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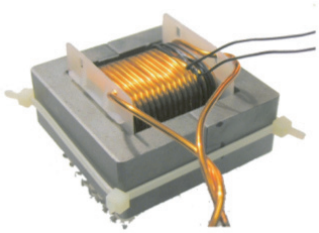
March 16th, 2015

Measurement Results - GeckoMAGNETICS

All of our models have been extensively tested. In the following, we will show some experimental results.

E-Core - Measurements with symmetric triangular flux waveforms

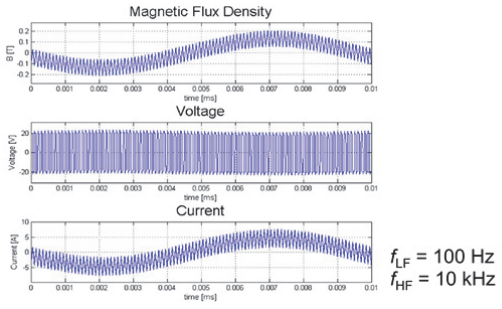


EPCOS E55/28/21, N27, $N = 18$
$d = 1.7$ mm, $l_g = 1$mm

Operating Points		Calculated Losses			Measured Losses	Comparison
ΔB [T]	f [kHz]	Core Losses [W]	Winding Losses [W]	Total Losses [W]	Total Losses [W]	Rel. Error [%]
0.25	5	0.4	0.23	0.63	0.61	3.28
0.5	5	2.04	0.92	2.96	2.70	9.63
0.1	10	0.11	0.08	0.19	0.20	-3.06
0.2	10	0.56	0.33	0.89	0.88	1.14
0.3	10	1.36	0.74	2.10	2.01	4.48

E-Core - Results of measurements with sinusoidal current with a superimposed high frequency triangular current ripple (LF: 100 Hz, HF: 10 kHz)

EPCOS E55/28/21, N27, $N = 18$
$d = 1.7$ mm, $l_g = 1$mm



Operating Points			Calculated Losses			Measured Losses	Comparison
$\hat{\imath}_{LF}$ [A]	ΔB_{LF} [T]	ΔB_{HF} [T]	Core Losses [W]	Winding Losses [W]	Total Losses [W]	Total Losses [W]	Rel. Error [%]
5	0.25	0.15	0.44	0.35	0.79	0.76	3.95
10	0.5	0.3	1.83	1.51	3.35	3.6	-6.94

E-Core - Thermal measurements (symmetric triangular waveforms)

E25/13/7 (N87, l_g = 1.1 mm; N = 27; d = 0.8)

Operating Points		Calculated Losses and Temperature					Measured Losses and Temperatures		
ΔB [T]	f [kHz]	Core Losses [W]	Winding Losses [W]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]
0.3	10	0.07	0.40	0.47	36	44	0.50	40	49
0.3	20	0.14	0.59	0.73	41	53	0.74	43	58

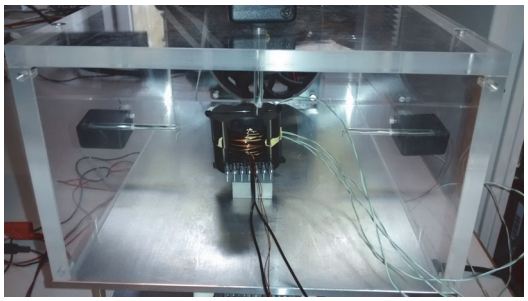
E32/16/9 (N87, l_g = 0.6 mm; N = 18; d = 0.8)

Operating Points		Calculated Losses and Temperature					Measured Losses and Temperatures		
ΔB [T]	f [kHz]	Core Losses [W]	Winding Losses [W]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]
0.3	10	0.14	0.31	0.45	33	38	0.45	35	43
0.3	20	0.28	0.37	0.65	37	41	0.60	37	45

E20/10/6 (N87, l_g = 1.0; N = 80; d = 0.45)

Operating Points		Calculated Losses and Temperature					Measured Losses and Temperatures		
ΔB [T]	f [kHz]	Core Losses [W]	Winding Losses [W]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]
0.3	20	0.07	0.33	0.40	38	46	0.38	39	46
0.4	50	0.22	1.44	1.66	64	97	1.60	60	91

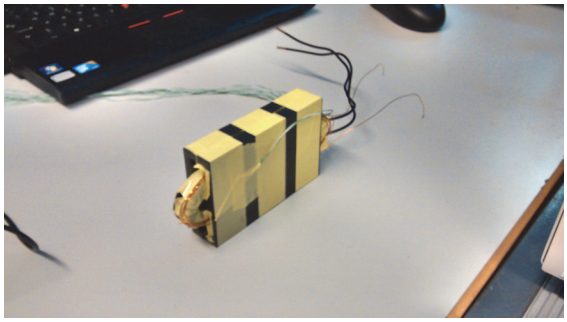
PM-Core - Thermal measurements (symmetric triangular waveforms)



PM50

Operating Points			Calculated Losses and Temperature			Measured Losses and Temperatures		
ΔB [T]	f [kHz]	Cooling Concept	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]
0.2	10	Nat. conv.	0.96	29	38	1.01	35	39
0.3	10	Forc. conv. (3.5 m/s)	2.17	29	45	2.38	31	41

ELP-Core - Thermal measurements (symmetric triangular waveforms)



ELP 64

Operating Points			Calculated Losses and Temperature			Measured Losses and Temperatures		
ΔB [T]	f [kHz]	Cooling Concept	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]	Total Losses [W]	Core Temp. [°C]	Winding Temp. [°C]
0.1	10	Nat. conv.	1.23	31	33	1.01*	28	32
0.3	10	Forc. conv. (2.5 m/s)	11.1	43	59	8.8*	38	63
0.3	2	Nat. conv.	1.69	-	-	1.69	-	-
0.3	2	Nat. conv.	0.19	-	-	0.18	-	-

***** The deviation between the measured and calculated losses is most likely due to the relatively high proximity losses. The proximity losses depend significantly on the actual construction of the inductor. Since the built laboratory prototype was hand-made, an exact alignment of the winding turns was difficult to achieve. Therefore, a deviation from the modeled inductor's proximity losses was unavoidable. The above theory is confirmed by the low frequency measurements, where the proximity losses are relatively small and therefore the total measured and calculated losses match very well.

P-Core - Measurements with symmetric triangular flux waveforms

EPCOS P 30x19, N87, $N = 10$
$d = 1.0$ mm, $l_g = 3 \times 0.24$mm

Operating Points		Calculated Losses	Measured Losses
ΔB [T]	f [kHz]	Total Losses [W]	Total Losses [W]
0.2	20	0.29	0.29
0.1	50	0.17	0.18
0.2	50	0.62	0.77

PM-Core - Measurements with symmetric triangular flux waveforms

EPCOS PM 50/39, N87, $N = 38$
$d = 1.0$ mm, $l_g = 3 \times 0.37$ mm

Operating Points		Calculated Losses	Measured Losses
ΔB [T]	f [kHz]	Total Losses [W]	Total Losses [W]
0.2	10	0.40	0.34
0.1	20	0.18	0.18
0.2	20	0.87	0.76

Many more measurements with different core shapes have been conducted. Please ask us if you are interested in measurement data for a particular core shape or application.