GS7227 High Speed USB 2.0(480Mbps) DPDT Analog Switch

General Description

The GS7227 is a high-speed, low-power double-pole/double-throw (DPDT) analog switch that operates from a single 1.8V to 5.5V power supply.

GS7227 is designed for the switching of high-speed USB 2.0 signals in handset and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers with limited USB I/Os.

The GS7227 has low bit-to-bit skew and high channel-to-channel noise isolation, and is compatible with various standards, such as high-speed USB 2.0 (480Mbps). Each switch is bidirectionalandoffers littleornoattenuationof the high-speed signals at the outputs. Its bandwidth is wide enough to pass high-speed USB 2.0 differential signals (480Mb/s) with good signal integrity.

The GS7227 contains special circuitry on the D+/D- pins which allows the device to withstand a V_{BUS} short to D+ or D- when the USB devices are either powered off or powered on.

GS7227 is available in Green UTQFN1.8×1.4-10L and MSOP10 packages. It operates over an ambient temperature range of -40°C to +85°C.

Features

- R_{ON} is Typically 5Ω at 3.0V
- Voltage Operation:1.8V to 5.5V
- Fast Switching Times:
  t_{ON} 15ns
  t_{OFF} 20ns
- Crosstalk:-30dB at 250MHz
- Off-Isolation:-35dB at 250MHz
- Rail-to-Rail Input and Output Operation
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to +85°C
- Available in Green UTQFN1.8×1.4-10L and MSOP10 Packages

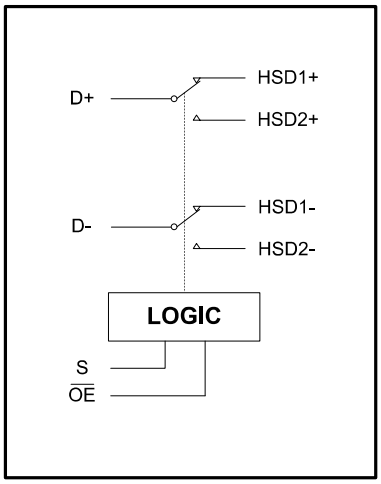
Applications

- Route Signals for USB 2.0
- MP3 and Other Personal Media Players
- Digital Cameras and Camcorders
- Portable Instrumentation
- Set-Top Box
- PDAs

Order Information

Model	PIN-PACKAGE	Ordering Number	Packing Option
GS7227	MSOP10	GS7227-MR	3000ea/Reel
	UTQFN1.8×1.4-10L	GS7227-FR	3000ea/Reel

Block Diagram

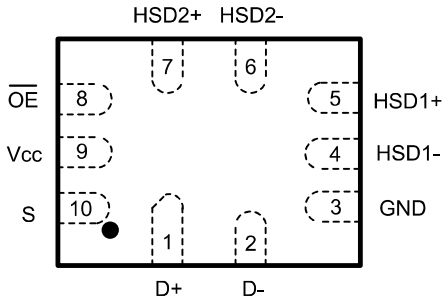


Absolute Maximum Ratings

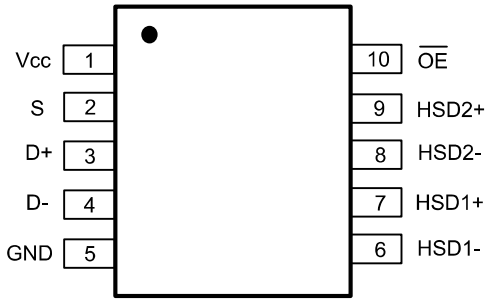
Parameter	Min.	Typ.	Max.	Unit	Note
V_{CC} to GND	0		6	V	
Analog, Digital voltage range	-0.3		V_{CC}+0.3	V	
Continuous Current HSDn or Dn	-50		+50	mA	
Peak Current HSDn or Dn	-100		+100	mA	
Operating Temperature Range	-40		+85	°C	
Junction Temperature			+150	°C	
Storage Temperature	-65		+150	°C	
Lead Temperature (soldering, 10s)			+260	°C	
ESD Susceptibility			4000V	V	HBM (UTQFN1.8×1.4-10L)
			400V	V	MM (UTQFN1.8×1.4-10L)

Note: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond 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.

Pin Description



UTQFN1.8×1.4-10L



MSOP10

Table 1 Pin Description

PIN		NAME	FUNCTION
UTQFN1.8×1.4-10L	MSOP10		
9	1	V_{CC}	Power Supply
3	5	GND	Ground
10	2	S	Select Input
8	10	$\overline{OE}$	Output Enable
5	7	HSD1+	Multiplexed Source Inputs
4	6	HSD1-	Multiplexed Source Inputs
7	9	HSD2+	Multiplexed Source Inputs
6	8	HSD2-	Multiplexed Source Inputs
1	3	D+	USB Data Bus
2	4	D-	USB Data Bus

Table 2 Function Table

$\overline{OE}$	S	HSD1+, HSD1-	HSD2+, HSD2-
0	0	ON	OFF
0	1	OFF	ON
1	×	OFF	OFF

Note: Switches Shown For Logic “0” Input.

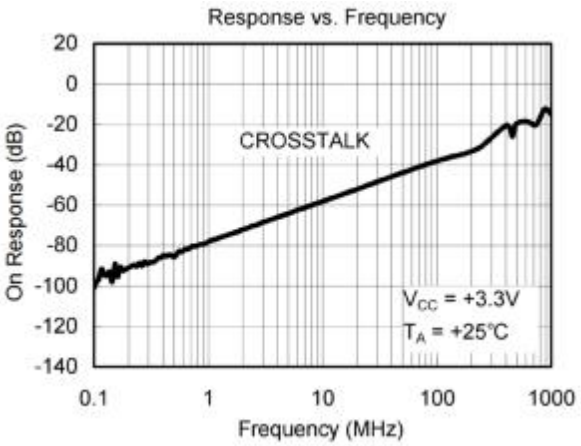
Electrical Characteristics

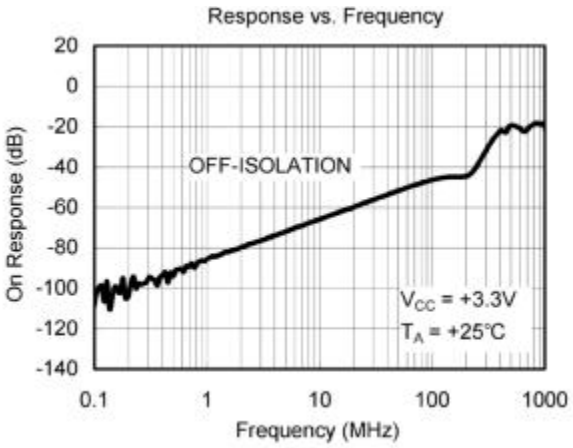
(V_{CC} = +3.3V, T_A = +25°C, unless otherwise noted.)

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Analog Switch						
Analog I/O Voltage (HSD1+, HSD1-, HSD2+, HSD2-)	V_{IS}	0		V_{CC}	V	
On-Resistance	R_{ON}		5	9	Ω	V_{CC}=3.0V, V_{IS}=0V to 0.4V, I_D=8mA, Test Circuit 1
On-Resistance Match Between Channels	ΔR_{ON}		0.3	0.8	Ω	V_{CC}=3.0V, V_{IS}=0V to 0.4V, I_D=8mA, Test Circuit 1
On-Resistance Flatness	$R_{FLAT(ON)}$		1	2	Ω	V_{CC}=3.0V, V_{IS}=0V to 1.0V, I_D=8mA, Test Circuit 1
Increase in I_{CC} per Control Voltage	I_{CCT}			5	μA	V_{CC}=3.6V, V_S, $V_{\overline{OE}}$=2.6V
Source Off Leakage Current	$I_{HSD2(OFF)}$ $I_{HSD1(OFF)}$			1	μA	V_{CC}=3.6V, V_{IS}=3.3V/0.3V, V_D=0.3V/3.3V
Channel On Leakage Current	$I_{HSD2(ON)}$ $I_{HSD1(ON)}$			1	μA	V_{CC}=3.6V, V_{IS}=3.3V/0.3V, V_D=0.3V/3.3V or floating
Digital Inputs						
Input High Voltage	V_{IH}	1.6			V	
Input Low Voltage	V_{IL}			0.5	V	
Input Leakage Current	I_{IN}			1	μA	V_{CC}=3.0V, V_S, $V_{\overline{OE}}$=0V or V_{CC}
Dynamic Characteristics						
Turn-On Time	t_{ON}			15	ns	V_{IS}=0.8V, R_L=50Ω, C_L=10pF, Test Circuit 2
Turn-Off Time	t_{OFF}			20	ns	
Break-Before-Make Time Delay	t_D			3.5	ns	V_{IS}=0.8V, R_L=50Ω, C_L=10pF, Test Circuit 3
Propagation Delay	t_{PD}			0.5	ns	R_L=50Ω, C_L=10pF
Off Isolation	O_{ISO}			-35	dB	Signal = 0dBm, R_L= 50Ω, f=250MHz, Test Circuit 4
Channel-to-Channel Crosstalk	X_{TALK}			-30	dB	Signal = 0dBm, R_L= 50Ω, f=250MHz, Test Circuit 5
–3dB Bandwidth	BW			550	MHz	Signal = 0dBm, R_L= 50Ω, C_L=5pF, Test Circuit 6

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Channel-to-Channel Skew	t_{SKEW}			130	ps	R_L= 50Ω, C_L=10pF
Charge Injection Select Input to Common I/O	Q			10	pC	V_G=GND, C_L=1.0nF, R_G=0Ω, Q=$C_{LX}V_{OUT}$, Test Circuit 7
HSD+, HSD-, D+, D- ON Capacitance	C_{ON}			6.5	pF	f=1MHz
				7		f=250MHz
Power Requirements						
Power Supply Range	V_{CC}	1.8		5.5	V	
Power Supply Current	I_{CC}			1	μA	VCC = 3.0V, V_S, $V_{\overline{OE}}$=0V or V_{CC}

Typical Performance Characteristics





Test Circuits

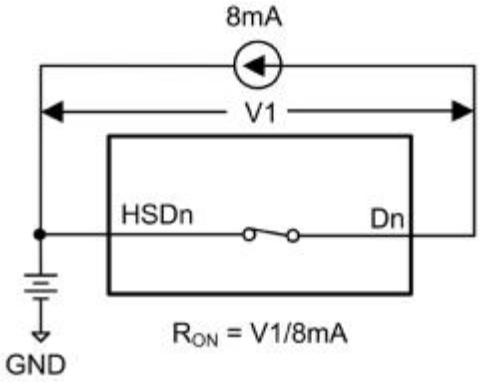


Figure 1 On Resistance

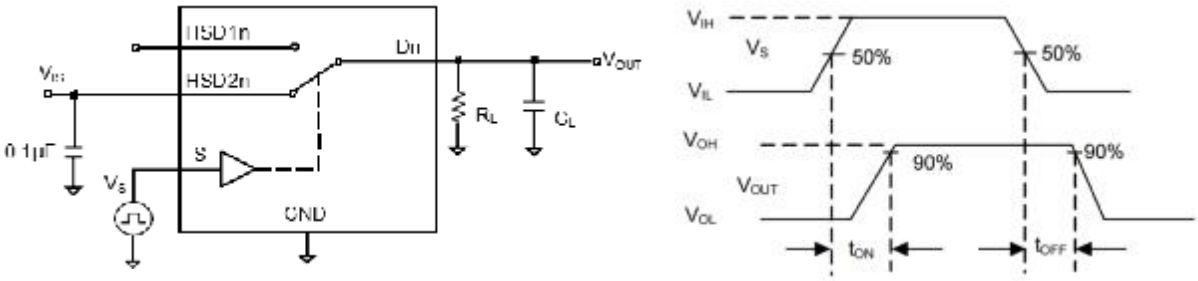


Figure 2 Switching Times (t_{ON},t_{OFF})

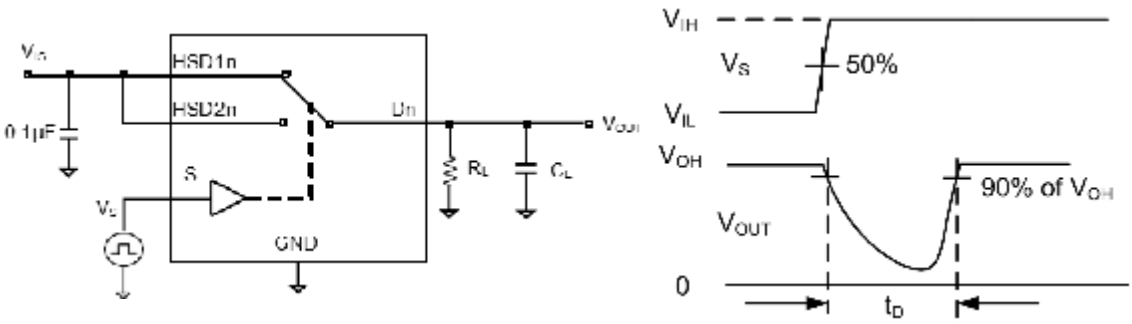


Figure 3 Break-Before-Make Time(t_D)

Test Circuits(Cont.)

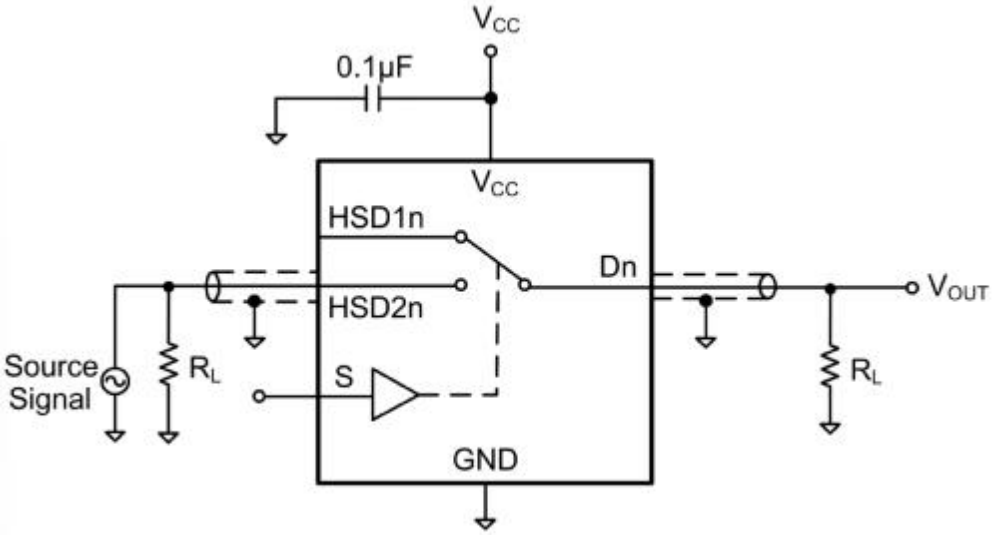
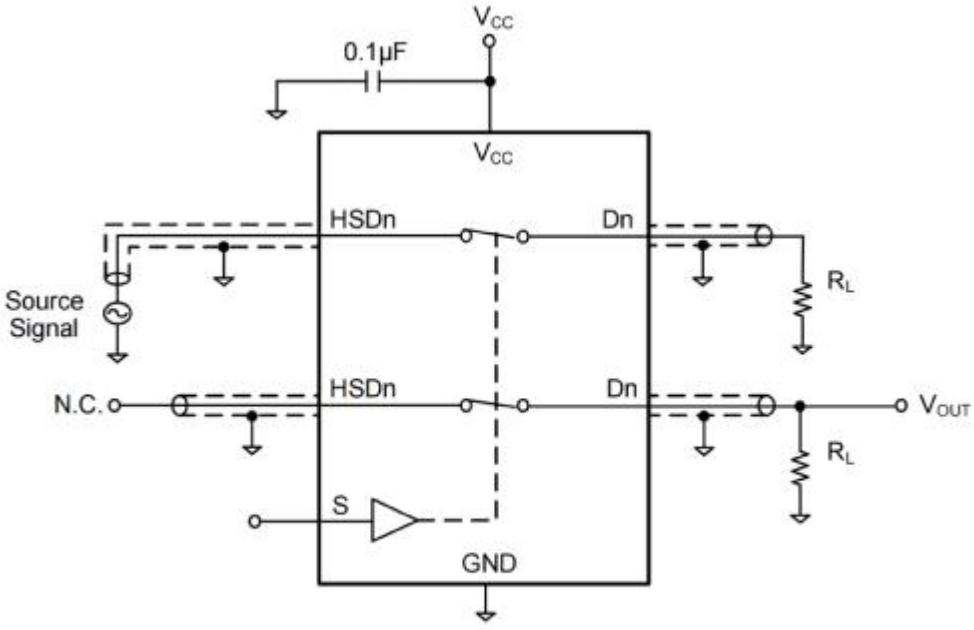


Figure 4 Off Isolation



$$\text{Channel To Channel Crosstalk} = -20 \times \log \frac{V_{HSDn}}{V_{OUT}}$$

Figure 5 Channel-to-Channel Crosstalk

Test Circuits(Cont.)

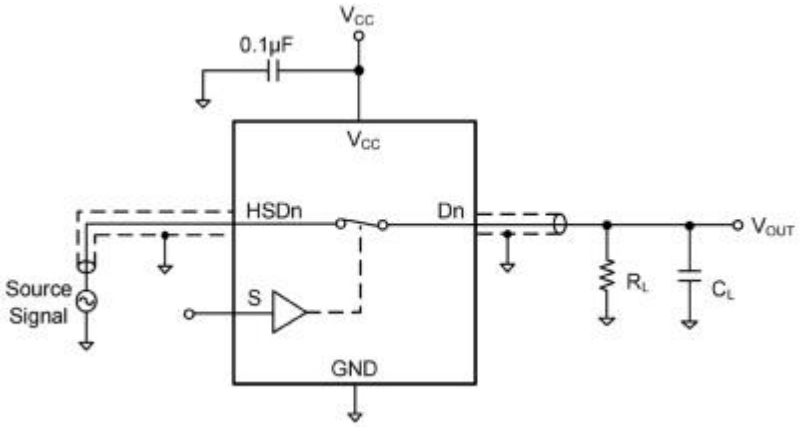


Figure 6 -3dB Bandwidth

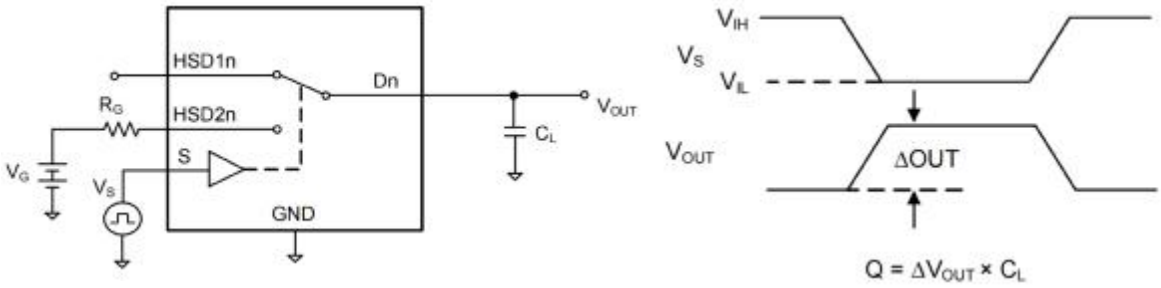
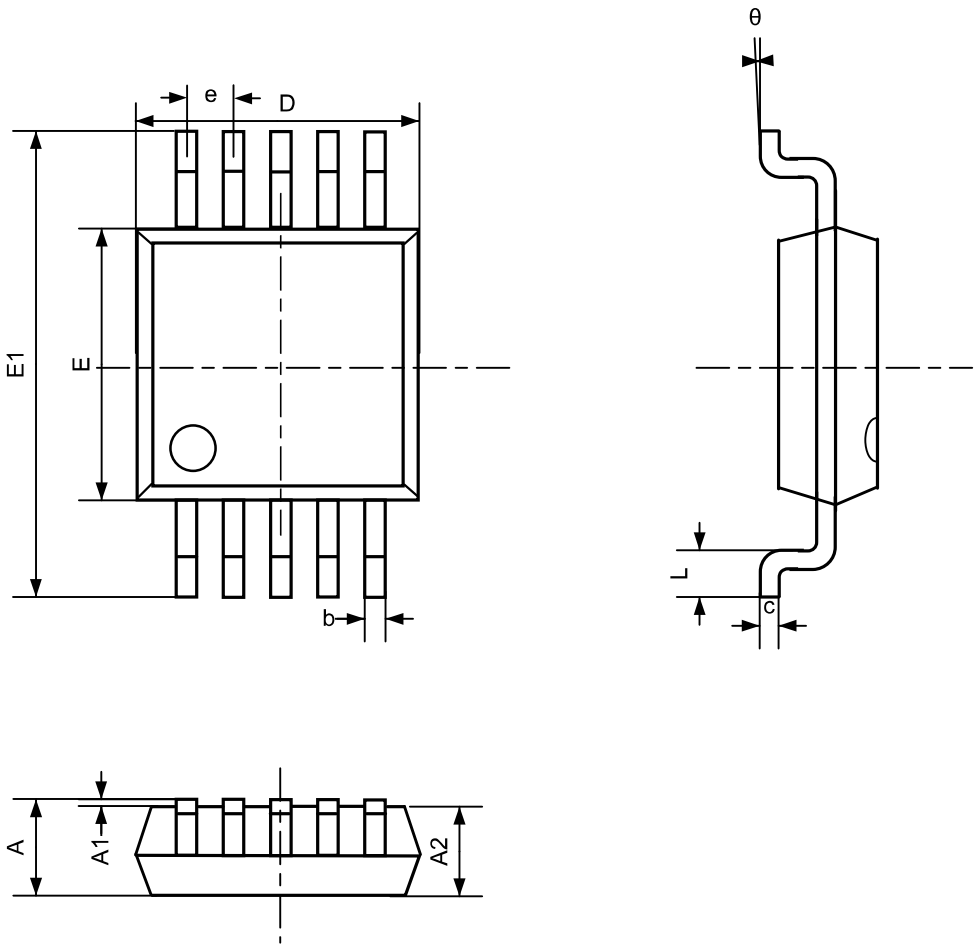


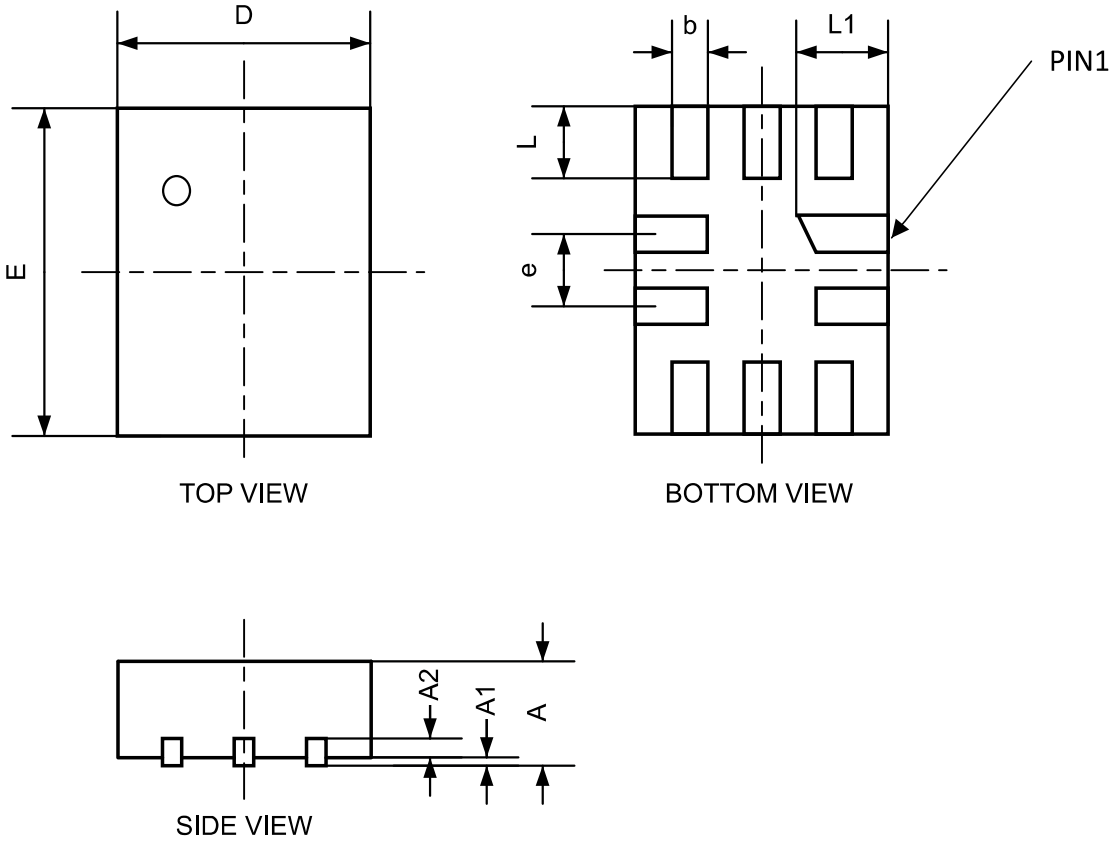
Figure 7 Charge Injection (Q)

Package Outline(MSOP10)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

Package Outline(UTQFN1.8×1.4-10L)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A2	0.152	0.152	0.006	0.006
b	0.150	0.250	0.006	0.010
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
e	0.400 TYP		0.016 TYP	
L	0.350	0.450	0.014	0.018
L2	0.450	0.550	0.015	0.002