

# ML-7209

## UHF Planar Triode

4.5 kw Pulse Power

2.2 kw RF Pulse Power



ELECTRON TUBE SPECIALIST

### DESCRIPTION

The ML-7209 is a high- $\mu$  triode of the planar-electrode type designed for use as a grid- or plate-pulsed oscillator, switch tube, or frequency multiplier at frequencies up to 3 Gc. Features include low interelectrode capacitances, high transconductance and great mechanical strength. Lead inductances and rf losses are minimized by a compact, rugged coaxial con-

struction, making the tube ideally suited to cavity type circuits as well as for parallel line operation. The cathode is an indirectly-heated, oxide-coated disc. The anode is forced-air cooled. The ML-7209 is a direct replacement for the ML-381 but is constructed to withstand more severe conditions of shock and vibration.

### GENERAL CHARACTERISTICS

#### Electrical

Heater Voltage, AC or DC (See "Application Notes") .....	6.0 $\pm$ 5 %	V
Heater Current at 6.0 Volts .....	1.0	A
Heater Heating Time, minimum .....	60	sec
Amplification Factor, Cutoff .....	60	
Amplification Factor, Dynamic .....	100	
Transconductance ( $I_b = 70$ mA, $E_b = 600$ V) .....	25000	$\mu$ mhos
Interelectrode Capacitances, without Heater Voltage		
Grid-Plate .....	2.01	pf
Grid-Cathode .....	6.60	pf
Plate-Cathode, maximum .....	.035	pf

#### Mechanical

Mounting Position .....	Optional	
Type of Cooling .....	Forced-air	
Maximum Anode Temperature .....	200	$^{\circ}$ C
Net Weight .....	2 $\frac{1}{4}$	oz

**MAXIMUM RATINGS****AND TYPICAL OPERATING CONDITIONS****Grid-Pulsed or Plate-Pulsed RF Oscillator and Amplifier — Class C**

## Maximum Ratings, Absolute Values

Frequency .....	3 Gc
Plate Voltage	
Grid-Pulsed, DC .....	1.5 kV
Plate-Pulsed, Peak Pulse Supply .....	3.5 kv
DC Grid Voltage .....	-150 V
Instantaneous Peak Grid-Cathode Voltage	
Grid negative to cathode .....	-750 v
Grid positive to cathode .....	250 v
Average Plate Current .....	10 mA
Average Grid Current .....	5 mA
Peak Plate Current .....	3 a
Average Plate Dissipation (Forced-Air Cooling) .....	35 W
Average Grid Dissipation .....	2 W
Pulse Duration .....	5 $\mu$ s†
Duty Factor .....	.0033 †

## Typical Operation, Plate-Pulsed RF Oscillator

Frequency .....	2.5 Gc
Filament Voltage .....	5.8 V
Pulse Duration .....	5 $\mu$ s
Duty Factor .....	.0030
Pulse Repetition Rate .....	660 pps
Peak Plate Pulse Supply Voltage .....	3.5 kv
DC Grid Voltage .....	-100 V
Peak RF Plate Voltage .....	2.5 kv
Peak RF Grid Voltage .....	340 v
Peak Plate Current from Pulse Supply .....	3 a
Average Plate Current .....	9 mA
Average Grid Current .....	3 mA
Driving Power During Pulse, approximate .....	450 w
Useful Peak Power Output, approximate .....	2.2 kw

**Pulse Modulator or Pulse Amplifier**

## Maximum Ratings, Absolute Values

DC Plate Voltage .....	1.5 kV
Peak Plate Voltage .....	1.8 kv
DC Grid Voltage .....	-150 V
Instantaneous Peak Grid-Cathode Voltage	
Grid negative to cathode .....	-750 v
Grid positive to cathode .....	250 v
DC Plate Current .....	100 mA
Pulse Cathode Current .....	4.8 a
Average Plate Dissipation (Forced-Air Cooling) .....	100 W
Average Grid Dissipation .....	1.5 W
Pulse Duration .....	5 $\mu$ s†
Duty Factor .....	.0033 †

**Frequency Doubler — Class C Telegraphy**

## Maximum Ratings, Absolute Values

Frequency .....	3 Gc
Peak Plate Pulse Supply Voltage .....	3.5 kv
Grid Bias Voltage (from cathode resistor) .....	-200 v
Instantaneous Peak Grid-Cathode Voltage	
Grid negative to cathode .....	-750 v
Grid positive to cathode .....	250 v
Peak Cathode Current .....	3 a
Average Plate Current .....	6.5 mA
Average Grid Current .....	2 mA
Average Plate Input .....	25 W
Average Plate Dissipation (Forced-Air Cooling) .....	25 W
Average Grid Dissipation .....	1 W
Pulse Duration .....	5 $\mu$ s†
Duty Factor .....	.0033 †

## Typical Operation, Frequency Doubler

Frequency .....	.6 to 1.2 Gc
Filament Voltage .....	5.5 V
Pulse Duration .....	3 $\mu$ s
Duty Factor .....	.0030
Peak Plate Pulse Supply Voltage .....	3.5 kv
Grid Bias Voltage (from cathode resistor) .....	-190 V
Cathode Resistor .....	160 ohms
Peak Plate Current .....	1.2 a
Average Plate Dissipation .....	9 W
Driving Power During Pulse, approximate .....	600 w
Useful Power Output at Peak of Pulse, approx. .....	1.2 kw

†For applications requiring longer pulse duration or higher duty factors, consult the Machlett Engineering Department

**CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN**

	Min.	Max.	
Filament Current at 6.0 volts (Note 1) .....	0.90	1.05	A
Plate Current (Note 2) .....	60	95	mAdc
Cut-off Bias (Note 3) .....	—	-15	Vdc
Transconductance .....	20,000	30,000	$\mu$ mhos
Grid-Plate Capacitance (Note 4) .....	1.86	2.16	pf
Grid-Cathode Capacitance (Note 4) .....	5.60	7.00	pf
Plate-Cathode Capacitance (Note 4) .....	—	.035	pf
Plate Tuning Range (Note 5) .....	1.98	2.02	Gc

Note 1 — For reduced filament voltage see "Heater Voltage" section under "Application Notes".

Note 2 — Measure at a plate voltage of 600 volts and a cathode-bias resistor of 30 ohms.

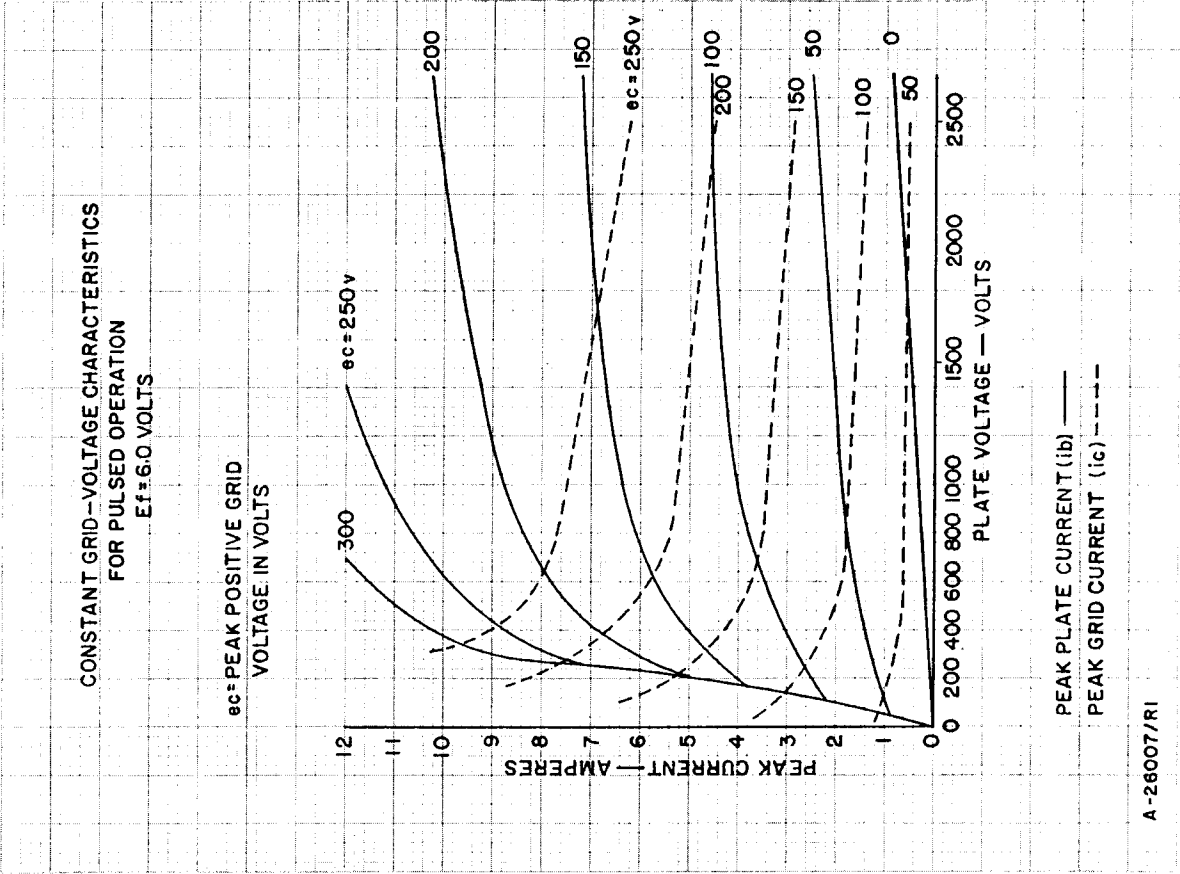
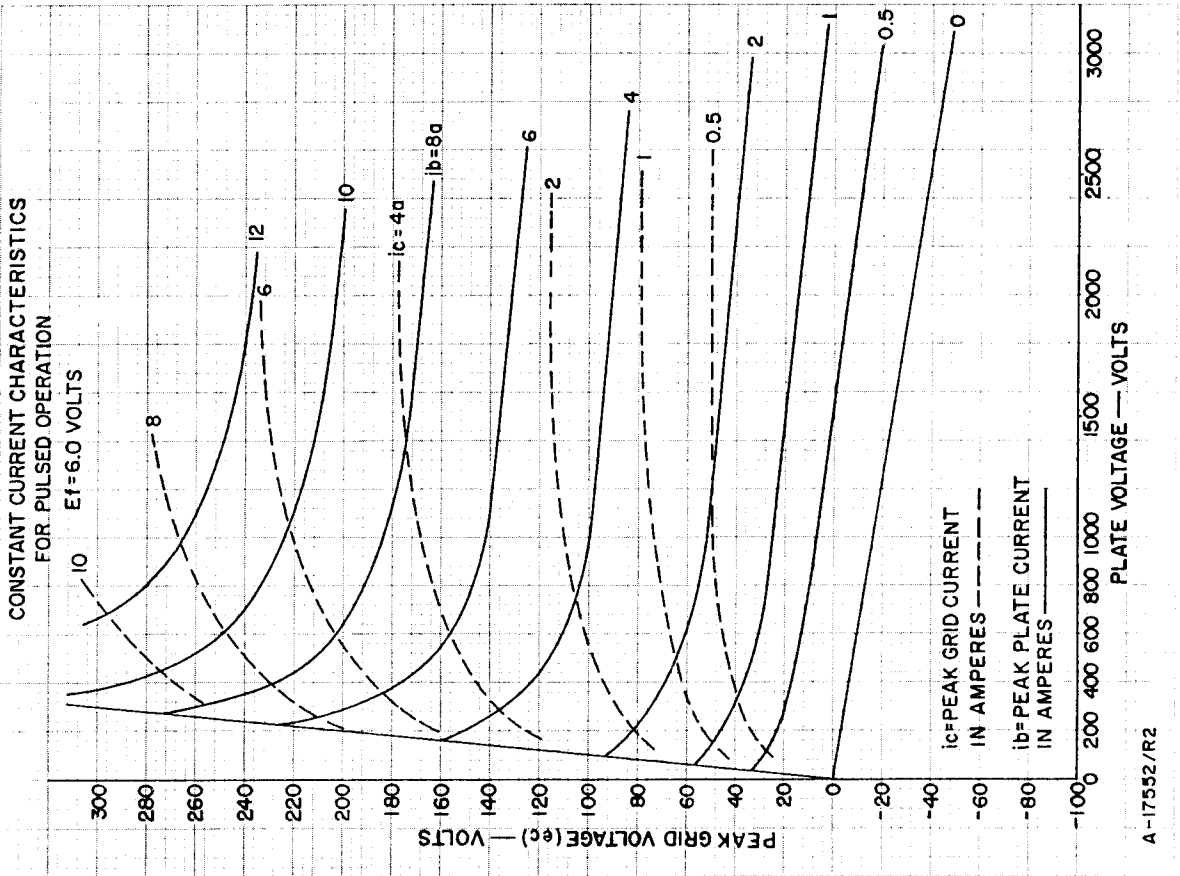
Note 3 — Measured at 1 mA of plate current and a plate voltage of 600 volts.

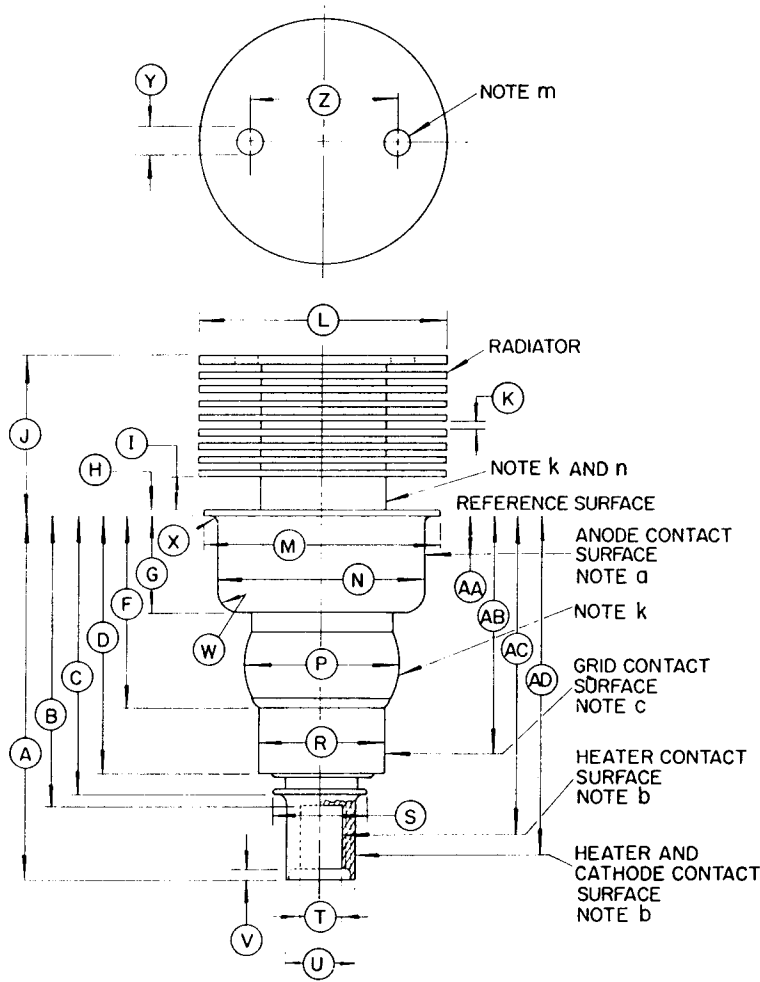
Note 4 — Capacitance measurements are with the tube cold. When the filament is heated to proper operating temperature the grid-cathode capacitance will increase by about 1 pf due to thermal expansion of the cathode.

Note 5 — With a plate-grid coaxial cavity of fixed dimensions, all tubes will resonate within the specified frequency range.

**APPLICATION NOTES**

Before designing equipment for use with these tubes and before installing tubes in equipment, refer to the general information given in the Machlett publication entitled *Application Notes, UHF Tubes — General*.





DIMENSIONS FOR OUTLINE (INCHES)

Ref.	Minimum	Maximum
A	1.815	1.875
B	—	1.534
C	—	1.475
D	1.289	1.329
F	—	.980
G	.462	.477
H	—	.040
I	.125	.185
J	.766	.826
K	.025	.046
L	1.234	1.264
M	1.180	1.195
N	1.025	1.035
P	—	.812
R	.655	.665
S	—	.545
T	.213	.223
U	.315	.325
V	—	.086
W	—	.100
X	—	.035
Y	.105	.145
Z	.650	.850

NOTES

- a. The total indicated runout of the anode contact surface with respect to the cathode contact surface will not exceed .020 inch.
- b. The total indicated runout of the cathode contact surface with respect to the heater contact surface will not exceed .012 inch.
- c. The total indicated runout of the grid contact surface with respect to the cathode contact surface will not exceed .020 inch.
- k. Do not clamp or locate on this surface.
- m. Hole provided for tube extractor through top fin only.
- n. Measure anode shank temperature here.

DIMENSIONS FOR ELECTRODE CONTACT AREA (INCHES)

Ref.	Dimensions	Contact
AA	0.198 ± 0.163	Anode
AB	1.225 ± .040	Grid
AC	1.631 ± .097	Heater
AD	1.645 ± .170	Cathode

DIMENSIONS—ML-7209

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