K band MMIC Power Amplifier

K-PA-1721 Previously named LE-Ka1330302

GaAs PHEMT MMIC Power Amplifier 17-21GHz

Overview

K-PA-1721 is a 3-stage MMIC power amplifier that covers frequencies from 17GHz to 21GHz. This MMIC provides 22dBm of saturated power and > 29% PAE, with 5dBm input power, from a 3V supply voltage and 220mA current. The small signal gain is > 21dB with 0.5dB flatness, and both input and output are well matched to 50 ohm.

The MMIC is fully passivated for additional protection and has all bond pads and backside gold plated. It is compatible with precision die attach methods, as well as thermo-compression and thermosonic wire bonding, making it ideal for MCM and hybrid microcircuit applications. All data shown is measured with the chip in a 50 Ohm environment, with 100pF decoupling capacitors on all DC connections and is contacted using RF probes.

Features

- 17 – 21GHz.
- > 22dBm saturated output power.
- > 29% PAE.
- > 21dB small signal gain.
- < 0.5dB gain flatness.
- Unconditionally stable.

Applications

- High speed data communications.
- Space communications.
- IOT.
- Security.

Specification Overview

Parameter	Min.	Typ.	Max.	Units
Frequency	17		21	GHz
Gain	20	21	22	dB
Input Return Loss	10	14		dB
Output Return Loss	8	15		dB
Pout	22	22.5	23	dBm
Drain Voltage		3		V
Current		220		mA

Notes
The tests indicated have all been performed with 100pF de-coupling capacitors on all bias pads.
All tests are carried out at 25°C.

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage	6V
Drain Current	400mA
RF Input Power	10dBm
Storage Temperature	−65°C to +150°C
Channel Temperature	+150°C
Operating Temperature	−40°C to +85°C

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features proprietary protection circuitry, damage may occur on devices subjected to ESD. Proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Measured Performance Data

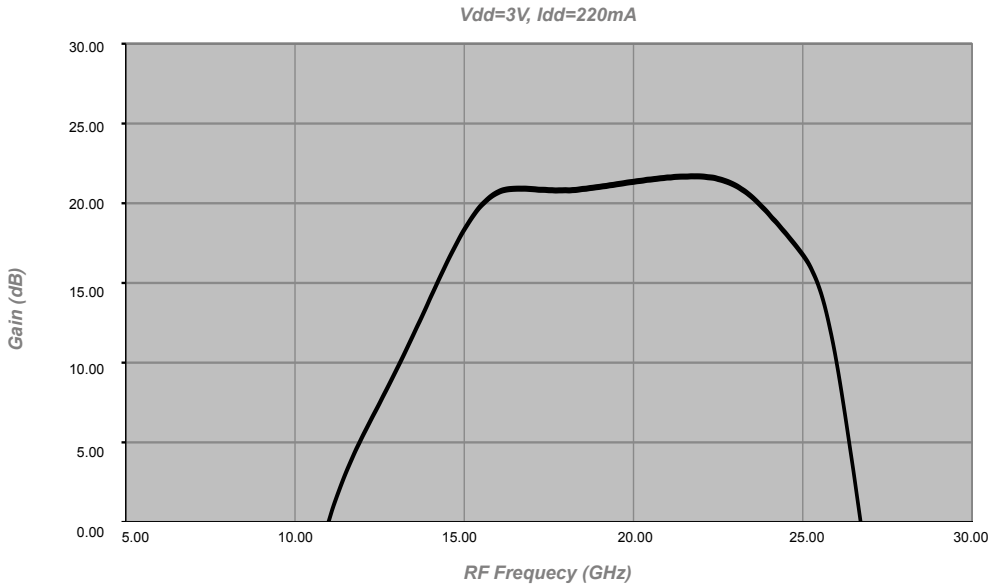


Figure 1
Gain

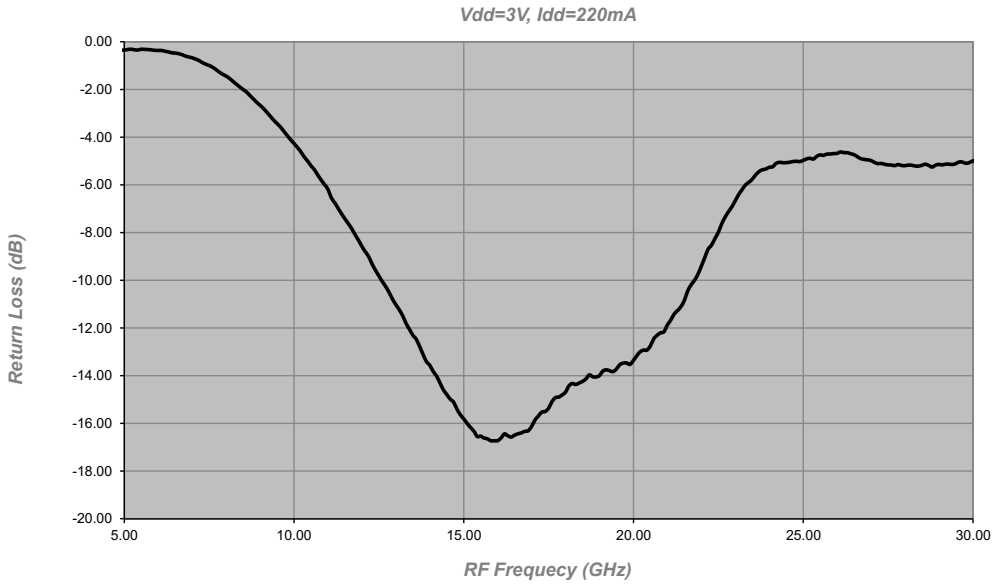


Figure 2
Input Return Loss

Measured Performance Data

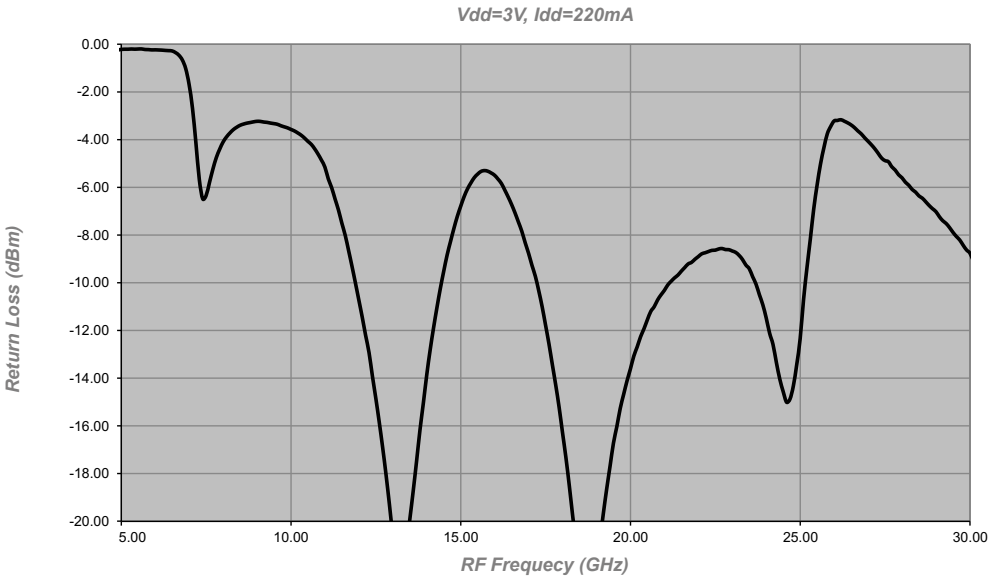


Figure 3
Output Return Loss

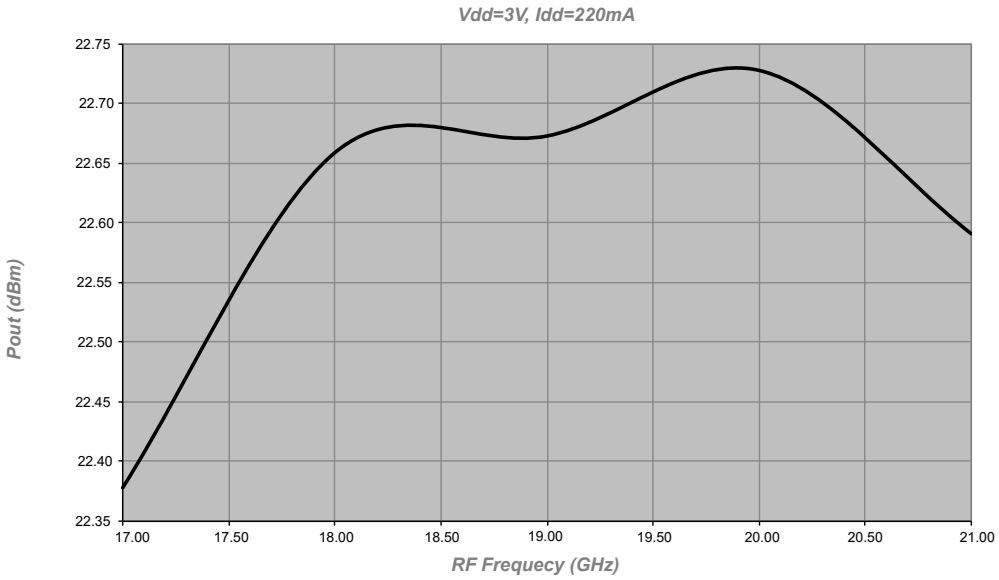


Figure 4
Saturated Output Power

Measured Performance Data

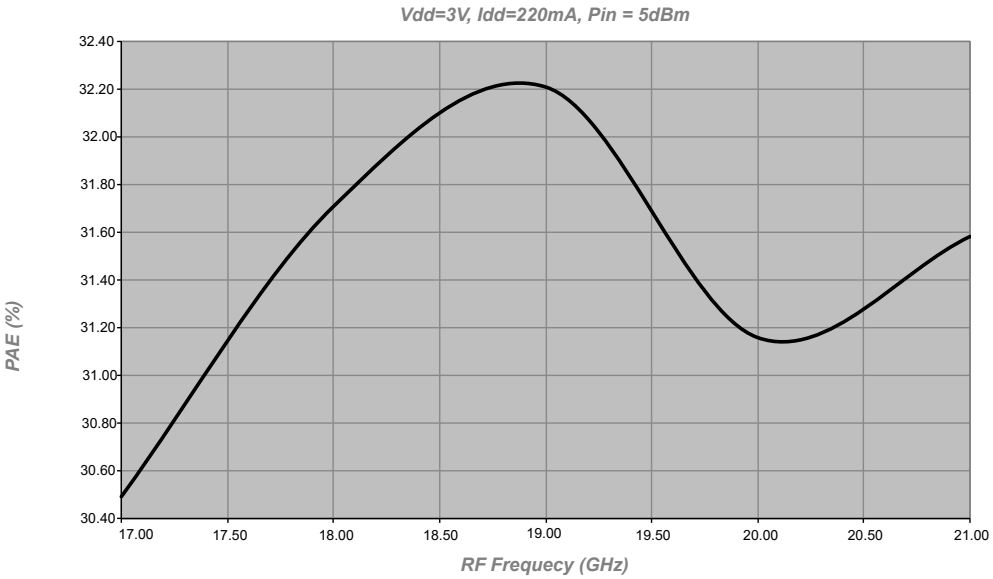


Figure 5
PAE

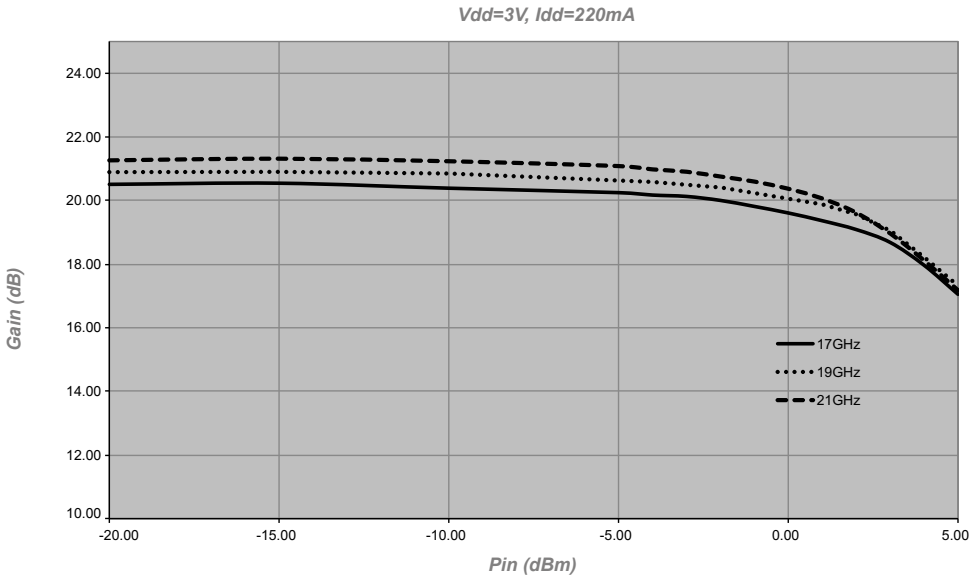


Figure 6
Power Gain

Measured Performance Data

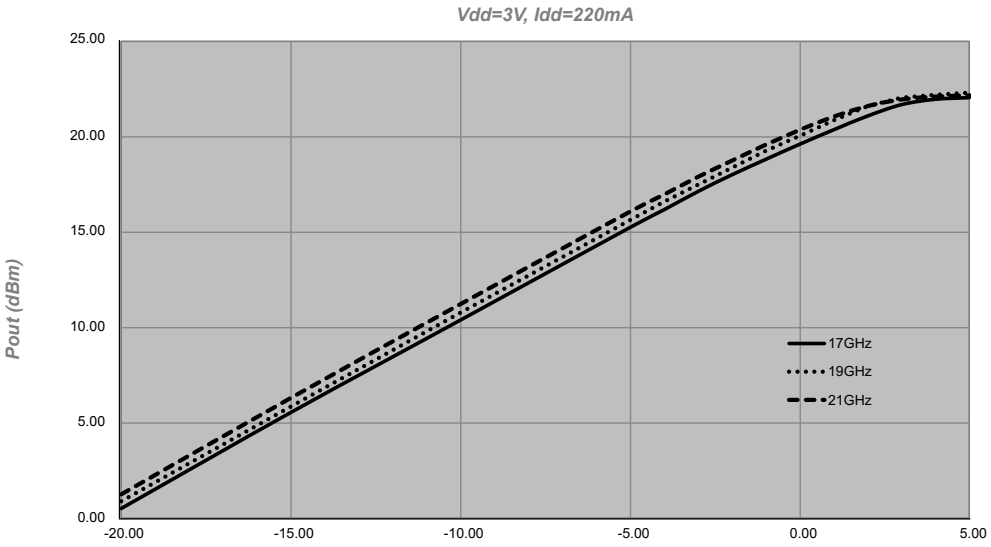


Figure 7
Output Power

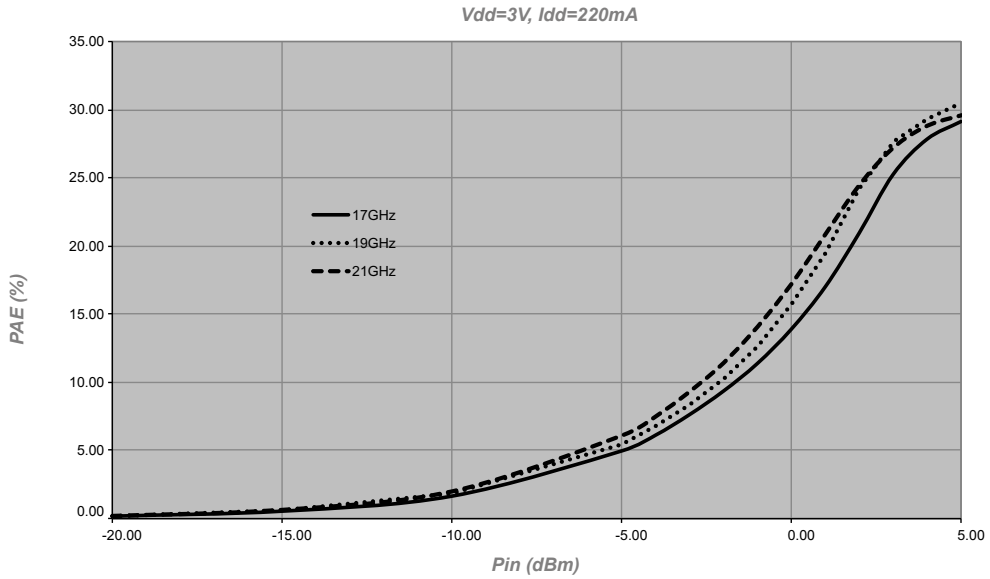
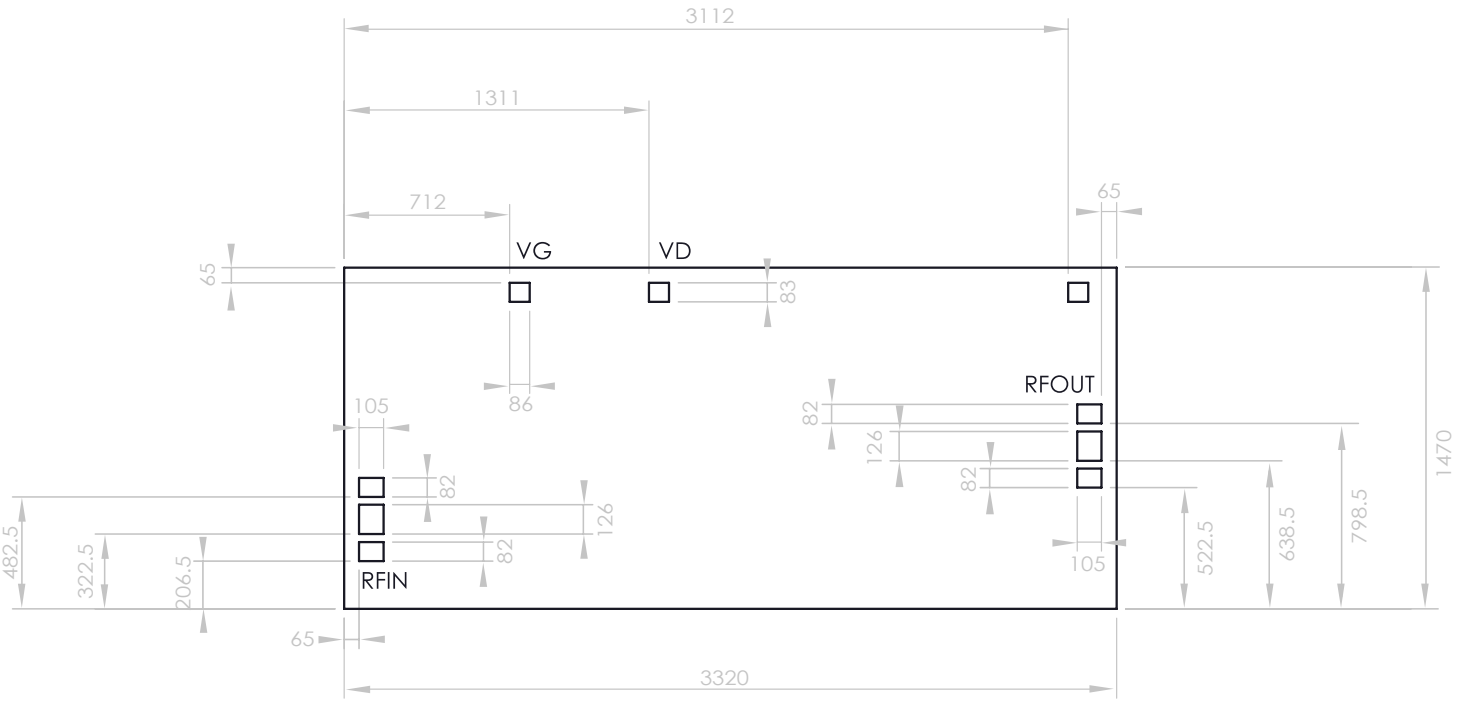


Figure 8
PAE

Outline Drawing



Notes

1. All dimensions are in um.
2. Typical DC bond pads are 80um square.
3. RF bond pads are 105 x 120um square.
4. All pads have gold metalisation.
5. Gold backside metalisation.
6. Backside metal is ground.
7. Connections are not required for unlabelled bond pads.
8. Die thickness is 100um

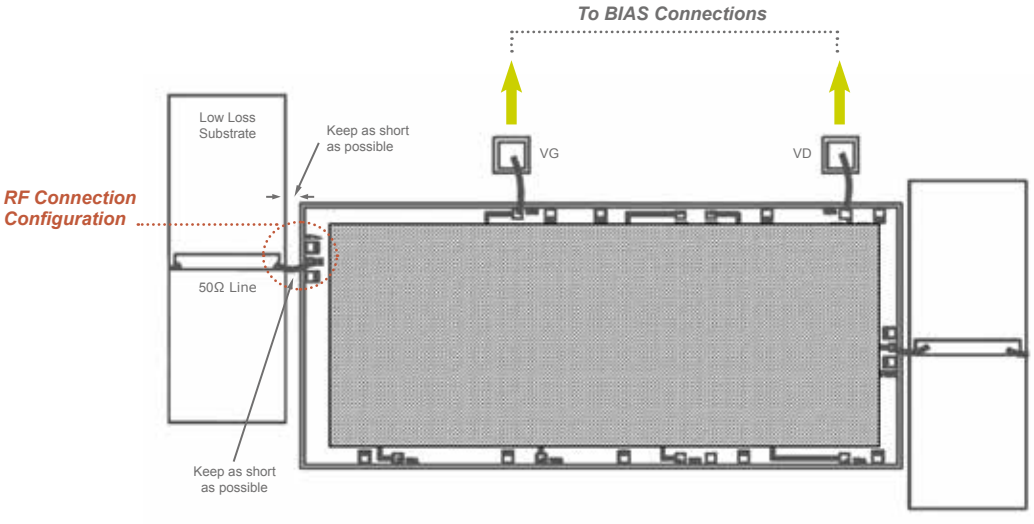
Die Packing Information

All die are delivered using gel-paks unless otherwise requested.

Pad Descriptions

Name	Description
RFIN	Input RF pad. This pad is AC coupled
RFOUT	Output RF pad. This pad is AC coupled
VD	Drain bias pad
VG	Gate bias pad
BOTTOM	The die backside must be connected to RF/DC ground

Connection Configurations



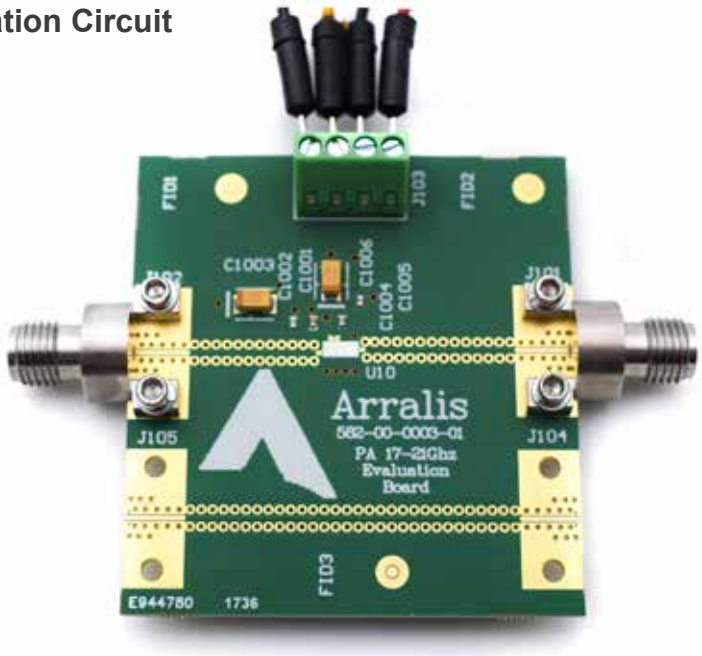
(Not actual die – these rules are applied to all MMICs unless otherwise stated)

General Notes on Assembly

Die should be mounted on conductive material such as gold-plated metal to provide a good ground and suitable heat sink, if necessary.

1. Attaching the die using Au/Sn preforms is preferable. The Eutectic melt for Au/Sn occurs at approximately 280°C so the die (plus mount and preform) is initially heated up to 180°C and then it is heated for approximately 10 seconds to 280°C using a nitrogen heat gun. The device will survive 10 seconds at this temperature. The static breakdown for GaAs devices is approximately 330°C.
2. Pure, dry nitrogen should be used as the heat source.
3. If the devices cannot be lifted/ placed by a vacuum device, then ESD die-lifting tweezers are preferable.
4. Supply lines should be decoupled with 100pF capacitors. Larger planar capacitors could be used if available.
5. Aluminium wire must not be used.

Application Circuit



K-PA-1721-EVAL evaluation PCB is available to assist in the testing of the K-PA-1721 MMIC. Boards are available both fully assembled or for self-assembly and come with an additional 50Ω line (connectors added on request) to help with calibration to the MMIC die. Further details can be found in the LE-Ka1330302-BD_ EVAL application note.

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