

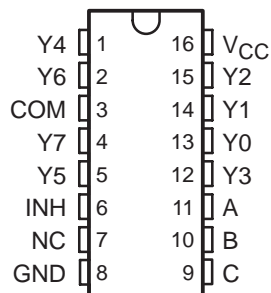
# SN74HC4851

## 8-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER WITH INJECTION-CURRENT EFFECT CONTROL

SCLS542B – SEPTEMBER 2003 – REVISED JANUARY 2004

- Injection-Current Cross Coupling <math><1\text{mV/mA}</math> (see Figure 1)
- Low Crosstalk Between Switches
- Pin Compatible With SN74HC4051, SN74LV4051A, and CD4051B
- 2-V to 6-V  $V_{CC}$  Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

D, DGV, N, OR PW PACKAGE  
(TOP VIEW)



NC – No internal connection

### description/ordering information

This eight-channel CMOS analog multiplexer/demultiplexer is pin compatible with the '4051 function and, additionally, features injection-current effect control, which has excellent value in automotive applications where voltages in excess of normal supply voltages are common.

The injection-current effect control allows signals at disabled analog input channels to exceed the supply voltage without affecting the signal of the enabled analog channel. This eliminates the need for external diode/resistor networks typically used to keep the analog channel signals within the supply-voltage range.

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	PDIP – N	Tube	SN74HC4851N	HC4851N
	SOIC – D	Tube	SN74HC4851D	HC4851
		Tape and reel	SN74HC4851DR	
	TSSOP – PW	Tube	SN74HC4851PW	HC4851
		Tape and reel	SN74HC4851PWR	
	TVSOP – DGV	Tape and reel	SN74HC4851DGVR	HC4851

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



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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**

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**WITH INJECTION-CURRENT EFFECT CONTROL**

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**XA**  
**STRUMENTS**





**SN74HC4851**  
**8-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER**  
**WITH INJECTION-CURRENT EFFECT CONTROL**

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 2\text{ V}$ ,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figures 9–14)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			UP TO $85^\circ\text{C}$		UP TO $125^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	COM or Y <sub>n</sub>		19.5	25		29		32	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	Channel Select		23	30		35		40	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Enable delay time	INH			95		105		115	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Disable delay time	INH			95		105		115	ns

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3\text{ V}$ ,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figures 9–14)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			UP TO $85^\circ\text{C}$		UP TO $125^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	COM or Y <sub>n</sub>		12	15.5		17.5		19.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	Channel Select		13.5	17.5		20		23	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Enable delay time	INH			90		100		110	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Disable delay time	INH			90		100		110	ns

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figures 9–14)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			UP TO $85^\circ\text{C}$		UP TO $125^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	COM or Y <sub>n</sub>		11	14.5		16.5		18.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay time	Channel Select		12.5	16.5		19		22	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Enable delay time	INH			85		95		105	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Disable delay time	INH			85		95		105	ns

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 4.5\text{ V}$ ,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Figures 9–14)

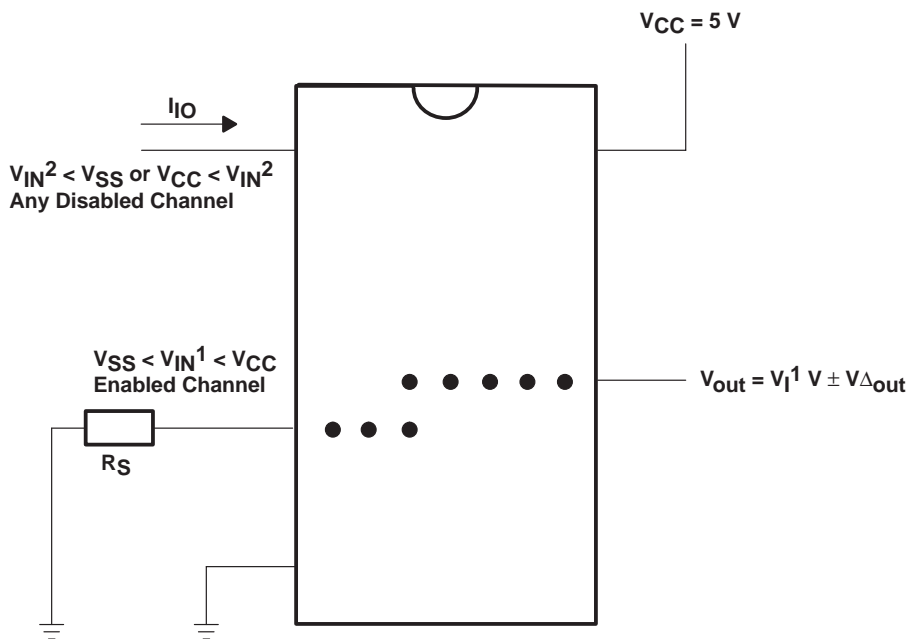
PARAMETER

FROM

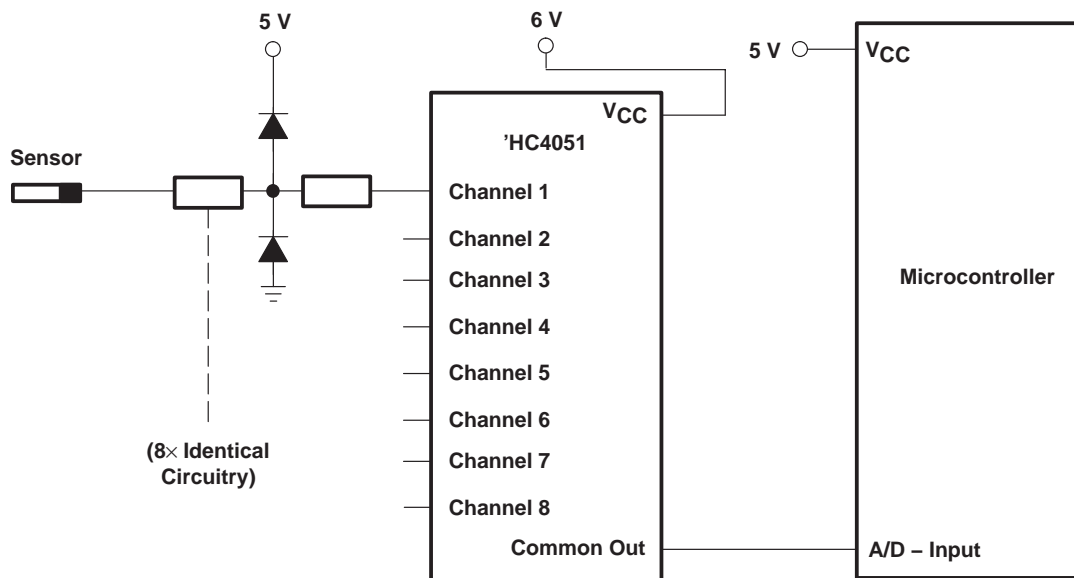


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**APPLICATION INFORMATION**



**Figure 1. Injection-Current Coupling Specification**

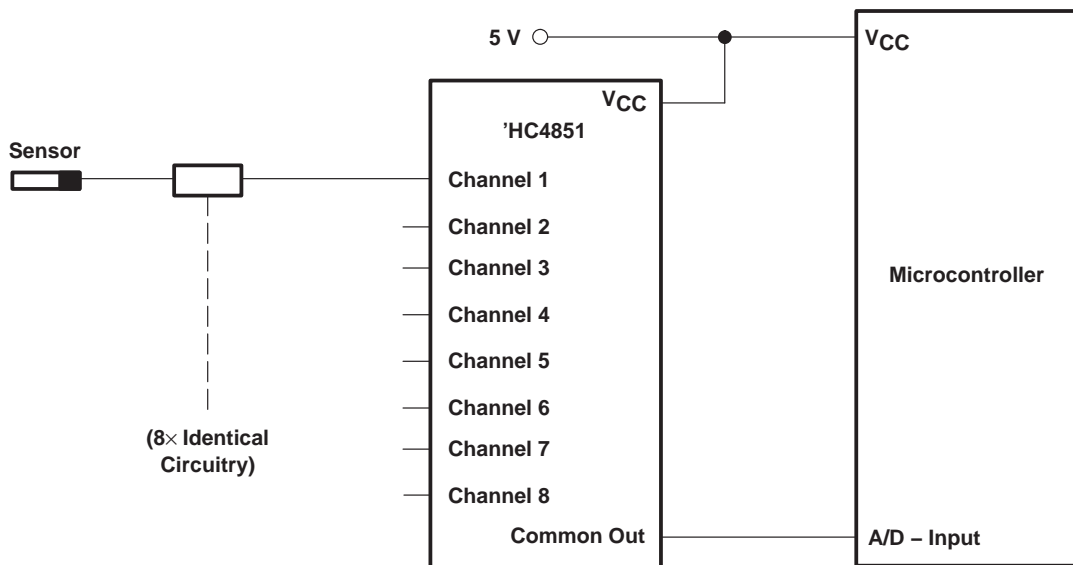


**Figure 2. Alternate Solution Requires 32 Passive Components and One Extra 6-V Regulator to Suppress Injection Current Into a Standard 'HC4051 Multiplexer**

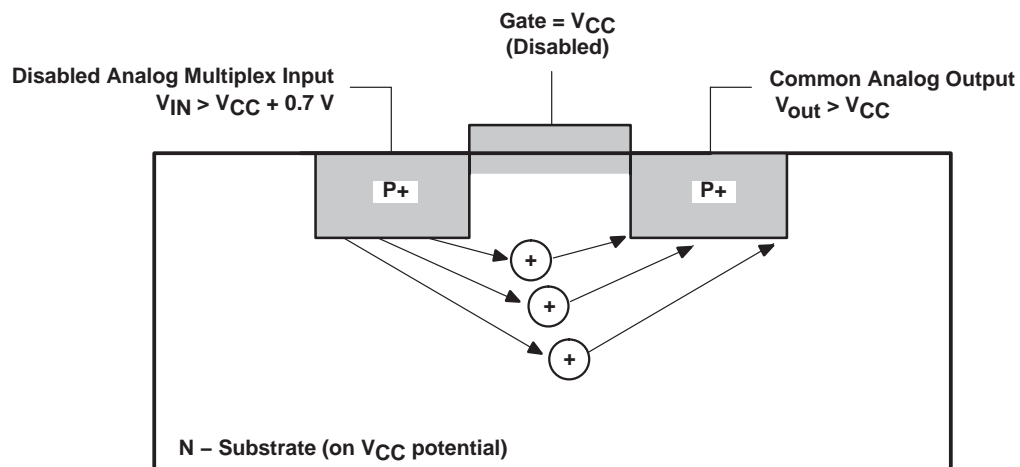
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**8-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER**  
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**APPLICATION INFORMATION**



**Figure 3. Solution by Applying the 'HC4851 Multiplexer**



**Figure 4. Diagram of Bipolar Coupling Mechanism**  
**(Appears if  $V_{IN}$  Exceeds  $V_{CC}$ , Driving Injection Current Into the Substrate)**



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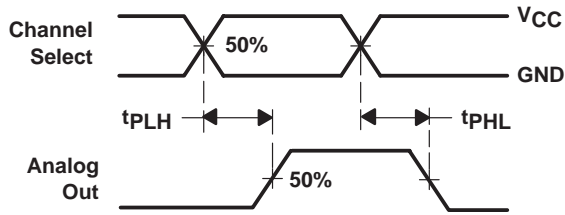
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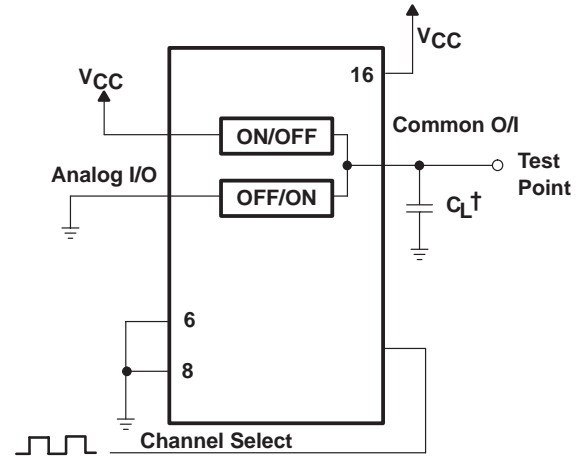
**SN74HC4851**  
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**PARAMETER MEASUREMENT INFORMATION**

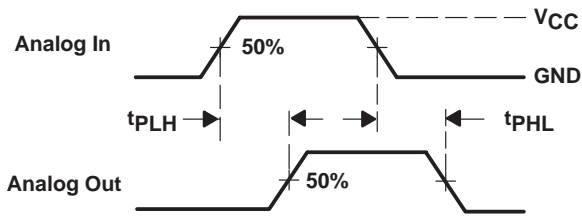


**Figure 9. Propagation Delays, Channel Select to Analog Out**

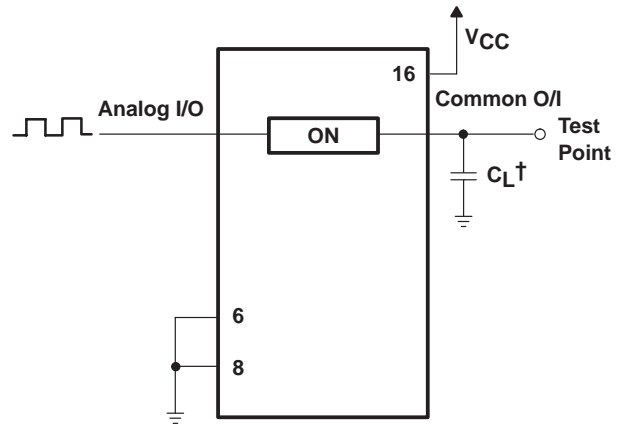


† Includes all probe and jig capacitance

**Figure 10. Propagation-Delay Test Setup, Channel Select to Analog Out**



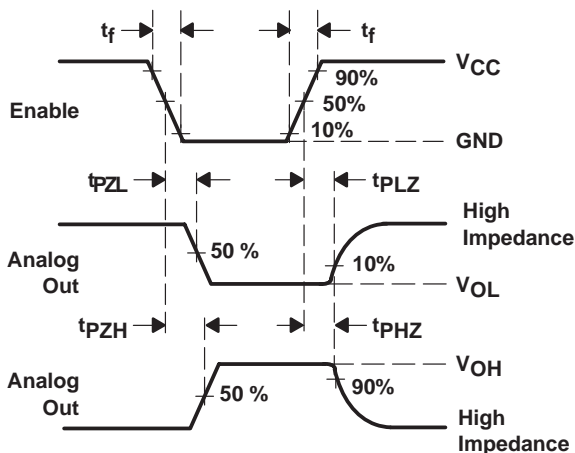
**Figure 11. Propagation Delays, Analog In to Analog Out**



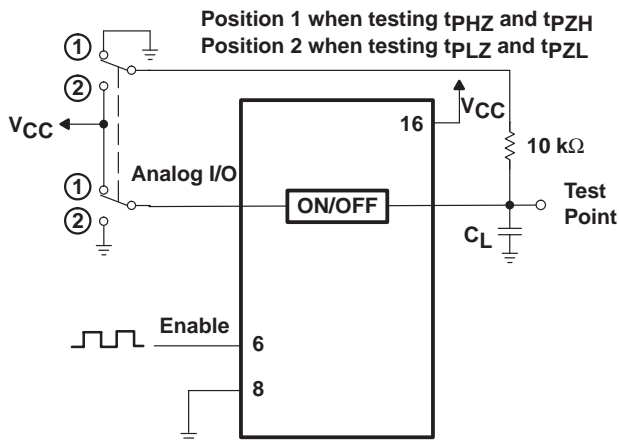
† Includes all probe and jig capacitance

**Figure 12. Propagation-Delay Test Setup, Analog In to Analog Out**

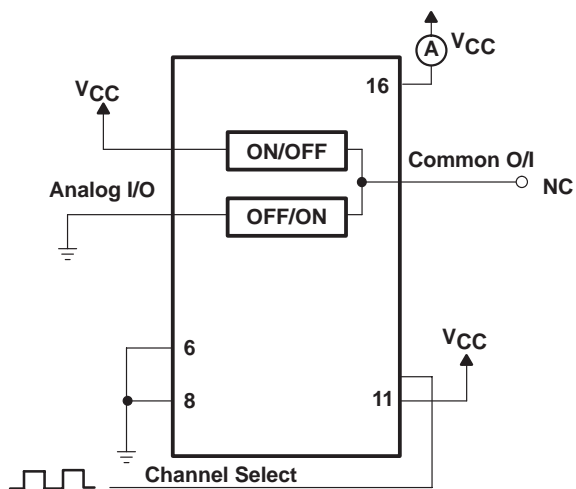
**PARAMETER MEASUREMENT INFORMATION**



**Figure 13. Propagation Delays, Enable to Analog Out**



**Figure 14. Propagation-Delay Test Setup, Enable to Analog Out**



**Figure 15. Power-Dissipation Capacitance Test Setup**

**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>
SN74HC4851D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DGV	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DGVRE4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DGVRG4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC4851NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC4851PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851PWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC4851QDRG4Q1	ACTIVE	SOIC	D	16	2500	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.

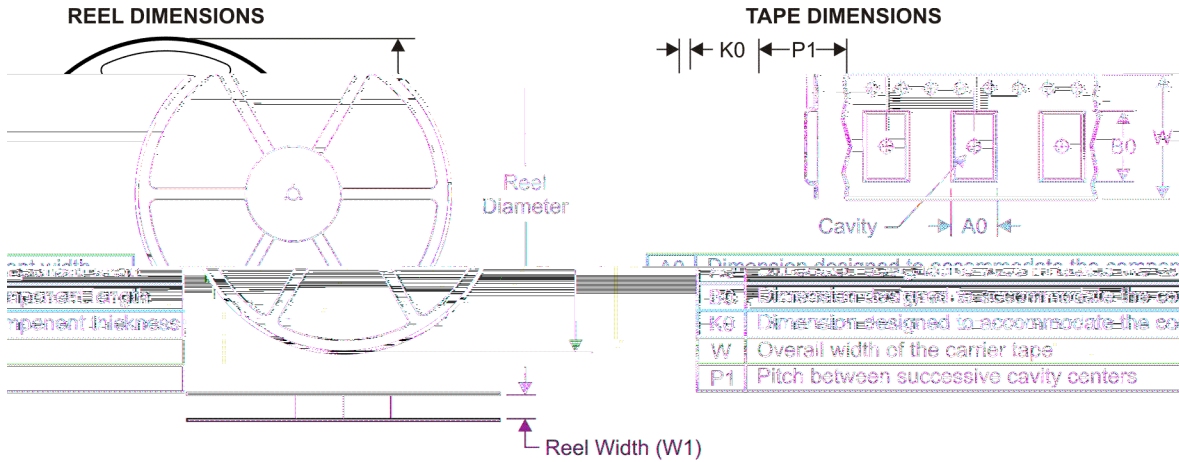
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

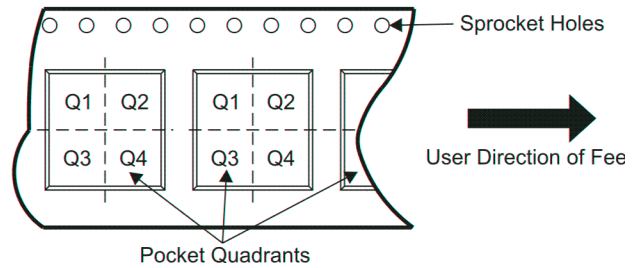
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**TAPE AND REEL INFORMATION**



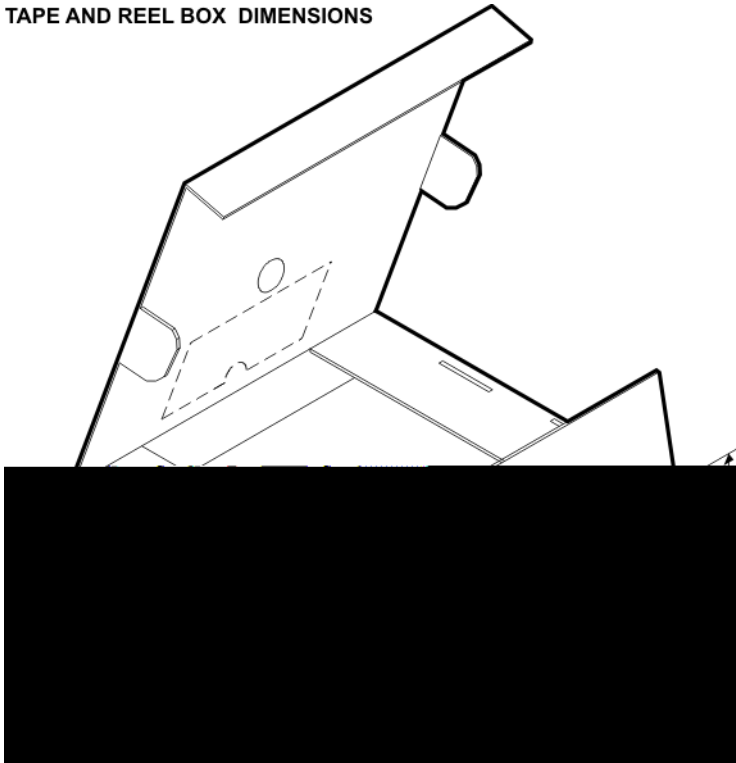
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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
SN74HC4851DGVR	TVSOP	DGV	16	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74HC4851DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC4851PWR	TSSOP	PW	16	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC4851DGVR	TVSOP	DGV	16	2000	346.0	346.0	29.0
SN74HC4851DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74HC4851PWR	TSSOP	PW	16	2000	346.0	346.0	29.0





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

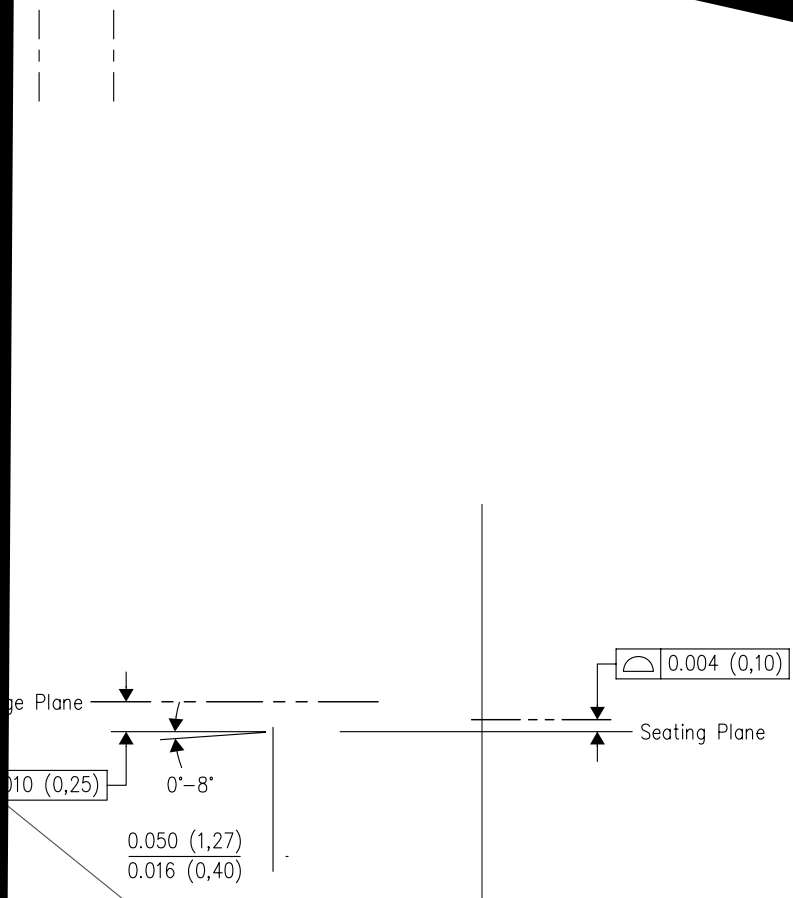
PLASTIC SMALL-OUTLINE

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

D (R-PDSO-



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...ar dimensions are in inches (millimeters).

3 This drawing is subject to change.

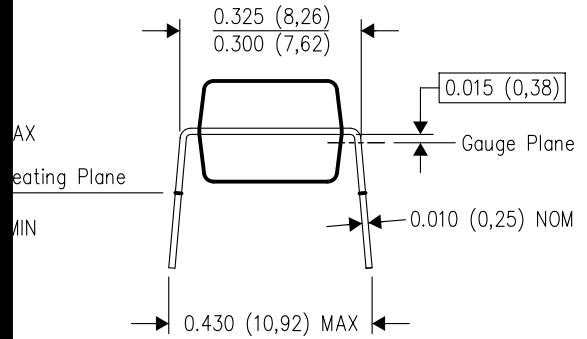
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not exc
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# MECHANICAL DATA

N (R  
16 PINS

## PLASTIC DUAL-IN-LINE PACKAGE

DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



Pin Only  
Vendor option  $\triangle$

4040049/E 12/2002

body length (Dim A).  
either half or full width.

RTS

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