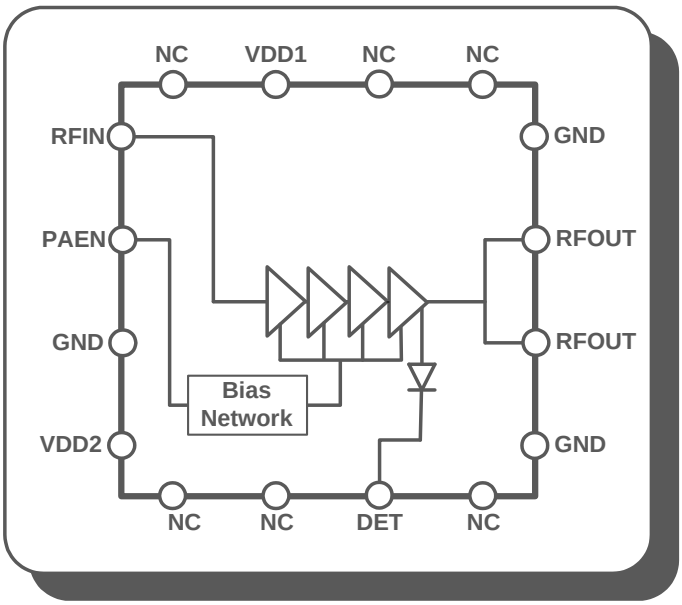
# 2.4GHz High Power 802.11n WLAN Linear Power Amplifier




## Description

The RFX240 is high power, high linearity power amplifier implemented in CMOS process. The device is optimized to provide all functionality of transmit power amplification for IEEE 802.11b/g/n applications in the 2.4GHz frequency range.

The RFX240 provides 30dB gain and up to +26dBm linear output power with low EVM of <3% for 802.11n MCS7 HT40 signals. It has CMOS logic control, on-chip input impedance matching, as well as integrated RF decoupling for the power supply.

The RFX240 is assembled in a compact 3.0x3.0mm 16L-QFN package. It requires minimal external components to greatly simplify RF front-end implementation.

## Applications

- High Power WLAN AP/Router
- Set-Top Box (STB)/ Home Gateway
- Enterprise/SOHO Wi-Fi Networks
- Outdoor WLAN Hotspots
- Wi-Fi Extenders
- Wi-Fi Dongles

## Features

- 2.4GHz, Single Chip, Single-Die RF Power Amplifier
- 2.4GHz High Power PA with Low-Pass Harmonic Filter
- 802.11n MCS7 HT40 Support with <3% EVM up to +26dBm at 5V
- High Gain of 30dB
- High Transmit Signal Linearity Meeting Standards for OFDM and CCK modulation
- Integrated Power Detector for Transmit Power Monitor and Control
- Compatible with Low Voltage (1.2V) CMOS Control Logic or levels up to VDD
- ESD Protection Circuitry on All Ports
- DC Decoupled RF Ports
- Internal RF Decoupling on All VDD Bias Pins
- Very Low DC Power Consumption
- Full On-chip Matching and Decoupling Circuitry
- Minimal External Components Required
- 50-Ohm Input / Output Matching
- 3 x 3 x 0.55mm Small Outline QFN-16 Package with Exposed Ground Pad





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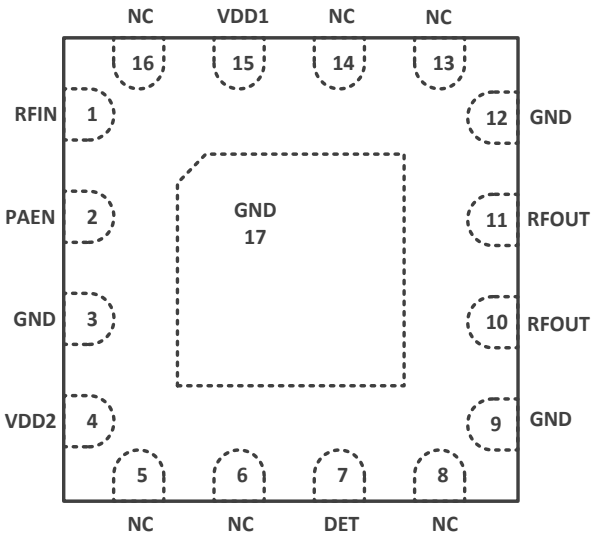
## Device Pin-Out Diagram




*(Top "See-Through" View)*

## Device Pin-Out Assignment

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | RFIN | RF Input Signal to the PA – DC Internally Shorted to GND |
| 2 | PAEN | CMOS Logic Control to Enable the PA |
| 3, 9, 12, 17 | GND | Ground – Must be Connected to Ground in the Application Circuit |
| 4, 15 | VDD1, VDD2 | DC Supply Voltage |
| 7 | DET | PA Power Detector Voltage Output |
| 5, 6, 8, 13, 14, 16 | NC | Not Connected Internally |
| 10, 11 | RFOUT | RF Output Signal from the PA |

## Control Logic Truth Table

| PAEN | Mode of Operation |
|---|---|
| 0 | PA is OFF; Device in Standby |
| 1 | PA is Enabled |

*Note: "1" denotes high voltage stage (>1.2V) at PAEN Control Pin;*
*"0" denotes low voltage stage (<0.3V) at PAEN Control Pin*

## Absolute Maximum Ratings

| Parameters | Min | Max | Units | Conditions |
|---|---|---|---|---|
| DC VCC Voltage Supply | 0 | 6.0 | V | All VCC Pins |
| DC Control Pin Voltage | 0 | 3.6 | V | All Control Pins |
| DC VCC Current Consumption | | 800 | mA | VCC Pins when PA is Enabled |
| TX RF Input Power | | +10 | dBm | |
| ANT RF Input Power | | +10 | dBm | |
| Junction Temperature | | 150 | °C | |
| Storage Ambient Temperature | -50 | +150 | °C | Appropriate care required according to JEDEC Standards |
| Operating Ambient Temperature | -40 | +85 | °C | All Operating Modes |
| ESD Voltage (HBM) | 1000 | | V | Human Body Model |

*Note: Sustained operation at or above the Absolute Maximum Ratings for any single or combinations of the above parameters may result in permanent damage to the device and is not recommended. All Maximum RF Input Power Ratings assume 50-Ohm terminal impedance.*

## General Characteristics

| Parameters | Min | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|
| Operating Frequency | 2.4 | | 2.5 | GHz | |
| DC VDD Voltage Supply *(Note 1)* | 3.6 | 5.0 | 5.5 | V | All VDD Pins |
| Control Voltage “High” | 1.2 | | 3.6 | V | |
| Control Voltage “Low” | | 0 | 0.3 | V | |
| Control Pin Current Consumption | | 1 | | µA | |
| DC Shutdown Current | | 5 | | µA | |
| PA Turn On/Off Time | | | 1 | µsec | |
| $\theta$ja *(Note 2)* | | 25 | | $^{o}$C/W | |
| Input Single-Ended Impedance | | 50 | | Ω | |

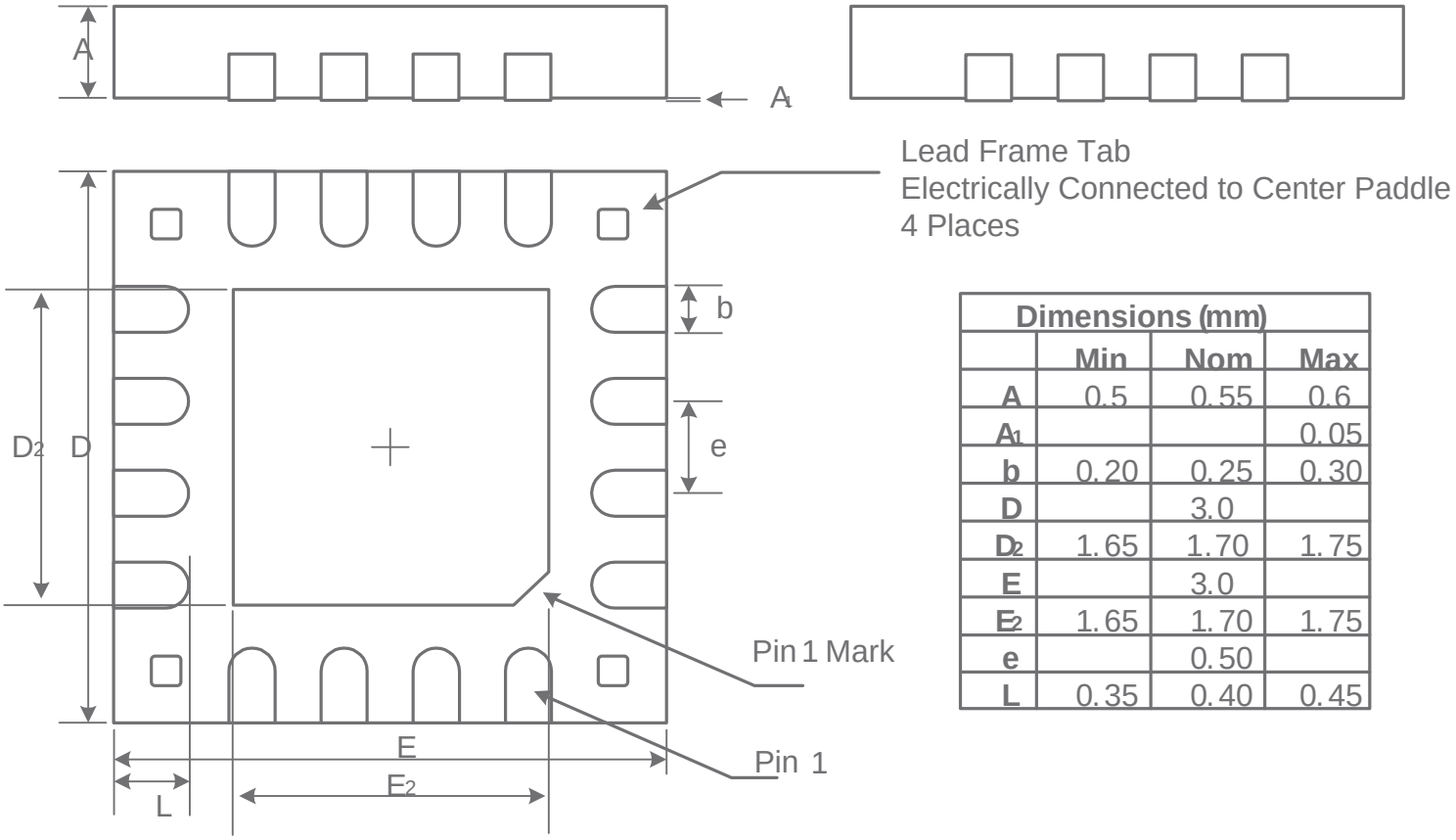
*Note 1 – For normal operation of the RFX240, VDD must be continuously applied to all VDD supply pins.*
*Note 2 – For operation above +85 ºC, use the $\theta$ja as guidance for system design to assure the junction temperature will not exceed the maximum of +150 ºC.*

## TRANSMIT CHARACTERISTICS

**(VDD = 5.0V, PAEN = HI, $T_A$ = +25°C, UNLESS OTHERWISE SPECIFIED, AS MEASURED ON THE RFX240 EVALUATION BOARD, DE-EMBEDDED TO THE DEVICE)**

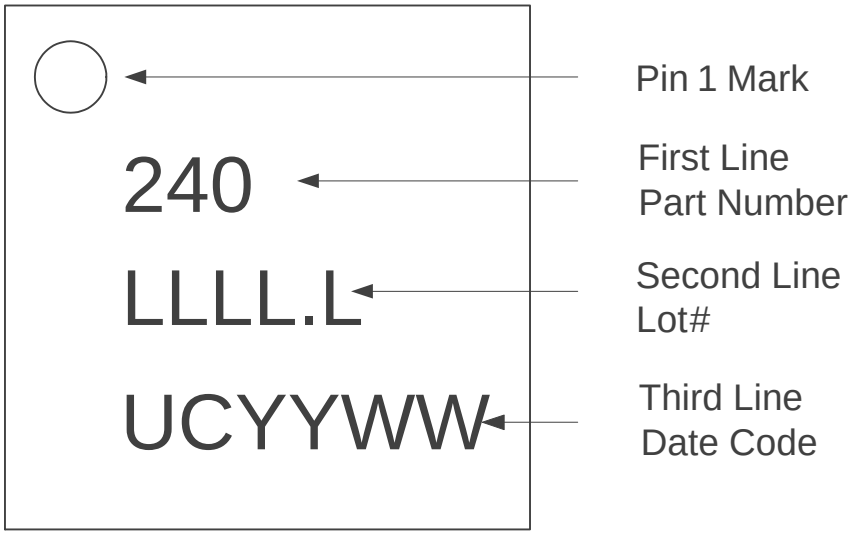
| Parameters | Min | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|
| Operating Frequency Band | 2.4 | | 2.5 | GHz | All RF Pins Terminated by 50 Ohms |
| Output P1dB | | +32 | | dBm | CW |
| Linear Output Power (802.11n) | | +25.5 | | dBm | 802.11n MCS7 HT20 <30dB DEVM |
| Linear Output Power (802.11b) | | +26 | | dBm | 1Mbps CCK Mask Compliance |
| Small-Signal Gain | | 30 | | dB | CW |
| Second Harmonic | | -70 | | dBc | $P_{OUT}$ = +29dBm, CW |
| Third Harmonic | | -70 | | dBc | $P_{OUT}$ = +29dBm, CW |
| Input Return Loss | | -15 | | dB | At RFIN Pin |
| Output Return Loss | | -5 | | dB | At RFOUT Pins |
| TX Quiescent Current | | 210 | | mA | No RF Input Signal |
| TX Linear Current | | 420 | | mA | $P_{OUT}$ = +26dBm, 11n MCS7 HT20 |
| Power Detector Voltage Output | | 0.2-0.9 | | V | 5dBm to +27dBm, 10KΩ Load |
| Load VSWR for Stability (CW, Fix Pin for $P_{OUT}$ = +29dBm with 50Ω Load) | 4:1 | 6:1 | | N/A | All non-harmonically related spurs less than -43 dBm/MHz |
| Load VSWR for Ruggedness (CW, Fix Pin for $P_{OUT}$ = +29dBm with 50Ω Load) | 8:1 | 10:1 | | N/A | No damage |

## PACKAGE DIMENSIONS

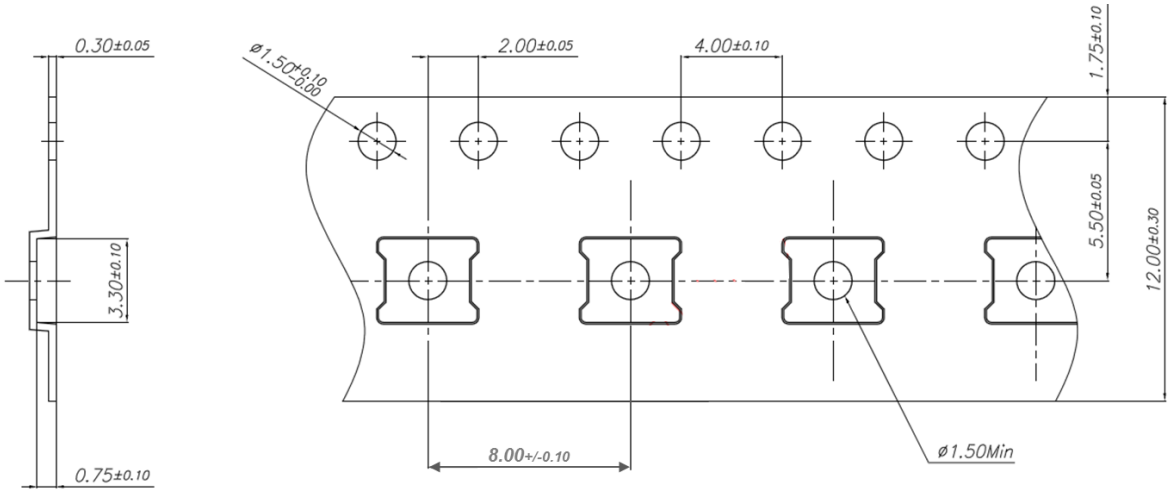


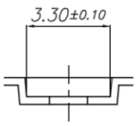

| Dimensions (mm) | | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 0.5 | 0.55 | 0.6 |
| $A_1$ | | | 0.05 |
| b | 0.20 | 0.25 | 0.30 |
| D | | 3.0 | |
| $D_2$ | 1.65 | 1.70 | 1.75 |
| E | | 3.0 | |
| $E_2$ | 1.65 | 1.70 | 1.75 |
| e | | 0.50 | |
| L | 0.35 | 0.40 | 0.45 |

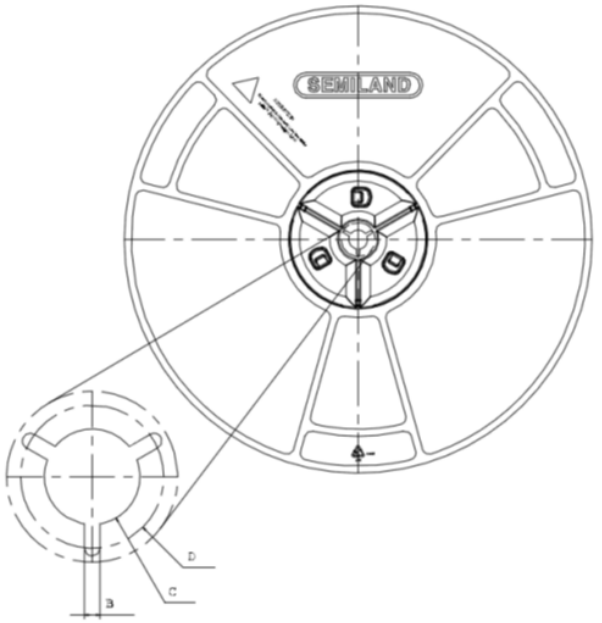
## PACKAGE MARKING

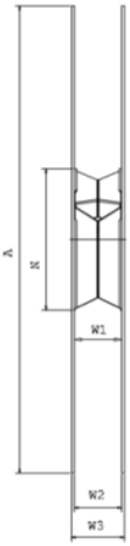


## TAPE AND REEL INFORMATION:




| Size | 12mm |
|---|---|
| A | 330 +0.2 -2.0 |
| B | 1.5min |
| C | 13.0 +0.5 -0.2 |
| D | 20.2min |
| N | 100 +2.0 -0.0 |
| W1 | 12.4 +3.0 -0.0 |
| W2 | 12.4 +3.0 -0.0 |
| W3 | 16.4 +2.0 -2.0 |
| PART# | SRL-12134H |