

# Surface Mount Switch

50Ω Transfer, DC<sup>3</sup> to 2.0 GHz Low Video Leakage

MSWT-4-20+



## Maximum Ratings

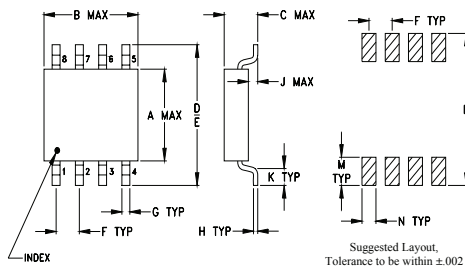
|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| Input Power                                                     | see Note 1     |
| Control Current                                                 | see Note 2     |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|           |   |
|-----------|---|
| Tx        | 2 |
| Rx        | 6 |
| J1        | 4 |
| J2        | 8 |
| CONTROL 1 | 1 |
| CONTROL 2 | 3 |
| CONTROL 3 | 5 |
| CONTROL 4 | 7 |

## Outline Drawing

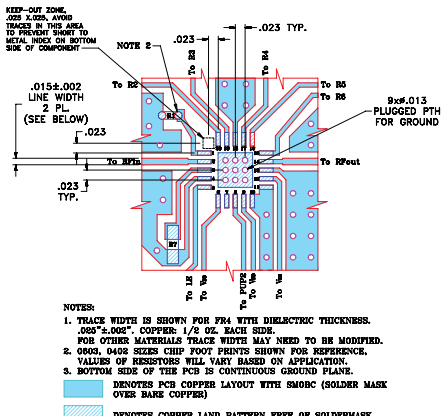
### PCB Land Pattern



## Outline Dimensions (inch/mm)

|      |      |      |      |      |      |       |
|------|------|------|------|------|------|-------|
| A    | B    | C    | D    | E    | F    | G     |
| .163 | .210 | .077 | .250 | .220 | .050 | .017  |
| 4.14 | 5.33 | 1.96 | 6.35 | 5.59 | 1.27 | 0.43  |
| H    | J    | K    | M    | N    | P    | wt    |
| .009 | .025 | .030 | .050 | .030 | .270 | grams |
| 0.23 | 0.64 | 0.76 | 1.27 | 0.76 | 6.86 | 0.10  |

## Demo Board MCL P/N: TB-202 Suggested PCB Layout (PL-220)



### Notes

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## Features

- wideband, DC to 2.0 GHz
- low video leakage, 15 mVp-p typ.
- excellent VSWR, 1.2:1 typ.

## Applications

- transmitter/receiver
- automatic test equipment

CASE STYLE: XX211-1  
PRICE: \$3.95 ea. QTY (10)

### +RoHS Compliant

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

## Electrical Specifications

| FREQ. <sup>3</sup><br>(GHz) |     | INSERTION LOSS<br>(dB) |      |                |      |                 |      |                  |      | 1dB COMPR.<br>(dBm) |      |                |      | ISOLATION<br>(dB) |      |               |      |                |      |                 |      |
|-----------------------------|-----|------------------------|------|----------------|------|-----------------|------|------------------|------|---------------------|------|----------------|------|-------------------|------|---------------|------|----------------|------|-----------------|------|
|                             |     | DC-100<br>MHz          |      | 100-500<br>MHz |      | 500-1000<br>MHz |      | 1000-2000<br>MHz |      | DC-100<br>MHz       |      | 100-500<br>MHz |      | 500-1000<br>MHz   |      | DC-100<br>MHz |      | 100-500<br>MHz |      | 500-1000<br>MHz |      |
|                             |     | Typ.                   | Max. | Typ.           | Max. | Typ.            | Max. | Typ.             | Max. | Typ.                | Max. | Typ.           | Max. | Typ.              | Max. | Typ.          | Max. | Typ.           | Max. | Typ.            | Max. |
| DC                          | 2.0 | Tx-J1/J2               |      | 0.9            | 1.2  | 1.1             | 1.5  | 1.25             | 1.8  | 1.45                | 2.2  | 18             | 25   | 28                | 29   | 51            | 44   | 34             | 27   | 26              | 21   |
|                             |     | J1/J2-Rx               |      | 1.1            | 1.4  | 1.3             | 1.7  | 1.5              | 2.0  | 1.6                 | 2.2  | 16             | 18   | 20                | 22   | 52            | 46   | 37             | 31   | 29              | 24   |
|                             |     | Tx-Rx                  |      | —              | —    | —               | —    | —                | —    | —                   | —    | —              | —    | —                 | —    | 60            | 53   | 41             | 36   | 34              | 27   |

### Additional Specifications

|                                                       |                                        |                                   |                                 |                                |
|-------------------------------------------------------|----------------------------------------|-----------------------------------|---------------------------------|--------------------------------|
| Control Current, mA                                   | 0.2 max to -8V, 0.02 max at 0 to -0.2V |                                   |                                 |                                |
| VSWR:(1)                                              | DC-.1GHz<br>1.2 typ.<br>1.65 max.      | .1-.5GHz<br>1.25 typ.<br>1.8 max. | .5-1GHz<br>1.4 typ.<br>1.9 max. | 1-2GHz<br>1.4 typ.<br>1.7 max. |
| Rise/Fall time (10%-90%), ns                          | 2 typ.                                 |                                   |                                 |                                |
| Switching time, 50% of Control to 90% RF(Turn-on), ns | 4 typ                                  |                                   |                                 |                                |
| 10% RF(Turn-off), ns                                  | 4 typ                                  |                                   |                                 |                                |
| **Video Leakage, mVp-p<br>0/-5V Control               | 15 typ.                                |                                   |                                 |                                |

- \*\* Video leakage or break through is defined as leakage of switching signal to RF output ports.
- RF Power Input (dBm), Max.  
• Steady State Control 0/-8V  
• As a Modulator
  - Control Current, 500μA (occurs at -9V to -12V typ.)
  - All RF connections must be DC blocked or held at 0V DC.

| Control Ports |    |    |    | "On" Path<br>(other paths are<br>"OFF")                         |
|---------------|----|----|----|-----------------------------------------------------------------|
| 1             | 2  | 3  | 4  |                                                                 |
| 0             | -V | -V | -V | T <sub>x</sub> -J <sub>2</sub>                                  |
| -V            | 0  | -V | -V | T <sub>x</sub> -J <sub>1</sub>                                  |
| -V            | -V | 0  | -V | R <sub>x</sub> -J <sub>1</sub>                                  |
| -V            | -V | -V | 0  | R <sub>x</sub> -J <sub>2</sub>                                  |
| 0             | -V | 0  | -V | T <sub>x</sub> -J <sub>2</sub> & R <sub>x</sub> -J <sub>1</sub> |
| -V            | 0  | -V | 0  | T <sub>x</sub> -J <sub>1</sub> & R <sub>x</sub> -J <sub>2</sub> |

## Application Note for MSWT-4-20 Transmit-Receive Switch:

The functional schematic diagram for a diversity application of the switch is shown in Figure 1, with the required external components including 4 independent drivers at the control ports. When operation as a transfer switch is desired only 2 drivers are needed, one connected to the V1 and V3 ports together, and the other connected to the V2 and V4 ports. In either case, two DC return paths are needed for the control voltages, represented by the ground symbols in the diagram. These returns must be via oppositely situated RF ports (Tx and Rx or J1 and J2), and can be furnished incidentally by the user's RF terminating devices themselves. However, if those devices are AC-coupled (that is, they contain DC blocking capacitors), then the shunt resistors shown in the diagram are needed. The resistor should be installed either at the Tx and Rx ports (connection shown as solid), or at J1 and J2 (shown dotted), with equal effect. If one external RF device has a DC return to ground, for example, then only one resistor is needed; it must be installed at the opposite RF port of the switch. The resistance of each of the external DC returns should be 20K ohms or less, for proper ON/OFF FETs.

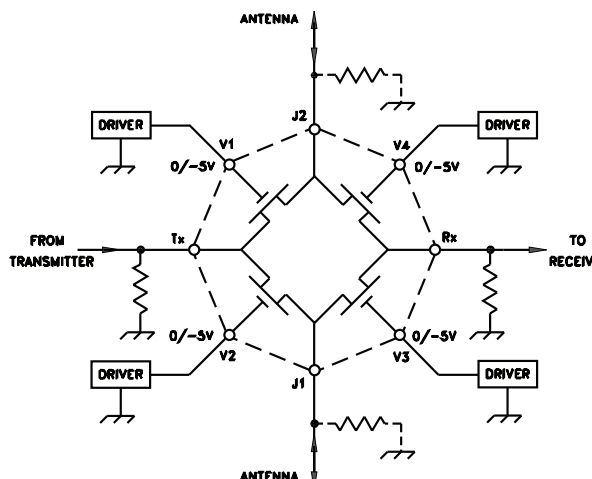
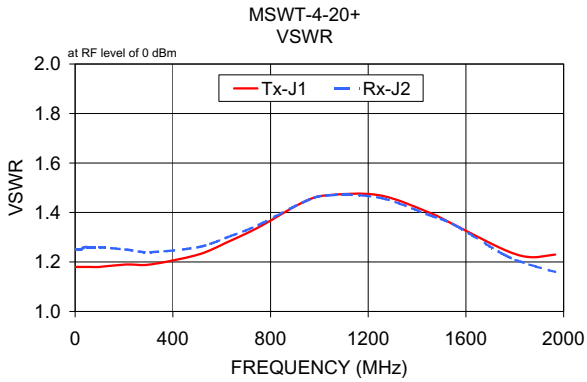
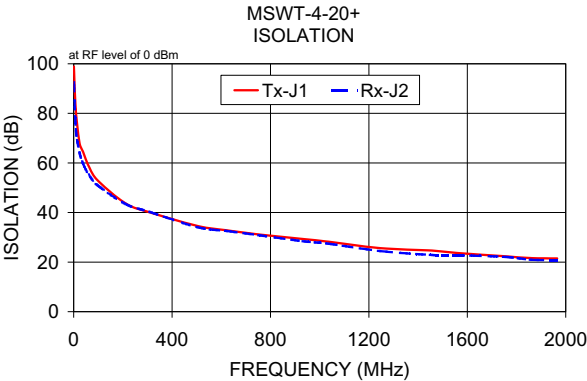
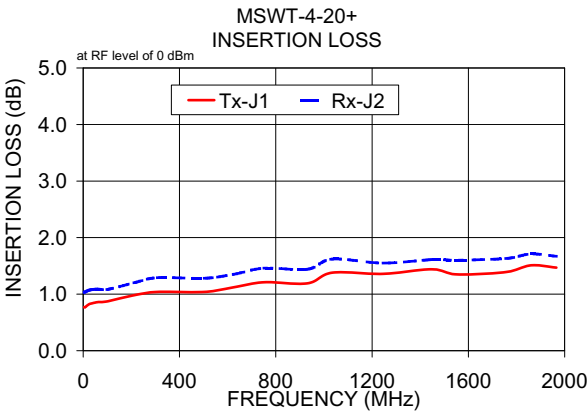


Figure 1. Functional Schematic Diagram

Typical Performance Data

| FREQ.<br>(MHz) | ON INSERTION LOSS (dB)<br>(CTRL <sub>1</sub> @ -8V, CTRL <sub>2</sub> @ 0V)<br>(CTRL <sub>3</sub> @ -8V, CTRL <sub>4</sub> @ 0V)<br>T <sub>X-J1</sub> R <sub>X-J2</sub> |      |          |      | AMPLITUDE<br>UNBALANCE |      |          |      | OFF ISOLATION (dB)<br>(CTRL <sub>1</sub> @ 0V, CTRL <sub>2</sub> @ -8V)<br>(CTRL <sub>3</sub> @ 0V, CTRL <sub>4</sub> @ -8V)<br>T <sub>X-J1</sub> R <sub>X-J2</sub> |      |          |      | VSWR<br>ON                     |                                |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------|------------------------|------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------|--------------------------------|--------------------------------|
|                | $\bar{X}$                                                                                                                                                               |      | $\sigma$ |      | $\bar{X}$              |      | $\sigma$ |      | $\bar{X}$                                                                                                                                                           |      | $\sigma$ |      | T <sub>X-J1</sub><br>$\bar{X}$ | R <sub>X-J2</sub><br>$\bar{X}$ |
|                |                                                                                                                                                                         |      |          |      |                        |      |          |      |                                                                                                                                                                     |      |          |      |                                |                                |
| 1.00           | 0.77                                                                                                                                                                    | 0.01 | 1.03     | 0.02 | 0.27                   | 0.03 | 98.89    | 2.58 | 92.52                                                                                                                                                               | 7.65 | 1.18     | 1.25 |                                |                                |
| 8.49           | 0.77                                                                                                                                                                    | 0.01 | 1.04     | 0.02 | 0.27                   | 0.03 | 81.64    | 2.04 | 73.58                                                                                                                                                               | 0.79 | 1.18     | 1.25 |                                |                                |
| 23.49          | 0.82                                                                                                                                                                    | 0.01 | 1.07     | 0.02 | 0.25                   | 0.02 | 68.21    | 1.03 | 64.25                                                                                                                                                               | 0.16 | 1.18     | 1.25 |                                |                                |
| 38.48          | 0.84                                                                                                                                                                    | 0.02 | 1.08     | 0.01 | 0.24                   | 0.01 | 64.34    | 0.08 | 59.52                                                                                                                                                               | 0.25 | 1.18     | 1.26 |                                |                                |
| 60.98          | 0.86                                                                                                                                                                    | 0.04 | 1.09     | 0.01 | 0.23                   | 0.00 | 58.77    | 0.40 | 55.31                                                                                                                                                               | 0.17 | 1.18     | 1.26 |                                |                                |
| 98.46          | 0.87                                                                                                                                                                    | 0.01 | 1.08     | 0.02 | 0.21                   | 0.02 | 52.85    | 0.01 | 50.90                                                                                                                                                               | 0.08 | 1.18     | 1.26 |                                |                                |
| 210.93         | 0.98                                                                                                                                                                    | 0.01 | 1.20     | 0.02 | 0.22                   | 0.03 | 43.69    | 0.14 | 43.46                                                                                                                                                               | 0.31 | 1.19     | 1.25 |                                |                                |
| 308.39         | 1.04                                                                                                                                                                    | 0.03 | 1.29     | 0.01 | 0.25                   | 0.01 | 40.09    | 0.12 | 40.29                                                                                                                                                               | 0.05 | 1.19     | 1.24 |                                |                                |
| 503.33         | 1.04                                                                                                                                                                    | 0.04 | 1.28     | 0.02 | 0.25                   | 0.01 | 34.58    | 0.17 | 34.09                                                                                                                                                               | 0.32 | 1.23     | 1.26 |                                |                                |
| 623.29         | 1.12                                                                                                                                                                    | 0.03 | 1.35     | 0.02 | 0.25                   | 0.02 | 32.82    | 0.07 | 32.54                                                                                                                                                               | 0.08 | 1.28     | 1.30 |                                |                                |
| 750.75         | 1.21                                                                                                                                                                    | 0.04 | 1.46     | 0.02 | 0.25                   | 0.02 | 31.17    | 0.06 | 30.89                                                                                                                                                               | 0.08 | 1.34     | 1.35 |                                |                                |
| 930.69         | 1.19                                                                                                                                                                    | 0.03 | 1.44     | 0.02 | 0.28                   | 0.02 | 29.33    | 0.09 | 28.45                                                                                                                                                               | 0.21 | 1.44     | 1.44 |                                |                                |
| 1035.65        | 1.38                                                                                                                                                                    | 0.03 | 1.62     | 0.02 | 0.26                   | 0.03 | 28.25    | 0.16 | 27.42                                                                                                                                                               | 0.11 | 1.47     | 1.47 |                                |                                |
| 1245.58        | 1.36                                                                                                                                                                    | 0.03 | 1.55     | 0.02 | 0.22                   | 0.05 | 25.64    | 0.15 | 24.47                                                                                                                                                               | 0.09 | 1.47     | 1.46 |                                |                                |
| 1448.01        | 1.44                                                                                                                                                                    | 0.02 | 1.61     | 0.01 | 0.24                   | 0.05 | 24.70    | 0.15 | 22.92                                                                                                                                                               | 0.24 | 1.40     | 1.39 |                                |                                |
| 1552.98        | 1.35                                                                                                                                                                    | 0.01 | 1.60     | 0.02 | 0.28                   | 0.02 | 23.72    | 0.06 | 22.75                                                                                                                                                               | 0.12 | 1.35     | 1.35 |                                |                                |
| 1755.41        | 1.39                                                                                                                                                                    | 0.03 | 1.63     | 0.02 | 0.24                   | 0.03 | 22.32    | 0.11 | 22.09                                                                                                                                                               | 0.15 | 1.25     | 1.23 |                                |                                |
| 1860.38        | 1.51                                                                                                                                                                    | 0.02 | 1.71     | 0.02 | 0.22                   | 0.02 | 21.60    | 0.13 | 20.95                                                                                                                                                               | 0.12 | 1.22     | 1.19 |                                |                                |
| 1965.34        | 1.47                                                                                                                                                                    | 0.04 | 1.67     | 0.01 | 0.22                   | 0.06 | 21.50    | 0.19 | 20.84                                                                                                                                                               | 0.12 | 1.23     | 1.16 |                                |                                |



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