

# NUF2101M

## USB Filter with ESD Protection

This device is designed for applications requiring **Line Termination**, **EMI Filtering** and **ESD Protection**. It is intended for use in downstream USB 1.1 ports, Cellular phones, Wireless equipment and computer applications. This device offers an integrated solution in a small package (TSOP-6, Case 318G) reducing PCB space and cost.

### Features:

- Provides USB Line Termination, Filtering and ESD Protection
- Single IC Offers Cost Savings by Replacing 4 Resistors, 2 Capacitors, and 5 TVs diodes
- EMI Filtering Prevents Noise from Entering/Leaving the System
- IEC61000-4-2 (Level 4)
  - 8 kV (Contact)
  - 15 kV (Air)
- ESD Ratings: Machine Model = C
  - Human Body Model = 3B
- Pb-Free Package is Available

### Benefits:

- TSOP-6 Package Minimizes PCB Space
- Integrated Circuit Increases System Reliability versus Discrete Component Implementation
- TVs Devices Provide ESD Protection That is Better than a Discrete Implementation because the Small IC minimizes Parasitic Inductances

### Typical Applications:

- USB Hubs
- Computer Motherboards

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Rating  | Symbol       | Value       | Unit             |
|---|--------------|-------------|------------------|
| Steady State Power                              | $P_D$        | 225         | mW               |
| Maximum Junction Temperature                    | $T_{J(max)}$ | 125         | $^\circ\text{C}$ |
| Operating Temperature Range                     | $T_J$        | -55 to +125 | $^\circ\text{C}$ |
| Storage Temperature Range                       | $T_{stg}$    | -55 to +125 | $^\circ\text{C}$ |
| Lead Solder Temperature<br>(10 second duration) | $T_L$        | 260         | $^\circ\text{C}$ |

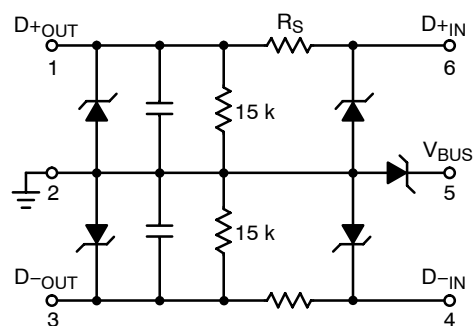
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.



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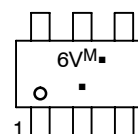
<http://onsemi.com>

### SCHEMATIC



TSOP-6  
CASE 318G  
STYLE 10

### MARKING DIAGRAM



6V = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device      | Package             | Shipping†        |
|-------------|---------------------|------------------|
| NUF2101MT1  | TSOP-6              | 3000/Tape & Reel |
| NUF2101MT1G | TSOP-6<br>(Pb-Free) | 3000/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NUF2101M

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

| Device      | Device Marking | V <sub>RWM</sub> (Volts) | V <sub>BR</sub> @ 1 mA (Volts) |     | Max I <sub>R</sub> @ V <sub>RWM</sub> = 5.25 V V <sub>BUS</sub> to GND (μA) | Max I <sub>R</sub> @ V <sub>RWM</sub> = 3.3 V V <sub>BUS</sub> Pin (μA) | Typical Line Capacitance (pF)<br>(Notes 2, 3) | Series Resistor R <sub>S</sub> (Ω) (Note 1) |     |      | Pull-down Resistor R <sub>pd</sub> (kΩ) |     |     |
|-------------|----------------|--------------------------|--------------------------------|-----|---|---|---|---|-----|------|---|-----|-----|
|             |                |                          | Min                            | Max |   |   |   | Min   | Nom | Max  | Min                                     | Nom | Max |
| NUF2101MT1  | 6V             | 5.25                     | 6.0                            | 8.0 | 1.0   | 0.1   | 55  | 26.3  | 30  | 33.7 | 13                                      | 15  | 17  |
| NUF2101MT1G | 6V             | 5.25                     | 6.0                            | 8.0 | 1.0   | 0.1   | 55  | 26.3  | 30  | 33.7 | 13                                      | 15  | 17  |

1. For other R<sub>S</sub> values (i.e. R<sub>S</sub> = 30 Ω) contact your local ON Semiconductor sales representative.
2. Measured at 25°C, V<sub>R</sub> = 0 V, f = 1 MHz, Pins 2, 3, 4 or 5 to GND with Pin 1 also grounded.
3. For other capacitance values contact your local ON Semiconductor sales representative.

# NUF2101M

## TYPICAL CHARACTERISTICS

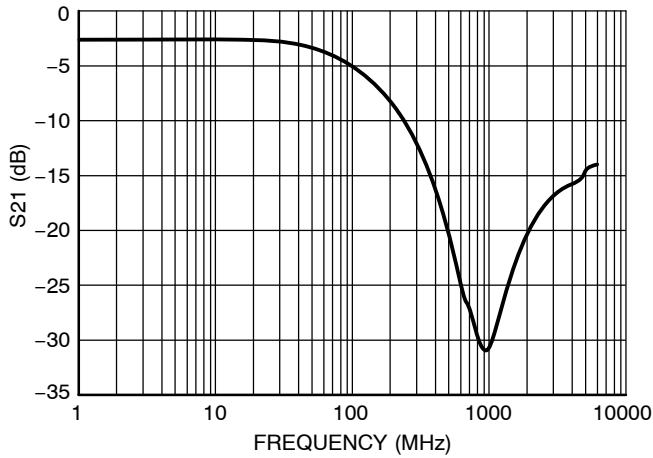


Figure 1. Insertion Loss Characteristics

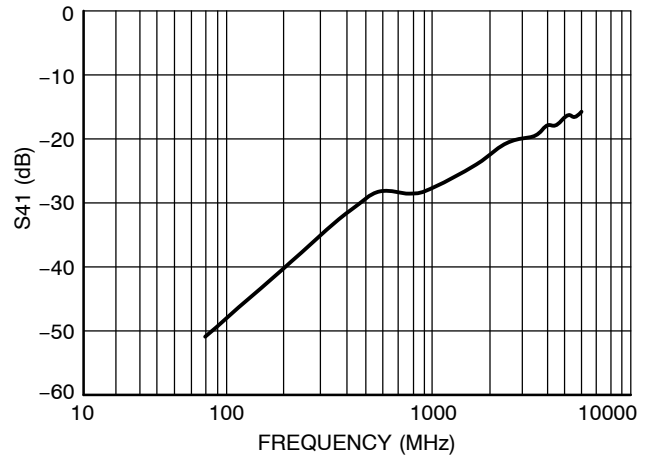


Figure 2. Analog Cross-Talk

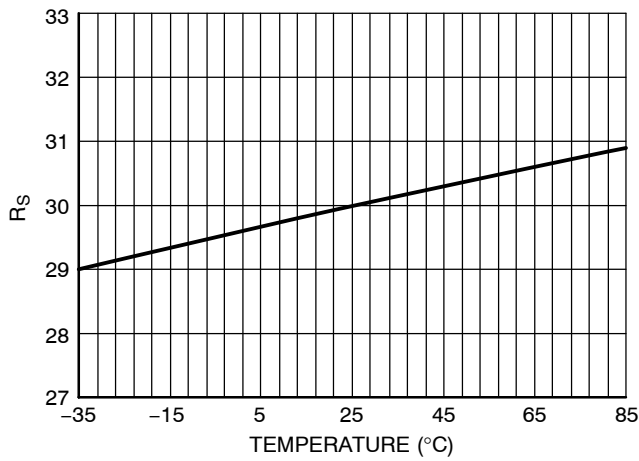


Figure 3. R<sub>S</sub> vs. Temperature

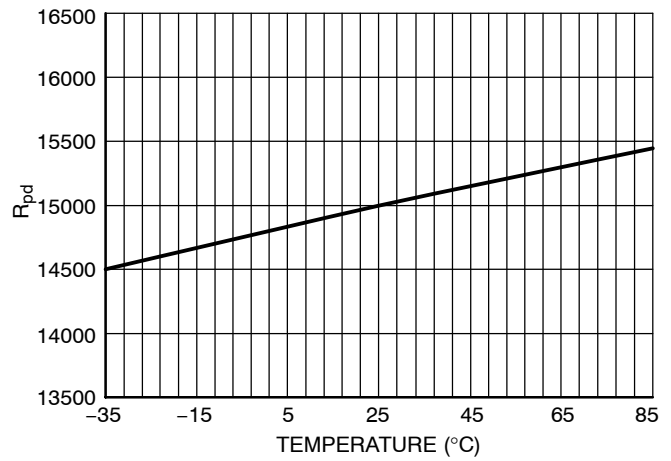


Figure 4. R<sub>pd</sub> vs. Temperature

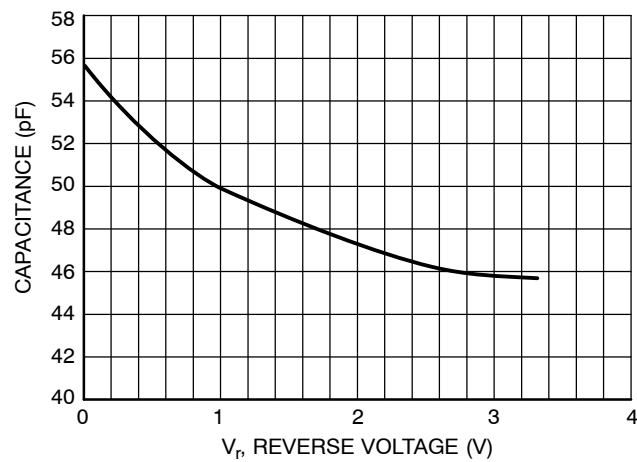


Figure 5. Typical Capacitance

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

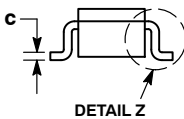
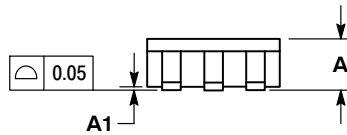
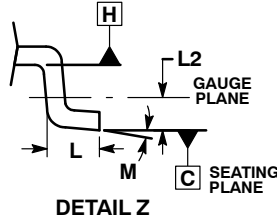
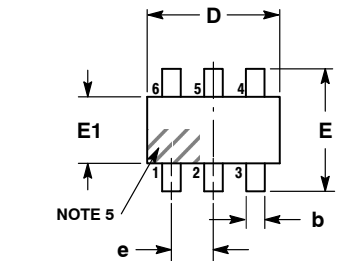
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SCALE 2:1

### TSOP-6 CASE 318G-02 ISSUE V

DATE 12 JUN 2012



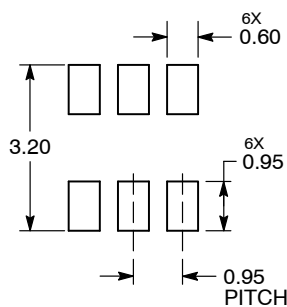
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | NOM  | MAX  |
| A   | 0.90        | 1.00 | 1.10 |
| A1  | 0.01        | 0.06 | 0.10 |
| b   | 0.25        | 0.38 | 0.50 |
| c   | 0.10        | 0.18 | 0.26 |
| D   | 2.90        | 3.00 | 3.10 |
| E   | 2.50        | 2.75 | 3.00 |
| E1  | 1.30        | 1.50 | 1.70 |
| e   | 0.85        | 0.95 | 1.05 |
| L   | 0.20        | 0.40 | 0.60 |
| L2  | 0.25 BSC    |      |      |
| M   | 0°          | -    | 10°  |

- |  |  |   |   |   |  |
|--|--|---|---|---|--|
| <p>STYLE 1:<br/>PIN 1. DRAIN<br/>2. DRAIN<br/>3. GATE<br/>4. SOURCE<br/>5. DRAIN<br/>6. DRAIN</p>              | <p>STYLE 2:<br/>PIN 1. EMITTER 2<br/>2. BASE 1<br/>3. COLLECTOR 1<br/>4. EMITTER 1<br/>5. BASE 2<br/>6. COLLECTOR 2</p>    | <p>STYLE 3:<br/>PIN 1. ENABLE<br/>2. N/C<br/>3. R BOOST<br/>4. Vz<br/>5. V in<br/>6. V out</p>                            | <p>STYLE 4:<br/>PIN 1. N/C<br/>2. V in<br/>3. NOT USED<br/>4. GROUND<br/>5. ENABLE<br/>6. LOAD</p>                | <p>STYLE 5:<br/>PIN 1. EMITTER 2<br/>2. BASE 2<br/>3. COLLECTOR 1<br/>4. EMITTER 1<br/>5. BASE 1<br/>6. COLLECTOR 2</p> | <p>STYLE 6:<br/>PIN 1. COLLECTOR<br/>2. COLLECTOR<br/>3. BASE<br/>4. EMITTER<br/>5. COLLECTOR<br/>6. COLLECTOR</p> |
| <p>STYLE 7:<br/>PIN 1. COLLECTOR<br/>2. COLLECTOR<br/>3. BASE<br/>4. N/C<br/>5. COLLECTOR<br/>6. EMITTER</p>   | <p>STYLE 8:<br/>PIN 1. Vbus<br/>2. D(in)<br/>3. D(in)+<br/>4. D(out)+<br/>5. D(out)<br/>6. GND</p>                         | <p>STYLE 9:<br/>PIN 1. LOW VOLTAGE GATE<br/>2. DRAIN<br/>3. SOURCE<br/>4. DRAIN<br/>5. DRAIN<br/>6. HIGH VOLTAGE GATE</p> | <p>STYLE 10:<br/>PIN 1. D(OUT)+<br/>2. GND<br/>3. D(OUT)-<br/>4. D(IN)-<br/>5. VBUS<br/>6. D(IN)+</p>             | <p>STYLE 11:<br/>PIN 1. SOURCE 1<br/>2. DRAIN 2<br/>3. DRAIN 2<br/>4. SOURCE 2<br/>5. GATE 1<br/>6. DRAIN 1/GATE 2</p>  | <p>STYLE 12:<br/>PIN 1. I/O<br/>2. GROUND<br/>3. I/O<br/>4. I/O<br/>5. VCC<br/>6. I/O</p>                          |
| <p>STYLE 13:<br/>PIN 1. GATE 1<br/>2. SOURCE 2<br/>3. GATE 2<br/>4. DRAIN 2<br/>5. SOURCE 1<br/>6. DRAIN 1</p> | <p>STYLE 14:<br/>PIN 1. ANODE<br/>2. SOURCE<br/>3. GATE<br/>4. CATHODE/DRAIN<br/>5. CATHODE/DRAIN<br/>6. CATHODE/DRAIN</p> | <p>STYLE 15:<br/>PIN 1. ANODE<br/>2. SOURCE<br/>3. GATE<br/>4. DRAIN<br/>5. N/C<br/>6. CATHODE</p>                        | <p>STYLE 16:<br/>PIN 1. ANODE/CATHODE<br/>2. BASE<br/>3. EMITTER<br/>4. COLLECTOR<br/>5. ANODE<br/>6. CATHODE</p> | <p>STYLE 17:<br/>PIN 1. EMITTER<br/>2. BASE<br/>3. ANODE/CATHODE<br/>4. ANODE<br/>5. CATHODE<br/>6. COLLECTOR</p>       |  |

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

### GENERIC MARKING DIAGRAM\*



- |  |   |
|--|---|
| <p>XXX = Specific Device Code<br/>A = Assembly Location<br/>Y = Year<br/>W = Work Week<br/>▪ = Pb-Free Package</p> | <p>XXX = Specific Device Code<br/>M = Date Code<br/>▪ = Pb-Free Package</p> |
|--|---|

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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