1. Description

- The M1716Q is a 12.5-15GHz power amplifier manufactured using a 0.25μm gate-length GaAs pHEMT process. The M1716Q is available in a low-cost, surface-mount 16 leads 3mmx3mm QFN package and is ideally suited for Point-to-Point Radio and Ku-Band VSAT ground terminals. All devices undergo 100% RF measurements.



M1716Q-PDS-F01

Figure 1. M1716Q Package Outline

2. Applications

- Point-to-Point Radio
- Ku-band VSAT
- Ku-band Phase Array

3. Features

- Frequency Range: 12.5-15GHz
- Output Power (P_{-1dB}): 24dBm
- Power Gain: 15dB
- Typical Power Added Efficiency: 33%
- Operating Bias: 5V (V_D), I_{DQ}=66mA
- Small Signal Gain: 15.5dB
- Input Return Loss: -13dB
- Output Return Loss: -10dB
- Package: 3.00 x 3.00 x 0.85mm QFN

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	Typical Value	Units
Frequency Range	12.5-15	GHz
Power Gain	15	dB
Output Power at 1dB Compression	24	dBm
Power Added Efficiency	33	%
Drain Dynamic Current	66	mA
Small Signal Gain	15.5	dB
Input Return Loss	-13	dB
Output Return Loss	-10	dB

• Test condition: V_D=5V，V_G=-0.8V，I_{DQ}=66mA，CW，25°C. EVB Test, De-embedded to device reference plane.

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5. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	6	V
Gate-Source Voltage	V_{GS}	-2	V
Maximum Input Power	P_{IN}	15	dBm
Maximum Forward Gate Current	$I_{G\ Max}$	200	mA
Storage Temperature Range	T_{STG}	- 65 ~ +150	°C

6. Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Temperature Range	-40	25	85	°C
Drain Voltage, V_{DS}	-	5	-	V
Drain Bias Current, I_{DQ}	-	66	-	mA
Gate Voltage (typical), V_{GS}	-	-0.8	-	V

7. RF Characteristics (T_C = 25˚C)

Table 4. RF Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Small Signal Gain	G_{lin}	14	15.5	17.6	dB
Power Gain	G_P	14	14.5	15.3	dB
Output Power at 1dB Compression	OP_{-1dB}	23.4	24	24.1	dBm
Power Added Efficiency	PAE	29.5	33	36.7	%
Drain Dynamic Current	I_d	-	140	-	mA
Input Return Loss	S11	-	-13	-	dB
Output Return Loss	S22	-	-10	-	dB

• Test condition: V_D=5V，V_G=-0.8V，I_{DQ}=66mA，CW，25°C. EVB Test, De-embedded to device reference plane.

8. Typical Performance Curve

■ Small signal Characteristics Curve (T_C = 25˚C)

(V_D=5V, V_G=-0.8V, I_{DQ}=66mA, CW)

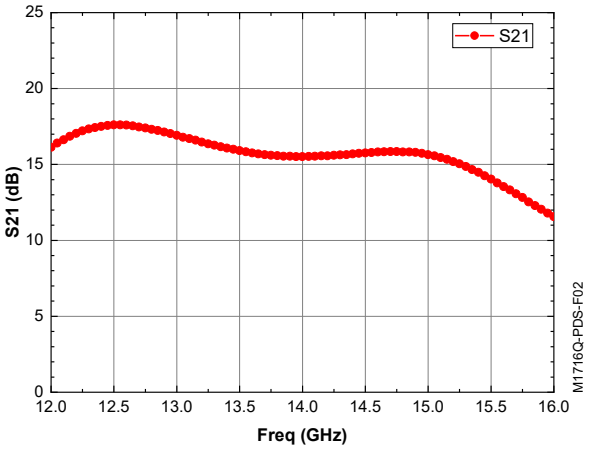


Figure 2. Small Signal Gain vs. Frequency

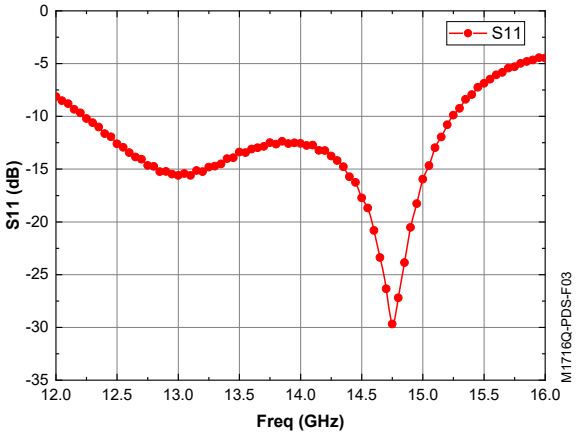


Figure 3. Input Return Loss vs. Frequency

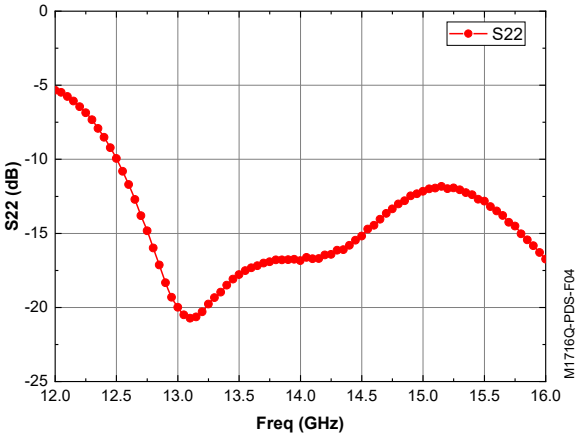


Figure 4. Output Return Loss vs. Frequency

■ Power Characteristic Curve

（V_D=5V，V_G=-0.8V，I_{DQ}=66mA，P_{IN}=8.5dBm，CW）

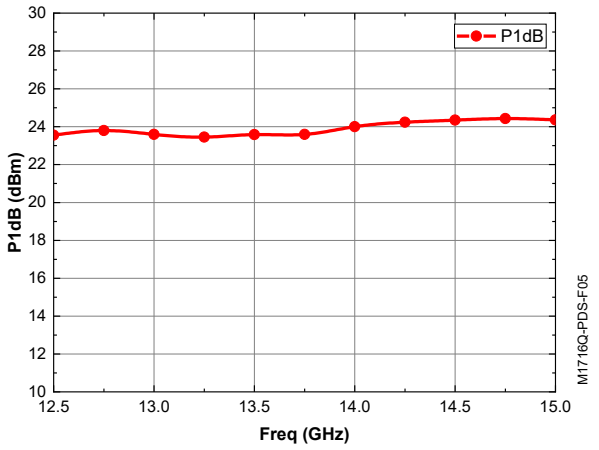


Figure 5. Output Power vs. Frequency

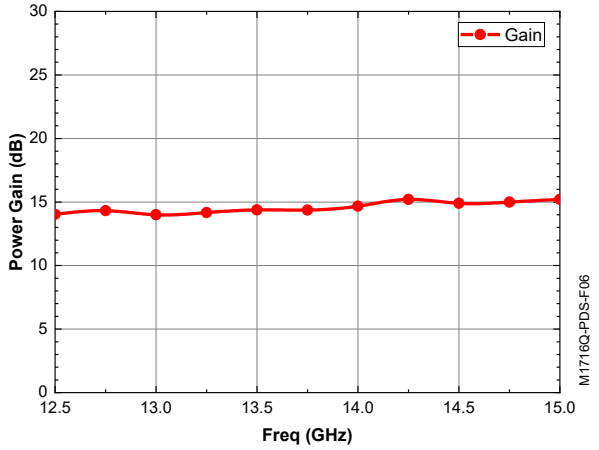


Figure 6. Power Gain vs. Frequency

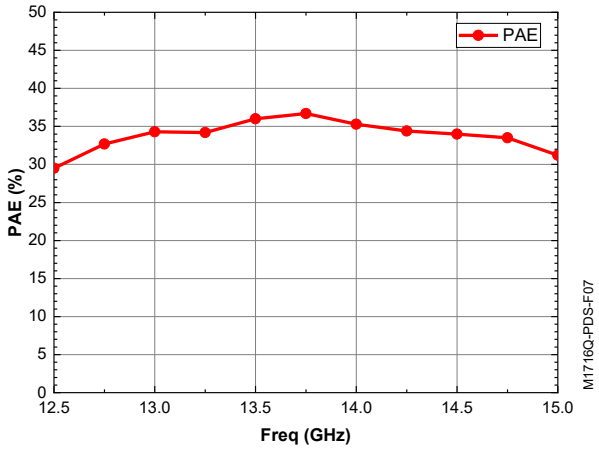


Figure 7. Power Added Efficiency vs. Frequency

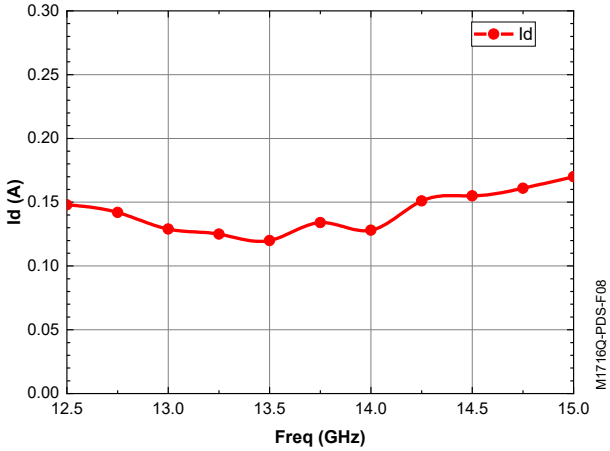
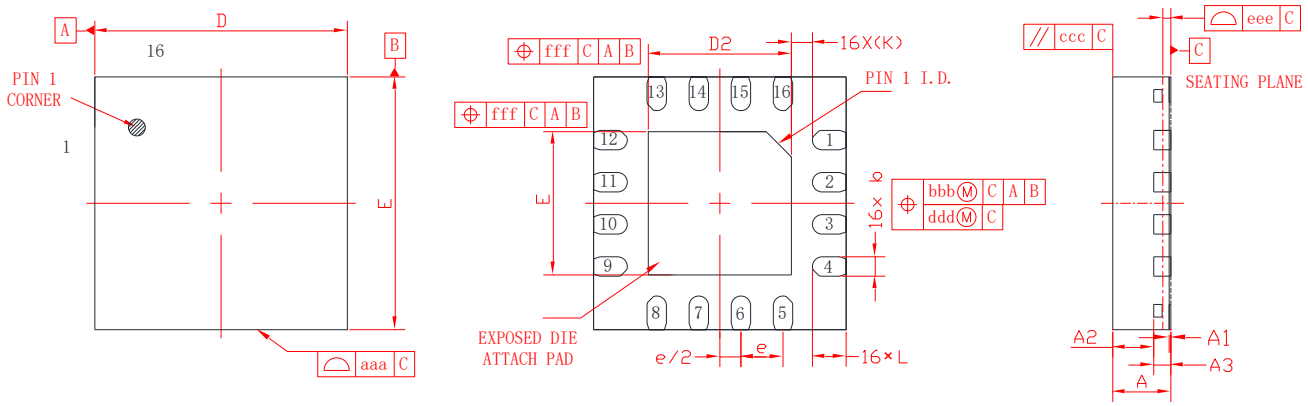


Figure 8. Drain Dynamic Current vs. Frequency

9. Package Diagram



M1716Q-PDS-F09

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.55	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.18	0.23	0.28
BODY SIZE	X	D		3 BSC	
	Y	E		3 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	D2	1.6	1.7	1.8
	Y	E2	1.6	1.7	1.8
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		0.25 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.1	
		bbb		0.05	
EXPOSED PAD OFFSET		fff		0.1	

- Dimensions shown in micrometre

Figure 9. M1716Q Package Information

Table 5. Pad Description

Pad	Symbol	Description
1,2,4,5,7,8,9,11,12,13,15,16	N/C	No internal connection. Recommend to GND at the PCB level
3	RF_{IN}	RF Input. 50Ohm. DC blocking capacitor is not required.
10	RF_{OUT}	RF Output. 50Ohm. DC blocking capacitor is not required.
6	V_G	Gate Voltage. Bypass network required, refer to Figure 10.
14	V_D	Drain Voltage. Bypass network required, refer to Figure 10.

10. Application Circuit

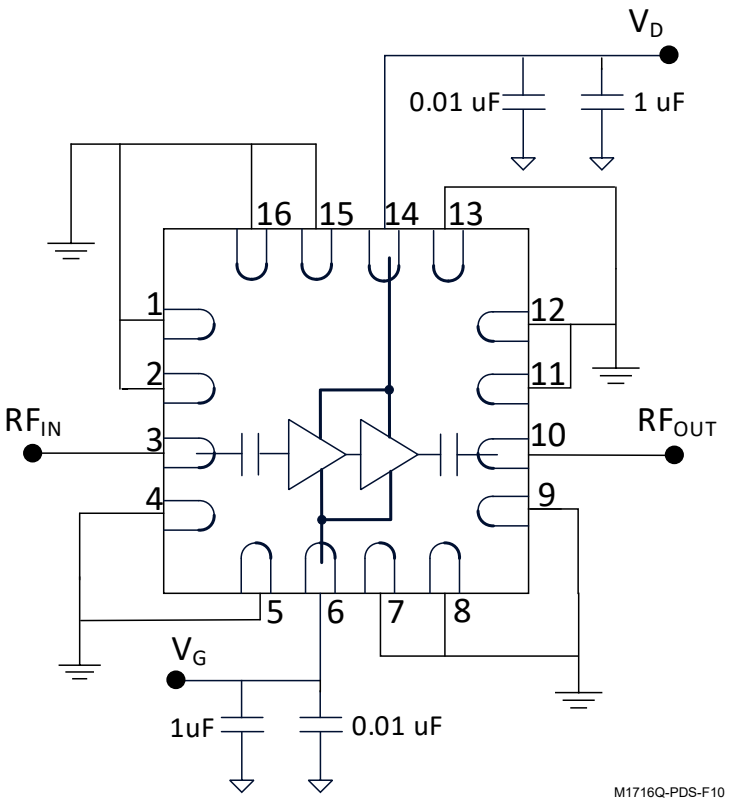


Figure 10. M1716Q Application Circuit

Table 6. Bias Procedure

Bias-up Procedure	Bias-down Procedure
1) Set V_{GS} to the pinch-off voltage, typically I_{DS}	1) Turn off RF signal
2) Turn on V_{DS} to nominal supply voltage (5V)	2) Turn off V_{DS}
3) Slowly adjust V_{GS} until I_{DS} current is attained	3) Wait two seconds to allow drain capacitor to discharge
4) Apply RF input power to desired level	4) Turn off V_{GS}

11. Recommended Solder Temperature Profile

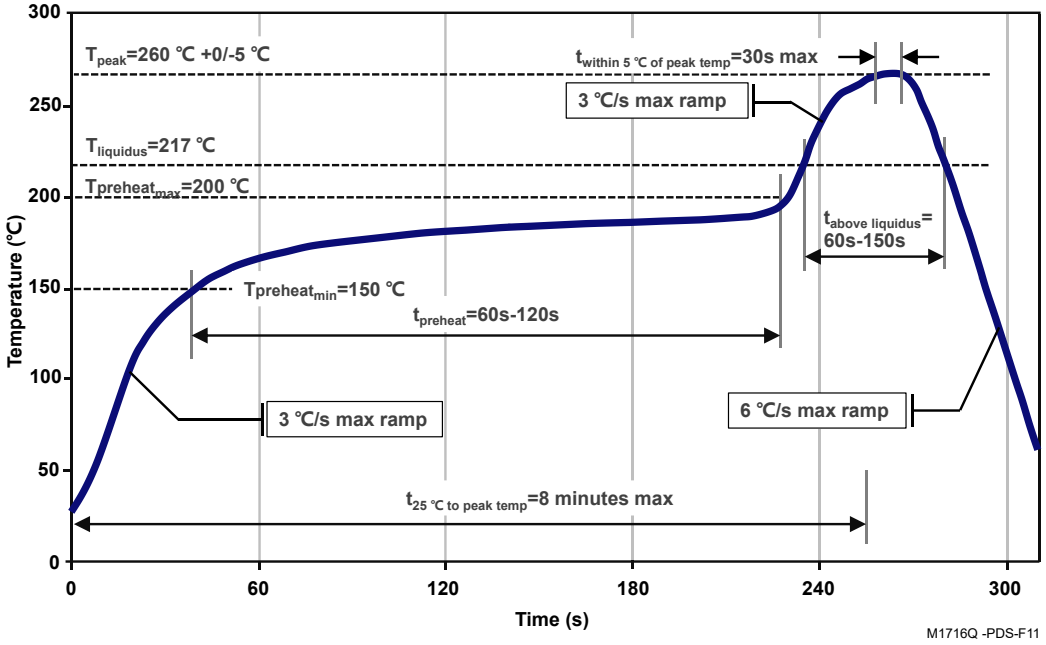


Figure 11. Recommended Solder Temperature Profile

12. Handling Precautions

■ ESD Caution

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



13. Contact Information

For the latest specifications, additional product information, technical support and sales support, please contact:

- **Email:** RF.support@raytrontek.com
- **Web:** www.raytrontek.com

14. Disclaimer

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