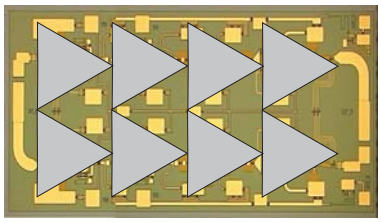
AMMC-6345
20 – 45 GHz Driver Amplifier

Data Sheet



Chip Size: 2500 x 1150 μm (100 x 45 mils)
Chip Size Tolerance: ± 10μm (±0.4 mils)
Chip Thickness: 100 ± 10μm (4 ± 0.4 mils)
Pad Dimensions: 100 x 100μm (4 ± 0.4 mils)

Description

The AMMC-6345 MMIC is a broadband medium power amplifier designed for use in driving stage for transmitters that operate in various frequency bands between 20GHz and 45GHz. It can be used as a driver stage for the AMMC-6425, 6430 and 6440 (18-27GHz, 25-32GHz and 37-42GHz) 1W MMIC power amplifiers when linear operation is required. At 40GHz, it provides 24dBm of output power (P-1dB), 20dB of gain, and a 32 dBm output third order intercept (OIP3). The device has input and output matching circuitry for use in 50 Ω environments. The AMMC-6345 integrates a temperature compensated RF power detection circuit that enables power detection of 0.8V/W at 40GHz. The device operates on 5V for current supply (negative voltage only needed for Vg). It is fabricated in a PHEMT process for exceptional power and gain performance. For improved reliability and moisture protection, the die is passivated at the active areas.

Features

- Wide frequency range: 20 - 45 GHz
- High gain: 20 dB
- Power: @40 GHz, P-1dB=24 dBm
- Highly linear: OIP3=32dBm
- Integrated RF power detector
- 5.0 Volt, -0.55 Volt, 480mA operation

Applications

- Microwave Radio systems
- Satellite VSAT and DBS systems
- LMDS & Pt-Pt mmW Long Haul
- 802.16 & 802.20 WiMax BWA
- WLL and MMDS loops
- Can be driver amplifier for the AMMC-64xx power amplifiers



NOTE: THESE DEVICES ARE ESD SENSITIVE. THE FOLLOWING PRECAUTIONS ARE STRONGLY RECOMMENDED. ENSURE THAT AN ESD APPROVED CARRIER IS USED WHEN DICE ARE TRANSPORTED FROM ONE DESTINATION TO ANOTHER. PERSONAL GROUNDING IS TO BE WORN AT ALL TIMES WHEN HANDLING THESE DEVICES

Absolute Maximum Ratings

Symbols	Parameters	Units	Minimum	Maximum	Notes
Vd-Vg	Drain to Gate Voltage	V		8	
Vd	Positive Supply Voltage	V		5.5	
Vg	Gate Supply Voltage	V	-2.5	0.5	
Id	Drain Current	mA		TBD	2
PD	Power Dissipation	W		3.5	2 and 3
Pin	CW Input Power	dBm		23	2
Tch	Operating Channel Temp	°C		+150	4
Tstg	Storage Case Temp.	°C		-65 to +155	
Tmax	Maximum Assembly Temp (30 sec max)	°C		+320	

Notes:
1. Operation in excess of any one of these conditions may result in permanent damage to this device. Functional operation at or near these limitations will significantly reduce the lifetime of the device.
2. Dissipated power PD is in any combination of DC voltage, Drain Current, input power and power delivered to the load.
3. When operated at maximum PD with a base plate temperature of 85 °C, the median time to failure (MTTF) is significantly reduced.
4. These ratings apply to each individual FET. The operating channel temperature will directly affect the device MTTF. For maximum life, it is recommended that junction temperatures (Tj) be maintained at the lowest possible levels. See MTTF vs. Tchannel Temperature Table.

AMMC-6345 DC Specifications/Physical Properties [1]

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
Id	Drain Supply Current (under any RF power drive and temperature) (Vd=5.0V, Vg set for Id typical)	mA		480	600
Vg	Gate Supply Operating Voltage $I_{d(Q)}$ = 480mA	V	-0.75	-0.55	-0.4
Vp	Pinch-off voltage (Vdd=2.5V, Ids=20mA)	V		-1.2	
θch-b	Thermal Resistance [2] Backside temperature, Tb=25°C	°C/W		8.2	

Notes:
1. Ambient operational temperature T_A=25°C unless otherwise noted.
2. Channel-to-backside Thermal Resistance (θ_{ch-b}) = 9.0°C/W at $T_{channel}$ (T_C) = 70°C as measured using infrared microscopy. Thermal Resistance at backside temperature (T_b) = 25°C calculated from measured data.

Thermal Properties

Parameter	Test Conditions	Value
Maximum Power Dissipation	Tbaseplate = 85°C	PD = 3.5W Tchannel = 150°C
Thermal Resistance (θjc)	Vd = 5V Id = 480mA PD = 2.4W Tbaseplate = 85°C	θjc = 8.2°C/W Tchannel = 104°C
Thermal Resistance (θjc) Under RF Drive	Vd = 5V Id = 510mA Pout = 24dBm Pd = 2.3W Tbaseplate = 85°C	θjc = 8.2°C/W Tchannel = 104°C

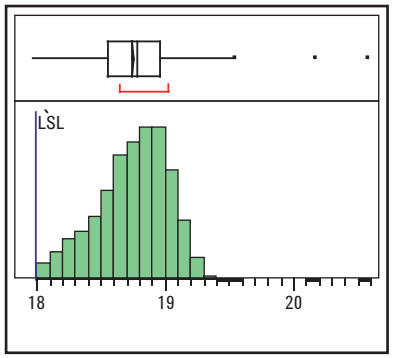
MTTF vs. Tchannel Temperature

Operation	60% Confidence Level		90% Confidence Level		Point Data R=	
Tj	λ (ΦIT)	MTTF (hrs)	λ (ΦIT)	MTTF (hrs)	λ (ΦIT)	MTTF (Yrs)
150	3511	2.8E+05	8822	1.1E+05	3831	2.6E+05
140	1298	7.7E+05	3260	3.1E+05	1416	7.1E+05
130	456	2.2E+06	1147	8.7E+05	498	2.0E+05
120	152	6.6E+06	382	2.6E+06	166	6.0E+06
110	48	2.1E+07	120	8.3E+06	52	1.9E+06
100	14	7.0E+07	36	2.8E+07	15	6.5E+07
90	4	2.5E+08	10	1.0E+08	4	2.3E+08
80	1	9.9E+08	3	3.9E+08	1	9.1E+08
70	0	4.2E+09	1	1.7E+09	0	3.8E+09
60	0	1.9E+10	0	7.6E+09	0	1.7E+10
50	0	9.6E+10	0	3.8E+10	0	8.8E+10

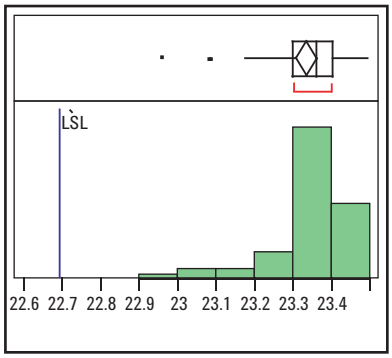
AMMC-6345 RF Specifications [1,2] (T_A= 25°C, V_d=5V, $I_{d(Q)}$=480 mA, Z_0=50 Ω)

Symbol	Parameters and Test Conditions	Units	Minimum	Typical	Maximum	Sigma
Gain	Small-signal Gain[2]	dB	18			0.28
P_{-1dB}	Output Power at 1dB Gain Compression	dBm	22.5	24		0.20
P_{-3dB}	Output Power at 3dB Gain Compression	dBm		25		0.17
OIP3	Third Order Intercept Point; Δf=100MHz; Pin=-20dBm	dBm		32		0.8
RLin	Input Return Loss[2]	dB		-17		0.92
RLout	Output Return Loss[2]	dB		-13		0.63
Isolation	Min. Reverse Isolation	dB		-40		1.30

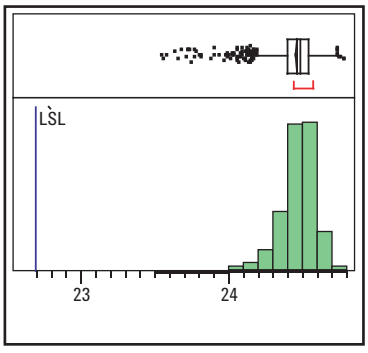
Notes:
1. Small/Large -signal data measured in wafer form T_A = 25°C.
2. 100% on-wafer RF test is done at frequency = 25, 30, and 38 GHz. Statistics based on 1500 part sample



Gain at 30 GHz



P-1dB at 30 GHz



P-1dB at 38 GHz

Typical distribution of Small Signal Gain and Output Power @P-1dB. Based on 1500 part sampled over several production lots.

AMMC-6345 Typical Performances (T_A = 25°C, V_d =5.0 V, I_D = 480 mA, Z_{in} = Z_{out} = 50 Ω)

NOTE: These measurements are in a 50 Ω test environment.

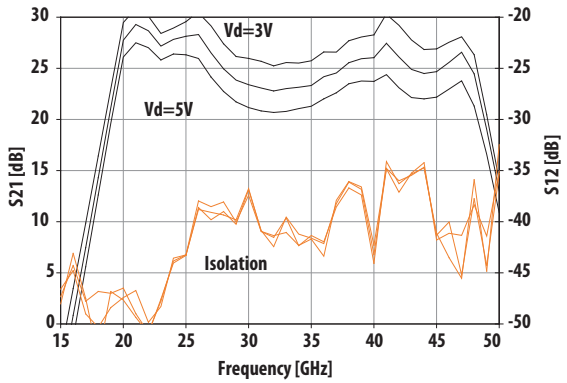


Figure 1. Typical Gain and Reverse Isolation at Vd= 3V, 4V, and 5V

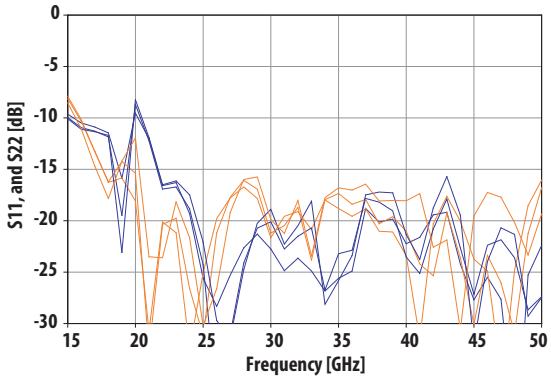


Figure 2. Typical Return Loss (Input and Output) at Vd= 3V, 4V, and 5V

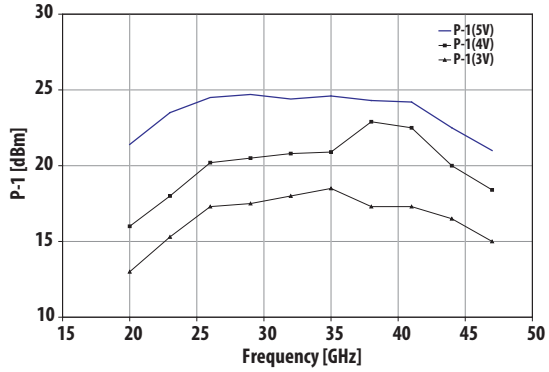


Figure 3. Typical Output Power (@P-1dB) and PAE at Vd= 3V, 4V, and 5V

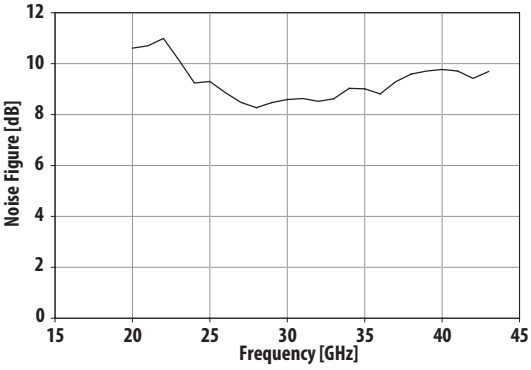


Figure 4. Typical Noise Figure

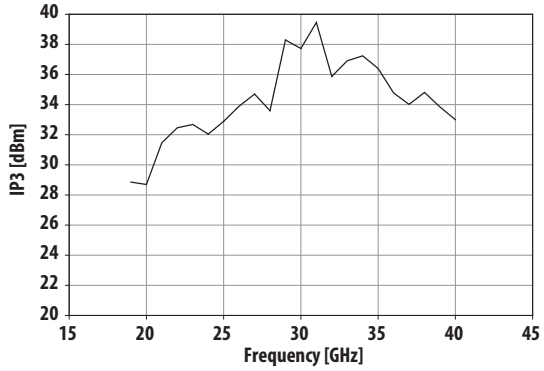


Figure 5. Typical Output 3rd Order Intercept Pt.

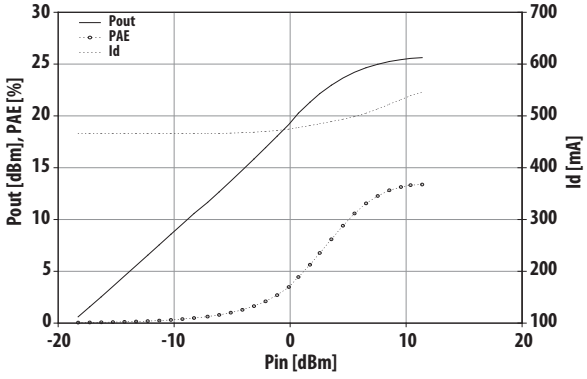


Figure 6. Typical Output Power, PAE, and Total Drain Current versus Input Power at30GHz

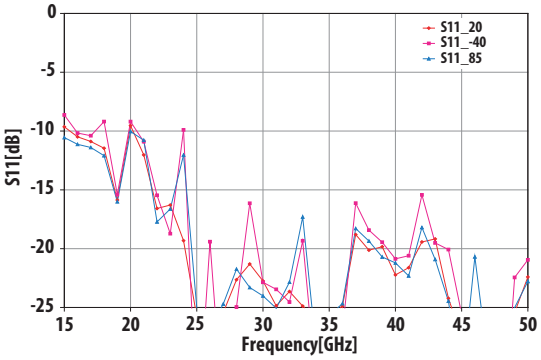


Figure 7. Typical S11 over temperature

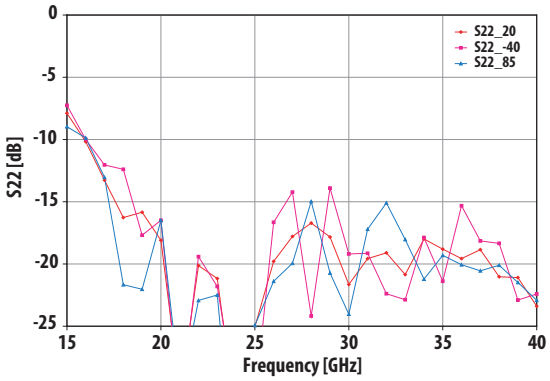


Figure 8. Typical S22 over temperature

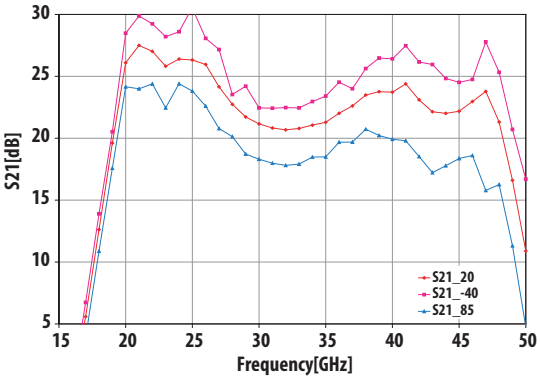


Figure 9. Typical Gain over temperature

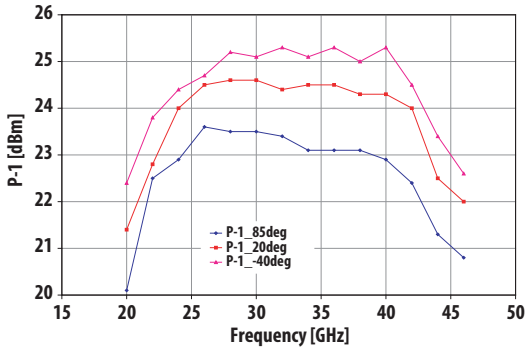


Figure 10. Typical One dB Compression over temperature

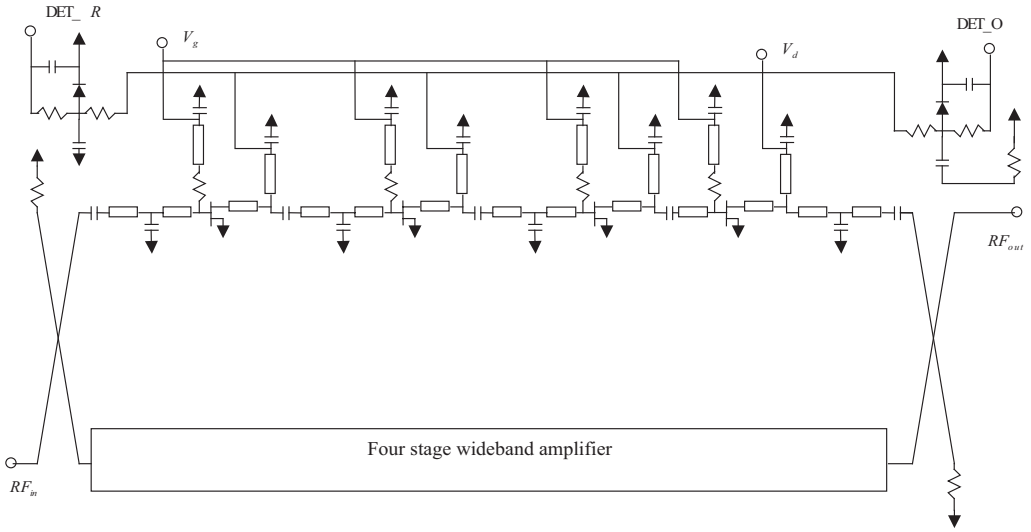


Figure 11. AMMC-6345 Schematic

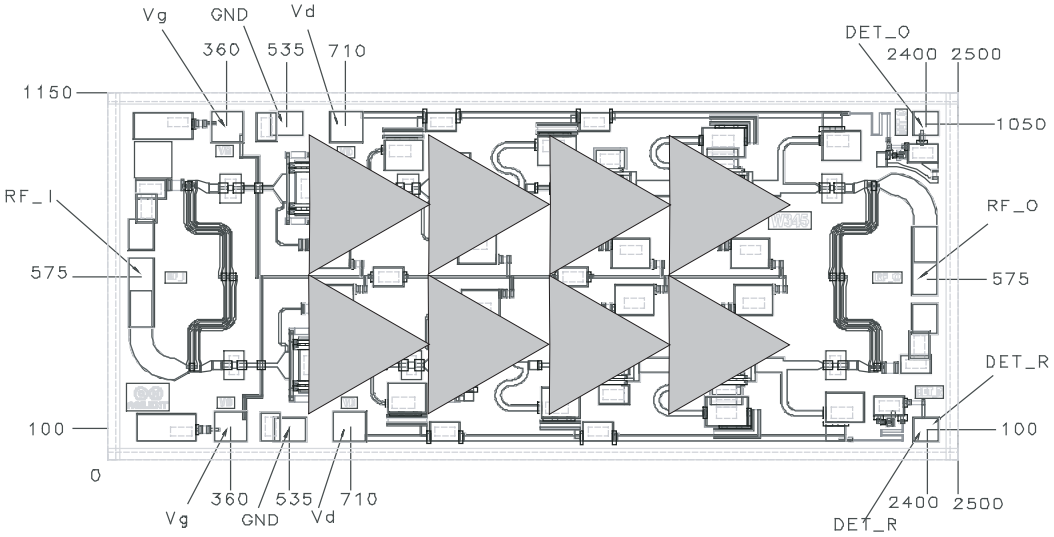


Figure 12. AMMC-6345 Bond pad locations

Typical Scattering Parameters [1], ($T_A = 25°C$, $V_d = 5$ V, $I_D = 480$ mA, $Z_{in} = Z_{out} = 50\ \Omega$)

Freq	S11			S21			S12			S22		
GHz	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase
1	-0.12	0.99	-19.15	-57.32	0.00	58.58	-84.82	5.74E-05	70.58	-0.08	0.99	-19.11
2	-0.36	0.96	-37.94	-55.89	0.00	177.71	-72.13	2.47E-04	12.23	-0.26	0.97	-38.22
3	-0.78	0.91	-56.52	-44.42	0.01	156.82	-73.64	2.08E-04	58.99	-0.68	0.92	-56.80
4	-1.24	0.87	-74.42	-44.66	0.01	18.13	-68.72	3.67E-04	-48.48	-0.90	0.90	-74.40
5	-1.83	0.81	-92.28	-41.91	0.01	-18.02	-64.72	5.81E-04	-6.62	-1.32	0.86	-92.91
6	-2.56	0.74	-109.82	-43.30	0.01	-74.83	-58.52	1.19E-03	-57.25	-1.83	0.81	-110.50
7	-3.48	0.67	-126.55	-46.99	0.00	-110.83	-59.25	1.09E-03	-84.92	-2.29	0.77	-127.65
8	-4.38	0.60	-142.45	-49.97	0.00	-167.43	-53.00	2.24E-03	-110.79	-2.68	0.73	-145.11
9	-5.32	0.54	-157.40	-44.20	0.01	-159.52	-50.89	2.86E-03	-135.83	-3.12	0.70	-163.32
10	-6.34	0.48	-171.66	-44.20	0.01	158.06	-49.45	3.37E-03	-155.71	-3.65	0.66	178.38
11	-7.32	0.43	175.24	-39.36	0.01	97.29	-49.30	3.43E-03	177.11	-4.23	0.61	159.66
12	-8.24	0.39	163.63	-32.87	0.02	28.85	-47.08	4.43E-03	165.36	-4.86	0.57	140.25
13	-9.06	0.35	152.38	-23.89	0.06	-33.55	-44.73	5.80E-03	129.26	-5.63	0.52	120.10
14	-9.65	0.33	141.86	-15.71	0.16	-84.27	-49.04	3.53E-03	119.12	-6.55	0.47	99.03
15	-10.03	0.32	132.41	-8.28	0.39	-133.47	-48.03	3.97E-03	126.80	-7.88	0.40	76.01
16	-10.37	0.30	119.00	-1.20	0.87	175.63	-43.10	7.00E-03	102.68	-9.68	0.33	53.09
17	-10.93	0.28	107.09	5.59	1.90	124.30	-47.51	4.21E-03	82.45	-12.19	0.25	28.87
18	-11.65	0.26	95.81	12.62	4.27	68.08	-53.58	2.09E-03	99.10	-15.60	0.17	5.21
19	-13.22	0.22	84.24	19.61	9.56	4.03	-46.83	4.55E-03	113.11	-19.86	0.10	-26.08
20	-12.80	0.23	94.60	26.10	20.19	-77.51	-47.66	4.14E-03	91.93	-25.66	0.05	-128.62
21	-10.44	0.30	68.43	27.50	23.72	-169.54	-49.36	3.40E-03	82.40	-20.66	0.09	120.00
22	-11.43	0.27	44.99	27.02	22.44	120.52	-50.90	2.85E-03	84.94	-21.88	0.08	103.50
23	-12.32	0.24	26.50	25.82	19.54	62.88	-47.58	4.18E-03	120.75	-17.37	0.14	57.61
24	-16.43	0.15	-13.72	26.40	20.90	11.34	-44.04	6.28E-03	118.67	-30.98	0.03	-23.98
25	-33.10	0.02	4.94	26.32	20.71	-44.56	-43.30	6.84E-03	97.04	-23.16	0.07	162.95
26	-18.10	0.12	116.73	25.96	19.87	-100.50	-38.62	1.17E-02	91.29	-13.22	0.22	130.94
27	-14.60	0.19	72.31	24.15	16.12	-150.08	-39.81	1.02E-02	79.49	-12.08	0.25	88.55
28	-14.58	0.19	36.54	22.74	13.71	169.71	-39.01	1.12E-02	66.21	-12.33	0.24	52.53
29	-15.53	0.17	16.63	21.72	12.19	131.45	-40.25	9.71E-03	52.18	-13.33	0.22	33.17
30	-17.91	0.13	8.16	21.16	11.43	90.73	-36.88	1.43E-02	39.00	-16.66	0.15	22.40
31	-19.92	0.10	17.96	20.83	11.01	54.44	-40.86	9.06E-03	27.57	-18.02	0.13	33.03
32	-19.18	0.11	10.21	20.68	10.82	17.84	-42.44	7.56E-03	23.47	-16.44	0.15	30.73
33	-24.05	0.06	-3.59	20.79	10.95	-18.83	-39.55	1.05E-02	34.21	-17.24	0.14	30.21
34	-21.13	0.09	8.05	21.06	11.30	-54.56	-41.21	8.70E-03	23.92	-14.43	0.19	13.79
35	-19.80	0.10	32.35	21.29	11.61	-95.07	-41.61	8.31E-03	24.14	-15.42	0.17	8.85
36	-23.53	0.07	32.05	22.02	12.61	-134.69	-42.14	7.82E-03	50.90	-18.45	0.12	-7.10
37	-17.56	0.13	5.55	22.61	13.50	-172.71	-38.23	1.23E-02	52.34	-13.77	0.20	3.88
38	-21.58	0.08	-52.01	23.49	14.95	141.12	-36.12	1.56E-02	17.88	-13.62	0.21	-41.65
39	-30.34	0.03	-114.67	23.76	15.42	95.64	-36.83	1.44E-02	6.44	-13.38	0.21	-69.60
40	-35.48	0.02	39.30	23.72	15.35	51.02	-43.22	6.91E-03	14.62	-20.67	0.09	-115.14
41	-17.21	0.14	143.54	24.39	16.57	-2.61	-34.82	1.81E-02	27.26	-14.67	0.18	178.89
42	-15.11	0.18	85.97	23.10	14.28	-50.90	-37.12	1.39E-02	23.49	-16.35	0.15	104.61
43	-12.25	0.24	53.08	22.14	12.80	-97.36	-35.25	1.73E-02	-1.27	-13.23	0.22	53.80
44	-12.99	0.22	17.98	22.01	12.61	-141.90	-34.23	1.94E-02	-13.24	-13.19	0.22	11.28
45	-15.86	0.16	13.27	22.18	12.86	168.99	-41.79	8.14E-03	-22.34	-18.56	0.12	-5.93
46	-23.96	0.06	15.35	22.97	14.08	113.52	-41.13	8.78E-03	-53.47	-32.37	0.02	-162.08
47	-24.63	0.06	102.35	23.78	15.45	42.51	-41.34	8.57E-03	-30.56	-19.03	0.11	168.70
48	-17.97	0.13	95.52	21.31	11.63	-33.83	-38.36	1.21E-02	50.51	-13.68	0.21	119.97
49	-14.20	0.19	46.11	16.60	6.76	-99.79	-41.40	8.51E-03	-16.54	-12.95	0.23	55.08
50	-14.67	0.18	22.54	10.89	3.50	-161.82	-35.04	1.77E-02	-0.97	-13.34	0.22	30.13

Note:
1. Data obtained from on-wafer measurements.

Typical Scattering Parameters [1], ($T_A = 25°C$, $V_d = 4$ V, $I_D = 480$ mA, $Z_{in} = Z_{out} = 50\ \Omega$)

Freq	S11			S21			S12			S22		
GHz	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase
1	-0.16	0.98	-19.19	-53.23	0.00	156.78	-68.83	3.62E-04	26.36	-0.08	0.99	-19.08
2	-0.39	0.96	-37.93	-67.95	0.00	55.37	-64.00	6.31E-04	-46.10	-0.26	0.97	-38.15
3	-0.78	0.91	-56.39	-40.54	0.01	131.73	-66.32	4.83E-04	20.50	-0.67	0.93	-56.74
4	-1.21	0.87	-74.41	-41.69	0.01	57.78	-69.07	3.52E-04	-130.05	-0.88	0.90	-74.37
5	-1.82	0.81	-92.14	-41.15	0.01	-19.49	-68.32	3.84E-04	-100.23	-1.31	0.86	-92.85
6	-2.56	0.74	-109.85	-41.77	0.01	-62.48	-65.80	5.13E-04	-99.25	-1.81	0.81	-110.47
7	-3.46	0.67	-126.58	-43.64	0.01	-133.57	-61.51	8.41E-04	-98.06	-2.28	0.77	-127.65
8	-4.41	0.60	-142.71	-56.23	0.00	-160.01	-55.12	1.75E-03	-107.65	-2.66	0.74	-145.13
9	-5.36	0.54	-157.57	-44.89	0.01	-148.14	-49.82	3.23E-03	-144.87	-3.08	0.70	-163.32
10	-6.34	0.48	-171.64	-41.33	0.01	164.06	-51.14	2.77E-03	-153.44	-3.66	0.66	178.32
11	-7.33	0.43	175.31	-37.05	0.01	100.59	-48.19	3.90E-03	171.91	-4.26	0.61	159.59
12	-8.29	0.39	163.66	-29.27	0.03	28.45	-45.53	5.29E-03	173.32	-4.89	0.57	140.42
13	-9.10	0.35	152.68	-21.03	0.09	-27.89	-45.00	5.62E-03	127.55	-5.70	0.52	120.37
14	-9.72	0.33	141.78	-13.45	0.21	-80.16	-48.38	3.81E-03	124.53	-6.66	0.46	99.20
15	-9.97	0.32	131.78	-6.07	0.50	-129.87	-46.59	4.68E-03	107.01	-8.03	0.40	76.86
16	-10.32	0.30	119.00	0.84	1.10	178.98	-44.78	5.77E-03	99.88	-9.85	0.32	54.59
17	-10.96	0.28	107.47	7.47	2.36	128.36	-49.02	3.54E-03	78.01	-12.37	0.24	30.81
18	-11.71	0.26	95.84	14.30	5.19	73.07	-50.33	3.04E-03	89.14	-15.82	0.16	7.87
19	-13.73	0.21	82.90	21.14	11.40	10.66	-48.40	3.80E-03	103.60	-20.31	0.10	-22.64
20	-13.44	0.21	101.63	27.75	24.40	-68.25	-47.42	4.25E-03	95.39	-24.25	0.06	-132.65
21	-10.17	0.31	73.51	29.29	29.14	-160.93	-46.73	4.61E-03	73.57	-17.32	0.14	120.11
22	-10.75	0.29	47.22	28.67	27.15	129.50	-49.84	3.22E-03	79.27	-19.85	0.10	96.63
23	-11.65	0.26	28.96	27.17	22.84	72.85	-48.29	3.85E-03	116.81	-15.29	0.17	58.23
24	-14.41	0.19	-12.94	27.83	24.63	25.32	-43.57	6.63E-03	111.65	-22.20	0.08	-12.94
25	-26.32	0.05	-49.37	28.13	25.51	-28.85	-43.25	6.88E-03	98.92	-27.47	0.04	-156.00
26	-17.59	0.13	144.74	28.31	26.02	-84.66	-38.80	1.15E-02	91.99	-13.18	0.22	146.66
27	-13.92	0.20	85.99	26.51	21.16	-136.32	-39.09	1.11E-02	75.56	-11.45	0.27	96.76
28	-13.53	0.21	44.86	24.96	17.69	-176.33	-39.34	1.08E-02	64.27	-11.51	0.27	55.30
29	-14.08	0.20	21.41	23.85	15.57	145.34	-39.82	1.02E-02	51.62	-12.15	0.25	33.35
30	-16.63	0.15	8.93	23.40	14.79	104.50	-36.76	1.45E-02	39.20	-15.64	0.17	14.37
31	-18.90	0.11	14.45	23.07	14.25	68.67	-40.95	8.97E-03	31.81	-18.45	0.12	25.83
32	-18.32	0.12	6.29	22.79	13.78	32.49	-41.36	8.55E-03	29.88	-16.78	0.14	27.77
33	-23.55	0.07	-19.09	23.02	14.15	-3.82	-41.06	8.85E-03	40.72	-18.01	0.13	28.28
34	-21.32	0.09	3.37	23.15	14.37	-39.05	-42.31	7.66E-03	23.74	-14.20	0.20	15.86
35	-20.70	0.09	39.68	23.32	14.66	-79.03	-41.70	8.23E-03	19.32	-15.46	0.17	12.48
36	-25.47	0.05	45.58	24.18	16.18	-117.44	-43.38	6.78E-03	45.45	-18.04	0.13	-10.74
37	-16.57	0.15	19.35	24.54	16.87	-154.34	-37.91	1.27E-02	48.15	-13.35	0.21	13.37
38	-18.72	0.12	-38.12	25.55	18.95	162.14	-36.08	1.57E-02	14.52	-12.05	0.25	-33.40
39	-24.40	0.06	-86.55	25.94	19.82	117.99	-36.60	1.48E-02	8.30	-11.11	0.28	-58.03
40	-34.49	0.02	-38.53	26.04	20.05	74.33	-42.30	7.67E-03	19.67	-16.29	0.15	-98.87
41	-16.04	0.16	176.52	27.45	23.57	21.73	-34.79	1.82E-02	31.11	-10.90	0.29	-152.87
42	-14.51	0.19	103.12	26.11	20.20	-29.49	-36.00	1.59E-02	19.97	-13.58	0.21	139.52
43	-10.71	0.29	62.82	24.89	17.57	-77.62	-35.46	1.69E-02	-8.94	-11.34	0.27	76.58
44	-11.02	0.28	24.70	24.50	16.78	-120.85	-34.68	1.85E-02	-14.35	-11.65	0.26	32.59
45	-13.86	0.20	16.77	24.68	17.13	-169.94	-41.32	8.59E-03	-10.57	-15.92	0.16	24.76
46	-21.24	0.09	-28.71	25.58	19.02	136.62	-40.03	9.97E-03	-46.31	-37.34	0.01	-5.22
47	-30.77	0.03	-132.19	26.58	21.32	69.26	-45.20	5.50E-03	-26.74	-26.86	0.05	-131.95
48	-18.22	0.12	137.35	24.46	16.71	-8.92	-37.76	1.29E-02	28.33	-14.49	0.19	146.63
49	-14.30	0.19	51.01	19.02	8.94	-75.39	-44.27	6.12E-03	-19.20	-13.28	0.22	60.47
50	-13.69	0.21	33.04	13.00	4.47	-134.58	-35.29	1.72E-02	4.22	-12.32	0.24	37.59

Note:
1. Data obtained from on-wafer measurements.

Typical Scattering Parameters [1], ($T_A = 25°C$, $V_d = 3$ V, $I_D = 480$ mA, $Z_{in} = Z_{out} = 50\ \Omega$)

Freq	S11			S21			S12			S22		
GHz	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase	dB	Mag	Phase
1	-0.17	0.98	-19.23	-56.53	0.00	-171.93	-70.34	3.04E-04	-153.86	-0.08	0.99	-19.04
2	-0.38	0.96	-37.92	-51.18	0.00	-121.05	-70.16	3.11E-04	-53.76	-0.25	0.97	-38.12
3	-0.80	0.91	-56.53	-44.83	0.01	160.51	-77.47	1.34E-04	51.20	-0.68	0.93	-56.61
4	-1.24	0.87	-74.31	-38.86	0.01	30.95	-63.95	6.34E-04	-26.36	-0.88	0.90	-74.33
5	-1.83	0.81	-92.16	-42.87	0.01	-0.87	-64.81	5.75E-04	-27.92	-1.29	0.86	-92.83
6	-2.58	0.74	-109.70	-42.04	0.01	-82.73	-61.74	8.19E-04	-55.95	-1.79	0.81	-110.36
7	-3.45	0.67	-126.71	-47.50	0.00	-124.89	-59.13	1.10E-03	-96.04	-2.27	0.77	-127.57
8	-4.41	0.60	-142.79	-51.25	0.00	-125.67	-56.49	1.50E-03	-112.50	-2.66	0.74	-145.05
9	-5.34	0.54	-157.73	-43.78	0.01	-158.45	-50.24	3.08E-03	-139.23	-3.08	0.70	-163.37
10	-6.39	0.48	-171.67	-40.49	0.01	155.31	-50.30	3.05E-03	-160.03	-3.67	0.66	178.35
11	-7.43	0.43	174.81	-33.61	0.02	103.90	-48.81	3.63E-03	172.69	-4.28	0.61	159.54
12	-8.39	0.38	163.69	-25.85	0.05	33.83	-46.83	4.55E-03	168.52	-4.97	0.56	140.38
13	-9.21	0.35	152.72	-17.98	0.13	-24.57	-45.51	5.31E-03	133.77	-5.86	0.51	120.58
14	-9.84	0.32	141.91	-10.27	0.31	-76.24	-49.80	3.24E-03	122.01	-6.86	0.45	99.88
15	-10.21	0.31	132.89	-3.24	0.69	-126.21	-47.33	4.30E-03	120.33	-8.29	0.39	78.40
16	-10.50	0.30	119.24	3.46	1.49	-177.90	-44.28	6.11E-03	104.06	-10.14	0.31	57.19
17	-11.09	0.28	107.27	9.86	3.11	131.33	-47.78	4.09E-03	70.83	-12.68	0.23	34.14
18	-11.92	0.25	95.38	16.43	6.63	76.66	-46.82	4.56E-03	94.42	-16.14	0.16	13.43
19	-14.27	0.19	81.85	22.99	14.11	15.73	-47.00	4.47E-03	103.59	-20.66	0.09	-18.52
20	-13.89	0.20	109.87	29.48	29.77	-61.10	-46.50	4.73E-03	95.56	-22.17	0.08	-143.49
21	-9.77	0.32	78.10	30.91	35.10	-152.91	-48.99	3.55E-03	80.33	-15.57	0.17	117.96
22	-10.36	0.30	50.77	30.16	32.21	139.42	-50.84	2.87E-03	78.70	-17.93	0.13	90.58
23	-10.95	0.28	33.06	28.41	26.33	83.98	-47.76	4.09E-03	119.47	-13.25	0.22	59.11
24	-12.82	0.23	-7.39	28.94	27.98	41.41	-43.84	6.43E-03	113.60	-17.27	0.14	0.38
25	-20.01	0.10	-46.93	29.56	30.07	-9.55	-43.25	6.88E-03	101.42	-24.21	0.06	-68.05
26	-16.16	0.16	-172.38	30.49	33.45	-62.31	-37.97	1.26E-02	93.87	-13.35	0.22	177.64
27	-13.11	0.22	109.32	29.15	28.67	-116.72	-38.53	1.18E-02	73.46	-11.00	0.28	111.78
28	-12.47	0.24	57.26	27.40	23.44	-157.52	-38.07	1.25E-02	60.67	-10.32	0.30	62.98
29	-12.52	0.24	29.69	26.16	20.32	163.66	-40.03	9.96E-03	48.58	-10.89	0.29	37.37
30	-14.80	0.18	11.67	25.97	19.89	122.81	-37.42	1.35E-02	39.15	-14.08	0.20	10.50
31	-17.96	0.13	12.34	25.69	19.24	87.37	-40.96	8.96E-03	31.23	-18.34	0.12	15.03
32	-16.96	0.14	6.25	25.24	18.29	51.25	-41.53	8.38E-03	21.47	-17.26	0.14	24.80
33	-20.37	0.10	-39.68	25.57	18.98	15.77	-39.63	1.04E-02	31.00	-19.79	0.10	22.11
34	-21.47	0.08	-3.95	25.51	18.86	-19.79	-42.35	7.63E-03	29.06	-13.89	0.20	17.95
35	-22.83	0.07	58.23	25.74	19.36	-59.85	-41.35	8.56E-03	19.38	-15.72	0.16	14.36
36	-31.25	0.03	74.59	26.60	21.37	-96.11	-41.97	7.97E-03	52.10	-17.91	0.13	-22.92
37	-16.05	0.16	33.66	26.59	21.35	-132.80	-38.56	1.18E-02	48.65	-13.59	0.21	22.15
38	-16.50	0.15	-19.00	27.70	24.26	-173.30	-36.70	1.46E-02	19.68	-11.01	0.28	-23.76
39	-20.37	0.10	-58.53	28.06	25.30	143.64	-37.38	1.35E-02	11.78	-9.50	0.33	-45.77
40	-27.13	0.04	-29.10	28.27	25.92	100.93	-44.07	6.26E-03	24.64	-13.62	0.21	-88.86
41	-13.76	0.21	-139.61	30.33	32.83	52.80	-34.12	1.97E-02	35.07	-7.29	0.43	-123.86
42	-13.77	0.20	125.55	29.21	28.86	-3.22	-36.28	1.53E-02	15.02	-9.84	0.32	167.90
43	-9.12	0.35	79.00	27.77	24.47	-55.08	-35.34	1.71E-02	-13.52	-8.57	0.37	102.39
44	-9.17	0.35	36.59	26.84	21.98	-97.87	-34.73	1.83E-02	-24.73	-9.16	0.35	55.64
45	-12.24	0.24	23.69	26.90	22.13	-146.40	-41.12	8.79E-03	-26.28	-13.03	0.22	47.72
46	-16.79	0.14	-23.95	27.55	23.85	161.76	-43.52	6.67E-03	-47.41	-20.18	0.10	47.13
47	-19.26	0.11	-63.42	28.08	25.36	100.83	-45.53	5.29E-03	13.07	-15.83	0.16	-14.71
48	-18.84	0.11	-143.35	26.33	20.72	25.90	-35.90	1.60E-02	56.12	-17.39	0.14	-122.16
49	-13.89	0.20	61.11	20.46	10.54	-43.29	-44.84	5.73E-03	-23.47	-15.07	0.18	63.99
50	-12.26	0.24	44.00	14.02	5.02	-100.68	-32.47	2.38E-02	-7.26	-12.37	0.24	50.76

Note:
1. Data obtained from on-wafer measurements.

Biasing and Operation

AMMC-6345 has quite flexible drain biasing conditions. Recommended quiescent DC bias condition for optimum power and linearity performances is Vd=5 volts with Vg set for Id=480 mA. For high gain applications, the AMMC-6345 can be biased at Vd=3V. Minor improvements in performance are possible depending on the application. The drain bias voltage range is 3 to 5.5V. A single DC gate supply connected to Vg will bias all gain stages. Muting can be accomplished by setting Vg to the pinch-off voltage Vp.

An optional output power detector network is also provided. The differential voltage between the Det-Ref and Det-Out pads can be correlated with the RF power emerging from the RF output port. The detected voltage is given by :

$$V = \left(V_{ref} - V_{\det}\right) - V_{ofs}$$

where V_{ref} is the voltage at the DET_R port, $V_{\det}$ is a voltage at the DET_O port, and V_{ofs} is the zero-input-power offset voltage. There are three methods to calculate :

1. V_{ofs} can be measured before each detector measurement (by removing or switching off the power source and measuring). This method gives an error due to temperature drift of less than 0.01dB/50°C.
2. V_{ofs} can be measured at a single reference temperature. The drift error will be less than 0.25dB.
3. V_{ofs} can either be characterized over temperature and stored in a lookup table, or it can be measured at two temperatures and a linear fit used to calculate at any temperature. This method gives an error close to the method #1.

The RF ports are AC coupled at the RF input to the first stage and the RF output of the final stage. No ground wired are needed since ground connections are made with plated through-holes to the backside of the device.

Assembly Techniques

The backside of the MMIC chip is RF ground. For microstrip applications the chip should be attached directly to the ground plane (e.g. circuit carrier or heatsink) using electrically conductive epoxy[1,2].

For best performance, the topside of the MMIC should be brought up to the same height as the circuit surrounding it. This can be accomplished by mounting a gold plate metal shim (same length and width as the MMIC) under the chip which is of correct thickness to make the chip and adjacent circuit the same height. The amount of epoxy used for the chip and/or shim attachment should be just enough to provide a thin fillet around the bottom perimeter of the chip or shim. The ground plain should be free of any residue that may jeopardize electrical or mechanical attachment.

The location of the RF bond pads is shown in Figure 12. Note that all the RF input and output ports are in a Ground-Signal configuration.

RF connections should be kept as short as reasonable to minimize performance degradation due to undesirable series inductance. A single bond wire is normally sufficient for signal connections, however double bonding with 0.7 mil gold wire or use of gold mesh is recommended for best performance, especially near the high end of the frequency band.

Notes:
1. Ablebond 84-1 LM1 silver epoxy is recommended.
2. Eutectic attach is not recommended and may jeopardize reliability of the device.

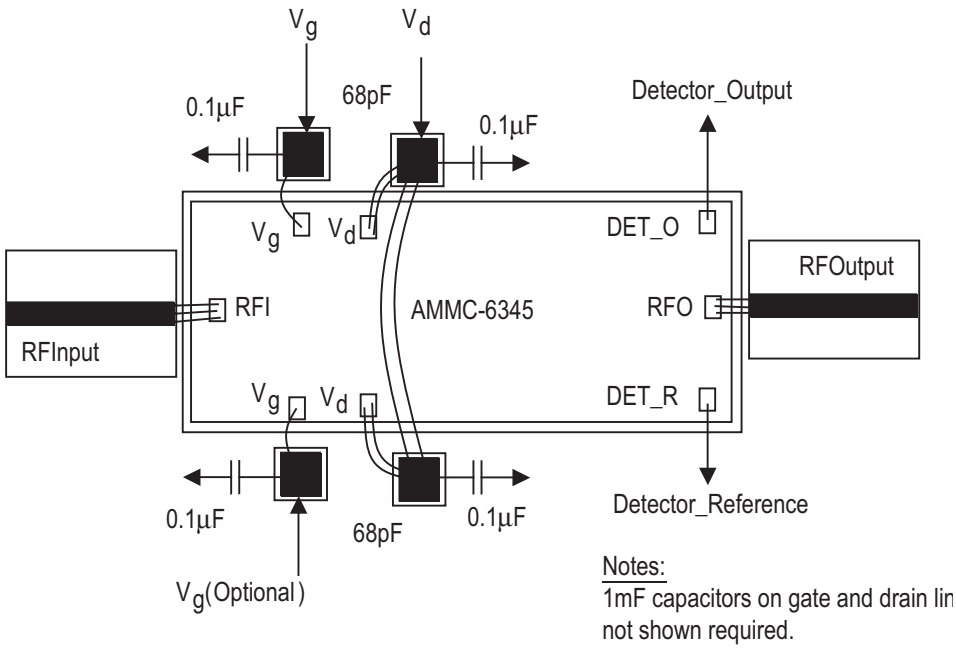


Figure 13. AMMC-6345 Assembly diagram

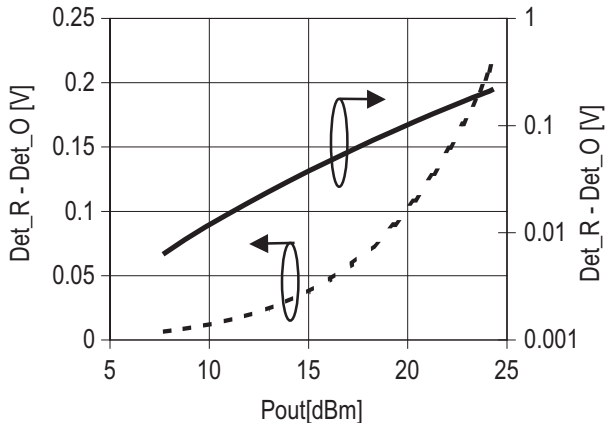


Figure 14. AMMC-6345 Typical Detector Voltage and Output Power, Freq=40 GHz

Ordering Information:

AMMC-6345-W10 = 10 devices per tray

AMMC-6345-W50 = 50 devices per tray

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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