0.5Ω Low Voltage Quad SPDT Analog Switch

■ General Description

The LN3699 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 RON (0.5Ω) and fast switching speeds (t_{ON} = 52ns, t_{OFF} = 25ns).

The LN3699 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.

LN3699 is available in a QFN3×3-16 package.

■ Features

- Voltage range: 1.8V ~ 4.2V
- Low resistance: 0.5Ω (TYP)
- Fast switching time (4.2V): t_{ON} = 50ns, t_{OFF} = 25ns
- -3dB bandwidth: 70MHz
- Low power consumption: <0.01μW
- Rail to rail scope of work
- TTL / CMOS compatible
- Small size package: QFN3 × 3-16L

■ Applications

- Battery-powered, hand-held and portable devices
- Mobile / cell phones
- Laptop notebook, handheld PDA
- Communication system, the user switch
- Medical equipment, ultrasound, ECG
- Test equipment, portable instrumentation, digital multimeter
- Audio and video transmission, conversion
- Sample and hold circuit
- Digital filter
- High-speed multiplexer
- Integral reset circuit

■ Package

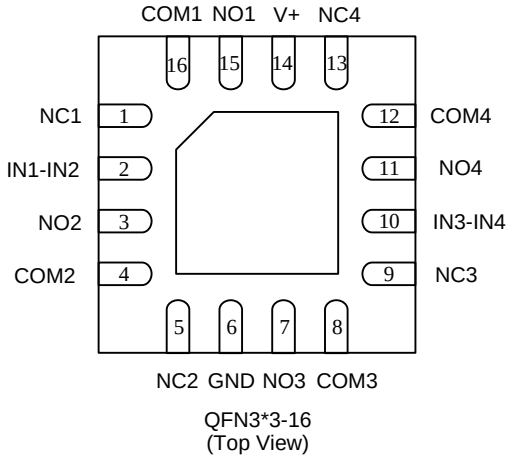
- QFNWB3×3-16L

■ Ordering Information

LN3699 ①②

Designator	Symbol	Description
①	Q	QFN3×3-16
	X	Others
②	R	Embossed Tape :Standard Feed
	L	Embossed Tape :Reverse Feed

■ Pin Configuration



QFN3*3-16
(Top View)

■ Pin Assignment

Pin Name	Pin Number	Function Description
V+	14	Power Supply
GND	6	Ground
IN1-IN2,IN3-IN4	2,10	Digital control pin to connect the COM terminal to the NO or NC terminals
COM1,COM2 COM3,COM4	16,4,8,12	Common terminal
NO1,NO2,NO3,NO4	15,3,7,11	Normally-open terminal
NC1,NC2,NC3,NC4	1,5,9,13	Normally-closed terminal

■ Absolute Maximum Ratings

V+ to GND ····· -0.3V to 5V
Analog, digital voltage range ·····-0.3V to V_+ +0.3V
Continuous current NO,NC,COM····· ±200mA
Peak current NO,NC,or COM ····· ±350mA
Operating temperature Range ····· -40℃～85℃
Junction temperature ·····150℃
Storage temperature·····-65℃～150℃
Lead temperature（soldering，10s） ·····+260℃
ESD(HBM)····· 4000V

■ Electrical Characteristics

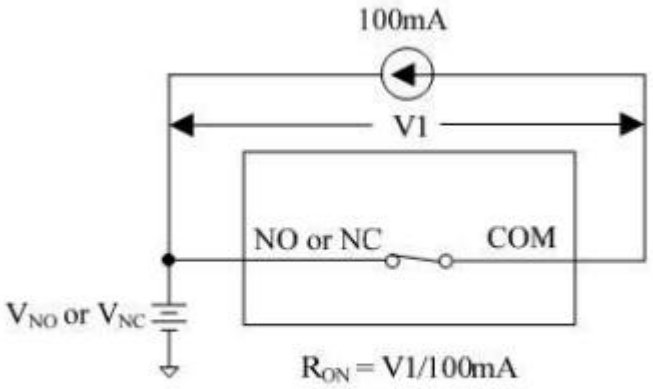
(V+ = +4.2 V ± 10%, GND = 0 V, TA = - 40°C to 85°C, unless otherwise noted. Typical values are at TA = + 25°C.)

Parameter	Symbol	Conditions	+25℃	-40℃～+125℃	Max/Min	Unit
Analog signal range	V_{COM} V_{NC}, V_{NO}			0	MIN	V
				V+	MAX	V
On-resistance	R_{ON}	V_{NO} or V_{NC}=1V,V+=4.2V I_{COM}=-10mA,TEST Circuit 1	0.5		TYP	Ω
			0.75	0.85	MAX	Ω
On-resistance match between channels	ΔR_{ON}	V_{NO} or V_{NC}=1V,V+=4.2V I_{COM}=-10mA,TEST Circuit 1	0.05	0.1	TYP	Ω
			0.15	0.2	MAX	Ω
On-resistance flatness	$R_{FLAT(ON)}$	V_{NO} or V_{NC}=1V,V+=4.2V I_{COM}=-10mA,TEST Circuit 1	0.1		TYP	Ω
			0.22	0.26	MAX	Ω
Source OFF leakage current	$I_{NC(OFF)}$ $I_{NO(OFF)}$	V_{NO} or V_{NC}=3.3V/0.3V，V+=4.2V，V_{COM}=0.3V/3.3V	±4		TYP	nA
			±10	±1000	MAX	nA
Channel ON leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{NO} or V_{NC}=V_{COM}=0.3V/3.3V V+=4.2V	±4		TYP	nA
			±10	±1000	MAX	nA
Input high voltage	V_{INH}			1.6	MIN	V
Input low voltage	V_{INL}			0.5	MAX	V
Input current	I_{INH} or I_{INL}	V_{IN}=V_{INH} or V_{INL}	±0.01		TYP	μA
			±1000	±1000	MAX	μA
Turn-on time	t_{ON}	V_{NO} or V_{NC}=2V，R_L=50Ω，C_L=35pF，Test Circuit 2	50		TYP	ns
Turn-off time	t_{OFF}	V_{NO} or V_{NC}=2V，R_L=50Ω，C_L=35pF，Test Circuit 2	25		TYP	ns
Bandwidth-3dB	BW	R_L=50Ω，C_L=5pF，Test Circuit 5	70		TYP	MHz
Channel on capacitance	$C_{NC(ON)}$ $C_{NO(ON)}$ $C_{COM(ON)}$	f=1MHz	80		TYP	pF
Power supply current	I_+	V+ =4.2V,V_{IN}=0V or V+	0.001		TYP	μA
			0.1	1	MAX	μA

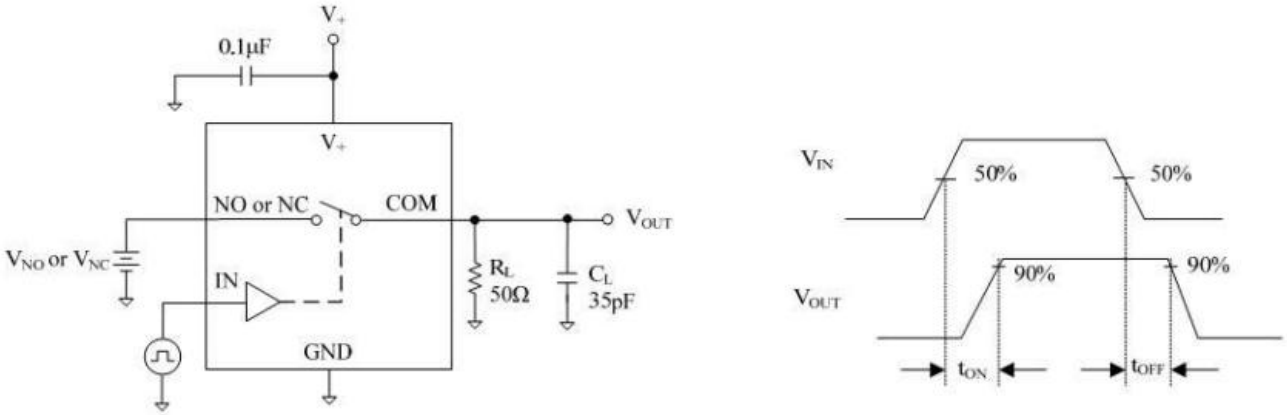
(V+ =2.7V~3.6V, GND = 0 V, TA = - 40°C to +85°C, unless otherwise noted. Typical values are at TA = + 25°C,V+=3V)

Parameter	Symbol	Conditions	+25℃	-40℃～+125℃	Max/Min	Unit
Analog signal range	V_{COM} V_{NC}, V_{NO}			0	MIN	V
				V+	MAX	V
On-resistance	R_{ON}	V_{NO} or V_N=1V,V+=2.7V I_{COM}=-100mA,TEST Circuit 1	0.6		TYP	Ω
			0.9	1.0	MAX	Ω
On-resistance match between channels	ΔR_{ON}	V_{NO} or V_N=1V,V+=2.7V I_{COM}=-100mA,TEST Circuit 1	0.15	0.15	TYP	Ω
			0.2	0.24	MAX	Ω
On-resistance flatness	$R_{FLAT(ON)}$	V_{NO} or V_N=1V/2.5V,V+=2.7V I_{COM}=-100mA,TEST Circuit 1	0.05	0.1	TYP	Ω
			0.15	0.2	MAX	Ω
Source OFF leakage current	$I_{NC(OFF)}$ $I_{NO(OFF)}$	V_{NO} or V_{NC}=3.3V/0.3V，V+=3.6V，V_{COM}=0.3V/3.3V	±5		TYP	nA
				±1000	MAX	nA
Channel ON leakage current	$I_{NC(ON)}$ $I_{NO(ON)}$ $I_{COM(ON)}$	V_{NO} or V_{NC}=0.3V/3.3V，V+=3.6V，V_{COM}=0.3V/3.3V	±5		TYP	nA
				±1000	MAX	nA
Input high voltage	V_{INH}			1.6	MIN	V
Input low voltage	V_{INL}			0.4	MAX	V
Input current	I_{INH} or I_{INL}	V+=2.7V,V_{IN}=2.7V or 0V	±0.01		TYP	μA
				±1	MAX	μA
Turn-on time	t_{ON}	V_{NO} or V_{NC}=2V，R_L=50Ω，C_L=35pF，Test Circuit 2	55		TYP	ns
Turn-off time	t_{OFF}	V_{NO} or V_{NC}=2V，R_L=50Ω，C_L=35pF，Test Circuit 2	35		TYP	ns
Bandwidth-3dB	BW	C_L=5pF，Test Circuit 3	70		TYP	MHz
Channel on capacitance	$C_{NC(ON)}$ $C_{NO(ON)}$ $C_{COM(ON)}$		80		TYP	pF
Power supply current	I_+	V+ =3.3V,V_{IN}=0V or V+	0.001		TYP	μA
				1	MAX	μA

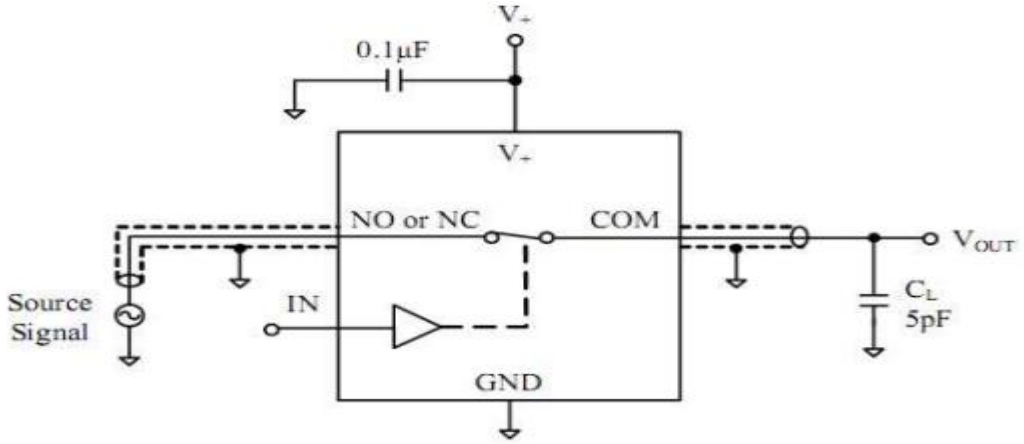
■ Test Circuits



Test Circuit 1. On Resistance



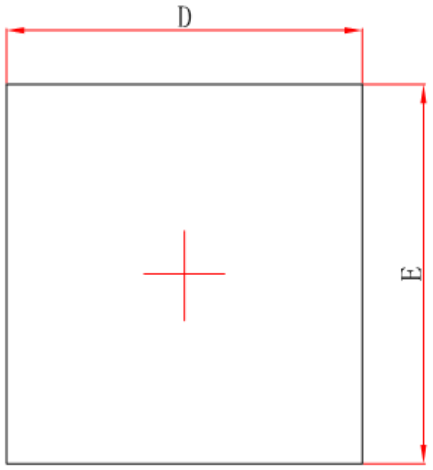
Test Circuit 2. Switching Times



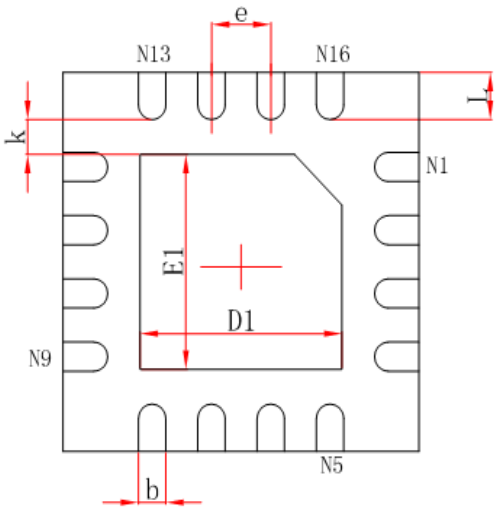
Test Circuit 3. -3dB Bandwidth

■ Package Information

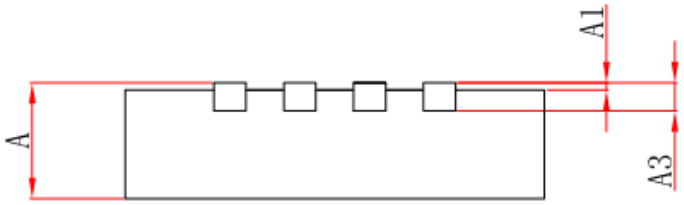
- **DFN3×3-16L**



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E1	1.600	1.800	0.063	0.071
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.300	0.500	0.012	0.020