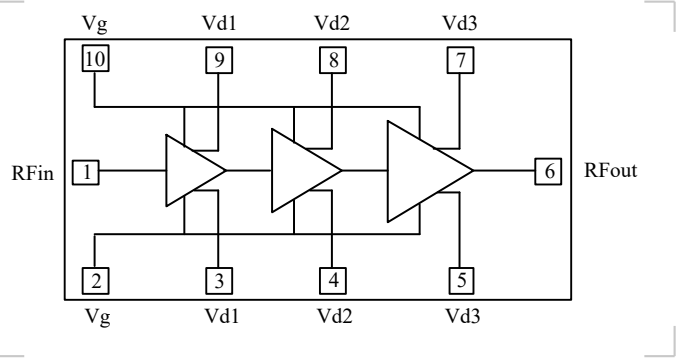
ER7176P4-35

GaN MMIC Power Amplifier, 71-76 GHz

Features

- Frequency Range: 71-76 GHz
- Power Gain: 13.5 dB
- Saturated Output Power: 35.5 dBm
- Power-Added Efficiency: 18%
- Supply: +18 V @ 1.3 A (quiescent)
- Die Size: 3.90 mm x 2.45 mm x 0.05 mm

Functional Block Diagram



Product Overview

ER7176P4-35 is a high-power amplifier die implemented with GaN HEMT transistors and fabricated using a 0.13 um GaN power MMIC process. The operating band is 71-76 GHz, with power gain greater than 13.5 dB, typical saturated output power of 4 W, and power-added efficiency greater than 18%. The device supports pulsed operation, uses backside via grounding, and operates from dual supplies. Typical bias conditions are Vd=+18 V, Vg=-1.8 V, pulse width 100 us, and duty cycle 10%.

DC Electrical Characteristics (TA=+25°C)

Parameter	Symbol	Min	Typ	Max	Unit
Gate Operating Voltage	Vg		-1.8		V
Drain Operating Voltage	Vd		+18		V
Quiescent Drain Current	Id		1.2		A
Dynamic Drain Current	Idd			1.3	A
Quiescent Gate Current	Ig			0.1	mA
Dynamic Gate Current	Igg			1	mA

RF Electrical Characteristics (TA=+25°C, Vd=+18 V, Vg=-1.8 V)

Parameter	Symbol	Min	Typ	Max	Unit
Frequency Range	f		71-76		GHz
Saturated Output Power	Psat	35.5		36.5	dBm
Power Gain	Gp	12.5		13.5	dB
Power Gain Flatness	Delta Gp			±0.5	dB
Power-Added Efficiency	PAE	18			%
Linear Gain	Gain	20		23	dB
Linear Gain Flatness	Delta Gain			±1.5	dB
Input VSWR	VSWR(in)			2	-

Notes

1. Each die is subjected to 100% on-wafer DC testing and 100% RF testing.

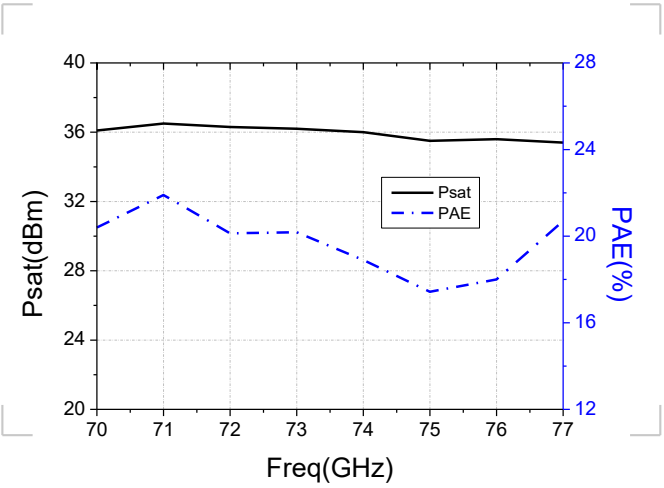
2. Unless otherwise specified, plot conditions are: Vd=+18 V, Vg=-1.8 V, Pin=22 dBm, pulse width 100 us, duty cycle 10%.

Absolute Maximum Ratings

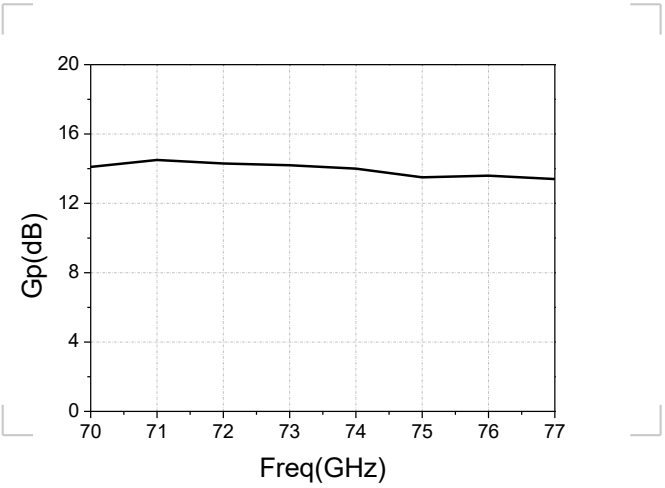
Parameter	Symbol	Limit
Maximum Drain-Source Voltage	Vd	+20 V
Minimum Gate-Source Voltage	Vg	-6 V
Maximum Input Power (CW)	Pp	+28 dBm
Storage Temperature	TSTG	-65°C to +150°C
Maximum Channel Temperature	Top	+200°C
Load VSWR Mismatch (Survivability)	Z0	5:1

Typical Performance (Vd=+18 V, Vg=-1.8 V)

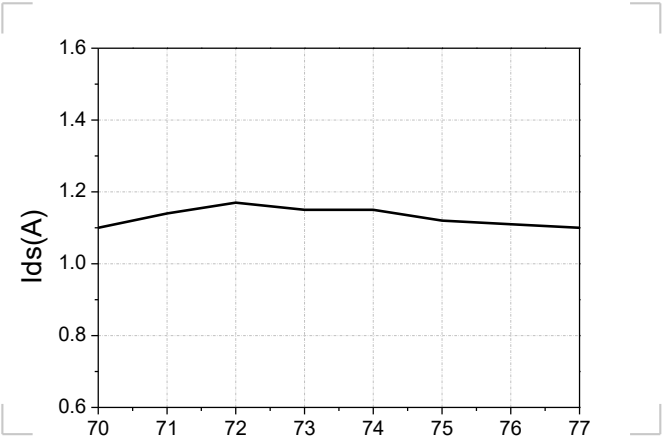
Saturated Output Power / Efficiency vs. Frequency (Pin=22 dBm)



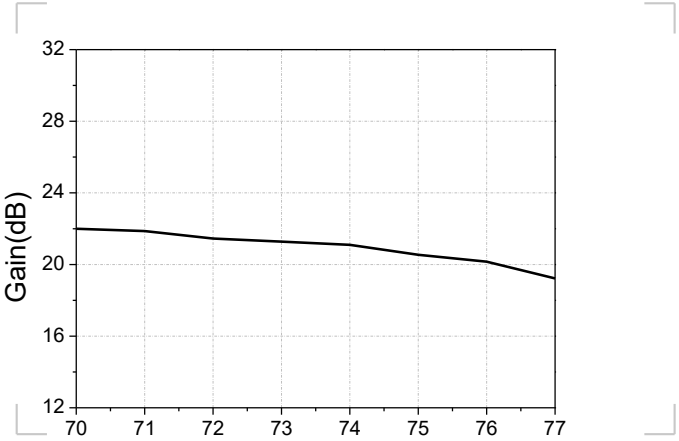
Power Gain vs. Frequency (Pin=22 dBm)



Dynamic Drain Current vs. Frequency (Pin=22 dBm)

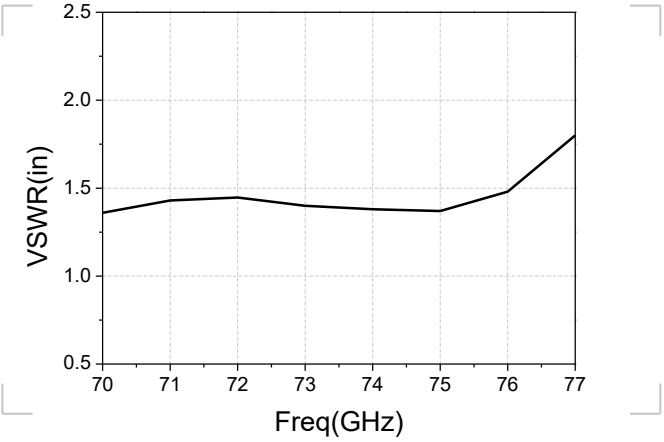


Small-Signal Gain vs. Frequency (Pin=-10 dBm)

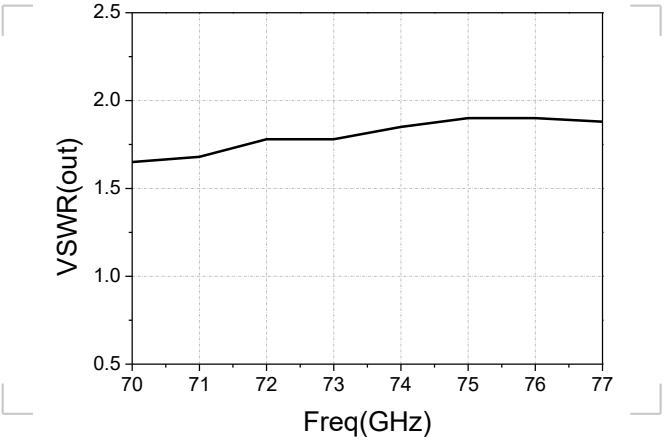


Typical Performance

Input VSWR vs. Frequency (Pin=-10 dBm)

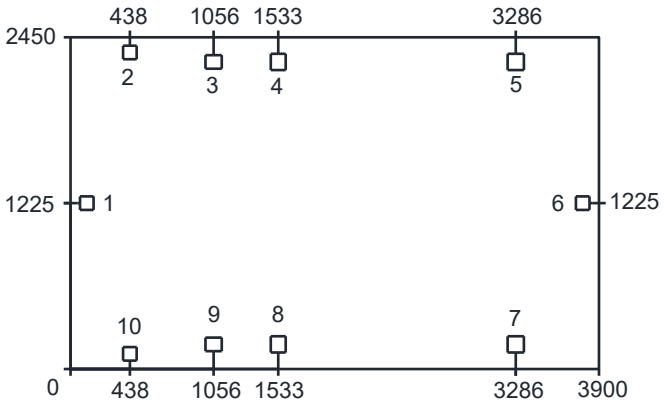


Output VSWR vs. Frequency (Pin=-10 dBm)



Outline Dimensions and Bond Pad Layout

ER7176P4-35 Outline Dimensions

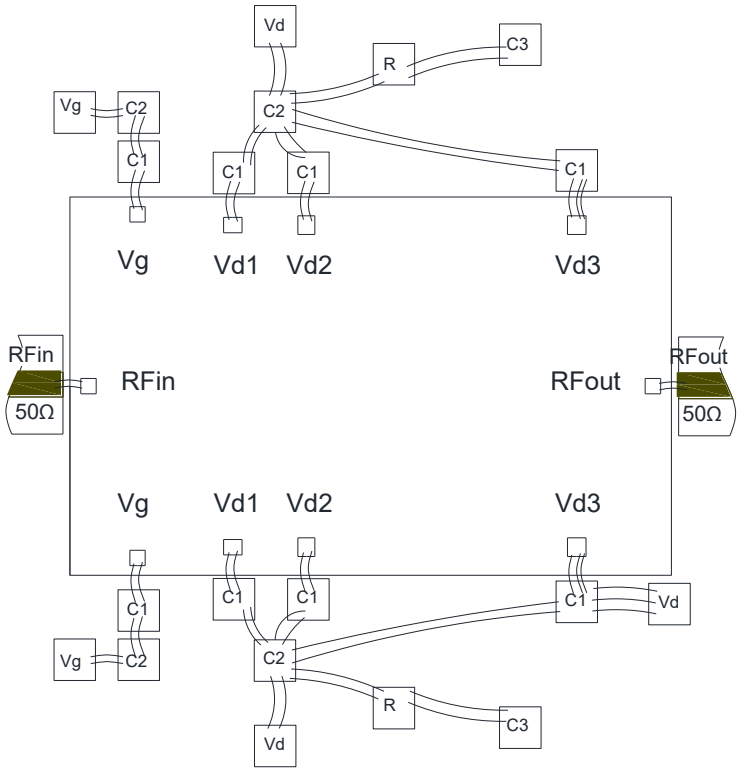


Units: um; outline dimensional tolerance: ±50 um.

Bond Pad Layout

No.	Symbol	Function	Pad Size
1	RFin	RF input pad	100 x 100 um²
2, 10	Vg	Gate bonding pad	100 x 100 um²
3, 9	Vd1	Drain bonding pad	120 x 100 um²
4, 8	Vd2	Drain bonding pad	110 x 120 um²
5, 7	Vd3	Drain bonding pad	120 x 120 um²
6	RFout	RF output pad	100 x 100 um²

Recommended Assembly



Assembly Notes

1. External component values: C1=100 pF, C2=1000 pF, C3=10000 pF. R is a 10-ohm chip resistor; NC6101C-E is recommended. Place capacitors as close to the die as possible, within 300 um.

2. Keep input and output gold bond wires within 300 um ±50 um and as short as practical.

Handling and Assembly Precautions

1. Store the die in a dry, clean N2 environment.
2. The 6H-SiC substrate is brittle; handle carefully to avoid die damage.
3. The die surface has an insulating passivation layer. Maintain a clean assembly environment to prevent surface contamination.
4. The carrier coefficient of thermal expansion should closely match 6H-SiC. The linear CTE of 6H-SiC is 4.2 x 10^-6/°C. Recommended carrier materials include CuMoCu, CuMo, CuW, or materials with higher thermal conductivity.
5. Avoid voids between the die and carrier and ensure adequate heat dissipation from the housing or carrier.
6. AuSn eutectic die attach is recommended. Keep attach temperature at or below 300°C and duration below 30 s. Avoid rapid temperature changes; use gradual heating and cooling.
7. Use 25-30 um diameter gold bond wire. Keep the bonding-stage temperature at or below 250°C, minimize bonding time, and avoid rapid temperature changes.
8. Power-up sequence: apply gate bias before drain bias. Power-down sequence: remove drain bias before gate bias.
9. Observe ESD precautions during handling and assembly. Use a grounded ESD wrist strap and properly ground die-attach and wire-bonding equipment.
10. Contact the supplier if technical assistance is required.