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### **ISOLATION TRANSFORMERS**

#### **10BASE-T FOR ADAPTER CARDS, MAUS, HUBS AND MOTHERBOARD APPLICATIONS**

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#### **ETHERNET AUI TRANSFORMERS**

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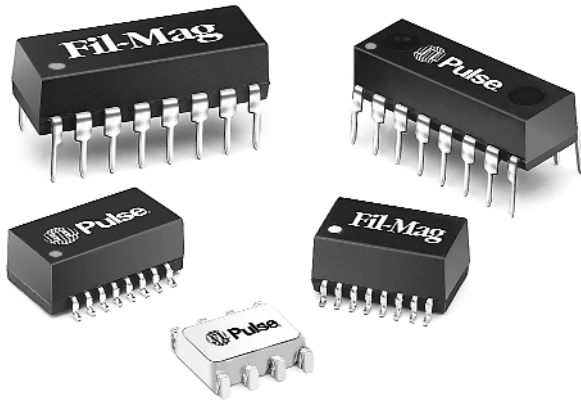
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# ISOLATION TRANSFORMERS FOR 10BASE-T

## For Adapter Cards, MAUs, Hubs, and Motherboard Applications



-  Meets IEEE 802.3 specification
-  Available with common mode chokes for EMI suppression
-  Through hole, auto-insertable, 16-pin DIP package

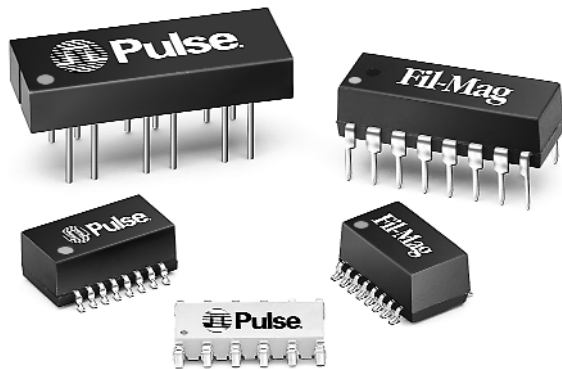
### Electrical Specifications @ 25°C — Operating Temperature 0°C to 70°C




| Part <sup>2</sup><br>Number      | Turns Ratio<br>(±5%) |          | Primary<br>Pins    | Common<br>Mode<br>Choke | Sine Wave<br>Inductance<br>OCL <sup>1</sup><br>(μH MIN) | Interwinding<br>Capacitance<br>C <sub>ww</sub> <sup>1</sup><br>(pF MAX) | Leakage<br>Inductance<br>L <sub>L</sub> <sup>1</sup><br>(μH MAX) | DCR<br>(Ω MAX) | Hipot<br>(Vrms) | Schem.    | Mech      |
|----------------------------------|----------------------|----------|--------------------|-------------------------|---|---|--|----------------|-----------------|-----------|-----------|
|                                  | Transmit             | Receive  |                    |                         |   |   |  |                |                 |           |           |
| <b>SURFACE MOUNT<sup>2</sup></b> |                      |          |                    |                         |   |   |  |                |                 |           |           |
|                                  |                      |          |                    |                         |   |   |  |                |                 | pages 6-7 | pages 8-9 |
| 23Z128SM                         | 1CT:1.414CT          | 1CT:1CT  | 6-8/1-3            |                         | 200   | 15  | 0.5  | 0.4            | 2000            | T4        | SMT5      |
| 23Z356SM                         | 1CT:1.414CT          | 1CT:1CT  | 6-8/1-3            | X                       | 200   | 12  | 0.5  | 0.6            | 2000            | T7        | SMT5      |
| 23Z467SM                         | 1CT:2CT              | 1CT:1CT  | 6-8/1-3            | X                       | 140   | 12  | 0.2  | 0.6            | 2000            | T7        | SMT5      |
| E2023 <sup>4</sup>               | 1CT: 2.5CT           | 1CT: 1CT | 6-8/1-3            | X                       | 200   | 15  | 0.5  | 0.4            | 2000            | T10       | SMT4      |
| E4001                            | 1CT:2CT              | 1CT:1CT  | 6-8/1-3            | X                       | 112   | 8   | 0.3  | 0.8            | 3000            | T5        | SMT4      |
| EX2024 <sup>3</sup>              | 1CT: 2.5CT           | 1CT:1CT  | 6-8/1-3            | X                       | 350   | 30  | 0.8  | 0.6            | 2000            | T10       | SMT4      |
| PE-65454                         | 1:1.414              | 1:1      | 3-4/1-2            |                         | 140   | 12  | 0.2  | 0.4            | 2000            | T1        | SMT2      |
| PE-65726                         | 1CT:1CT              | 1CT:1CT  | 1-3/6-8            |                         | 200   | 10  | 0.2  | 0.3            | 2000            | T4        | SMT4      |
| PE-65745                         | 1CT: 1.414CT         | 1CT:1CT  | 6-8/1-3            |                         | 140   | 12  | 0.2  | 0.3            | 1500            | T4        | SMT4      |
| PE-68023                         | 1CT:2CT              | 1CT:1CT  | 1-3/6-8            | X                       | 200   | 12  | 0.3  | 1.0            | 1500            | T6        | SMT4      |
| PE-68041                         | 1CT:2CT              | 1CT:1CT  | 6-8/1-3            |                         | 112   | 8   | 0.3  | 0.5            | 1500            | T4        | SMT4      |
| PE-68048                         | 1CT: 1.414CT         | 1CT:1CT  | 6-8/1-3            | X                       | 110   | 15  | 0.4  | 1.0            | 1500            | T5        | SMT4      |
| PE-68052                         | 2CT:1CT              | 1CT:1CT  | 1-3/6-8            | X                       | 140   | 12  | 0.3  | 1.0            | 1500            | T6        | SMT4      |
| PE-68810                         | —                    | 1:1 (4X) | 1-2/3-4            |                         | 140   | 12  | 0.2  | 0.4            | 2000            | T3        | SMT4      |
| PE-68820                         | 1:1.414 (4X)         | —        | 1-2/3-4<br>5-6/7-8 |                         | 40  | 12  | 0.2  | 0.4            | 2000            | T3        | SMT4      |
| <b>THROUGH HOLE</b>              |                      |          |                    |                         |   |   |  |                |                 |           |           |
|                                  |                      |          |                    |                         |   |   |  |                |                 | pages 6   | page 10   |
| 23Z128                           | 1CT: 2CT             | 1CT:1CT  | 6-8/1-3            |                         | 140   | 15  | 0.5  | 0.4            | 2000            | T4        | TH3       |
| PE-65263                         | 1CT:1CT              | 1CT:1CT  | 1-3/6-8            |                         | 200   | 15  | 0.25   | 0.3            | 2000            | T4        | TH4       |

1. OCL, C<sub>ww</sub> and L<sub>L</sub> are measured at 20 mVrms, 100 kHz.
2. For Tape & Reel packaging, add the suffix "T" to the end of the part number when ordering. e.g. E2023T.
3. Part numbers denoted "EX" are extended temperature parts -40°C to 85°C, electrical specifications @ 25°C.
4. E2023NL is the RoHS compliant version of E2023.

# ISOLATION TRANSFORMERS FOR ETHERNET

## AUI Transformers



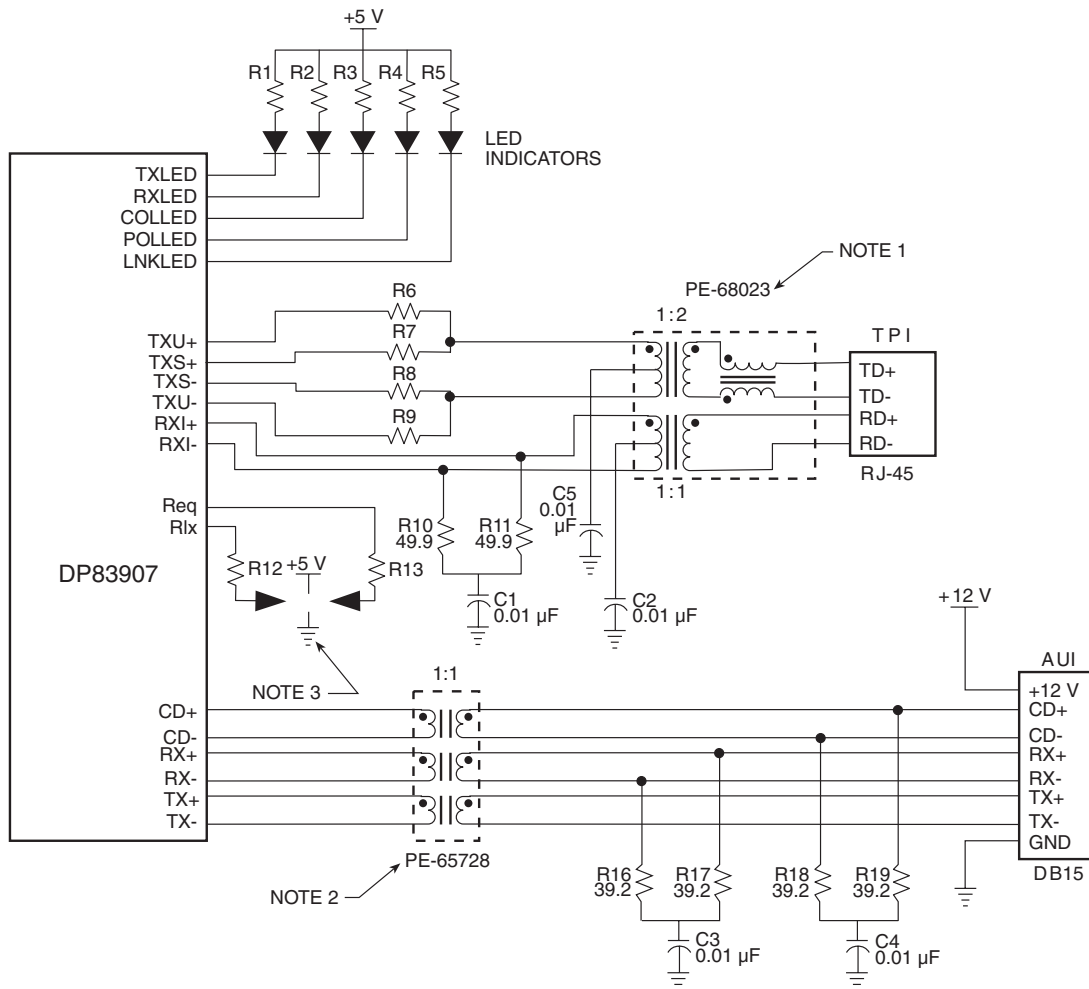
-  Low leakage inductance and coupling capacitance for faster rise times
-  Small form factor, 50 mil lead spacing
-  Through hole, auto-insertable, 16-pin DIP package

### Electrical Specifications @ 25°C — Operating Temperature 0°C to 70°C

| Part Number <sup>3</sup>         | Turns Ratio (±5%) | Primary Pins | Primary Sine Wave OCL <sup>1</sup> (μH ±20%) | Primary ET-Constant (V-μs MIN) | Rise Time <sup>2</sup> (ns MAX) | Interwinding Capacitance C <sub>ww</sub> <sup>1</sup> (pF MAX) | Leakage Inductance L <sub>L</sub> <sup>1</sup> (μH MAX) | DCR (Ω MAX) | Schem.  | Mech.     | Hipot (Vrms) |
|----------------------------------|-------------------|--------------|--|--------------------------------|---------------------------------|--|---|-------------|---------|-----------|--------------|
| <b>SURFACE MOUNT<sup>3</sup></b> |                   |              |  |                                |                                 |  |   |             | page 6  | pages 8-9 |              |
| 23Z90SM                          | 1:1               | 1-2/4-5/7-8  | 75   | 2.4                            | 3.0                             | 10   | 0.20  | 0.20        | T2      | SMT5      | 2000         |
| 23Z91SM                          | 1:1               | 1-2/4-5/7-8  | 100  | 2.4                            | 3.0                             | 10   | 0.20  | 0.30        | T2      | SMT5      | 2000         |
| 23Z108SM <sup>5</sup>            | 1:1               | 1-2/4-5/7-8  | 350  | 2.5                            | 3.5                             | 16   | 0.30  | 0.35        | T2      | SMT5      | 2000         |
| PE-65723                         | 1:1               | 1-2/4-5/7-8  | 75   | 1.8                            | 3.0                             | 8  | 0.20  | 0.30        | T2      | SMT4      | 2000         |
| PE-65727                         | 1:1               | 1-2/4-5/7-8  | 150  | 1.2                            | 3.0                             | 12   | 0.20  | 0.30        | T2      | SMT4      | 2000         |
| PE-65728                         | 1:1               | 1-2/4-5/7-8  | 100  | 1.8                            | 3.0                             | 9  | 0.20  | 0.30        | T2      | SMT4      | 2000         |
| <b>THROUGH HOLE</b>              |                   |              |  |                                |                                 |  |   |             | pages 6 | page 9-10 |              |
| PE-64102                         | 1:1               | 1-2/4-5/7-8  | 75   | 2.1                            | 3.0                             | 10   | 0.20  | 0.20        | T2      | TH4       | 500          |
| PE-64103                         | 1:1               | 1-2/4-5/7-8  | 100  | 2.1                            | 3.0                             | 10   | 0.20  | 0.30        | T2      | TH4       | 500          |
| PE-64104                         | 1:1               | 1-2/4-5/7-8  | 150  | 2.1                            | 3.5                             | 12   | 0.20  | 0.30        | T2      | TH4       | 500          |
| PE-64108                         | 1:1               | 1-2/4-5/7-8  | 100  | 2.1                            | 3.5                             | 10   | 0.25  | 0.40        | T2      | TH2       | 2000         |
| PE-64109                         | 1:1               | 1-2/4-5/7-8  | 150  | 3.0                            | 3.0                             | 15   | 0.20  | 0.45        | T2      | TH2       | 2000         |
| PE-64502                         | 1:1               | 1-2/4-5/7-8  | 75   | 2.1                            | 3.0                             | 10   | 0.20  | 0.20        | T2      | TH4       | 2000         |
| PE-64503                         | 1:1               | 1-2/4-5/7-8  | 100  | 2.1                            | 3.0                             | 10   | 0.20  | 0.30        | T2      | TH4       | 2000         |

1. OCL, C<sub>ww</sub> and L<sub>L</sub> are measured at 20 mVrms, 100 kHz.
2. Rise time is measured in 75 Ω systems.
3. For Tape & Reel packaging, add a suffix "T" to the end of the part number when ordering. e.g. PE-65723T.

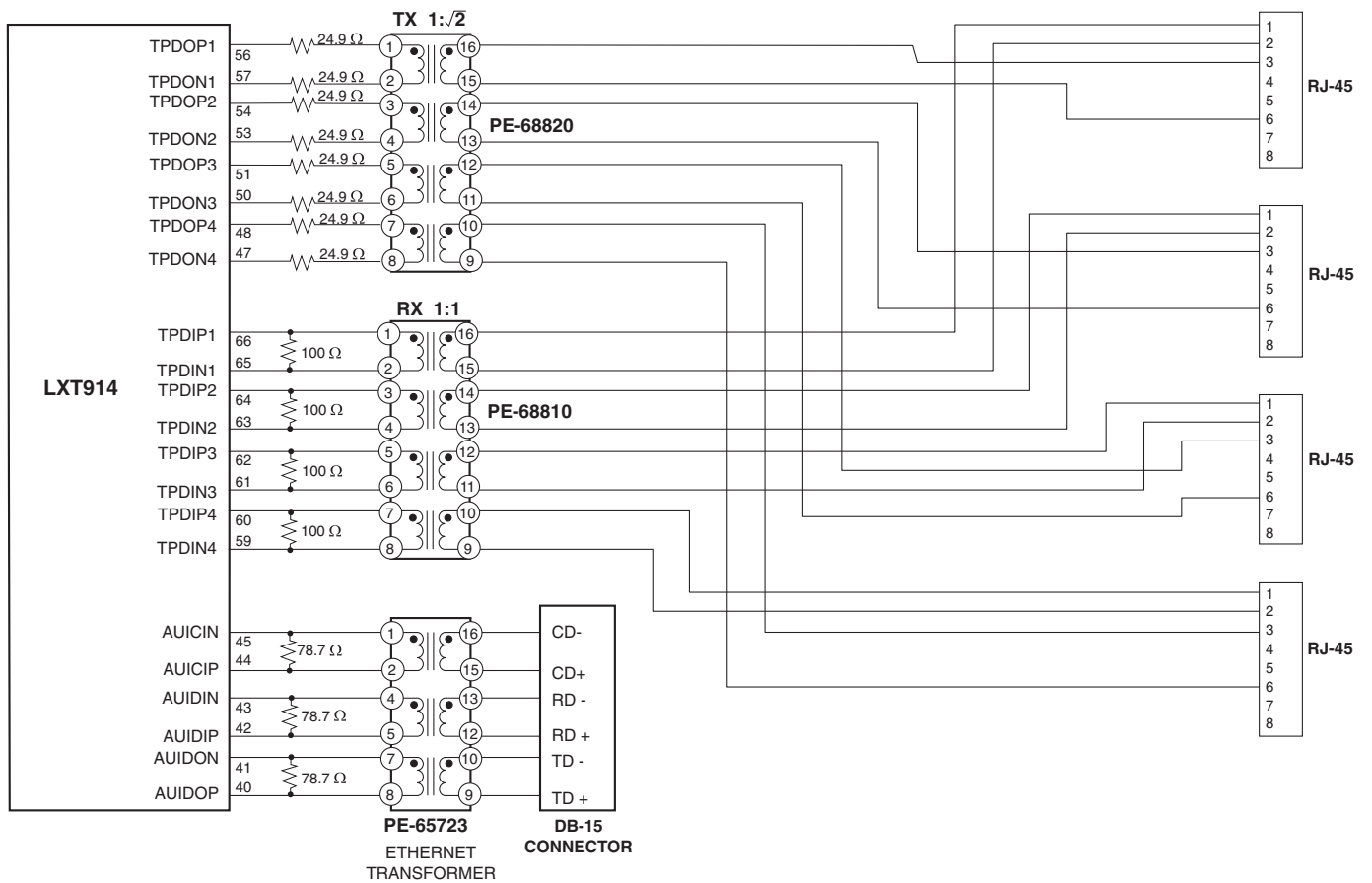
## Typical Application Circuit



**NOTES:**

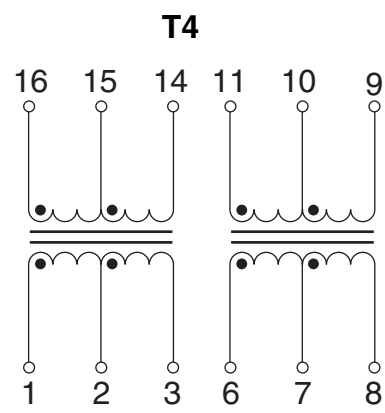
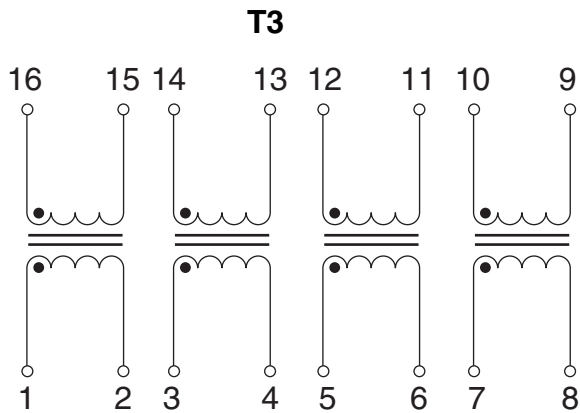
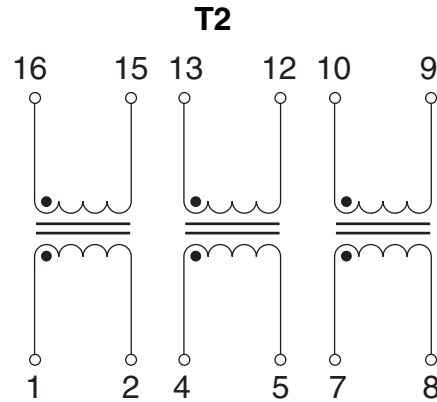
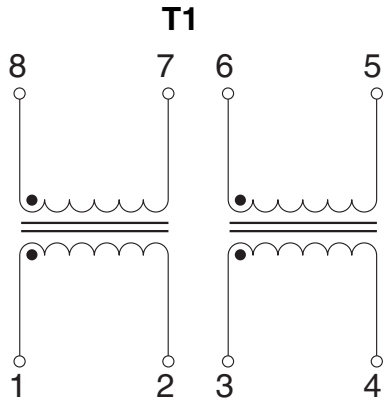
1. Connections at pins 12 and 13 apply to PE-68023 only. These are test points. **Do not ground.**
2. For specific information, see pages 2 and 3 in this catalog.
3. For specific connection, refer to National's Application Notes.

## Typical 10Base-T Application Circuit



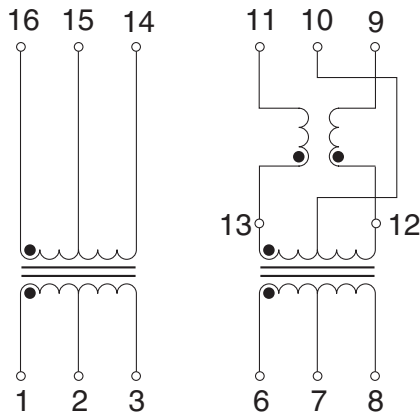
## Schematics

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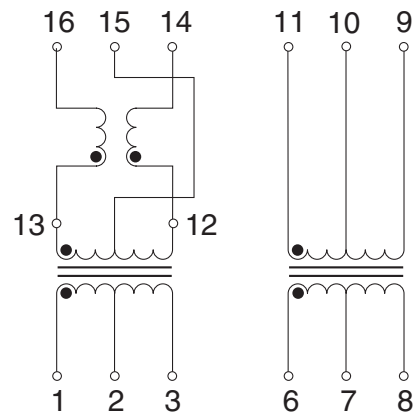


## Schematics (continued)

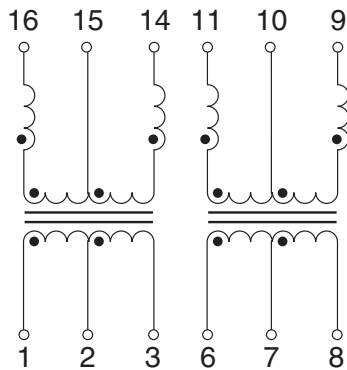
**T5**



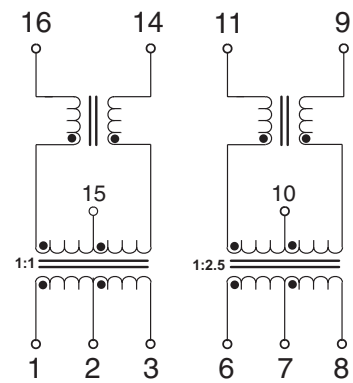
**T6**



**T7**



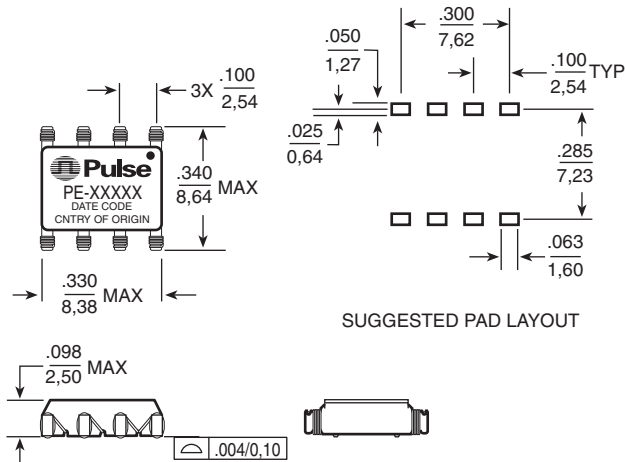
**T10**



PINS 4, 5, 12 AND 13 NOT CONNECTED.

## Surface Mount Mechanicals

### SMT2



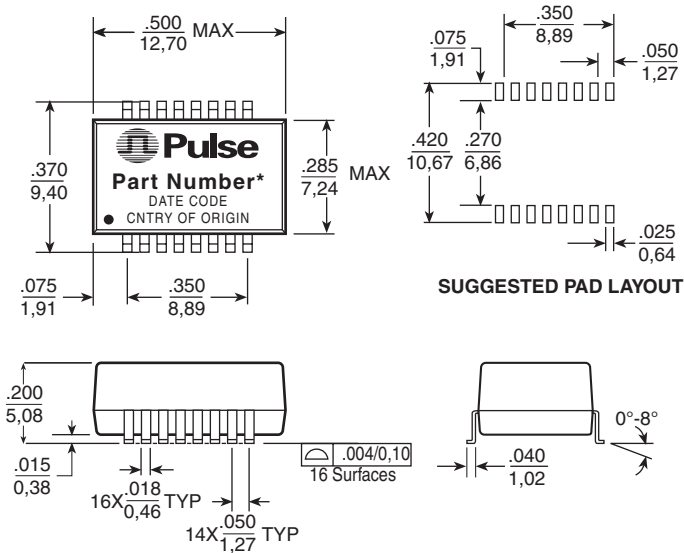
Dimensions:  $\frac{\text{Inches}}{\text{mm}}$

Unless otherwise specified, all tolerances are  $\pm \frac{.010}{0,25}$

Weight .....0.22 grams  
 Tube ..... .60/tube  
 Tape & Reel ..... .1500/reel

### SMT4

\*PE-6XXXX, EXXX, EX2XXX



Dimensions:  $\frac{\text{Inches}}{\text{mm}}$

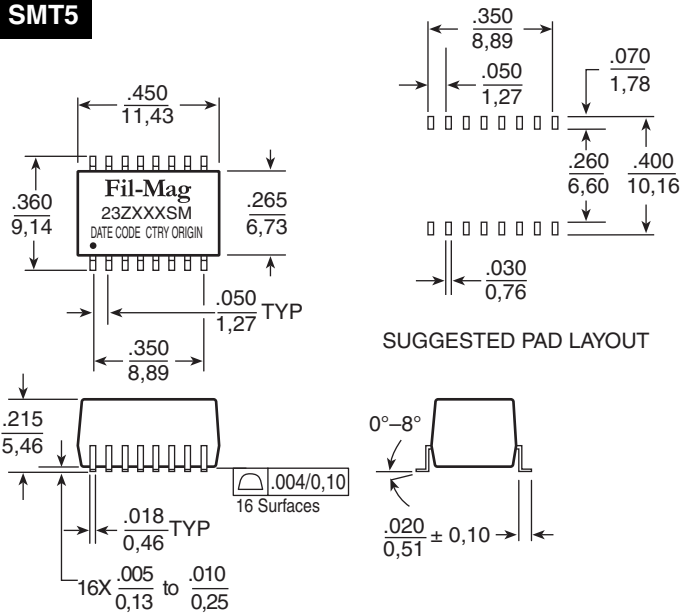
Unless otherwise specified, all tolerances are  $\pm \frac{.010}{0,25}$

Weight .....0.82 grams  
 Tube ..... .40/tube  
 Tape & Reel ..... .900/reel



## Surface Mount Mechanicals *(continued)*

### SMT5



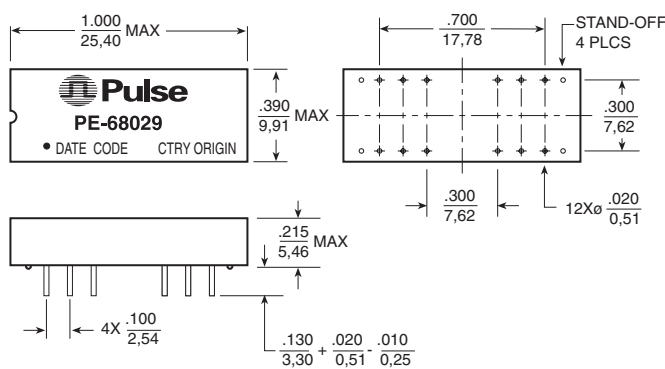
Dimensions:  $\frac{\text{Inches}}{\text{mm}}$

Unless otherwise specified, all tolerances are  $\pm \frac{.005}{0,13}$

Weight ..... .085 grams  
 Tube ..... .50/tube  
 Tape & Reel ..... .750/reel

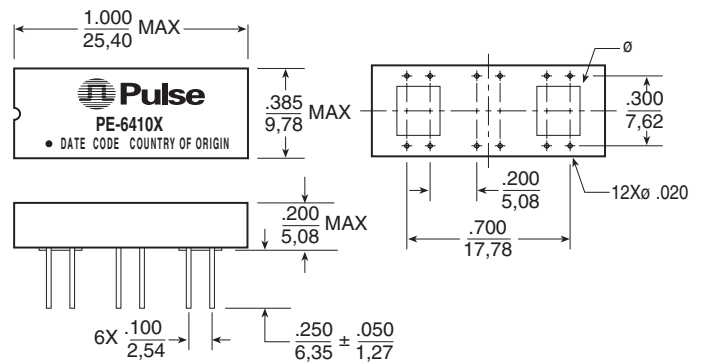
## Through Hole Mechanicals

### TH1



Weight ..... .217 grams  
 Tube ..... .20/tube

### TH2

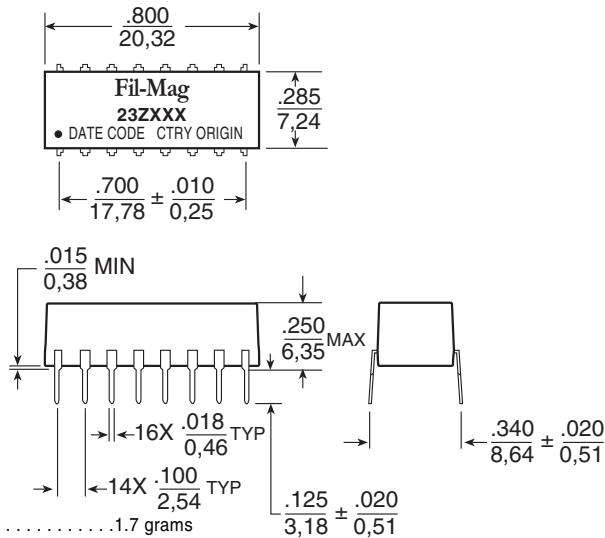


Weight ..... .218 grams  
 Tube ..... .20/tube

Dimensions:  $\frac{\text{Inches}}{\text{mm}}$  Unless otherwise specified, all tolerances are  $\pm \frac{.010}{0,25}$

## Through Hole Mechanicals - *continued*

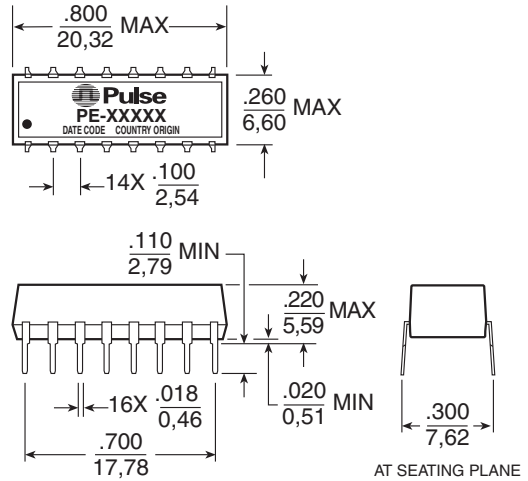
**TH3**



**Dimensions:**  $\frac{\text{Inches}}{\text{mm}}$

Unless otherwise specified, all tolerances are  $\pm \frac{.005}{0,13}$

**TH4**



**Dimensions:**  $\frac{\text{Inches}}{\text{mm}}$

Unless otherwise specified, all tolerances are  $\pm \frac{.010}{0,25}$

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