

### Applications

- W-CDMA / LTE
- Macrocell Base Station Driver
- Microcell Base Station
- Small Cell Final Stage
- Active Antenna
- General Purpose Applications

### Product Features

- Operating Frequency Range: DC to 4 GHz
- Output Power ( $P_{SAT}$ ): 30 W
- Drain Efficiency: 64%
- Linear Gain: 17 dB
- Package Dimensions: 3 x 4 x 0.85 mm

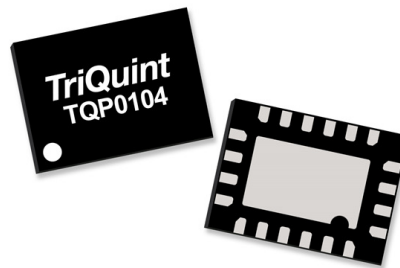
### General Description

The TQP0104 is a wide band over-molded QFN discrete GaN power amplifier. The device is a single stage unmatched power amplifier transistor.

The TQP0104 can be used in Doherty architecture for the final stage of a base station power amplifier for small cell, microcell, and active antenna systems. The TQP0104 can also be used as a driver in a macrocell base station power amplifier.

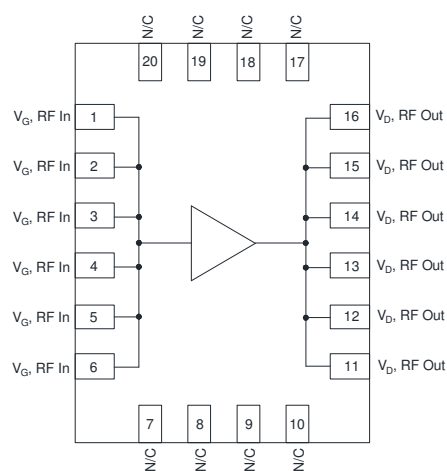
The wide bandwidth of the TQP0104 makes it suitable for many different applications from DC to 4 GHz. TQP0104 can deliver  $P_{SAT}$  of 30 W at 28 to 32 V operation.

Lead-free and ROHS compliant.



20 Pin 3x4mm QFN

### Functional Block Diagram



### Pin Configuration

| Pin No.         | Label         |
|-----------------|---------------|
| 1-6             | RF IN, $V_G$  |
| 7-10, 17-20     | N/C           |
| 11-16           | RF OUT, $V_D$ |
| Backside Paddle | RF/DC GND     |

### Ordering Information

| Part No.        | ECCN  | Description                |
|-----------------|-------|----------------------------|
| TQP0104         | EAR99 | 30 W, DC to 4 GHz, GaN PA  |
| TQP0104-2.6-EVB | EAR99 | 2.5-2.7 GHz Eval Board     |
| TQP0104-2.1-DOH | EAR99 | 2.1 GHz Doherty Eval Board |

### Absolute Maximum Ratings

| Parameter   | Rating                       |
|---|------------------------------|
| Gate Voltage ( $V_G$ )  | -6 V                         |
| Drain Voltage ( $V_D$ )   | +40 V                        |
| Peak RF Input Power   | 35 dBm                       |
| VSWR Mismatch, P1dB Pulse (20% duty cycle, 100 $\mu$ s width), $T = 25^\circ\text{C}$ | 10:1                         |
| Storage Temperature   | -65 to +150 $^\circ\text{C}$ |

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

### Recommended Operating Conditions

| Parameter                       | Min | Typ  | Max  | Units            |
|---------------------------------|-----|------|------|------------------|
| Operating Temperature           | -40 |      | +105 | $^\circ\text{C}$ |
| Gate Voltage ( $V_G$ )          |     | -2.9 |      | V                |
| Drain Voltage ( $V_D$ )         |     | 32   |      | V                |
| Quiescent Current ( $I_{CQ}$ )  |     | 60   |      | mA               |
| $T_{CH}$ for $>10^6$ hours MTTF |     |      | 225  | $^\circ\text{C}$ |

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

Test conditions unless otherwise noted:  $V_G = -2.73$  V,  $V_D = 32$  V,  $I_{CQ} = 70$  mA,  $T = 25^\circ\text{C}$ , 2.6 GHz single-ended applications circuit

| Parameter         | Conditions   | Min  | Typ  | Max  | Units |
|-------------------|--|------|------|------|-------|
| Frequency Range   |  | DC   |      | 4000 | MHz   |
| Quiescent Current |  | 60   | 70   | 80   | mA    |
| Linear Gain       | $P_{OUT} = 33$ dBm, Pulsed (10% duty cycle, 100 $\mu$ s width) | 15   | 17   |      | dB    |
| P3dB              | Pulsed (10% duty cycle, 100 $\mu$ s width)                     | 44.0 | 44.6 |      | dBm   |
| Drain Efficiency  | P3dB   | 60   | 64   |      | %     |
| Input Return Loss |  |      | 11   |      | dB    |

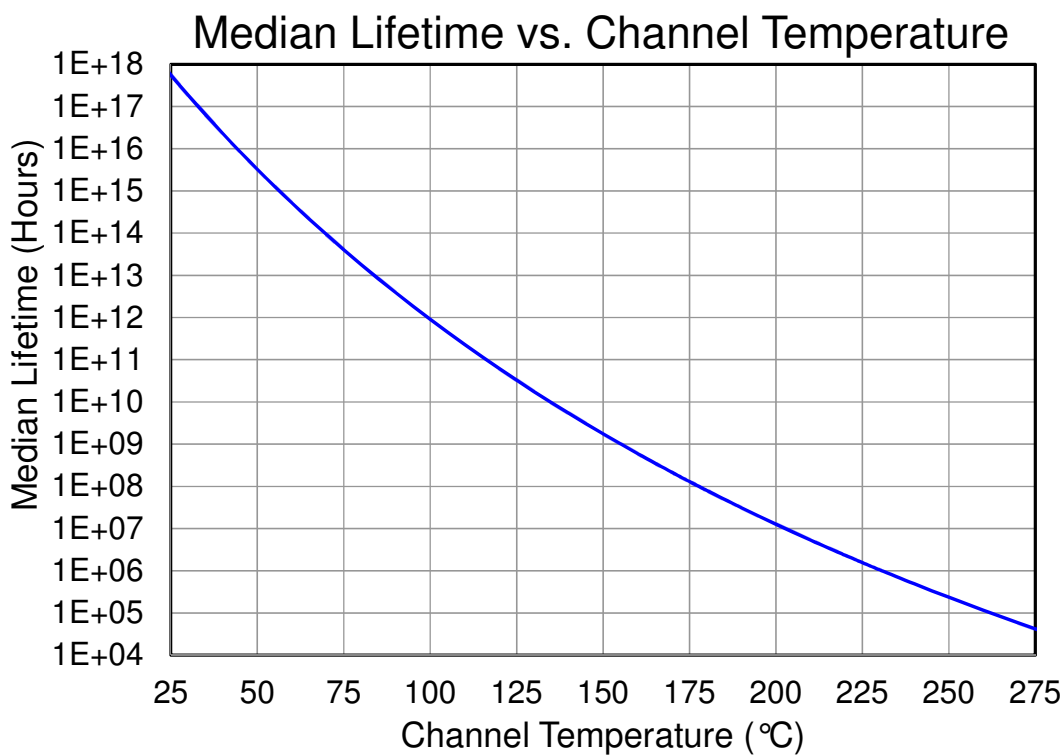
**Thermal Information**

| Parameter   | Conditions  | Value | Units         |
|---|---|-------|---------------|
| Thermal Resistance at Average Power ( $\theta_{JC}$ )   | $T_{CASE} = 85^{\circ}C$ , $T_{CH} = 128.0^{\circ}C$ ,<br>CW: $P_{DISS} = 8.83$ W, $P_{OUT} = 1.90$ W   | 4.9   | $^{\circ}C/W$ |
| Thermal Resistance at Saturated Power ( $\theta_{JC}$ ) | $T_{CASE} = 85^{\circ}C$ , $T_{CH} = 173.3^{\circ}C$ ,<br>CW: $P_{DISS} = 16.80$ W, $P_{OUT} = 30.55$ W | 5.3   | $^{\circ}C/W$ |

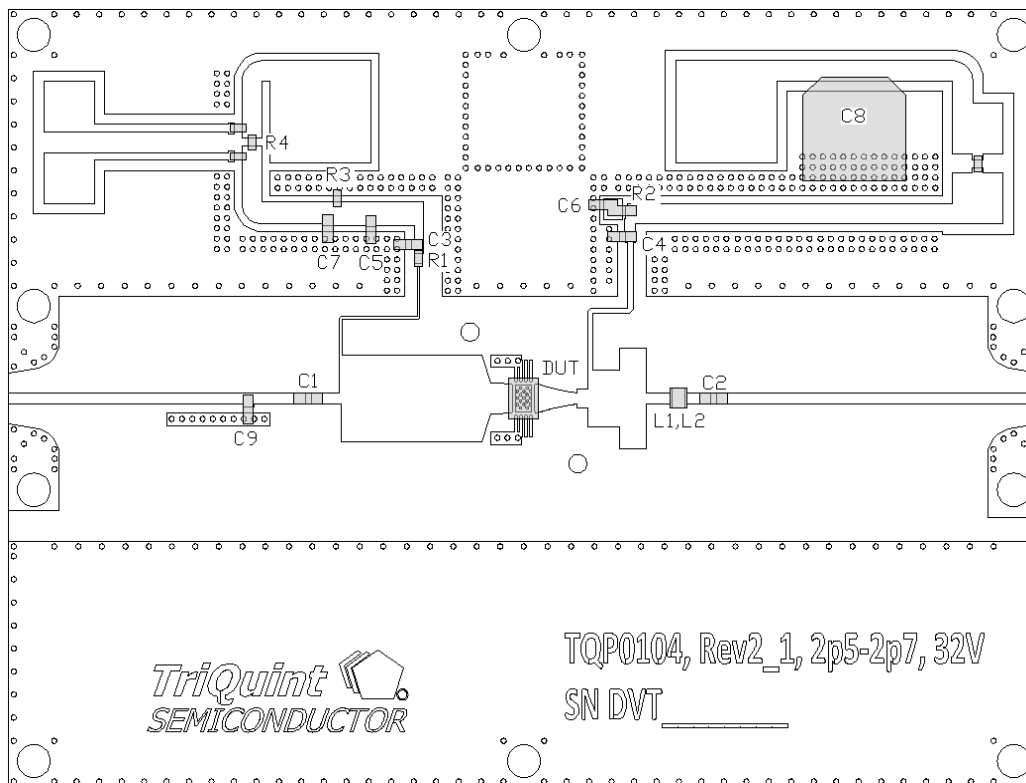
Notes:

1. Thermal resistance measured to package backside.

**Median Lifetime**



## TQP0104 Single-Ended Evaluation Board Layout (2500-2700 MHz)

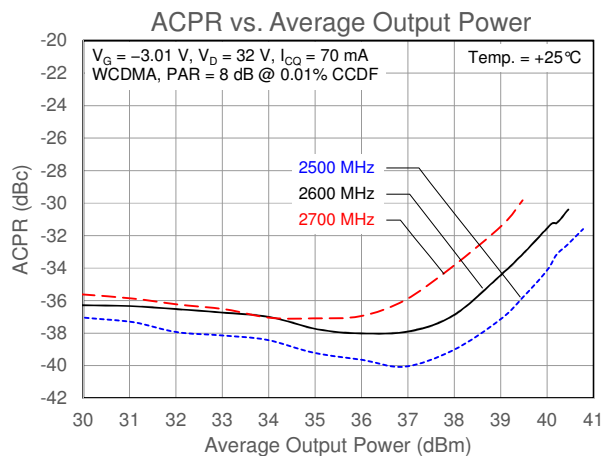
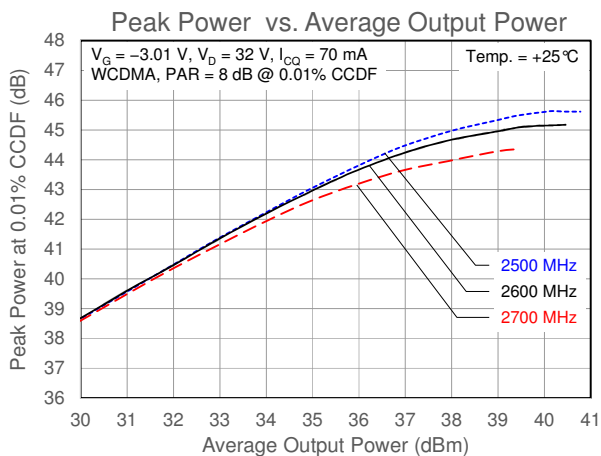
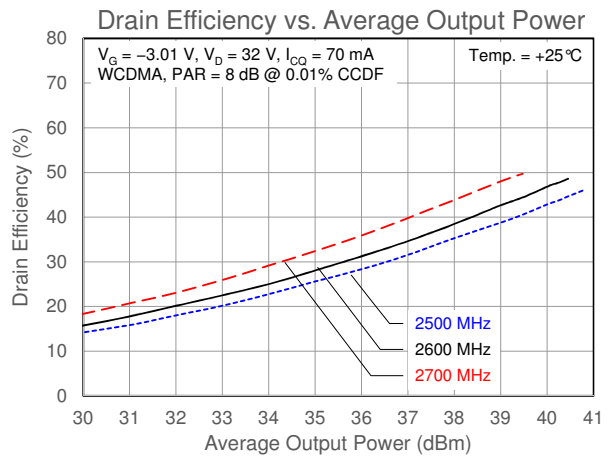
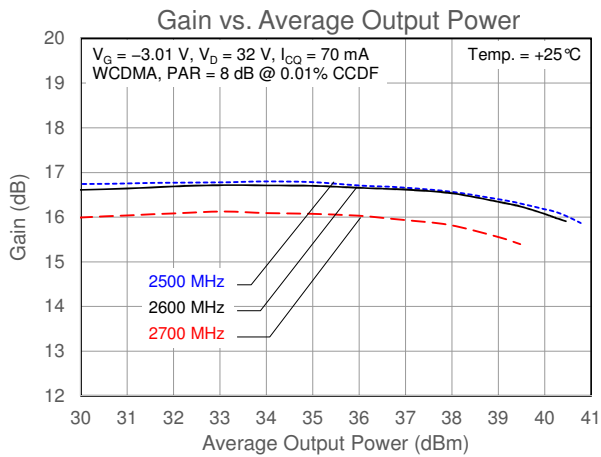
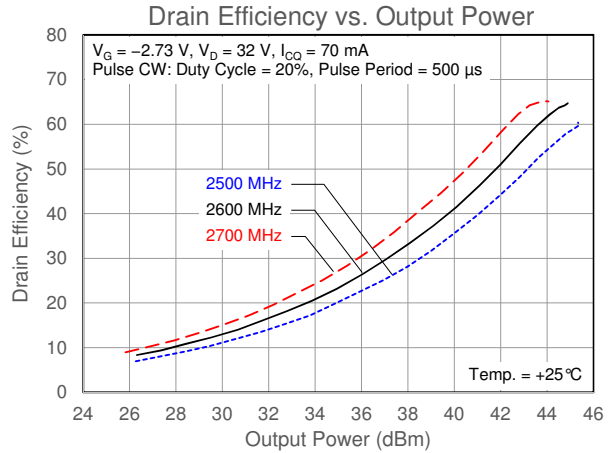
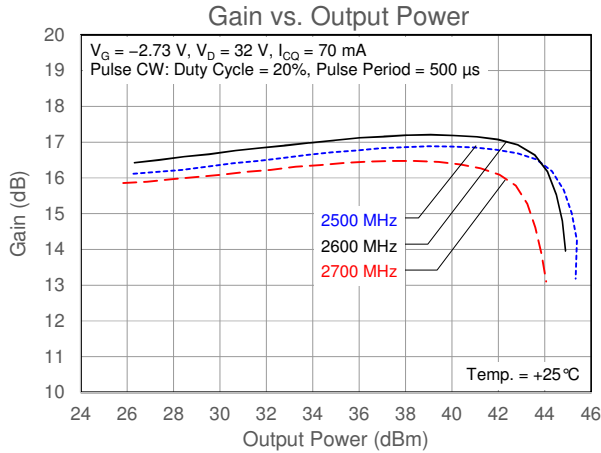


## Bill of Materials – TQP0104 Single-Ended Evaluation Board (2500-2700 MHz)

| Reference Des. | Value         | Description             | Manuf.    | Part Number |
|----------------|---------------|-------------------------|-----------|-------------|
| C1, C2, C3, C4 | 10.0 pF       | Capacitor               | ATC       | 600S        |
| L1, L2         | 1.8 nH        | Inductor                | Coilcraft | 0603HP      |
| C9             | 1.5 pF        | Capacitor               | ATC       | 600S        |
| R1             | 20 $\Omega$   | Resistor                | Venkel    | 0603-8 LCR  |
| C5, C6         | 1000 pF       | Capacitor               | various   |             |
| R2             | 10 $\Omega$   | Resistor                | Venkel    | 0603-8 LCR  |
| R3             | 1000 $\Omega$ | Resistor                | Venkel    | 0603-8 LCR  |
| C7             | 1 $\mu$ F     | Capacitor               | various   |             |
| R4             | 0 $\Omega$    | Jumper                  | Venkel    | 0603-8 LCR  |
| C8             | 220 $\mu$ F   | Capacitor, Electrolytic | various   |             |

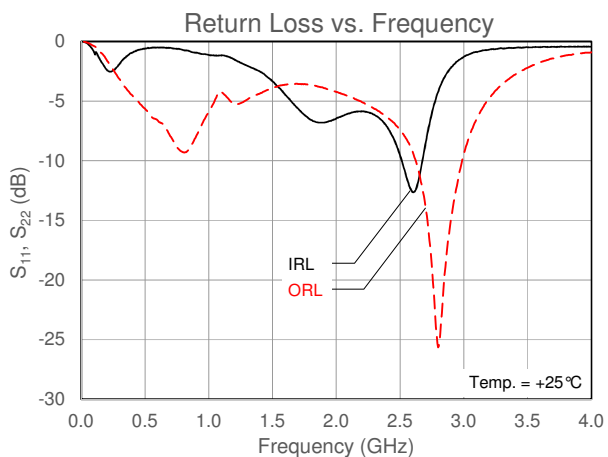
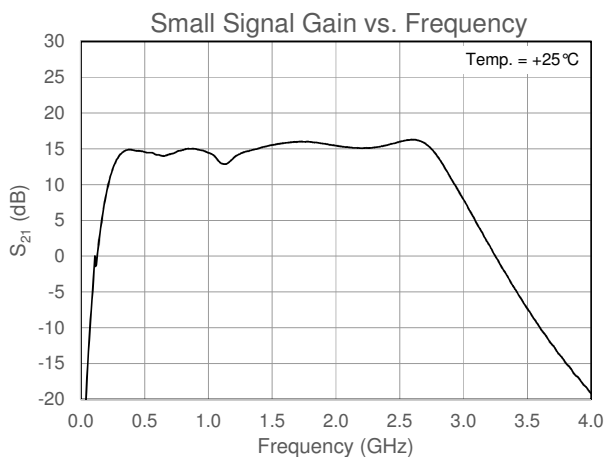
### Performance Plots – TQP0104 Single-Ended Eval. Board (2500-2700 MHz)

Test conditions unless otherwise noted:  $V_D = 32\text{ V}$ ,  $I_{CO} = 70\text{ mA}$ ,  $T = 25^\circ\text{C}$ , 2.6 GHz single-ended application circuit



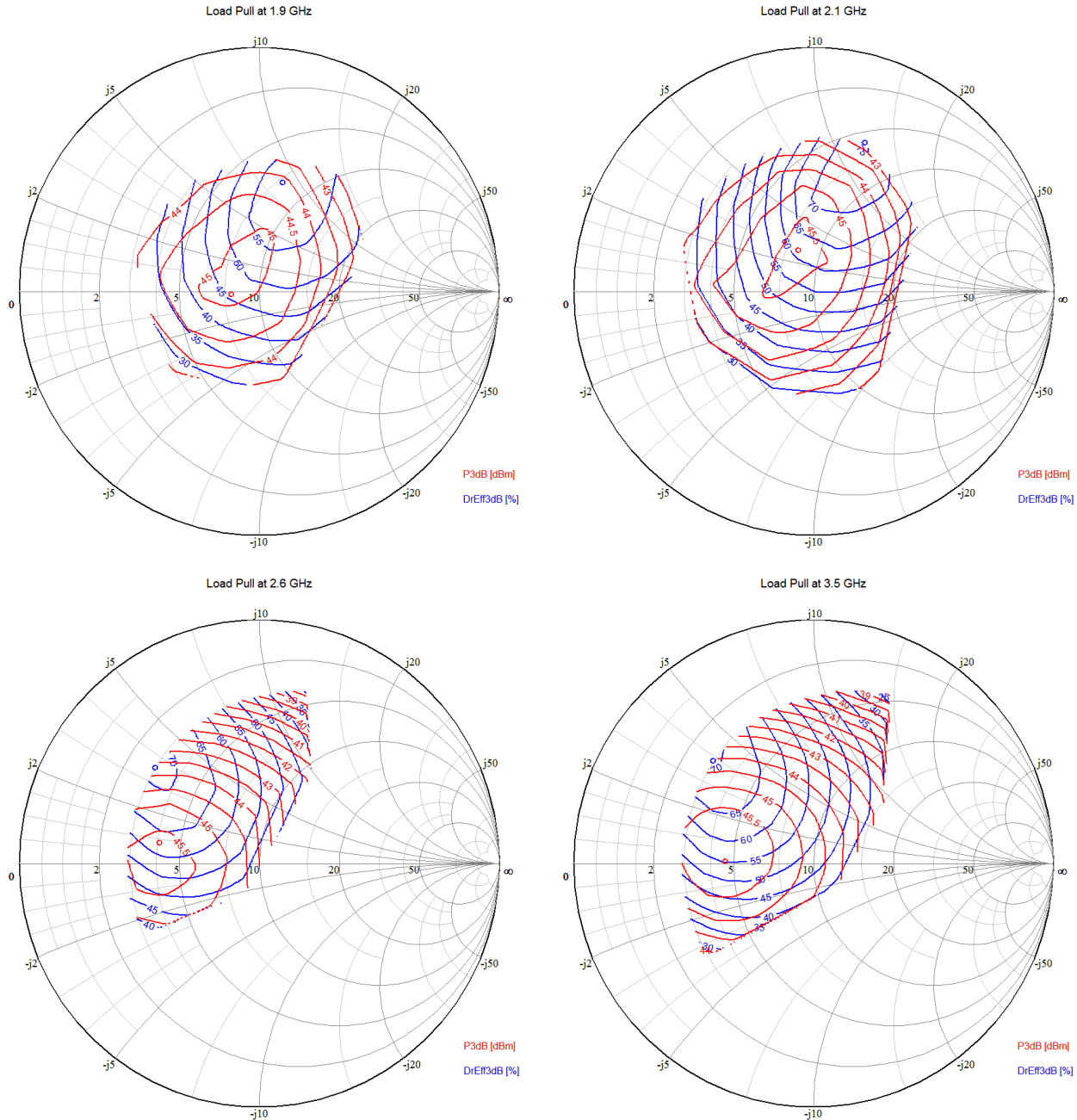
**Performance Plots – TQP0104 Single-Ended Eval. Board (2500-2700 MHz)**

Test conditions unless otherwise noted:  $V_D = 32\text{ V}$ ,  $I_{CQ} = 70\text{ mA}$ ,  $T = 25^\circ\text{C}$ , 2.6 GHz single-ended application circuit

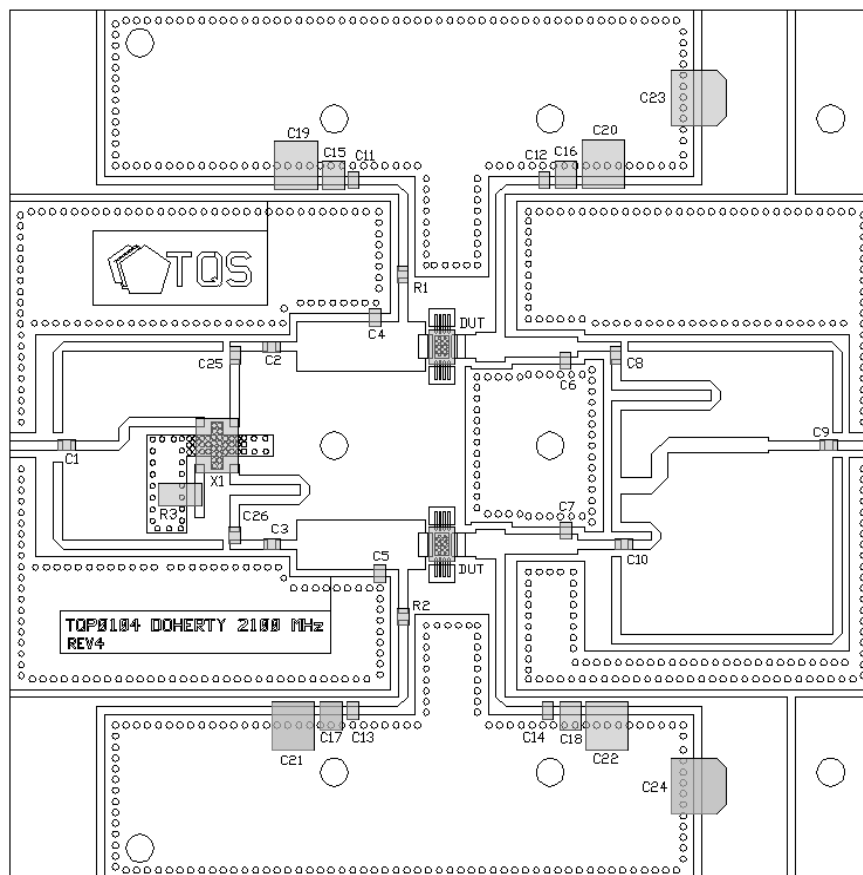


**Load Pull Plots**

Test conditions unless otherwise noted:  $V_D = 32\text{ V}$ ,  $I_{CQ} = 70\text{ mA}$ ,  $T = \text{ }^\circ\text{C}$ , Pulse CW (duty cycle = 20%, pulse period = 500  $\mu\text{s}$ )



## TQP0104 Doherty Evaluation Board Layout (2110-2170 MHz)



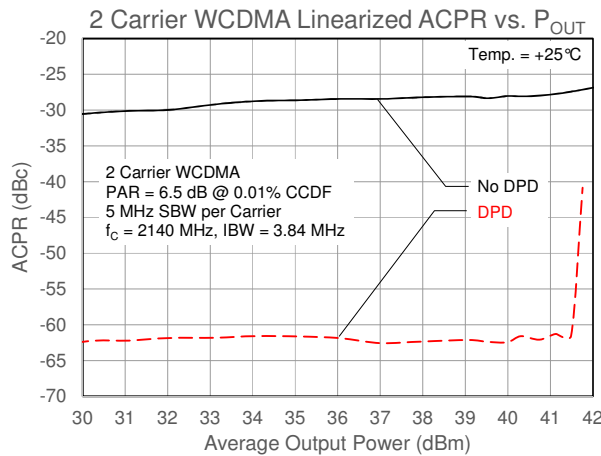
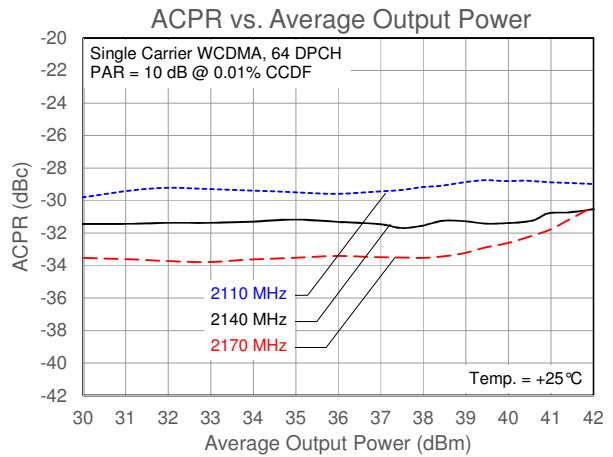
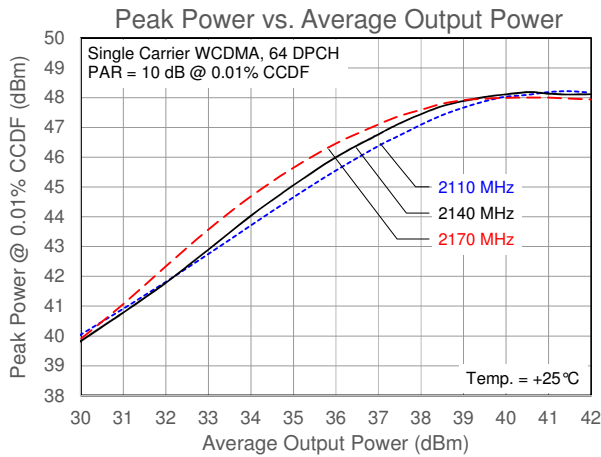
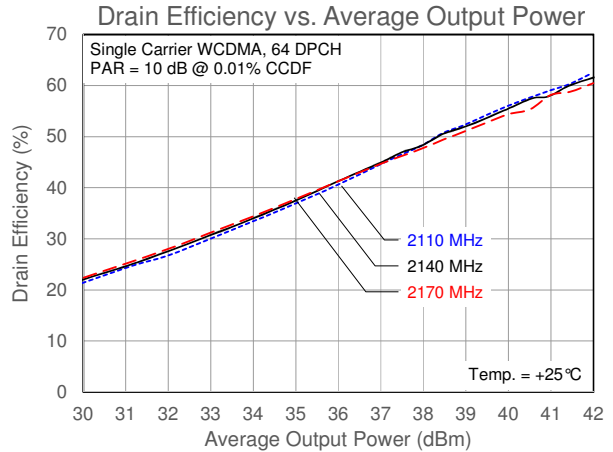
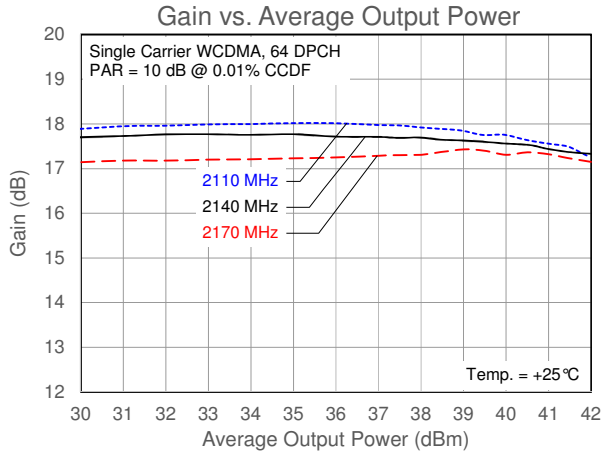
## Bill of Materials – TQP0104 Doherty Evaluation Board (2110-2170 MHz)

| Reference Des.  | Value       | Description                 | Manuf.           | Part Number     |
|---|-------------|-----------------------------|------------------|-----------------|
| C1, C2, C3, C8, C9, C10, C11, C12, C13, C14, C25, C26 | 33 pF       | Capacitor                   | ATC              | 600F            |
| C4, C5  | 3.3 pF      | Capacitor                   | ATC              | 600S            |
| C6, C7  | 1.8 pF      | Capacitor                   | ATC              | 600S            |
| C15, C16, C17, C18                                    | 1 $\mu$ F   | Capacitor                   |                  |                 |
| C19, C20, C21, C22                                    | 10 $\mu$ F  | Capacitor                   |                  |                 |
| C23, C24  | 220 $\mu$ F | Capacitor, Electrolytic     | United Chemi-Con |                 |
| R1, R2  | 10 $\Omega$ | Resistor                    |                  |                 |
| R3  | 50 $\Omega$ | Resistor, 10 W              | ATC              | CS12010T0050GBK |
| X1  |             | Hybrid Coupler, 2.0-2.3 GHz | Anaren           | JP503S/JP503AS  |

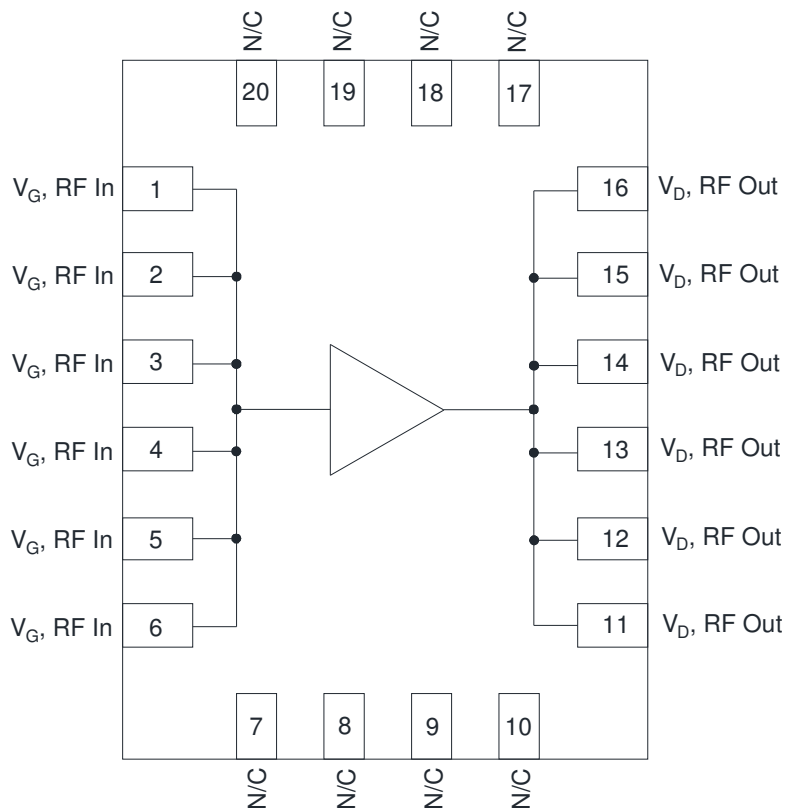


### Performance Plots – TQP0104 Doherty Evaluation Board (2110-2170 MHz)

Test conditions unless otherwise noted:  $V_{G,CARRIER} = -2.81$  V,  $V_{G,PEAKING} = -4.7$  V,  $V_D = 32$  V,  $I_{CQ} = 100$  mA,  $T = 25^\circ\text{C}$ , 2.1 GHz Doherty application circuit



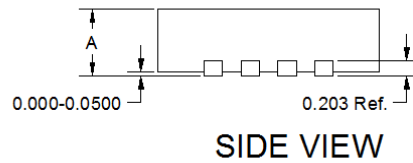
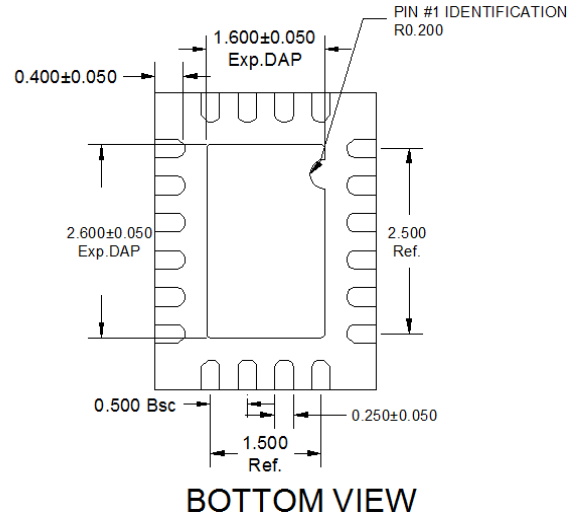
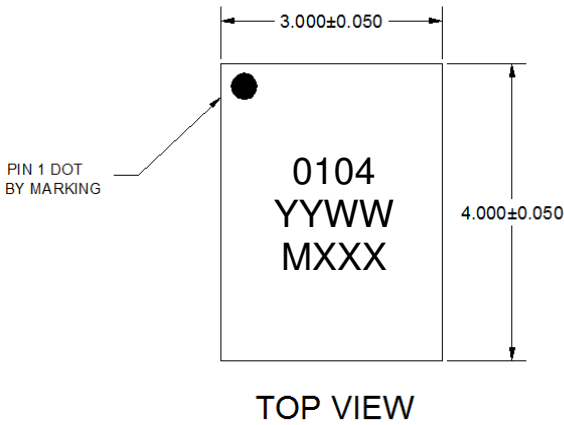
## Pin Configuration and Description



| Pin No.                     | Label         | Description           |
|-----------------------------|---------------|-----------------------|
| 1, 2, 3, 4, 5, 6            | RF IN, $V_G$  | RF Input, Gate Bias   |
| 7, 8, 9, 10, 17, 18, 19, 20 | N/C           | No Connection         |
| 11, 12, 13, 14, 15, 16      | RF OUT, $V_D$ | RF Output, Drain Bias |
| Backside Paddle             | RF/DC GND     | RF/DC Ground          |

**Package Marking and Dimensions**

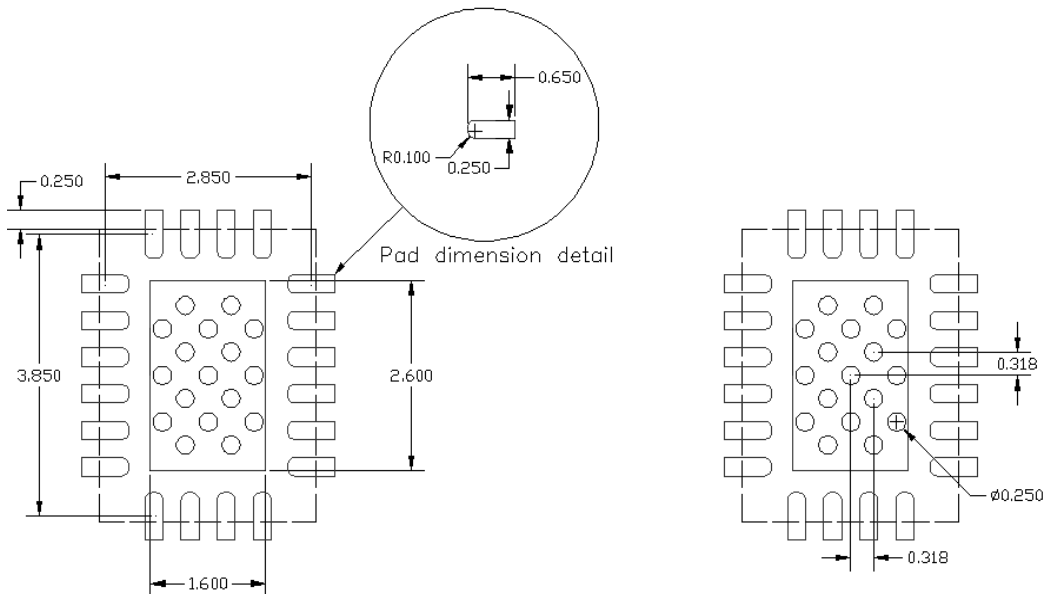
Marking: Part ID – 0104  
Year/Workweek – YYWW  
“M” + Lot Number – MXXX



|   |      |       |
|---|------|-------|
| A |      | QFN   |
|   | MAX. | 0.900 |
|   | NOM. | 0.850 |
|   | MIN. | 0.800 |

Notes:  
1. All dimensions are in millimeters. Angles are in degrees.

**PCB Mounting Pattern**



Notes:  
1. All dimensions are in millimeters. Angles are in degrees.

## Product Compliance Information

### ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1B  
Value: Passes  $\geq 600$  V  
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JS-001-2012

ESD Rating: Class C3  
Value: Passes  $\geq 1000$  V  
Test: Charged Device Model (CDM)  
Standard: JEDEC Standard JESD22-C101F

### MSL Rating

MSL Rating: Level 3  
Test: 260°C convection reflow  
Standard: JEDEC Standard IPC/JEDEC J-STD-020D.1

### ECCN

US Department of Commerce EAR99

### Solderability

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

Contact plating: NiPdAu

### 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 (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free

## Contact Information

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

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<http://moschip.ru/get-element>

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Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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