

**WAS7227Q**
**USB High speed (480Mbps), DPDT Analog Switch**
[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)
**Descriptions**

The WAS7227Q is a high performance, double pole double throw (DPDT) CMOS analog switch that operates from a single +2.5V to +5.5V power supply.

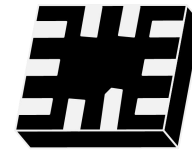
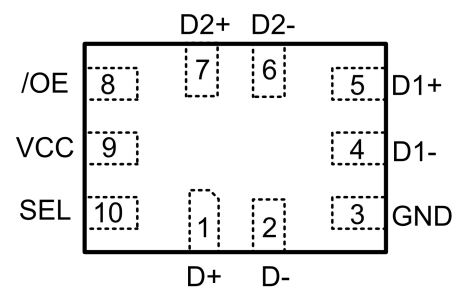
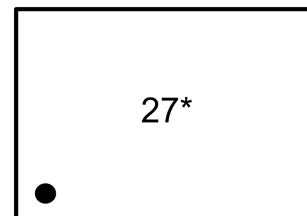
The WAS7227Q is designed for switching of high-speed USB2.0 signals in handset and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers with limited USB I/Os.

The WAS7227Q 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 bi-directional and offers little attenuation of the high-speed signals at the outputs. Its bandwidth is quite marginal to pass high-speed USB 2.0 differential signals (480Mbps) with good signal integrity.

The WAS7227Q is featured with special circuitry on the D+/D-, which allows the device to withstand a VBUS short to D+ or D- when the USB devices are either powered off or on.

The SEL/OE pin has overvoltage protection that allows voltages above VCC, up to 7.0V to be present on the pin without damage or disruption of operation of the part, regardless of the operating voltage. The WAS7227Q is also featured with smart circuitry to minimize VCC leakage current even when SEL/OE control voltage is lower than VCC supply voltage. In other word, there is no need of additional device to shift SEL/OE level to be the same as that of VCC in real application.

The WAS7227Q is available in QFN1418-10L package. Standard products are Pb-Free and halogen-Free.


**QFN1418-10L**

**Pin configuration (Top view)**

**Marking**
**27 = Device code**
**\* = Month (A~Z)**
**Order information**

Device	Package	Shipping
WAS7227Q-10/TR	QFN1418-10L	3000/Reel&Tape

**Applications**

- Cell phones
- MID
- Router
- Other electronics equipments

**Features**

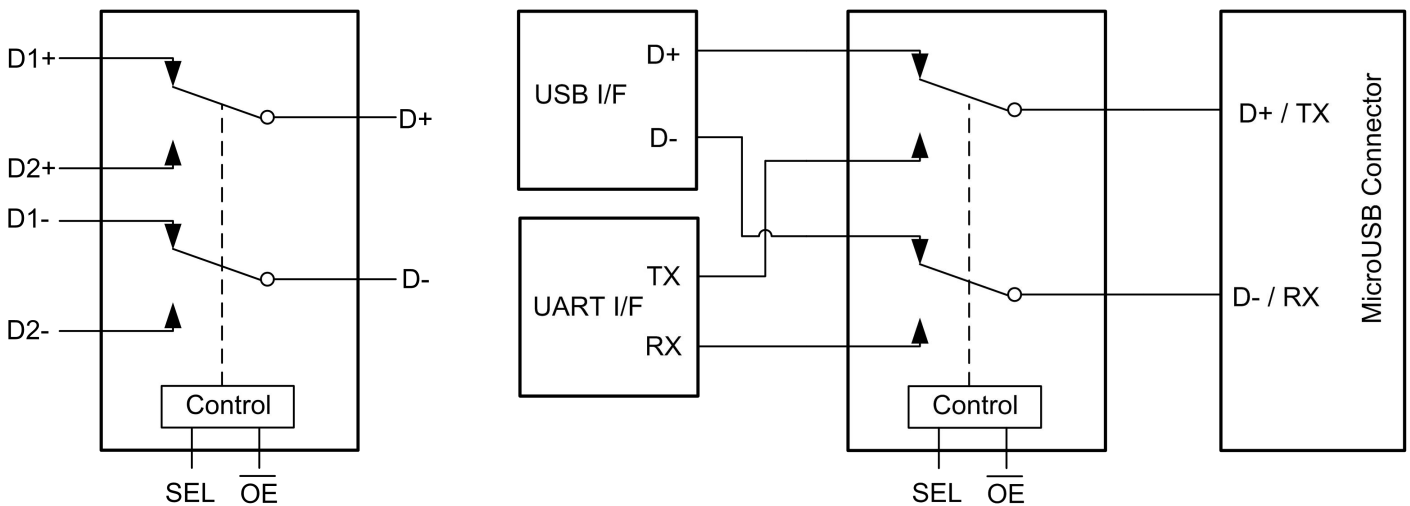
- Supply voltage : 2.5~ 5.5V
- -3dB Bandwidth : 550MHz @ C<sub>L</sub>=5pF
- Off isolation : -38dB @ 250MHz
- Crosstalk : -47dB @ 250MHz
- Low quiescent current : <1uA

**Pin descriptions**

Pin Number	Symbol	Descriptions
1	D+	Port A common data terminal, Connect to D1+ or D2+ according to SEL logic
2	D-	Port B common data terminal, Connect to D1- or D2- according to SEL logic
3	GND	Ground
4	D1-	Port B data 1 terminal
5	D1+	Port A data 1 terminal
6	D2-	Port B data 2 terminal
7	D2+	Port A data 2 terminal
8	$\overline{\text{OE}}$	Enable control, Active low
9	VCC	Power supply
10	SEL	Switch select pin, digital logic low or high

**Function descriptions**

SEL	$\overline{\text{OE}}$	Function
X	H	Switch disconnected
L	L	D+ connect to D1+ and D- connect to D1-
H	L	D+ connect to D2+ and D- connect to D2-

**Logic symbol and typical applications**

**Logic Symbol**
**Typical Applications**

**Absolute maximum ratings**

Parameter	Symbol	Value	Unit
Supply voltage range	VCC	-0.3 ~ 6.5	V
Data input/output voltage range	V <sub>AC</sub>	-0.3 ~ 6.5	V
Select input voltage range	V <sub>SEL</sub>	-0.3 ~ 6.5	V
Continues output current	I <sub>OUT</sub>	±50	mA
Junction temperature range	T <sub>J</sub>	150	°C
Lead temperature range	T <sub>L</sub>	260	°C
Storage temperature range	T <sub>STG</sub>	-65 ~ 150	°C
Thermal resistance	R <sub>θJA</sub>	250	°C/W
ESD protection (HBM)	All pins to GND	±8000	V
ESD protection (CDM)	All pins	±2000	V

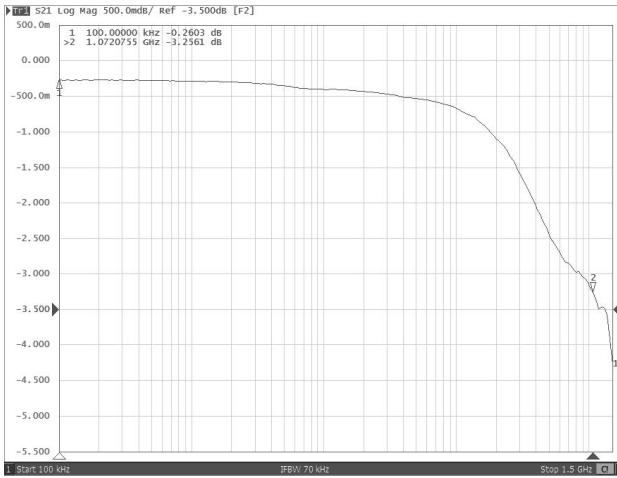
**Recommend operating ratings**

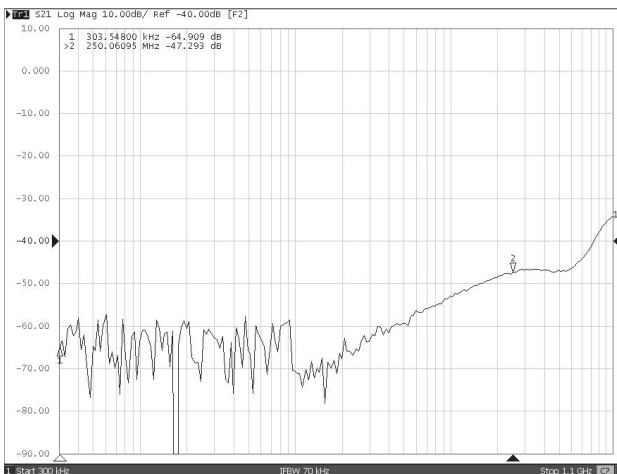
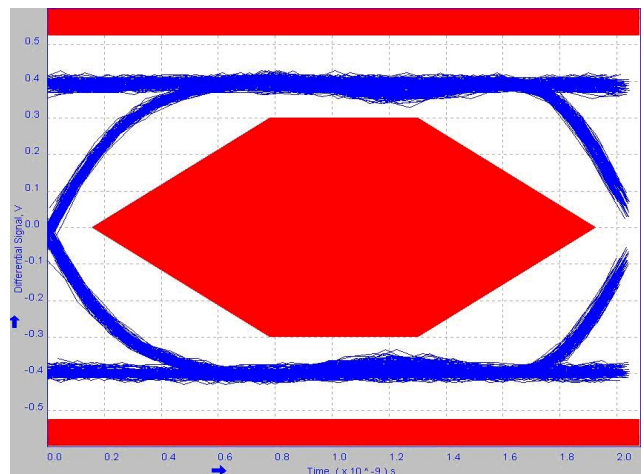
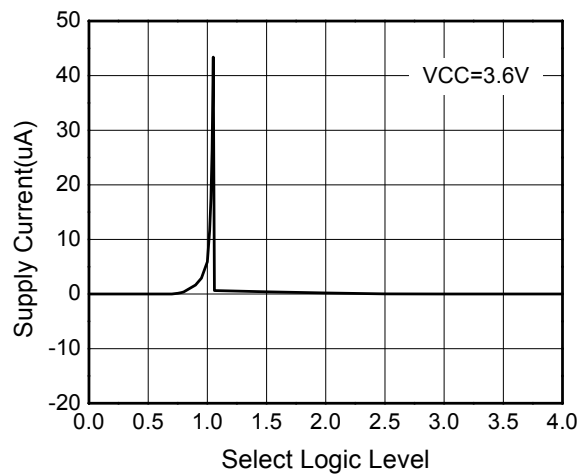
Parameter	Symbol	Value	Unit
Supply voltage range	VCC	2.5 ~ 5.5	V
Data input/output voltage range	V <sub>IS</sub>	0.0 ~ VCC	V
Select input voltage range	V <sub>SEL</sub>	0.0 ~ VCC	V
Enable control input voltage range	V <sub>OE</sub>	0.0 ~ VCC	V
Operating temperature range	T <sub>OPR</sub>	-40 ~ 85	°C

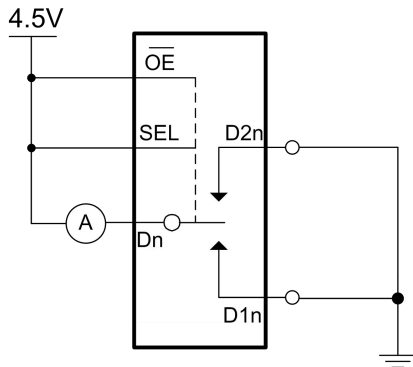
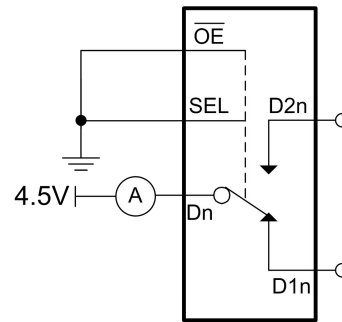
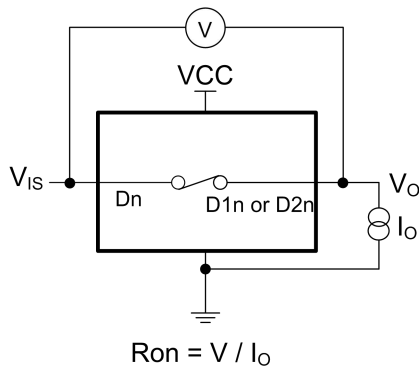
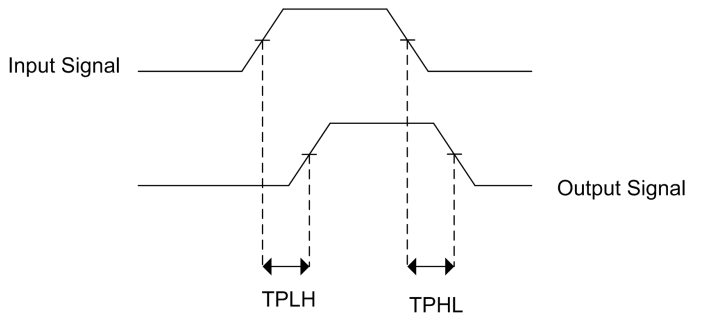
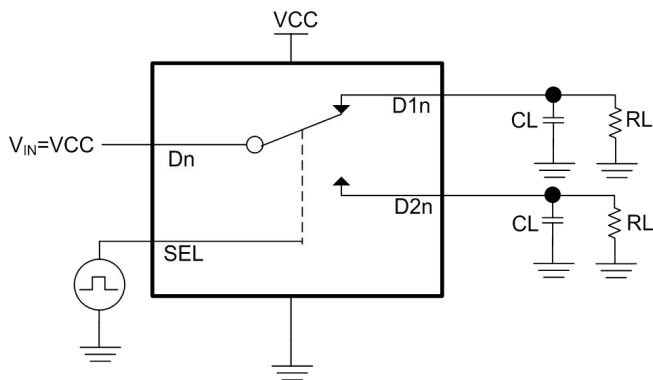
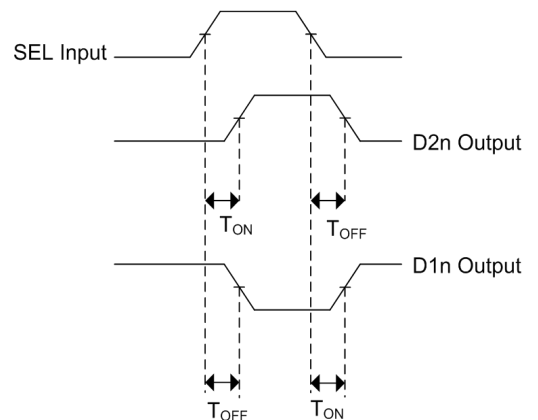
1. “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
3. Control input must be held high or Low, it must not float.

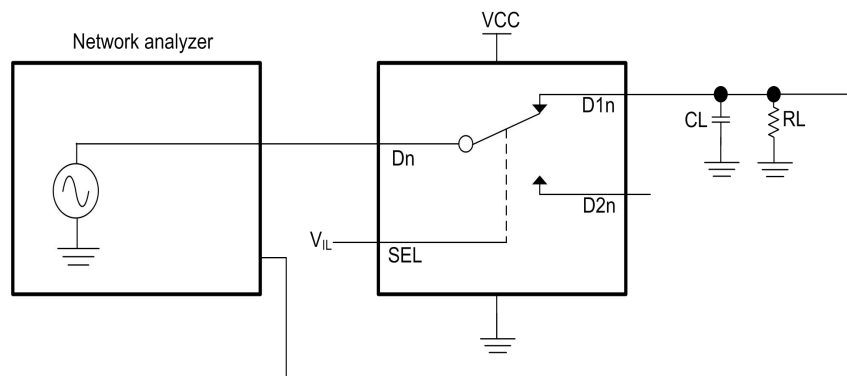
**Electronics Characteristics (Ta=25°C, VCC=4.5V, unless otherwise noted)**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Select and OE logic high level	V <sub>IH</sub>	VCC=3.6~4.5	1.6			V
		VCC=2.5~3.6	1.3			V
Select and OE logic low level	V <sub>IL</sub>	VCC=3.6~4.5			0.6	V
		VCC=2.5~3.6			0.4	V
Supply quiescent current	I <sub>CC</sub>	I <sub>OUT</sub> =0, V <sub>SEL</sub> >1.5V or V <sub>SEL</sub> <0.7V Refer to figure1			1.0	uA
Select pin leakage current	I <sub>SEL</sub>	V <sub>SEL</sub> =VCC			±1.0	uA
Off state leakage current	I <sub>OFF</sub>	Figure 2			±1.0	uA
On state switch leakage current	I <sub>ON</sub>	Figure 3			±1.0	uA
On-Resistance	R <sub>ON</sub>	VCC=3.0V, V <sub>IS</sub> =0~0.4V, I <sub>OUT</sub> =8mA, Figure 4		5.0	7.5	Ω
On-Resistance match	Δ R <sub>ON</sub>	VCC=3.0V, V <sub>IS</sub> =0~0.4V, I <sub>OUT</sub> =8mA, Figure 4		0.1	0.2	Ω
On-Resistance flatness	R <sub>FLAT(ON)</sub>	VCC=3.0V, V <sub>IS</sub> =0~1.0V, I <sub>OUT</sub> =8mA, See figure 4		1.8	2.2	Ω
Propagation delay time	T <sub>PLH</sub> / T <sub>PHL</sub>	C <sub>L</sub> =5pF, R <sub>L</sub> =50Ω Figure 5		0.25		ns
Select input to switch on time	T <sub>ON</sub>	C <sub>L</sub> =10pF, R <sub>L</sub> =50Ω Figure 6		48	70	ns
Select input to switch off time	T <sub>OFF</sub>	C <sub>L</sub> =10pF, R <sub>L</sub> =50Ω Figure 6		43	65	ns
Break-Before-Make time	T <sub>BBM</sub>	Generated by design	0.5			ns
-3dB Bandwidth	BW	R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF		550		MHz
		R <sub>L</sub> =50Ω, C <sub>L</sub> =0pF		800		
Off isolation	OIRR	R <sub>L</sub> =50Ω, F=250MHz		-38		dB
Crosstalk	Xtalk	R <sub>L</sub> =50Ω, F=250MHz		-47		dB
Select pin input capacitance	C <sub>IN</sub>	VCC=0V		3.5		pF
D1n, D2n,Dn Off capacitance	C <sub>OFF</sub>	VCC=3.3V, $\overline{OE}$ =3.3V		2.5		pF
D1n, D2n,Dn On capacitance	C <sub>ON</sub>	VCC=3.3V, $\overline{OE}$ =0V		3.8		pF

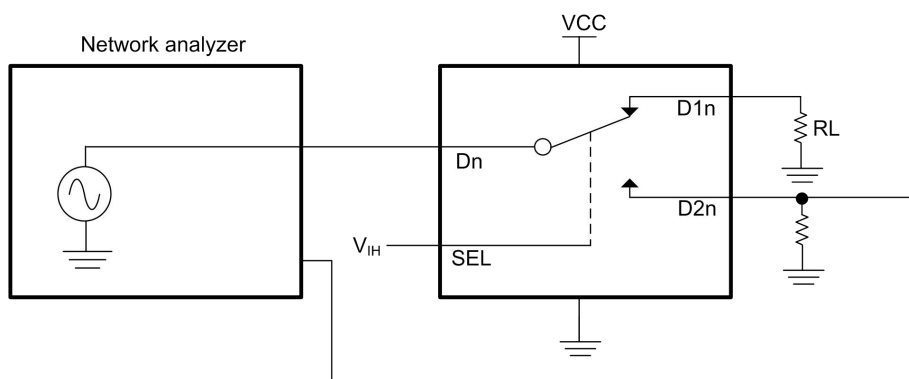
**Typical Characteristics (Ta=25°C, VCC=4.5V, unless otherwise noted)**

**Bandwidth**

**Off isolation**

**Crosstalk**

**Eye Diagram (480Mbps)**

**Figure 1: Supply current vs. Logic level**

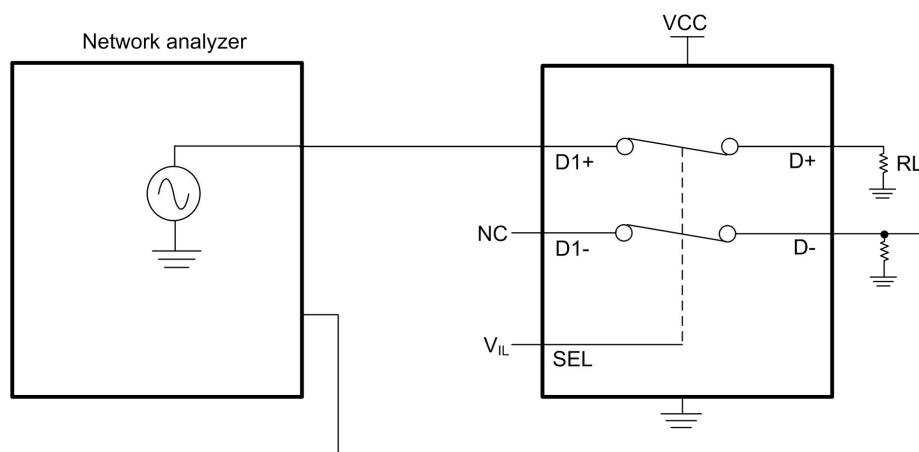
**Test Circuit**

**Figure 2: Off state leakage current**

**Figure 3: On state leakage current**

**Figure 4: On-Resistance**

**Figure 5: Propagation delay time**

**Figure 6: Select input to switch on/off time**




### Bandwidth (BW)



### Off isolation (OIRR)

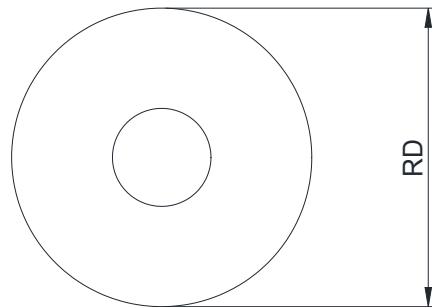
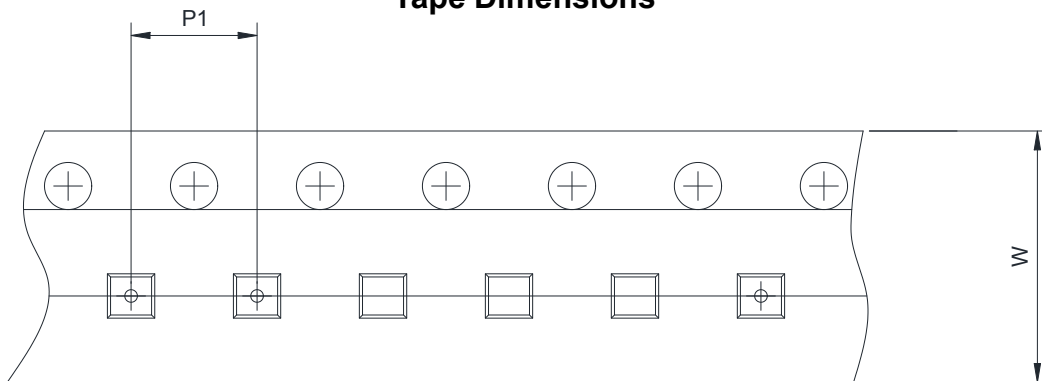
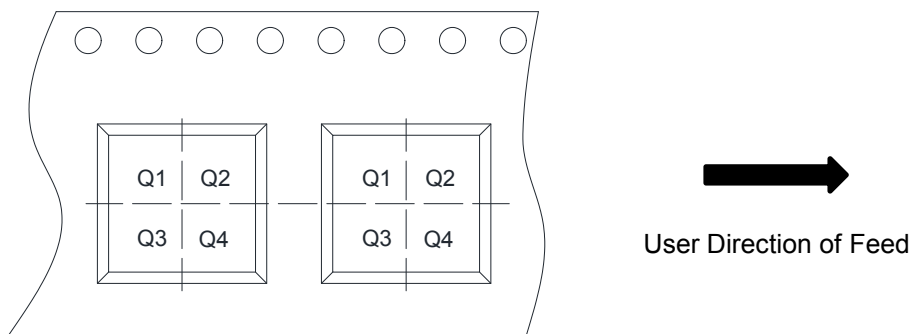


### Crosstalk (Xtalk)





Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.50	0.55	0.60
A1	--	0.02	0.05
A2	0.152REF		
D	1.30	1.40	1.50
E	1.70	1.80	1.90
b	0.15	0.20	0.25
e	0.40 BSC		
L	0.30	0.40	0.50
L1	0.40	0.50	0.60

**TAPE AND REEL INFORMATION**
**Reel Dimensions**

**Tape Dimensions**

**Quadrant Assignments For PIN1 Orientation In Tape**


RD	Reel Dimension	<input checked="" type="checkbox"/> 7inch	<input type="checkbox"/> 13inch		
W	Overall width of the carrier tape	<input checked="" type="checkbox"/> 8mm	<input type="checkbox"/> 12mm		
P1	Pitch between successive cavity centers	<input type="checkbox"/> 2mm	<input checked="" type="checkbox"/> 4mm	<input type="checkbox"/> 8mm	
Pin1	Pin1 Quadrant	<input checked="" type="checkbox"/> Q1	<input type="checkbox"/> Q2	<input type="checkbox"/> Q3	<input type="checkbox"/> Q4