

Bumped GaAs SP3T Switch for WLAN 2.4 - 2.5 GHz

Rev. V4

Features

- 802.11b/g and Bluetooth Applications
- Insertion Loss: 0.60 dB typical
- Isolation:
 - 31 dB typical (R_x Path)
 - 22 dB typical (T_x / BT paths)
- Flip-chip configuration
- RoHS* Compliant

Description

The MASW-008902-000DIE is a bumped single band GaAs pHEMT MMIC SP3T switch. Typical applications are for single band 2.4 GHz WLAN (802.11 b/g) and Bluetooth applications.

The MASW-008902-000DIE delivers high isolation, low insertion loss, and high linearity at 2.4 - 2.5 GHz.

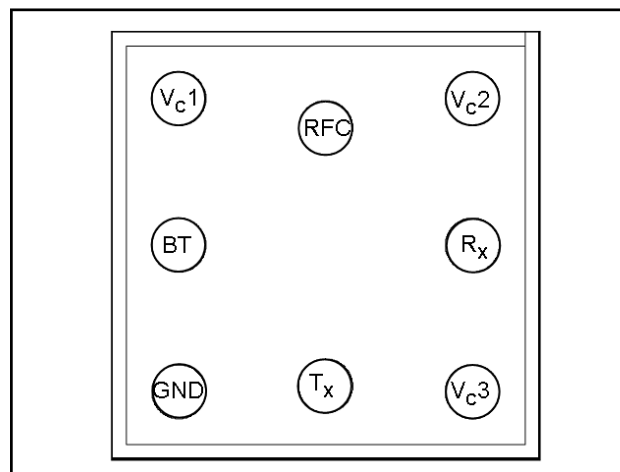
The MASW-008902-000DIE is fabricated using a 0.5 micron gate length GaAs pHEMT process. The process features full passivation for performance and reliability. This die features SnAg (2.5%) solder bumps for WLCSP applications.

Ordering Information ^{1,2}

Part Number	Package
MASW-008902-000DIE	Separated Die on Grip Ring
MASW-008902-000D3K	Die in 3000 piece reel
MASW-008902-001SMB	Sample Board SP3T

1. Die quantity varies.
2. Die on Grip Ring not available with orientation mark.

Die Bump Pad Layout (bump side up)



Die Bump Pad Configuration

Name	Description
Vc1	Voltage Control 1
BT	Blue Tooth T_x/R_x Port
GND	Ground
T_x	2.5 GHz T_x Port
Vc3	Voltage Control 3
R_x	2.5 GHz R_x Port
Vc2	Voltage Control 2
RFC	Antenna Port

Absolute Maximum Ratings ^{3,4}

Parameter	Absolute Maximum
Input Power @ 3 V Control	+32 dBm
Input Power @ 5 V Control	+35 dBm
Operating Voltage	+8 volts
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. M/A-COM Technology does not recommend sustained operation near these survivability limits.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Bumped GaAs SP3T Switch for WLAN

2.4 - 2.5 GHz

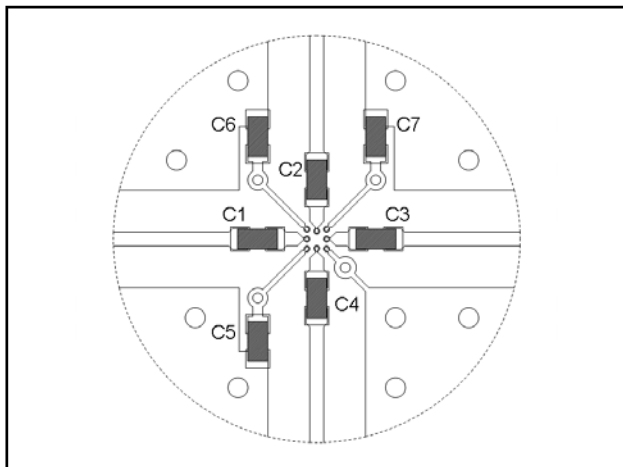
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Electrical Specifications⁵: $T_A = 25^\circ\text{C}$, $Z_0 = 50\ \Omega$, $V_C = 0/3\text{V}$, $P_{IN} = 0\ \text{dBm}$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	RFC to $T_X/R_X/BT$, 2.4 GHz	dB	—	0.60	0.75
Isolation	RFC to T_X , 2.4 GHz RFC to R_X , 2.4 GHz RFC to BT, 2.4 GHz	dB	20 30 20	23.5 31.0 21.0	— — —
Return Loss	2.4 - 2.5 GHz	dB	—	15	—
IP3	RF to $T_X/R_X/BT$, 2.4 GHz, 20 dBm Total Power, 1 MHz Spacing	dBm	—	55	—
Input P1dB	RF to T_X , 2.4 - 2.5 GHz RF to R_X , 2.4 - 2.5 GHz RF to BT, 2.4 - 2.5 GHz	dBm	— — —	32 28 32	— — —
Harmonics	RF to T_X , 2.4 - 2.5 GHz, 20 dBm	dBm	—	-75	—
Switching Speed	50% control to 90% RF 50% control to 10% RF	ns	— —	165 25	— —
Control Current	$ V_C = 3\ \text{V}$	μA	—	<1	10

5. External blocking capacitors on all RF ports.

Recommended PCB Configuration



Parts List

Part	Value	Case Style
C1 - C4	39 pF	0402
C5 - C7	1000 pF	0402

Truth Table^{6,7,8}

V_{C1}	V_{C2}	V_{C3}	RFC-BT	RFC- T_X	RFC- R_X
1	0	0	On	Off	Off
0	1	0	Off	On	Off
0	0	1	Off	Off	On

6. For positive voltage control, external DC blocking capacitors are required on all RF ports.

7. Differential voltage, $V(\text{state } 1) - V(\text{state } 0)$, must be +2.7 V minimum and must not exceed +5 V.

8. $0 = 0 \pm 0.3\ \text{V}$, $1 = +2.7\ \text{V}$ to +5 V.

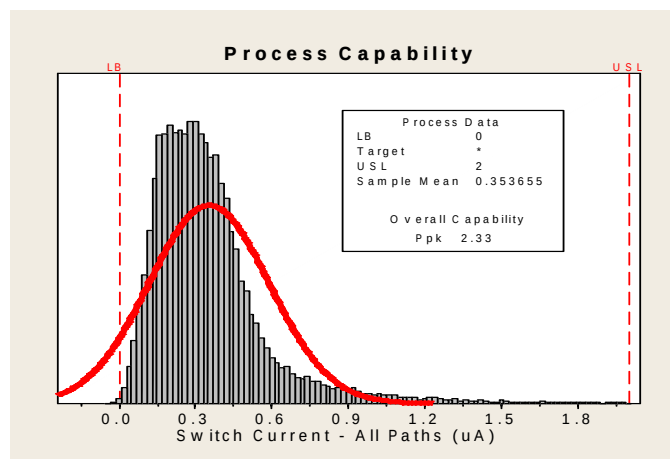
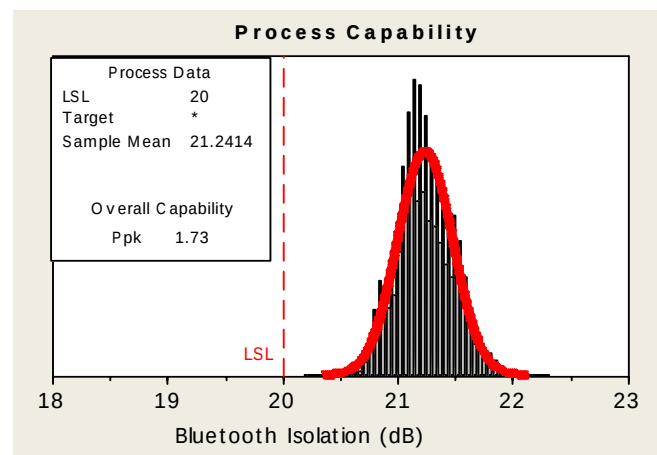
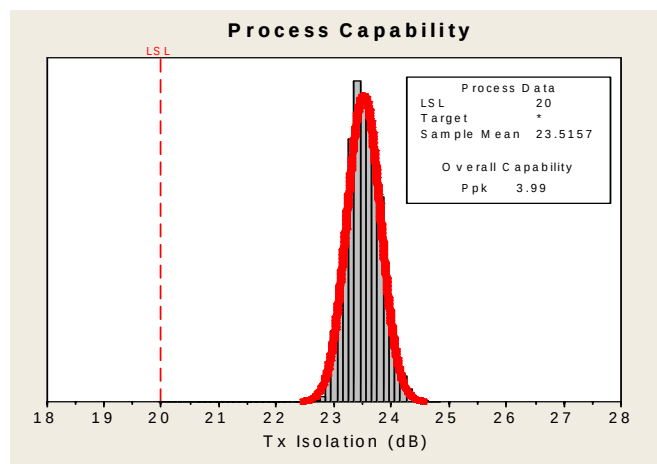
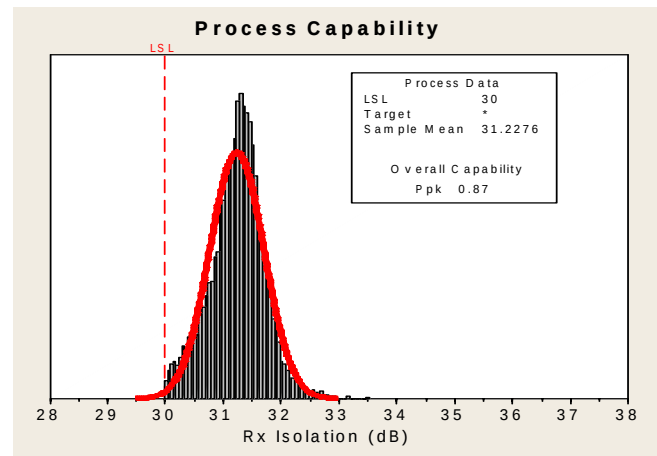
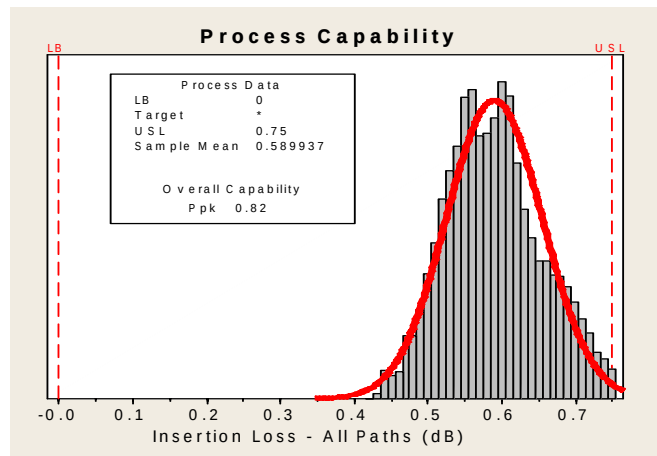
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Product Consistency Distribution Charts⁹ (on wafer RF test)

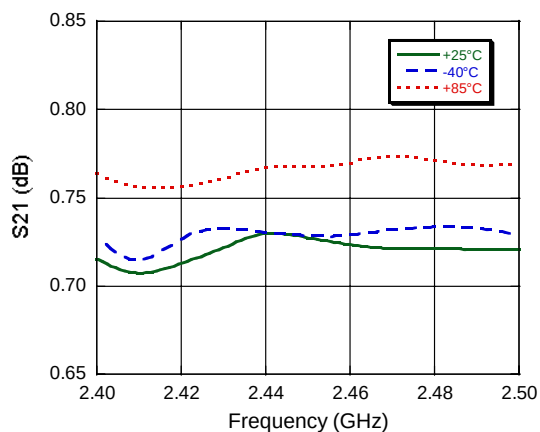
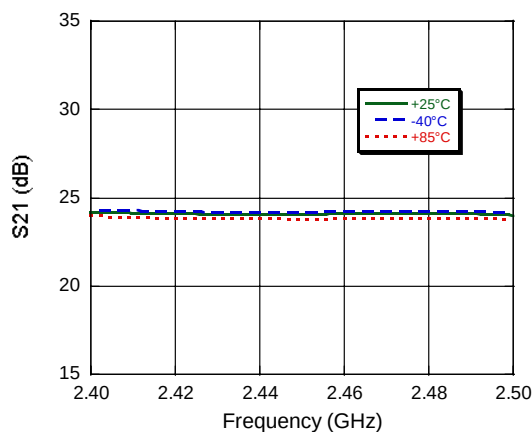
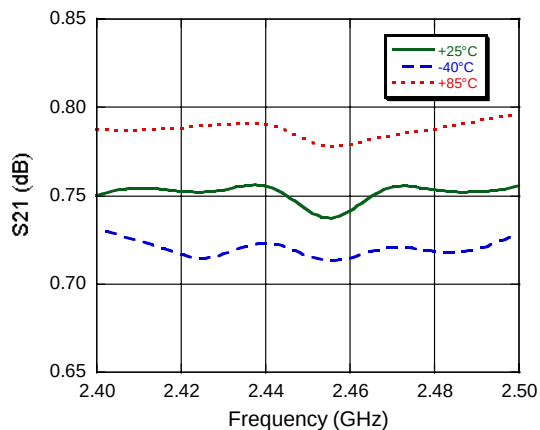
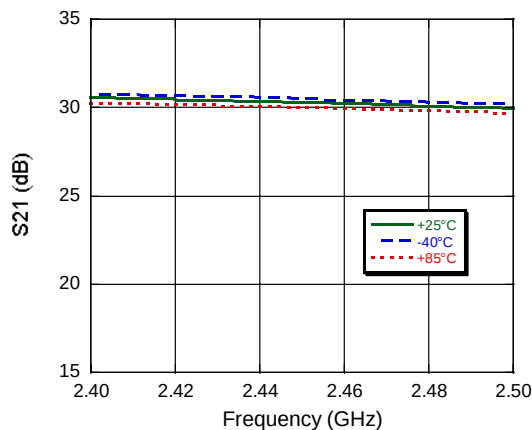
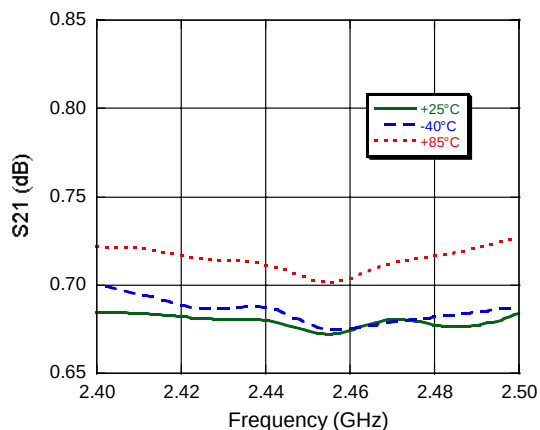
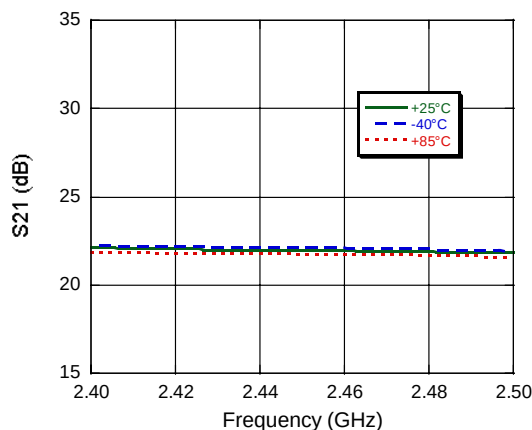


9. Represents >50 wafers, tested per electrical specifications: Freq. = 2.4 GHz, $T_A = 25^\circ\text{C}$, $Z_0 = 50\ \Omega$, $V_C = 0/3\text{V}$, $P_{IN} = 0\ \text{dBm}$

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Typical Performance Curves (plots = chip on board assembly)

 T_x Insertion Loss **T_x Isolation** **R_x Insertion Loss** **R_x Isolation****BT Insertion Loss****BT Isolation**

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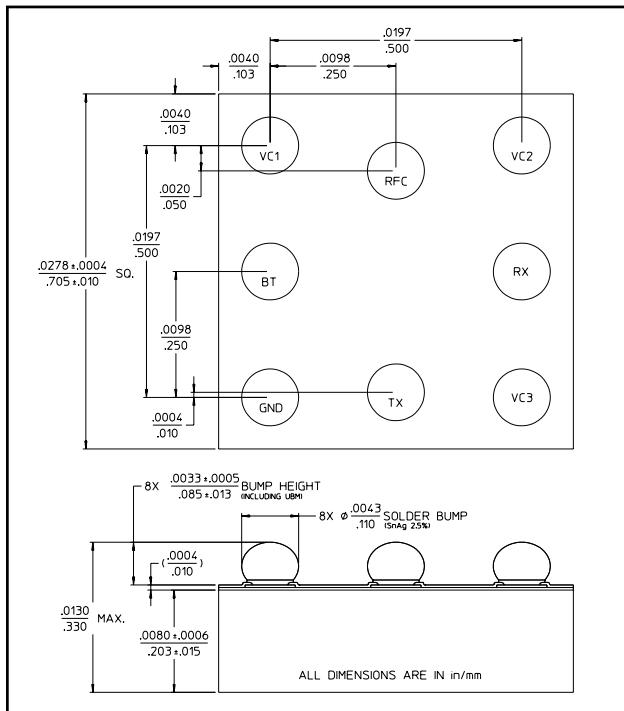
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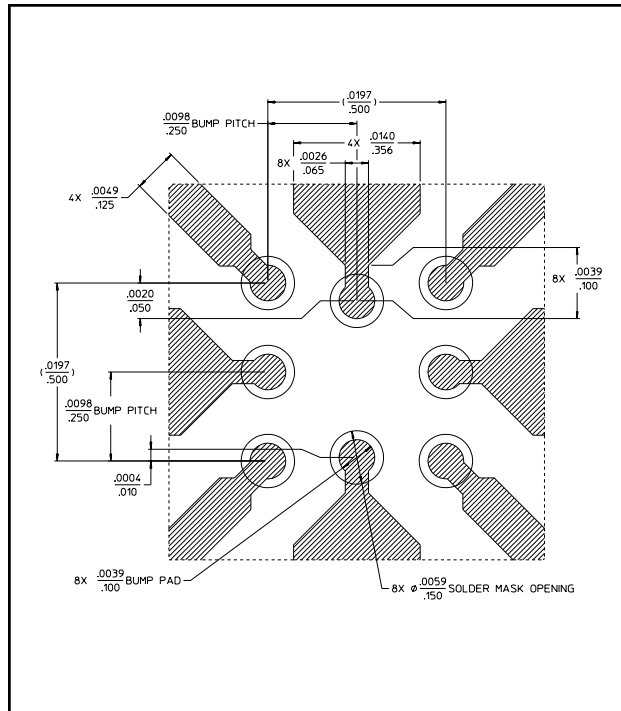
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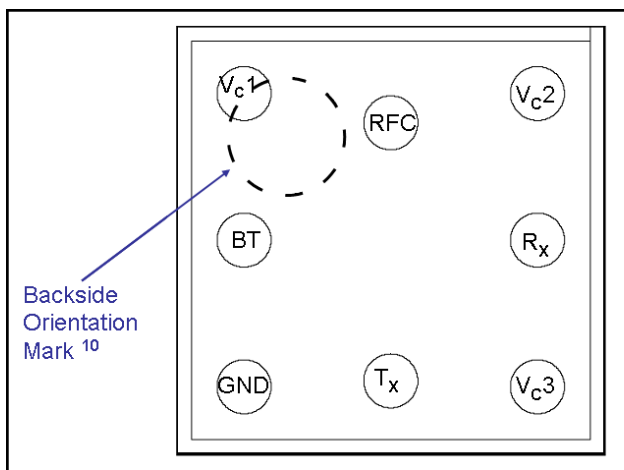
Die Dimensions (Top and Side Views)



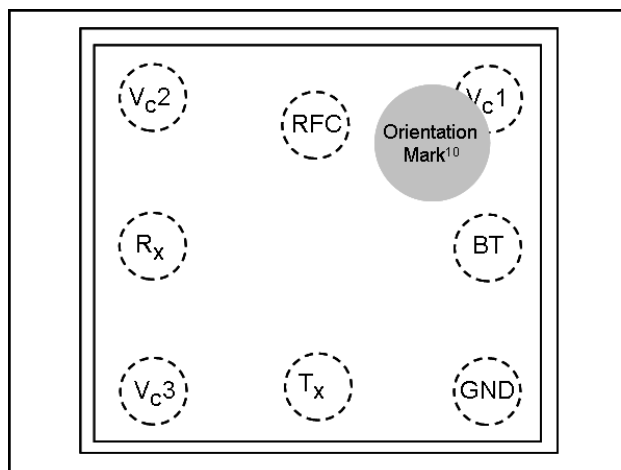
PCB Top Metal / Solder Mask



Die Bump Pad Layout - Top View (bump side up)



Die Bump Pad Layout - Bottom View (bump side down - as installed on board)



10. Orientation mark is only on material that is shipped in tape and reel. The mark is not available on die shipped on grip ring.