

# XT3116



GaAs MMIC Power Amplifier  
13.5GHz~14.75GHz 38dBm

Rev2.1

## Features

- Frequency: 13.5GHz~14.75GHz
- Gain: 33dB
- Output P<sub>1dB</sub>: 38.5dBm
- Supply Voltage: +7V
- Power-Added Efficiency: 35%
- Die Size: 4.05mm×3.5mm×0.1mm
- Packaged: Bare Die

## General Description

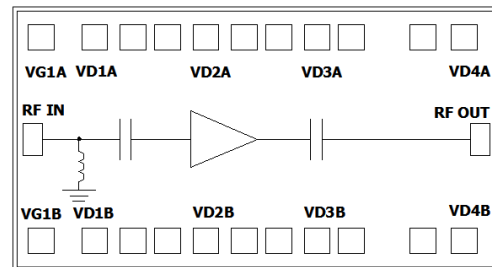
The XT3116 is a Ku-band GaAs MMIC power amplifier. The XT3116 provides 33 dB of gain, and 38.5dBm of output power for 1 dB compression and more than 35%PAE from a +7V supply.

The chip has surface passivation for protection and backside via holes and gold metallisation to allow a conductive epoxy die attach process. This device is well suited for communications, Point to Point radio and radar applications.

## Typical Applications

- Microwave radio including point to point communication
- Telecommunication
- Weather radar
- Optical communication
- Test instrumentation
- SatCom
- VSAT
- Military and Aerospace

## Functional Diagram



## Electrical Performance

T<sub>A</sub>=25°C, V<sub>D</sub>=+7V, I<sub>D</sub>=2.5A, Z<sub>0</sub>=50Ω, CW

| Parameter                                              | Min.       | Typ. | Max. | Units |
|--------------------------------------------------------|------------|------|------|-------|
| Frequency Range                                        | 13.5~14.75 |      |      | GHz   |
| Small Signal Gain                                      | 30         | 33   | —    | dB    |
| Small Signal Gain Flatness                             | —          | ±1.5 | —    | dB    |
| Reverse Isolation                                      | —          | -55  | —    | dB    |
| Input Return Loss                                      | —          | -11  | —    | dB    |
| Power-Added Efficiency                                 | —          | 35   | —    | %     |
| Output Power for 1 dB Compression (OP <sub>1dB</sub> ) | 38         | 38.5 | —    | dBm   |
| Output Third Order Intercept(OIP <sub>3</sub> )*       | —          | 43   | —    | dBm   |
| Drain Voltage(V <sub>D</sub> )                         | —          | 7    | 7.5  | V     |
| Gate Current                                           | —          | 8    | 20   | mA    |
| Supply Current(I <sub>D</sub> )                        | —          | 2.9  | 3.6  | A     |
| Thermal Resistance                                     | —          | 4.3  | —    | °C/W  |

\* Measurement taken at Pin / Tone = 0dBm, f<sub>c</sub>= 14GHz, Δf=10MHz

## Absolute Maximum Ratings

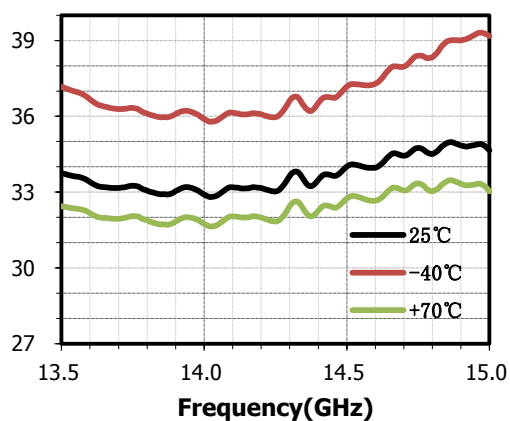
|                     |        |                       |               |
|---------------------|--------|-----------------------|---------------|
| Maximum Input Power | +13dBm | Operating Temperature | -40°C ~+70°C  |
| Channel Temperature | +150°C | Storage Temperature   | -65°C ~+150°C |
| Maximum $V_D$       | +8.5V  | Maximum $V_G$         | -1.2V         |

## Typical Small Signal Performance Curve

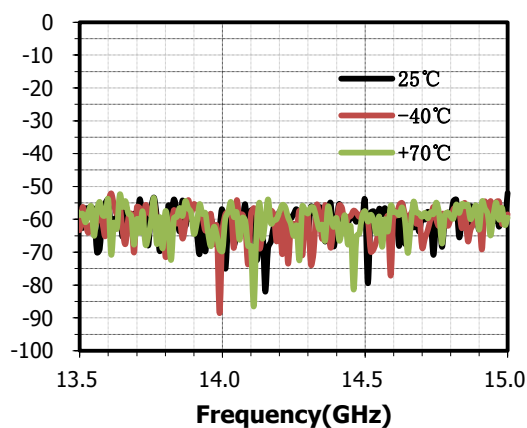
The results captured in the test-jig environment within connector plan

$V_D = +7V$   $I_D = 2.5A$

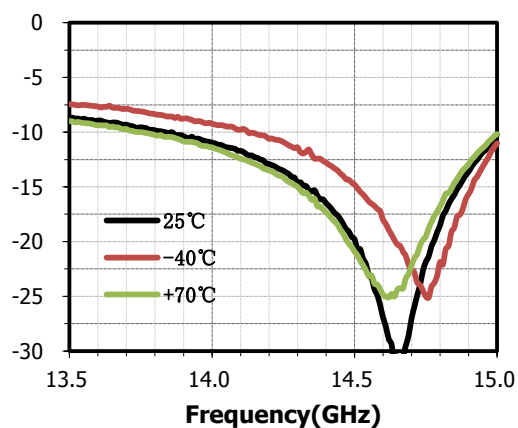
Small Signal Gain(dB) vs.Temperature



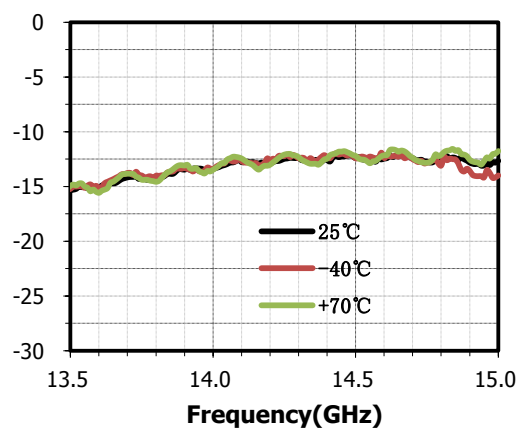
Reverse Isolation(dB) vs.Temperature



Input Return Loss(dB) vs.Temperature



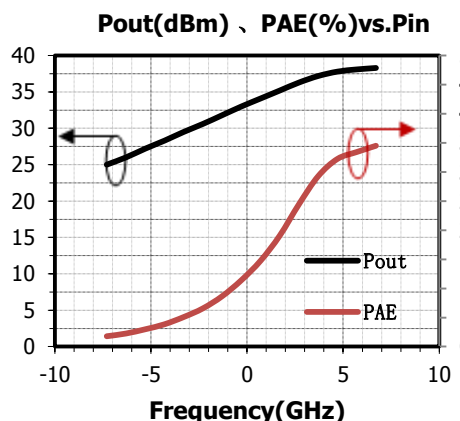
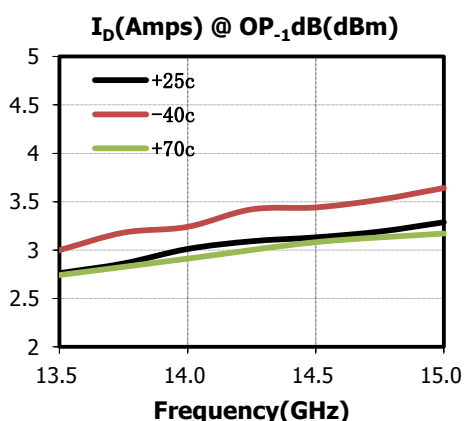
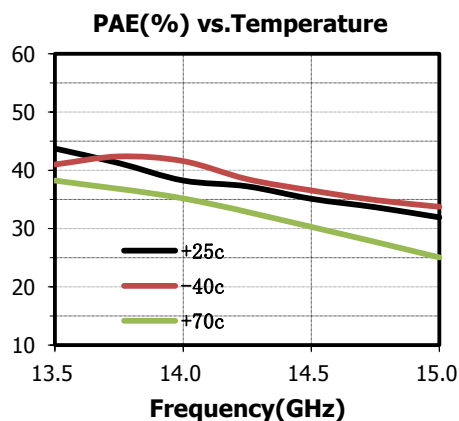
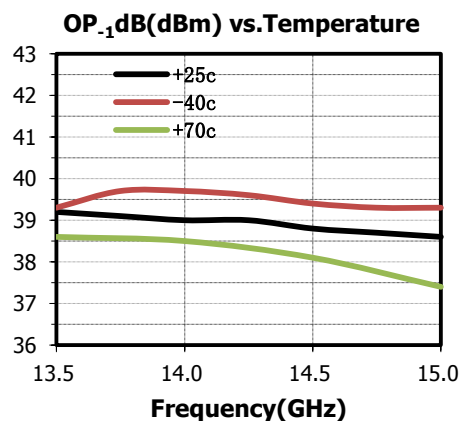
Output Return Loss(dB) vs.Temperature



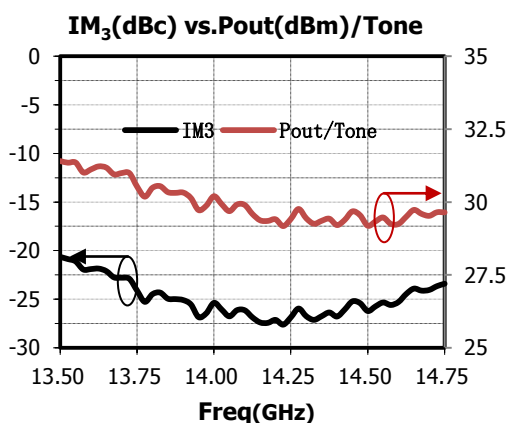
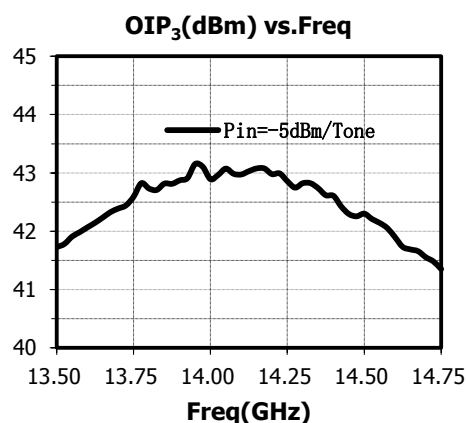
## Power and PAE Performance Curve

The results captured in the test-jig environment within connector plan, then de-embedded the housing an come back in the die plan

$$V_D = +7V \quad I_D = 2.5A \text{ CW}$$



## OIP<sub>3</sub> and IM<sub>3</sub> performance curve

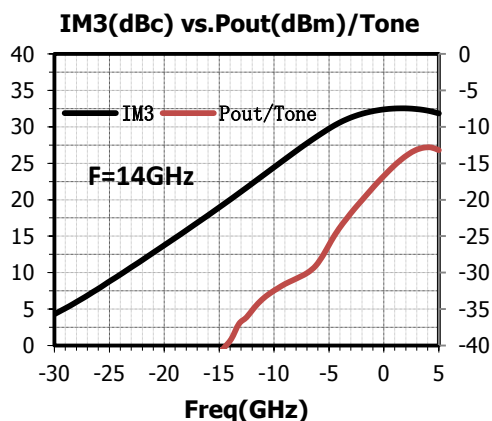


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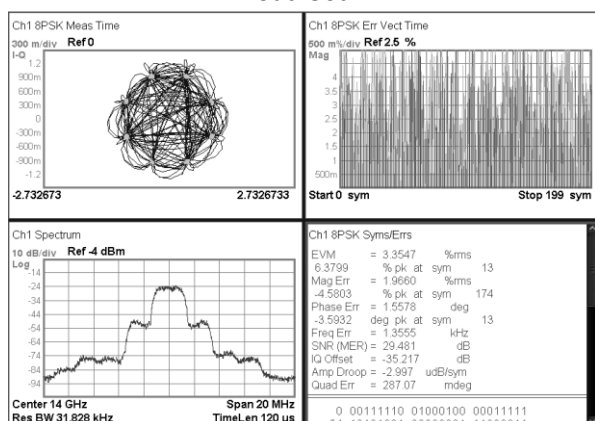
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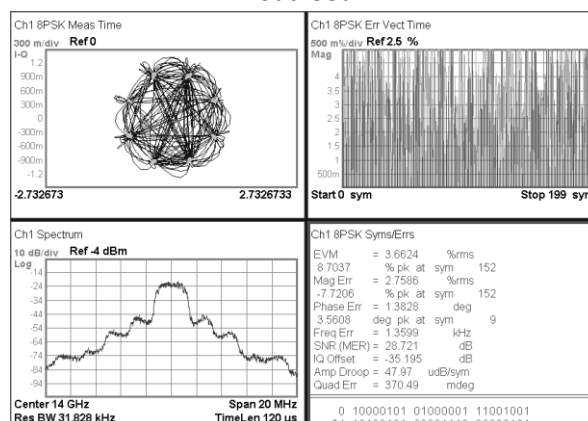
## EVM Characteristics

Modulation:8PSK, Filter alpha=0.5 Symbol Rate=2M

Pout=36dBm

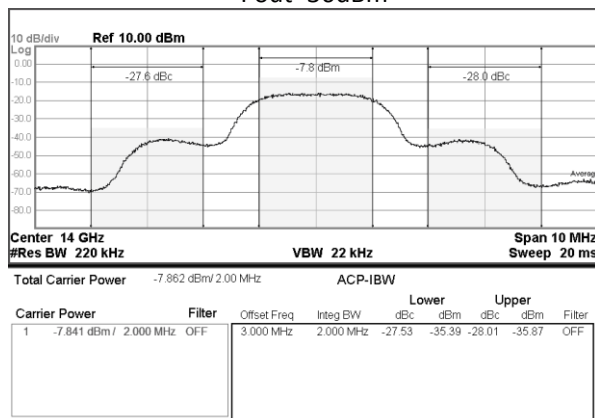


Pout=38dBm

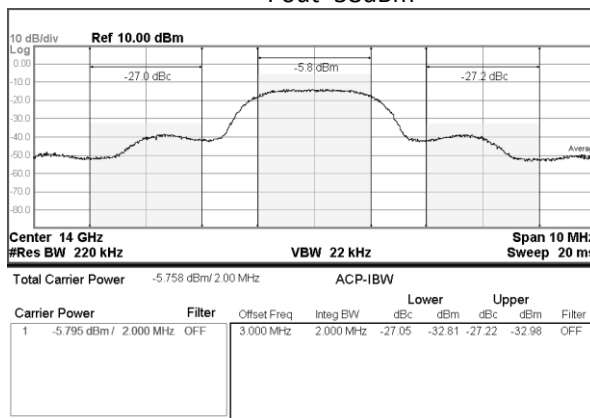


## ACPR Characteristics

Pout=36dBm



Pout=38dBm



# XT3116

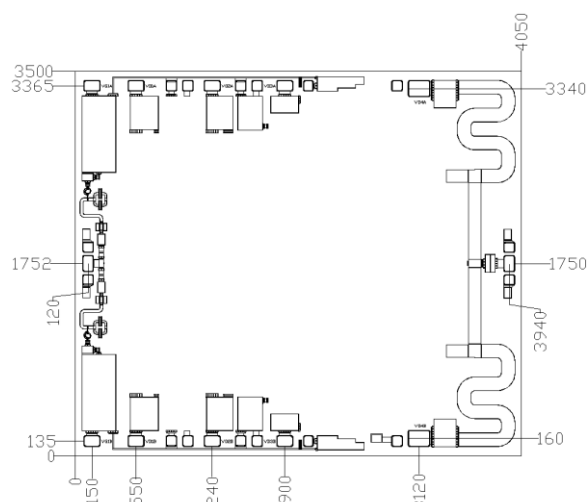


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## Die Outline

(all dimensions in  $\mu\text{m}$ )

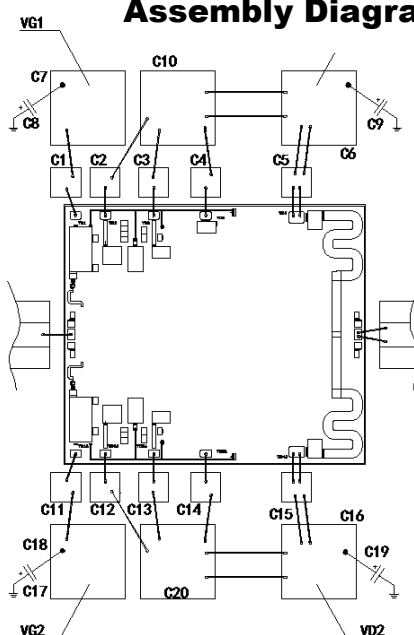


Bonding pad size:

150x90 $\mu\text{m}$  VG1x, VD1x~VD3x, RF IN, RFOUT pads

190x140 $\mu\text{m}$  VD4 pads

## Assembly Diagram



## Components List

| Reference Des.        | Value            | Part Number      | Manuf. | Size |
|-----------------------|------------------|------------------|--------|------|
| C8、C9、C17、C19         | 47 $\mu\text{F}$ | TPSB476K010R0500 | AVX    | —    |
| C1~C5、C11~C15         | 300pF            | —                | ANY    | SLC  |
| C6、C7、C10、C16、C18、C20 | 1000pF           | —                | ANY    | SLC  |

## Notes

1. The XT3116 is biased with a positive drain supply and negative gate supply. The recommended gate voltage is set to -0.7~-0.8V.
2. RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 1 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input require a single bond wire output require a double bond wire as shown.
3. The backside of the XT3116 is RF ground. Eutectic mounting is preferred, If using conductive epoxy, recommended epoxies are CT2700R7 or CT2700R7S cured per the manufacturer's cure schedule. Epoxy should be applied in accordance with the manufacturers specifications and should avoid contact with the top surface of the die. An epoxy fillet should be visible around the total die periphery.
4. Bypass caps C8、C9、C17、C19、 should be placed no farther than 1.5mm from the chip.