

- Member of the Texas Instruments Widebus™ Family
- DOC™ (Dynamic Output Control) Circuit Dynamically Changes Output Impedance, Resulting in Noise Reduction Without Speed Degradation
- Dynamic Drive Capability Is Equivalent to Standard Outputs With I_{OH} and I_{OL} of ± 24 mA at 2.5-V V_{CC}
- Overvoltage-Tolerant Inputs/Outputs Allow Mixed-Voltage-Mode Data Communications
- I_{off} Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

description

A Dynamic Output Control (DOC™) circuit is implemented, which, during the transition, initially lowers the output impedance to effectively drive the load and, subsequently, raises the impedance to reduce noise. Figure 1 shows typical V_{OL} vs I_{OL} and V_{OH} vs I_{OH} curves to illustrate the output impedance and drive capability of the circuit. At the beginning of the signal transition, the DOC circuit provides a maximum dynamic drive that is equivalent to a high-drive standard-output device. For more information, refer to TI application reports *AVC Logic Family Technology and Applications*, literature number SCEA006, and *Dynamic Output Control (DOC™) Circuitry Technology and Applications*, literature number SCEA009.

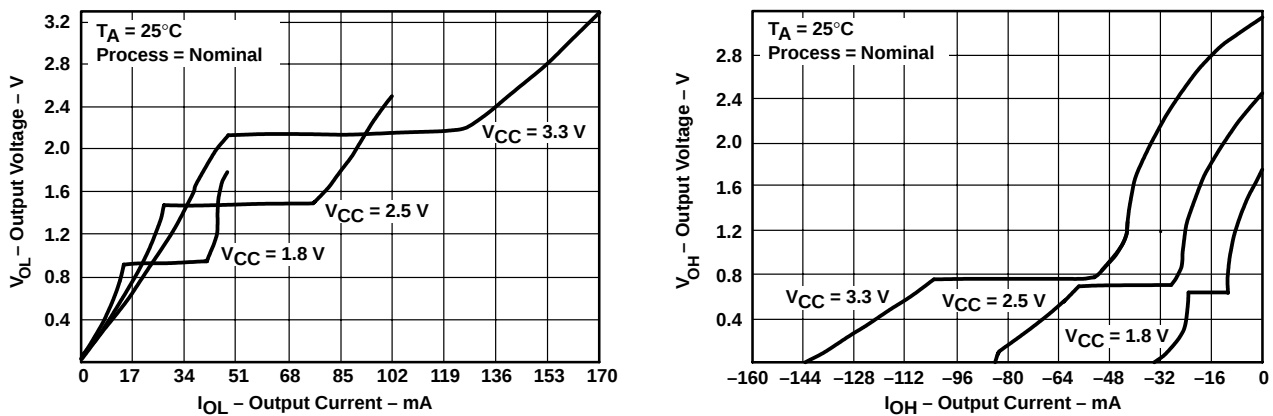


Figure 1. Output Voltage vs Output Current

This 18-bit universal bus driver is operational at 1.2-V to 3.6-V V_{CC} , but is designed specifically for 1.65-V to 3.6-V V_{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 (LE) input is high. The A data is latched if the clock (CLK) input is held at a high or low logic level. If LE is low, 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.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.



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.

DOC and Widebus are trademarks of Texas Instruments.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2002, Texas Instruments Incorporated

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

NC	1	56	GND
NC	2	55	NC
Y1	3	54	A1
GND	4	53	GND
Y2	5	52	A2
Y3	6	51	A3
V _{CC}	7	50	V _{CC}
Y4	8	49	A4
Y5	9	48	A5
Y6	10	47	A6
GND	11	46	GND
Y7	12	45	A7
Y8	13	44	A8
Y9	14	43	A9
Y10	15	42	A10
Y11	16	41	A11
Y12	17	40	A12
GND	18	39	GND
Y13	19	38	A13
Y14	20	37	A14
Y15	21	36	A15
V _{CC}	22	35	V _{CC}
Y16	23	34	A16
Y17	24	33	A17
GND	25	32	GND
Y18	26	31	A18
OE	27	30	CLK
LE	28	29	GND

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

SN74AVC16835
18-BIT UNIVERSAL BUS DRIVER
WITH 3-STATE OUTPUTS

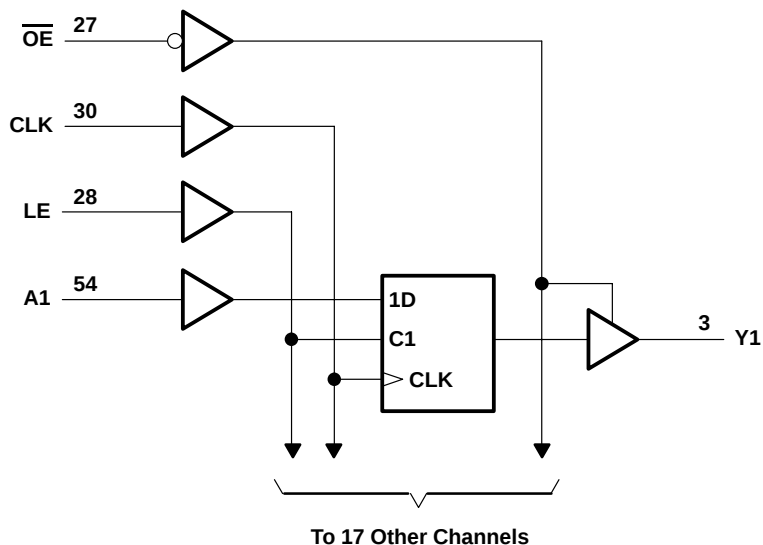
SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

FUNCTION TABLE
 (each universal bus driver)

INPUTS				OUTPUT Y
$\overline{OE}$	LE	CLK	A	
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	↑	L	L
L	L	↑	H	H
L	L	L or H	X	$Y_0^\dagger$

† Output level before the indicated steady-state input conditions were established, provided that CLK is high before LE goes low

logic diagram (positive logic)



SN74AVC16835

18-BIT UNIVERSAL BUS DRIVER

WITH 3-STATE OUTPUTS

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to 4.6 V
Voltage range applied to any output in the high-impedance or power-off state, V_O (see Note 1)	–0.5 V to 4.6 V
Voltage range applied to any output in the high or low state, V_O (see Notes 1 and 2)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O	±50 mA
Continuous current through each V_{CC} or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 3): DGG package	64°C/W
DGV package	48°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

[†] 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.

- NOTES:
1. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The output positive-voltage rating may be exceeded up to 4.6 V maximum if the output current rating is observed.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.



SN74AVC16835
18-BIT UNIVERSAL BUS DRIVER
WITH 3-STATE OUTPUTS

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V_{CC} Supply voltage	Operating	1.4	3.6	V
	Data retention only	1.2		
V_{IH} High-level input voltage	$V_{CC} = 1.2\text{ V}$	V_{CC}		V
	$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	$0.65 \times V_{CC}$		
	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.65 \times V_{CC}$		
	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7		
	$V_{CC} = 3\text{ V to }3.6\text{ V}$	2		
V_{IL} Low-level input voltage	$V_{CC} = 1.2\text{ V}$	GND		V
	$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	$0.35 \times V_{CC}$		
	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.35 \times V_{CC}$		
	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.7		
	$V_{CC} = 3\text{ V to }3.6\text{ V}$	0.8		
V_I Input voltage		0	3.6	V
V_O Output voltage	Active state	0	V_{CC}	V
	3-state	0	3.6	
I_{OHS} Static high-level output current [†]	$V_{CC} = 1.4\text{ V to }1.6\text{ V}$		–2	mA
	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$		–4	
	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		–8	
	$V_{CC} = 3\text{ V to }3.6\text{ V}$		–12	
I_{OLS} Static low-level output current [†]	$V_{CC} = 1.4\text{ V to }1.6\text{ V}$		2	mA
	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$		4	
	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$		8	
	$V_{CC} = 3\text{ V to }3.6\text{ V}$		12	
$\Delta t/\Delta v$ Input transition rise or fall rate	$V_{CC} = 1.4\text{ V to }3.6\text{ V}$		5	ns/V
T_A Operating free-air temperature		–40	85	°C

[†] Dynamic drive capability is equivalent to standard outputs with I_{OH} and I_{OL} of $\pm 24\text{ mA}$ at $2.5\text{-V }V_{CC}$. See Figure 1 for V_{OL} vs I_{OL} and V_{OH} vs I_{OH} characteristics. Refer to TI application reports **AVC Logic Family Technology and Applications**, literature number **SCEA006**, and **Dynamic Output Control (DOC™) Circuitry Technology and Applications**, literature number **SCEA009**.

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to TI application report *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

SN74AVC16835

18-BIT UNIVERSAL BUS DRIVER

WITH 3-STATE OUTPUTS

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

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

PARAMETER		TEST CONDITIONS	V _{CC}	MIN	TYP [†]	MAX	UNIT
V _{OH}	I _{OHS} = –100 µA,		1.4 V to 3.6 V	V _{CC} –0.2			V
	I _{OHS} = –2 mA,	V _{IH} = 0.91 V	1.4 V	1.05			
	I _{OHS} = –4 mA,	V _{IH} = 1.07 V	1.65 V	1.2			
	I _{OHS} = –8 mA,	V _{IH} = 1.7 V	2.3 V	1.75			
	I _{OHS} = –12 mA,	V _{IH} = 2 V	3 V	2.3			
V _{OL}	I _{OLS} = 100 µA		1.4 V to 3.6 V			0.2	V
	I _{OLS} = 2 mA,	V _{IL} = 0.49 V	1.4 V			0.4	
	I _{OLS} = 4 mA,	V _{IL} = 0.57 V	1.65 V			0.45	
	I _{OLS} = 8 mA,	V _{IL} = 0.7 V	2.3 V			0.55	
	I _{OLS} = 12 mA,	V _{IL} = 0.8 V	3 V			0.7	
I _I	V _I = V _{CC} or GND		3.6 V			±2.5	µA
I _{off}	V _I or V _O = 3.6 V		0			±10	µA
I _{OZ}	V _O = V _{CC} or GND, $\overline{\text{OE}}$ = V _{CC}		3.6 V			±10	µA
I _{CC}	V _I = V _{CC} or GND, I _O = 0		3.6 V			40	µA
C _i	CLK input	V _I = V _{CC} or GND	2.5 V			4	pF
			3.3 V			4	
	Control inputs	V _I = V _{CC} or GND	2.5 V			4	
			3.3 V			4	
	Data inputs	V _I = V _{CC} or GND	2.5 V			2.5	
			3.3 V			2.5	
C _O	Outputs	V _O = V _{CC} or GND	2.5 V			6.5	pF
			3.3 V			6.5	

[†] Typical values are measured at T_A = 25°C.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figures 2 through 5)

				V _{CC} = 1.2 V		V _{CC} = 1.5 V ± 0.1 V		V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency							150		150		150		MHz
t _w	Pulse duration	LE high						3.3		3.3		3.3		ns
		CLK high or low						3.3		3.3		3.3		
t _{su}	Setup time	Data before CLK↑		1		0.9		0.7		0.7		0.7		ns
		Data before LE↓	CLK high	1.7		1.6		1.2		0.8		0.8		
			CLK low	2		0.9		0.7		0.5		0.5		
		t _h	Hold time	Data after CLK↑		1.5		1.3		1		0.9		
Data after LE↓	CLK high			3.2		2.4		2		1.7		1.6		
	CLK low			2.8		2.1		1.7		1.5		1.4		

SN74AVC16835
18-BIT UNIVERSAL BUS DRIVER
WITH 3-STATE OUTPUTS

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figures 2 through 5)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.2 V	V _{CC} = 1.5 V ± 0.1 V		V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f _{max}						150		150		150		MHz
t _{pd}	A	Y	4.5	1.2	6.2	1.3	5.5	1	3.1	0.9	2.5	ns
	LE		6.2	1.6	9.4	1.3	7.2	1.1	4.7	0.9	3.8	
	CLK		5.2	1.6	7.8	1.5	6	1	3.7	0.8	3.1	
t _{en}	$\overline{\text{OE}}$	Y	7.1	2.4	10.2	2.2	8.8	1.5	6.7	1.2	6.2	ns
t _{dis}	$\overline{\text{OE}}$	Y	6.9	2.2	10.3	2	8.4	1.2	5.3	1.1	5.3	ns

switching characteristics, T_A = 0°C to 85°C, C_L = 0 pF[†]

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 3.3 V ± 0.15 V		UNIT
			MIN	MAX	
t _{pd}	A	Y	0.6	1.3	ns
	CLK		0.7	1.5	

[†] Texas Instruments SPICE simulation data

operating characteristics, T_A = 25°C

PARAMETER			TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	V _{CC} = 3.3 V	UNIT
				TYP	TYP	TYP	
C _{pd}	Power dissipation capacitance	Outputs enabled	C _L = 0, f = 10 MHz	45	48	52	pF
		Outputs disabled		23	25	28	



SN74AVC16835

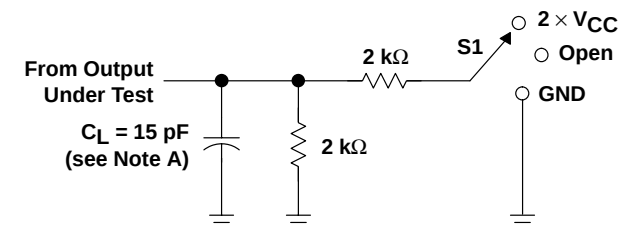
18-BIT UNIVERSAL BUS DRIVER

WITH 3-STATE OUTPUTS

SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

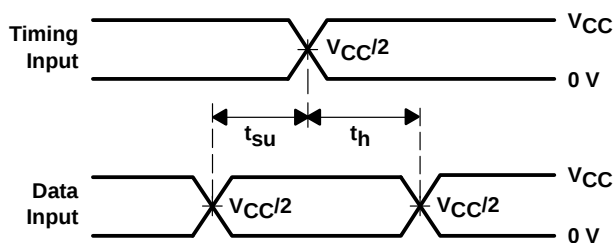
PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 1.2 \text{ V AND } 1.5 \text{ V} \pm 0.1 \text{ V}$

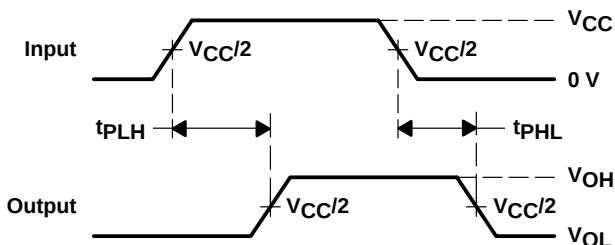


LOAD CIRCUIT

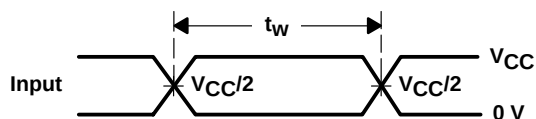
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 × V_{CC}
t_{PHZ}/t_{PZH}	GND



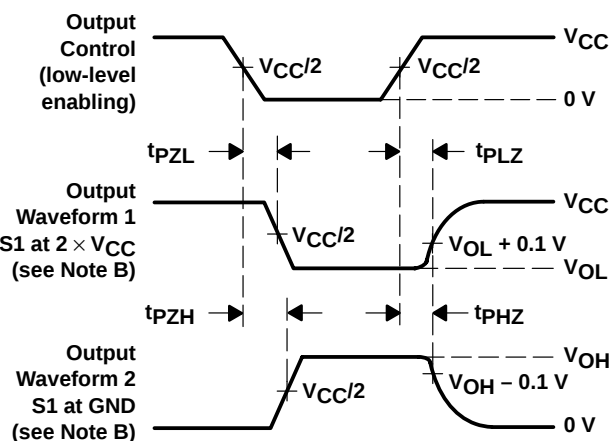
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



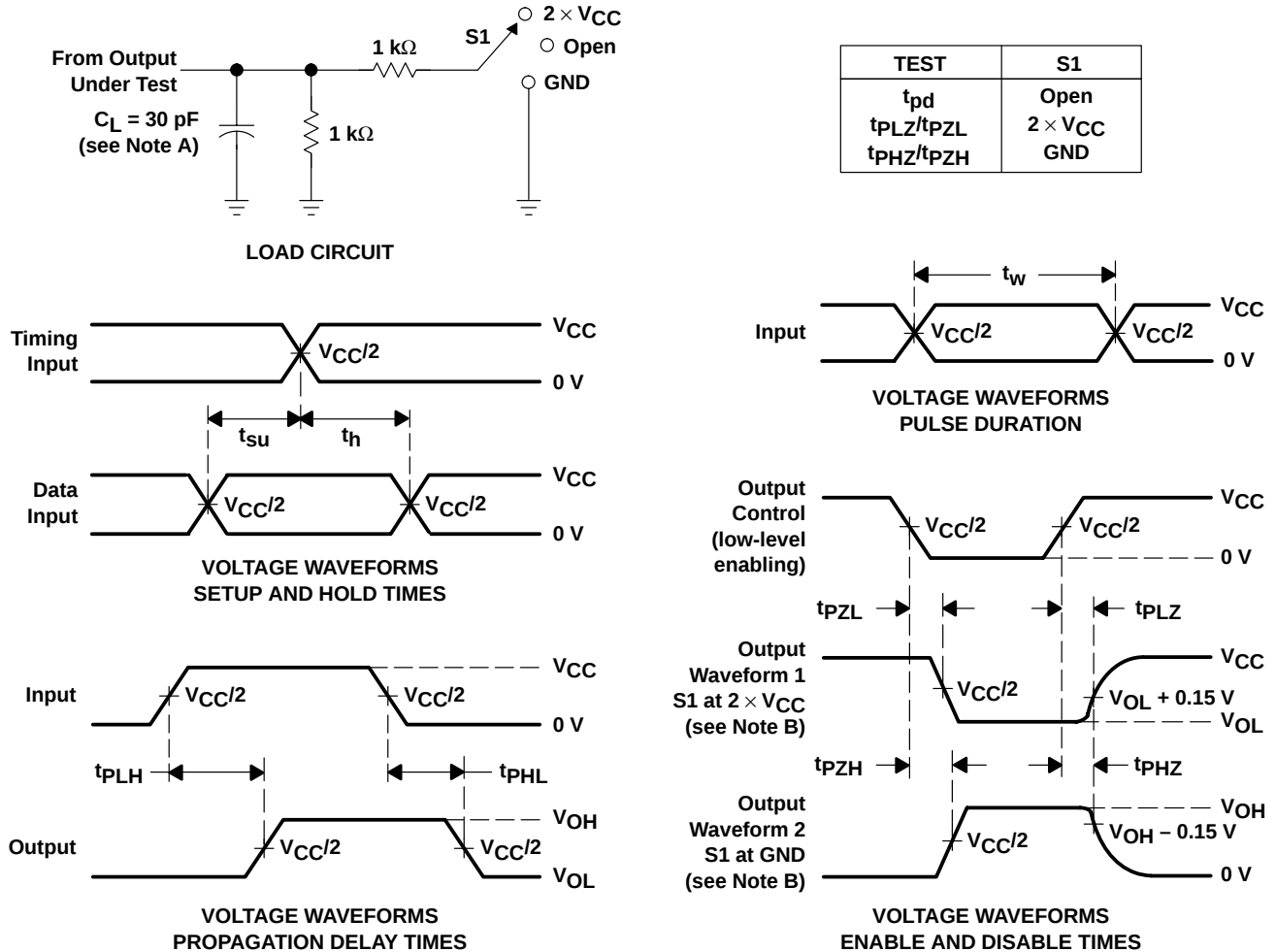
VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 2. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$$



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 3. Load Circuit and Voltage Waveforms

SN74AVC16835

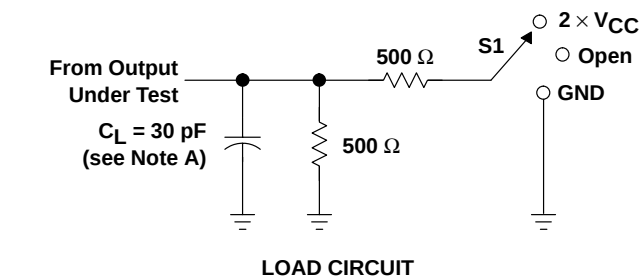
18-BIT UNIVERSAL BUS DRIVER

WITH 3-STATE OUTPUTS

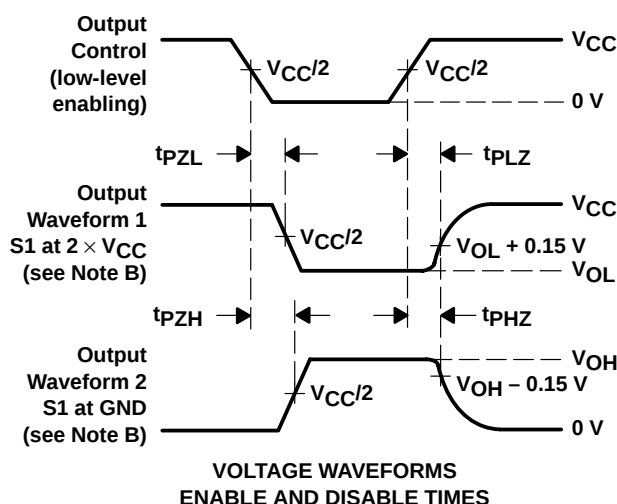
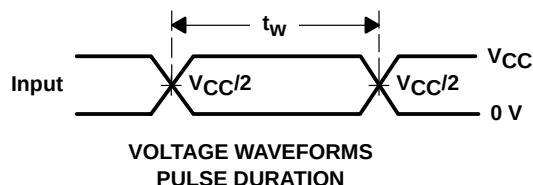
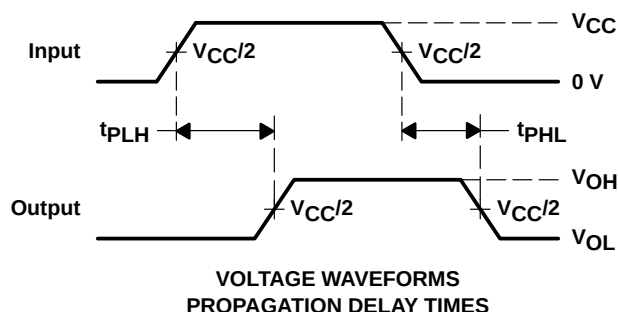
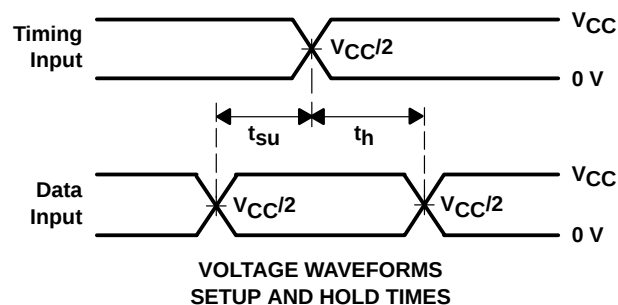
SCES168J – DECEMBER 1998 – REVISED FEBRUARY 2002

PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$$



TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PZH}	GND

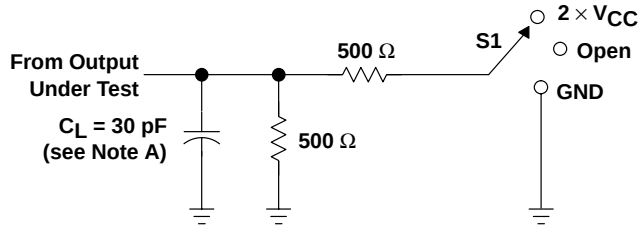


- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 4. Load Circuit and Voltage Waveforms

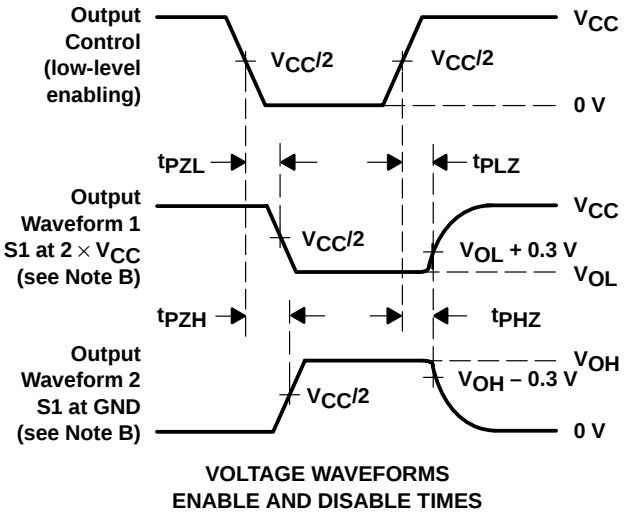
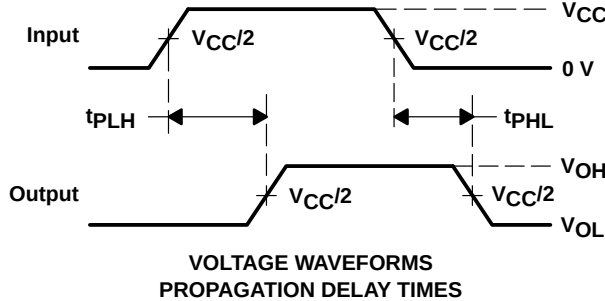
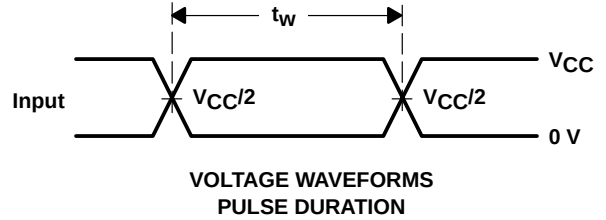
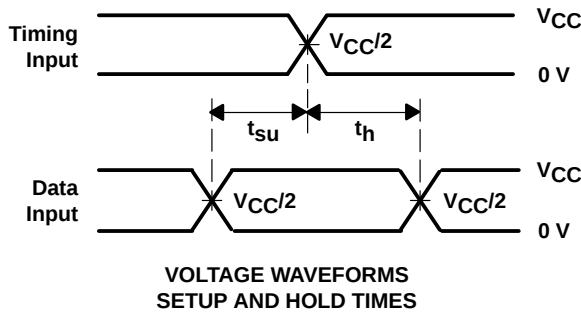
PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$$



LOAD CIRCUIT

TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PZH}	GND



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 5. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74AVC16835DGGRE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AVC16835DGGRG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AVC16835DGVRE4	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AVC16835DGVRG4	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC16835DGGR	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC16835DGVR	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), 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)

⁽³⁾ 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.

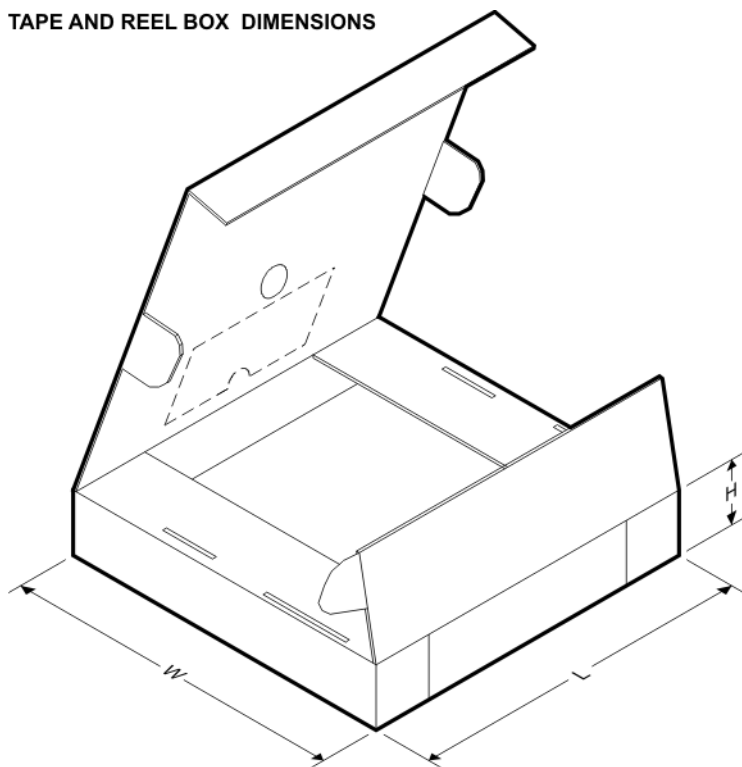
TAPE AND REEL INFORMATION



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AVC16835DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
SN74AVC16835DGVR	TVSOP	DGV	56	2000	330.0	24.4	6.8	11.7	1.6	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AVC16835DGGR	TSSOP	DGG	56	2000	346.0	346.0	41.0
SN74AVC16835DGVR	TVSOP	DGV	56	2000	346.0	346.0	41.0

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

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

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

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:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated