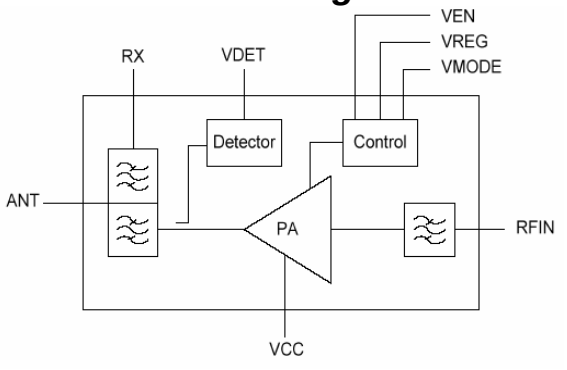
TQM663017A

Data Sheet

PowerPad™ CDMA PCS Band PA / Duplexer Module

Functional Block Diagram



Product Description

TriQuint's TQM663017A is a fully matched PA/Duplexer, Front End Module (FEM) for PCS band use in CDMA mobile phones. The 8 x 5 x 1.52 mm, 22-pin module includes an integrated BAW Duplexer, Power Amplifier, Transmit filter, RF Power Detector, enable switch and Logic Controller. With an RF Power Output up to 25.5dBm the TQM663017A FEM meets the strict ACPR and ALTR requirements for products designed to the IS-95/98 standards The quiescent current of the PA/Duplexer is set by the base-band processor using a 1-bit bias control (Vmode) to minimize battery consumption and maximize talk time.

TriQuint's multilayer laminate technology provides low loss interconnect and optimized match between the duplexer, PA and filter enabling the TQM663017A to achieve typically 460 mA current consumption at maximum output power (+25.5dBm) and only 53mA of current in low power operation (+10dBm). The small 8.0 × 5.0 mm module replaces four separate components requiring less board space. TQM663107 provides handset designers with a simple to use surface mount module requiring minimal external circuitry in the new generation of small and light phones.

Electrical Specifications

Parameter	Min	Typ	Max	Units
Frequency	1851.25		1908.75	MHz
Pout[1]		25.5		dBm
ACPR (+/- 1.25 MHz offset)[1]		-55		dBc
ALTR (+/- 1.98 MHz offset)[1]		-59		dBc
Current Consumption[1]		460		mA
TX to Rx Leakage @ 25.5dBm[1]		-30		dBm
ANT-to-Rx Insertion Loss		3.5		dB
Rx Noise		-185		dBm/Hz

Note 1: Test Conditions IS-95A/B V_{CC}=3.4VDC, V_{REF}=2.85VDC, Tc=25°C

Data Sheet:
For additional information and latest specifications, see our website: *www.triquint.com*

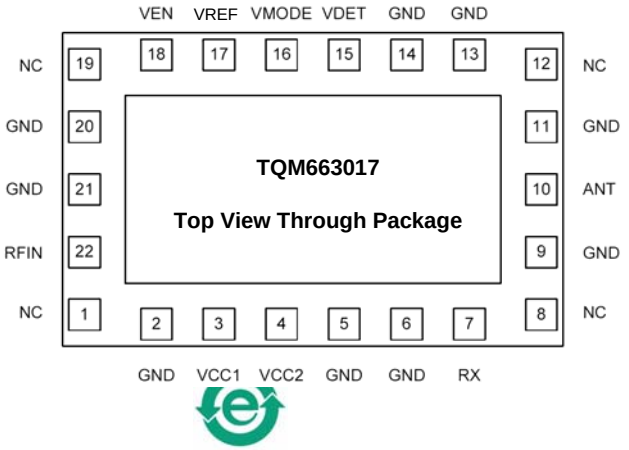
Features

- InGaP GaAs HBT PA
- High Efficiency Low Power Mode PA for lowest Suburban Transmit Profile
  "Average Currents" typically <58mA
- Low Current Consumption
  Typical: 460mA @ +25.5dBm
- Low Quiescent Current
  Typical: 30mA
- 1-Bit Bias Control for Extended Talk Time
- Integrated power detector
- Integrated duplexer and interstage filter
- Excellent ACPR
  Typical: -55 dBc @ +/- 1.25MHz offset
- Excellent ALTR
  Typical: -59 dBc @ +/- 1.98 MHz offset
- Low Voltage Operation 3.2 V to 4.4 V
  As low as 1.8V in low power mode
- Excellent Tx Leakage at Rx Port
  Typical: -29 dBm @ +25.5dBm
- Small Profile 22 pins, 8.0 x 5.0 x 1.52 mm
- Reduced Phone Board Space
  Replaces 4 Separate Components
- Easy to use with few External Components
  Internally matched inputs and outputs
- Compatible with DC/DC converter operation
- IS98E Code Domain and Channel Power compliant

Applications

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

Package Style



Revision D, March 9, 2007

PowerPad™ CDMA PCS Band PA / Duplexer Module

Electrical Specifications

Absolute Maximum Ratings[1]

Parameter	Symbol	Min.	Max.	Units
RF Input Power	P_{IN}	-	10.0	dBm
Supply Voltage	V_{CC}	-	6.0	Volts
Reference Voltage	V_{REF}	-0.5	3.0	Volts
Vmode (1 bit Bias Control)	V_{MODE}	-0.5	3.5	Volts
Venable	V_{EN}	-0.5	3.5	Volts
Case Operating Temperature	T_{CASE}	-30	+85	°C
Storage Temperature	T_{STORE}	-55	+125	°C
MSL		MSL-3, +260°C		

Note 1: The part may not survive all maximums applied simultaneously.

DC Electrical Characteristics

Parameter	Symbol	Min.	Typ/Nom	Max.	Units
Supply Voltage (P_{OUT}=13.5 to 25.5dBm)	V_{CC}	3.2	3.4	4.4	Volts
(P_{OUT}=-10 to 13.5dBm)	V_{CC}	1.8	3.4	4.4	Volts
Reference Voltage	V_{REF}	2.75	2.85	2.95	Volts
	I_{REF_H} ($V_{EN=H}$)		3.5	5.0	mA
	I_{REF_L} ($V_{EN=L}$)		.08	0.2	mA
Vmode (1 bit Bias Control)					
High Bias Mode (High Power State)	V_{MODE_H}	0	-	0.5	Volts
Low Bias Mode (Low Power State)	V_{MODE_L}	2.35	2.6	2.85	Volts
	I_{MODE}		0.06	0.1	mA
Venable	V_{EN_H}	2.35	2.6	2.85	Volts
	V_{EN_L}	0	.02	0.5	Volts
	I_{EN}		.04	0.1	mA
Case Operating Temperature	T_{CASE}	-30	25	+85	°C

Power Range Truth Table

Power State	VRef	Vmode	Ven	Range
High Power	2.85 V	Low	High	+8 dBm to +25.5 dBm
Low Power	2.85 V	High	High	< +8 dBm
Shut Down	0 V	High or Low	Low	-

Note 1: Logic Low is 0 V to +0.5V, Logic High is +2.35 V to +2.85V

PowerPad™ CDMA PCS Band PA / Duplexer Module

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

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		1851.25		1908.75	MHz
Power Output					
Po_H	Vcc=3.4, 25°C<T<70°C, Vmode = Low	25.5			dBm
Po_HVT	Vcc=3.2 to 4.4V, -30°C>T>85°C, Vmode = Low	24.5			dBm
Po_Rise	Vcc=1.8 to 4.4V, -30°C>T>85°C, Vmode = High	8.0			dBm
Po_L	Vcc=1.8 to 4.4V, -30°C>T>85°C, Vmode = High			-52.5	dBm
Large Signal Gain		19		28	dB
G_H	Vcc=3.4V, 25°C, Vmode = Low, Po_H	16		30	dB
G_HVT	Vcc=3.2 to 4.4V, -30°C>T>85°C, Vmode = Low, Po_H	11		28	dB
G_M	Vcc=3.4, 25°C, Vmode = High, Po_M	9		28	dB
G_MVT	Vcc=3.2 to 4.4V, -30°C>T>85°C, Vmode = High, Po_M				
$I_{AVERAGE}$	Vcc=3.4V; Vref=2.85V; Temp=25°C, Vmode=2.85V Pout = Suburban Profile		58		mA
Gain Flatness					
GFLAT_H	Vcc=3.4V, T=25°C, Po_Rise to Po_H	-1.5		1.5	dB
GFLAT_L	Vcc=3.4V, T=25°C, Po_L to Po_Rise	-1.5		1.5	dB
Gain Sensitivity					
GSEN_HV	Vcc=3.2 to 4.4V, 25°C, Po_H	-1.25		1.25	dB
GSEN_LV	Vcc=3.2 to 4.4V, 25°C, Po_Rise	-1.25		1.25	dB
GSEN_HT	Vcc=3.4V, -30°C>T>85°C, Po_H	-2.5		2.5	dB
GSEN_LT	Vcc=1.8V to 3.4V, -30°C>T>85°C, Po_Rise	-2.5		2.5	dB
Power Added Efficiency	Vcc=3.4V, 25C, Po_H		23		%
Quiescent Current (I_{CCQ})	No RF Power		22	50	mA
Standby Current (I_{STBY})	-30°C<Temp<85°C, Vcc=4.4V, Vref=2.85V, Ven=0V		0.2	1	mA
Shut Down Current (I_{SDWN})	-30°C<Temp<85°C, Vcc=4.4V, Vref=0V, Ven=0V, Vmode=0V			30	uA
Adjacent Channel Power Ratio (ACPR) Offset = +/- 1.25MHz	Pout ≤ +25.5dBm, Vcc=3.4V, -30°C<Temp<70°C		-55	-46	dBc
	Pout ≤ +24.5dBm, Vcc=3.2V to 4.4V; -30°C<Temp<85°C		-55	-46	dBc

PowerPad™ CDMA PCS Band PA / Duplexer Module

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Alternate Channel Power Ratio (ALTR) Offset = +/-1.98 MHz	Pout ≤ +25.5dBm, Vcc=3.4V, -30°C<Temp<70°C		-59	-53	dBc
	Pout ≤ +24.5dBm, Vcc=3.2V to 4.4V; -30°C<Temp<85°C		-59	-53	dBc
VSWR	Tx Port		1.5:1	2:5:1	
Stability (all spurious)	Pout=25.5dBm, 10:1 VSWR, Pin=10dBm, All angles			-90	dBc
Ruggedness	Pout = +25.5dBm, 10:1 VSWR all phases; RX Port 5:1 VSWR all phases.	No damage/degradation			
Noise Power in Rx band at Rx terminal [2]	Pout=+25.5dBm, 0°C<Temp<+85°C, 43dB noise source at CDMA input. $F_{RX}=F_{TX}$ + 80MHz.		-190	-180	dBm/Hz
Tx Leakage at Rx terminal	Pout= +25.5dBm; -25°C<Temp<70°C, Vcc=3.4V		-31	-26	dBm

Note 1: Test Conditions: V_{CC}=3.4V, V_{REF}=2.85V, T_C = +25°C, unless otherwise specified.

Note 2: Noise power is computed from a differential NF measurement of the Rx path while under CDMA Tx input RF drive with an added noise of 43dB above thermal noise floor .

Rx Characteristics

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Center Frequency	-30°C<Temp<85°C	1931.25	1960	1988.75	MHz
Maximum Insertion loss	-30°C<Temp<85°C		2.5	4.2	dB
Absolute Attenuation	-30°C<Temp<85°C				
643-663 MHz			35	-	dB
965-995 MHz			35	-	dB
1770-1830MHz			35	-	dB
1850-1910 MHz			50	-	dB
1890-1922 MHz		4	-	-	dB
2010-2070 MHz			25	-	dB
				-	
VSWR at Rx Terminal	-30°C<Temp<85°C		2.0:1	2.5:1	

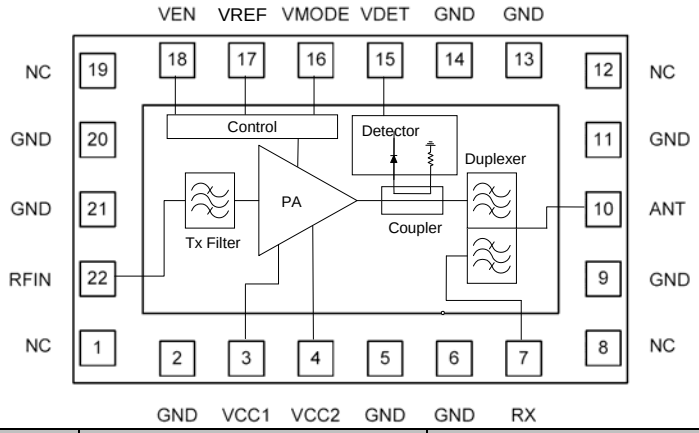
PowerPad™ CDMA PCS Band PA / Duplexer Module

Power Detector Characteristics

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Range	Vcc=3.2 to 4.4V, -30°C<Temp<85°C	15		28.5	dBm
Detector Error (high power)					
Dem_H1	Pout=22dBm to 26dBm, VSWR=4.5:1, all phases, Vcc=3.2 to 4.4V, -30°C>T>85°C	-1.7		1.7	dB
Dem_H2	Pout=18dBm to 26dBm, VSWR=1.5:1, all phases, Vcc=3.2 to 4.4V, -30°C>T>85°C	-0.3		0.3	dB
Variation in delivered power (D_PV)	Pout=22dBm to 26dBm, VSWR=3.5:1, all phases, Vcc=3.2-4.4V, -30°C>T>85°C	-4		0.5	dB
Detector Output Range (V_DR)	Pout=7dBm to 29dBm, Vcc=3.2 to 4.4V, -30°C>T>85°C	0.1		2.5	V
Detector voltage range @ 15dBm (V_DL)	Vcc=1.8 to 4.4V, -30°C>T>85°C	0.1			V
Detector voltage range @ 28.5dBm (V_DH)	Vcc=3.2 to 4.4V, -30°C>T>85°C	1.0		2.5	V
Detector output Impedance (off)	Vcc=3.2 to 4.4V, -30°C>T>85°C, Ven=Low	100	10,000		k-ohm
Detector Slope					
Sv_L	Pout=18dBm to 29dBm, VSWR=1.5:1, all phases, Vcc=3.2-4.4V, -30°C>T>85°C	9	55		mV/dB
Detector time Response					
Tdon	Vcc=3.2 to 4.4V, -30°C>T>85°C		0.3	30	µS
Tdoff	Vcc=3.2 to 4.4V, -30°C>T>85°C		0.5	30	µS
Output ripple (Prpl)	Vcc=3.2 to 4.4V, -30°C>T>85°C	-0.3		0.3	dB

PowerPad™ CDMA PCS Band PA / Duplexer Module

Pin Out and Assignments



Pin	Symbol	Description
1	N/C	No Connection
2	GND	Ground
3	V_{CC1}	DC Supply (Battery)
4	V_{CC2}	DC Supply (Battery)
5	GND	Ground
6	GND	Ground
7	RX	Receiver Output Port[1]
8	N/C	No Connection
9	GND	Ground
10	ANT	Antenna Port[1]
11	GND	Ground
12	N/C	No Connection
13	GND	Ground
14	GND	Ground
15	V_{DET}	Detector Voltage Output
16	V_{MODE}	Digital Bias Mode Control Input
17	V_{REF}	Reference DC Supply (Regulated)
18	V_{EN}	Enable/Disable
19	N/C	No Connection
20	GND	Ground
21	GND	Ground
22	RF_{IN}	Transmit Input Port[1]

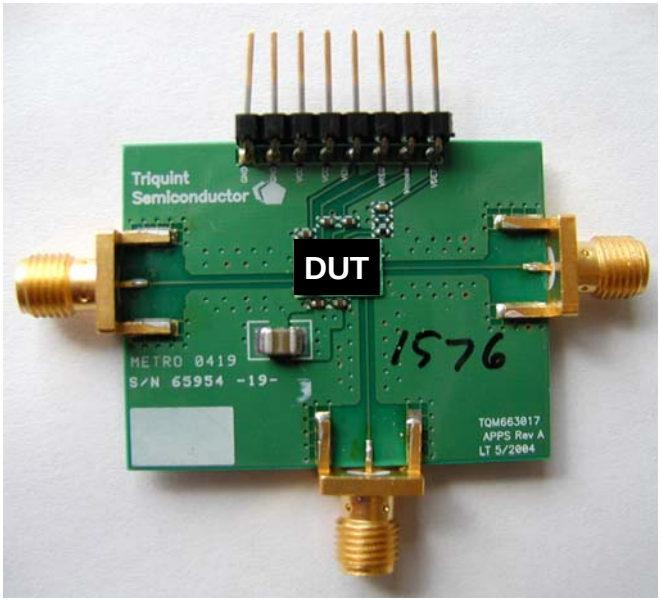
Note 1: DC Block included inside the module.

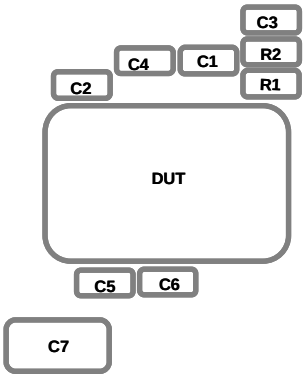
PowerPad™ CDMA PCS Band PA / Duplexer Module

Typical Test Circuit

TriQuint offers our customers the below evaluation board as a means for testing and analysis of 8 x 5mm PA/Duplexer. The evaluation board schematic and picture are provided for preliminary analysis and design. The resistors R1/R2 can be optimized to tradeoff the ACPR/Icc performance at medium/low power range.

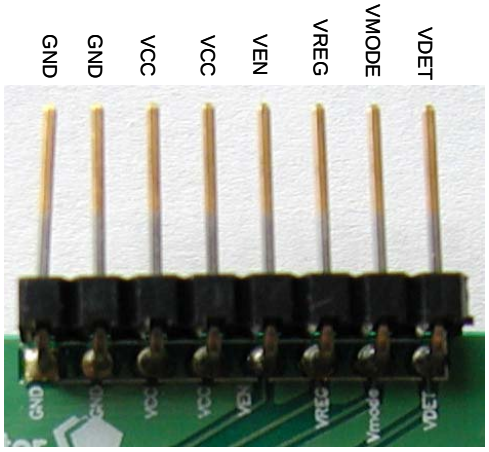
Evaluation Board





Component Layout

Single Row 8-position 0.1" Header Pins



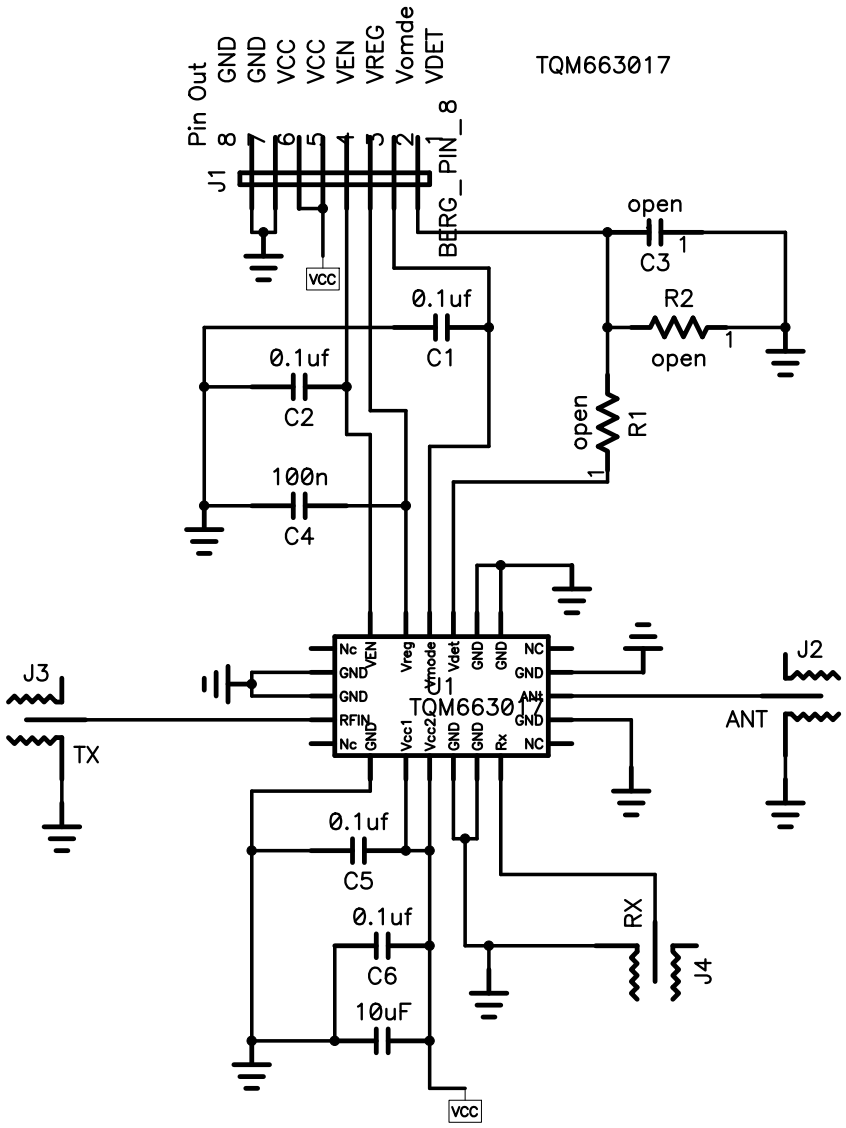
Signal	Description
GND	Common Ground
GND	Common Ground
VCC	DC Supply (Battery)
VCC	DC Supply (Battery)
VEN	Module Enable/Disable (Digital)
VREG	DC Supply (Regulated)
VMODE	Bias Mode Control (Digital)
VDET	Detector Voltage

Note: Both GND terminals and VCC terminals are tied together on the apps PCB.

Data Sheet:
For additional information and latest specifications, see our website: *www.triquint.com*

PowerPad™ CDMA PCS Band PA / Duplexer Module

Evaluation Board and Typical Phoneboard Schematic



PowerPad™ CDMA PCS Band PA / Duplexer Module

Applications Information: Power Up/Down Sequences

Power-Up Sequence

SEQUENCE	PIN	DESCRIPTION
1	V_{CC}	Apply Battery Voltage
2	V_{REF}	Apply Reference Voltage
3	V_{MODE}	Set Bias Mode
4	V_{EN}	Enable PA
5	RF	Apply RF

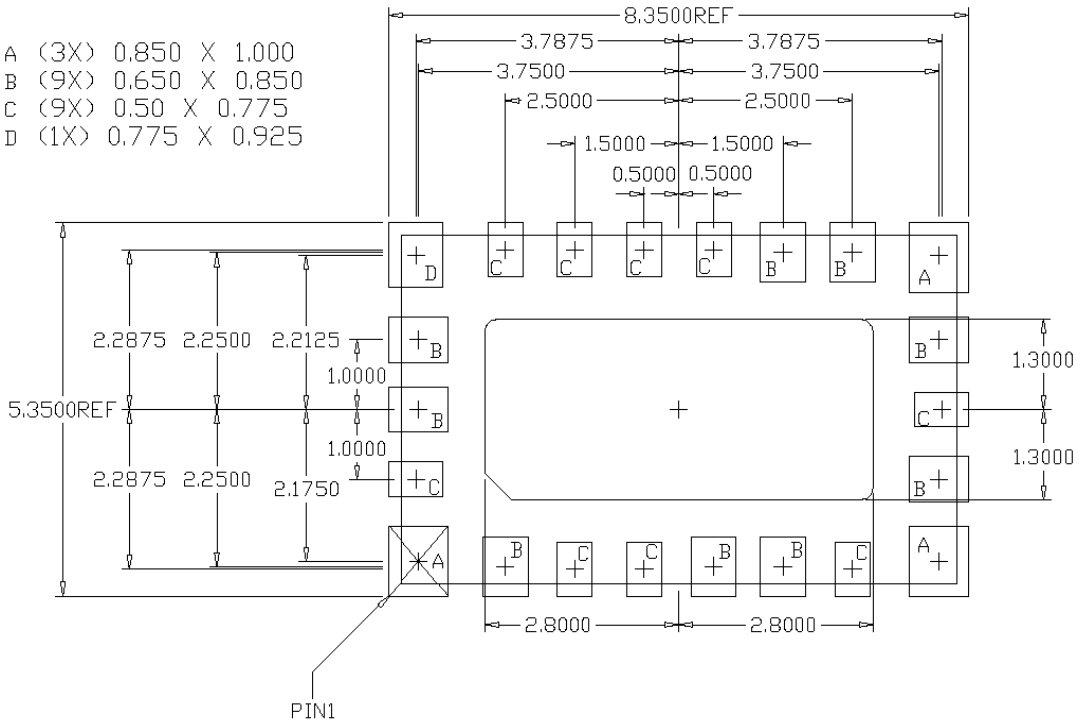
Power-Down Sequence

SEQUENCE	PIN	DESCRIPTION
1	RF	Remove RF
2	V_{EN}	Disable PA
3	V_{MODE}	Set Bias Mode to 0V
4	V_{REF}	Remove Reference Voltage
5	V_{CC}	Remove Battery Voltage

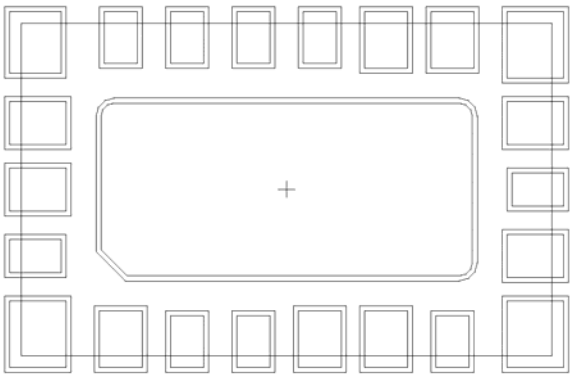
PowerPad™ CDMA PCS Band PA / Duplexer Module

PC Board Layout Recommendations

TOP VIEW ETCH RECOMMENDATIONS



TOP VIEW SOLDERMASK RECOMMENDATIONS
OVERSIZE MASK 6MIL

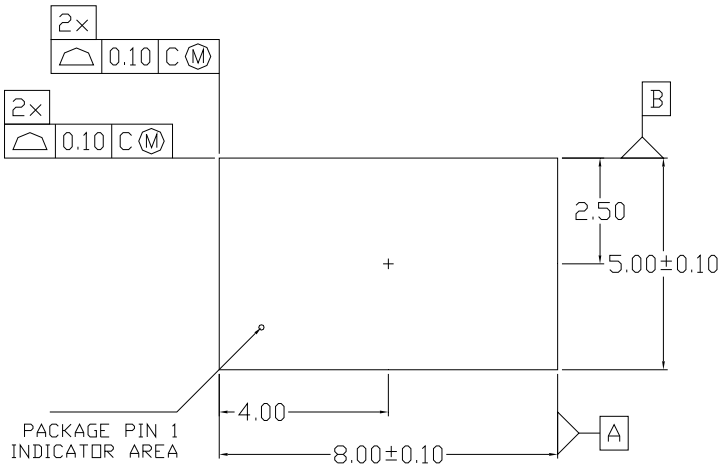


PowerPad™ CDMA PCS Band PA / Duplexer Module

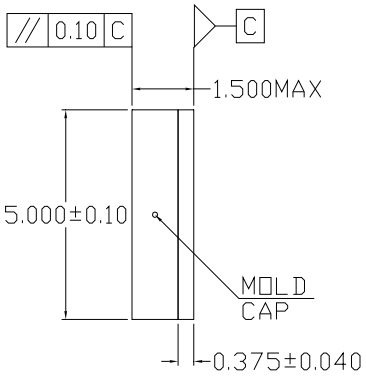
Packaging and Ordering Information

Package Dimensions:

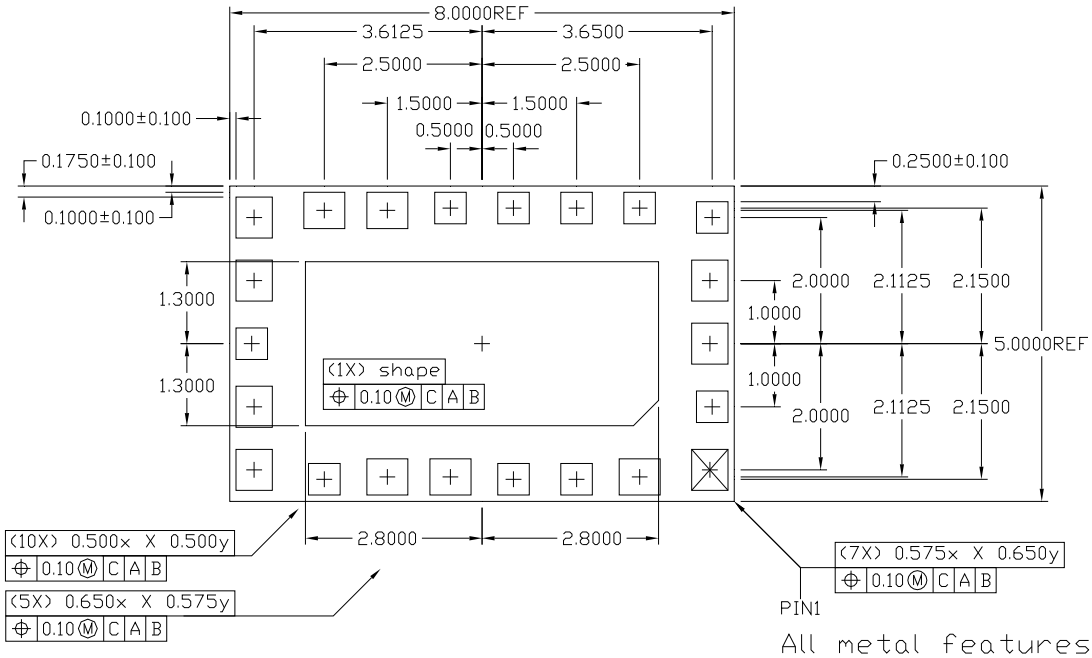
TOP VIEW



SIDE VIEW



BOTTOM VIEW



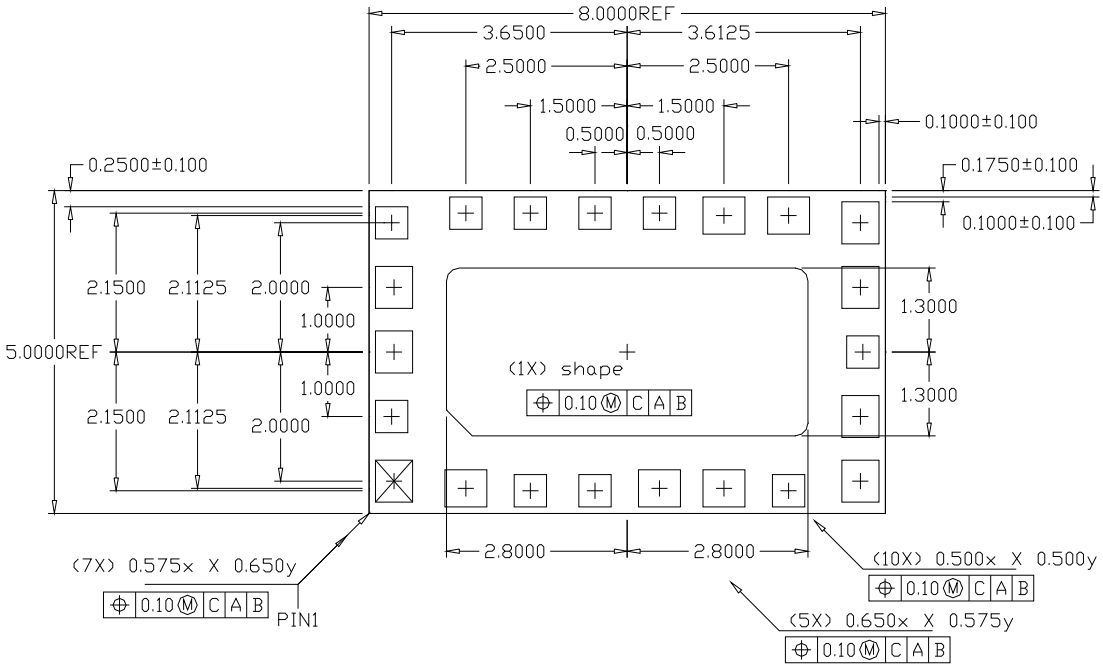
Data Sheet:
For additional information and latest specifications, see our website: *www.triquint.com*

Revision D, March 9, 2007

PowerPad™ CDMA PCS Band PA / Duplexer Module

Package Dimensions:

TOP VIEW LOOKING THROUGH MODULE



Package Marking:

PIN 1

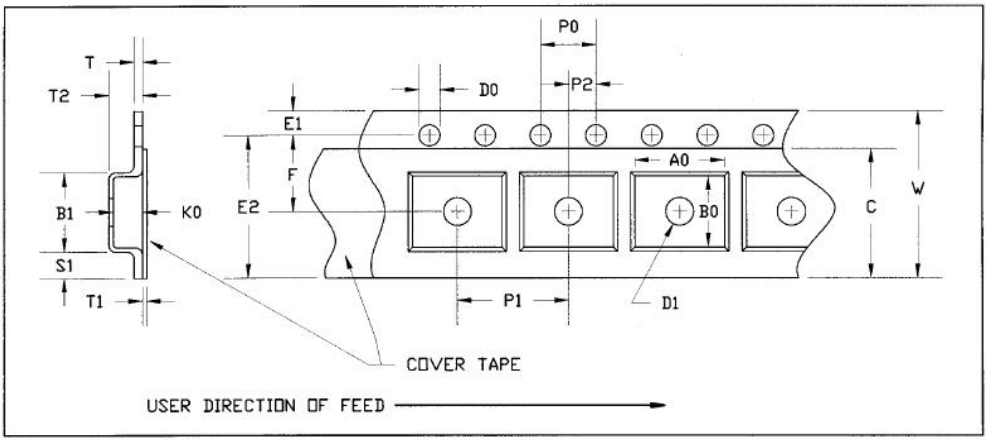
1) Line 1: Product code = TQM613017A
2) Line 2: Country Code = CCCC (USA = United States, PHIL = Philippines)
3) Line 3: AaXXXX = Aa = Vendor code + XXXX = TriQuint Lot Number
4) Line 4: YYWW = Year and Work Week

Data Sheet:
For additional information and latest specifications, see our website: *www.triquint.com*

Revision D, March 9, 2007

PowerPad™ CDMA PCS Band PA / Duplexer Module

Tape and Reel Specification:



FIXED CARRIER AND COVER TAPE DIMENSIONS

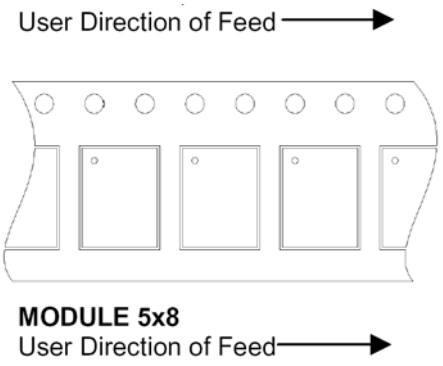
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	BOTTOM HOLE DIAMETER	D1	0.059	1.50
PERFORATION	DIAMETER	D0	0.059	1.50
	PITCH	P0	0.157	4.00
	POSITION	E1	0.069	1.75
CARRIER TAPE	THICKNESS	T	0.012	0.30
COVER TAPE	THICKNESS	T1	0.002	0.056

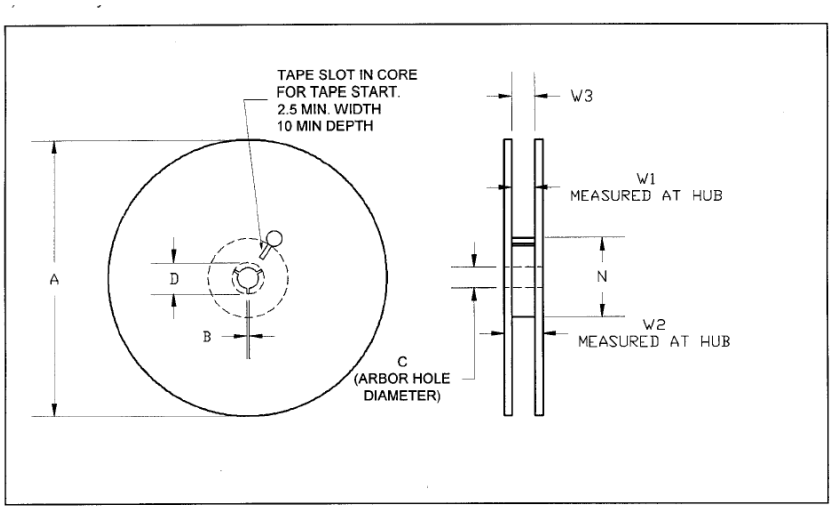
MODULE – 5x8 CARRIER AND COVER TAPE DIMENSIONS

PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.217	5.50
	WIDTH	B0	0.335	8.5
	DEPTH	K0	0.079	2.0
	PITCH	P1	0.472	12.00
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION LENGTH DIRECTION	P2	0.079	2.00
	CAVITY TO PERFORATION WIDTH DIRECTION	F	0.295	7.50
COVER TAPE	WIDTH	C	0.524	13.30
CARRIER TAPE	WIDTH	W	0.630	16.00

PowerPad™ CDMA PCS Band PA / Duplexer Module

Tape and Reel Specification:





Reel Dimensions for 16mm Carrier Tape

SOIC-14, SOIC-16 BATWING, QSOP 24, SSOP-24, TSSOP-20 & 28 HP VFQFP-N 7x7 and SOT 223. Modules 5X8, 5X9, 6X6, 7X7, 8X8, 7X10 and 9.55X8.75			13" REEL	
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
FLANGE	DIAMETER	A	12.992	330.0
	THICKNESS	W2	0.874	22.2
	SPACE BETWEEN FLANGE	W1	0.661	16.8
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

PowerPad™ CDMA PCS Band PA / Duplexer Module

Lead-free statement:

All new TriQuint products/packages introduced since June, 2003 are qualified using RoHS compliant Pb-free plating. Labels on the tape reel and the shipping carton will include the lead free logo.

TQM663017A 5 x 8 mm package has gold (Au) plated contacts.

Additional Information [1]

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

Web: www.triquint.com 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