Twin Triode *Type DET 19*

(POWER AMPLIFIER, OSCILLATOR AND MULTIPLIER)

General. The DET 19 is a low-power transmitting valve, consisting of two triodes in one envelope, suitable for use as a power amplifier, oscillator or frequency multiplier, at frequencies up to 250 Mc/s. It is necessary to neutralise the valve under all conditions of amplifier service; two capacitors which may each have a maximum value of 5 pF, are required for each valve.

Cooling. The valve must be adequately ventilated as it becomes very hot under normal operating conditions. No visible heating of the anodes should occur under any condition of operation.

APPROXIMATE DATA

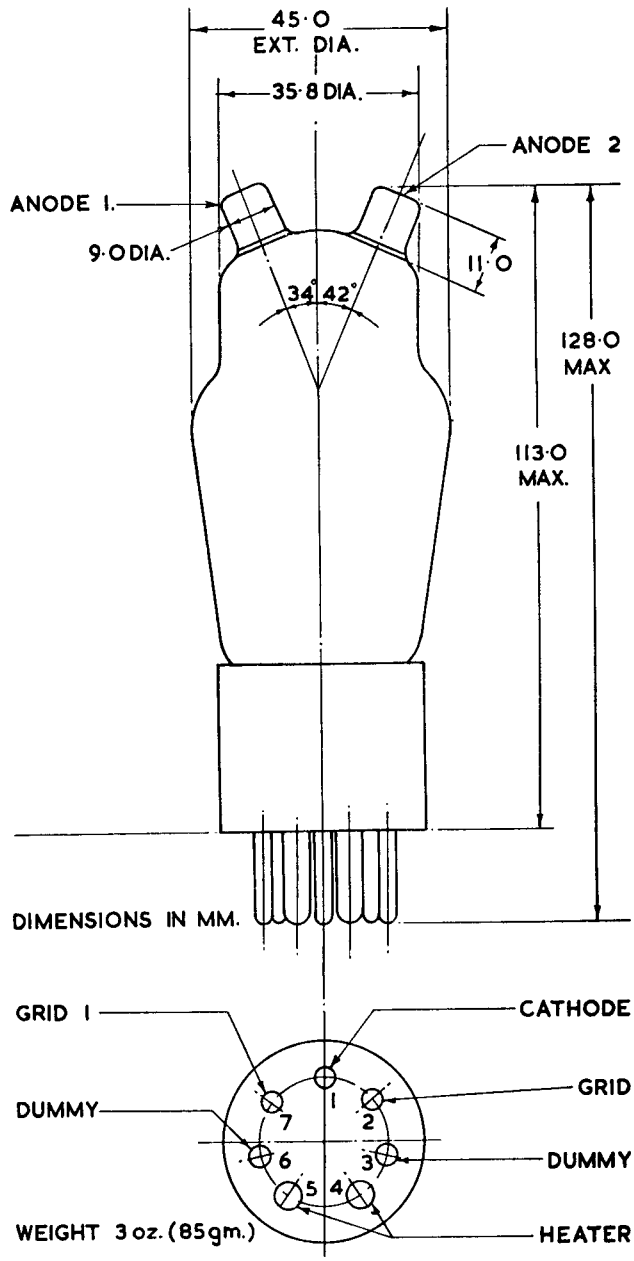
V_h		6·3	V
I_h		0·8	A
$V_{a(max)}$		300	V
$I_{a(max)}$ per anode		40	mA
$p_{a(max)}$ per anode		5	W
g_m	taken at	2·1	mA/V
μ	V_a 300 V	7	
r_a	I_a 25 mA	3,340	Ω
$V_{h\text{-}k(max)}$		100	V
$c_{a'\text{-}a''}$		1	pF
$c_{a\text{-}g1}$ (other electrodes earthed)		2·3	pF
$c_{a\text{-}k}$		0·6	pF
$c_{g1\text{-}k}$		4·2	pF

(1) PUSH-PULL RF AMPLIFIER. CLASS C TELEGRAPHY

(*Key down conditions, per valve, without modulation*)

Maximum permissible ratings

V_a		300	V
V_{g1}		−150	V
I_a	both triodes	80	mA
I_{g1}		25	mA
P_a		24	W
p_a		10	W



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Typical Operation

f	7	7	7	7	Mc/s
V_a	300	250	200	150	V
I_a	80	80	70	65	mA
V_{g_1} (i) from a fixed supply of	−50	−50	−50	−50	V
(ii) via R_k	625	625	715	770	Ω
(iii) via $R_{g_1\text{-}k}$	3,300	2,800	2,800	2,500	Ω
I_{g1} (a)	15	18	18	20	mA
$v_{g1'\text{-}g1''(pk)}$	210	220	220	230	V
P_{dr} (a)	2	2·5	2·5	3	W
P_{out}	15·9	12·5	8·5	5·4	W
η	66·5	62·5	60·5	55·5	%

(2) PUSH-PULL ANODE MODULATED RF AMPLIFIER. CLASS C TELEPHONY

(Carrier conditions, per valve, permissible modulation 100%)

Maximum permissible ratings

V_a	250	V
V_{g1}	−150	V
I_a	55	mA
I_{g1}	25	mA
P_a	13·5	W
p_a	6·5	W

Typical Operation

f	7	7	Mc/s
V_a	250	200	V
I_a	50	50	mA
V_g (i) from a fixed supply of	−45	−40	V
(ii) via R_k	900	800	Ω
(iii) via $R_{g_1\text{-}k}$	6,500	5,000	Ω
I_{g1}	7	8	mA
$v_{g1'\text{-}g1''(pk)}$	180	170	V
P_{dr} (a)	1	1	W
P_{out}	8·5	6·5	W
η	68	65	%

(3) PUSH-PULL RF AMPLIFIER. CLASS B TELEPHONY

(Carrier conditions, per valve, permissible modulation 100%)

Maximum permissible ratings

V_a	300	V
I_a	45	mA
I_{g1}	25	mA
P_a	13·5	W
p_a	10	W

Typical Operation

f	7	7	Mc/s
V_a	300	200	V
I_a	40	40	mA
V_g (i) from a fixed supply of (c)	−21	−13	V
(ii) via R_k (c)	525	325	Ω
I_{g1} (a)	1·8	3	mA
$v_{g1'\text{-}g1''(pk)}$	70	70	V
P_{dr} (a) (b)	1·5	2·2	W
P_{out}	3·5	2·3	W
η	29·3	28·3	%

(4) PUSH-PULL FREQUENCY DOUBLER

Maximum permissible ratings

V_a		300	V
V_{g1}		−150	V
I_a	both triodes	80	mA
I_{g1}	both triodes	25	mA
P_a	both triodes	24	W
p_a	both triodes	10	W

Typical Operation

$f_{(exc)}$	7	7	7	40	Mc/s
$f_{(out)}$	14	14	14	80	Mc/s
V_a	300	250	200	250	V
I_a	70	70	70	60	mA

V_{g_1} (i) from a fixed supply of	−70	−70	−70	−150	V
(ii) via R_k	1,000	1,000	1,000	—	Ω
(iii) via $R_{g_1\text{-}k}$	5,800	4,400	3,900	30,000	Ω
I_{g1} (a)	12	16	18	5	mA
$v_{g1'\text{-}g1''(pk)}$	240	250	250	—	V
P_{dr}	2·5	3	3	—	W
P_{out}	10·5	8	6·3	5·1	W
η	50	45·5	45	33	%

(5) CRYSTAL OSCILLATOR AND DOUBLER

Maximum permissible ratings

V_a	300	V
V_{g1}	−150	V
I_a	40	mA
p_a	5	W

Typical Operation

$f_{(xtal)}$	7	Mc/s
f_{out}	14	Mc/s
Triode (1) Crystal Oscillator		
V_a (d)	250	V
I_a	15	mA
V_{g1} via $R_{g_1\text{-}k}$	30,000	Ω
I_{g1}	0·8	mA
Triode (2) Frequency Doubler		
V_a	300	V
I_a	26	mA
V_{g_1} (i) from a fixed supply of	−90	V
(ii) via $R_{g_1\text{-}k}$	45,000	Ω
I_{g1}	2	mA
P_{out}	2·8	W

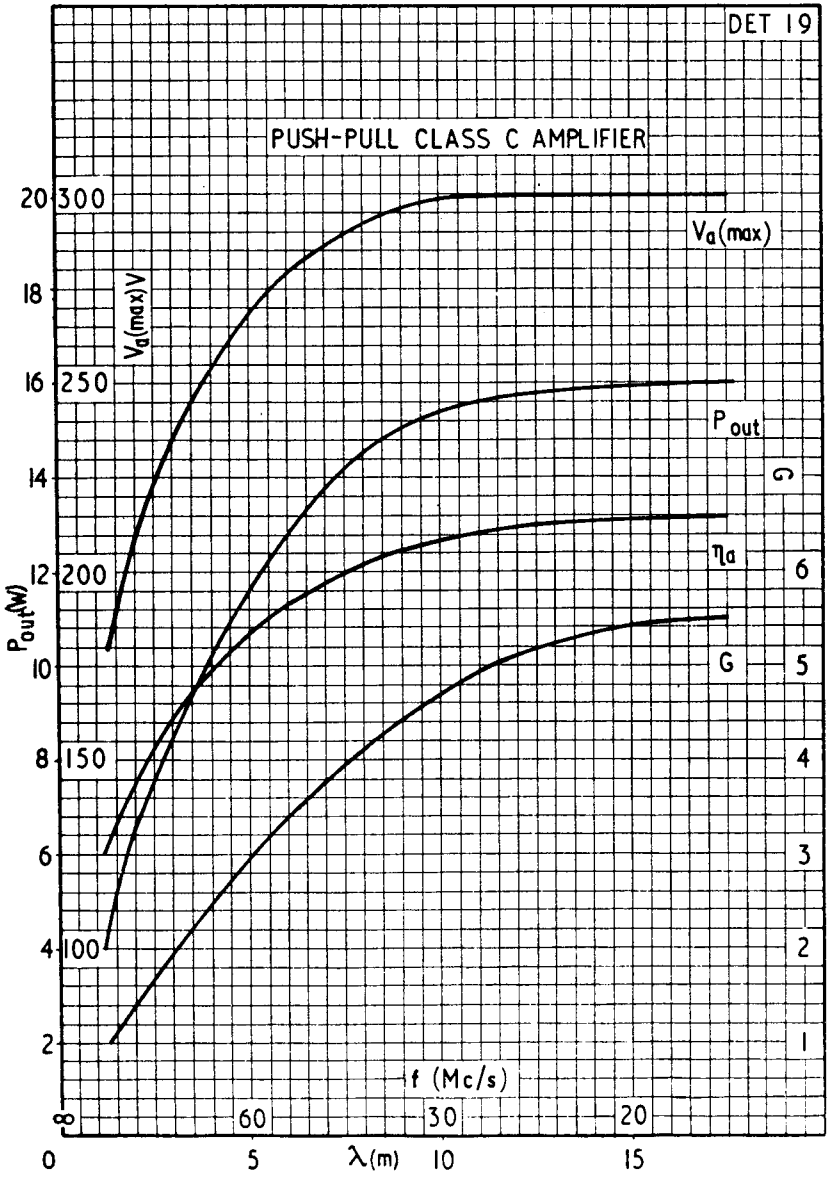
NOTES

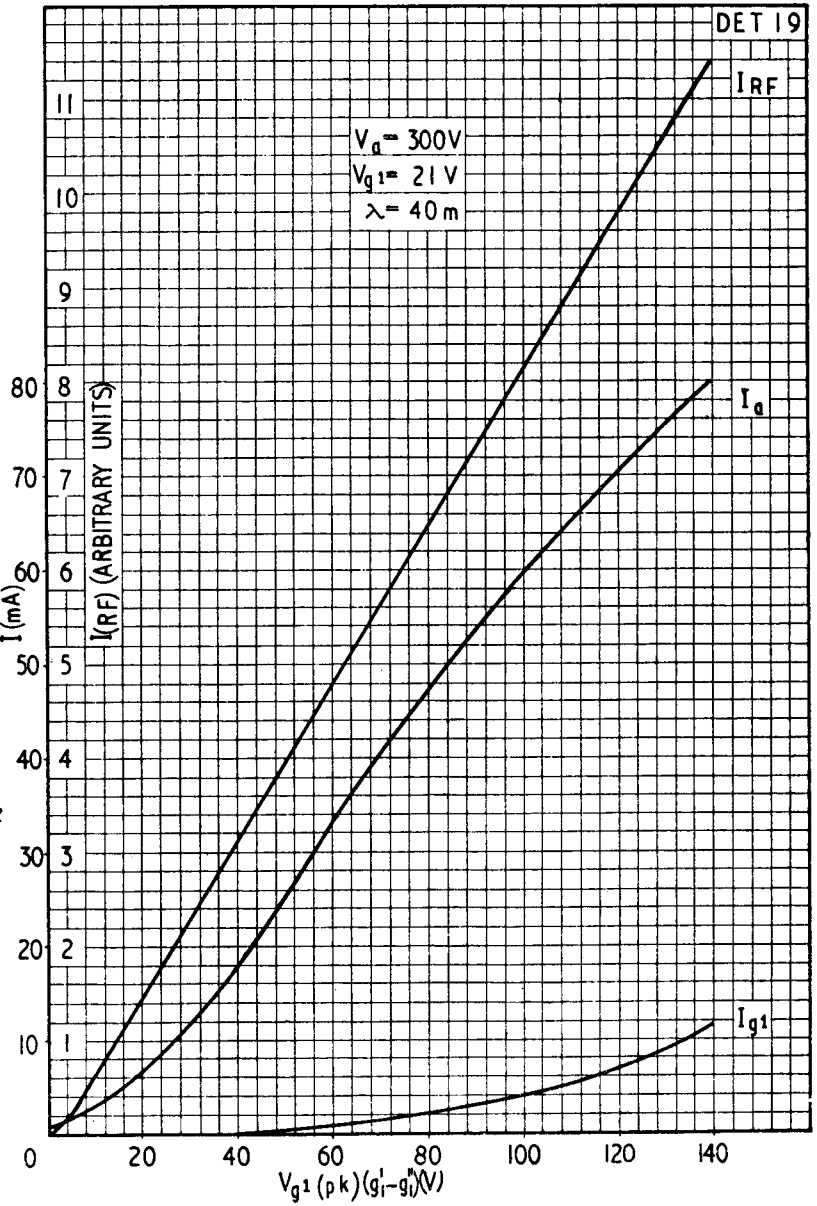
(a) Subject to wide variations depending on the impedance of the load circuit.

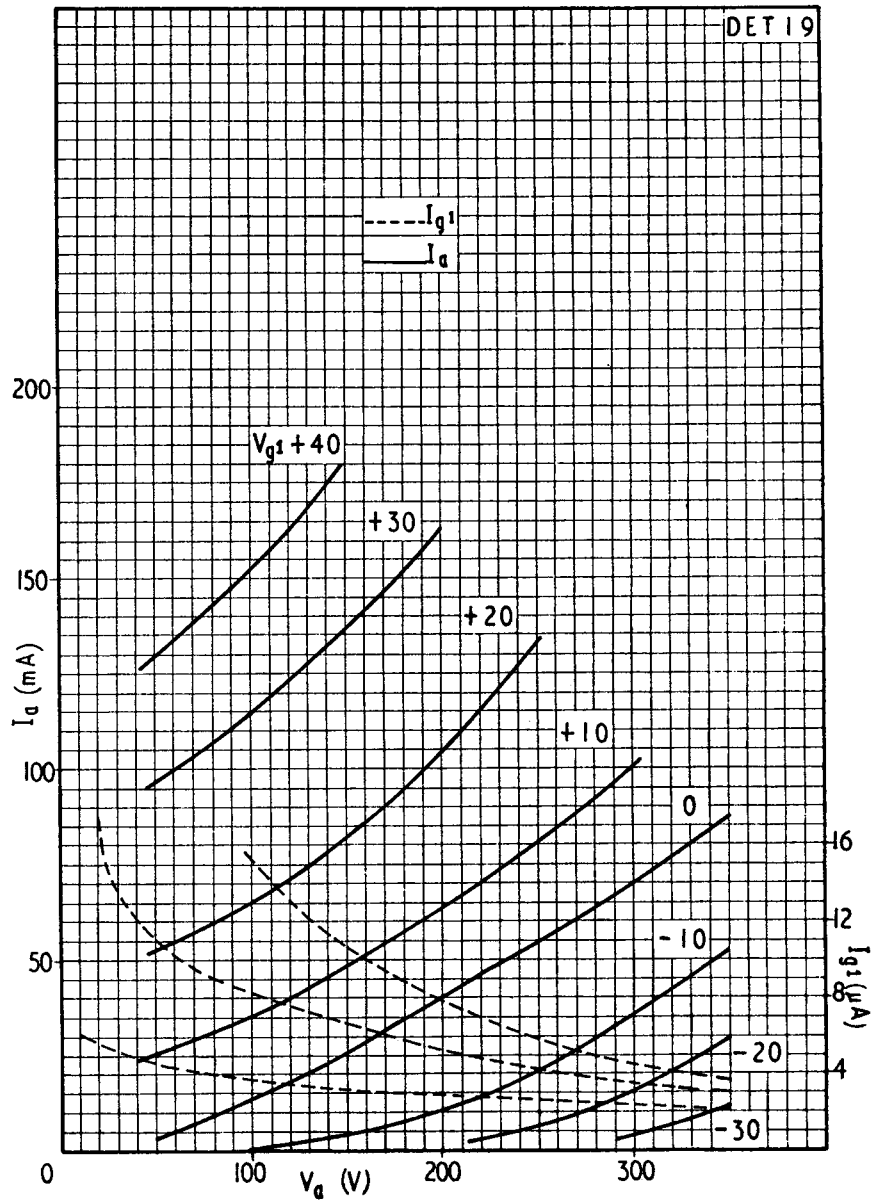
(b) At crest of modulation cycle.

(c) Grid leak operation is not permissible.

(d) The anode voltage applied to the first triode should be kept as low as is consistent with adequate output.


DET 19
PUSH-PULL CLASS C AMPLIFIER
V_a(max)V
P_{out}(W)
V_a(max)
P_{out}
η_a
G
%
f (Mc/s)
60
30
20
λ(m)
0
5
10
15


DET 19
V_a = 300V
V_{g1} = 21 V
λ = 40 m
I_{RF}
I_a
I_{g1}
I(RF) (ARBITRARY UNITS)
I (mA)
V_{g1} (pk) $(g_i'-g_i'')$(V)
0
20
40
60
80
100
120
140


DET 19
I_{g1}
I_a
V_{g1} +40
+30
+20
+10
0
-10
-20
-30
I_a (mA)
200
150
100
50
0
100
200
300
V_a (V)
16
12
8
4
I_{g1} (μA)

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