Fast Switching - MMIC

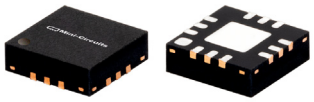
SPDT RF Switch

MSWA2-50+

50Ω DC to 5000 MHz

The Big Deal

- Very fast switching, 5ns rise/fall time typ.
- High isolation, 53 dB typ. at 1 GHz
- High IP3, +54 dBm typ. at 1 GHz



CASE STYLE: DQ1225

Product Overview

Mini-Circuits' MSWA2-50+ is an absorptive GaAs MESFET SPDT MMIC Switch supporting a wide range of switching applications from DC to 5000 MHz. This model provides high isolation and ultra-fast switching 5ns Rise/Fall time. It is produced using GaAs MESFET process and comes in a tiny 3x3mm QFN package rated MSL1.

Key Features

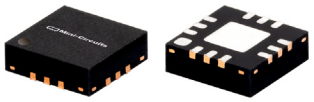
Feature	Advantages
Wideband, DC to 5000 MHz	One model can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrumentation.
High Isolation, 53 dB at 1000 MHz	High isolation significantly reduces leakage of power to the OFF port.
High linearity, +54 dBm IP3 at 1000 MHz	High linearity minimizes unwanted intermodulation products which are difficult or impossible to filter out in multi-carrier environments or in the presence of strong interfering signals from adjacent circuitry or received by an antenna.
Very fast switching, 5ns typ. rise/fall time	Fast switching makes this model suitable for applications where extremely fast transition between ports is required such as automated switching networks.
Small size, 3x3mm QFN package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

Fast Switching - MMIC

SPDT RF Switch

50Ω DC - 5000 MHz

Absorptive



Generic photo used for illustration purposes only

MSWA2-50+

CASE STYLE: DQ1225

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Product Features

- High Isolation, 53 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 54 dBm typ. at 1 GHz
- Fast switching, Rise/fall time, 5ns typ.
- Low current consumption, 6µA typ.

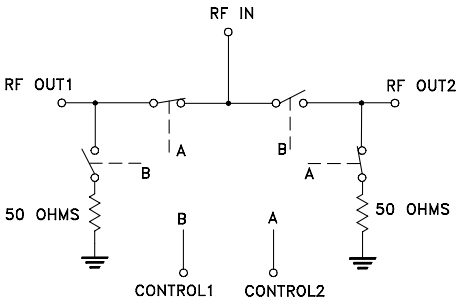
Typical Applications

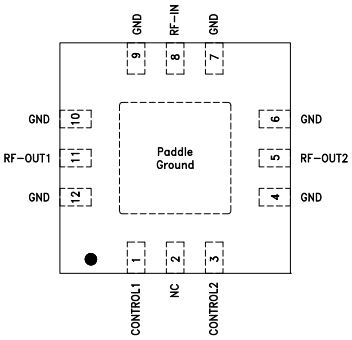
- Automated switching networks
- Cellular/ PCS infrasctructure
- Test instruments
- Military

General Description

Mini-Circuits' MSWA2-50+ is an absorptive GaAs MESFET SPDT MMIC Switch supporting a wide range of switching applications from DC to 5000 MHz. This model provides high isolation and ultra-fast switching 5ns Rise/Fall time. It is produced using GaAs MESFET process and comes in a tiny 3x3mm QFN package rated MSL1.

Simplified Schematic and Pad Description





Pad Number	Function
8	RF-IN
11	RF-OUT1
5	RF-OUT2
1	Control #1
3	Control #2
2	NO CONNECTION (NC)
4,6,7,9,10,12 & paddle	GROUND (GND)

RF Electrical Specifications[1], DC - 5000 MHz, T_{AMB}=25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency range[4]		DC		5000	MHz
Insertion loss[2]	0.3 - 100	—	0.5	0.8	dB
	100 - 1000	—	0.6	1.1	
	1000 - 2000	—	0.8	1.3	
	2000 - 4500	—	1.0	1.7	
	4500 - 5000	—	1.5	2.4	
Isolation between Common port and RF1/RF2 Ports	0.3 - 100	52	86	—	dB
	100 - 1000	46	59	—	
	1000 - 2000	43	51	—	
	2000 - 4500	29	47	—	
	4500 - 5000	25	32	—	
Isolation between RF1 and RF2 ports	0.3 - 100	56	88	—	dB
	100 - 1000	58	71	—	
	1000 - 2000	47	57	—	
	2000 - 4500	26	39	—	
	4500 - 5000	23	28	—	
Return loss (ON STATE)	0.3 - 100		27		dB
	100 - 1000		23		
	1000 - 2000		17		
	2000 - 4500		17		
	4500 - 5000		14		
Input Compression 0.1 dB[3] V_{DD}=-5V	10		15		dBm
	100		21		
	1000		24		
	5000		23		
Input Compression 0.1 dB[3] V_{DD}=-8V	10		16		
	100		28		
	1000		30		
	5000		29		
Input IP3 V_{DD}=-5V	10		34		dBm
	100		58		
	1000		53		
	5000		45		
Input IP3 V_{DD}=-8V	10		34		
	100		57		
	1000		58		
	5000		51		

Notes:
1. Tested on Mini-Circuit's test board TB-971A+, using Agilent's N5230A network analyzer (see Characterization Test Circuit, Fig.1).
2. Insertion loss values are deembedded from test board loss.
3. Do not exceed RF input power as shown in Absolute Maximum Rating table.
4. All RF connections must be DC blocked or held at 0V DC.

DC Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
Control voltage Low (V_L)	-0.2		0	V
Control voltage High (V_H)	-8		-5	V
Control Current at V_L		9		µA
Control Current at V_H		75		µA

Switching Specifications

Parameter	Min.	Typ.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)		4		nSec
Switching Time, 50% CTRL to 90/10% RF		7		nSec
Video Feedthrough, (control 0 to -5V, freq.=500 KHz		21		mV_{P-P}

Absolute Maximum Ratings[6]

Parameter	Ratings
Operating temperature	-40°C to + 85°C
Storage temperature	-65°C to +150°C
Control Voltage	-8.5V
RF Input Power	31dBm

6. Operation of this device above any of these conditions may cause permanent damage.

Truth Table (State of control voltage selects the desired switch state)

Control Voltage #1	Control Voltage #2	RF-IN	
		RF-Out 1	RF-Out 2
0	-5/-8	OFF	ON
-5/-8	0	ON	OFF

ON- low insertion loss state OFF- absorptive State

Characterization Test Circuit

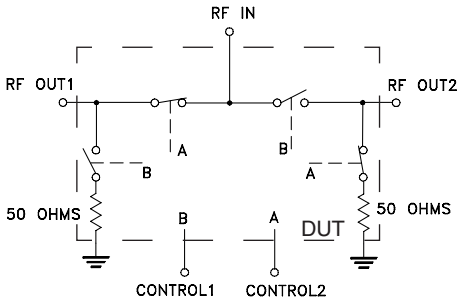
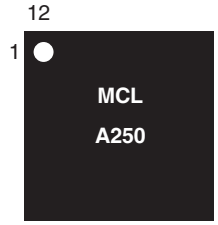


Figure 1. Block Diagram of test Circuit used for characterization
(DUT soldered on Mini-Circuit's TB-971A+)

Test Equipment:

For Insertion loss, Isolation, Return loss and DC current:
Agilent's N5230A Network Analyzer, E3631A power supply. Cblock: Internal to network Analyzer.
For Switching Time and DC Current:
Agilent's 54832B oscilloscope, 81110A pulse generator and E3631 A power supply. Cblock: Mini-Circuits BLK-18-S+
For Input IP3:
Mini-Circuits DC blocks: BLK-18-S+ on all ports, Agilent's E8257D signal generators, 437B power meter, N9020A Signal analyzer and E3631 A power supply.
For Compression:
Mini-Circuits DC blocks: BLK-18-S+ on all ports. ZVE-8G and ZHL-42W amplifier as driver amplifier at RF Common. Agi lent's N5230A Network Analyzer, E3631A power supply
Conditions:
Control Voltage = 0 and -5V/-8V
For Insertion loss, isolation and return loss: Pin=0 dBm
For Input IP3: Pin=-5dBm/tone.
For Switching time: RF frequency: 500 MHz at 0 dBm, Control Frequency: 500 KHz and 0 and -5V/-8V.

Product Marking



Marking may contain other features or characters for internal lot control

Recommended Application Circuit

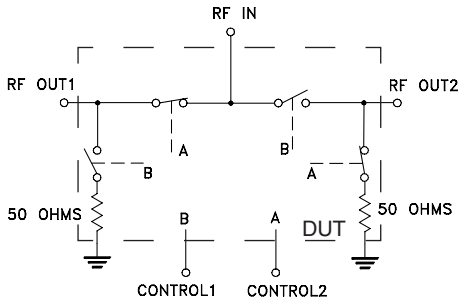


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

Additional Detailed Technical Information *additional information is available on our dash board. To access this information click here*	
Performance Data	Data Table
	Swept Graphs
Case Style	DQ1225 *Plastic package; Lead finish: Matte tin*
Tape & Reel **Standard quantities available on reel**	F66 *7" reels with 20, 50, 100, 200, 500, 1K , 2K devices*
Suggested Layout for PCB Design	PL-545
Evaluation Board	TB-971A+
Environmental Ratings	ENV12

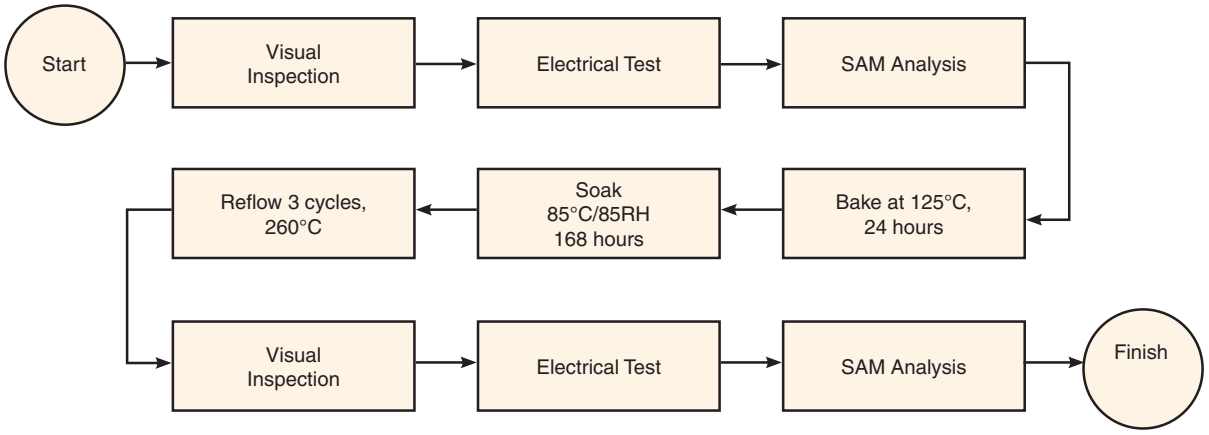
ESD Rating

Human Body Model (HBM): Class 1A (250V to <500V) in accordance with ANSI/ESD STM 5.1-2001

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart



Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

RF Absorptive Switch SPDT MSWA2-50+

Typical Performance Data

RF FREQ (MHz)	INSERTION LOSS (dB)				RF FREQ (MHz)	ISOLATION (dB)							
	VDD=-5V		VDD=-8V			VDD=-5V		VDD=-8V		VDD=-5V		VDD=-8V	
	RF IN-RF1	RF IN-RF2	RF IN-RF1	RF IN-RF2		RF IN-RF1	RF IN-RF2	RF IN-RF1	RF IN-RF2	RF1-RF2 RF1 (ON)	RF1-RF2 RF1 (OFF)	RF1-RF2 RF1 (ON)	RF1-RF2 RF1 (OFF)
0.3	0.43	0.43	0.43	0.43	0.3	91.21	94.60	92.73	98.26	88.45	102.44	95.19	99.30
2	0.43	0.42	0.42	0.42	2	95.81	97.45	94.41	90.58	102.70	97.15	96.84	89.98
5	0.44	0.44	0.43	0.43	5	91.71	100.20	84.69	89.62	96.59	91.53	99.51	90.70
10	0.46	0.46	0.45	0.45	10	89.59	90.74	89.34	91.59	91.59	100.73	92.07	111.37
50	0.52	0.51	0.49	0.49	50	78.48	76.43	77.78	76.98	105.12	79.45	101.80	79.07
100	0.54	0.54	0.51	0.51	100	68.72	74.43	68.82	74.26	79.83	81.67	79.46	81.61
200	0.57	0.57	0.54	0.54	200	66.14	68.24	66.36	68.15	73.91	80.19	73.66	79.57
300	0.58	0.59	0.56	0.56	300	61.71	59.49	61.61	59.52	68.78	78.00	68.87	77.73
400	0.61	0.61	0.59	0.58	400	61.26	61.00	61.19	61.01	74.16	71.35	74.01	71.75
500	0.63	0.63	0.61	0.61	500	58.99	59.26	59.00	59.21	71.40	70.48	71.38	70.20
600	0.65	0.65	0.63	0.63	600	57.01	57.28	56.93	57.24	70.51	71.10	70.54	71.28
700	0.68	0.67	0.66	0.65	700	56.06	55.97	56.05	55.95	69.11	67.55	69.36	67.88
800	0.71	0.70	0.69	0.68	800	55.15	55.19	55.12	55.16	66.61	65.51	66.95	65.76
900	0.73	0.72	0.71	0.70	900	54.18	54.23	54.14	54.14	65.59	64.39	65.80	64.42
1000	0.76	0.75	0.74	0.73	1000	53.09	53.08	53.13	52.97	64.18	63.27	64.64	63.26
1100	0.79	0.78	0.77	0.76	1100	52.69	52.75	52.53	52.64	61.56	60.87	62.03	61.46
1200	0.82	0.80	0.80	0.78	1200	52.13	52.19	51.96	52.07	60.40	59.56	60.77	60.07
1300	0.84	0.83	0.82	0.81	1300	51.49	51.25	51.28	51.11	59.52	58.37	60.08	58.93
1400	0.87	0.85	0.85	0.83	1400	51.03	51.13	50.90	50.95	57.44	57.22	57.99	57.56
1500	0.89	0.86	0.87	0.84	1500	50.50	50.75	50.28	50.56	56.18	56.03	56.79	56.63
1600	0.91	0.88	0.89	0.86	1600	50.36	50.41	50.02	50.16	55.06	54.42	55.63	55.07
1700	0.93	0.90	0.91	0.88	1700	49.87	49.67	49.44	49.38	54.50	53.49	55.14	54.12
1800	0.95	0.92	0.93	0.89	1800	49.75	49.74	49.35	49.44	52.63	52.44	53.22	53.12
1900	0.97	0.93	0.94	0.91	1900	49.70	49.82	49.39	49.47	51.46	51.31	52.07	51.75
2000	0.98	0.94	0.96	0.92	2000	49.78	49.73	49.27	49.32	50.47	50.12	51.10	50.74
2100	1.00	0.96	0.97	0.93	2100	49.90	49.44	49.42	48.98	49.56	48.91	50.21	49.49
2200	1.01	0.97	0.98	0.94	2200	50.16	49.83	49.66	49.29	48.11	47.70	48.73	48.23
2300	1.02	0.98	0.99	0.95	2300	50.55	50.07	49.90	49.44	47.04	46.60	47.68	47.20
2400	1.03	0.99	1.00	0.96	2400	50.63	50.11	49.90	49.44	46.12	45.77	46.77	46.36
2500	1.03	1.00	1.00	0.97	2500	50.94	50.36	50.14	49.61	45.16	44.83	45.82	45.44
2600	1.04	1.01	1.01	0.98	2600	51.48	50.84	50.43	49.96	44.16	43.85	44.81	44.53
2700	1.04	1.02	1.01	0.99	2700	51.70	51.13	50.56	50.17	43.29	43.09	43.95	43.81
2800	1.04	1.03	1.01	1.00	2800	52.02	51.20	50.95	50.25	42.50	42.30	43.17	42.96
2900	1.04	1.04	1.01	1.01	2900	52.18	51.40	51.18	50.43	41.71	41.48	42.40	42.15
3000	1.05	1.05	1.02	1.02	3000	52.43	51.54	51.49	50.73	40.83	40.68	41.53	41.39
3100	1.05	1.05	1.02	1.02	3100	51.93	51.23	51.47	50.68	40.06	40.00	40.77	40.69
3200	1.06	1.06	1.03	1.03	3200	50.66	50.75	50.65	50.40	39.39	39.53	40.11	40.25
3300	1.06	1.06	1.03	1.03	3300	49.87	49.71	50.20	49.83	38.71	38.62	39.45	39.32
3400	1.07	1.07	1.04	1.04	3400	48.22	48.43	48.78	48.92	38.00	37.92	38.75	38.68
3500	1.07	1.08	1.04	1.05	3500	46.89	47.06	47.77	47.89	37.30	37.21	38.07	38.00
3600	1.08	1.09	1.05	1.05	3600	45.49	45.55	46.64	46.55	36.65	36.46	37.45	37.26
3700	1.09	1.09	1.06	1.06	3700	44.08	44.13	45.28	45.26	35.97	35.74	36.79	36.56
3800	1.11	1.10	1.08	1.07	3800	42.61	42.75	43.91	43.99	35.22	35.00	36.04	35.82
3900	1.12	1.12	1.09	1.08	3900	41.25	41.29	42.56	42.54	34.47	34.30	35.30	35.14
4000	1.13	1.13	1.10	1.09	4000	39.95	40.06	41.29	41.34	33.77	33.60	34.64	34.46
4100	1.15	1.15	1.12	1.11	4100	38.72	38.87	40.08	40.17	32.99	32.87	33.86	33.75
4200	1.17	1.16	1.13	1.12	4200	37.59	37.63	38.93	38.94	32.24	32.23	33.12	33.14
4300	1.19	1.18	1.15	1.14	4300	36.40	36.53	37.71	37.81	31.53	31.52	32.43	32.46
4400	1.21	1.21	1.17	1.16	4400	35.26	35.45	36.55	36.73	30.77	30.77	31.69	31.71
4500	1.24	1.24	1.19	1.18	4500	34.08	34.33	35.36	35.57	29.99	29.99	30.91	30.93
4600	1.27	1.28	1.22	1.21	4600	33.10	33.33	34.36	34.56	29.25	29.23	30.18	30.18
4700	1.32	1.33	1.25	1.26	4700	32.20	32.44	33.45	33.67	28.51	28.47	29.45	29.42
4800	1.36	1.40	1.29	1.32	4800	31.32	31.49	32.55	32.71	27.74	27.74	28.69	28.70
4900	1.42	1.48	1.34	1.39	4900	30.52	30.66	31.75	31.86	27.06	27.05	28.01	28.01
5000	1.49	1.59	1.40	1.48	5000	29.79	29.87	31.00	31.05	26.38	26.36	27.33	27.33
5500	2.02	2.19	1.86	2.01	5500	26.72	26.32	27.86	27.41	23.05	23.07	23.99	24.03
6000	2.85	2.90	2.61	2.66	6000	23.98	23.52	25.03	24.52	20.20	20.02	21.09	20.94

Note:

Control Voltage #1	Control Voltage #2	RF IN	
		RF1	RF2
0	-5/-8	OFF	ON
-5/-8	0	ON	OFF

ON - Low insertion loss state
OFF - Absorptive state

Typical Performance Data

RF FREQ (MHz)	VSWR (:1)											
	VDD=-5V						VDD=-8V					
	RF IN		RF1		RF2		RF IN		RF1		RF2	
	RF1 (ON)	RF2 (ON)	RF1 (ON)	RF1 (OFF)	RF2 (ON)	RF2 (OFF)	RF1 (ON)	RF2 (ON)	RF1 (ON)	RF1 (OFF)	RF2 (ON)	RF2 (OFF)
0.3	1.10	1.10	1.09	1.11	1.09	1.11	1.10	1.10	1.09	1.11	1.09	1.11
2	1.09	1.10	1.09	1.11	1.09	1.11	1.09	1.09	1.09	1.11	1.08	1.11
5	1.09	1.09	1.09	1.11	1.09	1.11	1.09	1.09	1.08	1.11	1.08	1.11
10	1.09	1.09	1.08	1.11	1.08	1.11	1.08	1.08	1.08	1.11	1.08	1.11
50	1.08	1.08	1.08	1.10	1.07	1.10	1.07	1.07	1.07	1.10	1.07	1.10
100	1.08	1.08	1.08	1.10	1.07	1.10	1.08	1.07	1.07	1.10	1.07	1.10
200	1.10	1.10	1.09	1.11	1.09	1.10	1.09	1.09	1.09	1.11	1.09	1.10
300	1.12	1.12	1.12	1.11	1.11	1.11	1.12	1.11	1.11	1.11	1.10	1.11
400	1.15	1.14	1.14	1.12	1.13	1.11	1.14	1.14	1.14	1.12	1.12	1.11
500	1.18	1.17	1.17	1.13	1.15	1.12	1.17	1.16	1.16	1.13	1.15	1.12
600	1.21	1.20	1.19	1.14	1.17	1.12	1.20	1.19	1.19	1.14	1.17	1.12
700	1.24	1.22	1.22	1.15	1.20	1.13	1.23	1.22	1.21	1.15	1.19	1.13
800	1.27	1.25	1.25	1.16	1.23	1.14	1.26	1.24	1.24	1.16	1.22	1.14
900	1.30	1.28	1.28	1.18	1.25	1.16	1.29	1.27	1.27	1.17	1.25	1.15
1000	1.32	1.31	1.30	1.19	1.28	1.17	1.31	1.29	1.29	1.18	1.27	1.17
1100	1.35	1.33	1.32	1.20	1.30	1.18	1.34	1.32	1.31	1.20	1.29	1.18
1200	1.38	1.35	1.35	1.22	1.32	1.20	1.36	1.34	1.34	1.21	1.31	1.19
1300	1.40	1.37	1.36	1.23	1.34	1.21	1.38	1.36	1.35	1.23	1.32	1.21
1400	1.42	1.39	1.38	1.25	1.35	1.22	1.40	1.37	1.37	1.24	1.33	1.22
1500	1.43	1.40	1.39	1.26	1.35	1.23	1.41	1.38	1.38	1.26	1.33	1.23
1600	1.44	1.40	1.40	1.28	1.35	1.25	1.42	1.38	1.39	1.27	1.33	1.24
1700	1.45	1.40	1.41	1.29	1.35	1.26	1.43	1.38	1.39	1.29	1.33	1.26
1800	1.46	1.41	1.41	1.31	1.35	1.27	1.44	1.39	1.39	1.30	1.33	1.27
1900	1.46	1.41	1.41	1.32	1.34	1.28	1.44	1.39	1.39	1.32	1.33	1.28
2000	1.46	1.41	1.41	1.34	1.33	1.28	1.44	1.39	1.39	1.33	1.32	1.28
2100	1.45	1.41	1.40	1.35	1.32	1.28	1.43	1.39	1.38	1.35	1.30	1.28
2200	1.45	1.41	1.39	1.37	1.31	1.28	1.43	1.39	1.37	1.36	1.29	1.28
2300	1.44	1.40	1.38	1.38	1.29	1.28	1.41	1.38	1.36	1.37	1.27	1.28
2400	1.42	1.40	1.36	1.40	1.28	1.29	1.40	1.37	1.34	1.39	1.26	1.28
2500	1.41	1.39	1.34	1.41	1.27	1.29	1.38	1.37	1.32	1.40	1.25	1.29
2600	1.39	1.39	1.32	1.42	1.26	1.30	1.36	1.36	1.29	1.41	1.24	1.29
2700	1.37	1.38	1.29	1.43	1.26	1.30	1.34	1.36	1.27	1.42	1.23	1.29
2800	1.34	1.38	1.26	1.44	1.25	1.30	1.32	1.36	1.24	1.43	1.22	1.29
2900	1.32	1.37	1.24	1.44	1.24	1.29	1.29	1.35	1.21	1.44	1.21	1.29
3000	1.29	1.36	1.21	1.45	1.22	1.30	1.27	1.34	1.19	1.44	1.20	1.29
3100	1.27	1.34	1.19	1.45	1.20	1.30	1.24	1.31	1.16	1.45	1.18	1.30
3200	1.24	1.32	1.16	1.46	1.19	1.31	1.22	1.29	1.14	1.45	1.16	1.31
3300	1.22	1.29	1.14	1.46	1.17	1.33	1.20	1.27	1.12	1.45	1.14	1.33
3400	1.20	1.28	1.12	1.46	1.16	1.34	1.18	1.25	1.10	1.45	1.13	1.33
3500	1.18	1.25	1.10	1.45	1.14	1.34	1.16	1.23	1.08	1.45	1.11	1.34
3600	1.17	1.23	1.09	1.45	1.13	1.35	1.14	1.21	1.07	1.44	1.10	1.34
3700	1.15	1.21	1.07	1.44	1.11	1.34	1.13	1.19	1.06	1.44	1.08	1.33
3800	1.14	1.20	1.06	1.43	1.10	1.33	1.12	1.17	1.05	1.43	1.07	1.33
3900	1.13	1.18	1.06	1.42	1.08	1.33	1.10	1.16	1.04	1.42	1.05	1.32
4000	1.13	1.17	1.05	1.41	1.07	1.32	1.10	1.15	1.04	1.41	1.04	1.32
4100	1.12	1.16	1.05	1.39	1.06	1.32	1.09	1.14	1.03	1.40	1.03	1.32
4200	1.13	1.17	1.05	1.38	1.07	1.30	1.09	1.13	1.03	1.38	1.04	1.30
4300	1.13	1.18	1.06	1.36	1.10	1.26	1.10	1.15	1.03	1.36	1.06	1.26
4400	1.15	1.21	1.07	1.34	1.13	1.23	1.11	1.17	1.03	1.34	1.09	1.23
4500	1.17	1.23	1.09	1.32	1.16	1.19	1.13	1.19	1.05	1.32	1.13	1.20
4600	1.20	1.26	1.12	1.30	1.21	1.17	1.15	1.21	1.07	1.30	1.16	1.17
4700	1.25	1.32	1.15	1.27	1.27	1.13	1.19	1.26	1.11	1.28	1.22	1.13
4800	1.30	1.39	1.20	1.25	1.33	1.12	1.24	1.32	1.15	1.25	1.28	1.10
4900	1.36	1.46	1.25	1.23	1.39	1.12	1.29	1.39	1.19	1.23	1.33	1.09
5000	1.43	1.54	1.30	1.22	1.45	1.15	1.35	1.46	1.24	1.21	1.38	1.11
5500	1.92	2.14	1.70	1.25	1.97	1.44	1.81	2.01	1.61	1.20	1.88	1.37
6000	2.67	2.76	2.25	1.52	2.35	1.75	2.50	2.59	2.15	1.43	2.24	1.65

Note:

Control Voltage #1	Control Voltage #2	RF IN			
		RF1			RF2
0	-5/-8	OFF			ON
-5/-8	0	ON			OFF

ON - Low insertion loss state
OFF - Absorptive state

Typical Performance Data

RF FREQ (MHz)	INPUT IP3 (dBm)			
	VDD=-5V		VDD=-8V	
	RF IN-RF1	RF IN-RF2	RF IN-RF1	RF IN-RF2
10	33.54	33.57	33.59	33.58
50	53.03	52.51	52.70	52.31
100	57.05	63.48	57.61	69.03
200	57.07	60.18	57.95	65.75
300	55.71	57.97	57.06	62.35
400	56.27	59.68	58.07	67.01
500	55.66	56.41	58.61	61.49
600	54.82	56.33	57.37	64.39
700	55.20	55.63	60.81	59.76
800	53.56	54.36	56.64	59.85
900	54.82	56.59	58.11	61.40
1000	53.26	53.64	58.97	58.03
1100	53.61	54.84	56.84	61.00
1200	54.23	54.36	64.67	57.13
1300	51.99	52.93	55.82	58.65
1400	53.67	55.46	58.22	60.36
1500	52.09	52.95	56.97	59.91
1600	52.62	54.45	56.59	59.81
1700	52.28	52.95	58.74	58.24
1800	51.20	52.19	55.04	57.80
1900	52.41	53.39	60.36	64.59
2000	50.75	51.56	55.53	57.26
2100	51.94	53.26	56.80	59.19
2200	51.48	52.19	58.20	58.15
2300	50.47	51.46	55.64	57.99
2400	50.65	51.50	58.31	62.42
2500	50.25	50.88	55.71	58.02
2600	51.66	52.46	60.44	65.35
2700	49.92	50.61	55.78	58.99
2800	49.61	50.33	56.43	61.04
2900	49.34	50.07	55.11	56.68
3000	50.00	50.86	55.68	58.52
3100	49.52	50.35	57.57	60.85
3200	48.79	49.55	55.23	57.76
3300	49.37	50.04	57.51	59.51
3400	48.85	49.50	55.70	57.25
3500	48.31	48.91	55.06	56.73
3600	48.29	48.83	56.09	56.97
3700	48.00	48.59	55.32	57.52
3800	48.25	48.66	56.84	58.23
3900	47.31	47.83	54.17	56.36
4000	47.58	47.70	56.35	57.93
4100	46.82	47.07	53.43	54.97
4200	47.65	47.41	58.24	59.58
4300	47.95	45.63	56.04	61.34
4400	45.47	43.59	50.99	51.95
4500	47.02	44.61	53.52	53.96
4600	46.54	44.67	51.78	52.98
4700	45.35	43.39	51.36	51.61
4800	46.19	45.74	63.15	58.23
4900	44.99	44.86	51.42	51.80
5000	45.29	44.93	51.17	51.26

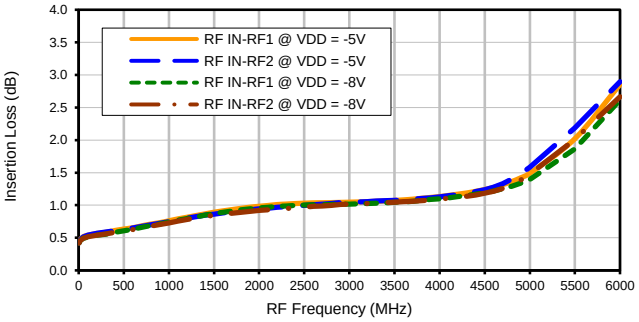
RF FREQ (MHz)	Pin @ 0.1 dB COMPRESSION (dBm)			
	VDD=-5V		VDD=-8V	
	RF IN-RF1	RF IN-RF2	RF IN-RF1	RF IN-RF2
10	16.07	16.07	15.33	15.77
50	20.26	20.56	24.24	24.98
100	21.31	21.46	27.74	27.94
200	22.76	22.91	28.68	28.67
300	23.21	23.37	28.66	28.65
400	23.34	23.51	28.93	28.94
500	23.41	23.57	28.61	28.60
600	23.34	23.50	28.85	28.86
700	23.46	23.58	29.89	30.02
800	23.37	23.50	29.76	29.75
900	23.38	23.66	29.78	29.94
1000	23.70	23.97	29.84	29.83
1100	23.70	23.98	29.85	29.85
1200	23.53	23.82	29.78	29.89
1300	23.73	24.01	29.84	29.97
1400	23.50	23.80	29.86	29.85
1500	23.80	23.96	29.46	29.50
1600	23.58	23.88	29.76	29.74
1700	23.91	24.20	29.59	29.61
1800	23.68	23.99	29.74	29.74
1900	23.76	24.07	29.39	29.44
2000	23.57	24.03	29.74	29.73
2100	23.87	24.26	29.69	29.69
2200	23.94	24.26	29.47	29.49
2300	23.67	24.14	29.48	29.50
2400	23.80	24.39	29.46	29.47
2500	23.82	24.09	29.53	29.53
2600	23.64	24.09	29.32	29.34
2700	23.79	24.32	29.22	29.30
2800	23.80	24.24	29.49	29.50
2900	23.79	24.29	29.32	29.39
3000	23.74	24.23	29.37	29.40
3100	23.77	24.31	29.17	29.27
3200	23.87	24.39	29.32	29.35
3300	23.65	24.16	29.29	29.33
3400	23.90	24.29	29.15	29.20
3500	23.89	24.33	29.17	29.18
3600	23.80	24.13	29.11	29.14
3700	23.70	24.05	29.13	29.17
3800	23.66	23.86	29.05	29.09
3900	23.46	23.72	29.08	29.06
4000	23.39	23.72	29.04	29.08
4100	23.25	23.39	29.14	29.12
4200	23.20	23.25	28.93	28.96
4300	23.10	23.22	29.10	29.06
4400	23.09	23.10	29.03	29.05
4500	22.99	22.99	29.07	29.18
4600	22.91	22.93	28.87	29.02
4700	22.82	22.82	28.75	28.86
4800	22.76	22.63	28.68	28.81
4900	22.69	22.69	28.86	28.86
5000	22.65	22.50	28.71	28.71

Note:

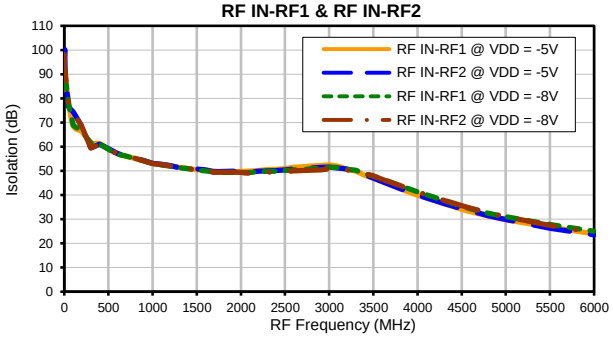
Control Voltage #1	Control Voltage #2	RF IN	
		RF1	RF2
0	-5/-8	OFF	ON
-5/-8	0	ON	OFF
ON - Low insertion loss state OFF - Absorptive state			

Typical Performance Curves

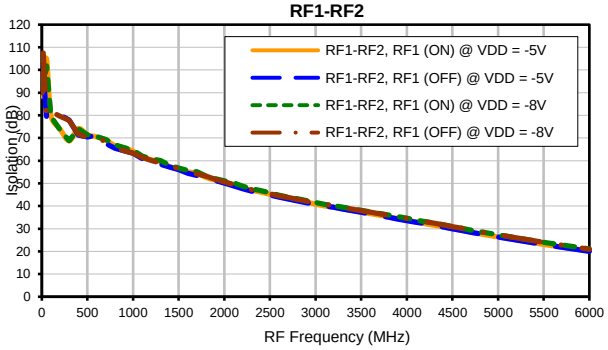
Insertion Loss vs. Frequency & VDD
RF IN-RF1 & RF IN-RF2



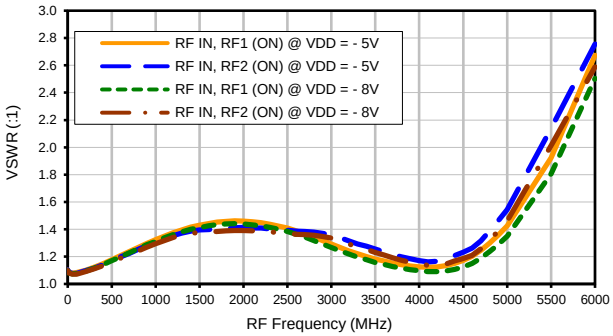
Isolation vs. Frequency & VDD
RF IN-RF1 & RF IN-RF2



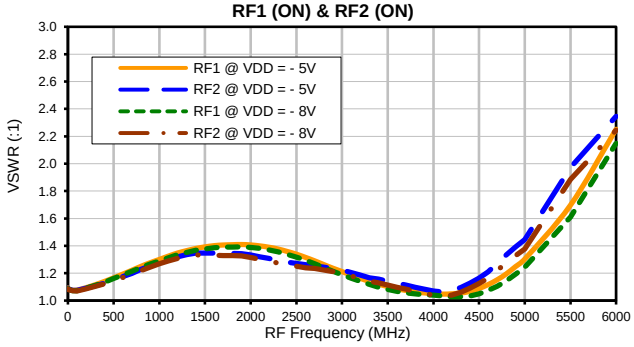
Isolation vs. Frequency & VDD
RF1-RF2



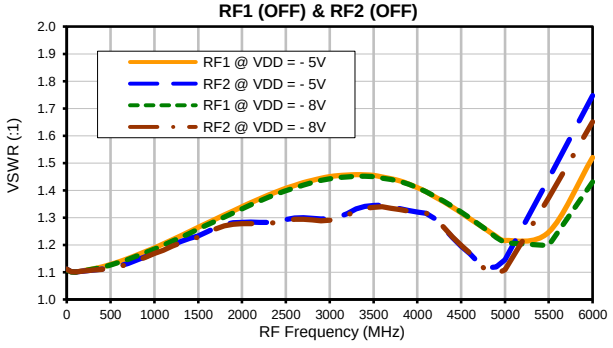
VSWR vs. Frequency & VDD
RF IN



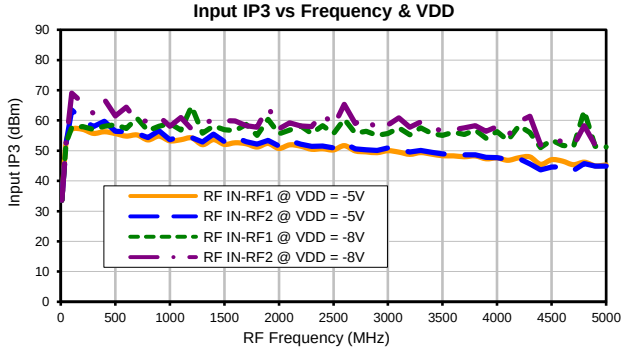
VSWR vs. Frequency & VDD
RF1 (ON) & RF2 (ON)



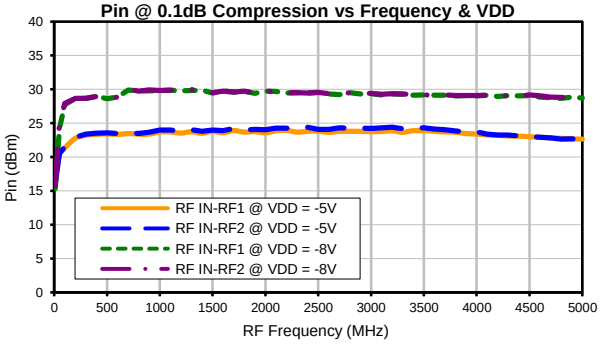
VSWR vs. Frequency & VDD
RF1 (OFF) & RF2 (OFF)



Input IP3 vs Frequency & VDD



Pin @ 0.1dB Compression vs Frequency & VDD



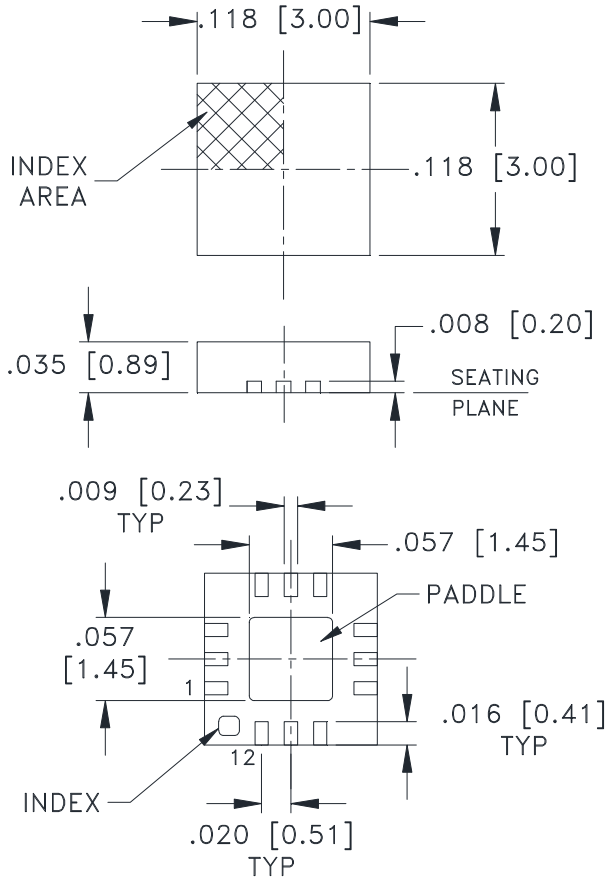
Note:

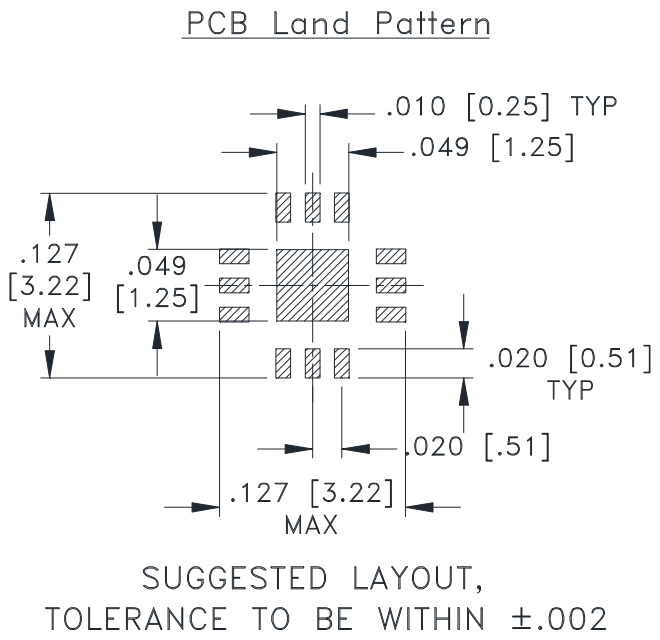
Control Voltage #1	Control Voltage #2	RF IN	
		RF1	RF2
0	-5/-8	OFF	ON
-5/-8	0	ON	OFF
ON - Low insertion loss state OFF - Absorptive state			

Case Style DQ

DQ1225

Outline Dimensions





Weight: .02 Grams

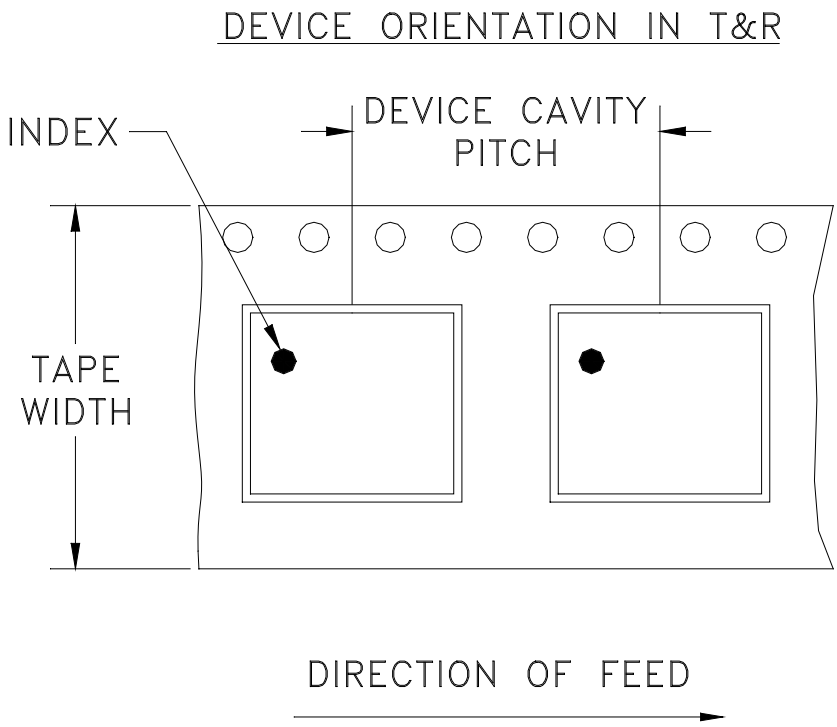
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3 Pl. ± .004

Notes:

1. Case material: Plastic.
2. Termination finish:
   - For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. All models, (+) suffix. See Data sheet.
   - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F66



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000, 3000

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

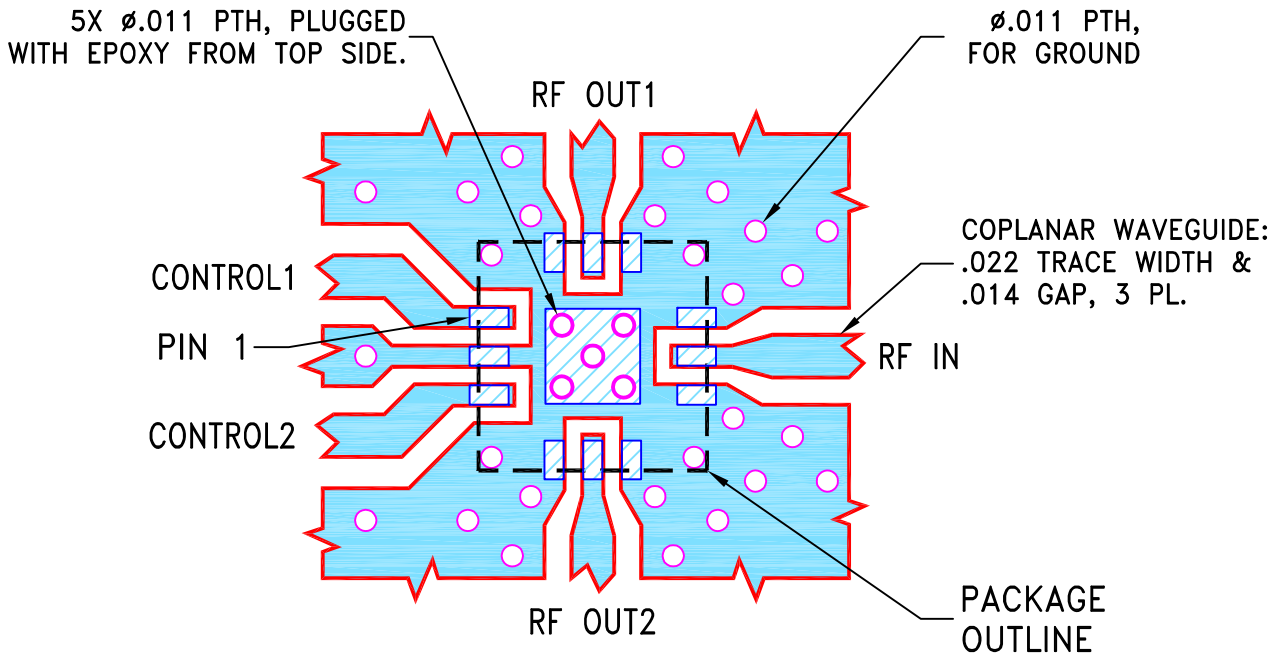
Go to: www.minicircuits.com/pages/pdfs/tape.pdf

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M165831	NEW RELEASE	01/24/18	ITG	WILSON P

SUGGESTED MOUNTING CONFIGURATION
FOR DQ1225 CASE STYLE, "12SW03" PIN CODE



NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010±.001. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	ITG	01/23/18
TOLERANCES ON:	CHECKED	GF	01/24/18
2 PL DECIMALS ±	APPROVED	WILSON P	01/24/18
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

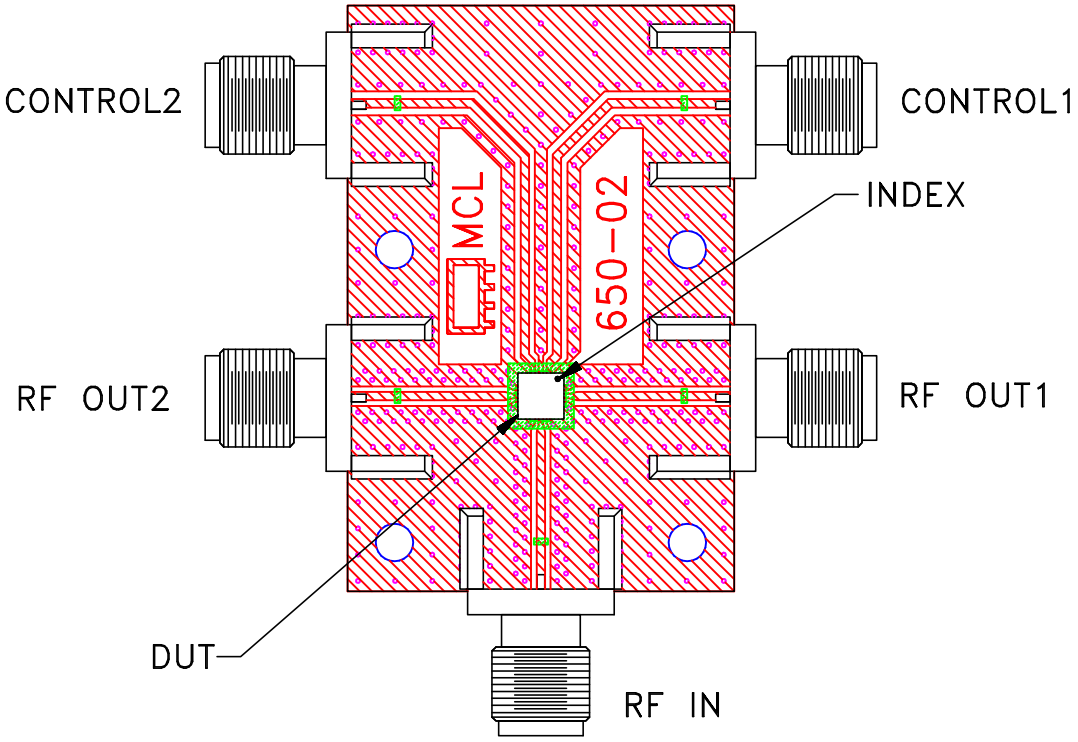
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 12SW03, DQ1225, TB-971+/TB-971A+

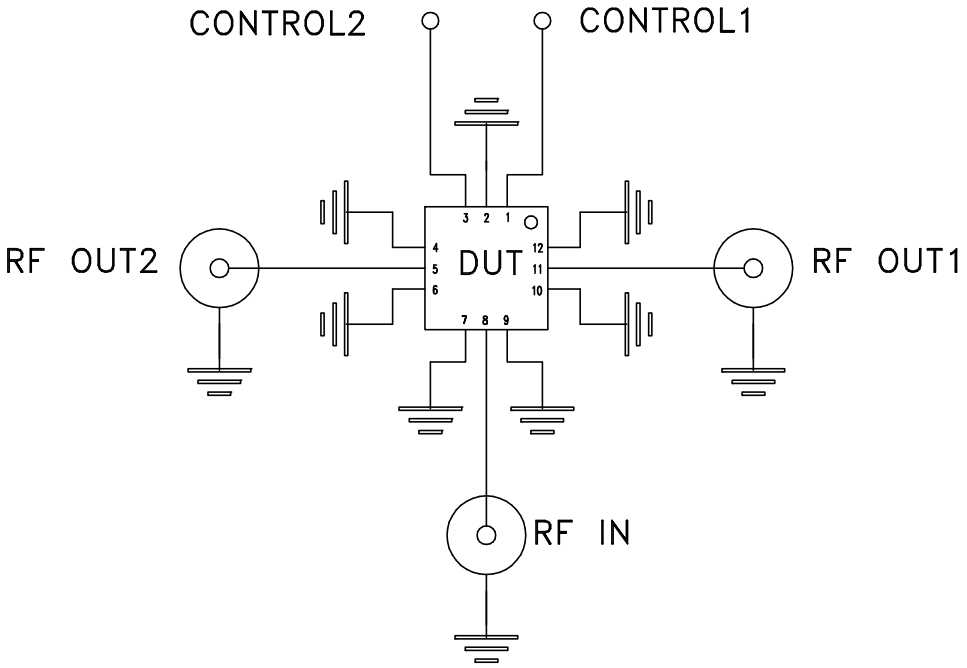
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-545	OR

FILE:	SCALE:	SHEET:
98PL545	10:1	1 OF 1

Evaluation Board and Circuit



TB-971A+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV12

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D