

DATA SHEET

E22/6/16

Planar E cores and accessories

Supersedes data of September 2004

2008 Sep 01

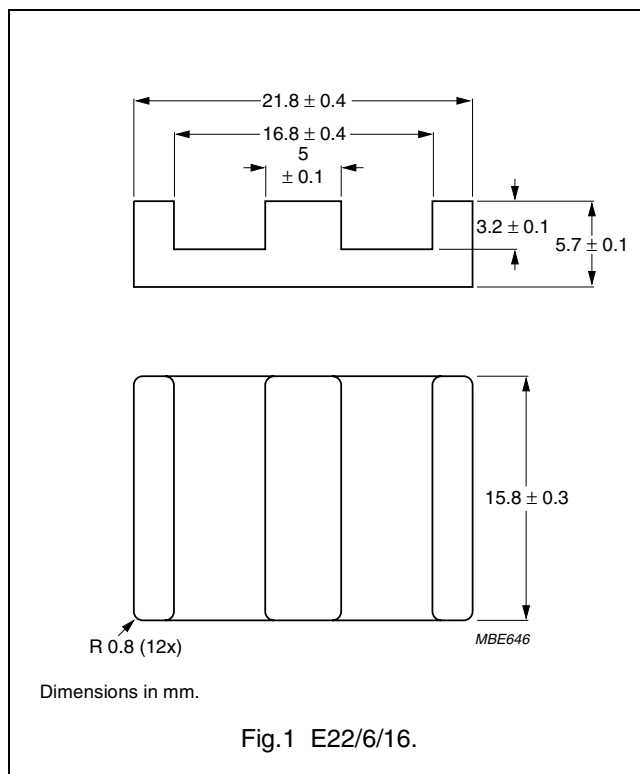


FERROXCUBE
A YAGEO COMPANY

CORES

Effective core parameters of a set of E cores

| SYMBOL | PARAMETER | VALUE | UNIT |
|---------------|-------------------|-------|------------------|
| $\Sigma(l/A)$ | core factor (C1) | 0.414 | mm ⁻¹ |
| V_e | effective volume | 2550 | mm ³ |
| l_e | effective length | 32.5 | mm |
| A_e | effective area | 78.3 | mm ² |
| A_{min} | minimum area | 78.3 | mm ² |
| m | mass of core half | ≈ 6.5 | g |

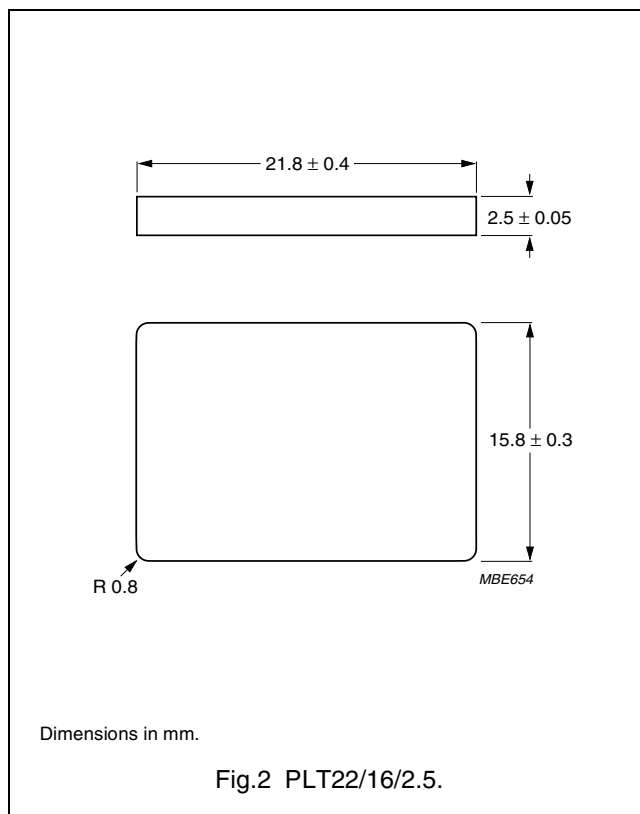


Effective core parameters of an E/PLT combination

| SYMBOL | PARAMETER | VALUE | UNIT |
|---------------|------------------|-------|------------------|
| $\Sigma(l/A)$ | core factor (C1) | 0.332 | mm ⁻¹ |
| V_e | effective volume | 2040 | mm ³ |
| l_e | effective length | 26.1 | mm |
| A_e | effective area | 78.5 | mm ² |
| A_{min} | minimum area | 78.5 | mm ² |
| m | mass of plate | ≈ 4 | g |

Ordering information for plates

| GRADE | TYPE NUMBER |
|--------------------------|-------------------|
| 3C90 | PLT22/16/2.5-3C90 |
| 3C92 <small>des</small> | PLT22/16/2.5-3C92 |
| 3C93 <small>des</small> | PLT22/16/2.5-3C93 |
| 3C94 | PLT22/16/2.5-3C94 |
| 3C95 <small>des</small> | PLT22/16/2.5-3C95 |
| 3C96 <small>des</small> | PLT22/16/2.5-3C96 |
| 3F3 | PLT22/16/2.5-3F3 |
| 3F35 <small>des</small> | PLT22/16/2.5-3F35 |
| 3F4 <small>des</small> | PLT22/16/2.5-3F4 |
| 3F45 <small>prot</small> | PLT22/16/2.5-3F45 |
| 3E6 | PLT22/16/2.5-3E6 |



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Core halves for use in combination with a non-gapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ± 10 N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

| GRADE | A_L (nH) | μ_e | AIR GAP (μm) | TYPE NUMBER |
|------------------|-------------------|----------------|------------------------------|----------------------|
| 3C90 | 160 $\pm 3\%$ | ≈ 53 | ≈ 900 | E22/6/16-3C90-A160-E |
| | 250 $\pm 3\%$ | ≈ 82 | ≈ 490 | E22/6/16-3C90-A250-E |
| | 315 $\pm 3\%$ | ≈ 104 | ≈ 360 | E22/6/16-3C90-A315-E |
| | 400 $\pm 5\%$ | ≈ 132 | ≈ 280 | E22/6/16-3C90-A400-E |
| | 630 $\pm 8\%$ | ≈ 208 | ≈ 160 | E22/6/16-3C90-A630-E |
| | 5150 $\pm 25\%$ | ≈ 1700 | ≈ 0 | E22/6/16-3C90 |
| 3C92 des | 3700 $\pm 25\%$ | ≈ 1220 | ≈ 0 | E22/6/16-3C92 |
| 3C93 des | 4300 $\pm 25\%$ | ≈ 1420 | ≈ 0 | E22/6/16-3C93 |
| 3C94 | 160 $\pm 3\%$ | ≈ 53 | ≈ 900 | E22/6/16-3C94-A160-E |
| | 250 $\pm 3\%$ | ≈ 82 | ≈ 490 | E22/6/16-3C94-A250-E |
| | 315 $\pm 3\%$ | ≈ 104 | ≈ 360 | E22/6/16-3C94-A315-E |
| | 400 $\pm 5\%$ | ≈ 132 | ≈ 280 | E22/6/16-3C94-A400-E |
| | 630 $\pm 8\%$ | ≈ 208 | ≈ 160 | E22/6/16-3C94-A630-E |
| | 5150 $\pm 25\%$ | ≈ 1700 | ≈ 0 | E22/6/16-3C94 |
| 3C95 des | 6220 $\pm 25\%$ | ≈ 2050 | ≈ 0 | E22/6/16-3C95 |
| 3C96 des | 4600 $\pm 25\%$ | ≈ 1520 | ≈ 0 | E22/6/16-3C96 |
| 3F3 | 160 $\pm 3\%$ | ≈ 53 | ≈ 900 | E22/6/16-3F3-A160-E |
| | 250 $\pm 3\%$ | ≈ 82 | ≈ 490 | E22/6/16-3F3-A250-E |
| | 315 $\pm 3\%$ | ≈ 104 | ≈ 360 | E22/6/16-3F3-A315-E |
| | 400 $\pm 5\%$ | ≈ 132 | ≈ 280 | E22/6/16-3F3-A400-E |
| | 630 $\pm 8\%$ | ≈ 208 | ≈ 160 | E22/6/16-3F3-A630-E |
| | 4300 $\pm 25\%$ | ≈ 1420 | ≈ 0 | E22/6/16-3F3 |
| 3F35 des | 3500 $\pm 25\%$ | ≈ 1160 | ≈ 0 | E22/6/16-3F35 |
| 3F4 des | 160 $\pm 3\%$ | ≈ 53 | ≈ 900 | E22/6/16-3F4-A160-E |
| | 250 $\pm 3\%$ | ≈ 82 | ≈ 490 | E22/6/16-3F4-A250-E |
| | 315 $\pm 3\%$ | ≈ 104 | ≈ 360 | E22/6/16-3F4-A315-E |
| | 400 $\pm 5\%$ | ≈ 132 | ≈ 280 | E22/6/16-3F4-A400-E |
| | 630 $\pm 8\%$ | ≈ 208 | ≈ 160 | E22/6/16-3F4-A630-E |
| | 2400 $\pm 25\%$ | ≈ 790 | ≈ 0 | E22/6/16-3F4 |
| 3F45 prot | 2400 $\pm 25\%$ | ≈ 790 | ≈ 0 | E22/6/16-3F45 |
| 3E6 | 22000 $+40/-30\%$ | ≈ 7250 | ≈ 0 | E22/6/16-3E6 |

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Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 20 ± 10 N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

| GRADE | A_L (nH) | μ_e | AIR GAP (μm) | TYPE NUMBER |
|------------------|-------------------|----------------|------------------------------|----------------------|
| 3C90 | 160 $\pm 3\%$ | ≈ 42 | ≈ 950 | E22/6/16-A160-P |
| | 250 $\pm 3\%$ | ≈ 66 | ≈ 550 | E22/6/16-3C90-A250-P |
| | 315 $\pm 3\%$ | ≈ 83 | ≈ 400 | E22/6/16-3C90-A315-P |
| | 400 $\pm 5\%$ | ≈ 106 | ≈ 280 | E22/6/16-3C90-A400-P |
| | 630 $\pm 8\%$ | ≈ 166 | ≈ 160 | E22/6/16-3C90-A630-P |
| | 6150 $\pm 25\%$ | ≈ 1620 | ≈ 0 | E22/6/16-3C90 |
| 3C92 des | 4410 $\pm 25\%$ | ≈ 1170 | ≈ 0 | E22/6/16-3C92 |
| 3C93 des | 5000 $\pm 25\%$ | ≈ 1320 | ≈ 0 | E22/6/16-3C93 |
| 3C94 | 160 $\pm 3\%$ | ≈ 42 | ≈ 950 | E22/6/16-3C94-A160-P |
| | 250 $\pm 3\%$ | ≈ 66 | ≈ 550 | E22/6/16-3C94-A250-P |
| | 315 $\pm 3\%$ | ≈ 83 | ≈ 400 | E22/6/16-3C94-A315-P |
| | 400 $\pm 5\%$ | ≈ 106 | ≈ 280 | E22/6/16-3C94-A400-P |
| | 630 $\pm 8\%$ | ≈ 166 | ≈ 160 | E22/6/16-3C94-A630-P |
| | 6150 $\pm 25\%$ | ≈ 1620 | ≈ 0 | E22/6/16-3C94 |
| 3C95 des | 7360 $\pm 25\%$ | ≈ 1950 | ≈ 0 | E22/6/16-3C95 |
| 3C96 des | 5450 $\pm 25\%$ | ≈ 1440 | ≈ 0 | E22/6/16-3C96 |
| 3F3 | 160 $\pm 3\%$ | ≈ 42 | ≈ 950 | E22/6/16-3F3-A160-P |
| | 250 $\pm 3\%$ | ≈ 66 | ≈ 550 | E22/6/16-3F3-A250-P |
| | 315 $\pm 3\%$ | ≈ 83 | ≈ 400 | E22/6/16-3F3-A315-P |
| | 400 $\pm 5\%$ | ≈ 106 | ≈ 280 | E22/6/16-3F3-A400-P |
| | 630 $\pm 8\%$ | ≈ 166 | ≈ 160 | E22/6/16-3F3-A630-P |
| | 5000 $\pm 25\%$ | ≈ 1320 | ≈ 0 | E22/6/16-3F3 |
| 3F35 des | 4100 $\pm 25\%$ | ≈ 1080 | ≈ 0 | E22/6/16-3F35 |
| 3F4 des | 160 $\pm 3\%$ | ≈ 42 | ≈ 950 | E22/6/16-3F4-A160-P |
| | 250 $\pm 3\%$ | ≈ 66 | ≈ 550 | E22/6/16-3F4-A250-P |
| | 315 $\pm 3\%$ | ≈ 83 | ≈ 400 | E22/6/16-3F4-A315-P |
| | 400 $\pm 5\%$ | ≈ 106 | ≈ 280 | E22/6/16-3F4-A400-P |
| | 630 $\pm 8\%$ | ≈ 166 | ≈ 160 | E22/6/16-3F4-A630-P |
| | 2900 $\pm 25\%$ | ≈ 770 | ≈ 0 | E22/6/16-3F4 |
| 3F45 prot | 2900 $\pm 25\%$ | ≈ 770 | ≈ 0 | E22/6/16-3F45 |
| 3E6 | 26000 $+40/-30\%$ | ≈ 6900 | ≈ 0 | E22/6/16-3E6 |

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 = 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 |
| E+E22-3C90 | ≥320 | ≤ 0.28 | – | – | – | – |
| E+PLT22-3C90 | ≥320 | ≤ 0.23 | – | – | – | – |
| E+E22-3C92 | ≥370 | ≤ 0.22 | – | ≤ 1.5 | – | – |
| E+PLT22-3C92 | ≥370 | ≤ 0.18 | – | ≤ 1.25 | – | – |
| E+E22-3C93 | ≥320 | ≤ 0.22 ⁽¹⁾ | – | ≤ 1.5 ⁽¹⁾ | – | – |
| E+PLT22-3C93 | ≥320 | ≤ 0.18 ⁽¹⁾ | – | ≤ 1.25 ⁽¹⁾ | – | – |
| E+E22-3C94 | ≥320 | ≤ 0.22 | – | ≤ 1.5 | – | – |
| E+PLT22-3C94 | ≥320 | ≤ 0.18 | – | ≤ 1.25 | – | – |
| E+E22-3C95 | ≥320 | – | ≤ 1.5 | ≤ 1.43 | – | – |
| E+PLT22-3C95 | ≥320 | – | ≤ 1.2 | ≤ 1.14 | – | – |
| E+E22-3C96 | ≥320 | ≤ 0.17 | – | ≤ 1.1 | ≤ 0.45 | ≤ 1.0 |
| E+PLT22-3C96 | ≥320 | ≤ 0.14 | – | ≤ 1.0 | ≤ 0.38 | ≤ 0.75 |
| E+E22-3F3 | ≥300 | ≤ 0.28 | – | – | ≤ 0.5 | – |
| E+PLT22-3F3 | ≥300 | ≤ 0.23 | – | – | ≤ 0.40 | – |
| E+E22-3F35 | ≥300 | – | – | – | ≤ 0.25 | ≤ 0.4 |
| E+PLT22-3F35 | ≥300 | – | – | – | ≤ 0.2 | ≤ 0.3 |

1. Measured at 140 °C.

Properties of core sets under power conditions (continued)

| GRADE | B (mT) at | | | | |
|--------------|---|---|--|--|--|
| | H = 250 A/m; f = 10 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 |
| E+E22-3F35 | ≥300 | ≤ 3.0 | – | – | – |
| E+PLT22-3F35 | ≥300 | ≤ 2.2 | – | – | – |
| E+E22-3F4 | ≥250 | – | ≤ 0.8 | – | ≤ 1.2 |
| E+PLT22-3F4 | ≥250 | – | ≤ 0.6 | – | ≤ 1.0 |
| E+E22-3F45 | ≥250 | – | ≤ 0.6 | ≤ 2.2 | ≤ 1.0 |
| E+PLT22-3F45 | ≥250 | – | ≤ 0.45 | ≤ 1.7 | ≤ 0.8 |

MOUNTING INFORMATION

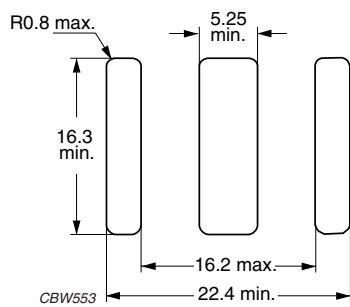


Fig.3 Recommended PCB cut-out for glued cores.

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DATA SHEET STATUS DEFINITIONS

| DATA SHEET STATUS | PRODUCT STATUS | DEFINITIONS |
|---------------------------|----------------|--|
| Preliminary specification | Development | This data sheet contains preliminary data. Ferroxcube reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification | Production | This data sheet contains final specifications. Ferroxcube reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |

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PRODUCT STATUS DEFINITIONS

| STATUS | INDICATION | DEFINITION |
|------------------|---|--|
| Prototype |  | These are products that have been made as development samples for the purposes of technical evaluation only. The data for these types is provisional and is subject to change. |
| Design-in |  | These products are recommended for new designs. |
| Preferred | | These products are recommended for use in current designs and are available via our sales channels. |
| Support |  | These products are not recommended for new designs and may not be available through all of our sales channels. Customers are advised to check for availability. |