EFD15
EFD cores and accessories

Product specification
Supersedes data of December 1998
File under Ferrite Ceramics, MA01
EFD cores and accessories

**CORES**

**Effective core parameters**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>VALUE</th>
<th>UNIT</th>
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</thead>
<tbody>
<tr>
<td>Σ(I/A)</td>
<td>core factor (C1)</td>
<td>2.27</td>
<td>mm⁻¹</td>
</tr>
<tr>
<td>Vₑ</td>
<td>effective volume</td>
<td>510</td>
<td>mm³</td>
</tr>
<tr>
<td>Iₑ</td>
<td>effective length</td>
<td>34.0</td>
<td>mm</td>
</tr>
<tr>
<td>Aₑ</td>
<td>effective area</td>
<td>15.0</td>
<td>mm²</td>
</tr>
<tr>
<td>Aₘₐᵟₚ</td>
<td>minimum area</td>
<td>12.2</td>
<td>mm²</td>
</tr>
<tr>
<td>m</td>
<td>mass of core half</td>
<td>~1.4</td>
<td>g</td>
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</table>

**Core sets**

Clamping force for $A_L$ measurements, 20 ± 5 N.

<table>
<thead>
<tr>
<th>GRADE</th>
<th>$A_L$ (nH)</th>
<th>$μₘ$</th>
<th>AIR GAP (µm)</th>
<th>TYPE NUMBER</th>
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<tbody>
<tr>
<td>3C90</td>
<td>63 ±5%</td>
<td>~115</td>
<td>~350</td>
<td>EFD15-3C90-A63-S</td>
</tr>
<tr>
<td></td>
<td>100 ±8%</td>
<td>~180</td>
<td>~170</td>
<td>EFD15-3C90-A100-S</td>
</tr>
<tr>
<td></td>
<td>160 ±10%</td>
<td>~290</td>
<td>~100</td>
<td>EFD15-3C90-A160-S</td>
</tr>
<tr>
<td></td>
<td>950 ±25%</td>
<td>~1700</td>
<td>~0</td>
<td>EFD15-3C90-S</td>
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<tr>
<td>3C94</td>
<td>63 ±5%</td>
<td>~115</td>
<td>~350</td>
<td>EFD15-3C94-A63-S</td>
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<tr>
<td></td>
<td>100 ±8%</td>
<td>~180</td>
<td>~170</td>
<td>EFD15-3C94-A100-S</td>
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<td></td>
<td>160 ±10%</td>
<td>~290</td>
<td>~100</td>
<td>EFD15-3C94-A160-S</td>
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<tr>
<td></td>
<td>950 ±25%</td>
<td>~1700</td>
<td>~0</td>
<td>EFD15-3C94-S</td>
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<tr>
<td>3C96</td>
<td>850 ±25%</td>
<td>~1520</td>
<td>~0</td>
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<td>3F3</td>
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<td>~115</td>
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<td>~170</td>
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<td>160 ±10%</td>
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<td>EFD15-3F3-A160-S</td>
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<tr>
<td></td>
<td>780 ±25%</td>
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<tr>
<td>3F35</td>
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<td>3F4</td>
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<td>~115</td>
<td>~350</td>
<td>EFD15-3F4-A63-S</td>
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<td>100 ±8%</td>
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<td>~160</td>
<td>EFD15-3F4-A100-S</td>
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<td></td>
<td>160 ±10%</td>
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<td>~90</td>
<td>EFD15-3F4-A160-S</td>
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<tr>
<td></td>
<td>400 ±25%</td>
<td>~720</td>
<td>~0</td>
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<tr>
<td>3E4</td>
<td>2000 ±40~/−30%</td>
<td>~3610</td>
<td>~0</td>
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<tr>
<td>3E5</td>
<td>3600 ±40~/−30%</td>
<td>~6500</td>
<td>~0</td>
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## Properties of core sets under power conditions

<table>
<thead>
<tr>
<th>GRADE</th>
<th>B (mT) at</th>
<th>CORE LOSS (W) at</th>
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<tbody>
<tr>
<td></td>
<td>H = 250 A/m; f = 25 kHz; T = 100 °C</td>
<td>f = 100 kHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 200 kHz;</td>
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<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 500 kHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 1 MHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 3 MHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td>3C90</td>
<td>≥320</td>
<td>≤0.057</td>
</tr>
<tr>
<td>3C94</td>
<td>≥320</td>
<td>≤0.045</td>
</tr>
<tr>
<td>3C96</td>
<td>≥320</td>
<td>≈0.032</td>
</tr>
<tr>
<td>3F35</td>
<td>≥300</td>
<td>–</td>
</tr>
<tr>
<td>3F3</td>
<td>≥315</td>
<td>≤0.06</td>
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<tr>
<td>3F4</td>
<td>≥250</td>
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## Properties of core sets under power conditions (continued)

<table>
<thead>
<tr>
<th>GRADE</th>
<th>B (mT) at</th>
<th>CORE LOSS (W) at</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>H = 250 A/m; f = 25 kHz; T = 100 °C</td>
<td>f = 500 kHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 100 kHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 3 MHz;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
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<tr>
<td></td>
<td></td>
<td>T = 100 °C</td>
</tr>
<tr>
<td>3C90</td>
<td>≥320</td>
<td>–</td>
</tr>
<tr>
<td>3C94</td>
<td>≥320</td>
<td>–</td>
</tr>
<tr>
<td>3C96</td>
<td>≥320</td>
<td>–</td>
</tr>
<tr>
<td>3F35</td>
<td>≥300</td>
<td>≈0.082</td>
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<tr>
<td>3F3</td>
<td>≥315</td>
<td>–</td>
</tr>
<tr>
<td>3F4</td>
<td>≥250</td>
<td>–</td>
</tr>
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</table>
EFD cores and accessories

**EFD15**

## COIL FORMERS

### General data

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil former material</td>
<td>phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with &quot;UL 94V-0&quot;; UL file number E167521(M)</td>
</tr>
<tr>
<td>Pin material</td>
<td>copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated</td>
</tr>
<tr>
<td>Maximum operating temperature</td>
<td>180 °C, “IEC 60085”, class H</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
<td>“IEC 60068-2-20”, Part 2, Test Tb, method 1B, 350 °C, 3.5 s</td>
</tr>
<tr>
<td>Solderability</td>
<td>“IEC 60068-2-20”, Part 2, Test Ta, method 1: 235 °C, 2 s</td>
</tr>
</tbody>
</table>

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![Diagram](image)

Dimensions in mm.

### Winding data for EFD15 coil former with 8-pins

<table>
<thead>
<tr>
<th>NUMBER OF SECTIONS</th>
<th>WINDING AREA (mm²)</th>
<th>MINIMUM WINDING WIDTH (mm)</th>
<th>AVERAGE LENGTH OF TURN (mm)</th>
<th>TYPE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.8</td>
<td>8.85</td>
<td>26.3</td>
<td>CSH-EFD15-1S-8P; see note 1</td>
</tr>
</tbody>
</table>

**Note**

1. Also available with post-inserted pins.
**Philips Components**

**Product specification**

**EFD cores and accessories**

**EFD15**

---

### COIL FORMERS

#### General data

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil former material</td>
<td>liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with &quot;UL 94V-0&quot;; UL file number E83005(M)</td>
</tr>
<tr>
<td>Pin material</td>
<td>copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated</td>
</tr>
<tr>
<td>Maximum operating temperature</td>
<td>155 °C, &quot;IEC 60085&quot;, class F</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
<td>&quot;IEC 60068-2-20&quot;, Part 2, Test Tb, method 1B, 350 °C, 3.5 s</td>
</tr>
<tr>
<td>Solderability</td>
<td>&quot;IEC 60068-2-20&quot;, Part 2, Test Ta, method 1: 235 °C, 2 s</td>
</tr>
</tbody>
</table>

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![Diagram](Figure3.png)

Dimensions in mm.

**Fig.3** EFD15 coil former; 8-pins.

#### Winding data for EFD15 coil former (PCB) with 8-pins

<table>
<thead>
<tr>
<th>NUMBER OF SECTIONS</th>
<th>WINDING AREA (mm²)</th>
<th>MINIMUM WINDING WIDTH (mm)</th>
<th>AVERAGE LENGTH OF TURN (mm)</th>
<th>TYPE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16.7</td>
<td>9.15</td>
<td>25.6</td>
<td>CPH-EFD15-1S-8P</td>
</tr>
</tbody>
</table>

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2000 Apr 20
COIL FORMERS

General data

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
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</thead>
<tbody>
<tr>
<td>Coil former material</td>
<td>liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance</td>
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<td>with “UL 94V-0”; UL file number E54705 (M)</td>
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<tr>
<td>Solder pad material</td>
<td>copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated</td>
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<tr>
<td>Maximum operating temperature</td>
<td>155 °C, “IEC 60085”, class F</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
<td>“IEC 60068-2-20”, Part 2, Test Tb, method 1B, 350 °C, 3.5 s</td>
</tr>
<tr>
<td>Solderability</td>
<td>“IEC 60068-2-20”, Part 2, Test Ta, method 1: 235 °C, 2 s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF SECTIONS</th>
<th>NUMBER OF SOLDER PADS</th>
<th>WINDING AREA (mm²)</th>
<th>MINIMUM WINDING WIDTH (mm)</th>
<th>AVERAGE LENGTH OF TURN (mm)</th>
<th>TYPE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>16</td>
<td>8.9</td>
<td>26</td>
<td>CPHS-EFD15-1S-8P-T</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>16</td>
<td>8.9</td>
<td>26</td>
<td>CPHS-EFD15-1S-10P</td>
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Dimensions in mm.

Fig.4 EFD15 coil former (SMD); 10-solder pads.
COIL FORMERS

General data

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<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
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<tr>
<td>Coil former material</td>
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<td></td>
<td>with &quot;UL 94V-0&quot;; UL file number E83005(M)</td>
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<tr>
<td>Solder pad material</td>
<td>copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated</td>
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<td>Maximum operating temperature</td>
<td>155 °C, &quot;IEC 60085&quot;, class F</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
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<tr>
<td>Solderability</td>
<td>&quot;IEC 60068-2-20&quot;, Part 2, Test Ta, method 1: 235 °C, 2 s</td>
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Winding data for EFD15 coil former (SMD) with 8-solder pads

<table>
<thead>
<tr>
<th>NUMBER OF SECTIONS</th>
<th>NUMBER OF SOLDER PADS</th>
<th>WINDING AREA (mm²)</th>
<th>MINIMUM WINDING WIDTH (mm)</th>
<th>AVERAGE LENGTH OF TURN (mm)</th>
<th>TYPE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>16.7</td>
<td>9.15</td>
<td>25.6</td>
<td>CPHS-EFD15-1S-8P</td>
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</tbody>
</table>

Fig.5 EFD15 coil former (SMD); 8-solder pads.
Philips Components

EFD cores and accessories

EFD15

COIL FORMERS

General data

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SPECIFICATION</th>
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<tbody>
<tr>
<td>Coil former material</td>
<td>phenolformaldehyde (PF), glass reinforced, flame retardant in accordance</td>
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<td>with &quot;UL 94V-0&quot;; UL file number E41429 (M)</td>
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<td>Pin material</td>
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<td>180 °C, &quot;IEC 60085&quot;, class H</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
<td>&quot;IEC 60068-2-20&quot;, Part 2, Test Tb, method 1B, 350 °C, 3.5 s</td>
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<tr>
<td>Solderability</td>
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<table>
<thead>
<tr>
<th>NUMBER OF SECTIONS</th>
<th>WINDING AREA (mm²)</th>
<th>MINIMUM WINDING WIDTH (mm)</th>
<th>AVERAGE LENGTH OF TURN (mm)</th>
<th>TYPE NUMBER</th>
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Dimensions in mm.

Fig.6 EFD15 coil former (SMD).
MOUNTING PARTS

General data

<table>
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<tr>
<th>ITEM</th>
<th>REMARKS</th>
<th>FIGURE</th>
<th>TYPE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamp</td>
<td>stainless steel (CrNi); clamping force ≈ 25 N</td>
<td>7</td>
<td>CLM-EFD15</td>
</tr>
<tr>
<td>Clip</td>
<td>stainless steel (CrNi); clamping force ≈ 12.5 N</td>
<td>8</td>
<td>CLI-EFD15</td>
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</table>

Fig.7 Clamp: CLM-EFD15.

Dimensions in mm.

Fig.8 Clip: CLI-EFD15.

Dimensions in mm.
DATA SHEET STATUS DEFINITIONS

<table>
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<tr>
<th>DATA SHEET STATUS</th>
<th>PRODUCT STATUS</th>
<th>DEFINITIONS</th>
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<tbody>
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<td>Preliminary specification</td>
<td>Development</td>
<td>This data sheet contains preliminary data. Philips Components reserves the</td>
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<td>right to make changes at any time without notice in order to improve design</td>
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<td>and supply the best possible product.</td>
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<tr>
<td>Product specification</td>
<td>Production</td>
<td>This data sheet contains final specifications. Philips Components reserves</td>
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<td>the right to make changes at any time without notice in order to improve</td>
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<tr>
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<td>design and supply the best possible product.</td>
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DISCLAIMER

Life support applications — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Components customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Components for any damages resulting from such application.

PRODUCT STATUS DEFINITIONS

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<td>These are products that have been made as development samples for the purposes</td>
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<td>of technical evaluation only. The data for these types is provisional and is</td>
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<td>subject to change.</td>
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<td>These products are recommended for new designs.</td>
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<tr>
<td>Preferred</td>
<td>🧑‍💻</td>
<td>These products are recommended for use in current designs and are available</td>
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<td>Support</td>
<td>🚫</td>
<td>These products are not recommended for new designs and may not be available</td>
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<td>through all of our sales channels. Customers are advised to check for</td>
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