

# DATA SHEET

**E14/3.5/5**

**Planar E cores and accessories**

Supersedes data of September 2004

2008 Sep 01

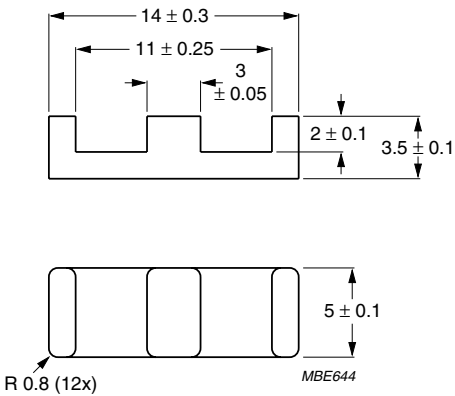
Planar E cores and accessories

E14/3.5/5

CORES

Effective core parameters of a set of E cores

| SYMBOL        | PARAMETER         | VALUE         | UNIT             |
|---------------|-------------------|---------------|------------------|
| $\Sigma(l/A)$ | core factor (C1)  | 1.43          | $\text{mm}^{-1}$ |
| $V_e$         | effective volume  | 300           | $\text{mm}^3$    |
| $l_e$         | effective length  | 20.7          | mm               |
| $A_e$         | effective area    | 14.3          | $\text{mm}^2$    |
| $A_{\min}$    | minimum area      | 14.3          | $\text{mm}^2$    |
| m             | mass of core half | $\approx 0.6$ | g                |



Dimensions in mm.

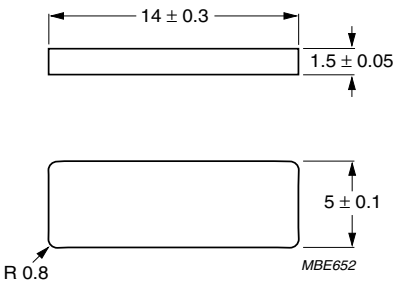
Fig.1 E14/3.5/5 core.

Effective core parameters of an E/PLT combination

| SYMBOL        | PARAMETER        | VALUE         | UNIT             |
|---------------|------------------|---------------|------------------|
| $\Sigma(l/A)$ | core factor (C1) | 1.16          | $\text{mm}^{-1}$ |
| $V_e$         | effective volume | 240           | $\text{mm}^3$    |
| $l_e$         | effective length | 16.7          | mm               |
| $A_e$         | effective area   | 14.5          | $\text{mm}^2$    |
| $A_{\min}$    | minimum area     | 14.5          | $\text{mm}^2$    |
| m             | mass of plate    | $\approx 0.5$ | g                |

Ordering information for plates

| GRADE                    | TYPE NUMBER      |
|--------------------------|------------------|
| 3C90                     | PLT14/5/1.5-3C90 |
| 3C92 <small>des</small>  | PLT14/5/1.5-3C92 |
| 3C93 <small>des</small>  | PLT14/5/1.5-3C93 |
| 3C94                     | PLT14/5/1.5-3C94 |
| 3C95 <small>des</small>  | PLT14/5/1.5-3C95 |
| 3C96 <small>des</small>  | PLT14/5/1.5-3C96 |
| 3F3                      | PLT14/5/1.5-3F3  |
| 3F35 <small>des</small>  | PLT14/5/1.5-3F35 |
| 3F4 <small>des</small>   | PLT14/5/1.5-3F4  |
| 3F45 <small>prot</small> | PLT14/5/1.5-3F45 |
| 3E6                      | PLT14/5/1.5-3E6  |



Dimensions in mm.

Fig.2 PLT14/5/1.5.

## Planar E cores and accessories

E14/3.5/5

**Core halves for use in combination with an ungapped E core**

$A_L$  measured in combination with a non-gapped core half, clamping force for  $A_L$  measurements,  $10 \pm 5$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

| GRADE                                                                                    | $A_L$<br>(nH)    | $\mu_e$        | AIR GAP<br>( $\mu\text{m}$ ) | TYPE NUMBER           |
|------------------------------------------------------------------------------------------|------------------|----------------|------------------------------|-----------------------|
| 3C90                                                                                     | $63 \pm 3\%$     | $\approx 72$   | $\approx 530$                | E14/3.5/5-3C90-A63-E  |
|                                                                                          | $100 \pm 5\%$    | $\approx 114$  | $\approx 270$                | E14/3.5/5-3C90-A100-E |
|                                                                                          | $160 \pm 8\%$    | $\approx 182$  | $\approx 130$                | E14/3.5/5-3C90-A160-E |
|                                                                                          | $1280 \pm 25\%$  | $\approx 1450$ | $\approx 0$                  | E14/3.5/5-3C90        |
| 3C92    | $960 \pm 25\%$   | $\approx 1090$ | $\approx 0$                  | E14/3.5/5-3C92        |
| 3C93    | $1100 \pm 25\%$  | $\approx 1250$ | $\approx 0$                  | E14/3.5/5-3C93        |
| 3C94                                                                                     | $63 \pm 3\%$     | $\approx 72$   | $\approx 530$                | E14/3.5/5-3C94-A63-E  |
|                                                                                          | $100 \pm 5\%$    | $\approx 114$  | $\approx 270$                | E14/3.5/5-3C94-A100-E |
|                                                                                          | $160 \pm 8\%$    | $\approx 182$  | $\approx 130$                | E14/3.5/5-3C94-A160-E |
|                                                                                          | $1280 \pm 25\%$  | $\approx 1450$ | $\approx 0$                  | E14/3.5/5-3C94        |
| 3C95    | $1500 \pm 25\%$  | $\approx 1730$ | $\approx 0$                  | E14/3.5/5-3C95        |
| 3C96   | $1200 \pm 25\%$  | $\approx 1360$ | $\approx 0$                  | E14/3.5/5-3C96        |
| 3F3                                                                                      | $63 \pm 3\%$     | $\approx 72$   | $\approx 530$                | E14/3.5/5-3F3-A63-E   |
|                                                                                          | $100 \pm 5\%$    | $\approx 114$  | $\approx 270$                | E14/3.5/5-3F3-A100-E  |
|                                                                                          | $160 \pm 8\%$    | $\approx 182$  | $\approx 130$                | E14/3.5/5-3F3-A160-E  |
|                                                                                          | $1100 \pm 25\%$  | $\approx 1250$ | $\approx 0$                  | E14/3.5/5-3F3         |
| 3F35  | $900 \pm 25\%$   | $\approx 1020$ | $\approx 0$                  | E14/3.5/5-3F35        |
| 3F4   | $63 \pm 3\%$     | $\approx 72$   | $\approx 530$                | E14/3.5/5-3F4-A63-E   |
|                                                                                          | $100 \pm 5\%$    | $\approx 114$  | $\approx 270$                | E14/3.5/5-3F4-A100-E  |
|                                                                                          | $160 \pm 8\%$    | $\approx 182$  | $\approx 130$                | E14/3.5/5-3F4-A160-E  |
|                                                                                          | $650 \pm 25\%$   | $\approx 740$  | $\approx 0$                  | E14/3.5/5-3F4         |
| 3F45  | $650 \pm 25\%$   | $\approx 740$  | $\approx 0$                  | E14/3.5/5-3F45        |
| 3E6                                                                                      | $5600 +40/-30\%$ | $\approx 6360$ | $\approx 0$                  | E14/3.5/5-3E6         |

## Planar E cores and accessories

E14/3.5/5

**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,  $10 \pm 5$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

| GRADE                                                                                    | $A_L$<br>(nH)    | $\mu_e$        | AIR GAP<br>( $\mu\text{m}$ ) | TYPE NUMBER           |
|------------------------------------------------------------------------------------------|------------------|----------------|------------------------------|-----------------------|
| 3C90                                                                                     | $63 \pm 3\%$     | $\approx 58$   | $\approx 600$                | E14/3.5/5-3C90-A63-P  |
|                                                                                          | $100 \pm 5\%$    | $\approx 92$   | $\approx 300$                | E14/3.5/5-3C90-A100-P |
|                                                                                          | $160 \pm 8\%$    | $\approx 148$  | $\approx 150$                | E14/3.5/5-3C90-A160-P |
|                                                                                          | $1500 \pm 25\%$  | $\approx 1400$ | $\approx 0$                  | E14/3.5/5-3C90        |
| 3C92    | $1130 \pm 25\%$  | $\approx 1040$ | $\approx 0$                  | E14/3.5/5-3C92        |
| 3C93    | $1300 \pm 25\%$  | $\approx 1200$ | $\approx 0$                  | E14/3.5/5-3C93        |
| 3C94                                                                                     | $63 \pm 3\%$     | $\approx 58$   | $\approx 600$                | E14/3.5/5-3C94-A63-P  |
|                                                                                          | $100 \pm 5\%$    | $\approx 92$   | $\approx 300$                | E14/3.5/5-3C94-A100-P |
|                                                                                          | $160 \pm 8\%$    | $\approx 148$  | $\approx 150$                | E14/3.5/5-3C94-A160-P |
|                                                                                          | $1500 \pm 25\%$  | $\approx 1400$ | $\approx 0$                  | E14/3.5/5-3C94        |
| 3C95    | $1740 \pm 25\%$  | $\approx 1600$ | $\approx 0$                  | E14/3.5/5-3C95        |
| 3C96   | $1350 \pm 25\%$  | $\approx 1260$ | $\approx 0$                  | E14/3.5/5-3C96        |
| 3F3                                                                                      | $63 \pm 3\%$     | $\approx 58$   | $\approx 600$                | E14/3.5/5-3F3-A63-P   |
|                                                                                          | $100 \pm 5\%$    | $\approx 92$   | $\approx 300$                | E14/3.5/5-3F3-A100-P  |
|                                                                                          | $160 \pm 8\%$    | $\approx 148$  | $\approx 150$                | E14/3.5/5-3F3-A160-P  |
|                                                                                          | $1300 \pm 25\%$  | $\approx 1200$ | $\approx 0$                  | E14/3.5/5-3F3         |
| 3F35  | $1050 \pm 25\%$  | $\approx 980$  | $\approx 0$                  | E14/3.5/5-3F35        |
| 3F4   | $63 \pm 3\%$     | $\approx 58$   | $\approx 600$                | E14/3.5/5-3F4-A63-P   |
|                                                                                          | $100 \pm 5\%$    | $\approx 92$   | $\approx 300$                | E14/3.5/5-3F4-A100-P  |
|                                                                                          | $160 \pm 8\%$    | $\approx 148$  | $\approx 150$                | E14/3.5/5-3F4-A160-P  |
|                                                                                          | $780 \pm 25\%$   | $\approx 720$  | $\approx 0$                  | E14/3.5/5-3F4         |
| 3F45  | $780 \pm 25\%$   | $\approx 720$  | $\approx 0$                  | E14/3.5/5-3F45        |
| 3E6                                                                                      | $6400 +40/-30\%$ | $\approx 5900$ | $\approx 0$                  | E14/3.5/5-3E6         |

## Planar E cores and accessories

E14/3.5/5

## Properties of core sets under power conditions

| GRADE        | B (mT) at                                 | CORE LOSS (W) at                                  |                                                  |                                                   |                                                  |                                                  |
|--------------|-------------------------------------------|---------------------------------------------------|--------------------------------------------------|---------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
|              | H = 250 A/m;<br>f = 10 kHz;<br>T = 100 °C | f = 100 kHz;<br>$\hat{B}$ = 100 mT;<br>T = 100 °C | f = 100 kHz;<br>$\hat{B}$ = 200 mT;<br>T = 25 °C | f = 100 kHz;<br>$\hat{B}$ = 200 mT;<br>T = 100 °C | f = 400 kHz;<br>$\hat{B}$ = 50 mT;<br>T = 100 °C | f = 500 kHz;<br>$\hat{B}$ = 50 mT;<br>T = 100 °C |
| E+E14-3C90   | ≥320                                      | ≤ 0.030                                           | –                                                | –                                                 | –                                                | –                                                |
| E+PLT14-3C90 | ≥320                                      | ≤ 0.026                                           | –                                                | –                                                 | –                                                | –                                                |
| E+E14-3C92   | ≥370                                      | ≤ 0.024                                           | –                                                | ≤ 0.16                                            | –                                                | –                                                |
| E+PLT14-3C92 | ≥370                                      | ≤ 0.021                                           | –                                                | ≤ 0.15                                            | –                                                | –                                                |
| E+E14-3C93   | ≥320                                      | ≤ 0.024 <sup>(1)</sup>                            | –                                                | ≤ 0.16 <sup>(1)</sup>                             | –                                                | –                                                |
| E+PLT14-3C93 | ≥320                                      | ≤ 0.021 <sup>(1)</sup>                            | –                                                | ≤ 0.15 <sup>(1)</sup>                             | –                                                | –                                                |
| E+E14-3C94   | ≥320                                      | ≤ 0.024                                           | –                                                | ≤ 0.16                                            | –                                                | –                                                |
| E+PLT14-3C94 | ≥320                                      | ≤ 0.021                                           | –                                                | ≤ 0.15                                            | –                                                | –                                                |
| E+E14-3C95   | ≥320                                      | –                                                 | ≤ 0.17                                           | ≤ 0.16                                            | –                                                | –                                                |
| E+PLT14-3C95 | ≥320                                      | –                                                 | ≤ 0.13                                           | ≤ 0.12                                            | –                                                | –                                                |
| E+E14-3C96   | ≥340                                      | ≤ 0.019                                           | –                                                | ≤ 0.13                                            | ≤ 0.05                                           | ≤ 0.11                                           |
| E+PLT14-3C96 | ≥340                                      | ≤ 0.016                                           | –                                                | ≤ 0.12                                            | ≤ 0.045                                          | ≤ 0.09                                           |
| E+E14-3F3    | ≥300                                      | ≤ 0.033                                           | –                                                | –                                                 | ≤ 0.06                                           | –                                                |
| E+PLT14-3F3  | ≥300                                      | ≤ 0.027                                           | –                                                | –                                                 | ≤ 0.047                                          | –                                                |
| E+E14-3F35   | ≥300                                      | –                                                 | –                                                | –                                                 | ≤ 0.03                                           | ≤ 0.05                                           |
| E+PLT14-3F35 | ≥300                                      | –                                                 | –                                                | –                                                 | ≤ 0.024                                          | ≤ 0.035                                          |

1. Measured at 140 °C.

## Properties of core sets under power conditions (continued)

| GRADE        | B (mT) at                                 | CORE LOSS (W) at                                  |                                                |                                                |                                                |
|--------------|-------------------------------------------|---------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
|              | H = 250 A/m;<br>f = 10 kHz;<br>T = 100 °C | f = 500 kHz;<br>$\hat{B}$ = 100 mT;<br>T = 100 °C | f = 1 MHz;<br>$\hat{B}$ = 30 mT;<br>T = 100 °C | f = 1 MHz;<br>$\hat{B}$ = 50 mT;<br>T = 100 °C | f = 3 MHz;<br>$\hat{B}$ = 10 mT;<br>T = 100 °C |
| E+E14-3F35   | ≥300                                      | ≤ 0.35                                            | –                                              | –                                              | –                                              |
| E+PLT14-3F35 | ≥300                                      | ≤ 0.27                                            | –                                              | –                                              | –                                              |
| E+E14-3F4    | ≥250                                      | –                                                 | ≤ 0.09                                         | –                                              | ≤ 0.15                                         |
| E+PLT14-3F4  | ≥250                                      | –                                                 | ≤ 0.07                                         | –                                              | ≤ 0.12                                         |
| E+E14-3F45   | ≥250                                      | –                                                 | ≤ 0.07                                         | ≤ 0.26                                         | ≤ 0.12                                         |
| E+PLT14-3F45 | ≥250                                      | –                                                 | ≤ 0.055                                        | ≤ 0.2                                          | ≤ 0.095                                        |

## MOUNTING INFORMATION

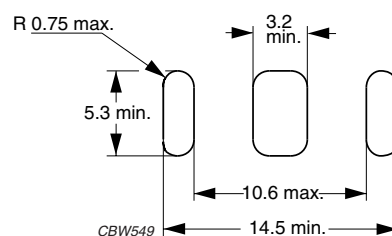
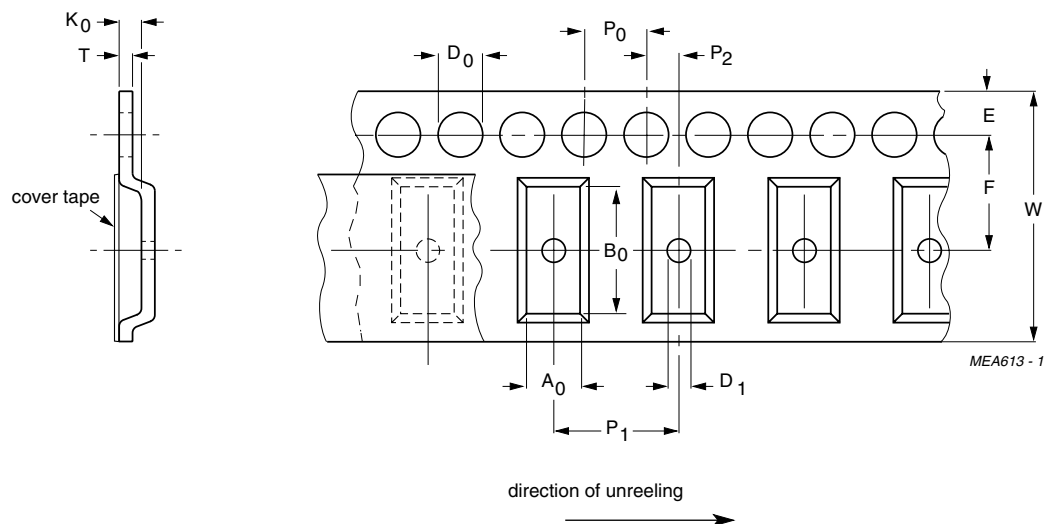


Fig.3 Recommended PCB cut-out for glued planar E14/3.5/5 cores.

**BLISTER TAPE AND REEL DIMENSIONS** prot

For dimensions see Table 1.

Fig.4 Blister tape.

**Table 1** Physical dimensions of blister tape; see Fig.4

| SIZE  | DIMENSIONS<br>(mm) |
|-------|--------------------|
| $A_0$ | $5.4 \pm 0.2$      |
| $B_0$ | $14.6 \pm 0.2$     |
| $K_0$ | $4.0 \pm 0.2$      |
| $T$   | $0.3 \pm 0.05$     |
| $W$   | $24.0 \pm 0.3$     |
| $E$   | $1.75 \pm 0.1$     |
| $F$   | $11.5 \pm 0.1$     |
| $D_0$ | $1.5 \pm 0.1$      |
| $D_1$ | $\geq 1.5$         |
| $P_0$ | $4.0 \pm 0.1$      |
| $P_1$ | $8.0 \pm 0.1$      |
| $P_2$ | $2.0 \pm 0.1$      |

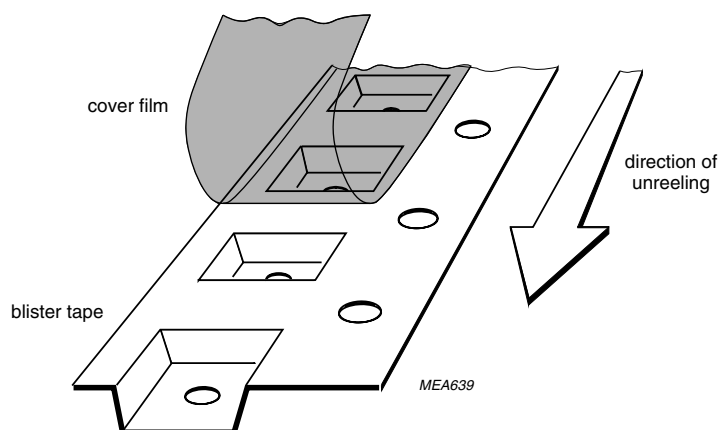
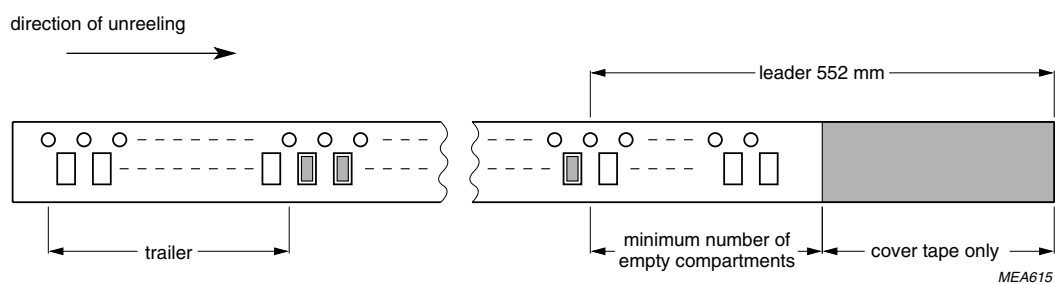


Fig.5 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.

Trailer: 160 mm minimum (secured with tape).

Storage temperature range for tape: -25 to +45 °C.

Fig.6 Leader/trailer tape.



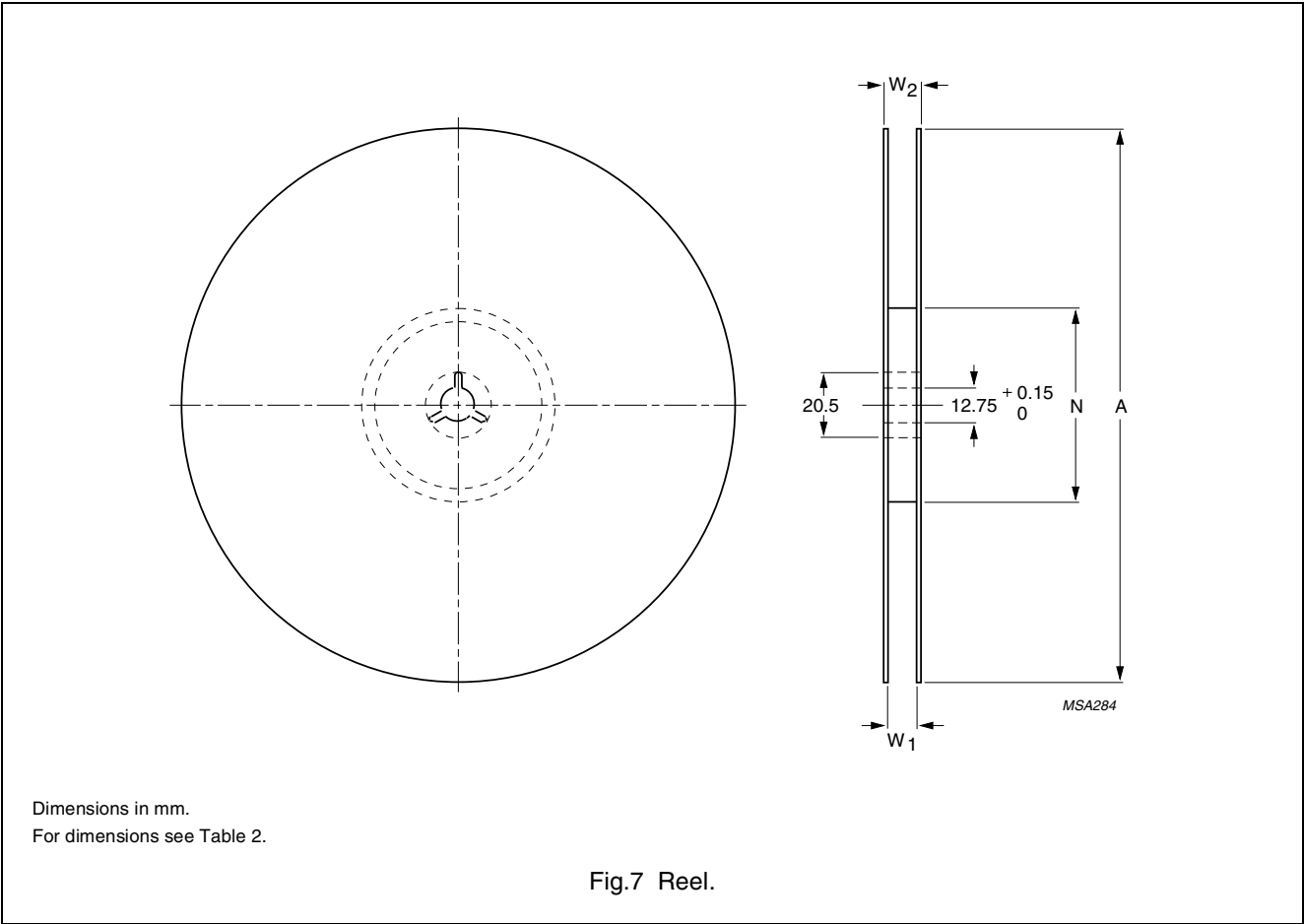


Table 2 Reel dimensions; see Fig.7

| SIZE | DIMENSIONS (mm) |        |                |                |
|------|-----------------|--------|----------------|----------------|
|      | A               | N      | W <sub>1</sub> | W <sub>2</sub> |
| 24   | 330             | 100 ±5 | 24.4           | ≤28.4          |

## Planar E cores and accessories

E14/3.5/5

## 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. |

## 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. Ferroxcube customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Ferroxcube for any damages resulting from such application.

## PRODUCT STATUS DEFINITIONS

| STATUS           | INDICATION                                                                          | DEFINITION                                                                                                                                                                     |
|------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Prototype</b> |  | 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. |
| <b>Design-in</b> |  | These products are recommended for new designs.                                                                                                                                |
| <b>Preferred</b> |                                                                                     | These products are recommended for use in current designs and are available via our sales channels.                                                                            |
| <b>Support</b>   |  | These products are <b>not</b> recommended for new designs and may not be available through all of our sales channels. Customers are advised to check for availability.         |