MIC4426/4427/4428

Dual 1.5A-Peak Low-Side MOSFET Driver

Bipolar/CMOS/DMOS Process

General Description

The MIC4426/4427/4428 family are highly reliable BiCMOS/DMOS buffer/driver/MOSFET drivers. They are pin compatible improved versions of the MIC426/427/428 family of buffer/drivers and are capable of giving reliable service in 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.

The MIC4426/4427/4428 series drivers are easier to use, more flexible in operation, and more forgiving than other CMOS or bipolar drivers currently available. Their BiCMOS/DMOS construction dissipates minimum power, and provides rail-to-rail voltage swings.

Primarily intended for driving power MOSFETs, the MIC4426/4427/4428 drivers are suitable for driving other loads (capacitive, resistive, or inductive) which require low-impedance, high peak currents, and fast switching times. Heavily loaded clock lines, coaxial cables, or piezoelectric transducers are some examples. 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

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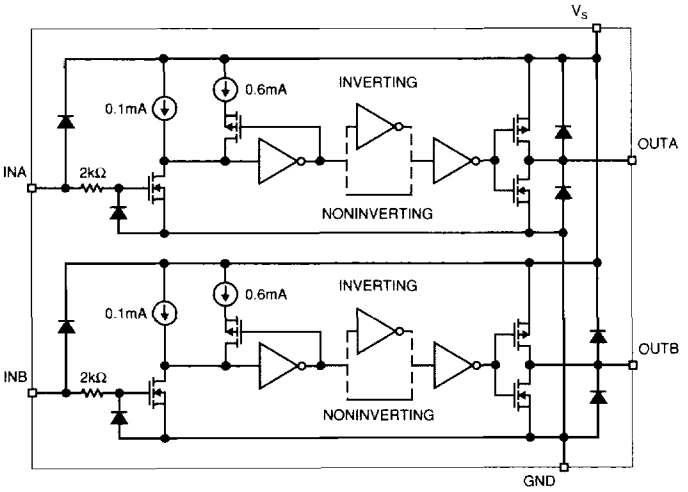
Functional Diagram



Ground Unused Inputs

Ordering Information

Part Number	Configuration	Temperature Range	Package
MIC4426CM MIC4426BM	Dual Inverting	0°C to +70°C –40°C to +85°C	8-Pin SOIC
MIC4426BMM	Dual Inverting	–40°C to +85°C	8-Pin MM8™
MIC4426CN MIC4426BN	Dual Inverting	0°C to +70°C –40°C to +85°C	8-Pin Plastic DIP
MIC4426AJ 5962-8850307PA[1]	Dual Inverting	–55°C to +125°C	8-Pin CerDIP
MIC4427CM MIC4427BM	Dual Noninverting	0°C to 70°C –40°C to +85°C	8-Pin SOIC
MIC4427BMM	Dual Noninverting	–40°C to +85°C	8-Pin MM8™
MIC4427CN MIC4427BN	Dual Noninverting	0°C to 70°C –40°C to +85°C	8-Pin PlasticDIP
MIC4427AJ 5962-8850308PA[2]	Dual Noninverting	–55°C to +125°C	8-Pin CerDIP
MIC4428CM MIC4428BM	Noninverting + Inverting	0°C to 70°C –40°C to +85°C	8-Pin SOIC
MIC4428BMM	Noninverting + Inverting	–40°C to +85°C	8-lead MSOP
MIC4428CN MIC4428BN	Noninverting + Inverting	0°C to 70°C –40°C to +85°C	8-Pin PlasticDIP
MIC4428AJ 5962-8850309PA[3]	Noninverting + Inverting	–55°C to +125°C	8-Pin CerDIP

[1] Standard Military Drawing number for MIC4426AJBQ
[2] Standard Military Drawing number for MIC4427AJBQ
[3] Standard Military Drawing number for MIC4428AJBQ

Absolute Maximum Ratings (Notes 1 and 2)

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

Supply Voltage ..... 22 V
Input Voltage ..... V_S + 0.3V to GND – 5V
Maximum Chip Temperature ..... 150°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (10 sec.) ..... 300°C
Package Thermal Resistance
- CERDIP $R_{\theta JA}$ ..... 100°C/W
- CERDIP $R_{\theta JC}$ ..... 50°C/W
- PDIP $R_{\theta JA}$ ..... 130°C/W
- PDIP $R_{\theta JC}$ ..... 42°C/W
- SOIC $R_{\theta JA}$ ..... 120°C/W
- SOIC $R_{\theta JC}$ ..... 75°C/W
- MM8™ $R_{\theta JA}$ ..... 250°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:

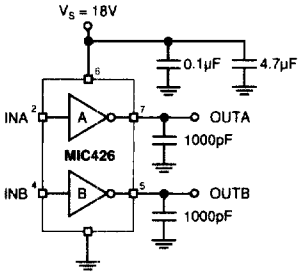
Specifications measured over operating temperature range with 4.5 V ≤ V_S ≤ 18 V unless otherwise specified.

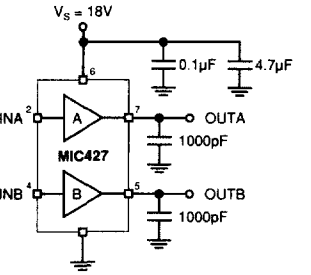
Symbol	Parameter	Conditions	Min	Typ	Max	Units
OUTPUT						
I_{PK}	Peak Output Current			1.5		A
I	Latch-Up Protection Withstand Reverse Current		>500			mA
SWITCHING TIME						
T_R	Rise Time	Test Figure 1		20	40	ns
T_F	Fall Time	Test Figure 1		29	40	ns
T_{D1}	Delay TIme	Test FIgure 1		19	40	ns
T_{D2}	Delay 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.

Test Circuits





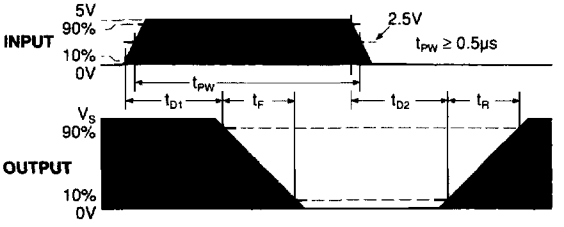


Figure 1. Inverting Driver Switching Time

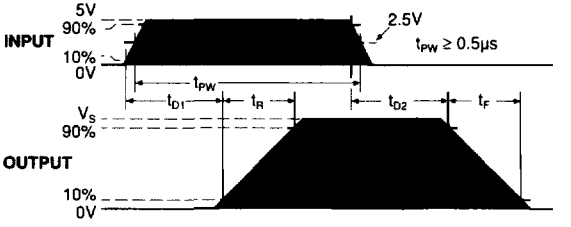


Figure 2. Noninverting Driver Switching Time

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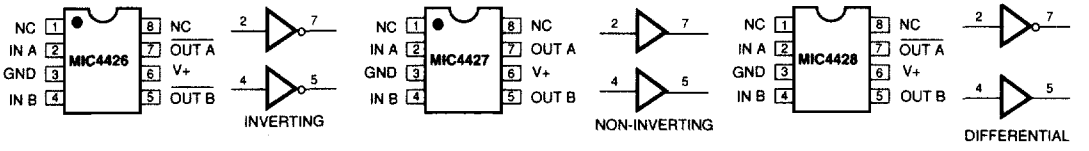
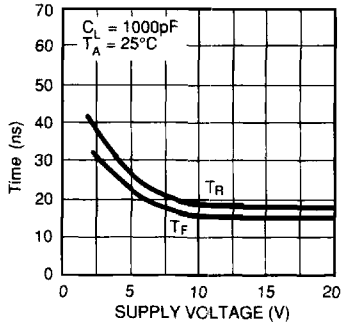
Pin Configuration

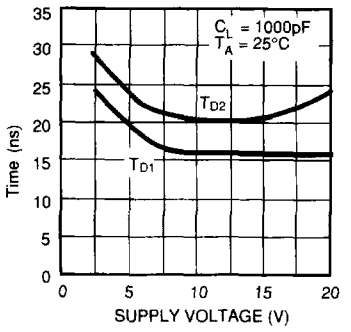


Typical Characteristic Curves

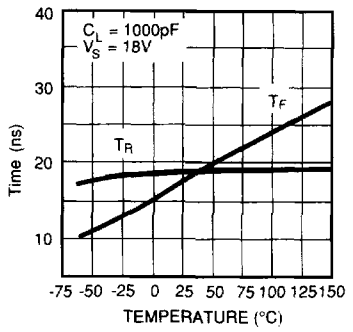
Rise and Fall Time vs. Supply Voltage



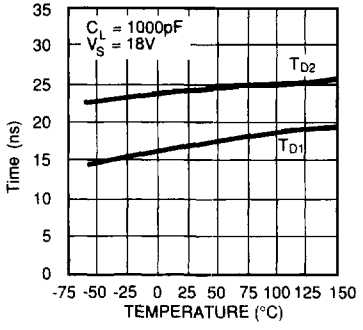
Delay Time vs. Supply Voltage



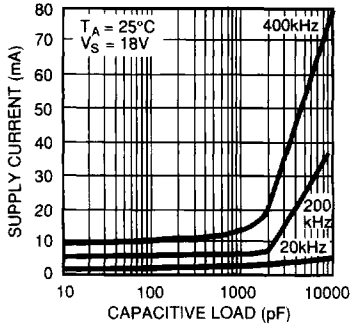
Rise and Fall Time vs. Temperature



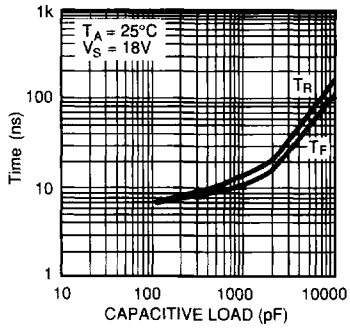
Delay Time vs. Temperature



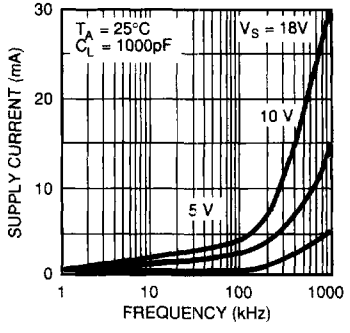
Supply Current vs. Capacitive Load



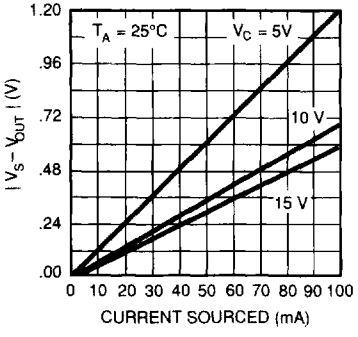
Rise and Fall Time vs. Capacitive Load



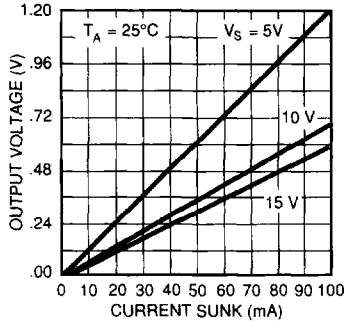
Supply Current vs. Frequency



High Output vs. Current

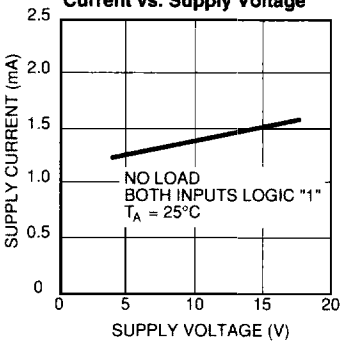


Low Output vs. Current

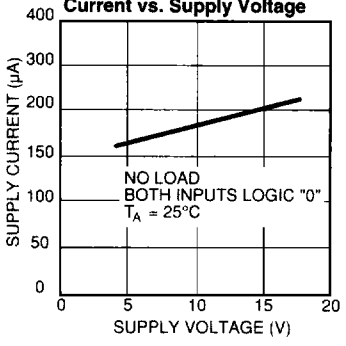


Typical Characteristic Curves (Continued)

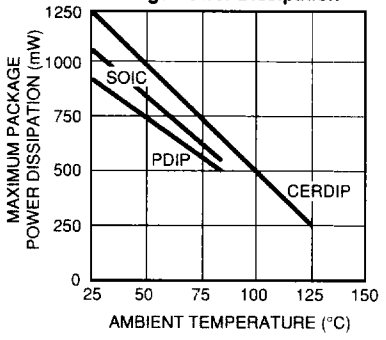
Quiescent Power Supply Current vs. Supply Voltage



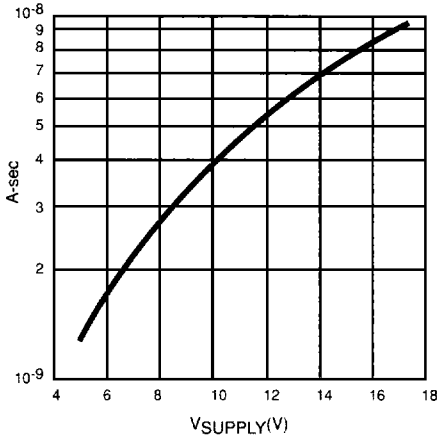
Quiescent Power Supply Current vs. Supply Voltage



Package Power Dissipation



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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