



MICROCHIP TC4421M/TC4422M

9A High-Speed MOSFET Drivers

Features

- High Peak Output Current: 9A
- Wide Input Supply Voltage Operating Range:
 - 4.5V to 18V
- High Continuous Output Current: 2A Max
- Fast Rise and Fall Times:
 - 30 ns with 4,700 pF Load
 - 180 ns with 47,000 pF Load
- Short Propagation Delays: 30 ns (typ)
- Low Supply Current:
 - With Logic '1' Input – 200 μ A (typ)
 - With Logic '0' Input – 55 μ A (typ)
- Low Output Impedance: 1.4 Ω (typ)
- Latch-Up Protected: Will Withstand 1.5A Output Reverse Current
- Input: Will Withstand Negative Inputs Up To 5V
- Pin-Compatible with the TC4420M/TC4429M 6A MOSFET Driver
- Wide Operating Temperature Range:
 - -55°C to +125°C
- See TC4421/TC4422 Data Sheet (DS21420) for additional temperature range and package offerings

Applications

- Line Drivers for Extra Heavily-Loaded Lines
- Pulse Generators
- Driving the Largest MOSFETs and IGBTs
- Local Power ON/OFF Switch
- Motor and Solenoid Driver

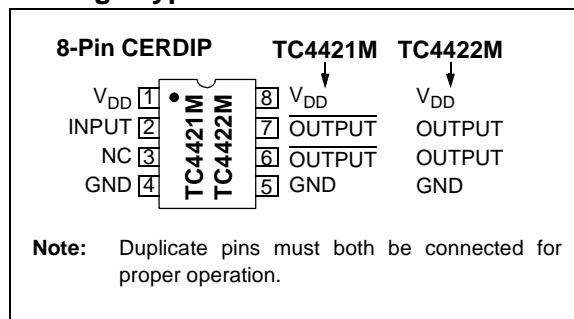
General Description

The TC4421M/TC4422M are high-current buffer/drivers capable of driving large MOSFETs and IGBTs.

They are essentially immune to any form of upset, except direct overvoltage or over-dissipation. They cannot be latched, under any conditions, within their power and voltage ratings. These parts are not subject to damage or improper operation when up to 5V of ground bounce is present on their ground terminals. They can accept, without damage or logic upset, more than 1A inductive current of either polarity being forced back into their outputs. In addition, all terminals are fully protected against up to 4 kV of electrostatic discharge.

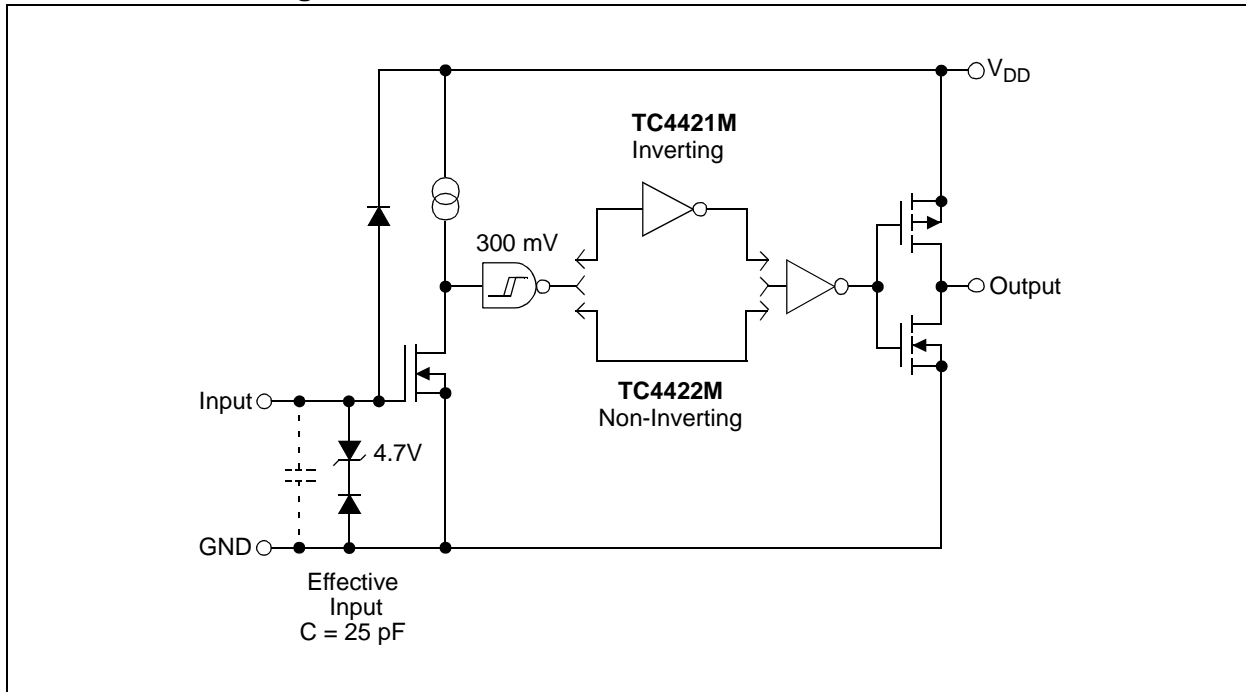
The TC4421M/TC4422M inputs may be driven directly from either TTL or CMOS (3V to 18V). In addition, 300 mV of hysteresis is built into the input, providing noise immunity and allowing the device to be driven from slowly rising or falling waveforms.

Package Types



TC4421M/TC4422M

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Supply Voltage+20V
 Input Voltage ($V_{DD} + 0.3V$) to (GND – 5V)
 Input Current ($V_{IN} > V_{DD}$) 50 mA

† 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.

DC CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, $T_A = +25^\circ\text{C}$ with $4.5V \leq V_{DD} \leq 18V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Input						
Logic '1', High Input Voltage	V_{IH}	2.4	1.8	—	V	
Logic '0', Low Input Voltage	V_{IL}	—	1.3	0.8	V	
Input Current	I_{IN}	-10	—	+10	μA	$0V \leq V_{IN} \leq V_{DD}$
Output						
High Output Voltage	V_{OH}	$V_{DD} - 0.025$	—	—	V	DC TEST
Low Output Voltage	V_{OL}	—	—	0.025	V	DC TEST
Output Resistance, High	R_{OH}	—	1.4	—	Ω	$I_{OUT} = 10\text{ mA}$, $V_{DD} = 18V$
Output Resistance, Low	R_{OL}	—	0.9	1.7	Ω	$I_{OUT} = 10\text{ mA}$, $V_{DD} = 18V$
Peak Output Current	I_{PK}	—	9.0	—	A	$V_{DD} = 18V$
Latch-Up Protection Withstand Reverse Current	I_{REV}	—	>1.5	—	A	Duty cycle $\leq 2\%$, $t \leq 300\ \mu\text{sec}$
Switching Time (Note 1)						
Rise Time	t_R	—	60	75	ns	Figure 4-1, $C_L = 10,000\text{ pF}$
Fall Time	t_F	—	60	75	ns	Figure 4-1, $C_L = 10,000\text{ pF}$
Delay Time	t_{D1}	—	30	60	ns	Figure 4-1
Delay Time	t_{D2}	—	33	60	ns	Figure 4-1
Power Supply						
Power Supply Current	I_S	—	0.2	1.5	mA	$V_{IN} = 3V$
		—	55	150	μA	$V_{IN} = 0V$
Operating Input Voltage	V_{DD}	4.5	—	18	V	

Note 1: Switching times ensured by design.

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DC CHARACTERISTICS (OVER OPERATING TEMPERATURE RANGE)

Electrical Specifications: Unless otherwise noted, over operating temperature range with $4.5V \leq V_{DD} \leq 18V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Input						
Logic '1', High Input Voltage	V_{IH}	2.4	—	—	V	
Logic '0', Low Input Voltage	V_{IL}	—	—	0.8	V	
Input Current	I_{IN}	-10	—	+10	μA	$0V \leq V_{IN} \leq V_{DD}$
Output						
High Output Voltage	V_{OH}	$V_{DD} - 0.025$	—	—	V	DC TEST
Low Output Voltage	V_{OL}	—	—	0.025	V	DC TEST
Output Resistance, High	R_{OH}	—	2.4	3.6	Ω	$I_{OUT} = 10 \text{ mA}$, $V_{DD} = 18V$
Output Resistance, Low	R_{OL}	—	1.8	2.7	Ω	$I_{OUT} = 10 \text{ mA}$, $V_{DD} = 18V$
Switching Time (Note 1)						
Rise Time	t_R	—	60	120	ns	Figure 4-1, $C_L = 10,000 \text{ pF}$
Fall Time	t_F	—	60	120	ns	Figure 4-1, $C_L = 10,000 \text{ pF}$
Delay Time	t_{D1}	—	50	80	ns	Figure 4-1
Delay Time	t_{D2}	—	65	80	ns	Figure 4-1
Power Supply						
Power Supply Current	I_S	—	—	3	mA	$V_{IN} = 3V$ $V_{IN} = 0V$
Operating Input Voltage	V_{DD}	4.5	—	18	V	

Note 1: Switching times ensured by design.

TEMPERATURE CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, all parameters apply with $4.5V \leq V_{DD} \leq 18V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Temperature Ranges						
Specified Temperature Range (M)	T_A	-55	—	+125	$^{\circ}C$	
Maximum Junction Temperature	T_J	—	—	+150	$^{\circ}C$	
Storage Temperature Range	T_A	-65	—	+150	$^{\circ}C$	
Package Thermal Resistances						
Thermal Resistance, 8L-CERDIP	θ_{JA}	—	150	—	$^{\circ}C/W$	

2.0 TYPICAL PERFORMANCE CURVES

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.

Note: Unless otherwise indicated, $T_A = +25^\circ\text{C}$ with $4.5\text{V} \leq V_{DD} \leq 18\text{V}$.

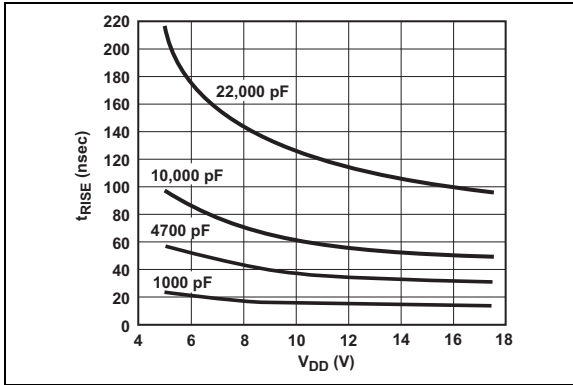


FIGURE 2-1: Rise Time vs. Supply Voltage.

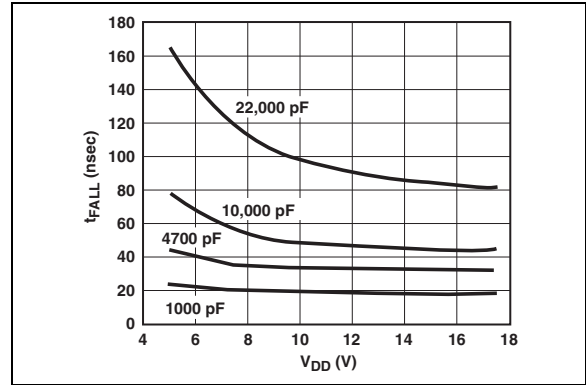


FIGURE 2-4: Fall Time vs. Supply Voltage.

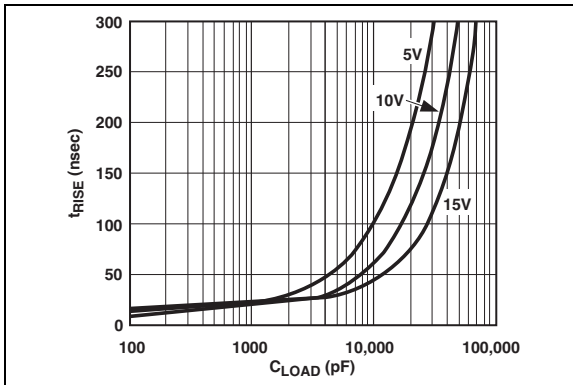


FIGURE 2-2: Rise Time vs. Capacitive Load.

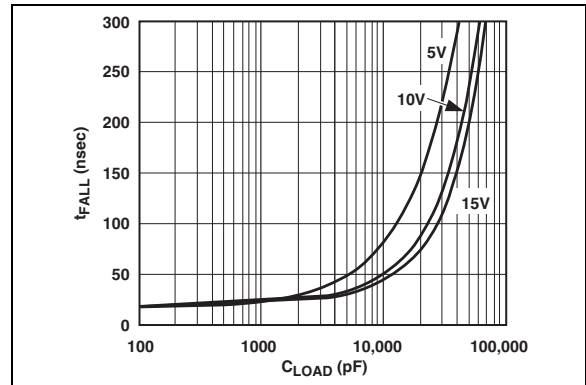


FIGURE 2-5: Fall Time vs. Capacitive Load.

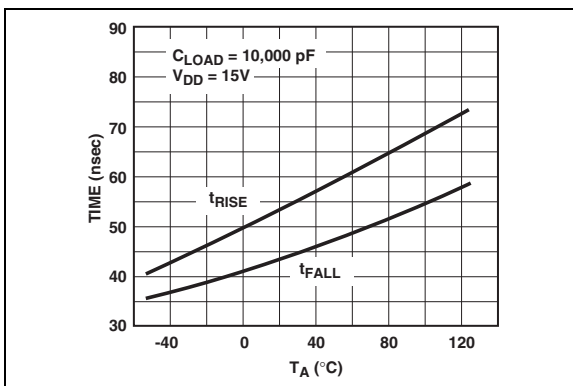


FIGURE 2-3: Rise and Fall Times vs. Temperature.

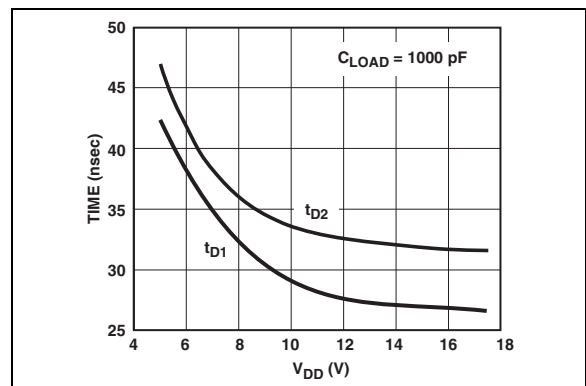


FIGURE 2-6: Propagation Delay vs. Supply Voltage.

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Note: Unless otherwise indicated, $T_A = +25^\circ\text{C}$ with $4.5\text{V} \leq V_{DD} \leq 18\text{V}$.

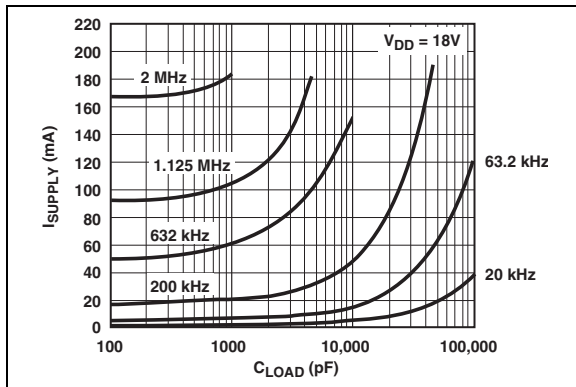


FIGURE 2-7: Supply Current vs. Capacitive Load ($V_{DD} = 18\text{V}$).

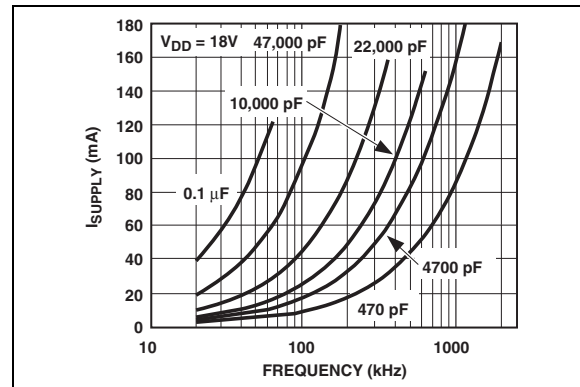


FIGURE 2-10: Supply Current vs. Frequency ($V_{DD} = 18\text{V}$).

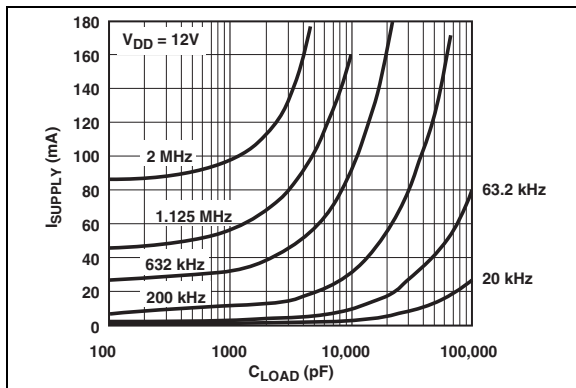


FIGURE 2-8: Supply Current vs. Capacitive Load ($V_{DD} = 12\text{V}$).

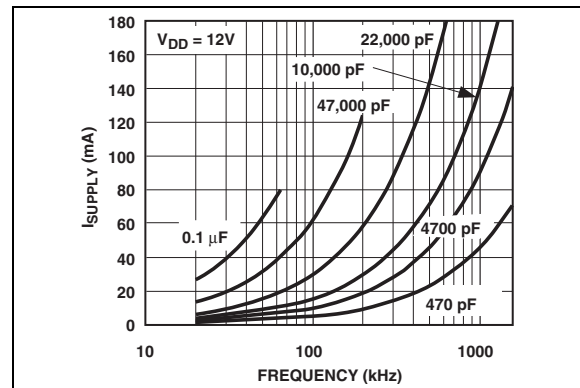


FIGURE 2-11: Supply Current vs. Frequency ($V_{DD} = 12\text{V}$).

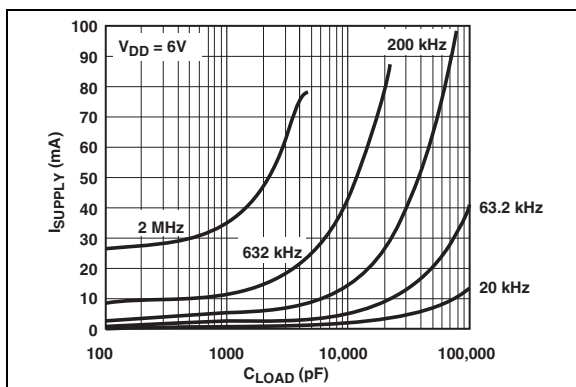


FIGURE 2-9: Supply Current vs. Capacitive Load ($V_{DD} = 6\text{V}$).

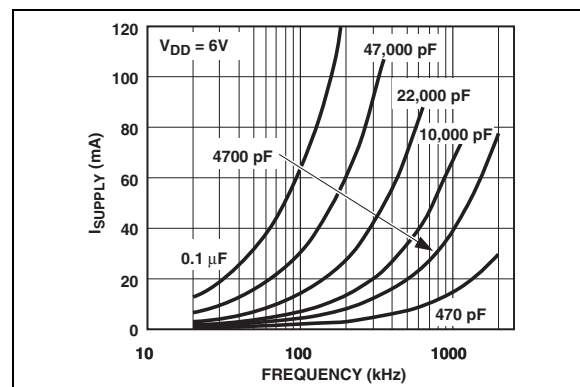


FIGURE 2-12: Supply Current vs. Frequency ($V_{DD} = 6\text{V}$).

Note: Unless otherwise indicated, $T_A = +25^\circ\text{C}$ with $4.5\text{V} \leq V_{DD} \leq 18\text{V}$.

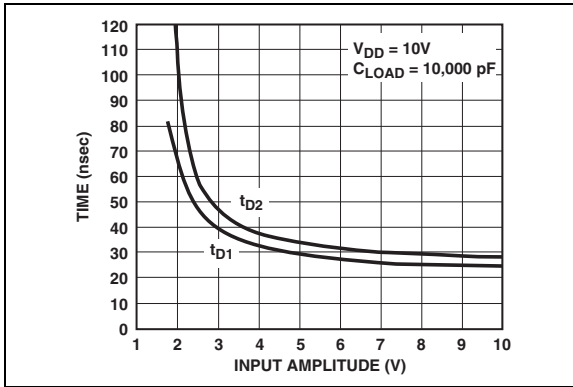


FIGURE 2-13: Propagation Delay vs. Input Amplitude.

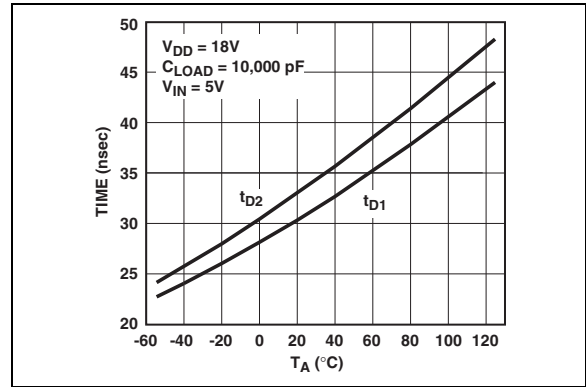


FIGURE 2-16: Propagation Delay vs. Temperature.

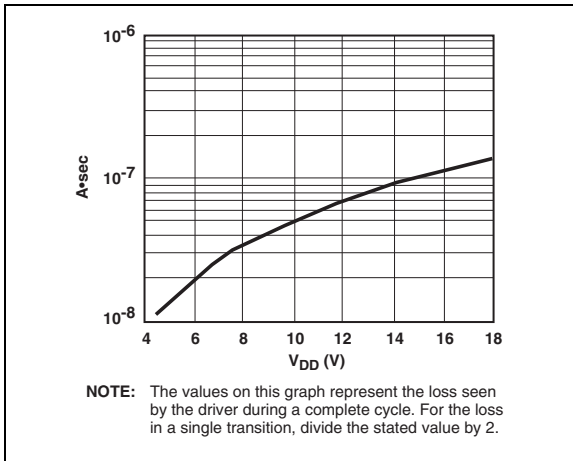


FIGURE 2-14: Crossover Energy vs. Supply Voltage.

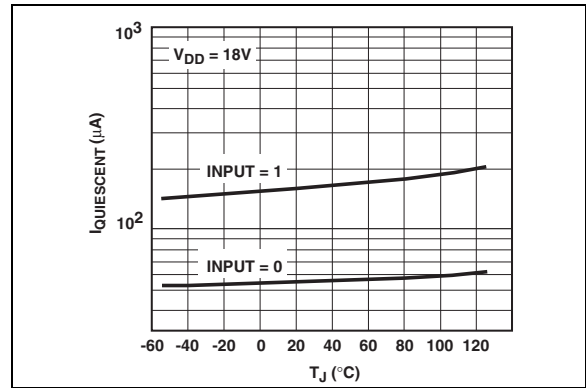


FIGURE 2-17: Quiescent Supply Current vs. Temperature.

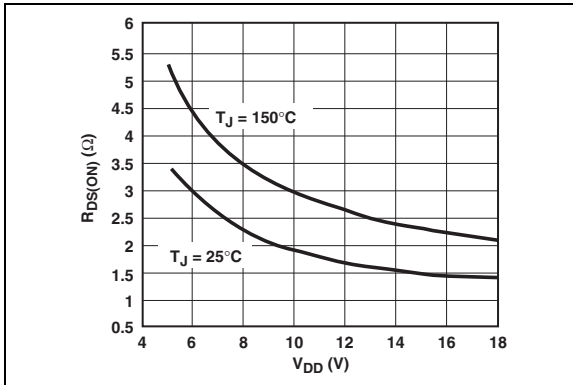


FIGURE 2-15: High-State Output Resistance vs. Supply Voltage.

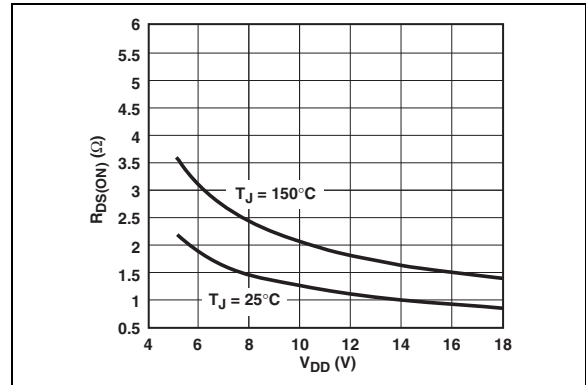


FIGURE 2-18: Low-State Output Resistance vs. Supply Voltage.

TC4421M/TC4422M

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 3-1.

TABLE 3-1: PIN FUNCTION TABLE

Pin No. 8-Pin CERDIP	Symbol	Description
1	V _{DD}	Supply input, 4.5V to 18V
2	INPUT	Control input, TTL/CMOS-compatible input
3	NC	No connection
4	GND	Ground
5	GND	Ground
6	OUTPUT	CMOS push-pull output
7	OUTPUT	CMOS push-pull output
8	V _{DD}	Supply input, 4.5V to 18V

3.1 Supply Input (V_{DD})

The V_{DD} input is the bias supply for the MOSFET driver and is rated for 4.5V to 18V with respect to the ground pin. The V_{DD} input should be bypassed to ground with a local ceramic capacitor. The value of the capacitor should be chosen based on the capacitive load that is being driven. A minimum value of 1.0 μ F is suggested.

3.2 Control Input

The MOSFET driver input is a high-impedance, TTL/CMOS-compatible input. The input also has 300 mV of hysteresis between the high and low thresholds that prevents output glitching even when the rise and fall time of the input signal is very slow.

3.3 CMOS Push-Pull Output

The MOSFET driver output is a low-impedance, CMOS, push-pull style output capable of driving a capacitive load with 9.0A peak currents. The MOSFET driver output is capable of withstanding 1.5A peak reverse currents of either polarity.

3.4 Ground

The ground pins are the return path for the bias current and for the high peak currents that discharge the load capacitor. The ground pins should be tied into a ground plane or have very short traces to the bias supply source return.

4.0 APPLICATIONS INFORMATION

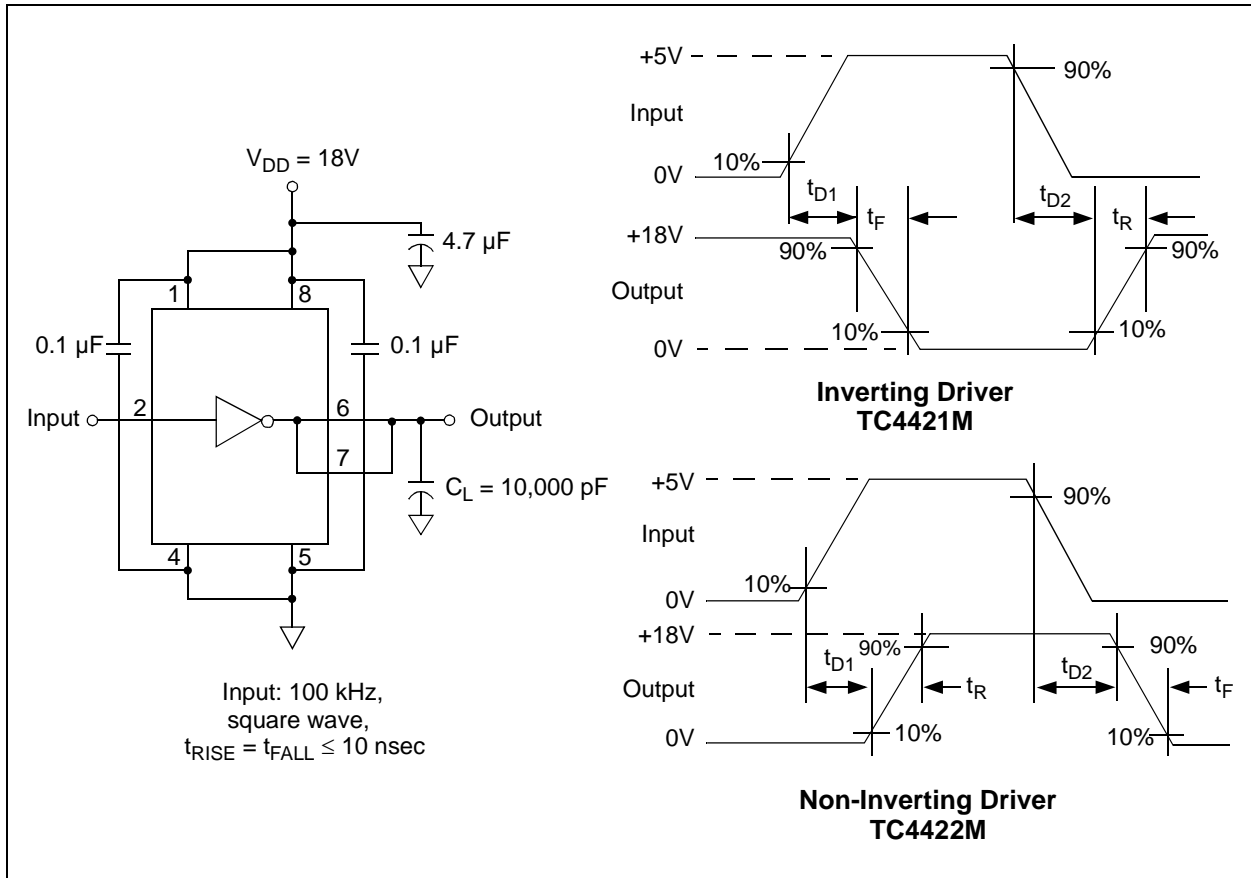


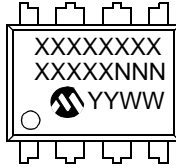
FIGURE 4-1: Switching Time Test Circuits.

TC4421M/TC4422M

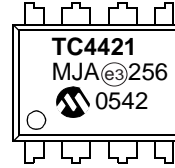
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

8-Lead CERDIP (300 mil)



Example:



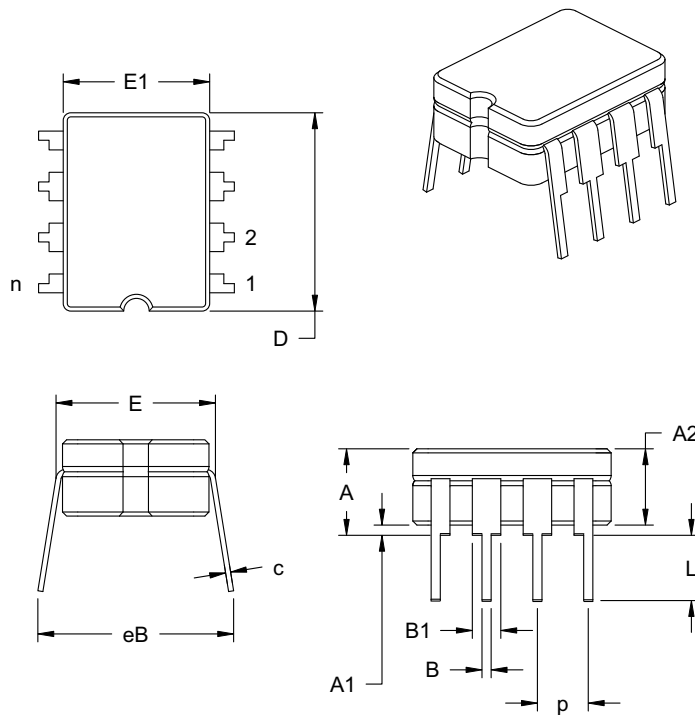
Legend:	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	^(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ^(e3) can be found on the outer packaging for this package.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

TC4421M/TC4422M

8-Lead Ceramic Dual In-line – 300 mil (CERDIP)

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



Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.160	.180	.200	4.06	4.57	5.08
Standoff §	A1	.020	.030	.040	0.51	0.77	1.02
Shoulder to Shoulder Width	E	.290	.305	.320	7.37	7.75	8.13
Ceramic Pkg. Width	E1	.230	.265	.300	5.84	6.73	7.62
Overall Length	D	.370	.385	.400	9.40	9.78	10.16
Tip to Seating Plane	L	.125	.163	.200	3.18	4.13	5.08
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.055	.065	1.14	1.40	1.65
Lower Lead Width	B	.016	.018	.020	0.41	0.46	0.51
Overall Row Spacing	eB	.320	.360	.400	8.13	9.15	10.16

*Controlling Parameter

JEDEC Equivalent: MS-030

Drawing No. C04-010

TC4421M/TC4422M

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (February 2005)

- Original Release of this Document.

Revision B (January 2013)

Added a note to each package outline drawing.

TC4421M/TC4422M

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>XX</u>
Device and Temperature Range	Package
Device and Temperature Range:	TC4421M: 9A High-Speed MOSFET Driver, Inverting, -55°C to +125°C TC4422M: 9A High-Speed MOSFET Driver, Non-Inverting, -55°C to +125°C
Package:	JA = Ceramic Dual In-Line (300 mil Body), 8-lead
Examples:	
a) TC4421MJA:	9A High-Speed MOSFET Driver, Inverting, 8LD CERDIP package.
a) TC4422MJA:	9A High-Speed MOSFET Driver, Non-Inverting, 8LD CERDIP package.

TC4421M/TC4422M

NOTES:

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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: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

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

11/29/12



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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