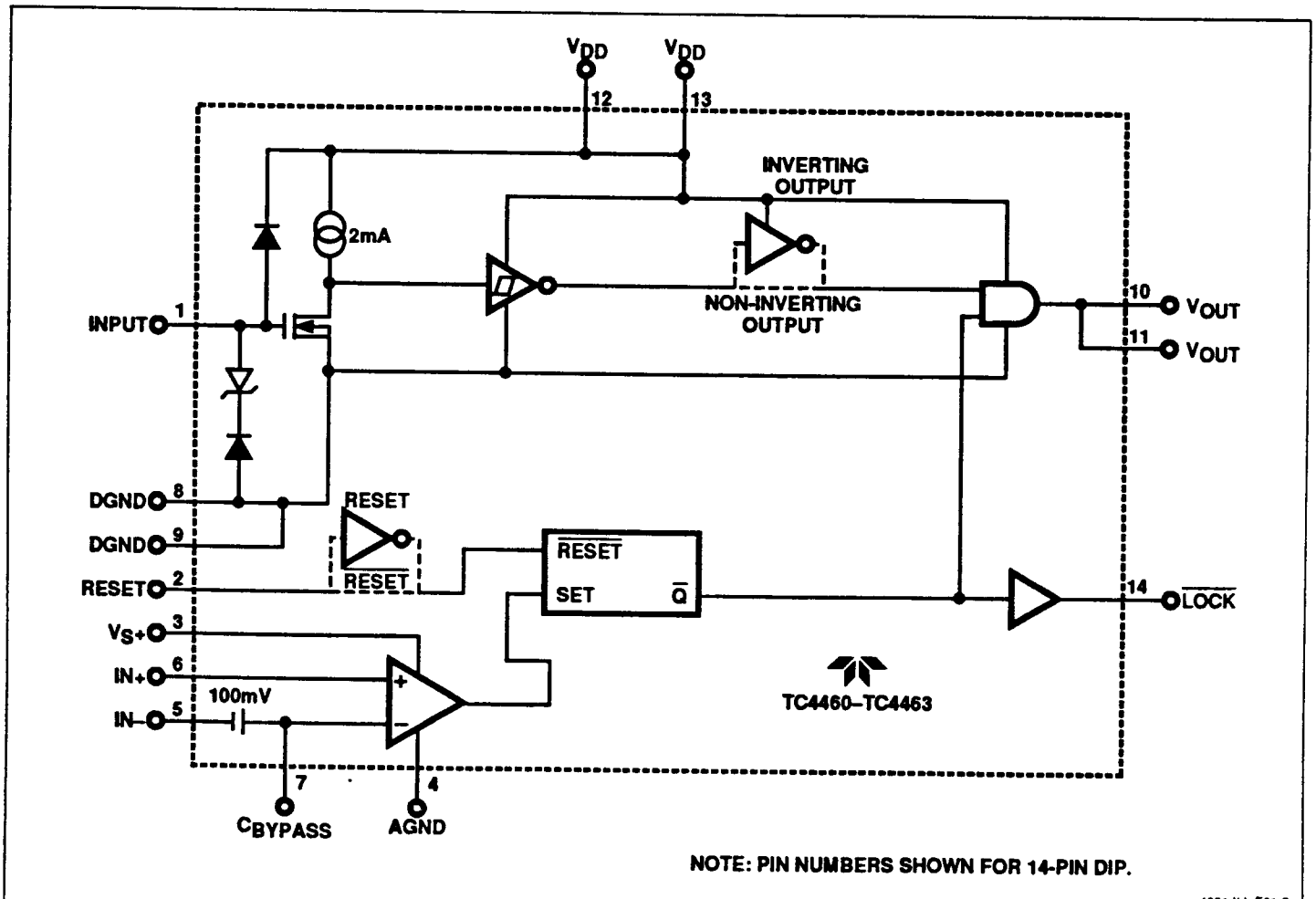


## CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

### FEATURES

- Complete Fault-Sensing Power Driver
  - High Peak Output Current Driver
  - Comparator
  - Latch
- High Peak Output Current .....6A
- Matched Rise and Fall Times
- High Capacitive Load Drive  
Capability .....2500 pF in 25 ns
- Output Swing to within 25 mV of DGND or V<sub>DD</sub>
- Low Output Impedance .....2.5Ω
- Fast Comparator ..... 170 ns typ
- Precision Comparator Threshold ... 100 mV ±10 mV
- Latch Status Output
- Tough CMOS™ Construction
- Logic Input Will Withstand Negative Swing Up to -5V
- Latch-up Protected: Will Withstand > 1.5A Reverse Output Current
- Logic High Input, Any Supply Voltage 2.4V to V<sub>DD</sub>
- Low Supply Current
  - With Logic '1' Input ..... 6 mA
  - With Logic '0' Input ..... 3 mA

### FUNCTIONAL DIAGRAM



# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

**TC4460 TC4462**  
**TC4461 TC4463**

## GENERAL DESCRIPTION

The TC4460/4461/4462/4463 are high speed CMOS drivers which incorporate a comparator input to terminate the output pulse. These devices are ideal for driving power MOSFETS, such as SENSEFETS®, which include a separate output which mirrors drain current.

The TC4460 devices consist of a power driver, comparator, and latch. In normal operation the device operates as a power driver with a 6 A peak current totem-pole output. When the comparator threshold is exceeded, the latch is set and the output turns off. The output will not turn on again until the latch is reset. A 'LOCK' output is provided to signal that the output is disabled.

The TC4460 is ideal for applications which require fast response to an overload condition, such as PWM motor drive circuits. The response time is enhanced because the overload indication does not have to propagate through the control loop circuitry. Instead, the comparator directly monitors the SENSEFET current and turns off the driver output. The comparator delay is typically only 170 ns.

The comparator threshold is set internally at 100 mV ±10 mV. In most applications the comparator threshold will be referenced to analog ground, but the comparator common mode range extends from 0 V to 3 V.

With a comparator threshold of only 100 mV, low value resistors can be used to monitor the SENSEFET's current. Low impedances maximize the SENSEFET linearity, as well as improving response time and reducing noise.

The totem-pole output will sink or source 6 A peak current, with an output impedance of 2.5Ω. Output swing is to within 25mV of either supply rail, which ensures that a power MOSFET will be turned fully ON or fully OFF. Rise and fall times are only 25 ns with a 2500 pF load. Maximum load capacitance is essentially limited by package power dissipation.

The TC4460/4461/4462/4463 are built with Teledyne Component's Tough CMOS™ process. Digital inputs are protected from noise spikes up to 5V below ground, while the output will accept up to 1.5A of reverse current (of either polarity) without damage.

## ORDERING INFORMATION

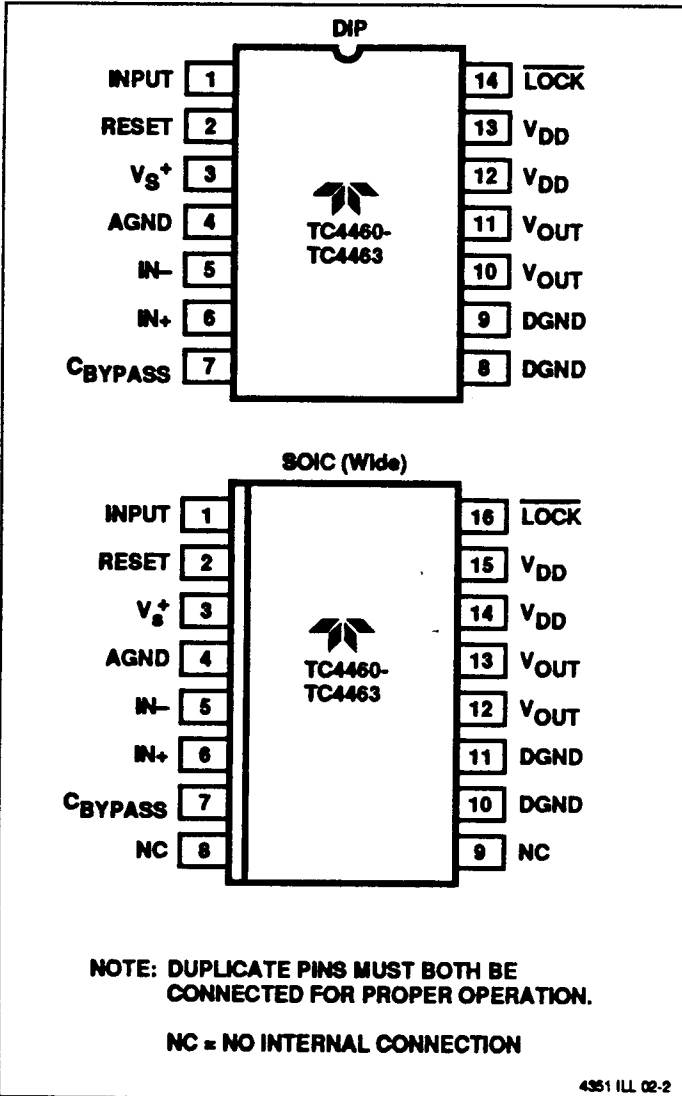
Part No.	Output Polarity	Reset Polarity	Package	Temp Range
TC4460CPD	Noninverting	Low	14-Pin PDIP	0°C to +70°C
TC4460COE	Noninverting	Low	16-Pin SOIC*	0°C to +70°C
TC4460EPD	Noninverting	Low	14-Pin PDIP	-40°C to +85°C
TC4460EOE	Noninverting	Low	16-Pin SOIC*	-40°C to +85°C
TC4460MJD	Noninverting	Low	14-Pin CerDIP	-55°C to +125°C
TC4461CPD	Inverting	Hi	14-Pin PDIP	0°C to +70°C
TC4461COE	Inverting	Hi	16-Pin SOIC*	0°C to +70°C
TC4461EPD	Inverting	Hi	14-Pin PDIP	-40°C to +85°C
TC4461EOE	Inverting	Hi	16-Pin SOIC*	-40°C to +85°C
TC4461MJD	Inverting	Hi	14-Pin CerDIP	-55°C to +125°C
TC4462CPD	Noninverting	Low	14-Pin PDIP	0°C to +70°C
TC4462COE	Noninverting	Low	16-Pin SOIC*	0°C to +70°C
TC4462EPD	Noninverting	Low	14-Pin PDIP	-40°C to +85°C
TC4462EOE	Noninverting	Low	16-Pin SOIC*	-40°C to +85°C
TC4462MJD	Noninverting	Low	14-Pin CerDIP	-55°C to +125°C
TC4463CPD	Inverting	Hi	14-Pin PDIP	0°C to +70°C
TC4463COE	Inverting	Hi	16-Pin SOIC*	0°C to +70°C
TC4463EPD	Inverting	Hi	14-Pin PDIP	-40°C to +85°C
TC4463EOE	Inverting	Hi	16-Pin SOIC*	-40°C to +85°C
TC4463MJD	Inverting	Hi	14-Pin CerDIP	-55°C to +125°C

\* = WIDE

# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

**TC4460 TC4462**  
**TC4461 TC4463**

## PIN CONFIGURATIONS



## ABSOLUTE MAXIMUM RATINGS

Supply Voltage, Digital and Analog	+22V
Input Voltage, Pins 1 and 2	V <sub>DD</sub> +0.3V to GND-5.0V
Input Voltage, Pins 5 and 6	V <sub>S</sub> <sup>+</sup> +0.3V to Analog GND-0.3V
Maximum Chip Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 sec)	+300°C
Package Thermal Resistance	
CerDIP R <sub>θJ-A</sub>	150°C/W
CerDIP R <sub>θJ-C</sub>	55°C/E
PDIP R <sub>θJ-A</sub>	125°C/W
PDIP R <sub>θJ-C</sub>	45°C/W
SOIC R <sub>θJ-A</sub>	250°C/W
SOIC R <sub>θJ-C</sub>	75°C/W
Operating Temperature Range	
C Device	0°C to +70°C
E Device	-40°C to +85°C
M Device	-55°C to +125°C
Power Dissipation	
Plastic DIP	1000 mW
CerDIP	800 mW
SOIC	500 mW

Static-sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. 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 operational sections of the specifications is not implied. Exposure to Absolute Maximum Rating Conditions for extended periods may affect device reliability.

# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

TC4460 TC4462  
TC4461 TC4463

**ELECTRICAL CHARACTERISTICS:**  $T_A = +25^\circ\text{C}$  with  $4.5\text{V} \leq V_{DD} \leq 18\text{V}$ , unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Input</b>						
$V_{IH}$	Logic 1 High Input Voltage		2.4	—	—	V
$V_{IL}$	Logic 1 Low Input Voltage		—	—	0.8	V
$I_{IN}$	Input Current	$0\text{V} \leq V_{IN} \leq V_{DD}$	-10	—	10	$\mu\text{A}$
<b>Output</b>						
$V_{OH}$	High Output Voltage		$V_{DD}-0.025$	—	—	V
$V_{OL}$	Low Output Voltage		—	—	0.025	V
$R_O$	Output Resistance, High	$I_{OUT} = 10\text{mA}$ , $V_{DD} = 18\text{V}$	—	2.2	2.8	$\Omega$
$R_O$	Output Resistance, Low	$I_{OUT} = 10\text{mA}$ , $V_{DD} = 18\text{V}$	—	1.9	2.5	$\Omega$
$I_{PK}$	Peak Output Current		—	6	—	A
$I_{REV}$	Latch-Up Protection Withstand Reverse Current	Duty Cycle $\leq 2\%$ $t \leq 300 \mu\text{s}$	1.5	—	—	A
<b>Switching Time (Note 1)</b>						
$t_R$	Rise Time	Figure 1, $C_L = 2500 \text{pF}$	—	21	25	ns
$t_F$	Fall Time	Figure 1, $C_L = 2500 \text{pF}$	—	21	25	ns
$t_{D1}$	Delay Time	Figure 1, $C_L = 2500 \text{pF}$	—	65	75	ns
$t_{D2}$	Delay Time	Figure 1, $C_L = 2500 \text{pF}$	—	65	75	ns
<b>Comparator (Note 1)</b>						
$I_{IN+}$	Comparator Input Bias Current (Plus)		—	—	1	$\mu\text{A}$
$I_{IN-}$	Comparator Input Bias Current (Minus)		—	—	150	$\mu\text{A}$
$V_{OS}$	Comparator Offset		90	—	110	mV
$V_{CMR}$	Comparator Common Mode Range		0	—	3	V
$T_{CDO}$	Comparator Delay to $V_{OUT}$	25 mV Overdrive	—	170	200	ns
$T_{CDL}$	Comparator Delay to <b>LOCK</b>	25 mV Overdrive	—	170	200	ns
$T_{RDL}$	Reset Delay to <b>LOCK</b>		—	70	100	ns
$T_{RDO}$	Reset Delay to Output		—	90	120	ns
$V_{IHL}$	Latch Input High	Pin 2, RESET	2.4	—	—	V
$V_{ILL}$	Latch Input Low	Pin 2, RESET	—	—	0.8	V
<b>Power Supply</b>						
$I_S$	Power Supply Current	$V_{IN} = 3\text{V}$ (Both Inputs) $V_{IN} = 0\text{V}$ (Both Inputs)	—	3.5 2.8	6 3	mA mA

NOTES: 1. Switching times guaranteed by design.

# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

TC4460 TC4462  
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**ELECTRICAL CHARACTERISTICS:** Over operating temperature range with  $4.5V \leq V_{DD} = 18V$ , unless otherwise specified.

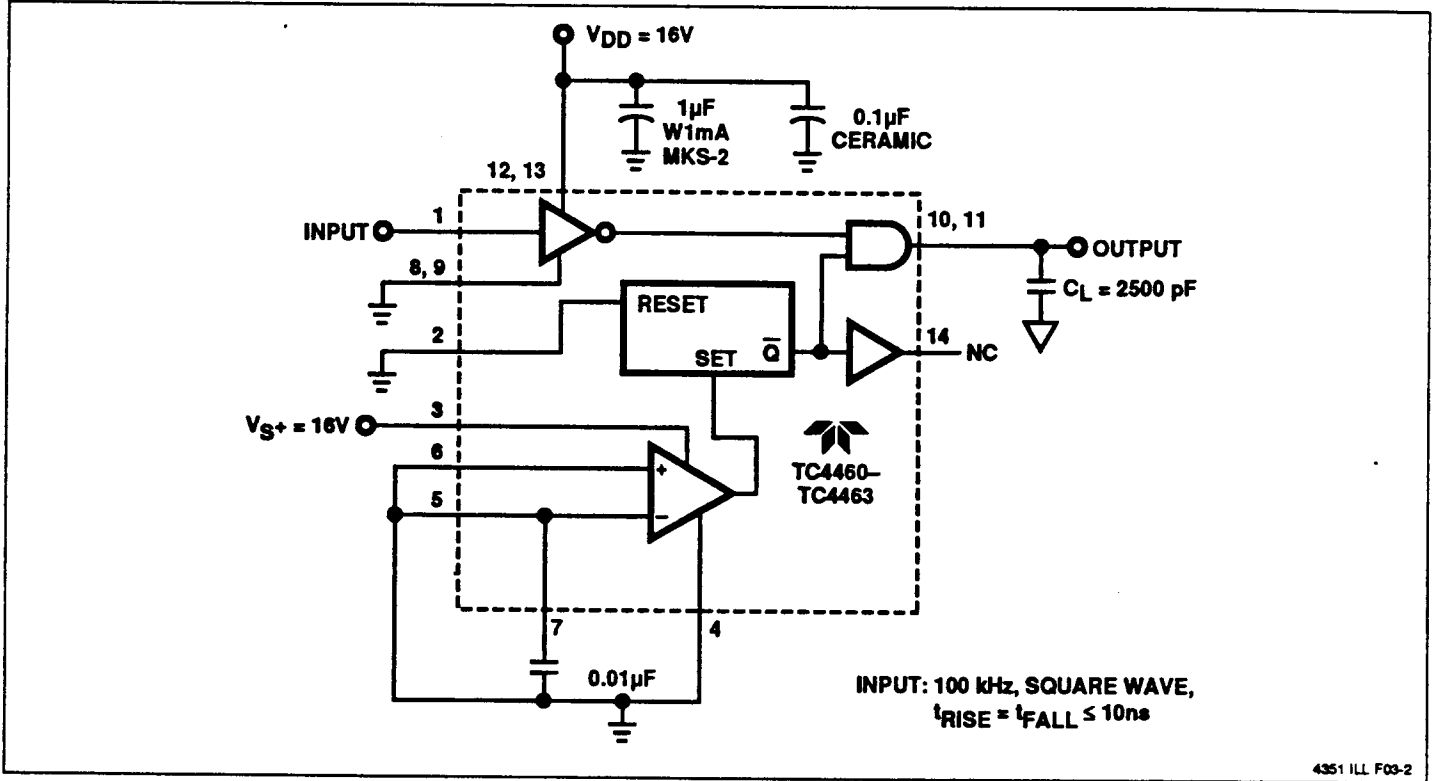
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Input</b>						
$V_{IH}$	Logic 1 High Input Voltage		2.4	—	—	V
$V_{IL}$	Logic 1 Low Input Voltage		—	—	0.8	V
$I_{IN}$	Input Current	$0V \leq V_{IN} \leq V_{DD}$	-10	—	10	$\mu A$
<b>Output</b>						
$V_{OH}$	High Output Voltage		$V_{DD}-0.025$	—	—	V
$V_{OL}$	Low Output Voltage		—	—	0.025	V
$R_{O1}$	Output Resistance, High	$I_{OUT} = 10mA, V_{DD} = 18V$	—	2.8	5	$\Omega$
$R_{O2}$	Output Resistance, Low	$I_{OUT} = 10mA, V_{DD} = 18V$	—	3.5	5	$\Omega$
$I_{PK}$	Peak Output Current		—	6	—	A
$I_{REV}$	Latch-Up Protection Withstand Reverse Current	Duty Cycle $\leq 2\%$ $t \leq 300 \mu s$	1.5	—	—	A
<b>Switching Time (Note 1)</b>						
$t_R$	Rise Time	Figure 1, $C_L = 2500 pF$	—	30	35	ns
$t_F$	Fall Time	Figure 1, $C_L = 2500 pF$	—	30	35	ns
$t_{D1}$	Delay Time	Figure 1, $C_L = 2500 pF$	—	80	90	ns
$t_{D2}$	Delay Time	Figure 1, $C_L = 2500 pF$	—	80	90	ns
<b>Comparator (Note 1)</b>						
$I_{IN+}$	Comparator Input Bias Current (Plus)		—	—	1	$\mu A$
$I_{IN-}$	Comparator Input Bias Current (Minus)		—	—	150	$\mu A$
$V_{OS}$	Comparator Offset		85	—	115	mV
$V_{CMR}$	Comparator Common Mode Range		0	—	3	V
$T_{CDO}$	Comparator Delay to $V_{OUT}$	25 mV Overdrive	—	150	280	ns
$T_{CDL}$	Comparator Delay to <b>LOCK</b>	25 mV Overdrive	—	150	280	ns
$T_{RD1}$	Reset Delay to <b>LOCK</b>		—	70	140	ns
$T_{RDO}$	Reset Delay to Output		—	90	160	ns
$V_{IHL}$	Latch Input High	Pin 2, RESET	2.4	—	—	V
$V_{ILL}$	Latch Input Low	Pin 2, RESET	—	—	0.8	V
<b>Power Supply</b>						
$I_S$	Power Supply Current	$V_{IN} = 3V$ (Both Inputs) $V_{IN} = 0V$ (Both Inputs)	—	3.5 2.8	6 3.0	mA mA

NOTES: 1. Switching times guaranteed by design.

# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

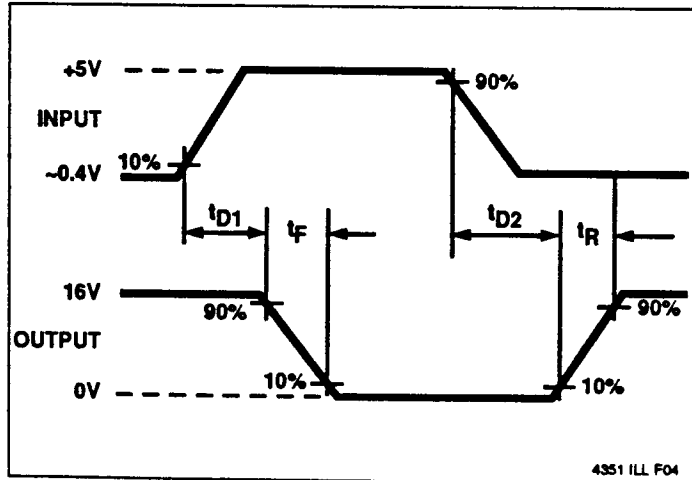
TC4460 TC4462  
TC4461 TC4463

## SWITCHING TIME TEST CIRCUIT



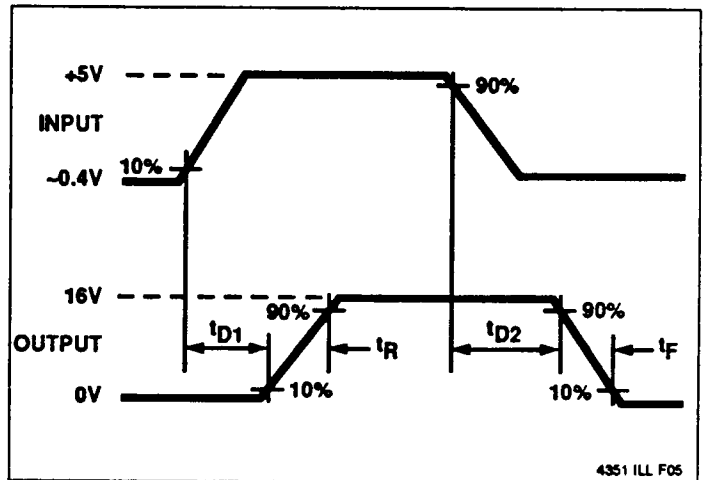
4351 ILL F03-2

## INVERTING DRIVER



4351 ILL F04

## NONINVERTING DRIVER



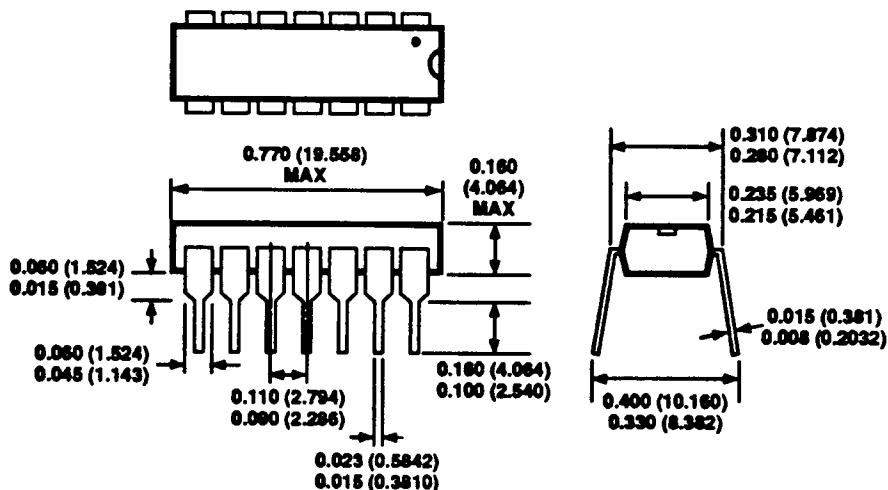
4351 ILL F05

# CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

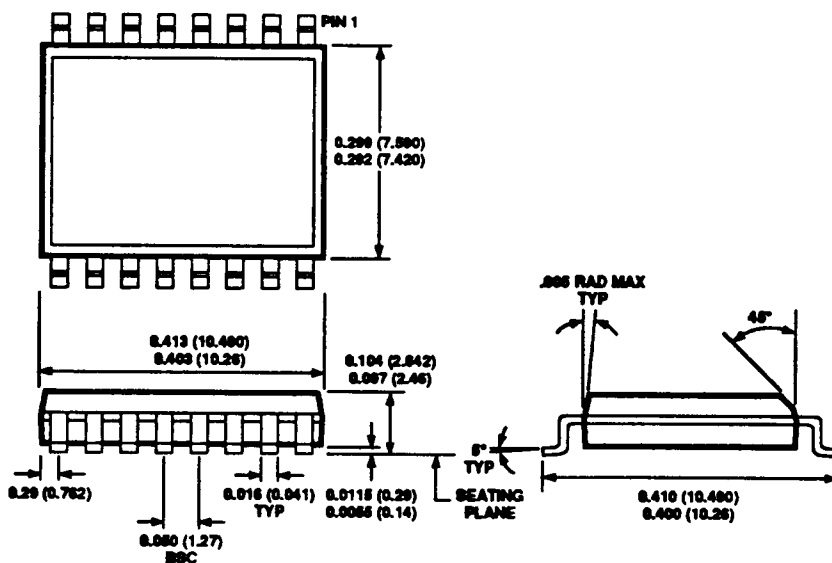
TC4460 TC4462  
TC4461 TC4463

## PACKAGE DIMENSIONS

### 14-Pin Plastic DIP (Package #6)



### 16-Pin Plastic "SO" (Wide) (Package #31)



Dimensions: millimeters (inches)

### Domestic Sales Offices

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10 Oceana Way  
Norwood, MA 02062-2601  
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FAX: 617-769-1249

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