



**TEST REPORT**

**ON**

**0.1 TO 20 GHz**

**LOW LOSS**

**MINIATURE, REFLECTIVE**

**SPST SOLID STATE RECTANGULAR SWITCH**

**AMC MODEL No:**

**MSNN-1DR-CS00109-06B**

Serial Numbers: 1MS303103 THRU 1MS303112

DESIGNED  
BY

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TESTED  
BY  
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REPORTED  
BY  
W. Steinhaus

**February 10, 2004**

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**ISO9001 : 1994 CERTIFIED**

*Handwritten signatures and initials:*  
JRM, WKS, JSS, DRH, JST, LC, PA, EB

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## SPST, REFLECTIVE, SOLID STATE SWITCH AMC MODEL No: MSNN-1DR-CS00109-06B

### FEATURES:

- **0.1 TO 20 GHz**
- **REFLECTIVE**
- **MINIATURE**
- **LOW LOSS**

### SPECIFICATIONS:

- FREQUENCY : 0.1 TO 20 GHz
- INSERTION LOSS : 2.5 dB MAXIMUM
- ISOLATION : 45 dB MAXIMUM
- VSWR : 2.0:1
- RF POWER : 1 WATT PEAK @ 10 uSEC PULSE WIDTH
- SWITCHING TIME : 100 nS MAXIMUM
- POWER SUPPLY : +5V @ 50 mA  
-15V @ 30 mA
- CONTROL : TTL LOGIC "0" ON, "1"=OFF
- SIZE : 0.82" (L) X 0.62" (W) X 0.22" (H)

### ENVIRONMENTAL RATINGS:

| ENVIRONMENTAL RATINGS       |                                       |
|-----------------------------|---------------------------------------|
| OPERATING TEMPERATURE       | - 65°C TO 110°C                       |
| NON - OPERATING TEMPERATURE | - 65°C TO 125°C                       |
| HUMIDITY                    | MIL - STD - 202F, METHOD 103B COND. B |
| SHOCK                       | MIL - STD - 202F, METHOD 213B COND. B |
| VIBRATION                   | MIL - STD - 202F, METHOD 204D COND. B |
| ALTITUDE                    | MIL - STD - 202F, METHOD 105C COND. B |
| TEMPERATURE CYCLE           | MIL - STD - 202F, METHOD 107D COND. A |

**PRODUCT FEATURE**

| ZONE | REV | REVISIONS | DESCRIPTION      | DATE    | APPROVED |
|------|-----|-----------|------------------|---------|----------|
|      |     |           | ORIGINAL RELEASE | 301015E | 03/04/03 |

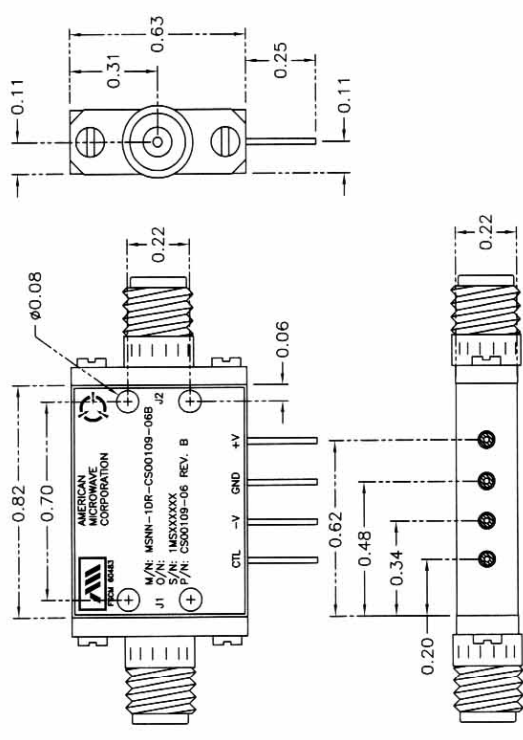
  

**DESCRIPTION:**  
 AMC MODEL MSNN-1DR-CS00109-06B IS A REFLECTIVE SPST SWITCH WITH LOW INSERTION LOSS, SLIM LINE DESIGN AND INTEGRAL TTL DRIVER THAT WORKS FROM 0.1 TO 20.0 GHz.


**SPECIFICATIONS:**

- FREQUENCY:.....0.1 TO 20 GHz
- INSERTION LOSS:.....2.5 dB MAXIMUM
- ISOLATION:.....45 dB MINIMUM
- VSWR:.....2.0:1
- RF POWER:.....1 WATT PEAK @ 10 USEC PULSE WIDTH
- SWITCHING TIME:.....100 nS MAXIMUM
- POWER SUPPLY:.....+5V @ 50mA  
 .....-15V @ 30mA
- CONTROL:.....TTL LOGIC "0"=ON "1"=OFF
- SIZE:.....0.82" (L) x 0.63" (W) x 0.22" (H)

M/N = MODEL NUMBER  
 O/N = OPTION NUMBER  
 S/N = SERIAL NUMBER  
 P/N = PART NUMBER



**BLOCK DIAGRAM**



ALL DIMENSIONS ARE IN INCHES  
 TOLERANCES:  
 X.XX ±0.020  
 X.XXX ±0.010

**ENVIRONMENTAL RATINGS**

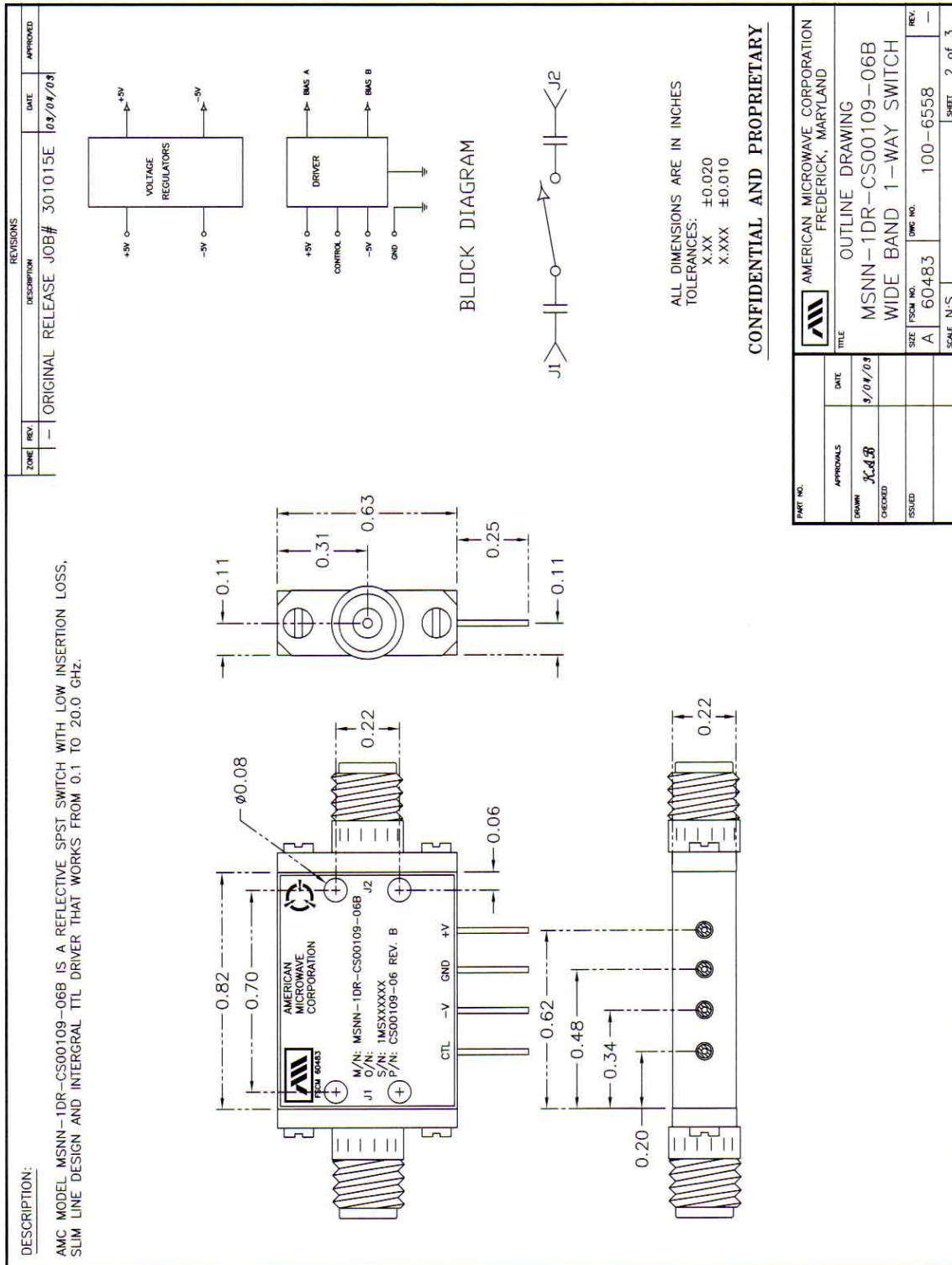
- OPERATING TEMPERATURE.....-65°C TO 110°C
- NON-OPERATING TEMPERATURE.....-65°C TO 125°C
- HUMIDITY.....MIL-STD-202F, METHOD 103B COND. B
- SHOCK.....MIL-STD-202F, METHOD 213B COND. B
- VIBRATION.....MIL-STD-202F, METHOD 204D COND. B
- ALTITUDE.....MIL-STD-202F, METHOD 105C COND. B
- TEMPERATURE CYCLE.....MIL-STD-202F, METHOD 107D COND. A

NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION

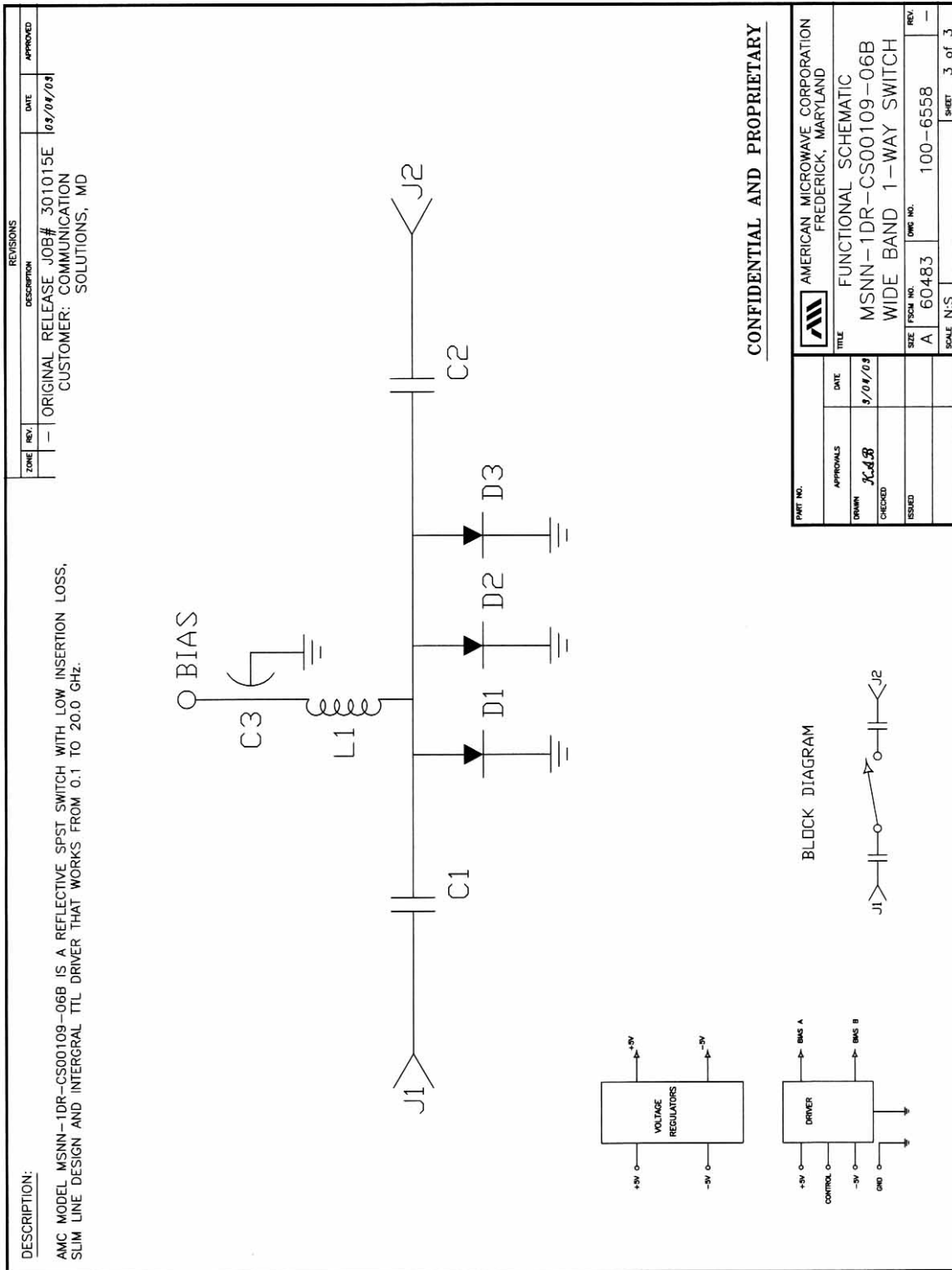
CONFIDENTIAL AND PROPRIETARY

|           |                                                       |                        |              |  |  |
|-----------|-------------------------------------------------------|------------------------|--------------|--|--|
| PART NO.  | AMERICAN MICROWAVE CORPORATION<br>FREDERICK, MARYLAND |                        |              |  |  |
| APPROVALS | DATE                                                  | TITLE                  |              |  |  |
| J.C.J.B   | 3/04/03                                               | PRODUCT FEATURE        |              |  |  |
| CHECKED   |                                                       | MSNN-1DR-CS00109-06B   |              |  |  |
| ISSUED    |                                                       | WIDE BAND 1-WAY SWITCH |              |  |  |
| SIZE      | FORM NO.                                              | TEMP NO.               | REV.         |  |  |
| A         | 60483                                                 | 100-6558               | -            |  |  |
| SCALE N:S |                                                       |                        | SHEET 1 of 3 |  |  |

**OUTLINE DRAWING**



**FUNCTIONAL SCHEMATIC**



CONFIDENTIAL AND PROPRIETARY

|                                                       |          |       |        |
|-------------------------------------------------------|----------|-------|--------|
| PART NO.                                              |          | DATE  |        |
| APPROVALS                                             | DATE     |       |        |
| DRAWN: <i>K.A.B.</i>                                  | 9/04/03  |       |        |
| CHECKED                                               |          |       |        |
| ISSUED                                                |          |       |        |
| TITLE                                                 |          | REV.  |        |
| AMERICAN MICROWAVE CORPORATION<br>FREDERICK, MARYLAND |          | -     |        |
| FUNCTIONAL SCHEMATIC                                  |          |       |        |
| MSNN-1DR-CS00109-06B                                  |          |       |        |
| WIDE BAND 1-WAY SWITCH                                |          |       |        |
| SIZE FROM NO.                                         | DWG. NO. |       |        |
| A 60483                                               | 100-6558 |       |        |
| SCALE                                                 | N:S      | SHEET | 3 of 3 |

**FINAL TEST DATA**

FINAL TEST DATA SHEETS

FOR

AMC MODEL NUMBER

**MSNN-1DR-CS00109-06B**

Serial Numbers:

1MS303103 THRU 1MS303112

### FINAL TEST DATA

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303103

FORM: 401-SW-DTA  
 DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
 7311-G GROVE RD., FREDERICK MD. 21704  
 TEL: 301-662-4700 FAX: 301-662-4938  
 URL: WWW.AMERICANMICROWAVECORP.COM  
 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

#### FINAL TEST DATA ON MICROWAVE SWITCH

|                                                       |                                        |
|-------------------------------------------------------|----------------------------------------|
| CUSTOMER: <u>COMMUNICATIONS SOLUTIONS</u>             | TECHNICIAN: <u>T. PHUNG</u>            |
| JOB NO: <u>301015E</u>                                | OPTION NO: _____                       |
| MODEL NO: <u>MSNN-1DR-CS00109-06B</u>                 | SPECIFICATION: _____                   |
| SERIAL NO: <u>1MS303103</u>                           | FREQUENCY RANGE: <u>0.1 - 20.0 GHz</u> |
| CURRENT DRAW: <u>+ 5 VDC @ 44mA; - 15 VDC @ 12 mA</u> |                                        |

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.38</u> dB @ 0.1 - 20.0 GHz | <u>12.09</u> dB          | <u>1.66</u> : 1 | <u>12.88</u> dB | <u>1.59</u> : 1   | — dB             | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |

| ISOLATION                           | SWITCHING SPEED |           |              |          |
|-------------------------------------|-----------------|-----------|--------------|----------|
|                                     | DELAY ON        | RISE TIME | DELAY OFF    | FALLTIME |
| J1-J2 <u>67</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | — nS      | <u>45</u> nS | — nS     |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |

NOTE: Any additional test data on back

TESTED ON: HP 8722ES

QA/QC APPROVAL: Dwight V. Smith 02 DATED: 4/25/03



**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303104

FORM: 401-SW-DTA  
DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
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FINAL TEST DATA  
ON  
MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHUNG  
JOB NO: 301015 E  
MODEL NO: MSNN-1DR-CS00109-06B      OPTION NO: \_\_\_\_\_  
SERIAL NO: 1MS 303104      SPECIFICATION: \_\_\_\_\_  
CURRENT DRAW: + 5 VDC @ 44 mA; - 15 VDC @ 12 mA      FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.32</u> dB @ 0.1 - 20.0 GHz | <u>10.31</u> dB          | <u>1.88</u> : 1 | <u>11.34</u> dB | <u>1.74</u> : 1   | - dB             | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| ISOLATION                             | SWITCHING SPEED          |                 |                 |                   |                  |                    |
|                                       | DELAY ON                 | RISE TIME       | DELAY OFF       | FALLTIME          |                  |                    |
| J1-J2 <u>69</u> dB @ 0.1 - 20.0 GHz   | <u>50</u> nS             | nS              | <u>45</u> nS    | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |

NOTE: Any additional test data on back

TESTED ON: HP 8722ES  
QA/QC APPROVAL: Dwight V. Smith **02** DATED: 4/25/03



**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303105

FORM: 401-SW-DTA  
 DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
 7311-G GROVE RD., FREDERICK MD 21704  
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 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

FINAL TEST DATA  
 ON  
 MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHONG  
 JOB NO: 301015E  
 MODEL NO: MSNN-1DR-CS00109-06B  
 SERIAL NO: 1MS303105      OPTION NO: \_\_\_\_\_  
 CURRENT DRAW: +5 VDC @ 37 mA; -15 VDC @ 12 mA      SPECIFICATION: \_\_\_\_\_  
 FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.24</u> dB @ 0.1 - 20.0 GHz | <u>11.71</u> dB          | <u>1.70</u> : 1 | <u>11.72</u> dB | <u>1.70</u> : 1   | - dB             | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |

| ISOLATION                           | SWITCHING SPEED |           |              |          |
|-------------------------------------|-----------------|-----------|--------------|----------|
|                                     | DELAY ON        | RISE TIME | DELAY OFF    | FALLTIME |
| J1-J2 <u>66</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | - nS      | <u>45</u> nS | - nS     |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |

NOTE: Any additional test data on back

TESTED ON: HP8722ES  
 QA/QC APPROVAL: [Signature] 02 DATED: 4/25/03

**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303106

FORM: 401-SW-DTA

DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
 7311-G GROVE RD., FREDERICK, MD. 21704  
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 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

FINAL TEST DATA  
 ON  
 MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS

TECHNICIAN: T. PHUNG

JOB NO: 301015E

MODEL NO: MSNN-1DR-CS00109-06B

OPTION NO: \_\_\_\_\_

SERIAL NO: 1MS303106

SPECIFICATION: \_\_\_\_\_

CURRENT DRAW: +5 VDC @ 50 mA; -15 VDC @ 12 mA

FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>db | OUTPUT<br>ON VSWR | OUTPUT OFF<br>db | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.30</u> dB @ 0.1 - 20.0 GHz | <u>11.40</u> dB          | <u>1.73</u> : 1 | <u>12.37</u> dB | <u>1.63</u> : 1   | <u>—</u> dB      | <u>—</u> : 1       |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |

| ISOLATION                           | SWITCHING SPEED |             |              |             |
|-------------------------------------|-----------------|-------------|--------------|-------------|
|                                     | DELAY ON        | RISE TIME   | DELAY OFF    | FALLTIME    |
| J1-J2 <u>70</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | <u>—</u> nS | <u>45</u> nS | <u>—</u> nS |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |
| dB @ GHz                            | nS              | nS          | nS           | nS          |

NOTE: Any additional test data on back

TESTED ON: 4p8722ES

QA/QC APPROVAL: Dwight V. Smith 02 DATED: 4/25/03

## FINAL TEST DATA

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303107

FORM: 401-SW-DTA  
 DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
 7311-G GROVE RD., FREDERICK MD. 21704  
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 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

### FINAL TEST DATA ON MICROWAVE SWITCH

|                                                     |                                        |
|-----------------------------------------------------|----------------------------------------|
| CUSTOMER: <u>COMMUNICATIONS SOLUTIONS</u>           | TECHNICIAN: <u>T. PHUNG</u>            |
| JOB NO: <u>301015 E</u>                             | OPTION NO: _____                       |
| MODEL NO: <u>MSNN-1DR-CS00109-06B</u>               | SPECIFICATION: _____                   |
| SERIAL NO: <u>1MS303107</u>                         | FREQUENCY RANGE: <u>0.1 - 20.0 GHz</u> |
| CURRENT DRAW: <u>+5 VDC @ 44mA; -15 VDC @ 12 mA</u> |                                        |

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.21</u> dB @ 0.1 - 20.0 GHz | <u>13.39</u> dB          | <u>1.54</u> : 1 | <u>11.88</u> dB | <u>1.68</u> : 1   | -                | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |

| ISOLATION                           | SWITCHING SPEED |           |              |          |
|-------------------------------------|-----------------|-----------|--------------|----------|
|                                     | DELAY ON        | RISE TIME | DELAY OFF    | FALLTIME |
| J1-J2 <u>70</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | -         | <u>45</u> nS | -        |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |
| dB @ GHz                            | nS              | nS        | nS           | nS       |

NOTE: Any additional test data on back

TESTED ON: 4p8722ES

QA/QC APPROVAL: Dwight V. Smith Q2 DATED: 4/25/03



**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303109

FORM: 401-SW-DTA  
 DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
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 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

FINAL TEST DATA  
 ON  
 MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHUNG  
 JOB NO: 301015E  
 MODEL NO: MSNN-1DR-CS00109-06B      OPTION NO: \_\_\_\_\_  
 SERIAL NO: 1MS 303109      SPECIFICATION: \_\_\_\_\_  
 CURRENT DRAW: +5VDC @ 44mA; -15VDC @ 12mA      FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE)        | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|---------------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                       | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 <u>2.26</u> dB @ 0.1 - 20.0 GHz | <u>13.96</u> dB          | <u>1.50</u> : 1 | <u>12.20</u> dB | <u>1.65</u> : 1   | - dB             | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| dB @ GHz                              | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
| ISOLATION                             | SWITCHING SPEED          |                 |                 |                   |                  |                    |
|                                       | DELAY ON                 | RISE TIME       | DELAY OFF       | FALLTIME          |                  |                    |
| J1-J2 <u>70</u> dB @ 0.1 - 20.0 GHz   | <u>50</u> nS             | nS              | <u>45</u> nS    | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |
| dB @ GHz                              | nS                       | nS              | nS              | nS                |                  |                    |

NOTE: Any additional test data on back

TESTED ON: HP8722ES  
 QA/QC APPROVAL: Dwight V. Smith 02 DATED: 4/25/03

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 Website: <http://www.americanmicrowavecorp.com>



**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: **1MS303110**

FORM: 401-SW-DTA  
 DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
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 E-MAIL: SALES@AMERICANMICROWAVECORP.COM

FINAL TEST DATA  
 ON  
 MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHUNG  
 JOB NO: 301015E  
 MODEL NO: MSNN-1DR-CS00109-06B      OPTION NO: \_\_\_\_\_  
 SERIAL NO: 1MS303110      SPECIFICATION: \_\_\_\_\_  
 CURRENT DRAW: +5VDC @ 44 mA; -15VDC @ 12mA      FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS (WORST CASE) |                                 | RETURN LOSS (WORST CASE) |                 |                 |                 |               |                 |
|-----------------------------|---------------------------------|--------------------------|-----------------|-----------------|-----------------|---------------|-----------------|
|                             |                                 | INPUT dB                 | INPUT VSWR      | OUTPUT ON dB    | OUTPUT ON VSWR  | OUTPUT OFF dB | OUTPUT OFF VSWR |
| J1-J2                       | <u>2.05</u> dB @ 0.1 - 20.0 GHz | <u>11.87</u> dB          | <u>1.68</u> : 1 | <u>12.96</u> dB | <u>1.58</u> : 1 | -             | -               |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |
|                             | dB @ GHz                        | dB                       | : 1             | dB              | : 1             | dB            | : 1             |

| ISOLATION |                               | SWITCHING SPEED |           |              |          |
|-----------|-------------------------------|-----------------|-----------|--------------|----------|
|           |                               | DELAY ON        | RISE TIME | DELAY OFF    | FALLTIME |
| J1-J2     | <u>67</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | -         | <u>45</u> nS | -        |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |
|           | dB @ GHz                      | nS              | nS        | nS           | nS       |

NOTE: Any additional test data on back

TESTED ON: HP8722ES  
 QA/QC APPROVAL: Dwight V. Smith 02      DATED: 4/25/03

**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303111

FORM: 401-SW-DTA  
DATE: 4-24-03



AMERICAN MICROWAVE CORPORATION  
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FINAL TEST DATA  
ON  
MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHUNG  
JOB NO: 301015 E  
MODEL NO: MSNN-IDR-CS00109-06B      OPTION NO:  
SERIAL NO: 1MS 303111      SPECIFICATION:  
CURRENT DRAW: + 5 VDC @ 44mA; - 15 VDC @ 12 mA      FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE) |                                 | RETURN LOSS (WORST CASE) |                 |                 |                   |                  |                    |
|--------------------------------|---------------------------------|--------------------------|-----------------|-----------------|-------------------|------------------|--------------------|
|                                |                                 | INPUT<br>dB              | INPUT<br>VSWR   | OUTPUT ON<br>db | OUTPUT<br>ON VSWR | OUTPUT OFF<br>db | OUTPUT<br>OFF VSWR |
| J1-J2                          | <u>2.26</u> dB @ 0.1 - 20.0 GHz | <u>11.01</u> dB          | <u>1.78</u> : 1 | <u>10.56</u> dB | <u>1.84</u> : 1   |                  |                    |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |
|                                | dB @ GHz                        | dB                       | : 1             | dB              | : 1               | dB               | : 1                |

| ISOLATION |                               | SWITCHING SPEED |             |              |             |
|-----------|-------------------------------|-----------------|-------------|--------------|-------------|
|           |                               | DELAY ON        | RISE TIME   | DELAY OFF    | FALLTIME    |
| J1-J2     | <u>70</u> dB @ 0.1 - 20.0 GHz | <u>50</u> nS    | <u>-</u> nS | <u>45</u> nS | <u>-</u> nS |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |
|           | dB @ GHz                      | nS              | nS          | nS           | nS          |

NOTE: Any additional test data on back

TESTED ON: H18722ES  
QA/QC APPROVAL: Dwight V. Smith 02 DATED: 4/25/03



**FINAL TEST DATA**

AMC MODEL NO: MSNN-1DR-CS00109-06B, SERIAL NUMBER: 1MS303112

FORM: 401-SW-DTA  
 DATE: 4-24-03



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FINAL TEST DATA  
 ON  
 MICROWAVE SWITCH

CUSTOMER: COMMUNICATIONS SOLUTIONS      TECHNICIAN: T. PHUNG  
 JOB NO: 303015E  
 MODEL NO: MSNN-1DR-CS00109-06B      OPTION NO: \_\_\_\_\_  
 SERIAL NO: 1MS303112      SPECIFICATION: \_\_\_\_\_  
 CURRENT DRAW: +5 VDC @ 44mA; -15 VDC @ 12mA      FREQUENCY RANGE: 0.1 - 20.0 GHz

| INSERTION LOSS<br>(WORST CASE) | RETURN LOSS (WORST CASE) |               |                 |                   |                  |                    |
|--------------------------------|--------------------------|---------------|-----------------|-------------------|------------------|--------------------|
|                                | INPUT<br>dB              | INPUT<br>VSWR | OUTPUT ON<br>dB | OUTPUT<br>ON VSWR | OUTPUT OFF<br>dB | OUTPUT<br>OFF VSWR |
| J1-J2 2.28 dB @ 0.1 - 20.0 GHz | 10.52 dB                 | 1.85 : 1      | 12.64 dB        | 1.61 : 1          | - dB             | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |
| dB @ GHz                       | dB                       | : 1           | dB              | : 1               | dB               | : 1                |

| ISOLATION                    | SWITCHING SPEED |           |           |          |
|------------------------------|-----------------|-----------|-----------|----------|
|                              | DELAY ON        | RISE TIME | DELAY OFF | FALLTIME |
| J1-J2 70 dB @ 0.1 - 20.0 GHz | 50 nS           | - nS      | 45 nS     | - nS     |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |
| dB @ GHz                     | nS              | nS        | nS        | nS       |

NOTE: Any additional test data on back

TESTED ON: 4p 8722ES  
 QA/QC APPROVAL: Dwight K. Smith **02**      DATED: 4/25/03