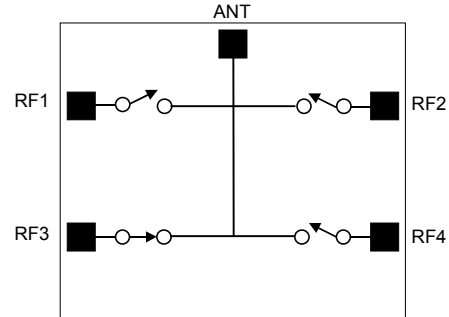


## High Power Reflective GaAs SP4T Switch

### Features:

- ◆ 3x3x0.9mm Packaged pHEMT Switch
- ◆ NiPdAu finish for Military and High reliability applications
- ◆ Excellent low control voltage performance
- ◆ Excellent harmonic performance under GSM/DCS/PCS/EDGE power levels
- ◆ Very high isolation: >29dB at 1.8GHz
- ◆ Very low Insertion loss: 0.65dB at 1.8GHz
- ◆ Very low control current

### Functional Schematic



### Description and Applications:

The FMS2016QFN is a low loss, high power and linear single pole four throw Gallium Arsenide antenna switch designed for use in mobile handset applications. The die is fabricated using the Filtronic FL05 0.5 $\mu$ m switch process technology, which offers excellent performance optimised for switch applications. The FMS2016QFN is designed for use in dual/tri and quad band GSM handset antenna switch modules and RF front-end modules. It can also find use in other applications where high power and linear RF switching is necessary.

### Electrical Specifications: (T<sub>AMBIENT</sub> = 25°C, V<sub>ctrl</sub> = 0V/2.5V, Z<sub>IN</sub> = Z<sub>OUT</sub> = 50 $\Omega$ )

| Parameter                                   | Test Conditions                                 | Min | Typ   | Max | Units   |
|---|---|-----|-------|-----|---------|
| Insertion Loss                              | 0.5 – 1.0 GHz                                   |     | <0.55 |     | dB      |
|   | 1.0 – 2.0 GHz                                   |     | <0.65 |     | dB      |
| Return Loss                                 | 0.5 – 2.5 GHz                                   |     | 20    |     | dB      |
| Isolation<br>RF1 – RF3 and RF2 – RF4        | 0.5 – 1.0 GHz                                   |     | 34    |     | dB      |
|   | 1.0 – 2.0 GHz                                   |     | 32    |     | dB      |
| Isolation<br>RF1 – RF2                      | 0.5 – 1.0 GHz                                   |     | 34    |     | dB      |
|   | 1.0 – 2.0 GHz                                   |     | 32    |     | dB      |
| Isolation<br>RF3 – RF4                      | 0.5 – 1.0 GHz                                   |     | 34    |     | dB      |
|   | 1.0 – 2.0 GHz                                   |     | 30    |     | dB      |
| 2nd Harmonic Level                          | 1 GHz, Pin = +35 dBm, 100% Duty Cycle           |     | -75   |     | dBc     |
|   | 2 GHz, Pin = +35 dBm, 100% Duty Cycle           |     | -75   |     | dBc     |
| 3rd Harmonic Level                          | 1 GHz, Pin = +35 dBm, 100% Duty Cycle           |     | -75   |     | dBc     |
|   | 2 GHz, Pin = +35 dBm, 100% Duty Cycle           |     | -75   |     | dBc     |
| Switching speed : Trise, Tfall<br>Ton, Toff | 10% to 90% RF and 90% to 10% RF                 |     | <0.3  |     | $\mu$ s |
|   | 50% control to 90% RF and 50% control to 10% RF |     |       | 1.0 | $\mu$ s |
| Control Current                             | +35dBm RF input @1GHz                           |     | <10   |     | $\mu$ A |

**Note:** External DC blocking capacitors are required on all RF ports (typ: 100pF)

**Absolute Maximum Ratings:**

| Parameter       | Symbol | Absolute Maximum |
|-----------------|--------|------------------|
| Max Input Power | Pin    | +38dBm           |
| Control Voltage | V ctrl | +5V              |
| Operating Temp  | T oper | -40°C to +100°C  |
| Storage Temp    | T stor | -55°C to +150°C  |

**Note:** Exceeding any one of these absolute maximum ratings may cause permanent damage to the device.

**Truth Table:**

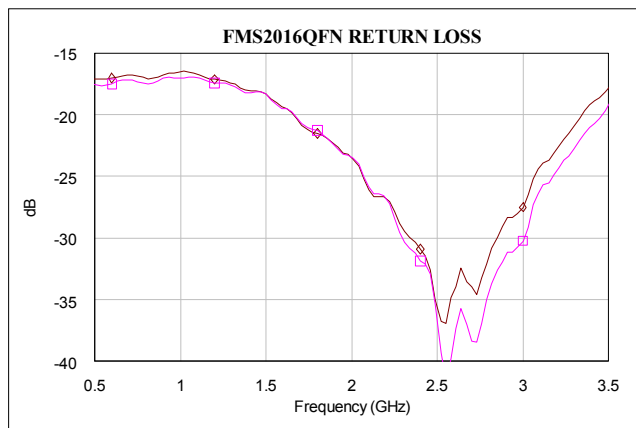
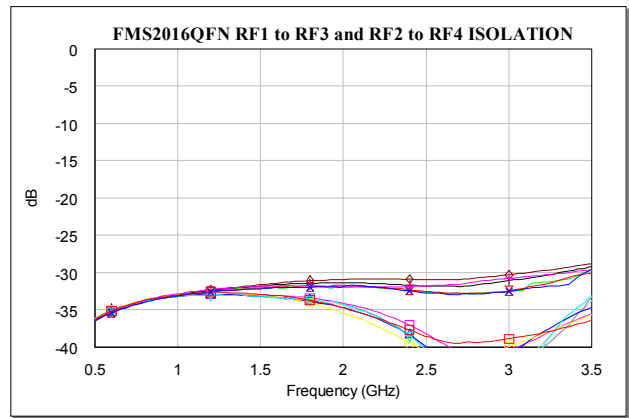
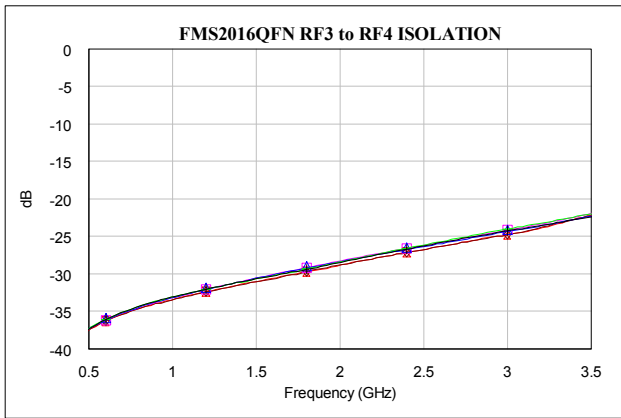
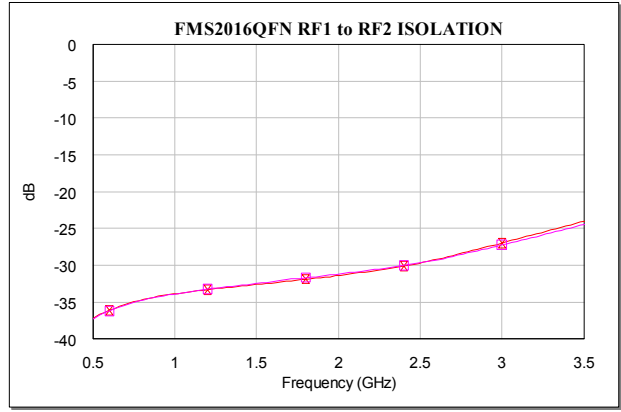
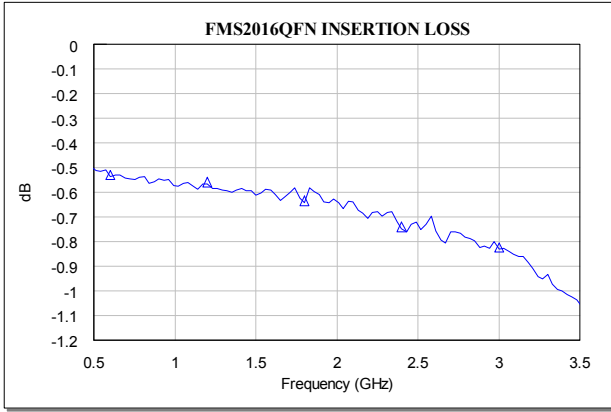
| Switch State | V1   | V2   | V3   | V4   | ANT TO RF1     | ANT TO RF2     | ANT TO RF1     | ANT TO RF2     |
|--------------|------|------|------|------|----------------|----------------|----------------|----------------|
| (A)          | HIGH | LOW  | LOW  | LOW  | Insertion Loss | Isolation      | Isolation      | Isolation      |
| (B)          | LOW  | HIGH | LOW  | LOW  | Isolation      | Insertion Loss | Isolation      | Isolation      |
| (C)          | LOW  | LOW  | HIGH | LOW  | Isolation      | Isolation      | Insertion Loss | Isolation      |
| (D)          | LOW  | LOW  | LOW  | HIGH | Isolation      | Isolation      | Isolation      | Insertion Loss |

**General Test Conditions:**

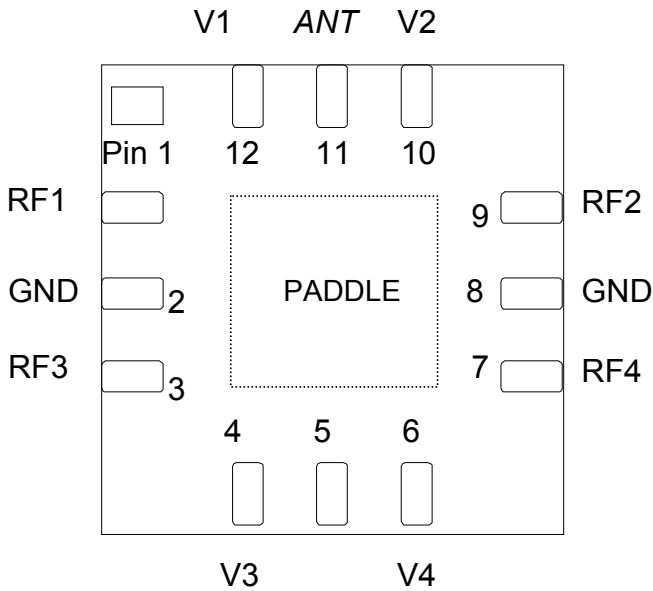
|                     |                                       |
|---------------------|---------------------------------------|
| Bias Voltages       | LOW = 0V to 0.2V<br>HIGH +2.5V to +5V |
| Port Impedances     | 50Ω                                   |
| Off arm termination | 50Ω                                   |

**Typical Measured Performance on Evaluation Board (De-Embedded):**

(Measurement Conditions  $V_{CTRL} = 2.5V$  (high) &  $0V$  (low),  $T_{AMBIENT} = 25^{\circ}C$  unless otherwise stated)



**Pad Layout:**

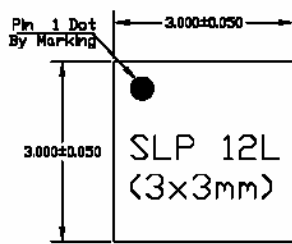


| Pin Number | Description |
|------------|-------------|
| 1          | RF1         |
| 2          | GND         |
| 3          | RF3         |
| 4          | V3          |
| 5          | N/C         |
| 6          | V4          |
| 7          | RF4         |
| 8          | GND         |
| 9          | RF2         |
| 10         | V2          |
| 11         | ANT RF      |
| 12         | V1          |
| PADDLE     | GND         |

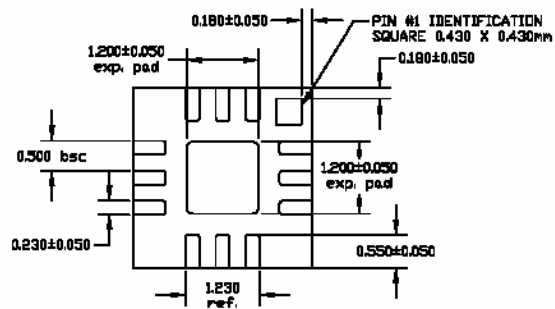
\*View from the top of the package

**QFN 12 Lead 3\*3 Package Outline:**

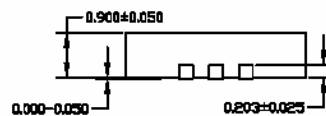
- ◆ NiPdAu finish for Military and High reliability applications



Top View



Btm View



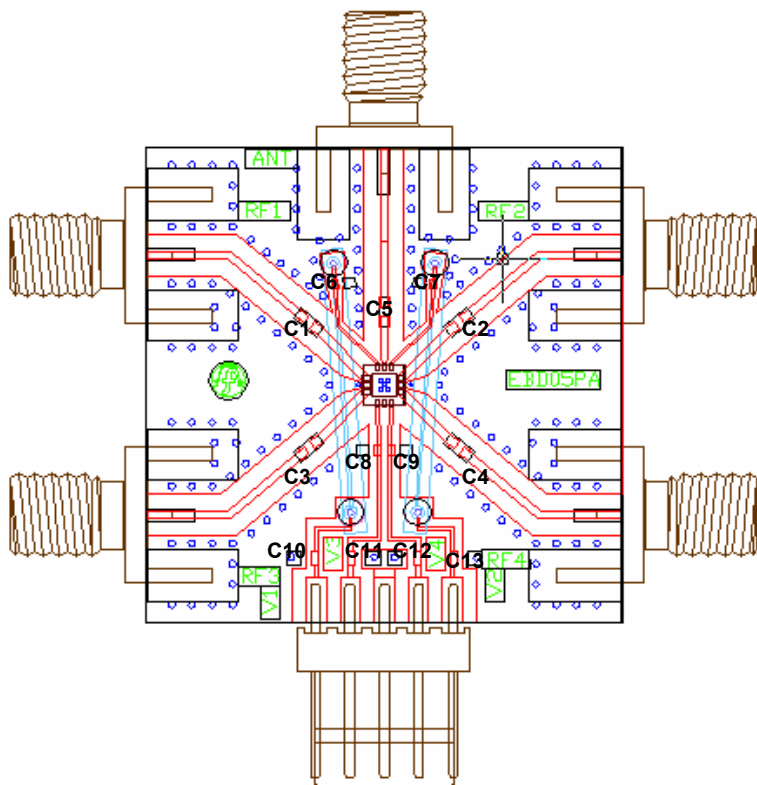
Side View

Preliminary specifications subject to change without notice

**Filtronic Compound Semiconductors Ltd**

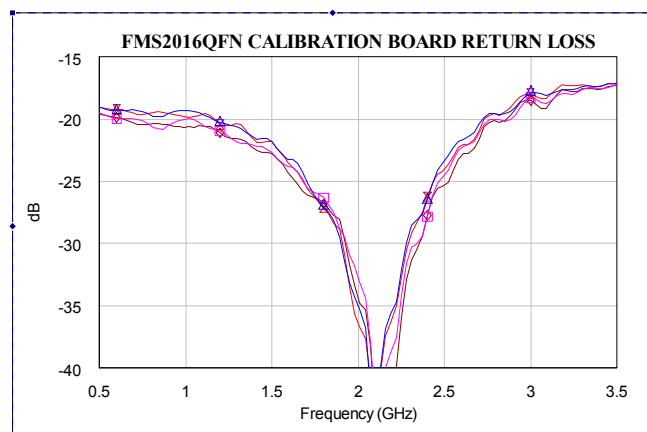
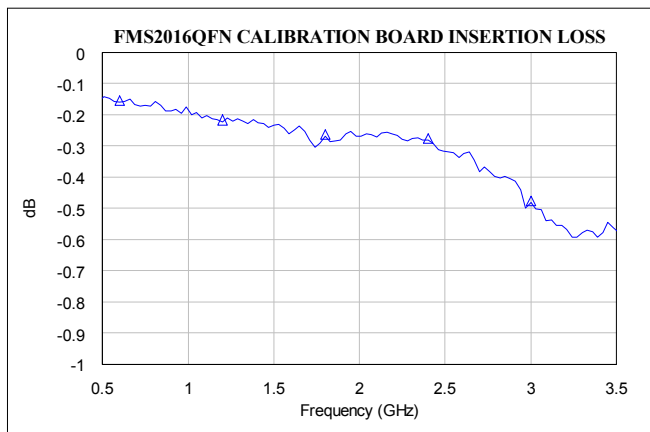
Contact Details (UK): Tel: +44 (0) 1325 301111 Fax: +44 (0) 1325 306177 Email: sales@filcs.com  
 Contact Details (USA): Tel: +1 (408) 850-5790 Fax: +1 (408) 850-5766 Email: sales@filcsi.com  
 Website: www.filtronic.com

**Evaluation Board:**



| BOM                |  |
|--------------------|--|
| Label              | Component  |
| C10, C11, C12, C13 | Capacitor, 470pF, 0603   |
| C1, C2, C3, C4, C5 | Capacitor, 100pF, 0402   |
| C6, C7, C8, C9     | Capacitor, 47pF, 0402  |
| BOARD              | Preferred evaluation board material is 0.25 mm thick ROGERS RT4350. All RF tracks should be 50 ohm characteristic impedance. |

**Evaluation Board De-Embedding Data (Measured):**



**Ordering Information:**

| <b>Part Number</b> | <b>Description</b>                       |
|--------------------|--|
| FMS2016-005        | Packaged Die                             |
| FMS2016-005-EB     | Packaged die mounted on evaluation board |

**Handling Precautions:**

To avoid damage to the devices care should be exercised during handling. Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing. These devices should be treated as Class 1A as defined in Jedec Standard No.22-A114 (0-500V).

Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

**Preferred Assembly Instructions:**

Please refer to FCSL applications note: FAN 003 (handling and assembly of Filtronic QFN devices)

**Disclaimers:**

This product is not designed for use in any space based or life sustaining/supporting equipment.