SYLVANIA

engineering data service 5896

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		300	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Plate to Plate	0.026	0.15 μμf Max.
Plate to All Other Electrodes[5] (Each Section)	3.0	2.4 μμf
Cathode to All Other Electrodes[6] (Each Section)	4.2	4.0 μμf

RATINGS[1 & 7] (Absolute Maximum)

Plate Supply Voltage (Each Plate)	165 Vac
Peak Inverse Plate Voltage[8]	460 v
Steady State Peak Plate Current (Each Plate)	60 ma
Transient Peak Plate Current (Each Plate)	350 ma
Output Current (Each Plate)	10 mAdc
Heater-Cathode Voltage[8]	
Heater Positive with Respect to Cathode	360 v
Heater Negative with Respect to Cathode	360 v

CHARACTERISTICS

Tube Voltage Drop for Ib = 18 mAdc (Each Plate)	4.5 Vdc

TYPICAL OPERATION

Full-Wave Rectifier—Capacitor Input to Filter	
Plate Voltage (Each Plate)	150 Vac
Filter Input Capacitance	8 μf
Load Resistor	11000 Ohms
Effective Plate Supply Impedance (Each Plate)	300 Ohms
Output Current	18 mAdc

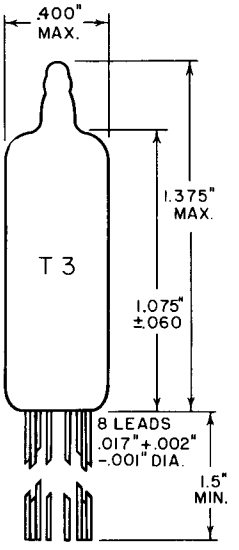
NOTES:

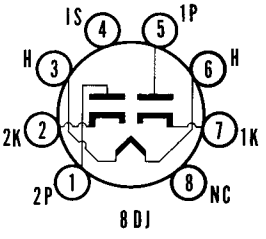
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to heater.*
5. *Diode input; plate to cathode, heater, internal shield and external shield (other section grounded).*
6. *Cathode to heater, plate, internal shield and external shield (other section grounded)*
7. *Values shown are as registered with RETMA.*
8. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5896 is a high perveance double diode having separate cathode connections for each section. Electrically this type is similar to the 6AL5 and is intended for a variety of detector applications at UHF as well as low frequencies.

The 5896 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability and is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
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FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Load Resistance	11000 Ohms
Plate Supply Voltage Per Plate	165 Vac	Load Capacitance	8 μf
Heater-Cathode Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 24	--	—	288	300	312	—	mA
4.10.8	Heater Current:	0.65	280	—	—	—	320	mA
4.10.15	Heater-Cathode Leakage: Note 2	0.65	—	—	—	—	—	
	Ehk = +360 Vdc	—	—	—	—	—	40	μAdc
	Ehk = -360 Vdc	--	—	—	—	—	40	μAdc
4.10.13	Operation: Note 5 Io	0.65	16	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: Note 2 p-all	2.5	100	—	—	—	—	Meg
4.10.1.1	Emission: Note 2 Is Eb = 10 Vdc	2.5	30	—	—	—	--	mAdc
4.10.4.1	Plate Current: Note 2 Ebb = O V; Rp = 40,000 Ohms	2.5	5.0	—	—	—	25	μAdc
4.10.4.1	Plate Current Difference Between Sections:	2.5	—	—	—	—	5.0	μAdc
4.10.14	Capacitance: 0.405 In. Dia. Shield	6.5	—	—	—	—	—	
	C1p to 2p	—	—	—	—	—	0.026	μμf
	C1p to h+1k+sd	—	2.5	—	—	—	3.5	μμf
	C2p to h+2k+sd	—	2.5	—	—	—	3.5	μμf
	C1k to h+1p+sd	—	3.5	—	—	—	4.9	μμf
	C2k to h+2p+sd	—	3.5	—	—	—	4.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 55 ±5 mm Hg.; Voltage = 330 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 3								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage							
	Ehk = +360 Vdc	—	—	—	—	—	80	μAdc
	Ehk = -360 Vdc	—	—	—	—	—	80	μAdc
	Operation Io	—	14	—	—	—	—	mAdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 3							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; E1b = E2b = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 hour) Note 6 TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Operation of Individual Tubes Δ_t Io	—	—	—	—	10.0	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
- - - -	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Operation Io	1.0	—	—	14.0	—	mAdc
4.11.5 4.11.3.1	Intermittent Life Test: Note 4 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	276	328	mA
	Operation Io	—	1	3	14	—	mAdc
	Change in Operation of Individual Tubes Δ_t Io	—	1	3	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +360 Vdc	—	—	—	—	80	μAdc
	Ehk = -360 Vdc	—	—	—	—	80	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	p-all	—	—	—	25	—	Meg
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Test each section separately.

3: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

4: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

5: In a full-wave circuit, adjust Zp/p so that a bogey tube gives Io = 18 mAdc. A bogey tube has a tube drop Etd = 10 Vdc at Is = 50 mAdc per plate. Ehk = Eo +117 Vac.

6: In a full-wave life test circuit, the values specified for RL and CL may be considered approximate and shall be adjusted initially to give not less than Io = 18 mAdc and ib = 50 ma with a bogey tube. Ehk = Eo +117 Vac.

APPLICATION DATA

The Premium Subminiature Type 5896 is a high perveance subminiature double diode. Separate cathode connection permit independent operation of each section. Electrically, this type is very similar to the miniature Type 6AL5. It is particularly useful in a variety of detector application including discriminators or ratio detectors at uhf as well as low frequencies.

The resonant frequency of each diode section is greater than 900 megacycles, making the type applicable to use in automatic frequency control discriminator circuits in the uhf region. The line length in push-pull applications of this nature is plotted against frequency in Figure 1.

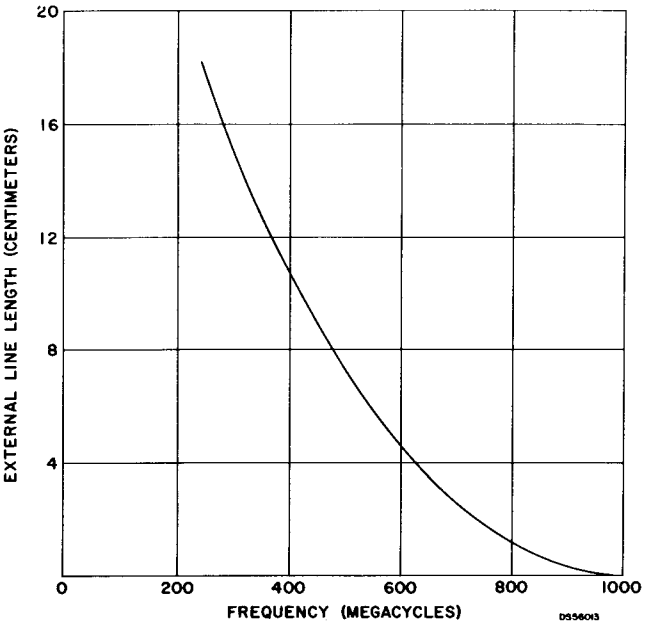


Figure 1 Approximate resonant-line length vs frequency

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve which departs from that obtained with rated heater voltage, Figure 2. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

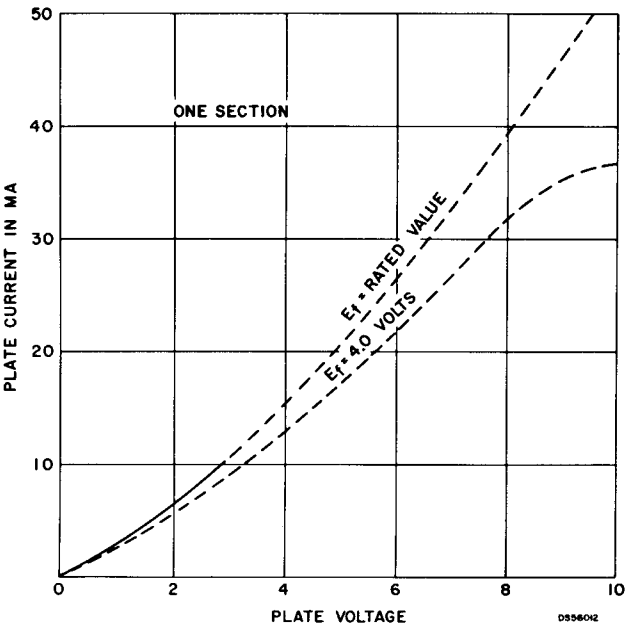


Figure 2 Approximate Plate Characteristics at reduced heater voltage

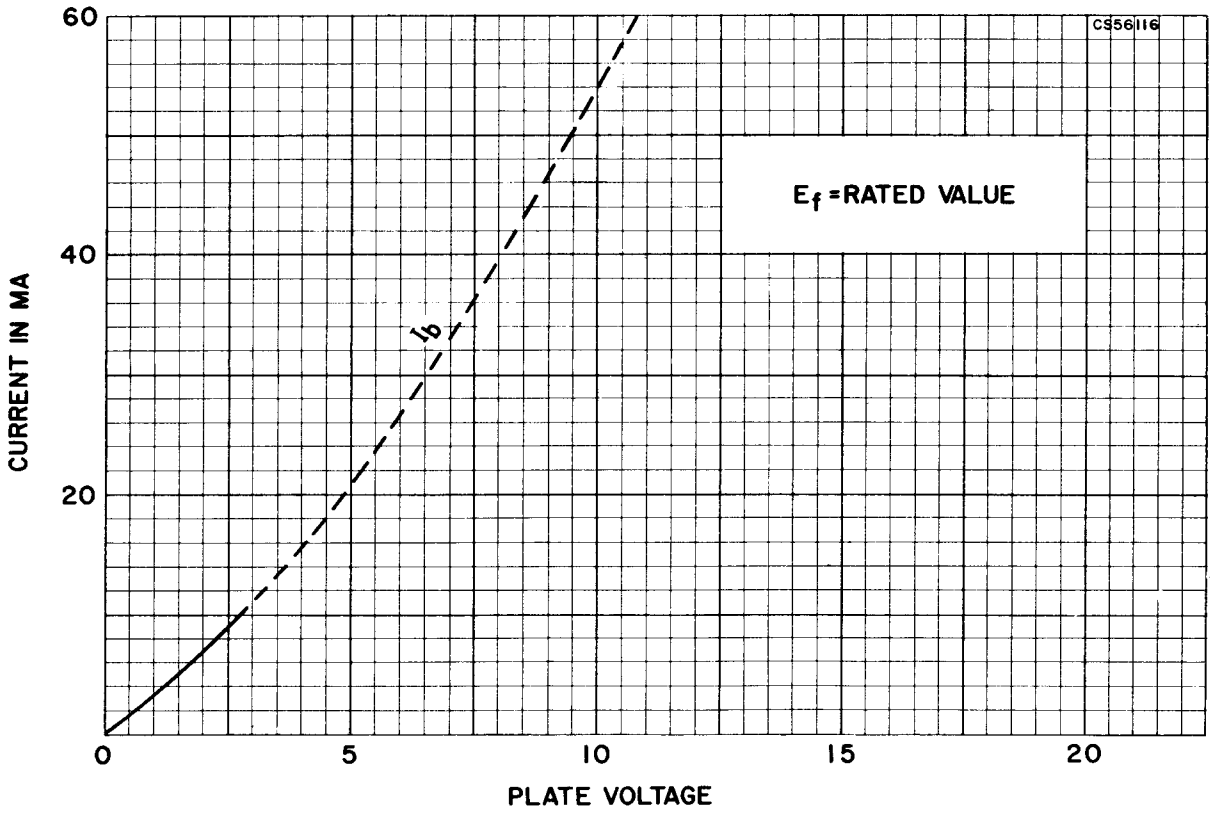
The 5896 is also useful in clamping and gating applications.

The 5896 is intended for operation under conditions of severe shock, vibration, high altitude and high temperature and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



AVERAGE CHARACTERISTICS
(EACH SECTION)