

## Tube Amplifier Output Transformers

### LL1688

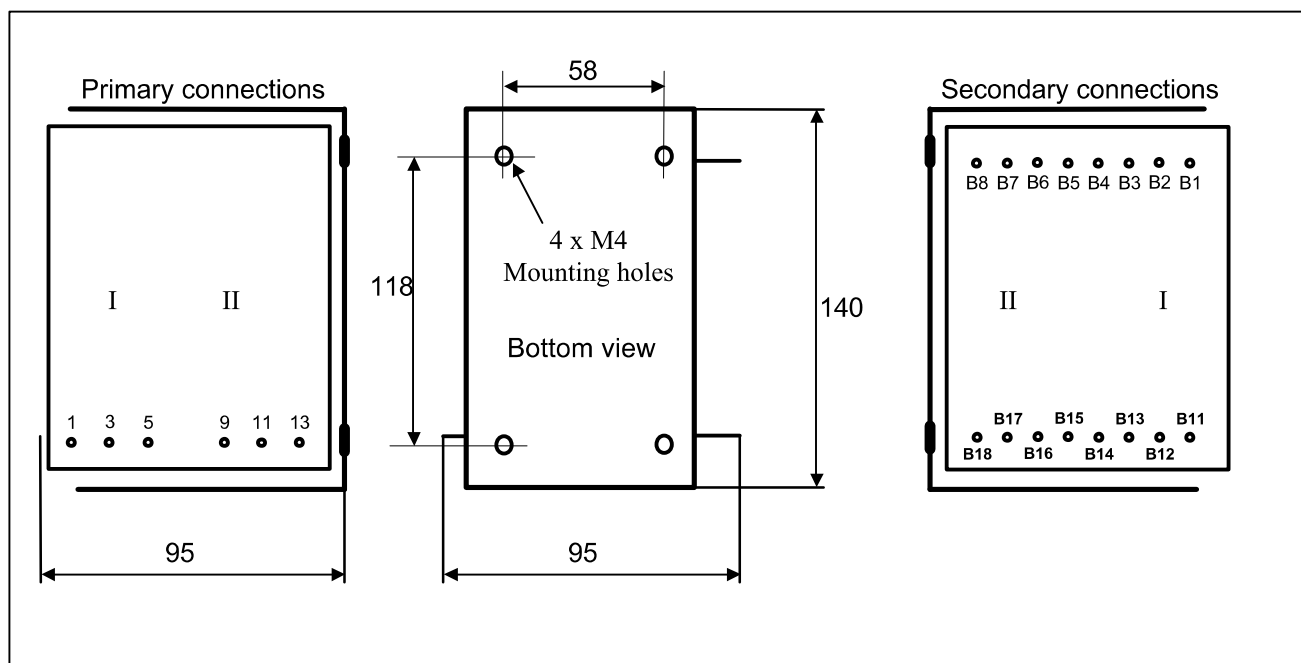
LL1688 is an output transformer, designed primarily for 845 tube amplifiers, but the LL1688 is available with different core air-gaps for different types of output stages. The transformers are highly sectioned with harmonically sized sections, which results in a minimum leakage inductance. This, combined with a low capacitance coil winding technique results in a wide frequency range.

The primary winding can be tapped for 33% UL connection.

The transformers have a special audio C-core of our own production.

The transformers are unpotted, open frame type suitable for mounting inside an amplifier housing.

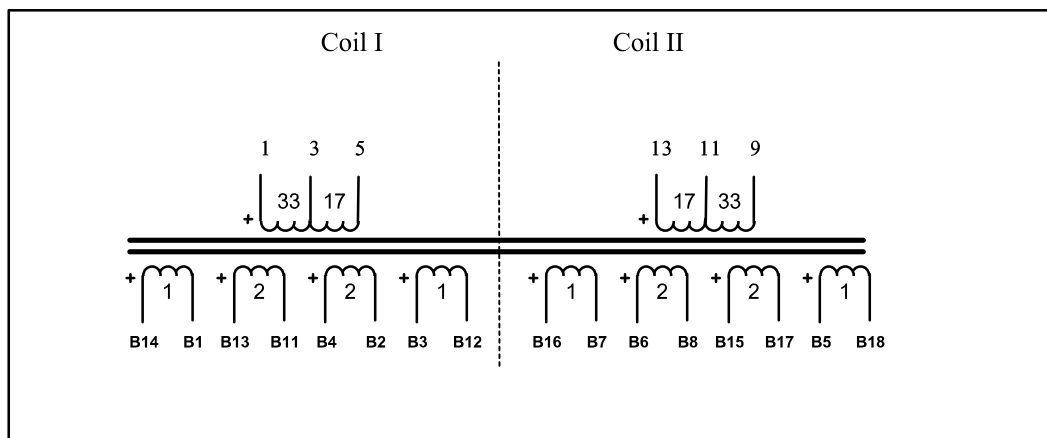
**Physical dimensions, pin and mounting hole layout LL1688 (all dimensions in mm)**



R040312

**Pin spacing module:** 5.08 mm (0.2")  
**Row spacing:** 91 mm approx.  
**Weight:** 4 kg  
**Turns ratio:** 50 + 50 : 1 + 2 + 2 + 1 + 1 + 2 + 2 + 1

**Winding schematics:**



LL1688		
Turns ratio:	50 + 50 : 1 + 2 + 2 + 1 + 1 + 2 + 2 + 1	
Static resistance of primary (all in series)	260 Ω (130Ω + 130Ω)	
Static resistance of secondary windings (in -> out)	0.3Ω, 0.7Ω, 0.7Ω, 0.4Ω	
Primary leakage inductance (all in series)	7 mH	
Max recommended primary DC current (heat dissip. 10W)	200mA	
Max. primary signal voltage r.m.s. at 30 Hz (all in series)	Push-Pull (1.6T) 1220V	Single End (0.7T) 530V

Isolation between primary and secondary windings / between windings and core: 4 kV / 2 kV

### Electrical characteristics

#### Primary Load Impedance, Max power and power loss.

	Sec. connection for 4/8/16 Ω (See next page)		
	-/B/C	B/C/D	C/D/E
	Primary Load Impedance (transformer copper resistance included)		
<b>LL1688</b>	20.5 kΩ	9.2 kΩ	5.5 kΩ
	Power and Loss		
Max. Power, P-P at 30 Hz	72W	160W	320W
Max. Power, S.E. at 30 Hz	15W	30W	60W
Power loss across transformer	0.15 dB	0.25 dB	0.5 dB

#### Primary DC Current Core Air-gap and Primary inductance

	LL1688/70mA
Core Airgap (delta/2)	240 μ
Single end standing current for 0.9 Tesla (recommended operating point)	70mA
Primary inductance	70 H

#### Frequency response, LL1688/70mA

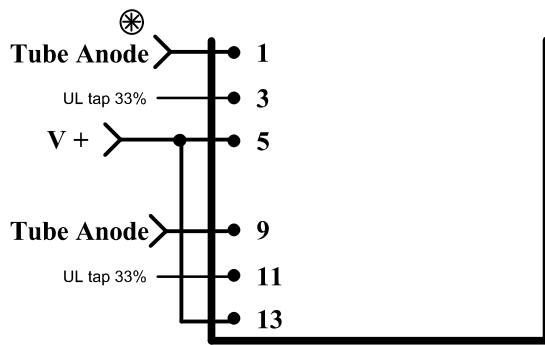
(source impedance 2.2k, load impedance 10 ohms. Primary winding is series, secondary winding "alt. C".

Secondary winding not grounded. Primary signal level approx 10V)

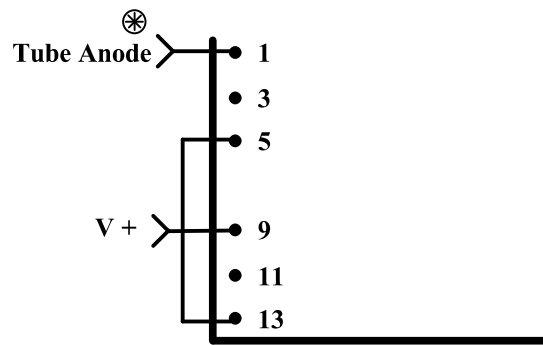
10 Hz – 25kHz +0 / -1 dB

5Hz – 33 kHz +0 / -3 dB

### Primary connections, Push-Pull

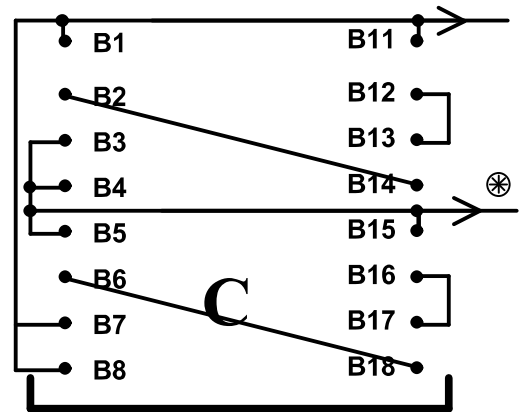
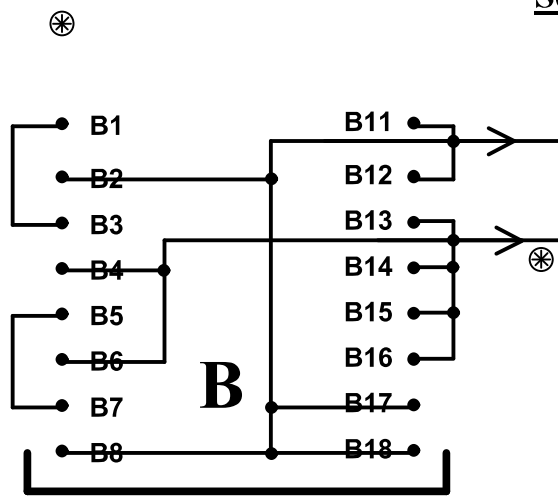


### Primary connections, Single End



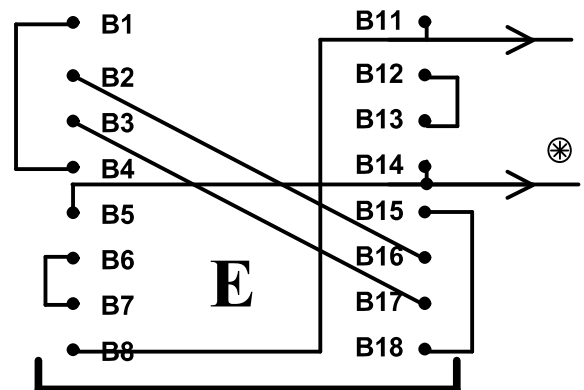
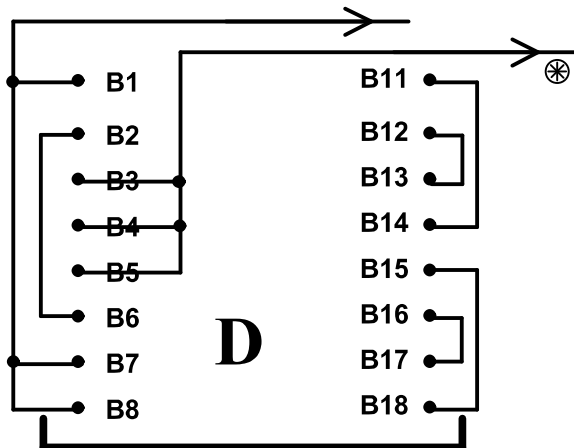
### Secondary connections

⊗ Indicates phase



Max secondary Voltage RMS @ 30 Hz	
P-P: 25V	SE : 11V
Sec. copper resistance 0.15 Ω	Windings in series 2

Max secondary Voltage RMS @ 30 Hz	
P-P: 37V	SE : 16V
Sec. copper resistance 0.2 Ω	Windings in series 3



Max secondary Voltage RMS @ 30 Hz	
P-P: 50V	SE : 22V
Sec. copper resistance 0.5 Ω	Windings in series 4

Max secondary Voltage RMS @ 30 Hz	
P-P: 74V	SE : 32V
Sec. copper resistance 1 Ω	Windings in series 6