

The Toshiba 7390 is a hydrogen thyatron for switching service in radar modulators and in other pulse applications.

The ceramic seals and external-anode design provide the cooling capacity required for the high average current and power ratings. A hydrogen reservoir assures freedom from failure due to gas clean-up.

The tube ratings make it especially suitable for pulsing magnetrons and other high frequency oscillators with power inputs up to 33 MW peak and 40 kW average.

### GENERAL DATA

ELECTRICAL:	Minimum	Bogie	Maximum	
Cathode — Indirectly Heated Cathode Tied to Heater Midpoint.				
Heater Voltage <sup>(1)</sup> .....	6.0	6.3	6.6	V
Heater Current, Ef=6.3V .....	22	-	35	A
Heater Reservoir Voltage <sup>(1)</sup> <sup>(2)</sup> .....	3.5	-	5.5	V
Heater Reservoir Current, Eres=4.5V..	8	-	10	A
Cathode and Reservoir Heating Time ..	900	-	-	sec
Anode Voltage drop .....	-	300	-	V
Anode Delay Time .....	-	-	1.0	μs
Anode Current Time Jitter .....	-	-	0.01	μs

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\* The information contained herein may be changed without prior notice. It is therefore advisable to contact TOSHIBA before proceeding with the design of equipment incorporating this product.

## MECHANICAL

Mounting Position .....	Vertical, Base down
Dimensions .....	See Outline Drawing
Cooling <sup>(3)</sup> .....	Convection
Base .....	See Outline Drawing
Net Weight, approximate .....	3500 g

## RATINGS

## ABSOLUTE MAXIMUM;

Maximum Peak Anode Voltage;<sup>(4)</sup>

Inverse .....	33000	V
Forward .....	33000	V
Minimum Supply Voltage .....	3500	Vdc
Maximum Negative Control Grid Voltage .....	650	V
(Before Conduction)		

## Maximum Anode Current

Peak .....	2000	A
Average .....	4	Adc
RMS <sup>(5)</sup> .....	60	A
Duration .....	6	$\mu$ s
Rate of Rise .....	10000	A/ $\mu$ s
Anode Dissipation Factor <sup>(6)</sup> .....	$30 \times 10^9$	-
Ambient Temperature .....	-55 ~ +75	$^{\circ}$ C
Altitude .....	3000	m

GRID DRIVE; <sup>(7)</sup>

Peak Grid Trigger Voltage .....	1300 ~ 2500	V
Minimum Grid Pulse Duration .....	20	$\mu$ s
Maximum Rise Time .....	0.35	$\mu$ s
Grid Drive Impedance .....	10 ~ 25	$\Omega$

- Note (1) Stand-by operation with heater and reservoir voltages is not recommended. Where necessary, the tube should be operated at full equipment conditions for a minimum of two hours during each twelve-hour period of stand-by.
- (2) Reservoir voltage is marked on the base of each tube. This is the appropriate voltage for one typical operation. This value may be used initially in new application, however, it should be adjusted to the optimum value on either side of this voltage. Excess reservoir voltage will result in a failure of the thyratron to deionize between pulses. Insufficient reservoir voltage will result in excessive anode dissipation as indicated by heating of the anode and by jitter and other erratic firing characteristics as viewed on an oscilloscope.
- (3) Cooling air blast about 18 cfm should be directed on the anode and upper portions of the tube envelope. The bulb or anode temperature should not exceed 225 °C.
- (4) Instantaneous starting is not recommended. However, in case where it is necessary to apply anode voltage instantaneously, the maximum permissible forward starting voltage is 22,000 volts peak. The power-supply filter should be designed to limit the rate of application of this voltage to 550,000 volts per second. The minimum inverse anode voltage permissible is 5 percent of the peak forward voltage and the maximum is 5000 volts during the first 25 microseconds following the anode pulse exclusive of a spike of 0.05 microsecond maximum duration.

Note (5) The root mean square anode current shall be computed as the square root of the product of peak current (ib) and the average current (Ib), i.e.

$$I_{rms} = \sqrt{ib \times Ib}$$

- (6) Anode dissipation factor is  $p_b = e_{py}$  (peak forward anode voltage)  $\times ib$  (peak anode current)  $\times prr$  (pulse repetition rate).
- (7) Driver pulse measured at tube socket; time of rise measured from 26 percent to 70 percent of peak value; pulse duration measured between 70 percent of peak on rising side and 70 percent of peak on falling side.

## GENERAL OPERATIONAL RECOMMENDATION

### 1. High Voltage

Operating voltages for power tubes range from several hundred volts to higher than 50,000 volts. Since these voltage can be deadly, equipment must be designed so that one can not come in contact with high voltage.

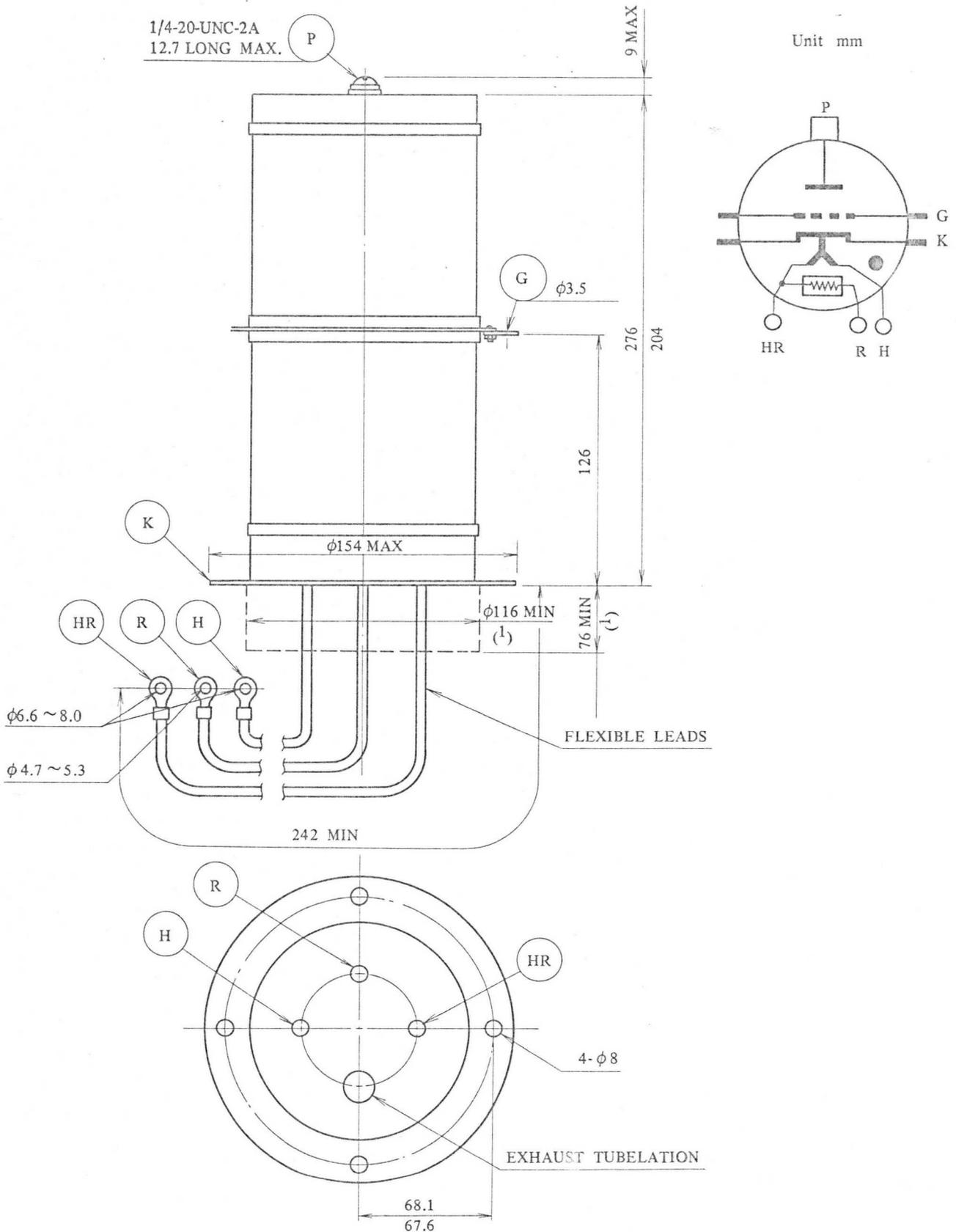
### 2. X-RAY Radiation

High-vacuum tubes operating at voltage higher than 10 kilovolts produce progressively more dangerous X-ray radiation as the voltage is increased. X-ray shielding must be provided on all sides of tubes which operate above 10 kilovolts, to provide adequate protection through the tube's life. If there is any doubt as to the adequacy of shielding, an expert in this field should be contacted to perform an X-ray survey of the equipment.

### 3. High Temperature

Don't come in contact with the vacuum tubes, not only the period of the operation but also immediately after the removal of all tube voltages, because the temperature of the tube during the operation often exceeds 200°C.

7390 OUTLINE DRAWING



Note (1) Provide clearance in equipment for profile indicated by dotted lines.