

Fe-Si 60u Inductor DC Bias Roll-Off

Inductance vs. DC Bias Current Characteristic

Design Parameters

Core Material	Fe-Si 60u (Sendust/Kool Mu)
Turns (N)	38
Effective Path Length (Le)	8.62 cm
Zero-Bias Inductance (L0)	200 uH
Frequency	66 kHz
H/I Coefficient	5.539 Oe/A
Isat @ 70% (140uH)	~10.8 A
L @ 40A (measured)	68 uH (34% of L0)
L @ 60A	~30 uH (~15% of L0)

1. Core Characteristic - %Initial Permeability vs DC Bias

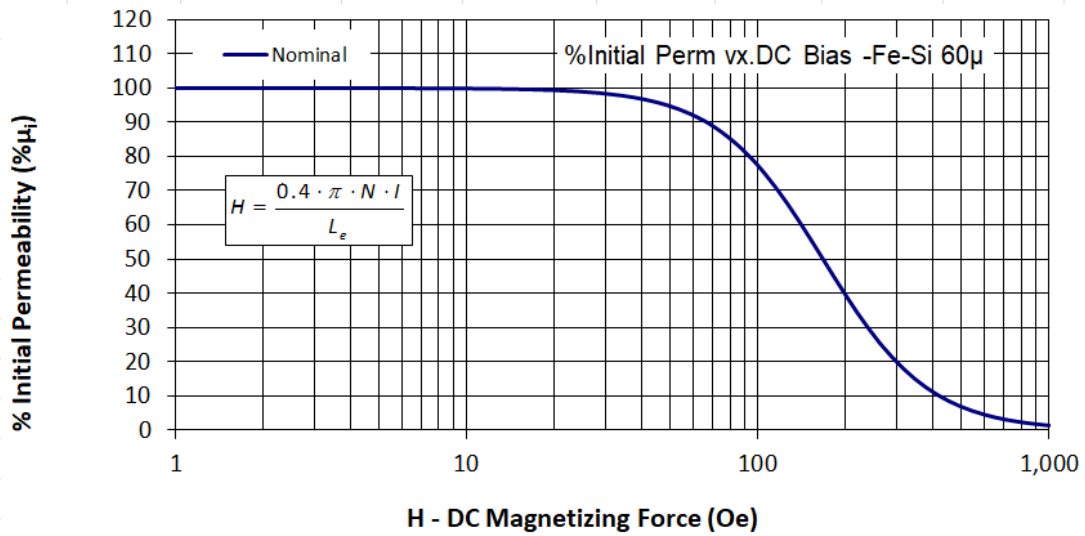
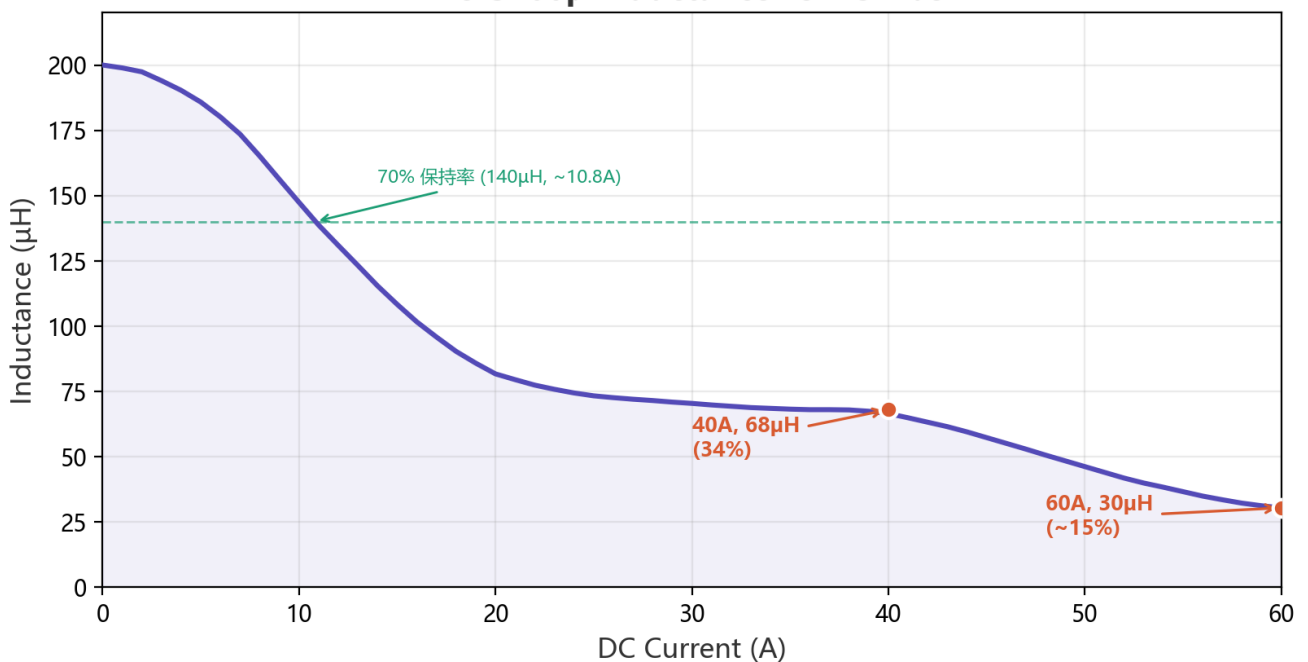


Figure 1: Fe-Si 60u %Initial Permeability vs DC Bias Field Strength (Oersteds)

2. Inductance vs DC Bias Current (Calculated)

Fe-Si 60μ Inductance vs DC Bias



Core: Fe-Si 60μ | N=38T | Le=8.62cm | L0=200μH | f=66kHz | H = 0.4·π·N·I/Le

Fe-Si 60u Inductor DC Bias Roll-Off Analysis

Figure 2: Calculated L(I) from digitized curve ($H = 0.4 * \pi * N * I / L_e$)

3. Key Data Points

I (A)	H (Oe)	% μ_r	L (uH)	Roll-off
0	0.0	100.0%	200.0	0.0%
5	27.7	92.9%	185.8	7.1%
10	55.4	73.7%	147.4	26.3%
15	83.1	54.1%	108.3	45.9%
20	110.8	40.8%	81.7	59.2%
25	138.5	36.7%	73.3	63.3%
30	166.2	35.2%	70.4	64.8%
35	193.9	34.1%	68.2	65.9%
40	221.6	33.3%	66.5	66.7%
45	249.3	28.6%	57.3	71.4%
50	277.0	23.1%	46.2	76.9%
55	304.7	18.3%	36.6	81.7%
60	332.4	15.2%	30.4	84.8%

4. Calculation Formula

$$H \text{ (Oe)} = 0.4 * \pi * N * I / L_e(\text{cm}) = 5.539 * I$$

$$L(I) = L_0 * \% \text{Initial Permeability}(H) / 100 = 200 * \mu(H) / 100$$

At I=40A: H=221.6 Oe, $\mu=34\%$, L=68uH (measured)

At I=60A: H=332.3 Oe, $\mu \sim 15\%$, L \sim 30uH (estimated)