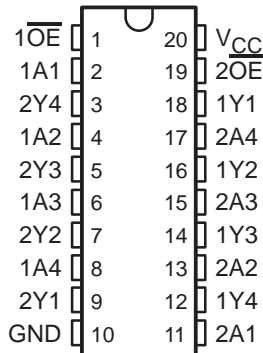


SN54HC244, SN74HC244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

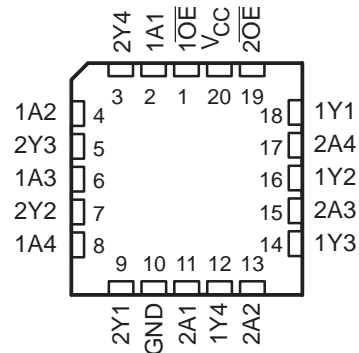
SCLS130D – DECEMBER 1982 – REVISED AUGUST 2003

- Wide Operating Voltage Range of 2 V to 6 V
- High-Current Outputs Drive Up To 15 LSTTL Loads
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- Low Power Consumption, 80- μ A Max I_{CC}
- Typical $t_{pd} = 11$ ns
- ± 6 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max

SN54HC244 . . . J OR W PACKAGE
SN74HC244 . . . DB, DW, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54HC244 . . . FK PACKAGE
(TOP VIEW)



description/ordering information

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The 'HC244 devices are organized as two 4-bit buffers/drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the device passes noninverted data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	PDIP – N	Tube of 20	SN74HC244N	SN74HC244N
	SOIC – DW	Tube of 25	SN74HC244DW	HC244
		Reel of 2000	SN74HC244DWR	
	SOP – NS	Reel of 2000	SN74HC244NSR	HC244
	SSOP – DB	Reel of 2000	SN74HC244DBR	HC244
	TSSOP – PW	Tube of 70	SN74HC244PW	HC244
		Reel of 2000	SN74HC244PWR	
Reel of 250		SN74HC244PWT		
–55°C to 125°C	CDIP – J	Tube of 20	SNJ54HC244J	SNJ54HC244J
	CFP – W	Tube of 85	SNJ54HC244W	SNJ54HC244W
	LCCC – FK	Tube of 55	SNJ54HC244FK	SNJ54HC244FK

† 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.

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
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

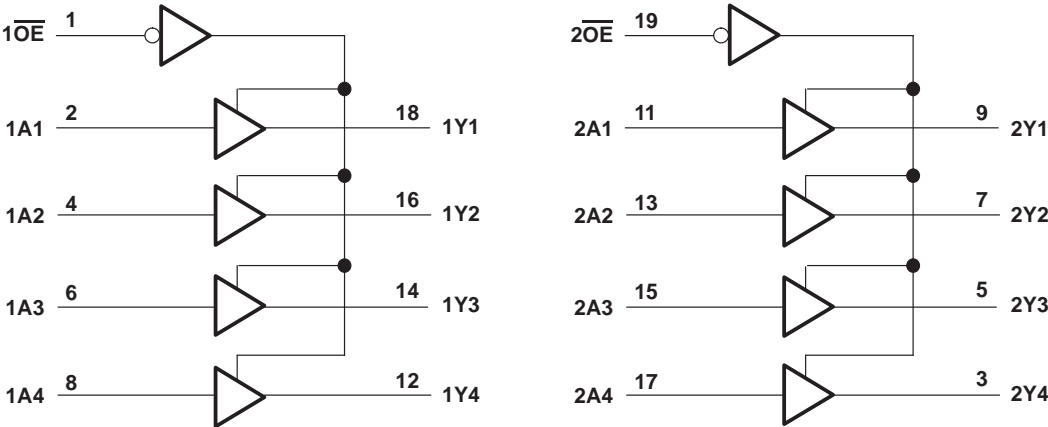
SN54HC244, SN74HC244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS130D – DECEMBER 1982 – REVISED AUGUST 2003

FUNCTION TABLE
(each buffer/driver)

INPUTS		OUTPUT Y
\overline{OE}	A	
L	H	H
L	L	L
H	X	Z

logic diagram (positive logic)



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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±35 mA
Continuous current through V_{CC} or GND	±70 mA
Package thermal impedance, θ_{JA} (see Note 2):	
DB package	70°C/W
DW package	58°C/W
N package	69°C/W
NS package	60°C/W
PW package	83°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 voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

SN54HC244, SN74HC244

OCTAL BUFFERS AND LINE DRIVERS

WITH 3-STATE OUTPUTS

SCLS130D – DECEMBER 1982 – REVISED AUGUST 2003

recommended operating conditions (see Note 3)

			SN54HC244			SN74HC244			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage		2	5	6	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5			1.5			V
		V _{CC} = 4.5 V	3.15			3.15			
		V _{CC} = 6 V	4.2			4.2			
V _{IL}	Low-level input voltage	V _{CC} = 2 V			0.5			0.5	V
		V _{CC} = 4.5 V			1.35			1.35	
		V _{CC} = 6 V			1.8			1.8	
V _I	Input voltage		0		V _{CC}	0		V _{CC}	V
V _O	Output voltage		0		V _{CC}	0		V _{CC}	V
$\Delta t/\Delta v$	Input transition rise/fall time	V _{CC} = 2 V			1000			1000	ns
		V _{CC} = 4.5 V			500			500	
		V _{CC} = 6 V			400			400	
T _A	Operating free-air temperature		–55		125	–40		85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C			SN54HC244		SN74HC244		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = –20 μ A	2 V	1.9	1.998		1.9		1.9		V
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		I _{OH} = –6 mA	4.5 V	3.98	4.3		3.7		3.84		
		I _{OH} = –7.8 mA	6 V	5.48	5.8		5.2		5.34		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μ A	2 V		0.002	0.1		0.1		0.1	V
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	
		I _{OL} = 6 mA	4.5 V		0.17	0.26		0.4		0.33	
		I _{OL} = 7.8 mA	6 V		0.15	0.26		0.4		0.33	
I _I	V _I = V _{CC} or 0		6 V		±0.1	±100		±1000		±1000	nA
I _{OZ}	V _O = V _{CC} or 0, V _I = V _{IH} or V _{IL}		6 V		±0.01	±0.5		±10		±5	μ A
I _{CC}	V _I = V _{CC} or 0, I _O = 0		6 V			8		160		80	μ A
C _i			2 V to 6 V		3	10		10		10	pF



SN54HC244, SN74HC244

OCTAL BUFFERS AND LINE DRIVERS

WITH 3-STATE OUTPUTS

SCLS130D – DECEMBER 1982 – REVISED AUGUST 2003

switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC244		SN74HC244		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2 V		40	115		170		145	ns
			4.5 V		13	23		34		29	
			6 V		11	20		29		25	
t_{en}	\overline{OE}	Y	2 V		75	150		225		190	ns
			4.5 V		15	30		45		38	
			6 V		13	26		38		32	
t_{dis}	\overline{OE}	Y	2 V		75	150		225		190	ns
			4.5 V		15	30		45		38	
			6 V		13	26		38		32	
t_t		Y	2 V		28	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

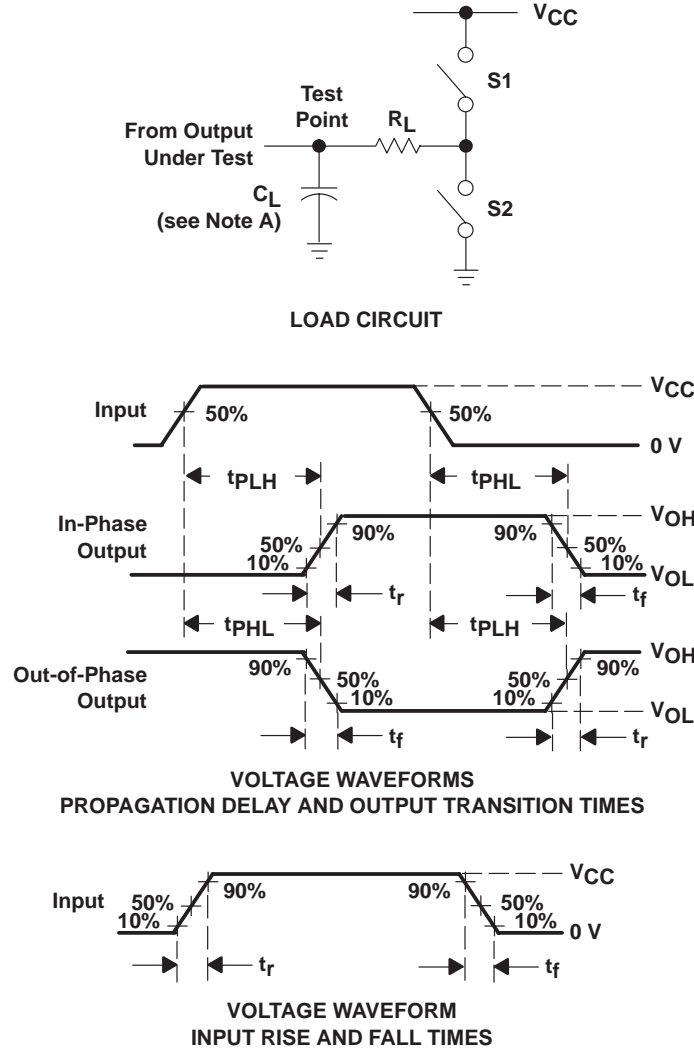
switching characteristics over recommended operating free-air temperature range, $C_L = 150$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC244		SN74HC244		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2 V		56	165		245		210	ns
			4.5 V		18	33		49		42	
			6 V		15	28		42		35	
t_{en}	\overline{OE}	Y	2 V		100	200		300		250	ns
			4.5 V		20	40		60		50	
			6 V		17	34		51		43	
t_t		Y	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

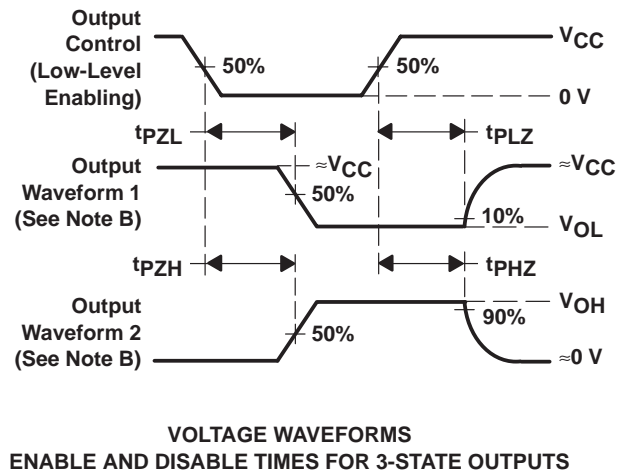
operating characteristics, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per buffer/driver	No load	35	pF

PARAMETER MEASUREMENT INFORMATION



PARAMETER	R_L	C_L	S1	S2
t_{en}	1 k Ω	50 pF or 150 pF	Open	Closed
			Closed	Open
t_{dis}	1 k Ω	50 pF	Open	Closed
			Closed	Open
t_{pd} or t_t	—	50 pF or 150 pF	Open	Open



- NOTES:
- C_L includes probe and test-fixture 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.
 - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - The outputs are measured one at a time with one input 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 1. 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)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8409601VRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8409601VR A SNV54HC244J	Samples
5962-8409601VSA	ACTIVE	CFP	W	20	25	TBD	Call TI	N / A for Pkg Type	-55 to 125	5962-8409601VS A SNV54HC244W	Samples
84096012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84096012A SNJ54HC 244FK	Samples
8409601RA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8409601RA SNJ54HC244J	Samples
8409601SA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8409601SA SNJ54HC244W	Samples
JM38510/65705B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 65705B2A	Samples
JM38510/65705BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65705BRA	Samples
JM38510/65705BSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	JM38510/ 65705BSA	Samples
M38510/65705B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 65705B2A	Samples
M38510/65705BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65705BRA	Samples
M38510/65705BSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	JM38510/ 65705BSA	Samples
SN54HC244J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54HC244J	Samples
SN74HC244ADBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI	-40 to 85		
SN74HC244APWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85		
SN74HC244DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI	-40 to 85		
SN74HC244DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC244DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC244N	Samples
SN74HC244N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI	-40 to 85		
SN74HC244NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC244N	Samples
SN74HC244NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85		
SN74HC244PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HC244PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWT	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWTE4	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244PWTG4	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC244	Samples
SN74HC244QDWRG4Q1	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		HC244Q	Samples
SNJ54HC244FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84096012A SNJ54HC 244FK	Samples
SNJ54HC244J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	8409601RA SNJ54HC244J	Samples
SNJ54HC244W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8409601SA SNJ54HC244W	Samples

(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.

(4) 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.

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OTHER QUALIFIED VERSIONS OF SN54HC244, SN54HC244-SP, SN74HC244 :

- Catalog: [SN74HC244](#), [SN54HC244](#)
- Automotive: [SN74HC244-Q1](#), [SN74HC244-Q1](#)
- Enhanced Product: [SN74HC244-EP](#), [SN74HC244-EP](#)
- Military: [SN54HC244](#)
- Space: [SN54HC244-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

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
SN74HC244DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HC244DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HC244DWRG4	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HC244NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74HC244PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74HC244PWT	TSSOP	PW	20	250	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC244DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74HC244DWR	SOIC	DW	20	2000	600.0	144.0	84.0
SN74HC244DWRG4	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HC244NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HC244PWR	TSSOP	PW	20	2000	367.0	367.0	38.0
SN74HC244PWT	TSSOP	PW	20	250	367.0	367.0	38.0

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	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.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only.
 - Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



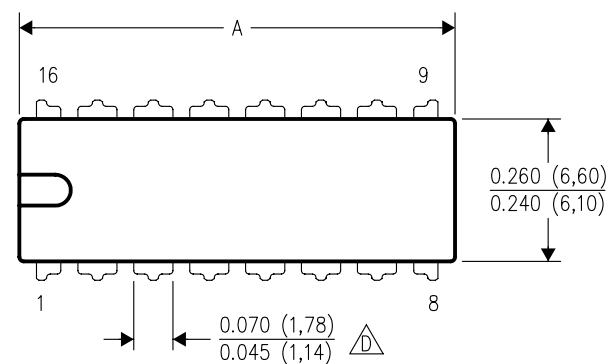
4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - Falls within JEDEC MS-004

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	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



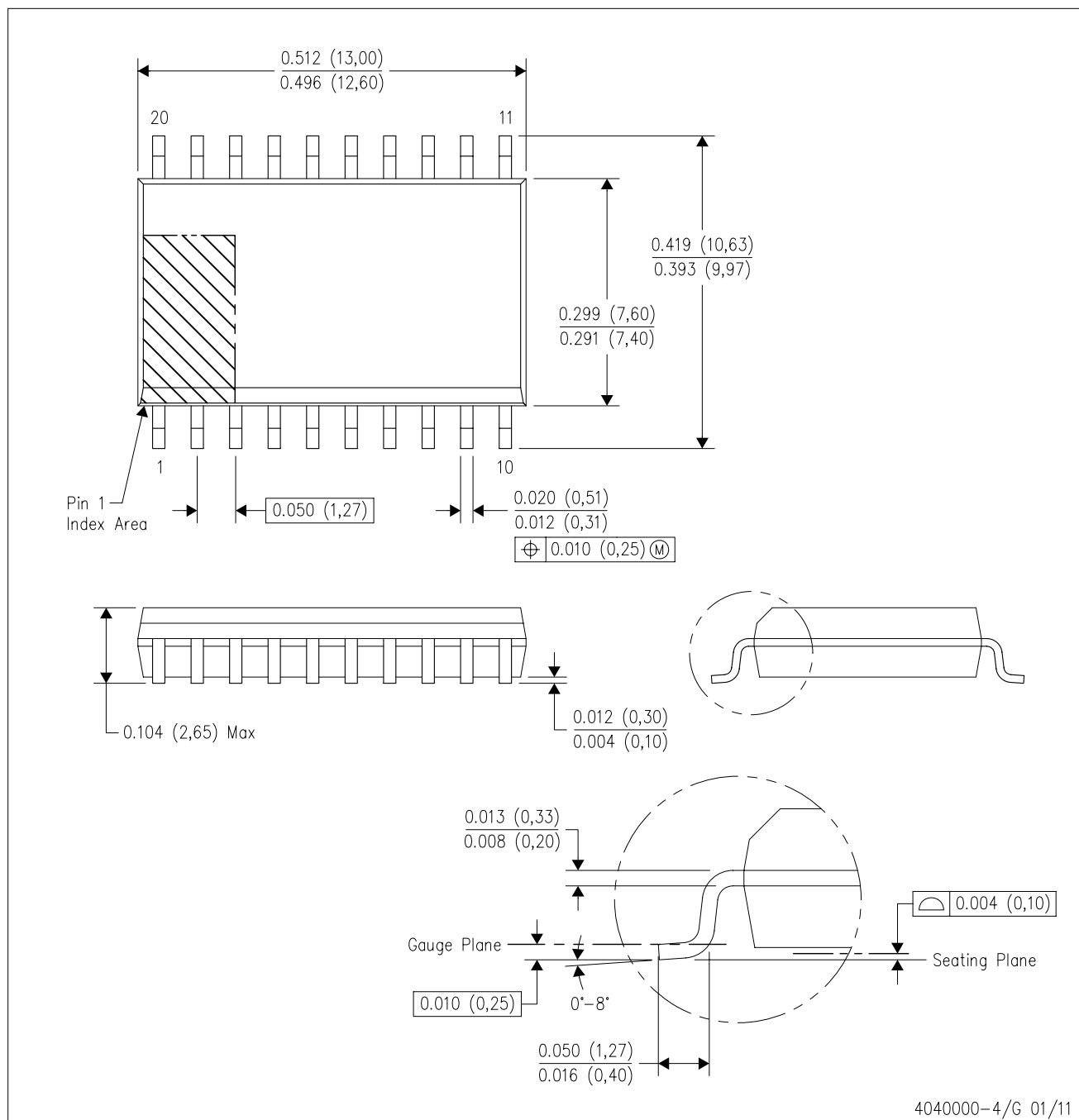
4040049/E 12/2002

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.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
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 MS-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/F 08/13

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



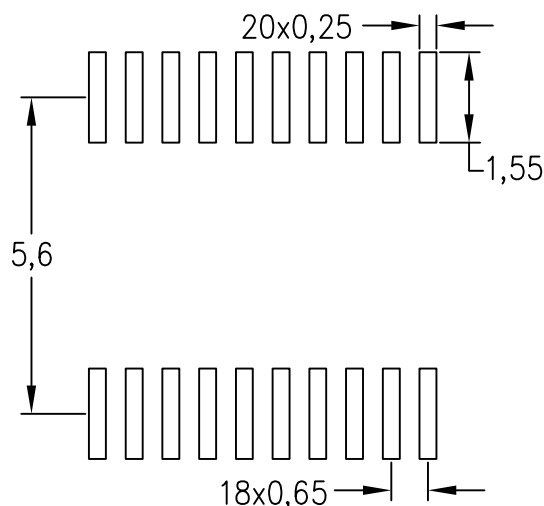
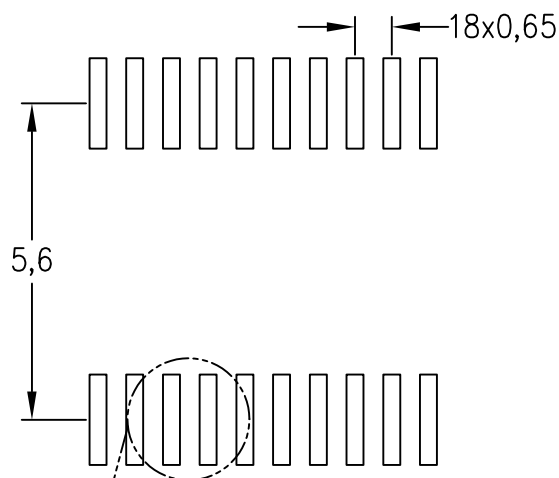
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

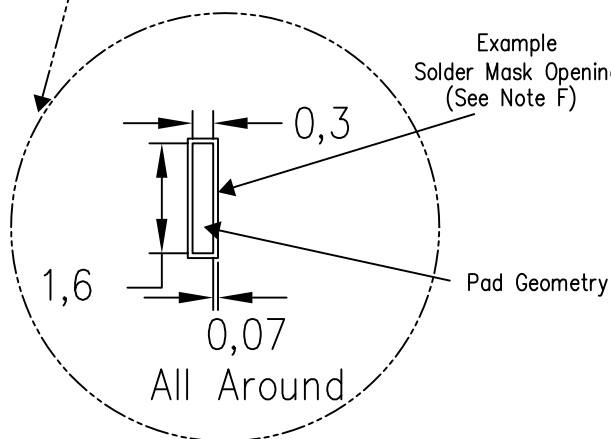
Example Board Layout

Based on a stencil thickness
of .127mm (.005inch).



Example
Non Soldermask Defined Pad

Example
Solder Mask Opening
(See Note F)



4211284-5/F 12/12

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

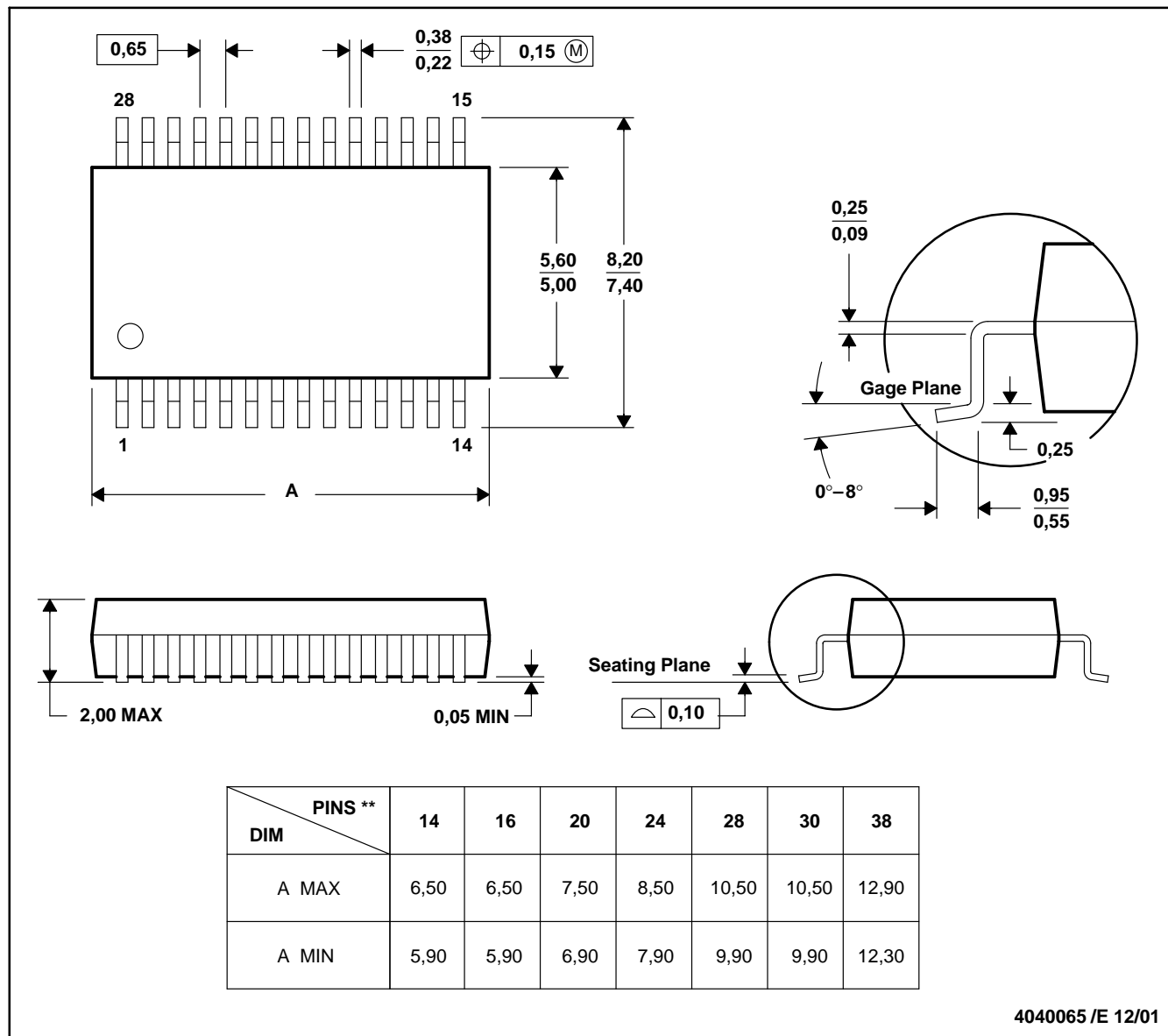
4040062/C 03/03

- 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.

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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