MIC4426/4427/4428

Dual 1.5A Low-Side MOSFET Driver

Bipolar/CMOS/DMOS Process

General Description

The MIC4426/4427/4428 family of buffer/drivers are built using a new, highly reliable BiCMOS/DMOS process. They are improved versions of the MIC426/427/428 family of buffer/drivers (with which they are pin compatible) and are capable of giving reliable service in far more demanding electrical environments: they will not latch 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, occurs on the ground pin. They can accept, without either damage or logic upset, up to half an amp of reverse current (of either polarity) being forced back into their outputs.

As a result, the MIC4426/27/28 series drivers are much easier to use, more flexible in operation, and much more forgiving than any other driver, CMOS or bipolar, currently available. Because they are fabricated in BiCMOS/DMOS, they dissipate a minimum of power, and provide rail-to-rail voltage swings to better insure the logic state of any load they are driving.

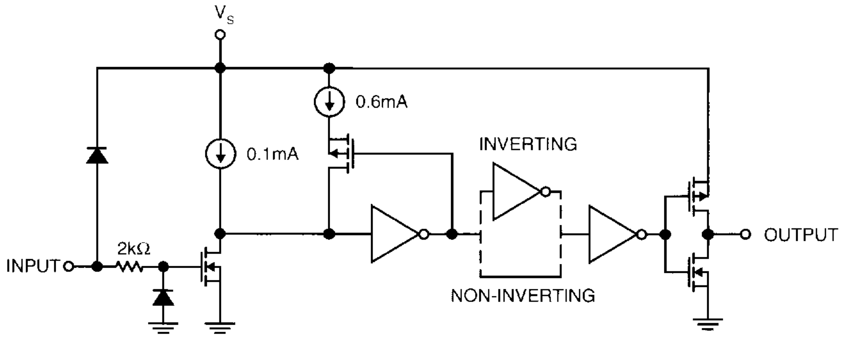
Although primarily intended for driving power MOSFETs, the 4426/4427/4428 series drivers are equally well suited to driving any other load (capacitive, resistive, or inductive) which requires a low-impedance driver capable of high peak currents and fast switching times. For example, heavily loaded clock lines, coaxial cables, or piezoelectric transducers all can be driven from the MIC4426/27/28. The only known limitation on loading is that total power dissipated in the driver must be kept within the maximum power dissipation limits of the package.

Features

- Built using reliable, low power Bipolar/CMOS/DMOS processes
- Latch-Up Protected: Withstands >500mA Reverse Current
- Logic Input Will Withstand Negative Swing Up to 5V
- High Peak Output Current .... 1.5A Peak
- Wide Operating Range .... 4.5V to 18V
- High Capacitive Load
  Drive Capability .... 1000pF in 25ns
- Short Delay Times .... <40ns typ.
- Consistent Delay Times with Changes in Supply Voltage
- Matched Rise and Fall Times
- Logic High Input for Any Voltage From 2.4V to V_S
- Logic Input Threshold Independent of Supply Voltage
- Low Equivalent Input Capacitance (typ) 6pF
- Low Supply Current
  - 4 mA with Logic 1 Inputs
  - 400 µA with Logic 0 Inputs
- Low Output Impedance 7Ω
- Output Voltage Swing to Within 25mV of Ground or V_S
- Pin-Out Same as MIC426/427/428
- Available in Inverting, Non-Inverting, and Differential Configurations
- ESD Protected
- MIL-STD-883 Method 5004/5005 version available

As MOSFET drivers, the MIC4426/27/28 can easily switch 1000pF gate capacitances in under 30ns, and provide low enough impedances in both the ON and OFF states to assure that a MOSFET's intended state will not be affected even by large transients.

Functional Diagram



Functional Diagram for One Driver (Two Drivers per Package—Ground Unused Drivers)

Ordering Information

Part Number	Temperature Range	Package	Configuration
MIC4426CM MIC4426BM	0°C to +70°C –40°C to+85°C	8-Pin SOIC	Dual Inverting
MIC4426CN MIC4426BN	0°C to +70°C –40°C to +85°C	8-Pin Plastic DIP	Dual Inverting
MIC4426AJ MIC4426AJB*	–55°C to +125°C –55°C to +125°C	8-Pin CerDIP	Dual Inverting SMD#5962-8850307PX
MIC4427CM MIC4427BM	0°C to +70°C –40°C to +85°C	8-Pin SOIC	Dual Non-Inverting
MIC4427CN MIC4427BN	0°C to +70°C –40°C to +85°C	8-Pin Plastic DIP	Dual Non-Inverting
MIC4427AJ MIC4427AJB*	–55°C to +125°C –55°C to +125°C	8-Pin CerDIP	Dual Non-Inverting SMD#5962-8850308PX
MIC4428CM MIC4428BM	0°C to +70°C –40°C to +85°C	8-Pin SOIC	Inverting + Non-Inverting
MIC4428CN MIC4428BN	0°C to +70°C –40°C to +85°C	8-Pin Plastic DIP	Inverting + Non-Inverting
MIC4428AJ MIC4428AJB*	–55°C to +125°C –55°C to +125°C	8-Pin CerDIP	Inverting + Non-Inverting SMD#5962-8850309PX
MIC4426CY MIC4427CY MIC4428CY	0°C to +70°C 0°C to +70°C 0°C to +70°C	Die Die Die	Dual Inverting Dual Non-Inverting Inverting + Non-Inverting

* AJB indicates units screened to MIL-STD 883, Method 5004, condition B, and burned-in for 1-week. Use SMD (Standard Military Drawing) number for ordering.

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Absolute Maximum Ratings (Notes 1 and 2)

If Military/Aerospace specified devices are required, contact Micrel for availability and specifications.

Supply Voltage	22 V
Maximum Chip Temperature	150°C
Storage Temperature Range	–65°C to 150°C
Lead Temperature (10 sec.)	300°C
Package Thermal Resistance	
CERDIP $R_{\theta J\text{-}A}$	100°C/W
CERDIP $R_{\theta J\text{-}C}$	50°C/W
PDIP $R_{\theta J\text{-}A}$	130°C/W
PDIP $R_{\theta J\text{-}C}$	42°C/W
SOIC $R_{\theta J\text{-}A}$	120°C/W
SOIC $R_{\theta J\text{-}C}$	75°C/W
Operating Temperature Range	
C Version	0°C to +70°C
B Version	–40°C to +85°C
A Version	–55°C to +125°C

MIC4426/4427/4428 Electrical Characteristics:

Specifications measured at T_A = 25°C with 4.5V ≤ V_S ≤ 18V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
INPUT						
V_{IH}	Logic 1 Input Voltage		2.4	1.4		V
V_{IL}	Logic 0 Input Voltage			1.1	0.8	V
I_{IN}	Input Current	0 ≤ V_{IN} ≤ V_S	–1		1	μA
OUTPUT						
V_{OH}	High Output Voltage		V_S–0.025			V
V_{OL}	Low Output Voltage				0.025	V
R_O	Output Resistance	I_{OUT} = 10mA, V_S = 18V		6	10	Ω
I_{PK}	Peak Output Current			1.5		A
I	Latch-Up Protection Withstand Reverse Current		>500			mA
SWITCHING TIME						
T_R	Rise Time	Test Figure 1		18	30	ns
T_F	Fall Time	Test Figure 1		23	30	ns
T_{D1}	Delay TIme	Test FIgure 1		17	30	ns
T_{D2}	Delay Time	Test Figure 1		23	50	ns
POWER SUPPLY						
I_S	Power Supply Current	V_{IN} = 3.0V (Both Inputs)		1.4	4.5	mA
I_S	Power Supply Current	V_{IN} = 0.0V (Both Inputs)		0.18	0.4	mA

MIC4426/4427/4428 Electrical Characteristics:

Specifications measured over operating temperature range with 4.5V ≤ V_S ≤ 18V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
INPUT						
V_{IH}	Logic 1 Input Voltage		2.4	1.5		V
V_{IL}	Logic 0 Input Voltage			1.0	0.8	V
I_{IN}	Input Current	0 ≤ V_{IN} ≤ V_S	–1		1	μA
OUTPUT						
V_{OH}	High Output Voltage		V_S–0.025			V
V_{OL}	Low Output Voltage				0.025	V
R_O	Output Resistance	I_{OUT} = 10mA, V_S = 18V		8	12	Ω

MIC4426/4427/4428 Electrical Characteristics:

Specifications measured over operating temperature range with 4.5 V ≤ V_S ≤ 18 V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OUTPUT						
I_{PK}	Peak Output Current			1.5		A
I	Latch-Up Protection Withstand Reverse Current		>500			mA
SWITCHING TIME						
T_R	Rise Time	Test Figure 1		20	40	ns
T_F	Fall Time	Test Figure 1		29	40	ns
T_{D1}	Delay Time	Test Figure 1		19	40	ns
T_{D2}	Delay Time	Test Figure 1		27	60	ns
POWER SUPPLY						
I_S	Power Supply Current	V_{IN} = 3.0 V (Both Inputs)		1.5	8	mA
I_S	Power Supply Current	V_{IN} = 0.0 V (Both Inputs)		0.19	0.6	mA

Note 1: Functional operation above the absolute maximum stress ratings is not implied.
Note 2: Static Sensitive device. Store only in conductive containers. Handling personnel and equipment should be grounded to prevent static damage.

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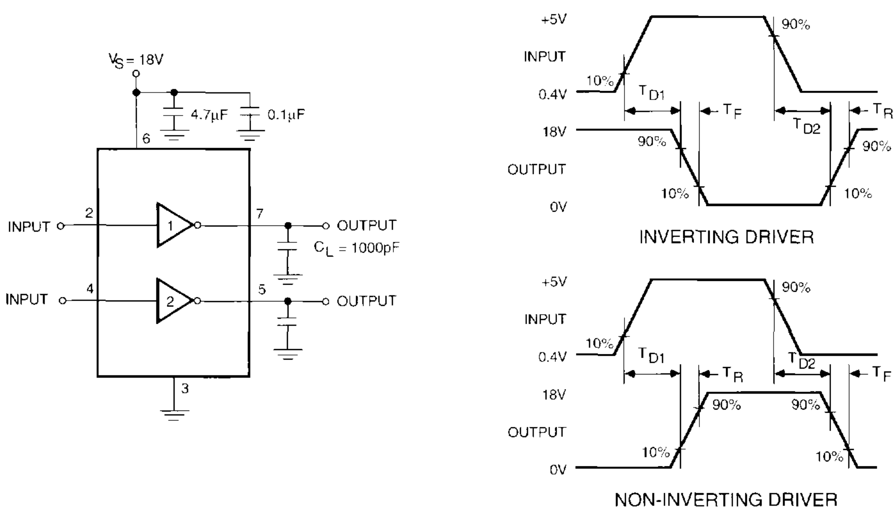
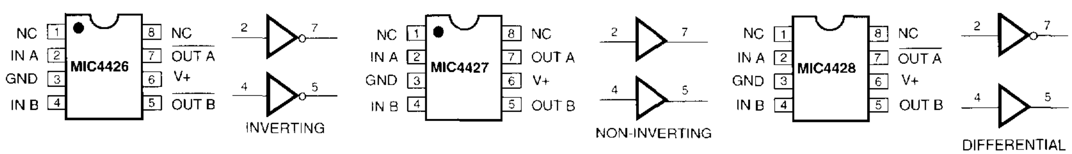


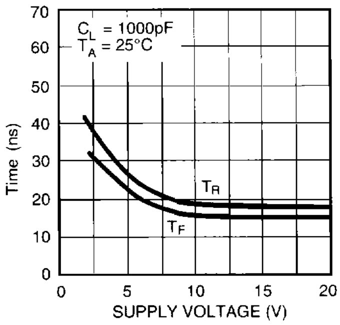
Figure 1. Switching Time Test Circuit

Pin Configuration

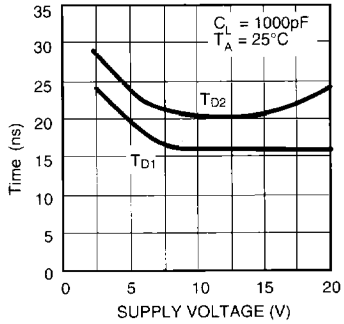


Typical Characteristic Curves

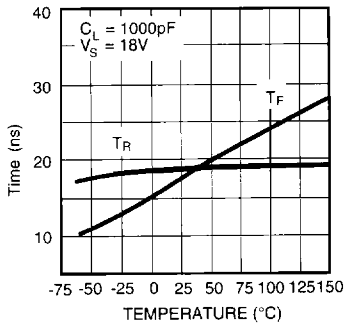
Rise and Fall Time vs. Supply Voltage



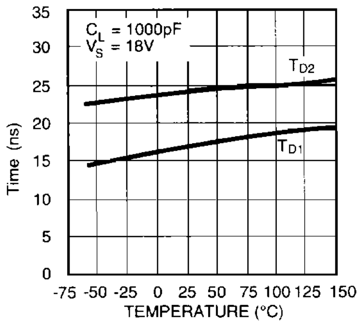
Delay Time vs. Supply Voltage



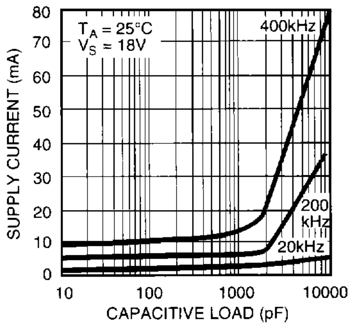
Rise and Fall Time vs. Temperature



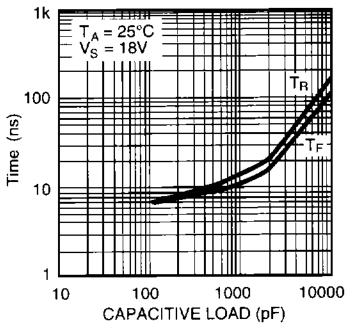
Delay Time vs. Temperature



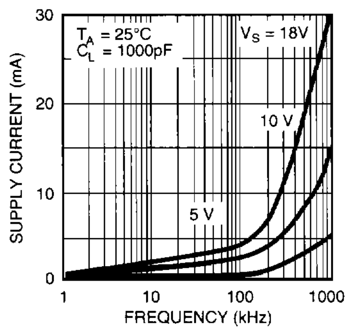
Supply Current vs. Capacitive Load



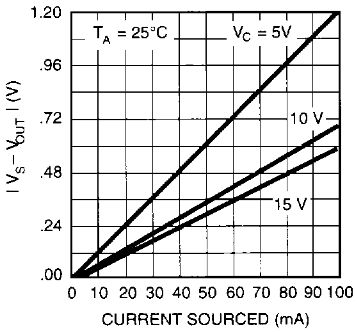
Rise and Fall Time vs. Capacitive Load



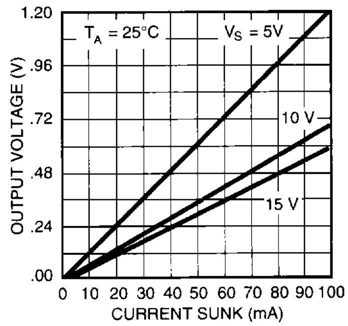
Supply Current vs. Frequency



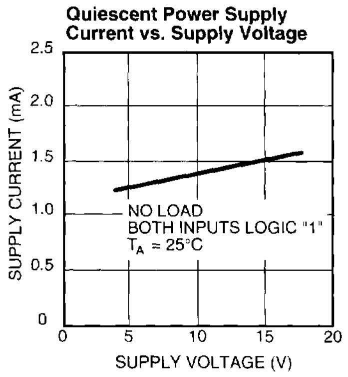
High Output vs. Current

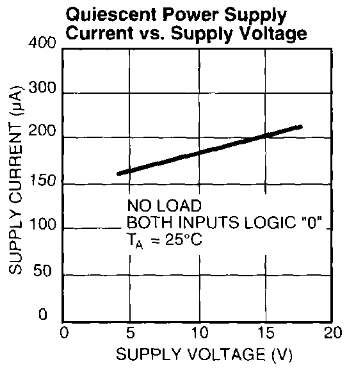


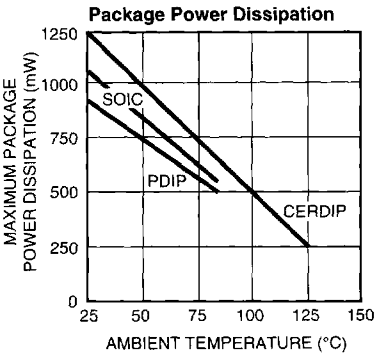
Low Output vs. Current



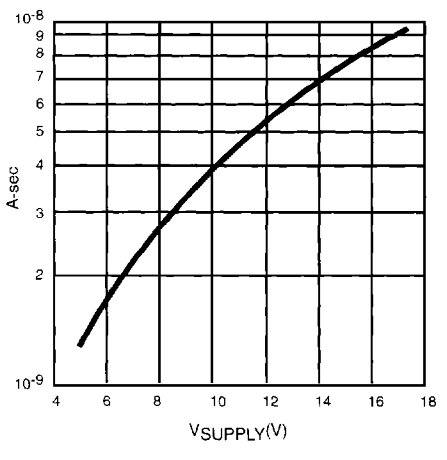
Typical Characteristic Curves (Continued)







Crossover Energy Loss



Note: The values on this graph represent the loss seen by a single transition of a single driver. For a complete cycle of a single driver multiply the stated value by 2.

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