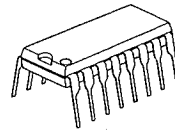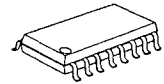# C-MOS QUAD SPST ANALOG SWITCH

■ GENERAL DESCRIPTION

The NJU7301 is a quad break-before-make SPST analog switch protected up to 44V operating voltage.

Each switch is controlled by TTL or C-MOS compatible input.
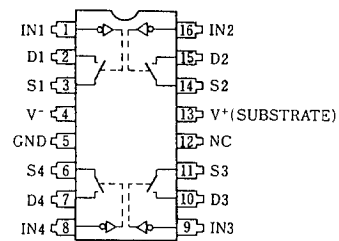
■ PACKAGE OUTLINE

NJU7301D   NJU7301M

■ FEATURES
● High Break Down Voltage -- 44V
● Package Outline   -- DIP/DMP 16
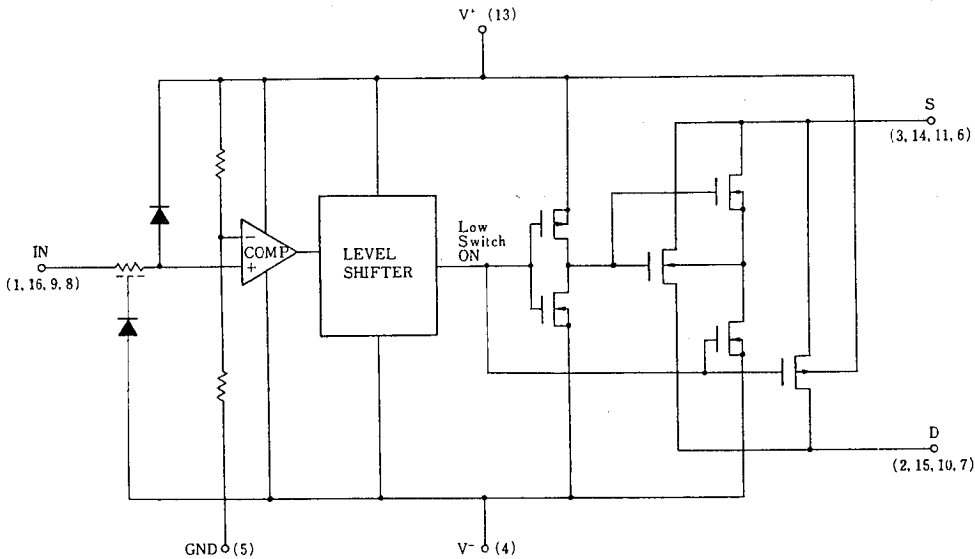● C-MOS Technology

■ PIN CONFIGURATION

IN1 [1		16] IN2
D1 [2		15] D2
S1 [3		14] S2
V⁻ [4		13] V⁺(SUBSTRATE)
GND [5		12] NC
S4 [6		11] S3
D4 [7		10] D3
IN4 [8		9] IN3

■ TRUTH TABLE

Logic (In)	Switch
0	ON
1	OFF

■ EQUIVALENT CIRCUIT

V⁺ (13)

S (3, 14, 11, 6)

IN (1, 16, 9, 8)

COMP

LEVEL SHIFTER

Low Switch ON

D (2, 15, 10, 7)

GND (5)   V⁻ (4)

* Logic input threshold voltage V_{TH} is about $V^+ \times 0.128(V)$.
When the designing, enough margin is required.

■ TERMINAL DESCRIPTION

No.	SYMBOL	F U N C T I O N	No.	SYMBOL	F U N C T I O N
1	IN1	Control Signal Input	9	IN3	Control Signal Input
2	D1	Input/Output 1	10	D3	Input/Output 3
3	S1		11	S3	
4	V⁻	Negative (V⁻) Power Supply	12	NC	Non Connection
5	GND	Ground	13	V⁺	Positive (V⁺) Power Supply
6	S4	Input/Output 4	14	S2	Input/Output 2
7	D4		15	D2	
8	IN4	Control Signal Input	16	IN2	Control Signal Input

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

P A R A M E T E R	SYMBOL	R A T I N G S	UNIT
Supply Voltage	$V^+ - V^-$	44	V
	$V^+ - GND$	19	
	$GND - V^-$	25	
Input Voltage	V_I, V_S, V_D	$V^- - 0.5 \sim V^+ + 0.5$ ∗	V
Input Current	I_I	30	mA
	I_S, I_D Continuous	20	
	Peak Value (PW=1ms, Duty0.1)	70	
Power Dissipation	P_D	500 (DIP) 200 (DMP)	mW
Operating Temperature Range	Topr	$0 \sim +70$	℃
Storage Temperature Range	Tstg	$-65 \sim +125$	℃

∗ V⁺+0.5V must be 44V or less.

■ ELECTRICAL CHARACTERISTICS (DC CHARACTERISTICS)

(V⁺=15V , V⁻=−15V , GND=0V)

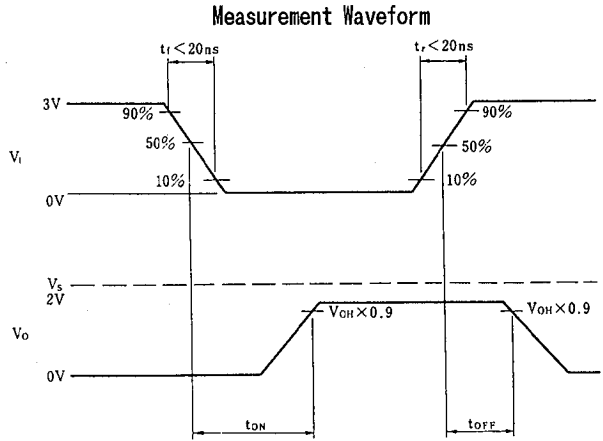| PARAMETER	SYMBOL	CONDITIONS		TYP 25℃	MAX 0℃	MAX 25℃	MAX 70℃	UNIT
Analog Signal Range	V_{ANALOG}			±15		±15	±15	V
On-state Resistance	R_{ON}	V_{IN}=0.8V I_S=−1mA	V_D=10V	105	200	200	250	Ω
			V_D=−10V	115	200	200	250	
Source-off Leakage Current	I_S(off)	V_I=2.4V	V_S=14V, V_D=−14V	0.01		5	100	nA
			V_S=−14V, V_D=14V	−0.02		− 5	−100	
Drain-off Leakage Current	I_D(off)	V_I=2.4V	V_D=14V, V_S=−14V	0.01		5	100	nA
			V_D=−14V, V_S=14V	−0.02		− 5	−100	
Drain-on Leakage Current	I_D(on)	V_I=0.8V	V_D=V_S=14V	0.1		5	200	nA
			V_D=V_S=−14V	−0.15		− 5	−200	
Input Current	I_{IH}	V_I=2.4V		−0.0004		− 1	− 10	μA
		V_I=15V		0.003		1	10	
	I_{IL}	V_I=0V		−0.0004		− 1	− 10	
Quiescent Current	I^+	V_I=0 or 2.4V		0.9		2		mA
	I^-			−0.3		−1		

■ SWITCHING CHARACTERISTICS

(V⁺=15V , V⁻=−15V , GND=0V)

PARAMETER	SYMBOL	CONDITIONS		TYP 25℃	MAX 0℃	MAX 25℃	MAX 70℃	UNIT
Turn-on Time	t_{on}	R_L=1kΩ, C_L=35pF		480		600		ns
Turn-off Time	t_{off}			370		450		
Charge Injection	Q	C_L=1000pF, V_{GEN}=0V, R_{GEN}=0Ω		20				pC
Source-Off Capacit.	C_S(off)		V_S=0V, V_I=5V	5				pF
Drain-Off Capacit.	C_D(off)		V_D=0V, V_I=5V	5				
Channel-On Capacitance	C_D(on) +C_S(on)	f=100kHz	V_D=V_S=0V, V_I=0V	16				
Off Isolation	OIRR		V_S=2V_{P-P}, R_L=75Ω	70				dB
Channel-to-channel Crosstalk	CCRR			90				

■ MEASUREMENT CIRCUITS

(1) Turn-on/Turn-off Time
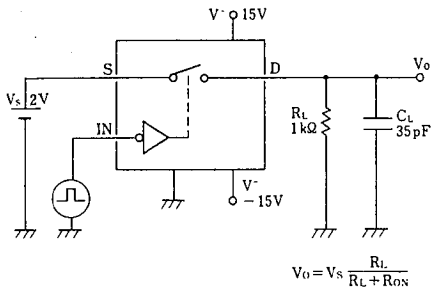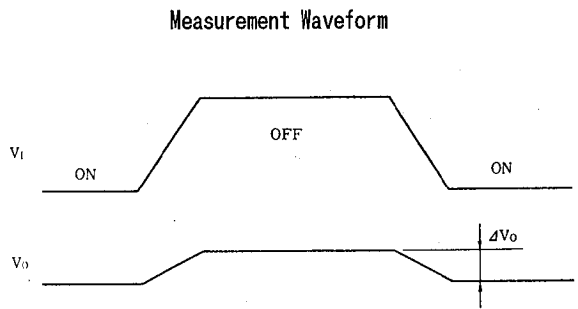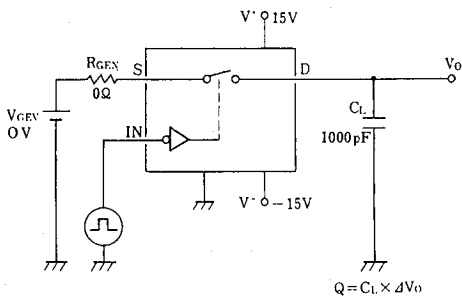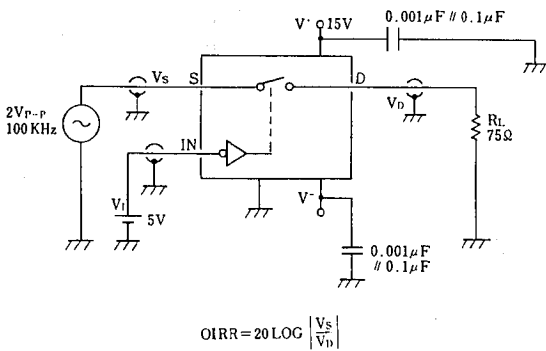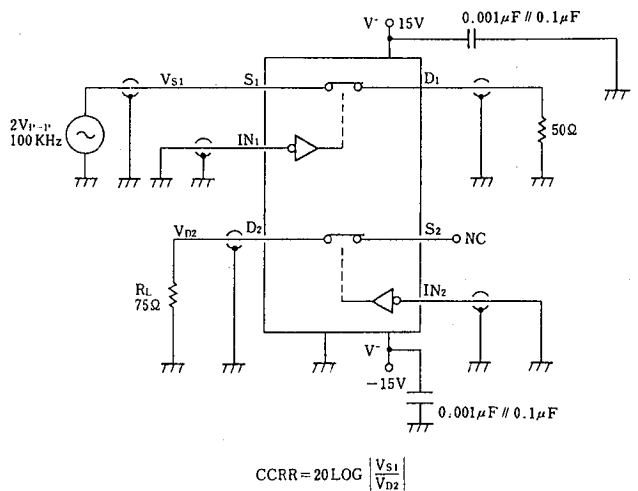
Measurement Waveform

$$V_0 = V_S \frac{R_L}{R_L + R_{ON}}$$

(2) Charge Injection

Measurement Waveform

$$Q = C_L \times \Delta V_0$$

(3) Off Isolation

$$OIRR = 20 \, LOG \left| \frac{V_S}{V_D} \right|$$

(4) Channel-To-Channel Crosstalk

$$CCRR = 20 \, LOG \left| \frac{V_{S1}}{V_{D2}} \right|$$

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