

# HIGH FREQUENCY PLANAR TRANSFORMERS

Industrial Grade



- ⊗ Power Rating: up to 250W
- ⊗ Height: 9.1mm to 10.4mm max
- ⊗ Footprint: 29.5mm x 26.7mm Max
- ⊗ Frequency Range: 200kHz to 700kHz
- ⊗ Isolation (Primary to Secondary): 1750V<sub>DC</sub>

## Electrical Specifications @ 25 °C – Operating Temperature – 40 °C to +125 °C

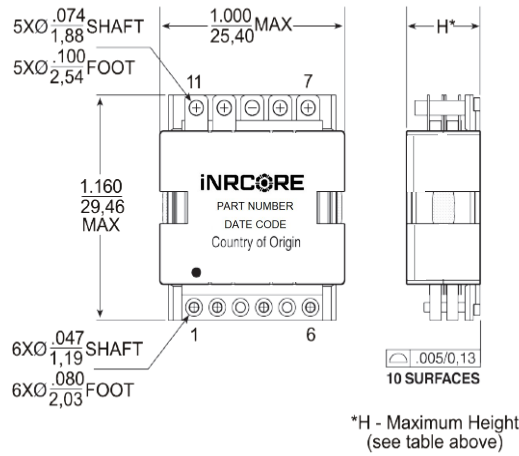
| Part Number   | Turns Ratio        |                     | Schematic | Primary* Inductance (µH MIN) | Leakage** Inductance (µH MAX) | DCR (mΩ MAX) |           |              |             | Height MAX (mm) |
|---|--------------------|---------------------|-----------|------------------------------|-------------------------------|--------------|-----------|--------------|-------------|-----------------|
|   | Primary            | Secondary           |           |                              |                               | Primary A    | Primary B | Primary Aux. | Secondary   |                 |
| <b>DOUBLE INTERLEAVE DESIGNS (HIGHER EFFICIENCY, LOWER DCR AND LOWER LEAKAGE)</b> |                    |                     |           |                              |                               |              |           |              |             |                 |
| R8201NL   | 4T & 4T            | 4T<br>(1T:1T:1T:1T) | A1        | 216                          | 0.3                           | 13           | 13        | —            | 4.5         | 10.2            |
| R8203NL   | 5T & 5T (w/5T aux) |                     |           | 340                          | 0.2                           | 15           | 15        | 235          |             |                 |
| R8205NL   | 6T & 6T (w/2T aux) |                     |           | 480                          | 0.35                          | 21           | 21        | 78           |             |                 |
| R8207NL   | 7T & 7T (w/3T aux) |                     |           | 660                          | 0.45                          | 50           | 50        | 100          |             |                 |
| R8209NL   | 8T & 8T            |                     |           | 860                          | 0.5                           | 45           | 45        | —            |             |                 |
| R8208NL   | 4T & 4T            | 1T & 1T             | A2        | 216                          | 0.2                           | 13           | 13        | —            | 0.56 & 0.56 | 10.2            |
| R8210NL   | 5T & 5T (w/5T aux) |                     |           | 340                          | 0.3                           | 15           | 15        | 235          |             |                 |
| R8212NL   | 6T & 6T (w/2T aux) |                     |           | 480                          | 0.35                          | 21           | 21        | 78           |             |                 |
| R8214NL   | 7T & 7T (w/3T aux) |                     |           | 660                          | 0.45                          | 50           | 50        | 100          |             |                 |
| R8216NL   | 8T & 8T            |                     |           | 860                          | 0.5                           | 45           | 45        | —            |             |                 |
| <b>SINGLE INTERLEAVE DESIGNS</b>  |                    |                     |           |                              |                               |              |           |              |             |                 |
| R8230NL   | 4T                 | 4T<br>(1T:1T:1T:1T) | B1        | 54                           | 0.2                           | 13           | —         | —            | 4.5         | 9.1             |
| R8231NL   | 5T (w/5T aux)      |                     |           | 85                           | 0.3                           | 15           | —         | 470          |             |                 |
| R8232NL   | 6T (w/2T aux)      |                     |           | 120                          | 0.35                          | 21           | —         | 160          |             |                 |
| R8233NL   | 7T (w/3T aux)      |                     |           | 165                          | 0.45                          | 50           | —         | 200          |             |                 |
| R8246NL   | 8T                 |                     |           | 215                          | 0.5                           | 45           | —         | —            |             |                 |
| R8234NL   | 4T                 | 7T & 7T             | B2        | 54                           | 0.2                           | 13           | —         | —            | 40 & 40     | 9.1             |
| R8235NL   | 5T (w/5T aux)      |                     |           | 85                           | 0.3                           | 15           | —         | 470          |             |                 |
| R8236NL   | 6T (w/2T aux)      |                     |           | 120                          | 0.35                          | 21           | —         | 160          |             |                 |
| R8237NL   | 7T (w/3T aux)      |                     |           | 165                          | 0.45                          | 50           | —         | 200          |             |                 |
| R8247NL   | 8T                 |                     |           | 215                          | 0.5                           | 45           | —         | —            |             |                 |
| R8238NL   | 4T                 | 1T & 1T             | B2        | 54                           | 0.2                           | 13           | —         | —            | 1.12 & 1.12 | 9.1             |
| R8239NL   | 5T (w/5T aux)      |                     |           | 85                           | 0.3                           | 15           | —         | 470          |             |                 |
| R8240NL   | 6T (w/2T aux)      |                     |           | 120                          | 0.35                          | 21           | —         | 160          |             |                 |
| R8241NL   | 7T (w/3T aux)      |                     |           | 165                          | 0.45                          | 50           | —         | 200          |             |                 |
| R8248NL   | 8T                 |                     |           | 215                          | 0.5                           | 45           | —         | —            |             |                 |
| R8242NL   | 4T                 | 2T & 1T             | B3        | 54                           | 0.2                           | 13           | —         | —            | 1.8 & 0.6   | 9.1             |
| R8243NL   | 5T (w/5T aux)      |                     |           | 85                           | 0.3                           | 15           | —         | 470          |             |                 |
| R8244NL   | 6T (w/2T aux)      |                     |           | 120                          | 0.35                          | 21           | —         | 160          |             |                 |
| R8245NL   | 7T (w/3T aux)      |                     |           | 165                          | 0.45                          | 50           | —         | 200          |             |                 |
| R8249NL   | 8T                 |                     |           | 215                          | 0.5                           | 45           | —         | —            |             |                 |

**Notes:** 1. Option Tape & Reel packaging can be ordered by adding a "T" suffix at the end of the part number (i.e. R8235NLT).

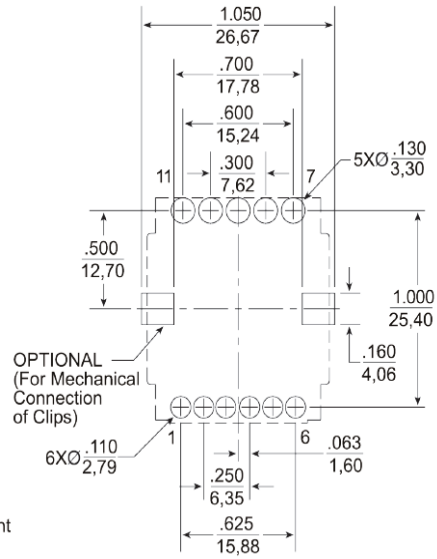


## Mechanicals

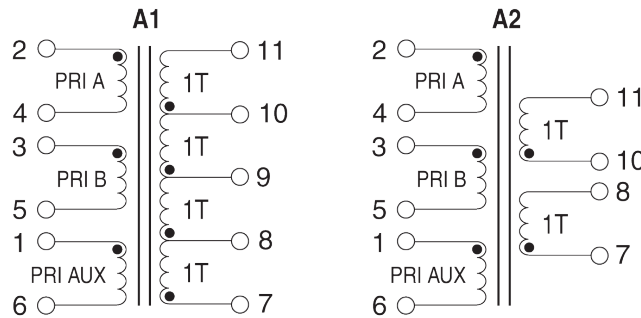
NOTE: The below is a universal footprint for a component that has all 11 pins populated. For a given part number it is only necessary to provide pads for the terminations shown



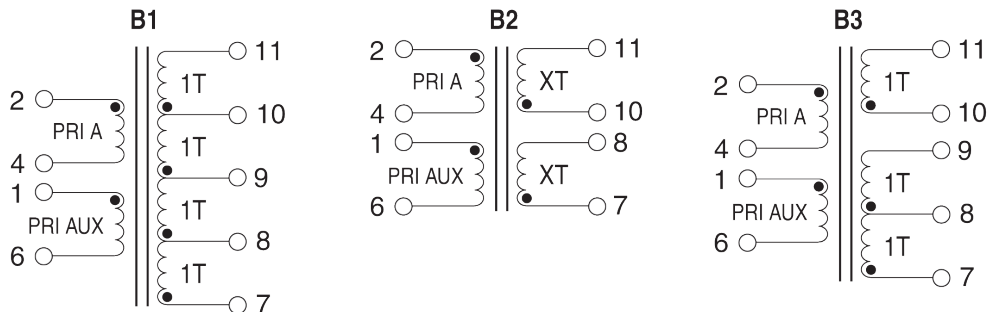
### SUGGESTED PAD LAYOUT



## Electrical Schematics



### — SINGLE INTERLEAVE SCHEMATICS —



## R82XXNL Transformer Winding Configuration Matrix

The following is a matrix of the winding configurations that are possible with the iNRCORE R82XXNL Planar Transformer Platform. The package is typically capable of handling between 150-250W of power depending on the application, ambient conditions and available cooling.

Once a configuration is selected, the formulae and charts can be used to determine the approximate power dissipation and temperature rise of the component in a given application.

| High Efficiency Double Interleaved Designs |                |          |                    |         |         |                |          |         |              |         |
|--|----------------|----------|--------------------|---------|---------|----------------|----------|---------|--------------|---------|
|  |                |          | SECONDARY WINDINGS |         |         |                |          |         |              |         |
|  |                |          | Single Winding     |         |         | Tapped Winding |          |         | Dual Winding |         |
|  |                |          | Turns              | 1T      | 2T      | 4T             | 1:1      | 1:3     | 2:2          | 1T & 1T |
|  |                | DCR (mΩ) | 0.28               | 1.12    | 4.5     | 1.12           | 4.5      | 4.5     | 1.12         |         |
| PRIMARY WINDINGS                           | Single Winding | 4T       | 5                  | R8208NL | R8208NL | R8201NL        | R8208NL  | R8201NL | R8201NL      | R8208NL |
|  |                | 5T       | 7.5                | R8210NL | R8210NL | R8203NL        | R8210NL  | R8203NL | R8203NL      | R8210NL |
|  |                | 6T       | 12                 | R8212NL | R8212NL | R8205NL        | R8212NL  | R8205NL | R8205NL      | R8212NL |
|  |                | 7T       | 30                 | R8214NL | R8214NL | R8207NL        | R8214NL  | R8207NL | R8207NL      | R8214NL |
|  |                | 8T       | 20                 | R8208NL | R8208NL | R8201NL        | R8208 NL | R8201NL | R8201NL      | R8208NL |
|  |                | 10T      | 30                 | R8210NL | R8210NL | R8203NL        | R8210NL  | R8203NL | R8203NL      | R8210NL |
|  |                | 12T      | 48                 | R8212NL | R8212NL | R8205NL        | R8212NL  | R8205NL | R8205NL      | R8212NL |
|  |                | 14T      | 120                | R8214NL | R8214NL | R8207NL        | R8214NL  | R8207NL | R8207NL      | R8214NL |
|  | 16T            | 140      | R8216NL            | R8216NL | R8209NL | R8216NL        | R8209NL  | R8209NL | R8216NL      |         |
|  | Dual Winding   | 4T & 4T  | 20                 | R8208NL | R8208NL | R8201NL        | R8208NL  | R8201NL | R8201NL      | R8208NL |
|  |                | 5T & 5T  | 30                 | R8210NL | R8210NL | R8203NL        | R8210NL  | R8203NL | R8203NL      | R8210NL |
|  |                | 6T & 6T  | 48                 | R8212NL | R8212NL | R8205NL        | R8212NL  | R8205NL | R8205NL      | R8212NL |
|  |                | 7T & 7T  | 120                | R8214NL | R8214NL | R8207NL        | R8214NL  | R8207NL | R8207NL      | R8214NL |
|  |                | 8T & 8T  | 140                | R8216NL | R8216NL | R8209NL        | R8216NL  | R8209NL | R8209NL      | R8216NL |

| Lower Cost Single Interleaved Designs |                |          |                    |         |         |          |          |                |         |         |         |          |              |         |         |         |
|---------------------------------------|----------------|----------|--------------------|---------|---------|----------|----------|----------------|---------|---------|---------|----------|--------------|---------|---------|---------|
|                                       |                |          | SECONDARY WINDINGS |         |         |          |          |                |         |         |         |          |              |         |         |         |
|                                       |                |          | Single Winding     |         |         |          |          | Tapped Winding |         |         |         |          | Dual Winding |         |         |         |
|                                       |                |          | Turns              | 1T      | 2T      | 3T       | 4T       | 7T             | 1:1     | 1:2     | 1:3     | 2:2      | 7:7          | 1T & 1T | 1T & 2T | 7T & 7T |
|                                       |                | DCR (mΩ) | 0.56               | 2.24    | 3.4     | 4.5      | 20       | 2.24           | 3.4     | 4.5     | 4.5     | 80       | 2.24         | 4.5     | 80      |         |
| PRIMARY WINDINGS                      | Single Winding | 4T       | 10                 | R8238NL | R8238NL | R8242NL  | R8230NL  | R8234NL        | R8238NL | R8242NL | R8230NL | R8230NL  | R8234NL      | R8238NL | R8242NL | R8234NL |
|                                       |                | 5T       | 15                 | R8239NL | R8239NL | R8243NL  | R8231NL  | R8235NL        | R8239NL | R8243NL | R8231NL | R8231NL  | R8235NL      | R8239NL | R8243NL | R8235NL |
|                                       |                | 6T       | 24                 | R8240NL | R8240NL | R8244 NL | R8232NL  | R8236NL        | R8240NL | R8244NL | R8232NL | R8232NL  | R8236NL      | R8240NL | R8244NL | R8236NL |
|                                       |                | 7T       | 60                 | R8241NL | R8241NL | R8245NL  | R8233NL  | R8237NL        | R8241NL | R8245NL | R8233NL | PR8233NL | R8237NL      | R8241NL | R8245NL | R8237NL |
|                                       |                | 8T       | 70                 | R8248NL | R8248NL | R8249NL  | PR8246NL | R8247NL        | R8248NL | R8249NL | R8246NL | R8246NL  | R8247NL      | R8248NL | R8249NL | R8247NL |

NOTES: 1. The base PN (ie: R8201NL) uses an ungapped core. The minimum primary inductance for any configuration can be calculated as:

$$\text{Primary Inductance } (\mu\text{H Min}) = 3.4 * (\text{Primary Turns})^2$$

2. The above base part numbers (R82XXNL) are available from stock

3. It is possible to add a small gap to the transformer. Gapped transformers are non-standard and can be made available upon request, but are not typically available from stock. To request a gapped version of the transformer, add a suffix "G" to the base number (ie: **R8201GNL**). The nominal inductance with a gap can be calculated as:

$$\text{Primary Inductance } (\mu\text{H Nominal}) = 2.2 * (\text{Primary Turns})^2$$

