

**Advanced Product Information**  
**September 2003** (1 of 3)

**0.5 to 18 GHz**  
**GaAs pHEMT MMIC**  
**SPDT Switch**

**Features**

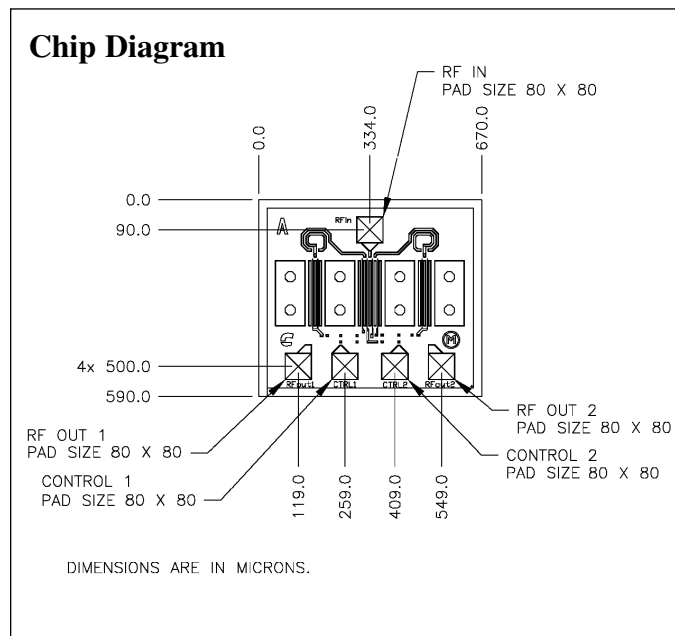
- ❑ **Broadband Coverage: 0.5 to 18.0 GHz**
- ❑ **Insertion Loss: 1.8 dB Typ. @ 10 GHz**
- ❑ **Isolation: 35 dB**
- ❑ **P1dB: +20 dBm, Typical**
- ❑ **Current Consumption: 50  $\mu$ A , Typ. with Control Voltage of -7.0V, 0.0V**
- ❑ **2 nsec Rise/Fall Time**
- ❑ **0.5  $\mu$ m pHEMT Technology**
- ❑ **Small Size: 670  $\mu$ m x 590  $\mu$ m x 76  $\mu$ m (26.4 mil x 23.2 mil x 3.0 mil)**

**Applications**

- ❑ **Radar**
- ❑ **Communications**
- ❑ **Avionics**
- ❑ **Test and Measurement**

**Description**

The CSW0118-BD is a single-pole double-throw (SPDT) GaAs pHEMT MMIC switch that covers the frequency range from 0.5 to 18 GHz. The CSW0118-BD is 80% smaller than comparable broadband FET switch MMICs offering similar performance. It has very low power consumption requirements and offers very fast switching speeds. Celeritek's 0.5  $\mu$ m pHEMT in-house GaAs process provides for excellent uniformity and high manufacturing yields.



Backside via holes are used to provide low inductance ground connections and to facilitate ease of use. Gold-plated metallization is used on both front side and backside metal. The MMIC is compatible with either eutectic or conductive epoxy die attach and either thermocompression or thermosonic wire bonding. Minimal off-chip components provides ease of use in design and manufacturing steps.

CSW0118-BD SPDT MMIC switches are shipped in Gel Pack from Celeritek's foundry.

**Specifications ( $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 0.0\text{V}$ )**

Parameters	Units	Min	Typ	Max
Frequency Range	GHz	0.5		18.0
Vp ( $V_{ds} = 3.0\text{V}$ , $I_d = 1 \text{ mA}$ )	Volts	-1.5	-1.0	-0.5
BVdg0 (100 $\mu\text{A/mm}$ )	Volts	16.0	19.0	
$I_{dss}$ ( $V_{ds} = 3.0\text{V}$ )	mA/mm		150	

**RF Specifications at Frequency ( $T_A = 25^\circ\text{C}$ )**

Parameters	@ 0.5 GHz	@ 2.0 GHz	@ 10.0 GHz	@ 18.0
Insertion Loss, dB	1.4	1.6	1.8	2.7
Isolation, dB	-40	-30	-23	-24
P-1dB, dBm	20.0	21.5	21.0	21.5
VSWR In/Out	2.5:1	1.5:1	1.5:1	1.5:1

## Absolute Maximum Ratings

Parameter	Rating
Input Power (Pin)	≥ +30 dBm
Control Voltage (Vctrl)	-10 V (min.) 0.0V (max)
Operating Channel Temperature	+150°C
Mounting Temperature	+320°C
Storage Temperature	-65°C to +150°C

## Die Attach and Bonding Procedures

**Die Attach:** Eutectic die attach is recommended. For eutectic die attach: Preform: AuSn (80% Au, 20% Sn); Stage Temperature: 290°C, ±5°C; Handling Tool: Tweezers; Time: 1 min or less.

**Wire Bonding:** Wire Size: 0.7 to 1.0 mil in diameter (pre-stressed); Thermocompression or thermosonic bonding is acceptable. For thermocompression bonding: Stage Temperature: 250°C; Bond Tip Temperature: 150°C; Bonding Tip Pressure: 18 to 40 gms depending on size of wire.

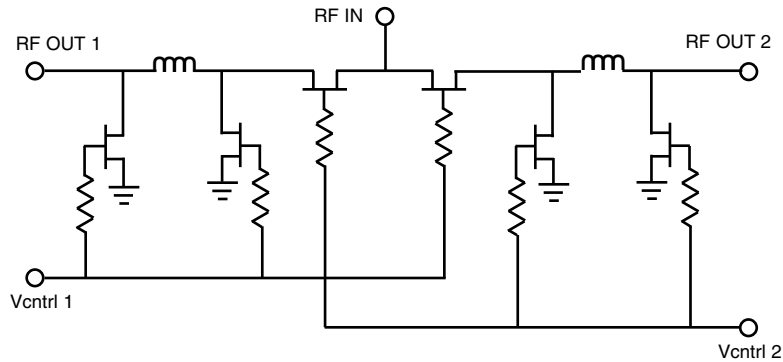
## Biasing and Operation

No voltage is required at the RF input or RF output ports to turn the switch "ON." The control voltage for the desired through path should be set to 0.0V in order to turn that leg of the switch "ON." The control voltage of the isolated path should be set to a negative voltage exceeding -1.5V (more negative than -1.5V). As the voltage of the isolated path control voltage pad is taken more negative the isolation will improve up to the voltage limit of -7.0V. See the following Truth Table for an explanation of how to set the through path and the isolated path of the switch.

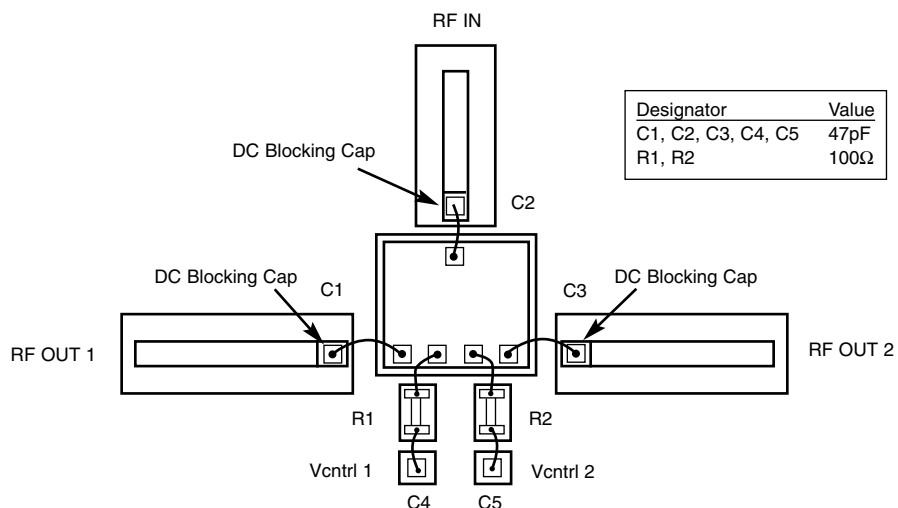
## Truth Table

Vcntrl 1	Vcntrl 2	Path 1	Path 2
-2.0V	0.0V	OFF	ON
0.0V	-2.0V	ON	OFF

## Schematic Diagram



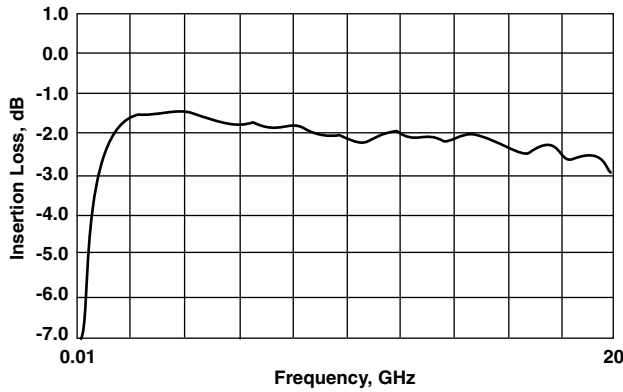
## Bonding Diagram



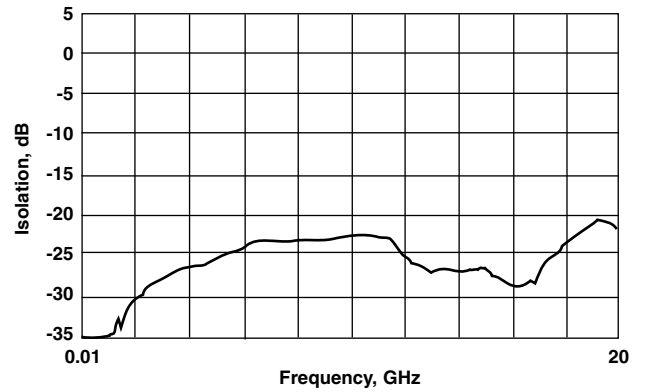


**Typical Performance**

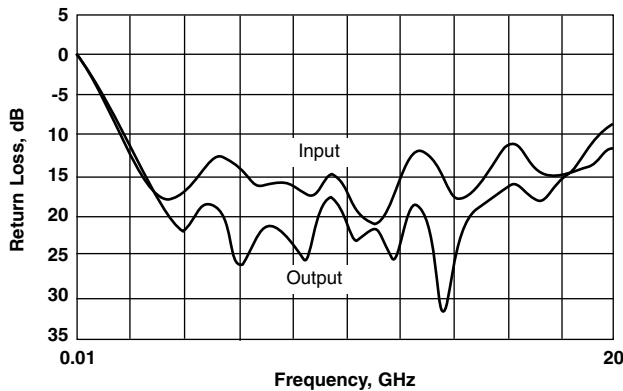
**Insertion Loss vs Frequency**



**Isolation vs Frequency**



**Input and Output Return Loss vs Frequency**



**Ordering Information**

The CSW0118-BD is available in bare die and is shipped in Gel Pak.

Part Number for Ordering

**CSW0118-BD**

Description

**Bare Die**

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