

CD54HC373, CD74HC373 OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCLS452A – FEBRUARY 2001 – REVISED APRIL 2003

- 2-V to 6-V V_{CC} Operation
- Wide Operating Temperature Range of -55°C to 125°C
- Balanced Propagation Delays and Transition Times
- Standard Outputs Drive up to 15 LS-TTL Loads
- Significant Power Reduction Compared to LS-TTL Logic ICs

description/ordering information

The 'HC373 devices are octal transparent D-type latches designed for 2-V to 6-V V_{CC} operation.

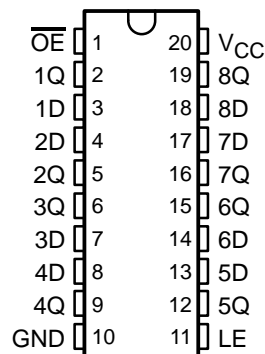
When the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is low, the Q outputs are latched at the logic levels of the D inputs.

A buffered output-enable ($\overline{\text{OE}}$) input can be used to place the eight outputs in either a normal logic state (high or low) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

$\overline{\text{OE}}$ does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ 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.

CD54HC373 ... F PACKAGE
CD74HC373 ... E OR M PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-55°C to 125°C	PDIP – E	Tube	CD74HC373E	CD74HC373E
	SOIC – M	Tube	CD74HC373M	HC373M
		Tape and reel	CD74HC373M96	
	CDIP – F	Tube	CD54HC373F3A	CD54HC373F3A

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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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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.

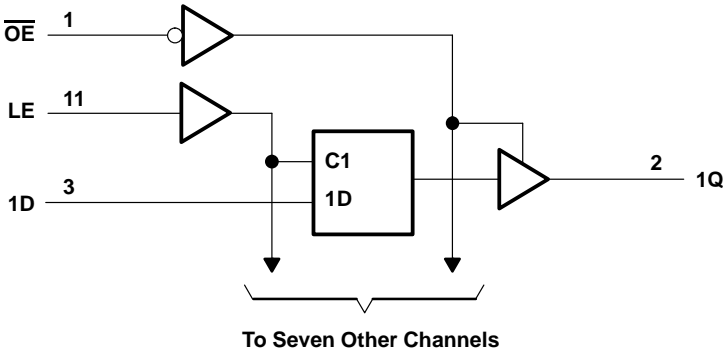
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FUNCTION TABLE
 (each latch)

INPUTS			OUTPUT Q
\overline{OE}	LE	D	
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	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 drain current per output, I_O ($V_O = 0$ to V_{CC})	±35 mA
Continuous output source or sink current per output, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 2): E package	69°C/W
M package	58°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.

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recommended operating conditions (see Note 3)

				MIN	MAX	UNIT
V _{CC}	Supply voltage			2	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V		1.5		V
		V _{CC} = 4.5 V		3.15		
		V _{CC} = 6 V		4.2		
V _{IL}	Low-level input voltage	V _{CC} = 2 V			0.5	V
		V _{CC} = 4.5 V			1.35	
		V _{CC} = 6 V			1.8	
V _I	Input voltage			0	V _{CC}	V
V _O	Output voltage			0	V _{CC}	V
t _t	Input transition (rise and fall) time	V _{CC} = 2 V			1000	ns
		V _{CC} = 4.5 V			500	
		V _{CC} = 6 V			400	
T _A	Operating free-air temperature			–55	125	°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		T _A = –55°C TO 125°C		T _A = –40°C TO 85°C		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = –20 µA	2 V	1.9		1.9		1.9		V
			4.5 V	4.4		4.4		4.4		
			6 V	5.9		5.9		5.9		
		I _{OH} = –6 mA	4.5 V	3.98		3.7		3.84		
		I _{OH} = –7.8 mA	6 V	5.48		5.2		5.34		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 µA	2 V		0.1		0.1		0.1	V
			4.5 V		0.1		0.1		0.1	
			6 V		0.1		0.1		0.1	
		I _{OL} = 6 mA	4.5 V		0.26		0.4		0.33	
		I _{OL} = 7.8 mA	6 V		0.26		0.4		0.33	
I _I	V _I = V _{CC} or 0		6 V		±0.1		±1		±1	µA
I _{OZ}	V _O = V _{CC} or 0		6 V		±0.5		±10		±5	µA
I _{CC}	V _I = V _{CC} or 0, I _O = 0		6 V		8		160		80	µA
C _i					10		10		10	pF
C _O					20		20		20	pF



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timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

	V_{CC}	$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO 125°C		$T_A = -40^\circ\text{C}$ TO 85°C		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w Pulse duration, LE high	2 V	80		120		100		ns
	4.5 V	16		24		20		
	6 V	14		20		17		
t_{su} Setup time, data before LE \downarrow	2 V	50		75		65		ns
	4.5 V	10		15		13		
	6 V	9		13		11		
t_h Hold time, data after LE \downarrow	2 V	5		5		5		ns
	4.5 V	5		5		5		
	6 V	5		5		5		

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	V_{CC}	$T_A = 25^\circ\text{C}$		$T_A = -55^\circ\text{C}$ TO 125°C		$T_A = -40^\circ\text{C}$ TO 85°C		UNIT
					MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	D	Q	$C_L = 50\text{ pF}$	2 V		150		225		190	ns
				4.5 V		30		45		38	
				6 V		26		38		33	
	LE	Q	$C_L = 50\text{ pF}$	2 V		175		265		220	
				4.5 V		35		53		44	
				6 V		30		45		37	
t_{en}	\overline{OE}	Q	$C_L = 50\text{ pF}$	2 V		150		225		190	ns
				4.5 V		30		45		38	
				6 V		26		38		33	
t_{dis}	\overline{OE}	Q	$C_L = 50\text{ pF}$	2 V		150		225		190	ns
				4.5 V		30		45		38	
				6 V		26		38		33	
t_t		Q	$C_L = 50\text{ pF}$	2 V		60		90		75	ns
				4.5 V		12		18		15	
				6 V		10		15		13	

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

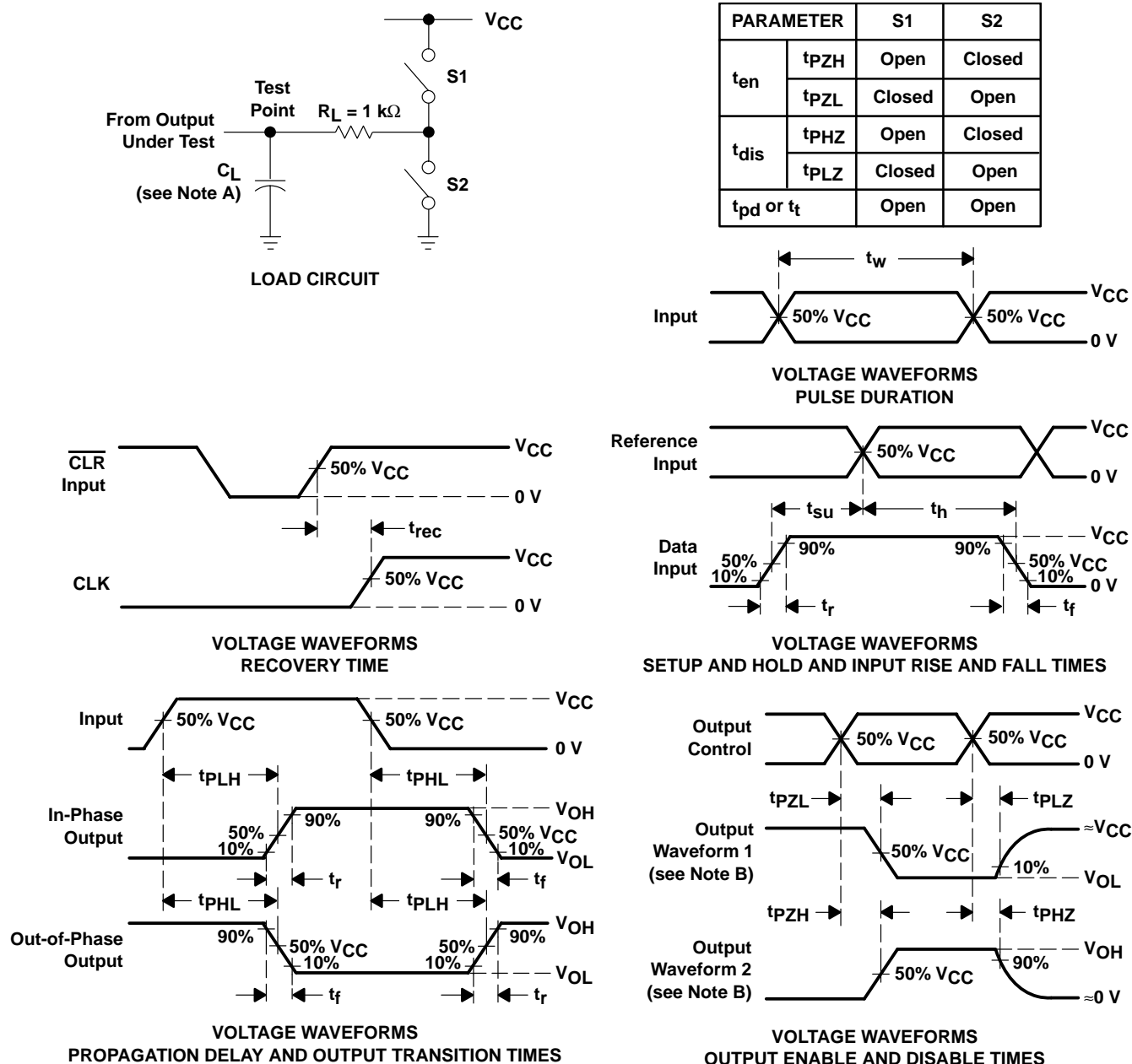
PARAMETER	TYP	UNIT
C_{pd} Power dissipation capacitance	51	pF



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PARAMETER MEASUREMENT INFORMATION



- 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: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r = 6\text{ ns}$, $t_f = 6\text{ ns}$.
 - For clock inputs, f_{max} is measured with the input duty cycle at 50%.
 - 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} .
 - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CD54HC373F	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HC373F	Samples
CD54HC373F3A	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8407201RA CD54HC373F3A	Samples
CD74HC373E	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC373E	Samples
CD74HC373EE4	ACTIVE	PDIP	N	20	20	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC373E	Samples
CD74HC373M	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC373M	Samples
CD74HC373M96	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC373M	Samples
CD74HC373ME4	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC373M	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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

⁽⁶⁾ Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF CD54HC373, CD74HC373 :

- Catalog : [CD74HC373](#)
- Military : [CD54HC373](#)

NOTE: Qualified Version Definitions:

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

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
CD74HC373M96	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	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)
CD74HC373M96	SOIC	DW	20	2000	367.0	367.0	45.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
CD74HC373E	N	PDIP	20	20	506	13.97	11230	4.32
CD74HC373EE4	N	PDIP	20	20	506	13.97	11230	4.32
CD74HC373M	DW	SOIC	20	25	507	12.83	5080	6.6
CD74HC373ME4	DW	SOIC	20	25	507	12.83	5080	6.6

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.

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



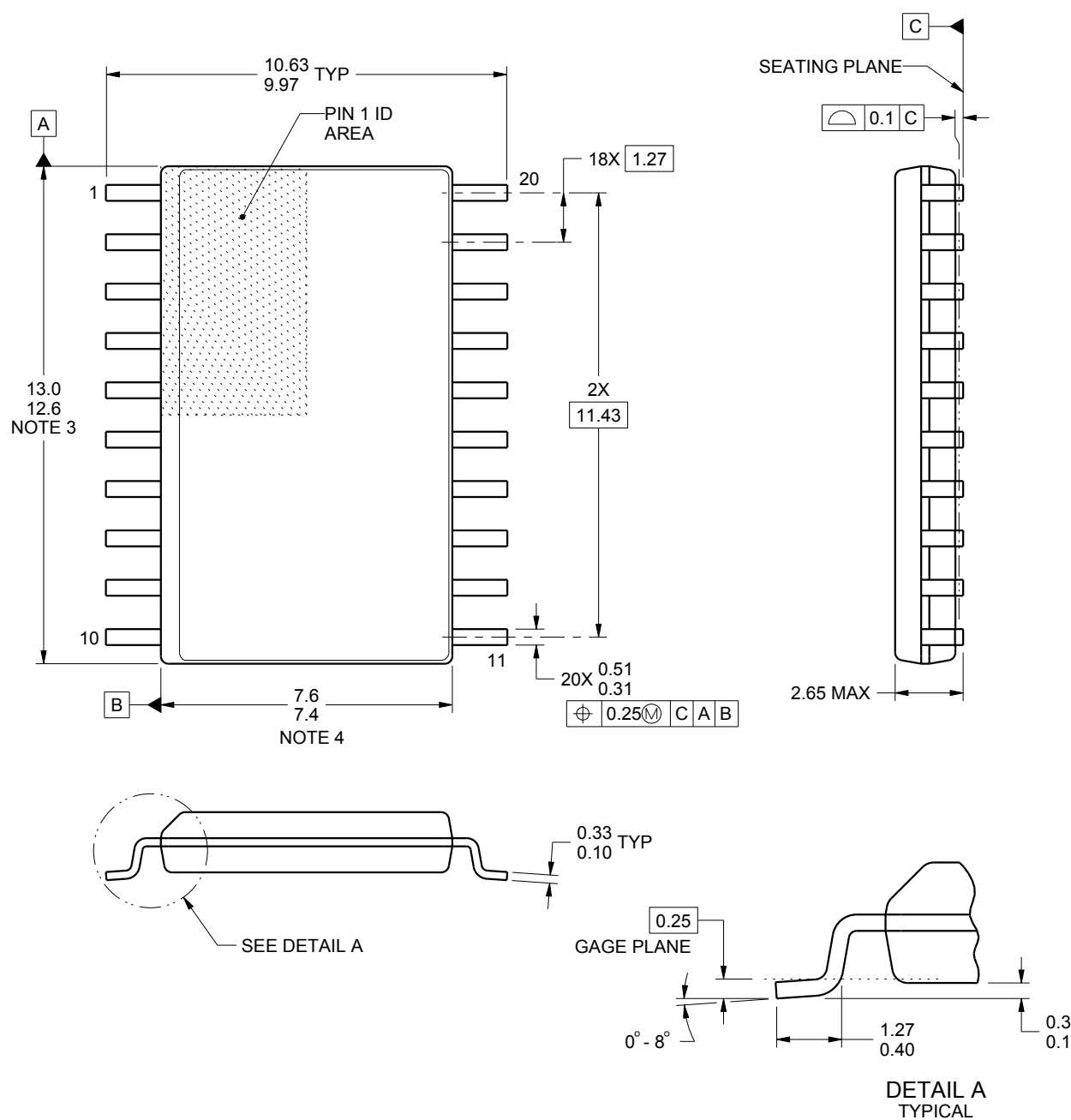
PINS **	14	16	18	20
DIM				
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



14/18 Pin Only
20 Pin vendor option

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.



4220724/A 05/2016

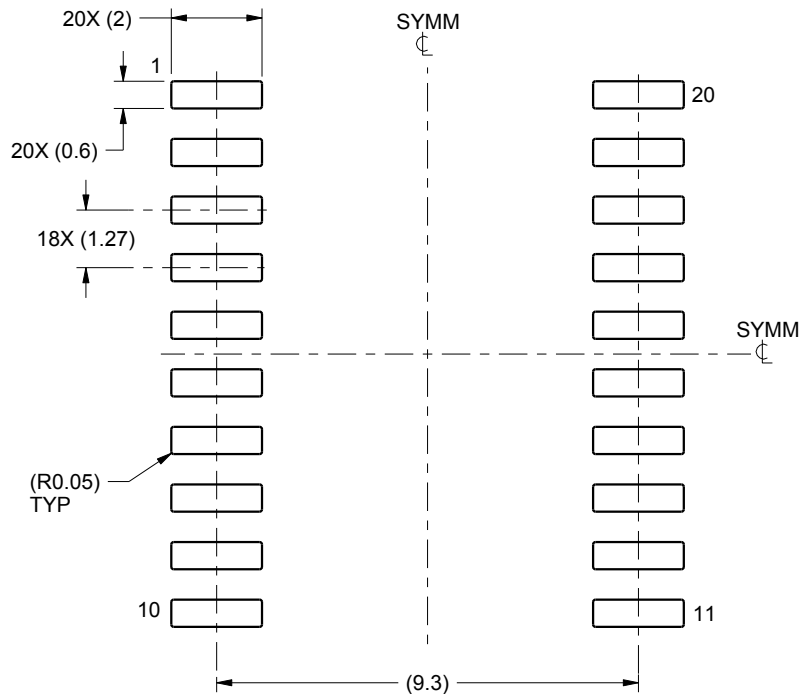
NOTES:

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.

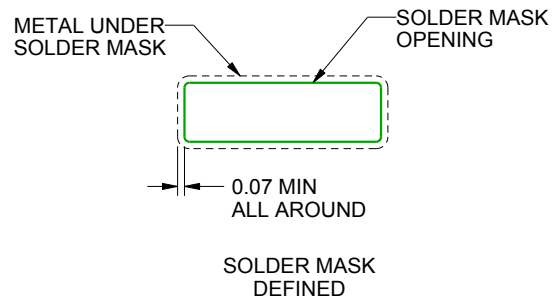
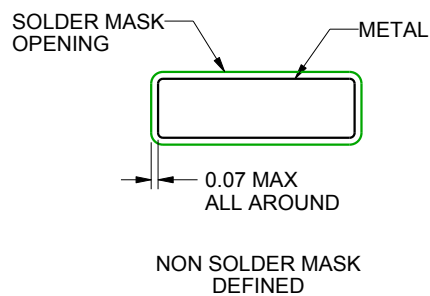
DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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.

EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

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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.

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