

## 1.5A High-Speed, Floating Load Driver

### Features

- Low Quiescent Current: 300 $\mu$ A Max
- Capacitive Inputs With 300mV Hysteresis
- Both Inputs Must Be Driven to Drive Load
- Low Output Leakage
- High Peak Current Capability
- Fast Output Rise Time
- Outputs Individually Testable

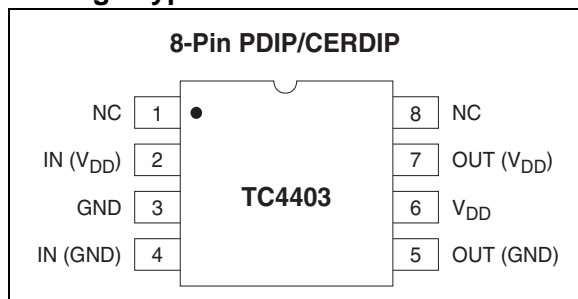
### Applications

- Isolated Load Drivers
- Pulsers
- Safety Interlocks

### Device Selection Table

Part Number	Package	Temp. Range
TC4403CPA	8-Pin PDIP	0°C to +70°C
TC4403EPA	8-Pin PDIP	-40°C to +85°C
TC4403MJA	8-Pin CERDIP	-55°C to +125°C

### Package Type



### General Description

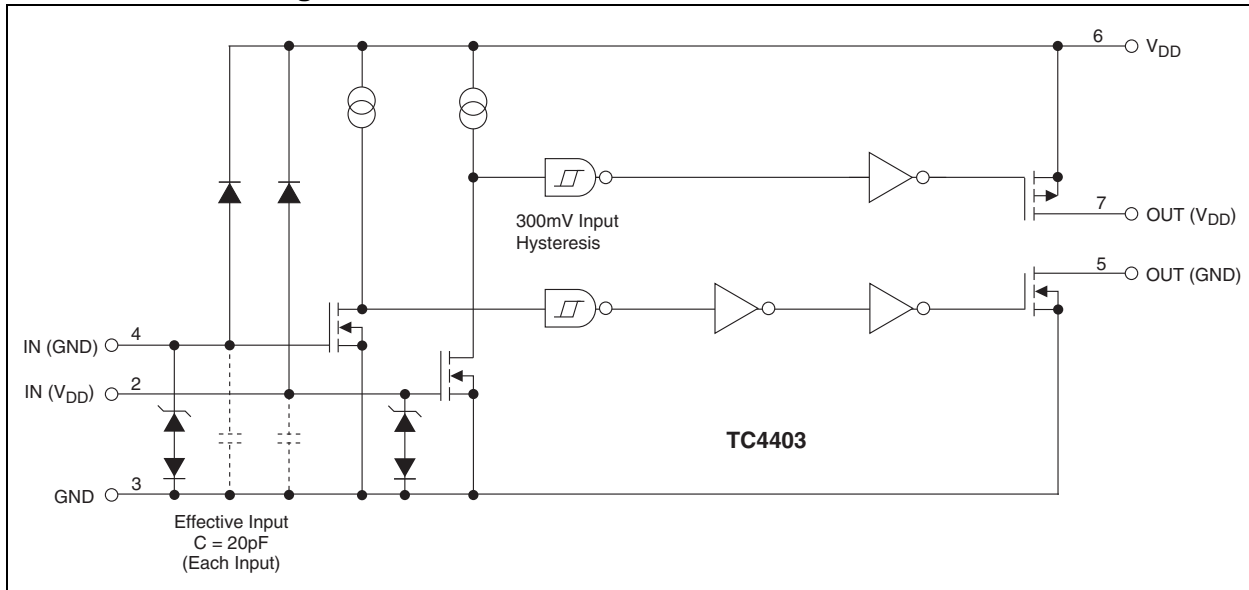
The TC4403 is a modified version of the TC4425 driver, intended to drive floating or isolated loads requiring high-current pulses. The load is intended to be connected between the outputs without other reference to supply or ground. Then, only when both logic inputs and the V<sub>DD</sub> input are energized, is power supplied to the load. This construction allows the implementation of a wide variety of redundant input controllers.

The low OFF-state output leakage and independence of the two half-circuits permit a wide variety of testing schemes to be utilized to assure functionality. The high peak current capability, short internal delays, and fast output rise and fall times ensure that sufficient power will be available to the load when it is needed. The TTL and CMOS compatible inputs allow operation from a wide variety of input devices. The ability to swing the inputs negative without affecting device performance allows negative biases to be placed on the inputs for greater safety. In addition, the capacitive nature of the inputs allows the use of series resistors on the inputs for extra noise suppression.

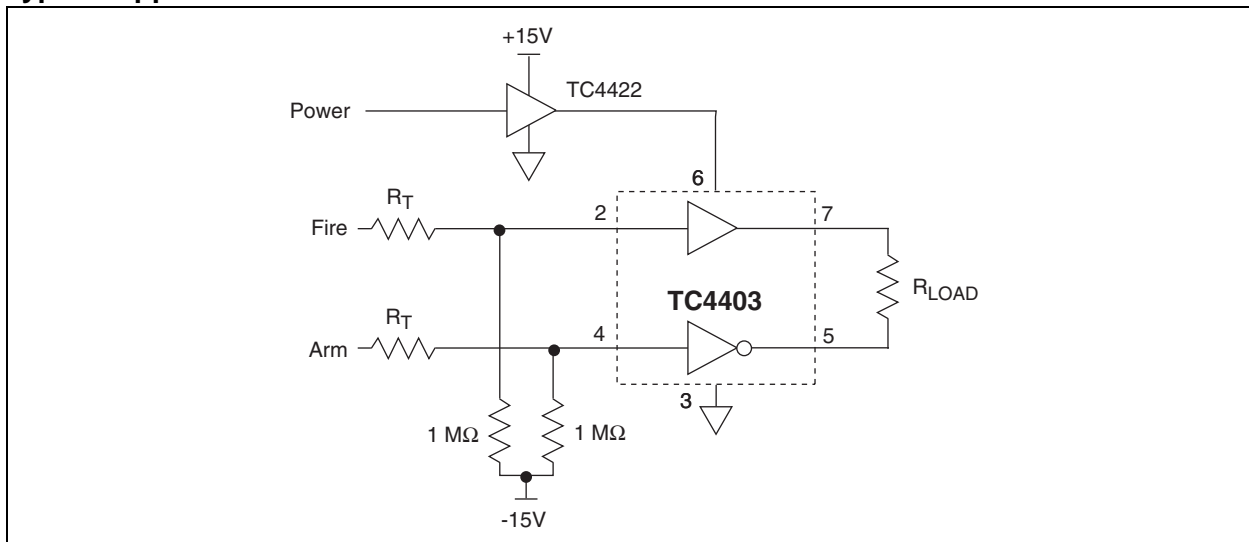
The TC4403 is built for outstanding ruggedness and reliability in harsh applications. Input voltage excursions above the supply voltage or below ground are clamped internally without damaging the device. The output stages are power MOSFETs with high-speed body diodes to prevent damage to the driver from inductive kickbacks.

# TC4403

## Functional Block Diagram



## Typical Application



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings\*

Supply Voltage.....	+22V
Package Thermal Resistance	
CERDIP R <sub>θJ-A</sub> .....	150°C/W
CERDIP R <sub>θJ-C</sub> .....	50°C/W
PDIP R <sub>θJ-A</sub> .....	125°C/W
PDIP R <sub>θJ-C</sub> .....	42°C/W
Operating Temperature Range	
C Version.....	0°C to +70°C
E Version.....	-40°C to +85°C
M Version.....	-55°C to +125°C
Storage Temperature Range.....	-65°C to +150°C

\*Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

### TC4403 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: T <sub>A</sub> = +25°C, with 4.5V ≤ V <sub>DD</sub> ≤ 18V, unless otherwise noted.						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
<b>Input</b>						
V <sub>IH</sub>	Logic 1, High Input Voltage	2.4	—	—	V	
V <sub>IL</sub>	Logic 0, Low Input Voltage	—	—	0.8	V	
I <sub>IN</sub>	Input Current	-1000	±10	±1000	nA	-5V ≤ V <sub>IN</sub> ≤ V <sub>DD</sub>
<b>Output</b>						
V <sub>OH</sub>	High Output Voltage	V <sub>DD</sub> - 0.025	—	—	V	
V <sub>OL</sub>	Low Output Voltage	—	—	0.025	V	
R <sub>OS</sub>	Sourcing Output Resistance	—	2.8	5	Ω	I <sub>OUT</sub> = 10mA, V <sub>DD</sub> = 18V
R <sub>OG</sub>	Grounding Output Resistance	—	3.5	5	Ω	I <sub>OUT</sub> = -10mA, V <sub>DD</sub> = 18V
I <sub>PK</sub>	Peak Output Current	—	1.5	—	A	
<b>Switching Time (Note 1)</b>						
t <sub>R</sub>	Rise Time	—	23	35	nsec	Figure 3-1, C <sub>L</sub> = 1800pF
t <sub>F</sub>	Fall Time	—	25	35	nsec	Figure 3-1, C <sub>L</sub> = 1800pF
t <sub>D1</sub>	Delay Time	—	33	75	nsec	Figure 3-1, C <sub>L</sub> = 1800pF
t <sub>D2</sub>	Delay Time	—	38	75	nsec	Figure 3-1, C <sub>L</sub> = 1800pF
<b>Power Supply</b>						
I <sub>S</sub>	Power Supply Current	—	1.5	2.5	mA	V <sub>IN</sub> = 3V (Both Inputs)
		—	0.15	0.25		V <sub>IN</sub> = 0V (Both Inputs)

**Note 1:** Switching times ensured by design.

# TC4403

## TC4403 ELECTRICAL SPECIFICATIONS (CONTINUED)

Electrical Characteristics: Over operating temperature range with $4.5V \leq V_{DD} \leq 18V$ , unless otherwise noted.						
Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
<b>Input</b>						
$V_{IH}$	Logic 1, High Input Voltage	2.4	—	—	V	
$V_{IL}$	Logic 0, Low Input Voltage	—	—	0.8	V	
$I_{IN}$	Input Current	-10,000	$\pm 10$	$\pm 10,000$	nA	$-5V \leq V_{IN} \leq V_{DD}$
<b>Output</b>						
$V_{OH}$	High Output Voltage	$V_{DD} - 0.025$	—	—	V	
$V_{OL}$	Low Output Voltage	—	—	0.025	V	
$R_{OS}$	Sourcing Output Resistance	—	3.7	8	$\Omega$	$V_{IN} = 2.4V, I_{OUT} = 10mA, V_{DD} = 18V$
$R_{OG}$	Grounding Output Resistance	—	4.3	8	$\Omega$	$V_{IN} = 2.4V, I_{OUT} = -10mA, V_{DD} = 18V$
<b>Switching Time (Note 1)</b>						
$t_R$	Rise Time	—	28	60	nsec	Figure 3-1, $C_L = 1800pF$
$t_F$	Fall Time	—	32	60	nsec	Figure 3-1, $C_L = 1800pF$
$t_{D1}$	Delay Time	—	32	100	nsec	Figure 3-1, $C_L = 1800pF$
$t_{D2}$	Delay Time	—	38	100	nsec	Figure 3-1, $C_L = 1800pF$
<b>Power Supply</b>						
$I_S$	Power Supply Current	—	2	3.5	mA	$V_{IN} = 3V$ (Both Inputs)
		—	0.2	0.3		$V_{IN} = 0V$ (Both Inputs)

**Note 1:** Switching times ensured by design.

## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

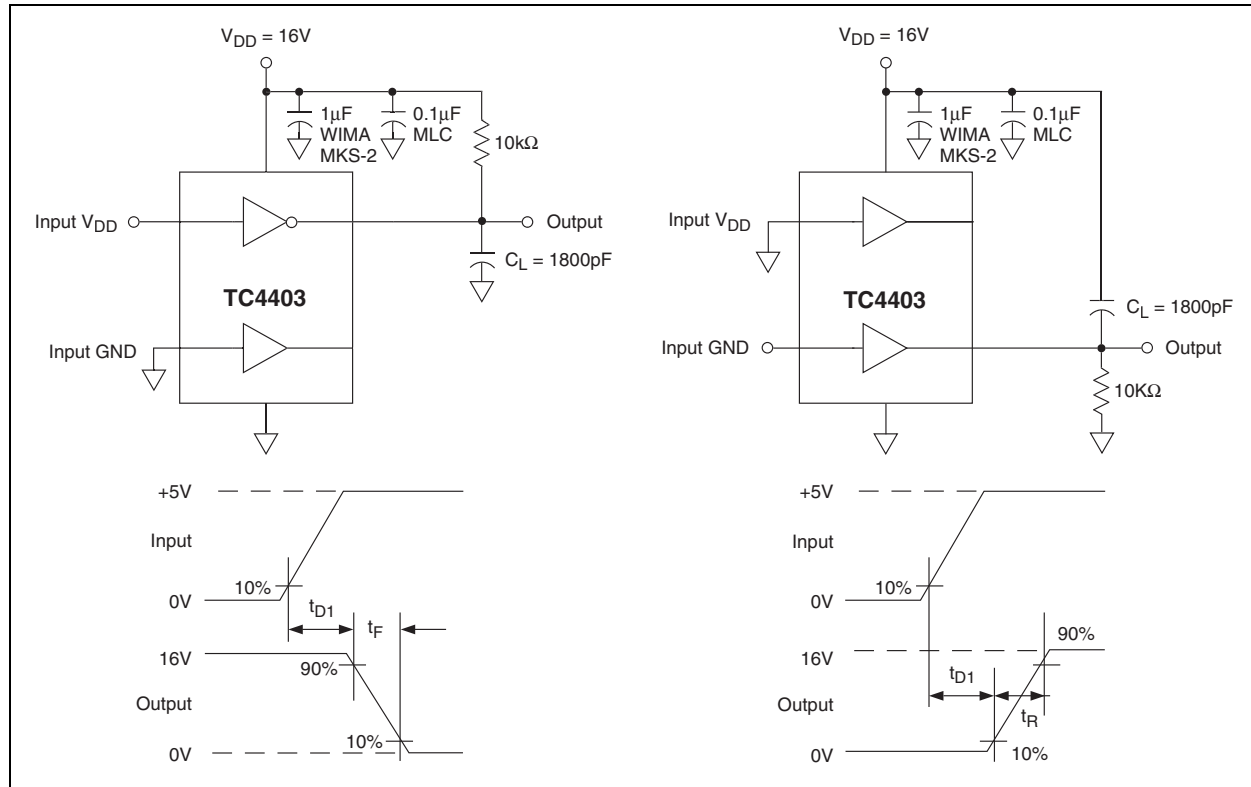
**TABLE 2-1: PIN FUNCTION TABLE**

Pin No. (8-Pin PDIP, CERDIP)	Symbol	Description
1	NC	No connection.
2	IN ( $V_{DD}$ )	Control input $V_{DD}$ , TTL/CMOS compatible logic input signal, controls OUT ( $V_{DD}$ ).
3	GND	Ground.
4	IN (GND)	Control Input GND, TTL/CMOS compatible logic input signal, controls OUT (GND).
5	OUT (GND)	Output GND, CMOS Pull Down Output.
6	$V_{DD}$	Supply Input, 4.5V to 18V.
7	OUT ( $V_{DD}$ )	Output $V_{DD}$ , CMOS pull-up output.
8	NC	No connection.

# TC4403

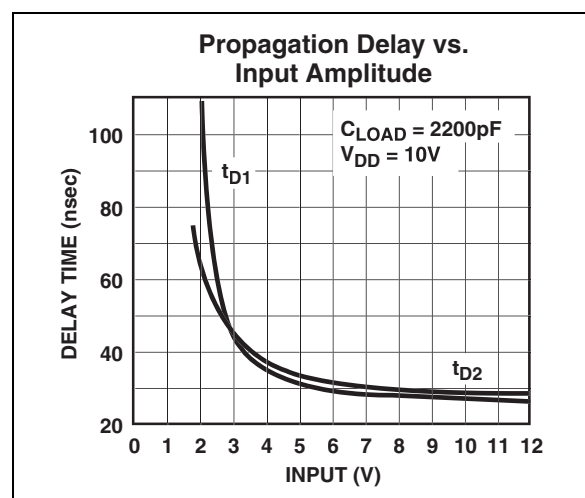
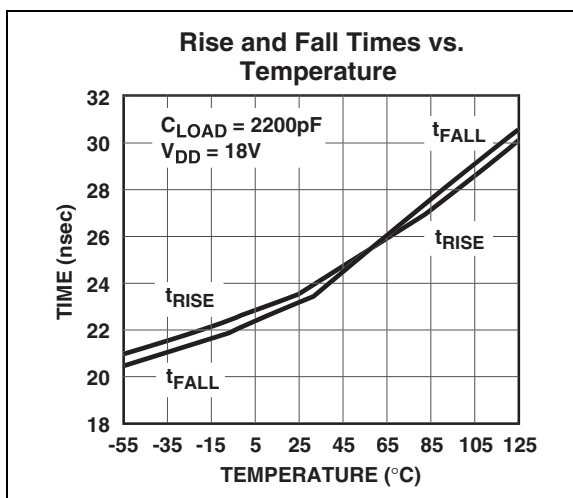
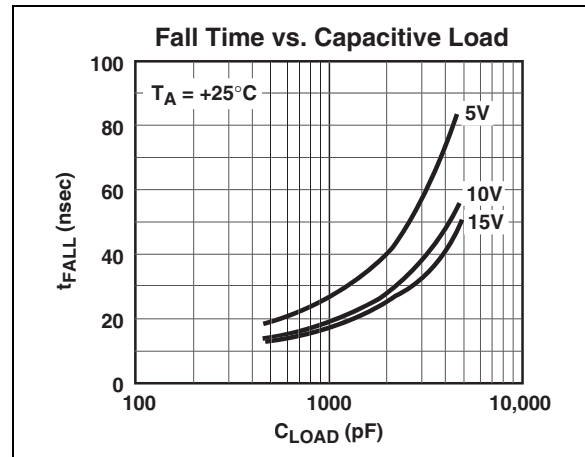
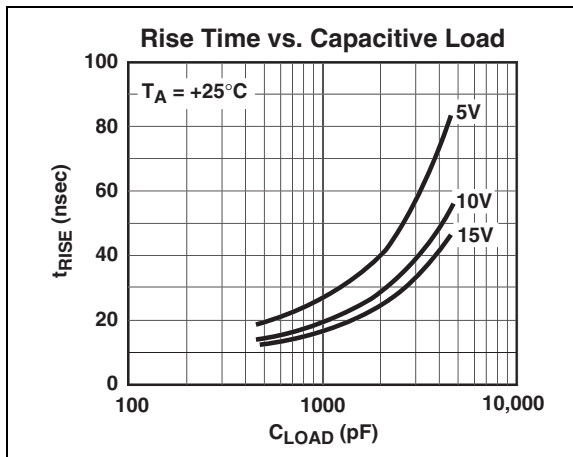
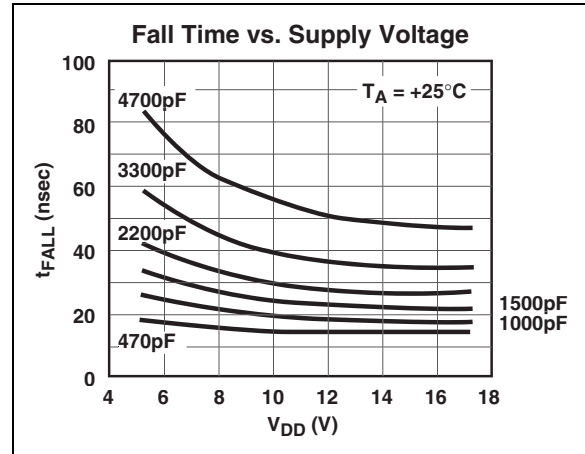
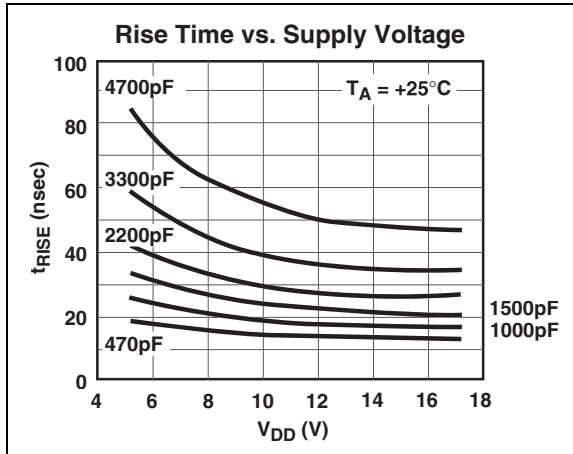
## 3.0 APPLICATIONS INFORMATION

FIGURE 3-1: SWITCHING TIME TEST CIRCUITS



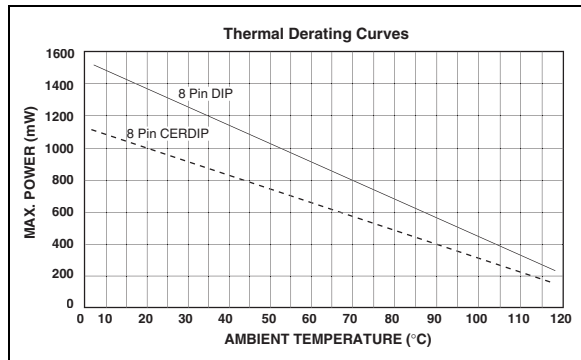
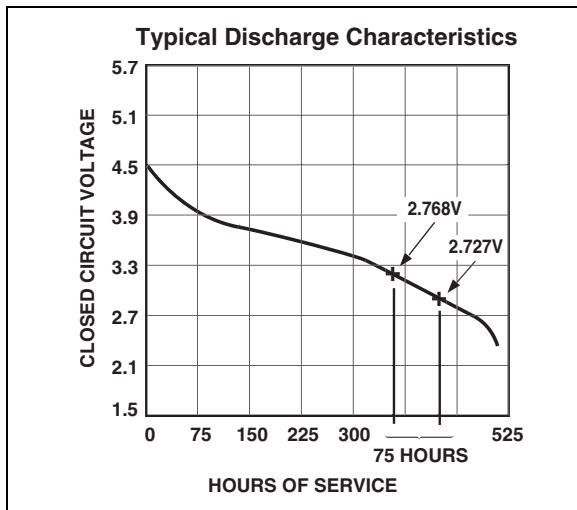
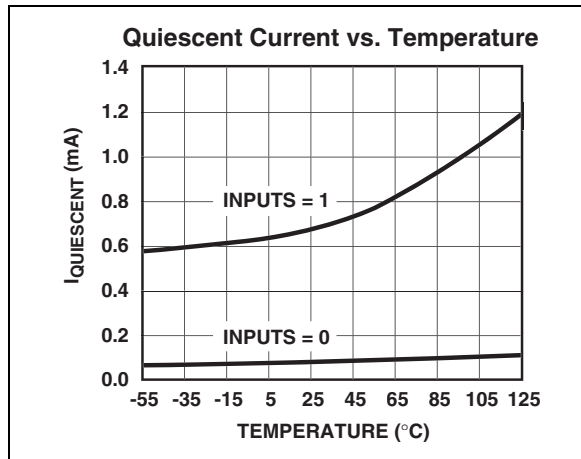
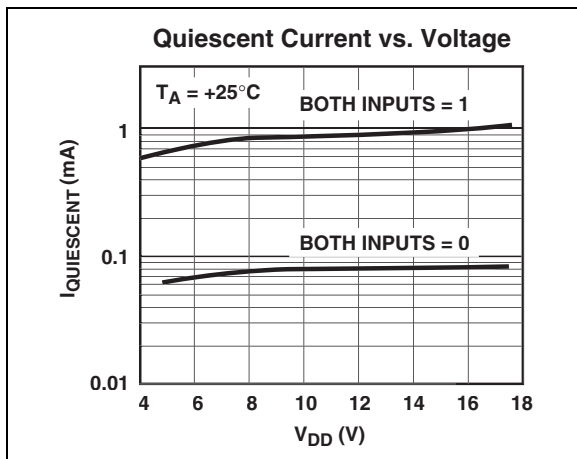
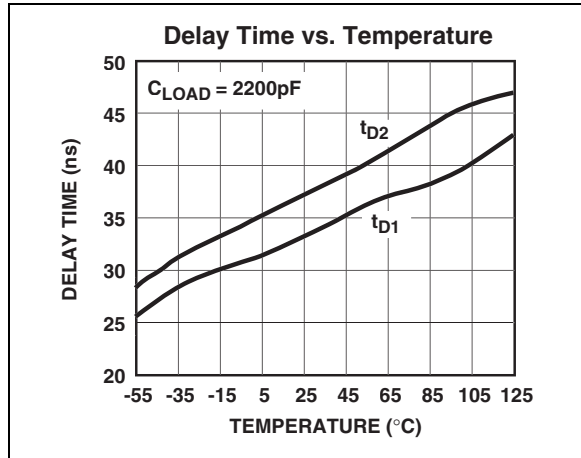
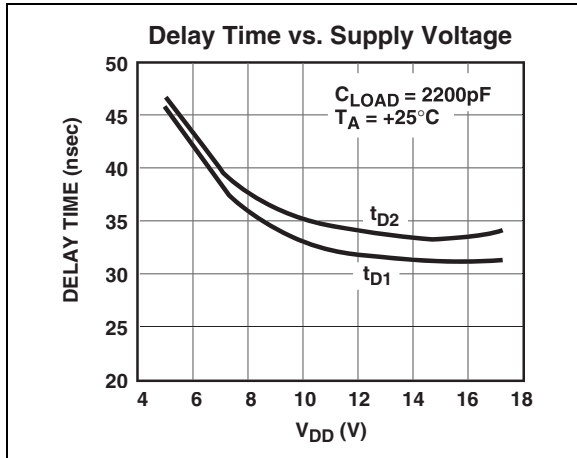
## 4.0 TYPICAL CHARACTERISTICS

**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.



# TC4403

## TYPICAL CHARACTERISTICS (CONTINUED)





## 5.0 PACKAGING INFORMATION

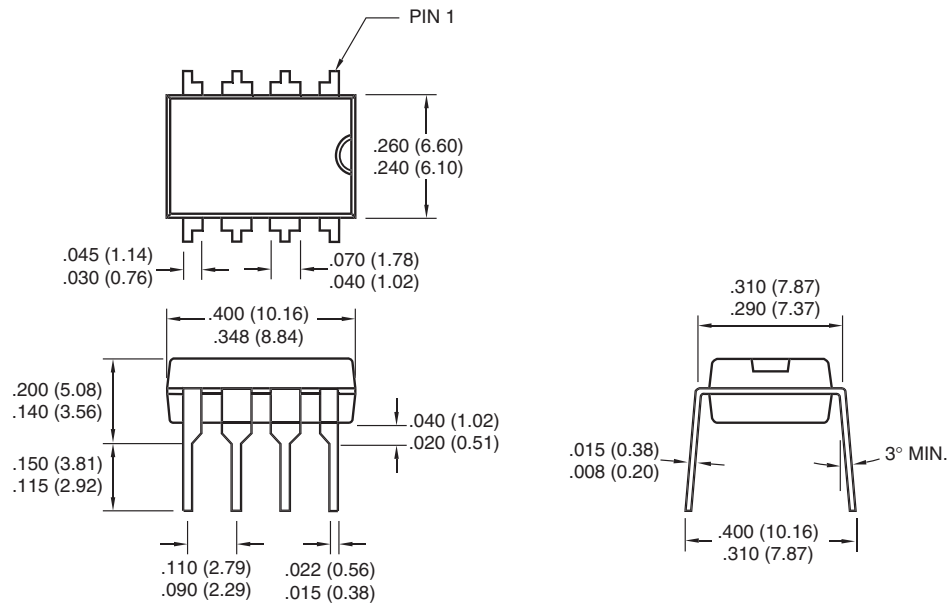
### 5.1 Package Marking Information

Package marking data not available at this time.

### 5.2 Package Dimensions

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

#### 8-Pin Plastic DIP

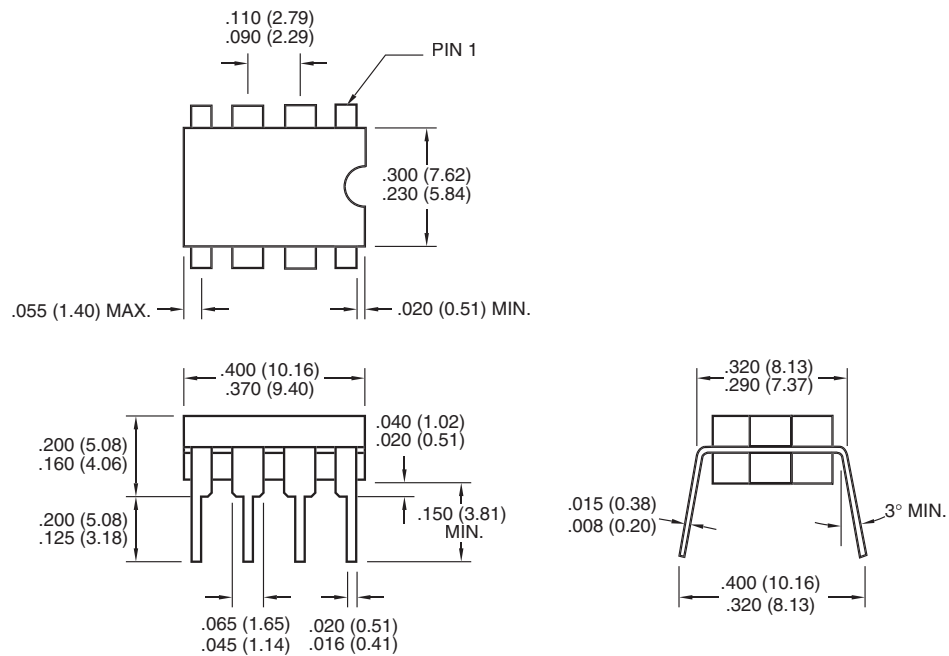


Dimensions: inches (mm)

# TC4403

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

## 8-Pin CERDIP (Narrow)



Dimensions: inches (mm)

## 6.0 REVISION HISTORY

### Revision C (December 2012)

Added a note to each package outline drawing.

# TC4403

---

---

NOTES:

## **Sales and Support**

### **Data Sheets**

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

1. Your local Microchip sales office
2. The Microchip Worldwide Site ([www.microchip.com](http://www.microchip.com))

Please specify which device, revision of silicon and Data Sheet (include Literature #) you are using.

### **New Customer Notification System**

Register on our web site ([www.microchip.com/cn](http://www.microchip.com/cn)) to receive the most current information on our products.

# TC4403

---

---

NOTES:

---

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

---

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

#### **Trademarks**

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC<sup>32</sup> logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniclient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. & KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2002-2012, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 9781620767924

**QUALITY MANAGEMENT SYSTEM**  
**CERTIFIED BY DNV**  
**== ISO/TS 16949 ==**

*Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC<sup>®</sup> MCUs and dsPIC<sup>®</sup> DSCs, KEELOQ<sup>®</sup> code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*



# MICROCHIP

## Worldwide Sales and Service

### AMERICAS

**Corporate Office**  
2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7200  
Fax: 480-792-7277  
Technical Support:  
<http://www.microchip.com/support>  
Web Address:  
[www.microchip.com](http://www.microchip.com)

**Atlanta**  
Duluth, GA  
Tel: 678-957-9614  
Fax: 678-957-1455

**Boston**  
Westborough, MA  
Tel: 774-760-0087  
Fax: 774-760-0088

**Chicago**  
Itasca, IL  
Tel: 630-285-0071  
Fax: 630-285-0075

**Cleveland**  
Independence, OH  
Tel: 216-447-0464  
Fax: 216-447-0643

**Dallas**  
Addison, TX  
Tel: 972-818-7423  
Fax: 972-818-2924

**Detroit**  
Farmington Hills, MI  
Tel: 248-538-2250  
Fax: 248-538-2260

**Indianapolis**  
Noblesville, IN  
Tel: 317-773-8323  
Fax: 317-773-5453

**Los Angeles**  
Mission Viejo, CA  
Tel: 949-462-9523  
Fax: 949-462-9608

**Santa Clara**  
Santa Clara, CA  
Tel: 408-961-6444  
Fax: 408-961-6445

**Toronto**  
Mississauga, Ontario,  
Canada  
Tel: 905-673-0699  
Fax: 905-673-6509

### ASIA/PACIFIC

**Asia Pacific Office**  
Suites 3707-14, 37th Floor  
Tower 6, The Gateway  
Harbour City, Kowloon  
Hong Kong  
Tel: 852-2401-1200  
Fax: 852-2401-3431

**Australia - Sydney**  
Tel: 61-2-9868-6733  
Fax: 61-2-9868-6755

**China - Beijing**  
Tel: 86-10-8569-7000  
Fax: 86-10-8528-2104

**China - Chengdu**  
Tel: 86-28-8665-5511  
Fax: 86-28-8665-7889

**China - Chongqing**  
Tel: 86-23-8980-9588  
Fax: 86-23-8980-9500

**China - Hangzhou**  
Tel: 86-571-2819-3187  
Fax: 86-571-2819-3189

**China - Hong Kong SAR**  
Tel: 852-2943-5100  
Fax: 852-2401-3431

**China - Nanjing**  
Tel: 86-25-8473-2460  
Fax: 86-25-8473-2470

**China - Qingdao**  
Tel: 86-532-8502-7355  
Fax: 86-532-8502-7205

**China - Shanghai**  
Tel: 86-21-5407-5533  
Fax: 86-21-5407-5066

**China - Shenyang**  
Tel: 86-24-2334-2829  
Fax: 86-24-2334-2393

**China - Shenzhen**  
Tel: 86-755-8864-2200  
Fax: 86-755-8203-1760

**China - Wuhan**  
Tel: 86-27-5980-5300  
Fax: 86-27-5980-5118

**China - Xian**  
Tel: 86-29-8833-7252  
Fax: 86-29-8833-7256

**China - Xiamen**  
Tel: 86-592-2388138  
Fax: 86-592-2388130

**China - Zhuhai**  
Tel: 86-756-3210040  
Fax: 86-756-3210049

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-3090-4444  
Fax: 91-80-3090-4123

**India - New Delhi**  
Tel: 91-11-4160-8631  
Fax: 91-11-4160-8632

**India - Pune**  
Tel: 91-20-2566-1512  
Fax: 91-20-2566-1513

**Japan - Osaka**  
Tel: 81-66-152-7160  
Fax: 81-66-152-9310

**Japan - Yokohama**  
Tel: 81-45-471-6166  
Fax: 81-45-471-6122

**Korea - Daegu**  
Tel: 82-53-744-4301  
Fax: 82-53-744-4302

**Korea - Seoul**  
Tel: 82-2-554-7200  
Fax: 82-2-558-5932 or  
82-2-558-5934

**Malaysia - Kuala Lumpur**  
Tel: 60-3-6201-9857  
Fax: 60-3-6201-9859

**Malaysia - Penang**  
Tel: 60-4-227-8870  
Fax: 60-4-227-4068

**Philippines - Manila**  
Tel: 63-2-634-9065  
Fax: 63-2-634-9069

**Singapore**  
Tel: 65-6334-8870  
Fax: 65-6334-8850

**Taiwan - Hsin Chu**  
Tel: 886-3-5778-366  
Fax: 886-3-5770-955

**Taiwan - Kaohsiung**  
Tel: 886-7-213-7828  
Fax: 886-7-330-9305

**Taiwan - Taipei**  
Tel: 886-2-2508-8600  
Fax: 886-2-2508-0102

**Thailand - Bangkok**  
Tel: 66-2-694-1351  
Fax: 66-2-694-1350

### EUROPE

**Austria - Wels**  
Tel: 43-7242-2244-39  
Fax: 43-7242-2244-393

**Denmark - Copenhagen**  
Tel: 45-4450-2828  
Fax: 45-4485-2829

**France - Paris**  
Tel: 33-1-69-53-63-20  
Fax: 33-1-69-30-90-79

**Germany - Munich**  
Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

**Italy - Milan**  
Tel: 39-0331-742611  
Fax: 39-0331-466781

**Netherlands - Drunen**  
Tel: 31-416-690399  
Fax: 31-416-690340

**Spain - Madrid**  
Tel: 34-91-708-08-90  
Fax: 34-91-708-08-91

**UK - Wokingham**  
Tel: 44-118-921-5869  
Fax: 44-118-921-5820

11/27/12