# ON Semiconductor

# Is Now

**To learn more about onsemi™, please visit our website at**
**www.onsemi.com**

# AND9525/D

# AM Radio Amplifier with Filter using the NSVJ2394SA3

ON Semiconductor®

www.onsemi.com

**APPLICATION NOTE**

## Overview

This application note explains about ON Semiconductor's NSVJ2394SA3 which is used as a Low Noise Amplifier (LNA) for AM Radio.

The NSVJ2394SA3 is a silicon junction field effect transistor best suited for high-frequency applications which is assembled in the 3-pin surface mount package.
For information about the performance, please refer to the datasheet of this product.

The evaluation board is adjusted to provide +9.5dB gain in AM band (520 to 1720 kHz) and reduce gain to −70dB in FM band (76 to 108 MHz).

A standard material FR4 is used for the printed circuit board (PCB).



November 2016 - Rev. 0

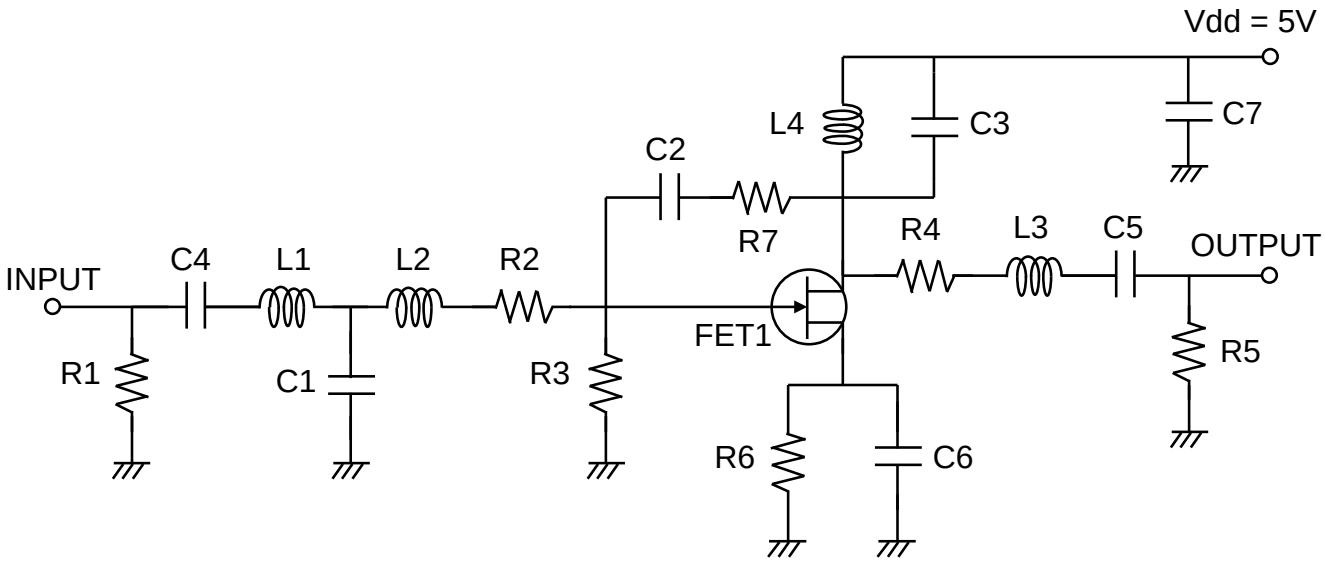
Publication Order Number :
AND9525/D

## ■ Summary of Performance

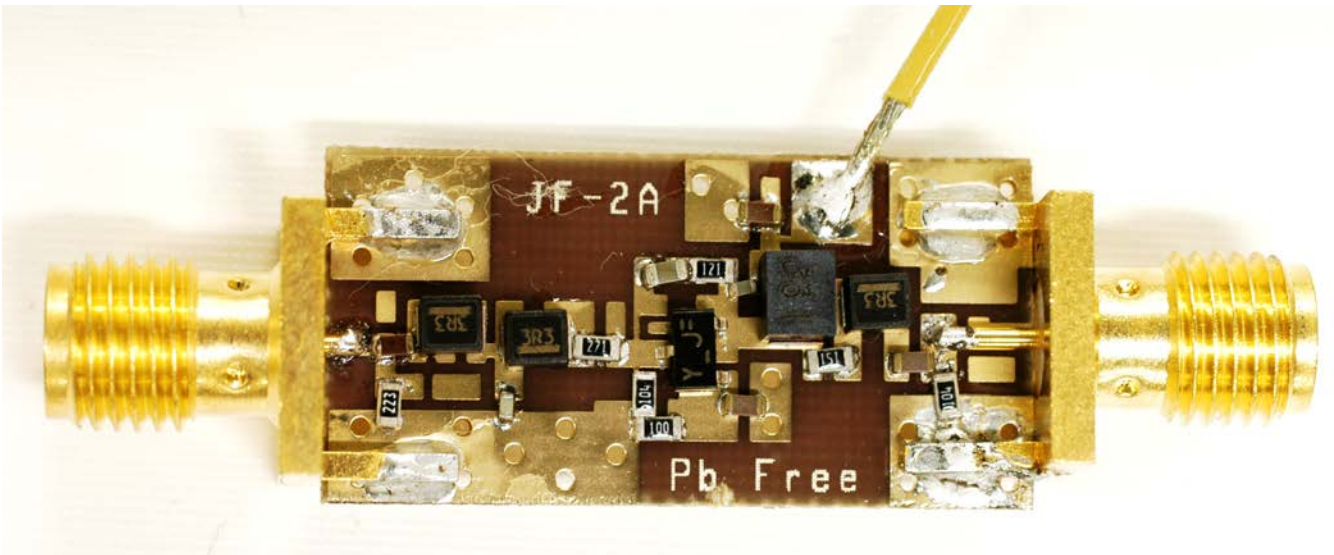
Ta = 25°C, Input Power = −30 dBm, Zo = 50 Ω

| Parameter | Symbol | Condition | Result | Unit |
|---|---|---|---|---|
| DC Voltage | Vdd | | 5 | V |
| DC Current | Idd | | 16.0 | mA |
| Power Gain | Gp1 | f = 520 kHz | 9.55 | dB |
| | | f = 1120 kHz | 9.90 | |
| | | f = 1720 kHz | 9.86 | |
| | Gp2 | f = 76 MHz | −77.0 | |
| | | f = 90 MHz | −84.7 | |
| | | f = 108 MHz | −71.4 | |
| Input Return Loss | RLin | f = 520 kHz | −0.03 | dB |
| | | f = 1120 kHz | −0.18 | |
| | | f = 1720 kHz | −0.46 | |
| Output Return Loss | RLout | f = 520 kHz | −0.26 | dB |
| | | f = 1120 kHz | −0.50 | |
| | | f = 1720 kHz | −1.10 | |
| Isolation | ISL | f = 520 kHz | −48.7 | dB |
| | | f = 1120 kHz | −40.5 | |
| | | f = 1720 kHz | −36.9 | |

## ■ Circuit Diagram



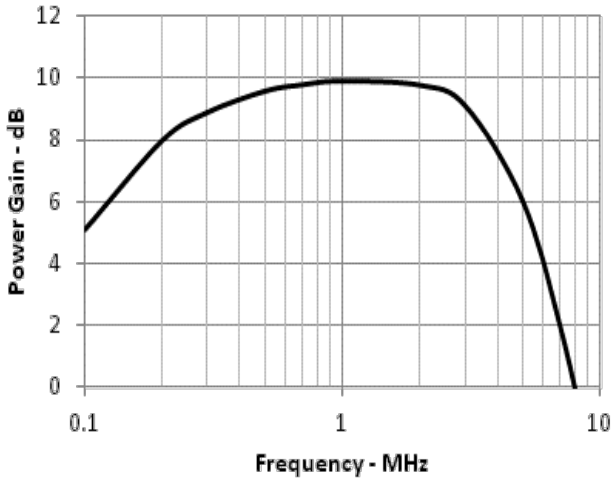

## ■ Evaluation Board



## ■ Bill of Materials

| Item | Symbol | Value | Manufacture | Size |
|---|---|---|---|---|
| J-FET | FET1 | NSVJ2394SA3 | ON Semiconductor | SC-59 |
| Capacitor | C1 | 10 pF | Murata GRM155 | 1005 |
| | C2 | 12 pF | Murata GQM188 | 1608 |
| | C3 | 120 pF | Murata GRM155 | 1005 |
| | C4, C5, C6, C7 | 0.1 μF | ROHM MCH182CN | 1608 |
| Resistor | R1 | 22 kΩ | Various | 1608 |
| | R2 | 270 Ω | Various | 1608 |
| | R3 | 100 kΩ | Various | 1608 |
| | R4 | 150 Ω | Various | 1608 |
| | R5 | 100 kΩ | Various | 1608 |
| | R6 | 10 Ω | Various | 1608 |
| | R7 | 120 Ω | Various | 1608 |
| Inductor | L1, L2, L3 | 3.3 μH | TDK NLV25T | 2520 |
| | L4 | 330 μH | TDK NLCV32T | 3225 |
| Material | | FR-4 | | 25 x 13 mm |

## ■ Measurement Results



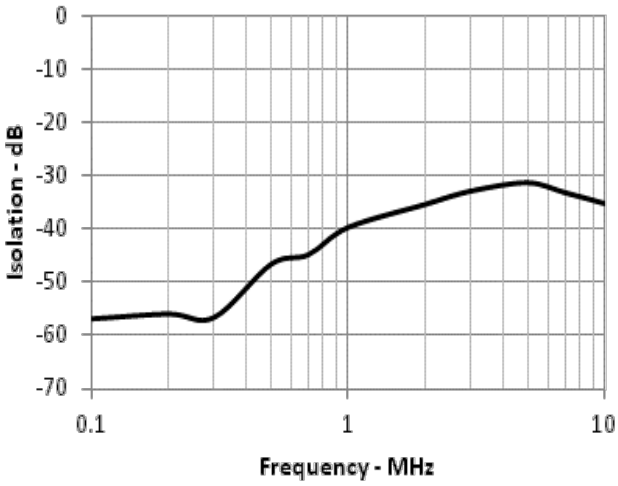




**Figure 1 Power Gain vs. Frequency**

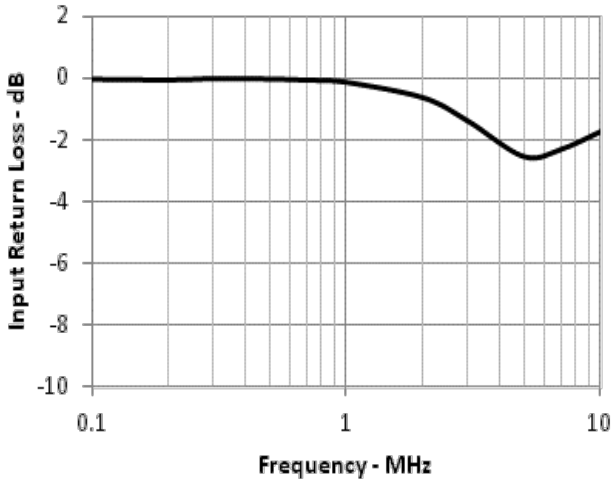



**Figure 3 Input Return Loss vs. Frequency**

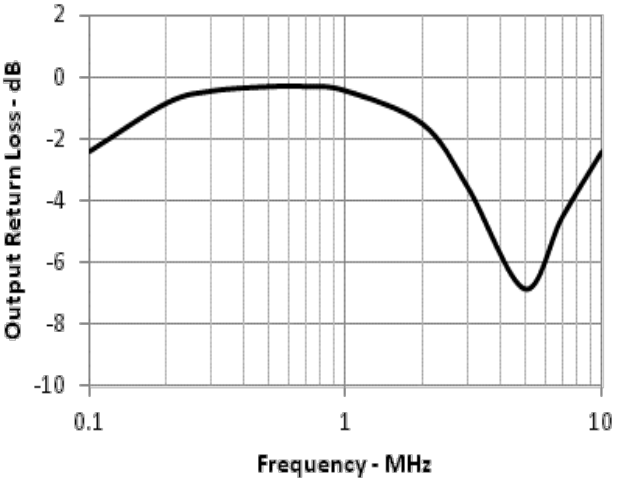
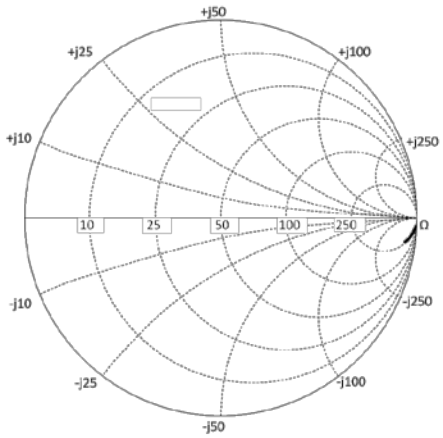
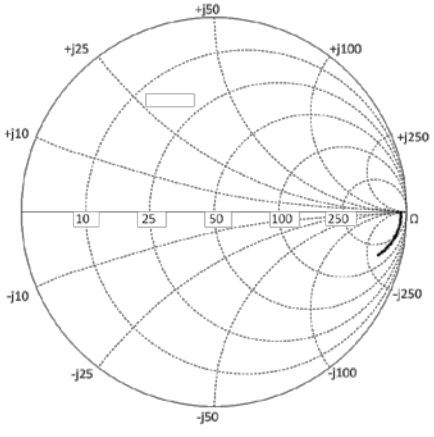



**Figure 4 Output Return Loss vs. Frequency**




520 kHz to 1720 KHz

**Figure 5 Smith Chart S11**




520 kHz to 1720 kHz

**Figure 6 Smith Chart S22**

## ■ Measurement Results

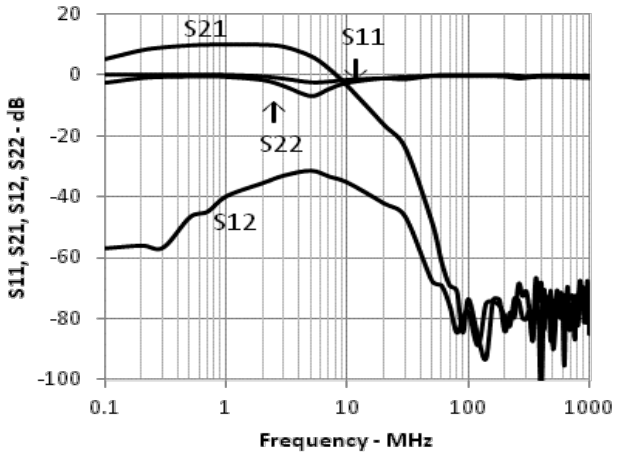



Figure 7 S11, S21, S12, S22 Wide Span

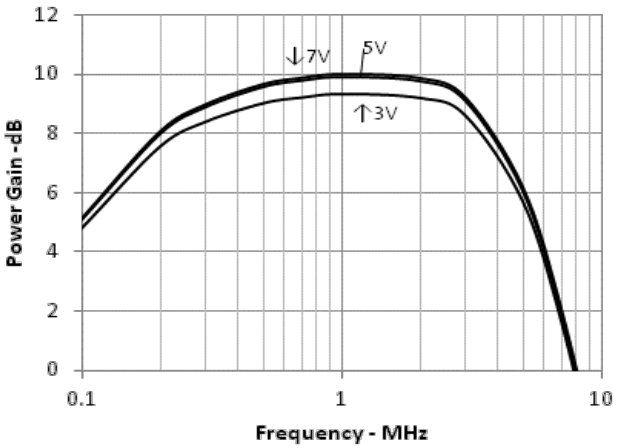



Figure 8 Voltage Dependency