

ELECTRONIC TUBE REFERENCE

10L14

Voltage - Dual Triode (similar) electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
TRIODE-TRIODE

Dissimilar dual triode with a high-gain section documented at approximately 55 amplification factor and 6 mA/V transconductance, intended for specialized television-frequency circuitry.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	26 V / 100 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
TRANSCONDUCTANCE	0.006 S
AMPLIFICATION FACTOR	55
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	15 mA
Published ratings and characteristics promoted where clearly stated; identical repeated sections compressed when applicable.	

SECTION2 Triode	
TRANSCONDUCTANCE	0.006 S
AMPLIFICATION FACTOR	55
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	15 mA
Second physical triode restored under one-row-per-physical-section policy; duplicated from reviewed identical-section specification.	

10L14 — Double Triode Vacuum Tube

An indirectly heated double triode designed for high-frequency amplification and self-oscillating mixer service in F.M. receivers.

Overview

The **10L14** (also designated as the [UCC85](#)) is a high-frequency double triode vacuum tube manufactured by Mazda. It is primarily intended for use as a radio frequency (R.F.) amplifier and self-oscillating mixer in frequency modulation (F.M.) receivers. The tube features two independent triode sections with separate cathodes and an internal shield, housed in a compact glass envelope with a standard B9A nine-pin miniature base.

Construction, Heater, and Pinout

The 10L14 is designed with an internal shield connected to a dedicated pin to minimize capacitive coupling between the two triode sections, ensuring stable operation at high frequencies. The tube has a maximum bulb height (excluding pins) of 49 mm (1.937 inches) and a maximum diameter of 22.2 mm (0.875 inches). It can be operated in any mounting position.

The heater is designed for series-string operation with a nominal current of 0.1 A and a nominal voltage of 26 V.

Calculation of heater power: $P_h = V_h \times I_h = 26\text{ V} \times 0.1\text{ A} = 2.6\text{ W}$

The B9A base pin connections, viewed from the underside of the base, are as follows:

Pin	Connection
1	Anode, triode 2 (a'')
2	Grid, triode 2 (g'')
3	Cathode, triode 2 (k'')

Pin	Connection
4	Heater (h)
5	Heater (h)
6	Anode, triode 1 (a')
7	Grid, triode 1 (g')
8	Cathode, triode 1 (k')
9	Internal Shield (s)

To optimize performance and minimize unwanted coupling, the manufacturer specifies that the triode section on pins 6, 7, and 8 should be utilized as the R.F. amplifier, while the section on pins 1, 2, and 3 should be used as the self-oscillating mixer.

Absolute Maximum Ratings

To ensure reliable operation and prevent premature failure, the 10L14 must be operated within the following absolute maximum limits:

Parameter	Symbol	Maximum Value	Unit
Maximum Anode Voltage	$V_{a(max)}$	250	V
Maximum Anode Dissipation (either section)	$P_{a(max)}$	2.5	W
Maximum Total Anode Dissipation	$P_{a(tot)max}$	4.5	W
Maximum Heater to Cathode Voltage (R.M.S.)	$V_{h-k(max)r.m.s.}$	90	V
Maximum Cathode Current	$I_{k(max)}$	15	mA
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1	M

Electrical Characteristics

The electrical characteristics of each individual triode section are evaluated at two distinct operating points:

Parameter	Symbol	Point A	Point B	Unit
Anode Voltage	V_a	170	200	V
Anode Current	I_a	10	10	mA
Grid Voltage	V_g	-1.5	-2.1	V
Mutual Conductance	g_m	6.2	5.8	mA/V
Amplification Factor	μ	50	48	
Valve Anode Resistance	r_a	8.1	8.3	k Ω

Verification of the triode relationship ($\mu \approx g_m \times r_a$):

- At Point A (170 V): $6.2 \text{ mA/V} \times 8.1 \text{ k}\Omega = 50.22$ (compared to the nominal $\mu = 50$).
- At Point B (200 V): $5.8 \text{ mA/V} \times 8.3 \text{ k}\Omega = 48.14$ (compared to the nominal $\mu = 48$).

Inter-electrode Capacitances

The high-frequency performance of the 10L14 is heavily influenced by its inter-electrode capacitances. The capacitances are documented under three distinct measurement conditions to assist designers in accounting for socket and shielding effects:

- Condition ***: Measured in a fully-shielded socket, without an external screening can (except where noted).
- Condition †**: Measured with the socket holder capacitance balanced out.
- Condition ‡**: Total capacitance including Plessey B9A ceramic holders (type CP180900/1 without can, or CP180024/3 with can).

Capacitance Parameter	Symbol	Condition * (pF)	Condition † (pF)	Condition ‡ (pF)
Anode' to Grid'	$c_{a'-g'}$	1.5	1.6	1.8
Anode'' to Grid''	$c_{a''-g''}$	1.5	1.6	1.6
Anode' to Cathode', Heater, Shield	$c_{a'-k',h,s}$	1.2	1.6	2.5

Capacitance Parameter	Symbol	Condition * (pF)	Condition \dag (pF)	Condition \ddag (pF)
Anode' to Cathode', Heater, Shield (with can)	$c_{a'-k',h,s}$	1.9	2.0	2.8
Anode'' to Cathode'', Heater, Shield	$c_{a''-k'',h,s}$	1.2	1.6	2.4
Anode'' to Cathode'', Heater, Shield (with can)	$c_{a''-k'',h,s}$	1.9	2.1	2.8
Grid' to Cathode', Heater, Shield	$c_{g'-k',h,s}$	3.0	3.3	4.2
Grid'' to Cathode'', Heater, Shield	$c_{g''-k'',h,s}$	3.0	3.4	4.2
Anode' to Anode''	$c_{a'-a''}$	0.028	0.032	0.033
Anode' to Anode'' (with can)	$c_{a'-a''}$	0.003	0.0067	0.0081
Anode'' to Cathode'	$c_{a''-k'}$	0.006	0.014	0.02

The addition of an external screening can significantly reduces the direct capacitive coupling between the two anodes ($c_{a'-a''}$), dropping it from 0.028 pF to 0.003 pF under Condition *, which is highly beneficial for preventing parasitic oscillation between the R.F. stage and the mixer stage.

Typical Operating Conditions

The 10L14 is optimized for two primary circuit configurations in F.M. receivers:

R.F. Amplifier Service

When configured as an R.F. amplifier, the triode section on pins 6, 7, and 8 is operated with the following typical parameters:

Parameter	Symbol	Case 1	Case 2	Unit
Supply Voltage	V_b	170	170	V
Anode Load Resistance	R_a	1.5	1.3	k

Parameter	Symbol	Case 1	Case 2	Unit
Anode Voltage	V_a	155	160	V
Anode Current	I_a	8.7	6.0	mA
Grid Bias Voltage	V_g	-1.4	-2.0	V
Mutual Conductance	g_m	6.0	4.7	mA/V
Valve Anode Resistance	r_a	8.4	10.5	k
Equivalent Grid Noise Resistance	R_{eq}	500	650	..
Input Loss at 100 Mc/s	r_g	6	8	k

Self-Oscillating Mixer Service

When configured as a self-oscillating mixer, the triode section on pins 1, 2, and 3 is operated with the following typical parameters:

Parameter	Symbol	Case 1	Case 2	Unit
Supply Voltage	V_b	170	200	V
Anode Load Resistance	R_a	4.7	8.2	k
Grid to Cathode Resistance	R_{g-k}	1	1	M
Anode Current	I_a	4.8	5.2	mA
Peak Heterodyne Voltage	$V_{(pk)het}$	4	4	V
Conversion Conductance	g_c	2.2	2.3	mA/V
Valve Anode Resistance	r_a	16	15	k

In the self-oscillating mixer configuration, the application of an intermediate frequency (I.F.) feedback voltage tends to stabilize the oscillator performance. This stabilization permits the use of a relatively high grid leak resistance of 1 M.

A typical practical circuit layout for the self-oscillating mixer utilizes a 200 V supply voltage (V_b) with an $8.2\text{ k}\Omega$ anode load resistor. The circuit incorporates a series of bypass capacitors (typically 1000 pF) on the heater supply lines and the grid return paths, along with an I.F. feedback component of approximately 100 pF, whose precise value depends on the physical layout and component tolerances.

Characteristic Curves and Design Interpretation

The performance of the 10L14 is further illustrated by its characteristic curves:

- **Transfer Characteristics (I_a/V_g):** The curves show the relationship between anode current and control grid voltage for anode voltages of 100 V, 170 V, and 200 V. At $V_a = 170\text{ V}$, the anode current approaches cutoff as the grid voltage is biased more negatively than -6 V .
- **Plate Characteristics (I_a/V_a):** The family of plate curves plots anode current against anode voltage for grid voltages ranging from 0 V to -6 V in 1 V increments. The maximum anode dissipation boundary of 2.5 W ($p_{a(max)}$) is superimposed on these curves, defining the safe operating envelope. For example, at $V_a = 250\text{ V}$, the anode current must not exceed 10 mA to remain within the 2.5 W dissipation limit.
- **Dynamic Parameters vs. Anode Current:** The curves plotting mutual conductance (g_m), amplification factor (μ), valve anode resistance (r_a), and control grid voltage ($-V_g$) against anode current (I_a) at $V_a = 170\text{ V}$ and $V_a = 200\text{ V}$ show that the amplification factor remains relatively stable between 40 and 50 over a wide range of anode currents (from 2 mA to 20 mA), while the mutual conductance rises sharply as anode current increases, peaking near 10 mA to 12 mA.

Technical Summary

The **10L14 (UCC85)** is a high-performance, indirectly heated double triode designed specifically for high-frequency applications in F.M. receivers. Featuring a 26 V, 0.1 A heater, a B9A miniature base, and an internal shield, it is optimized to function as a combined R.F. amplifier and self-oscillating mixer. With an amplification factor of approximately 48 to 50 and a mutual conductance of 5.8 to 6.2 mA/V under typical Class A conditions, each section provides excellent gain and low noise. By utilizing the recommended pin assignments and incorporating appropriate shielding and I.F. feedback, designers can achieve stable, low-noise frequency conversion and amplification in the VHF band.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1973 Mazda Valves Binder 2

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1973 MAZDA VALVES BINDER 2

Section 1 · Triode

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater or filament voltage	26 V	Published nominal value
Heater or filament current	100 mA	Published nominal value
Transconductance	6000 μ S	Published operating characteristic

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate dissipation	2.5 W	Published maximum rating

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