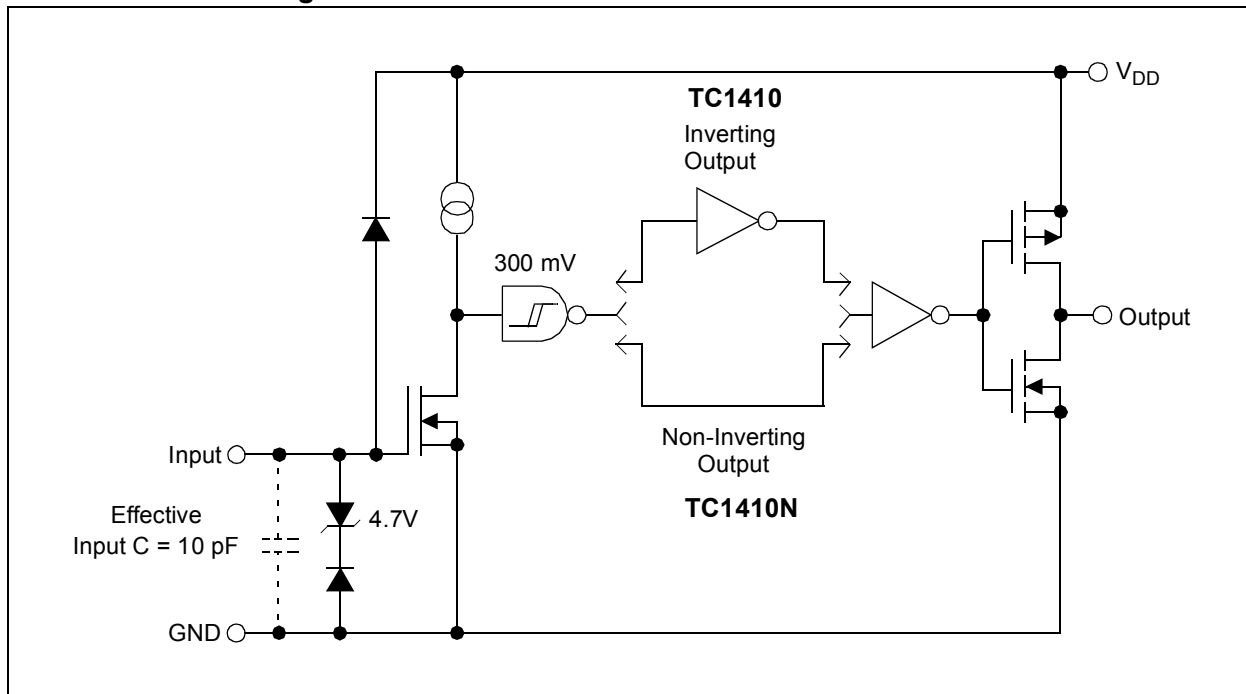


TC1410/TC1410N

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage +20V
 Input Voltage $V_{DD} + 0.3V$ to GND – 5.0V
 Power Dissipation ($T_A \leq 70^\circ C$)
 MSOP 340 mW
 PDIP 730 mW
 SOIC 470 mW

Storage Temperature Range $-65^\circ C$ to $+150^\circ C$

Maximum Junction Temperature $+150^\circ C$

† 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.

PIN FUNCTION TABLE

Symbol	Description
V_{DD}	Supply input, 4.5V to 16V
INPUT	Control input
NC	No connection
GND	Ground
GND	Ground
OUTPUT	CMOS push-pull output, common to pin 7
OUTPUT	CMOS push-pull output, common to pin 6
V_{DD}	Supply input, 4.5V to 16V

DC ELECTRICAL CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, over operating temperature range with $4.5V \leq V_{DD} \leq 16V$. Typical values are measured at $T_A = +25^\circ C$, $V_{DD} = 16V$.

Parameters	Sym	Min	Typ	Max	Units	Conditions
Input						
Logic '1', High Input Voltage	V_{IH}	2.0	—	—	V	
Logic '0', Low Input Voltage	V_{IL}	—	—	0.8	V	
Input Current	I_{IN}	-1 -10	— —	1 10	μA	$0V \leq V_{IN} \leq V_{DD}$, $T_A = +25^\circ C$ $-40^\circ C \leq T_A \leq +85^\circ C$
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	R_O	— — —	16 20 20	22 28 28	Ω	$V_{DD} = 16V$, $I_O = 10 mA$, $T_A = +25^\circ C$ $0^\circ C \leq T_A \leq +70^\circ C$ $-40^\circ C \leq T_A \leq +85^\circ C$
Peak Output Current	I_{PK}	—	0.5	—	A	$V_{DD} = 16V$
Latch-Up Protection Withstand Reverse Current	I_{REV}	—	0.5	—	A	Duty cycle $\leq 2\%$, $t \leq 300 \mu sec$, $V_{DD} = 16V$
Switching Time (Note 1)						
Rise Time	t_R	— — —	25 27 29	35 40 40	nsec	$T_A = +25^\circ C$ $0^\circ C \leq T_A \leq +70^\circ C$ $-40^\circ C \leq T_A \leq +85^\circ C$, Figure 4-1
Fall Time	t_F	— — —	25 27 29	35 40 40	nsec	$T_A = +25^\circ C$ $0^\circ C \leq T_A \leq +70^\circ C$ $-40^\circ C \leq T_A \leq +85^\circ C$, Figure 4-1
Delay Time	t_{D1}	— — —	30 33 35	40 45 45	nsec	$T_A = +25^\circ C$ $0^\circ C \leq T_A \leq +70^\circ C$ $-40^\circ C \leq T_A \leq +85^\circ C$, Figure 4-1

Note 1: Switching times ensured by design.

TC1410/TC1410N

DC ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Specifications: Unless otherwise noted, over operating temperature range with $4.5V \leq V_{DD} \leq 16V$. Typical values are measured at $T_A = +25^{\circ}C$, $V_{DD} = 16V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Delay Time	t_{D2}	—	30	40	nsec	$T_A = +25^{\circ}C$
		—	33	45		$0^{\circ}C \leq T_A \leq +70^{\circ}C$
		—	35	45		$-40^{\circ}C \leq T_A \leq +85^{\circ}C$, Figure 4-1
Power Supply						
Power Supply Current	I_S	—	0.5	1.0	mA	$V_{IN} = 3V$, $V_{DD} = 16V$
		—	0.1	0.15		$V_{IN} = 0V$

Note 1: Switching times ensured by design.

TEMPERATURE CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, all parameters apply with $4.5V \leq V_{DD} \leq 16V$.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Temperature Ranges						
Specified Temperature Range (C)	T_A	0	—	+70	$^\circ C$	
Specified Temperature Range (E)	T_A	-40	—	+85	$^\circ C$	
Maximum Junction Temperature	T_J	—	—	+150	$^\circ C$	
Storage Temperature Range	T_A	-65	—	+150	$^\circ C$	
Package Thermal Resistances						
Thermal Resistance, 8L-MSOP	θ_{JA}	—	206	—	$^\circ C/W$	
Thermal Resistance, 8L-PDIP	θ_{JA}	—	125	—	$^\circ C/W$	
Thermal Resistance, 8L-SOIC	θ_{JA}	—	155	—	$^\circ C/W$	

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, over operating temperature range with $4.5V \leq V_{DD} \leq 16V$.

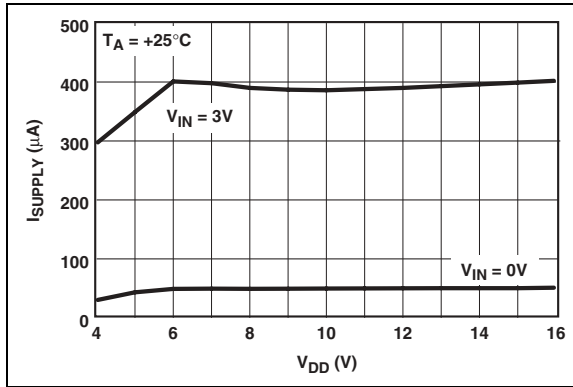


FIGURE 2-1: Quiescent Supply Current vs. Supply Voltage.

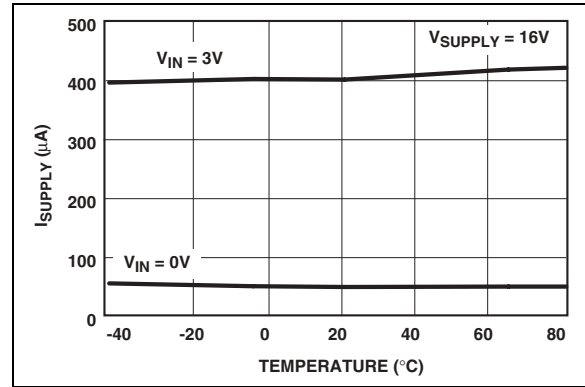


FIGURE 2-4: Quiescent Supply Current vs. Temperature.

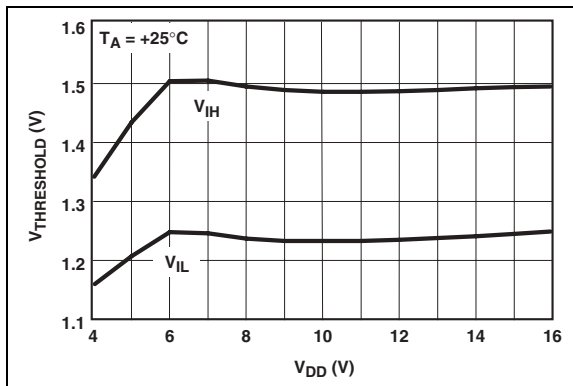


FIGURE 2-2: Input Threshold vs. Supply Voltage.

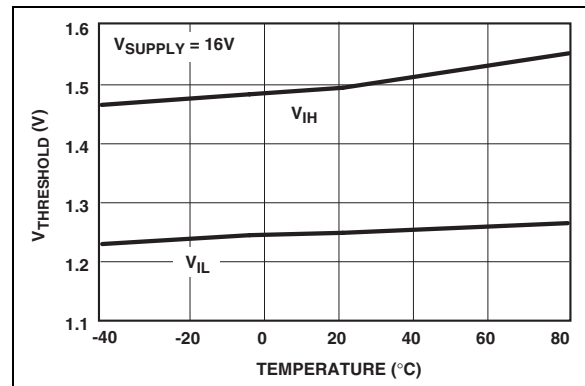


FIGURE 2-5: Input Threshold vs. Temperature.

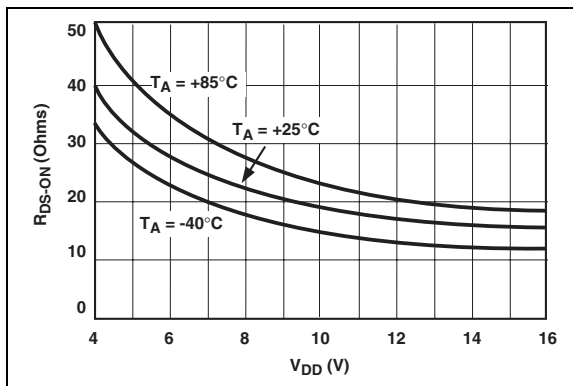


FIGURE 2-3: High-State Output Resistance vs. Supply Voltage.

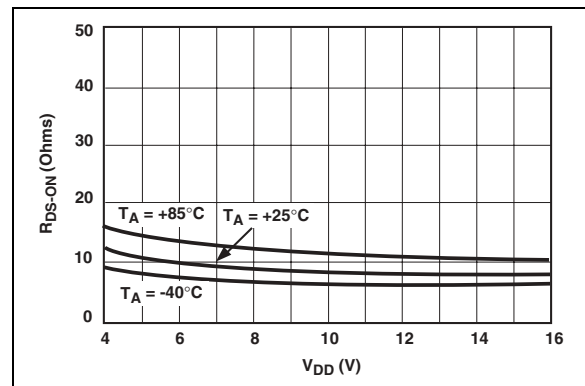


FIGURE 2-6: Low-State Output Resistance vs. Supply Voltage.

TC1410/TC1410N

Note: Unless otherwise indicated, over operating temperature range with $4.5V \leq V_{DD} \leq 16V$.

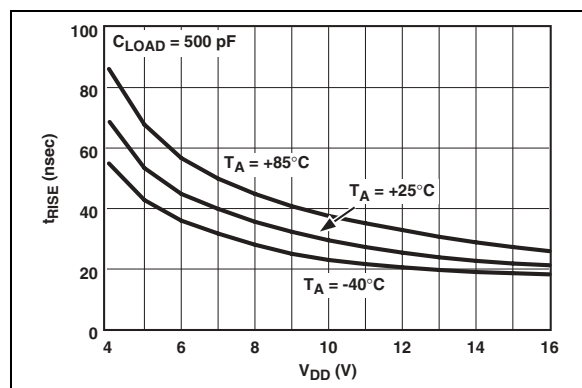


FIGURE 2-7: Rise Time vs. Supply Voltage.

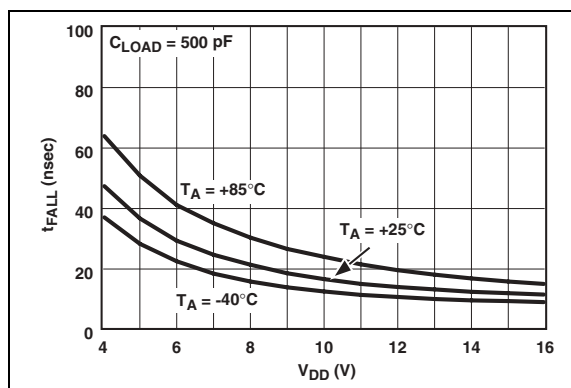


FIGURE 2-10: Fall Time vs. Supply Voltage.

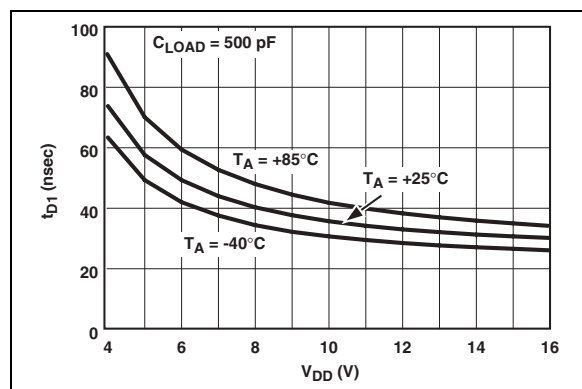


FIGURE 2-8: Propagation Delay vs. Supply Voltage.

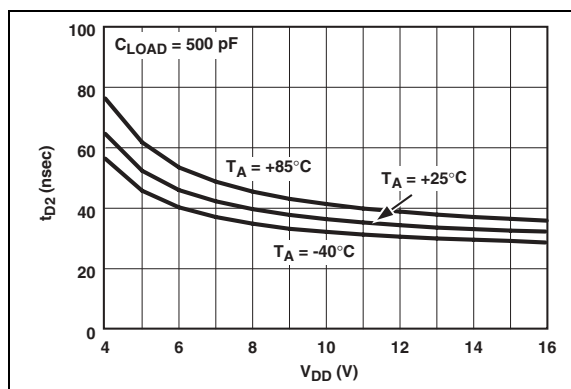


FIGURE 2-11: Propagation Delay vs. Supply Voltage.

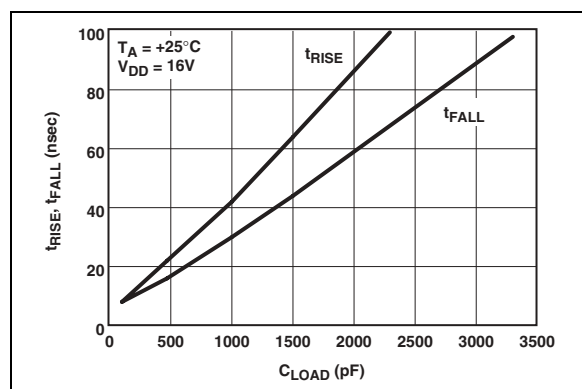


FIGURE 2-9: Rise and Fall Times vs. Capacitive Load.

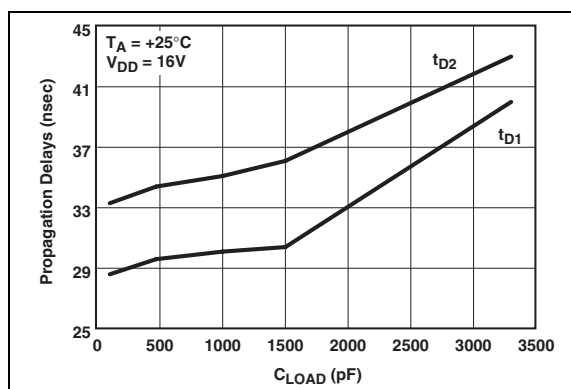


FIGURE 2-12: Propagation Delays vs. Capacitive Load.

3.0 PIN DESCRIPTIONS

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

TABLE 3-1: PIN FUNCTION TABLE

Pin No.	Symbol	Description
1	V _{DD}	Supply input, 4.5V to 16V
2	INPUT	Control input
3	NC	No connection
4	GND	Ground
5	GND	Ground
6	OUTPUT	CMOS push-pull output, common to pin 7
7	OUTPUT	CMOS push-pull output, common to pin 6
8	V _{DD}	Supply input, 4.5V to 16V

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 16V 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 value of 1.0 μ F is suggested.

3.2 Control Input (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 (OUTPUT)

The MOSFET driver output is a low-impedance, CMOS, push-pull style output, capable of driving a capacitive load with 0.5 A peak currents.

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.

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4.0 APPLICATIONS INFORMATION

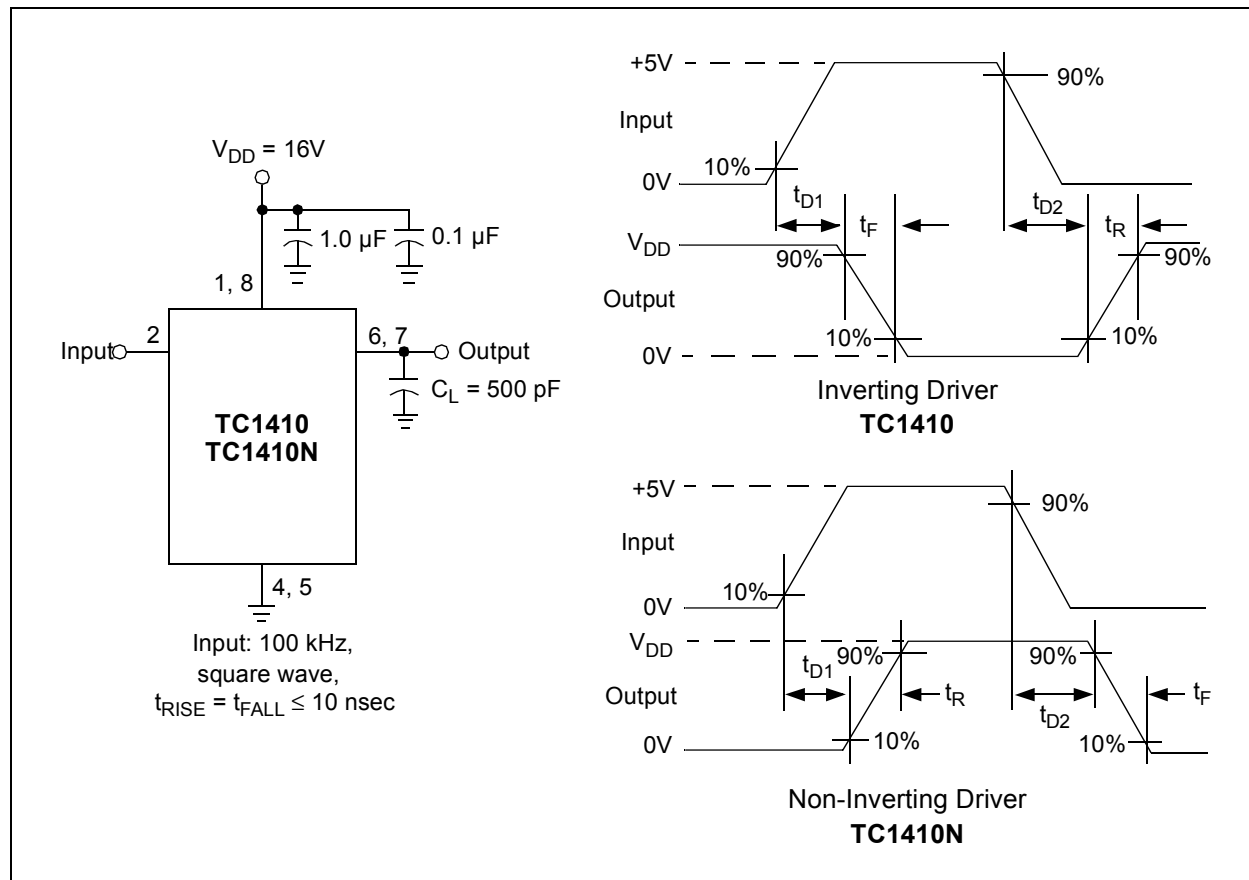
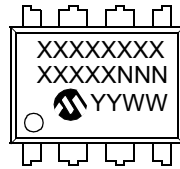


FIGURE 4-1: Switching Time Test Circuit.

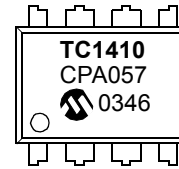
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

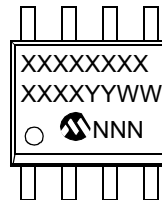
8-Lead PDIP (300 mil)



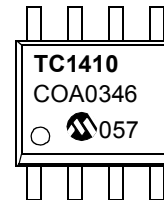
Example:



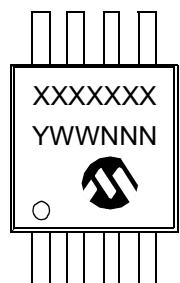
8-Lead SOIC (150 mil)



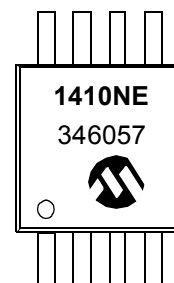
Example:



8-Lead MSOP



Example:



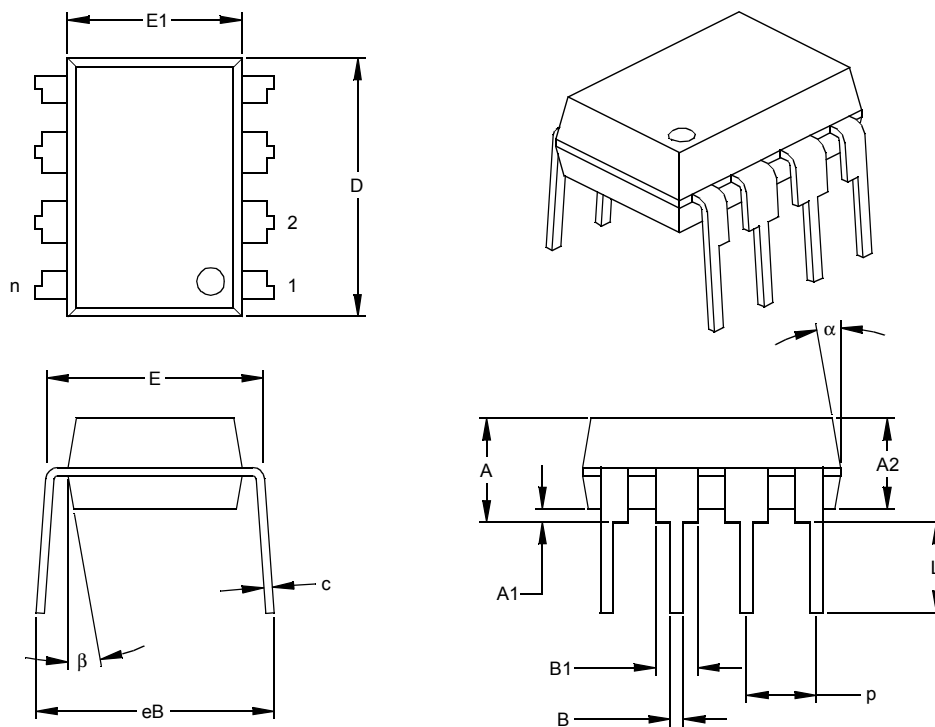
Legend:	XX...X	Customer specific information*
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code

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.

- * Standard marking consists of Microchip part number, year code, week code, traceability code (facility code, mask rev#, and assembly code). For marking beyond this, certain price adders apply. Please check with your Microchip Sales Office.

TC1410/TC1410N

8-Lead Plastic Dual In-line (PA) – 300 mil (PDIP)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.100			2.54	
Top to Seating Plane	A	.140	.155	.170	3.56	3.94	4.32
Molded Package Thickness	A2	.115	.130	.145	2.92	3.30	3.68
Base to Seating Plane	A1	.015			0.38		
Shoulder to Shoulder Width	E	.300	.313	.325	7.62	7.94	8.26
Molded Package Width	E1	.240	.250	.260	6.10	6.35	6.60
Overall Length	D	.360	.373	.385	9.14	9.46	9.78
Tip to Seating Plane	L	.125	.130	.135	3.18	3.30	3.43
Lead Thickness	c	.008	.012	.015	0.20	0.29	0.38
Upper Lead Width	B1	.045	.058	.070	1.14	1.46	1.78
Lower Lead Width	B	.014	.018	.022	0.36	0.46	0.56
Overall Row Spacing	§ eB	.310	.370	.430	7.87	9.40	10.92
Mold Draft Angle Top	α	5	10	15	5	10	15
Mold Draft Angle Bottom	β	5	10	15	5	10	15

* Controlling Parameter

§ Significant Characteristic

Notes:

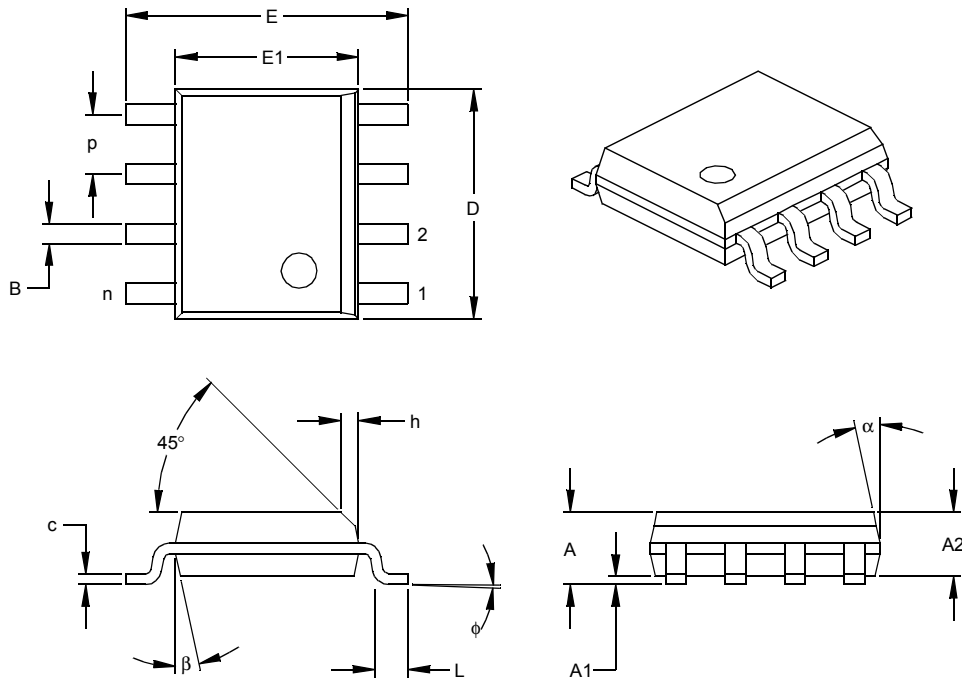
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-018

TC1410/TC1410N

8-Lead Plastic Small Outline (OA) – Narrow, 150 mil (SOIC)



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

* Controlling Parameter
§ Significant Characteristic

Notes:

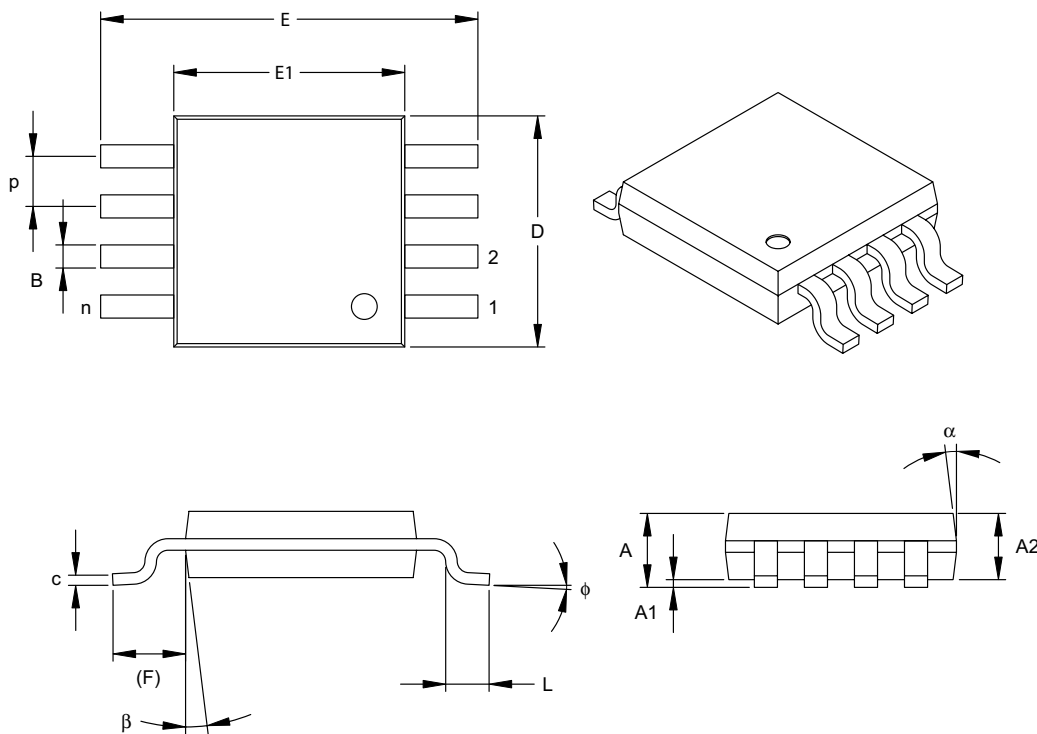
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

TC1410/TC1410N

8-Lead Plastic Micro Small Outline Package (UA) (MSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	P	.026 BSC			0.65 BSC		
Overall Height	A	-	-	.043	-	-	1.10
Molded Package Thickness	A2	.030	.033	.037	0.75	0.85	0.95
Standoff	A1	.000	-	.006	0.00	-	0.15
Overall Width	E	.193 TYP.			4.90 BSC		
Molded Package Width	E1	.118 BSC			3.00 BSC		
Overall Length	D	.118 BSC			3.00 BSC		
Foot Length	L	.016	.024	.031	0.40	0.60	0.80
Footprint (Reference)	F	.037 REF			0.95 REF		
Foot Angle	φ	0°	-	8°	0°	-	8°
Lead Thickness	c	.003	.006	.009	0.08	-	0.23
Lead Width	B	.009	.012	.016	0.22	-	0.40
Mold Draft Angle Top	α	5°	-	15°	5°	-	15°
Mold Draft Angle Bottom	β	5°	-	15°	5°	-	15°

*Controlling Parameter

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-187

Drawing No. C04-111

PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	X	/XX
Device	Temperature Range	Package
Device: TC1410: 0.5A Single MOSFET Driver, Inverting TC1410N: 0.5A Single MOSFET Driver, Non-Inverting Temperature Range: C = 0°C to +70°C E = -40°C to +85°C Package: OA = Plastic SOIC, (150 mil Body), 8-lead OA713 = Plastic SOIC, (150 mil Body), 8-lead (Tape and Reel) UA = Plastic Micro Small Outline (MSOP), 8-lead * UA713 = Plastic Micro Small Outline (MSOP), 8-lead * (Tape and Reel) PA = Plastic DIP (300 mil Body), 8-lead * MSOP package is only available in E-Temp.		
Examples: a) TC1410COA: 0.5A Single MOSFET driver, SOIC package, 0°C to +70°C. b) TC1410CPA: 0.5A Single MOSFET driver, PDIP package, 0°C to +70°C. c) TC1410EUA713: Tape and Reel, 0.5A Single MOSFET driver, MSOP package, -40°C to +85°C. a) TC1410NCPA: 0.5A Single MOSFET driver, PDIP package, 0°C to +70°C. b) TC1410NEPA: 0.5A Single MOSFET driver, PDIP package, -40°C to +85°C. c) TC1410NEUA: 0.5A Single MOSFET driver, MSOP package, -40°C to +85°C.		

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TC1410/TC1410N

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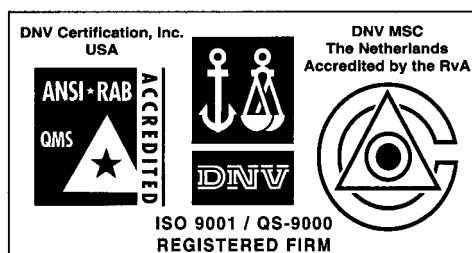
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Fax: 408-436-7955

Toronto

6285 Northam Drive, Suite 108
Mississauga, Ontario L4V 1X5, Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Australia

Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing

Unit 915
Bei Hai Wan Tai Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100
Fax: 86-10-85282104

China - Chengdu

Rm. 2401-2402, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-86766200
Fax: 86-28-86766599

China - Fuzhou

Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506
Fax: 86-591-7503521

China - Hong Kong SAR

Unit 901-6, Tower 2, Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Shanghai

Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
Tel: 86-21-6275-5700
Fax: 86-21-6275-5060

China - Shenzhen

Rm. 1812, 18/F, Building A, United Plaza
No. 5022 Binhe Road, Futian District
Shenzhen 518033, China
Tel: 86-755-82901380
Fax: 86-755-8295-1393

China - Shunde

Room 401, Hongjian Building
No. 2 Fengxiangnan Road, Ronggui Town
Shunde City, Guangdong 528303, China
Tel: 86-765-8395507 Fax: 86-765-8395571

China - Qingdao

Rm. B505A, Fullhope Plaza,
No. 12 Hong Kong Central Rd.
Qingdao 266071, China
Tel: 86-532-5027355 Fax: 86-532-5027205

India

Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, O'Shaughnessy Road
Bangalore, 560 025, India
Tel: 91-80-2290061 Fax: 91-80-2290062

Japan

Benex S-1 6F
3-18-20, Shinyokohama
Kohoku-Ku, Yokohama-shi
Kanagawa, 222-0033, Japan
Tel: 81-45-471-6166 Fax: 81-45-471-6122

Korea

168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea 135-882
Tel: 82-2-554-7200 Fax: 82-2-558-5932 or
82-2-558-5934

Singapore

200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-6334-8870 Fax: 65-6334-8850

Taiwan

Kaohsiung Branch
30F - 1 No. 8
Min Chuan 2nd Road
Kaohsiung 806, Taiwan
Tel: 886-7-536-4818
Fax: 886-7-536-4803

Taiwan

Taiwan Branch
11F-3, No. 207
Tung Hua North Road
Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

Austria

Durisolstrasse 2
A-4600 Wels
Austria
Tel: 43-7242-2244-399
Fax: 43-7242-2244-393

Denmark

Regus Business Centre
Lautrup høj 1-3
Ballerup DK-2750 Denmark
Tel: 45-4420-9895 Fax: 45-4420-9910

France

Parc d'Activite du Moulin de Massy
43 Rue du Saule Trapu
Batiment A - 1er Etage
91300 Massy, France
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany

Steinheilstrasse 10
D-85737 Ismaning, Germany
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy

Via Quasimodo, 12
20025 Legnano (MI)
Milan, Italy
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands

P. A. De Biesbosch 14
NL-5152 SC Drunen, Netherlands
Tel: 31-416-690399
Fax: 31-416-690340

United Kingdom

505 Eskdale Road
Winnersh Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44-118-921-5869
Fax: 44-118-921-5820

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