

### Features

- Low On-resistance,  $R_{on}=1.5\Omega$  when  $V_{CC}=5V$
- 1.8V Logic Compatible Control Pin
- High Off-Isolation:  $-100dB @ 100KHz$
- COM+/- Overrides VCC to Achieve True Isolation Even When Supply Is Dead
- Low Channel-to-Channel Crosstalk:  $-97dB @ 100KHz$
- High Bandwidth ( $-3dB @ 800MHz$ ) Suitable For USB2.0 High-Speed Routing
- Low Quiescent Current ( $<2\mu A$ ) With Very Wide Supply Range ( $1.5V \sim 5.5V$ )

### Applications

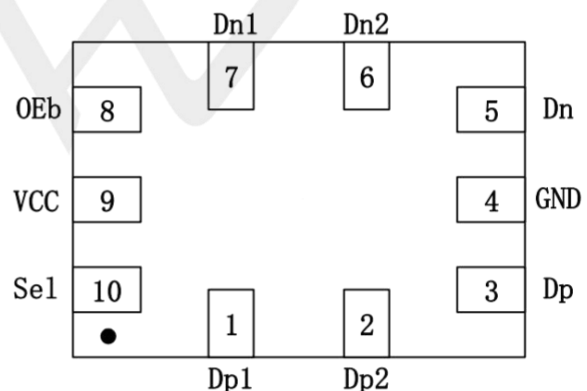
- Mobile Phones, Tablets and Notebooks
- Anywhere a USB Type-C™ or Micro-B Connector is Used

### General Description

The is a bidirectional low-power dual port, high-speed, USB 2.0 analog switch with integrated protection for USB Type-C™ systems. The device is configured as a dual 2:1 or 1:2 switch. It is optimized for use with the USB 2.0 DP/DM lines in a USB Type-C™ system. The device is capable of true isolation. Even when COM+/- overrides VCC, very little current will flow back to the supply. 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 bidirectional and offers little or no attenuation of the high-speed signals at the outputs. Its bandwidth is wide enough to pass high-speed USB 2.0 differential signals (480 Mb/s) with good signal integrity.

### PIN CONFIGURATIONS (TOP VIEW)

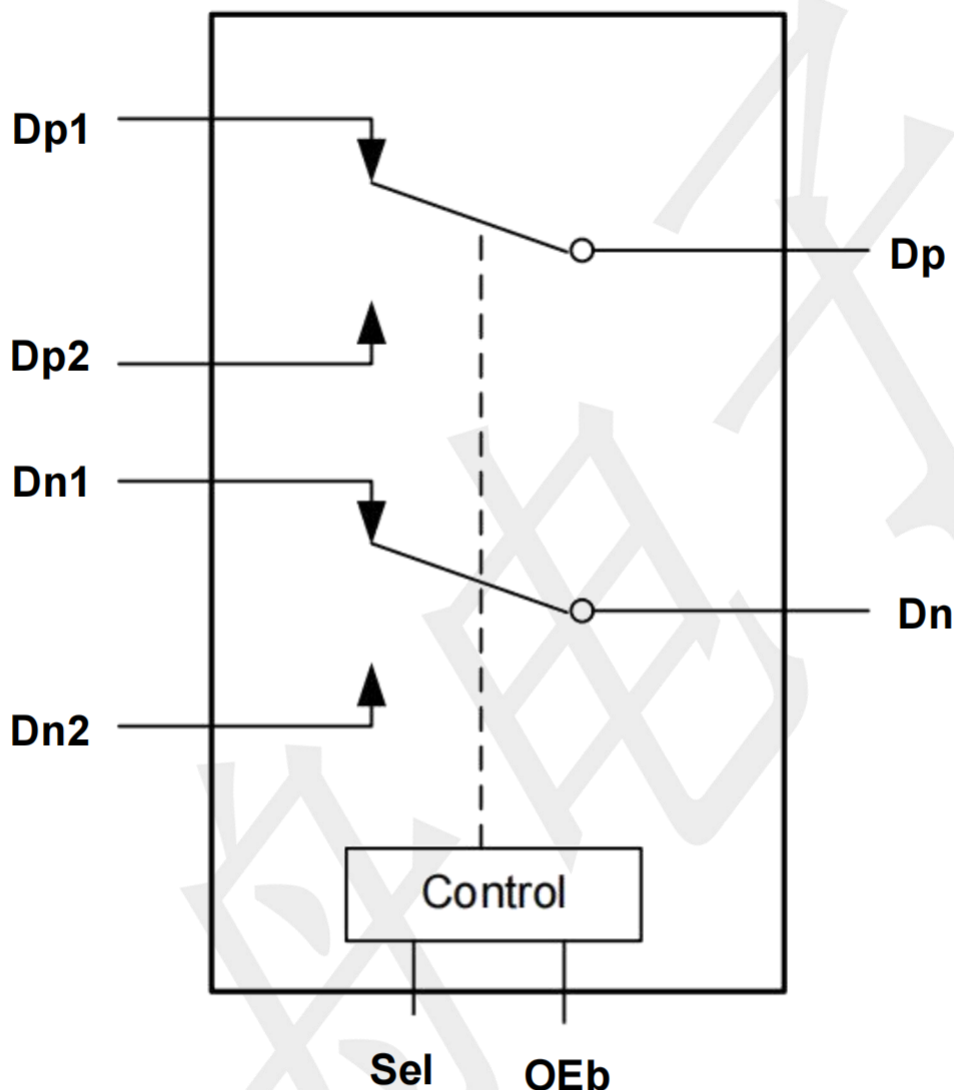
QFN1418-10L



### PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION                                                               |
|---------|----------|---------------------------------------------------------------------------|
| 1       | Dp1      | Analog/Digital Signal Ports (Normally closed)                             |
| 2       | Dp2      | Analog/Digital Signal Ports (Normally open)                               |
| 3       | Dp       | Port A common data terminal, Connect to Dp1 or Dp2 according to Sel logic |
| 4       | GND      | Ground                                                                    |
| 5       | Dn       | Port B common data terminal, Connect to NC2 or NO2 according to SEL logic |
| 6       | Dn2      | Analog/Digital Signal Ports (Normally open)                               |
| 7       | Dn1      | Analog/Digital Signal Ports (Normally closed)                             |
| 8       | OEb      | output enable input (active LOW), prohibit high level connection          |
| 9       | VCC      | Supply voltage                                                            |
| 10      | Sel      | Logic Input Selection                                                     |

## BLOCK DIAGRAM



## Function Table

| OEb | Input Sel | Function          |
|-----|-----------|-------------------|
| 0   | 0         | Dp=Dp1 and Dn=Dn1 |
| 0   | 1         | Dp=Dp2 and Dn=Dn2 |

Switches Shown For Logic "0" Input, /OE is prohibited from connecting to high level 1 in application.

### Absolute Maximum Ratings

(Unless otherwise specified)

| PARAMETER                                                     | SYMBOL           | RATINGS     | UNIT |
|---------------------------------------------------------------|------------------|-------------|------|
| Supply Voltage                                                | V <sub>CC</sub>  | -0.3 ~ +6.5 | V    |
| Input Voltage                                                 | V <sub>IN</sub>  | -0.3 ~ +6.5 | V    |
| OEB Input Voltage                                             | VOEB             | -0.3 ~ +0   | V    |
| Continuous Current Through Dp, Dn                             |                  | ±100        | mA   |
| Peak Current Through Dp, Dn<br>(pulsed at 1ms 50% duty cycle) |                  | ±200        | mA   |
| Storage Temperature Range                                     | T <sub>STG</sub> | -55 ~ +150  | °C   |
| Operating Junction Temperature                                | T <sub>J</sub>   | 150         | °C   |
| Lead Temperature (Soldering, 10 seconds)                      | T <sub>L</sub>   | 260         | °C   |
| Power Dissipation                                             | P <sub>D</sub>   | 250         | mW   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### Recommend operating ratings

(Unless otherwise specified)

| PARAMETER                | SYMBOL           | RATINGS    | UNIT |
|--------------------------|------------------|------------|------|
| Supply Voltage Operating | V <sub>CC</sub>  | 1.5 ~ 5.5  | V    |
| Control Input Voltage    | V <sub>IN</sub>  | -0.3 ~ 5.5 | V    |
| Input Signal Voltage     | V <sub>D</sub>   | -0.3 ~ 5.5 | V    |
| Operating Temperature    | T <sub>A</sub>   | -40 ~ +85  | °C   |
| Junction to Ambient      | R <sub>θJA</sub> | 360        | °C/W |

### DC Electrical Characteristics (TA =25°C, VC=+3.3V, unless otherwise specified)

| PARAMETER                                       | SYMBOL             | TEST Conditions                                                               | MIN | TYP | MAX  | UNIT |
|-------------------------------------------------|--------------------|-------------------------------------------------------------------------------|-----|-----|------|------|
| High-Level Input Voltage                        | V <sub>IH</sub>    | VCC=3.3V ~ 5.5V                                                               | 1.6 | --  | --   | V    |
|                                                 |                    | VCC=1.5V ~ 3.3V                                                               | 1.4 | --  | --   | V    |
| Low-Level Input Voltage                         | V <sub>IL</sub>    | VCC=3.3V ~ 5.5V                                                               | --  | --  | 0.6  | V    |
|                                                 |                    | VCC=1.5V ~ 3.3V                                                               | --  | --  | 0.4  | V    |
| Supply quiescent current                        | I <sub>CC</sub>    | I <sub>A</sub> =0, V <sub>SEL</sub> =0 or V <sub>SEL</sub> =VCC               | --  | --  | 1.0  | uA   |
| Increase in ICC per input                       | I <sub>CC</sub> T  | I <sub>A</sub> =0, VCC=4.5V<br>V <sub>SEL</sub> >1.8 or V <sub>SEL</sub> <0.5 | --  | --  | 1.0  | uA   |
| Off state leakage from Dn or Dp to Dnx (or Dpx) | I <sub>COMx</sub>  | V <sub>COM</sub> = 5.5V, V <sub>NC(or NO)</sub> = 0V                          | --  | --  | ±2.0 | uA   |
| On-Resistance                                   | R <sub>ON1</sub>   | V <sub>A</sub> =0 ~ 0.5V, I <sub>A</sub> =30mA                                | --  | 3.6 | 3.9  | Ω    |
|                                                 | R <sub>ON2</sub>   | V <sub>A</sub> =0.5 ~ 2.0V, I <sub>A</sub> =30mA                              | --  | 3.0 | 3.5  | Ω    |
|                                                 | R <sub>ON3</sub>   | V <sub>A</sub> =2.0 ~ 4.0V, I <sub>A</sub> =30mA                              | --  | 2.5 | 3.5  | Ω    |
|                                                 | R <sub>ON4</sub>   | V <sub>A</sub> =4.0 ~ 5.5V, I <sub>A</sub> =30mA                              | --  | 1.5 | 1.8  | Ω    |
| On-Resistance Flatness                          | R <sub>FLAT1</sub> | V <sub>A</sub> =0 ~ 0.5V, I <sub>A</sub> =30mA                                | --  | 1.6 | --   | Ω    |
|                                                 | R <sub>FLAT2</sub> | V <sub>A</sub> =0.5 ~ 2.0V, I <sub>A</sub> =30mA                              | --  | 0.7 | --   | Ω    |
|                                                 | R <sub>FLAT3</sub> | V <sub>A</sub> =2.0 ~ 4.0V, I <sub>A</sub> =30mA                              | --  | 0.5 | --   | Ω    |
|                                                 | R <sub>FLAT4</sub> | V <sub>A</sub> =4.0 ~ 5.5V, I <sub>A</sub> =30mA                              | --  | 0.3 | --   | Ω    |
| On-Resistance Matching Between Channels         | Δ R <sub>ON</sub>  | V <sub>A</sub> =0~5.5V, I <sub>A</sub> =30mA                                  | --  | 0.1 | 0.2  | Ω    |

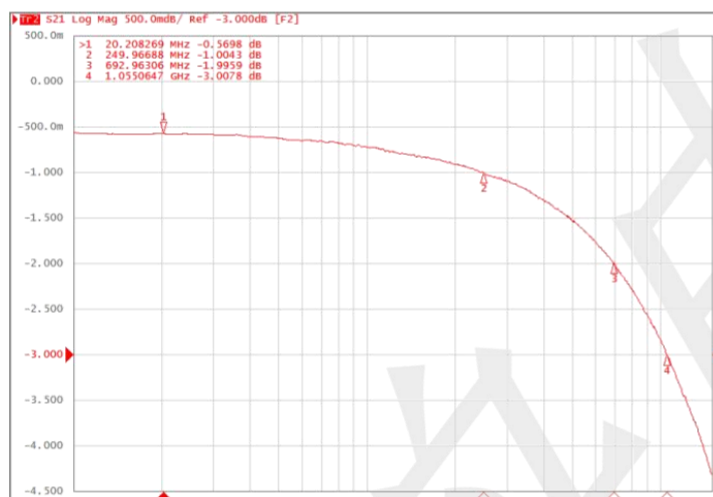
### AC Electronics Characteristics (Ta=25°C, VCC=+3.3V, unless otherwise noted)

| PARAMETER                 | SYMBOL           | TEST Conditions                                                  | MIN | TYP | MAX | UNIT |
|---------------------------|------------------|------------------------------------------------------------------|-----|-----|-----|------|
| Turn-On Time              | T <sub>ON</sub>  | V <sub>A</sub> =1.5V, C <sub>L</sub> =35pF, R <sub>L</sub> =50Ω  | --  | 200 | --  | ns   |
| Turn-Off Time             | T <sub>OFF</sub> | V <sub>A</sub> =1.5V, C <sub>L</sub> =35pF, R <sub>L</sub> =50Ω  | --  | 200 | --  | ns   |
| Break-Before-Make time    | T <sub>BBM</sub> | V <sub>A</sub> =1.5V, C <sub>L</sub> =35pF, R <sub>L</sub> =50Ω  | --  | 500 | --  | 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 | --  | MHz  |
| Off isolation             | OIRR             | F=1KHz, R <sub>L</sub> =50Ω                                      | --  | -81 | --  | dB   |
|                           |                  | F=10KHz, R <sub>L</sub> =50Ω                                     | --  | -80 | --  | dB   |
| Crosstalk                 | Xtalk            | F=1KHz, R <sub>L</sub> =50Ω                                      | --  | -83 | --  | dB   |
|                           |                  | F=10KHz, R <sub>L</sub> =50Ω                                     | --  | -82 | --  | dB   |
| Total Harmonic Distortion | THD              | F=20Hz to 20KHz<br>V <sub>A</sub> =600mVp-p @R <sub>L</sub> =32Ω | --  | -80 | --  | dB   |

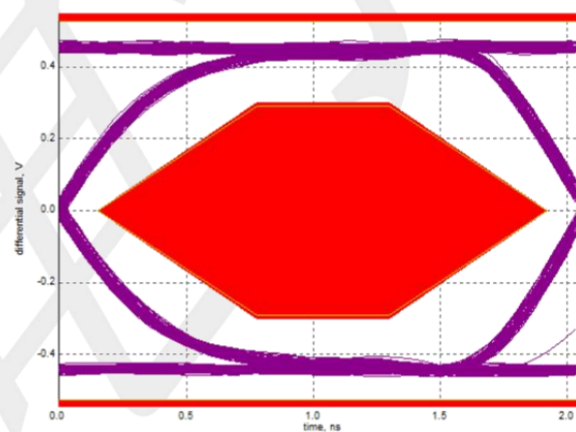
**Capacitance** ( $T_a=25^\circ\text{C}$ ,  $V_{CC}=+3.3\text{V}$ , unless otherwise noted)

| PARAMETER       | SYMBOL    | TEST Conditions     | MIN | TYP | MAX | UNIT |
|-----------------|-----------|---------------------|-----|-----|-----|------|
| Off capacitance | $C_{OFF}$ | $F=100\text{KHz}$ , | --  | 5.0 | --  | pF   |
| On capacitance  | $C_{ON}$  | $F=100\text{KHz}$ , | --  | 7.0 | --  | pF   |

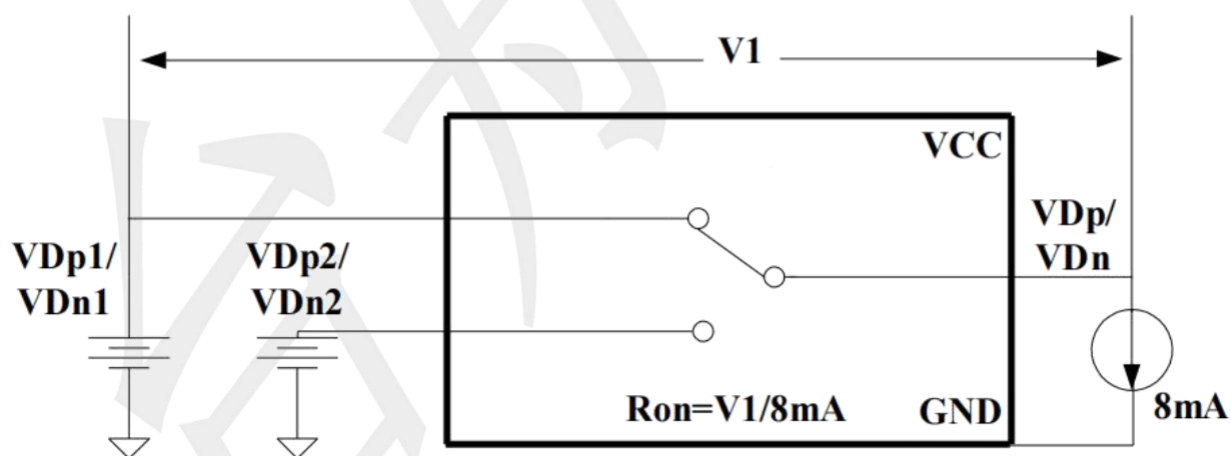
**Typical Characteristics** ( $T_a=25^\circ\text{C}$ ,  $V_{CC}=3.3\text{V}$ , unless otherwise noted)



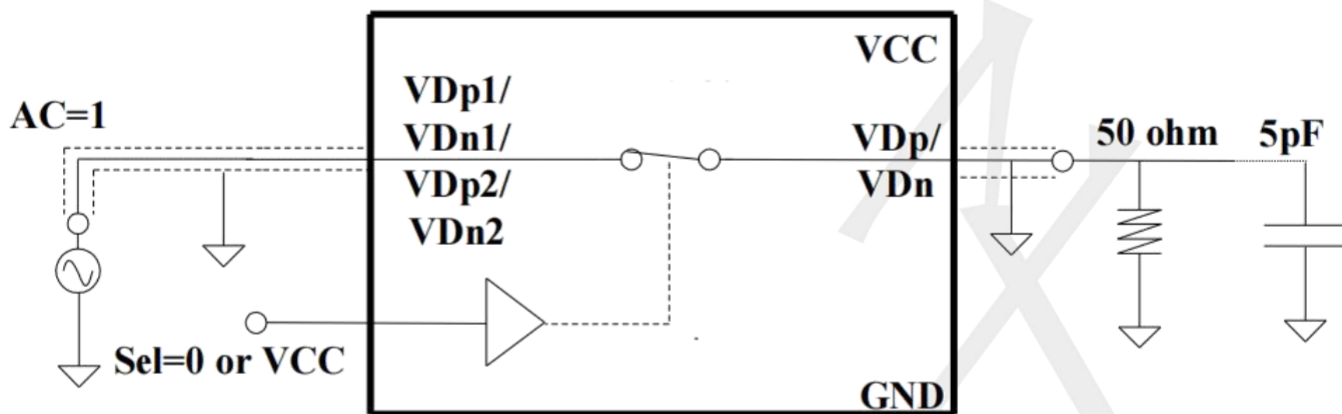
Bandwidth



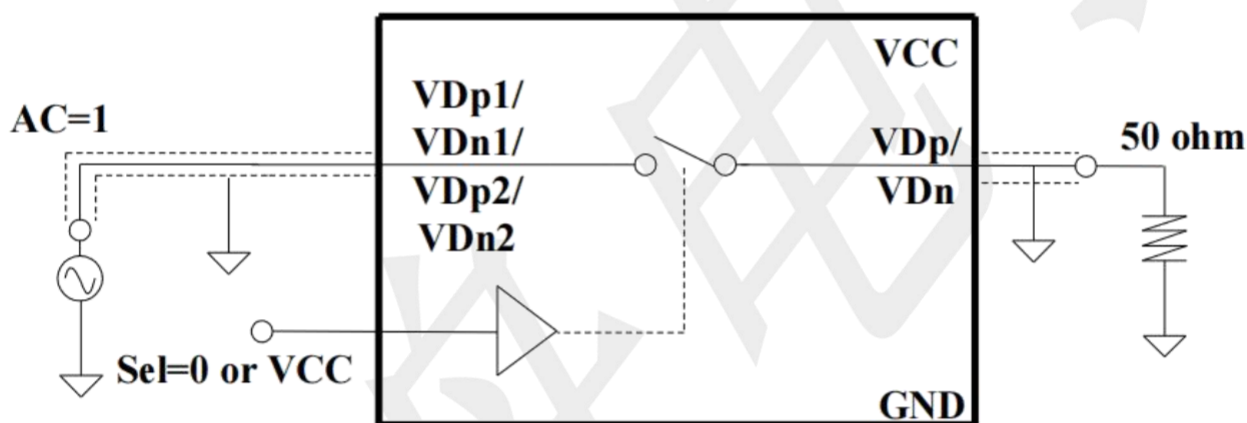
Eye Diagram (480Mbps)



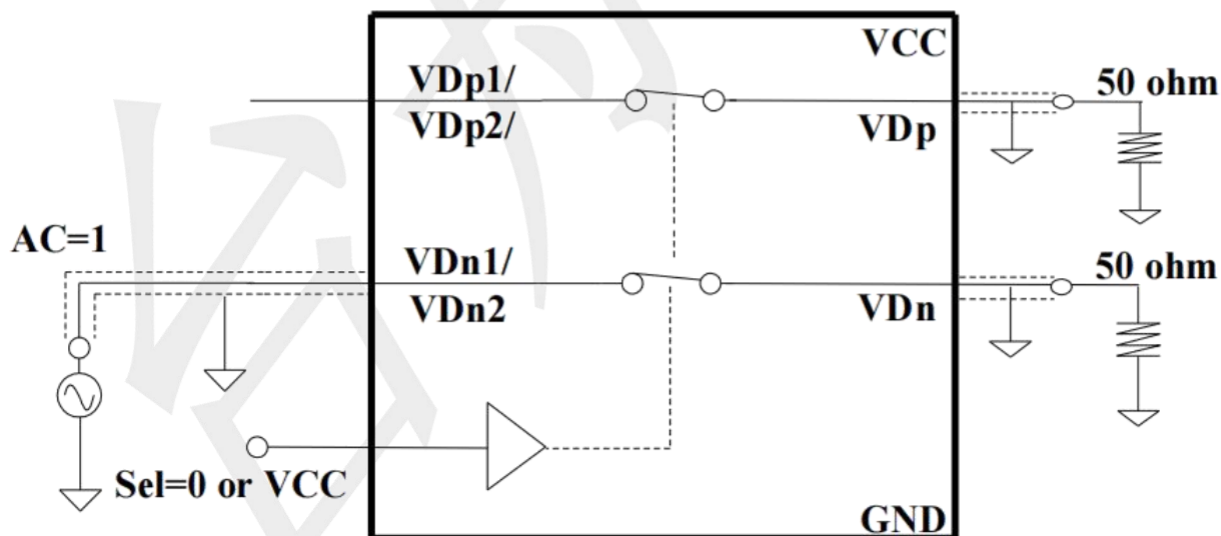
**Typical Characteristics** ( $T_a=25^{\circ}\text{C}$ , unless otherwise noted)



**Test Circuit for Bandwidth**



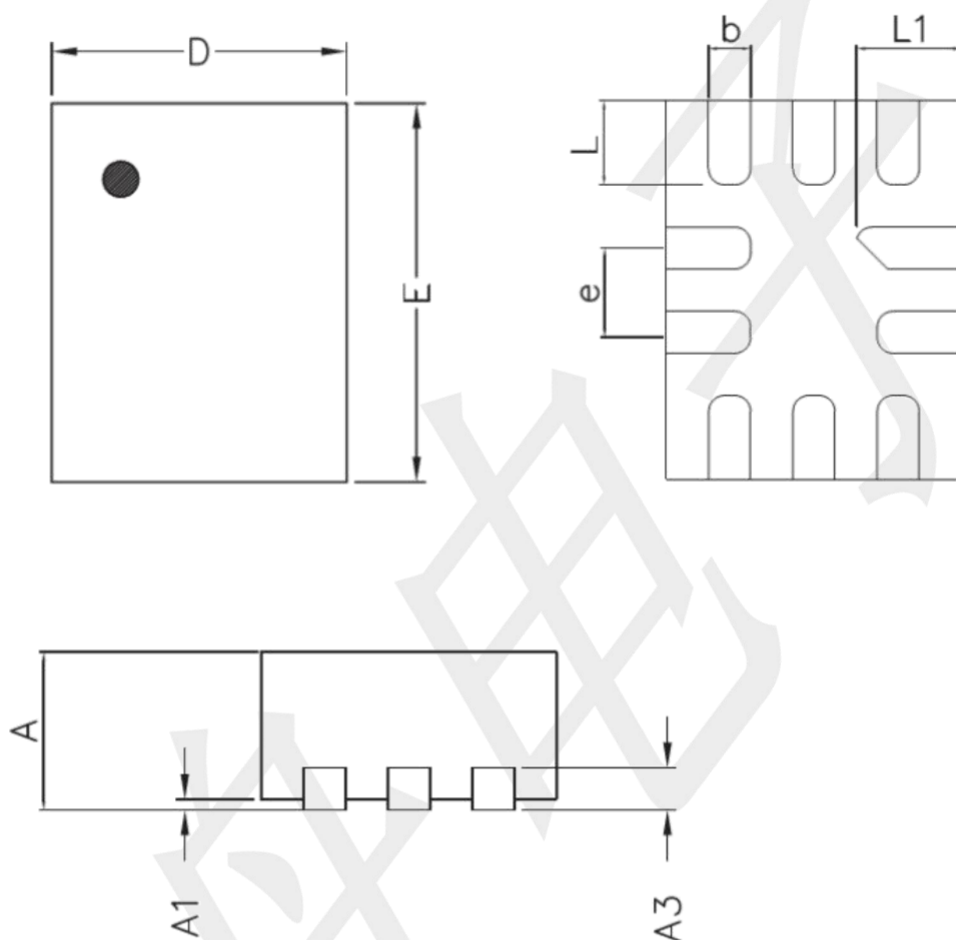
**Test Circuit for Off Isolation**



**Test Circuit for Crosstalk**

### Package information

QFN1418-10L (Unit: mm)



| Symbol | Dimension in Millimeters |       |
|--------|--------------------------|-------|
|        | Min.                     | Max.  |
| A      | 0.450                    | 0.550 |
| A1     | 0.000                    | 0.050 |
| A3     | 0.152 Ref.               |       |
| D      | 1.350                    | 1.450 |
| E      | 1.750                    | 1.850 |
| b      | 0.150                    | 0.250 |
| e      | 0.400 Typ.               |       |
| L      | 0.350                    | 0.450 |
| L1     | 0.450                    | 0.550 |