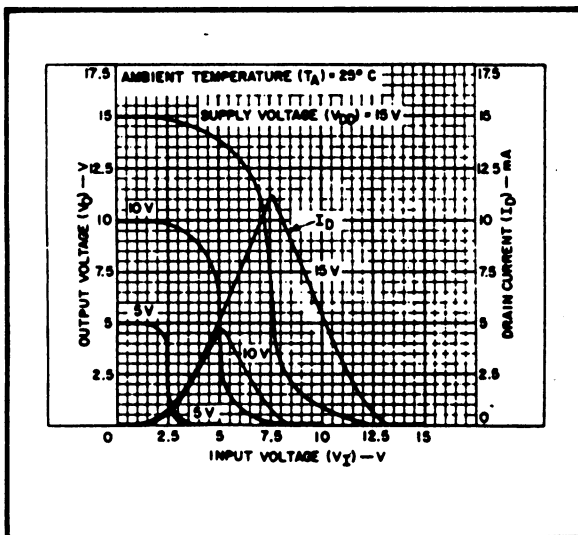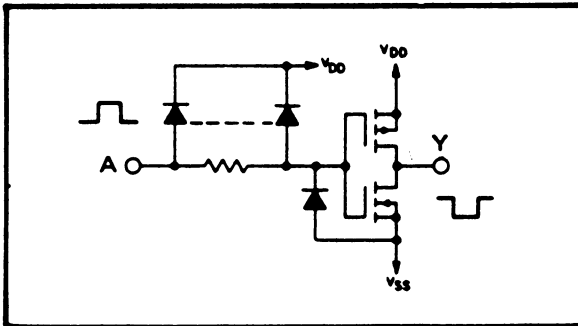# *R&E* INTERNATIONAL, INC.

CMOS HEX INVERTER

FEATURES

♦ All Inputs Fully Diode-Protected
♦ Pin Compatible with 4009B, 4049B
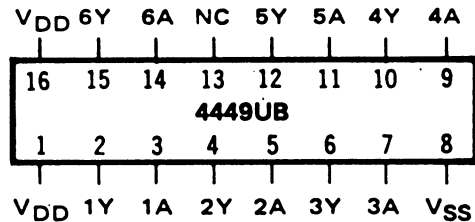♦ Fully "B"-Series Compatible

DESCRIPTION

The 4449UB consists of six CMOS inverter circuits. It is pin-compatible with the 4009UB, 4049UB, and equivalent device types. In systems which do not require the high output current and level-shifting capabilities of the buffers, the 4449 can be substituted directly with no change in board layout. The device is particularly useful for quasi-linear circuits, such as oscillators and multivibrators.

SCHEMATIC DIAGRAM
(one of six inverters)

CONNECTION DIAGRAM
(all packages)

V_{DD}	6Y	6A	NC	5Y	5A	4Y	4A
16	15	14	13	12	11	10	9

4449UB

1	2	3	4	5	6	7	8
V_{DD}	1Y	1A	2Y	2A	3Y	3A	V_{SS}

RECOMMENDED OPERATING CONDITIONS
For maximum reliability:

DC Supply Voltage	$V_{DD} - V_{SS}$	3 to 15	Vdc
Operating Temperature	T_A		
C		-55 to +125	°C
E		-40 to +85	°C

Typical current and voltage transfer characteristics.

LOGIC DIAGRAM

$$Y = \overline{A}$$
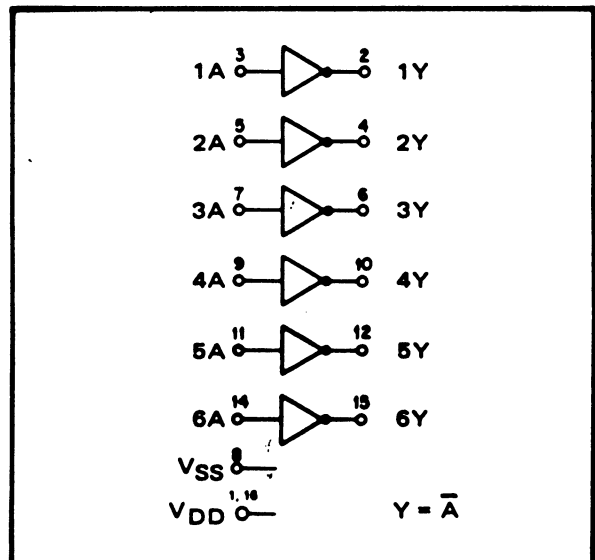
ELECTRICAL CHARACTERISTICS

STATIC CHARACTERISTICS [1]

PARAMETER		V_{DD} (Vdc)	CONDITIONS	T_{LOW}[2]		+25°C			T_{HIGH}[2]		Units
				Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I_{DD}	5	V_{IN} = V_{SS} or V_{DD}	–	0.05	–	0.0005	0.05	–	1.5	μAdc
		10	All valid input	–	0.10	–	0.001	0.10	–	3.0	
		15	combinations	–	0.20	–	0.002	0.20	–	6.0	

NOTES: [1] Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".

[2] T_{LOW} = –55°C for C
= –40°C for E
T_{HIGH} = +125°C for C
= + 85°C for E

DYNAMIC CHARACTERISTICS (C_L = 50pF, T_A = 25°C)

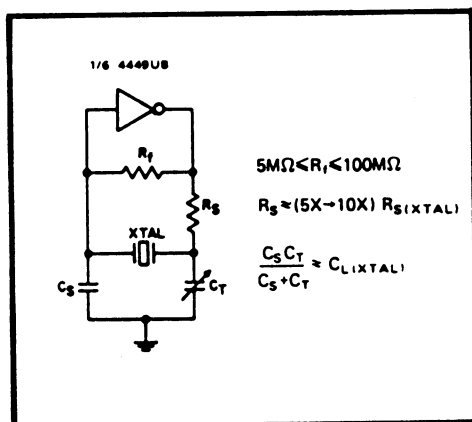| PARAMETER		V_{DD} (Vdc)	Min.	Typ.	Max.	Units
PROPAGATION DELAY TIME	t_{PLH}, t_{PHL}	5	–	60	120	ns
		10	–	30	60	
		15	–	25	50	
OUTPUT TRANSITION TIME	t_{TLH}, t_{THL}	5	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
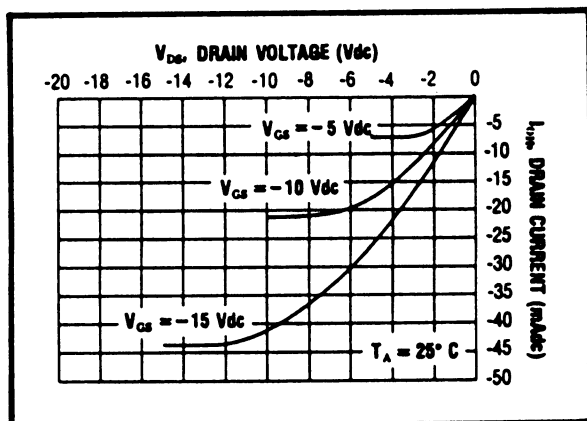
Typical P-Channel Source Current Characteristics
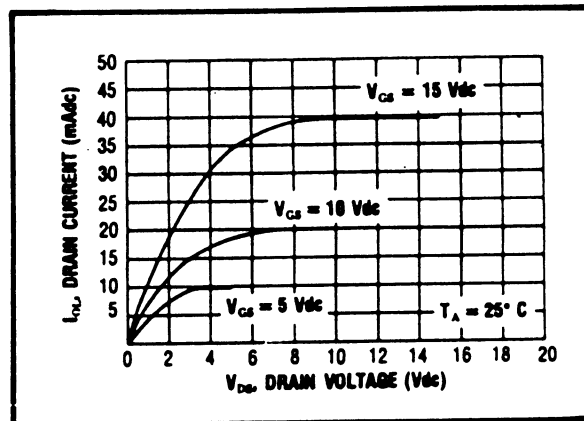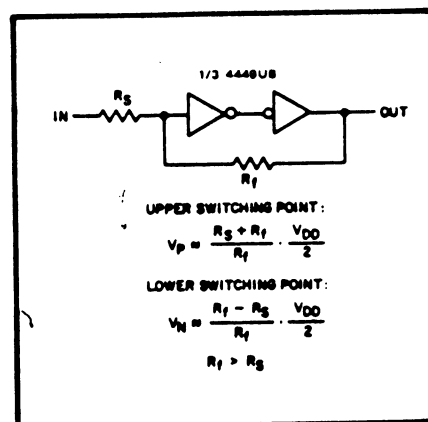

Typical N-Channel Sink Current Characteristics

APPLICATIONS INFORMATION

$5M\Omega < R_f < 100M\Omega$

$R_S \approx (5X \rightarrow 10X) R_{S(XTAL)}$

$\dfrac{C_S C_T}{C_S + C_T} \approx C_{L(XTAL)}$

Typical crystal oscillator circuit

$f \approx \dfrac{1}{2.2 R_T C_T}$

$R_S \approx (2X \rightarrow 10X) R_T$
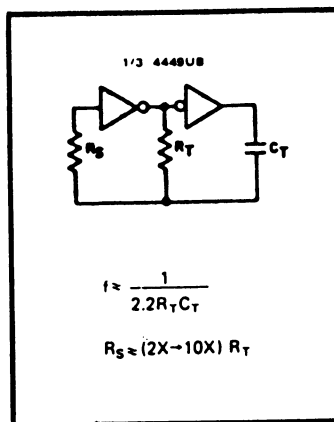
Typical RC oscillator circuit

UPPER SWITCHING POINT:

$V_P \approx \dfrac{R_S + R_f}{R_f} \cdot \dfrac{V_{DD}}{2}$

LOWER SWITCHING POINT:

$V_N \approx \dfrac{R_f - R_S}{R_f} \cdot \dfrac{V_{DD}}{2}$

$R_f > R_S$

Input pulse shaping circuit (Schmitt trigger)