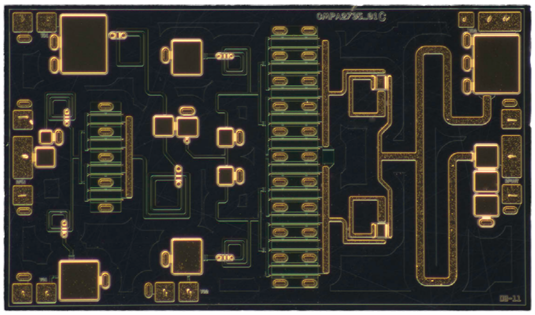
# CMPA2735030D

## 30 W, 2.7 - 3.5 GHz, GaN MMIC, Power Amplifier



### Description

Wolfspeed's CMPA2735030D is a gallium nitride (GaN) high electron mobility transistor (HEMT) based monolithic microwave integrated circuit (MMIC). GaN has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity and higher thermal conductivity. GaN HEMTs also offer greater power density and wider bandwidths compared to Si and GaAs transistors. This MMIC contains a two-stage reactively matched amplifier design approach enabling very wide bandwidths to be achieved.

### Features

- 33 dB small signal gain
- Operation up to 50 V
- High breakdown voltage
- High temperature operation
- Size 0.130 x 0.08 x 0.004 inches

### Applications

- Civil and military pulsed radar amplifiers

### Typical Performance Over 2.7 - 3.5 GHz ($T_C$ = 25 °C)

| Parameter | 2.7 GHz | 2.9 GHz | 3.1 GHz | 3.3 GHz | 3.5 GHz | Units |
|---|---|---|---|---|---|---|
| Small Signal Gain | 32.4 | 33.1 | 33.3 | 33.3 | 33.5 | dB |
| Output Power[1] | 31 | – | 43 | – | 37 | W |
| Power Gain[1] | 26.0 | – | 27.4 | – | 26.6 | dB |
| PAE[1] | 50.8 | – | 53.8 | – | 54.3 | % |

Note:
[1] $P_{IN}$ = 19 dBm, pulse width = 100 µs; duty cycle = 10%.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### Absolute Maximum Ratings (Not Simultaneous) at 25 °C

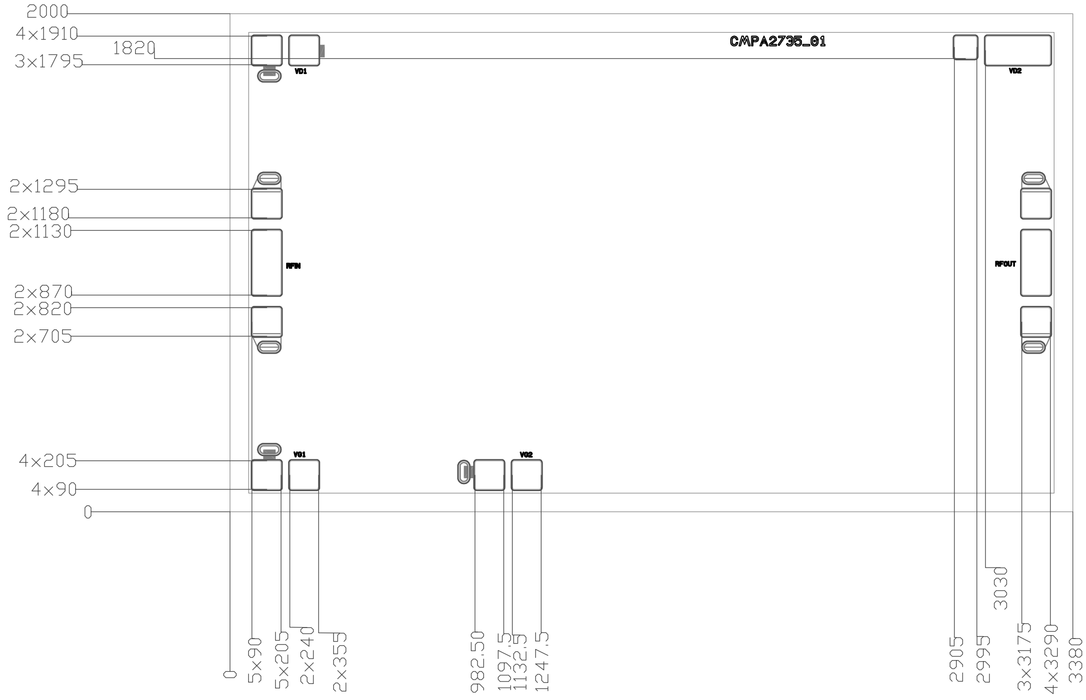
| Parameter | Symbol | Rating | Conditions |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 150 | $V_{DC}$ |
| Gate-to-Source Voltage | $V_{GS}$ | -10, +2 | $V_{DC}$ |
| Storage Temperature | $T_{STG}$ | -65, +150 | °C |
| Operating Junction Temperature | $T_J$ | 225 | °C |
| Thermal Resistance, Junction to Case (Packaged) | $R_{\theta JC}$ | – | °C/W |
| Mounting Temperature (30 Seconds) | $T_s$ | 260 | °C |

### Electrical Characteristics (Frequency = 2.7 GHz to 3.5 GHz Unless Otherwise Stated; $T_C$ = 25 °C)

| Characteristics | Symbol | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| DC Characteristics | | | | | | |
| Gate Pinch-Off Voltage | $V_{GS(th)}$ | -3.8 | -3.0 | -2.3 | V | $V_{DS}$ = 10 V, $I_D$ = 7.6 mA |
| Drain Current | $V_{GS(Q)}$ | – | -2.7 | – | $V_{DC}$ | $V_{DS}$ = 50 V, $V_{DQ}$ = 135 mA |
| Saturated Drain Current[1] | $I_{DS}$ | – | 4.6 | – | A | $V_{DS}$ = 6.0 V, $V_{GS}$ = 2.0 V |
| Drain-Source Breakdown Voltage | $V_{BD}$ | – | 150 | – | V | $V_{GS}$ = -8 V, $I_D$ = 7.6 mA |
| RF Characteristics[2] | | | | | | |
| Small Signal Gain[1] | S21 | – | 32.4 | – | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 2.7 GHz |
| Small Signal Gain[2] | S21 | – | 33.3 | – | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 3.1 GHz |
| Small Signal Gain[3] | S21 | – | 33.5 | – | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 3.5 GHz |
| Power Output[1] | $P_{OUT}$ | – | 30.7 | – | W | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, $P_{IN}$ = 19 dBm, Frequency = 2.7 GHz |
| Power Output[2] | $P_{OUT}$ | – | 43.7 | – | W | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, $P_{IN}$ = 19 dBm, Frequency = 3.1 GHz |
| Power Output[3] | $P_{OUT}$ | – | 35.6 | – | W | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, $P_{IN}$ = 19 dBm, Frequency = 3.5 GHz |
| Power Added Efficiency[1] | PAE | – | 52 | – | % | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 2.7 GHz |
| Power Added Efficiency[2] | PAE | – | 56 | – | % | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 3.1 GHz |
| Power Added Efficiency[3] | PAE | – | 54 | – | % | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, Frequency = 3.5 GHz |
| Power Gain | $G_P$ | – | 25.9 | – | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA |
| Input Return Loss | S11 | – | – | -11.9 | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA |
| Output Return Loss | S22 | – | – | -10.7 | dB | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA |
| Output Mismatch Stress | VSWR | – | – | 5 : 1 | Ψ | $V_{DD}$ = 50 V, $I_{DQ}$ = 135 mA, 10 °C & 40 °C |

Notes:
[1] Scaled from PCM data.
[2] All data pulse tested on-wafer with pulse width = 10 µs, duty cycle = 1%.

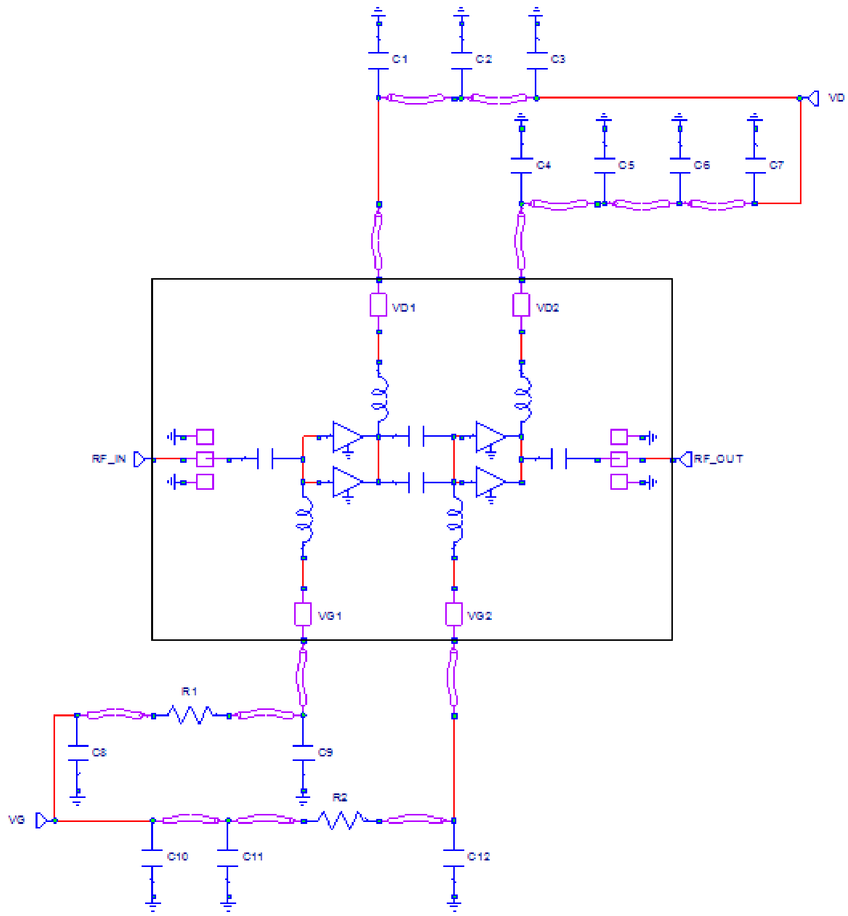
## DIE Dimensions (Units in Microns)




## Die Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Wolfspeed's website for the Eutectic Die Bond Procedure Application Note at www.wolfspeed.com/rf/document-library
- Vacuum collet is the preferred method of pick-up
- The backside of the die is the source (ground) contact
- Die back side gold plating is 5 microns thick minimum
- Thermosonic ball or wedge bonding are the preferred connection methods
- Gold wire must be used for connections
- Use the die label (XX-YY) for correct orientation

## Block Diagram Showing Additional Capacitors & Output Matching Section for Operation Over 2.7 to 3.5 GHz




| Designator | Description | Quantity |
|---|---|---|
| C1, C2, C3, C4 | 110 pF, +/-40% SINGLE LAYER, 103 X 180, Er 3300, 100 V, Ni/Au TERMINATION | 4 |
| C5, C6 | 560 pF +/-40% SINGLE LAYER, 103 X 180, Er 3300, 100 V, Ni/Au TERMINATION | 1 |

Notes:
[1] The input, output and decoupling capacitors should be attached as close as possible to the die- typical distance is 40 to 50 mils.
[2] The MMIC die and capacitors should be connected with 1 mil gold bond wires.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## Typical Performance

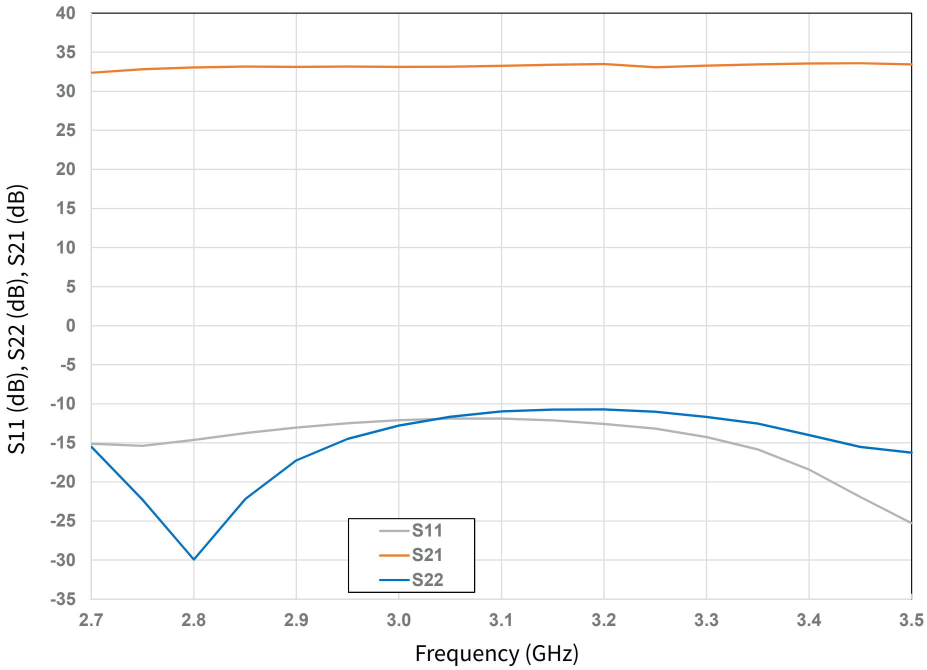


Figure 1. Gain and Return Loss vs Frequency of CMPA2735030D
$V_{DD}$ = 50 V, $I_{DQ}$ = 0.135 A

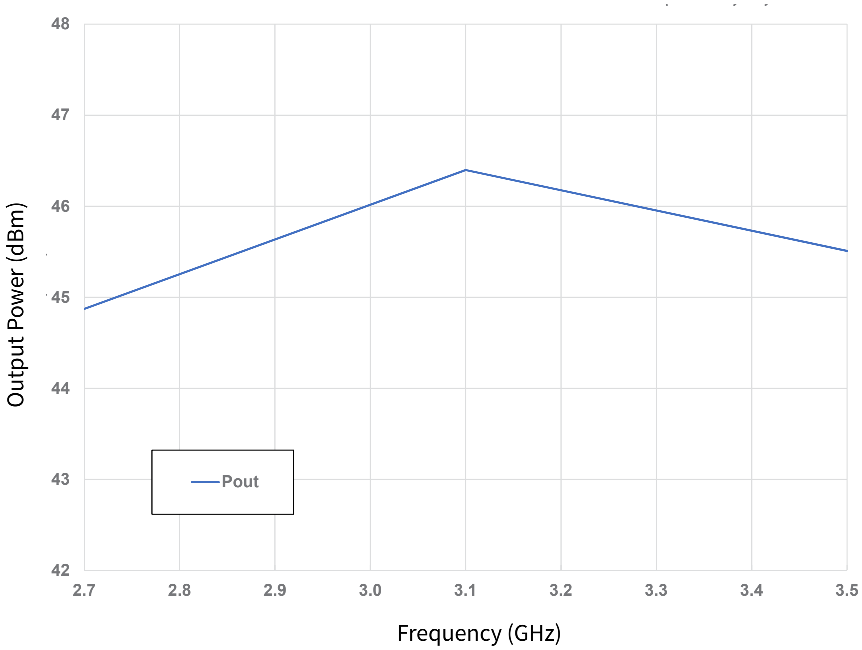


Figure 2. Pulsed Output Power vs Frequency as a Function of Input Power
$V_{DD}$ = 50 V, $I_{DQ}$ = 0.135 A, $P_{IN}$ = 19 dBm, Pulse Width = 10 µs, Duty Cycle = 1%

## Typical Performance

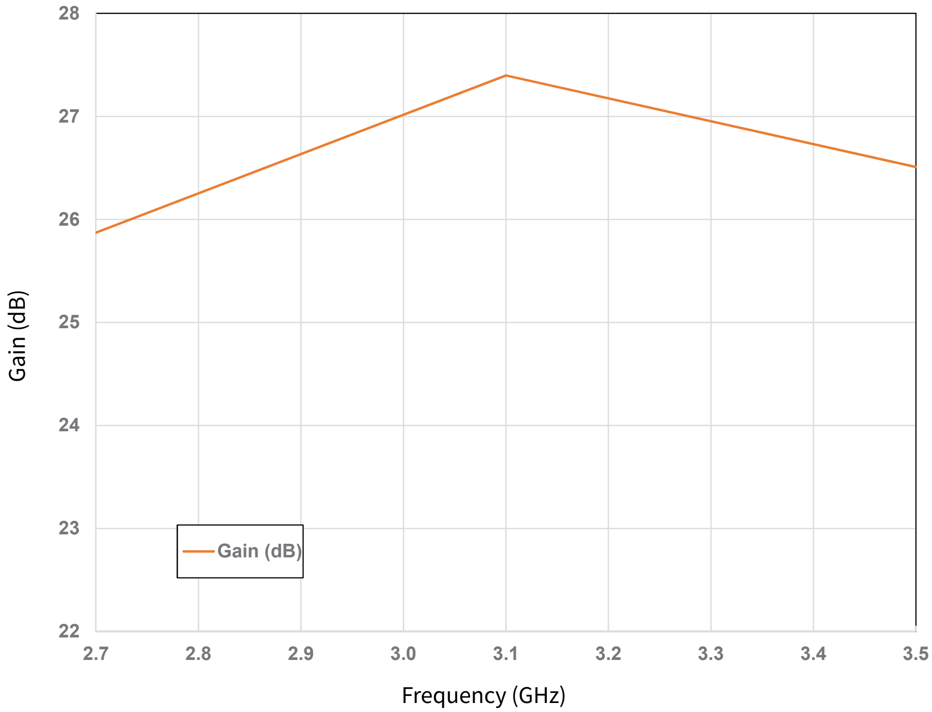


Figure 3. Gain vs Frequency as a Function of Output Power
$V_{DD}$ = 50 V, $I_{DQ}$ = 0.135 A, $P_{IN}$ = 19 dBm, Pulse Width = 10 µs, Duty Cycle = 1%

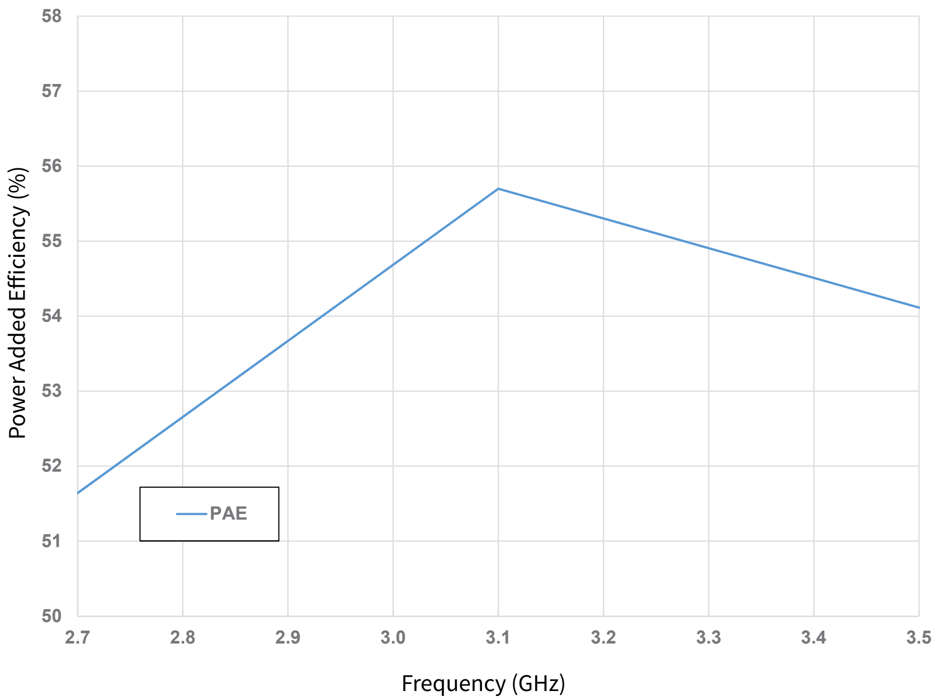


Figure 4. Power Added Efficiency vs Frequency as a Function of Output Power
$V_{DD}$ = 50 V, $I_{DQ}$ = 0.135 A, Pulse Width = 10 µs, Duty Cycle = 1%

## Part Number System

# CMPA2735030D

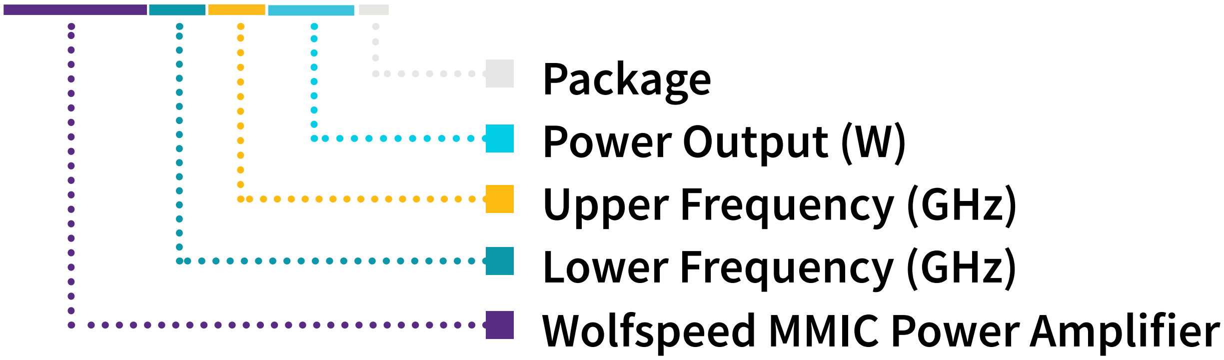


**Table 1.**

| Parameter | Value | Units |
|---|---|---|
| Lower Frequency | 2.7 | GHz |
| Upper Frequency | 3.5 | GHz |
| Power Output | 30 | W |
| Package | Bare Die | – |

Note:
Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

**Table 2.**

| Character Code | Code Value |
|---|---|
| A | 0 |
| B | 1 |
| C | 2 |
| D | 3 |
| E | 4 |
| F | 5 |
| G | 6 |
| H | 7 |
| J | 8 |
| K | 9 |
| Examples: | 1 A = 10.0 GHz<br>2 H = 27.0 GHz |


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## Product Ordering Information

| Order Number | Description | Unit of Measure |
|---|---|---|
| CMPA2735030D | GaN MMIC | Each |

**For more information, please contact:**

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