TSG-220 Series

■ Product features and applications

The TSG-224 is a PLL oscillator to generate a wave in a bandwidth of 100–2,500 MHz. The compact and lightweight design makes it suitable as a local signal source to be integrated into a communication device. The TSG-225/235/239 are PLL oscillators for the 6–13 GHz frequency range. Low phase noise is generated by sampling phase detectors. These models serve well as local signal sources in the microwave band.

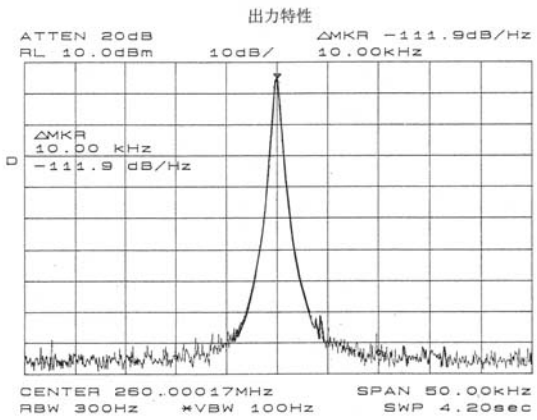
	Common Specifications			
	TSG-224	TSG-225	TSG-235	TSG-239
Output Frequency Range	100～2500	6300～7580	10130～10680	12830～13109
Output Level	＋10dBm±1dB	＋12dBm±2dB		
Frequency Stability	±2.5＊10^{-6}	External 10MHz		
Spurious	60 dBc(Max.)	70 dBc(Max.)		
Harmonics	40 dBc(Max.)	30 dBc(Max.)		
Phase Noise (at 10KHz offset)	95 dBc/Hz (Max.)	100 dBc/Hz (Max.)	97 dBc/Hz (Max.)	
Supply voltage , Consumption current	DC＋15V（±5%）、0.5Amax	DC＋12V（±5%）、0.5Amax		
Reference Frequency	12.8MHz	External 10MHz		
Output Connectors	SMA－J			
Operating Temperature Range	0～＋50℃	－10～＋55℃		
Weight	（160g）	（500g）		

Output frequency becomes onewave specified from the above-mentioned output frequency range.

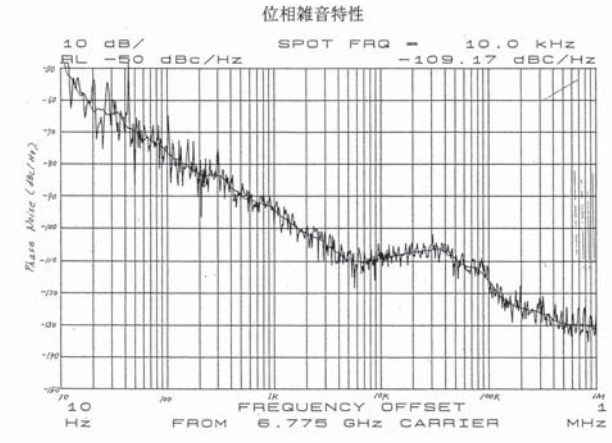
It is preparing external standard signal input and with lock alarm as an option.

■ Phase Noise Characteristics

TSG-224

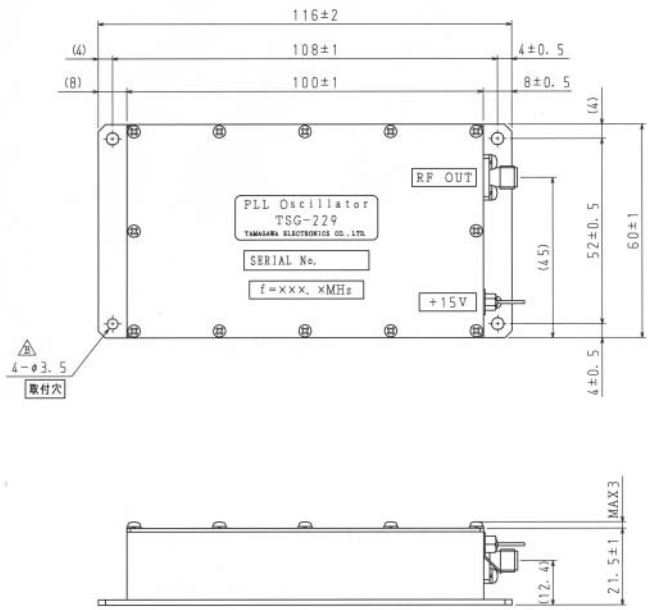


TSG-225

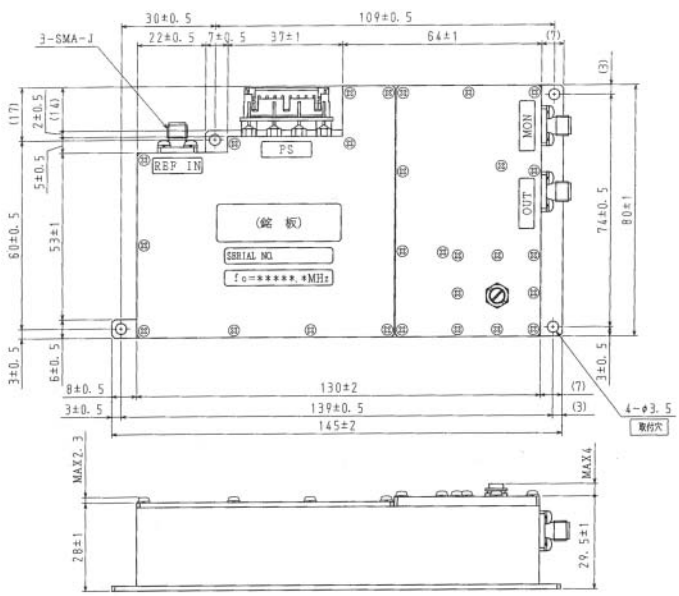


Outline Drawings

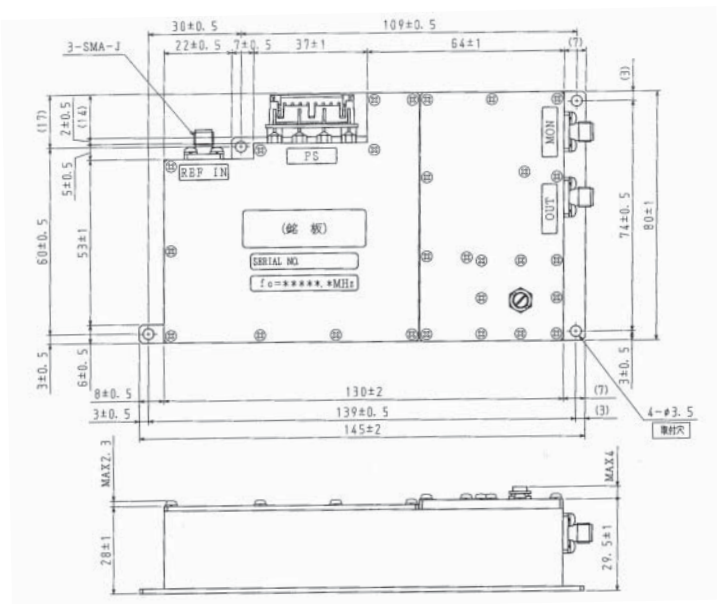
TSG-224



TSG-225/TSG-235



TSG-239



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TSG-250 Series

Product features and applications

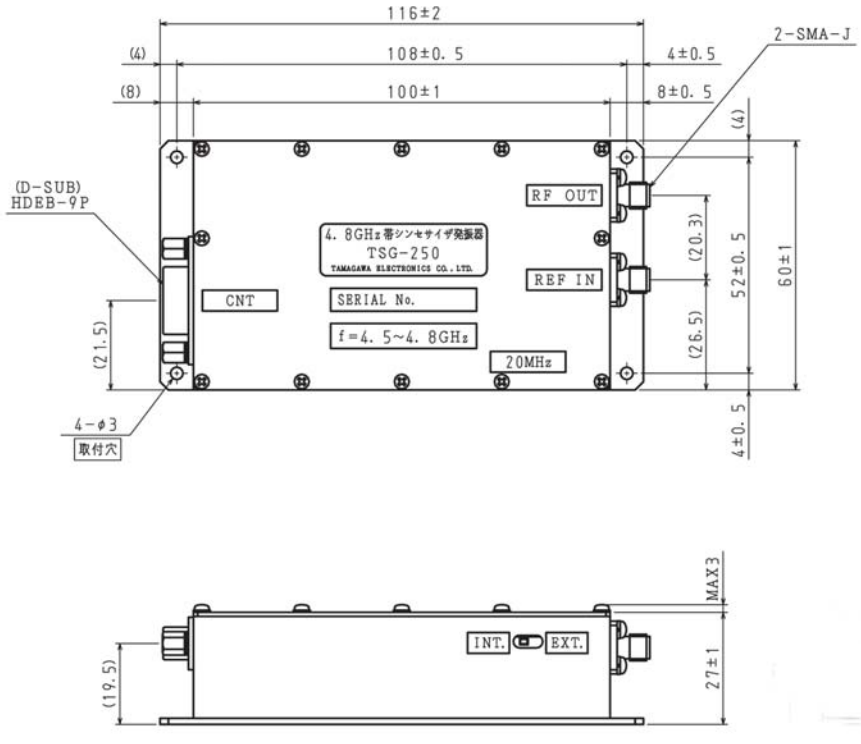
The TSG-250 series are broadband frequency synthesizers covering the 4,500–4,800 MHz frequency range.

The compact and lightweight design is suitable for integration into communication devices.

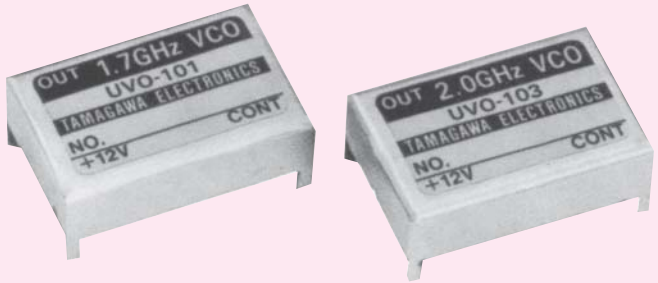
	Standard Specifications		
Output Frequency Range	4500～4800MHz	Switching Speed	100ms(Max.)
Output Level	+10dBm±1.5dB (Max.)	Power supply	+15V±5%
Frequency Stability	±2.5＊10^{-6} (Internal X'tal)	Consumption current	0.5A (Max.)
Spurious	-60dBc (Max.)	Reference Frequency	20MH z
Harmonics	-30dBc (Max.)	External Reference Function	Model lockable to an internal or external reference
Phase Noise	-73dBc/Hz (Max.) 10kHz offset -95dBc/Hz (Max.) 100kHz offset -115dBc/Hz (Max.) 1MHz offset	Dimensions	116 (W) ＊60 (D) ＊27 (H)
Output Impedance	50Ω	Connectors	Output RF and Reference : SMA-J Power supply and frequency control : D-sub 9 pin
Minimum step	1MHz	Weight	500g (Max.)
Frequency setting data	Serial frequency control	Operating Temperature Range	+0℃～+50℃

Outline Drawings

TSG-250



UVO Series



Product features and applications

The UVO-100 series are voltage controlled oscillators (VCO) combining high performance and miniaturized design, and can be mounted on a printed circuit board directly.

A broadband model covering a wide range of variable frequencies, and a narrowband model are available. Both of them are widely used in industry and measurement applications.

note : 1 Desingned 10KHz away from center freqency.
note : 2 Desingned VSWR 2.0 under total phase.
note : 3 Desingned Vcc±0.3V.

Wide range type Standard Specifications

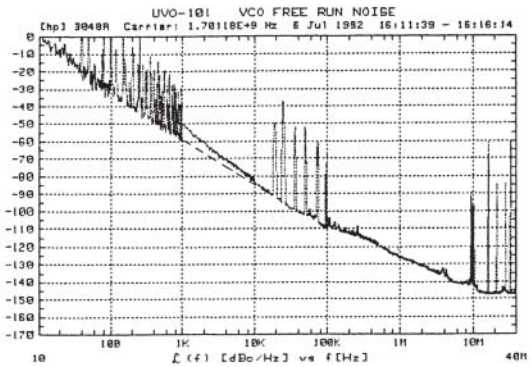
Models	Center Frequency (MHz)	Electric Tuning range (MHz)	Output Level (dBm)	PhaseNoise (dBc/Hz) (Min.) note:1	Operating voltage Operating current (Max.)	Tuning Voltage	Frequency Temperature Of Characteristics	Pulling (Max.) note:2	Pushing (Max.) note:3	Operating Temperature Range (℃)
UVO-120	885	±60	+1±3	95	+9.5V 30mA	+1V ～+9V	±8.5MHz (Max.)	±1.5MHz	±1.0MHz	−10～+65
UVO-126	1465	±100	+1±3	90	+9.5V 30mA	+1V ～+9V	±7.5MHz (Max.)	±3.5MHz	±1.0MHz	−10～+65
UVO-101	1700	+262 −302	+8±3	83	+12V 30mA	+1V ～+11V	±15MHz (Max.)	±15MHz	±1.0MHz	−10～+65
UVO-103	2000	+400 −300	+7±3	83	+12V 30mA	+0.5V ～+14V	±20MHz (Max.)	±20MHz	±1.0MHz	−10～+65

Narrow range type Standard Specifications

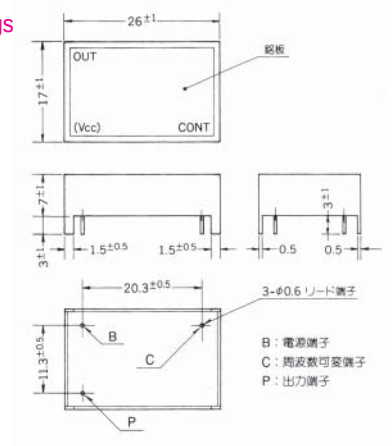
Models	Center Frequency (MHz)	Electric Tuning range (MHz)	Output Level (dBm)	PhaseNoise (dBc/Hz) (Min.) note:1	Operating voltage Operating current (Max.)	Tuning Voltage	Frequency Temperature Of Characteristics	Pulling (Max.) note:2	Pushing (Max.) note:3	Operating Temperature Range (℃)
UVO-154	1017	±15	+4±3	102	+10V 45mA	+0.5V ～+9.5V	±4MHz (Max.)	±0.5MHz	±0.5MHz	−10～+65
UVO-117	1600	±12	+4±3	98	+12V 30mA	+1V ～+11V	±4MHz (Max.)	±3.0MHz	±1.0MHz	−10～+65
UVO-107	2000	±12	+4±3	98	+12V 30mA	+1V ～+11V	±3MHz (Max.)	±3.0MHz	±1.0MHz	−10～+65
UVO-119	2400	±12	+4±3	98	+12V 30mA	+1V ～+11V	±3MHz (Max.)	±3.0MHz	±1.0MHz	−10～+65

Frequency Characterictic

UVO-101 The Chracteristic of Phase Noise



Outline Drawings



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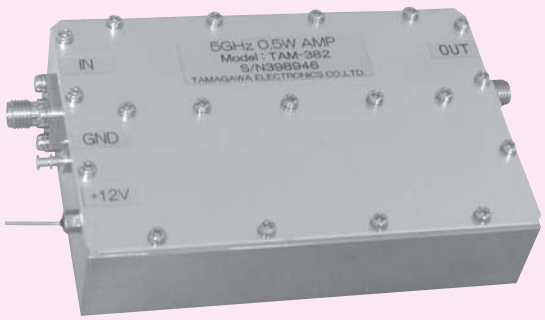
TAM Series



Product features and applications

The TAM series are Gallium Arsenide (GaAs) FET working in the 1 MHz – 15 GHz frequency range. The function ranges from a low noise amplifier to a medium- to high-power amplifier. It can be used as a transmission amplifier and a measuring amplifier for communication devices in up to the SHF band.

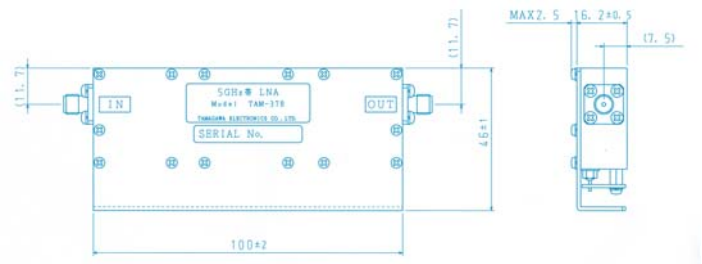
	Common Specifications
Impedance	50Ω
Connectors	SMAJ
I/O VSWR	2(Max.)

Standard Specifications (Low Noise Amplifier)

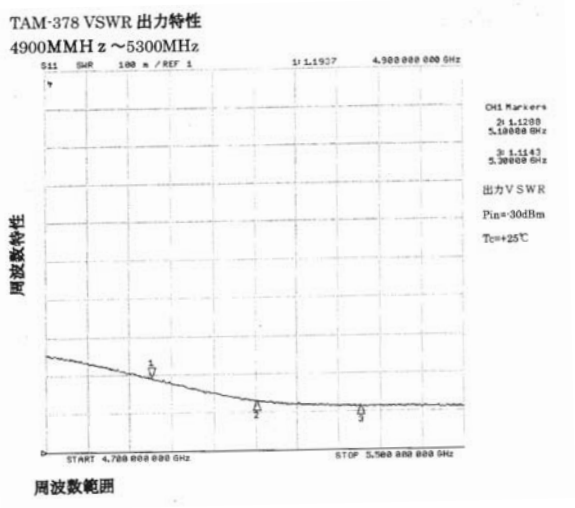
Models	Frequency Range (GHz)	Output Power (dBm)	Gain (dB)	Gain Flatness (dBm)	NF(dB) (Max.)	Voltage/ Current	Operating Temperature Range (℃)	Dimensions (mm) W＊D＊H
TAM-375	1.940～1.960		41	±1.0	1.6	+10V/350mA	−10～+60	90＊150＊35
TAM-378	4.90～5.30	+10	20	±1.0	2.0	+12V/100mA	−10～+50	100＊16.2＊46
TAM-292	5.8～6.4	+5	20	±1.0	2.0	+12V/50mA	−10～+50	94＊46＊16.2
TAM-379	6.425～7.125	+5	20	±2.0	2.0	+12V/50mA	−10～+65	97＊53＊22
TAM-294	7.2～7.8	+5	20	±1.0	2.0	+12V/50mA	−10～+50	94＊46＊16.2
TAM-335	7.8～8.15	+5	20	±1.0	2.0	+12V/100mA	−10～+50	94＊46＊16.2
TAM-318	10.7～11.7	0	20	±2.0	3.0	AC100V/0.2A	0～+50	150＊200＊100
TAM-316	12.2～12.8	+5	20	±1.0	2.0	+12V/100mA	−10～+45	78＊40.3＊17.6
TAM-319	14.4～15.3	0	20	±2.0	3.0	AC100V/0.2A	0～+50	150＊200＊100

Outline Drawings

TAM-378



Frequency Characteristic



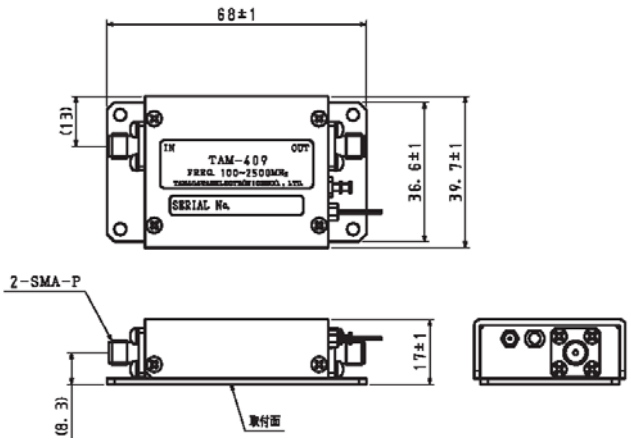
■ Standard Specifications (Medium Power Amplifiers below +30dBm)

Models	Frequency Range(GHz)	Output Power (dBm)	Gain (dB)	Gain Flatness (dBm)	Voltage/Current	Operating Temperature Range (℃)	Dimensions (mm) W＊D＊H
TAM-409	0.1～2.3	+10	30	±1.0	+12V/100mA	−10～+60	68＊39.7＊17
TAM-157	0.8～2.0	+30	30	±1.5	+12V/1.5A note:1	0～+65 note:1	160＊60＊17.5
TAM-382	5.0～6.0	+27	25	±1.0	+12V/500mA	−10～+50	90＊22＊60

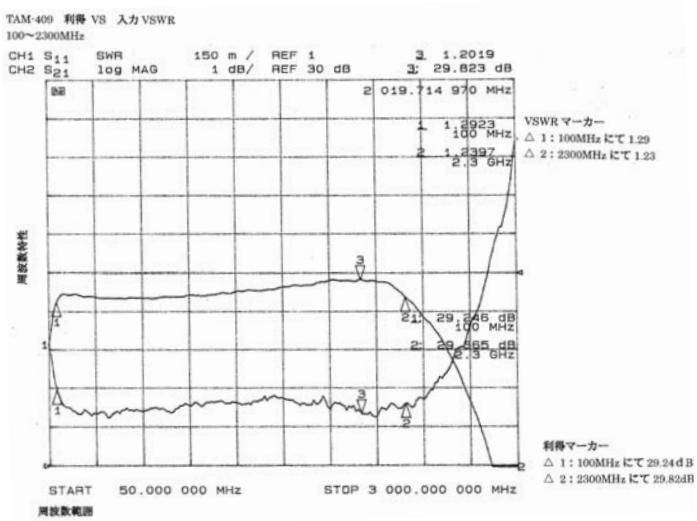
(note:1 needs fins to radiate)

■ Outline Drawings

TAM-409



■ Frequency Characteristic



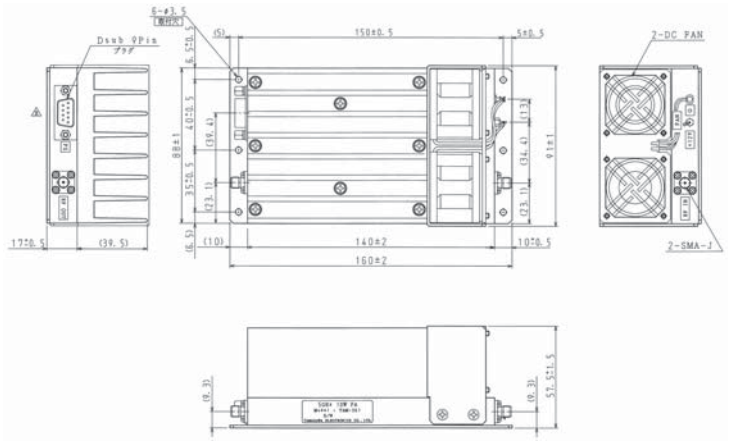
■ Standard Specifications (Medium Power Amplifiers upper +33dBm)

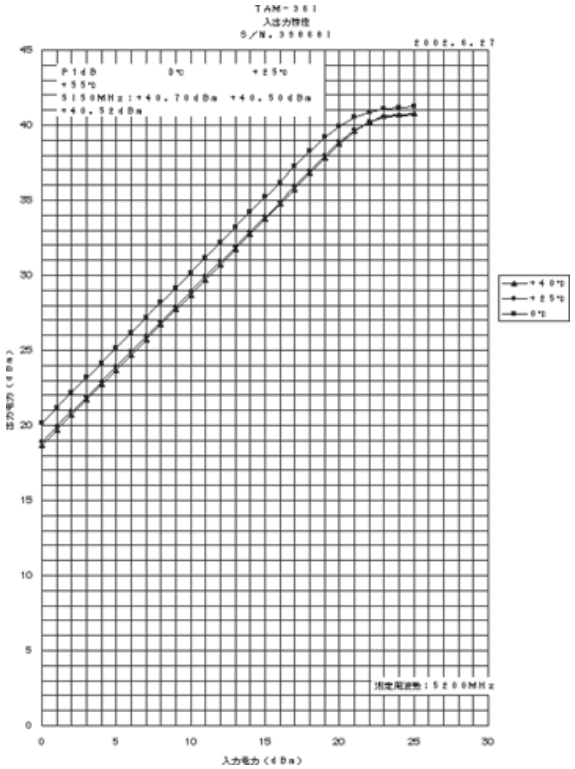
Models	Frequency Range (GHz)	Output Power (dBm)	Gain (dB)	Gain Flatness (dBm)	Voltage/Current	Operating Temperature Range (℃)	Dimensions (mm) W＊D＊H
TAM-374	0.8～1.0	+33	33	±1.5	+12V/1.5A note:1	0～+50 note:1	199＊60＊46
TAM-386	4.57～4.70	+40	45	±1.0	+12V/10A note:2	0～+60 note:2	250＊140＊30
TAM-377	4.90～5.30	+33	20	±1.0	+12V/2A	−10～+50	160＊56.5＊88
TAM-361	5.15～5.25	+40	16	±1.0	+12V/6A	−10～+40	160＊57.5＊91
TAM-333	5.8～5.9	+43	35	±0.5	+12V/15A note:2	0～+70 note:2	280＊140＊35

(note:1 needs fins to radiate / note:2 needs fins with force cooled)

■ Outline Drawings

TAM-361





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E/O･O/E CONVERTER

Product features and applications

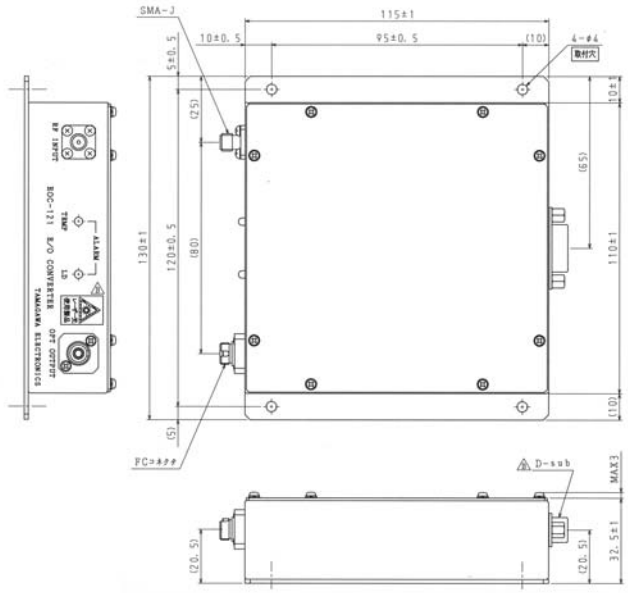
Our analog E/O and O/E converters are designed]for RF signals with low distortion. They convert wireless signals from CATV and micro cells in a mobile network to optical signals, and then transmit them through optical fibers to be reconverted into wireless signals.

The advantages are as follows:
- Low distortion even in multicarrier transmission (over 55 dB intermodulation)
- High signal-to-noise ratio (over 60 dB at 30 kHz bandwidth)
- Long optical transmission distance (up to 20 km when using SM fiber)
- Wide modulation frequency (applicable to 100–2,200 MHz)

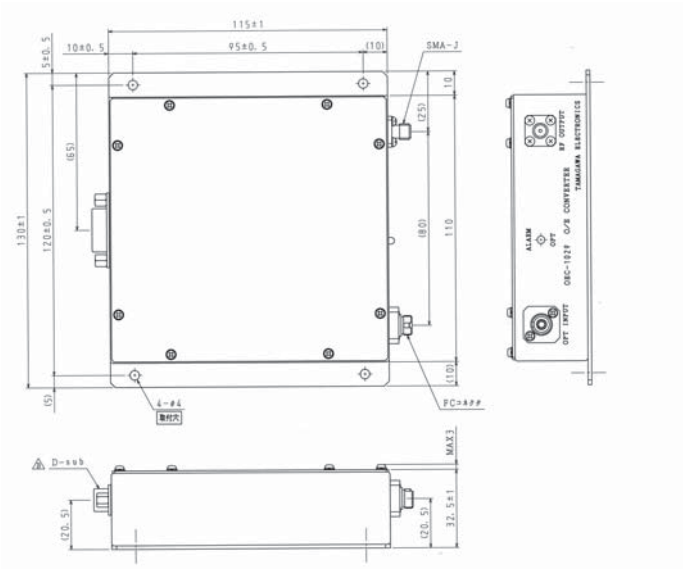
	Common Specifications
Wavelength	1.31 μ m
Fiber Type	SM(Single Mode) Fiber
Connctors	FC(Reflected Attenuation MIN.40dB)
Optical Power Level	+7.8dBm(Standard)
Optical Received Level	+4.8dBm(Standard)
Optical Transmitted Gain	0dB(Optical Insertion Loss at 3dB)
S / N(Max.)	60dB (BW 30KHz)
RF Input Output Level	−20dBm(Standard)
RF Impedance	50Ω
RF Connectors	SMAJ
Operting Voltage	DC±12V
Performance Temperature	10～40℃
Operating Temperature	0～50℃

Outline Drawings

EOC-121

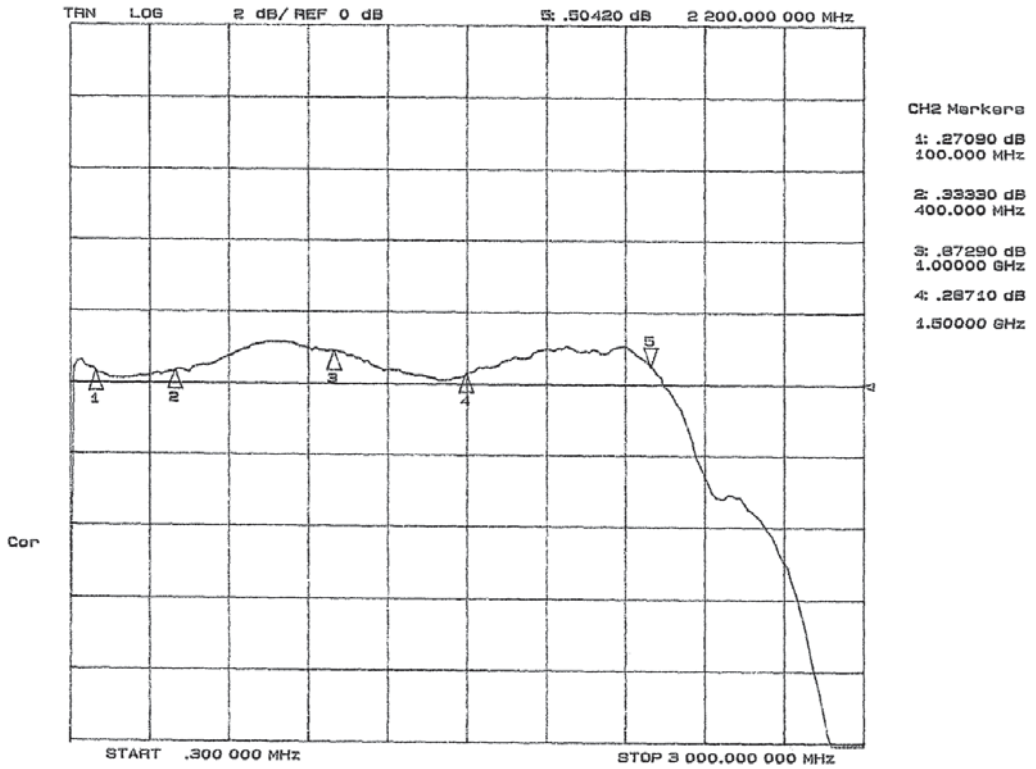


OEC-1029

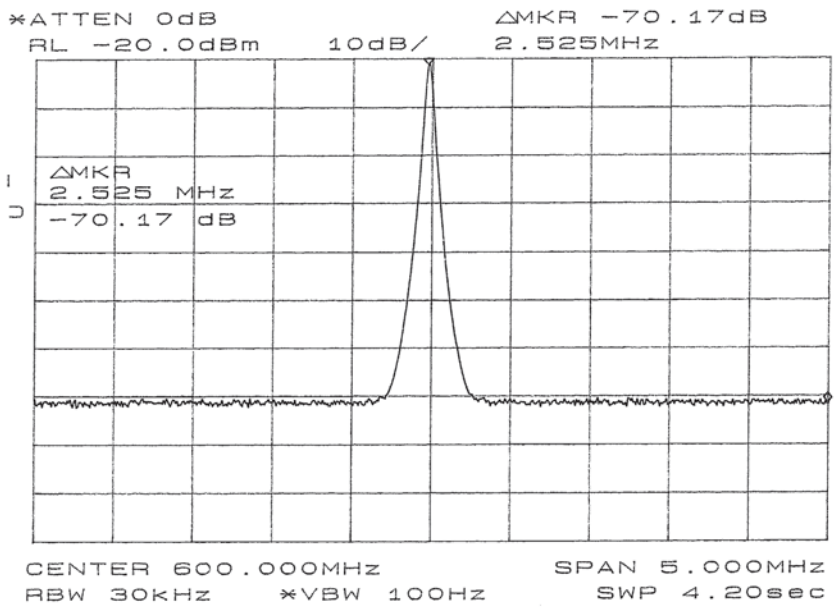


Example Of Optical Link Characteristics

Frequency Characteristics



Dynamic Range



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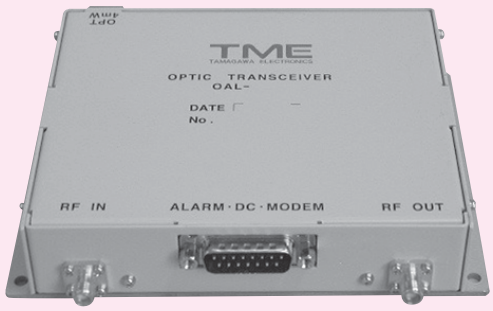
OAL-146JA/147JA



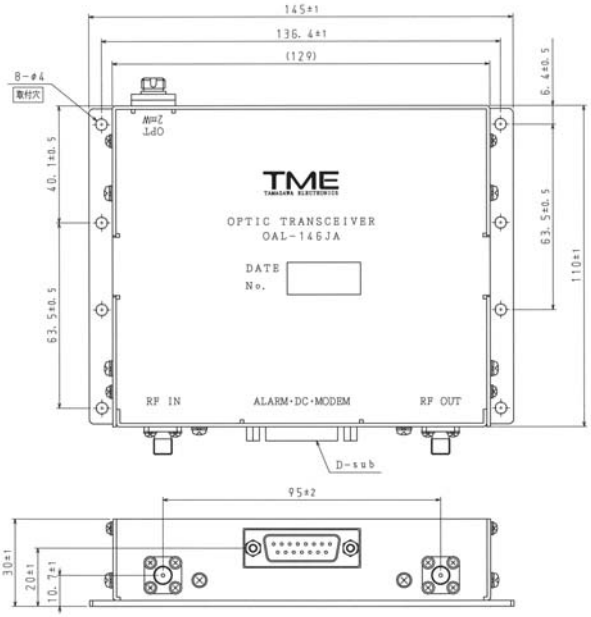
Product features and applications

This is an optical link for wavelength-division multiplexing having a single mode fiber to send and receive signals.
The applicable wavelengths are 1.31 µm and 1.55 µm. The unit is capable of handling analog RF signals of 70–2,000 MHz for input and output. Therefore it can be connected directly to sending and receiving ports and used as an optical repeater for long-distance transmission. It can be used between base station equipment and a tower mount amplifier, as well as an optical link for a repeater. A built-in 1,200 bps modem controls signals between devices.

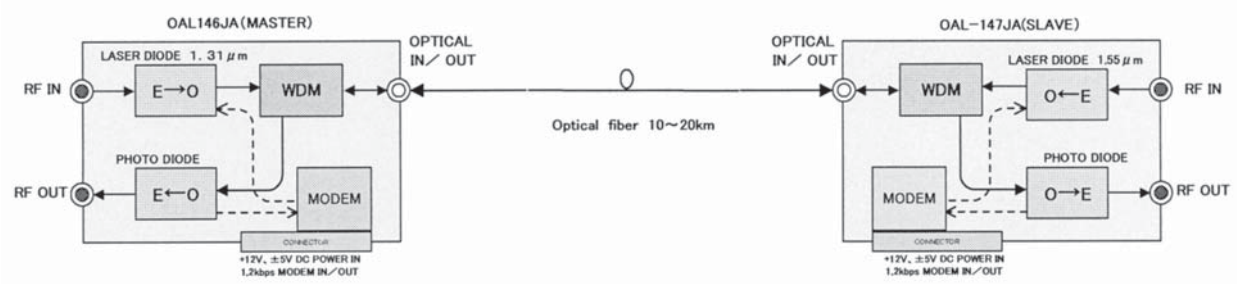
	Common Specifications
Using Wavelength	1.31 μ m、1.55 μ m
Fiber Type	SM(Single Mode) Fiber
Connctors	FC(SPC or APC)
Optical Power Level	+3dBm ±1dB(Standard)
Optical Received Level	+3dBm(Standard)
Maximum distance between Optical Links	20km(Insertion loss at 0.38dB/km)
RF Frequency Range	70MHz～2000MHz
Optical Transmitted Gain	0dB(Optical Insertion Loss at 0dB)
RF Input Output Level	0dBm(Standard)
RF Impedance	50Ω(VSWR 1.5(Max.))
RF Isolation Between Output and Input Port	70dBc(Min.) (OAL146JA is 80dBc(Max.))
CNR(30kHz BW)	84dBc(Min.) (0dBm at Input)
IMD	50dBc(Min.) (+5dBm at Output)
RF Connectors	SMAJ
Modem	Available in 1200bps modem control signals between devices, fiber Insertion loss below 15dB
Performance Temperature	0～50℃
Operating Temperature	−25～+75℃
Storage Temperature	−40～+85℃

Outline Drawings

OAL146JA/147JA



The usage of optical link



TSG Series

Product features and applications

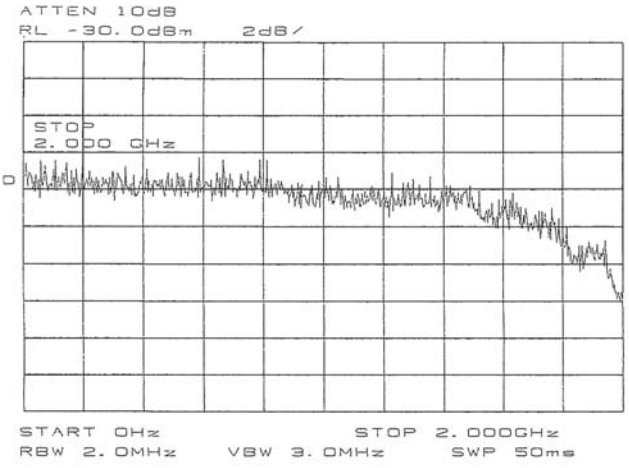
The TSG series are white noise generators. Noise testing is essential for all digital and analog equipment like wireless devices, electric devices and computers. This series provides useful noise sources for research and study.

Standard Specifications

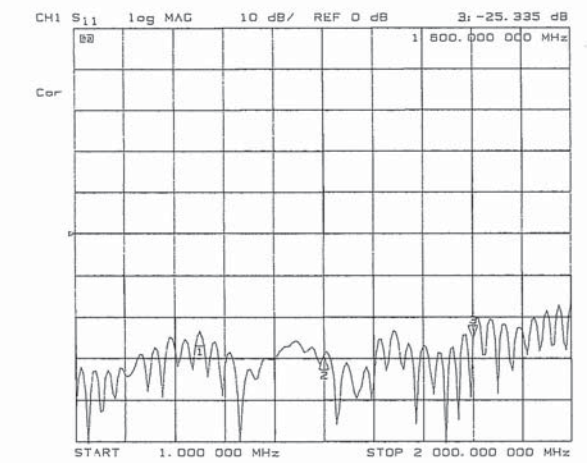
Models	Frequency Range (MHz)	Output Impedance	VSWR (Max.)	Output Level	Output Connectors	Operating Voltage	Weight	Dimensions (mm) W×D×H	Control
TSG-106	1～1600	50Ω	1.3	−80dBm～−20dBm	BNCJ	AC100V ±10V	3.5kg	175×290×100	Manual
TSG-108	0.5～500	75Ω	1.3	−60dBm～0dBm	BNCJ	AC100V ±10V	4.0kg	300×250×120	Manual
TSG-112	50～2000	50Ω	1.3	−60dBm～0dBm	NJ	AC100V ±10V	3.5kg	175×290×100	Manual
TSG-114	1～1600	50Ω	1.3	−80dBm～−20dBm	NJ	AC100V ±10V	3.5kg	175×290×100	Manual GP-IB
TSG-120	50～2000	50Ω	1.3	−60dBm～0dBm	NJ	AC100V ±10V	3.5kg	175×290×100	Manual GP-IB
TSG-160	1000～3000	50Ω	1.3	−60dBm～0dBm	SMAJ	AC100V ±10V	5.0kg	260×341×150	Manual GP-IB
TSG-190	0.2～500 100～2600	50Ω	1.5	−60dBm～0dBm	SMAJ	AC100V ±10V	7.0kg	425×286×133	Manual GP-IB
TSG-221	4800～6000	50Ω	1.5	−40dBm～0dBm	NJ	AC100V ±10V	10kg	430×350×88	Manual GP-IB

＊Operating temperature range 0~+40℃, TSG-190 has 2 output port

TSG-106 Noisegenerater Characteristic Data
Output Noise Characteristic

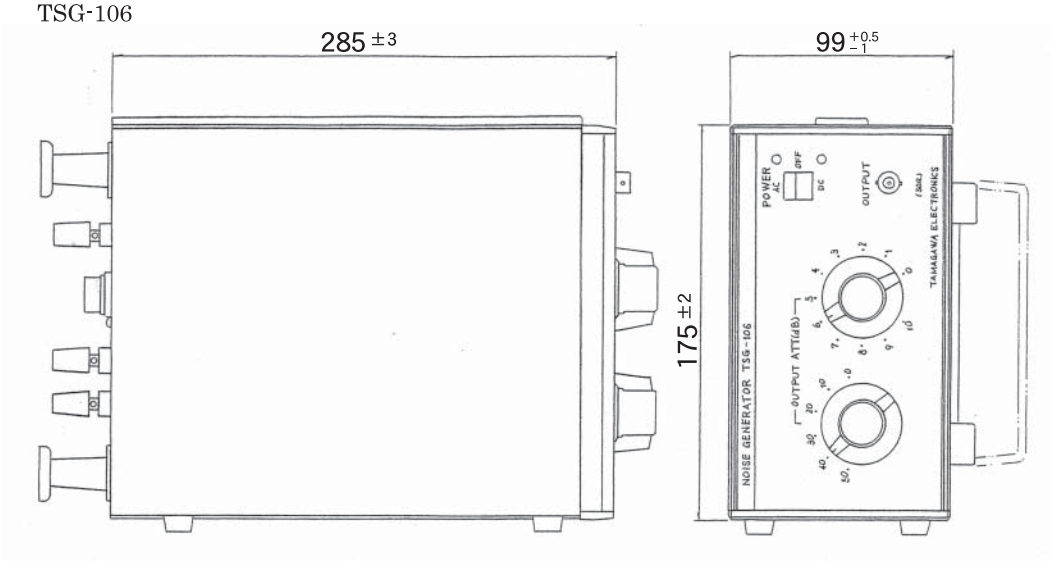


Output Return Loss (TSG 106)

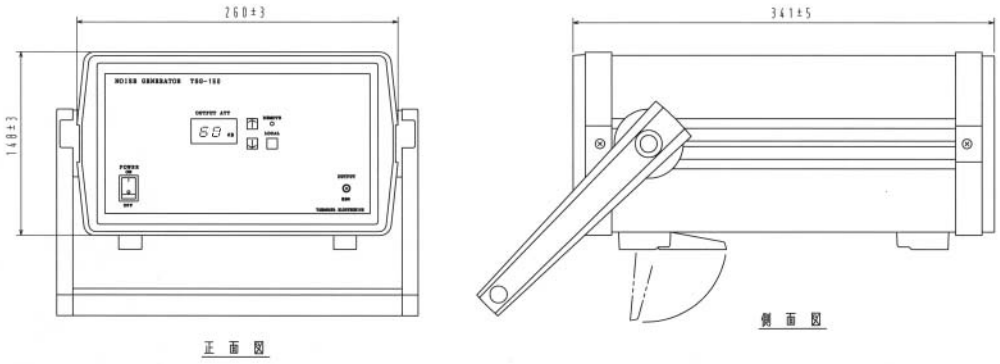


Outline Drawings

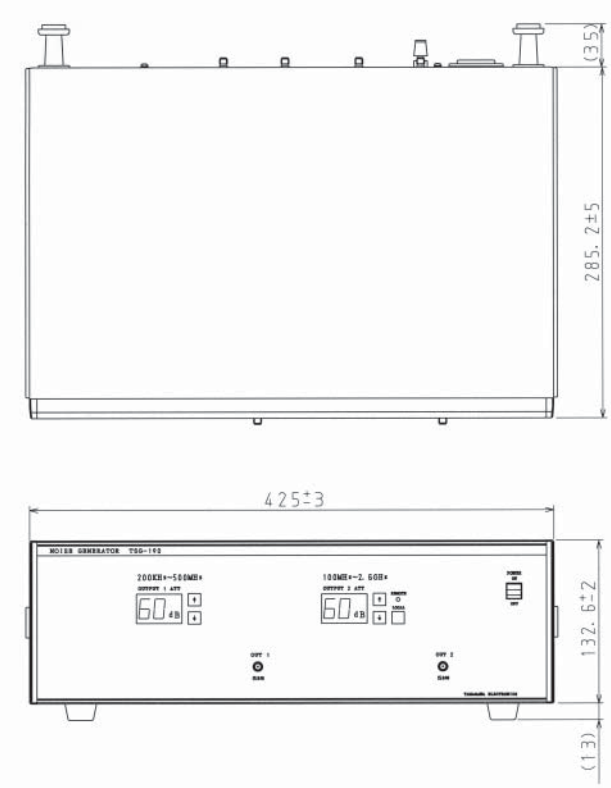
TSG-106



TSG-160



TSG-190



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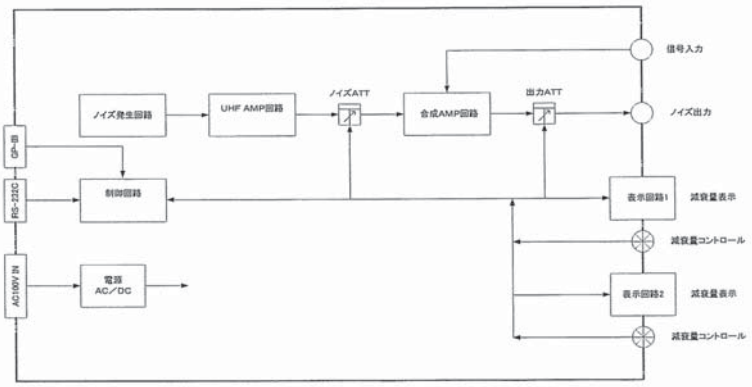
TBT Series

Product features and applications

The TBT-118 consists of a white noise generator, synthesizer, DC block and variable resistance attenuator which are needed to measure the CN ratio of input signals and SN ratio of output images in the UHF band. It features a high resolution of 0.1 dB and easy operation.
A built-in directional coupler allows you to monitor a part of signals easily by a spectrum analyzer.
The noise level and the signal synthesis can be adjusted by external control signals (RS232C, GP-IB) or manual operation on a panel.
The remote control software is included in the set.

	Common Specifications
	TBT-118
Frequency Range	30MHz～1000MHz
White Noise Output Level	－100dBm/Hz (Max.)
White Noise Output Devation	±2.5dB (Max.)
White Noise Variable Attenuator	0～79.9dB(0.1dB Step)
Output Variable Attenuator	0～79dB(1 dB Step)
Input Impedance	50Ω （Connector・・・NJ)
Output Impedance	50Ω （Connector・・・NJ)
Voltage and Current	AC100V±10V、 1 A
I/O controls	RS-232C、GP-IB
Operating Temperature Range	0～＋40℃
Dimensions(mm)	350(W)×285(D)×133(H)
Weight	(15kg)

Diagram Illustration of Block Diagram



Outline Drawings

TBT-118