# 3 A Dual High-Speed **MOSFET Drivers**

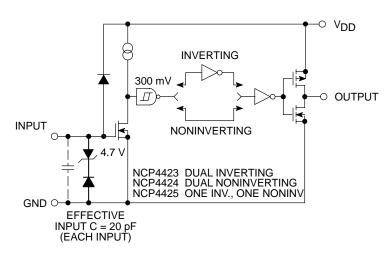
The NCP4423/4424/4425 are MOSFET drivers that are capable of giving reliable service in demanding electrical environments.

Although primarily intended for driving power MOSFETs, these drivers are well-suited for driving other loads (capacitive, resistive, or inductive) which require a low impedance driver capable of high peak currents and fast switching times. Applications such as heavily loaded clock lines, coaxial cables, or piezoelectric transducers can all be driven with the NCP4423/4424/4425. The only known limitation on loading is that the total power dissipated of the driver must be kept within the maximum power dissipation limits of the package.

#### **Features**

- High Peak Output Current (3 A)
- Wide Operating Range (4.5 V to 18 V)
- High Capacitive Load Drive Capability (1800 pF in 25 nsec)
- Short Delay Times (<40 nsec Typ)
- Matched Rise/Fall Times
- Low Supply Current With Logic "1" Input (3.5 mA) With Logic "0" Input (350 µA)
- Low Output Impedance (3.5 Ω Typ)
- Latch-Up Protected: Will Withstand 1.5 A Reverse Current
- Logic Input Will Withstand Negative Swing Up to 5 V
- ESD Protected (4 kV)

#### **FUNCTIONAL BLOCK DIAGRAM**



- 1. NCP4425 has one inverting and one noninverting driver.
- 2. Ground any unused driver input.



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SO-16 **DW SUFFIX CASE 751G** 





PDIP-8 **P SUFFIX CASE 626** 



= Device Number (3, 4, or 5)

= Year

WW = Work Week

= Assembly ID Code

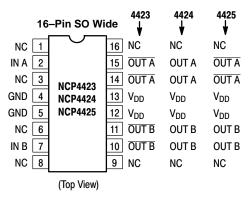
= Subcontractor ID Code

CO = Country of Origin

#### **ORDERING INFORMATION**

Package	Shipping
SO-16	1000 Tape & Reel
SO-16	1000 Tape & Reel
SO-16	1000 Tape & Reel
PDIP-8	50 Units/Rail
PDIP-8	50 Units/Rail
PDIP-8	50 Units/Rail
	SO-16 SO-16 SO-16 PDIP-8 PDIP-8

#### **PIN CONNECTIONS**



NC = NO CONNECTION

**NOTE:** Duplicate pins must **both** be connected for proper operation.

### **ABSOLUTE MAXIMUM RATINGS**

Rating	Value	Unit
Supply Voltage	+22	V
Input Voltage, IN A or IN B (V <sub>DD</sub> + 0.3 V to GND – 5.0 V)	-5	V
Maximum Chip Temperature	+150	°C
Storage Temperature Range, T <sub>stg</sub>	-65 to +150	°C
Lead Temperature (Soldering, 10 sec)	+300	°C
Package Thermal Resistance SOIC, $R_{\theta JA}$ PDIP, $R_{\theta JA}$ PDIP, $R_{\theta JC}$	155 –125 –45	°C/W
Operating Temperature Range	-40 to +85	°C
Package Power Dissipation ( $T_A \le 70^{\circ}C$ ) SOIC PDIP	470 730	mW mc

# **ELECTRICAL CHARACTERISTICS** ( $T_A$ = +25°C with 4.5 V $\leq$ V<sub>DD</sub> $\leq$ 18 V, unless otherwise specified.)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Input						
Logic 1 High Input Voltage	V <sub>OH</sub>	_	2.4	-	-	V
Logic 0 Low Input Voltage	V <sub>IL</sub>	-	-	_	0.8	V
Input Current	I <sub>IN</sub>	$0 \text{ V} \leq \text{V}_{\text{IN}} \leq \text{V}_{\text{DD}}$	-1.0	_	1.0	μΑ
Output	·					
High Output Voltage	V <sub>OH</sub>	_	V <sub>DD</sub> -0.025	_	-	V
Low Output Voltage	V <sub>OL</sub>	-	-	-	0.025	V
Output Resistance, High	R <sub>OH</sub>	I <sub>OUT</sub> = 10 mA, V <sub>DD</sub> = 18 V	-	2.8	5.0	Ω
Output Resistance, Low	R <sub>OL</sub>	I <sub>OUT</sub> = 10 mA, V <sub>DD</sub> = 18 V	-	3.5	5.0	Ω
Peak Output Current	I <sub>PK</sub>	-	-	3.0	-	Α
Latch–Up Protection Withstand Reverse Current	I <sub>REV</sub>	Duty Cycle ≤ 2% t ≤ 300 μs	1.5	-	-	А
Switching Time (Note 1.)						
Rise Time	t <sub>R</sub>	Figure 1, C <sub>L</sub> = 1800 pF	-	23	35	nsec
Fall Time	t <sub>F</sub>	Figure 1, C <sub>L</sub> = 1800 pF	-	25	35	nsec
Delay Time 1	t <sub>D1</sub>	Figure 1, C <sub>L</sub> = 1800 pF	-	33	75	nsec
Delay Time 2	t <sub>D2</sub>	Figure 1, C <sub>L</sub> = 1800 pF	-	38	75	nsec
Power Supply						
Power Supply Current	Is	V <sub>IN</sub> = 3.0 V (Both Inputs) V <sub>IN</sub> = 0 V (Both Inputs)		1.5 0.15	2.5 0.25	mA

<sup>1.</sup> Switching times guaranteed by design.

**ELECTRICAL CHARACTERISTICS** (Over operating temperature range with 4.5 V  $\leq$  V<sub>DD</sub>  $\leq$  18 V, unless otherwise specified.)

Characteristic	Symbol	Test Conditions	Min	Тур	Max	Unit
Input						
Logic 1 High Input Voltage	V <sub>IH</sub>	-	2.4	-	_	V
Logic 0 Low Input Voltage	V <sub>IL</sub>	-	_	-	0.8	V
Input Current	I <sub>IN</sub>	$0 \text{ V} \leq \text{V}_{\text{IN}} \leq \text{V}_{\text{DD}}$	-10	-	10	μΑ
Output						
High Output Voltage	V <sub>OH</sub>	-	V <sub>DD</sub> -0.025	-	_	V
Low Output Voltage	V <sub>OL</sub>	-	-	-	0.025	V
Output Resistance, High	R <sub>O</sub>	I <sub>OUT</sub> = 10 mA, V <sub>DD</sub> = 18 V	-	3.7	8.0	Ω
Output Resistance, Low	R <sub>O</sub>	I <sub>OUT</sub> = 10 mA, V <sub>DD</sub> = 18 V	-	4.3	8.0	Ω
Peak Output Current	I <sub>PK</sub>	-	-	3.0	_	А
Latch–Up Protection Withstand Reverse Current	I <sub>REV</sub>	Duty Cycle ≤ 2% t ≤ 300 μsec	1.5	-	-	А
Switching Time (Note 1.)						
Rise Time	t <sub>R</sub>	Figure 1, C <sub>L</sub> = 1800 pF	_	28	60	nsec
Fall Time	t <sub>F</sub>	Figure 1, C <sub>L</sub> = 1800 pF	_	32	60	nsec
Delay Time 1	t <sub>D1</sub>	Figure 1, C <sub>L</sub> = 1800 pF	_	32	100	nsec
Delay Time 2	t <sub>D2</sub>	Figure 1, C <sub>L</sub> = 1800 pF	_	38	100	nsec
Power Supply						
Power Supply Current	Is	V <sub>IN</sub> = 3.0 V (Both Inputs) V <sub>IN</sub> = 0 V (Both Inputs)		2.0 0.2	3.5 0.3	mA

<sup>1.</sup> Switching times guaranteed by design.

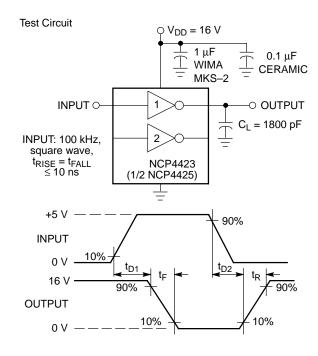


Figure 1. Inverting Driver Switching Time

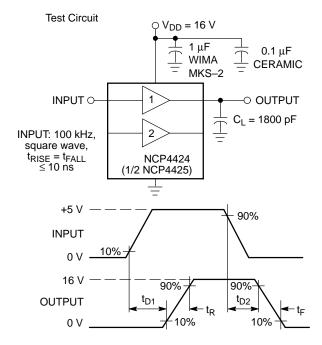
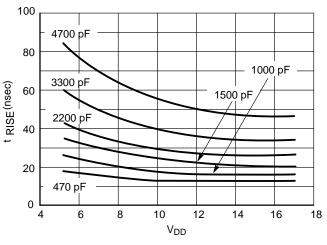


Figure 2. Noninverting Driver Switching Time

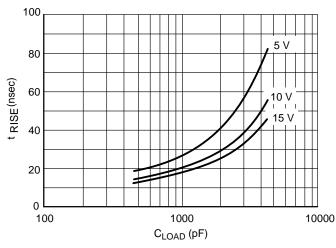
#### TYPICAL ELECTRICAL CHARACTERISTICS



100 4700 pF 80 1000 pF 3300 pF t FALL (nsec) 1500 pF 60 2200 pF 40 20 470 pF 0 6 4 8 10 12 16 18  $V_{DD}$ 

Figure 3. Rise Time vs. Supply Voltage

Figure 4. Fall Time vs. Supply Voltage



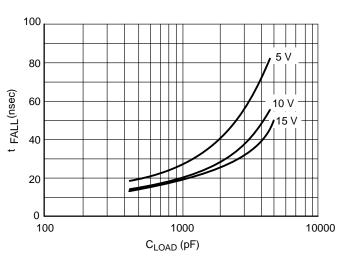
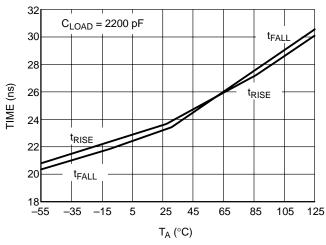


Figure 5. Rise Time vs. Capacitive Load

Figure 6. Fall Time vs. Capacitive Load



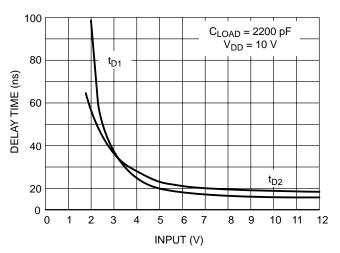


Figure 7. Rise and Fall Times vs. Temperature

Figure 8. Propagation Delay vs. Input Amplitude

### TYPICAL ELECTRICAL CHARACTERISTICS

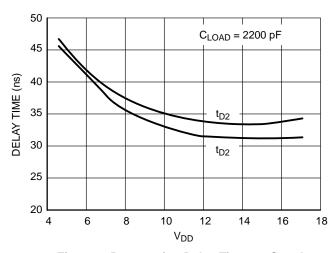


Figure 9. Propagation Delay Time vs. Supply Voltage

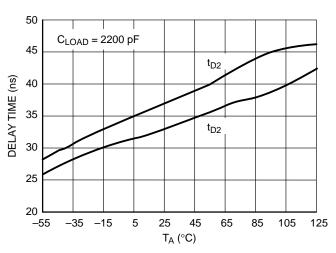


Figure 10. Delay Time vs. Temperature

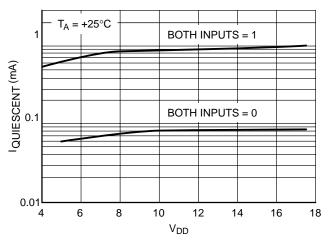


Figure 11. Quiescent Current vs. Supply Voltage

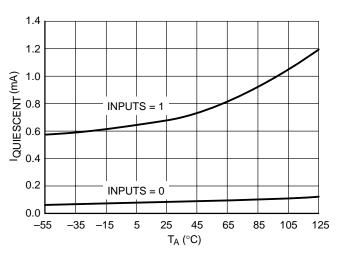


Figure 12. Quiescent Current vs. Temperature

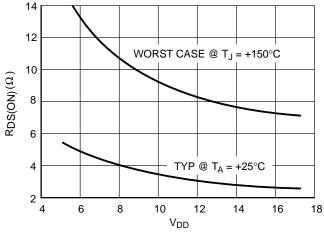


Figure 13. Output Resistance (Output High) vs. Supply Voltage

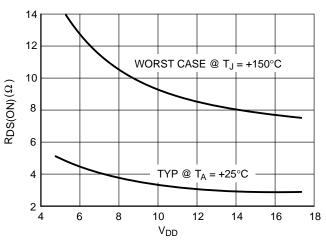


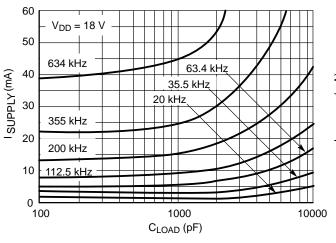
Figure 14. Output Resistance (Output Low) vs. Supply Voltage

#### TYPICAL ELECTRICAL CHARACTERISTICS

60

50

V<sub>DD</sub> = 18 V



40 30 10,000 pF 10 10 100 100 100

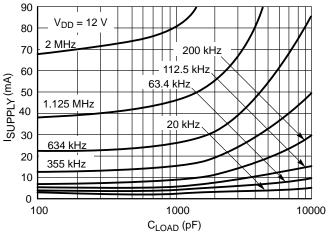
Figure 15. Supply Current vs. Capacitive Load

FREQUENCY (kHz)

Figure 16. Supply Current vs. Frequency

3300 pF

1000 pF



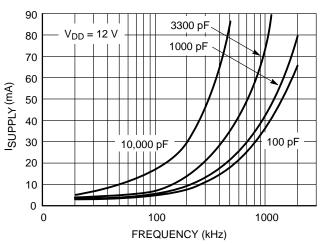
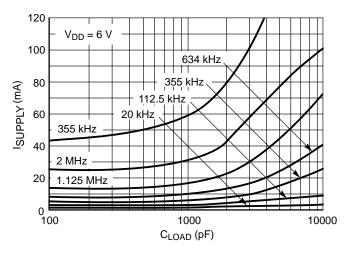


Figure 17. Supply Current vs. Capacitive Load

Figure 18. Supply Current vs. Frequency



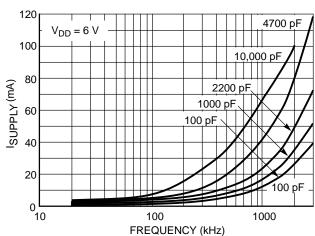


Figure 19. Supply Current vs. Capacitive Load

Figure 20. Supply Current vs. Frequency

#### TYPICAL ELECTRICAL CHARACTERISTICS

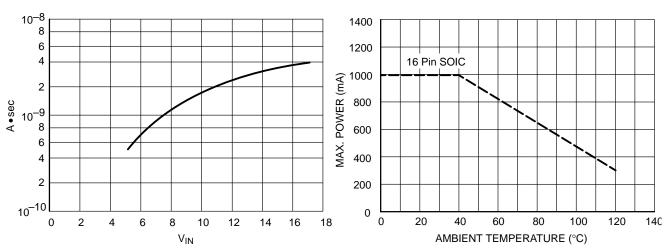


Figure 21. NCP4423 Crossover Energy

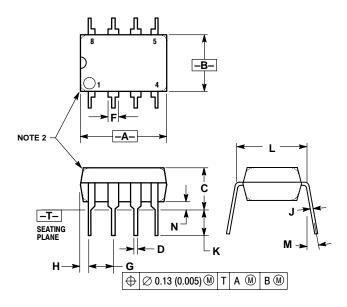
NOTE: The values on this graph represent the loss seen by both drivers in a package during one complete cycle. For a single driver, divide the stated values by 2. For a single transition of a single driver, divide the stated value by 4.

Static—sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. Stresses above those listed under Absolute Maximum Ratings (See page 2) may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

Figure 22. Thermal Derating Curves

### **PACKAGE DIMENSIONS**

#### PDIP-8 **P SUFFIX** CASE 626-05 ISSUE K

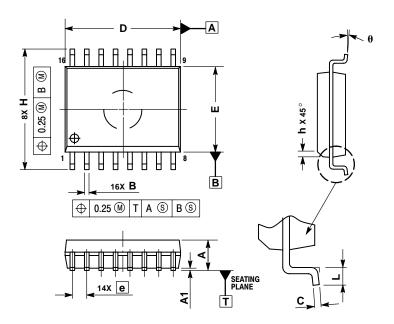


- NOTES:
  1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  2. PACKAGE CONTOUR OPTIONAL (ROUND OR
- SQUARE CORNERS).

  3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	9.40	10.16	0.370	0.400
В	6.10	6.60	0.240	0.260
С	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54	BSC	0.100	BSC
Н	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300	BSC
M		10°		10°
N	0.76	1.01	0.030	0.040

### SO-16 **DW SUFFIX** CASE 751G-03 ISSUE B



#### NOTES:

- NOTES:

  1. DIMENSIONS ARE IN MILLIMETERS.
  2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
  3. DIMENSIONS D AND E DO NOT INLCUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
  5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE R DIMENSION AT MAXIMUM MATERIAL OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS			
DIM	MIN	MAX		
Α	2.35	2.65		
A1	0.10	0.25		
В	0.35	0.49		
С	0.23	0.32		
D	10.15	10.45		
Е	7.40	7.60		
е	1.27 BSC			
Н	10.05	10.55		
h	0.25	0.75		
L	0.50	0.90		
A	0 °	7 °		





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