

#### **FEATURES**

- Member of the Texas Instruments Widebus™
  Family
- Operates From 1.65 V to 3.6 V
- Max t<sub>pd</sub> of 3.6 ns at 3.3 V
- ±24-mA Output Drive at 3.3 V
- 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)
  - 1000-V Charged-Device Model (C101)

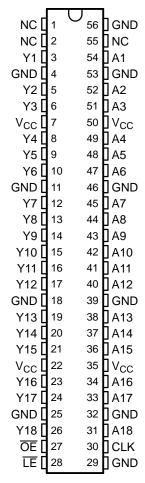
#### **DESCRIPTION/ORDERING INFORMATION**

This 18-bit universal bus driver is designed for 1.65-V to 3.6-V  $V_{\rm CC}$  operation.

Data flow from A to Y is controlled by the output-enable  $(\overline{OE})$  input. The device operates in the transparent mode when the latch-enable  $(\overline{LE})$  input is low. The A data is latched if the clock (CLK) input is held at a high or low logic level. If  $\overline{LE}$  is high, the A data is stored in the latch/flip-flop on the low-to-high transition of CLK. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

# DGG, DGV, OR DL PACKAGE (TOP VIEW)



NC - No internal connection

#### ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING	
	SSOP - DL	Tube	SN74ALVC16834DL	ALVC16834	
	330P - DL	Tape and reel	SN74ALVC16834DLR	ALVC10034	
-40°C to 85°C	TSSOP - DGG	Tape and reel	SN74ALVC16834DGGR	ALVC16834	
-40 C to 65 C	TVSOP - DGV	Tape and reel	SN74ALVC16834DGVR	VC834	
	VFBGA - GQL	Tana and root	SN74ALVC16834GQLR	V/C024	
	VFBGA - ZQL (Pb-free)	Tape and reel	SN74ALVC16834ZQLR	VC834	

(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.

Widebus is a trademark of Texas Instruments.



# GQL OR ZQL PACKAGE (TOP VIEW)

#### 1 2 3 4 5 6 000000 000000 В 000000 С 000000 D $\bigcirc$ $\bigcirc$ Ε OO $\bigcirc$ F 000000 G 000000 Н 000000 J 000000

### TERMINAL ASSIGNMENTS(1)

	1	2	3	4	5	6
Α	Y1	NC	NC	GND	NC	A1
В	Y3	Y2	GND	GND	A2	А3
С	Y5	Y4	V <sub>CC</sub>	V <sub>CC</sub>	A4	A5
D	Y7	Y6	GND	GND	A6	A7
Ε	Y9	Y8			A8	A9
F	Y10	Y11			A11	A10
G	Y12	Y13	GND	GND	A13	A12
Н	Y14	Y15	V <sub>CC</sub>	V <sub>CC</sub>	A15	A14
J	Y16	Y17	GND	GND	A17	A16
K	Y18	ŌE	LE	GND	CLK	A18

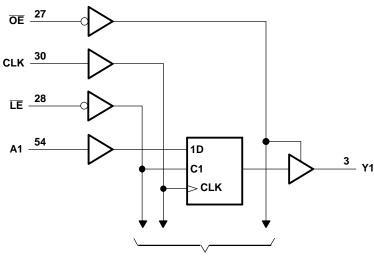
(1) NC - No internal connection

### **FUNCTION TABLE**

	INF	PUTS		OUTPUT
ŌĒ	LE	CLK	Α	Y
Н	Χ	X	Χ	Z
L	L	X	L	L
L	L	X	Н	Н
L	Н	$\uparrow$	L	L
L	Н	$\uparrow$	Н	Н
L	Н	Н	Χ	Y <sub>0</sub> <sup>(1)</sup>
L	Н	L	Χ	Y <sub>0</sub> <sup>(2)</sup>

- (1) Output level before the indicated steady-state input conditions were established, provided that CLK is high before LE goes high
- (2) Output level before the indicated steady-state input conditions were established

## **LOGIC DIAGRAM (POSITIVE LOGIC)**



To 17 Other Channels

Pin numbers shown are for the DGG, DGV, and DL packages.





## **ABSOLUTE MAXIMUM RATINGS**(1)

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

			MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range		-0.5	4.6	V	
V <sub>I</sub>	Input voltage range <sup>(2)</sup>		-0.5	4.6	V	
Vo	Output voltage range <sup>(2)(3)</sup>	Output voltage range (2)(3)				
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-50	mA	
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50	mA	
lo	Continuous output current		±50	mA		
	Continuous current through each V <sub>CC</sub> or C	GND		±100	mA	
		DGG package		64		
0	Dealer as the second instruction of (4)	DGV package		48	0000	
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	DL package		56	°C/W	
		GQL/ZQL package		42		
T <sub>stg</sub>	Storage temperature range		-65	150	°C	

<sup>(1)</sup> 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.

## **RECOMMENDED OPERATING CONDITIONS<sup>(1)</sup>**

			MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage		1.65	3.6	V	
		V <sub>CC</sub> = 1.65 V to 1.95 V	$0.65 \times V_{CC}$			
$V_{IH}$	High-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7		V	
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2			
		V <sub>CC</sub> = 1.65 V to 1.95 V		$0.35 \times V_{CC}$		
$V_{IL}$	Low-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V	
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$		0.8		
VI	Input voltage		0	3.6	V	
Vo	Output voltage		0	V <sub>CC</sub>	V	
		V <sub>CC</sub> = 1.65 V		-4		
	High lavel autout august	V <sub>CC</sub> = 2.3 V		-12	mA	
I <sub>OH</sub>	High-level output current	$V_{CC} = 2.7 \text{ V}$		-12		
		V <sub>CC</sub> = 3 V		-24		
		V <sub>CC</sub> = 1.65 V		4		
	Low lovel output ourrent	V <sub>CC</sub> = 2.3 V		12		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2.7 V		12	mA	
		V <sub>CC</sub> = 3 V		24		
Δt/Δν	Input transition rise or fall rate			10	ns/V	
T <sub>A</sub>	Operating free-air temperature		-40	85	°C	

<sup>(1)</sup> 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.

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

<sup>(3)</sup> This value is limited to 4.6 V maximum.

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

SCES140I-JULY 1998-REVISED OCTOBER 2004



## **ELECTRICAL CHARACTERISTICS**

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

P	ARAMETER	TEST CONDITIONS	V <sub>cc</sub>	MIN TYF	<sup>(1)</sup> MAX	UNIT		
		$I_{OH} = -100  \mu A$	1.65 V to 3.6 V	V <sub>CC</sub> - 0.2				
		$I_{OH} = -4 \text{ mA}$	1.65 V	1.2				
		$I_{OH} = -6 \text{ mA}$	2.3 V	2				
$V_{OH}$			2.3 V	1.7		V		
		I <sub>OH</sub> = -12 mA	2.7 V	2.2				
			3 V	2.4				
		I <sub>OH</sub> = -24 mA	3 V	2				
		I <sub>OL</sub> = 100 μA	1.65 V to 3.6 V		0.2			
		I <sub>OL</sub> = 4 mA	1.65 V		0.45			
.,		I <sub>OL</sub> = 6 mA	2.3 V		0.4	V		
V <sub>OL</sub>		1 40 50	2.3 V		0.7			
		I <sub>OL</sub> = 12 mA	2.7 V		0.4			
		I <sub>OL</sub> = 24 mA	3 V		0.55			
I		$V_{I} = V_{CC}$ or GND	3.6 V		±5	μΑ		
l <sub>OZ</sub>		$V_O = V_{CC}$ or GND	3.6 V		±10	μΑ		
I <sub>CC</sub>		$V_I = V_{CC}$ or GND, $I_O = 0$	3.6 V		40	μΑ		
$\Delta I_{CC}$		One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	3 V to 3.6 V		750	μΑ		
_	Control inputs	V V T OND	0.01/	4				
Ci	Data inputs	$V_1 = V_{CC}$ or GND	3.3 V		pF			
Co	Outputs	$V_O = V_{CC}$ or GND	3.3 V		7	pF		

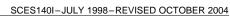
<sup>(1)</sup> All typical values are at  $V_{CC}$  = 3.3 V,  $T_A$  = 25°C.

## **TIMING REQUIREMENTS**

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

				V <sub>CC</sub> = 1.8 V MIN MAX		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 2.7 V		$V_{CC}$ = 3.3 V $\pm$ 0.3 V		UNIT	
						MIN	MAX	MIN	MAX	MIN	MAX		
f <sub>clock</sub>	Clock frequency	У			(1)		150		150		150	MHz	
t Dules duration	LE low		(1)		3.3		3.3		3.3				
t <sub>w</sub>	Pulse duration	CLK high or low		(1)		3.3		3.3		3.3		ns	
		Data before CLK↑		(1)		2.1		2.1		1.7			
t <sub>su</sub>	Setup time	Data hafara ITA	CLK high	(1)		2.2		2.3		1.9		ns	
		Data before LE↑	CLK low	(1)		1.5		1.9		1.5			
		Data after CLK↑		(1)		0.6		0.6		0.7			
t <sub>h</sub>	Hold time	Data after LE↑	CLK high or low	(1)		0.8		0.8		0.9		ns	

<sup>(1)</sup> This information was not available at the time of publication.





## **SWITCHING CHARACTERISTICS**

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

PARAMETER	PARAMETER FROM		V <sub>CC</sub> =	V <sub>CC</sub> = 1.8 V		$V_{CC}$ = 2.5 V $\pm$ 0.2 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V	
	(INPUT)	(OUTPUT)	MIN	TYP	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			(1)		150		150		150		MHz
	Α			(1)	1	4.4		4.2	1	3.6	
t <sub>pd</sub>	ĪĒ	Y		(1)	1.3	6		5.9	1.5	4.9	ns
	CLK			(1)	1.2	6		5.3	1.5	4.6	
t <sub>en</sub>	ŌĒ	Υ		(1)	1.4	5.6		5.6	1.5	5	ns
t <sub>dis</sub>	ŌĒ	Y		(1)	1	4		4.7	1.8	4.5	ns

<sup>(1)</sup> This information was not available at the time of publication.

### **SWITCHING CHARACTERISTICS**

from  $0^{\circ}$ C to  $65^{\circ}$ C,  $C_{L} = 50 \text{ pF}$ 

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 1 ± 0.1	UNIT		
	(INFOT)	(001701)	MIN	MAX		
t <sub>p</sub>	d	CLK	Y	1.7	4.3	ns

## **OPERATING CHARACTERISTICS**

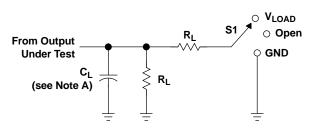
 $T_A = 25^{\circ}C$ 

PARAMETER		TEST (	CONDITIONS	V <sub>CC</sub> = 1.8 V TYP	V <sub>CC</sub> = 2.5 V TYP	V <sub>CC</sub> = 3.3 V TYP	UNIT	
_	Dower dissination conscitance	Outputs enabled	0 0	f = 10 MHz	(1)	38	41	~F
$C_{pd}$	Power dissipation capacitance	Outputs disabled	$C_L = 0$ ,	I = IU IVIDZ	(1)	13	15	рF

 $<sup>\</sup>begin{tabular}{ll} \begin{tabular}{ll} \be$ 



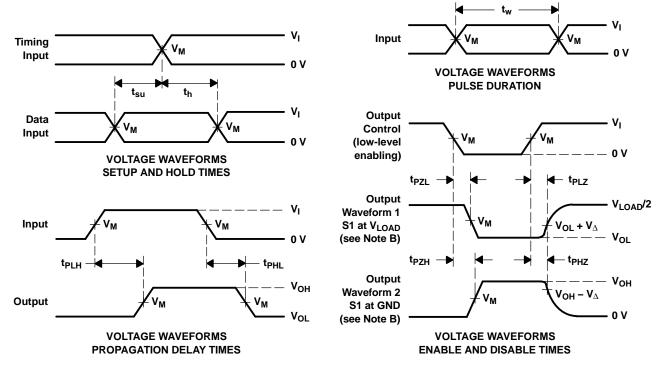
### PARAMETER MEASUREMENT INFORMATION



TEST	S1		
t <sub>pd</sub> t <sub>PLZ</sub> /t <sub>PZL</sub>	Open V <sub>LOAD</sub>		
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND		

LOAD CIRCUIT

V	INPUT		V	v		В	V
V <sub>CC</sub>	VI	t <sub>r</sub> /t <sub>f</sub>	V <sub>M</sub>	V <sub>LOAD</sub>	CL	R <sub>L</sub>	$oldsymbol{V}_\Delta$
1.8 V	V <sub>CC</sub>	≤ <b>2</b> ns	V <sub>CC</sub> /2	2×V <sub>CC</sub>	30 pF	<b>1 k</b> Ω	0.15 V
2.5 V $\pm$ 0.2 V	V <sub>CC</sub>	≤2 ns	V <sub>CC</sub> /2	2×V <sub>CC</sub>	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
3.3 V $\pm$ 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V



NOTES: A. C<sub>L</sub> includes probe and jig capacitance.

- 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,  $Z_{O} = 50 \Omega$ .
- 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





20-Aug-2011

#### **PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
74ALVC16834DGGRE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
74ALVC16834DGGRG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
74ALVC16834DGVRE4	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
74ALVC16834DGVRG4	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALVC16834DGGR	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALVC16834DGVR	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALVC16834DL	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALVC16834DLG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74ALVC16834ZQLR	ACTIVE	BGA MICROSTAR JUNIOR	ZQL	56	1000	Green (RoHS & no Sb/Br)	SNAGCU	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.

**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>(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.



## **PACKAGE OPTION ADDENDUM**

20-Aug-2011

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

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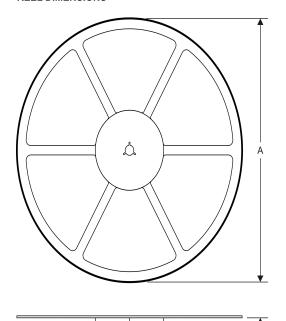
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## PACKAGE MATERIALS INFORMATION

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## TAPE AND REEL INFORMATION

### **REEL DIMENSIONS**



### **TAPE DIMENSIONS**



A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

## TAPE AND REEL INFORMATION

### \*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALVC16834DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
SN74ALVC16834DGVR	TVSOP	DGV	56	2000	330.0	24.4	6.8	11.7	1.6	12.0	24.0	Q1
SN74ALVC16834ZQLR	BGA MI CROSTA R JUNI OR	ZQL	56	1000	330.0	16.4	4.8	7.3	1.5	8.0	16.0	Q1

**PACKAGE MATERIALS INFORMATION** 

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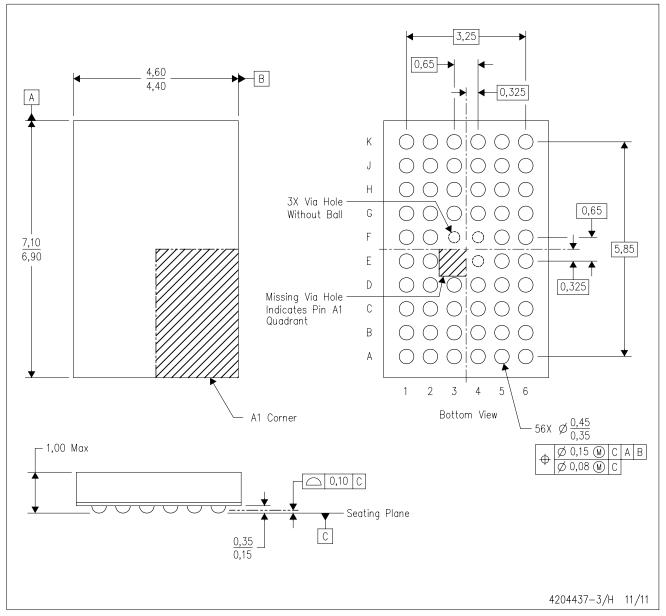


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVC16834DGGR	TSSOP	DGG	56	2000	367.0	367.0	45.0
SN74ALVC16834DGVR	TVSOP	DGV	56	2000	367.0	367.0	45.0
SN74ALVC16834ZQLR	BGA MICROSTAR JUNIOR	ZQL	56	1000	333.2	345.9	28.6

# ZQL (R-PBGA-N56)

## PLASTIC BALL GRID ARRAY



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

- B. This drawing is subject to change without notice.
- C. Falls within JEDEC MO-285 variation BA-2.
- D. This package is Pb-free. Refer to the 56 GQL package (drawing 4200583) for tin-lead (SnPb).

MicroStar Junior is a trademark of Texas Instruments



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

### **24 PINS SHOWN**

### **PLASTIC SMALL-OUTLINE**



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



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

### **48 PINS SHOWN**

#### 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 MO-118

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

## PLASTIC SMALL-OUTLINE PACKAGE

#### **48 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 protrusion not to exceed 0,15.

D. Falls within JEDEC MO-153

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