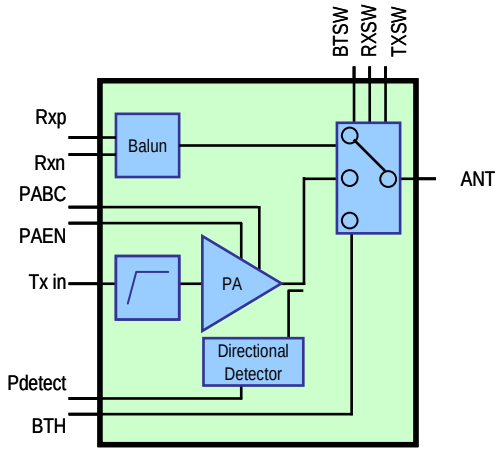
TQM679002

Data Sheet

802.11b/g/n WLAN/BT Front-End Module

Block Diagram



Product Description

The TQM679002 is full WLAN/BT front-end module in an ultra small 3mm x 3mm footprint package for 802.11b/g/n and Bluetooth applications. The TQM679002 contains 2.4GHz PA, directional detector, front-end switch, Bluetooth path and receive balun. The architecture and interface are optimized for next generation WLAN integration into handset devices. The front-end module features CMOS compatible control voltages to facilitate ease of use. With its low power dissipation, the front-end Module contributes to the extended battery life of next generation WLAN solutions. The front-end module is manufactured in TriQuint's high-reliability E/D pHEMT technology and is assembled in thin profile 3mm x 3mm x 0.45mm ETSLP - 16 Pb-Free package.

Electrical Specifications

Parameter	Min	Typ	Max	Units
Frequency	2400		2500	MHz
Pout, 802.11g, 64QAM		17		dBm
EVM		3.5		%
Current, 802.11g, Pout=16dBm		115		mA

Note 1: 3.6V supply, +25°C

Features

- ***Fully Integrated, 802.11b/g/n + BT front-end module***
- ***Internally matched input/output***
- ***Integrated directional detector***
- ***Temperature Compensated Bias Network***
- ***Single battery voltage of 2.3V-5.5V***
- ***Leadless 3.0 x 3.0 x 0.45 mm SMT Pb-Free***
- ***Pout = 20.5dBm 802.11b and 16dBm OFDM 64QAM at 3% EVM***

Applications

- *IEEE802.11b/g/n WLAN/BT Applications*
- *Single-Chip RF Front-end Module*
- *Wireless LAN Systems*
- *Portable Battery-Powered Equipment*

Package Style

• *3.0x3.0x0.45mm ETSLP Plastic Package*

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Absolute Maximum Ratings

Symbol	Parameter	Absolute Maximum Value	Units
V_{B1}, V_{B2}, V_{B3}	Power Supply Voltage, no RF Applied	-0.5 to 6.0	VDC
P_{INPUT}	Maximum TX Input Power	10	dBm
P_{DISS}	Power Dissipation	3	W
T_C	Case Temperature, Survival	-40 to +100	°C
T_{STG}	Storage Temperature	-40 to +150	°C

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

General Characteristics (Supply Voltage, Leakage Currents, Ambient Temp. ESD, etc…)

Symbol	Parameter	Min	Typ/Nom	Max	Units
V_{B1}, V_{B2}, V_{B3}	Supply Voltage	2.3	3.6	4.8	VDC
V_{B1}, V_{B2}, V_{B3}	Supply Voltage (Maximum Operating Condition)			5.5	VDC
V_{B1}, V_{B2}, V_{B3}	Supply voltage ripple with no degradation			500	mVp-p
V_{B1}, V_{B2}, V_{B3}	Supply voltage ripple with degraded performance			900	mVp-p
I_{LKG}	Leakage current single-band (T < 25C)			20	uA
I_{LKG}	Leakage current single-band (T < 85C)			50	uA
T_{AMB}	Ambient Temperature (Degraded Performance)	-40		-30	°C
T_{AMB}	Ambient Temperature (No Degradation)	-30		+75	°C
T_{AMB}	Ambient Temperature (Degraded Performance)	+75		+85	°C
ESD_{HBM}	Human Body Model (HBM) – all pins	500			V
ESD_{CDM}	Charge Device Model (CDM) – all pins	750			V
ESD_{MM}	Machine Model (MM) – all pins	10			V
VIH	Digital control lines HIGH	1.58		2.0	V
VIL	Digital control lines LOW	0.0		0.01	V

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Electrical Characteristics[1,2,3]

Parameter	Conditions	Min.	Typ/Nom	Max.	Units
RF Frequency		2400		2500	MHz
Output Power	802.11n MCS7 (@2.7-4.8Vbatt, -30C to +75C), EVM < 2.8%	14.5	16.0		dBm
EVM	802.11n MCS7 (@2.7-4.8Vbatt, -30C to +75C)		2	2.8	%
Current	802.11n MCS7 (@2.7-4.8Vbatt), Pout=15.5dBm min.		110		mA
Output Power	802.11g QAM64 (@2.7-4.8Vbatt, -30C to +75C), EVM < 3.5%	15.5	17		dBm
EVM	80211g QAM64 (@2.7-4.8Vbatt, -30C to +75C)		2.2	3.5	%
Current	802.11g QAM64 (@2.7-4.8Vbatt, -30C to +75C), Pout=16dBm min.		115	135	mA
Output Power[4]	802.11b (@3.6Vbatt, -30C to +75C, Min. Spectral Mask Margin 2.0dB	20.5	21.5		dBm
Current	802.11b CCK (@2.7-4.8Vbatt, -30C to +75C), Pout=20.5dBm min.		200	220	mA
PA NF[5]	PA Noise Figure		7		dB
2nd Harmonic [5]	Up to Pout=20.5dBm, (@2.7-4.8Vbatt, -30C to +75C)		-40	-30	dBc
3rd Harmonic [5]	Up to Pout=20.5dBm, (@2.7-4.8Vbatt, -30C to +75C)		-50	-42	dBc
4th Harmonic [5]	Up to Pout=20.5dBm, (@2.7-4.8Vbatt, -30C to +75C)		-62	-52	dBc
Timing					
PA Turn On Time[5]	To within 0.2dB steady state power		1.0		uSec
PA Turn Off Time[5]	To within -20dB w/r/t steady state “ON” output power		1.0		uSec
Gain and Matching					
PA ripple across channel[5]	PA ripple across 20MHz bandwidth		0.5		dB
Gain	Gain in 2.4GHz band	28	33	37	dB
WLAN TX Port Impedance			50		Ohm
TX Rejection [5]					
869-894MHz	@ 50Ohm relative to transmit gain at 2.4-2.5GHz		75		dBr
1570-1580MHz	@ 50Ohm relative to transmit gain at 2.4-2.5GHz		35		dBr
1805-1880MHz	@ 50Ohm relative to transmit gain at 2.4-2.5GHz		28		dBr
2110-2170MHz	@ 50Ohm relative to transmit gain at 2.4-2.5GHz		18		dBr

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Parameter	Conditions	Min.	Typ/Nom	Max.	Units
Power Detector					
Frequency Range		2.4		2.5	GHz
Readout @20.5dBm			0.7	0.85	V
WLAN Receive					
Passband Insertion Loss	All other ports are terminated to their nominal impedances (-30C to +75C)		1.8	2.25	dB
Passband Ripple[5]	Across 20MHz BW, within Frequency Range, comply with Passband IL		0.05		dB PTP
Balanced Output Amplitude Imbalance [5]	In ISM band	-1		1	dB
Balanced Output Phase Imbalance [5]		-10		10	Deg
RX Port Impedance	Differential at the WLAN-RX port		100		Ohm
RX Port Return Loss [5]	All other ports are terminated in their nominal impedances	10	17		dB
RX S21 [5]					
824-829MHz	Referenced to 50Ohms		-7	-5	dB
1710-1785MHz	Referenced to 50Ohms		-3	-2	dB
1920-1980MHz	Referenced to 50Ohms		-2	-1.5	dB
BT RX/TX					
Passband Insertion Loss			1.1	1.4	dB
Passband Ripple[5]	Comply with Passband Insertion Loss		0.05		dB
Maximum Port Power Level [5]	Due to Bluetooth Class 1.5		12	15	dBm
RX/TX Port Nominal Impedance			50		Ohm
RX/TX Port Return Loss [5]	In band, all other ports terminated in nominal impedance	10	14		

Note 1: Test Conditions: V_{B1}=3.6V, V_{B2}=3.6V, V_{B3}=3.6V.

Note 2: All limits are at +25°C case temperature unless otherwise specified.

Note 3: TriQuint Test Board.

Note 4: Additional degradation of 0.5dB at extreme conditions

Note 5: Guaranteed by design, not tested in production

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Logic Truth Table

	PAEN	TX SW	RX SW	BT SW	PABC
TX mode	1	1	0	0	500 uA
RX mode	0	0	1	0	0 uA
RX-RX mode	0	0	1	1	0 uA
Calibration Mode	1	0	1	0	500 uA
BT	0	0	0	1	0 uA
Shutdown Mode all “0”	0	0	0	0	0 uA
Shutdown Mode all “NC”	NC	NC	NC	NC	0 uA

Logic 0 = 0V - 0.01V
Logic 1 = 1.58V – 2.0V

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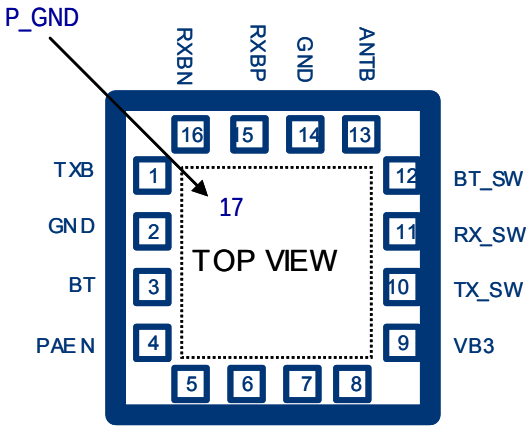
Pin Out and Assignments



Pin	Symbol	Description
1	TXB	2.4GHz Transmit Input
2	GND	Ground
3	BT	Bluetooth port
4	PAEN	PA Enable Pin
5	VB1	Vbatt
6	VB2	Vbatt
7	PABC	PA Bias Control
8	PDET	Detector Voltage Output
9	VB3	Vbatt
10	TX_SW	TX Switch Control Voltage
11	RX_SW	RX Switch Control Voltage
12	BT_SW	BT Switch Control Voltage
13	ANTB	Antenna
14	GND	Ground
15	RXBp	RX differential Port Output +
16	RXBn	RX differential Port Output -
17	P_GND	Package Common Ground

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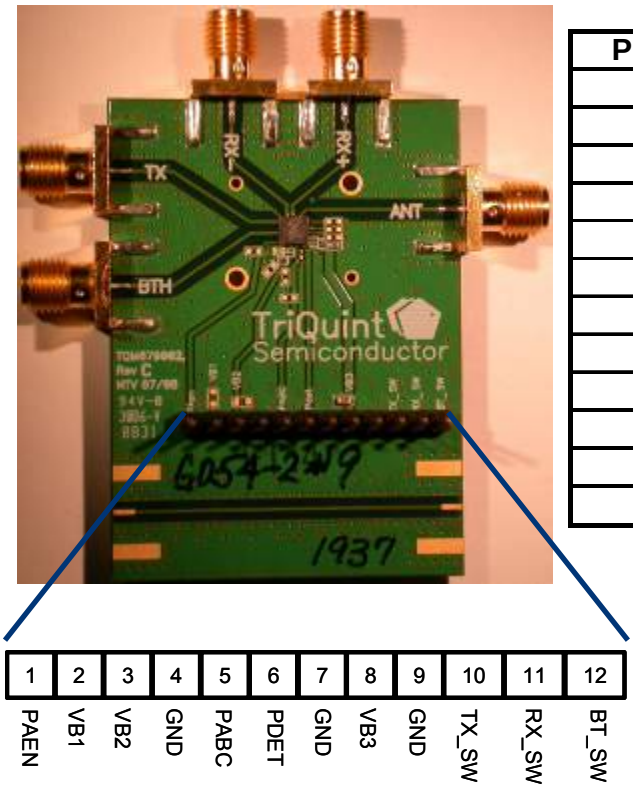
DC Blocking

Pin	DC block/path
TXB	DC blocked internally
BT	DC blocked internally
ANTB	DC blocked internally
RXBp	Internal DC path to ground, Internal DC path to RXBn
RXBn	Internal DC path to ground, Internal DC path to RXBp

TQS Evaluation Board

TriQuint offers our customers the below evaluation board as a means for testing and analysis of the TQM679002.



Pin #	Name	Function
1	PAEN	Power amplifier enable logic voltage
2	VB1	Battery Supply voltage
3	VB2	Battery Supply voltage
4	GND	Ground
5	PABC	Reference current for PA bias network
6	PDET	Power detector output voltage
7	GND	Ground
8	VB3	Battery Supply voltage
9	GND	Ground
10	TX_SW	Switch TX path logic voltage
11	RX_SW	Receive path logic voltage
12	BT_SW	Bluetooth path logic voltage

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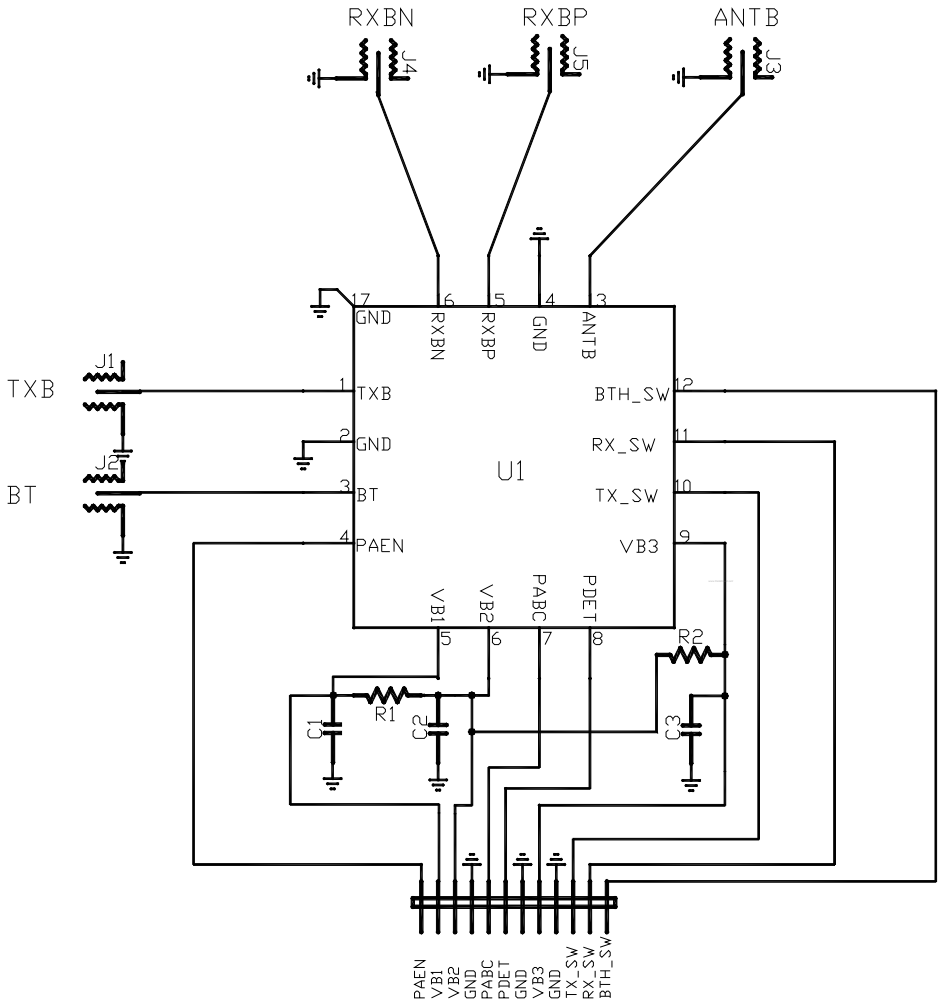
Typical Test Application Circuit



Component	Value
C1	0.22 uF
C2	0.1 uF
C3	1.0 uF
R1, R2	0 Ω

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Applications Information: Power Up/Down Sequence

Shutdown Mode to TX Mode Power-Up Sequence

Sequence	Pin	Description
1	VB1, VB2, VB3[1]	Apply Battery Voltage
2	TX SW, RX SW, BT SW, PABC	Apply RF switch control signals and PABC Reference Current of 500uA[2]
3	PAEN	Enable PA
4	RF	Apply RF

TX Mode to Shutdown Mode Power-down Sequence

Sequence	Pin	Description
1	RF	Remove RF
2	PAEN	Disable PA
3	TX SW, RX SW, BT SW, PABC	Apply RF switch control signals and Remove Reference Current
4	VB1, VB2, VB3	Remove Battery Voltage

Notes:

1) VB1, VB2 and VB3 are jumpered with 0Ω resistors on the TQS evaluation board.
2) The voltage on the Pabc pin varies so TQS would not recommend applying a fixed DC voltage to this pin with a DC voltage supply. A current source or an adjustable voltage supply can be used instead.

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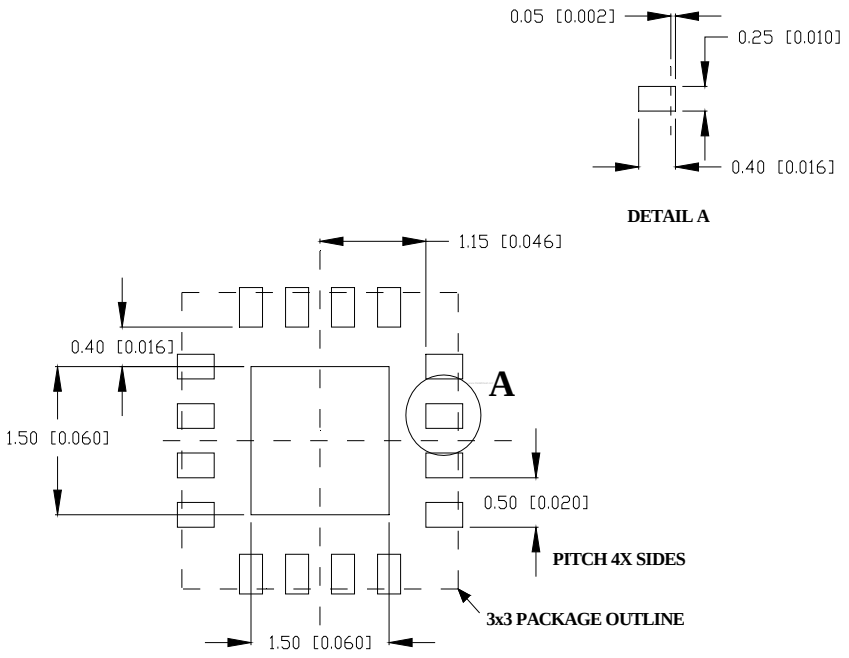
Preliminary PCB Footprint *(Notes: Primary dimensions are in millimeters alternate dimensions in brackets are in inches)*



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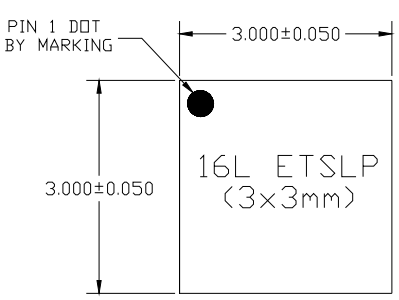
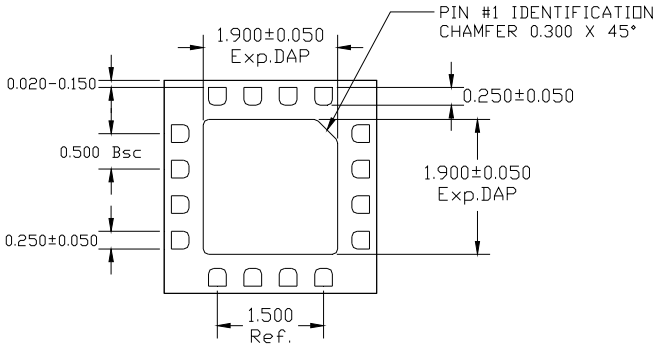
Packaging and Ordering Information

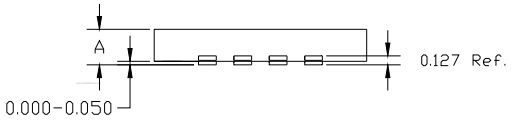


TOP VIEW



BOTTOM VIEW

		ETSLP
A	MAX.	0.500
	NOM.	0.450
	MIN.	0.400



SIDE VIEW

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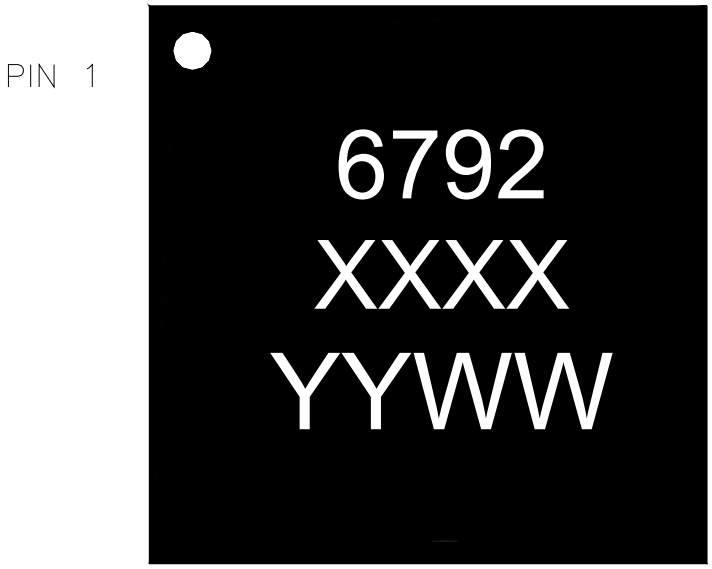
Part Marking



Line 1: 6792 = Product code.

Line 2: XXXX -TriQuint assembly lot number

Line 3: YYWW - Year and workweek.

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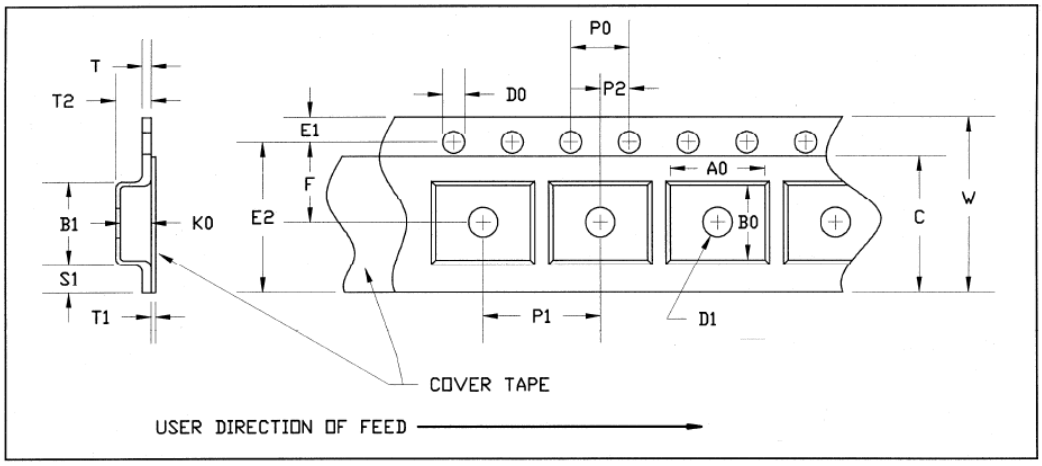
Tape and Reel Information

16L ETSLP 3 x 3mm



3x3 16 ETSLP and 3x3 16 T/SLP 8mm WIDE CARRIER AND COVER TAPE DIMENSIONS

PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
CAVITY	LENGTH	A0	0.134	3.40
	WIDTH	B0	0.126	3.20
	DEPTH	K0	0.055	1.40
	PITCH	P1	0.157	4.00
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION LENGTH DIRECTION	P2	0.079	2.00
	CAVITY TO PERFORATION WIDTH DIRECTION	F	0.138	3.50
COVER TAPE	WIDTH	C	0.213	5.40
CARRIER TAPE	WIDTH	W	0.315	8.00

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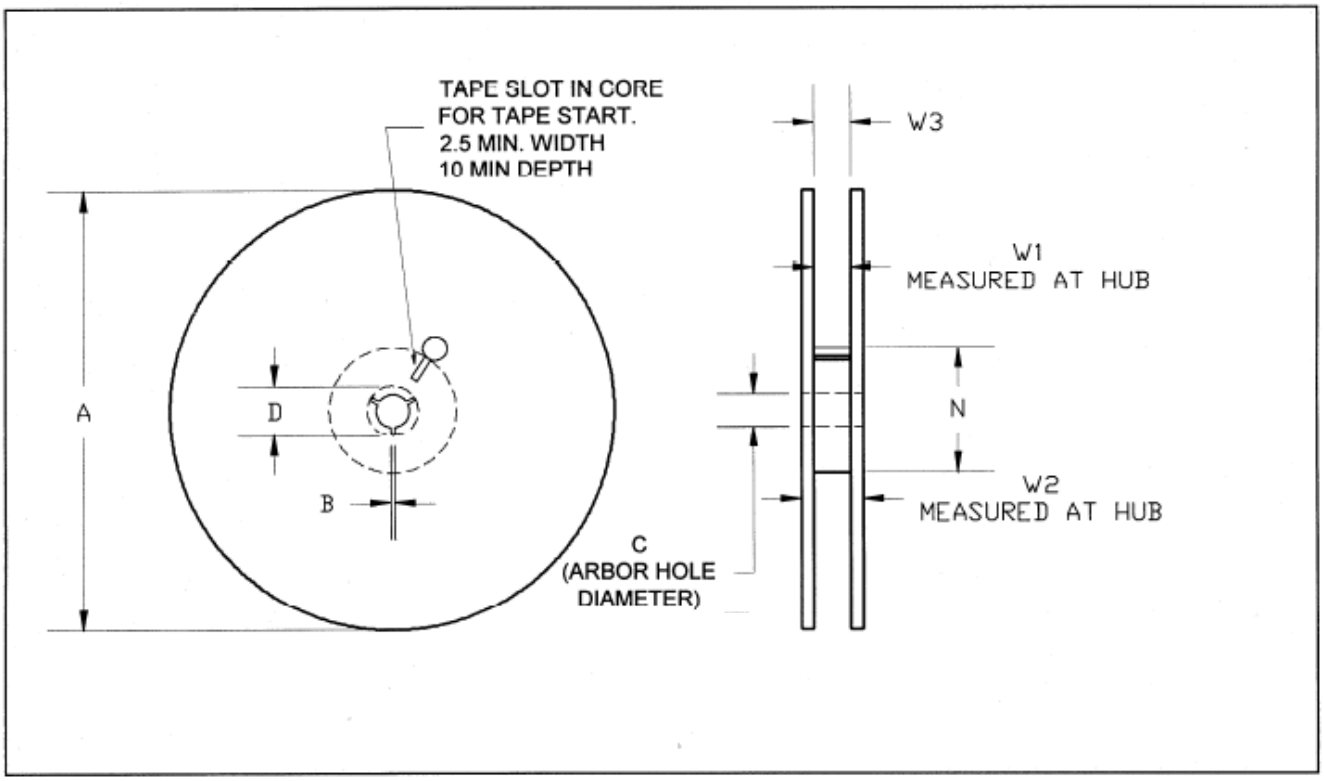
Reel Physical Dimensions



Reel Dimensions for 8mm Carrier Tape – 7" Reel

SOT 23-6 & 8, HP VFQFP-N 2X2, 3X3, MW-6, SCT-598, SC 70-4 & 6, SLIM 7, 13 & 17, VQFN 6 3x2 and ETSLP-6 and 1.5X1.5 ETSLP and 3x3 16 ETSLP and 3x3 16 T/SLP			7" Reel	
PART	FEATURE	SYMBOL	SIZE (in)	SIZE (mm)
FLANGE	DIAMETER	A	6.969	177.0
	THICKNESS	W2	0.559	14.2
	SPACE BETWEEN FLANGE	W1	0.346	8.8
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

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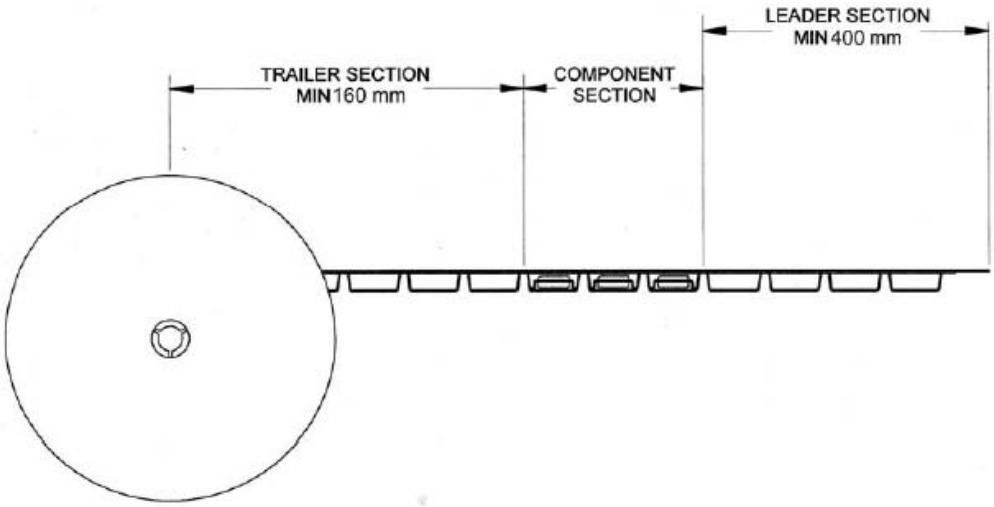
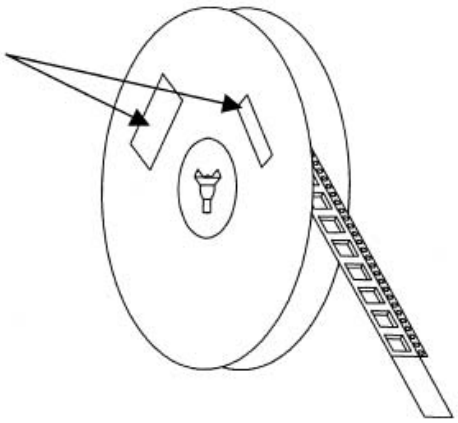
Tape Length and Label Placement



Empty part cavities at the trailing and leading ends are sealed with cover tape.
See EIA 481-1-A

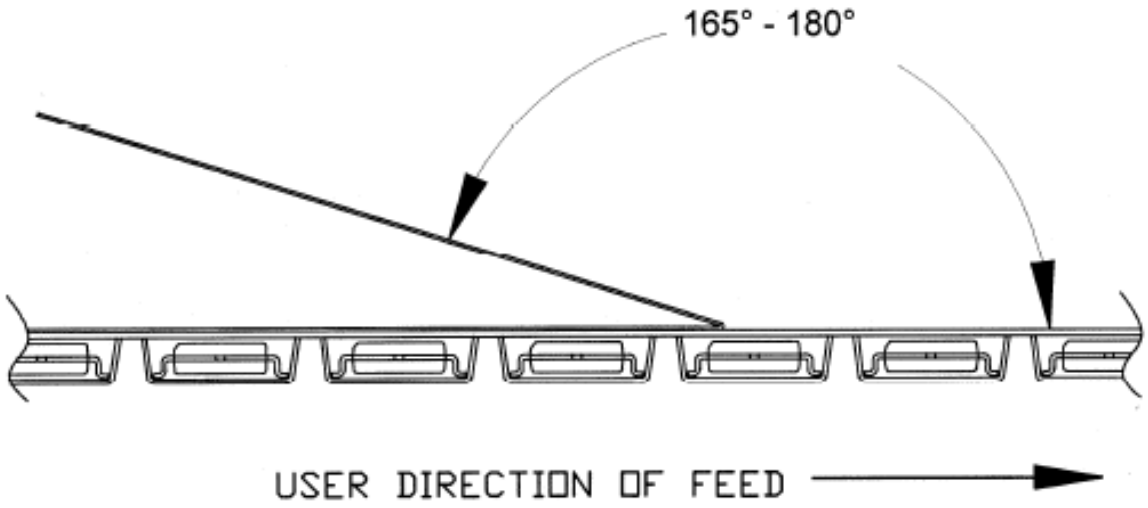
LABEL PLACEMENT

Labels are placed on the flange opposite to the sprockets in the carrier tape.



802.11b/g/n WLAN/BT Front-End Module

TAPE PEEL STRENGTH, PULL VELOCITY, AND PEEL ANGLE



Peel strength 0.1 N to 1.0 N for 8 mm Carrier Tape
Peel strength 0.1 N to 1.3 N for 12 mm Carrier Tape
Pull velocity 300 +/- 10 mm/min

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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 1 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

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