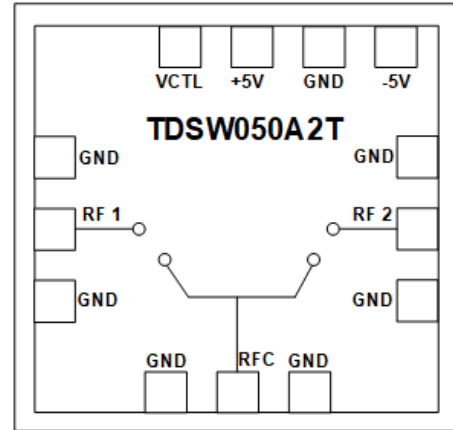


**DC – 50 GHz Reflective GaAs SPDT**

**Switch Features**

- Frequency Range: dc-50 GHz
- Low Insertion Loss: 3.4 dB @ 50 GHz (Typ)
- Isolation: 23 dB @ 50 GHz
- Input & Output Return Loss: >10 dB @ 50 GHz
- Input P1dB: 23 dBm
- -40 °C to +85 °C Operating Temperature
- Die Size: 1.15 mm x 1.47 mm x 0.1 mm



**Figure 1 TDSW050A2T Functional Diagram**

**Typical Applications**

- Radar
- Military & Space Communication Systems
- Instrumentation

**Description**

The Teledyne TDSW050A2T is a wide band, reflective, single pole, double throw (SPDT) Switch covering dc to 50 GHz. The switch features insertion loss of 3.4 dB(typ) and greater than 23 dB Isolation up to 50 GHz. The input power for 1 dB compression is 23 dBm typical. The switch operates on +5V / -5V supplies with minimal dc power consumption and is controlled using TTL-compatible voltage levels. The die is fabricated using a robust 0.15 μm InGaAs pHEMT technology. The switch is available in die form only with Class K element evaluation screening performed.

**Absolute Maximum Ratings<sup>1</sup>**

Parameter	Absolute Maximum	Units
RF Input Power <sup>1</sup>	30	dBm
Control Voltage <sup>1</sup>	-0.5 to +5.5	V
ON State <sup>1</sup>	+6	V
OFF State <sup>1</sup>	-6	V
Operating temperature	-40 to +85	°C
Storage Temperature <sup>1</sup>	-65 to +150	°C

1. Stresses beyond those listed as “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 is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. Operation beyond these limits may cause permanent damage to the component.

**Electrical Specifications @  $T_A = 25\text{ }^\circ\text{C}$ ,  $Z_o = 50\text{ }\Omega$ ,**

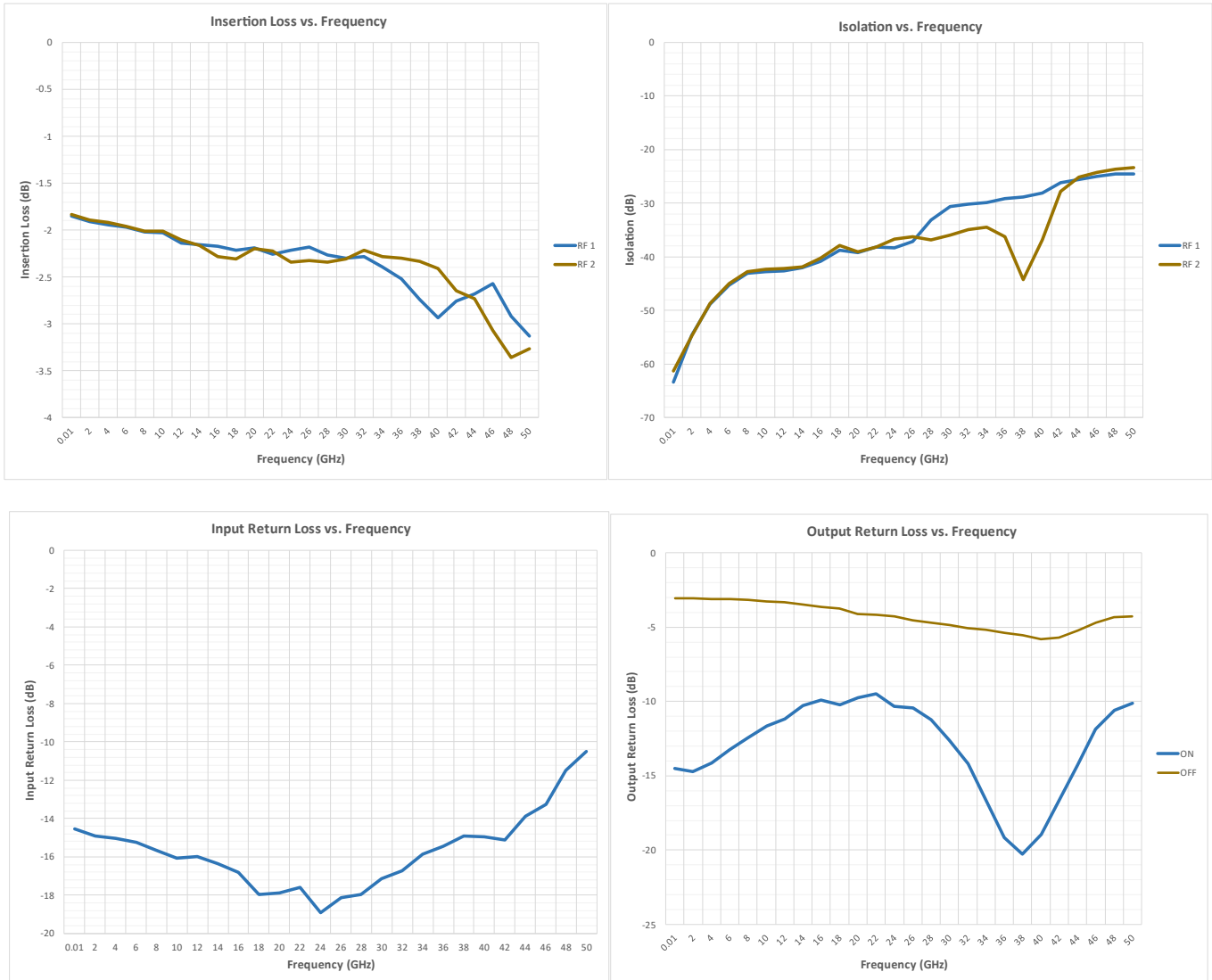
Parameter	Typical Values	Units
Frequency Range	dc - 50.0	GHz
Insertion Loss	3.4	dB
Input Return Loss	10.5	dB
Output Return Loss	10	dB
Off State Return Loss	3	dB
Isolation	23	dB
Input P1dB	23	dBm
+5V Supply Voltage	5	V
-5V Supply Voltage	-5	V
+5V Supply Current	1.1	mA
-5V Supply Current	0.17	mA
VCTL Control Voltage	0/+5	V
VCTL Input Current @ 5V	2	$\mu\text{A}$

**Note:**

1. The RF input & output ports are dc coupled.
2. For reliable operation external dc blocking capacitors are required at the RF input & output ports.

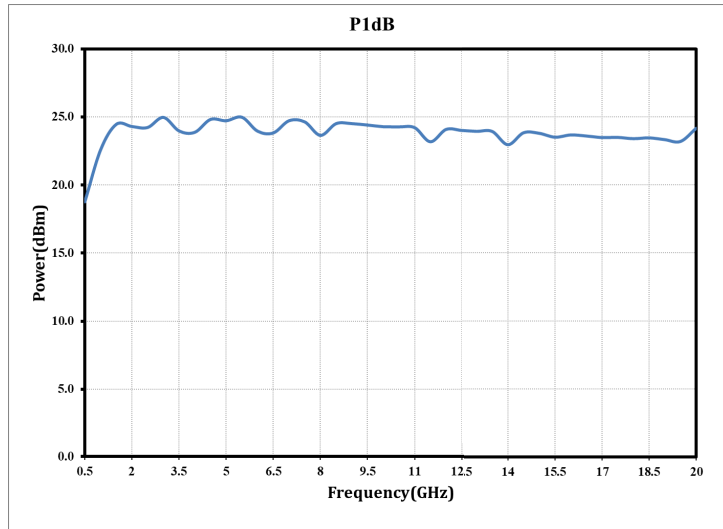
## On Wafer Probed Data

$T_A = 25^\circ\text{C}$ ,  $Z_o = 50\ \Omega$



### Test Fixture Data – Input P1dB Compression

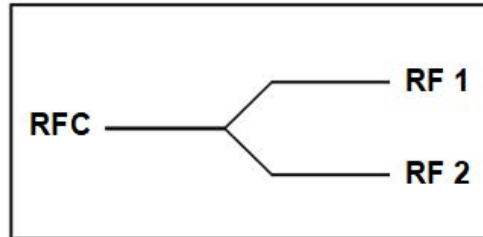
$T_A = 25^\circ\text{C}$ ,  $Z_o = 50\ \Omega$



## Truth Table

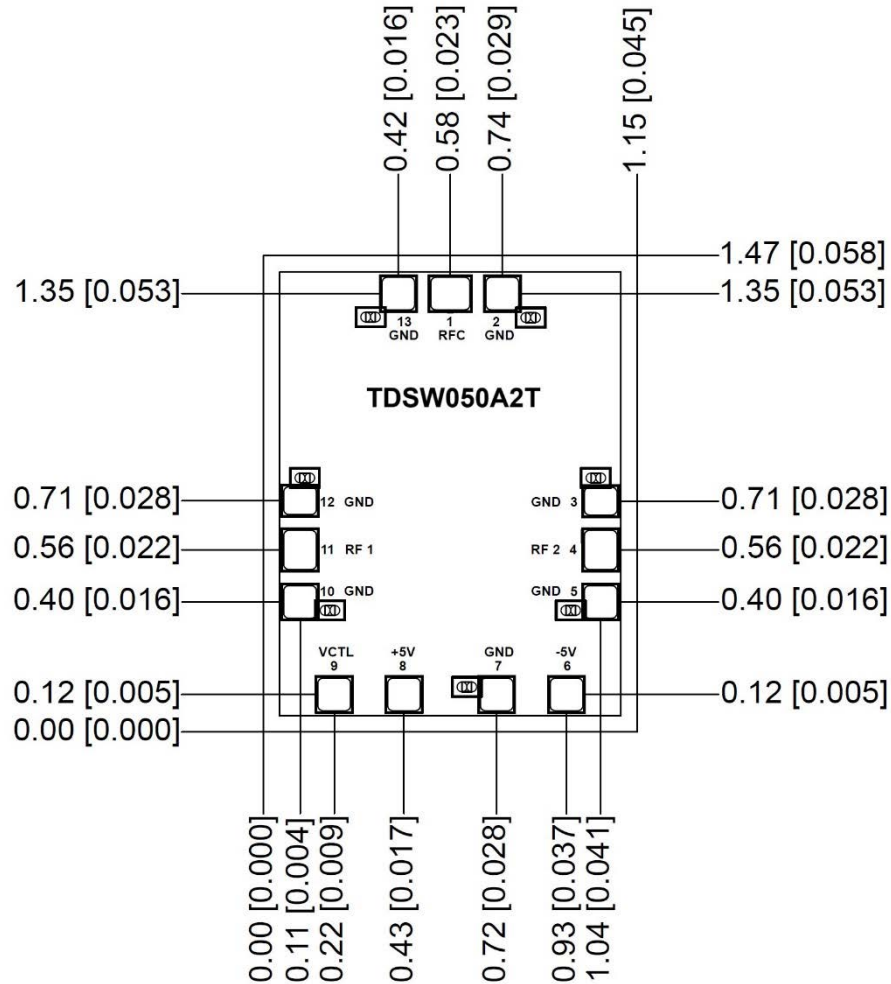
### Control Voltage

State	Bias condition
Low "0"	0 to 0.5 V
High "1"	3.3 V to 5.0 V



VCTL	RFC to RF 1	RFC to RF 2
0(Low)	On	Off
1(High)	Off	On

## RF and DC Pad Details

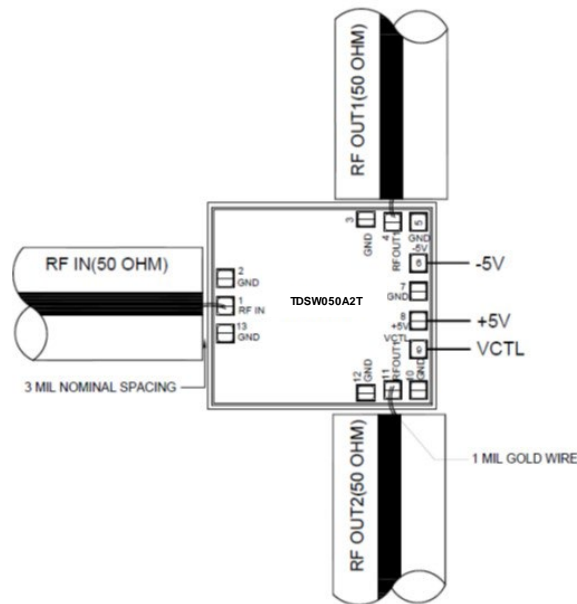


**Units:** millimeters [inches]

**Note:**

1. All RF and dc bond pads are 100µm x 100µm
2. Pad no. 1 : RFC
3. Pad no. 2,3,5,7,10,12 : GND
4. Pad no. 11 : RF 1
5. Pad no.6 : -5V
6. Pad no.8 : +5V
7. Pad no.9 : VCTL
8. Pad no.4 : RF 2

## Recommended Die Assembly Diagram



### Note:

1. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input, RF output.
2. Input and output 50-ohm lines are preferably on 5 mil or 10 mil RT Duroid substrate.
3. The RF input & output ports are dc decoupled on-chip.
4. Coefficient of thermal expansion matching is recommended for reliability purpose.
5. Use high thermal conductive material for die mounting for long term reliability.
6. Maintain base plate temperature less than 70 °C under RF operation for optimum performance.

**Die attach:** For Epoxy attachment, use of a two-component conductive epoxy is recommended. An epoxy fillet should be visible around the total die periphery. If Eutectic attachment is preferred, use of flux less AuSn (80/20) 1 – 2 mil thick preform solder is recommended. Use of AuGe preform should be strictly avoided.

**Wire bonding:** For dc pad connections use either ball or wedge bonds. For best RF performance, use of 150 – 200  $\mu\text{m}$  length of wedge bonds is advised. Single Ball bonds of 250 – 300  $\mu\text{m}$  though acceptable, may cause a deviation in RF performance.



***GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing***

## Part Number Ordering Details

The TDSW050A2T RF Switch is available in the following bare die forms:

Part Number	Description	Packaging	Notes
TDSW050A2T-98	EM DIE	Gel-Pack	
TDSW050A2T-99	FM DIE	Gel-Pack	w/ Method 2010 space visual

## Document Revision History:

Document	Description / Comments	Date / Revision
TDSW050A2T 01_2025	Initial Release	01_29_2025 Rev -
-	-	-

## Contact Information and Data Sheet Categories:

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