3A DUAL HIGH-SPEED MOSFET DRIVERS

FEATURES

- Tough CMOS™ Construction
- Latch-Up Protected: Will Withstand 1.5A Reverse Current
- Logic Input Will Withstand Negative Swing Up to 5V
- ESD Protected ..... 4 kV
- High Peak Output Current 3A
- Wide Operating Range ..... 4.5V to 18V
- High Capacitive Load Drive Capability ..... 1800 pF in 25 ns
- Short Delay Times ..... <40 ns Typ
- Consistent Delay Times With Changes in Supply Voltage
- Matched Rise/Fall Times
- Logic High Input, Any Voltage ..... 2.4V to V_{DD}
- Logic Input Threshold Independent of Supply Voltage
- Low Supply Current
  - — With Logic "1" Input ..... 3.5 mA
  - — With Logic "0" Input ..... 350 µA
- Low Input Impedance ..... 3.5W Typ
- Output Voltage Swing to Within 25 mV of Ground or V_{DD}
- Pinouts Same as TC1426/27/28; TC4426/27/28
- Available in Inverting, Noninverting, and Differential Configurations

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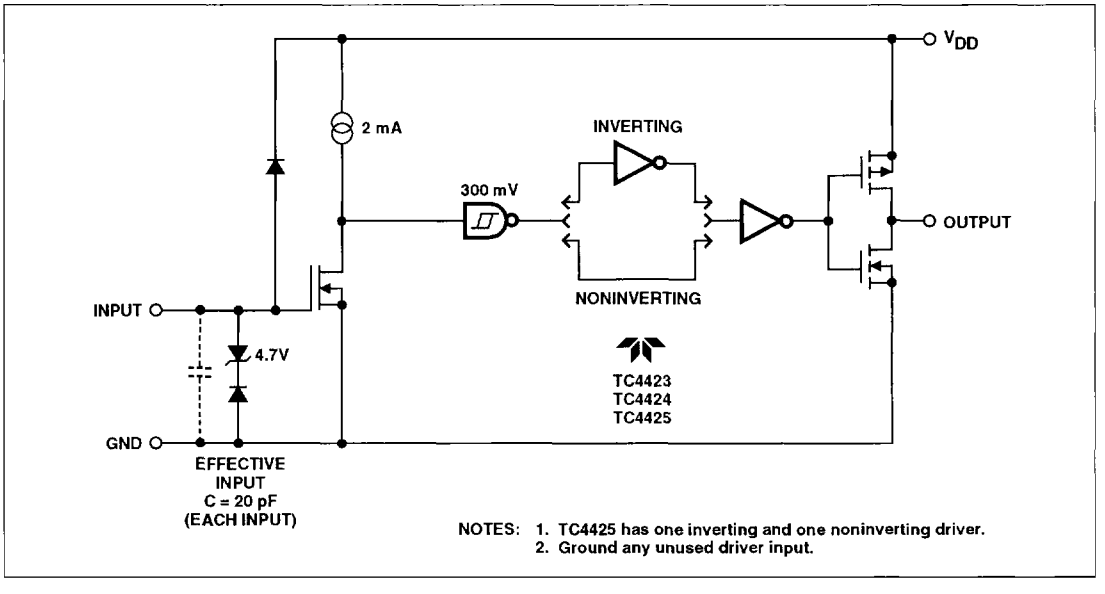
FUNCTIONAL DIAGRAM



NOTES: 1. TC4425 has one inverting and one noninverting driver.
2. Ground any unused driver input.

TC4423
TC4424
TC4425

3A DUAL HIGH-SPEED MOSFET DRIVERS

GENERAL DESCRIPTION

The TC4423/4424/4425 are CMOS buffer/drivers built using Teledyne Components' new Tough CMOS process. They are higher output current versions of the new TC4426/4427/4428 buffer/drivers, which, in turn, are improved versions of the earlier TC426/427/428 series. All three families are pin-compatible. The TC4423/4424/4425 drivers are capable of giving reliable service in far more demanding electrical environments than their antecedents. They will not latch up under any conditions within their power and voltage ratings. They are not subject to damage, even when up to 5V of noise spiking (of either polarity) occurs on the ground pin. They can accept, without either damage or logic upset, up to 1.5A of reverse current (of either polarity) being forced back into their outputs. All terminals are also fully protected against up to 4 kV of electrostatic discharge.

As a result, the TC4423/4424/4425 drivers are much easier to use, more flexible in operation, and much more forgiving than any other drivers (CMOS or bipolar) currently available. Because they are fabricated in CMOS, they dissipate a minimum of power and provide rail-to-rail voltage swings to better ensure the logic state of any load they drive.

Although primarily intended for driving power MOSFETs, the TC4423/4424/4425 drivers are equally well-suited to driving any other load (capacitive, resistive, or inductive) which requires a low impedance driver capable of high peak currents and fast switching times. For example, heavily loaded clock lines, coaxial cables, or piezoelectric transducers can all be driven from the TC4423/4424/4425. The only known limitation on loading is the total power dissipated in the driver must be kept within the maximum power dissipation limits of the package.

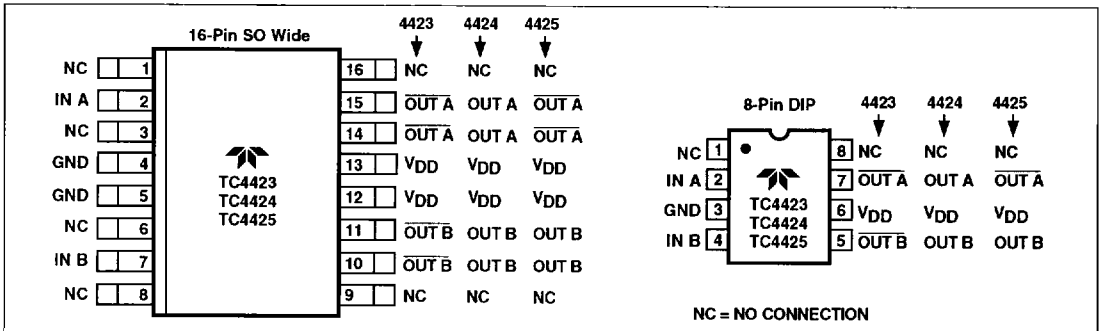
As MOSFET drivers, the TC4423/4424/4425 can easily switch 1800 pF gate capacitances in under 30 ns, and provide low enough impedances in both the ON and OFF states to ensure the MOSFET's intended state will not be affected, even by large transients.

The TC4423/4424/4425 design has taken into account five years of field use (and abuse) of our earlier parts, with the goal of making these drivers immune to all forms of improper operation known from that period, except exceeding the breakdown voltage and power dissipation ratings. We believe we have succeeded.

ORDERING INFORMATION

Part No.	Package	Temperature Range
TC4423COE	16-Pin SO Wide	0°C to +70°C
TC4423CPA	8-Pin Plastic DIP	0°C to +70°C
TC4423IJA	8-Pin CerDIP	–25°C to +85°C
TC4423MJA	8-Pin CerDIP	–55°C to +125°C
TC4423EOE	16-Pin SO Wide	–40°C to +85°C
TC4423EPA	8-Pin Plastic DIP	–40°C to +85°C
TC4424COE	16-Pin SO Wide	0°C to +70°C
TC4424CPA	8-Pin Plastic DIP	0°C to +70°C
TC4424IJA	8-Pin CerDIP	–25°C to +85°C
TC4424MJA	8-Pin CerDIP	–55°C to +125°C
TC4424EOE	16-Pin SO Wide	–40°C to +85°C
TC4424EPA	8-Pin Plastic DIP	–40°C to +85°C
TC4425COE	16-Pin SO Wide	0°C to +70°C
TC4425CPA	8-Pin Plastic DIP	0°C to +70°C
TC4425IJA	8-Pin CerDIP	–25°C to +85°C
TC4425MJA	8-Pin CerDIP	–55°C to +125°C
TC4425EOE	16-Pin SO Wide	–40°C to +85°C
TC4425EPA	8-Pin Plastic DIP	–40°C to +85°C

PIN CONFIGURATIONS



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

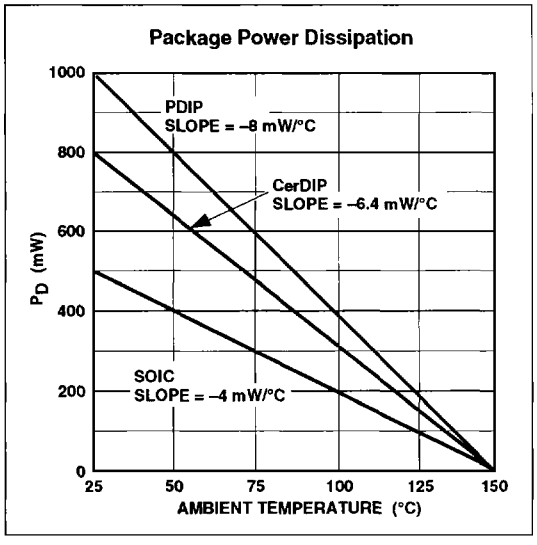
ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... +22V
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 $R_{\theta J-C}$ ..... 55°C/W
- PDIP $R_{\theta J-A}$ ..... 125°C/W
- PDIP $R_{\theta J-C}$ ..... 45°C/W
- SOIC $R_{\theta J-A}$ ..... 250°C/W
- SOIC $R_{\theta J-C}$ ..... 75°C/W

Operating Temperature Range
- C Version ..... 0°C to +70°C
- I Version ..... –25°C to +85°C
- E Version ..... –40°C to +85°C
- M Version ..... –55°C to +125°C

Power Dissipation
- Plastic DIP ..... 1000 mW
- CerDIP ..... 800 mW
- SOIC ..... 500 mW

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 operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.



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ELECTRICAL CHARACTERISTICS: T_A = +25°C with 4.5V ≤ V_{DD} ≤ 18V, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Input						
V_{OH}	Logic 1 High Input Voltage		2.4	—	—	V
V_{IL}	Logic 0 Low Input Voltage		—	—	0.8	V
I_{IN}	Input Current	0V ≤ V_{IN} ≤ V_{DD}	–1	—	1	µA
Output						
V_{OH}	High Output Voltage		V_{DD}–0.025	—	—	V
V_{OL}	Low Output Voltage		—	—	0.025	V
R_O	Output Resistance, High	I_{OUT} = 10 mA, V_{DD} = 18V	—	2.8	5	Ω
R_O	Output Resistance, Low	I_{OUT} = 10 mA, V_{DD} = 18V	—	3.5	5	Ω
I_{PK}	Peak Output Current		—	3	—	A
I_{REV}	Latch-Up Protection Withstand Reverse Current	Duty Cycle ≤ 2% t ≤ 300 µs	1.5	—	—	A
Switching Time (Note 1)						
t_R	Rise Time	Figure 1, C_L = 1800 pF	—	23	35	ns
t_F	Fall Time	Figure 1, C_L = 1800 pF	—	25	35	ns
t_{D1}	Delay Time	Figure 1, C_L = 1800 pF	—	33	75	ns
t_{D2}	Delay Time	Figure 1, C_L = 1800 pF	—	38	75	ns

ELECTRICAL CHARACTERISTICS:

Over operating temperature range with 4.5V ≤ V_{DD} ≤ 18V, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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	0V ≤ V_{IN} ≤ V_{DD}	–10	—	10	µA
Output						
V_{OH}	High Output Voltage		V_{DD}–0.025	—	—	V
V_{OL}	Low Output Voltage		—	—	0.025	V
R_O	Output Resistance, High	I_{OUT} = 10 mA, V_{DD} = 18V	—	3.7	8	Ω
R_O	Output Resistance, Low	I_{OUT} = 10 mA, V_{DD} = 18V	—	4.3	8	Ω
I_{PK}	Peak Output Current		—	3	—	A
I_{REV}	Latch-Up Protection Withstand Reverse Current	Duty Cycle ≤ 2% t ≤ 300 µs	1.5	—	—	A
Switching Time (Note 1)						
t_R	Rise Time	Figure 1, C_L = 1800 pF	—	28	60	ns
t_F	Fall Time	Figure 1, C_L = 1800 pF	—	32	60	ns
t_{D1}	Delay Time	Figure 1, C_L = 1800 pF	—	32	100	ns
t_{D2}	Delay Time	Figure 1, C_L = 1800 pF	—	38	100	ns
Power Supply						
I_S	Power Supply Current	V_{IN} = 3V (Both Inputs) V_{IN} = 0V (Both Inputs)	— —	2 0.2	3.5 0.3	mA mA

NOTE: 1. Switching times guaranteed by design.

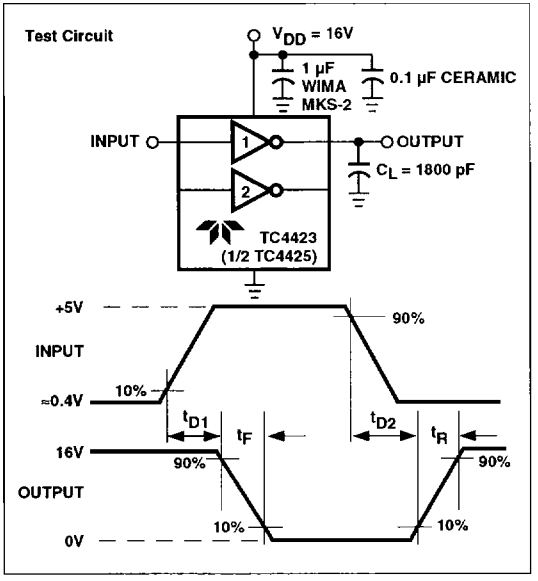


Figure 1 Inverting Driver Switching Time

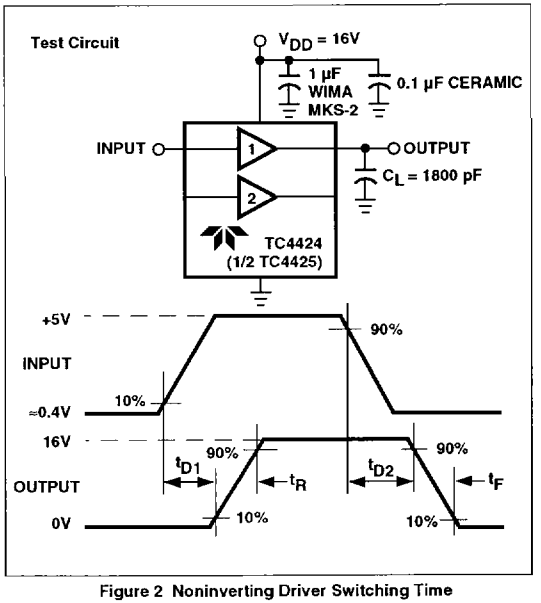
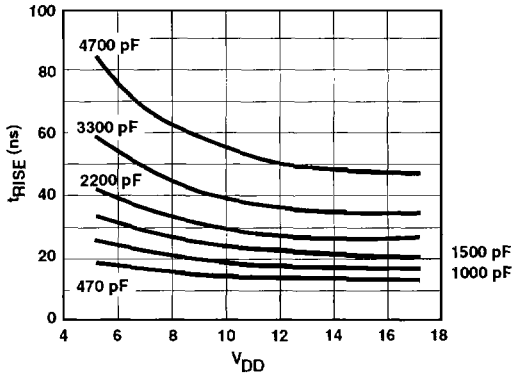


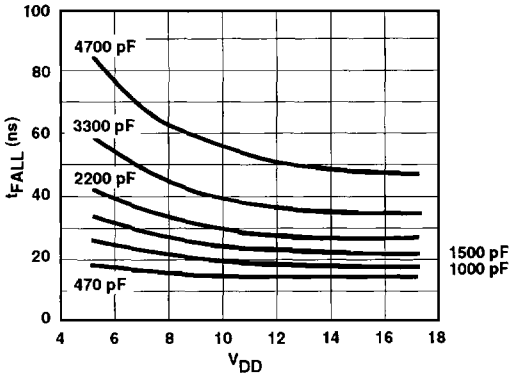
Figure 2 Noninverting Driver Switching Time

TYPICAL CHARACTERISTICS CURVES

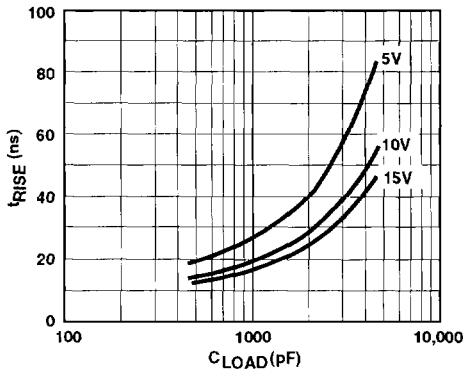
Rise Time vs Supply Voltage



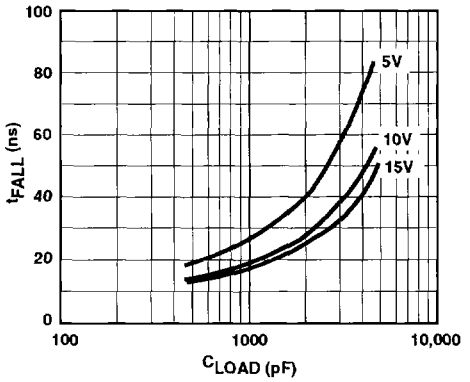
Fall Time vs Supply Voltage



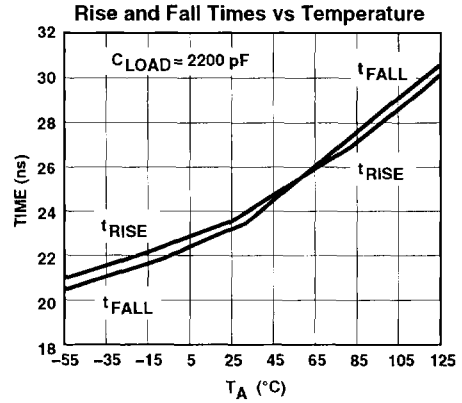
Rise TIme vs Capacitive Load



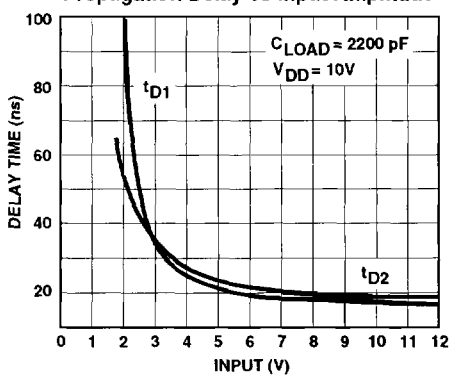
Fall TIme vs Capacitive Load



Rise and Fall Times vs Temperature



Propagation Delay vs Input Amplitude



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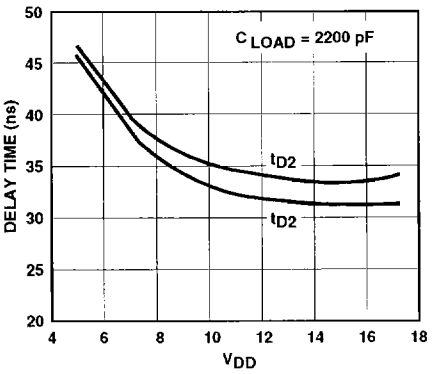
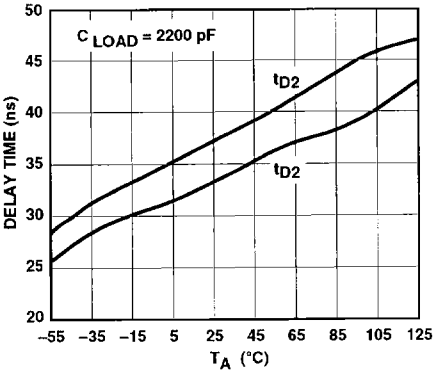
TYPICAL CHARACTERISTICS CURVES (Cont.)

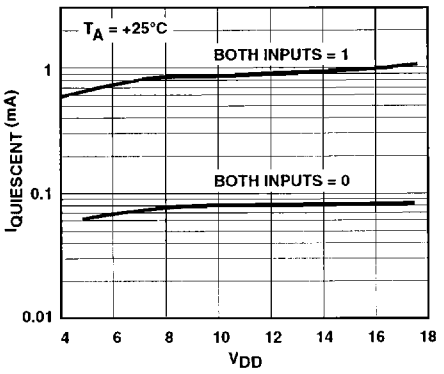
Propagation Delay Time vs Supply Voltage



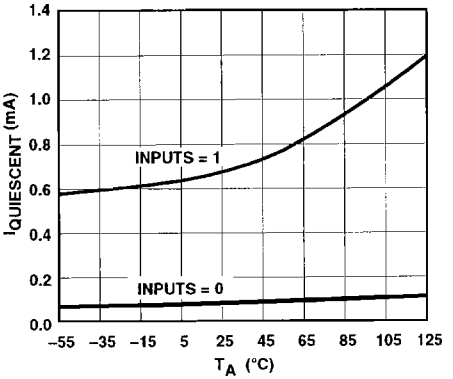
Delay Time vs Temperature



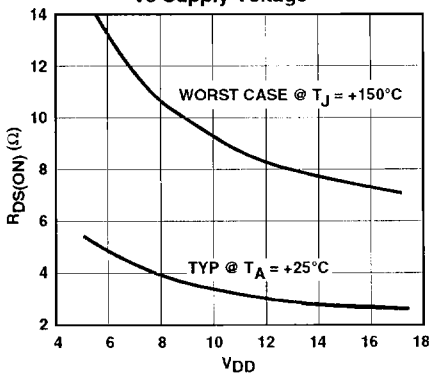
Quiescent Current vs Supply Voltage



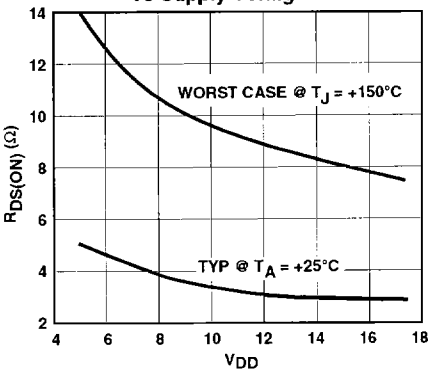
Quiescent Current vs Temperature



Output Resistance (Output High) vs Supply Voltage

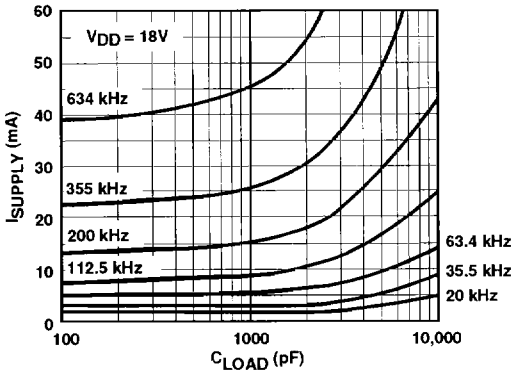


Output Resistance (Output Low) vs Supply Voltage

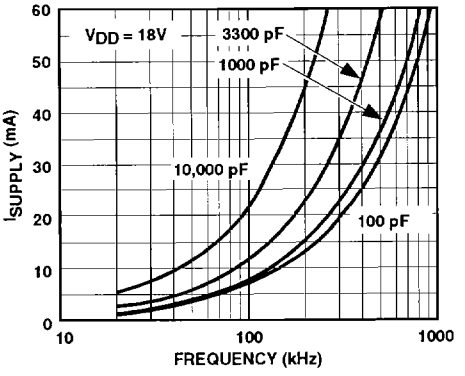


SUPPLY CURRENT CHARACTERISTICS (Load on Single Output Only)

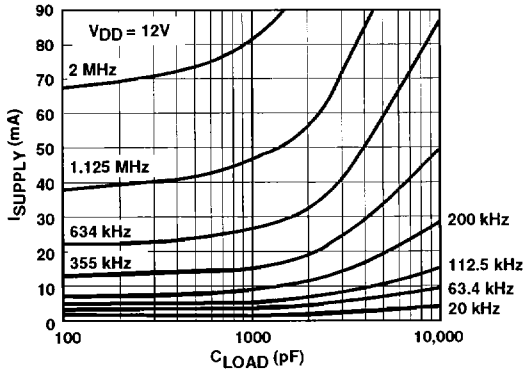
Supply Current vs Capacitive Load



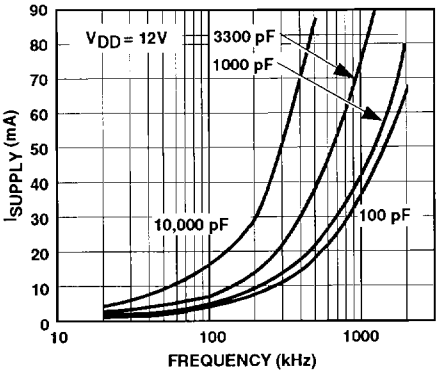
Supply Current vs Frequency



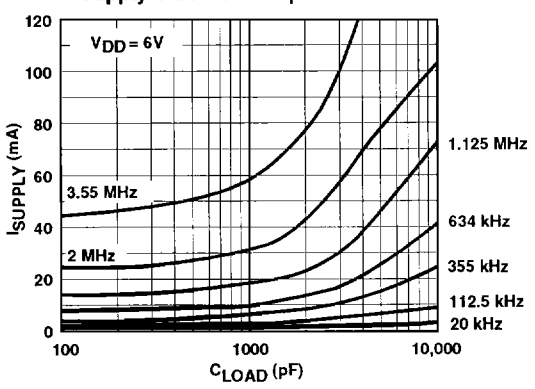
Supply Current vs Capacitive Load



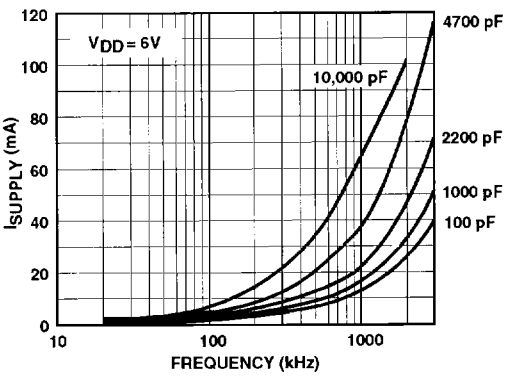
Supply Current vs Frequency



Supply Current vs Capacitive Load



Supply Current vs Frequency



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