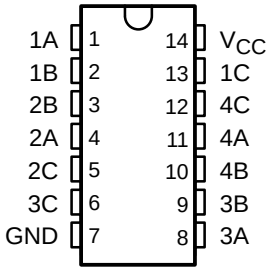
- **Wide Operating Voltage Range of 2 V to 6 V**
- **Typical Switch Enable Time of 18 ns**
- **Low Power Consumption, 20-μA Max I_{CC}**
- **Low Input Current of 1 μA Max**
- **High Degree of Linearity**
- **High On-Off Output-Voltage Ratio**
- **Low Crosstalk Between Switches**
- **Low On-State Impedance . . . 50-Ω TYP at V_{CC} = 6 V**
- **Individual Switch Controls**

D, DB, N, NS, OR PW PACKAGE
(TOP VIEW)



description/ordering information

The SN74HC4066 is a silicon-gate CMOS quadruple analog switch designed to handle both analog and digital signals. Each switch permits signals with amplitudes of up to 6 V (peak) to be transmitted in either direction.

Each switch section has its own enable input control (C). A high-level voltage applied to C turns on the associated switch section.

Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	PDIP – N	Tube of 25	SN74HC4066N	SN74HC4066N
	SOIC – D	Tube of 50	SN74HC4066D	HC4066
		Reel of 2500	SN74HC4066DR	
		Reel of 250	SN74HC4066DT	
	SOP – NS	Reel of 2000	SN74HC4066NSR	HC4066
	SSOP – DB	Reel of 2000	SN74HC4066DBR	HC4066
	TSSOP – PW	Tube of 90	SN74HC4066PW	HC4066
		Reel of 2000	SN74HC4066PWR	
		Reel of 250	SN74HC4066PWT	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE
(each switch)

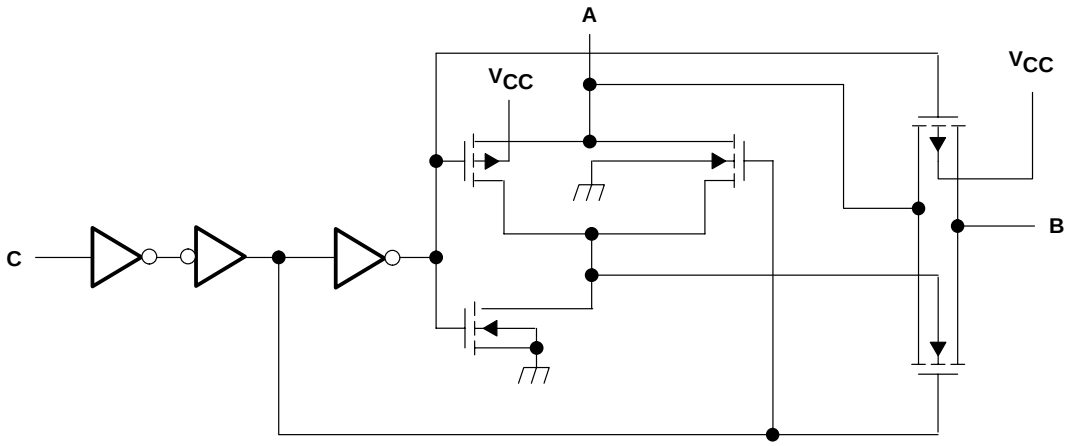
INPUT CONTROL (C)	SWITCH
L	OFF
H	ON

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2003, Texas Instruments Incorporated

logic diagram, each switch (positive logic)



One of Four Switches

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

Supply voltage range, V_{CC} (see Note 1)	–0.5 V to 7 V
Control-input diode current, I_I ($V_I < 0$ or $V_I > V_{CC}$)	±20 mA
I/O port diode current, I_I ($V_I < 0$ or $V_{I/O} > V_{CC}$)	±20 mA
On-state switch current ($V_{I/O} = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	86°C/W
DB package	96°C/W
N package	80°C/W
NS package	76°C/W
PW package	113°C/W
Storage temperature range, T_{stg}	–65°C to 150°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 voltages are with respect to ground unless otherwise specified.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		2†	5	6	V
$V_{I/O}$	I/O port voltage		0		V_{CC}	V
V_{IH}	High-level input voltage, control inputs	V_{CC} = 2 V	1.5		V_{CC}	V
		V_{CC} = 4.5 V	3.15		V_{CC}	
		V_{CC} = 6 V	4.2		V_{CC}	
V_{IL}	Low-level input voltage, control inputs	V_{CC} = 2 V	0		0.3	V
		V_{CC} = 4.5 V	0		0.9	
		V_{CC} = 6 V	0		1.2	
$\Delta t/\Delta v$	Input transition rise/fall time	V_{CC} = 2 V			1000	ns
		V_{CC} = 4.5 V			500	
		V_{CC} = 6 V			400	
T_A	Operating free-air temperature		–40		85	°C

† With supply voltages at or near 2 V, the analog switch on-state resistance becomes very nonlinear. It is recommended that only digital signals be transmitted at these low supply voltages.

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS	V_{CC}	T_A = 25°C			MIN	MAX	UNIT
					MIN	TYP	MAX			
r_{on}	On-state switch resistance		I_T = –1 mA, V_I = 0 to V_{CC}, V_C = V_{IH} (see Figure 1)	2 V		150				Ω
				4.5 V		50	85		106	
				6 V		30				
$r_{on(p)}$	Peak on-state resistance		V_I = V_{CC} or GND, V_C = V_{IH}, I_T = –1 mA	2 V		320				Ω
				4.5 V		70	170		215	
				6 V		50				
I_I	Control input current		V_C = 0 or V_{CC}	6 V		±0.1	±100		±1000	nA
I_{soff}	Off-state switch leakage current		V_I = V_{CC} or 0, V_O = V_{CC} or 0, V_C = V_{IL} (see Figure 2)	6 V			±0.1		±5	µA
I_{son}	On-state switch leakage current		V_I = V_{CC} or 0, V_C = V_{IH} (see Figure 3)	6 V			±0.1		±5	µA
I_{CC}	Supply current		V_I = 0 or V_{CC}, I_O = 0	6 V			2		20	µA
C_i	Input capacitance	A or B		5 V		9				pF
		C				3	10		10	
C_f	Feed-through capacitance	A to B	V_I = 0			0.5				pF
C_o	Output capacitance	A or B		5 V		9				pF

switching characteristics over recommended operating free-air temperature range

PARAMETER		FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	V_{CC}	T_A = 25°C			MIN	MAX	UNIT
						MIN	TYP	MAX			
t_{PLH}, t_{PHL}	Propagation delay time	A or B	B or A	C_L = 50 pF (see Figure 4)	2 V		10	60		75	ns
					4.5 V		4	12		15	
					6 V		3	10		13	
t_{PZH}, t_{PZL}	Switch turn-on time	C	A or B	R_L = 1 kΩ, C_L = 50 pF (see Figure 5)	2 V		70	180		225	ns
					4.5 V		21	36		45	
					6 V		18	31		38	
t_{PLZ}, t_{PHZ}	Switch turn-off time	C	A or B	R_L = 1 kΩ, C_L = 50 pF (see Figure 5)	2 V		50	200		250	ns
					4.5 V		25	40		50	
					6 V		22	34		43	
f_I	Control input frequency	C	A or B	C_L = 15 pF, R_L = 1 kΩ, V_C = V_{CC} or GND, V_O = V_{CC}/2 (see Figure 6)	2 V		15				MHz
					4.5 V		30				
					6 V		30				
	Control feed-through noise	C	A or B	C_L = 50 pF, R_{in} = R_L = 600 Ω, V_C = V_{CC} or GND, f_{in} = 1 MHz (see Figure 7)	4.5 V		15				mV (rms)
					6 V		20				

operating characteristics, V_{CC} = 4.5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance per gate	C_L = 50 pF,	f = 1 MHz	45	pF
	Minimum through bandwidth, A to B or B to A† [20 log (V_O/V_I)] = –3 dB	C_L = 50 pF, V_C = V_{CC}	R_L = 600 Ω, (see Figure 8)	30	MHz
	Crosstalk between any switches‡	C_L = 10 pF, f_{in} = 1 MHz	R_L = 50 Ω, (see Figure 9)	45	dB
	Feed through, switch off, A to B or B to A‡	C_L = 50 pF, f_{in} = 1 MHz	R_L = 600 Ω, (see Figure 10)	42	dB
	Amplitude distortion rate, A to B or B to A	C_L = 50 pF, f_{in} = 1 kHz	R_L = 10 kΩ, (see Figure 11)	0.05%	

† Adjust the input amplitude for output = 0 dBm at f = 1 MHz. Input signal must be a sine wave.
‡ Adjust the input amplitude for input = 0 dBm at f = 1 MHz. Input signal must be a sine wave.

PARAMETER MEASUREMENT INFORMATION

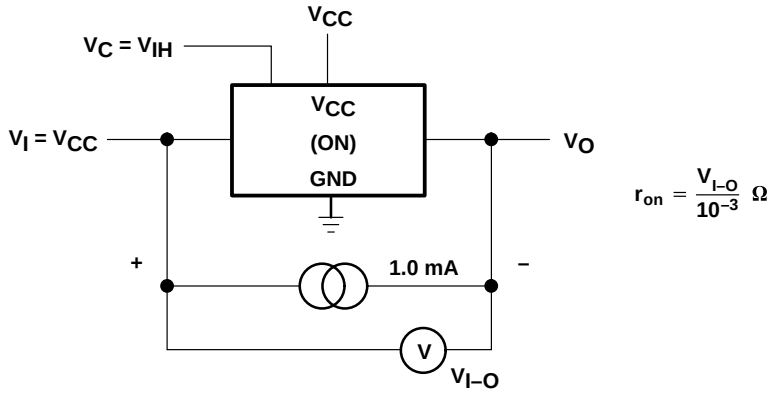
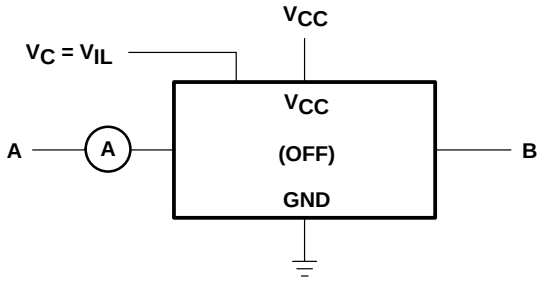


Figure 1. On-State Resistance Test Circuit



$V_S = V_A - V_B$
CONDITION 1: $V_A = 0$, $V_B = V_{CC}$
CONDITION 2: $V_A = V_{CC}$, $V_B = 0$

Figure 2. Off-State Switch Leakage-Current Test Circuit

PARAMETER MEASUREMENT INFORMATION

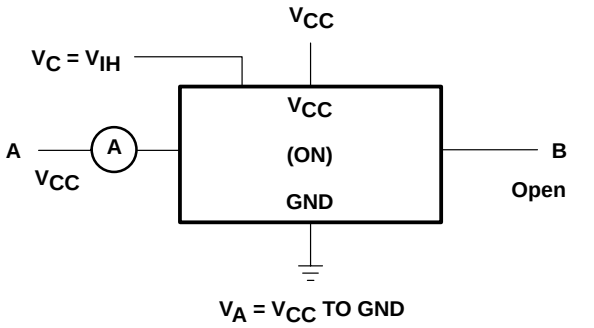


Figure 3. On-State Leakage-Current Test Circuit

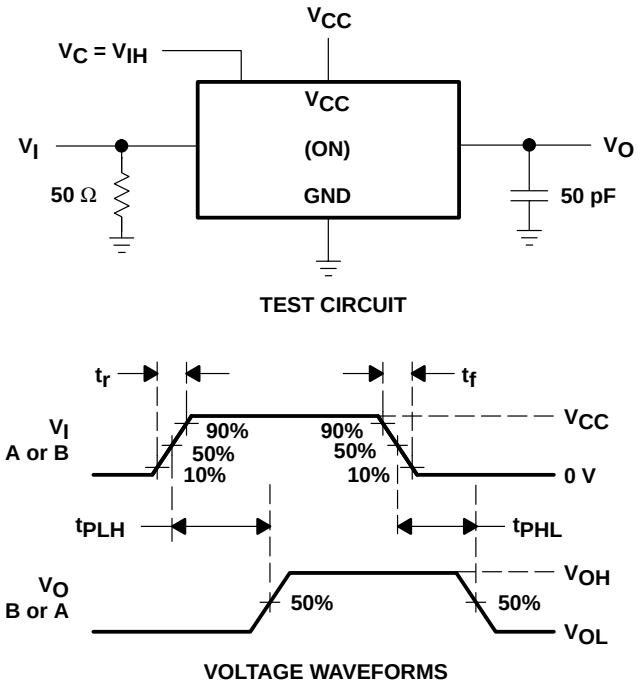
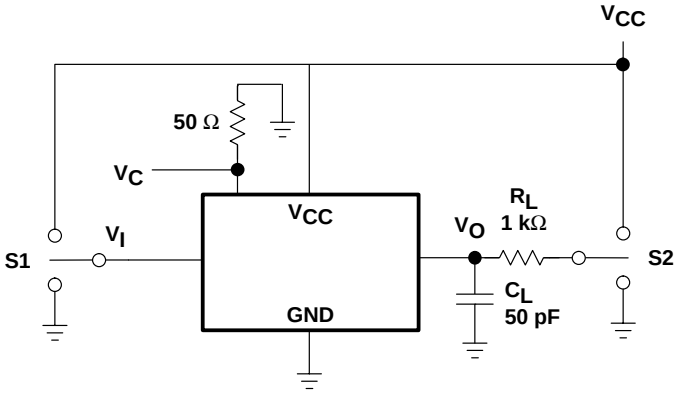


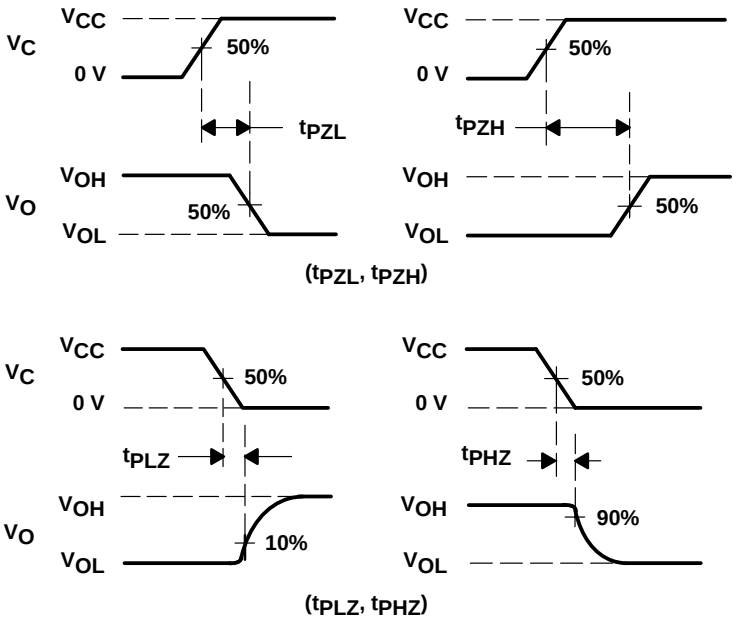
Figure 4. Propagation Delay Time, Signal Input to Signal Output

PARAMETER MEASUREMENT INFORMATION



TEST	S1	S2
t_{PZL}	GND	V_{CC}
t_{PZH}	V_{CC}	GND
t_{PLZ}	GND	V_{CC}
t_{PHZ}	V_{CC}	GND

TEST CIRCUIT



VOLTAGE WAVEFORMS

Figure 5. Switching Time (t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}), Control to Signal Output

PARAMETER MEASUREMENT INFORMATION

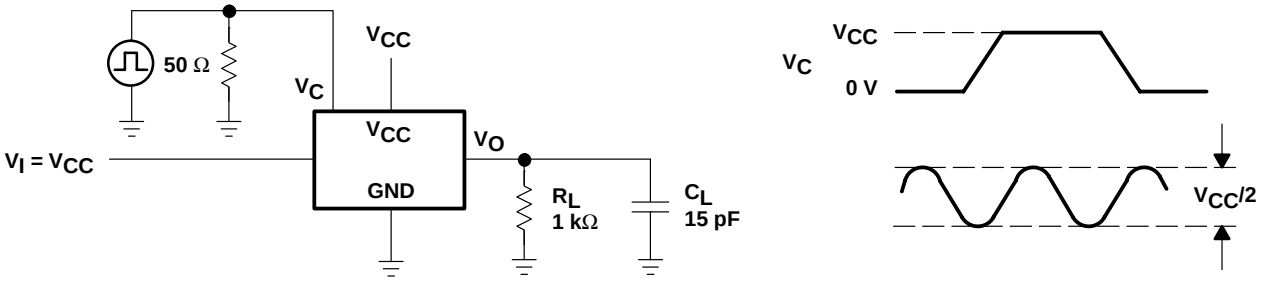


Figure 6. Control-Input Frequency

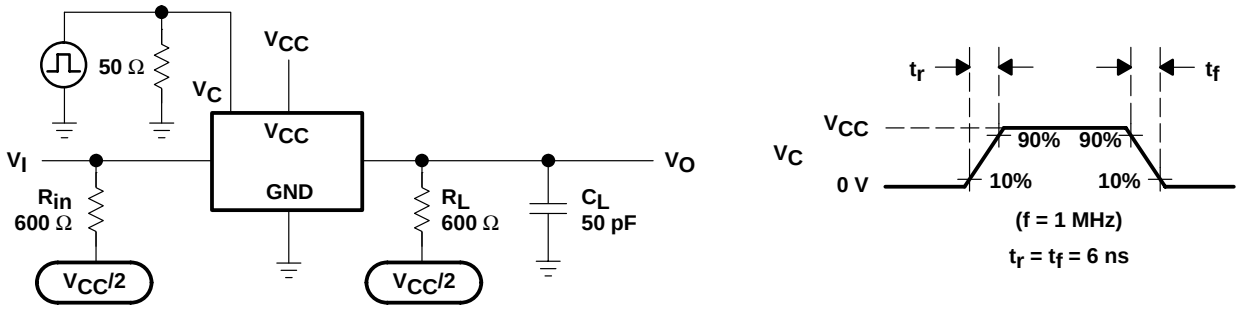


Figure 7. Control Feed-Through Noise

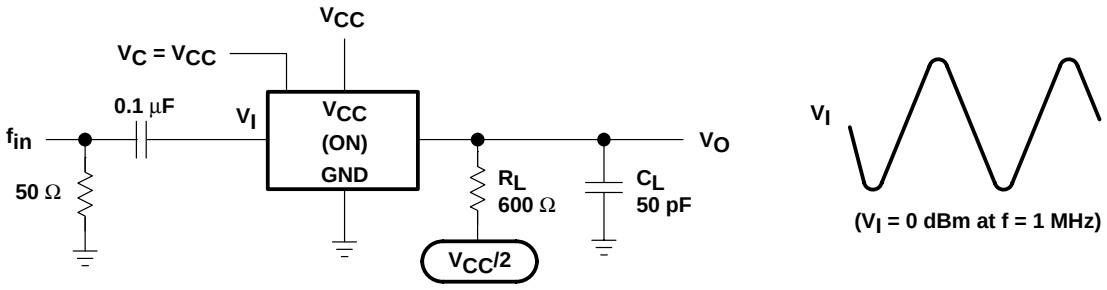


Figure 8. Minimum Through Bandwidth

PARAMETER MEASUREMENT INFORMATION

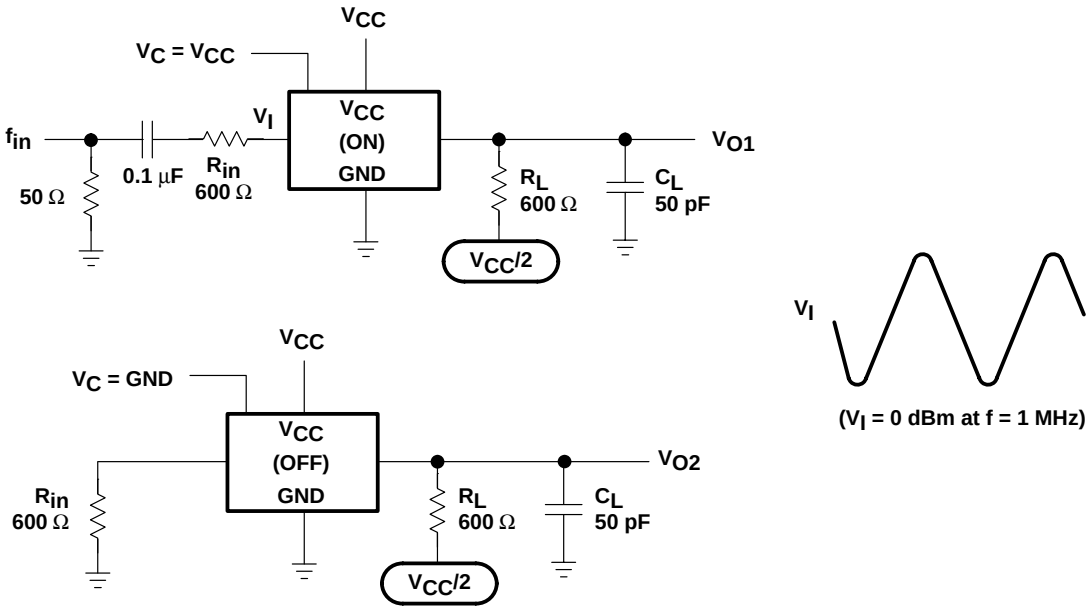


Figure 9. Crosstalk Between Any Two Switches

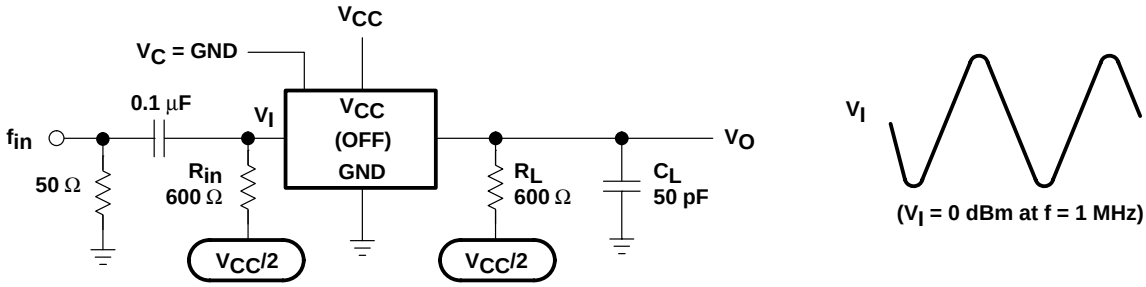


Figure 10. Feed Through, Switch Off

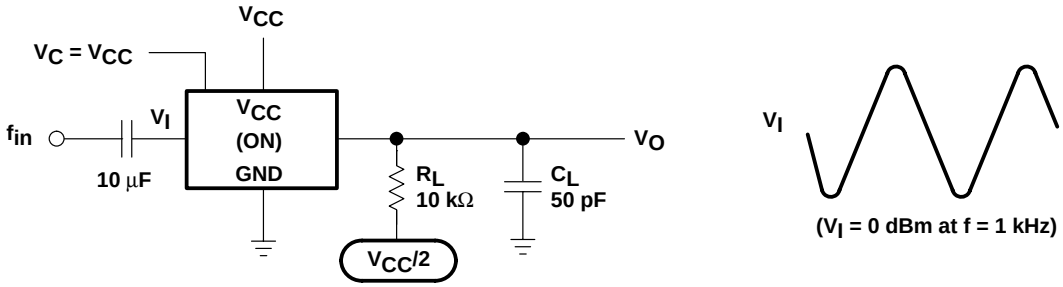


Figure 11. Amplitude-Distortion Rate

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
SN74HC4066D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI
SN74HC4066DBR	ACTIVE	SSOP	DB	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DBRE4	ACTIVE	SSOP	DB	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DR	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DRE4	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4066DT	ACTIVE	SOIC	D	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066DTE4	ACTIVE	SOIC	D	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74HC4066NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74HC4066NSR	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74HC4066NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4066PW	ACTIVE	TSSOP	PW	14	90	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HC4066PWE4	ACTIVE	TSSOP	PW	14	90	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HC4066PWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI
SN74HC4066PWR	ACTIVE	TSSOP	PW	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HC4066PWT	ACTIVE	TSSOP	PW	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74HC4066PWTE4	ACTIVE	TSSOP	PW	14	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements

for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

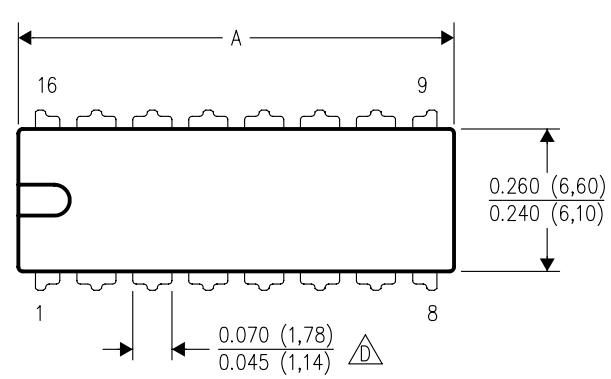
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

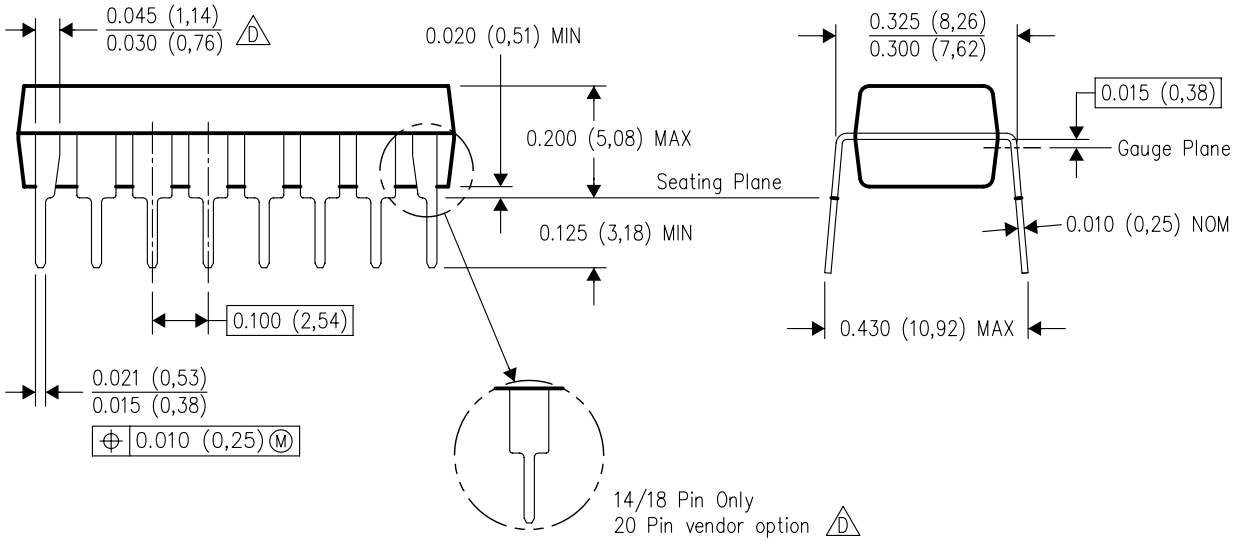
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



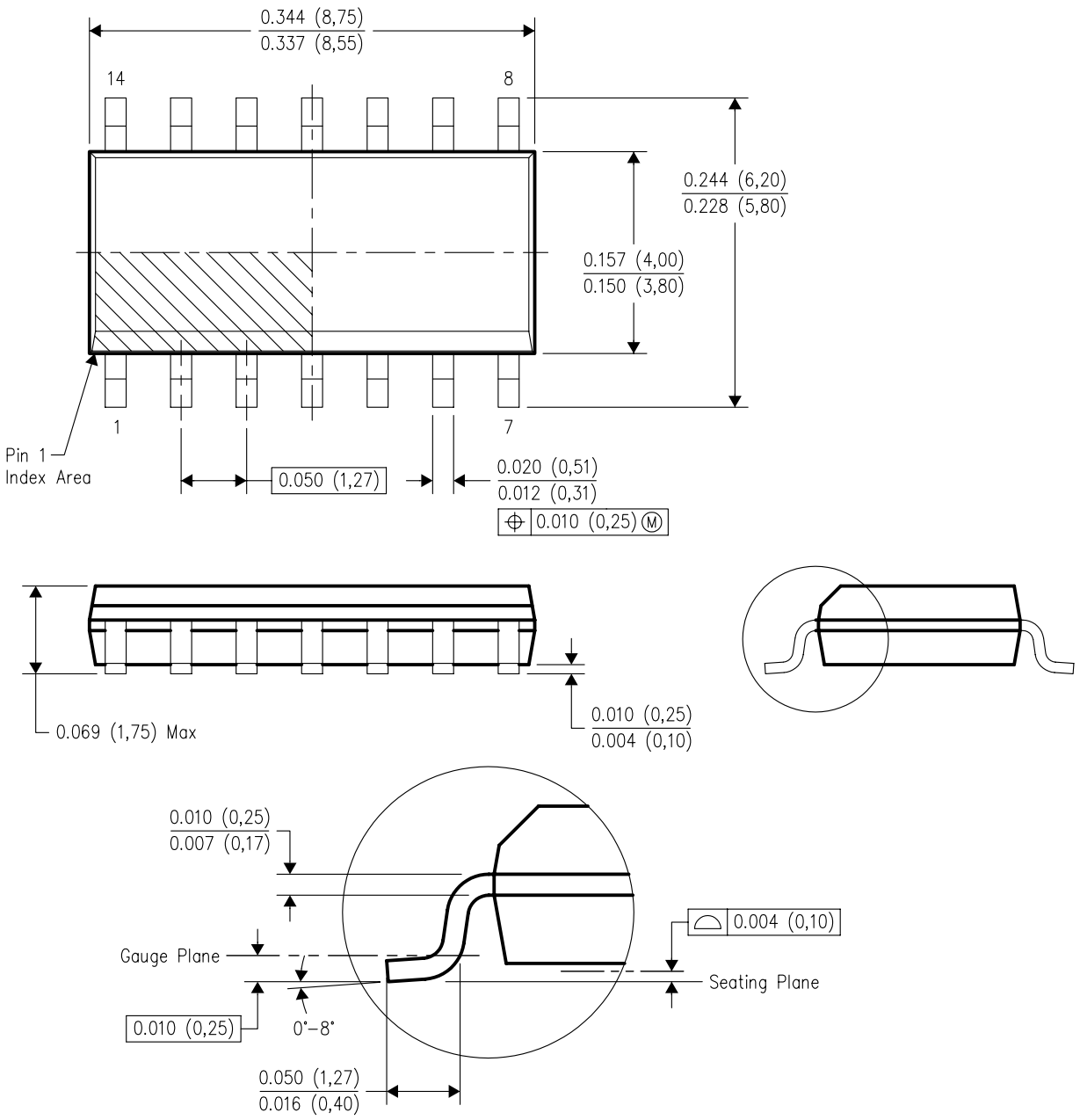
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R–PDSO–G14) PLASTIC SMALL–OUTLINE PACKAGE

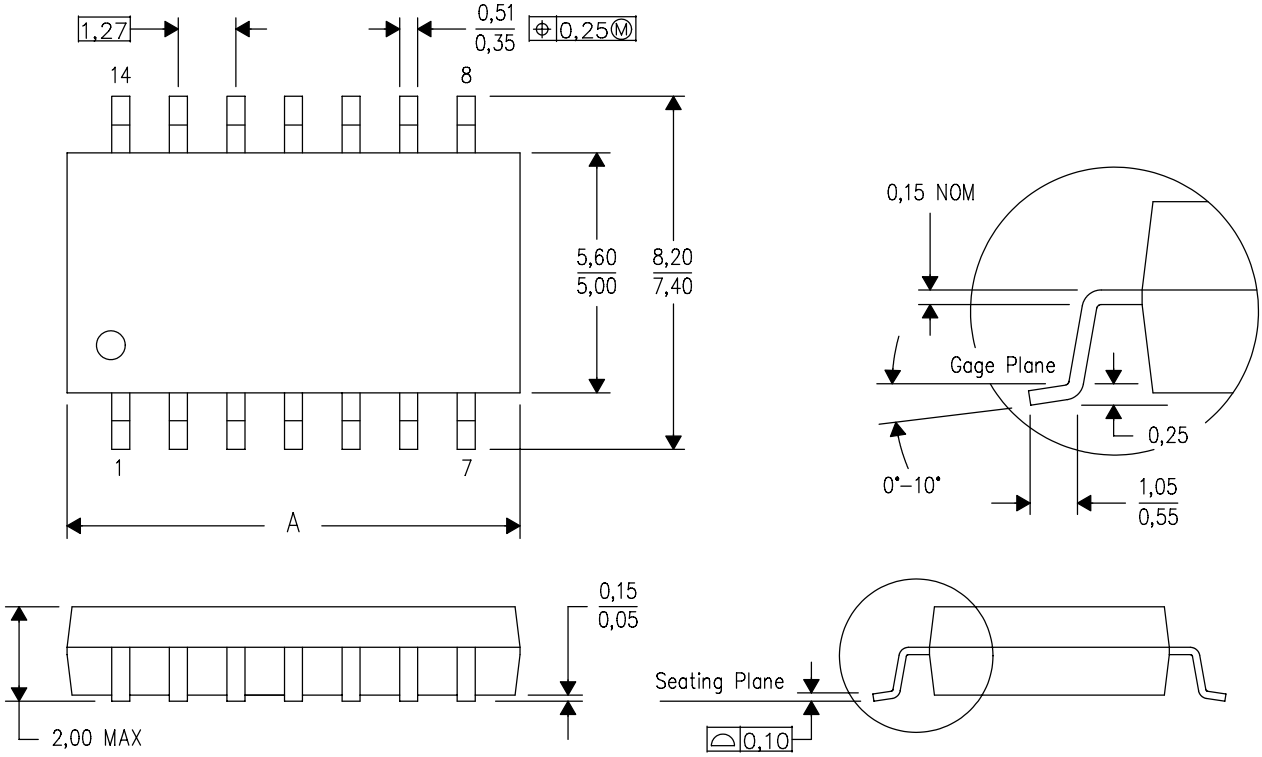


NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–012 variation AB.

MECHANICAL DATA

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

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

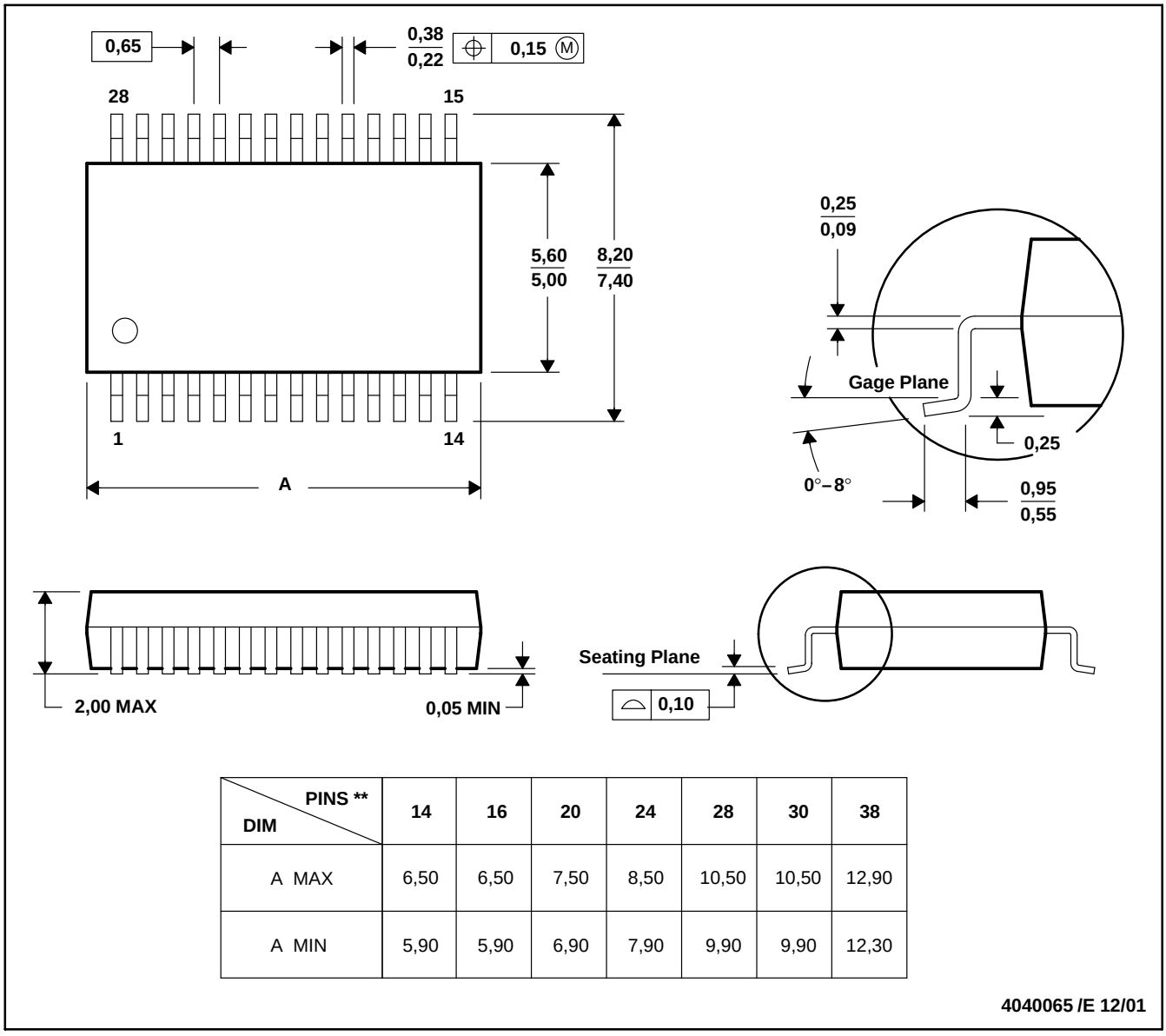
4040062/C 03/03

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.

MSSO002E – JANUARY 1995 – REVISED DECEMBER 2001

DB (R-PDSO-G)** **PLASTIC SMALL-OUTLINE**

28 PINS SHOWN



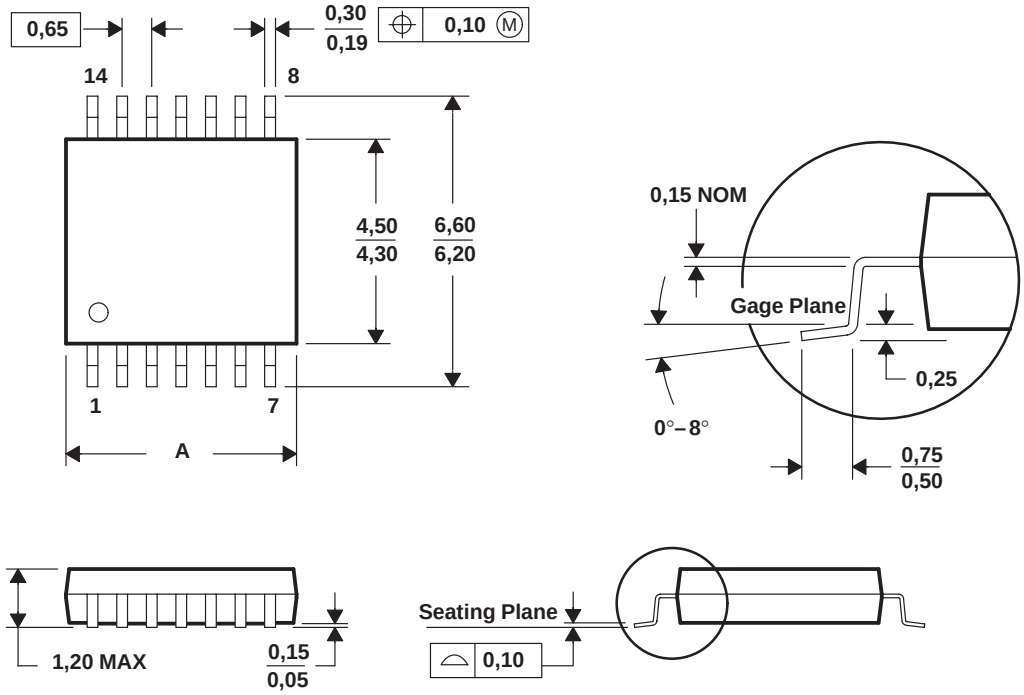
DIM \ PINS **	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

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-150

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

14 PINS SHOWN



DIM \ PINS **	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/F 01/97

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

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated

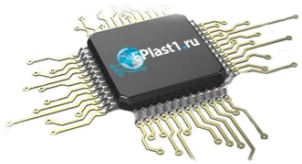
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.