

# 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.

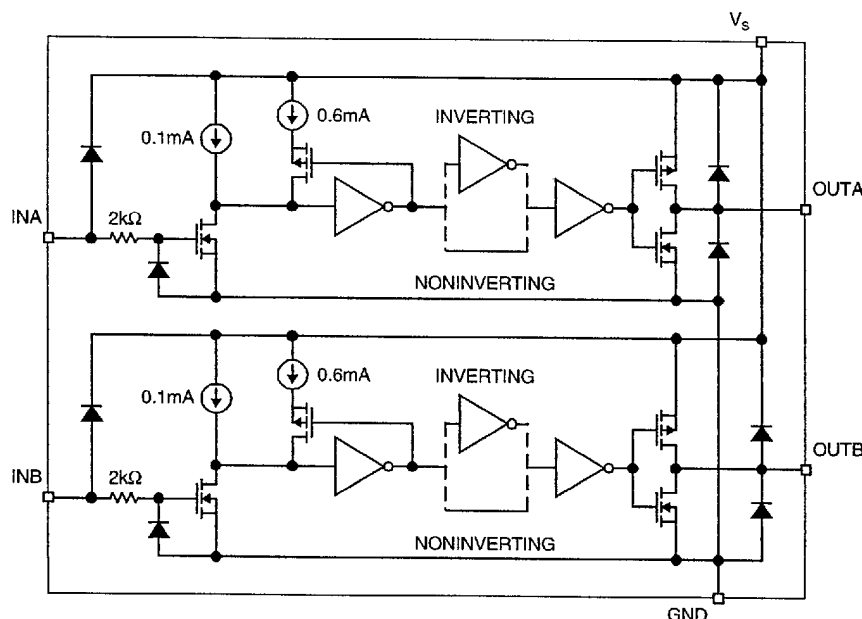
### Features

- 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

### Functional Diagram



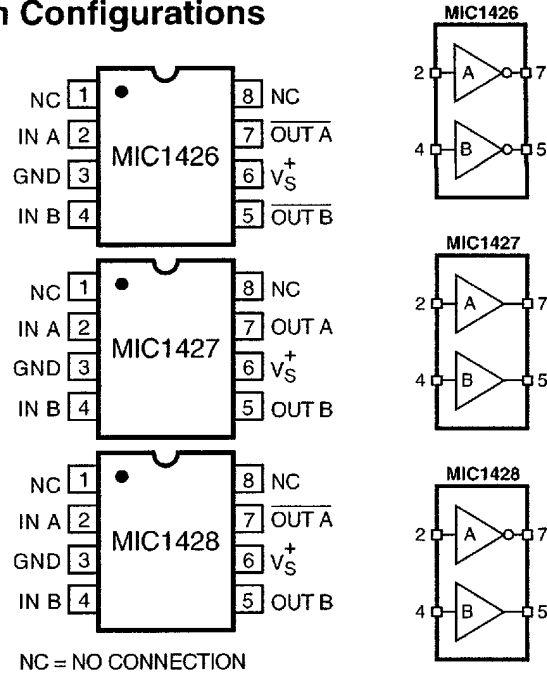
Ground Unused Inputs

6088819 0002131 8T1

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

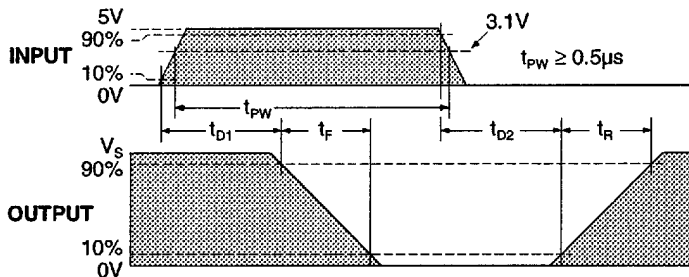
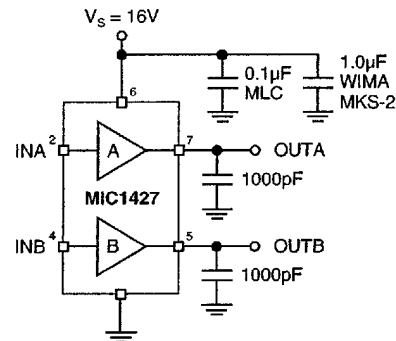
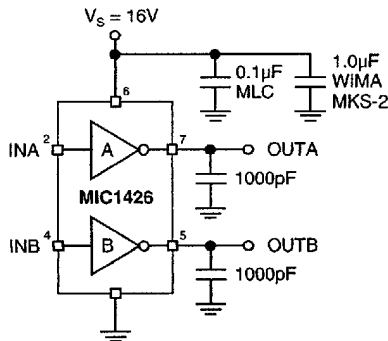


Figure 1. Inverting Driver Switching Time

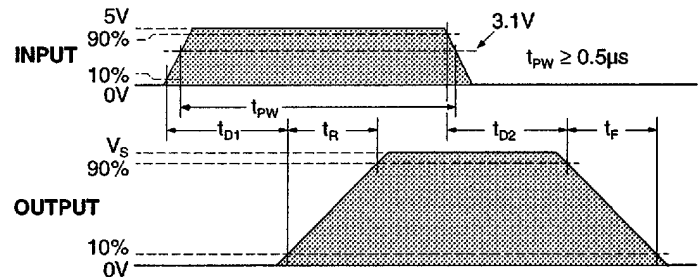


Figure 2. Noninverting Driver Switching Time

**Absolute Maximum Ratings** (Notes 1, 2 and 3)

Power Dissipation		Input Voltage, Any Terminal	$V_S + 0.3V$ to GND – 0.3V
Plastic DIP	750mW	Operating Temperature: C Version	0°C to +70°C
SOIC	830mW	Maximum Chip Temperature	+150°C
Derating Factor		Storage Temperature	-55°C to +150°C
Plastic DIP	7.7mW/°C	Lead Temperature (10 sec)	+300°C
SOIC	8.3mW/°C		
Supply Voltage	18V		

- 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:**  $T_A = 25^\circ\text{C}$  with  $4.75V < V_S < 16V$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>INPUT</b>						
$V_{IH}$	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	$\mu\text{A}$
<b>OUTPUT</b>						
$V_{OH}$	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	$V_{IN} = 0.8V$ $I_{OUT} = 10\text{ mA}, V_S = 16V$		6	18	$\Omega$
$R_O$	Output Resistance	$V_{IN} = 3V$ $I_{OUT} = 10\text{ mA}, V_S = 16V$		6	12	$\Omega$
$I_{PK}$	Peak Output Current			1.5		A
$I$	Latch-Up Current	Withstand Reverse Current	>500			mA
<b>SWITCHING TIME</b>						
$t_R$	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
<b>POWER SUPPLY</b>						
$I_S$	Power Supply Current	$V_{IN} = 3V$ (Both Inputs) $V_{IN} = 0V$ (Both Inputs)		1.4 0.18	9 0.5	mA mA

**Electrical Characteristics:**Over operating temperature range with  $4.75V < V_S < 16V$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>INPUT</b>						
$V_{IH}$	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	$\mu A$
<b>OUTPUT</b>						
$V_{OH}$	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	$V_{IN} = 0.8V$ $I_{OUT} = 10\text{ mA}, V_S = 16V$		8	23	$\Omega$
$R_O$	Output Resistance	$V_{IN} = 3V$ $I_{OUT} = 10\text{ mA}, V_S = 16V$		10	18	$\Omega$
$I$	Latch-Up Current	Withstand Reverse Current	>500	1.5		mA
<b>SWITCHING TIME</b>						
$t_R$	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
<b>POWER SUPPLY</b>						
$I_S$	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 1.0 $\mu F$  film capacitor in parallel with one or two 0.1 $\mu F$  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 500 $\mu A$  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.

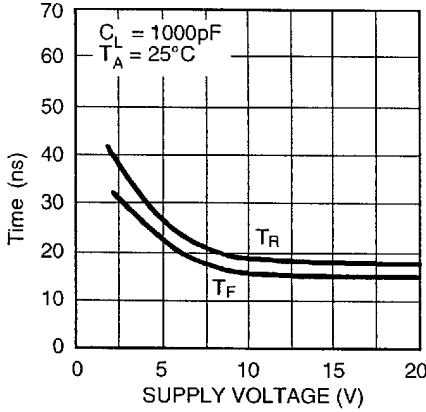
The drivers are designed with 100mV of hysteresis. This provides clean transitions and minimizes output stage current spiking when changing states. Input voltage thresholds are approximately 1.5V, making logic "1" input any voltage greater than 1.5V up to  $V_S$ . Input current is less than 1 $\mu A$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

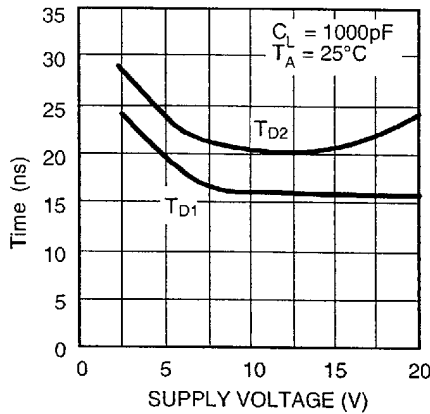
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# MIC1426/7/8 Typical Characteristic Curves

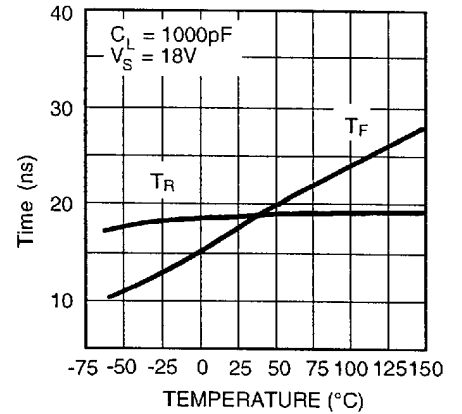
**Rise and Fall Time vs. Supply Voltage**



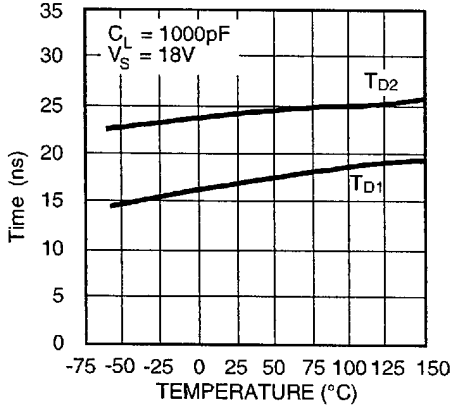
**Delay Time vs. Supply Voltage**



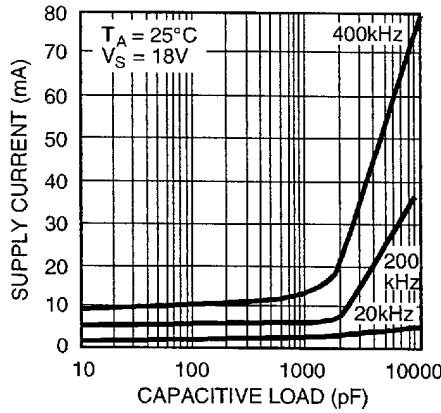
**Rise and Fall Time vs. Temperature**



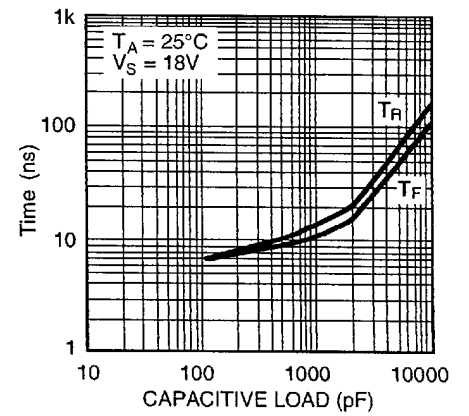
**Delay Time vs. Temperature**



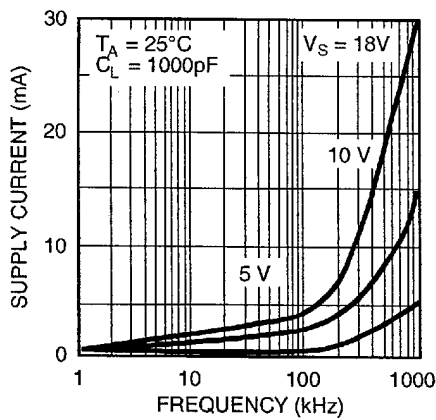
**Supply Current vs. Capacitive Load**



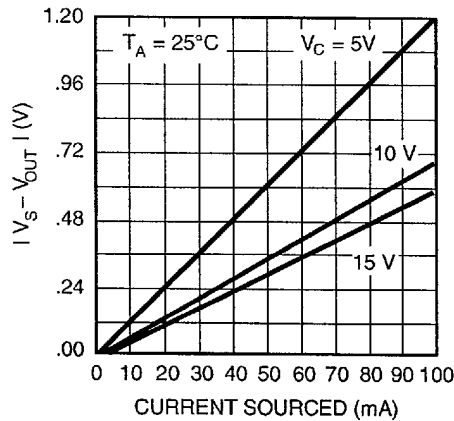
**Rise and Fall Time vs. Capacitive Load**



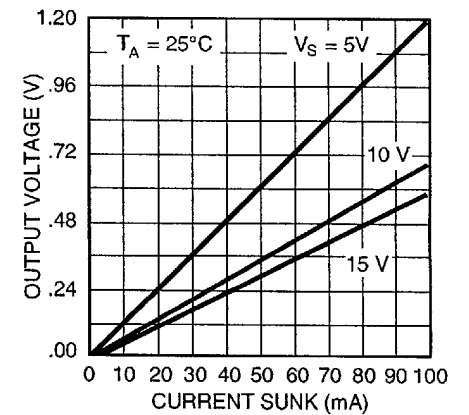
**Supply Current vs. Frequency**

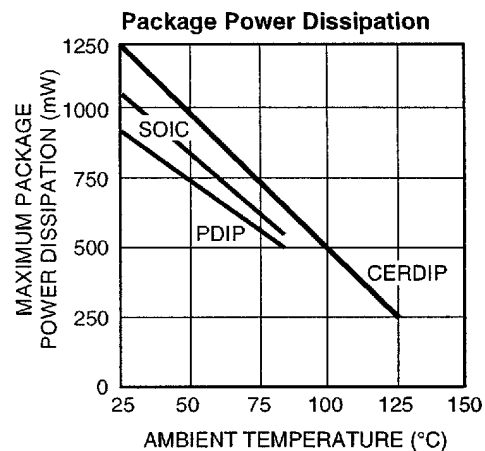
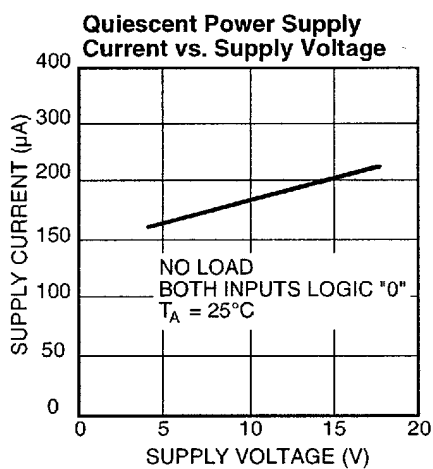
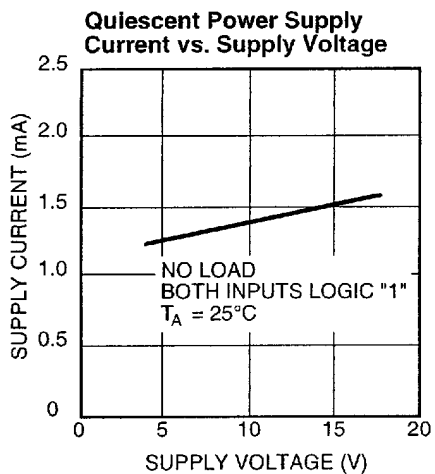


**High Output vs. Current**

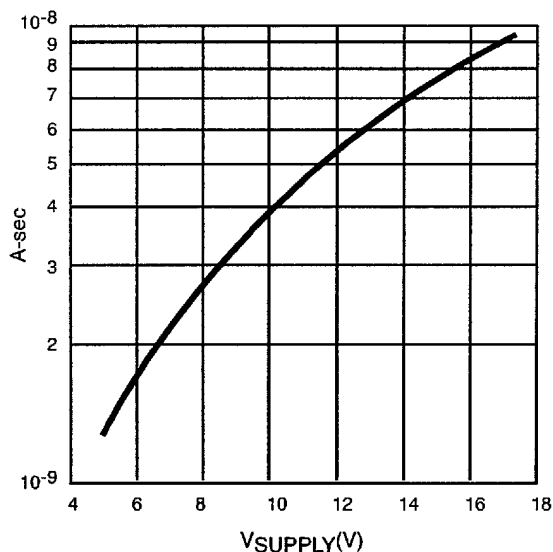


**Low Output vs. Current**

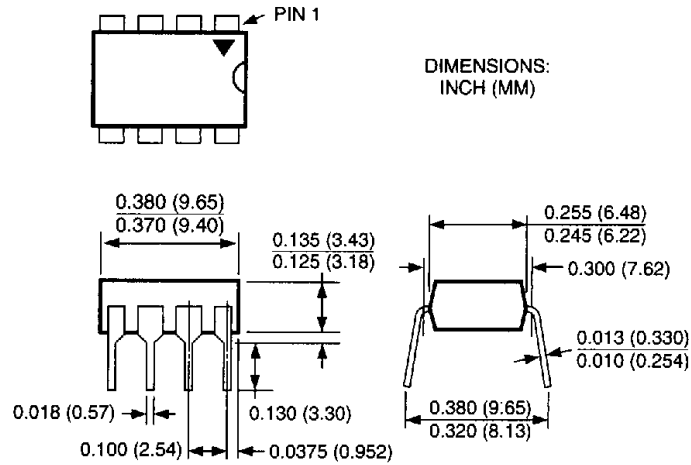




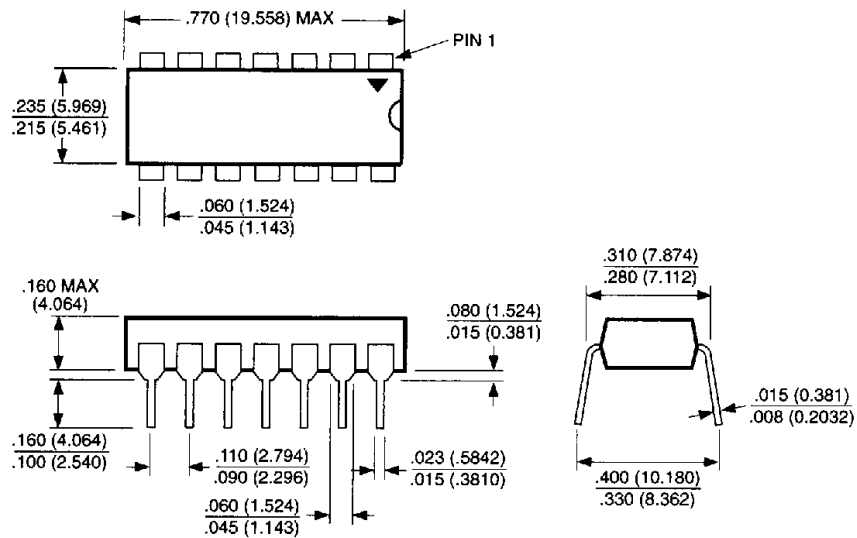
### Crossover Energy Loss



**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.

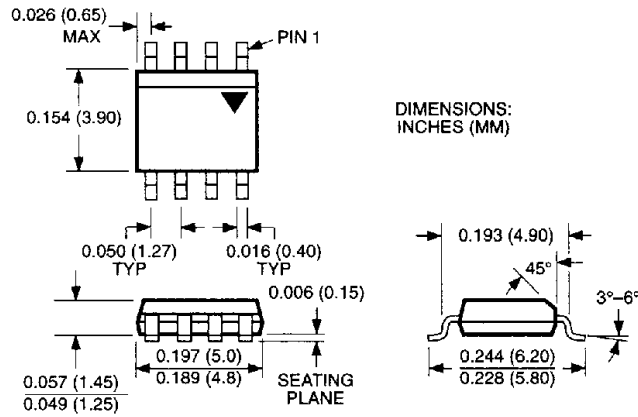


8-Pin Plastic DIP (N)

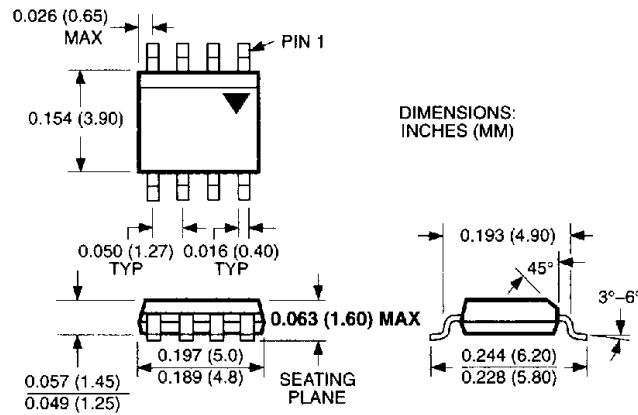


14-Pin Plastic DIP (N)

Note: Pin 1 is denoted by one or more of the following: a notch, a printed triangle, or a mold mark.



8-Pin SOIC (M)



8-Pin Low-Profile SOIC (LM)

**Note:** Pin 1 is denoted by one or more of the following: a notch, a printed triangle, or a mold mark.