Preliminary

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# 26 GHz Silicon 5G Tx/Rx Quad Core IC

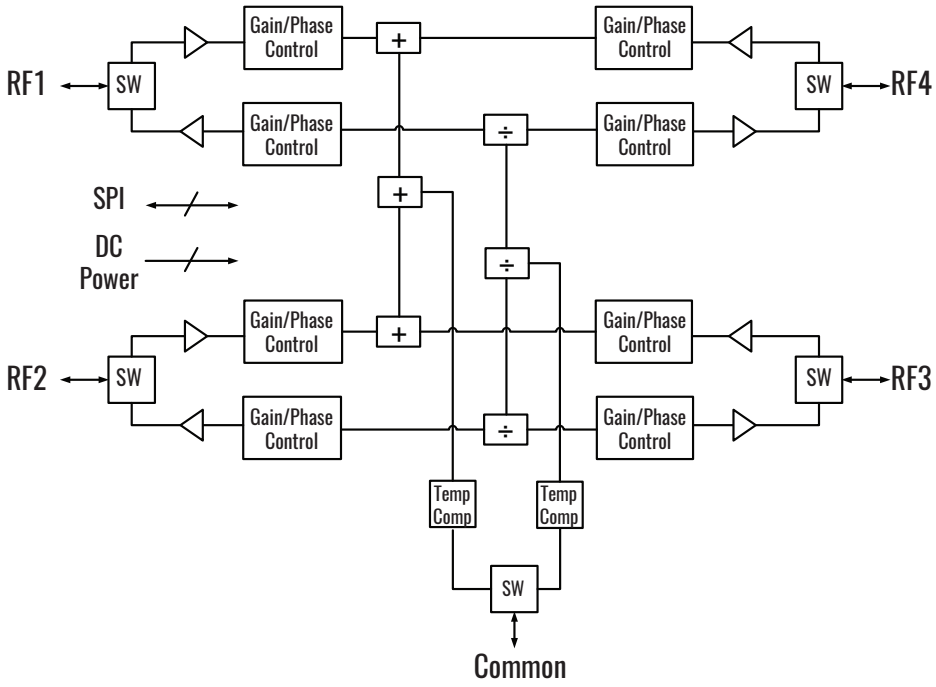
## AWMF-0135

## Product Overview

## Product Features

- 24.25 - 27.5 GHz operation
- Supports 4 radiating elements
- Tx/Rx half duplex operation
- +10 dBm Tx OP1dB
- +29 dB Tx gain
- +30 dB Rx coherent gain*
- 5.0 dB Rx NF
- -30 dBm Rx IIP3
- 5 bit phase control (LSB=11.25°)
- 5 bit gain control (LSB=1.0 dB)
- Fast beam steering
- Telemetry reporting
- 6x6 mm QFN
- +1.8 V operation
- 0.6 W DC Tx mode quiescent
- 0.83 W DC Tx mode at P1dB
- 0.47 W DC Rx mode

## Block Diagram




## Applications

5G communications antenna arrays

## General Description

The AWMF-0135 is a highly integrated silicon quad core IC intended for 5G phased array applications. The device supports four Tx/Rx radiating elements, includes 5 bit phase and 5 bit gain control for analog RF beam steering, and operates in half duplex fashion to enable a single antenna to support both Tx and Rx operation. The device provides 29 dB gain and +10 dBm output power during transmit mode and 30 dB coherent gain, 5.0 dB NF, and -30 dBm IIP3 during receive mode. Additional features include gain compensation over temperature, temperature reporting, Tx power telemetry, and fast beam switching. The device features ESD protection on all pins, operates from +1.8 V, and is packaged in a 48 lead 6x6 mm QFN for easy installation in planar phased array antennas.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# Product Overview

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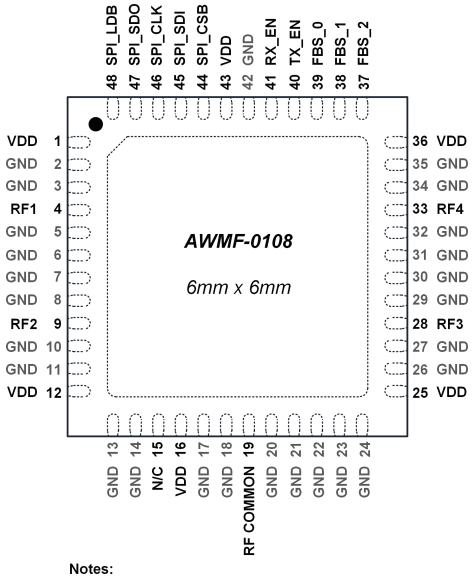
## Specifications

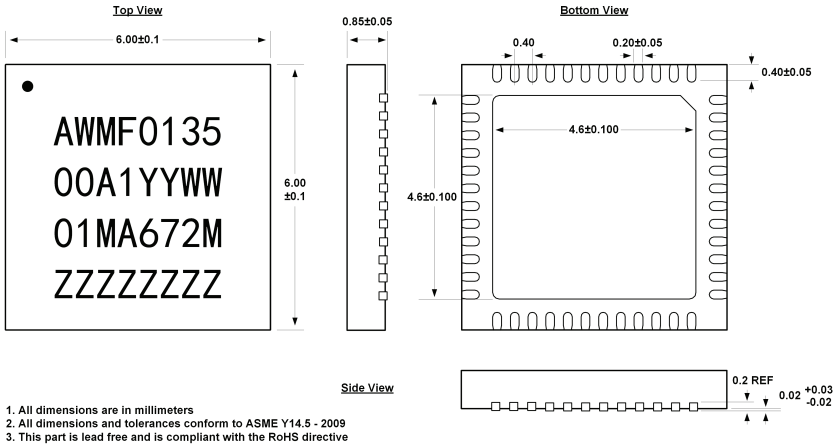
| Parameter | Nominal Performance | Units |
|---|---|---|
| General | | |
| Frequency Range | 24.25 - 27.5 | GHz |
| # Elements | 4 | - |
| Tx # Beams<br>Rx # Beams | Single<br>Single | - |
| Supply Voltage | +1.8 | V |
| Beam Steering | | |
| Phase Bits | 5 | |
| Phase LSB | 11.25 | degrees |
| RMS Phase Error | 5 | deg RMS |
| Amplitude Bits | 5 | - |
| Amplitude LSB | 1 | dB |
| Amplitude Dynamic Range | 31 | dB |
| RMS Amplitude Error | 0.5 | dB RMS |

| Parameter | Nominal Performance | Units |
|---|---|---|
| Transmit Mode | | |
| Channel Gain | +29 | dB |
| Tx Output P1dB | +10 | dBm |
| Receive Mode | | |
| Coherent Channel Gain | +30* | dB |
| Noise Figure | 5.0 | dB |
| IIP3 | -30 | dBm |
| Other | | |
| Telemetry | Temperature, Tx output power | - |
| DC Power Tx Mode | 0.6 (quiescent), 0.83 (at P1dB) | W |
| DC Power Rx Mode | 0.47 | W |
| Operating Range | -40 to +95 | ¦C |
| Package Size | 48 lead 6x6 (QFN) | mm |
| ESD Sensitivity, CDM | Class C4 (500V) | |
| ESD Sensitivity, HBM | Class 1C (1kV) | |
| Additional Features | Eight beam weight registers for storage for fast beam switching | - |

## Package and Pin Out




Notes:
SPI_xxx – Serial command and telemetry reporting
FBS_x – Fast beam steering address select




1. All dimensions are in millimeters
2. All dimensions and tolerances conform to ASME Y14.5 - 2009
3. This part is lead free and is compliant with the RoHS directive

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nqa. ISO 9001 Registered Quality Management


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Rev. V1P

# 26 GHz Silicon 5G Tx/Rx Quad Core IC

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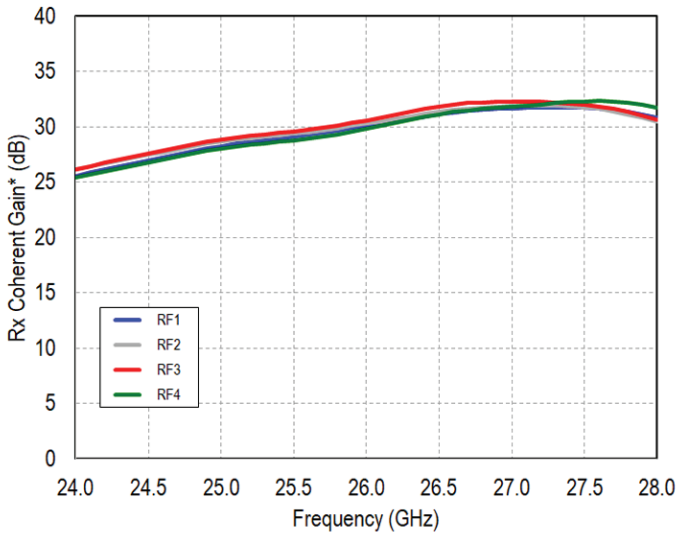
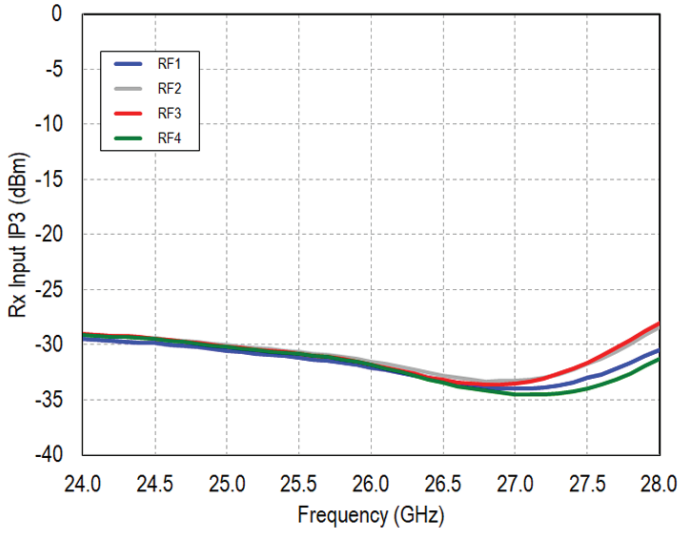
## Product Overview

## Data

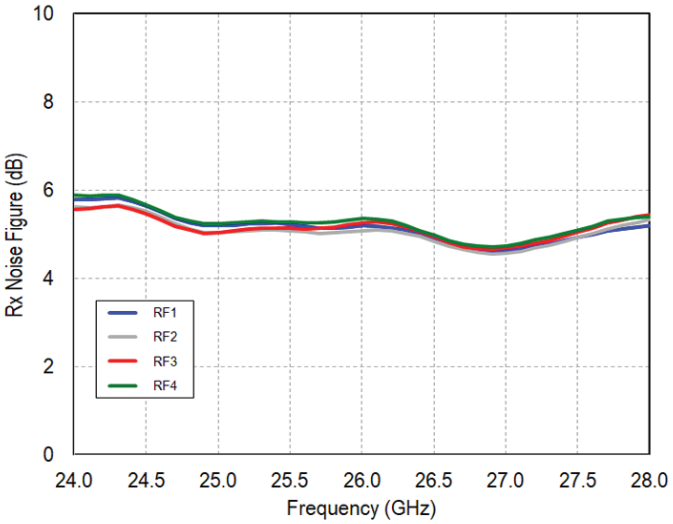
### Rx Coherent Gain* vs. Frequency
**Temp = +25ºC, Vs = +1.8V**




### Rx Input IP3 vs. Frequency
**Temp = +25ºC, Vs = +1.8V**




### Rx Input Noise Figure vs. Frequency
**Temp = +25ºC, Vs = +1.8V**




*NOTE: Coherent gain (CG) is the RF gain with all Rx input ports energized and is most useful for assessing RF power handling in the beam forming network. Electronic gain (EG) is the RF gain exclusive of the 4:1 sum and is most useful for cascaded NF and gain calculation. The total gain of the antenna aperture can be calculated from EG + 10*log(n), where n is the number of antenna elements in the array. Single path gain (SPG) is the RF gain with only one input port energized. This is representative of the RF gain measured in a 2 port measurement system, such as with the Developer's Kit. In the coherent gain plot above, 12 dB has been added to the single path gain value from each quadrant.

CG = SPG + 12 dB = EG + 6 dB for a quad IC

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## Product Overview

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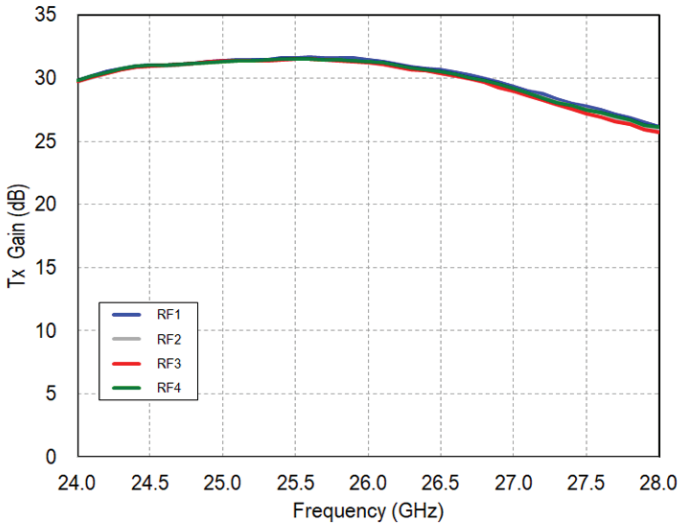
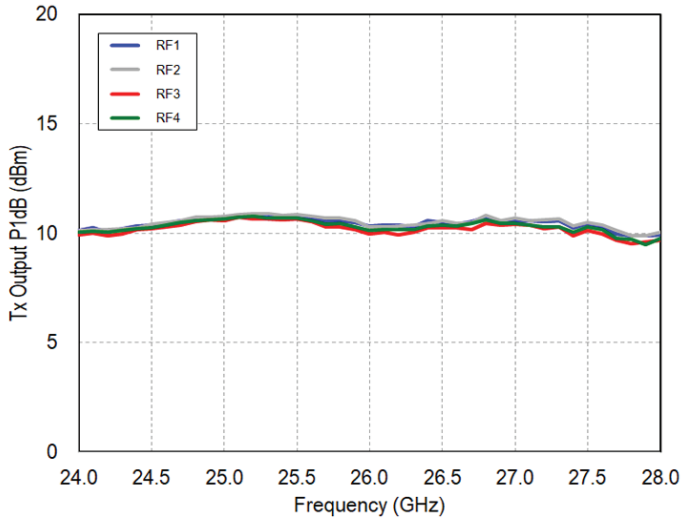
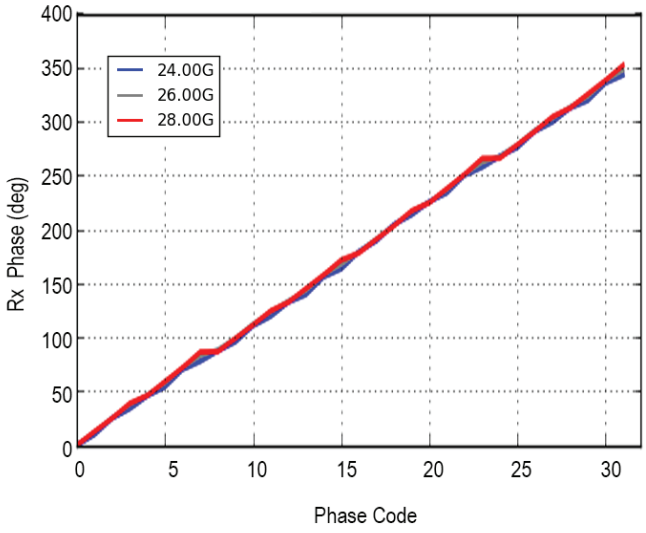
### Tx Channel Gain vs. Frequency
**Temp = +25ºC, Vs = +1.8V**



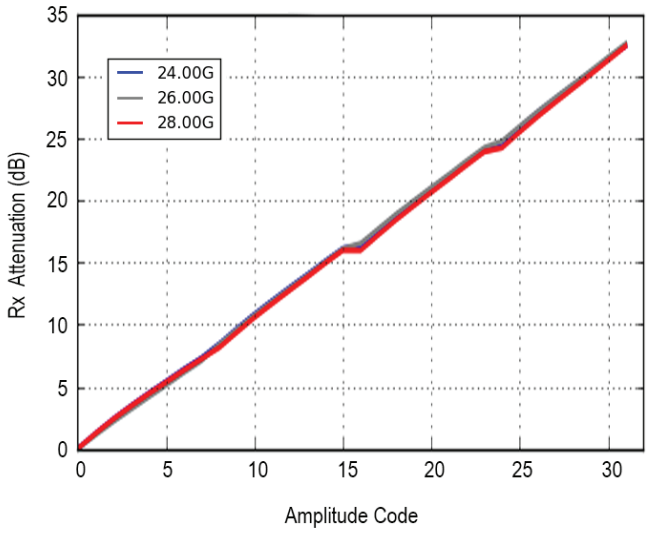

### Tx Output P1dB vs. Frequency
**Temp = +25ºC, Vs = +1.8V**




### Rx Phase vs. Phase Code
**Temp = +25ºC, Vs = +1.8V, Freq = 24, 26, 28 GHz**




### Rx Attenuation vs. Amplitude Code
**Temp = +25ºC, Vs = +1.8V, Freq = 24, 26, 28 GHz**

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### Tx Phase vs. Phase Code
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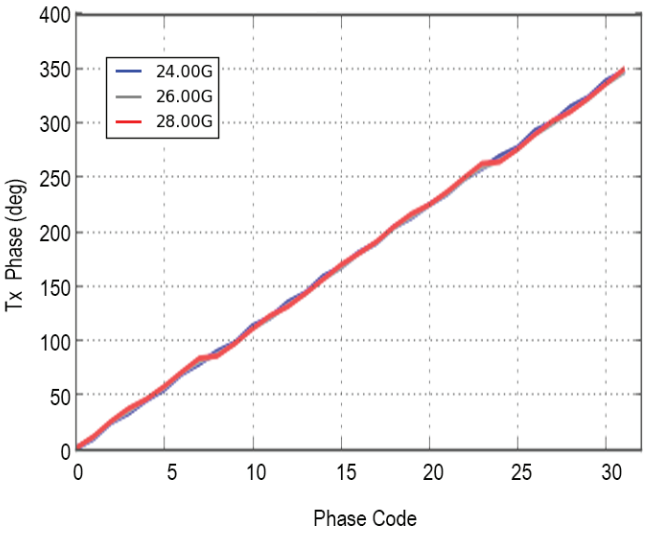
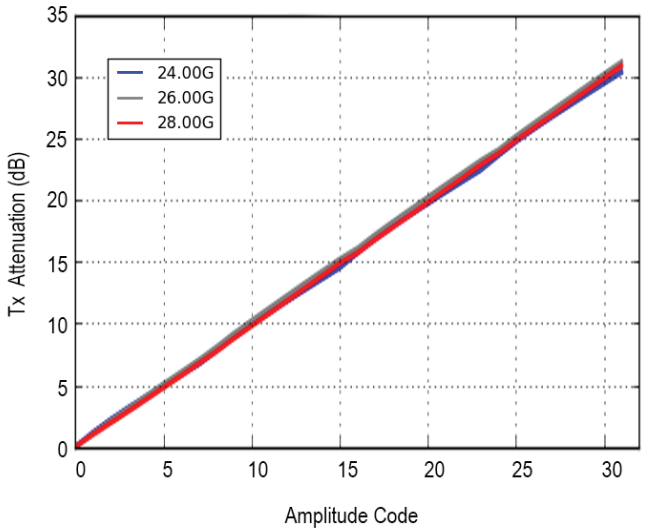



### Tx Attenuation vs. Amplitude Code
**Temp = +25ºC, Vs = +1.8V, Freq = 24, 26, 28 GHz**

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