

Quad 2-Input Multiplexer with Three-State Outputs

Features

- 'AC257, 'ACT257..... Non-Inverting Outputs
 - CD74ACT258 Inverting Outputs
 - Buffered Inputs
 - Typical Propagation Delay
 - 4.4ns at $V_{CC} = 5V$, $T_A = 25^{\circ}C$, $C_L = 50pF$
 - Exceeds 2kV ESD Protection MIL-STD-883, Method 3015
 - SCR-Latchup-Resistant CMOS Process and Circuit Design
 - Speed of Bipolar FAST™/AS/S with Significantly Reduced Power Consumption
 - Balanced Propagation Delays
 - AC Types Feature 1.5V to 5.5V Operation and Balanced Noise Immunity at 30% of the Supply
 - $\pm 24mA$ Output Drive Current
 - Fanout to 15 FAST™ ICs
- Drives 50Ω Transmission Lines

Description

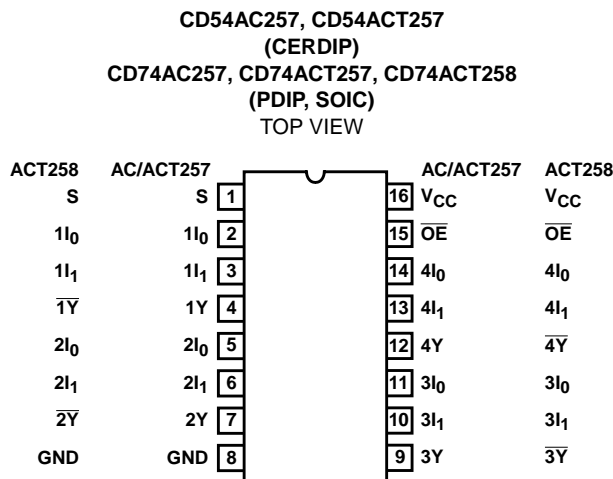
The 'AC257, 'ACT257 and CD74ACT258 are quad 2-input multiplexers with three-state outputs that utilize Advanced CMOS Logic technology. Each of these devices selects four bits of data from two sources under the control of a common Select input (S). The Output Enable (\overline{OE}) is active LOW. When \overline{OE} is HIGH, all of the outputs (Y or \overline{Y}) are in the high-impedance state regardless of all other input conditions.

Moving data from two groups of registers to four common output buses is a common use of the 'AC257, 'ACT257, and CD74ACT258. The state of the Select input determines the particular register from which the data comes. The 'AC257, 'ACT257 and CD74ACT258 can also be used as function generators.

Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE
CD54AC257F3A	-55 to 125	16 Ld CERDIP
CD74AC257E	0 to 70°C, -40 to 85, -55 to 125	16 Ld PDIP
CD74AC257M	0 to 70°C, -40 to 85, -55 to 125	16 Ld SOIC
CD54ACT257F3A	-55 to 125	16 Ld CERDIP
CD74ACT257E	0 to 70°C, -40 to 85, -55 to 125	16 Ld PDIP
CD74ACT257M	0 to 70°C, -40 to 85, -55 to 125	16 Ld SOIC
CD74ACT258E	0 to 70°C, -40 to 85, -55 to 125	16 Ld PDIP
CD74ACT258M	0 to 70°C, -40 to 85, -55 to 125	16 Ld SOIC

Pinout

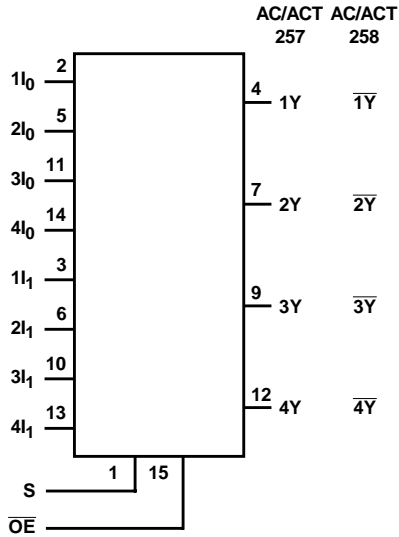


NOTES:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer and die for this part number is available which meets all electrical specifications. Please contact your local TI sales office or customer service for ordering information.

CD54/74AC257, CD54/74ACT257, CD74ACT258

Functional Diagram



TRUTH TABLE

OUTPUT ENABLE	SELECT INPUT	DATA INPUTS		257 OUTPUTS	258 OUTPUTS
\overline{OE}	S	I_0	I_1	Y	\overline{Y}
H	X	X	X	Z	Z
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

H = High level voltage, L = Low level voltage, Z = High impedance (off) state, X = Don't Care

CD54/74AC257, CD54/74ACT257, CD74ACT258

Absolute Maximum Ratings

DC Supply Voltage, V_{CC}	-0.5V to 6V
DC Input Diode Current, I_{IK}	
For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	$\pm 20mA$
DC Output Diode Current, I_{OK}	
For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	$\pm 50mA$
DC Output Source or Sink Current per Output Pin, I_O	
For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$	$\pm 50mA$
DC V_{CC} or Ground Current, I_{CC} or I_{GND} (Note 3)	$\pm 100mA$

Thermal Information

Thermal Resistance (Typical, Note 5)	θ_{JA} ($^{\circ}C/W$)
PDIP Package	—
SOIC Package	—
Maximum Junction Temperature (Plastic Package)	$150^{\circ}C$
Maximum Storage Temperature Range	$-65^{\circ}C$ to $150^{\circ}C$
Maximum Lead Temperature (Soldering 10s)	$300^{\circ}C$

Operating Conditions

Temperature Range, T_A	$-55^{\circ}C$ to $125^{\circ}C$
Supply Voltage Range, V_{CC} (Note 4)	
AC Types	1.5V to 5.5V
ACT Types	4.5V to 5.5V
DC Input or Output Voltage, V_I , V_O	0V to V_{CC}
Input Rise and Fall Slew Rate, dt/dv	
AC Types, 1.5V to 3V	50ns (Max)
AC Types, 3.6V to 5.5V	20ns (Max)
ACT Types, 4.5V to 5.5V	10ns (Max)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

3. For up to 4 outputs per device, add $\pm 25mA$ for each additional output.
4. Unless otherwise specified, all voltages are referenced to ground.
5. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		V_{CC} (V)	25 $^{\circ}C$		-40 $^{\circ}C$ TO 85 $^{\circ}C$		-55 $^{\circ}C$ TO 125 $^{\circ}C$		UNITS	
		V_I (V)	I_O (mA)		MIN	MAX	MIN	MAX	MIN	MAX		
AC TYPES												
High Level Input Voltage	V_{IH}	-	-	1.5	1.2	-	1.2	-	1.2	-	V	
				3	2.1	-	2.1	-	2.1	-	V	
				5.5	3.85	-	3.85	-	3.85	-	V	
Low Level Input Voltage	V_{IL}	-	-	1.5	-	0.3	-	0.3	-	0.3	V	
				3	-	0.9	-	0.9	-	0.9	V	
				5.5	-	1.65	-	1.65	-	1.65	V	
High Level Output Voltage	V_{OH}	V_{IH} or V_{IL}	-0.05	-0.05	1.5	1.4	-	1.4	-	1.4	-	V
			-0.05	-0.05	3	2.9	-	2.9	-	2.9	-	V
			-0.05	-0.05	4.5	4.4	-	4.4	-	4.4	-	V
			-4	-4	3	2.58	-	2.48	-	2.4	-	V
			-24	-24	4.5	3.94	-	3.8	-	3.7	-	V
			-75 (Note 6, 7)	-75	5.5	-	-	3.85	-	-	-	V
			-50 (Note 6, 7)	-50	5.5	-	-	-	-	3.85	-	V

CD54/74AC257, CD54/74ACT257, CD74ACT258

DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS		V _{CC} (V)	25°C		-40°C TO 85°C		-55°C TO 125°C		UNITS
		V _I (V)	I _O (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
Low Level Output Voltage	V _{OL}	V _{IH} or V _{IL}	0.05	1.5	-	0.1	-	0.1	-	0.1	V
			0.05	3	-	0.1	-	0.1	-	0.1	V
			0.05	4.5	-	0.1	-	0.1	-	0.1	V
			12	3	-	0.36	-	0.44	-	0.5	V
			24	4.5	-	0.36	-	0.44	-	0.5	V
			75 (Note 6, 7)	5.5	-	-	-	1.65	-	-	V
			50 (Note 6, 7)	5.5	-	-	-	-	-	1.65	V
Input Leakage Current	I _I	V _{CC} or GND	-	5.5	-	±0.1	-	±1	-	±1	µA
Three-State Leakage Current	I _{OZ}	V _{IH} or V _{IL} V _O = V _{CC} or GND	-	5.5	-	±0.5	-	±5	-	±10	µA
Quiescent Supply Current MSI	I _{CC}	V _{CC} or GND	0	5.5	-	8	-	80	-	160	µA
ACT TYPES											
High Level Input Voltage	V _{IH}	-	-	4.5 to 5.5	2	-	2	-	2	-	V
Low Level Input Voltage	V _{IL}	-	-	4.5 to 5.5	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage	V _{OH}	V _{IH} or V _{IL}	-0.05	4.5	4.4	-	4.4	-	4.4	-	V
			-24	4.5	3.94	-	3.8	-	3.7	-	V
			-75 (Note 6, 7)	5.5	-	-	3.85	-	-	-	V
			-50 (Note 6, 7)	5.5	-	-	-	-	3.85	-	V
Low Level Output Voltage	V _{OL}	V _{IH} or V _{IL}	0.05	4.5	-	0.1	-	0.1	-	0.1	V
			24	4.5	-	0.36	-	0.44	-	0.5	V
			75 (Note 6, 7)	5.5	-	-	-	1.65	-	-	V
			50 (Note 6, 7)	5.5	-	-	-	-	-	1.65	V
Input Leakage Current	I _I	V _{CC} or GND	-	5.5	-	±0.1	-	±1	-	±1	µA
Three-State or Leakage Current	I _{OZ}	V _{IH} or V _{IL} V _O = V _{CC} or GND	-	5.5	-	±0.5	-	±5	-	±10	µA
Quiescent Supply Current MSI	I _{CC}	V _{CC} or GND	0	5.5	-	8	-	80	-	160	µA
Additional Supply Current per Input Pin TTL Inputs High 1 Unit Load	ΔI _{CC}	V _{CC} -2.1	-	4.5 to 5.5	-	2.4	-	2.8	-	3	mA

NOTES:

- Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.
- Test verifies a minimum 50Ω transmission-line-drive capability at 85°C, 75Ω at 125°C.

CD54/74AC257, CD54/74ACT257, CD74ACT258

ACT Input Load Table

INPUT	UNIT LOAD
Data	0.83
S	1.27
OE	1.27

NOTE: Unit load is ΔI_{CC} limit specified in DC Electrical Specifications Table, e.g., 2.4mA max at 25°C.

Switching Specifications Input t_r , $t_f = 3ns$, $C_L = 50pF$ (Worst Case)

PARAMETER	SYMBOL	V_{CC} (V)	-40°C TO 85°C			-55°C TO 125°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
ACT TYPES									
Propagation Delay, In to Y AC/ACT257	t_{PLH} , t_{PHL}	1.5	-	-	106	-	-	117	ns
		3.3 (Note 9)	3.3	-	11.8	3.3	-	13	ns
		5 (Note 10)	2.4	-	8.5	2.3	-	9.3	ns
Propagation Delay, S to Y AC/ACT257	t_{PLH} , t_{PHL}	1.5	-	-	153	-	-	168	ns
		3.3	4.8	-	17.1	4.7	-	18.8	ns
		5	3.5	-	12.2	3.4	-	13.4	ns
Propagation Delay, OE to Y AC/ACT257	t_{PLZ} , t_{PHZ} , t_{PZL} , t_{PZH}	1.5	-	-	167	-	-	184	ns
		3.3	5.3	-	18.7	5.2	-	20.6	ns
		5	3.8	-	13.4	3.7	-	14.7	ns
Propagation Delay, In to Y 'AC/CD74ACT258	t_{PLH} , t_{PHL}	1.5	-	-	91	-	-	100	ns
		3.3	2.9	-	10.2	2.8	-	11.2	ns
		5	2.1	-	7.3	2	-	8	ns
Propagation Delay, S to Y 'AC/CD74ACT258	t_{PLH} , t_{PHL}	1.5	-	-	153	-	-	168	ns
		3.3	4.8	-	17.1	4.7	-	18.8	ns
		5	3.5	-	12.2	3.4	-	13.4	ns
Propagation Delay, OE to Y 'AC/CD74ACT258	t_{PLZ} , t_{PHZ} , t_{PZL} , t_{PZH}	1.5	-	-	167	-	-	184	ns
		3.3	5.3	-	18.7	5.2	-	20.6	ns
		5	3.8	-	13.4	3.7	-	14.7	ns
Three-State Output Capacitance	C_O	-	-	-	15	-	-	15	pF
Input Capacitance	C_I	-	-	-	10	-	-	10	pF
Power Dissipation Capacitance	C_{PD} (Note 11)	-	-	130	-	-	130	-	pF
ACT TYPES									
Propagation Delay, In to Y AC/ACT257	t_{PLH} , t_{PHL}	5 (Note 10)	2.8	-	9.7	2.7	-	10.7	ns
Propagation Delay, S to Y AC/ACT257	t_{PLH} , t_{PHL}	5	4	-	14	3.9	-	15.4	ns

CD54/74AC257, CD54/74ACT257, CD74ACT258

Switching Specifications Input $t_r, t_f = 3\text{ns}$, $C_L = 50\text{pF}$ (Worst Case) (Continued)

PARAMETER	SYMBOL	V_{CC} (V)	-40°C TO 85°C			-55°C TO 125°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay, \overline{OE} to Y AC/ACT257	$t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}$	5	4.1	-	14.6	4	-	16.1	ns
Propagation Delay, In to Y 'AC/CD74ACT258	t_{PLH}, t_{PHL}	5	2.4	-	8.5	2.3	-	9.3	ns
Propagation Delay, S to Y 'AC/CD74ACT258	t_{PLH}, t_{PHL}	5	4	-	14	3.9	-	15.4	ns
Propagation Delay, \overline{OE} to Y 'AC/CD74ACT258	$t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}$	5	4.1	-	14.6	4	-	16.1	ns
Three-State Output Capacitance	C_O	-	-	-	15	-	-	15	pF
Input Capacitance	C_I	-	-	-	10	-	-	10	pF
Power Dissipation Capacitance	C_{PD} (Note 11)	-	-	130	-	-	130	-	pF

NOTES:

8. Limits tested 100%.
9. 3.3V Min is at 3.6V, Max is at 3V.
10. 5V Min is at 5.5V, Max is at 4.5V.
11. C_{PD} is used to determine the dynamic power consumption per multiplexer.
 AC: $P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o)$
 ACT: $P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$ where f_i = input frequency, f_o = output frequency, C_L = output load capacitance, V_{CC} = supply voltage.

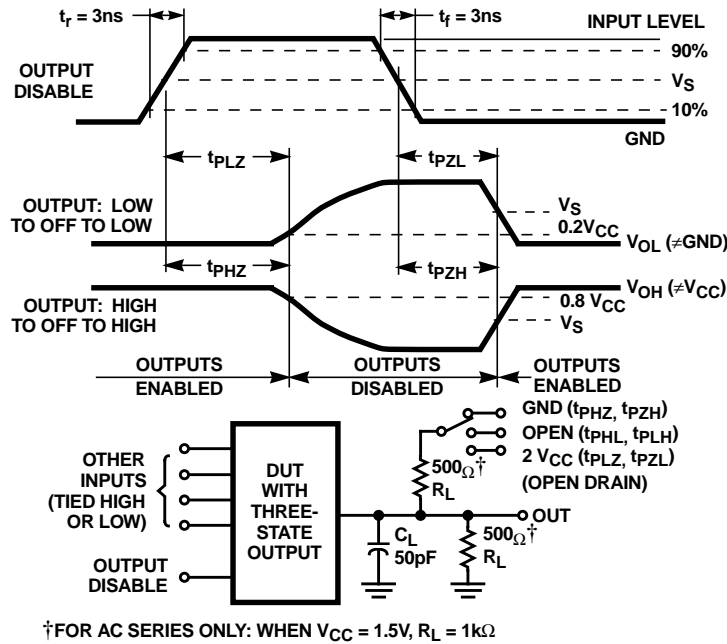


FIGURE 1. THREE-STATE PROPAGATION DELAY TIMES AND TEST CIRCUIT

CD54/74AC257, CD54/74ACT257, CD74ACT258

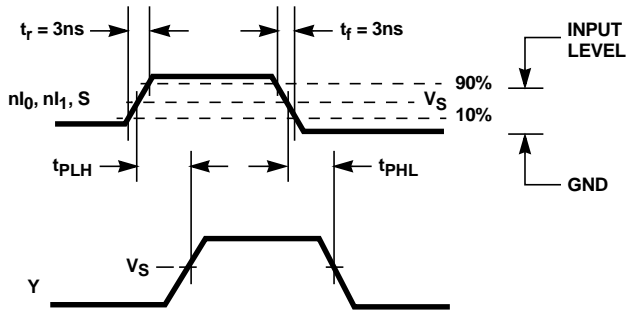


FIGURE 2. INPUTS OR SELECT TO OUTPUT PROPAGATION DELAYS (AC/ACT257)

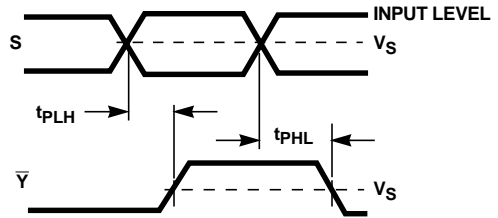
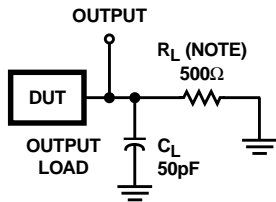


FIGURE 3. SELECT TO OUTPUT PROPAGATION DELAYS (CD74ACT258)



NOTE: For AC Series Only: When $V_{CC} = 1.5V$, $R_L = 1k\Omega$.

	AC	ACT
Input Level	V_{CC}	3V
Input Switching Voltage, V_S	$0.5 V_{CC}$	1.5V
Output Switching Voltage, V_S	$0.5 V_{CC}$	$0.5 V_{CC}$

FIGURE 4. PROPAGATION DELAY TIMES

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CD54AC257F3A	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
CD54ACT257F3A	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
CD74AC257E	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74AC257EE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74AC257M	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC257M96	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC257M96E4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC257ME4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74AC257SM	OBSOLETE	SSOP	DB	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT257E	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74ACT257EE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74ACT257M	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT257M96	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT257M96E4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT257ME4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT257SM	OBSOLETE	SSOP	DB	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74ACT258M	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
CD74ACT258M96	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
CD74ACT258M96E4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
CD74ACT258ME4	ACTIVE	SOIC	D	16	40	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)

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

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J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

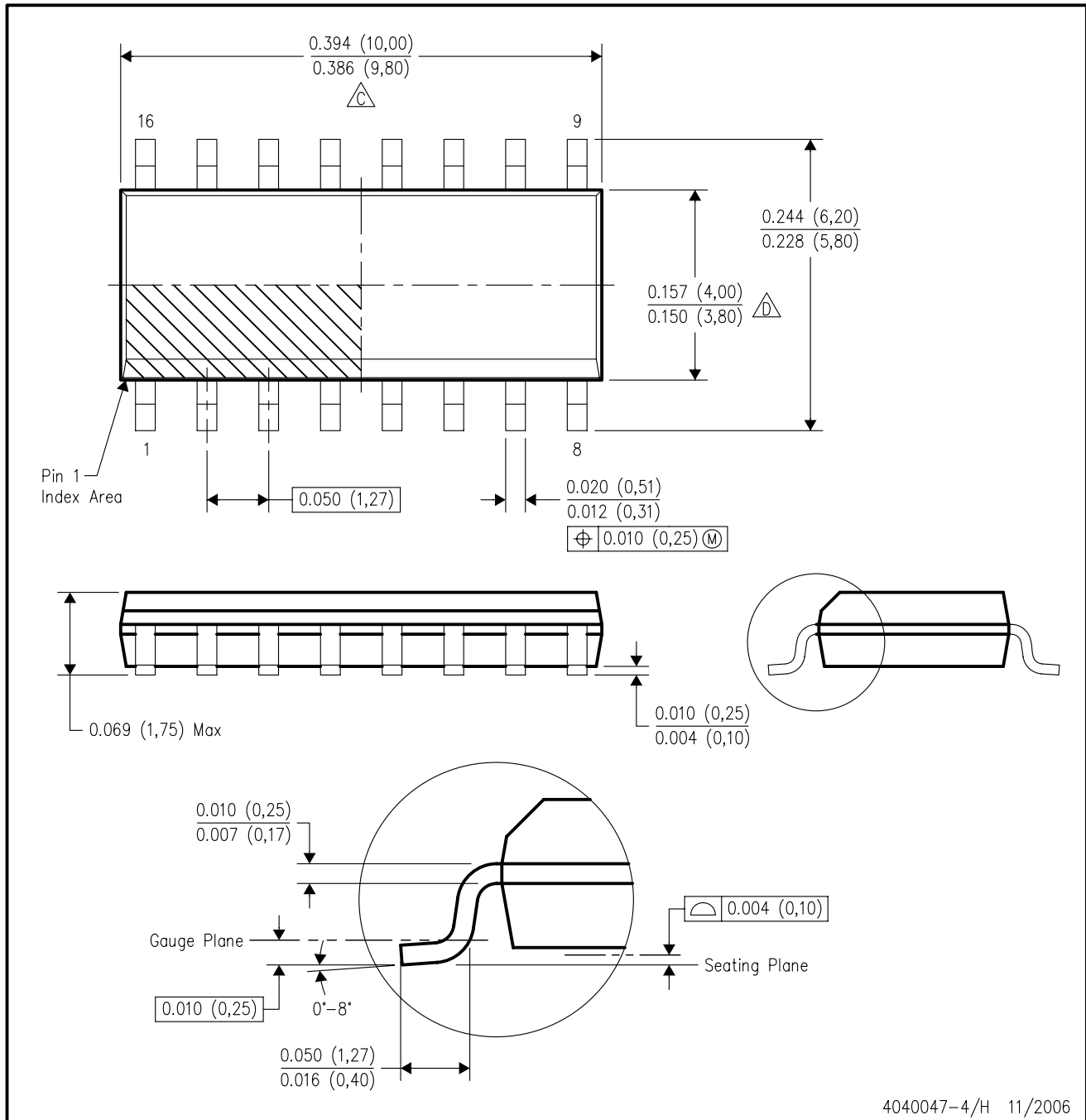
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



4040047-4/H 11/2006

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. 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.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AC.

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

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