

## HM3340

### Two-Channel Differential 2:1/1:2 USB 3.1 Super Speed 10Gbps Mux/DeMux

#### Descriptions

The HM3340 is a high-speed bidirectional passive switch in mux or demux configurations suited for USB Type-C™ application supporting USB 3.1 Gen 1 and Gen 2 data rates. Based on control pin SEL, the device provides switching on differential channels between Port L0 or Port L1 to Port C0. The A340 is a generic analog differential passive switch that can work for any high-speed interface applications requiring a common mode voltage range of 0 to 2 V and differential signaling with differential amplitude up to 1.8Vpp. It employs adaptive tracking that ensures the channel remains unchanged for the entire common mode voltage range. Excellent dynamic characteristics of the device allow high-speed switching with minimum attenuation to the signal eye diagram with very little added jitter. It consumes <2mW of power when operational and has a shutdown mode exercisable by \_EN pin resulting <20uW.

The HM3340 is available in QFN 2 x 3 -18L with Pb-free and Halogen-free making it a perfect candidate for mobile and space constrained applications.

#### Order Information

| Package        |               | Part Number | Top-Side Marking |
|----------------|---------------|-------------|------------------|
| QFN 2 x 3 -18L | Tape and Reel | HM3340      | A340UXYW         |

#### Features

- Pin-to-Pin **ASW3410, DIO3340, FUSB340**
- Wide Supply Range 1.5 V to 5.5 V
- Differential 2:1 or 1:2 Switch/Multiplexer
- USB 3.1 Super Speed **10Gbps** Switch
- High Bandwidth: **5.1GHz** @-3dB Bandwidth
- Isolation: -24dB @ 1.25 GHz
- Crosstalk: -34dB @ 1.25 GHz
- Low bit-to-bit skew, Bidirectional
- ESD Tolerance: 2kV HBM
- Powered Off Protection When VDD = 0 V
- 1.8-V Compatible Logic Inputs

## Applications

- USB Type-C Ecosystem
- Desktop and Notebook PCs
- Server/Storage Area Networks
- PCI Express Backplanes
- Shared I/O Ports
- FPD LinkII and FPD LinkIII Switching

## Block Diagram

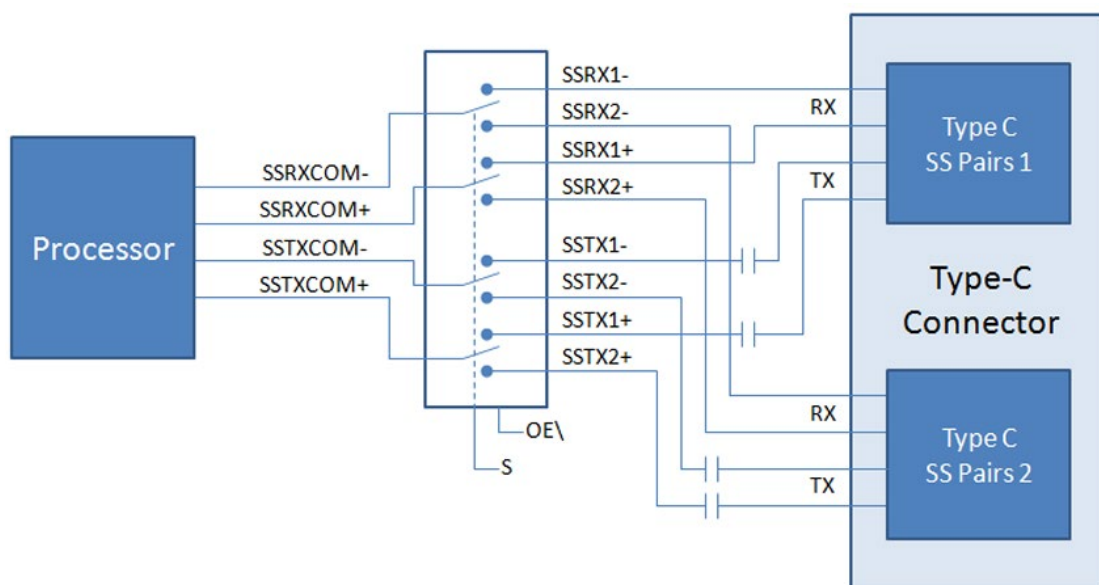


Fig.1 Block Diagram

## Typical Application

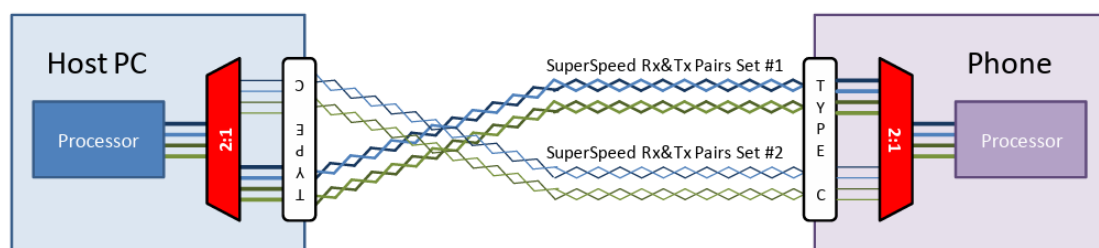


Fig.2 Typical Application

Pin Configuration

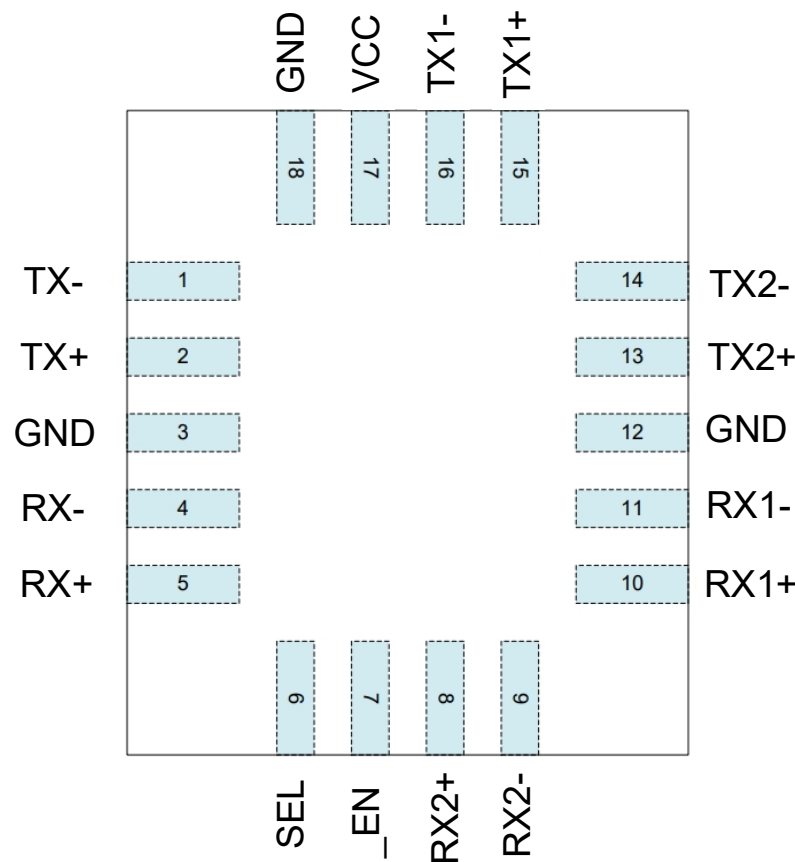


Fig.3 Pin Configuration

## Pin Description

| Pin#    | Pin Name | Signal Type | Description             |
|---------|----------|-------------|-------------------------|
| 1       | TX-      | I/O         | Super Speed TX- Common  |
| 2       | TX+      | I/O         | Super Speed TX+ Common  |
| 3,12,18 | GND      | GND         | Ground                  |
| 4       | RX-      | I/O         | Super Speed RX- Common  |
| 5       | RX+      | I/O         | Super Speed RX+ Common  |
| 6       | SEL      | I           | Switch logic control    |
| 7       | _EN      | I           | Chip Enable, Active Low |
| 8       | RX2+     | I/O         | Super Speed RX2+        |
| 9       | RX2-     | I/O         | Super Speed RX2-        |
| 10      | RX1+     | I/O         | Super Speed RX1+        |
| 11      | RX1-     | I/O         | Super Speed RX1-        |
| 13      | TX2+     | I/O         | Super Speed TX2+        |
| 14      | TX2-     | I/O         | Super Speed TX2-        |
| 15      | TX1+     | I/O         | Super Speed TX1+        |
| 16      | TX1-     | I/O         | Super Speed TX1-        |
| 17      | VCC      | Power       | Supply Voltage          |

Table-1 Pin Description

## Truth Table

| _EN  | SEL  | TX+  | TX-  | RX+  | RX-  |
|------|------|------|------|------|------|
| High | X    | Hi-Z | Hi-Z | Hi-Z | Hi-Z |
| Low  | Low  | TX1+ | TX1- | RX1+ | RX1- |
| Low  | High | TX2+ | TX2- | RX2+ | RX2- |

Table-2 Truth Table

## Maximum Ratings

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

|                                    |                 |
|------------------------------------|-----------------|
| Storage Temperature                | -65°C to +150°C |
| Junction Temperature               | 125°C           |
| Supply Voltage to Ground Potential | -0.5V to +5.5V  |
| Supere Speed Data Channel TX / RX  | -0.5V to 3.8V   |
| DC Input Voltage                   | -0.5V to VCC    |
| DC Output Current                  | 50mA            |
| Power Dissipation                  | 300mW           |

**Table-3 Maximum Description**

Notes:

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.

**Electrical Characteristics (Ta=25°C, VCC=1.8V, unless otherwise specified)**

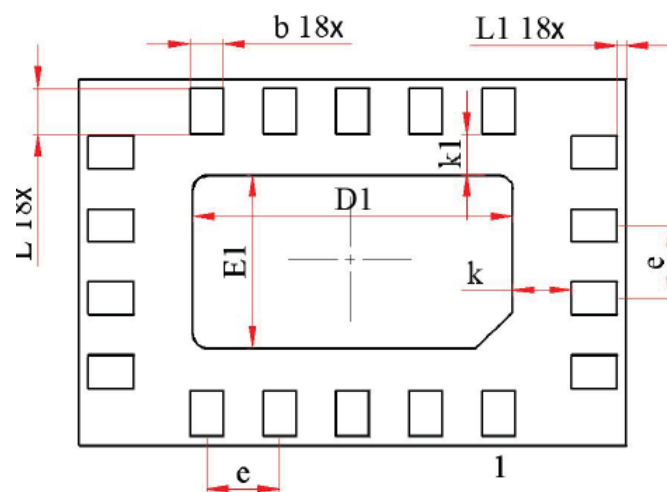
| Parameter                                 | Symbol               | Conditions                                                           | Min. | Typ. | Max. | Unit |
|-------------------------------------------|----------------------|----------------------------------------------------------------------|------|------|------|------|
| <b>POWER SUPPLY</b>                       |                      |                                                                      |      |      |      |      |
| VCC Quiescent Current                     | I <sub>Q</sub>       | SEL=0 or VCC, _EN=0                                                  |      | 28   |      | uA   |
| Power-down Current                        | I <sub>PD</sub>      | SEL=0 or VCC, _EN=VCC                                                |      |      | 1    | uA   |
| <b>DC CHARACTERISTICS</b>                 |                      |                                                                      |      |      |      |      |
| Input logic high                          | V <sub>IH</sub>      | VCC=1.8~4.5V                                                         | 1.6  |      |      | V    |
| Input logic low                           | V <sub>IL</sub>      | VCC=1.8~4.5V                                                         |      |      | 0.4  | V    |
| _EN Internal pull-up resistor             | R <sub>UP</sub>      |                                                                      |      | 2    |      | MΩ   |
| SEL Internal pull-down resistor           | R <sub>DN</sub>      |                                                                      |      | 2    |      | MΩ   |
| On-Resistance for TX/RX                   | R <sub>ON_HS</sub>   | V <sub>IS</sub> = 0.2V I <sub>ON</sub> =8mA                          |      | 6.7  | 8    | Ω    |
| R <sub>ON</sub> Flatness for TX/RX        | R <sub>FLAT_LP</sub> | V <sub>IS</sub> = 0 to 1.2V I <sub>ON</sub> =8mA                     |      | 0.8  | 1    | Ω    |
| R <sub>ON</sub> Flatness for TX/RX        | R <sub>FLAT_LP</sub> | V <sub>IS</sub> = 0 to 0.2V I <sub>ON</sub> =8mA                     |      | 0.2  | 0.3  | Ω    |
| R <sub>ON</sub> Matching Between Channels | R <sub>MATCH</sub>   | V <sub>IS</sub> = 0 to 1.2V I <sub>ON</sub> =8mA                     |      | 0.1  |      | Ω    |
| Switch Off Leakage Current                | I <sub>OFF</sub>     | _EN=VCC, Tx, Rx =VCC<br>TX1, TX2, RX1, RX2=0                         | -0.5 |      | 0.5  | uA   |
| <b>AC CHARACTERISTICS</b>                 |                      |                                                                      |      |      |      |      |
| Enable Time _EN to Output                 | t <sub>EN</sub>      | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 80   | 150  | uS   |
| Disable Time _EN to Output                | t <sub>DIS</sub>     | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 40   | 250  | nS   |
| Turn-On Time SEL to Output                | t <sub>ON</sub>      | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 400  | 1200 | nS   |
| Turn-Off Time SEL to Output               | t <sub>OFF</sub>     | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 130  | 800  | nS   |
| Break-Before-Make Time                    | t <sub>BBM</sub>     | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 250  | 500  | nS   |
| Propagation Delay                         | t <sub>PD</sub>      | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF V <sub>IS</sub> = 0.6V       |      | 0.25 |      | nS   |
| Off Isolation                             | Off                  | R <sub>L</sub> = 50Ω f = 1.2GHz V <sub>IS</sub> = 0.2V <sub>PP</sub> |      | -27  |      | dB   |
| Crosstalk                                 | X <sub>TALK</sub>    | R <sub>L</sub> = 50Ω f = 1.2GHz V <sub>IS</sub> = 0.2V <sub>PP</sub> |      | -43  |      | dB   |
| -3dB Bandwidth                            | BW <sub>-3dB</sub>   | R <sub>L</sub> =50Ω C <sub>L</sub> =0pF Signal 0dBm                  | 4.5  | 5.1  |      | GHz  |
| <b>CAPACITANCE</b>                        |                      |                                                                      |      |      |      |      |
| Switch On Capacitance                     | C <sub>ON</sub>      | V <sub>Bias</sub> = 0.2V, f = 1.5GHz                                 |      | 1.5  |      | pF   |
| Switch Off Capacitance                    | C <sub>OFF</sub>     | V <sub>Bias</sub> = 0.2V, f = 1.5GHz                                 |      | 1.0  |      | pF   |

**Table-4 Electrical Characteristics**

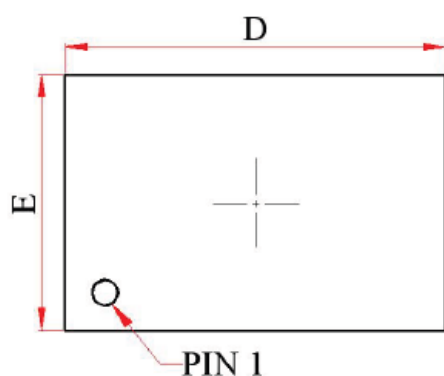
**Note:**

- (1) Flatness is defined as the difference between maximum and minimum value of ON-resistance at the specified analog signal voltage points.
- (2) R<sub>ON</sub> matching between channels is calculated by subtracting the channel with the lowest max Ron value from the channel with the highest max Ron value.
- (3) Crosstalk is inversely proportional to source impedance

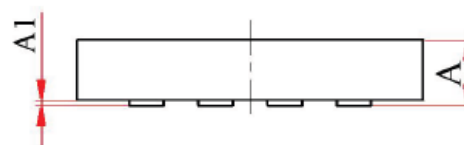
Package Outline Dimensions



Bottom View



Top View



Side View

| Symbol | Dimension In Millimeters |       |       | Dimension In Inches |       |       |
|--------|--------------------------|-------|-------|---------------------|-------|-------|
|        | Normal                   | Min   | Max   | Normal              | Min   | Max   |
| A      | --                       | 0.340 | 0.400 | --                  | 0.013 | 0.016 |
| A1     | --                       | 0.010 | 0.050 | --                  | 0.000 | 0.002 |
| D      | 3.000                    | 2.950 | 3.050 | 0.118               | 0.116 | 0.120 |
| E      | 2.000                    | 1.950 | 2.050 | 0.079               | 0.077 | 0.081 |
| D1     | 1.750                    | 1.700 | 1.800 | 0.069               | 0.067 | 0.071 |
| E1     | 0.950                    | 0.900 | 1.000 | 0.037               | 0.035 | 0.039 |
| b      | 0.180                    | 0.150 | 0.210 | 0.007               | 0.006 | 0.008 |
| L      | 0.250                    | 0.200 | 0.300 | 0.010               | 0.008 | 0.012 |
| L1     | 0.050                    | 0.010 | 0.090 | 0.002               | 0.000 | 0.004 |
| k      | 0.325 REF                |       |       | 0.013 REF           |       |       |
| k1     | 0.225 REF                |       |       | 0.009 REF           |       |       |
| e      | 0.400 BSC                |       |       | 0.016 BSC           |       |       |