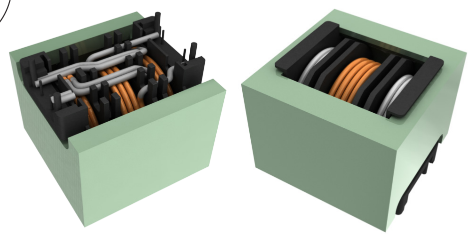
Power Transformers

PTLA Series LLC Transformer

YAGEO GROUP PULSE

ROHS COMPLIANT

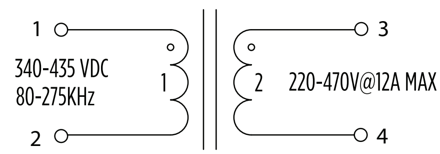
IATF 16949



- *3.6KW Transformer for OBC Applications*
- *PQ50/50 Platform, 52.8x52x43mm MAX*
- *Basic Insulation, 5mm Creepage*
- *4.4KVrms Hi-pot Isolation Voltage*
- *Primary Side Concentrated Leakage Inductance*

Pulse PN	Electrical Specifications @25°C – Operating Temperature -40°C to 125°C [1]			
PM9525NL	Pri. Inductance	(1-2)	42.4uH +/- 5%	
	Lk. Inductance	(1-2)W(3-4) shorted	6.4uH +/- 8%	
	DCR	(1-2)	12.5	mΩ Max
		(3-4)	44	
	Hi-Pot	Pri-Sec	4000 Vdc	
	Capacitance	(1-2) to (3-4)	30 pF Max	

Schematic

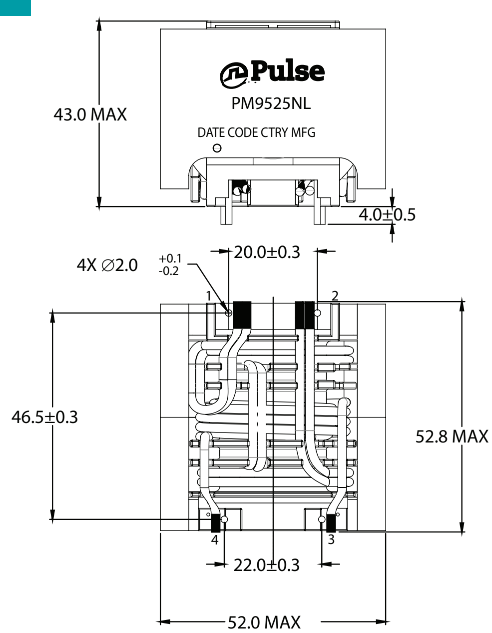


Notes:

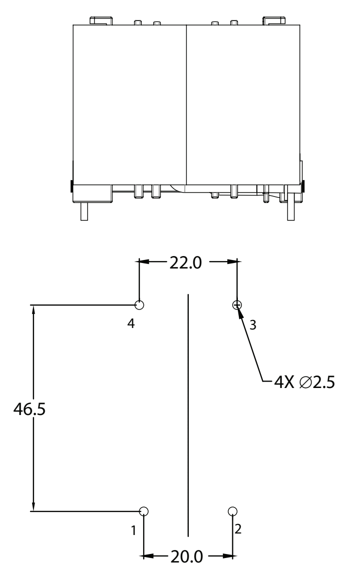
1. Storage Temperature: -40°C to 125°C
2. The temperature of the component (ambient plus temperature rise) must be within the stated operating temperature range.
3. Pri/Lk. Inductance value is measured at 100Khz/0.1Vrms.
4. 3.6KW power based on thermal conductive potting within aluminium housing.
5. Potting material provides additional mechanical fixation of the component in the OCB application. Therefore, shock and vibration testing is waived in the AEC-Q200 qualification test plan of the stand alone component

Mechanical

PM9525NL



FINAL OUTLINE



SUGGESTED LAYOUT

Weight: 300g

Pan Size: 12pcs/Tray

Dimensions: mm

Unless otherwise specified, all tolerance are ±0.25

Application

PM9525NL

The benefits of the LLC topology for multi-KW On Board Charger (OBC) applications are well understood, with the resonant inductor facilitating zero volt switching operation. The LLC transformer primary side leakage inductance (Lk_prim) can replace the need for a discrete external resonant inductor (Lext) if the value can be correctly sized and with the required tight tolerance. However, what is less understood is that the measured primary winding leakage inductance (primary inductance with secondary winding shorted) is a combination of LK_prim and the secondary side leakage inductance (Lk_sec) reflected on the primary side. So all of this measured leakage inductance is not available as primary side resonant inductance

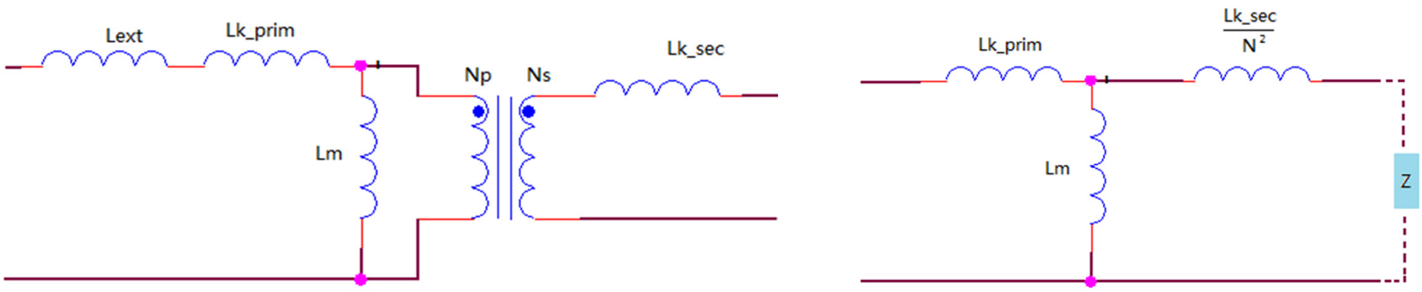


Figure 1 - Transformer Model including leakage inductance, and measure primary winding leakage inductance with secondary side leakage inductance reflected on primary side.

PM9525NL implements a novel winding construction where the flux generated by the primary winding induction is loosely coupled with the secondary winding (i.e. high leakage inductance) while the flux generated by the secondary winding induction is tightly coupled with the primary winding (i.e. low leakage inductance) This is illustrated by the following simulation of the flux primary and secondary flux linkage, with the secondary winding occupying the centre winding segment over the air gap. The air gap provides a reluctance to the primary winding flux (outer winding segments) linking with the secondary winding.

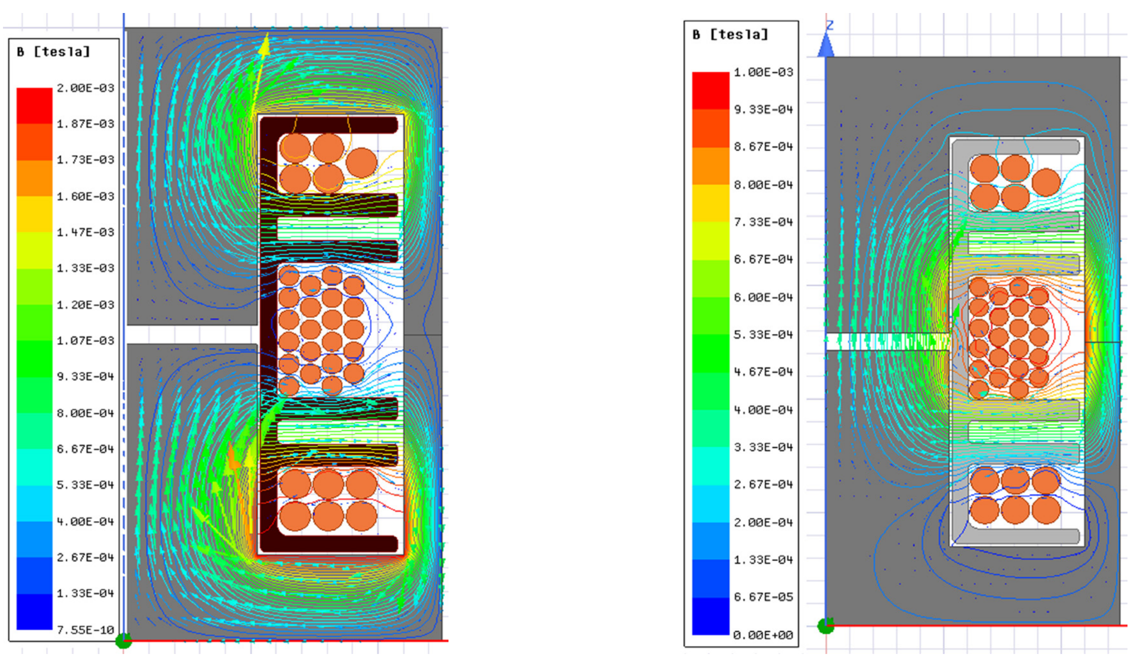


Figure 2 - Finite Element Modelling of the primary and secondary flux paths

Application

PM9525NL

Based on the following measured inductance values

- Primary Inductance, Secondary Open (Lso)
- Primary Inductance, Secondary Shorted (Lss)
- Secondary inductance, Primary Open Lpo

Magnetising inductance (Lm), Lk_prim and Lk_Sec can be calculated as follows

- Lm = SQRT ((Lso-Lss) x Lpo/N^2)
- Lk_prim = Lso – Lm
- Lk_sec = Lpo - Lm x N^2

Of the 6.5uH measured primary winding leakage inductance on one PM9525NL sample, 6.48uH is calculated as primary side leakage inductance while just 0.04uH is calculated as secondary side leakage inductance. Therefore practically all of the 6.4uH 3 8% specified primary winding leakage inductance is available for the resonant circuit.

Measured			Calculated		
Lso µH	Lss µH	Lpo µH	Lm µH	Lk_Prim µH	Lk_sec µH
42.88	6.48	145.68	36.4	6.5	0.040

Figure 3 – PM9525NL measured and calculated inductances

This makes PM9525NL an well optimized solution, allowing for OBC cost and size reduction.