

# OUTPUT PENTODE

# EL34

Output pentode rated for 25W anode dissipation, intended for use in a.c. mains operated equipment.

## HEATER

$V_h$	6.3	V
$I_h$	1.5	A

## CAPACITANCES

$C_{out}$	8.4	pF
$C_{in}$	15.2	pF
$C_{a-g1}$	<1.0	pF
$C_{g1-h}$	<1.0	pF
$C_{h-k}$	11	pF

## CHARACTERISTICS

### Pentode connection

$V_{a1}$	250	V
$V_{g2}$	250	V
$V_{g3}$	0	V
$I_a$	100	mA
$I_{g2}$	15	mA
$V_{g1}$	-12.2	V
$g_m$	11	mA/V
$r_a$	15	k $\Omega$
$\mu_{g1-g2}$	11	
$V_{g1 \text{ max.}}$ ( $I_{g1} = +0.3\mu A$ )	-1.3	V

### Triode connection ( $g_2$ connected to a)

$V_a$	250	V
$I_a$	70	mA
$V_{g1}$	-15.5	V
$g_m$	11.5	mA/V
$r_a$	910	$\Omega$
$\mu$	10.5	

## OPERATING CONDITIONS AS SINGLE VALVE CLASS "A" AMPLIFIER

### Pentode connection

$V_a$	250	300	V
$V_{g2}$	250	300	V
$V_{g3}$	0	0	V
$R_k$	106	190	$\Omega$
$R_a$	2.0	3.5	k $\Omega$
$I_a$	100	83	mA
$I_{g2}$	15	13	mA
$V_{in(r.m.s.)}$ ( $P_{out} = 50mW$ )	500	450	mV
$V_{in(r.m.s.)}$	8.0	8.2	V
* $P_{out}$	11	11	W
* $D_{tot}$	10	10	%

\* $P_{out}$  and  $D_{tot}$  are measured at fixed bias and therefore represent the power output available during the reproduction of speech and music. When a sustained sine wave is applied to the control-grid the bias across the cathode resistor will readjust itself as a result of the increased anode and screen-grid currents. This will result in a reduction in power output of approximately 10%.

### OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

Distributed load conditions for maximum output (screen-grid tapping at 20% of primary turns)

$V_b$		450	V
$R_{g2}$ (per valve)		1.0	k $\Omega$
$R_k$ (per valve)		500	$\Omega$
$R_{a-a}$		7.0	k $\Omega$
$I_{a(o)}$		2 × 55	mA ←
$I_{g2(o)}$		2 × 9.0	mA ←
$V_{in(g1-g1)r.m.s.}$		55.2	V
$P_{out}$		40	W
$D_{tot}$		4.5	%
$I_a$ (max. sig.)		2 × 74	mA
$I_{g2}$ (max. sig.)		2 × 9.0	mA

Distributed load conditions for minimum distortion (with screen-grid tapping at 43% of primary turns)

$V_b$	430	430	V
$R_{g2}$ (per valve)	1.0	1.0	k $\Omega$
$R_k$ (per valve)	470	470	$\Omega$
$R_{a-a}$	6.0	6.0	k $\Omega$
$I_{a(o)}$	2 × 62.5	2 × 62.5	mA
$I_{g2(o)}$	2 × 10	2 × 10	mA
$V_{in(g1-g1)r.m.s.}$	35	50	V
$P_{out}$	20	34	W
$D_{tot}$	0.35	2.5	%
$I_a$ (max. sig.)	2 × 65	2 × 70	mA
$I_{g2}$ (max. sig.)	2 × 10.2	2 × 14	mA

### OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL

Fixed bias

$V_b$	375	400	V
$V_{g3}$	0	0	V
* $R_{g2}$	600	800	$\Omega$
$V_{g1}$	-33	-36	V
$R_{a-a}$	3.5	3.5	k $\Omega$
$I_{a(o)}$	2 × 30	2 × 30	mA
$I_{g2(o)}$	2 × 4.7	2 × 4.5	mA
$V_{in(g1-g1)r.m.s.}$	46.7	50	V
$P_{out}$	48	54	W
$D_{tot}$	2.8	1.6	%
$I_a$ (max. sig.)	2 × 107.5	2 × 110.5	mA
$I_{g2}$ (max. sig.)	2 × 23.5	2 × 23	mA

\*Screen-grid resistor common to both valves.

**Cathode bias**

$V_b$	375	450	V
$V_{g3}$	0	0	V
* $R_{g2}$	0.47	1.0	k $\Omega$
$R_k$ (per valve)	260	465	$\Omega$
$R_{a-a}$	3.5	6.5	k $\Omega$
$I_{a(o)}$	2 $\times$ 75	2 $\times$ 60	mA
$I_{g2(o)}$	2 $\times$ 12.5	2 $\times$ 10	mA
$V_{in(g1-g1)r.m.s.}$	40	54	V
$P_{out}$	35	40	W
$D_{tot}$	1.7	5.1	%
$I_a(max. sig.)$	2 $\times$ 94	2 $\times$ 71.5	mA
$I_{g2(max. sig.)}$	2 $\times$ 19.5	2 $\times$ 22	mA

\*Screen-grid resistor common to both valves.

**OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL**

**Triode connection** ( $g_2$  connected to a,  $g_3$  to k) with separate cathode bias resistors.

**With  $R_k$  bypassed**

$V_b$	430	V
$V_a$	400	V
$V_{g3}$	0	V
$R_k$ (per valve)	440	$\Omega$
$R_{a-a}$	5.0	k $\Omega$
$I_{a(o)}$	2 $\times$ 70	mA
$V_{in(g1-g1)r.m.s.}$	48	V
$P_{out}$	19	W
$D_{tot}$	1.8	%
$I_a(max. sig.)$	2 $\times$ 75	mA

**With  $R_k$  unbypassed**

$V_b$	430	V
$V_a$	400	V
$V_{g3}$	0	V
$R_k$ (per valve)	440	$\Omega$
$R_{a-a}$	10	k $\Omega$
$I_{a(o)}$	2 $\times$ 70	mA
$V_{in(g1-g1)r.m.s.}$	48	V
$P_{out}$	14	W
$D_{tot}$	0.4	%
$I_a(max. sig.)$	2 $\times$ 73	mA



### OPERATING CONDITIONS FOR TWO VALVES IN PUSH-PULL WITH CONTINUOUS SINE WAVE DRIVE

#### Fixed bias

$V_b$	375	400	V
$V_{g3}$	0	0	V
$R_{g2}$	1.0	1.5	k $\Omega$
$V_{g1}$	-32	-35.5	V
$R_{a-a}$	3.5	3.5	k $\Omega$
$I_{a(o)}$	2 × 30	2 × 30	mA
$I_{g2(o)}$	2 × 4.4	2 × 4.4	mA
$V_{in(g1-g1)r.m.s.}$	45	50	V
$P_{out}$	42	51	W
$D_{tot}$	3.0	1.8	%
$I_{a(max. sig.)}$	2 × 98	2 × 106	mA
$I_{g2(max. sig.)}$	2 × 19	2 × 21	mA

#### Cathode bias

Any of the cathode bias conditions published in this data sheet are suitable for continuous sine wave drive.

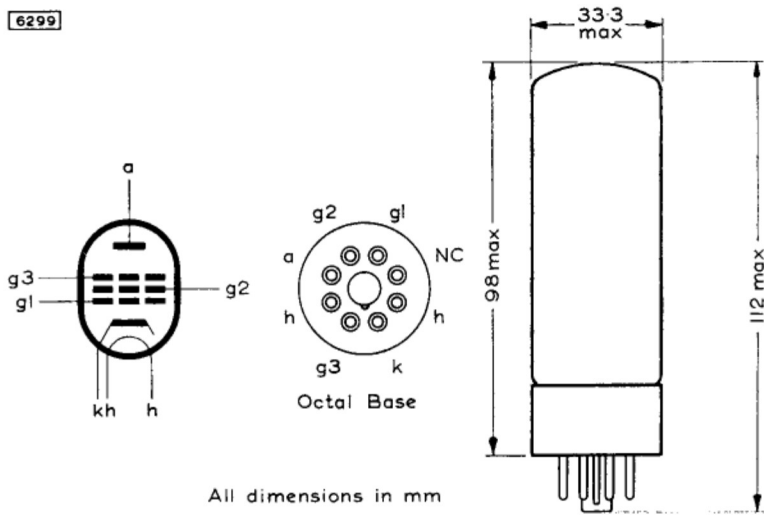
### DESIGN CENTRE RATINGS

$V_{a(b)} \text{ max.}$	2.0	kV
$V_a \text{ max.}$	800	V
$p_a \text{ max.}$	25	W
$V_{g2(b)} \text{ max.}$	800	V
$V_{g2} \text{ max.}$	500	V
$p_{g2} \text{ max.}$	8.0	W
$I_k \text{ max.}$	150	mA
$R_{g1-k} \text{ max.}$	500	k $\Omega$
$V_{h-k} \text{ max.}$	100	V
$R_{h-k} \text{ max.}$	20	k $\Omega$

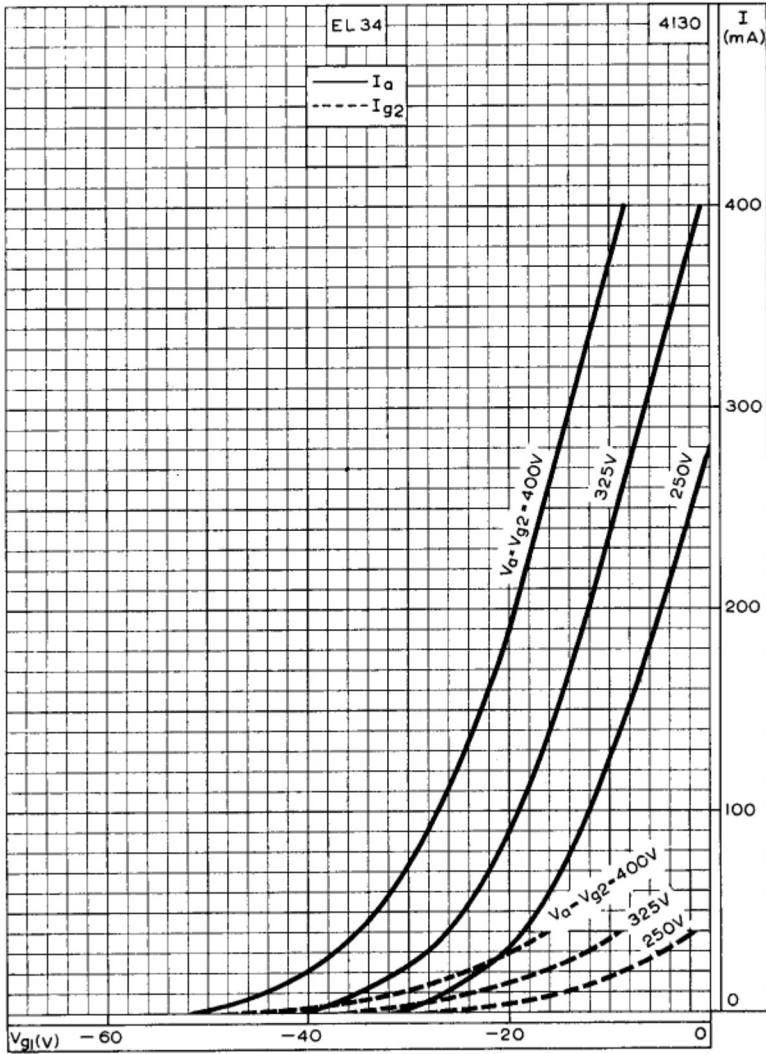
#### Triode connected

$V_a \text{ max.}$	600	V
$p_{a+g2} \text{ max. (} V_a = 500V \text{)}$	30	W
$p_{a+g2} \text{ max. (} V_a = 600V \text{)}$	15	W

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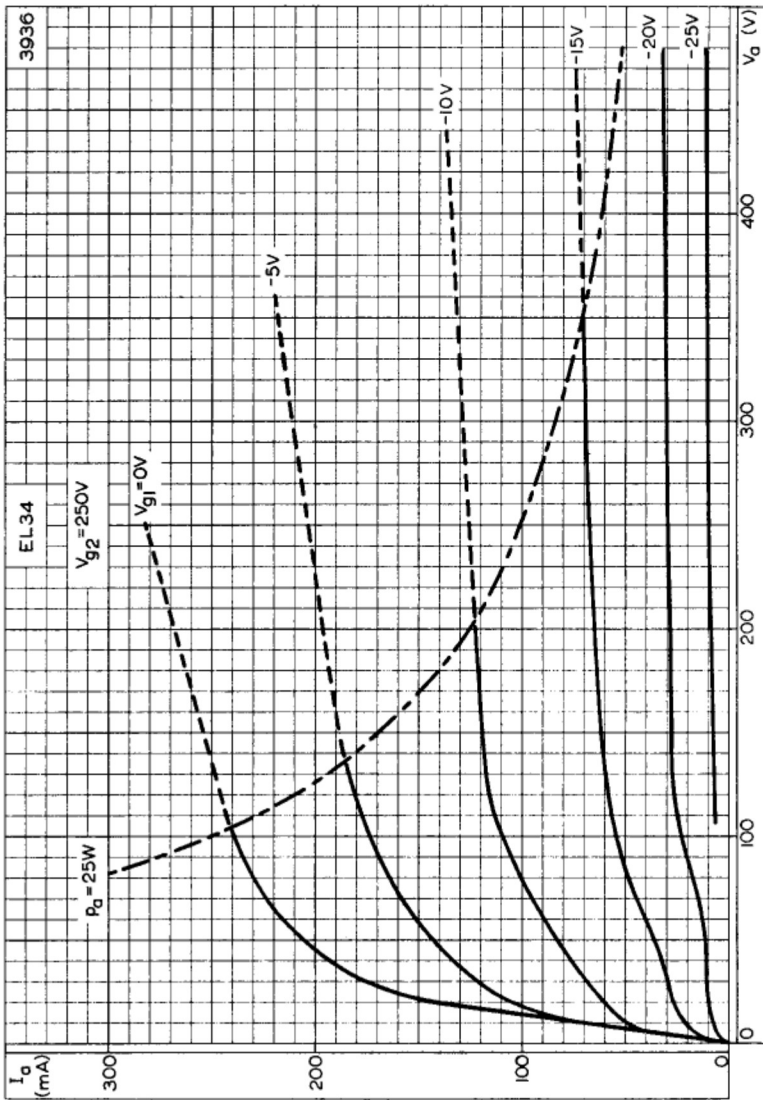


All dimensions in mm

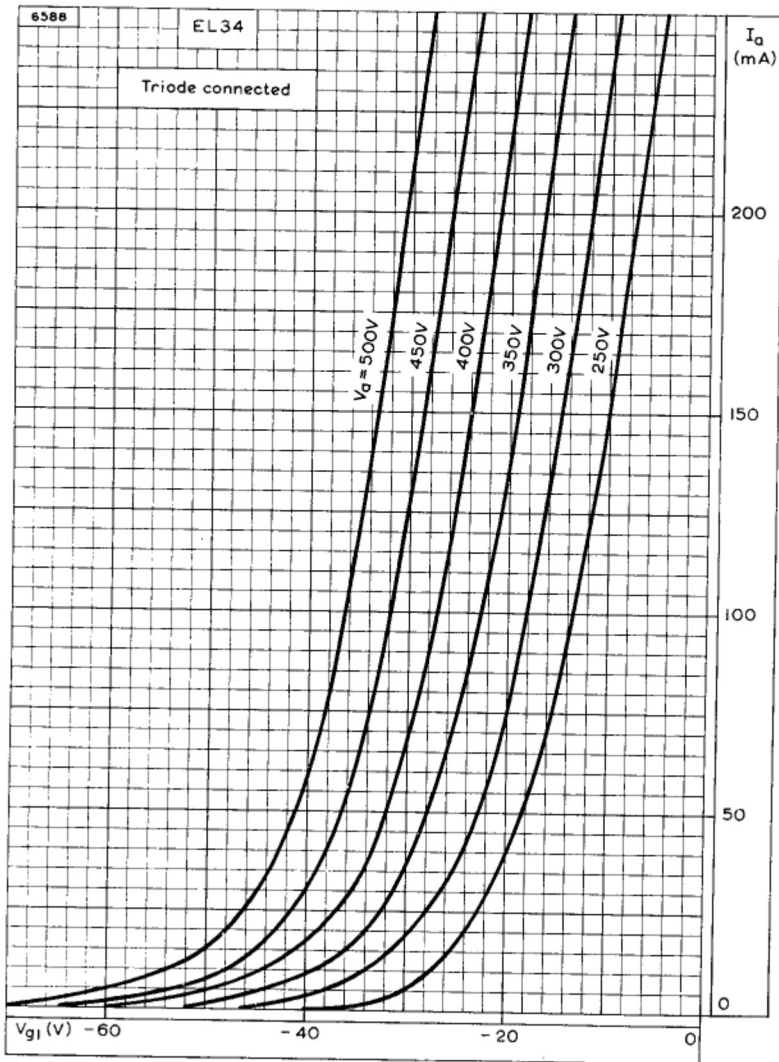


ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH ANODE AND SCREEN-GRID VOLTAGES AS PARAMETERS





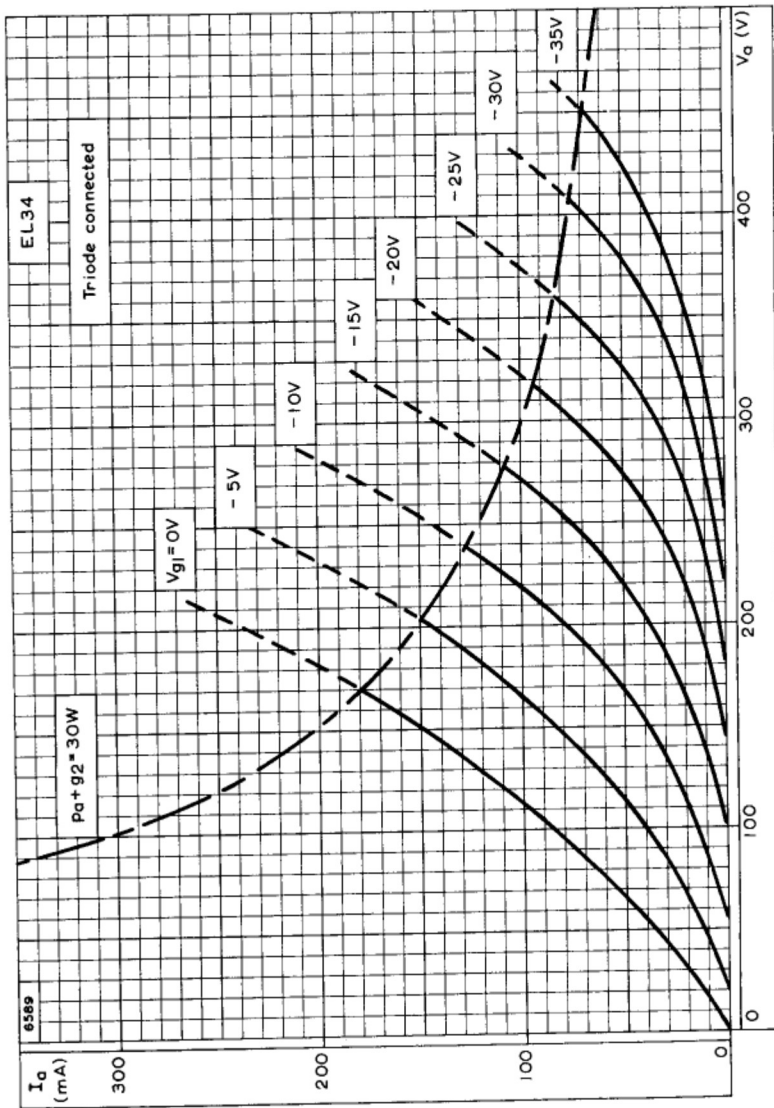
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER



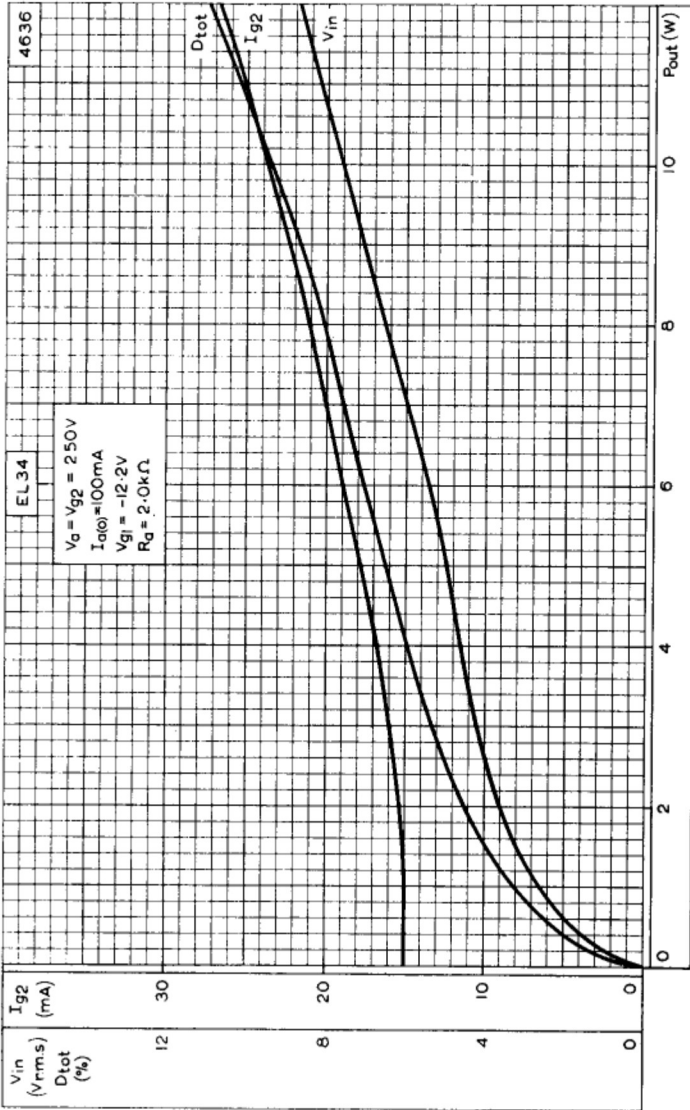
ANODE CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH ANODE VOLTAGE AS PARAMETER WHEN TRIODE CONNECTED



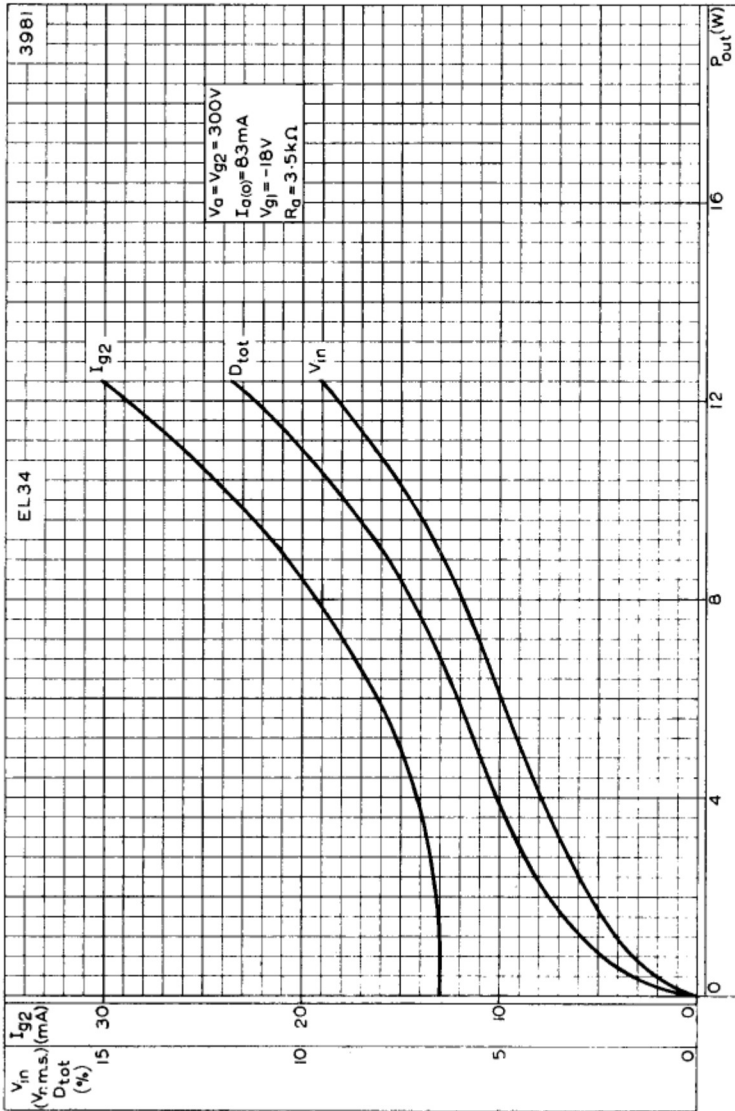




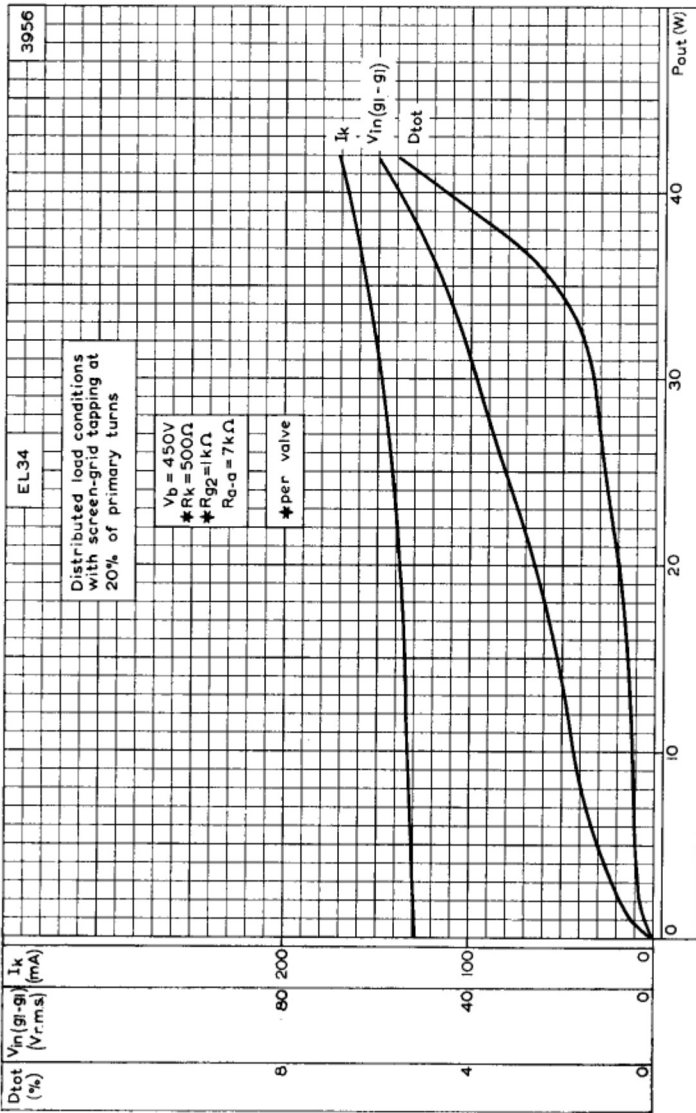
ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER WHEN TRIODE CONNECTED



PERFORMANCE OF EL34 WHEN USED AS A SINGLE VALVE CLASS 'A' AMPLIFIER.  $V_a = 250V$

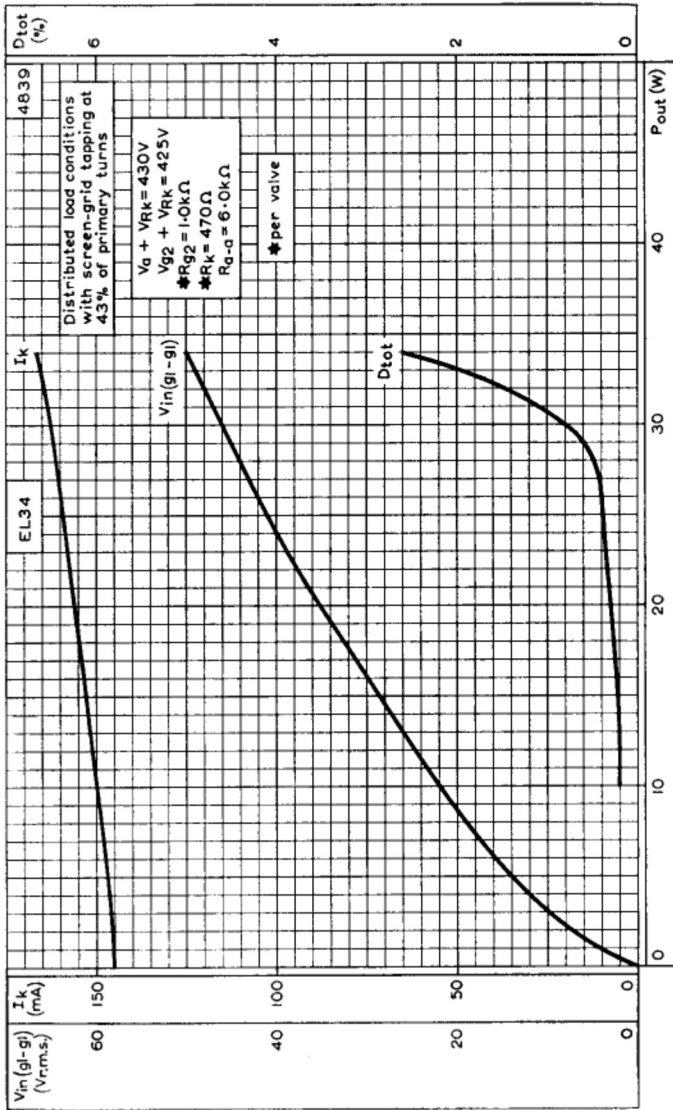


PERFORMANCE OF EL34 WHEN USED AS A SINGLE VALVE CLASS 'A' AMPLIFIER.  $V_a = 300V$

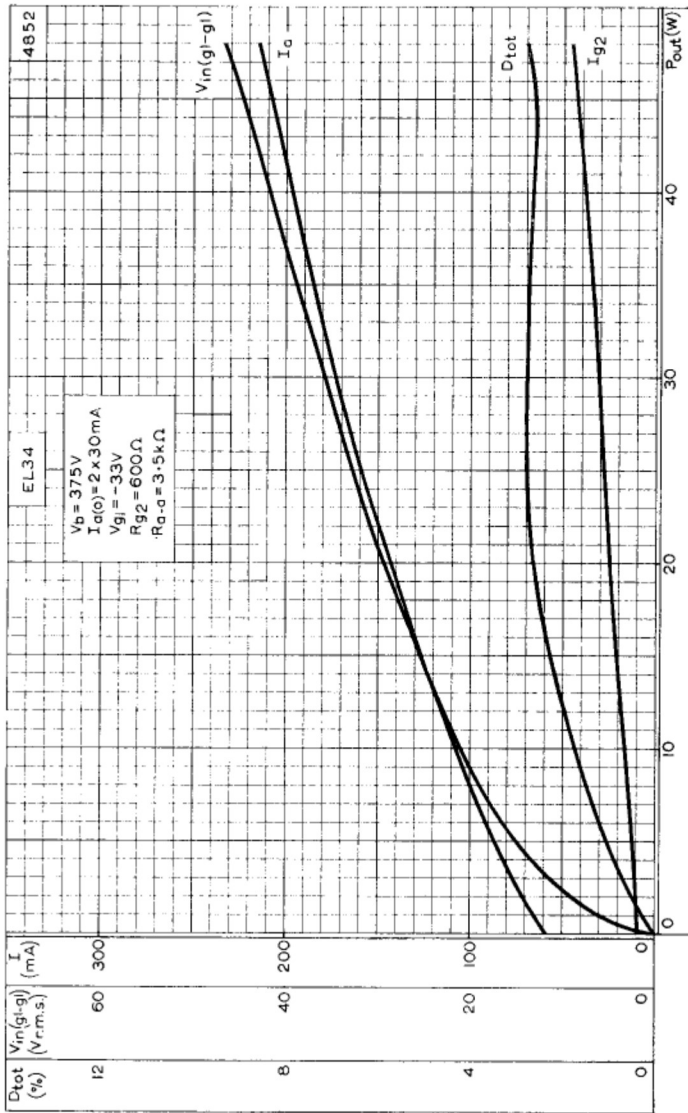


PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH DISTRIBUTED LOAD CONDITIONS. SCREEN-GRID TAPPING AT 20% OF PRIMARY TURNS

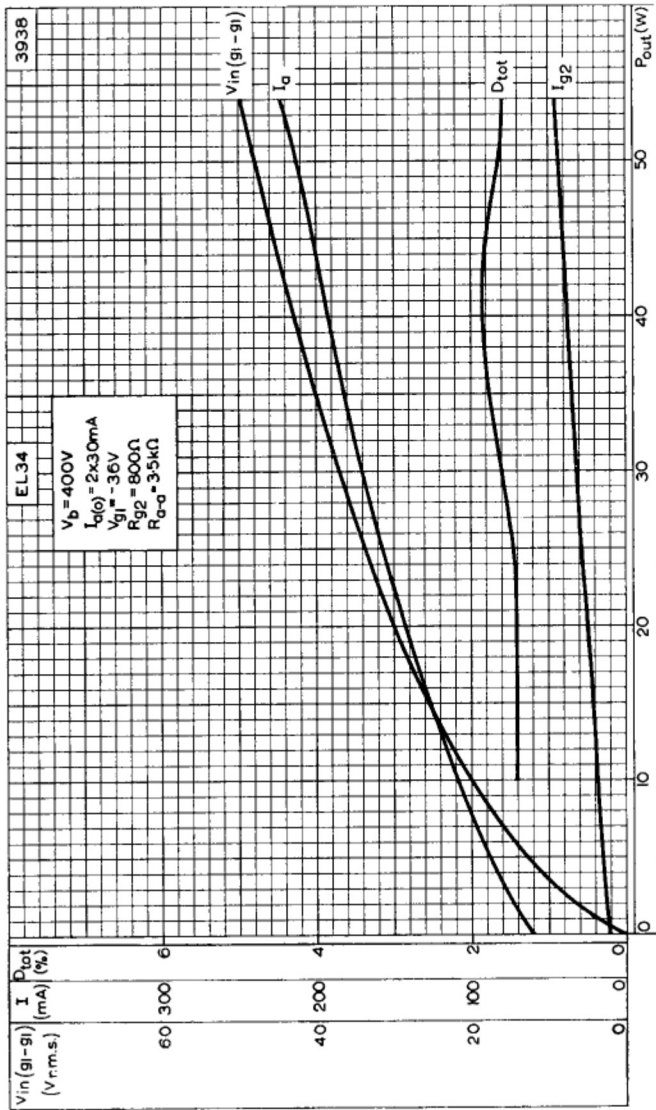




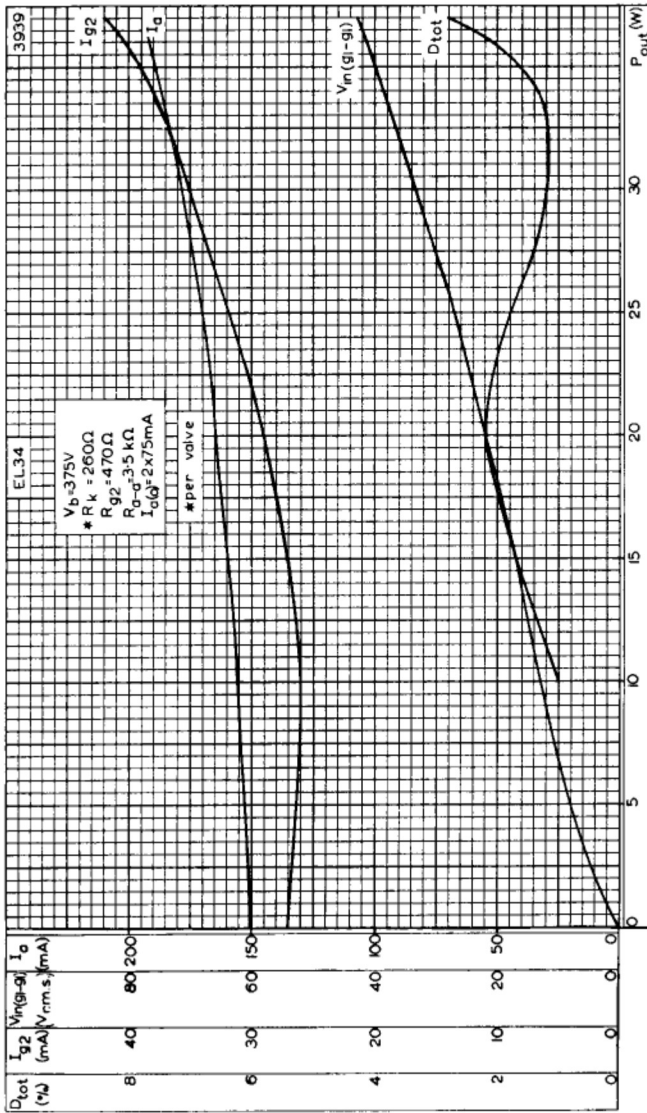
PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH DISTRIBUTED LOAD CONDITIONS. SCREEN-GRID TAPPING AT 43% OF PRIMARY TURNS



PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH FIXED BIAS  
 $V_b = 375V$



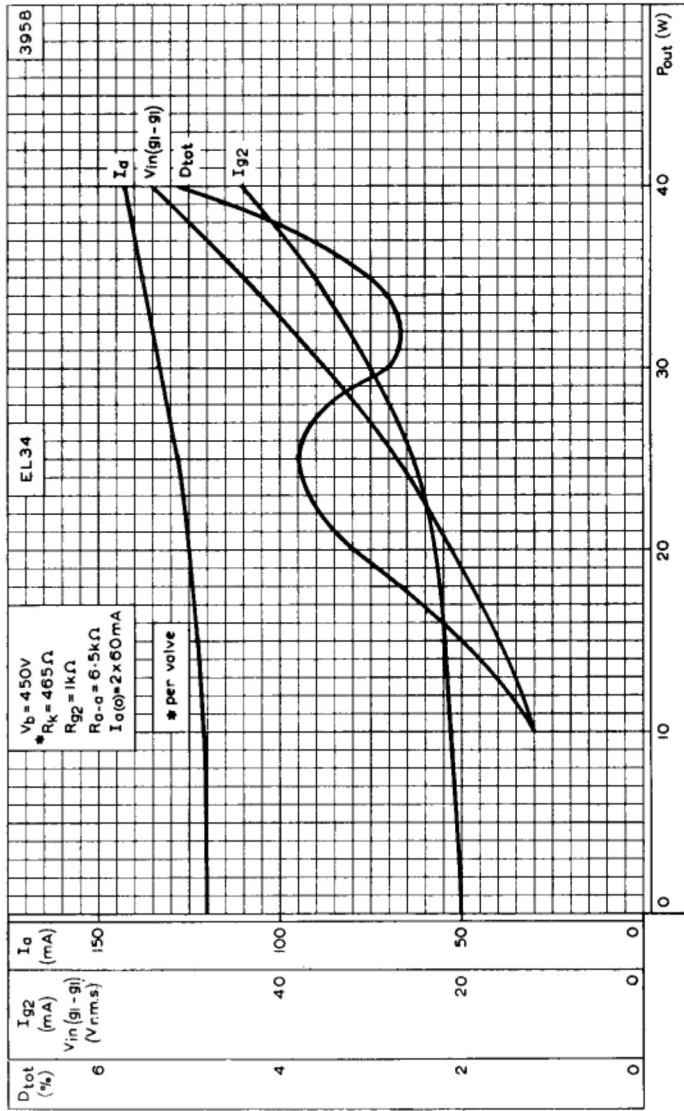
PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH FIXED BIAS  
 $V_b = 400V$



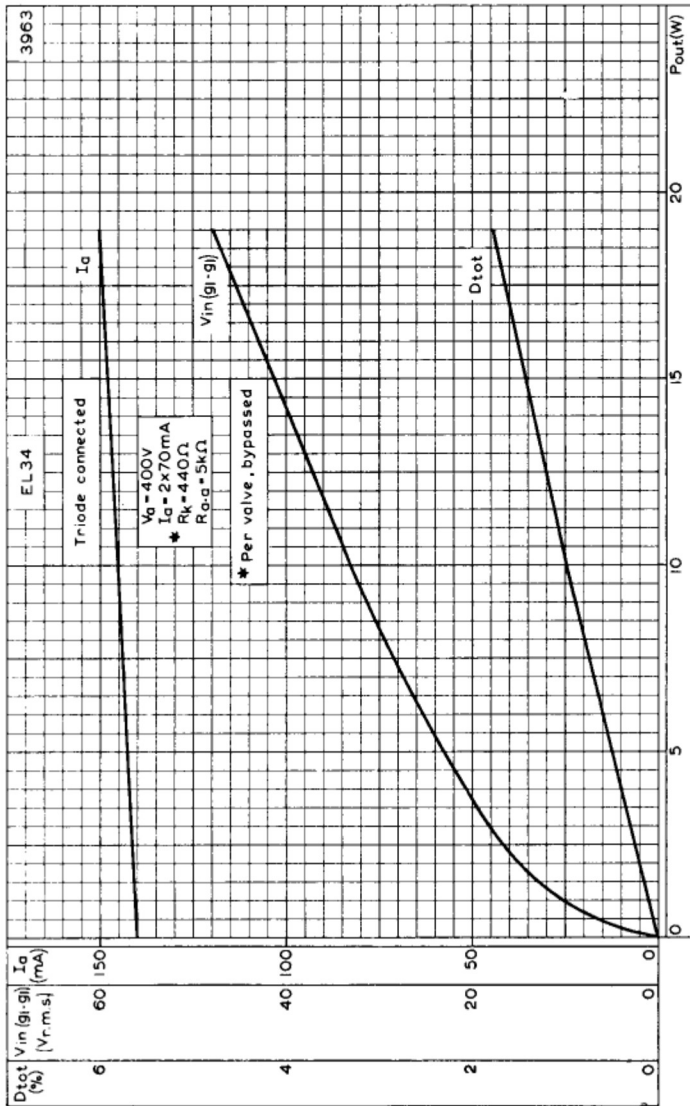
PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH CATHODE BIAS  
 $V_b = 375V$





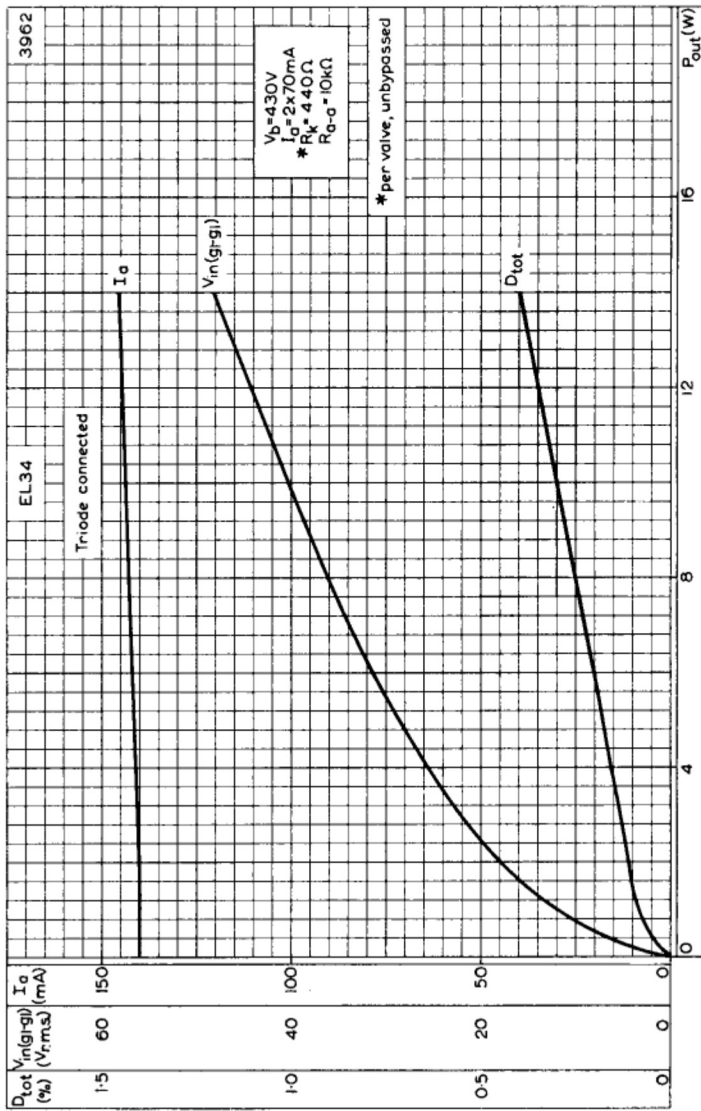


PERFORMANCE OF TWO EL34 IN PUSH-PULL WITH CATHODE BIAS  
 $V_b = 450V$



PERFORMANCE OF TWO EL34 IN PUSH-PULL WHEN TRIODE CONNECTED AND THE CATHODE BYPASSED





PERFORMANCE OF TWO EL34 IN PUSH-PULL WHEN TRIODE CONNECTED AND THE CATHODE UNBYPASSED