

Single Pole, Single Throw (SPST) Switches, SKS Series

FEATURES:

- ◆ Frequency coverage: 18 to 110 GHz
- ◆ Reflective and absorptive
- ◆ Low insertion loss and high isolation
- ◆ Control: TTL High



APPLICATIONS:

- ◆ Amplitude modulations
- ◆ Radar systems
- ◆ Communication systems
- ◆ System integration

DESCRIPTION:

SKS series single pole, single throw (SPST) switches are discrete or MMIC-based PIN diode switches. The operating frequency of these switches is from 18 to 110 GHz. The switches are reflective. While the TTL driver is internally integrated for switches with a coax configuration, an external TTL driver is provided for switches with a waveguide configuration.

While the below standard models address specific operation frequencies and package styles, custom models, as well as absorptive switches, can be offered to meet different application needs. Check the website for additional models.

CATALOG MODELS:

Model Number	Frequency Range (GHz)	Insertion Loss (dB)	Isolation (dB)	Switching Time (ns)	Power Handling (W)	Bias V/I (V/mA)	VSWR (On State)	Outline
SKS-1832731830-KFKF-R1	18.0 to 26.5	1.8	30	100	0.25	±5.0/20	1.5:1	KS-RC
SKS-2734032030-KFKF-R1	26.5 to 40.0	2.0	30	100	0.25	±5.0/20	1.5:1	KS-RC
SKS-2734032030-2828-R1	26.5 to 40.0	2.0	30	100	0.25	±5.0/20	1.5:1	KS-RA
SKS-1834032030-KFKF-R1	18.0 to 40.0	2.0	30	100	0.25	±5.0/20	1.5:1	KS-RC
SKS-3534532535-2F2F-R1	35.0 to 45.0	2.5	35	100	0.25	±5.0/20	1.5:1	KS-RC
SKS-3534532535-2222-R1	35.0 to 45.0	2.5	35	100	0.25	±5.0/20	1.5:1	KS-RQ
SKS-1835032330-2F2F-R1	18.0 to 50.0	2.3	30	100	0.25	±5.0/20	1.5:1	KS-RC
SKS-4535532525-1919-R1	45.0 to 55.0	2.5	25	100	0.25	±5.0/30	1.5:1	KS-RU
SKS-5037533025-1515-R1	50.0 to 75.0	3.0	25	100	0.25	±5.0/10	1.5:1	KS-RV
SKS-6039033030-1212-R1	60.0 to 90.0	3.0	30	100	0.25	±5.0/10	1.5:1	KS-RE
SKS-9031042825-1010-R1	90.0 to 100.0	2.8	25	100	0.25	±5.0/10	1.5:1	KS-RW

CUSTOM MODELS:

SAGE Millimeter's SPST switch model numbers are configured per the following format. Customers may refer to the format and specify their own model numbers accordingly when placing an order.

SKS - F1N F2N IL IS - CI CO - XY

- F1N is the start frequency in MHz x 10N. For example: 10 GHz = 103
- F2N is the stop frequency in MHz x 10N. For example: 40 GHz = 403
- IL is the insertion loss in 1/10 dB. For example: 2.0 dB = 20
- IS is the isolation in dB. For example: 35 dB = 35
- CI is the input connector type. For example: K(F) = KF
- CO is the output connector type. For example: K(M) = KM
- X is the switch type. "A" is absorptive and "R" is reflective.
- Y is for factory reserve.

Example: SKS-1034032035-KFKM-R1 is a reflective SPST switch with an RF frequency range of 10 to 40 GHz, an insertion loss of 2.0 dB and an isolation of 35 dB. The SPST has a female and male K connector at the input and output port, respectively. "1" is a factory assigned number.

Single Pole, Double Throw (SPDT) Switches, SKD Series

FEATURES:

- ◆ Frequency coverage: 18 to 110 GHz
- ◆ Reflective and absorptive
- ◆ Low insertion loss and high isolation
- ◆ Control: TTL High



APPLICATIONS:

- ◆ Radar systems
- ◆ Communication systems
- ◆ System integration
- ◆ Test instrumentation

DESCRIPTION:

SKD series single pole, double throw (SPDT) switches are discrete or MMIC-based PIN diode switches. The operating frequency of these switches is from 18 to 110 GHz. The switches are reflective. While the TTL driver is internally integrated for switches with a coax configuration, an external TTL driver is provided for switches with a waveguide configuration.

While the below standard models address specific operation frequencies and package styles, custom models, as well as absorptive switches, can be offered to meet different application needs. Check the website for additional models.

CATALOG MODELS:

Model Number	Frequency Range (GHz)	Insertion Loss (dB)	Isolation (dB)	Switching Time (ns)	Power Handling (W)	Bias V/I (V/mA)	VSWR	Outline
SKD-1832732540-KFKF-R1	18.0 to 26.5	2.5	40	100	0.25	±5.0/20	1.5:1	KD-RC
SKD-2734032735-KFKF-R1	26.5 to 40.0	2.7	35	100	0.25	±5.0/20	1.5:1	KD-RC
SKD-1834034040-KFKF-R1	18.0 to 40.0	4.0	40	100	0.25	±5.0/20	1.5:1	KD-RC
SKD-3335033530-2F2F-R1	33.0 to 50.0	3.5	30	100	0.25	±5.0/20	1.5:1	KD-RC
SKD-1835033530-2F2F-R1	18.0 to 50.0	3.5	30	100	0.25	±5.0/20	1.5:1	KD-RC
SKD-4535532525-1919-R1	45.0 to 55.0	2.5	25	100	0.25	±5.0/30	1.5:1	KD-RU
SKD-5536532725-1515-R1	55.0 to 65.0	2.7	25	100	0.25	±5.0/30	1.5:1	KD-RV
SKD-7538533025-1212-R1	75.0 to 85.0	3.0	25	100	0.25	±5.0/30	1.5:1	KD-RE
SKD-9031045030-1010-R1	90.0 to 100.0	5.0	30	100	0.25	±5.0/10	1.5:1	KD-RWM

CUSTOM MODELS:

SAGE Millimeter's SPDT switch model numbers are configured per the following format. Customers may refer to the format and specify their own model numbers accordingly when placing an order.

SKD - F1N F2N IL IS - CI CO - XY

F1N is the start frequency in MHz x 10N. For example: 10 GHz = 103

F2N is the stop frequency in MHz x 10N. For example: 40 GHz = 403

IL is the insertion loss in 1/10 dB. For example: 2.0 dB = 20

IS is the isolation in dB. For example: 35 dB = 35

CI is the input connector type. For example: K(F) = KF

CO is the output connector type. For example: K(M) = KM

X is for switch type. "A" is absorptive and "R" is reflective.

Y is for factory reserve.

Example: SKD-1034032235-KFKM-R1 is a reflective SPDT switch with an RF frequency range of 10 to 40 GHz, an insertion loss of 2.2 dB and an isolation of 35 dB. The SPST has a female and male K connector at the input and output port, respectively. "1" is a factory assigned number.

Single Pole, Four Throw (SP4T) Switches, SK4 Series

FEATURES:

- ◆ Frequency coverage: 18 to 81 GHz
- ◆ Reflective and absorptive
- ◆ Low insertion loss and high isolation
- ◆ Control: TTL High



APPLICATIONS:

- ◆ Radar systems
- ◆ Communication systems
- ◆ System integration
- ◆ Test instrumentation

DESCRIPTION:

SK4 series single pole, four throw (SP4T) switches are discrete or MMIC-based PIN diode switches. The operating frequency of these switches is from 18 to 110 GHz. The switches are reflective. While the TTL driver is internally integrated for switches with a coax configuration, an external TTL driver is provided for switches with a waveguide configuration.

While the below standard models address specific operation frequencies and package styles, custom models, as well as absorptive switches, can be offered to meet different application needs. Check the website for additional models.

CATALOG MODELS:

Model Number	Frequency Range (GHz)	Insertion Loss (dB)	Isolation (dB)	Switching Time (ns)	Power Handling (W)	Blas V/I (V/mA)	VSWR	Outline
SK4-1832734035-KFKF-R1	18.0 to 26.5	4.0	35	100	0.25	±5.0/20	2.0:1	K4-RC
SK4-2734035540-KFKF-R1	26.5 to 40.0	5.5	40	100	0.25	±5.0/20	2.0:1	K4-RC
SK4-1834034530-KFKF-R1	18.0 to 40.0	4.5	30	100	0.25	±5.0/20	2.0:1	K4-RC
SK4-3335035030-2F2F-R1	33.0 to 50.0	5.0	30	100	0.25	±5.0/20	2.0:1	K4-RC
SK4-1835035030-2F2F-R1	18.0 to 50.0	5.0	30	100	0.25	±5.0/20	2.0:1	K4-RC
SK4-4535535530-1919-R1	45.0 to 55.0	5.5	30	100	0.25	±5.0/30	2.0:1	K4-RU
SK4-5536536530-1515-R1	55.0 to 65.0	6.5	30	100	0.25	±5.0/30	2.0:1	K4-RV-2
SK4-5037536530-1515-R1	50.0 to 75.0	6.5	30	100	0.25	±5.0/30	2.0:1	K4-RV-2
SK4-7238139030-1212-R1	72.0 to 81.0	8.0	30	100	0.25	±5.0/75	2.0:1	K4-RE-2

CUSTOM MODELS:

SAGE Millimeter's SP4T switch model numbers are configured per the following format. Customers may refer to the format and specify their own model numbers accordingly when placing an order.

SK4 - F1N F2N IL IS - CI CO - XY

F1N is the start frequency in MHz x 10N. For example: 10 GHz = 103

F2N is the stop frequency in MHz x 10N. For example: 40 GHz = 403

IL is the insertion loss in 1/10 dB. For example: 3.0 dB = 30

IS is the isolation in dB. For example: 30 dB = 30

CI is the input connector type. For example: K(F) = KF

CO is the output connector type. For example: K(M) = KM

X is for switch type. "A" is absorptive and "R" is reflective.

Y is for factory reserve.

Example: SK4-1034033230-KFKM-R1 is a reflective SP4T switch with an RF frequency range of 10 to 40 GHz, an insertion loss of 3.2 dB and an isolation of 30 dB. The SP4T has a female and male K connector at the input and output port, respectively. "1" is a factory assigned number.

Control Devices Application Notes

Microwave and millimeterwave control devices are key components in radar, communication and test systems. In general, control devices include electrical attenuators, power limiters, phase shifters and switches. The control devices offered in this catalog are PIN-diode or MMIC based. The followings are concepts, terms and definitions that are widely used and accepted in the industry.

Electrical Attenuator:

Electrical attenuators are used to control signal levels and are offered with either analog or digital controls.

Analog Controlled Attenuator:

Analog controlled attenuators have attenuation values that are continuously controlled by the applied current.

Digitally Controlled Attenuator:

Digitally controlled attenuators have attenuation values that are digitally controlled by the bits. For example, if the attenuation range is 64 dB and the bit size is 6, the attenuation step size is 1 dB.

Phase Stability:

Phase stability is used to measure the phase variation of an electrical attenuator while the attenuation values are adjusted. High phase stability attenuators are designed to achieve a near constant phase during attenuation adjustments.

Electrical Limiter:

An **electrical limiter** has a negligible insertion loss when the applied power level is below the threshold. However, its insertion loss will increase dramatically once the applied power level exceeds the threshold. In other words, the limiter's output power level is independent from the input power once "triggered". This feature is desirable when over power protection is required, such as for low noise amplifiers or mixers in a communication or radar system.

Leaking Power:

Leaking power is the output power after an electrical limiter is "triggered", which is when the input power exceeds the desired value.

Power handling:

Power handling is the maximum input power that a device can sustain without being damaged.

Recovery time:

Recovery time is the time it takes for the insertion loss of an electrical limiter to return from the "triggered" stage to 3 dB higher than the normal insertion loss. The shorter the recovery time, the better. The recovery time can range from 100 ns to 2 μ s. During the recovery time, the system is "blind".

Electrical Phase Shifter:

An **electrical phase shifter** is a device that can cause a signal phase change when an external voltage is applied. Phase shifters are offered with either analog or digital controls.

Analog Controlled Phase Shifter

Analog controlled phase shifters have phase shifting values that are continuously controlled by the applied voltage.

Digital Controlled Phase Shifter:

Digital controlled phase shifters have phase shifting values that are digitally controlled by the bits. For example, if the phase shifting range is 360° and the bit size is 5, the phase shifting step size is 11.25°.

PIN Diode Switch:

PIN diode switches are used to electrically direct signals through an applied voltage/current. Various types of switches, such as single pole, single throw (SPST), single pole, double throw (SPDT), etc. are offered. Both absorptive and reflective switches are widely used in the industry.

Absorptive Switch:

Absorptive switches exhibit low VSWR in both "on" and "off" states. In general, these switches offer lower insertion loss and cost less than reflective switches.

Reflective Switch:

Reflective switches only exhibit low VSWR in the "on" state since the "off" state is achieved by shortening the RF signal's transmission path.

Switching Time:

Switching time refers to the "on" time and "off" time. As illustrated on the right, the "on" time begins when a 50% control pulse is applied and ends when 90% of the RF signal is achieved. On the other hand, the "off" time begins when the control pulse drops below 50% and ends when 90% of the RF signal disappears. The switching time is related to the PIN diode and TTL driver.

