# MIC4467/4468/4469

## Quad 1.2A-Peak Low-Side MOSFET Driver

## Bipolar/CMOS/DMOS

## General Description

The MIC4467/8/9 family of 4-output CMOS buffer/drivers is an expansion from the earlier single- and dual-output drivers, to which they are functionally closely related. Because package pin count permitted it, each driver has been equipped with a 2-input logic gate for added flexibility. Placing four high-power drivers in a single package also improves system reliability and reduces total system cost. In some applications, one of these drivers can replace not only two packages of single-input drivers, but some of the associated logic as well.

Although primarily intended for driving power MOSFETs, and similar highly capacitive loads, these drivers are equally well suited to driving any other load (capacitive, resistive, or inductive), which requires a high-efficiency, low-impedance driver capable of high peak currents, rail-to-rail voltage swings, and fast switching times. For example, heavily loaded clock lines, coaxial cables, and piezoelectric transducers can all be driven easily with MIC446X series drivers. The only limitation

## Features

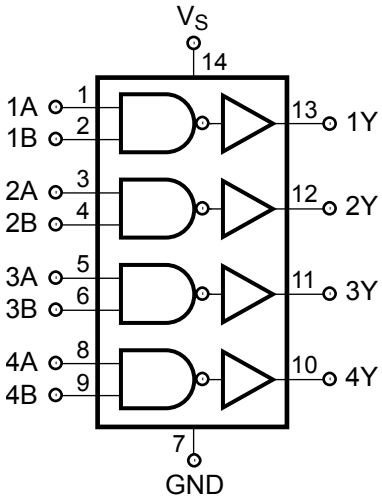
- Built using reliable, low power CMOS processes
- Latchproof. Withstands 500mA Inductive Kickback
- 3 Input Logic Choices
- Symmetrical Rise and Fall Times.....25ns
- Short, Equal Delay Times .....75ns
- High Peak Output Current..... 1.2A
- Wide Operating Range .....4.5 to 18V
- Low Equivalent Input Capacitance (typ) ..... 6pF
- Inputs = Logic 1 for Any Input From 2.4V to $V_S$
- ESD Protected

## Applications

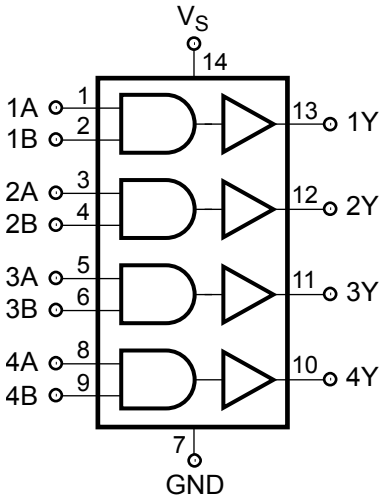
- General-Purpose CMOS Logic Buffer
- Driving All 4 MOSFETs in an H-Bridge
- Direct Small-Motor Driver
- Relay or Peripheral Drivers
- Dual Differential Output Power Drivers
- CCD Driver
- Pin-Switching Network Driver

## Logic Diagrams

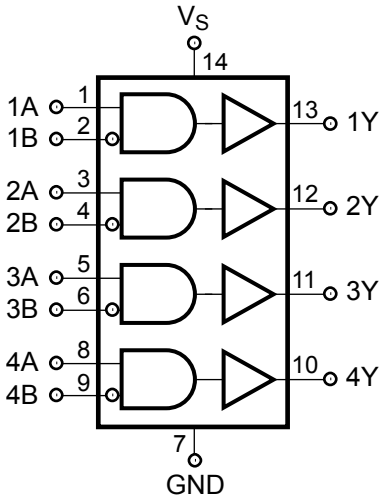
MIC4467




MIC4468




MIC4469



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 |

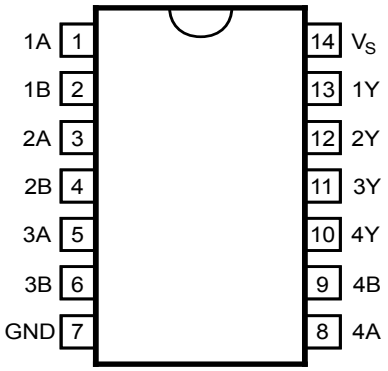
* xx identifies input logic:
67 — NAND 68 — AND 69 — AND with 1 inverting input
**Pb-Free industrial grade PDIP available in MIC4468 & MIC4469 only.

## Truth Table

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

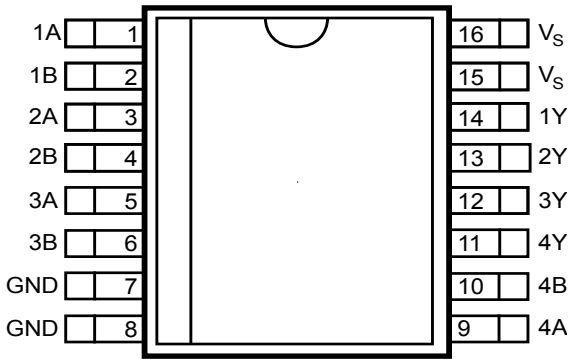
## Pin Configurations

14-Pin DIP (N)



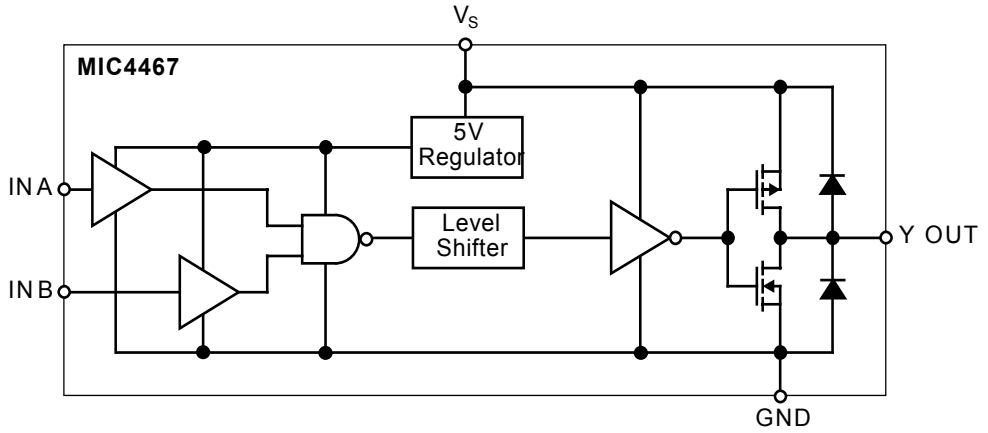

TOP VIEW

16-Pin Wide SOIC (WM)

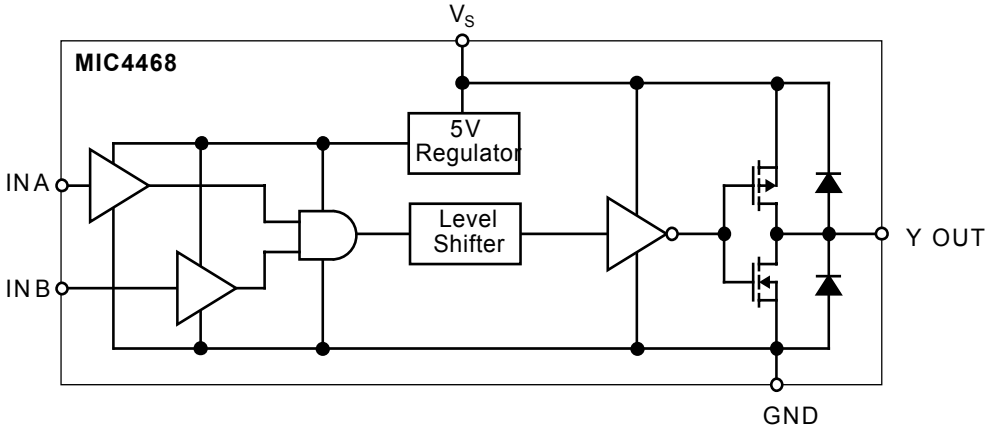



TOP VIEW

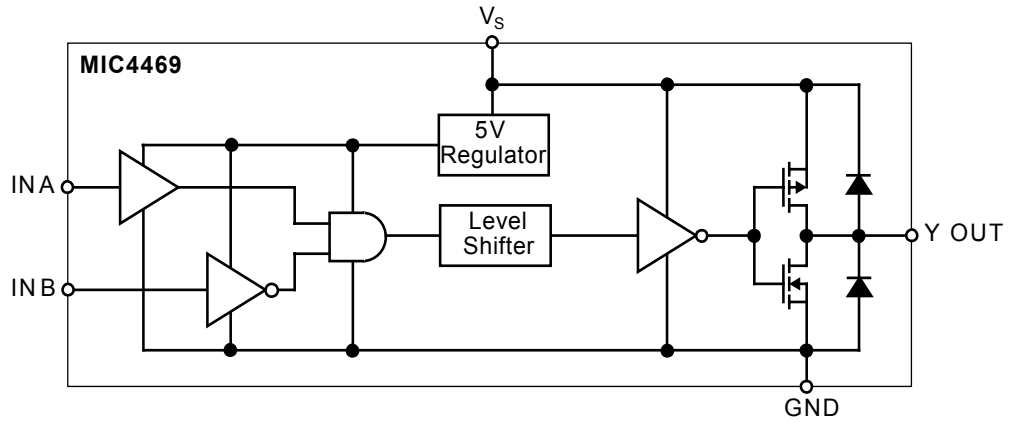
## Block Diagrams




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
Input Voltage (GND – 5V) to ($V_S$ + 0.3V)
Maximum Chip Temperature
  Operating 150°C
  Storage –65° to +150°C
Maximum Load Temperature
  (10 sec, for soldering) 300°C
Operating Ambient Temperature
  C Version 0° to +70°C
  B Version –40° to +85°C

Power Dissipation
  N Package (14-Pin Plastic DIP) 1.5W
  WM Package (16-Pin Wide SOIC) 1W

Package Thermal Resistance
  N Package (14-Pin Plastic DIP) $\theta_{JA}$ 80°C/W
  WM Package (16-Pin Wide SOIC) $\theta_{JA}$ 120°C/W

## Electrical Characteristics: Measured at $T_A$ = 25°C with 4.5V ≤ $V_S$ ≤ 18V unless otherwise specified. (**Note 3**)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **INPUT** | | | | | | |
| $V_{IH}$ | 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 ≤ $V_{IN}$ ≤ $V_S$ | –1 | | 1 | µA |
| **OUTPUT** | | | | | | |
| $V_{OH}$ | High Output Voltage | $I_{LOAD}$ = 10mA | $V_S$-0.15 | | | V |
| $V_{OL}$ | Low Output Voltage | $I_{LOAD}$ = 10mA | | | 0.15 | V |
| $R_O$ | Output Resistance | $I_{OUT}$ = 10mA, $V_S$ = 18V | | 5 | 15 | Ω |
| $I_{PK}$ | Peak Output Current | | | 1.2 | | A |
| I | Latch-Up Protection Withstand Reverse Current | | >500 | | | mA |
| **SWITCHING TIME** | | | | | | |
| $t_R$ | 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 |
| **POWER SUPPLY** | | | | | | |
| $I_S$ | Power Supply Current Supply | | | 0.2 | 4 | mA |

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

## Electrical Characteristics:

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

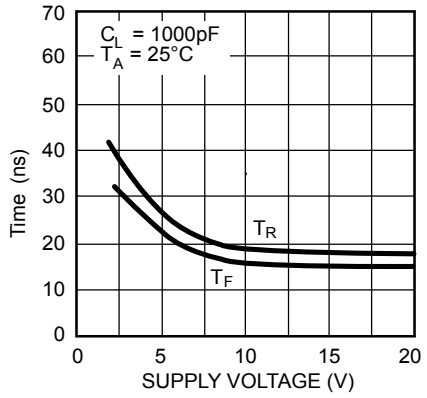
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **INPUT** | | | | | | |
| $V_{IH}$ | Logic 1 Input Voltage | | 2.4 | 1.4 | | V |
| $V_{IL}$ | Logic 0 Input Voltage | | | 1.0 | 0.8 | V |
| $I_{IN}$ | Input Current | 0 ≤ $V_{IN}$ ≤ $V_S$ | –1 | | 1 | µA |
| **OUTPUT** | | | | | | |
| $V_{OH}$ | High Output Voltage | $I_{LOAD}$ = 10 mA | $V_S$-0.3 | | | V |
| $V_{OL}$ | Low Output Voltage | $I_{LOAD}$ = 10 mA | | | 0.3 | V |
| $R_O$ | Output Resistance | $I_{OUT}$ = 10 mA, $V_S$ = 18V | | 7 | 30 | Ω |
| $I_{PK}$ | Peak Output Current | | | 1.2 | | A |
| I | Latch-Up Protection Withstand Reverse Current | | 500 | | | mA |
| **SWITCHING TIME** | | | | | | |
| $t_R$ | 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 |
| **POWER SUPPLY** | | | | | | |
| $I_S$ | Power Supply Current Supply | | | 0.4 | 8 | mA |

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

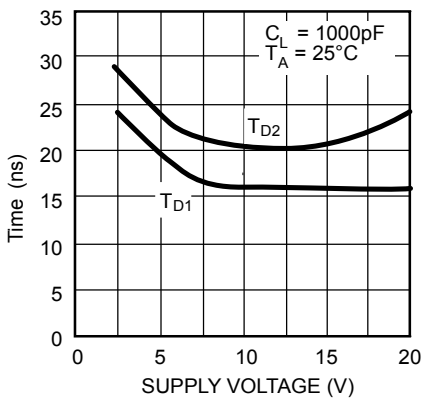
**NOTE 2:** Static sensitive device. Store only in conductive containers. Handling personnel and equipment should be grounded to prevent static damage.

## Typical Characteristics

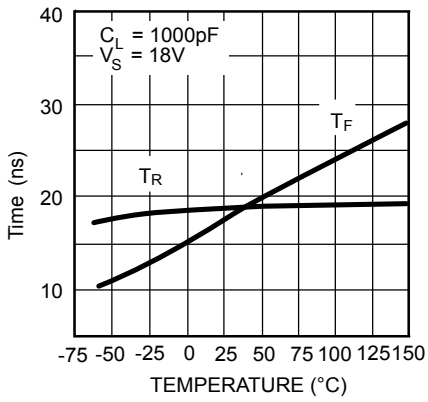
Rise and Fall Time vs. Supply Voltage



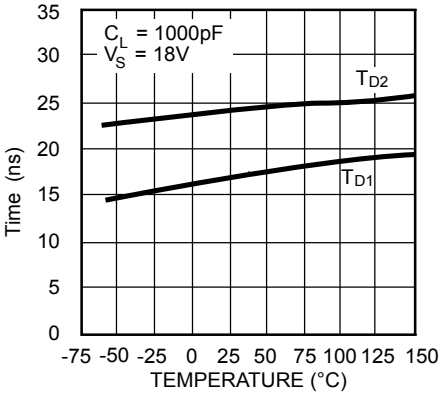

Delay Time vs. Supply Voltage



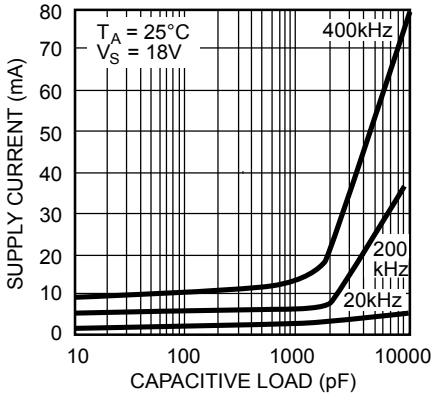

Rise and Fall Time vs. Temperature



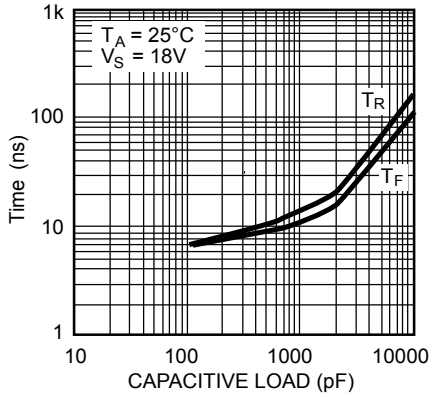

Delay Time vs. Temperature



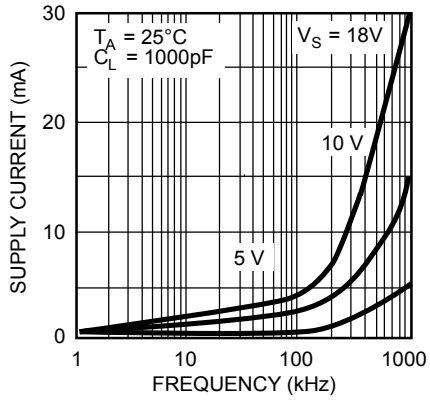

Supply Current vs. Capacitive Load



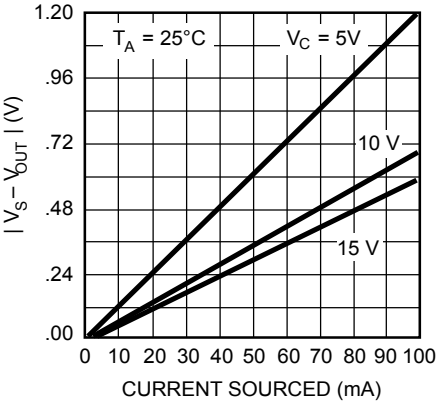

Rise and Fall Time vs. Capacitive Load



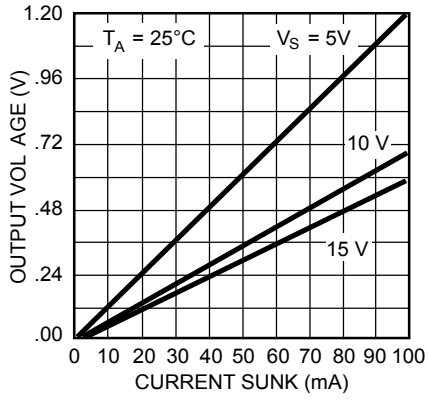

Supply Current vs. Frequency

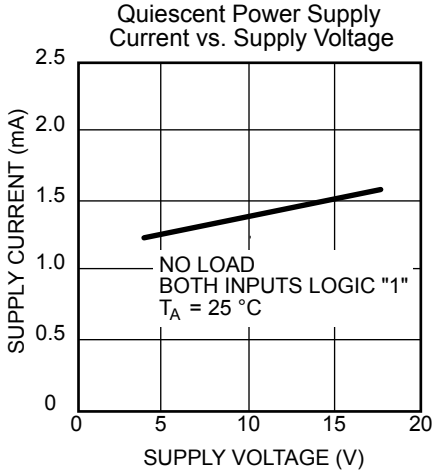


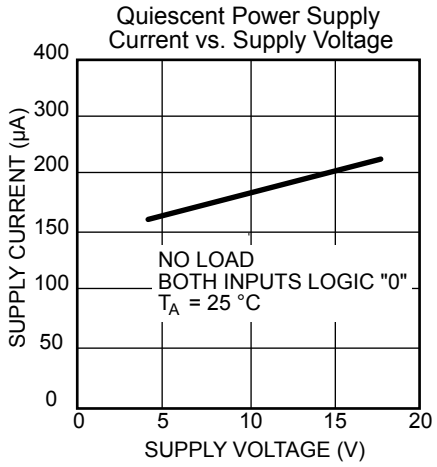

High Output vs. Current



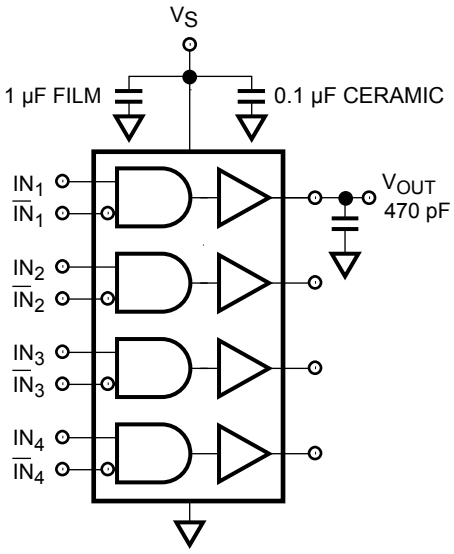

Low Output vs. Current

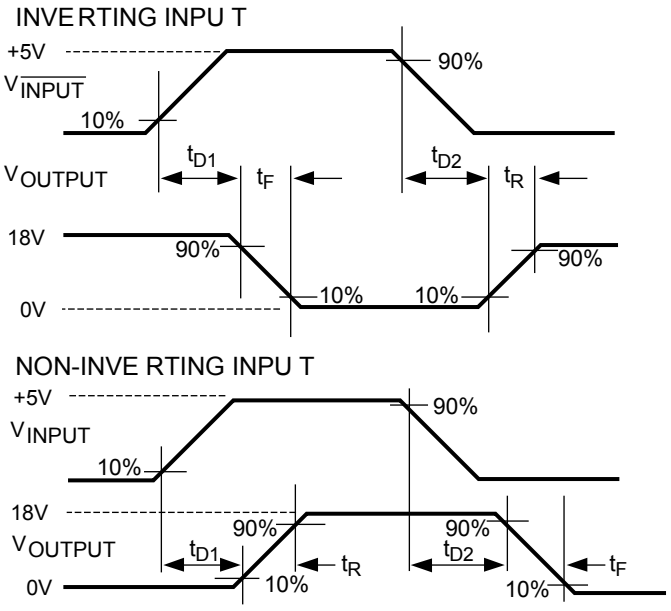




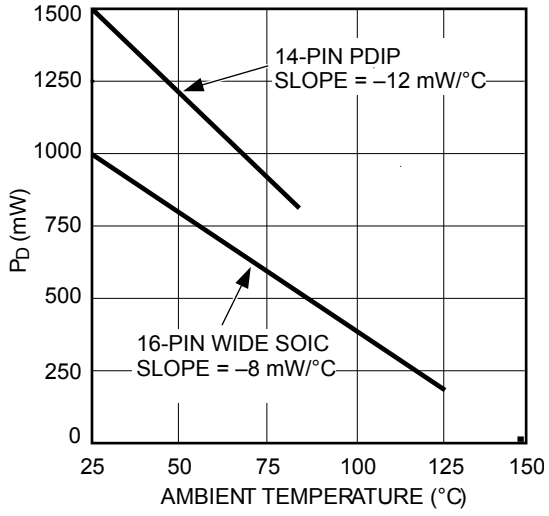




## Test Figure 1

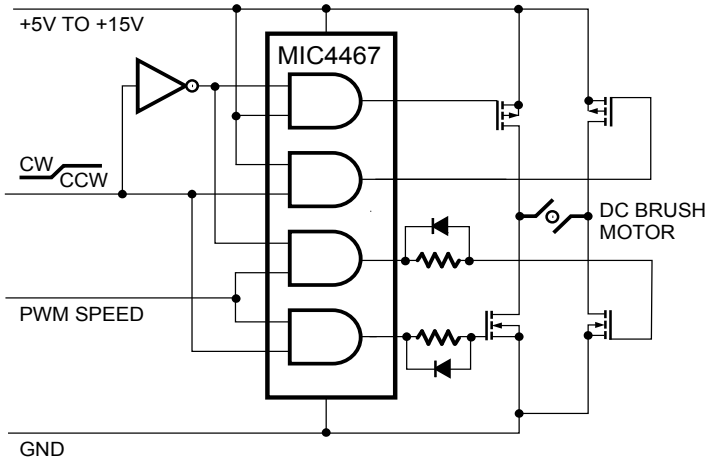


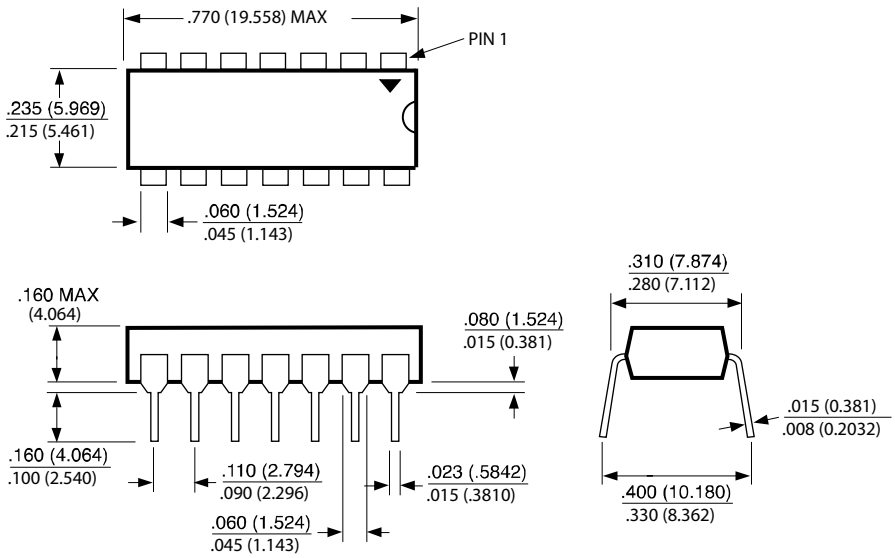

## Package Power Dissipation



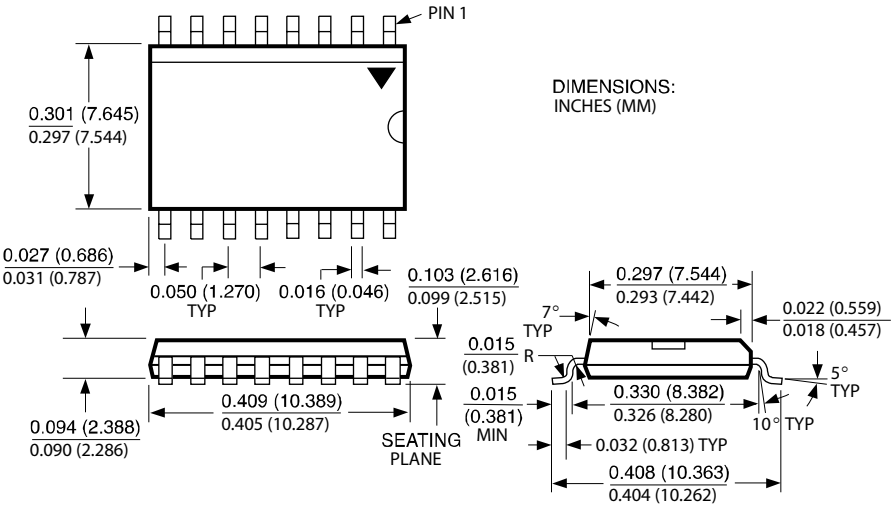

## Quad Driver Drives H Bridge to Control Motor Speed and Direction



## Package Information




**14-Pin Plastic DIP (N)**




**16-Pin Wide SOP (WM)**

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