

## FEATURES

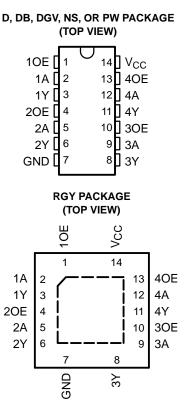
- Operates From 1.65 V to 3.6 V
- Specified From –40°C to 85°C and From –40°C to 125°C
- Inputs Accept Voltages to 5.5 V
- Max t<sub>pd</sub> of 4.7 ns at 3.3 V
- Typical V<sub>OLP</sub> (Output Ground Bounce) < 0.8 V at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C
- Typical V<sub>OHV</sub> (Output V<sub>OH</sub> Undershoot)
  > 2 V at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)

# **DESCRIPTION/ORDERING INFORMATION**

This quadruple bus buffer gate is designed for 1.65-V to 3.6-V  $V_{\text{CC}}$  operation.

The SN74LVC126A features independent line drivers with 3-state outputs. Each output is disabled when the associated output-enable (OE) input is low.

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To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of this device as a translator in a mixed 3.3-V/5-V system environment.

T <sub>A</sub>	Р	ACKAGE <sup>(1)</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
–40°C to 85°C	QFN – RGY	Reel of 1000	SN74LVC126ARGYR	LC126A	
		Tube of 50	SN74LVC126AD		
	SOIC – D	Reel of 2500	SN74LVC126ADR	LVC126A	
		Reel of 250	SN74LVC126ADT		
	SOP – NS	Reel of 2000	SN74LVC126ANSR	LVC126A	
–40°C to 125°C	SSOP – DB	Reel of 2000	SN74LVC126ADBR	LC126A	
		Tube of 90	SN74LVC126APW		
	TSSOP – PW	Reel of 2000	SN74LVC126APWR	LC126A	
		Reel of 250	SN74LVC126APWT		
	TVSOP – DGV	Reel of 2000	SN74LVC126ADGVR	LC126A	

### ORDERING INFORMATION

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



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.

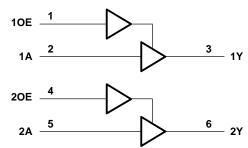
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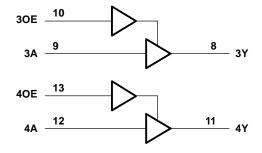


### **FUNCTION TABLE** (EACH BUFFER)

INPL	JTS	OUTPUT
OE	Α	Y
Н	Н	Н
Н	L	L
L	Х	Z

### LOGIC DIAGRAM (POSITIVE LOGIC)





## Absolute Maximum Ratings<sup>(1)</sup>

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range		-0.5	6.5	V
VI	Input voltage range <sup>(2)</sup>		-0.5	6.5	V
Vo	Output voltage range <sup>(2)(3)</sup>		-0.5	$V_{CC} + 0.5$	V
I <sub>IK</sub>	Input clamp current	V <sub>1</sub> < 0		-50	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50	mA
I <sub>O</sub>	Continuous output current			±50	mA
	Continuous current through $V_{CC}$ or GND			±100	mA
		D package <sup>(4)</sup>		86	
		DB package <sup>(4)</sup>		96	
0		DGV package <sup>(4)</sup>	127 76 113		°C/W
$\theta_{JA}$	Package thermal impedance	NS package <sup>(4)</sup>			
		PW package <sup>(4)</sup>			
		RGY package <sup>(5)</sup>		47	
T <sub>stg</sub>	Storage temperature range		-65	150	°C
P <sub>tot</sub>	Power dissipation	$T_A = -40^{\circ}C$ to $125^{\circ}C^{(6)(7)}$		500	mW

(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.

The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed. (2)

The value of  $V_{CC}$  is provided in the recommended operating conditions table. (3)

(4) The package thermal impedance is calculated in accordance with JESD 51-7.

The package thermal impedance is calculated in accordance with JESD 51-5. (5)

(6)

For the D package: above 70°C, the value of  $P_{tot}$  derates linearly with 8 mW/K. For the DB, NS, and PW packages: above 60°C, the value of  $P_{tot}$  derates linearly with 5.5 mW/K. (7)

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# Recommended Operating Conditions<sup>(1)</sup>

			T <sub>A</sub> = 25°C		-40 T	D 85°C	–40 TO		
			MIN	MAX	MIN	MAX	MIN	MAX	UNIT
V	Cupply yeltogo	Operating	1.65	3.6	1.65	3.6	1.65	3.6	V
V <sub>CC</sub>	Supply voltage	Data retention only	1.5		1.5		1.5		v
		$V_{CC} = 1.65 \text{ V} \text{ to } 1.95 \text{ V}$	$0.65  imes V_{CC}$		$0.65 \times V_{CC}$		$0.65  imes V_{CC}$		
V <sub>IH</sub>	High-level input voltage	$V_{CC}$ = 2.3 V to 2.7 V	1.7		1.7		1.7		V
	input voltage	$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2		2		2		
		$V_{CC}$ = 1.65 V to 1.95 V		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$	
V <sub>IL</sub>	Low-level input voltage	$V_{CC}$ = 2.3 V to 2.7 V		0.7		0.7		0.7	V
input	input voltage	V <sub>CC</sub> = 2.7 V to 3.6 V		0.8		0.8		0.8	
VI	Input voltage		0	5.5	0	5.5	0	5.5	V
Vo	Output voltage		0	V <sub>CC</sub>	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.65 V		-4		-4		-4	
	High-level	V <sub>CC</sub> = 2.3 V		-8		-8		-8	A
I <sub>OH</sub>	output current	V <sub>CC</sub> = 2.7 V		-12		-12		-12	mA
		$V_{CC} = 3 V$		-24		-24		-24	
		V <sub>CC</sub> = 1.65 V		4		4		4	
	Low-level output current	V <sub>CC</sub> = 2.3 V		8		8		8	
IOL		V <sub>CC</sub> = 2.7 V		12		12		12	mA
		$V_{CC} = 3 V$		24		24		24	
$\Delta t/\Delta v$	Input transition ri	se or fall rate		10		10		10	ns/V

(1) All unused inputs of the device must be held at V<sub>CC</sub> 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)

	TEST CONDITIONS	V	T <sub>A</sub> = 25°C			–40 TO 85°C		–40 TO 125°C			
PARAMETER	TEST CONDITIONS	V <sub>cc</sub>	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
	I <sub>OH</sub> = -100 μA	1.65 V to 3.6 V	V <sub>CC</sub> – 0.2			V <sub>CC</sub> – 0.2		$V_{CC} - 0.3$			
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.29			1.2		1.05			
V	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9			1.7		1.55		V	
V <sub>OH</sub>	1 10 m 4	2.7 V	2.2			2.2		2.05		v	
	I <sub>OH</sub> = -12 mA	3 V	2.4			2.4		2.25			
	$I_{OH} = -24 \text{ mA}$	3 V	2.3			2.2		2			
	I <sub>OL</sub> = 100 μA	1.65 V to 3.6 V			0.1		0.2		0.3		
	$I_{OL} = 4 \text{ mA}$	1.65 V			0.24		0.45		0.6		
V <sub>OL</sub>	I <sub>OL</sub> = 8 mA	2.3 V			0.3		0.7		0.75 V		
	I <sub>OL</sub> = 12 mA	2.7 V			0.4		0.4		0.6		
	I <sub>OL</sub> = 24 mA	3 V			0.55		0.55		0.8		
I <sub>I</sub>	$V_{I} = 5.5 V \text{ or GND}$	3.6 V			±1		±5		±20	μA	
I <sub>OZ</sub>	$V_0 = V_{CC}$ or GND	3.6 V			±1		±10		±20	μA	
I <sub>CC</sub>	$V_{I} = V_{CC} \text{ or } GND, \qquad I_{O} = 0$	3.6 V			1		10		40	μA	
$\Delta I_{CC}$	One input at $V_{CC}$ – 0.6 V, Other inputs at $V_{CC}$ or GND	2.7 V to 3.6 V			500		500		5000	μA	
Ci	$V_{I} = V_{CC}$ or GND	3.3 V		4.5						pF	
Co	$V_{O} = V_{CC}$ or GND	3.3 V		7						pF	

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## **Switching Characteristics**

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

	FROM	то	V	Τ <sub>4</sub>	T <sub>A</sub> = 25°C		–40 TO	85°C	<b>-40 TO</b> 1	25°C	
PARAMETER	(INPUT)	(OUTPUT)	V <sub>cc</sub>	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNI
			1.8 V ± 0.15 V	1	4.2	9.3	1	9.8	1	11.3	
	٨	Y	$2.5~V\pm0.2~V$	1	2.7	6.7	1	7.2	1	9.3	
t <sub>pd</sub>	A	ř	2.7 V	1	2.9	5	1	5.2	1	6.5	ns
			$3.3~\text{V}\pm0.3~\text{V}$	1	2.5	4.5	1	4.7	1	6	
	OE		$1.8 \text{ V} \pm 0.15 \text{ V}$	1	4.8	9.5	1	10	1	11.5	ns
		Y	$2.5~V\pm0.2~V$	1	2.8	7.8	1	8.3	1	10.4	
t <sub>en</sub>		Y	2.7 V	1	3.1	6.1	1	6.3	1	8	
			$3.3~\text{V}\pm0.3~\text{V}$	1	2.5	5.5	1	5.7	1	7.5	
			1.8 V ± 0.15 V	1	4.4	12.1	1	12.6	1	14.1	
t <sub>dis</sub>	05	V	$2.5~V\pm0.2~V$	1	2.7	8.2	1	8.7	1	10.8	ns
	OE	Y	2.7 V	1	2.7	6.5	1	6.7	1	8.5	
			$3.3~\text{V}\pm0.3~\text{V}$	1.3	2.3	5.8	1.3	6	1.3	7.5	
t <sub>sk(o)</sub>			3.3 V ± 0.3 V					1		1.5	ns

TEXAS INSTRUMENTS

www.ti.com

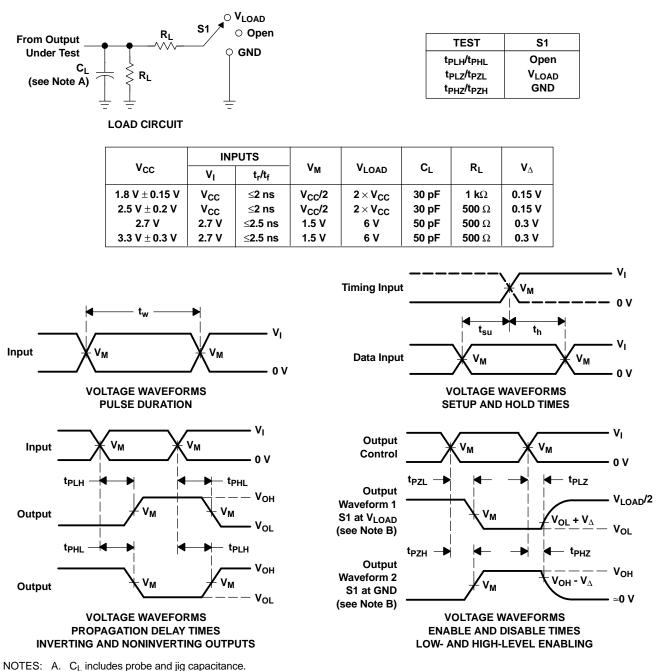
# **Operating Characteristics**

 $T_A = 25^{\circ}C$ 

	PARAMETER	TEST CONDITIONS	v <sub>cc</sub>	ТҮР	UNIT	
				1.8 V	20	pF
		Outputs enabled		2.5 V	21	
<u> </u>	Power dissipation capacitance per gate		f = 10 MHz	3.3 V	22	
C <sub>pd</sub>				1.8 V	2	
		Outputs disabled		2.5 V	3	
				3.3 V	4	

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#### PARAMETER MEASUREMENT INFORMATION



- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz, Z<sub>0</sub> = 50  $\Omega$ .
- D. The outputs are measured one at a time, with one transition per measurement.
- E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
- H. All parameters and waveforms are not applicable to all devices.

#### Figure 1. Load Circuit and Voltage Waveforms

6-Dec-2006

### **PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74LVC126AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI
SN74LVC126ADBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADGVR	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADGVRE4	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ADTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ANSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWLE	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI
SN74LVC126APWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126APWTE4	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC126ARGYR	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SN74LVC126ARGYRG4	ACTIVE	QFN	RGY	14	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR

(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), 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.

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PLASTIC SMALL-OUTLINE

MPDS006C - FEBRUARY 1996 - REVISED AUGUST 2000

## DGV (R-PDSO-G\*\*)

24 PINS SHOWN



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 per side.
- D. Falls within JEDEC: 24/48 Pins MO-153

14/16/20/56 Pins – MO-194



D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



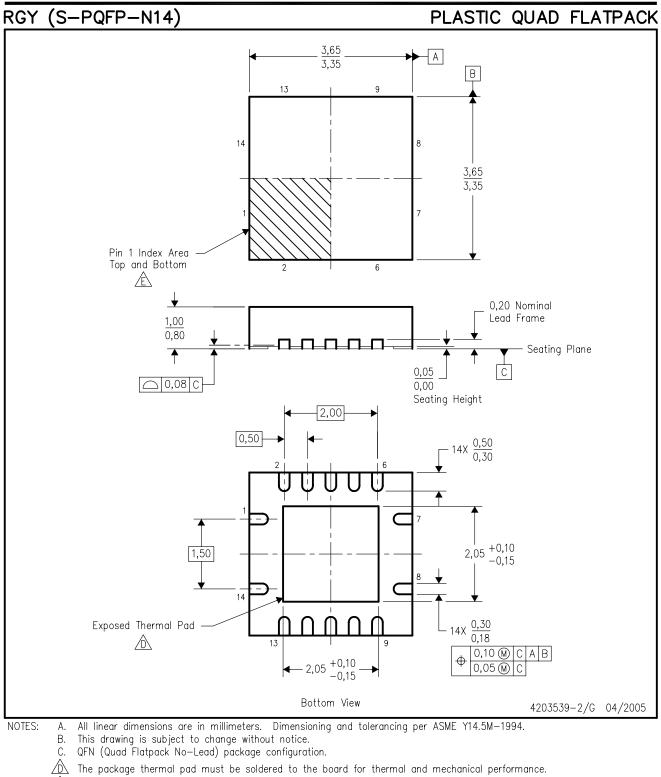
NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- 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.

Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.

E. Reference JEDEC MS-012 variation AB.





Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.

F. Package complies to JEDEC MO-241 variation BA.



## PLASTIC SMALL-OUTLINE PACKAGE

#### 0,51 0,35 ⊕0,25⊛ 1,27 8 14 0,15 NOM 5,60 8,20 5,00 7,40 $\bigcirc$ Gage Plane ₽ 0,25 7 1 1,05 0,55 0-10 Δ 0,15 0,05 Seating Plane — 2,00 MAX 0,10PINS \*\* 14 16 20 24 DIM 10,50 10,50 12,90 15,30 A MAX A MIN 9,90 9,90 12,30 14,70 4040062/C 03/03

NOTES: A. All linear dimensions are in millimeters.

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

**14-PINS SHOWN** 

- 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



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



MTSS001C - JANUARY 1995 - REVISED FEBRUARY 1999

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

### PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



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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