

### General Description

The GS4157/4157B is a high-bandwidth, fast single-pole double-throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. Specified over a wide operating power supply voltage range, 1.65V to 5.5V, the GS4157/4157B has a maximum ON resistance of 5.1-ohms at 1.65V, 3.9-ohms at 2.3V & 2.85-ohms at 4.5V. Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

The control input, S, tolerates input drive signals up to 5.5V, independent of supply voltage.

GS4157/4157B is an improved direct replacement for the FSA4157/NC7SB4157

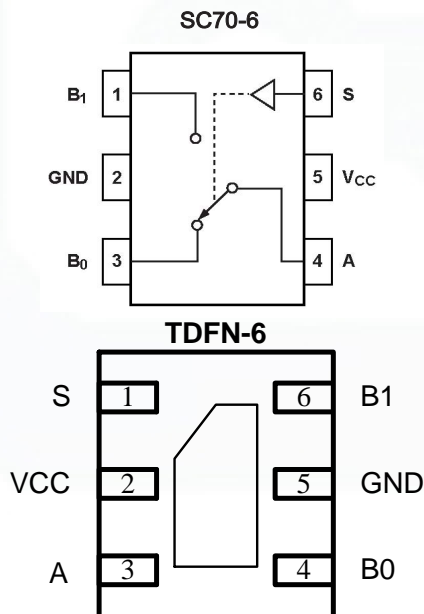
### Features

- ◆ CMOS Technology for Bus and Analog Applications
- ◆ Low ON Resistance: 3-ohms @ 2.7V
- ◆ Wide VCC Range: 1.65V to 5.5V
- ◆ Rail-to-Rail Signal Range
- ◆ Control Input Overvoltage Tolerance: 5.5V min.
- ◆ High Off Isolation: 57dB at 10MHz
- ◆ 54dB (10MHz) Crosstalk Rejection Reduces Signal Distortion
- ◆ Break-Before-Make Switching
- ◆ High Bandwidth: 300 MHz
- ◆ Extended Industrial Temperature Range: -40°C to 85°C
- ◆ Improved Direct Replacement for NC7SB4157
- ◆ Packaging (Pb-free & Green available):

### Applications

Cell Phones  
PDAs  
Portable Instrumentation  
Battery Powered Communications  
Computer Peripherals

### Connection Diagram(Top View)



### Pin Description

Name	Description
S	Logic Control
Vcc	Positive Power Supply
A	Common Output/Data Port
B0	Data Port (Normally Closed)
GND	Ground
B1	Data Port

### Logic Function Table

Logic Input (S)	Function
0	B0 Connected to A
1	B1 Connected to A

### ORDERING INFORMATION

Ordering Code	Package Description	Temp Range	Top Marking
GS4157EXT-TR	6-pin SC70	-40 °C to +85 °C	ABG
GS4157BEXT-TR	6-pin TDFN 1.45X1	-40 °C to +85 °C	ABG

### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Supply Voltage $V_{CC}$ .....	-0.5V to +7V
DC Switch Voltage ( $V_S$ ) <sup>(2)</sup> .....	-0.5V to $V_{CC} + 0.5V$
DC Input Voltage ( $V_{IN}$ ) <sup>(2)</sup> .....	-0.5V to +7.0V
DC $V_{CC}$ or Ground Current ( $I_{CC}/I_{GND}$ ).....	$\pm 100mA$
DC Output Current ( $I_{OUT}$ ).....	128mA
Storage Temperature Range ( $T_{STG}$ ).....	-65°C to +150°C
Junction Temperature under Bias ( $T_J$ ).....	150°C
Junction Lead Temperature ( $T_L$ ).....	
(Soldering, 10 seconds).....	260°C
Power Dissipation ( $P_D$ ) @ +85°C.....	180mW

### RECOMMENDED OPERATING CONDITIONS<sup>(3)</sup>

Supply Voltage Operating ( $V_{CC}$ ).....	1.65V to 5.5V
Control Input Voltage ( $V_{IN}$ ).....	0V to $V_{CC}$
Switch Input Voltage ( $V_{IN}$ ).....	0V to $V_{CC}$
Output Voltage ( $V_{OUT}$ ).....	0V to $V_{CC}$
Operating Temperature ( $T_A$ ).....	-40°C to +85°C
Thermal Resistance ( $\theta_{JA}$ ).....	350°C/W

Note 1: Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.

Note 2: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

Note 3: Control input must be held HIGH or LOW; it must not float.

### DC ELECTRICAL CHARACTERISTICS ( $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ )

Parameter	Description	Test Conditions	Supply Voltage	Temp (°C)	Min.	Typ	Max.	Units
$V_{IAR}$	Analog Input Signal Range		$V_{CC}$	$T_A = 25^\circ\text{C}$ & $-40^\circ\text{C}$ to $85^\circ\text{C}$	0		$V_{CC}$	V
$R_{ON}$	ON Resistance <sup>(4)</sup>	$I_{out} = 100mA$ , $B_0$ or $B_1 = 1.5V$	2.7V	$T_A = 25^\circ\text{C}$		3	4.5	$\Omega$
$R_{ON}$	ON Resistance <sup>(4)</sup>	$I_{out} = 100mA$ , $B_0$ or $B_1 = 3.5V$	4.5V	$T_A = 25^\circ\text{C}$			3	$\Omega$
$\Delta R_{ON}$	ON Resistance Match Between Channels <sup>(4,5,6)</sup>	$I_{out} = 100mA$ , $B_0 = B_1 = 1.5V$	2.7V	$T_A = 25^\circ\text{C}$			0.75	$\Omega$
$R_{ONF}$	ON Resistance <sup>(4,5,7)</sup> Flatness	$I(A) = -100mA$ ; $B_0$ or $B_1 = 0V, 1.5V, 1.5V$	2.7V	$T_A = 25^\circ\text{C}$			1.5	$\Omega$
$R_{ONF}$	ON Resistance <sup>(4,5,7)</sup> Flatness	$I(A) = -100mA$ ; $B_0$ or $B_1 = 0V, 1.5V, 3.0V,$	4.5V	$T_A = 25^\circ\text{C}$			0.5	$\Omega$
$V_{IH}$	Input High Voltage	Logic High Level	$V_{CC} = 1.65V$ to $1.95V$	$T_A = 25^\circ\text{C}$ & $-40^\circ\text{C}$ to $85^\circ\text{C}$	1.5			V
			$V_{CC} = 2.3V$ to $5.5V$		1.7			
$V_{IL}$	Input Low Voltage	Logic Low Level	$V_{CC} = 1.65V$ to $1.95V$				0.5	V
			$V_{CC} = 2.3V$ to $5.5V$				0.8	

### DC ELECTRICAL CHARACTERISTICS (TA = -40°C to +85°C)

I <sub>IN</sub>	Input Leakage Current	0 ≤ V <sub>IN</sub> ≤ 5.5V	V <sub>CC</sub> = 0V to 5.5V	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40°C to 85°C		μA
				Min.	Typ.	Min.	Max.	
I <sub>OFF</sub>	OFF State Leakage Current	A=1V, 4.5V, B0 or B1=4.5V, 1V	V <sub>CC</sub> = 5.5V	-2.0				2.0
I <sub>CC</sub>	Quiescent Supply Current	All channels ON or OFF, V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	V <sub>CC</sub> = 5.5V	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40°C to 85°C		1
								10

Note 4: Measured by voltage drop between A and B pins at the indicated current through the device. ON resistance is determined by the lower of the voltages on two ports (A or B)

Note 5: Parameter is characterized but not tested in production.

Note 6: DR<sub>ON</sub> = R<sub>ON</sub> max – R<sub>ON</sub> min. measured at identical V<sub>CC</sub>, temperature and voltage levels.

Note 7: Flatness is defined as difference between maximum and minimum value of ON resistance over the specified range of conditions..

Note 8: Guaranteed by design.

### CAPACITANCE<sup>(12)</sup>

Parameter	Description	Test Conditions	Supply Voltage	Temp (°C)	Min.	Typ	Max.	Units	
C <sub>IN</sub>	Control Input		V <sub>CC</sub> = 5.0V	T <sub>A</sub> = 25°C		2.3		pF	
C <sub>IO-B</sub>	For B Port, Switch OFF	f = 1 MHz <sup>(12)</sup>					6.5		
C <sub>IOA-ON</sub>	For A Port, Switch ON						18.5		

### SWITCH AND AC CHARACTERISTICS

Parameter	Description	Test Conditions	Supply Voltage	Temp (°C)	Min.	Typ	Max.	Units
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay: A to B <sub>n</sub>	See test circuit diagrams 1 and 2. V <sub>I</sub> Open <sup>(10)</sup>	V <sub>CC</sub> = 2.3V to 2.7V	T <sub>A</sub> = 25°C & -40 to 85°C		1.2		
			V <sub>CC</sub> = 3.0V to 3.6V			0.8		
			V <sub>CC</sub> = 4.5V to 5.5V			0.3		
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Turn ON Time: A to B <sub>n</sub>	diagrams 1 & 2. See test circuit V <sub>I</sub> = 2V <sub>CC</sub> for T <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 1.65V to 1.95V	T <sub>A</sub> = 25°C	7		23	ns
			V <sub>CC</sub> = 2.3V to 2.7V		3.5		13	
			V <sub>CC</sub> = 3.0V to 3.6V		2.5		6.9	
			V <sub>CC</sub> = 4.5V to 5.5V		1.7		5.2	
t <sub>PZL</sub> t <sub>PZH</sub>	OUTPUT ENABLE TURN NOTIME: A TO B <sub>N</sub>	See test circuit diagrams 1 and 2. V <sub>I</sub> = 2V <sub>CC</sub> for T <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = 25°C & -40 to 85°C			24	
			V <sub>CC</sub> = 3.3V				14	
			V <sub>CC</sub> = 3.0V to 3.6V				7.6	
			V <sub>CC</sub> = 4.5V to 5.5V				5.7	

t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Turn OFF Time: A to Bn	See test circuit diagrams 1 and 2. V <sub>I</sub> = 2V <sub>CC</sub> for t <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 1.65V to 1.95V	T <sub>A</sub> = 25°C	3	12.5	
			V <sub>CC</sub> = 2.3V to 2.7V		2	7	
			V <sub>CC</sub> = 3.0V to 3.6V		1.5	5	
			V <sub>CC</sub> = 4.5V to 5.5V		0.8	3.5	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Turn OFF Time: A to Bn	See test circuit diagrams 1 and 2. V <sub>I</sub> = 2V <sub>CC</sub> for t <sub>PZL</sub> , V <sub>I</sub> = 0V for t <sub>PZH</sub>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = -40 to 85°C		13	
			V <sub>CC</sub> = 3.3V			7.5	
			V <sub>CC</sub> = 3.0V to 3.6V			5.3	
			V <sub>CC</sub> = 4.5V to 5.5V			3.8	
t <sub>BM</sub>	Break Before Make Time	See test circuit diagram 9. <sup>(9)</sup>	V <sub>CC</sub> = 2.5V	T <sub>A</sub> = 25°C & -40 to 85°C	0.5		
			V <sub>CC</sub> = 3.3V		0.5		
			V <sub>CC</sub> = 3.0V to 3.6V		0.5		
			V <sub>CC</sub> = 4.5V to 5.5V		0.5		
Q	Charge Injection	C <sub>L</sub> = 0.1nF, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω. See test circuit 4.	V <sub>CC</sub> = 5.0V	T <sub>A</sub> = 25°C		7	pC
			V <sub>CC</sub> = 3.3V			3	
OIRR	Off Isolation	R <sub>L</sub> = 50Ω, V <sub>GEN</sub> = 0V, R <sub>GEN</sub> = 0Ω. See test circuit 5. <sup>(11)</sup>	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		-57	dB
X <sub>TALK</sub>	Crosstalk Isolation	See test circuit 6.	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		-54	
f <sub>3dB</sub>	-3dB Bandwidth	See test circuit 9	V <sub>CC</sub> = 1.65V to 5.5V	T <sub>A</sub> = 25°C		300	MHz

Note 6: Guaranteed by design

Note 7: Guaranteed by design but not production tested. The device contributes no other propagation delay other than the RC delay of the switch ON resistance and the 50pF load capacitance, when driven by an ideal voltage source with zero output impedance.

Note 8: Off Isolation = 20 Log<sub>10</sub> [ V<sub>A</sub> / V<sub>Bn</sub> ] and is measured in dB.

Note 9: T<sub>A</sub> = 25°C, f = 1MHz. Capacitance is characterized but not tested in production.

### TEST CIRCUITS AND TIMING DIAGRAMS

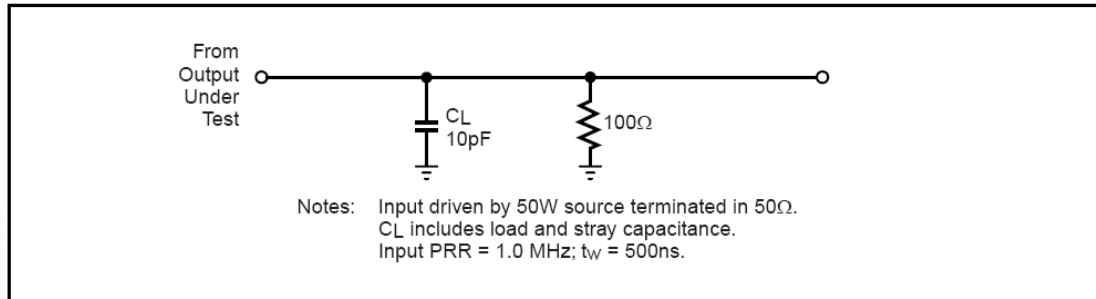


Figure 1. AC Test Circuit

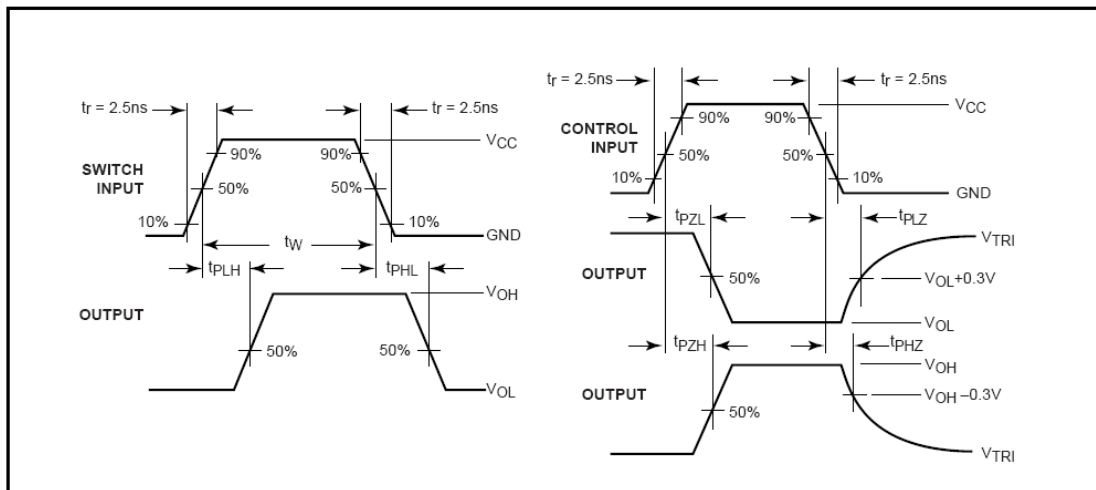


Figure 2. AC Waveforms

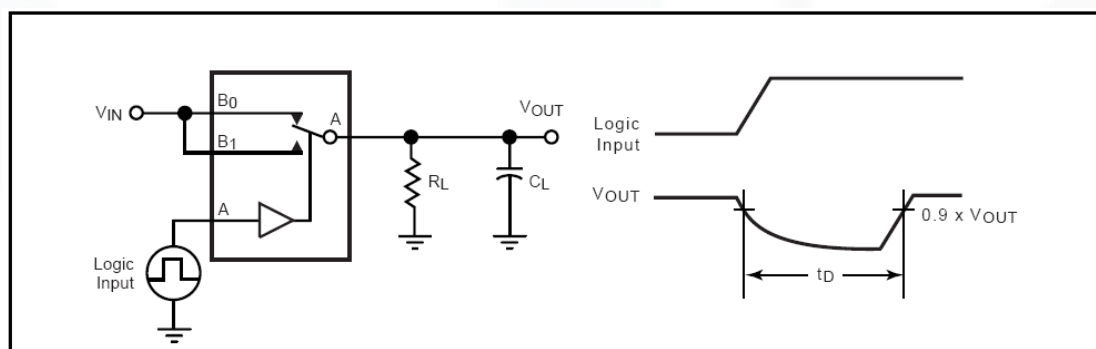


Figure 3. Break Before Make Interval Timing

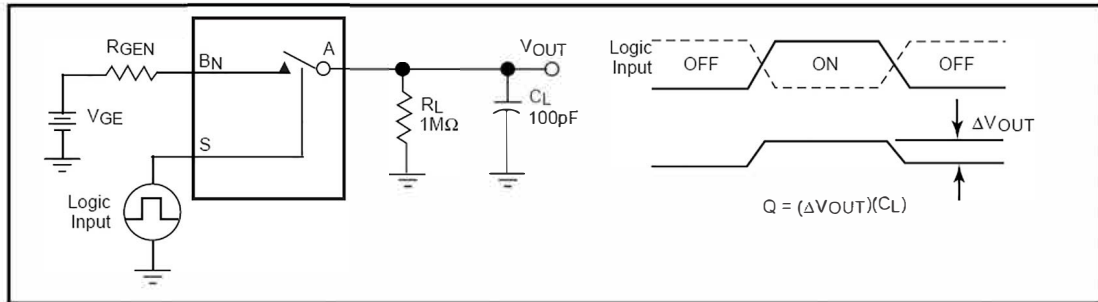


Figure 4. Charge Injection Test

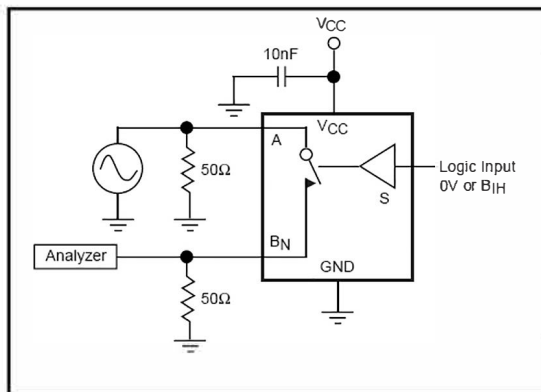


Figure 5. Off Isolation

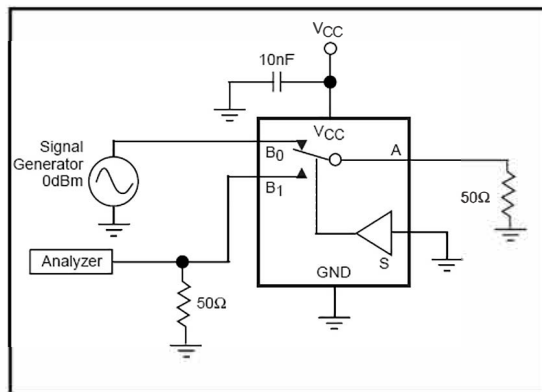


Figure 6. Crosstalk

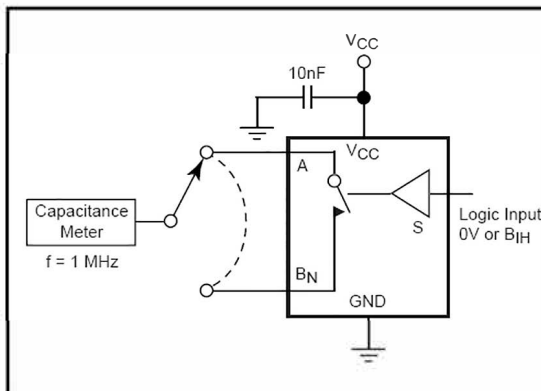


Figure 7. Channel Off Capacitance

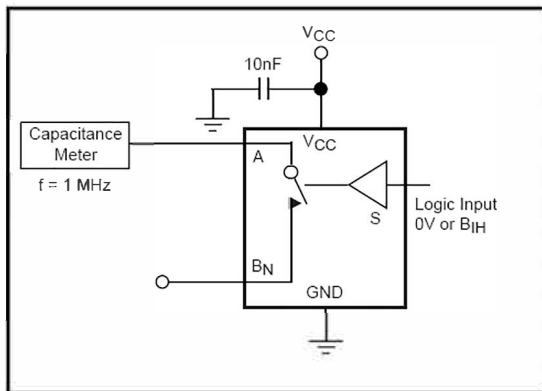


Figure 8. Channel On Capacitance

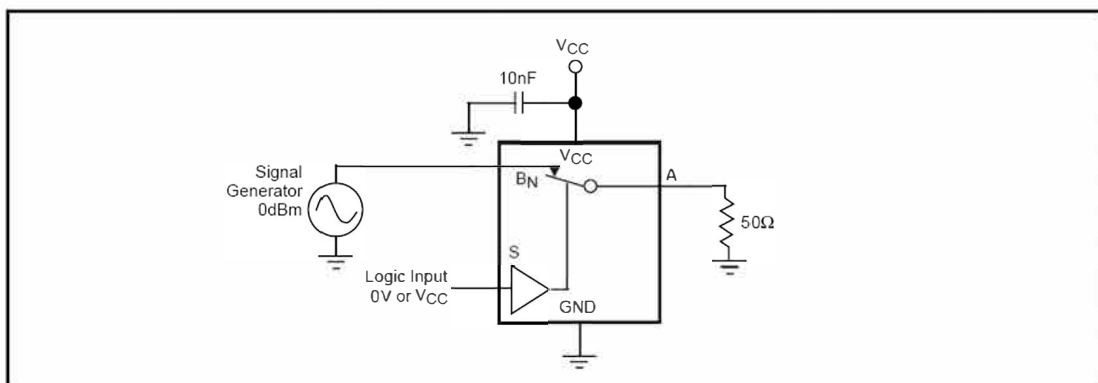
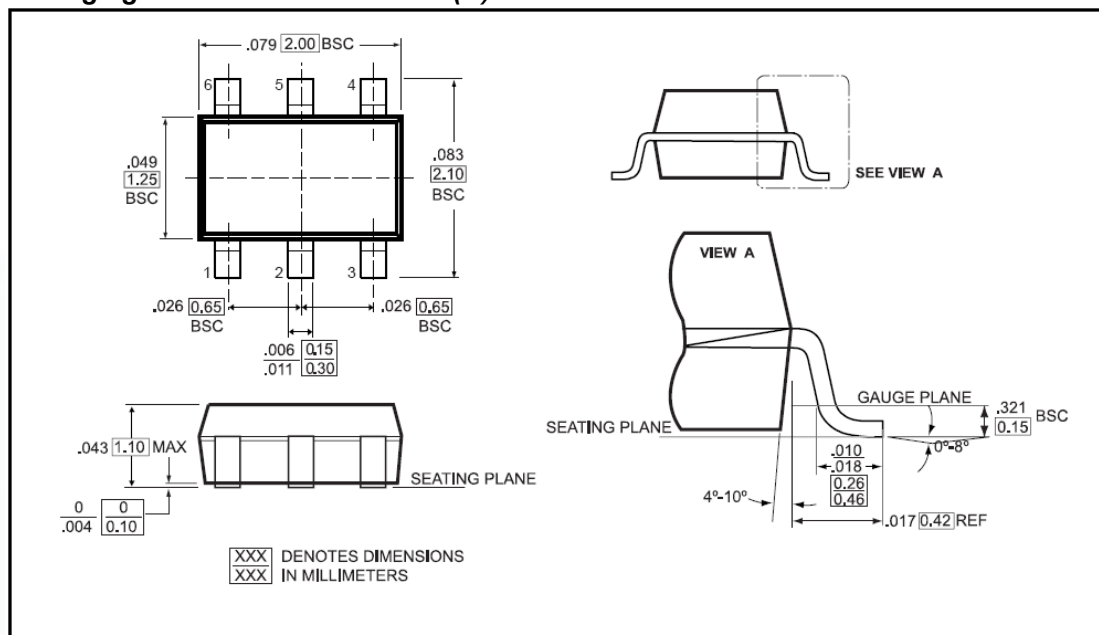
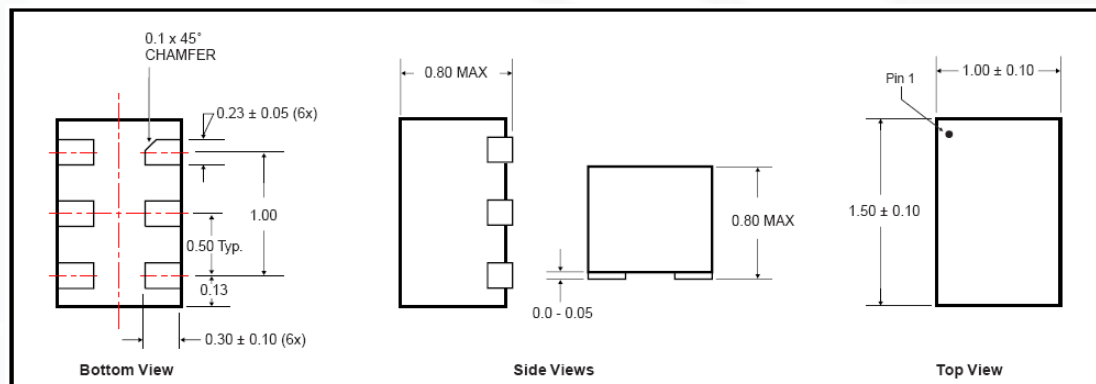


Figure 9. Bandwidth

### Packaging Mechanical: 6-Pin SC70 (C)



### Packaging Mechanical: 6-Pin TDFN



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