

**PRELIMINARY DATA SHEET**

# IS013286: DC to 8 GHz Hermetic GaAs IC SPDT Absorptive Switch

## Features

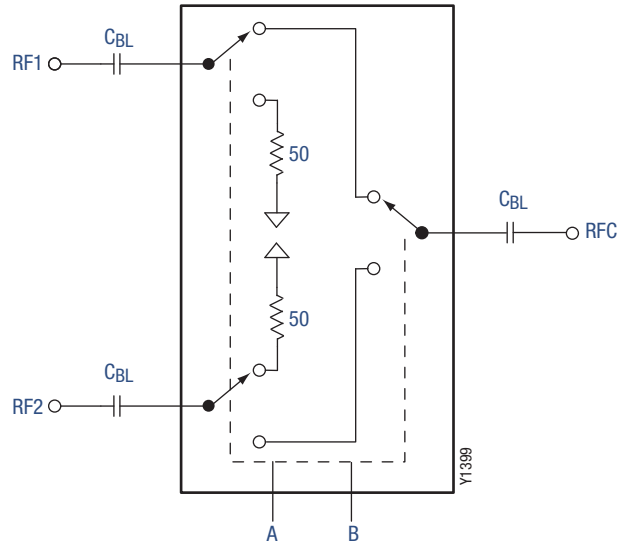
- Wideband frequency range: DC to 8 GHz
- Isolation: 50 dB @ 4 GHz
- Low Loss: 1.5 dB @ 4 GHz
- Absorptive
- High reliability Class B and S screening available

## Description

The IS013286 is a GaAs pHEMT non-reflective, high-performance, low-loss switch.

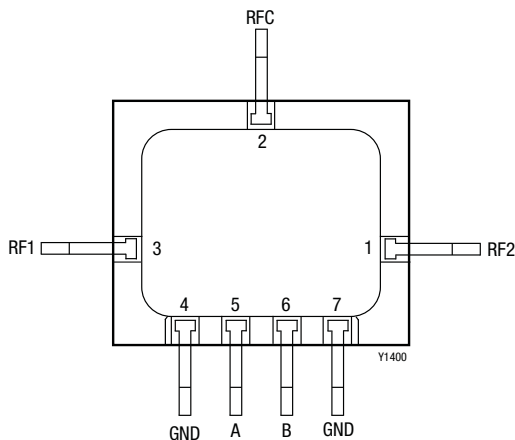
The IS013286 uses hermetic surface-mount technology (SMT) for defense and satellite applications.

The device can be supplied and tested to the screening requirements of MIL-PRF-38535 Class B and S, in addition to the required QCI.



**Figure 1. IS013286 Block Diagram**

A functional block diagram of the IS013286 is shown in Figure 1. The IS013286 device package and pinout are shown in Figure 2. Pin assignments and signal descriptions are shown in Table 1.



**Figure 2. IS013286 Pinout (Top View)**

**Table 1. IS013286 Pin Descriptions**

Pin	Name	Description
1	RF2	RF output 2
2	RFC	RF input
3	RF1	RF output 1
4	GND	Ground
5	A	Control voltage A
6	B	Control voltage B
7	GND	Ground

### Electrical and Mechanical Specifications

The absolute maximum ratings of the ISO13286 are provided in Table 2. Electrical specifications are provided in Tables 3 and 4. The truth table is shown in Table 5.

Typical performance characteristics of the ISO13286 are illustrated in Figures 3 through 10.

**Table 2. ISO13286 Absolute Maximum Ratings (Note 1)**

Parameter	Minimum	Maximum	Units
Control voltages (A and B)	-7.5	+1.0	V
RF input power		+26	dBm
Storage temperature	-65	+150	°C
Operating case temperature	-55	+125	°C
Junction temperature		+150	°C
Operating frequency	0.03	8.00	GHz

**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. ISO13286 Recommended Operating Conditions**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Switching characteristics:						
Rise, fall		10/90% or 90/10% RF		5		ns
On/off		50% control to 90/10% RF		15		ns
Video feedthrough		T <sub>RISE</sub> = 3 ns, measurement bandwidth = 500 MHz		25		mV
Input power for 1 dB compression	OP1dB	0.5 to 4.0 GHz		+26		dBm
Input power for 0.1 dB compression	OP.1dB	0.5 to 4.0 GHz		+24		dBm
2 <sup>nd</sup> harmonic	2fo	f <sub>0</sub> = 2400 MHz, P <sub>IN</sub> = -15 dBm		-60		dBm
Third order intercept point	IP3	For 2-tone input power, +8 dBm/tone, 1 MHz spacing, V <sub>CTL</sub> = 0/5 V, 0.7 to 3.0 GHz		+46		dBm
Control voltages	V <sub>CTL</sub> Low V <sub>CTL</sub> High		-0.2 -5		0 -7	V V
Control currents	V <sub>CTL</sub> Low V <sub>CTL</sub> High	-5 V/-7 V		4 100/200		μA μA

**Table 4. ISO13286 Electrical Specifications (Note 1)**  
**(V<sub>CTL</sub> = 0 V/3 V, V<sub>DD</sub> = 5 V, T<sub>OP</sub> = +25 °C, P<sub>INPUT</sub> = 0 dBm, Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
CW insertion loss	IL	0.1 to 2.0 GHz		0.8	1.10	dB
		2.0 to 4.0 GHz		0.8	1.5	dB
		4.0 to 6.0 GHz		2.5	3.0	dB
		6.0 to 8.0 GHz		2.5	3.0	dB
Isolation	Iso	0.1 to 2.0 GHz	50	60		dB
		2.0 to 4.0 GHz	45	50		dB
		4.0 to 6.0 GHz	40	45		dB
		6.0 to 8.0 GHz	40	45		dB
Return loss (insertion loss state) (Note 2)	RL	0.1 to 2.0 GHz		22		dB
		2.0 to 4.0 GHz		20		dB
		4.0 to 6.0 GHz		12		dB
		6.0 to 8.0 GHz		10		dB
Return loss (isolation state) (Note 2)	RL	0.1 to 2.0 GHz		12		dB
		2.0 to 4.0 GHz		15		dB
		4.0 to 6.0 GHz		15		dB
		6.0 to 8.0 GHz		13		dB
Insertion loss settling time	ΔIL	Insertion loss in dB measured @ 1 μs (referenced to a rising 10% RF level on J1 & J2) minus the CW insertion loss in dB. Freq = 2 GHz, T <sub>OP</sub> = +25 °C, V <sub>CTL</sub> = 5 V, pulse width = 1.15 ms, 50% duty cycle.		0.4		dB

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

**Note 2:** Lower frequency return loss is dependent on DC blocks.

**Table 5. Truth Table**

Control Input		Signal Path State	
B	A	RFC to RF1	RFC to RF2
High	Low	ON	OFF
Low	High	OFF	ON

### Typical Performance Characteristics

(VCTL = 0 V/5 V, Top = +25 °C, PINPUT = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, Unless Otherwise Noted)

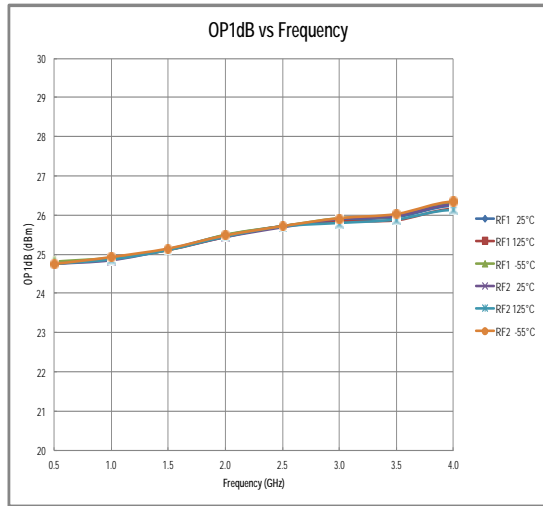


Figure 3. OP1dB vs Frequency

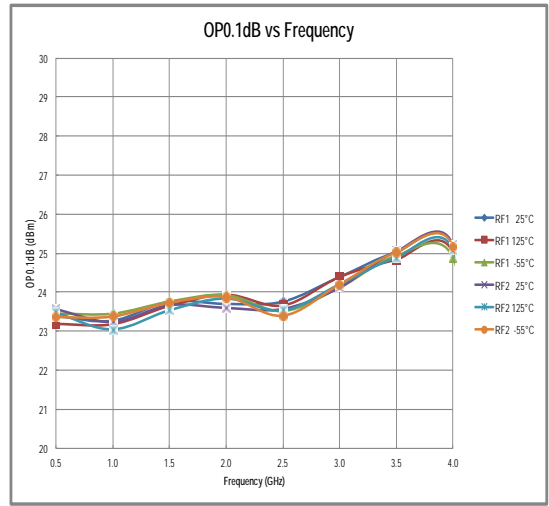


Figure 4. OP0.1dB vs Frequency

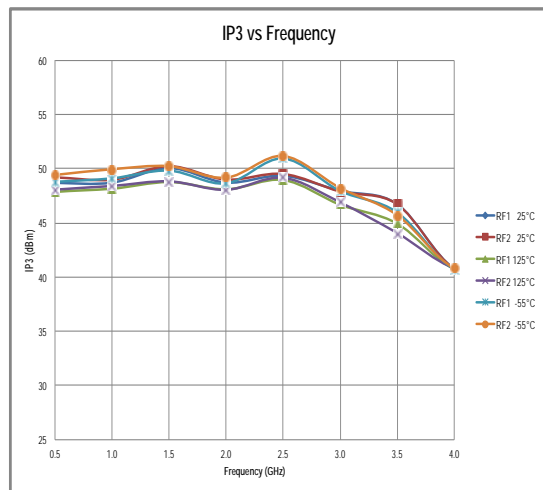


Figure 5. IP3 vs Frequency

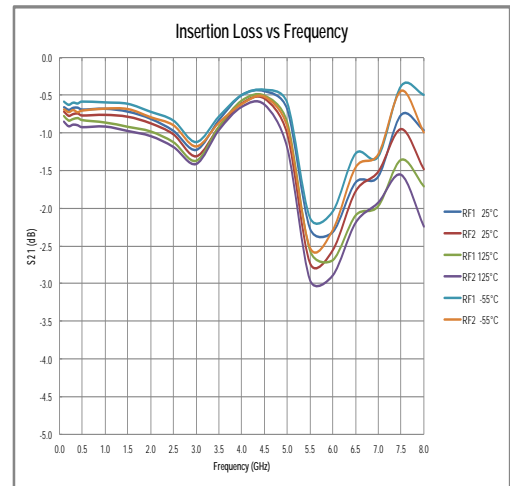


Figure 6. Insertion Loss vs Frequency

### Typical Performance Characteristics

(VCTL = 0 V/5 V, Top = +25 °C, PINPUT = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, Unless Otherwise Noted)

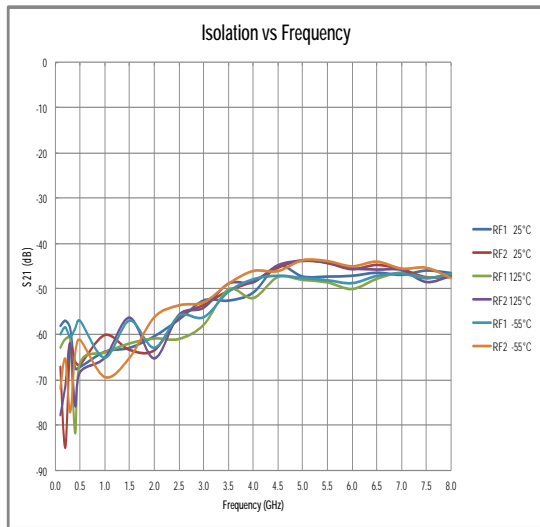


Figure 7. Isolation vs Frequency

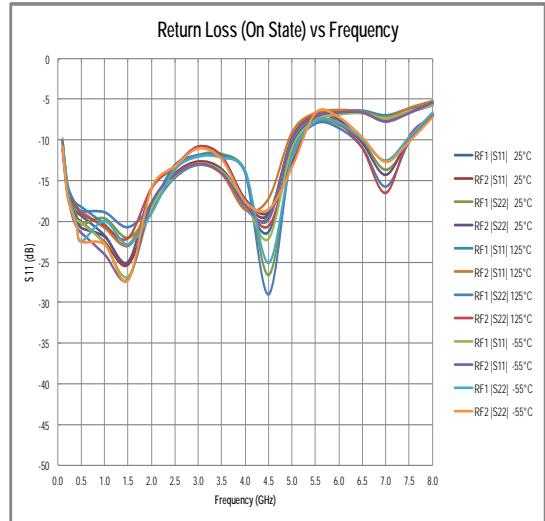


Figure 8. Return Loss (On State) vs Frequency

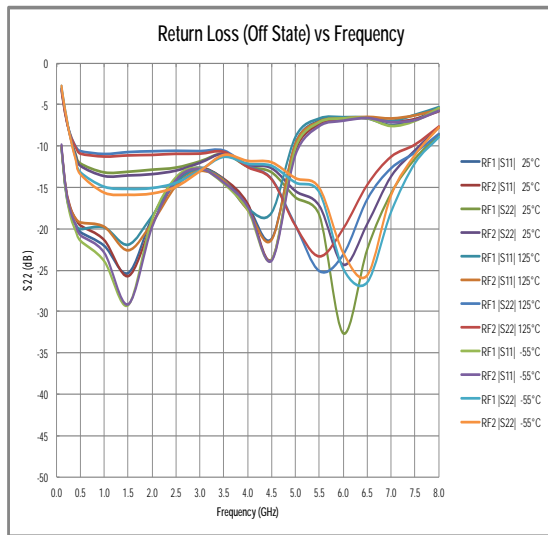


Figure 9. Return Loss (Off State) vs Frequency

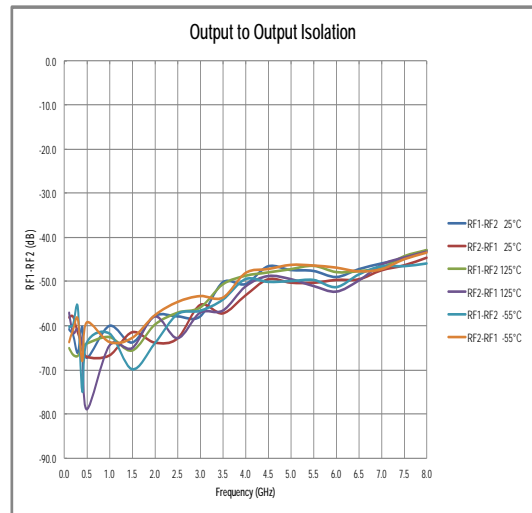


Figure 10. Output to Output Isolation

### Evaluation Board Description

The ISO13286 Evaluation Board is used to test the performance of the ISO13286 switch. An Evaluation Board schematic is shown in Figure 11. An assembly drawing for the Evaluation Board is shown in Figure 12. A suggested driver circuit is shown in Figure 13.

### Package Dimensions

Package dimensions for the ISO13286 are shown in Figure 14. Figure 15 shows the pad locations.

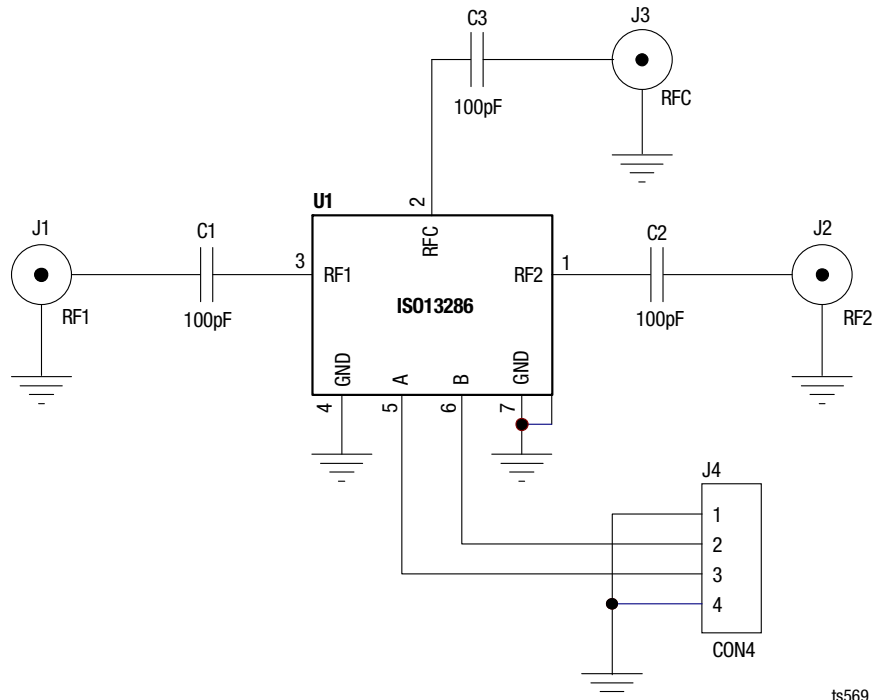


Figure 11. ISO13286 Evaluation Board Schematic

ts569

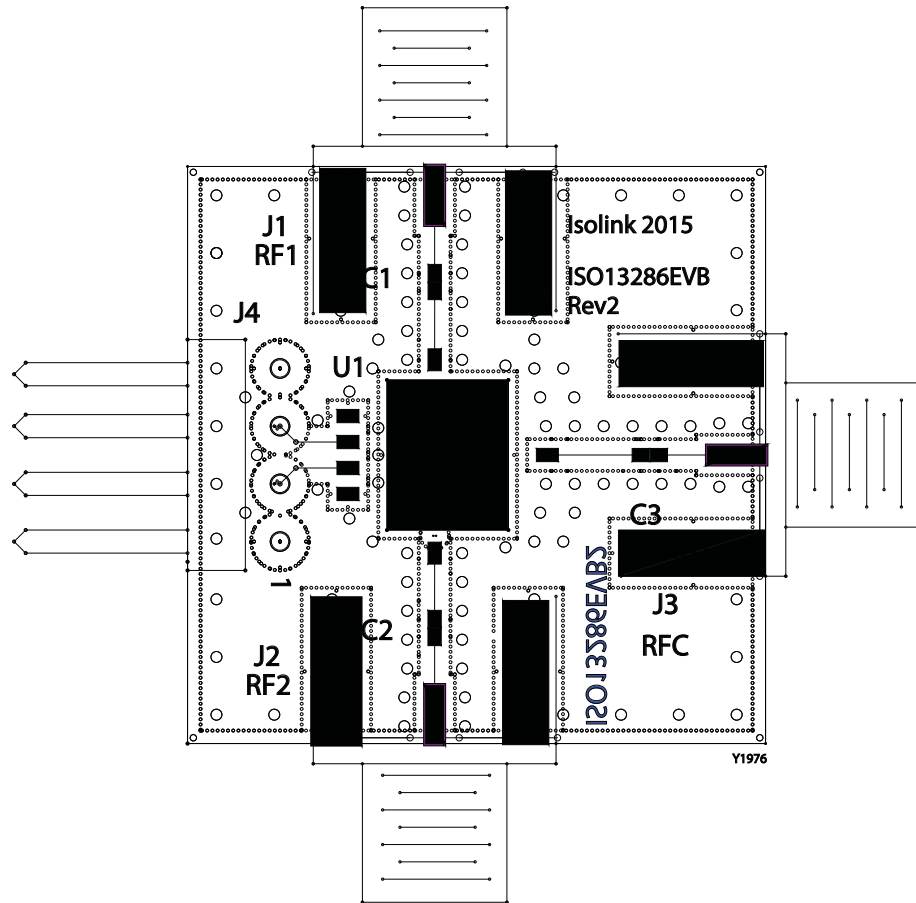


Figure 12. ISO13286 Evaluation Board Assembly Diagram

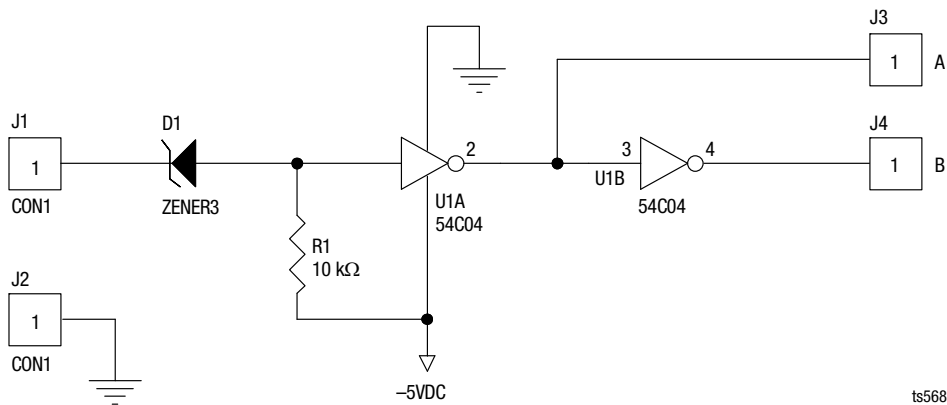
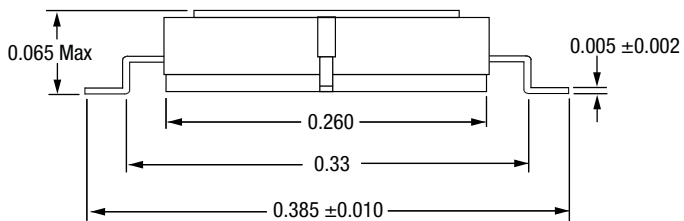
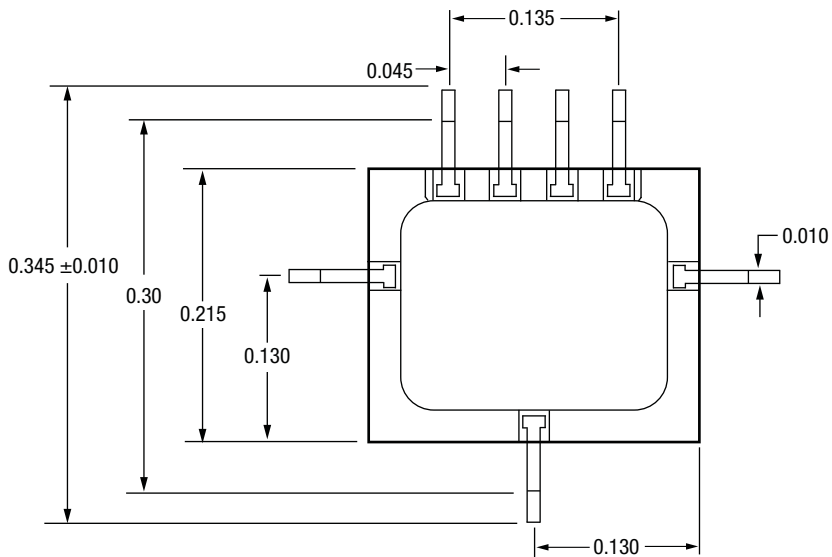


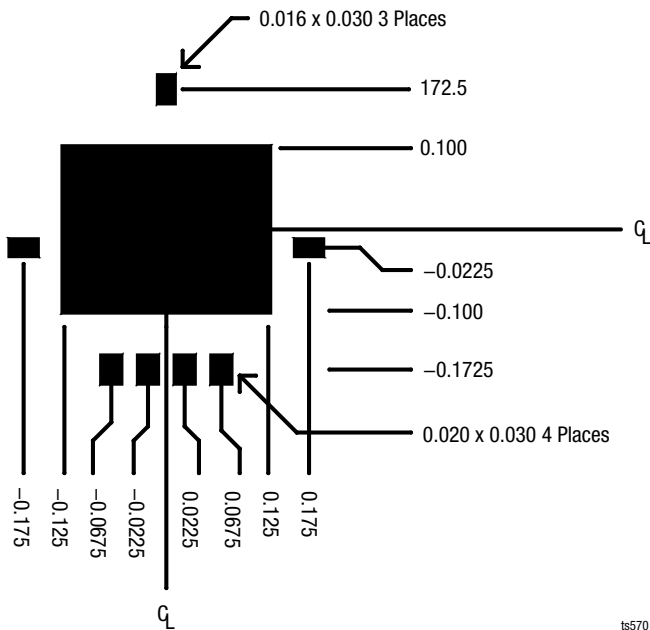
Figure 13. ISO13286 Suggested Driver Circuit

ts568



Y1096

Figure 14. ISO13286 Package Dimensions



ts570

Figure 15. Pad Locations for the ISO13286



## Ordering Information

Model Name	Manufacturing Part Number
ISO13286: DC to 8 GHz Low Loss SPDT	ISO13286

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