High Isolation Power Transformers

EP7 Platform SMD - PH9185.XXXNL and PM2190.XXXNL













- **Push Pull Transformer**
- Reinforced insulation for isolated power supply driver
- 8mm creepage
- 5KVrms isolation (1000Vrms continuous)⁷
- 💇 UL and TUV certified

| Electrical Specifications @ 25°C – Operating Temperature –40°C to +125°C | | | | | | | | | |
|--|-------------------------|------------------|--------------------|----------------|----------------|---------------------------|----------|-------------|-------------------------------|
| Part Number | | Inductance (1-3) | Leakage Inductance | DCR (1-3) | DCR (4-6) | ET MAX (1-3) ¹ | CAP | Turns Ratio | Isolated Voltage ⁴ |
| Commercial | Automotive ⁸ | (μH ±45%) | (μΗ MAX) | (ΩMAX) | (ΩMAX) | (V-µsec MAX) | (pF MAX) | (1:3) (6:4) | (Vrms) |
| PH9185.011NL | PM2190.011NL | 750 | 1.2 | 0.50 | 0.55 | 66 | 10.0 | 1CT : 1CT | |
| PH9185.012NL | PM2190.012NL | 450 | 0.9 | 0.40 | 0.80 | 52 | 10.0 | 1CT : 2CT | |
| PH9185.013NL | PM2190.013NL | 200 | 0.6 | 0.35 | 0.95 | 36 | 8.0 | 1CT : 3CT | |
| PH9185.021NL | PM2190.021NL | 1800 | 3.0 | 0.75 | 0.45 | 100 | 10.0 | 2CT : 1CT | Γ000 |
| PH9185.034NL | PM2190.034NL | 750 | 1.2 | 0.50 | 0.75 | 66 | 10.0 | 3CT : 4CT | 5000 |
| PH9185.038NL | PM2190.038NL | 310 | 0.9 | 0.44 | 1.00 | 44 | 8.0 | 3CT : 8CT | |
| PH9185.043NL | PM2190.043NL | 1260 | 1.5 | 0.70 | 0.56 | 89 | 12.0 | 4CT : 3CT | |
| PH9185.083NL | PM2190.083NL | 2350 | 6.0 | 0.90 | 0.40 | 110 | 8.0 | 8CT : 3CT | |

Notes:

- 1. The ET Max is calculated to limit the core loss and temperature rise at 100KHz based on a bipolar flux swing of 180mT Peak.
- 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_Primary² * DCR_Primary + Irms_Secondary²*DCR_Secondary
 - B. To calculate total core loss (W), use the following formula:

 Core Loss (W) = 4.40E-10 * (Frequency in kHz)^{1,67} * (180 * [ET/ET Max])^{2,53}

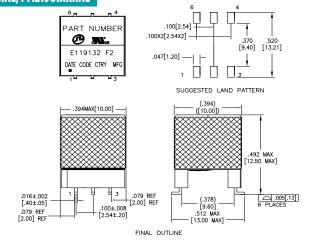
 Where ET is the applied Volt Second, ET Max is the rated Volt Second for 180mT flux swing
 - C. To calculate temperature rise, use the following formula: Temperature Rise (°C) =

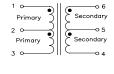
- 90 * (Core Loss(W) + Copper Loss (W))
- 4. The AEC-Q200 temperature and humidity operational life testing was completed using a dielectric strength test of 5000Vdc.
- Optional Tape & Reel packing can be ordered by adding a "T" suffix to the part number (i.e. PH9185.012NL becomes PH9185.012NLT). Pulse 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.
- The PM2190.XXXNL part numbers are AEC-Q200 and IATF16949 certified. The mechanical dimensions are 100% tested in production but do not necessarily meet a product capability index (Cpk) >1.33 and therefore may not strictly conform to PPAP.

Mechanical

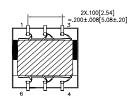
Schematic

PH9185.XXXNL/PM2190.XXXNL





SCHEMATIC



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

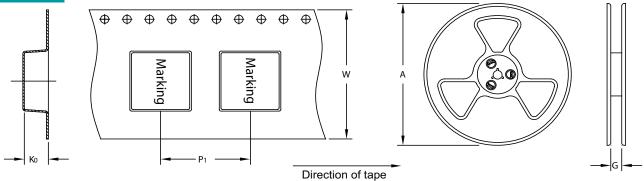
Unless otherwise specified, all tolerances are $\pm \frac{.010}{0.25}$

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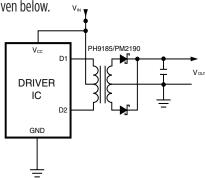


| SURFACE MOUNTING TYPE, REEL/TAPE LIST | | | | | | | | |
|---------------------------------------|----------|---------|----------------|-----|------------|----------|--|--|
| PART NUMBER | REEL SIZ | 'E (mm) | T.A | QTY | | | | |
| PAKI NUMBEK | А | G | P ₁ | W | $K_{_{0}}$ | PCS/REEL | | |
| PH9185.XXXNLT/PM2190.XXXNLT | Ø330 | 32.4 | 24 | 32 | 12.8 | 150 | | |

APPLICATION

PH9185.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 3W) from a low voltage source. A typical implementation would be an isolated RS-485/RS-232 power supply driver circuit, the design is compatible with the MAXIM™ MAX253 IC.

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 transformer design has been certified by UL to comply with UL60950-1 2nd edition, and CAN/CSA C22.2 NO. 60950-1-07 2nd edition; and by TUV to comply with EN61558-1 and EN61558-2-16 with reinforced insulation for a working voltage up to 400Vac 8mm creepage and 5000Vrms isolation voltage is guaranteed to meet this requirement. The design also complies with the Pulse's class F insulation system. PH9185.013NL was not included in the original UL/TUV certification but is complaint. Cost reduced versions without UL/TUV certification available, please contact Pulse Electronics for more information.

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For More Information

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