3A HIGH-SPEED MOSFET DRIVERS

FEATURES

- **Latch-Up Protected: Will Withstand 500mA Reverse Current**
- **Input Will Withstand Negative Inputs Up to 5V**
- **ESD Protected 4kV**
- **High Peak Output Current 3A**
- **Wide Operating Range ..... 4.5V to 16V**
- **High Capacitive Load Drive Capability ..... 180 pF in 20nsec**
- **Short Delay Time ..... 35nsec Typ**
- **Consistent Delay Times With Changes in Supply Voltage**
- **Matched Delay Times**
- **Low Supply Current**
  - **— With Logic "1" Input 50μA**
  - **— With Logic "0" Input 150μA**
- **Low Output Impedance 2.7Ω**
- **Pinout Same as TC1410/11/12**

GENERAL DESCRIPTION

The TC1413/1413N are 3A CMOS buffer/drivers. They will not latch up under any conditions within their power and voltage ratings. They are not subject to damage when up to 5V of noise spiking of either polarity that occurs on the ground pin. They can accept, without damage or logic upset, up to 500 mA of current of either polarity being forced back into their output. All terminals are fully protected against up to 4 kV of electrostatic discharge.

As MOSFET drivers, the TC1413/1413N can easily switch 1800pF gate capacitance in 20 ns with matched rise and fall times, and provide low enough impedance in both the ON and the OFF states to ensure the MOSFET's intended state will not be affected, even by large transients. The rise and fall time edges are matched to allow driving short-duration inputs with greater output accuracy.

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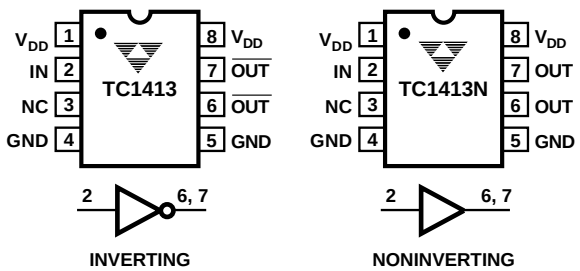
PIN CONFIGURATIONS



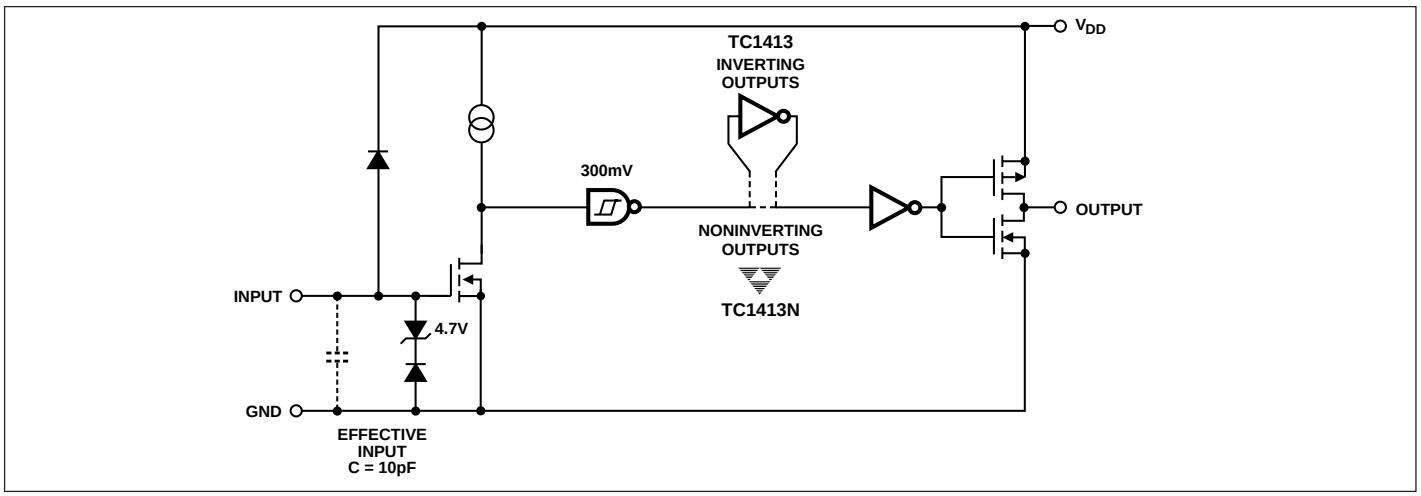
NC = NO INTERNAL CONNECTION

NOTE: SOIC pinout is identical to DIP.

ORDERING INFORMATION

Part No.	Package	Temp.Range
TC1413COA	8-Pin SOIC	0°C to +70°C
TC1413CPA	8-Pin Plastic DIP	0°C to +70°C
TC1413EOA	8-Pin SOIC	– 40°C to +85°C
TC1413EPA	8-Pin Plastic DIP	– 40°C to +85°C
TC1413NCOA	8-Pin SOIC	0°C to +70°C
TC1413NCPA	8-Pin Plastic DIP	0°C to +70°C
TC1413NEOA	8-Pin SOIC	– 40°C to +85°C
TC1413NEPA	8-Pin Plastic DIP	– 40°C to +85°C

FUNCTIONAL BLOCK DIAGRAM



TC1413
TC1413N

ABSOLUTE MAXIMUM RATINGS*

Supply Voltage ..... +20V
Input Voltage, IN A or IN B ..(V_{DD} + 0.3V) to (GND – 5.0V)
Maximum Chip Temperature ..... +150°C
Storage Temperature Range ..... – 65°C to +150°C
Lead Temperature (Soldering, 10 sec) ..... +300°C
Package Thermal Resistance
- CerDIP $R_{\theta J-A}$ ..... 150°C/W
- CerDIP $R_{\theta J-C}$ ..... 50°C/W
- PDIP $R_{\theta J-A}$ ..... 125°C/W
- PDIP $R_{\theta J-C}$ ..... 42°C/W
- SOIC $R_{\theta J-A}$ ..... 155°C/W
- SOIC $R_{\theta J-C}$ ..... 45°C/W

Operating Temperature Range
- C Version ..... 0°C to +70°C
- E Version ..... – 40°C to +85°C

Power Dissipation ($T_A \leq 70°C$)
- Plastic 730mW
- CerDIP 800mW
- SOIC 470mW

*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" 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.

ELECTRICAL CHARACTERISTICS:

Over operating temperature range with $4.5V \leq V_{DD} \leq 16V$, unless otherwise specified. Typical values are measured at $T_A = 25°C$; $V_{DD} = 16V$.

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
Input							
V_{IH}	Logic 1 High Input Voltage			2.0	—	—	V
V_{IL}	Logic 0 Low Input Voltage			—	—	0.8	V
I_{IN}	Input Current	$-5V \leq V_{IN} \leq V_{DD}$	$T_A = 25°C$	– 1	—	1	µA
			$-40°C \leq T_A \leq 85°C$	– 10	—	10	
Output							
V_{OH}	High Output Voltage	DC Test		V_{DD} – 0.025	—	—	V
V_{OL}	Low Output Voltage	DC Test		—	—	0.025	V
R_O	Output Resistance	$V_{DD} = 16V$, $I_O = 10$ mA	$T_A = 25°C$	—	2.7	4	Ω
			$0°C \leq T_A \leq 70°C$	—	3.3	5	
			$-40°C \leq T_A \leq 85°C$	—	3.3	5	
I_{PK}	Peak Output Current	$V_{DD} = 16V$		—	3.0	—	A
I_{REV}	Latch-Up Protection Withstand Reverse Current	Duty Cycle ≤ 2% t ≤ 300 µsec	$V_{DD} = 16V$	0.5	—	—	A
Switching Time (Note 1)							
t_R	Rise Time	Figure 1	$T_A = 25°C$	—	20	28	nsec
			$0°C \leq T_A \leq 70°C$	—	22	33	
			$-40°C \leq T_A \leq 85°C$	—	24	33	
t_F	Fall Time	Figure 1	$T_A = 25°C$	—	20	28	nsec
			$0°C \leq T_A \leq 70°C$	—	22	33	
			$-40°C \leq T_A \leq 85°C$	—	24	33	
t_{D1}	Delay Time	Figure 1	$T_A = 25°C$	—	35	45	nsec
			$0°C \leq T_A \leq 70°C$	—	40	50	
			$-40°C \leq T_A \leq 85°C$	—	40	50	
t_{D2}	Delay Time	Figure 1	$T_A = 25°C$	—	35	45	nsec
			$0°C \leq T_A \leq 70°C$	—	40	50	
			$-40°C \leq T_A \leq 85°C$	—	40	50	
Power Supply							
I_S	Power Supply Current	$V_{IN} = 3V$	$V_{DD} = 16V$	—	0.5	1.0	mA
		$V_{IN} = 0V$		—	0.1	0.15	

NOTE: 1. Switching times are guaranteed by design.

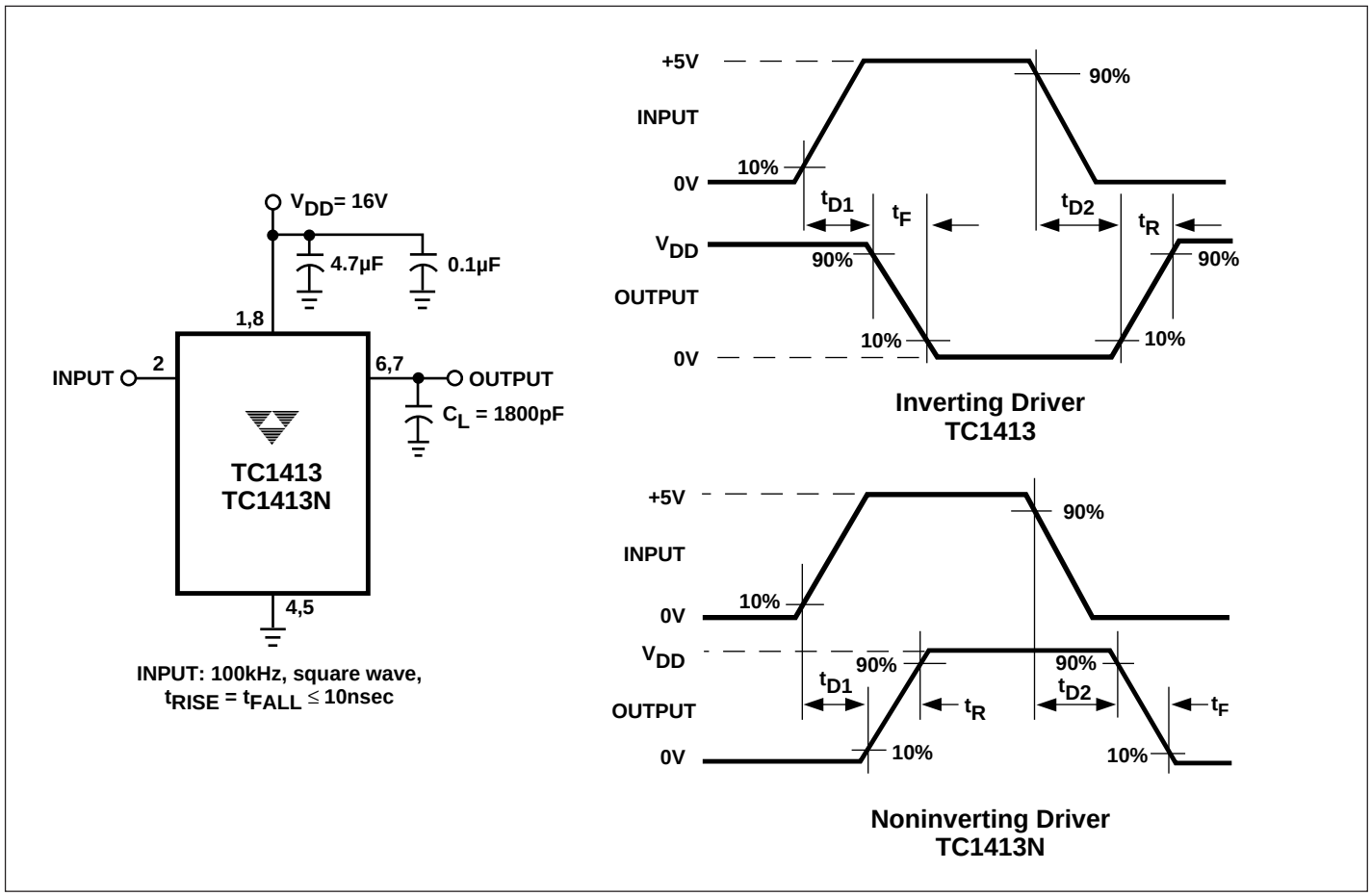
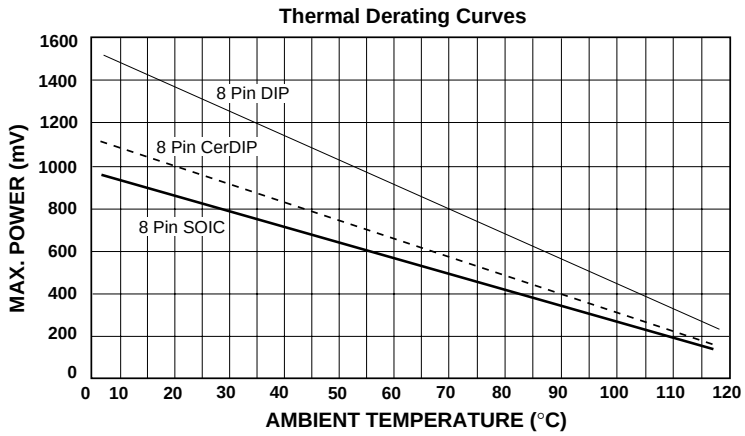
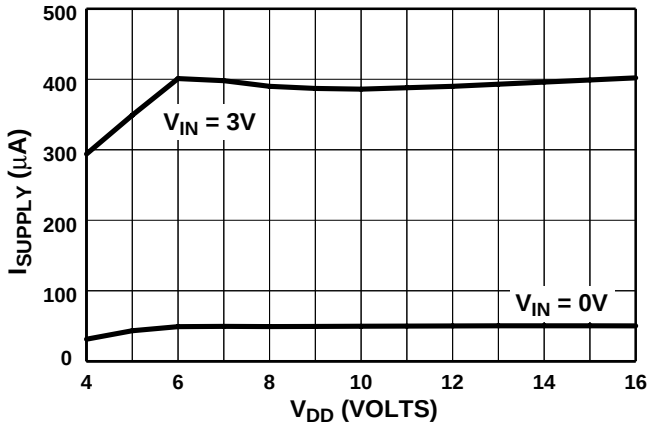


Figure 1. Switching Time Test Circuit

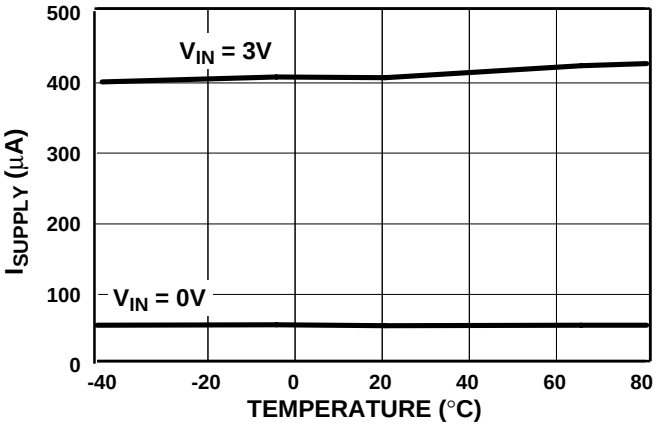


TYPICAL CHARACTERISTICS

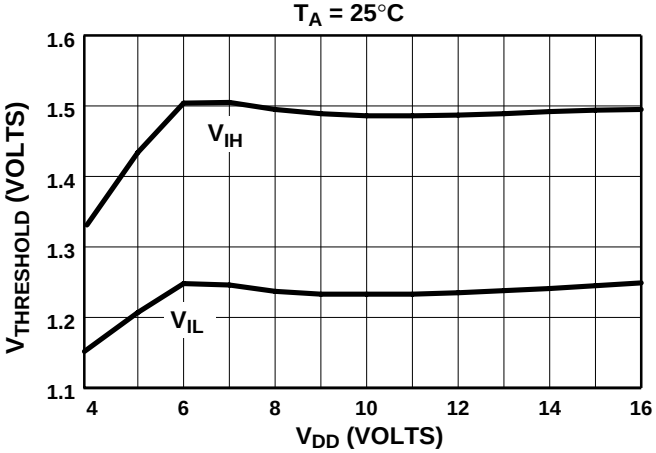
Quiescent Supply Current vs. Supply Voltage
T_A = 25°C



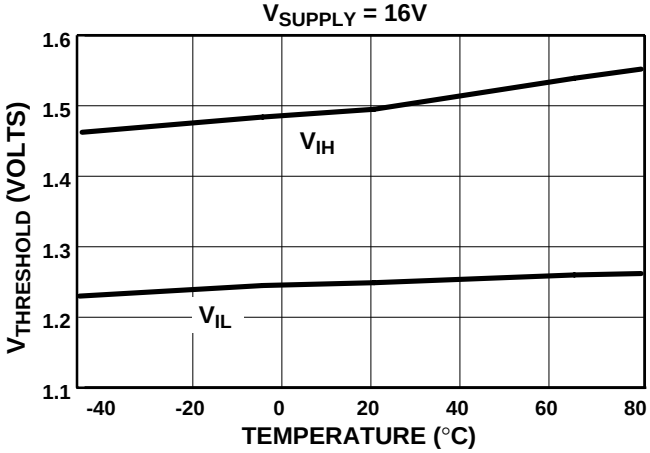
Quiescent Supply Current vs. Temperature
V_{SUPPLY} = 16V



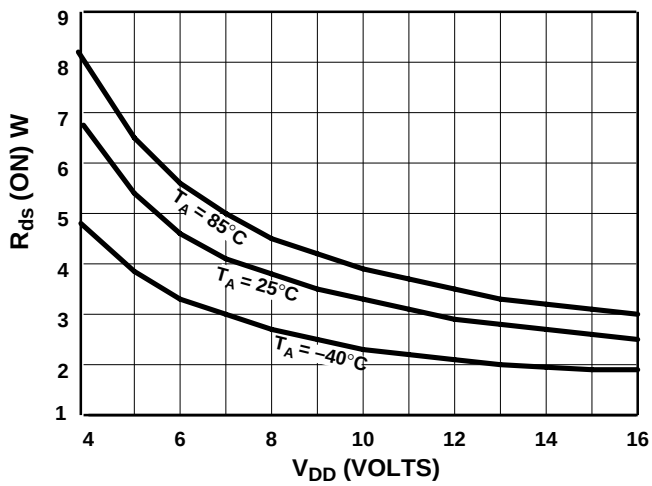
Input Threshold vs. Supply Voltage
T_A = 25°C



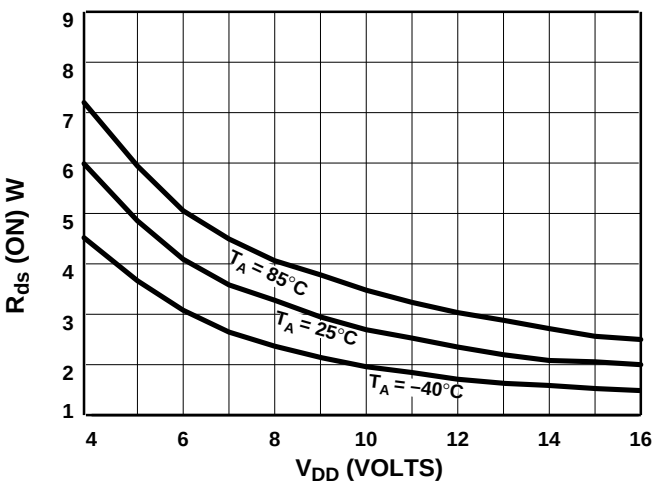
Input Threshold vs. Temperature
V_{SUPPLY} = 16V



High-State Output Resistance

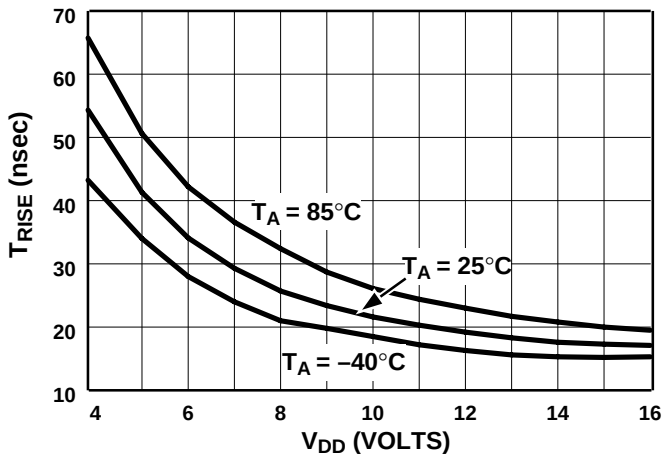


Low-State Output Resistance

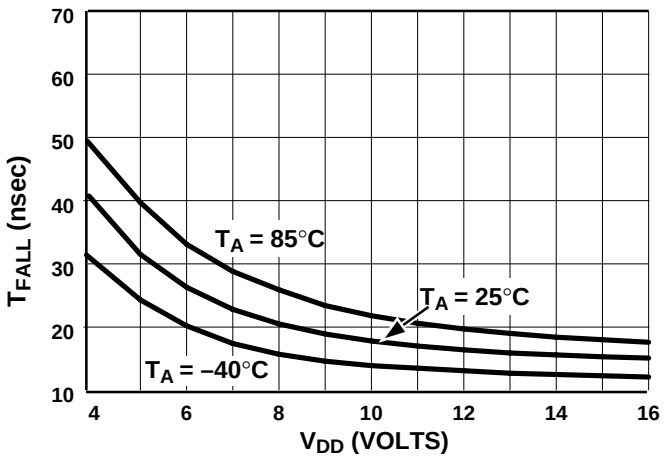


TYPICAL CHARACTERISTICS (Cont.)

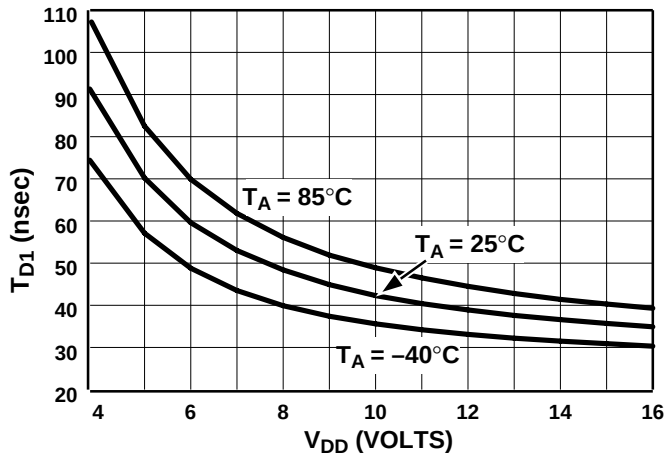
Rise Time vs. Supply Voltage
C_{LOAD} = 1800pF



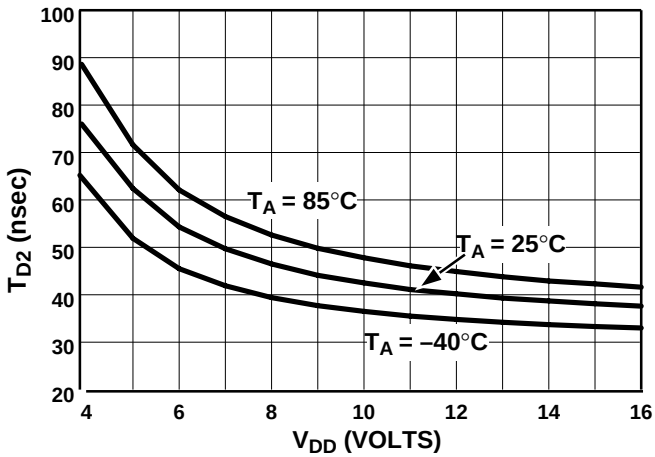
Fall Time vs. Supply Voltage
C_{LOAD} = 1800pF



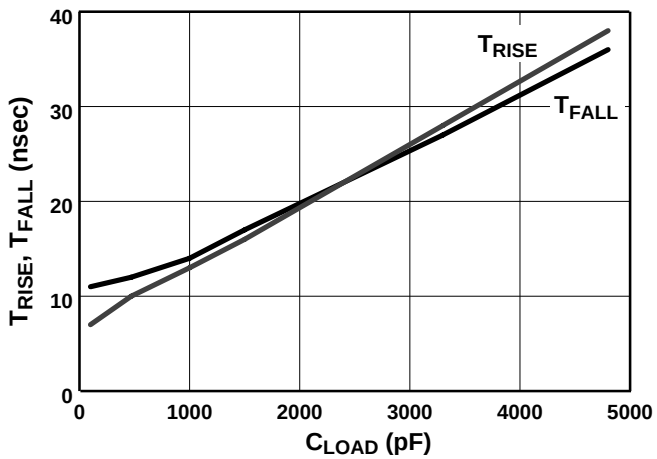
T_{D1} Propagation Delay vs. Supply Voltage
C_{LOAD} = 1800pF



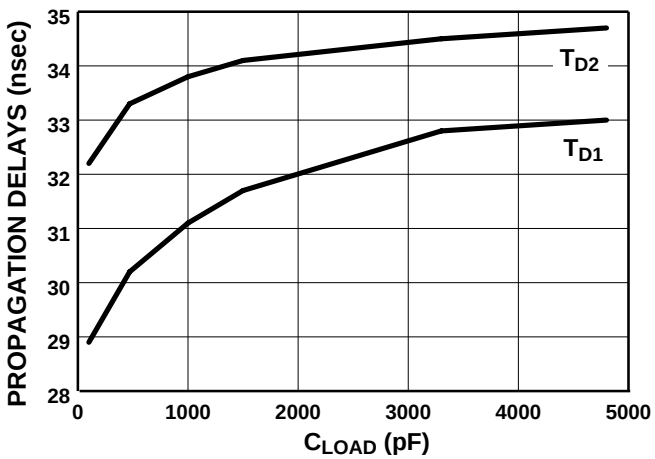
T_{D2} Propagation Delay vs. Supply Voltage
C_{LOAD} = 1800pF



Rise and Fall Times vs. Capacitive Load
T_A = 25°C, V_{DD} = 16V



Propagation Delays vs. Capacitive Load
T_A = 25°C, V_{DD} = 16V



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