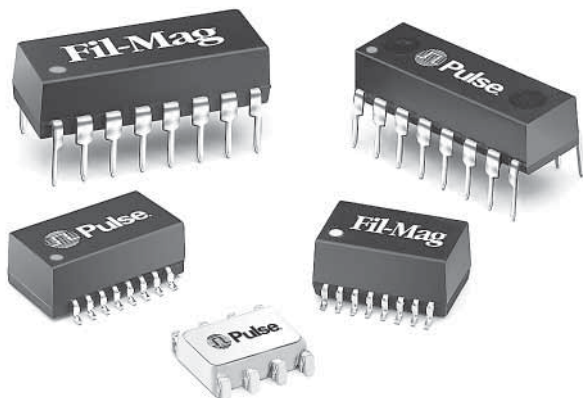


# ISOLATION TRANSFORMERS FOR 10BASE-T

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<br>(μH MIN) | Interwinding<br>Capacitance<br>C <sub>ww</sub> <sup>1</sup><br>(pF MAX) | Leakage<br>Inductance<br>L <sup>1</sup><br>(μH MAX) | DCR<br>(Ω MAX) | Hipot<br>(Vrms) | Schem. | Mech      |           |
|-----------------------------|----------------------|----------|--------------------|-------------------------|--------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------|----------------|-----------------|--------|-----------|-----------|
|                             | Transmit             | Receive  |                    |                         |                                            |                                                                         |                                                     |                |                 |        |           |           |
| SURFACE MOUNT <sup>2</sup>  |                      |          |                    |                         |                                            |                                                                         |                                                     |                |                 |        | 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            | ✓                       | 200                                        | 12                                                                      | 0.5                                                 | 0.6            | 2000            | T7     | SMT5      |           |
| 23Z467SM                    | 1CT:2CT              | 1CT:1CT  | 6-8/1-3            | ✓                       | 140                                        | 12                                                                      | 0.2                                                 | 0.6            | 2000            | T7     | SMT5      |           |
| E2023 <sup>4</sup>          | 1CT: 2.5CT           | 1CT: 1CT | 6-8/1-3            | ✓                       | 200                                        | 15                                                                      | 0.5                                                 | 0.4            | 2000            | T10    | SMT4      |           |
| E4001                       | 1CT:2CT              | 1CT:1CT  | 6-8/1-3            | ✓                       | 112                                        | 8                                                                       | 0.3                                                 | 0.8            | 3000            | T5     | SMT4      |           |
| EX2024 <sup>3</sup>         | 1CT: 2.5CT           | 1CT:1CT  | 6-8/1-3            | ✓                       | 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-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            | ✓                       | 200                                        | 12                                                                      | 0.3                                                 | 1.0            | 1500            | T6     | SMT4      |           |
| PE-68048                    | 1CT: 1.414CT         | 1CT:1CT  | 6-8/1-3            | ✓                       | 110                                        | 15                                                                      | 0.4                                                 | 1.0            | 1500            | T5     | SMT4      |           |
| PE-68052                    | 2CT:1CT              | 1CT:1CT  | 1-3/6-8            | ✓                       | 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      |           |
| THROUGH HOLE                |                      |          |                    |                         |                                            |                                                                         |                                                     |                |                 |        | PAGE 6    | PAGE 10   |
| 23Z128                      | 1CT: 2CT             | 1CT:1CT  | 6-8/1-3            | —                       | 140                                        | 15                                                                      | 0.5                                                 | 0.4            | 2000            | T4     | TH3       |           |

1. OCL, C<sub>ww</sub> and L<sub>L</sub> are measured at 20 mVrms, 100 kHz.

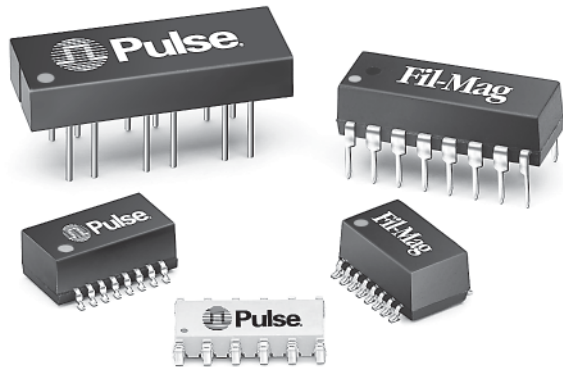
2. For Tape & Reel packaging, add the suffix "T" to the end of the part number when ordering. e.g. E2023T.

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



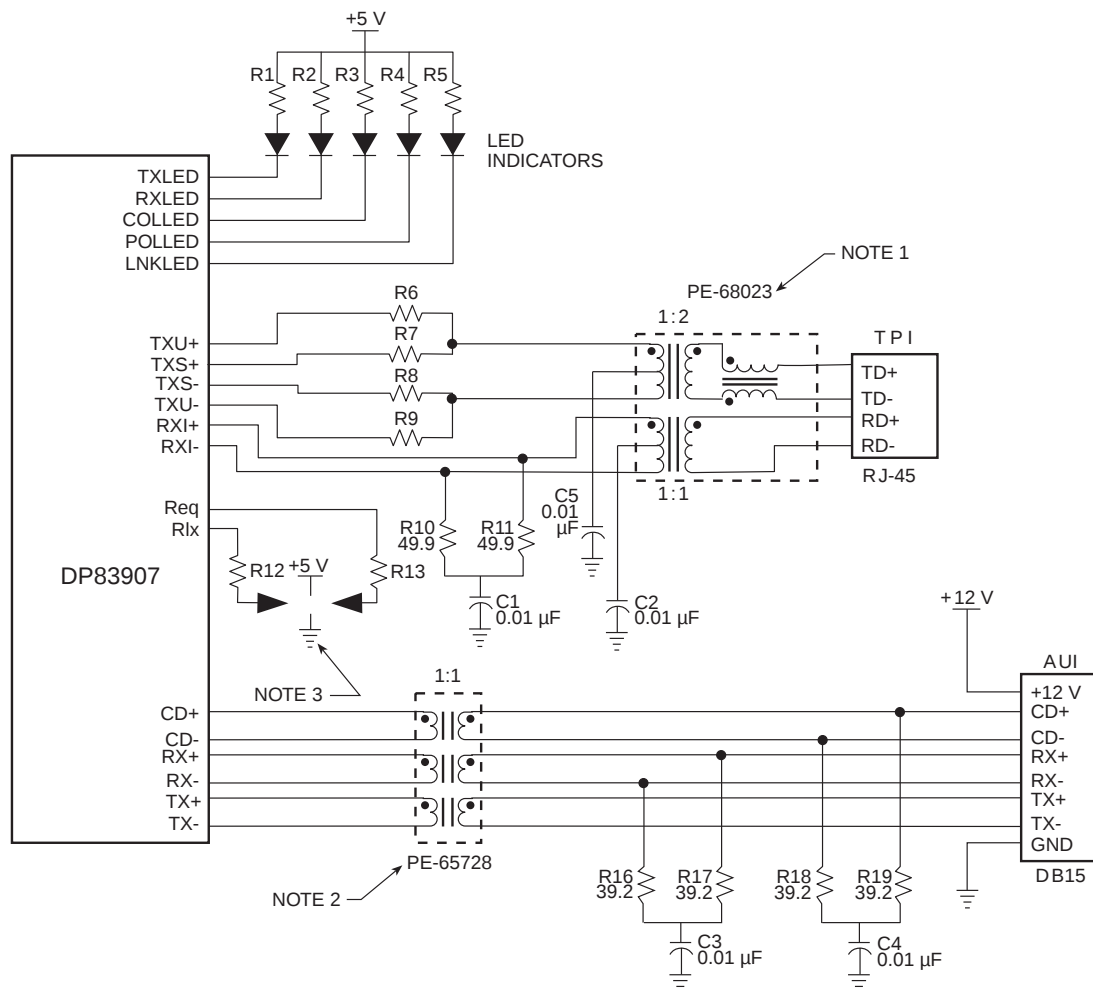
- Low leakage inductance and coupling capacitance for faster rise times
- Small form factor, 50 mil lead spacing
- Through hole, auto-insertable, 16-pin DIP package

### 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 |              |
| <b>23Z90SM</b>                   | 1:1               | 1-2/4-5/7-8  | 75                                           | 2.4                            | 3.0                             | 10                                                             | 0.20                                                    | 0.20        | T2      | SMT5      | 2000         |
| <b>23Z91SM</b>                   | 1:1               | 1-2/4-5/7-8  | 100                                          | 2.4                            | 3.0                             | 10                                                             | 0.20                                                    | 0.30        | T2      | SMT5      | 2000         |
| <b>23Z108SM<sup>5</sup></b>      | 1:1               | 1-2/4-5/7-8  | 350                                          | 2.5                            | 3.5                             | 16                                                             | 0.30                                                    | 0.35        | T2      | SMT5      | 2000         |
| <b>PE-65723</b>                  | 1:1               | 1-2/4-5/7-8  | 75                                           | 1.8                            | 3.0                             | 8                                                              | 0.20                                                    | 0.30        | T2      | SMT4      | 2000         |
| <b>PE-65727</b>                  | 1:1               | 1-2/4-5/7-8  | 150                                          | 1.2                            | 3.0                             | 12                                                             | 0.20                                                    | 0.30        | T2      | SMT4      | 2000         |
| <b>PE-65728</b>                  | 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 |              |
| <b>PE-64108</b>                  | 1:1               | 1-2/4-5/7-8  | 100                                          | 2.1                            | 3.5                             | 10                                                             | 0.25                                                    | 0.40        | T2      | TH2       | 2000         |
| <b>PE-64109</b>                  | 1:1               | 1-2/4-5/7-8  | 150                                          | 3.0                            | 3.0                             | 15                                                             | 0.20                                                    | 0.45        | T2      | TH2       | 2000         |

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

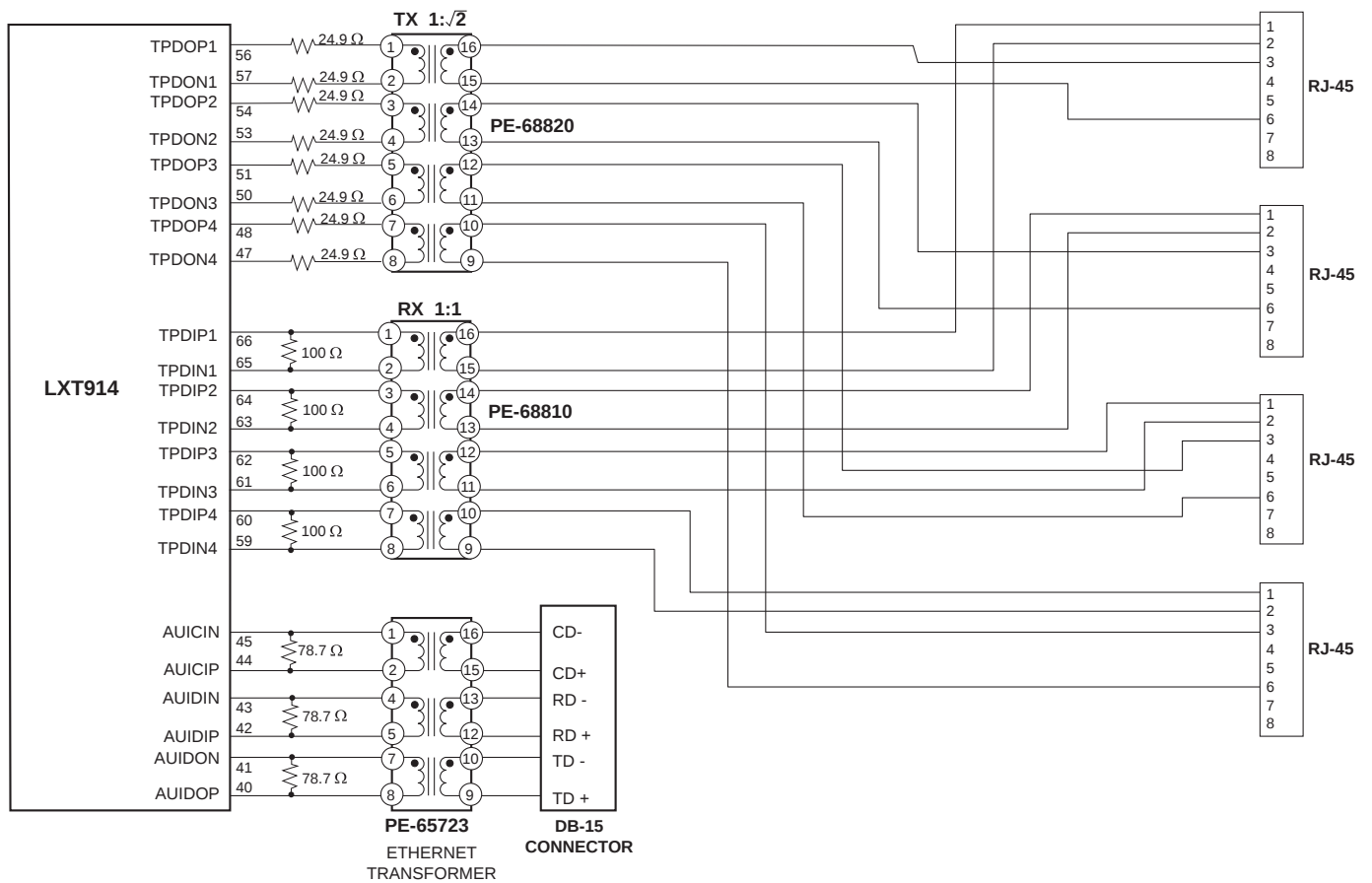
## Typical Application Circuit



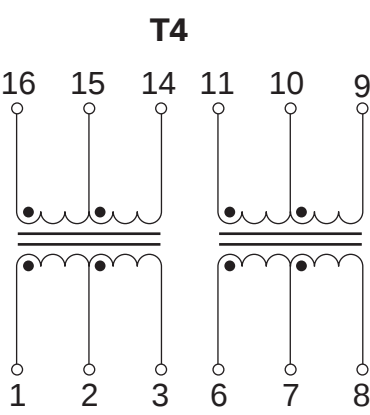
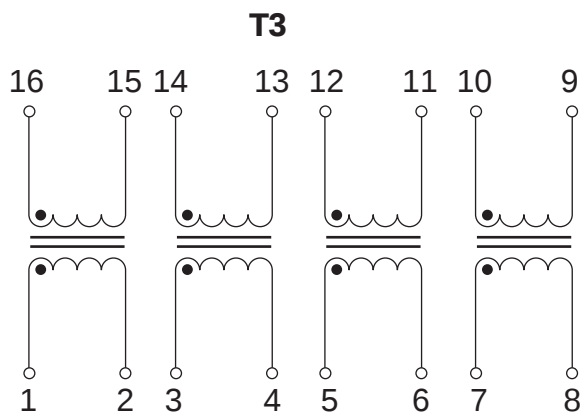
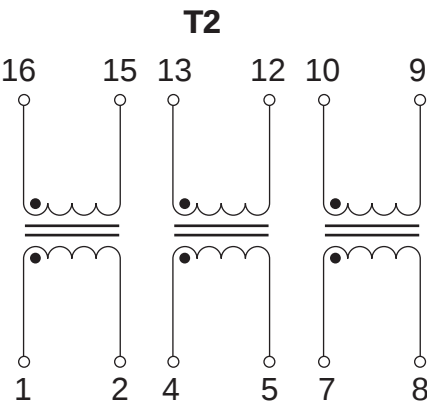
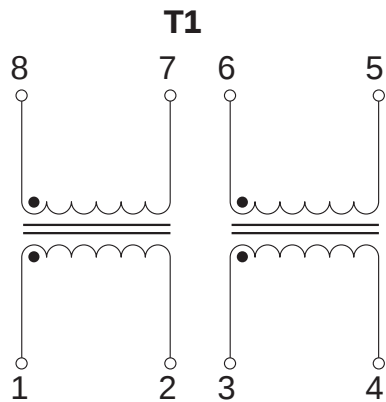
### NOTES:

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.

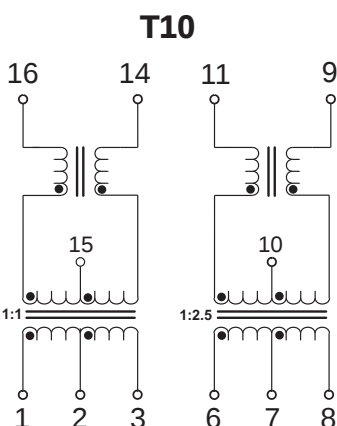
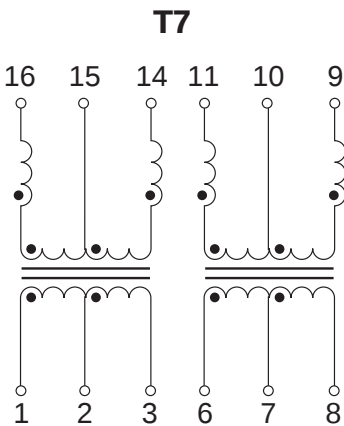
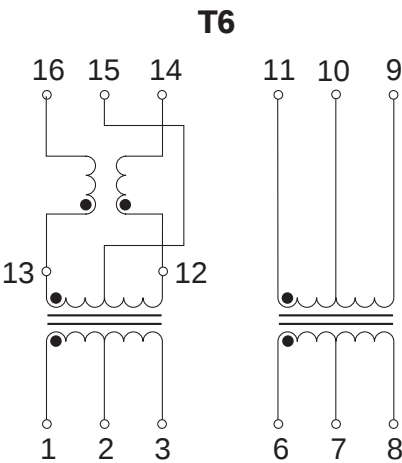
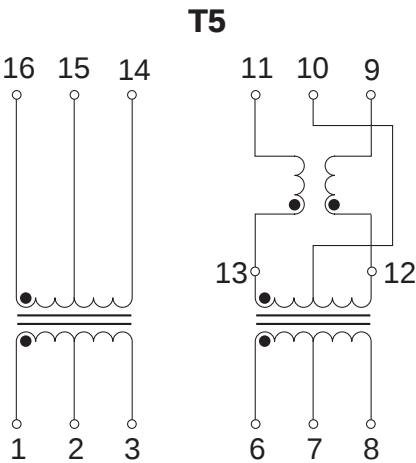
## Typical 10Base-T Application Circuit



## Schematics



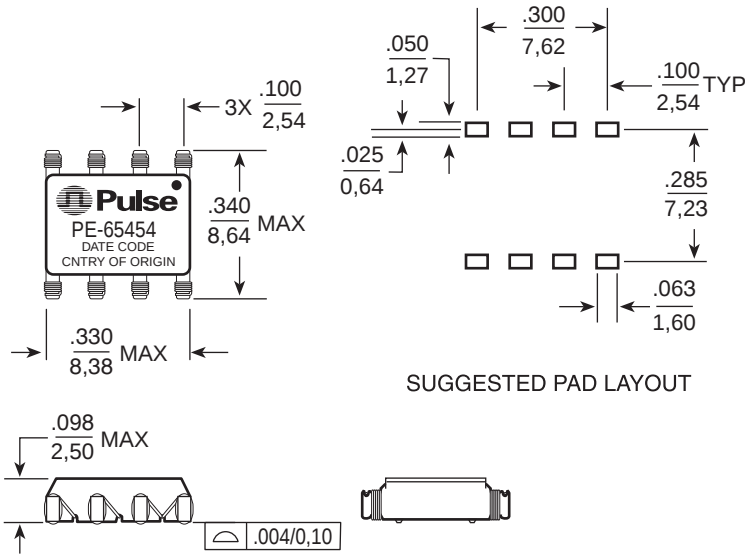
Schematics (continued)



PINS 4, 5, 12 AND 13 NOT CONNECTED.

## Surface Mount Mechanicals

### SMT2

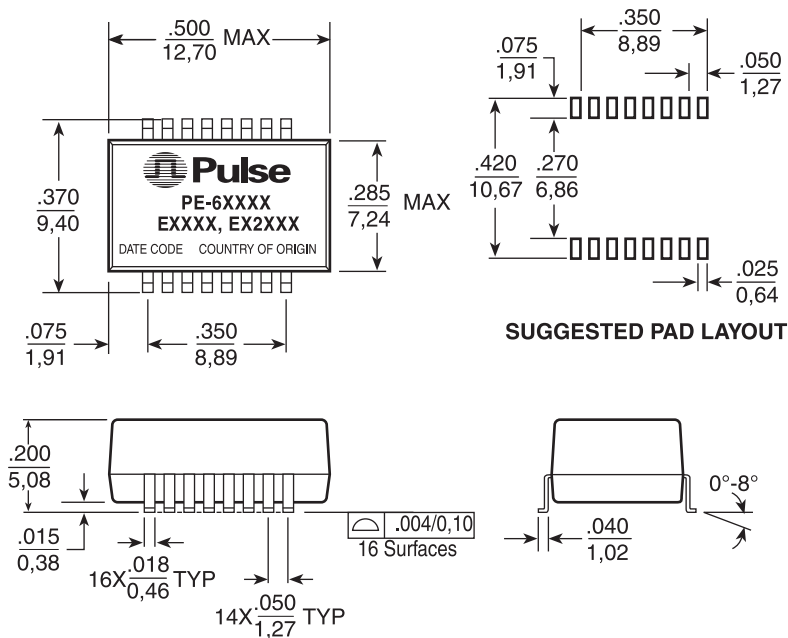


Dimensions:  $\frac{\text{Inches}}{\text{mm}}$

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

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

### SMT4



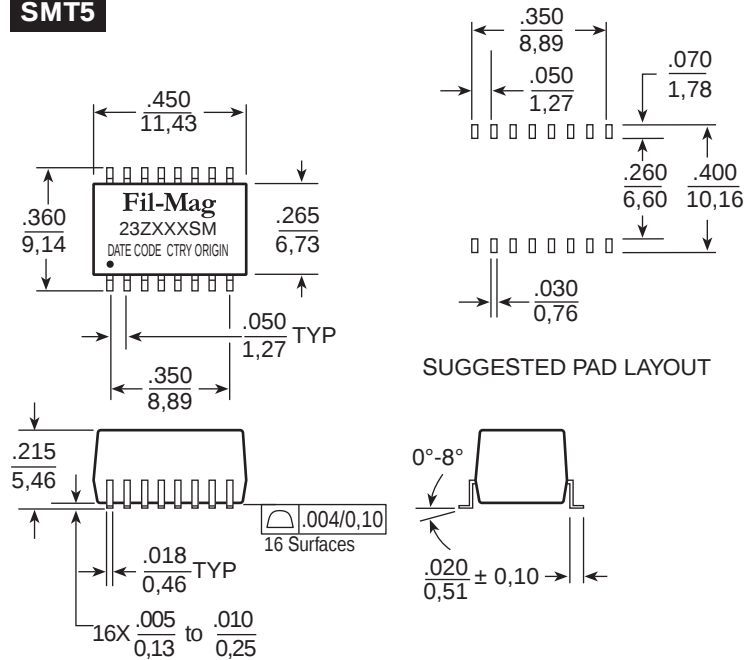
Dimensions:  $\frac{\text{Inches}}{\text{mm}}$

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

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

## Through Hole Mechanicals - (continued)

### SMT5



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

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

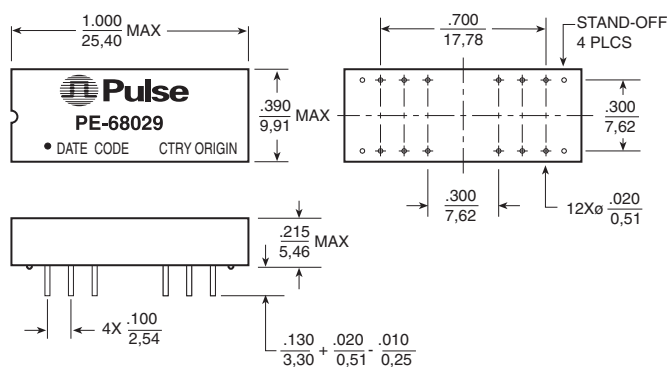
**Weight** ..... 0.85 grams

**Tube** ..... .50/tube

**Tape & Reel** ..... 750/reel

## Through Hole Mechanicals

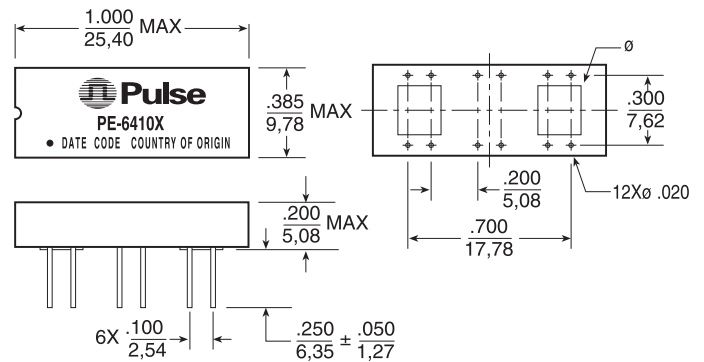
### TH1



**Weight** ..... 2.17 grams

**Tube** ..... 20/tube

### TH2



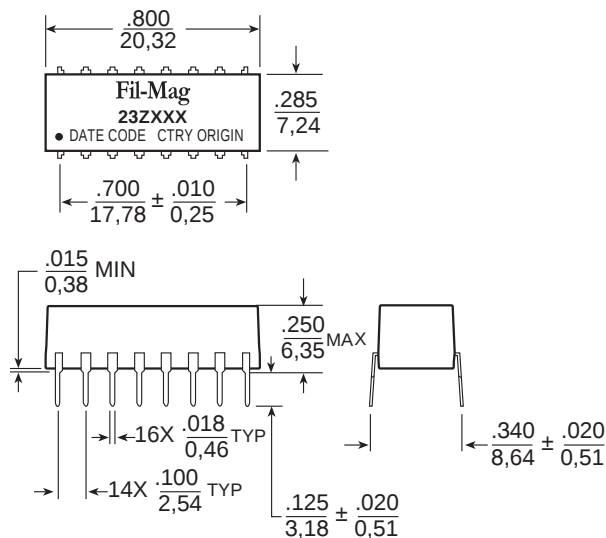
**Weight** ..... 2.18 grams

**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



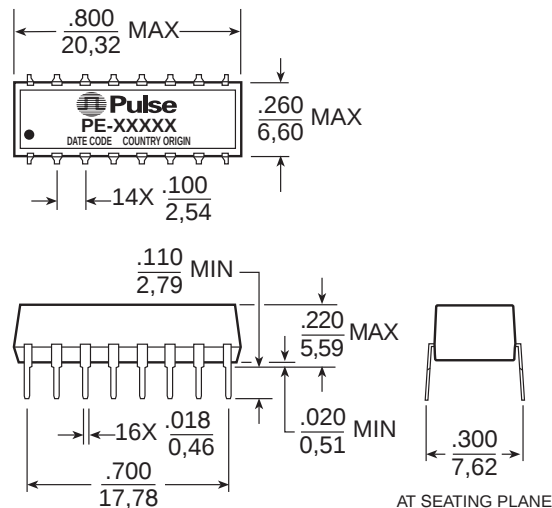
Weight ..... 1.7 grams

Tube ..... 28/tube

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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