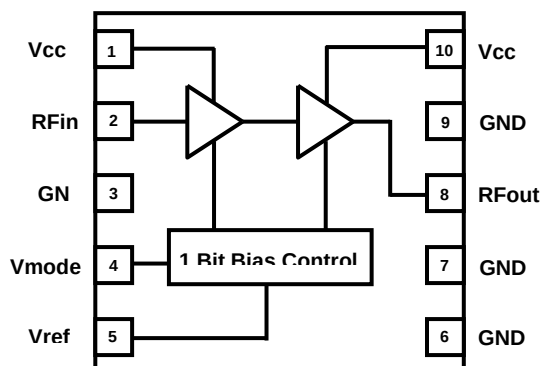


3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

Functional Block Diagram



Product Description

The TQM763022 is a 3V, 2 stage GaAs HBT Power Amplifier Module designed for use in mobile phones. Its compact 4x4mm package makes it ideal for today's extremely small data enabled phones. Its RF performance meets the requirements for products designed to IS-95/98/CDMA2000 standards.

The TQM763022 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. TQM763022 is footprint compatible with industry standard 4x4mm CDMA PA modules. The PA has been specifically designed to provide ULTRA-low quiescent current to minimize the average current consumption of the handset per the CDG Curve thus extending its talk-time capability.

Electrical Specifications

Parameter	Min	Typ	Max	Units
Frequency	1850		1910	MHz
CDMA mode maximum Pout ¹		28		dBm
Gain		29		dB
CDMA ACPR		-50		dBc
CDMA ALTR		-60		dBc
Power Supply Current @ 28dBm		520		mA
Rx Band Noise		-140		dBm/Hz

Note 1: Test Conditions CDMA Mode: $V_{CC1}=3.4VDC$, $V_{CC2}=3.4VDC$, $V_{REF}=2.85VDC$, $T_C=25^{\circ}C$

Data Sheet

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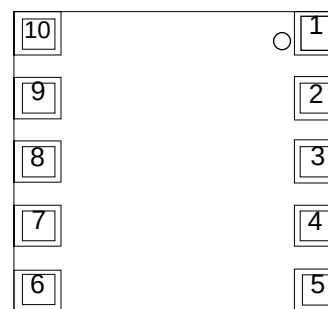
Features

- InGaP HBT Technology
- High Efficiency: 16% @ 16dBm
- ULTRA I technology: Low I_{cq} = 26mA
- Optimized for 50 Ω system
- Small 10-pin, 4x4mm module
- Excellent Rx band noise performance
- Lead-free 260 $^{\circ}C$ RoHS compliant
- Full ESD protection

Applications

- IS-95/CDMA2000
- Single-mode, Dual-Mode, and Tri-Mode CDMA/AMPS phones

Package Style



10-Pin Plastic Module Package ; Bottom View



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Electrical Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ/Nom	Max.	Units
RF Input Power	P _{IN}	-	4.0	10.0	dBm
Supply Voltage	V _{CC}	0	3.4	5.0	Volts
Reference Voltage	V _{REF}	0	2.85	3.5	Volts
Vmode (1 bit Bias Control)	Vmode	0	-	3.5	Volts
Case Operating Temperature	T _{CASE}	-40	25	+100	°C
Storage Temperature	T _{STORE}	-55	25	+150	°C

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

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ/Nom	Max.	Units
Supply Voltage	V _{CC}	3.2	3.4	4.2	Volts
Reference Voltage	V _{REF}				Volts
PA On		2.75	2.85	2.95	
PA Off		0	-	0.5	
Vmode (1 bit Bias Control)	Vmode				Volts
High Bias Mode		0	-	0.5	
Low Bias Mode		2.5	2.85	3.0	
Case Operating Temperature	T _{CASE}	-30	25	+85	°C

Power Range Truth Table

Parameter	V _{ref}	Vmode	Range
High Power	2.85 V	Low	16 dBm - 28 dBm
Low Power	2.85 V	High	< 16 dBm
Shut Down	0 V	Low	-

Data Sheet

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3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

CDMA (IS-98C) Electrical Characteristics¹

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		1850	1880	1910	MHz
Large Signal Gain	V _{CC} =3.4V; V _{REF} =2.85V; Temp=25°C				
• +16dBm ≤ P _{out} ≤ +28dBm		23.5	29	31	dB
• P _{out} ≤ +16dBm		16	22		
Adjacent Channel Power (ACP1) ²	V _{CC} =3.4V; V _{REF} =2.85V; Temp=25°C				
• +16dBm ≤ P _{out} ≤ +28dBm			-50	-45	dBc
• P _{out} ≤ +16dBm			-50	-45	
Alternate Channel Power (ACP2) ²	V _{CC} =3.4V; V _{REF} =2.85V; Temp=25°C				
• +16dBm ≤ P _{out} ≤ +28dBm			-60	-51	dBc
• P _{out} ≤ +16dBm			-55	-51	
Quiescent Current	V _{CC} =3.4V; V _{REF} =2.85V; Temp=25°C				
• Low Bias			26		mA
• High Bias			75		
I _{REF}	P _{out} = +28dBm, V _{CC} =3.4V; V _{REF} =2.85V; V _{mode} =0V; Temp=25°C		3.0	4.5	mA
I _{TOTAL}	P _{out} = +28dBm, V _{CC} =3.4V; V _{REF} =2.85V; V _{mode} =0V; Temp=25°C		520		mA
I _{LK} current	V _{CC} =3.4V; V _{mode} /V _{REF} = 0v		5		uA
PAE	V _{CC} =3.4V; V _{REF} =2.85V; Temp=25°C				
• P _{out} = 28dBm			36		%
• P _{out} = 16dBm			16		
Input VSWR	All terminals		1.5:1	2.0:1	
Harmonics	P _{out} ≤ +28dBm				
• 2fo			-40	-30	dBc
• 3fo			-45	-30	
Spurious/Stability	P _{out} ≤ 28dBm, 10:1 VSWR, V _{CC} =3.2V to 4.2V, -30°C < Temp < 85°C			-65	dBc
Ruggedness	10:1 VSWR, Pin=+10dBm, -30°C < Temp < 85°C	No Degradation			
Noise Power in Rx band	P _{out} =+28dBm, IS-95 Standard		-140	-136	dBm/Hz

Note 1: Typ. Test Conditions: V_{CC}=3.4VDC, V_{REF}=2.85VDC, T_C = +25 °C, TriQuint Test Board.

Note 2: ACPR1 Measured @ ±1.25MHz Offset; ACPR2 Measured @ ±1.98MHz

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3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

cdma2000 (IS-98D) Electrical Characteristics^{1,3}

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		1850	1880	1910	MHz
Large Signal Gain - P_{out} = +27.5dBm - P_{out} = +16dBm	V _{cc} =3.4V; V _{ref} =2.85V; Temp=25°C	23.5 16	27 22	31	dB
Adjacent Channel Power (ACP1) ² +16dBm ≤ P_{out} ≤ +27.5dBm - P_{out} ≤ +16dBm	V _{cc} =3.4V; V _{ref} =2.85V; Temp=25°C		-50 -50	-45 -45	dBc
Alternate Channel Power (ACP2) ² +16dBm ≤ P_{out} ≤ +27.5dBm - P_{out} ≤ +16dBm	V _{cc} =3.4V; V _{ref} =2.85V; Temp=25°C		-60 -60	-56 -56	dBc
Quiescent Current - Low Bias - High Bias	V _{cc} =3.4V; V _{ref} =2.85V; Temp=25°C		26 75		mA
I _{REF}	P _{out} = +27.5 dBm, V _{cc} =3.4V; V _{ref} =2.85V; V _{mode} =0V; Temp=25°C		3.0	4.5	mA
Input VSWR	All terminals		1.5:1	2.0:1	
Noise Power in Rx band	P _{out} =+27.5dBm, IS-95 Standard		-140	-136	dBm/Hz

Note 1: Typ. Test Conditions: V_{CC}=3.4VDC, V_{REF}=2.85VDC, T_C = +25 °C, TriQuint Test Board.

Note 2: ACPR1 Measured @ ±1.25MHz Offset; ACPR2 Measured @ ±1.98MHz

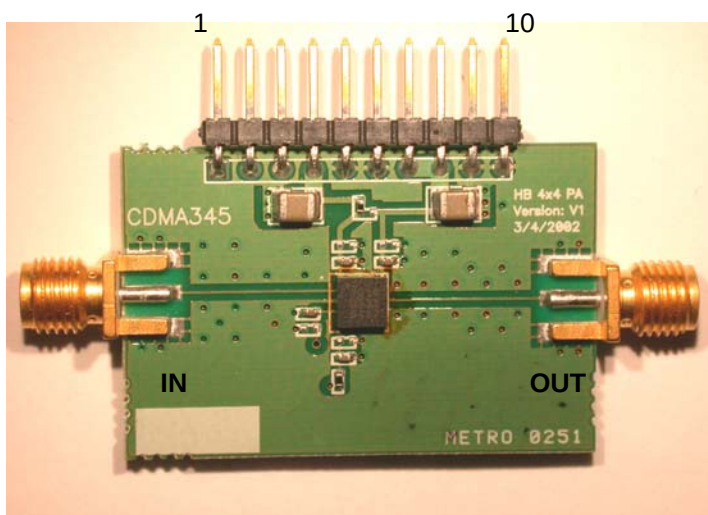
Note 3: 9600 bps Fundamental & Supplemental Traffic Channels (0 dB), peak-to-average ratio (CCDF=1%)= 4.5 dB.



3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

Evaluation Board

TriQuint offers our customers the below evaluation board as a means for testing and analysis of TQM763022. 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, 1 st Stage Collector Voltage
5	GND, DC Ground
6	GND, DC Ground
7	Vcc2, 2 nd Stage Collector Voltage
8	Vcc2, 2 nd Stage Collector Voltage
9	GND, DC Ground
10	GND, DC Ground

Figure 1: Evaluation Board

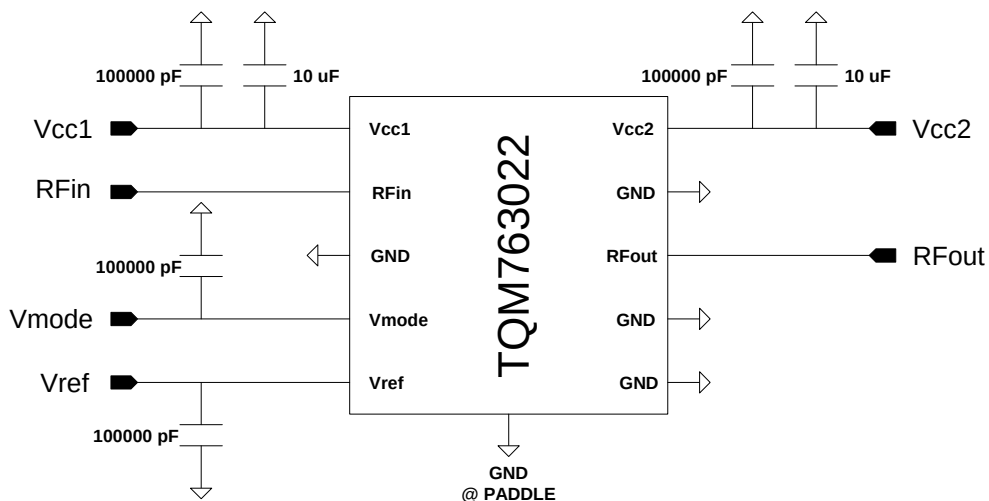


Figure 2: Evaluation Board Schematic

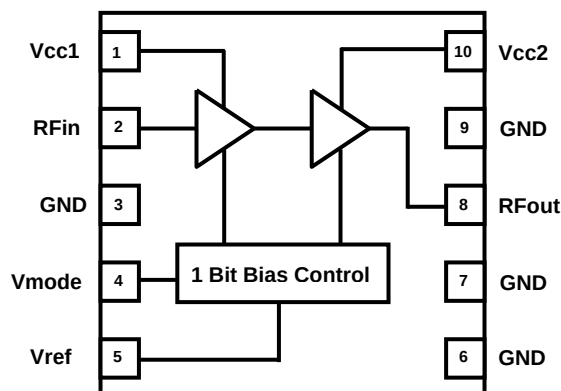
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Package Pinout:



Pin Descriptions:

Pin Name	Pin #	Description and Usage (Equivalent Circuit)	
GND	Paddle	Device Ground and Heat Sink. Needs good thermal path to remove heat.	
V _{CC1}	1	Collector voltage for input stage.	
RFin	2	RF input. The RF circuit is DC grounded. 50 Ohm RF impedance.	
V _{MODE}	4	1 Bit bias control	
V _{REF}	5	Regulated supply for setting bias. Vref is set to 0VDC to power-off the TQM763022	
RF _{OUT}	8	RF output. The RF circuit is DC blocked internally. 50 Ohm RF impedance.	
V _{CC2}	10	Collector voltage for output stage.	
GND	3, 6, 7, 9	Ground	

TriQuint recommends use of several via holes to the backside ground under the paddle.

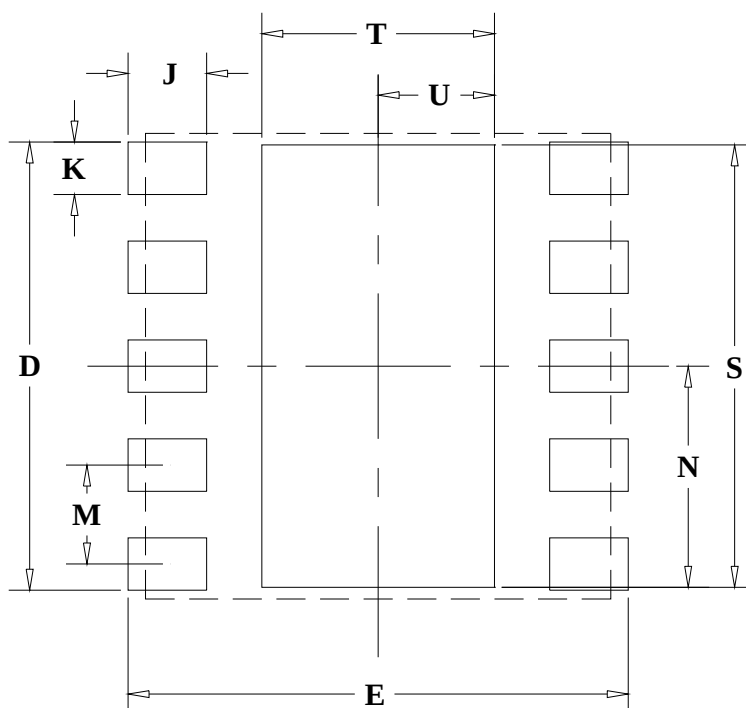
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PC Board Layout recommendations



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

Notes:

- 1 Only ground signal traces are allowed directly under the package
- 2 Primary dimensions are in millimeters alternate dimensions are in inches.

Data Sheet

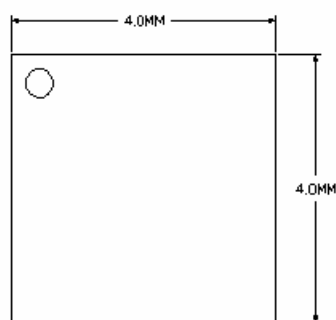
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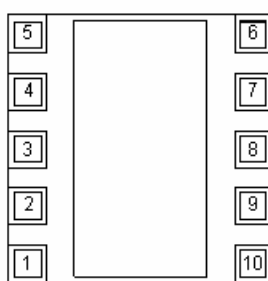
3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

Packaging and Ordering Information

Package Type: 10 Pin Plastic Module Package



TOP VIEW



BOTTOM VIEW



SIDE VIEW

CASE MARKING

Top View



- 1) WHITE INK OR LASER MARK .
- 2) Line 1: 763022
- 3) Line 2: AaXXXX = TriQuint assembly lot number
- 4) Line 3: YYWW = Year and Work Week

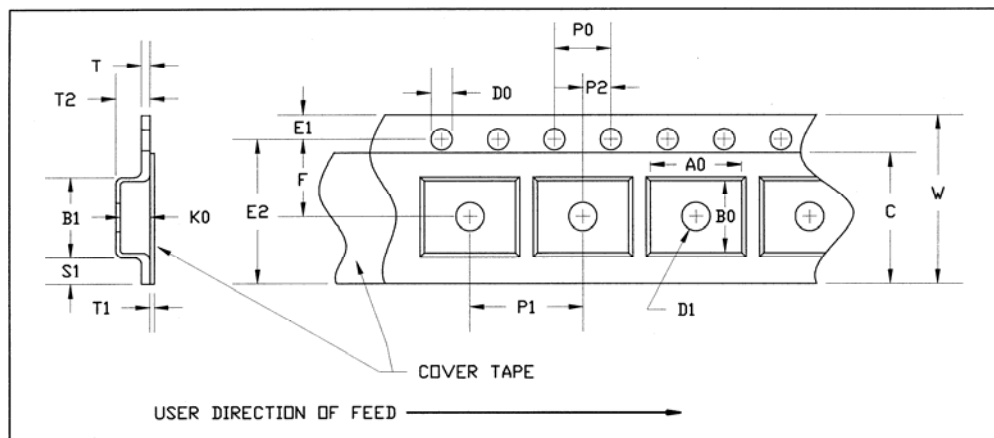
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Tape & Reel



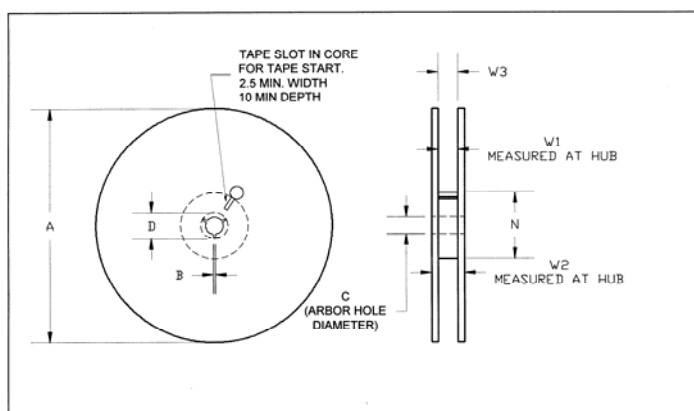
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.171	4.35
	WIDTH	B0	0.171	4.35
	DEPTH	K0	0.071	1.80
	PITCH	P1	0.315	8.00
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION LENGTH DIRECTION	P2	0.079	2.00
	CAVITY TO PERFORATION WIDTH DIRECTION	F	0.217	5.50
COVER TAPE	WIDTH	C	0.362	9.20
CARRIER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

Data Sheet

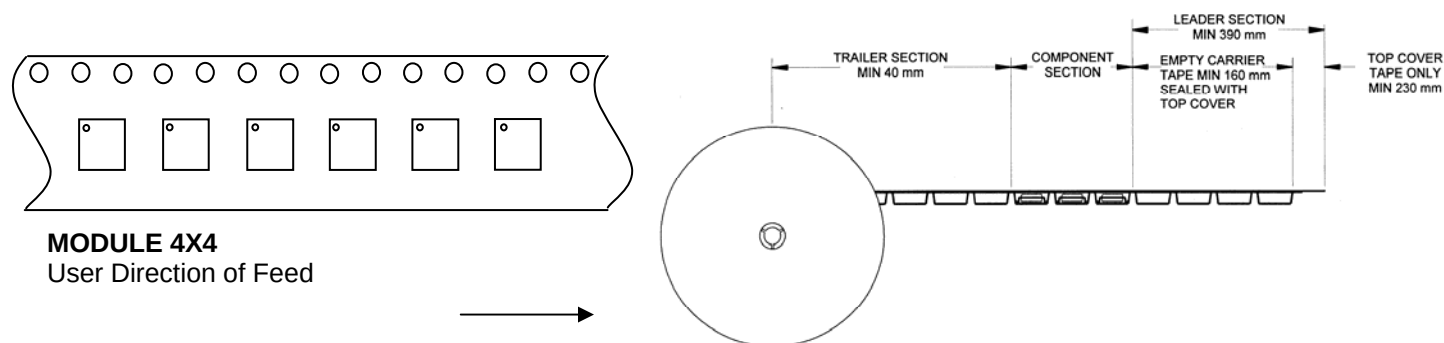
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3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

Tape & Reel (con't)



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



Reel Quantity = 2,500 units

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3V HBT GaAs CDMA PCS Power Amplifier Module ULTRA I

Additional Information¹

This part is compliant with RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment.

The part is rated Moisture Sensitivity Level 3 at 260deg C per JEDEC standard IPC/JEDEC J-STD-020.

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

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