CMOS Dual Complementary Pair Plus Inverter

Features

- High-Voltage Type (15V Rating)
- Standardized Symmetrical Output Characteristics
- Medium Speed Operation: t_{PHL}, t_{PLH} = 30 ns (typ) at 10V
- 100% Tested for Maximum Quiescent Current at 15V
- Meets All Requirements of JEDEC Tentative Stan- dards No.13B, “Standard Specifications for Description of “B” Series CMOS Devices”
- Maximum Input Current of 1μA at 15V Over Full Pack- age-Temperature Range; 100nA at 15V and +25°C

DIP-14

SOP-14

TSSOP-14

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
CD4007UBE/ CD4007UBN	DIP-14	CD4007UB	TUBE	1000pcs/Box
CD4007UBM/TR	SOP-14	CD4007UB	REEL	2500pcs/Reel
CD4007UBMT/TR	TSSOP-14	CD4007UB	REEL	2500pcs/Reel

Description

CD4007UB 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.

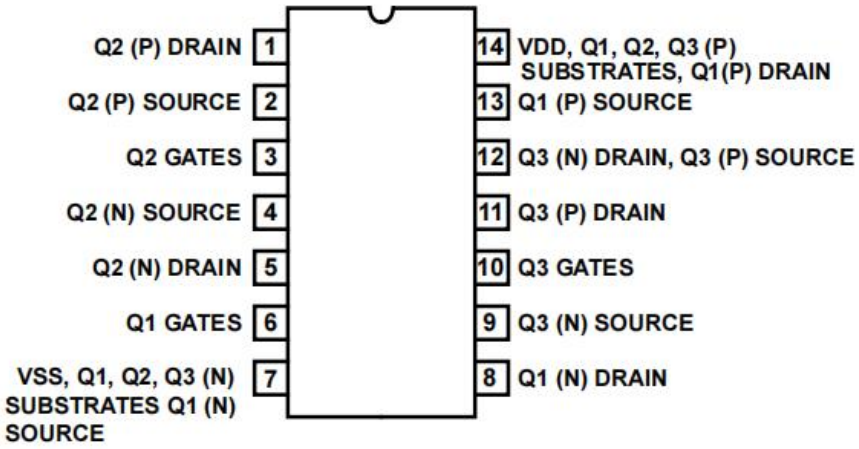
More complex functions are possible using multiple pack- ages. Numbers shown in parentheses indicate terminals that are connected together to form the various configurations listed.

Applications

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

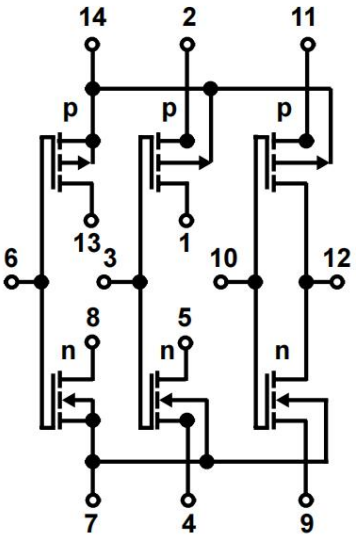
Pin Configuration

DIP/SOP/TSSOP



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 VSS Terminals)	-0.5	+15	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	+85	°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	-	+260	°C

Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{DD}	DC Supply Voltage Range, (V_{DD})	3.0	15	V

Dc Electrical Performance Characteristics

PARAMETER	SYMBOL	CONDITIONS (NOTE 1)		GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
						MIN	MAX	
Supply Current	I_{DD}	V_{DD} = 15V, VIN = V_{DD} or GND		1	+25°C	-	0.5	μA
				2	+85°C	-	50	μA
		V_{DD} = 15V, VIN = V_{DD} or GND		3	-40°C	-	0.5	μA
Input Leakage Current	IIL	VIN = V_{DD} or GND	V_{DD}= 15V	1	+25°C	-100	-	nA
				2	+85°C	-1000	-	nA
			V_{DD}=15V	3	-40°C	-100	-	nA
Input Leakage Current	IIH	VIN = V_{DD} or GND	V_{DD}=15V	1	+25°C	-	100	nA
				2	+85°C	-	1000	nA
			V_{DD}=15V	3	-40°C	-	100	nA
Output Voltage	VOL15	V_{DD} = 15V, No Load		1, 2, 3	+25°C, +85°C, -40°C	-	50	mV
Output Voltage	VOH15	V_{DD} = 15V, No Load (Note 3)		1, 2, 3	+25°C, +85°C, -40°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} =15V, V_{IN} = V_{DD} or GND		8A	+85°C			
		V_{DD} =3V, V_{IN} = V_{DD} or GND		8B	-40°C			
Input Voltage Low (Note 2)	VIL	V_{DD} = 5V, V_{OH} > 4.5V, VOL < 0.5V		1, 2, 3	+25°C, +85°C, -40°C	-	1.0	V
Input Voltage High (Note 2)	VIH	V_{DD} = 5V, V_{OH} > 4.5V, VOL < 0.5V		1, 2, 3	+25°C, +85°C, -40°C	4.0	-	V
Input Voltage Low (Note 2)	VIL	V_{DD} = 15V, V_{OH} > 13.5V, VOL < 1.5V		1, 2, 3	+25°C, +85°C, -40°C	-	2.5	V
Input Voltage High (Note 2)	VIH	V_{DD} = 15V, V_{OH} > 13.5V, VOL < 1.5V		1, 2, 3	+25°C,+85°C, -40°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, VIN=V_{DD} or GND	9	+25°C	-	110	ns
			10, 11	+85°C, -40°C	-	149	ns
Transition Time	TTHL TTLH	V_{DD}=5V, VIN=V_{DD} or GND	9	+25°C	-	200	ns
			10, 11	+85°C, -40°C	-	270	ns

NOTES:

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

55°C and +85°C limits guaranteed, 100% testing being implemented.

Electrical Performance Characteristics

PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Supply Current	I_{DD}	V_{DD} = 5V, V_{IN} = V_{DD} or GND	1, 2	-40°C, +25°C	-	0.25	μA
				+85°C	-	7.5	μA
		V_{DD}=10V, V_{IN} = V_{DD} or GND	1, 2	-40°C, +25°C	-	0.5	μA
				+85°C	-	15	μA
		V_{DD}=15V, V_{IN} = V_{DD} or GND	1, 2	-40°C, +25°C	-	0.5	μA
				+85°C	-	30	μA
Output Voltage	VOL	V_{DD} = 5V, No Load	1, 2	+25°C,+85°C,-40°C	-	50	mV
Output Voltage	VOL	V_{DD} = 10V, No Load	1, 2	+25°C,+85°C,-40°C	-	50	mV
Output Voltage	VOH	V_{DD} = 5V, No Load	1, 2	+25°C,+85°C,-40°C	4.95	-	V
Output Voltage	VOH	V_{DD} = 10V, No Load	1, 2	+25°C,+85°C,-40°C	9.95	-	V
Output Current (Sink)	IOL5	V_{DD} = 5V, V_{OUT} = 0.4V	1, 2	+85°C	0.36	-	mA
				-40°C	0.64	-	mA
Output Current (Sink)	IOL10	V_{DD} = 10V, V_{OUT} = 0.5V	1, 2	+85°C	0.9	-	mA
				-40°C	1.6	-	mA
Output Current (Sink)	IOL15	V_{DD} = 15V, V_{OUT} = 1.5V	1, 2	+85°C	2.4	-	mA
				-40°C	4.2	-	mA
Output Current (Source)	IOH5A	V_{DD} = 5V, V_{OUT} = 4.6V	1, 2	+85°C	-	-0.36	mA
				-40°C	-	-0.64	mA
Output Current (Source)	IOH5B	V_{DD} = 5V, V_{OUT} = 2.5V	1, 2	+85°C	-	-1.15	mA
				-40°C	-	-2.0	mA
Output Current (Source)	IOH10	V_{DD} = 10V, V_{OUT} = 9.5V	1, 2	+85°C	-	-0.9	mA
				-40°C	-	-1.6	mA
Output Current (Source)	IOH15	V_{DD} =15V, V_{OUT} = 13.5V	1, 2	+85°C	-	-2.4	mA
				-40°C	-	-4.2	mA
Input Voltage Low	VIL	V_{DD}=10V, V_{OH}>9V,V_{OL}<1V	1, 2	+25°C,+85°C,-40°C	-	2	V
Input Voltage High	VIH	V_{DD}=10V, V_{OH}>9V,V_{OL}<1V	1, 2	+25°C,+85°C,-40°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:

1. All voltages referenced to device GND.
2. 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.
3. CL = 50pF, RL = 200K, Input TR, TF < 20ns.

Schematic Diagram

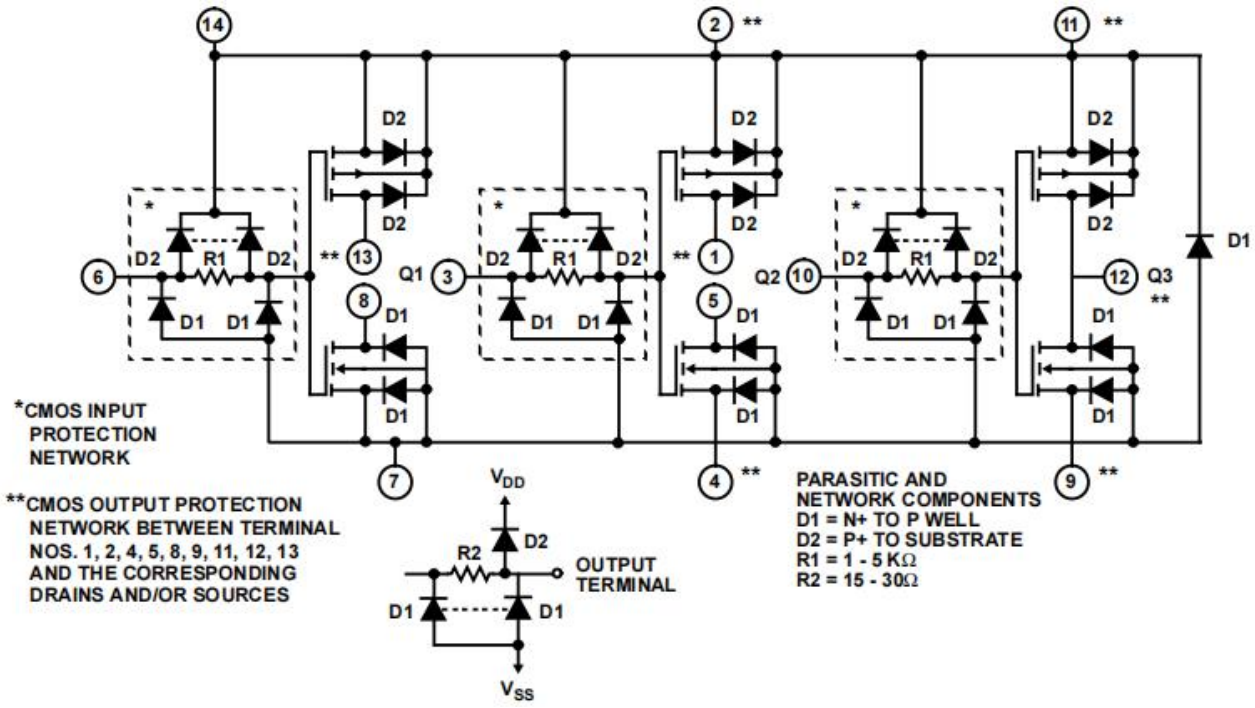
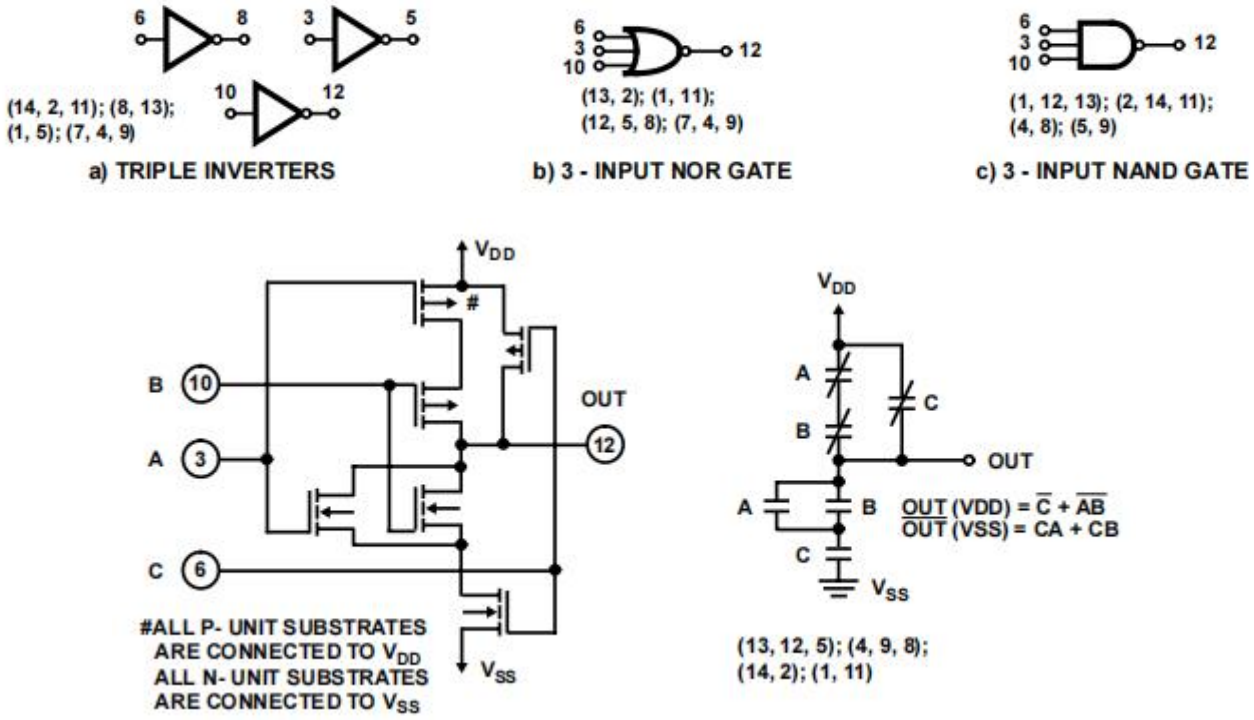


FIGURE 1. DETAILED SCHEMATIC DIAGRAM OF CD4007UB SHOWING INPUT, OUTPUT, AND PARASITIC DIODES

Logic Circuits



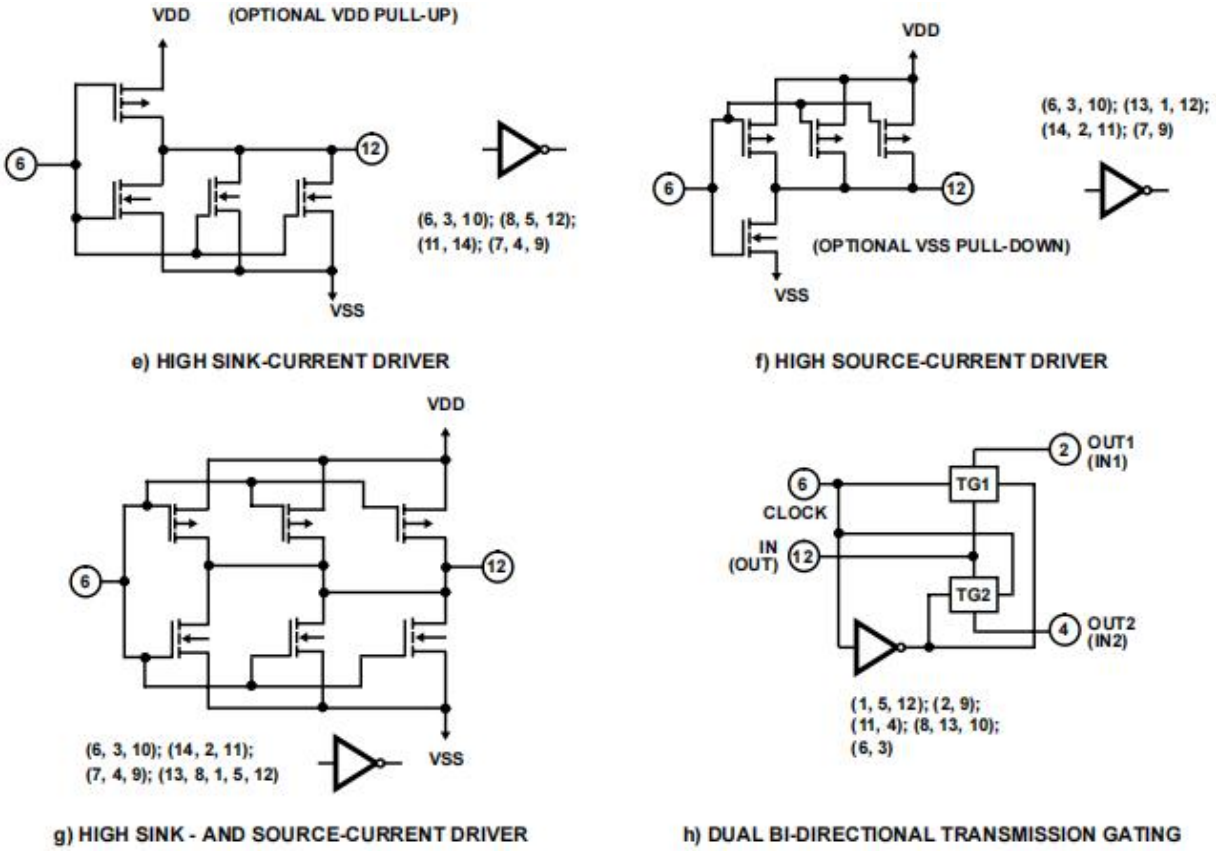


FIGURE 2. SAMPLE CMOS LOGIC CIRCUIT ARRANGEMENTS USING TYPE CD4007UB

Typical Performance Characteristics

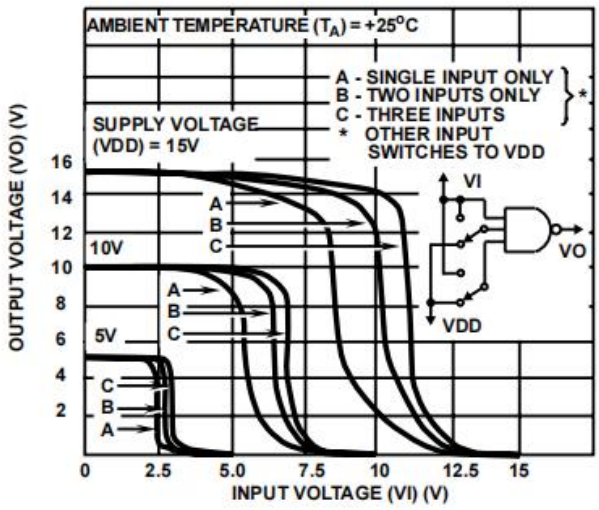


FIGURE 3. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS FOR NAND GATE

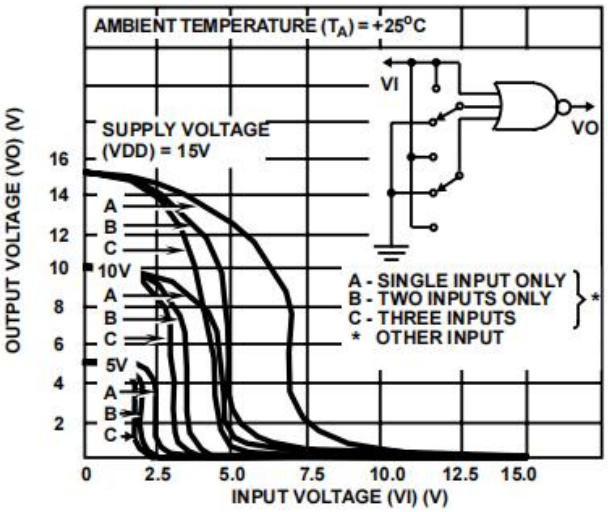


FIGURE 4. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS FOR NOR GATE

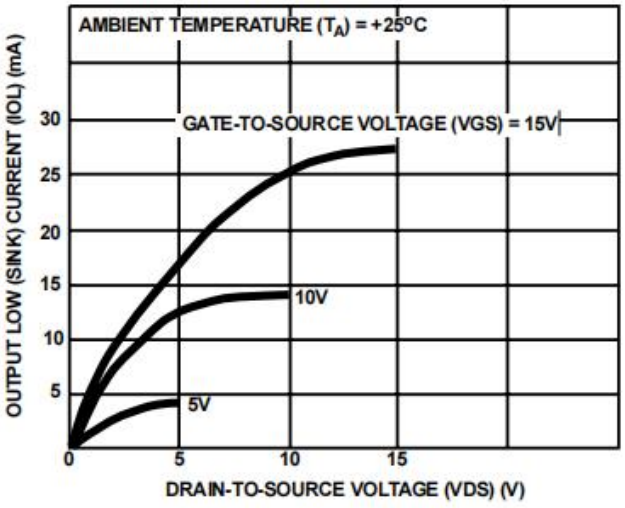


FIGURE 5. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

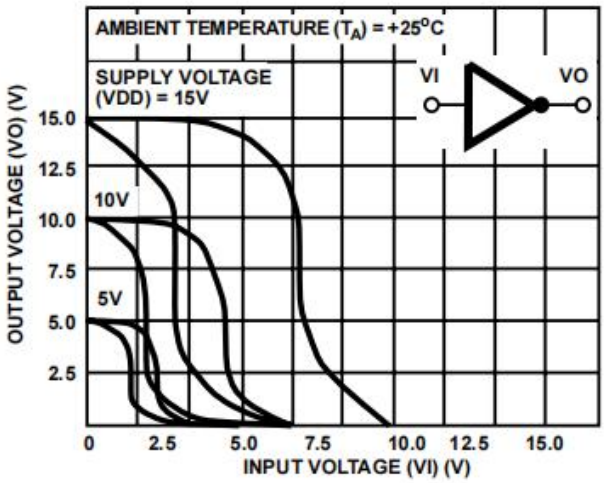


FIGURE 6. MINIMUM AND MAXIMUM VOLTAGE-TRANSFER CHARACTERISTICS FOR INVERTER

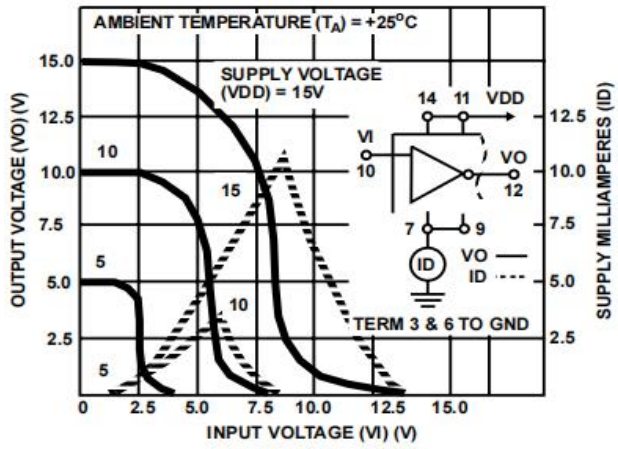


FIGURE 7. TYPICAL CURRENT AND VOLTAGE-TRANSFER CHARACTERISTICS FOR INVERTER

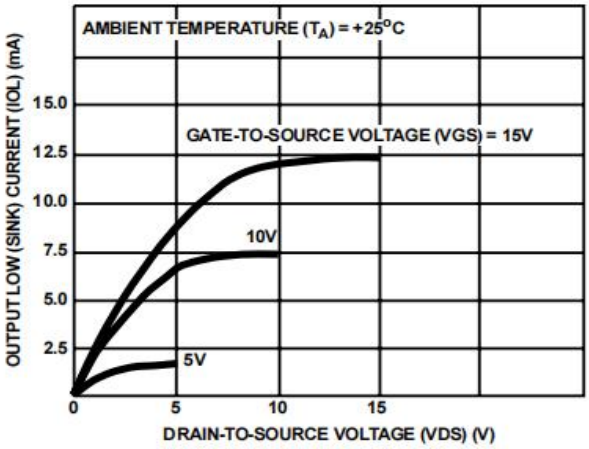


FIGURE 8. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

Typical Performance Characteristics (Continued)

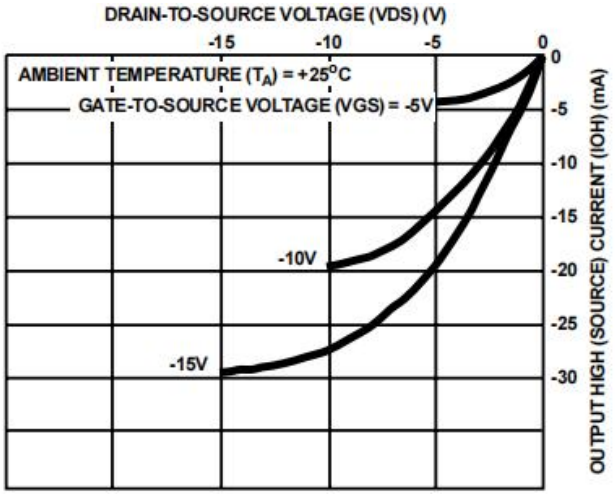


FIGURE 9. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

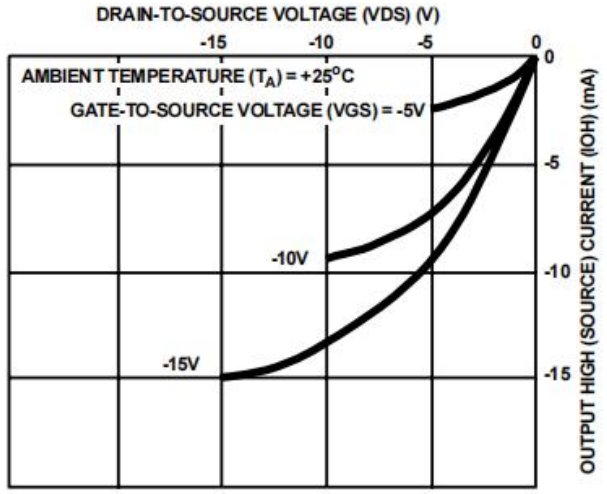


FIGURE 10. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

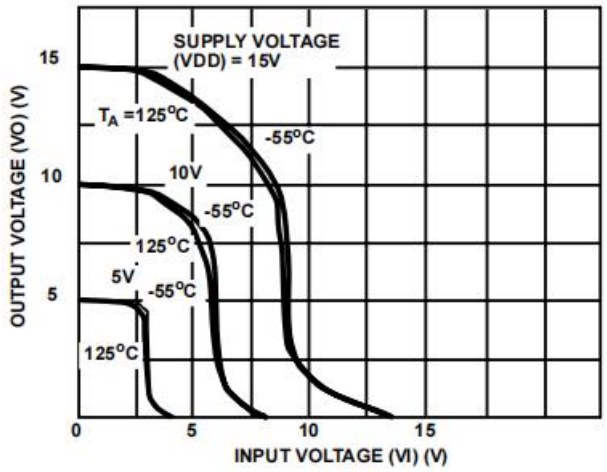


FIGURE 11. TYPICAL VOLTAGE-TRANSFER CHARACTERISTICS AS A FUNCTION OF TEMPERATURE

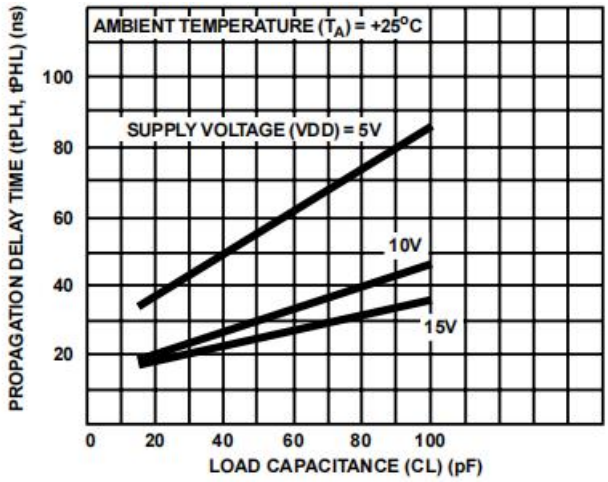


FIGURE 12. TYPICAL PROPAGATION DELAY TIME vs LOAD CAPACITANCE

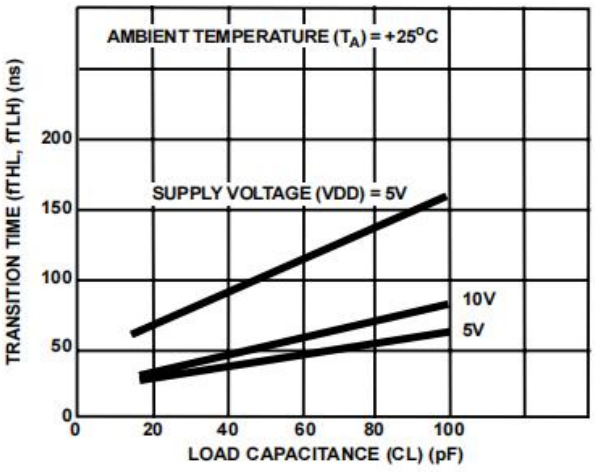


FIGURE 13. TYPICAL TRANSISTION TIME vs LOAD CAPACITANCE

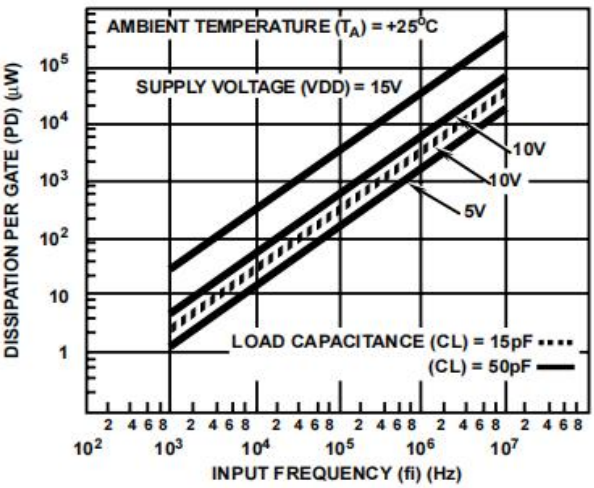
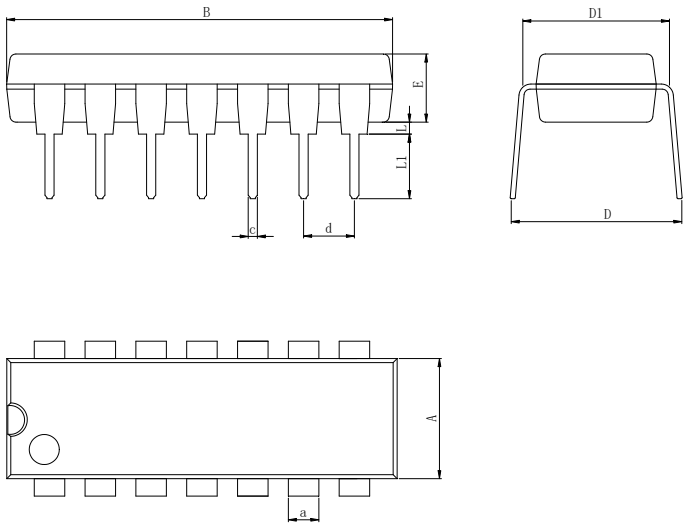


FIGURE 14. TYPICAL DISSIPATION vs FREQUENCY CHARACTERISTICS

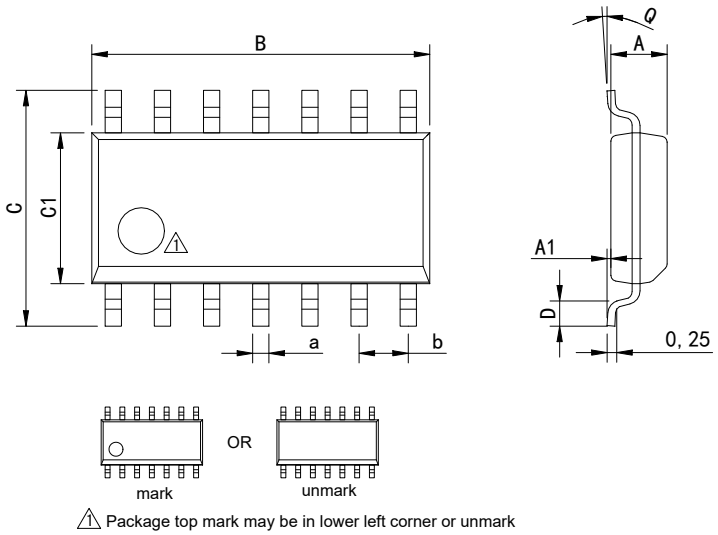
Physical Dimensions

DIP-14



Dimensions In Millimeters(DIP-14)										
Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.50	

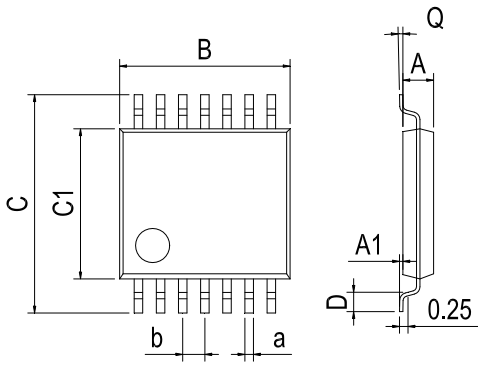
SOP-14



Dimensions In Millimeters(SOP-14)									
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

TSSOP-14



Dimensions In Millimeters(TSSOP-14)									
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	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2014-6-	New	1-13
V1.1	2017-11	Updated DIP-14 dimension、Add annotation for Maximum Ratings、Update DIP Package New Model	3、10
V1.2	2020-5	Update encapsulation type	1
V1.3	2024-11	Update Lead Temperature	3
V1.4	2025-11	Update important statements、Update SOP-14 Dimension drawing	10、13

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