



SKYWORKS®

DATA SHEET

AS193-73LF: PHEMT GaAs IC High-Linearity 3 V Control SPDT Switch 0.1 to 3.0 GHz

Applications

- High-power transmit/receive switching
- Small cell base station
- Analog and digital wireless communication systems

Features

- 2.5 to 5 V linear operation
- Harmonics H₂, H₃ > +65 dBc @ P_{IN} = 34.5 dBm
- Low insertion loss (0.35 dB @ 0.9 GHz)
- High isolation (24 dB @ 0.9 GHz)
- PHEMT process
- Available in an ultra-miniature SOT-6 package (MSL-1 @ 260 °C per JEDEC J-STD-020)
- For RoHS and other product compliance information, see the [Skyworks Certificate of Conformance](#)

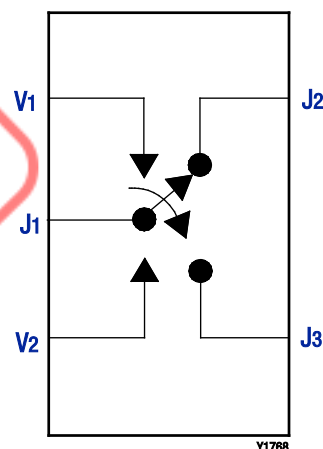
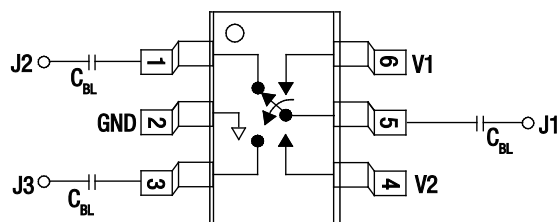


Figure 1. AS193-73LF Block Diagram



Note: DC blocking capacitors (C_{BL}) must be supplied externally.
 $C_{BL} = 100 \text{ pF}$ for operating frequency > 500 MHz.

Figure 2. AS193-73LF Pinout

Description

The AS193-73LF is a PHEMT GaAs FET IC high-linearity SPDT switch in a SOT-6 plastic package. This switch has been designed for use where extremely high linearity, low control voltage, high isolation, low insertion loss and ultra-miniature package size are required. It can be controlled with positive, negative or a combination of both voltages. Some standard implementations include antenna changeover, T/R and diversity switching over 3 W. The AS193-73LF switch can be used in many analog and digital wireless communication systems including cellular, GSM and UMTS applications.

A functional block diagram is shown in Figure 1. The AS193-73LF is available in an ultra-miniature SOT-6 package. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

Table 1. AS193-73LF Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	J2	RF output (Note 1)	4	V1	DC control voltage
2	GND	Ground	5	J1	RF output (Note 1)
3	J3	RF output. (Note 1)	6	V2	DC control voltage

Note 1: A 100 pF blocking capacitor is required for > 500 MHz operation. Use larger value capacitors for lower frequency operation.

Electrical and Mechanical Specifications

The absolute maximum ratings of the AS193-73LF are provided in Table 2. The recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

The state of the AS193-73LF is determined by the logic provided in Table 5. Typical performance characteristics are shown in Figures 3 through 6.

Table 2. AS193-73LF Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V _{CTRL}	-0.2	+8	V
RF input power (V _{CTL} = 0/5 V), > 900 MHz			6	W
Operating temperature	T _{OP}	-40	+85	°C
Storage temperature	T _{STG}	-65	+150	°C

Note 1: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Table 3. AS193-73LF DC Electrical Specifications (Note 1)

(T_A = 25 °C [0, 3 V], Unless Otherwise Noted)

Parameter	Condition	Frequency	Minimum	Typical	Maximum	Units
Control voltages	V _{LOW} = 0 to 0.2 V @ 20 µA max. V _{HIGH} = 2.5 V @ 100 µA max. to 5 V @ 200 µA max.					

Note 1: Performance is guaranteed only under the conditions listed in this table.

Table 4. AS193-73LF RF Electrical Specifications (Note 1)
($T_A = +25\text{ }^{\circ}\text{C}$, [0/3 V], Unless Otherwise Noted)

Parameter (Note 1)	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss (Note 2)	IL	0.1 to 0.5 GHz		0.30	0.4	dB
		0.5 to 1.0 GHz		0.35	0.5	dB
		1.0 to 2.0 GHz		0.45	0.6	dB
		2.0 to 2.5 GHz		0.55	0.7	dB
		2.5 to 3.0 GHz		0.70	0.9	dB
Isolation	ISO	0.1 to 0.5 GHz	28	30		dB
		0.5 to 1.0 GHz	22	24		dB
		1.0 to 2.0 GHz	17	19		dB
		2.0 to 2.5 GHz	15	17		dB
		2.5 to 3.0 GHz	14	16		dB
Return loss (Note 3)	RL	0.1 to 1.0 GHz		-23	-20	dB
		1.0 to 2.0 GHz		-30	-25	dB
		2.0 to 3.0 GHz		-20	-15	dB
Input power for -0.1 dB compression	$V_{CTL} = 0/3\text{ V}$	0.9 GHz		+37		dBm
		2.7 GHz		+36		dBm
Harmonics H2, H3	$P_{IN} = +34.5\text{ dBm}$	0.9 GHz		-65		dBc
Switching characteristics:						
Rise, fall	10/90% or 90/10% RF			60		ns
On, off	50% V_{CTL} to 90/10% RF			100		ns
Video feedthru	$T_{RISE} = 1\text{ ns}$, BW = 500 MHz			50		mV
Thermal resistance				25		$^{\circ}\text{C/W}$

Note 1: All measurements made in a 50 Ω system, unless otherwise specified.**Note 2:** Insertion loss changes by 0.003 dB/ $^{\circ}\text{C}$.**Note 3:** Insertion loss state.**Table 5. AS193-73LF Truth Table (Notes 1, 2)**

V1	V2	J1-J2	J1-J3
0	V _{HIGH}	Isolation	Insertion loss
V _{HIGH}	0	Insertion loss	Isolation

Note 1: All other conditions are not recommended.**Note 2:** V_{HIGH} = 2.5 to 5.0 V.

Typical Performance Data

(TA = +25 °C, [0/3 V], Unless Otherwise Noted)

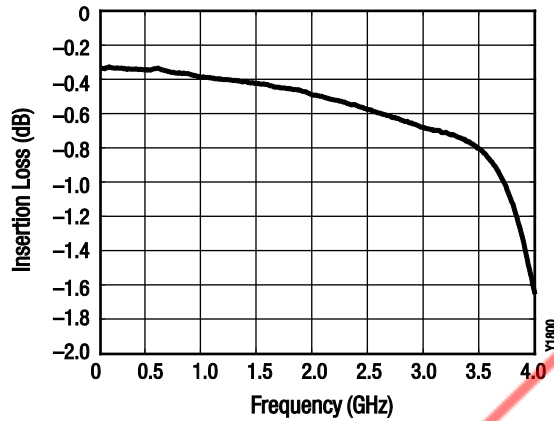


Figure 3. Insertion Loss vs Frequency

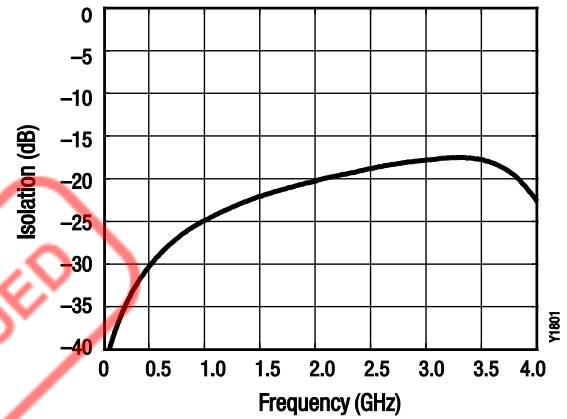


Figure 4. Isolation vs Frequency

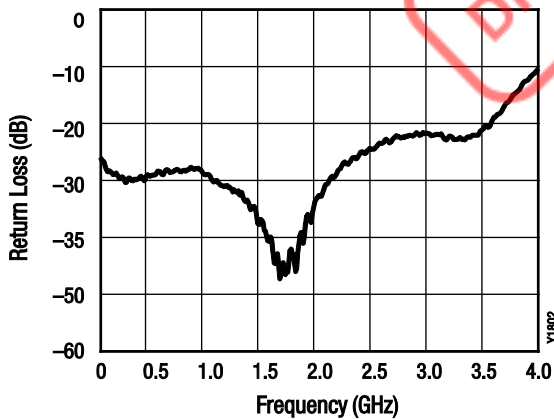


Figure 5. Return Loss vs Frequency

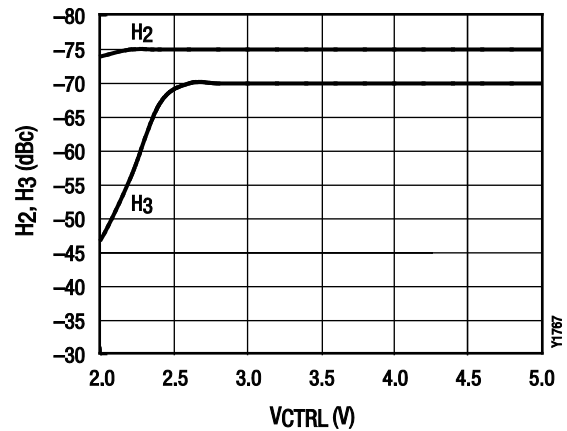


Figure 6. Harmonics vs. Control Voltage
(34.5 dBm 900 MHz GSM Pulse)

Package Dimensions

Package dimensions for the AS193-73LF are shown in Figure 7. Typical part markings are shown in Figure 8, and tape and reel dimensions are provided in Figure 9.

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The AS193-73LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

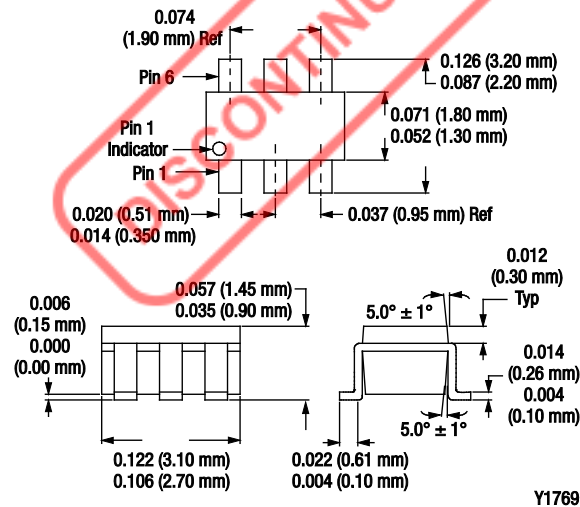


Figure 7. AS193-73LF Package Dimensions

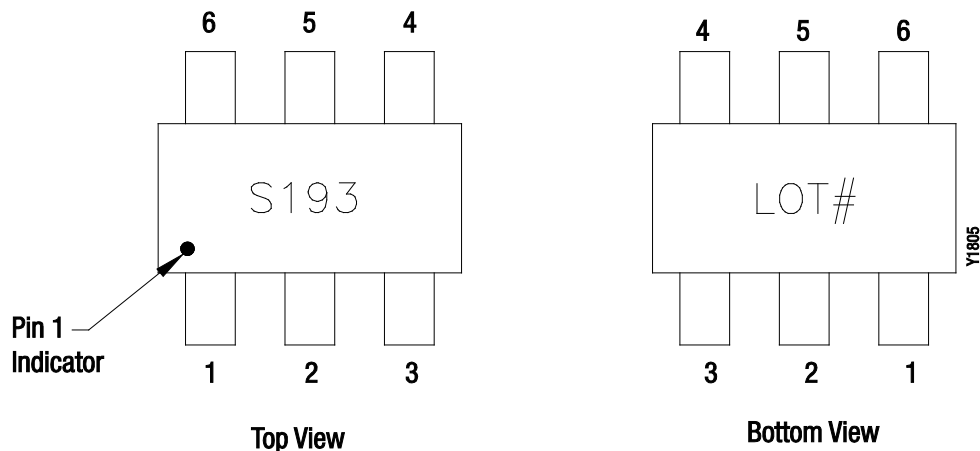


Figure 8. AS193-79LF Typical Part Markings

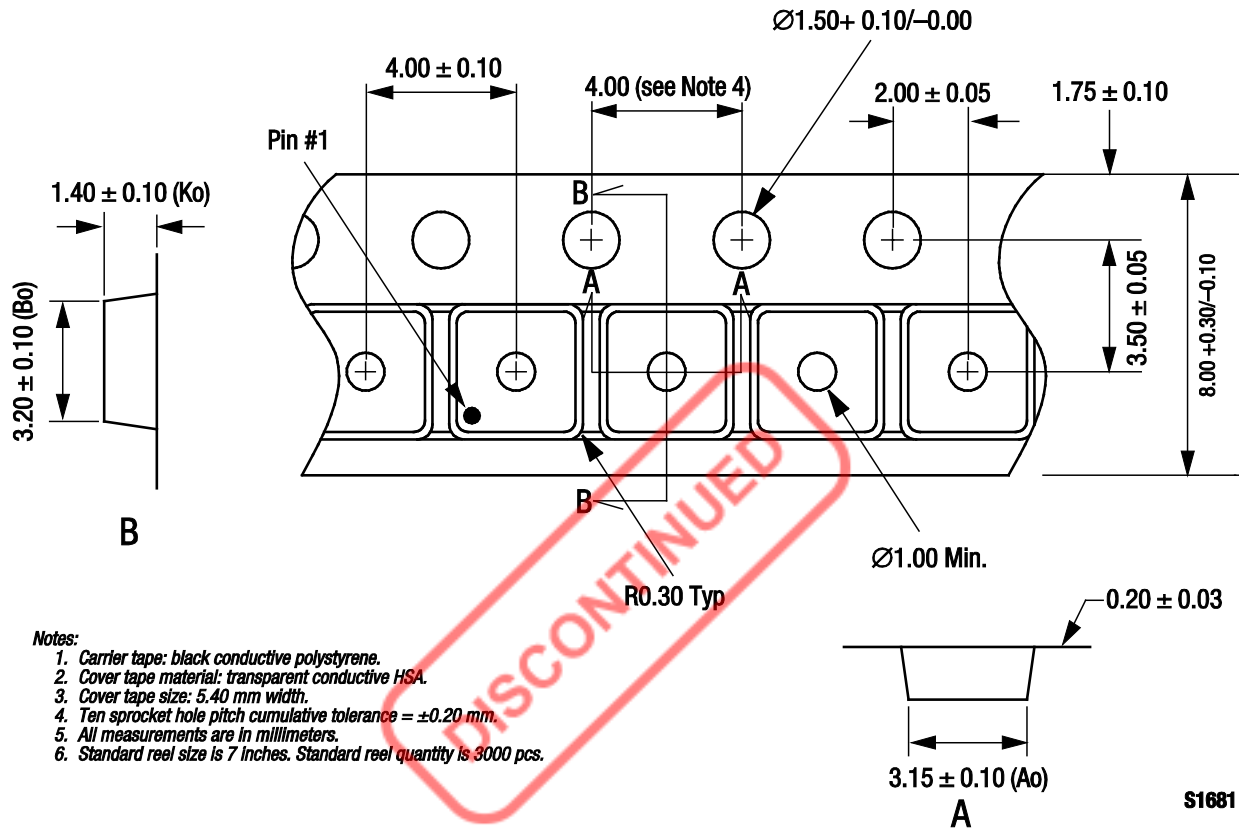


Figure 9. AS193-73LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
AS193-73LF: High-Linearity SPDT Switch 0.1 to 3.0 GHz	AS193-73LF	AS193-73LF-EVB



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