

## 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/°C Above 36°C
CERDIP .....	6.0mW/°C
Operating Temperature Range (Ambient)	
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.

### 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
<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	-1	—	1	$\mu A$	$0V \leq V_{IN} \leq V_{DRIVE}$
<b>Output</b>						
$V_{OH}$	High Output Voltage	$V_{BOOST} - 0.025$	—	—	V	
$V_{OL}$	Low Output Voltage	—	—	0.025	V	
$R_O$	Output Resistance, High	—	10	15	$\Omega$	$I_{OUT} = 10mA$ , $V_{DD} = 5V$
$R_O$	Output Resistance, Low	—	8	10	$\Omega$	$I_{OUT} = 10mA$ , $V_{DD} = 5V$
$I_{PK}$	Peak Output Current	—	1.5	—	A	
<b>Switching Time</b>						
$t_R$	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
<b>Voltage Booster</b>						
$R_3$	Voltage Tripler Output Source Resistance	—	300	400	$\Omega$	$I_L = 10mA$ , $V_{DD} = 5V$
$R_2$	Voltage Doubler Output Source Resistance	—	120	200	$\Omega$	
$F_{OSC}$	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

# TC4626/TC4627

## TC4626/TC4627 ELECTRICAL SPECIFICATIONS (CONTINUED)

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

# TC4626/TC4627

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## 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 <sub>BOOST</sub>	
7	IN	
8	V <sub>DD</sub>	

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 <sub>BOOST</sub>	
12	NC	No connect.
13	IN	
14	NC	No connect.
15	NC	No connect.
16	V <sub>DD</sub>	

## 3.0 APPLICATIONS INFORMATION

**FIGURE 3-1: INVERTING DRIVER SWITCHING TIME**



**FIGURE 3-2: NONINVERTING DRIVER SWITCHING TIME**



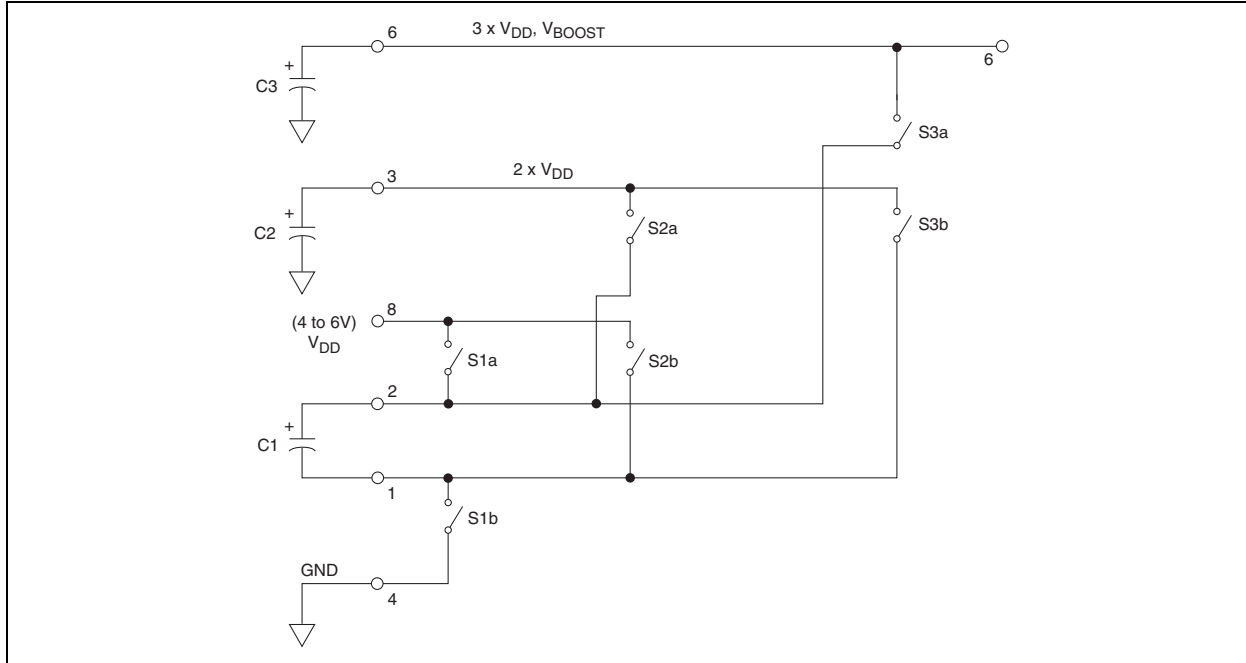
# TC4626/TC4627

## 3.1 BOOSTER FUNCTION

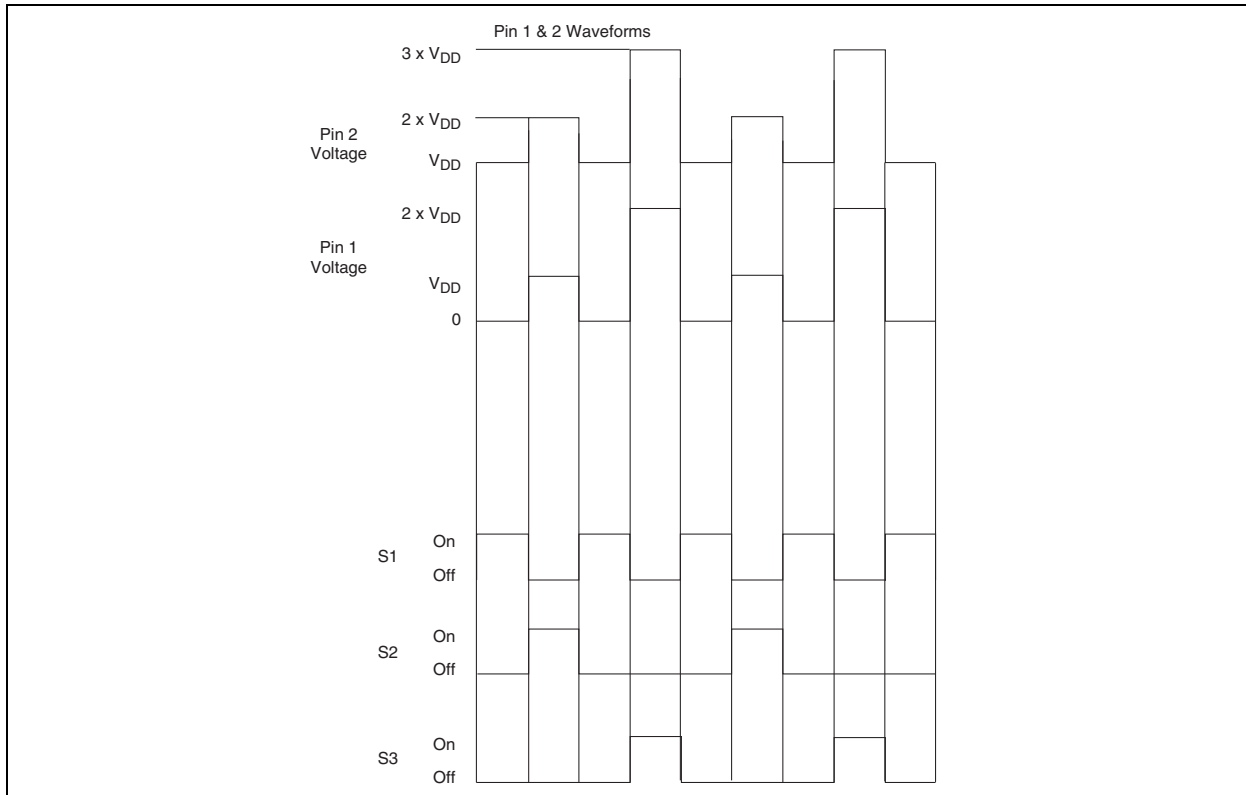
The voltage booster is an unregulated voltage tripler circuit. The tripler consists of three sets of internal switches and three external capacitors. S1a and S1b charge capacitor C1 to  $V_{DD}$  potential. S2a and S2b add

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**



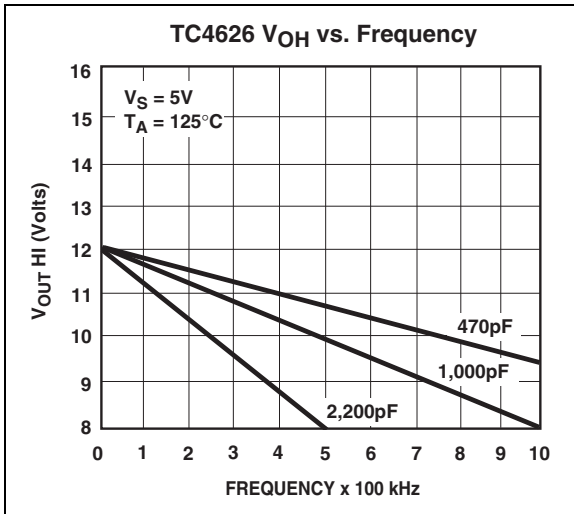
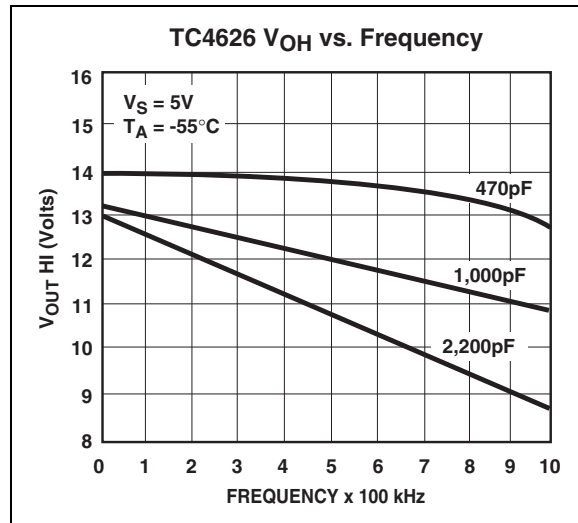
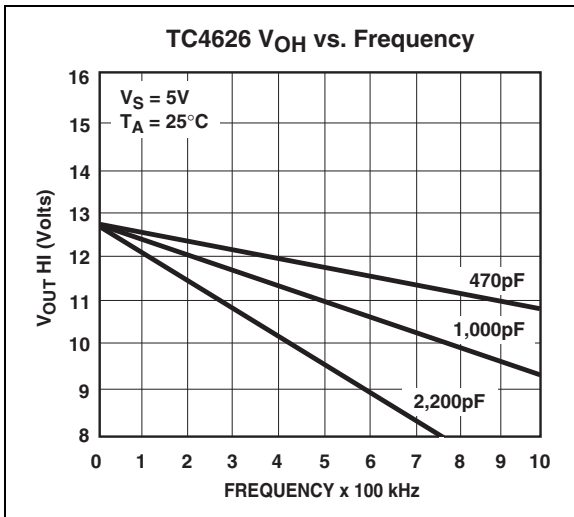
## 4.0 TYPICAL CHARACTERISTICS

**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.



# TC4626/TC4627

## TYPICAL CHARACTERISTICS (CONTINUED)





## 5.0 PACKAGING INFORMATION

Package marking data not available at this time.

# TC4626/TC4627

## 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)**

# TC4626/TC4627

## 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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# TC4626/TC4627

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NOTES:



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