

Applications

- Repeaters
- Mobile Infrastructure
- LTE / WCDMA / CDMA / EDGE
- General Purpose Wireless

Product Features

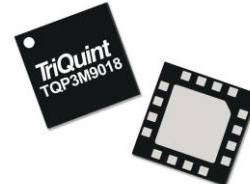
- 20-4000 MHz
- 20.5 dB Gain at 1900 MHz
- 1.3 dB Noise Figure at 1900 MHz
- +37 dBm Output IP3
- 50 Ohm Cascadable Gain Block
- Unconditionally Stable
- High Input Power Capability
- +5 V Single Supply, 85mA Current
- 3x3 mm QFN Package

General Description

The TQP3M9018 is a cascadable, high linearity gain block amplifier in a low-cost surface-mount package. At 1.9 GHz, this amplifier typically provides 20.5 dB gain, +37 dBm output IP3 and 1.3 dB noise figure while only drawing 85 mA current. The device is housed in a lead-free/green/RoHS-compliant industry-standard 16-pin 3x3mm QFN package.

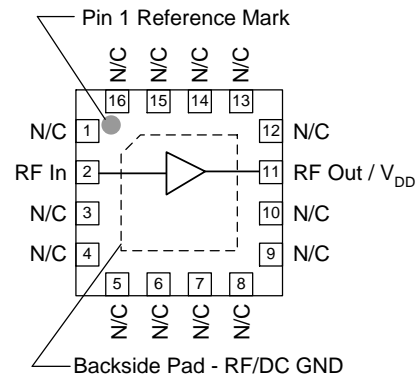
The TQP3M9018 has the benefit of having high gain across a broad range of frequencies while also providing very low noise. This allows the device to be used in both receiver and transmitter chains for high performance systems. The amplifier is internally matched using a high performance E-pHEMT process and requires only an external RF choke and blocking/bypass capacitors for operation from a single +5 V supply. The internal active bias circuit also provides stable operation over bias and temperature variations.

The TQP3M9018 covers the 0.02-4 GHz frequency band and is targeted for wireless infrastructure or other applications requiring high linearity and/or low noise figure.



16 Pin 3x3 mm QFN Package

Functional Block Diagram



Pin Configuration

Pin No.	Label
2	RF In
11	RF Out / V _{DD}
All Other Pins	N/C
Backside Paddle	RF/DC GND

Ordering Information

Part No.	Description
TQP3M9018	High Linearity LNA Gain Block
TQP3M9018-PCB_IF	50-500 MHz Evaluation Board
TQP3M9018-PCB_RF	0.5-4 GHz Evaluation Board

Standard T/R size = 2500 pieces on a 7" reel

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-65 to 150°C
RF Input Power, CW, 50Ω, T=25°C	+23 dBm
Supply Voltage (V _{DD})	+7 V
Reverse Supply Voltage	-0.3 V

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Supply Voltage (V _{DD})	+3.0	+5.0	+5.25	V
T _{CASE}	-40		+105	°C
T _j for >10 ⁶ hours MTTF			+190	°C

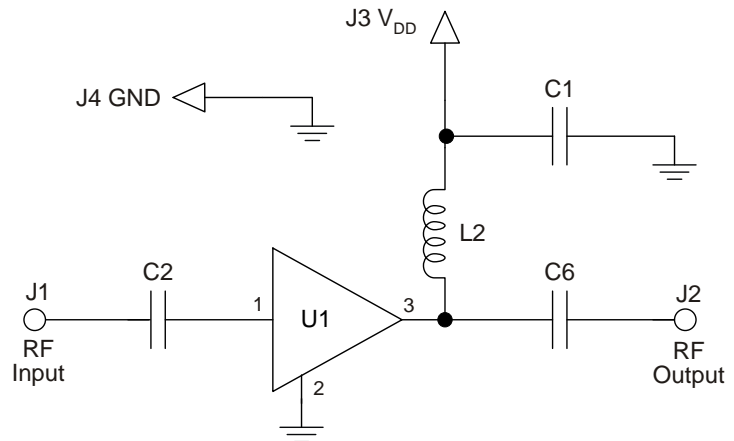
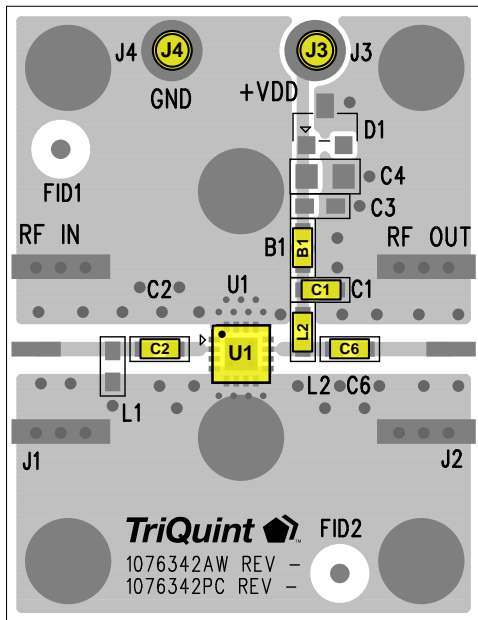
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise noted: V_{DD}=+5V, Temp.=+25°C, 50 Ω system

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		20		4000	MHz
Test Frequency			1900		MHz
Gain		19	20.5	22	dB
Input Return Loss			16		dB
Output Return Loss			19		dB
Output P1dB			+21		dBm
Output IP3	P _{out} =+3 dBm/tone, Δf = 1 MHz	+33	+37		dBm
Noise Figure			1.3		dB
Current, I _{DD}			85	100	mA
Thermal Resistance, θ _{jc}	Module (junction to case)			38.7	°C/W

TQP3M9018-PCB_RF Evaluation Board (500–4000 MHz)



Notes:

1. See Evaluation Board PCB Information section for material and stack-up.
2. Components shown on the silkscreen but not on the schematic are not used.
3. B1 (0 Ω jumper) is not shown on the schematic and may be replaced with copper trace in the target application layout.
4. The recommended component values are dependent upon the frequency of operation.
5. All components are of 0603 size unless otherwise specified.

Bill of Material – TQP3M9018-PCB_RF

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	1076342
U1	n/a	High Linearity LNA Gain Block	TriQuint	TQP3M9018
C2, C6	100 pF	CAP, 0603, 5%, 100V, NPO/COG	various	
C1	0.01 uF	CAP, 0603, 5%, 50V, X7R	various	
L2	68 nH	IND, 0603, 5%	CoilCraft	0603CS-68NXJL
B1	0 Ω	RES, 0603	various	
L1, D1, C3, C4	DNP	n/a	n/a	n/a

Note: Performances can be optimized at frequency of interest by using recommended component values shown in the table below. Inductors are wirewound Coilcraft.

Reference Designation	Frequency (MHz)					
	50	200	500	2000	2500	3500
C2, C6	0.01 uF	1000 pF	100 pF	22 pF	22 pF	22 pF
L2	470 nH	220 nH	82 nH	22 nH	18 nH	15 nH

Typical Performance – TQP3M9018-PCB_RF

Test conditions unless otherwise noted: $V_{DD}=+5V$, $I_{DD}=85\text{ mA typ.}$, Temp= $+25^{\circ}\text{C}$

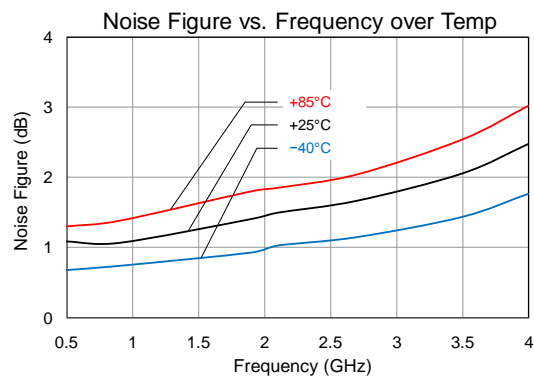
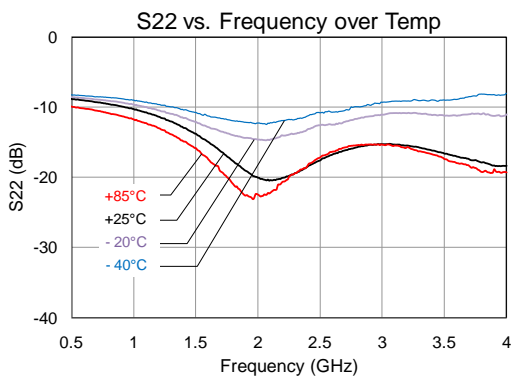
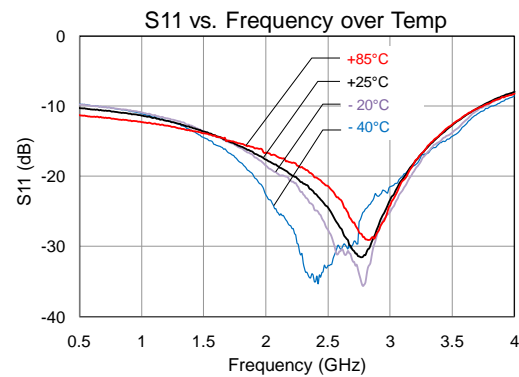
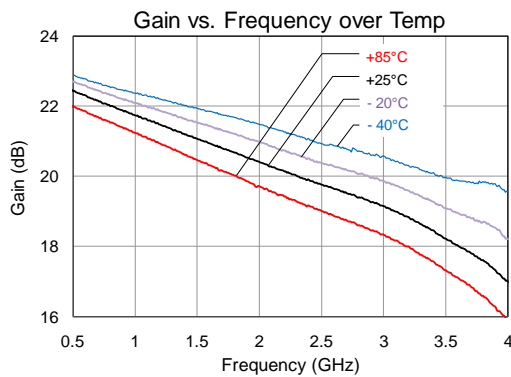
Parameter	Typical Value						Units
Frequency	500	900	1900	2700	3500	4000	MHz
Gain	22.4	21.9	20.5	19.5	18.2	17	dB
Input Return Loss	10	11	16.6	30.5	12.7	8	dB
Output Return Loss	9	10	19	16	16.6	18	dB
Output P1dB	+21.4	+21.4	+21	+20.2	+19.8	+19.2	dBm
OIP3 ⁽¹⁾	+38.4	+37.5	+37	+35.3	+34.7	+34.4	dBm
Noise figure ⁽²⁾	1.1	1.1	1.3	1.6	2	2.5	dB

Notes:

- OIP3 measured with two tones at an output power of +4 dBm / tone separated by 1 MHz.
- Noise figure data listed in the table above includes PCB losses. $\sim 0.1\text{dB @ } 2\text{ GHz}$.

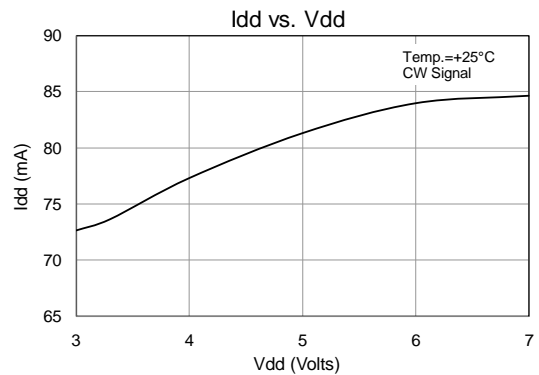
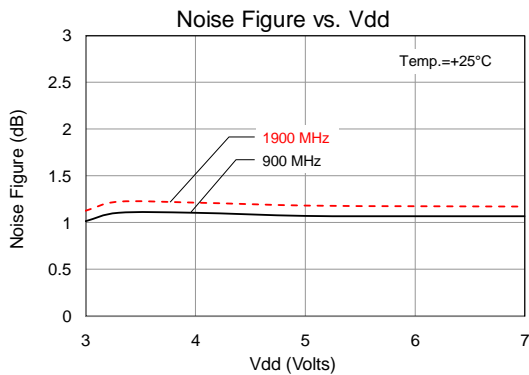
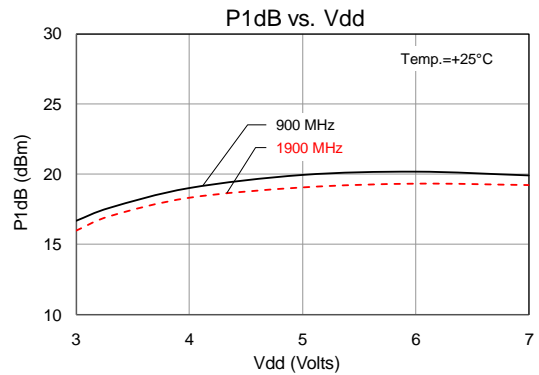
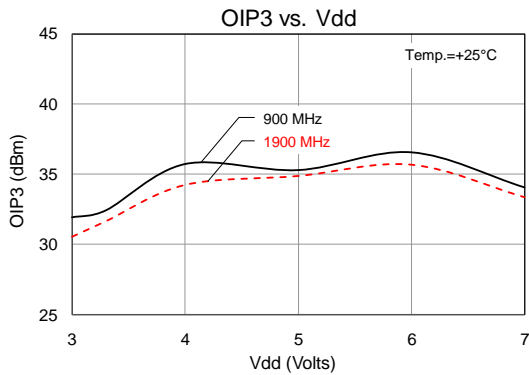
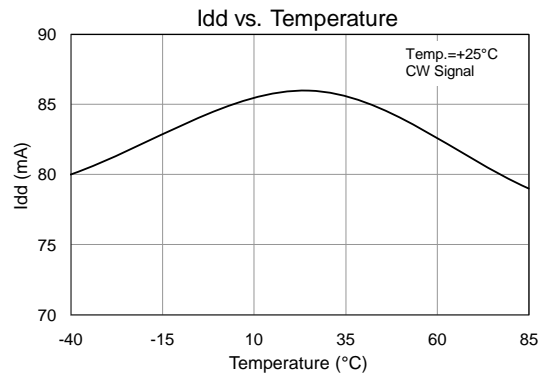
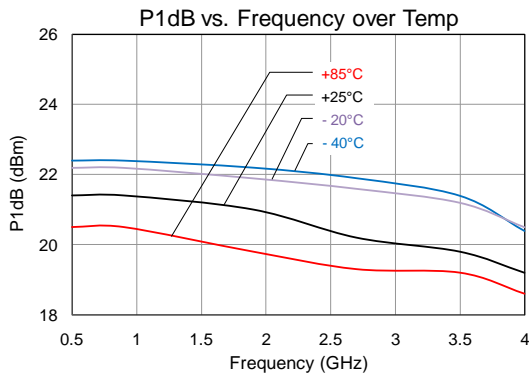
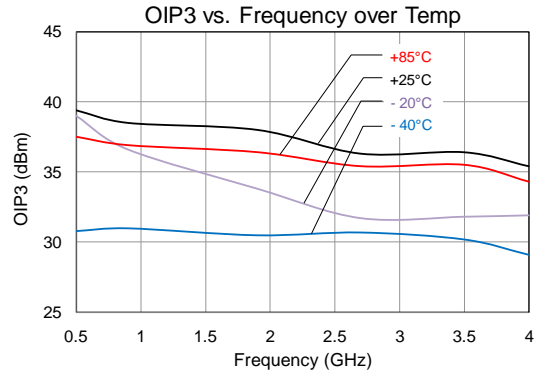
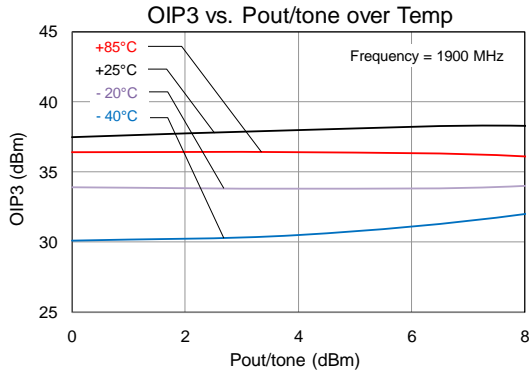
Performance Plots – TQP3M9018-PCB_RF

Test conditions unless otherwise noted: $V_{DD}=+5V$, $I_{DD}=85\text{ mA typ.}$, Temp= $+25^{\circ}\text{C}$

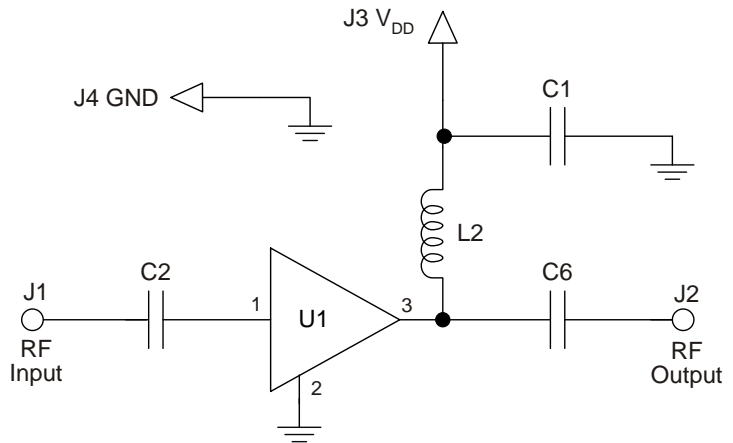
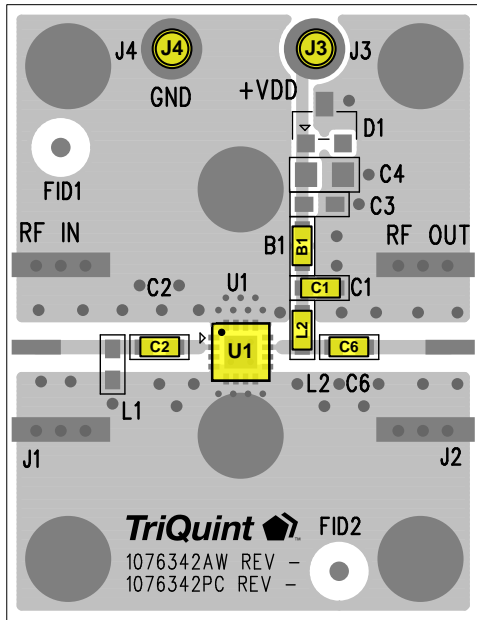


Performance Plots – TQP3M9018-PCB_RF

Test conditions unless otherwise noted: $V_{DD}=+5V$, $I_{DD}=85\text{ mA typ.}$, $Temp.=+25^{\circ}C$



TQP3M9018-PCB_IF Evaluation Board (50–500 MHz)



Notes:

1. See Evaluation Board PCB Information section for material and stack-up.
2. Components shown on the silkscreen but not on the schematic are not used.
3. B1 (0 Ω jumper) is not shown on the schematic and may be replaced with copper trace in the target application layout.
4. The recommended component values are dependent upon the frequency of operation.
5. All components are of 0603 size unless stated on the schematic.

Bill of Material – TQP3M9018-PCB_IF

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	1076342
U1	n/a	High Linearity LNA Gain Block	TriQuint	TQP3M9018
C2, C6	1000 pF	CAP, 0603, 5%, 50V, X7R	various	
C1	0.01 uF	CAP, 0603, 5%, 50V, X7R	various	
L2	330 nH	IND, 0603, 5%	CoilCraft	0603CS-R33XJL
B1	0 Ω	RES, 0603	various	
L1, D1, C3, C4	DNP	n/a	n/a	n/a

Note: Performances can be optimized at frequency of interest by using recommended component values shown in the table below. Inductors are wirewound Coilcraft.

Reference Designation	Frequency (MHz)					
	50	200	500	2000	2500	3500
C2, C6	0.01 uF	1000 pF	100 pF	22 pF	22 pF	22 pF
L2	470 nH	220 nH	82 nH	22 nH	18 nH	15 nH

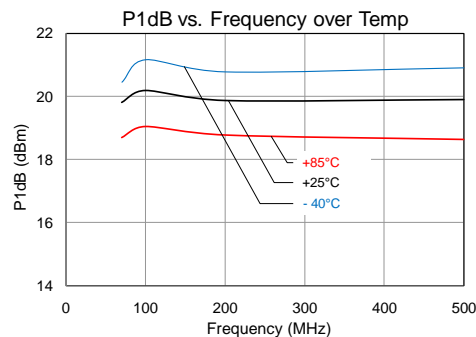
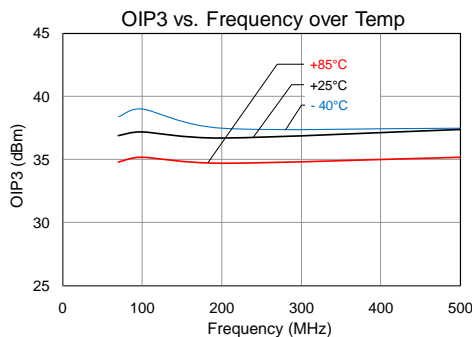
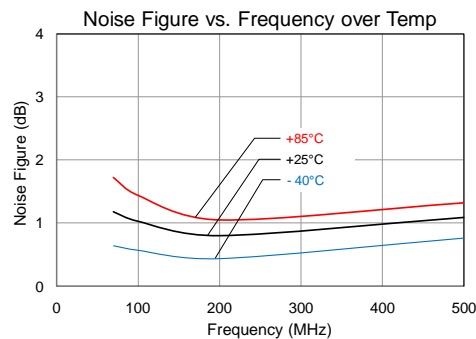
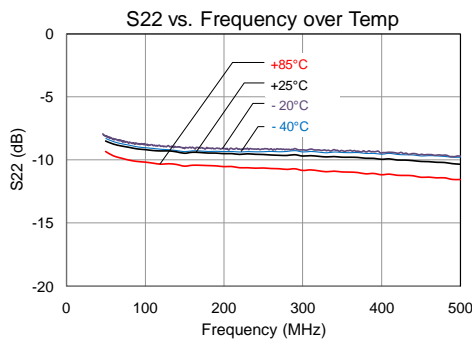
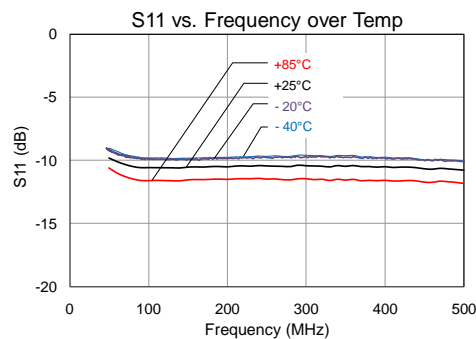
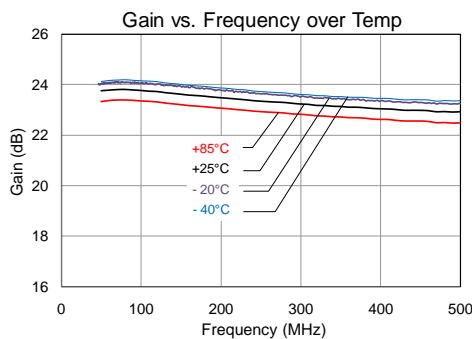
Typical Performance – TQP3M9018-PCB_IF

Test conditions unless otherwise noted: $V_{DD}=+5V$, $I_{DD}=85\text{ mA typ.}$, $Temp=+25^{\circ}C$

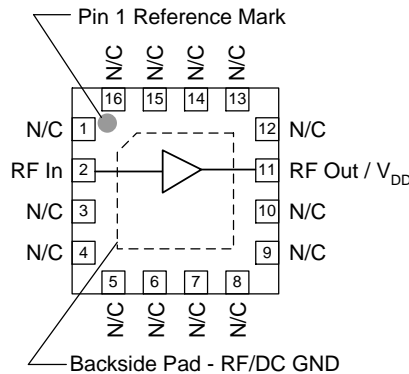
Parameter	Conditions	Typical Values				Units
Frequency		70	100	200	500	MHz
Gain		23.2	23.2	22.9	22.3	dB
Input Return Loss		10	11	11	11	dB
Output Return Loss		9	9	10	10	dB
Output P1dB		+19.8	+20.2	+19.9	+19.9	dBm
OIP3	$P_{out} = +3\text{ dBm/tone}$, $\Delta f=1\text{ MHz}$	+37	+37	+37	+37	dBm
Noise figure		1.2	1.1	0.8	1.1	dB

Performance Plots – TQP3M9018-PCB_IF

Test conditions unless otherwise noted: $V_{DD}=+5V$, $Temp.=+25^{\circ}C$



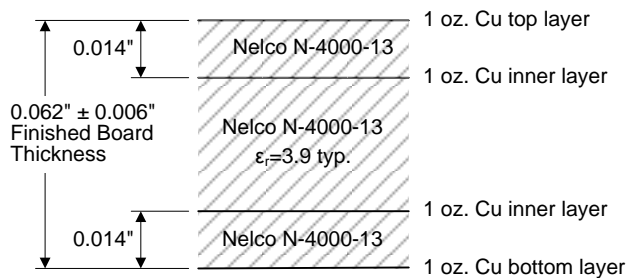
Pin Configuration and Description



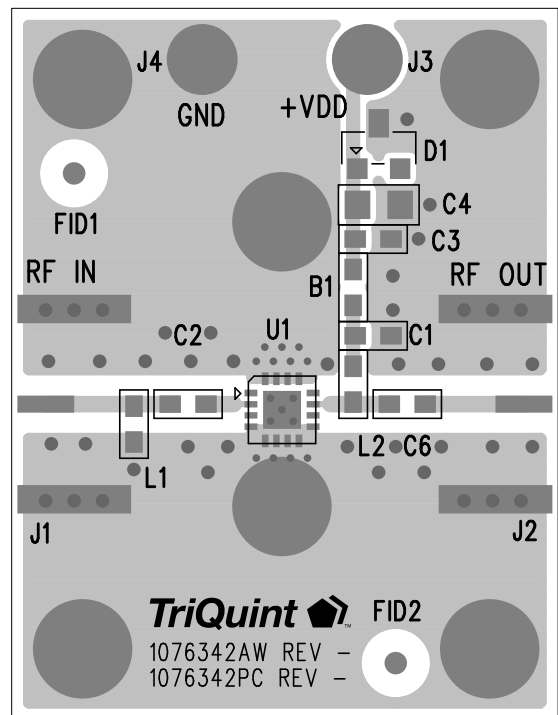
Pin No.	Label	Description
2	RF In	RF input matched to 50 ohms. External DC Block is required.
11	RF Out / V _{DD}	RF output matched to 50 ohms. Bias voltage and external DC Block required.
All other pins	N/C	No internal connection. Provide grounded PCB land pads for optimal isolation and mounting integrity.
Backside Pad	RF/DC GND	RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern.

Evaluation Board PCB Information

TriQuint PCB 1076342 Material and Stack-up

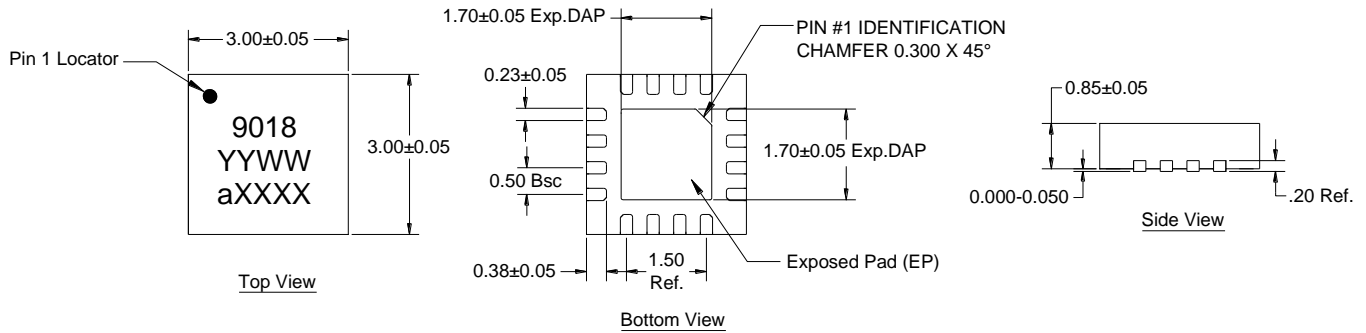


50 ohm line dimensions: width = 0.029", spacing = 0.035"



Package Marking and Dimensions

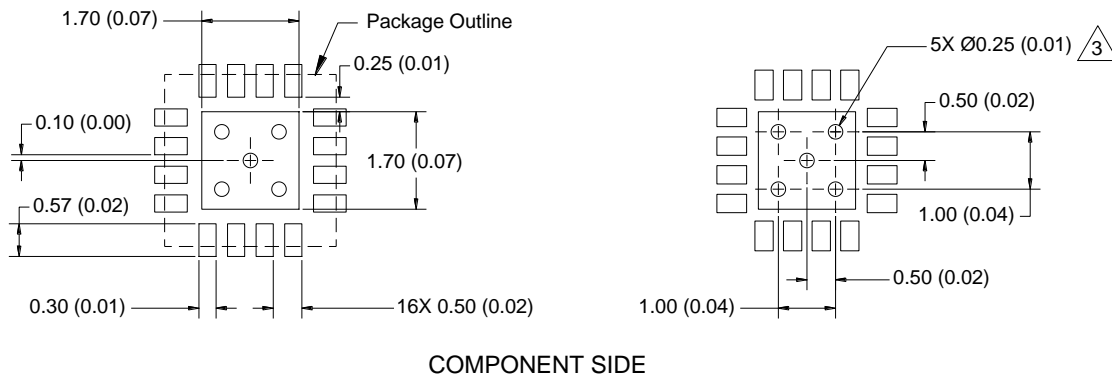
Package Marking: Part number – 9018
 Year/week/country code – YYWW
 Lot code – aXXXX



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

PCB Mounting Pattern



Notes:

1. All dimensions are in millimeters (inches). Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Ground/thermal vias are required for the proper operation of this device. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25mm (0.10").
4. Ensure good package backside exposed pad (EP) solder attach for best electrical and thermal performance.

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1A
Value: Passes ≥ 250 V to < 500 V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class C3
Value: Passes ≥ 1000 V
Test: Charged Device Model (CDM)
Standard: JEDEC Standard JESD22-C101

MSL Rating

MSL Rating: Level 1
Test: 260°C convection reflow
Standard: JEDEC Standard IPC/JEDEC J-STD-020

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Contact plating: Annealed Matte Tin

RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

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Email: sjcappliations.engineering@tqs.com

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