E2V Technologies
MG5424
X-Band Magnetron

The data should be read in conjunction with the Magnetron Preamble.

DESCRIPTION

Compact, rugged, lightweight, fixed frequency pulse magnetron, electrically the same as M5187.

GENERAL DATA

Electrical

Operating frequency	9410 ± 30	MHz
Typical peak output power	25	kW
Cathode	indirectly heated	
Heater voltage (see note 1)	6.3	V
Heater current at 6.3 V (see note 2)	0.5	A
Cathode pre-heating time (minimum) (see note 3)	60	s
Input capacitance	9.0	pF max
Temperature coefficient of frequency	see note 4	

Mechanical

Output	no. 16 waveguide (22.86 x 10.16 mm internal)
Overall dimensions	see outline
Net weight	0.7 kg approx
Mounting position	any
Magnet	integral

A minimum clearance of 25 mm must be maintained between the magnetron and any magnetic materials.

Coupler	IEC UBR100
Cooling	natural

MAXIMUM AND MINIMUM RATINGS
(Absolute values)

These ratings cannot necessarily be used simultaneously, and no individual rating should be exceeded.

	Min	Max	
Heater voltage (see note 1)	5.7	6.9	V
Heater starting current (peak)	–	3.0	A
Anode voltage (peak)	–	8.6	kV
Anode current (peak)	5.0	10	A
Input power (mean) (see note 5)	–	100	W
Pulse duration	–	2.0	μs
Rate of rise of voltage pulse (see notes 6 and 7)	–	150	kV/μs
VSWR at the output coupler	–	1.5:1	
Anode temperature	–	120	°C

TYPICAL OPERATION

Operating Conditions

Heater voltage (for operation)	6.3	V
Anode current (peak)	8.0	A
Pulse duration	0.8	μs
Pulse repetition rate	900	pps
Rate of rise of voltage pulse	80	kV/μs

Typical Performance

Anode voltage (peak)	8.4	kV
Output power (peak)	25	kW
Output power (mean)	18	W

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TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification.

Test Conditions

	Oscillation 1	Oscillation 2	
Heater voltage (for test)	6.3	6.3	V
Anode current (mean)	8.0	0.8	mA
Duty cycle	0.001	0.0001	
Pulse duration (see note 8)	1.0	0.05	µs
VSWR at the output coupler	1.15:1	1.15:1	max
Rate of rise of voltage pulse (see note 6):			
using hard tube pulser	150	150	kV/µs min
alternatively using line type pulser	90	90	kV/µs min

Limits

	Min	Max	Min	Max	
Anode voltage (peak)	7.5	8.5	-	-	kV
Output power (mean)	20	-	2.0	-	W
Frequency (see note 9)	9380	9440	-	-	MHz
RF bandwidth at 1/4 power	-	2.5	-	-	MHz
Frequency pulling (VSWR not less than 1.5:1)	-	23	-	-	MHz
Stability (see note 10)	-	0.05	-	-	%

LIFE TEST

The quality of all production is monitored by the random selection of tubes which are then life-tested under Test Conditions Oscillation 1. If the tube is to be operated under conditions other than those specified herein, E2V Technologies should be consulted to verify that the life of the magnetron will not be impaired.

End of Life Criteria (under Test Conditions Oscillation 1)

Anode voltage (peak)	7.3 to 8.7	kV
Output power (mean)	18	W min
RF bandwidth at 1/4 power	5.0	MHz max
Frequency	9380 to 9440	MHz

NOTES

1. For optimum performance a value of 6.3 V is recommended. However, this magnetron will work satisfactorily within the specified limits.

   The magnetron heater must be protected against arcing by the use of a minimum capacitance of 4000 pF shunted across the heater directly at the input terminals; in some cases a capacitance as high as 2 µF may be necessary depending on the equipment design. For further details see the Magnetron Preamble.
2. Measured with heater voltage of 6.3 V and no anode input power, the heater current limits are 0.5 A minimum, 0.6 A maximum.
3. For ambient temperatures above 0 °C. For ambient temperatures between 0 and −55 °C, cathode pre-heating time is 90 seconds minimum.
4. Design test only. The maximum frequency change with anode temperature change (after warming) is −0.25 MHz/°C.
5. The various parameters are related by the following formula:

   $$P_i = i_{apk} \times v_{apk} \times D_u$$

   where Pi = mean input power in watts

   i_{apk} = peak anode current in amperes

   v_{apk} = peak anode voltage in volts

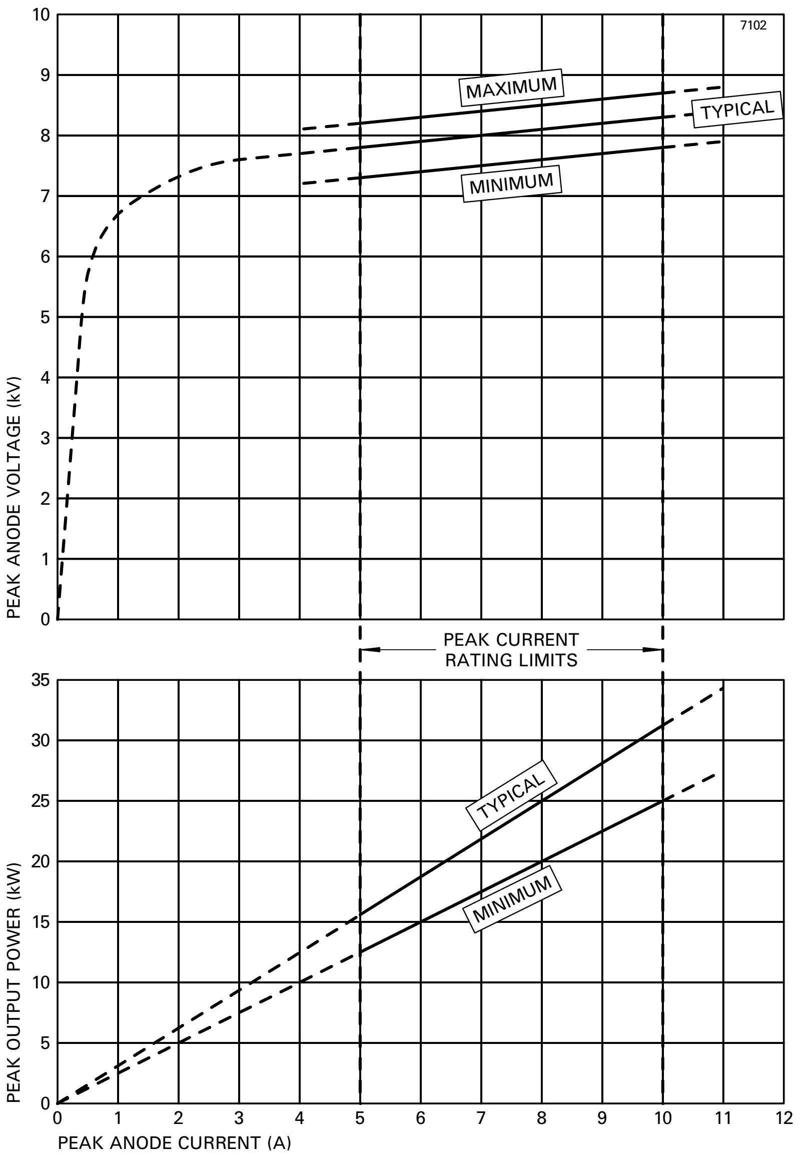
   and Du = duty cycle.

   For mean pulse input power greater than 45 W the heater voltage must be reduced within 3 seconds after the application of HT according to the following schedule:

   $$V_h = 0.08\,(110 - P_i) \text{ volts}$$

   where Pi = mean input power in watts.
6. Defined as the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0 pF.
7. The maximum rate of rise of voltage for stable operation depends upon detailed characteristics of the applied pulse and the pulser design. The specified maximum rating applies to typical hard tube pulsers. For minimum starting jitter and optimum operation, the recommended rate of rise of voltage for most line type pulsers is from 60 to 90 kV/µs.
8. Tolerance ± 10%.
9. Other frequency ranges can be supplied on request.
10. With the magnetron operating into a VSWR of 1.15:1 over a peak anode current range of 6.0 to 10 A. Pulses are defined as missing when the RF energy level is less than 70% of the normal energy level in a 0.5% frequency range. Missing pulses are expressed as a percentage of the number of input pulses applied during a two minute period of observation.
11. Measurements taken 'as read' using suitably calibrated equipment.

PERFORMANCE CHART



HEALTH AND SAFETY HAZARDS

E2V Technologies magnetrons are safe to handle and operate, provided that the relevant precautions stated herein are observed. E2V Technologies does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating E2V Technologies devices and in operating manuals.

High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and other stored charges before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

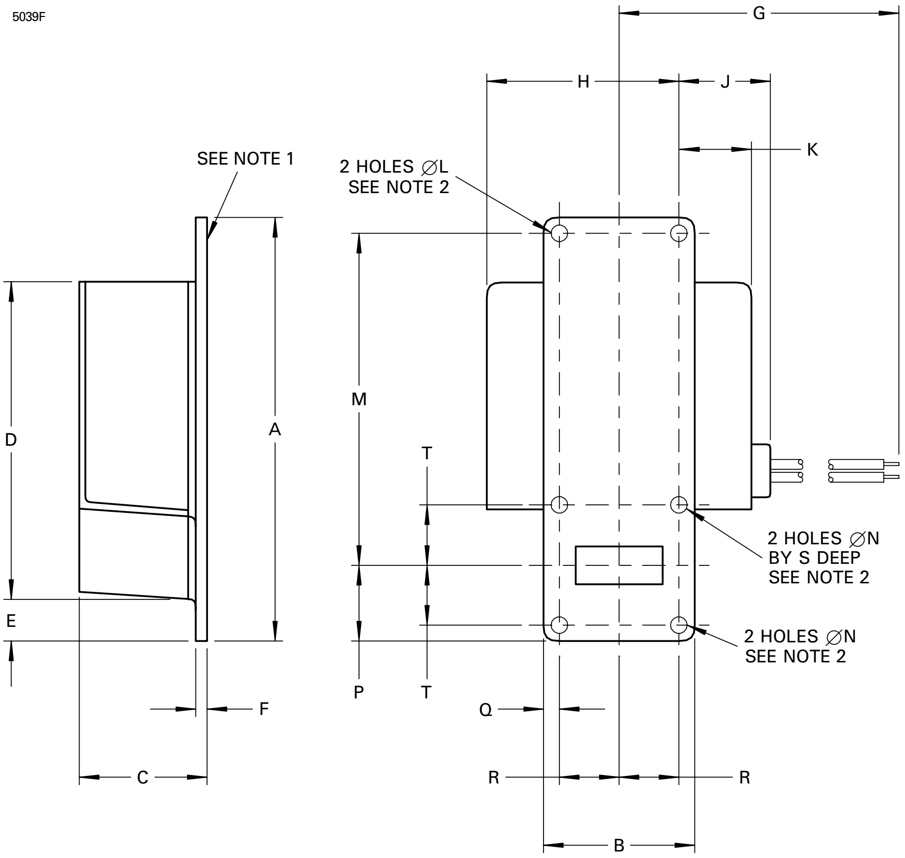
RF Radiation

Personnel must not be exposed to excessive RF radiation. All RF connectors must be correctly fitted before operation so that no leakage of RF energy can occur and the RF output must be coupled efficiently to the load. It is particularly dangerous to look into open waveguide or coaxial feeders while the device is energised. Screening of the cathode sidearm of high power magnetrons may be necessary.

X-Ray Radiation

High voltage magnetrons emit a significant intensity of X-rays not only from the cathode sidearm but also from the output waveguide. These rays can constitute a health hazard unless adequate shielding for X-ray radiation is provided. This is a characteristic of all magnetrons and the X-rays emitted correspond to a voltage much higher than that of the anode.

OUTLINE
(All dimensions without limits are nominal)



Ref	Millimetres
A	113.0 max
B	41.53 max
C	36.0 max
D	86.0 max
E	10.0 min
F	3.33 max
G	240.0 min
H	52.5 max
J	30.0 max
K	21.5 max
L	4.52 max 4.37 min
M	87.95
N	4.39 max 4.24 min
P	20.2 max
Q	5.15 ± 0.10
R	15.5
S	5.00 min
T	16.26

Lead Connections

Colour	Element
Green	Heater
Yellow	Heater, cathode

Outline Notes

1. The mating surface of the magnetron baseplate will be flat to within 0.20 mm.
2. Positional tolerance of holes ±0.2 mm with respect to waveguide aperture.