

December 2013

GENERAL DESCRIPTION

The HI-8190H family are quad analog CMOS switches fabricated with Silicon-on-Insulator (SOI) technology for latch-up free operation and maximum switch isolation. They are optimized for use in high temperature avionics applications. The devices are capable of operating at extended temperature ranges of -55°C to 175°C for plastic packages and -55°C to 200°C for the ceramic CERDIP-16 package.

The switch voltages can range from bipolar $\pm 3.3V$ to $\pm 15V$ or single ended from 3.3V to 15V. The logic supply can range from 3.3V to 5.0V. The HI-8190H provides four each normally open switches when the switch control inputs are Low. The HI-8191H provides four each normally closed switches when the switch control inputs are Low. The HI-8192H provides a combination of two normally On and two normally Off switches. The limits of the operating range are defined by the $V+/V-$ bias voltage (rail-to-rail switching capability).

On-resistance of each switch depends upon only the VLOGIC selection. At 5V, RON ranges from 10Ω to 17Ω while at 3.3V supply RON ranges from 10Ω to 22Ω. Each switch is designed using back to back high voltage transistors. Switch transistors are symmetrical and conduct equally well in either direction. Signal range can run the full rails. Off leakages are very low (1 nA typical) and charge injection is less than 3 pC. Switch ESD tolerance is greater than 4 KV.

The Off state is achieved first before any On condition is applied. Switching times with a 3.3V VLOGIC supply are typically 35 ns to the On state and 20 ns to the Off state.

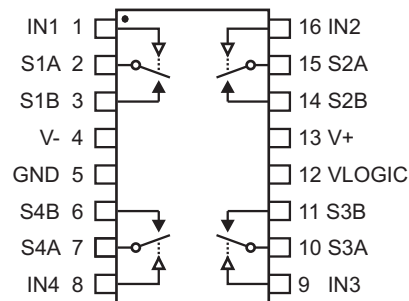
APPLICATIONS

- Down-hole drilling and oil exploration
- High temperature avionics
- Data bus isolation
- Data Acquisition Systems
- Engine controllers (FADEC)

FEATURES

- Extended Temperature Ranges
 - -55°C to 175°C (plastic packages)
 - -55°C to 200°C (ceramic CERDIP-16 package)
- $\pm 3.3V$ to $\pm 15V$ CMOS analog switches
- Low RON: 12 Ω to 15 Ω typical
- Robust CMOS Silicon-on-Insulator (SOI) technology
- SOI switch isolation with 1nA typical Off leakage
- Superior ESD protection > 4KV HBM
- Fast switching time with break-before-make
- Low power

PIN CONFIGURATIONS (Top Views)

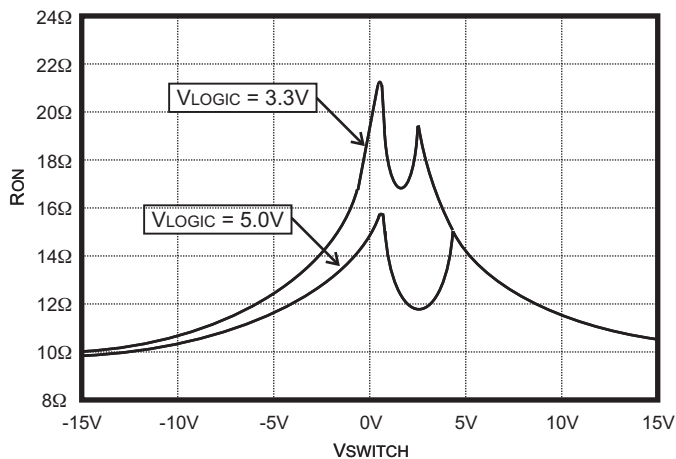


HI-8190PSH, 16-Pin SOIC

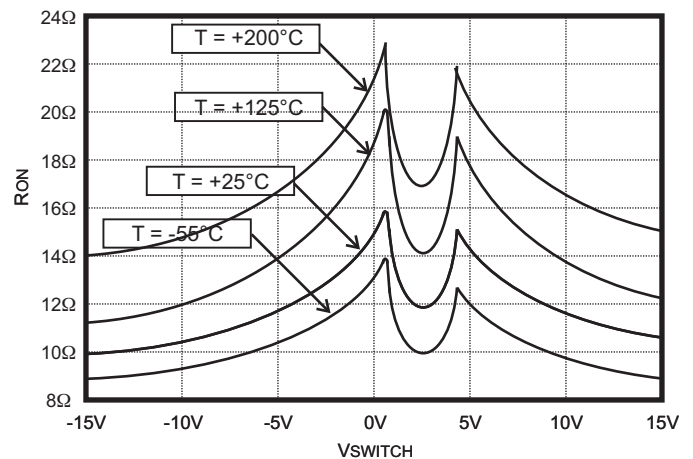
PRODUCT OPTIONS								
PART TYPE	IN1	Switch 1	IN2	Switch 2	IN3	Switch 3	IN4	Switch 4
HI-8190H	0	Open	0	Open	0	Open	0	Open
	1	Closed	1	Closed	1	Closed	1	Closed
HI-8191H	0	Closed	0	Closed	0	Closed	0	Closed
	1	Open	1	Open	1	Open	1	Open
HI-8192H	0	Open	0	Closed	0	Closed	0	Open
	1	Closed	1	Open	1	Open	1	Closed

PIN DESCRIPTIONS

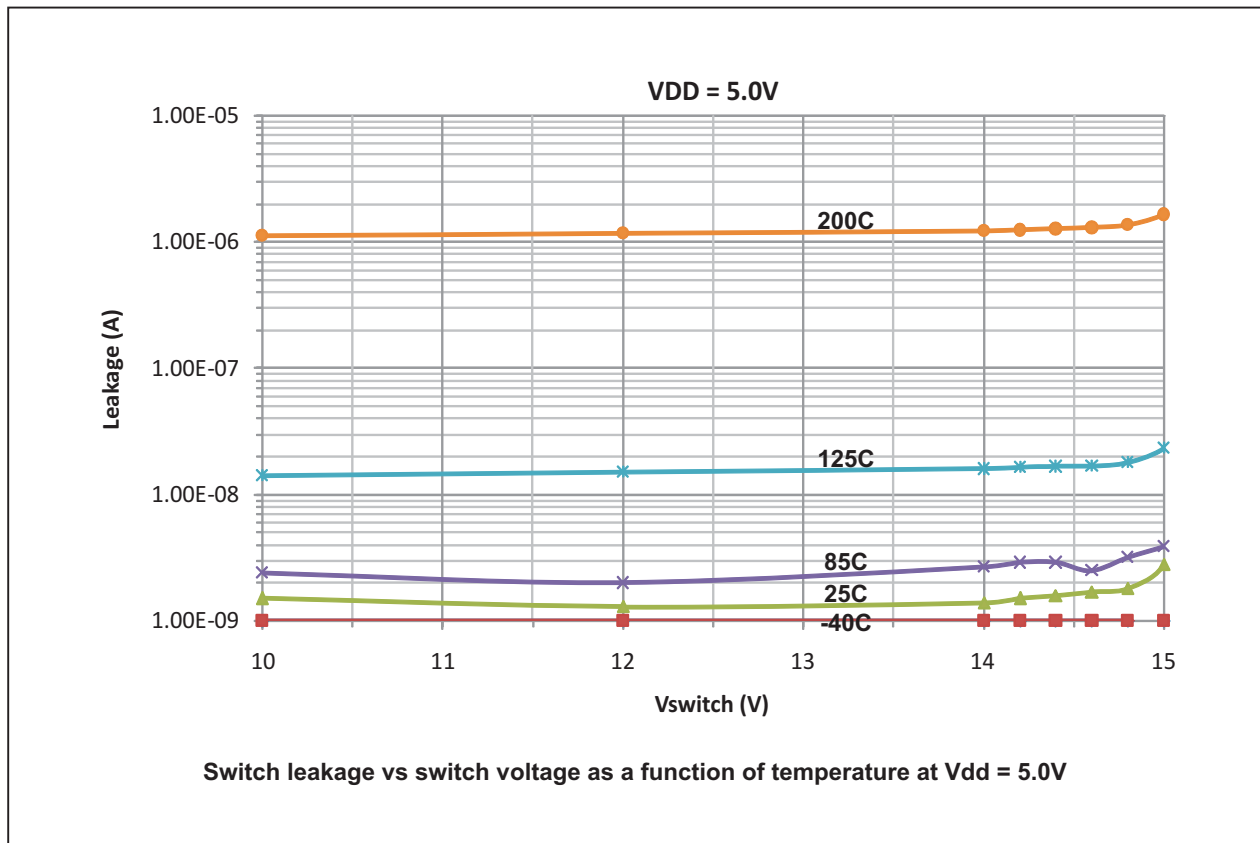
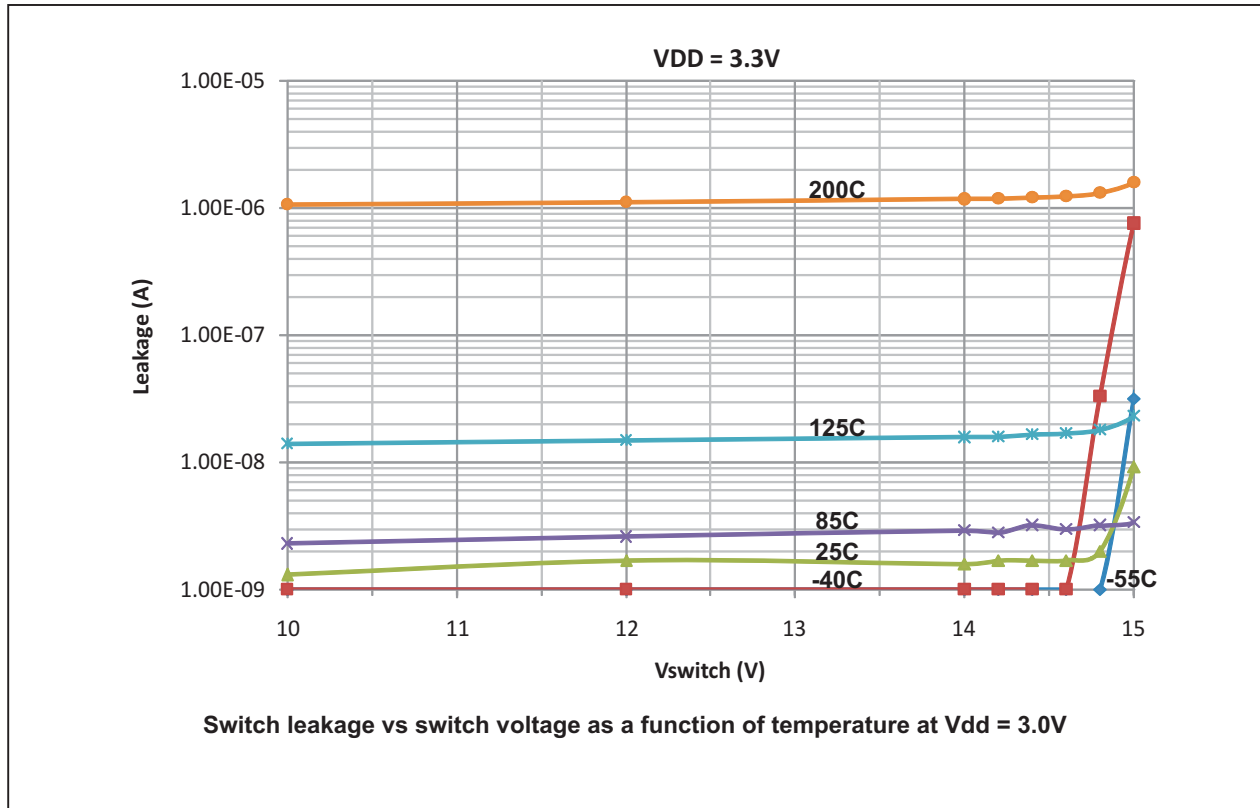
SIGNAL	FUNCTION	DESCRIPTION
IN1	Logic Input	HI-8190H and HI-8192H are normally Open when input Low
S1A	Switch Node	Switch 1 Node
S1B	Switch Node	Switch 1 Node
V-	Supply	Negative supply for Bipolar configuration. GND for Unipolar use
GND	Supply	Reference Ground
S4B	Switch Node	Switch 4 Node
S4A	Switch Node	Switch 4 Node
IN4	Logic Input	HI-8190H and HI-8192H are normally Open when input Low
IN3	Logic Input	HI-8191H and HI-8192H are normally Closed when input Low
S3A	Switch Node	Switch 3 Node
S3B	Switch Node	Switch 3 Node
VLOGIC	Supply	3.3V or 5.0V Logic supply
V+	Supply	Positive supply for Bipolar and Unipolar configurations
S2B	Switch Node	Switch 2 Node
S1B	Switch Node	Switch 2 Node
IN2	Logic input	HI-8191H and HI-8192H are normally Closed when input Low



Typical RON as a function of VLOGIC and VSWITCH
(10mA switch current, 25°C)



Typical RON as a function of VSWITCH and Temperature (10mA switch current)
VLOGIC = 5V



ABSOLUTE MAXIMUM RATINGS

(Voltages referenced to GND = 0V)

Supply Voltage, V+ :	16.5V	Operating Temperature Range: (Plastic)	-55°C to +175°C	
Supply Voltage, V- :	-16.5V		(Ceramic)	-55°C to +200°C
Supply Voltage, V _{LOGIC} :	5.5V	Storage Temperature Range:	-65°C to +150°C	
Switch Current (either direction, DC):	20mA		Reflow Soldering Temperature:	+260°C Max.
Peak Switch Current (1 ms pulse, 10% duty cycle max.):	100mA			
Digital Input Voltage (IN1-4):	-0.3V to V _{LOGIC} + 0.3V			

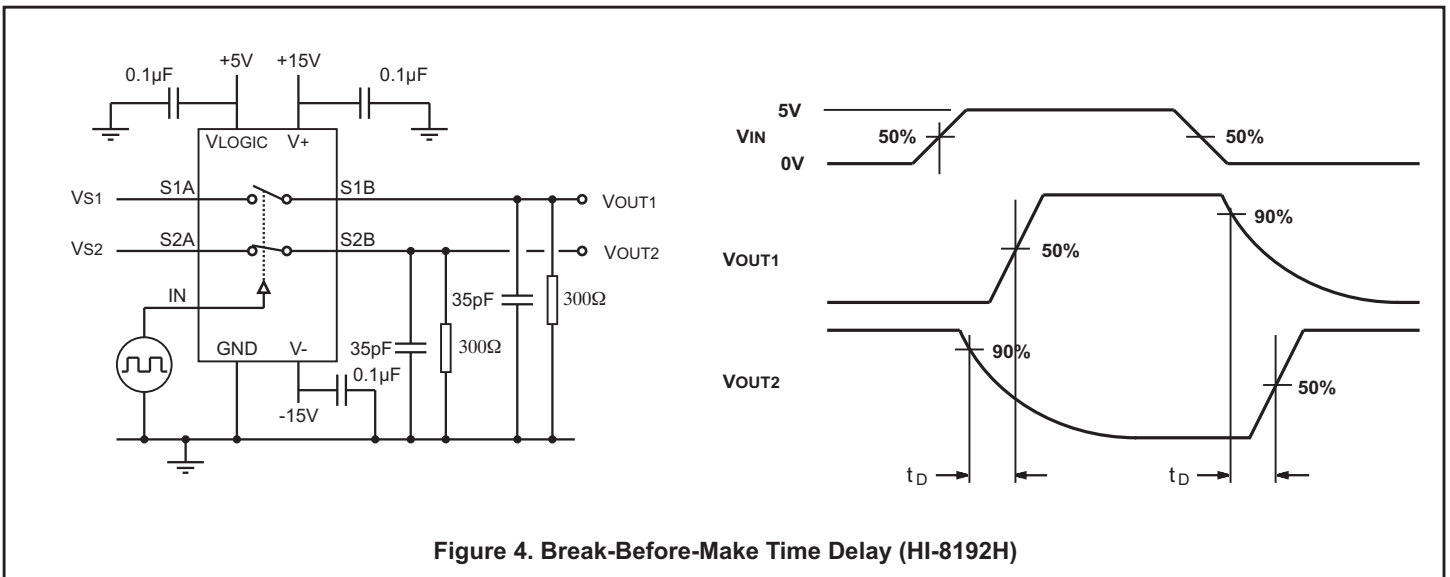
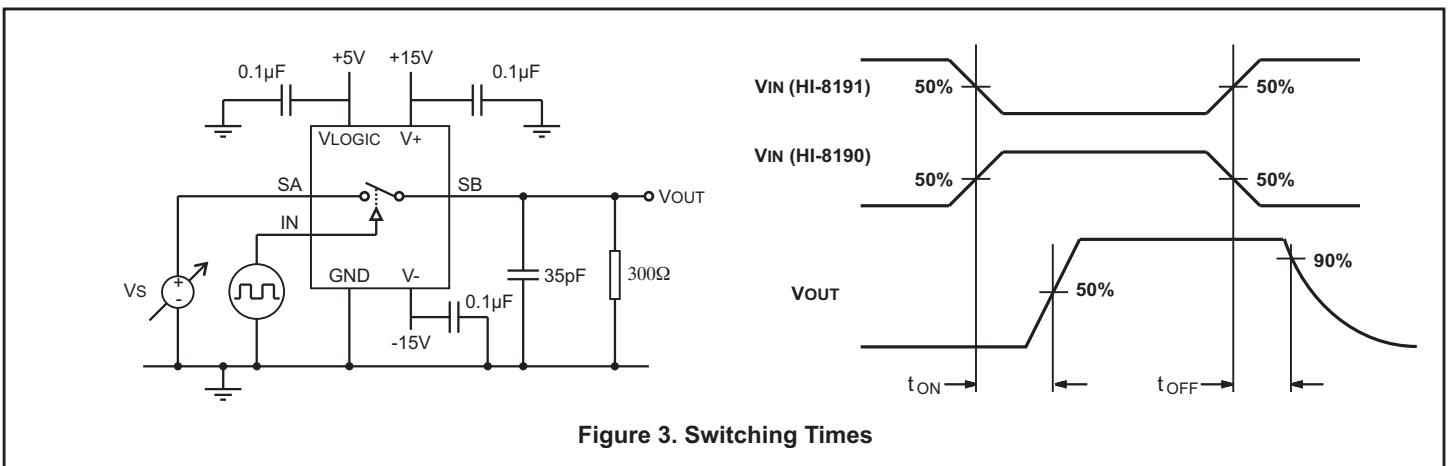
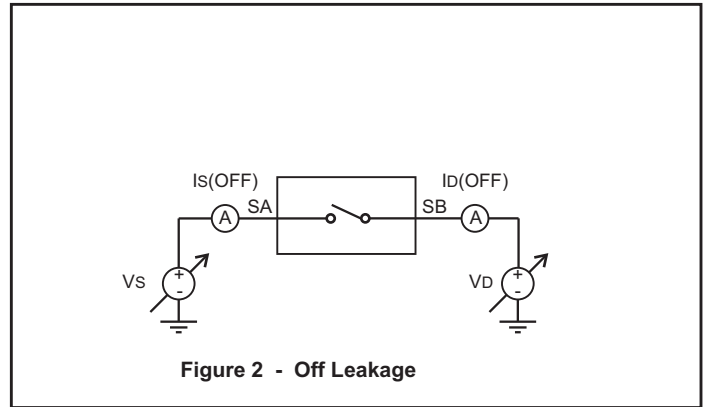
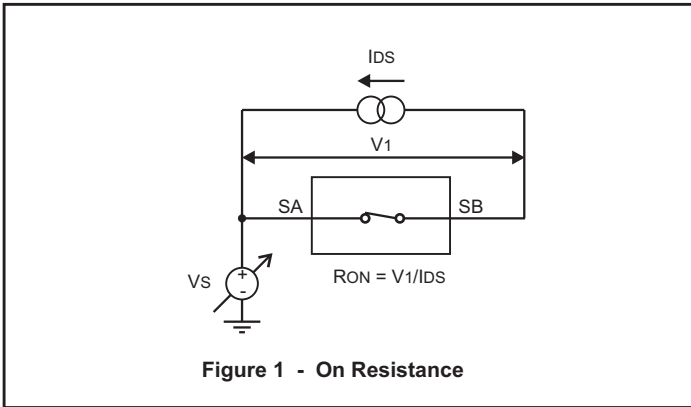
NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

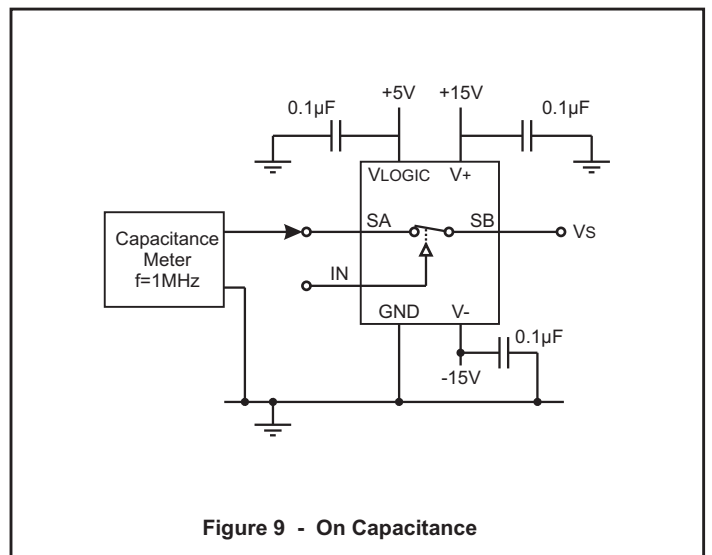
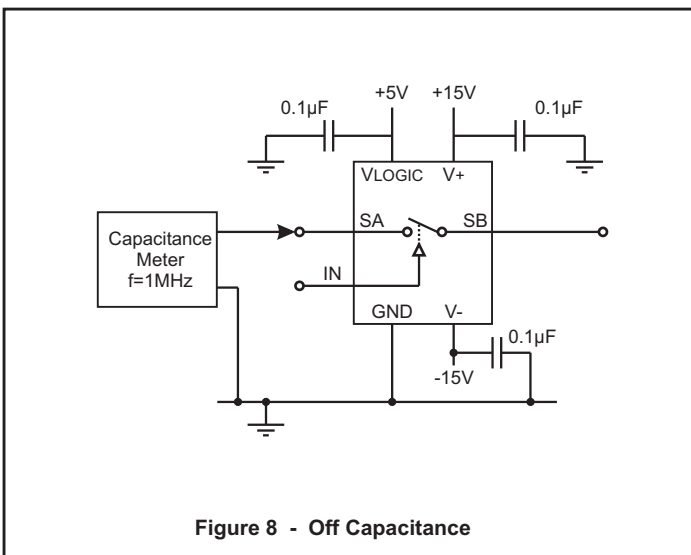
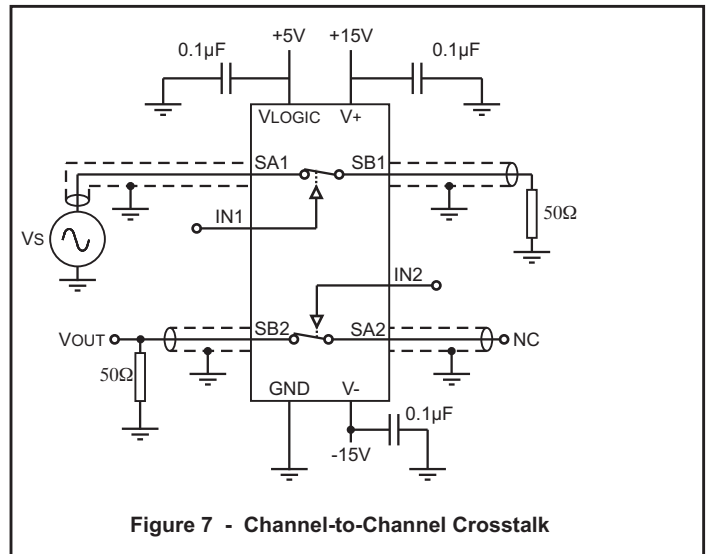
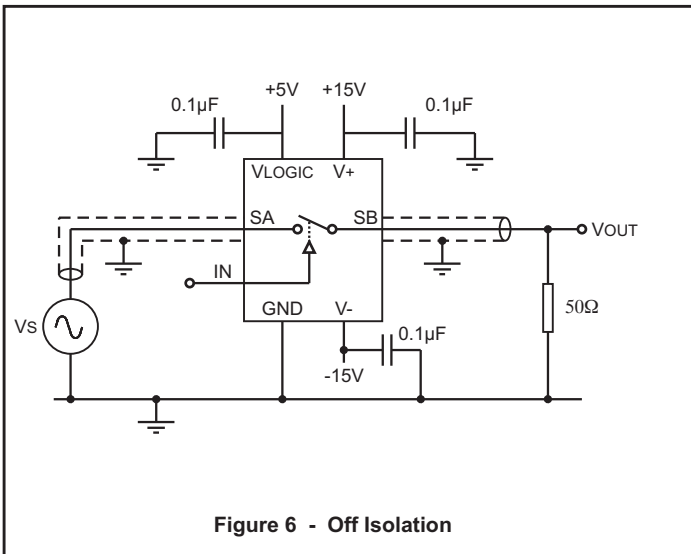
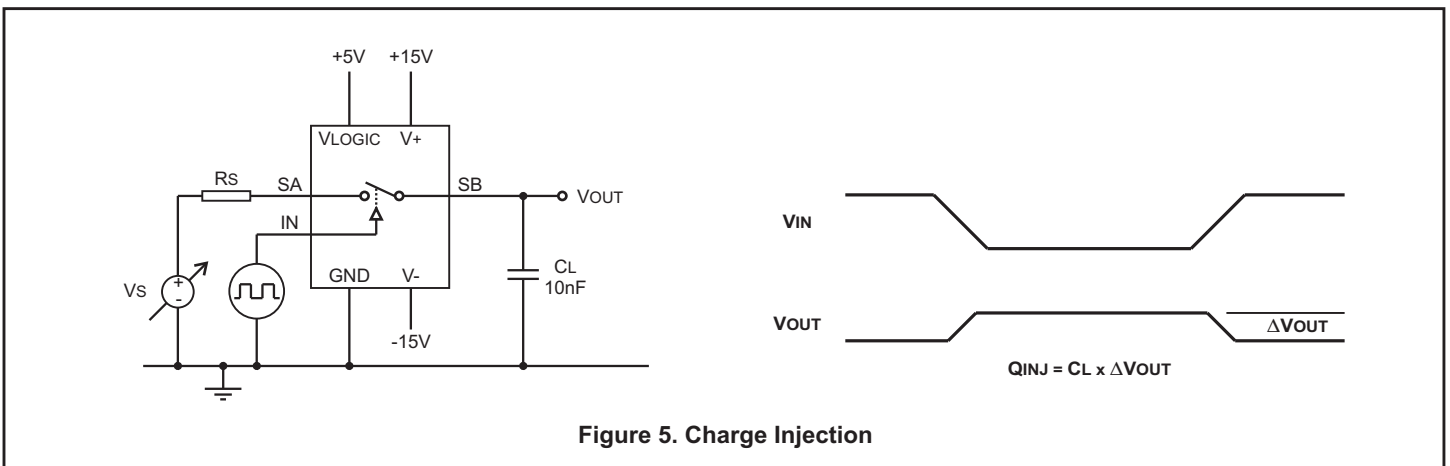
ELECTRICAL CHARACTERISTICS

V+ = 15V, V- = -15V, GND = 0V. Operating temperature range (unless otherwise noted).

PARAMETER	SYMBOL	CONDITIONS	FIGURE	V _{LOGIC} = 3.3V			V _{LOGIC} = 5.0V			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SWITCH PARAMETERS										
Switch Signal Range	V _{RANGE}						-15		+15	V
Switch Resistance	R _{ON}	25°C, 10mA -55°C to +125°C, 10mA	1	10	22	10		17		Ω
			1	8	26	8		26		Ω
Leakage	I _{SWLEAK}	Switch voltage ± 15V, 25°C	2		5			5		nA
			2		20			20		nA
			2		5			5		μA
			2		150			150		nA
		Switch voltage ± 15V, 125°C	2							
		Switch voltage ± 15V, 200°C	2							
		Switch voltage ± 15V, -55°C	2							
LOGIC INPUTS										
Input High Voltage	V _{IH}			70			70			%V _{LOGIC}
Input Low Voltage	V _{IL}					30			30	%V _{LOGIC}
Input Current	I _{IN}	V _{IN} = 0V or V _{IN} =V _{LOGIC}		-0.5		0.5	-0.5		0.5	μA
SUPPLY										
V _{LOGIC} Current	I _{DD1}	Any state				2.0			4.0	μA
V+ Current	I _{DD2}	Any state				2.0			2.0	μA
V- Current	I _{EE}	Any state		-2.0			-2.0			μA
DYNAMIC PARAMETERS										
Turn On Time	T _{ON}	V+/V- = ±10V, 25°C V _S = ±10V, -55°C to +125°C	3		55			35		ns
			3		75		55		ns	
Turn Off time	T _{OFF}	V+/V- = ±10V, 25°C V _S = ±10V, -55°C to +125°C	3		35			20		ns
			3		40		25		ns	
Break-Before-Make Time	T _D	10V signal, 25°C 10V signal, -55°C to +125°C	4		8			8		ns
			4	4		4		ns		
Charge Injection	Q	V _S =0V, R _S =0Ω, 25°C	5		4			4		pC
Off Isolation	R _R	f = 1 MHz, 25°C	6		65			65		dB
Crosstalk	C _R	f = 1 MHz, 25°C	7		90			90		dB
Capacitance	C _{OFF} C _{ON}	Switch Off, 25°C Switch On, 25°C	8		5			5		pF
			9		20		20		pF	

TEST CIRCUITS





FREQUENCY RESPONSE

Figure 10 shows a typical frequency response.

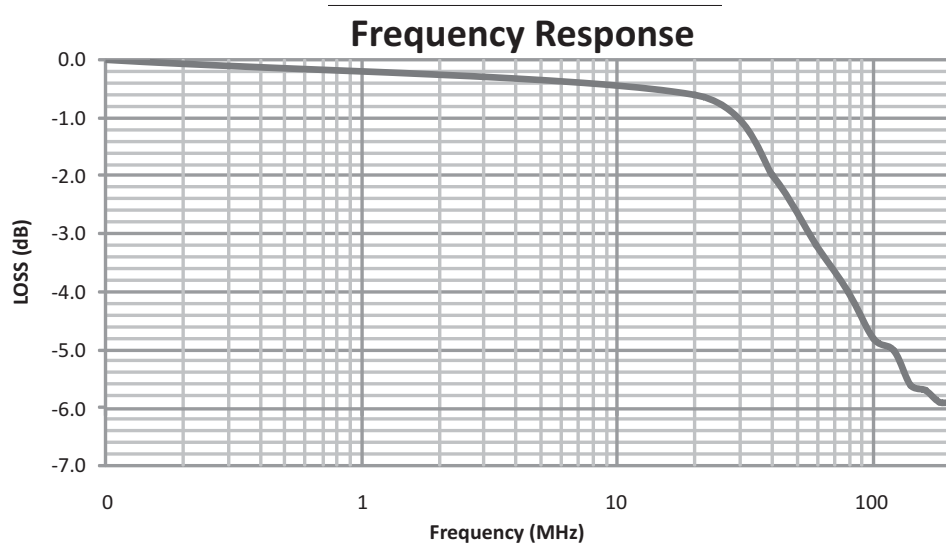


Figure 10. Frequency Response.

ORDERING INFORMATION

HI - 819x PS H F

PART NUMBER	LEAD FINISH
F	100% Matte Tin (Pb-free, RoHS compliant)

PART NUMBER	PACKAGE DESCRIPTION
PS	16 PIN PLASTIC NARROW BODY SOIC (16HN): -55°C to +175°C.

PART NUMBER	FUNCTION
8190	QUAD SWITCH, NORMALLY OPEN
8191	QUAD SWITCH, NORMALLY CLOSED
8192	QUAD SWITCH, TWO NORMALLY OPEN, TWO NORMALLY CLOSED

HI - 819x CR H

PART NUMBER	PACKAGE DESCRIPTION
CR	16 PIN CERDIP (16D) not available Pb-free : -55°C to +200°C.

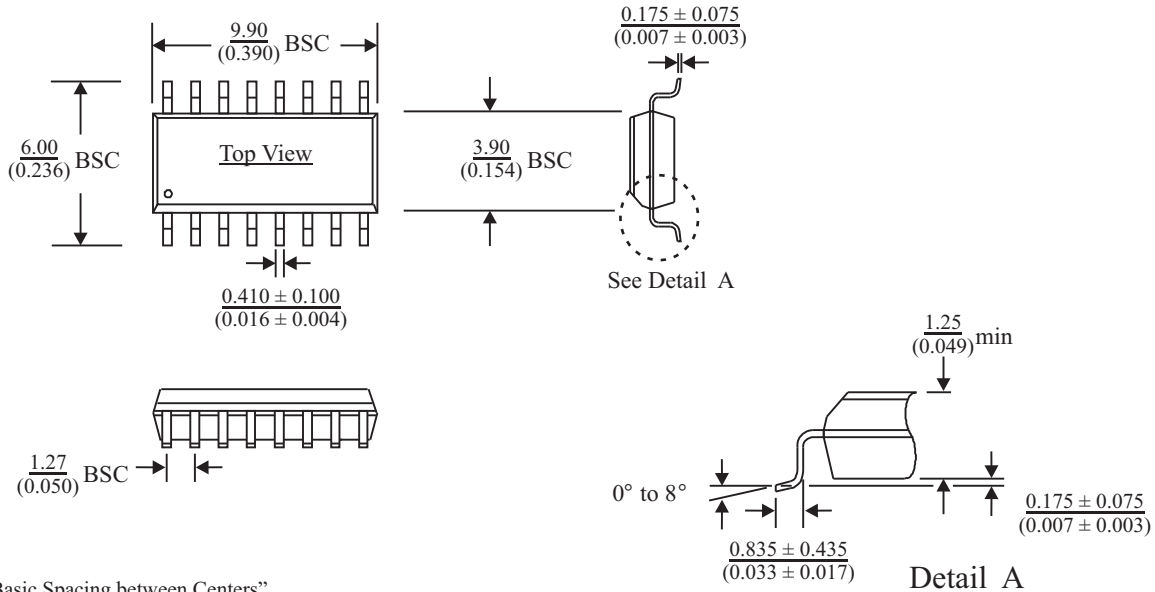
PART NUMBER	FUNCTION
8190	QUAD SWITCH, NORMALLY OPEN
8191	QUAD SWITCH, NORMALLY CLOSED
8192	QUAD SWITCH, TWO NORMALLY OPEN, TWO NORMALLY CLOSED

REVISION HISTORY

P/N	Rev	Date	Description of Change
DS8190H	New	07/23/13	Initial release
	A	12/05/13	Add leakage vs switch voltage as a function of temperature curves. Update 16-pin SOIC package drawing.

16-PIN PLASTIC SMALL OUTLINE (SOIC) - NB
(Narrow Body)

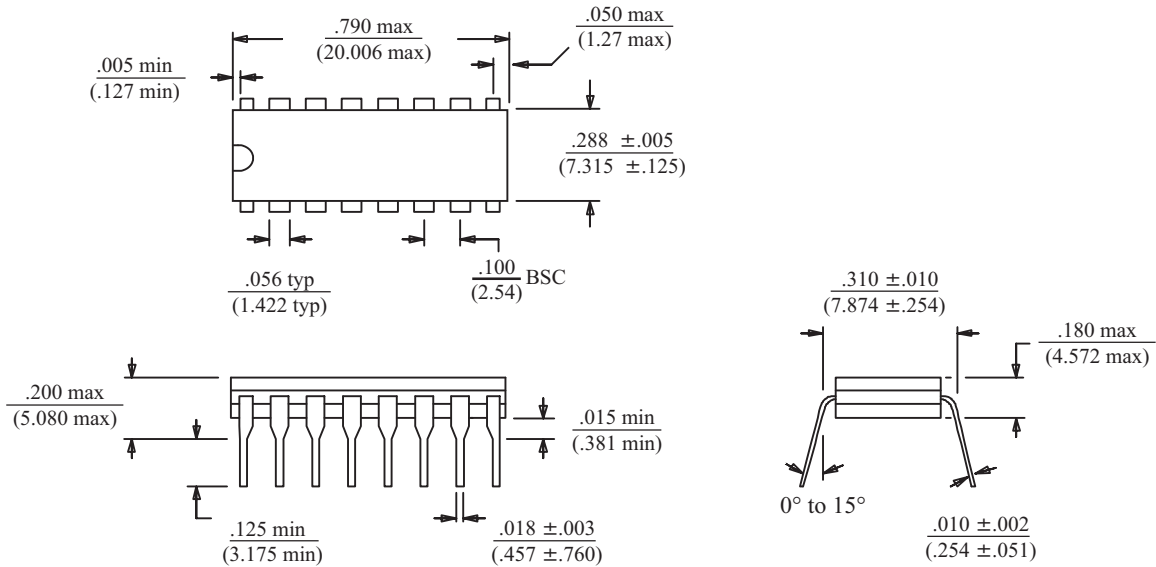
millimeters (inches)
Package Type: 16HN



BSC = "Basic Spacing between Centers"
is theoretical true position dimension and
has no tolerance. (JEDEC Standard 95)

16-PIN Cerdip

inches (millimeters)
Package Type: 16D



BSC = "Basic Spacing between Centers"
is theoretical true position dimension and
has no tolerance. (JEDEC Standard 95)