TC4421/TC4422

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.

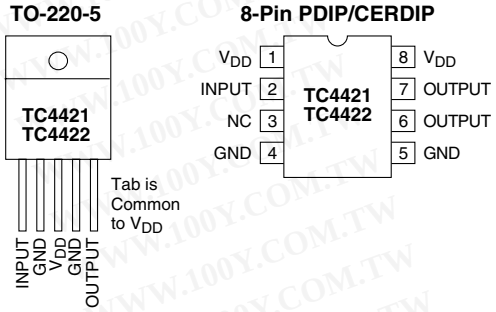
Applications

- 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



NC = No connection
NOTE: Duplicate pins must both be connected for proper operation.

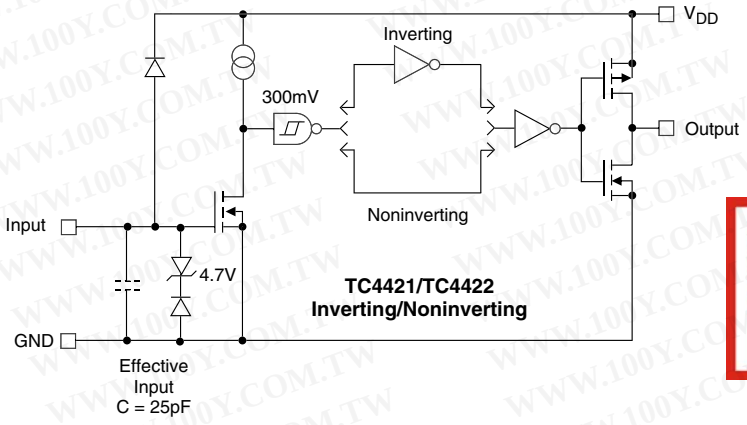
General Description

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



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 ($T_A \leq 70°C$)
- PDIP 730mW
- CERDIP 800mW
- 5-Pin TO-220 ..... 1.6W

Package Power Dissipation ($T_A \leq 25°C$)
- 5-Pin TO-220 (With Heatsink) 12.5W

Derating Factors (To Ambient)
- PDIP ..... 8mW/°C
- CERDIP ..... 6.4mW/°C
- 5-Pin TO-220 ..... 12mW/°C

Thermal Impedances (To Case)
- 5-Pin TO-220 $R_{\theta J-C}$ ..... 10°C/W

Operating Temperature Range (Ambient)
- C Version ..... 0°C to +70°C
- E Version ..... -40°C to +85°C
- M Version ..... -55°C to +125°C

Storage Temperature Range ..... -65°C to +150°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°C, with 4.5V ≤ V_{DD} ≤ 18V, unless otherwise noted.

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
Input						
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	µA	0V ≤ V_{IN} ≤ V_{DD}
Output						
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	—	Ω	I_{OUT} = 10mA, V_{DD} = 18V
R_O	Output Resistance, Low	—	0.9	1.7	Ω	I_{OUT} = 10mA, V_{DD} = 18V
I_{PK}	Peak Output Current	—	9	—	A	V_{DD} = 18V
I_{DC}	Continuous Output Current	2	—	—	A	10V ≤ V_{DD} ≤ 18V, T_A = +25°C (TC4421/TC4422 CAT only)
I_{REV}	Latch-Up Protection Withstand Reverse Current	—	>1.5	—	A	Duty cycle ≤ 2%, t ≤ 300µsec
Switching Time (Note 1)						
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°C, with 4.5V ≤ V_{DD} ≤ 18V, unless otherwise noted.						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Units**	**Test Conditions**
Power Supply						
I_S	Power Supply Current	— —	0.2 55	1.5 150	mA µA	V_{IN} = 3V V_{IN} = 0V
V_{DD}	Operating Input Voltage	4.5	—	18	V	
Electrical Characteristics: Over operating temperature range with 4.5V ≤ V_{DD} ≤ 18V, unless otherwise noted.						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Units**	**Test Conditions**
Input						
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	µA	0V ≤ V_{IN} ≤ V_{DD}
Output						
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	Ω	I_{OUT} = 10mA, V_{DD} = 18V
R_O	Output Resistance, Low	—	1.8	2.7	Ω	I_{OUT} = 10mA, V_{DD} = 18V
Switching Time (Note 1)						
t_R	Rise Time	—	60	120	nsec	Figure 3-1, C_L = 10,000pF
t_F	Fall Time	—	60	120	nsec	Figure 3-1, C_L = 10,000pF
t_{D1}	Delay Time	—	50	80	nsec	Figure 3-1
t_{D2}	Delay Time	—	65	80	nsec	Figure 3-1
Power Supply						
I_S	Power Supply Current	— —	0.45 0.06	3 0.2	mA	V_{IN} = 3V V_{IN} = 0V
V_{DD}	Operating Input Voltage	4.5	—	18	V	

Note 1: Switching times ensured by design.

2.0 PIN DESCRIPTIONS

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

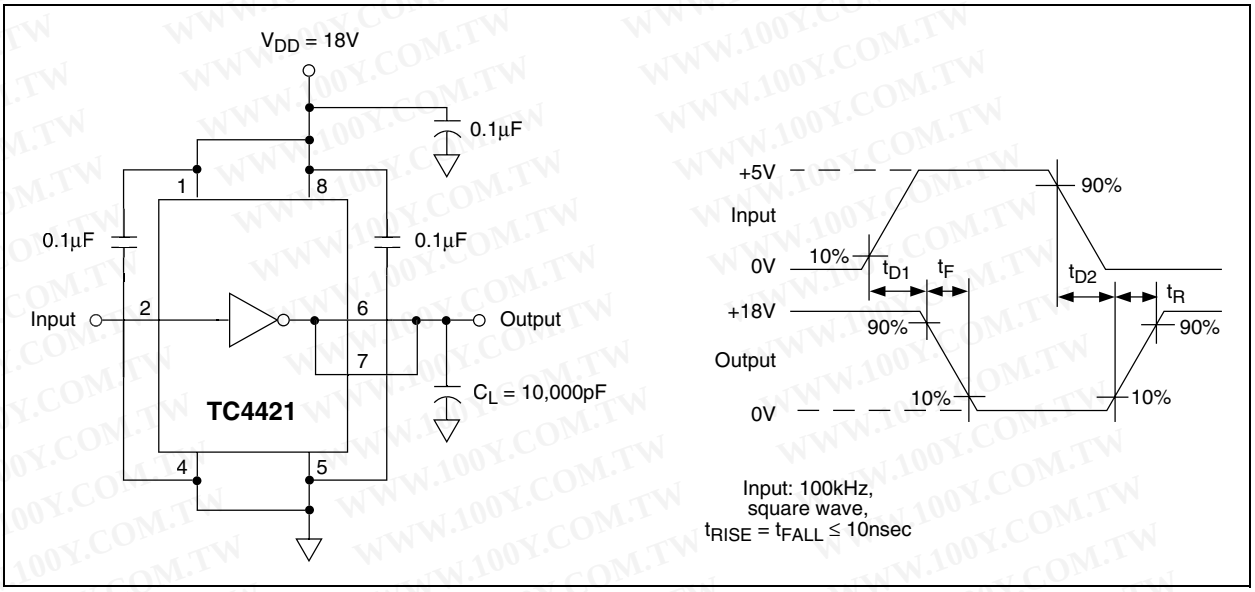
TABLE 2-1: PIN FUNCTION TABLE

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.

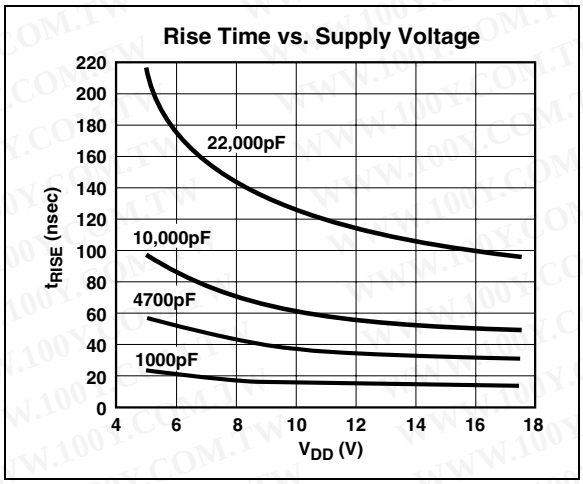
3.0 APPLICATIONS INFORMATION

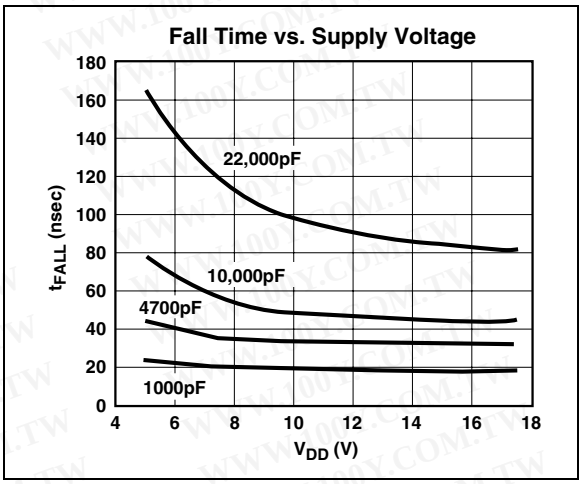
FIGURE 3-1: SWITCHING TIME TEST CIRCUITS

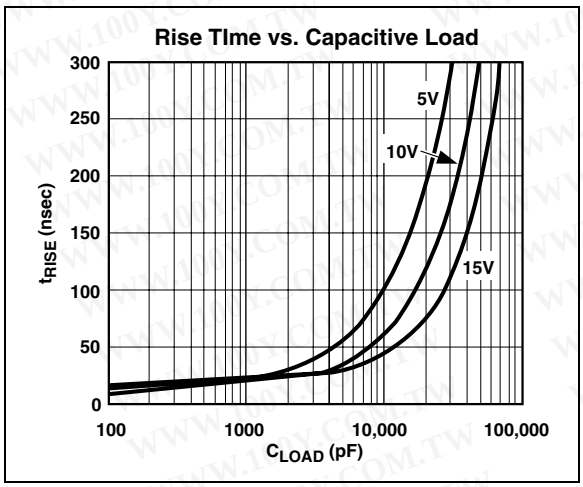


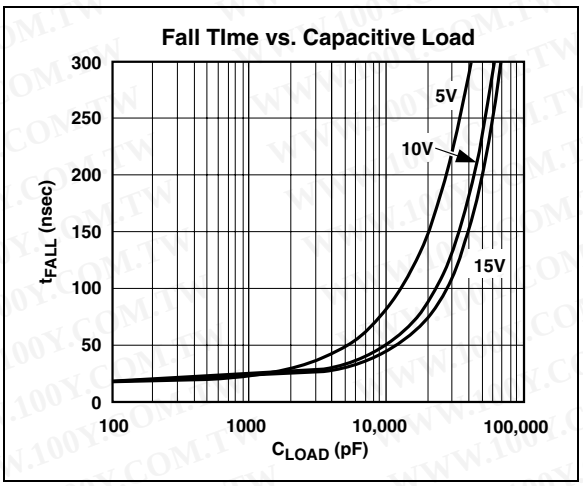
4.0 TYPICAL CHARACTERISTICS

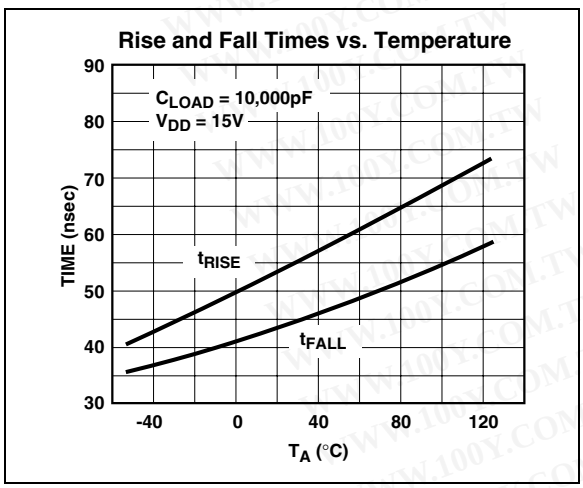
Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside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

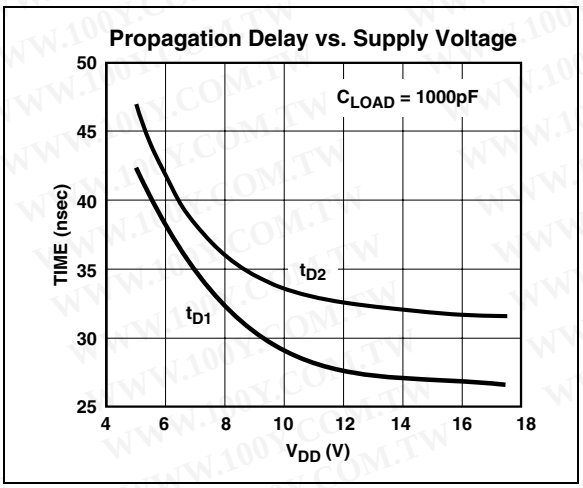




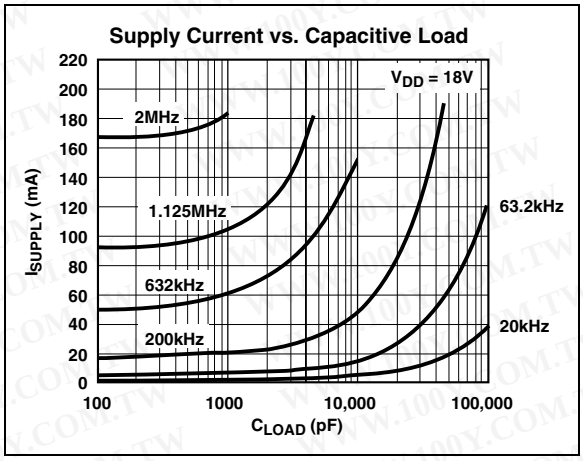


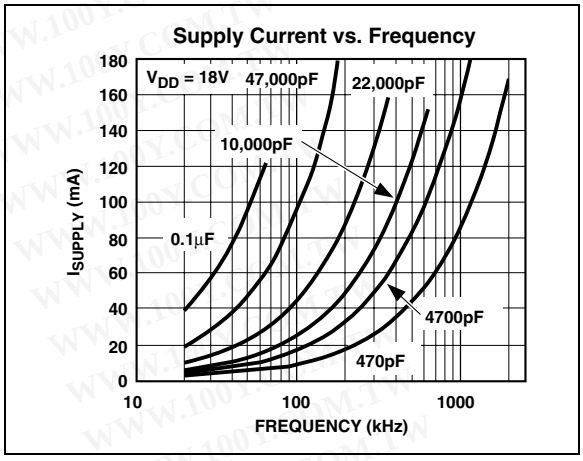


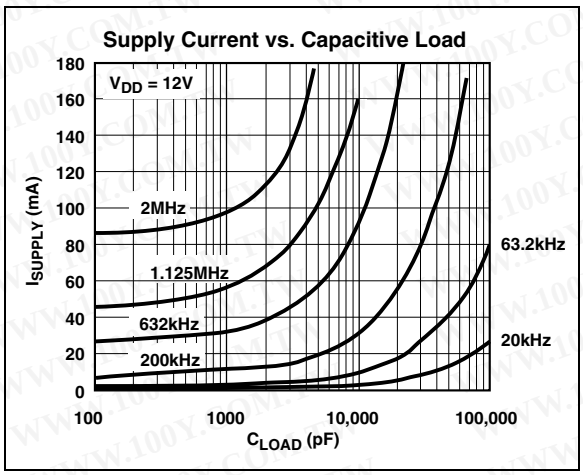


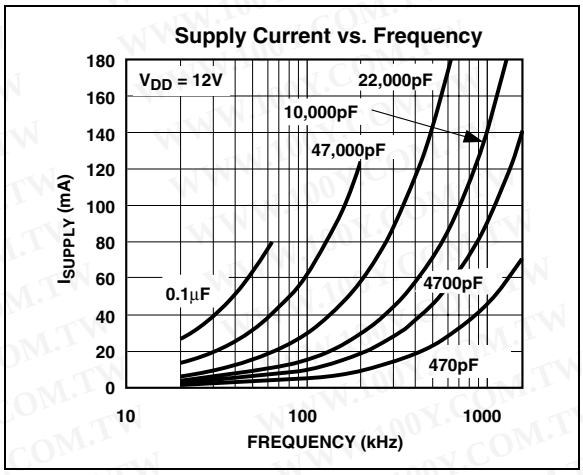


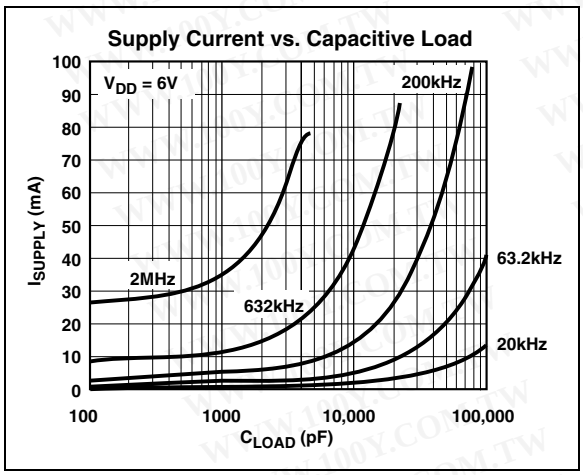
TYPICAL CHARACTERISTICS (CONTINUED)

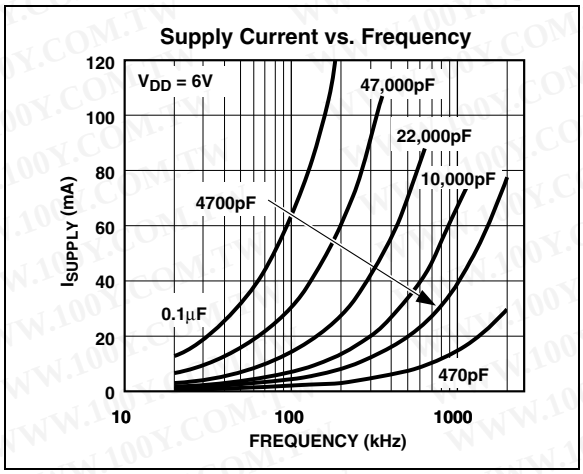




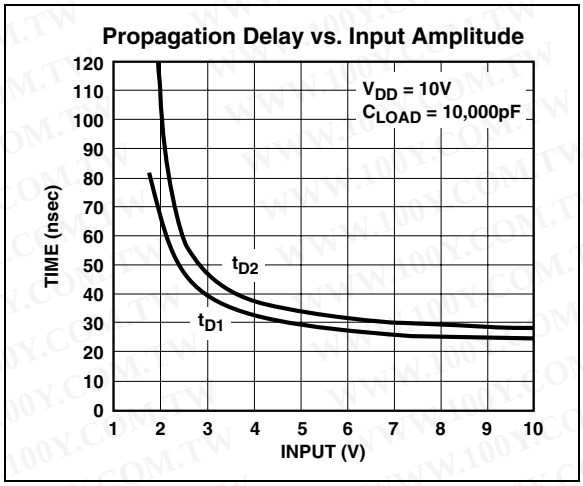


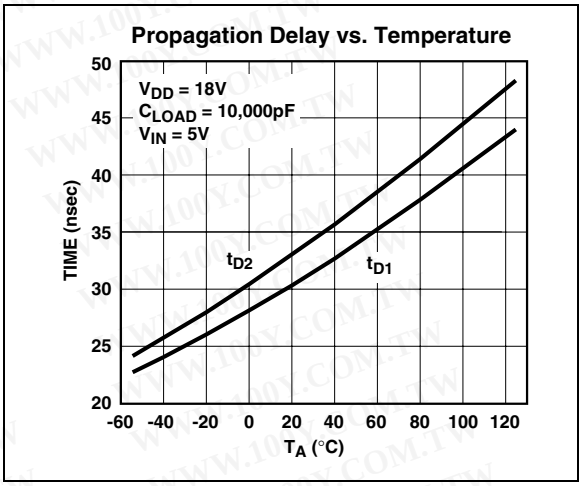


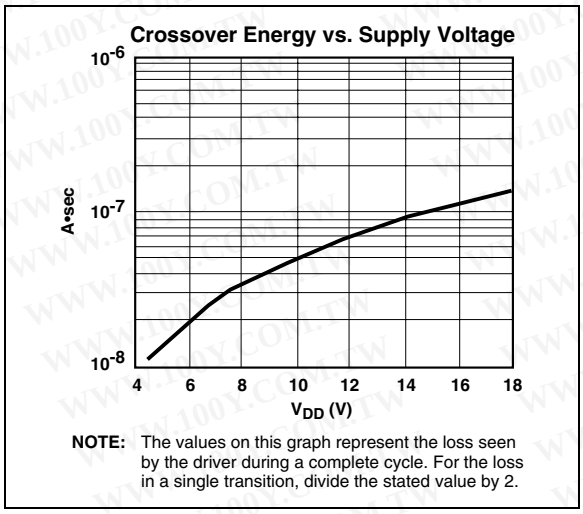




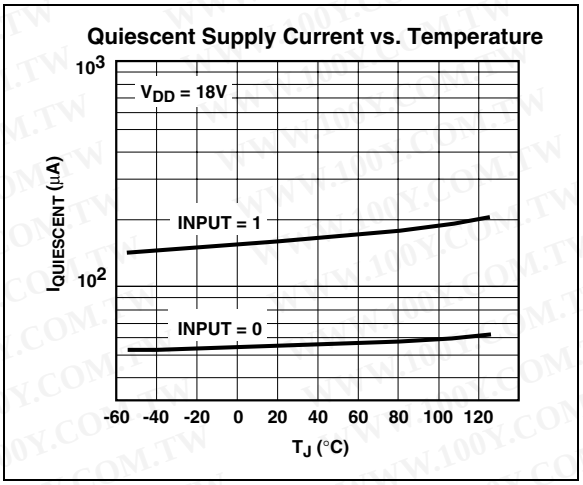
TYPICAL CHARACTERISTICS (CONTINUED)

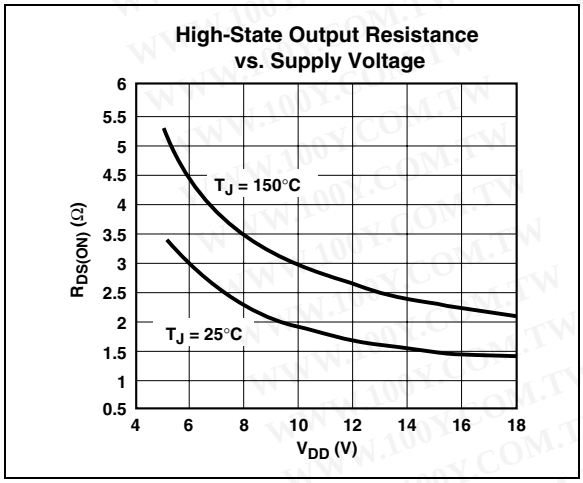


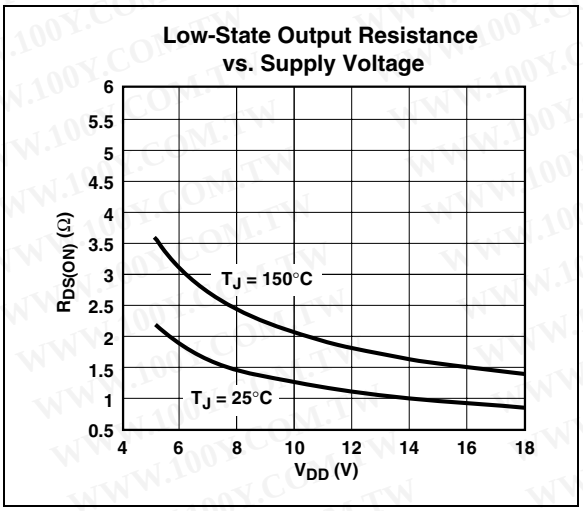




NOTE: The values on this graph represent the loss seen by the driver during a complete cycle. For the loss in a single transition, divide the stated value by 2.







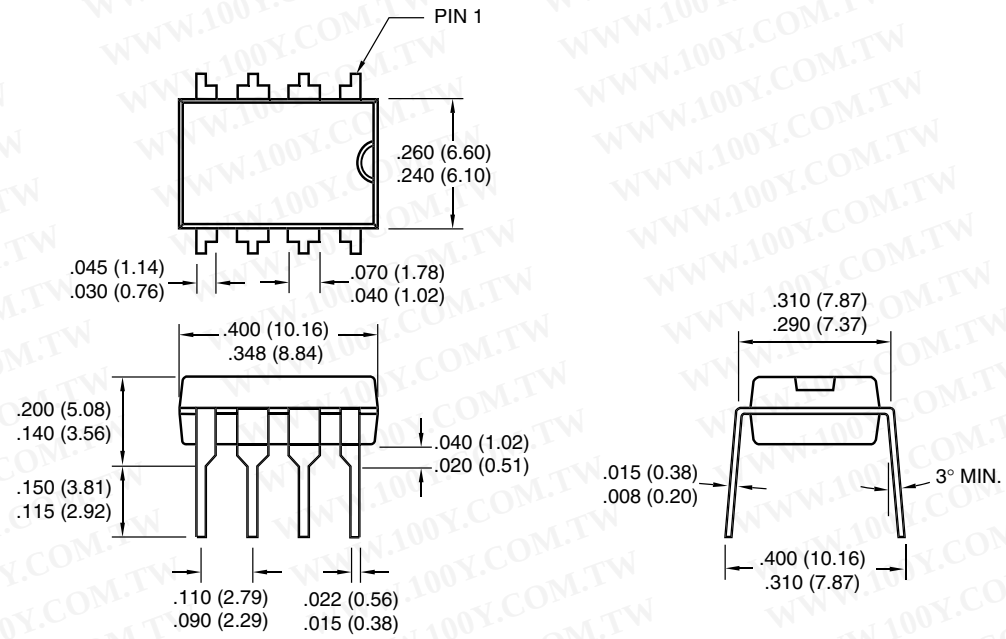
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

Package marking data not available at this time.

5.2 Package Dimensions

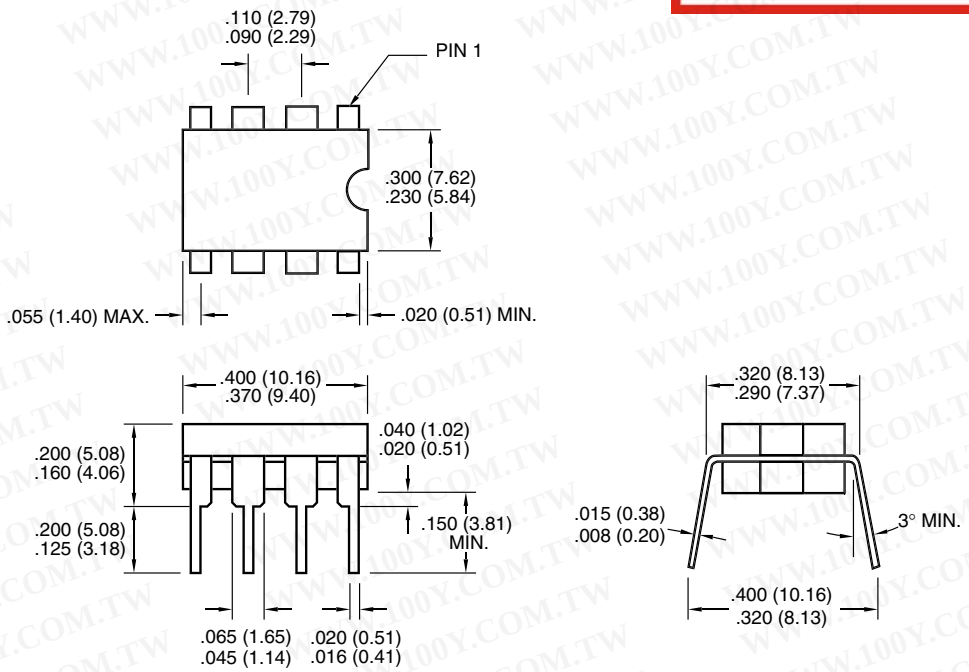
8-Pin Plastic DIP



Dimensions: inches (mm)

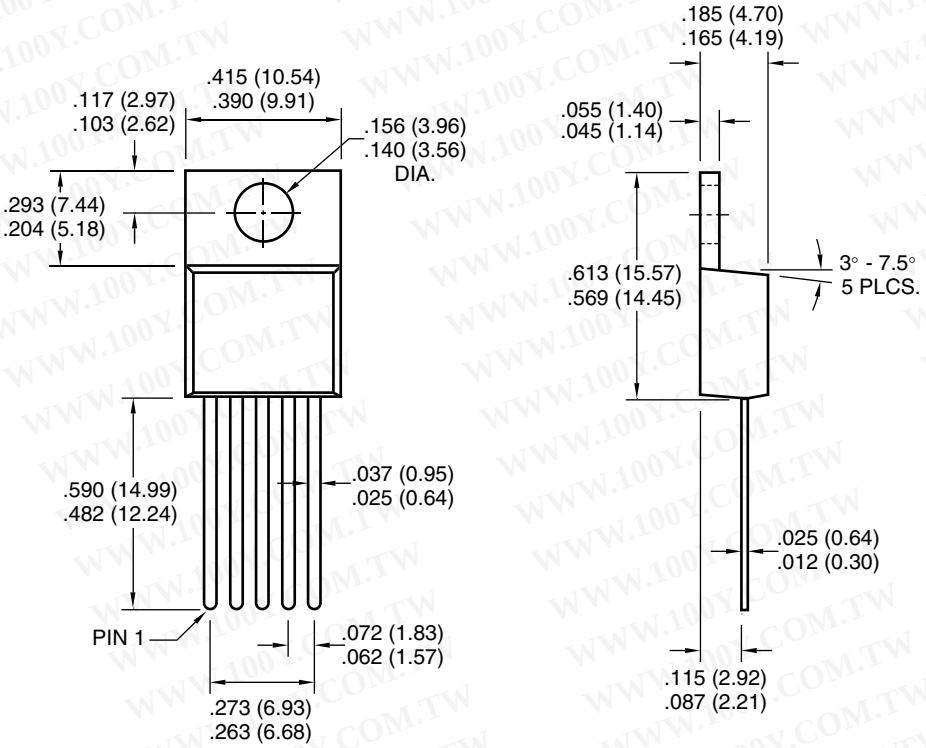
Package Dimensions (Continued)

8-Pin CERDIP (Narrow)



Dimensions: inches (mm)

5-Pin TO-220



Dimensions: inches (mm)

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