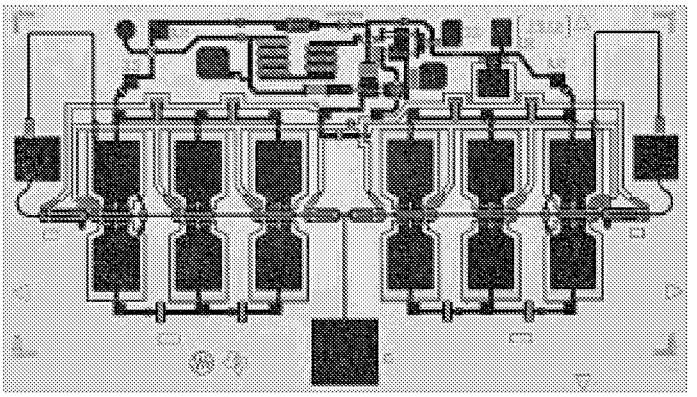
TGS8630-XCC

SPDT FET Switch

8630

- **DC to 12-GHz Frequency Range**
- **On-Chip Driver Compatible with CMOS or Open-Collector TTL**
- **Typical Insertion Loss: 2.3-dB at 12-GHz**
- **High Isolation: 46-dB through 12-GHz**
- **Useable Bandwidth through 18-GHz**
- **3,454 x 2,007 x 0,102 mm (0.136 x 0.079 x 0.004 in.)**

PHOTO ENLARGEMENT



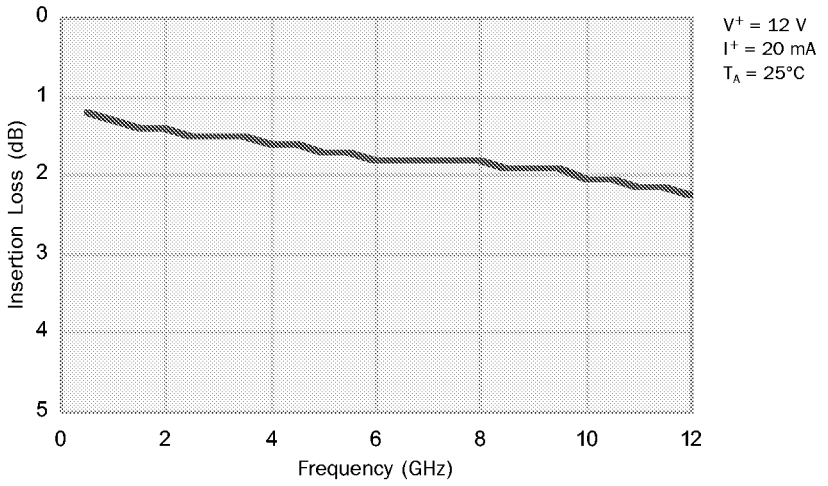
DESCRIPTION

The Texas Instruments TGS8630-XCC is a GaAs single-pole, double-throw (SPDT) monolithic switch, which operates over the DC to 12-GHz frequency range. This switch maintains 46-dB isolation and has an on-chip driver compatible with CMOS or open-collector TTL. The driver also provides a complementary output. Output return loss is greater than 19-dB. Input power, at 1-dB gain compression, is typically 22-dBm. Ground is provided to the circuitry through vias to the backside metallization.

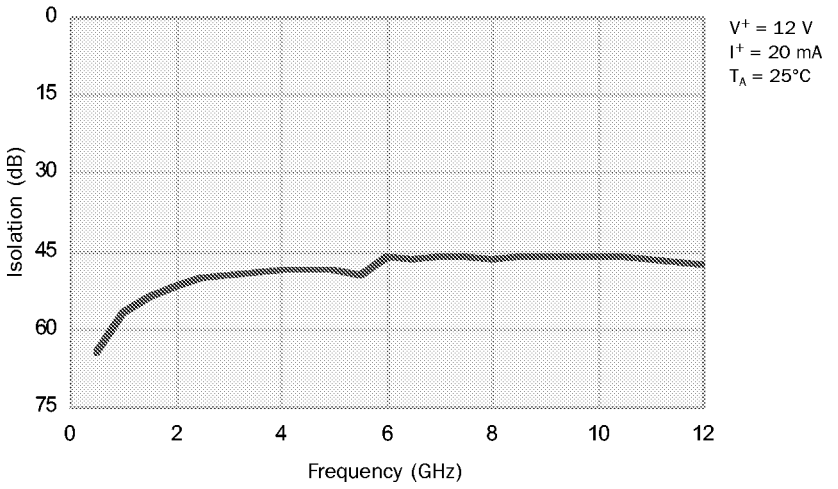
The TGS8630-XCC is suitable for a variety of wide-band applications such as radar systems, missile guidance, and communication systems.

Bond pad and backside metallization is gold-plated for compatibility with eutectic alloy attachment methods as well as the thermocompression and thermosonic wire-bonding processes. The TGS8630-XCC is supplied in chip form and is readily assembled using automated equipment.

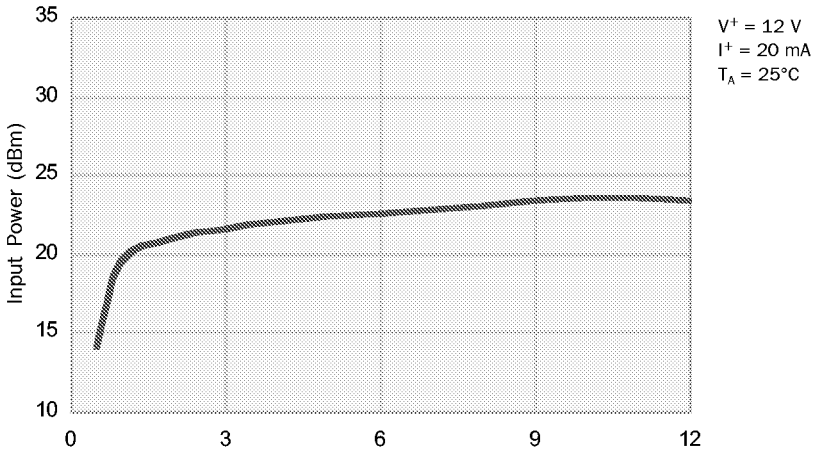
TYPICAL INSERTION LOSS



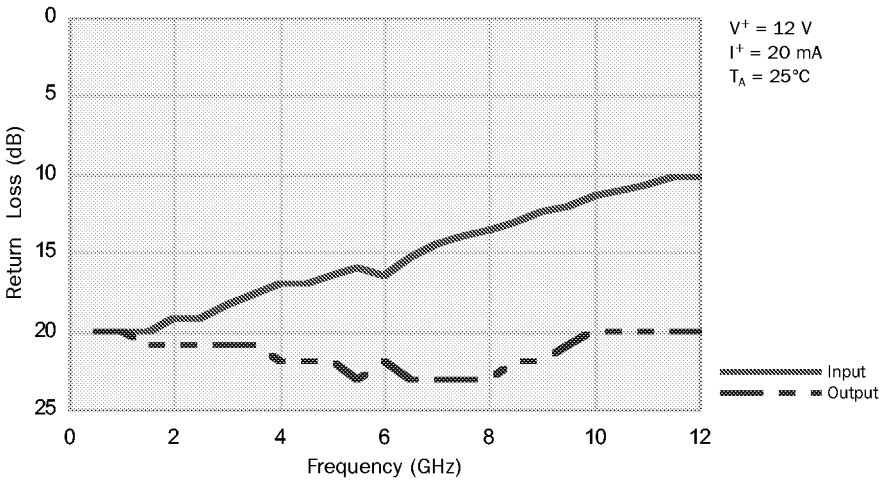
TYPICAL ISOLATION



TYPICAL INPUT POWER
P_{1dB}



TYPICAL RETURN LOSS



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+	15 V
Control voltage range, V_{CTRL}	-0 V to +10 V
Power dissipation, P_D	0.36 W
Input continuous wave power, P_{IN}	1 W
Operating channel temperature, T_{CH}*	150°C
Mounting temperature (30 sec)	320°C
Storage temperature range, T_{STG}	-65 to 150°C

Ratings over channel temperature range, T_{CH} (unless otherwise noted)

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "RF Characteristics" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

* Operating channel temperature will directly affect the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

TYPICAL S-PARAMETERS
Through Path

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		Insertion Loss
(GHz)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	(dB)
0.5	0.10	-14	0.87	-8	0.87	-8	0.10	-16	1.2
1.0	0.10	-24	0.86	-15	0.86	-15	0.10	-30	1.3
1.5	0.10	-33	0.85	-22	0.85	-22	0.09	-43	1.4
2.0	0.11	-41	0.85	-29	0.85	-29	0.09	-55	1.4
2.5	0.11	-48	0.84	-36	0.84	-36	0.09	-66	1.5
3.0	0.12	-55	0.84	-43	0.84	-43	0.09	-78	1.5
3.5	0.13	-62	0.84	-50	0.84	-50	0.09	-92	1.6
4.0	0.14	-68	0.83	-57	0.83	-57	0.08	-104	1.6
4.5	0.14	-75	0.83	-64	0.83	-64	0.08	-117	1.6
5.0	0.15	-81	0.82	-71	0.82	-71	0.08	-131	1.7
5.5	0.16	-82	0.82	-78	0.82	-78	0.07	-144	1.8
6.0	0.15	-90	0.81	-85	0.81	-85	0.08	-162	1.9
6.5	0.17	-92	0.81	-91	0.81	-91	0.07	-173	1.8
7.0	0.19	-99	0.81	-98	0.81	-98	0.07	176	1.9
7.5	0.20	-104	0.81	-105	0.81	-105	0.07	165	1.9
8.0	0.21	-111	0.81	-113	0.81	-113	0.07	153	1.9
8.5	0.22	-117	0.80	-120	0.80	-120	0.08	140	1.9
9.0	0.24	-124	0.80	-127	0.80	-127	0.08	127	1.9
9.5	0.25	-132	0.80	-134	0.80	-134	0.09	116	2
10.0	0.27	-139	0.79	-141	0.79	-141	0.10	107	2
10.5	0.28	-145	0.79	-148	0.79	-148	0.10	98	2.1
11.0	0.29	-151	0.78	-155	0.78	-155	0.10	86	2.2
11.5	0.31	-157	0.78	-162	0.78	-162	0.10	73	2.2
12.0	0.31	-164	0.77	-169	0.77	-169	0.10	64	2.3

T_A = 25°C, V^+ = 12 V, I^+ = 29 mA

Reference planes for S-parameter data include bond wires as specified in the recommended assembly diagram. The S-parameters are available on floppy disk and the world wide web.

TYPICAL S-PARAMETERS
Isolated Path

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		Isolation
(GHz)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	(dB)
0.5	0.09	-24	0.001	54	0.001	56	0.89	180	64.7
1.0	0.11	-21	0.001	70	0.001	68	0.87	173	57.1
1.5	0.10	-30	0.002	67	0.002	67	0.86	167	53.8
2.0	0.12	-51	0.003	65	0.003	66	0.85	162	51.7
2.5	0.11	-43	0.003	63	0.003	62	0.84	157	50.2
3.0	0.13	-65	0.003	56	0.003	55	0.83	153	49.6
3.5	0.14	-55	0.004	59	0.004	59	0.82	149	49.1
4.0	0.15	-77	0.004	58	0.004	58	0.81	144	48.6
4.5	0.17	-82	0.004	59	0.004	58	0.80	140	48.9
5.0	0.12	-82	0.004	61	0.004	60	0.79	136	48.9
5.5	0.20	-85	0.003	77	0.003	76	0.78	132	50.0
6.0	0.14	-111	0.005	74	0.005	74	0.78	129	46.0
6.5	0.18	-92	0.005	70	0.005	70	0.78	124	46.5
7.0	0.17	-103	0.005	69	0.005	69	0.77	120	46.2
7.5	0.23	-113	0.005	70	0.005	71	0.77	116	46.1
8.0	0.16	-118	0.005	69	0.005	70	0.76	112	46.6
8.5	0.21	-124	0.005	72	0.005	73	0.76	108	46.0
9.0	0.20	-113	0.005	75	0.005	75	0.75	105	46.4
9.5	0.26	-136	0.005	73	0.005	73	0.75	101	46.0
10.0	0.25	-127	0.005	77	0.005	77	0.75	97	46.4
10.5	0.31	-148	0.005	74	0.005	73	0.75	94	46.0
11.0	0.29	-149	0.005	73	0.005	75	0.75	90	46.6
11.5	0.29	-162	0.004	71	0.004	72	0.74	87	47.4
12.0	0.38	-157	0.004	78	0.004	78	0.74	84	48.0

T_A = 25°C, V^+ = 12 V, I^+ = 29 mA

Reference planes for S-parameter data include bond wires as specified in the "Recommended Assembly Diagram. The S-parameters are available on floppy disk and the world wide web.

DC CHARACTERISTICS

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V^+	Supply voltage		11	12	14	V
V_{IH}	High–level control input voltage		4.5	5	6	V
V_{IL}	Low–level control input voltage		0	0	0.5	V
I^+	Positive supply current	V^+ = 12 V		29		mA

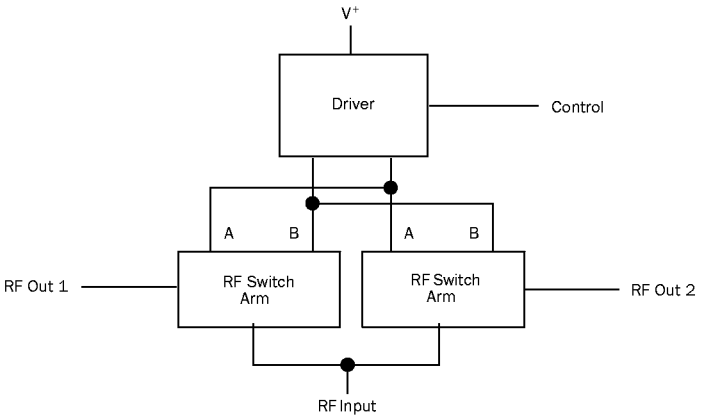
T_A = 25°C

RF CHARACTERISTICS

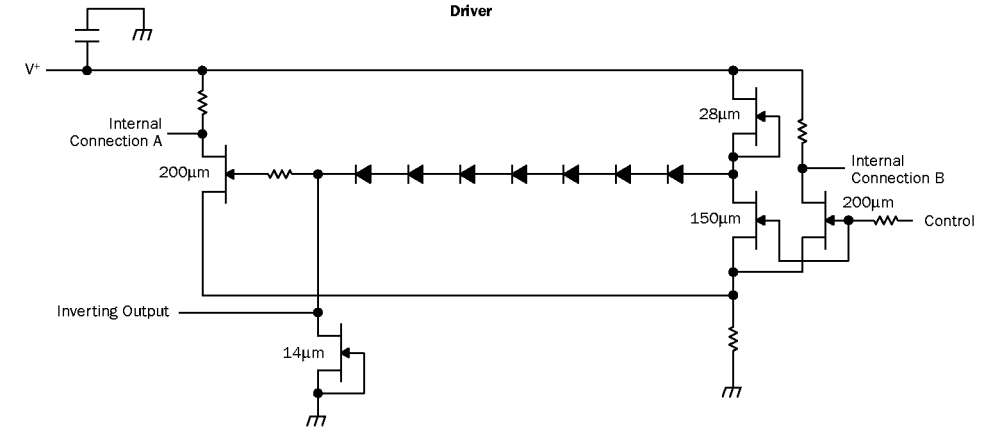
PARAMETER		TEST CONDITIONS	TYP	UNIT
IL	Insertion loss	f = DC to 8 GHz	1.8	dB
		f = 8 to 12 GHz	2.2	
SWR(in)	Input standing wave ratio	f = DC to 8 GHz	1.6:1	-
		f = 8 to 12 GHz	1.9:1	
SWR(out)	Output standing wave ratio	f = DC to 12 GHz	1.25:1	-
	Isolation	f = DC to 12 GHz	46	dB
$P_{1dB(in)}$	Input power at 1-dB gain compression	f = DCc to 2 GHz	15	dBm
		f = 2 to 12 GHz	22.5	
t_d	Delay time, 50% open–collector TTL input to 90% (10%) RF output		8	ns
t_r	Rise time, 10% RF output to 90% RF output		6	ns
t_f	Fall time, 90% RF output to 10% RF output		6	ns
V_{OH}	High–level inverting output voltage		5.5	V
V_{OL}	Low–level inverting output voltage		0.6	V
	Inverting output current source/sink capability		2	mA

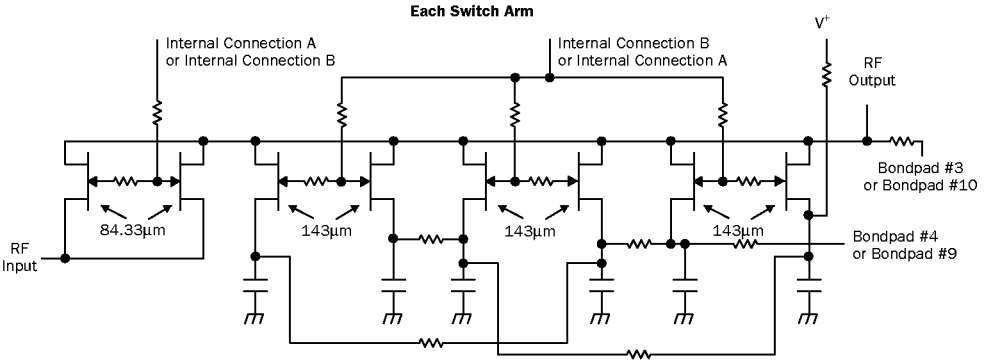
V_+ = 12 V, T_A = 25°C

FUNCTIONAL BLOCK DIAGRAM



EQUIVALENT SCHEMATIC

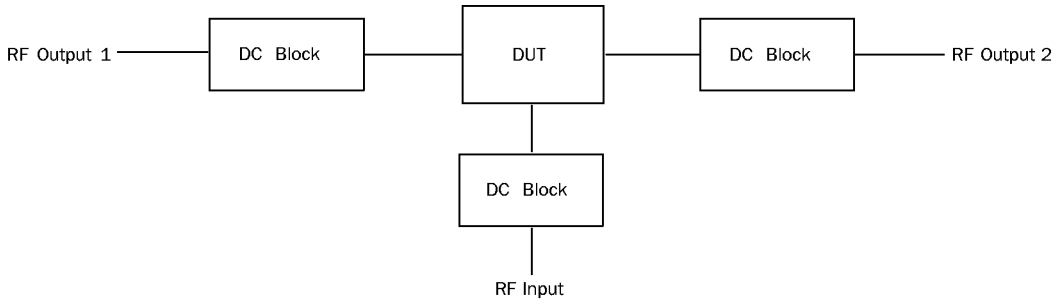




The two switch arms are identical.

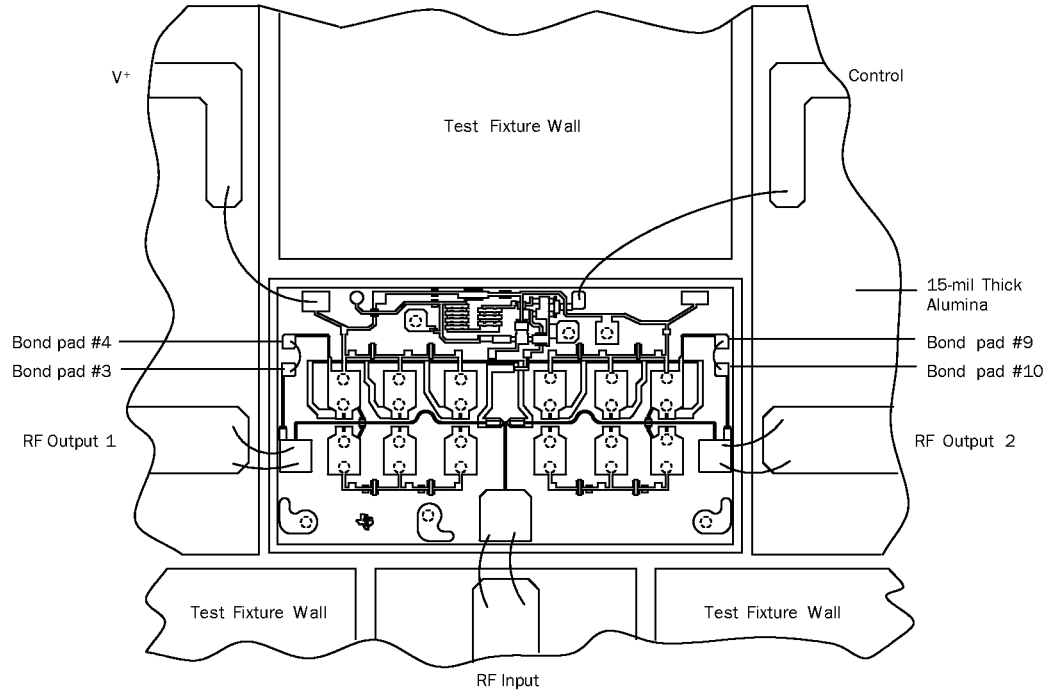
RF ports are not DC-isolated.

RECOMMENDED TEST CONFIGURATION



Place a 50 W load on unused output port.

RECOMMENDED ASSEMBLY DIAGRAM



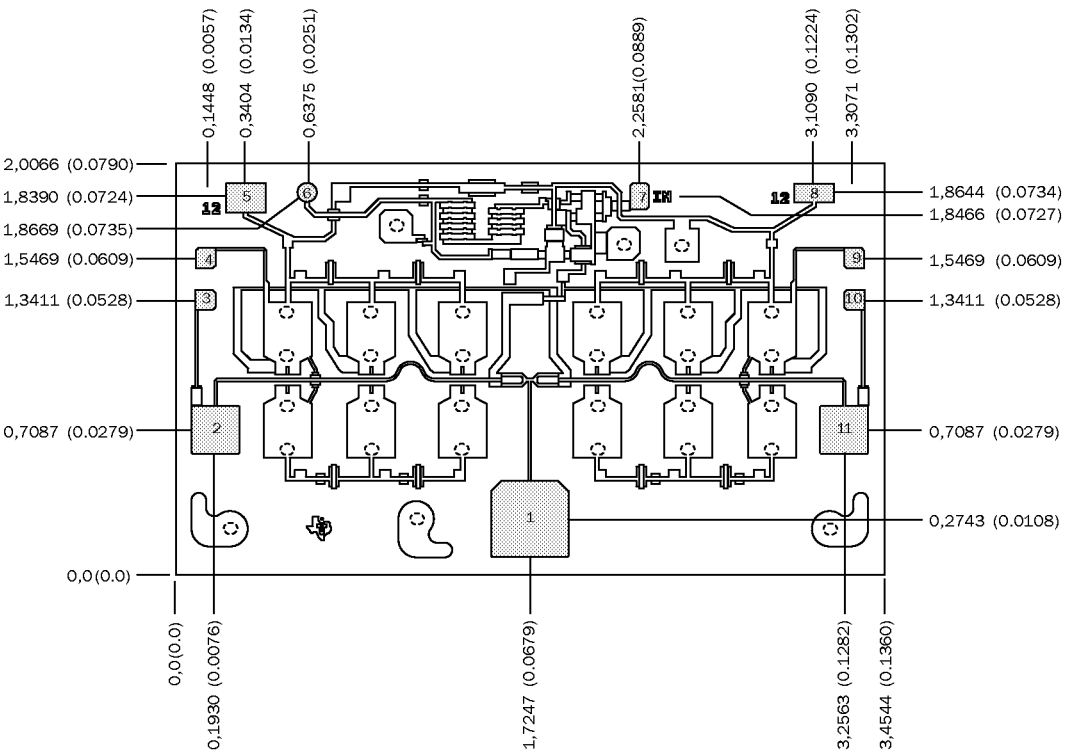
RF connections: bond using two 1-mil diameter, 20 to 25-mil-length gold bond wires at both RF Input and RF Output ports for optimum RF performance.

Bond pads 3 and 4 and bond pads 9 and 10 must be bonded together for proper operation.

Low-loss path is RF Input to RF Output 1 for $V_{control}$ = 0 V. Low-loss path is RF Input to RF Output 2 for $V_{control}$ = 5 V.

RF isolation will be limited by the chip operating environment.

MECHANICAL DRAWING



Units: Millimeters (inches)
Thickness: 0,102 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad.
Chip size ± 0,0508 (0.002)

Bond pad #1 (RF In):	0,3810 x 0,3785 (0.0150 x 0.0149)
Bond pad #2 (RF Out 1):	0,2388 x 0,2388 (0.0094 x 0.0094)
Bond pad #3:	0,1016 x 0,1016 (0.0040 x 0.0040)
Bond pad #4:	0,1016 x 0,1016 (0.0040 x 0.0040)
Bond pad #5 (V^+):	0,1981 x 0,1473 (0.0078 x 0.0058)
Bond pad #6 (Inverting Output):	0,0911 (0.0039) diameter
Bond pad #7 (CONTROL)	0,0965 x 0,1321 (0.0038 x 0.0052)
Bond pad #8 (V^+):	0,1981 x 0,0965 (0.0078 x 0.0038)
Bond pad #9:	0,1016 x 0,1016 (0.0040 x 0.0040)
Bond pad #10:	0,1016 x 0,1016 (0.0040 x 0.0040)
Bond pad #11 (RF Out 2):	0,2388 x 0,2388 (0.0094 x 0.0094)

This device is susceptible to damage from electric discharge. Handling and packaging of this device and/or assembly should be accomplished only with adequate provisions to prevent electrostatic discharge damage.
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