DIO3222
Low-Power, USB2.0 Hi-Speed Switch

Features

- V_{CC} operation at 2.7V to 4.2V
- Low Con: 6.5pF Typical
- Low Ron: 6Ω Typical
- Low Power Consumption: 1μA Maximum
- Low I_{CCT} : 15μA Maximum @V_{IN}=1.8V, V_{CC}=3.6V
- -3dB Bandwidth: > 720MHz
- Packaged in Pb-free DQFN-10; MSOP-10 and QFN-10
- 8kV HBM ESD Rating
  2kV CDM ESD Rating
- Power-Off/On Protection on Common port. D+/D- Pins Tolerate up to 5.25V

Description

The DIO3222 is a low power, dual SPDT 2-port high-speed analog switch. It handles bi-directional signal flow and is optimized for switching a hi-speed (480Mbps) source or a full-speed (12Mbps) source.

DIO3222 has high channel-to-channel noise isolation and low bit-to-bit skew which allows it to pass high-speed differential signals with good signal integrity. Each switch offers little or no attenuation of the high-speed signals at the outputs.

The DIO3222 contains special circuitry on the D+/D- pins, which can tolerate up to 5.25V when the USB devices are either powered off or powered on.

DIO3222 is available in three type Pb-free packages: DQFN-10, MSOP-10 and QFN-10.

Applications

- Cell-Phone/PDA
- MP3/MP4/PMP
- STB/LCDTV

Block Diagram

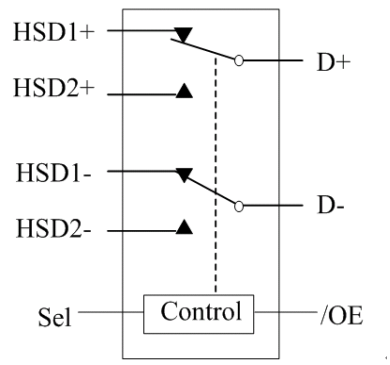


Figure 1 Symbol

Ordering Information

Order Part Number	Top Marking	Pb-Free	TA	Package	
DIO3222AMP10	DIO3222	Yes	-40 to +85°C	MSOP-10	Tape & Reel, 3000
DIO3222ALP10	YWGZ	Yes	-40 to +85°C	DQFN-10	Tape & Reel, 3000
DIO3222AQN10	YWGZ	Yes	-40 to +85°C	QFN-10	Tape & Reel, 3000

Pin Assignments

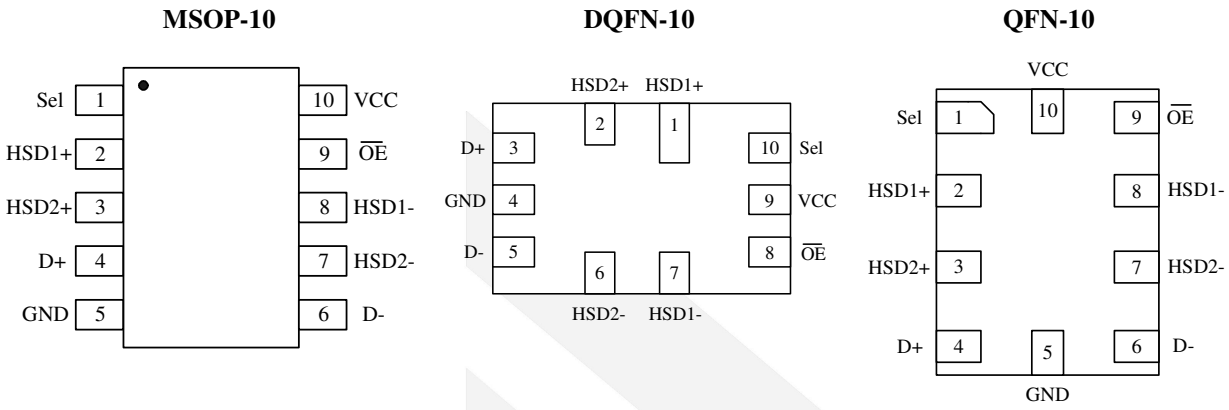


Figure 2 Top View

Pin Definitions

Pin Name	Description
/OE	Switch Enable
Sel	Switch Select
D+, D-	USB Data Bus
HSDn+, HSDn-	Multiplexed Source inputs

Truth Table

Sel	/OE	Function
X	H	Disconnect
L	L	D+, D- = HSD1+, HSD1-
H	L	D+, D- = HSD2+, HSD2-

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maxim rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply Voltage	-0.3	+4.6	V
V_{CNTRL}	DC input Voltage(S, /OE)	-0.3	V_{CC}	V
V_{SW}	DC input I/O Voltage	-0.3	V_{CC} + 0.3	V
	DC input I/O Voltage (D+/D-)	-0.3	5.5	V
I_{IK}	DC input Diode current	-50		mA
I_{OUT}	DC output current		50	mA
T_{STG}	Storage Temperature	-65	+150	°C
ESD	HBM, JEDEC: JESD22-A114		8	kV
	CDM, JEDEC : JESD22-C101		2	

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended Operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not Recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	2.7	4.2	V
V_{CNTRL}	Control input voltage(S,/OE)	0	V_{CC}	V
V_{SW}	Switch I/O voltage (HSD1±, HSD2±)	0	V_{CC}	V
	Switch I/O voltage (D+, D-)	0	5.25	V
T_A	Operating Temperature	-40	85	°C

DC Electrical Characteristics

All typical value are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	TEMP (℃)	Min.	Typ.	Max.	Units
V_{IH}	Input voltage high		3.0 to 3.6	full	1.2			V
V_{IL}	Input voltage low		3.0 to 3.6	full			0.6	V
I_{IN}	Control input leakage	V_{SW} = 0 to Vcc	3.6	full	-1		1	uA
I_{OZ}	Off state leakage	0<= Dn, HSD1n, HSD2n <=3.6V	3.6	full	-2		2	uA
I_{OFF}	Power-Off leakage current(All I/O ports)	V_{SW} = 0V to 3.6V, V_{CC} =0V,See Figure 4	0	full	-2		2	uA
R_{ON}	HS switch on Resistance	V_{SW}=0.4V,I_{ON}=8mA, See Figure 3	3.0	full		6	8	Ω
ΔR_{ON}	HS Delta R_{ON}	V_{SW}=0.4V,I_{ON}=8mA	3.0	full		0.35		Ω
I_{CC}	Quiescent supply current	V_{CNTRL}=0 or Vcc,	3.6	full			1	uA
I_{CCT}	Increase in ICC current per control voltage and V_{CC}	V_{CNTRL}=2.6V, V_{CC}=3.6V	3.6	full			10.0	uA
		V_{CNTRL}=1.8V, V_{CC}=3.6V	3.6	full			20.0	uA

AC Electrical Characteristics

All typical value are for Vcc = 3.3V at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	Vcc(V)	TEMP (℃)	Min.	Typ.	Max.	Units
t_{ON}	Turn-On time S, /OE to output	R_L=50Ω, C_L=5pF, V_{SW} = 0.8V See Figure 10	3.0 to 3.6	full		20	30	ns
t_{OFF}	Turn-Off time S, /OE to output	R_L=50Ω, C_L=5pF, V_{SW} = 0.8V See Figure 10	3.0 to 3.6	full		10	25	ns
t_{PD}	Propagation delay	R_L=50Ω, C_L=5pF, See Figure 11	3.3	25°C		0.25		ns
				full			5	ns
t_{BBM}	Break-Before-Make	R_L=50Ω, C_L=5pF, V_{SW} =0.8V See Figure 9	3.0 to 3.6	25°C			6.5	ns
				full			10	ns
OIRR	Off Isolation	R_L=50Ω, f=240MHz See Figure 8	3.0 to 3.6	25°C		-30		dB
Xtalk	Non-Adjacent Channel Crosstalk	R_L=50Ω, f=240MHz See Figure 7	3.0 to 3.6	25°C		-45		dB
BW	-3dB bandwidth	R_L=50Ω, C_L=0pF, See Figure 6	3.0 to 3.6	25°C		720		MHz
		R_L=50Ω, C_L=5pF, See Figure 6		25°C		550		MHz
$t_{SK(P)}$	Skew of Opposite Transitions of the same output	R_L=50Ω, C_L=5pF	3.0 to 3.6	25°C		20		ps

Capacitance

Symbol	Parameter	Conditions	TEMP (℃)	Min.	Typ.	Max.	Units
C_{IN}	Control Pin input Capacitance	V_{CC}=0V	25°C		1.5		pF
C_{ON}	D+/D- on Capacitance	V_{CC}=3.3V,/OE=0V, f=240MHz, See Figure 5	25°C		6.5		
C_{OFF}	HSD1n,HSD2n off capacitance	V_{CC} and /OE=3.3V See Figure 5	25°C		2.5		

Test Diagrams

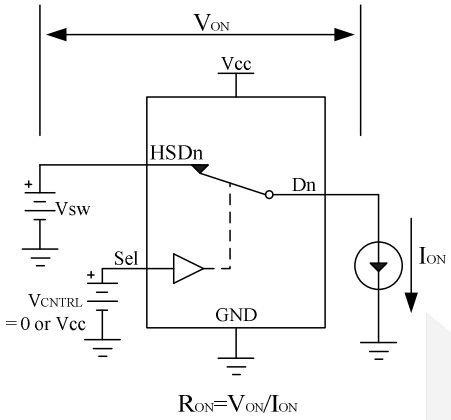


Figure 3 Switch on resistor

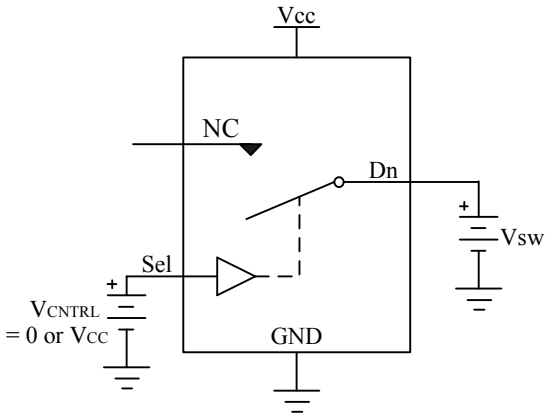


Figure 4 Switch Off Leakage

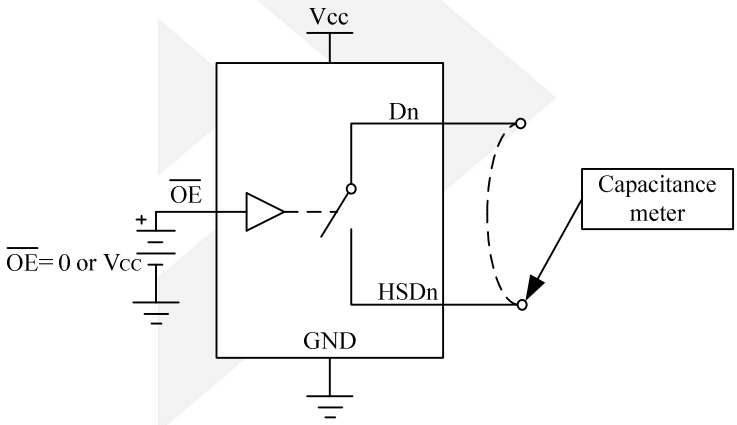


Figure 5 On/off Capacitance test

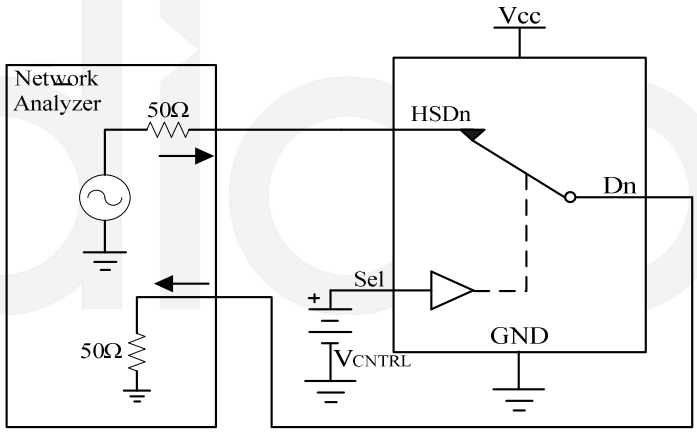


Figure 6 Bandwidth

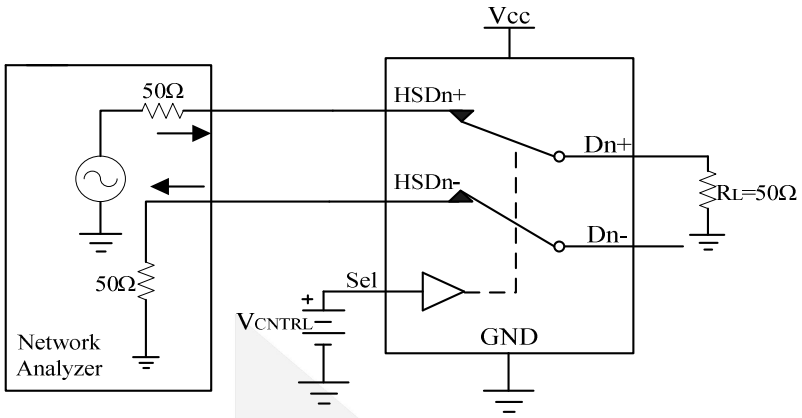


Figure 7 Channel-to-channel crosstalk

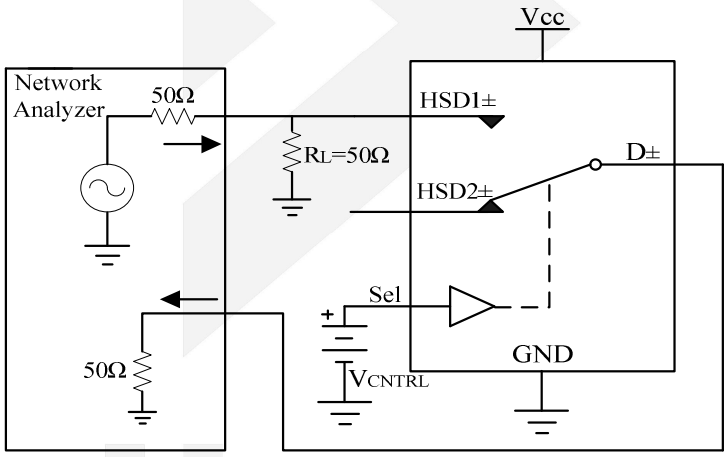


Figure 8 Off-isolation

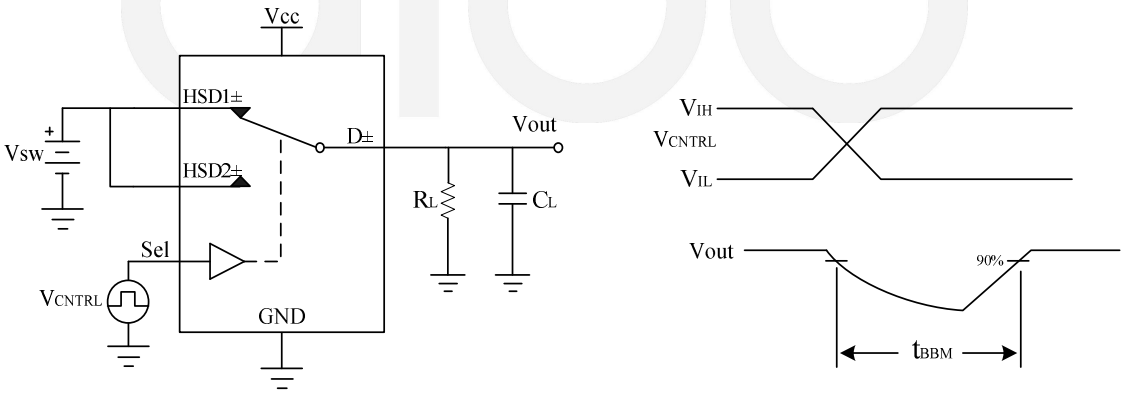


Figure 9 Break-Before-Make

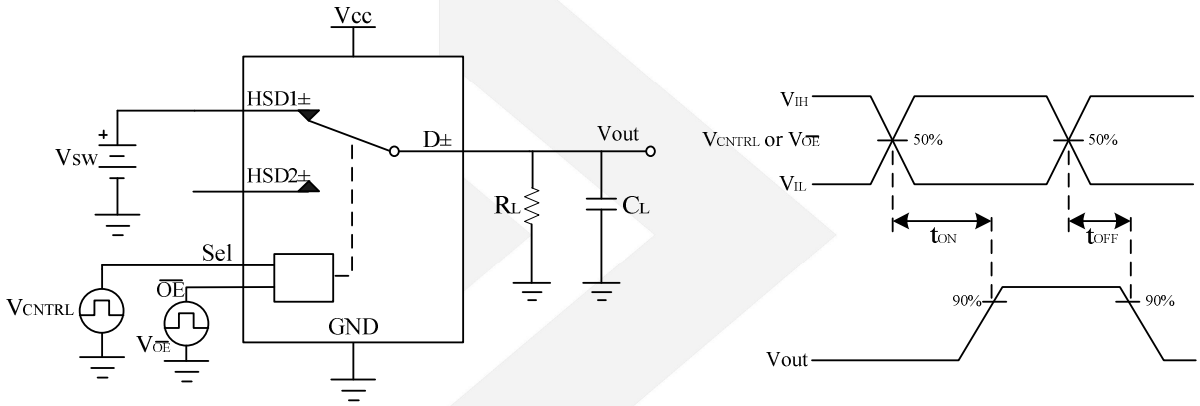


Figure 10 Turn-On/Turn-Off

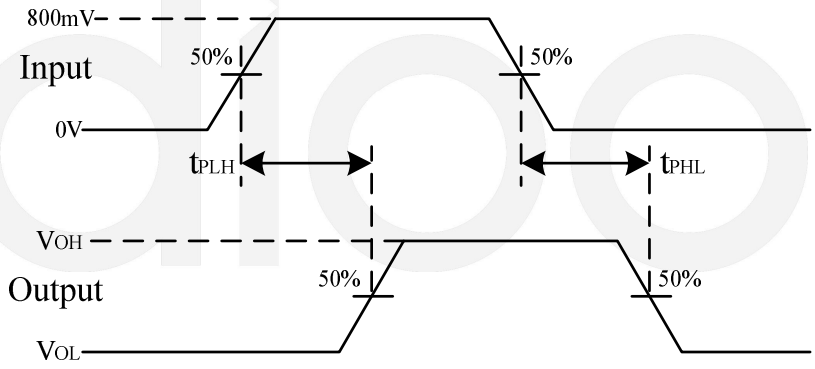
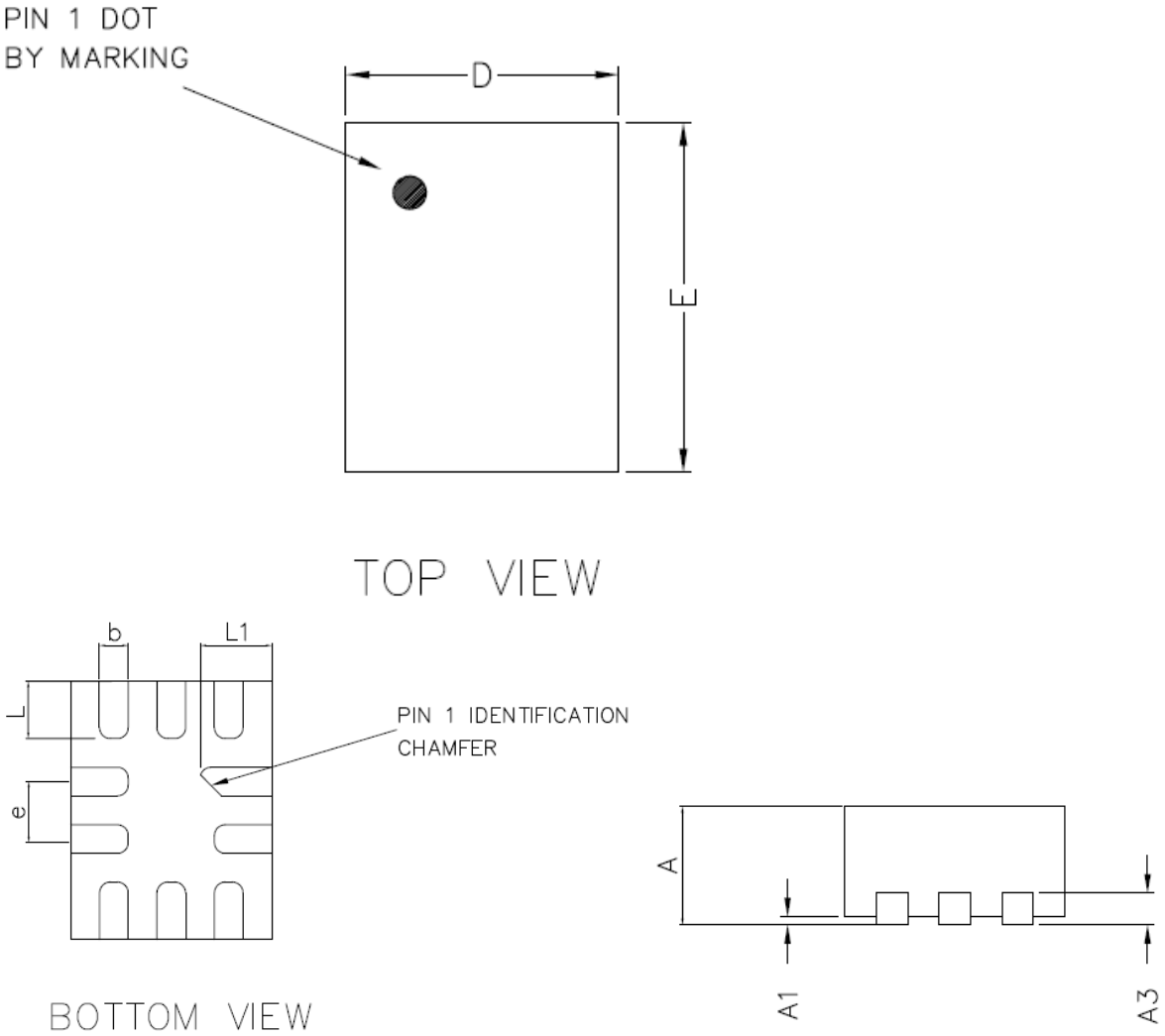


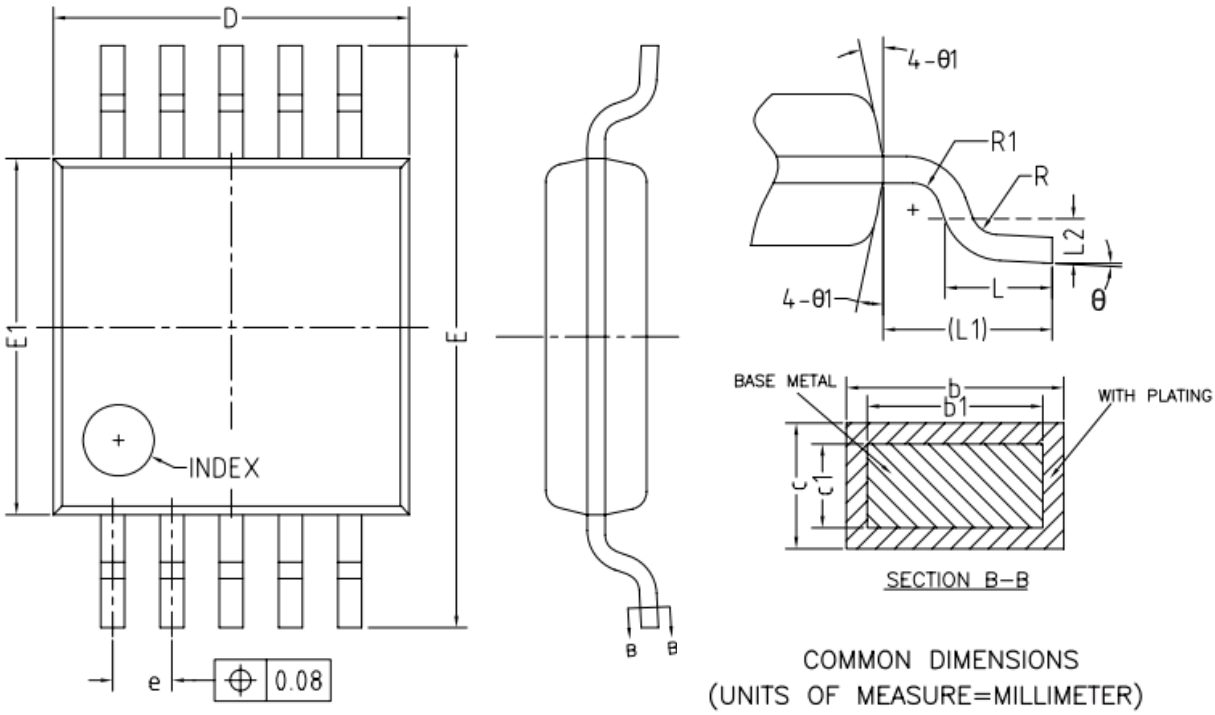
Figure 11 Propagation delay

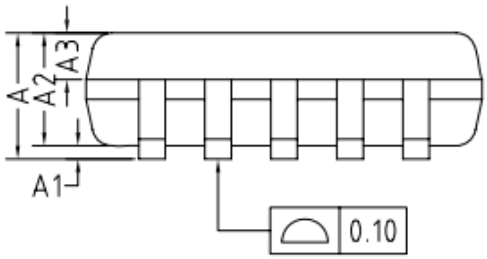
Physical Dimensions: DQFN-10



COMMON DIMENSIONS(MM)			
PKG.	UT:ULTRA THIN		
REF.	MIN.	NOM	MAX
A	0.5	0.55	0.6
A1	0		0.05
A3	0.15REF.		
D	1.35	1.4	1.45
E	1.75	1.8	1.85
b	0.15	0.2	0.25
L	0.3	0.4	0.5
L1	0.4	0.5	0.6
e	0.4BSC		

Physical Dimension: MSOP-10





COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.10
A1	0	–	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.18	–	0.27
b1	0.17	0.20	0.23
c	0.15	–	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.40	0.50	0.60
L	0.40	0.60	0.80
L1	0.95REF		
L2	0.25BSC		
R	0.07	–	–
R1	0.07	–	–
θ	0°	–	8°
θ 1	9°	12°	15°

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