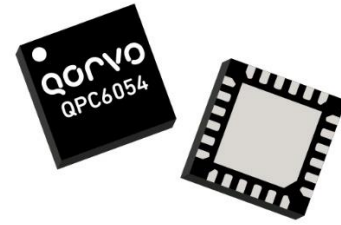


Product Overview

The QPC6054 is a Silicon on Insulator (SOI) Single-Pole 5-Throw (SP5T) switch designed for uses in cellular, 3G, LTE and other high-performance communication systems. It offers a high isolation, identical throw ports with excellent linearity and power handling capability. No DC blocking capacitors are necessary on the RF ports. The design is non-reflective as such the RF1, RF2, RF3, RF4 and RF5 ports are terminated with 50 Ω load(s) in the non-throw or All OFF state. The QPC6054 is 1.8V positive control logic compatible. It incorporates the control to disable the internal Negative Voltage Generator (NVG) and the required negative voltage supplied by an off-chip external source to the same pin.

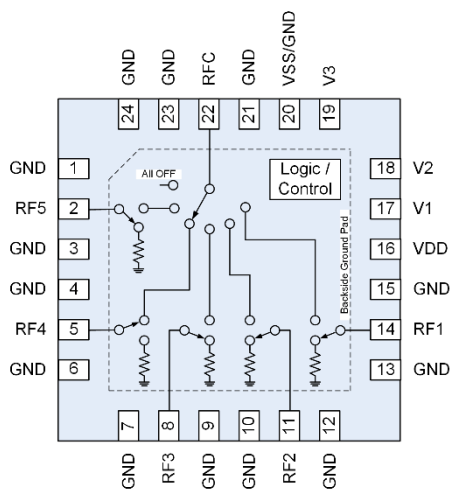


24-Pin, 4 x 4 mm QFN Package

Key Features

- 5 – 6000 MHz Operation
- Single Pole 5 Throw
- Non-Reflective RF1, RF2, RF3, RF4 & RF5 Ports, Terminated in ALL-OFF State
- No Blocking Capacitors Necessary Unless DC Voltage on RF line
- High Isolation: 60 dB at 2 GHz
- High Input IP3: +59 dBm
- +1.8 V Control Logic Compatible

Functional Block Diagram



Top View

Applications

- Cellular, 3G, 4G, 5G Infrastructure
- WiBro, WiMax, LTE
- High Performance Communication Systems
- Test Equipment

Ordering Information

| Part No. | Description |
|----------------|--|
| QPC6054TR13 | 2,500 pieces on a 13" reel (standard) |
| QPC6054 PCK410 | 5 MHz – 6GHz Evaluation Board with 5-piece samples |

Absolute Maximum Ratings

| Parameter | Rating | |
|---|----------------|------|
| Storage Temperature | -55 to +150 °C | |
| RF Input Power, non-internally terminated | +37.5 dBm | |
| RF Input Power, RFX terminated | +29 dBm | |
| Device Voltage | (VDD) | +6 V |
| | (VSS) | -6 V |
| Control Voltage (V1, V2, V3) Low / High | -0.2 V / +6 V | |

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|---|------|------|------|-------|
| Device Voltage (VDD) | +2.7 | +5.0 | +5.5 | V |
| Device Voltage (VSS), External Negative Voltage Supply | -5.5 | -5.0 | -2.7 | V |
| Device Voltage (VSS), Internal Negative Voltage Generator | | 0 | | V |
| T _{CASE} | -40 | +25 | +105 | °C |
| T _j for ≥10 ⁶ hours MTTF | | | +125 | °C |

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

Electrical Specifications

| Parameter | Conditions ⁽¹⁾ | Min | Typ | Max | Units | | |
|---|--|--|--|----------|-------|------|----|
| Operational Frequency Range | | 5 | | 6000 | MHz | | |
| Insertion Loss ⁽²⁾ (RFC to RF1/RF2/RF3/RF4/RF5) | 450 MHz | | 0.95 | 1.15 | dB | | |
| | 900 MHz | | 1.00 | 1.20 | dB | | |
| | 2100 MHz | | 1.10 | 1.30 | dB | | |
| | 2600 MHz | | 1.17 | 1.40 | dB | | |
| | 4000 MHz | | 1.40 | 1.70 | dB | | |
| Group Delay | ON Path | | 0.1 | 0.5 | ns | | |
| | | | | | | | |
| Isolation ⁽³⁾ (RFC to RF1/RF2/RF3/RF4) | 450 MHz | 61 | 70 | | dB | | |
| | 900 MHz | 57 | 63 | | dB | | |
| | 2100 MHz | 48 | 56 | | dB | | |
| | 2600 MHz | 48 | 54 | | dB | | |
| | 4000 MHz | 45 | 50 | | dB | | |
| | 5000 MHz | 45 | 50 | | dB | | |
| Isolation ⁽³⁾ (RF1/2/3/4/5 to RF1/2/3/4/5) | 450 MHz | 61 | 70 | | dB | | |
| | 900 MHz | 56 | 66 | | dB | | |
| | 2100 MHz | 50 | 59 | | dB | | |
| | 2600 MHz | 48 | 56 | | dB | | |
| | 4000 MHz | 43 | 50 | | dB | | |
| | 5000 MHz | 41 | 48 | | dB | | |
| Isolation (RF1 – RF4) ⁽³⁾ | 3500 MHz | 50 | 56 | | dB | | |
| | Isolation (RF2 – RF1, RF2 ON) ⁽⁴⁾ | 5000 MHz | 41 | 42.3 | | dB | |
| | | Isolation (RF3 – RF2, RF3 ON) ⁽⁴⁾ | 5000 MHz | 41 | 42.8 | | dB |
| | | | Isolation (RF4 – RF3, RF4 ON) ⁽⁴⁾ | 5000 MHz | 43 | 44.8 | |
| | | Isolation (RF5 – RF4, RF5 ON) ⁽⁴⁾ | 5000 MHz | 40 | 41.7 | | dB |
| | | Isolation (RF5 – RF1, RF5 ON) ⁽⁴⁾ | 5000 MHz | 43 | 45 | | dB |

Notes:

1. Test conditions unless otherwise noted: VDD = +5V; V1, V2 and V3 = 0/+5V; T_A = +25 °C; Standard application circuit; 50 Ω system,
2. PCB trace loss deducted
3. Isolation based on an optimized evaluation board
4. Only these RF path-ports listed, and the other ports' isolation is better.

Electrical Specifications (continued)

| Parameter | Conditions ⁽¹⁾ | Min | Typ | Max | Units |
|---|--|-----|------|------|-------|
| Operational Frequency Range | | 5 | | 6000 | MHz |
| Return Loss (RF1/RF2/RF3/RF4/RF5 ON-State) | 450 MHz | | 30 | | dB |
| | 900 MHz | | 31 | | dB |
| | 2100 MHz | | 31 | | dB |
| | 2600 MHz | | 30 | | dB |
| | 4000 MHz | | 20 | | dB |
| | 5000 MHz | | 16 | | dB |
| | 6000 MHz | | 12 | | dB |
| Return Loss (RF1/RF2/RF3/RF4/RF5 OFF-State) | 450 MHz | | 37 | | dB |
| | 900 MHz | | 30 | | dB |
| | 2100 MHz | | 24 | | dB |
| | 2600 MHz | | 23 | | dB |
| | 4000 MHz | | 22 | | dB |
| | 5000 MHz | | 19 | | dB |
| | 6000 MHz | | 14 | | dB |
| Input IP2 | 1000 MHz | | 117 | | dBm |
| Input IP3 | 1.0 GHz, +17 dBm input power per-tone, 1 MHz tone spacing | 55 | 59 | | dBm |
| Input 1 dB Compression Power | | 36 | | | dBm |
| NVG Spur | Internal Negative Voltage Generator ON | | -104 | | dBm |
| Spurious Signal Level | >100MHz | | | -120 | dBm |
| Second Harmonic | Pin = +13 dBm, F ₀ = 1GHz | | -105 | -95 | dBc |
| Third Harmonic | Pin = +13 dBm, F ₀ = 1GHz | | -105 | -95 | dBc |
| Setting Time | 50% V1/V2/V3 to optimum functionality | | 1 | 4 | μs |
| Start-up Time | 90% VDD to full functionality | | 5 | 25 | μs |
| Switching Time | 50% control to 10/90% RF | | 150 | 240 | ns |
| Supply Current (I _{VDD}) | VDD +5.0V | | 100 | | μA |
| Control Current, (I _{V1} , I _{V2} , I _{V3}) | V1, V2, V3 each at +5.0V | | 2 | | μA |
| VSS Current (I _{VSS}) | VSS -5.0V, Internal NVG disabled | | 100 | | μA |
| Low Control Voltage (V1, V2, V3) | +1.8 V Control Logic compatible | 0 | | 0.63 | V |
| High Control Voltage (V1, V2, V3) | | 1.1 | | VDD | V |

Notes:

1. Test conditions unless otherwise noted: VDD = +5V; V1, V2 and V3 = 0/+5V; T_A = +25 °C; Standard application circuit; 50 Ω system

Truth Table

| Control Input | | | Mode of Signal Path |
|---------------|----|----|---|
| V1 | V2 | V3 | |
| 0 | 0 | 0 | All OFF; RFC Reflective; RFX Terminated |
| 1 | 0 | 0 | RFC ⇔ RF1 Active ON |
| 0 | 1 | 0 | RFC ⇔ RF2 Active ON |
| 1 | 1 | 0 | RFC ⇔ RF3 Active ON |
| 0 | 0 | 1 | RFC ⇔ RF4 Active ON |
| 1 | 0 | 1 | RFC ⇔ RF5 Active ON |
| 0 | 1 | 1 | All OFF; RFC Reflective; RFX Terminated |
| 1 | 1 | 1 | |

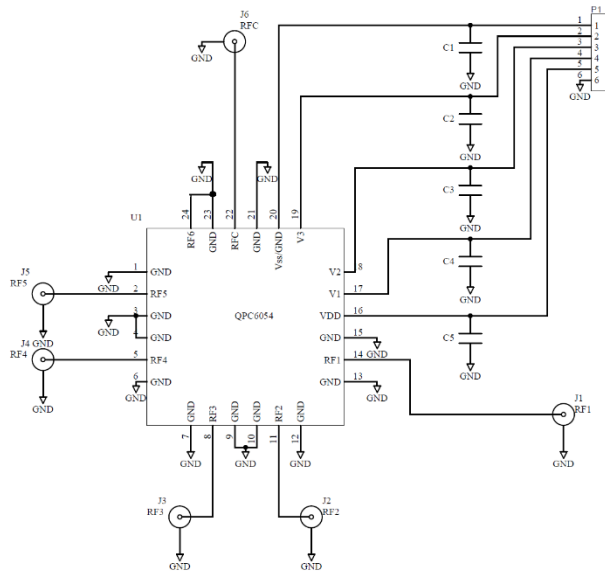
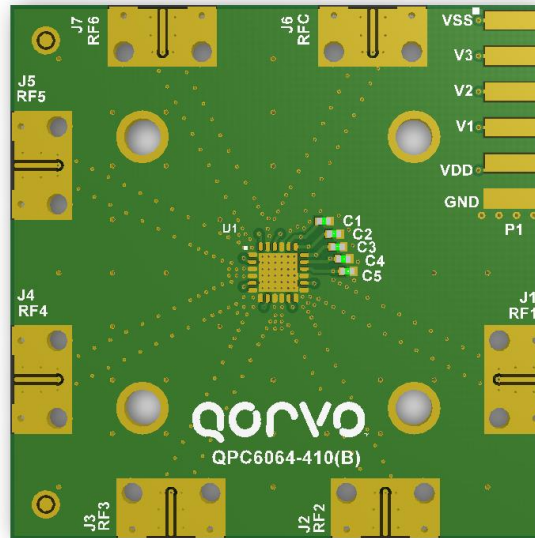
Maximum Operating Power at High Temperature, ≥50 MHz CW, 50 Ω System

| Input Port | State | Power at each port | | Thermal Resistance, θ_{jc} |
|--------------------------------|-----------------------|--------------------|----------------------------|-----------------------------------|
| | | Tc +85°C | Tc +105°C | |
| RFC, RF1, RF2, RF3, RF4 or RF5 | ON, Active Throw | 35.5 dBm | 32.3 dBm ⁽¹⁾ | 53 °C/W |
| RF1, RF2, RF3, RF4 or RF5 | OFF, 1 port | 28.1 dBm | 25.1 dBm ⁽³⁾ | 61 °C/W |
| RF1, RF2, RF3, RF4, RF5 | OFF, 2 ports adjacent | 26.6 dBm | 23.6 dBm ⁽²⁾⁽³⁾ | 86 °C/W |
| RF1, RF2, RF3, RF4 and RF5 | OFF, All 5 ports | 26.2 dBm | 23.1dBm ⁽³⁾ | 96 °C/W |

Notes:

1. For frequency <50 MHz, the maximum operating power at all temperatures should be at least 2 dB below P1dB refer to performance plot
2. On any two ports adjacent being driven simultaneously
3. Internally terminated OFF state

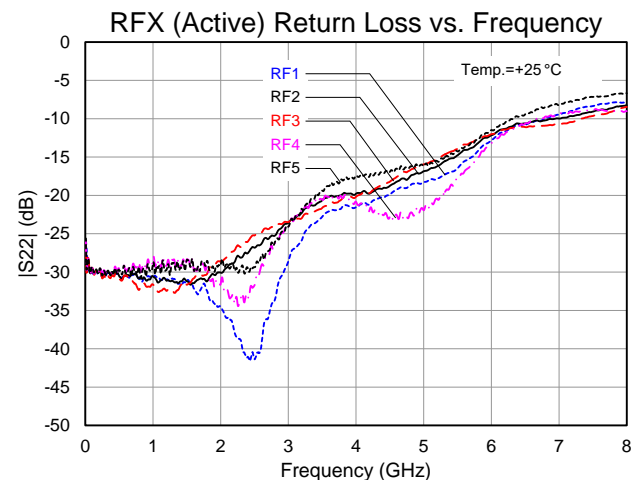
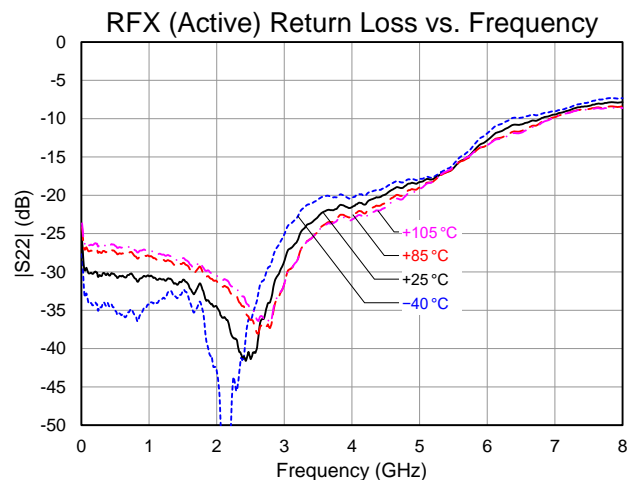
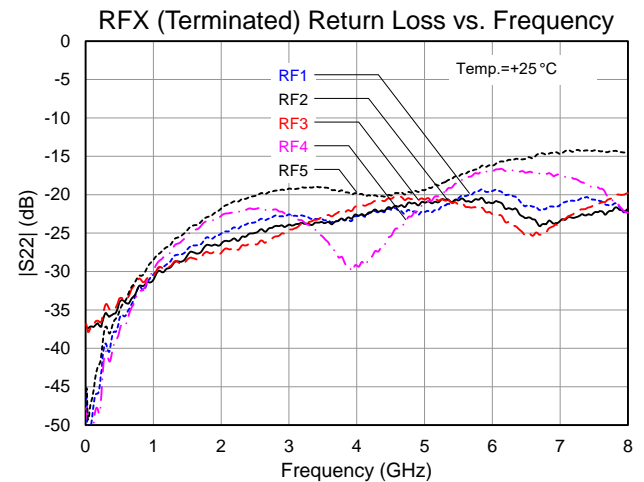
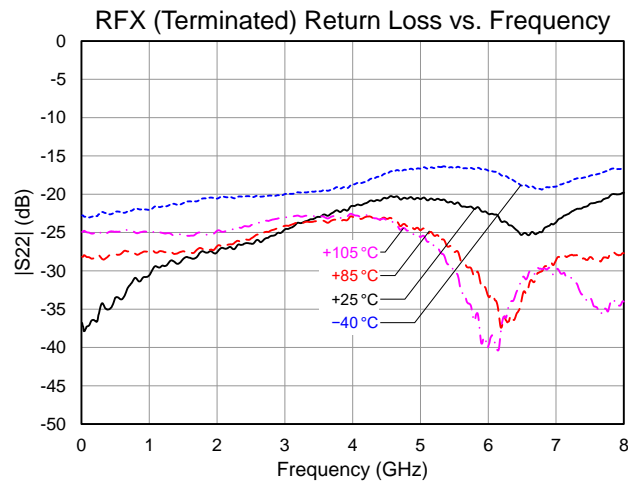
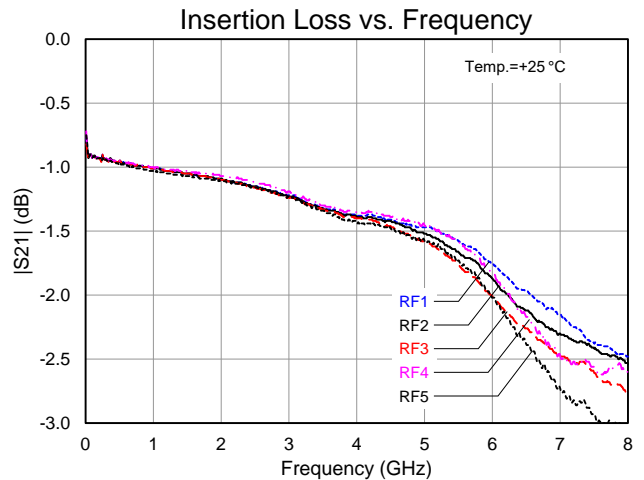
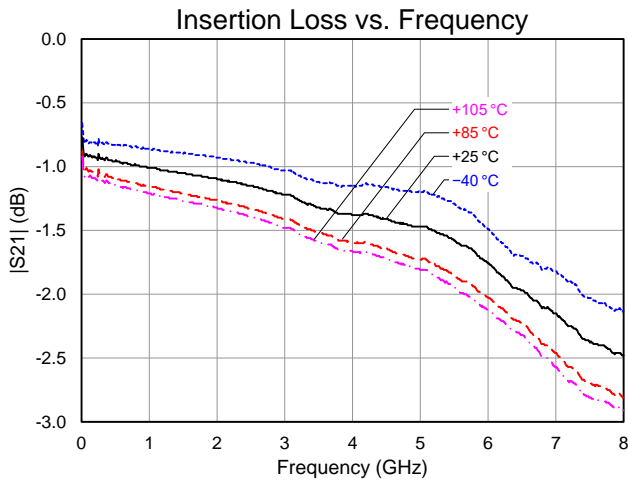
5 MHz to 6 GHz Evaluation Board – QPC6054PCK410



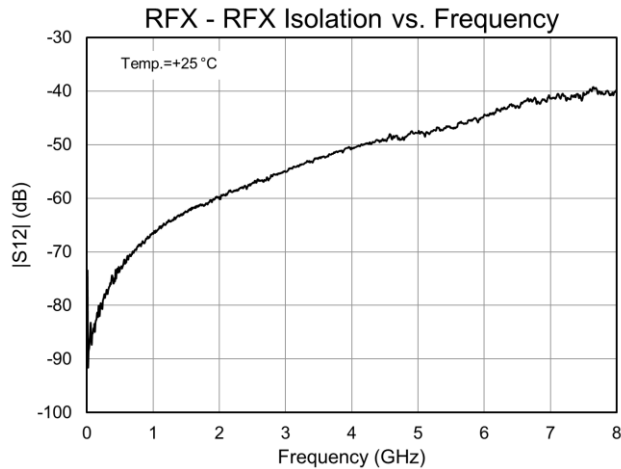
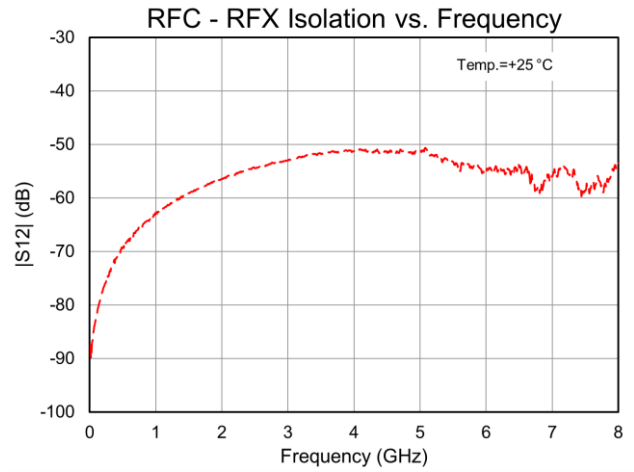
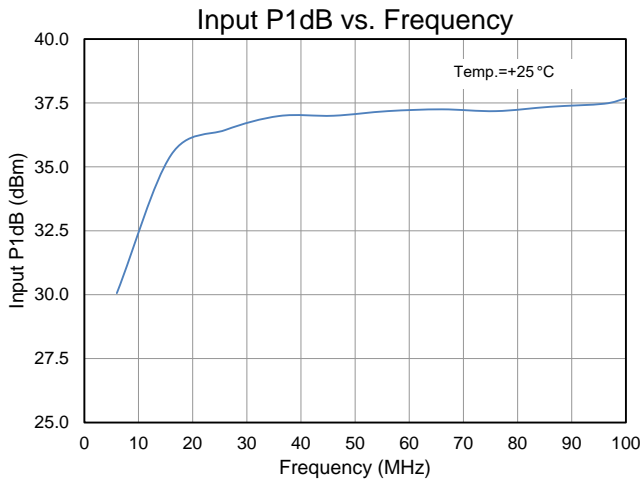
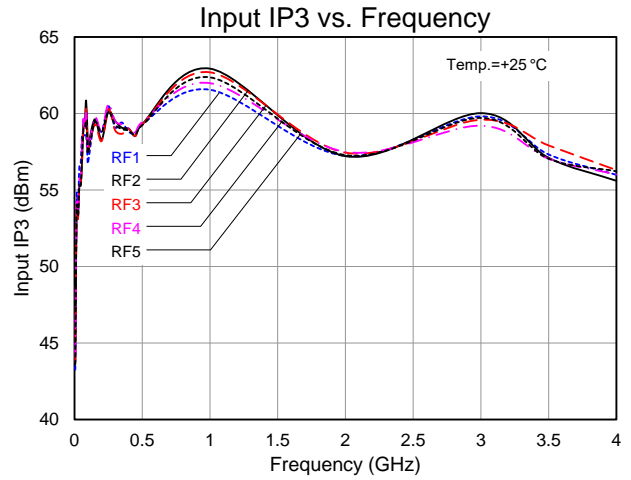
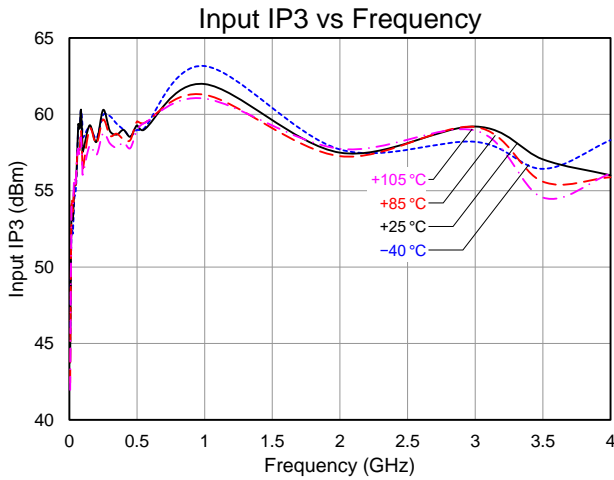
Bill of Material – QPC6054PCK410

| Reference Des. | Value | Description | Manuf. | Part Number |
|------------------------|--------|---------------------------------------|-------------|---------------------|
| - | - | PCB, QPC6064-410(B) | Qorvo | 279707 |
| U1 | - | SOI, High Isolation SP5T RF switch | Qorvo | QPC6054 |
| C1, C2, C3, C4, C5 | 100 pF | CAP, 100 pF, 5%, 50V, COG, 0402 | Taiyo Yuden | RM UMK105 CG101JV-F |
| J1, J2, J3, J4, J5, J6 | SMA | CONN, SMA, EL, FLT VIPER, MAT-21-1038 | Amphenol | 901-10425 |
| P1 | - | CONN, HDR, ST, PLRZD, 6-Pin, 0.100" | AMP | 640454-6 |

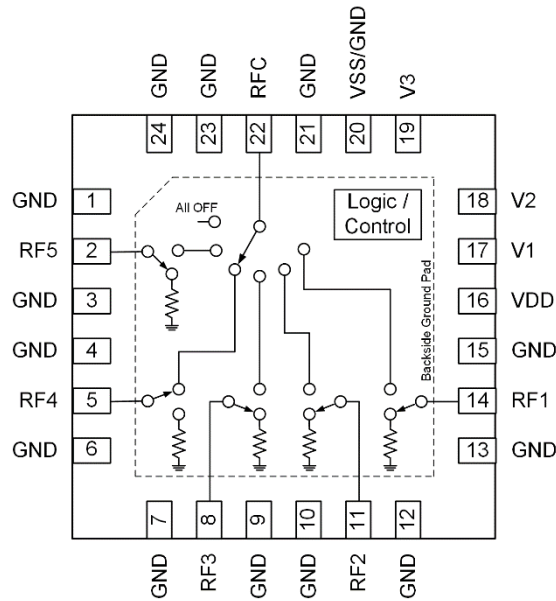
Performance Plots – QPC6054PCK410



Performance Plots – QPC6054PCK410 (Continued)



Pad Configuration and Description



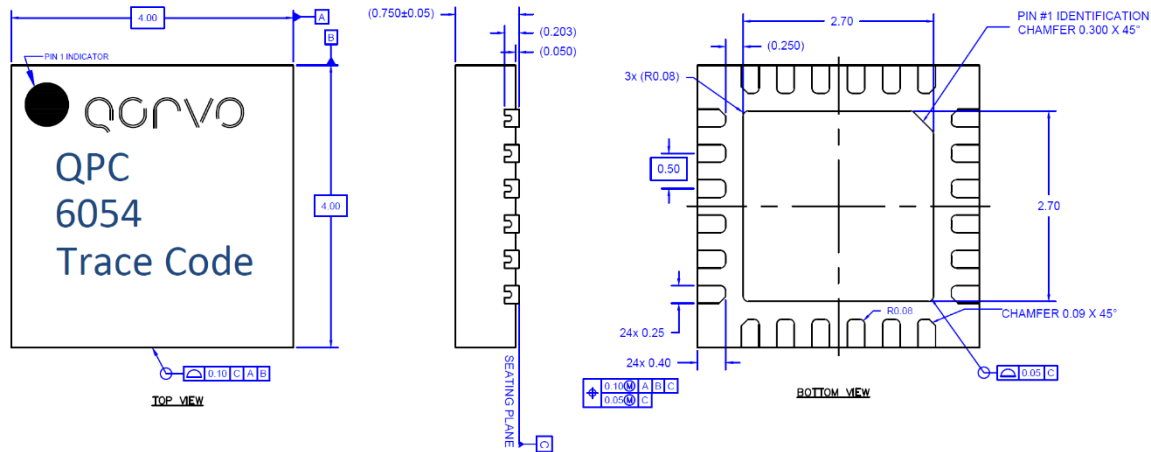
Top View

| Pad No. | Label | Description |
|--|---------|---|
| 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 21, 23, 24 | GND | DC and RF ground, connect to low inductive path to PCB ground |
| 2 | RF5 | RF Port 5 |
| 5 | RF4 | RF Port 4 |
| 8 | RF3 | RF Port 3 |
| 11 | RF2 | RF Port 2 |
| 14 | RF1 | RF Port 1 |
| 16 | VDD | DC Supply Voltage Input |
| 17 | V1 | Control Input 1 |
| 18 | V2 | Control Input 2 |
| 19 | V3 | Control Input 3 |
| 20 | VSS/GND | Negative DC Supply Voltage and Internal Negative Voltage Generator (NVG) control input. Provide low inductive ground connection on this pin to enable internal NVG or directly connect -2.7V to -5V external voltage supply to disable the internal NVG. Re-enable internal NVG, VDD cycling required |
| 22 | RFC | RF Common Port |
| Backside Paddle | GND | RF and DC ground. Must be soldered on PCB ground plane over a bed of via holes to minimize inductance and thermal resistance |

Package Marking and Dimensions

Marking: Part Number – QPC
6054

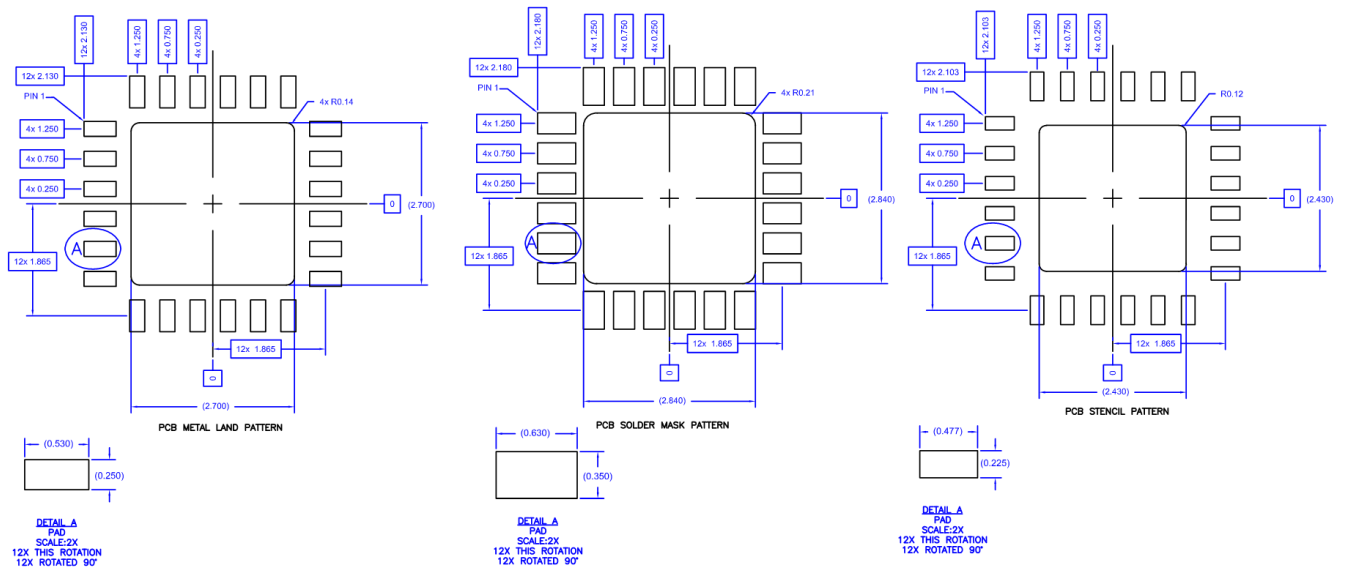
Trace Code – Assigned by subcontractor



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.
3. Contact plating: NiPdAu

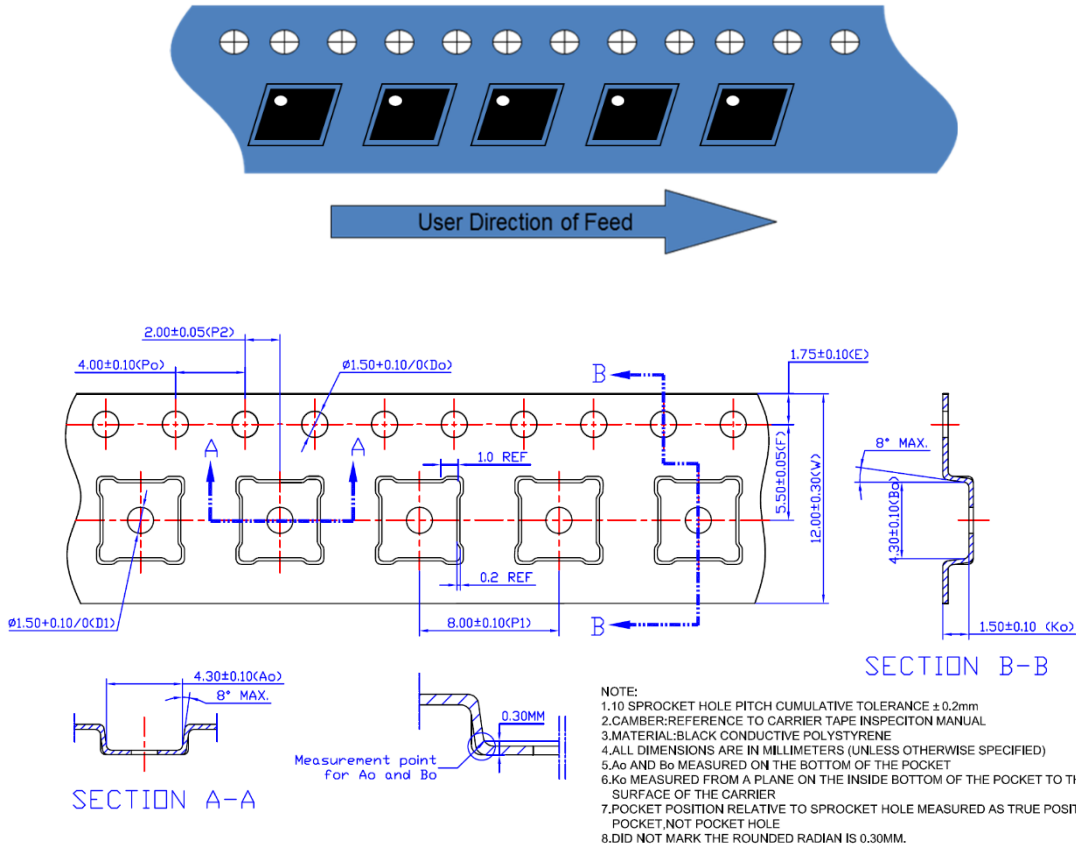
PCB Mounting Pattern



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Via holes are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.01").
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

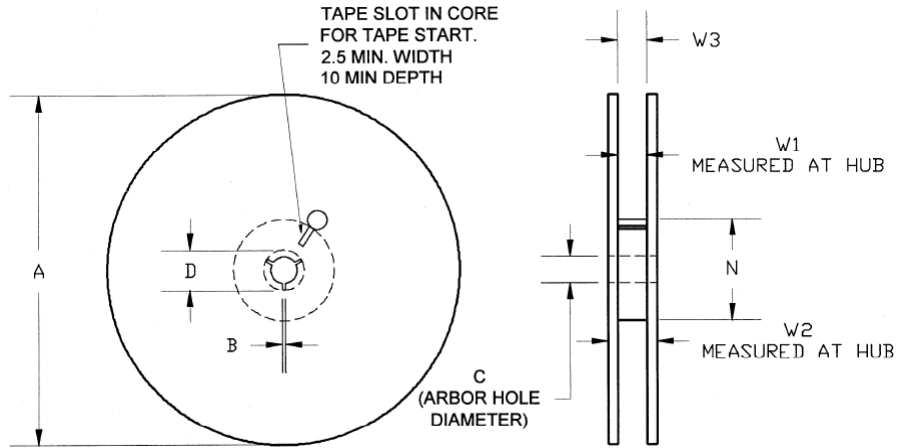
Tape and Reel Information – Carrier and Cover Tape Dimensions



| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---------------------|--|--------|-----------|-----------|
| Cavity | Length | A0 | 0.169 | 4.30 |
| | Width | B0 | 0.169 | 4.30 |
| | Depth | K0 | 0.059 | 1.50 |
| | Pitch | P1 | 0.314 | 8.00 |
| Centerline Distance | Cavity to Perforation - Length Direction | P2 | 0.079 | 2.00 |
| | Cavity to Perforation - Width Direction | F | 0.217 | 5.50 |
| Cover Tape | Width | C | 0.362 | 9.20 |
| Carrier Tape | Width | W | 0.472 | 12.0 |

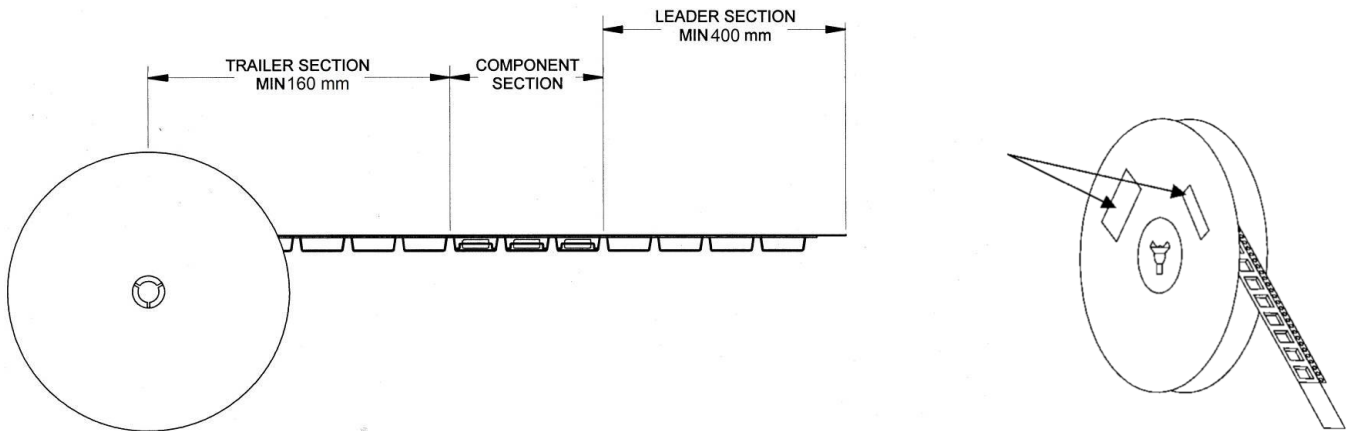
Tape and Reel Information – Reel Dimensions

Standard T/R size = 2,500 pieces on a 13" reel.



| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---------|----------------------|--------|-----------|-----------|
| Flange | Diameter | A | 12.992 | 330.0 |
| | Thickness | W2 | 0.717 | 18.2 |
| | Space Between Flange | W1 | 0.504 | 12.8 |
| 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 |

Tape and Reel Information – Tape Length and Label Placement



- Notes:
1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
 2. Labels are placed on the flange opposite the sprockets in the carrier tape.

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|----------|--------------------------|
| ESD – Human Body Model (HBM) | Class 2 | ESDA / JEDEC JS-001-2012 |
| ESD – Charged Device Model (CDM) | Class C3 | JEDEC JESD22-C101F |
| MSL – Moisture Sensitivity Level | Level 2 | IPC/JEDEC J-STD-020 |



Caution!
ESD-Sensitive Device

Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes. Solder profiles available upon request.

Contact plating: NiPdAu

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

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



Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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JONHON

«**JONHON**» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«**FORSTAR**» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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