

Power CMOS Drivers With Voltage Tripler

Features

- Power Driver With On Board Voltage Booster
- Low I_{DD} – <4mA
- Small Package – 8-Pin PDIP
- Under-Voltage Circuitry
- Fast Rise-Fall Time – <40nsec @ 1000pF
- Below-Rail Input Protection

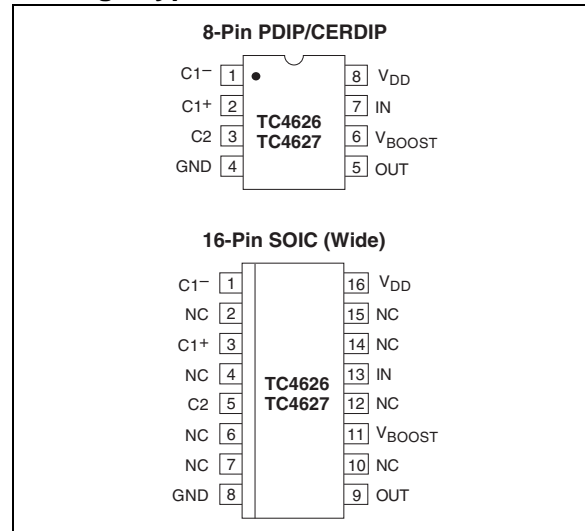
Applications

- Raises 5V to drive higher – V_{gs} (ON) MOSFETs
- Eliminates one system power supply

Device Selection Table

| Part Number | Package | Temp. Range |
|-------------|--------------------|-----------------|
| TC4626COE | 16-Pin SOIC (Wide) | -55°C to +125°C |
| TC4626CPA | 8-Pin PDIP | -40°C to +85°C |
| TC4626EOE | 16-Pin SOIC (Wide) | -40°C to +85°C |
| TC4626EPA | 8-Pin PDIP | 0°C to +70°C |
| TC4626MJA | 8-Pin CERDIP | 0°C to +70°C |
| TC4627COE | 16-Pin SOIC (Wide) | -55°C to +125°C |
| TC4627CPA | 8-Pin PDIP | -40°C to +85°C |
| TC4627EOE | 16-Pin SOIC (Wide) | -40°C to +85°C |
| TC4627EPA | 8-Pin PDIP | 0°C to +70°C |
| TC4627MJA | 8-Pin CERDIP | 0°C to +70°C |

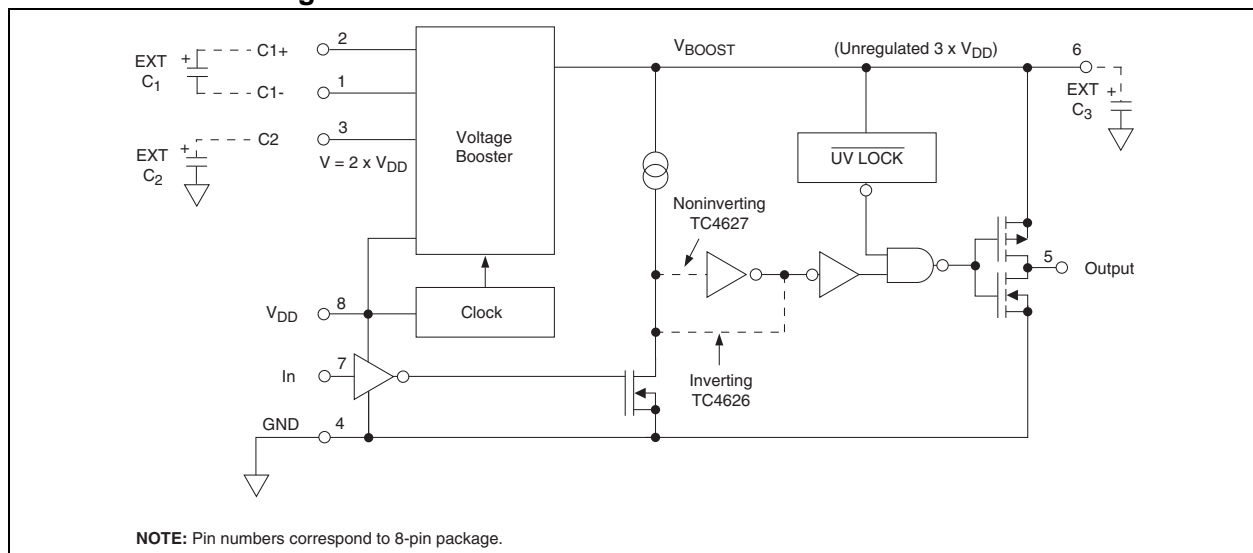
Package Type



General Description

The TC4626/TC4627 are single CMOS high speed drivers with an on-board voltage boost circuit. These parts work with an input supply voltage from 4 to 6 volts. The internal voltage booster will produce a V_{BOOST} potential up to 12 volts above V_{IN} . This V_{BOOST} is not regulated, so its voltage is dependent on the input V_{DD} voltage and output drive loading requirements. An internal undervoltage lockout circuit keeps the output in a low state when V_{BOOST} drops below 7.8 volts. Output is enabled when V_{BOOST} is above 11.3 volts.

Functional Block Diagram



TC4626/TC4627

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

| | |
|---|---------------------------------------|
| Supply Voltage | 6.2V |
| Input Voltage, Any Terminal | $V_S + 0.3V$ to $GND - 0.3V$ |
| Package Power Dissipation ($T_A \leq 70^\circ C$) | |
| PDIP | 730mW |
| CERDIP | 800mW |
| SOIC | 760mW |
| Derating Factor PDIP | 5.6 mW/ $^\circ C$ Above $36^\circ C$ |
| CERDIP | 6.0mW/ $^\circ C$ |
| Operating Temperature Range (Ambient) | |
| C Version | $0^\circ C$ to $+70^\circ C$ |
| E Version | $-40^\circ C$ to $+85^\circ C$ |
| M Version | $-55^\circ C$ to $+125^\circ C$ |
| Storage Temperature Range | $-65^\circ C$ to $+150^\circ C$ |

*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.

TC4626/TC4627 ELECTRICAL SPECIFICATIONS

| Electrical Characteristics: $T_A = +25^\circ C$, $V_{DD} = 5V$, $C_1 = C_2 = C_3 = 10\mu F$ unless otherwise noted. | | | | | | |
|---|--|---------------------|------|-------|----------|---|
| Symbol | Parameter | Min | Typ | Max | Units | Test Conditions |
| Input | | | | | | |
| V_{IH} | Logic 1, High Input Voltage | 2.4 | — | — | V | |
| V_{IL} | Logic 0, Low Input Voltage | — | — | 0.8 | V | |
| I_{IN} | Input Current | -1 | — | 1 | μA | $0V \leq V_{IN} \leq V_{DRIVE}$ |
| Output | | | | | | |
| V_{OH} | High Output Voltage | $V_{BOOST} - 0.025$ | — | — | V | |
| V_{OL} | Low Output Voltage | — | — | 0.025 | V | |
| R_O | Output Resistance, High | — | 10 | 15 | Ω | $I_{OUT} = 10mA$, $V_{DD} = 5V$ |
| R_O | Output Resistance, Low | — | 8 | 10 | Ω | $I_{OUT} = 10mA$, $V_{DD} = 5V$ |
| I_{PK} | Peak Output Current | — | 1.5 | — | A | |
| Switching Time | | | | | | |
| t_R | Rise Time | — | 33 | 40 | nsec | Figure 3-1, Figure 3-2 |
| t_F | Fall Time | — | 27 | 35 | nsec | Figure 3-1, Figure 3-2 |
| t_{D1} | Delay Time | — | 35 | 45 | nsec | Figure 3-1, Figure 3-2 |
| t_{D2} | Delay Time | — | 45 | 55 | nsec | Figure 3-1, Figure 3-2 |
| F_{MAX} | Maximum Switching Frequency | 1.0 | — | — | MHz | $V_{DD} = 5V$, $V_{BOOST} > 8.5V$, Figure 3-1 |
| Voltage Booster | | | | | | |
| R_3 | Voltage Tripler Output Source Resistance | — | 300 | 400 | Ω | $I_L = 10mA$, $V_{DD} = 5V$ |
| R_2 | Voltage Doubler Output Source Resistance | — | 120 | 200 | Ω | |
| F_{OSC} | Oscillator Frequency | 12 | — | 28 | kHz | |
| V_{OSC} | Oscillator Amplitude Measured at C1- | 4.5 | — | 10 | V | $R_{LOAD} = 10k\Omega$ |
| $UV @ V_{BOOST}$ | Undervoltage Threshold | 7.0 | 7.8 | 8.5 | V | |
| $V_{START} @ V_{BOOST}$ | Start Up Voltage | 10.5 | 11.3 | 12 | V | |
| V_{BOOST} | @ $V_{DD} = 5V$ | 14.6 | — | — | V | No Load |

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TC4626/TC4627 ELECTRICAL SPECIFICATIONS (CONTINUED)

| Symbol | Parameter | Min | Typ | Max | Units | Test Conditions |
|--|--|----------------------------|----------|----------|-------|--|
| Power Supply | | | | | | |
| I _{DD} | Power Supply Current | — | — | 2.5 | mA | V _{IN} = LOW or HIGH |
| V _{DD} | Supply Voltage | 4.0 | — | 6.0 | V | |
| Electrical Characteristics: Over operating temperature range, V _{DD} = 5V, C ₁ = C ₂ = C ₃ 10μF unless otherwise noted. | | | | | | |
| Symbol | Parameter | Min | Typ | Max | Units | Test Conditions |
| Input | | | | | | |
| 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 | — | 1 | μA | 0V ≤ V _{IN} ≤ V _{BOOST} |
| Output | | | | | | |
| V _{OH} | High Output Voltage | V _{DRIVE} - 0.025 | — | — | V | |
| V _{OL} | Low Output Voltage | — | — | 0.025 | V | |
| R _O | Output Resistance, High | — | 15 15 | 20 25 | Ω | I _{OUT} = 10mA, V _{DD} = 5V C & E Version (T _A = 70°C or 85°C) M Version (T _A = 125°C) |
| R _O | Output Resistance, Low | — | 10 10 | 13 15 | Ω | I _{OUT} = 10mA, V _{DD} = 5V C & E Version (T _A = 70°C or 85°C) M Version (T _A = 125°C) |
| I _{PK} | Peak Output Current | — | 1.5 | — | A | |
| Switching Time | | | | | | |
| t _R | Rise Time | — | — | 55 | nsec | Figure 3-1, Figure 3-2 |
| t _F | Fall Time | — | — | 50 | nsec | Figure 3-1, Figure 3-2 |
| t _{D1} | Delay Time | — | — | 60 | nsec | Figure 3-1, Figure 3-2 |
| t _{D2} | Delay Time | — | — | 70 | nsec | Figure 3-1, Figure 3-2 |
| F _{MAX} | Maximum Switching Frequency | 750 | — | — | kHz | V _{DD} = 5V, V _{BOOST} > 8.5V, Figure 3-1 |
| Voltage Booster | | | | | | |
| R ₃ | Voltage Boost Output Source Resistance | — | 400 | 500 | Ω | I _L = 10mA, V _{DD} = 5V |
| R ₂ | Voltage Doubler Output Source Resistance | — | 170 | 300 | Ω | |
| F _{OSC} | Oscillator Frequency | 5 | — | 50 | kHz | |
| V _{OSC} | Oscillator Amplitude Measured at C1- | 4.5 | — | 10 | V | R _{LOAD} = 10kΩ |
| UV @V _{BOOST} | Undervoltage Threshold | 7.0 | 7.8 | 8.5 | V | |
| V _{START} @V _{BOOST} | Start Up Voltage | 10.5 | 11.3 | 12 | V | |
| V _{BOOST} | @V _{DD} = 5V | 14.6 | — | — | V | No Load |
| Power Supply | | | | | | |
| I _{DD} | Power Supply Current | — | — | 4 | mA | V _{IN} = LOW or HIGH |
| V _{DD} | Supply Voltage | 4.0 | — | 6.0 | V | |

TC4626/TC4627

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 | C1- | |
| 2 | C1+ | |
| 3 | C2 | |
| 4 | GND | Ground. |
| 5 | OUT | |
| 6 | V _{BOOST} | |
| 7 | IN | |
| 8 | V _{DD} | |

| Pin No. (16-Pin SOIC Wide) | Symbol | Description |
|----------------------------------|--------------------|-------------|
| 1 | C1- | |
| 2 | NC | No connect. |
| 3 | C1+ | |
| 4 | NC | No connect. |
| 5 | C2 | |
| 6 | NC | No connect. |
| 7 | NC | No connect. |
| 8 | GND | Ground. |
| 9 | OUT | |
| 10 | NC | No connect. |
| 11 | V _{BOOST} | |
| 12 | NC | No connect. |
| 13 | IN | |
| 14 | NC | No connect. |
| 15 | NC | No connect. |
| 16 | V _{DD} | |

3.0 APPLICATIONS INFORMATION

FIGURE 3-1: INVERTING DRIVER SWITCHING TIME



FIGURE 3-2: NONINVERTING DRIVER SWITCHING TIME



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3.1 BOOSTER FUNCTION

The voltage booster is an unregulated voltage tripler circuit. The tripler consists of three sets of internal switches and three external capacitors. S1a and S1b charge capacitor C1 to V_{DD} potential. S2a and S2b add

C1 potential to V_{DD} input to charge C2 to $2 \times V_{DD}$. S3a and S3b add C1 potential to C2 to charge C3 to $3 \times V_{DD}$. The position of the switches is controlled by the internal 4 phase clock.

FIGURE 3-3: VOLTAGE BOOSTER

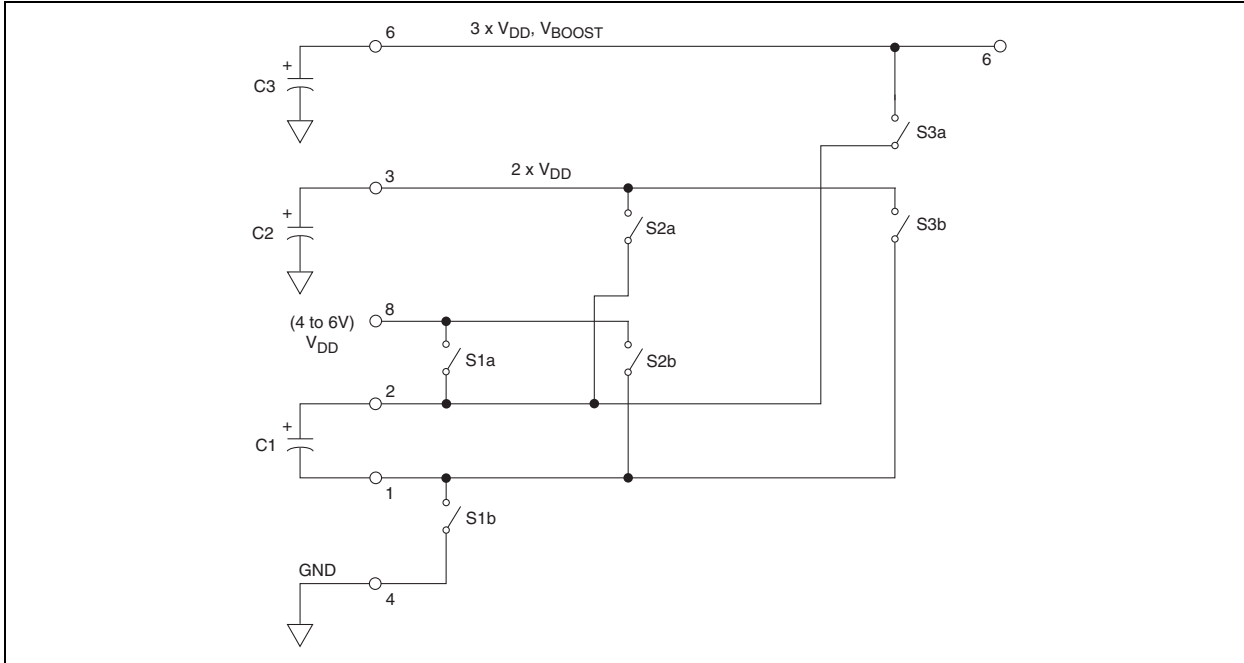
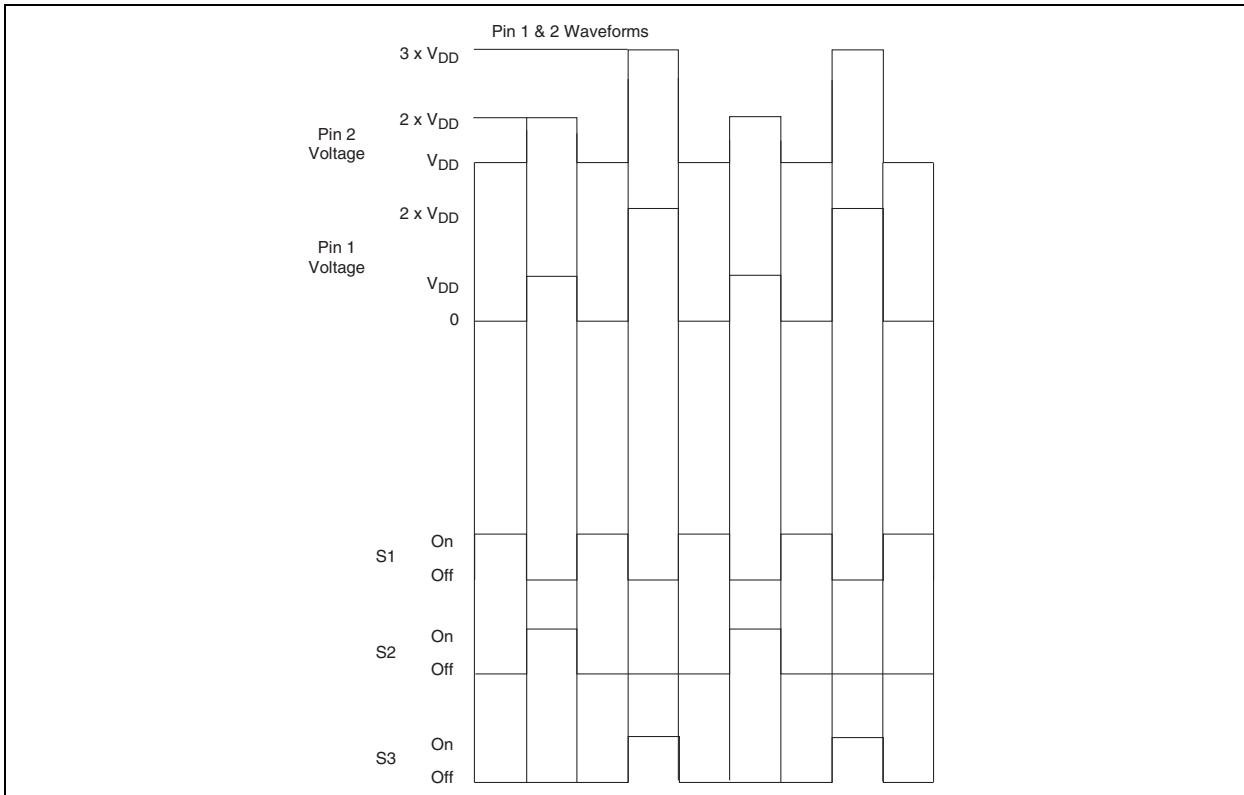


FIGURE 3-4: POSITION OF SWITCHES



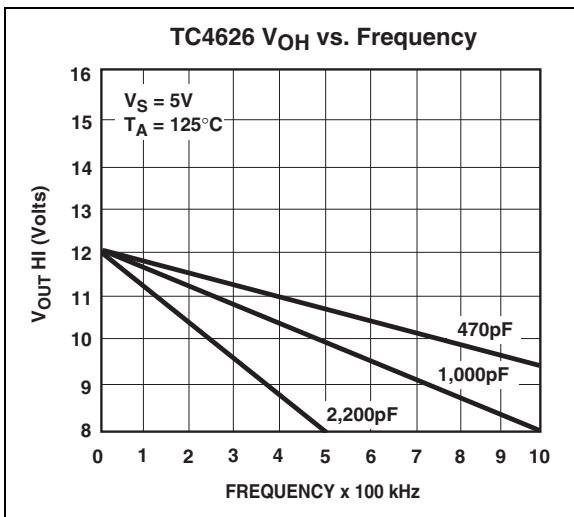
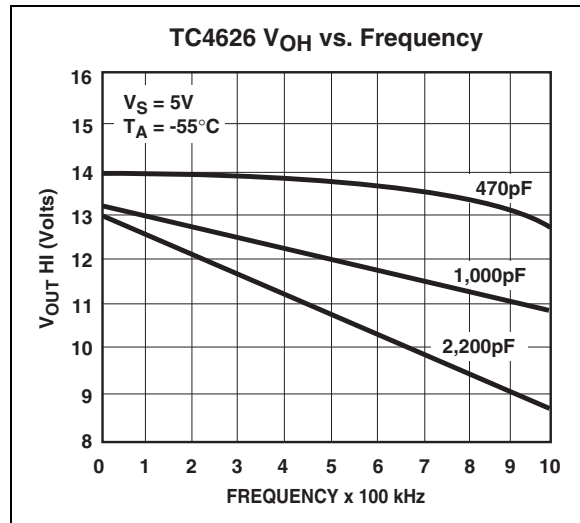
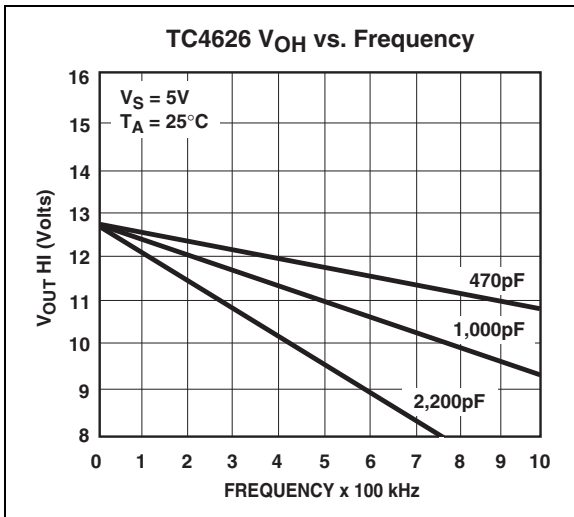
4.0 TYPICAL CHARACTERISTICS

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.



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TYPICAL CHARACTERISTICS (CONTINUED)



5.0 PACKAGING INFORMATION

Package marking data not available at this time.

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5.1 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

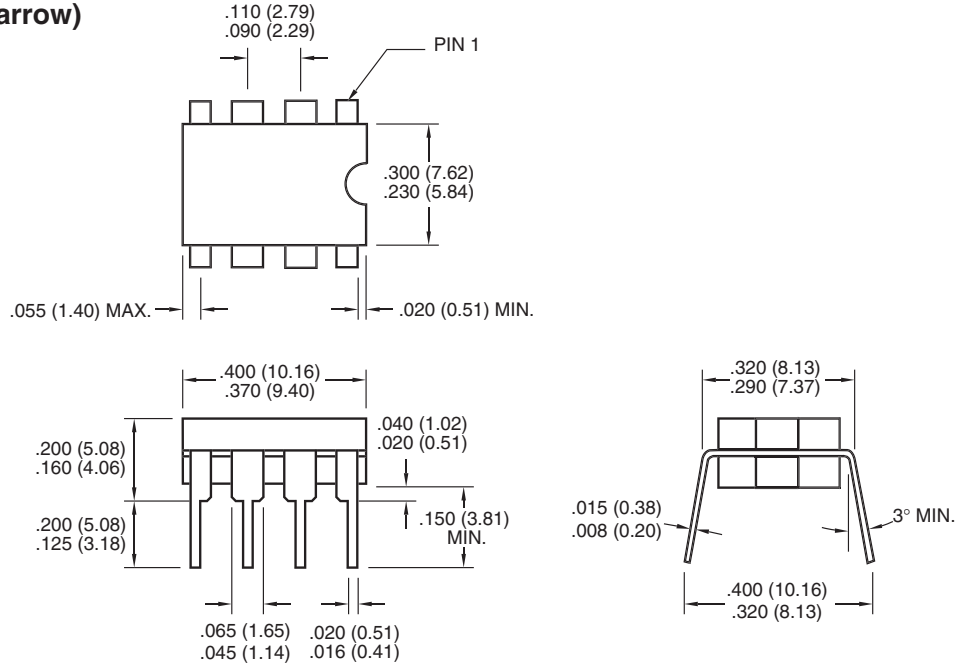


Dimensions: inches (mm)

Package Dimensions (Continued)

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

8-Pin CDIP (Narrow)



Dimensions: inches (mm)

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Package Dimensions (Continued)

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

16-Pin SOIC (Wide)



Dimensions: inches (mm)

6.0 REVISION HISTORY

Revision C (December 2012)

Added a note to each package outline drawing.

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