TL5580, TL5580A
DUAL LOW-NOISE WIDE-BANDWIDTH PRECISION AMPLIFIER

SLOS477A–JUNE 2005–REVISED JULY 2005

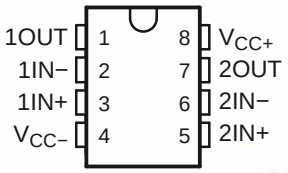
FEATURES

- **Operating Voltage…±2 V to ±18 V**
- **Low Offset Voltage…1 mV Max at 25°C, TL5580A**
- **Wide GBW…12 MHz Typ**
- **Slew Rate…5 V/μs Typ**
- **Low THD…0.0005% Typ**
- **Low-Noise Voltage…7 nV/√Hz at 1 kHz Typ**

APPLICATIONS

- **Audio**
- **Test Equipment**
- **Industrial Process Controls**
- **Data-Acquisition Systems**
- **Active Filters**
- **Power-Supply Regulation**

D, P, OR PW PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

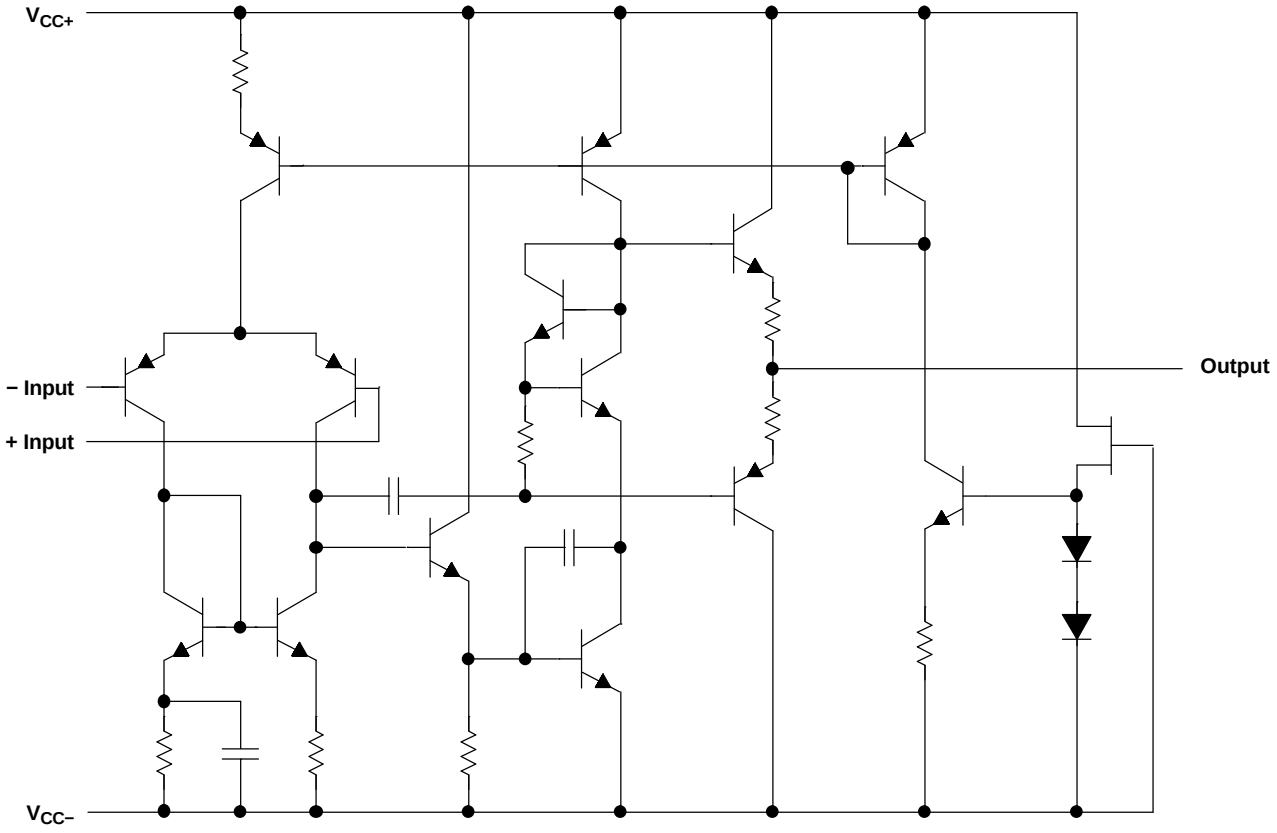
The TL5580 is a dual bipolar operational amplifier that combines both high dc and ac performance with its low offset voltage, high-gain bandwidth, low harmonic distortion, and low-noise characteristics. In addition, its output is capable of driving 600-Ω loads. All these characteristics make the device ideally suited for use in audio, active filtering, and industrial measurement applications.

ORDERING INFORMATION

T_A	V_{IO} (25°C, MAX)	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	Standard grade 1.5 mV	PDIP – P	Tube of 50	TL5580IP	TL5580IP
		SOIC – D	Tube of 75	TL5580ID	Z5580
			Reel of 2500	TL5580IDR	
		TSSOP – PW	Tube of 150	TL5580IPW	Z5580
			Reel of 2000	TL5580IPWR	
	A grade 1 mV	PDIP – P	Tube of 50	TL5580AIP	TL5580AIP
		SOIC – D	Tube of 75	TL5580AID	Z5580A
			Reel of 2500	TL5580AIDR	
		TSSOP – PW	Tube of 150	TL5580AIPW	Z5580A
			Reel of 2000	TL5580AIPWR	

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

EQUIVALENT SCHEMATIC



Absolute Maximum Ratings(1)

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

			MIN	MAX	UNIT
$V_{CC\pm}$	Supply voltage			±18	V
V_I	Input voltage (any input)			±15	V
V_{ID}	Differential input voltage			±30	V
I_O	Output current			±50	mA
θ_{JA}	Package thermal impedance(2)(3)	D package		97	°C/W
		P package		85	
		PW package		149	
T_J	Operating virtual junction temperature			150	°C
T_{stg}	Storage temperature range		–60	125	°C

(1) 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.
(2) Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
(3) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

		MIN	MAX	UNIT
V_{CC+}	Supply voltage	2	16	V
$V_{CC–}$		–2	–16	
T_A	Operating free-air temperature	–40	85	°C

Electrical Characteristics

$V_{CC\pm}$ = ±15 V (unless otherwise noted)

PARAMETER			TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	TL5580A	$R_S \le 10\ k\Omega$	25°C		0.3	1	mV
				–40°C to 85°C			1.35	
		TL5580		25°C		0.3	1.5	
				–40°C to 85°C			2	
αV_{IO}	Average temperature coefficient of input offset voltage			–40°C to 85°C		1.8	5	µV/°C
I_{IO}	Input offset current			25°C		5	75	nA
				–40°C to 85°C			100	
I_{IB}	Input bias current			25°C		100	500	nA
				–40°C to 85°C			800	
A_{VD}	Large-signal differential-voltage amplification		$R_L \ge 2\ k\Omega$, V_O = ±10 V	25°C	90	110		dB
				–40°C to 85°C	87			
V_{OM}	Output voltage swing		$R_L \ge 2\ k\Omega$	25°C	12.75 – 12.25	±13.5		V
				–40°C to 85°C	12.5 –12			
V_{ICR}	Common-mode input voltage range			25°C	±13	±13.5		V
				–40°C to 85°C	±12			
CMRR	Common-mode rejection ratio		$R_S \le 10\ k\Omega$, V_{ICR} = –12 V to 12 V	25°C	90	110		dB
				–40°C to 85°C	85			
k_{SVR} (1)	Supply-voltage rejection ratio		$R_S \le 10\ k\Omega$	25°C	85	110		dB
				–40°C to 85°C	83			
I_{CC}	Supply current (all amplifiers)			25°C		6	9	mA
				–40°C to 85°C			12	

(1) Measured with $V_{CC\pm}$ varied simultaneously

Operating Characteristics

$V_{CC\pm}$ = ±15 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TYP	UNIT
SR	Slew rate at unity gain	$R_L \ge 2\ k\Omega$	5	V/µs
GBW	Gain bandwidth product	f = 10 kHz	12	MHz
THD	Total harmonic distortion	V_O = 5 V, R_L = 2 kΩ, f = 1 kHz, A_{VD} = 20 dB	0.0005	%
V_n	Equivalent input noise voltage	f = 1 kHz	7	nV/$\sqrt{Hz}$

TYPICAL CHARACTERISTICS

MAXIMUM OUTPUT VOLTAGE SWING vs LOAD RESISTANCE

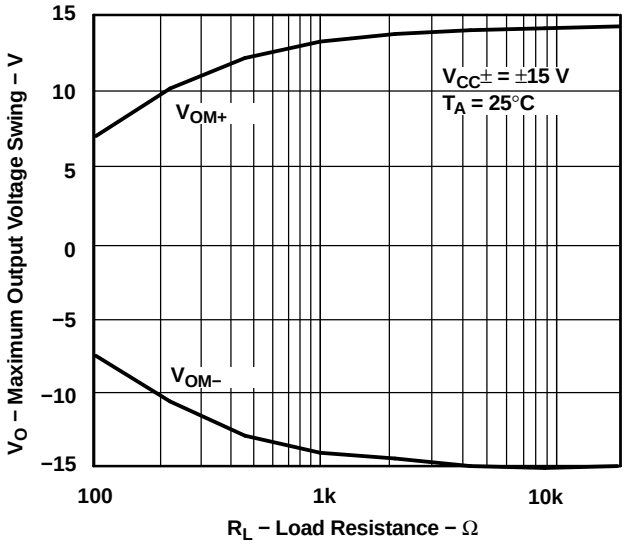


Figure 1.

MAXIMUM OUTPUT VOLTAGE SWING vs FREQUENCY

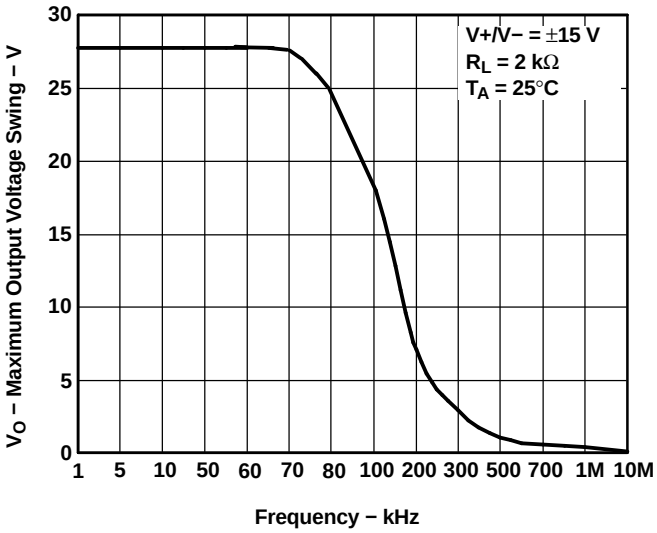


Figure 2.

OUTPUT VOLTAGE SWING vs OUTPUT CURRENT

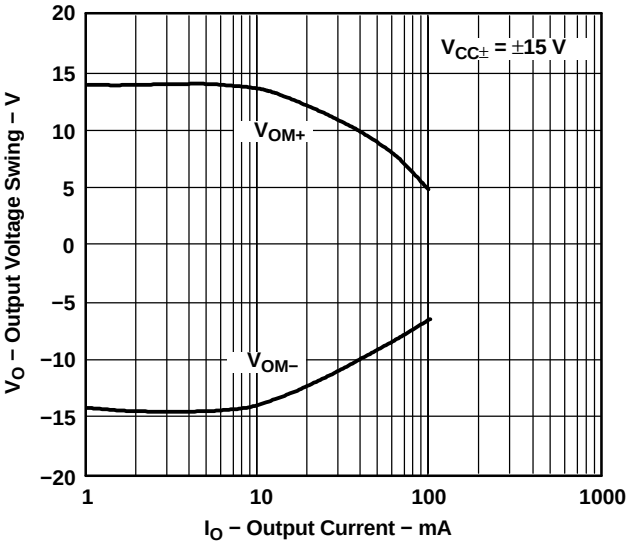


Figure 3.

EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY

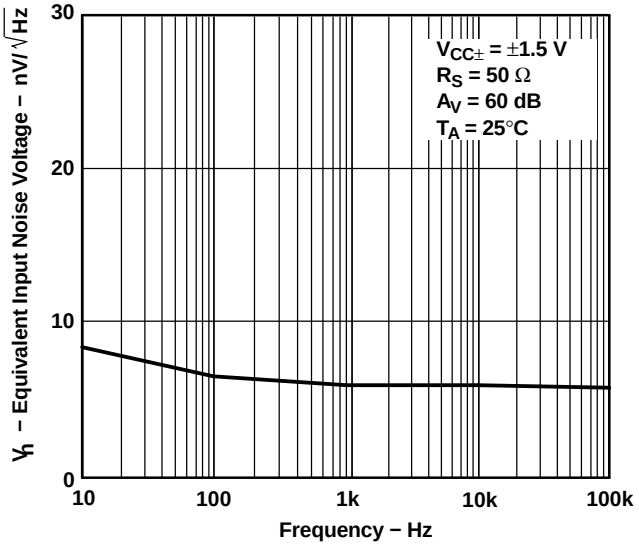


Figure 4.

TYPICAL CHARACTERISTICS (continued)

OPERATING CURRENT vs TEMPERATURE

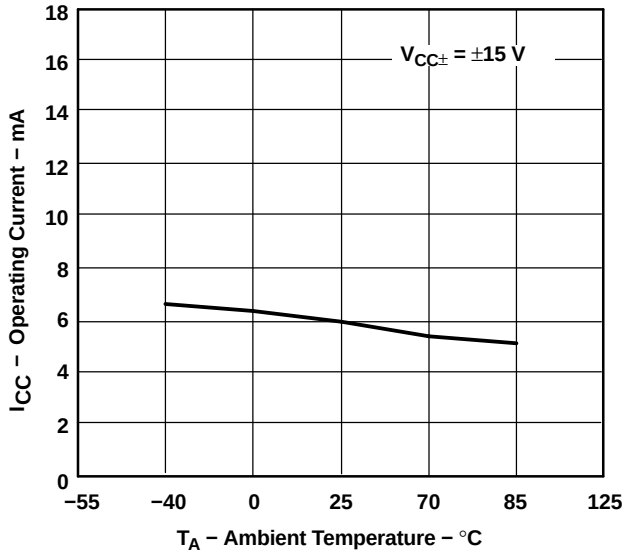


Figure 5.

OUTPUT VOLTAGE SWING vs TEMPERATURE

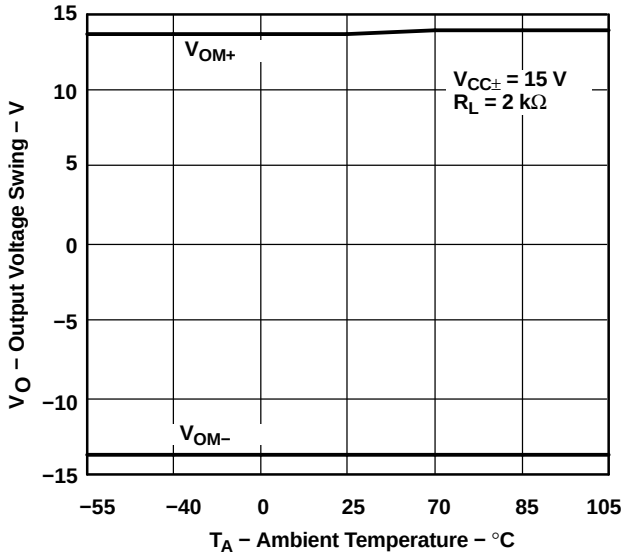


Figure 6.

INPUT OFFSET VOLTAGE vs TEMPERATURE

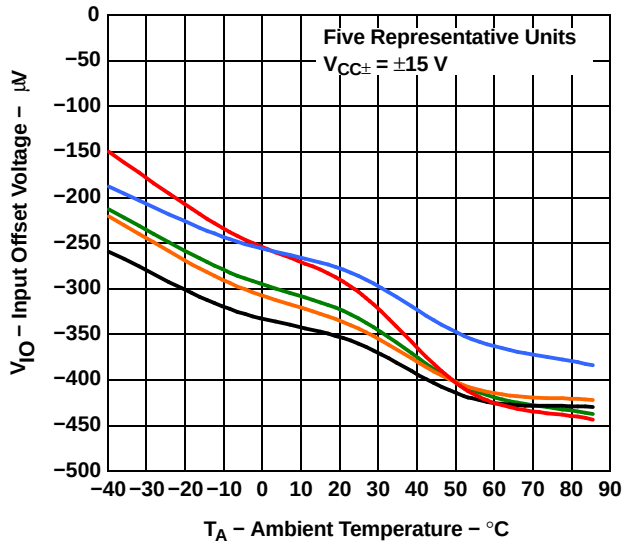


Figure 7.

INPUT BIAS CURRENT vs TEMPERATURE

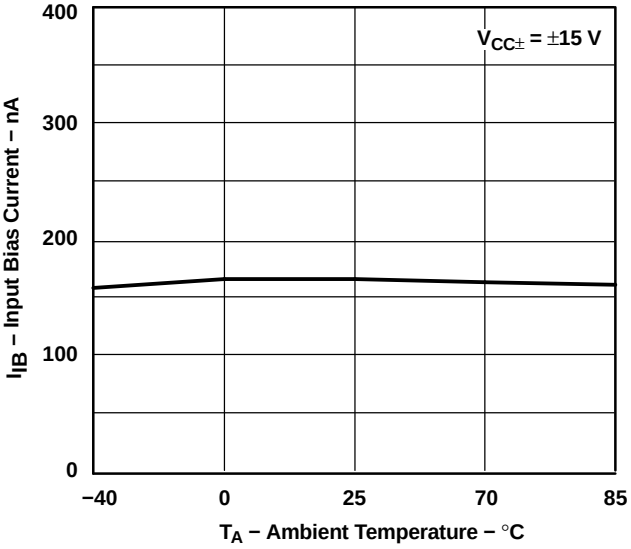


Figure 8.

TYPICAL CHARACTERISTICS (continued)

MAXIMUM OUTPUT VOLTAGE SWING vs OPERATING VOLTAGE

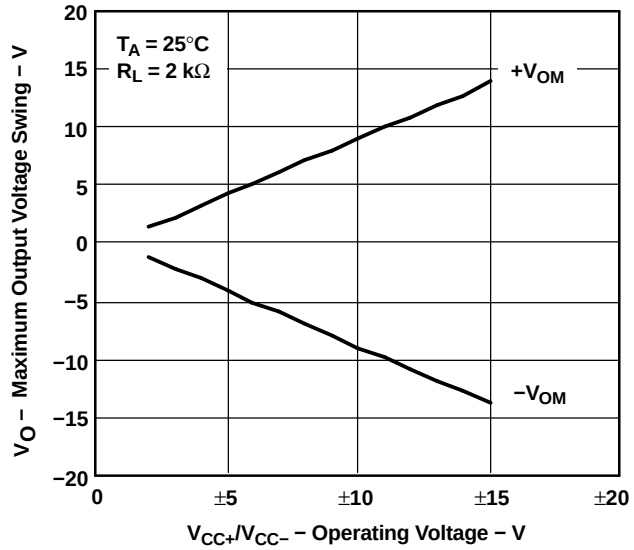


Figure 9.

OPERATING CURRENT vs OPERATING VOLTAGE

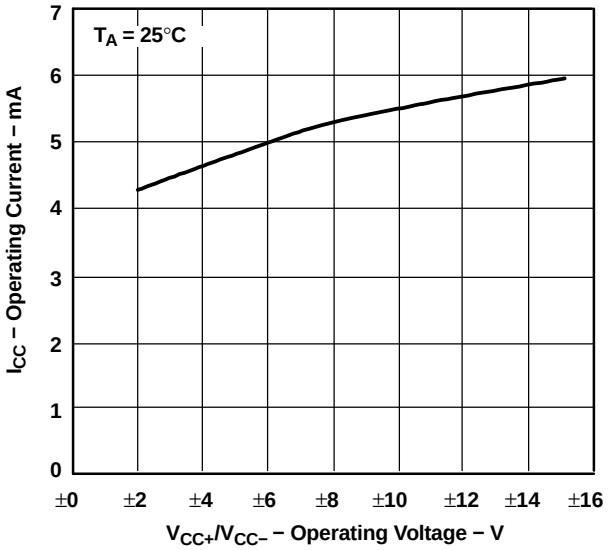


Figure 10.

TOTAL HARMONIC DISTORTION vs OUTPUT VOLTAGE

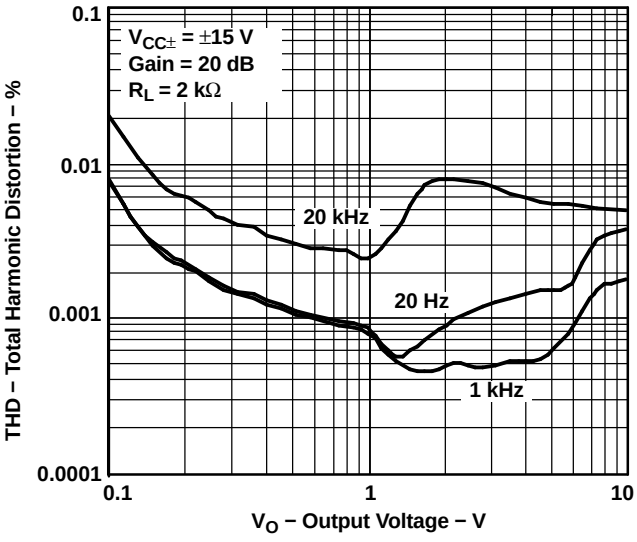


Figure 11.

VOLTAGE GAIN, PHASE vs FREQUENCY

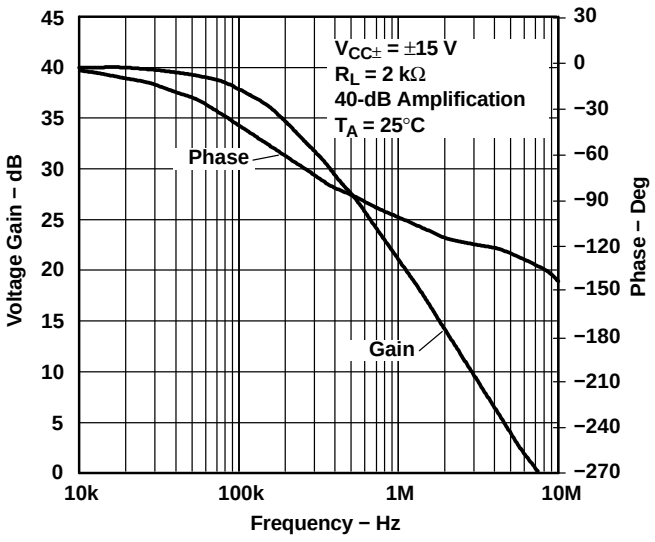


Figure 12.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TL5580AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580AIP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
TL5580AIPW	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580AIPWR	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580IP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
TL5580IPW	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL5580IPWR	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

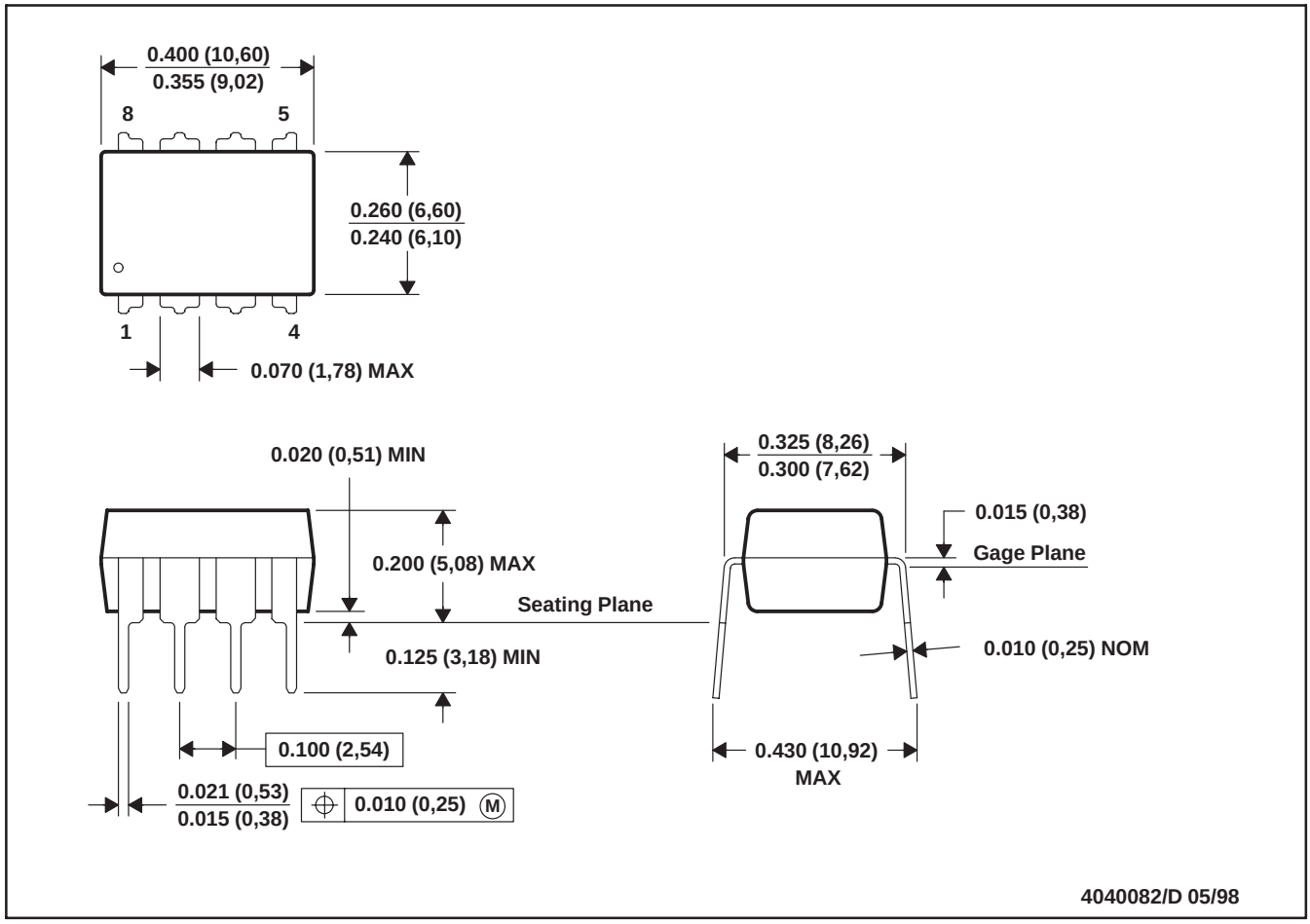
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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.

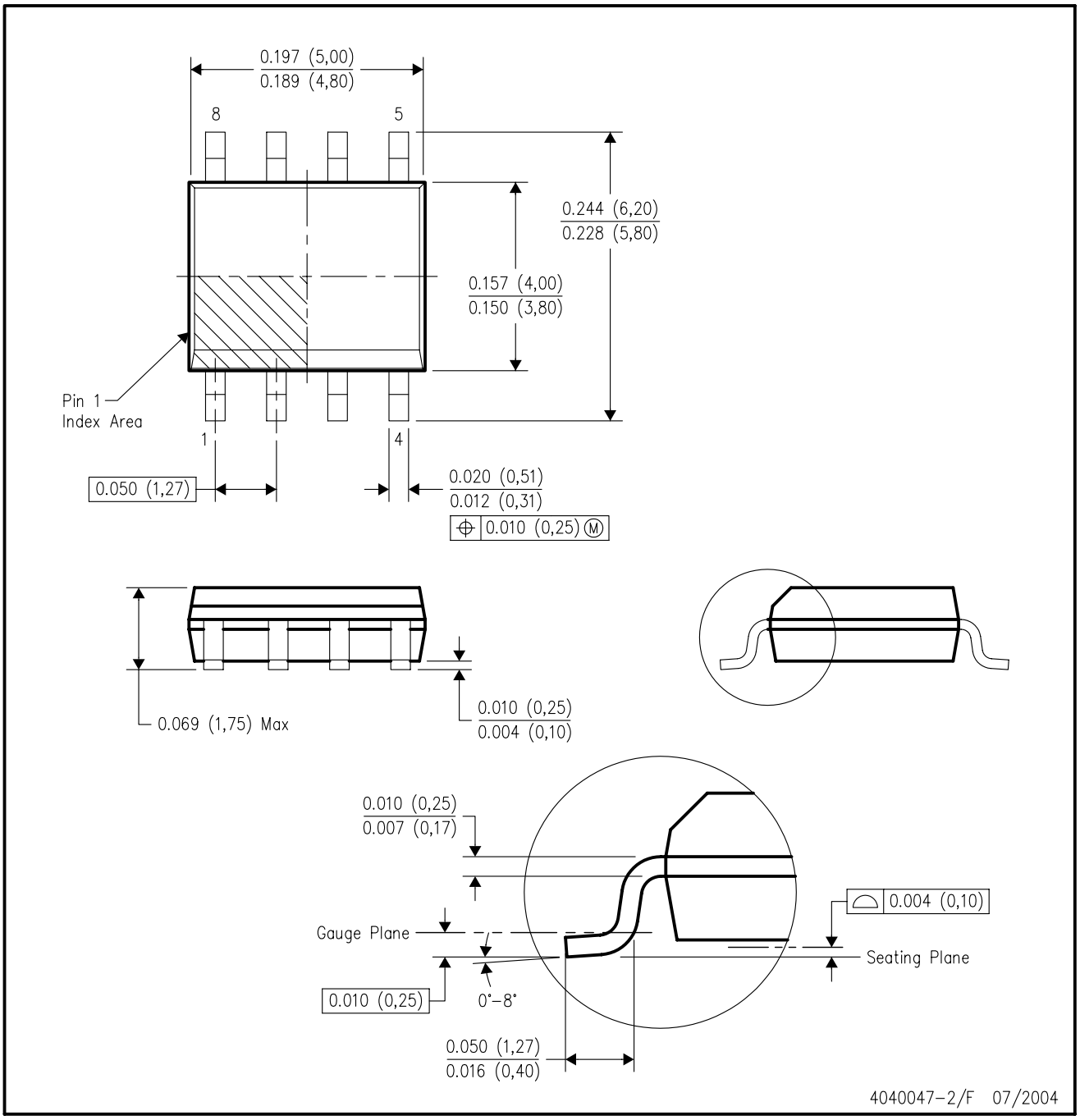
MPDI001A – JANUARY 1995 – REVISED JUNE 1999

P (R-PDIP-T8) **PLASTIC DUAL-IN-LINE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001

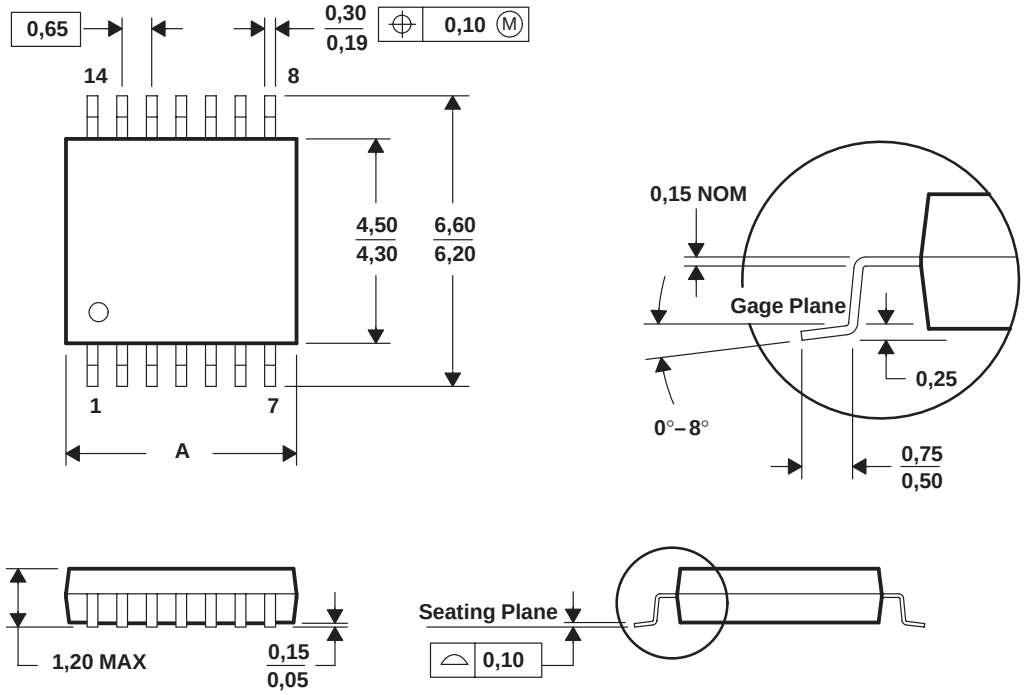
D (R–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



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 AA.

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

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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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