

# Technical Information

## CK6080WB

RELIABLE  
TWIN POWER TRIODE

The CK6080WB is a reliable, heater-cathode type, low mu, twin power triode, suitable for operation as a regulator tube in DC power supplies. It is designed for service where conditions of high temperature and mechanical shock or vibration are encountered. Several CK6080WB tubes can be paralleled as desired for increased levels of current or power.

### MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock).....	450 G
Fatigue (Vibrational Acceleration for extended periods).....	2.5 G
Maximum Bulb Temperature .....	300 °C
Altitude .....	60,000 ft.

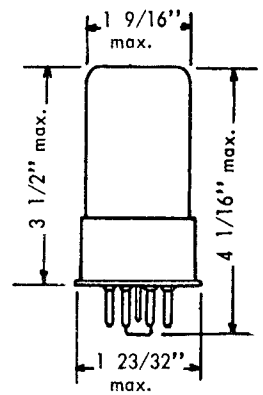
### ELECTRICAL DATA

Ratings and Normal Operation	MIL-E-1 Symbol	Test Limit or Absolute Minimum	Normal Test Conditions	Normal Operation	Test Limit or Absolute Maximum	MIL-E-1 Units
			Ratings			
Heater Voltage	Ef:	6.0	6.3	---	6.6	V
Plate Voltage	Eb:	---	135	---	250	Vdc
Grid Voltage	Ec:	---	0	---	0	Vdc
Heater-Cathode Voltage	Ehk:	-450	---	---	+450	v
Cathode Resistance (per cathode)	Rk/k:	---	250	---	---	Ohms
Grid Resistance (per grid) Note A	Rg/g:	---	---	---	---	Meg.
Grid Current (per grid)	Ic/g:	---	---	---	5.0	mAdc
Plate Dissipation (per plate)	Pp/p:	---	---	---	13 (Design Max.)	W
Cathode Current (per cathode)	Ik/k:	---	---	---	200	mAdc
			Tests			
Heater Current	If:	2.35	---	---	2.65	A
Heater Cathode Leakage -(Ehk=±450 Vdc) Note B	Ihk:	---	---	---	25	μAdc
Plate Current (Notes B, C)	Ib:	100	---	125	150	mAdc
Transconductance (Notes B, C)	Sm:	6000	---	7000	8200	μmhos
Transconductance (2) (Notes B, C) Ef=5.7V	ΔEf Sm:	---	---	---	10	%
Plate Current (1) Difference between sections	ΔIb:	---	---	---	25	mAdc

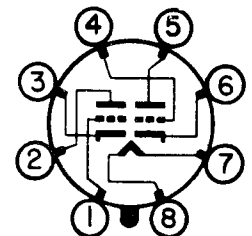
### MECHANICAL DATA

ENVELOPE ..... T-12 Glass  
BASE..... B8-98  
CATHODE:... Coated Unipotential  
BASING..... 8BD  
MOUNTING POSITION..... Any

### PHYSICAL DIMENSIONS



### BASING



### BOTTOM VIEW

### TERMINAL CONNECTIONS:

- Pin 1 Grid, Unit #2
- Pin 2 Plate, Unit #2
- Pin 3 Cathode, Unit #2
- Pin 4 Grid, Unit #1
- Pin 5 Plate, Unit #1
- Pin 6 Cathode, Unit #1
- Pin 7 Heater
- Pin 8 Heater



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Ratings and Normal Operations	MIL-E-1 Symbol	Test Limit or Absolute Minimum	Normal Test Conditions	Normal Operation	Test Limit or Absolute Maximum	MIL-E-1 Units
			Tests			
Amplification (Notes B,C,D)	Mu:	1.5	---	---	2.5	---
Vibration (2) Rp=2000; Ec=-7Vdc (Note D) Rk=0, F=50-500 cps. G=2.5	Ep:	---	---	---	500	mVac
Plate Current (2) Eb=250Vdc; Ec=-200Vdc (Notes B,C)	Ib:	---	---	---	10	mAdc

### SPECIAL TESTS AND RATINGS TO INSURE RELIABILITY.

Randomly selected statistical samples are subjected to the following tests:

- Shock Test -** 450G. 30° hammer angle in Navy high impact shock machine. Sample subjected to twenty impact accelerations, five impact accelerations in each of four different positions.
- Fatigue Test -** 2.5G. Sample subjected to vibrational acceleration of 2.5G for 96 hours (32 hours in each of three positions). The sinusoidal vibration is applied at a sweep frequency of 50 to 500 and back to 50 cps. Ef=6.3V, no other voltage applied.
- Heater-Cycling Life Test-** A sample is subjected to 2000 on-off heater cycles at the following conditions. Ef=7.5 V Ehk = 300 Vac and other elements floating. At the conclusion of this test the tubes will not show open heater or cathode circuits, heater-cathode shorts, or heater-cathode leakage current in excess of 50 μAdc.
- Stability Life Test-** Sample is operated for one hour to assure initial electrical stability ( $\Delta I_{Sm} < 10\%$ ). Tubes operated at room temperature ambient with Eb=150; Ehk=300Vac; Rk/k=400.
- Survival Rate Life Test -** Sample is operated one hundred hours to assure electrical stability ( $S_m > 5800 \mu\text{mhos}$ ) and freedom from inoperatives. Tubes are operated at Stability Life Test conditions.
- Intermittent Life Test -** 1000 hours. Sample is operated with minimum Envelope Temperature of 300 °C. Tubes are operated at Stability Life Test conditions.
- Altitude -** Sample is subjected to a pressure of 55±5 mmHg (60,000 ft) at 500 Vac to assure freedom from flashover of corona at the pins of the tube.

### APPLICATION NOTES

**CAUTION - -** To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.



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Note A: Maximum grid circuit resistance:

- (a) 1.0 megohm for Cathode-bias operation.
- (b) 0.1 megohm for fixed bias operation.
- (c) 0.1 megohm for combined fixed and cathode-bias operation.

Note B: Test each unit separately.

Note C: Both units shall be operating.

Note D: Units connected in parallel.

### ACCEPTANCE CRITERIA

The following tests shall be performed:

For the purpose of inspection, use applicable reliable paragraphs of MIL-E-1

For miscellaneous requirements, see Paragraph 3.6.

### TEST CONDITIONS

Heater Voltage	6.3 V
Plate Voltage	135 V <sub>dc</sub>
Grid Voltage	0 V <sub>dc</sub>
Cathode Resistance (per cathode)	250 Ω

Ref.	Test	Conditions	AQL (Percent Defective)	Inspection Level or Code	Symbol	LIMITS (See Note 4)						Units
						Min.	LAL	Bogie	UAL	Max	ALD	
<b>QUALIFICATION APPROVAL TESTS</b>												
3.1	Qualification Approval:	Required for JAN Marking	---	---								
4.9.4	Base Material:		---	---								
---	Cathode:	Coated Unipotential	---	---								
3.4.3	Base Connections:	B8-98	---	---								
4.9.20.3	Vibration(1):	E <sub>c1</sub> =-7V <sub>dc</sub> ; R <sub>k</sub> =0; R <sub>p</sub> =2000 ohms; Note 2	---	---	Ep:	---	---	---	500	---		mVac
<b>MEASUREMENTS ACCEPTANCE TESTS, PART 1, NOTE 3</b>												
4.10.8	Heater Current:		0.65	II	If:	2.35	---	---	---	2.65	---	A
4.10.15	Heater-Cathode Leakage:	Note 1 E <sub>hk</sub> =+450V <sub>dc</sub> E <sub>hk</sub> =-450V <sub>dc</sub>	.65	II	lhk: lhk:	---	---	---	---	25 25	---	μA <sub>dc</sub> μA <sub>dc</sub>
4.10.6.1	†Grid Current:	R <sub>g</sub> =1.0 Meg; R <sub>k</sub> =125 ohms; Note 2	.65	II	lc:	0	---	---	---	-1.0	---	μA <sub>dc</sub>
4.10.4.1	†Plate Current(1):	Notes 1,5	.65	II	lb:	100	---	---	---	150	---	mA <sub>dc</sub>
4.10.4.1	Plate Current(1):	Notes 1,5	---	---	lb:	---	115	125	135	---	25	mA <sub>dc</sub>
4.10.9	Transconductance(1):	Notes 1,5,7	.65	II	Sm:	6000	---	---	---	8200	---	μmhos
4.10.9	Transconductance(1):	Notes 1,5,7	---	---	Sm:	---	6600	7000	7400	---	1000	μmhos
4.7.5	Continuity and Shorts (Inoperatives)		.4	II		---	---	---	---	---	---	
4.9.1	Mechanical	Envelope Outline per Figure 1	---	---		---	---	---	---	---	---	
<b>MEASUREMENTS ACCEPTANCE TESTS, PART 2</b>												
4.8	Insulation of Electrodes:	E <sub>g</sub> -all=-100V <sub>dc</sub> E <sub>p</sub> -all=-300V <sub>dc</sub> Note 1	2.5	L6	R: R:	200 200	---	---	---	---	---	Meg Meg
4.10.9	Transconductance(2):	E <sub>f</sub> =5.7V; Notes 1,5,7	2.5	I	Δ <sub>E<sub>f</sub></sub> Sm:	---	---	---	---	10	---	%
4.9.12.1	Low Pressure Voltage Breakdown:	Pressure=55±5mm Hg.; Voltage=500Vac	6.5	Note 6		---	---	---	---	---	---	



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Ref.	Test	Conditions	AQL (Percent Defective)	Inspection Level or Code	Symbol	LIMITS (See Note 4)						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
<b>MEASUREMENTS ACCEPTANCE TESTS, PART 2 (Cont.)</b>												
4.10.4.1	Plate Current(1) Difference Between Sections:		2.5	I	$\Delta I_b$ :	---	---	---	---	25	---	mAdc
4.10.11.1	Amplification Factor:	Rk=250 ohms; Notes 1,5,7	6.5	Code G	$\mu$ :	1.5	---	---	---	2.5	---	
---	Vibration(2):	Rk=0; Rp=2000; Ec= -7Vdc; F=50-500 cps; G=2.5; Note 19	6.5	Code G	Ep:	---	---	---	---	500	---	mVac
4.10.4.1	Plate Current(2):	Eb=250Vdc; Ec=200 Vdc; Notes 1,5	2.5	I	Ib:	---	---	---	---	10	---	mAdc
<b>DEGRADATION RATE ACCEPTANCE TESTS, NOTE 8</b>												
4.9.20.5	Shock:	Hammer angle =30°; Ehk=+450Vdc; Ec=-7Vdc; Rp=2000 ohms; Rk=0; Note 2	---	---		---	---	---	---	---	---	
---	Fatigue:	F=50-500 cps; G=2.5; Ef=6.3V; no other voltages applied; Note 19, except t=96 hours	6.5	Note 6		---	---	---	---	---	---	
---	Post Shock and Fatigue End Points:	Vibration Heater-Cathode Leakage Ehk=+450Vdc Ehk=-450Vdc Transconductance(1) Grid Current	---	---	Ep: Ihk: Ihk: $\Delta I_{Sm}$ : Ic:	---	---	---	---	500 50 50 10 -1.5	---	mVac $\mu$ Adc $\mu$ Adc % $\mu$ Adc

Ref.	Test	Conditions	AQL (Percent Defective)	Inspection Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					First Sample	Combined Samples		Min	Max	
<b>ACCEPTANCE LIFE TESTS, NOTE 8</b>										
4.11.7	Heater Cycling Life Test:	Ef=7.5V; Ehk=300Vac; Eb=Ec=0; 1 min. on 4 min. off; Note 9	---	---	---	---		---	---	
4.11.4	Heater Cycling Life Test End Points:	Heater-Cathode Leakage Ehk=+450Vdc Ehk=-450Vdc	---	---	---	---	Ihk: Ihk:	---	50 50	$\mu$ Adc $\mu$ Adc
---	Stability Life Test: (1 hour)	Eb=150; Ehk=300Vac; Rk/k=400; TA=Room; Notes 1,10	1.0	Code I	---	---		---	---	
4.11.4	Stability Life Test End Points:	Change in Transconduc- tance(1) of individual tubes	---	---	---	---	$\Delta I_{Sm}$ :	---	10	%
---	Survival Rate Life Tests (100 hours)	Stability Life Test Condi- tions or Equivalent; Notes 11,12	---	II	---	---		---	---	
4.11.4	Survival Rate Life Test End Points:	Continuity and Shorts (Inoperatives) Transconductance(1)	0.65 1.0	---	---	---	Sm:	5800	---	$\mu$ hos
4.11.5	Intermittent Life Test:	Stability Life Test Conditions; T Envelope= 300°C min; Notes 13,14	---	---	---	---		---	---	



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Ref.	Test	Conditions	AQL (Percent Defective)	Inspection Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					First Sample	Combined Samples		Min	Max	
<b>ACCEPTANCE LIFE TESTS, NOTE 8 (Cont.)</b>										
4.11.4	Intermittent Life Test End Points, (1000 hrs)	Notes 15,17 Inoperatives; Note 16 Grid Current Transconductance(2) Heater-Cathode Leakage Ehk=+450Vdc Ehk=-450Vdc Heater Current Change in Transduc- tance(1) of individual tubes Insulation of Electrodes g-all p-all	--- --- --- --- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- --- --- --- ---	1 1 1 1 1 1 1 1 1 1 1	3 3 3 3 3 3 3 3 3 3 3	$I_g$ : $\Delta E_{FSm}$ :  $I_{hk}$ : $I_{hk}$ : $I_f$ : $\Delta_{FSm}$ :  R: R:	--- 0 --- --- --- 2.35 --- 100 100	--- -5 10 25 25 2.75 15 --- ---	$\mu$ Adc %  $\mu$ Adc $\mu$ Adc A %  Meg Meg
4.11.5	Intermittent Life Test: (5000 hour Information)	Note 20	---	---	---	---	---	---	---	---
<b>PACKAGING REQUIREMENTS</b>										
4.9.18.1.1	Container Drop:	(d) Package Group I; Container Size G								

- Note 1: Test each unit separately.
- Note 2: Tie 1k to 2k; 1g to 2g; and 1p to 2p.
- Note 3: 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. MIL-STD-105, Inspection Level II shall apply.
- Note 4: Variables Sampling Procedure:  
See paragraphs 5.3.3 to 5.3.3.4, inclusive, of the Inspection Instructions for Electron Tubes.
- Note 5: Both units shall be operating.
- Note 6: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. When one lot has passed, the 30-day rule shall apply. In the event of lot failure, the lot shall be rejected and the succeeding lots shall be subjected to this test until a lot passes. MIL-STD-105, sample size code letter F shall apply.
- Note 7: Rk bypassed with 1000  $\mu$ f capacitor.
- Note 8: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.
  - 4.9.20.5 Shock
  - 4.9.20.6 Fatigue
  - 4.11.7 Heater-Cycling Life Test
  - 4.11.5 Intermittent Life Test



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### NOTES: (Cont'd)

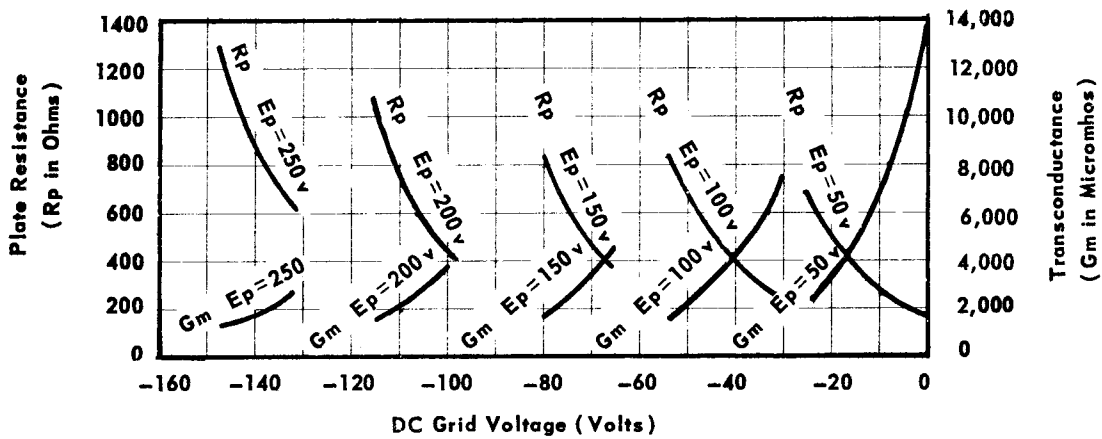
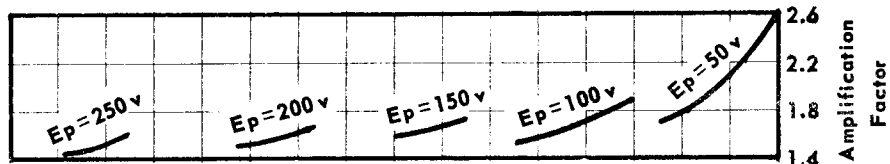
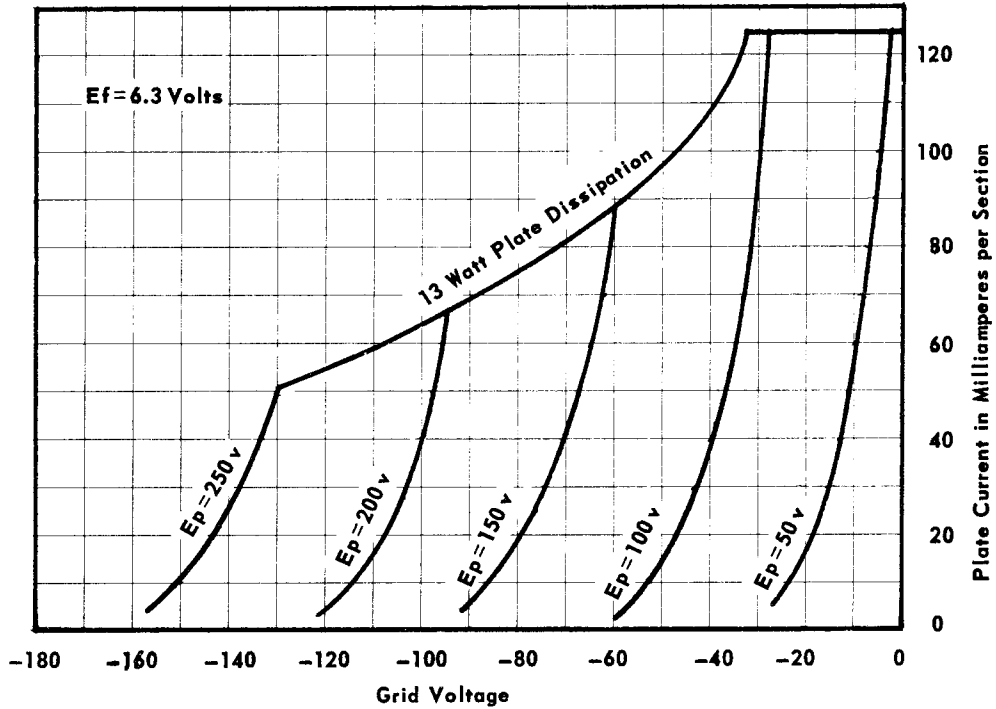
- Note 9: The no-load to steady state full load regulation of the heater voltage supply shall be not more than 3.0 percent. This test shall be made on a lot by lot basis. A failure or defect shall consist of an open heater, open cathode circuit, heater-cathode short, or heater-cathode leakage current in excess of the specified heater cycling life test end point limit.
- Note 10: Stability Life Test: The sampling and testing procedures for this test shall be in accordance with paragraphs 5.3.4.1(a) to 5.3.4.1(g), inclusive, of the Inspection Instructions for Electron Tubes.
- Note 11: SURVIVAL RATE LIFE TEST: The sampling and testing procedures for this test shall be as defined in paragraphs 5.3.4.2 to 5.3.4.2.4, inclusive, of the Inspection Instructions for Electron Tubes.
- Note 12: For Survival Rate Life Test, the equivalent Stability Life Test conditions shall be as defined in paragraph 5.3.4.2.5 of the Inspection Instructions for Electron Tubes.
- Note 13: Intermittent Life Test: Sampling and acceptance procedures for these tubes shall be as defined in paragraphs 5.3.4.3(a) to 5.3.4.3(i), inclusive, of the Inspection Instructions for Electron Tubes, except for the following:
- Under Par. 5.3.4.3 d (2), delete reference to 500 hour requirements.
  - Delete Par. 5.3.4.3. e (1).
  - Add to Par. 5.3.4.3 e (2): "The life test sample meets the 1000 hour life requirements at 500 hours".
  - Under Par. 5.3.4.3 e (3), replace "500 hours" with "1000 hours".
- Note 14: Envelope Temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements placed in contact with the envelope. Envelope Temperature requirement will be satisfied if tube, having bogie 1b ( $\pm 5\%$ ) under normal test conditions, is determined to operate at minimum specified temperature at any position in the life test rack.
- Note 15: Order for Evaluation of Life Test Defects: See Paragraph 5.3.4.4 of the Inspection Instructions for Electron Tubes.
- Note 16: An inoperative as referenced in Life Test is defined as a tube having one (1) or more of the following defects: discontinuity (Ref. MIL-E-1, par. 4.7.1), shorts (Ref. MIL-E-1, par. 4.7.2), air leaks (Ref. MIL-E-1, par. 3.2.4.3).
- Note 17: The total allowable combined defectives for Inoperatives, Grid Current and Transconductance(2) shall be 2 and 5, for first sample and combined samples, respectively. The total allowable combined defectives for Heater-Cathode Leakage, Heater Current, Change in Transconductance(1) of Individual Tubes and Insulation of Electrodes (g-all and p-all), shall be 3 and 6 for first sample and combined samples, respectively.
- Note 18: Maximum grid circuit resistance:
- 1.0 megohm for Cathode-bias operation.
  - 0.1 megohm for fixed bias operation.
  - 0.1 megohm for combined fixed and cathode-bias operation.
- Note 19: Vibration and Fatigue Test Procedure
- This test is to be performed with an average acceleration level equal to the specified value while being swept continuously during a time of approximately one(1) minute through the frequency range of 50 to 500 and back to 50 cycles per second.
  - The total excitation time for the test shall not be less than three (3) minutes. The tubes shall be mounted in each of three planes X-1, X-2 and Y-1 for one third of the total excitation time. In each mounting plane, the tubes shall experience at least one complete frequency sweep.
- Note 20: Ten percent (10%) of the tubes placed on life for the 1000 hour test shall be continued on life until failure or 5000 hours have elapsed for the purpose of data collection to substantiate life expectancy. Five (5) copies of these data shall be forwarded to the Armed Services Electro-Standards Agency, Fort Monmouth, New Jersey, for information and evaluation.



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TRANSFER CHARACTERISTICS FOR EACH TRIODE SECTION





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## RELIABLE TWIN POWER TRIODE

### PLATE CHARACTERISTICS FOR EACH TRIODE SECTION

