AMMC-5040

20-40 GHz GaAs Amplifier

All Detail Applications

Description

AMMC-5040 is a high gain broadband amplifier designed for both military applications and commercial communication systems.

This four-stage amplifier has input and output matching circuitry for use in 50Ω enviroments. It is fabricatied using PHEMT integrated circuit structures that provide exceptional broadband performance.

Lead (PB) Free
RoHS 6 fully compliant

Lifecycle status: Active

Features

- Frequency Range: 20-45 GHz
- High Gain: 25 dB
- Gain Flatness: /- 1.5 dB
- Return Loss: Input: 17 dB; Output: 11 dB
- Output Power:
  P-1dB = 21 dBm at 38 GHz
  P-3dB = 22.5 dBm at 38 GHz

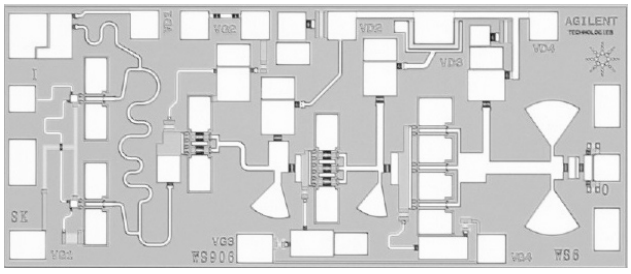
Applications

- Broadband gain block
- Broadband driver amplifier
- Point-to-point radio
- LMDS
- EW
- Instrumentation
- Frequency Multiplier (X2 and X3)

AMMC-5040
20 – 45 GHz GaAs Amplifier

Data Sheet

Description
The AMMC-5040 is a high gain broadband amplifier designed for both military applications and commercial communication systems. This four-stage amplifier has input and output matching circuitry for use in 50 ohm environments. It is fabricated using PHEMT integrated circuit structures that provide exceptional broadband performance. The backside of this chip is both RF and DC ground. This simplifies the assembly process and reduces assembly related performance variations and costs. For improved reliability and moisture protection, the die is passivated at the active areas. This MMIC is a cost effective alternative to hybrid (discrete-FET) amplifiers that require complex tuning and assembly process.



Chip Size:	1720 x 760 µm (67.7 x 29.9 mils)
Chip Size Tolerance:	±10 µm (±0.4 mils)
Chip Thickness:	100 ± 10 µm (4 ± 0.4 mils)
Pad Dimensions:	75 x 75 µm (3 ±0.4 mils)

Absolute Maximum Ratings[1]

Symbol	Parameters/Conditions	Units	Min.	Max.
$V_{D1,2-3-4}$	Drain Voltage	V		5
$V_{G1,2-3-4}$	Gate Voltage	V	-3.0	0.5
I_{DD}	Total Drain Current	mA		550
P_{in}	CW Input Power	dBm		21
T_{ch}	Operating Channel Temperature	°C		+160
T_b	Operating Backside Temperature	°C	-55	+75
T_{stg}	Storage Temperature	°C	-65	+165
T_{max}	Max. Assembly Temp (60 sec max)	°C		+300

Notes:
1. Operation in excess of any one of these conditions may result in permanent damage to this device.

Features
- Frequency range: 20 – 45 GHz
- High gain: 25 dB
- Gain flatness: ±1.5 dB
- Return loss:
  Input: 17 dB, Output: 11 dB
- Output power:
  P_{-1dB} = 21 dBm at 38 GHz
  P_{-3dB} = 22.5 dBm at 38 GHz

Applications
- Broadband gain block
- Broadband driver amplifier
- Point-to-point radio
- LMDS
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- Instrumentation
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AMMC-5040 DC Specifications/Physical Properties[1]

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
$V_{D1,2-3-4}$	Drain Supply Operating Voltage	V	2	4.5	5
I_{D1}	First Stage Drain Supply Current (V_{DD} = 4.5 V, V_{G1} = -0.5 V)	mA		50	
I_{D2-3-4}	Total Drain Supply Current for Stages 2, 3 and 4 (V_{DD} = 4.5 V, V_{GG}= -0.5 V)	mA		225	
$V_{G1,2-3-4}$	Gate Supply Operating Voltages (I_{DD} = 300 mA)	V		-0.45	
V_P	Pinch-off Voltage (V_{DD} = 4.5 V, I_{DD} < 10 mA)	V		-1.5	
θ_{ch-b}	Thermal Resistance[2] (Backside Temp. T_b = 25°C)	°C/W		49	

Notes:

1. Measured in wafer form with T_{chuck} = 25°C (except θ_{ch-bs}.)
2. Channel-to-backside Thermal Resistance (θ_{ch-b}) = 58°C/W at $T_{channel}$ (T_c) = 150°C as measured using the liquid crystal method. Thermal Resistance at backside temperature (T_b) = 25°C calculated from measured data.

RF Specifications[3,4] (V_{DD} = 4.5V, I_{DD} (Q) = 300 mA, Z_0 = 50Ω)

		Units	Broadband		Narrow Band Typical Performance			
		GHz	23–40		21–24	27–29	37–40	40–45
Symbol	Parameters and Test Conditions		Min.	Typ.	Typical			
$\|S_{21}\|^2$	Small-signal Gain	dB	20	25	25.5	25	22.4	21.3
$\Delta\|S_{21}\|^2$	Small-signal Gain Flatness	dB		±1.5	±0.2	±0.4	±0.2	±1.2
RL_{in}	Input Return Loss	dB	15	17	17	18	21	17
RL_{out}	Output Return Loss	dB	8	11	10	14	13	13
P_{-1dB}	Output Power @ 1 dB Gain Compression f = 22 GHz	dBm		19.5	20	22.5	21	20
P_{-3dB}	Output Power @ 3 dB Gain Compression, f = 22 GHz	dBm		21	21.6	23.5	22.5	21.5
OIP3	Output 3rd Order Intercept Point, Δf = 2 MHz, P_{in} = -8 dBm, f = 22 GHz	dBm		30	29	29	31	27
$\|S_{12}\|^2$	Isolation	dB	40	55	55	55	55	55

Notes:

3. Data measured in wafer form, T_{chuck} = 25°C.
4. 100% on-wafer RF test is done at frequency = 24, 27, 29, 37 and 40 GHz, except as noted.

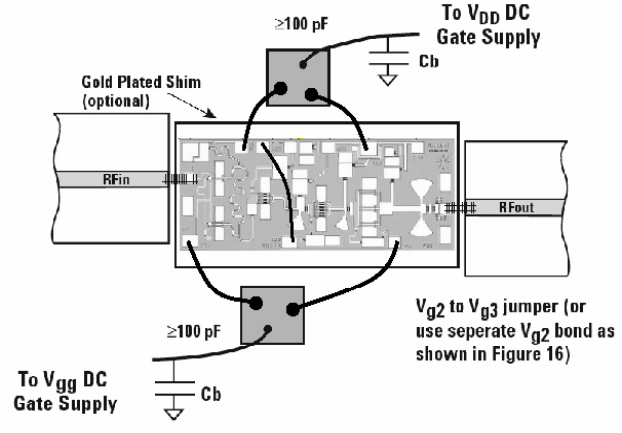

Figure 15. AMMC-5040 assembly for normal amplifier applications with single drain and single gate supply connections.

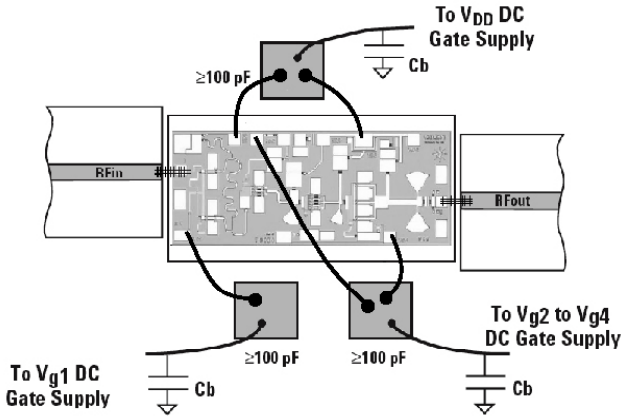

Figure 16. Separate first-stage gate bias for using the AMMC-5040 as a frequency doubler or quadrupler. This diagram also shows an option to the Vg_2 jumper bonding scheme used in Figure 15.

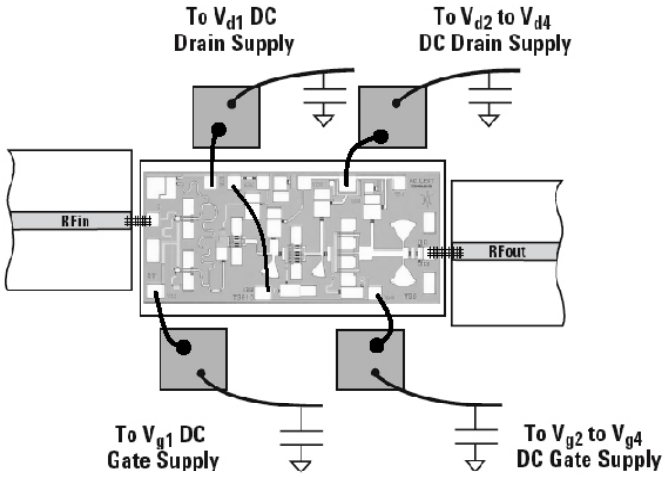

Figure 17. Separate first-stage gate and drain bias for using the AMMC-5040 as a frequency tripler.

Ordering Information

AMMC-5040-W10 = 10 devices per tray
AMMC-5040-W50 = 50 devices per tray