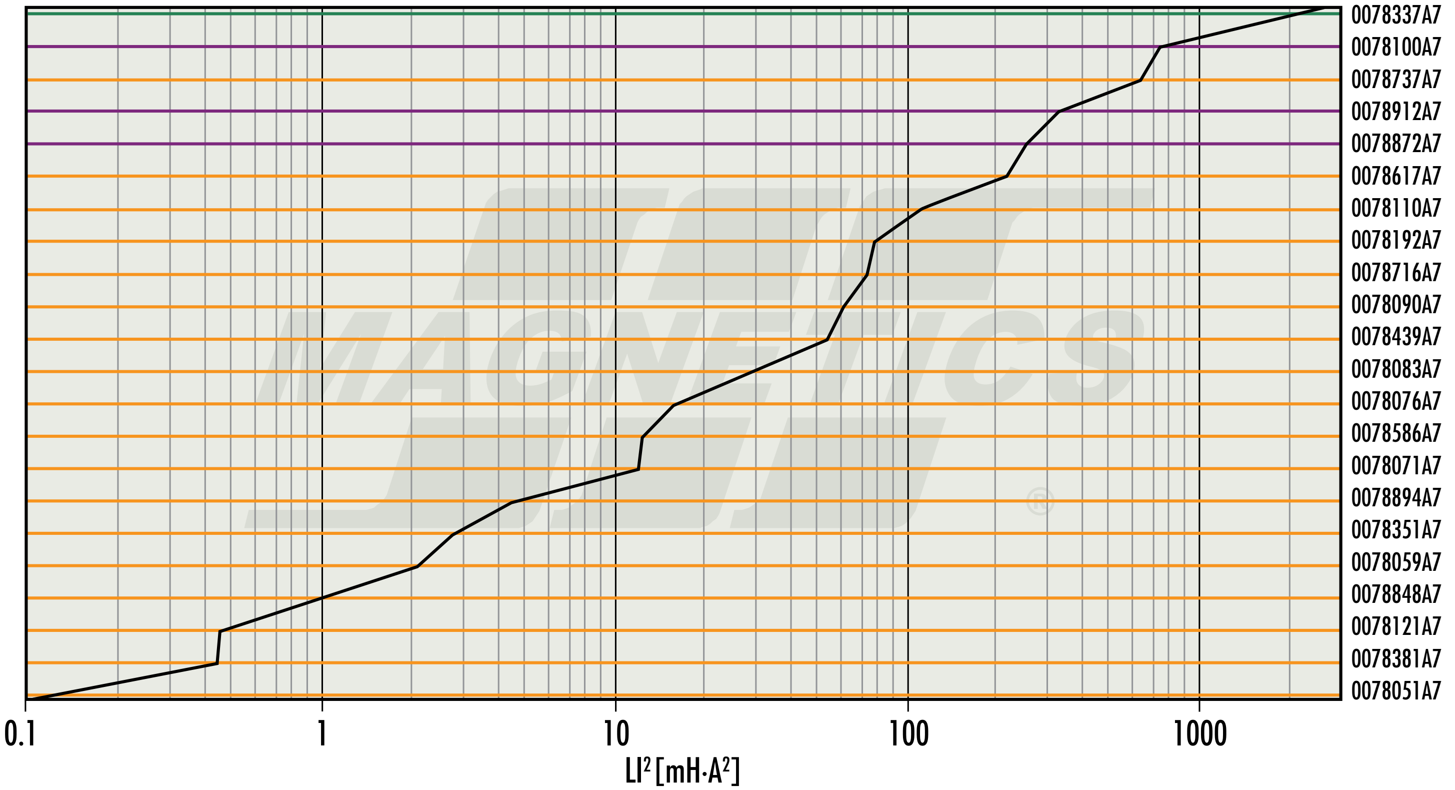


Only two parameters of a design application must be known to select a core for a current-limited inductor: inductance required with DC bias and the DC current. Use the following procedure to determine the appropriate XFLUX core size.

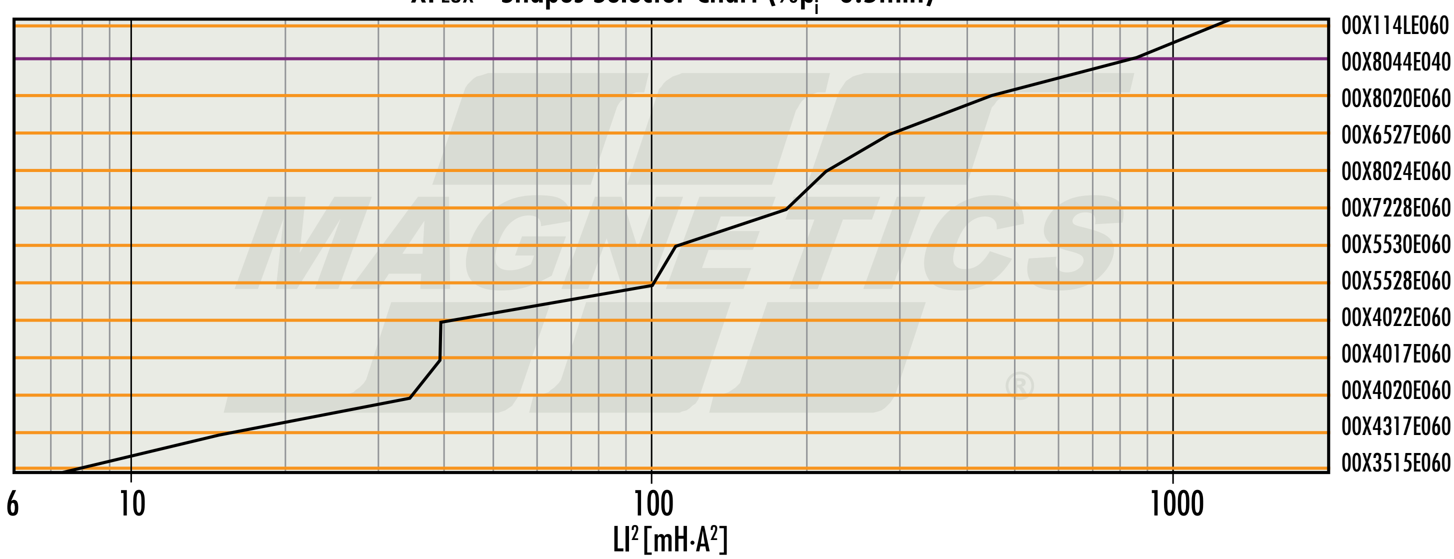
1. Compute the product of LI^2 where:
   L = inductance required with DC bias (mH)
   I = DC current (A)
2. Locate the LI^2 value on the appropriate Selector Chart below. Follow this coordinate to the intersection with the first core size that lies above the diagonal permeability line. This is the smallest core size that can be used, and the permeability listed is the best trade-off between A_L and DC Bias.

KEY
60µ
40µ
26µ

XFLUX® Toroid Selector Chart (%μ_i=0.5min)



XFLUX® Shapes Selector Chart (%μ_i=0.5min)



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