- **Ultrafast Operation . . . 7.6 ns (Typ)**
- **Low Positive Supply Current
  10.6 mA (Typ)**
- **Operates From a Single 5-V Supply or From
  a Split ±5-V Supply**
- **Complementary Outputs**
- **Low Offset Voltage**
- **No Minimum Slew Rate Requirement**
- **Output Latch Capability**
- **Functional Replacement to the LT1016**

**D AND PW PACKAGE
(TOP VIEW)**

V_{CC+}	1	8	$\overline{Q}$ OUT
IN+	2	7	Q OUT
IN−	3	6	GND
$V_{CC−}$	4	5	LATCH ENABLE
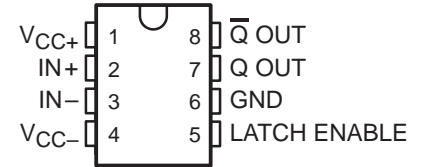
description

The TL3016 is an ultrafast comparator designed to interface directly to TTL logic while operating from either a single 5-V power supply or dual ±5-V supplies. It features extremely tight offset voltage and high gain for precision applications. It has complementary outputs that can be latched using the LATCH ENABLE terminal. Figure 1 shows the positive supply current of this comparator. The TL3016 only requires 10.6 mA (typical) to achieve a propagation delay of 7.6 ns.

The TL3016 is a pin-for-pin functional replacement for the LT1016 comparator, offering higher speed operation but consuming half the power.

symbol (each comparator)

IN+ → Q OUT
IN− → $\overline{Q}$ OUT

**POSITIVE SUPPLY CURRENT
vs
FREE-AIR TEMPERATURE**
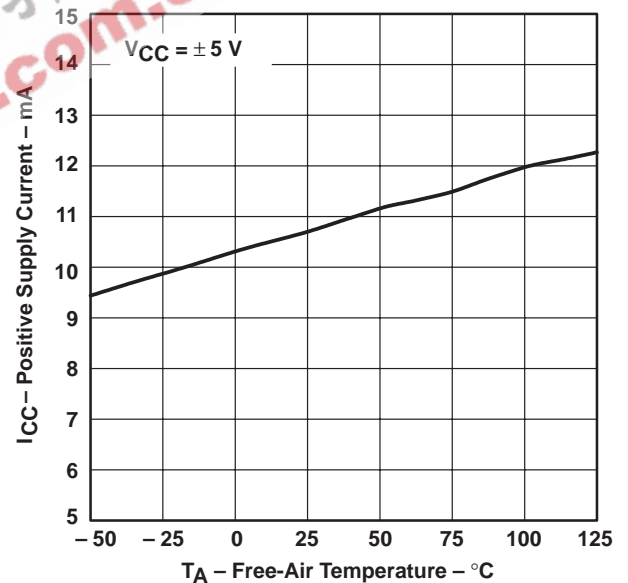
Figure 1

AVAILABLE OPTIONS

	PACKAGED DEVICES		CHIP FORM‡ (Y)
T_A	SMALL OUTLINE† (D)	TSSOP (PW)	
0°C to 70°C	TL3016CD	TL3016CPWLE	TL3016Y
−40°C to 85°C	TL3016ID	TL3016IPWLE	—

† The PW packages are available left-ended taped and reeled only.
‡ Chip forms are tested at T_A = 25°C only.
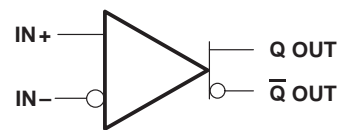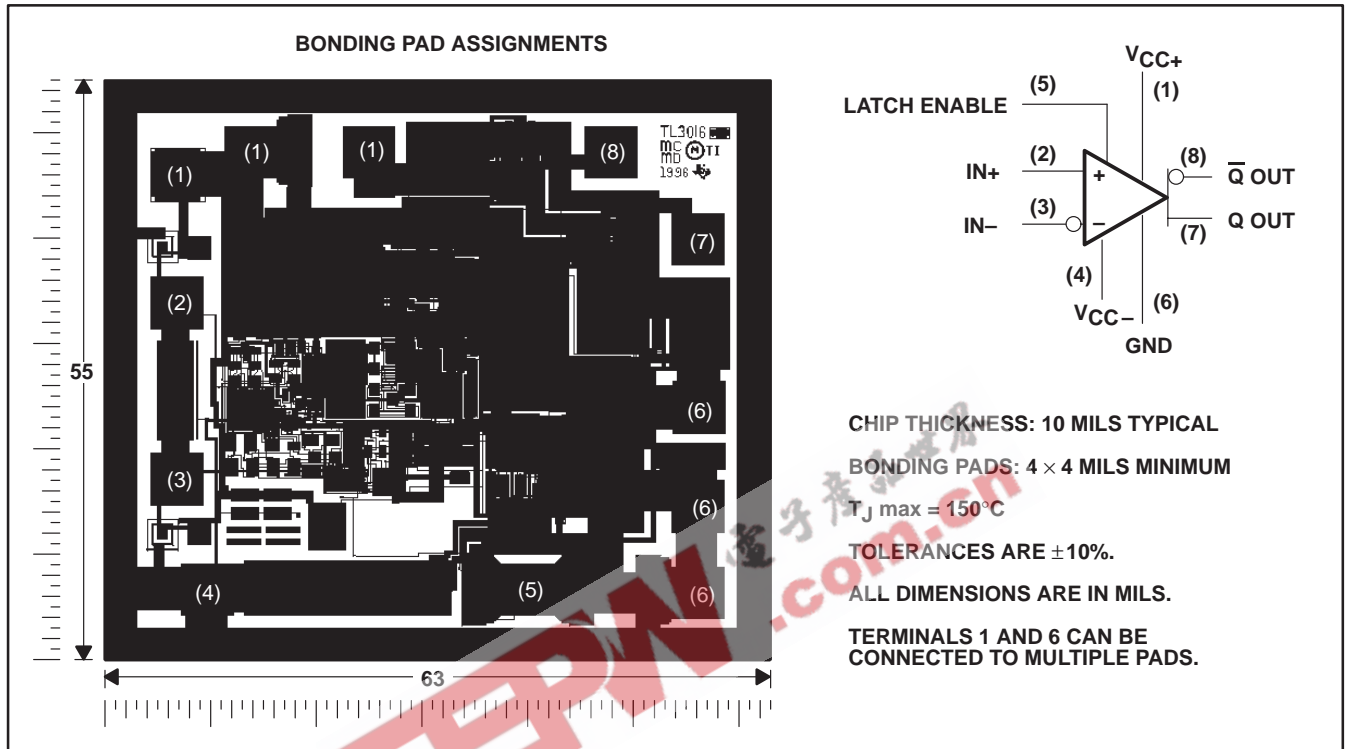
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TEXAS INSTRUMENTS

TL3016, TL3016Y
ULTRA-FAST LOW-POWER
PRECISION COMPARATORS
SLCS130D – MARCH 1997 – REVISED MARCH 2000

TL3016Y chip information

This chip displays characteristics similar to the TL3016C. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS

CHIP THICKNESS: 10 MILS TYPICAL

BONDING PADS: 4×4 MILS MINIMUM

T_J max = 150°C

TOLERANCES ARE ±10%.

ALL DIMENSIONS ARE IN MILS.

TERMINALS 1 AND 6 CAN BE CONNECTED TO MULTIPLE PADS.

COMPONENT COUNT	
Bipolars	53
MOSFETs	49
Resistors	46
Capacitors	14

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{DD} (see Note 1) . . . . – 7 V to 7 V
Differential input voltage, V_{ID} (see Note 2) . . . . 7 V
Input voltage range, V_I . . . . 7 V
Input voltage, V_I (LATCH ENABLE) . . . . 7 V
Output current, I_O . . . . ± 20 mA
Continuous total power dissipation . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . −40°C to 85°C
Storage temperature range, T_{stg} . . . . – 65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . 260°C

† Stresses beyond 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 beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values, except differential voltages, are with respect to network ground.
2. Differential voltages are at IN+ with respect to IN–.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW
PW	525 mW	4.2 mW/°C	336 mW

electrical characteristics at specified operating free-air temperature, $V_{DD} = \pm5$ V, $V_{LE} = 0$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†	TL3016C			TL3016I			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IO}	Input offset voltage	$T_A = 25°C$		0.5	3		0.5	3	mV
		T_A = full range			3.5			3.5	
α_{VIO}	Temperature coefficient of input offset voltage			−4.8			−4.5		µV/°C
I_{IO}	Input offset current	$T_A = 25°C$		0.1	0.6		0.1	0.6	µA
		T_A = full range			0.9			1.3	
I_{IB}	Input bias current	$T_A = 25°C$		6	10		6	10	µA
		T_A = full range			10			10	
V_{ICR}	Common-mode input voltage range	$V_{DD} = \pm5$ V	−3.75		3.5	−3.75		3.5	V
		$V_{DD} = 5$ V	1.25		3.5	1.25		3.5	
CMRR	Common-mode rejection ratio	$-3.75 \leq V_{IC} \leq 3.5$ V, $\quad T_A = 25°C$	80	97		80	97		dB
k_{SVR}	Supply-voltage rejection ratio	Positive supply: 4.6 V $\leq$ +$V_{DD} \leq$ 5.4 V, $T_A = 25°C$	60	72		60	72		dB
		Negative supply: -7 V $\leq -V_{DD} \leq -2$ V, $T_A = 25°C$	80	100		80	100		
V_{OL}	Low-level output voltage	$I_{(sink)} = 4$ mA, $\quad$ V+ $\leq$ 4.6 V, $T_A = 25°C$		500	600		500	600	mV
		$I_{(sink)} = 10$ mA, $\quad$ V+ $\leq$ 4.6 V, $T_A = 25°C$		750			750		
V_{OH}	High-level output voltage	V+ $\leq$ 4.6 V, $\quad I_O = 1$ mA, $T_A = 25°C$	3.6	3.9		3.6	3.9		V
		V+ $\leq$ 4.6 V, $\quad I_O = 10$ mA, $T_A = 25°C$	3.4	3.7		3.4	3.7		
I_{DD}	Positive supply current	T_A = full range		10.6	12.5		10.6	12.5	mA
	Negative supply current		−1.8	−1.3		−2.4	−1.3		
V_{IL}	Low-level input voltage (LATCH ENABLE)				0.8			0.8	V
V_{IH}	High-level input voltage (LATCH ENABLE)		2			2			V
I_{IL}	Low-level input current (LATCH ENABLE)	$V_{LE} = 0$		0	1		0	1	µA
		$V_{LE} = 2$ V		24	39		24	45	

† Full range for the TL3016C is $T_A = 0°C$ to $70°C$. Full range for the TL3016I is $T_A = -40°C$ to $85°C$.
‡ All typical values are measures with $T_A = 25°C$.

switching characteristics, $V_{DD} = \pm 5$ V, $V_{LE} = 0$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		TL3016C			TL3016I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{pd1}	Propagation delay time‡	$\Delta V_I = 100$ mV, $V_{OD} = 5$ mV	$T_A = 25°C$		7.8	10		7.8	10	ns
			T_A = full range		7.8	11.2		7.8	12.2	
		$\Delta V_I = 100$ mV, $V_{OD} = 20$ mV	$T_A = 25°C$		7.6	10		7.6	10	
			T_A = full range		7.6	11.2		7.6	12.2	
$t_{sk(p)}$	Pulse skew ($|t_{pd+} - t_{pd-}|$)	$\Delta V_I = 100$ mV, $V_{OD} = 5$ mV, $T_A = 25°C$			0.5			0.5		ns
t_{su}	Setup time, LATCH ENABLE				2.5			2.5		ns

† Full range for the TL3016C is 0°C to 70°C. Full range for the TL3016I is −40°C to 85°C.

‡ t_{pd1} cannot be measured in automatic handling equipment with low values of overdrive. The TL3016 is 100% tested with a 1-V step and 500-mV overdrive at $T_A = 25°C$ only. Correlation tests have shown that t_{pd1} limits given can be ensured with this test, if additional dc tests are performed to ensure that all internal bias conditions are correct. For low overdrive conditions, V_{OS} is added to the overdrive.

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
I_{CC}	Positive supply current	vs Input voltage	2
		vs Frequency	3
		vs Free-air temperature	4
I_{CC}	Negative supply current	vs Free-air temperature	5
t_{pd}	Propagation delay time	vs Overdrive voltage	6
		vs Supply voltage	7
		vs Input impedance	8
		vs Load capacitance	9
		vs Free-air temperature	10
V_{IC}	Common-mode input voltage	vs Free-air temperature	11
	Input threshold voltage (LATCH ENABLE)	vs Free-air temperature	12
V_O	Output voltage	vs Output source current	13
		vs Output sink current	14
I_I	Input current (LATCH ENABLE)	vs Input voltage	15

TYPICAL CHARACTERISTICS

POSITIVE SUPPLY CURRENT
vs
INPUT VOLTAGE
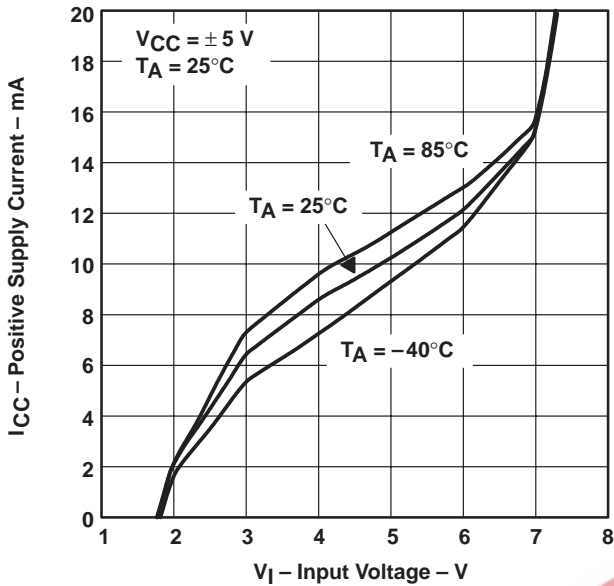
Figure 2

POSITIVE SUPPLY CURRENT
vs
FREQUENCY

Figure 3

POSITIVE SUPPLY CURRENT
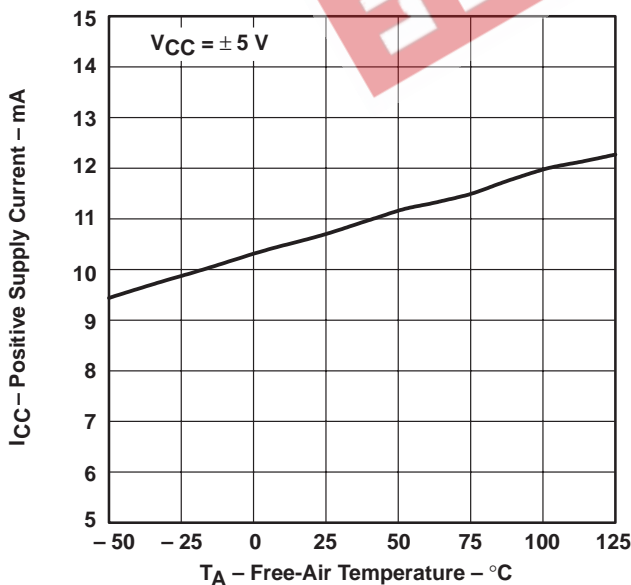**vs**
FREE-AIR TEMPERATURE

Figure 4

NEGATIVE SUPPLY CURRENT
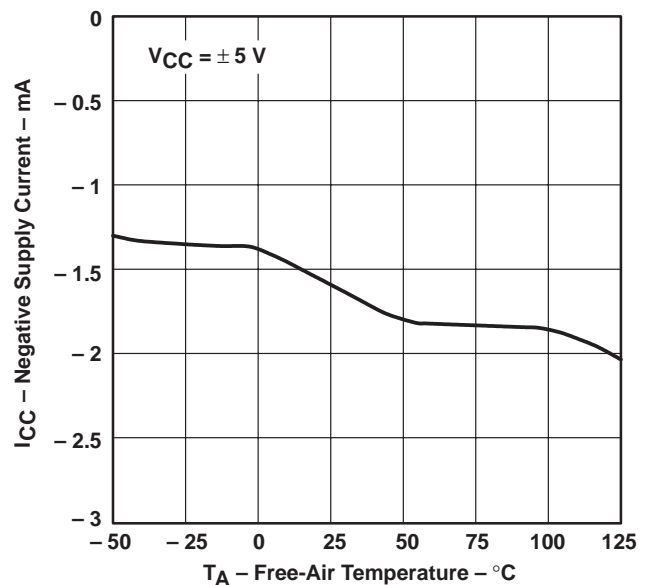**vs**
FREE-AIR TEMPERATURE

Figure 5

TYPICAL CHARACTERISTICS
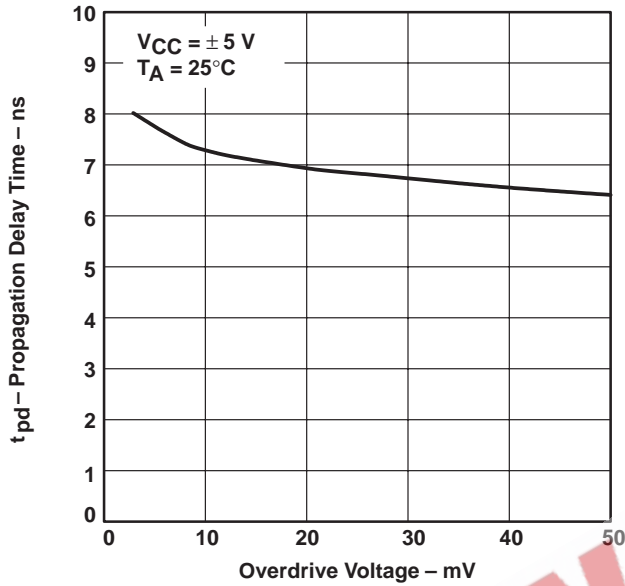
**PROPAGATION DELAY TIME
vs
OVERDRIVE VOLTAGE**

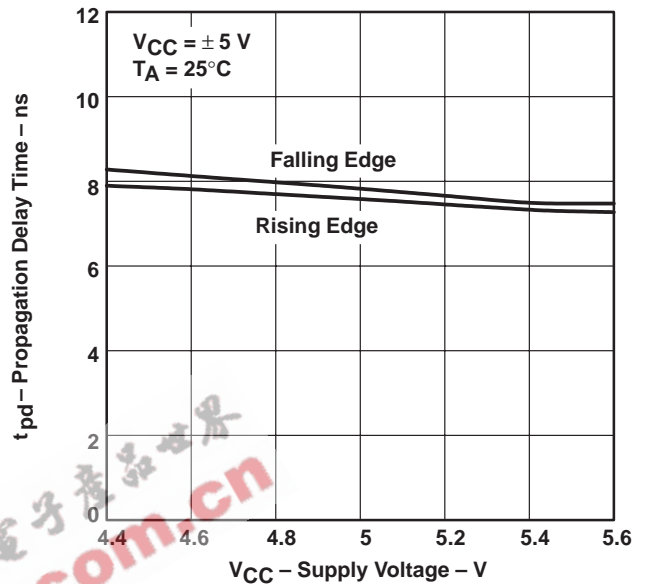Figure 6

**PROPAGATION DELAY TIME
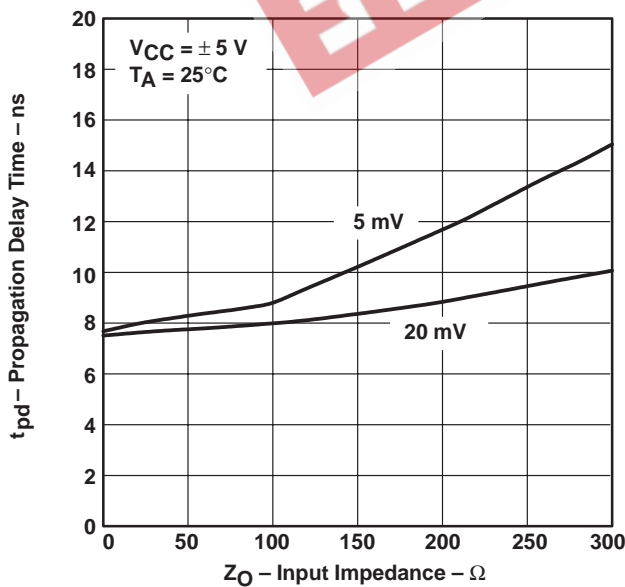vs
SUPPLY VOLTAGE**

Figure 7

**PROPAGATION DELAY TIME
vs
INPUT IMPEDANCE**

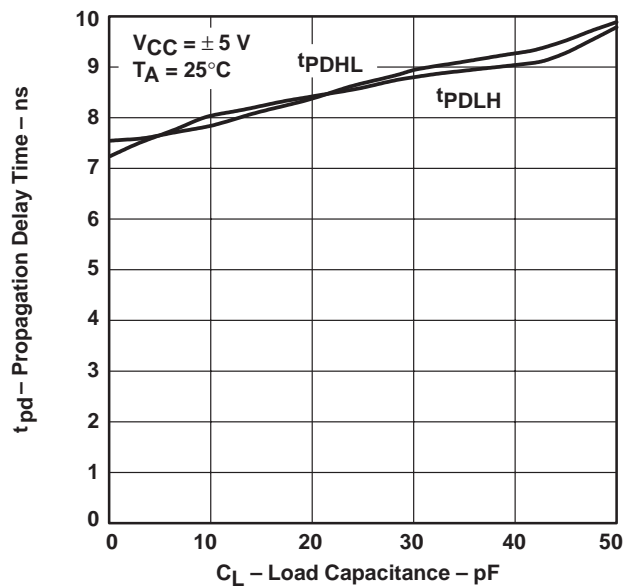Figure 8

**PROPAGATION DELAY TIME
vs
LOAD CAPACITANCE**

Figure 9

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME
vs
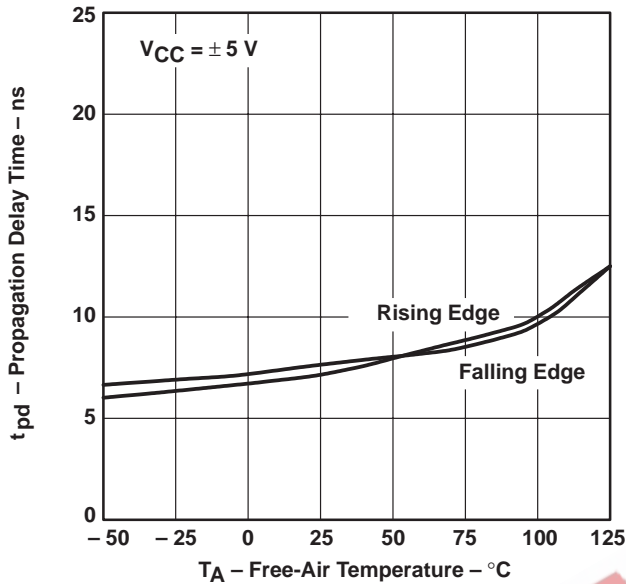FREE-AIR TEMPERATURE

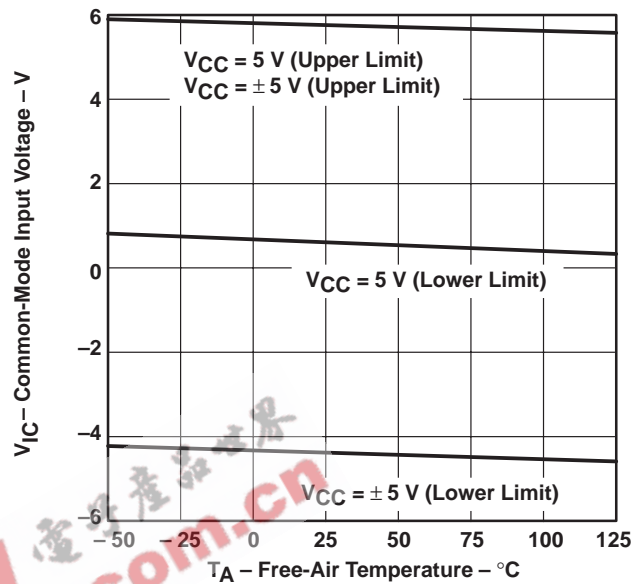**Figure 10**

COMMON-MODE INPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

Figure 11

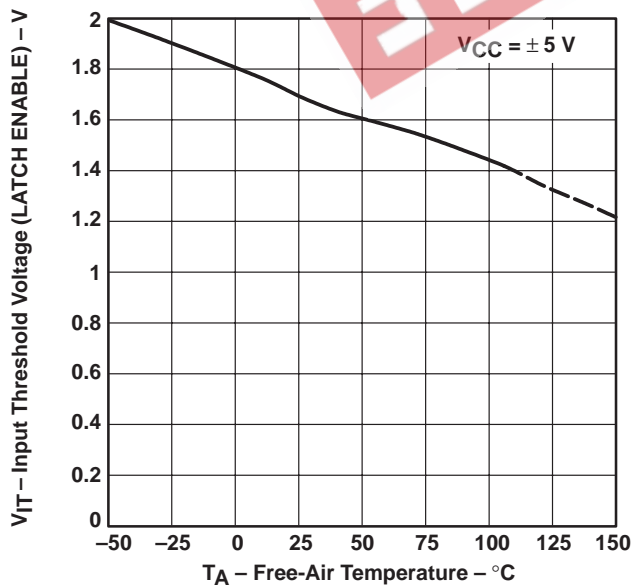INPUT THRESHOLD VOLTAGE (LATCH ENABLE)
vs
FREE-AIR TEMPERATURE

Figure 12

OUTPUT VOLTAGE
vs
OUTPUT SOURCE CURRENT

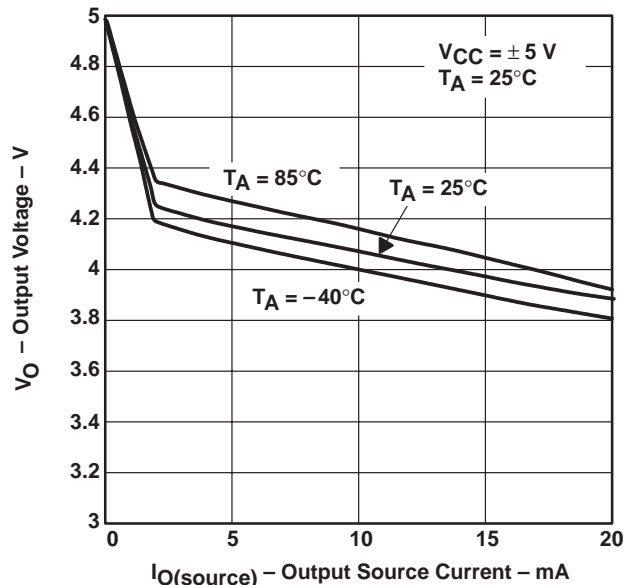**Figure 13**

TEXAS
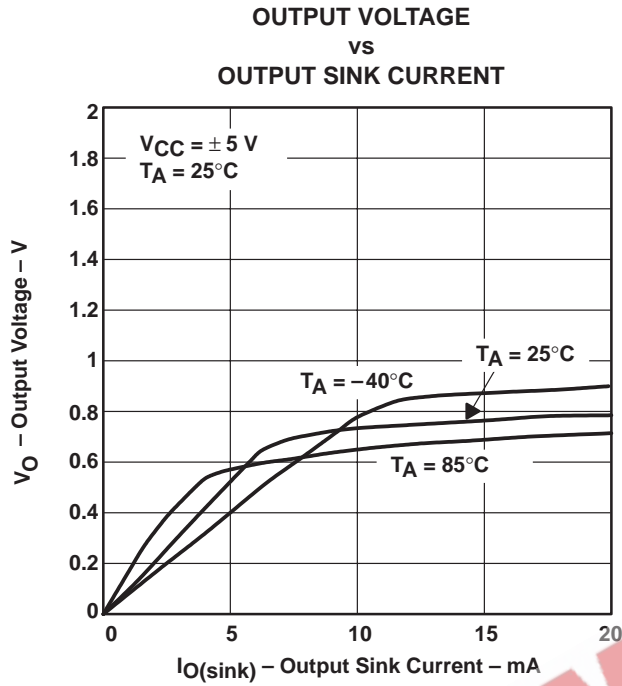INSTRUMENTS
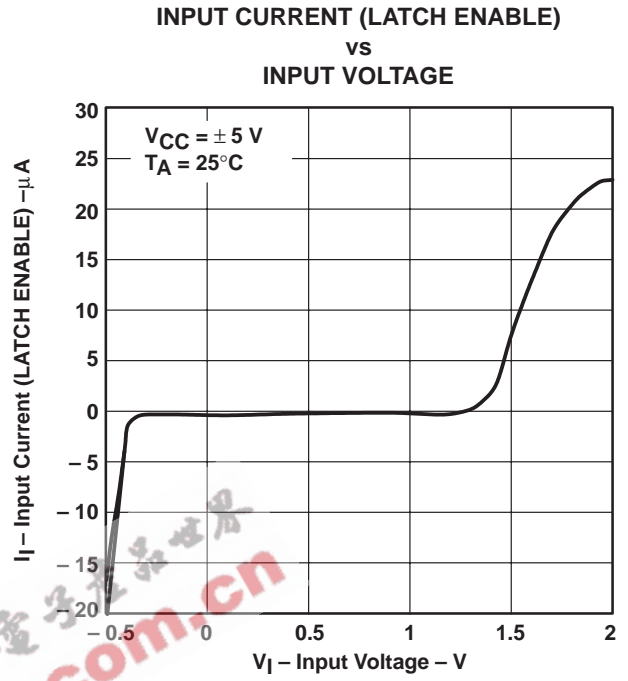
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TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
OUTPUT SINK CURRENT

Figure 14

INPUT CURRENT (LATCH ENABLE)
vs
INPUT VOLTAGE

Figure 15

MECHANICAL INFORMATION

D (R-PDSO-G**)   **PLASTIC SMALL-OUTLINE PACKAGE**

14 PIN SHOWN

PINS **	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

4040047 / B 03/95

NOTES: A. All linear dimensions are in inches (millimeters).
   B. This drawing is subject to change without notice.
   C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
   D. Four center pins are connected to die mount pad.
   E. Falls within JEDEC MS-012
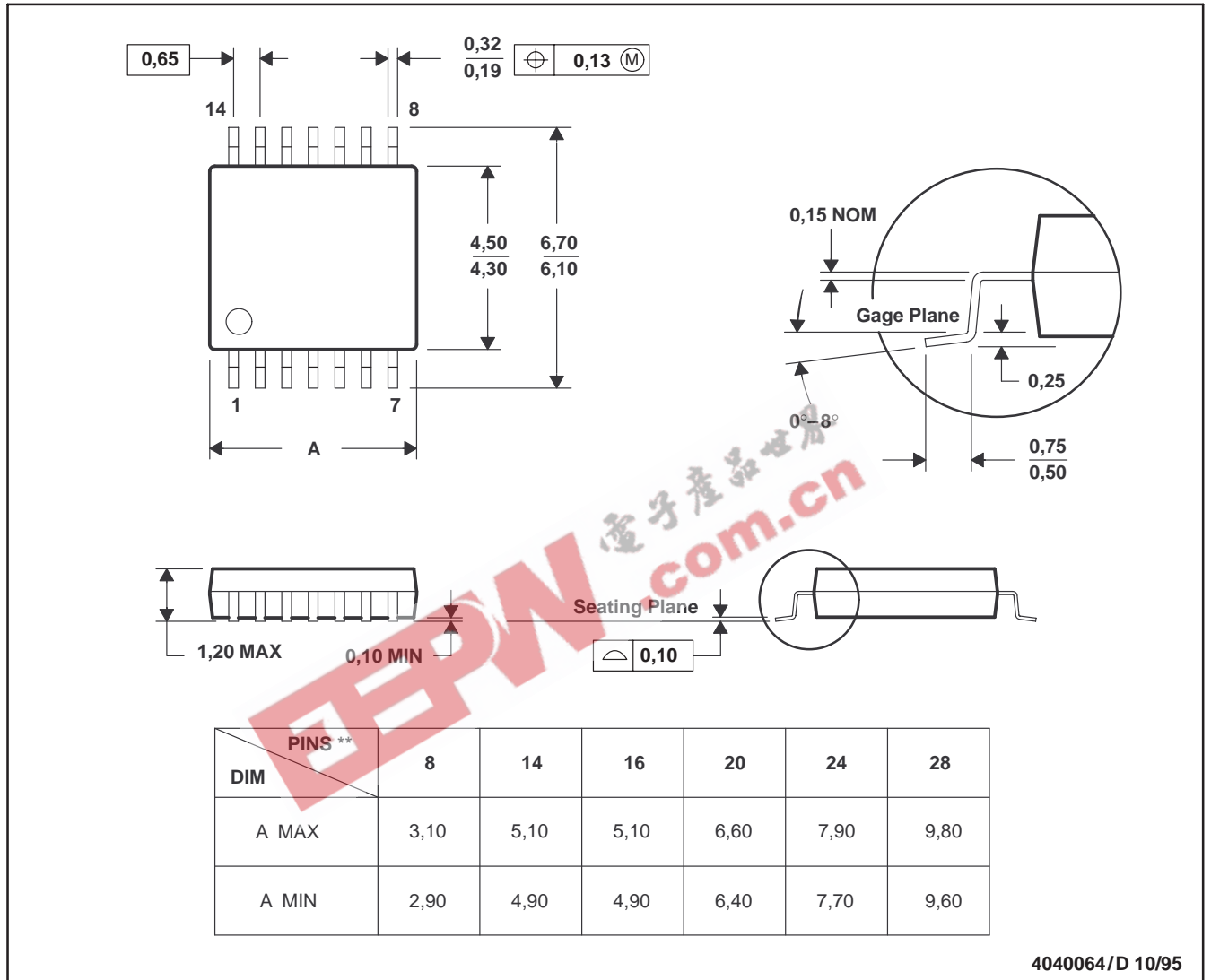
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MECHANICAL INFORMATION

PW (R-PDSO-G)**   **PLASTIC SMALL-OUTLINE PACKAGE**

14 PIN SHOWN

PINS ** DIM	8	14	16	20	24	28
A MAX	3,10	5,10	5,10	6,60	7,90	9,80
A MIN	2,90	4,90	4,90	6,40	7,70	9,60

4040064 / D 10/95

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
D. Falls within JEDEC MO-153

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