

**SPDT 10W/50W<sub>peak</sub> Power Switch 500 MHz to 12.0 GHz**

**Features**

- Full integrated solution, single  $V_{DD}=2.6...5.25\text{ V}$
- Frequency Range 500 MHz to 12.0 GHz
- 10 W CW Power, 50 W<sub>p</sub> Peak Power
- Highest pulse power in the industry
- No sudden voltage breakdown compared to SOI
- Low insertion loss:  
0.3 dB @ 1.0 GHz  
0.5 dB @ 8.0 GHz  
0.8 dB @ 12.0 GHz
- High isolation:  
20 dB @ 10.0 GHz
- Switch time = 50 ns, no power derating
- Low power consumption, less than 1 mW
- No need to supply negative voltages

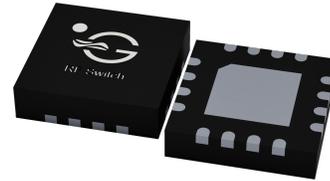


Figure 1: TSX221K in 3.0 x 3.0 mm<sup>2</sup> QFN 16-pin package.

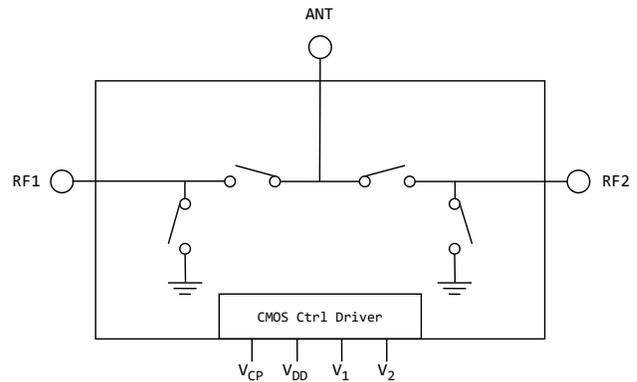


Figure 2: TSX221K functional diagram

**Applications**

- X-band Radar
- C-band Radar
- Cellular infrastructure
- Satellite terminals
- Datalinks

**General Description**

The TSX221K is a X-band fully integrated Single Pole Dual Throw (SPDT) switch designed for high power switching applications based on GaN technology. The TSX221K covers 500 MHz to 12.0 GHz bandwidth and provides low insertion loss, high isolation, and high linearity within a small package size. The TSX221K is a 10 W CW with peak power capability of 50 W<sub>p</sub>, switch suitable for applications requiring low insertion loss, high isolation, and high linearity. TSX221 utilizes standard single  $V_{DD}=2.6...5.25\text{ V}$ , no extra negative voltage needed, neither high voltages.

The TSX221K is packaged into a compact Quad Flat No lead (QFN) 3.0x3.0 mm<sup>2</sup> 16 leads plastic package.



RoHS/Reach/Halogen free

## Absolute Maximum Ratings

Table 1: Absolute Maximum Ratings  $T_A = +25^\circ\text{C}$  unless otherwise specified<sup>1</sup>.

Parameter	Symbol	Value	Unit
<b>Electrical Ratings</b>			
Power Supply Voltage	$V_{DD}$	5.5	V
Storage Temperature Range	$T_{st}$	-55...+125	$^\circ\text{C}$
Operating Temperature Range	$T_{op}$	-40...+85	$^\circ\text{C}$
Maximum Junction Temperature	$T_j$	+140	$^\circ\text{C}$
Maximum RF CW input power	RFx/ANT	41	dBm
Maximum RF peak input power, 1% duty cycle, 10 $\mu\text{s}$ pulse	RFx/ANT	47.5	dBm
<b>Thermal Ratings</b>			
Thermal Resistance (junction-to-case) – Bottom side	$R_{\theta jc}$	25	$^\circ\text{C}/\text{W}$
Thermal Resistance (junction-to-top)	$R_{\theta jt}$	39	$^\circ\text{C}/\text{W}$
Soldering Temperature	$T_{solder}$	+260	$^\circ\text{C}$
<b>ESD Ratings</b>			
Human Body Model (HBM)	Level 1B	500...<1000	V
Charged Device Model (CDM)	Level C3	$\geq 1000$	V
<b>Moisture Rating</b>			
Moisture Sensitivity Level	MSL	1	

<sup>1</sup> Maximum ratings are absolute ratings. Exposure to absolute maximum rating conditions for extended periods may affect device reliability and can cause permanent damage to the device. Exceeding one or a combination of the absolute maximum ratings may cause permanent and irreversible damage to the device and/or to surrounding circuit. Functional operation of the device is not implied in any conditions above those indicated in the Electrical Specifications section.

## Electrical Specifications

Table 2: Electrical Specifications  $T_A = +25^\circ\text{C}$ ;  $V_{DD} = +3.3\text{V}$ ;  $50\Omega$  Source/Load.

Parameter	Condition	Minimum	Typical	Maximum	Unit
Operating frequency	$f$	0.5		12.0	GHz
Insertion loss  ANT – RFx	500MHz		0.30		dB
	1.0GHz		0.30		dB
	3.0GHz		0.30		dB
	5.0GHz		0.40		dB
	8.0GHz		0.60		dB
	10.0GHz		0.50		dB
	12.0GHz		0.80		dB
Isolation  ANT – RFx	500MHz		30		dB
	1.0GHz		25		dB
	3.0GHz		20		dB
	5.0GHz		18		dB
	8.0GHz		20		dB
	10.0GHz		20		dB
	12.0GHz		15		dB
Return Loss  ANT – RFx	500MHz		-25		dB
	1.0GHz		-22		dB
	3.0GHz		-25		dB
	5.0GHz		-17		dB
	8.0GHz		-15		dB
	10.0GHz		-15		dB
	12.0GHz		-13		dB

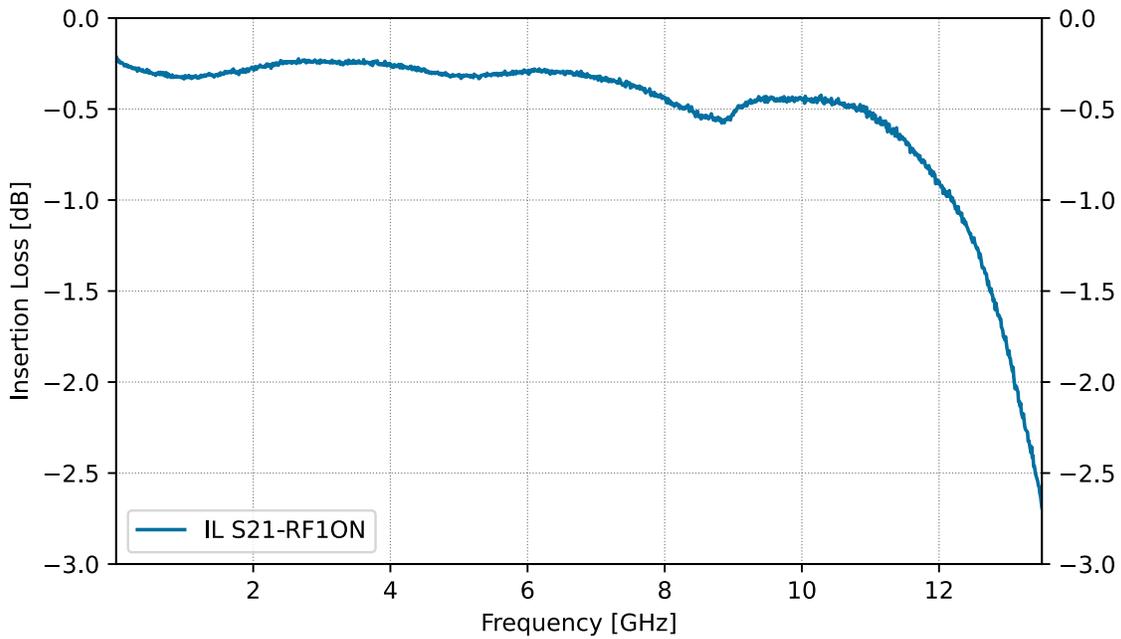
Table 3: Electrical Specifications  $T_A = +25^\circ\text{C}$ ;  $V_{DD} = +3.3\text{V}$ ;  $50\Omega$  Source/Load.

Parameter	Condition	Minimum	Typical	Maximum	Unit
Operating frequency	$f$	0.5		12.0	GHz
<b>Harmonic Distortion</b>					
$H_2$	800MHz, $P_{in} = 40\text{dBm}$		tbd		dBc
$H_3$	800MHz, $P_{in} = 40\text{dBm}$		tbd		dBc
IIP3	800MHz		tbd		dBm
<b>Power and Compression point</b>					
$P_{\text{maxCW}}$	Max RF CW Power		40		dBm
$P_{\text{maxpeak}}$	Max RF Peak Power 1% duty cycle		47		dBm
<b>Noise</b>					
CP switching noise	RBW=1kHz		-140		dBm
<b>Switching Time</b>					
$t_{\text{ON}}^1$	Switch ON time		50		ns
$t_{\text{OFF}}^1$	Switch OFF time		50		ns
$t_{\text{RISE}}$	Switch RISE time		40		ns
$t_{\text{FALL}}$	Switch FALL time		40		ns
$t_{\text{startup}}$ , $C_{\text{VCP}} = 1\text{nF}$	startup time		0.8		ms
<b>Power Supply, DC</b>					
Control voltage	Power Supply $V_{DD}$	2.6	3.3	5.25	V
	All control pins high, $V_{ih}$	1.0	3.3	5.25	V
	All control pins low, $V_{il}$	-0.3	0	0.5	V
Control current	All control pins high, $I_{ih}$			7.5	$\mu\text{A}$
	All control pins low, $I_{il}$		0		$\mu\text{A}$
Current consumption	$I_{DD}$ , active mode ( $V_{DD}$ on)		220		$\mu\text{A}$

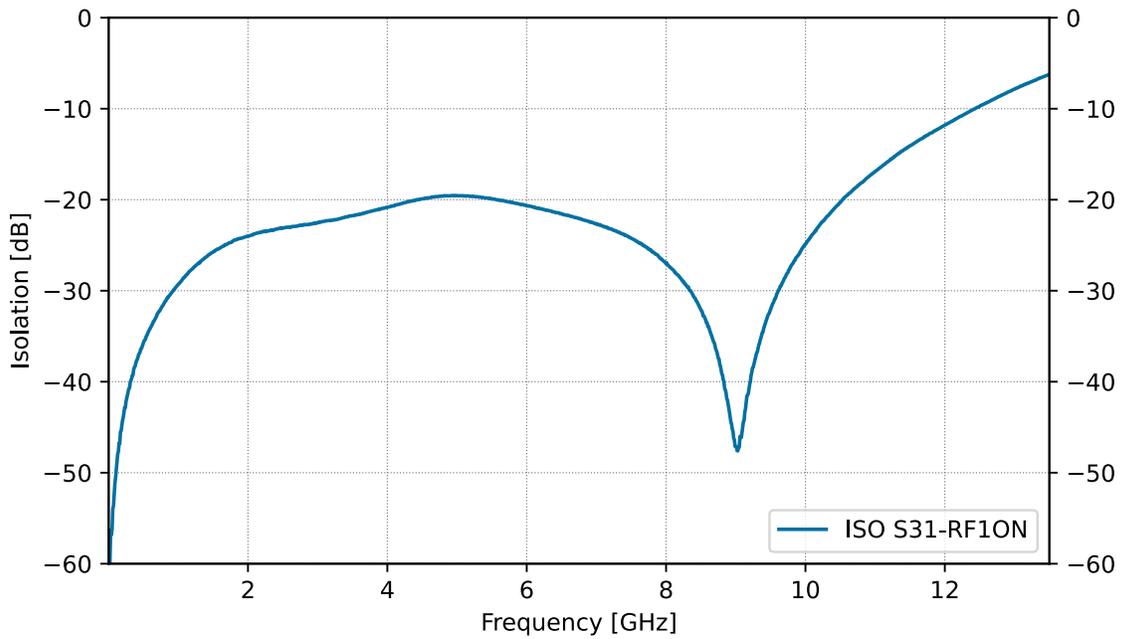
<sup>1</sup> This switching time is complete switching time. Many industry solutions require external biasing and control circuitry, which is not taken into account in switching time. TSX221K switching time definition includes time of the internal biasing and control circuitry.

## Measured Electrical Performance

Typical sample in room temperature  $T_A = +25^\circ\text{C}$ ;  $V_{DD} = +3.3\text{V}$ ;  $50\Omega$  Source/Load.



Insertion loss of ANT to RFx.



Isolation of ANT to RFx.

## Legal Information

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### Changelog

Table 4: Changelog

Date	Revision	Notes
09/19/2025	0.1	Product Brief Published