

# NUF4107FC

## 4 Channel EMI Pi-Filter Array with Full USB Filter

This device is a 4 channel EMI filter array for data lines. Greater than -35 dB attenuation is obtained at frequencies from 800 MHz to 2.2 GHz. It also offers USB filtering circuitry with speed detection. This includes the inline resistors for impedance matching and EMI filtering. ESD protection is provided across all capacitors.

### Features

- EMI Filtering and ESD Protection for Data Lines
- USB 1.1 Filtering Provided with Speed Detection
- Integration of 27 Discretes Offers Cost and Space Savings
- Pb-Free Package May be Available. The G-Suffix Denotes a Pb-Free Lead Finish
- 350  $\mu$ m Solder Spheres
- All TVS Protected Inputs Comply with IEC61000-4-2 (Level 4)
  - 30 kV (Contact)
  - 30 kV (Air)
- Low Profile Flip-Chip Packaging
- MSL 1
- All Pins Exceed 2000 Volts Human Body Model

### Typical Applications

- EMI and USB Filtering and ESD Protection for Data Lines
- Cell Phones
- Handheld Portables
- Notebook Computers
- MP3 Players

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

| Rating                              | Symbol    | Value       | Unit             |
|-------------------------------------|-----------|-------------|------------------|
| ESD Discharge IEC61000-4-2 (Note 1) | $V_{PP}$  |             | kV               |
| – Air Discharge, Contact Discharge  |           | 30          |                  |
| Human Body Model                    |           | 16          |                  |
| Machine Model                       |           | 0.4         |                  |
| DC Power per Resistor               | $P_R$     | 100         | mW               |
| DC Power per Package                | $P_T$     | 600         | mW               |
| Junction Temperature                | $T_J$     | 150         | $^\circ\text{C}$ |
| Operating Temperature Range         | $T_{op}$  | -40 to +85  | $^\circ\text{C}$ |
| Storage Temperature Range           | $T_{stg}$ | -55 to +150 | $^\circ\text{C}$ |

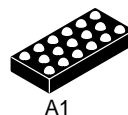
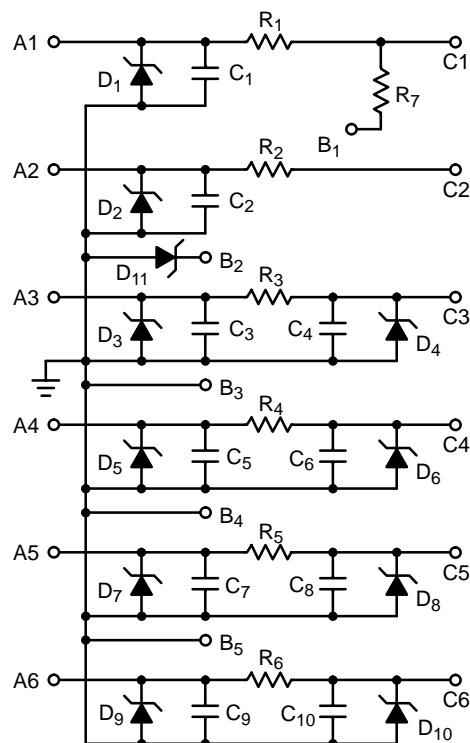
1. This does not include Pins B1, C1 and C2



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### CIRCUIT DESCRIPTION



FLIP-CHIP-17  
CASE 499AD

### DEVICE MARKING



### ORDERING INFORMATION

| Device       | Package   | Shipping†        |
|--------------|-----------|------------------|
| NUF4107FCT1G | Flip-Chip | 3000/Tape & Reel |

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

## NUF4107FC

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

| Symbol                          | Characteristic                        | Min  | Typ  | Max  | Unit |
|---------------------------------|---------------------------------------|------|------|------|------|
| V <sub>BR</sub>                 | I <sub>R</sub> = 1 mA                 | 6.0  | 6.8  | 8.0  | V    |
| I <sub>R</sub>                  | V <sub>RM</sub> = 3.3 V per line      | –    | –    | 0.1  | μA   |
| R <sub>3</sub> – R <sub>6</sub> | EMI Filter Resistors                  | 80   | 100  | 120  | Ω    |
| R <sub>1</sub> , R <sub>2</sub> | USB Resistors; Impedance Matching     | 18   | 22   | 26   | Ω    |
| R <sub>7</sub>                  | USB Pull-up; Speed Detection Resistor | 1250 | 1500 | 1750 | Ω    |
| C <sub>line</sub>               | At 2.5 V Bias                         | 48   | 60   | 72   | pF   |
| C <sub>1</sub> , C <sub>2</sub> | At Pins A1 and A2; At 2.5 V Bias      | 29   | 36   | 43   | pF   |
| C <sub>power</sub>              | At Pins B2; At 2.5 V Bias             | 54   | 68   | 82   | pF   |

TYPICAL CHARACTERISTICS

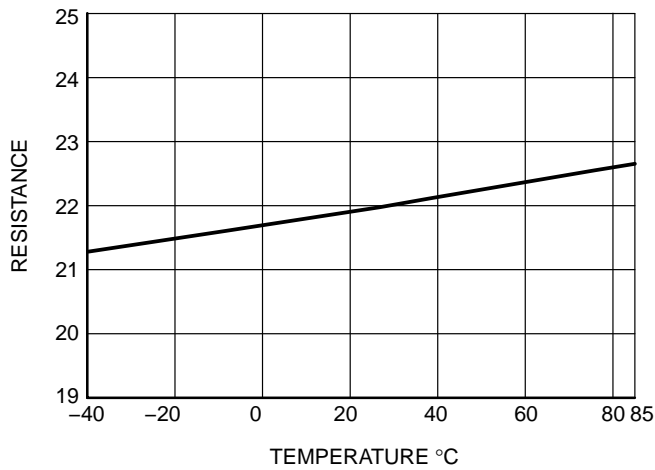


Figure 1. USB 1.1 Resistors (R1, R2) vs. Temperature

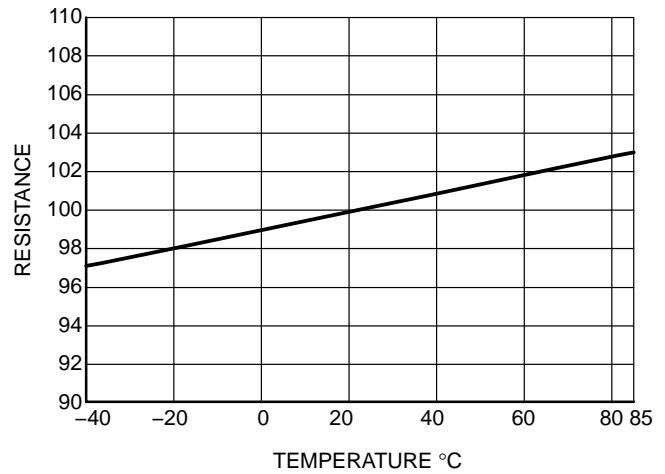


Figure 2. Data Resistors (R3, R4, R5, R6) vs. Temperature

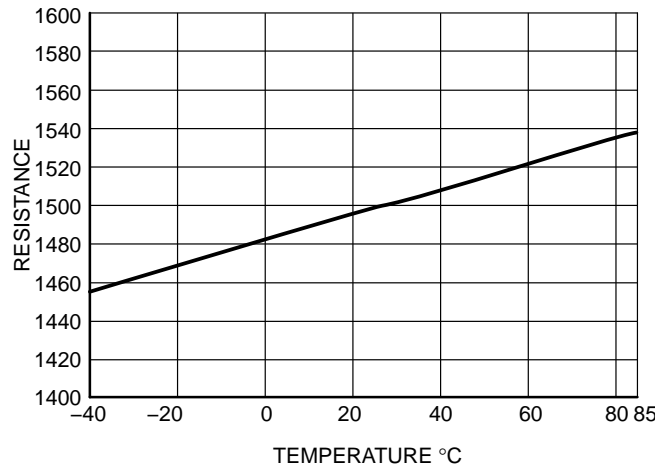


Figure 3. Pull-up Resistor (R7) vs. Temperature

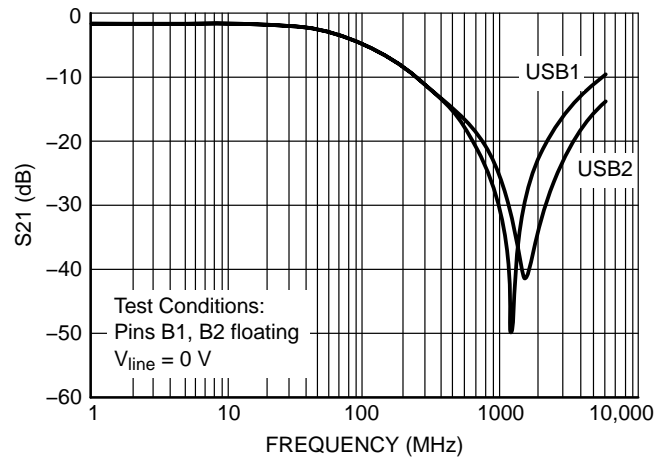


Figure 4. Insertion Loss Characteristic USB1, USB2

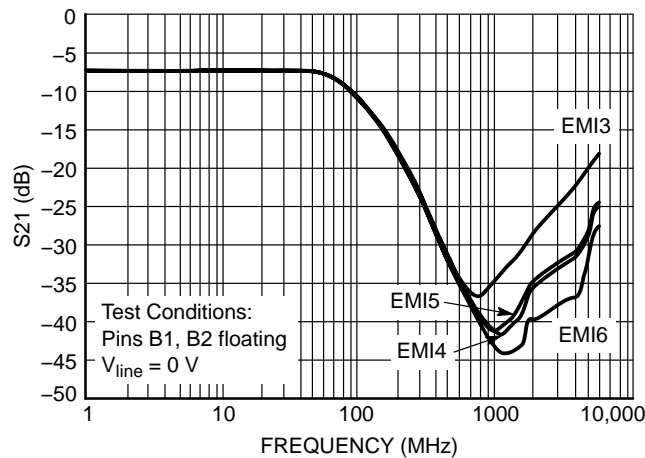


Figure 5. Insertion Loss Characteristic EMI3, EMI4, EMI5, EMI6

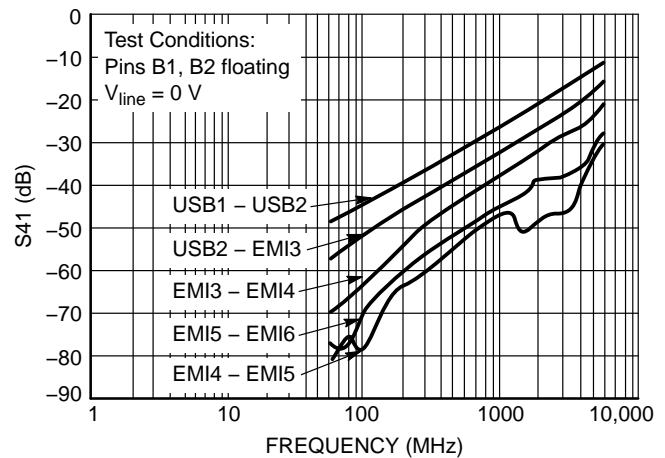


Figure 6. Analog Crosstalk Curve EMI Filter

Printed Circuit Board Recommendations

| Parameter                | 500 $\mu\text{m}$ Pitch<br>300 $\mu\text{m}$ Solder Ball |
|--------------------------|--|
| PCB Pad Size             | 250 $\mu\text{m}$ +25<br>-0                              |
| Pad Shape                | Round  |
| Pad Type                 | NSMD   |
| Solder Mask Opening      | 350 $\mu\text{m}$ $\pm$ 25                               |
| Solder Stencil Thickness | 125 $\mu\text{m}$  |
| Stencil Aperture         | 250 x 250 $\mu\text{m}$ sq.                              |
| Solder Flux Ratio        | 50/50  |
| Solder Paste Type        | No Clean Type 3 or Finer                                 |
| Trace Finish             | OSP Cu   |
| Trace Width              | 150 $\mu\text{m}$ Max                                    |

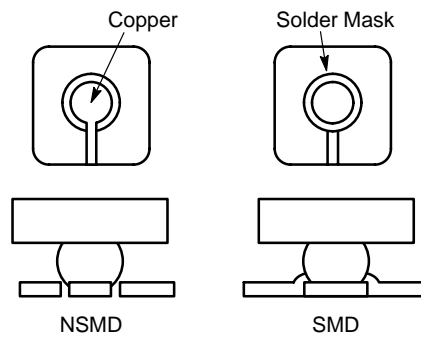


Figure 7. Solder Mask versus Non-Solder Mask Definition

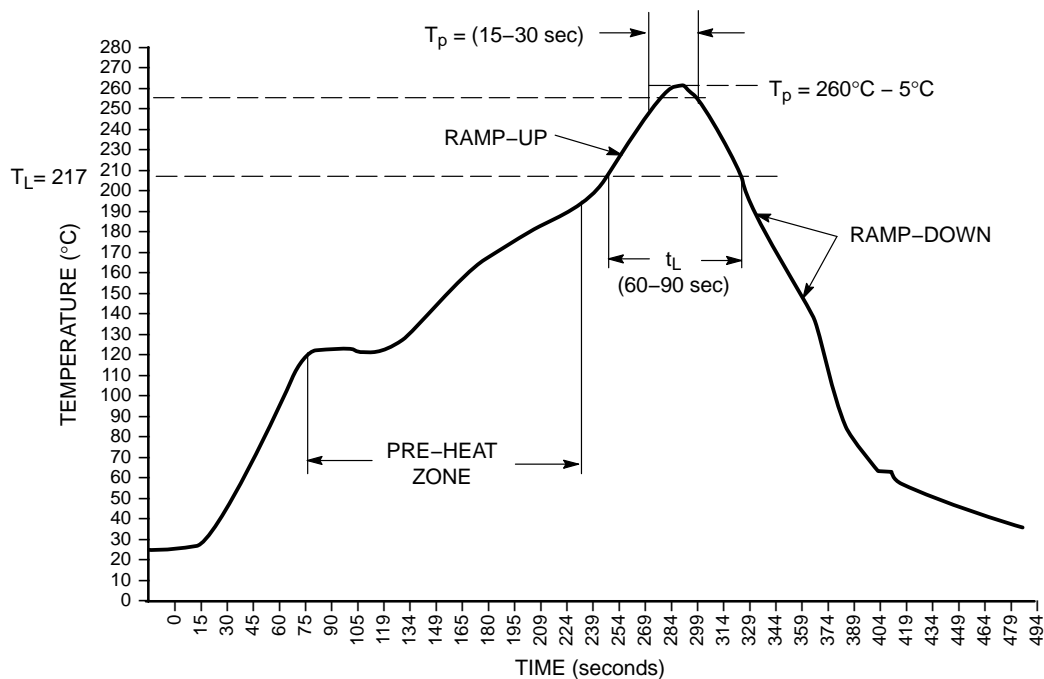
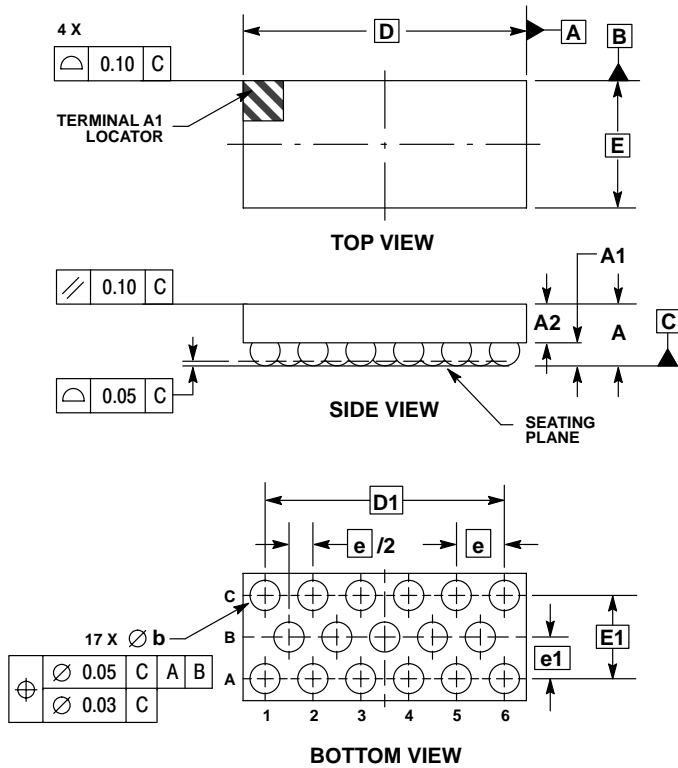


Figure 8. Typical Pb-Free Solder Heating Profile

# NUF4107FC


## PACKAGE DIMENSIONS

FLIP-CHIP-17 CSP  
CASE 499AD-01  
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | ---         | 0.740 |
| A1  | 0.250       | 0.310 |
| A2  | 0.380       | 0.430 |
| D   | 2.960 BSC   |       |
| E   | 1.330 BSC   |       |
| b   | 0.290       | 0.350 |
| e   | 0.500 BSC   |       |
| e1  | 0.435 BSC   |       |
| D1  | 2.500 BSC   |       |
| E1  | 0.870 BSC   |       |

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