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# APM-7516CH

## 1 GHz – 22 GHz Low Phase Noise Amplifier

## DEVICE OVERVIEW

### General Description

The APM-7516 is a robust broadband distributed, low phase noise LO driver amplifier designed to provide greater than +20 dBm output power with excellent return losses and high input power handling. This amplifier uses GaAs HBT technology for low phase noise and is optimized to provide enough power to drive the LO port of an S-diode mixer from 1 GHz to 18 GHz or of an H or L diode mixer from 1 GHz to 22 GHz. This amplifier can be operated with a variety of bias conditions for both low power and high-power applications.

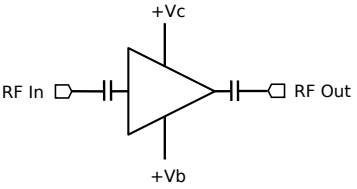
### Features

- -164 dBc/Hz phase noise at 10 kHz offset frequency
- +20 dBm output power up to 18GHz
- High Linearity (+33 dBm OIP3)
- Excellent Return Losses
- +20dBm Input Power Handling
- Positive-only biasing

### Applications

- Mobile test and measurement equipment
- 5G transceivers
- Driver amplifier L,H,S – diode mixers
- Radar
- SATCOM

### Functional Block Diagram




### Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| APM-7516CH | 1 GHz – 22 GHz Low Phase Noise Amplifier | CH | REACH RoHS | Released | EAR99 |
| APM-7516KGD | Known Good Die, 1 GHz – 22 GHz Low Phase Noise Amplifier | CH | REACH RoHS | Released | EAR99 |

## Table Of Contents



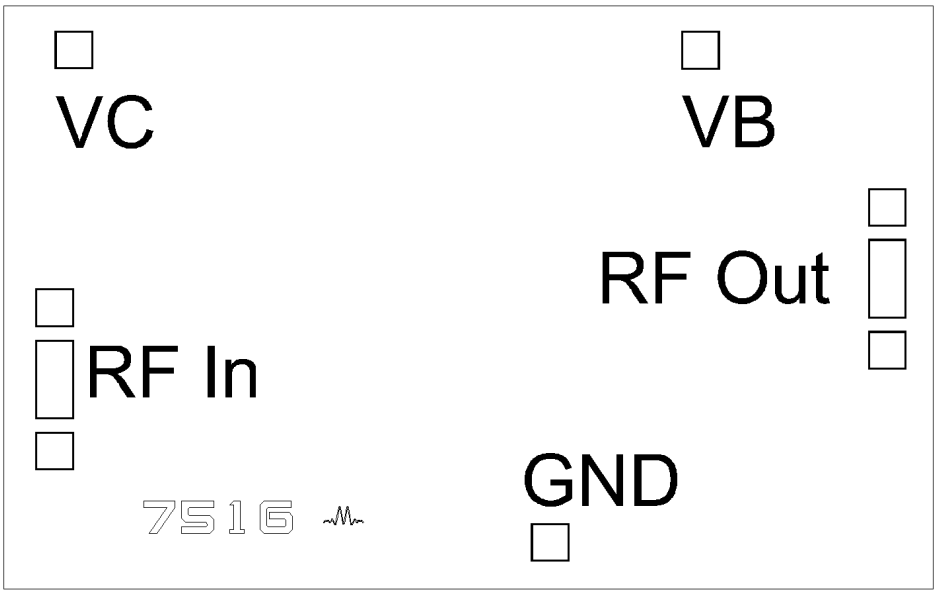
## Revision History

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2025-07-25 | Initial Release |
| A | 2026-02-13 | MTTF Table Added. |

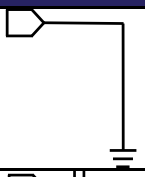
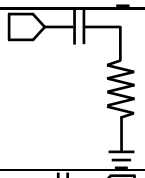
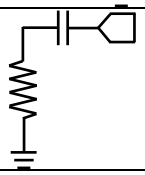
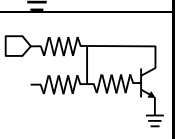
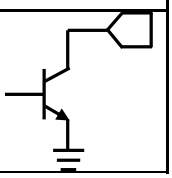
## Port Configuration and Functions

### Port Diagram

A port diagram of the APM-7516CH is shown below.




## Port Functions

| Port | Function | Description | DC Equivalent Circuit |
|---|---|---|---|
| GND | Ground | Housing or outside of the coaxial cables must be connected to a DC/RF ground potential with high thermal and electrical conductivity. |  |
| RF In | RF Input | This is the RF Input port of the amplifier die. It is RF matched to 50 Ω, and has built-in DC blocking capacitors. |  |
| RF Out | RF Output | This is the amplifier's RF Output. It is RF matched to 50 Ω and has built-in DC blocking capacitors. Must have less than 7:1 VSWR when operating. |  |
| VB | Base Current Mirror Bias Port | Port VB is the DC voltage bias for the current mirror that controls collector current supplied to the amplifier. Larger voltages result in a higher current draw through port VC, effectively functioning as a gain control pin of the amplifier. See Typical Performance Plots for performance at different bias conditions. |  |
| VC | Collector DC Supply Port | Port VC is the DC voltage supply that supplies the amplifier's collector current. It is connected directly to the VC port on the amplifier IC. |  |

## Specifications

### Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may become inoperable or have a reduced lifetime.

| Parameter | Maximum Rating | Unit |
|---|---|---|
| Collector Positive Bias Voltage (Vc) | 6 | V |
| Continuous Power Dissipation (PDISS) (at 85 ˚C case temp.) | 1.2 | W |
| Maximum Operating Temperature | 85 | °C |
| Maximum Storage Temperature | 150 | °C |
| Max Junction Temperature for MTTF> 1E6 hours | 125 | °C |
| Minimum Operating Temperature | -40 | °C |
| Minimum Storage Temperature | -65 | °C |
| Output Load VSWR | 7 | - |
| Positive Bias Current (Ic) | 240 | mA |
| Positive DC Current Mirror Current (Ib) | 15 | mA |
| Positive DC Current Mirror Voltage (Vb) | 6 | V |
| RF Input Power | 20 | dBm |
| θJC, Junction to Ambient Thermal Resistance | 33 | ºC/W |

### FIT and MTTF Table

| T (°C) | λ (TIF) | MTTF (hr) | MTTF (yr) |
|---|---|---|---|
| 105 | 2,441.45 | 4.10E+05 | 47 |
| 85 | 310.48 | 3.22E+06 | 368 |
| 55 | 8.79 | 1.14E+08 | 12,992 |
| 25 | 0.12 | 8.24E+09 | 941,063 |

### Package Information

| Parameter | Details | Rating |
|---|---|---|
| Dimensions | - | 28.5 x 15 mm |

### Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the electrical specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

| Parameter | Min | Nominal | Max | Unit |
|---|---|---|---|---|
| Positive DC Current Mirror Current (Ib) [1] | - | 5 | - | mA |
| Positive DC Voltage (VC) | - | 5 | - | V |
| Positive DC Current Mirror Voltage (VB) | - | 5 | - | V |
| Positive DC Current (Ic) [2] | - | 106 | - | mA |

[1][2] Recommended operating current conditions given without RF input applied. Please see typical performance plots for relationship between RF input power and DC current draw.

## Sequencing Requirements

There is no sequencing required to power up or power down the amplifier.
Amplifier must have an output load connected when operating.

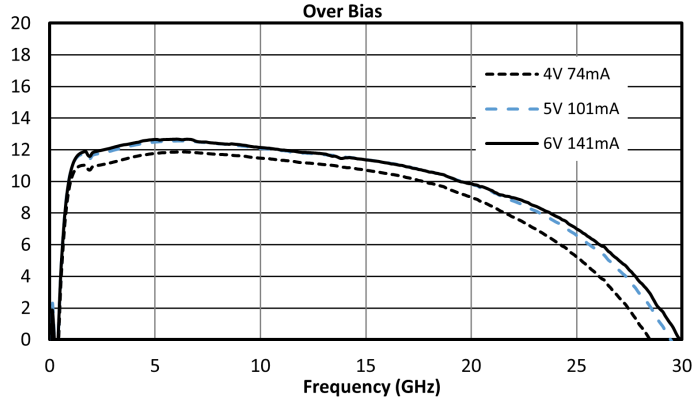
## Electrical Specifications

The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C.

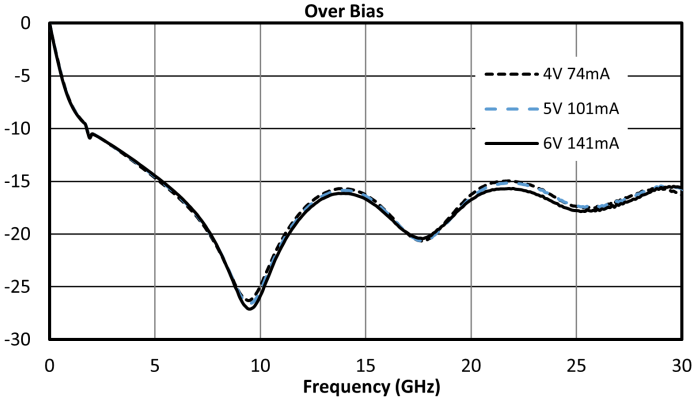
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Small Signal Gain | 5V/5V bias, -15 dBm Input Power | 1 | 22 | - | 12 | - | dB |
| Saturated Output Power | 5V/5V bias, P5dB | 1 | 3 | - | 23 | - | dBm |
| Saturated Output Power | 5V/5V bias, P5dB | 3 | 15 | 19 | 23 | - | dBm |
| Saturated Output Power | 5V/5V bias, P5dB | 15 | 22 | - | 20 | - | dBm |
| Current Consumption | 5V/4V | - | - | - | 74 | - | mA |
| Current Consumption | 5V/5V | - | - | - | 106 | - | mA |
| Current Consumption | 5V/6V | - | - | - | 141 | - | mA |
| Current Mirror, Ib | 5V/4V | - | - | - | 4 | - | mA |
| Current Mirror, Ib | 5V/5V | - | - | - | 5 | - | mA |
| Current Mirror, Ib | 5V/6V | - | - | - | 7 | - | mA |
| Input IP3 | 5V/5V, -15 dBm Input Power | 1 | 22 | - | 21 | - | dBm |
| Input Power for Saturation | 5V/5V | 1 | 22 | - | 12 | - | dBm |
| Input Return Loss | 5V/5V bias, -15 dBm Input Power | 1 | 22 | - | 18 | - | dB |
| Noise Figure | 5V/5V bias, -30 dBm Input Power | 1 | 22 | - | 6 | - | dB |
| Output IP3 | 5V/5V, -15 dBm Input Power | 1 | 22 | - | 33 | - | dBm |
| Output P1dB | 5V/5V | 1 | 22 | - | 18 | - | dBm |
| Output Return Loss | 5V/5V bias, -15 dBm Input Power | 1 | 22 | - | 20 | - | dB |
| Phase Noise @ 10 kHz Offset | +13 dBm Input power | 4 | 4 | - | -164 | - | dBc/Hz |
| Reverse Isolation | 5V/5V bias, -15 dBm Input Power | 1 | 22 | - | 34 | - | dB |

## APM-7516CH Typical Performance Plots

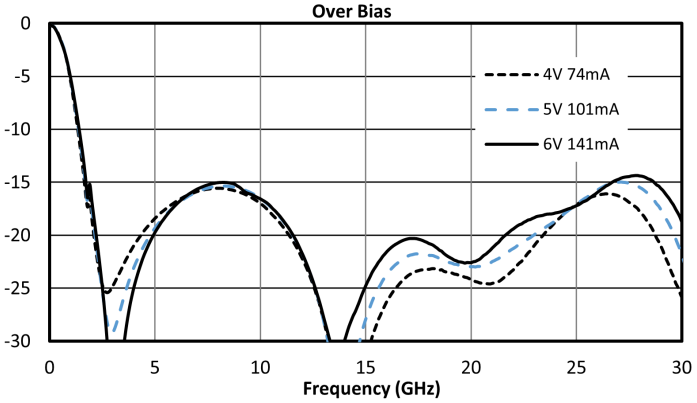
Small Signal Gain (dB) vs Frequency, Over Bias



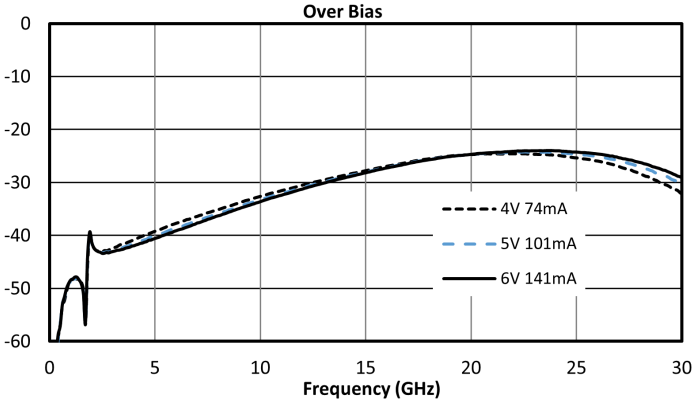

Input Return Loss (dB) vs Frequency, Over Bias



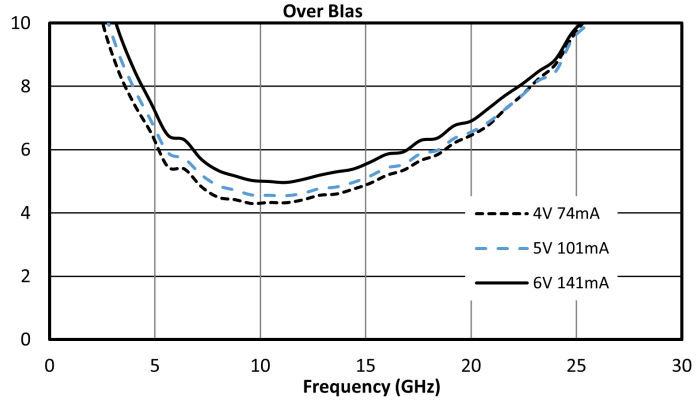

Output Return Loss (dB) vs Frequency, Over Bias



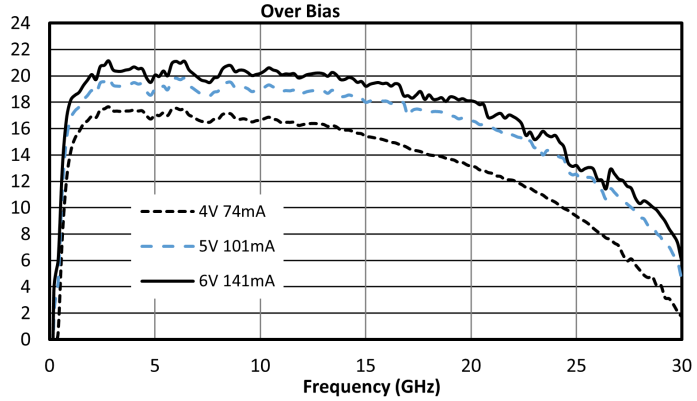

Reverse Isolation (dB) vs Frequency, Over Bias



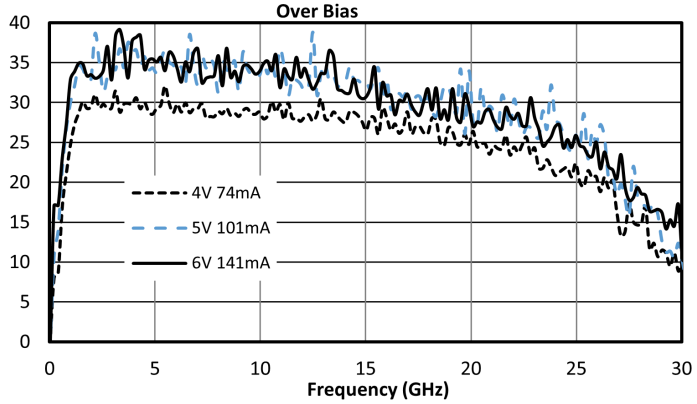

Noise Figure (dB) vs Frequency, Over Bias



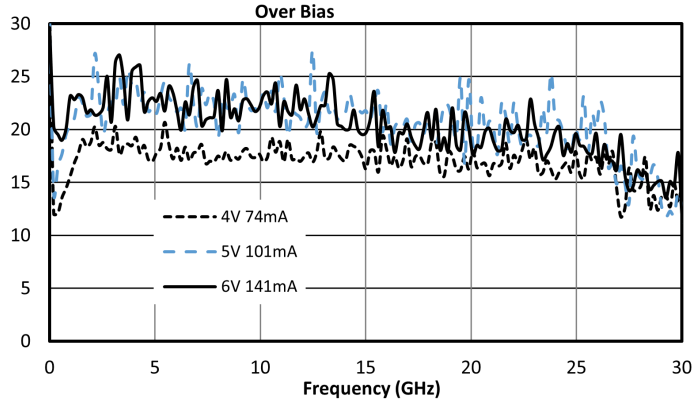

P1dB (dBm) vs Frequency, Over Bias

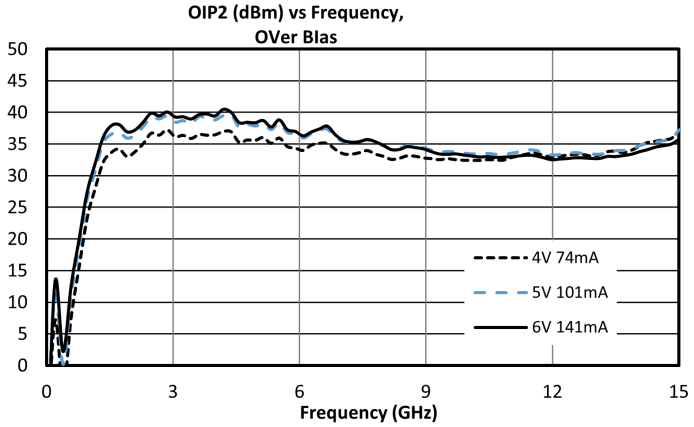


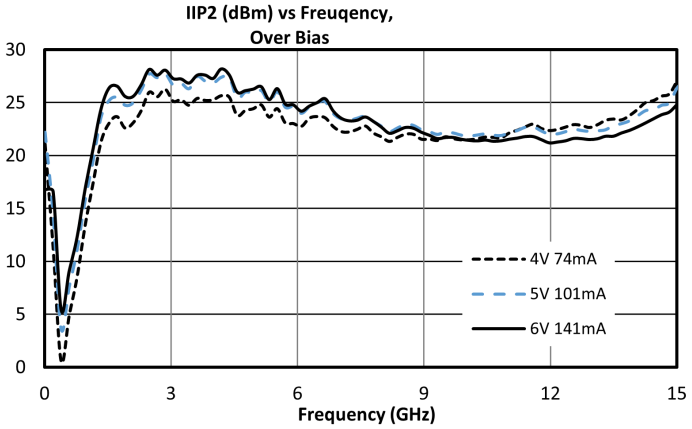

OIP3 (dBm) vs Frequency, Over Bias



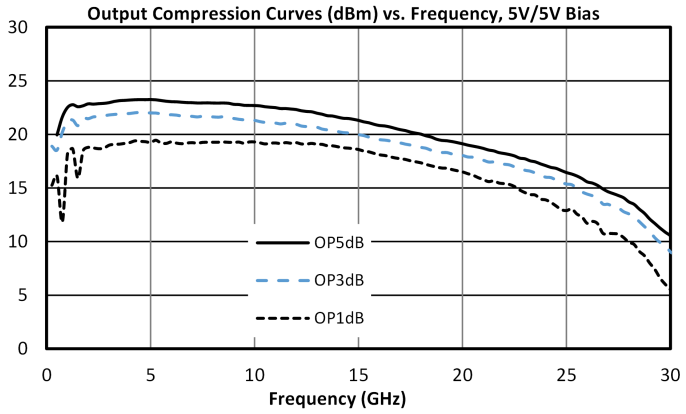

IIP3 (dBm) vs Frequency, Over Bias

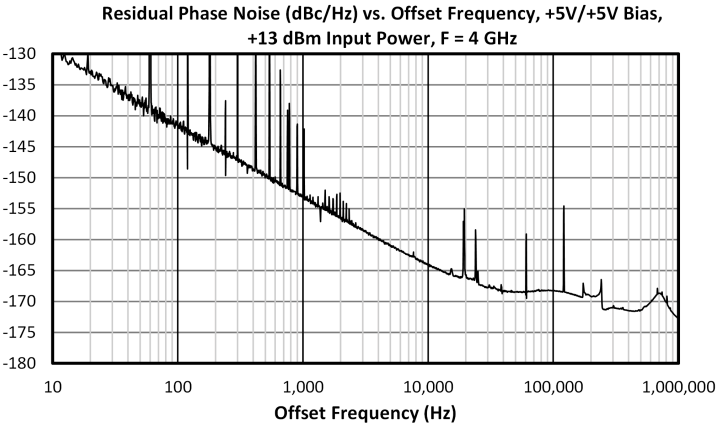




## APM-7516PA Typical Performance Plots

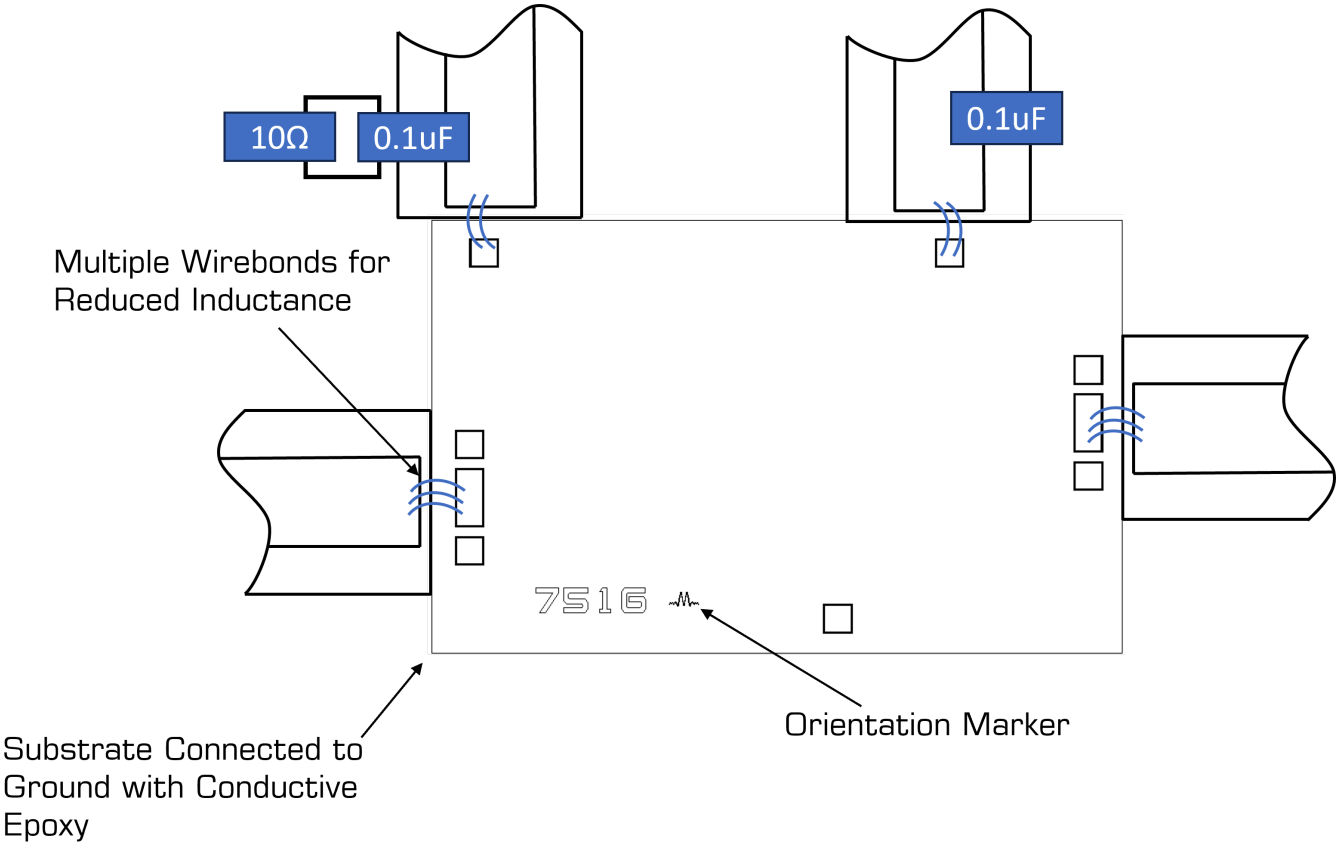


## Application Information

Below is the recommended application circuit for the APM-7516CH.

## Application Circuit



## Application Circuit Description

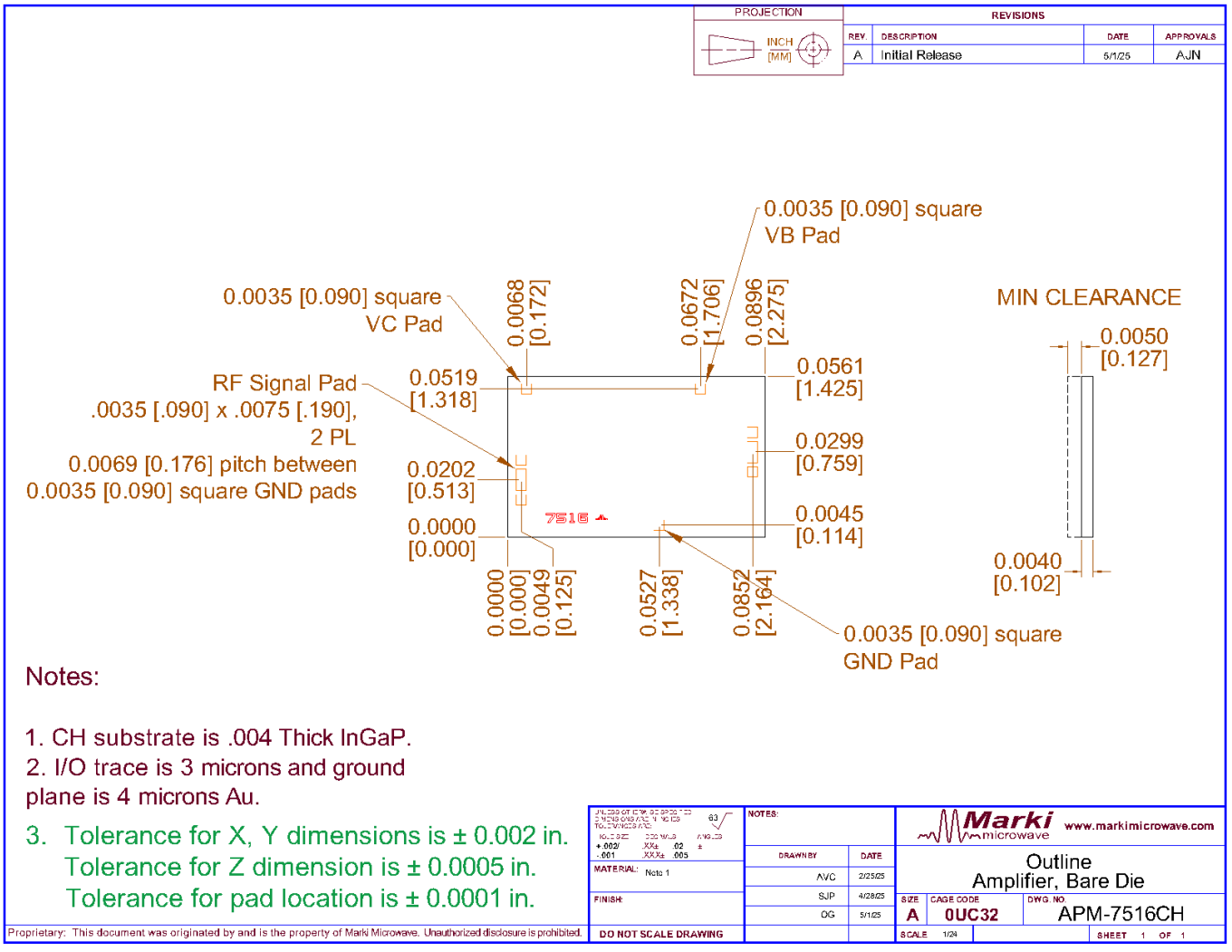
RF input and output should be soldered to 50 Ω traces.

| Description | Sample Part Number |
|---|---|
| 0402 Capacitor .1uF 16V | Kyocera 0402YG104ZAT2A |
| 0402 Resistor 10 Ohm | Vishay Dale CRCW040210R0FKED |

## Mechanical Data

### Outline Drawing

Download : Outline 2D Drawing



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