

SCBS300G-MARCH 1994-REVISED JANUARY 2006

# FEATURES

FEATURES	SN54ABT16245AWD PACKAGE
<ul> <li>Members of the Texas Instruments</li></ul>	SN74ABT16245A DGG, DGV, OR DL PACKAGE
Widebus™ Family	(TOP VIEW)
<ul> <li>State-of-the-Art EPIC-IIB<sup>™</sup> BiCMOS Design Significantly Reduces Power Dissipation</li> </ul>	
<ul> <li>Typical V<sub>OLP</sub> (Output Ground Bounce) &lt;1 V at</li></ul>	1B1 2 47 1A1
V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C	1B2 3 46 1A2
<ul> <li>High-Impedance State During Power Up and Power Down</li> </ul>	GND 4 45 GND 1B3 5 44 1A3 1B4 6 43 1A4
<ul> <li>Distributed V<sub>CC</sub> and GND Pin Configuration</li></ul>	$V_{CC} \begin{bmatrix} 1 & 43 \\ 7 & 42 \end{bmatrix} V_{CC}$
Minimizes High-Speed Switching Noise	1B5 $\begin{bmatrix} 8 & 41 \end{bmatrix}$ 1A5
<ul> <li>Flow-Through Architecture Optimizes PCB</li></ul>	1B6 [] 9 40 ] 1A6
Layout	GND [] 10 39 ] GND
<ul> <li>High-Drive Outputs (–32-mA I<sub>OH</sub>, 64-mA I<sub>OL</sub>)</li> </ul>	1B7 <b>[</b> 11 38 <b>]</b> 1A7
<ul> <li>Latch-Up Performance Exceeds 500 mA Per</li></ul>	1B8 0 12 37 0 1A8
JESD 70	2B1 0 13 36 0 2A1
<ul> <li>ESD Protection Exceeds 2000 V Per</li></ul>	2B2   14 35   2A2
MIL-STD-883, Method 3015; Exceeds 200 V	GND   15 34   GND
Using Machine Model (C = 200 pF, R = 0)	2B3   16 33   2A3
<ul> <li>Package Options Includes Plastic Thin Very Small-Outline (DGV), Shrink Small-Outline (DL), and Thin Shrink Small-Outline (DGG)</li> </ul>	2B4 0 17 32 0 2A4 V <sub>CC</sub> 0 18 31 0 V <sub>CC</sub> 2B5 0 19 30 0 2A5 2B6 0 20 29 0 2A6
Packages and 380-mil Fine-Pitch Ceramic	GND 21 28 GND
(WD) Flat Package Using 25-mil	2B7 22 27 2A7
Center-to-Center Spacings	2B8 23 26 2A8
	2DIR 24 25 2 <del>0E</del>

### DESCRIPTION

The 'ABT16245A devices are 16-bit noninverting 3-state transceivers designed for synchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

These devices can be used as two 8-bit transceviers or one 16-bit transceiver. They allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

When V<sub>CC</sub> is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impendance state above 2.1 V, OE should be tied to V<sub>CC</sub> through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT16245A is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74ABT16245A is characterized for operation from -40°C to 85°C.



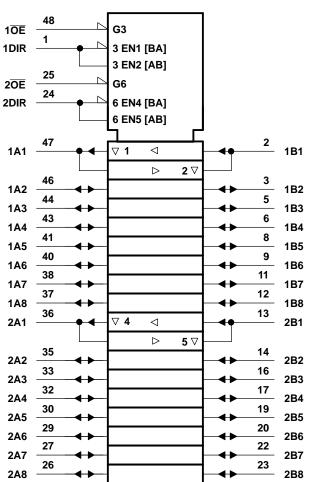
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#### FUNCTION TABLE (EACH 8-BIT SECTION)

INP	UTS	OPERATION
OE	DIR	OFERATION
L	L	B data to A bus
L	Н	A data to B bus
н	Х	Isolation

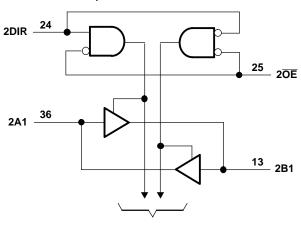


#### LOGIC SYMBOL<sup>(1)</sup>

(1) This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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# 1DIR 1 48 10E 1A1 47 1A1 47 To Seven Other Channels



**To Seven Other Channels** 

### 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	7	V	
VI	Input voltage range (except I/O ports) <sup>(2)</sup>		-0.5	7	V	
Vo	Voltage range applied to any output in the high c	r power-off state	-0.5	5.5	V	
	Current into any output in the low state	SN54ABT16245A		96	mA	
I <sub>O</sub>	Current into any output in the low state	SN74ABT16245A		128		
I <sub>IK</sub>	Input clamp current	V <sub>1</sub> < 0		-18	mA	
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50	mA	
		DGG package		89		
$\theta_{JA}$	Package thermal impedance <sup>(3)</sup>	DGV package		93	°C/W	
		DL package		94		
T <sub>stg</sub>	Storage temperature range		-65	150	°C	

LOGIC DIAGRAM (POSITIVE LOGIC)

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

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

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

			SN54ABT	16245A	SN74ABT	16245A	UNIT
			MIN	MAX	MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage		4.5	5.5	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage		2		2		V
V <sub>IL</sub>	Low-level input voltage		0.8		0.8	V	
VI	Input voltage	0	$V_{CC}$	0	$V_{CC}$	V	
I <sub>OH</sub>	High-level output current			-24		-32	mA
I <sub>OL</sub>	Low-level output current			48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		10		10	ns/V
$\Delta t / \Delta V_{CC}$	Power-up ramp rate	200		200		μs/V	
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C	

 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.



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### **Electrical Characteristics**

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

		TEAT OF	-	T <sub>A</sub> = 25°	0	SN54ABT	16245A	SN74ABT16245A			
PAR	AMETER	TEST CC	ONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	MIN	MAX	MIN	MAX	UNIT
V <sub>IK</sub>		V <sub>CC</sub> = 4.5 V,	I <sub>I</sub> = -18 mA			-1.2		-1.2		-1.2	V
		V <sub>CC</sub> = 4.5 V,	I <sub>OH</sub> = -3 mA	2.5			2.5		2.5		
		$V_{CC} = 5 V$ , $I_{OH} = -3 mA$		3			3		3		v
V <sub>OH</sub>		V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -24 mA	2			2				V
		$v_{\rm CC} = 4.5 \ v$	I <sub>OH</sub> = -32 mA	2 <sup>(2)</sup>					2		1
V	$V_{OL}$ $V_{CC} = 4.5 V$		I <sub>OL</sub> = 48 mA			0.55		0.55			v
V <sub>OL</sub>		$v_{\rm CC} = 4.5 v$	I <sub>OL</sub> = 64 mA			0.55 <sup>(2)</sup>				0.55	v
V <sub>hys</sub>					100						mV
	Control inputs	$V_{CC} = 0$ to 5.5 V, $V_{I} = V_{CC}$	/ <sub>CC</sub> or GND			±1		±1		±1	
I <sub>I</sub>	A or B port	$V_{CC} = 2.1 \text{ V to } 5.5 \text{ V}, \text{ V}$	I = V <sub>CC</sub> or GND			±20 <sup>(2)</sup>		±100		±20	μA
I <sub>OZPU</sub>		$V_{CC}$ = 0 to 2.1 V, $V_{O}$ =	0.5 V to 2.7 V, OE = X			±50 <sup>(3)</sup>		±50 <sup>(3)</sup>		±50	μΑ
I <sub>OZPD</sub>		$V_{CC}$ = 2.1 V to 0, $V_{O}$ =			±50 <sup>(3)</sup>		±50 <sup>(3)</sup>		±50	μΑ	
I <sub>OZH</sub> <sup>(4)</sup>		$V_{CC} = 2.1 \text{ V to } 5.5 \text{ V}, \text{ V}$			10 <sup>(5)</sup>		10		10 <sup>(5)</sup>	μΑ	
I <sub>OZL</sub> <sup>(4)</sup>		$V_{CC} = 2.1 \text{ V to } 5.5 \text{ V}, \text{ V}$	<sup>7</sup> <sub>O</sub> = 0.5 V, OE ≥ 2 V			-10 <sup>(5)</sup>		-10		-10 <sup>(5)</sup>	μΑ
I <sub>off</sub>		$V_{CC} = 0,$	$V_{I} \text{ or } V_{O} \leq 5.5 \text{ V}$			±100				±100	μΑ
I <sub>CEX</sub>		$V_{CC} = 5.5 V,$ $V_{O} = 5.5 V$	Outputs high			50		50		50	μA
I <sub>O</sub> <sup>(6)</sup>		V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.5 V	-50	-100	-180	-50	-180	-50	-180	mA
			Outputs high			2		2		2	
I <sub>CC</sub>	A or B port	$V_{CC} = 5.5 \text{ V}, I_O = 0,$ $V_I = V_{CC} \text{ or GND}$	Outputs low			32		32		32	mA
	pon		Outputs disabled			2		2		2	
		$V_{\rm CC} = 5.5  \rm V,$	Outputs enabled			2		1.5		2	
$\Delta I_{CC}^{(7)}$	Data inputs	One inputs at 3.4 V, Other inputs at $V_{CC}$ or GND	Outputs disabled		0.05			1		0.05	mA
	$\begin{array}{c} \text{Control} \\ \text{inputs} \end{array} \begin{array}{c} \text{V}_{\text{CC}} = 5.5 \text{ V}, \text{ One input at} \\ \text{Other inputs at } \text{V}_{\text{CC}} \text{ or GN} \end{array}$					1.5		1.5		1.5	
Ci	Control inputs	V <sub>I</sub> = 2.5 V or 0.5 V			3						pF
Co	A or B port	$V_0 = 2.5 \text{ V or } 0.5 \text{ V}$			6						pF

(1)

(2)

All typical values are at  $V_{CC}$  = 5 V. On products compliant to MIL-PRF-38535, this parameter does not apply. On products compliant to MIL-PRF-38535, this parameter is not production tested. (3)

(4) The parameters  $I_{\text{OZH}}$  and  $I_{\text{OZL}}$  include the input leakage current.

This limit may vary among suppliers. (5)

(6) Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

(7) This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V<sub>CC</sub> or GND. SCBS300G-MARCH 1994-REVISED JANUARY 2006

### **Switching Characteristics**

over recommended operating ranges of supply voltage and operating free-air temperature,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1)

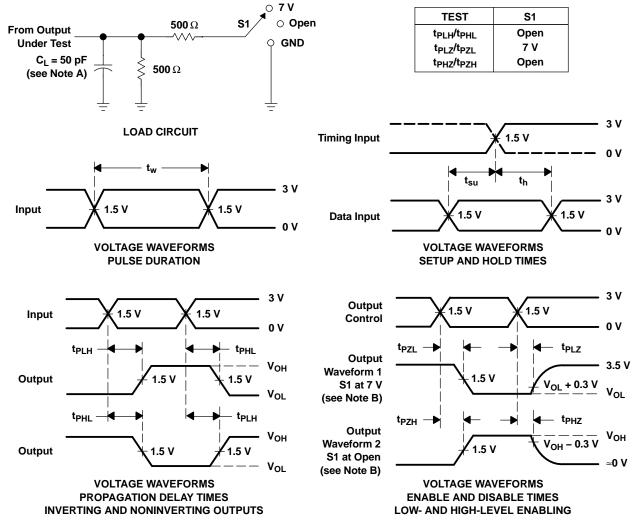
				SN54ABT16245A					
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>C</sub> T	<sub>CC</sub> = 5 V, <sub>A</sub> = 25°C		MIN	МАХ	UNIT	
			MIN	TYP	MAX				
t <sub>PLH</sub>	A or B	B or A	0.5	2.2	3.4	0.5	4	ns	
t <sub>PHL</sub>		BUIA	0.5	2.3	3.8	0.5	4.6		
t <sub>PZH</sub>	OE	B or A	0.8	3.6	5.2	0.8	5.5	ns	
t <sub>PZL</sub>	OL	BUIA	0.9	3.7	6.1	0.1	7.3	115	
t <sub>PHZ</sub>	OE	B or A	1.3	4.4	5.8	1.3	6.3	ns	
t <sub>PLZ</sub>	0L	BUX	1.4	3.3	4.7	1.4	5.5	115	

### **Switching Characteristics**

over recommended operating ranges of supply voltage and operating free-air temperature,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1 )

				SN74	ABT162	45A		
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>C</sub> T	<sub>CC</sub> = 5 V <sub>A</sub> = 25°C		MIN	МАХ	UNIT
			MIN	TYP	MAX			
t <sub>PLH</sub>	A or D	B or A	1	2.2	3.4	1	3.9	~~
t <sub>PHL</sub>	A or B	D OF A	1	2.3	3.7	1	4.2	ns
t <sub>PZH</sub>	OE	B or A	1	3.6	5.2	1	6.3	20
t <sub>PZL</sub>	UE	BUIA	1	3.7	5.4	1	6.4	ns
t <sub>PHZ</sub>	ŌĒ	B or A	2	4.4	5.8	2	6.3	ns
t <sub>PLZ</sub>	OL	DUIA	1.5	3.3	4.7	1.5	5.2	115

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### PARAMETER MEASUREMENT INFORMATION

NOTES: A. CL 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<sub>O</sub> = 50  $\Omega$ , t<sub>r</sub>  $\leq$  2.5 ns, t<sub>f</sub>  $\leq$  2.5 ns.

D. The outputs are measured one at a time, with one transition per measurement.

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



10-Jun-2014

### PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9317501MXA	ACTIVE	CFP	WD	48	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9317501MX A SNJ54ABT16245A WD	Samples
74ABT16245ADGGRG4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SN74ABT16245ADGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SN74ABT16245ADGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AH245A	Samples
SN74ABT16245ADL	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SN74ABT16245ADLG4	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SN74ABT16245ADLR	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SN74ABT16245ADLRG4	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16245A	Samples
SNJ54ABT16245AWD	ACTIVE	CFP	WD	48	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9317501MX A SNJ54ABT16245A WD	Samples

<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.



# PACKAGE OPTION ADDENDUM

10-Jun-2014

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.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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#### OTHER QUALIFIED VERSIONS OF SN54ABT16245A, SN74ABT16245A :

- Catalog: SN74ABT16245A
- Enhanced Product: SN74ABT16245A-EP, SN74ABT16245A-EP
- Military: SN54ABT16245A

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Enhanced Product Supports Defense, Aerospace and Medical Applications
- Military QML certified for Military and Defense Applications

# PACKAGE MATERIALS INFORMATION

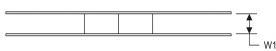
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### TAPE AND REEL INFORMATION

#### REEL DIMENSIONS

TEXAS INSTRUMENTS





#### TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	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

*All dimensions are nominal	

TAPE AND REEL INFORMATION

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
SN74ABT16245ADGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1
SN74ABT16245ADGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74ABT16245ADLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

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# PACKAGE MATERIALS INFORMATION

14-Jul-2012



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT16245ADGGR	TSSOP	DGG	48	2000	367.0	367.0	45.0
SN74ABT16245ADGVR	TVSOP	DGV	48	2000	367.0	367.0	38.0
SN74ABT16245ADLR	SSOP	DL	48	1000	367.0	367.0	55.0

### **MECHANICAL DATA**

MCFP010B - JANUARY 1995 - REVISED NOVEMBER 1997

#### **CERAMIC DUAL FLATPACK**

#### WD (R-GDFP-F\*\*)

48 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only
  - E. Falls within MIL STD 1835: GDFP1-F48 and JEDEC MO-146AA
    - GDFP1-F56 and JEDEC MO-146AB



# **MECHANICAL DATA**

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



DL (R-PDSO-G48)

PLASTIC SMALL-OUTLINE PACKAGE



- 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

PowerPAD is a trademark of Texas Instruments.



# **MECHANICAL DATA**

MTSS003D - JANUARY 1995 - REVISED JANUARY 1998

#### 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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