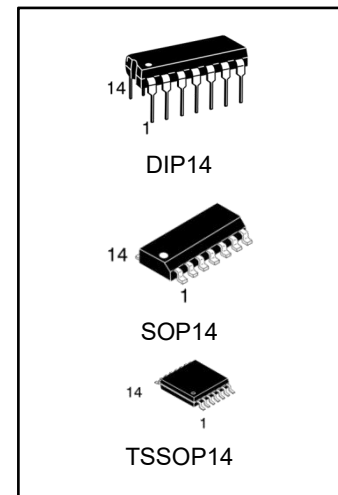


CMOS Dual Complementary Pair Plus Inverter

Features

- High-Voltage Type (20V Rating)
- Standardized Symmetrical Output Characteristics
- Medium Speed Operation: $t_{PHL}, t_{PLH} = 30 \text{ ns (typ)}$ at 10V
- 100% Tested for Maximum Quiescent Current at 20V
- Meets All Requirements of JEDEC Tentative Standards No.13B, "Standard Specifications for Description of "B" Series CMOS Devices"
- Maximum Input Current of $1\mu\text{A}$ at 18V Over Full Package-Temperature Range; 100nA at 18V and $+25^{\circ}\text{C}$



Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
CD4007UBE	DIP14	CD4007UB	TUBE	1000pcs/Box
CD4007UBM/TR	SOP14	CD4007UB	REEL	2500pcs/Reel
CD4007UBMT/TR	TSSOP14	CD4007UB	REEL	2500pcs/Reel

Description

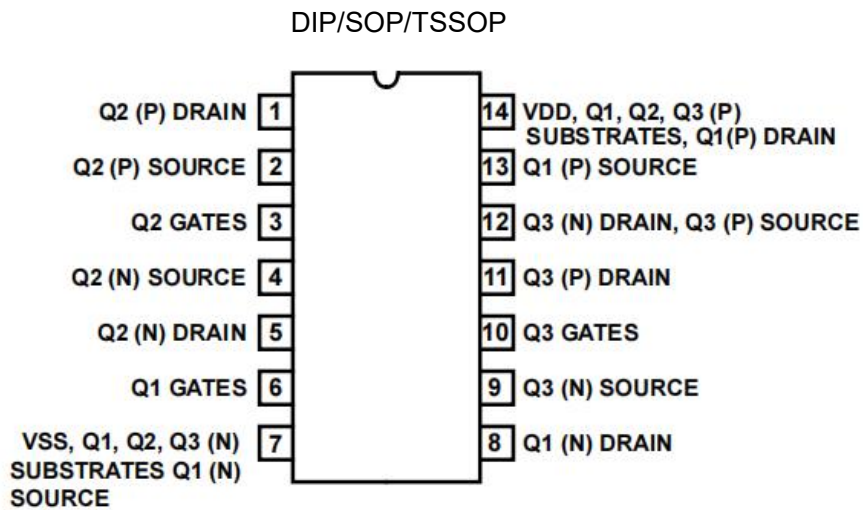
CD4007B types are comprised of three n-channel and three p-channel enhancement-type MOS transistors. The transistor elements are accessible through the package terminals to provide a convenient means for constructing the various typical circuits as shown in Figure 2.

More complex functions are possible using multiple packages. Numbers shown in parentheses indicate terminals that are connected together to form the various configurations listed.

Applications

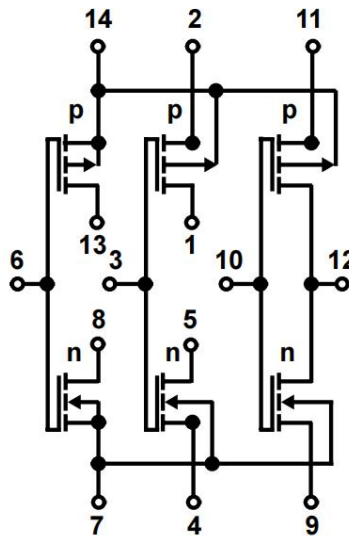
- Extremely High-Input Impedance Amplifiers
- Shapers
- Inverters
- Threshold Detector
- Linear Amplifiers
- Crystal Oscillators

Pin Configuration



CD4007UB (TOP VIEW)

Functional Diagram



TERMINAL NO.14- V_{DD}
 TERMINAL NO.7- V_{SS}

Absolute Maximum Ratings

Condition	Min	Max	UNITS
DC Supply Voltage Range, (V_{DD}) (Voltage Referenced to V_{SS} Terminals)	-0.5	+20	V
Input Voltage Range, All Inputs	-0.5	$V_{DD}+0.5V$	V
DC Input Current, Any One Input	± 10		mA
Operating Temperature Range	-40	+855	°C
Storage Temperature Range (T_{STG})	-65	+150	°C
Lead Temperature (During Soldering) At Distance 1/16±1/32 Inch (1.59mm±0.79mm) from case for 10s Maximum	-	+265	°C

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{DD}	DC Supply Voltage Range, (V_{DD})	3.0	18	V

DC ELECTRICAL PERFORMANCE CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS (NOTE 1)	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS	
					MIN	MAX		
Supply Current	I _{DD}	V _{DD} = 20V, V _{IN} = V _{DD} or GND	1	+25°C	-	0.5	μA	
			2	+125°C	-	50	μA	
		V _{DD} = 18V, V _{IN} = V _{DD} or GND	3	-55°C	-	0.5	μA	
Input Leakage Current	I _{IL}	V _{IN} = V _{DD} or GND	V _{DD} = 20V	1	+25°C	-100	-	nA
			V _{DD} =18V	2	+125°C	-1000	-	nA
				3	-55°C	-100	-	nA
Input Leakage Current	I _{IH}	V _{IN} = V _{DD} or GND	V _{DD} = 20V	1	+25°C	-	100	nA
			V _{DD} =18V	2	+125°C	-	1000	nA
				3	-55°C	-	100	nA
Output Voltage	VOL15	V _{DD} = 15V, No Load	1, 2, 3	+25°C, +125°C, -55°C	-	50	mV	
Output Voltage	VOH15	V _{DD} = 15V, No Load (Note 3)	1, 2, 3	+25°C, +125°C, -55°C	14.95	-	V	
Output Current (Sink)	IOL5	V _{DD} = 5V, V _{OUT} = 0.4V	1	+25°C	0.53	-	mA	
Output Current (Sink)	IOL10	V _{DD} = 10V, V _{OUT} = 0.5V	1	+25°C	1.4	-	mA	
Output Current (Sink)	IOL15	V _{DD} = 15V, V _{OUT} = 1.5V	1	+25°C	3.5	-	mA	
Output Current (Source)	IOH5A	V _{DD} = 5V, V _{OUT} = 4.6V	1	+25°C	-	-0.53	mA	
Output Current (Source)	IOH5B	V _{DD} = 5V, V _{OUT} = 2.5V	1	+25°C	-	-1.8	mA	
Output Current (Source)	IOH10	V _{DD} = 10V, V _{OUT} = 9.5V	1	+25°C	-	-1.4	mA	
Output Current (Source)	IOH15	V _{DD} = 15V, V _{OUT} = 13.5V	1	+25°C	-	-3.5	mA	
N Threshold Voltage	VNTH	V _{DD} = 10V, I _{SS} = -10μA	1	+25°C	-2.8	-0.7	V	
P Threshold Voltage	VPTH	V _{SS} = 0V, I _{DD} = 10μA	1	+25°C	0.7	2.8	V	
Functional	F	V _{DD} = 2.8V, V _{IN} = V _{DD} or GND	7	+25°C	V _{OH} > V _{DD} /2	V _{OL} < V _{DD} /2	V	
		V _{DD} = 20V, V _{IN} = V _{DD} or GND	7	+25°C				
		V _{DD} = 18V, V _{IN} = V _{DD} or GND	8A	+125°C				
		V _{DD} = 3V, V _{IN} = V _{DD} or GND	8B	-55°C				
Input Voltage Low (Note 2)	VIL	V _{DD} = 5V, V _{OH} > 4.5V, V _{OL} < 0.5V	1, 2, 3	+25°C, +125°C, -55°C	-	1.0	V	
Input Voltage High (Note 2)	VIH	V _{DD} = 5V, V _{OH} > 4.5V, V _{OL} < 0.5V	1, 2, 3	+25°C, +125°C, -55°C	4.0	-	V	
Input Voltage Low (Note 2)	VIL	V _{DD} = 15V, V _{OH} > 13.5V, V _{OL} < 1.5V	1, 2, 3	+25°C, +125°C, -55°C	-	2.5	V	
Input Voltage High (Note 2)	VIH	V _{DD} = 15V, V _{OH} > 13.5V, V _{OL} < 1.5V	1, 2, 3	+25°C, +125°C, -55°C	12.5	-	V	

NOTES:

1. All voltages referenced to device GND, 100% testing being implemented.
2. Go/No Go test with limits applied to inputs
3. For accuracy, voltage is measured differentially to V_{DD}. Limit is 0.050V max.

AC ELECTRICAL PERFORMANCE CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS (NOTE 1, 2)	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Propagation Delay	TPHL TPLH	$V_{DD}=5V, V_{IN}=V_{DD}$ or GND	9	+25°C	-	110	ns
			10, 11	+125°C, -55°C	-	149	ns
Transition Time	TTHL TTLH	$V_{DD}=5V, V_{IN}=V_{DD}$ or GND	9	+25°C	-	200	ns
			10, 11	+125°C, -55°C	-	270	ns

NOTES:

CL = 50pF, RL = 200K, Input TR, TF < 20ns.

55°C and +125°C limits guaranteed, 100% testing being implemented.

ELECTRICAL PERFORMANCE CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Supply Current	IDD	$V_{DD} = 5V, V_{IN} = V_{DD}$ or GND	1, 2	-55°C, +25°C	-	0.25	A
				+125°C	-	7.5	A
		$V_{DD}=10V, V_{IN} = V_{DD}$ or GND	1, 2	-55°C, +25°C	-	0.5	A
				+125°C	-	15	A
		$V_{DD}=15V, V_{IN} = V_{DD}$ or GND	1, 2	-55°C, +25°C	-	0.5	A
				+125°C	-	30	A
Output Voltage	VOL	$V_{DD} = 5V$, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOL	$V_{DD} = 10V$, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOH	$V_{DD} = 5V$, No Load	1, 2	+25°C, +125°C, -55°C	4.95	-	V
Output Voltage	VOH	$V_{DD} = 10V$, No Load	1, 2	+25°C, +125°C, -55°C	9.95	-	V
Output Current (Sink)	IOL5	$V_{DD} = 5V, V_{OUT} = 0.4V$	1, 2	+125°C	0.36	-	mA
				-55°C	0.64	-	mA
Output Current (Sink)	IOL10	$V_{DD} = 10V, V_{OUT} = 0.5V$	1, 2	+125°C	0.9	-	mA
				-55°C	1.6	-	mA
Output Current (Sink)	IOL15	$V_{DD} = 15V, V_{OUT} = 1.5V$	1, 2	+125°C	2.4	-	mA
				-55°C	4.2	-	mA
Output Current (Source)	IOH5A	$V_{DD} = 5V, V_{OUT} = 4.6V$	1, 2	+125°C	-	-0.36	mA
				-55°C	-	-0.64	mA
Output Current (Source)	IOH5B	$V_{DD} = 5V, V_{OUT} = 2.5V$	1, 2	+125°C	-	-1.15	mA
				-55°C	-	-2.0	mA
Output Current (Source)	IOH10	$V_{DD} = 10V, V_{OUT} = 9.5V$	1, 2	+125°C	-	-0.9	mA
				-55°C	-	-1.6	mA
Output Current (Source)	IOH15	$V_{DD} = 15V, V_{OUT} = 13.5V$	1, 2	+125°C	-	-2.4	mA
				-55°C	-	-4.2	mA
Input Voltage Low	VIL	$V_{DD}=10V, V_{OH}>9V, V_{OL}<1V$	1, 2	+25°C, +125°C, -55°C	-	2	V
Input Voltage High	VIH	$V_{DD}=10V, V_{OH}>9V, V_{OL}<1V$	1, 2	+25°C, +125°C, -55°C	8	-	V
Propagation Delay	TPHL TPLH	$V_{DD} = 10V$	1, 2, 3	+25°C	-	60	ns
		$V_{DD} = 15V$	1, 2, 3	+25°C	-	50	ns
Transition Time	TTHL TTLH	$V_{DD}=10V$	1, 2, 3	+25°C	-	100	ns
		$V_{DD}=15V$	1, 2, 3	+25°C	-	80	ns
INPUT Capacitance	CIN	Any Input	1, 2	+25°C	-	15.0	pF

NOTES:

- All voltages referenced to device GND.
- The parameters listed on Table 3 are controlled via design or process and are not directly tested. These parameters are characterized on initial design release and upon design changes which would affect these characteristics.
- CL = 50pF, RL = 200K, Input TR, TF < 20ns.

Schematic Diagram

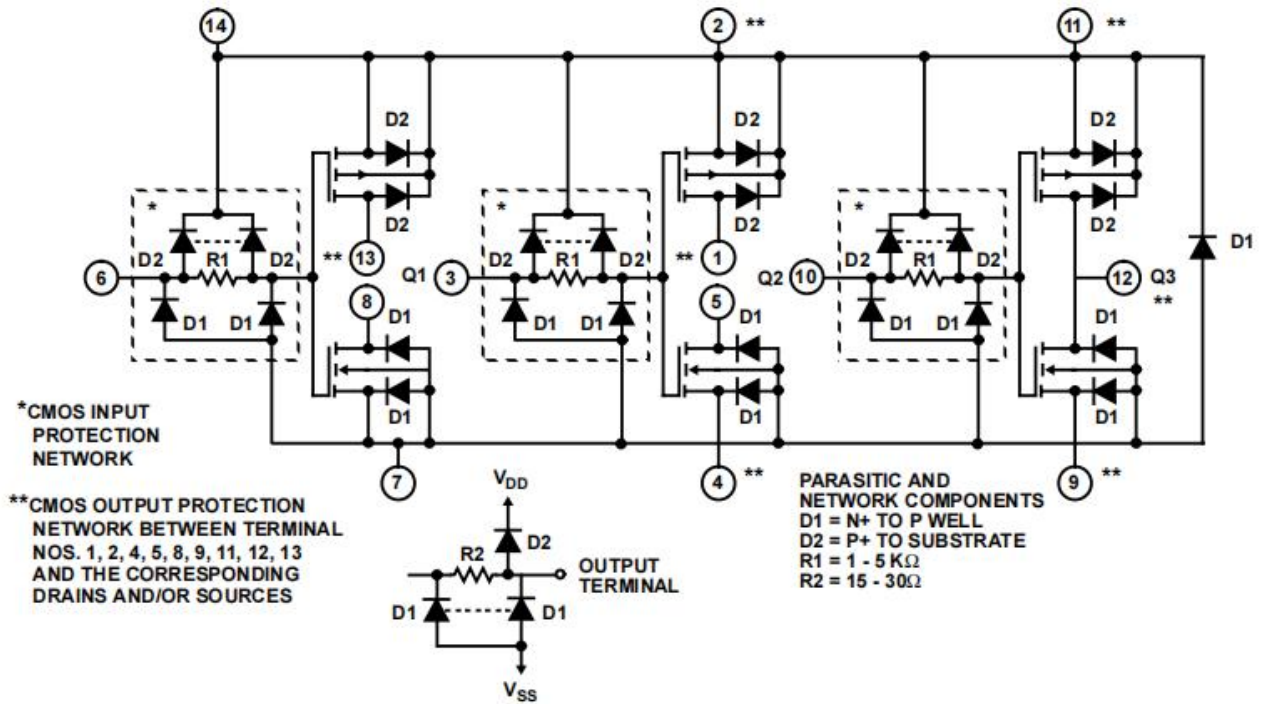
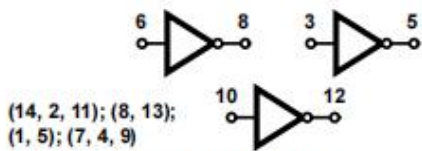
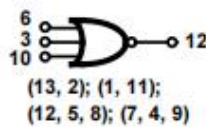


FIGURE 1. DETAILED SCHEMATIC DIAGRAM OF CD4007UB SHOWING INPUT, OUTPUT, AND PARASITIC DIODES

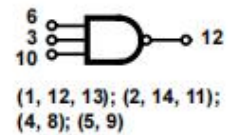
Logic Circuits



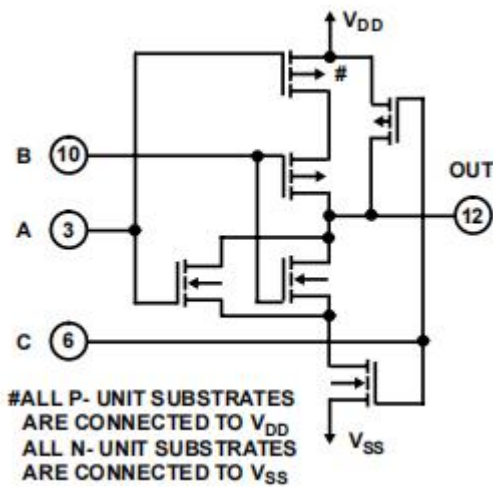
a) TRIPLE INVERTERS



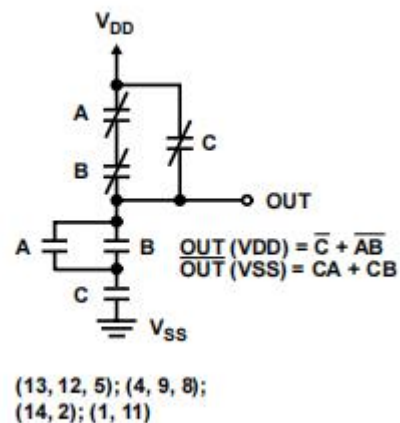
b) 3 - INPUT NOR GATE



c) 3 - INPUT NAND GATE



d) TREE(RELAY)LOGIC



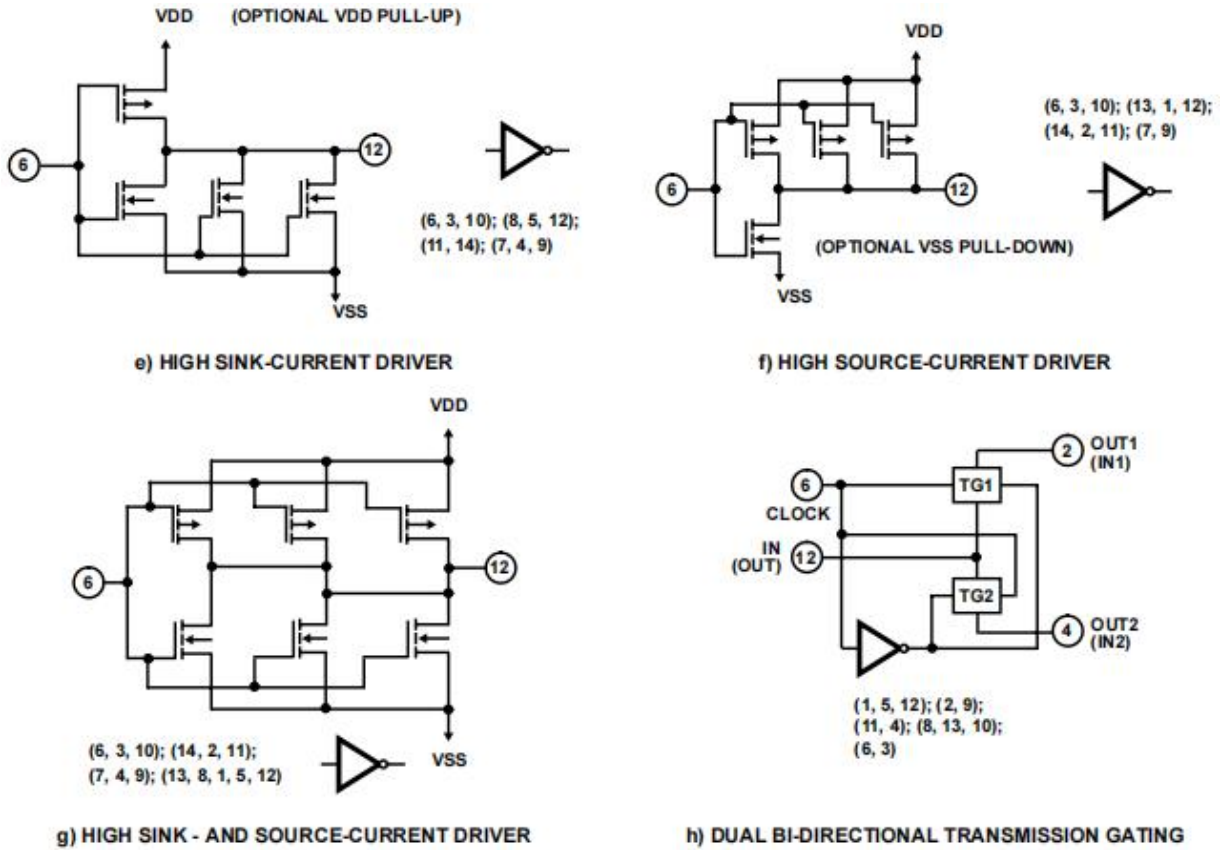


FIGURE 2. SAMPLE CMOS LOGIC CIRCUIT ARRANGEMENTS USING TYPE CD4007UB

Typical Performance Characteristics

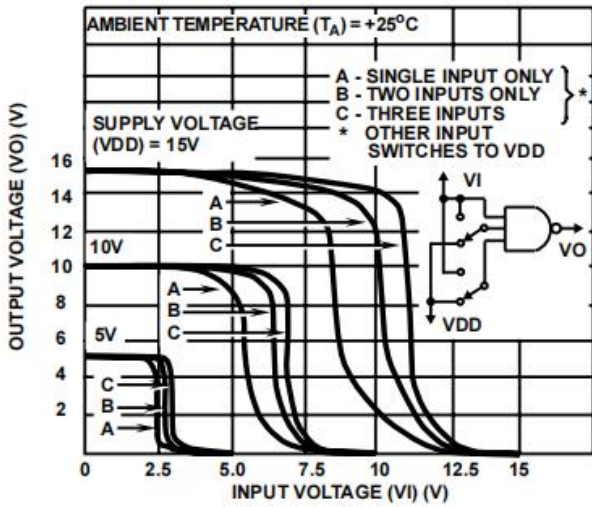


FIGURE 3. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS FOR NAND GATE

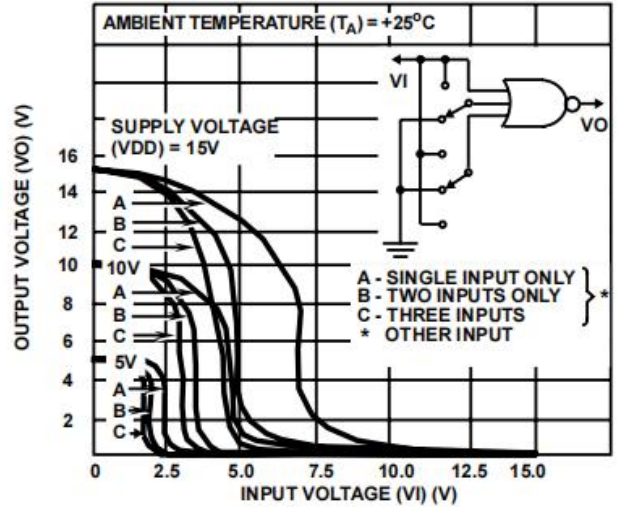


FIGURE 4. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS FOR NOR GATE

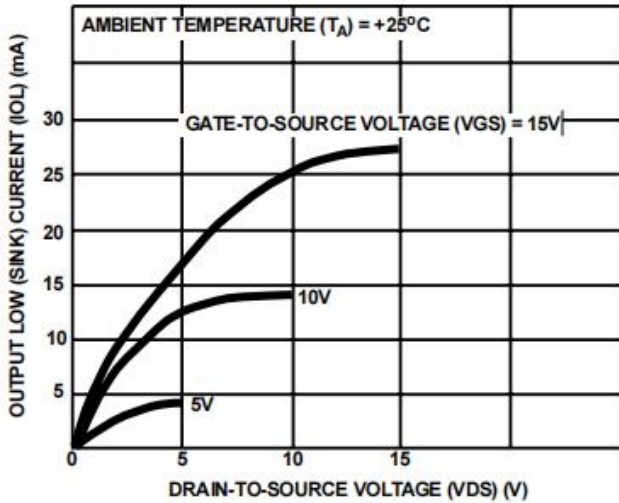


FIGURE 5. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

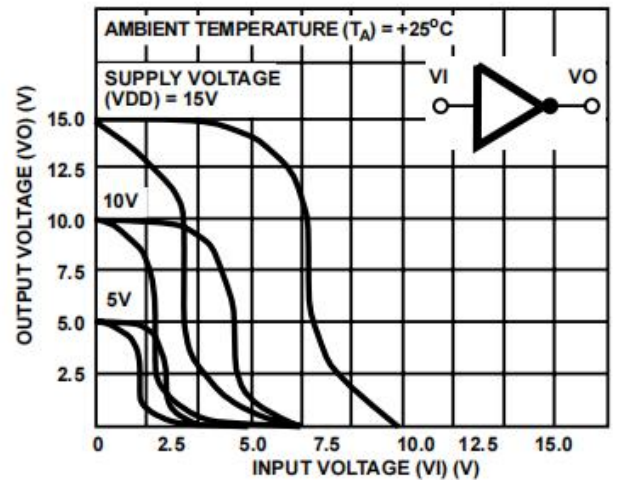


FIGURE 6. MINIMUM AND MAXIMUM VOLTAGE-TRANSFER CHARACTERISTICS FOR INVERTER

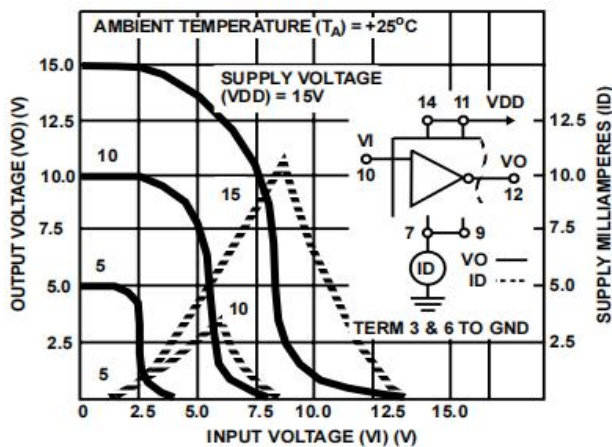


FIGURE 7. TYPICAL CURRENT AND VOLTAGE-TRANSFER CHARACTERISTICS FOR INVERTER

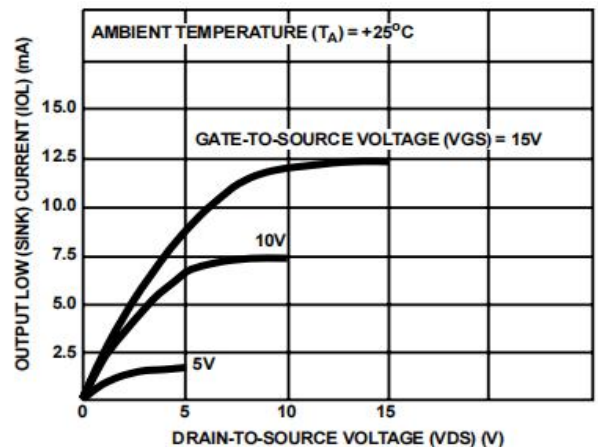


FIGURE 8. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

Typical Performance Characteristics (Continued)

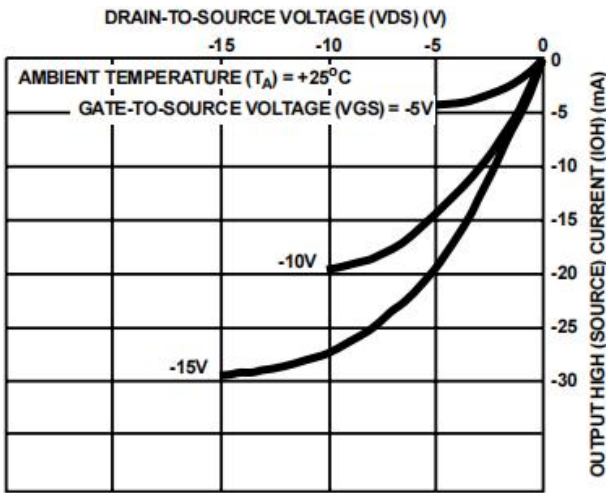


FIGURE 9. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

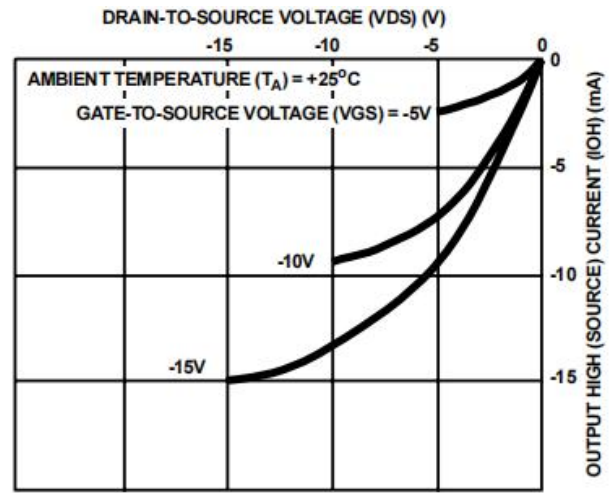


FIGURE 10. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

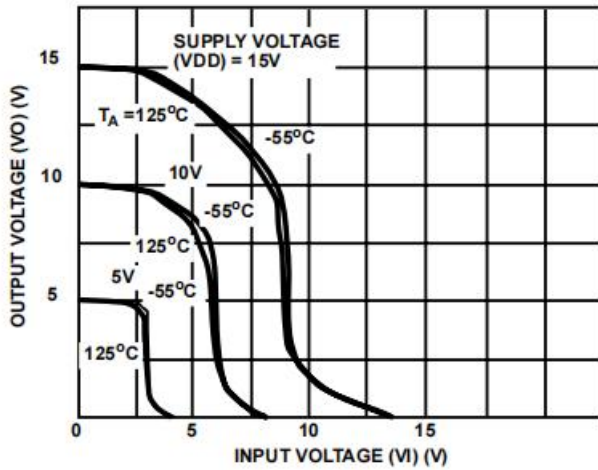


FIGURE 11. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS AS A FUNCTION OF TEMPERATURE

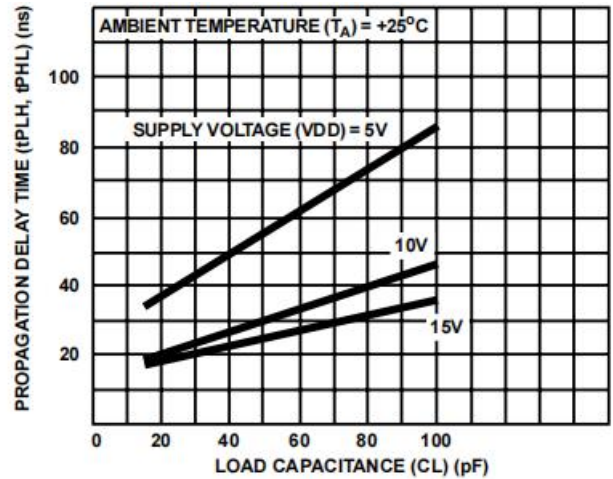


FIGURE 12. TYPICAL PROPAGATION DELAY TIME vs LOAD CAPACITANCE

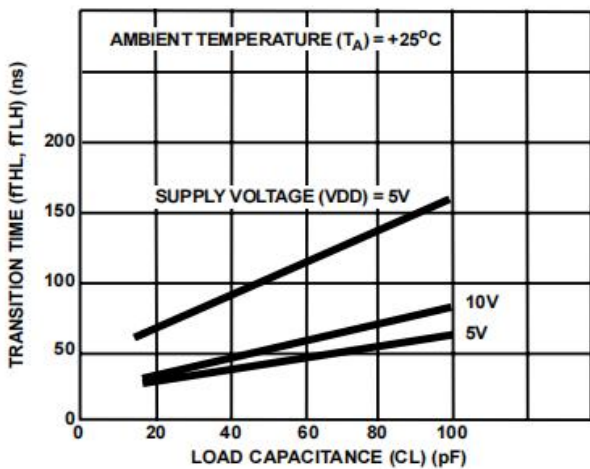


FIGURE 13. TYPICAL TRANSITION TIME vs LOAD CAPACITANCE

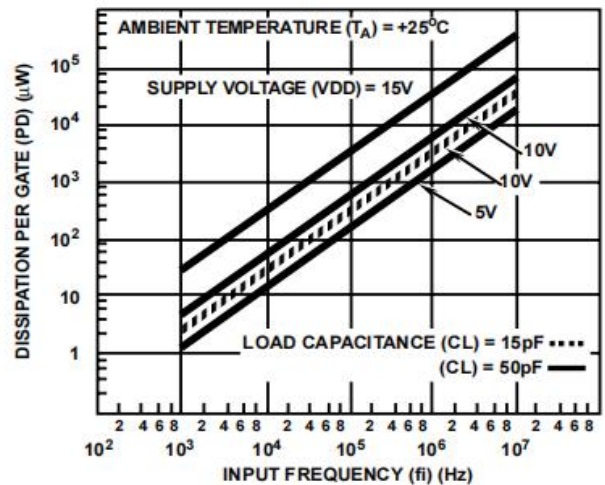
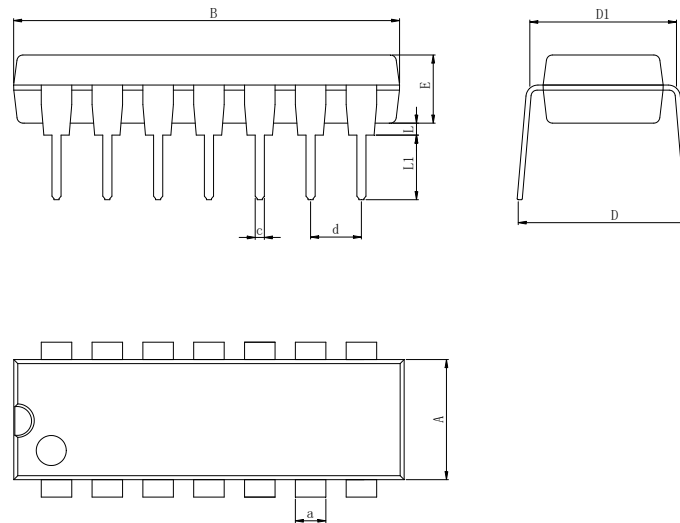


FIGURE 14. TYPICAL DISSIPATION vs FREQUENCY CHARACTERISTICS

Physical Dimensions

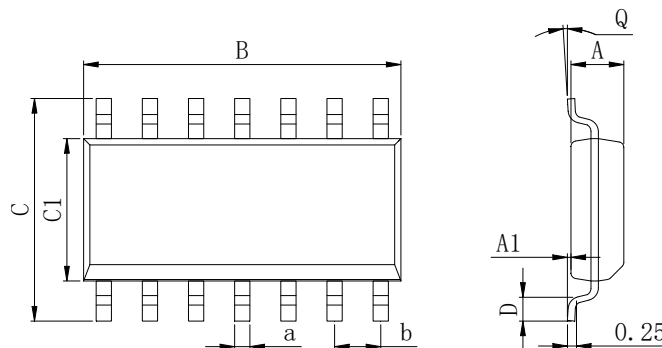
DIP14



Dimensions In Millimeters(DIP14)

Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.40	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	9.00	7.82	3.55	0.70	3.60	1.55	0.50	

SOP14

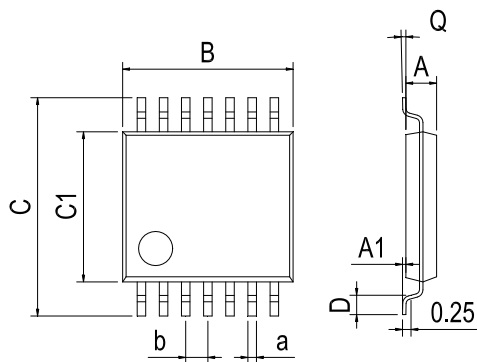


Dimensions In Millimeters(SOP14)

Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

Physical Dimensions

TSSOP14



Dimensions In Millimeters(TSSOP14)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

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