4:1 High-Speed USB Multiplexer/Switch

1 FEATURES

- **Wide Bandwidth: 550MHz**
- **Supply Operation +2.5V to +4.4V**
- **Low ON Resistance, 6Ω (TYP) at 3.3V**
- **1.8V Logic Threshold Compatibility for Control Inputs**
- **Rail-to-Rail Operation**
- **Fast Switching Time**
- **Operating Temperature Range: -40°C to 125°C**
- **Packages: UQFN2.6X1.8-16**

2 APPLICATIONS

- **Routes Signals for USB 1.0, 1.1, and 2.0**
- **MP3 and Other Personal Media Players**
- **Mobile POS and Portable POS**
- **USB Switching for TV Display Panel**

3 DESCRIPTIONS

The RS2274 is a bi-directional, low-power, high-speed USB 2.0 switch comprised of dual 4:1 multiplexers. RS2274 has very low on-resistance, allowing the inputs to be connected to the outputs without adding propagation delay. It is optimized for switching from four high-speed (480Mbps) sources or any combination of high-speed and full-/low-speed USB/UART sources to one USB 2.0 connector.

The RS2274 is available in Green UQFN2.6X1.8-16 packages. It operates over an ambient temperature range of -40°C to 125°C.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2274	UQFN2.6X1.8-16	2.60mm×1.80mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

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4 REVISION HISTORY

Note: Page numbers for previous revisions may different from page numbers in the current version.

VERSION	Change Date	Change Item
A.0	2024/05/17	Preliminary version completed
A.0.1	2024/05/20	1. Modify FEATURES, APPLICATIONS and DESCRIPTIONS 2. Modify PIN DESCRIPTION 3. Add UQFN2.6X1.8-16 Land Pattern
A.1	2025/01/06	Initial version completed
A.2	2025/02/11	Delete QFN3X3-16 Package

5 PACKAGE/ORDERING INFORMATION (1)

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING (2)	MSL (3)	PACKAGE OPTION
RS2274	RS2274XTQQ16	-40°C ~125°C	UQFN2.6X1.8-16	2274	MSL3	Tape and Reel, 3000

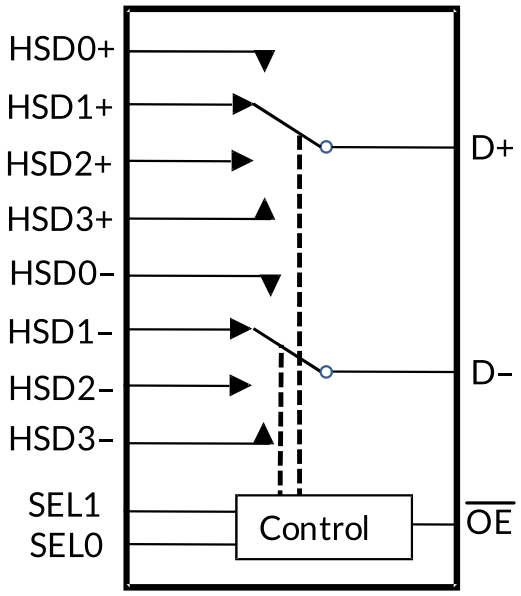
NOTE:

(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

(3) RUNIC classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F. Please align with RUNIC if your end application is quite critical to the preconditioning setting or if you have special requirement.

6 LOGIC FUNCTION



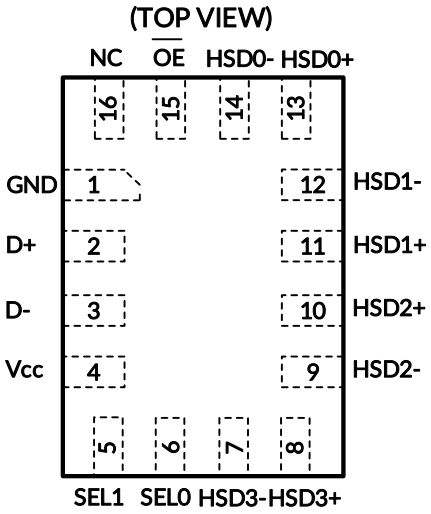
FUNCTION TABLE

$\overline{OE}$	SEL0	SEL1	Function
1	X	X	D+, D- Switch paths open
0	0	0	D+ = HSD0+, D- = HSD0-
0	1	0	D+ = HSD1+, D- = HSD1-
0	0	1	D+ = HSD2+, D- = HSD2-
0	1	1	D+ = HSD3+, D- = HSD3-

X=Don't care

NOTE: Input and output pins are identical and inter-changeable. Either may be considered an input or output; signals pass equally well in either direction.

7 PIN CONFIGURATIONS



UQFN2.6X1.8-16

PIN DESCRIPTION

NAME	PIN	FUNCTION
	UQFN2.6X1.8-16	
D+	2	D+ common port
D-	3	D- common port
HSD0+	13	D+ from first source path
HSD0-	14	D- from first source path
HSD1+	11	D+ from second source path
HSD1-	12	D- from second source path
HSD2+	10	D+ from third source path
HSD2-	9	D- from third source path
HSD3+	8	D+ from fourth source path
HSD3-	7	D- from fourth source path
GND	1	Ground
V_{CC}	4	Power Supply
$\overline{OE}$	15	Enable control pin, Pull Low enable this device
SEL1	5	Digital Control Pin
SEL0	6	Digital Control Pin
NC	16	No connect

NOTE:
1. This analog switch is no direction, each port can as input or output.

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

SYMBOL	PARAMETER		MIN	MAX	UNIT
V_{CC}	Supply Voltage		-0.5	5.25	V
V_{CNTRL}	DC Input Voltage (SEL1, SEL0, $\overline{OE}$, SELS) (2)		-0.5	V_{CC}	V
V_{SW}	DC Switch I/O Voltage (1)		-0.5	5.25	V
I_{IK}	DC Input Diode Current		-30		mA
θ_{JA}	Package thermal impedance (3)	UQFN2.6X1.8-16		145	°C/W
T_{STG}	Storage Temperature		-65	150	°C

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.
(2) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation.
(3) The package thermal impedance is calculated in accordance with JESD-51.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

SYMBOL	PARAMETER		VALUE	UNIT
ESD	IEC61000-4-2 System on USB connector pins D+ & D-	Contact	±8	kV
	Human Body Model, JEDEC: JESD22-A114	D+, D- to GND	±7	
		Power to GND	±7	
		All Other Pins	±4	
	Charged-Device Model (CDM), ANSI/ESDA/JEDEC JS-002-2018		±1000	V
	Machine Model (MM), JESD22-A115C (2010)		±200	

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.3 Recommended Operating Conditions

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

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{CC}	Supply Voltage	2.5	4.4	V
V_{CNTRL}	Control Input Voltage (SEL1, SEL0, $\overline{OE}$ and SELS)	0	V_{CC}	V
V_{SW}	Switch I/O Voltage	-0.5	4.4	V
T_A	Operating Temperature	-40	125	°C

8.4 DC Electrical Characteristics

All typical values are for V_{CC}=3.3V at 25°C unless otherwise specified, FULL = -40°C - 125°C.

PARAMETER	SYMBOL	CONDITIONS	V_{CC} (V)	T_A	MIN(2)	TYP(3)	MAX(2)	UNIT
On-Resistance	R_{ON} (1)	V_{SW} = 0.4V, I_{ON} = 8mA, Figure 1	3.3	25°C		6	7	Ω
				FULL			9	
On-Resistance Match Between Channels	ΔR_{ON}	V_{SW} = 0.4V, I_{ON} = 8mA	3.3	25°C		0.34	0.5	Ω
				FULL			0.6	
Control Input Leakage	I_{IN}	All Combinations of $\overline{OE}$ SEL1 & SEL0 in the Truth Table (1=V_{CC}, 0=0V)	4.4	FULL	-1		1	μA
Off State Leakage	I_{OZ}	0≤Dn, HSD0n, HSD1n, HSD2n, HSD3n≤4.4V	4.4	FULL	-1		1	μA
Power-Off Leakage Current (All I/O Ports)	I_{OFF}	V_{SW} =0V to 4.4V, Figure 2	0	FULL	-1		1	μA
Sleep Mode Supply Current	I_{CCSLP}	$\overline{OE}$=V_{CC}	4.4	FULL			1	μA
Active Mode Supply Current	I_{CCACT}	All Active Modes in Truth Table	4.4	FULL		8	16	μA
Increase in I_{CC} Current per Control Input and V_{CC}	I_{CCT}	V_{CNTRL} =1.8V	4.4	FULL			3.5	μA
		V_{CNTRL} =1.2V	4.4	FULL			4	μA
Clamp Diode Voltage	V_{IK}	I_{IN}=-18mA	2.5	FULL			-1.2	V
Control Input Voltage High	V_{IH}	SEL1, SEL0, $\overline{OE}$	2.5 to 4.4	FULL	1			V
Control Input Voltage Low	V_{IL}	SEL1, SEL0, $\overline{OE}$	2.5 to 4.4	FULL			0.35	V

(1) Measured by the voltage drop between HSDn and Dn pins at the indicated current through the switch. On resistance is determined by the lower of the voltage on the two (HSDn or Dn ports).

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

8.5 AC Electrical Characteristics

All typical values are for V_{CC}=3.3V at 25°C unless otherwise specified, FULL = -40°C - 125°C.

PARAMETER	SYMBOL	CONDITIONS	T_A	MIN(2)	TYP(3)	MAX(2)	UNIT
Turn-On Time when Switching from One USB Path (or Disabled $\overline{OE}$=1) to Another USB Path	t_{ON}	R_L =50Ω, C_L =35pF, V_{SW} =0.8V, Figure 3, Figure 4	25°C		200		µs
Turn-Off Time, Turning Off Any of the USB Paths	t_{OFF}	R_L =50Ω, C_L =35pF, V_{SW} =0.8V, Figure 3, Figure 4	25°C		92		ns
Propagation Delay (1)	t_{PD}	C_L =5pF, R_L =50Ω, Figure 3, Figure 5	25°C		0.35		ns
Slow Turn-On/Off Switch Paths (1)	t_{RF}	C_L =5pF, Dn at 0V or 3.6V, 40.5Ω in series with switch 10% to 90%	25°C		4.5		ns
Break-Before-Make Time	t_{BBM}	R_L =50Ω, C_L =35pF, V_{SW1}=V_{SW2} =0.8V, Figure 7	25°C		200		µs
-3dB Bandwidth	BW	R_L =50Ω, C_L =5pF, Figure 8	25°C		550		MHz
Off Isolation	O_{IRR}	R_L =50Ω, f=240MHz, Figure 9	25°C		-40		dB
Channel-to-Channel Crosstalk	X_{talk}	R_L =50Ω, f=240MHz, Figure 10	25°C		-40		dB
Pulse Skew (1)	$t_{SK(P)}$	V_{SW} =0.2V_{diffPP}, C_L =5pF, Figure 6	25°C		25		ps
Skew Between Differential Signals Within a Pair (1)	$t_{SK(I)}$	V_{SW} =0.2V_{diffPP}, C_L =5pF, Figure 6	25°C		25		ps
Input Capacitance	C_{IN}	f=1MHz, V_{IN}=0 to V_{CC}	25°C		3		pF
D+/D- On Capacitance	C_{ON}	f=1MHz, V_{IN}=0 to V_{CC}	25°C		11.5		pF
HSD0n, HSD1n, HSD2n, HSD3n Off Capacitance	C_{OFF}	f=1MHz, V_{IN}=0 to V_{CC}	25°C		2.8		pF

(1) This parameter is ensured by design and/or characterization and is not tested in production.
(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

9 PARAMETER MEASUREMENT INFORMATION

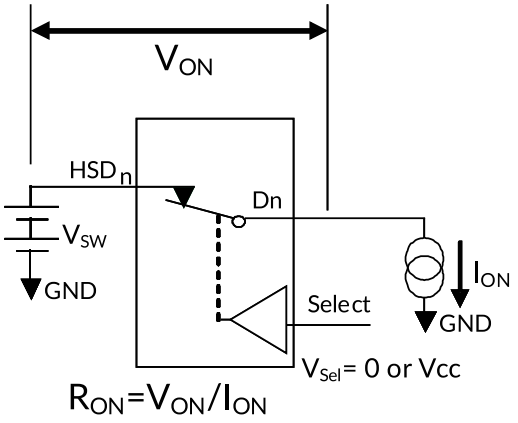
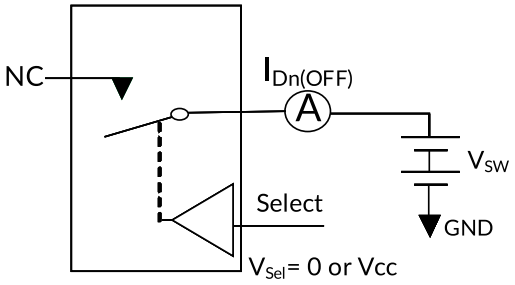
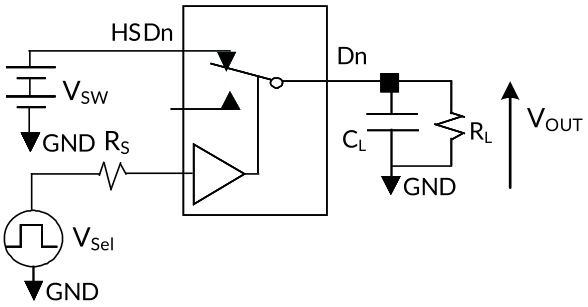


Figure 1. On Resistance



**Each switch port is tested separately

Figure 2. Off Leakage



R_L, R_S and C_L are functions of the application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance.

Figure 3. AC Test Circuit Load

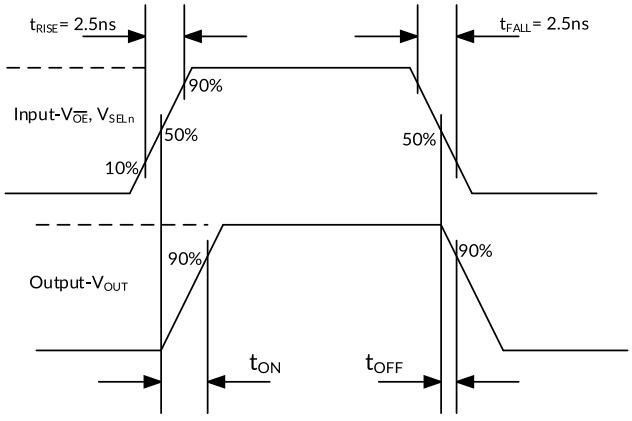


Figure 4. Turn-On / Turn-Off Waveforms

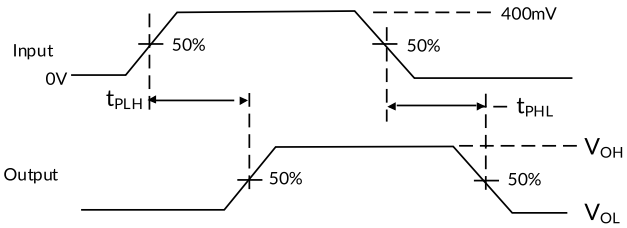


Figure 5. Propagation Delay (t_Rt_F - 500ps)

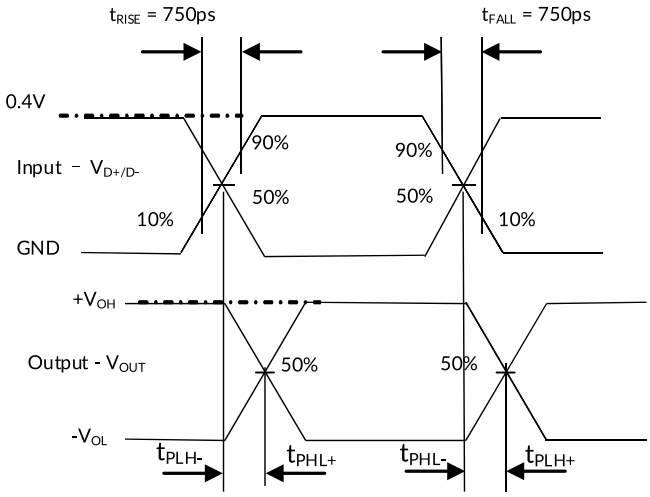
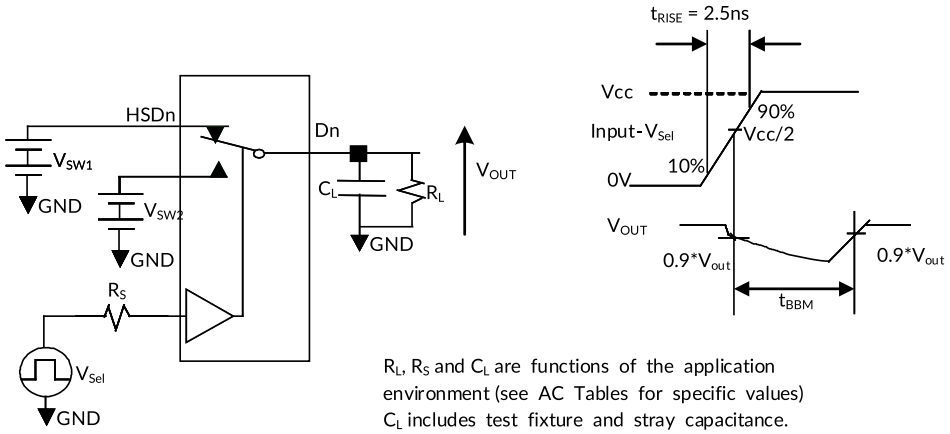


Figure 6. Skew Test Waveforms

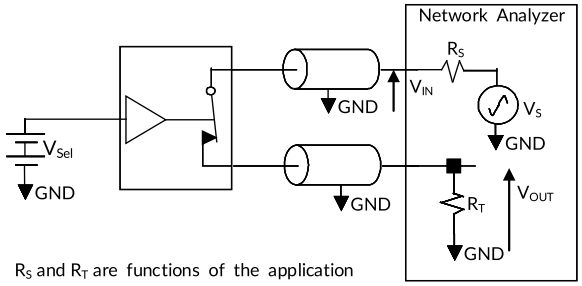
$t_{SK(P)}$ = | t_{PLH-} - t_{PHL-} | or | t_{PLH+} - t_{PHL+} |
$t_{SK(I)}$ = | t_{PLH-} - t_{PHL+} | or | t_{PLH+} - t_{PHL-} |

PARAMETER MEASUREMENT INFORMATION (continued)



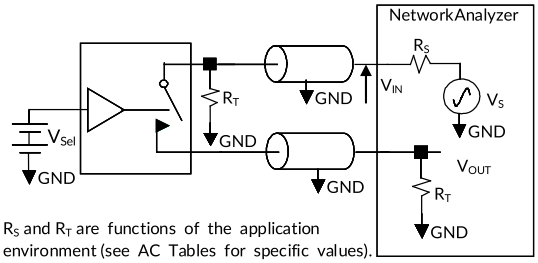
R_L, R_S and C_L are functions of the application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance.

Figure 7. Break-Before-Make Interval Timing



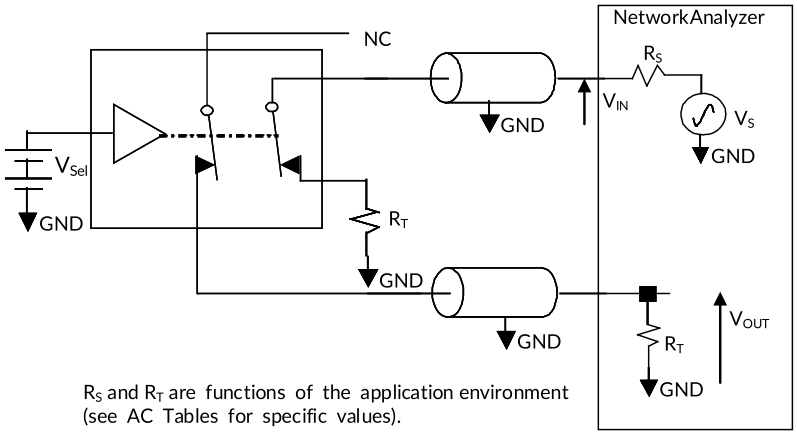
R_S and R_T are functions of the application environment (see AC Tables for specific values).

Figure 8. Bandwidth



R_S and R_T are functions of the application environment (see AC Tables for specific values).
Off isolation = 20 Log (V_{OUT} /V_{IN})

Figure 9. Channel Off Isolation



R_S and R_T are functions of the application environment (see AC Tables for specific values).
Crosstalk = 20 Log (V_{OUT} /V_{IN})

Figure 10. Non-Adjacent Channel-to-Channel Crosstalk

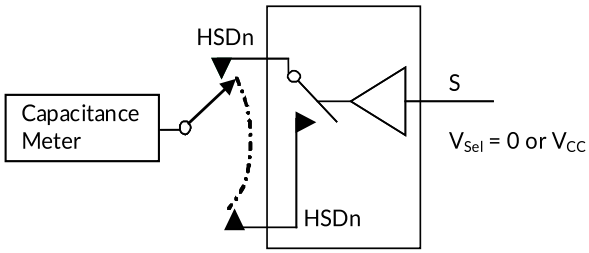


Figure 11. Channel Off Capacitance

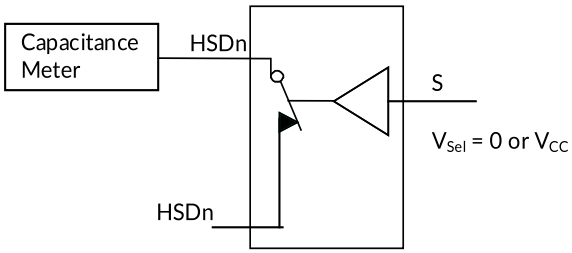
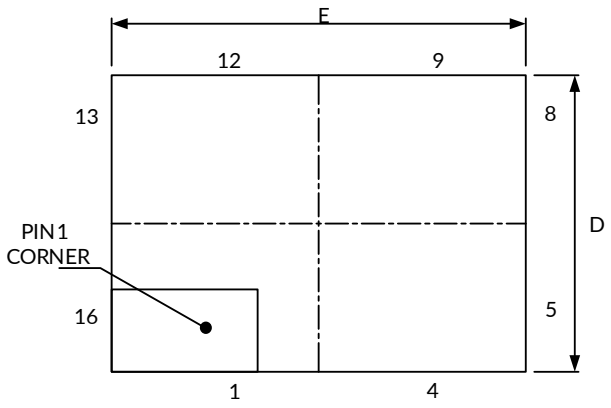


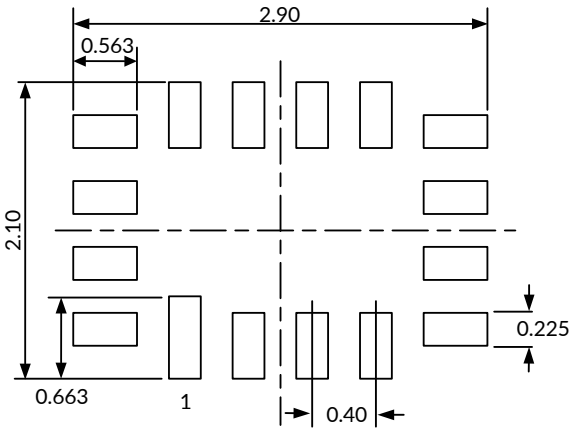
Figure 12. Channel On Capacitance

10 PACKAGE OUTLINE DIMENSIONS

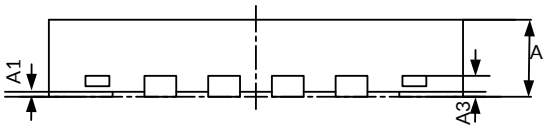
UQFN2.6X1.8-16 (3)



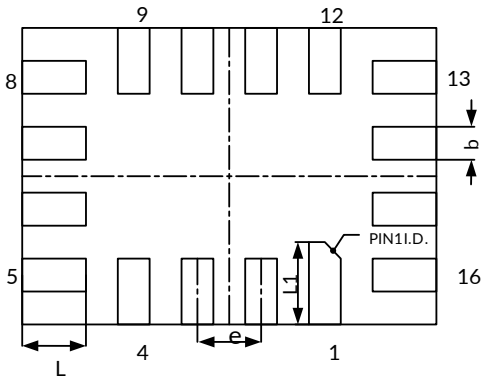
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



BOTTOM VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)	0.450	0.550	0.018	0.022
A1	0.000	0.046	0.000	0.002
A3	0.110 (REF) (2)		0.004 (REF) (2)	
b	0.150	0.250	0.006	0.010
E (1)	2.550	2.650	0.100	0.104
D (1)	1.750	1.850	0.069	0.073
e	0.400 (TYP)		0.016 (TYP)	
L	0.350	0.450	0.014	0.018
L1	0.450	0.550	0.018	0.022

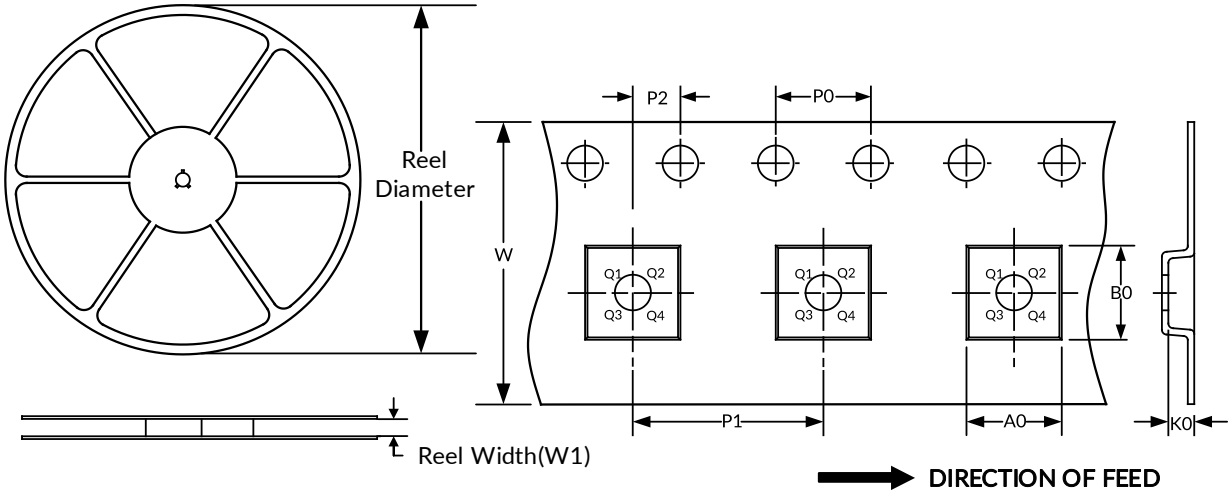
NOTE:

1. Plastic or metal protrusions of 0.075mm maximum per side are not included.
2. REF is the abbreviation for Reference.
3. This drawing is subject to change without notice.

11 TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
UQFN2.6X1.8-16	7”	8.3	2.10	2.90	0.75	4.0	4.0	2.0	8.0	Q1

NOTE:
1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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