SCBS185B - FEBRUARY 1991 - REVISED JANUARY 1997

- State-of-the-Art *EPIC*-II*B*<sup>™</sup> BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V<sub>OLP</sub> (Output Ground Bounce) < 1 V at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C
- High-Drive Outputs (–32-mA I<sub>OH</sub>, 64-mA I<sub>OL</sub>)
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Plastic (N) and Ceramic (J) DIPs, and Ceramic Flat (W) Package

#### description

The 'ABT273 are 8-bit positive-edge-triggered D-type flip-flops with a direct clear (CLR) input. They are particularly suitable for implementing buffer and storage registers, shift registers, and pattern generators.

Information at the data (D) inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock (CLK) input is at either the high or low level, the D input signal has no effect at the output.

SN54ABT27 SN74ABT273		N, C	
CLR [ 1Q [ 1D [ 2D [ 2Q [ 3Q [ 4D [ 4Q [ GND [	1 2 3 4 5 6 7 8 9 10	20 19 18 17 16 15 14 13 12 11	V <sub>CC</sub> 8Q 8D 7D 7Q 6Q 6D 5D 5Q CLK
l			

SN54ABT273 . . . FK PACKAGE (TOP VIEW)

	1D CLR 80 80
2D	3 2 1 20 19 4 18 8D
2D 2Q 3Q 3D 4D	4     18     8D       5     17     7D       6     16     7Q       7     15     6Q
3Q	6 16 7Q 7 15 6Q
3D	]7 15[6Q
4D	
	9 10 11 12 13
1	
	S C N C A A A A A A A A A A A A A A A A A

The SN54ABT273 is characterized for operation over the full military temperature range of  $-55^{\circ}$ C to  $125^{\circ}$ C. The SN74ABT273 is characterized for operation from  $-40^{\circ}$ C to  $85^{\circ}$ C.

	FUNCTION TABLE (each flip-flop)													
	INPUTS		OUTPUT											
CLR	CLK	D	Q											
L	Х	Х	L											
н	$\uparrow$	Н	н											
н	$\uparrow$	L	L											
н	H or L	Х	Q <sub>0</sub>											



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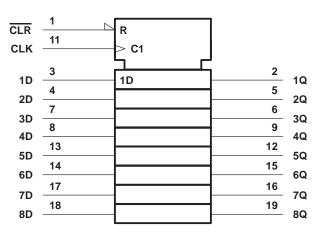
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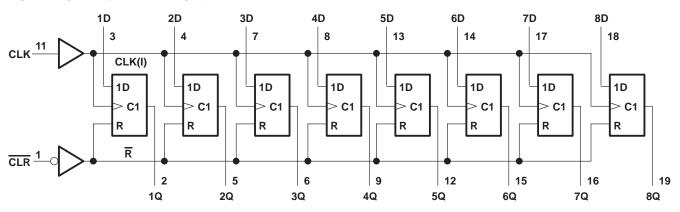
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#### logic symbol<sup>†</sup>



<sup>†</sup> This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

#### logic diagram (positive logic)



#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>‡</sup>

	0.5 V to 7 V 0.5 V to 7 V
Voltage range applied to any output in the high or	power-off state, V <sub>O</sub> –0.5 V to 5.5 V
Current into any output in the low state, IO: SN54	ABT273
SN74	ABT273 128 mA
Input clamp current, I <sub>IK</sub> (V <sub>I</sub> < 0)	
Output clamp current, $I_{OK}$ (V <sub>O</sub> < 0)	
Package thermal impedance, $\theta_{JA}$ (see Note 2): D	PB package 115°C/W
	W package 97°C/W
Ν	I package 67°C/W
F	W package 128°C/W
Storage temperature range, T <sub>stg</sub>	

<sup>‡</sup> 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 clamp-current ratings are observed.

2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51, except for through-hole packages, which use a trace length of zero.



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#### recommended operating conditions (see Note 3)

		SN54A	BT273	SN74A	BT273	UNIT
		MIN	MAX	MIN	MAX	UNIT
VCC	Supply voltage	4.5	5.5	4.5	5.5	V
VIH	High-level input voltage	2		2		V
VIL	Low-level input voltage		0.8		0.8	V
VI	Input voltage	0	VCC	0	VCC	V
ЮН	High-level output current		-24		-32	mA
IOL	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		10		10	ns/V
Т <sub>А</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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

DADAMETED				1	A = 25°	C	SN54A	BT273	SN74A	BT273	LINUT
PARAMETER		TEST CONDITIO	NS	MIN	түр†	MAX	MIN	MAX	MIN	MAX	UNIT
VIK	V <sub>CC</sub> = 4.5 V,	lı = -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		
Vari	V <sub>CC</sub> = 5 V,	I <sub>OH</sub> = -3 mA		3			3		3		V
VOH	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -24 mA		2			2				v
	VCC = 4.5 V	I <sub>OH</sub> = -32 mA		2*					2		
Vo	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 48 mA				0.55		0.55			V
VOL	VCC = 4.5 V	I <sub>OL</sub> = 64 mA				0.55*				0.55	v
V <sub>hys</sub>					100						mV
l	V <sub>CC</sub> = 5.5 V,	$V_{I} = V_{CC} \text{ or } G$	ND			±1		±1		±1	μΑ
l <sub>off</sub>	$V_{CC} = 0,$	$V_I \text{ or } V_O \leq 4.5$	V			±100				±100	μΑ
ICEX	V <sub>CC</sub> = 5.5 V,	$V_{O} = 5.5 V$	Outputs high			50		50		50	μΑ
IO‡	V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 2.5 V		-50	-100	–200§	-50	–200§	-50	–200§	mA
las	V <sub>CC</sub> = 5.5 V, I <sub>C</sub>	<b>)</b> = 0,	Outputs high		1	400§		400§		400§	μΑ
ICC	$V_{I} = V_{CC}$ or GN	1D	Outputs low		24	30		30		30	mA
$\Delta I_{CC}$ ¶	V <sub>CC</sub> = 5.5 V, O Other inputs at	ne input at 3.4 V, V <sub>CC</sub> or GND				1.5		1.5		1.5	mA
Ci	V <sub>I</sub> = 2.5 V or 0.5	5 V			7						pF

\* On products compliant to MIL-PRF-38535, this parameter does not apply.

<sup>†</sup> All typical values are at  $V_{CC} = 5$  V.

<sup>‡</sup>Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

§ This data sheet limit may vary among suppliers.

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.



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# timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

			V <sub>CC</sub> =	= 5 V, 25°C	SN54A	BT273	SN74A	UNIT	
			MIN	MAX	MIN	MAX	MIN	MAX	
fclock	Clock frequency		0	150	0	150	0	150	MHz
•	Pulse duration	CLK high or low	3.3		3.3		3.3		20
t <sub>w</sub>		CLR low	3.3		3.3		3.3		ns
		Data high	2		2		2		
t <sub>su</sub>	Setup time before CLK↑	Data low	2.5		2.5		2.5		ns
		CLR high	2		2		2		
th	Hold time after CLK <sup>↑</sup>	Data high or low	1.2†		1.4†		1.2†		ns

<sup>†</sup> This data sheet limit may vary among suppliers.

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

PARAMETER	FROM (INPUT)	ТО (OUTPUT)	V <sub>CC</sub> = T <sub>A</sub> = 2	= 5 V, 25°C	SN54A	UNIT	
		(001101)	MIN	MAX	MIN	MAX	
fmax			150		150		MHz
tPLH		Q	2.5	6	2.5	7	
<sup>t</sup> PHL	CLK	Q	3.3	6.8	3.3	7.5	ns
<sup>t</sup> PHL	CLR	Q	2.5	7.5†	2.5	8.2	ns

<sup>†</sup> This data sheet limit may vary among suppliers.

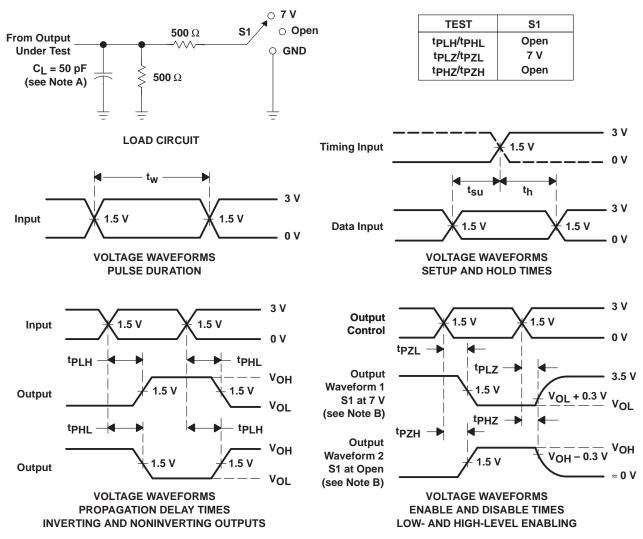
# switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = T <sub>A</sub> = 2	= 5 V, 25°C	SN74A	UNIT	
		(001101)	MIN	MAX	MIN	MAX	
fmax			150		150		MHz
tPLH	CLK	Q	2.5	6	2.5	6.5	ns
t <sub>PHL</sub>	ULK	Q	3.3	6.8	3.3	7.3	115
<sup>t</sup> PHL	CLR	Q	2.5	6.7†	2.5	7.4†	ns

<sup>†</sup> This data sheet limit may vary among suppliers.



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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 ≤ 10 MHz, Z<sub>Q</sub> = 50 Ω, t<sub>r</sub> ≤ 2.5 ns, t<sub>f</sub> ≤ 2.5 ns.
- C. All input pulses are supplied by generators having the rollowing characteristics: PRR  $\leq$  10 MHz, 20 = 50 Ω, t<sub>f</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





24-Apr-2015

#### PACKAGING INFORMATION

Orderable Device		Package Type		Pins		Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
5962-9321701Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321701Q2A SNJ54ABT 273FK	Samples
5962-9321701QRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321701QR A SNJ54ABT273J	Samples
5962-9321701QSA	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321701QS A SNJ54ABT273W	Samples
SN74ABT273DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI	-40 to 85		
SN74ABT273DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB273	Samples
SN74ABT273DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB273	Samples
SN74ABT273DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT273	Samples
SN74ABT273DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT273	Samples
SN74ABT273DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT273	Samples
SN74ABT273DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT273	Samples
SN74ABT273N	ACTIVE	PDIP	Ν	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74ABT273N	Samples
SN74ABT273NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74ABT273N	Samples
SN74ABT273NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT273	Samples
SN74ABT273PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB273	Samples
SN74ABT273PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI	-40 to 85		
SN74ABT273PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB273	Samples



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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
SN74ABT273PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB273	Samples
SNJ54ABT273FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321701Q2A SNJ54ABT 273FK	Samples
SNJ54ABT273J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321701QR A SNJ54ABT273J	Samples
SNJ54ABT273W	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321701QS A SNJ54ABT273W	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.

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.

<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.

<sup>(5)</sup> 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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## PACKAGE OPTION ADDENDUM

24-Apr-2015

<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 SN54ABT273, SN74ABT273 :

- Catalog: SN74ABT273
- Military: SN54ABT273

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

# PACKAGE MATERIALS INFORMATION

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#### TAPE AND REEL INFORMATION





### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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
SN74ABT273DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74ABT273DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74ABT273NSR	SO	NS	20	2000	330.0	24.4	9.0	13.0	2.4	4.0	24.0	Q1
SN74ABT273PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

TEXAS INSTRUMENTS

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# PACKAGE MATERIALS INFORMATION

17-Apr-2015



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT273DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74ABT273DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74ABT273NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74ABT273PWR	TSSOP	PW	20	2000	367.0	367.0	38.0

J (R-GDIP-T\*\*) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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: A. All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice. В.
  - 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 GDFP2-F20



LEADLESS CERAMIC CHIP CARRIER

FK (S-CQCC-N\*\*) 28 TERMINAL 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 metal lid.
- D. Falls within JEDEC MS-004



## 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).
- $\triangle$  The 20 pin end lead shoulder width is a vendor option, either half or full width.



# **DW0020A**



# **PACKAGE OUTLINE**

#### SOIC - 2.65 mm max height

SOIC



NOTES:

- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M. 2. This drawing is subject to change without notice. 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
- 5. Reference JEDEC registration MS-013.



# DW0020A

# **EXAMPLE BOARD LAYOUT**

### SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



# DW0020A

# **EXAMPLE STENCIL DESIGN**

### SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.



PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.  $\beta$ . This drawing is subject to change without notice.

Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153



## LAND PATTERN DATA



NOTES: Α. 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**

MSSO002E - JANUARY 1995 - REVISED DECEMBER 2001

#### 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



#### MECHANICAL DATA

#### PLASTIC SMALL-OUTLINE PACKAGE

#### 0,51 0,35 ⊕0,25⊛ 1,27 8 14 0,15 NOM 5,60 8,20 5,00 7,40 $\bigcirc$ Gage Plane ₽ 0,25 7 1 1,05 0,55 0°-10° Δ 0,15 0,05 Seating Plane — 2,00 MAX 0,10PINS \*\* 14 16 20 24 DIM 10,50 10,50 12,90 15,30 A MAX A MIN 9,90 9,90 12,30 14,70 4040062/C 03/03

NOTES: A. All linear dimensions are in millimeters.

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

**14-PINS SHOWN** 

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



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