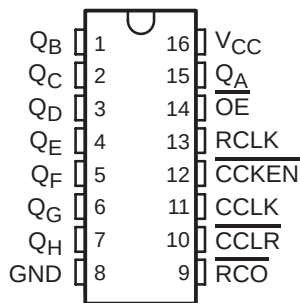


SN54HC590A, SN74HC590A 8-BIT BINARY COUNTERS WITH 3-STATE OUTPUT REGISTERS

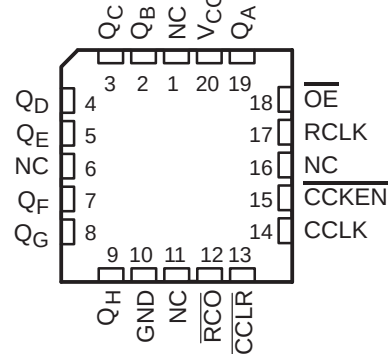
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- 2-V to 6-V V_{CC} Operation
- High-Current 3-State Parallel Register Outputs Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80- μ A Max I_{CC}
- Typical $t_{pd} = 14$ ns
- ± 6 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max
- 8-Bit Counter With Register
- Counter Has Direct Clear

SN54HC590A . . . J OR W PACKAGE
SN74HC590A . . . D, DW, OR N PACKAGE
(TOP VIEW)



SN54HC590A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The 'HC590A devices contain an 8-bit binary counter that feeds an 8-bit storage register. The storage register has parallel outputs. Separate clocks are provided for both the binary counter and storage register. The binary counter features direct clear ($\overline{CCLR}$) and count-enable ($\overline{CCKEN}$) inputs. A ripple-carry output ($\overline{RCO}$) is provided for cascading. Expansion is accomplished easily for two stages by connecting $\overline{RCO}$ of the first stage to $\overline{CCKEN}$ of the second stage. Cascading for larger count chains can be accomplished by connecting $\overline{RCO}$ of each stage to the counter clock (CCLK) input of the following stage.

CCLK and the register clock (RCLK) inputs are positive-edge triggered. If both clocks are connected together, the counter state always is one count ahead of the register. Internal circuitry prevents clocking from the clock enable.

ORDERING INFORMATION

T _A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube of 25	SN74HC590AN	SN74HC590AN
		SOIC – D	Tube of 40	SN74HC590AD
	Reel of 2500		SN74HC590ADR	
	Reel of 250		SN74HC590ADT	
	SOIC – DW	Tube of 40	SN74HC590ADW	HC590A
		Reel of 2000	SN74HC590ADWR	
-55°C to 125°C	CDIP – J	Tube of 25	SNJ54HC590AJ	SNJ54HC590AJ
	CFP – W	Tube of 150	SNJ54HC590AW	SNJ54HC590AW
	LCCC - FK	Tube of 55	SNJ54HC590AFK	SNJ54HC590AFK

[†] 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.

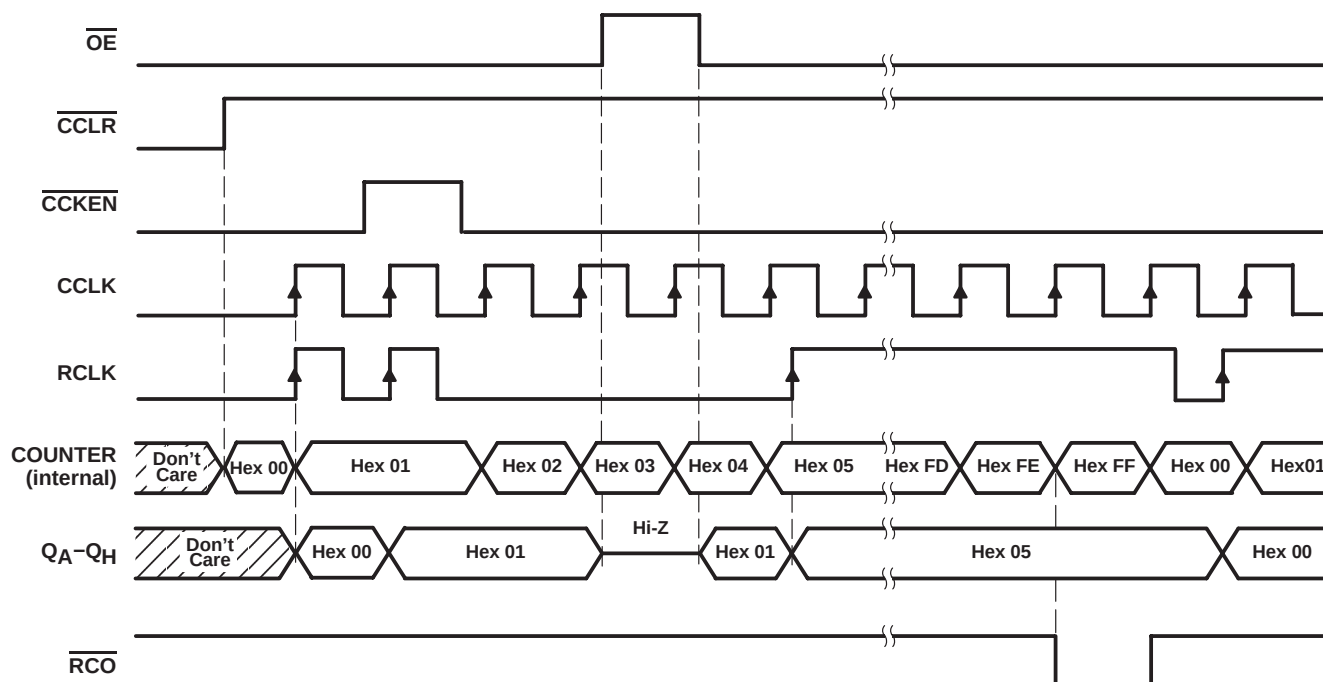
SN54HC590A, SN74HC590A

8-BIT BINARY COUNTERS

WITH 3-STATE OUTPUT REGISTERS

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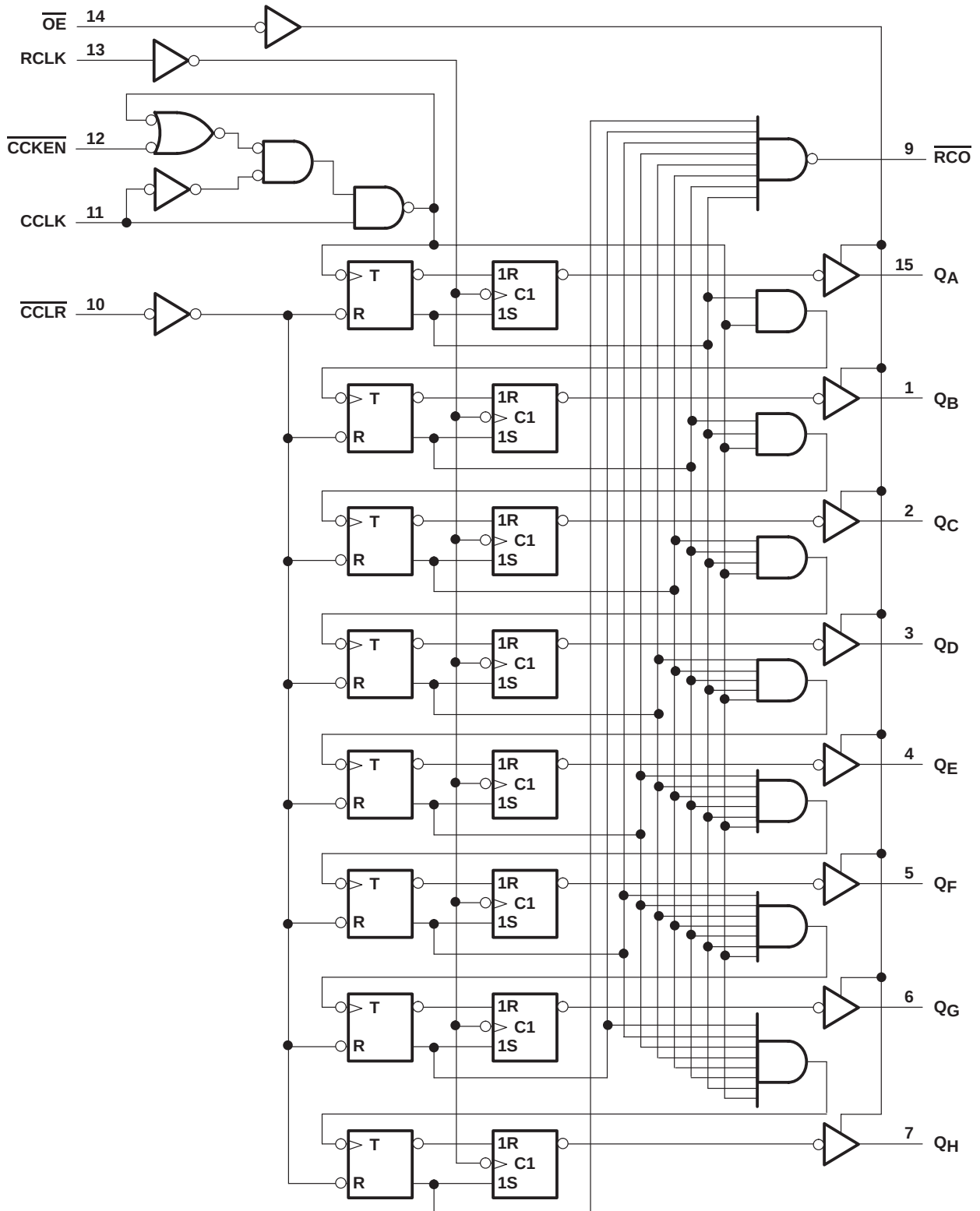
timing diagram



TIMING SEQUENCE

1. Clear Counter (asynchronous).
2. Count up: 0x01. Store 0x00 in register.
3. Inhibit counter clock (CCKEN = HIGH). Store 0x01 in register.
4. Count 0x02, 0x03.
5. 3-state the outputs
6. Count up: 0x04
7. Enable outputs.
8. Continue up: 0x05
9. Store 0x05 in register.
10. Continue counting: 0x06...0xFD, 0xFE, 0xFF, 0x00, etc.
11. Store 0x00 in register.

logic diagram (positive logic)



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

SN54HC590A, SN74HC590A

8-BIT BINARY COUNTERS

WITH 3-STATE OUTPUT REGISTERS

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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): D package	73°C/W
DW package	57°C/W
N package	67°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.

recommended operating conditions (see Note 3)

			SN54HC590A			SN74HC590A			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
t _t [‡]	Input transition (rise and 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

[‡] If this device is used in the threshold region (from $V_{ILmax} = 0.5$ V to $V_{IHmin} = 1.5$ V), there is a potential to go into the wrong state from induced grounding, causing double clocking. Operating with the inputs at $t_t = 1000$ ns and $V_{CC} = 2$ V does not damage the device; however, functionally, the CCLK and RCLK inputs are not ensured while in the shift, count, or toggle operating modes.

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.

SN54HC590A, SN74HC590A
8-BIT BINARY COUNTERS
WITH 3-STATE OUTPUT REGISTERS
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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C			SN54HC590A		SN74HC590A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 µA	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		
		$\overline{\text{RCO}}$, I _{OH} = -4 mA	4.5 V	3.98	4.3		3.7		3.84		
		Q _A -Q _H , I _{OH} = -6 mA		3.98	4.3		3.7		3.84		
		$\overline{\text{RCO}}$, I _{OH} = -5.2 mA	6 V	5.48	5.8		5.2		5.34		
		Q _A -Q _H , I _{OH} = -7.8 mA		5.48	5.8		5.2		5.34		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 µA	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	
		$\overline{\text{RCO}}$, I _{OL} = 4 mA	4.5 V		0.17	0.26		0.4		0.33	
		Q _A -Q _H , I _{OL} = 6 mA			0.17	0.26		0.4		0.33	
		$\overline{\text{RCO}}$, I _{OL} = 5.2 mA	6 V		0.15	0.26		0.4		0.33	
		Q _A -Q _H , I _{OL} = 7.8 mA			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		6 V		±0.01	±0.5		±10		±5	µA
I _{CC}	V _I = V _{CC} or 0, I _O = 0		6 V			8		160		80	µA
C _i			2 V to 6 V		3	10		10		10	pF

SN54HC590A, SN74HC590A

8-BIT BINARY COUNTERS

WITH 3-STATE OUTPUT REGISTERS

SCLS039F – DECEMBER 1982 – REVISED SEPTEMBER 2003

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

		V _{CC}	T _A = 25°C		SN54HC590A		SN74HC590A		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency	2 V		4		2.5		3.2	MHz
		4.5 V		20		13		16	
		6 V		24		16		19	
t _w	Pulse duration	2 V	125		200		155		ns
		4.5 V	25		38		31		
		6 V	21		32		26		
	$\overline{\text{CCLR}}$ low	2 V	100		150		125		
		4.5 V	20		30		25		
		6 V	17		26		21		
t _{su}	$\overline{\text{CCKEN}}$ low before CCLK↑	2 V	100		150		125		ns
		4.5 V	20		30		25		
		6 V	17		26		21		
	$\overline{\text{CCLR}}$ high (inactive) before CCLK↑	2 V	100		150		125		
		4.5 V	20		30		25		
		6 V	17		26		21		
	CCLK↑ before RCLK↑†	2 V	100		150		125		
		4.5 V	20		30		25		
		6 V	17		26		21		
t _h	$\overline{\text{CCKEN}}$ low after CCLK↑	2 V	50		75		60		ns
		4.5 V	10		15		12		
		6 V	9		13		11		

† This setup time ensures that the register gets stable data from the counter outputs. The clocks may be tied together, in which case the register is one clock pulse behind the counter.

SN54HC590A, SN74HC590A
8-BIT BINARY COUNTERS
WITH 3-STATE OUTPUT REGISTERS
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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}	SN54HC590A				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
f _{max}			2 V	4	8		2.5	MHz	
			4.5 V	20	35		13		
			6 V	24	40		16		
t _{pd}	CCLK↑	$\overline{RCO}$	2 V		80	150	225	ns	
			4.5 V		20	31	45		
			6 V		15	26	38		
t _{PLH}	$\overline{CCLR}\downarrow$	$\overline{RCO}$	2 V		70	130	195	ns	
			4.5 V		18	28	39		
			6 V		14	23	33		
t _{pd}	RCLK↑	Q	2 V		70	140	210	ns	
			4.5 V		18	31	42		
			6 V		14	25	36		
t _{en}	$\overline{OE}\downarrow$	Q	2 V		80	125	185	ns	
			4.5 V		20	30	37		
			6 V		15	28	31		
t _{dis}	$\overline{OE}\uparrow$	Q	2 V		80	125	185	ns	
			4.5 V		20	30	37		
			6 V		15	28	31		
t _t [*]		$\overline{RCO}$	2 V		38	75	110	ns	
			4.5 V		8	15	22		
			6 V		6	13	19		
		Q	2 V		38	60	90		
			4.5 V		8	12	18		
			6 V		6	10	15		

* This parameter is not production tested for the SN54HC590A.

SN54HC590A, SN74HC590A
8-BIT BINARY COUNTERS
WITH 3-STATE OUTPUT REGISTERS

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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}	SN74HC590A				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
f _{max}			2 V	4	8		3.2	MHz	
			4.5 V	20	35		16		
			6 V	24	40		19		
t _{pd}	CCLK↑	$\overline{RCO}$	2 V		80	150		190	ns
			4.5 V		20	30		38	
			6 V		15	26		33	
t _{PLH}	$\overline{CCLR}\downarrow$	$\overline{RCO}$	2 V		70	130		165	ns
			4.5 V		18	26		33	
			6 V		14	22		28	
t _{pd}	RCLK↑	Q	2 V		70	140		175	ns
			4.5 V		18	28		35	
			6 V		14	24		30	
t _{en}	$\overline{OE}\downarrow$	Q	2 V		80	125		155	ns
			4.5 V		20	25		31	
			6 V		15	21		26	
t _{dis}	$\overline{OE}\uparrow$	Q	2 V		80	125		155	ns
			4.5 V		20	25		31	
			6 V		15	21		26	
t _t		$\overline{RCO}$	2 V		38	75		95	ns
			4.5 V		8	15		19	
			6 V		6	13		16	
		Q	2 V		38	60		75	
			4.5 V		8	12		15	
			6 V		6	10		13	

SN54HC590A, SN74HC590A
8-BIT BINARY COUNTERS
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switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	SN54HC590A				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
t _{pd}	RCLK↑	Q	2 V	100		300	447	ns	
			4.5 V	24		60	90		
			6 V	20		51	77		
t _{en}	$\overline{OE}$	Q	2 V	90		200	300	ns	
			4.5 V	23		40	60		
			6 V	19		34	51		
t _t [*]		Q	2 V	45		210	315	ns	
			4.5 V	17		42	63		
			6 V	13		36	53		

* This parameter is not production tested for the SN54HC590A.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	VCC	SN74HC590A			UNIT		
				T _A = 25°C				MIN	MAX
				MIN	TYP	MAX			
t _{pd}	RCLK↑	Q	2 V	100	300	380	ns		
			4.5 V	24	60	76			
			6 V	20	51	65			
t _{en}	$\overline{OE}$	Q	2 V	90	200	250	ns		
			4.5 V	23	40	50			
			6 V	19	34	43			
t _t		Q	2 V	45	210	265	ns		
			4.5 V	17	42	53			
			6 V	13	36	45			

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

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load	250	pF

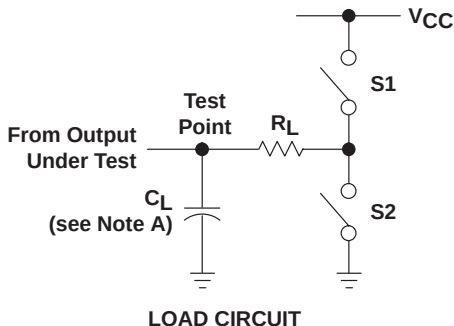
SN54HC590A, SN74HC590A

8-BIT BINARY COUNTERS

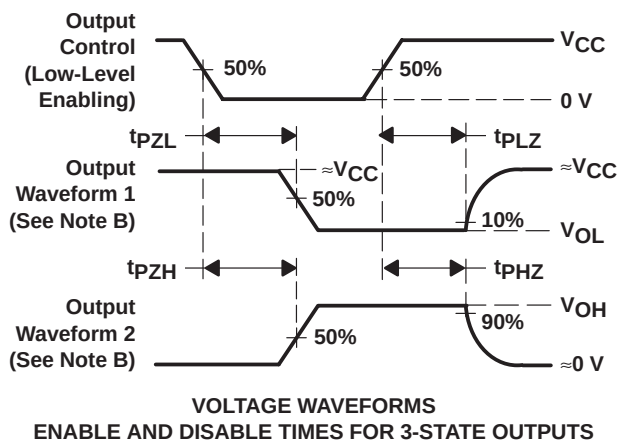
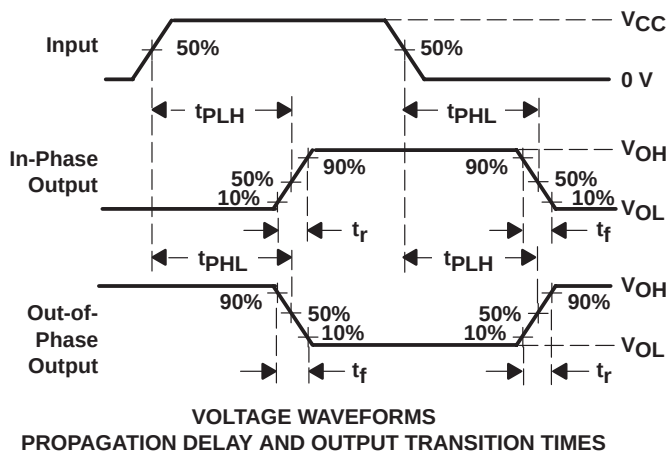
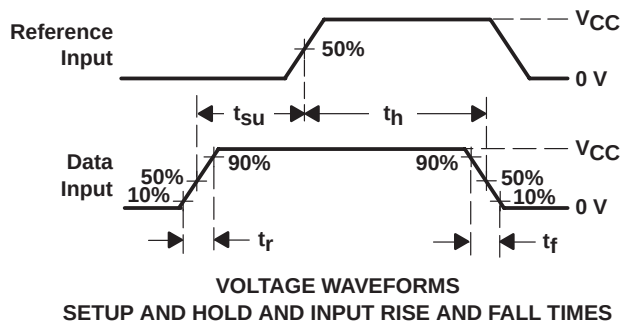
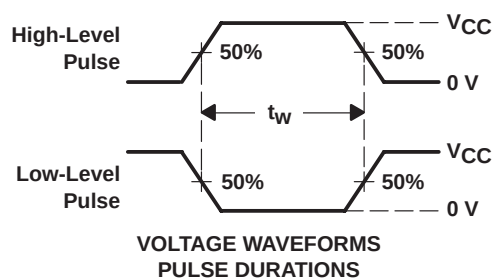
WITH 3-STATE OUTPUT REGISTERS

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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 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)
5962-89603012A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 89603012A SNJ54HC 590AFK
5962-8960301EA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301EA SNJ54HC590AJ
5962-8960301FA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301FA SNJ54HC590AW
SN54HC590AJ	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HC590AJ
SN54HC590AJ.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HC590AJ
SN74HC590AD	Obsolete	Production	SOIC (D) 16	-	-	Call TI	Call TI	-40 to 85	HC590A
SN74HC590ADR	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC590A
SN74HC590ADR.A	Active	Production	SOIC (D) 16	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC590A
SN74HC590ADT	Obsolete	Production	SOIC (D) 16	-	-	Call TI	Call TI	-40 to 85	HC590A
SN74HC590ADW	Obsolete	Production	SOIC (DW) 16	-	-	Call TI	Call TI	-40 to 85	
SN74HC590ADWR	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC590A
SN74HC590ADWR.A	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC590A
SN74HC590AN	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC590AN
SN74HC590AN.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC590AN
SN74HC590ANE4	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC590AN
SNJ54HC590AFK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 89603012A SNJ54HC 590AFK
SNJ54HC590AFK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 89603012A SNJ54HC 590AFK
SNJ54HC590AJ	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301EA SNJ54HC590AJ
SNJ54HC590AJ.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301EA SNJ54HC590AJ

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)
SNJ54HC590AW	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301FA SNJ54HC590AW
SNJ54HC590AW.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8960301FA SNJ54HC590AW

⁽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.

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OTHER QUALIFIED VERSIONS OF SN54HC590A, SN74HC590A :

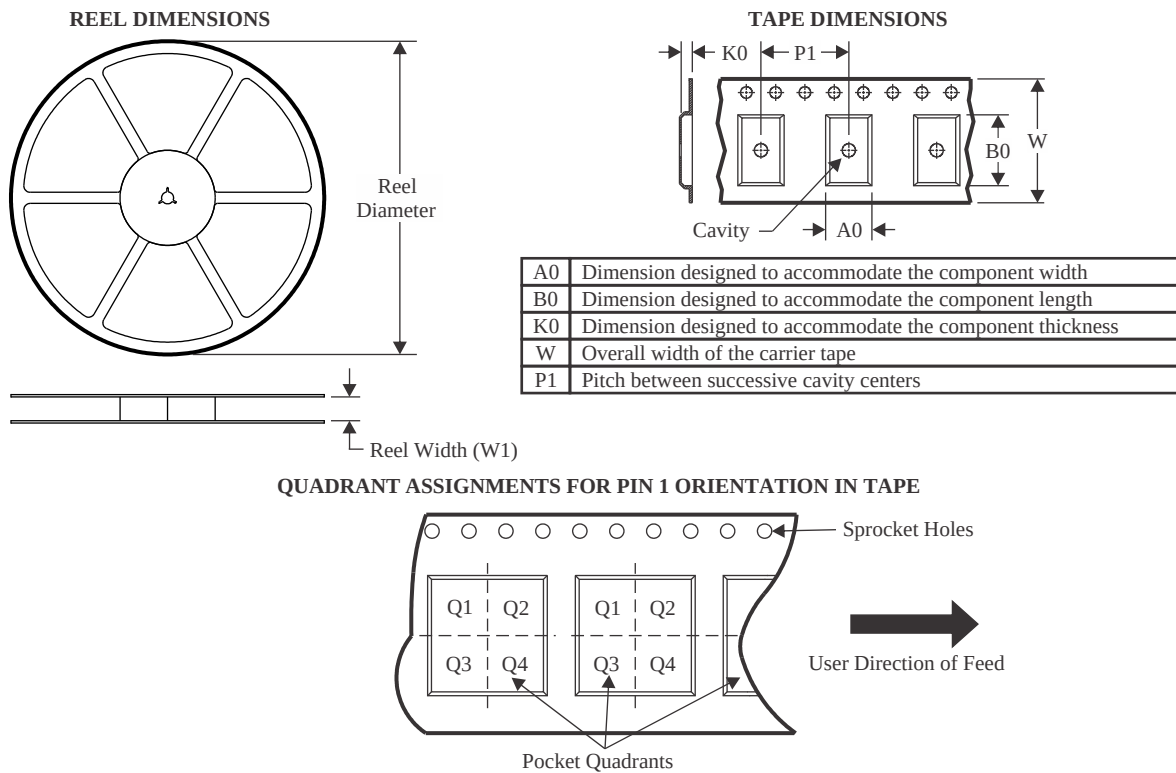
- Catalog : [SN74HC590A](#)

- Military : [SN54HC590A](#)

NOTE: Qualified Version Definitions:

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

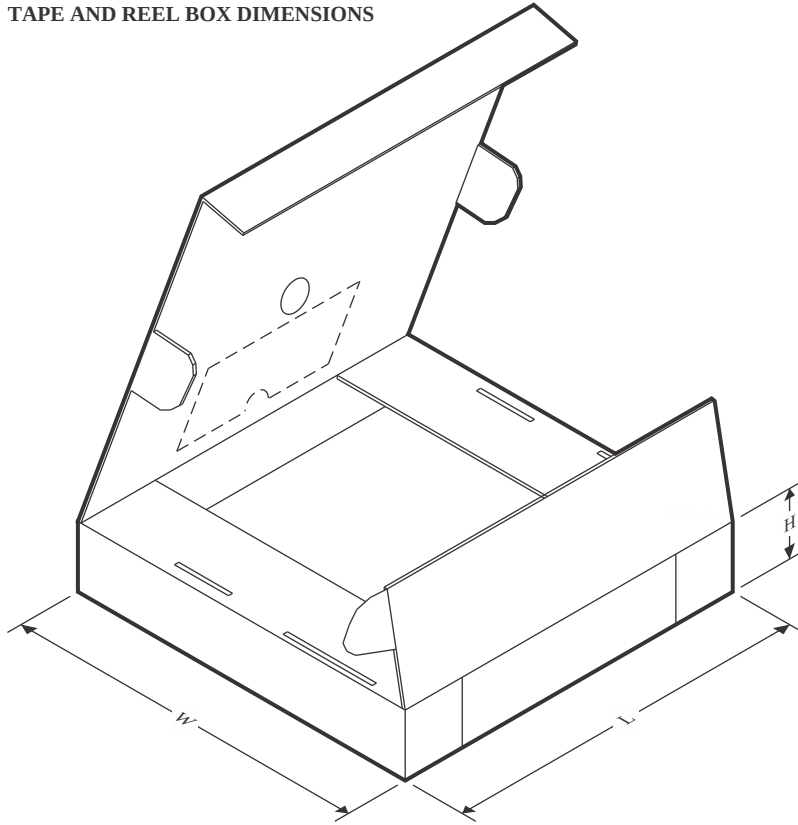
TAPE AND REEL INFORMATION



*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
SN74HC590ADR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC590ADWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

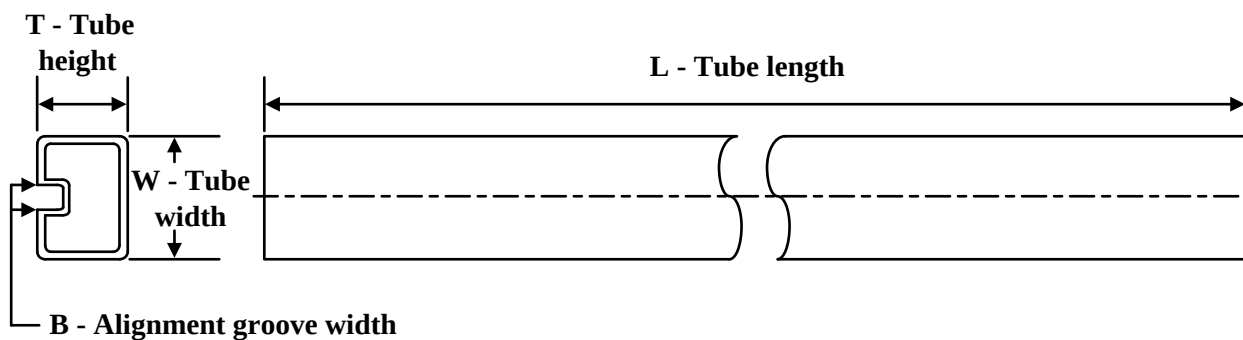
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC590ADR	SOIC	D	16	2500	353.0	353.0	32.0
SN74HC590ADWR	SOIC	DW	16	2000	350.0	350.0	43.0

TUBE

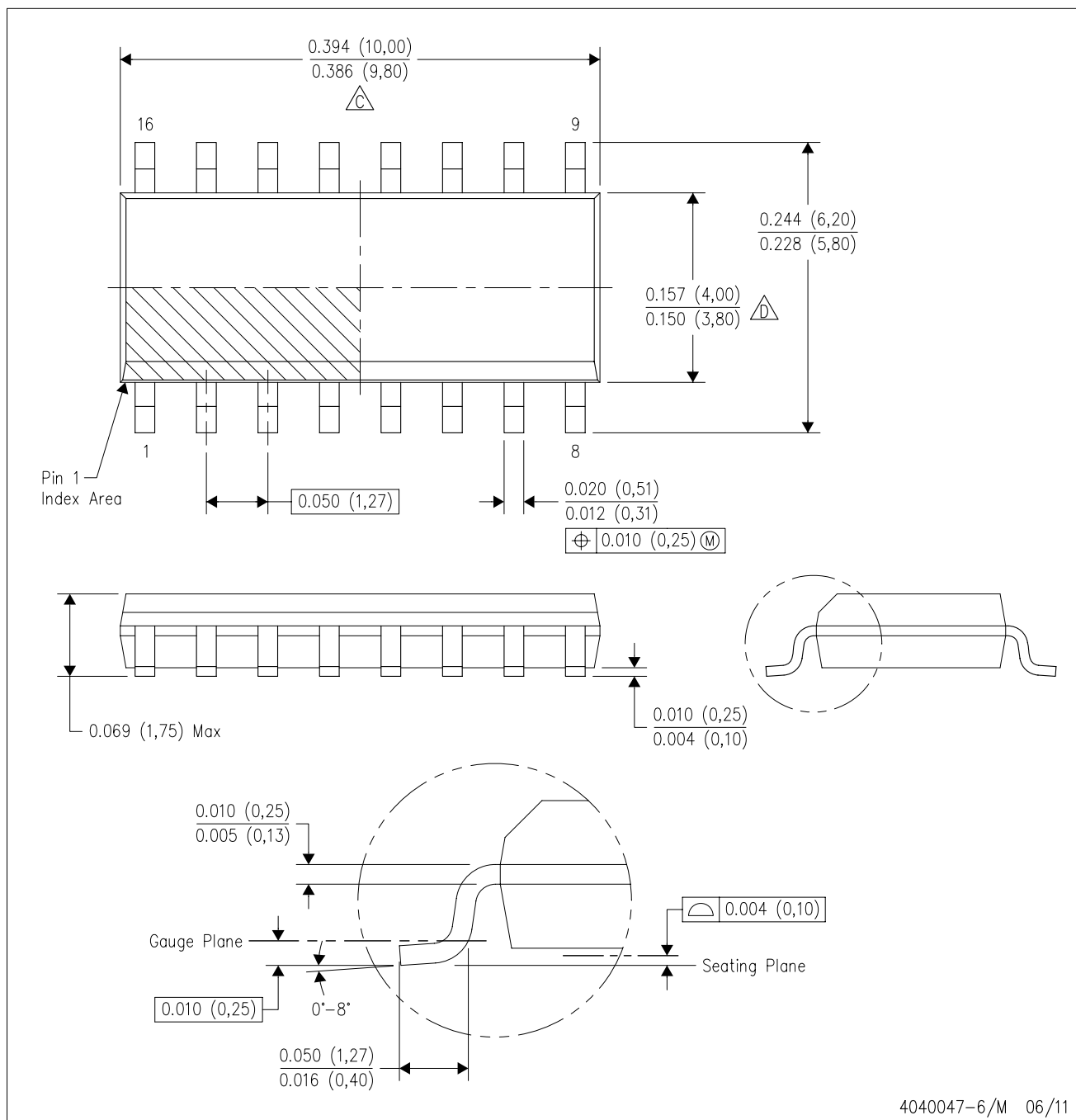


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-89603012A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-8960301FA	W	CFP	16	25	506.98	26.16	6220	NA
SN74HC590AN	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC590AN	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC590AN.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC590AN.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC590ANE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC590ANE4	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54HC590AFK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HC590AFK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HC590AW	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54HC590AW.A	W	CFP	16	25	506.98	26.16	6220	NA

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- 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.

GENERIC PACKAGE VIEW

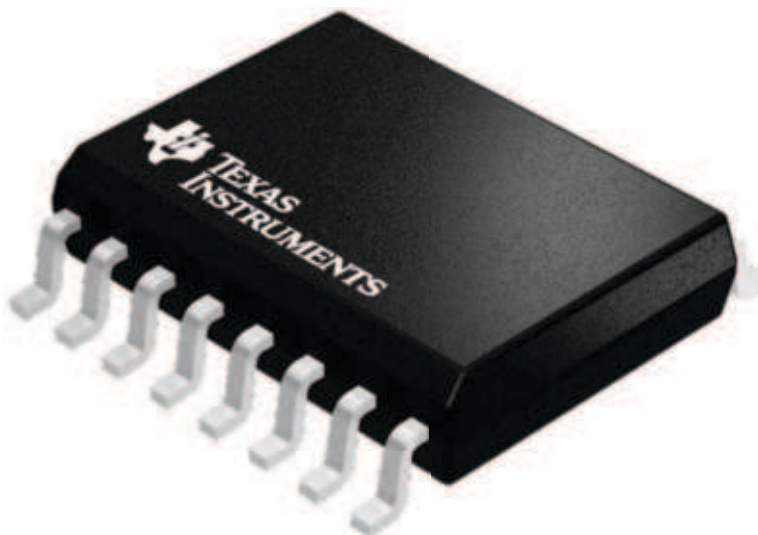
DW 16

SOIC - 2.65 mm max height

7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

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



4224780/A

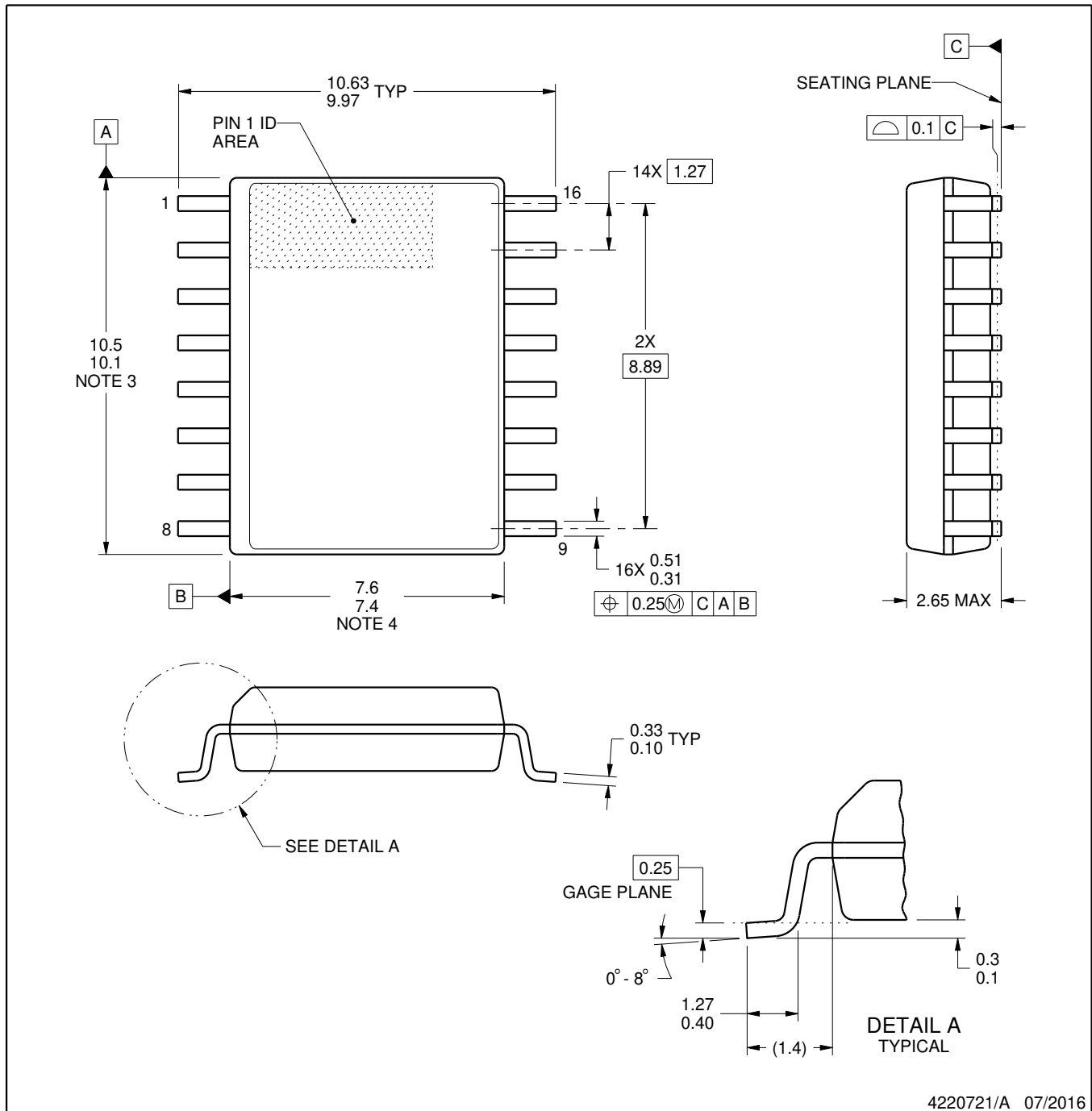


DW0016A

PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220721/A 07/2016

NOTES:

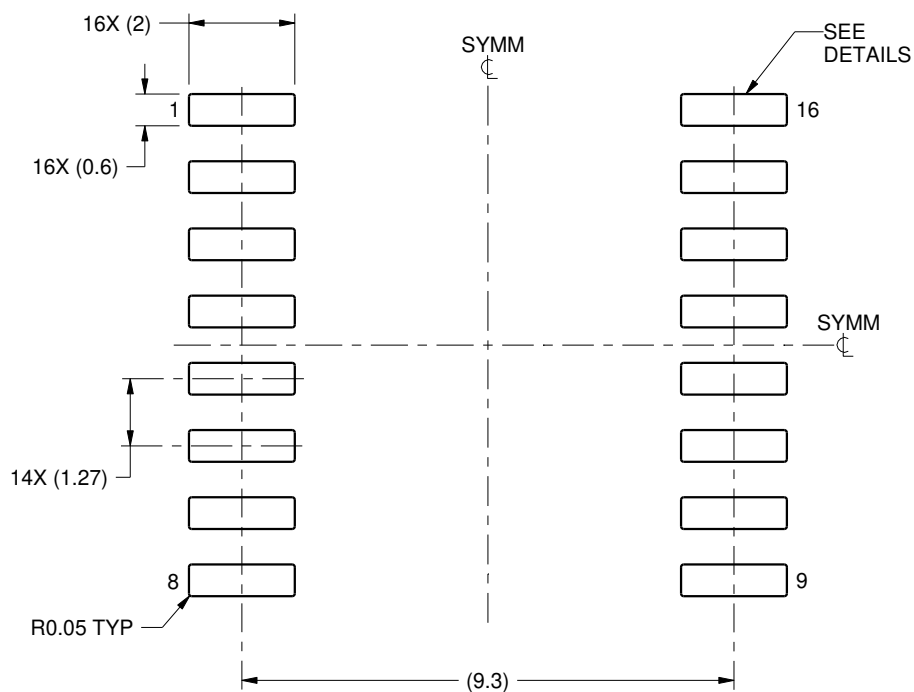
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

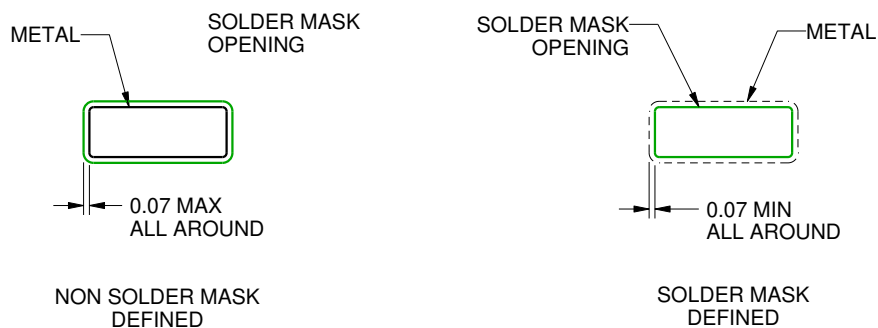
DW0016A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:7X



SOLDER MASK DETAILS

4220721/A 07/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

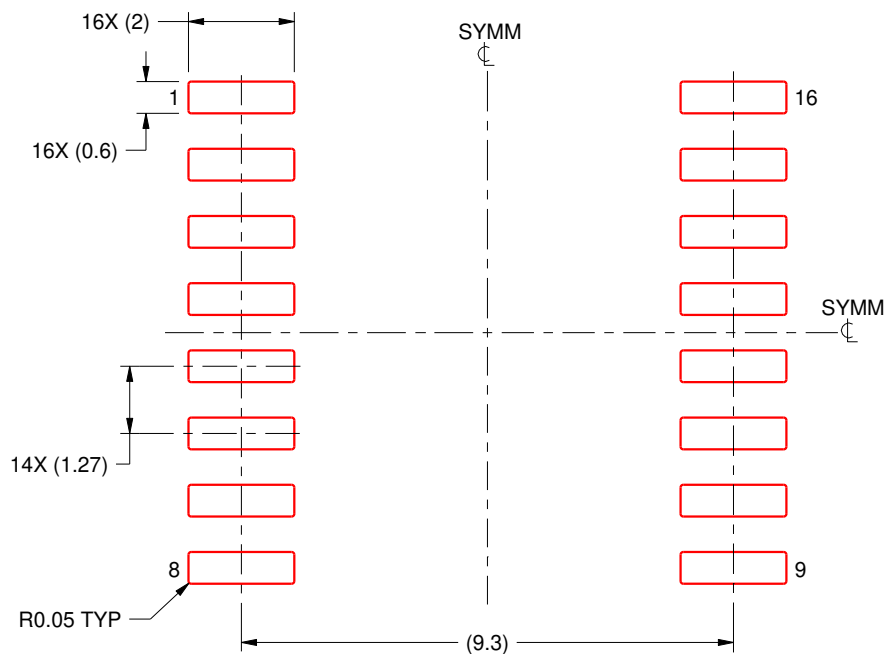
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0016A

SOIC - 2.65 mm max height

SOIC



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

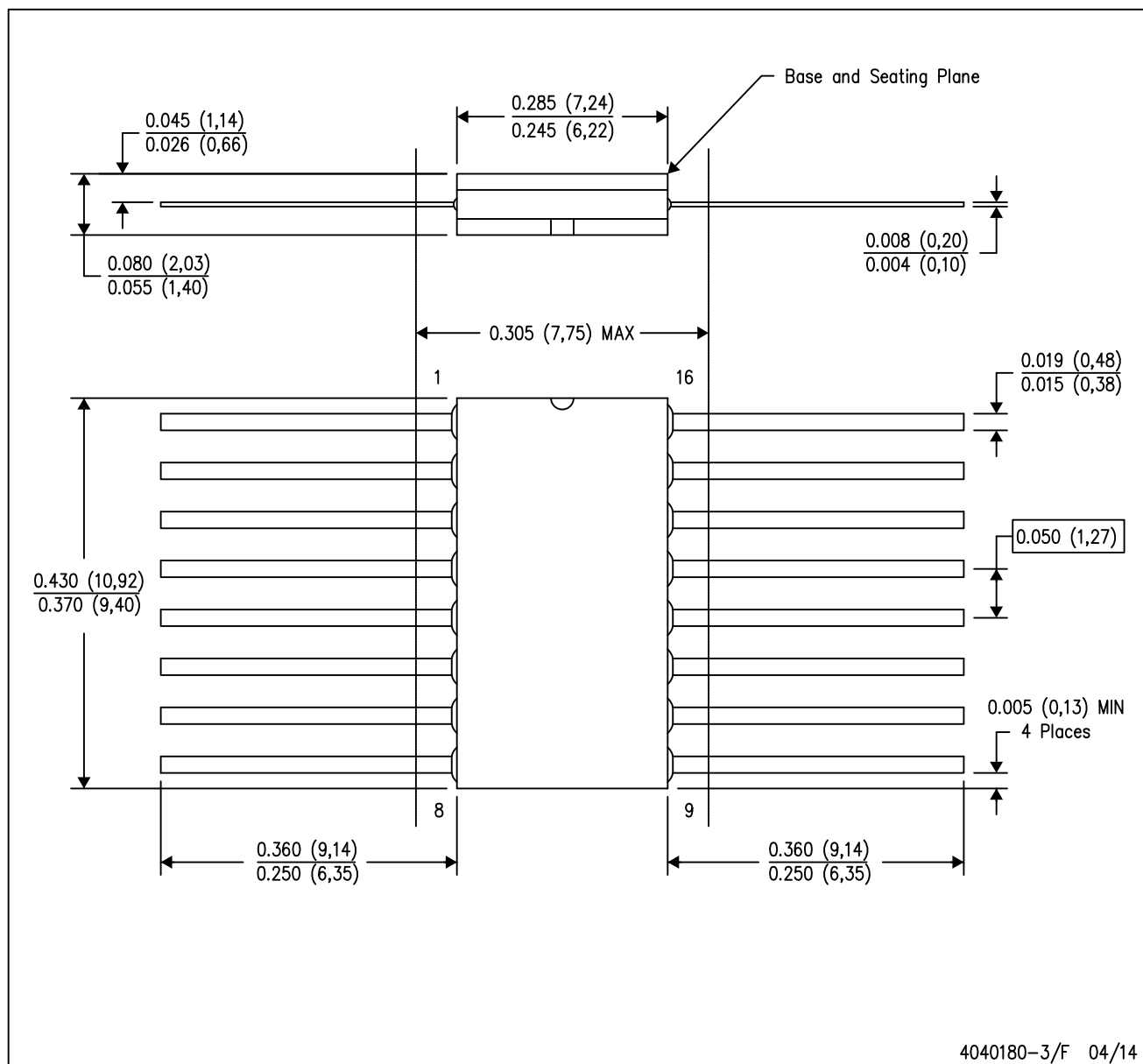
4220721/A 07/2016

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.

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

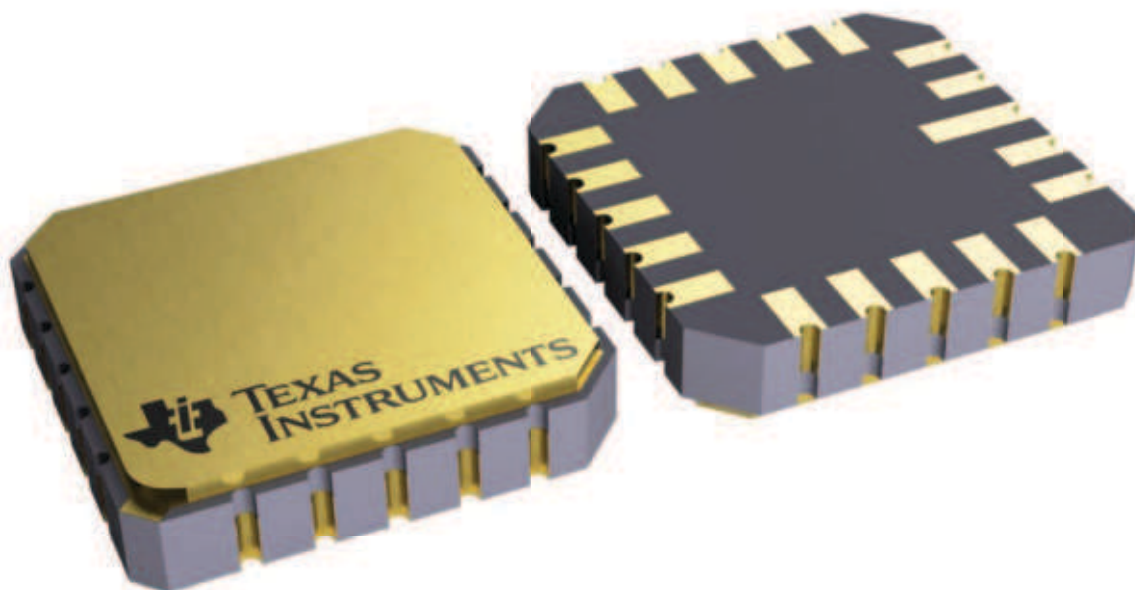
FK 20

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.

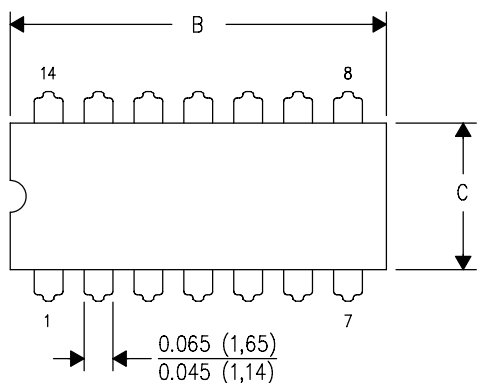


4229370VA\

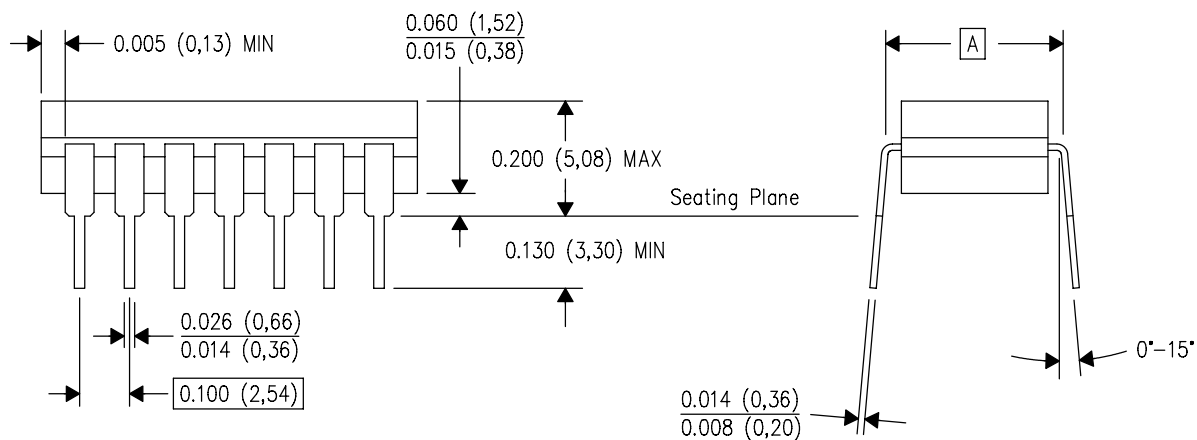
J (R-GDIP-T**)

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)



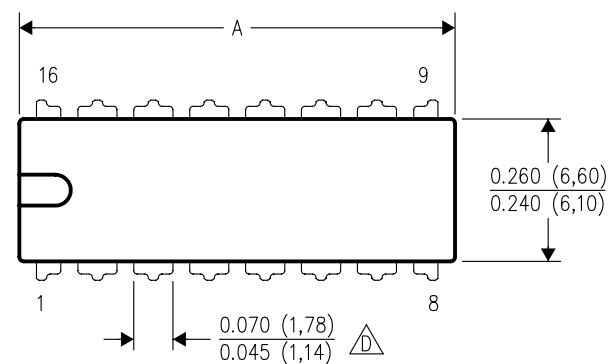
4040083/F 03/03

- 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.

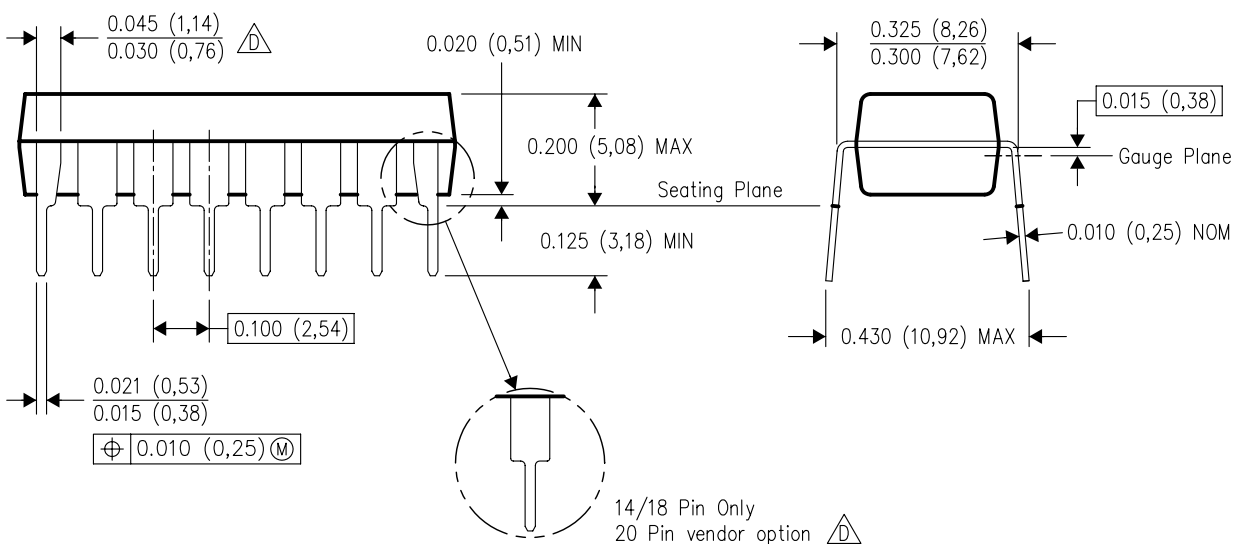
N (R-PDIP-T**)

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.

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