

Soft Ferrites

EFD cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EFD cores

CORE TYPE	V _e (mm ³)	A _e (mm ²)	MASS (g)
EFD10/5/3	171	7.2	0.45
EFD12/6/3.5	325	11.4	0.9
EFD15/8/5	510	15.0	1.4
EFD20/10/7	1460	31.0	3.5
EFD25/13/9	3300	58.0	8
EFD30/15/9	4700	69.0	12

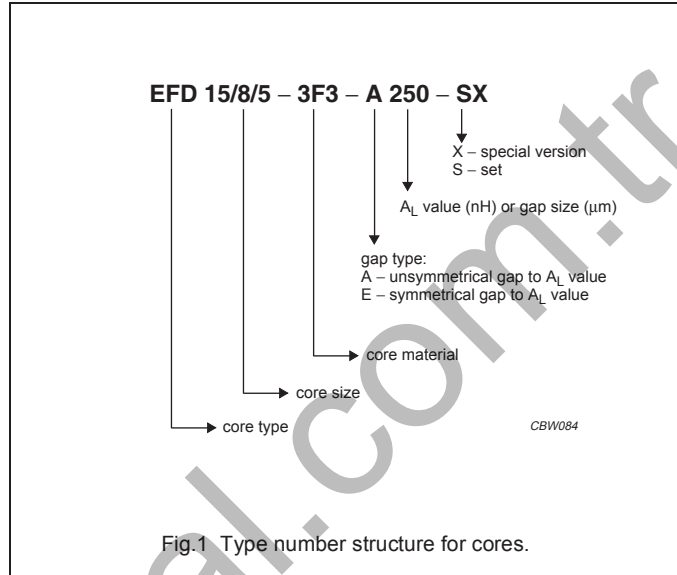


Fig.1 Type number structure for cores.

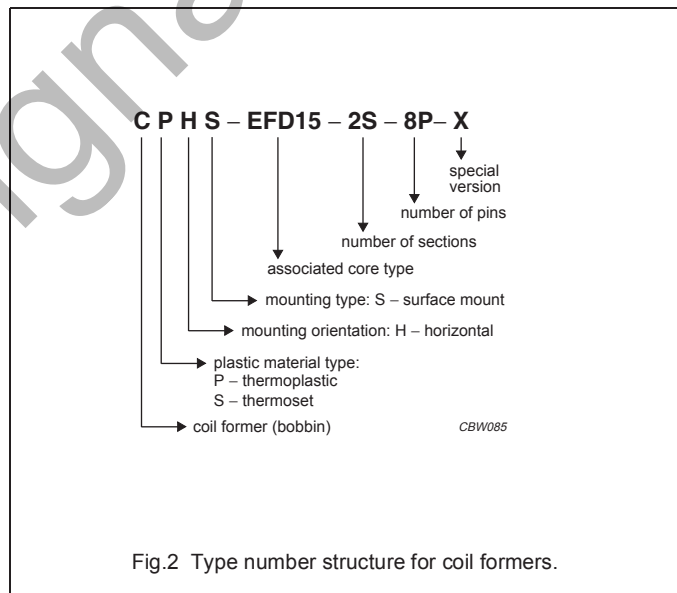
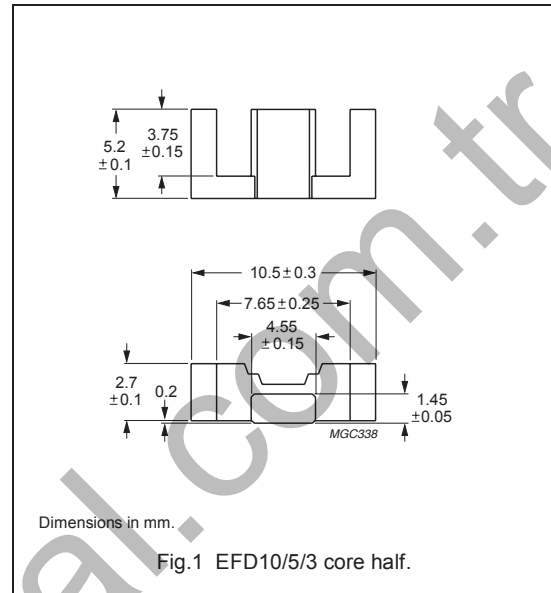


Fig.2 Type number structure for coil formers.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.29	mm ⁻¹
V_e	effective volume	171	mm ³
l_e	effective length	23.7	mm
A_e	effective area	7.2	mm ²
A_{min}	minimum area	6.5	mm ²
m	mass of core half	≈ 0.45	g



Core sets

Clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μ m)	TYPE NUMBER
3C90	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3C90-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3C90-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3C90-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10/5/3-3C90-S
3C94	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3C94-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3C94-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3C94-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10/5/3-3C94-S
3C96 <small>des</small>	525 ±25%	≈ 1360	≈ 0	EFD10/5/3-3C96-S
3F3	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3F3-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3F3-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3F3-A63-S
	500 ±25%	≈ 1290	≈ 0	EFD10/5/3-3F3-S
3F35 <small>des</small>	400 ±25%	≈ 1030	≈ 0	EFD10/5/3-3F35-S
3F4 <small>des</small>	25 ±5%	≈ 66	≈ 570	EFD10/5/3-3F4-A25-S
	40 ±8%	≈ 105	≈ 280	EFD10/5/3-3F4-A40-S
	63 ±10%	≈ 165	≈ 150	EFD10/5/3-3F4-A63-S
	280 ±25%	≈ 730	≈ 0	EFD10/5/3-3F4-S
3F45 <small>prot</small>	280 ±25%	≈ 730	≈ 0	EFD10/5/3-3F45-S

Properties of core sets under power conditions

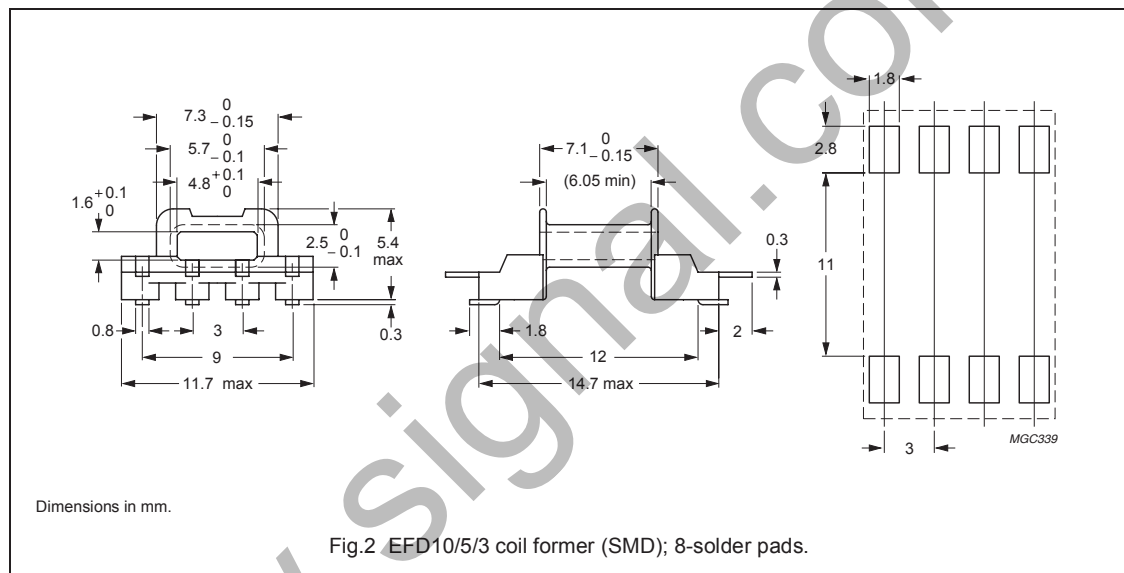
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	≥320	≤ 0.019	–	–	–
3C94	≥320	≤ 0.015	≤ 0.09	–	–
3C96	≥340	≤ 0.01	≤ 0.07	≤ 0.03	≤ 0.06
3F35	≥300	–	–	≤ 0.015	≤ 0.03
3F3	≥315	≤ 0.020	–	≤ 0.035	–
3F4	≥250	–	–	–	–

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} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥300	≤ 0.2	–	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	≤ 0.05	–	≤ 0.08
3F45	≥250	–	≤ 0.04	≤ 0.15	≤ 0.065

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)
Solder pad 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

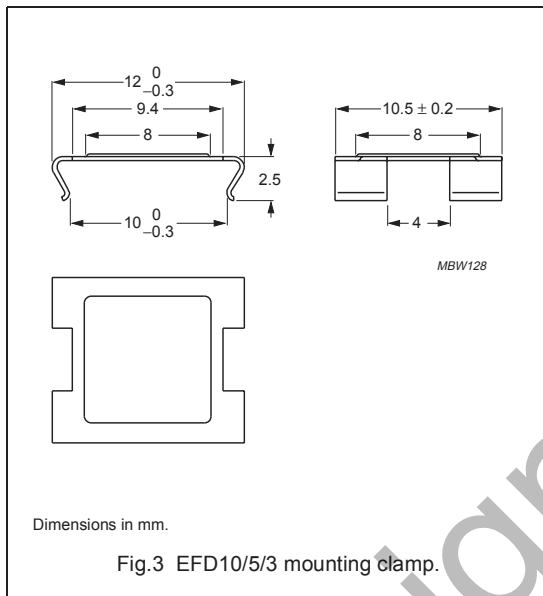
**Winding data and area product for EFD10/5/3 coil former (SMD) with 8-solder pads**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	MINIMUM WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	8	4.2	6.05	14.8	30.24	CPHS-EFD10-1S-8P

MOUNTING PARTS

General data

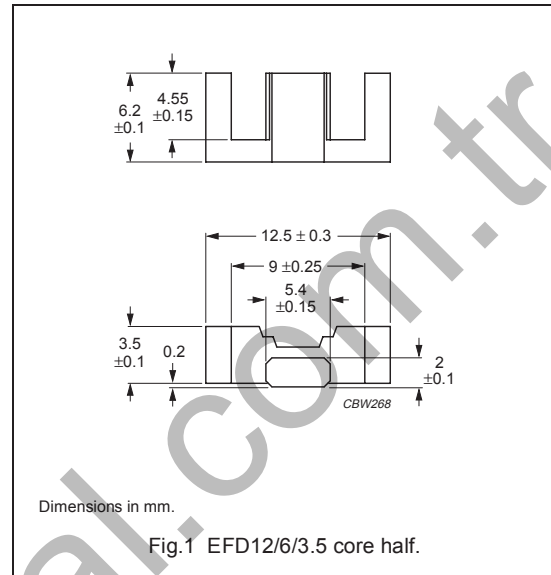
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 15 N	3	CLM-EFD10



CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.50	mm ⁻¹
V_e	effective volume	325	mm ³
l_e	effective length	28.5	mm
A_e	effective area	11.4	mm ²
A_{min}	minimum area	10.7	mm ²
m	mass of core half	≈ 0.9	g



Core sets

Clamping force for A_L measurements, 15 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	40 ± 5%	≈ 80	≈ 540	EFD12/6/3.5-3C90-A40-S
	63 ± 8%	≈ 125	≈ 290	EFD12/6/3.5-3C90-A63-S
	100 ± 10%	≈ 200	≈ 160	EFD12/6/3.5-3C90-A100-S
	825 ± 25%	≈ 1610	≈ 0	EFD12/6/3.5-3C90-S
3C94	40 ± 5%	≈ 80	≈ 540	EFD12/6/3.5-3C94-A40-S
	63 ± 8%	≈ 125	≈ 290	EFD12/6/3.5-3C94-A63-S
	100 ± 10%	≈ 200	≈ 160	EFD12/6/3.5-3C94-A100-S
	825 ± 25%	≈ 1610	≈ 0	EFD12/6/3.5-3C94-S
3C96 <small>des</small>	750 ± 25%	≈ 1460	≈ 0	EFD12/6/3.5-3C96-S
3F3	40 ± 5%	≈ 80	≈ 540	EFD12/6/3.5-3F3-A40-S
	63 ± 8%	≈ 125	≈ 290	EFD12/6/3.5-3F3-A63-S
	100 ± 10%	≈ 200	≈ 160	EFD12/6/3.5-3F3-A100-S
	700 ± 25%	≈ 1370	≈ 0	EFD12/6/3.5-3F3-S
3F35 <small>des</small>	550 ± 25%	≈ 1070	≈ 0	EFD12/6/3.5-3F35-S
3F4 <small>des</small>	40 ± 5%	≈ 80	≈ 500	EFD12/6/3.5-3F4-A40-S
	63 ± 8%	≈ 125	≈ 260	EFD12/6/3.5-3F4-A63-S
	100 ± 10%	≈ 200	≈ 130	EFD12/6/3.5-3F4-A100-S
	380 ± 25%	≈ 730	≈ 0	EFD12/6/3.5-3F4-S
3F45 <small>prot</small>	380 ± 25%	≈ 730	≈ 0	EFD12/6/3.5-3F45-S

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 = 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	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	≥320	≤ 0.036	–	–	–
3C94	≥320	≤ 0.029	≤ 0.2	–	–
3C96	≥340	≤ 0.022	≤ 0.15	≤ 0.06	≤ 0.12
3F35	≥300	–	–	≤ 0.03	≤ 0.045
3F3	≥315	≤ 0.04	–	≤ 0.065	–
3F4	≥250	–	–	–	–

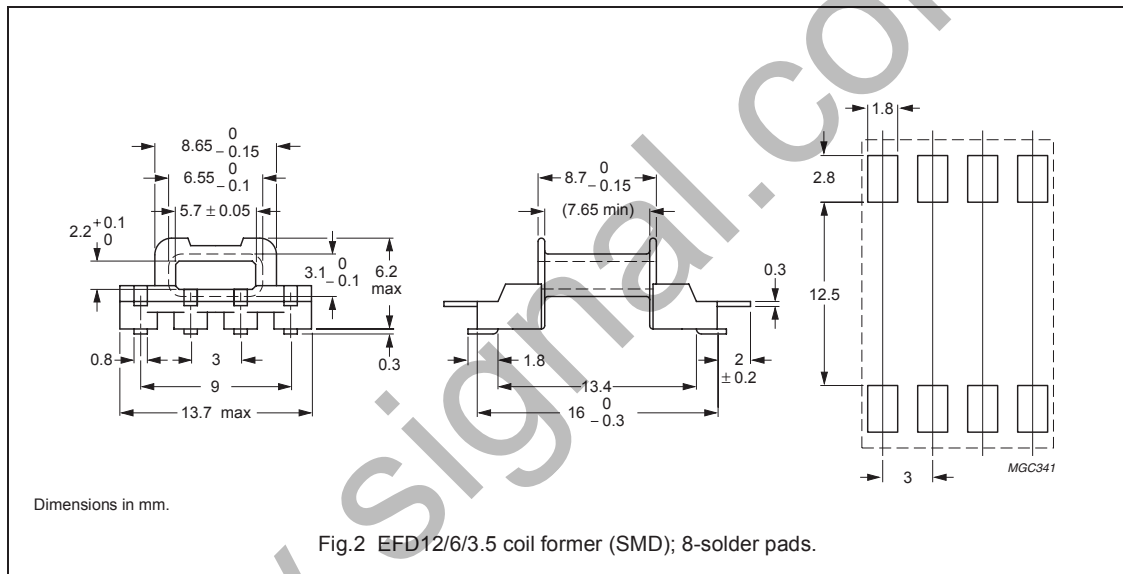
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; \hat{B} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	–	–	–	–
3F35	≥300	≤ 0.35	–	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	≤ 0.095	–	≤ 0.15
3F45	≥250	–	≤ 0.075	≤ 0.28	≤ 0.12

COIL FORMERS

General data

ITEM	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E83005(M)
Solder pad 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



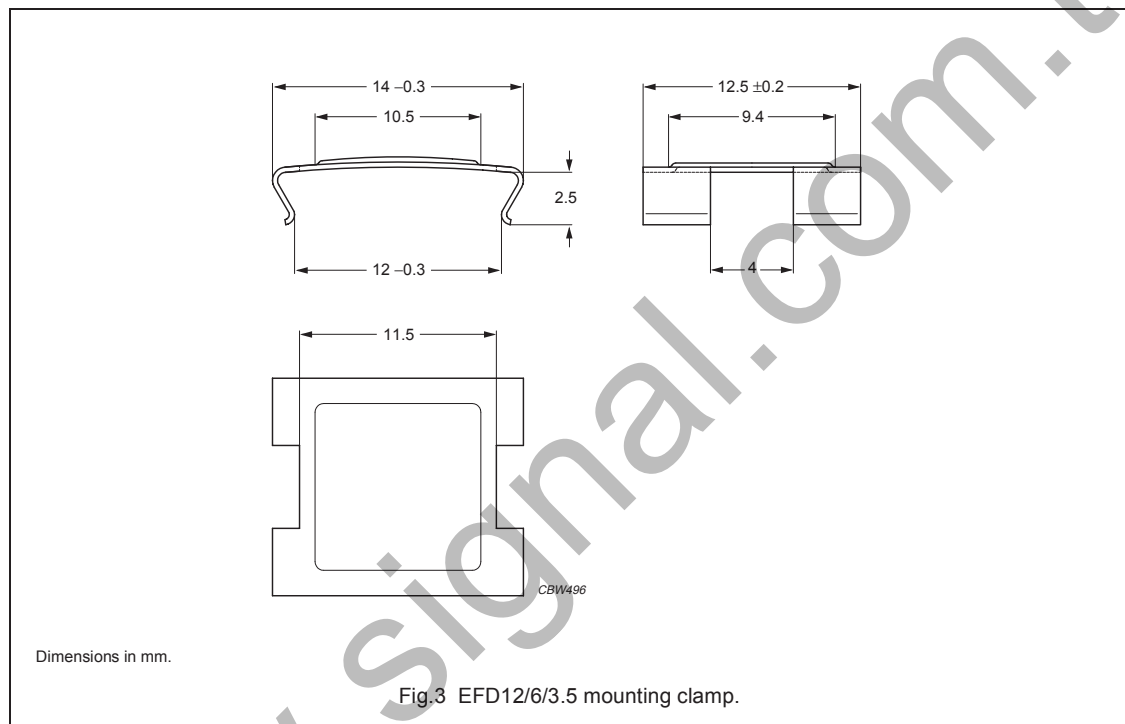
Winding data and area product for EFD12/6/3.5 coil former (SMD) with 8-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	MINIMUM WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	8	6.5	7.65	18.6	74.1	CPHS-EFD12-1S-8P-Z

MOUNTING PARTS

General data

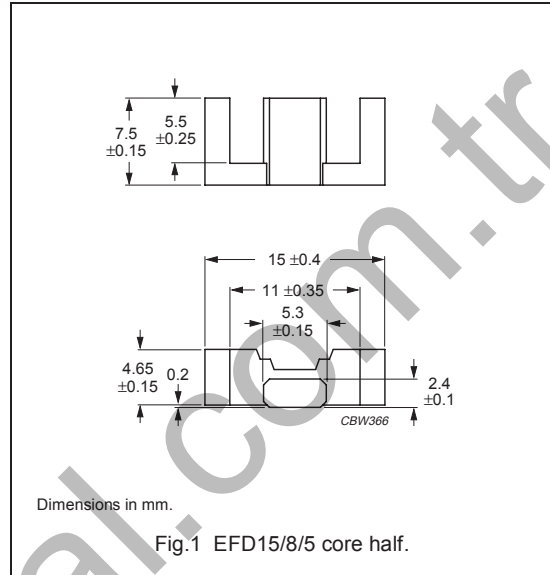
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 20 N	3	CLM-EFD12



CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.27	mm ⁻¹
V_e	effective volume	510	mm ³
l_e	effective length	34.0	mm
A_e	effective area	15.0	mm ²
A_{min}	minimum area	12.2	mm ²
m	mass of core half	≈ 1.4	g



Core sets

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 115	≈ 400	EFD15/8/5-3C90-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15/8/5-3C90-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15/8/5-3C90-A160-S
	950 ±25%	≈ 1700	≈ 0	EFD15/8/5-3C90-S
3C94	63 ±5%	≈ 115	≈ 400	EFD15/8/5-3C94-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15/8/5-3C94-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15/8/5-3C94-A160-S
	950 ±25%	≈ 1700	≈ 0	EFD15/8/5-3C94-S
3C95 <small>des</small>	1140 ±25%	≈ 2070	≈ 0	EFD15/8/5-3C95-S
3C96 <small>des</small>	850 ±25%	≈ 1520	≈ 0	EFD15/8/5-3C96-S
3F3	63 ±5%	≈ 115	≈ 400	EFD15/8/5-3F3-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15/8/5-3F3-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15/8/5-3F3-A160-S
	780 ±25%	≈ 1400	≈ 0	EFD15/8/5-3F3-S
3F35 <small>des</small>	630 ±25%	≈ 1130	≈ 0	EFD15/8/5-3F35-S
3F4 <small>des</small>	63 ±5%	≈ 115	≈ 360	EFD15/8/5-3F4-A63-S
	100 ±8%	≈ 180	≈ 190	EFD15/8/5-3F4-A100-S
	160 ±10%	≈ 290	≈ 90	EFD15/8/5-3F4-A160-S
	400 ±25%	≈ 720	≈ 0	EFD15/8/5-3F4-S
3F45 <small>prot</small>	400 ±25%	≈ 720	≈ 0	EFD15/8/5-3F45-S

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 = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 25 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C	f = 500 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	≥320	≤ 0.057	–	–	–	–
3C94	≥320	≤ 0.045	–	≤ 0.28	–	–
3C95	≥320	–	≤ 0.28	≤ 0.27	–	–
3C96	≥340	≤ 0.035	–	≤ 0.22	≤ 0.09	≤ 0.19
3F35	≥300	–	–	–	≤ 0.05	≤ 0.06
3F3	≥315	≤ 0.06	–	–	≤ 0.1	–
3F4	≥250	–	–	–	–	–

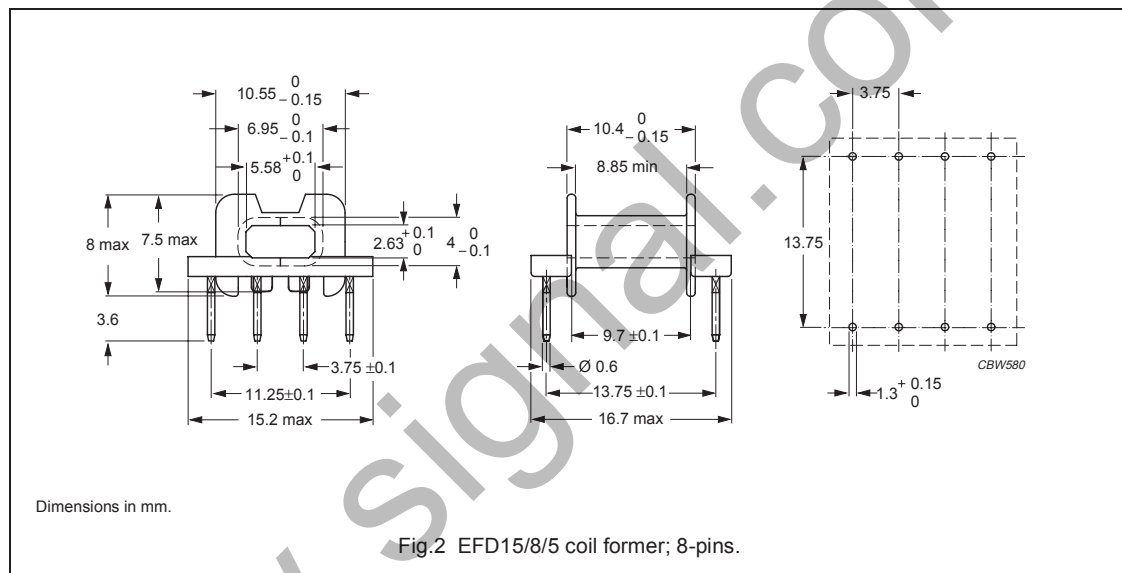
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; \hat{B} = 100 mT; T = 100 °C	f = 1 MHz; \hat{B} = 30 mT; T = 100 °C	f = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C95	≥320	–	–	–	–
3C96	≥340	–	–	–	–
3F35	≥300	≤ 0.5	–	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	≤ 0.15	–	≤ 0.24
3F45	≥250	–	≤ 0.12	≤ 0.45	≤ 0.2

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), Ni flash, tin (Sn) plated, see note 1
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 EFD15/8/5 coil former with 8-pins

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	14.8	8.85	26.3	222	CSH-EFD15-1S-8P ⁽¹⁾

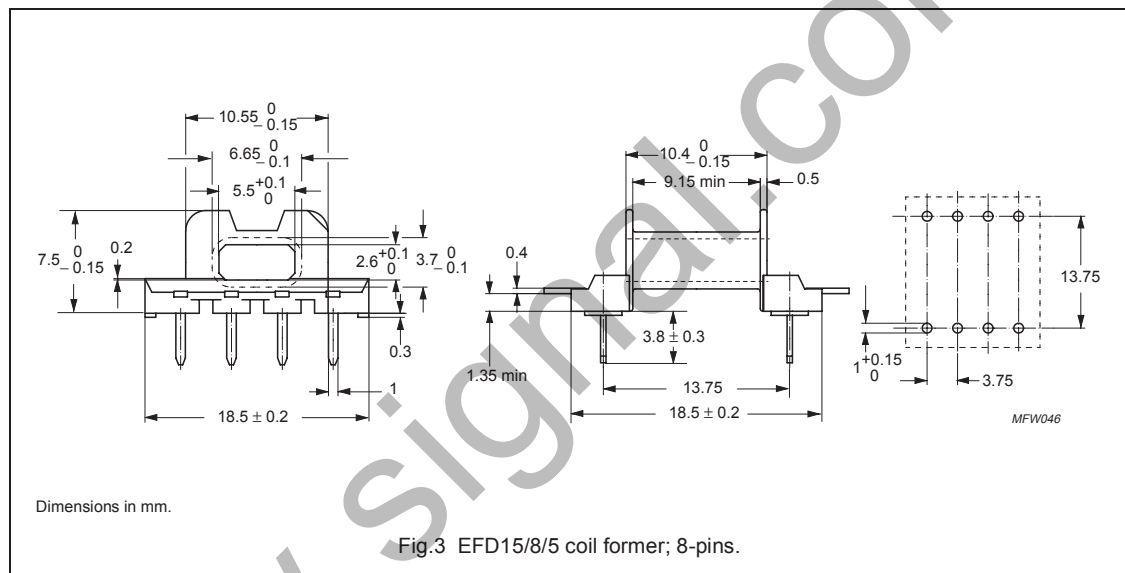
Note

1. Also available with post-inserted pins.

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), nickel flash, 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



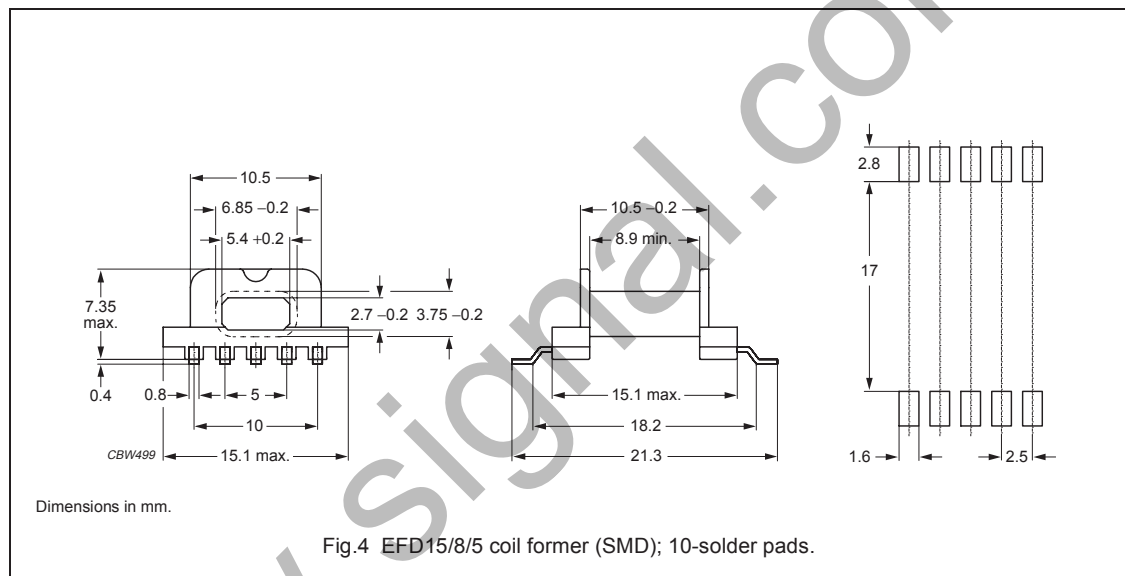
Winding data and area product for EFD15/8/5 coil former (PCB) with 8-pins

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	16.7	9.15	25.6	251	CPH-EFD15-1S-8PD-Z

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)
Solder pad 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



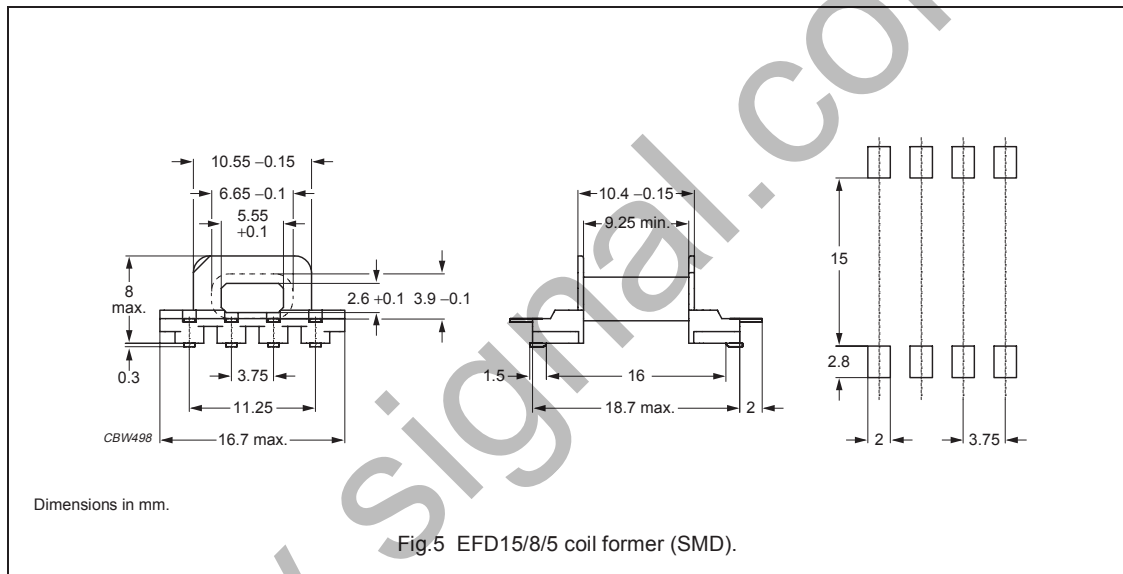
Winding data and area product for EFD15/8/5 coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	10	16.0	8.9	26	240	CPHS-EFD15-1S-10P

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-tin alloy (CuSn), 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



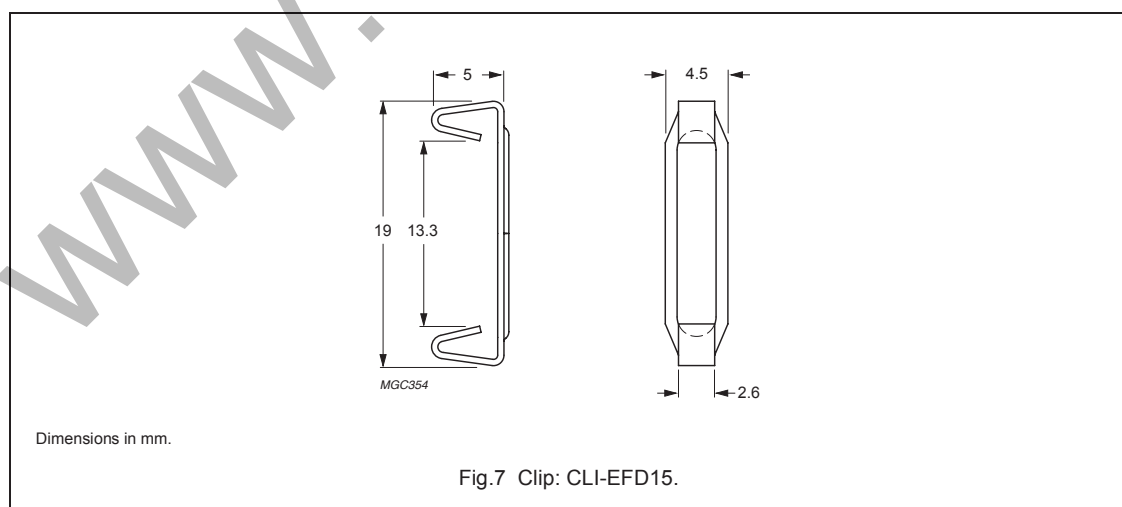
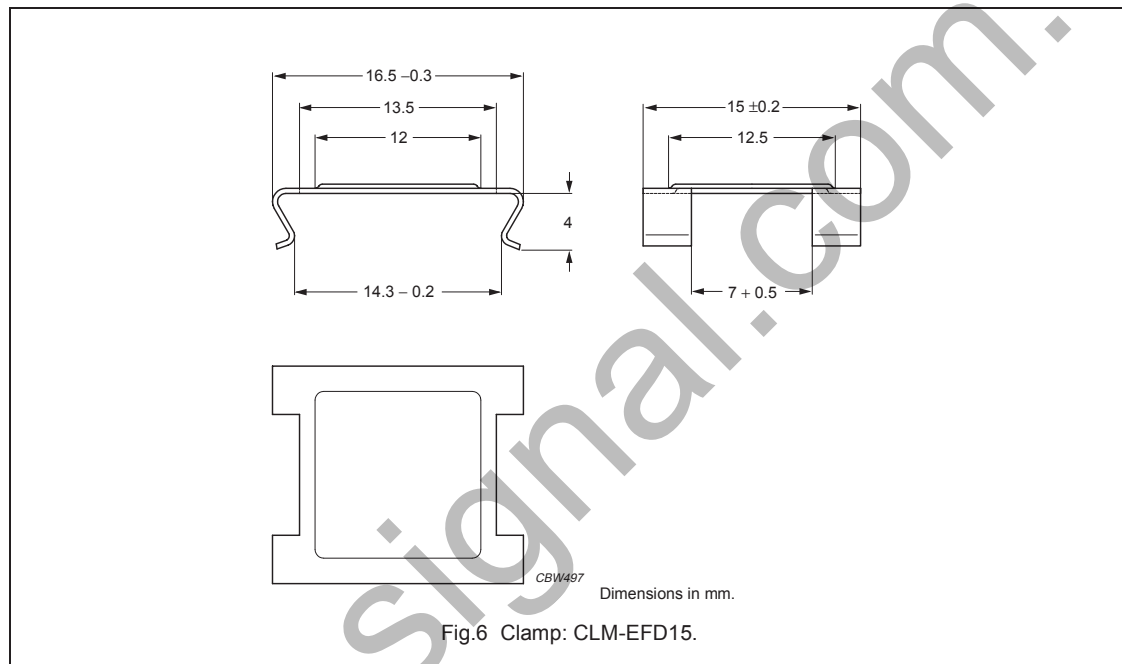
Winding data and area product for EFD15/8/5 (SMD) coil former

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	16.7	9.25	24.1	251	CSHS-EFD15-1S-8P-Z

MOUNTING PARTS

General data

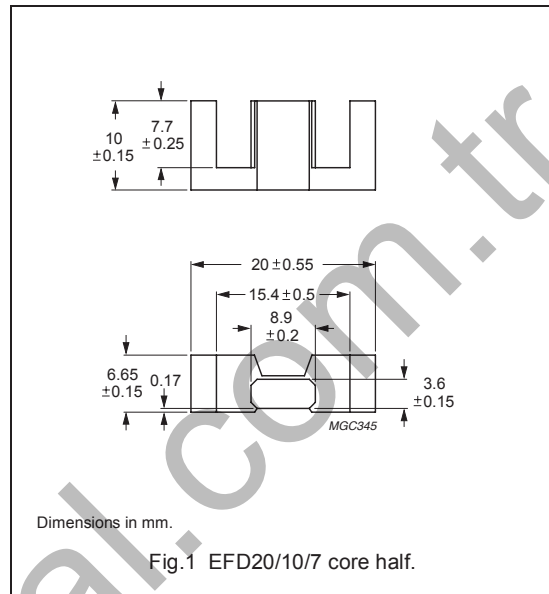
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 25 N	6	CLM-EFD15
Clip	stainless steel (CrNi); clamping force ≈ 12.5 N	7	CLI-EFD15



CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.52	mm ⁻¹
V_e	effective volume	1460	mm ³
l_e	effective length	47.0	mm
A_e	effective area	31.0	mm ²
A_{min}	minimum area	29	mm ²
m	mass of core half	≈ 3.5	g



Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 20 ± 10 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3C90	63 ± 3% ⁽¹⁾	≈ 76	≈ 960	EFD20/10/7-3C90-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3C90-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3C90-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3C90-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3C90-A315
	1300 ± 25%	≈ 1570	≈ 0	EFD20/10/7-3C90
3C94	63 ± 3% ⁽¹⁾	≈ 76	≈ 960	EFD20/10/7-3C94-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3C94-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3C94-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3C94-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3C94-A315
	1300 ± 25%	≈ 1570	≈ 0	EFD20/10/7-3C94
3C95 <small>des</small>	1540 ± 25%	≈ 1865	≈ 0	EFD20/10/7-3C95
3C96 <small>des</small>	1200 ± 25%	≈ 1450	≈ 0	EFD20/10/7-3C96
3F3	63 ± 3% ⁽¹⁾	≈ 76	≈ 960	EFD20/10/7-3F3-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3F3-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3F3-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3F3-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3F3-A315
	1200 ± 25%	≈ 1450	≈ 0	EFD20/10/7-3F3

EFD cores and accessories

EFD20/10/7

GRADE	A_L (nH)	μ_e	TOTAL AIR GAP (μm)	TYPE NUMBER
3F35 <small>des</small>	920 \pm 25%	\approx 1110	\approx 0	EFD20/10/7-3F35
3F4 <small>des</small>	63 \pm 3% ⁽¹⁾	\approx 76	\approx 900	EFD20/10/7-3F4-E63
	100 \pm 3%	\approx 121	\approx 450	EFD20/10/7-3F4-A100
	160 \pm 5%	\approx 193	\approx 230	EFD20/10/7-3F4-A160
	250 \pm 8%	\approx 302	\approx 120	EFD20/10/7-3F4-A250
	315 \pm 10%	\approx 380	\approx 80	EFD20/10/7-3F4-A315
650 \pm 25%	\approx 780	\approx 0	EFD20/10/7-3F4	
3F45 <small>prot</small>	650 \pm 25%	\approx 780	\approx 0	EFD20/10/7-3F45

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 20 \pm 10 N.

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 = 25 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	\geq 330	\leq 0.16	\leq 0.17	–	–	–
3C94	\geq 330	–	\leq 0.13	–	\leq 0.8	–
3C95	\geq 330	–	–	\leq 0.86	\leq 0.82	–
3C96	\geq 330	–	\leq 0.1	–	\leq 0.6	\leq 0.26
3F35	\geq 300	–	–	–	–	\leq 0.13
3F3	\geq 315	–	\leq 0.17	–	–	\leq 0.28
3F4	\geq 300	–	–	–	–	–

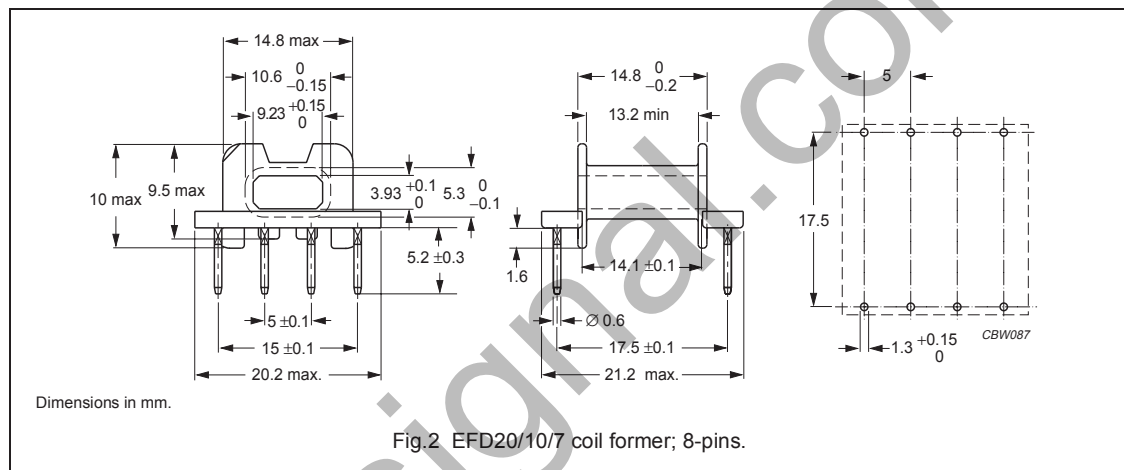
Properties of core sets under power conditions (continued)

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 = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	\geq 330	–	–	–	–	–
3C94	\geq 330	–	–	–	–	–
3C95	\geq 330	–	–	–	–	–
3C96	\geq 330	\leq 0.5	–	–	–	–
3F35	\geq 300	\leq 0.2	\leq 1.5	–	–	–
3F3	\geq 315	–	–	–	–	–
3F4	\geq 300	–	–	\leq 0.43	–	\leq 0.7
3F45	\geq 300	–	–	\leq 0.34	\leq 1.25	\leq 0.55

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL94 V-0"; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), Ni flash, tin (Sn) plated, see note 1
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 EFD20 coil former with 8-pins

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	26.4	13.2	36.5	818	CSH-EFD20-1S-8P ⁽¹⁾

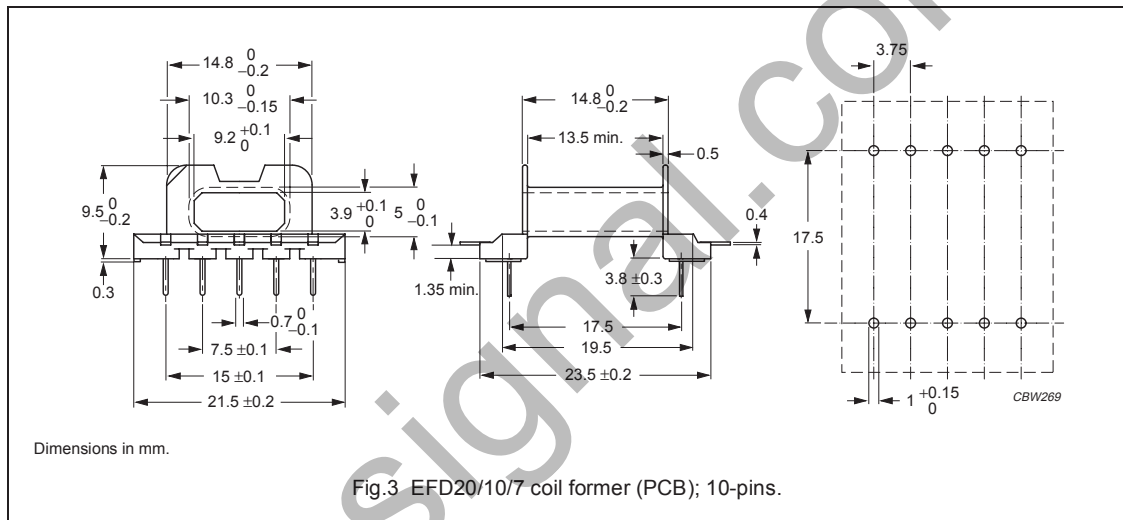
Note

1. Also available with post-inserted pins.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with "UL94 V-0"; UL file number E54705 (M)
Pin material	copper-tin alloy (CuSn), Ni flash, 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



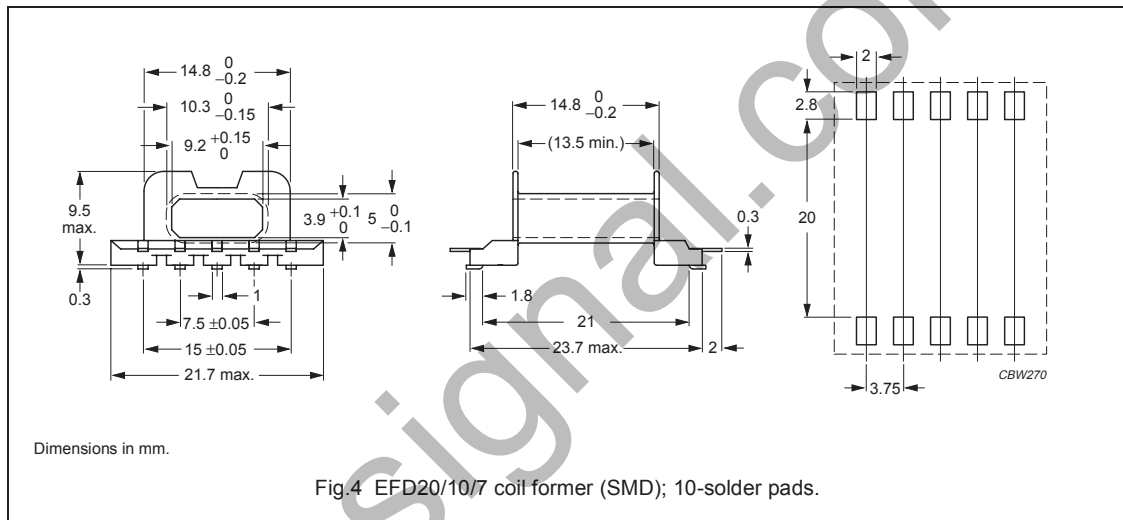
Winding data and area product for EFD20/10/7 coil former (PCB) with 10-pins

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	27.7	13.5	34.1	859	CPH-EFD20-1S-10PD-Z

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with "UL94 V-0"; UL file number E83005 (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



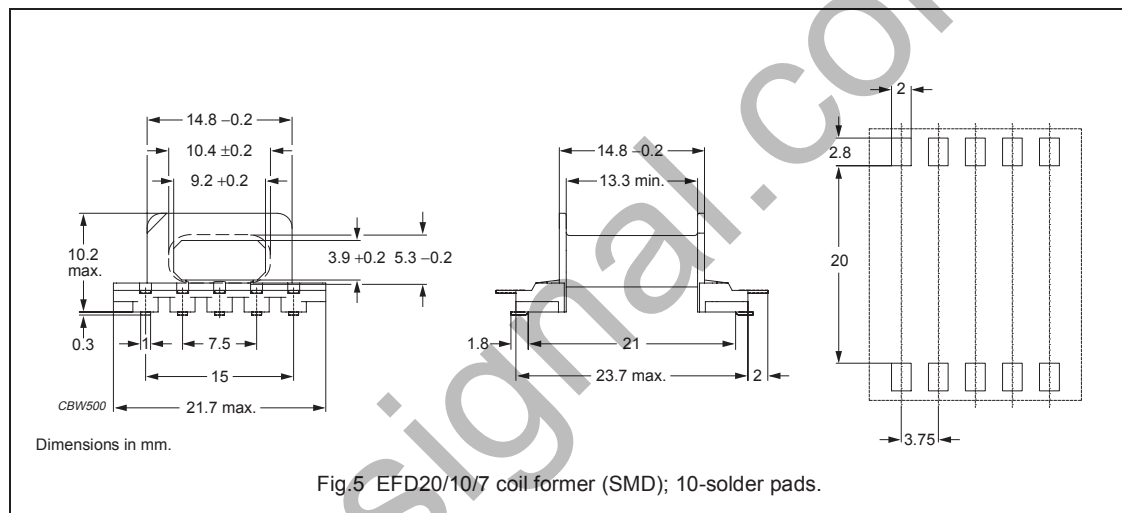
Winding data and area product for EFD20/10/7 coil former (SMD) with 10-solder pads

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	27.7	13.5	34.1	859	CPHS-EFD20-1S-10P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with "UL94 V-0"; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), 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



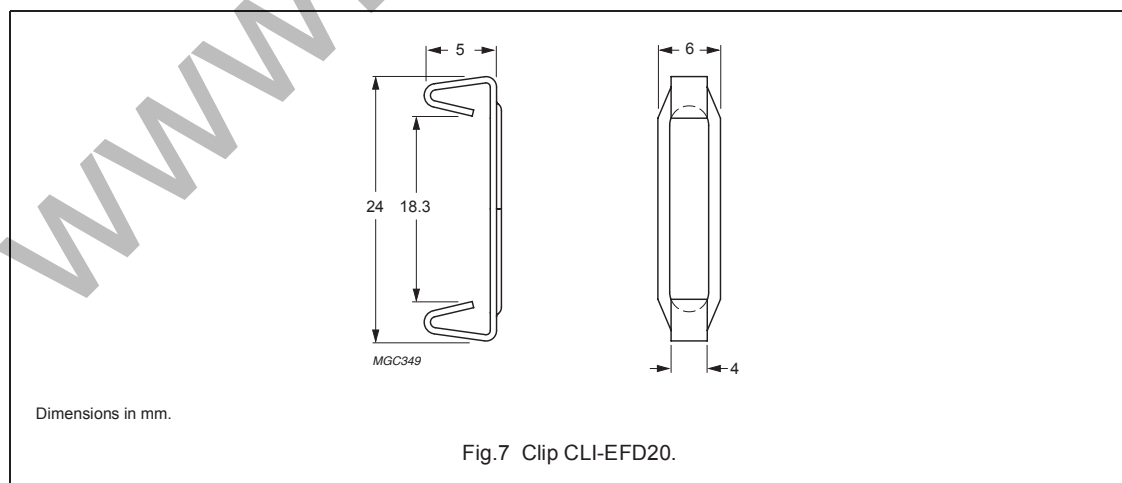
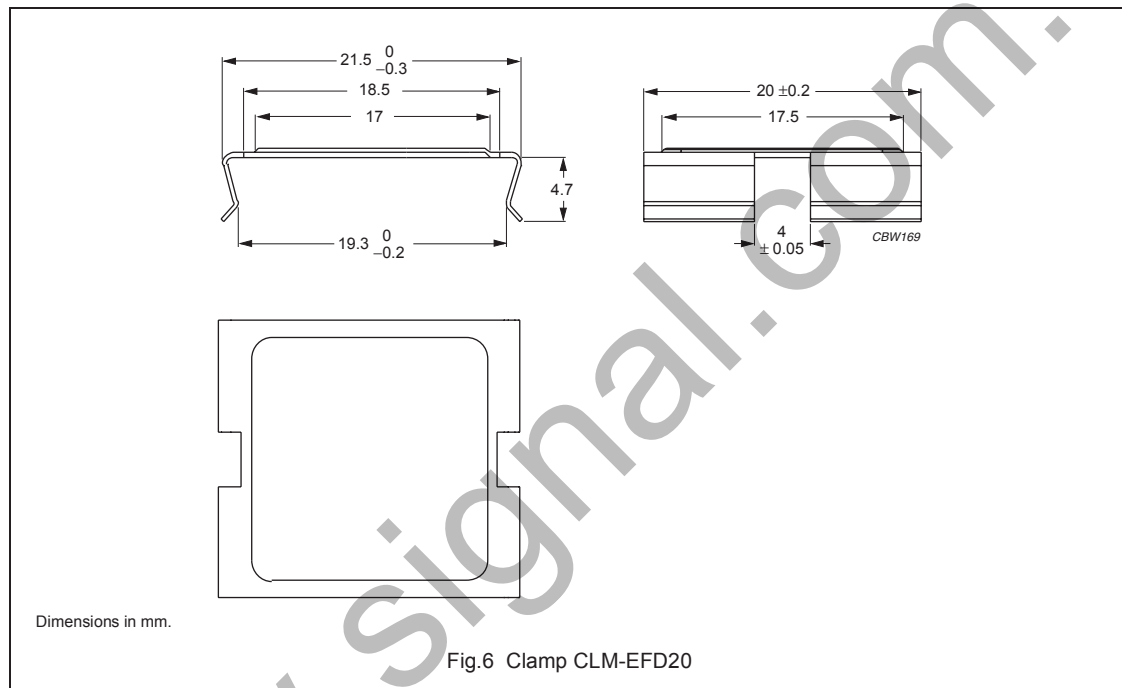
Winding data and area product for EFD20/10/7 coil former (SMD) with 10-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	10	27.2	13.3	34.9	843	CSHS-EFD20-1S-10P-Z

MOUNTING PARTS

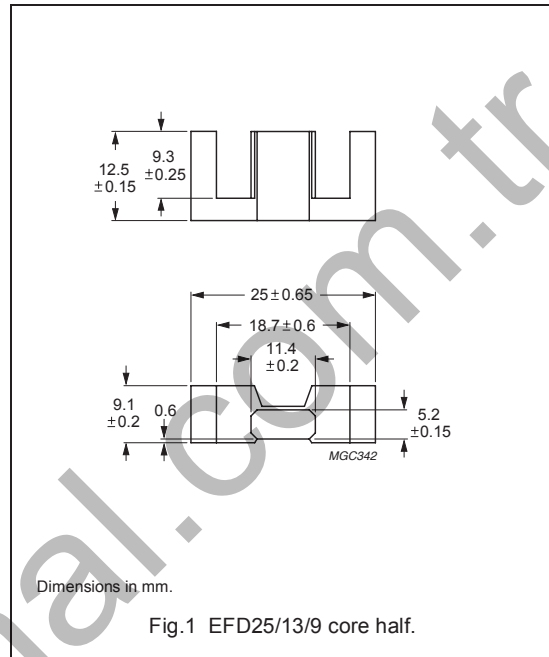
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force \approx 30 N	6	CLM-EFD20
Clip	stainless steel (CrNi); clamping force \approx 20 N	7	CLI-EFD20



CORES**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.00	mm ⁻¹
V_e	effective volume	3300	mm ³
l_e	effective length	57.0	mm
A_e	effective area	58.0	mm ²
A_{min}	minimum area	55.0	mm ²
m	mass of core half	≈ 8	g

**Core halves and sets**

A_L measured as a set or in combination with a non-gapped core half, clamping force for A_L measurements, 40 ± 20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ± 3%	≈ 125	≈ 570	EFD25/13/9-3C90-A160
	250 ± 3%	≈ 196	≈ 320	EFD25/13/9-3C90-A250
	315 ± 5%	≈ 246	≈ 240	EFD25/13/9-3C90-A315
	400 ± 8%	≈ 313	≈ 180	EFD25/13/9-3C90-A400
	630 ± 10%	≈ 493	≈ 100	EFD25/13/9-3C90-A630
	2200 ± 25%	≈ 1720	≈ 0	EFD25/13/9-3C90
3C94	160 ± 3%	≈ 125	≈ 570	EFD25/13/9-3C94-A160
	250 ± 3%	≈ 196	≈ 320	EFD25/13/9-3C94-A250
	315 ± 5%	≈ 246	≈ 240	EFD25/13/9-3C94-A315
	400 ± 8%	≈ 313	≈ 180	EFD25/13/9-3C94-A400
	630 ± 10%	≈ 493	≈ 100	EFD25/13/9-3C94-A630
	2200 ± 25%	≈ 1720	≈ 0	EFD25/13/9-3C94
3C95 <small>des</small>	2660 ± 25%	≈ 2085	≈ 0	EFD25/13/9-3C95
3C96 <small>des</small>	2000 ± 25%	≈ 1560	≈ 0	EFD25/13/9-3C96

EFD cores and accessories

EFD25/13/9

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 \pm 3%	\approx 125	\approx 570	EFD25/13/9-3F3-A160
	250 \pm 3%	\approx 196	\approx 320	EFD25/13/9-3F3-A250
	315 \pm 5%	\approx 246	\approx 240	EFD25/13/9-3F3-A315
	400 \pm 8%	\approx 313	\approx 180	EFD25/13/9-3F3-A400
	630 \pm 10%	\approx 493	\approx 100	EFD25/13/9-3F3-A630
	2000 \pm 25%	\approx 1560	\approx 0	EFD25/13/9-3F3
3F35 des	1500 \pm 25%	\approx 1170	\approx 0	EFD25/13/9-3F35
3F4 des	160 \pm 3%	\approx 125	\approx 500	EFD25/13/9-3F4-A160
	250 \pm 3%	\approx 196	\approx 270	EFD25/13/9-3F4-A250
	315 \pm 5%	\approx 246	\approx 290	EFD25/13/9-3F4-A315
	400 \pm 8%	\approx 313	\approx 130	EFD25/13/9-3F4-A400
	630 \pm 10%	\approx 493	\approx 60	EFD25/13/9-3F4-A630
	1000 \pm 25%	\approx 780	\approx 0	EFD25/13/9-3F4
3F45 prot	1000 \pm 25%	\approx 780	\approx 0	EFD25/13/9-3F45

Properties of core sets under power conditions

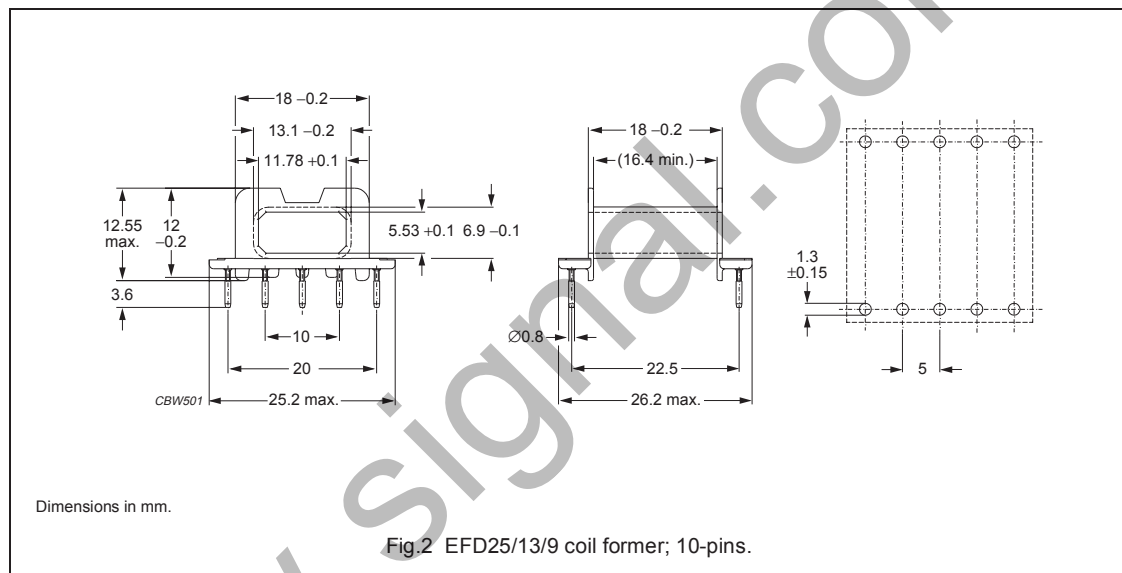
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; \hat{B} = 200 mT; T = 100 °C	f = 100 kHz; \hat{B} = 100 mT; T = 100 °C	f = 100 kHz; \hat{B} = 200 mT; T = 25 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	\geq 330	\leq 0.35	\leq 0.38	–	–	–
3C94	\geq 330	–	\leq 0.30	–	\leq 1.8	–
3C95	\geq 330	–	–	\leq 1.95	\leq 1.85	–
3C96	\geq 330	–	\leq 0.22	–	\leq 1.4	\leq 0.6
3F35	\geq 300	–	–	–	–	\leq 0.28
3F3	\geq 315	–	\leq 0.38	–	–	\leq 0.66
3F4	\geq 300	–	–	–	–	–

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 = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	\geq 330	–	–	–	–	–
3C94	\geq 330	–	–	–	–	–
3C95	\geq 330	–	–	–	–	–
3C96	\geq 330	\leq 1.2	–	–	–	–
3F35	\geq 300	\leq 0.42	\leq 3.4	–	–	–
3F3	\geq 315	–	–	–	–	–
3F4	\geq 300	–	–	\leq 1.0	–	\leq 1.6
3F45	\geq 300	–	–	\leq 0.75	\leq 2.8	\leq 1.25

COIL FORMERS**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin (Sn) plated, see note 1
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 EFD25/13/9 coil former with 10-pins**

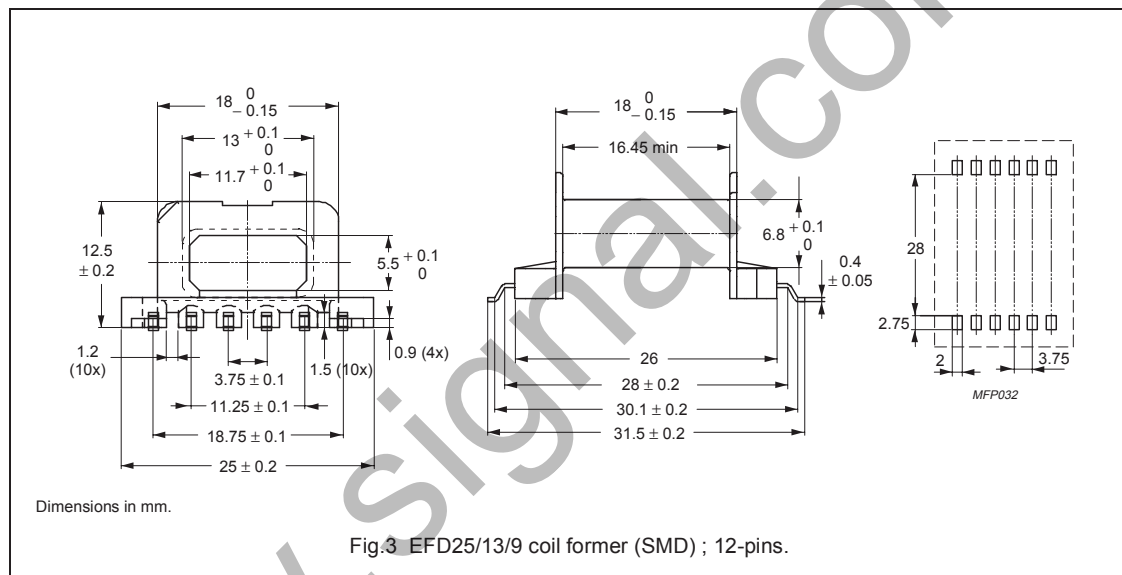
NUMBER OF SECTIONS	WINDING AREA (mm ²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	AREA PRODUCT Ae x Aw (mm ⁴)	TYPE NUMBER
1	40.2	16.4	46.4	2330	CSH-EFD25-1S-10P ⁽¹⁾

1. Also available with post-inserted pins.

COIL FORMERS

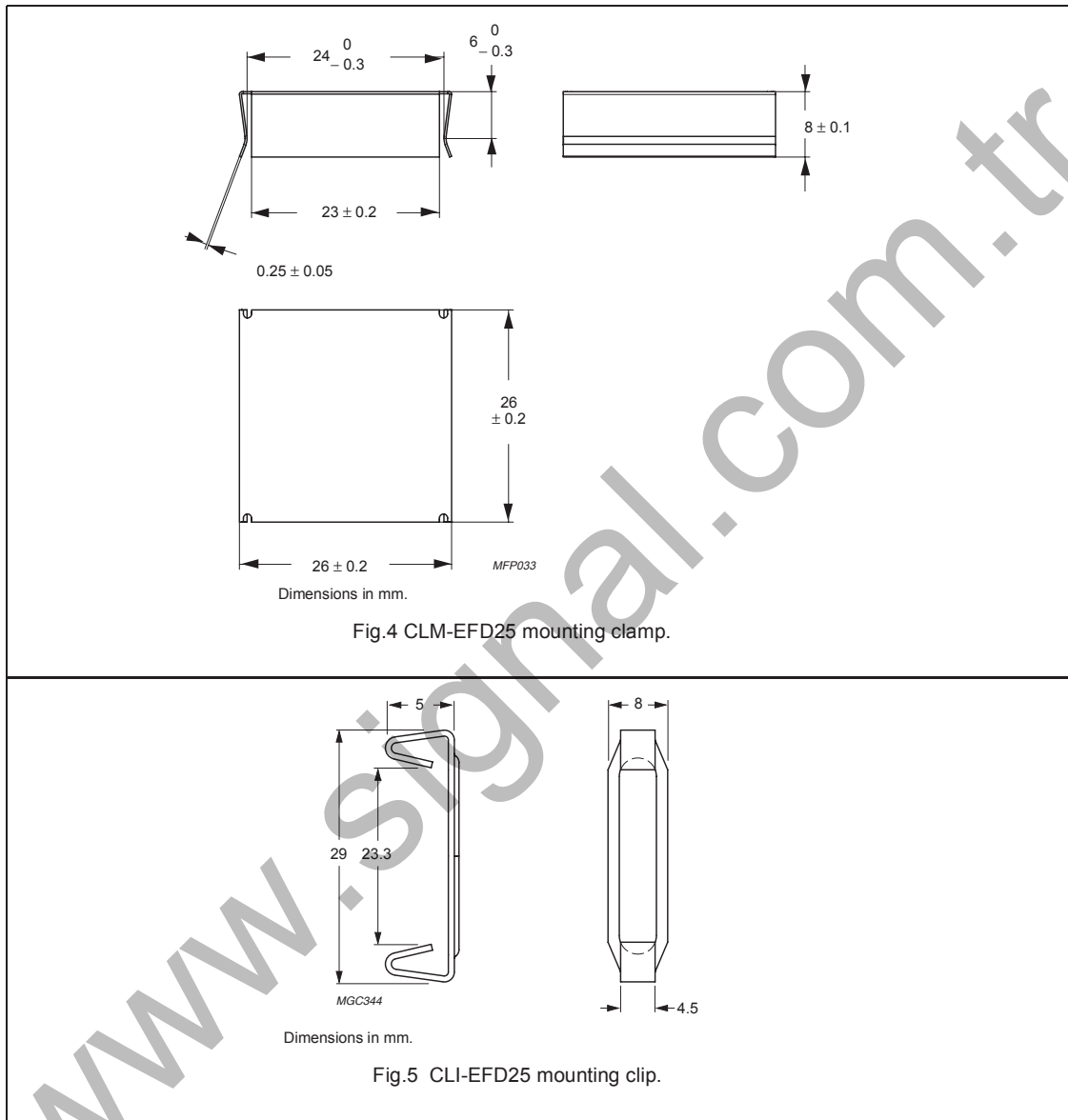
General data

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM-9630 (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429
Pin material	copper-tin alloy (CuSn), Gold (Au) 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 EFD25/13/9 coil former with 12-pins

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	39.0	16.45	46.4	2260	CSHS-EFD25-1S-12P



MOUNTING PARTS

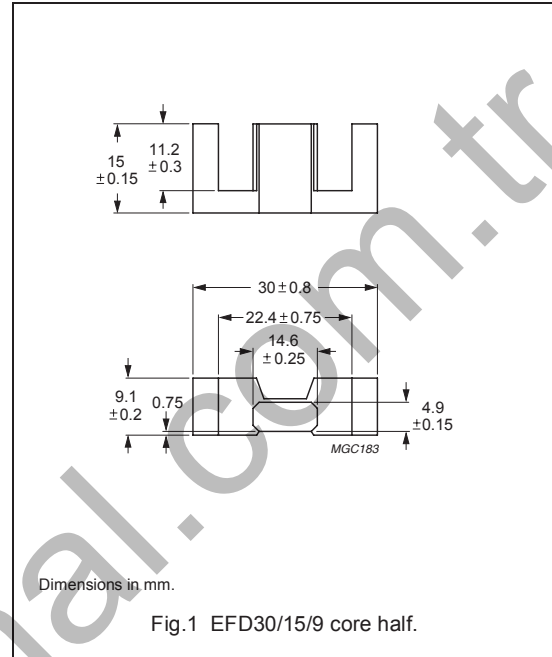
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈ 30 N	4	CLI-EFD25
Clamp	stainless steel (CrNi); clamping force ≈ 30 N	5	CLM-EFD25

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.98	mm ⁻¹
V_e	effective volume	4700	mm ³
l_e	effective length	68.0	mm
A_e	effective area	69.0	mm ²
A_{min}	minimum area	66.0	mm ²
m	mass of core half	≈ 12	g



Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 70 ± 20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ± 3%	≈ 125	≈ 690	EFD30/15/9-3C90-A160
	250 ± 3%	≈ 196	≈ 390	EFD30/15/9-3C90-A250
	315 ± 5%	≈ 247	≈ 290	EFD30/15/9-3C90-A315
	400 ± 8%	≈ 314	≈ 210	EFD30/15/9-3C90-A400
	630 ± 10%	≈ 494	≈ 120	EFD30/15/9-3C90-A630
	2100 ± 25%	≈ 1720	≈ 0	EFD30/15/9-3C90
3C94	160 ± 3%	≈ 125	≈ 690	EFD30/15/9-3C94-A160
	250 ± 3%	≈ 196	≈ 390	EFD30/15/9-3C94-A250
	315 ± 5%	≈ 247	≈ 290	EFD30/15/9-3C94-A315
	400 ± 8%	≈ 314	≈ 210	EFD30/15/9-3C94-A400
	630 ± 10%	≈ 494	≈ 120	EFD30/15/9-3C94-A630
	2100 ± 25%	≈ 1720	≈ 0	EFD30/15/9-3C94
3C95 <small>des</small>	2520 ± 25%	≈ 1980	≈ 0	EFD30/15/9-3C95
3C96 <small>des</small>	1900 ± 25%	≈ 1560	≈ 0	EFD30/15/9-3C96

EFD cores and accessories

EFD30/15/9

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 \pm 3%	\approx 125	\approx 690	EFD30/15/9-3F3-A160
	250 \pm 3%	\approx 196	\approx 390	EFD30/15/9-3F3-A250
	315 \pm 5%	\approx 247	\approx 290	EFD30/15/9-3F3-A315
	400 \pm 8%	\approx 314	\approx 210	EFD30/15/9-3F3-A400
	630 \pm 10%	\approx 494	\approx 120	EFD30/15/9-3F3-A630
	1900 \pm 25%	\approx 1560	\approx 0	EFD30/15/9-3F3
3F35 ^{des}	1450 \pm 25%	\approx 1170	\approx 0	EFD30/15/9-3F35
3F4 ^{des}	160 \pm 3%	\approx 125	\approx 620	EFD30/15/9-3F4-A160
	250 \pm 3%	\approx 196	\approx 320	EFD30/15/9-3F4-A250
	315 \pm 5%	\approx 247	\approx 230	EFD30/15/9-3F4-A315
	400 \pm 8%	\approx 314	\approx 160	EFD30/15/9-3F4-A400
	630 \pm 10%	\approx 494	\approx 65	EFD30/15/9-3F4-A630
	1000 \pm 25%	\approx 780	\approx 0	EFD30/15/9-3F4
3F45 ^{prot}	1000 \pm 25%	\approx 780	\approx 0	EFD30/15/9-3F45

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 = 25 °C	f = 100 kHz; \hat{B} = 200 mT; T = 100 °C	f = 400 kHz; \hat{B} = 50 mT; T = 100 °C
3C90	\geq 330	\leq 0.50	\leq 0.54	–	–	–
3C94	\geq 330	–	\leq 0.43	–	\leq 2.6	–
3C95	\geq 330	–	–	\leq 2.77	\leq 2.63	–
3C96	\geq 340	–	\leq 0.32	–	\leq 2.0	\leq 0.82
3F35	\geq 300	–	–	–	–	\leq 0.4
3F3	\geq 315	–	\leq 0.54	–	–	\leq 0.91
3F4	\geq 300	–	–	–	–	–

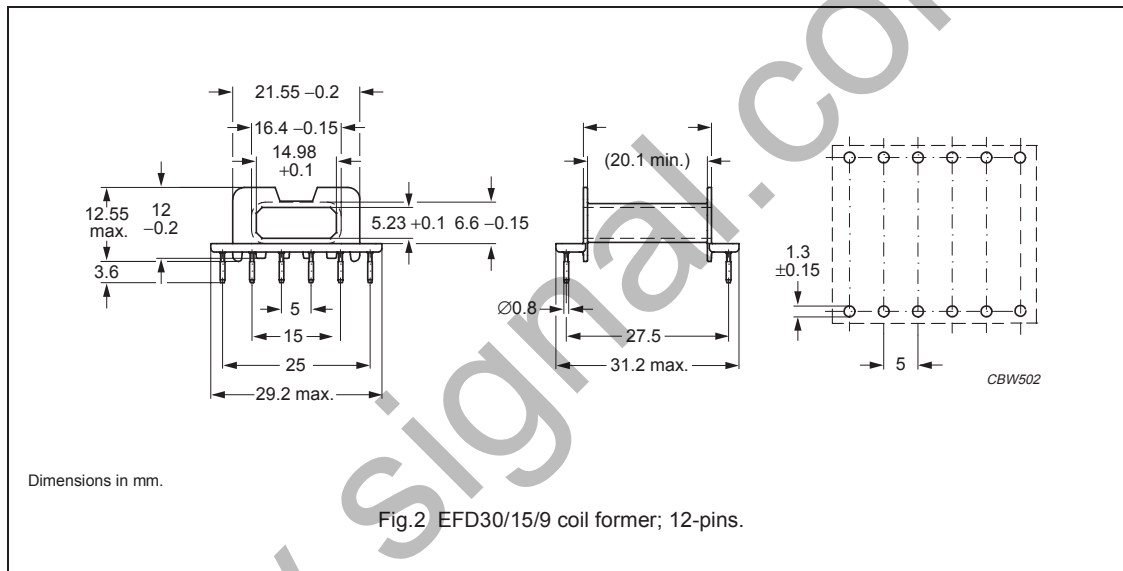
Properties of core sets under power conditions (continued)

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 = 1 MHz; \hat{B} = 50 mT; T = 100 °C	f = 3 MHz; \hat{B} = 10 mT; T = 100 °C
3C90	\geq 330	–	–	–	–	–
3C94	\geq 330	–	–	–	–	–
3C95	\geq 330	–	–	–	–	–
3C96	\geq 340	\leq 1.7	–	–	–	–
3F35	\geq 300	\leq 0.6	\leq 4.5	–	–	–
3F3	\geq 315	–	–	–	–	–
3F4	\geq 300	–	–	\leq 1.4	–	\leq 2.2
3F45	\geq 300	–	–	\leq 1.1	\leq 4.0	\leq 1.8

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E167521 (M)
Pin material	copper-tin alloy (CuSn), tin (Sn) plated, see note 1
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 EFD30/15/9 coil former with 12-pins

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	52.3	20.1	52.9	3610	CSH-EFD30-1S-12P ⁽¹⁾

Note

- 1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈ 35 N	3	CLI-EFD30

