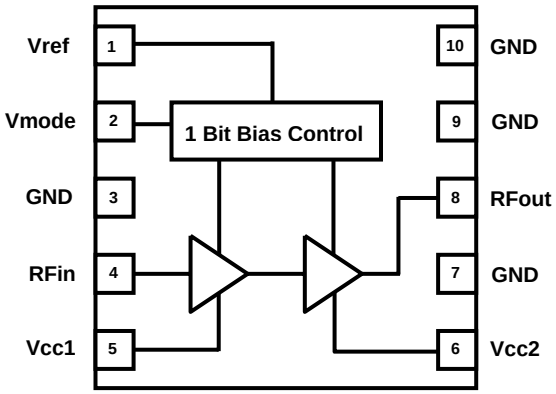
TQM713019

Data Sheet

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Functional Block Diagram



Product Description

The TQM713019 is a 3V, 2 stage GaAs HBT Power Amplifier Module designed for use in mobile phones. Its extremely small 4x4mm package makes it ideal for today's compact data enabled phones. Its RF performance meets the requirements for products designed to IS-95/98 standards.

The TQM713019 is designed on TriQuint's advanced InGaP HBT GaAs technology offering state of the art reliability, temperature stability, and ruggedness. Selectable bias mode and a shutdown mode with low leakage current improves talk and standby time. The output match, realized within the module package, optimizes efficiency/linearity at maximum rated output power. The module is a 4x4mm land grid array with backside ground. The TQM713019 is footprint compatible with industry standard 4x4mm CDMA PA modules.

Electrical Specifications

Parameter	Min	Typ	Max	Units
Frequency	824		849	MHz
CDMA mode maximum Pout[1]		28		dBm
Gain		29		dB
CDMA ACPR		50		dBc
CDMA ALTR		65		dBc
Power Supply Current @ 28dBm		450		mA
I_{REF}		2.0		mA
Rx Band Noise		-140		dBm/Hz

Note 1 : CDMA Mode: V_{CC1}=3.4VDC, V_{CC2}=3.4VDC, V_{REF}=2.85VDC, Tc=25°C

Features

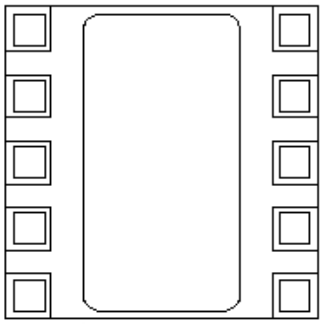
- InGaP HBT Technology
- High Efficiency: 41% CDMA
- Low Leakage Current: < 1uA
- Low Icq = 55mA
- Supports new chipsets with Vref @ 2.6V
- Capable of running as 0-bit PA in low bias mode to 28dBm
- Optimized for 50Ω system
- Small 10 pin 4x4mm module
- Excellent Rx band noise performance
- CDMA 1XRTT, 1XEV-DO compliant
- Full ESD protection

Applications

- IS-95 / CDMA2000
- Single mode, dual mode, and tri mode CDMA/AMPS phones

Package Style

4mm x 4mm LGA package



3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Absolute Maximum Ratings

Symbol	Parameter	Absolute Maximum Value	Units
P_{IN}	RF Input Power	10	dBm
V_{CC}	Supply Voltage	0.0 to 5.0	V_{DC}
V_{REF}	Reference Voltage	0.0 to 3.5	V_{DC}
V_{MODE}	Vmode (1 bit Bias Control)	0.0 to 3.5	V_{DC}
T_{CASE}	Case Operating Temperature	-40 to +100	°C
T_{STORE}	Storage Temperature	-55 to +150	°C

Note: The part may not survive all maximums applied simultaneously.

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ/Nom	Max.	Units
V_{CC}	Supply Voltage	3.2	3.4	4.2	V_{DC}
V_{REF}	Reference Voltage				
PA On		2.70	2.85	2.95	V_{DC}
PA Off		0	<0.5	-	V_{DC}
V_{MODE}	Vmode (1 bit Bias Control)				
High Bias Mode		0	-	0.5	V_{DC}
Low Bias Mode		2.5	2.85	3.0	V_{DC}
T_{CASE}	Case Operating Temperature	-30	25	+85	°C

Power Range Truth Table

Parameter	V_{REF}	V_{MODE}	Range
High Power	2.85 V	Low	16 dBm – 28 dBm
Low Power	2.85 V	High	< 16 dBm
Shut Down	0.0 V	Low	-

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

CDMA (IS-98C) Electrical Characteristics[1]

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		824		849	MHz
Large Signal Gain	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
Pout = +28 dBm		25	29	33	dB
Pout = +16 dBm		23	27		dB
Adjacent Channel Power (ACPR1)[2]	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
+16dBm ≤ Pout ≤ +28dBm			-50	-45	dBc
Pout ≤ +16dBm			-52	-45	dBc
Adjacent Channel Power (ACPR2)[2]	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
+16dBm ≤ Pout ≤ +28dBm			-60	-57	dBc
Pout ≤ +16dBm			-65	-57	dBc
Quiescent Current	V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 2.85V ; Temp = 25 ºC		55		mA
I_{REF}	Pout = +28dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 0V; Temp = 25ºC		2	3	mA
I_{MODE}	All Conditions			75	uA
PAE	Pout = +28dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 0V; Temp = 25ºC		41		%
PAE	Pout = +16dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 2.85V; Temp = 25ºC		9.5		%
Input VSWR	All Terminals		1.5 :1	2.0 :1	
Harmonics	Pout ≤ +28dBm				
2fo			-50	-40	dBc
3fo			-65	-40	dBc
Spurious / Stability	Pout ≤ +28dBm; 10:1 VSWR; V_{CC} = 3.2 to 4.2V; -30 ºC < Temp < 85ºC			-65	dBc
Ruggedness	10:1 VSWR; Pin = +10dBm; -30 ºC < Temp < 85ºC		No degradation		
Noise Power in Rx Band	Pout = +28dBm, IS-95 Standard		-140	-135	dBm/Hz

Note 1: Test Conditions: V_{CC}=3.4V_{DC} , V_{REF}=2.85V_{DC}, T_C = 25℃ unless otherwise specified; TriQuint Test Board

Note 2: ACPR1 Measured @ ±885kHz Offset; ACPR2 Measured @ ±1.98MHz

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cdma2000 (IS-98D) Electrical Characteristics[1,3]

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		824		849	MHz
Large Signal Gain	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
Pout = +27.5 dBm		25	28.5		dB
Pout = +16 dBm		23	27		dB
Adjacent Channel Power (ACPR1)[2]	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
+16dBm ≤ Pout ≤ +27.5dBm			-50	-45	dBc
Pout ≤ +16dBm			-55	-45	dBc
Adjacent Channel Power (ACPR2)[2]	V_{CC} = 3.2 to 4.2V; V_{REF} = 2.85V; -30 ºC < Temp < 85ºC				
+16dBm ≤ Pout ≤ +27.5dBm			-60	-57	dBc
Pout ≤ +16dBm			-65	-57	dBc
Quiescent Current	V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 2.85V ; Temp = 25 ºC		55		mA
I_{REF}	Pout = +27.5dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 0V; Temp = 25ºC		2	3	mA
I_{MODE}	All Conditions			75	uA
PAE	Pout = +27.5dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 0V; Temp = 25ºC		40		%
PAE	Pout = +16dBm; V_{CC} = 3.4V; V_{REF} = 2.85V; V_{MODE} = 2.85V; Temp = 25ºC		9.5		%
Input VSWR	All Terminals		1.5 :1	2.0 :1	
Noise Power in Rx Band	Pout = +28dBm, IS-95 Standard		-140	-135	dBm/Hz

Note 1: Test Conditions: V_{CC}=3.4V_{DC} , V_{REF}=2.85V_{DC}, T_C = 25 ℃ unless otherwise specified; TriQuint Test Board

Note 2: ACPR1 Measured @ ±885kHz Offset; ACPR2 Measured @ ±1.98MHz

Note 3: 9600 bps Fundamental and Supplemental Traffic Channels (0 dB), peak-to-average ratio (CCDF=1%) = 4.5dB

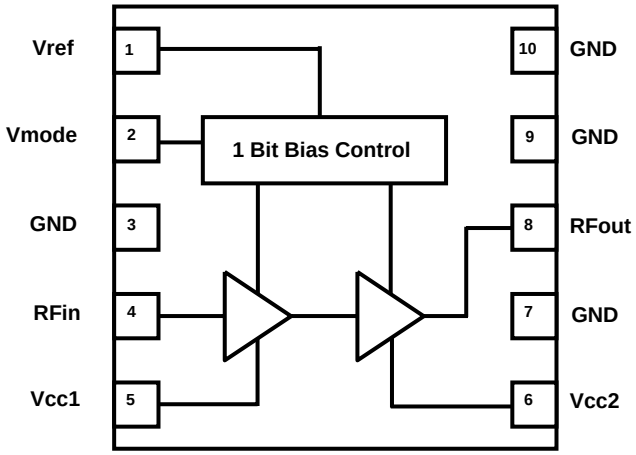
AMPS Mode Electrical Characteristics[1]

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		824		849	MHz
High Power Output, Pout			31.5		dBm
Large Signal Gain			27.5		dB
PAE	Pout = 31.5dBm; V_{CC} = 3.4V; Temp = 25ºC	50	57		%

Note 1: Test Conditions: V_{CC}=3.4V_{DC} , V_{REF}=2.85V_{DC}, T_C = 25 ℃ unless otherwise specified; TriQuint Test Board

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

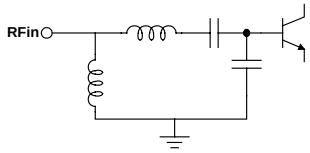
Pin Out and Assignments



Pin	Symbol	Description
1	V_{REF}	Regulated voltage for bias setting. V_{REF} is set to $0V_{DC}$ to power off the TQM713019
2	V_{MODE}	1 step bias control
3	GND	Ground
4	RF_{IN}	RF input. The RF circuit is DC grounded internally[2]. 50 Ohm RF impedance.
5	V_{CC1}	Collector voltage for input stage
6	V_{CC2}	Collector voltage for output stage
7	GND	Ground
8	RF_{OUT}	RF output. The RF circuit is DC blocked internally. 50 Ohm RF impedance
9	GND	Ground
10	GND	Ground
Paddle[1]	GND	Device ground and thermal path for heat removal

Note 1: TriQuint recommends the use of several via holes to the backside ground under the paddle

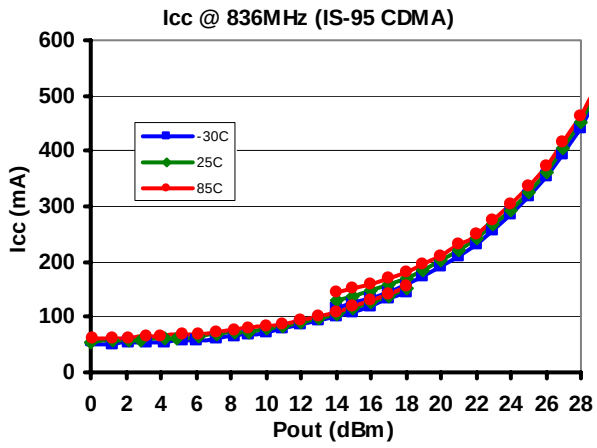
Note2: Internal DC ground for RF_{IN}

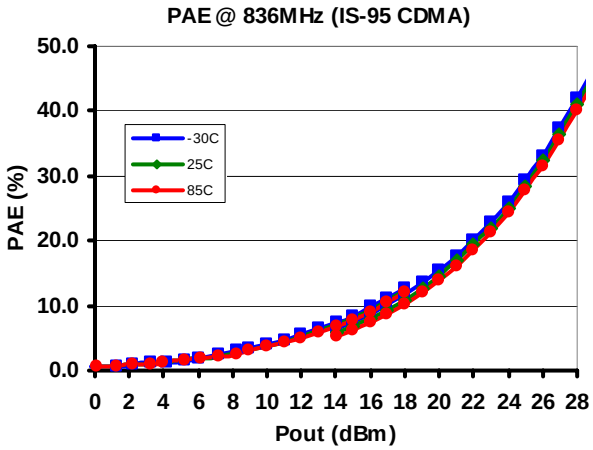


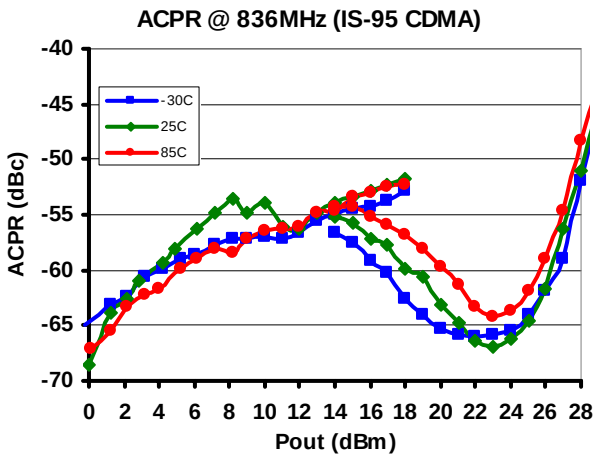
3V HBT GaAs CDMA 4x4mm Power Amplifier Module

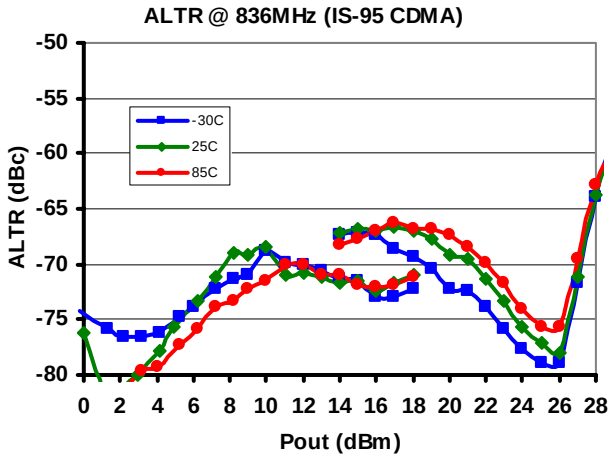
Typical Performance

Test Conditions (Unless Otherwise Specified): V_{CC}=3.4V_{DC}, V_{REF}=2.85V_{DC}, V_{MODE}= 0 or 2.85V_{DC}, P_{OUT}=28.0 or 16dBm



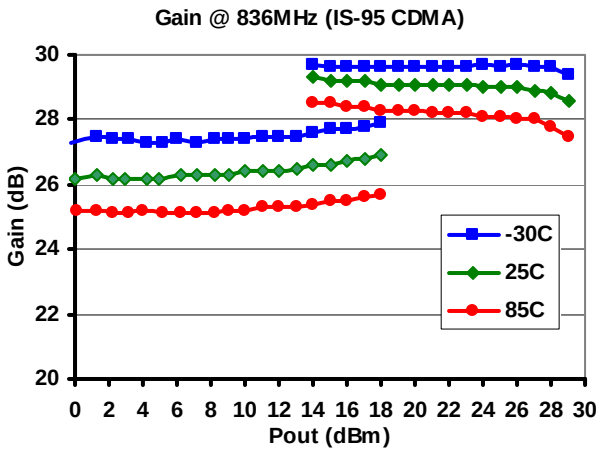


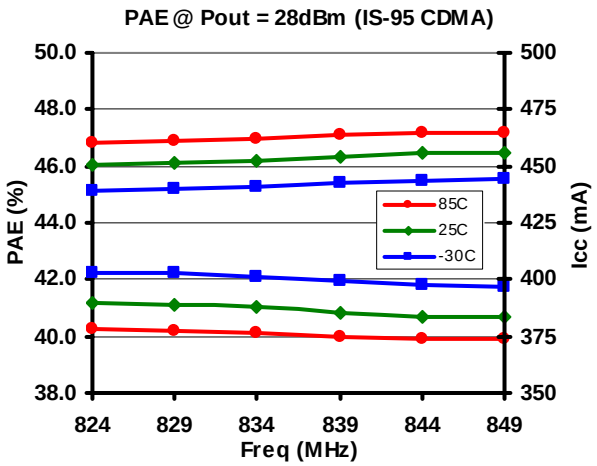


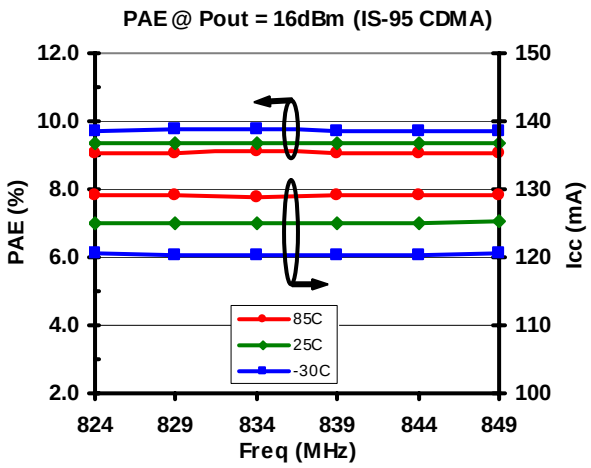


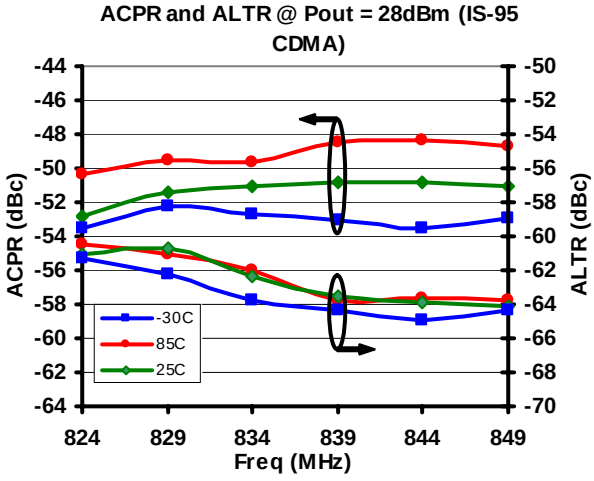
3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Typical Performance (Continued)



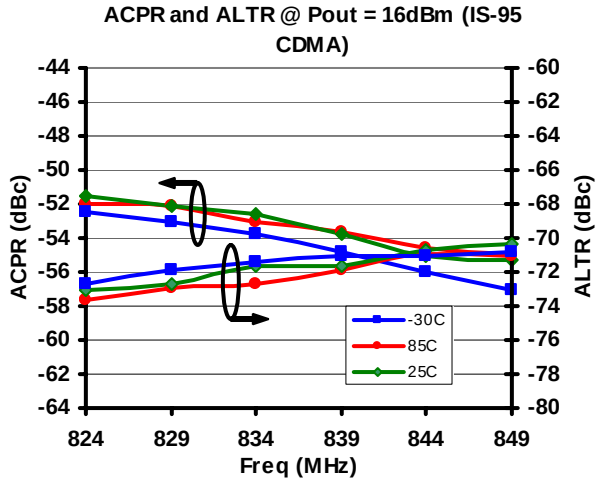


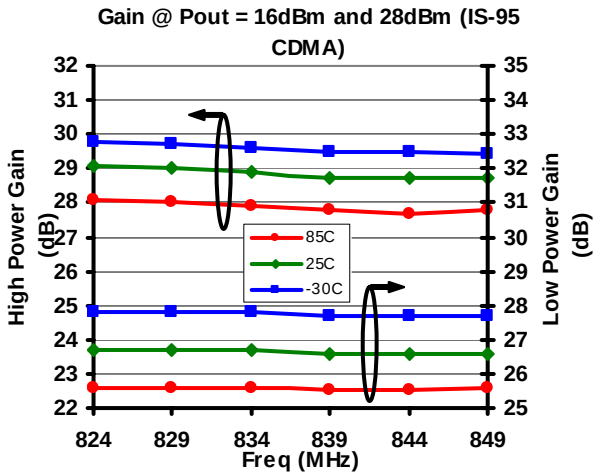




3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Typical Performance (Continued)

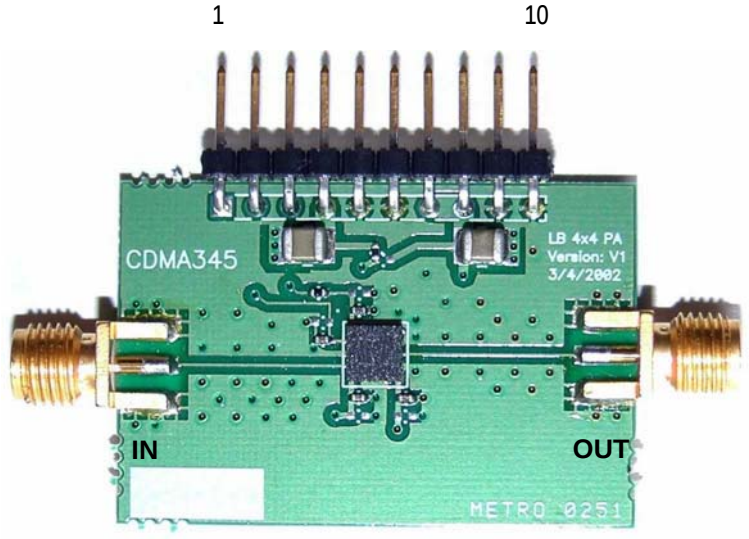




3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Application Information; tuning procedures; board layout precautions

TriQuint offers our customers the below evaluation board as a means for testing and analysis of TQM713019. The evaluation board schematic and picture are provided for preliminary analysis and design. Figure 1 shows the TriQuint application board, while Figure 2 shows the schematic of the board.



Pin #	Function
1	No Connect
2	Vmode, High/low Bias Mode
3	Vref, Reference Voltage
4	Vcc1, 1st Stage Collector Voltage
5	GND, DC Ground
6	GND, DC Ground
7	Vcc2, 2nd Stage Collector Voltage
8	Vcc2, 2nd Stage Collector Voltage
9	GND, DC Ground
10	GND, DC Ground

Figure 1: Evaluation Board

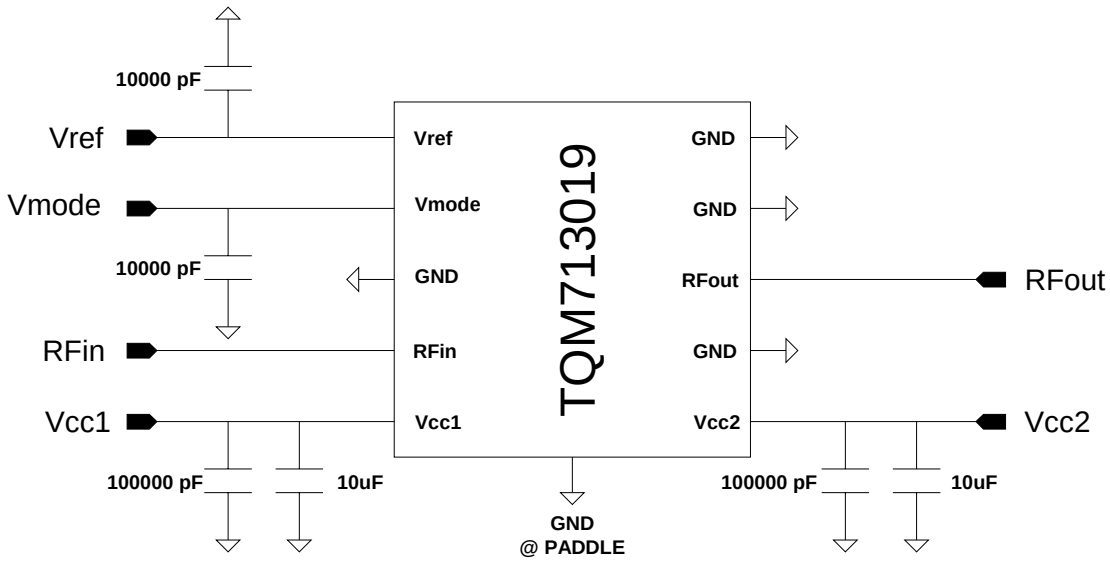
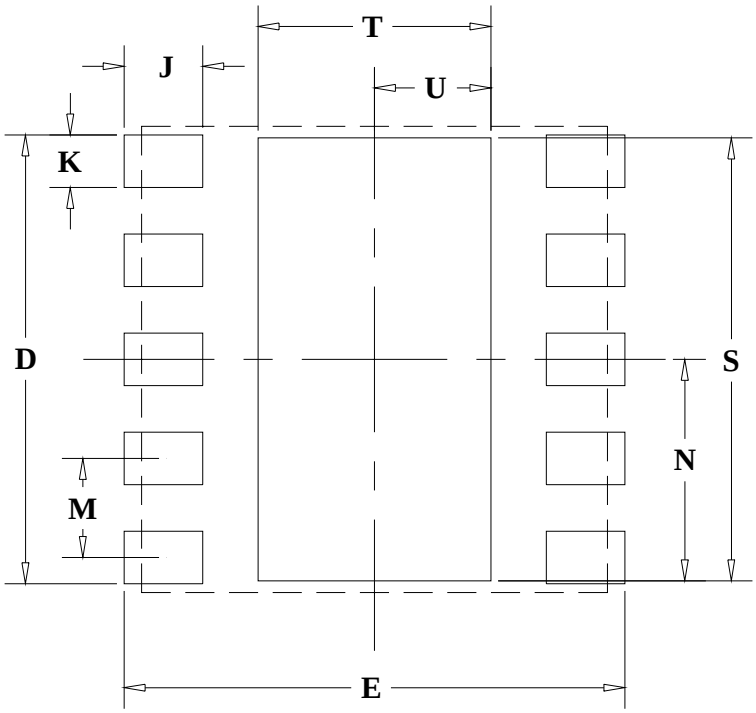


Figure 2: Evaluation Board Schematic

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

PC Board Layout Recommendations



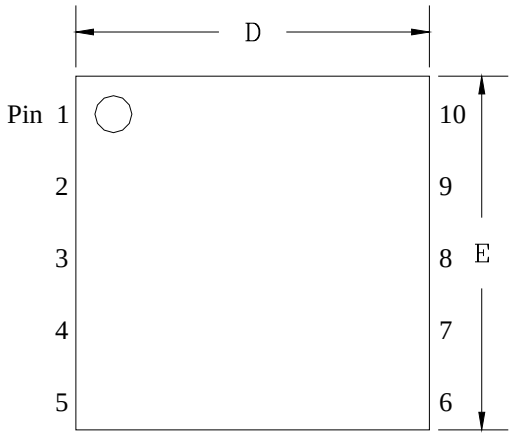
DIMENSION	MM
D	3.85
E	4.30
J	0.68
K	0.45
M	0.85
N	1.90
S	3.80
T	2.00
U	1.00

Note1: Only ground signal traces are allowed directly under the package
Note 2: Primary dimensions are in millimeters alternate dimensions are in inches.

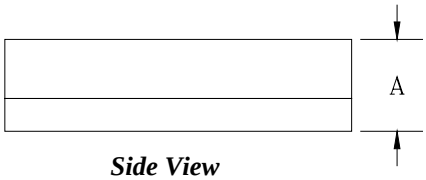
3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Packaging and Ordering Information

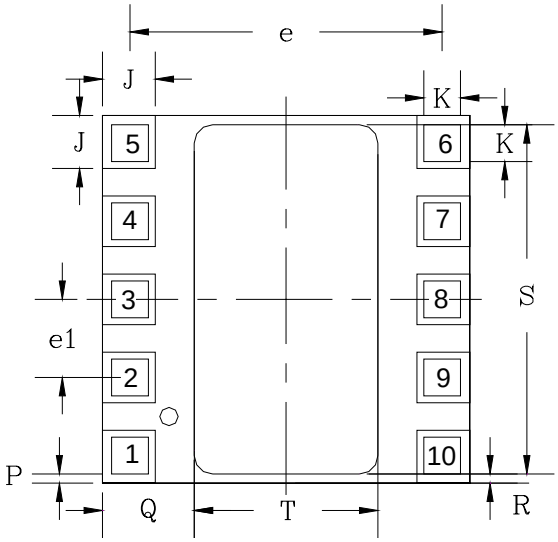
Package Type: 10 Pin Plastic Module Package



Top View



Side View



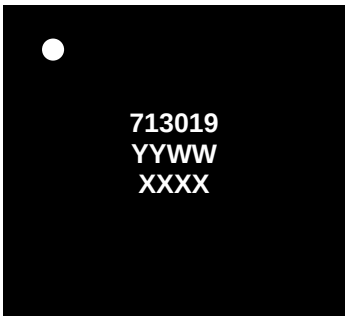
Bottom View

DESIGNATION	DESCRIPTION	DIMENSION	
A	OVERALL HEIGHT	1.5	+/-0.12 mm
D	PACKAGE LENGTH	4.0	+/-0.1 mm
E	PACKAGE WIDTH	4.0	+/-0.1 mm
J	SOLDER MASK OPENING LENGTH AND WIDTH	0.575	+/-0.075 mm
K	METAL PAD LENGTH AND WIDTH	0.40	+/-0.05 mm
P	DISTANCE BETWEEN METAL PAD AND PACKAGE EDGE	0.10	+/-0.025 mm
T	GND SOLDER MASK OPENING WIDTH	2.00	+/-0.05 mm
S	GND SOLDER MASK OPENING LENGTH	3.80	+/-0.05 mm
R	DISTANCE BETWEEN GND SOLDER MASK OPENING AND PACKAGE EDGE	0.10	+/-0.1 mm
Q	DISTANCE BETWEEN GND SOLDER MASK OPENING AND PACKAGE EDGE	1.00	+/-0.1 mm
e	TERMINAL PITCH FOR TERMINAL 1-10, 2-9, 3-8, 4-7 AND 5-6	3.400	mm
e1	TERMINAL PITCH FOR TERMINAL 1-2-3-4-5 AND 6-7-8-9-10	0.850	mm

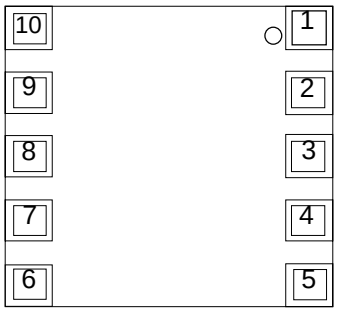
Note: GND SOLDER MASK OPENING IS NOT CENTERED ON THE PACKAGE

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Package Marking



Top View



Bottom View

WHITE INK OR LASER MARK

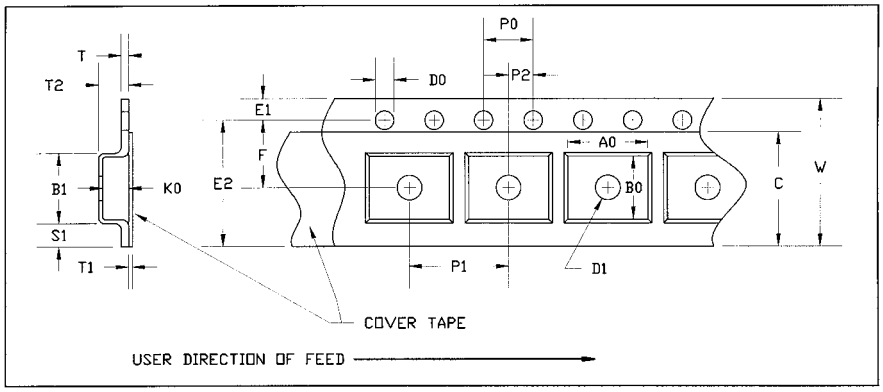
Line 1: Part Number: 713019

Line 2: YYWW = Year and Work Week

Line 3: XXXX = TriQuint assembly lot number

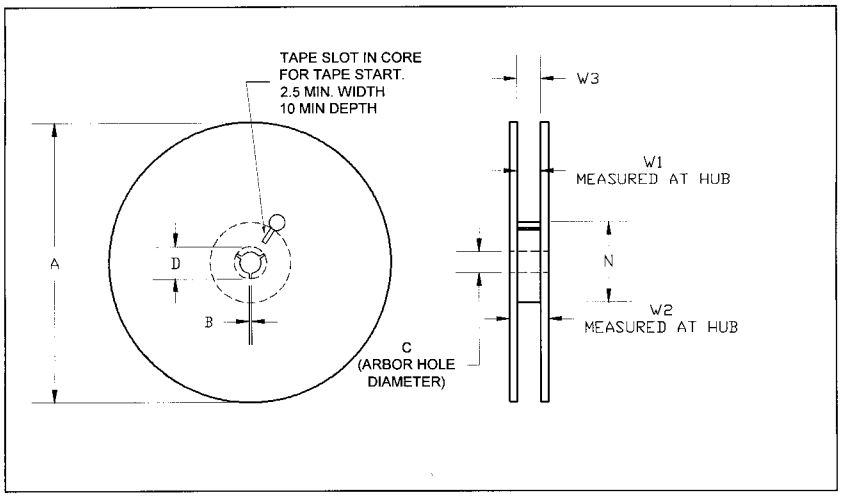
3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Tape & Reel

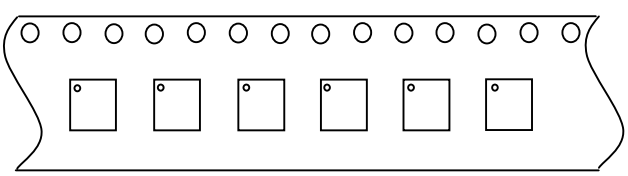


PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.171	4.35
	WIDTH	B0	0.171	4.35
	DEPTH	K0	0.071	1.80
	PITCH	P1	0.315	8.00
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION LENGTH DIRECTION	P2	0.079	2.00
	CAVITY TO PERFORATION WIDTH DIRECTION	F	0.217	5.50
COVER TAPE	WIDTH	C	0.362	9.20
CARRIER TAPE	WIDTH	W	0.472	12.00

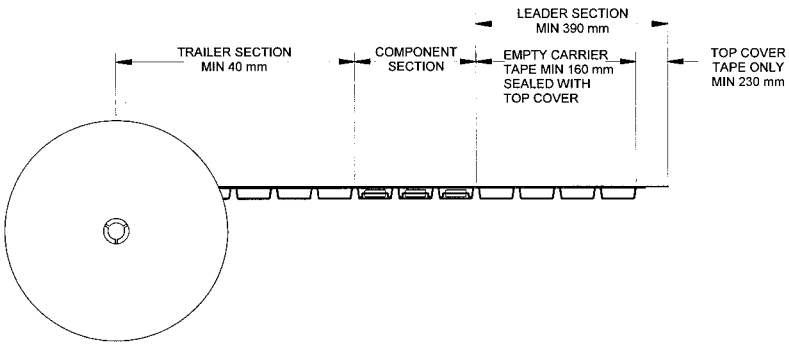
3V HBT GaAs CDMA 4x4mm Power Amplifier Module



SOIC-8, QSOP 16, MSOP 08 & 10, TSSOP 16, HP VFQFP-N 4X4 & 5X5, VQFN-24, VQFN-20. Modules 4X4			13" REEL	
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
FLANGE	DIAMETER	A	12.992	330
	THICKNESS	W2	0.717	18.2
	SPACE BETWEEN FLANGE	W1	0.504	12.8
HUB	OUTER DIAMETER	N	4.016	102.0
	ARBOR HOLE DIAMETER	C	0.512	13.0
	KEY SLIT WIDTH	B	0.079	2.0
	KEY SLIT DIAMETER	D	0.787	20.0



MODULE 4X4
User Direction of Feed



Reel Quantity = 2500 units

3V HBT GaAs CDMA 4x4mm Power Amplifier Module

Additional Information [1]T

1 For latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

Web: Hwww.triquint.comH Tel: (503) 615-9000

Email: info_wireless@tqs.com Fax: (503) 615-8902

For technical questions and additional information on specific applications:

Email: info_wireless@tqs.com

射 频 和 天 线 设 计 培 训 课 程 推 荐

易迪拓培训(www.edatop.com)由数名来自于研发第一线的资深工程师发起成立，致力并专注于微波、射频、天线设计研发人才的培养；我们于 2006 年整合合并微波 EDA 网(www.mweda.com)，现已发展成为国内最大的微波射频和天线设计人才培养基地，成功推出多套微波射频以及天线设计经典培训课程和 ADS、HFSS 等专业软件使用培训课程，广受客户好评；并先后与人民邮电出版社、电子工业出版社合作出版了多本专业图书，帮助数万名工程师提升了专业技术能力。客户遍布中兴通讯、研通高频、埃威航电、国人通信等多家国内知名公司，以及台湾工业技术研究院、永业科技、全一电子等多家台湾地区企业。

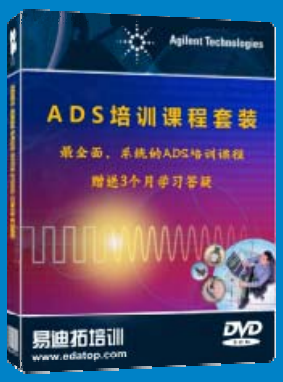
易迪拓培训课程列表：http://www.edatop.com/peixun/rfe/129.html

射频工程师养成培训课程套装

该套装精选了射频专业基础培训课程、射频仿真设计培训课程和射频电路测量培训课程三个类别共 30 门视频培训课程和 3 本图书教材；旨在引领学员全面学习一个射频工程师需要熟悉、理解和掌握的专业知识和研发设计能力。通过套装的学习，能够让学员完全达到和胜任一个合格的射频工程师的要求…

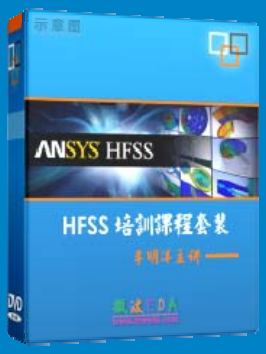
课程网址：http://www.edatop.com/peixun/rfe/110.html

ADS 学习培训课程套装



该套装是迄今国内最全面、最权威的 ADS 培训教程，共包含 10 门 ADS 学习培训课程。课程是由具有多年 ADS 使用经验的微波射频与通信系统设计领域资深专家讲解，并多结合设计实例，由浅入深、详细而又全面地讲解了 ADS 在微波射频电路设计、通信系统设计和电磁仿真设计方面的内容。能让您在最短的时间内学会使用 ADS，迅速提升个人技术能力，把 ADS 真正应用到实际研发工作中去，成为 ADS 设计专家...

课程网址： http://www.edatop.com/peixun/ads/13.html



HFSS 学习培训课程套装

该套课程套装包含了本站全部 HFSS 培训课程，是迄今国内最全面、最专业的 HFSS 培训教程套装，可以帮助您从零开始，全面深入学习 HFSS 的各项功能和在多个方面的工程应用。购买套装，更可超值赠送 3 个月免费学习答疑，随时解答您学习过程中遇到的棘手问题，让您的 HFSS 学习更加轻松顺畅…

课程网址：http://www.edatop.com/peixun/hfss/11.html

CST 学习培训课程套装

该培训套装由易迪拓培训联合微波 EDA 网共同推出，是最全面、系统、专业的 CST 微波工作室培训课程套装，所有课程都由经验丰富的专家授课，视频教学，可以帮助您从零开始，全面系统地学习 CST 微波工作的各项功能及其在微波射频、天线设计等领域的设计应用。且购买该套装，还可超值赠送 3 个月免费学习答疑…

课程网址：http://www.edatop.com/peixun/cst/24.html

HFSS 天线设计培训课程套装

套装包含 6 门视频课程和 1 本图书，课程从基础讲起，内容由浅入深，理论介绍和实际操作讲解相结合，全面系统的讲解了 HFSS 天线设计的全过程。是国内最全面、最专业的 HFSS 天线设计课程，可以帮助您快速学习掌握如何使用 HFSS 设计天线，让天线设计不再难…

课程网址：http://www.edatop.com/peixun/hfss/122.html

13.56MHz NFC/RFID 线圈天线设计培训课程套装

套装包含 4 门视频培训课程，培训将 13.56MHz 线圈天线设计原理和仿真设计实践相结合，全面系统地讲解了 13.56MHz 线圈天线的工作原理、设计方法、设计考量以及使用 HFSS 和 CST 仿真分析线圈天线的具体操作，同时还介绍了 13.56MHz 线圈天线匹配电路的设计和调试。通过该套课程的学习，可以帮助您快速学习掌握 13.56MHz 线圈天线及其匹配电路的原理、设计和调试…

详情浏览：http://www.edatop.com/peixun/antenna/116.html

我们的课程优势：

※ 成立于 2004 年，10 多年丰富的行业经验，

※ 一直致力并专注于微波射频和天线设计工程师的培养，更了解该行业对人才的要求

※ 经验丰富的一线资深工程师讲授，结合实际工程案例，直观、实用、易学

联系我们：

※ 易迪拓培训官网：http://www.edatop.com

※ 微波 EDA 网：http://www.mweda.com

※ 官方淘宝店：http://shop36920890.taobao.com