Ferrites and accessories

Toroids (ring cores) accessories
General information

Series/Type: **B64293, B64291, B64292**
Date: June 2013

Toroids (ring cores) accessories

General information

Examples of final applications of ring core accessories

Application of ring core housings – horizontal / vertical version

Application of ring core base plate

Epoxy coated ring cores and accessories is ideal combination for current-compensated chokes. Combination of various wire diameters and hole/pin arrangement offer many alternatives of application.

Preliminary data

Base plate for ring cores

Material: GFR polycarbonate UL94 V-0
Makrolon 9415 [E41613], color code blue, Fa. BAYER MATERIALSCIENCE AG

Base plate					Ordering code
Figure	Dimensions mm	Hole diameter d mm	Lead spacing mm	Holes	
a	40.4 × 20.5	1.1	22.86 × 15.24	4	B64293A1000X000
	40.4 × 20.5	1.4	22.86 × 15.24	4	B64293A1100X000
b	∅ 47.8	1.7	see picture	8	B64293A1200X000[1)]
c	∅ 64.0	2.9	see picture	6	B64293A1300X000[2)]
	∅ 64.0	2.1	see picture	6	B64293A1400X000[2)]

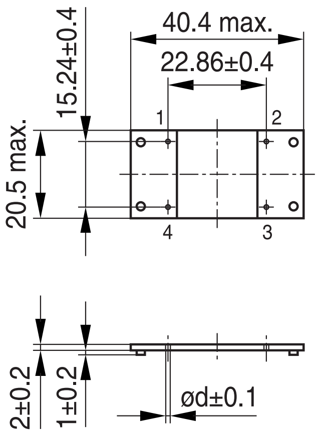
1) Combination with ring core housing B64291A1704X000
2) Hole diameter 1.0 … 3.1 mm possible

Toroids (ring cores) accessories

Base plate for ring cores **B64293**

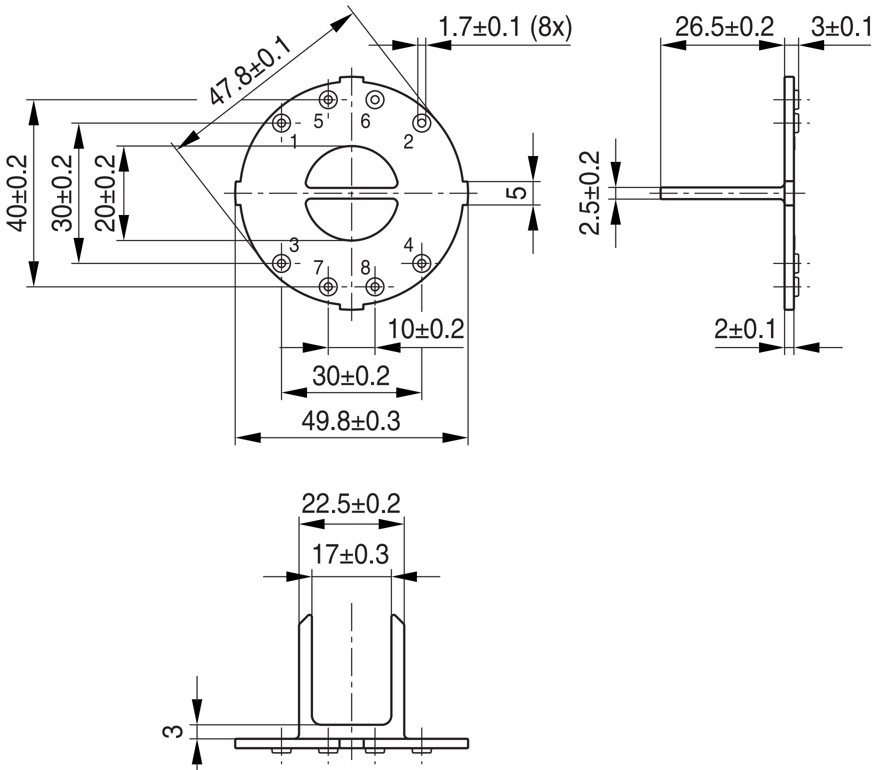
Preliminary data

Figure a



FUS0174-E

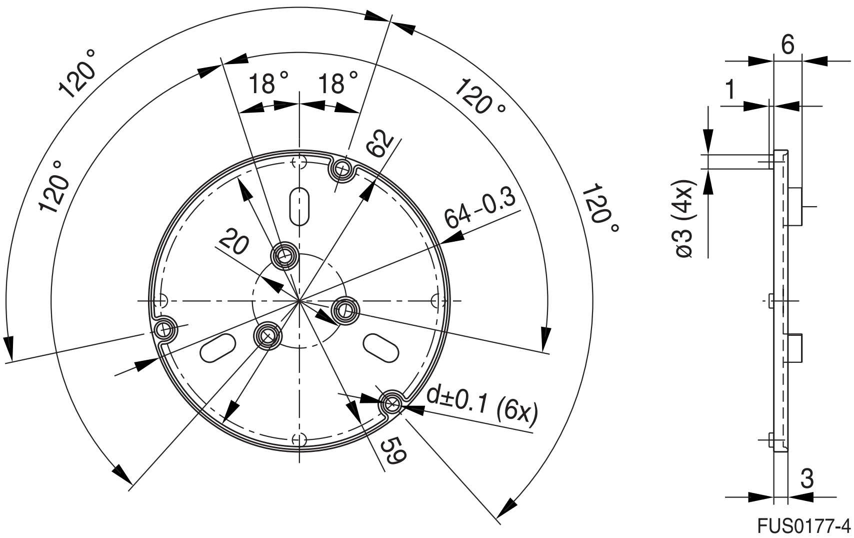
Figure b*)



FUS0176-V

*) Combination with ring core housing B64291A1704X000

Figure c



FUS0177-4

Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

Preliminary data

Housings for ring cores – horizontal version

Material: B64291A: GFR polycarbonate UL94 V-0
Makrolon 9415 [E41613], color code blue, BAYER MATERIALSCIENCE AG
B64291B: GFR liquid crystal polymer UL94 V-0
Vectra E130i [E83005], color code natural, TICONA

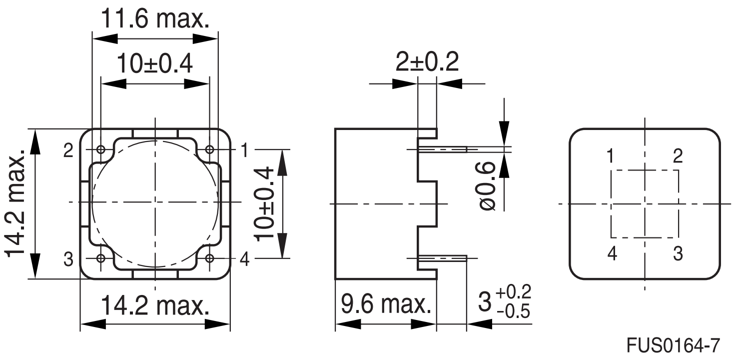
Solderability (lead-free): to IEC 60068-2-20, test Ta, + 245 ± 5 °C, 3 ± 0.3 s
Resistance to soldering heat (wave soldering): to IEC 60068-2-20, test Tb, + 260 ± 5 °C, 10 ± 1 s

Housings – horizontal version					Ordering code
Figure	Inner diameter mm	Height mm	Lead spacing mm	Pins	
a	11.6	9.6	10 × 10	4	B64291A1004X000
b	12.0	8.0	see picture	8	B64291B1008X000
c	20.4	13.3	20 × 12.5	4	B64291A1104X000
d	26.0	16.8	25 × 15	4	B64291A1204X000
e	30.0	19.7	30 × 20	4	B64291A1304X000
f	30.0	25.0	30 × 20	4	B64291A1404X000
g	39.3	25.0	15 × 40	4	B64291A1504X000
h	39.3	30.0	15 × 40	4	B64291A1604X000
i	48.0	32.0	–	–	B64291A1704X000[1)]
j	70.6	39.1	–	–	B64291A1804X000

1) Combination with base plate B64293A1200X000

Preliminary data

Figure a



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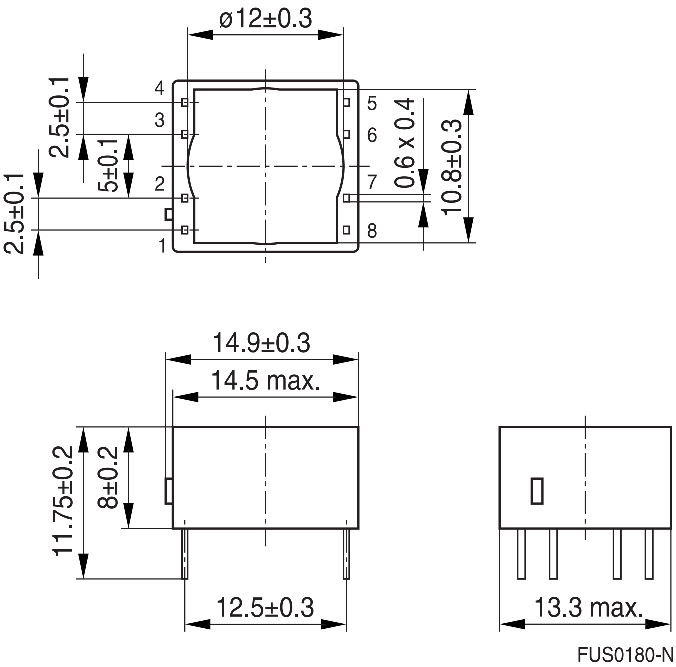


Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

Preliminary data

Figure c

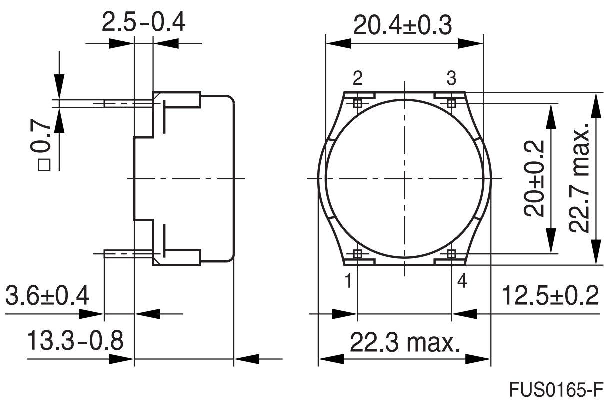


Figure d

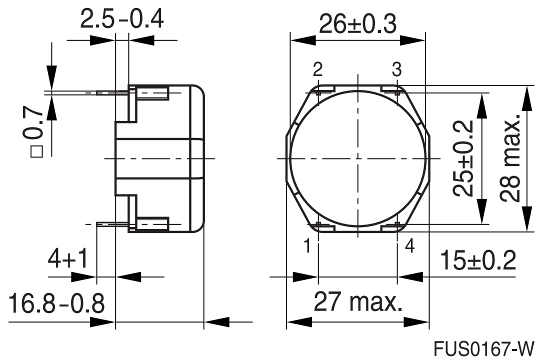
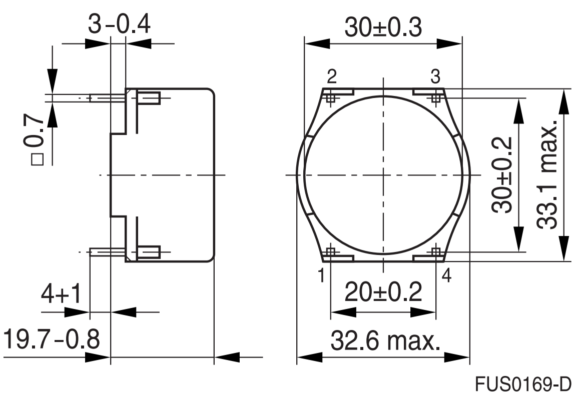


Figure e



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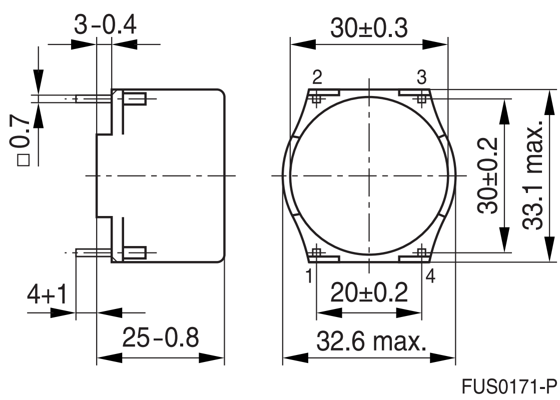
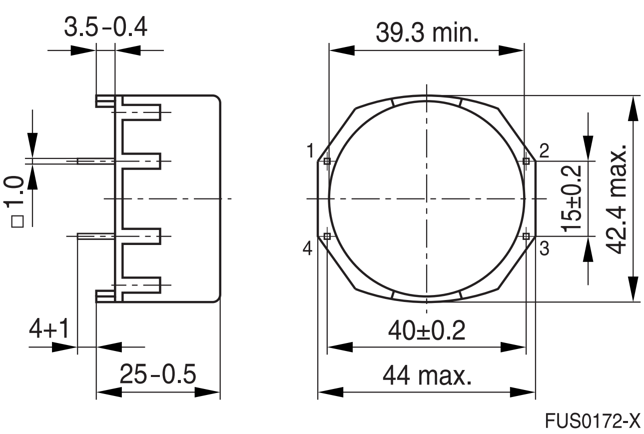


Figure g



Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

Preliminary data

Figure h

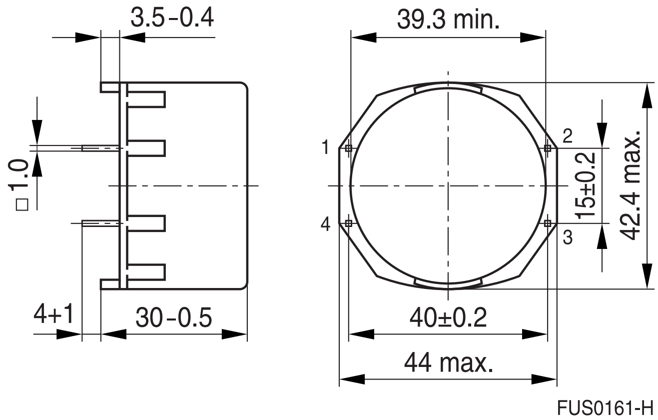


Figure i*)

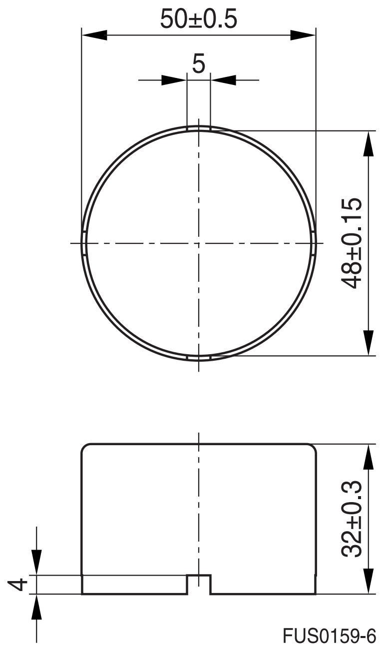
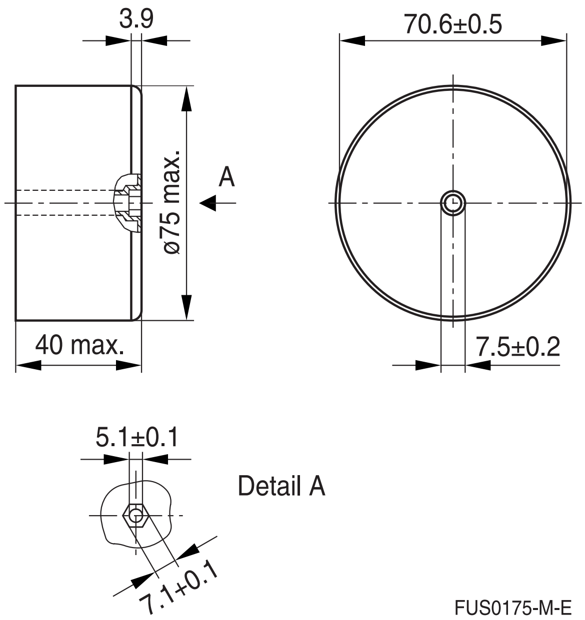


Figure j



*) Combination with base plate B64293A1200X000

Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

Preliminary data

Housings for ring cores – vertical version

Material: B64292A: GFR polycarbonate UL94 V-0
Makrolon 9415 [E41613], color code blue, BAYER MATERIALSCIENCE AG
B64292B: GFR liquid crystal polymer UL94 V-0
Vectra E130i [E83005], color code natural, TICONA

Solderability (lead-free): to IEC 60068-2-20, test Ta, + 245 ± 5 °C, 3 ± 0.3 s

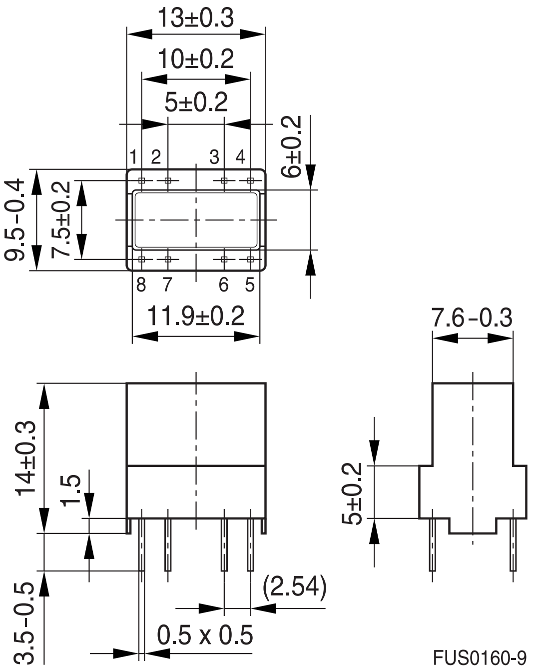
Resistance to soldering heat (wave soldering): to IEC 60068-2-20, test Tb, + 260 ± 5 °C, 10 ± 1 s

Housings – vertical version					Ordering code
Figure	Inner diamensions mm	Height mm	Lead spacing mm	Pins	
a	11.9 × 6.0	14.0	10.0 × 7.5	4	B64292A1004X000
	11.9 × 6.0	14.0	10.0 × 7.5	4	B64292B1004X000
	11.9 × 6.0	14.0	see picture	8	B64292A1008X000
b	21.0 × 10.5	25.4	10.0 × 12.5	4	B64292A1104X000
c	25.7 × 13.2	30.5	12.5 × 15.0	4	B64292A1204X000
d	29.0 × 11.3	33.2	12.5 × 15.0	4	B64292A1304X000
e	38.3 × 13.3	40.0	12.5 × 17.5	4	B64292A1404X000

1) B64292A1604X000 with unsymetrical lead spacing (12.7 × 2.54/5.08 mm)

Preliminary data

Figure a*)



*) For 4 PIN version B64292A1004X000
and B64292B1004X000 PIN 2, 3, 6 and 7 omitted

Figure b

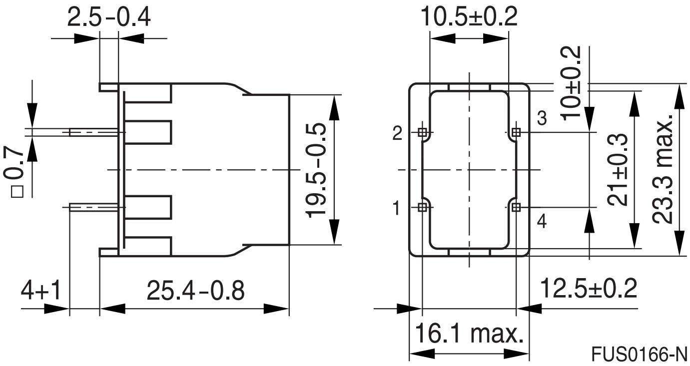
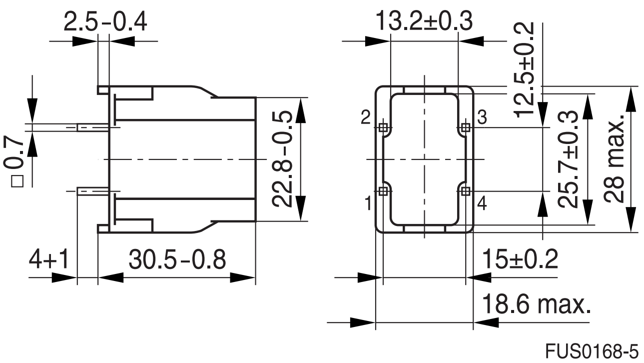


Figure c



Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

Preliminary data

Figure d

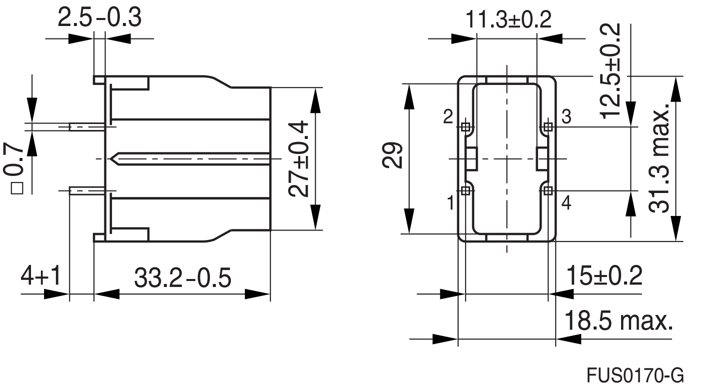
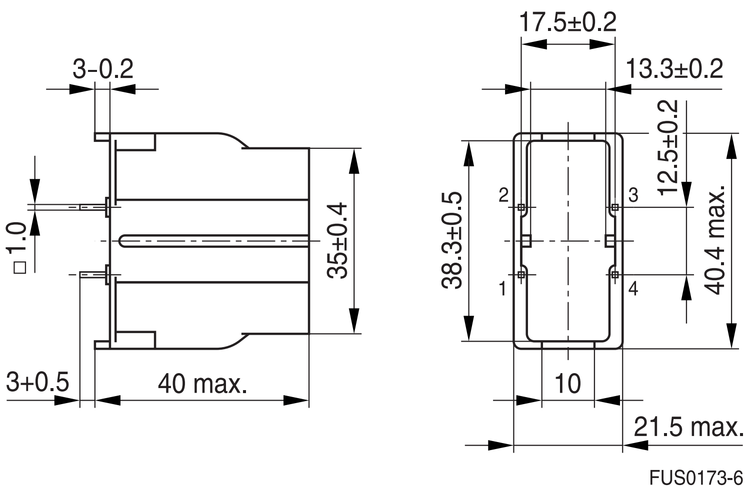


Figure e



Tolerances to ISO 2768-C unless otherwise noted.
Dimensions in mm.

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 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 chapter *"Definitions"*, section 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 chapter *"Definitions"*, section 8.2.

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.

Processing notes

- The start of the winding process should be soft. Else the flanges may be destroid.
- To strong winding forces may blast the flanges or squeeze the tube that the cores can no more be mount.
- To 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 oxyd of the tin bath or burned insulation of the wire. For detailed information see chapter *"Processing notes"*, section 8.2.
- 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.

Symbols and terms

Symbol	Meaning	Unit
A	Cross section of coil	mm^2
A_e	Effective magnetic cross section	mm^2
A_L	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; $A_R = R_{Cu}/N^2$	$\mu\Omega = 10^{-6}\ \Omega$
B	RMS value of magnetic flux density	Vs/m^2, mT
ΔB	Flux density deviation	Vs/m^2, mT
$\hat{B}$	Peak value of magnetic flux density	Vs/m^2, mT
$\Delta\hat{B}$	Peak value of flux density deviation	Vs/m^2, mT
B_{DC}	DC magnetic flux density	Vs/m^2, mT
B_R	Remanent flux density	Vs/m^2, mT
B_S	Saturation magnetization	Vs/m^2, mT
C_0	Winding capacitance	F = As/V
CDF	Core distortion factor	$mm^{-4.5}$
DF	Relative disaccommodation coefficient $DF = d/\mu_i$	
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
H	RMS value of magnetic field strength	A/m
$\hat{H}$	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	A
I_{DC}	Direct current	A
$\hat{I}$	Peak value of current	A
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
$\Delta L/L$	Relative inductance change	H
L_0	Inductance of coil without core	H
L_H	Main inductance	H
L_p	Parallel inductance	H
L_{rev}	Reversible inductance	H
L_s	Series inductance	H
l_e	Effective magnetic path length	mm
l_N	Average length of turn	mm
N	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 ($Q = \omega L/R_s = 1/\tan \delta_L$)	
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
T	Temperature	°C
ΔT	Temperature difference	K
T_C	Curie temperature	°C
t	Time	s
t_v	Pulse duty factor	
$\tan \delta$	Loss factor	
$\tan \delta_L$	Loss factor of coil	
$\tan \delta_r$	(Residual) loss factor at $H \to 0$	
$\tan \delta_e$	Relative loss factor	
$\tan \delta_h$	Hysteresis loss factor	
$\tan \delta/\mu_i$	Relative loss factor of material at $H \to 0$	
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 $\lvert Z \rvert_n = \lvert Z \rvert / N^2 \times \Sigma (l_e/A_e)$	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	$A^{-1}H^{-1/2}$
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 $\bar{\mu}$ (for parallel components)	
μ_p''	Relative imaginary (loss) component of $\bar{\mu}$ (for parallel components)	
μ_r	Relative permeability	
μ_{rev}	Relative reversible permeability	
μ_s'	Relative real (inductive) component of $\bar{\mu}$ (for series components)	
μ_s''	Relative imaginary (loss) component of $\bar{\mu}$ (for series components)	
μ_{tot}	Relative total permeability derived from the static magnetization curve	
ρ	Resistivity	Ωm^{-1}
$\Sigma l/A$	Magnetic form factor	mm^{-1}
τ_{Cu}	DC time constant $\tau_{Cu} = L/R_{Cu} = A_L/A_R$	s
ω	Angular frequency; $\omega = 2\ \Pi f$	s^{-1}

All dimensions are given in mm.

SMD Surface-mount device

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The following applies to all products named in this publication:

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