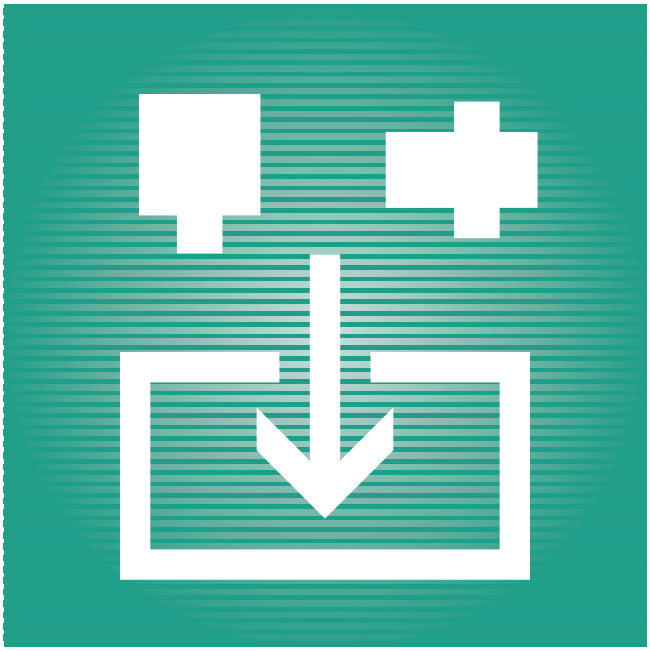


COMPONENTS

RF Fuse Holder 696
Fuse Element 696
Fixed Attenuators for High Power Measurement 696
Four-port Junction Pad 697
2Way/4Way Low Amplitude Error Divider 697
Resistive Power Tap 698
Precision RF & Microwave Components 699
H-Field/E-Field sensor 701
E-Field Isotropic Antenna 701
Kelvin Bias Tee 707
56 Gbaud Differential Linear Amplifier 708, 711

RF Fuse Holder / Fuse Element

MP612A / MP613A

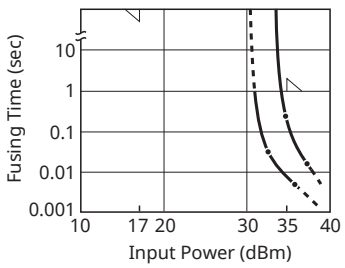
DC to 1 GHz

The RF Fuse Holder MP612A protects measuring instruments by preventing internal damage (parts burnout, etc.). The Fuse Element MP613A uses a vacuum-deposited metal resin film for low melting point and excellent high-frequency characteristics. The high fuse performance is designed to prevent damage even to 1/16 W small resistors commonly found in measuring instruments and offers superior protection for high-frequency measuring instruments, such as Frequency Counters and Spectrum Analyzers, against excessive input power or Signal Generators, against reverse input power.

Specifications

RF Fuse Holder	MP612A (without fuse elements)
Frequency Range	DC to 1 GHz
Impedance	50Ω, unbalanced
VSWR	≤1.2 (50Ω termination)
Connector	N-P, N-J
Insertion Loss	≤0.5 dB
Rated Power	17 dBm (50Ω load)
Max. Fuse Rated Power	≤35 dBm (50Ω load)
Operating Temperature Range	0°C to 45°C
Dimensions and Mass	20ø × 65 mm, ≤110 g
CE	RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Fuse Element: MP613A (5 pcs/set)



Fusing time (sec) and Input power (dBm) characteristics

Fixed Attenuators for High Power Measurement

J0063, J0078, J0395, B0472

DC to 9 GHz/12.4 GHz/18 GHz

J0063

Specifications

Model	J0063	J0395
Frequency Range	DC to 12.4 GHz	DC to 9 GHz
Attenuation	30 dB	30 dB
Attenuation Accuracy	±0.7 dB	±0.5 dB
VSWR (max.)	1.06 + 0.02f (GHz)	1.2 (DC to 4.0 GHz) 1.3 (4.0 GHz to 9.0 GHz)
Maximum Allowable Power	10 W (40 dBm)	30 W (44.7 dBm)
Connector	N-type, 50Ω	
CE	RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018	

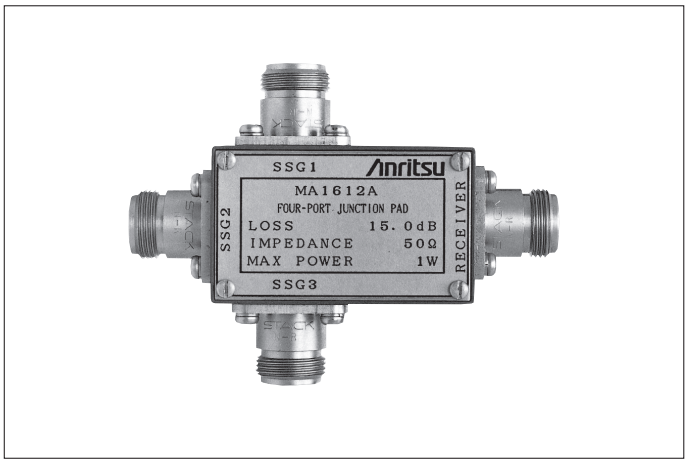
Model	B0472*	J0078*
Frequency Range	DC to 18 GHz	DC to 18 GHz
Attenuation	30 dB	20 dB
Attenuation Accuracy	±1.0 dB	±0.5 dB
VSWR (max.)	1.25 (DC to 8.0 GHz) 1.35 (8.0 GHz to 12.4 GHz) 1.45 (12.4 GHz to 18.0 GHz)	1.15 (DC to 4.0 GHz) 1.20 (4.0 GHz to 8.0 GHz) 1.25 (8.0 GHz to 12.4 GHz) 1.40 (12.4 GHz to 18.0 GHz)
Maximum Allowable Power	100 W (50 dBm)	10 W (40 dBm)
Connector	N-type, 50Ω	

*: RoHS non-compliant product
Cannot be shipped to the EU, UK and EFTA.

Four-Port Junction Pad

MA1612A

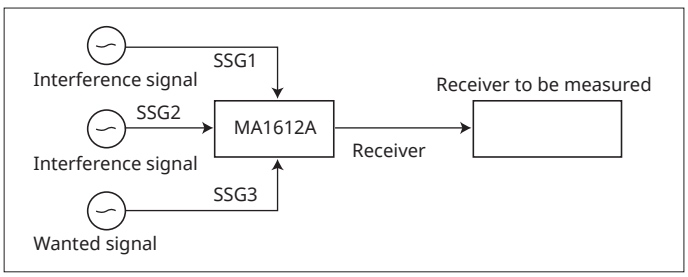
5 MHz to 3 GHz



The MA1612A are used as an impedance matching box applying the mixed output of three RF signal generators to a receiver input terminal for measurement of three-signal characteristics (such as receiver SINAD performance).

Specifications

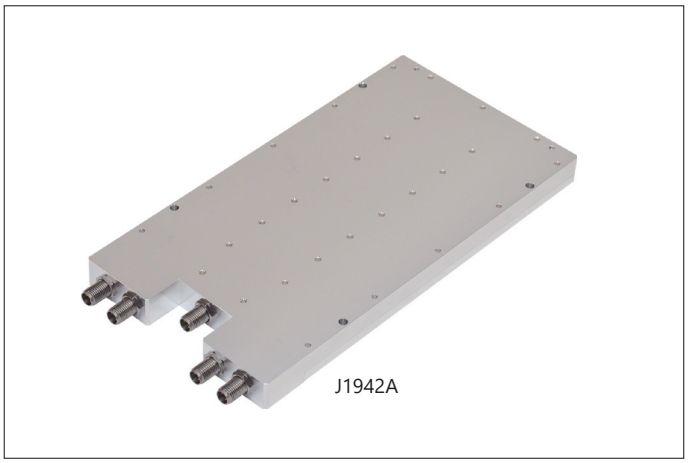
Frequency Range	5 MHz to 3 GHz
Insertion Loss	15 ±1.0 dB (<1 GHz) 15 ±1.5 dB (≥1 GHz)
Impedance Characteristics	50Ω VSWR: ≤1.4 (<1 GHz) ≤2.0 (≥1 GHz)
Connector	N (S)-J
Isolation	SSG1-SSG2, SSG1-SSG3: ≥30 dB (<1 GHz) ≥25 dB (<2 GHz) ≥20 dB (≤3 GHz) SSG2-SSG3: ≥20 dB
Maximum Allowable Power	1 W
Operating Temperature Range	0°C to 50°C
CE	RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018



2Way/4Way Low Amplitude Error Divider

J1941A/J1942A

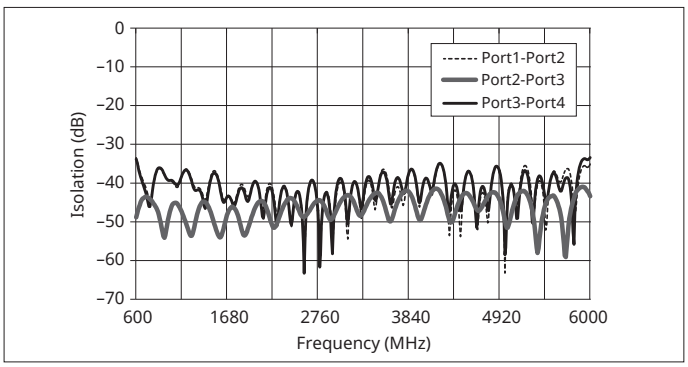
0.6 GHz to 6 GHz



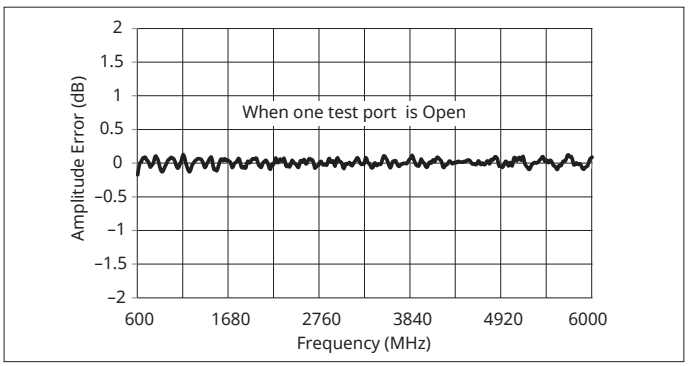
Specifications

Model	J1941A	J1942A
Frequency Range	0.6 GHz to 6 GHz	
Divide Number	2	4
Ports Unbalance	≤0.1 dB (0.6 GHz to 4 GHz) ≤0.15 dB (4 GHz to 6 GHz)	
Amplitude Error	≤0.5 dB	
Insertion Loss	≤0.5f + 7 dB	≤0.5f + 10 dB
VSWR (Common port)	<1.5	
VSWR (Test port)	<1.3	
Input Level (Max.)	+38 dBm (max., Duty ≤50%, ≤30°C)	
Connector	SMA (J)	
CE	RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018	

J1941A/J1942A of low amplitude error 2 divider/4 divider is a divider that suppresses occurrence of amplitude error even if there is an open end on the test port side.



J1942A Isolation Performance (Actual measurement value)

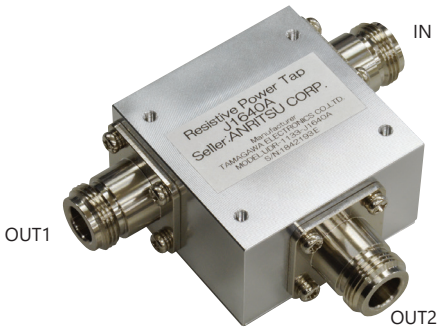


J1942A Amplitude Error Performance (Actual measurement value)

Resistive Power Tap

J1640A

DC to 3000 MHz

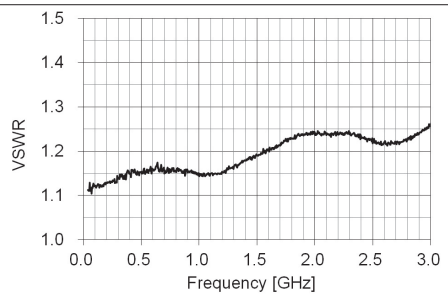


The Resistive Power Tap J1640A is used to branch the transmitted signal when measuring the spurious characteristics of a transmitter with a field strength meter or spectrum analyzer. It has flat attenuation frequency characteristics over DC to 3000 MHz, eliminating the need to consider frequency characteristics when making measurements.
The maximum allowable input power is 16 Watts.

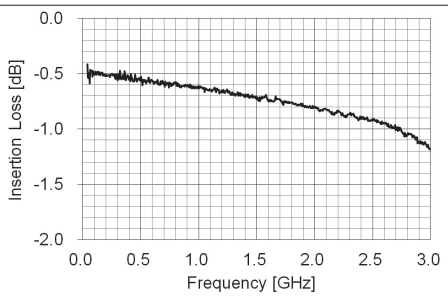
Specifications

Frequency Range	DC to 3000 MHz
Impedance	50Ω (nom.)
VSWR	≤1.35 (DC to 3000 MHz) (IN, OUT1, OUT2)
Maximum Allowable Power	16 W (IN-OUT1)
Insertion Loss (IN-OUT1)	≤1.0 dB (DC to 1000 MHz) ≤1.2 dB (1000 MHz to 1700 MHz) ≤1.5 dB (1700 MHz to 3000 MHz)
Branching Attenuation	40 dB ±1 dB (100 MHz) (IN-OUT2)
Frequency Characteristics of Branching Attenuation (IN-OUT2)	±0.5 dB (DC to 300 MHz) ±1.0 dB (300 MHz to 1000 MHz) ±1.5 dB (1000 MHz to 1700 MHz) ±2.5 dB (1700 MHz to 3000 MHz)
Connectors	N (f)
Operating Temperature Range	0°C to +45°C
CE	RoHS: 2011/65/EU, (EU) 2015/863, EN IEC 63000: 2018

Characteristics



VSWR Characteristics: IN



Insertion Loss Characteristics: IN-OUT1

Precision RF & Microwave Components

The Industry Leader for High Frequency Components

Precision Components-Precision Measurements

Anritsu is a leader in the design and production of precision microwave components.

- Precision Coaxial Connector Systems to 145 GHz
- Precision Coaxial and Waveguide to Coax Adapters
- RF Detectors
- Precision Terminations
- Precision Fixed Attenuators
- Precision Directional Coupler up to 110 GHz
- Precision Step Attenuators
- Precision Power Dividers and Splitters
- Precision Kelvin and Standard Bias Tees
- Broadband Microwave Limiters

Connector Design Leadership

Anritsu is the leader of high frequency microwave connector technology and is driven by an ongoing commitment to exceed customer needs. Anritsu created and trademarked the K Connector™ with coverage to 40 GHz, along with a complete family of 40 GHz test equipment. It was an immediate success and today is used on many commercial components, test fixtures, and defense and aerospace systems.

For certain applications, users want to access frequencies up to 43.5 GHz on a K connector. Anritsu has developed and introduced Extended-K™ connectors that not only provides frequency scalability to 43.5 GHz with mode-free performance on a K connector, but is also traceable ensuring a known measurement uncertainty.

The V Connector™ offers coaxial coverage to 65 GHz and uses a 1.85 mm geometry endorsed by the International Electrotechnical Commission (IEC). It mates with commercially available 2.4 mm connectors.

The W1 Connector™ provides mode-free performance to 110 GHz and uses a 1.00 mm coaxial connector front side interface.

The 0.8 mm connector family is a complete coaxial connector system with single-mode performance to 145 GHz. It contains male and female non-hermetic connectors, male and female broadband terminations and in series adapters. The 0.8 mm connector is well suited for high frequency applications ranging from components to systems and instrumentation.

Coaxial and Waveguide to Coax Adapters

A series of precision measurement adapters are available to adapt one connector type to another. Poor adapter VSWR (or poor return loss) can be a major source of measurement error and, therefore adapters must be carefully selected. Anritsu precision adapters typically have 6-12 dB better return loss than competitive units. Coaxial adapters are available to 145 GHz. Waveguide-to-coax adapters are available to 110 GHz.

Precision Terminations and Air Lines

Anritsu is recognized as the leader in the field of impedance standards. Anritsu air lines and terminations are unsurpassed for accuracy and impedance match. Not only do these products increase measurement accuracy, they also provide the only method of certifying the performance of SWR autotesters, bridges, directional couplers, and other devices.

Precision Fixed Attenuators

Anritsu attenuators offer superior performance in a low cost package. The low VSWR (excellent return loss) minimizes signal reflections and simultaneously reduces ripple effects in the output frequency response. This assures flat, consistent attenuation characteristics regardless of other devices reflection characteristics.
The 41K, 41VA, and 41W Series attenuators are specifically designed for applications where accuracy is a basic requirement. Available frequency ranges cover DC to 26.5, 40, 70, and 110 GHz.

Many other attenuator applications principal objective is the reduction of power. Since the attenuator might not be inserted at a measurement point, the measurement precision discussed earlier is not required.
In such a power-reducing system application, attenuators are often required in large quantities, making price an important consideration.
The 43K Series includes models covering DC to 26.5 GHz, and DC to 40 GHz. All are available with 3, 6, 10, or 20 dB attenuation values.
All have the Anritsu K Connectors and are compatible with 3.5 mm and SMA connectors.

Whatever your fixed attenuator needs might be, Anritsu provides the solution.

Precision Step Attenuators

Anritsu offers low loss, high precision step attenuators. These programmable step attenuators are available with 10 dB steps from 0 to 70 dB or 0 to 110 dB ranges. DC to 40 GHz frequency range ensures the broadest attenuation and frequency coverage available. Contact Anritsu for needs above 40 GHz or for custom step sizes.

Precision Power Dividers and Splitters

Anritsu offers the world's only W1 coaxial power divider and power splitter solution up to 110 GHz. Anritsu produces precision V Connector dividers and splitters to 65 GHz and precision K Connector dividers and splitters to 40 GHz. All Anritsu power dividers are 3-resistor symmetrical designs with excellent amplitude and phase tracking. Anritsu power splitters are 2-resistor designs, used to accurately split signals for ratio measurements.

Precision Bias Tees

Anritsu bias tees are used to combine DC and RF for active device measurements. Low RF throughline loss and low SWR ensure negligible effect on measurements from 50 kHz to 65 GHz. For users that require the most precision measurements by eliminating DC errors, Anritsu offers Kelvin bias tees. A high resistance of the DC coil results in voltage drop that leads to biasing voltage error which can be corrected through a sense coil on the Kelvin bias tee. Kelvin bias tees are available from 50 kHz to 10/65/110 GHz.

Broadband DC Blocks

Anritsu DC Blocks are used to prevent DC signals from passing through and are available up to 110 GHz.

Broadband Microwave Limiters

Anritsu broadband microwave limiters provide the widest frequency range available in a limiter. Designed to protect sensitive microwave equipment, these limiters incorporate unique single-side limiting to provide soft limiting characteristics over 10 MHz to 26.5 GHz.

RF Detectors

Just as directivity is the principal error contributor in reflection measurements, the impedance match of the signal source and RF detector is a significant error contributor in transmission measurements.

Anritsu offers a complete line of coaxial RF detectors covering from 10 MHz to 50 GHz with the lowest SWR available. The excellent impedance match of the detectors, along with that of the test port on the SWR Autotesters and bridges, minimize errors when making simultaneous transmission and measurements.

Calibration and Verification Kits

Anritsu offers calibration kits which contain all of the precision components and tools required to calibrate an Anritsu VNA in a connector style of your choice. Anritsu K, V, and W coaxial calibration kits offer optional data-based calibration files. Data-based calibration, along with precision components, provide superior VNA accuracy for R&D and production environments.

Specials

Anritsu also manufactures assemblies and components to meet specific customer requirements in both coaxial and waveguide structures. These include such components as Connectors, Bias Tee, Step Attenuator, Detector, Power Sensors, Waveguide, Coaxial Adapters, and RF Cables etc.

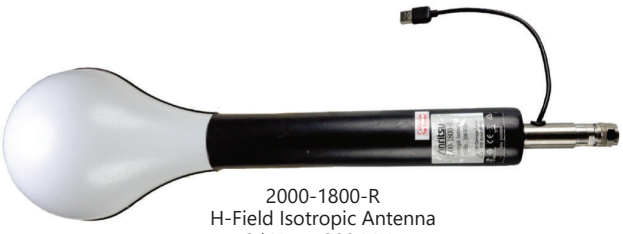
When requesting quotations on special assemblies, as a minimum please provide this information: frequency range, electrical characteristics, mechanical details and outline dimensions if any.

H-Field/E-Field sensor/E-Field Isotropic Antenna

2000-1800-R/2000-1791-R/2000-1792-R EMF Option 444

ElectroMagnetic Field Measurements

The Isotropic Antennas are Tri-axis with Integrated RF Switches.



2000-1800-R
H-Field Isotropic Antenna
9 kHz to 300 MHz

2000-1792-R
E-Field Isotropic Antenna
30 MHz to 3 GHz

2000-1791-R
E-Field Isotropic Antenna
700 MHz to 6 GHz

Anritsu's ElectroMagnetic Field (EMF) measurements are designed to measure radiation compliance with various national standards for personal safety set by governmental regulatory authorities. Many countries have mandated EMF safety testing in areas where cellular or other high power transmission antennas are located. The EMF option is primarily targeted to both cellular operators and government regulators. Additionally, contractors and small service companies perform building inspections and field surveys to monitor radiation exposure intensities in areas situated near transmission antennas.
Anritsu's EMF measurements are designed to be easy to use, while providing the user with numerous automated features which will enable them to do their job quickly and more efficiently. EMF measurements (EMF, Option 444) are available on the following Anritsu products: Field Master Pro™ MS2090A; Spectrum Master™ MS2711E, MS2712E, MS2713E, and MS2720T; Cell Master™ MT8213E; and LMR Master™ S412E. Firmware version 1.56 or later is required for the MS2711E/12E/13E and MT8213E. For the MS2720T and S412E, firmware version 1.12 or later is required. For the MS2090A, firmware version V2020.4.2 or later is required.
EMF Option (444) provides the capability to measure electromagnetic field radiation when used in conjunction with an Anritsu isotropic antenna. Automated measurements can be taken using user-definable time intervals.

EMF Measurements Key Features and Benefits

- Limit lines that are user-settable at various power levels across the spectrum
- Limits can be saved for recall at a later time
- Axis dwell time is user-settable (time that each axis [X, Y, and Z] measures radiation before switching to next axis)
- Pass/Fail indicators on screen for immediate feedback on test results
- Automatic save feature for easy storage of measurement results to internal memory (autologging) or USB stick
- Results provided for maximum, minimum, average of all measurements conducted
- Clear display of measurement status, measurement time, number of measurements taken, and most other user settings
- Measurement time is user-configurable
- Pre-amp standard for measurements of low-level signals (optional for MS2711E)

Available field strength units include the following:
(S412E supports spectrum analyzer and LTE modes only; MS2090A supports spectrum analyzer mode only.)

Spectrum analyzer mode: dBm/m^2, dBmV/m, dBuV/m, V/m, W/m^2, dBW/m^2, A/m, dBA/m, W/cm^2,
MS2090A is dBm/m^2 and dBW/m^2 only

- LTE and TD-LTE mode: dBm/m^2, V/m, W/m^2
- W-CDMA mode: dBm/m^2, V/m, W/m^2, % of Limit (V/m), % of Limit (W/m^2)

For wideband radiation measurements, the EMF option operates in spectrum analyzer mode. Total radiation from all sources can be measured over the frequency band desired. The EMF option will also conduct radiation measurements of demodulated signals in specific frequency bands. In this way, measurements can be extrapolated assuming a fully loaded traffic channel in order to present a worst-case analysis. Option 444 will work with demodulated signals of the following types: (S412E supports LTE only)

- W-CDMA
- LTE
- TD-LTE

If the user desires to measure EMF with a demodulated signal, the appropriate demodulation option also will need to be purchased. Additionally, Option 9 (demodulation) will need to be purchased if not offered as standard with the spectrum analyzer being used. Customers with spectrum analyzers purchased previously may upgrade their units with the EMF Option 444. If EMF demodulation measurements are required, the appropriate demodulation option will also need to be purchased and installed.

Isotropic Antenna

In order to conduct EMF measurements, an Anritsu isotropic antenna is required. Anritsu offers three isotropic antennas covering a frequency range from 9 kHz to 6 GHz. These antennas along with their corresponding frequency ranges are shown below.

- 9 kHz to 300 MHz H-Field Isotropic Antenna (Anritsu part number: 2000-1800-R)
- 30 MHz to 3 GHz E-Field Isotropic Antenna (Anritsu part number: 2000-1792-R)
- 700 MHz to 6 GHz E-Field Isotropic Antenna (Anritsu part number: 2000-1791-R)

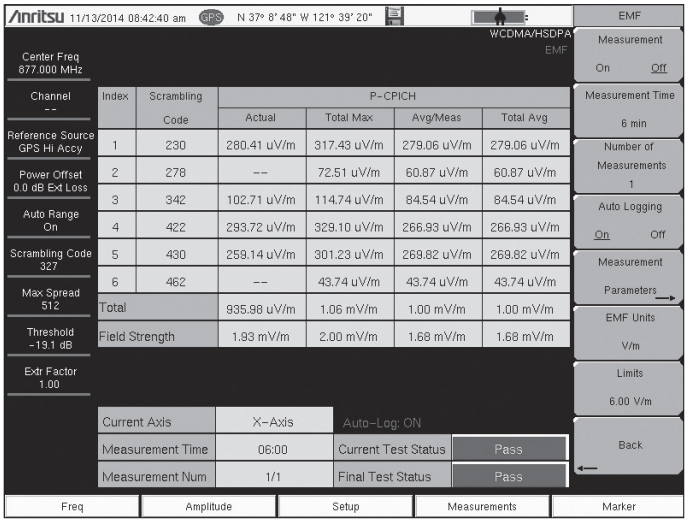
Each antenna contains a tri-axis sensor with an integrated RF switch device, microcontroller and memory. Each of the three sensors is situated orthogonally inside the antenna housing to transmit and receive a spherical radiation pattern. In this way, all radiation at the antenna's geographical position is measured, regardless of direction of arrival.

EMF Measurements on Demodulated Signals

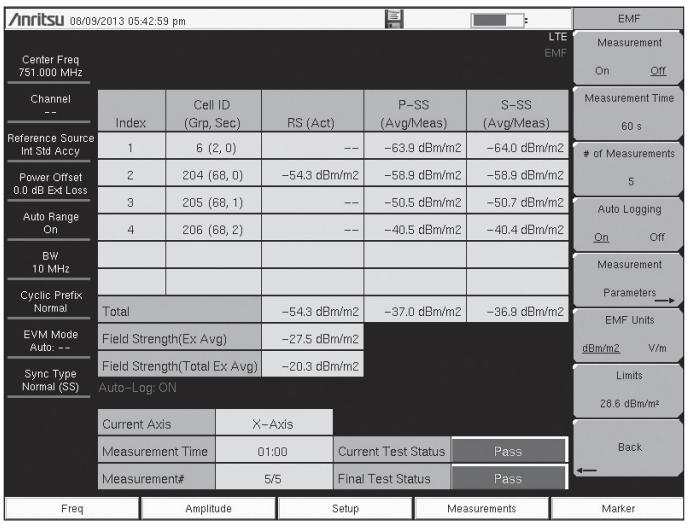
Users may purchase the EMF option in order to make radiation power measurements in Spectrum Analyzer mode. These are power measurements for either narrowband or wideband field strength measurements across the frequency range of the Spectrum Analyzer and isotropic antenna being used. Additionally, EMF testing can be conducted on demodulated signals in various cellular channels. This includes the LTE, TD-LTE, and W-CDMA standards.
To measure demodulated W-CDMA signals, Option 35 is required for the MS2712E/13E and MT8213E platforms. For MS2720T, Option 81 is required for W-CDMA. Option 9 is also required for the MS2712E/13E and MS2720T platforms for W-CDMA demodulation capability. The field strength of the pilot channel (P-CPICH) is measured for all such signals present. Results are then displayed for each individual scrambling code as well as for total power levels for all measurements combined. Additionally, the analog signal strength across the channel is measured and displayed for comparison. In order to present a "worst case" result, extrapolation factors can be automatically calculated and displayed where a fully loaded traffic channel is assumed.

For LTE and TD-LTE, options 546 and 556 respectively are required for the MS2712E/13E and MT8213E platforms. Option 83 is required for either LTE or TD-LTE on the MS2720T platform. Option 9 is also required for the MS2712E/13E and MS2720T platforms for LTE or TD-LTE demodulation capability. For LTE only, Options 31 and 546 are required for the S412E. Primary Synchronization Signals (P-SS), Secondary Synchronization Signals (S-SS), and Reference Signals (RS) are measured and displayed based on each Cell ID received. In addition, the total radiation field resulting from all cell site signals combined is calculated and displayed. The analog signal strength across the channel is also measured and displayed for comparison. In order to present a "worst case" result, extrapolation factors can be automatically calculated and displayed where a fully loaded traffic channel is assumed. See the picture below for a sample display of an LTE EMF measurement. The display for the TD-LTE EMF measurement is identical.

The RF switch, microcontroller, and memory inside the antenna are controlled by firmware in the Spectrum Analyzer via a USB cable. The microcontroller operates the RF switch, controlling which probe is active. Once all three probes are switched, a composite RMS calculation is made. The memory inside the antenna is used to store parameters associated with that particular antenna. This includes serial number, E-Field Isotropic Antenna 30 MHz to 3 GHz 2000-1792-R date of calibration, antenna frequency range, and calibration factors.
Each isotropic antenna is calibrated over its entire frequency range. The antenna factors are stored in the antenna's memory and automatically downloaded into the Spectrum Analyzer once the antenna USB cable is inserted.



Sample Display of W-CDMA Measurement



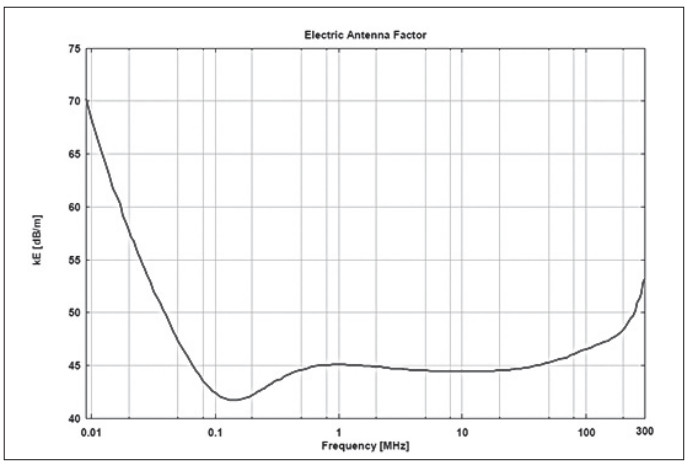
Sample Display of EMF LTE Measurement

Isotropic Antenna Specifications

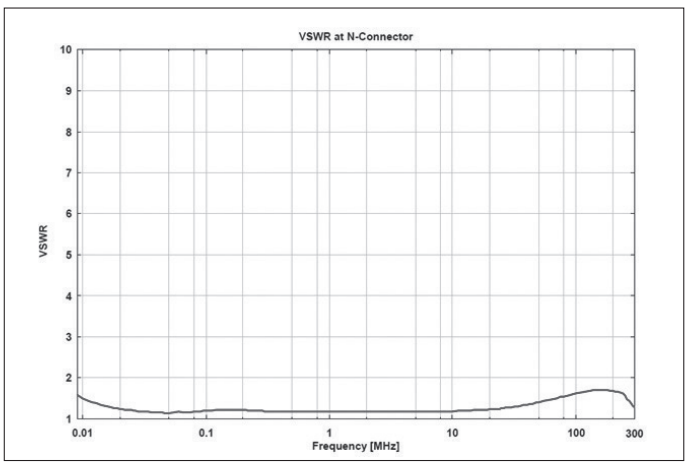
The 2000-1800-R isotropic antenna is a tri-axis H-Field sensor with an integrated RF switch. The RF switch is controlled by the analyzer via a USB port. Each antenna comes with a calibration certificate and supporting test data.

Electrical Characteristics (2000-1800-R)

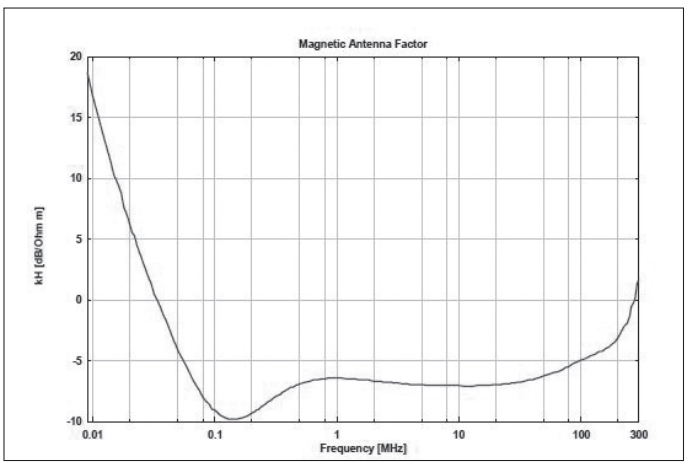
2000-1800-R	H-Field sensor
Sensor Type	Three axis sensor with scanned axes
Frequency Range	9 kHz to 300 MHz
1 dB Compression Point at Output	118 dBµV (typ.)
Decoupling of the Axis	>20 dB (typ.)
VSWR	<1.5 (20 kHz to 50 MHz) (typ.)
RF Connector	N-Connector (m), 50Ω
Supply and Control	USB



Antenna Factors (typ.)



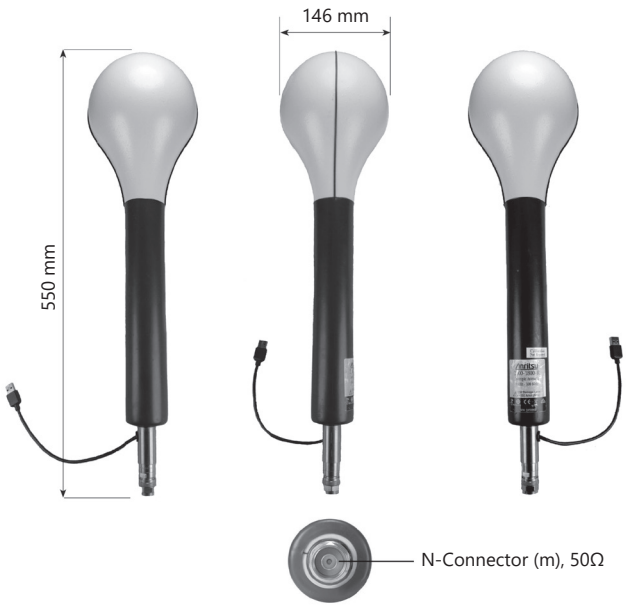
VSWR (typ.)



Magnetic Antenna Factor (typ.)

Mechanical Characteristics (2000-1800-R)

Color	Body: B-39047 "Light Grey" Handle: "Black"
Mass	850 g
Environmental Conditions	–10°C to +50°C, IP54
Mechanical Compliancy	Operating: 7M3 (IEC 60721-3)
Dimensions	550 × 146 mm

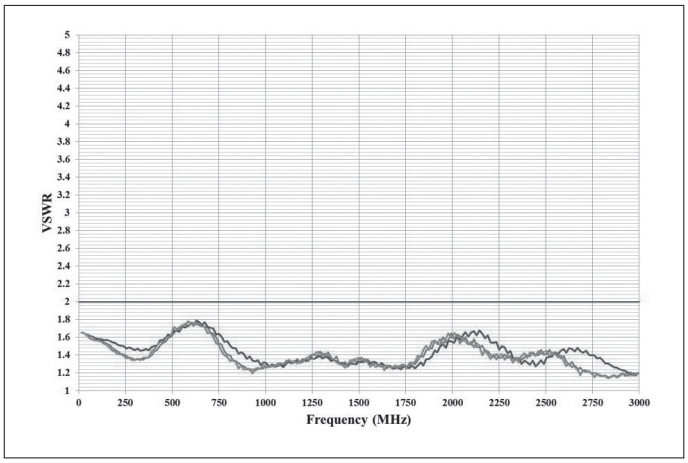


Isotropic Antenna Specifications

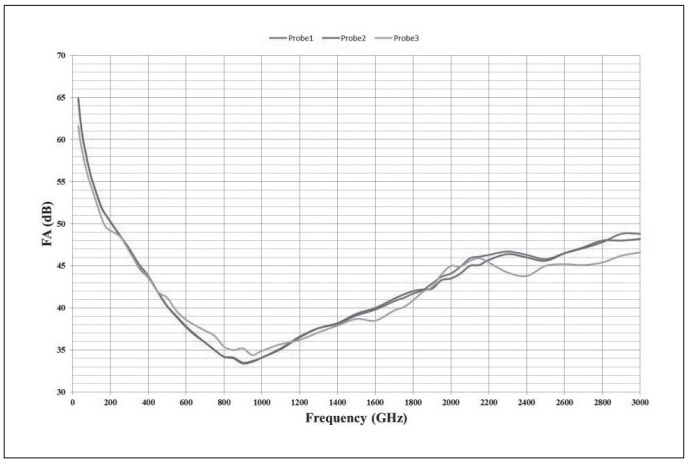
The 2000-1792-R isotropic antenna is a tri-axis E-Field sensor with an integrated RF switch. The RF switch is controlled by the analyzer via a USB port. Each antenna comes with a calibration certificate and supporting test data.

Electrical Characteristics (2000-1792-R)

2000-1792-R	E-Field sensor
Sensor Type	Three axis sensor with scanned axes
Frequency Range	30 MHz to 3 GHz
Typical 3D Isotropy	<±1.5 dB (300 MHz to 1 GHz) <±2.3 dB (1 GHz to 3 GHz)
Dynamic Range (with 1 kHz RBW)	0.1 mV/m to 200 V/m (typ.) 25 µV at 900 MHz 35 µV at 1800 MHz 50 µV at 3000 MHz
Maximum Field Strength	500 V/m (destruction limit)
Switching Time	<10 µs
RF Connector	N-Connector (m), 50Ω
Supply and Control	USB



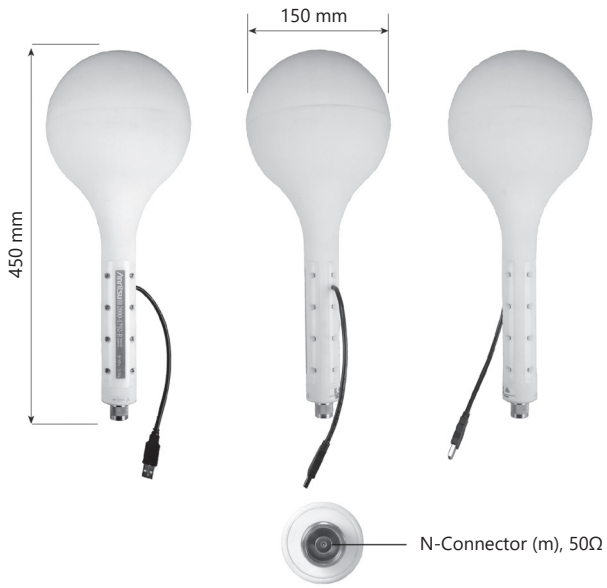
VSWR (typ.)



Antenna Factors (typ.)

Mechanical Characteristics (2000-1792-R)

Radome Material	ABS	
Color	Body: B-39047 "Light Grey" Handle: B-39042 "Dark Grey"	
Mass	800 g	
Climatic Compliancy	Operating: 7K3 (IEC 60721-3)	
Mechanical Compliancy	Operating: 7M3 (IEC 60792-3)	
Operating Temperature Range	–25°C to +70°C	
Humidity	100% at +40°C for up to 96 hours	
Dimensions	Maximum Length	Maximum Width
	450 mm ±5 mm (with connector)	150 mm ±1 mm



EU Standards (CE Marking)

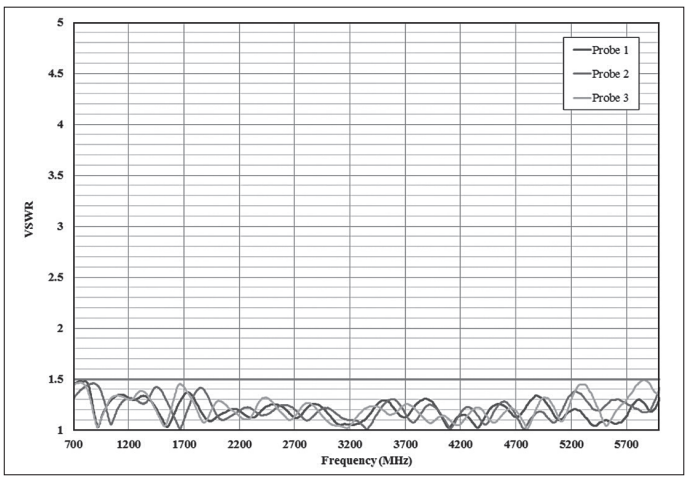
(EU) 2015/863

Isotropic Antenna Specifications

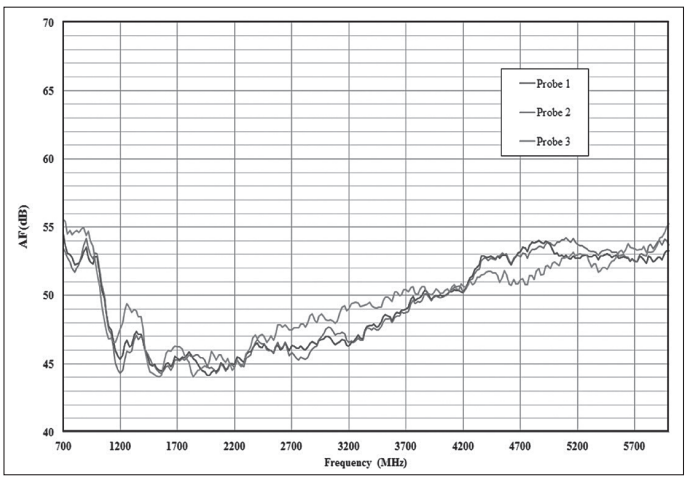
The 2000-1791-R isotropic antenna is a tri-axis E-Field sensor with an integrated RF switch. The RF switch is controlled by the analyzer via a USB port.

Electrical Characteristics (2000-1791-R)

2000-1791-R	E-Field sensor
Sensor Type	Three axis sensor with scanned axes
Frequency Range	700 MHz to 6 GHz
Typical 3D Isotropy	≤±2 dB (0.7 GHz to 2 GHz) ≤±2.5 dB (2 GHz to 3.6 GHz) ≤±3.5 dB (3.6 GHz to 6 GHz)
Dynamic Range (with 1 kHz RBW)	0.2 mV/m to 200 V/m (typ.)
Maximum Field Strength	500 V/m (destruction limit)
Switching Time	<10 µs
RF Connector	N-Connector (m), 50Ω
Supply and Control	USB



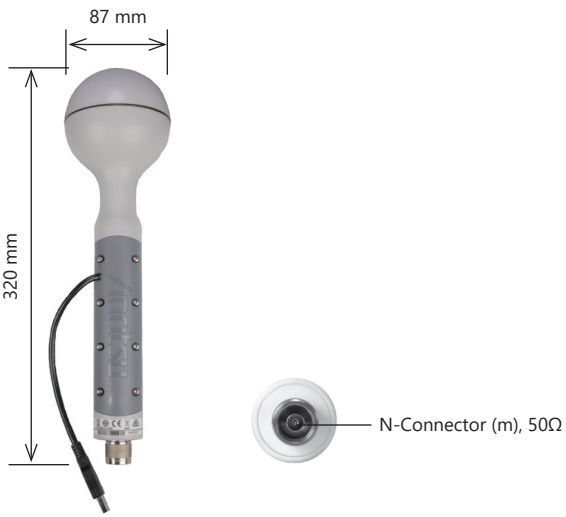
VSWR (typ.)



Antenna Factors (typ.)

Mechanical Characteristics (2000-1791-R)

Radome Material	ABS	
Color	Body: B-39047 "Light Grey" Handle: B-39042 "Dark Grey"	
Mass	450 g	
Climatic Compliancy	Operating: 7K3 (IEC 60721-3)	
Mechanical Compliancy	Operating: 7M3 (IEC 60792-3)	
Operating Temperature Range	–25°C to +70°C	
Humidity	100% at +40°C for up to 96 hours	
Dimensions	Maximum Length	Maximum Width
	320 mm ±5 mm (with connector)	87 mm ±1 mm



Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names.
The actual name of the item may differ from the Order Name.

Model/Order No.	Name
	Required Instrument Options and Accessories
MS2711E-0444	EMF Option 444 for MS2711E
MS2712E-0444	EMF Option 444 for MS2712E
MS2713E-0444	EMF Option 444 for MS2713E
MS2720T-0444	EMF Option 444 for MS2720T
MS2090A-0444	EMF Option 444 for MS2090A
MT8213E-0444	EMF Option 444 for MT8213E
S412E-0444	EMF Option 444 for S412E
2000-1800-R	Isotropic Antenna, 9 kHz to 300 MHz, N Connector (m), 50Ω
2000-1792-R	Isotropic Antenna, 30 MHz to 3 GHz, N Connector (m), 50Ω
2000-1791-R	Isotropic Antenna, 700 MHz to 6 GHz, N Connector (m), 50Ω
200-1528-R	GPS Antenna, SMA (m) with 15 ft cable
	Related Instrument Options
MS2712E-0009	20 MHz Bandwidth Demodulation for MS2712E
MS2713E-0009	20 MHz Bandwidth Demodulation for MS2713E
MS2720T-0009	20 MHz Bandwidth Demodulation for MS2720T
MS2712E-0035	W-CDMA OTA Measurements for MS2712E*
MS2713E-0035	W-CDMA OTA Measurements for MS2713E*
MS2720T-0881	W-CDMA OTA Measurements for MS2720T*
MT8213E-0035	W-CDMA OTA Measurements for MT8213E
MS2712E-0546	LTE OTA Measurements for MS2712E*
MS2713E-0546	LTE OTA Measurements for MS2713E*
MS2720T-0883	LTE OTA Measurements for MS2720T*
MS2090A-0883	LTE FDD Measurement for MS2090A (requires Option 31)
MT8213E-0546	LTE OTA Measurements for MT8213E
MS2712E-0556	TD-LTE OTA Measurements for MS2712E*
MS2713E-0556	TD-LTE OTA Measurements for MS2713E*
MS2720T-0883	TD-LTE OTA Measurements for MS2720T*
MT8213E-0556	TD-LTE OTA Measurements for MT8213E
S412E-0006	6 GHz Coverage for S412E Spectrum Analyzer
S412E-0031	GPS Receiver for S412E (Requires suitable GPS Antenna)
S412E-0546	LTE OTA Measurement for S412E (Requires Option 31)

*: Requires Option 9, Option 31 recommended

Cell Master MT8213E
with 2000-1800-R
Isotropic Antenna

Spectrum Master MS2712E
with 2000-1792-R
Isotropic Antenna

Kelvin Bias Tee

K252, V252, W252MF, W252FM

100 MHz to 110 GHz

NEW

K252

W252

For precision bias applications, the Kelvin connection bias tee is available. The high resistance of the standard bias tee DC coil results in a voltage drop that can lead to DC biasing voltage errors in the bias signal. A Kelvin connection bias tee is used to eliminate DC biasing errors by allowing a user to measure the DC bias signal through the sense connector, post DC coil. Kelvin connection bias tees, unlike standard bias tees, are designed for applications where the user can accurately measure the DC signal to a device under test (DUT), effectively creating a precision bias signal.

Features

- 100 MHz to 110 GHz frequency coverage on kelvin bias tee products
- The W1 connector™ is compatible with 1.00 mm connectors
- The V connector™ is compatible with 2.4 and 1.85 mm connectors
- The K connector™ is compatible with SMA, 3.5, and 2.92 mm connectors
- Design is robust and well suited for high-frequency system and instrumentation applications

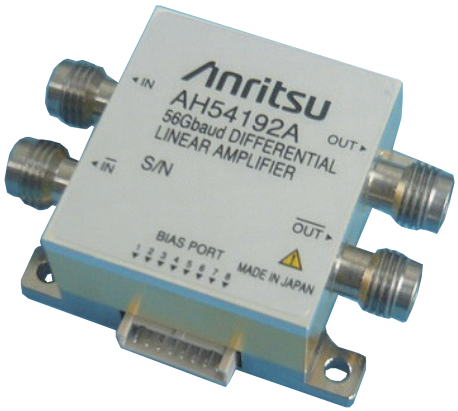
Specifications

Model Name	K252	V252
Frequency Range	100 MHz to 40 GHz	100 MHz to 65 GHz
Insertion Loss	<2.5 dB (typ.)	<3.7 dB (typ.)
Return Loss	11 dB	10 dB (60 GHz) 8 dB (65 GHz)
Maximum DC Voltage	50 V	
Maximum Direct Current	0.5 A	
RF Power	1 W	
RF Connector	Input: K (m), Output: K (f)	Input: V (m), Output: V (f)
DC Connector	SCM (m)	
Temperature Range	0°C to +50°C	
CE	RoHS Directive (EU) 2015/863	

Model Name	W252FM	W252MF
Frequency Range	100 MHz to 110 GHz	
Insertion Loss	<3.5 dB	
Return Loss	12 dB (Min.) (100 MHz to 26 GHz) 9.5 dB (Min.) (>26 GHz to >65 GHz) 8 dB (Min.) (>65 GHz to 110 GHz)	
Rise Time	<3.2 ps (typ.)	
Group Delay	108±20 psl (typ.)	
Maximum DC Voltage	16 V	
Maximum Direct Current	0.4 A	
RF Power	1 W	
RF Connector	Input: W1 (f), Output: W1 (m)	Input: W1 (m), Output: W1 (f)
DC Connector	SCM (m)	
Temperature Range	0°C to +50°C	
CE	RoHS Directive (EU) 2015/863	

56 Gbaud Differential Linear Amplifier

AH54192A



RoHS Compliant Part

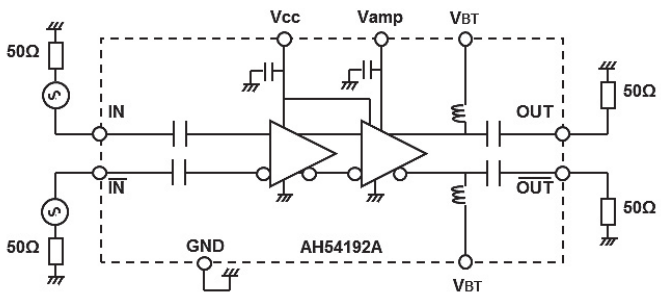
Features

Operating baud-rate: up to 56 Gbaud
Differential output: 4 Vp-p typ.
Wideband: 100 kHz to 40 GHz
Power consumption: 0.9 W typ.
I/O interface: Differential
Package size: 36(W) × 17(H) × 28(D)mm
Standard accessory with dedicated power supply

Applications

Driver for 400G coherent MZ modulator
Booster amplifier for measuring equipment

Block Diagram



Absolute Maximum Ratings

Items	Symbols	Conditions	Ratings		Units
			Min.	Max.	
Input Signal Voltage	Vin	—	–1	+0.7	V
Supply Voltage	V_{BT}	—	–0.5	+5	V
	V_{CC}	—	–0.5	+3.5	V
	V_{amp}	—	–0.5	+3.5	V
Operating Temperature	Ta	Ambient temperature No dew condensation	+5	+50	°C
Storage Temperature	Tstg	No dew condensation	0	+60	°C

Electrical Characteristics

Ta = 25°C, VBT = +4.2 V, VCC = +3 V, Vamp=+3 V, Zin = 50Ω, Zout = 50Ω

Items	Conditions	Specifications			Units
		Min.	Typ.	Max.	
Baud-rate	—	56	—	—	Gbaud
Differential Input Voltage*1	—	—	1	—	Vpp (diff)
Linear Output Voltage*2	—	—	4	—	Vpp (diff)
Small Signal Gain	@1 GHz	—	12	—	dB
Bandwidth	–3 dB (low end)	—	100	—	kHz
	–3 dB (high end)	—	40	—	GHz
Input Return Loss	10 MHz to 30 GHz	—	10	—	dB
Output Return Loss	10 MHz to 30 GHz	—	10	—	dB
Output Polarity	—	Inverted			—

*1: The data input condition is differential only.
*2: In the case of being measured in the following conditions.
Connect 15 cm V-type coaxial cable to the output of AH54192A.
Measured by the Keysight 86118A 70 GHz remote sampling head with 86107A precision time base.
Operated by AH54192A-01 dedicated power supply.

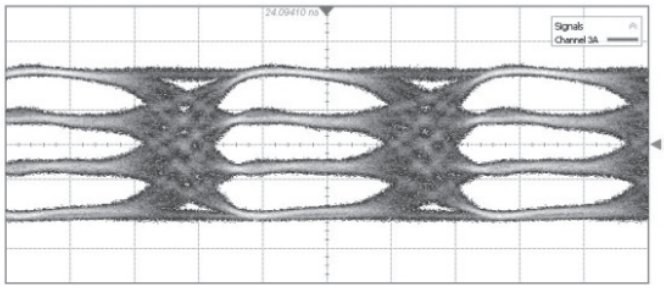
Power Supplies

Items	Conditions	Specifications			Units
		Min.	Typ.	Max.	
Supply Voltage	VBT	—	+4.2	+4.4	V
	VCC	—	+3	—	
	Vamp	—	+3	—	
Supply Current	IBT (x2)	—	160	180	mA
	ICC	—	65	80	
	Iamp	—	10	20	
Power Consumption	—	—	0.9	—	W

Electrical Characteristics

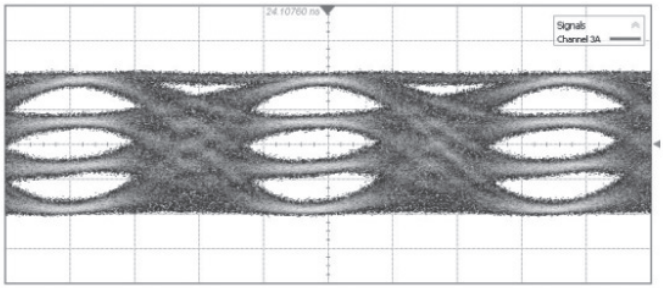
Pulse Response (single-ended output)

26 Gbaud PAM4



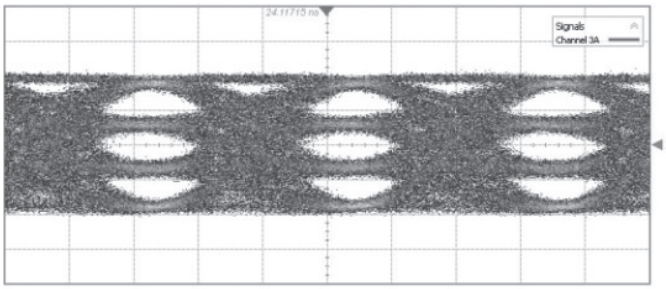
V: 0.5 V/div H: 10 ps/div

53 Gbaud PAM4



V: 0.5 V/div H: 5 ps/div

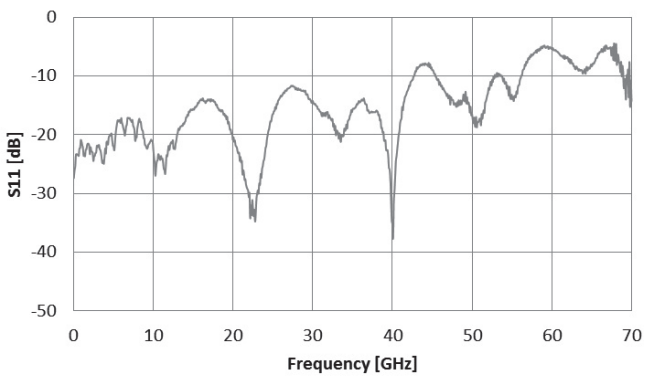
64 Gbaud PAM4



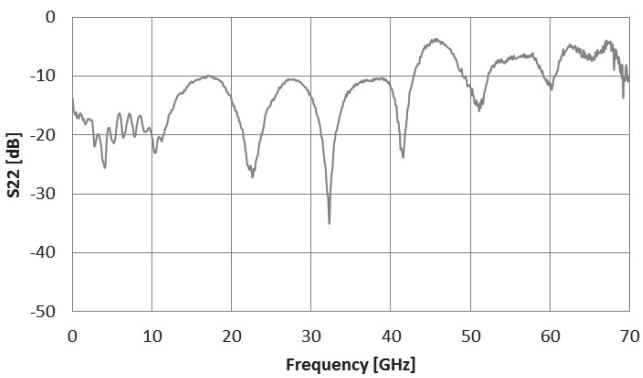
V: 0.5 V/div H: 5 ps/div

Differential input signals had been taken from the PAM4 PPG adjusted with emphasis.

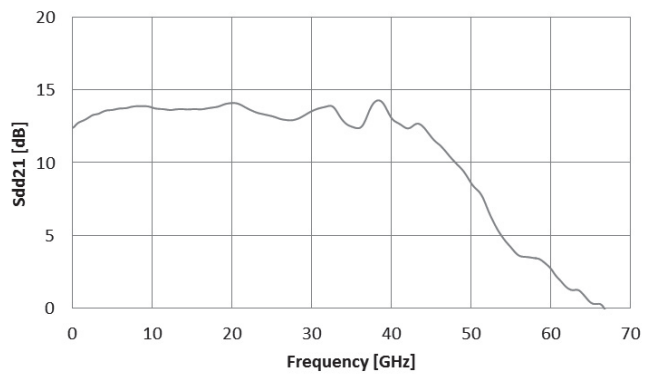
Frequency Response



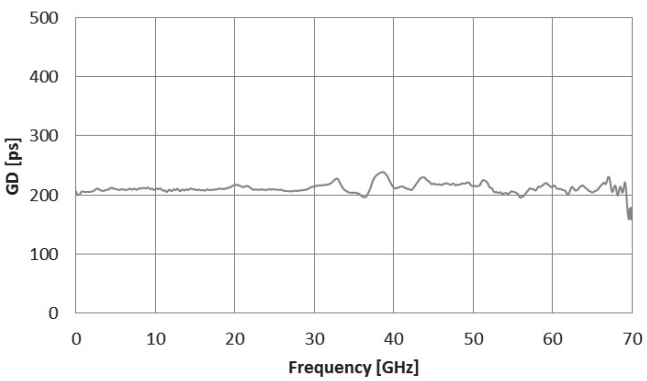
S11



S12

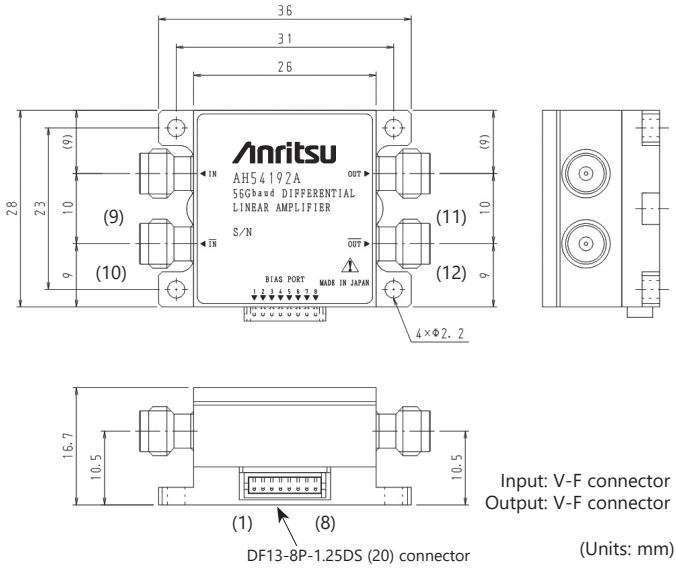


Sdd21



Group Delay

Dimensions



Input: V-F connector
Output: V-F connector

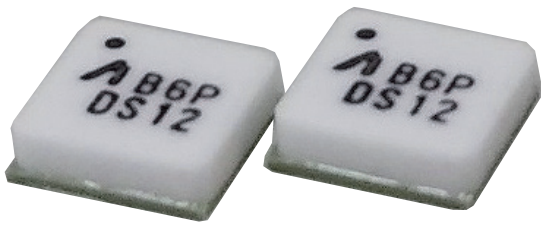
(Units: mm)

No.	Symbols	Functions	Remarks
1	NC	—	—
2	NC	—	—
3	NC	—	—
4	GND	Ground	—
5	VCC	Power supply	+3 V
6	Vamp	Power supply	+3 V
7	VBT	Choke bias	+4.2 V
8	VBT	Choke bias	+4.2 V
9	IN	Input port (non-invert)	AC coupled
10	$\overline{\text{IN}}$	Input port (invert)	
11	OUT	Output port (non-invert)	AC coupled
12	$\overline{\text{OUT}}$	Output port (invert)	

56 Gbaud Differential Linear Amplifier

AG5PB6P

NEW



RoHS Compliant Part

Features

Operating baud rate: 56 Gbaud
Linear differential output voltage: 3.0 Vppd
Gain control range: –12 to +15 dB
Peaking control range: 15 dB
Power consumption: 1.8 W typ.
I/O interface: Differential
28 pin QFN Package: 5 (W) × 5 (H) × 1.6 (D) mm
Input/Output DC block capacitors included

Applications

Booster amplifier for measuring equipment
Driver for 400 GbE (PAM4) optical modulators etc.

Absolute Maximum Ratings

Item	Symbol	Condition	Rating		Unit
			Min.	Max.	
Input Voltage (single-ended input voltage to each input port (IN/INb))	V_{IN}	—	—	1.0	Vpp
Supply Voltage	V_{CC1}	—	–0.5	6.0	V
	V_{CC2}	—	–0.5	5.0	
	V_T	—	–0.5	7.5	
Output Amplitude Control Bias	V_{amp}	—	–0.5	2.5	V
Gain/Peaking Control Bias	V_{gG}	—	–1.5	7.0	V
	V_{gP}	—	–1.5	7.0	
Current Source Bias	V_{CSG}	—	–0.5	5.0	V
	V_{CSP}	—	–0.5	5.0	
Input DC Voltage	V_{INDC}	—	–7.0	10.0	V
Output DC Voltage	V_{OUTDC}	—	–4.0	10.0	V
Operating Temperature	T_C	—	5	85	°C
Storage Temperature	T_{stg}	—	–40	90	°C

Recommended Conditions

Item	Symbol	Condition	Specifications			Units
			Min.	Typ.	Max.	
Supply Voltage	V_{CC1}	—	—	4.7	—	V
	V_{CC2}	—	—	4.0	—	
	V_T	—	—	6.2	—	
Output Amplitude Control Bias	V_{amp}	—	0.0	2.0	2.2	V
Gain/peaking Control Bias	V_{gG}	—	0.9	—	5.0	V
	V_{gP}	—	–1.0	—	5.0	
Current Source Bias	V_{CSG}	—	0.0	4.0	—	V
	V_{CSP}	—	0.0	4.2	—	
Differential Input Signal Level	V_{in}	—	—	—	0.8	Vppd
Input/Output Interface	AC coupled (DC block capacitors are included in PKG)					
Case Temperature Backside	T_C	—	5	—	50	°C

Electrical Characteristics

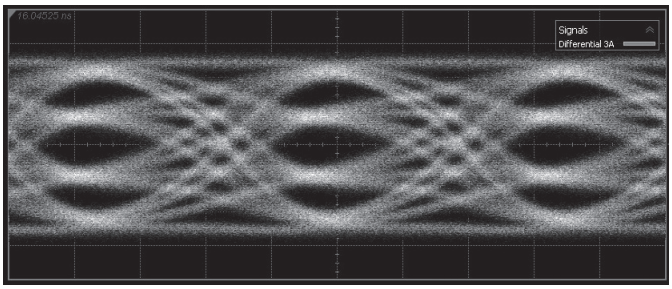
T_C = 25°C, V_{CC1} = 4.7 V, V_{CC2} = 4.0 V, V_T = 6.2 V, V_{CSG} = 4.0 V, V_{CSP} = 0.0 V, Zin = 50Ω, Zout = 50Ω

Item	Condition	Specifications			Units
		Min.	Typ.	Max.	
Baud Rate	—	—	56	—	Gbaud
Differential Output Voltage	V_{gG} = 5.0 V V_{amp} = 2.0 V	—	3.0	—	Vppd
Gain Control Range (@1 GHz)	V_{gG} = 0 V to 5.0 V V_{amp} = 2.0 V	–5	—	15	dB
	V_{gG} = 0 V to 5.0 V V_{amp} = 0.0 V	–12	—	5	dB
Peaking Control Range (SDD21@43 GHz/ SDD21@1 GHz)	V_{gG} = 5.0 V V_{amp} = 2.0 V V_{CSP} = 4.2 V V_{CSG} = 0.0 V	—	15	—	dB
Bandwidth	–3 dB (low end) V_{gG} = 5.0 V V_{amp} = 2.0 V	—	250	—	kHz
	–3 dB (high end) V_{gG} = 5.0 V V_{amp} = 2.0 V	—	45	—	GHz
Input Return Loss (40 MHz to 20 GHz)	V_{gG} = 5.0 V V_{amp} = 2.0 V	—	10	—	dB
Output Return Loss (40 MHz to 20 GHz)	V_{gG} = 5.0 V V_{amp} = 2.0 V	—	10	—	dB
Temperature monitor Thermistor resistance	Tc = 25°C B = 3930 ±50K	9.5	10	10.5	kΩ

Electrical Characteristics

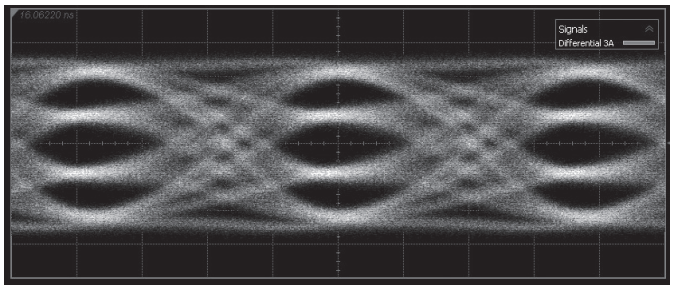
Typical Output Waveform (at Maximum Gain)

56Gbaud PAM4



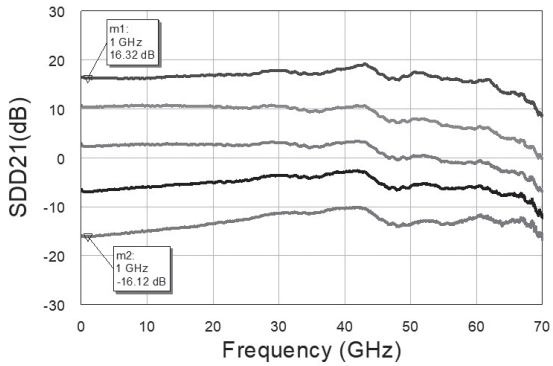
Vout: 3.05 Vpp (diff.) Linearity: 0.89

53Gbaud PAM4

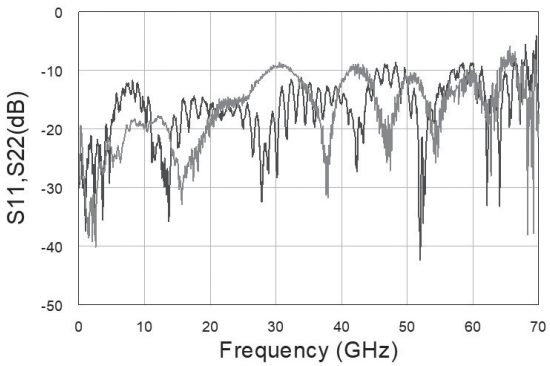


Vout: 2.99 Vpp (diff.) Linearity: 0.91

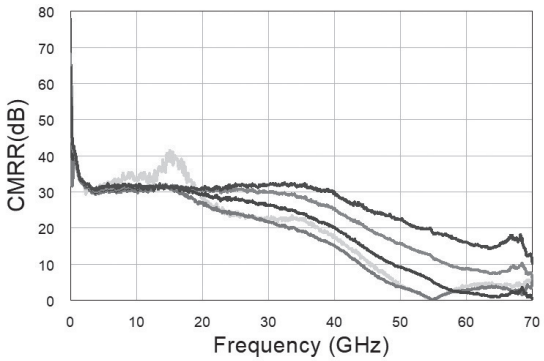
Frequency Response



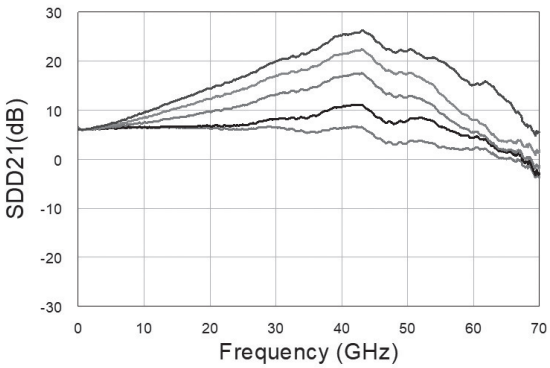
Differential Mode Gain at Adjusting Gain (SDD21)



Reflection Characteristics at Maximum Gain (S11, S22)



CMRR at Adjusting Gain



Differential Mode Gain During Peaking Adjustment (SDD21)

Dimensions