# GSR2358

***2.4 GHz Front End Module***

## Product Description

The GSR2358 is a highly integrated front end module (FEM) designed for 2.4GHz 802.11b/g/n/ac/ax/be systems. The device provides all the functionality of a fully matched power amplifier (PA), power detector, RF coupler, a 2.4G low-noise amplifier (LNA), and a single-pole, double-throw (SPDT) switches.

The GSR2358 also includes a transmitter power detector with 20 dB dynamic range. A Digital Pre-Distortion (DPD) coupler is provided to improve the linearity of the FEM.

The device is provided in a compact, 16-pin 3.0 x 3.0 mm Quad Flat No-Lead (QFN) package. Pin map is shown in Figure 1. A functional block diagram is shown in Figure 2.

## Pin Map

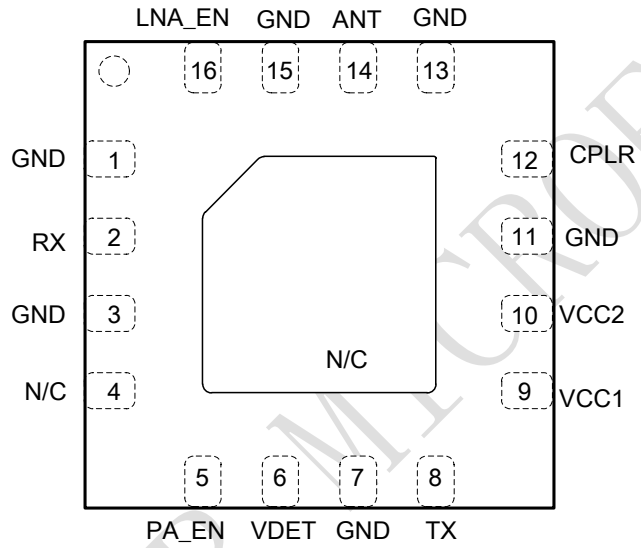



Figure 1 GSR2358 Pin Map (Top View)

## Functional Block Diagram

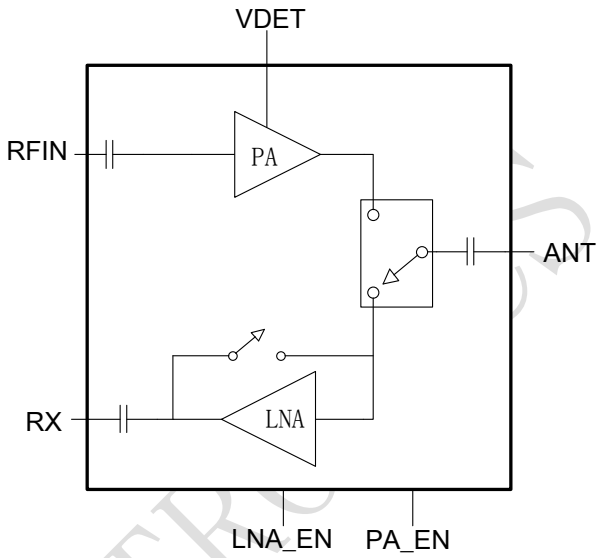



Figure 2 Block Diagram

## Key Features

- Pout = +21.5 dBm EHT40 MCS13 -43dB DEVM
- Pout = +22.5 dBm HE40 MCS11 -40dB DEVM
- Pout = +23.5 dBm VTH40 MCS9 -35dB DEVM
- Pout = +24 dBm HT40/20 MCS7 -30dB DEVM
- Integrated positive slope power detector
- Receive gain: 15 dB
- 1.6 dB LNA Noise Figure

## Applications

- Mobile Access Points
- Mobile Phones
- Consumer Electronics
- Customer Premise Equipment
- Internet of Things

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## Pin Description

| Pin | Name | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | RX | RF receive output |
| 3 | GND | Ground |
| 4 | N/C | No connection |
| 5 | PA_EN | PA Enable |
| 6 | VDET | Power detector output voltage |
| 7 | GND | Ground |
| 8 | TX | RF transmit input |
| 9 | VCC1 | PA supply voltage |
| 10 | VCC2 | PA supply voltage |
| 11 | GND | Ground |
| 12 | CPLR | DPD coupler output |
| 13 | GND | Ground |
| 14 | ANT | Antenna |
| 15 | GND | Ground |
| 16 | LNA_EN | LNA Enable |

## Absolute Maximum Ratings

| Parameter | Conditions | Rating |
|---|---|---|
| DC Supply Voltage | | -0.3 to +5.25 V |
| Control Voltage ( PA_EN,LNA_EN) | | -0.3 to +3.6 V |
| Storage Temperature | | -40 to 150 ℃ |
| Junction Temperature | | Max 150 ℃ |
| RF Input Power at TX | ANT connect 50 Ω Load | +10 dBm |
| RF Input Power at ANT | RX connect 50 Ω Load, LNA active | +10 dBm |
| RF Input Power at ANT | RX connect 50 Ω Load, LNA off | +30 dBm |

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

## Recommended Operating Conditions

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| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Operating Frequency | 2400 | - | 2500 | MHz |
| DC Supply Voltage | 3 | 5 | 5.25 | V |
| Control Voltage – High | 1.8 | - | 3.6 | V |
| Control Voltage – Low | 0 | - | 0.4 | V |
| Operating temperature | -40 | 25 | 85 | ℃ |

## Logic Truth Table

| Mode | PA_EN | LNA_EN |
|---|---|---|
| WLAN receive LNA | 0 | 1 |
| WLAN receive bypass | 0 | 0 |
| WLAN transmit | 1 | 0 |

## Electrical Specifications

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Transmit Mode | Unless otherwise noted: VCC1, 2 =5 V, Temp=+25ºC, PA_EN =High ,LNA_EN=Low | | | | |
| 11be Output Power | EHT40 MCS13 | | 21.5 | | dBm |
| Dynamic EVM | | | -43 | | dB |
| 11ax Output Power | HE40 MCS11 | | 22 | | dBm |
| Dynamic EVM | | | -43 | | dB |
| 11ax Output Power | HE40 MCS11 | | 22.5 | | dBm |
| Dynamic EVM | | | -40 | | dB |
| 11ac Output Power | VHT40 MCS9 | | 23.5 | | dBm |
| Dynamic EVM | | | -35 | | dB |
| 11n HT20 Output Power | HT40 MCS7 | | 24 | | dBm |
| Dynamic EVM | | | -30 | | dB |
| mask compliant power | 802.11n HT20 MCS0 | | 27 | | dBm |
| Gain | | | 28 | | dB |
| Gain Flatness | Across any 40 MHz Channel | -0.5 | | +0.5 | dB |
| TX Port Return Loss | | | 13 | | dB |
| ANT Port Return Loss | | | 12 | | dB |
| Operating Current | @No RF | | 160 | | mA |
| | @+22.0dBm | | 265 | | mA |
| | @+24.0dBm | | 315 | | mA |
| | @+27.0dBm | | 415 | | mA |
| PA_EN Current | PA_EN =High | | 5 | | uA |
| 2nd Harmonics | Pout=25 dBm, 11b 1Mbps | | -25 | | dBm/MHz |
| 3rd Harmonics | Pout=25 dBm, 11b 1Mbps | | -30 | | dBm/MHz |

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| | | | | | |
|---|---|---|---|---|---|
| VDET Voltage | @ No RF | | 0.16 | | V |
| | @+10.0dBm | | 0.48 | | V |
| | @+22.0dBm | | 0.9 | | V |
| | @+24.5dBm | | 0.99 | | V |
| | @+27.0dBm | | 1.1 | | V |
| Coupling factor | | | 21 | | dB |
| Switching Time | LNA On or Bypass to Transmit Mode | | 400 | | nS |
| Ruggedness | Rated power = 27 dBm, load VSWR 10:1 | No damage | | | |
| Transmit Mode | Unless otherwise noted: VCC1,2 =3.3 V, Temp=+25ºC, PA_EN =High,LNA_EN=Low | | | | |
| 11be Output Power | EHT40 MCS13 | | 18 | | dBm |
| Dynamic EVM | | | -43 | | dB |
| 11ax Output Power | HE40 MCS11 | | 18.5 | | dBm |
| Dynamic EVM | | | -43 | | dB |
| 11ax Output Power | HE40 MCS11 | | 19 | | dBm |
| Dynamic EVM | | | -40 | | dB |
| 11ac Output Power | VHT40 MCS9 | | 19.5 | | dBm |
| Dynamic EVM | | | -35 | | dB |
| 11n HT20 Output Power | HT40 MCS7 | | 20.5 | | dBm |
| Dynamic EVM | | | -30 | | dB |
| mask compliant power | 802.11n HT20 MCS0 | | 23 | | dBm |
| Operating Current | @No RF | | 155 | | mA |
| | @+15.0dBm | | 185 | | mA |
| | @+18.0dBm | | 205 | | mA |
| | @+20.0dBm | | 230 | | mA |
| | @+23.0dBm | | 290 | | mA |
| VDET Voltage | @ No RF | | 0.16 | | V |
| | @+10.0dBm | | 0.48 | | V |
| | @+15.0dBm | | 0.66 | | V |
| | @+20.0dBm | | 0.85 | | V |
| | @+23.0dBm | | 0.97 | | V |
| Receive LNA Mode | Unless otherwise noted: VCC1, 2 =5&3.3 V, Temp=+25ºC, PA_EN =LOW,LNA_EN=High | | | | |
| Noise Figure | | | 1.6 | | dB |
| Gain | | | 14.5 | | dB |
| Gain Flatness | Across any 40 MHz Channel | -0.5 | | +0.5 | dB |
| Out of Band Gain | f = 5000 ~ 6000 MHz | | 3 | | dB |
| RX Port Return Loss | | | | | dB |
| ANT Port Return Loss | | | | | dB |
| Quiescent Current | | | 15 | | mA |
| LNA_EN Current | LNA_EN=High | | | | uA |
| Input P1dB | | | | | dBm |
| Switching Time | Transmit to Receive LNA Mode | | | | nS |
| | Bypass to LNA Mode | | | | nS |

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| Receive Bypass Mode | Unless otherwise noted: VCC1, 2 =5 &3.3V, Temp=+25ºC, PA_EN = LNA_EN=0 V | | | | |
|---|---|---|---|---|---|
| Gain | | | -5.5 | | dB |
| Gain Flatness | Across any 40 MHz Channel | -0.25 | | +0.25 | dB |
| Out of Band Gain | f = 5000 ~ 6000 MHz | | -20 | | dB |
| RX Port Return Loss | | | 11 | | dB |
| ANT Port Return Loss | | | 15 | | dB |
| Quiescent Current | RF OFF | | 50 | | uA |
| Input P1dB | | | 27 | | dBm |
| Switching Time | Transmit to Receive Bypass Mode | | 450 | | nS |
| | LNA to Bypass Mode | | 60 | | nS |

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## Evaluation Board Schematic

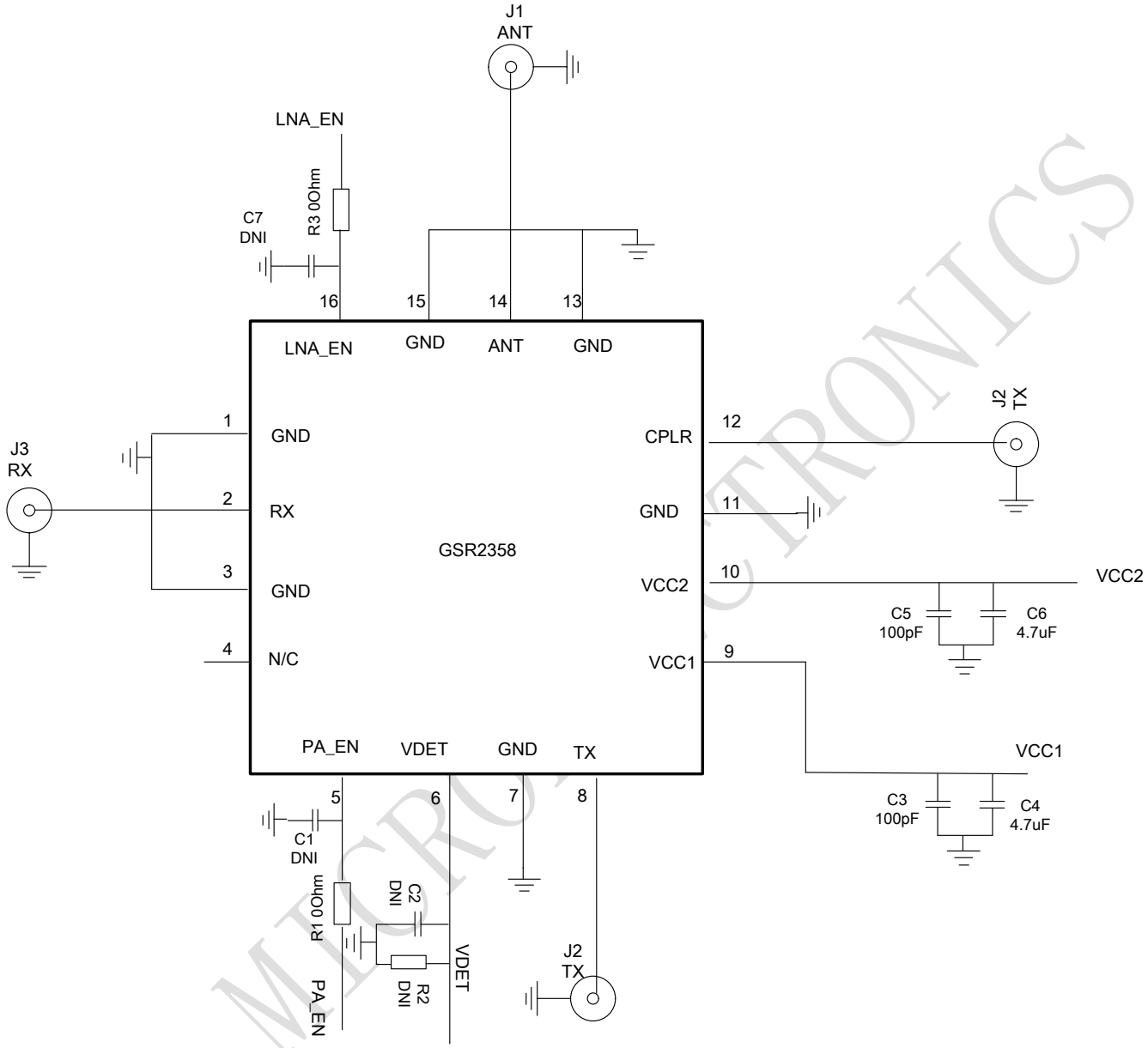
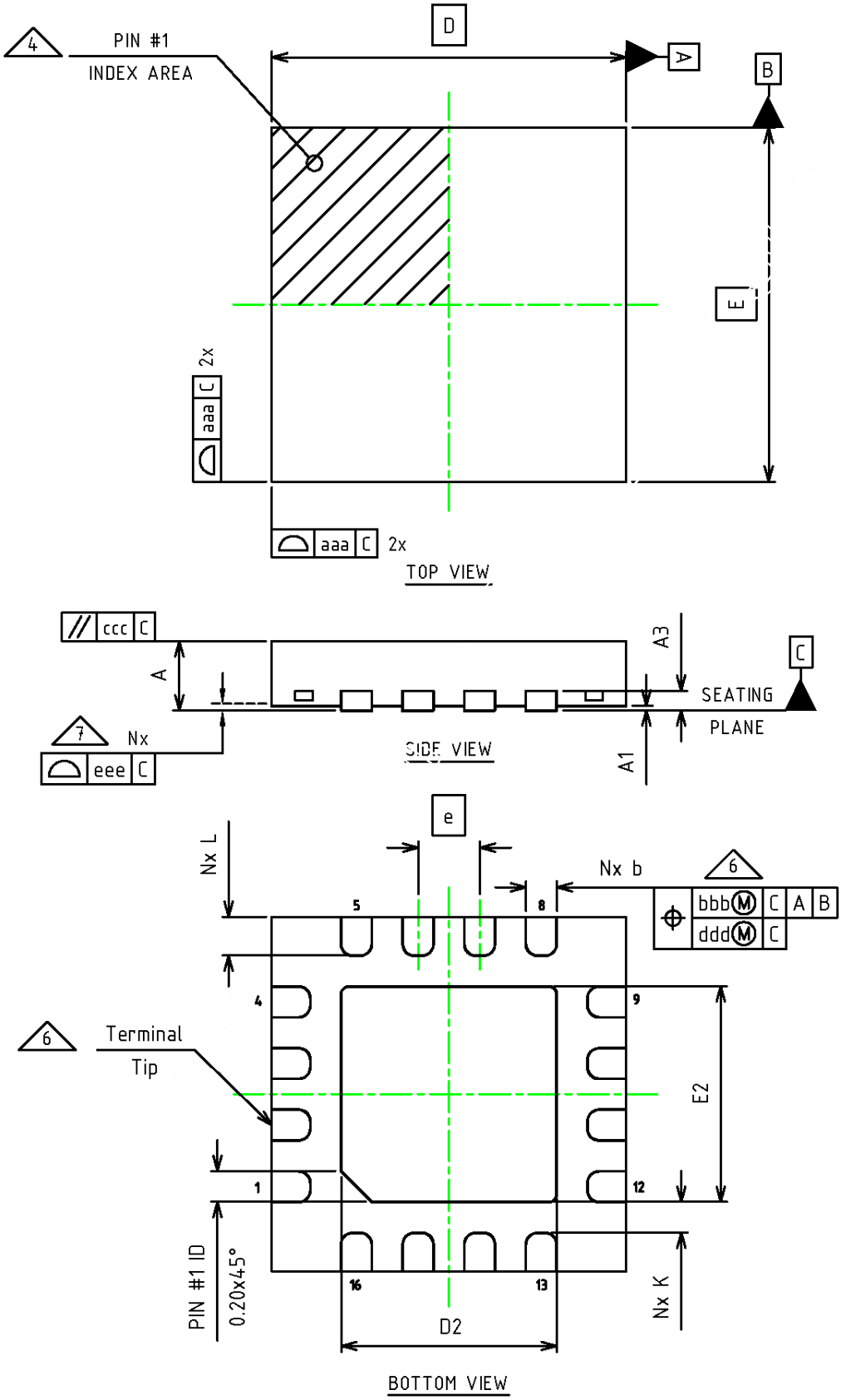



Figure 3 GSR2358 Application Schematic

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## Package Outline


4
PIN #1
INDEX AREA
D
A
B
E
2x
aaa C
aaa C 2x
TOP VIEW
ccc C
A
A3
C
SEATING
PLANE
7
Nx
eee C
SIDE VIEW
A1
e
Nx L
Nx b
6
bbb M C A B
ddd M C
5
8
4
9
6
Terminal
Tip
E2
1
12
PIN #1 ID
0.20x45°
16
13
D2
Nx K
BOTTOM VIEW

| Dimension Table | | | | |
|---|---|---|---|---|
| | MINIMUM | NOMINAL | MAXIMUM | NOTE |
| A | 0.51 | 0.55 | 0.60 | |
| b | 0.18 | 0.25 | 0.3 | |
| D | | 3.0 | | |
| E | | 3.0 | | |
| e | | 0.5 | | |
| D2 | 1.55 | 1.70 | 1.80 | |
| E2 | 1.55 | 1.70 | 1.80 | |
| K | 0.15 | | | |
| L | 0.3 | 0.4 | 0.5 | |
| N | | 16 | | |

Notes: All dimensions are in millimeters.

## Contact Information

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