

TMD

...the *power* in microwaves!

MPMs (MICROWAVE  
POWER MODULES)



product summary

# MPMs (MICROWAVE POWER MODULES)

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# MPMs (MICROWAVE POWER MODULES)

FOR RADAR, EW AND COMMUNICATIONS/DATALINKS APPLICATIONS

Expertise in both TWT and solid state technology means whatever your needs, we've got them covered!

TMD began developing TWT based MPMs around 15 years ago. Since then we have produced a wide variety of bespoke products. Most recently we have added solid state MPMs to the range, which offer technical advantages for particular specifications and applications.

Each of our TWT based units comprises compact power supply and mini TWT, combined into an ultra-compact, lightweight "drop in" amplifier block. This simplifies system design and installation, increases reliability and minimises safety hazards. The units also feature high electrical efficiency and excellent thermal management. Performance is factory set, removing the need for any user adjustments in the field, and if necessary permitting easy field replacement of the complete unit. The product range covers S to Ka band, and includes CW, pulsed and CW/pulsed units.

Our solid state units incorporate the latest advances in 0.25  $\mu\text{m}$  GaN MMIC technology and low loss power combiners; optimised for EW applications.



Pictured left: Our latest development in solid state microwave technology; the PTS6900 SSPA.

Pictured right: Our ultra-compact and lightweight TWT microwave power module; the PTXM1000.

## Pocket-sized Power aptly describes TMD's MPMs, our newest and neatest range of rugged amplifiers.

The table on page 4 shows a selection of generic products, but don't worry if you can't see exactly what you are looking for – bespoke solutions are available and our Business Development Team is always eager to discuss the ways in which TMD can contribute to new technology areas.

### Brand New Product Developments

The recently developed PTXM range of TWT based MPMs typically has an exceptionally low weight and small size - typically 1.7 kg and 190 x 120 x 30 mm, which has been achieved with no reduction in RF power or reliability! This high power-to-volume feature is the result of superior packaging techniques to efficiently use all available space. These MPMs are particularly suitable for airborne applications or for other situations where space and weight are critical.

Another very important development is our new range of solid state MPMs especially optimised for EW/ECM applications. These units utilise the latest advances in 0.25  $\mu\text{m}$  GaN MMIC Technology and feature a very fast mute time of 1  $\mu\text{s}$ .

More details of both these new developments are given in the following pages.

**For full details of all TMD's products and capabilities, please go to [www.tmd.co.uk](http://www.tmd.co.uk)**

### After sales support

At TMD relationships with our customers do not end when an order is placed. We pride ourselves in our after sales support, through delivery, set up and user testing. We also offer a comprehensive repairs service for our own or other companies' microwave products; contact us at [wecare@tmd.co.uk](mailto:wecare@tmd.co.uk) for an evaluation.

### DID YOU KNOW?

Bespoke products are what TMD does best. This product summary brochure provides a brief insight into just a few of our product ranges. If you don't see exactly what you are looking for, let us know and we'll be happy to work towards a collaborative bespoke solution.



# PTXM ULTRA-COMPACT MODULAR MPMs

The result of many years' experience in the design and manufacture of high frequency, high power TWT based MPMs, the state of the art PTXM Series from TMD offers possibly the highest power density on the market.

By incorporating mini TWTs and employing extremely efficient packaging these ultra-compact units, weighing typically only 1.7 kg, are ideal for airborne radar, EW and communications applications - particularly in UAVs, where low volume and weight are critical considerations. Moreover, the exceptionally low weight and small size (190 x 120 x 30 mm typically) has been achieved with no reduction in RF power or reliability. This high power-to-volume feature is the result of employing superior packaging techniques to efficiently use all available space.

To cover a range of application requirements, TMD is currently offering three PTXM models: namely the PTXM1000, PTXM1001 and PTXM1002, in total covering the frequency band 4.5 to 18 GHz and with output powers from 100 to 140 W.

## **Fully integrated and modular design**

Because of TMD's cost effective fully integrated, modular concept the PTXM units are easier to manufacture and test - offering higher performance, extreme reliability and safe and simple installation at a lower price.

Each PTXM unit integrates a mini TWT and an optimised high density switched mode power supply to produce a single 'drop in' microwave amplifier block. Included are a solid state pre-amplifier and/or lineariser, depending on model or application. Moreover, the system designer's task is made easier by the integration of the TWT and its high voltage power supply – eliminating the TWT interconnect along with associated reliability and safety issues. This integration also allows reduction in system size, simplifying installation.

All units feature excellent thermal management and high electrical efficiency, with minimum cooling required over a wide operating temperature range - significantly contributing to the exceptional reliability.

## **No user adjustments required**

To optimise TWT performance the MPM adjustments are set at the factory. This not only eliminates the need for user adjustment, but also makes any field replacements easier and quicker.

The system designer's task is made easier by the integration of the TWT and its high voltage power supply - eliminating the TWT interconnect along with associated reliability and safety issues.



Pictured below:  
The PTXM1000 ultra compact and lightweight MPM featuring a Ku band (13.75 GHz to 14.5 GHz) TWT capable of providing 110 W across the band.



## To sum up...

The aerospace and defence market continues to demand higher frequency and power at the lowest possible weight and volume. In high power, or high frequency applications tube based solutions still have the advantage. TMD continues to invest in engineering development to remain at the forefront of this technology.

The versatile configuration of the MPMs means that a range of different TWTs can be incorporated, allowing the customer to specify frequency and peak power. The range also covers models with a number of input power supply options including 28 V DC, 270 V DC, or 115 V AC.

A control interface provides remote operation and status monitoring, making available diagnostic outputs for BIT purposes. This allows the operator to identify and resolve issues quickly and efficiently.

## Withstanding the harshest conditions

A fully encapsulated high voltage section allows the PTXM units to operate in the harshest of environments - at high altitudes and humidity, and surviving high levels of vibration and shock. Again, making this product highly suitable for airborne applications.

**For full details of all TMD's products and capabilities, please go to [www.tmd.co.uk](http://www.tmd.co.uk) or email us at [wecare@tmd.co.uk](mailto:wecare@tmd.co.uk)**

# PTS6900 SOLID STATE MPM

The new PTS6900 MPM is a good example of TMD's growing solid state design and manufacturing expertise. Employing the latest advances in 0.25  $\mu\text{m}$  GaN MMIC technology and low loss combiners, this compact, low weight unit covers the 2 to 6 GHz frequency band at 150 W RF output power. It has a gain of 55 db adjustable from 50 to 60 dB, which aids system integration. The PTS6900 is a fully integrated solution optimised for fast integration into EW systems; both airborne and ground based, but is also suitable for other high power microwave applications where volume and weight are critical requirements.

Key markets include; airborne EW/ECM, vehicle based EW applications (including Counter IED) and other applications (including EMC Testing etc) both broad and narrow band in the 2 to 6 GHz range.

The inherent high reliability of the PTS6900 offers a predicted MTBF of over 30,000 hours for an airborne uninhabited fighter environment, at the maximum allowable baseplate temperature. Moreover, the module will survive an infinite output load VSWR at the full rated RF output power, reducing the likelihood of accidental damage.

Also, the new MPM is entirely ITAR free. Since most similar competitor-manufactured units are from the USA, this gives non-US users the significant benefit of an alternative European ITAR-free source.

## Fast RF mute capability

As well as providing an instant start up, the PTS6900 allows the RF output to be muted in less than 1  $\mu\text{s}$  - making it ideal for deception jamming EW applications.

In addition, harmonic performance is -20 dBc maximum, which is much improved over a Helix TWT solution.

## Built-in testing

A comprehensive built-in test capability includes monitoring of the internal DC to DC converters and module baseplate over-temperature. An RF sample output is included to aid testing and integration of the module without the need for an additional output test coupler.

## Mechanical

The PTS6900 is very compact measuring just 325 x 200 x 50mm at 4.5 kg making it suitable for airborne applications.

## Prime Power

The PTS6900 operates from a power supply of +28 V DC (optional +270 V DC) as a standard primary source, with a maximum input power requirement of only 850 W. Efficiency is typically 20% from either +28 V or +270 V prime power input to RF output.

## Environmental

The PTS6900 has a military airborne environmental specification which includes the ability to operate in a condensing humidity environment. Provided that the baseplate hot-spot temperature of +85  $^{\circ}\text{C}$  is not exceeded the module will operate reliably in high ambient temperatures. It offers good gain flatness without the need to incorporate a gain equaliser and is internally temperature compensated to maintain its performance across the whole operating temperature range. The PTS6900 can be supplied with a heatsink, but is not offered as standard so that customers have the option of using their own cooling fixture. To ensure full compliance with the EMC requirements of MIL-STD-461F an internal filter is incorporated on the power supply input, making the use of an external filter unnecessary.

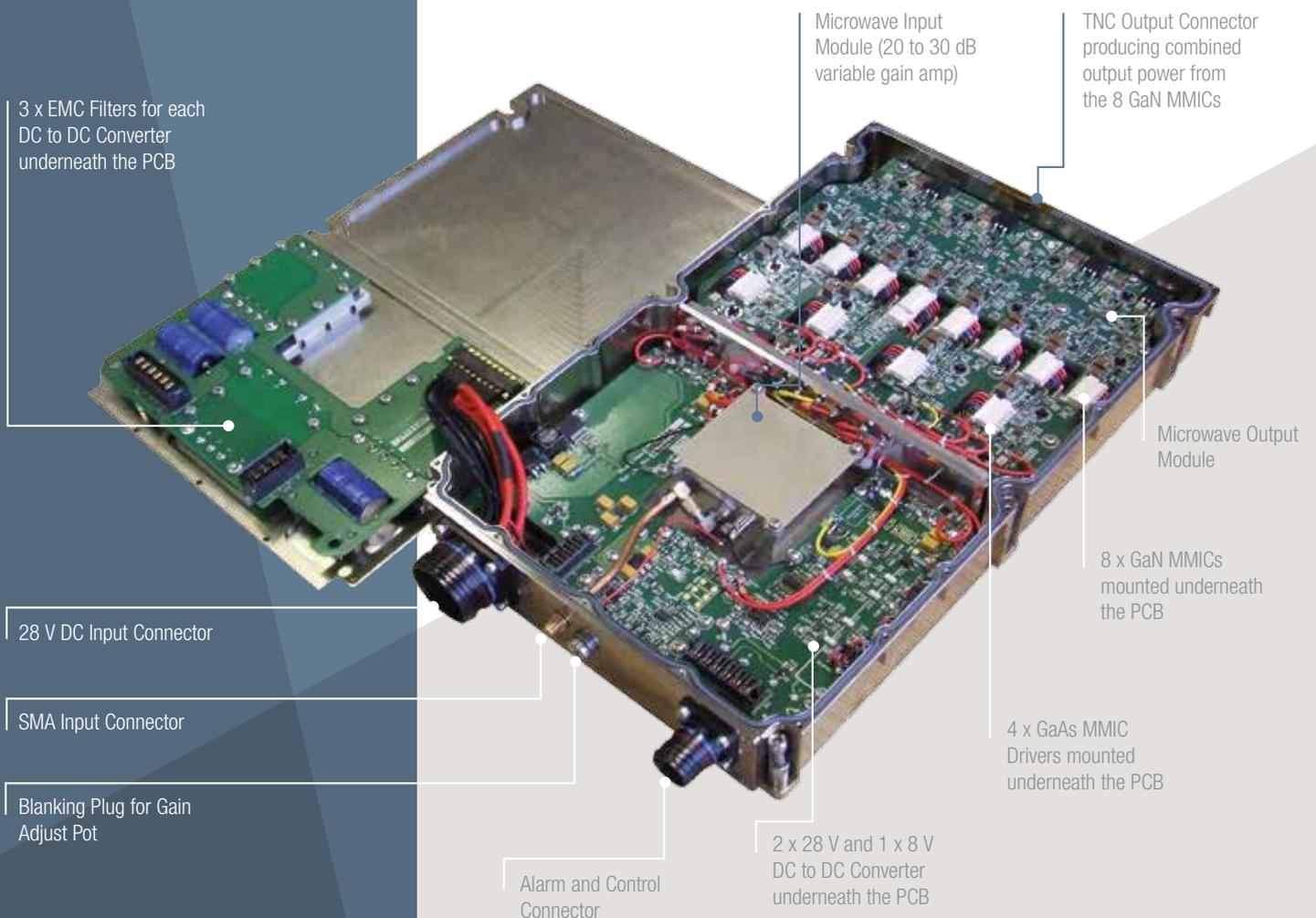


## To sum up...

When comparing the solid state PTS6900 with a tube based solution in the same frequency range, it has the advantages of an instant on time; lower output noise; fast mute time; and will continue to function with inadvertent output mismatches (VSWR) while providing high reliability and a long service life.

The PTS6900 is a fully integrated solution optimised for fast integration into EW systems; both airborne and ground based.

## INTERNAL LAYOUT



# MICROWAVE POWER MODULES (MPMs)

Please note - These tables list just a few of our generic product types. Many other variants are available, so if you don't see exactly what you are looking for, let us know and we'd be happy to work towards a collaborative bespoke solution.

Type Number	Frequency (Lowest) GHz	Frequency (Highest) GHz	Output Power W (RF)	Gain dB	Duty Cycle %	Pulse Length us	Prime Power VDC	Tube/Gun Type	Cooling	Size LxWxH mm	Weight kg	App-lication	Special Features
<b>Ultra Compact Travelling Wave Tube MPMs</b>													
PTXM1052	6	18	100	55	CW/Pulsed	-	270	FE TWT	Cond'n	202.5x120x35	1.95	EW,R	-
PTXM1059	6	18	125 ***	55	CW/Pulsed	-	270	FE TWT	Cond'n	254x135x45.5	2.4	EW,R	-
PTXM1057	7.5	18	140 ***	55	CW/Pulsed	-	270	FE TWT	Cond'n	254x135x45.5	2.4	EW,R	-
PTXM1056	8.5	15	125	55	CW/Pulsed	-	270	FE TWT	Cond'n	202.5x120x35	1.95	EW,R	-
PTXM1000	13.75	14.5	110	53	CW only	-	270	CW TWT**	Cond'n	190x120x30	1.7	C	-
PTXM1058	14.4	18	110	53	CW only	-	270	CW TWT**	Cond'n	202.5x120x35	1.95	C	-
<b>Compact Travelling Wave Tube MPMs</b>													
PTX8110	6	18	200	-	CW/Pulsed	-	270	FE TWT	Cond'n	TBDxTBDxTBD	-	EW,R	-
PTX8511	9	10	2000	58	5	50	28	Grid TWT	Cond'n	350x160x50	4.5	R	-
PTX8400	X Band	-	1000	55	5	100	28	Grid TWT	Cond'n	300x160x50	3.8	R	-
PTX8621	15.5	17.5	600	60	7	50	28	Grid TWT	Cond'n	305x250x80	10	R	Fwd/Rev power protection
<b>Ka Band Compact Travelling Wave Tube MPMs</b>													
PTX8802	30	40	125	21	CW/Pulsed	-	270	Grid TWT	Cond'n	330x165x51	4.5	EW,R	-
PTX8803	30	40	200	55	CW/Pulsed	-	270	Grid TWT	Cond'n	330x165x51	4.5	EW,R	-
PTX8822	30	40	125	21	CW/Pulsed	-	270	Grid TWT	Cond'n	330x190x51	5	EW,R	-
PTX8823	30	40	200	55	CW/Pulsed	-	270	Grid TWT	Cond'n	330x190x51	5	EW,R	-
PTX8807	32	36	200	55	CW/Pulsed	-	270	Grid TWT	Cond'n	450x225x55	6.5	EW,R	-
<b>Solid State MPMs</b>													
PTS6900	2	6	150	50-60*	CW	-	28	-	-	325x200x50	4.5	EW	GaN MMIC. Accepts Mil-STD PSU input
PTS9734	2	6	150	50-60*	CW	-	270	-	-	325x200x50	4.5	EW	GaN MMIC. Accepts Mil-STD PSU input
PTS9800	6	18	-	-	-	-	5	-	-	80x30x9.7	0.05	-	Gain equaliser for broadband TWT amplifiers

EW - Electronic Warfare; R - Radar; FE - Focus Electrode; C - Communications \*user adjustable \*\*no modulator \*\*\* this value achieved over part of the band

<b>Power Converters</b>	
PTM1010	28 to 270 V DC-DC. No EMC filter
PTM1015	28 to 270 V DC-DC. With EMC filter
PTM1020	115 V AC (400 Hz) to 270 V converter. No EMC filter
PTM1025	115 V AC (400 Hz) to 270 V converter. With EMC filter
<b>Control Boxes</b>	
Custom control boxes can be provided for many of TMD's MPMs and rugged amplifiers (datasheet EVD6106 describes the range)	

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