

Soft Ferrites

EP cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EP cores

CORE TYPE	V _e (mm ³)	A _e (mm ²)	MASS (g)
EP5	28.7	3.0	0.5
EP7	165	10.7	1.4
EP10	215	11.3	2.8
EP13	472	19.5	4.7
EP17	999	33.7	12
EP20	3230	78.7	27

- In accordance with IEC 62317, part 5.

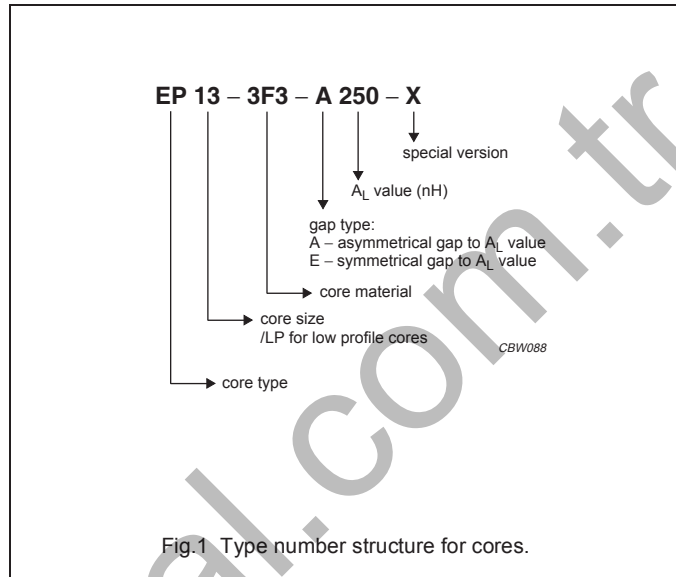


Fig.1 Type number structure for cores.

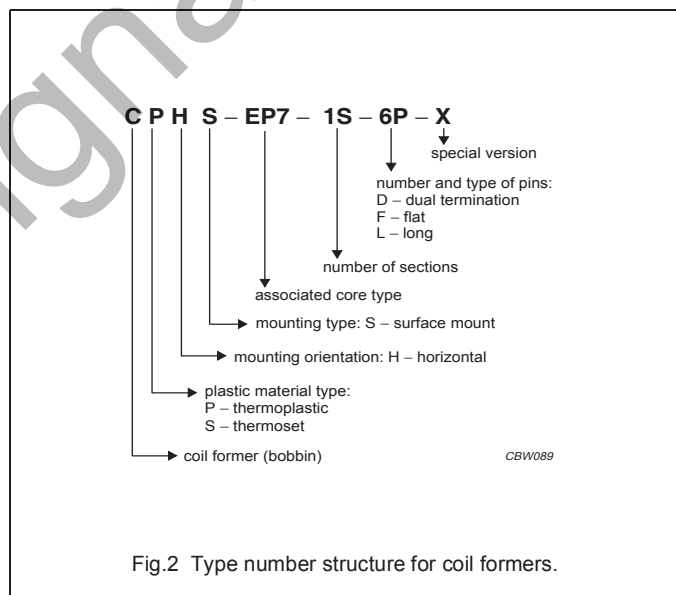
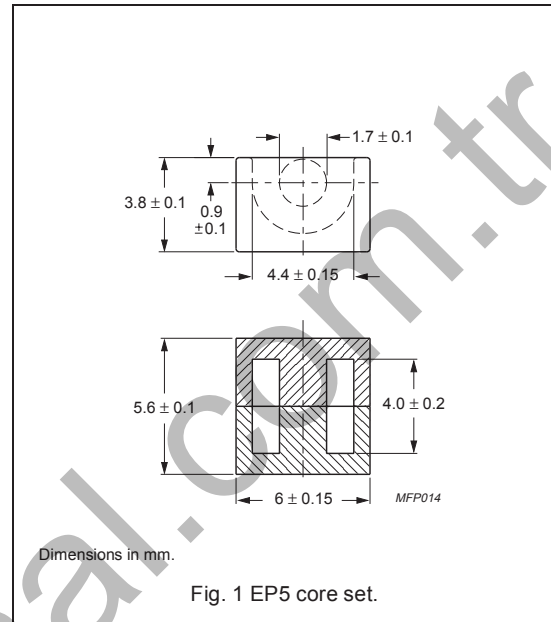


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.20	mm ⁻¹
V_e	effective volume	28.7	mm ³
l_e	effective length	9.70	mm
A_e	effective area	3.00	mm ²
A_{min}	minimum area	2.27	mm ²
m	mass of core set	≈ 0.5	g



Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94	16 ± 3 %	≈ 41	≈ 320	EP5-3C94-A16
	25 ± 3 %	≈ 64	≈ 170	EP5-3C94-A25
	40 ± 5 %	≈ 102	≈ 90	EP5-3C94-A40
	63 ± 8 %	≈ 160	≈ 50	EP5-3C94-A63
	400 ± 25 %	≈ 1020	≈ 0	EP5-3C94
3C96 <small>des</small>	380 ± 25 %	≈ 970	≈ 0	EP5-3C96
3F35 <small>des</small>	16 ± 3 %	≈ 41	≈ 320	EP5-3F35-A16
	25 ± 3 %	≈ 64	≈ 170	EP5-3F35-A25
	40 ± 5 %	≈ 102	≈ 90	EP5-3F35-A40
	63 ± 8 %	≈ 160	≈ 50	EP5-3F35-A63
	320 ± 25 %	≈ 815	≈ 0	EP5-3F35

Core sets for filter applicationsClamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	$500 \pm 25 \%$	≈ 1280	≈ 0	EP5-3B46

Core sets of high permeability gradesClamping force for A_L measurements, 10 ± 5 N.

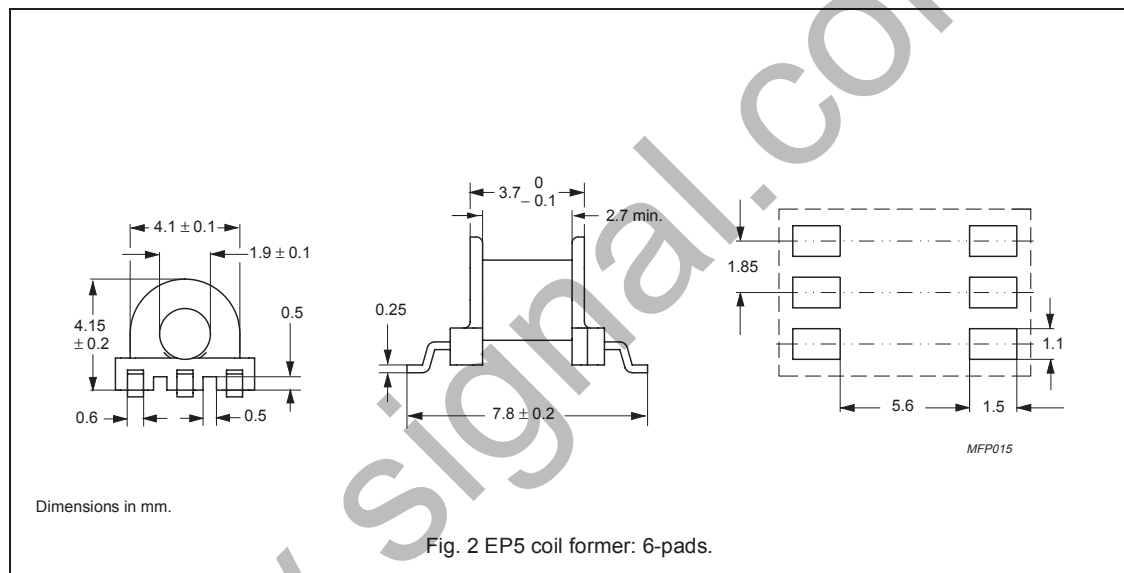
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 <small>des</small>	$16 \pm 3 \%$	≈ 41	≈ 320	EP5-3E55-A16
	$25 \pm 3 \%$	≈ 64	≈ 170	EP5-3E55-A25
	$40 \pm 5 \%$	≈ 102	≈ 90	EP5-3E55-A40
	$63 \pm 8 \%$	≈ 160	≈ 50	EP5-3E55-A63
	$2000 + 40 / - 30 \%$	≈ 5100	≈ 0	EP5-3E55
3E6	$2200 + 40 / - 30 \%$	≈ 5600	≈ 0	EP5-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B} = 100$ mT; T = 100 °C	f = 100 kHz; $\hat{B} = 200$ mT; T = 100 °C	f = 500 kHz; $\hat{B} = 50$ mT; T = 100 °C	f = 500 kHz; $\hat{B} = 100$ mT; T = 100 °C
3C94	≥ 320	≤ 0.002	≤ 0.014	–	–
3C96	≥ 340	–	≤ 0.011	≤ 0.009	–
3F35	≥ 300	–	–	≤ 0.003	≤ 0.025

COIL FORMERS**General data**

PARAMETER	SPECIFICATION
Coil former material	Liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s

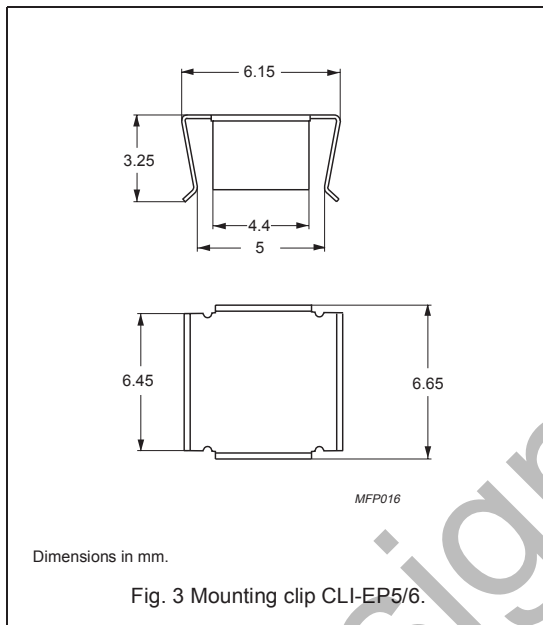
**Winding data and area product for 6-pads EP5 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	1.89	2.7	10.5	5.67	CPHS-EP5-1S-6P

MOUNTING PARTS

General data

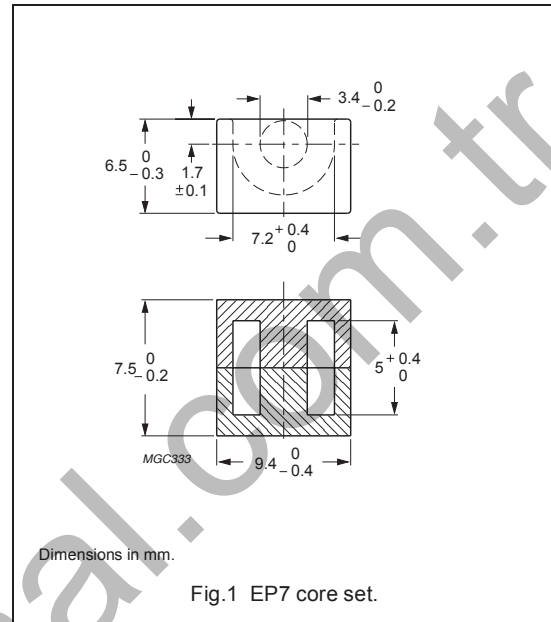
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CPHS-EP5-1S-6P	3	CLI-EP5/6



CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.45	mm ⁻¹
V_e	effective volume	165	mm ³
l_e	effective length	15.5	mm
A_e	effective area	10.7	mm ²
A_{min}	minimum area	8.55	mm ²
m	mass of core set	≈ 1.4	g



Core sets for filter applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	1500 ±25%	≈ 1730	≈ 0	EP7-3B46

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C81	25 ±3%	≈ 29	≈ 880	EP7-3C81-E25
	40 ±3%	≈ 46	≈ 480	EP7-3C81-A40
	63 ±3%	≈ 73	≈ 270	EP7-3C81-A63
	100 ±3%	≈ 115	≈ 150	EP7-3C81-A100
	160 ±5%	≈ 184	≈ 90	EP7-3C81-A160
	1300 ±25%	≈ 1500	≈ 0	EP7-3C81
3C91 <small>des</small>	1300 ±25%	≈ 1500	≈ 0	EP7-3C91
3C94	25 ±3%	≈ 29	≈ 880	EP7-3C94-E25
	40 ±3%	≈ 46	≈ 480	EP7-3C94-A40
	63 ±3%	≈ 73	≈ 270	EP7-3C94-A63
	100 ±3%	≈ 115	≈ 150	EP7-3C94-A100
	160 ±5%	≈ 184	≈ 90	EP7-3C94-A160
	1200 ±25%	≈ 1380	≈ 0	EP7-3C94

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C96 <small>des</small>	1120 \pm 25%	\approx 1290	\approx 0	EP7-3C96
3F3	25 \pm 3%	\approx 29	\approx 880	EP7-3F3-E25
	40 \pm 3%	\approx 46	\approx 480	EP7-3F3-A40
	63 \pm 3%	\approx 73	\approx 270	EP7-3F3-A63
	100 \pm 3%	\approx 115	\approx 150	EP7-3F3-A100
	160 \pm 5%	\approx 184	\approx 90	EP7-3F3-A160
	1000 \pm 25%	\approx 1150	\approx 0	EP7-3F3
3F35 <small>des</small>	850 \pm 25%	\approx 980	\approx 0	EP7-3F35

Core sets of high permeability gradesClamping force for A_L measurements, 20 \pm 10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	3400 \pm 25%	\approx 3920	EP7-3E27
3E5	5200 +40/-30%	\approx 5990	EP7-3E5
3E55 <small>des</small>	5200 +40/-30%	\approx 5990	EP7-3E55
3E6	5800 +40/-30%	\approx 6680	EP7-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; \hat{B} = 200 mT; T = 100 °C	f = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C81	≥320	≤ 0.04	–	–	–
3C91	≥320	–	≤ 0.11 ⁽¹⁾	≤ 0.06 ⁽¹⁾	–
3C94	≥320	–	≤ 0.014	≤ 0.08	–
3C96	≥340	–	≤ 0.011	≤ 0.06	≤ 0.025
3F35	≥320	–	–	–	≤ 0.015
3F3	≥315	–	≤ 0.02	–	≤ 0.035

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C	f = 500 kHz; \hat{B} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.055	–	–	–
3F35	≥320	≤ 0.02	≤ 0.15	–	–
3F3	≥315	–	–	–	–

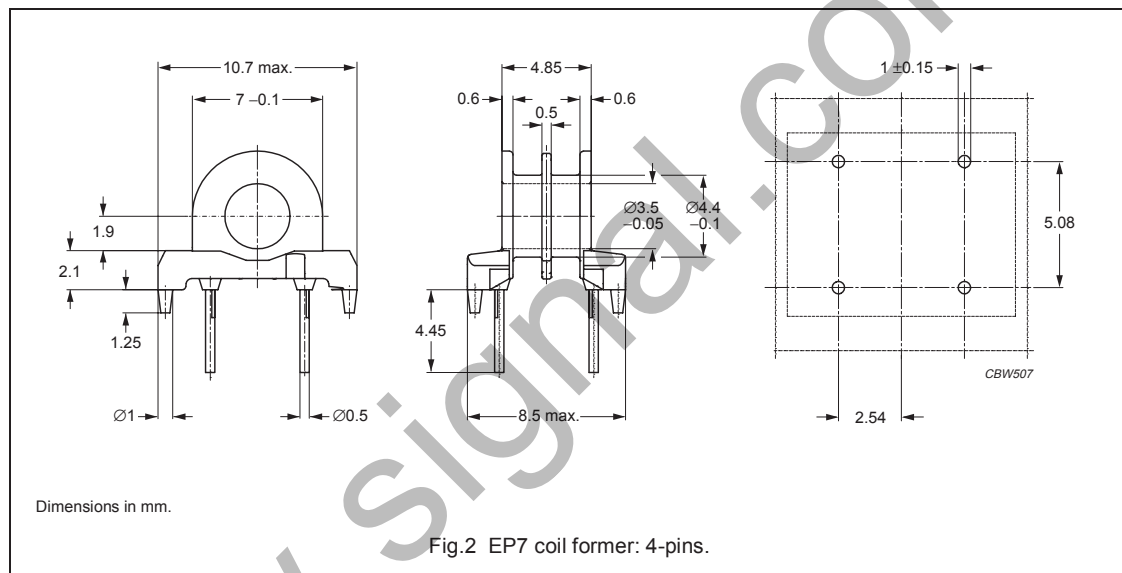
Note

1. Measured at 60 °C.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429(M)
Pin material	copper clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s

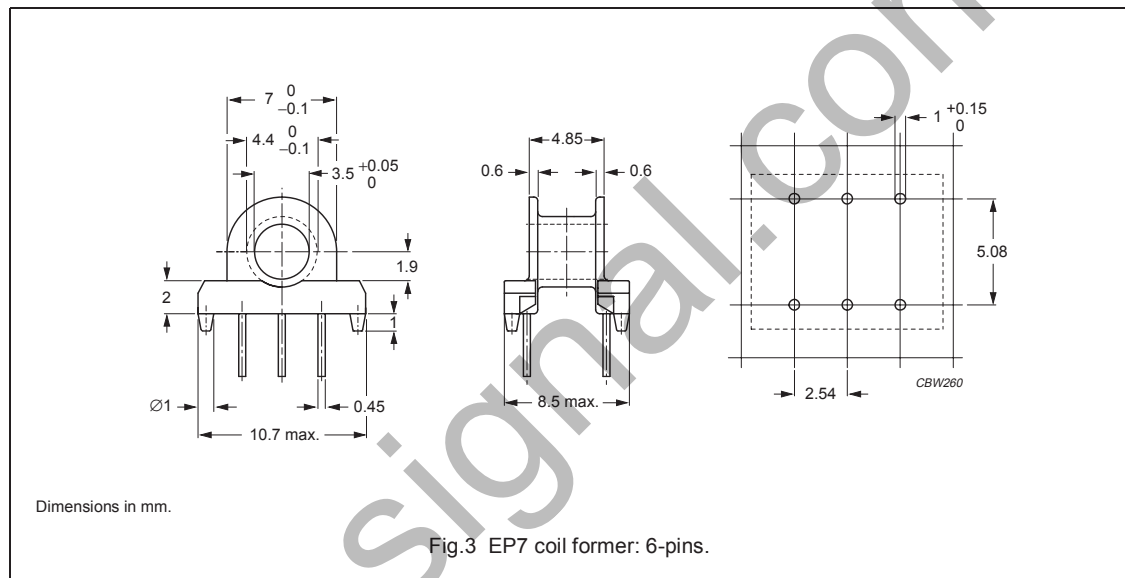


Winding data and area product for 4-pins EP7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
2	2 x 1.75	2 x 1.45	17.9	2 x 18.7	CSH-EP7-2S-4P-TA

General data CSH-EP7-1S-6P-B

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429(M)
Pin material	copper clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s

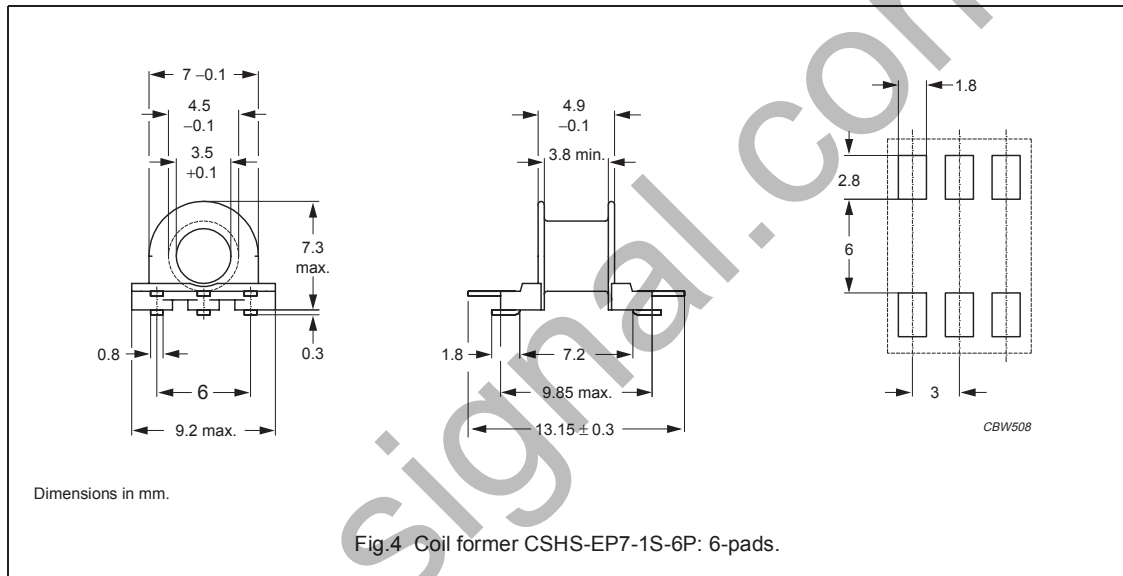


Winding data and area product for 4 and 6-pins EP7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	4.3	3.4	17.7	46.0	CSH-EP7-1S-6P-BZ
1	4.3	3.4	17.7	46.0	CSH-EP7-1S-4P-BZ

General data for 6-pads EP7 SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number: E41429 (M)
Solder pad material	copper-clad steel , tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



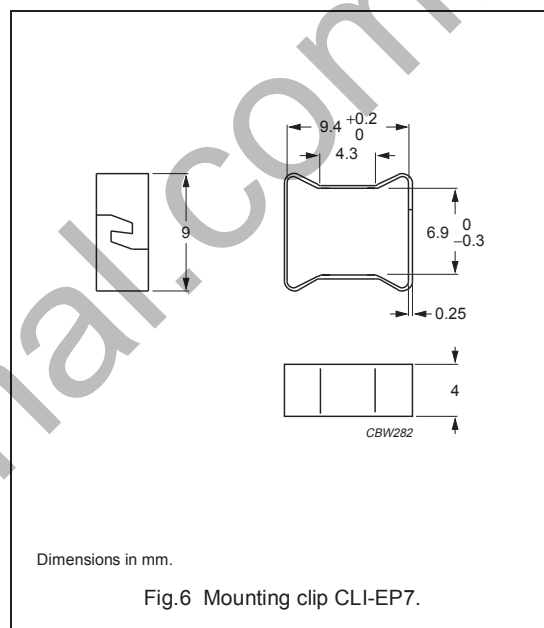
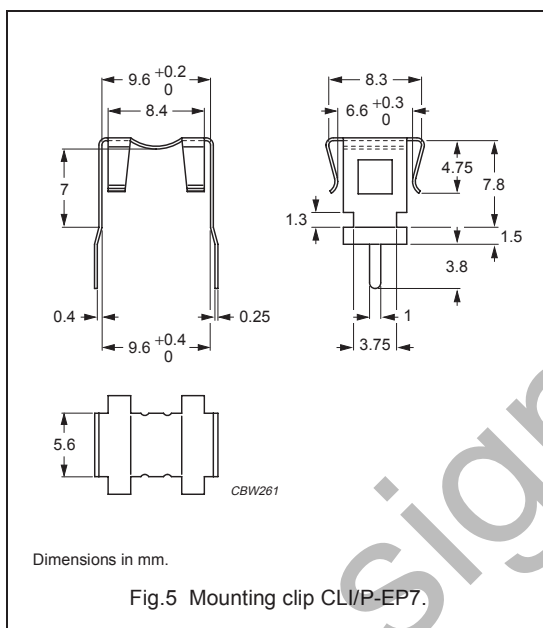
Winding data and area product for 6-pads EP7 SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	4.7	3.9	17.9	50.3	CSHS-EP7-1S-6P-Z
1	4.7	3.9	17.9	50.3	CSHS-EP7-1S-5P-Z

MOUNTING PARTS

General data

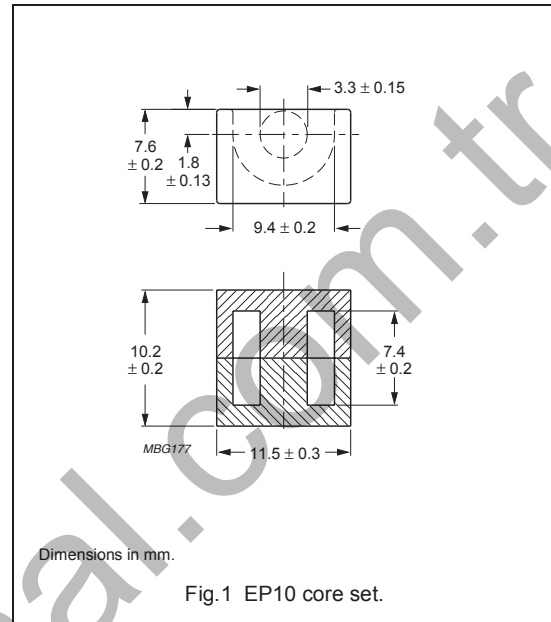
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi), tin (Sn) plated ; to be used in combination with CSH-EP7-1S-6P-BZ	5	CLI/P-EP7
Mounting clip	stainless steel (CrNi); clamping force ≈ 22 N	6	CLI-EP7



CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.70	mm ⁻¹
V_e	effective volume	215	mm ³
l_e	effective length	19.3	mm
A_e	effective area	11.3	mm ²
A_{min}	minimum area	8.55	mm ²
m	mass of core set	≈ 2.8	g



Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	1400 ±25%	≈ 1890	≈ 0	EP10-3B46

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C81	25 ±3%	≈ 34	≈ 1010	EP10-3C81-E25
	40 ±3%	≈ 54	≈ 530	EP10-3C81-A40
	63 ±3%	≈ 86	≈ 290	EP10-3C81-A63
	100 ±3%	≈ 136	≈ 160	EP10-3C81-A100
	160 ±5%	≈ 217	≈ 90	EP10-3C81-A160
	1200 ±25%	≈ 1630	≈ 0	EP10-3C81
3C91 <small>des</small>	1200 ±25%	≈ 1630	≈ 0	EP10-3C91
3C94	25 ±3%	≈ 34	≈ 1010	EP10-3C94-E25
	40 ±3%	≈ 54	≈ 530	EP10-3C94-A40
	63 ±3%	≈ 86	≈ 290	EP10-3C94-A63
	100 ±3%	≈ 136	≈ 160	EP10-3C94-A100
	160 ±5%	≈ 217	≈ 90	EP10-3C94-A160
	1140 ±25%	≈ 1550	≈ 0	EP10-3C94

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C96 <small>des</small>	1000 \pm 25%	\approx 1350	\approx 0	EP10-3C96
3F3	25 \pm 3%	\approx 34	\approx 1010	EP10-3F3-E25
	40 \pm 3%	\approx 54	\approx 530	EP10-3F3-A40
	63 \pm 3%	\approx 86	\approx 290	EP10-3F3-A63
	100 \pm 3%	\approx 136	\approx 160	EP10-3F3-A100
	160 \pm 5%	\approx 217	\approx 90	EP10-3F3-A160
1000 \pm 25%	\approx 1360	\approx 0	EP10-3F3	
3F35 <small>des</small>	800 \pm 25%	\approx 1090	\approx 0	EP10-3F35

Core sets of high permeability gradesClamping force for A_L measurements, 30 \pm 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	3400 \pm 25%	\approx 4630	\approx 0	EP10-3E27
3E5	4800 +40/-30%	\approx 6530	\approx 0	EP10-3E5
3E55 <small>des</small>	4800 +40/-30%	\approx 6530	\approx 0	EP10-3E55
3E6	5400 +40/-30%	\approx 7340	\approx 0	EP10-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	\geq 315	\leq 0.043	–	–	–
3C91	\geq 315	–	\leq 0.014 ⁽¹⁾	\leq 0.08 ⁽¹⁾	–
3C94	\geq 320	–	\leq 0.019	\leq 0.1	–
3C96	\geq 340	–	\leq 0.014	\leq 0.08	\leq 0.035
3F3	\geq 315	–	\leq 0.025	–	\leq 0.045
3F35	\geq 300	–	–	–	\leq 0.02

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	\geq 315	–	–	–	–
3C91	\geq 315	–	–	–	–
3C94	\geq 320	–	–	–	–

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C96	≥340	≤ 0.07	–	–	–
3F35	≥300	≤ 0.025	≤ 0.2	–	–
3F3	≥315	–	–	–	–

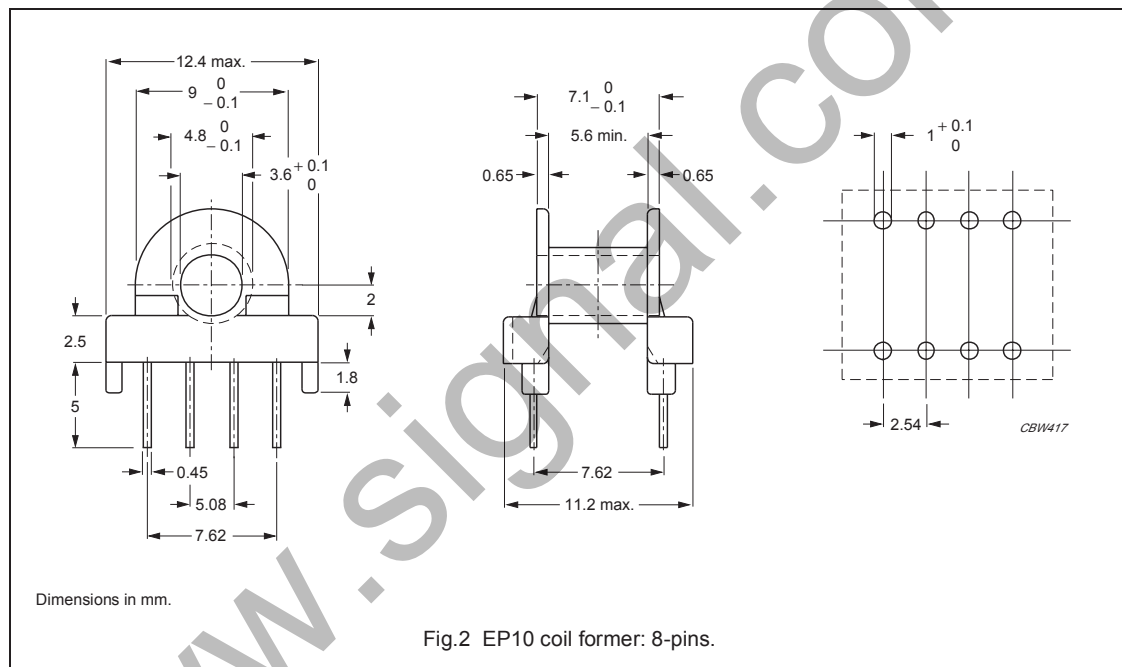
Note

1. Measured at 60 °C.

COIL FORMER

General data CSH-EP10-1S-8P

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429(M)
Pin material	copper clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s

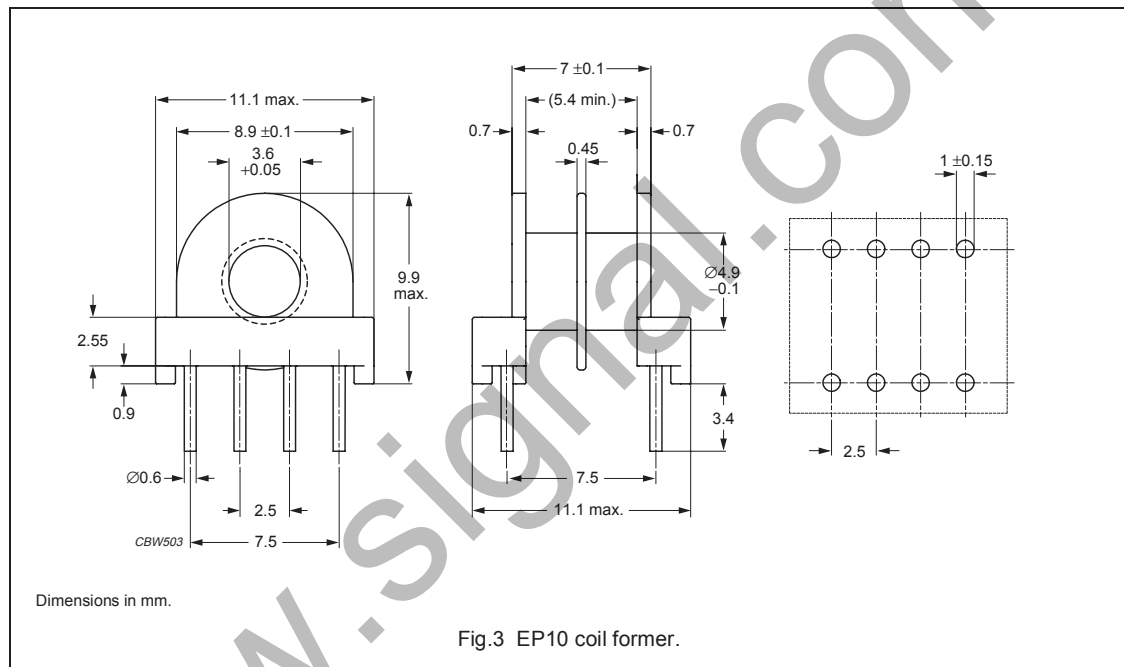


Winding data and area product for 8-pins EP10 coil former

NUMBER OF SECTIONS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	11.4	5.6	21.5	129	CSH-EP10-1S-8P

General data CSH-EP10-2S-8P

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429 (M)
Pin material	copper-clad steel, tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s

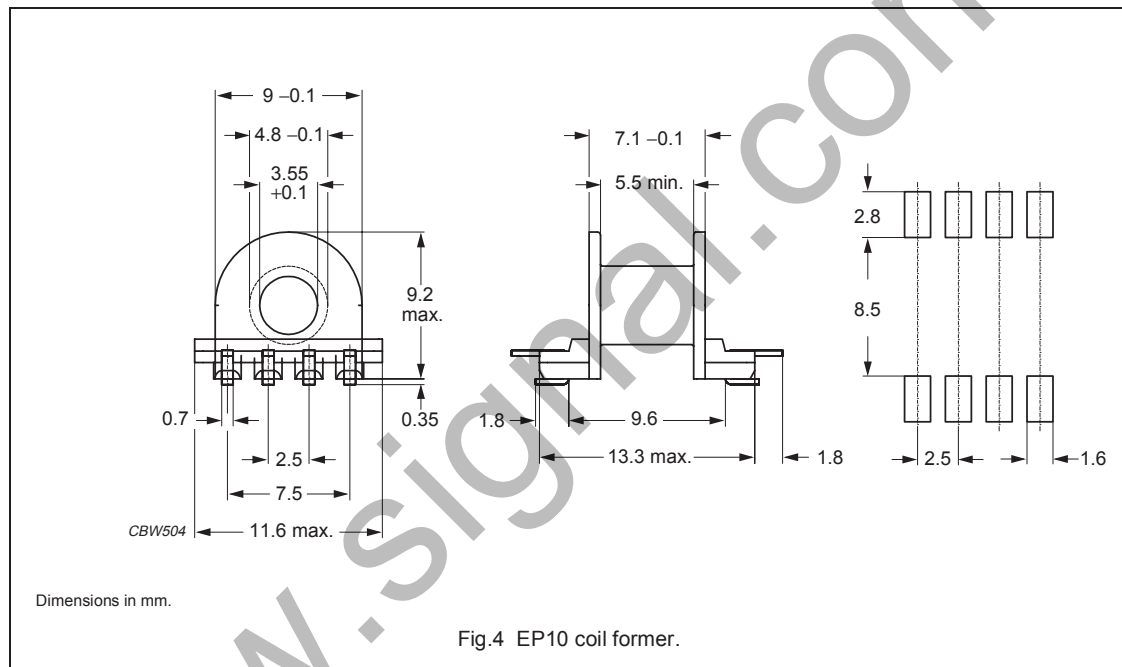


Winding data and area product for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
2	2 × 4.8	2 × 2.6	21.6	2 × 54.2	CSH-EP10-2S-8P

General data CSHS-EP10-1S-8P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429 (M)
Pin material	copper-clad steel, tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



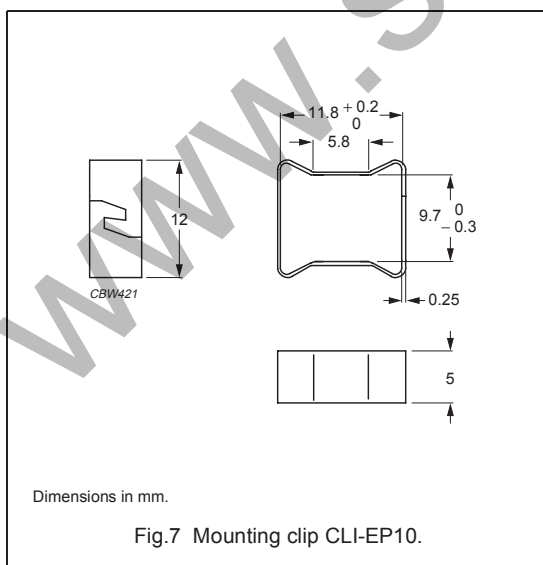
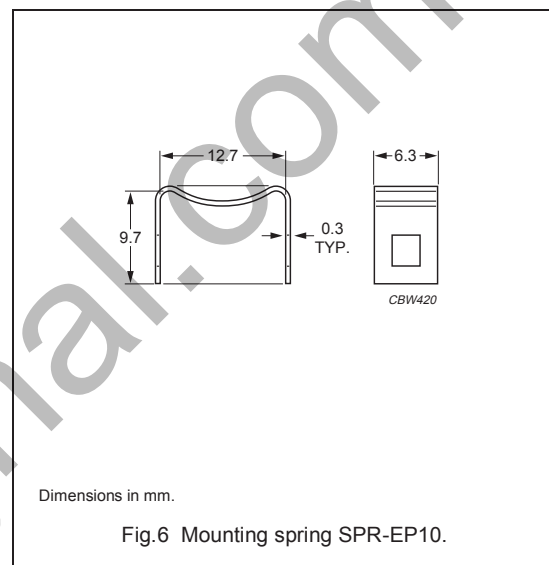
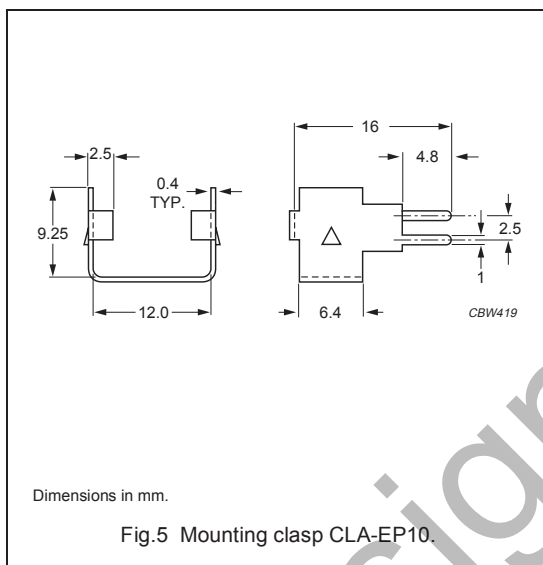
Winding data and area product for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	11.3	5.5	21.5	128	CSHS-EP10-1S-8P-T

MOUNTING PARTS

General data

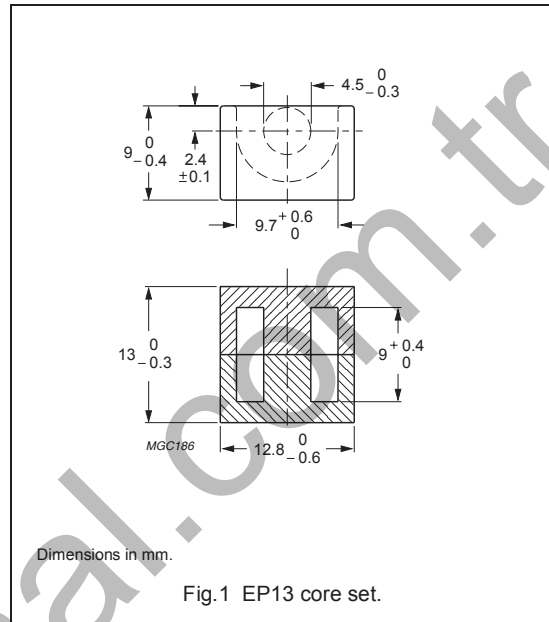
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	5	CLA-EP10
Spring	copper-nickel-zinc alloy (nickel silver)	6	SPR-EP10
Clip	stainless steel (CrNi); clamping force ≈ 27 N	7	CLI-EP10



CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.24	mm ⁻¹
V_e	effective volume	472	mm ³
l_e	effective length	24.2	mm
A_e	effective area	19.5	mm ²
A_{min}	minimum area	14.9	mm ²
m	mass of core set	≈ 4.7	g



Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	2150 ±25%	≈ 2090	≈ 0	EP13-3B46

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C81	40 ±3%	≈ 40	≈ 1000	EP13-3C81-E40
	63 ±3%	≈ 62	≈ 540	EP13-3C81-A63
	100 ±3%	≈ 99	≈ 300	EP13-3C81-A100
	160 ±3%	≈ 158	≈ 170	EP13-3C81-A160
	250 ±5%	≈ 247	≈ 100	EP13-3C81-A250
	1700 ±25%	≈ 1680	≈ 0	EP13-3C81
3C91 <small>des</small>	1700 ±25%	≈ 1680	≈ 0	EP13-3C91
3C94	40 ±3%	≈ 40	≈ 1000	EP13-3C94-E40
	63 ±3%	≈ 62	≈ 540	EP13-3C94-A63
	100 ±3%	≈ 99	≈ 300	EP13-3C94-A100
	160 ±3%	≈ 158	≈ 170	EP13-3C94-A160
	250 ±5%	≈ 247	≈ 100	EP13-3C94-A250
	1650 ±25%	≈ 1630	≈ 0	EP13-3C94

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C96 <small>des</small>	1500 \pm 25%	\approx 1480	\approx 0	EP13-3C96
3F3	40 \pm 3%	\approx 40	\approx 1000	EP13-3F3-E40
	63 \pm 3%	\approx 62	\approx 540	EP13-3F3-A63
	100 \pm 3%	\approx 99	\approx 300	EP13-3F3-A100
	160 \pm 3%	\approx 158	\approx 170	EP13-3F3-A160
	250 \pm 5%	\approx 247	\approx 100	EP13-3F3-A250
	1325 \pm 25%	\approx 1310	\approx 0	EP13-3F3
3F35 <small>des</small>	1100 \pm 25%	\approx 1090	\approx 0	EP13-3F35

Core sets of high permeability gradesClamping force for A_L measurements, 30 \pm 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	4600 \pm 25%	\approx 4540	\approx 0	EP13-3E27
3E5	7000 +40/-30%	\approx 6900	\approx 0	EP13-3E5
3E55 <small>des</small>	100 \pm 3%	\approx 99	\approx 310	EP13-3E55-A100
	160 \pm 3%	\approx 158	\approx 180	EP13-3E55-A160
	250 \pm 5%	\approx 247	\approx 110	EP13-3E55-A250
	315 \pm 5%	\approx 311	\approx 80	EP13-3E55-A315
	400 \pm 8%	\approx 395	\approx 65	EP13-3E55-A400
	630 \pm 15%	\approx 622	\approx 40	EP13-3E55-A630
	7000 +40/-30%	\approx 6900	\approx 0	EP13-3E55
3E6	8500 +40/-30%	\approx 8400	\approx 0	EP13-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; \hat{B} = 200 mT; T = 100 °C	f = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C81	≥315	≤ 0.1	–	–	–
3C91	≥315	–	≤ 0.03 ⁽¹⁾	≤ 0.17 ⁽¹⁾	–
3C94	≥320	–	≤ 0.04	≤ 0.22	–
3C96	≥340	–	≤ 0.03	≤ 0.17	≤ 0.075
3F35	≥300	–	–	–	≤ 0.04
3F3	≥315	–	≤ 0.05	–	≤ 0.1

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C	f = 500 kHz; \hat{B} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.15	–	–	–
3F35	≥300	≤ 0.06	≤ 0.45	–	–
3F3	≥315	–	–	–	–

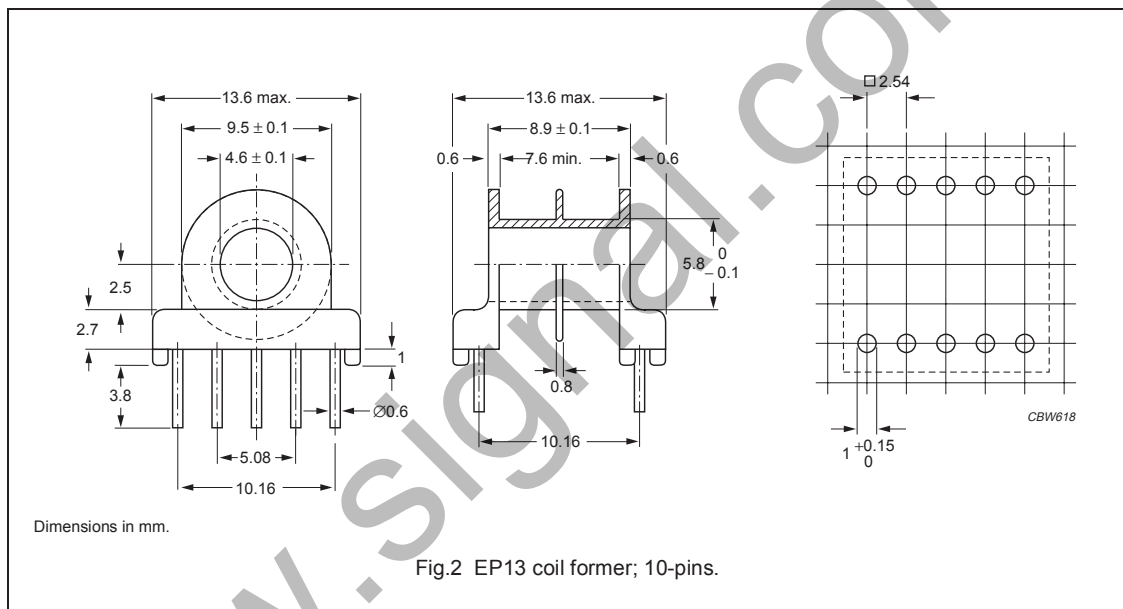
Note

1. Measured at 60 °C.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number: E41429(M)
Pin material	copper clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s

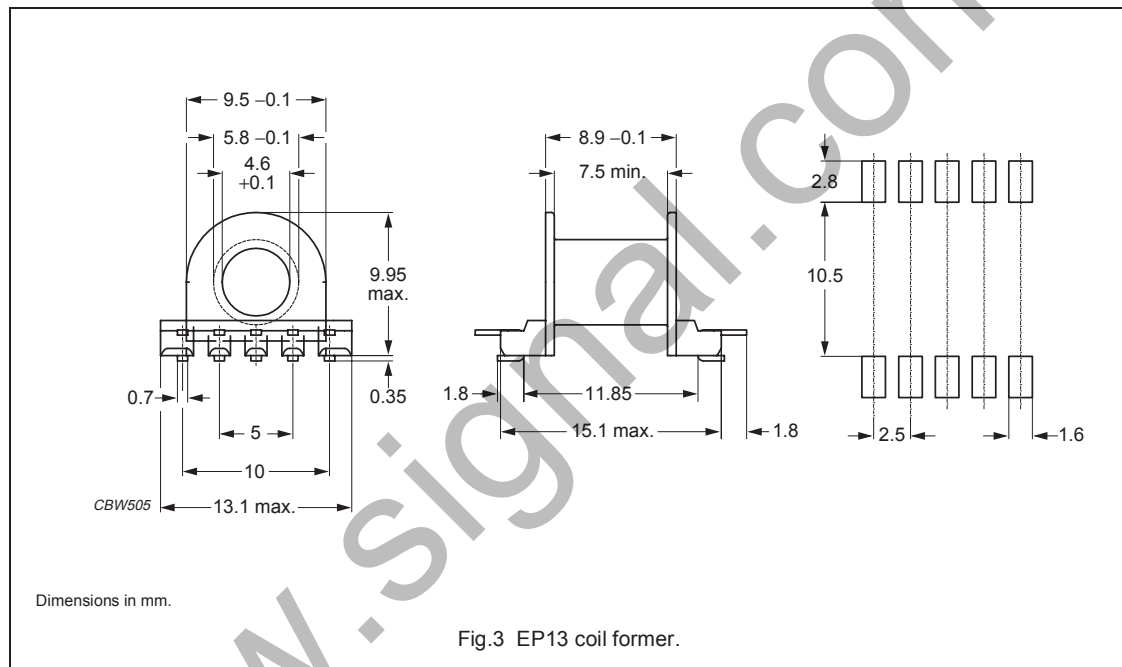


Winding data and area product for 10-pins EP13 coil former

NUMBER OF SECTIONS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	13.6	7.6	23.8	265	CSH-EP13-1S-10P
2	2 x 6.1	2 x 3.4	23.8	2 x 119	CSH-EP13-2S-10P

General data CSHS-EP13-1S-10P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429 (M)
Pin material	copper-clad steel, tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



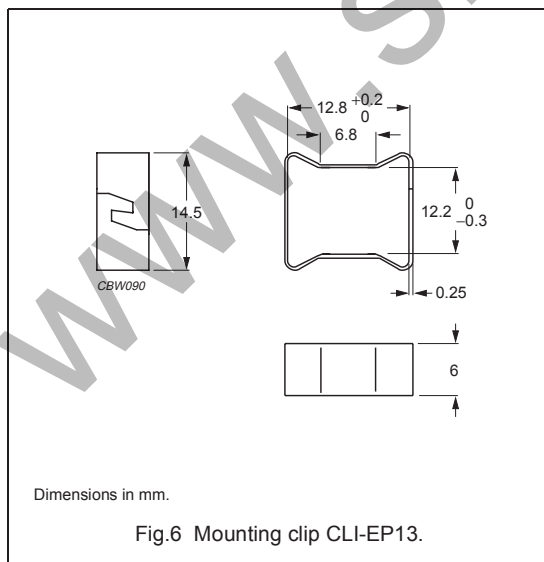
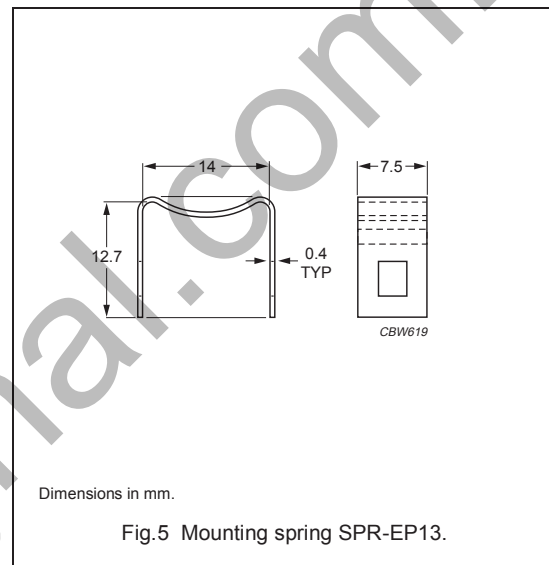
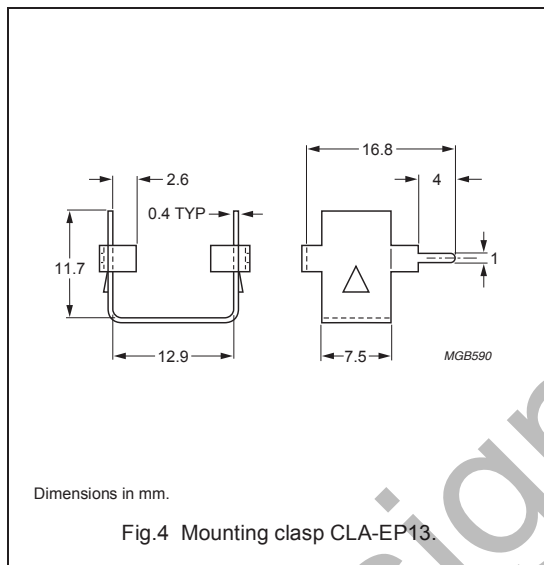
Winding data and area product for EP13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	13.5	7.5	23.8	263	CSHS-EP13-1S-10P-T

MOUNTING PARTS

General data

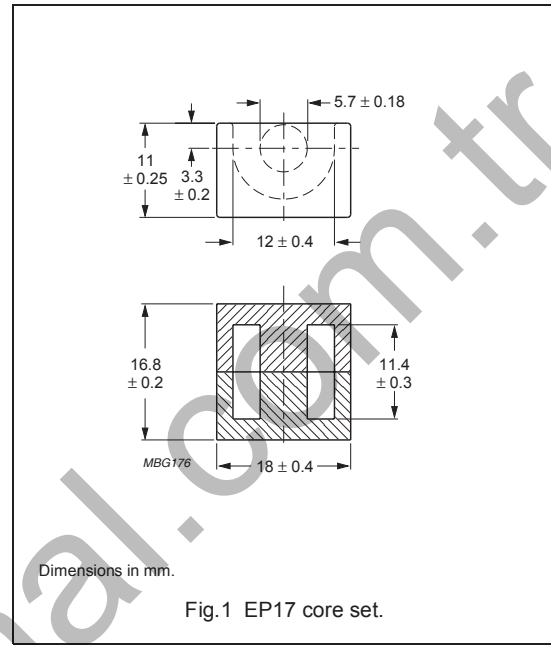
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver), tin (Sb) plated	4	CLA-EP13
Spring	copper-nickel-zinc alloy (nickel silver)	5	SPR-EP13
Clip	stainless steel (CrNi); clamping force ≈ 32 N	6	CLI-EP13



CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.870	mm ⁻¹
V_e	effective volume	999	mm ³
l_e	effective length	29.5	mm
A_e	effective area	33.7	mm ²
A_{min}	minimum area	25.5	mm ²
m	mass of set	≈ 12	g



Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ± 10 N.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C81	63 ± 3%	≈ 44	≈ 1020	EP17-3C81-E63
	100 ± 3%	≈ 70	≈ 560	EP17-3C81-A100
	160 ± 3%	≈ 111	≈ 310	EP17-3C81-A160
	250 ± 3%	≈ 174	≈ 180	EP17-3C81-A250
	315 ± 5%	≈ 219	≈ 135	EP17-3C81-A315
	2670 ± 25%	≈ 1860	≈ 0	EP17-3C81
3C91 <small>des</small>	2670 ± 25%	≈ 1860	≈ 0	EP17-3C91
3C94	63 ± 3%	≈ 44	≈ 1020	EP17-3C94-E63
	100 ± 3%	≈ 70	≈ 560	EP17-3C94-A100
	160 ± 3%	≈ 111	≈ 310	EP17-3C94-A160
	250 ± 3%	≈ 174	≈ 180	EP17-3C94-A250
	315 ± 5%	≈ 219	≈ 135	EP17-3C94-A315
	2500 ± 25%	≈ 1740	≈ 0	EP17-3C94
3C96 <small>des</small>	2200 ± 25%	≈ 1530	≈ 0	EP17-3C96

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3F3	63 $\pm 3\%$	≈ 44	≈ 1020	EP17-3F3-E63
	100 $\pm 3\%$	≈ 70	≈ 560	EP17-3F3-A100
	160 $\pm 3\%$	≈ 111	≈ 310	EP17-3F3-A160
	250 $\pm 3\%$	≈ 174	≈ 180	EP17-3F3-A250
	315 $\pm 5\%$	≈ 219	≈ 135	EP17-3F3-A315
	2200 $\pm 25\%$	≈ 1530	≈ 0	EP17-3F3

Core sets of high permeability gradesClamping force for A_L measurements, 40 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	7100 $\pm 25\%$	≈ 4950	≈ 0	EP17-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B} = 200$ mT; T = 100 °C	f = 100 kHz; $\hat{B} = 100$ mT; T = 100 °C	f = 100 kHz; $\hat{B} = 200$ mT; T = 100 °C	f = 400 kHz; $\hat{B} = 50$ mT; T = 100 °C
3C81	≥ 315	≤ 0.23	–	–	–
3C91	≥ 315	–	$\leq 0.06^{(1)}$	$\leq 0.36^{(1)}$	–
3C94	≥ 320	–	≤ 0.08	≤ 0.45	–
3C96	≥ 340	–	≤ 0.06	≤ 0.36	≤ 0.15
3F3	≥ 315	–	≤ 0.15	–	≤ 0.2

Properties of core sets under power conditions (continued)

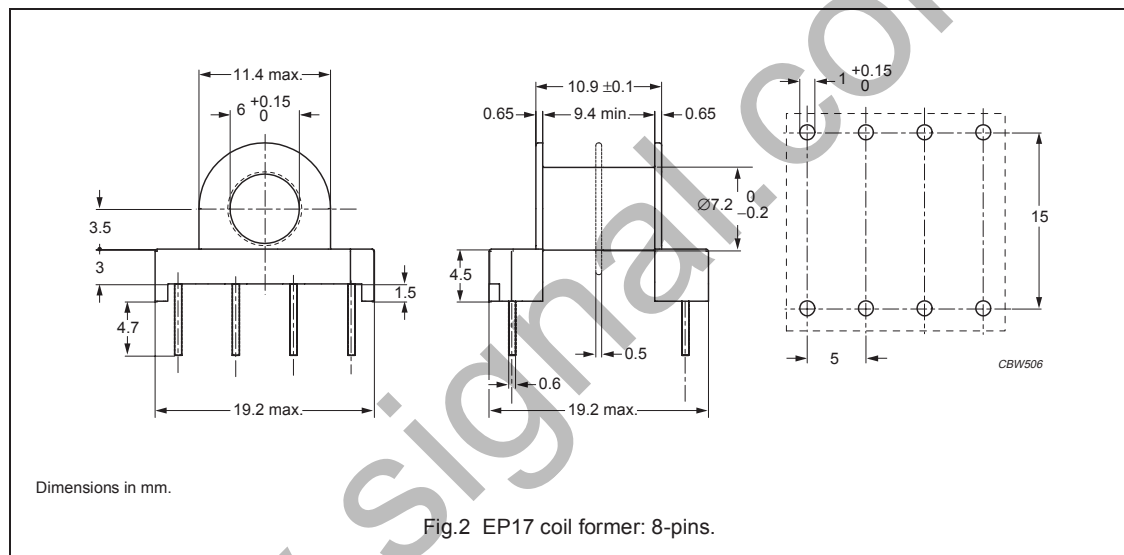
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B} = 50$ mT; T = 100 °C	f = 500 kHz; $\hat{B} = 100$ mT; T = 100 °C	f = 1 MHz; $\hat{B} = 30$ mT; T = 100 °C	f = 3 MHz; $\hat{B} = 10$ mT; T = 100 °C
3C81	≥ 315	–	–	–	–
3C91	≥ 315	–	–	–	–
3C94	≥ 320	–	–	–	–
3C96	≥ 340	≤ 0.3	–	–	–
3F3	≥ 315	–	–	–	–

Note

1. Measured at 60 °C.

COIL FORMER**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429 (M)
Pin material	copper clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s

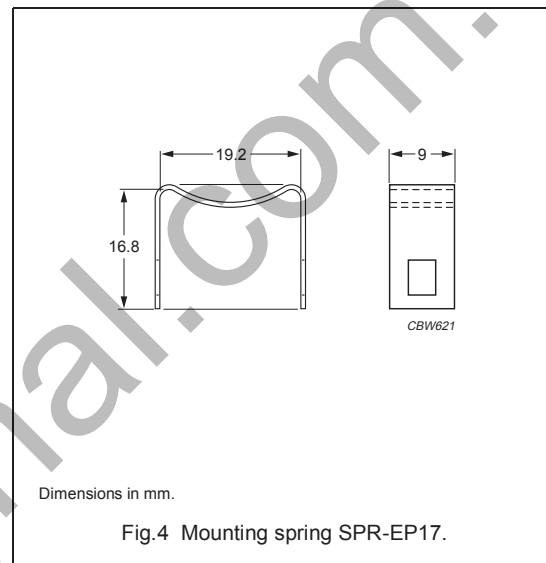
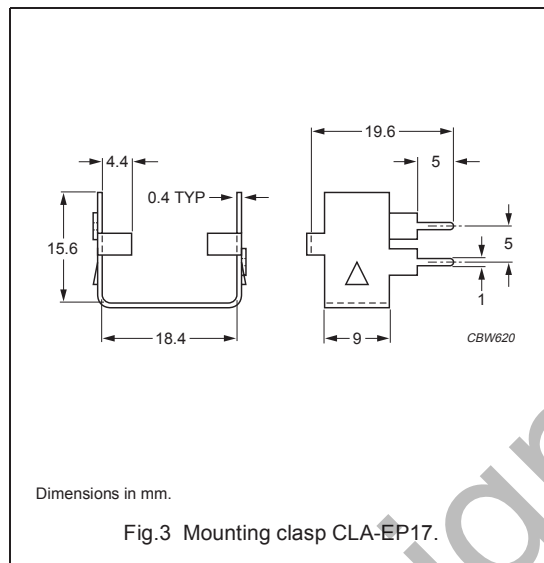
**Winding data and area product for 8-pins EP17 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	18.0	9.45	28.9	607	CSH-EP17-1S-8P
2	2 x 8.3	2 x 4.6	28.9	2 x 280	CSH-EP17-2S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-tin alloy (CuSn), tin (Sn) plated	3	CLA-EP17
Spring	copper-tin alloy (CuSn), tin (Sn) plated	4	SPR-EP17



CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.520	mm ⁻¹
V_e	effective volume	3230	mm ³
l_e	effective length	41.1	mm
A_e	effective area	78.7	mm ²
A_{min}	minimum area	60.8	mm ²
m	mass of set	≈27	g

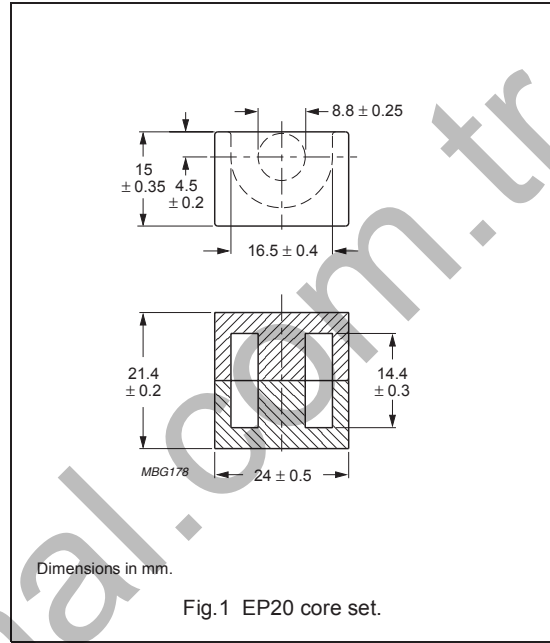


Fig.1 EP20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 67	≈ 790	EP20-3C81-E160
	250 ±3%	≈ 104	≈ 460	EP20-3C81-A250
	315 ±3%	≈ 131	≈ 350	EP20-3C81-A315
	400 ±3%	≈ 166	≈ 260	EP20-3C81-A400
	630 ±5%	≈ 262	≈ 150	EP20-3C81-A630
	4900 ±25%	≈ 2040	≈ 0	EP20-3C81
3C91 <small>des</small>	4900 ±25%	≈ 2040	≈ 0	EP20-3C91
3C94	160 ±3%	≈ 67	≈ 790	EP20-3C94-E160
	250 ±3%	≈ 104	≈ 460	EP20-3C94-A250
	315 ±3%	≈ 131	≈ 350	EP20-3C94-A315
	400 ±3%	≈ 166	≈ 260	EP20-3C94-A400
	630 ±5%	≈ 262	≈ 150	EP20-3C94-A630
	4435 ±25%	≈ 1840	≈ 0	EP20-3C94
3C96 <small>des</small>	3850 ±25%	≈ 1600	≈ 0	EP20-3C96

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3F3	160 \pm 3%	\approx 67	\approx 790	EP20-3F3-E160
	250 \pm 3%	\approx 104	\approx 460	EP20-3F3-A250
	315 \pm 3%	\approx 131	\approx 350	EP20-3F3-A315
	400 \pm 3%	\approx 166	\approx 260	EP20-3F3-A400
	630 \pm 5%	\approx 262	\approx 150	EP20-3F3-A630
	3550 \pm 25%	\approx 1480	\approx 0	EP20-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; \hat{B} = 200 mT; T = 100 °C	f = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C81	\geq 315	\leq 0.75	–	–	–
3C91	\geq 315	–	\leq 0.2 ⁽¹⁾	\leq 1.3 ⁽¹⁾	–
3C94	\geq 320	–	\leq 0.25	\leq 1.6	–
3C96	\geq 340	–	\leq 0.2	\leq 1.3	\leq 0.5
3F3	\geq 315	–	\leq 0.36	–	\leq 0.62

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C	f = 500 kHz; \hat{B} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C81	\geq 315	–	–	–	–
3C91	\geq 315	–	–	–	–
3C94	\geq 320	–	–	–	–
3C96	\geq 340	\leq 1.0	–	–	–
3F3	\geq 315	–	–	–	–

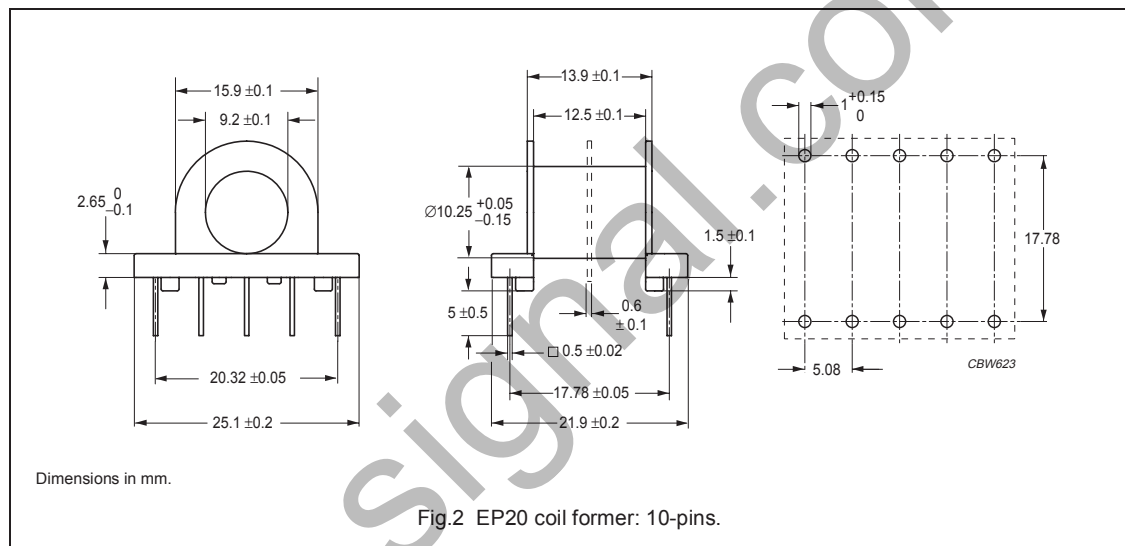
Note

1. Measured at 60 °C.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429(M)
Pin material	copper-clad steel, tin (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



Winding data and area product for 10-pins EP20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm ²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	40.3	12.4	39.4	3170	CSH-EP20-1S-10P-T
2	2 x 19.0	2 x 5.95	39.4	2 x 1500	CSH-EP20-2S-10P-T

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, tin (Sn) plated (thickness 3-5 microns)	3	CLA-EP20-Z
Spring	copper-tin alloy (CuSn), tin (Sn) plated	4	SPR-EP20-Z

