communications
Electron Devices

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M 1021[1]
Description of Operation

The M1021 Microwave Power Module is a fully integrated microwave amplifier. Integral to the M1021 is a Vacuum Power Booster (VPB), a high voltage power supply and a 115 VAC 60 Hz AC to DC converter. The VPB is a high-efficiency mini traveling wave tube, which serves as the microwave amplifier. The high voltage power supply converts the output voltage from the AC to DC converter to the levels required to power the VPB. A logic circuit, built into the high voltage power supply, functions as the user interface of the M1021.

Upon application of prime power (by plugging the M1021 into a 115 VAC 60Hz source) the internal low voltage power supply is enabled and the MPM enters the warm-up state, which lasts approximately two minutes. While in the warm-up state the Warm-Up indicator (pin 11) is active. In this mode the MPM ignores the RF On/Off input command (pin 3).

Once the MPM completes the warm-up cycle, the Warm-up indicator becomes inactive and the MPM reacts to the RF On/Off Input command. Application of a RF On command results in the high voltage being applied to the VPB, turning the VPB on and allowing RF amplification to occur. In this mode the HV On indicator (pin 12) is active. The M1021 has no internal gain equalizer and therefore requires variable drive across the operating band. Generally, input power levels between 18 dBm and 30 dBm, depending upon the frequency of operation, will saturate the VPB. The final test data, supplied with each MPM, defines the drive level versus frequency to reach saturated output power. Drive data is taken every 500 MHz and requires linear interpolation between points. **Do not exceed these drive levels by more than 1 dB.**

When in the fault mode, the High Voltage On indicator is inactive and the Fault indicator (pin 6) is active. For helix over current fault, prime power over current fault and temperature fault, the MPM immediately reverts to the fault state for approximately one second and then automatically recycles back into the state defined by the RF On command. If approximately four successive faults are detected, the MPM latches in the fault state and the unit must be reset to clear the fault. The MPM can be reset by cycling the RF On/Off command from On to Off and then back On. The line voltage fault causes the MPM to remain in the fault mode until the fault disappears.

A helix current monitor (pin 15) is also provided at the MPM interface connector. The helix current monitor is a voltage proportional to the helix current. The helix current of the VPB is sensed through a 200 ohm resistor in the power supply, therefore the scale is .2 volts/mA. Under normal operation the voltage across the resistor should not exceed 2.0 volts.

The M1021 is configured for conduction cooling with baseplate temperatures between -40°C and +55°C. Maintaining a +55°C baseplate will generally require active cooling, such as using a finned-extrusion and forced air cooling. An example fin configuration is .125" wide, .75" long with .2" spacing, covering the entire M1021 baseplate. The fan should be capable of approximately 100 CFM.

[1] This Description of Operation also applies to M1000, M1001, M1020, M1025, M1030, M1040, M1125 and M1021

M1021 - Interface Signals

Input Connector: D-subminiature 15 pin male

Pin Number	Function	Signal Format	Note
1	Spare		
2	Spare		
3	RF On/Off	TTL	Logic 1 = RF On
4	Spare		
5	Spare		
6	Fault Indicator	TTL	Logic 1 = Fault (RF Disabled)
7	+5V, 100mA	Logic Power	
8	Signal Return	Ground	
9	Spare		
10	Spare		
11	Warm-Up Indicator	TTL	Logic 1 = Warmup
12	High Voltage Indicator	TTL	Logic 1 = HV On
13	Spare		
14	Spare		
15	Helix Current Monitor	Analog	200mV = 1mA

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