

65W Peak Power Broadband SPDT

FEATURES

- Low insertion loss
 - 0.45dB @ 1GHz
- High isolation
 - 40dB @ 1GHz
- High peak power handling
- No external DC blocking capacitors on RF lines
- Versatile 2.6-5.25V power supply

APPLICATIONS

- TDD Cellular infrastructure
- LTE relays and microcells

DESCRIPTION

The TS7322K is a symmetrical reflective single pole dual throw (SPDT) switch designed for broadband, high peak power switching applications. Its broadband behavior from 30MHz to 4GHz frequencies makes the TS7322K an excellent switch for all the applications requiring low insertion loss, high isolation and high linearity within a small package size.

The TS7322K is packaged into a compact Quad Flat No lead (QFN) 3x3mm 16 leads plastic package.

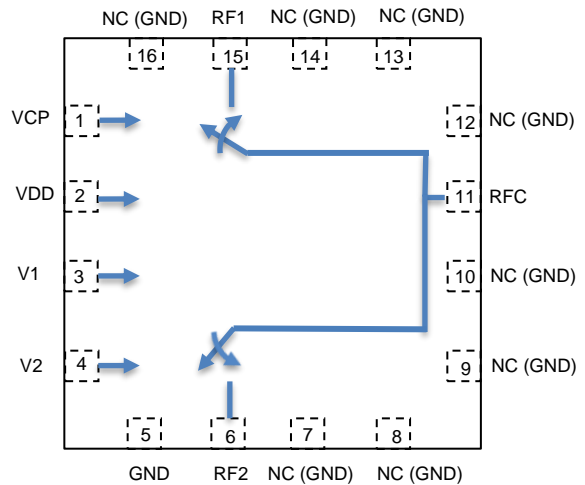


Figure 1: Functional Block Diagram (top view)

ORDERING INFORMATION

| Base Part Number | Package Type | Standard Pack | | Orderable Part Number |
|------------------|-----------------|---------------|----------|-----------------------|
| | | Form | Quantity | |
| TS7322K | QFN 3 mm x 3 mm | Tape and Reel | 3000 | TS7322KMTRPBF |

PIN DESCRIPTION

| PIN NUMBER | PIN NAME | DESCRIPTION |
|------------|----------|--|
| 1 | VCP | Input Pin. Connecting a SMD Capacitor (or capacitor in parallel with high value resistor) between this pin and ground enable faster switching time |
| 2 | VDD | DC power supply |
| 3 | V1 | Switch control input 1 |
| 4 | V2 | Switch control input 2 |
| 5 | GND | Ground |
| 6 | RF2 | RF throw 2 |
| 7 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 8 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 9 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 10 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 11 | RFC | RF Common port |
| 12 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 13 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 14 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |
| 15 | RF1 | RF throw 1 |
| 16 | NC | This pin is not connected to internal circuit. Connect to PCB ground plane if needed (e.g. coplanar access line) |

The backside ground slug of the package must be grounded directly to the ground plane to ensure proper operation

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNITS |
|--|-----------------|-------------|-------|
| Power supply voltage | VDD | 2.6 to 5.5 | V |
| Storage temperature Range | T _{st} | -55 to +125 | °C |
| Operating Temperature Range | T _{op} | -40 to +105 | °C |
| RF Input Power CW 450MHz-4GHz (25degC) | RFx | 43 | dBm |
| RF Input Power CW <450MHz (25degC) | RFx | 42.5 | dBm |

Exceeding one or a combination of the Absolute Maximum Ratings conditions may cause permanent damage to the device.

SWITCH TRUTH TABLE

| V2 | V1 | RF PATH |
|----|----|---------------|
| 1 | 0 | All OFF state |
| 0 | 0 | RFC-RF1 |
| 0 | 1 | RFC-RF2 |

Note: VDD should be applied first before V1 and V2.

There is an internal pull-down to ground on the V2 control pin: this pin can be left floating when the all OFF state is not used.

There is an internal pull-down to ground on the V1 control pin: default switch state at start-up without any control voltage applied will be RFC-RF1 on.

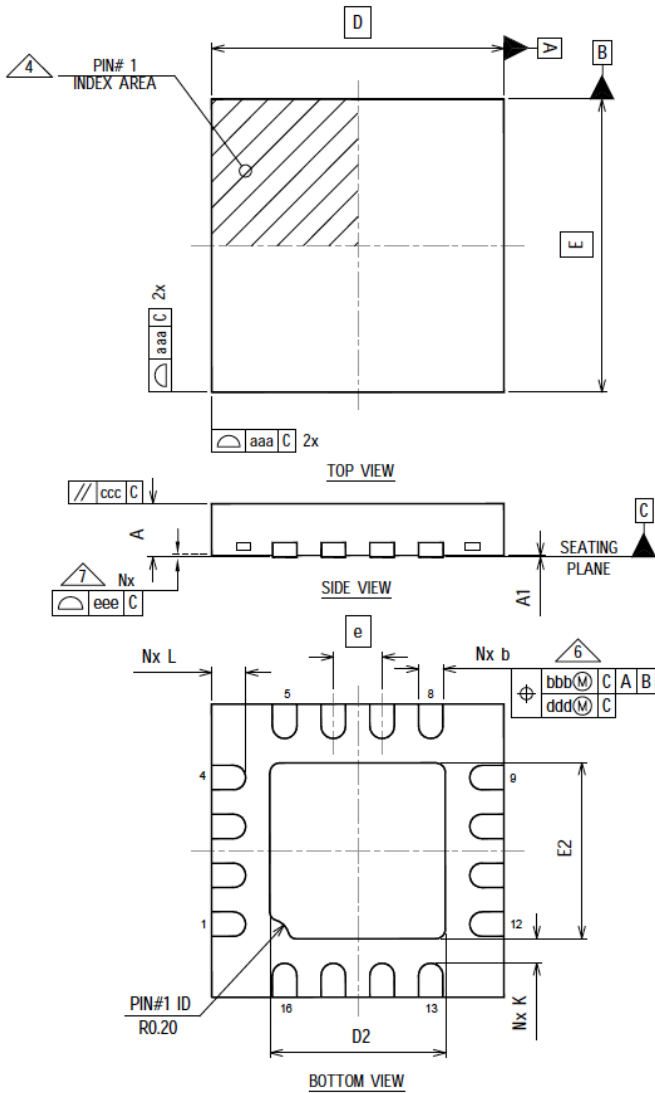
ELECTRICAL SPECIFICATIONS

Temperature=25°C, VDD=2.7V, 50Ω source and load conditions

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------------|---|----------|------|---------|-------|
| Operating frequency | | 30 | | 4000 | MHz |
| Insertion loss | 800MHz | | 0.42 | | dB |
| | 1.95GHz | | 0.55 | | |
| | 2.7GHz | | 0.65 | | |
| | 4GHz | | 0.8 | | |
| Isolation RFC-RFx | 800MHz | | 43 | | dB |
| | 1.95GHz | | 33 | | |
| | 2.7GHz | | 27 | | |
| | 4GHz | | 23 | | |
| Return Loss RFC, RFx | 800MHz | | 23 | | dB |
| | 1.95GHz | | 25 | | |
| | 2.7GHz | | 22 | | |
| | 4GHz | | 18 | | |
| Harmonic distortion | | | | | |
| H2 | 800MHz, Pin=35dBm | | -49 | | dBm |
| H3 | 800MHz, Pin=35dBm | | -50 | | dBm |
| IIP3 | 800MHz | | 73 | | dBm |
| P0.1dB ¹ | 450MHz – 4000MHz CW signal | | 44 | | dBm |
| P0.1dB ¹ | <450MHz CW signal | | 43 | | dBm |
| P0.1dB Peak ² | 800MHz Pulsed Signal | | 48 | | dBm |
| Enhanced Switching Time | 50% ctrl to 0.1dB of max RF power. C1=1nF (refer to figure 5 schematic) | | 2.5 | | μs |
| Control voltage | Power Supply VDD | 2.6 | 3.3 | 5.25 | V |
| | V1, V2 ctrl pin V _{ih} | 0.67*VDD | VDD | VDD+0.3 | V |
| | All control pin V _{il} | -0.3 | | 0.3*VDD | V |
| Control current | I _{il} , V1 or V2 ctrl voltage =0.3*VDD | | 0 | | μA |
| | I _{ih} , V1 or V2 ctrl voltage = VDD | | | 7.5 | μA |
| Current consumption | Active mode (VDD On) | | 225 | | μA |

Note 1: P0.1dB is a Figure Of Merit.**Note 2:** 1% Duty Cycle, 10us pulse width**Note 3:** No external DC blocking capacitors required on the RF terminals unless DC voltage is applied on an RF terminal.

PACKAGE INFORMATION



| Dimension Table | | | | NOTE |
|------------------|----------|---------|---------|------|
| Thickness Symbol | V | | | |
| | MINIMUM | NOMINAL | MAXIMUM | |
| A | 0.80 | 0.90 | 1.00 | |
| A1 | 0.00 | 0.02 | 0.05 | |
| b | 0.20 | 0.25 | 0.30 | 6 |
| D | 3.00 BSC | | | |
| E | 3.00 BSC | | | |
| e | 0.50 BSC | | | |
| D2 | 1.65 | 1.80 | 1.90 | |
| E2 | 1.65 | 1.80 | 1.90 | |
| K | 0.20 | --- | --- | |
| L | 0.30 | 0.35 | 0.40 | |
| aaa | 0.05 | | | |
| bbb | 0.10 | | | |
| ccc | 0.10 | | | |
| ddd | 0.05 | | | |
| eee | 0.08 | | | |
| N | 16 | | | 3 |
| ND | 4 | | | 5 |
| NE | 4 | | | 5 |
| NOTES | 1, 2 | | | |
| LF DWG NO. | B-3490 | | | |
| REV. | 1 | | | |

Figure 2: Package drawings

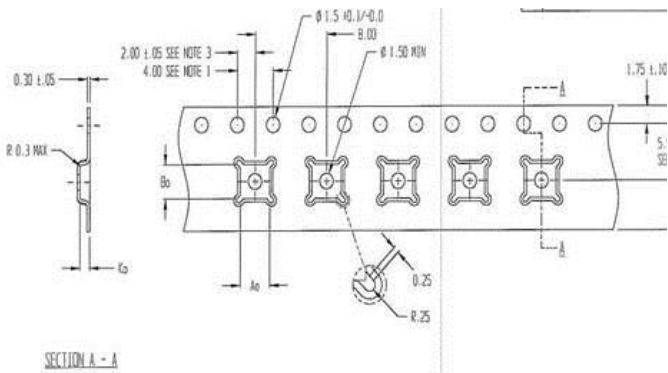


Figure 3: Tape drawing for 3x3mm packages
Ao=3.30, Bo=3.30, Ko=1.10

EVALUATION KIT

The board consists of a 4 layer stack with 2 outer layers made of Rogers 4350B ($\epsilon_r = 3.48$) and 2 inner layers of FR4 ($\epsilon_r = 4.80$). The total thickness of the board is 62 mils (1.57mm). The inner layers provide a ground plane for the 50 Ω transmission lines. The thickness between signal and ground plane is 16mils. Each transmission line is designed using coplanar waveguide with ground plane (CPWG) model using a trace width of 32 mils (0.813mm), gap of 15 mils (0.381mm), and a metal thickness of 1.4mils (0.051mm).

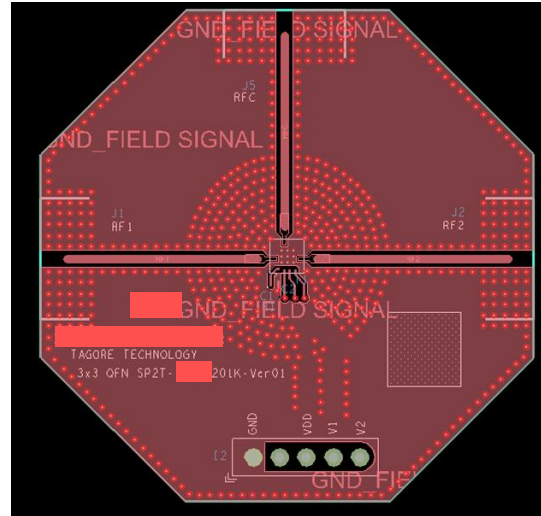


Figure 3: Evaluation board

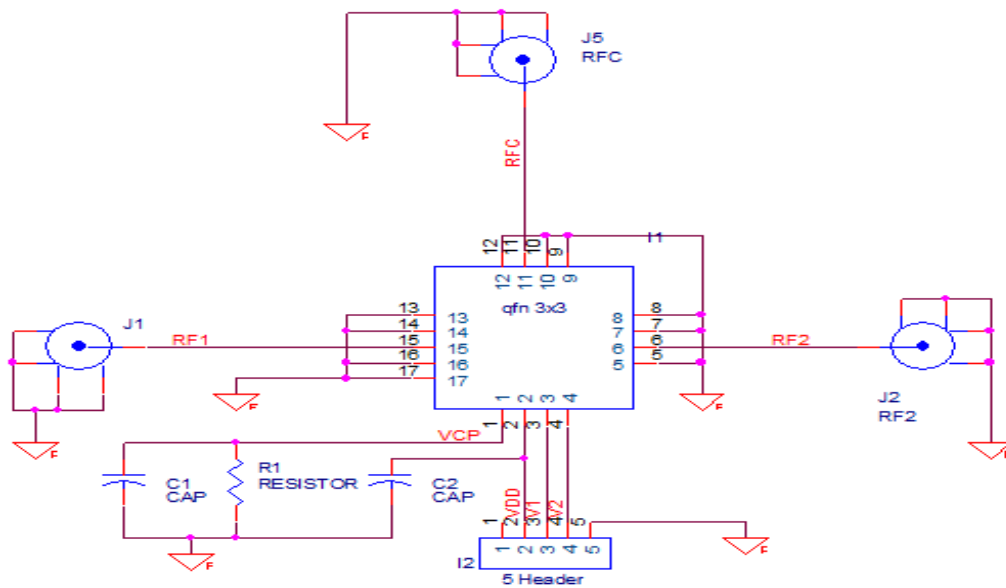


Figure 5: Evaluation board schematic

QUALIFICATION INFORMATION†

| | | | |
|-----------------------------------|----------------------|----------|------|
| Qualification Level | | Consumer | |
| Moisture Sensitivity Level | | 3x3 QFN | MSL1 |
| | Human Body Model | Class 1A | |
| | Charged Device Model | NA | |
| RoHS Compliant | | Yes | |

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