

## SPECIAL QUALITY DOUBLE TRIODE

# M8136

Special quality low  $\mu$  double triode for use in equipment where mechanical vibration and shocks are unavoidable and where statistically controlled major electrical characteristics are required.

This data should be read in conjunction with the GENERAL NOTES – SPECIAL QUALITY VALVES which precede this section of the handbook, and the index numbers are used to indicate where reference should be made to a specific note.

### HEATER

The heater is centre-tapped and the two sections may be operated in series or in parallel with one another.

	Series	Parallel	
$V_h^1$	12.6	6.3	V
$I_h$	150	300	mA

$V_h$  applied between pins 4 and 5  
 $V_h$  applied between pin 9 and pins 4 and 5 connected together

### MOUNTING POSITION

Any

### CAPACITANCES<sup>2</sup> (measured without an external shield)

* $C_{a-g}$	1.5	pF
* $C_{in}$	1.6	pF
$C_{out'}$	550	mpF
$C_{out''}$	450	mpF

\*Each section

### CHARACTERISTICS<sup>3</sup> (each section)

$V_a$	250	V
$I_b$	10.5	mA
$V_g$	-8.5	V
$g_m$	2.2	mA/V
$r_a$	7.7	k $\Omega$
$\mu$	17	
$R_k$	0	$\Omega$

### LIMITING VALUES<sup>4</sup> (absolute ratings) each section

$V_a$ max.	330	V
$p_a$ max.	3.0	W
$I_k$ max.	20	mA
$-V_g$ max.	110	V
* $-V_{g(pulse)}$ max.	200	V ←
$V_{n-k}$ max.	200	V
Maximum acceleration (continuous operation)	2.5	g
Maximum shock (short duration)	500	$g$
$T_{bulb}$ max.	200	$^{\circ}C$

\* $t_p = 800\mu s$ , duty factor (max.) = 0.05



# M8136

## SPECIAL QUALITY DOUBLE TRIODE

### TEST CONDITIONS (unless otherwise specified)

$V_h$	$V_a$	$V_g$	$R_k$	$V_{h-k}$
(V)	(V)	(V)	( $\Omega$ )	(V)
12.6	250	-8.5	0	0

### TESTS

	A.Q.L. <sup>5</sup>	Individuals <sup>6</sup>		Lot average <sup>7</sup>		Lot standard deviation <sup>8</sup> Max.	
		Bogey <sup>9</sup>	Min.	Max.	Min.		Max.
<b>GROUP A</b>							
Insulation							
a-rest measured at -300V	0.25	100	—	—	—	M $\Omega$	
g-rest measured at -100V	0.25	100	—	—	—	M $\Omega$	
Reverse grid current	0.25	—	—	0.5	—	$\mu$ A	
$R_g$ max. = 500k $\Omega$							
<b>GROUP B</b>							
Heater current	0.65	138	162	—	—	mA	
Heater to cathode leakage current	0.65	—	—	—	—	—	
$V_{h-k}$ = 100V (cathode negative)	—	—	10	—	2.0	$\mu$ A	
$V_{h-k}$ = 100V (cathode positive)	—	—	10	—	2.0	$\mu$ A	
Anode current	0.65	10.5	6.5	14.5	9.0	12	
Mutual conductance	0.65	2.2	1.75	2.65	2.0	2.4	
Group quality level <sup>10</sup>	1.0	—	—	—	—	—	





# M8136

## SPECIAL QUALITY DOUBLE TRIODE

TESTS	A.Q.L. <sup>5</sup> (%)	Individuals <sup>6</sup>		Lot average <sup>7</sup>		Lot standard deviation <sup>8</sup> Max.
		Bogey <sup>9</sup>	Min.	Max.	Min.	
<b>GROUP E</b>						
<b>Fatigue<sup>14</sup></b>						
V <sub>h</sub> = 14V, 1 minute on 3 minutes off. No other voltages applied, 5g min. peak acceleration, f = 170c/s for 33 hours in each of 3 mutually perpendicular planes.						
<b>Post fatigue tests</b>						
Heater to cathode leakage current.						
	2.5	—	—	30	—	—
						μA
V <sub>h-k</sub> = ±100V						
Reverse grid current.						
	2.5	—	—	1.5	—	—
						μA
R <sub>g</sub> max. = 500kΩ						
Mutual conductance						
	2.5	—	—	—	—	—
						mA/V
Microphonic noise as in group C						
	2.5	—	—	150	—	—
						mV
(r.m.s.)						
	6.5	—	—	—	—	—
Sub-group quality level <sup>10</sup>						
<b>Shock<sup>15</sup></b>						
No applied voltages, 500g						
<b>Post shock tests</b>						
Heater to cathode leakage current.						
	2.5	—	—	30	—	—
						μA
V <sub>h-k</sub> = ±100V						
Reverse grid current.						
	2.5	—	—	1.5	—	—
						μA
R <sub>g</sub> max. = 500kΩ						
Mutual conductance						
	2.5	—	—	—	—	—
						mA/V
Microphonic noise as in group C						
	2.5	—	—	150	—	—
						mV
(r.m.s.)						
	6.5	—	—	—	—	—
Sub-group quality level <sup>10</sup>						



## GROUP F

### Stability life test<sup>14</sup>

Running conditions:  $R_g = 500k\Omega$ ,  
 $V_{h-k} = 175V$  (cathode negative)

### Stability life test end point

Change in mutual conductance after 1 hour 1.0 — 10 — %

### Intermittent life test

Running conditions:  $R_g = 500k\Omega$ ,  
 $V_{h-k} = 175V$  (cathode negative)

### Intermittent life test end points

#### Sub-group (a)

	A.Q.L. <sup>5</sup> (%)	Min.	Max.
Inoperatives <sup>16</sup>	2.5	—	—
Heater current	4.0	—	—
Heater to cathode leakage current. $V_{h-k} = \pm 100V$	2.5	138	162
Reverse grid current. $R_g$ max. = $500k\Omega$	2.5	—	20
Mutual conductance	4.0	—	20
Average change in mutual conductance	2.5	—	0.5
	4.0	—	0.5
	2.5	1.6	2.65
	4.0	1.5	2.65
	—	—	15

#### Sub-group (b)

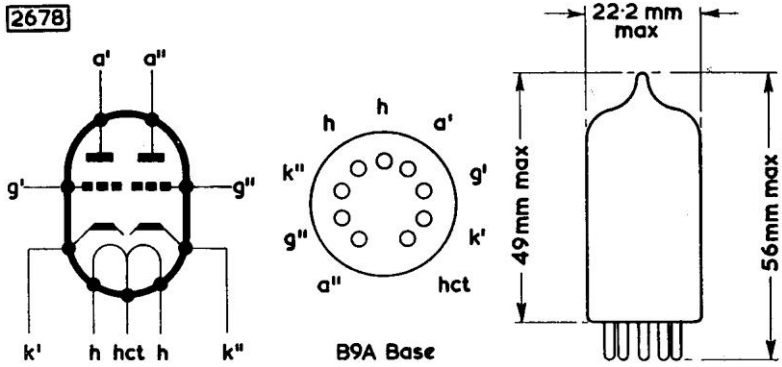
	A.Q.L. <sup>5</sup> (%)	Min.	Max.
Anode current	4.0	5.5	14.5
Insulation as in group A	6.5	5.0	14.5
Group quality level <sup>10</sup>	4.0	50	—
	6.5	30	—
	6.5	—	—
	10	—	—



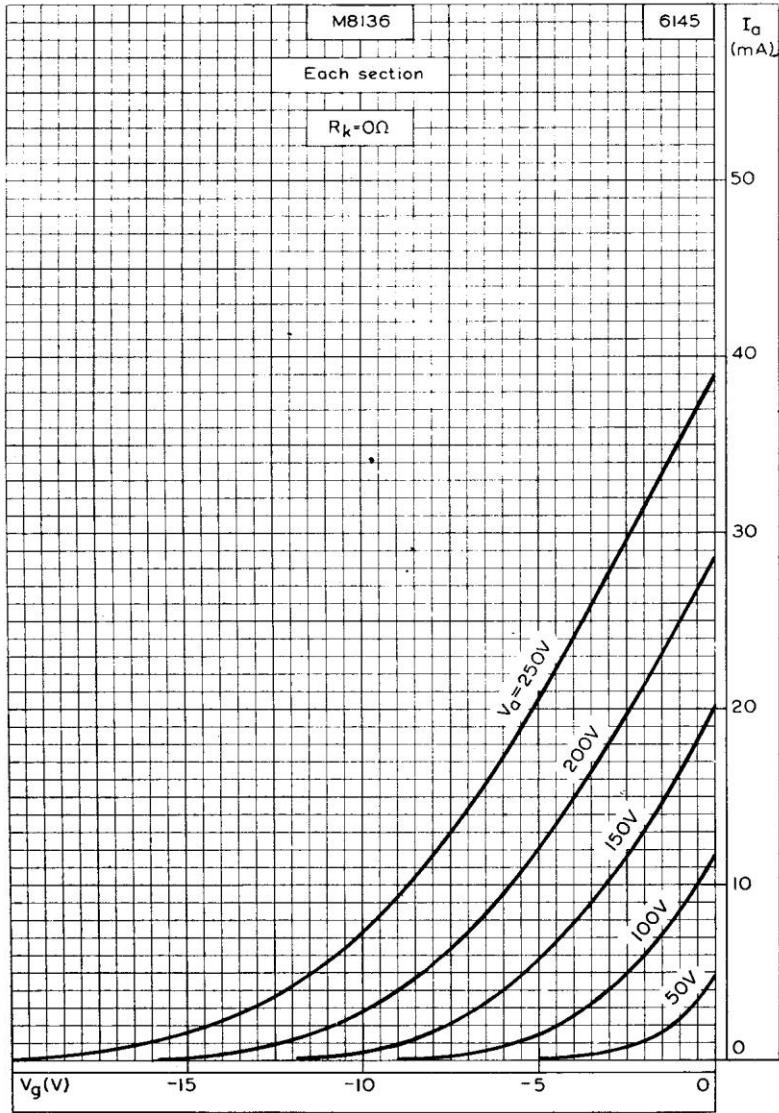
# M8136

## SPECIAL QUALITY DOUBLE TRIODE

GROUP G	A.Q.L. <sup>5</sup> (%)	Min.	Max.
Valves are held for 28 days and retested for Inoperatives <sup>16</sup>	0.5	—	—
Reverse grid current. $R_g$ max. = 500k $\Omega$	0.5	—	0.5 $\mu$ A



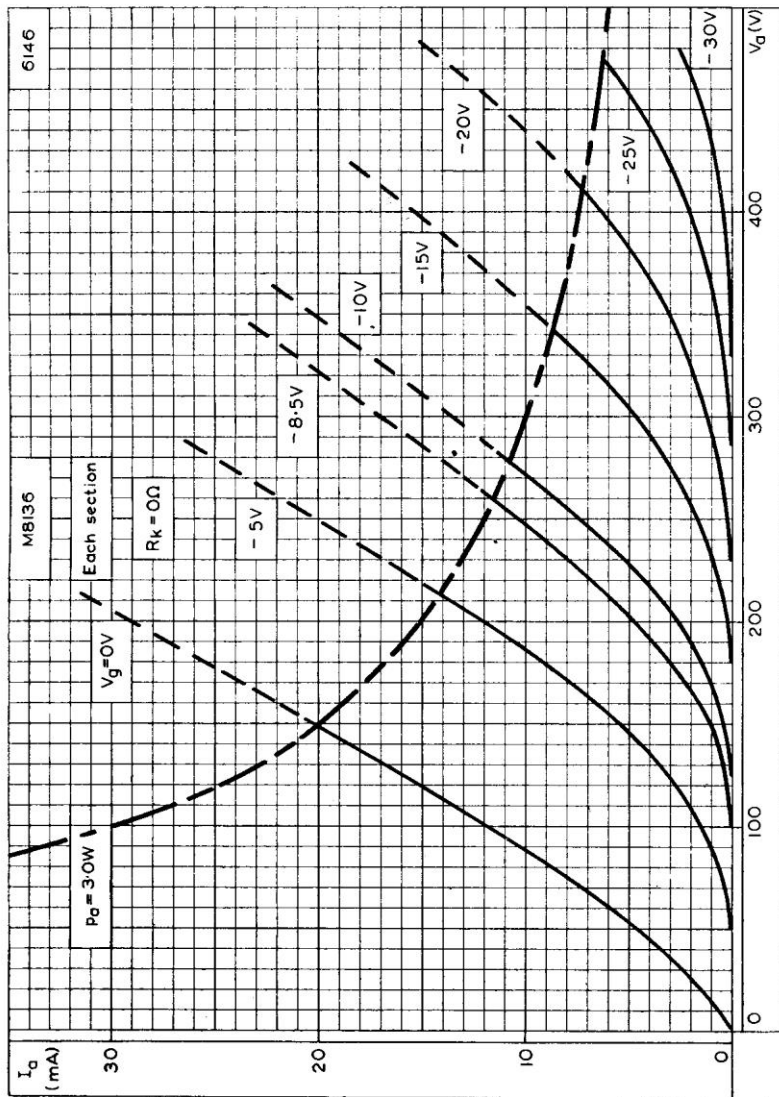
The bulb and base dimensions of this valve are in accordance with BS448, Section B9A



ANODE CURRENT PLOTTED AGAINST GRID VOLTAGE WITH ANODE VOLTAGE AS PARAMETER

# M8136

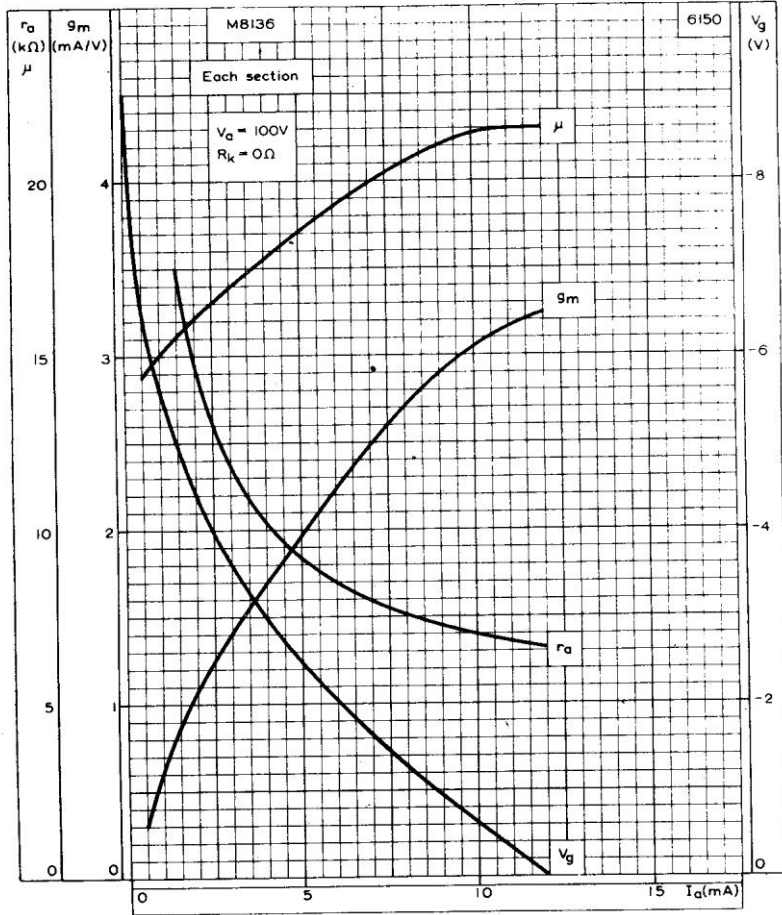
SPECIAL QUALITY DOUBLE TRIODE



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH GRID VOLTAGE AS PARAMETER



SPECIAL QUALITY DOUBLE TRIODE **M8136**

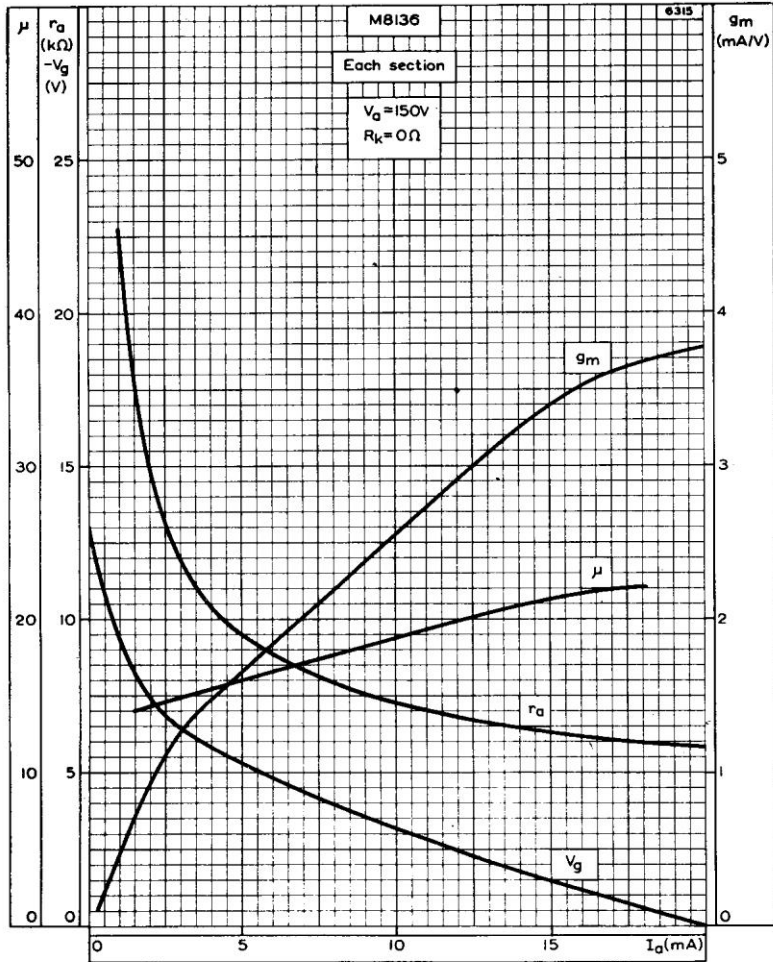


ANODE IMPEDANCE, AMPLIFICATION FACTOR, MUTUAL CONDUCTANCE AND GRID VOLTAGE PLOTTED AGAINST ANODE CURRENT.  $V_a = 100V$



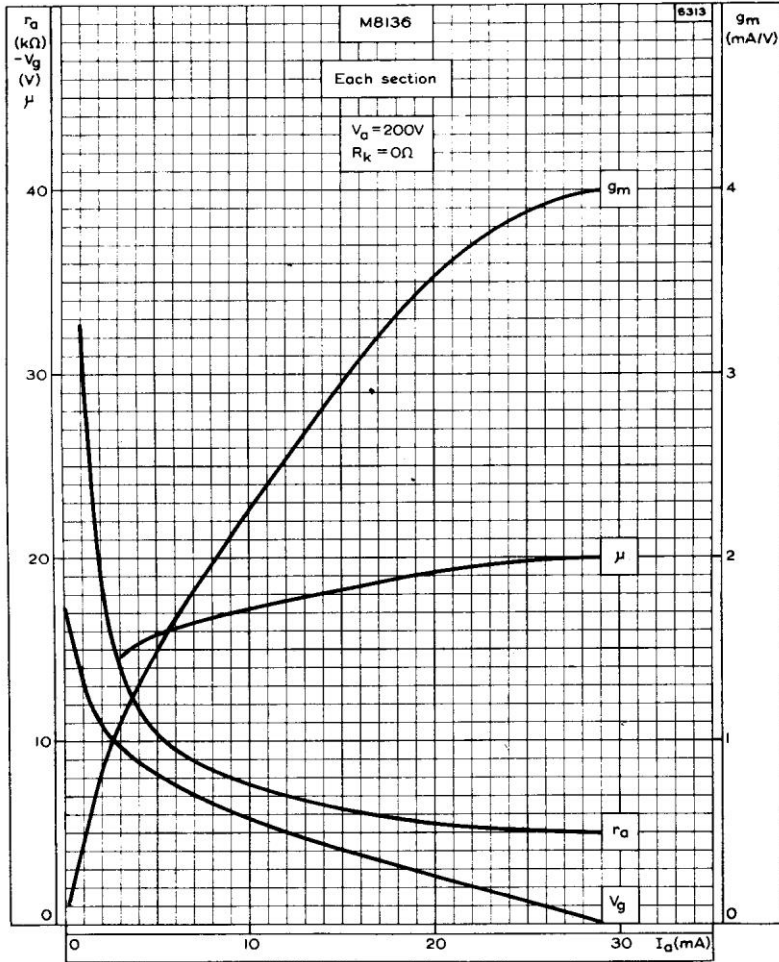
# M8136

SPECIAL QUALITY DOUBLE TRIODE



ANODE IMPEDANCE, AMPLIFICATION FACTOR, MUTUAL CONDUCTANCE AND GRID VOLTAGE PLOTTED AGAINST ANODE CURRENT.  $V_a = 150V$

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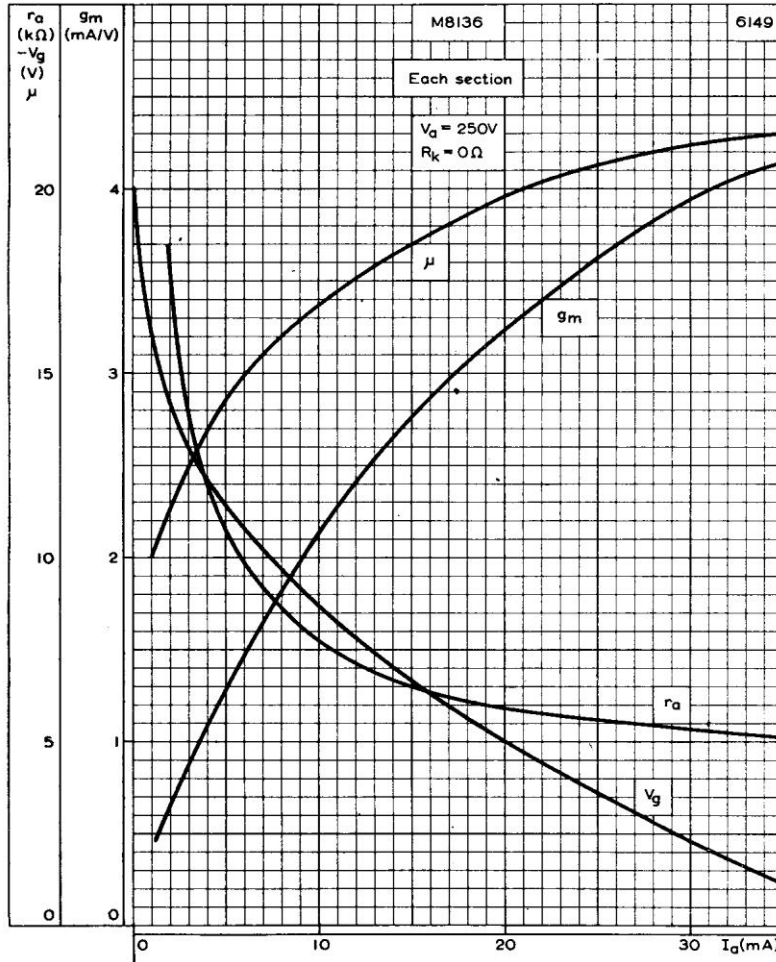


ANODE IMPEDANCE, AMPLIFICATION FACTOR, MUTUAL CONDUCTANCE AND GRID VOLTAGE PLOTTED AGAINST ANODE CURRENT.  $V_a = 200V$



# M8136

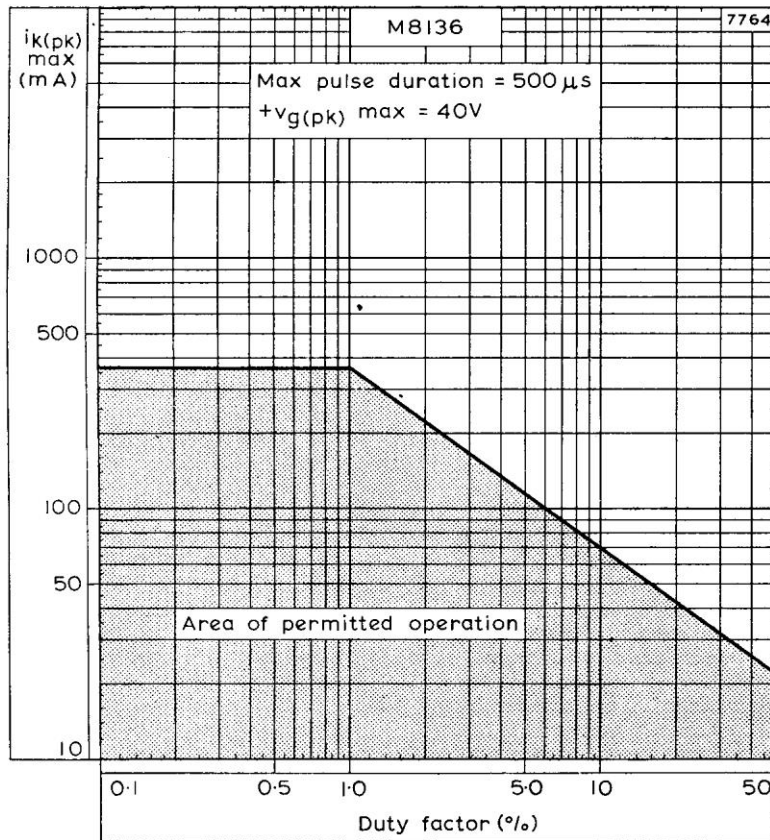
SPECIAL QUALITY DOUBLE TRIODE



ANODE IMPEDANCE, AMPLIFICATION FACTOR, MUTUAL CONDUCTANCE AND GRID VOLTAGE PLOTTED AGAINST ANODE CURRENT.  $V_a = 250V$



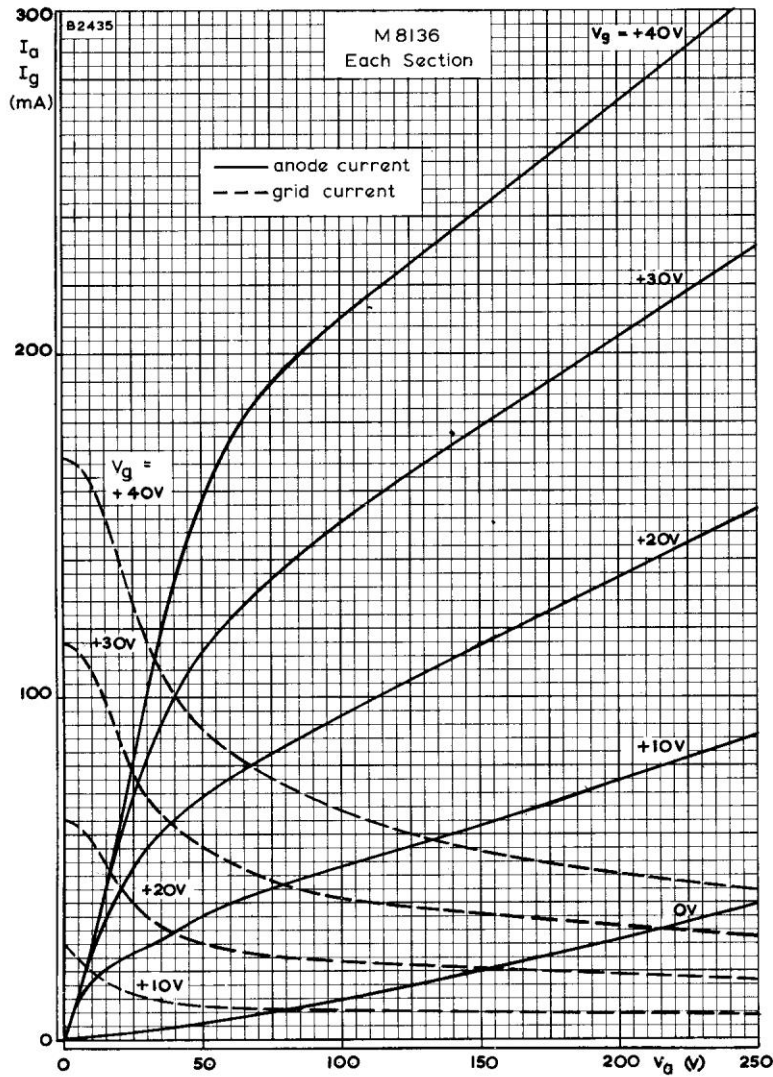
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PULSE RATING CHART

# M8136

SPECIAL QUALITY DOUBLE TRIODE



ANODE AND GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH POSITIVE GRID VOLTAGE AS PARAMETER