AMMC-5024

30 KHz - 40 GHz GaAs MMIC Traveling Wave Amplifier

Description

AMMC-5024 is a broadband PHEMT GaAs MMIC TWA designed for medium output power and high gain over the full 30 KHz to 40 GHz frequency range.

The design employs a 9-stage, cascade-connected FET strycture to ensure flat gain and power as well as uniform group delay.

Lead (PB) Free
RoHS 6 fully compliant

Lifecycle status: Active

Features

- Wide Frequency Range: 30 KHz - 40 GHz
- High Gain: 16 dB
- Gain Flatness: /- 0.75 dB
- Return Loss: Input: 13 dB; Output: 13 dB
- Medium Power: P-1dB = 22.5 dBm at 22 GHz
- Low Noise Figure: 3.7 dB at 26 GHz

Applications

- Communication systems
- Microwave instrumentation
- Optical systems
- Broadband applications requiring flat gain and group delay with excellent input and output port matches over the 30 KHz and 40 GHz frequency range

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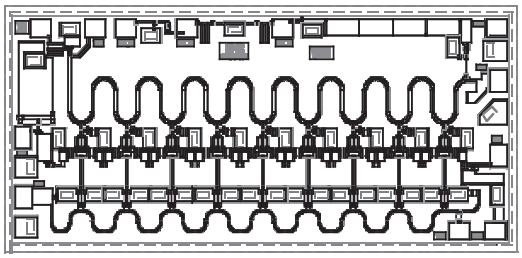
Data Sheet



Chip Size:	**2350 x 1050 µm (92.5 x 41.3 mils)**
Chip Size Tolerance:	**±10 µm (±0.4 mils)**
Chip Thickness:	**100 ± 10 µm (4 ± 0.4 mils)**
Pad Dimensions:	**80 x 80 µm (2.95 ± 0.4 mils)**

Description

Avago Technologies' AMMC-5024 is a broadband PHEMT GaAs MMIC TWA designed for medium output power and high gain over the full 30 KHz to 40 GHz frequency range. The design employs a 9-stage,cascade-connected FET structure to ensure flat gain and power as well as uniform group delay. E-beam lithography is used to produce uniform gate lengths of 0.15 µm and MBE technology assures precise semiconductor layer control. For improved reliability and moisture protection, the die is passivated at the active areas.

Features

- Wide frequency range: 30 KHz – 40 GHz
- High gain: 16 dB
- Gain flatness: ±0.75 dB
- Return loss:
  Input: 13 dB, Output: 13 dB
- Medium power: P-1dB = 22.5 dBm at 22 GHz
- Low noise figure: 4.6 dB at 26 GHz

Applications

- Communication systems
- Microwave instrumentation
- Optical systems
- Broadband applications requiring flat gain and group delay with excellent input and output port matches over the 30 KHz and 40 GHz frequency range

Absolute Maximum Ratings[1]

Symbol	Parameters/Conditions	Units	Min.	Max.
V_{dd}	Positive Drain Voltage	V		10
I_{dd}	Total Drain Current	mA		340
V_{g1}	First Gate Voltage	V	-9.5	0
I_{g1}	First Gate Current	mA	-38	+1
V_{g2}	Second Gate Voltage	V	-3.5	+4
I_{g2}	Second Gate Current	mA	-20	
P_{in}	CW Input Power	dBm		17
T_{ch}	Operating Channel Temperature	°C		+150
T_b	Operating Backside Temperature	°C	-55	
T_{stg}	Storage Temperature	°C	-65	+165
T_{max}	Max. Assembly Temp (60 sec max)	°C		+300

Notes:

1. Absolute maximum ratings for continuous operation unless otherwise noted.

AMMC-5024 DC Specifications/Physical Properties [1]

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
I_{dss}	Saturated Drain Current (V_{dd}=7 V, V_{g1}=0 V, V_{g2}=open circuit)	mA	265	350	385
V_p	First Gate Pinch-off Voltage (V_{dd}=7 V, I_{dd}=30 mA, V_{g2}=open circuit)	V		-8.2	
V_{g2}	Second Gate Self-bias Voltage (V_{dd}=7 V, I_{dd} = 200 mA, V_{g2}=open circuit)	V		2.75	
I_{dsmin} (V_{g1})	First Gate Minimum Drain Current (V_{dd}=7 V, V_{g1}=-7 V, V_{g2}=open circuit)	mA		47	
I_{dsmin} (V_{g2})	Second Gate Minimum Drain Current (V_{dd}=7 V, V_{g1}=0 V, V_{g2}= -3.5 V)	mA		105	
θ_{ch-b}	Thermal Resistance[2] (Backside temperature, T_b = 25°C)	°C/W		16.2	

RF Specifications for High Power Applications [2, 3] (V_{dd}=7 V, I_{dd}(Q)=200 mA, Z_{in}=Z_o=50Ω

Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
$\|S_{21}\|^2$	Small-signal Gain		dB	14	16	18
$\Delta\|S_{21}\|^2$	Small-signal Gain Flatness		dB		±0.75	±2
RL_{in}	Input Return Loss		dB	12	16.9	
RL_{out}	Output Return Loss		dB	10	16.8	
$\|S_{12}\|^2$	Isolation		dB	26	28	
P_{-1dB}	Output Power @ 1 dB Gain Compression	f = 22 GHz	dBm	21	22.5	
P_{sat}	Saturated Output Power	f = 22 GHz	dBm	23	24.5	
OIP3	Output 3rd Order Intercept Point, Rf_{in1} = Rf_{in2} = 2 dBm, f = 22 GHz, Δf = 2 MHz		dBm	27	30	
NF	Noise Figure (V_{ds} = 3V, I_{ds} = 140 mA)	f = 26 GHz f = 40 GHz	dB dB		4.6 7.2	6.5 9

RF Specifications for High Gain and Low Power Applications [2, 3] (V_{dd}=4 V, I_{dd}(Q)=160 mA, Z_{in}=Z_o=50Ω)

Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
$\|S_{21}\|^2$	Small-signal Gain		dB		17.5	
$\Delta\|S_{21}\|^2$	Small-signal Gain Flatness		dB		±1.5	
RL_{in}	Minimum Input Return Loss		dB		13	
RL_{out}	Minimum Output Return Loss		dB		13	
$\|S_{12}\|^2$	Isolation		dB		30	
P_{-1dB}	Output Power @ 1 dB Gain Compression	f = 22 GHz	dBm		17.3	
P_{sat}	Saturated Output Power	f = 22 GHz	dBm		20.5	
OIP3	Output 3rd Order Intercept Point, Rf_{in1} = Rf_{in2} = 2 dBm, f = 22 GHz, Δf = 2 MHz		dBm		22.5	
NF	Noise Figure	f = 26 GHz f = 40 GHz	dB dB		3.7 5.5	

Notes:
1. Backside temperature T_b = 25°C unless otherwise noted.
2. Channel to board Thermal Resistance is measured using QFI method.
3. 100% on-wafer RF test is done at frequency = 2, 10, 20, 30 and 40 GHz, except as noted.

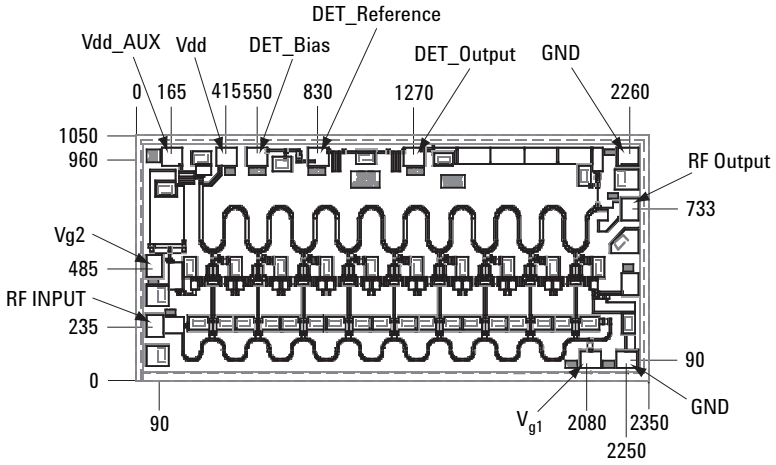


Figure 20. AMMC-5024 Bonding Pad Locations. (dimensions in micrometers)

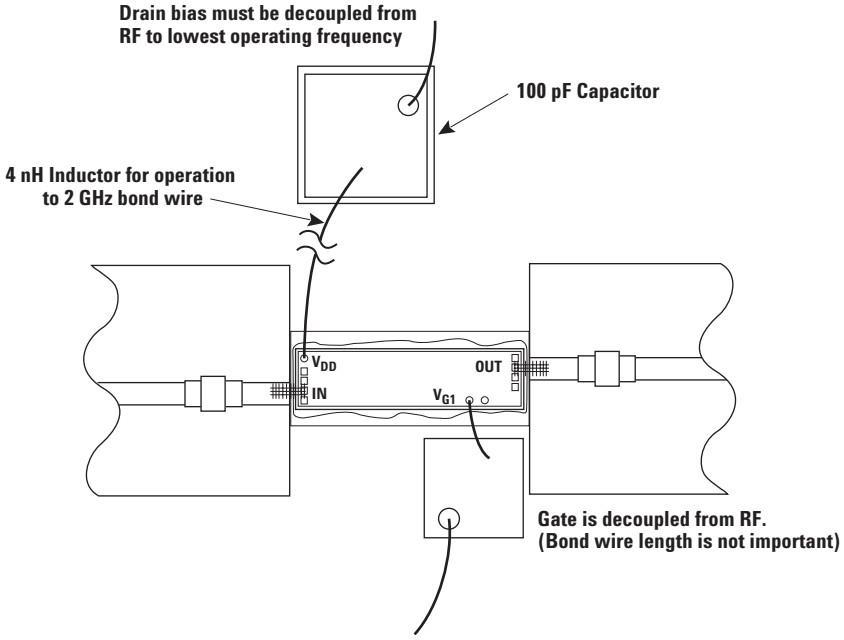


Figure 21. AMMC-5024 Assembly Diagram.

Ordering Information

AMMC-5024-W10 = 10 devices per tray
AMMC-5024-W50 = 50 devices per tray