

**PSMUX136**

**High Speed 1:2 Mux/DeMux**

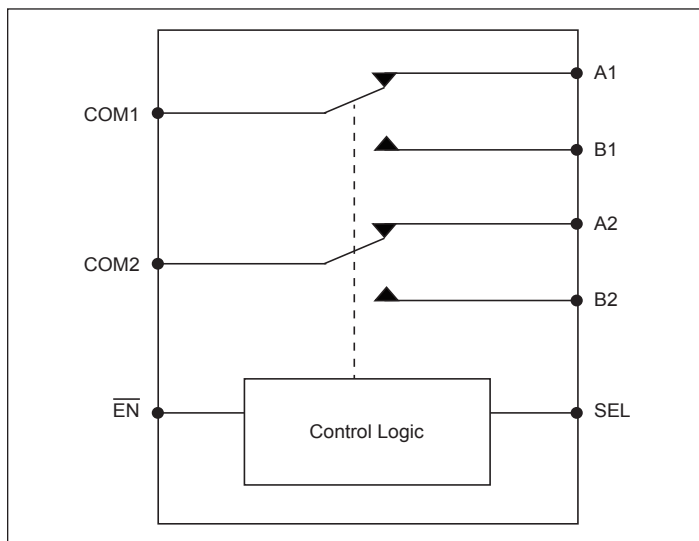
**Description**

The DIODES PSMUX136 is a 2-to-1 differential channel multiplexer/demultiplexer switch. The PSMUX136 can pass high speed signals with a bandwidth of 5.5GHz to provide excellent signal integrity and the eye diagram opening.

**Application(s)**

- Smart Phones
- Tablets
- NBs
- PCs

**Block Diagram**



**Features**

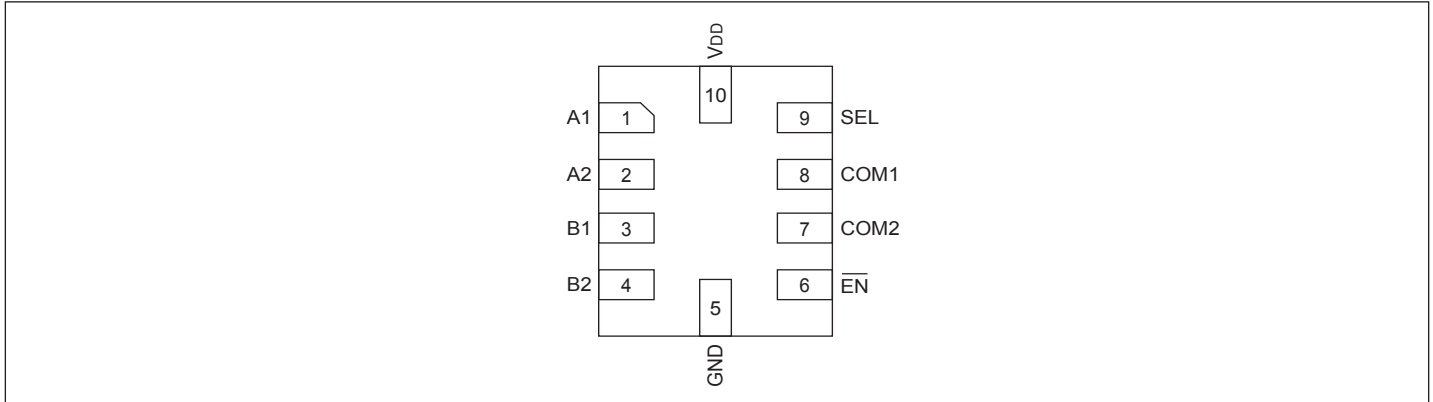
- Differential Bi-Directional 2:1 Mux/DeMux
- Wide Input Voltage Range: 0V to 3.6V
- High Performance Switch Characteristics:
  - Bandwidth (-3dB): 5.5GHz (A Port); 5.3GHz (B Port)
  - R<sub>ON</sub> (Typical): 4.6Ω (A Port); 5.7Ω (B Port)
  - C<sub>ON</sub> (Typical): 1.5pF @ 240MHz
- Low Propagation Delay, 0.1ns Typical
- Low Off-Isolation: -34dB @ 240MHz
- Low Crosstalk: -37dB @ 240MHz,
- Low Power Consumption: 35μA Typical
- Power-Off Protection for Minimizing Current Leakage in Power Down Mode
- Wide Supply Voltage: 1.8V to 5.5V
- Supports 1.8V Logic on Control Pins
- Wide Temperature Range: -40°C to 125°C
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>
- Packaging (Pb-free & Green):
  - 10-contact, UQFN (ZUA), 1.5x2mm, 0.5mm(H), 0.6mm pitch

**Notes:**

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Configuration

Top View



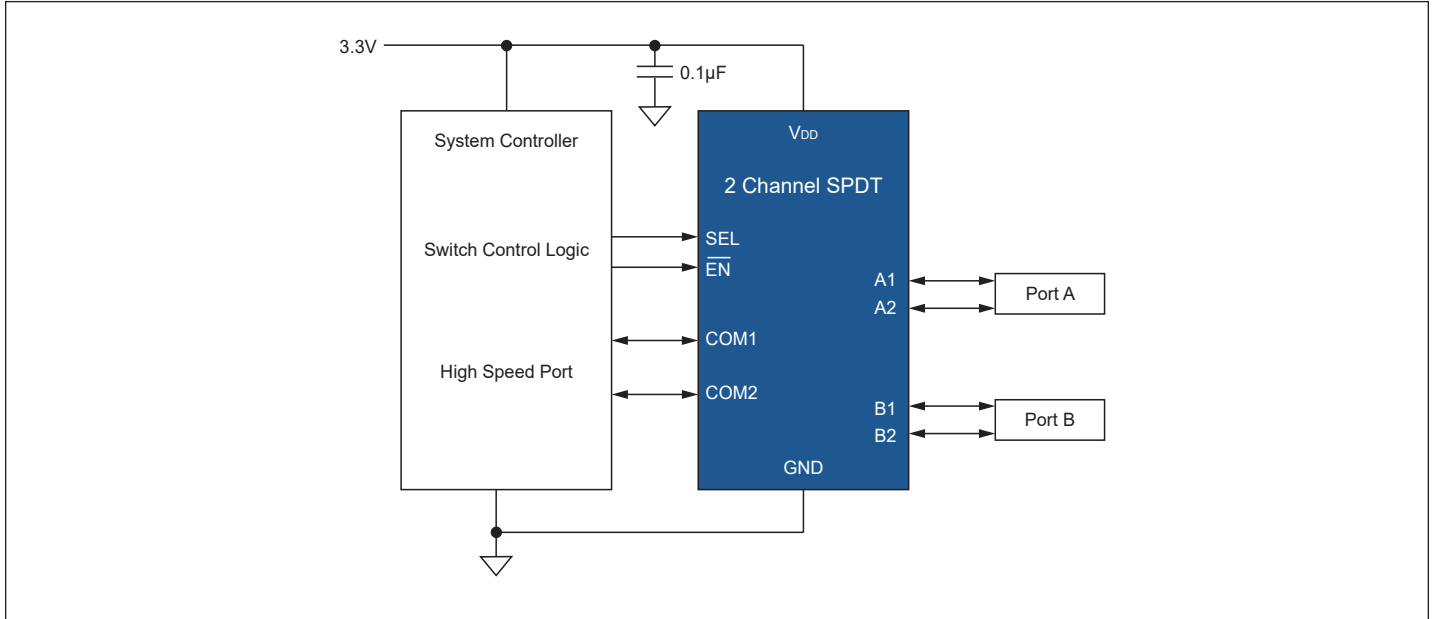
## Pin Description

Pin#	Pin Name	Signal Type	Description
8, 7	COM1, COM2	I/O	Signal I/O, Common Port
3, 4	B1, B2	I/O	Signal I/O, B Port Channel
1, 2	A1, A2	I/O	Signal I/O, A Port Channel
9	SEL	I	Operation Mode Select (when SEL = L: COM → A Port, when SEL = H: COM → B Port)
10	V <sub>DD</sub>	PWR	Positive Supply Voltage
5	GND	PWR	Power Ground
6	$\overline{\text{EN}}$	I	$\overline{\text{EN}} = 1$ , Chip is Power Down. $\overline{\text{EN}} = 0$ , Chip is Enabled. Please See Truth Table.

## Truth Table

Function	SEL	$\overline{\text{EN}}$
COM to A Port	L	L
COM to B Port	H	L
All Switches Hi-Z	X	H

**Typical Application Diagram**



## Maximum Ratings

(Above which useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....	-65°C to +150°C
Supply Voltage (VDD) to Ground Potential .....	-0.3V to +6V
Channel Input/Output Voltage (A Port/B Port) .....	-0.3V to +5.5V
Channel Input/Output Voltage (COM Port) .....	-0.3V to +5.5V
Control Pins Input Voltage ( $\overline{EN}/SEL$ ) .....	-0.3V to +6V
ESD (All Pins).....	3.5KV (HBM) and 1KV (CDM)
Channel Input/Output Current (COM Port→A Port, COM Port→B Port) .....	±10mA
Junction Temperature .....	125°C

Note:  
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Recommended Operating Conditions

Symbol	Description	Test Conditions	Min.	Typ.	Max.	Units
V <sub>DD</sub>	Power Supply		1.8	3.3	5.5	V
V <sub>I/O</sub>	Analog Voltage Range		0		3.6	V
V <sub>I</sub>	Voltage Range for Control Pins		0		5.5	V
I <sub>DD</sub>	Current Consumption in Normal Operation	V <sub>IO</sub> = 0V, SEL = GND or V <sub>DD</sub> , chip enabled		35	55	μA
		V <sub>IO</sub> = 0V, SEL = GND or V <sub>DD</sub> , chip enabled, T <sub>A</sub> = -40°C to 125°C			75	
I <sub>DDQ</sub>	Chip Disabled Current Consumption	V <sub>IO</sub> = 0V, SEL = GND or V <sub>DD</sub> , $\overline{EN}$ = High		1	2	μA
		V <sub>IO</sub> = 0V, SEL = GND or V <sub>DD</sub> , $\overline{EN}$ = High, T <sub>A</sub> = -40°C to 125°C			10	
T <sub>A</sub>	Operating Temperature Range		-40		125	°C

## DC Electrical Characteristics for Switching over Operating Range

T<sub>A</sub> = -40°C to 125°C, Typical values are at V<sub>DD</sub> = 3.3V, T<sub>A</sub> = 25°C,  $\overline{EN}$  = 0V (unless otherwise noted)

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Pins – <math>\overline{EN}/SEL</math></b>						
V <sub>IH</sub> - cntrl signals	Input HIGH Voltage for SEL and $\overline{EN}$	V <sub>DD</sub> = 1.8-5.5V	1.3			V
V <sub>IL</sub> - cntrl signals	Input LOW Voltage for SEL and $\overline{EN}$	V <sub>DD</sub> = 1.8-5.5V			0.6	V
I <sub>IH</sub>	Input HIGH Current for SEL and $\overline{EN}$	V <sub>I</sub> = 5.5V	-1		1	μA
I <sub>IL</sub>	Input LOW Current for SEL and $\overline{EN}$	V <sub>I</sub> = 0V	-1		1	μA

Parameter	Description	Test Conditions		Min.	Typ.	Max.	Units
<b>B Port Switch</b>							
R <sub>ON</sub>	ON-state Resistance	V <sub>DD</sub> = 2.7V	V <sub>I/O</sub> = 1.65V, I <sub>ON</sub> = -8mA		5.7	9	Ω
		V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 1.65V, I <sub>ON</sub> = -8mA		5.7	9.5	
		V <sub>DD</sub> = 2.7V	V <sub>I/O</sub> = 1.65V, I <sub>ON</sub> = -8mA, T <sub>A</sub> = -40°C to 125°C			13	
		V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 1.65V, I <sub>ON</sub> = -8mA, T <sub>A</sub> = -40°C to 125°C			13	
ΔR <sub>ON</sub>	ON-state Resistance match between + and - paths	V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 1.65V, I <sub>ON</sub> = -8mA		0.1		Ω
R <sub>ON(FLAT)</sub>	ON-state Resistance Flatness	V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 1.65V to 3.45V, I <sub>ON</sub> = -8mA		1		Ω
I <sub>OZ</sub>	OFF Leakage Current	V <sub>DD</sub> = 4.8V	Switch OFF, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = 0V	-2		2	μA
			Switch OFF, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = 0V, T <sub>A</sub> = -40°C to 125°C	-10		10	
I <sub>OFF</sub>	Power-off Leakage Current	V <sub>DD</sub> = 0V	Switch ON or OFF, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC	-10		10	μA
			Switch ON or OFF, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-10		10	
I <sub>ON</sub>	ON Leakage Current	V <sub>DD</sub> = 4.8V	Switch ON, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC	-2		2	μA
			Switch ON, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-10		10	
		V <sub>DD</sub> = 1.8V	Switch ON, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC	-2		2	
			Switch ON, V <sub>B Port</sub> = 1.65V to 3.45V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-10		10	
<b>A Port Switch</b>							
R <sub>ON</sub>	ON-state Resistance	V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 0.4V, I <sub>ON</sub> = -8mA		4.6	7.5	Ω
			V <sub>I/O</sub> = 0.4V, I <sub>ON</sub> = -8mA, T <sub>A</sub> = -40°C to 125°C			12	
ΔR <sub>ON</sub>	ON-state Resistance match between + and - paths	V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 0.4V, I <sub>ON</sub> = -8mA		0.1		Ω
R <sub>ON(FLAT)</sub>	ON-state Resistance Flatness	V <sub>DD</sub> = 1.8V	V <sub>I/O</sub> = 0V or 0.4V, I <sub>ON</sub> = -8mA		0.2		Ω

Parameter	Description	Test Conditions		Min.	Typ.	Max.	Units
I <sub>OZ</sub>	OFF Leakage Current	V <sub>DD</sub> = 4.8V	Switch OFF, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = 0V	-2		2	μA
			Switch OFF, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = 0V, T <sub>A</sub> = -40°C to 125°C	-10		10	
I <sub>OFF</sub>	Power-off Leakage Current	V <sub>DD</sub> = 0V	Switch ON or OFF, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC	-10		10	μA
			Switch ON or OFF, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-50		50	
I <sub>ON</sub>	ON Leakage Current	V <sub>DD</sub> = 4.8V	Switch ON, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC	-2		2	μA
			Switch ON, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-10		10	
		V <sub>DD</sub> = 1.8V	Switch ON, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC	-2		2	
			Switch ON, V <sub>A Port</sub> = 0V to 3.6V, V <sub>COM Port</sub> = NC, T <sub>A</sub> = -40°C to 125°C	-10		10	

## Dynamic Electrical Characteristics

T<sub>A</sub> = -40°C to 125°C, Typical values are at V<sub>DD</sub> = 3.3V, T<sub>A</sub> = 25°C, (unless otherwise noted)

Parameter	Description	Test Conditions		Min.	Typ.	Max.	Units
C <sub>ON(B Port)</sub>	B Port path ON Capacitance	Switch ON	V <sub>DD</sub> = 3.3V, V <sub>I/O</sub> = 0 or 3.3V, f = 240MHz		1.5	2	pF
C <sub>ON(A Port)</sub>	A Port path ON Capacitance	Switch ON	V <sub>DD</sub> = 3.3V, V <sub>I/O</sub> = 0 or 3.3V, f = 240MHz		1.5	2	pF
C <sub>OFF(B Port)</sub>	B Port path OFF Capacitance	Switch OFF	V <sub>DD</sub> = 3.3V, V <sub>I/O</sub> = 0 or 3.3V, f = 240MHz		1.5	2	pF
C <sub>OFF(A Port)</sub>	A Port path OFF Capacitance	Switch OFF	V <sub>DD</sub> = 3.3V, V <sub>I/O</sub> = 0 or 3.3V, f = 240MHz		1.5	2	pF
C <sub>I</sub>	Digital Input Capacitance		V <sub>DD</sub> = 3.3V, V <sub>I</sub> = 0 or 2V		2.2		pF
O <sub>IOS</sub>	OFF Isolation	Switch OFF	R <sub>L</sub> = 50Ω, f = 240MHz		-34		dB
X <sub>TALK</sub>	Crosstalk	Switch ON	R <sub>L</sub> = 50Ω, f = 240MHz		-37		dB
B <sub>W(B Port)</sub>	B Port path -3dB Bandwidth	Switch ON	R <sub>L</sub> = 50Ω		5.3		GHz
B <sub>W(A Port)</sub>	A Port path -3dB Bandwidth	Switch ON	R <sub>L</sub> = 50Ω		5.5		GHz

### Switching Characteristics<sup>(1)</sup>

$T_A = -40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , Typical values are at  $V_{DD} = 3.3\text{V}$ ,  $T_A = 25^{\circ}\text{C}$ , (unless otherwise noted)

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Units
$t_{PZH}$ , $t_{PZL}$	Line Enable Time (SEL to Output)	See Test Circuit for Electrical Characteristics			600	ns
$t_{PHZ}$ , $t_{PLZ}$	Line Disable Time			50		ns
$t_{pd}$	Propagation Delay			100		ps
$t_{b-b}$	Bit-to-bit Skew Within the Same Differential Pair <sup>(1)</sup>			8	20	ps
$T_{on}$	Device Enable Time			100		$\mu\text{s}$
$T_{off}$	Device Disable Time			50		ns

Note:

1. Guaranteed by design.

**PSMUX136**

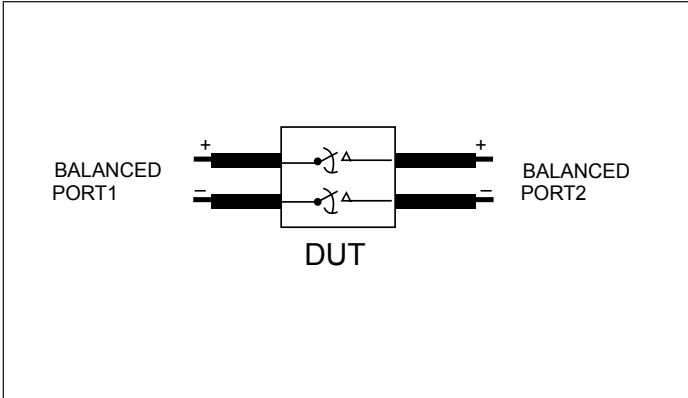


Figure 1. Differential Insertion Loss Setup

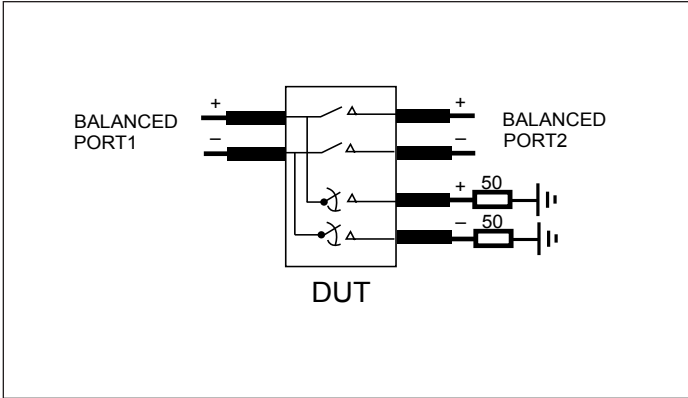


Figure 2. Off-isolation Setup

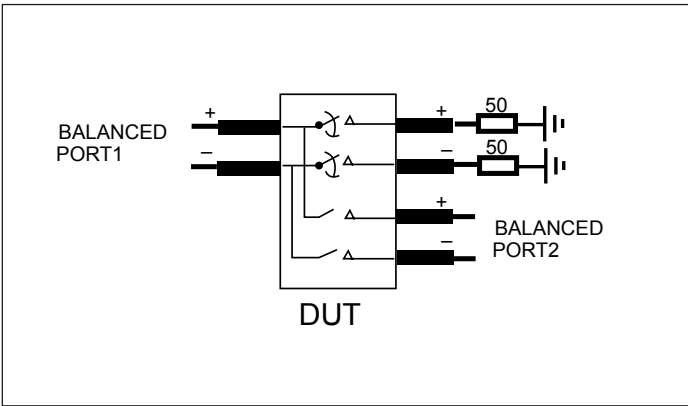


Figure 3. Crosstalk Setup

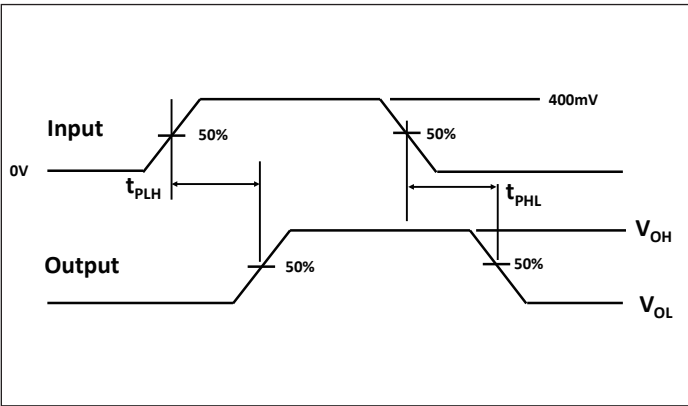


Figure 4. Propagation Delay

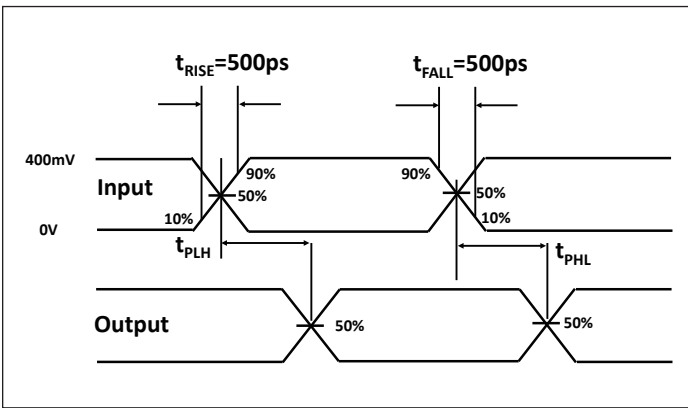
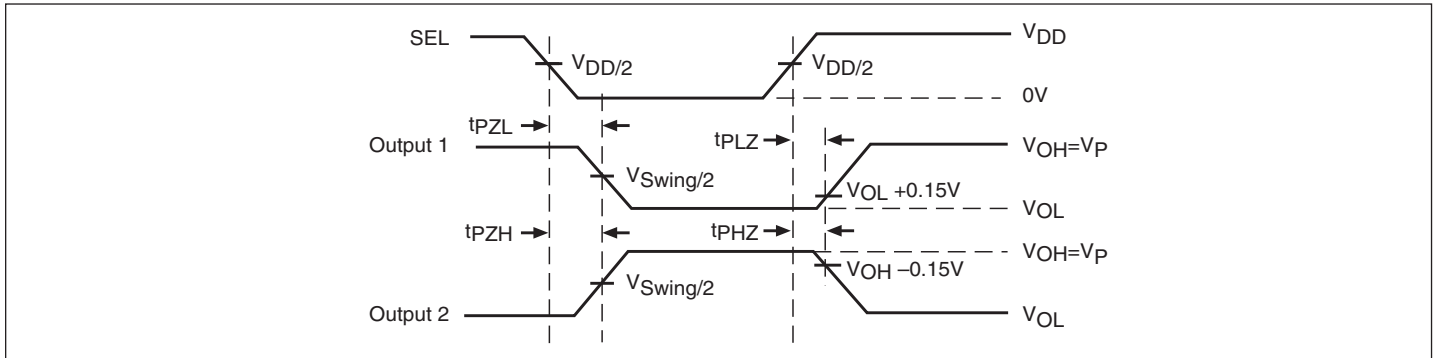


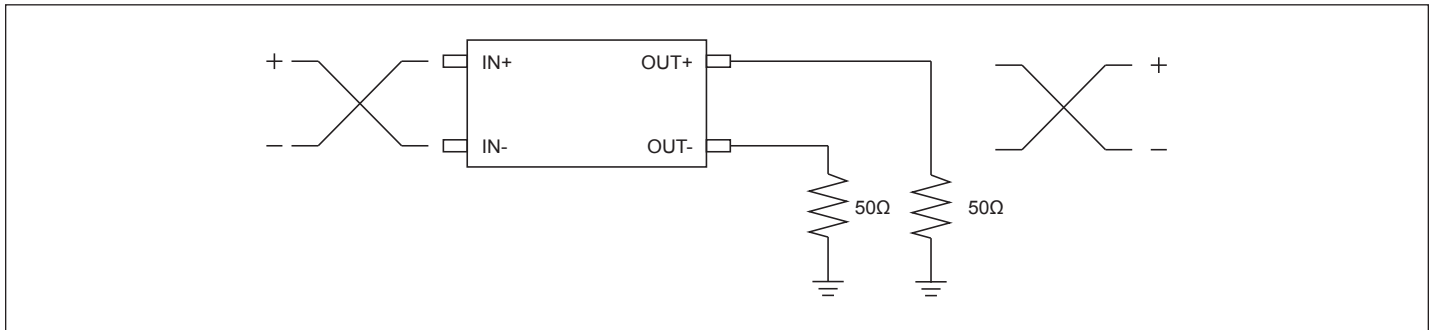
Figure 5. Skew Test



**Switching Waveforms**

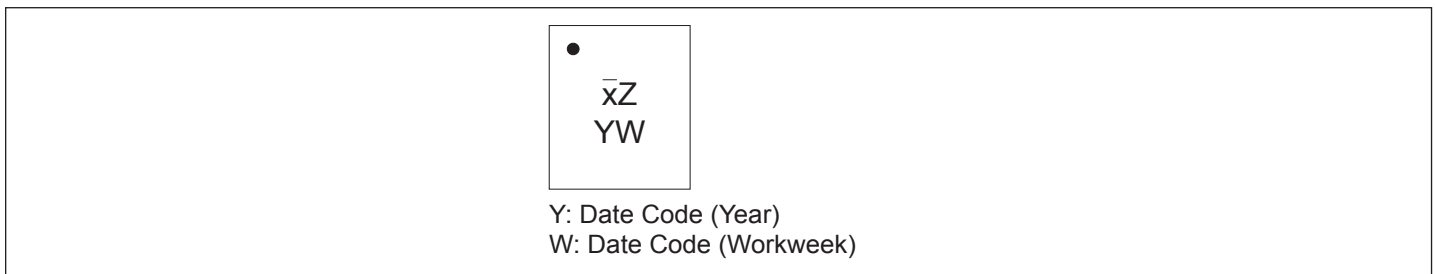


**Figure 6. Voltage Waveforms Enable and Disable Times**



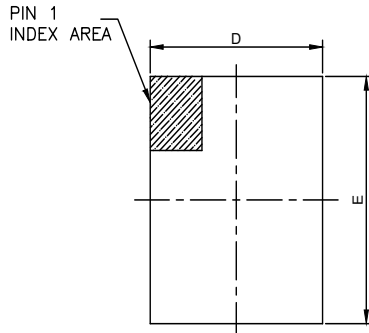
**Figure 7. Test Circuit for Propagation Delay**

**Part Marking**

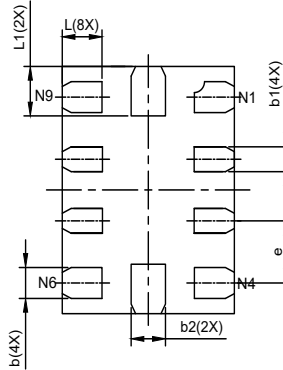


**Packaging Mechanical**

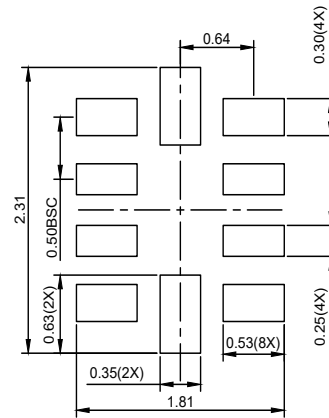
**10-UQFN (ZUA)**



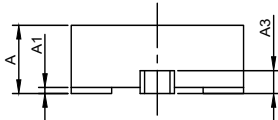
TOP VIEW



BOTTOM VIEW



RECOMMENDED LAND PATTERN(unit:mm)



SIDE VIEW

PKG. DIMENSIONS(MM)			
SYMBOL	Min	NOM	Max
A	0.50	0.60	0.65
A1	0.00	0.02	0.05
A3	0.15 REF		
D	1.45	1.50	1.55
E	1.95	2.00	2.05
b	0.20	0.25	0.30
b1	0.15	0.20	0.25
b2	0.25	0.30	0.35
e	0.50 BSC		
L	0.25	0.35	0.45
L1	0.30	0.40	0.50

**Notes:**

1. Ref: JEDEC MO-288B.



DATE: 01/06/17

DESCRIPTION: 10-Pin, UQFN, 1.5X2.0

PACKAGE CODE: ZUA(ZUA10)

DOCUMENT CONTROL#: PD-2220

REVISION: --

17-0002

For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

**Ordering Information**

Ordering Code	Package Code	Package Description	Pin 1 Orientation
PSMUX136ZUAEX	ZUA	10-Pin, 1.5mmx2.0mm (UQFN)	Top Left Corner
PSMUX136ZUAEX-13R	ZUA	10-Pin, 1.5mmx2.0mm (UQFN)	Bottom Left Corner

**Notes:**

- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- E = Pb-free and Green
- X suffix = Tape/Reel
- For packaging detail, go to our website at: <https://www.diodes.com/assets/MediaList-Attachments/Diodes-Package-Information.pdf>

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