

## DC-20GHz Reflective SPDT Switch

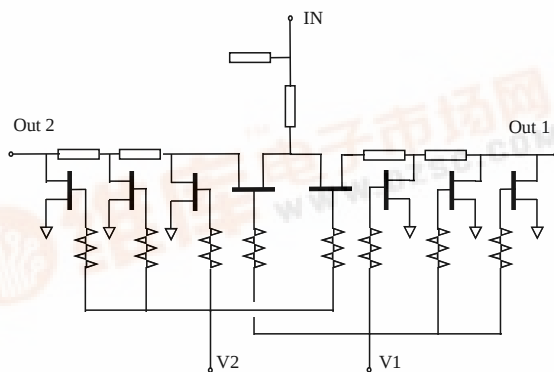
### GaAs Monolithic Microwave IC

#### Description

The CHS5100 is a wideband monolithic FET based reflective switch manufactured on a standard power process using  $0.7\mu\text{m}$  implanted active layer MESFET, via holes, air bridges and electron beam gate lithography.

This wideband switch is suitable for ultra broadband ECM and EW systems. It can also be used in instrumentation and wideband signal processing applications.

Available in chip form



#### Main Features

- ☑ Broadband performance : DC-20GHz
- ☑ Low insertion loss : 2.1dB@20GHz
- ☑ High isolation : 53dB@1GHz  
30dB@20GHz
- ☑ Excellent input and output matching:  
VSWR < 1.5:1
- ☑ Chip size : 1,92 x 1,22 x 0.1mm

#### Main Characteristics

Tamb = +25°C

| Symbol | Parameter               | Min | Typ | Max | Unit |
|--------|-------------------------|-----|-----|-----|------|
| II     | On state insertion loss |     |     | 2.5 | dB   |

Ref. : DSCHS51006354

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Specifications subject to change without notice

# CHS5100

## DC-20GHz Reflective SPDT Switch

|      |                           |    |  |       |    |
|------|---------------------------|----|--|-------|----|
| Is   | Off state isolation       | 25 |  |       | dB |
| VSWR | Input and output matching |    |  | 1.5:1 |    |

ESD Protections : Electrostatic sensitive discharge device observe handling precautions !

**Electrical Characteristics**

Tamb = +25°C, specifications are given for typical control voltages and for 50ohm source and load impedance.

| Symbol           | Parameter                   | Test Conditions                         | Min | Typ                                  | Max   | Unit |
|------------------|-----------------------------|-----------------------------------------|-----|--------------------------------------|-------|------|
| Fop              | Operating frequency range   |                                         | 0.5 |                                      | 20    | GHz  |
| II               | On state insertion loss     | 1GHz<br>5GHz<br>10GHz<br>15GHz<br>20GHz |     | 1.15<br>1.20<br>1.40<br>1.60<br>2.10 | 2.50  | dB   |
| Is               | Off state reverse isolation | 1GHz<br>5GHz<br>10GHz<br>15GHz<br>20GHz | 25  | 53<br>42<br>37<br>34<br>30           |       | dB   |
| VSWR             | Input VSWR                  |                                         |     |                                      | 1.5:1 |      |
| VSWR             | Ouput VSWR                  |                                         |     |                                      | 1.5:1 |      |
| P <sub>1dB</sub> | Input compressed power      | 20GHz                                   |     | 20                                   |       | dBm  |
| Ic               | Control current             |                                         |     |                                      | 100   | μA   |
| VH               | High level control voltage  |                                         | -2  | 0                                    |       | Volt |
| VL               | Low level control voltage   |                                         |     | -6                                   | -4.75 | Volt |

**Absolute Maximum Ratings (1)**

Tamb = +25°C

| Symbol | Parameter                              | Value       | Unit |
|--------|----------------------------------------|-------------|------|
| VH,VL  | Control voltages                       | -8 to 0     | Volt |
| Pin    | Maximum peak input power overdrive (2) | 30          | dBm  |
| Top    | Operating temperature range            | -40 to +85  | °C   |
| Tstg   | Storage temperature range              | -55 to +125 | °C   |

(1) Operation of this device above anyone of these parameters may cause permanent damage

(2) Duration < 1s

**Typical Scattering Parameters**

Tamb = +25°C, Bias Conditions : VL = -6V, VH = 0V, on-state IN-Out1 path

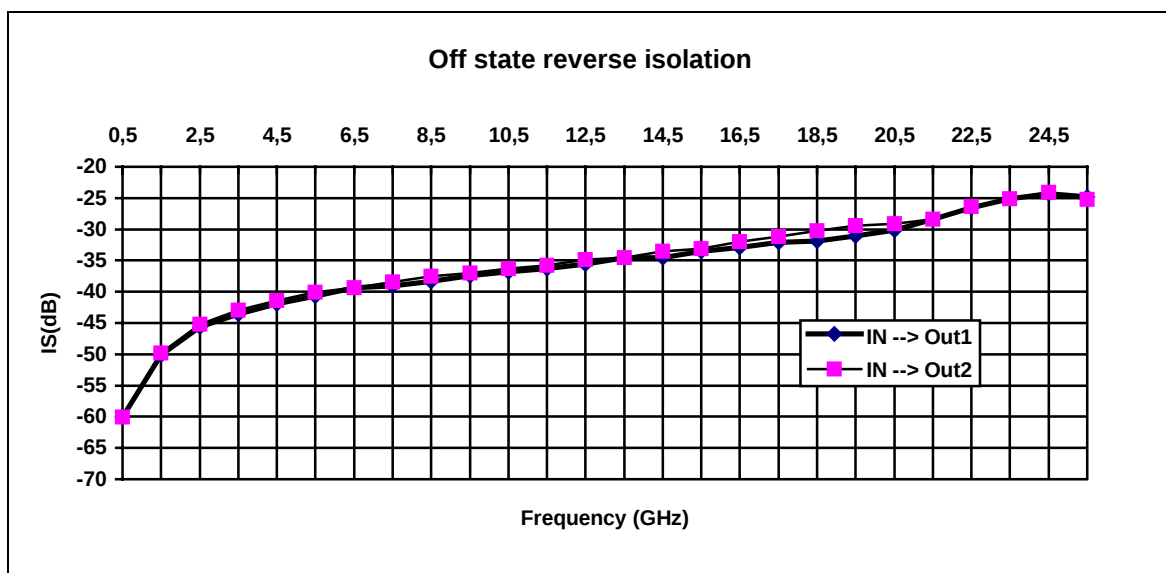
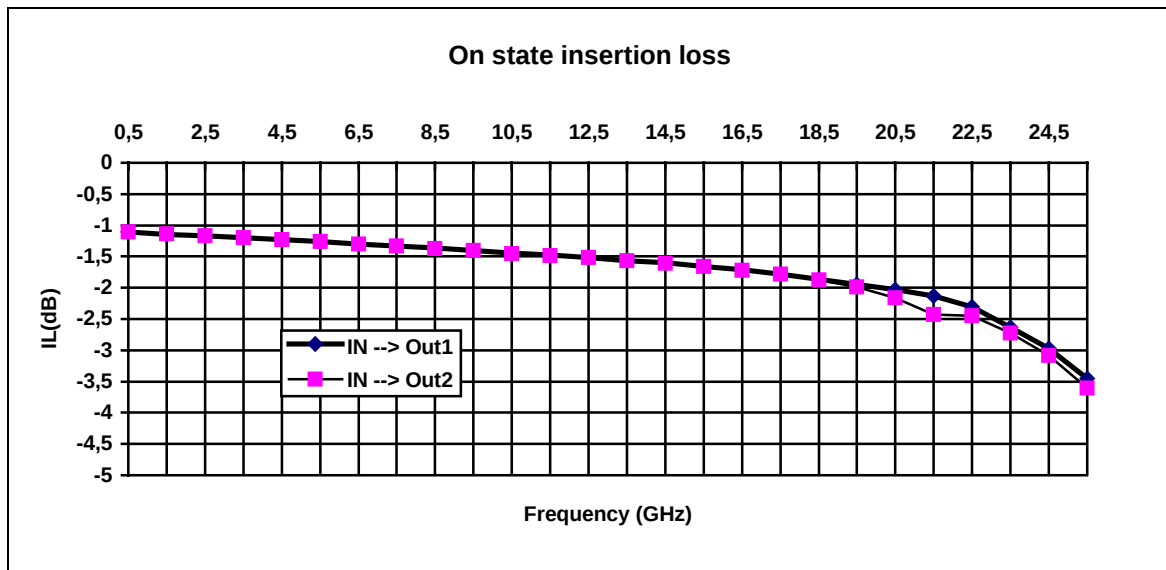
| Freq.<br>GHz | S11<br>dB | S11<br>/° | S12<br>dB | S12<br>/° | S21<br>dB | S21<br>/° | S22<br>dB | S22<br>/° |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0.50         | -19.93    | -4.0      | -1.10     | -5.6      | -1.11     | -5.6      | -19.98    | -5.8      |
| 1.00         | -19.85    | -11.9     | -1.12     | -10.3     | -1.13     | -10.3     | -19.88    | -15.7     |
| 1.50         | -19.73    | -19.5     | -1.14     | -15.2     | -1.14     | -15.2     | -19.75    | -25.1     |
| 2.00         | -19.63    | -26.6     | -1.15     | -20.1     | -1.15     | -20.1     | -19.60    | -33.4     |
| 2.50         | -19.59    | -33.4     | -1.17     | -25.0     | -1.17     | -25.0     | -19.41    | -42.0     |
| 3.00         | -19.46    | -39.7     | -1.18     | -29.9     | -1.19     | -29.9     | -19.27    | -50.1     |
| 3.50         | -19.38    | -46.0     | -1.19     | -34.8     | -1.20     | -34.8     | -19.08    | -58.0     |
| 4.00         | -19.27    | -52.0     | -1.21     | -39.8     | -1.21     | -39.7     | -18.91    | -65.0     |
| 4.50         | -19.21    | -57.8     | -1.23     | -44.7     | -1.23     | -44.7     | -18.74    | -72.6     |
| 5.00         | -19.22    | -62.4     | -1.25     | -49.6     | -1.25     | -49.6     | -18.62    | -78.5     |
| 5.50         | -19.05    | -67.7     | -1.26     | -54.5     | -1.26     | -54.6     | -18.45    | -85.2     |
| 6.00         | -19.02    | -72.0     | -1.28     | -59.5     | -1.28     | -59.5     | -18.45    | -90.5     |
| 6.50         | -18.96    | -75.5     | -1.30     | -64.4     | -1.30     | -64.4     | -18.35    | -95.8     |
| 7.00         | -18.59    | -88.0     | -1.31     | -69.6     | -1.31     | -69.6     | -18.01    | -109.3    |
| 7.50         | -18.61    | -92.8     | -1.33     | -74.5     | -1.33     | -74.6     | -17.84    | -115.5    |
| 8.00         | -18.52    | -96.7     | -1.34     | -79.5     | -1.35     | -79.6     | -17.92    | -121.1    |
| 8.50         | -18.56    | -101.6    | -1.36     | -84.6     | -1.36     | -84.6     | -17.76    | -127.2    |
| 9.00         | -18.50    | -104.7    | -1.38     | -89.6     | -1.38     | -89.6     | -17.83    | -132.3    |
| 9.50         | -18.51    | -109.3    | -1.40     | -94.7     | -1.40     | -94.7     | -17.82    | -138.3    |
| 10.00        | -18.56    | -112.4    | -1.42     | -99.8     | -1.42     | -99.8     | -18.04    | -143.2    |
| 10.50        | -18.59    | -115.7    | -1.45     | -104.9    | -1.44     | -104.9    | -18.05    | -149.0    |
| 11.00        | -18.69    | -119.2    | -1.46     | -110.1    | -1.46     | -110.1    | -18.22    | -153.3    |
| 11.50        | -18.67    | -122.1    | -1.48     | -115.2    | -1.48     | -115.3    | -18.29    | -158.7    |
| 12.00        | -18.83    | -124.5    | -1.50     | -120.5    | -1.50     | -120.5    | -18.52    | -162.7    |
| 12.50        | -18.95    | -127.1    | -1.52     | -125.7    | -1.52     | -125.7    | -18.68    | -167.4    |
| 13.00        | -18.97    | -130.0    | -1.54     | -131.0    | -1.55     | -131.1    | -19.01    | -171.5    |
| 13.50        | -19.12    | -132.8    | -1.57     | -136.4    | -1.57     | -136.4    | -19.21    | -175.7    |
| 14.00        | -19.19    | -134.6    | -1.58     | -141.8    | -1.59     | -141.8    | -19.63    | -179.8    |
| 14.50        | -19.33    | -136.9    | -1.60     | -147.2    | -1.60     | -147.3    | -20.01    | 175.2     |
| 15.00        | -19.54    | -139.0    | -1.63     | -152.7    | -1.63     | -152.7    | -20.18    | 172.7     |
| 15.50        | -19.67    | -141.7    | -1.66     | -158.2    | -1.66     | -158.2    | -20.59    | 166.4     |
| 16.00        | -19.73    | -143.1    | -1.68     | -163.8    | -1.68     | -163.8    | -20.97    | 163.5     |
| 16.50        | -20.17    | -145.3    | -1.71     | -169.5    | -1.71     | -169.5    | 21.10     | 160.4     |
| 17.00        | -20.44    | -148.3    | -1.75     | -175.3    | -1.75     | -175.3    | -21.89    | 154.9     |
| 17.50        | -20.80    | -149.5    | -1.78     | 179.0     | -1.78     | 178.9     | -21.89    | 151.5     |
| 18.00        | -21.11    | -154.0    | -1.82     | 173.0     | -1.82     | 173.0     | -22.51    | 147.0     |
| 18.50        | -21.78    | -156.3    | -1.86     | 167.1     | -1.86     | 167.1     | -23.39    | 140.1     |
| 19.00        | -22.61    | -159.3    | -1.91     | 161.1     | -1.91     | 161.0     | -22.64    | 126.9     |
| 19.50        | -24.05    | -164.4    | -1.95     | 155.1     | -1.95     | 155.0     | -22.32    | 125.9     |
| 20.00        | -25.54    | -162.9    | -1.98     | 148.8     | -1.98     | 148.7     | -23.99    | 122.6     |
| 20.50        | -29.33    | -165.4    | -2.02     | 142.3     | -2.03     | 142.3     | -23.53    | 99.0      |
| 21.00        | -33.39    | -164.3    | -2.07     | 135.7     | -2.08     | 135.7     | -22.77    | 89.5      |
| 21.50        | -46.45    | -92.3     | -2.13     | 129.1     | -2.13     | 129.0     | -23.50    | 92.1      |
| 22.00        | -32.38    | -30.2     | -2.21     | 122.3     | -2.21     | 122.2     | -22.97    | 61.6      |
| 22.50        | -26.53    | -20.4     | -2.30     | 115.0     | -2.31     | 115.0     | -20.57    | 52.6      |
| 23.00        | -22.06    | -23.9     | -2.44     | 107.6     | -2.44     | 107.6     | -19.13    | 47.1      |
| 23.50        | -19.35    | -29.7     | -2.62     | 100.5     | -2.63     | 100.4     | -18.64    | 27.7      |
| 24.00        | -16.65    | -34.4     | -2.78     | 93.1      | -2.79     | 93.1      | -17.00    | 15.9      |
| 24.50        | -14.54    | -39.5     | -2.98     | 85.5      | -2.97     | 85.6      | -15.65    | 6.2       |
| 25.00        | -12.84    | -45.9     | -3.21     | 78.0      | -3.21     | 77.9      | -14.67    | -6.7      |
| 25.50        | -11.32    | -51.7     | -3.45     | 70.2      | -3.45     | 70.2      | -13.41    | -16.0     |

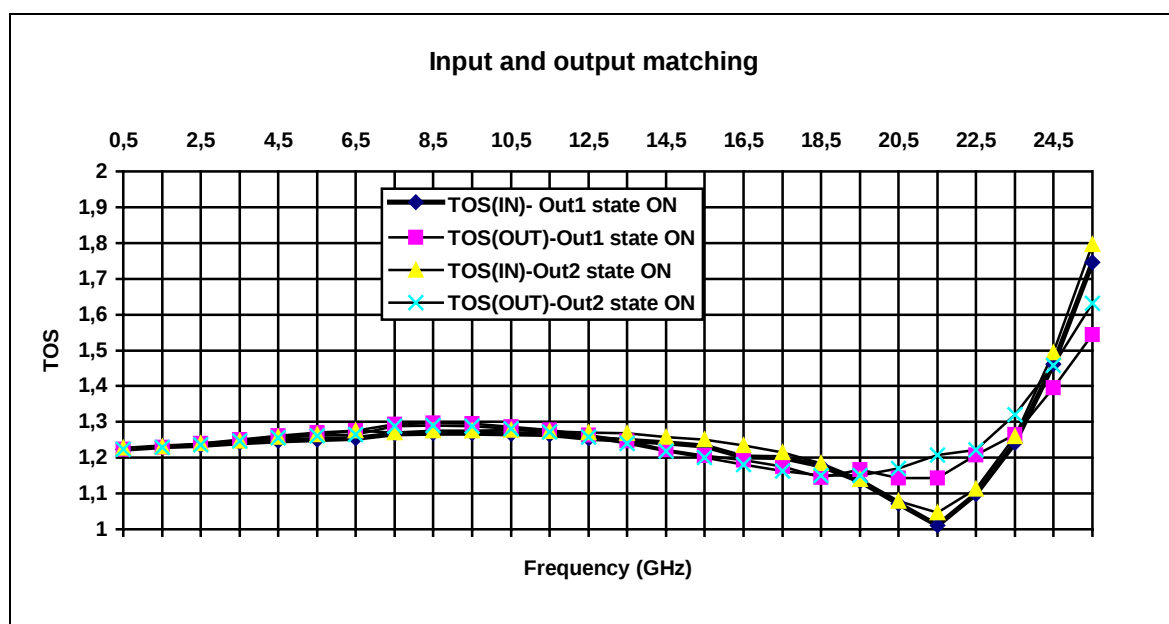
**Typical Scattering Parameters**Tamb = +25°C, Bias Conditions : VL = -6V, VH = 0V, **off-state IN-Out1 path**

| Freq.<br>GHz | S11<br>dB | S11<br>/° | S12<br>dB | S12<br>/° | S21<br>dB | S21<br>/° | S22<br>dB | S22<br>/° |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0.50         | -18.28    | 2.8       | -60.07    | 100.4     | -62.13    | 82.9      | -1.64     | 177.1     |
| 1.00         | -17.46    | -6.1      | -52.95    | 85.5      | -54.18    | 79.4      | -1.66     | 175.3     |
| 1.50         | -18.42    | -30.5     | -50.17    | 78.2      | -49.95    | 76.6      | -1.70     | 173.4     |
| 2.00         | -17.00    | -33.7     | -47.30    | 71.7      | -47.23    | 71.4      | -1.74     | 171.4     |
| 2.50         | -18.65    | -43.5     | -45.64    | 71.5      | -45.87    | 67.7      | -1.80     | 169.6     |
| 3.00         | -19.40    | -39.9     | -44.56    | 63.7      | -44.59    | 65.9      | -1.85     | 167.7     |
| 3.50         | -16.10    | -53.3     | -43.57    | 59.8      | -43.48    | 61.0      | -1.90     | 166.0     |
| 4.00         | -17.52    | -65.5     | -42.76    | 54.3      | -42.72    | 56.3      | -1.95     | 164.1     |
| 4.50         | -20.00    | -85.2     | -41.88    | 53.2      | -41.87    | 51.5      | -1.99     | 162.6     |
| 5.00         | -18.14    | -70.0     | -40.89    | 50.3      | -41.19    | 50.4      | -2.05     | 160.8     |
| 5.50         | -19.42    | -83.4     | -40.66    | 47.2      | -40.67    | 47.4      | -2.10     | 159.3     |
| 6.00         | -18.43    | -86.0     | -40.18    | 44.0      | -40.16    | 44.2      | -2.14     | 157.5     |
| 6.50         | -17.59    | -76.1     | -39.40    | 41.9      | -39.44    | 42.2      | -2.18     | 156.1     |
| 7.00         | -18.33    | -108.9    | -39.34    | 39.4      | -39.53    | 39.6      | -2.17     | 153.9     |
| 7.50         | -17.68    | -115.8    | -39.09    | 37.6      | -38.91    | 36.0      | -2.20     | 152.4     |
| 8.00         | -22.95    | -97.1     | -38.53    | 38.5      | -38.79    | 37.6      | -2.23     | 150.6     |
| 8.50         | -20.38    | -105.2    | -38.31    | 35.6      | -38.16    | 34.2      | -2.26     | 149.2     |
| 9.00         | -17.48    | -107.6    | -37.71    | 32.3      | -37.69    | 31.3      | -2.29     | 147.5     |
| 9.50         | -18.61    | -116.2    | -37.41    | 31.1      | -37.43    | 30.3      | -2.30     | 145.9     |
| 10.00        | -20.56    | -116.4    | -37.08    | 29.7      | -37.13    | 28.4      | -2.34     | 144.1     |
| 10.50        | -18.57    | -111.6    | -36.76    | 27.3      | -36.83    | 27.3      | -2.35     | 142.6     |
| 11.00        | -16.32    | -119.9    | -36.27    | 25.9      | -36.23    | 25.1      | -2.38     | 141.0     |
| 11.50        | -18.80    | -130.9    | -36.24    | 23.4      | -36.26    | 22.2      | -2.37     | 139.4     |
| 12.00        | -16.65    | -135.8    | -35.73    | 21.5      | -35.69    | 20.4      | -2.40     | 137.8     |
| 12.50        | -18.34    | -147.2    | -35.60    | 18.8      | -35.68    | 19.7      | -2.42     | 136.2     |
| 13.00        | -23.83    | -126.4    | -35.47    | 19.6      | -35.38    | 19.6      | -2.44     | 134.6     |
| 13.50        | -14.94    | -132.1    | -34.53    | 16.4      | -34.62    | 16.6      | -2.46     | 133.0     |
| 14.00        | -17.12    | -166.8    | -34.51    | 14.1      | -34.74    | 12.5      | -2.49     | 131.4     |
| 14.50        | -17.13    | 176.4     | -34.60    | 13.8      | -34.74    | 15.3      | -2.48     | 129.5     |
| 15.00        | -16.70    | -131.4    | -33.60    | 12.2      | -33.74    | 12.0      | -2.52     | 128.1     |
| 15.50        | -17.75    | -157.7    | -33.51    | 8.6       | -33.71    | 10.0      | -2.51     | 126.3     |
| 16.00        | -18.49    | 177.3     | -33.18    | 4.5       | -33.24    | 6.1       | -2.54     | 124.8     |
| 16.50        | -19.10    | -177.5    | -32.91    | 5.2       | -32.66    | 3.7       | -2.52     | 123.3     |
| 17.00        | -37.58    | 165.7     | -33.06    | 4.1       | -32.88    | 4.4       | -2.58     | 121.3     |
| 17.50        | -21.78    | -133.6    | -32.09    | 3.4       | -32.26    | 3.6       | -2.59     | 119.9     |
| 18.00        | -15.61    | -168.0    | -31.17    | -2.6      | -31.45    | -2.6      | -2.63     | 118.0     |
| 18.50        | -21.68    | 113.7     | -31.92    | -6.6      | -32.08    | -7.0      | -2.69     | 116.3     |
| 19.00        | -42.95    | 175.9     | -31.66    | -4.9      | -31.49    | -4.6      | -2.61     | 114.5     |
| 19.50        | -27.64    | -149.1    | -31.10    | -6.7      | -31.03    | -6.1      | -2.61     | 113.6     |
| 20.00        | -26.13    | -24.4     | -31.31    | -7.2      | -31.09    | -7.5      | -2.72     | 112.4     |
| 20.50        | -21.30    | -124.6    | -30.11    | -6.6      | -30.11    | -6.8      | -2.68     | 109.3     |
| 21.00        | -23.02    | -162.6    | -29.61    | -8.0      | -29.61    | -7.6      | -2.59     | 107.8     |
| 21.50        | -26.02    | 54.4      | -28.43    | -7.5      | -28.39    | -7.6      | -2.61     | 107.3     |
| 22.00        | -30.85    | -11.7     | -26.93    | -15.9     | -26.97    | -16.0     | -2.82     | 104.3     |
| 22.50        | -23.81    | -46.8     | -26.54    | -23.0     | -26.51    | -22.8     | -2.71     | 102.0     |
| 23.00        | -20.26    | -8.9      | -26.28    | -30.3     | -26.28    | -31.0     | -2.65     | 100.2     |
| 23.50        | -19.14    | -64.5     | -25.11    | -31.2     | -25.03    | -31.1     | -3.00     | 99.2      |
| 24.00        | -21.68    | -36.9     | -24.32    | -45.3     | -24.34    | -45.2     | -2.96     | 97.8      |
| 24.50        | -14.51    | -18.5     | -24.33    | -58.0     | -24.31    | -57.9     | -2.93     | 96.1      |
| 25.00        | -14.74    | -45.9     | -24.38    | -63.4     | -24.39    | -63.2     | -3.02     | 95.2      |
| 25.50        | -11.78    | -45.7     | -24.82    | -74.5     | -24.87    | -74.1     | -3.05     | 93.6      |

### Typical on Wafer [S] Parameters

Tamb = +25°C, Bias Conditions : VL = -6V, VH = 0V

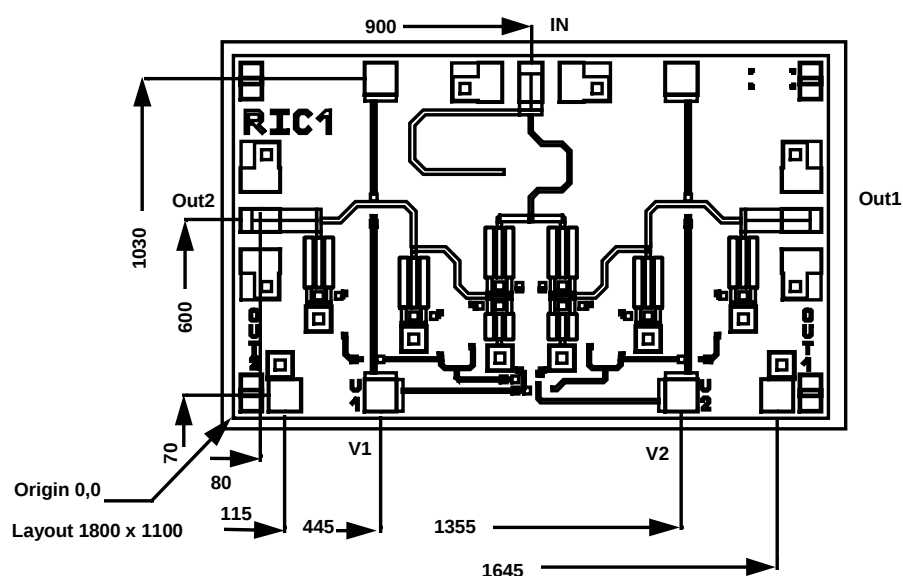




### Switch truth table (complementary logic)

| V1   | V2   | IN to Out1 | IN to Out2 |
|------|------|------------|------------|
| Low  | High | On         | Off        |
| High | Low  | Off        | On         |

### Chip Mechanical Data



| Dimensions ( $\mu\text{m}$ ) |           |        |      |
|------------------------------|-----------|--------|------|
|                              | +10       |        | +10  |
| 1920                         | -100      | x 1220 | -100 |
|                              | +10       |        |      |
| Thickness :                  | 100       |        | -10  |
| HF pads :                    | 120 x 80  |        |      |
| DC pads :                    | 100 x 100 |        |      |

## Ordering Information

Chip form: CHS5100-99F/00

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