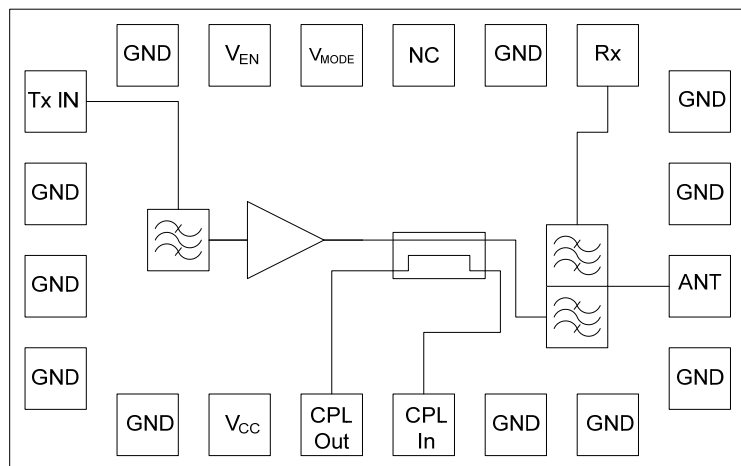


Tritium II PA-Duplexer Module™ CDMA Cellular Band

Functional Block Diagram



Product Description

The TQM613030 cellular band CDMA PA-Duplexer module integrates the duplexer, PA, coupler, Tx inter-stage filter, and built-in voltage regulator circuitry into a fully matched and compact RF solution. With 5mA of quiescent current in the low power mode, it draws less than 50mA of average current and is one of the most efficient CDMA PA solutions available. The RF power output of up to 26dBm meets the strict ACPR/ALTR requirements of multi-band, feature-rich CDMA2000 handset designs while it's small size and high-levels of integration make it an easy to use and ideal solution for any cellular band CDMA application.

Electrical Specifications

Test Conditions $V_{CC}=3.4V$, $V_{EN}=High$, $T=25^{\circ}C$

Parameter	Typ	Units
Frequency	824 - 849	MHz
Max P _{OUT}	26	dBm
ACPR ($\pm 885kHz$ offset) at Max P _{OUT}	-50	dBc
ALTR ($\pm 1.98MHz$ offset) at Max P _{OUT}	-60	dBc
Current Consumption (at +25dBm P _{out})	380	mA
Quiescent Current in LPM	5	mA
Quiescent Current in HPM	80	mA
Leakage at Rx Port	-32	dBm

Features

- Compact 7.0x4.0x1.1mm module replacing more than 10 discrete components
- Integrated duplexer, Inter-stage filter, PA die, RF power coupler and matching
- Built-in voltage regulator functionality eliminating any external switch circuitry
- High efficiency two gain state PA for low overall current consumption
- Typical quiescent current values:
 Low Power Mode (LPM) = 5mA
 High Power Mode (HPM) = 80mA
- Low Current Consumption
 Typical: 380 mA @ +25dBm
 Typical: 28 mA @ +11dBm
- Excellent ACPR
 Typical: -50 dBc @ +/- 885kHz offset
- Excellent ALTR
 Typical: -60 dBc @ +/- 1.98 MHz offset
- Lead-free 260°C RoHS Compliant
- Halogen Free (HF)

Tritium II PA-Duplexer Module™ CDMA Cellular Band

Absolute Maximum Ratings¹

Symbol	Parameter	Absolute Maximum Value	Units
V _{CC}	Supply Voltage with no RF applied	+6.0	V
	Supply Voltage with RF applied	+4.7	V
V _{MODE}	Mode Control Voltage	+2.7	V
P _{IN}	Input RF Power at Tx Port	+10	dBm
	Input RF Power at Antenna Port	+30	dBm
	Input RF Power at Rx Port	+10	dBm
T _C	Case Temperature, Survival	-35 to +95	°C
T _{STG}	Storage Temperature	-55 to +125	°C
ESD ²	Human Body Model (10pF, 1500Ω) at ANT, T _{XIN} , and Rx	±500	V
	Human Body Model (10pF, 1500Ω) at all other ports	±2,000	V
	Charged Device Model all pins	±2,000	V

Note 1: Stresses above those listed under absolute maximum ratings may cause permanent and functional damage to the device. Exposure exceeding absolute maximum rating conditions for extended periods may affect device reliability. The part may not survive all maximums applied simultaneously.

Note 2: Device is classified as a HBM Class 1B per JEDEC standard JESD22-A114 and CDM Class IV per JEDEC standard JESD22-C101.

DC Electrical Characteristics

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Supply Voltage (V _{CC})	No RF	3.2	3.8	6.0	V
	HPM, LPM with RF	3.2	3.8	4.2	V
	Ruggedness Testing			4.7	V
PA Enable Digital Control Voltage (V _{EN})	Low – PA off	0.0		0.5	V
	High – PA Enabled	1.5		2.7	V
PA Bias Mode Control Voltage (V _{MODE})	V _{MODE} = Low	0.0		0.5	V
	V _{MODE} = High	1.5		2.7	V
Control Line Current (I _{CONTROL})	All control lines (source or sink current)			1	mA
Leakage Current (I _{LEAK})	Total current on all pins; T=-20to+85°C, V _{CC} =4.7V, V _{EN} =0V		5	15	µA
Turn on/off time ¹ (T _{ON-DC} , T _{OFF-DC})				20	µs
Gain switching time (T _{MODE})	High-Low			6	µs
Ambient Operating Temperature		-30		+85	°C

Note 1: Definition of switching time: T_{ON-DC} = The time required to obtain the idle bias condition ±10% from a zero bias condition with RF signal applied

T_{OFF-DC} = The time required for the bias current (idle current) to decrease to < 100µA

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Tritium II PA-Duplexer Module™ CDMA Cellular Band

Power Range Truth Table

Mode of Operation	V _{EN}	V _{MODE}	V _{CC}
Power Down / PA Off	Low	X	ON
High Power Mode – HPM (-50 dBm < P _{OUT} ≤ +26 dBm)	High	High	ON
Low Power Mode – LPM (-50 dBm < P _{OUT} < +11 dBm)	High	Low	ON

Tx to Antenna Port RF Electrical Characteristics¹

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		824.70	-	848.31	MHz
Maximum Output Power	HPM, V _{CC} =3.4 – 4.2V, 25°C<T<60°C	26	-	-	dBm
	LPM, V _{CC} =3.4 – 4.2V, 25°C<T<60°C	11	-	-	dBm
Maximum Input Power	HPM	7	-	-	dBm
	LPM	9	-	-	dBm
Tx Gain	HPM	22	26	31	dB
	LPM	8	12	16	dB
Step Function Droop ²	HPM, 25°C, 25dBm, over 400ms	-	-	0.3	dB
Gain Flatness vs Frequency	HPM	-	-	±2.0	dB
	LPM	-	-	±1.5	dB
Gain Flatness vs Power	HPM	-	-	±2.0	dB
	LPM	-	-	±1.5	dB
Tx VSWR	Tx in port	-	-	2.5:1	
Adjacent Channel Power	HPM, 3.8V, 26dBm, 25°C	-	-50	-45	dBc
	HPM, 3.4V, 25dBm, 25°C	-	-53	-48	dBc
	HPM, 3.4V, 25dBm, 70°C	-	-50	-45	dBc
	LPM, 3.4V, 11dBm, 70°C	-	-50	-45	dBc
Alternate Channel Power	HPM, 3.8V, 26dBm, 25°C	-	-60	-57	dBc
	HPM, 3.4V, 25dBm, 25°C	-	-60	-57	dBc
	HPM, 3.4V, 25dBm, 70°C	-	-60	-57	dBc
	LPM, 3.4V, 11dBm, 70°C	-	-60	-57	dBc
BC0 Tx Noise in BC0 Rx Band	HPM, N _{IN} at Ant port = -135dBm/Hz	-	-178	-176	dBm/Hz
	LPM, N _{IN} at Ant port = -135 – (HP _{MAX} – LP _{MAX}) dBm/Hz	-	-	-176	dBm/Hz
Harmonics		-	-	-56	dBc
Duplexer Rx isolation	869 – 894 MHz, T=25°C	50	-	-	dB
Stability (all spurious)	Load VSWR = 10:1 @ all angles	-	-	-90	dBc
Ruggedness	HPM, Load VSWR = 10:1 @ all angles, No Damage		26dBm		
	LPM, Load VSWR = 10:1 @ all angles, No Damage		11dBm		
Current Draw	HPM, 3.8V, 25°C, 25dBm	-	380	-	mA
CDG Current ³	V _{CC} = 3.8V, 25°C	-	45	-	mA
PA Switching Time: Rise / Fall ⁴	0dB < P _{OUT} < 5dBm	-	-	6.0	µs
Code Domain Power ⁵	25°C < T < 60°C	23	-	-	dB

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Tx to Antenna Port RF Electrical Characteristics¹ (cont.)

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Code Channel Reverse Plot Power Accuracy	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 9600 rate	3.50	-	4.00	
Convolution Encoding	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 9600 rate	3.50	-	4.00	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 19.2K rate	3.38	-	3.88	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 19.2K rate	6.00	-	6.50	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 38.4K rate	2.13	-	2.63	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 38.4K rate	7.25	-	7.75	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 76.8K rate	0.88	-	1.38	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 76.8K rate	8.75	-	9.25	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 153.6K rate	-1.00	-	-0.50	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 153.6K rate	10.25	-	10.75	
Code Channel Reverse Pilot Power Accuracy	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 19.2K rate	3.250	-	3.750	
Turbo Encoding	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 19.2K rate	5.250	-	5.750	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 38.4K rate	2.250	-	2.750	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 38.4K rate	6.750	-	7.250	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 76.8K rate	1.125	-	1.625	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 76.8K rate	8.250	-	8.750	
	HPM, 5.5dBm P _{OUT} , R-FCH to R-Pilot @ 153.6K rate	-0.625	-	-0.125	
	HPM, 5.5dBm P _{OUT} , R-SCH to R-Pilot @ 153.6K rate	9.250	-	9.750	

Note 1: Test Conditions: V_{CC1}=3.8VDC, T_C = 25 °C unless otherwise specified.

Note 2: With the module in high gain mode steps the RF signal from -80dBm a level such that PO = POUT (H). The rise time for the step in the input power to the module shall not exceed 250ns

Note 3: Total current integrated across CDMA suburban CDG curve.

Note 4: Rise: time required to go from (Pout - 30 dB) to (Pout ± 1 dB); Fall: time required to reach (Pout - 30 dB) from (Pout ± 1 dB) when input signal removed.

Note 5: To be measured at Pout = 26dBm. Refer to IS98E section 4.3.5.

Rx to Antenna Port RF Electrical Characteristics

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Frequency		869	-	894	MHz
Insertion Loss	869 – 894 MHz, -30°C<T<85°C	-	2.2	3.2	dB
Rx VSWR	ANT and Rx ports	-	-	2.5:1	
Attenuation	BC0 Tx 824-849 MHz	45	-	-	dB
	BC1 Tx 1850-1910 MHz	35	-	-	dB
	ISM Tx 2400-2484 MHz	35	-	-	dB
	Rx 2 nd Harmonic 1738-1788MHz	30	-	-	dB
	Rx 3 rd Harmonic 2607-2682 MHz	30	-	-	dB
	Rx 4 th Harmonic 3476-3576 MHz	20	-	-	dB

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Tx to Rx Port RF Electrical Characteristics

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Tx Leakage	25 dBm, 3.8V, -30°C < T < 70°C	-	-32	-27	dBm

Coupled Port RF Electrical Characteristics

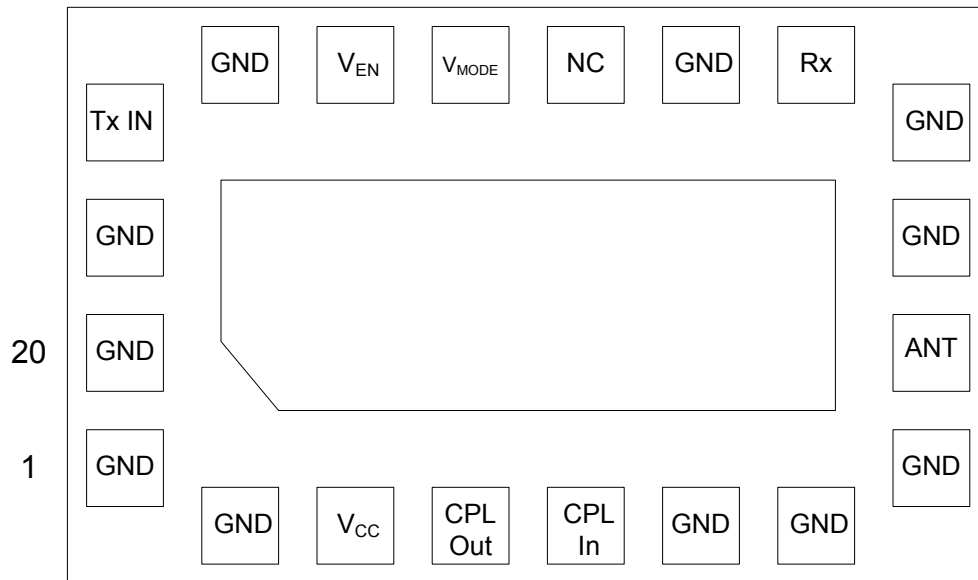
Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Tx Power at Coupled Port	Over freq relative to P _{OUT} , 16dBm < P _{OUT} < 26dBm, CPL_IN = 50Ω, , -30°C < T < 85°C	-23	-20	-17	dBc
Coupler Loss	CPLin to CPLout, 1850-1910 MHz	-	1.3	-	dB
Output Impedance		-	50	-	Ω
VSWR	HPM, Coupled Port	-	-	2.0:1	
Variation in Delivered Power ¹	HPM, 3.5:1 @ all angles, 22dBm < P _{OUT} < 26dBm	-4.0	-	0.5	dB
Temp Variation	HPM, 25dBm, 50Ω load at ANT, 3.8V, -30°C < T < 85°C	-0.5	-	0.5	dB

Note 1: Set the input power using a 50 Ohm load, then measure variation in output power for the same coupled power. The coupled power should be adjusted to remain constant.

Tritium II PA-Duplexer Module™ CDMA Cellular Band

Pin Out and Assignments

TOP VIEW (through package)



Pin	Symbol	Description
1	GND	Ground
2	GND	Ground
3	V _{CC}	Supply Voltage
4	CPL _{Out}	Directional Coupler Out
5	CPL _{In}	Directional Coupler In (Coupler Termination Port)
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	ANT	Duplexer ANT Port
10	GND	Ground
11	GND	Ground
12	Rx	Duplexer Rx Output Port
13	GND	Ground
14	NC	No Connect
15	V _{MODE}	Control for mode change
16	V _{EN}	Enable Control
17	GND	Ground
18	Tx _{in}	Tx Input
19	GND	Ground
20	GND	Ground

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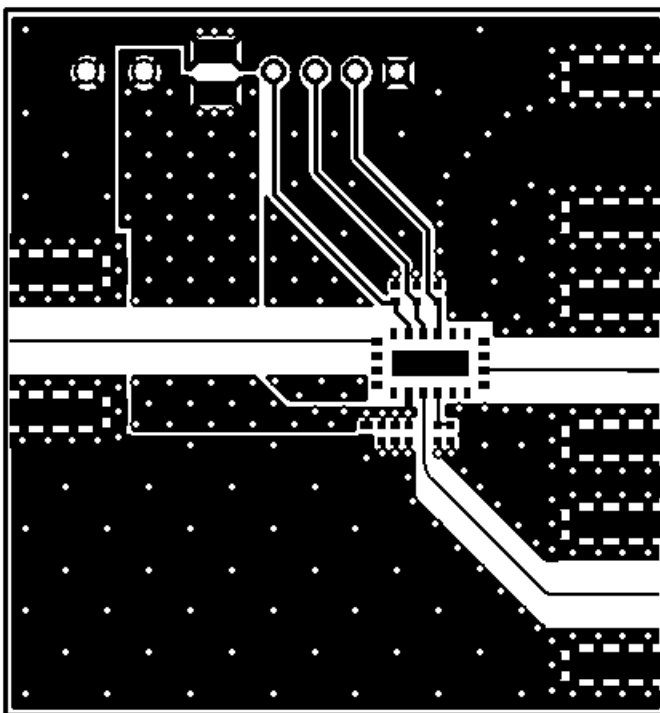
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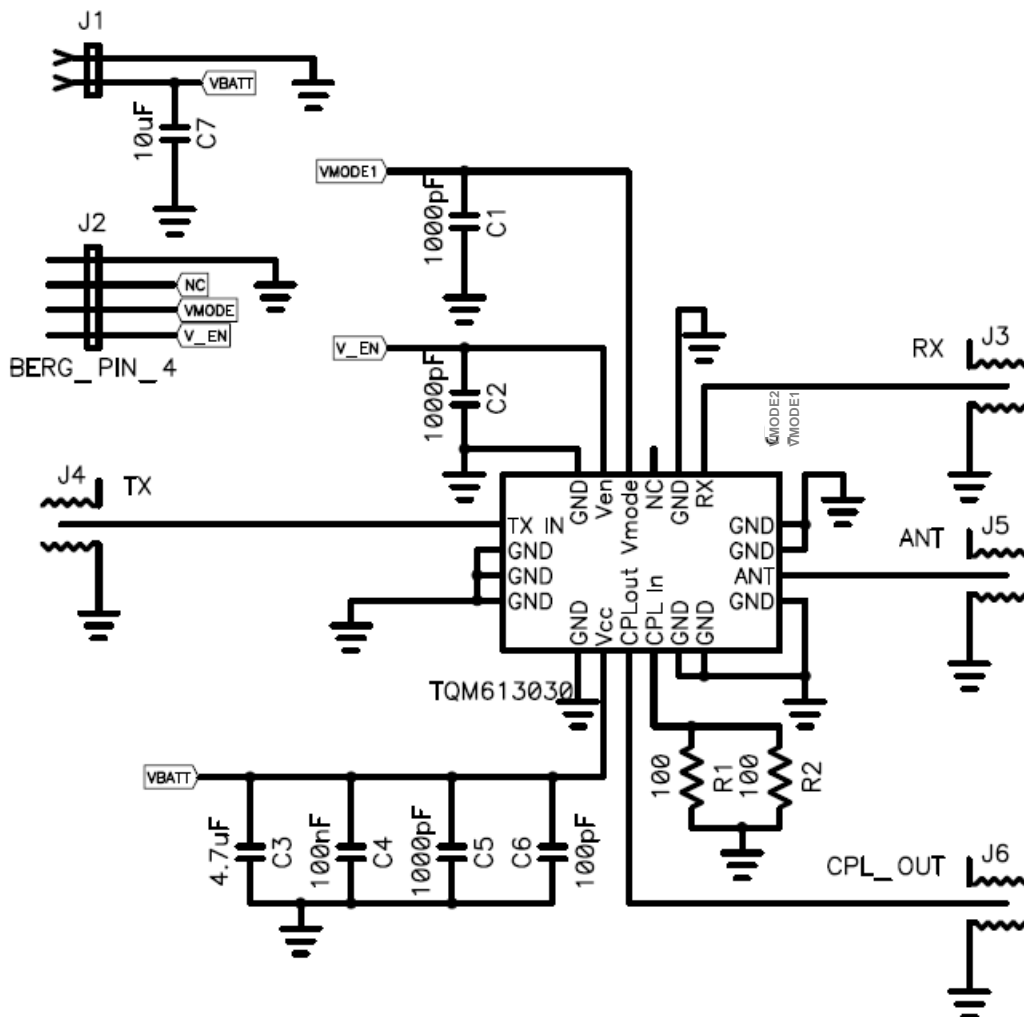
Tritium II PA-Duplexer Module™ CDMA Cellular Band

Applications information; tuning procedures; board layout precautions

TriQuint offers our customers the below evaluation board as a means for testing and analysis of the TQM613030. The evaluation board schematic and picture are provided for preliminary analysis and design. The following figures show the TriQuint application board and the schematic of the board followed by the power-up/power-down sequence instructions (*Drawing to be updated to show BAL Rx port – only change from below*)



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Note: Above is the application schematic for the TQM613029. This is included for reference in the Advanced Datasheet but will be updated to the TQM613030 application schematic on future datasheet revisions.

Applications Information: Power Up/Down Sequences

Power-Up Sequence			Power-Down Sequence		
Sequence	PIN	Description	Sequence	PIN	Description
1	V _{CC}	Apply Battery Voltage	1	RF	Remove RF
2	V _{MODE}	Set PA Mode bit	2	V _{EN}	Disable PA
3	V _{EN}	Enable PA	3	V _{MODE}	Set V _{MODE} = 0V
4	RF	Apply RF	4	V _{CC}	Remove Battery Voltage

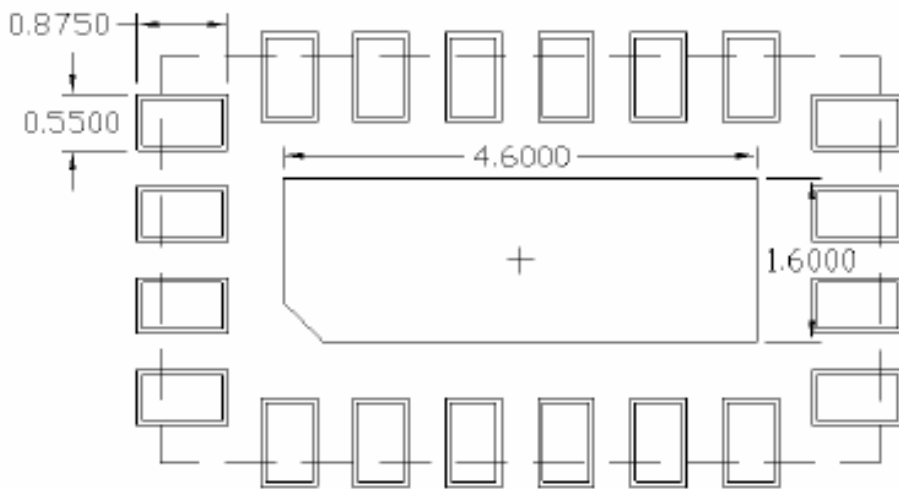
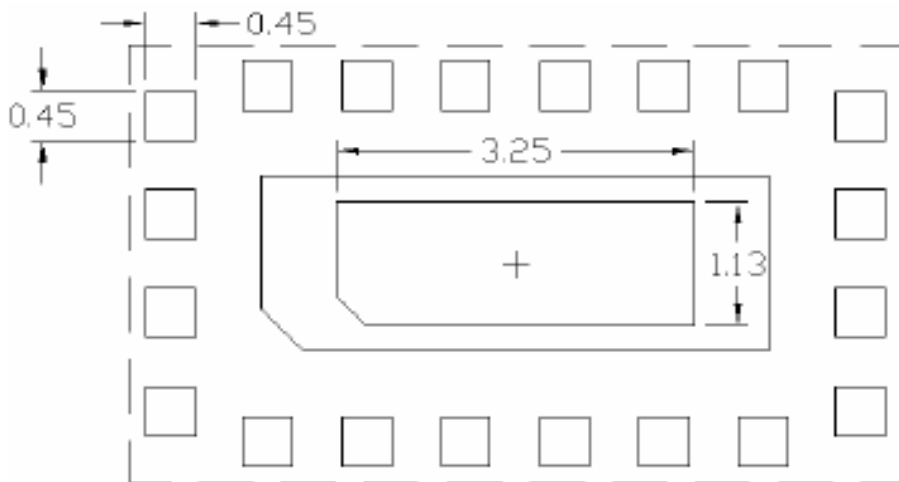
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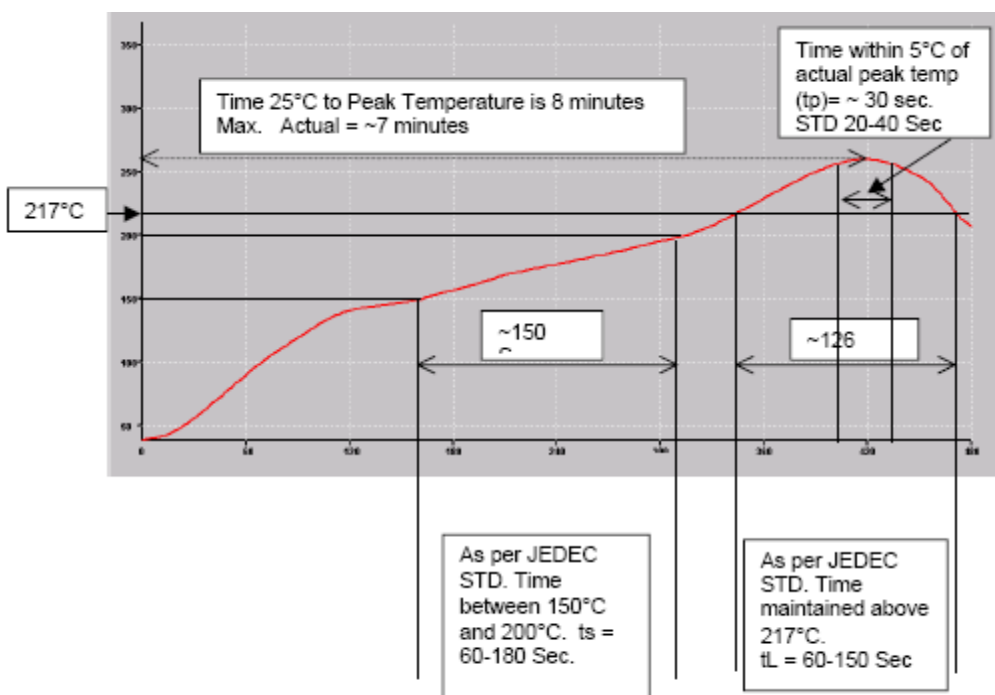
PC Board Layout recommendations



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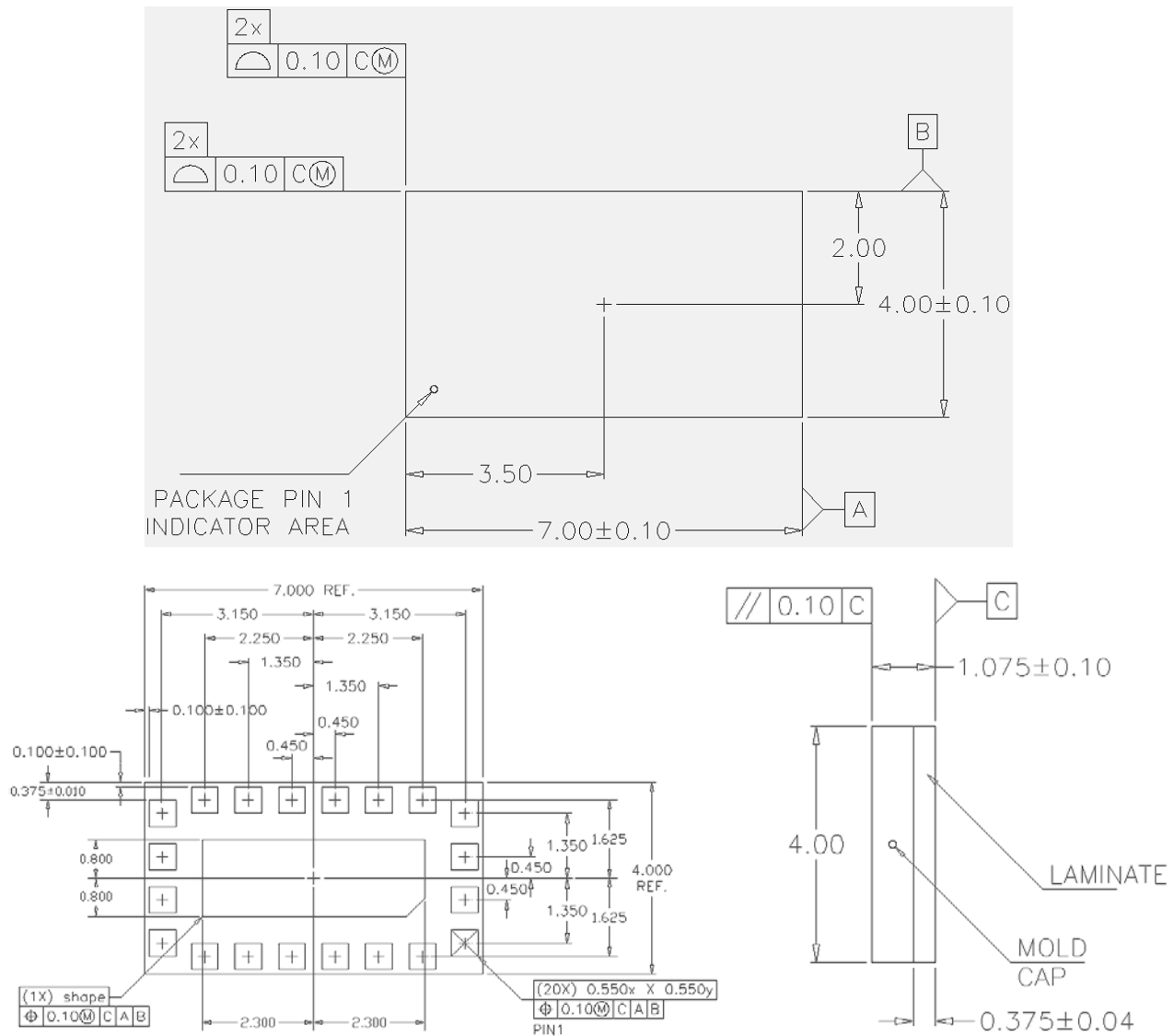
Recommended Reflow Profile

The TQM613030 is rated for 260°C reflow profile. Below is a general recommendation for 260°C reflow. The specific profile used will need to take into account the requirements of the board, other components, and the layout. The following recommendation should only be used as a guideline.



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Package Dimensions



Package Drawing

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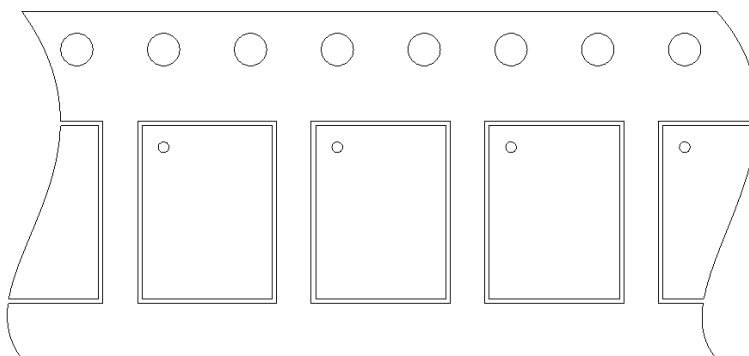
Package Marking



4x7mm, Pin 1 Lower Left Hand Corner

- 1) Line 1: TriQuint + Logo
- 2) Line 2: Product Name: TQM613030
- 3) Line 3: YYWW = Year/Week [CCCC = Country Code (Production Parts), Engineering Mark (Must start w/ letter "E", ENGR (Default) E#@# (Engineering Revision with 3 Digits, where # = number, @ = letter), ES#@ (Engineering revision with 2 digits, where # = number, @ = letter))]
- 4) Line 4: AxXXXX (Aa = Vendor Code, XXXX = lot number)

Tape and Reel Specification:



MODULE 4x7 and 5x8
User Direction of Feed →

Carrier tape - 3M part # 3M053091, Ao = 4.55mm, Bo = 7.60mm, Ko = 1.73mm, width = 16mm, pitch = 8mm
Cover tape - 3M part # 2678 13.3mm wide

Note: Packaged quantity is 2,500 per reel

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Tritium II PA-Duplexer Module™ CDMA Cellular Band

Shipment Box & Label Description:

Tape & Reels will be packaged in a dry-pack bag and then in a shipment box. The box dimensions will depend on the number of reels shipped in each box and are noted in the table below. The box label and a description of each item on the label are also shown below.

13 Inch x16mm--Drypack		
Box Size	Reel Qty/Box	Empty Box Wt w/ Packing
15x15x7	3	2
18x15x11	5	2.36
17x16x17	9	2.76



Format: 4 * 6.5 in 102 * 166 mm Code 39 1:2	Ship From: TRIQUINT SEMICONDUCTOR, INC 2300 NE BROOKWOOD PARKWAY HILLSBORO, OR 97124	Ship To: Recipient Address Information Here
Supplier Code: 10 Character Max. + TQS Shipper Number. (Pkg. ID/Serial Number)	(3S) Pkg ID: 581+23047123 	
Customer Purchase Order. 20 Character Max.	(K) Trans ID: 812934657 	
Customer Part Number. 22 Character Max.	(P) CPN: 5871-2489 	
Quantity.	(Q) QTY: 20000 	
Supplier Product Number. 21 Character Max.	(1P) SPN: TQD777001 	
Box Count (1/3, 2/3, etc.)	(13Q) Pkg Count: 1/1 	
	MPN: 1005859	
	Package Weight 3.0 LB / 1.36 KG	

All Barcodes Contain Data Identifier Followed by Data, e.g. K812934657

Manufacturer's Part Number

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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 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

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