MSKSEMI 美森科
SEMICONDUCTOR

ESD   TVS   TSS   MOV   GDT   PLED

MS2227XN/MS2227XU

Product specification

GENERAL DESCRIPTION

The MS2227XN/MS2227XU is a high bandwidth, fast double-pole double-throw (DPDT) analog switch. Its wide bandwidth and low bit-to-bit skew allow it to pass high-speed differential signals with good sign al integrity. Each switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs.Its high channel-to-channel crosstalk rejection results in minimal noise interference.
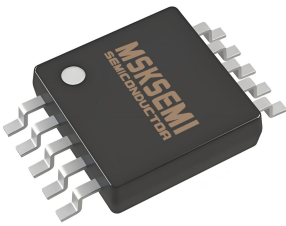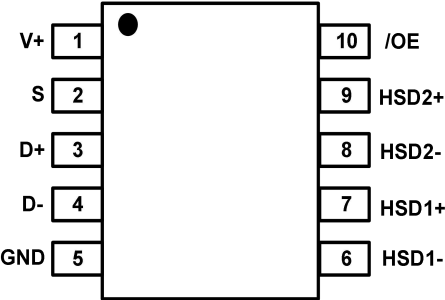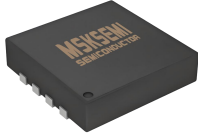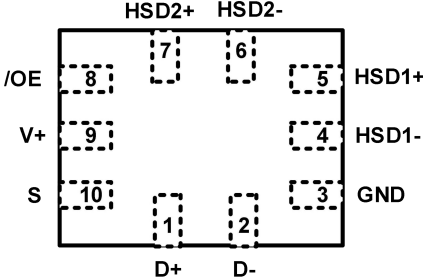
FEATURES

- Supply Range: 1.8 V to 5.5 V
- Rail-to-Rail Signal Range
- On-Resistance Matching: 0.05 Ω (TYP)
- ON-Resistance Flatness: 6.5 Ω (TYP) at 3 V
- High Off Isolation: -32 dB at 250 MHz
- -41 dB (250 MHz) Crosstalk Rejection Reduces
- Break-Before-Make Switching
- -3 dB Bandwidth: 720 MHz
- Operation Temperature Range: -40°C to +125°C

Application

- Cell Phones
- PDAs
- Portable Instrumentation
- Differential Signal Data Routings
- USB 2.0 Signal Routing

Reference News

MSOP-10	Pin Configuration	MARKING

Pin Configuration (MSOP-10):
- 1 V+
- 2 S
- 3 D+
- 4 D-
- 5 GND
- 10 /OE
- 9 HSD2+
- 8 HSD2-
- 7 HSD1+
- 6 HSD1-

MARKING: MSKSEMI 2227XN

UFQFN-10(1.4x1.8)	Pin Configuration	MARKING

Pin Configuration (UFQFN-10):
- 7 HSD2+
- 6 HSD2-
- 8 /OE
- 5 HSD1+
- 9 V+
- 4 HSD1-
- 10 S
- 3 GND
- 1 D+
- 2 D-

MARKING: MSK 2227XU

Pin Description

Name	Pin Number		Description
	QA	MA	
V+	9	1	Positive Power Supply
S	10	2	Select Input
D+,D-	1,2	3,4	Data Ports
HSD1+,HSD1-	5,4	7,6	Data Ports 1
HSD2+,HSD2-	7,6	9,8	Data Ports 2
/OE	8	10	Output Enable
GND	3	5	Ground

Logic Function Table

/OE	S	HSD1+,HSD1-	HSD2+,HSD2-
0	0	ON	OFF
0	1	OFF	ON
1	X	OFF	OFF

Order information

P/N	PKG	QTY
MS2227XN	MSOP-10	4000PCS
MS2227XU	UFQFN-10(1.4x1.8)	4000PCS

Circuit Diagram
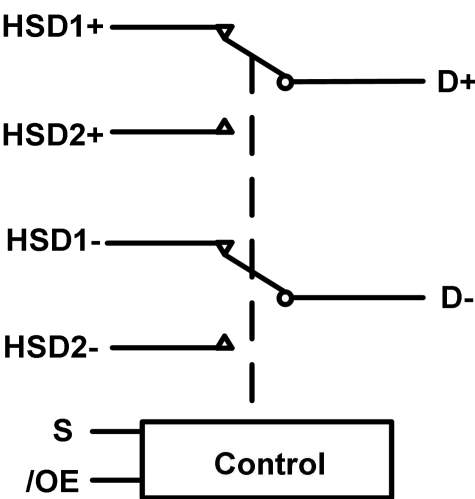
Voltage, Temperature, ESD and Thermal Ratings

Absolute Maximum Ratings

Parameters		Min.	Max.	Unit
V+	Supply Voltage Range	-0.3	6	V
V_{IS}	Analog, Digital Voltage Range	-0.3	(V+)+0.3	V
I_{IN}	Continuous Current HSDn or Dn	-100	+100	mA
I_{peak}	Peak Current HSDn or Dn	-150	+150	mA
T_J	Junction Temperature		150	°C
T_{stg}	Storage Temperature	-65	150	°C

(1) 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 under "Recommended Operating Conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM)	5K	V
		Charged-Device Model (CDM)	2K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter	Min	Max	Unit
Vcc	Supply Voltage	1.8	5.5	V
T_A	Operating Temperature	-40	125	°C

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
MSOP-10	180.7	66.2	°C/W
UFQFN-10(1.4x1.8)	120	46	°C/W

Electrical Specifications

DC Electrical Characteristics

V+=1.8V to 5.5 V, GND=0V, FULL=−40°C to +125°C. Typical values are at T_A=+25°C. (unless otherwise noted)

| Parameter	Symbol	Conditions	V+	Temp	Min	Typ	Max	Units
Analog Switch								
On-Resistance	R_{ON}	V_{IS}=0V to 0.4V, I_D=10mA, See Fig.8-1.	4.5V	+25°C		4.5	5	Ω
				Full			7	
			3V	+25°C		6.5	7	Ω
				Full			10	
On-Resistance Flatness	R_{FLAT}	V_{IS}=0V to 1.0V, I_D=10mA, See Fig.8-1.	4.5V	+25°C		0.9	1.2	Ω
				Full			1.5	
			3V	+25°C		3.2	3.5	Ω
				Full			4.5	
On-Resistance Matching	ΔR_{ON}	V_{IS}=0V to 0.4V, I_D=10mA, See Fig.8-1.	4.5V	+25°C		0.05	0.1	Ω
				Full			0.15	
			3V	+25°C		0.05	0.1	Ω
				Full			0.15	
Increase In Iccper Control Voltage	I_{CCT}	Vs or $V_{/OE}$=2.6 V	4.3V	Full			20	µA
Source Off Leakage Current	$I_{HSD2(OFF)}$ $I_{HSD1(OFF)}$	V_{IS}=5V/ 0.5V, V_D=0.5V/ 5V	5.5V	Full			1	µA
Channel On Leakage Current	$I_{HSD2(ON)}$ $I_{HSD1(ON)}$	V_{IS}=5V/ 0.5V, V_D=floating	5.5V	Full			1	µA
Digital Control Inputs								
Input High Voltage	V_{IH}		3.3V	Full	1.7			V
Input Low Voltage	V_{IL}		3.3V	Full			0.5	V
Input Leakage current	I_{IN}	Vs, $V_{/OE}$=0V or V+	5.5V	Full			1	µA
Power Requirements								
Power Supply Range	V+			Full	1.8		5.5	V
Quiescent Supply Current	Icc	Vs, $V_{/OE}$=0V or V+	5.5V	Full			1	µA

Electrical Specifications(Continued)

Switch And AC Characteristics

V+=1.8V to 5.5 V, GND=0V,FULL=−40°C to +125°C.Typical values are at T_A=+25°C. (unless otherwise noted)

Parameter	Symbol	Conditions	V+	Temp	Min	Typ	Max	Units
Turn-On Time	t_{ON}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF,See Fig.8-2.	5V	+25°C		12		ns
			3.3V	+25°C		14		ns
Turn-Off Time	t_{OFF}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF,See Fig.8-2.	5V	+25°C		6		ns
			3.3V	+25°C		8		ns
Break-Before-Make Delay	t_{BBM}	V_{IS}=0.8V, R_L=50Ω, C_L=10pF,See Fig.8-3.	5V	+25°C		5		ns
			3.3V	+25°C		4		ns
-3 dB Bandwidth	BW	Signal=0dBm, R_L=50Ω C_L=5pF,See Fig.8-6.	5V	+25°C		720		MHz
			3.3V	+25°C		700		MHz
Off-Isolation	OIRR	Signal=0dBm, R_L=50Ω, f=250MHz,See Fig.8-4.	5V	+25°C		-32		dB
			3.3V	+25°C		-32		dB
Non-Adjacent Channel Crosstalk	XTALK	Signal=0dBm, R_L=50Ω, f=250MHz,See Fig.8-5.	5V	+25°C		-41		dB
			3.3V	+25°C		-41		dB
Channel-to-Channel Skew	t_{SKEW}	R_L=50Ω,C_L=10pF	5V	+25°C		0.1		ns
		R_L=50Ω,C_L=10pF	3.3V	+25°C		0.1		ns
Charge Injection	Q	R_G=0Ω, C_L=1nF,See Fig.8-7.	5V	+25°C		6		pC
		R_G=0Ω, C_L=1nF,See Fig.8-7.	3.3V	+25°C		4		pC
On Capacitance	C_{ON}		5V	+25°C		6		pF

MeasurementInformation
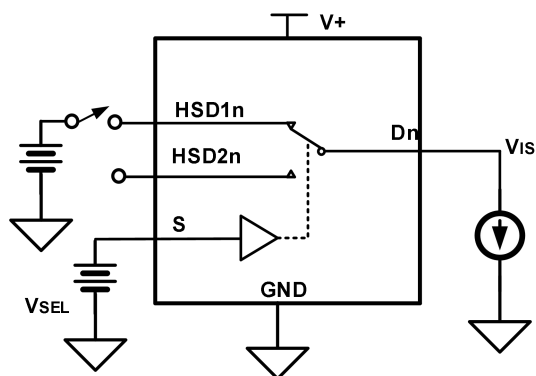
Channel On

$RON=(VHDS1n\ or\ VHSD2n-VIS)/ID$

$VSEL=VIH\ or\ VIL$

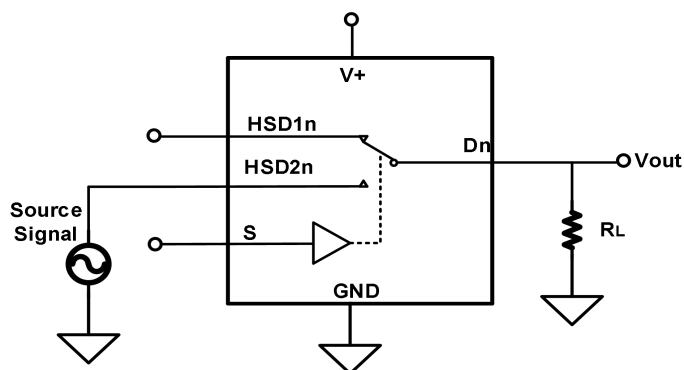**FON-State Resistance (R_{ON})**
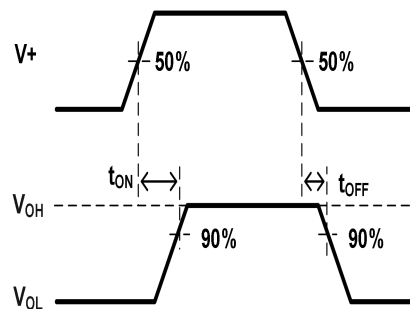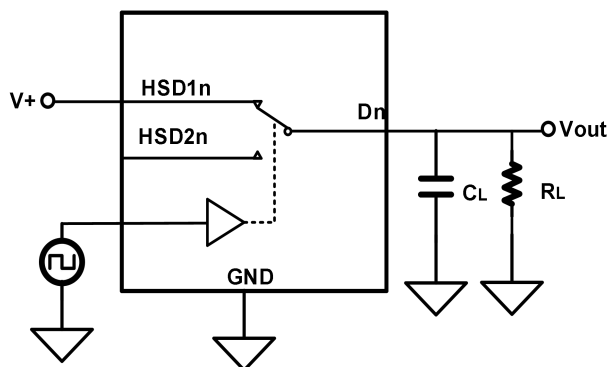
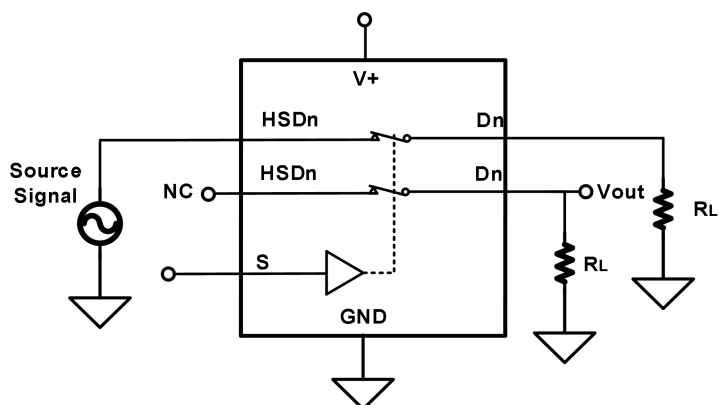**Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})**
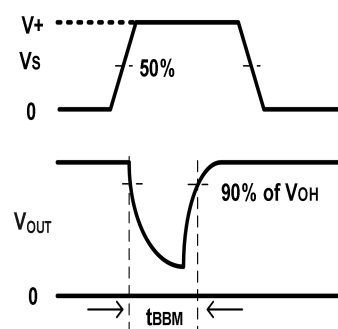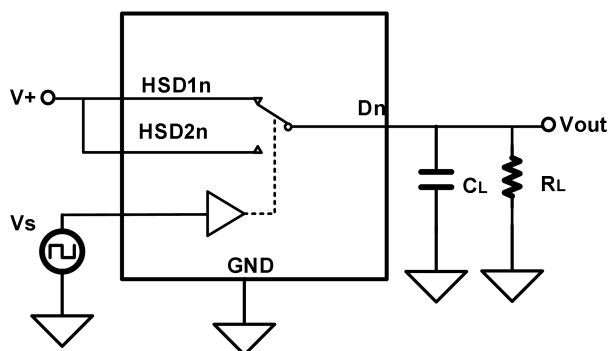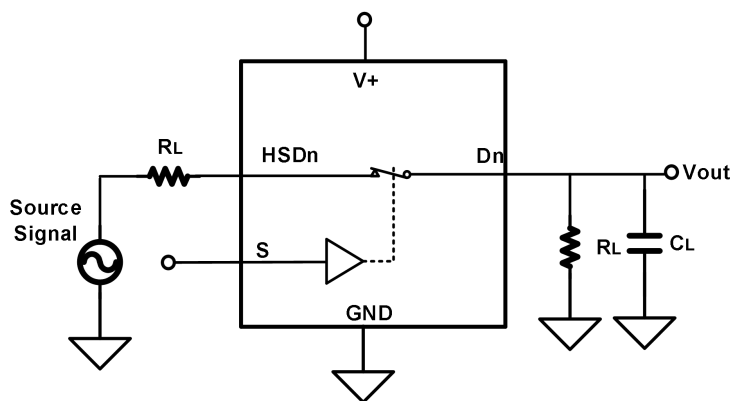

Break-Before-Make Time Delay (t_{BBM})

MeasurementInformation(Continued)
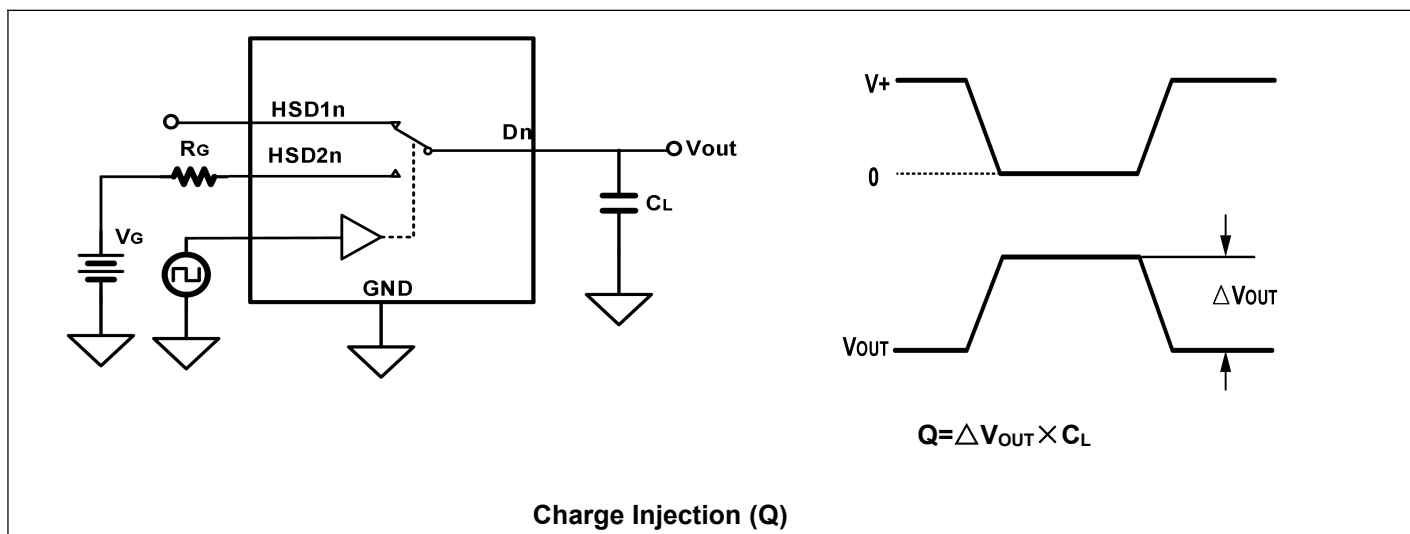
Off Isolation(OIRR)

Channel To Channel Crosstalk=-20 × log (V_{HSDn}/V_{OUT})

**Channel-to-Channel Crosstalk**

-3dB Bandwidth

MeasurementInformation(Continued)

$$Q=\triangle V_{OUT}\times C_L$$

Charge Injection (Q)

Applications Note

There are many USB applications in which the USB hubs or controllers have a limited number of USB I/Os. The MS2227XN/MS2227XU solution can effectively expand the limited USB IOs by switching between multiple USB buses inorder to interface them to a single USB hub or controller. MS2227XN/MS2227XU can also be used to conn ect a single controller to two USB connectors or controllers.

Design requirements of the USB 1.0, 1.1, and 2.0 standards should be followed. It is recommended that the digital control pins S and /OE be pulled up to V+ or down to GND to avoid undesired switch positions that could result from the floating pin.
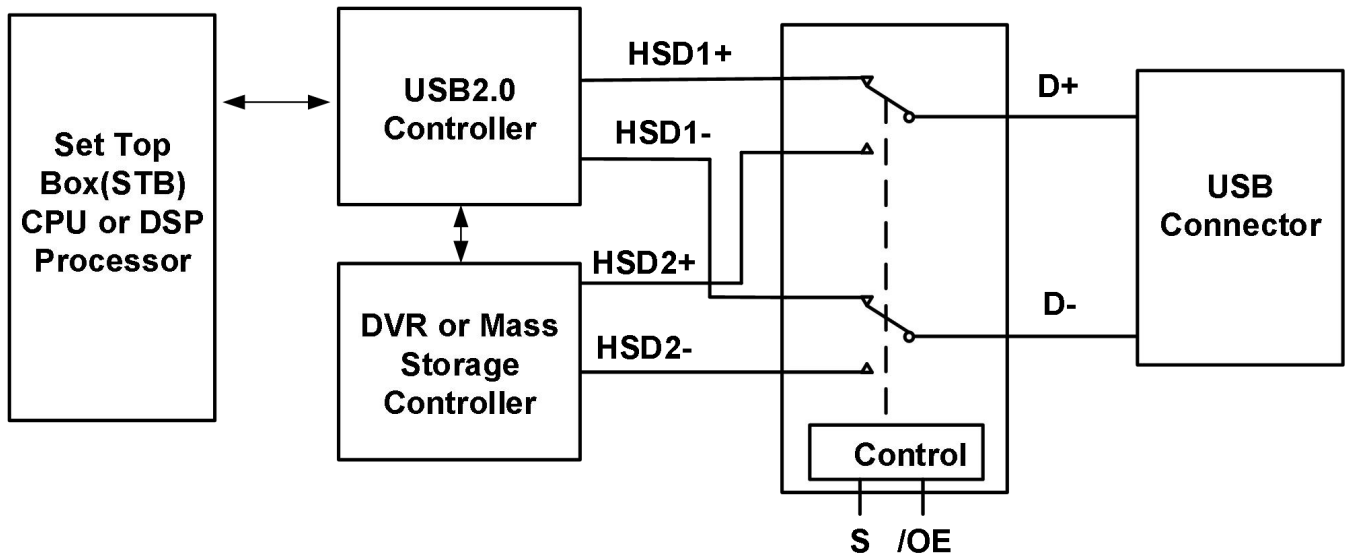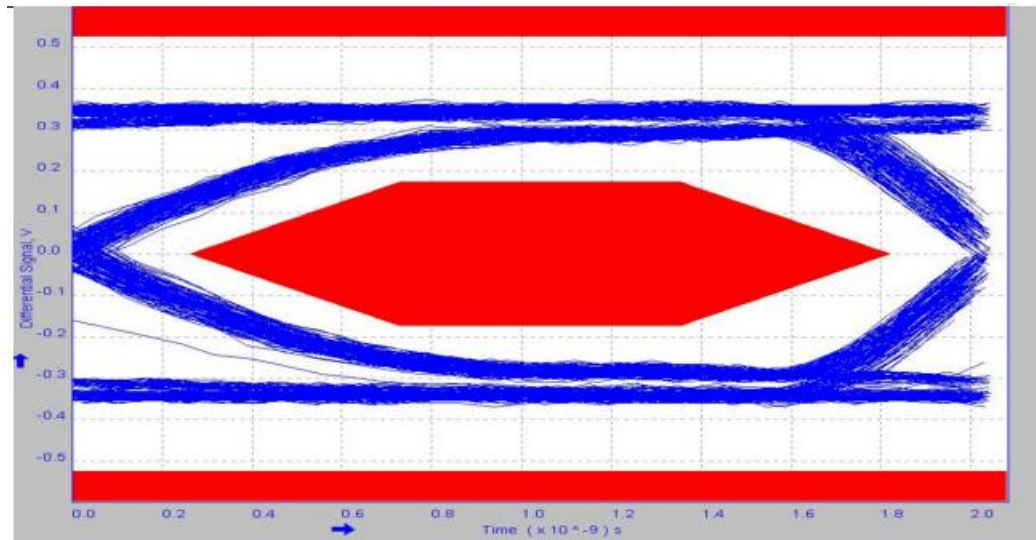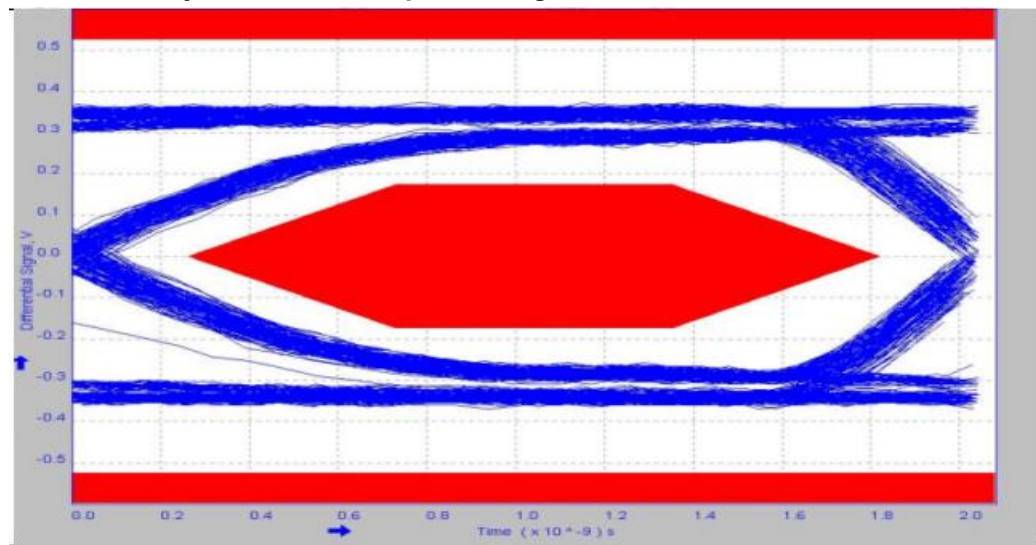

Application Diagram

Eye Diagram Measurements
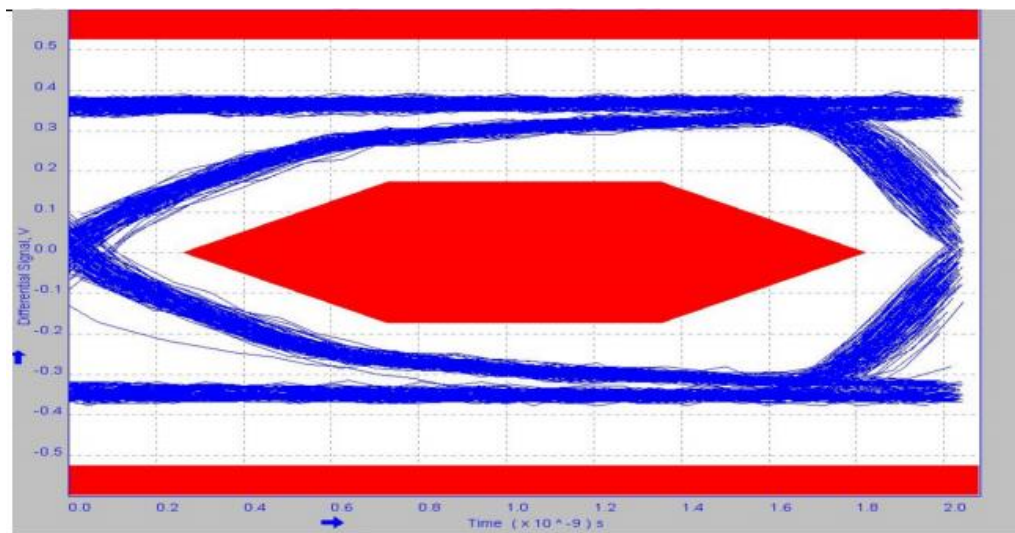
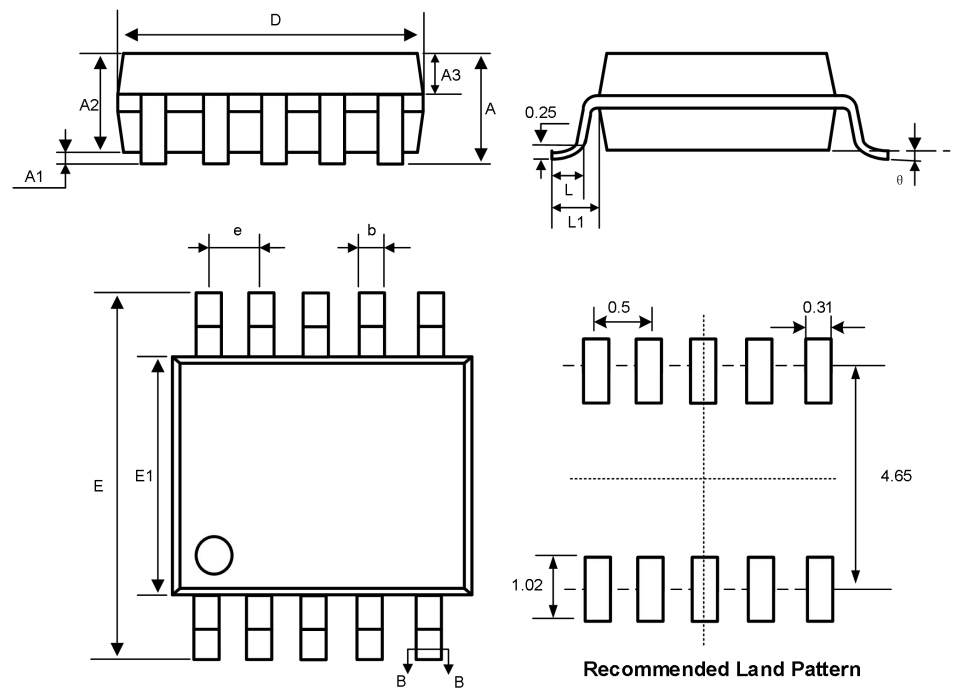**Eye Pattern:480Mbps USB Signal with No Switch (Through Path)**

Eye Pattern:480Mbps USB Signal with Switch D+ Path


Eye Pattern:480Mbps USB Signal with Switch D- Path
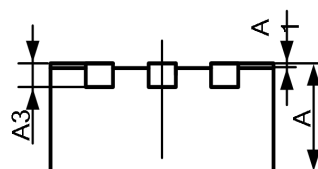
Package Outline Dimension

MSOP-10

Recommended Land Pattern

Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	1.10	—	—	0.043
A1	0.05	—	0.15	0.002	—	0.006
A2	1.30	1.40	1.50	0.051	0.055	0.059
A3	0.75	0.85	0.95	0.030	0.033	0.037
D	2.90	3.00	3.10	0.114	0.118	0.122
E	4.70	4.90	5.10	0.185	0.193	0.201
E1	2.90	3.00	3.10	0.114	0.118	0.122
e	0.50BSC			0.02BSC		
L	0.40	—	0.70	0.016	—	0.028
L1	0.95REF			0.037REF		
θ	0	—	8°	0	—	8°

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Package Outline Dimension(Continued)

UFQFN-10(1.4x1.8)
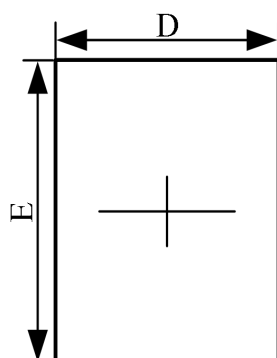
TOP VIEW
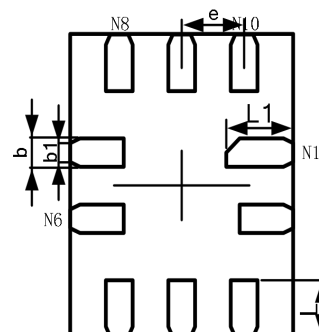
BOTTOM VIEW

SIDE VIEW
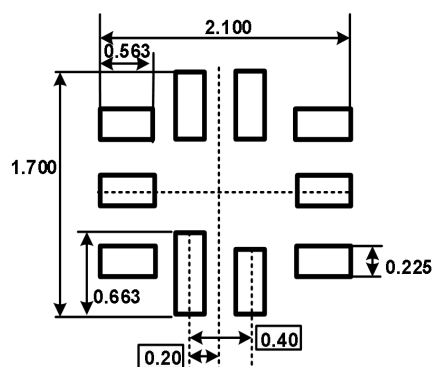
Recommended Land
Pattern

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
A3	0.152REF		0.006REF	
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
D1	—	—	—	—
E1	—	—	—	—
k	—		—	
b	0.150	0.250	0.006	0.010
b1	0.100	0.200	0.004	0.008
e	0.400TYP		0.016TYP	
L	0.350	0.450	0.014	0.018
L1	0.450	0.550	0.018	0.022

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