

on loading is that total power dissipation in the IC must be kept within the power dissipation limits of the package.

The MIC446X series drivers are built using a BCD process. 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 (either polarity) occurs on the ground line. They can accept up to half an amp of inductive kickback current (either polarity) into their outputs without damage or logic upset.

## Ordering Information

| Part Number |             | Temperature Range | Package            |
|-------------|-------------|-------------------|--------------------|
| Standard    | Pb-Free     |                   |                    |
| MIC44xxCN*  | MIC44xxZN*  | 0°C to +70°C      | 14-pin Plastic DIP |
| MIC44xxCWM* | MIC44xxZWM* | 0°C to +70°C      | 16-pin Wide SOIC   |
| MIC44xxBN*  | MIC44xxYN*  | −40°C to +85°C    | 14-pin Plastic DIP |
| MIC44xxBWM* | MIC44xxYWM* | −40°C to +85°C    | 16-pin Wide SOIC   |

\* xx identifies input logic:

67 — NAND      68 — AND      69 — AND with 1 inverting input

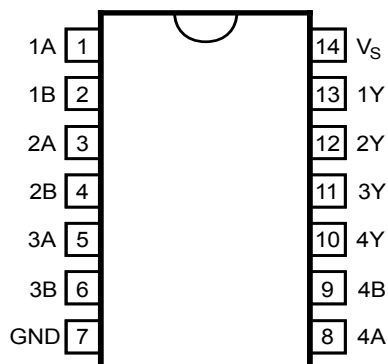
\*\*Pb-Free industrial grade PDIP available in MIC4468 & MIC4469 only.

## Truth Table

| Part No.                 | Inputs |   | Output Y |
|--------------------------|--------|---|----------|
|                          | A      | B |          |
| MIC4467<br>(Each Driver) | L      | X | H        |
|                          | X      | L | H        |
|                          | H      | H | L        |
| MIC4468<br>(Each Driver) | H      | H | H        |
|                          | L      | X | L        |
|                          | X      | L | L        |
| MIC4469<br>(Each Driver) | L      | X | L        |
|                          | X      | H | L        |
|                          | H      | L | H        |

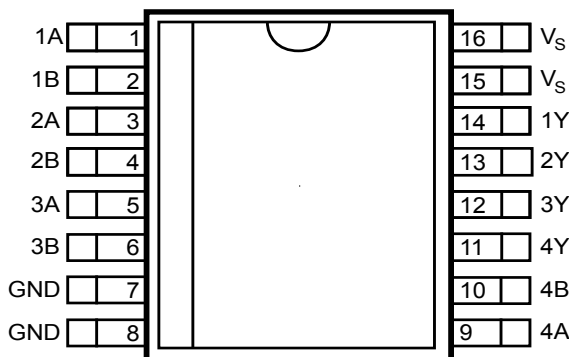
## Pin Configurations

14-Pin DIP (N)



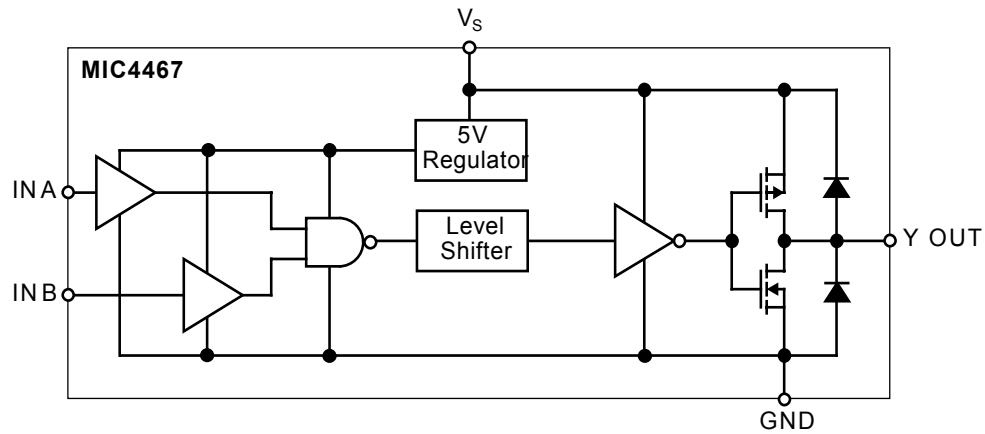
TOP VIEW

16-Pin Wide SOIC (WM)

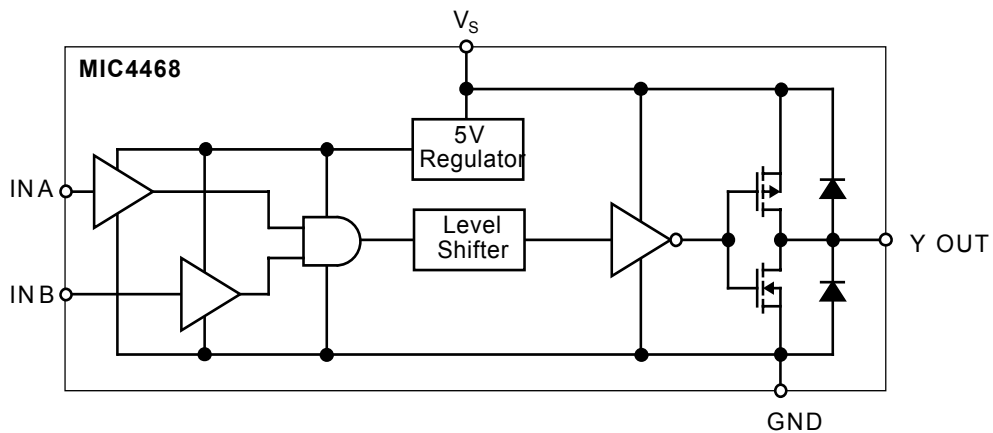


TOP VIEW

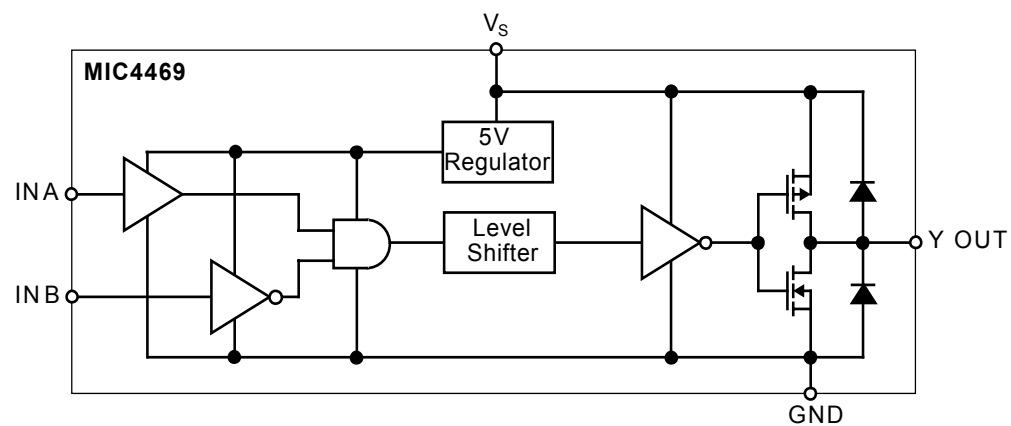
## Block Diagrams



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



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



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

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

|                               |                                |                                              |         |
|-------------------------------|--------------------------------|----------------------------------------------|---------|
| Supply Voltage                | 22V                            | Power Dissipation                            |         |
| Input Voltage                 | (GND – 5V) to ( $V_S + 0.3V$ ) | N Package (14-Pin Plastic DIP)               | 1.5W    |
| Maximum Chip Temperature      |                                | WM Package (16-Pin Wide SOIC)                | 1W      |
| Operating                     | 150°C                          | Package Thermal Resistance                   |         |
| Storage                       | –65° to +150°C                 | N Package (14-Pin Plastic DIP) $\theta_{JA}$ | 80°C/W  |
| Maximum Load Temperature      |                                | WM Package (16-Pin Wide SOIC) $\theta_{JA}$  | 120°C/W |
| (10 sec, for soldering)       | 300°C                          |                                              |         |
| Operating Ambient Temperature |                                |                                              |         |
| C Version                     | 0° to +70°C                    |                                              |         |
| B Version                     | –40° to +85°C                  |                                              |         |

**Electrical Characteristics:** Measured at  $T_A = 25^\circ\text{C}$  with  $4.5V \leq V_S \leq 18V$  unless otherwise specified. (**Note 3**)

| Symbol                | Parameter                                        | Conditions                            | Min          | Typ | Max  | Units         |
|-----------------------|--------------------------------------------------|---------------------------------------|--------------|-----|------|---------------|
| <b>INPUT</b>          |                                                  |                                       |              |     |      |               |
| $V_{IH}$              | Logic 1 Input Voltage                            |                                       | 2.4          | 1.3 |      | V             |
| $V_{IL}$              | Logic 0 Input Voltage                            |                                       |              | 1.2 | 0.8  | V             |
| $I_{IN}$              | Input Current                                    | $0 \leq V_{IN} \leq V_S$              | –1           |     | 1    | $\mu\text{A}$ |
| <b>OUTPUT</b>         |                                                  |                                       |              |     |      |               |
| $V_{OH}$              | High Output Voltage                              | $I_{LOAD} = 10\text{mA}$              | $V_S - 0.15$ |     |      | V             |
| $V_{OL}$              | Low Output Voltage                               | $I_{LOAD} = 10\text{mA}$              |              |     | 0.15 | V             |
| $R_O$                 | Output Resistance                                | $I_{OUT} = 10\text{mA}$ , $V_S = 18V$ |              | 5   | 15   | $\Omega$      |
| $I_{PK}$              | Peak Output Current                              |                                       |              | 1.2 |      | A             |
| I                     | Latch-Up Protection<br>Withstand Reverse Current |                                       | >500         |     |      | mA            |
| <b>SWITCHING TIME</b> |                                                  |                                       |              |     |      |               |
| $t_R$                 | Rise Time                                        | Test Figure 1                         |              | 14  | 25   | ns            |
| $t_F$                 | Fall Time                                        | Test Figure 1                         |              | 13  | 25   | ns            |
| $t_{D1}$              | Delay Time                                       | Test Figure 1                         |              | 30  | 75   | ns            |
| $t_{D2}$              | Delay Time                                       | Test Figure 1                         |              | 45  | 75   | ns            |
| <b>POWER SUPPLY</b>   |                                                  |                                       |              |     |      |               |
| $I_S$                 | Power Supply Current<br>Supply                   |                                       |              | 0.2 | 4    | mA            |

**Note 3.** Specification for packaged product only.

**Electrical Characteristics:**

Measured over operating temperature range with  $4.5V \leq V_S \leq 18V$  unless otherwise specified.

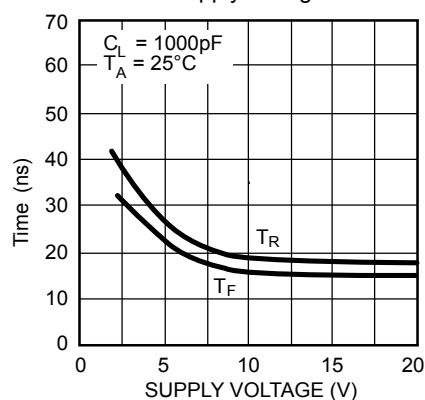
| Symbol                | Parameter                                        | Conditions                           | Min         | Typ | Max | Units    |
|-----------------------|--------------------------------------------------|--------------------------------------|-------------|-----|-----|----------|
| <b>INPUT</b>          |                                                  |                                      |             |     |     |          |
| $V_{IH}$              | Logic 1 Input Voltage                            |                                      | 2.4         | 1.4 |     | V        |
| $V_{IL}$              | Logic 0 Input Voltage                            |                                      |             | 1.0 | 0.8 | V        |
| $I_{IN}$              | Input Current                                    | $0 \leq V_{IN} \leq V_S$             | -1          |     | 1   | $\mu A$  |
| <b>OUTPUT</b>         |                                                  |                                      |             |     |     |          |
| $V_{OH}$              | High Output Voltage                              | $I_{LOAD} = 10 \text{ mA}$           | $V_S - 0.3$ |     |     | V        |
| $V_{OL}$              | Low Output Voltage                               | $I_{LOAD} = 10 \text{ mA}$           |             |     | 0.3 | V        |
| $R_O$                 | Output Resistance                                | $I_{OUT} = 10 \text{ mA}, V_S = 18V$ |             | 7   | 30  | $\Omega$ |
| $I_{PK}$              | Peak Output Current                              |                                      |             | 1.2 |     | A        |
| I                     | Latch-Up Protection<br>Withstand Reverse Current |                                      | 500         |     |     | mA       |
| <b>SWITCHING TIME</b> |                                                  |                                      |             |     |     |          |
| $t_R$                 | Rise Time                                        | Test Figure 1                        |             | 17  | 50  | ns       |
| $t_F$                 | Fall Time                                        | Test Figure 1                        |             | 16  | 50  | ns       |
| $t_{D1}$              | Delay Time                                       | Test Figure 1                        |             | 35  | 100 | ns       |
| $t_{D2}$              | Delay Time                                       | Test Figure 1                        |             | 55  | 100 | ns       |
| <b>POWER SUPPLY</b>   |                                                  |                                      |             |     |     |          |
| $I_S$                 | Power Supply Current<br>Supply                   |                                      |             | 0.4 | 8   | mA       |

**NOTE 1:** Functional operation above the absolute maximum stress ratings is not implied.

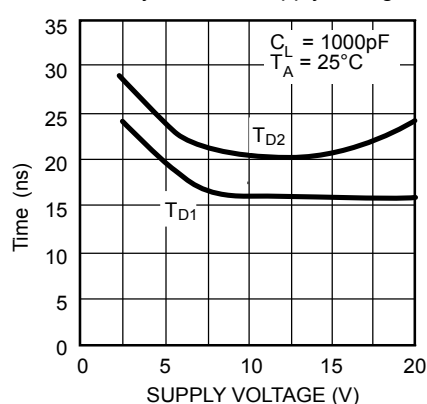
**NOTE 2:** Static sensitive device. Store only in conductive containers. Handling personnel and equipment should be grounded to prevent static damage.

# Typical Characteristics

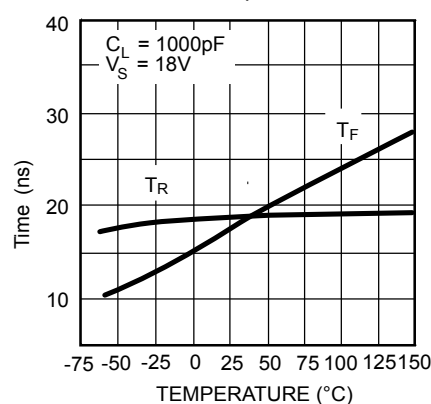
Rise and Fall Time vs. Supply Voltage



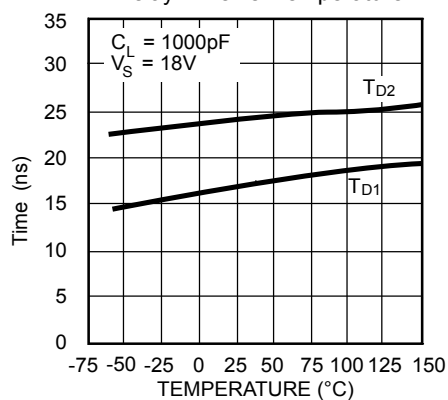
Delay Time vs. Supply Voltage



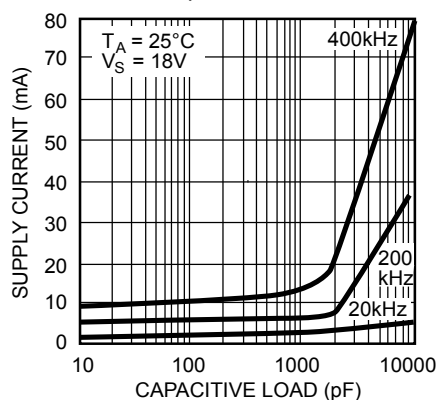
Rise and Fall Time vs. Temperature



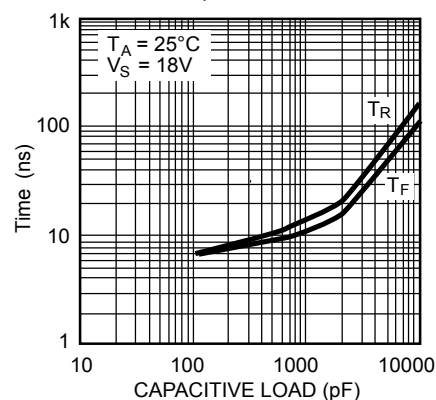
Delay Time vs. Temperature



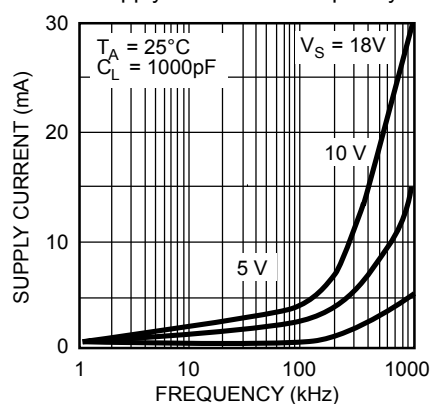
Supply Current vs. Capacitive Load



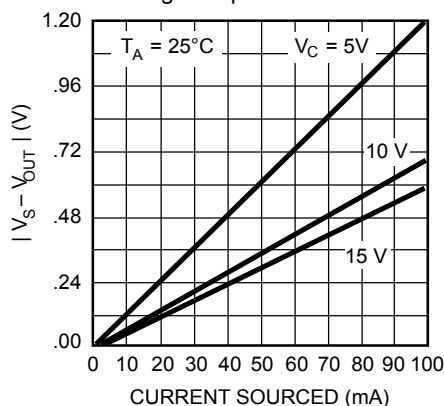
Rise and Fall Time vs. Capacitive Load



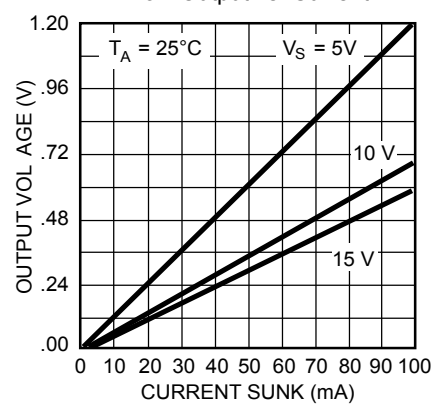
Supply Current vs. Frequency

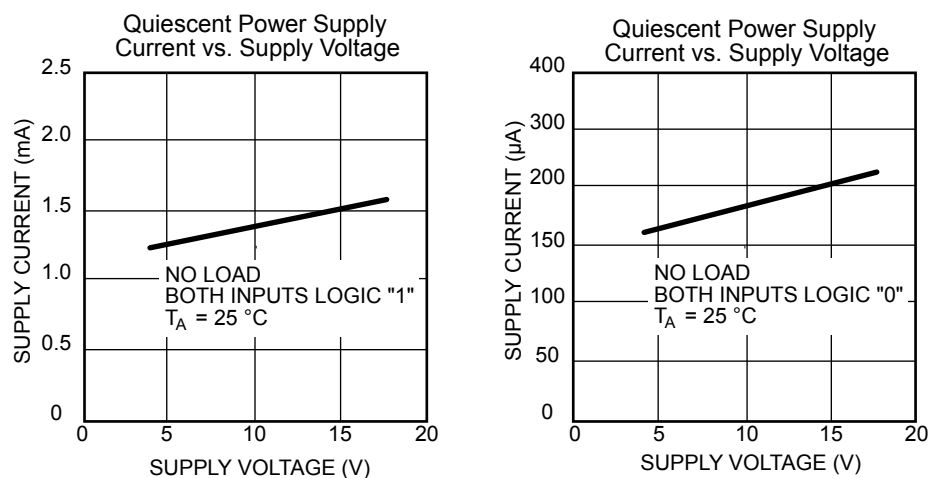


High Output vs. Current

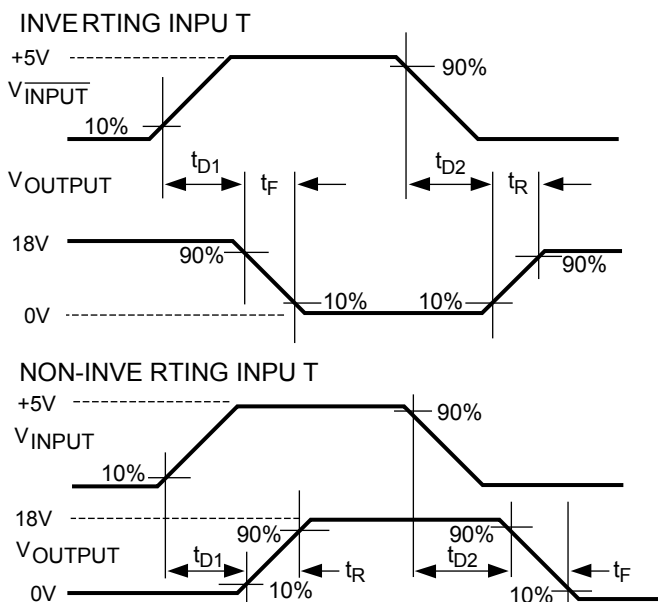
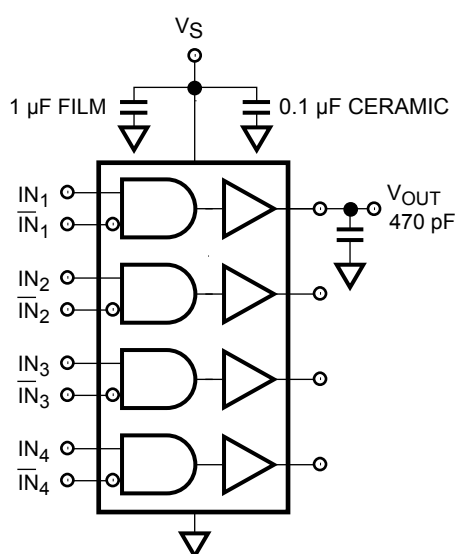


Low Output vs. Current

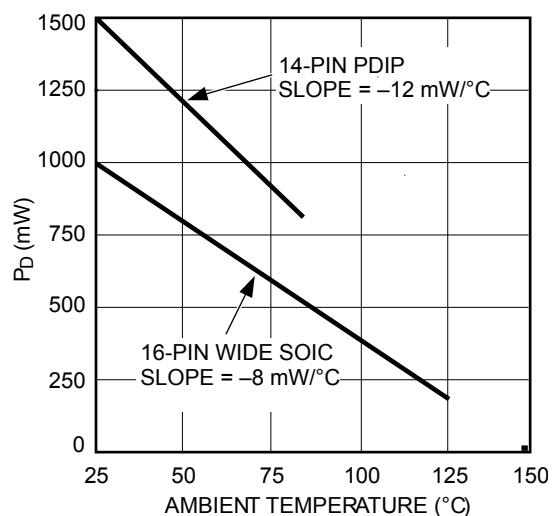




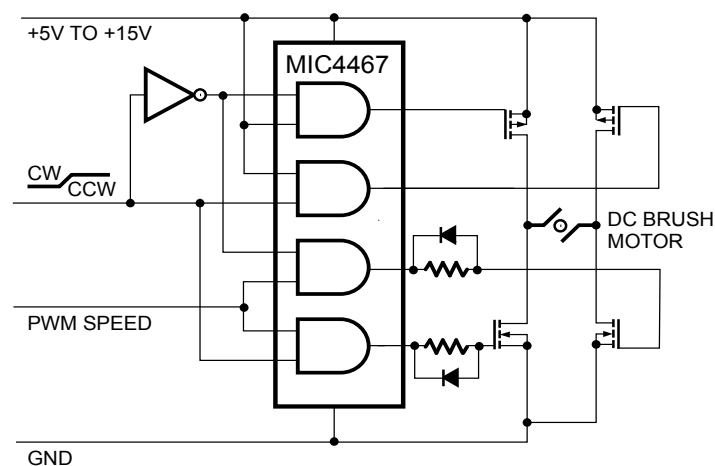
Test Figure 1



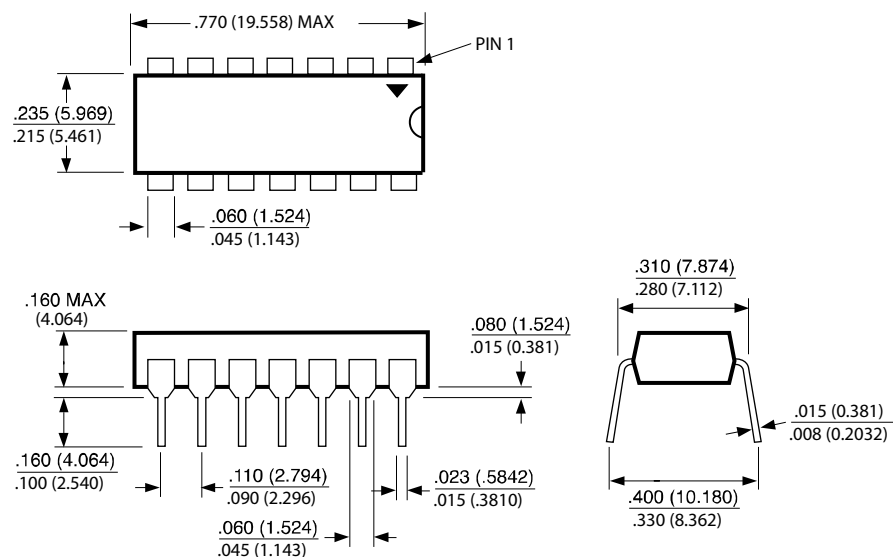
## Package Power Dissipation



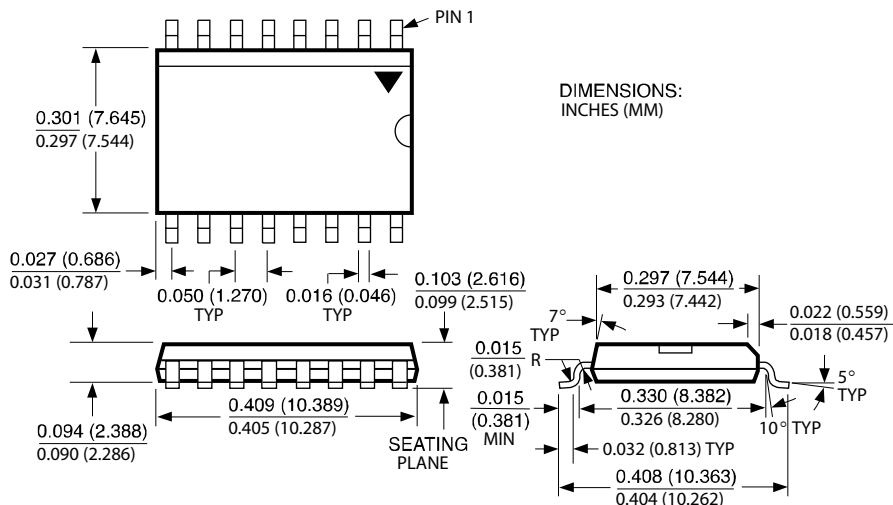
## Quad Driver Drives H Bridge to Control Motor Speed and Direction



### 14-Pin Plastic DIP (N)



### 16-Pin Wide SOP (WM)



TEL + 1 (408) 944-0800 FAX + 1 (408) 474-1000 WEB <http://www.micrel.com>

Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 1998 Micrel, Inc.