

# HI-8195, HI-8196, HI-8197

## 28Ω QUAD SPST ANALOG SWITCH

### Open Circuit when Power Off

## GENERAL DESCRIPTION

The HI-8195 is a quad analog CMOS switch fabricated with Silicon-on-Insulator (SOI) technology for latch-up free operation and maximum switch isolation. These switches are ideally suited for applications demanding low switch leakage when the power pins are 0V.

The logic supply (VLOGIC) can be independently set from 2.5V to 5V without changing the switch resistance (RON). With V+/V- set at +/-15V and a signal range from +5V to -5V, the RON maximum is 28Ω at 25°C and the maximum deviation from flat is typically less than 10%.

These switches conduct equally well in either direction. Power down and Off state leakages are less than 10nA maximum. Charge injection is less than 10pC. Switching times with a 3.3V VLOGIC supply are typically 55ns to the On state and 35ns to the Off state.

The HI-8195 provides four each normally open switches when the switch control inputs are low. The HI-8196 provides four each normally closed switches when the switch control inputs are low. The HI-8197 provides a combination of two normally closed and two normally open switches.

Industry-standard plastic package options include 16-pin SOIC, DIP and QFN. Ceramic packaging is available on request. All three products are offered in both industrial (-40°C to +85°C) and extended (-55°C to +125°C) temperature range options.

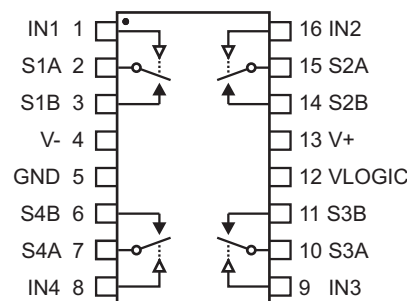
## APPLICATIONS

- Avionics
- Data bus isolation
- Sample-and-Hold circuits
- Test Equipment
- Communications Systems

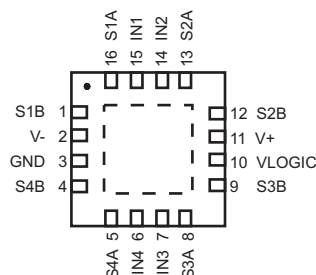
## FEATURES

- CMOS analog switches with up to +/-10V Common Mode Range
- 28 Ω max at 25°C with Common Mode < +/-5V
- Robust CMOS Silicon-on-Insulator (SOI) technology
- Switch nodes are open-circuit when chip is powered down
- SOI switch isolation with 1nA typical Off leakage
- Superior ESD protection > 4KV HBM
- Fast switching time with break-before-make
- Low power
- Extended Temperature Range (-55°C to +125°C)

## PIN CONFIGURATIONS (Top Views)



**HI-8195PSx, HI-8195PDx**  
16-Pin SO or DIP package

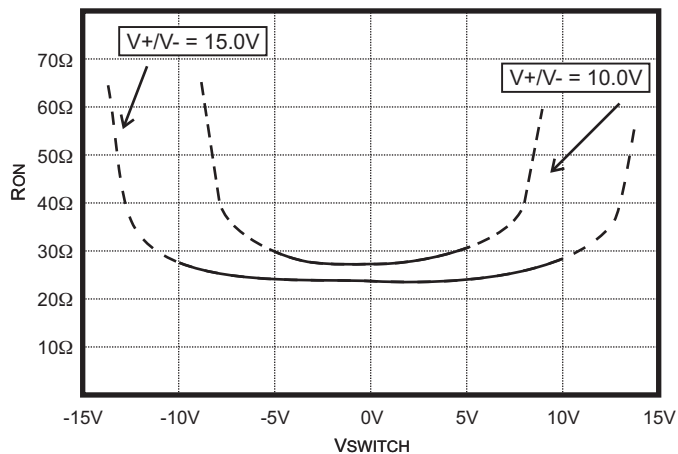


**HI-8195PCx**  
16-pin 5mm x 5mm Chip-scale package

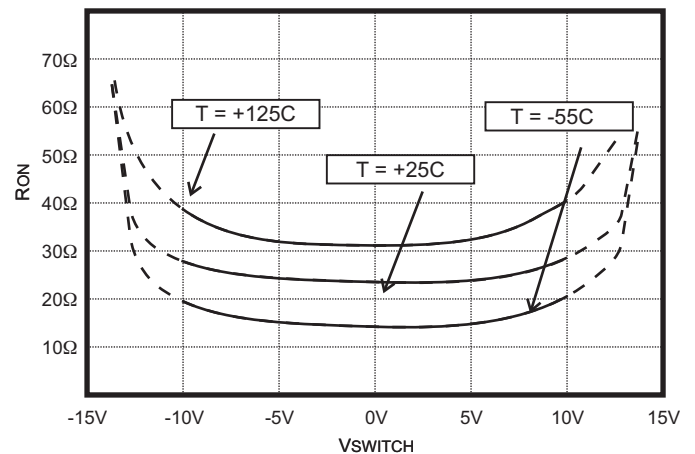
| PRODUCT OPTIONS |     |          |     |          |     |          |     |          |
|-----------------|-----|----------|-----|----------|-----|----------|-----|----------|
| PART TYPE       | IN1 | Switch 1 | IN2 | Switch 2 | IN3 | Switch 3 | IN4 | Switch 4 |
| HI-8195         | 0   | Open     | 0   | Open     | 0   | Open     | 0   | Open     |
|                 | 1   | Closed   | 1   | Closed   | 1   | Closed   | 1   | Closed   |
| HI-8196         | 0   | Closed   | 0   | Closed   | 0   | Closed   | 0   | Closed   |
|                 | 1   | Open     | 1   | Open     | 1   | Open     | 1   | Open     |
| HI-8197         | 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-8195 and HI-8197 are normally Open when input Low   |
| S1A    | Switch Node | Switch 1 Node                                          |
| S1B    | Switch Node | Switch 1 Node                                          |
| V-     | Supply      | Negative supply                                        |
| GND    | Supply      | Reference Ground                                       |
| S4B    | Switch Node | Switch 4 Node                                          |
| S4A    | Switch Node | Switch 4 Node                                          |
| IN4    | Logic Input | HI-8195 and HI-8197 are normally Open when input Low   |
| IN3    | Logic Input | HI-8196 and HI-8197 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                                        |
| S2B    | Switch Node | Switch 2 Node                                          |
| S1B    | Switch Node | Switch 2 Node                                          |
| IN2    | Logic input | HI-8196 and HI-8197 are normally Closed when input Low |



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



Typical RON as a function of VSWITCH and Temperature (10mA switch current, VSUPPLY = +/-15V)

## ABSOLUTE MAXIMUM RATINGS

(Voltages referenced to GND = 0V)

|                                                                                                 |                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supply Voltage, V+: .....16.5V                                                                  | Continuous Power Dissipation (TA=70°C):<br>SO Package (derate 6.7mW/°C above 70°C).....696mW<br>Plastic DIP (derate 10.53 mW/°C above 70°C) .....842mW<br>Thin QFN (derate 21.3mW/°C above 70°C) .....1702mW |
| Supply Voltage, V-: .....-16.5V                                                                 |                                                                                                                                                                                                              |
| Supply Voltage, V <sub>LOGIC</sub> .....5.5V                                                    |                                                                                                                                                                                                              |
| Switch Current (either direction, DC): .....20mA                                                |                                                                                                                                                                                                              |
| Peak Switch Current (1 ms pulse, 10% duty cycle max.): .....100mA                               |                                                                                                                                                                                                              |
| Digital Input Voltage (IN1-4): .....-0.3V to V <sub>LOGIC</sub> + 0.3V                          | Storage Temperature Range: .....-65°C to +150°C                                                                                                                                                              |
| Operating Temperature Range: (Industrial) .....-40°C to +85°C<br>(Hi-Temp) .....-55°C to +125°C | Soldering Temperature: (Ceramic).....60 sec. at +300°C<br>(Plastic - leads).....10 sec. at +280°C<br>(Plastic - body) .....+260°C Max.                                                                       |
| Maximum Junction Temperature .....175°C                                                         |                                                                                                                                                                                                              |

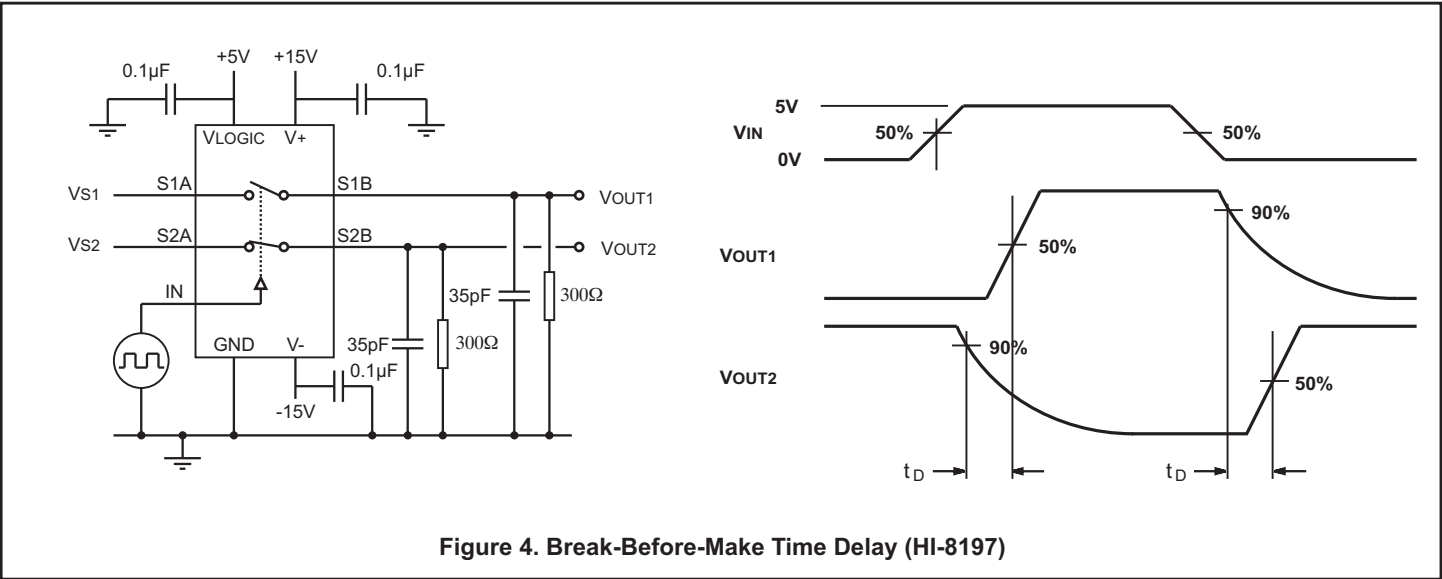
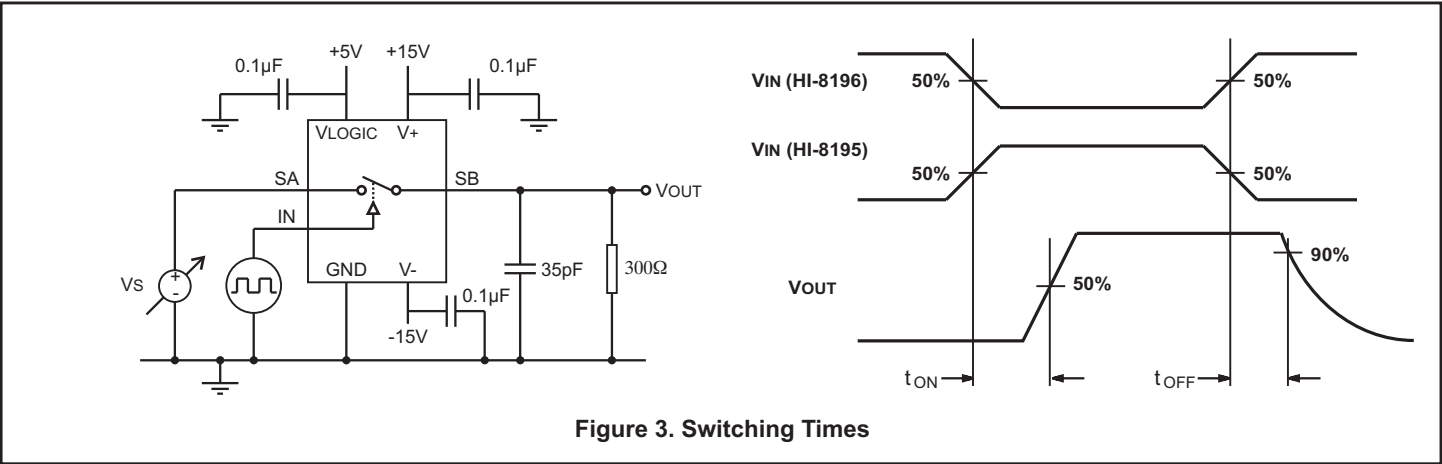
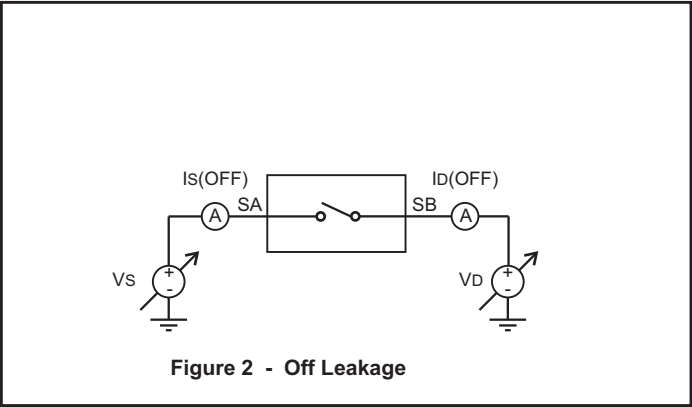
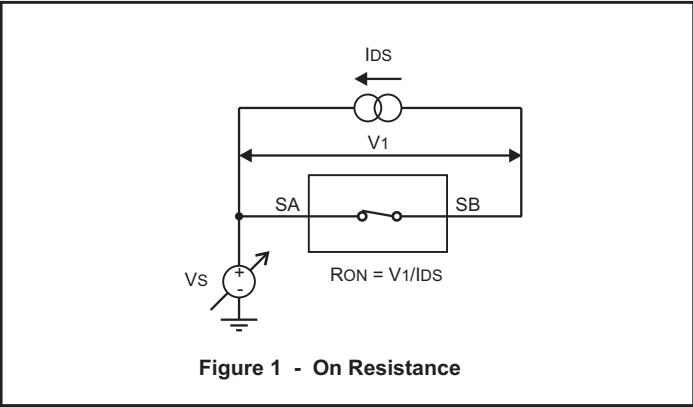
NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure 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 | VLOGIC = 3.3V |     |     | VLOGIC = 5.0V |     |     | UNIT     |
|---------------------------------------------|---------|--------------------------------------------------|--------|---------------|-----|-----|---------------|-----|-----|----------|
|                                             |         |                                                  |        | MIN           | TYP | MAX | MIN           | TYP | MAX |          |
| SWITCH PARAMETERS                           |         |                                                  |        |               |     |     |               |     |     |          |
| Switch Resistance<br>25°C, 10mA             | RON     | V+/V- = +/-15V, Vs = +/-5V                       | 1      | 18            | 24  | 28  | 18            | 24  | 28  | Ω        |
|                                             |         | V+/V- = +/-15V, Vs = +/-10V                      | 1      | 18            | 27  | 31  | 18            | 27  | 31  | Ω        |
|                                             |         | V+/V- = +/-10V, Vs = +/-5V                       | 1      | 20            | 28  | 32  | 20            | 28  | 32  | Ω        |
| Leakage<br>(open circuit and<br>power down) | ISWLEAK | Switch voltage ± 10V, 25°C                       | 2      |               |     | 5   |               |     | 5   | nA       |
|                                             | ISWLEAK | Switch voltage ± 10V, 125°                       | 2      |               |     | 20  |               |     | 20  | nA       |
|                                             | ISWLEAK | Switch voltage ± 10V, -55°C                      | 2      |               |     | 150 |               |     | 150 | nA       |
| LOGIC INPUTS                                |         |                                                  |        |               |     |     |               |     |     |          |
| Input High Voltage                          | VIH     |                                                  |        | 70            |     |     | 70            |     |     | %VLOGIC  |
| Input Low Voltage                           | VIL     |                                                  |        |               |     | 30  |               |     | 30  | %VLOGIC  |
| Input Current                               | IIN     | VIN = 0V or VIN=VLOGIC                           |        | -0.5          |     | 0.5 | -0.5          |     | 0.5 | μA       |
| SUPPLY                                      |         |                                                  |        |               |     |     |               |     |     |          |
| VLOGIC Current                              | IDD1    | Any state                                        |        |               |     | 0.5 |               |     | 0.5 | μA       |
| V+ Current                                  | IDD2    | Any state                                        |        |               |     | 0.5 |               |     | 0.5 | μA       |
| V- Current                                  | IEE     | Any state                                        |        | -0.5          |     |     | -0.5          |     |     | μA       |
| DYNAMIC PARAMETERS                          |         |                                                  |        |               |     |     |               |     |     |          |
| Turn On Time                                | TON     | V+/V- = ±10V, 25°C<br>Vs = ±10V, -55°C to +125°C | 3<br>3 |               | 55  | 75  |               | 35  | 55  | ns<br>ns |
| Turn Off time                               | TOFF    | V+/V- = ±10V, 25°C<br>Vs = ±10V, -55°C to +125°C | 3<br>3 |               | 35  | 40  |               | 20  | 25  | ns<br>ns |
| Break-Before-Make Time                      | TD      | 10V signal, 25°C<br>10V signal, -55°C to +125°C  | 4<br>4 | 4             | 8   |     | 4             | 8   |     | ns<br>ns |
| Charge Injection                            | Q       | Vs=0V, Rs=0Ω, 25°C                               | 5      |               | -10 |     |               | -10 |     | pC       |
| Off Isolation                               | RR      | f = 1 MHz, 25°C                                  | 6      |               | 65  |     |               | 65  |     | dB       |
| Crosstalk                                   | CR      | f = 1 MHz, 25°C                                  | 7      |               | 90  |     |               | 90  |     | dB       |
| Capacitance                                 | COFF    | Switch Off, 25°C                                 | 8      |               | 12  |     |               | 12  |     | pF       |
|                                             | CON     | Switch On, 25°C                                  | 9      |               | 46  |     |               | 46  |     | pF       |

TEST CIRCUITS



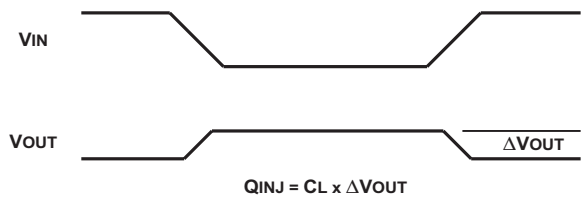
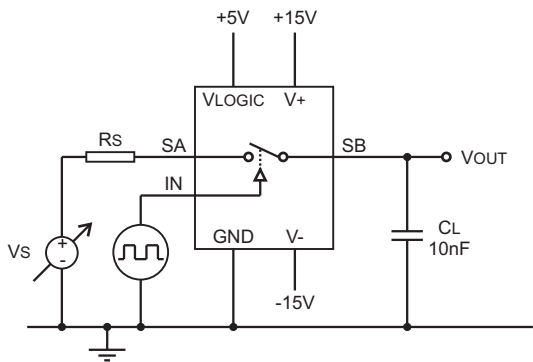


Figure 5. Charge Injection

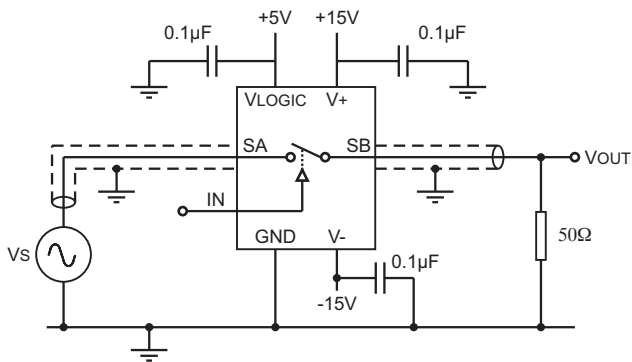


Figure 6 - Off Isolation

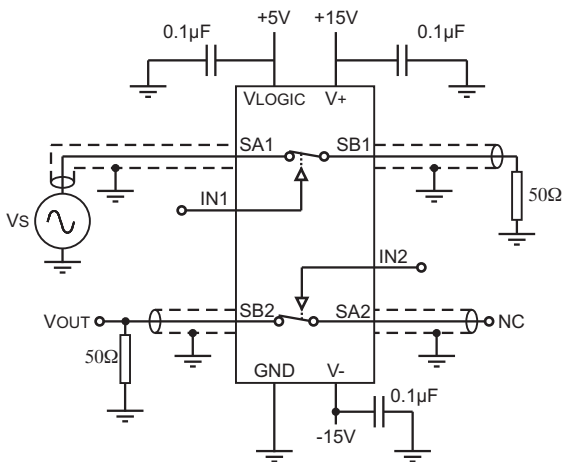


Figure 7 - Channel-to-Channel Crosstalk

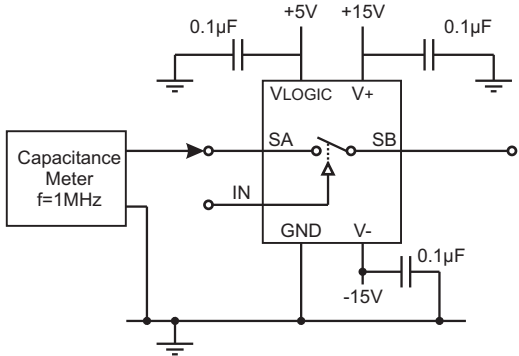


Figure 8 - Off Capacitance

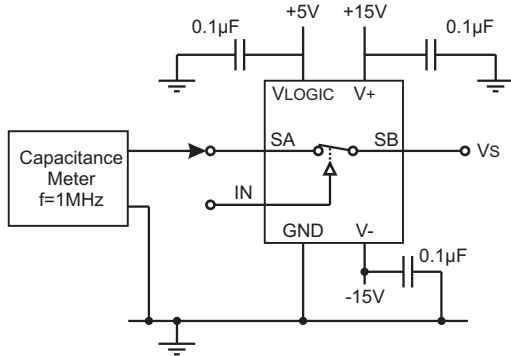


Figure 9 - On Capacitance

# FREQUENCY RESPONSE

Figure 10 shows a typical frequency response.

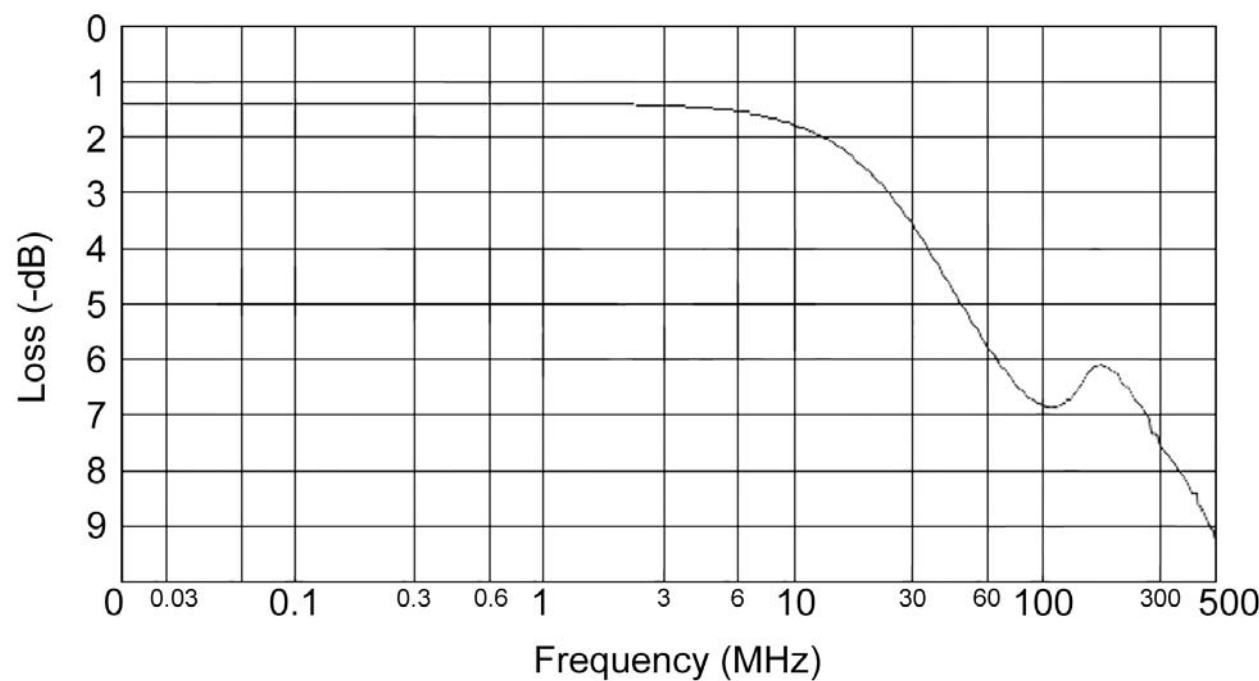


Figure 10. Frequency Response.

## ORDERING INFORMATION

HI - 819x xx x x

| PART NUMBER | LEAD FINISH                 |
|-------------|-----------------------------|
| Blank       | Tin / Lead (Sn / Pb) Solder |
| F           | Pb-free, RoHS compliant     |

| PART NUMBER | TEMPERATURE RANGE | FLOW | BURN IN |
|-------------|-------------------|------|---------|
| I           | -40°C TO +85°C    | I    | NO      |
| T           | -55°C TO +125°C   | T    | NO      |
| M           | -55°C TO +125°C   | M    | YES     |

| PART NUMBER | PACKAGE DESCRIPTION                                                   |
|-------------|-----------------------------------------------------------------------|
| PC          | 16 PIN PLASTIC 5 x 5 mm CHIP SCALE (16PCS1) (No M-flow, Pb-free only) |
| PS          | 16 PIN PLASTIC NARROW BODY SOIC (16HN)                                |
| PD          | 16 PIN PLASTIC DIP (16P)                                              |

| PART NUMBER | FUNCTION                                            |
|-------------|-----------------------------------------------------|
| 8195        | QUAD SWITCH, NORMALLY OPEN                          |
| 8196        | QUAD SWITCH, NORMALLY CLOSED                        |
| 8197        | QUAD SWITCH, TWO NORMALLY OPEN, TWO NORMALLY CLOSED |

## REVISION HISTORY

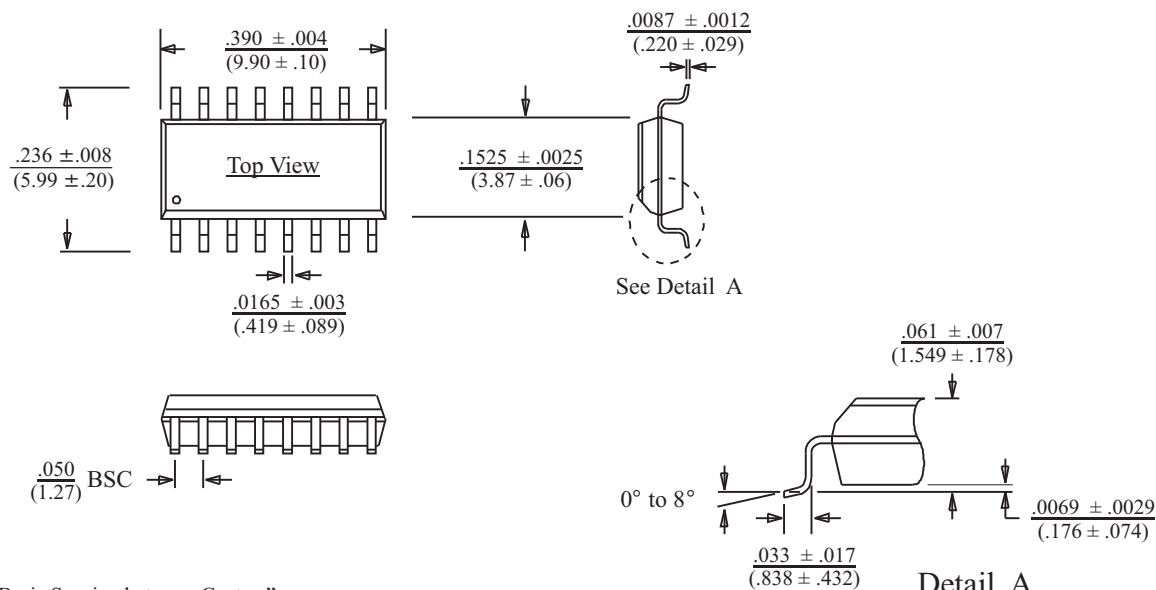
| P/N    | Rev | Date     | Description of Change         |
|--------|-----|----------|-------------------------------|
| DS8195 | New | 12/08/11 | Initial Release               |
|        | A   | 11/08/17 | Add frequency response curve. |



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

inches (millimeters)

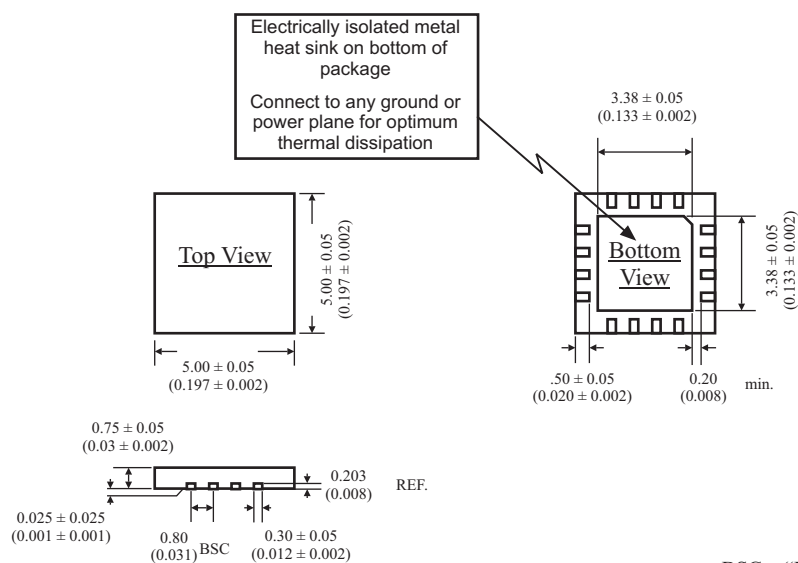
Package Type: 16HN



### 16-PIN PLASTIC CHIP-SCALE PACKAGE

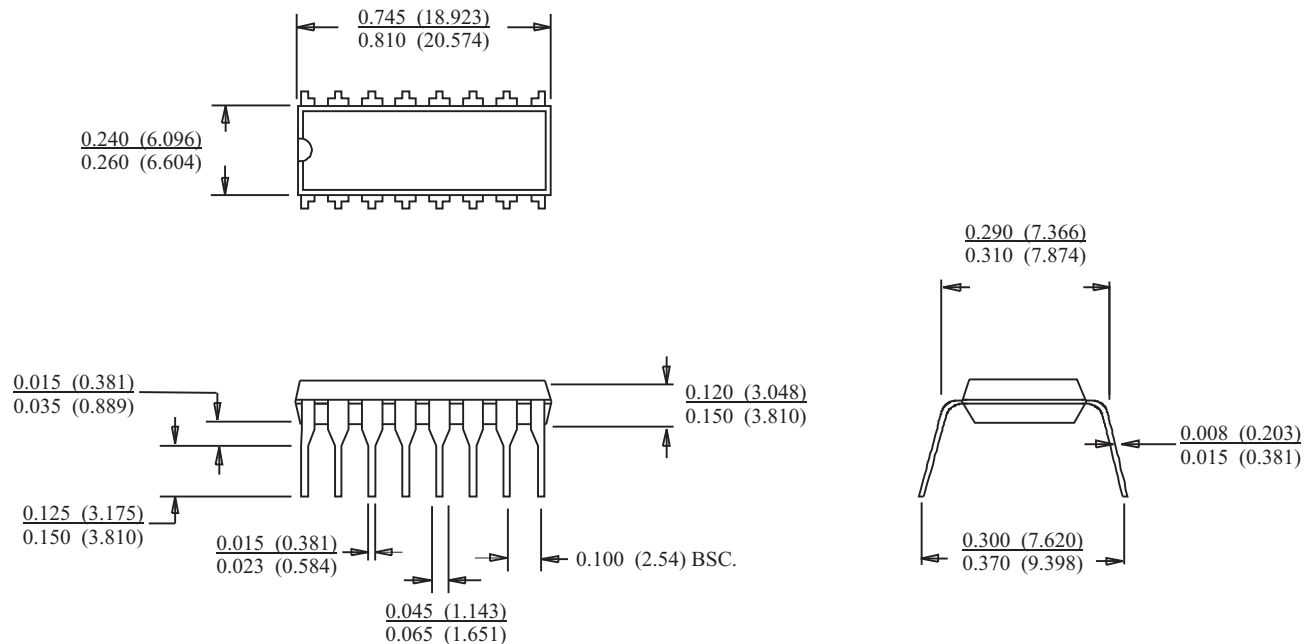
millimeters

Package Type: 16PCS1



## 16-PIN PLASTIC DIP

Package Type: 16P



*inches (millimeters)*