

# High Isolation Power Transformers

EP7 Platform SMD - PH9185.XXXNL and PM2190.XXXNL



- Push Pull Transformer
- Reinforced insulation for isolated power supply driver
- 8mm creepage and clearance
- 5KVrms isolation (Up to 1000Vpk rated voltage)<sup>6</sup>
- UL and TUV certified



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

Part Number		Inductance (1-3) (μH ±45%)	Leakage Inductance (μH MAX)	DCR (1-3) (Ω MAX)	DCR (4-6) (Ω MAX)	ET MAX (1-3) <sup>1</sup> (V-μsec MAX)	CAP (pF MAX)	Turns Ratio (1:3) (6:4)	Isolated Voltage <sup>4</sup> (Vrms)
Commercial	Automotive								
PH9185.011NL	PM2190.011NL	750	1.2	0.50	0.55	66	10.0	1CT : 1CT	5000
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	
PH9185.034NL	PM2190.034NL	750	1.2	0.50	0.75	66	10.0	3CT : 4CT	
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:

- 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.
- 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
  - To calculate total copper loss (W), use the following formula:  

$$\text{Copper Loss (W)} = \text{Irms\_Primary}^2 \cdot \text{DCR\_Primary} + \text{Irms\_Secondary}^2 \cdot \text{DCR\_Secondary}$$
  - To calculate total core loss (W), use the following formula:  

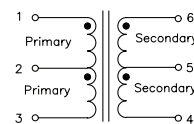
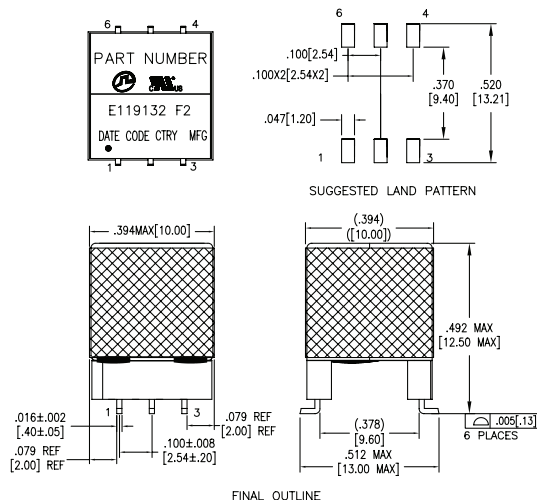
$$\text{Core Loss (W)} = 8.73 \cdot 11 \cdot (\text{Frequency in kHz})^{1.67} \cdot (180 \cdot [\text{ET/ET Max}])^{2.55}$$

Where ET is the applied Volt Second, ET Max is the rated Volt Second for 180mT flux swing
  - To calculate temperature rise, use the following formula: Temperature Rise (°C) =  $140 \cdot (\text{Core Loss (W)} + \text{Copper Loss (W)})$
- The AEC-Q200 temperature and humidity operational life testing was completed using a dielectric strength test of 5000Vdc.
- Creepage and clearance is in accordance with IEC 61558-1 and IEC61558-2-16 for reinforced insulation to a working voltage of 400Vrms (for basic insulation to a working voltage of 800Vrms) based on material group III, pollution degree 2, OVC II and 5000m altitude. The PM2190.XXXNL part numbers are AEC-Q200 and IATF16949 certified.
- Rated voltage is based on a positive partial discharge test (discharge < 10pC) for the profile shown in page 3, in accordance with IEC60664 for basic insulation. In an application which requires a reinforced insulation barrier, a rated voltage of 880Vpk is defined and confirmed by partial discharge testing. ⚡

## Mechanical

## Schematic

### PH9185.XXXNL/PM2190.XXXNL



Weight .....2.6grams  
Tape & Reel .....150/reel  
Tray .....80/tray

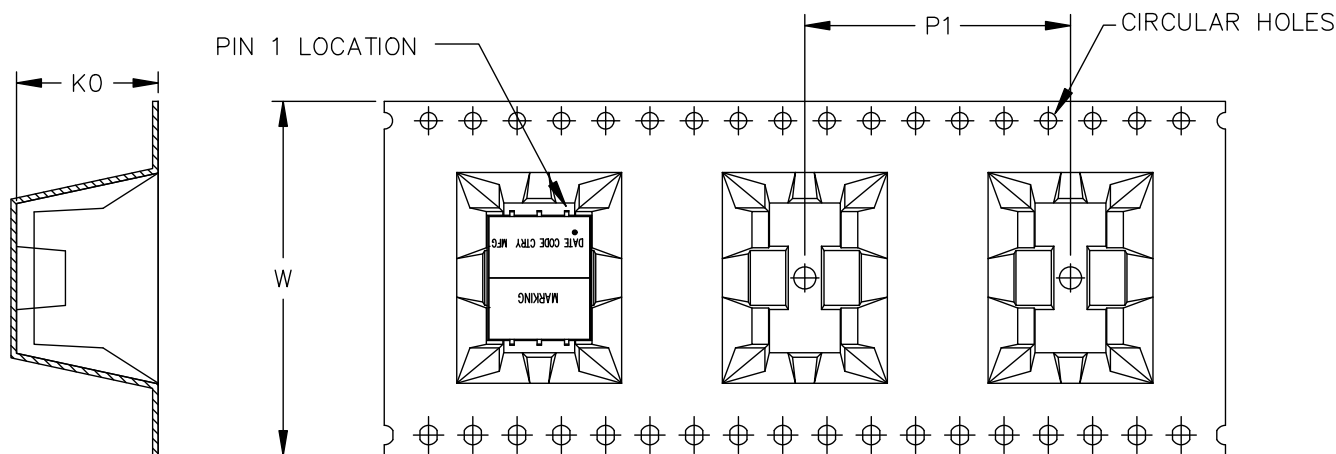
Dimensions: Inches  
mm

Unless otherwise specified,  
all tolerances are ± .010  
0.25

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## TAPE & REEL INFO



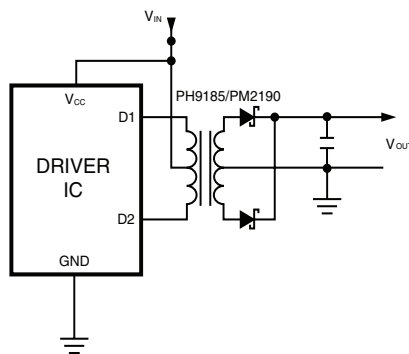
SURFACE MOUNTING TYPE, REEL/TAPE LIST

PART NUMBER	REEL SIZE (mm)		TAPE SIZE (mm)			QTY
	A	G	P <sub>1</sub>	W	K <sub>0</sub>	PCS/REEL
PH9185.XXXNL/PM2190.XXXNL	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 2<sup>nd</sup> edition, and CAN/CSA C22.2 NO. 60950-1-07 2<sup>nd</sup> 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 certification but is compliant with the standard. The technically identical PM2190.013NL is listed, if a UL certified product is required for this turns ratio.

# High Isolation Power Transformers

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## Test Procedure Setting

### PD - MV no.2

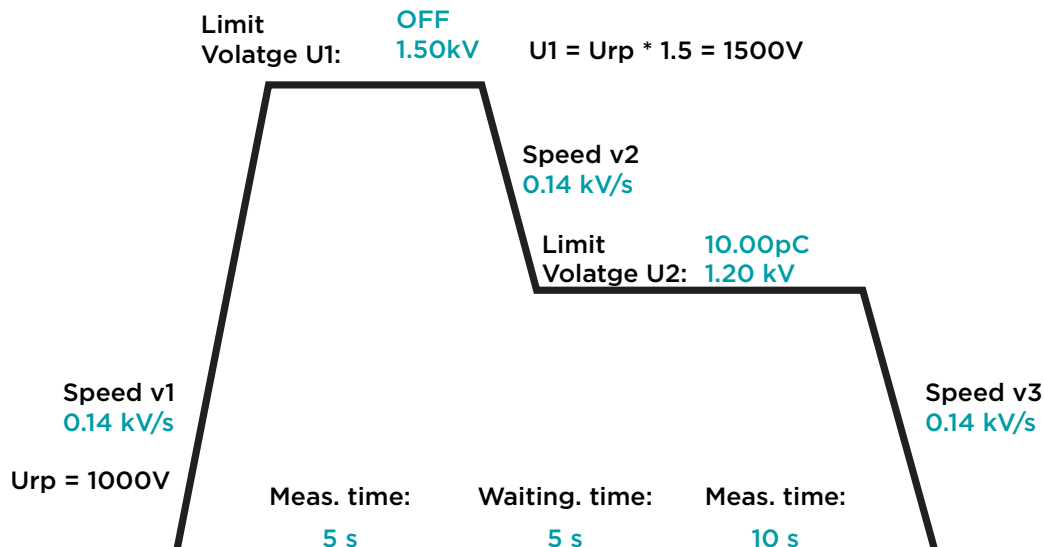
U inc.:  
yes

U ext.:  
yes

Limit:  
10 pC

Range:  
AUTO

Basic Insulation - Partial Discharge Test Passed



## Test Procedure Setting

### PD - MV no.2

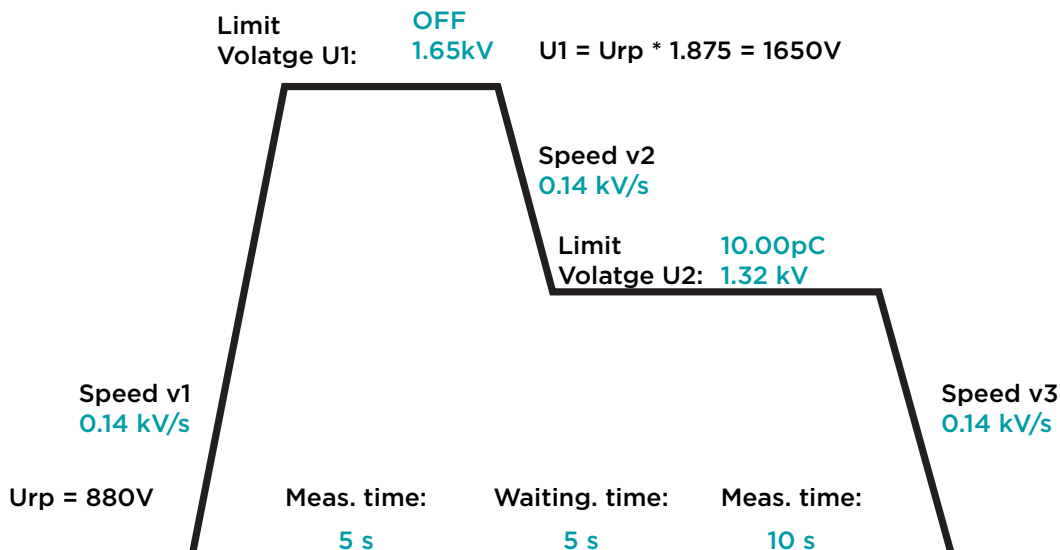
U inc.:  
yes

U ext.:  
yes

Limit:  
10 pC

Range:  
AUTO

Reinforced Insulation - Partial Discharge Test Passed



## For More Information:

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