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WIDE BANDWIDTH TOROIDAL STEP-UP TRANSFORMER FOR ELECTROSTATIC LOUDSPEAKERS

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TYPE & APPLICATION	:	VDVST106PP; ESL step-up	
Step-Up Ratio ( = $N_s / N_p$ )	:	Ratio = 75.07	[ ]
Nominal Power	:	$P_{nom} = 50$	[Watt] (1)
Nominal Power to be delivered in	:	$Z_{out} = 4$	[ $\Omega$ ] (1)
Secondary Inductance (maximum value)	:	$L_s = 1.7 \cdot 10^3$	[H] (2)
Effective Secondary Leakage Inductance	:	$L_{sse} = 26$	[mH]
Primary DC Resistance	:	$R_{ip} = 0.138$	[ $\Omega$ ]
Secondary DC Resistance	:	$R_{is} = 248$	[ $\Omega$ ]
Effective Secondary Internal Capacitance	:	$C_{is} = 3.21 \cdot 10^{-10}$	[F]

LOW FREQUENCY INFORMATION:

-3dB Power Bandwidth starting at	:	$f_u = 35.355$	[Hz] (3)
Tuning Resistor in series with Primary	:	$R_{ep} = 1.05$	[ $\Omega$ ] (4)
-3dB Bandwidth (with $R_{ep}$ ) starting at	:	$f_{3L} = 0.627$	[Hz] (5)
Primary Impedance at 10 Hz (with $R_{ep}$ )	:	$Z_{10} = 19.16$	[ $\Omega$ ] (6)

HIGH FREQUENCY INFORMATION (with  $C_{es}$  &  $R_{ep}$ )

Capacitance of Electrostatic Loudspeaker	:	$C_{es} = 1 \cdot 10^{-9}$	[F]
2-nd order Resonance Frequency	:	$F_o = 27.157$	[kHz] (7)
Q-factor 2-nd order HF filter section	:	$Q = 0.639$	[ ] (8)
-3dB High Frequency Bandwidth	:	$f_{3H} = 24.295$	[kHz] (8)
Effective Primary Impedance at 20 kHz	:	$Z_{20k} = 1.326$	[ $\Omega$ ]

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- (1): A step-up transformer transforms Voltages;  $V_{\text{primary}} = (P_{nom} \cdot Z_{out})^{0.5}$   
(2):  $L_s$  is not constant; see M. van der Veen, Glass Audio 5/97 starting pp.20  
(3): -3dB means  $1/2 \cdot P_{nom}$  at  $f_u$ ;  $P_{nom}$  at  $1.4 \cdot f_u$ ;  $2 \cdot P_{nom}$  at  $2 \cdot f_u$ ; etc.  
(4):  $R_{ep}$  (= series resistor with primary) stops High Frequency ringing.  
This resistor is an important external High Frequency tuning device.  
(5): With  $L_{s,max}$  (see (2)) and  $R_{ep}$ ; values upto  $6 \cdot f_{3L}$  can be met in practice.  
(6): This impedance is based on  $L_{s,max}$  (see (2)) and  $R_{ep}$ .  
At small primary Voltages values of  $1/6 \cdot Z_{10}$  can be measured.  
(7): This fundamental frequency is determined by  $L_{ss}$  and  $C_{is} + C_{es}$ .  
(8):  $R_{ep}$  influences  $Q$ ,  $f_{3H}$ ,  $Z_p$ ; Select  $R_{ep}$  for  $0.50 < Q < 0.74$
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