

# 6C33C-B (RU) – 6S33S-V

These triodes are intended to work as regulating valve in electronic stabilisers of voltage.

They consist of two triodes (A and B) in the same glass envelope. Cathodes, grids and plates are internally connected in parallel. The filaments are lead out separately for each triode.

**Manufacturers:** Ulyanov  
Svetlana (production stopped before 1980)

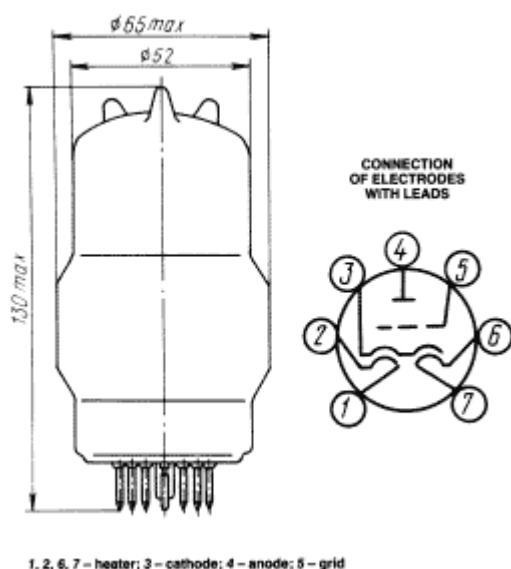
**Envelope:** Hard glass casing

**Mass:** ≤ 200g

**Height:** ≤ 130 mm

**Diameter:** ≤ 65 mm

## Envelope and base:



Base Pin	Septar 7 Electrode
1	Heater Filament A - 1
2	Heater Filament A - 2
3	Cathode
4	Plate
5	Grid
6	Heater Filament B - 1
7	Heater Filament B - 2

## Typical operating data:

Filament Current	
Serial heater connection – filament voltage 12,6 V	3,3 ± 0,3 A
Parallel heater connection – filament voltage 6,3 V	6,6 ± 0,6 A
Typical Operation	
Plate voltage	120V
Cathode resistor for cathode bias	35 Ohms
Warm-up time to steady state	≥ 600 s <sup>1</sup>
Plate current	550 ± 80 mA <sup>2</sup>

<sup>1</sup> Warm-up time to 90% emission ≤ 120 s.

<sup>2</sup> Older versions and 6C33C/6S33S 540 mA ± 90 mA.

<b>Transconductance</b>	
Filament voltage 6,3/12,6V~	$40 \pm 10 \text{ mS} (= \text{mA/V})^3$
Filament voltage 5,7/11,3V~	$\geq 24 \text{ mS} (= \text{mA/V})$
<b>Internal resistance <math>R_p</math></b>	$80..120^4$
<b>Amplification factor <math>m/\mu</math></b>	2,7 (2,5..4)
<b>Reverse grid current</b>	$\leq 5 \text{ uA} (U_g = -0,5 \text{ V})$
<b>Leakage currents</b>	
between plate and all other electrodes	$\leq 30 \text{ uA}$
between grid and all other electrodes	$\leq 20 \text{ uA}$
between cathode and heater filaments	$\leq 150 \text{ uA}$
<i>(leakage measured at maximum envelope temperature)</i>	
<b>Vibration-induced noise voltage</b>	
(plate load 2 kOhm , vibration 10g 10..300 Hz)	$\leq 500 \text{ mV}$
<b>Internal inter-electrode capacitances</b>	
Input ( $C_e$ )	$30 \pm 7 \text{ pF}$
Output ( $C_a$ )	$10,5 \pm 1 \text{ pF}$
Transfer ( $C_{ga}$ )	$31 \pm 7 \text{ pF}$
Cathode to heater	$\leq 60 \text{ pF}^5$
<b>Rated Service Life under above operating conditions</b>	$\geq 750 \text{ h}^{6,7}$
<i>Criteria for End of Service Life:</i>	
Reverse grid current	$\geq 15 \text{ uA}$
Plate current	$\leq 340 \text{ mA}$
Reduction of emission compared to new valve	$\geq 30 \%$

<sup>3</sup> Older versions and 6C33C/6S33S  $g_m = 39 \pm 11 \text{ mS}$ .

<sup>4</sup> Older versions and 6C33C/6S33S  $R_i \leq 130 \text{ Ohm}$ .

<sup>5</sup> Older versions and 6C33C/6S33S  $C_{fk} \leq 70 \text{ pF}$ .

<sup>6</sup> If envelope temperature and shock/vibration are kept low, the life expectation under the electrical conditions given above will exceed 2000 h.

<sup>7</sup> Rated service life inside environmental condition ratings for 6C33C/6S33S 1000 h, for 6C33C-EB/6S33S-EV 3000 h.

## Absolute Maximum Ratings:

Exceeding these ratings will cause permanent damage and/or premature failure of the valve. The circuit design has to assure that these absolute maximum ratings are not exceeded under any circumstances (worst case component tolerances and aging, environmental conditions and mains voltage deviations).

<b>Filament voltage</b>	
Serial connection of heater filaments	11,3 V .. 13,9 V
Parallel connection of heater filaments	5,7 V .. 6,9 V
<b>Plate voltage</b>	
Dissipation > 30 W	250 V
Dissipation ≤ 30 W	450 V
Zero Current at power-up	600 V
<b>Negative grid voltage</b>	-0,5 V .. -150 V
<b>Grid circuit resistance</b>	200 kOhm <sup>8</sup>
<b>Voltage between cathode and heater</b>	± 300 V
<b>Envelope temperature (J)</b>	
Ambient $\vartheta = 20^{\circ}$ C	260° C
Ambient $\vartheta = 100^{\circ}$ C	300° C <sup>9</sup>
Ambient $\vartheta = 150^{\circ}$ C	320° C <sup>10</sup>
<b>Plate current</b>	
One triode operating	350 mA
Both triodes operating	600 mA
<b>Plate dissipation</b>	
One triode operating	45 W
Both triodes operating	60 W

<sup>8</sup> Valid for fixed negative grid voltage. In actively servo-controlled loop, in which the grid bypass resistor forms at the same time the plate load of the servo amplifier valve, a maximum value of 1,5 MOhms is permissible.

<sup>9</sup> Maximum duration 100 h.

<sup>10</sup> Maximum duration 2 h.

## Environmental Conditions<sup>11</sup>:

In the table, environmental conditions are specified which shall be survived by any sample valve taken from a production batch without suffering permanent degradation. They do not, however, represent sensible operating conditions for maximum valve performance and service life.

<b>Vibration (10-300 Hz)</b>	6 g <sup>12</sup>
<b>Multiple impacts (duration ≤ 50ms)</b>	150 g <sup>13</sup>
<b>Single impact (duration ≤ 50ms)</b>	500 g <sup>14</sup>
<b>Constant acceleration</b>	100 g <sup>15</sup>
<b>Operating temperatures (ambient)</b>	-60° C .. +100° C <sup>16</sup>
<b>Relative humidity (at ambient <math>\vartheta</math><sup>17</sup> = + 40° C)</b>	98 %

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<sup>11</sup> Valid for 6C33C-B/6S33S-V (750h rated service life) and 6C33C-EB/6S33S-EV (3000 h rated service life).

<sup>12</sup> Older versions and 6C33C/6S33S 4 g.

<sup>13</sup> Older versions and 6C33C/6S33S 10 g.

<sup>14</sup> Older versions and 6C33C/6S33S 35 g.

<sup>15</sup> Older versions and 6C33C/6S33S 10 g

<sup>16</sup> Older versions and 6C33C/6S33S - 60° C .. + 70° C

<sup>17</sup>  $\vartheta$  = temperature.

## **Maximum ratings for extended service life:**

The ratings given under the heading 'Absolute Maximum Rating' are valid for a rated service life of 750 h and average reliability.

If a longer service life or high operational reliability is required, maximum ratings for current, power dissipation and envelope temperature must be reduced, and mechanical stress (vibration and shock) during operation kept to a minimum. The table below specifies de-rated maximum values for extended service life expectancy.

<b>Rated Service Life</b>	750 h ( <i>average</i> reliability)		3000 h ( <i>high</i> reliability) <sup>18</sup>	
	One triode	Both triodes	One triode	Both triodes
<b>Plate dissipation</b>				
Plate voltage $\leq 250\text{V}$	45 W	60 W	35 W	45 W
Plate voltage $> 250\text{V}$	30 W	30 W	25 W	30 W
<b>Plate current (avg.)</b>	350 mA	600 mA	250 mA	450 mA
<b>Plate current (peak)</b>	700 mA	1200 mA	500 mA	900 mA
<b>Envelope temperature</b>				
Ambient $\vartheta = 20^\circ\text{C}$	260° C		200° C	
Ambient $\vartheta = 100^\circ\text{C}$ <sup>19</sup>	300° C		200° C	
Ambient $\vartheta = 150^\circ\text{C}$	320° C		Not recommended	

<sup>18</sup> Vibration, shock and acceleration loads shall be kept within the limits for the 6C33C/6S33S.

<sup>19</sup> Maximum duration 100 h.

## De-rating Table for parallel operation of valves:

This table specifies absolute maximum ratings for plate current and dissipation in parallel operation of valves. Grids and plates are to be connected in parallel, cathodes are to be connected via series resistors as outlined in the table. The data are given for the simultaneous operation of both triodes per valve envelope and under the following operating conditions:

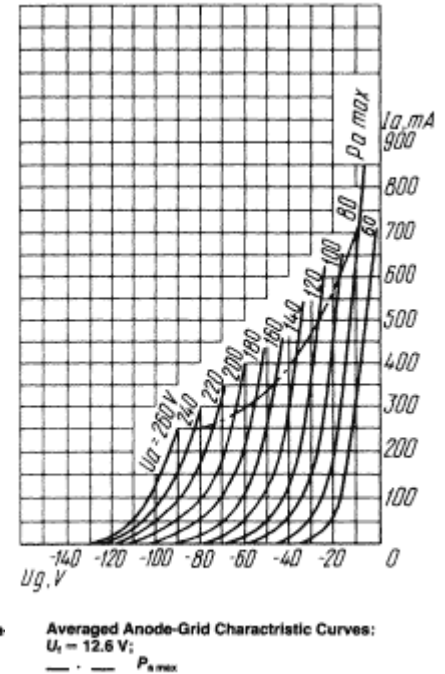
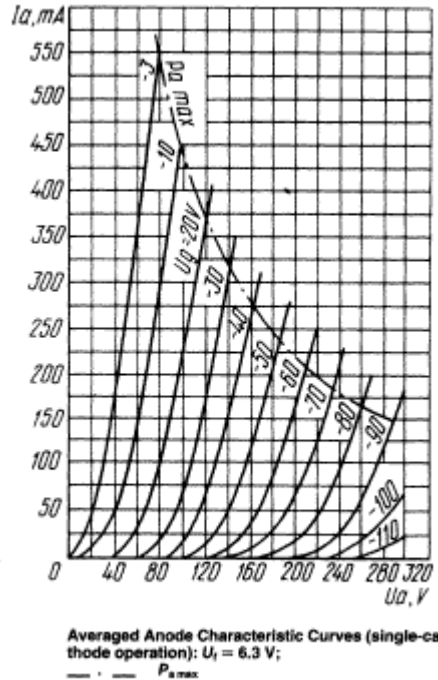
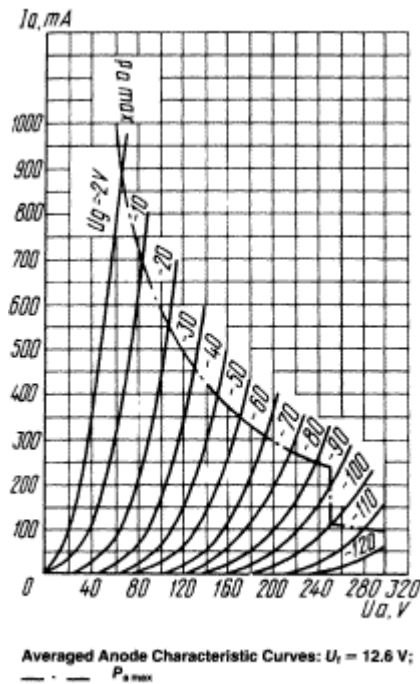
Plate voltage:  $\leq 250V$   
 Heater voltage:  $6,3/12,6V \pm 10\%$   
 Rated valve life:  $\geq 750 h$

Valves do not need to be matched – they can be taken from any production batch, as long as the valves are inside the AQL tolerance field. It is sufficient to assure in the design that the figures are met *on average*; individual adjustments per valve are not necessary.

For higher voltages, longer required lifetime or use of only one triode per valve envelope, de-rating figures as given for these modes of operation shall be applied pro rata.

Valves connected in parallel	Cathode series resistor for each valve in Ohms													
	0	10	20	30	40	50	70	0	10	20	30	40	50	70
	Plate current for each valve in mA							Plate dissipation for each valve in W						
1	600	600	600	600	600	600	600	60	60	60	60	60	60	60
2	425	473	499	517	529	539	552	42,5	47,2	50,0	51,7	53,0	53,9	55,0
3	364	428	464	487	504	518	535	36,4	42,8	46,5	48,7	50,5	51,8	53,4
4	338	410	448	475	495	511	526	33,3	40,8	45,0	47,6	49,5	50,8	52,8
5	320	395	439	468	486	502	523	32,1	39,6	44,0	46,7	48,8	50,2	52,2
6	208	388	432	461	482	498	521	30,9	38,7	43,3	46,2	48,9	49,8	51,9
8	294	377	424	454	476	494	516	29,4	37,7	42,5	45,5	47,8	49,4	51,5
10	285	371	418	450	472	490	512	28,6	37,0	42,0	45,1	47,4	49,0	51,2
12	280	365	416	448	471	487	511	28,0	36,6	41,6	44,8	47,1	48,8	51,0

## Characteristic Curves:



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