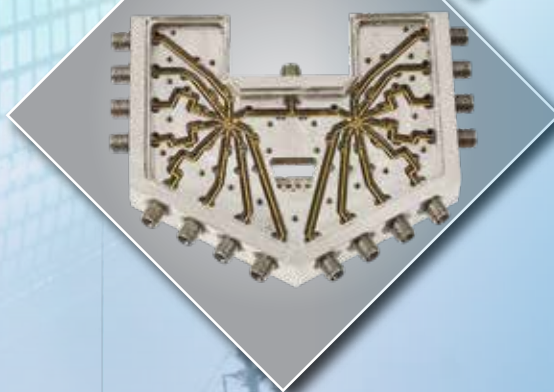
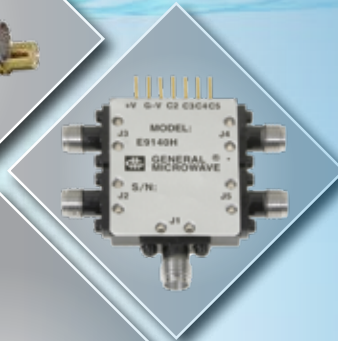
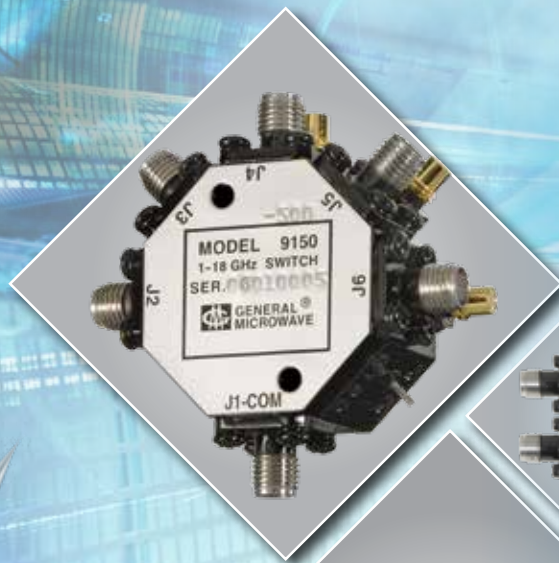


**KRATOS** | **GENERAL MICROWAVE**  
Microwave Electronics Division

# SWITCHES LIMITERS

CONTROL C COMPONENTS - 2



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**The information contained in this short form brochure is basic marketing information and does not contain any export controlled information.**

## COMPANY PROFILE



### ABOUT KRATOS GENERAL MICROWAVE

KRATOS General Microwave incorporates engineering innovation and excellence with high-quality design and production to deliver special requirements and mission critical needs.

Having built numerous products for the most rigid requirements and demanding environments, KRATOS General Microwave has become a leader in Innovative Microwave Solutions. Whether it is off-the-shelf, or custom made, KRATOS General Microwave designs provide top performance at a competitive price and uncompromised quality, while powering many military, governmental and commercial applications.

For more than 50 years, our multi-disciplinary expertise in RF technology, signal processing, hardware and firmware have been utilized worldwide in state-of-the-art microwave components and sub-assemblies for a wide range of defense and civil applications.

### TYPICAL APPLICATIONS

**Military and Defense** - Electronic Warfare (EW) Systems, Radars, Missiles, UAVs, Smart Munition/Precision Guided Munition, GPS Immune/Navigation Warfare, Communications, Homeland Security (HLS), Simulators, Munition Proximity Sensors and Software Defined Radio (SDR).

**Commercial** - In-Flight Connectivity, Maritime and Train Connectivity, Airborne Weather Radars, IFF, Test Equipment, RF and Fiber Optic Communications, Industry Manufacturing Instrumentation, Research Laboratories and Medical Instruments.

### PRODUCT LINES

#### MICROWAVE PRODUCT SOLUTIONS

**Broadband Oscillators and Synthesizers** - This product line covers 0.5 to 18 GHz band (and beyond) and includes Fast Indirect Synthesizers with less than 1 microsecond settling time with modulation, Direct Coherent Synthesizers with 40 nanosecond settling time, Digitally Tuned Oscillators (DTOs), Phase Locked Oscillator PLOs) and Voltage Controlled Oscillators (VCOs).

**Solid State Power Amplifiers (SSPAs)** - Up to 1KW in X, Ku and Ka-bands for missiles, airborne Radars and HLS radars. Up to 1 KW in VHF for military and non-military applications as well as for Pulse Power Amplifiers for IFF systems and Low Noise Amplifiers.

**Data-Links** - A variety of customized DATA-LINKS subsystems, from small, simple, low cost and low power to complex, high-end and high-power products that incorporate state-of-the-art microwave technology, mixed signal processing, System on Chip (SoC) devices, high power FPGAs and other Digital technologies.

### INTEGRATED MICROWAVE ASSEMBLIES (IMAS) AND SUB-SYSTEMS

**Beam Forming Modules** - A versatile line of complex, high-density modules, utilizing Surface Mount Technology for Phase Array Radars.

**Transceivers and Receivers** - Superior performance and cost-effective product line that includes both Narrowband and Broadband products and covers 0.5 – 18 GHz bands. A perfect fit for various applications, such as Direction Finder subsystem for ELINT and ESM airborne systems, Data Links for Missiles, Smart Munition, UAVs, Centric Network Warfare, JDAM/BDI and more.

**Custom IMAs** - Integrated Microwave Assemblies (IMA) built per specific requirements such as: RF Front-Ends, Complicated Switching Assemblies and Frequency Up and Down Converters.

### CONTROL COMPONENTS

Control Components (0.1 – 40 GHz) - Based on PIN diode and proprietary coupler technology, this product line includes low, medium, and high-power switches (SPST up to SP16T), Switched Filter Banks, Attenuators, Limiters, Modulators, Phase Shifters, Frequency Translators. All control components are available with either digital or analog control.

### STANDARDS AND CERTIFICATIONS

KRATOS General Microwave Quality Management has been certified to AS9100 and ISO9001. General Microwave Corporation US is certified to ISO 9001:2015. Certain companies within the Microwave Electronics Division are FAA certified to maintain microwave modules for commercial aircraft and is in process of being certified by the European Union Aviation Safety Agency (EASA). KRATOS Microwave Electronics Division shares the concern for a better world for all, and certain companies within the division are certified to ISO 14001. Our products can be ordered to be REACH or RoHS compliant.



L sbupt !Hf of sbtM!dspx bv f !ef ubj rfe!pspev du rjof !dbubph!jt !bv bj rtdorf!porjof !bu!!!!!!!!!!!!!!!!!!!!!!  
x x x .l sbupt rfe. qpr/nrdubuph.

## KRATOS GENERAL MICROWAVE SWITCHES

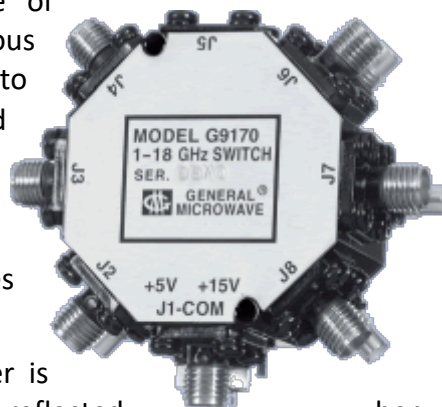
### GENERAL

Kratos General Microwave has become an industry standard in microwave PIN diode switches. Kratos offers a comprehensive set of COTS switches in various standard options, as well as customized switches, covering the entire frequency range of 100MHz to 50 GHz. The COTS switches are available in various topologies, ranging from Single-Pole Single-Throw (SPST) to Single-Pole 16-Throw (SP16T), in both reflective and non-reflective configurations.

### THE SWITCH TOPOLOGY

There are two fundamental methods of connecting PIN diodes and a transmission line to provide a switching function:

1. In series with the transmission line, so that RF power is conducted when the PIN diode is forward biased and reflected when reverse biased;
2. In shunt with the transmission line, so that the RF power is conducted when the diode is reverse biased and reflected when forward biased.



A simple reflective SPST switch can be designed utilizing one or more PIN diodes in either configuration, as depicted in Fig. 1.

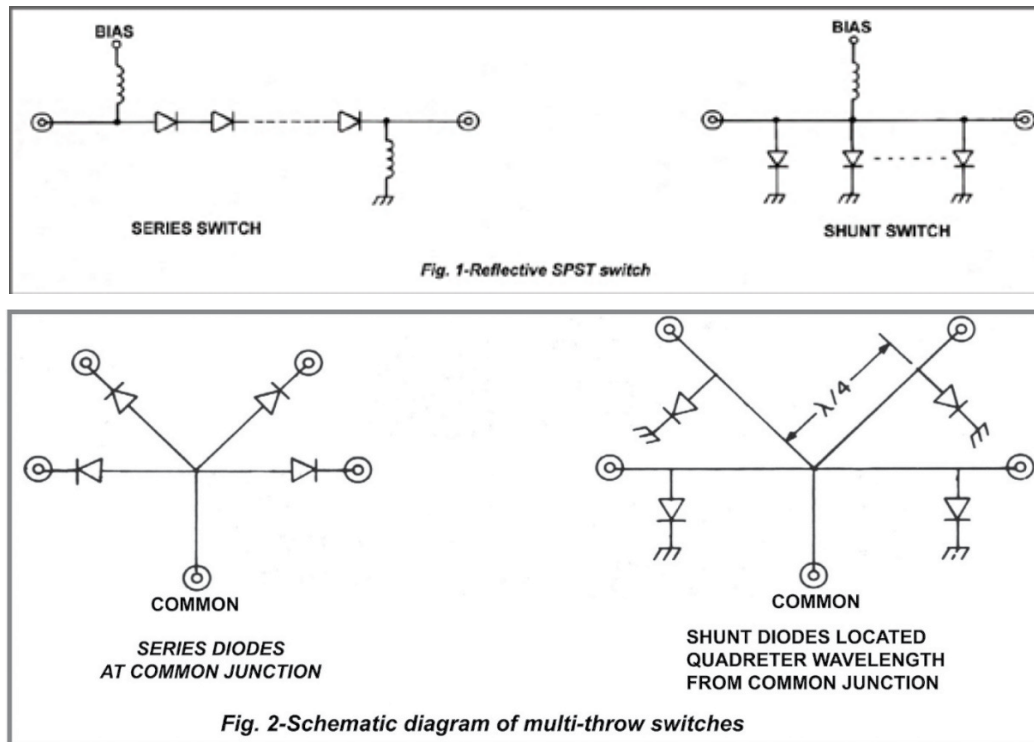
A multi-throw switch essentially consists of a combination of SPST switches connected to a common junction and biased so that each switch port can be enabled individually. The common junction of the switch must be designed to minimize the resistive and reactive loading, presented by the OFF ports in order to obtain low insertion loss and VSWR for the ON port.

There are two basic methods of realizing a multi-throw switch common junction for optimum performance over a broad frequency range.

The first employs a series of mounted PIN diodes, connected to the common junction. A path is selected by forward biasing its series diode and simultaneously reverse biasing all the other diodes. This provides the desired low-loss path for the ON port, with a minimum of loading from the OFF ports.

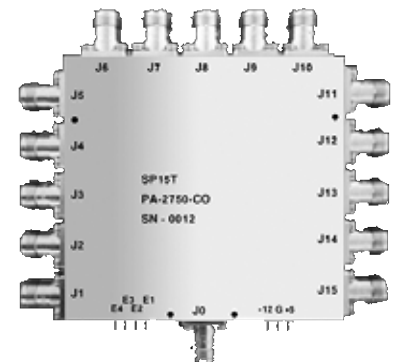
The second method utilizes shunt mounted PIN diodes, located a quarter wavelength from the junction. The diode(s) of the selected ON port is reverse biased while the OFF ports are forward biased to create a short circuit across the transmission line. As a result of quarter wavelength spacing, the short circuits are transformed to open circuits at the junction. By proper choice of transmission line impedances and minimization of stray reactance, it is possible to construct a switch with low insertion loss and VSWR of over a three to one bandwidth.

The schematic diagrams for both switches are depicted in Fig. 2.



## ABSORPTIVE SWITCHES

In order to maintain desired system performance, it is frequently necessary to have a PIN diode switch present a low VSWR in its OFF position as well as in its ON state. Kratos General Microwave offers a broad line of single and multi-throw absorptive switches, which incorporate 50 $\Omega$  terminations in each of the output ports. Fig. 3 depicts the schematic diagrams of the two versions of absorptive (also known as Non-reflective or terminated) switches. The shunt termination is used in "all-series" configured absorptive switches, ending with "T" or "W" suffix. These absorptive switches offer a minimum penalty in insertion loss due to the addition of the terminating elements. Series termination is used in the high speed, "series-shunt" configured absorptive switches, since it provides optimum switching performance.



The common port of standard absorptive multi-throw switches will be reflective, only when all ports are turned OFF. If there is a need for this port to remain matched under these conditions, it can be realized either by employing an additional port, to which an external termination is connected, or by providing automatic connection of an internal termination to the common port in a custom design.

## PHASE AND AMPLITUDE MATCHING

Switches are available on a custom basis with phase and/or amplitude matching. Matching can be either between ports of a switch, between like ports on different switches, or a combination of the two. The uniformity of broadband catalog switches is quite good and is usually better than  $\pm 0.75$  dB and  $\pm 15$  degrees over the entire operating frequency of the switch. Please consult the factory for special requirements.

## HARMONIC AND INTERMODULATION PRODUCTS

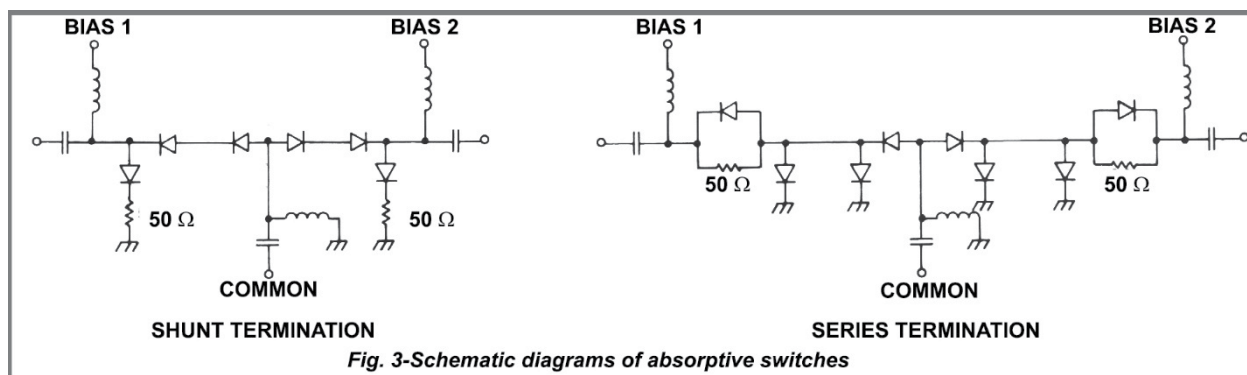
All PIN diode switches generate harmonics and inter-modulations since the PIN diodes are fundamentally non-linear devices. The magnitude of these spurious signals is typically small since the switch diodes are usually either in their saturated forward biased state or in their reversed biased state.

The physics of the PIN diode causes a cut-off frequency phenomena, such that the level of harmonics and intermods greatly increase at low frequencies. These levels will vary with the minority carrier lifetime of the diode. A high-speed switch operating below 500 MHz may have a second order intercept point of 35 dBm, while a slow switch operating at 8 GHz will have a second order intercept point of 70 dBm. Typical performance is demonstrated in table-1:

SWITCH	FREQUENCY	2 <sup>ND</sup> ORDER INTERCEPT	3 <sup>RD</sup> ORDER INTERCEPT
High Speed	2.0 GHz	+50 dBm	+40 dBm
Low Speed	2.0 GHz	+65dBm	+50 dBm

Table 1 - typical switch intercept points

Since these levels vary significantly with frequency, switching speed and RF topology, please consult the factory for any specific requirements.



## VIDEO LEAKAGE

Video leakage refers to the spurious signals present at the RF ports of the switch, when it is switched without an RF signal present. These signals arise from the waveforms generated by the switch driver and, in particular, from the leading-edge voltage spike required for high speed switching of PIN diodes. When measured in a 50Ω system, the magnitude of the video leakage can be as much as several volts. The frequency content is concentrated in the band below 200 MHz, although measurable levels for high speed switches are observed as high as 6.0 GHz. The magnitude of the out-of-band video leakage can be reduced significantly by the inclusion of high pass or “video filters” <sup>(1)</sup> in the switch. Our E-series switches are specially designed for low in-band video leakage, without sacrificing switching speed.

<sup>(1)</sup> For switches with internal video filters, specify Option 41, Option 42, or Option 43. These filters reduce the leakage as shown in the Video leakage filter options table. Please refer to specification table notes.

## POWER HANDLING

The power handling of PIN diode switches depends on the RF topology, forward and reverse biasing levels, and speed of the switch. This catalog addresses both the maximum operating power levels and the survival limits of the components. Maximum operating limits are typically set at the power level, which will cause the reversed biased diodes to begin conduction and thereby degrade the insertion loss, VSWR, or isolation of the switch. The survival power limits are based on the maximum ratings of the semiconductors in the switch.

For special applications, significantly higher operational power levels can be provided, particularly for narrow band requirements. Please consult the factory for specific applications.

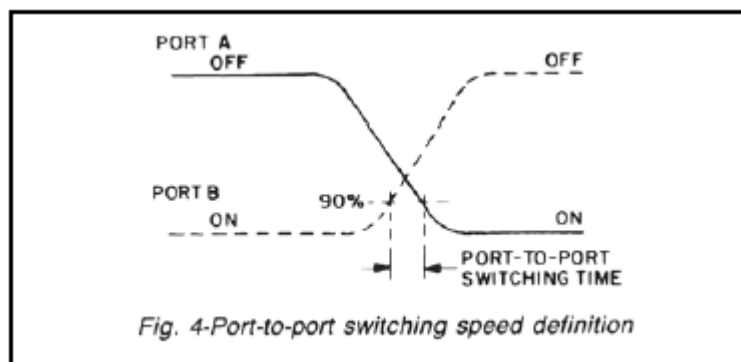
## DEFINITION OF PARAMETERS

**INSERTION LOSS** is the maximum loss measured in a 50Ω system, when only a single port of the switch is in ON state.

**ISOLATION** is the ratio of the power level when the switch port is ON to the power level measured when the switch port is OFF. In a multi-throw switch, the isolation is measured when one of the other ports is turned ON and terminated in 50 Ω.

**VSWR** is defined for the input and output ports of the selected ON path. For those switches with a “T”, “W” or “HT” suffix, the VSWR is also defined for the OFF state.

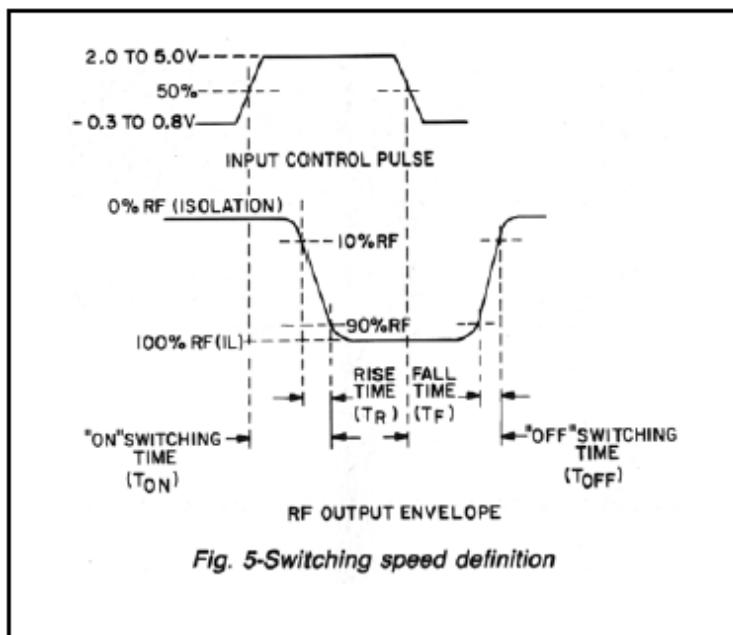
**SWITCHING SPEED.** Port-To-Port Switching is the interval from the time the RF power level at the off-going port drops to 90% of its original value, to the time the RF power level in the on-going port rises to 90% of its final value. See Fig. 4



**RISE TIME** is measured between the 10% and 90% points of the square-law detected RF power, when the unit is switched from full OFF to full ON. See Fig. 5.

**FALL TIME** is measured between the 90% and 10% points of the square-law detected RF power, when the unit is switched from full ON to full OFF.





**ON TIME** is measured from the 50% level of the input control signal to the 90% point of the square-law detected RF power, when the unit is switched from full OFF to full ON.

**OFF TIME** is measured from the 50% level of the input control signal to the 10% point of the square-law detected RF power, when the unit is switched from full ON to full OFF.

**SWITCHING TO ISOLATION** – Although catalog switching speed specifications are usually defined to the 10% level of detected RF (equivalent to 10 dB isolation), the user of a switch may be more interested in the required time to reach rated isolation. This latter time is strongly dependent on the topology of the switch. For all-shunt mounted, a combination series and shunt mounted topologies, the time to reach final isolation is usually less than twice the fall time. For an all-series topology, the time to reach final isolation may be as much as ten times the fall time.

**SWITCHING TO INSERTION LOSS** – For multi-throw switches, the ON time depends on whether the switch is being operated in a commutating or single port mode. In the former mode, switching speed is slower than in the latter due to the loading effect at the junction of the port turning OFF. All our switching speed measurements are performed in the commutating mode.

## CUSTOM SWITCHES

Kratos General Microwave also offers customized switches to address specific requirements. Custom switches, up to 50 GHz, can be made to order with every electrical specification and mechanical formation, including all in-line outputs. Special order switches may incorporate phase and amplitude matching among ports in the same switch or among group of switches. Additional

available options include switches with decoder as well as specific control, such as serial, TTL, USB and GUI. Switch matrix custom products incorporate various MIC technologies and mechanical packaging of switches and splitters. For example, 12-way power divider with 21 inputs, SP21T, 12 inputs to 2 outputs UHF switch, or 4-port transfer switch in C Band.

Contact [sales@kratos-med.com](mailto:sales@kratos-med.com) for more information.



## CATALOG SWITCHES

For the past 50 years, Kratos General Microwave has been an industry standard in microwave PIN diode switches. Our comprehensive line of cost-effective COTS switches offers low, medium and high-power options that range from SPST to SP16T and includes:

- Operating frequencies from 1 – 40 GHz. All switches have additional frequency options. Please consult factory for price and availability.
- Reflective and Non-Reflective
- Fast Switching Time
- High Isolation
- Phase and Amplitude matched (between ports)
- Low Video Leakage
- Integrated Driver

Kratos General Microwave switches come with hundreds of standard and custom options. You can also order fully customized products, based on specific requirements. Please consult factory for price and availability of such customized products. The specifications table listed below includes the following columns:

- Model name
- Frequency Range
- Min isolation per each frequency range
- Max insertion loss per each frequency range
- Reflective / non reflective
- Switching speed
- Power supply requirements are stated for one port ON. For additional specifications please refer to the switch page in the online catalog
- Available options numbers. All options are detailed in the following Specification Table Notes chapter

**Additional specifications and diagrams can be found in the online catalog at [www.kratosmed.com/gmcatalog](http://www.kratosmed.com/gmcatalog).**

## SPECIFICATION TABLE NOTES

### <sup>(1)</sup> SPECIAL ORDER PRODUCTS

Contact [sales@kratos-med.com](mailto:sales@kratos-med.com) for price and availability.

### <sup>(2)</sup> AVAILABLE OPTIONS

**3** - SMA female control connector

**7** - Two SMA male RF connectors

**7A** - J1 SMA male; J2 and J3 SMA female

**7B** - J1 SMA female; J2 and J3 SMA male

**9** - Inverse control logic; “1” for switch ON, “0” for switch OFF

**10** - One SMA male (J1) and one SMA female (J2) RF connector

**27** - Single-port toggle control; logic “0” connects J1 to J2

**33** - EMI filter solder-type control terminal, 48 +5V, –15V operation

**41, 42, 43** - Internal video filter, common port only. Not applicable to F92/G92 series.

VIDEO LEAKAGE FILTER OPTIONS			
Applicability: F91 and G91 Switch Series			
		Peak (mV)	Bandwidth (MHz)
Video leakage with video filter options		100 max.	100
INSERTION LOSS DEGRADATION			
Option	Affected Ports	Frequency	Additional IL
41	Common port only	1-12.4 GHz 12.4-18 GHz	0.1 dB 0.2 dB
42	Output ports only	1-12.4 GHz 12.4-18 GHz	0.1 dB 0.2 dB
43	All ports	1-12.4 GHz 12.4-18 GHz	0.2 dB 0.4 dB
VSWR DEGRADATION			
Option	Affected Ports	Frequency	VSWR*
41, 42, 43	All ports	1-4 GHz 4-18 GHz	1.7:1* No change

\* As shown for 1-4 GHz switches whose VSWR is less than 1.7. No change for 1-4 GHz switches, whose VSWR specification is 1.7 or greater.

**48** - +5V, –15V operation

## 49 - High Reliability Screening

TEST	MIL-STD-883	NOTES
Internal Visual	METHOD E2017	-
Temperature Cycle	METHODE 1010	-55°C to +95°C, 10 CYCLES Dwell time at temperature 20 minutes min. temp. rise time 3°C/MIN
Mechanical Shock	METHODE 2002, COND. B	1,500g, 0.5ms
Burn-In	METHODE 1015, COND. B	48 hours, at +110 °C
Leak	METHODE 1014 COND. A1	5X10-8

**55** - Extended Frequencies. When option 55 is applicable, a switch that covers the 1-18 GHz range can be modified to cover 0.5 to 18 GHz. The following specification changes will apply:

- Insertion loss and isolation in 0.5 to 1.0 GHz is the same as in 1 to 2 GHz specification.
- Insertion loss in the 12.4 to 18 GHz bands increases by 0.3dB. Consult factory for cost.
- VSWR degrades to 2.0:1.

**62** - +5, -15V operation

**64** - SMC male control connectors

**64A** - SMB male control connectors

**65** - ±12V operation

**C37** - 100 nsec. switching time. Not applicable to F92/C92 series. Minimum order buy of 100 switches.

**G07** - 2.4 mm Female RF connectors

**G09** - Guaranteed to meet the Environmental Ratings

**G11** - 12V & +6 to +15V

**G12** - RoHS Compliant

**G18** - REACH Compliant

**893<sup>(1)</sup>** - Video Filters. RF band 0.5-2 GHz. Leakage 100 mV P-P into 100MHz bandwidth

**5004<sup>(1)</sup>** (options 9 & 33 are included)- Video Filters. RF band: 6-18 GHz. Leakage 50 mV P-P into a 300MHz bandwidth. Consult factory in order to remove options 9 / 33

**5037<sup>(1)</sup>** - Video Filters. RF band 2-18 GHz. Leakage 100 mV. P-P into 100MHz bandwidth

## SPECIFICATIONS TABLE

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
<b>Microwave Switches</b>								
<b>SPST Switches</b>								
F9016	0.1 - 40.0 GHz	0.1-18.0 GHz: <b>65</b> 18.0-6.5 GHz: <b>60</b> 26.5-40.0 GHz: <b>50</b>	0.1-4.0 GHz: <b>2.3</b> 4.0-18.0 GHz: <b>2.9</b> 18.0-26.5 GHz: <b>3.5</b> 26.5-40.0 GHz: <b>5.0</b>	Yes	250 nsec	+5V ±2%, 60 mA -15V ±5%, 50 mA	G09, G12, G18	Ultra-Broadband
F9214A	0.2 - 4.0 GHz	0.2-0.5 GHz: <b>40</b> 0.5-1.0 GHz: <b>45</b> 1.0-4.0 GHz: <b>50</b>	0.2-4.0 GHz: <b>1.0</b>	Yes	40 nsec	+5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 9, 10, 33, 55, 64A, G09, G12, G18	
9214 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-0.5 GHz: <b>40</b> 0.5-1.0 GHz: <b>45</b> 1.0-4.0 GHz: <b>50</b>	0.2-4.0 GHz: <b>1.0</b>	Yes	40 nsec	For rated isolation: +35 mA For rated insertion loss: -10V	3, 7, 9, 10, 33, 55, 64A, G09, G12, G18	Driverless
F192A	0.2 – 18.0 GHz	0.2-0.2 GHz: <b>70</b> 0.5-18.0 GHz: <b>80</b> < 0.5 GHz: <b>70</b>	0.2-2.0 GHz: <b>2.0</b> 2.0-8.0 GHz: <b>2.5</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.5</b>	No	<b>ON:</b> 30 nsec <b>OFF:</b> 15 nsec	+5V ±5%, 90 mA -12V ±5%, 75 mA	3, 7, 9, 10, 33, G09, G12, G18, 893 <sup>(1)</sup> , 5004 <sup>(1)</sup> , 5037 <sup>(1)</sup> .	Ideally as Pulse Modulator
F9114A	1.0 – 18.0 GHz	1.0-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>74</b> 4.0-18.0 GHz: <b>80</b>	1.0-4.0 GHz: <b>0.9</b> 4.0-8.0 GHz: <b>1.0</b> 8.0-12.4 GHz: <b>1.6</b> 12.4-18.0 GHz: <b>2.5</b>		20 nsec	+5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 9, 10, 33, 41, 42, 43, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9114 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>74</b> 4.0-18.0 GHz: <b>80</b>	1.0-4.0 GHz: <b>0.9</b> 4.0-8.0 GHz: <b>1.0</b> 8.0-12.4 GHz: <b>1.6</b> 12.4-18.0 GHz: <b>2.5</b>	Yes	20 nsec	For rated isolation: +35 mA For rated insertion loss: -10V	3, 7, 9, 10, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
E9114H	1.0 - 18.0 GHz	1.0-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>74</b> 4.0-18.0 GHz: <b>80</b>	1.0-4.0 GHz: <b>0.9</b> 4.0-8.0 GHz: <b>1.2</b> 8.0-12.4 GHz: <b>1.6</b> 12.4-18.0 GHz: <b>2.5</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 60 mA max -12V ±5%, 40 mA max	7, 9, 11, 43, 49, 62, G09	Low profile
F9112A <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-2.0 GHz: <b>36</b> 2.0-4.0 GHz: <b>40</b> 4.0-18.0 GHz: <b>45</b>	1.0-4.0 GHz: <b>0.8</b> 4.0-8.0 GHz: <b>0.9</b> 8.0-12.4 GHz: <b>1.1</b> 12.4-18.0 GHz: <b>1.8</b>	Yes	20 nsec	+5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 9, 10, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9112 <sup>(4)</sup>	1.0 – 18.0 GHz	1.0-2.0 GHz: <b>36</b> 2.0-4.0 GHz: <b>40</b> 4.0-18.0 GHz: <b>45</b>	1.0-4.0 GHz: <b>0.8</b> 4.0-8.0 GHz: <b>0.9</b> 8.0-12.4 GHz: <b>1.1</b> 12.4-18.0 GHz: <b>1.8</b>	Yes	20 nsec	For rated isolation: +35 mA For rated insertion loss: -10V	3, 7, 9, 10, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
F9014	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>75</b> 26.5-40.0 GHz: <b>70</b>	18.0-26.5 GHz: <b>2.8</b> 26.5-40.0 GHz: <b>3.5</b>	Yes	20 nsec	+5V ±2%, 65 mA -12 to -15V, 20 mA		

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9014	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>75</b> 26.5-40.0 GHz: <b>70</b>	18.0-26.5 GHz: <b>2.8</b> 26.5-40.0 GHz: <b>3.5</b>	Yes	20 nsec	For rated isolation: +35 mA  For rated insertion loss: -10V	3, 7, 10, 33, 64, G07, G09, G12, G18	Driverless
F9013 <sup>(1)</sup>	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>55</b> 26.5-40.0 GHz: <b>50</b>	18.0-26.5 GHz: <b>2.5</b> 26.5-40.0 GHz: <b>3.0</b>	Yes	20 nsec	+5V ±2%, 65 mA -12 to -15V, 20 mA	3, 7, 9, 10, 33, 64, G07, G09, G12, G18	
9013 <sup>(1)</sup>	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>55</b> 26.5-40.0 GHz: <b>50</b>	18.0-26.5 GHz: <b>2.5</b> 26.5-40.0 GHz: <b>3.0</b>	Yes	20 nsec	For rated isolation: +35 mA  For rated insertion loss: -10V	3, 7, 10, 33, 64, G07, G09, G12, G18	Driverless
F9012	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>35</b> 26.5-40.0 GHz: <b>30</b>	18.0-26.5 GHz: <b>2.2</b> 26.5-40.0 GHz: <b>2.7</b>	Yes	20 nsec	+5V ±2%, 65 mA -12 to -15V, 20 mA	3, 7, 9, 10, 33, 64, G07, G09, G12, G18	
9012	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>35</b> 26.5-40.0 GHz: <b>30</b>	18.0-26.5 GHz: <b>2.2</b> 26.5-40.0 GHz: <b>2.7</b>	Yes	20 nsec	For rated isolation: +35 mA  For rated insertion loss: -10V	3, 7, 10, 33, 64, G07, G09, G12, G18	Driverless
<b>SPDT Switches</b>								
2677	0.1 - 20.0 GHz	0.1-12.0 GHz: <b>65</b> 12.0-20.0 GHz: <b>55</b>	0.1-12.0 GHz: <b>2.0</b> 12.0-18.0 GHz: 3.0 18.0-20.0 GHz: 3.8	Yes	500 nsec	ON: +7.0 V ±0.5 V, 50 mA max  OFF: - 1.0 V ±0.5 V, 50 mA max		Wide frequency band

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9025	0.1 - 40.0 GHz	0.1-4.0 GHz: <b>70</b> 4.0-18.0 GHz: <b>60</b> 18.0-26.5 GHz: <b>55</b> 26.5-40.0 GHz: <b>40</b>	0.1-4.0 GHz: <b>2.6</b> 4.0-18.0 GHz: <b>3.2</b> 18.0-26.5 GHz: <b>3.8</b> 26.5-40.0 GHz: <b>5.3</b>	Yes	250 nsec	+5V ±2%, 75 mA max -15V ±5%, 50 mA max	G09, G12, G18	Ultra-Broadband
F9220 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.5</b>	Yes	500 nsec	+5V ± 5%, 65 mA -12 to -15V, 65 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	
9220-500 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.5</b>	Yes	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	Driverless
G9220 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.8</b>	Yes	500 nsec	+5V ±5%, 100 mA +15V ±5%, 30 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	Positive voltages only
F9220T <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.3</b>	No	500 nsec	+5V ± 5%, 65 mA -12 to -15V, 65 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	



Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9220T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.3</b>	No	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	Driverless
G9220T <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.3</b>	No	500 nsec	+5V ±5%, 100 mA +15V ±5%, 30 mA	3, 7, 7A, 7B, 9, 27, 33, 64A, G09, G12, G18	Positive voltages only
F940H	0.5 - 18.0 GHz	0.5 - 8.0 GHz: <b>60</b> 8 - 12.4 GHz: <b>55</b> 12.4 - 18 GHz: <b>50</b>	0.5 - 8.0 GHz: <b>2.0</b> 8 - 12.4 GHz: <b>2.5</b> 12.4 - 18.0 GHz: <b>3.5</b>	No	30 nsec	+5V ±5%, 60 mA -12V ±5%, 75 mA	7, 9, 33, 48, 64A, G09, G12, G18	Broadband Transfer Switch High Speed
9120-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>50</b>	1.0 - 4.0 GHz: <b>1.1</b> 4.0 - 8.0 GHz: <b>1.4</b> 8.0 - 12.4 GHz: <b>2.0</b> 12.4 - 18.0 GHz: <b>2.5</b>	Yes	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
F9120	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>50</b>	1.0 - 4.0 GHz: <b>1.1</b> 4.0 - 8.0 GHz: <b>1.4</b> 8.0 - 12.4 GHz: <b>2.0</b> 12.4 - 18.0 GHz: <b>2.5</b>	Yes	250 nsec	+5V ± 5%, 65 mA -12 to -15V, 65 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
G9120 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>50</b>	1.0 - 8.0 GHz: <b>1.8</b> 8.0 - 12.4 GHz: <b>2.2</b> 12.4 - 18.0 GHz: <b>2.5</b>	Yes	250 nsec	+5V ±5%, 100 mA +15V ±5%, 30 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9120W	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>55</b>	1.0 - 8.0 GHz: <b>1.8</b> 8.0 - 12.4 GHz: <b>2.2</b> 12.4 - 18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ± 5%, 65 mA -12 to -15V, 65 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9120W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>55</b>	1.0 - 8.0 GHz: <b>1.8</b> 8.0 - 12.4 GHz: <b>2.2</b> 12.4 - 18.0 GHz: <b>2.5</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
F9120AH	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4 - 18.0 GHz: <b>50</b>	1.0 - 4.0 GHz: <b>1.1</b> 4.0 - 8.0 GHz: <b>1.4</b> 8.0 - 12.4 GHz: <b>2.0</b> 12.4 - 18.0 GHz: <b>2.5</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ± 5%, 60 mA -12 to -15V, 50 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High-Speed

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9120AH-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0 - 12.4 GHz: <b>60</b> 12.4- 18.0 GHz: <b>50</b>	1.0 - 4.0 GHz: <b>1.1</b> 4.0 - 8.0 GHz: <b>1.4</b> 8.0 - 12.4 GHz: <b>2.0</b> 12.4 - 18.0 GHz: <b>2.5</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	ON: -30 mA OFF: +35 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High-Speed Driverless
F9120AHT	1.0 - 18.0 GHz	1.0- 12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0 - 4.0 GHz: <b>1.3</b> 4.0 - 8.0 GHz: <b>1.7</b> 8.0 - 12.4 GHz: <b>2.5</b> 12.4 - 18.0 GHz: <b>3.0</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ± 5%, 80 mA -12 to -15V, 50 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High-Speed
9120AHT-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.3</b> 4.0-8.0 GHz: <b>1.7</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.0</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec.	ON: -30 mA OFF: +35 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High-Speed Driverless
E9120H	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.1</b> 4.0-8.0 GHz: <b>1.4</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 95 mA max -12V ±5%, 70 mA max	7, 9, 11, 27, 43, 49, 62, G09	High Speed
E9120HT	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.3</b> 4.0-8.0 GHz: <b>1.7</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.0</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 95 mA max -12V ±5%, 70 mA max	7, 9, 11, 27, 43, 49, 62, G09	High Speed

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
G9120W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>55</b> 12.4-18.0 GHz: <b>50</b>	1.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.2</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ±5%, 100 mA +15V ±5%, 30 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9120T	1.0 - 18.0 GHz	1.0-8.0 GHz: <b>50</b> 8.0-12.4 GHz: <b>45</b> 12.4-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-12.4 GHz: <b>1.5</b> 12.4-18.0 GHz: <b>2.2</b>	No	250 nsec	+5V ±5%, 65 mA -12 to -15V, 65 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9120T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-8.0 GHz: <b>50</b> 8.0-12.4 GHz: <b>45</b> 12.4-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-12.4 GHz: <b>1.5</b> 12.4-18.0 GHz: <b>2.2</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9120T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-8.0 GHz: <b>50</b> 8.0-12.4 GHz: <b>45</b> 12.4-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-12.4 GHz: <b>1.5</b> 12.4-18.0 GHz: <b>2.2</b>	No	250 nsec	+5V ±5%, 100 mA +15V ±5%, 30 mA	3, 7, 7A, 7B, 9, 27, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9321T	2.0 - 21.0 GHz	<b>45</b>	<b>4.0</b>	No	100 nsec	+5V ±5%, 80 mA max -12V to -15V, 50 mA max	G09, G12, G18	Phase & Amplitude Matched

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F8922 <sup>(1)</sup>	2.0 - 4.0 GHz	<b>60</b>	<b>1.0</b>	Yes	<b>ON:</b> 35 nsec <b>OFF:</b> 30 nsec	+5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 7A,7B, 9, 27, 62, 64, 64A, 65, G09, G12, G18	High-Speed Octave Band
	1.5 - 4.5 GHz	<b>55</b>	<b>2.0</b>					
F8924 <sup>(1)</sup>	4.0 - 8.0 GHz	4.0-8.0 GHz: <b>50</b>	<b>1.4</b>	Yes	<b>ON:</b> 35 nsec <b>OFF:</b> 30 nsec	+5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 7A,7B, 9, 27, 62, 64, 64A, 65, G09, G12, G18	High-Speed Octave Band
	3.0 - 9.0 GHz	3.0-9.0 GHz: <b>45</b>	<b>2.3</b>					
F8928	8.0 - 18.0 GHz	8.0-16.0 GHz: <b>45</b> 16.0-18.0 GHz: <b>40</b>	8.0-18.0 GHz: <b>2.3</b>	Yes	<b>ON:</b> 35 nsec <b>OFF:</b> 30 nsec	For one port ON: +5V ±5%, 65 mA -12 to -15V, 20 mA	3, 7, 7A,7B, 9, 27, 62, 64, 64A, 65, G09, G12, G18	High-Speed Octave Band
	6.0 - 18.0 GHz	6.0-16.0 GHz: <b>45</b> 16.0-18.0 GHz: <b>40</b>	6.0-18.0 GHz: <b>2.5</b>					
F9022	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>45</b> 26.5-40.0 GHz: <b>40</b>	18.0-26.5 GHz: <b>3.0</b> 26.5-40.0 GHz: <b>4.0</b>	Yes	25 nsec	+5V ±2%, 75 mA -12 to -15V, 50 mA	3, 7, 7A, 7B, 9, 10, 273,52, 64A, G07, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9023	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>45</b> 26.5-40.0 GHz: <b>40</b>	18.0-26.5 GHz: <b>3.5</b> 26.5-40.0 GHz: <b>4.5</b>	Yes	25 nsec	+5V ±2%, 75 mA -12 to -15V, 50 mA	3, 7, 7A, 7B, 9, 10, 273,52, 64A, G07, G09, G12, G18	
F9021	18.0 - 40.0 GHz	18.0-26.5 GHz: <b>30</b> 26.5-40.0 GHz: <b>20</b>	18.0-26.5 GHz: <b>3.0</b> 26.5-40.0 GHz: <b>3.6</b>	Yes	25 nsec	+5V ±2%, 75 mA -12 to -15V, 50 mA	3, 7, 7A, 7B, 9, 10, 273,52, 64A, G07, G09, G12, G18	
<b>SP3T Switches</b>								
F9230 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.5</b>	Yes	500 nsec	+5V ± 5%, 130 mA -12 to -15V, 60 mA	3, 7, 9, 33, 55, 64A, G09, G12, G18	
9230-500 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.5</b>	Yes	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9230 <sup>(1)</sup>	0.2 - 4.0 GHz	<b>60</b>	<b>1.8</b>	Yes	500 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 55, 64A, G09, G12, G18	Positive voltages only
F9230T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.2</b> 2.0-4.0 GHz: <b>1.4</b>	No	500 nsec	+5V ± 5%, 130 mA -12 to -15V, 60 mA	3, 7, 9, 33, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9230T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.2</b> 2.0-4.0 GHz: <b>1.4</b>	No	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9230T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.2</b> 2.0-4.0 GHz: <b>1.4</b>	No	500 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 55, 64A, G09, G12, G18	Positive voltages only
F9130W	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>1.8</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>2.8</b>	No	250 nsec	+5V ±5%, 130 mA -12V to -15V 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9130W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>1.8</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>2.8</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9130W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>1.8</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>2.8</b>	No	250 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9130	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	Yes	250 nsec	+5V ±5%, 130 mA -12V to -15V 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9130-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	Yes	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9130 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.8</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	250 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9130AH	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.6</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 75 mA -12V to -15V 55 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed
9130AH-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.6</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	ON: -35 mA OFF: +30 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed Driverless



Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9130AHT	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 105 mA -12V to -15V 55 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed
9130AHT-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	ON: -35 mA OFF: +30 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed Driverless
E9130H	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.2</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.6</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 110 mA max -12V ±5%, 65 mA max	7, 9, 11, 43, 49, 62, G09	High Speed
E9130HT	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 110 mA max -12V ±5%, 65 mA max	7, 9, 11, 43, 49, 62, G09	High Speed
F9130T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.6</b> 8.0-12.4 GHz: <b>1.8</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ±5%, 130 mA -12V to -15V 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9130T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.6</b> 8.0-12.4 GHz: <b>1.8</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9130T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.6</b> 8.0-12.4 GHz: <b>1.8</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
<b>SP4T Switches</b>								
F9240 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	+5V ±5%, 190 mA -12 to -15V, 80 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9240-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9240 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>2.0</b>	Yes	500 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 64A, G09, G12, G18	Positive voltages only
F9240T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.3</b> 2.0-4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 190 mA -12 to -15V, 80 mA	3, 7, 9, 33, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9240T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.3</b> 2.0-4.0 GHz: <b>1.5</b>	No	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 4A, G09, G12, G18	Driverless
G9240T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>50</b>	0.2-2.0 GHz: <b>1.3</b> 2.0-4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 64A, G09, G12, G18	Positive voltages only
F9140W	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.0</b>	No	250 nsec	+5V ± 5%, 190 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9140W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.0</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9140W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.0</b>	No	250 nsec	+5V ±5%, 150 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9140AH	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.4</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ± 5%, 95 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9140AH-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.4</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	ON: -35 mA OFF: +30 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed Driverless
F9140AHT	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 135 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed
9140AHT-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	ON: -35 mA OFF: +30 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	High Speed Driverless
F9140	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.4</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	250 nsec	+5V ±5%, 190 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	
9140-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.4</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
G9140 <sup>(1)</sup>	1.0 - 18 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.0</b>	Yes	250 nsec	For one port ON: +5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
E9140H	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.4</b> 4.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.8</b>	Yes	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 135 mA -12V ±5%, 65 mA	7, 9, 11, 43, 49, 62, G09	High Speed
E9140HT	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.3</b>	No	<b>ON:</b> 25 nsec <b>OFF:</b> 20 nsec	+5V ±5%, 135 mA -12V ±5%, 65 mA	7, 9, 11, 43, 49, 62, G09	High Speed
2600	1.0 - 18.0 GHz	1.0-18.0 GHz: <b>50</b>	1.0-18.0 GHz: <b>4.4</b>	No	500 nsec	+5V ±5%, 190 mA -12V ±5%, 60 mA	G09, G12, G18	Phase & Amplitude Matched  All in-line output ports
F9140T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.7</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ± 5%, 190 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9140T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.7</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Driverless
G9140T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>1.7</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>2.5</b>	No	250 nsec	+5V ±5%, 100 mA +15V ±5%, 40 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, G09, G12, G18	Positive voltages only
F9341T	2.0 - 21.0 GHz	2.0-21.0 GHz: <b>50</b>	2.0-21.0 GHz: <b>5.5</b>	No	500 nsec	+5V ±5%, 190 mA -12V ±5%, 60 mA	G09, G11, G12, G18	Phase & Amplitude Matched
2578	6.0 - 18.0 GHz	6.0-18.0 GHz: <b>55</b>	6.0-18.0 GHz: <b>3.5</b>	No	250nsec	+5V ±5%, 135mA -12V ±5%, 60 mA	G09, G12, G18	Phase & Amplitude Matched
F9044	26.0 - 40.0 GHz	26.0-40.0 GHz: <b>55</b>	26.0-33.0 GHz: <b>6.0</b> 33.0-37.0 GHz: <b>6.5</b> 37.0-40.0 GHz: <b>8.5</b>	No	50 nsec	+5V ±5%, 375 mA -12V ±5%, 250 mA		Amplitude & Phase matched
F9043-C79	32.0 - 36.0 GHz	32.0-36.0 GHz: <b>55</b>	32.0-36.0 GHz: <b>5.9</b>	No	50 nsec	+5V ±5%, 120 mA -12V ±5%, 30 mA		

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
<b>SP5T Switches</b>								
F9250 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500nsec	For one port ON: +5V ±5%, 250 mA -12 to -15V, 80 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9250-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9250 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>2.2</b>	Yes	500nsec	+5V ±5%, 150 mA +15V ±5%, 60 mA	3, 7, 9, 33, 64A, C37, G09, G12, G18	Positive voltages only
F9250T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b>	No	500nsec	+5V ±5%, 250 mA -12 to -15V, 80 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9250T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b>	No	500nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9250T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-2.0 GHz: <b>1.4</b> 2.0-4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 150 mA +15V ±5%, 60 mA	3, 7, 9, 33, 64A, C37, G09, G12, G18	Positive voltages only
ER-2260-UK	0.5 - 18.0 GHz	0.5-8.0 GHz: <b>70</b> 8.0-12.0 GHz: <b>65</b> 12.0-18.0 GHz: <b>60</b>	0.5-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.5</b> 8.0-12.0 GHz: <b>3.0</b> 12.0-18.0 GHz: <b>3.6</b>	Yes	20 nsec	+5V ±0.5V (mA), 140 -12V ±10% (mA), 90	G09, OP1	Removable Connectors

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9150W	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.3</b>	No	250nsec	+5V ±5%, 250 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	
9150W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.3</b>	No	250nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Driverless
G9150W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.3</b>	No	250nsec	+5V ±5%, 150 mA +15V ±5%, 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only
F9150	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>3.0</b>	Yes	250nsec	For one port ON: +5V ±5%, 250 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	
9150-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-8.0 GHz: <b>1.5</b> 8.0-12.4 GHz: <b>2.0</b> 12.4-18.0 GHz: <b>3.0</b>	Yes	250nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Driverless



Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
G9150 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.3</b>	Yes	250nsec	+5V ±5%, 150 mA +15V ±5%, 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only
F9150T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.0</b>	No	250nsec	+5V ±5%, 250 mA -12 to -15V, 80 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	
9150T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.0</b>	No	250nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Driverless
G9150T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.5</b> 12.4-18.0 GHz: <b>3.0</b>	No	250nsec	+5V ±5%, 150 mA +15V ±5%, 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only
<b>SP6T Switches</b>								
F9260 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	+5V ±5%, 315 mA -12 to -15V, 60 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9260-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
G9260 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2 - 4.0 GHz: <b>60</b>	0.2 - 4.0 GHz: <b>2.2</b>	Yes	500 nsec	+5V ±5%, 150 mA +15V ±5%, 70 mA	3, 7, 9, 33, 64A, G09, G12, G18	Positive voltages only
F9260T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2 - 4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 315 mA -12 to -15V, 60 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9260T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2 - 4.0 GHz: <b>1.5</b>	No	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9260T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2 - 4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 150 mA +15V ±5%, 70 mA	3, 7, 9, 33, 64A, G09, G12, G18	Positive voltages only
FR-2260-UK	0.5 - 18.0 GHz	0.2-2.0 GHz: <b>70</b> 2.0-4.0 GHz: <b>75</b> 4.0-8.0 GHz: <b>70</b> 8.0-12.0 GHz: <b>65</b> 12.0-18.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.5</b> 8.0-12.0 GHz: <b>3.0</b> 12.0-18.0 GHz: <b>3.6</b>	No	20 nsec	+5V, 160mA -12V, 100mA	G09	
F9160W	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.6</b> 8.0-12.4 GHz: <b>3.2</b> 12.4-18.0 GHz: <b>3.5</b>	No	250 nsec	+5V ±5%, 315 mA -12 to -15V, 60 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9160W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.6</b> 8.0-12.4 GHz: <b>3.2</b> 12.4-18.0 GHz: <b>3.5</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Driverless
G9160W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.6</b> 8.0-12.4 GHz: <b>3.2</b> 12.4-18.0 GHz: <b>3.5</b>	No	250 nsec	+5V ±5%, 150 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Positive voltages only
F9160 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.2</b> 12.4-18.0 GHz: <b>3.4</b>	Yes	250 nsec	+5V ±5%, 315 mA -12 to -15V, 60 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	
9160-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.6</b> 4.0-8.0 GHz: <b>1.8</b> 8.0-12.4 GHz: <b>2.2</b> 12.4-18.0 GHz: <b>3.4</b>	Yes	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Driverless
G9160 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.6</b> 8.0-12.4 GHz: <b>3.2</b> 12.4-18.0 GHz: <b>3.5</b>	Yes	250 nsec	+5V ±5%, 150 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G0, G12, G18	Positive voltages only

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
2629	1.0 – 18.0 GHz	1.0-18.0 GHz: <b>55</b>	1.0-18.0 GHz: <b>4.8</b>	No	500 nsec	+5V ±5%, 250 mA max -12V ±5%, 100 mA max	G09, G12, G18	Phase and amplitude matched  All in-line output ports
F9160T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.2</b>	No	250 nsec	+5V ±5%, 315 mA -12 to -15V, 100 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	
9160T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.2</b>	No	250 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Driverless
G9160T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.2</b> 8.0-12.4 GHz: <b>2.7</b> 12.4-18.0 GHz: <b>3.2</b>	No	250 nsec	+5V ±5%, 150 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Positive voltages only
9361T	2.0 - 21.0 GHz	2.0-21.0 GHz: <b>55</b>	2.0-21.0 GHz: <b>5.5</b>	No	500 nsec	+5V ±5%, 250 mA -12V ±5%, 100 mA max	G09, G11, G12, G18	Phase and amplitude matched

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
<b>SP7T Switches</b>								
F9270 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	+5V ±5%, 375 mA -12 to -15V, 60 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9270-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>1.5</b>	Yes	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9270 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-4.0 GHz: <b>60</b>	0.2-4.0 GHz: <b>2.2</b>	Yes	500 nsec	+5V ±5%, 190 mA +15V ±5%, 70 mA	3, 7, 9, 33, 64A, G09, G12	Positive voltages only
F9270T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 375 mA -12 to -15V, 60 mA	3, 7, 9, 33, 64A, G09, G12, G18	
9270T-500 <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-4.0 GHz: <b>1.5</b>	No	500 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 64A, G09, G12, G18	Driverless
G9270T <sup>(1)</sup>	0.2 - 4.0 GHz	0.2-2.0 GHz: <b>60</b> 2.0-4.0 GHz: <b>50</b>	0.2-4.0 GHz: <b>1.5</b>	No	500 nsec	+5V ±5%, 190 mA +15V ±5%, 70 mA	3, 7, 9, 33, 64A, G09, G12	Positive voltages only
F9170W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.8</b> 8.0-12.4 GHz: <b>3.5</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	For one port ON: +5V ±5%, 375 mA -12 to -15V, 60 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
9170W-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.8</b> 8.0-12.4 GHz: <b>3.5</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 64A, C37, G09, G12, G18	Driverless
G9170W <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.8</b> 8.0-12.4 GHz: <b>3.5</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	+5V ±5%, 190 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only
F9170 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.75</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.6</b> 12.4-18.0 GHz: <b>3.8</b>	Yes	250 nsec With Option C37 100 nsec	+5V ±5%, 375 mA -12 to -15V, 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	
9170-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>60</b> 4.0-8.0 GHz: <b>55</b> 8.0-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>1.75</b> 4.0-8.0 GHz: <b>2.0</b> 8.0-12.4 GHz: <b>2.6</b> 12.4-18.0 GHz: <b>3.8</b>	Yes	250 nsec With Option C37 100 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Driverless
G9170 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>50</b>	1.0-4.0 GHz: <b>2.2</b> 4.0-8.0 GHz: <b>2.8</b> 8.0-12.4 GHz: <b>3.5</b> 12.4-18.0 GHz: <b>3.8</b>	Yes	250 nsec With Option C37 100 nsec	+5V ±5%, 190 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9170T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	+5V ±5%, 375 mA -12 to -15V, 60 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	
9170T-500 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	ON: -50 mA OFF: +50 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Driverless
G9170T <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-4.0 GHz: <b>50</b> 4.0-8.0 GHz: <b>45</b> 8.0-18.0 GHz: <b>40</b>	1.0-4.0 GHz: <b>1.5</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.0</b> 12.4-18.0 GHz: <b>3.8</b>	No	250 nsec With Option C37 100 nsec	+5V ±5%, 190 mA +15V ±5%, 70 mA	3, 7, 9, 33, 41, 42, 43, 55, 64A, C37, G09, G12, G18	Positive voltages only
<b>SP8T Switches</b>								
F9180 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-12.4 GHz: <b>65</b> 12.4-18.0 GHz: <b>60</b>	1.0-2.0 GHz: <b>1.5</b> 2.0-4.0 GHz: <b>2.0</b> 4.0-8.0 GHz: <b>2.4</b> 8.0-12.4 GHz: <b>3.2</b> 12.4-18.0 GHz: <b>4.4</b>	Yes	250 nsec	+5V ±5%, 100 mA -12 to -15V, 50 mA	7, 9, 11, 41, 42, 43, G09, G12, G18	

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
F9180W	1.0 - 18.0 GHz	1.0-8.0 GHz: <b>65</b> 8.0-12.4 GHz: <b>60</b> 12.4-18.0 GHz: <b>55</b>	1.0-2.0 GHz: <b>2.0</b> 2.0-4.0 GHz: <b>2.3</b> 4.0-8.0 GHz: <b>3.2</b> 8.0-12.4 GHz: <b>3.5</b> 12.4-18.0 GHz: <b>4.8</b>	No	250 nsec	+5V ±5% ,100 mA -12 to -15V, 50 mA	7, 9, 11, 41, 42, 43, G09, G12, G18	
2553-B90 <sup>(1)</sup>	1.0 - 18.0 GHz	1.0-18.0 GHz: <b>55</b>	1.0-18.0 GHz: <b>5.2</b>	No	700 nsec	+5V ±5%, 350 mA -12V ±5%, 100 mA	G12, G18	Phase and Amplitude Matched All in-line output ports
<b>SP9T Switches</b>								
IA-2470-XO	8.0 - 12.0 GHz	8.0-12.0 GHz: <b>70</b>	8.0-12.0 GHz: <b>4.0</b>	No	25 nsec	+5V ±2%, 250 mA -12V ±2%, 110 mA	G09	All in-line output ports
<b>SP10T Switches</b>								
2553-B39 <sup>(1)</sup>	1.0 - 18.0 GHz	6.0-18.0 GHz: <b>70</b>	6.0-12.0 GHz: <b>4.3</b> 12.0-18.0 GHz: <b>5.6</b>	No	700 nsec	+5V ±5%, 350 mA -12V ±5%, 100 mA	G12, G18	Phase and Amplitude Matched All in-line output ports



Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss (dB)	Reflective	Switching Speed Max.	Power Supply Requirements	Available Options <sup>(2)</sup>	Notes
KA-2970-LK	1.0 - 18.0 GHz	1.0-10.0 GHz: <b>70</b> 10.0-18.0 GHz: <b>60</b>	1.0-10.0 GHz: <b>4.1</b> 10.0-18.0 GHz: <b>5.6</b>	No	500 nsec	+5V ±2%, 300 mA -12V ±2%, 100 mA	G09	Low-Profile,
<b>SP12T Switches</b>								
2553-B48 <sup>(1)</sup>	6.0 - 18.0 GHz	6.0-18.0 GHz: <b>70</b>	6.0-12.0 GHz: <b>4.3</b> 12.0-18.0 GHz: <b>5.6</b>	No	700 nsec	+5V ±5%, 350 mA -12V ±5%, 100 mA	G12, G18	Phase and Amplitude Matched  All in-line output ports
<b>SP16T Switches</b>								
PA1606	0.5 - 6.0 GHz	0.5-6.0 GHz: <b>65</b>	0.5-6.0 GHz: <b>6.0</b>	No	500 nsec	+5V ±5%, 450 mA -12V ±5%, 135 mA	G12, G18	Phase and Amplitude Matched
PA1618	1.0 - 18.0 GHz	1.0-18.0 GHz: <b>60</b>	1.0-18.0 GHz: <b>6.5</b>	No	500 nsec	+5V ±5%, 450 mA -12V ±5%, 135 mA	G12, G18	Phase and Amplitude Matched

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss(dB)	Reflective	Switching Speed	Power Supply Requirements	Power Handling	Available Options <sup>(2)</sup>
<b>High Power &amp; Medium Power Microwave Switches</b>								
<b>SPDT Switches</b>								
SW-2746-02 <sup>(1)</sup>	0.25 - 0.8 GHz	0.25-0.8 GHz: <b>40</b>	0.25-0.8 GHz: <b>1.0</b>	Yes	100 nsec	+5V ±5%, 170 mA -60V , 30 mA	100 W Pulse	9, G09
HPS 9201 <sup>(1)</sup>	L Band, 10%	<b>40</b>	<b>1.2</b>	No	3.5 µsec	+5V ±5%, 270 mA -60V , 40 mA	100 W Pulse	G09
SW-2367-01 <sup>(1)</sup>	1.4 - 1.8 GHz	1.4–1.8 GHz: <b>35</b>	1.4–1.8 GHz: <b>1.0</b>	No	100 nsec	+5V ±5%, 200 mA -50V , 30 mA	60 W CW	9, G09
HPS-9257 <sup>(1)</sup>	2.5 - 7.5 GHz	2.5-7.5 GHz: <b>20</b>	2.5-7.5 GHz: <b>1.2</b>	Yes	3.5 µsec	+5V ±5%, 250 mA -50V, 10 mA	200 W CW	G09
SW-2876-02 <sup>(1)</sup>	4.4 - 5.0 GHz	4.4-5.0 GHz: <b>60</b>	4.4-5.0 GHz: <b>1.2</b>	No	100 nsec	+5V ±5%, 150 mA -15V, 20 mA	20 W CW	9, G09
<b>SP3T Switches</b>								
SW-2746-03 <sup>(1)</sup>	0.2 - 0.8 GHz	0.2-0.8 GHz: <b>50</b>	0.2-0.8 GHz: <b>0.7</b>	No	1 µsec	+5V ±5%, 200 mA -28V , 30 mA	10 W Pulse	9
HPS 9301 <sup>(1)</sup>	IFF	<b>40</b>	<b>1.2</b>	No	3.5 µsec	+5V ±5%, 400 mA -60V , 40 mA	350 W Pulse	G09
HPS 9303 <sup>(1)</sup>	L BAND, 10%	<b>40</b>	<b>1.3</b>	No	3.5 µsec	+5V ±5%, 450 mA -90V , 40 mA	1,000 W Pulse	G09
HPS 9302 <sup>(1)</sup>	L BAND, 10%	<b>30</b>	<b>1.2</b>	No	3.5 µsec	+5V ±5%, 450 mA -60V, 40 mA	500 W Pulse	G09

Model	Frequency Range	Min Isolation (dB)	Max Insertion Loss(dB)	Reflective	Switching Speed	Power Supply Requirements	Power Handling	Available Options <sup>(2)</sup>
<b>SP4T Switches</b>								
SW-1193-00 <sup>(1)</sup>	1.0 - 1.3 GHz	1.0-1.3 GHz: <b>30</b>	1.0-1.3 GHz: <b>1.0</b>	Yes	10 μsec	+5V ±5%, 250 mA -50V , 60 mA	65 W CW	9, G09
SW-1996-00 <sup>(1)</sup>	1.9 - 2.1 GHz	1.9-2.1 GHz: <b>30</b>	1.9-2.1 GHz: <b>1.3</b>	Yes	10 μsec	+5V ±5%, 150 mA -28V , 50 mA	50 W CW	9, G09
HPS-9417 <sup>(1)</sup>	5.0 - 17.0 GHz	5.0-17.0 GHz: <b>20</b>	5.0-12.0 GHz: <b>2.1</b> 12.0-17.0 GHz: <b>2.3</b>	Yes	100 nsec	+5V ±5%, 80 mA -12V ± 0.2, 80 mA	7 W CW	G09
<b>SP6T Switches</b>								
SW-2876-06 <sup>(1)</sup>	4.4 - 5.0 GHz	4.4-5.0 GHz: <b>55</b>	4.4-5.0 GHz: <b>1.7</b>	Yes	85 nsec	+5V ±5%, 180 mA -15V, 60 mA	5 W CW	9, G09

## KRATOS GENERAL MICROWAVE LIMITERS

### GENERAL

KRATOS General Microwave offers PIN diode-based limiters, supporting up to 600 watts of pulsed power. The limiters are provided in various configurations: connectorized, drop-in or with field-removable connectors.

KRATOS General Microwave limiters are available as standalone limiters, or as integrated modules that include a limiter and a control component, such as a switch or attenuator, as follows:

- Switch Limiters - A switch module is available before the limiter, handling up to 25-watt CW/ 250-watt Peak power.
- Limiter Attenuator - Provides combined protection and attenuation capabilities (optional).
- Limiter Amplifier - A limiter and an amplifier module that maintains the required power. Signal is amplified if power is not within the specified range (optional).

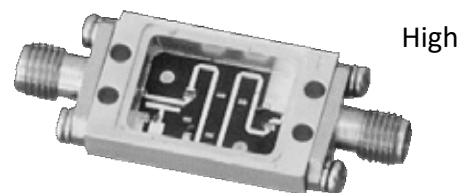
### LIMITER TYPES

#### LOW POWER LIMITERS

Low power limiters are available in 1GHz – 18GHz frequency range, with up to 20-Watts average power and 1 KW Peak power.

#### HIGH POWER LIMITERS

power limiters are available in 1GHz – 12GHz frequency range, with up to 60-Watts average power and 1 KW Peak power.



### DEFINITION OF PARAMETERS

#### RECOVERY TIME

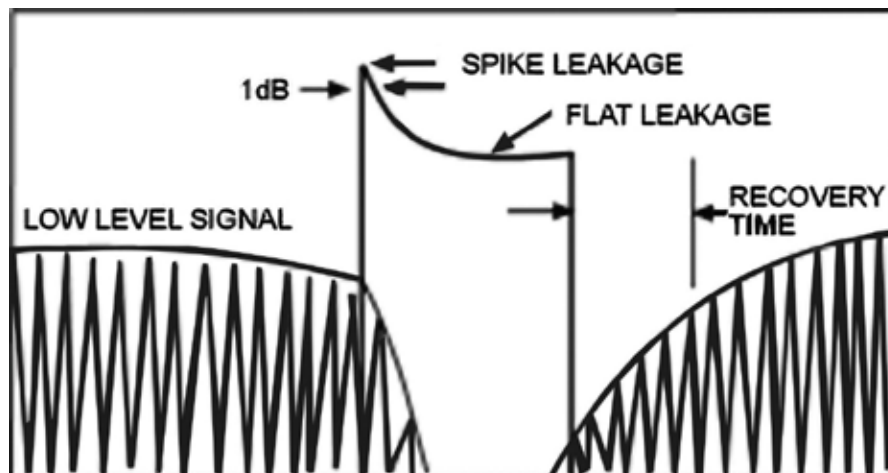
The time period from the end of a high-power pulse to the point where the insertion loss value has returned to within 3 dB of the quiescent loss state.

#### SPIKE LEAKAGE

After pulsed high-power is applied, the limiter will momentarily pass significantly more power than when it is totally saturated. This power rise is seen as a spike on the leading edge of the leakage pulse. The rise time of the high-power pulse and the turn-on time of the diode determine the spike's amplitude. The spike is defined by its energy content, i.e., in ergs. The formula for calculating the spike leakage is as follows:

$$\text{SPIKE LEAKAGE (ERGS)} = t_s \times P_s \times 10^7$$

where  $t_s$  equals spike width at the half-power point in seconds, and  $P_s$  equals maximum spike amplitude in watts.



## POWER HANDLING

There are two important considerations when defining the power handling required of a limiter.

1. Peak Pulsed Power: for narrow pulses, the equivalent CW power is the multiplication of the Peak Power by the Duty Cycle. For pulses exceeding 10 microseconds, Peak Power is considered CW.
2. Source VSWR: when it is fully turned on, the Limiter presents a short circuit across the transmission line, and 90% incident power is reflected back towards the source

Any mismatch at the source reflects power back toward the limiter, resulting in standing waves. In a correct limiter-source phase relationship, the maximum current point occurs at the input diode, causing the diode to dissipate a greater level of power than incident power. For a source VSWR of up to 2.0:1, an approximate maximum effective power can be achieved by multiplying the source VSWR by the incident power.

The following formula applies for source VSWRs over 2.0:1:

$$P_A = \frac{P_s}{[1 \pm (PF_L * PF_S)]^2}$$

where:

$P_A$  = actual power

$P_s$  = source power

$PF_L$  = load (limiter) power factor 0.96 typical

$PF_S$  = source power factor

## CONSIDERATIONS IN USING LIMITERS

- The difference between the flat leakage and the 0.1 dB compression point is typically between 10 and 13 dBm, but may vary according to limiter type.
- Noise of 10 dBm may be generated following the start of limiter compression. However, limiters can and usually do exhibit signs of limiter compression at 0 dBm.
- Limiters dissipate approximately 8% of incident power as heat. Therefore, all limiters should be attached to a heatsink, whose temperature does not exceed the maximum rated ambient temperature.
- Limiters are inherently broadband components. Band limitation results from DC return are required by some limiter designs. Limiters with bandwidths of up to 10:1. are relatively simple, while those with bandwidths exceeding 10: 1 are progressively more complex and costly.

**CAUTION!** Limiters are NOT bilateral components! They have a defined input and output. Backwards installation will damage the component.

## CUSTOM LIMITERS

Kratos General Microwave also offers customized limiters to address specific requirements. Custom limiters can be made per specific customer's requirements, to meet the system's needs.

## CATALOG LIMITERS

The specifications table listed below includes the following columns:

- Model name
- Frequency range
- Max input power (in Watt) - CW & Pulse
- Max insertion Loss (in dB)
- Flat Leakage (in mW)

**Additional specifications and diagrams can be found in the web catalog on [www.kratosmed.com/gmcatalog](http://www.kratosmed.com/gmcatalog)**

## AVAILABLE OPTION

**G09** - Guaranteed to meet the environmental ratings.

## LIMITERS SPECIFICATIONS TABLE

Model	Frequency Range	Max Input Power (W)		Max Insertion Loss(dB)	Flat Leakage (mW)	Notes
		CW	Pulse			
LIM-12-VHP <sup>(1)</sup>	1-2 GHz	40	400	0.8	100	Narrowband
LIM-118-L <sup>(1)</sup>	1-18 GHz	5	500	2.5	100	Broadband
LIM-1214-VHP <sup>(1)</sup>	1.2-1.4 GHz	30	300	0.7	100	Narrowband
LIM-2564-00 <sup>(1)</sup>	1.28-1.4 GHz	30	300	0.6	32	Narrowband
LIM-218-L <sup>(1)</sup>	2-18 GHz	1	150	2-4 GHz: 1.0 4-8 GHz: 1.4 8-12 GHz: 1.8 12-18 GHz: 2.3	2-4 GHz: 150 4-18 GHz: 130	Broadband
LIM-218-H <sup>(1)</sup>	2-18 GHz	3	500	2-4 GHz: 1.3 4-8 GHz: 1.8 8-12 GHz: 2.2 12-18 GHz: 2.7	2-4 GHz: 150 4-18 GHz: 130	Broadband
LIM-335-VHP <sup>(1)</sup>	3.1-3.5 GHz	25	250	1.0	32	Narrowband
LIM-812-50 <sup>(1)</sup>	8-12 GHz	5	50	2.2	100	Narrowband
LIM-89-15 <sup>(1)</sup>	8.4-9.6 GHz	15	50	2.0	64	Narrowband
LIM-1015-20 <sup>(1)</sup>	10-15 GHz	20	50	2.0	32	Narrowband

### (1) NOTE

All limiters are special order products. Contact our sales representative in your area for price and availability before ordering. Minimum order quantity applies.



## CONTROL COMPONENTS - 2

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