# Isolation Power Transformers

*Toroid Platform SMD - PH9385.XXXNLT and PM2155.XXXNLT*



- *Push Pull Converter Transformer*
- *IEC 60950 and 61558 basic insulation*
- *Compliant, 12mm creepage*
  *4KVrms isolation (600Vrms continuous)*
- ***Patented:** US Patent 9,646,755*

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

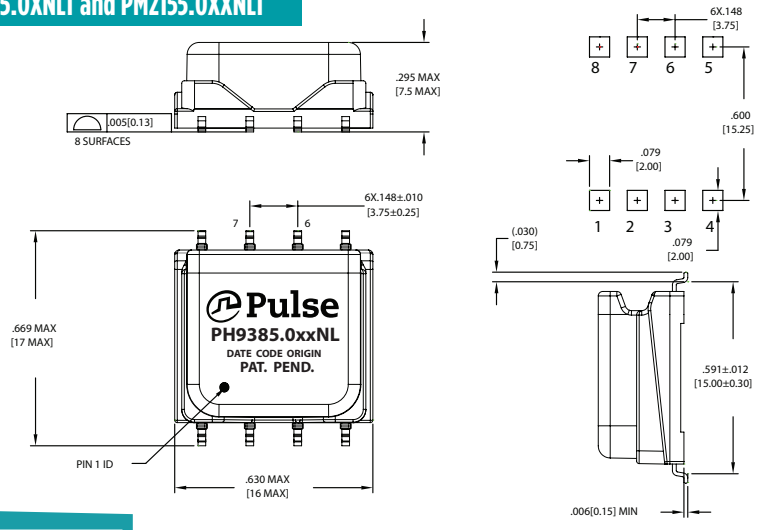
| Part Number | | Inductance (1-4) (µH ±35%) | Leakage Inductance (1-4) with (5-8) shorted (µH MAX) | Capacitance (1, 4) to (5, 8) (pF MAX) | DCR (1-4) (Ω MAX) | DCR (5-8) (Ω MAX) | ET (1-4)[1] (V-µsec Max) | Turns Ratio (1:4) (8:5) | Isolated Voltage [2] (Vrms) |
|---|---|---|---|---|---|---|---|---|---|
| Commerical | Automotive[8] | | | | | | | | |
| PH9385.011NL | PM2155.011NL | 3200 | 6.0 | 36 | 1.10 | 1.00 | 109 | 1CT : 1CT | 4000 |
| PH9385.045NL | PM2155.045NL | 3200 | 4.0 | 36 | 1.10 | 1.25 | 109 | 4CT : 5CT | |
| PH9385.034NL | PM2155.034NL | 2600 | 3.0 | 36 | 1.00 | 1.50 | 98 | 3CT : 4CT | |
| PH9385.012NL | PM2155.012NL | 2600 | 3.0 | 40 | 1.00 | 1.90 | 98 | 1CT : 2CT | |
| PH9385.038NL | PM2155.038NL | 2600 | 3.0 | 40 | 1.00 | 2.20 | 98 | 3CT : 8CT | |
| PH9385.013NL | PM2155.013NL | 2600 | 3.0 | 40 | 1.00 | 2.75 | 98 | 1CT : 3CT | |
| PH9385.027NL | PM2155.027NL | 2600 | 3.0 | 40 | 1.00 | 3.00 | 98 | 2CT : 7CT | |
| PH9385.015NL | PM2155.015NL | 1350 | 3.0 | 30 | 0.80 | 3.20 | 70 | 1CT :5CT | |

**Notes:**

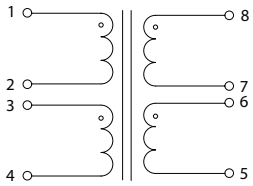
1. The ET Max is calculated to limit the core loss and temperature rise at 200KHz based on a bipolar flux swing of 180mT Peak.
2. For Push-Pull topology, where the voltage is applied across half the primary winding turns, the ET needs to be derated by 50% for the same flux swing.
3. The applied ET may need to be further derated for higher frequencies based on the temperature rise which results from the core and copper losses
   A. To calculate total copper loss (W), use the following formula:
   Copper Loss (W) = $Irms_Primary^2 * DCR_Primary + Irms_Secondary^2 * DCR_Secondary$.
   B. To calculate total core loss (W), use the following formula:
   Core Loss (W) = $3.93E\text{-}10 * (Frequency\ in\ kHz)^{1.7} * (180 * [ET/ET\ Max])^{2.17}$
   Where ET is the applied Volt Second, ET Max is the rated Volt Second for 180mT flux swing
   C. To calculate temperature rise, use the following formula:
   Temperature Rise (°C) = 100 * (Core Loss(W) + Copper Loss (W))
4. The AEC-Q200 temperature and humidity operational life testing was completed using a dielectric strength test of 4000Vdc.
5. Optional Tape & Reel packing can be ordered by adding a "T" suffix to the part number (i.e. PH9385.011NL becomes PH9385.011NLT). Pulse complies to industry standard tape and reel specification EIA481.
6. The "NL" suffix indicates an RoHS-compliant part number.
7. Continuous isolation voltage confirmed by 125°C/1000hrs accelerated aging with the bias voltage applied between primary and secondary windings.
8. The PM2155.XXXNLT part numbers are AEC-Q200 and IATF16949 certified. The mechanical dimensions are 100% tested in production but do not necessarily meet aproduct capability index (Cpk) >1.33 and therefore may not strictly conform to PPAP.

## Mechanical

**PH9385.0XNLT and PM2155.0XXNLT**




## Schematic




**Weight** .....2.5/grams
**Tray** .....80/tray

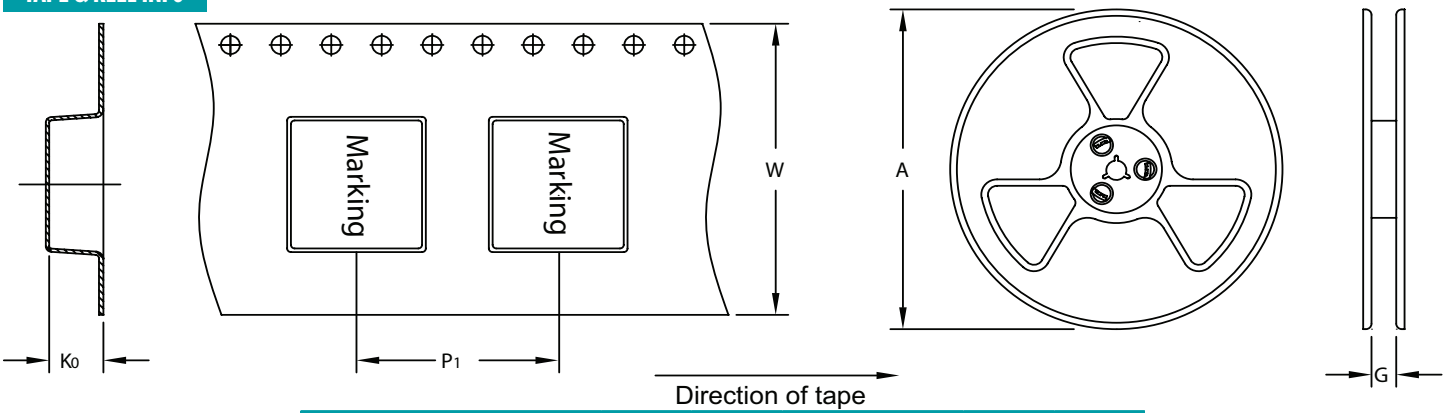
**Dimensions:** Inches / mm

Unless otherwise specified, all tolerances are ± .010 / 0,25

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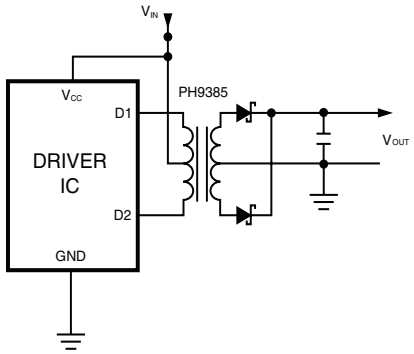
## TAPE & REEL INFO




| SURFACE MOUNTING TYPE, REEL/TAPE LIST | | | | | | |
|---|---|---|---|---|---|---|
| PART NUMBER | REEL SIZE (mm) | | TAPE SIZE (mm) | | | QTY |
| | A | G | $P_1$ | W | $K_0$ | PCS/REEL |
| PH9385.XXXNLT/PM2155.XXXNLT | Ø330 | 32.4 | 24 | 32 | 8.3 | 300 |

## APPLICATION

PH9385.XXXNL is a series of high isolation power supply transformer drivers. Intended to operate in a fixed duty cycle Push Pull topology, it is a part of a low cost solution for delivering lower power (up to 2.5W) from a low voltage source. A typical implementation would be an isolated RS-485 power supply driver circuit, the design is compatible with the MAXIM™ MAX253 IC. Other IC's include Texas SN6501 UCC2808, Analog ADuM4070, ADuM447x.
A schematic diagram for the Push Pull converter topology is given below.




For a fixed 50% duty cycle mode of operation, the output voltage is simply determined by the input voltage and turns ratio. So, with the available turns ratios, a variety of output voltages can be selected. This range can be extended by implementing different topologies such as forward or bridge and can be used with controllers offered by different IC vendors for a number of different applications.

## For More Information


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