DESCRIPTION

The A4722 is a quad, low on-resistance, low voltage, bidirectional, single-pole/double-throw (SPDT) CMOS analog switch that is designed to operate from a single +1.8V to +4.2V power supply. Targeted applications include battery powered equipment that benefit from low R_{ON} (0.5Ω) and fast switching speeds (t_{ON} = 52 ns, t_{OFF} = 25 ns).

The A4722 consists of four SPDT switches. It is configured as a dual double-pole/double-throw (DPDT) device with two logic control inputs that control two SPDT switches each. The configuration can be used as a dual differential 2-to-1 multiplexer/demultiplexer.

The A4722 is available in QFN16 package.

ORDERING INFORMATION

Package Type	Part Number	
QFN16 SPQ: 3,000pcs/Reel	Q16	A4722Q16R
		A4722Q16VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

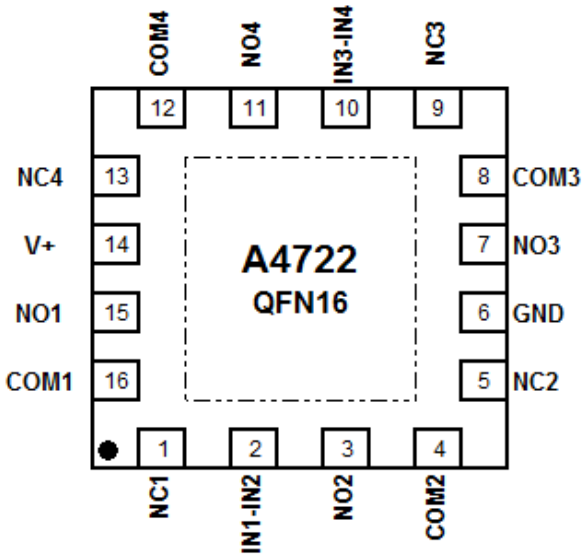
FEATURES

- Low Voltage Operation: 1. 8V to 4. 2V
- Low On-Resistance: 0. 5Ω(TYP)
- Low On-Resistance Flatness
- –3dB Bandwidth: 70MHz
- Fast Switching Time(4.2V)
  t_{ON} 52ns
  t_{OFF} 25ns
- Rail-to-Rail Operation
- Typical Power Consumption (<0.01 μW)
- TTL/CMOS Compatible
- Available in QFN16 Package

APPLICATION

- Communication Systems
- Cell Phones
- Portable Instrumentation
- Audio Signal Routing
- Audio and Video Switching
- PCMCIA Cards
- Computer Peripherals
- Modems
- PDAs

PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1, 5, 9, 13	NCx	Normally-closed terminal
2, 10	INx	Digital control pin to connect the COM terminal to the NO or NC terminals
3, 7, 11, 15	NOx	Normally-open terminal
4, 8, 12, 16	COMx	Common terminal
6	GND	Ground
14	V+	Power supply

NOTE: NOx, NCx and COMx terminal may be an input or output.

ABSOLUTE MAXIMUM RATINGS

V+ to GND	0V ~ +4.6V
Analog, Digital voltage range[NOTE1]	- 0.3V ~ V+ + 0.3V
Continuous Current NO, NC, or COM	±200mA
Peak Current NO, NC, or COM	±350mA
Operating Temperature Range	-40℃ ~ 85℃
Junction Temperature	150°C
Storage Temperature	-65℃ ~ +150℃
Lead Temperature (soldering, 10s)	260°C
ESD Susceptibility	
HBM	4000V
MM	400V

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE1: Signals on NC, NO, or COM or INx exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

ELECTRICAL CHARACTERISTICS

V+ = +4.2V, GND = 0V, V_{IH} = +1.6 V, V_{IL} = +0.6V, T_A = - 40°C to +85°C. Typical values are at V+ = +4.2V, T_A = + 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	TEMP	Min.	Typ.	Max.	Unit
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		- 40°C to +85°C	0	-	V+	V
On-Resistance	R_{ON}	V+ = 4.2V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.5	0.75	Ω
			- 40°C to +85°C	-	-	0.85	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V+ = 4.2V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.05	0.15	Ω
			- 40°C to +85°C	-	0.1	0.2	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V+ = 4.2V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.1	0.22	Ω
			- 40°C to +85°C	-	-	0.26	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V+ = 4.2V, V_{NO} or V_{NC} = 3.3V/ 0.3V, V_{COM} = 0.3V/ 3.3V	- 40°C to +85°C	-	-	1	µA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V+ = 4.2V, V_{COM} = 0.3V/ 3.3V, V_{NO} or V_{NC} = 0.3V/ 3.3V, or floating	- 40°C to +85°C	-	-	1	µA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		- 40°C to +85°C	1.6	-	-	V
Input Low Voltage	V_{INL}		- 40°C to +85°C	-	-	0.5	V
Input Leakage Current	I_{IN}	V+ = 4.2V, V_{IN} = 0 or 4.2V	- 40°C to +85°C	-	-	1	µA

Parameter	Symbol	Conditions		TEMP	Min.	Typ.	Max.	Unit
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V+ = 4.2V, V_{COM} = 2.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2		+25°C	-	52	-	ns
Turn-Off Time	t_{OFF}			+25°C	-	25	-	ns
Charge Injection,	Q	C_L = 1.0nF, V_G = 0V, R_G = 0Ω Test Circuit 3		+25°C	-	30	-	pC
Break-Before-Make Time Delay	t_D	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Test Circuit 4		+25°C	-	8	-	ns
Off Isolation	O_{ISO}	Signal = 0dBm, V_{NO} or V_{NC} centered between V+ and GND , R_L = 50Ω, Test Circuit 5	f = 100kHz	+25°C	-	-75	-	dB
			f = 1MHz	+25°C	-	-55	-	dB
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, Test Circuit 6	f = 1MHz	+25°C	-	-103	-	dB
			f = 10MHz	+25°C	-	-65	-	dB
Bandwidth –3 dB	BW	Signal = 0dBm, Test Circuit 7		+25°C	-	70	-	MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz		+25°C	-	80	-	pF
POWER REQUIREMENTS								
Power Supply Range	V+		- 40°C to +85°C		1.8	-	4.2	V
Power Supply Current	I+	V+ = 4.2V, V_{IN} = 0V or V+	- 40°C to +85°C		-	-	1	μA

ELECTRICAL CHARACTERISTICS

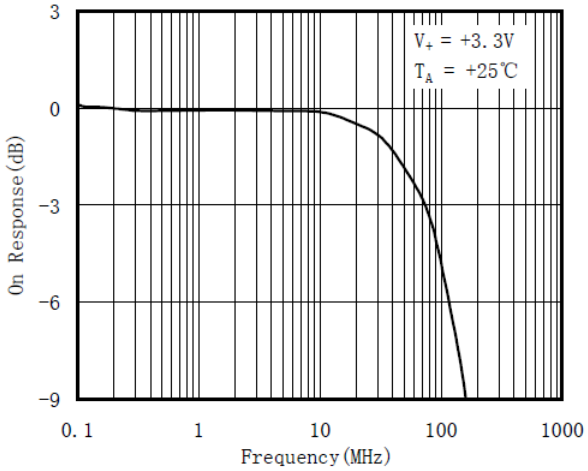
V+ = +2.7 to +3.6V, GND = 0V, V_{IH} = +1.6 V, V_{IL} = +0.4V, T_A = - 40°C to +85°C. Typical values are at V+ = +3.0V, T_A = + 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	TEMP	Min.	Typ.	Max.	Unit
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		- 40°C to +85°C	0	-	V+	V
On-Resistance	R_{ON}	V+ = 2.7V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.6	0.9	Ω
			- 40°C to +85°C	-	-	1	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V+ = 2.7V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.15	0.2	Ω
			- 40°C to +85°C	-	0.15	0.24	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V+ = 2.7V, V_{NO} or V_{NC} = 1V, I_{COM} = -100mA, Test Circuit 1	+25°C	-	0.05	0.15	Ω
			- 40°C to +85°C	-	0.1	0.2	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V+ = 3.6V, V_{NO} or V_{NC} = 3.3V/ 0.3V, V_{COM} = 0.3V/ 3.3V	- 40°C to +85°C	-	-	1	µA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V+ = 3.6V, V_{COM} = 0.3V/ 3.3V, V_{NO} or V_{NC} = 0.3V/ 3.3V, or floating	- 40°C to +85°C	-	-	1	µA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		- 40°C to +85°C	1.5	-	-	V
Input Low Voltage	V_{INL}		- 40°C to +85°C	-	-	0.4	V
Input Leakage Current	I_{IN}	V+ = 2.7V, V_{IN} = 0 or 2.7V	- 40°C to +85°C	-	-	1	µA

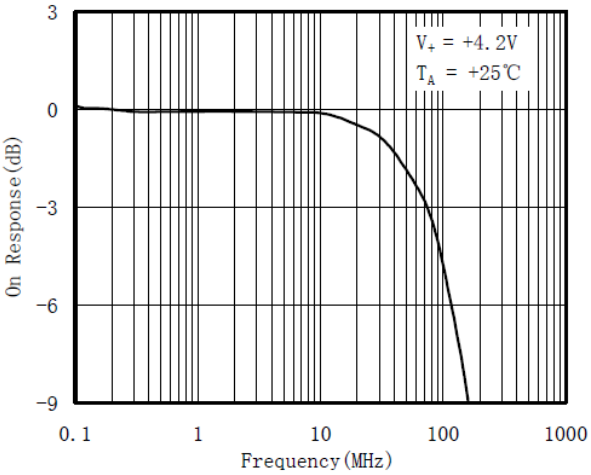
Parameter	Symbol	Conditions		TEMP	Min.	Typ.	Max.	Unit
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V+ = 3.3V, V_{COM} = 2.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2		+25°C	-	54	-	ns
Turn-Off Time	t_{OFF}			+25°C	-	38	-	ns
Charge Injection	Q	C_L = 1.0nF, V_G = 0V, R_G = 0Ω Test Circuit 3		+25°C	-	26	-	pC
Break-Before-Make Time Delay	t_D	V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, Test Circuit 4		+25°C	-	12	-	ns
Off Isolation	O_{ISO}	Signal = 0dBm, V_{NO} or V_{NC} centered between V+ and GND , R_L = 50Ω, Test Circuit 5	f = 100kHz	+25°C	-	-75	-	dB
			f = 1MHz	+25°C	-	-55	-	dB
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, Test Circuit 6	f = 1MHz	+25°C	-	-103	-	dB
			f = 10MHz	+25°C	-	-65	-	dB
Bandwidth –3 dB	BW	Signal = 0dBm, Test Circuit 7		+25°C	-	70	-	MHz
Channel ON Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	f = 1MHz		+25°C	-	80	-	pF

TYPICAL PERFORMANCE CHARACTERISTICS

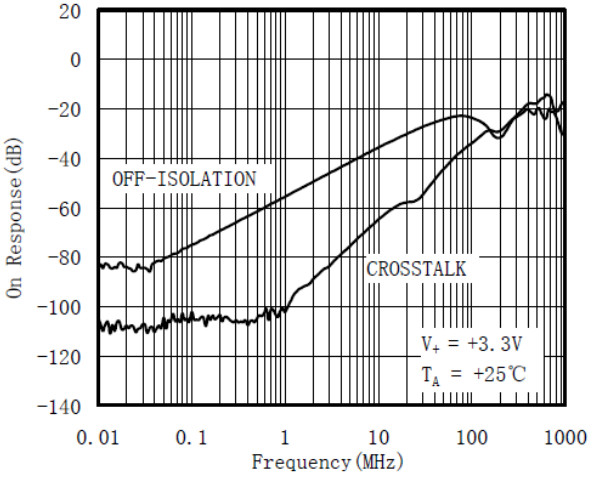
1. On Response vs. Frequency



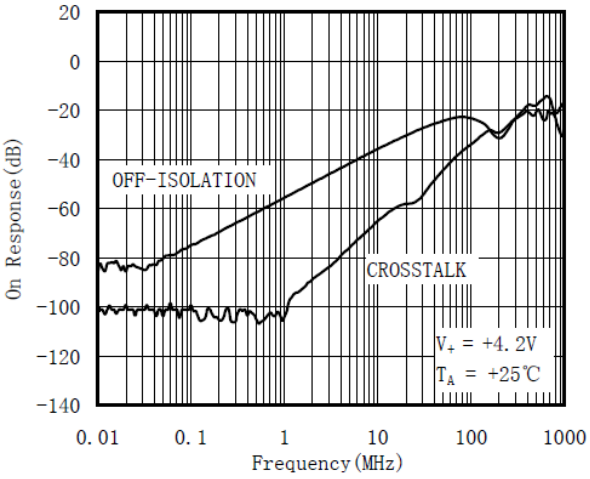
2. On Response vs. Frequency



3. Response vs. Frequency

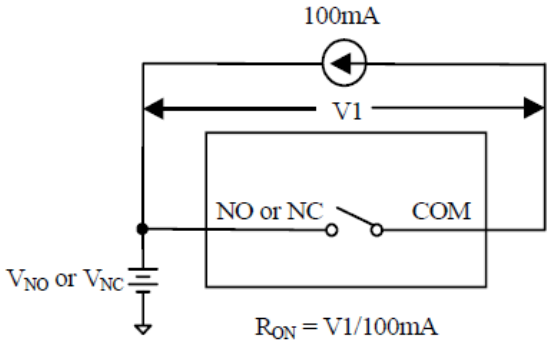


4. Response vs. Frequency

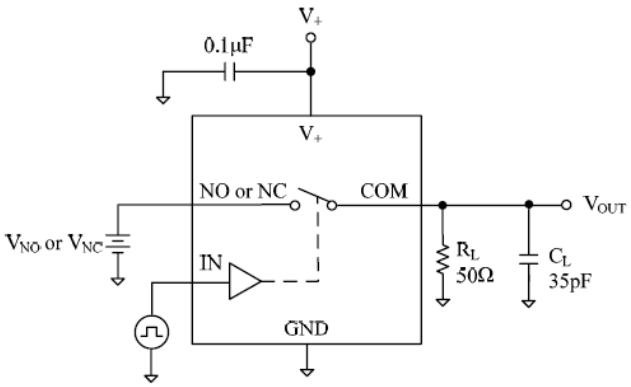


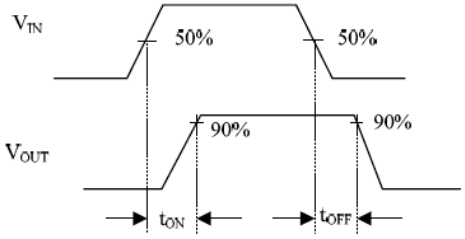
TEST CIRCUITS

1. On Resistance

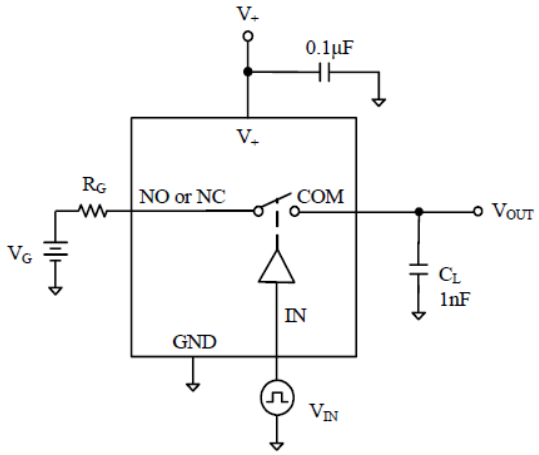


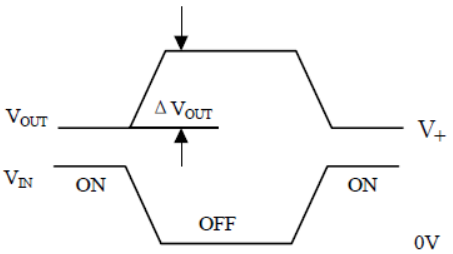
2. Switching Times



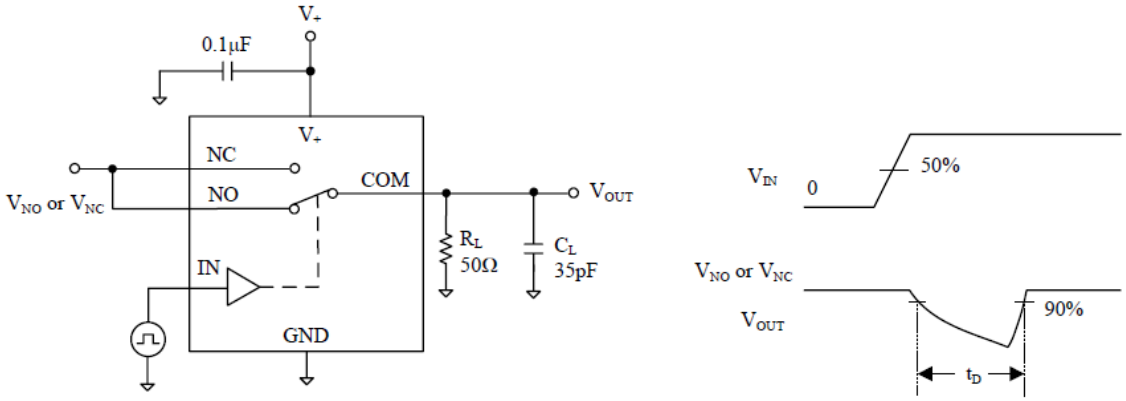


3. Charge Injection

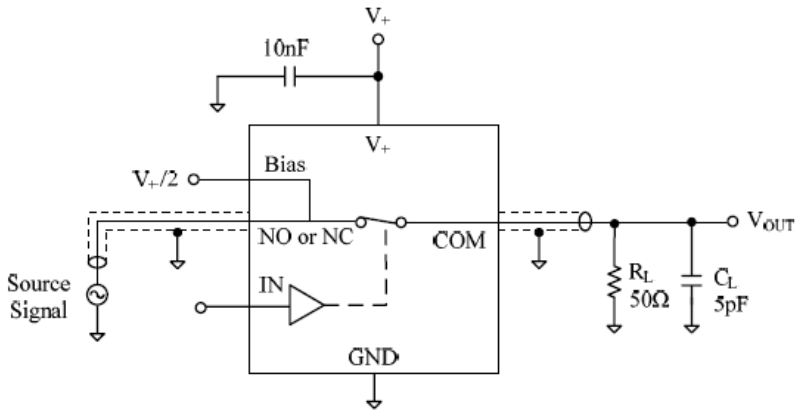




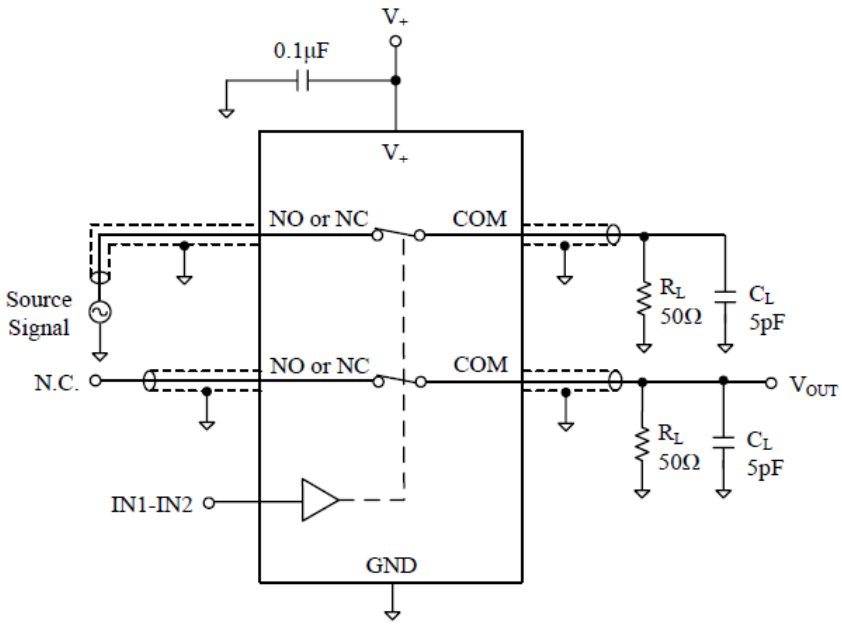
4. Break-Before-Make Time Delay, t_D



5. Off Isolation

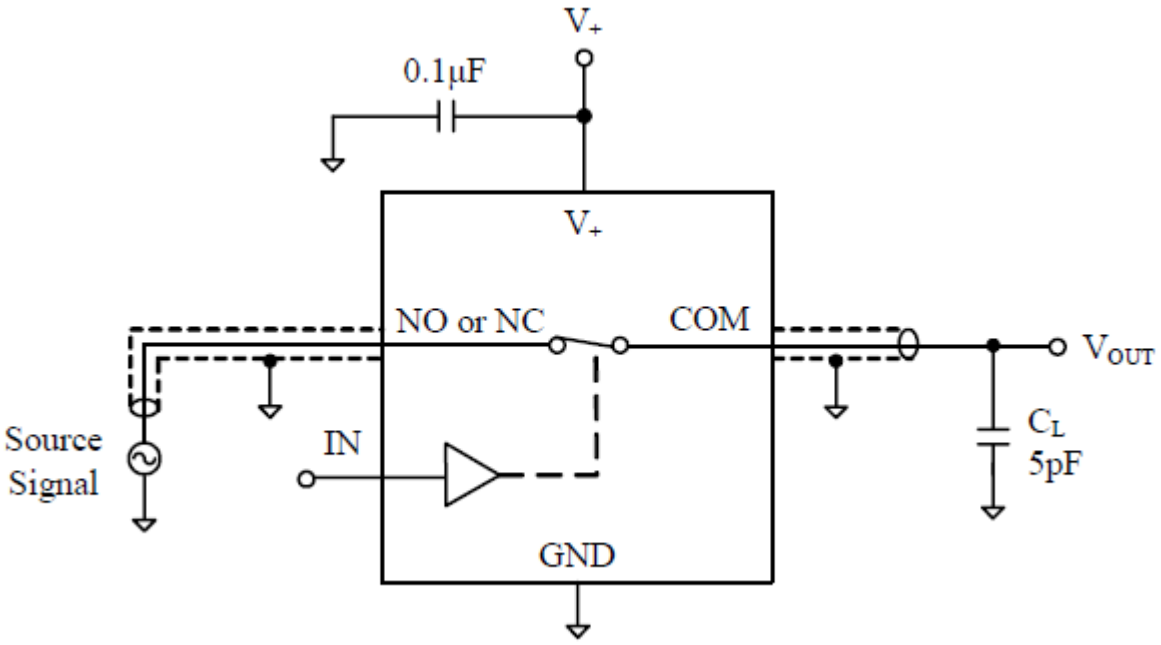


6. Channel-to-Channel Crosstalk

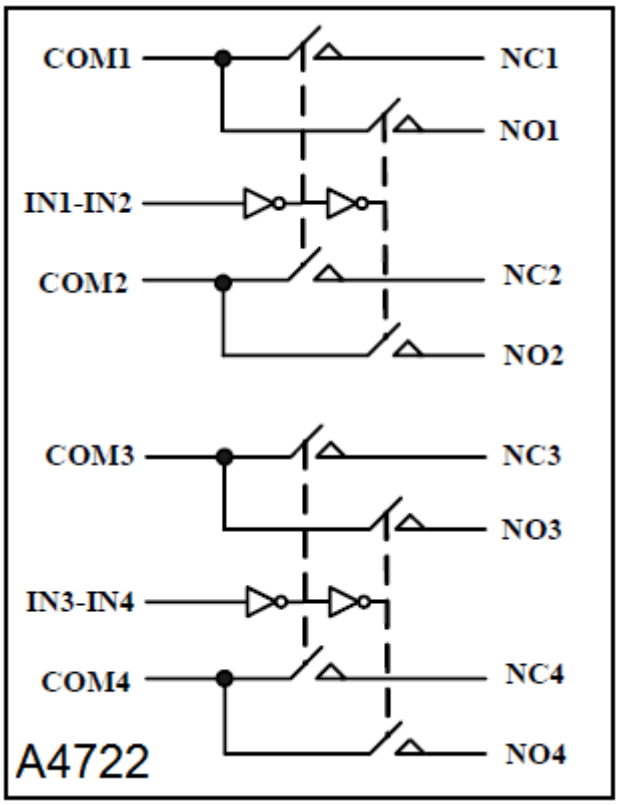


$$\text{Channel To Channel Crosstalk} = -20 \times \log \frac{V_{NO} \text{ or } V_{NC}}{V_{OUT}}$$

7. Bandwidth

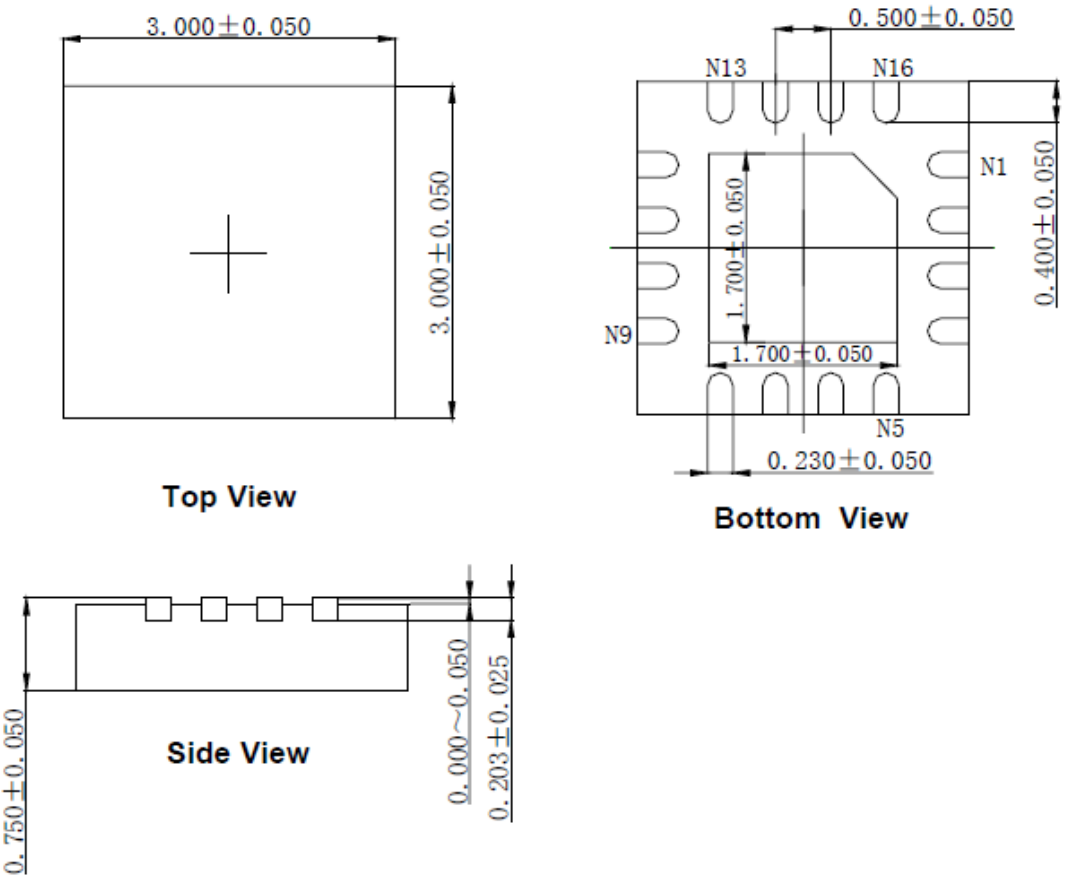


BLOCK DIAGRAM



PACKAGE INFORMATION

Dimension in QFN16 (Unit: mm)



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