

DC – 50 GHz Reflective GaAs SPDT

DRAFT as of 01/17/25

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

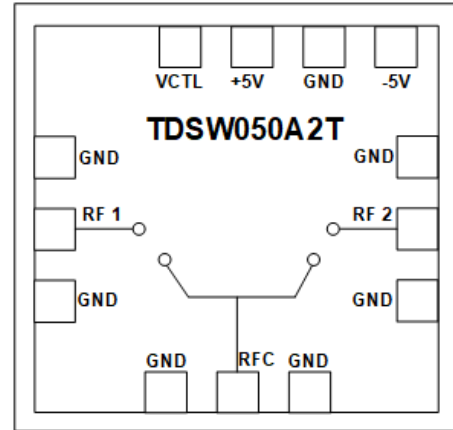


Figure 1 TDSW050A2T Functional Diagram

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 s upplies 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 Ratings¹

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

1. Operation beyond these limits may cause permanent damage to the component

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

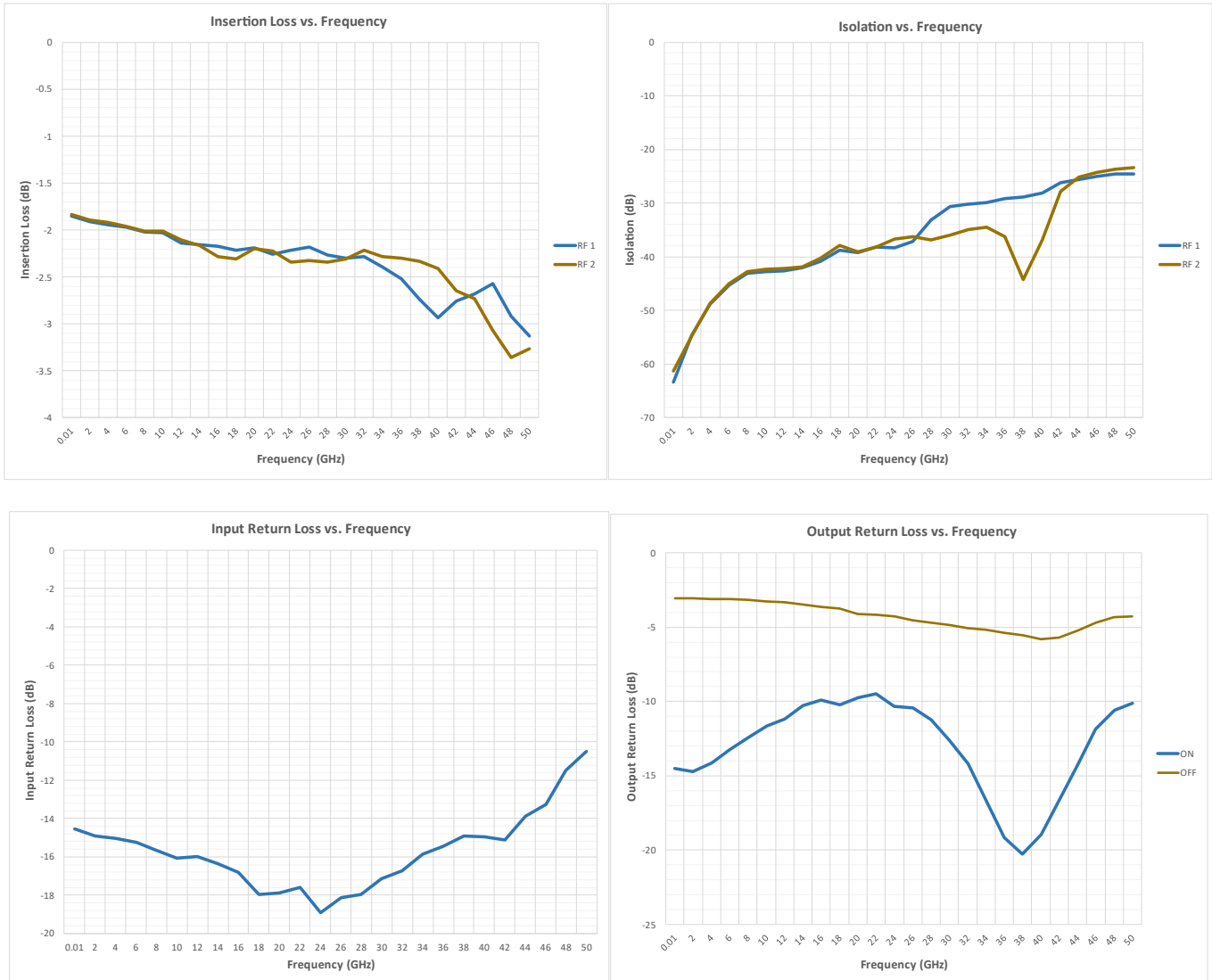
Parameter	Typical Values	Units
Frequency Range	dc - 50.0	GHz
Insertion Loss	3.4	dB
Input Return Loss	10.5	dB
Output Return Loss	10	dB
Off State Return Loss	3	dB
Isolation	23	dB
Input P1dB	23	dBm
+5V Supply Voltage	5	V
-5V Supply Voltage	-5	V
+5V Supply Current	1.1	mA
-5V Supply Current	0.17	mA
VCTL Control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

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.

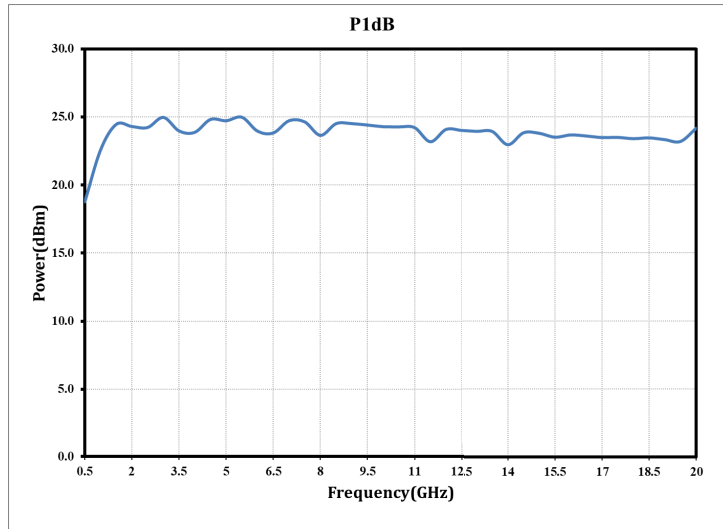
On Wafer Probed Data

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



Test Fixture Data – Input P1dB Compression

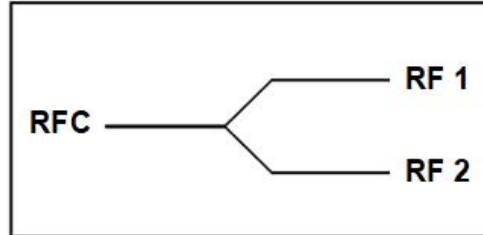
$T_A = 25^\circ\text{C}$, $Z_o = 50\ \Omega$



Truth Table

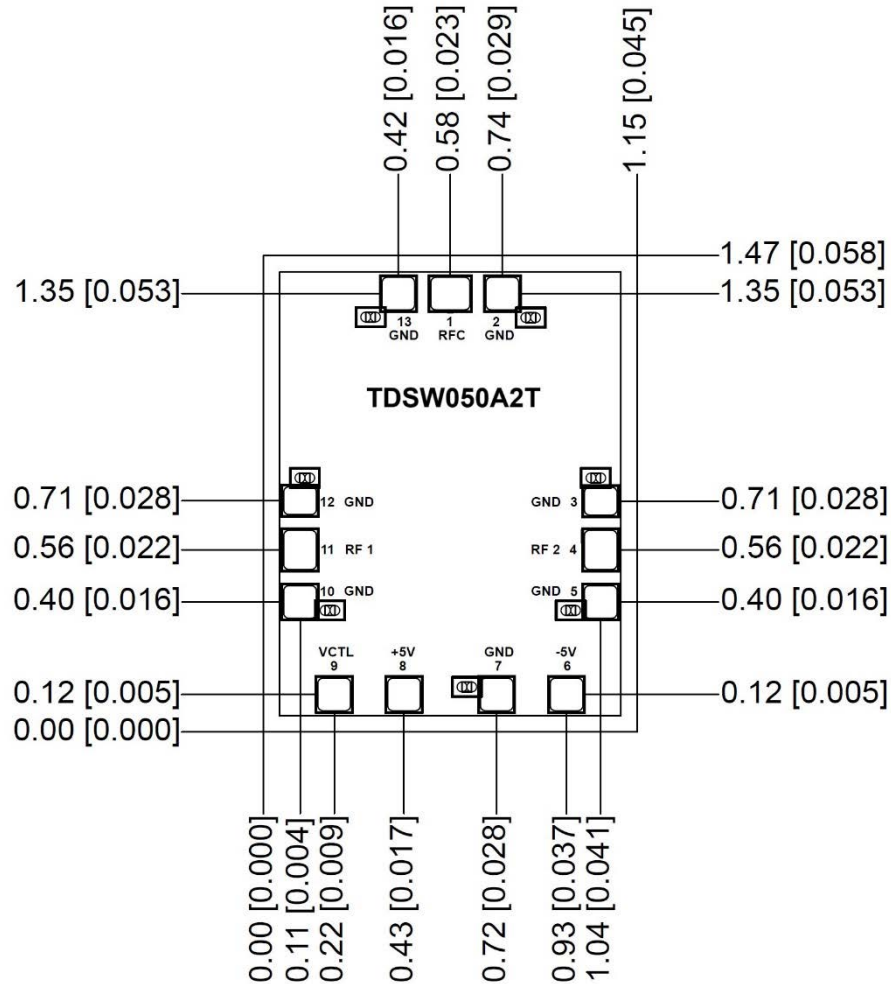
Control Voltage

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

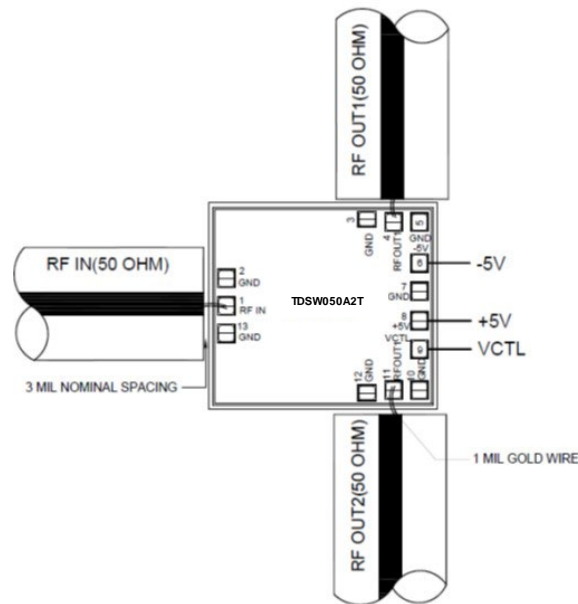


Units: millimeters [inches]

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 µm length of wedge bonds is advised. Single Ball bonds of 250 – 300 µm 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

All information and Specifications are subject to change without prior notice. Before using the product, please download and refer to latest datasheet from website.

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_17_2025 Rev -
-	-	-

Contact Information and Data Sheet Categories:

Teledyne HiRel Electronics at: www.tdehirel.com

Email: hiRel@teledyne.com

Preliminary Specification: The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Advanced Information: The data sheet contains preliminary data. Additional data may be added at a later date. Teledyne HiRel Electronics reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification - The data sheet contains final data. In the event Teledyne HiRel Electronics decides to change the specifications, Teledyne e2v HiRel will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

The information in this data sheet is believed to be reliable. However, Teledyne HiRel Electronics assumes no liability for the use of this information. Use shall be entirely at the user's own risk. No patent rights or licenses to any circuits described in this data sheet are implied or granted to any third party. Teledyne e2v HiRel products are not designed or intended for use in devices or systems intended for surgical implant, or in other applications intended to support or sustain life, or in any application in which the failure of the Teledyne e2v HiRel product could create a situation in which personal injury or death might occur. Teledyne e2v HiRel assumes no liability for damages, including consequential or incidental damages, arising out of the use of its products in such applications.

Disclaimers: The information in this document is believed to be reliable. However, Teledyne HiRel Electronics assumes no liability for the use of this information. Use shall be entirely at the user's own risk. No patent rights or licenses to any circuits described in this document are implied or granted to any third party. Teledyne e2v HiRel's products are not designed or intended for use in devices or systems intended for surgical implant, or in other applications intended to support or sustain life, or in any application in which the failure of the Teledyne e2v HiRel's product could create a situation in which personal injury or death might occur. Teledyne HiRel Electronics assumes no liability for damages, including consequential or incidental damages, arising out of the use of its products in such applications.

Trademarks are the property of their respective owners.

©2025, Teledyne HiRel Electronics All rights reserved.