

SN54122, SN54123, SN54130, SN54LS122, SN54LS123, SN74122, SN74123, SN74130, SN74LS122, SN74LS123 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SDLS043 – DECEMBER 1983 – REVISED MARCH 1988

- D-C Triggered from Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses, Up to 100% Duty Cycle
- Overriding Clear Terminates Output Pulse
- '122 and 'LS122 Have Internal Timing Resistors

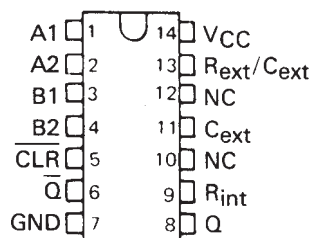
description

These d-c triggered multivibrators feature output pulse-duration control by three methods. The basic pulse time is programmed by selection of external resistance and capacitance values (see typical application data). The '122 and 'LS122 have internal timing resistors that allow the circuits to be used with only an external capacitor, if so desired. Once triggered, the basic pulse duration may be extended by retriggering the gated low-level-active (A) or high-level-active (B) inputs, or be reduced by use of the overriding clear. Figure 1 illustrates pulse control by retriggering and early clear.

The 'LS122 and 'LS123 are provided enough Schmitt hysteresis to ensure jitter-free triggering from the B input with transition rates as slow as 0.1 millivolt per nanosecond.

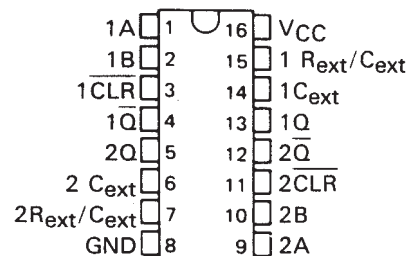
The R_{int} is nominally 10 k Ω for '122 and 'LS122.

SN54122, SN54LS122 . . . J OR W PACKAGE
SN74122 . . . N PACKAGE
SN74LS122 . . . D OR N PACKAGE
(TOP VIEW) (SEE NOTES 1 THRU 4)

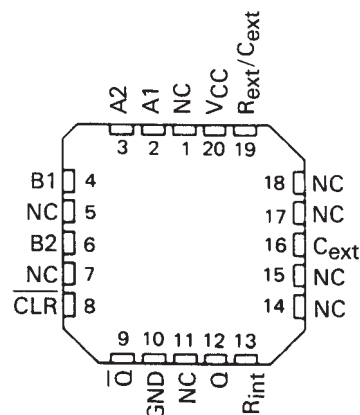


- NOTES: 1. An external timing capacitor may be connected between C_{ext} and R_{ext}/C_{ext} (positive).
2. To use the internal timing resistor of '122 or 'LS122, connect R_{int} to VCC.
3. For improved pulse duration accuracy and repeatability, connect an external resistor between R_{ext}/C_{ext} and VCC with R_{int} open-circuited.
4. To obtain variable pulse durations, connect an external variable resistance between R_{int} or R_{ext}/C_{ext} and VCC.

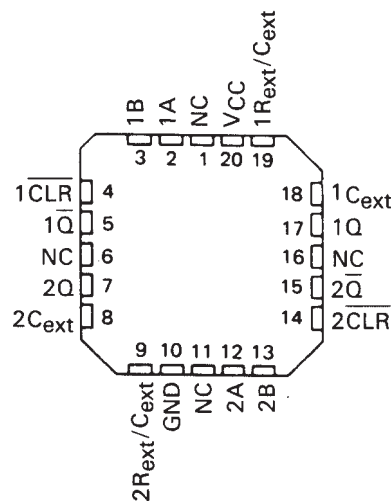
SN54123, SN54130, SN54LS123 . . . J OR W PACKAGE
SN74123, SN74130 . . . N PACKAGE
SN74LS123 . . . D OR N PACKAGE
(TOP VIEW) (SEE NOTES 1 THRU 4)



SN54LS122 . . . FK PACKAGE
(TOP VIEW) (SEE NOTES 1 THRU 4)



SN54LS123 . . . FK PACKAGE
(TOP VIEW) (SEE NOTES 1 THRU 4)

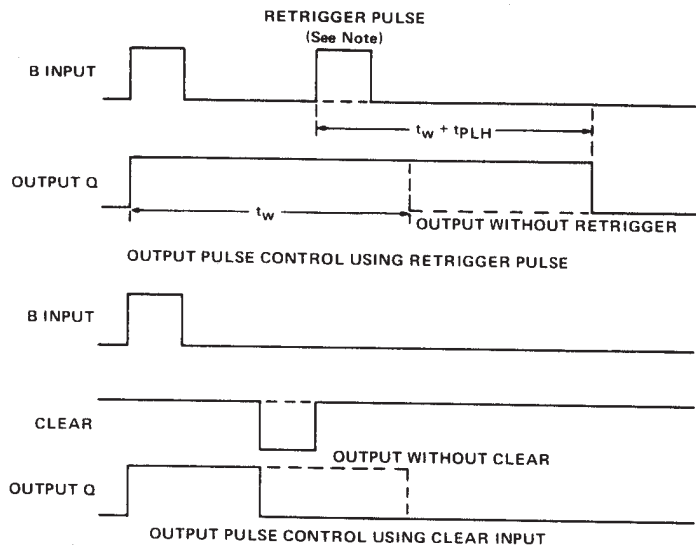


NC - No internal connection

SN54122, SN54123, SN54130, SN54LS122, SN54LS123,
 SN74122, SN74123, SN74130, SN74LS122, SN74LS123
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description (continued)



NOTE: Retrigger pulses starting before 0.22 C_{ext} (in picofrads) nanoseconds after the initial trigger pulse will be ignored and the output duration will remain unchanged.

FIGURE 1—TYPICAL INPUT/OUTPUT PULSES

'122, 'LS122
 FUNCTION TABLE

INPUTS					OUTPUTS	
CLEAR	A1	A2	B1	B2	Q	\bar{Q}
L	X	X	X	X	L	H
X	H	H	X	X	L†	H†
X	X	X	L	X	L†	H†
X	X	X	X	L	L†	H†
H	L	X	↑	H		
H	L	X	H	↑		
H	X	L	↑	H		
H	X	L	H	↑		
H	H	↓	H	H		
H	↓	↓	H	H		
H	↓	H	H	H		
↑	L	X	H	H		
↑	X	L	H	H		

'123, '130, 'LS123
 FUNCTION TABLE

INPUTS			OUTPUTS	
CLEAR	A	B	Q	\bar{Q}
L	X	X	L	H
X	H	X	L†	H†
X	X	L	L†	H†
H	L	↑		
H	↓	H		
↑	L	H		

See explanation of function tables on page

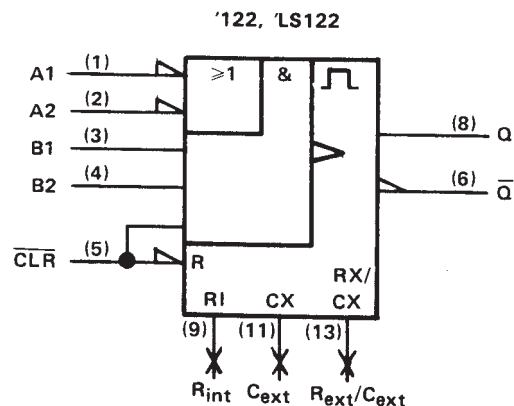
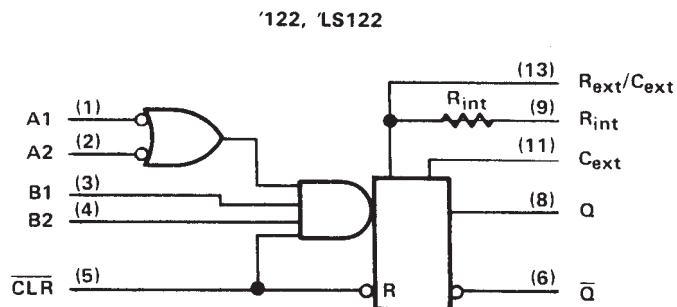
† These lines of the functional tables assume that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the set up.

SN54122, SN54123, SN54130, SN54LS122, SN54LS123, SN74122, SN74123, SN74130, SN74LS122, SN74LS123 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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logic diagram (positive logic)

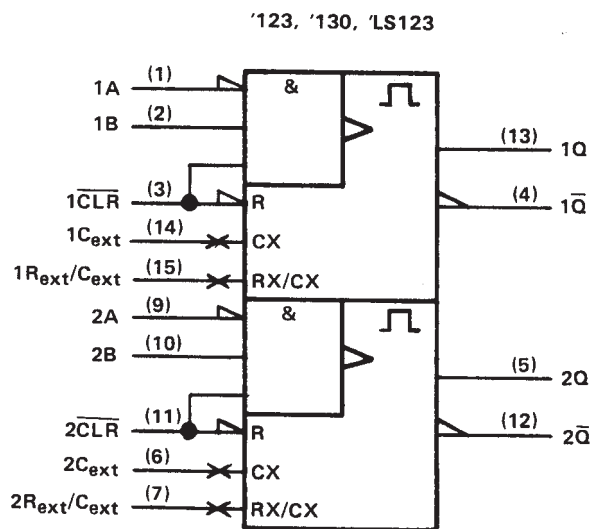
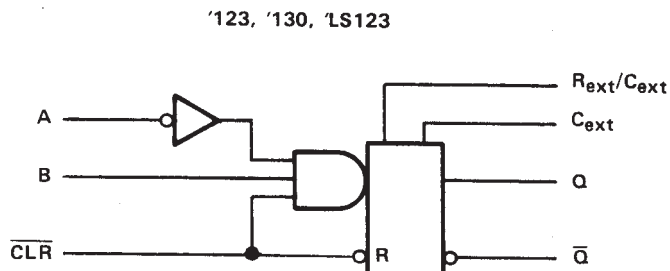
logic symbol†



R_{int} is nominally 10 k Ω for '122 and 'LS122

logic diagram (positive logic) (each multivibrator)

logic symbol†



Pin numbers shown are for D, J, N, and W packages.

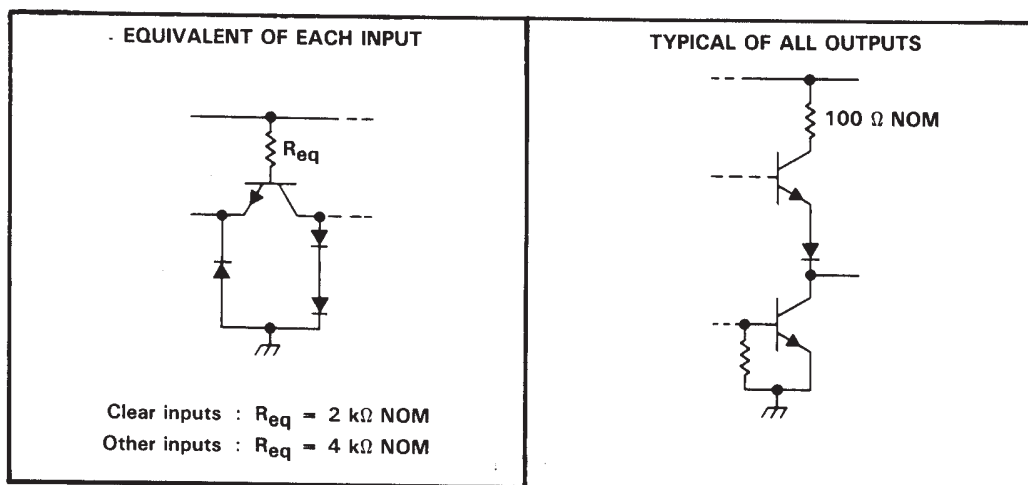
†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN54122, SN54123, SN54130, SN54LS122, SN54LS123, SN74122, SN74123, SN74130, SN74LS122, SN74LS123 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

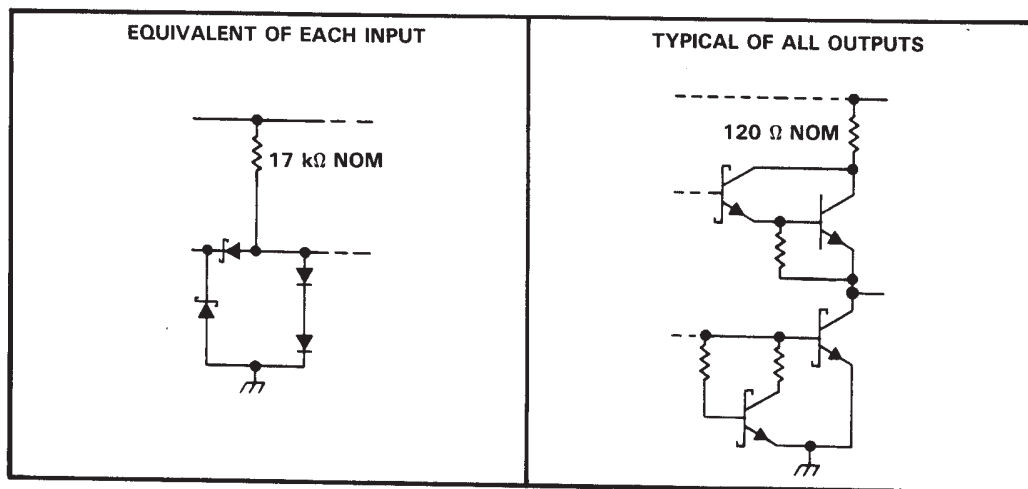
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schematics of inputs and outputs

'122, '123, '130 CIRCUITS



'LS122, 'LS123 CIRCUITS



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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: '122, '123, '130	5.5 V
'LS122, 'LS123	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

SN54122, SN54123, SN54130, SN74122, SN74123, SN74130 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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recommended operating conditions

	SN54'			SN74'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-800			-800	μA
Low-level output current, I_{OL}			16			16	mA
Pulse duration, t_W	40			40			ns
External timing resistance, R_{ext}	5		25	5		50	k Ω
External capacitance, C_{ext}	No restriction			No restriction			
Wiring capacitance at R_{ext}/C_{ext} terminal			50			50	pF
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}C$

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

PARAMETER		TEST CONDITIONS†	'122			'123, '130			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH}	High-level input voltage		2			2			V
V_{IL}	Low-level input voltage				0.8			0.8	V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5			-1.5	V
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}, I_{OH} = -800 \mu A$, See Note 5	2.4	3.4		2.4	3.4		V
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}, I_{OL} = 16 \text{ mA}$, See Note 5		0.2	0.4		0.2	0.4	V
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
I_{IH}	High-level input current	Data inputs $V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	μA
		Clear input			80			80	
I_{IL}	Low-level input current	Data inputs $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
		Clear input			-3.2			-3.2	
I_{OS}	Short-circuit output current§	$V_{CC} = \text{MAX}$, See Note 5	-10		-40	-10		-40	mA
I_{CC}	Supply current (quiescent or triggered)	$V_{CC} = \text{MAX}$, See Notes 6 and 7	23	36		46	66		mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}C$.

§ Not more than one output should be shorted at a time.

NOTES: 5. Ground C_{ext} to measure V_{OH} at Q, V_{OL} at \bar{Q} , or I_{OS} at Q. C_{ext} is open to measure V_{OH} at \bar{Q} , V_{OL} at Q, or I_{OS} at \bar{Q} .

6. Quiescent I_{CC} is measured (after clearing) with 4.5 V applied to all clear and A inputs, B inputs grounded, all outputs open and $R_{ext} = 25 \text{ k}\Omega$. R_{int} of '122 is open.

7. I_{CC} is measured in the triggered state with 2.4 V applied to all clear and B inputs, A inputs grounded, all outputs open, $C_{ext} = 0.02 \mu F$, and $R_{ext} = 25 \text{ k}\Omega$. R_{int} of '122 is open.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}C$, see note 8

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'122, '130			'123			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	A	Q	$C_{ext} = 0$, $R_{ext} = 5 \text{ k}\Omega$, $C_L = 15 \text{ pF}$, $R_L = 400 \Omega$	22	33		22	33		ns
	B	Q		19	28		19	28		
t_{PHL}	A	\bar{Q}		30	40		30	40		ns
	B	\bar{Q}		27	36		27	36		
t_{PHL}	Clear	Q		18	27		18	27		ns
t_{PLH}	Clear	\bar{Q}		30	40		30	40		
$t_{WQ}(\text{min})$	A or B	Q		45	65		45	76		ns
t_{WQ}	A or B	Q	$C_{ext} = 1000 \text{ pF}$, $R_{ext} = 10 \text{ k}\Omega$, $C_L = 15 \text{ pF}$, $R_L = 400 \Omega$	3.08	3.42	3.76	2.76	3.03	3.37	μs

¶ t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

t_{WQ} = duration of pulse at output Q.

NOTE 8: Load circuits and voltage waveforms are shown in Section 1.



SN54LS122, SN54LS123, SN74LS122, SN74LS123 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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recommended operating conditions

	SN54LS'			SN74LS'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-400			-400	μA
Low-level output current, I_{OL}			4			8	mA
Pulse duration, t_w	40			40			ns
External timing resistance, R_{ext}	5		180	5		260	$k\Omega$
External capacitance, C_{ext}	No restriction			No restriction			
Wiring capacitance at R_{ext}/C_{ext} terminal			50			50	pF
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}C$

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

PARAMETER	TEST CONDITIONS†	SN54LS'			SN74LS'			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage				0.7			0.8	V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu A$	2.5	3.5		2.7	3.5		V
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OL} = 4 \text{ mA}$	0.25	0.4		0.25	0.4		V
							0.35 0.5	
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA
I_{CC} Supply current (quiescent or triggered)	$V_{CC} = \text{MAX}, \text{ See Note 13}$			'LS122 6 11			'LS123 6 11	mA
				12 20			12 20	

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}C$.

§Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTES: 12. To measure V_{OH} at Q, V_{OL} at Q, or I_{OS} at Q, ground R_{ext}/C_{ext} , apply 2 V to B and clear, and pulse A from 2 V to 0 V.

13. With all outputs open and 4.5 V applied to all data and clear inputs. I_{CC} is measured after a momentary ground, then 4.5 V, is applied to A or B inputs.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}C$ (see note 8)

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	A	Q	Cext = 0, Rext = 5 kΩ, CL = 15 pF, RL = 2 kΩ		23	33	ns
	B				23	44	
tPHL	A	Q̅			32	45	ns
	B				34	56	
tPHL	Clear	Q			20	27	ns
tPLH		Q̅			28	45	
twQ (min)		Q			116	200	
twQ	A or B	Q	Cext = 1000 pF, Rext = 10 kΩ, CL = 15 pF, RL = 2 kΩ	4	4.5	5	μs

¶ t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

t_{wQ} = duration of pulse at output Q.

NOTE 8: Load circuits and voltage waveforms are shown in Section 1.



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TYPICAL APPLICATION DATA FOR '122, '123, '130

For pulse durations when $C_{ext} \leq 1000$ pF, see Figure 4.

The output pulse duration is primarily a function of the external capacitor and resistor. For $C_{ext} > 1000$ pF, the output pulse duration (t_W) is defined as:

$$t_W = K \cdot R_T \cdot C_{ext} \left(1 + \frac{0.7}{R_T} \right)$$

where

K is 0.32 for '122, 0.28 for '123 and '130

R_T is in $k\Omega$ (internal or external timing resistance.)

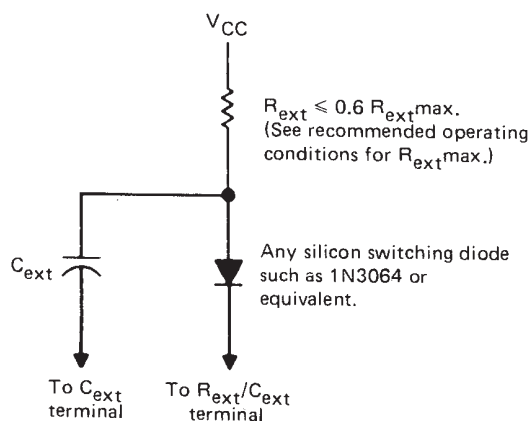
C_{ext} is in pF

t_W is in ns

To prevent reverse voltage across C_{ext} , it is recommended that the method shown in Figure 2 be employed when using electrolytic capacitors and in applications utilizing the clear function. In all applications using the diode, the pulse duration is:

$$t_W = K_D \cdot R_T \cdot C_{ext} \left(1 + \frac{0.7}{R_T} \right)$$

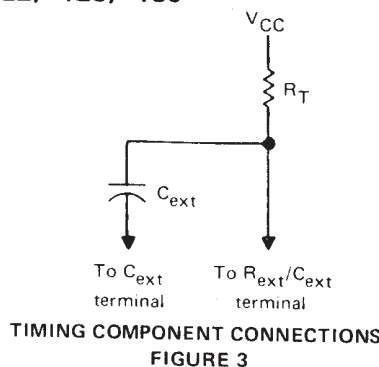
K_D is 0.28 for '122, 0.25 for '123 and '130



TIMING COMPONENT CONNECTIONS WHEN
 $C_{ext} > 1000$ pF AND CLEAR IS USED

FIGURE 2

Applications requiring more precise pulse durations (up to 28 seconds) and not requiring the clear feature can best be satisfied with the '121.



TYPICAL OUTPUT PULSE DURATION
vs
EXTERNAL TIMING CAPACITANCE

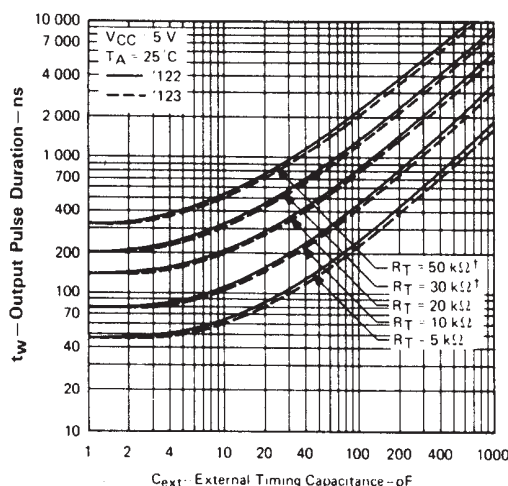


FIGURE 4

†These values of resistance exceed the maximum recommended for use over the full temperature range of the SN54' circuits.

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TYPICAL APPLICATION DATA FOR 'LS122, 'LS123

The basic output pulse duration is essentially determined by the values of external capacitance and timing resistance. For pulse durations when $C_{ext} \leq 1000$ pF, use Figure 6, or use Figure 7 where the pulse duration may be defined as:

$$t_w = K \cdot R_T \cdot C_{ext}$$

When $C_{ext} \geq 1 \mu F$, the output pulse width is defined as:

$$t_w = 0.33 \cdot R_T \cdot C_{ext}$$

For the above two equations, as applicable;

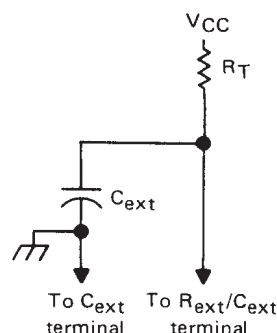
K is multiplier factor, see Figure 7

R_T is in $k\Omega$ (internal or external timing resistance)

C_{ext} is in pF

t_w is in ns

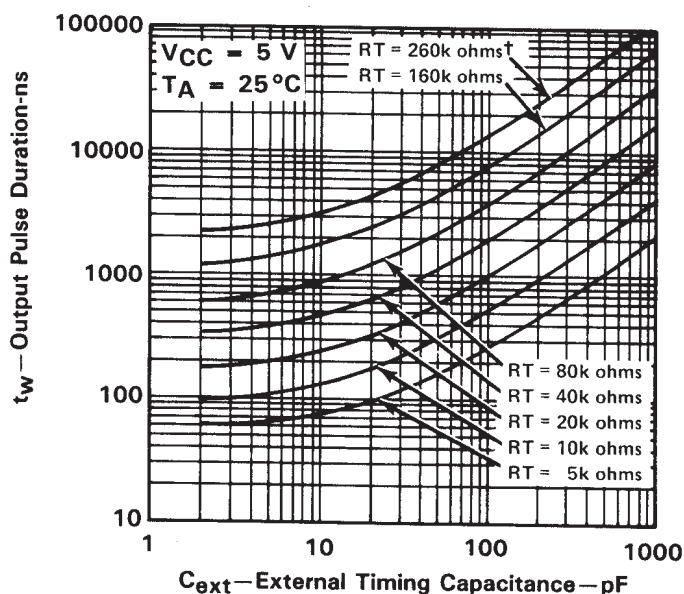
For maximum noise immunity, system ground should be applied to the C_{ext} node, even though the C_{ext} node is already tied to the ground lead internally. Due to the timing scheme used by the 'LS122 and 'LS123, a switching diode is not required to prevent reverse biasing when using electrolytic capacitors.



TIMING COMPONENT CONNECTIONS

FIGURE 5

'LS122, 'LS123 TYPICAL OUTPUT PULSE DURATION vs EXTERNAL TIMING CAPACITANCE



[†]This value of resistance exceeds the maximum recommended for use over the full temperature range of the SN54LS circuits.

FIGURE 6

SN54LS122, SN54LS123, SN74LS122, SN74LS123 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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TYPICAL APPLICATION DATA FOR 'LS122, 'LS123†

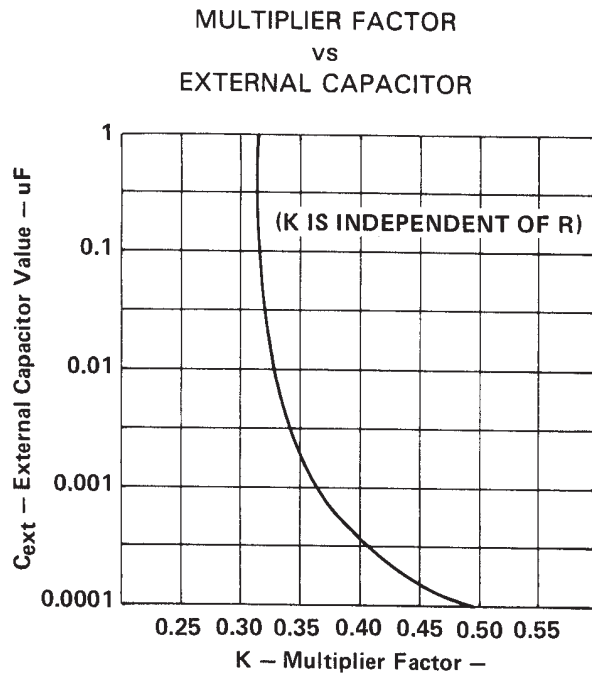


FIGURE 7

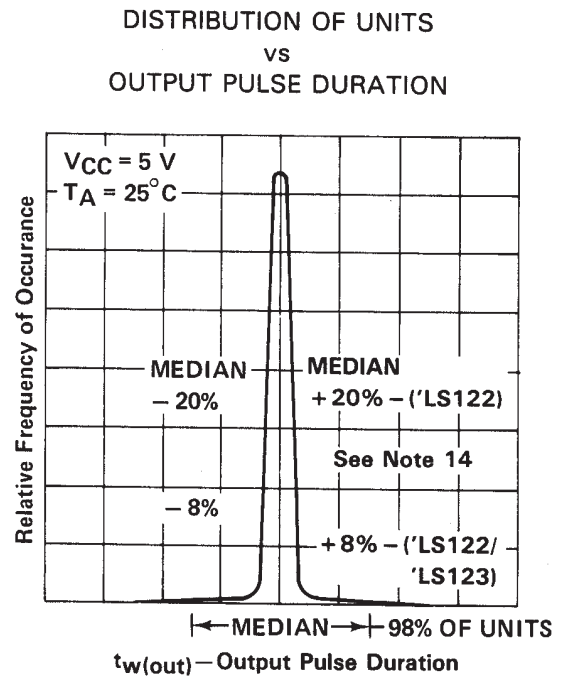


FIGURE 8

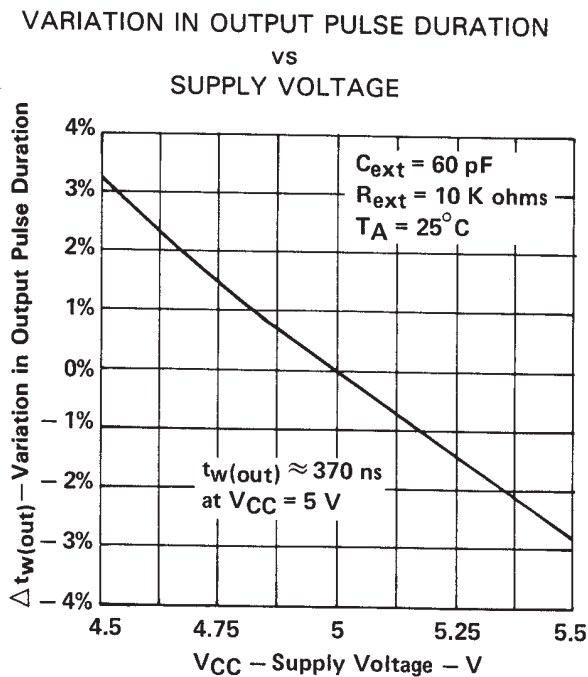


FIGURE 9

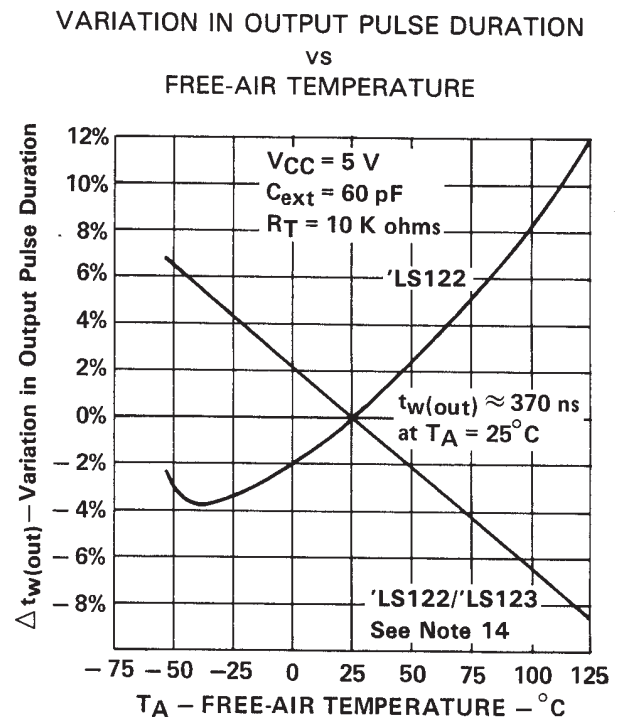


FIGURE 10

NOTE 14: For the 'LS122, the internal timing resistor, R_{int} was used. For the 'LS122/123, an external timing resistor was used for R_T .

†Data for temperatures below $0^\circ C$ and above $70^\circ C$ and for supply voltages below 4.75 V and above 5.25 V are applicable for SN54LS122 and SN54LS123 only.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-7603901VEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7603901VE A SNV54LS123J
5962-7603901VEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7603901VE A SNV54LS123J
5962-7603901VFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7603901VF A SNV54LS123W
5962-7603901VFA.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7603901VF A SNV54LS123W
7603901EA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901EA SNJ54LS123J
7603901FA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901FA SNJ54LS123W
JM38510/01203BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 01203BEA
JM38510/01203BEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 01203BEA
JM38510/31401B2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401B2A
JM38510/31401B2A.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401B2A
JM38510/31401BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BEA
JM38510/31401BEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BEA
JM38510/31401BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BFA
JM38510/31401BFA.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BFA
M38510/01203BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 01203BEA

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
M38510/31401B2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401B2A
M38510/31401BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BEA
M38510/31401BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31401BFA
SN54123J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54123J
SN54123J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54123J
SN54LS123J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS123J
SN54LS123J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS123J
SN74123N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74123N
SN74123N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74123N
SN74LS122D	Obsolete	Production	SOIC (D) 14	-	-	Call TI	Call TI	0 to 70	LS122
SN74LS122DR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS122
SN74LS122DR.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS122
SN74LS122DRE4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS122
SN74LS122N	Active	Production	PDIP (N) 14	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS122N
SN74LS122N.A	Active	Production	PDIP (N) 14	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS122N
SN74LS122NSR	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS122
SN74LS122NSR.A	Active	Production	SOP (NS) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS122
SN74LS123D	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123D.A	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123DBR	Active	Production	SSOP (DB) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	LS123
SN74LS123DBR.A	Active	Production	SSOP (DB) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123DE4	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123DR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123DR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123DRG4	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS123
SN74LS123N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS123N
SN74LS123N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS123N
SN74LS123NE4	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS123N

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74LS123NSR	Active	Production	SOP (NS) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS123
SN74LS123NSR.A	Active	Production	SOP (NS) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS123
SN74LS123NSRG4	Active	Production	SOP (NS) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS123
SNJ54123J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54123J
SNJ54123J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54123J
SNJ54123W	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54123W
SNJ54123W.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54123W
SNJ54LS123FK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 123FK
SNJ54LS123FK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 123FK
SNJ54LS123J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901EA SNJ54LS123J
SNJ54LS123J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901EA SNJ54LS123J
SNJ54LS123W	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901FA SNJ54LS123W
SNJ54LS123W.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7603901FA SNJ54LS123W

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts 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.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54123, SN54LS123, SN54LS123-SP, SN74123, SN74LS123 :

- Catalog : [SN74123](#), [SN74LS123](#), [SN54LS123](#)
- Military : [SN54123](#), [SN54LS123](#)
- Space : [SN54LS123-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

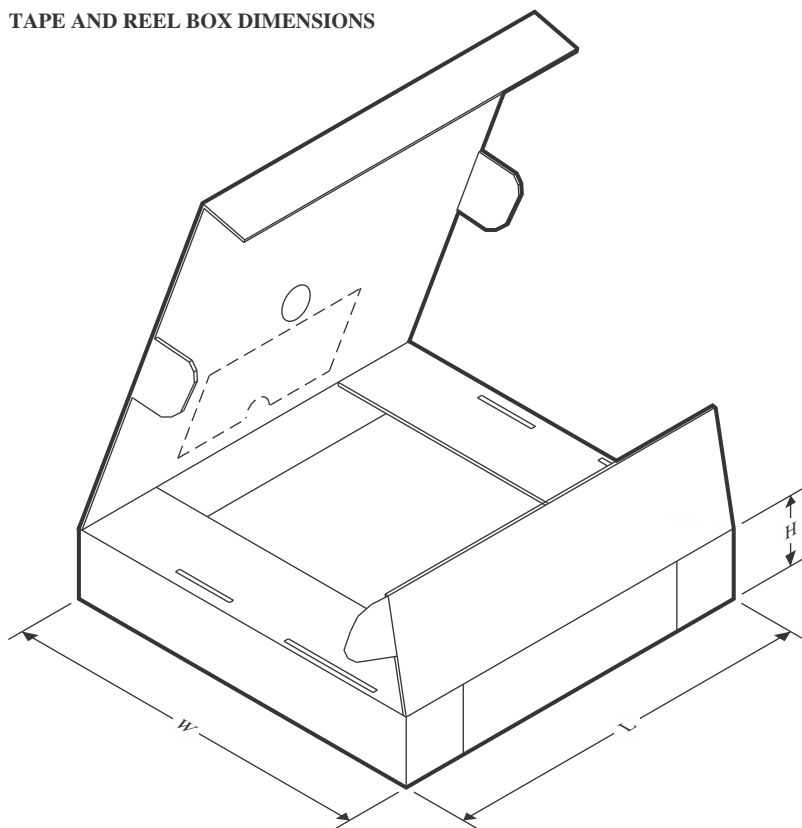
TAPE AND REEL INFORMATION



*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
SN74LS122DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS122NSR	SOP	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LS123DBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74LS123DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LS123NSR	SOP	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LS123NSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1

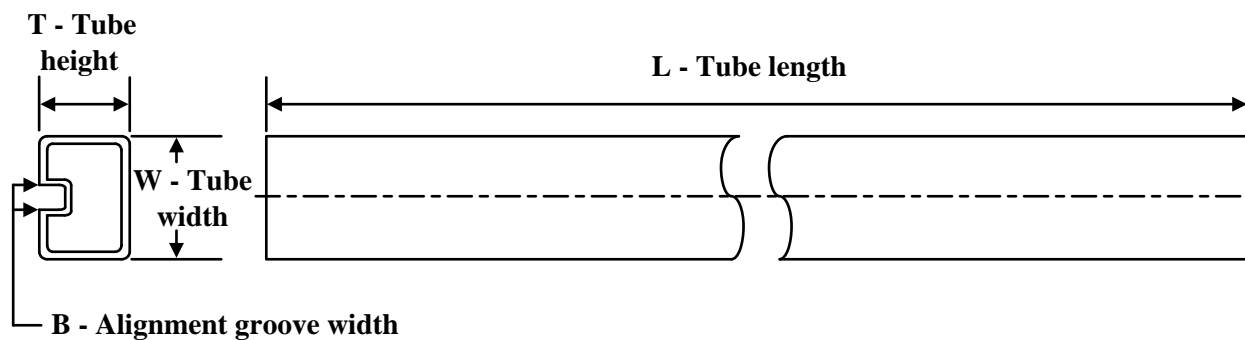
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS122DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74LS122NSR	SOP	NS	14	2000	356.0	356.0	35.0
SN74LS123DBR	SSOP	DB	16	2000	356.0	356.0	35.0
SN74LS123DR	SOIC	D	16	2500	353.0	353.0	32.0
SN74LS123NSR	SOP	NS	16	2000	353.0	353.0	32.0
SN74LS123NSR	SOP	NS	16	2000	356.0	356.0	35.0

TUBE

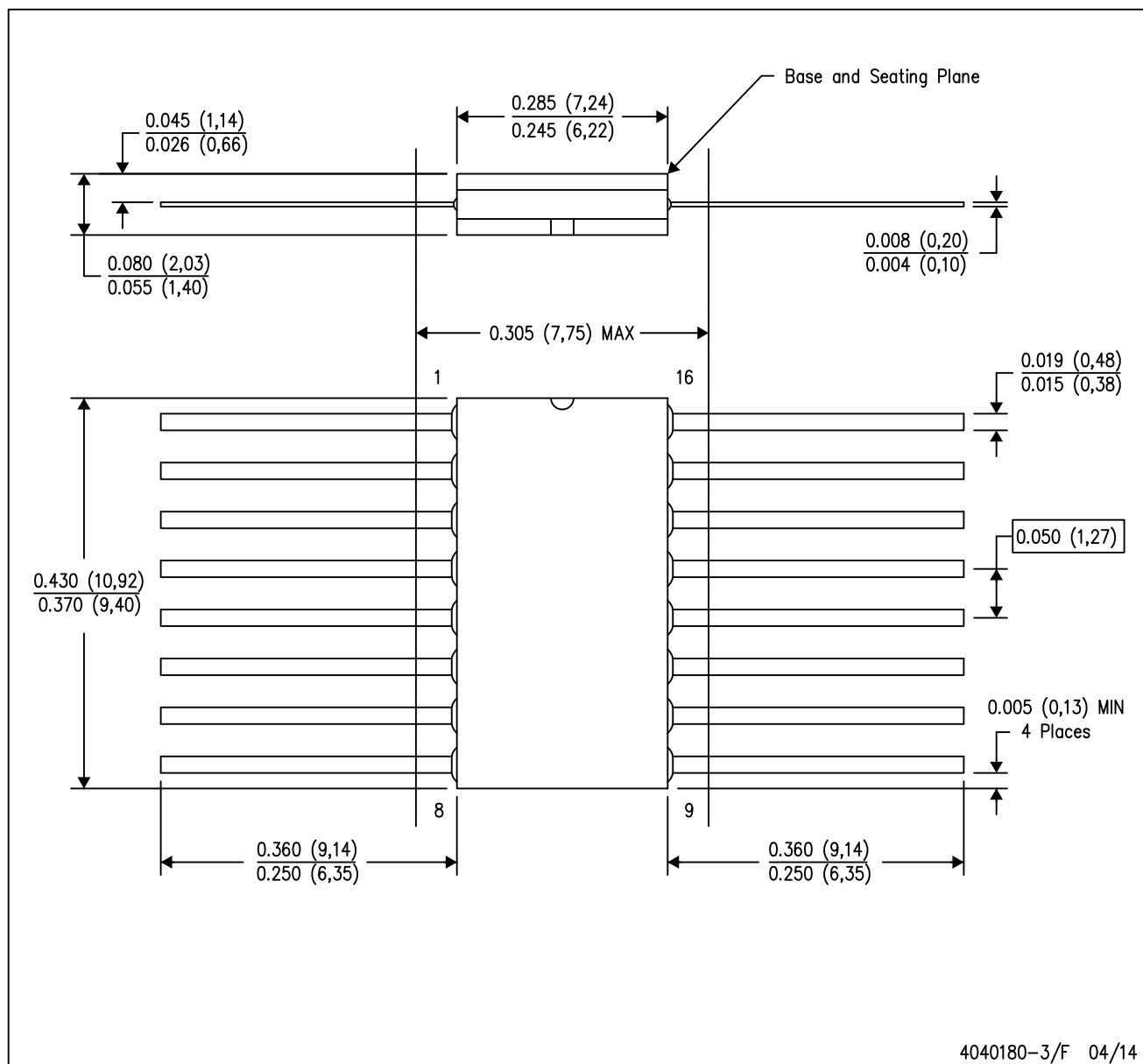


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-7603901VFA	W	CFP	16	25	506.98	26.16	6220	NA
5962-7603901VFA.A	W	CFP	16	25	506.98	26.16	6220	NA
JM38510/31401B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/31401B2A.A	FK	LCCC	20	55	506.98	12.06	2030	NA
JM38510/31401BFA	W	CFP	16	25	506.98	26.16	6220	NA
JM38510/31401BFA.A	W	CFP	16	25	506.98	26.16	6220	NA
M38510/31401B2A	FK	LCCC	20	55	506.98	12.06	2030	NA
M38510/31401BFA	W	CFP	16	25	506.98	26.16	6220	NA
SN74123N	N	PDIP	16	25	506	13.97	11230	4.32
SN74123N	N	PDIP	16	25	506	13.97	11230	4.32
SN74123N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74123N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS122N	N	PDIP	14	25	506	13.97	11230	4.32
SN74LS122N	N	PDIP	14	25	506	13.97	11230	4.32
SN74LS122N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74LS122N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74LS123D	D	SOIC	16	40	507	8	3940	4.32
SN74LS123D.A	D	SOIC	16	40	507	8	3940	4.32
SN74LS123DE4	D	SOIC	16	40	507	8	3940	4.32
SN74LS123N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS123N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS123NE4	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54123W	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54123W.A	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54LS123FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LS123FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA

W (R-GDFP-F16)

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-F16

GENERIC PACKAGE VIEW

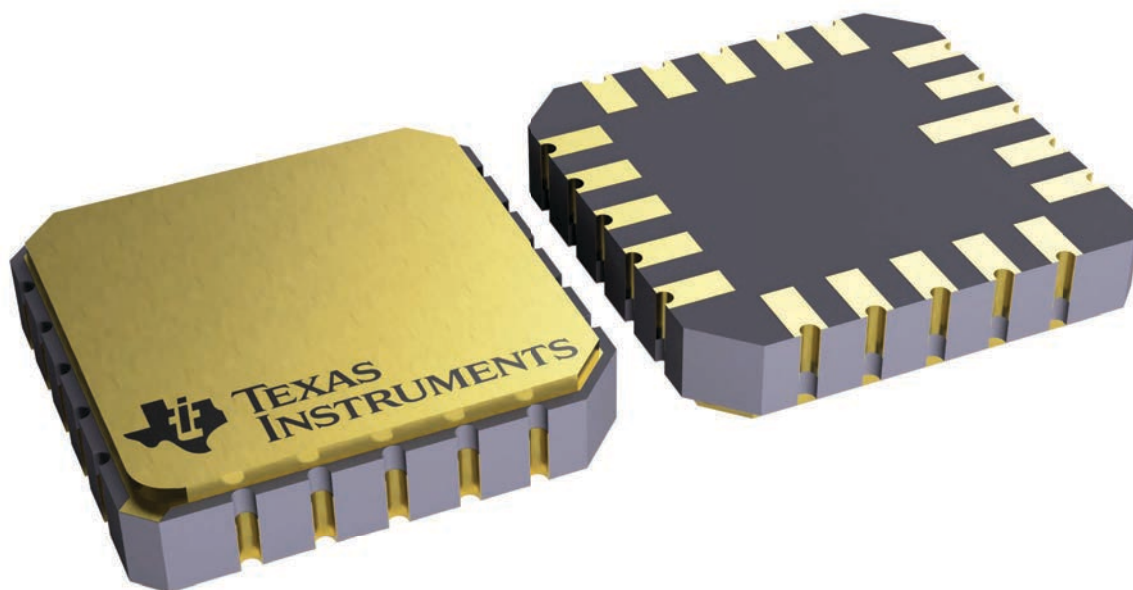
FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

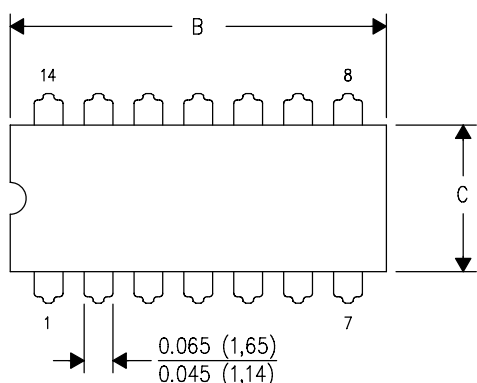


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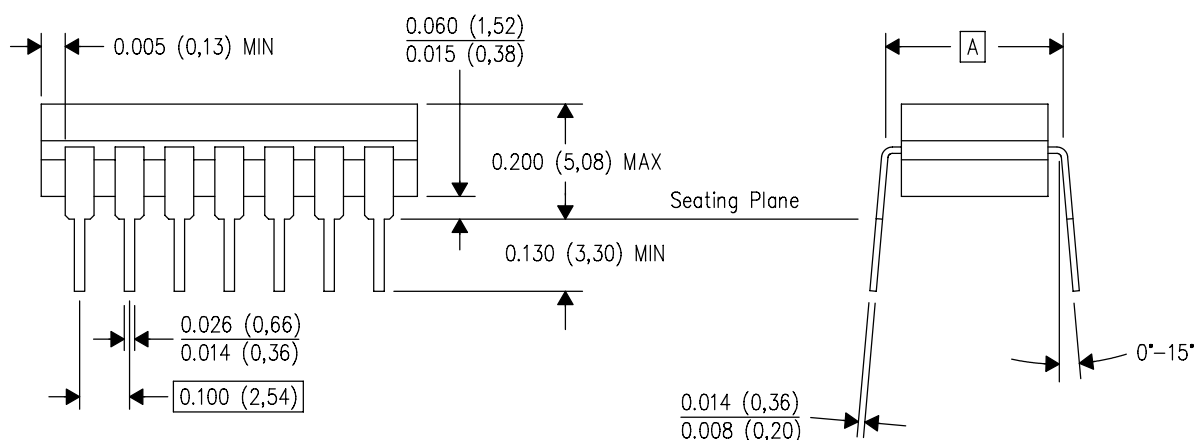
J (R-GDIP-T**)

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)



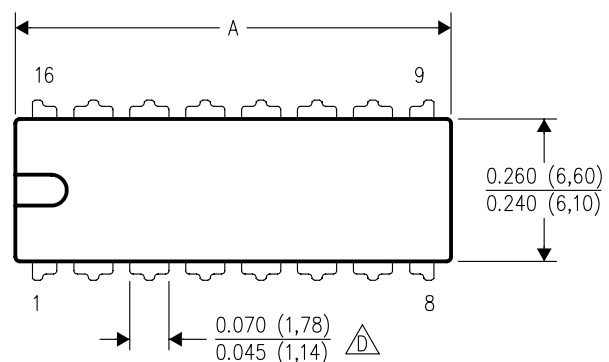
4040083/F 03/03

- 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.

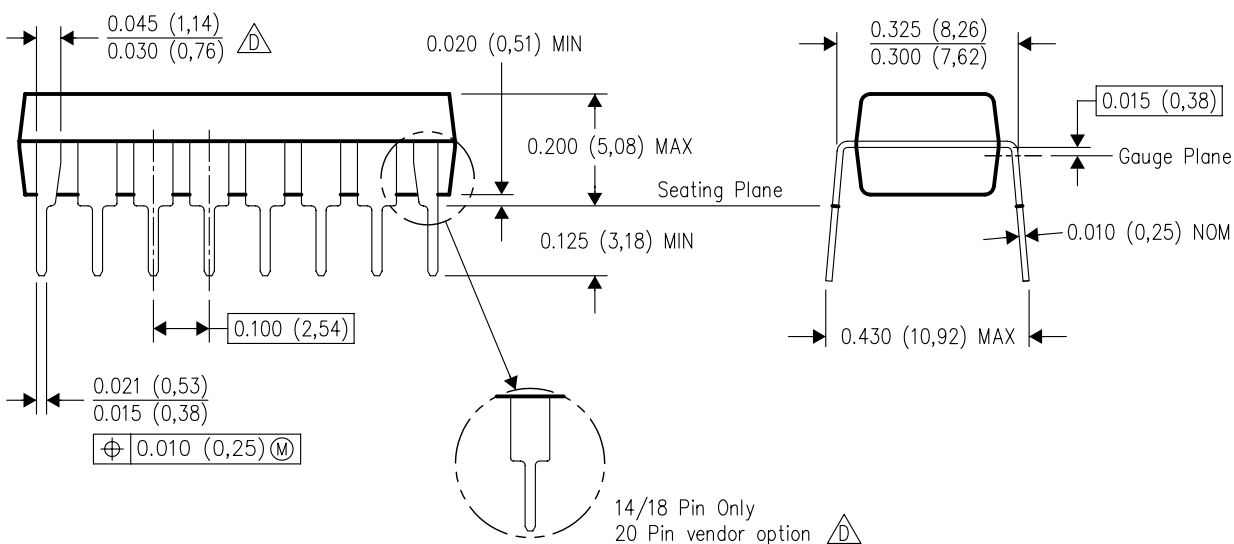
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE





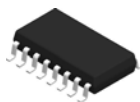
PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



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.

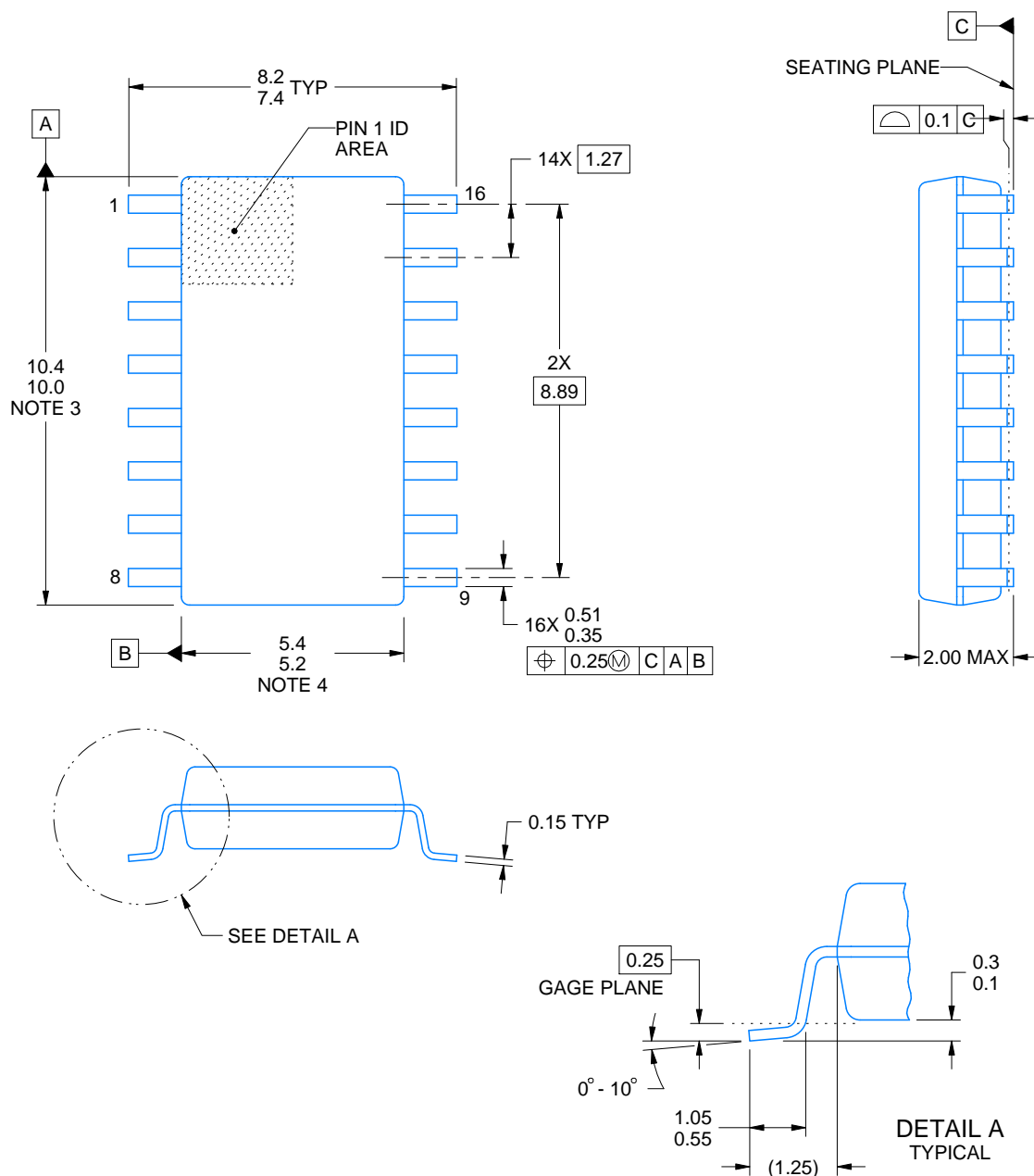


PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES:

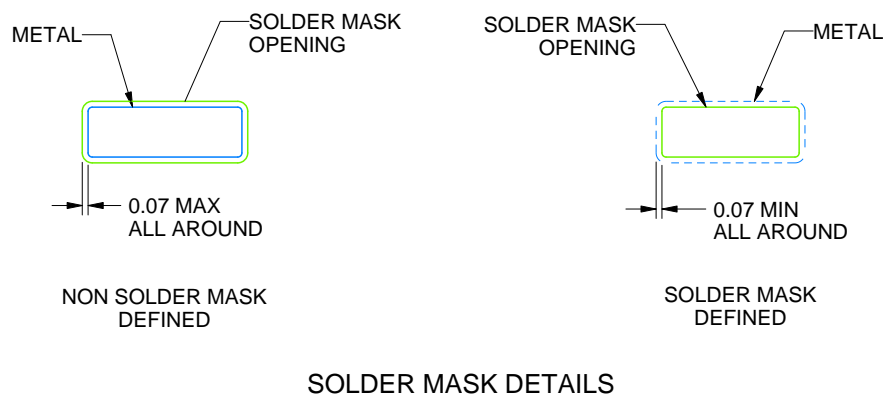
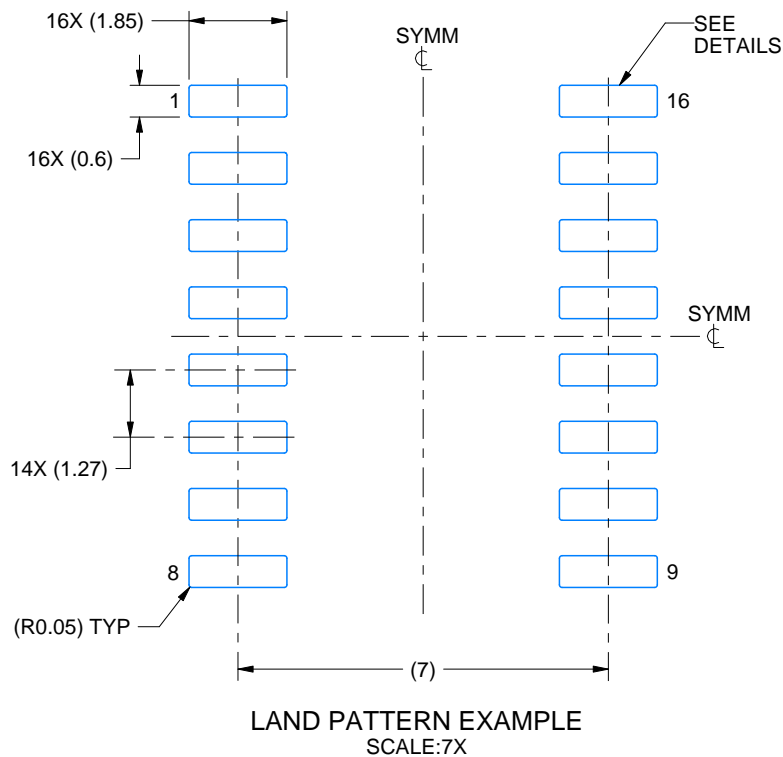
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

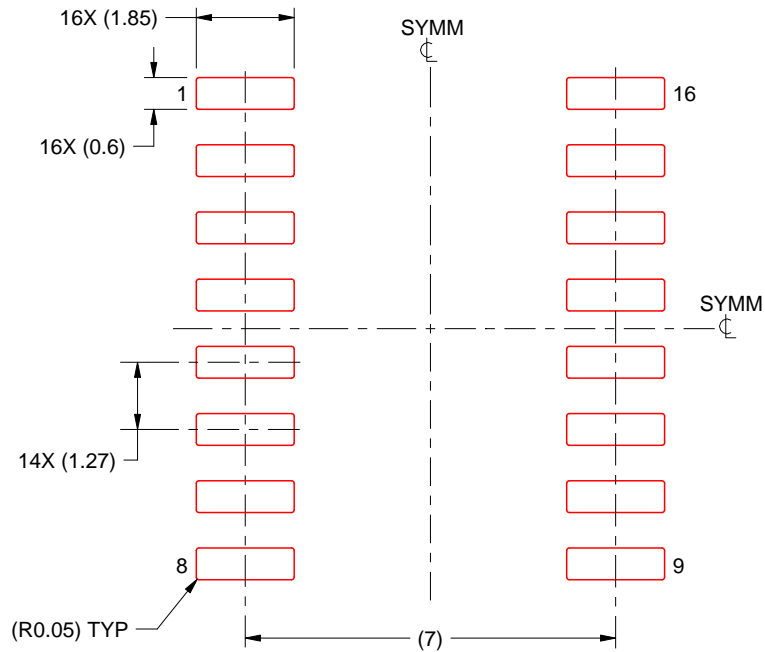
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP

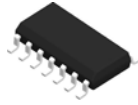


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

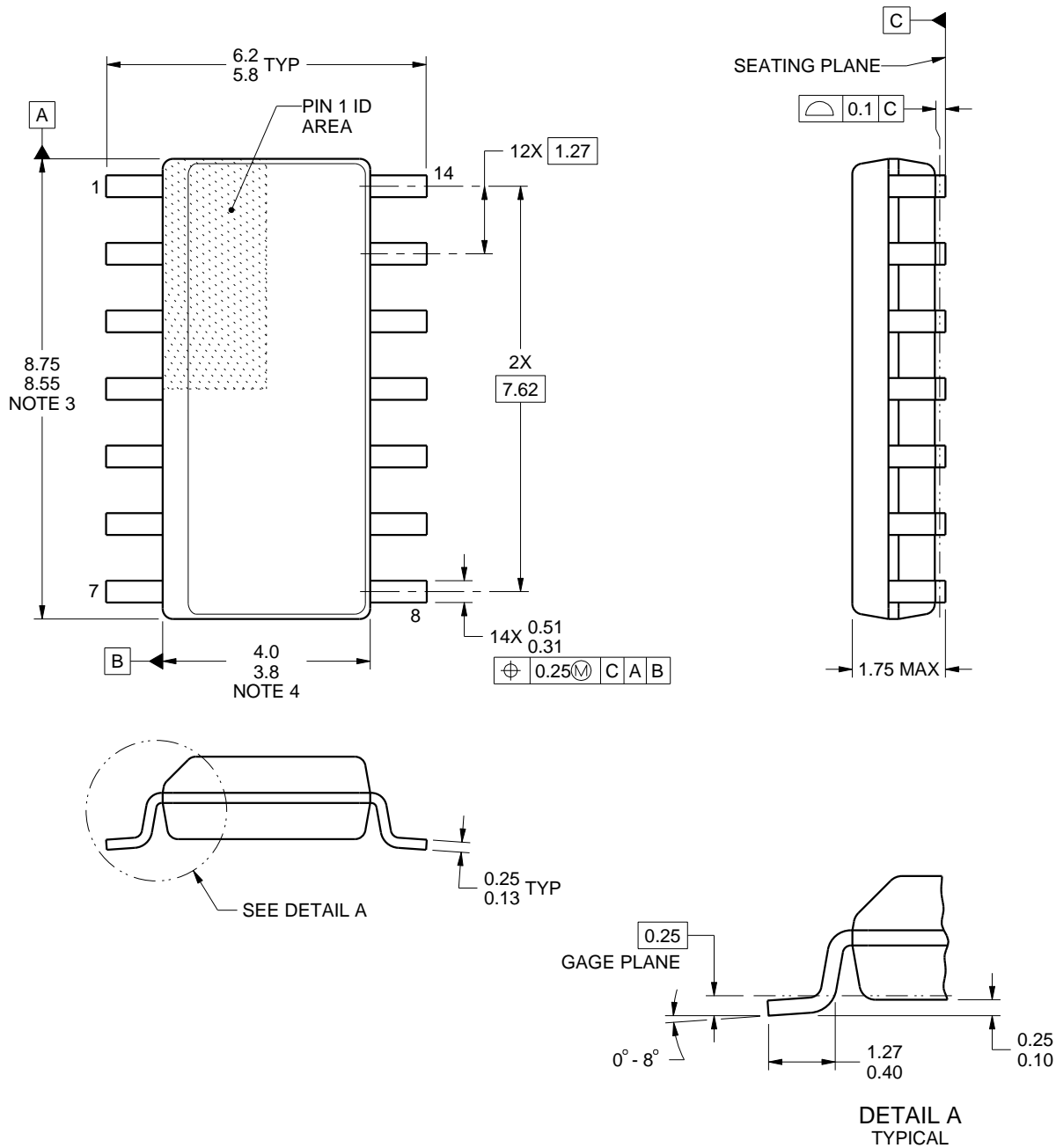
4220735/A 12/2021

NOTES: (continued)

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

D0014A**PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

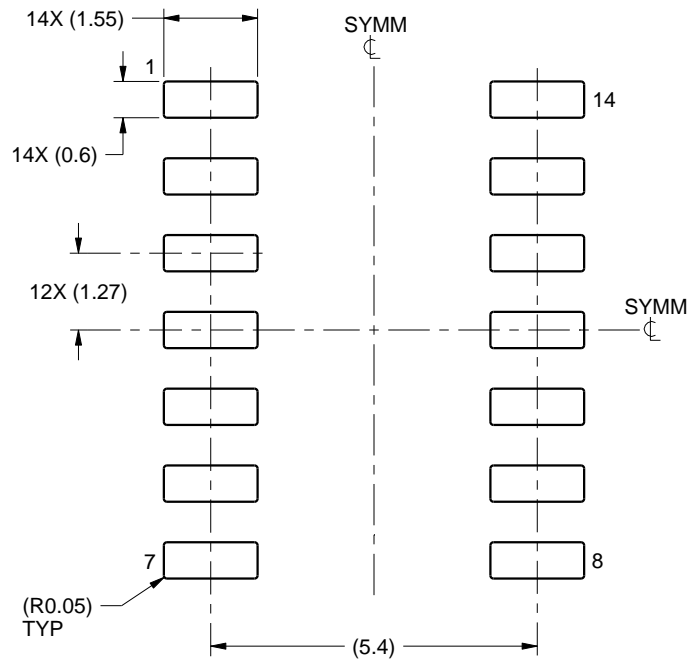
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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-012, variation AB.

EXAMPLE BOARD LAYOUT

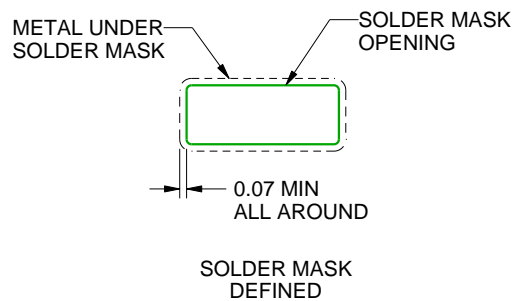
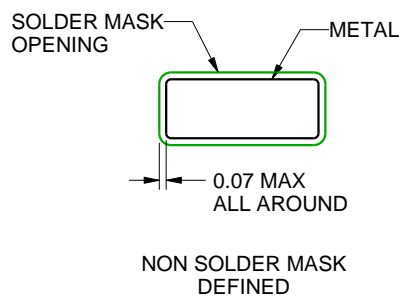
D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

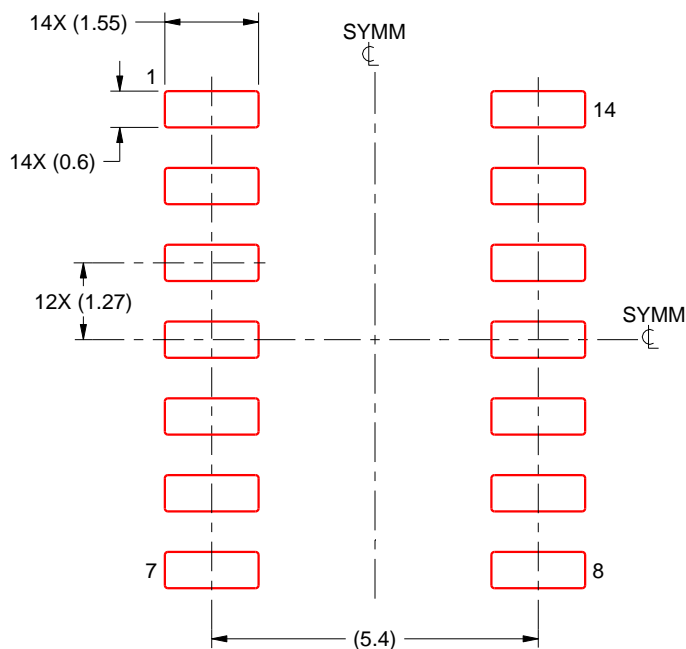
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:8X

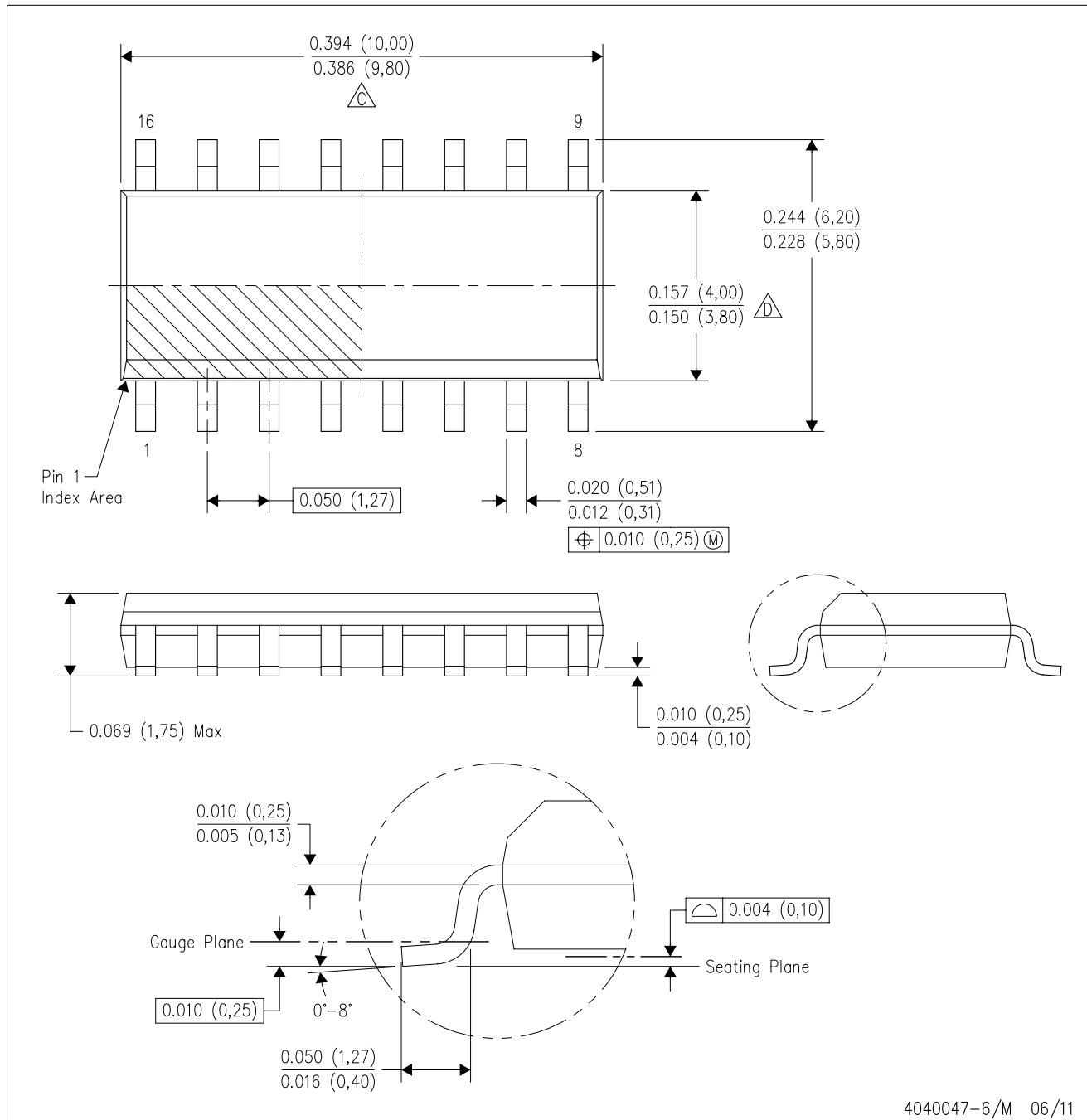
4220718/A 09/2016

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.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AC.



SSOP - 2 mm max height

Technical drawing of a connector housing, showing three views: front, side, and detail A.

Front View:

- Overall width: 8.2 TYP (7.4 minimum)
- Overall height: 6.5 (5.9 minimum) (NOTE 3)
- Pin 1 Index Area (circled)
- Pin 16 location (16)
- Pin 9 location (9)
- Pin 8 location (8)
- Pin 1 location (1)
- Pin 14 location (14X 0.65)
- Pin 2 location (2X 4.55)
- Pin 16X location (16X 0.38 0.22)
- Pin 5.6 location (5.6 5.0 minimum) (NOTE 4)

Side View:

- Seating Plane (indicated)

Detail A:

- SEE DETAIL A (indicated)
- 0.25 (0.09 minimum)
- GAGE PLANE (indicated)
- 0.25 (indicated)
- 0.95 (0.55 minimum)
- 0.05 MIN (indicated)
- 2 MAX (indicated)
- 0°-8° (indicated)

DETAIL A TYPICAL

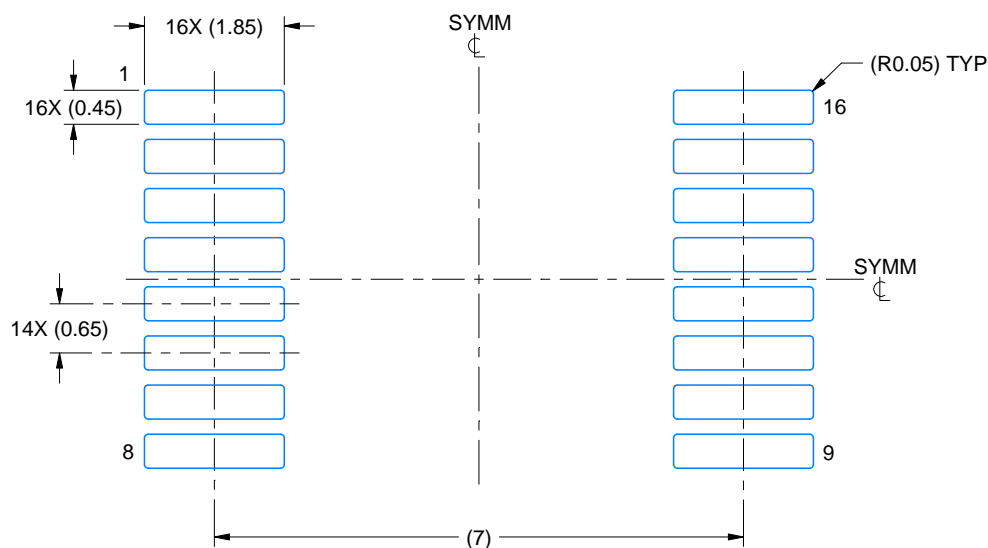
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-150.

EXAMPLE BOARD LAYOUT

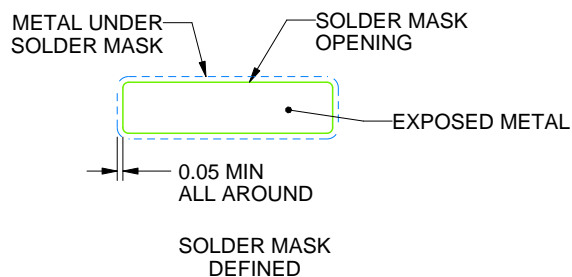
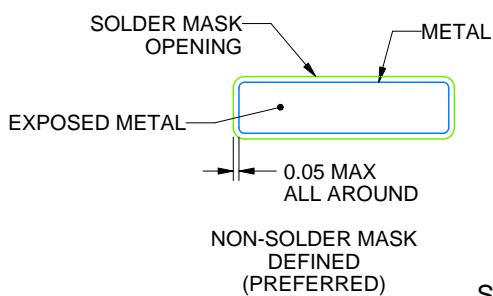
DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

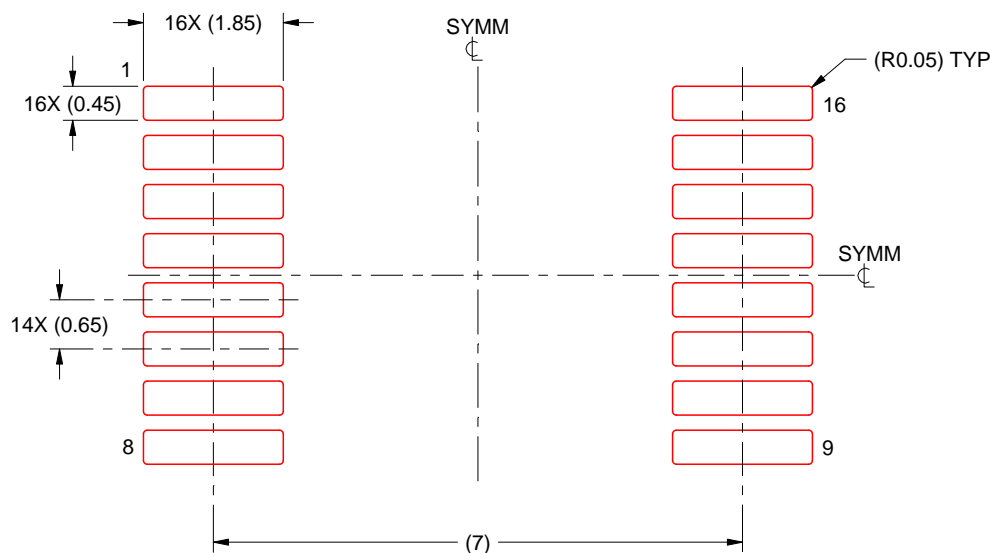
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

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NOTES: (continued)

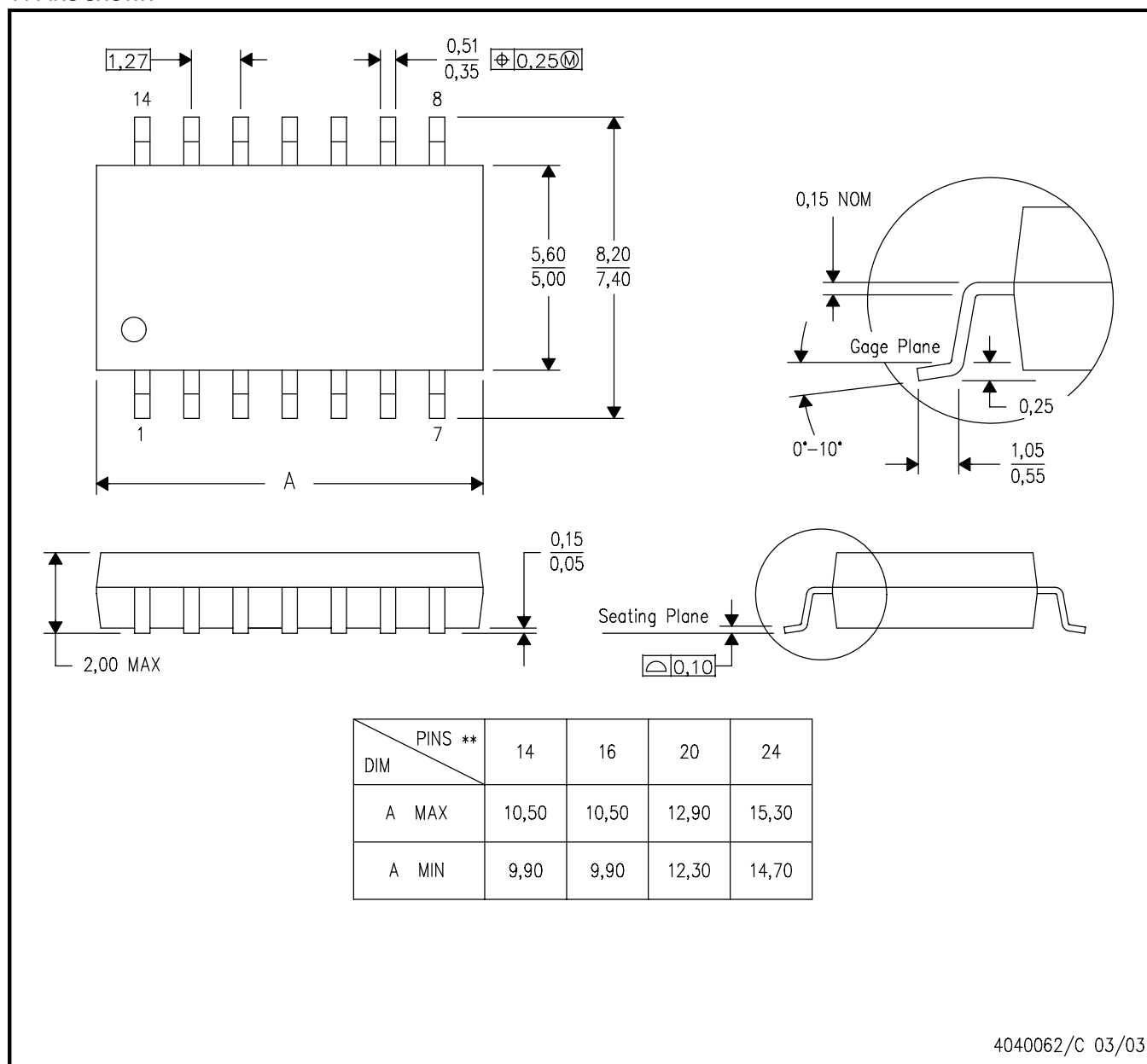
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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