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Toshiba DEVELOPMENTS FOR SATELLITE COMMUNICATIONS

- HIGH-POWER TRAVELING-WAVE TUBE M7880 FOR SATELLITE COMMUNICATIONS
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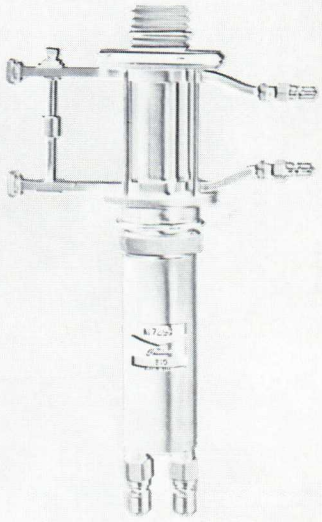
- MILLIMETER-WAVE TRAVELING-WAVE TUBE M3803
- CRYOGENIC CIRCULATOR M5820X
- TOSHIBA EQUIPMENT FOR SATELLITE COMMUNICATIONS EARTH STATIONS



High-Power Traveling-Wave Tube M7880 for Satellite Communications

The TOSHIBA M7880 traveling-wave tube is of the cavity-coupled type for high-power amplification of CW transmissions. Its frequency range is from 5925 MHz to 6425 MHz, and its saturated output is 12 kW. The small signal gain is about 42 dB.

The features of this TWT developed for satellite communications earth stations, are as follows:

1. AM-PM conversion and intermodulation are minimized
2. Stable operation over a wide bandwidth is possible without adjustment
3. Simplified design of power supply due to extremely stable functioning.

M7880

Typical Operation

Frequency Range	5925 to 6425 MHz
Slow Wave Circuit Voltage	19 kV DC
Collector Current	3 A DC
Accelerator Voltage	19 kV DC
Small Signal Gain	40 dB, minimum
Saturated Output	8 kW, minimum

Millimeter-Wave High-Power Traveling-Wave Tube M7894

Because an increasing volume of information must be transmitted by satellite communication systems, the use of millimeter-wave is on the increase. Generation of high-power millimeter-wave is also required in high-density plasma research.

Backed by its experience in high-power micro-wave TWT research and manufacture, TOSHIBA has developed the M7894 traveling-wave tube rated at 300-watt continuous operation in the 30 GHz band.

This tube incorporates a cavity-coupled slow-wave circuit, and has an attenuator for stable operation. Excellent electron beam transmission is obtained by an electromagnet.

M7894

General Specifications

Beam Voltage	15 kV
Beam Current	0.3 A
Beam Focusing	Electromagnet
Frequency Range	28 to 30 GHz
Continuous Power Output	300 watts, minimum
Gain at Rated Power	20 dB, minimum
Cooling	Liquid

Millimeter-Wave Traveling-Wave Tube E3803

The TOSHIBA TWT E3803 is of the helix type, with permanent magnet focusing, for power amplification of CW transmissions. Its frequency range is from 26 GHz to 33 GHz, with saturated power output of about 6 watts, and small signal gain of about 30 dB.

Primarily designed for driving wide-band, high-gain satellite communications output tubes, the E3803 has a helix for its slow-wave circuit. It is also suitable for use as power output tube in millimeter-wave, multi-channel communication systems.

Features:

1. Wide-band, high-gain, high-power operation with relatively low working voltages
2. High strength and durability because of metal-ceramic construction
3. Long life with maximum reliability due to high stability of the electron beam.

Typical Operation

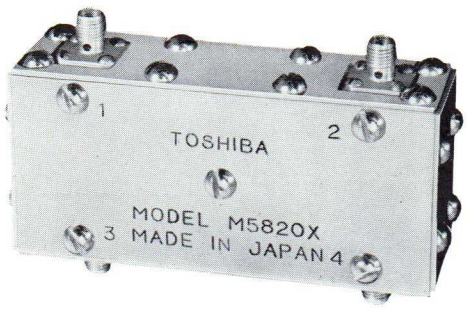
Frequency	28 GHz
Collector Voltage	3000 V DC
Collector Current	20 mA DC
Helix Voltage	3000 V DC
Driving Power	6.3 mW
Power Output	4 watts
Gain	28 dB
Small Signal Gain	30 dB
Saturated Power Output	6 watts

Cryogenic Circulator M5820X

Developed for low-noise cryogenically cooled parametric amplifiers in satellite communications, TOSHIBA's four-port cryogenic circulator functions under a low magnetic biasing field for wide-band operation, and incorporates DC-blocks, integrated non-reciprocal junctions, and magnetic shielding. Because specially developed TOSHIBA garnet is used, its electrical characteristics can be optimized at 4.2°K, 20°K or 77°K.

General Specifications

Frequency Range		3.7 to 4.2 GHz
Isolation	2→1	23 dB, minimum
	3→2	45 dB, minimum
Loss	1→2	0.3 dB, maximum
	2→3	0.6 dB, maximum
VSWR		1.2, maximum
Connector		OSM female
Size		84×40×25 mm
Weight		270 grams



M5820X

Toshiba Equipment for Satellite Communications Earth Stations

TOSHIBA equipment for satellite communication earth stations is installed and in use at the Ibaraki and Yamaguchi Earth Stations of KDD (Japan's satellite communications system). The first America-Japan commercial link by sattellite was established by means of equipment developed for this purpose by TOSHIBA engineers. Notable benefits in efficiency and cost are to be reaped by dependence on a supplier capable of integrating the design of circuitry and components for entire systems.

Of outstanding excellence among the equipment developed by TOSHIBA for satellite communications is its high-power traveling-wave tube M7880 for microwave transmission. This tube has a bandwidth of 600 MHz and a saturated power output of more than 10 kilowatts. A special feature of this tube is its low intermodulation. With two 1-kilowatt carriers being transmitted, intermodulation is less than −25 dB. Because it is sturdily built, there is no need for special safeguards such as the "crowbar" circuit.

Another development of which TOSHIBA is proud is the cryogenically cooled low-noise parametric amplifier. The bandwidth of this amplifier is 550 MHz, and the noise temperature throughout this bandwidth is less than 15°K. The performance of this equipment ranks with the best in the world.

Toshiba

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