Tetrode *Type TT 16 D*

VHF AMPLIFIER OR MODULATOR

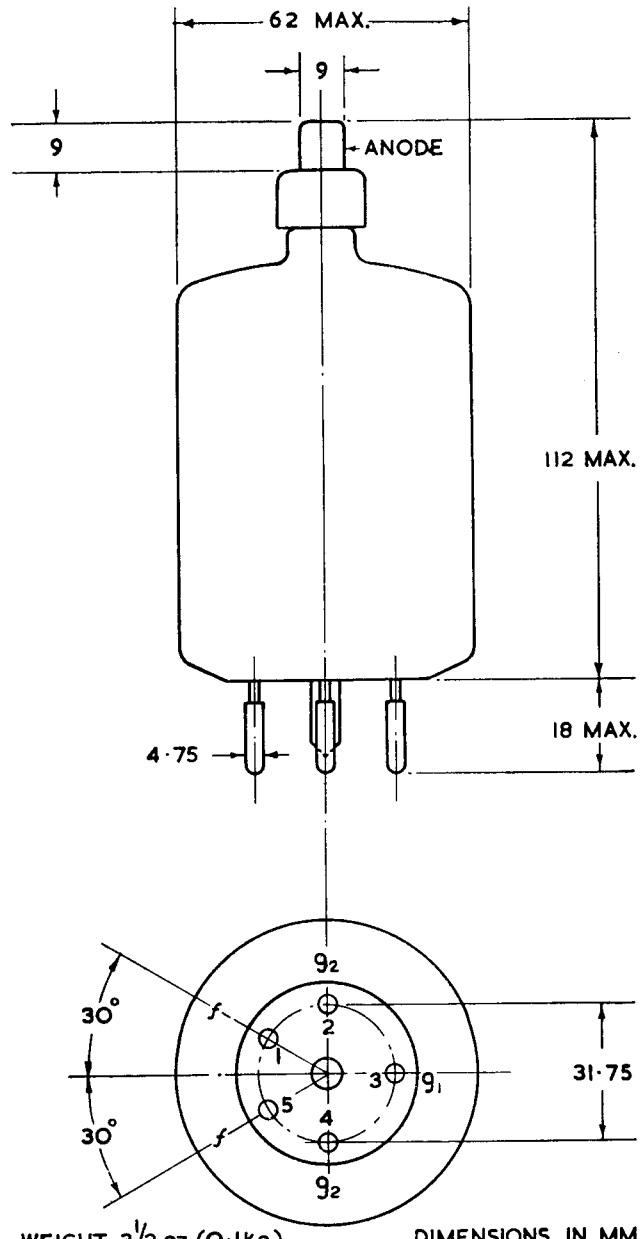
General. The TT 16D is a power tetrode fitted with a thoriated tungsten filament. The valve may be operated at full ratings at frequencies up to 120 Mc/s and, at reduced ratings, up to 200 Mc/s.

Cooling. The temperature of the anode seal must not exceed 220°C and that of the base pins must not exceed 180°C. It may be necessary to direct an air flow on to the anode seal and on to the base of the valve, when operating at frequencies above 50 Mc/s in order to keep within these temperature limits. The air stream on to the base should be so directed that it also passes over the valve envelope. At frequencies below 50 Mc/s radiation cooling from the envelope should be sufficient, but an anode connector of large surface area will be required to cool the anode seal.

Mounting. The valve should be mounted vertically. The base may be either at the top or the bottom.

APPROXIMATE DATA

V_f		5	V
I_f		6·5	A
$V_{a(max)}$		3	kV
$V_{g2(max)}$		600	V
$p_{a(max)}$ (*a*)		125	W
→ $p_{g2(max)}$		20	W
$I_{k(max)}$		270	mA
→ $I_{k(pk)(max)}$		1·6	A
g_m	taken at V_a 2·5 kV,	2·2	mA/V
u_{g1-g2}	V_{g2} 350 V, I_a 40 mA	6·2	
→ c_{in}		10·8	pF
→ c_{out}		3·1	pF
c_{a-g1}		0·05	pF



WEIGHT 3½ oz. (0·1kg.)

DIMENSIONS IN MM.

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

Head Office: Marconi House, Chelmsford, England. Telephone: Chelmsford 3221. *Telegraphic Address: Expanse, Chelmsford*

Typical Operation

(1) RF POWER AMPLIFIER CLASS C TELEGRAPHY OR FM TELEPHONY. SINGLE VALVE

Maximum ratings

V_a		3·0	kV
p_a	(*a*)	125	W
I_k		300	mA
$i_{k(pk)}$		1·6	A
V_{g2}		400	V
p_{g2}		20	W
p_{g1}		5·0	W
V_{g1}		−500	V
I_{g1}		15	mA

Typical Operating Conditions at f ≦120 Mc/s

V_a	2·0	2·5	3·0	kV
V_{g2}	350	350	350	V
V_{g1}	−100	−150	−150	V
I_a	200	200	167	mA
I_{g2}	50	40	30	mA
I_{g1}	9·0	9·0	6·5	mA
$V_{in(pk)}$	260	330	300	V
P_{dr}	2·4	3·0	2·0	W
p_a	125	125	125	W
p_{g2}	17·5	14	10·5	W
P_{out}	275	375	375	W
P_{load} (*b*)	220	300	300	W
η	69	75	75	%

(2) RF POWER AMPLIFIER CLASS B TELEPHONY. SINGLE VALVE

Maximum ratings

V_a		3·0	kV
p_a	(*a*)	125	W
I_k		120	mA
$i_{k(pk)}$		350	mA
V_{g2}		400	V
p_{g2}		14	W

Typical Operating Conditions f ≦120 Mc/s

V_a	2·0	2·5	3·0	kV
V_{g2}	350	350	350	V
V_{g1}	−50	−50	−50	V
I_a	83	70	60	mA
I_{g2}	1·5	1·0	1·0	mA
$V_{in(pk)}$	65	55	50	V
p_a	112	120	122	W
p_{g2}	0·52	0·35	0·35	W
P_{out}	54	55	58	W
P_{load} (*b*)	43	45	46	W
η for 100% mod.	32·5	31·5	32	%
I_{g1}	4·0	4·0	4·5	mA
P_{dr}	0·52	0·44	0·45	W

(3) RF POWER AMPLIFIER CLASS C TELEPHONY, ANODE AND SCREEN GRID MODULATION. SINGLE VALVE

Maximum ratings

V_a		2·5	kV
p_a		83	W
I_k		200	mA
$i_{k(pk)}$		2·0	A
V_{g2}		400	V
p_{g2}		20	W
V_{g1}		−500	V
I_{g1}		15	mA

Typical Operating Conditions at f ≦120 Mc/s

V_a	2·0	2·5	kV
V_{g2}	350	350	V
V_{g1}	−220	−210	V
I_a	150	152	mA
I_{g2}	33	30	mA
I_{g1}	5·0	4·5	mA
P_{dr}	2·0	1·7	W
$V_{in(pk)}$	390	380	V
p_a	75	80	W
p_{g2}	11·5	10·5	W
P_{out}	225	300	W
P_{load} (*b*)	180	240	W
η for 100% mod.	75	79	%
P_{mod}	150	190	W
$V_{g2(pk)mod.}$	300	300	V

(4) AF POWER AMPLIFIER OR MODULATOR CLASS B. TWO VALVES IN PUSH-PULL

Maximum ratings

V_a		3·0	kV
p_a	(*a*)	125	W

I_k	320	mA
$i_{k(pk)}$	1·0	A
V_{g2} (Ig1 = 0)	600	V
V_{g2} (Ig1 > 0)	400	V
p_{g2}	20	W
V_{g1}	−500	V
R_{g1-k}	150	kΩ

Typical Operating Conditions. Class B1

V_a	1·5	2·0	2·5	kV
V_{g2}	600	600	600	V
V_{g1}	−94	−96	−97	V
$I_{a\ (zero\text{-}sig)}$	2×30	2×30	2×30	mA
$I_{a\ (max\text{-}sig)}$	2×109	2×111	2×108	mA
$I_{g2\ (max\text{-}sig)}$	2×13·5	2×12	2×13	mA
$V_{in\ (g1-g1)\ (r.m.s.)}$	130	132	134	V
p_a	2×78	2×92	2×95	W
P_{out}	170	260	345	W
R_{a-a}	12	17·6	25	kΩ
η	52	58·5	64	%
D_{tot}	3·5	3·6	4·0	%

Typical Operating Conditions. Class B2

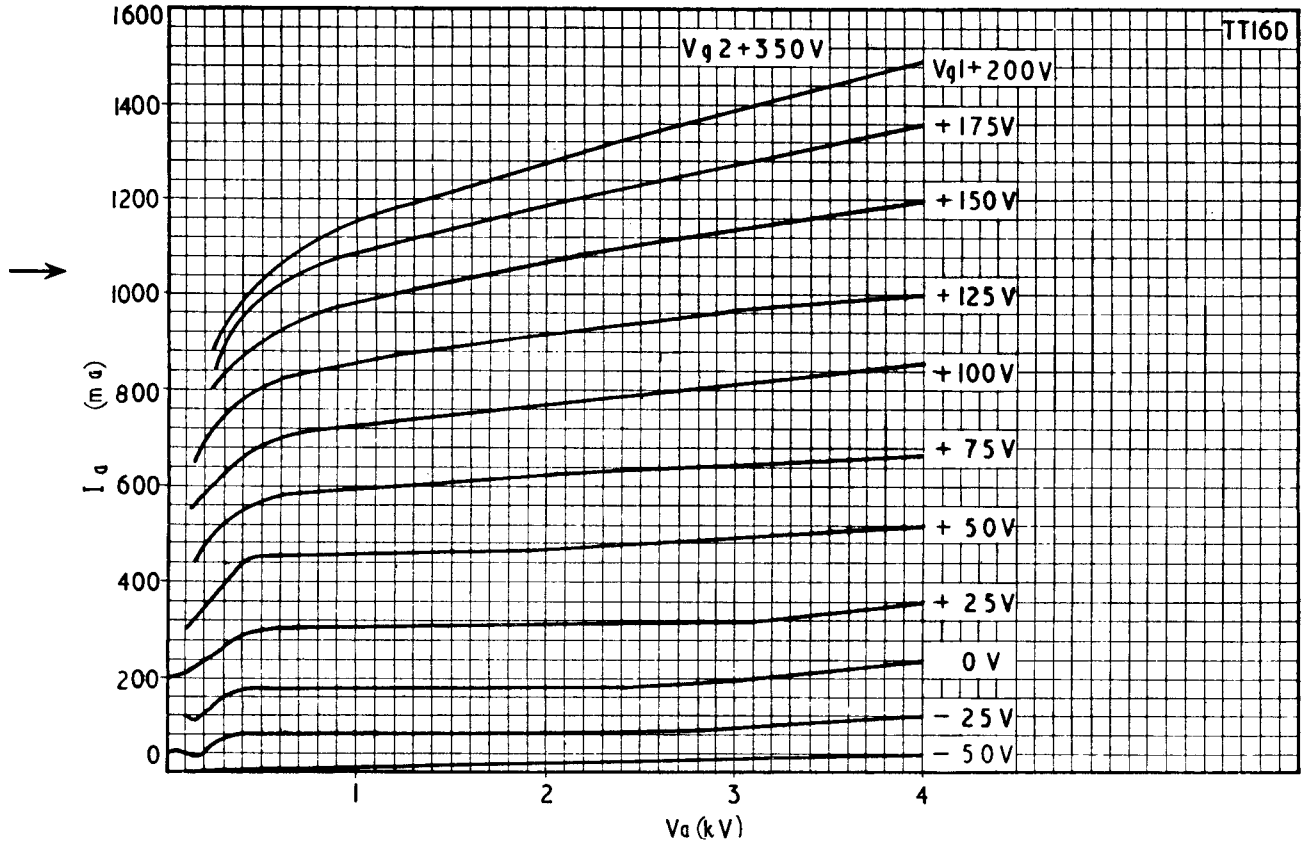
V_a	1·5	2·0	2·5	kV
V_{g2}	350	350	350	V
V_{g1}	−48	−50	−51	V
$I_{a\ (zero\text{-}sig)}$	2×30	2×30	2×30	mA
$I_{a\ (max\text{-}sig)}$	2×225	2×197	2×151	mA
$I_{g2\ (max\text{-}sig)}$	2×42	2×32	2×18	mA
I_{g1}	2×16	2×12	2×8·5	mA
$V_{in\ (g1-g1)\ (r.m.s.)}$	234	210	170	V
P_{dr}	2×2·4	2×1·6	2×0·9	W
p_a	2×114	2×120	2×103	W
P_{out}	455	550	550	W
R_{a-a}	7·2	12	20	kΩ
η	66·5	69·5	72·5	%
D_{tot}	5·0	5·0	5·0	%

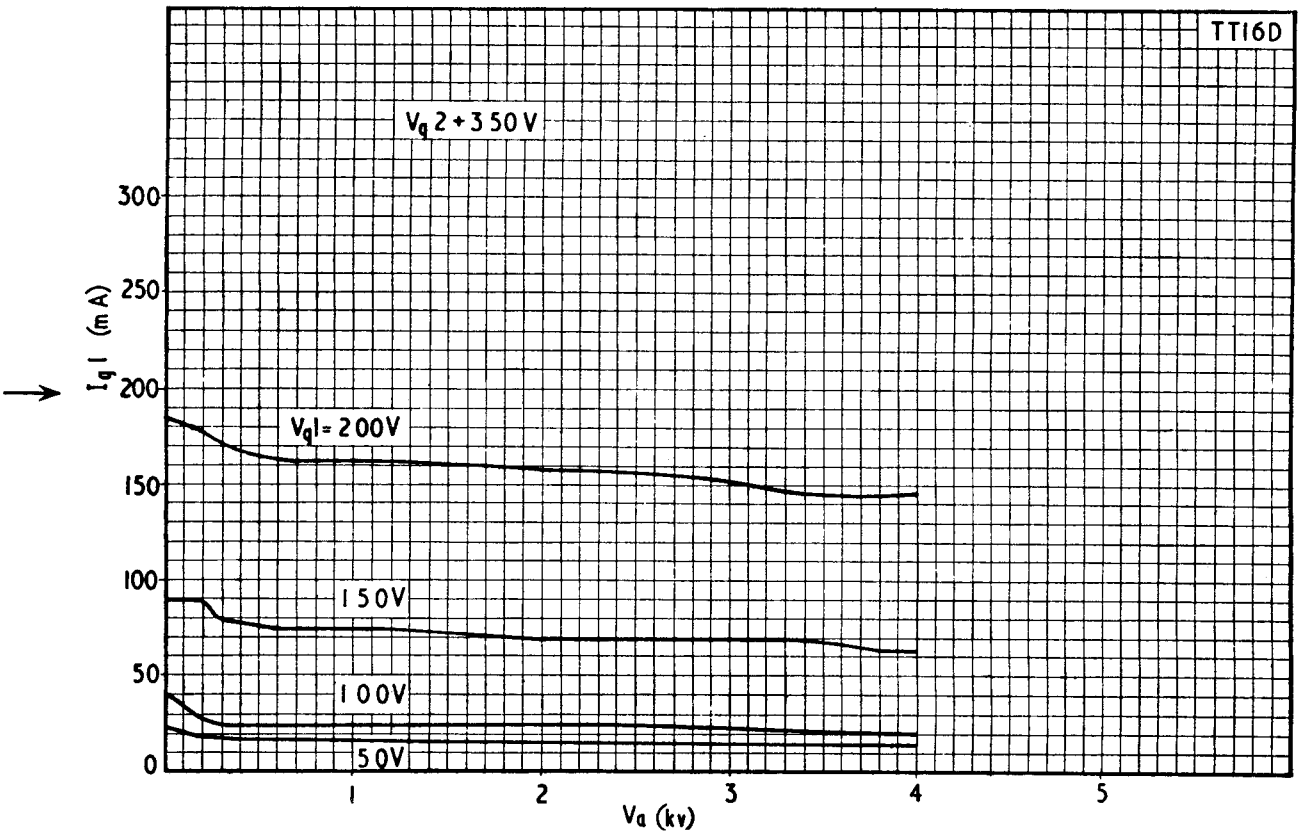
NOTES

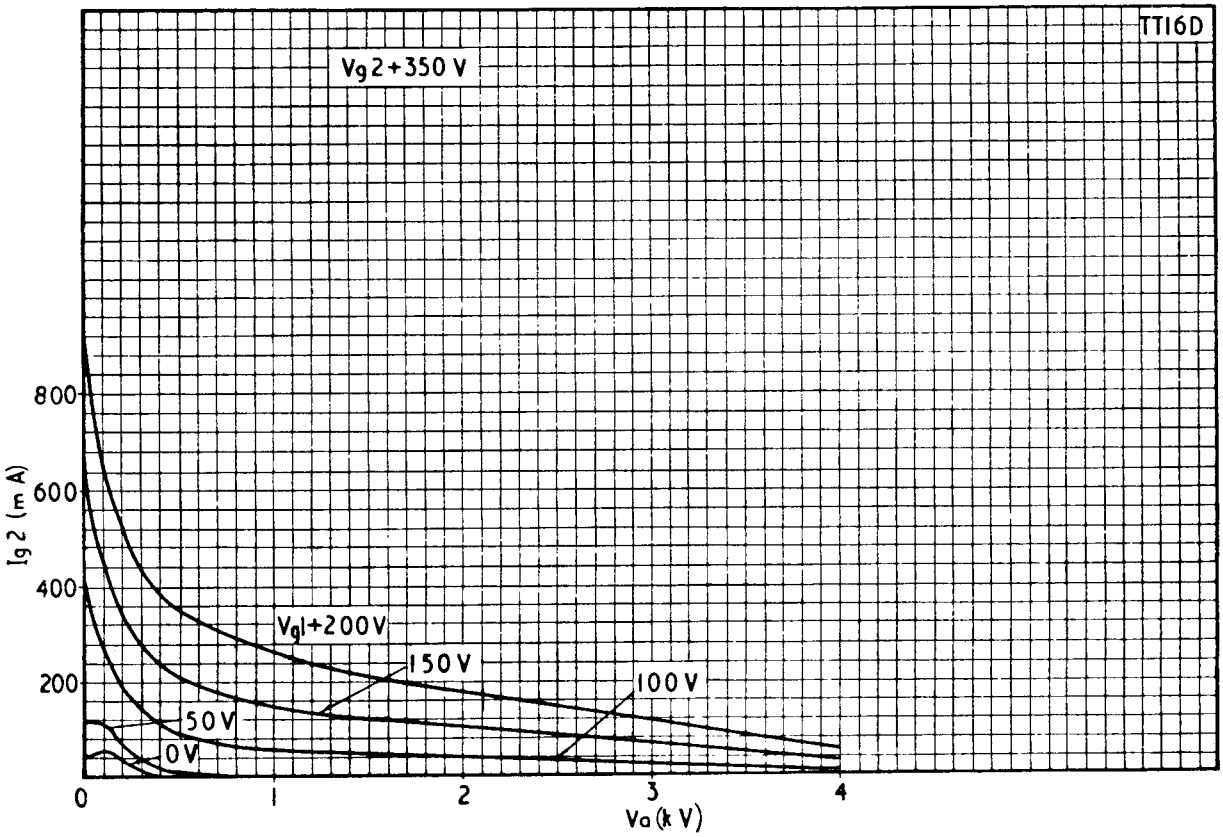
1. The RF circuit returns must be brought to the filament connection on Pin No. 1.
2. To ensure equal distribution of the currents through the seals, the screen-grid leads should be strapped together at the valve holder and the circuit connections joined to the mid-point of the strap. This should not be allowed to impair the free flotation of individual contacts.

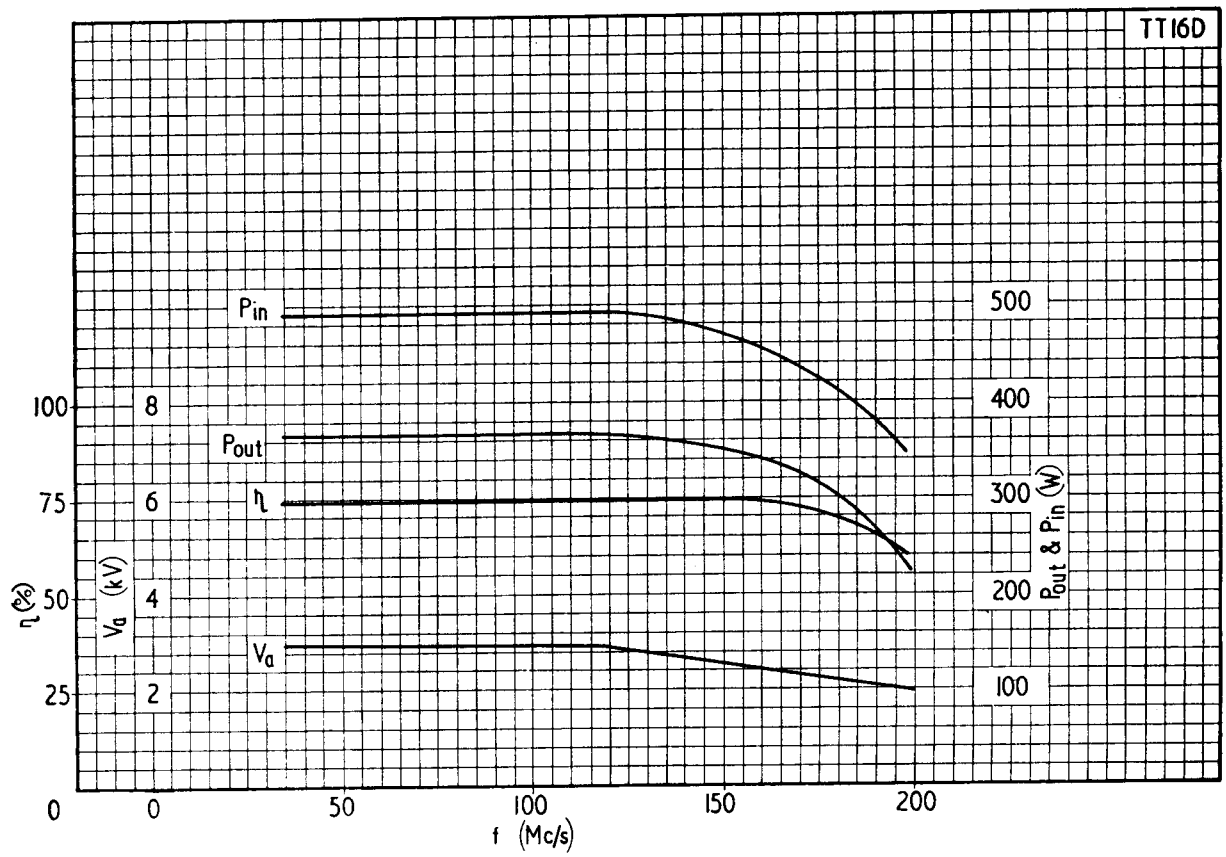
(*a*) Corresponding to anode temperature of 850°C, i.e. red heat.

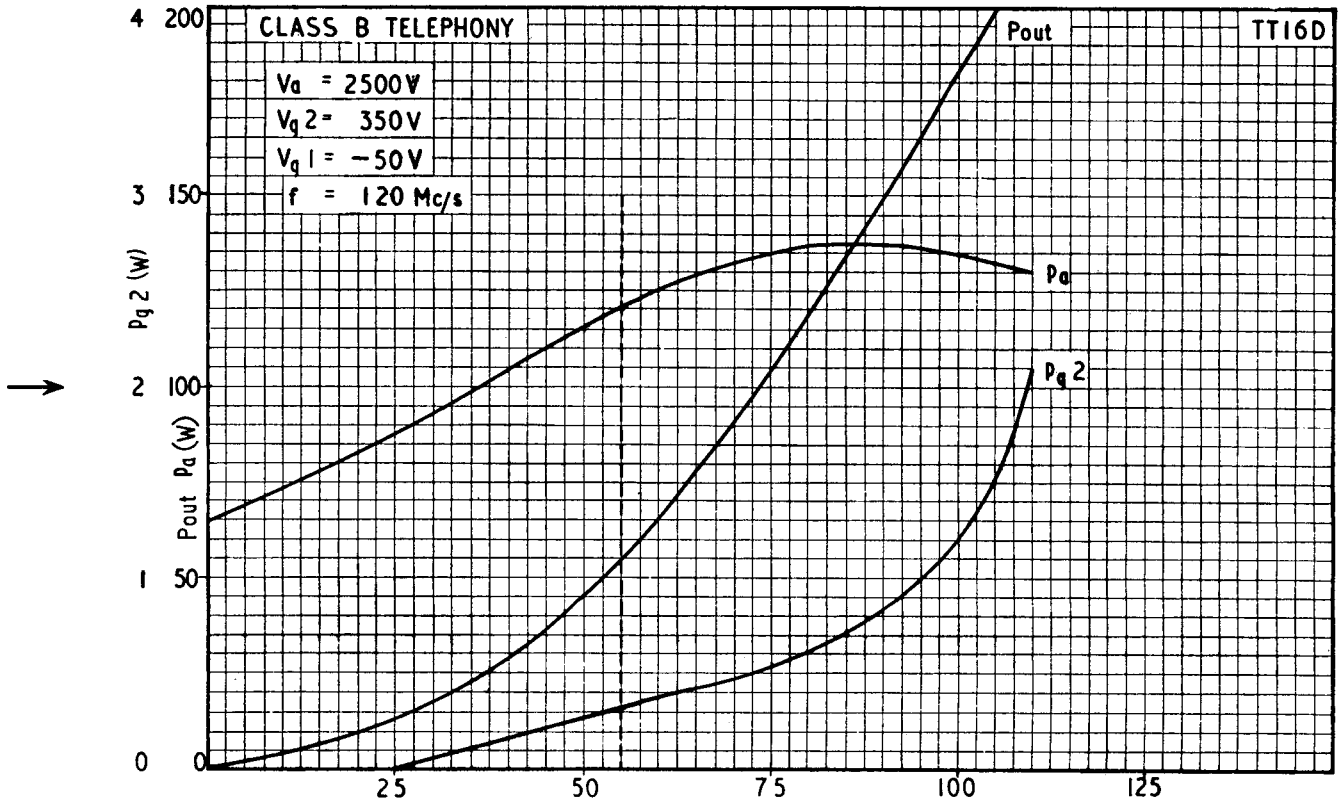
(*b*) With a circuit transfer efficiency of 80%.

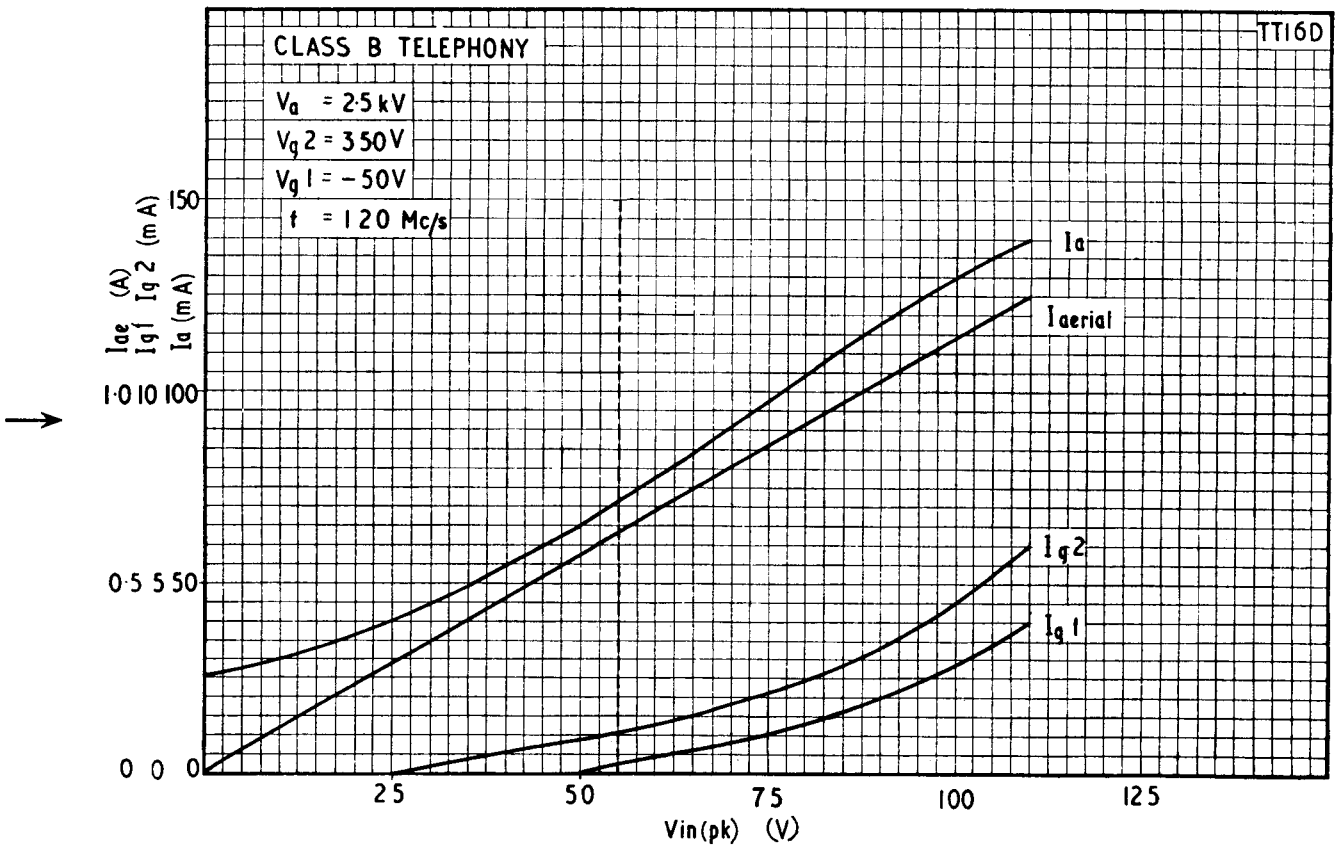

TT16D
Vg2 +350V
Vg1 +200V
+175V
+150V
+125V
+100V
+75V
+50V
+25V
0V
−25V
−50V
Ia (mA)
Va (kV)

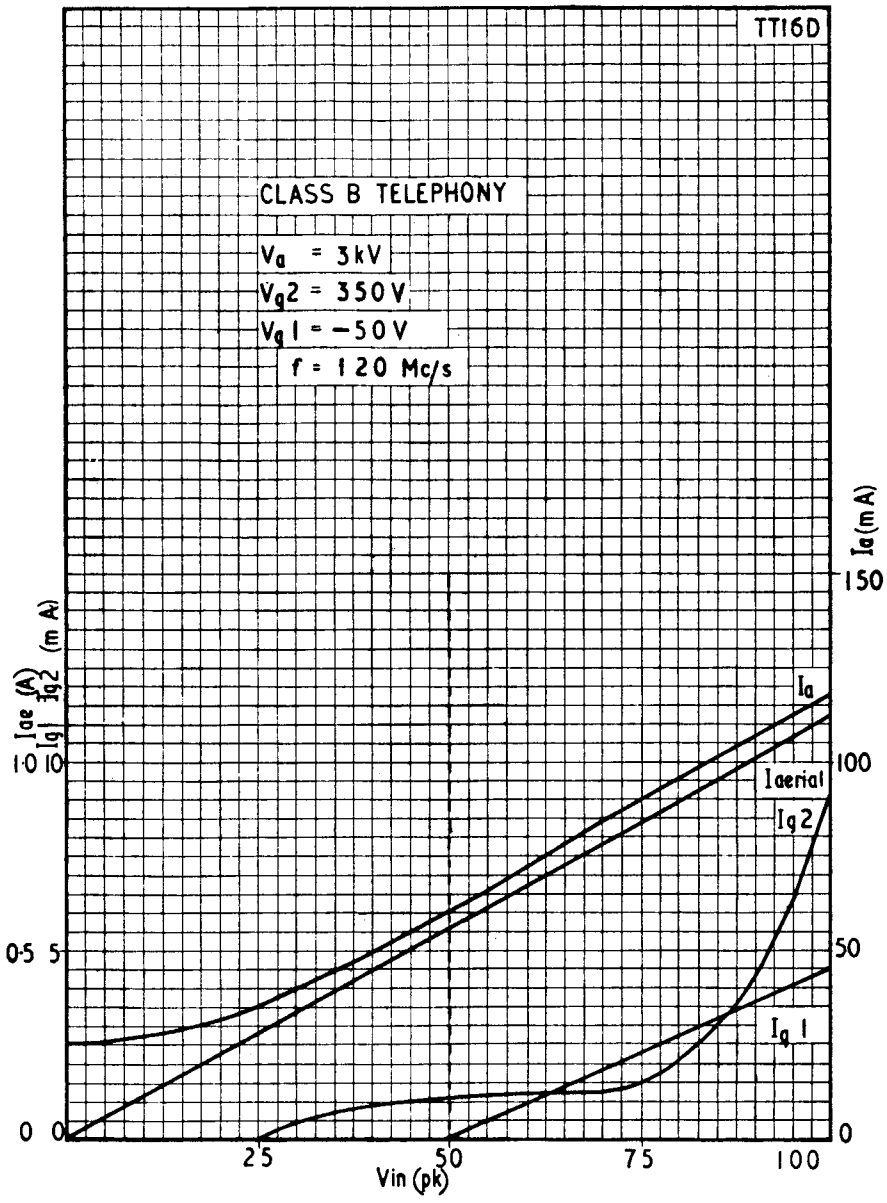

TT16D
Vg2 +350V
Vg1 = 200V
150V
100V
50V
Ig1 (mA)
Va (kv)

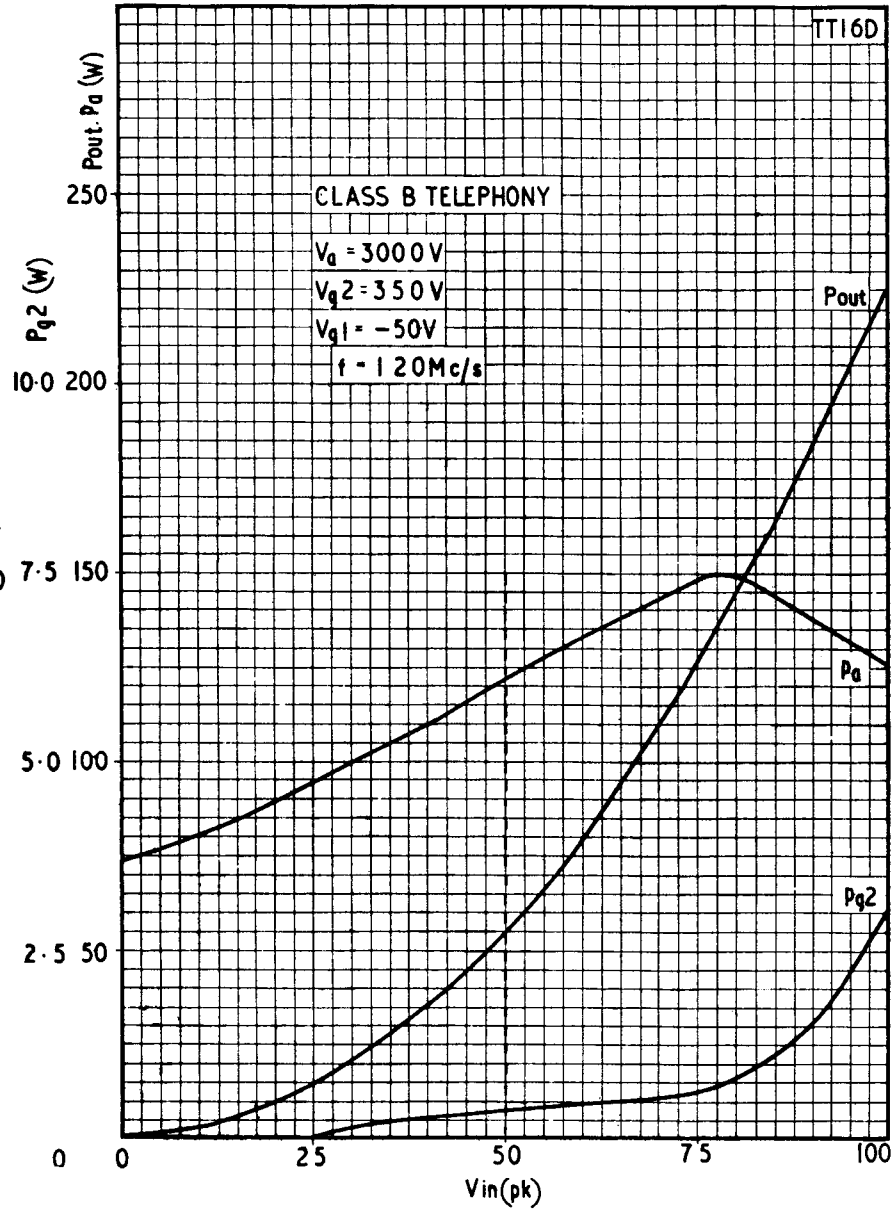

TT16D
Vg2+350 V
Ig2 (mA)
800
600
400
200
Vg1+200V
150 V
100 V
50 V
0 V
0
1
2
3
4
Va (k V)

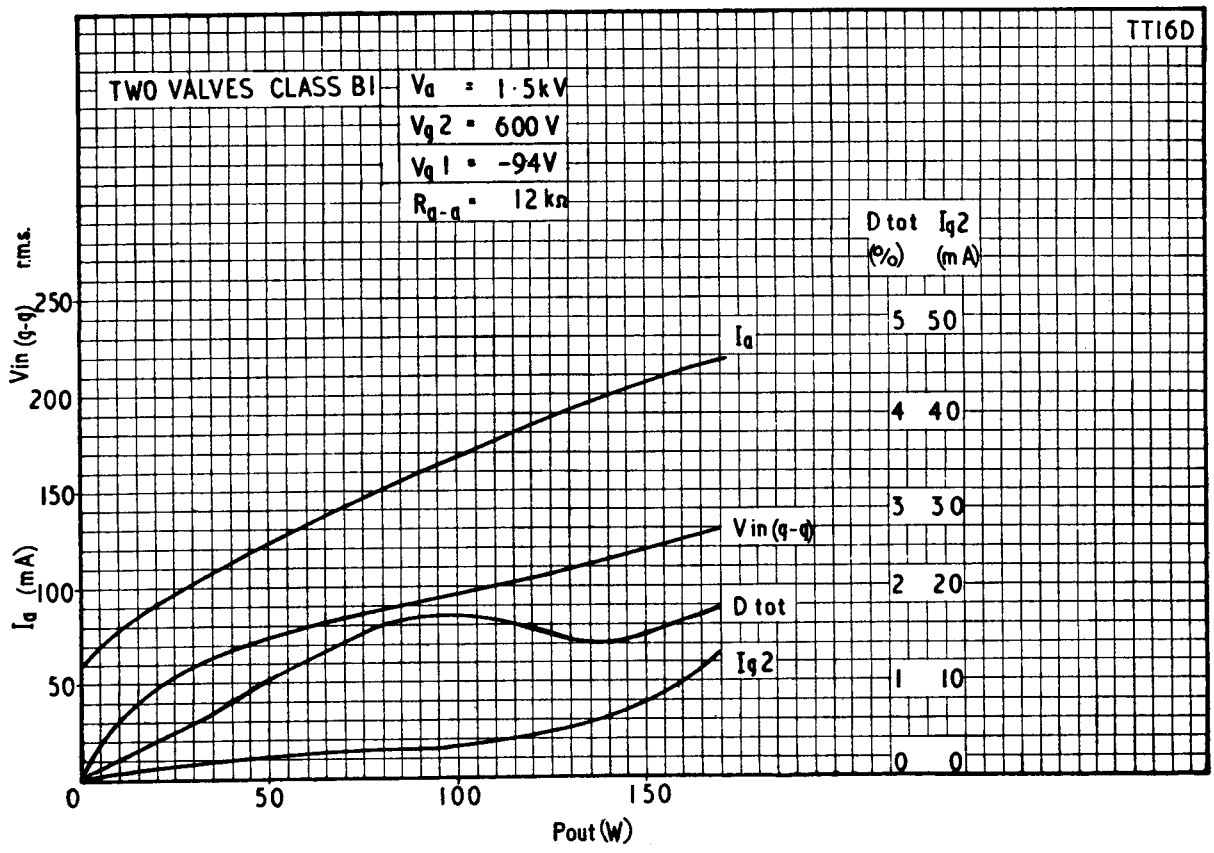

TT16D
Pin
Pout
η
Va
100
75
50
25
η (%)
8
6
4
2
Va (kV)
500
400
300
200
100
Pout & Pin (W)
0
0
50
100
150
200
f (Mc/s)

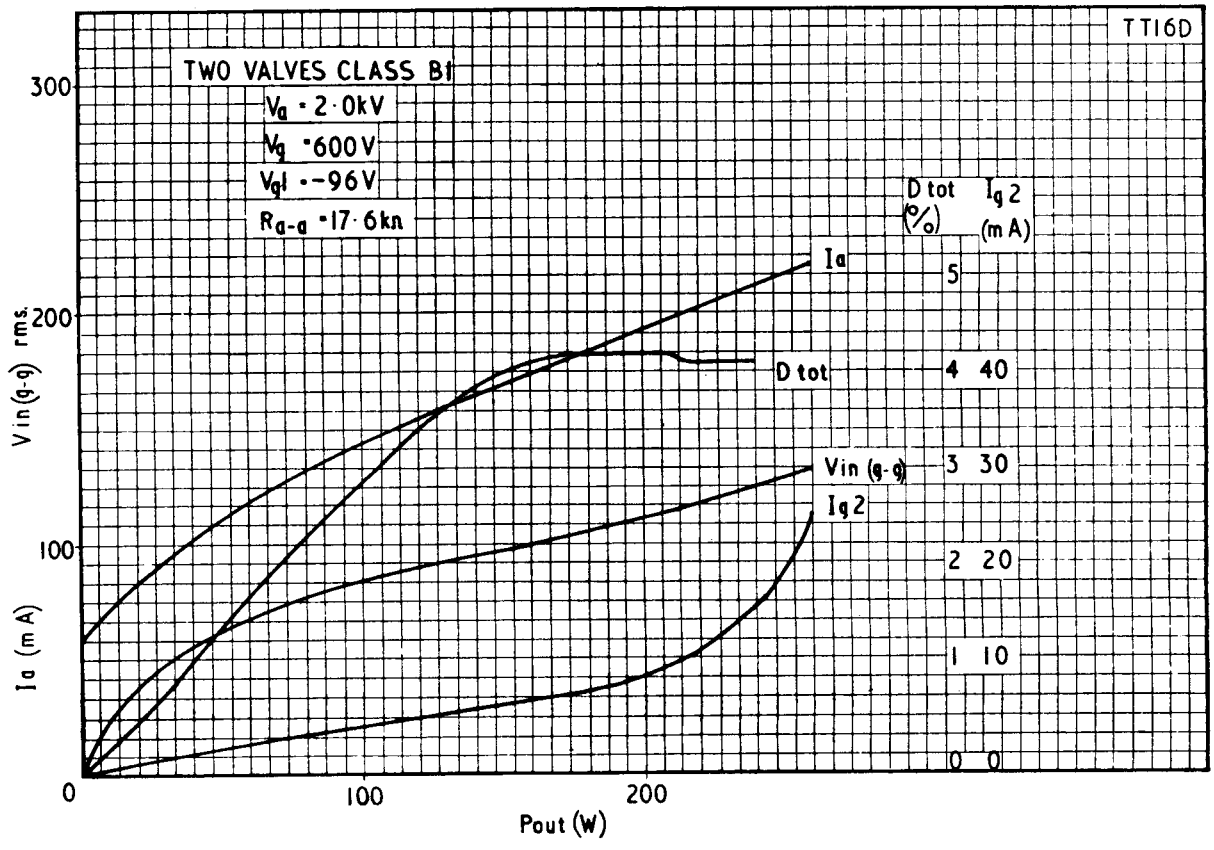

CLASS B TELEPHONY
TT16D
Va = 2500V
Vg2 = 350V
Vg1 = −50V
f = 120 Mc/s
Pout
Pa
Pg2
Pg2 (W)
Pout Pa (W)
4 200
3 150
2 100
1 50
0 0
25
50
75
100
125

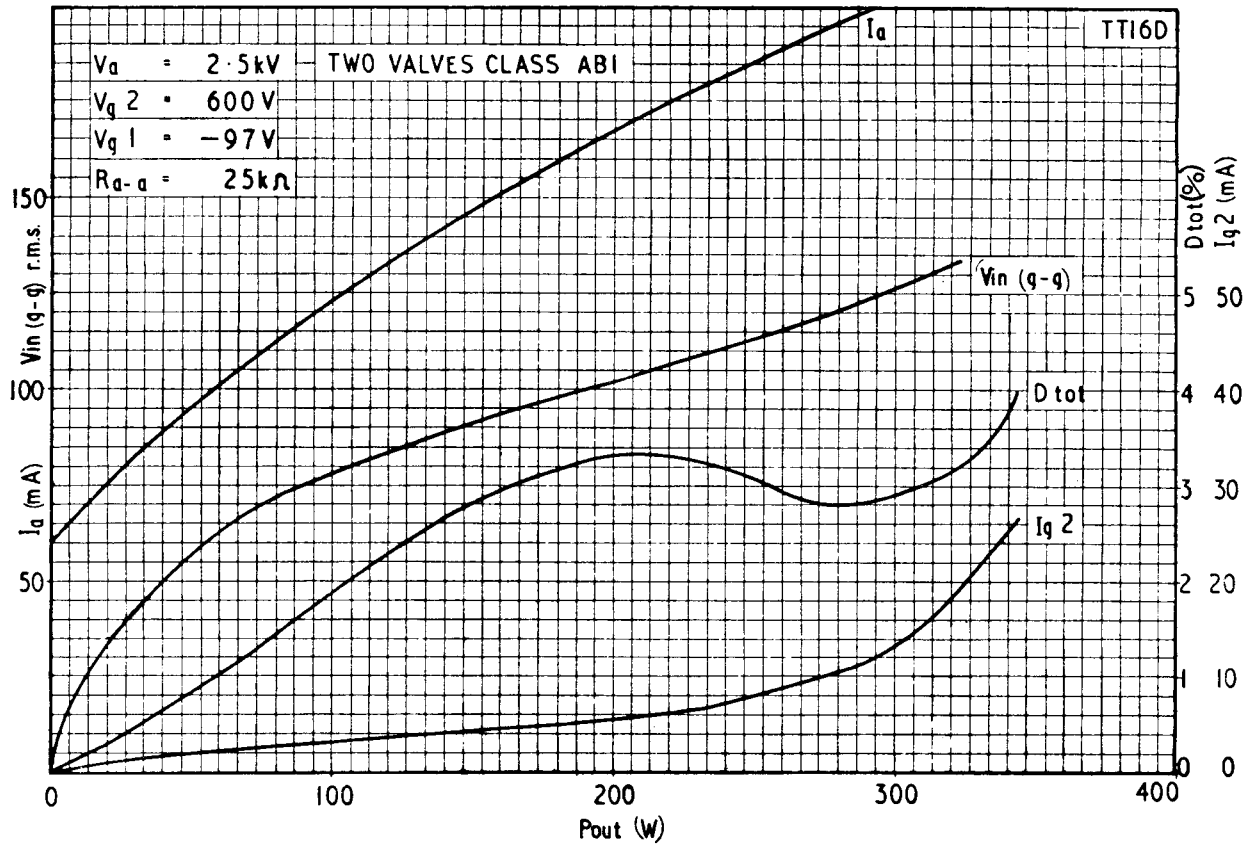

CLASS B TELEPHONY
TT16D
Va = 2·5 kV
Vg2 = 350V
Vg1 = −50V
f = 120 Mc/s
Ia
Iaerial
Ig2
Ig1
Iae (A)
Ig1 Ig2 (mA)
Ia (mA)
1·0 10 100
0·5 5 50
0 0 0
25
50
75
100
125
Vin(pk) (V)

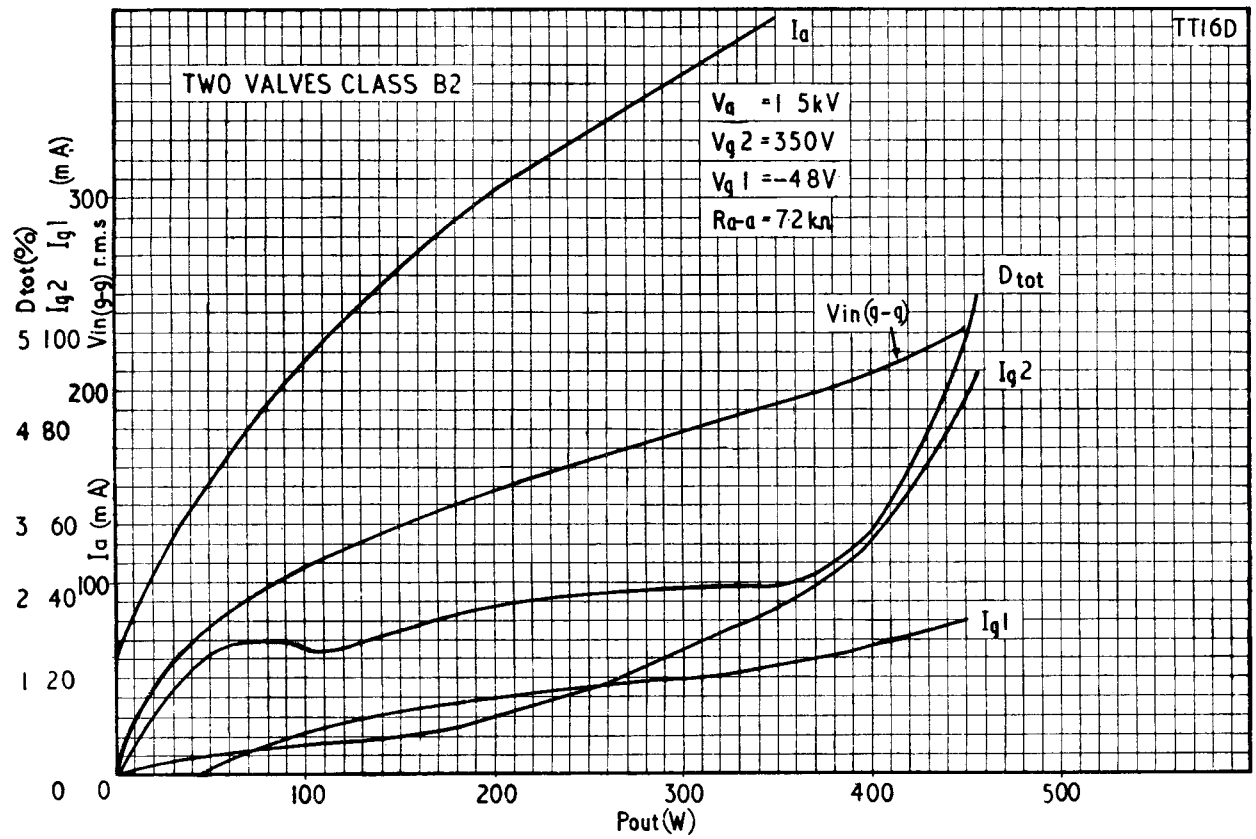

TT16D
CLASS B TELEPHONY
Va = 3kV
Vg2 = 350V
Vg1 = −50V
f = 120 Mc/s
Iae (A)
Ig1 Ig2 (mA)
Ia (mA)
Ia
Iaerial
Ig2
Ig1
Vin (pk)
0
25
50
75
100
0·5
1·0
5
10
50
100
150

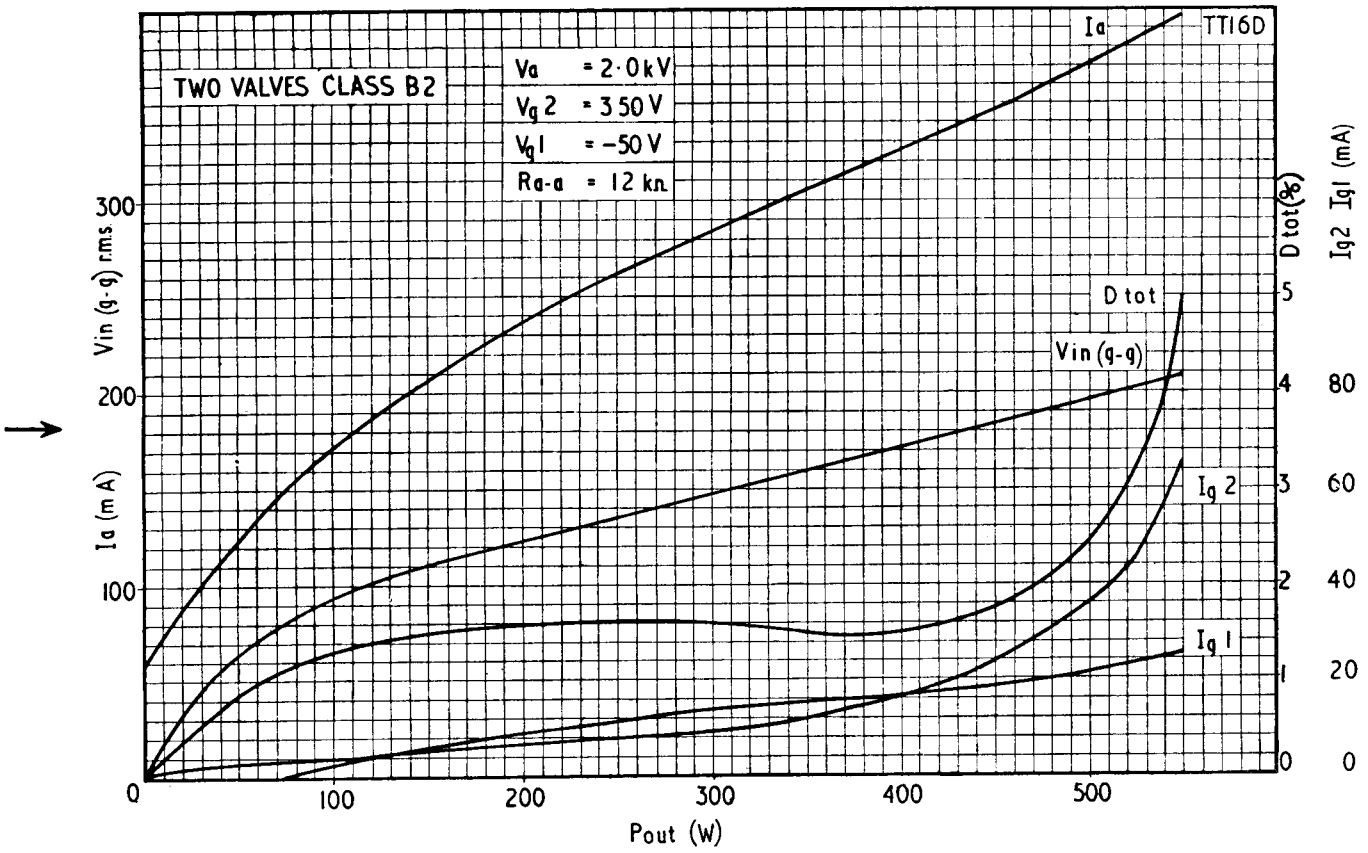

TT16D
CLASS B TELEPHONY
Va = 3000V
Vg2 = 350V
Vg1 = −50V
f = 120Mc/s
Pout. Pa (W)
Pg2 (W)
Pout
Pa
Pg2
Vin (pk)
0
25
50
75
100
2·5
5·0
7·5
10·0
50
100
150
200
250

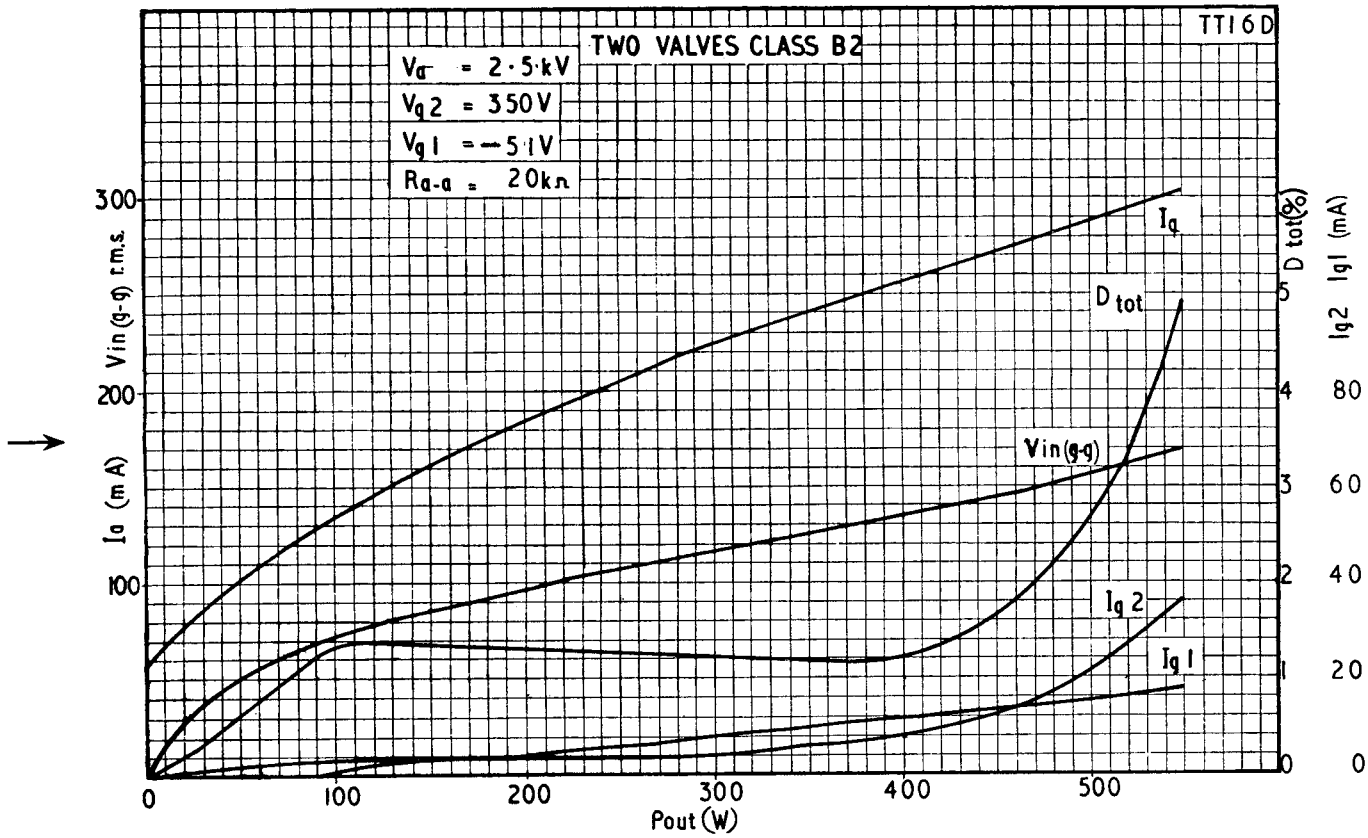

TT16D
TWO VALVES CLASS BI
Va = 1·5kV
Vg2 = 600V
Vg1 = -94V
Ra-a = 12kΩ
D tot (%)
Ig2 (mA)
5 50
4 40
3 30
2 20
1 10
0 0
Ia
Vin (g-g)
D tot
Ig2
Vin (g-g) rms.
Ia (mA)
250
200
150
100
50
0
50
100
150
Pout (W)

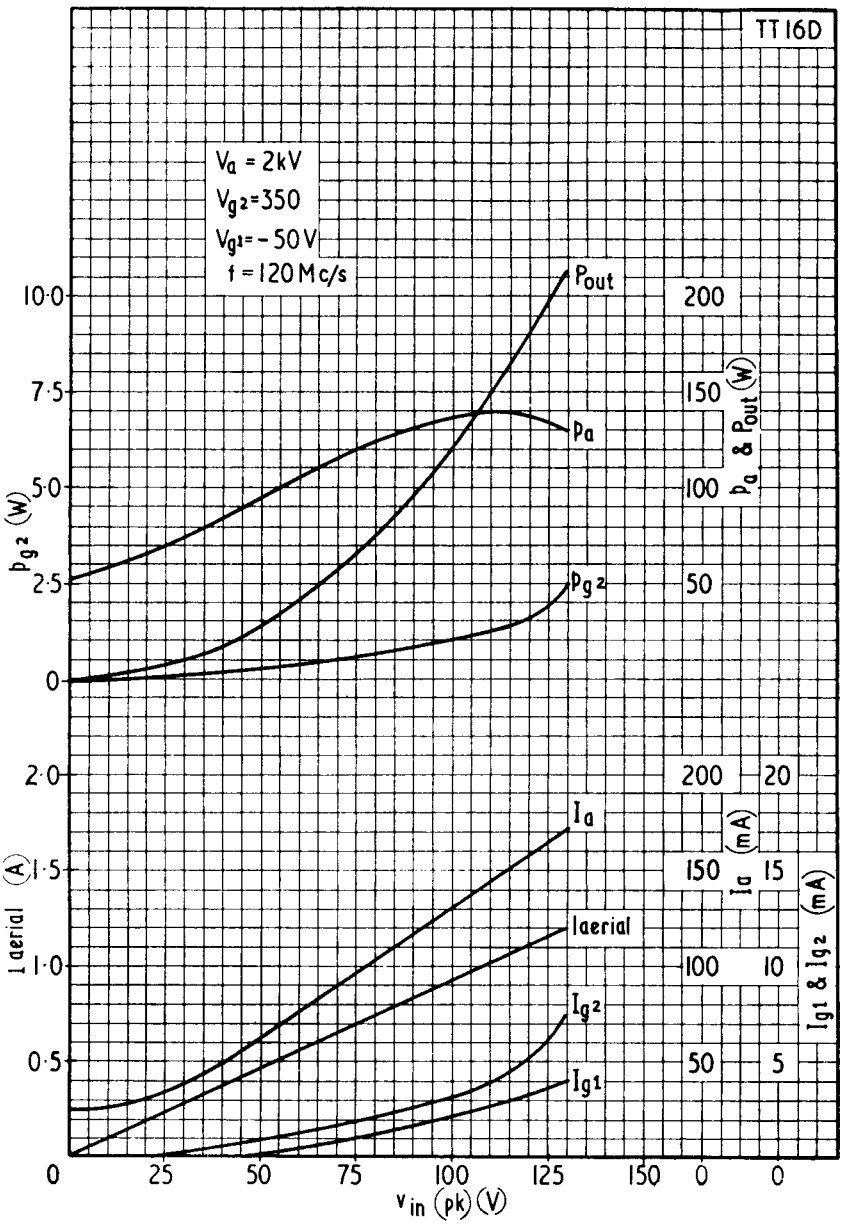

TT16D
TWO VALVES CLASS BI
Va = 2·0kV
Vg = 600V
Vg1 = -96V
Ra-a = 17·6kΩ
D tot (%)
Ig2 (mA)
5
4 40
3 30
2 20
1 10
0 0
Ia
D tot
Vin (g-g)
Ig2
Vin (g-g) rms.
Ia (mA)
300
200
100
0
100
200
Pout (W)


TT16D
Va = 2·5kV
Vg 2 = 600V
Vg 1 = −97V
Ra-a = 25kΩ
TWO VALVES CLASS AB1
Ia
Vin (g-g)
D tot
Ig 2
Ia (mA)
Vin (g-g) r.m.s.
Dtot(%)
Ig2 (mA)
Pout (W)


TT16D
TWO VALVES CLASS B2
Va = 1·5kV
Vg 2 = 350V
Vg 1 = −48V
Ra-a = 7·2kΩ
Ia
Dtot
Vin(g-g)
Ig2
Ig1
Dtot(%)
Ig2
Ig1 (mA)
Vin(g-g) r.m.s
Ia (mA)
Pout (W)


TWO VALVES CLASS B2
Va = 2·0 kV
Vg2 = 350 V
Vg1 = −50 V
Ra-a = 12 kΩ
Ia
TT16D
D tot
Vin (g-g)
Ig 2
Ig 1
Vin (g-g) r.m.s.
Ia (mA)
D tot(%)
Ig2 Ig1 (mA)
Pout (W)
0
100
200
300
400
500
20
40
60
80


TWO VALVES CLASS B2
Va = 2·5 kV
Vg2 = 350 V
Vg1 = −51 V
Ra-a = 20kΩ
TT16D
Ia
D tot
Vin(g-g)
Ig 2
Ig 1
Vin (g-g) r.m.s.
Ia (mA)
D tot(%)
Ig2 Ig1 (mA)
Pout (W)
0
100
200
300
400
500
20
40
60
80


TT16D
V_a = 2kV
V_{g2}=350
V_{g1}= - 50V
f = 120 Mc/s
P_{out}
p_a
p_{g2}
I_a
I_{aerial}
I_{g2}
I_{g1}
p_{g2} (W)
I_{aerial} (A)
p_a & P_{out} (W)
I_a (mA)
I_{g1} & I_{g2} (mA)
V_{in} (pk) (V)
10·0
7·5
5·0
2·5
0
2·0
1·5
1·0
0·5
0
25
50
75
100
125
150
0
0
200
150
100
50
200
150
100
50
20
15
10
5

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