

ER 9.5/5 Planar cores in sets

 Series/Type:
 B65523, B65527

 Date:
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B65523

ER 9.5/5

Planar core

- To IEC 62317-9
- For transformers featuring high inductance and low overall height
- Delivery mode: sets

Magnetic characteristics (per set)

$$\begin{split} \Sigma I/A &= 1.54 \text{ mm}^{-1} \\ I_e &= 13.6 \text{ mm} \\ A_e &= 8.81 \text{ mm}^2 \\ A_{min} &= 7.6 \text{ mm}^2 \\ V_e &= 120 \text{ mm}^3 \end{split}$$

Approx. weight 0.6 g/set

Ungapped

Material	A _L value nH	μ _e	Ordering code
N92	660 +30/–20%	811	B65523J0000R092
N87	800 +30/-20%	1000	B65523J0000R087
N97	840 +30/-20%	1032	B65523J0000R097
T38	4500 +40/-30%	5680	B65523J0000Y038

Gapped (A_L values/air gaps examples)

Material	A _L value nH	s approx. mm	μ _e	Ordering code
N49	40 ±5%	0.27	49	B65523J0040J049
N87	100 ±5% 400 ±10%	0.14 0.02	90 491	B65523J0100J087 B65523J0400K087

Other A_L values/air gaps and materials available on request – see Processing remarks on page 4.



FEK0530-Z



ER 9.5/5

Accessories

SMD

SMD coil former with gullwing terminals

DIEC 60085:
k
AL CORP.
3 s
oup 3): 255 °C, 10 s
n on coil former: 400 °C, 1 s

Yoke

Material: Stainless spring steel (0.1 mm)

Coil former					Ordering code
Sections	A _N mm ²	l _N mm	A _R value μΩ	Terminals	
1	3.23	18.4	196	8	B65527B1008T001
Yoke					B65527A2000X000

Coil former





3 5/17

B65527



Cautions and warnings

Mechanical stress and mounting

Ferrite cores have to meet mechanical requirements during assembling and for a growing number of applications. Since ferrites are ceramic materials one has to be aware of the special behavior under mechanical load.

As valid for any ceramic material, ferrite cores are brittle and sensitive to any shock, fast temperature changing or tensile load. Especially high cooling rates under ultrasonic cleaning and high static or cyclic loads can cause cracks or failure of the ferrite cores.

For detailed information see data book, chapter "General - Definitions, 8.1".

Effects of core combination on A_L value

Stresses in the core affect not only the mechanical but also the magnetic properties. It is apparent that the initial permeability is dependent on the stress state of the core. The higher the stresses are in the core, the lower is the value for the initial permeability. Thus the embedding medium should have the greatest possible elasticity.

For detailed information see data book, chapter "General - Definitions, 8.1".

Heating up

Ferrites can run hot during operation at higher flux densities and higher frequencies.

NiZn-materials

The magnetic properties of NiZn-materials can change irreversible in high magnetic fields.

Ferrite Accessories

EPCOS ferrite accessories have been designed and evaluated only in combination with EPCOS ferrite cores. EPCOS explicitly points out that EPCOS ferrite accessories or EPCOS ferrite cores may not be compatible with those of other manufacturers. Any such combination requires prior testing by the customer and will be at the customer's own risk.

EPCOS assumes no warranty or reliability for the combination of EPCOS ferrite accessories with cores and other accessories from any other manufacturer.

Processing remarks

The start of the winding process should be soft. Else the flanges may be destroyed.

- Too strong winding forces may blast the flanges or squeeze the tube that the cores can not be mounted any more.
- Too long soldering time at high temperature (>300 °C) may effect coplanarity or pin arrangement.
- Not following the processing notes for soldering of the J-leg terminals may cause solderability problems at the transformer because of pollution with Sn oxyde of the tin bath or burned insulation of the wire. For detailed information see chapter *"Processing notes"*, section 2.2.
- The dimensions of the hole arrangement have fixed values and should be understood as a recommendation for drilling the printed circuit board. For dimensioning the pins, the group of holes can only be seen under certain conditions, as they fit into the given hole arrangement. To avoid problems when mounting the transformer, the manufacturing tolerances for positioning the customers' drilling process must be considered by increasing the hole diameter.

Δ



Cautions and warnings

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Symbols and terms

Symbol	Meaning	Unit
A	Cross section of coil	mm ²
A _e	Effective magnetic cross section	mm ²
AL	Inductance factor; $A_L = L/N^2$	nH
A _{L1}	Minimum inductance at defined high saturation ($\triangleq \mu_a$)	nH
A _{min}	Minimum core cross section	mm ²
A _N	Winding cross section	mm ²
A _R	Resistance factor; A _R = R _{Cu} /N ²	$\mu\Omega$ = 10 ⁻⁶ Ω
В	RMS value of magnetic flux density	Vs/m², mT
ΔB	Flux density deviation	Vs/m², mT
Ê	Peak value of magnetic flux density	Vs/m², mT
$\Delta \hat{B}$	Peak value of flux density deviation	Vs/m², mT
B _{DC}	DC magnetic flux density	Vs/m², mT
B _R	Remanent flux density	Vs/m², mT
B _S	Saturation magnetization	Vs/m², mT
C ₀	Winding capacitance	F = As/V
CDF	Core distortion factor	mm ^{_4.5}
DF	Relative disaccommodation coefficient DF = d/μ_i	
d	Disaccommodation coefficient	
E _a	Activation energy	J
f	Frequency	s ^{−1} , Hz
f _{cutoff}	Cut-off frequency	s ^{−1} , Hz
f _{max}	Upper frequency limit	s ^{−1} , Hz
f _{min}	Lower frequency limit	s−1, Hz
f _r	Resonance frequency	s ^{−1} , Hz
f _{Cu}	Copper filling factor	
g	Air gap	mm
Н	RMS value of magnetic field strength	A/m
Ĥ	Peak value of magnetic field strength	A/m
H _{DC}	DC field strength	A/m
H _c	Coercive field strength	A/m
h	Hysteresis coefficient of material	10 ^{_6} cm/A
h/µ _i ²	Relative hysteresis coefficient	10 ^{–6} cm/A
I	RMS value of current	А
I _{DC}	Direct current	А
Î	Peak value of current	А
J	Polarization	Vs/m ²
k	Boltzmann constant	J/K
k ₃	Third harmonic distortion	
k _{3c}	Circuit third harmonic distortion	
L	Inductance	H = Vs/A



Symbols and terms

Symbol	Meaning	Unit
ΔL/L	Relative inductance change	Н
L ₀	Inductance of coil without core	Н
L _H	Main inductance	Н
L _p	Parallel inductance	Н
L _{rev}	Reversible inductance	Н
L _s	Series inductance	Н
l _e	Effective magnetic path length	mm
I _N	Average length of turn	mm
Ν	Number of turns	
P _{Cu}	Copper (winding) losses	W
P _{trans}	Transferrable power	W
P _V	Relative core losses	mW/g
PF	Performance factor	
Q	Quality factor (Q = $\omega L/R_s$ = 1/tan δ_L)	
R	Resistance	Ω
R _{Cu}	Copper (winding) resistance (f = 0)	Ω
R _h	Hysteresis loss resistance of a core	Ω
ΔR_h	R _h change	Ω
R _i	Internal resistance	Ω
R _p	Parallel loss resistance of a core	Ω
R _s	Series loss resistance of a core	Ω
R _{th}	Thermal resistance	K/W
R _V	Effective loss resistance of a core	Ω
S	Total air gap	mm
Т	Temperature	°C
ΔT	Temperature difference	К
Т _С	Curie temperature	°C
t	Time	s
t _v	Pulse duty factor	
tan δ	Loss factor	
tan δ_L	Loss factor of coil	
tan δ _r	(Residual) loss factor at $H \rightarrow 0$	
tan δ_e	Relative loss factor	
tan δ _h	Hysteresis loss factor	
tan δ/μ _i	Relative loss factor of material at $H \rightarrow 0$	
U	RMS value of voltage	V
Û	Peak value of voltage	V
V _e	Effective magnetic volume	mm ³
Z	Complex impedance	Ω
Z _n	Normalized impedance $ Z _n = Z / N^2 \times \epsilon (I_e / A_e)$	Ω/mm



Symbols and terms

Symbol	Meaning	Unit
α	Temperature coefficient (TK)	1/K
α_{F}	Relative temperature coefficient of material	1/K
α _e	Temperature coefficient of effective permeability	1/K
ε _r	Relative permittivity	
Φ	Magnetic flux	Vs
η	Efficiency of a transformer	
η_{B}	Hysteresis material constant	mT ⁻¹
η_i	Hysteresis core constant	A-1H-1/2
λ _s	Magnetostriction at saturation magnetization	
μ	Relative complex permeability	
μ ₀	Magnetic field constant	Vs/Am
μ_a	Relative amplitude permeability	
μ_{app}	Relative apparent permeability	
μ _e	Relative effective permeability	
μ_i	Relative initial permeability	
μ _p '	Relative real (inductive) component of $\overline{\mu}$ (for parallel components)	
μ _p "	Relative imaginary (loss) component of $\overline{\mu}$ (for parallel components)	
μ_r	Relative permeability	
μ_{rev}	Relative reversible permeability	
μ_{s}'	Relative real (inductive) component of $\overline{\mu}$ (for series components)	
μ _s "	Relative imaginary (loss) component of $\overline{\mu}$ (for series components)	
μ_{tot}	Relative total permeability	
	derived from the static magnetization curve	
ρ	Resistivity	Ωm^{-1}
$\Sigma I/A$	Magnetic form factor	mm ⁻¹
τ _{Cu}	DC time constant τ_{Cu} = L/R _{Cu} = A _L /A _R	S
ω	Angular frequency; $\omega = 2 \Pi f$	s ⁻¹

All dimensions are given in mm.

Surface-mount device

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