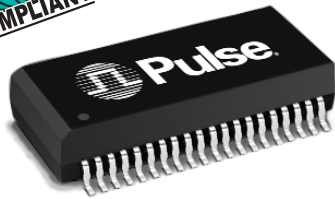


# T1/E1/CEPT/ISDN-PRI TRANSFORMERS

## Quad Port T1/E1 with 8 Transformers, 1500Vrms



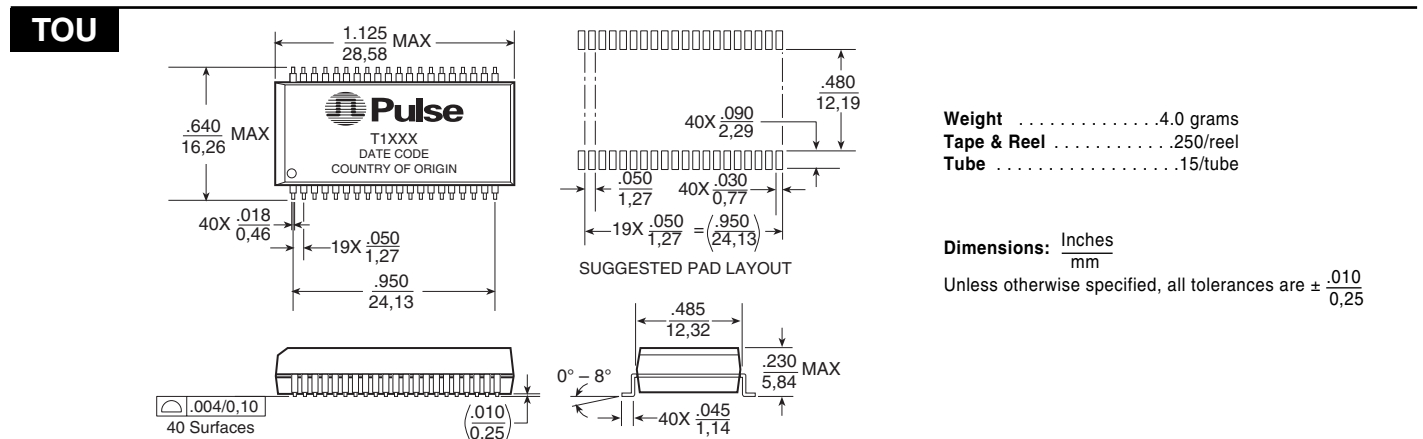
-  Models matched to leading quad and dual T1/E1/CEPT/ISDN-PRI transceivers
-  Crosstalk: -65dB or better
-  UL1950 recognized (some parts pending approval)
-  RoHS compliant versions available upon request

### Electrical Specifications @ 25°C

| Part Number <sup>G</sup> |                    | Turns Ratio <sup>A,B</sup><br>(Pri:Sec ±2%) |          | OCL @ 25°C<br>(mH MIN) <sup>F</sup> |         | LL<br>(μH MAX) |         | C <sub>w/w</sub><br>(pF MAX) |         | Package/<br>Schematic <sup>E</sup> | Primary Pins               |                            |
|--------------------------|--------------------|---------------------------------------------|----------|-------------------------------------|---------|----------------|---------|------------------------------|---------|------------------------------------|----------------------------|----------------------------|
| STD Temp.                | EXT Temp.          | Transmit                                    | Receive  | Transmit                            | Receive | Transmit       | Receive | Transmit                     | Receive |                                    | Transmit                   | Receive                    |
| T1063                    | T1103              | 1:1.36                                      | 1:1.36CT | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/1                              | 1-2, 6-7, 11-12, 16-17     | 38-36, 33-31, 28-26, 23-21 |
| T1064                    | T1104              | 1:1.14                                      | 1:1.14CT | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/1                              | 1-2, 6-7, 11-12, 16-17     | 38-36, 33-31, 28-26, 23-21 |
| T1065                    | T1105              | 1:2CT                                       | 1:2CT    | 1.2                                 | 1.2     | .8             | .8      | 35                           | 35      | TOU/3                              | 4-5, 9-10, 14-15, 19-20    | 24-25, 29-30, 34-35, 39-40 |
| T1066                    | T1106              | 1:2                                         | 1:2CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/4                              | 1-2, 9-10, 11-12, 19-20    | 23-25, 26-28, 33-35, 36-38 |
| T1067                    | T1107              | 1:1.36CT                                    | 1:2CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 24-25, 29-30, 34-35, 39-40 | 4-5, 9-10, 14-15, 19-20    |
| T1068                    | T1108              | 1:2CT                                       | 1:1CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/2                              | 1-2, 6-7, 11-12, 16-17     | 21-22, 26-27, 31-32, 36-37 |
| T1069                    | T1109              | 1CT:1.41                                    | 1CT:1.41 | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 1-3, 6-8, 11-13, 16-18     | 21-23, 26-28, 31-33, 36-38 |
| T1070                    | T1110              | 1:1.15                                      | 1:2CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/1                              | 1-2, 6-7, 11-12, 16-17     | 21-23, 26-28, 31-33, 36-38 |
| T1071 <sup>D</sup>       | T1111 <sup>D</sup> | 1:1/1.26                                    | 1:2CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/2                              | 1-2, 6-7, 11-12, 16-17     | 21-22, 26-27, 31-32, 36-37 |
| T1072                    | T1112              | 1:1.15                                      | 1:1.15   | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |
| T1073                    | T1113              | 1:2                                         | 1:2      | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |
| T1078                    | —                  | 1:1.08                                      | 1.08CT:1 | 1.2                                 | 1.2     | .4             | .5      | 35                           | 35      | TOU/1                              | 1-2, 6-7, 11-12, 16-17     | 38-36, 33-31, 28-26, 23-21 |
| T1124                    | T1114              | 1:2CT                                       | 1CT:2    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 4-5, 9-10, 14-15, 19-20    | 1-3, 6-8, 11-13, 16-18     |
| T1125                    | —                  | 1:1.70                                      | 1:1.36CT | 1.2                                 | 1.2     | .8             | .6      | 35                           | 35      | TOU/1                              | 1-2, 6-7, 11-12, 16-17     | 21-23, 26-28, 31-33, 36-38 |
| T1129                    | —                  | 1:1.36CT                                    | 1:1CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 24-25, 29-30, 34-35, 39-40 | 4-5, 9-10, 14-15, 19-20    |
| T1142                    | T1231              | 1:2.4                                       | 1:1      | 1.0                                 | 1.0     | .5             | .5      | 35                           | 35      | TOU/6                              | 1-2, 8-9, 11-12, 18-19     | 24-25, 27-28, 34-35, 37-38 |
| —                        | TX1268             | 1:2.8                                       | 1:1      | 1.0                                 | 1.0     | .5             | .5      | 35                           | 35      | TOU/6                              | 1-2, 8-9, 11-12, 18-19     | 24-25, 27-28, 34-35, 37-38 |
| —                        | T1226              | 1:1.5                                       | 1.41:1   | 1.0                                 | 1.0     | .5             | .5      | 35                           | 35      | TOU/6                              | 1-2, 8-9, 11-12, 18-19     | 24-25, 27-28, 34-35, 37-38 |
| T1145 <sup>D</sup>       | —                  | 1:2/2.4                                     | 1:0.79/1 | 1.0                                 | 1.0     | 1.0            | 1.0     | 35                           | 35      | TOU/7                              | 1-2, 9-10, 11-12, 19-20    | 37-36, 35-34, 27-26, 25-24 |
| T1180                    | —                  | 1:2.42                                      | 1:2.42   | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |
| T1181                    | —                  | 1:2.1CT                                     | 1:2.1CT  | 1.2                                 | .6      | .6             | .6      | 35                           | 35      | TOU/2                              | 1-2, 6-7, 11-12, 16-17     | 21-22, 26-27, 31-32, 36-37 |
| T1182                    | —                  | 1:2.45CT                                    | 1:2.45CT | 1.2                                 | .6      | .6             | .6      | 35                           | 35      | TOU/2                              | 1-2, 6-7, 11-12, 16-17     | 21-22, 26-27, 31-33, 36-37 |
| —                        | TX1262             | 1:2                                         | 1:2      | 1.2                                 | 1.2     | .7             | .7      | 35                           | 35      | TOU/6                              | 1-2, 6-7, 11-12, 16-17     | 3-4, 8-9, 13-14, 18-19     |
| —                        | TX1264             | 1:2CT                                       | 1CT:1    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 4-5, 9-10, 14-15, 19-20    | 1-3, 6-8, 11-13, 16-18     |
| —                        | TX1266             | 1:2                                         | 1:1      | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |
| —                        | TX1292             | 1:1.36                                      | 1:1      | 1.2                                 | 1.2     | .6             | .6      | 40                           | 40      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |
| —                        | TX1294             | 1:1CT                                       | 1:1CT    | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 4-5, 9-10, 14-15, 19-20    | 24-25, 29-30, 34-35, 39-40 |
| —                        | TX1295             | 1:1.26CT                                    | 1:1.26CT | 1.2                                 | 1.2     | .6             | .6      | 35                           | 35      | TOU/3                              | 4-5, 9-10, 14-15, 19-20    | 24-25, 29-30, 34-35, 39-40 |
| —                        | TX1298             | 1:1                                         | 1:1      | 1.2                                 | 1.2     | .7             | .7      | 35                           | 35      | TOU/5                              | 1-3, 6-8, 11-13, 16-18     | 4-5, 9-10, 14-15, 19-20    |

Note: RoHS-6 compliant parts can be ordered by adding an "NL" suffix to the part number (i.e. T1063 becomes T1063NL).

## Mechanical



# T1/E1/CEPT/ISDN-PRI TRANSFORMERS

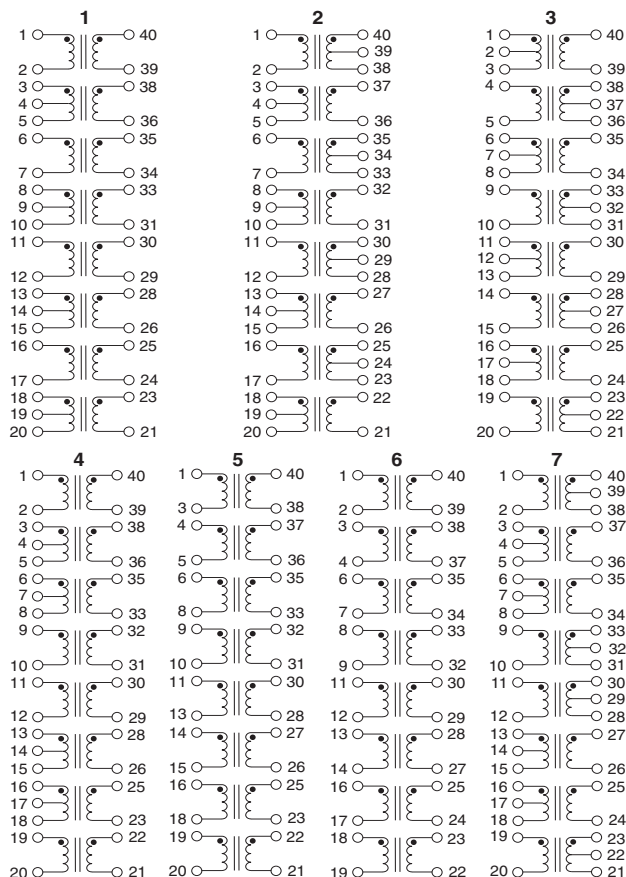
## Quad Port T1/E1 with 8 Transformers, 1500Vrms



### Transformer Selection Guide

| IC Mfr.                               | IC Part Number             | Comments   | Octal SMT |          |
|---------------------------------------|----------------------------|------------|-----------|----------|
|                                       |                            |            | STD temp  | EXT temp |
| Mindspeed<br>(Conexant)               | BT8510                     | T1/E1      | T1071     | T1111    |
|                                       | BT8510                     | T1/E1      | T1071     | T1111    |
|                                       | CN8380                     |            | T1124     | T1114    |
|                                       | BT8370/5/6                 | Better RI  | T1067     | T1107    |
|                                       | BT8370/5/6                 | Low Power  | T1070     | T1110    |
| Cirrus Logic<br>(Crystal)             | 61318                      | 120 E1     | T1068     | T1108    |
|                                       | 61577                      | T1 & E1    | T1065     | T1105    |
|                                       | 61304A/5A/535A/574A,/75    | T1         | T1070     | T1110    |
|                                       | 61304A/5A/535A/574A,/75    | 75 E1      | T1068     | T1108    |
|                                       | 61304A/5A/535A/574A,/75    | 120 E1     | T1071     | T1111    |
|                                       | 61582, 61583               |            | T1064     | T1104    |
|                                       | 61310, 61581               |            | T1068     | T1108    |
|                                       | 61881                      |            | T1070     | T1110    |
|                                       | 61584/84A                  | IQ3        | T1065     | T1105    |
|                                       | 61584/82/83/A              | IQ5        | T1064     | T1104    |
| Maxim<br>(Dallas)                     | DS2196                     |            | T1068     | T1108    |
|                                       | DS2151/2152/2153/2154      |            | T1070     | T1110    |
|                                       | DS2151/2152/2153/2154      |            | T1067     | T1107    |
|                                       | DS2148/Q48                 | 3V         | T1068     | T1108    |
|                                       | DS2148/Q48                 | 5V         | T1067     | T1107    |
|                                       | DS21352/Q352, DS21354/Q354 |            | T1068     | T1108    |
|                                       | DS21552/Q552, DS21554/Q554 |            | T1070     | T1110    |
| Exar                                  | DS21552/Q552, DS21554/Q554 |            | T1067     | T1107    |
|                                       | T5683A, 59L91              |            | T1065     | T1105    |
|                                       | T5894, T5897, T5997        |            | T1065     | T1105    |
|                                       | T5791/93/94/95             |            | T1071     | T1111    |
|                                       | 81L27, 82L24, 82D20        |            | T1067     | T1107    |
|                                       | 83L30/34/38                |            | T1065     | T1105    |
|                                       | T5684, T7288, 82D20        |            | T1067     | T1107    |
| Infineon<br>Technologies<br>(Siemens) | PEB 2254/55                | E1/T1 & J1 | T1069     | T1109    |
|                                       | PEB 2254/55                | E1/T1 & J1 | T1069     | T1109    |
|                                       | PEB 22504                  | 3.3V       | T1142     | T1231    |
|                                       | PEB 22504                  | 5V         | T1226     | T1226    |
|                                       | PEB22554                   | 3.3V       | T1142     | T1231    |
|                                       | PEB2256 3.3 V              | E1/T1/J1   | T1142     | T1231    |
| Intel<br>(Level One)                  | LXT 300/301                |            | T1065     | T1105    |
|                                       | LXT 304/305/307            | T1,E1      | T1065     | T1105    |
|                                       | LXT 304/305/307            | T1         | T1070     | T1110    |
|                                       | LXT 304/305/307            | 75E1,120E1 | T1071     | T1111    |
|                                       | LXT 310/317/318            |            | T1068     | T1108    |
|                                       | LXT 331                    | T1,E1      | T1068     | T1108    |
|                                       | LXT 331, LXT 332           |            | T1065     | T1105    |
|                                       | LXT 331, LXT 332           |            | T1070     | T1110    |
|                                       | LXT 334, LXT 335           | T1/E1      | T1065     | T1105    |
|                                       | LXT 334, LXT 335           | 120/75 E1  | T1067     | T1107    |
|                                       | LXT 334, LXT 335           | 75 E1      | T1071     | T1111    |
|                                       | LXT 336                    |            | T1065     | T1105    |
|                                       | LXT 350, LXT 351, LXT 359  | T1,E1      | T1068     | T1108    |
|                                       | LXT 350, LXT 351           |            | T1070     | T1110    |
|                                       | LXT 360/361/362/363        | T1,E1      | T1068     | T1108    |
|                                       | LXT 360/361/362/363        |            | T1070     | T1110    |
|                                       | LXT 380/381/384/386/388    | T1/E1      | T1068     | T1108    |
|                                       | LXT 380/381/384/386/388    | T1/E1      | T1124     | T1114    |
|                                       | LXT 3104, LXT 3108         |            | T1068     | T1108    |
| Lucent<br>Technologies                | T7288, T290A               | CEPT       | T1067     | T1107    |
|                                       | T7289A                     | DS1        | T1070     | T1110    |
|                                       | T7688, T7690, T7698        | CEPT       | T1063     | T1103    |
|                                       | T7689, T7690, T7698        | DS1        | T1064     | T1104    |
|                                       | T7693, T7697               | CEPT       | T1180     |          |
|                                       | TLIU04C1                   | DS1        | T1064     | T1104    |
|                                       | TLIU04C1                   | CEPT       | T1063     | T1103    |
| Zarlink<br>(Mitel)                    | MT9071, MT9076             |            | T1180     |          |
|                                       | MT9076, MT9075             |            | T1142     | T1231    |
|                                       | MT9074, MT9075             |            | T1068     | T1108    |
| PMC-Sierra                            | PM4341/6341/4314           |            | T1067     | T1107    |
|                                       | PM4318                     |            | T1065     | T1105    |
|                                       | PM4351/4354                | COMET      | T1180     | TX1299   |

### Schematics



#### NOTES FROM TABLES

- OCL (primary inductance) is measured at the primary winding. Turns ratio is specified primary: secondary. (CT = Center Tap).
- To make a 1CT:1 ratio from a 1CT:2CT ratio, use only one-half of the secondary (2CT) winding.
- It is possible to use the same transformer model for the three impedance levels of T1 (100Ω) and CEPT (75Ω & 120Ω). For specific connection information and resistor values, refer to IC vendors' data book.
- Dual Ratio Transformer (T1071, T1111 and T1145) — These transformers have tapped secondary windings to provide two turns ratios (T/R). Use the entire primary winding and connect the secondary pins listed below to obtain desired turns ratio:

| Part Number     | Turns Ratio 1 | Secondary Pins | Turns Ratio 2 | Secondary Pins |
|-----------------|---------------|----------------|---------------|----------------|
| T1071 and T1111 | 1:1           | 40-39          | 1:1.26        | 40-38          |
|                 | 1:1           | 35-34          | 1:1.26        | 35-33          |
|                 | 1:1           | 30-29          | 1:1.26        | 30-28          |
|                 | 1:1           | 25-24          | 1:1.26        | 25-23          |
| T1145           | 1:2           | 40-39          | 1:2.4         | 40-38          |
|                 | 1:2           | 33-32          | 1:2.4         | 33-31          |
|                 | 1:2           | 30-29          | 1:2.4         | 30-28          |
|                 | 1:2           | 23-22          | 1:2.4         | 23-21          |

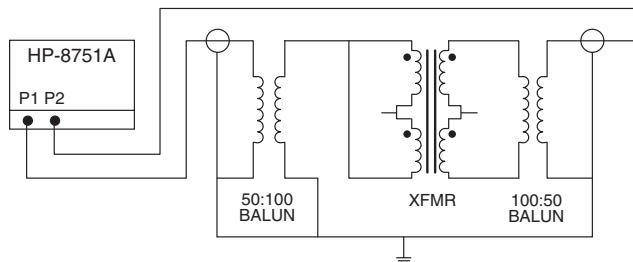
- Standard packaging for the surface mount package is anti-static tubes. Optional Tape & Reel packaging can be ordered by adding a "T" suffix to the part number, (i.e. T1063T).
- Extended Temperature Range Models — For extended temperature range transformers (-40°C to +85°C operating temperature range), OCL (Open Circuit Inductance for the primary winding) is specified at both -40°C and +25°C. At -40°C, OCL is 600 μH minimum. All other parameters are specified at +25°C only. Standard temperature range is 0°C to +70°C.

# T1/E1/CEPT/ISDN-PRI TRANSFORMERS

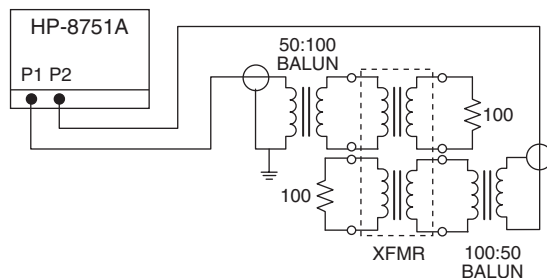
## Quad Port T1/E1 with 8 Transformers, 1500Vrms



- ET Product** — All coils have an ET product of 10V-μsec minimum.
- Flammability** — Materials used in the products are recognized as UL94-VO approved. Products meet the requirements of IEC 695-2-2 (Needle Flame Test).
- Balance Characteristics** — The transformers meet the requirements for longitudinal balance of FCC part 68.
- Common Mode Rejection Ratio** — the CMRR for all transformers is better than 50dB at 1MHz. A typical test circuit is shown below.
- Isolation Voltage** — 100% of transformers are tested during production to the specified isolation voltage level.
- General Information** — The transformers are specifically designed for use in 1.544Mbps (T1), 2.048Mbps (CEPT) and ISDN Primary rate (PRI) interface applications. They are matched to the majority of the line interface transceiver ICs currently available. Use of the proper transformer allows the interface circuit to comply with ITU-T G.703 and other standards regarding pulse waveform, return loss, and balance.



- Crosstalk Attenuation** — In the packages which contain transmit and receive transformers side by side, sufficient crosstalk attenuation is achieved by the inherent characteristics of the toroid cores as well as by their proper positioning. The crosstalk attenuation is typically 65dB or better. This result was established with the test circuit shown below.



- Return Loss** — ITU-T G.703 and European national regulatory documents specify minimum return loss levels. The transformers will allow these limits to be complied within the situations where they are applicable.

| Frequency   | 50-100kHz | 100kHz-2MHz | 2-3MHz |
|-------------|-----------|-------------|--------|
| Return Loss |           |             |        |
| XMIT        | 9dB       | 15dB        | 11dB   |
| RCV         | 12dB      | 18dB        | 14dB   |

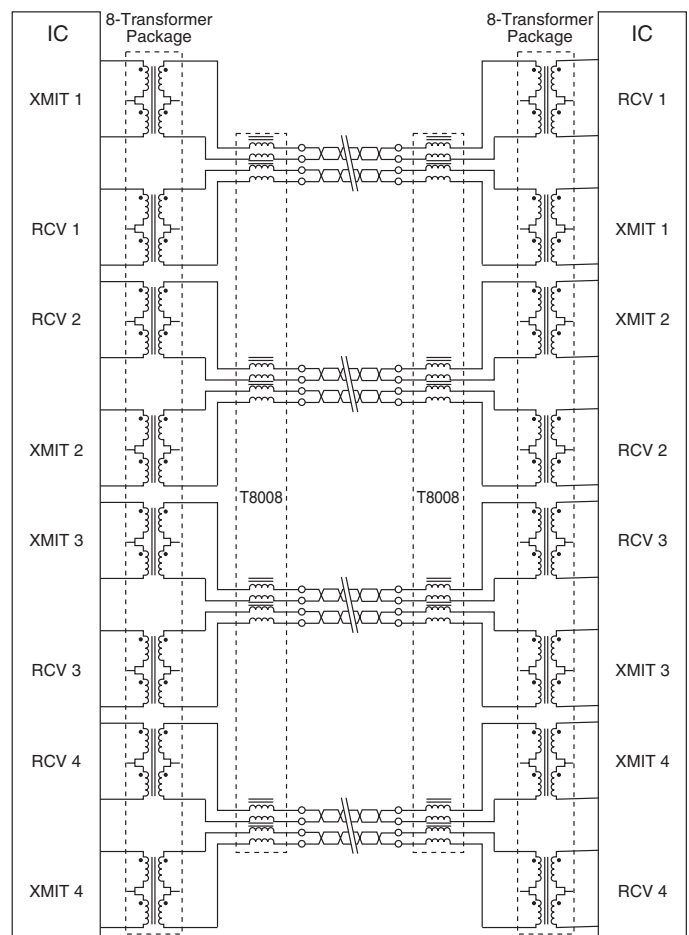
- Surge Voltage Capability** — All transformers and chokes meet surge voltage tests according to the most stringent regulatory documents, when used with the proper voltage and current suppression devices:

Metallic Voltage: 800V peak, 10/560μsec

Longitudinal Voltage: 2,400V peak, 10/700μsec

- Common Mode Chokes** — Additional high-frequency 4-line common mode chokes may be used to provide an effective means of complying with national and international regulations on EMI. The common mode chokes are designed to be used in conjunction with Pulse's T1/CEPT transformers as shown in the typical application below. Crosstalk is typically -65dB or better.

## Typical Application



# T1/E1/CEPT/ISDN-PRI TRANSFORMERS

## Quad Port T1/E1 with 8 Transformers, 1500Vrms



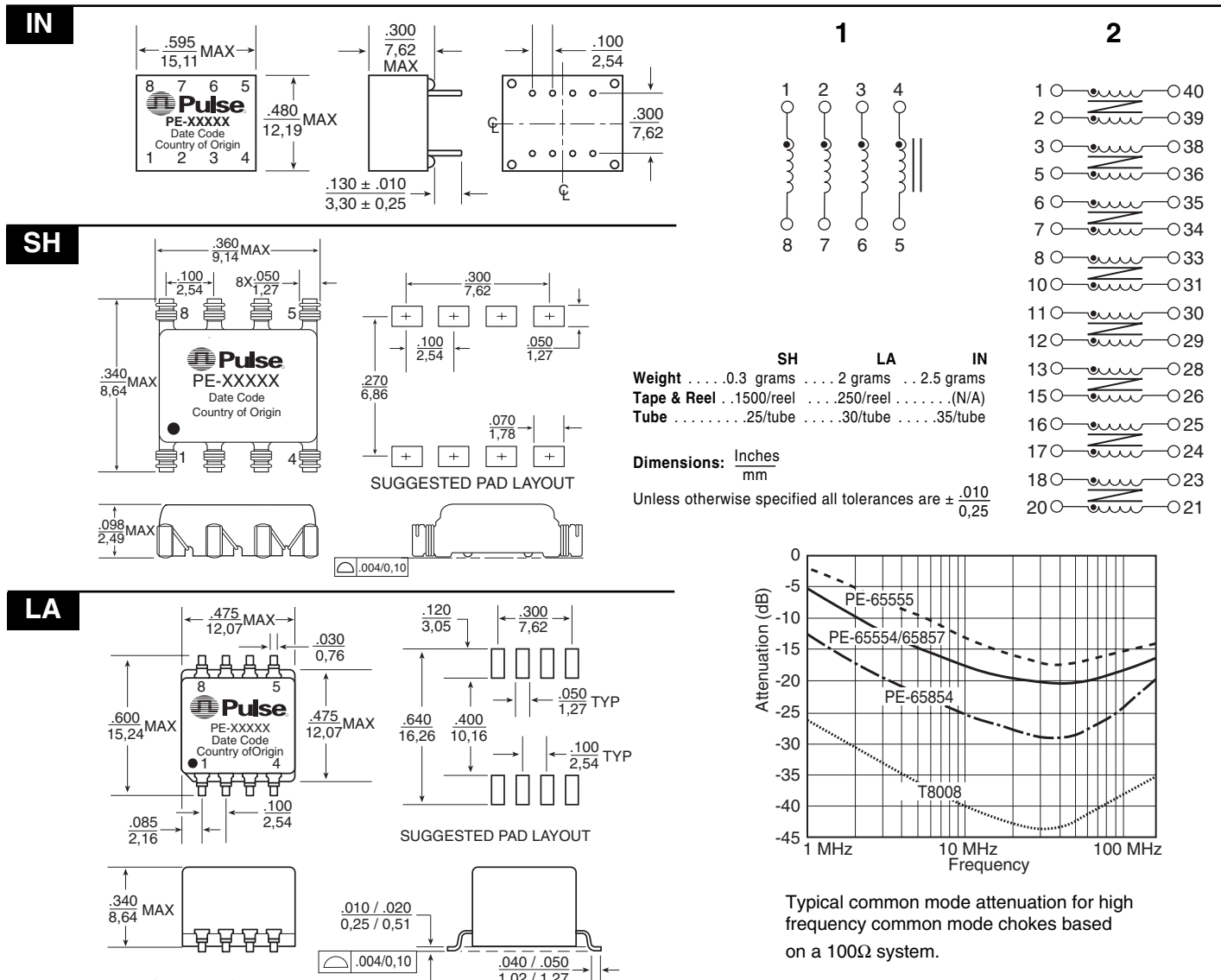
### Electrical Specifications @ 25°C

| Pulse Part Number                        | Number of Lines | Turns Ratio (±5%) | OCL (μH MIN) | C <sub>w/w</sub> (pF MAX) | L <sub>L</sub> (μH MAX) | DCR (Ω MAX) | Isolation (Vrms MIN) | Package/ Schematic    |
|------------------------------------------|-----------------|-------------------|--------------|---------------------------|-------------------------|-------------|----------------------|-----------------------|
| <b>HIGH FREQUENCY COMMON MODE CHOKES</b> |                 |                   |              |                           |                         |             |                      |                       |
| T8008                                    | 16 (8 x 2 line) | 1:1 (8 places)    | 47.0         | 25                        | .18                     | 0.40        | 500                  | TOU/2 (Surface Mount) |
| PE-65554                                 | 4               | 1:1:1:1           | 24.0         | 15                        | .20                     | 0.30        | 500                  | IN/1 (Through Hole)   |
| PE-65555                                 | 4               | 1:1:1:1           | 8.0          | 10                        | .20                     | 0.25        | 500                  | IN/1 (Through Hole)   |
| PE-65854                                 | 4               | 1:1:1:1           | 47.0         | 16                        | .20                     | 0.30        | 500                  | SH/1 (Surface Mount)  |
| PE-65857                                 | 4               | 1:1:1:1           | 24.0         | 15                        | .23                     | 0.30        | 500                  | LA/1 (Surface Mount)  |

NOTE: For additional Common Mode Chokes, refer to data sheets G002, T627, T661, T639 and T673.

## Mechanicals

## Schematics



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