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## NTE861 Integrated Circuit Quad, Normally Open, SPST JFET Analog Switch <sup>w</sup>/Disable

**Description:**

The NTE861 is a monolithic combination of bipolar and JFET technology producing a one chip quad JFET switch. A unique circuit technique is employed to maintain a constant resistance over the analog voltage range of  $\pm 10V$ . The input is designed to operate from minimum TTL levels, and switch operation also ensures a break-before-make action.

**Features:**

- Analog signals are not loaded
- Constant "ON" resistance for signals up to  $\pm 10V$  and 100kHz
- Pin compatible with CMOS switches with the advantage of blow out free handling
- Small signal analog signals to 50MHz
- Break-before-make action
- High open switch isolation at 1.0MHz
- Low leakage in "OFF" state
- TTL, DTL, RTL compatibility
- Single disable pin opens all switches in package

This device operates from a  $\pm 15V$  supply and swings a  $\pm 10V$  analog signal. The JFET switches are designed for applications where a dc to medium frequency analog signal needs to be controlled.

**Absolute Maximum Ratings:**

Positive Supply-Negative Supply ( $V_{CC} - V_{EE}$ )	36V
Reference Voltage	$V_{EE} \leq V_R \leq V_{CC}$
Logic Input Voltage	$V_R - 4.0V \leq V_{IN} \leq V_R + 6.0V$
Analog Voltage	$V_{EE} \leq V_A \leq V_{CC} + 6V; V_A \leq V_{EE} + 36V$
Analog Current	$I_A < 20mA$
Power Dissipation (Note 1)	500mW
Operating Temperature Range	0° to 70°C
Storage Temperature	-65° to 150°C
Typical Thermal Resistance, Junction-to-Ambient, $R_{thJA}$	85°C/W
Lead Temperature (Soldering, 10 seconds)	+300°C

Note 1 For operating at high temperature this device must be derated based on a +100°C maximum junction temperature and a thermal resistance of +150°C/W.

## Electrical Characteristics: (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
"ON" Resistance	$R_{ON}$	$V_A = 0, I_D = 1\text{mA}$	$T_A = +25^\circ\text{C}$	–	150	250	$\Omega$
				–	200	350	$\Omega$
"ON" Resistance Matching	$R_{ON\ Match}$	$T_A = +25^\circ\text{C}$	–	10	50	$\Omega$	
Analog Range	$V_A$		$\pm 10$	$\pm 11$	–	V	
Leakage Current in "ON" Condition	$I_{S(ON)} + I_{D(ON)}$	Switch "ON", $V_S = V_D = \pm 10\text{V}$	$T_A = +25^\circ\text{C}$	–	0.3	10	nA
				–	3	30	nA
Source Current in "OFF" Condition	$I_{S(OFF)}$	Switch "OFF", $V_S = +10\text{V}, V_D = -10\text{V}$	$T_A = +25^\circ\text{C}$	–	0.4	10	nA
				–	3	30	nA
Drain Current in "OFF" Condition	$I_{D(OFF)}$		$T_A = +25^\circ\text{C}$	–	0.1	10	nA
				–	3	30	nA
Logical "1" Input Voltage	$V_{INH}$		2.0	–	–	V	
Logical "0" Input Voltage	$V_{INL}$		–	–	0.8	V	
Logical "1" Input Current	$I_{INH}$	$V_{IN} = 5\text{V}$	$T_A = +25^\circ\text{C}$	–	3.6	40	$\mu\text{A}$
				–	–	100	$\mu\text{A}$
Logical "0" Input Current	$I_{INL}$	$V_{IN} = 0.8\text{V}$	$T_A = +25^\circ\text{C}$	–	–	0.1	$\mu\text{A}$
				–	–	1.0	$\mu\text{A}$
Delay Time "ON"	$t_{ON}$	$V_S = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	500	–	ns	
Delay Time "OFF"	$t_{OFF}$	$V_S = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	90	–	ns	
Break-Before-Make	$t_{ON} - t_{OFF}$	$V_S = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	80	–	ns	
Source Capacitance	$C_{S(OFF)}$	Switch "OFF", $V_S = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	4.0	–	pF	
Drain Capacitance	$C_{D(OFF)}$	Switch "OFF", $V_D = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	3.0	–	pF	
Active Source and Drain Capacitance	$C_{S(ON)} + C_{D(ON)}$	Switch "ON", $V_S = V_D = \pm 10\text{V}, T_A = +25^\circ\text{C}$	–	5.0	–	pF	
"OFF" Isolation	$I_{SQ(OFF)}$	$T_A = +25^\circ\text{C}$ , Note 3	–	–50	–	dB	
Crosstalk	CT	$T_A = +25^\circ\text{C}$ , Note 3	–	–65	–	dB	
Analog Slew Rate	SR	$T_A = +25^\circ\text{C}$ , Note 4	–	50	–	V/ $\mu\text{s}$	
Disable Current	$I_{DIS}$	Note 5	$T_A = +25^\circ\text{C}$	–	0.6	1.5	mA
				–	0.9	2.3	mA
Negative Supply Current	$I_{EE}$	All Switches "OFF", $V_S = \pm 10\text{V}$	$T_A = +25^\circ\text{C}$	–	4.3	7.0	mA
				–	6.0	10.5	mA
Reference Supply Current	$I_R$		$T_A = +25^\circ\text{C}$	–	2.7	5.0	mA
				–	3.8	7.5	mA
Positive Supply Current	$I_{CC}$		$T_A = +25^\circ\text{C}$	–	7.0	9.0	mA
				–	9.8	13.5	mA

Note 2.  $V_{CC} = +15\text{V}$ ,  $V_{EE} = -15\text{V}$ ,  $V_R = 0\text{V}$ , and limits apply for  $-25^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$  unless otherwise specified.

Note 3. These parameters are limited by the pin to pin capacitance of the package.

Note 4. This is the analog signal slew rate above which the signal is distorted as a result of finite internal slew rates.

Note 5. All switches in the device are turned "OFF" by saturating a transistor at the disable node. The delay times will be approximately equal to the  $t_{ON}$  or  $t_{OFF}$  plus the delay introduced by the external transistor.

### Pin Connection Diagram

