

T.52-13-90



TC4460 TC4462
TC4461 TC4463

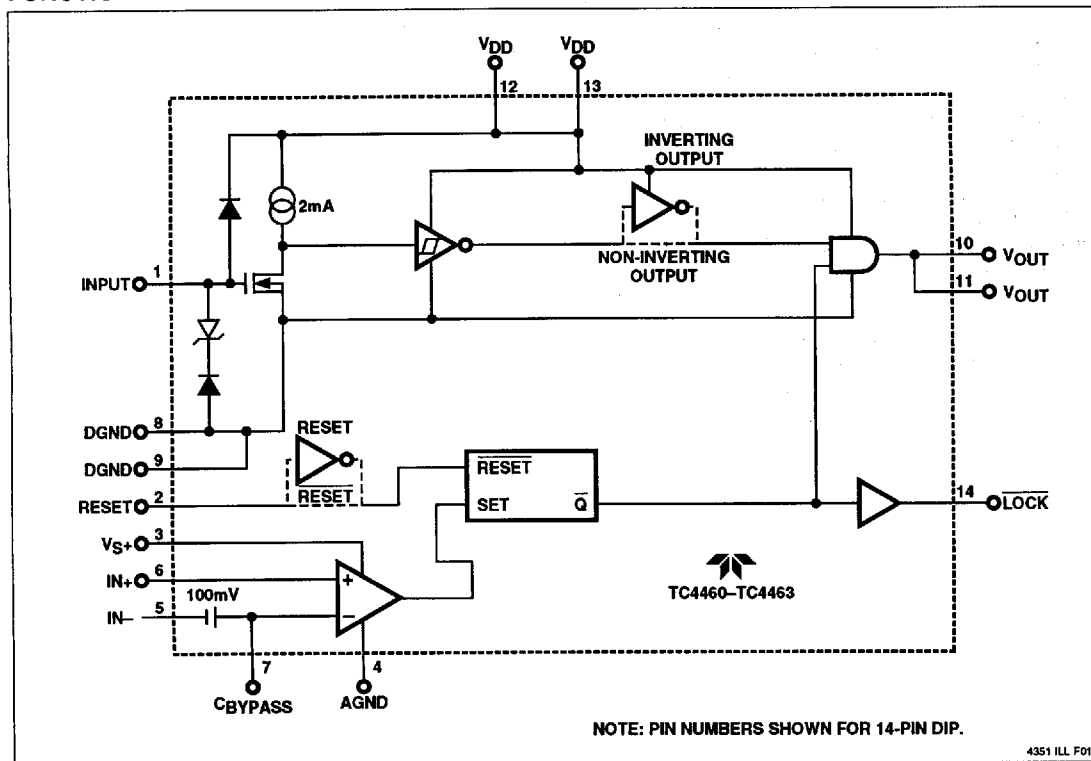
CURRENT-SENSING, 6 AMP POWER MOSFET DRIVER

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_{DD}
- 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_{DD}
- Low Supply Current
 - With Logic '1' Input 6 mA
 - With Logic '0' Input 3 mA

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FUNCTIONAL DIAGRAM



CURRENT-SENSING, 6 AMP
POWER MOSFET DRIVERTC4460 TC4462
TC4461 TC4463

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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 \pm 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 2.5 Ω . 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

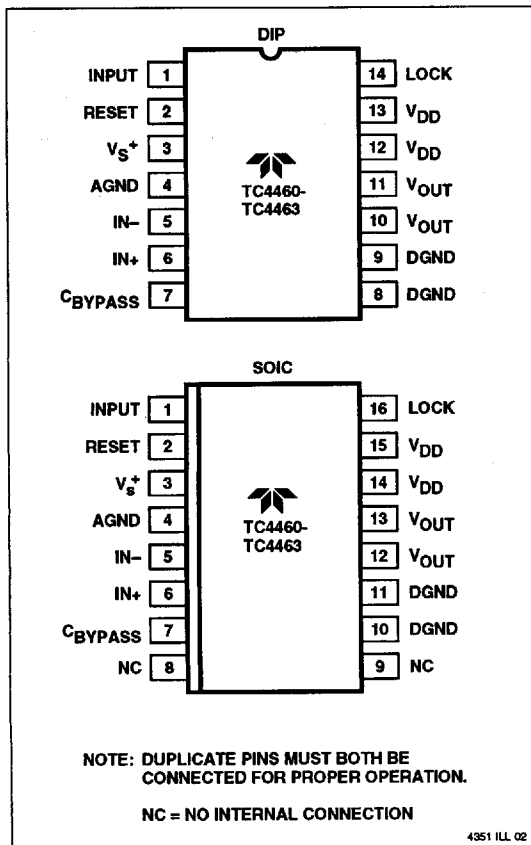
Part No.	Output Polarity	Reset Polarity	Package	Temp Range
TC4460CPD	Noninverting	Low	8-Pin PDIP	0°C to +70°C
TC4460COE	Noninverting	Low	8-Pin SOIC	0°C to +70°C
TC4460EPD	Noninverting	Low	8-Pin PDIP	-40°C to +85°C
TC4460EOE	Noninverting	Low	8-Pin SOIC	-40°C to +85°C
TC4460MJD	Noninverting	Low	8-Pin CerDIP	-55°C to +125°C
TC4461CPD	Inverting	Low	8-Pin PDIP	-55°C to +125°C
TC4461COE	Inverting	Low	8-Pin PDIP	-55°C to +125°C
TC4461EPD	Inverting	Low	8-Pin PDIP	-55°C to +125°C
TC4461EOE	Inverting	Low	8-Pin PDIP	-55°C to +125°C
TC4461MJD	Inverting	Low	8-Pin PDIP	-55°C to +125°C
TC4462CPD	Noninverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4462COE	Noninverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4462EPD	Noninverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4462EOE	Noninverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4462MJD	Noninverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4463CPD	Inverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4463COE	Inverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4463EPD	Inverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4463EOE	Inverting	Hi	8-Pin PDIP	-55°C to +125°C
TC4463MJD	Inverting	Hi	8-Pin PDIP	-55°C to +125°C

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**CURRENT-SENSING, 6 AMP
POWER MOSFET DRIVER**

PIN CONFIGURATIONS



ABSOLUTE MAXIMUM RATINGS

Supply Voltage, Digital and Analog	+22V
Input Voltage, Pins 1 and 2	V _{DD} +0.3V to GND-5.0V
Input Voltage, Pins 5 and 6	V _S ⁺ +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 _{θJ-A}	150°C/W
CerDIP R _{θJ-C}	55°C/E
PDIP R _{θJ-A}	125°C/W
PDIP R _{θJ-C}	45°C/W
SOIC R _{θJ-A}	250°C/W
SOIC R _{θJ-C}	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.

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CURRENT-SENSING, 6 AMP
POWER MOSFET DRIVERTC4460 TC4462
TC4461 TC4463

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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
Input						
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	μA
Output						
V_{OH}	High Output Voltage		$V_{DD}-0.025$	—	—	V
V_{OL}	Low Output Voltage		—	—	0.025	V
R_{OH}	Output Resistance, High	$I_{OUT} = 10\text{mA}$, $V_{DD} = 18\text{V}$	—	2.2	2.8	Ω
R_{OL}	Output Resistance, Low	$I_{OUT} = 10\text{mA}$, $V_{DD} = 18\text{V}$	—	1.9	2.5	Ω
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
Switching Time (Note 1)						
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
Comparator (Note 1)						
I_{IN+}	Comparator Input Bias Current (Plus)		—	—	1	μA
I_{IN-}	Comparator Input Bias Current (Minus)		—	—	150	μA
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 LOCK	25 mV Overdrive	—	170	200	ns
T_{RD1}	Reset Delay to LOCK		—	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
Power Supply						
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**

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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
Input						
V_{IH}	Logic 1 High Input Voltage		2.4	—	—	V
V_{IL}	Logic 1 Low Input Voltage		—	—	0.8	V
I_N	Input Current	$0V \leq V_{IN} \leq V_{DD}$	-10	—	10	μA
Output						
V_{OH}	High Output Voltage		$V_{DD}-0.025$	—	—	V
V_{OL}	Low Output Voltage		—	—	0.025	V
R_O	Output Resistance, High	$I_{OUT} = 10mA, V_{DD} = 18V$	—	2.8	5	Ω
R_O	Output Resistance, Low	$I_{OUT} = 10mA, V_{DD} = 18V$	—	3.5	5	Ω
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
Switching Time (Note 1)						
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
Comparator (Note 1)						
I_{IN+}	Comparator Input Bias Current (Plus)		—	—	1	μA
I_{IN-}	Comparator Input Bias Current (Minus)		—	—	150	μA
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 LOCK	25 mV Overdrive	—	150	280	ns
T_{RD1}	Reset Delay to LOCK		—	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
Power Supply						
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.

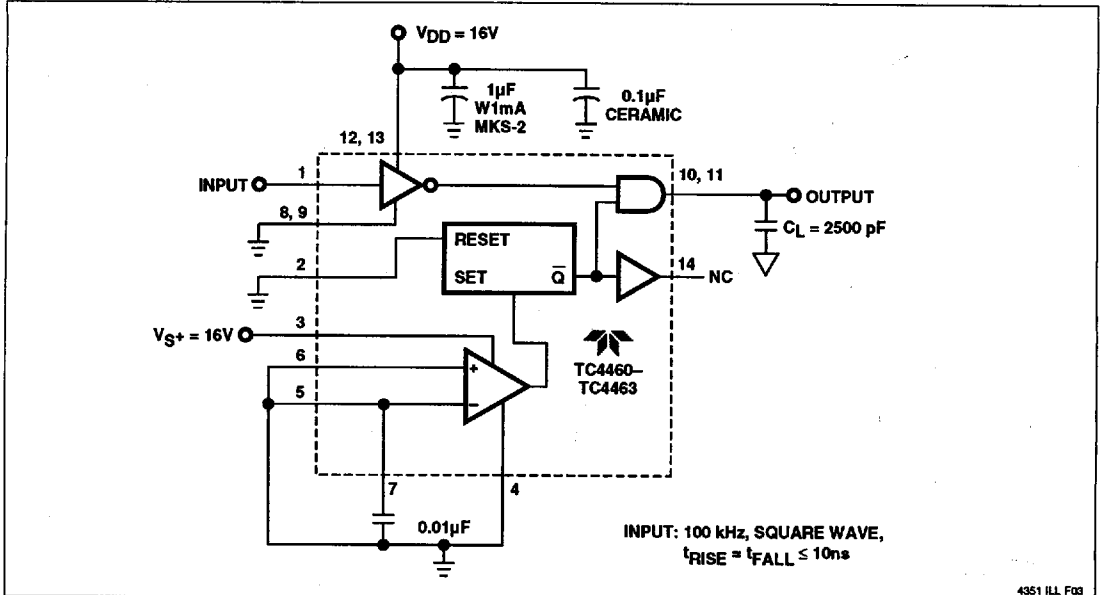
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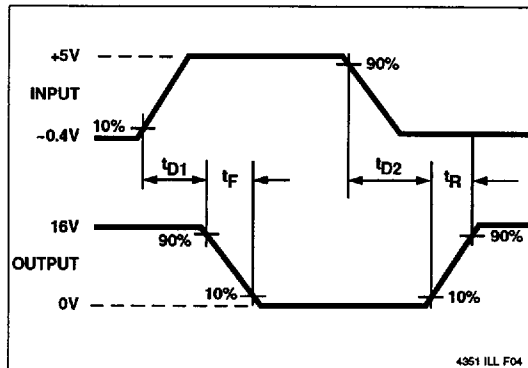
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SWITCHING TIME TEST CIRCUIT



4351 ILL F03

INVERTING DRIVER



NONINVERTING DRIVER

