MIC1426/1427/1428

Dual 1.2A-Peak Low-Side MOSFET Driver

Bipolar/CMOS/DMOS Process

General Description

The MIC1426/27/28 are a family of 1.2A dual high-speed drivers. They are ideal for high-volume OEM manufacturers, with latch-up protection, and ESD protection. BiCMOS/DMOS fabrication is used for low power consumption and high efficiency.

These devices are fabricated using an epitaxial layer to effectively short out the intrinsic parasitic transistor responsible for CMOS latch-up. They incorporate a number of other design and process refinements to increase their long-term reliability.

The MIC1426 is compatible with the bipolar DS0026, but only draws 1/5 of the quiescent current. The MIC1426/27/28 are also compatible with the MIC426/27/28, but with 1.2A peak output current rather than the 1.5A of the MIC426/27/28 devices.

The high-input impedance MIC1426/27/28 drivers are CMOS/TTL input-compatible, do not require the speed-up needed by the bipolar devices, and can be directly driven by most PWM ICs.

This family of devices is available in inverting and non-inverting versions. Specifications have been optimized to achieve low-cost and high-performance devices, well-suited for the high-volume manufacturer.

Features

- Low Cost
- Latch-Up Protected: Will Withstand 500mA Reverse Output Current
- ESD Protected ..... ±2kV
- High Peak Output Current ..... 1.2A Peak
- High Capacitive Load Drive Capability ..... 1000pF in 35ns
- Wide Operating Range ..... 4.75V to 16V
- Low Delay Time ..... 75ns Max
- Low Equivalent Input Capacitance (typ) 6pF
- Logic Input Threshold Independent of Supply Voltage
- Output Voltage Swing to Within 25mV of Ground or V_S
- Low Output Impedance 8Ω

Applications

- Power MOSFET Drivers
- Switched Mode Power Supplies
- Pulse Transformer Drive
- Small Motor Controls
- Print Head Drive

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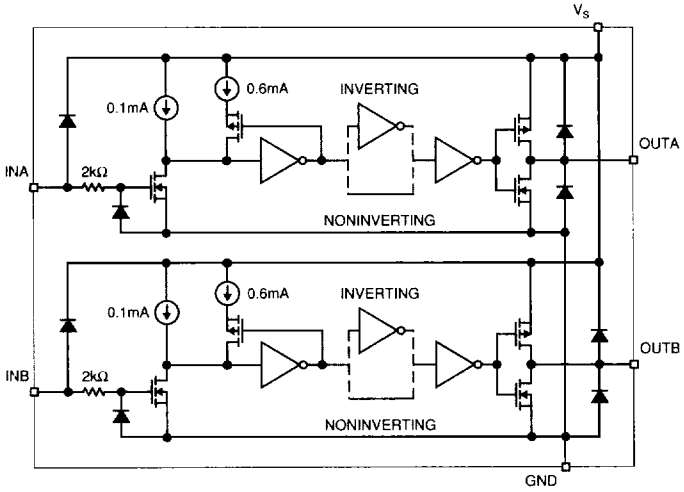
Functional Diagram

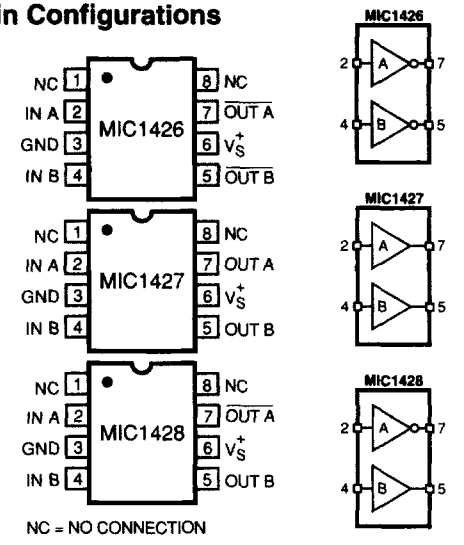


Ground Unused Inputs

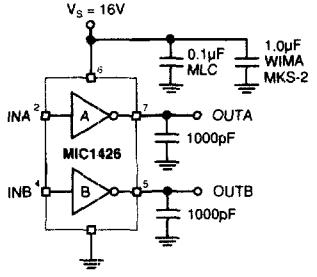
Ordering Information

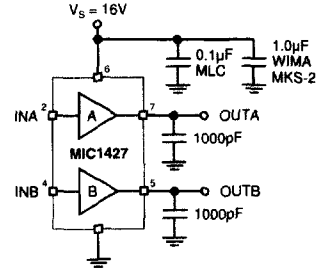
Part No.	Temperature Range	Package	Configuration
MIC1426CM	0°C to 70°C	8-Pin SO	Dual-Inverting
MIC1426CN	0°C to 70°C	8-Pin Plastic DIP	Dual-Inverting
MIC1427CM	0°C to 70°C	8-Pin SO	Dual Non-Inverting
MIC1427CN	0°C to 70°C	8-Pin Plastic DIP	Dual Non-Inverting
MIC1428CM	0°C to 70°C	8-Pin SO	Inverting and Non-Inverting
MIC1428CN	0°C to 70°C	8-Pin Plastic DIP	Inverting and Non-Inverting

Pin Configurations



Test Circuits





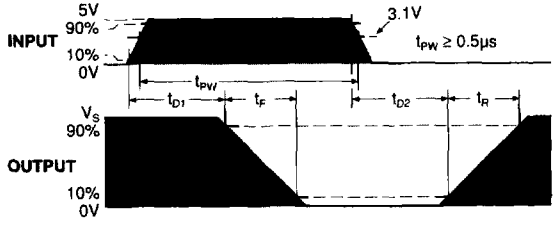


Figure 1. Inverting Driver Switching Time

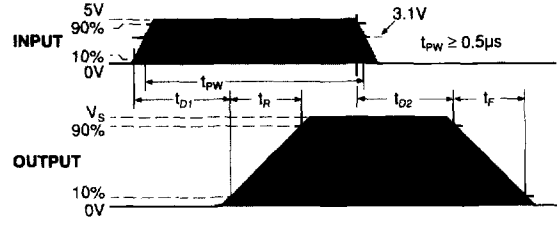


Figure 2. Noninverting Driver Switching Time

Absolute Maximum Ratings (Notes 1, 2 and 3)

Power Dissipation
- Plastic DIP 750mW
- SOIC 830mW

Derating Factor
- Plastic DIP 7.7mW/°C
- SOIC 8.3mW/°C

Supply Voltage 18V

Input Voltage, Any Terminal V_S + 0.3V to GND – 0.3V

Operating Temperature: C Version 0°C to +70°C

Maximum Chip Temperature +150°C

Storage Temperature –55°C to +150°C

Lead Temperature (10 sec) +300°C

NOTES: 1. Functional operation above the absolute maximum stress ratings is not implied.
2. Static-sensitive device (above 2kV). Unused devices must be stored in conductive material to protect devices from static discharge.
3. Switching times guaranteed by design.

Electrical Characteristics: T_A = 25°C with 4.75V < V_S < 16V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
INPUT						
V_{IH}	Logic 1, Input Voltage		3	1.4		V
V_{IL}	Logic 0, Input Voltage			1.1	0.8	V
I_{IN}	Input Current	0V < V_{IN} < V_S	–1		1	µA
OUTPUT						
V_{OH}	High Output Voltage	Test Figures 1 and 2	V_S–0.025			V
V_{OL}	Low Output Voltage	Test Figures 1 and 2			0.025	V
R_O	Output Resistance	V_{IN} = 0.8V I_{OUT} = 10 mA, V_S = 16V		6	18	Ω
R_O	Output Resistance	V_{IN} = 3V I_{OUT} = 10 mA, V_S = 16V		6	12	Ω
I_{PK}	Peak Output Current			1.5		A
I	Latch-Up Current	Withstand Reverse Current	>500			mA
SWITCHING TIME						
t_R	Rise Time	Test Figures 1 and 2		18	35	ns
t_F	Fall Time	Test Figures 1 and 2		15	25	ns
t_{D1}	Delay Time	Test Figures 1 and 2		17	75	ns
t_{D2}	Delay Time	Test Figures 1 and 2		23	75	ns
POWER SUPPLY						
I_S	Power Supply Current	V_{IN} = 3V (Both Inputs) V_{IN} = 0V (Both Inputs)		1.4 0.18	9 0.5	mA mA

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Electrical Characteristics:

Over operating temperature range with 4.75V < V_S < 16V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
INPUT						
V_{IH}	Logic 1, Input Voltage		3	1.5		V
V_{IL}	Logic 0, Input Voltage			1.0	0.8	V
I_{IN}	Input Current	0V < V_{IN} < V_S	–10		10	µA
OUTPUT						
V_{OH}	High Output Voltage	Test Figures 1 and 2	V_S–0.025			V
V_{OL}	Low Output Voltage	Test Figures 1 and 2			0.025	V
R_O	Output Resistance	V_{IN} = 0.8V I_{OUT} = 10 mA, V_S = 16V		8	23	Ω
R_O	Output Resistance	V_{IN} = 3V I_{OUT} = 10 mA, V_S = 16V		10	18	Ω
I	Latch-Up Current	Withstand Reverse Current	>500	1.5		mA
SWITCHING TIME						
t_R	Rise Time	Test Figures 1 and 2		20	60	ns
t_F	Fall Time	Test Figures 1 and 2		29	40	ns
t_{D1}	Delay Time	Test Figures 1 and 2		19	125	ns
t_{D2}	Delay Time	Test Figures 1 and 2		27	125	ns
POWER SUPPLY						
I_S	Power Supply Current	V_{IN} = 3V (Both Inputs)		1.5	13	mA
I_S	Power Supply Current	V_{IN} = 0V (Both Inputs)		0.19	0.7	mA

Supply Bypassing

Large currents are required to charge and discharge large capacitive loads quickly. For example, changing a 1000pF load 16V in 25ns, requires a 0.8A current from the device power supply.

To guarantee low supply impedance over a wide frequency range, a parallel capacitor combination is recommended for supply bypassing. Low-inductance ceramic MLC capacitors with short lead lengths (<0.5in.) should be used. A 1.0µF film capacitor in parallel with one or two 0.1µF ceramic MLC capacitors normally provides adequate bypassing.

Grounding

The MIC1426 and MIC1428 contain inverting drivers. Ground potential drops developed in common ground impedances from input to output will appear as negative feedback and degrade switching speed characteristics.

Individual ground returns for the input and output circuits or a ground plane should be used.

Input Stage

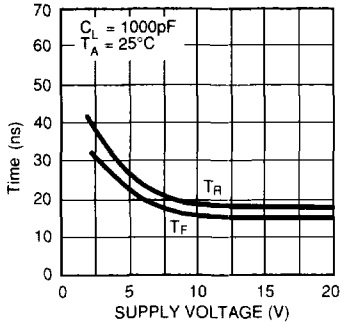
The input voltage level changes the no-load or quiescent supply current. The N-channel MOSFET input stage transistor drives a 2.5mA current source load. With a logic "1" input, the maximum quiescent supply current is 9mA. Logic "0" input level signals reduce quiescent current to 500µA maximum. **Unused driver inputs must be connected to V_S or GND.** Minimum power dissipation occurs for logic "0" inputs for the MIC1426/27/28.

The drivers are designed with 100mV of hysteresis. This provides clean transitions and minimizes output stage current spiking when changing states. Input voltage thresholds are approximately 1.5V, making logic "1" input any voltage greater than 1.5V up to V_S. Input current is less than 1µA over this range.

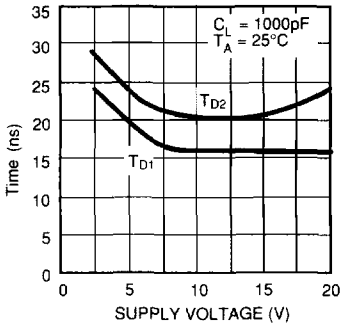
The MIC1426/27/28 may be directly driven by the TL494, SG1526/27, MIC38C42, TSC170 and similar switch-mode power supply integrated circuits.

MIC1426/7/8 Typical Characteristic Curves

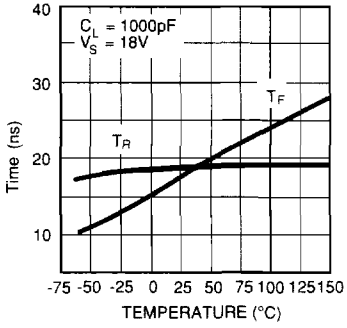
Rise and Fall Time vs. Supply Voltage



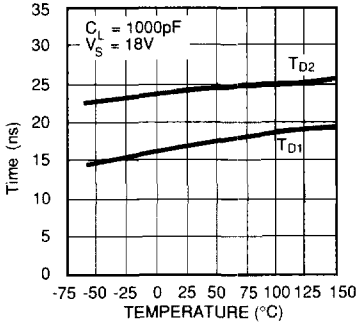
Delay Time vs. Supply Voltage



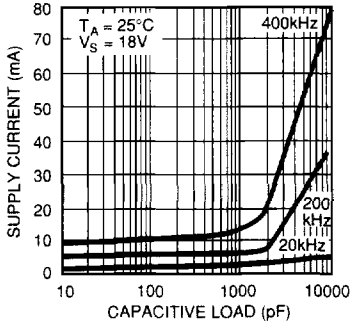
Rise and Fall Time vs. Temperature



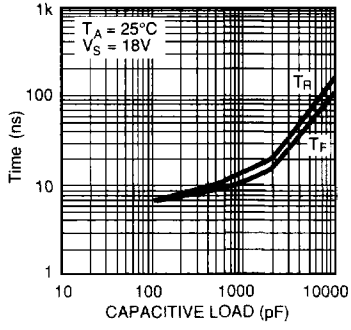
Delay Time vs. Temperature



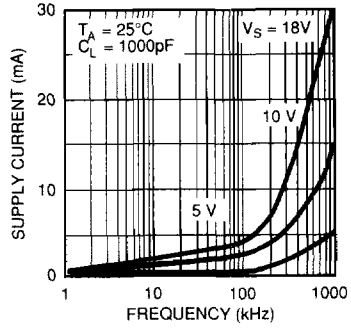
Supply Current vs. Capacitive Load



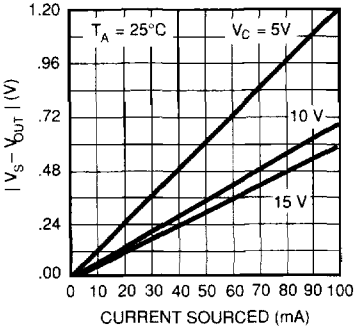
Rise and Fall Time vs. Capacitive Load



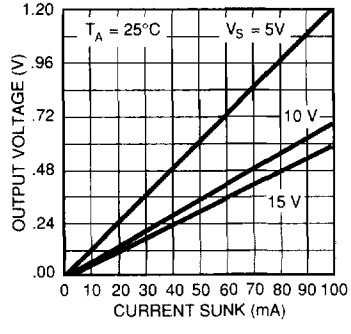
Supply Current vs. Frequency



High Output vs. Current



Low Output vs. Current



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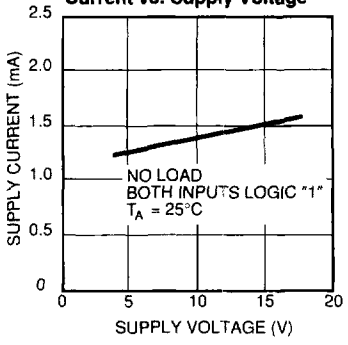
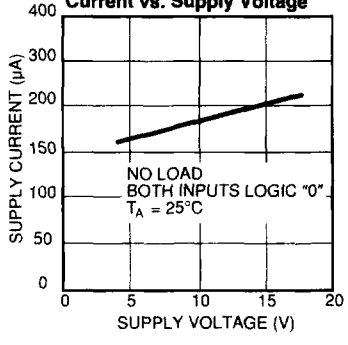
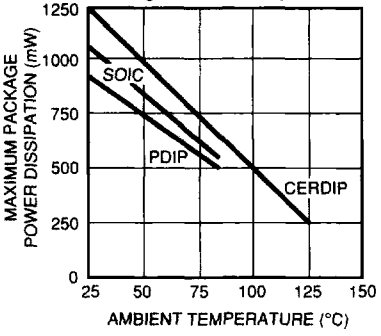
Quiescent Power Supply Current vs. Supply Voltage



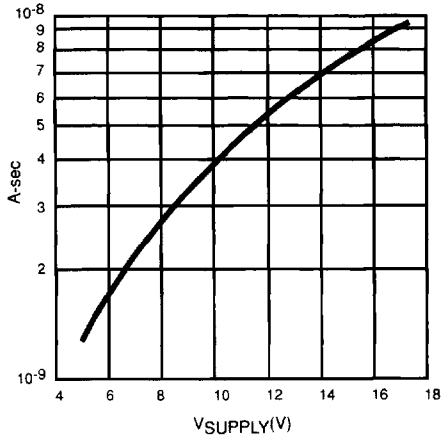
Quiescent Power Supply Current vs. Supply Voltage



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.