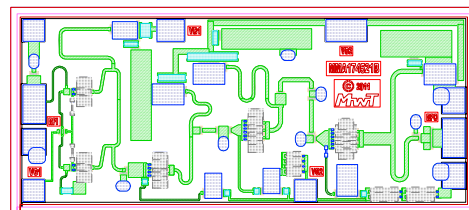


MMA-174321 17 - 43 GHz, 0.1 W Gain Block

Features:

- Frequency Range: 17 – 43 GHz
- P1dB: 21 dBm
- Psat: 22 dBm
- Gain: 22 dB
- Vdd = 5 V (3 V to 5 V)
- Ids = 200 mA (150 mA to 300 mA)
- Input and Output Fully Matched to 50 Ω
- 2x and 3x Frequency multiplier applications



Die size: 1720 x 760 x 50 μm
(69 x 30 x 2 mil)

Applications:

- Communication systems
- Microwave instrumentations

Description:

The MMA-174321 is a broadband GaAs MMIC general purpose gain block for 0.1 watt maximum output power and high gain over full 17 to 43 GHz frequency range. This amplifier is able to use as 2x and 3x Frequency multipliers when biased under class-B condition for the first stage.

Absolute Maximum Ratings: (Ta = 25 °C)*

SYMBOL	PARAMETERS	UNITS	Min.	Max.
Vd1, Vd2	Drain-Supply Voltage	V		5.4
Vg1	Optional Gate supply Voltage	V	-2	0.5
Vg2	Optional Gate supply Voltage	V	-2	0.5
Idd	Total Drain Supply Current	mA		400
Pin max	RF Input Power	dBm		21
Toper	Operating Temperature	°C		-40 to +85
Tch	Channel Temperature	°C		+150
Tstg	Storage Temperature	°C		-55 to +165
Tmax	Max. Assembly Temp (60 sec max)	°C		+300

*Operation of this device above any one of these parameters may cause permanent damage.

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17 - 43 GHz, 0.1 W Gain Block

Electrical Specifications: $V_{ds} = 5\text{ V}$, $V_{gs} = -0.7\text{ V}$, $I_{ds} = 200\text{ mA}$, $T_a = 25\text{ }^{\circ}\text{C}$, $Z_0 = 50\text{ }\Omega$

Parameter	Units	Typical Data
Frequency Range	GHz	17 - 43
Gain (Typ / Min)	dB	22 / 20
Gain Flatness (Typ / Max)	$\pm$ dB	2.0 / 2.5
Input RL (Typ / Max)	dB	8 / 6
Output RL (Typ / Max)	dB	8 / 6
Output P1dB (Typ / Min)	dBm	21 / 19.5
Output IP3 ⁽¹⁾	dBm	26
Output Psat (Typ / Min)	dBm	22 / 20.5
Operating Current at P1dB (Typ / Max)	mA	240 / 250
Thermal Resistance	$^{\circ}\text{C} / \text{W}$	30

(1) Output IP3 is measured with two tones at output power of 5 dBm/tone separated by 20 MHz.

ESD Caution

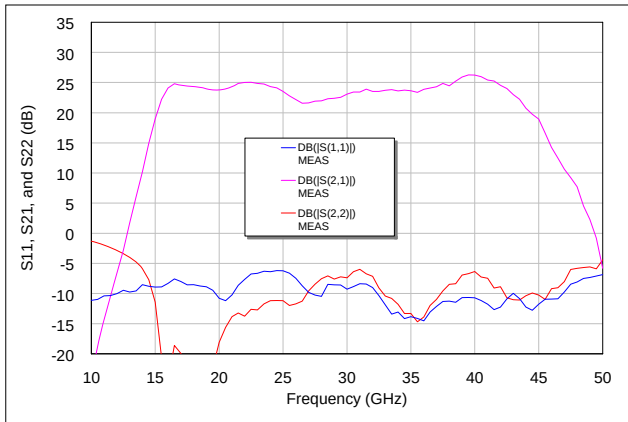


High-performance RF integrated circuits are highly sensitive to electrostatic discharge (ESD) and may contain unprotected inputs and outputs. Handling and assembly should be conducted in an ESD-controlled environment. It is recommended that ESD precautions and protocols are adopted to minimise the risk of electrostatic discharge and protect product integrity.

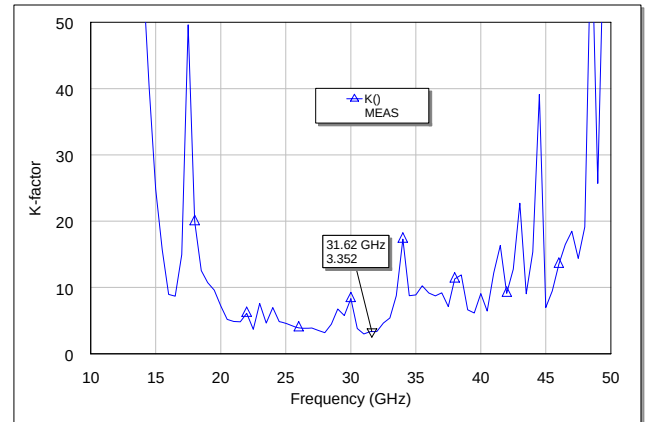
MMA-174321

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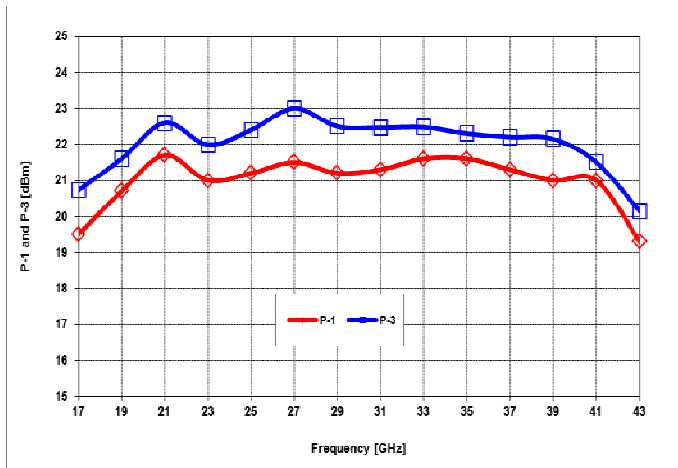
Typical RF Performance: $V_{ds} = 5\text{ V}$, $V_{gs} = -0.7\text{ V}$, $I_{ds} = 200\text{ mA}$, $Z_0 = 50\ \Omega$, $T_a = 25\text{ }^\circ\text{C}$



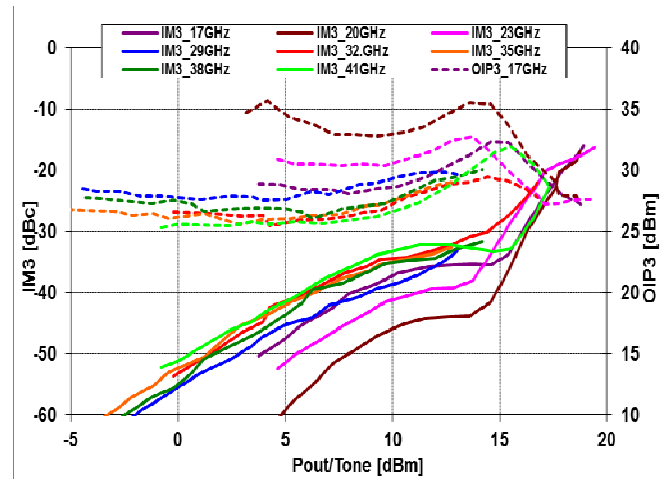
S11 [dB], S21 [dB], and S22 [dB] vs. Frequency



K-factor vs. Frequency

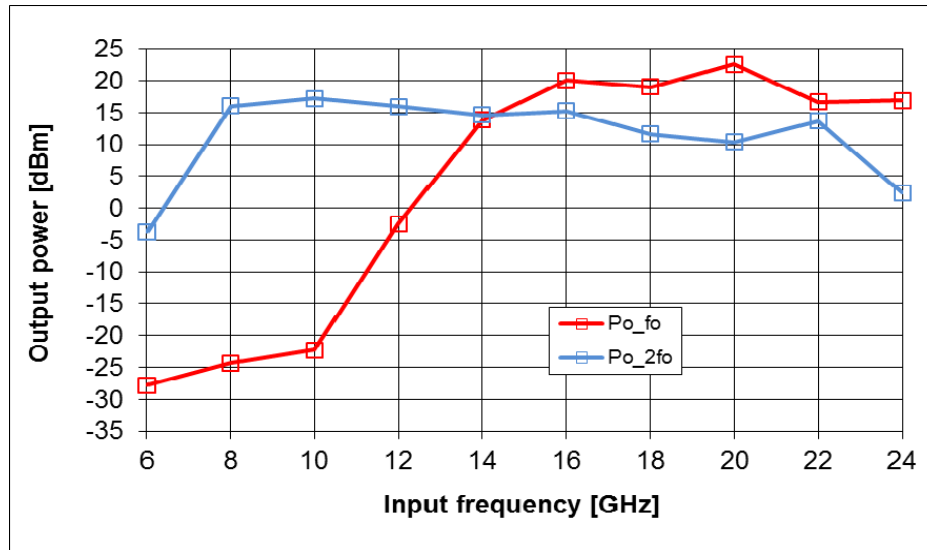


P-1 and Psat vs. Frequency



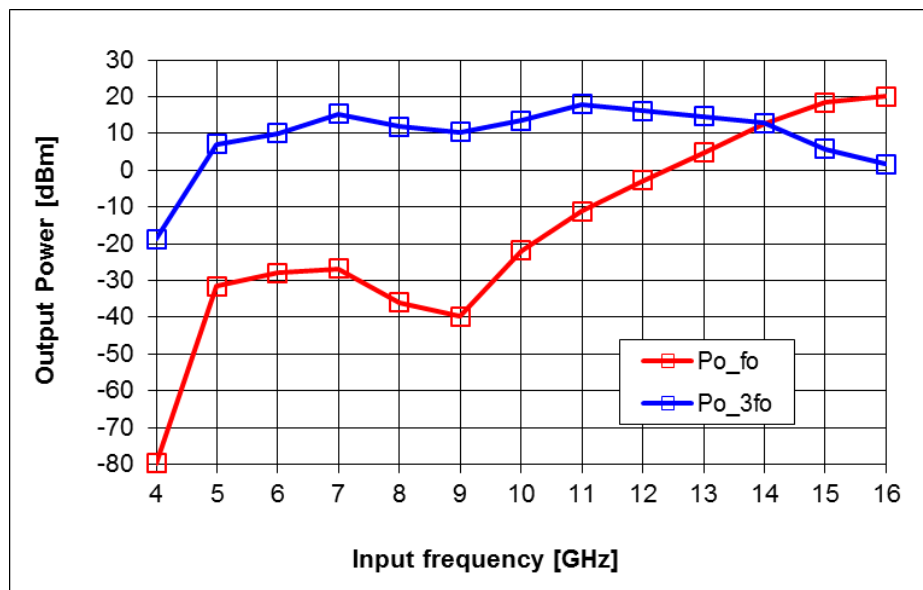
IM3 level [dBc] vs. Input power [dBm / tone]

Frequency 2x and 3x multiplier Data:



Measured 2x multiplier data:

Pin = 9 dBm, Vd1 = 5 V, Vd2 = 5 V, Vg1 = -1.4 V, Vg2 = -0.7 V, Id1 = 1 mA, and Id2 = 163 mA



Measured 3x multiplier data:

Pin = 9 dBm, Vd1 = 1 V, Vd2 = 5 V, Vg1 = -0.75 V, Vg2 = -0.75 V, Id1 = 21 mA, and Id2 = 144 mA

Applications

The **MMA-174321** MMIC general purpose amplifier is designed for use as a gain stage amplifier in microwave transmitters. It is ideally suited for 17 to 43 GHz band applications requiring a flat gain response and excellent power performance. This amplifier is provided as a bare die format in a Gel-pak.

Biasing and Operation

The recommended bias conditions for best performance for the **MMA-174321** are $V_{DD} = 5.0\text{ V}$, $I_{dsq} = 200\text{ mA}$. Performance improvements are possible depending on applications. The drain bias voltage range is 3 to 6 V and the quiescent drain current biasing range is 150 mA to 250 mA. V_{g1} is connected to first stages of gate, and V_{g2} is connected to following three stages of gates. Muting can be accomplished by setting V_{g1} and V_{g2} to the pinched-off voltage ($V_p = -2\text{ V}$). The gate voltages (V_{g1} and V_{g2}) should be applied prior to the drain voltages (V_{d1} and V_{d2}) during power up and removed after the drain voltages during power down. The RF input port is connected internally to the $50\ \Omega$ load for ESD protection purpose; therefore, an input decoupling capacitor is needed if the preceding output stage has DC present. The RF output is DC decoupled internally. Typical DC supply connection with bi-passing capacitors for the **MMA-174321** is shown in following pages.

Frequency x2 and x3 Multiplier Applications

MMA-174321 is able to use as a frequency x2 multiplier when biased under $V_{d1} = 5\text{ V}$, $V_{d2} = 5\text{ V}$, $V_{g1} = -1.4\text{ V}$, $V_{g2} = -0.7\text{ V}$, $I_{d1} = 1\text{ mA}$, and $I_{d2} = 163\text{ mA}$. Optimum input RF power level is +9 dBm. Typical measured data is shown in previous page. **MMA-174321** is also able to use as a frequency x3 multiplier when biased under $V_{d1} = 1\text{ V}$, $V_{d2} = 5\text{ V}$, $V_{g1} = -0.75\text{ V}$, $V_{g2} = -0.75\text{ V}$, $I_{d1} = 21\text{ mA}$, and $I_{d2} = 144\text{ mA}$. Optimum input RF power level is +9dBm. Typical measured data is shown in previous page.

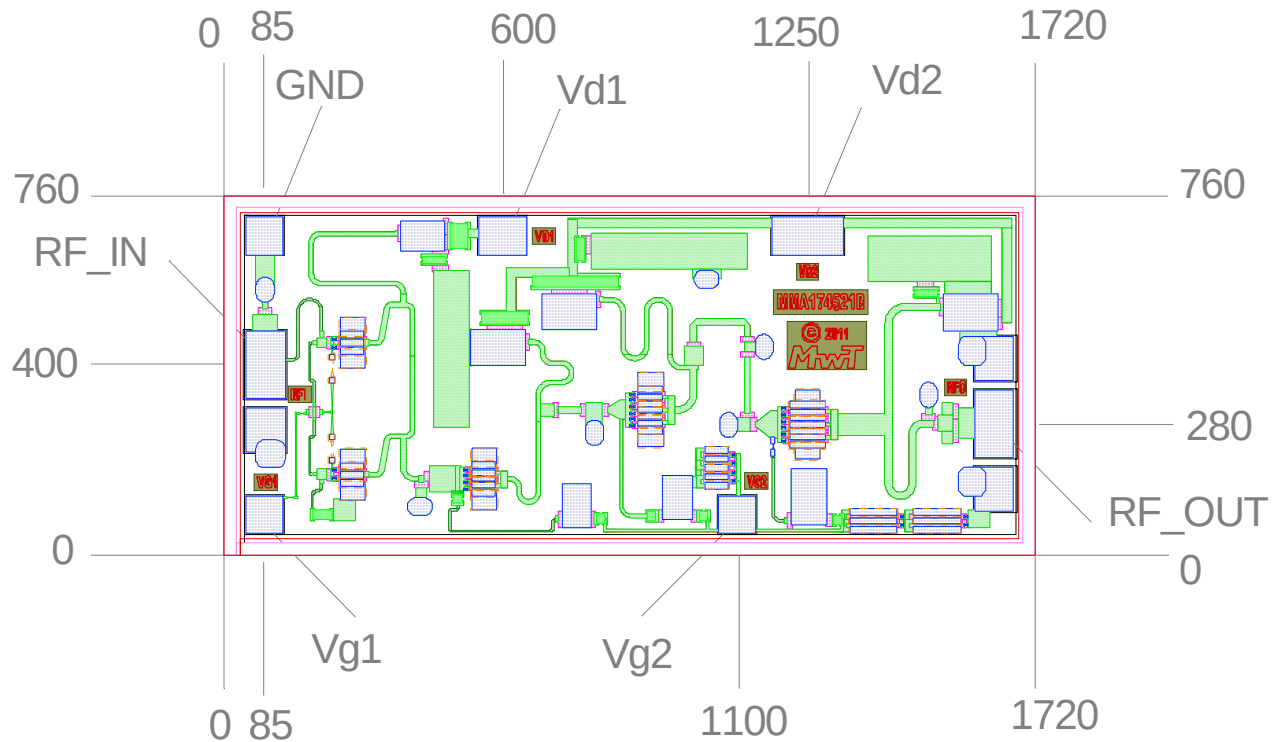
Assembly Techniques

GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, die attach and bonding methods are critical factors in successful GaAs MMIC performance and reliability.

MMA-174321

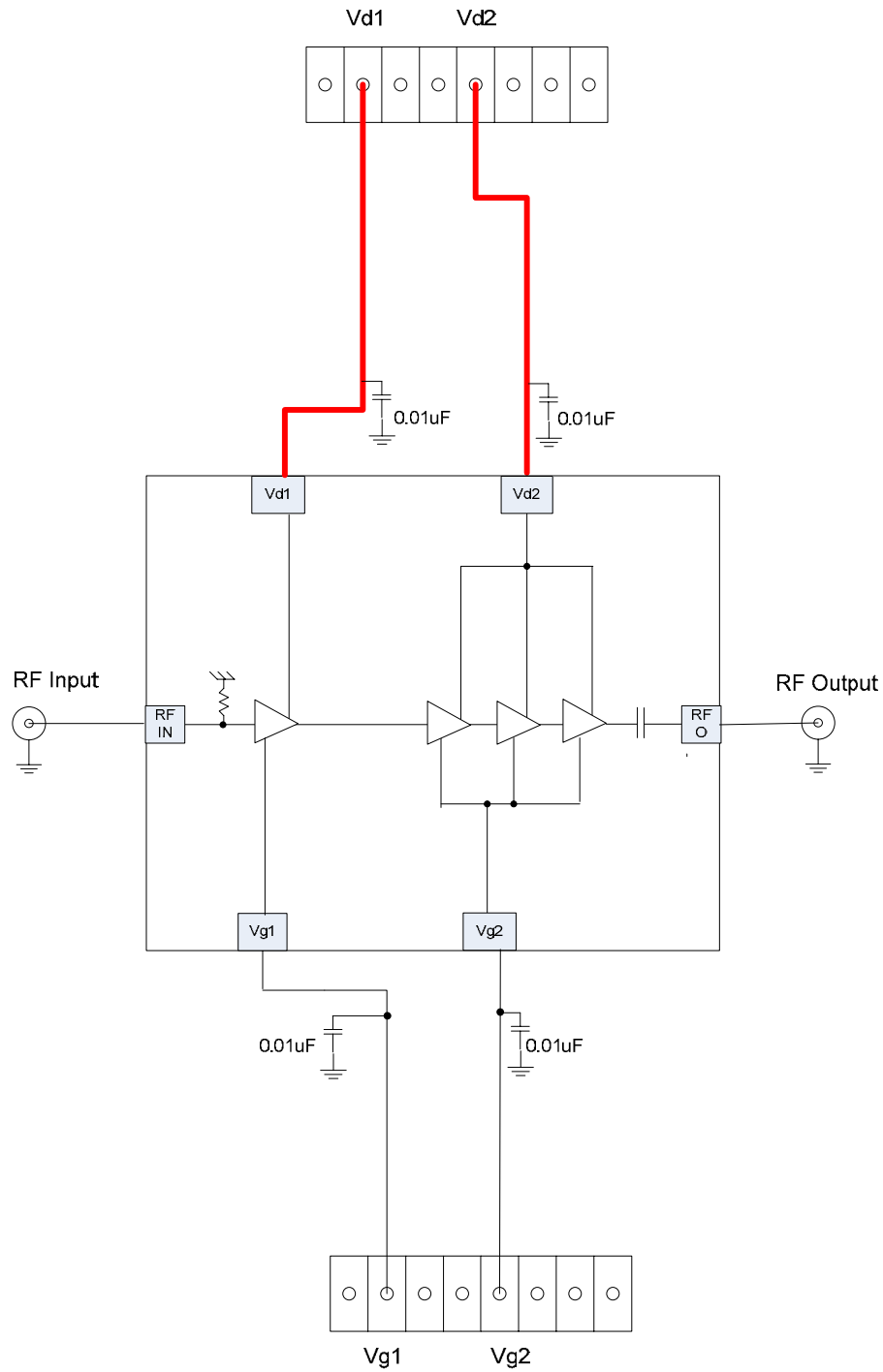
17 - 43 GHz, 0.1 W Gain Block

Mechanical Information: *Top view*



Units are in μm .

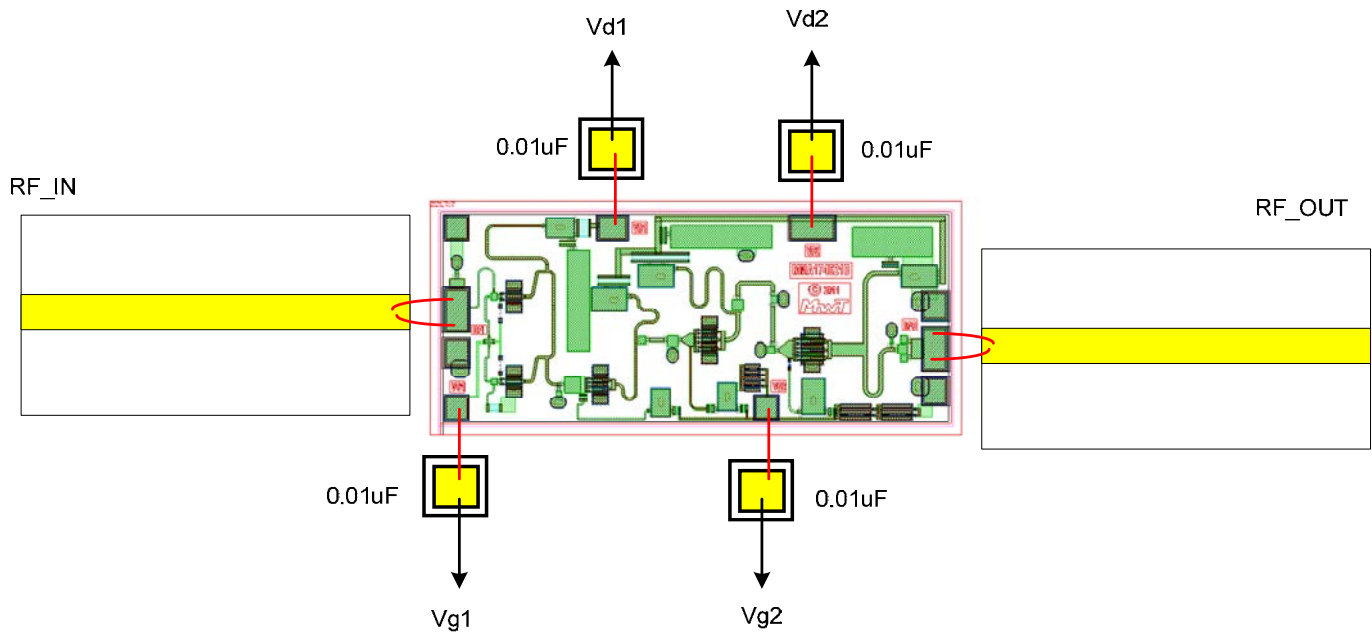
Application Circuit:



MMA-174321

17 - 43 GHz, 0.1 W Gain Block

Assembly example:



RoHS Compliance



CML Micro certifies, to the best of our knowledge, that its products comply with RoHS directive (2011/65/EU), as amended by Directive (EU) 2015/863.

REACH Compliance



CML Micro certifies, to the best of our knowledge, that its products do not contain any of the banned substances specified in the SVHC list at <https://echa.europa.eu/candidate-list-table>. CML Micro are committed to ensuring the safety of products and the compliance with regulations. Publications will be updated in the event that REACH control is compromised.

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