10MHz, Rail-to-Rail I/O CMOS Operational Amplifier

1 FEATURES

- **High Gain Bandwidth: 10MHz**
- **Rail-to-Rail Input and Output**
  1mV Typical Vos
- **Input Voltage Range: -0.1V to +5.6V with Vs = 5.5V**
- **Supply Range: +2.5V to +5.5V**
- **Specified Up to +125°C**
- **Micro Size Packages: SC70-5**

2 APPLICATIONS

- **Sensors**
- **Photodiode Amplification**
- **Active Filters**
- **Test Equipment**
- **Driving A/D Converters**

3 DESCRIPTIONS

The RS721XC5 offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (10MHz) and slew rate of 7V/μs. The op-amps are unity gain stable and feature an ultra-low input bias current.

The devices are ideal for sensor interfaces, active filters and portable applications. The RS721XC5 is specified at the full temperature range of −40°C to +125°C under single supplies of 2.5V to 5.5V or dual power supplies of ±1.25V to ±2.75V.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE(NOM)
RS721XC5	SC70-5	2.10mm×1.25mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Table of Contents

4 REVISION HISTORY

Note: Page numbers for previous revisions may different from page numbers in the current version.

VERSION	Change Date	Change Item
B.1	2022/05/25	Datasheet completed
B.2	2025/01/09	1. Modify packaging naming 2. Add MSL on Page 2 in RevB.1 3. Update PACKAGE note 4. Change the product name to: RS721XC5

5 PACKAGE/ORDERING INFORMATION (1)

Orderable Device	Temperature Range	Package Lead	Package Marking (2)	MSL(3)	Package Qty
RS721XC5	-40°C ~125°C	SC70-5 (4)	RS721	MSL3	Tape and Reel, 3000

NOTE:

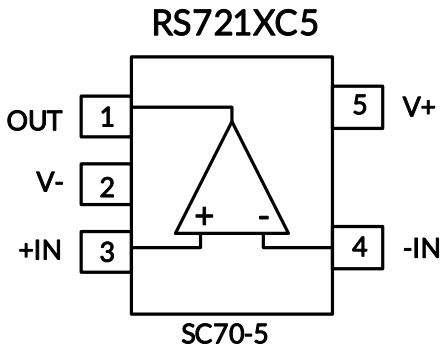
(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.

(2) There may be additional marking, which relates to the lot trace code information(data code and vendor code)，the logo or the environmental category on the device.

(3) RUNIC classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F. Please align with RUNIC if your end application is quite critical to the preconditioning setting or if you have special requirement.

(4) Equivalent to SOT353.

6 PIN CONFIGURATION AND FUNCTIONS



Pin Description

NAME	PIN	I/O (1)	DESCRIPTION
	SC70-5		
-IN	4	I	Negative (inverting) input
+IN	3	I	Positive (noninverting) input
OUT	1	O	Output
V-	2	-	Negative (lowest) power supply
V+	5	-	Positive (highest) power supply

(1) I = Input, O = Output.

7 SPECIFICATIONS

7.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

			MIN	MAX	UNIT
Voltage	Supply Voltage, V+ to V-			7	V
	Input Terminals (2)		-0.5	(V+) +0.5	
Current	Input Terminals (2)		-10	10	mA
θ_{JA}	Package thermal impedance (3)	SC70-5		380	°C/W
Temperature	Operating, T_A		-40	125	°C
	Junction, T_J (4)			150	
	Storage, T_{stg}		-65	150	
	Lead Temperature (Soldering, 10s)			260	

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.
(2) Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.
(3) The package thermal impedance is calculated in accordance with JESD-51.
(4) The maximum power dissipation is a function of $T_{J(MAX)}$, $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.

7.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-Body Model (HBM)	±3000	V
		Machine Model (MM)	±200	

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

7.3 Electrical Characteristics

(At T_A= +25°C, Vs=5V, R_L = 10kΩ connected to V_S/2, and V_{OUT} = V_S/2, Full [9] = -40°C to +125°C, unless otherwise noted.) [1]

PARAMETER		CONDITIONS	T_J	RS721XC5			UNIT
				MIN[2]	TYP[3]	MAX[2]	
POWER SUPPLY							
Vs	Operating Voltage Range		25°C	2.5		5.5	V
I_Q	Quiescent Current Per Amplifier		25°C		1.15	1.55	mA
PSRR	Power-Supply Rejection Ratio	Vs=2.5V to 5.5V, V_{CM}=(V-)+0.5V	25°C	77	90		dB
			Full	68			
INPUT							
Vos	Input Offset Voltage	V_{CM}=2.5V	25°C		±1	±3	mV
Vos TC	Input Offset Voltage Average Drift		Full		2.6		μV/°C
IB	Input Bias Current [4] [5]		25°C		1	10	pA
Ios	Input Offset Current [5]		25°C		1	10	pA
V_{CM}	Common-Mode Voltage Range	Vs= 5.5V	25°C	-0.1		5.6	V
CMRR	Common-Mode Rejection Ratio	Vs= 5.5V, V_{CM}=-0.1V to 4V	25°C	77	90		dB
			Full	70			
		Vs= 5.5V, V_{CM}=-0.1V to 5.6V	25°C	63	80		
			Full	60			
OUTPUT							
A_{OL}	Open-Loop Voltage Gain	R_L=2KΩ, Vo=0.15V to 4.85V	25°C	96	105		dB
			Full	75			
		R_L=10KΩ, Vo= 0.05V to 4.95V	25°C	100	110		
			Full	77			
	Output Swing from Rail	R_L=2KΩ	25°C		52		mV
		R_L=10KΩ			7		
Iout	Output Short-Circuit Current [6] [7]		25°C		150		mA
FREQUENCY RESPONSE							
SR	Slew Rate [8]		25°C		7		V/μs
GBP	Gain-Bandwidth Product		25°C		10		MHz
PM	Phase Margin [5]		25°C		62		°
t_s	Settling Time, 0.1%				0.2		μs
	Overload Recovery Time	V_{IN} · Gain ≥ V_S			0.35		μs
NOISE							
e_n	Input-Referred Voltage Noise	f = 1KHz	25°C		9.5		nV/$\sqrt{\text{Hz}}$
		f = 10KHz	25°C		6.5		nV/$\sqrt{\text{Hz}}$

NOTE:
(1) Electrical table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device.
(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.
(4) Positive current corresponds to current flowing into the device.
(5) This parameter is ensured by design and/or characterization and is not tested in production.
(6) The maximum power dissipation is a function of $T_{J(MAX)}$, $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is PD = ($T_{J(MAX)}$ - T_A) / $R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.
(7) Short circuit test is a momentary test.
(8) Number specified is the slower of positive and negative slew rates.
(9) Specified by characterization only.

7.4 Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, V_{OUT} = $V_S/2$, unless otherwise noted.

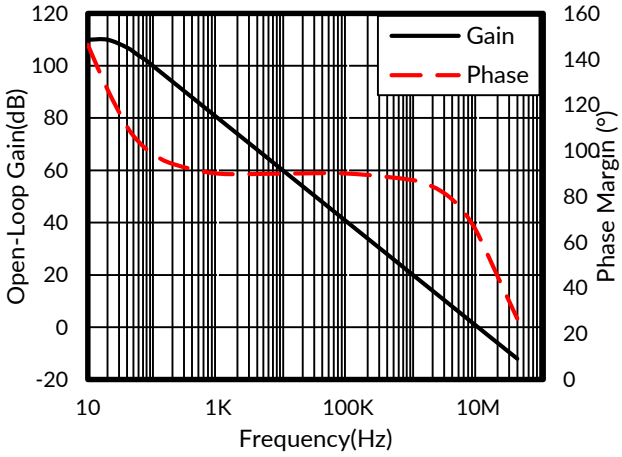


Figure 1. Open−Loop Gain And Phase vs Frequency

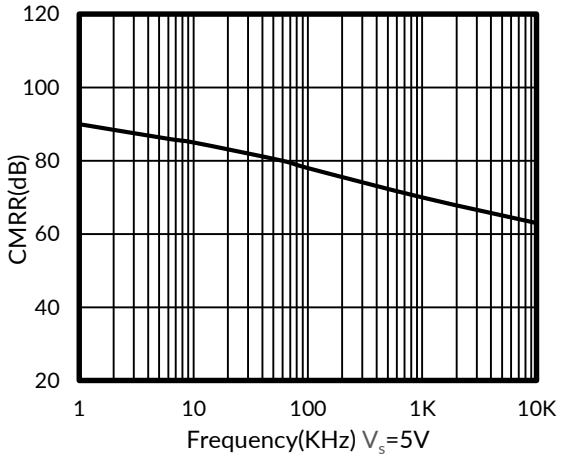


Figure 2. Common−Mode Rejection Ratio vs Frequency

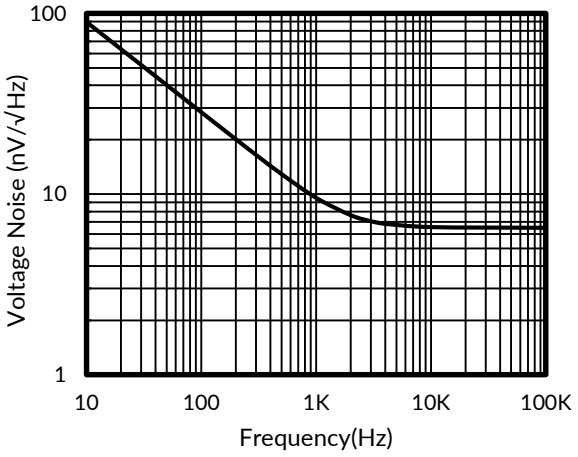


Figure 3. Input Voltage Noise Spectral Density vs Frequency

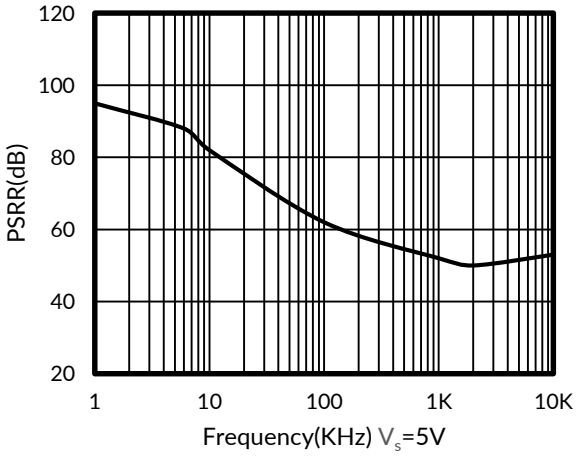


Figure 4. Power−Supply Rejection Ratio vs Frequency

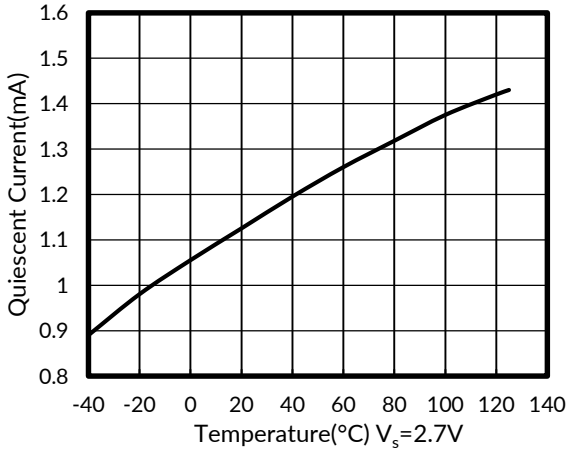


Figure 5. Quiescent Current Vs Temperature

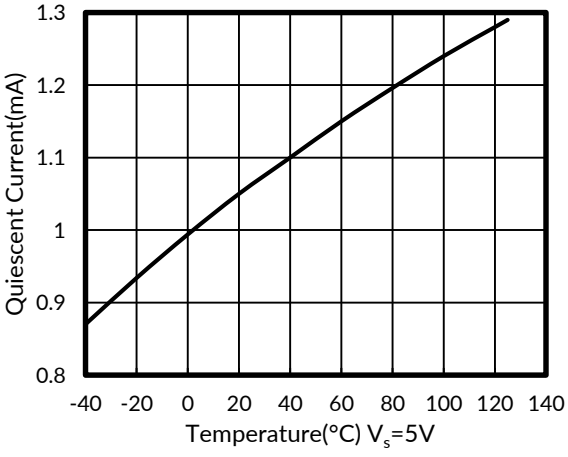


Figure 6. Quiescent Current Vs Temperature

Typical Characteristics

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, V_{OUT} = $V_S/2$, unless otherwise noted.

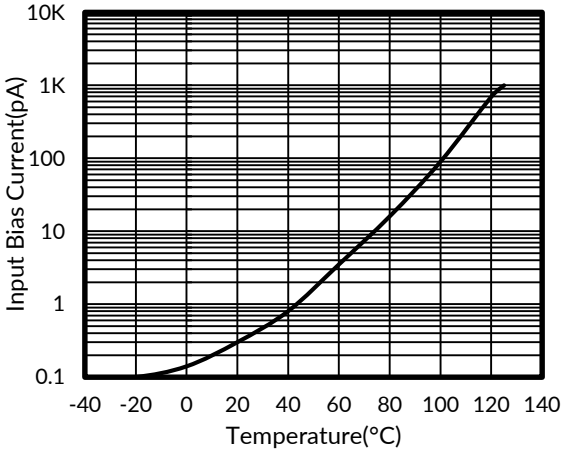


Figure 7. Input Bias Current vs Temperature

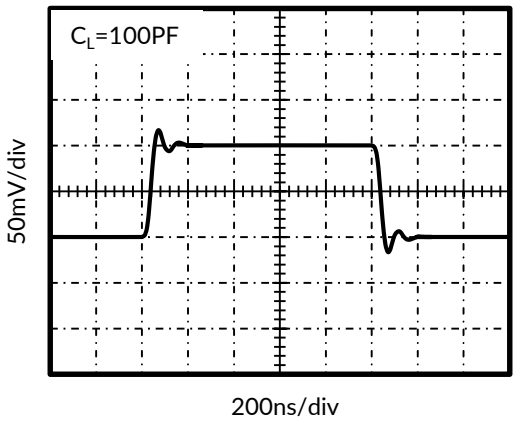


Figure 8. Small−Signal Step Response

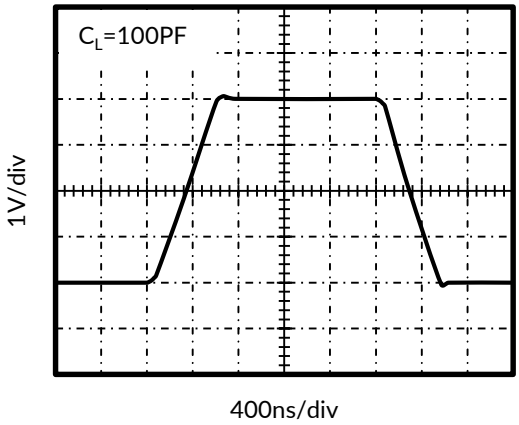


Figure 9. Large−Signal Step Response

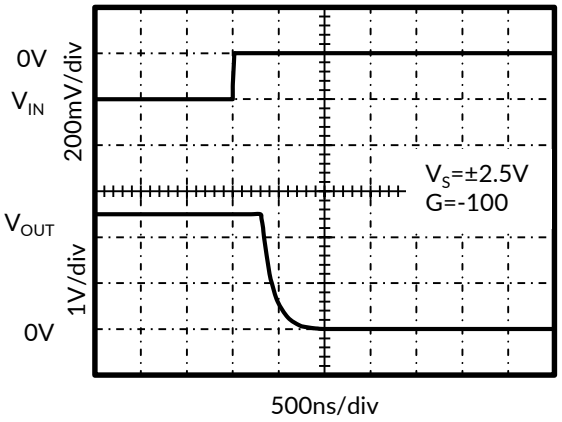


Figure 10. Positive Overload Recovery

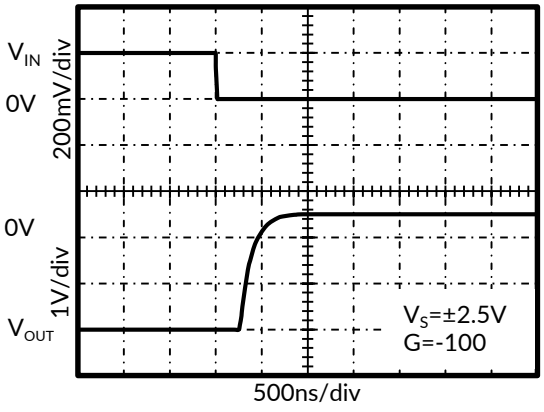
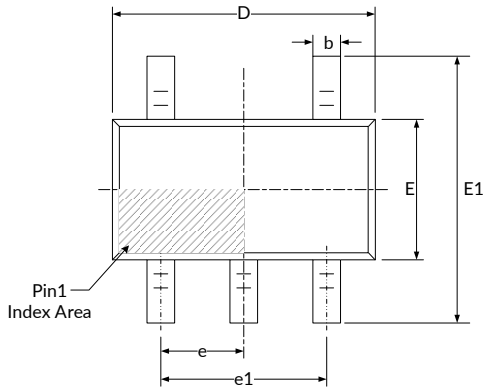
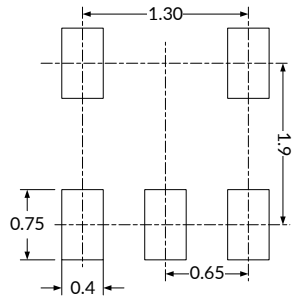


Figure 11. Negative Overload Recovery

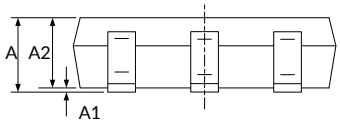
8 PACKAGE OUTLINE DIMENSIONS

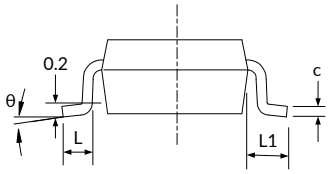
SC70-5 (3)





RECOMMENDED LAND PATTERN (Unit: mm)





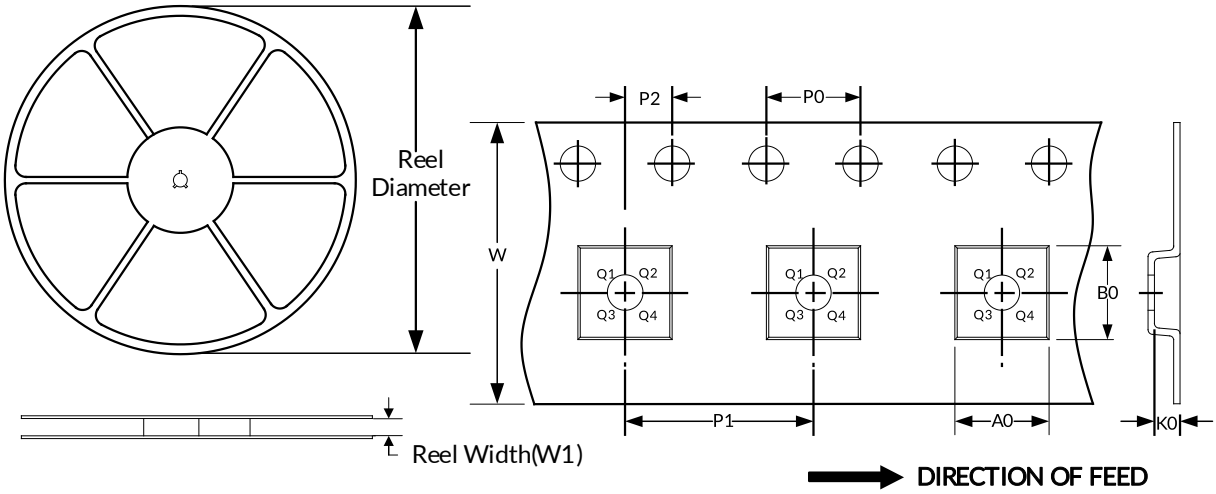
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A (1)	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D (1)	2.000	2.200	0.079	0.087
E (1)	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC) (2)		0.026(BSC) (2)	
e1	1.300(BSC) (2)		0.051(BSC) (2)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

NOTE:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

9 TAPE AND REEL INFORMATION

REEL DIMENSIONS **TAPE DIMENSION**



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SC70-5	7”	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3

NOTE:
1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

IMPORTANT NOTICE AND DISCLAIMER

Jiangsu RUNIC Technology Co., Ltd. will accurately and reliably provide technical and reliability data (including data sheets), design resources (including reference designs), application or other design advice, WEB tools, safety information and other resources, without warranty of any defect, and will not make any express or implied warranty, including but not limited to the warranty of merchantability Implied warranty that it is suitable for a specific purpose or does not infringe the intellectual property rights of any third party.

These resources are intended for skilled developers designing with RUNIC products You will be solely responsible for: (1) Selecting the appropriate products for your application; (2) Designing, validating and testing your application; (3) Ensuring your application meets applicable standards and any other safety, security or other requirements; (4) RUNIC and the RUNIC logo are registered trademarks of RUNIC INCORPORATED. All trademarks are the property of their respective owners; (5) For change details, review the revision history included in any revised document. The resources are subject to change without notice. Our company will not be liable for the use of this product and the infringement of patents or third-party intellectual property rights due to its use.