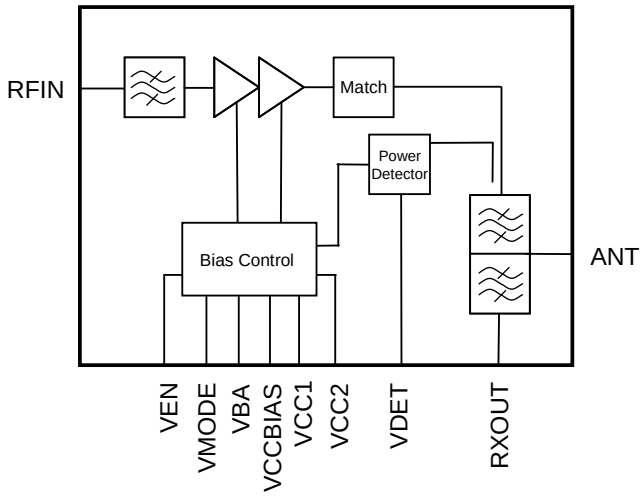
TQM626028L

Data Sheet

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

Functional Block Diagram



Product Description

The Tritium III PAD™ is an integrated 3V Linear Power Amplifier, Duplexer and Transmit Filter Module including a highly accurate Output Power Detector designed for mobile UMTS handset applications, supporting HSUPA operation with transmission data-rates up to 10Mb/s.
It features 2 output power modes, additional continuous bias in low power mode, low off and standby currents, and a separate pin for module enable. RF input and output matching is included within the module; therefore, minimal external circuitry is required. The Tritium III PAD™ gives excellent RF performance with low current consumption resulting in longer talk times in portable applications. The tiny 7x4x1.1 mm³ surface mount package is ideal for new generation slim, small and light phones.

Electrical Specifications

Parameter	Min	Typ	Max	Units
Frequency	880		915	MHz
Linear P_{OUT}(HSUPA) high power mode	24.0			dBm
Maximum current high power mode		325		mA
Idle current low power mode		15		mA
ACPR (HSUPA) 5 MHz		-43		dBc
ALPR (HSUPA) 10 MHz		-60		dBc
Ant-to-RX Insertion Loss		2		dB

Test Conditions: V_{CC1} = V_{CC2}= 3.8 V, Ta = 25°C

Features

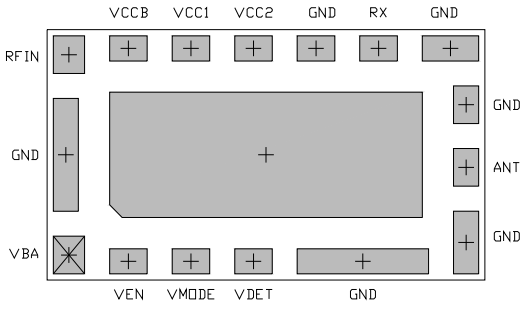
- Handset Tritium III PAD™ (PA-Duplexer) Module for UMTS Band VIII (GSM900 MHz band)
- Specified for HSUPA Modulation
- Integrates Power Amplifier, Highly Accurate Output Power Detector, Transmit Filter and Duplexer
- No Regulated Voltage Required
- Separate 'Module Enable' Pin
- All RF Ports Matched to 50 Ω
- Low Current Consumption:
  – 2 Power Modes
  – Continuous Bias in Low Power Mode
  – Low Idle Current
  (15mA typ.) in Low Power Mode
- Compatible for Low Collector Voltage Operation with DC-DC-Converters

Applications

- 3G UMTS Handsets and Data-Cards

Package Style

- Compact 7 x 4 x 1.1 mm³ 16-Pin LGA Package



For additional information and latest specifications, see our website: www.triquint.com
Revision C, June 2010

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Absolute Maximum Ratings

Item #	Parameter	Symbol	Specification			Unit	Remarks
			Min	Typ	Max		
1	DC Supply Voltage 1, 2	Vcc1, Vcc2	0.7		6	V	no RF power
			0.7		4.7	V	no damage at max. RF Power, VSWR=10:1 -20°C ≤ Ta ≤ 85°C
2	Bias Supply Voltage	VccB	3.1		6	V	no RF power
					4.7	V	no damage at max. RF Power, VSWR=10:1 -20°C ≤ Ta ≤ 85°C
3	Mode Control Voltage	Vmode	-0.5		3	V	no RF power
4	Enable Voltage	VEN	-0.5		3	V	no RF power
5	Bias Control Voltage	VBA	-0.5		3	V	no RF power
6	RF Input power	Pin			10	dBm	
7	Operating case temperature	Top	-30		85	°C	
8	Operating ambient temperature	Ta	-30		85	°C	
9	Storage temperature	Ts	-55		125	°C	

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

Operating Conditions

#			Min	Typ	Max	Unit	
1	DC Supply Voltage 1, 2	Vcc1, Vcc2	3.3	3.8	4.45	V	=Vrange
2	DC Supply voltage 1, 2 with DCDC converter	Vcc1, Vcc2	0.7		4.45	V	
3	Bias Supply Voltage	VccBias	3.3	3.8	4.45	V	
4	Mode Control Voltage						
	High Power Mode	VmodeH	0		0.56	V	
	Low Power Mode	VmodeL	1.5		2.86	V	
5	Bias Control						
	High Power Mode	VBA				V	VBA ignored in High Power Mode
	Low Power Mode	VBA	1.15		1.9	V	
6	TX Enable Voltage						
	Module disabled	VENL	0		0.56	V	
	Module enabled	VENH	1.5		2.86	V	
7	Operating case temperature						
	50 Ohm operation	TC	-20	25	85	°C	= Trange 1
	Load VSWR = 2:1	TC	-20	25	60	°C	=Trange 2

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

Vba, Bias Control voltage

	Low Power Mode				High Power Mode
Pout (dBm)	**≤ - 10**	**≤ 3**	**≤ 10**	**≤ +16**	
VBA (V)	**1.35**	**1.60**	**1.70**	**1.90**	**don`t care**

ESD Ratings

Item #	Parameter	Symbol	Specification			Unit	Remarks
			Min	Typ	Max		
1	ESD Protect ANT (HBM)	V_{ESDROH}	+/-300			V	Human Body Model 100pF, 1500 Ohm
2	ESD Protect TX in (HBM)	V_{ESDTxH}	+/-300			V	Human Body Model 100pF, 1500 Ohm
3	ESD Protect Rxout (HBM)	V_{ESDRxH}	+/-300			V	Human Body Model 100pF, 1500 Ohm
4	ESD Protect other pins (HBM)	V_{ESDH}	+/-1.5			kV	Human Body Model 100pF, 1500 Ohm

DC Operating Parameters

Item #	Parameter	Symbol	Specification			Unit	Remarks
			Min	Typ	Max		
1	Standby current	I_{STDBY}		150	200	µA	V_{EN}=0.5V, V_{BA}=1.9V, V_{mode}=0V Vcc1=Vcc2=Vcc=4.45V, -20°C <Ta<85°C sum current on all pins
2	Off current	I off		12	20	µA	V_{EN}=0.5V, V_{BA}=0V, V_{mode}=0V Vcc1=Vcc2=Vcc=3.4V, -20°C <Ta<85°C
3	Mode Control Current	I_{Mode}			1	mA	
4	Bias Control						
	Bias Control Current	I_{BA}			1	mA	
	Bias Control Off Resistance	R_{BAL}	1			Mohm	VEN= 0.5V
	Bias Control Off Capacitance	C_{BAL}			4	pF	VEN= 0.5V
5	TX Enable Current	I_E			1	mA	

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RF Test Conditions

Item #	Parameter	Symbol	Definition
1	Test Conditions Voice	TC1	HPSK modulated carrier in 3.84MHz BW UL ref. Meas. Channel (12.2kbps) from 3GPP TS25.101 Annex A sec. A.2.1. 1 DPCCH@15ksps, Spread Code=0, Relative Power=-6.547dB 1 DPDCH@60ksps, Spread Code=16, Relative Power=-1.087dB CW testing, input power adjusted to meet output power requirements
2	Test Conditions HSDPA	TC2	HPSK modulated carrier in 3.84MHz BW 1 DPCCH@15ksps, Spread Code=0, Relative Power=-7.095dB 1 DPDCH@60ksps, Spread Code=16, Relative Power=-5.157dB 1 HS-DPCCH@15ksps, Spread Code=64, Relative Power=-3.012dB CW testing, input power adjusted to meet output power requirements
3	Test Conditions HSUPA without Power Back-Off	TC3	DPCCH@15ksps, Spread Code=0, Relative Power=-19.391dB, Q branch DPDCH@960ksps, Spread Code=1, Relative Power=-13.931dB, I branch HS-DPCCH@15ksps, Spread Code=64, Relative Power=-19.391dB, Q branch E-DPCCH@15ksps, Spread Code=1, Relative Power=-17.338dB, I branch E-DPDCH1@960ksps, Spread Code=2, Relative Power=-0.371dB, I branch CW testing, input power adjusted to meet output power requirements
4	Test Conditions HSUPA with 2.6dB Power Back-Off	TC4	DPCCH@15ksps, Spread Code=0, Relative Power=-12.499dB, Q branch DPDCH@960ksps, Spread Code=1, Relative Power=-4.540dB, I branch HS-DPCCH@15ksps, Spread Code=64, Relative Power=-22.041dB, Q branch E-DPCCH@15ksps, Spread Code=1, Relative Power=-6.478dB, I branch E-DPDCH1@960ksps, Spread Code=2, Relative Power=-4.425dB, I branch CW testing, input power adjusted to meet output power requirements

Logic Truth Table

Item #	Mode of operation	Symbol	Specification			VCC	Remarks
			VEN	Vmode	VBA		
1	Off	Off	Low	Low	Low	On	
2	Standby	STBY	Low	Low	High	On	
3	High Power Mode	HPM	High	Low	x	On	
4	Low Power Mode	LPM	High	High	0.5 -1.9 V	On	

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

RF Specification for WCDMA Operation in 900 MHz Band

Item #	Parameter	Symbol	Specification Min	Typ	Max	Unit	Remarks
1	operating frequency	f	882.4		912.6	MHz	
2	Linear output power						
	High Power Mode	Po (H1)	24.0			dBm	Vcc=3.3-4.45V, -20°C ≤ T ≤ 85°C, TC1,2,3
	High and Low Power Mode	Po (Th)	16.0			dBm	Vcc=3.3 - 4.45V, -20°C ≤ T ≤ 85°C, TC1,2, 3
3	Total active current						
	High Power Mode, Po = 24.0 dBm	Itot (H1)		325	370	mA	Vcc=3.8V; T=25°C, TC3 into 50 Ohm
	Low Power Mode, Po = 16.0 dBm	Itot (L16)		70	100	mA	Vcc=3.8V; T=25°C, TC3 into 50 Ohm
	Low Power Mode, Po = -10 dBm	Itot (L -10)		14	20	mA	Vcc=3.8V; T=25°C, TC3 into 50 Ohm
4	Adjacent Channel Leakage						ACLR referenced to Po, RBW=30 kHz TC1/TC2 /TC3 into 50 Ohm, T=25°C
	Po ≤ 24.0 dBm	ACLR1		-43	-38	dBc	offset +/- 5 MHz, Vcc=3.8V
	Po ≤ 24.0 dBm	ACLR 2		-60	-48	dBc	offset +/- 10 MHz, Vcc =3.8V
							ACLR referenced to Po, RBW=30 kHz TC1/TC2 /TC3 into 2.0:1 VSWR -20°C < T < 60°C
	Po ≤ 22.0 dBm	ACLR1			-34	dBc	offset +/- 5 MHz, 3.3 V ≤ Vcc ≤ 4.45 V
	Po ≤ 22.0 dBm	ACLR2			-44	dBc	offset +/- 10 MHz, 3.3 V ≤ Vcc ≤ 4.45 V
5	Error Vector Magnitude (EVM)						
	Po ≤ 24.0 dBm	EVM		3.5	7	%	TC1,2,3 into 50 Ohm, 3.3V ≤ Vcc ≤ 4.45V -20°C ≤ T ≤ +85°C
	Po ≤ 24.0 dBm	EVM			9	%	TC1,2,3 into VSWR 2.0:1, 3.3V ≤ Vcc ≤ 4.45V -20°C ≤ T ≤ +60°C
	Rx path EVM			2.5	3	%	TC3 into 50Ohm, 927.4 MHz < f < 957.6 MHz - 20°C ≤ T ≤ 85°C, 3.3 V ≤ Vcc ≤ 4.45 V
6	Gain						
	High Power Mode, Po=24.0 dBm	G(H1)	22.0		30.0	dB	TC1/TC2/TC3 into 50 Ohm, -20°C < T < +85°C , 3.3V < Vcc< 4.45V
	Low Power Mode, Po=16.0 dBm	G(Th,L)	15.0		25.0	dB	TC1/TC2/TC3 into 50 Ohm, -20°C < T < +85°C , 3.3V < Vcc< 4.45V
	Low Power Mode, Po < -10 dBm	G(L, -10)	5		17.0	dB	TC1/TC2/TC3 into 50 Ohm, -20°C < T < +85°C , 3.3V < Vcc< 4.45V

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

RF Specification for WCDMA Operation in 900 MHz Band (continued)

Item #	Parameter	Symbol	Specification Min	Typ	Max	Unit	Remarks
7	Insertion phase shift low to high / high to low power mode transition variation from nominal	Pshift_var	-30		30	deg	10dBm <Pout<16dBm, all TCs, VSWR=2:1 -20°C ≤T≤ 85°C, 3.3V ≤ Vccc ≤4,45V includes variation over f and part to part
8	Gain sensitivity vs gain at Vcc=3.4V, T=25°C High Power Mode at any fixed Po/f combination, 16dBm<Po<24.4dBm	DeltaG(H)		± 2.5	± 3.2	dB	All TC, 3.3V < Vcc < 4.45V, -20°C < T < 85°C
	Low Power Mode at any fixed Po/f combination , Po<16dBm	DeltaG(L)		± 2.5	± 3.2	dB	All TC, 3.3V < Vcc < 4.45V, -20°C < T < 85°C
9	Gain Slope vs V_{BA} Low Power Mode at any fixed Po/f-combination	Gs	1		45	dB/V	VBA adjusted for ACLR compliance all TCs, Pout ≤16dBm, V_{CC}=3.4V, T=25°C
10	Receive Noise f_{TX}=882.4 - 912.6 MHz	N_{RX}			-114	dBm	all TC into 50 Ohm f_{RX}=925-960MHz, RBW=3,84MHz 3.3V≤Vcc ≤4.45V, -20°C ≤T≤ 85°C,
11	Reverse Intermodulation $f_{int}=f_{TX}$-5MHz	IMR1			-33	dBc	TC1,2,3 at Pout=24 dBm, Pint = - 14.8dBm RBW=3.84MHz, 3.3V ≤ Vcc ≤ 4.45 V
	$f_{int}=f_{TX}$-10MHz	IMR2			-43	dBc	-20°C ≤ T ≤ +85°C
	$f_{int}=f_{TX}$- 45 MHz	IMR3			- 78.0	dBint	all TCs at Pout=22dBm, Pint = - 17dBm RBW=3.84MHz, 3.3V ≤ Vcc ≤ 4.45 V -20°C ≤ T ≤ +85°C
12	Harmonics Po <24.0 dBm	Hi		-40	-33	dBm	3.3V ≤ Vcc ≤ 4.45 all Harmonics up to 12.5GHz RBW=3.84MHz, -10°C ≤ T ≤ + 65°C TC1 /TC2 /TC3 into VSWR 2.0:1
13	Input VSWR Po < 24.0 dBm				2.4 :1	VSWR	3.3V<Vcc<4.45V, -20°C < T < 85°C, all TCs
14	Load Mismatch Stability Po ≤ 25.0 dBm all spurious < 65 dBc		8:1			VSWR	all TCs, Vcc<4.7V, 0.5V<VBA<2V -30°C ≤T ≤ 85°C, angles, max Pin= +10dBm

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

RF Specification for WCDMA Operation in 900 MHz (continued)

Item #	Parameter	Symbol	Specification Min	Typ	Max	Unit	Remarks
15	Load Mismatch Ruggedness Po ≤ 25.0 dBm no degradation, no damage		10:1			VSWR	all TCs, Vcc<4.7V, 0.5V<VBA<2V -30°C ≤T ≤ 85°C, angles, max Pin= +10dBm
16	Rise/ Fall Time, all Po incl. Gain settling time for mode switch	RT			10	µs	10% max Po to 90% max Po
		FT			10	µs	90% max Po to 10% max Po -20°C ≤ T≤ +85°C, 3.1V ≤ Vcc ≤ 4.45 V
17	Rx Path Losses						
	f_{RX}=35-55 MHz	A_{RX1}	40			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=293 -305 MHz	A_{RX2}	25			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=440-458 MHz	A_{RX3}	45			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=835 - 870 MHz	A_{RX4}	45			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=925 - 927.4 MHz	A_{RX5a}			3.6	dB	T=25°C
	f_{RX}=925 - 927.4 MHz	A_{RX5a}			5.0	dB	-20°C ≤ T ≤ +85°C
	f_{RX}=927.4 -960 MHz	A_{RX5b}			3.0	dB	T= 25°C
	f_{RX}=927.4 -960 MHz	A_{RX5b}			3.6	dB	-20°C ≤ T ≤ +85°C
	f_{RX}=925 -960 MHz variation within any 5MHz channel	A_{RX5var}	-0.5		0.5	dB	-20°C ≤ T ≤ +85°C
	f_{RX}=1980 -1710 MHz	A_{RX6}	9			dB	T=25°C
	f_{RX}=1710 -1785 MHz	A_{RX7}	33			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=1805 -1875 MHz	A_{RX8}	28			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=1920 -1980 MHz	A_{RX9}	33			dB	-20°C < T < +85°C
	f_{RX}=2400 - 2500 MHz	A_{RX10}	30			dB	-20°C < T < +85°C
	f_{RX}=2685 - 2790 MHz	A_{RX11}	28			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=2790 -6000 MHz	A_{RX12}	25			dB	-20°C ≤ T ≤ +85°C
	f_{RX}=6000 -12750 MHz	A_{RX13}	15			dB	-20°C ≤ T ≤ +85°C
18	TX Power @ RX port	RX iso			-27	dBm	- 20°C ≤ T ≤ 85°C fTX=882.4-912.6 MHz, Po= 24.0 dBm 3.3V < Vcc < 4.45 V

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

Power Detector Specification

Item #	Parameter	Symbol	Specification Min	Typ	Max	Unit	Remarks
1	Detector Output Range Po= 3 - 25 dBm	Vdet	60		1300	mV	-20°C≤T≤ 85°C, 3.1V≤ Vccc≤4,45V average Vdet over time signal
2	Power Detector Error (over Vcc and T at fixed f and Pout) Po-Po(3.8V, 25°C), f and Vdet f	Pdet_Err1			 ± 1.0 ± 1.5 ± 2.0	 dB dB dB	-20°C≤T≤ 85°C, 3.3V≤ Vcc≤4,45V 22dBm≤Po≤25 dBm, into 50 Ohm 10dBm ≤ Po < 22 dBm, into 50 Ohm 3dBm ≤ Po < 10dBm, into 50 Ohm
3	Power Detector Error (over VSWR at fixed f, Vcc, T and Pout) Po-Po(into 50Ohm) , f,Vcc,T and Vdet fixe 	Pdet_Err2 Pdet_Err2		 ± 0.5 ± 0.5	 ± 0.75 ± 0.75	 dB dB	-10°C≤T≤ 60°C, 3.3V≤ Vcc≤4,45V VSWR= 1.0:1 to 2.0:1, any angle 10dBm ≤ Po ≤ 25 dBm 3dBm ≤ Po ≤ 16dBm
4	Power Detector Error (over Vmode switch) Po(Vmode high)-Po(VmodeLow); f,Vcc,T and Vdet fixed	Pdet_Err3 Pdet_Err3			 ± 0.25 ± 0.25	 dB dB	10dBm ≤ Po ≤ 16 dBm 3.3V ≤ Vcc ≤ 4,45V -20°C≤T≤ 85°C, into 50 Ohm -10°C≤T≤ 60°C, VSWR=1.0:1 to 2.0:1, any angle
5	Detector Load	$Z_{loadDet}$	100			kOhm	load driven by Vdet -20°C≤T≤ 85°C, 3.3V≤ Vcc≤4,45V
7	Detector Off State Impedance	$Zoff_{Det}$	5			MOhm	looking into Vdet, VEN=0.5V -20°C≤T≤ 85°C, 3.3V≤ Vcc≤4,45V
8	Detector Response (settle within 90% of final Vdet, C_{load}=2pF)			 100 100	 150 150	 ns ns	-20°C<T< 85°C, 3.3V< Vcc<4,45V change from 0 to 25 dBm change from 25 to 0 dBm
9	Detector Turn on (cload = 2pF)				 10	 µs	-20°C<T< 85°C, 3.3V< Vcc<4,45V detector stabilized at any Po

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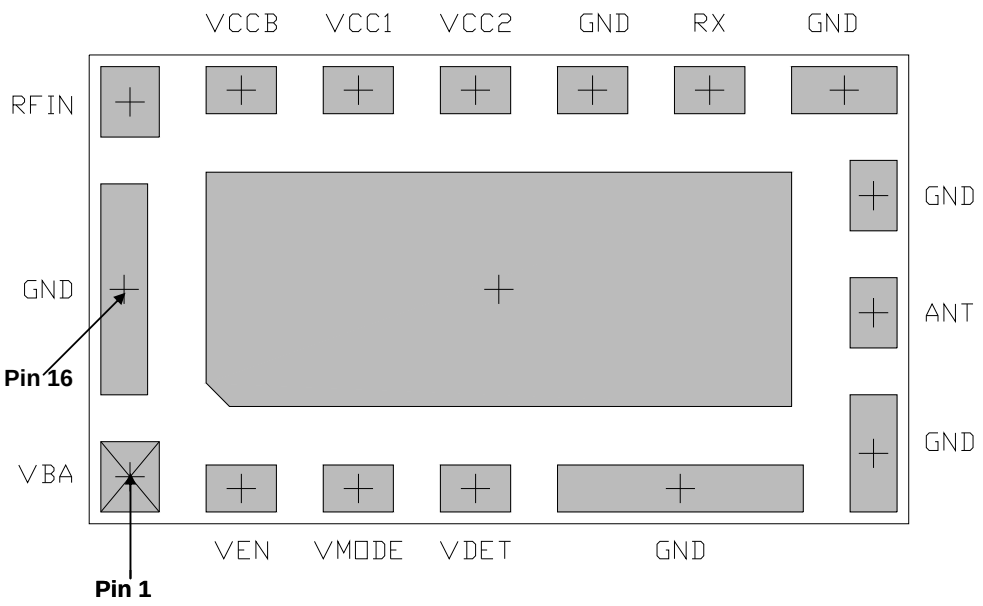
Pin Out and Assignments

TOP VIEW

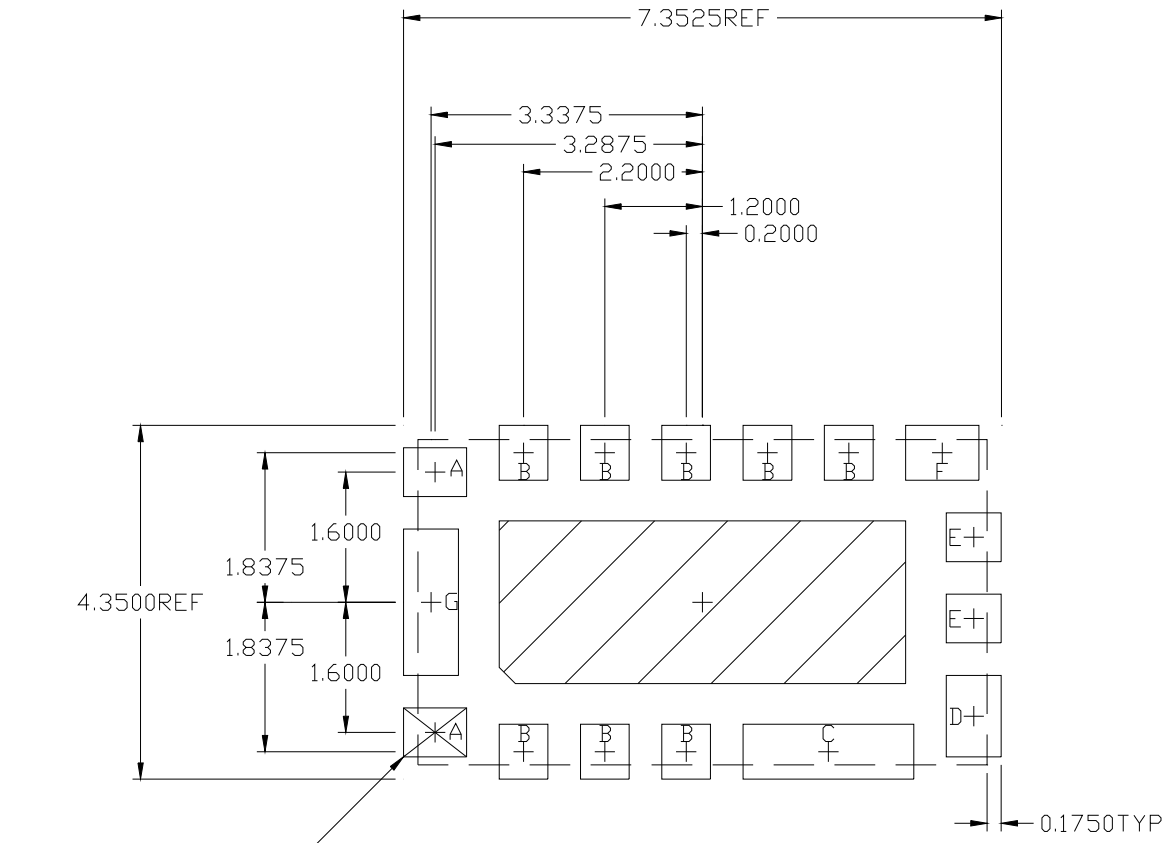


Pin #	Description	Function
1	VBA	Analog bias adjust voltage
2	VEN	Module enable voltage
3	VMODE	Mode voltage
4	VDET	Detector output voltage
5	GND	Ground
6	GND	Ground
7	ANT	RF output (to antenna)
8	GND	Ground
9	GND	Ground
10	RX	Rx output
11	GND	Ground
12	VCC2	Supply voltage for 2nd amplifier stage
13	VCC1	Supply voltage for 1st amplifier stage
14	VCCBIAS	Supply voltage for bias circuit
15	RFIN	RF input
16	GND	Ground
17	GND	Ground

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

PC Board Layout Recommendations

TOP VIEW ETCH RECOMMENDATIONS

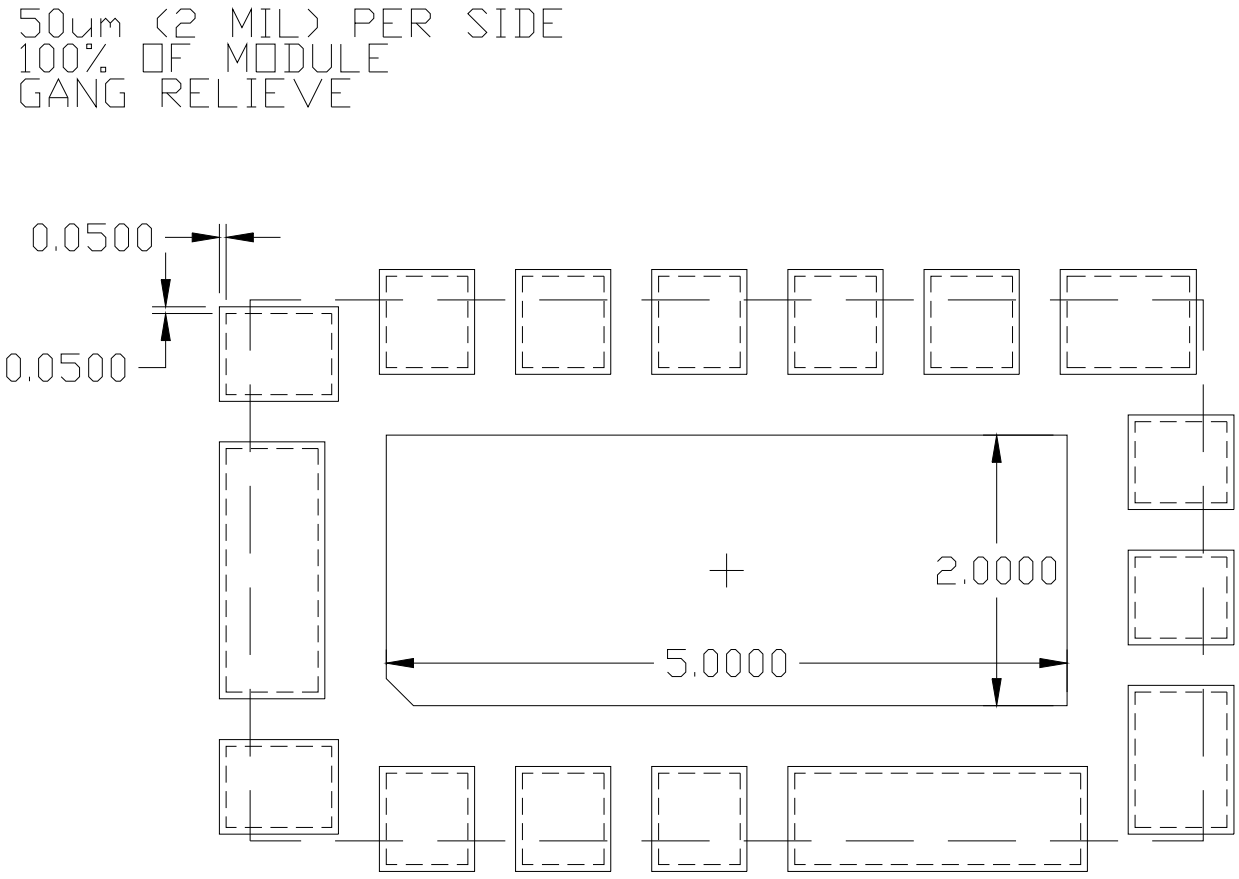


PIN 1

A (02X) 0.775 X 0.600
B (08X) 0.600 X 0.675
C (01X) 2.100 X 0.675
D (01X) 0.675 X 1.000
E (02X) 0.675 X 0.600
F (01X) 0.900 X 0.675
G (01X) 0.675 X 1.800

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

TOP VIEW SOLDERMASK RECOMMENDATIONS



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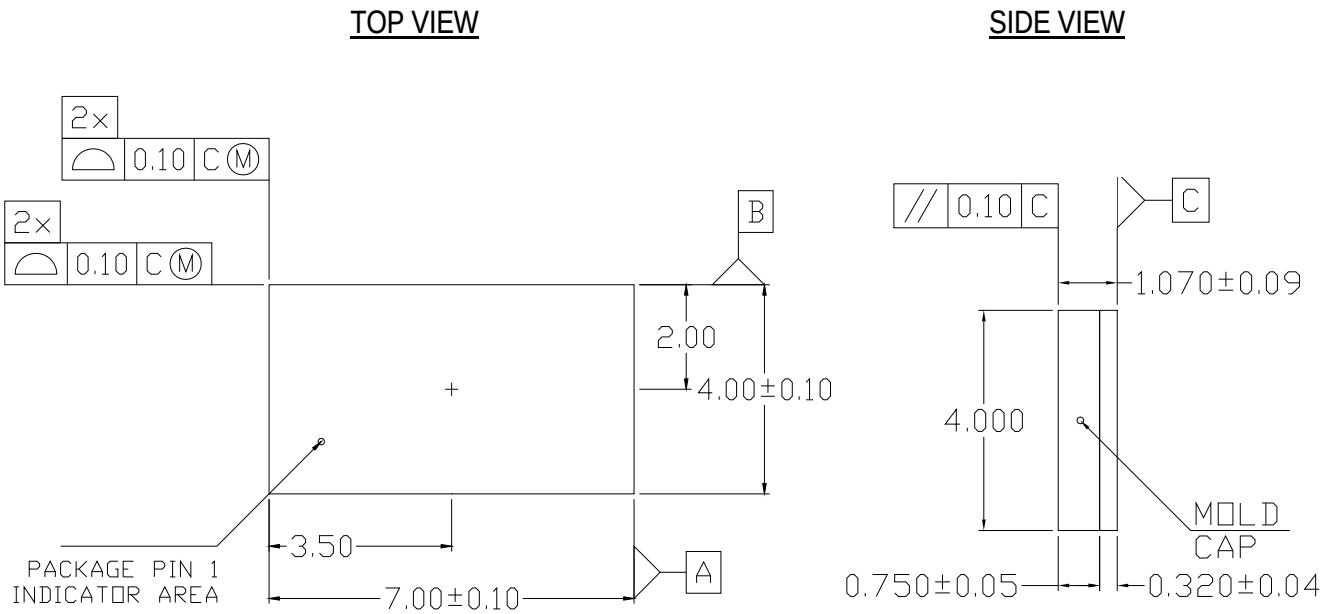
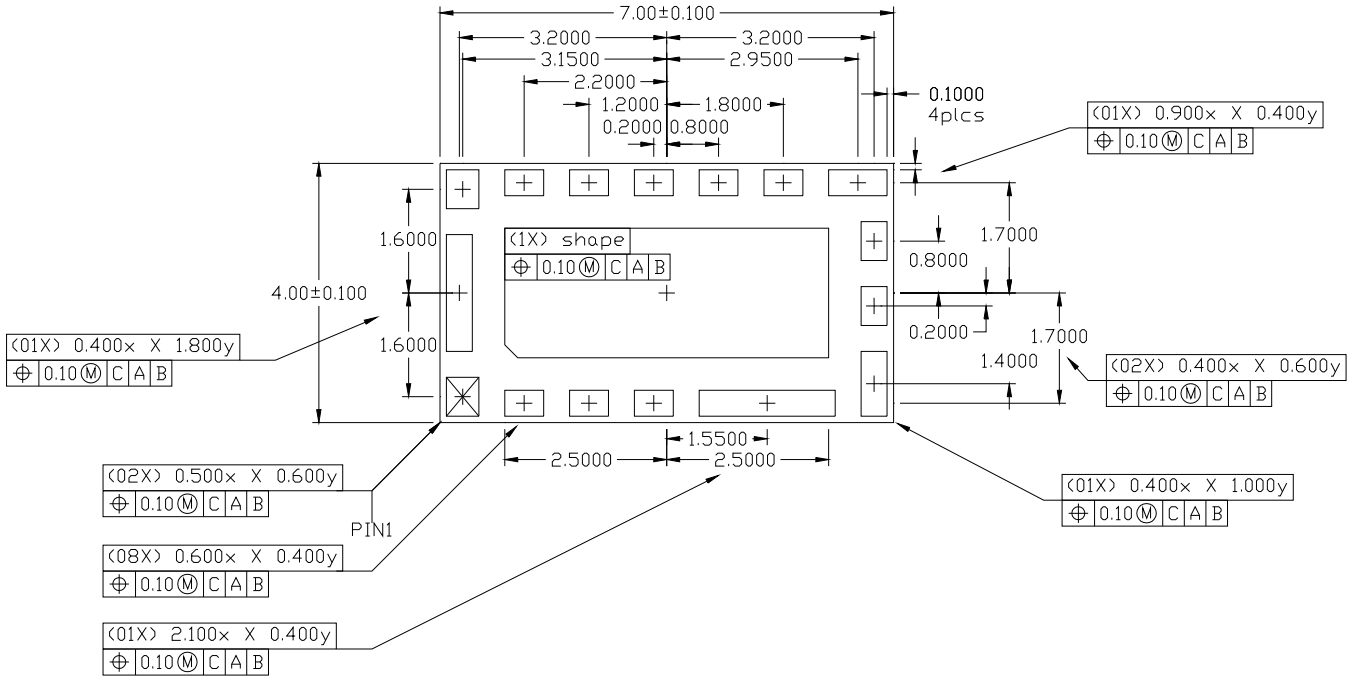
Packaging Information



For additional information and latest specifications, see our website: *www.triquint.com*
Revision C, June 2010

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

TOP VIEW LOOKING THROUGH MODULE



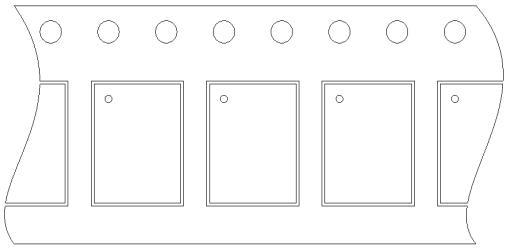
WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

TOP MARK

Line 1 – TriQuint + Logo
Line 2 – Product Name
Line 3 – Year/Wk, CCCC = Country Code (production Only)
Line 4 – AaXXXX (Aa = Vendor, XXXX= lot #)

PIN 1 DOT – drag to proper location

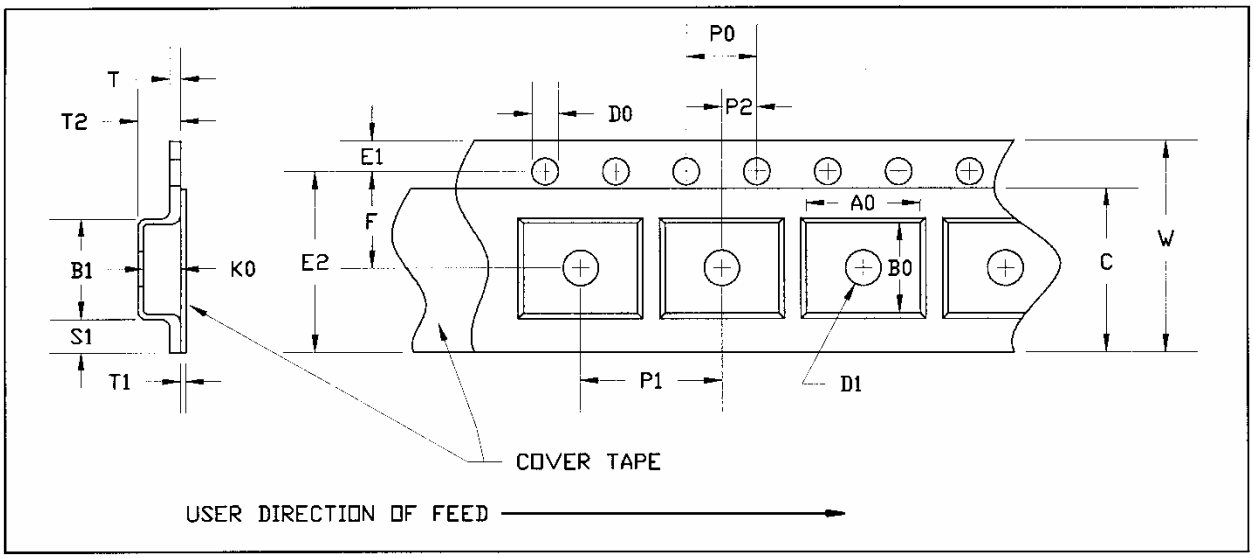
Tape and Reel information



MODULE 4x7
User Direction of Feed →

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

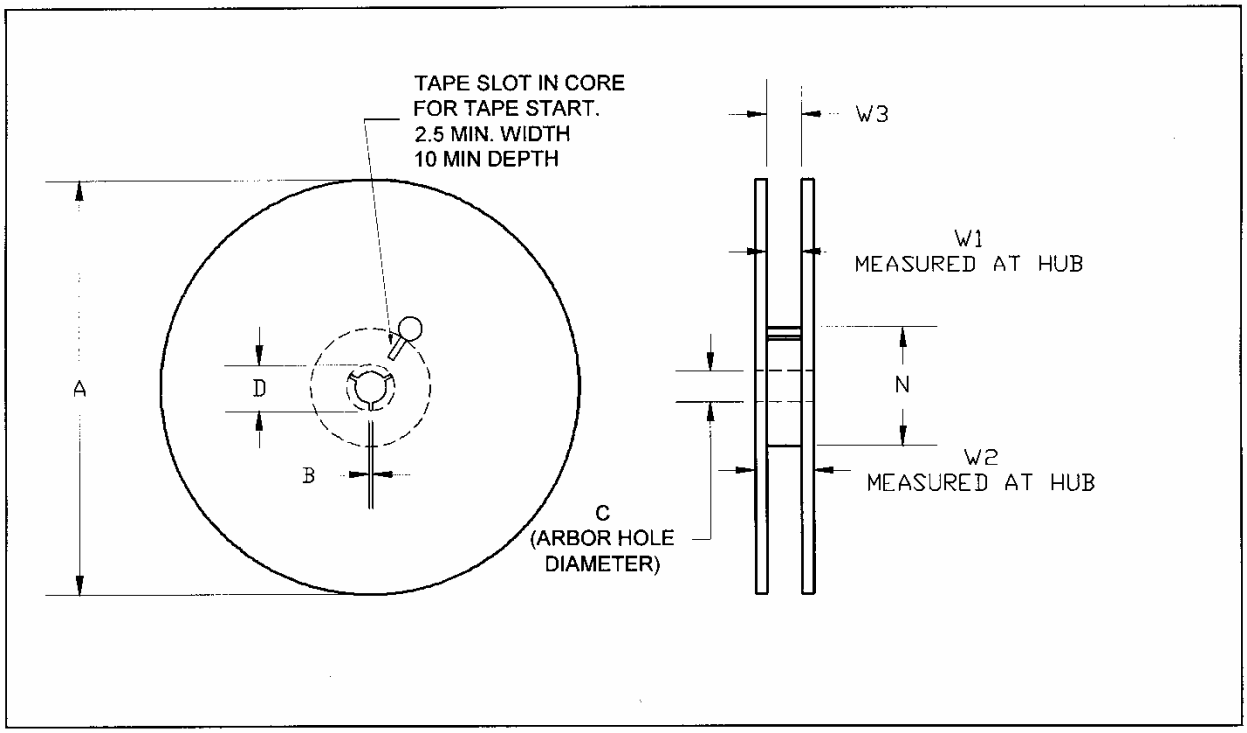
Carrier and Cover Tape Physical dimensions



PART		SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.179	4.55
	WIDTH	B0	0.299	7.60
	DEPTH	K0	0.068	1.73
	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	0.295	7.50
COVER TAPE	WIDTH	C	0.524	13.30
CARRIER TAPE	WIDTH	W	0.630	16.00

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

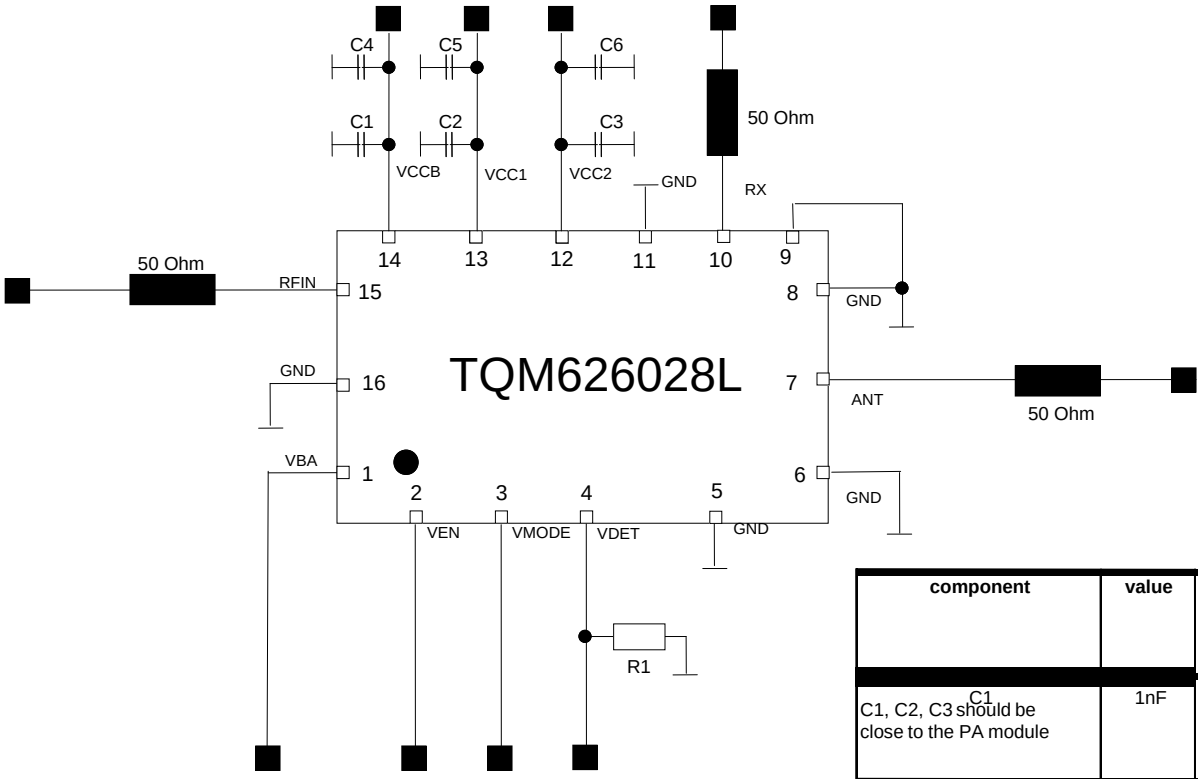
Reel Physical dimensions



Modules 4x7			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

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

Application Circuit



component	value
C1 C1, C2, C3 should be close to the PA module	1nF
C2, C3	100nF
C3, C4, C5	10 uF
R1	100k

WCDMA / HSUPA Band VIII Tritium III PA Duplexer Module™

Additional Information [1]

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 260°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:

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