

## 9A High-Speed MOSFET Drivers

### Features

- Tough CMOS Construction
- High Peak Output Current: 9A
- High Continuous Output Current: 2A Max
- Fast Rise and Fall Times:
  - 30nsec with 4,700pF Load
  - 180nsec with 47,000pF Load
- Short Internal Delays: 30nsec Typ.
- Low Output Impedance: 1.4Ω Typ.

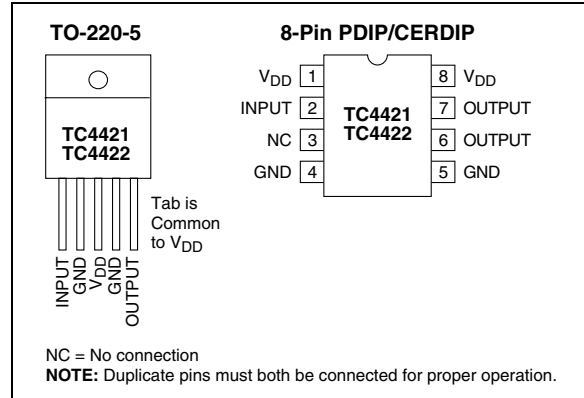
### Applications

- Line Drivers for Extra-Heavily-Loaded Lines
- Pulse Generators
- Driving the Largest MOSFETs and IGBTs
- Local Power ON/OFF Switch
- Motor and Solenoid Driver

### Device Selection Table

Part Number	Package	Temp. Range
TC4421CAT	5-Pin TO-220	0°C to +70°C
TC4421CPA	8-Pin PDIP	0°C to +70°C
TC4421EPA	8-Pin PDIP	-40°C to +85°C
TC4421MJA	8-Pin Cerdip	-55°C to +125°C
TC4422CAT	5-Pin TO-220	0°C to +70°C
TC4422CPA	8-Pin PDIP	0°C to +70°C
TC4422EPA	8-Pin PDIP	-40°C to +85°C
TC4422MJA	8-Pin Cerdip	-55°C to +125°C

### Package Type



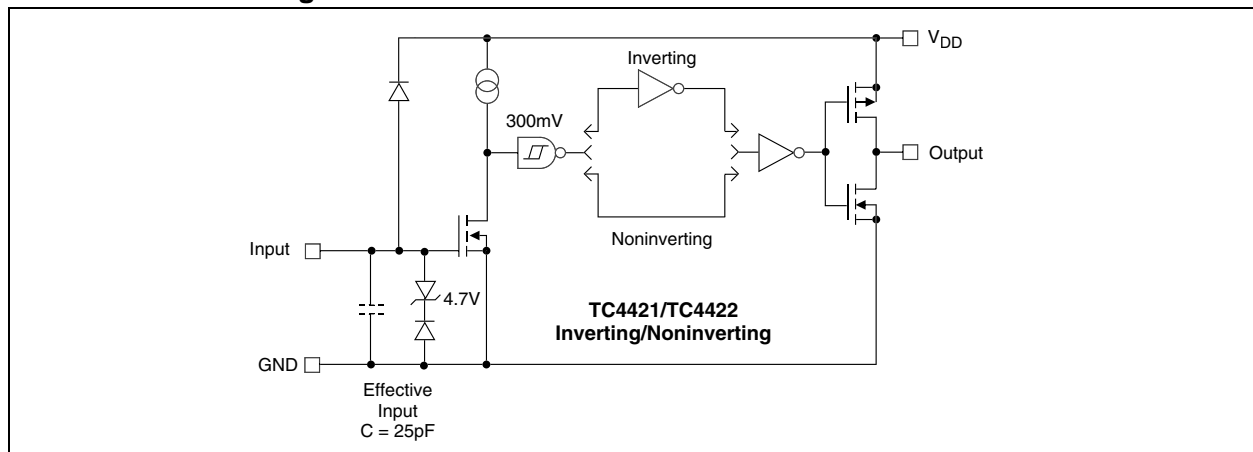
### General Description

The TC4421/TC4422 are high current buffer/drivers capable of driving large MOSFETs and IGBTs.

They are essentially immune to any form of upset except direct overvoltage or over-dissipation – they cannot be latched under any conditions within their power and voltage ratings; they are not subject to damage or improper operation when up to 5V of ground bounce is present on their ground terminals; they can accept, without either damage or logic upset, more than 1A inductive current of either polarity being forced back into their outputs. In addition, all terminals are fully protected against up to 4kV of electrostatic discharge.

The TC4421/TC4422 inputs may be driven directly from either TTL or CMOS (3V to 18V). In addition, 300mV of hysteresis is built into the input, providing noise immunity and allowing the device to be driven from slowly rising or falling waveforms.

### Functional Block Diagram



# TC4421/TC4422

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings\*

Supply Voltage .....	+20V
Input Voltage .....	( $V_{DD} + 0.3V$ ) to (GND – 5V)
Input Current ( $V_{IN} > V_{DD}$ ) .....	50mA
Package Power Dissipation ( $T_A \leq 70^\circ C$ )	
PDIP .....	730mW
CERDIP .....	800mW
5-Pin TO-220 .....	1.6W
Package Power Dissipation ( $T_A \leq 25^\circ C$ )	
5-Pin TO-220 (With Heatsink) .....	12.5W
Derating Factors (To Ambient)	
PDIP .....	8mW/ $^\circ C$
CERDIP .....	6.4mW/ $^\circ C$
5-Pin TO-220 .....	12mW/ $^\circ C$
Thermal Impedances (To Case)	
5-Pin TO-220 $R_{\theta J-C}$ .....	10 $^\circ C/W$
Operating Temperature Range (Ambient)	
C Version .....	0 $^\circ C$ to +70 $^\circ C$
E Version .....	-40 $^\circ C$ to +85 $^\circ C$
M Version .....	-55 $^\circ C$ to +125 $^\circ C$
Storage Temperature Range .....	-65 $^\circ C$ to +150 $^\circ C$

\*Stresses above those listed under "Absolute Maximum Ratings" 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 operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

### TC4421/TC4422 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: $T_A = +25^\circ C$ , with $4.5V \leq V_{DD} \leq 18V$ , unless otherwise noted.						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
<b>Input</b>						
$V_{IH}$	Logic 1, High Input Voltage	2.4	1.8	—	V	
$V_{IL}$	Logic 0, Low Input Voltage	—	1.3	0.8	V	
$I_{IN}$	Input Current	-10	—	10	$\mu A$	$0V \leq V_{IN} \leq V_{DD}$
<b>Output</b>						
$V_{OH}$	High Output Voltage	$V_{DD} - 0.025$	—	—	V	Figure 3-1
$V_{OL}$	Low Output Voltage	—	—	0.025	V	Figure 3-1
$R_O$	Output Resistance, High	—	1.4	—	$\Omega$	$I_{OUT} = 10mA$ , $V_{DD} = 18V$
$R_O$	Output Resistance, Low	—	0.9	1.7	$\Omega$	$I_{OUT} = 10mA$ , $V_{DD} = 18V$
$I_{PK}$	Peak Output Current	—	9	—	A	$V_{DD} = 18V$
$I_{DC}$	Continuous Output Current	2	—	—	A	$10V \leq V_{DD} \leq 18V$ , $T_A = +25^\circ C$ (TC4421/TC4422 CAT only)
$I_{REV}$	Latch-Up Protection Withstand Reverse Current	—	>1.5	—	A	Duty cycle $\leq 2\%$ , $t \leq 300\mu sec$
<b>Switching Time (Note 1)</b>						
$t_R$	Rise Time	—	60	75	nsec	Figure 3-1, $C_L = 10,000pF$
$t_F$	Fall Time	—	60	75	nsec	Figure 3-1, $C_L = 10,000pF$
$t_{D1}$	Delay Time	—	30	60	nsec	Figure 3-1
$t_{D2}$	Delay Time	—	33	60	nsec	Figure 3-1

**Note 1:** Switching times ensured by design.

## TC4421/TC4422 ELECTRICAL SPECIFICATIONS (CONTINUED)

Electrical Characteristics: $T_A = +25^\circ\text{C}$ , with $4.5\text{V} \leq V_{DD} \leq 18\text{V}$ , unless otherwise noted.						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
<b>Power Supply</b>						
$I_S$	Power Supply Current	—	0.2	1.5	mA	$V_{IN} = 3\text{V}$
		—	55	150	$\mu\text{A}$	$V_{IN} = 0\text{V}$
$V_{DD}$	Operating Input Voltage	4.5	—	18	V	
<b>Electrical Characteristics: Over operating temperature range with <math>4.5\text{V} \leq V_{DD} \leq 18\text{V}</math>, unless otherwise noted.</b>						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
<b>Input</b>						
$V_{IH}$	Logic 1, High Input Voltage	2.4	—	—	V	
$V_{IL}$	Logic 0, Low Input Voltage	—	—	0.8	V	
$I_{IN}$	Input Current	-10	—	10	$\mu\text{A}$	$0\text{V} \leq V_{IN} \leq V_{DD}$
<b>Output</b>						
$V_{OH}$	High Output Voltage	$V_{DD} - 0.025$	—	—	V	Figure 3-1
$V_{OL}$	Low Output Voltage	—	—	0.025	V	Figure 3-1
$R_O$	Output Resistance, High	—	2.4	3.6	$\Omega$	$I_{OUT} = 10\text{mA}$ , $V_{DD} = 18\text{V}$
$R_O$	Output Resistance, Low	—	1.8	2.7	$\Omega$	$I_{OUT} = 10\text{mA}$ , $V_{DD} = 18\text{V}$
<b>Switching Time (Note 1)</b>						
$t_R$	Rise Time	—	60	120	nsec	Figure 3-1, $C_L = 10,000\text{pF}$
$t_F$	Fall Time	—	60	120	nsec	Figure 3-1, $C_L = 10,000\text{pF}$
$t_{D1}$	Delay Time	—	50	80	nsec	Figure 3-1
$t_{D2}$	Delay Time	—	65	80	nsec	Figure 3-1
<b>Power Supply</b>						
$I_S$	Power Supply Current	—	0.45	3	mA	$V_{IN} = 3\text{V}$
		—	0.06	0.2		$V_{IN} = 0\text{V}$
$V_{DD}$	Operating Input Voltage	4.5	—	18	V	

**Note 1:** Switching times ensured by design.

# TC4421/TC4422

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## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

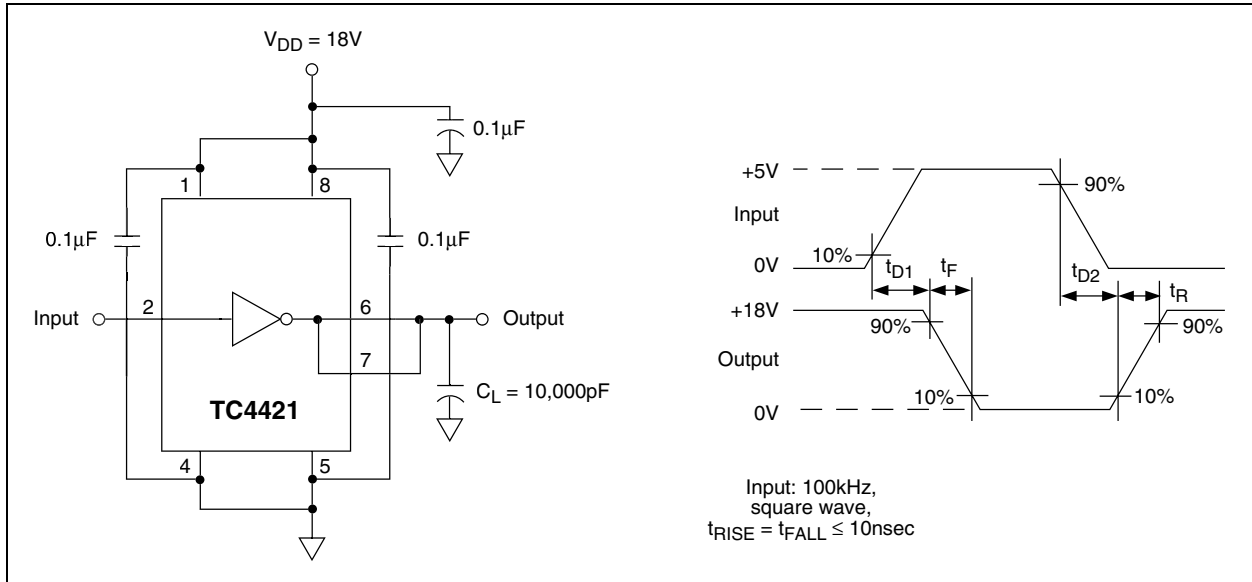
**TABLE 2-1: PIN FUNCTION TABLE**

Pin No. (8-Pin PDIP, CERDIP)	Symbol	Description
1	$V_{DD}$	Supply input, 4.5V to 18V.
2	INPUT	Control input, TTL/CMOS compatible input.
3	NC	No Connection.
4	GND	Ground.
5	GND	Ground.
6	OUTPUT	CMOS totem pole output.
7	OUTPUT	CMOS totem pole output.
8	$V_{DD}$	Supply input, 4.5V to 18V.

Pin No. (5-Pin TO-220)	Symbol	Description
1	INPUT	Control input, TTL/CMOS compatible input.
2	GND	Ground.
3	$V_{DD}$	Supply input, 4.5V to 18V.
4	GND	Ground
5	OUTPUT	CMOS totem pole output.

## 3.0 APPLICATIONS INFORMATION

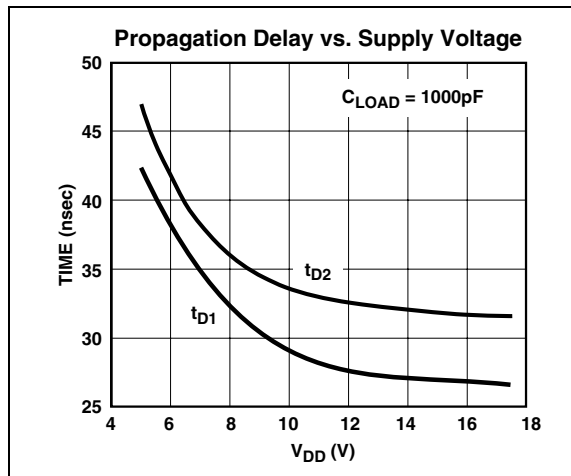
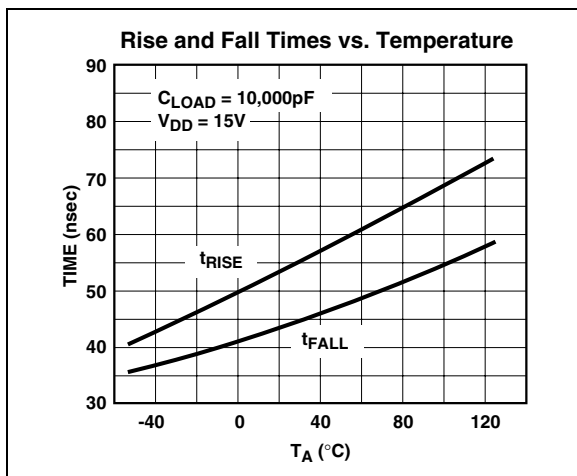
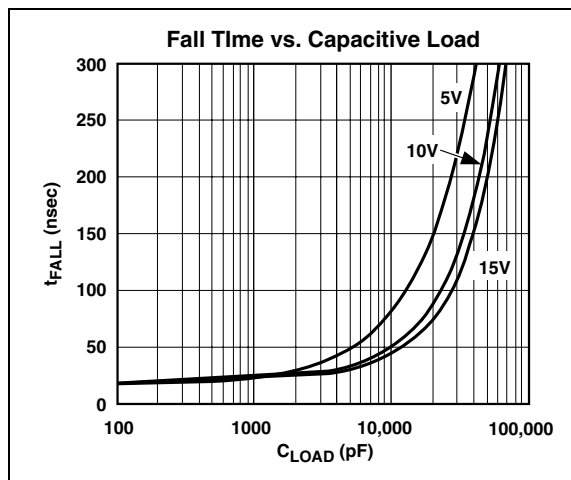
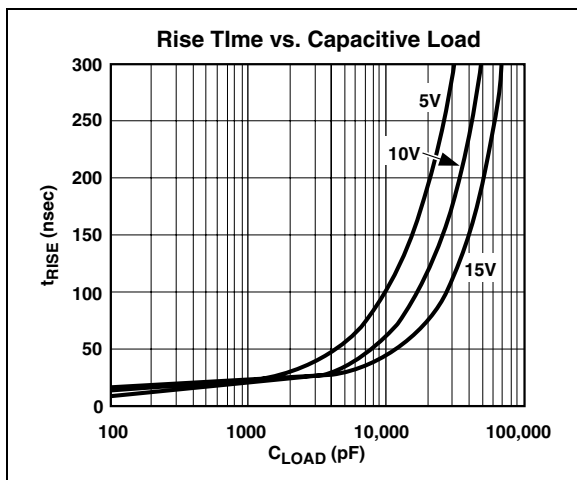
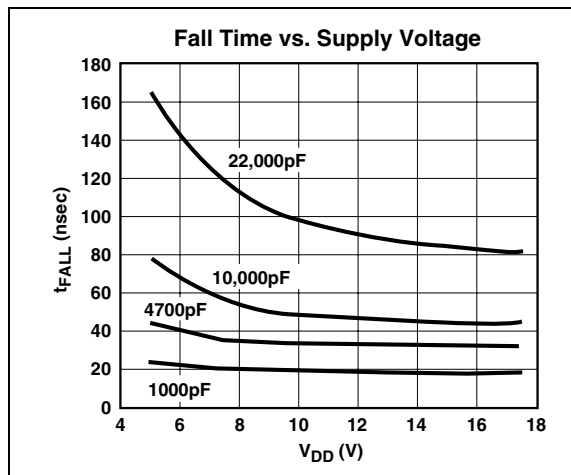
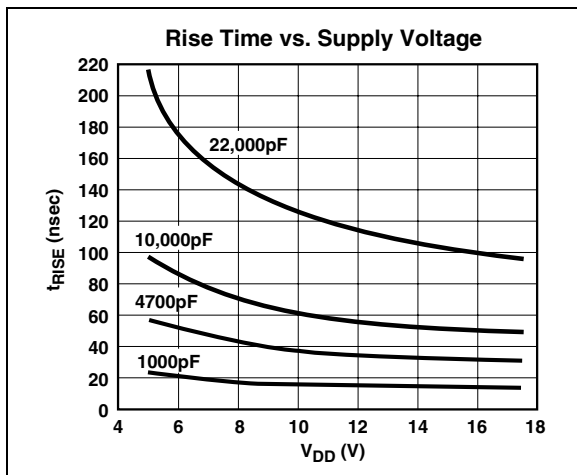
**FIGURE 3-1: SWITCHING TIME TEST CIRCUITS**



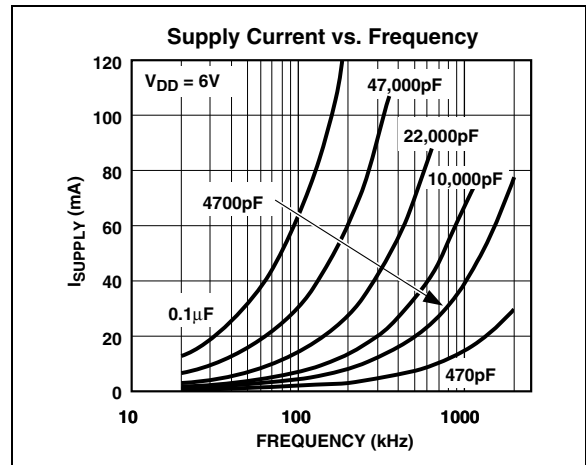
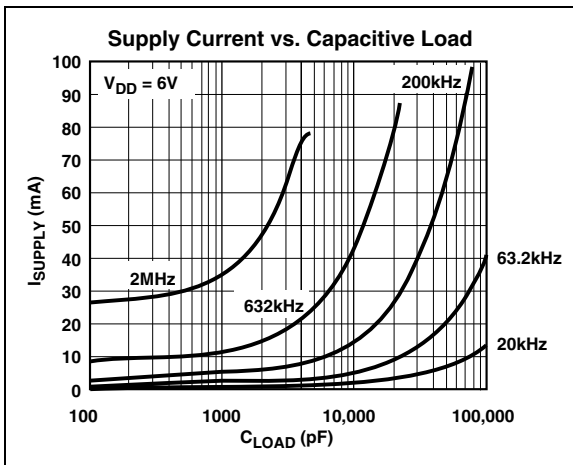
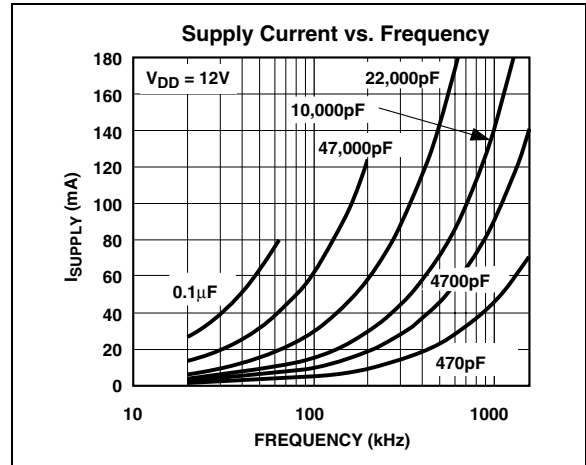
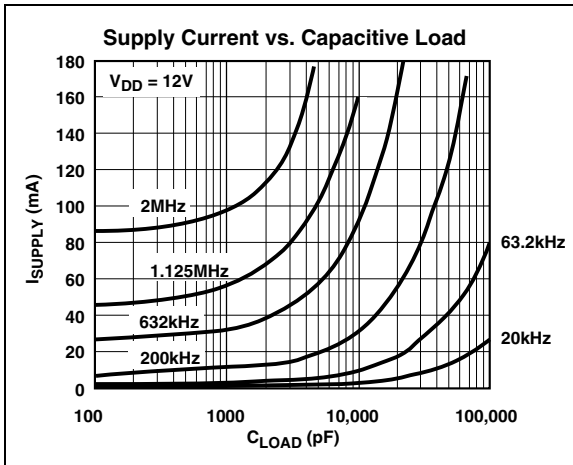
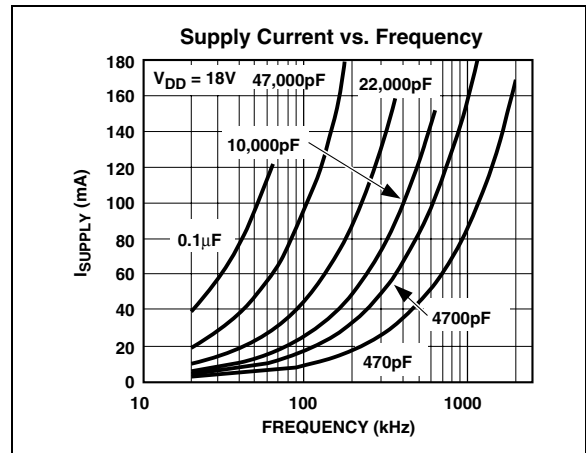
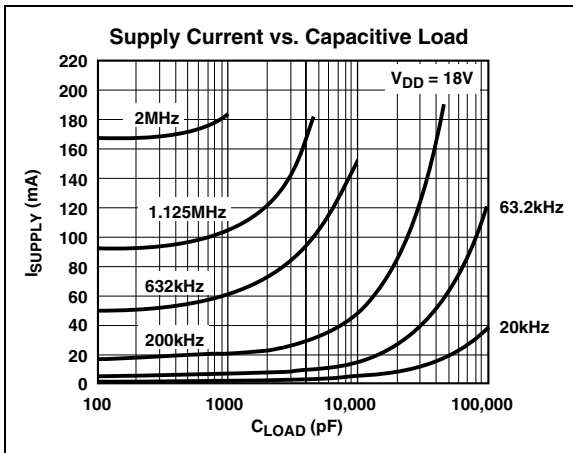
# TC4421/TC4422

## 4.0 TYPICAL CHARACTERISTICS

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

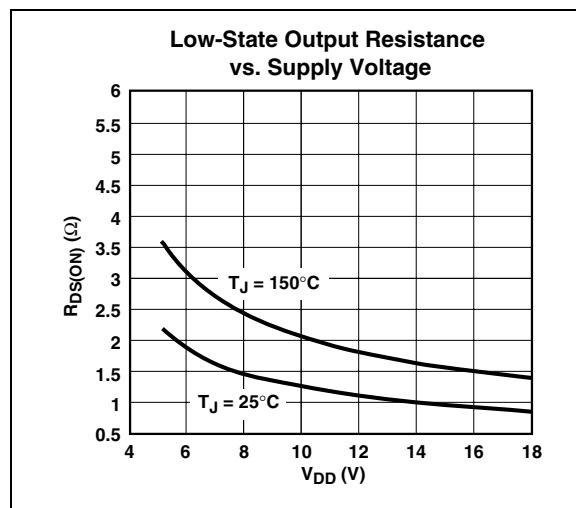
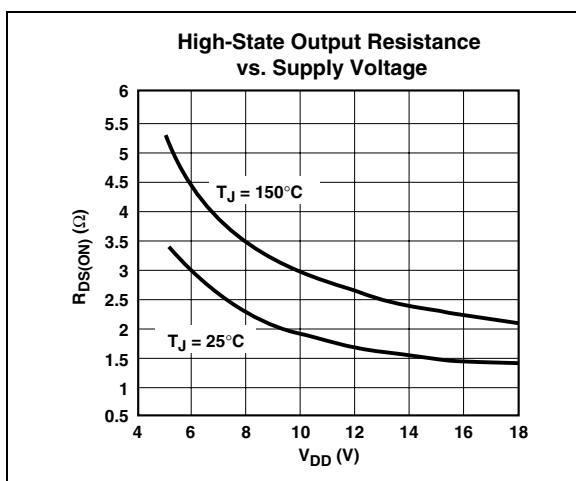
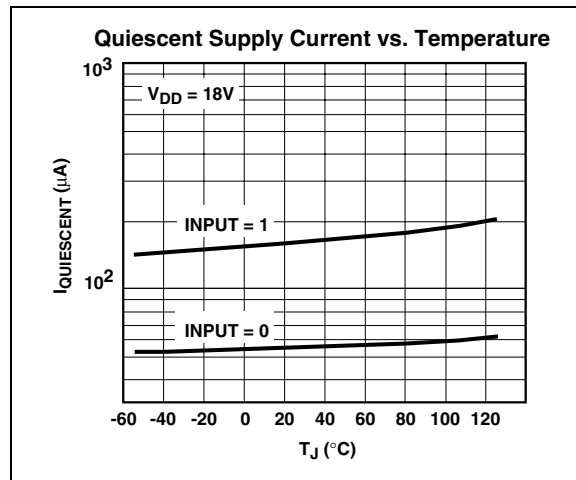
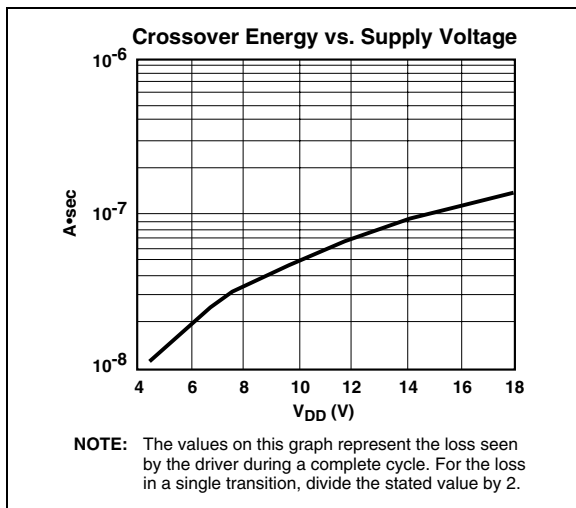
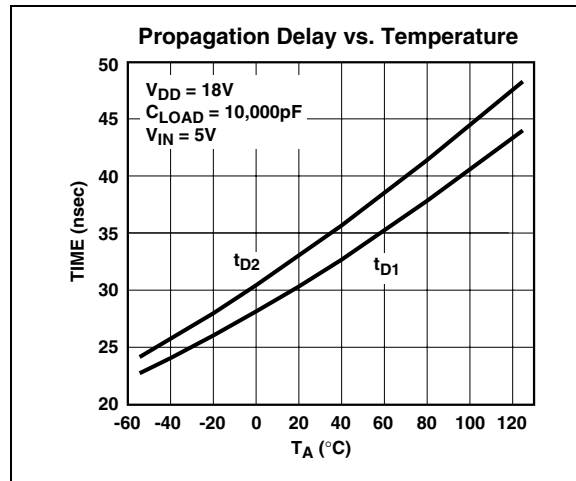
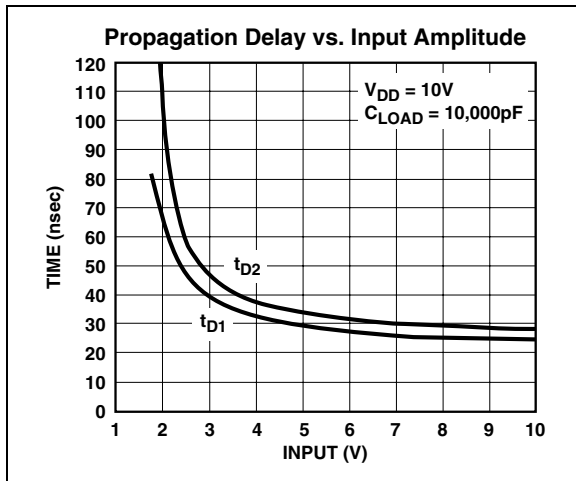


## TYPICAL CHARACTERISTICS (CONTINUED)



# TC4421/TC4422

## TYPICAL CHARACTERISTICS (CONTINUED)



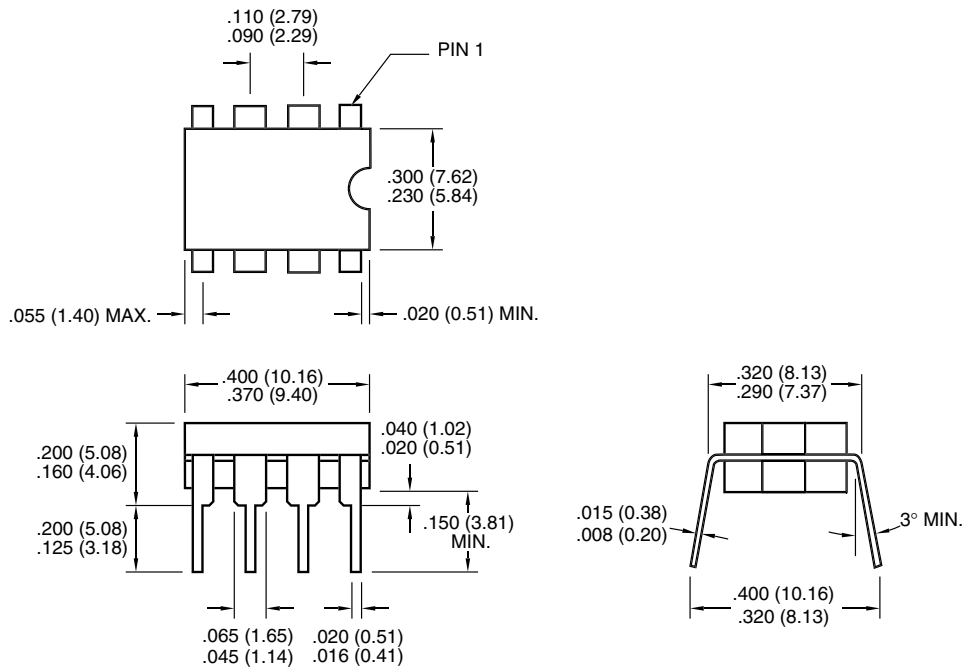




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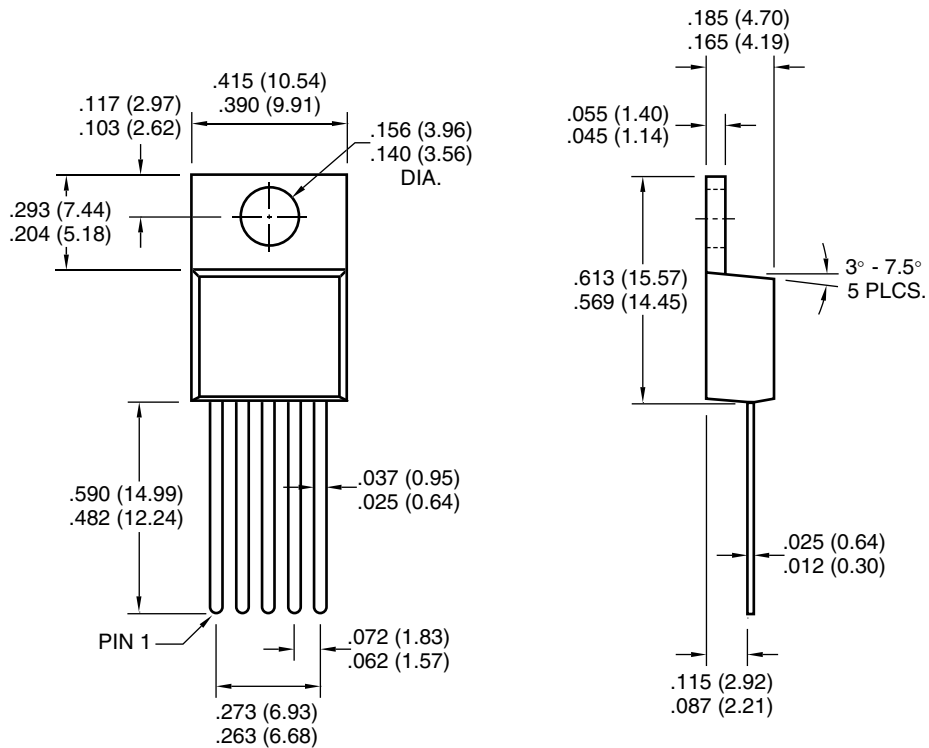
## Package Dimensions (Continued)

### 8-Pin Cerdip (Narrow)



Dimensions: inches (mm)

### 5-Pin TO-220



Dimensions: inches (mm)

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# TC4421/TC4422

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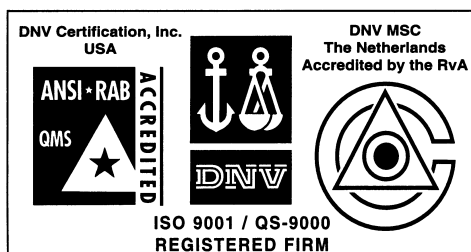
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