TDSW020A2T

Product Specification
November 11, 2021

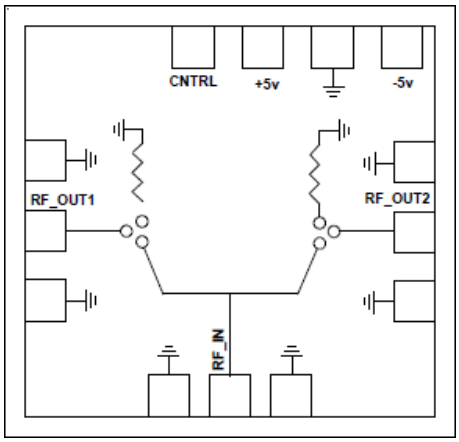
TELEDYNE e2v HIREL ELECTRONICS
Everywhereyoulook™

dc – 20 GHz Absorptive GaAs SPDT

Switch Features

- Frequency Range: dc – 20 GHz
- Low Insertion Loss: 3 dB(Max)
- Isolation: >40 dB
- Input & Output Return Loss: > 15 dB
- Input P1dB: 28 dBm
- Die Size: 1.5 mm × 1.5 mm × 0.1 mm
- Package*: 5 mm x 5 mm Hermetic Ceramic QFN

Figure 1 TDSW020A2T Functional Diagram



Typical Applications

- Radar
- Military & Space
- Instrumentation

Description

The Teledyne TDSW020A2T is a wide band, absorptive, single pole, double throw (SPDT) Switch covering dc to 20 GHz. The switch features insertion loss of 3 dB(max) and greater than 40 dB Isolation up to 20 GHz. The input power for 1dB compression is 28 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 will be available in both space screened die form and an alternative 5 mm x 5 mm hermetic sealed QFN package* with space level screening.

Absolute Maximum Ratings[1]

Parameter	Absolute Maximum	Units
RF Input Power	35	dBm
Control Voltage ON State OFF State	-0.5 to +5.5 +6 -6	V V V
Operating temperature	-40 to +85	^{o}C
Storage Temperature	-65 to +150	^{o}C

Note:

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

* Package preview: Contact factory for availability.

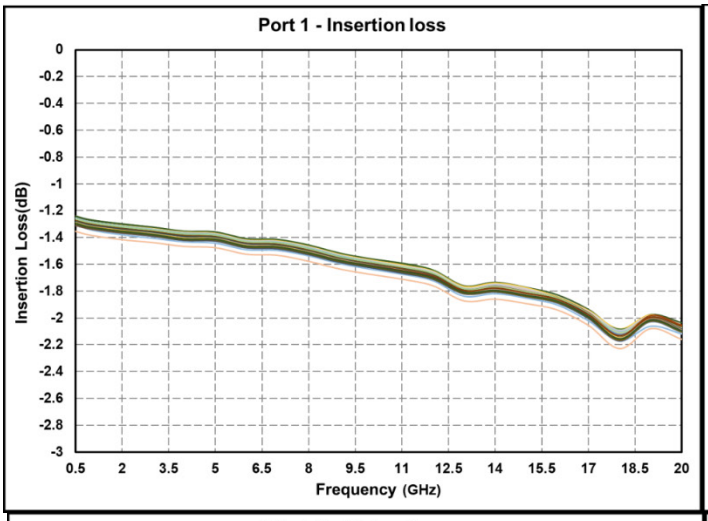
Electrical Specifications for Bare Die @ T_A = 25 °C, Z_O = 50 Ω[3, 4, 5]

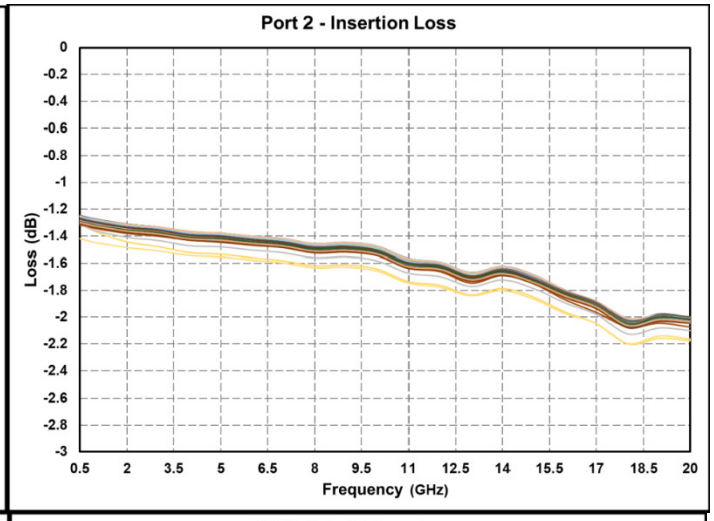
Parameter	Minimum	Typical	Maximum	Units
Frequency Range	dc		20.0	GHz
Insertion Loss		2.2	3.0	dB
Input Return Loss		-17	-15	dB
Output Return Loss		-17	-15	dB
Off State Return Loss		-15	-10	dB
Isolation	-37	-40		dB
Input P1dB		28		dBm
+5 V Supply Voltage (V_{DD})	4.5	5.0	5.5	V
-5 V Supply Voltage (V_{SS})	-5.5	-5.0	-4.5	V
+5 V Supply Current (I_{DD})		0.86	1.5	mA
-5 V Supply Current (I_{SS})	-0.5	-0.11		mA
CNTRL V_{IH}	0.7 x V_{DD}	5	5.5	V
CNTRL V_{IL}	-0.5	0	0.3xV_{DD}	V

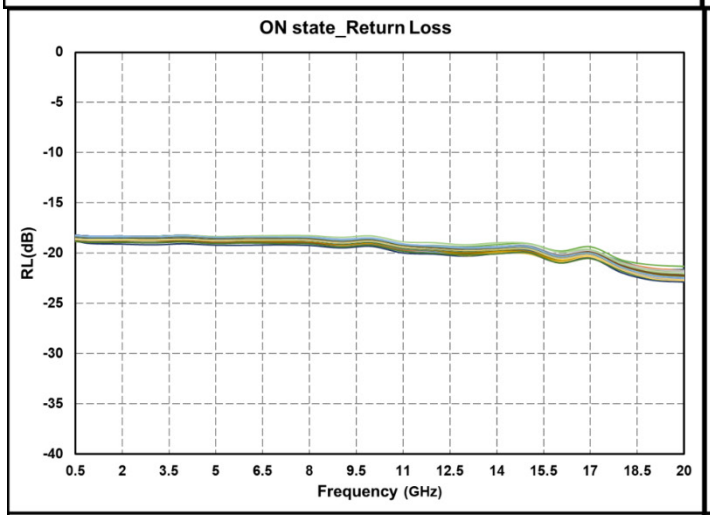
Notes:

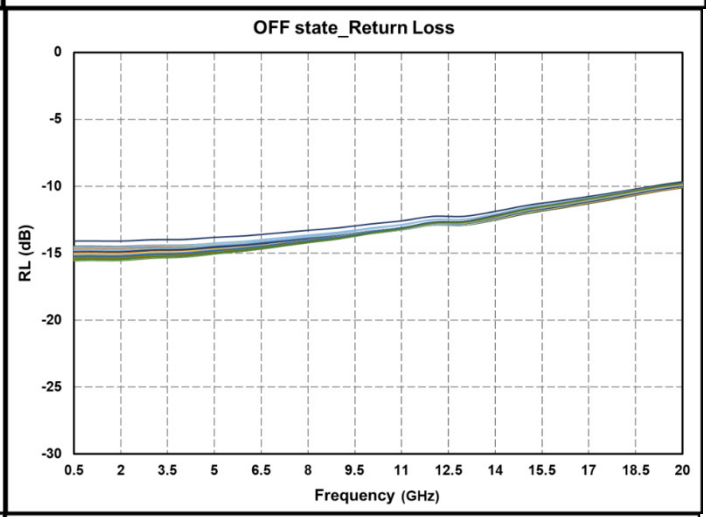
3. The RF input & output ports are dc coupled.
4. For reliable operation external dc blocking capacitors are required at the RF input & output ports
5. Bare/unpackaged die only. Contact factory for information about packaged die product

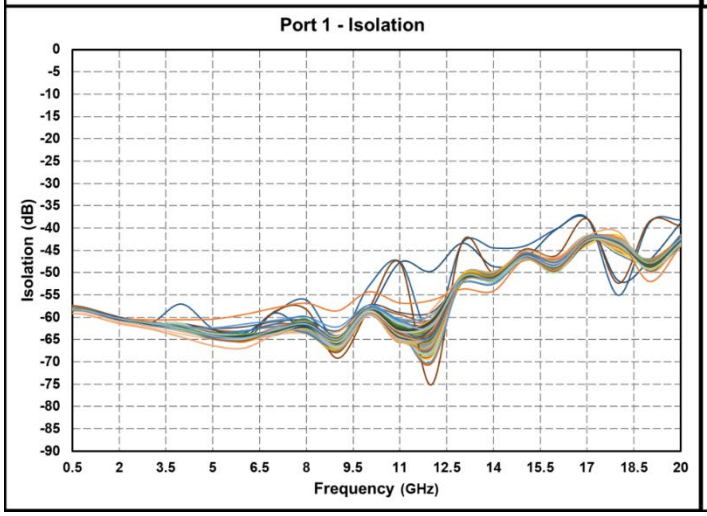
One Wafer Bare Die Probed Data @ T_A = 25 °C, Zo = 50 Ω, 255 random die from one wafer

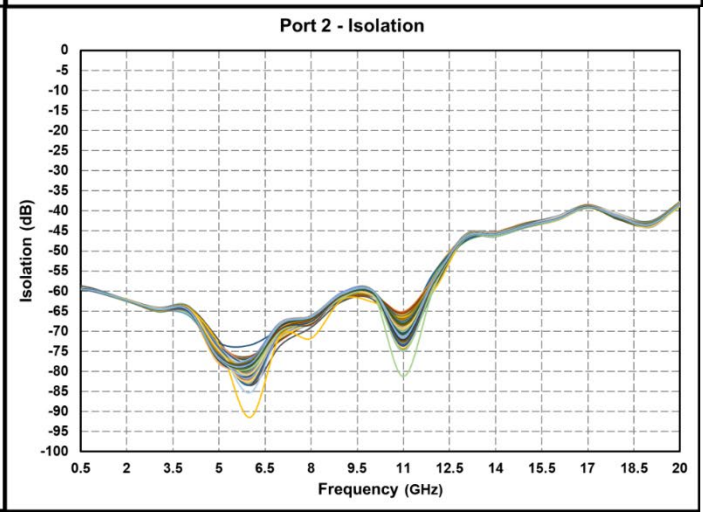




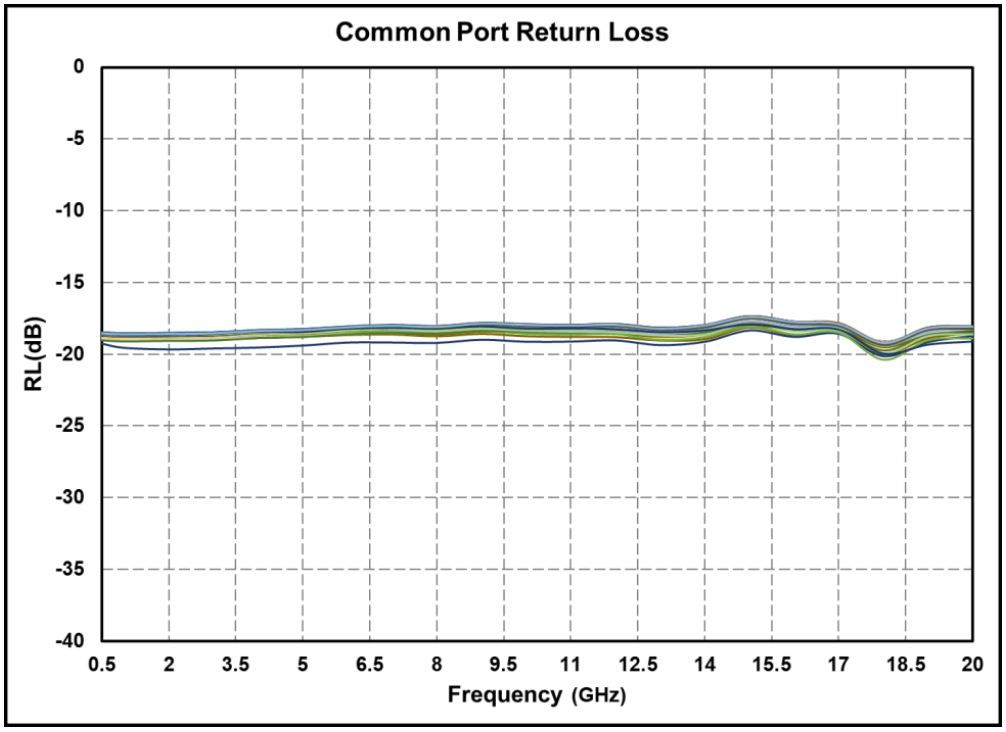




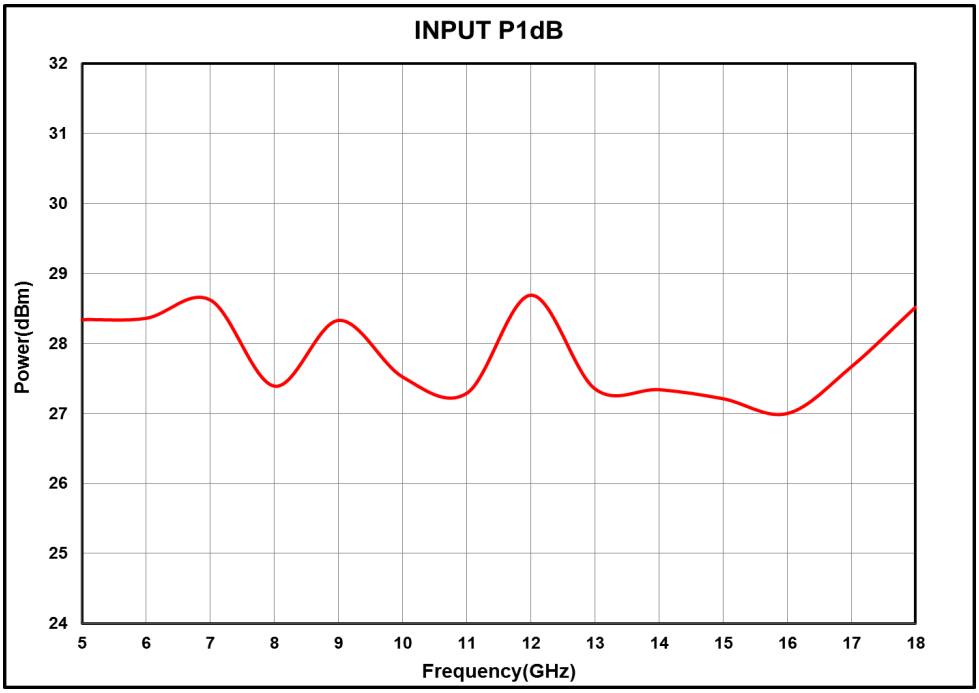




One Wafer Bare Die Probed Data @ T_A = 25 °C, Zo = 50 Ω, 255 random die from one wafer



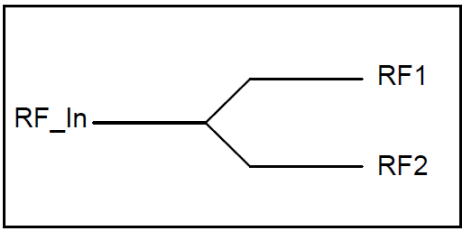
Test Fixture Data Bare Die @ T_A = 25 °C, Zo = 50 Ω



Truth Table

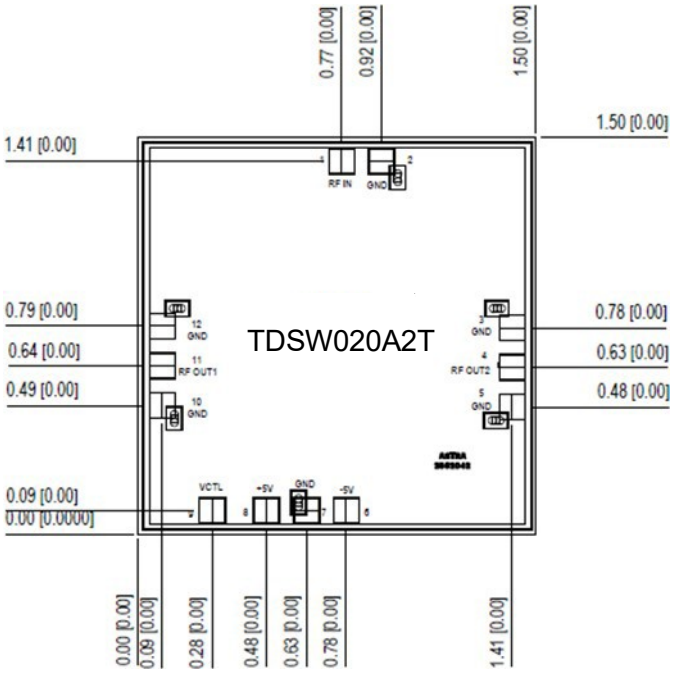
Control Voltage

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



Ctrl_vol	RF_In to RF1	RF_In to RF2
0(Low)	Off	On
1(High)	On	Off

RF and dc Pad Details



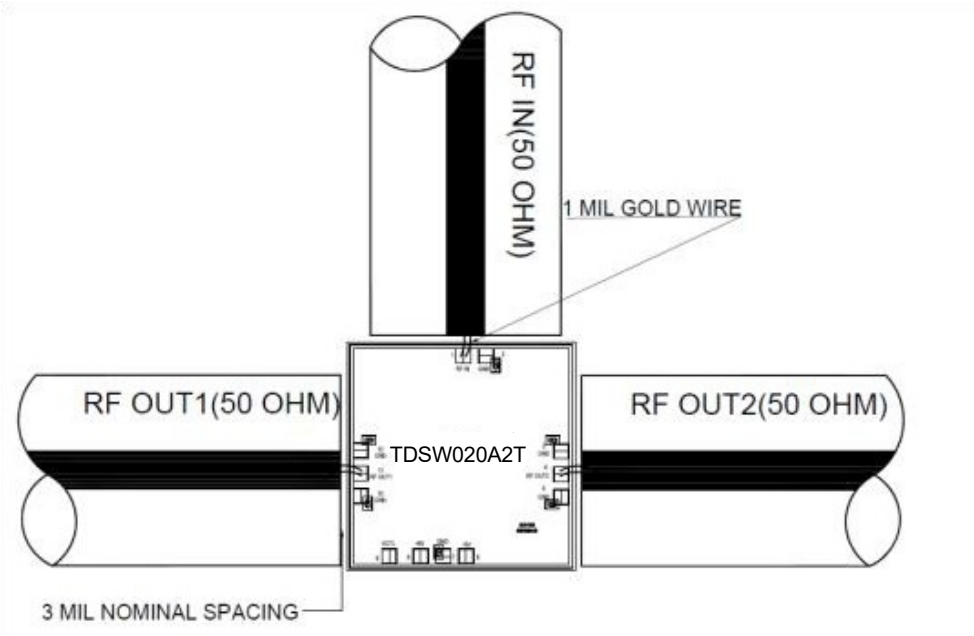
Units : millimeters (inches)

Notes:

1. All RF bond pads are 110 µm x 110 µm and dc bond pads are 100 µm x 100 µm

2.	Pad no. 1	: RF IN
3.	Pad no. 2,3,5,7,10,12	: GND
4.	Pad no. 11	: RF OUT1
5.	Pad no.6	: -5 V
6.	Pad no.8	: +5 V
7.	Pad no.9	: Vctrl
8.	Pad no.4	: RFOUT2

Recommended Die Assembly Diagram



Notes:

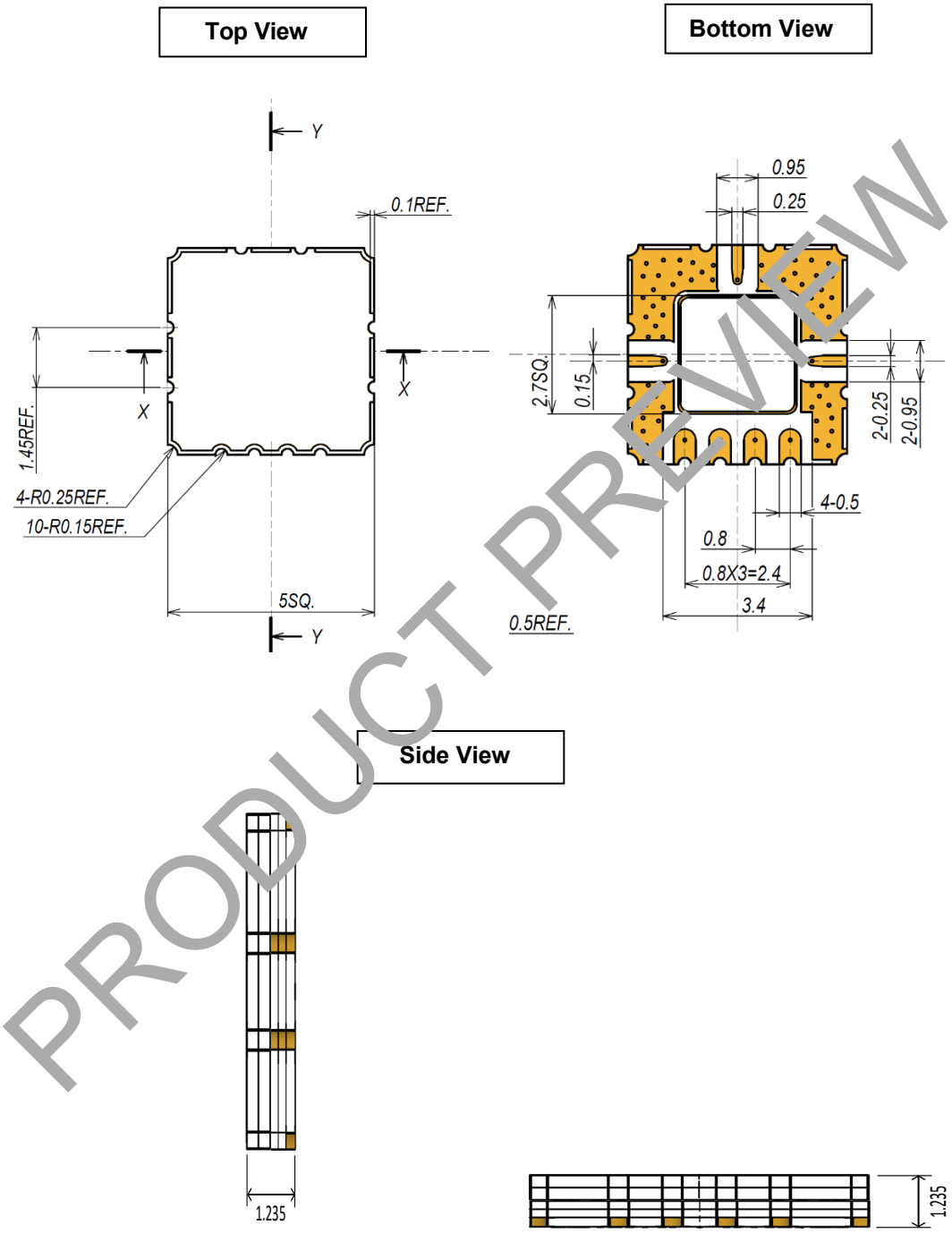
1. Two 1 mil (0.0254 mm) bond wires of minimum length should be used for RF input, RF output.
2. Input and output 50-ohm lines are preferably on 5 mil or 10 mil RT Duroid substrate.
3. The RF input & output ports are dc decoupled on-chip.
4. Coefficient of thermal expansion matching is recommended for reliability purpose.
5. Use high thermal conductive material for die mounting for long term reliability.
6. Maintain base plate temperature less than 70^0C 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

CQFN Package Diagram*



***Package preview:** Contact factory for availability. Information on packaged product is subject to change without prior notification.

Part Number Ordering Details

The TDSW020A2T RF Switch is available in the following die and 5 mm x 5 mm ceramic QFN* configurations.

Part Number	Description	Packaging	Notes
TDSW020A2T-98	EM DIE	Gel-Pack	
TDSW020A2T-99	FM DIE	Gel-Pack	w/ Method 2010 space visual
TDSW020A2T-00	EVK	Module	EVK for packaged device
TDSW020A2T-01*	EM Flight Unit	CQFN*	25 ˚C testing only
TDSW020A2T-11*	FM Flight Unit	CQFN*	Contact factory for space screening options

***Contact factory** for availability. Information on packaged product is subject to change without prior notification.

Document Revision History

Document No.	Description	Date
TDSW020A2T_Rev 1 11_11_2021	Initial Release	11/11/2021

Contact Information:

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