TRIODE-PENTODE

High transconductance triode and R.F. pentode intended for use as frequency changer in V.H.F. T.V. tuners.

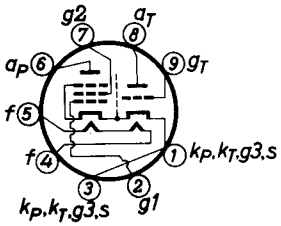
QUICK REFERENCE DATA			
Pentode section			
Anode current	I_a	10	mA
Transconductance	S	11	mA/V
Amplification factor	$\mu_{g_2g_1}$	55	-
Internal resistance	R_i	min. 350	kΩ
Triode section			
Anode current	I_a	15	mA
Transconductance	S	9	mA/V
Amplification factor	μ	20	-

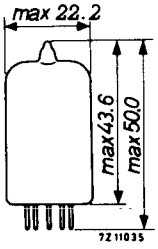
HEATING: Indirect by A.C. or D.C.; series supply

Heater current	I_f	0.3 A
Heater voltage	V_f	8.5 V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CAPACITANCES (with external shield)

Pentode section

Grid No.1 to all except anode	$C_{g_1(a)}$		5.9	pF
Anode to all except grid No.1	$C_{a(g_1)}$		3.7	pF
Anode to grid No.1	C_{ag_1}		0.009	pF
	C_{ag_1}	max.	0.012	pF
Grid No.1 to grid No.2	$C_{g_1g_2}$		1.6	pF

Triode section

Grid to all except anode	$C_{g(a)}$		3.3	pF
Anode to all except grid	$C_{a(g)}$		1.7	pF
Anode to grid	C_{ag}		1.8	pF

Between pentode and triode sections

Pentode anode to triode anode	C_{aPaT}	max.	0.025	pF
Pentode anode to triode grid	C_{aPgT}	max.	0.010	pF
Pentode grid No.1 to triode anode	C_{g1PaT}	max.	0.010	pF
Pentode grid No.1 to triode grid	C_{g1PgT}	max.	0.010	pF

TYPICAL CHARACTERISTICS

Pentode section

Anode voltage	V_a		170	V
Grid No.2 voltage	V_{g_2}		120	V
Grid No.1 voltage	V_{g_1}		-1.4	V
Anode current	I_a		10	mA
Grid No.2 current	I_{g_2}		3	mA
Transconductance	S		11	mA/V
Internal resistance	R_i	min.	350	kΩ
Amplification factor	$\mu_{g_2g_1}$		55	
Equivalent noise resistance	R_{eq}		1.5	kΩ

TYPICAL CHARACTERISTICS (continued)

Triode section

Anode voltage	V_a	100	V
Grid voltage	V_g	-3	V
Anode current	I_a	15	mA
Transconductance	S	9	mA/V
Amplification factor	μ	20	-

OPERATING CHARACTERISTICS

Pentode section as I.F. amplifier

Anode supply voltage	V_{ba}	200		V
Grid No.2 supply voltage	V_{bg_2}	200		V
Grid No.2 resistor	R_{g_2}	27		kΩ
Anode resistor	R_a	2.7	4.7	kΩ
Grid No.1 supply voltage	V_{bg_1}	-1.4	0	V
Grid No.1 resistor	R_{g_1}	0.1	1	MΩ
Anode current	I_a	10	13	mA
Grid No.2 current	I_{g_2}	3.0	3.9	mA
Transconductance	S	11	14.5	mA/V
Input resistance at 50 MHz	r_{g_1}	10	10	kΩ
Grid No.1 voltage	V_{g_1}	-12	-	V
Transconductance	S	0.11	-	mA/V

OPERATING CHARACTERISTICS (continued)

Pentode section as mixer

Anode supply voltage	V_{ba}	200		V
Grid No.2 supply voltage	V_{bg_2}	200		V
Grid No.2 resistor	R_{g_2}	27		kΩ
Anode resistor	R_a	2.7	4.7	kΩ
Grid No.1 supply voltage	V_{bg_1}	-1.4	0	V
Grid No.1 resistor	R_{g_1}	0.1	1	MΩ
Oscillator voltage	V_{osc}	1.6	1.6	$V_{(RMS)}$
Anode current	I_a	10	9.3	mA
Grid No.2 current	I_{g_2}	3.0	2.9	mA
Grid No.1 current	I_{g_1}	8	2.3	μA
Conversion conductance	S_c	5	4.7	mA/V

OPERATING CHARACTERISTICS

Triode section as oscillator

Anode supply voltage	V_{ba}	200		V
Grid resistor	R_g	10		kΩ
Anode resistor	R_a	8.2	12	kΩ
Oscillator voltage	V_{osc}	4.5	3.3	$V_{(RMS)}$
Anode current	I_a	16	12	mA
Effective transconductance (without higher harmonics)	S_{eff}	3.7	3.7	mA/V

LIMITING VALUES (Design centre rating system)

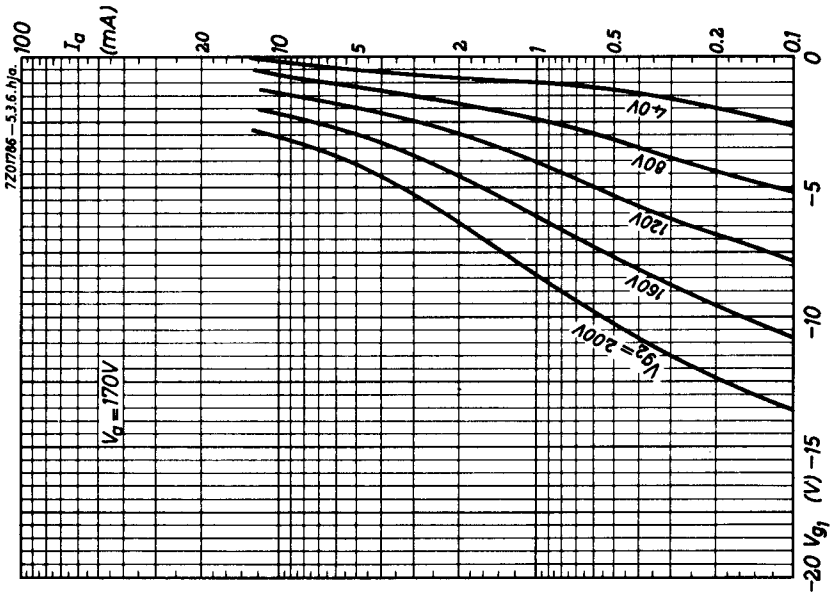
Pentode section

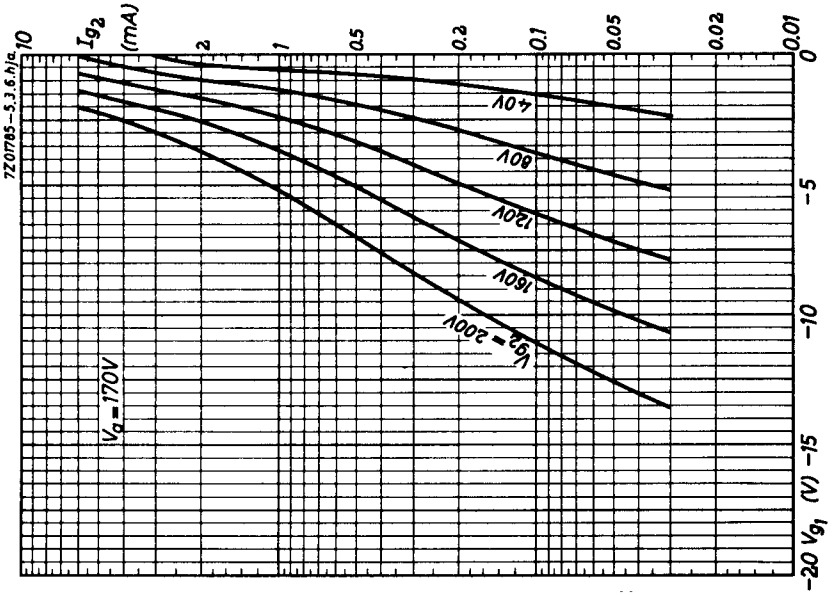
Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	2.0	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
Grid No.2 supply voltage	V_{bg_2}	max.	250	V
Grid No.2 voltage	V_{g_2}	max.	250	V
Grid No.2 dissipation	See page 10			
Grid No.1 voltage	$-V_{g_1}$	max.	50	V
Grid No.1 resistor, fixed bias	R_{g_1}	max.	1	MΩ
automatic bias	R_{g_1}	max.	2.2	MΩ
Cathode current	I_k	max.	18	mA
Cathode to heater voltage	V_{kf}	max.	100	V [1])

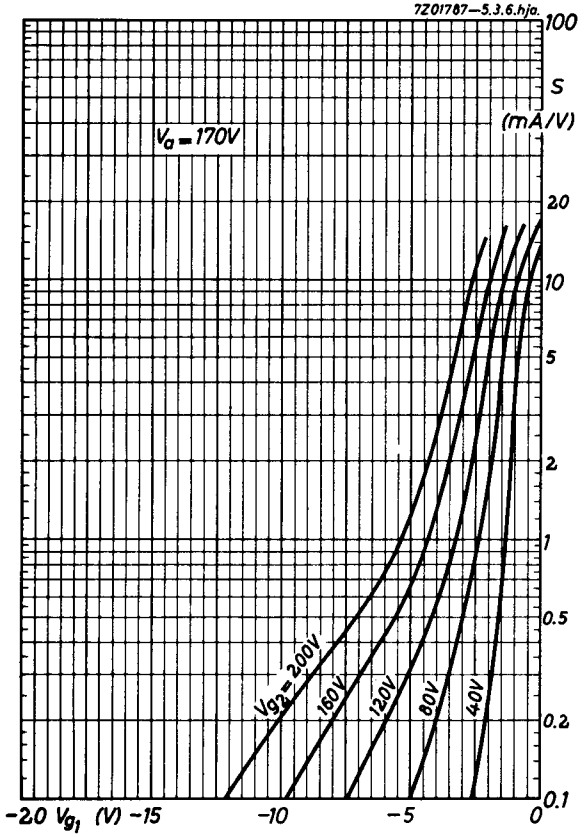
Triode section

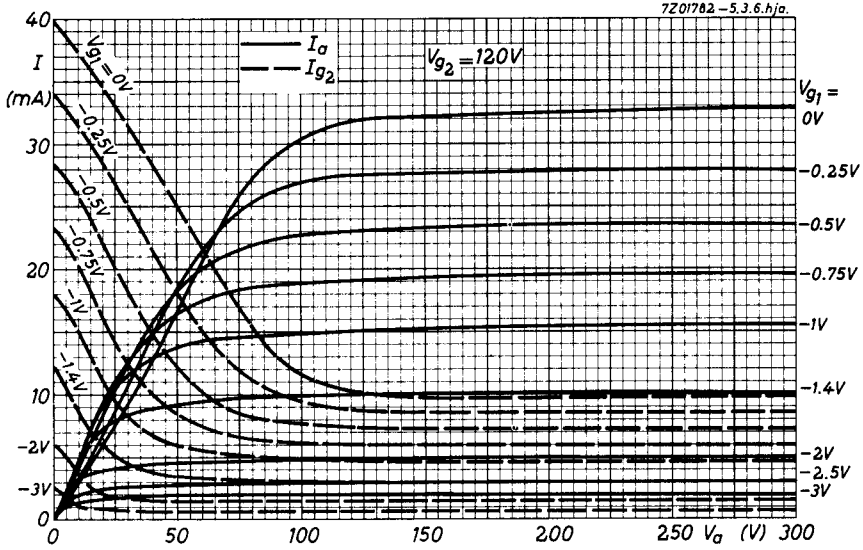
Anode voltage	V_{a_o}	max.	550	V
Anode supply voltage	V_{b_a}	max.	250	V
Anode voltage	V_a	max.	125	V
Anode dissipation	W_a	max.	1.5	W
Grid voltage	$-V_g$	max.	50	V
Grid resistor	R_g	max.	0.5	MΩ
Cathode current	I_k	max.	20	mA
Cathode to heater voltage	V_{kf}	max.	100	V [1])

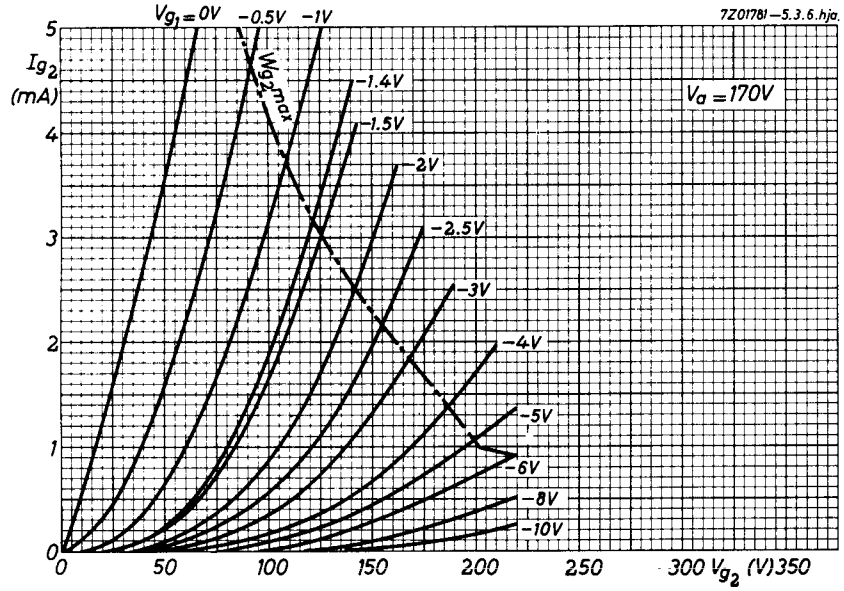
[1]) To fulfil the modulation hum requirements in intercarrier receivers, the voltage between heater and cathode should not exceed 100 $V_{(RMS)}$.
With respect to modulation hum in A.M. sound receivers the voltage between heater and cathode should not exceed 50 $V_{(RMS)}$.

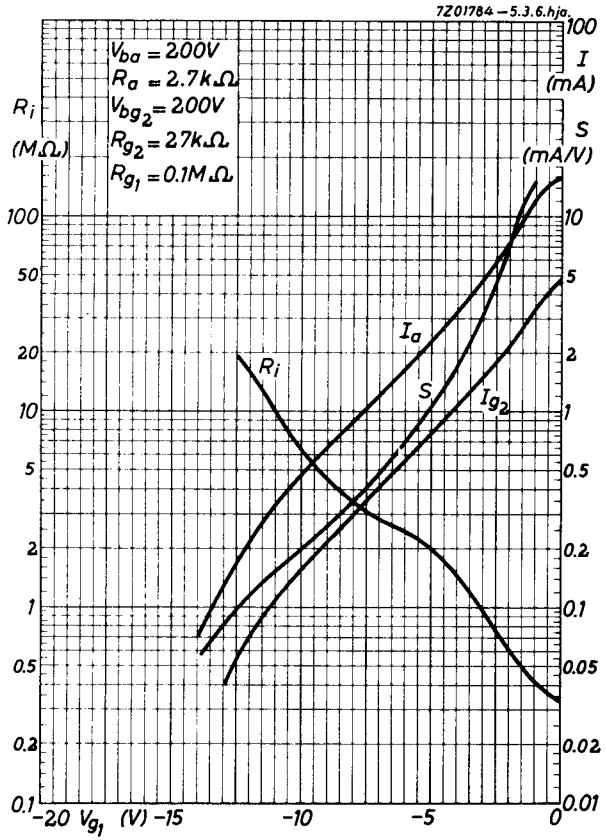

7Z01786—5.3.6.hja.
I_a (mA)
100
20
10
5
2
1
0.5
0.2
0.1
0
-5
-10
-15
-20 V_{g1} (V)
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V

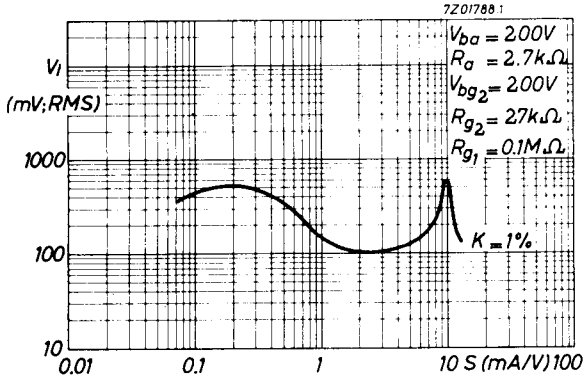

7Z01785—5.3.6.hja.
I_{g2} (mA)
10
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0
-5
-10
-15
-20 V_{g1} (V)
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V

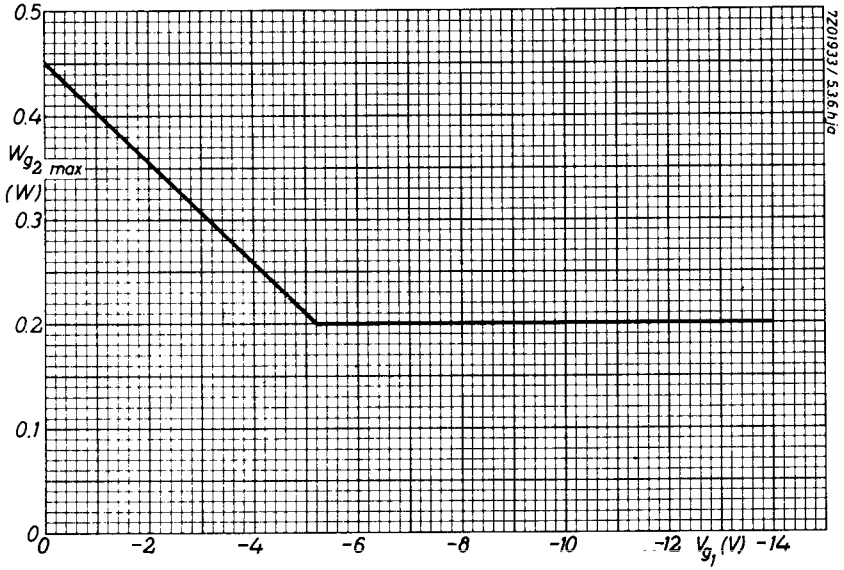

7Z01787—5.3.6.hja.
100
S
(mA/V)
20
10
5
2
1
0.5
0.2
0.1
V_a = 170V
V_{g2} = 200V
160V
120V
80V
40V
-20 V_{g1} (V) -15
-10
-5
0

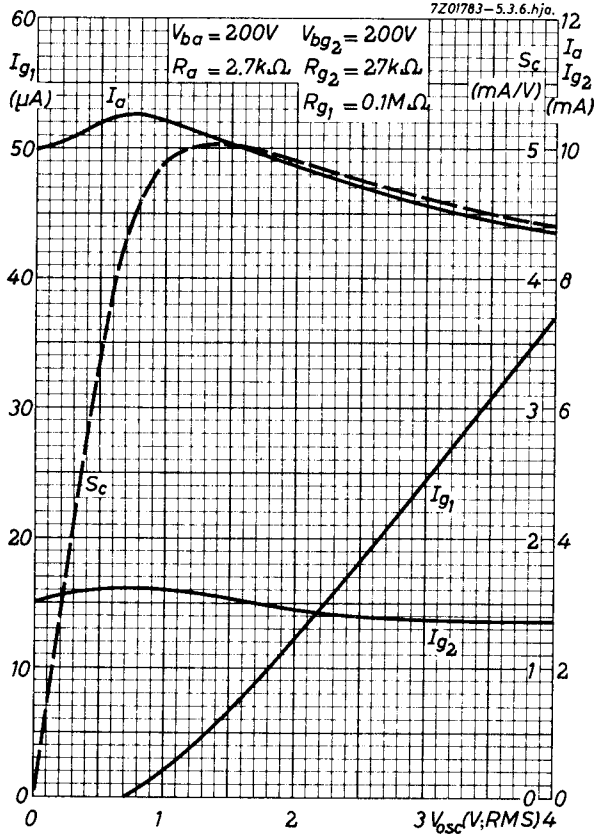

7Z01782–5.3.6.hja.
I (mA)
I_a
I_{g_2}
V_{g_2} = 120V
V_{g_1} = 0V
−0.25V
−0.5V
−0.75V
−1V
−1.4V
−2V
−3V
V_{g_1} =
0V
−0.25V
−0.5V
−0.75V
−1V
−1.4V
−2V
−2.5V
−3V
40
30
20
10
0
0
50
100
150
200
250 V_a (V) 300

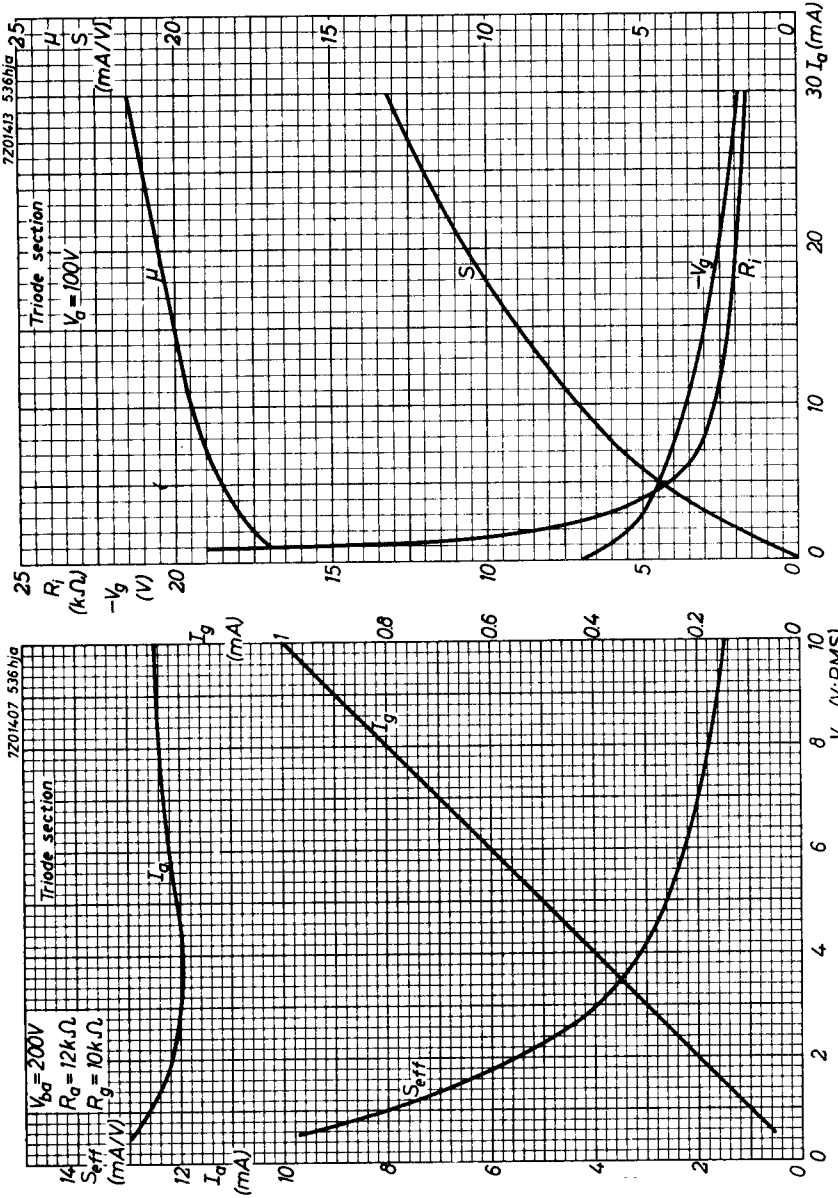

7Z01781–5.3.6.hja.
I_{g_2} (mA)
V_{g_1} = 0V
−0.5V
−1V
V_{g_2} max
−1.4V
−1.5V
−2V
−2.5V
−3V
−4V
−5V
−6V
−8V
−10V
V_a = 170V
5
4
3
2
1
0
0
50
100
150
200
250
300 V_{g_2} (V) 350

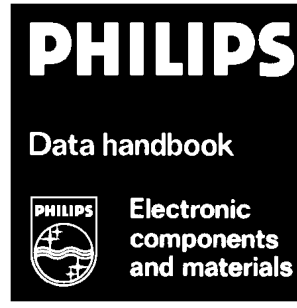

7Z01784 – 5.3.6.hja
$V_{ba} = 200V$
$R_a = 2.7k\Omega$
$V_{bg_2} = 200V$
$R_{g_2} = 27k\Omega$
$R_{g_1} = 0.1M\Omega$
R_i (MΩ)
I (mA)
S (mA/V)
100
50
20
10
5
2
1
0.5
0.2
0.1
100
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
I_a
R_i
S
I_{g_2}
−20 V_{g_1} (V) −15
−10
−5
0


7Z01788.1
V_{ba} = 200V
R_a = 2.7kΩ
V_{bg_2} = 200V
R_{g_2} = 2.7kΩ
R_{g_1} = 0.1MΩ
K = 1%
V_i
(mV;RMS)
1000
100
10
0.01
0.1
1
10 S (mA/V) 100


7Z01933/536bja
0.5
0.4
W_{g_2} max
(W)
0.3
0.2
0.1
0
0
-2
-4
-6
-8
-10
-12
V_{g_1} (V)
-14


7Z01783-5.3.6.hja.
V_{ba} = 200V V_{bg_2} = 200V
R_a = 2.7kΩ R_{g_2} = 27kΩ
R_{g_1} = 0.1MΩ
I_{g_1} (μA)
I_a
S_c
S_c (mA/V)
I_a
I_{g_2} (mA)
I_{g_1}
I_{g_2}
60
50
40
30
20
10
0
12
10
8
6
4
2
0
5
4
3
2
1
0
0
1
2
3
4
V_{osc}(V;RMS)


7201413 536hja
Triode section
V_a=100V
μ
S (mA/V)
R_i (kΩ)
$-V_g$ (V)
30 I_a (mA)
7201407 536hja
Triode section
V_{ba}=200V
R_a=12kΩ
R_g=10kΩ
S_{eff} (mA/V)
I_a (mA)
I_g (mA)
V_{osc} (V; RMS)



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