

E2V Technologies

MG5223F

S-Band Magnetron

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

ABRIDGED DATA

Fixed frequency pulse magnetron.

Operating frequency 3050 ± 10 MHz
 Typical peak output power 30 kW
 Magnet integral
 Output no. 10 waveguide
 Coupler mates with NATO S.N. 5985-99-083-0058
 Cooling natural or forced-air

GENERAL DATA

Electrical

Cathode indirectly heated
 Heater voltage (see note 1) 6.3 V
 Heater current at 6.3 V 1.25 A
 Heater starting current, peak value,
 not to be exceeded 6.0 A max
 Cathode pre-heating time (minimum) 180 s

Mechanical

Overall dimensions see outline
 Net weight 2.1 kg approx
 Mounting position any
 A minimum clearance of 50 mm must be maintained between
 the magnetron and any magnetic materials.

Cooling (see note 2) natural or forced-air

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)	-	6.0	A
Anode voltage (peak)	7.5	8.5	kV
Anode current (peak)	6.0	12	A
Anode input power (mean) (see note 3)	-	100	W
Duty cycle	-	0.001	
Pulse duration	-	1.2	µs
Rate of rise of voltage pulse (see note 4)	-	150	kV/µs
VSWR at the output coupler	-	1.5:1	
Anode temperature (see note 2)	-	120	°C



TYPICAL OPERATION

Operating Conditions

	Condition		
	1	2	
Heater voltage	5.3	6.3	V
Anode current (peak)	8.0	8.0	A
Pulse duration	0.55	0.07	µs
Pulse repetition rate	1000	4000	pps
Rate of rise of voltage pulse	150	150	kV/µs

Typical Performance

Anode voltage (peak)	8.0	8.0	kV
Output power (peak)	30	30	kW
Output power (mean)	16.5	8.4	W

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)	5.3	6.3	V
Anode current (mean)	4.4	2.25	mA
Duty cycle	0.00055	0.00028	
Pulse duration (see note 5)	0.55	0.07	μs
VSWR at the output coupler	1.15:1	1.15:1	max
Rate of rise of voltage pulse (see note 4)	150	150	kV/μs

Limits

	Min	Max	Min	Max	
Anode voltage (peak)	7.5	8.5	-	-	kV
Output power (mean)	16.0	-	8.1	-	W
Frequency (see note 6)	3040	3060	-	-	MHz
RF bandwidth at $\frac{1}{4}$ power (see note 7)	-	4.0	-	30	MHz
Frequency pulling (VSWR not less than 1.5:1)	-	13	-	-	MHz
Frequency pushing (see note 7)	-	1.5	-	-	MHz/A
Stability (see note 8)	-	0.5	-	0.5	%
Cold impedance					see note 9
Heater current					see note 10
Temperature coefficient of frequency					see note 11

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)

	Min	Max	
Output power (mean)	13	-	W
RF bandwidth at $\frac{1}{4}$ power (see note 7)	-	4.5	MHz
Frequency	3040	3060	MHz
Stability (see note 8)	-	1.0	%

NOTES

- With no anode input power.
On the application of anode power, the heater voltage must be reduced as follows:

Mean input power (W)	Heater voltage (V _{rms})
less than 25	6.3
25 to 62	5.3
62 to 100	4.5

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.
- The anode temperature must be kept below the limit specified by means of a suitable flow of air over the anode body.

- The various parameters are related by the following formula:

$$P_i = i_{apk} \times V_{apk} \times Du$$

where P_i = mean input power in watts

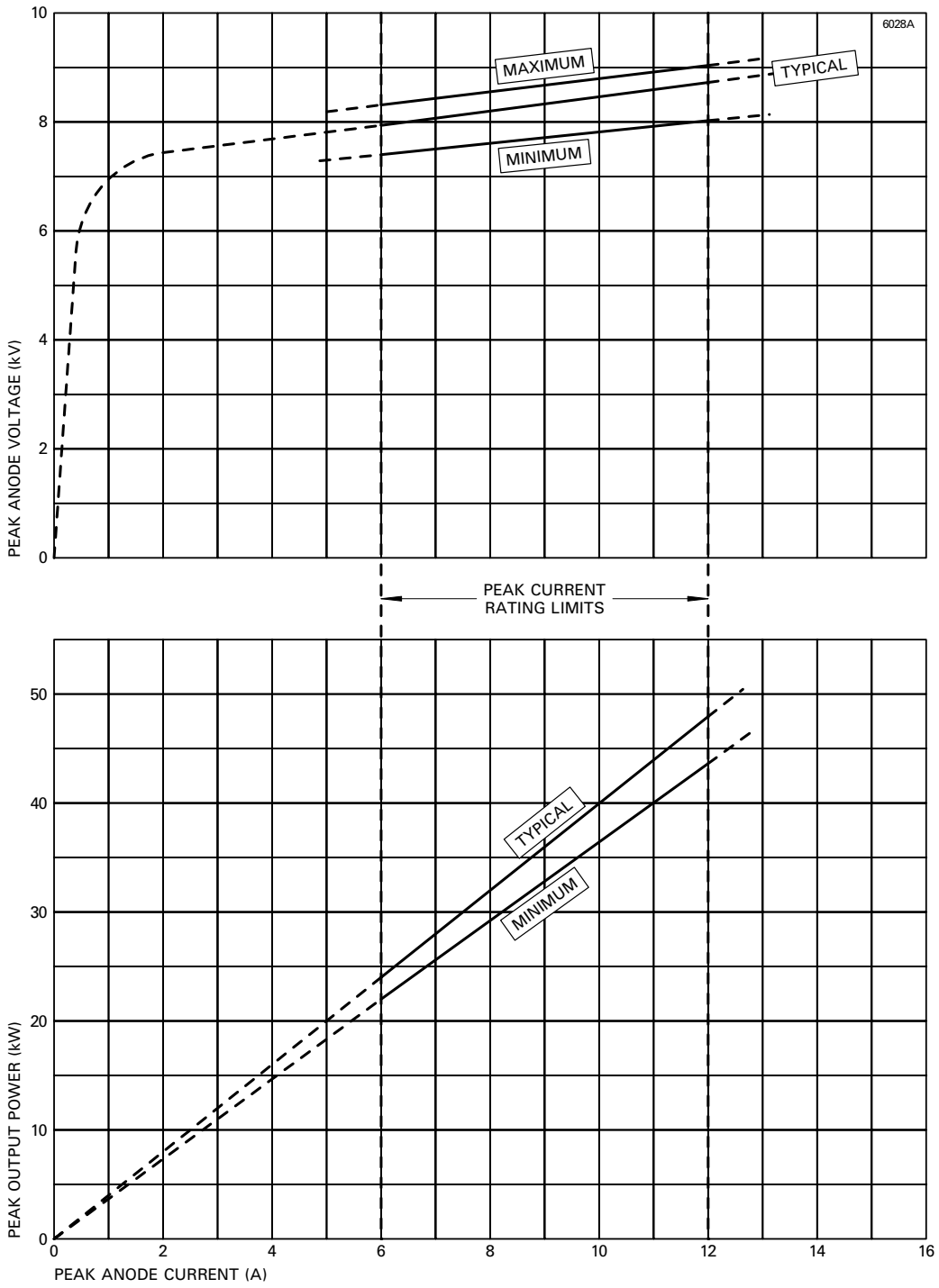
i_{apk} = peak anode current in amperes

V_{apk} = peak anode voltage in volts

and Du = duty cycle.

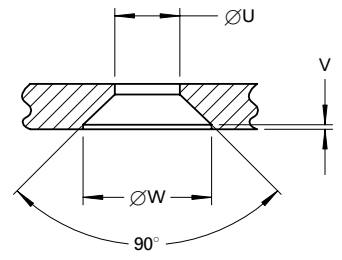
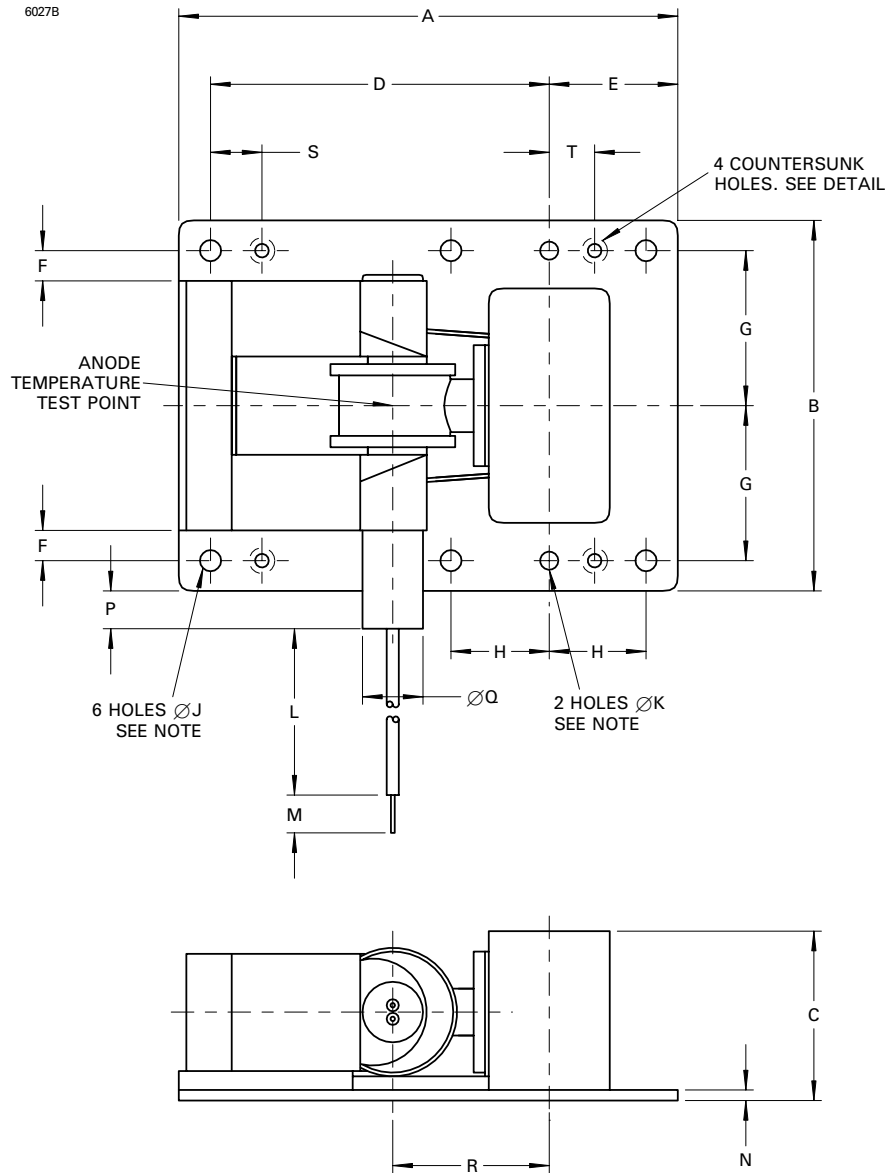
- Defined as the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0 pF. The maximum rate of rise of voltage for stable operation depends upon detailed characteristics of the applied pulse and the pulser design. The specified maximum rating applies to typical hard tube pulsers.
- Tolerance $\pm 10\%$.
- Other frequency ranges can be supplied on request.
- Measured as the peak anode current is varied between 6 and 12 A.
- With the magnetron operating into a VSWR of 1.5:1, phased to give maximum instability. Pulses are defined as missing when the RF energy level is less than 70% of the normal energy level in the frequency range 3040 to 3060 MHz. Missing pulses are expressed as a percentage of the number of input pulses applied during the last minute of a test period not to exceed 5 minutes.
- The impedance of the magnetron measured at the operating frequency when not oscillating will be such as to give a VSWR of at least 10:1, with a voltage minimum 43 to 61 mm from the output flange away from the anode.
- Measured with heater voltage of 6.3 V and no anode input power, the heater current limits are 1.1 A minimum, 1.4 A maximum.
- Design test only. The maximum frequency change with anode temperature change (after warming) is $-0.07 \text{ MHz}/^\circ\text{C}$.
- Measurements taken 'as read' using suitably calibrated equipment.

PERFORMANCE CHART



OUTLINE

(All dimensions without limits are nominal)



Detail of Countersunk Holes

Ref	Millimetres
A	165.1 max
B	123.2 max
C	60.0 max
D	111.13
E	43.69 max
F	11.09
G	51.59
H	32.54
J	7.14 + 0.15 - 0.00
K	6.50 ± 0.05
L	305.0 ± 5.0
M	12.7
N	3.1 min
P	20.0 max
Q	22.0
R	48.0
S	16.0
T	15.0
U	4.25 ± 0.10
V	0.5
W	8.5 ± 0.1

Lead Connections

Colour	Element
Green	Heater
Yellow	Heater, cathode

Outline Note

Positional tolerance of holes 0.4 mm diameter with respect to waveguide.

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.

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