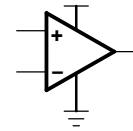


## FAMILY OF LOW-POWER WIDE BANDWIDTH SINGLE SUPPLY OPERATIONAL AMPLIFIERS WITH SHUTDOWN

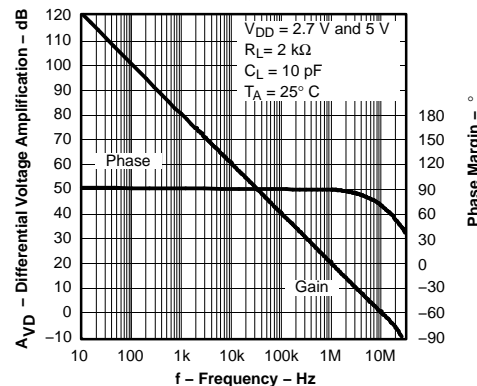
### FEATURES

- CMOS Rail-To-Rail Output
- $V_{ICR}$  Includes Positive Rail
- Wide Bandwidth . . . 11 MHz
- Slew Rate . . . 10 V/ $\mu$ s
- Supply Current . . . 800  $\mu$ A/Channel
- Input Noise Voltage . . . 27 nV/ $\sqrt{\text{Hz}}$
- Ultralow Power-Down Mode:  
 $I_{DD(\text{SHDN})} = 4 \mu\text{A/Channel}$
- Supply Voltage Range . . . 2.7 V to 5.5 V
- Specified Temperature Range:  
-40°C to 125°C . . . Industrial Grade
- Ultrasmall Packaging:  
5 or 6 Pin SOT-23 (TLV2620/1)  
8 or 10 Pin MSOP (TLV2622/3)
- Universal Opamp EVM (See SLOU060 for More Information)

Operational Amplifier



DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE  
vs  
FREQUENCY



### DESCRIPTION

The TLV262x single supply operational amplifiers provide rail-to-rail output with an input range that includes the positive rail. The TLV262x takes the minimum operating supply voltage down to 2.7 V over the extended industrial temperature range (-40°C to 125°C) while adding the rail-to-rail output swing feature. The TLV262x also provides 11-MHz bandwidth from only 800  $\mu$ A of supply current. The maximum recommended supply voltage is 5.5 V, which, when coupled with a 2.7-V minimum, allows the devices to be operated from lithium ion cells. The combination of wide bandwidth, low noise, and low distortion makes it ideal for high speed and high resolution data converter applications. The positive input range allows it to directly interface to positive rail referred systems. All members are available in PDIP and SOIC with the singles in the small SOT-23 package, duals in the MSOP, and quads in the TSSOP package.

The 2.7-V operation makes it compatible with Li-Ion powered systems and the operating supply voltage range of many micro-power micro-controllers available today including TI's MSP430.

AMPLIFIER SELECTION TABLE

DEVICE	$V_{DD}$ [V]	$I_{DD/\text{ch}}$ [ $\mu$ A]	$V_{IO}$ [ $\mu$ V]	$I_{IB}$ [ $\mu$ A]	$V_{ICR}$ [V]	GBW [MHz]	SLEW RATE [V/ $\mu$ s]	$V_n$ , 1 kHz [nV/ $\sqrt{\text{Hz}}$ ]	$I_o$ [mA]	SHUT-DOWN
TLV262x	2.7-5.5	750	250	1	1 V to $V_{DD} + 0.2$	11	10	27	28	Y
TLV263x	2.7-5.5	750	250	1	GND to $V_{DD} - 0.8$	10	9	27	28	Y
TLV278x	1.8-3.6	650	250	2.5	-0.2 to $V_{DD} + 0.2$	8	5	9	10	Y
TLC07x	4.5 - 16	1900	60	1.5	0.5 to $V_{DD} - 0.8$	10	19	7	55	Y
TLC08x	4.5 - 16	1900	60	3	GND to $V_{DD} - 1$	10	19	8.5	55	Y



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.



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### TLV2620 AND TLV2621 AVAILABLE OPTIONS<sup>(1)</sup>

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGED DEVICES			
		SMALL OUTLINE (D) <sup>(2)</sup>	SOT-23		PLASTIC DIP (P)
			(DBV) <sup>(3)</sup>	SYMBOL	
-40°C to 125°C	3500 μV	TLV2620ID TLV2621ID	TLV2620IDBV TLV2621IDBV	VBAI VBBI	TLV2620IP TLV2621IP

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).  
 (2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2620IDR).  
 (3) The SOT23 package devices are only available taped and reeled. The **R** Suffix denotes quantities (3,000 pieces per reel). For smaller quantities (250 pieces per mini-reel), add a **T** suffix to the part number (e.g. TLV2620IDBVT).

### TLV2622 AND TLV2623 AVAILABLE OPTIONS<sup>(1)</sup>

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGED DEVICES						
		SMALL OUTLINE <sup>(2)</sup> (D)	MSOP				PLASTIC DIP (N)	PLASTIC DIP (P)
			(DGK) <sup>(2)</sup>	SYMBOL	(DGS) <sup>(2)</sup>	SYMBOL		
-40°C to 125°C	3500 μV	TLV2622ID TLV2623ID	TLV2622IDGK —	xxTIAKM —	— TLV2623IDGS	— xxTIALC	— TLV2623IN	TLV2622IP —

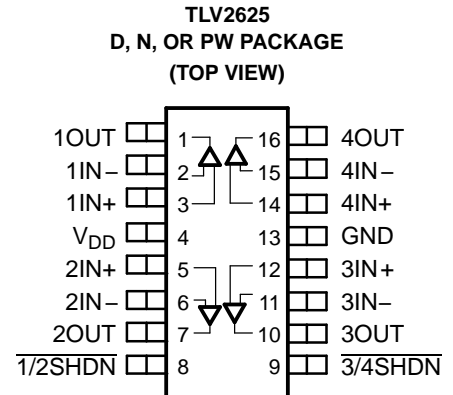
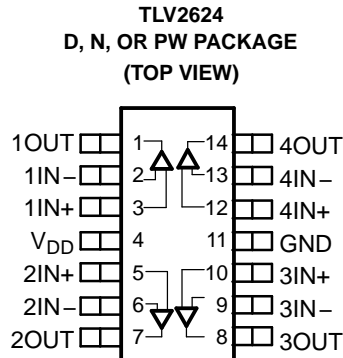
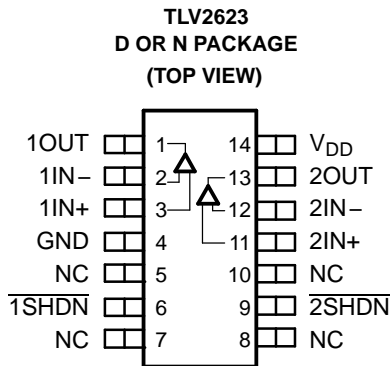
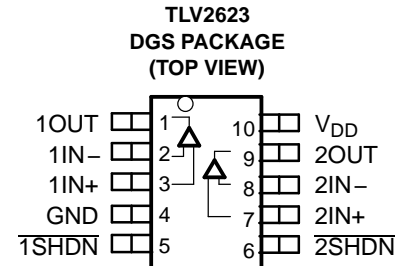
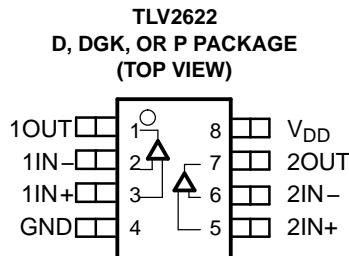
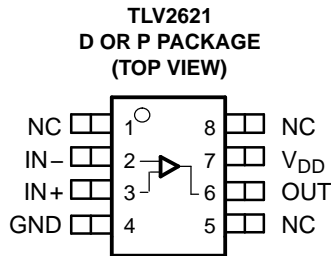
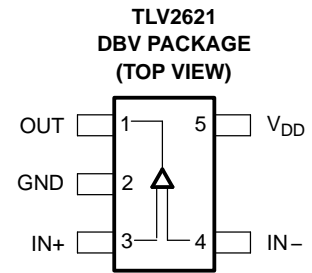
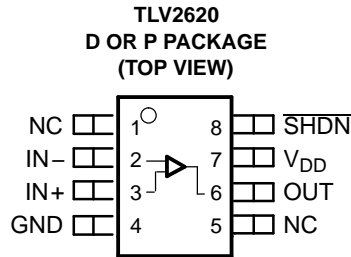
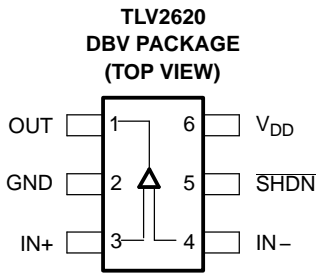
- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).  
 (2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2622IDR).

### TLV2624 AND TLV2625 AVAILABLE OPTIONS<sup>(1)</sup>

T <sub>A</sub>	V <sub>IO</sub> max AT 25°C	PACKAGED DEVICES		
		SMALL OUTLINE (D) <sup>(2)</sup>	PLASTIC DIP (N)	TSSOP (PW)
-40°C to 125°C	3500 μV	TLV2624ID TLV2625ID	TLV2624IN TLV2625IN	TLV2624IPW TLV2625IPW

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).  
 (2) This package is available taped and reeled. To order this packaging option, add an **R** suffix to the part number (e.g., TLV2624IDR).

### TLV262X PACKAGE PINOUTS<sup>(1)</sup>

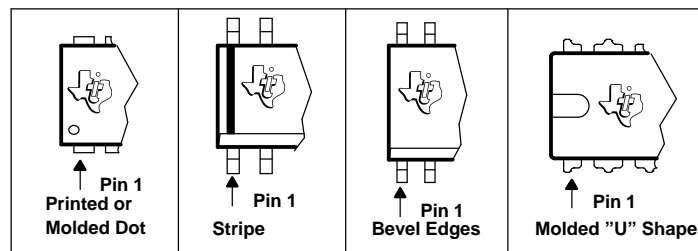


NC – No internal connection

$\overline{1/2SHDN}$  Pin (8) controls amplifiers 1 and 2.  
 $\overline{3/4SHDN}$  Pin (9) controls amplifiers 3 and 4.

(1) SOT-23 may or may not be indicated.

### TYPICAL PIN 1 INDICATORS



#### NOTE:

If there is not a Pin 1 indicator, turn device to enable reading the symbol from left to right. Pin 1 is at the lower left corner of the device.

## ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

$V_{DD}$	Supply voltage <sup>(2)</sup>	6 V
$V_{ID}$	Differential input voltage	$\pm V_{DD}$
$V_I$	Input voltage range <sup>(2)</sup>	+1 to $V_{DD} + 0.2$ V
$I_I$	Input current (any input)	$\pm 10$ mA
$I_O$	Output current	$\pm 40$ mA
	Continuous total power dissipation	See Dissipation Rating Table
$T_A$	Operating free-air temperature range: I-suffix	-40°C to 125°C
$T_J$	Maximum junction temperature	150°C
$T_{stg}$	Storage temperature range	-65°C to 150°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°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) All voltage values, except differential voltages, are with respect to GND.

## DISSIPATION RATING TABLE

PACKAGE	$\theta_{JC}$ (°C/W)	$\theta_{JA}$ (°C/W)	$T_A \leq 25^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D (8)	38.3	176	710 mW	142 mW
D (14)	26.9	122.3	1022 mW	204.4 mW
D (16)	25.7	114.7	1090 mW	218 mW
DBV (5)	55	324.1	385 mW	77.1 mW
DBV (6)	55	294.3	425 mW	85 mW
DGK (8)	54.2	259.9	481 mW	96.1 mW
DGS (10)	54.1	259.7	485 mW	97 mW
N (14, 16)	32	78	1600 mW	320.5 mW
P (8)	41	104	1200 mW	240.4 mW
PW (14)	29.3	173.6	720 mW	144 mW
PW (16)	28.7	161.4	774 mW	154.9 mW

## RECOMMENDED OPERATING CONDITIONS

			MIN	MAX	UNIT
$V_{DD}$	Supply voltage	Single supply	2.7	5.5	V
		Split supply	$\pm 1.35$	$\pm 2.75$	
$V_{ICR}$	Common-mode input voltage range		1	$V_{DD} + 0.2$	V
$T_A$	Operating free-air temperature	I-suffix	-40	125	°C
	Shutdown on/off voltage level <sup>(1)</sup>	$V_{IL}$		0.4	V
		$V_{IH}$	2		

- (1) Relative to GND.

## ELECTRICAL CHARACTERISTICS

at specified free-air temperature,  $V_{DD} = 2.7\text{ V}, 5\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		$T_A^{(1)}$	MIN	TYP	MAX	UNIT
<b>DC PERFORMANCE</b>								
$V_{IO}$	Input offset voltage	$V_{IC} = V_{DD}/2, V_O = V_{DD}/2,$ $R_S = 50\ \Omega$		25°C	250	3500		$\mu\text{V}$
				Full range		4500		
$\alpha_{VIO}$	Temperature coefficient of input offset voltage			25°C		3		$\mu\text{V}/^\circ\text{C}$
$CMRR$	Common-mode rejection ratio	$V_{IC} = 1\text{ to }V_{DD},$ $R_S = 50\ \Omega$	$V_{DD} = 2.7\text{ V}$	25°C	77	98		dB
				Full range	63			
			$V_{DD} = 5\text{ V}$	25°C	78	99		
				Full range	75			
$A_{VD}$	Large-signal differential voltage amplification	$V_{DD} = 2.7\text{ V}, R_L = 2\text{ k}\Omega,$ $V_{O(PP)} = 1.7\text{ V}$		25°C	90	100		dB
				Full range	82			
				25°C	95	100		
				Full range	90			
<b>INPUT CHARACTERISTICS</b>								
$I_{IO}$	Input offset current	$V_{IC} = V_{DD}/2, V_O = V_{DD}/2,$ $R_S = 50\ \Omega$		25°C	2	50		pA
				Full Range		100		
$I_{IB}$	Input bias current			25°C	2	50		
				Full Range		200		
$r_{i(d)}$	Differential input resistance			25°C		100		G $\Omega$
$C_{i(c)}$	Common-mode input capacitance	$f = 1\text{ kHz}$		25°C		8		pF
<b>OUTPUT CHARACTERISTICS</b>								
$V_{OH}$	High-level output voltage	$V_{IC} = V_{DD}/2,$ $I_{OH} = -1\text{ mA}$	$V_{DD} = 2.7\text{ V}$	25°C	2.6	2.67		V
				Full range	2.55			
			$V_{DD} = 5\text{ V}$	25°C	4.95	4.98		
				Full range	4.9			
		$V_{IC} = V_{DD}/2,$ $I_{OH} = -10\text{ mA}$	$V_{DD} = 2.7\text{ V}$	25°C	2.3	2.43		
				Full range	2.2			
			$V_{DD} = 5\text{ V}$	25°C	4.7	4.8		
				Full range	4.6			
$V_{OL}$	Low-level output voltage	$V_{IC} = V_{DD}/2,$ $I_{OL} = 1\text{ mA}$	$V_{DD} = 2.7\text{ V}$	25°C		0.03	0.1	V
				Full range			0.15	
			$V_{DD} = 5\text{ V}$	25°C		0.025	0.05	
				Full range			0.1	
		$V_{IC} = V_{DD}/2,$ $I_{OL} = 10\text{ mA}$	$V_{DD} = 2.7\text{ V}$	25°C		0.26	0.4	
				Full range			0.45	
			$V_{DD} = 5\text{ V}$	25°C		0.2	0.25	
				Full range			0.35	
$I_O$	Output current	$V_{DD} = 2.7\text{ V},$ $V_O = 0.5\text{ V from rail}$		25°C	Sourcing		14	mA
					Sinking		19	
					Sourcing		28	
					Sinking		28	
$I_{OS}$	Short-circuit output current			25°C	$V_{DD} = 2.7\text{ V}$		50	mA
					$V_{DD} = 5\text{ V}$		95	
					$V_{DD} = 2.7\text{ V}$		50	
					$V_{DD} = 5\text{ V}$		95	

(1) Full range is  $-40^\circ\text{C}$  to  $125^\circ\text{C}$  for the I-suffix.

## ELECTRICAL CHARACTERISTICS (continued)

at specified free-air temperature,  $V_{DD} = 2.7\text{ V}$ ,  $5\text{ V}$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		$T_A^{(1)}$	MIN	TYP	MAX	UNIT
<b>POWER SUPPLY</b>								
$I_{DD}$	Supply current (per channel)	$V_O = V_{DD}/2$ ,	$\overline{SHDN} = V_{DD}$	25°C	800	1000		$\mu\text{A}$
				Full range		1300		
PSRR	Supply voltage rejection ratio ( $\Delta V_{DD}/\Delta V_{IO}$ )	$V_{DD} = 2.7\text{ V}$ to $3.3\text{ V}$ , $V_{IC} = V_{DD}/2$	No load	25°C	80	98		dB
				Full range	75			
		25°C		75	90			
		Full range		70				
<b>DYNAMIC PERFORMANCE</b>								
UGBW	Unity gain bandwidth	$R_L = 2\text{ k}\Omega$ , $C_L = 10\text{ pF}$		25°C		11		MHz
SR+	Positive slew rate at unity gain	$R_L = 2\text{ k}\Omega$ , $C_L = 50\text{ pF}$		25°C	3.5	4.5		$\text{V}/\mu\text{s}$
				Full range	2.7			
				25°C	5.4	7		
				Full range	3.4			
SR-	Negative slew rate at unity gain	$R_L = 2\text{ k}\Omega$ , $C_L = 50\text{ pF}$		25°C	2.7	5		$\text{V}/\mu\text{s}$
				Full range	2.3			
				25°C	4.5	6		
				Full range	3.2			
$\phi_m$	Phase margin	$R_L = 2\text{ k}\Omega$ , $C_L = 10\text{ pF}$		25°C	63°			
	Gain margin				8			dB
<b>NOISE/DISTORTION PERFORMANCE</b>								
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = V_{DD}/2$ , $R_L = 2\text{ k}\Omega$ , $f = 10\text{ kHz}$	$A_V = 1$	25°C	0.002%			
			$A_V = 10$		0.019%			
			$A_V = 100$		0.095%			
$V_n$	Equivalent input noise voltage	$f = 1\text{ kHz}$ $f = 10\text{ kHz}$		25°C	53		$\text{nV}/\sqrt{\text{Hz}}$	
					27			
$I_n$	Equivalent input noise current	$f = 1\text{ kHz}$		25°C	0.9		$\text{fA}/\sqrt{\text{Hz}}$	
<b>SHUTDOWN CHARACTERISTICS</b>								
$I_{DD(SHDN)}$	Supply current, per channel in shutdown mode (TLV2620, TLV2623, TLV2625)	$\overline{SHDN} = 0.4\text{ V}$		25°C	4	11		$\mu\text{A}$
				Full range		13		
$t_{(on)}$	Amplifier turnon time <sup>(2)</sup>	$R_L = 2\text{ k}\Omega$		25°C	4.5			$\mu\text{s}$
				$V_{DD} = 5\text{ V}$	1.5			
$t_{(off)}$	Amplifier turnoff time <sup>(2)</sup>	$R_L = 2\text{ k}\Omega$		25°C	200			ns

(2) Disable time and enable time are defined as the interval between application of the logic signal to  $\overline{SHDN}$  and the point at which the supply current has reached half its final value.

## TYPICAL CHARACTERISTICS

### TABLE OF GRAPHS

			FIGURE
$V_{IO}$	Input offset voltage	vs Common-mode input voltage	1, 2
CMRR	Common-mode rejection ratio	vs Frequency	3
$V_{OH}$	High-level output voltage	vs High-level output current	4, 6
$V_{OL}$	Low-level output voltage	vs Low-level output current	5, 7
$I_{DD}$	Supply current	vs Supply voltage	8
$I_{DD}$	Supply current	vs Free-air temperature	9
PSRR	Power supply rejection ratio	vs Frequency	10
$A_{VD}$	Differential voltage amplification & phase	vs Frequency	11
	Gain-bandwidth product	vs Free-air temperature	12
SR	Slew rate	vs Supply voltage	13
		vs Free-air temperature	14, 15
$\phi_m$	Phase margin	vs Load capacitance	16
$V_n$	Equivalent input noise voltage	vs Frequency	17
	Voltage-follower large-signal pulse response		18
	Voltage-follower small-signal pulse response		19
	Crosstalk	vs Frequency	20
$I_{DD(SHDN)}$	Shutdown supply current	vs Free-air temperature	21
$I_{DD(SHDN)}$	Shutdown supply current	vs Supply voltage	22
$I_{DD(SHDN)}$	Shutdown supply current/output voltage	vs Time	23

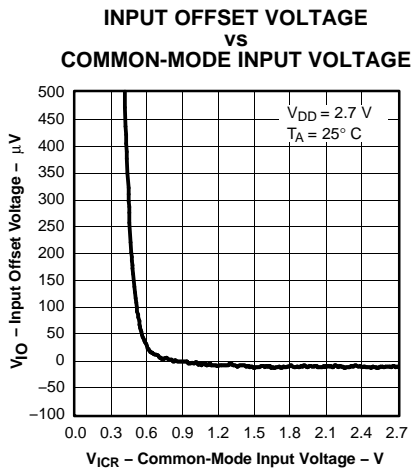


Figure 1.

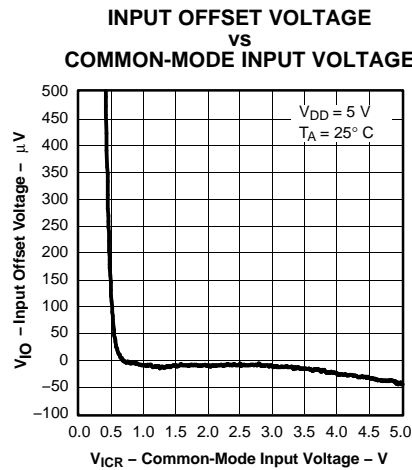


Figure 2.

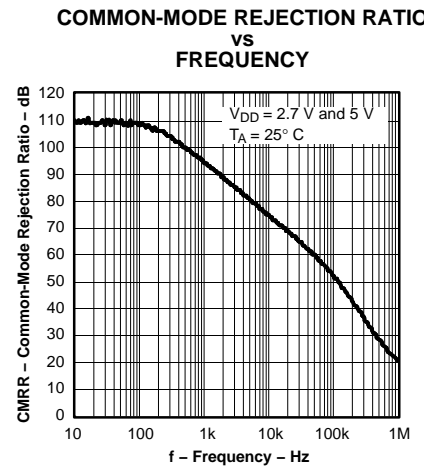


Figure 3.

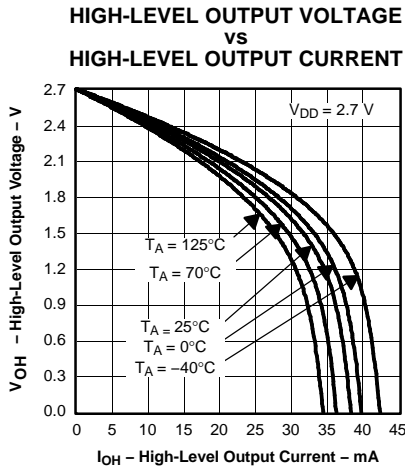


Figure 4.

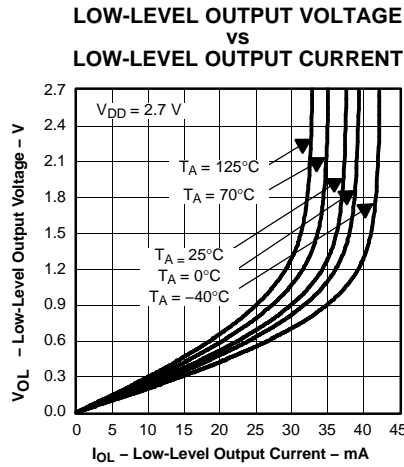


Figure 5.

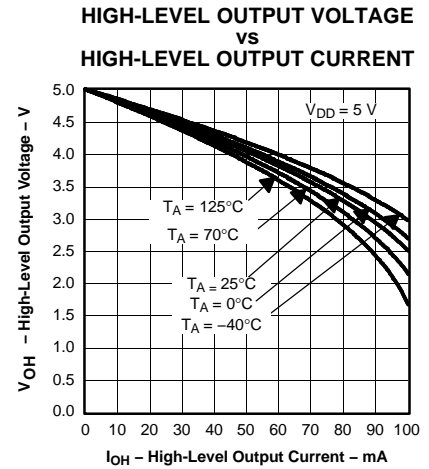


Figure 6.

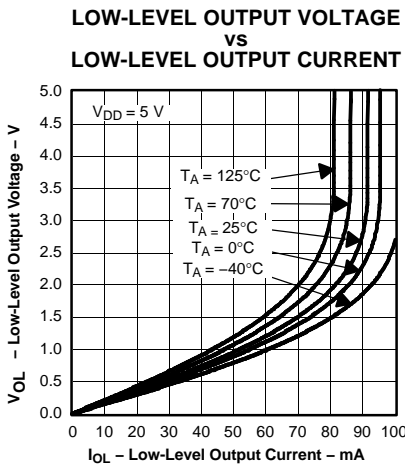


Figure 7.

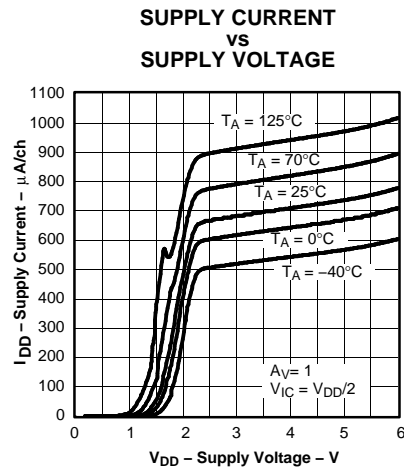


Figure 8.

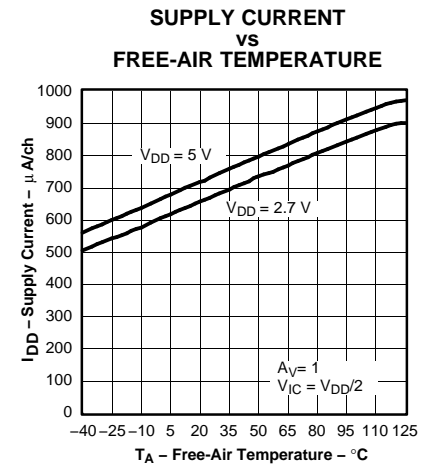


Figure 9.

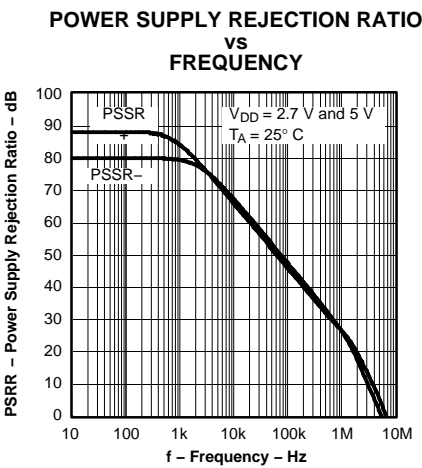


Figure 10.

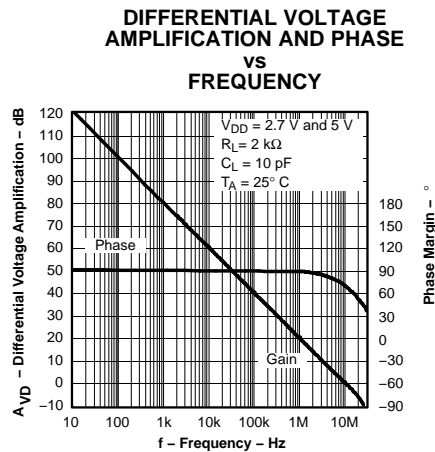


Figure 11.

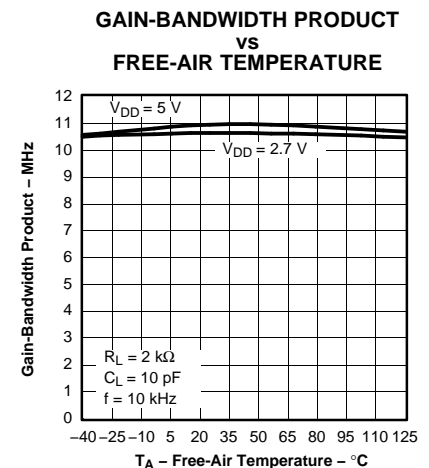


Figure 12.



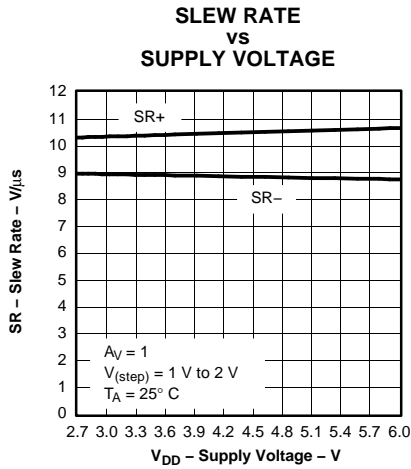


Figure 13.

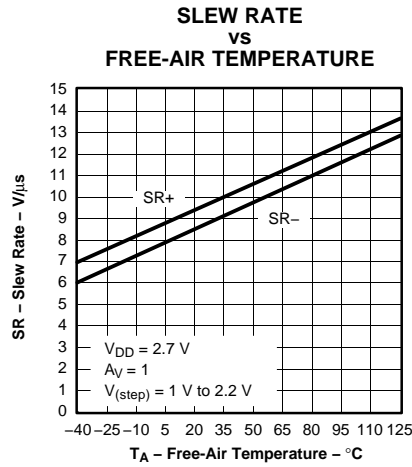


Figure 14.

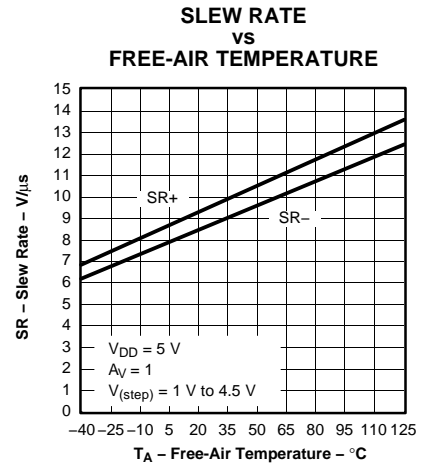


Figure 15.

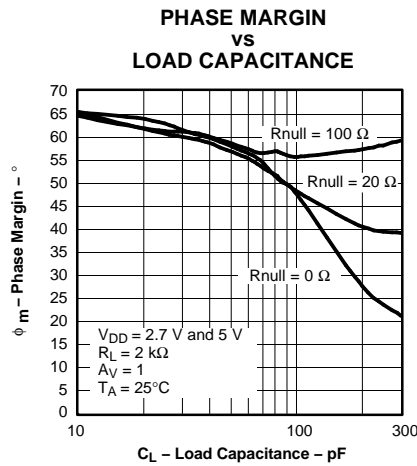


Figure 16.

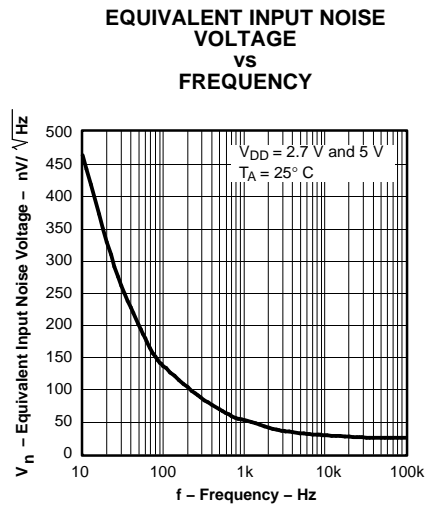


Figure 17.

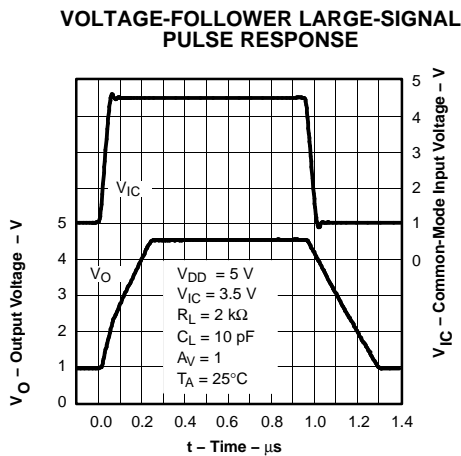


Figure 18.

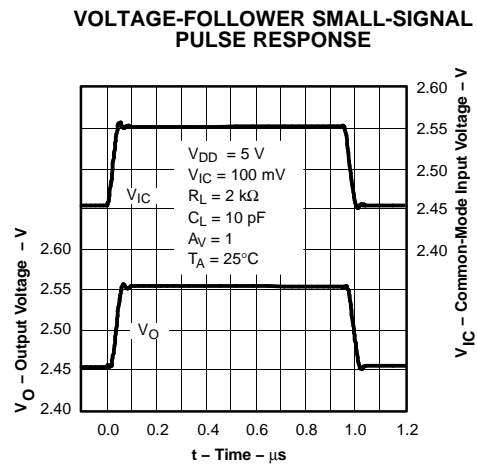


Figure 19.

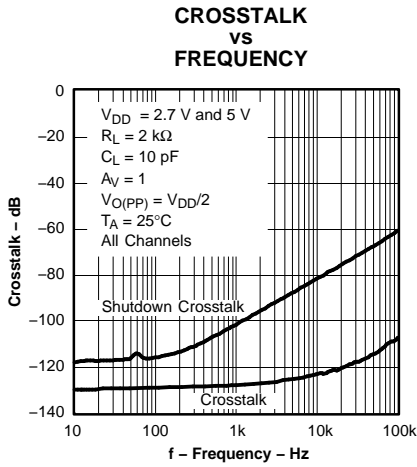


Figure 20.

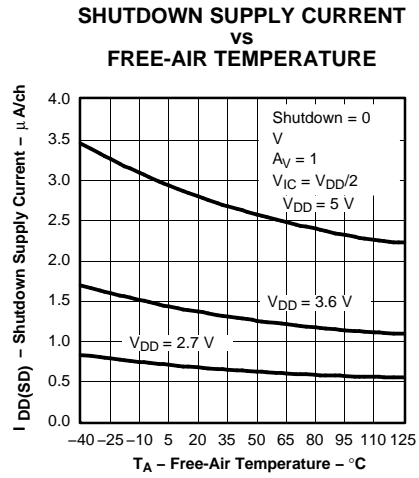


Figure 21.

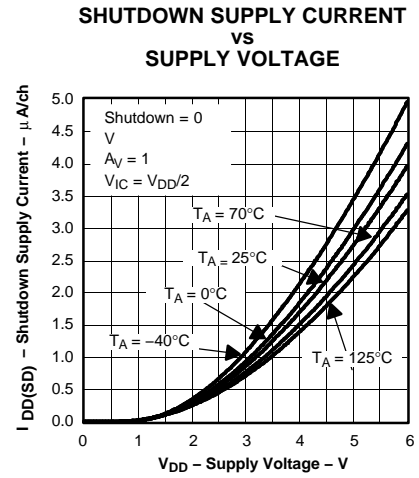


Figure 22.

SHUTDOWN SUPPLY CURRENT/OUTPUT VOLTAGE  
 vs  
 TIME

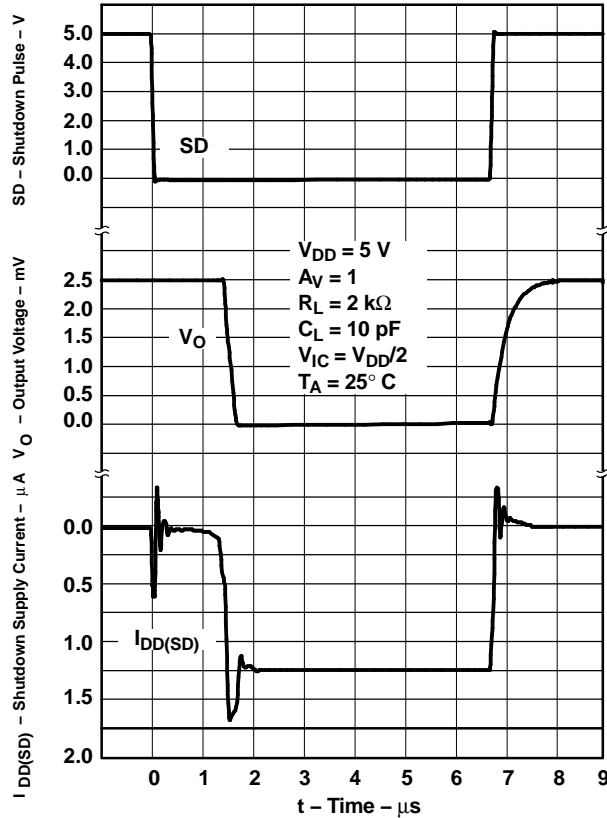


Figure 23.

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TLV2620IDBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2620IDBVRG4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2620IDBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2620IDBVTG4	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2620IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2620IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2621IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDGK	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDGKG4	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDGKR	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDGKRG4	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2622IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2623IDGS	ACTIVE	MSOP	DGS	10	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2623IDGSG4	ACTIVE	MSOP	DGS	10	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2623IDGSR	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TLV2623IDGSRG4	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2623IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2623IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2624IPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2625IDR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2625IDRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2625INE4	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
TLV2625IPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV2625IPWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

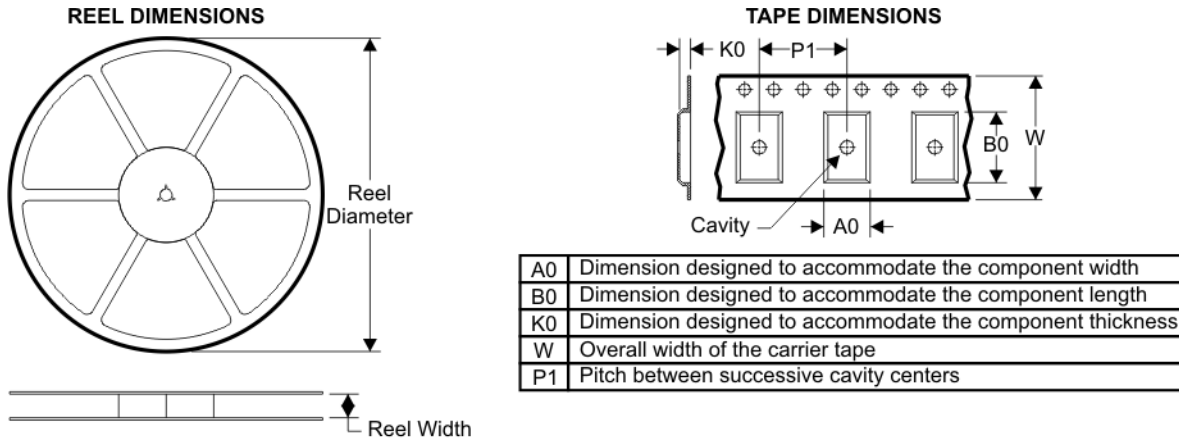
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

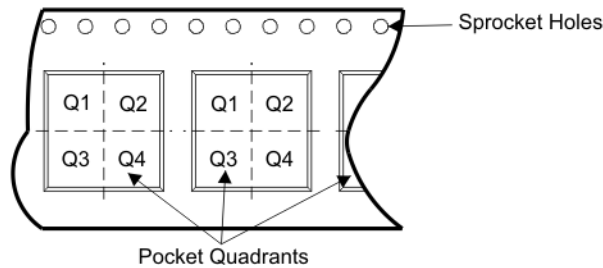
**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

**TAPE AND REEL BOX INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLV2620IDBVR	DBV	6	SITE 40	180	9	3.15	3.2	1.4	4	8	Q3
TLV2620IDBVT	DBV	6	SITE 40	180	9	3.15	3.2	1.4	4	8	Q3
TLV2620IDR	D	8	SITE 27	330	12	6.4	5.2	2.1	8	12	Q1
TLV2621IDBVR	DBV	5	SITE 40	180	9	3.15	3.2	1.4	4	8	Q3
TLV2621IDBVT	DBV	5	SITE 40	180	9	3.15	3.2	1.4	4	8	Q3
TLV2621IDR	D	8	SITE 27	330	12	6.4	5.2	2.1	8	12	Q1
TLV2622IDGKR	DGK	8	SITE 35	330	12	5.3	3.4	1.4	8	12	Q1
TLV2622IDR	D	8	SITE 27	330	12	6.4	5.2	2.1	8	12	Q1
TLV2623IDGSR	DGS	10	SITE 35	330	12	5.3	3.4	1.4	8	12	Q1
TLV2623IDR	D	14	SITE 27	330	16	6.5	9.0	2.1	8	16	Q1
TLV2624IDR	D	14	SITE 27	330	16	6.5	9.0	2.1	8	16	Q1
TLV2624IPWR	PW	14	SITE 41	330	12	7.0	5.6	1.6	8	12	Q1
TLV2624IPWRG4	PW	14	SITE 41	330	12	7.0	5.6	1.6	8	12	Q1
TLV2625IDR	D	16	SITE 27	330	16	6.5	10.3	2.1	8	16	Q1
TLV2625IPWR	PW	16	SITE 41	330	12	7.0	5.6	1.6	8	12	Q1

**TAPE AND REEL BOX DIMENSIONS**



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
TLV2620IDBVR	DBV	6	SITE 40	182.0	182.0	20.0
TLV2620IDBVT	DBV	6	SITE 40	182.0	182.0	20.0
TLV2620IDR	D	8	SITE 27	342.9	336.6	20.64
TLV2621IDBVR	DBV	5	SITE 40	182.0	182.0	20.0
TLV2621IDBVT	DBV	5	SITE 40	182.0	182.0	20.0
TLV2621IDR	D	8	SITE 27	342.9	336.6	20.64
TLV2622IDGKR	DGK	8	SITE 35	358.0	335.0	35.0
TLV2622IDR	D	8	SITE 27	342.9	336.6	20.64
TLV2623IDGSR	DGS	10	SITE 35	358.0	335.0	35.0
TLV2623IDR	D	14	SITE 27	342.9	336.6	28.58
TLV2624IDR	D	14	SITE 27	342.9	336.6	28.58
TLV2624IPWR	PW	14	SITE 41	346.0	346.0	29.0
TLV2624IPWRG4	PW	14	SITE 41	346.0	346.0	29.0
TLV2625IDR	D	16	SITE 27	342.9	336.6	28.58
TLV2625IPWR	PW	16	SITE 41	346.0	346.0	29.0

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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



DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
- $\triangle$  Falls within JEDEC MO-178 Variation AB, except minimum lead width.

DGK (S-PDSO-G8)

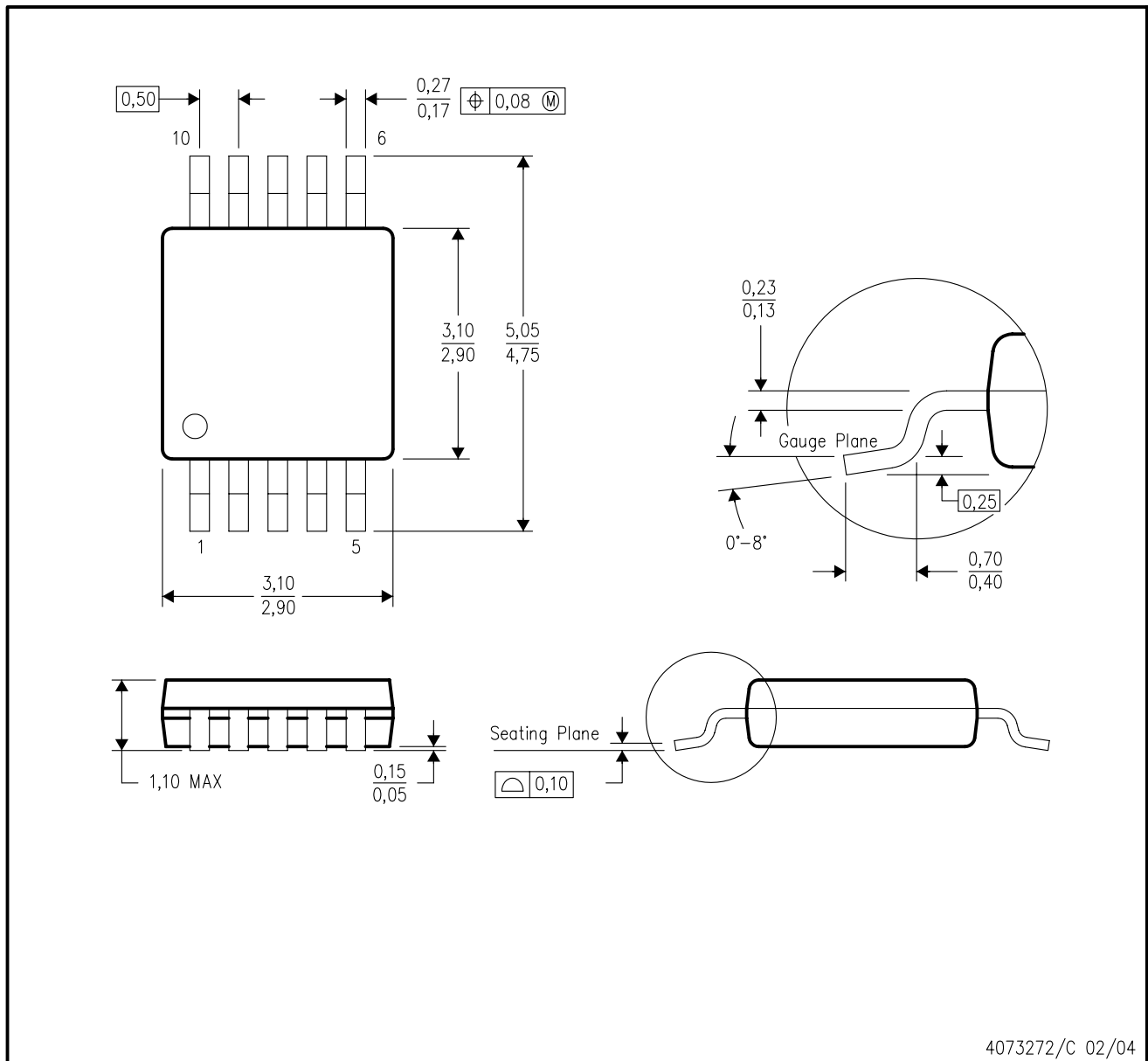
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
  - E. Falls within JEDEC MO-187 variation AA, except interlead flash.

DGS (S-PDSO-G10)

PLASTIC SMALL-OUTLINE PACKAGE



- 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.
  - D. Falls within JEDEC MO-187 variation BA.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE

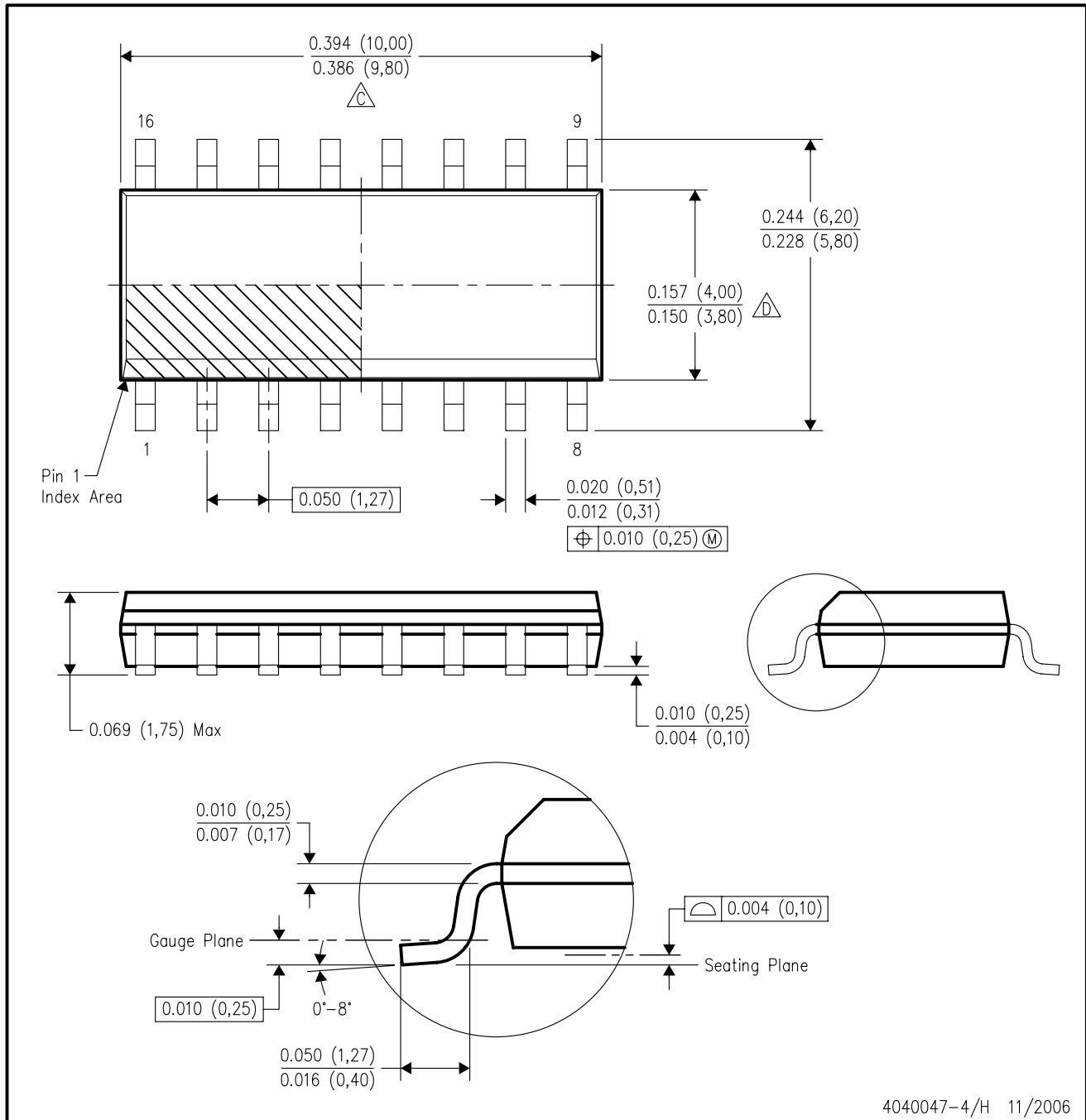


4040047-3/H 11/2006

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G16)

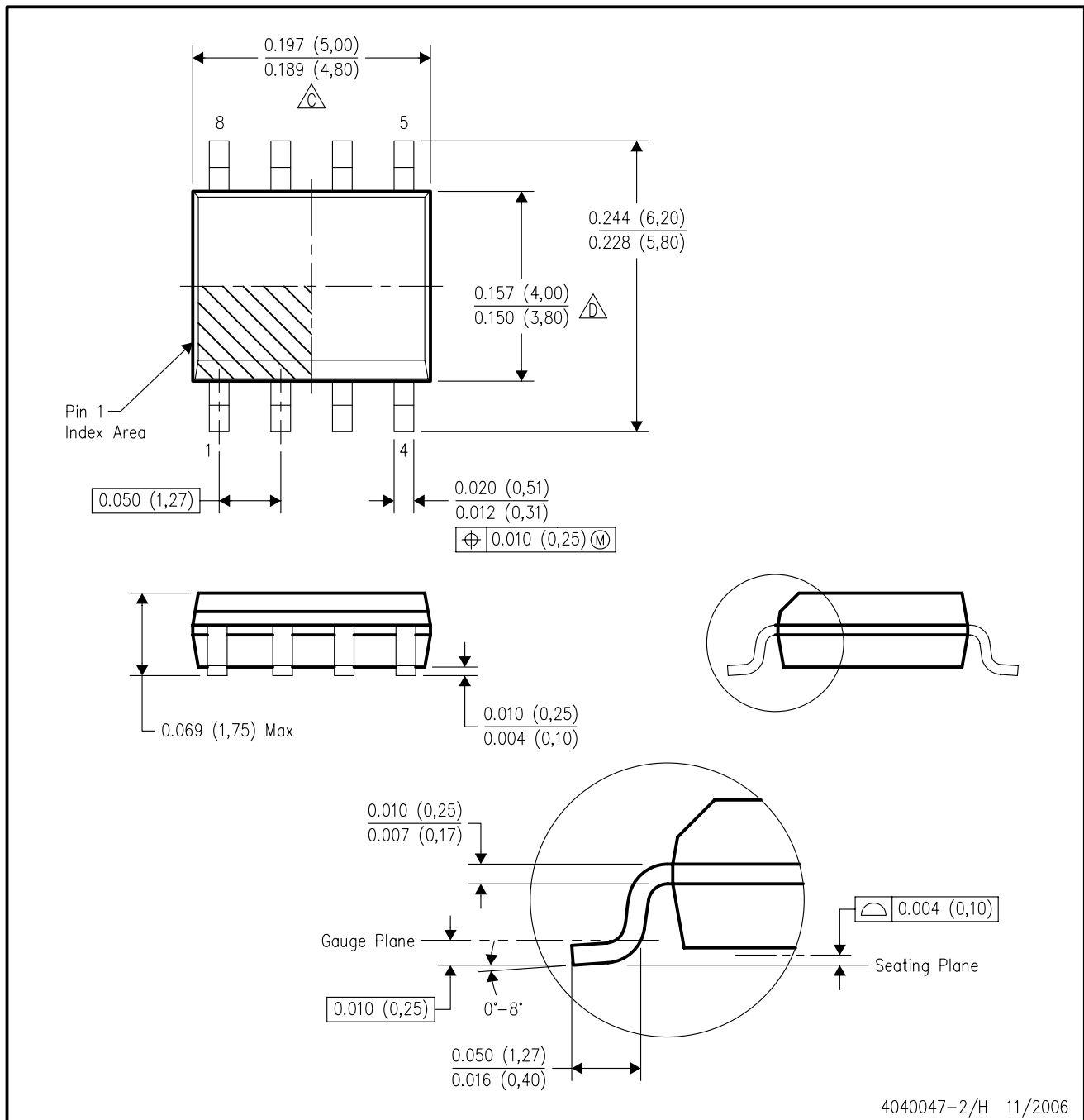
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AC.

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.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AA.

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



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 TI 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. Information of third parties may be subject to additional restrictions.

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.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

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

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Low Power Wireless	<a href="http://www.ti.com/lpw">www.ti.com/lpw</a>	Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2007, Texas Instruments Incorporated