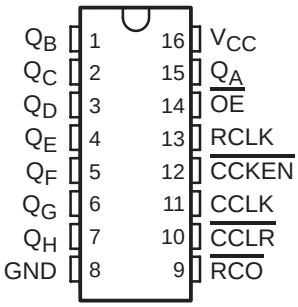
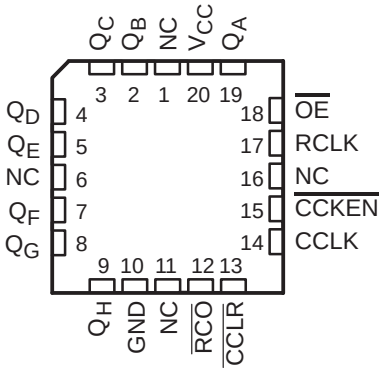
- **2-V to 6-V V_{CC} Operation**
- **High-Current 3-State Parallel Register Outputs Can Drive Up To 15 LSTTL Loads**
- **Low Power Consumption, 80-μA Max I_{CC}**
- **Typical t_{pd} = 14 ns**
- **±6-mA Output Drive at 5 V**
- **Low Input Current of 1 μA Max**
- **8-Bit Counter With Register**
- **Counter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

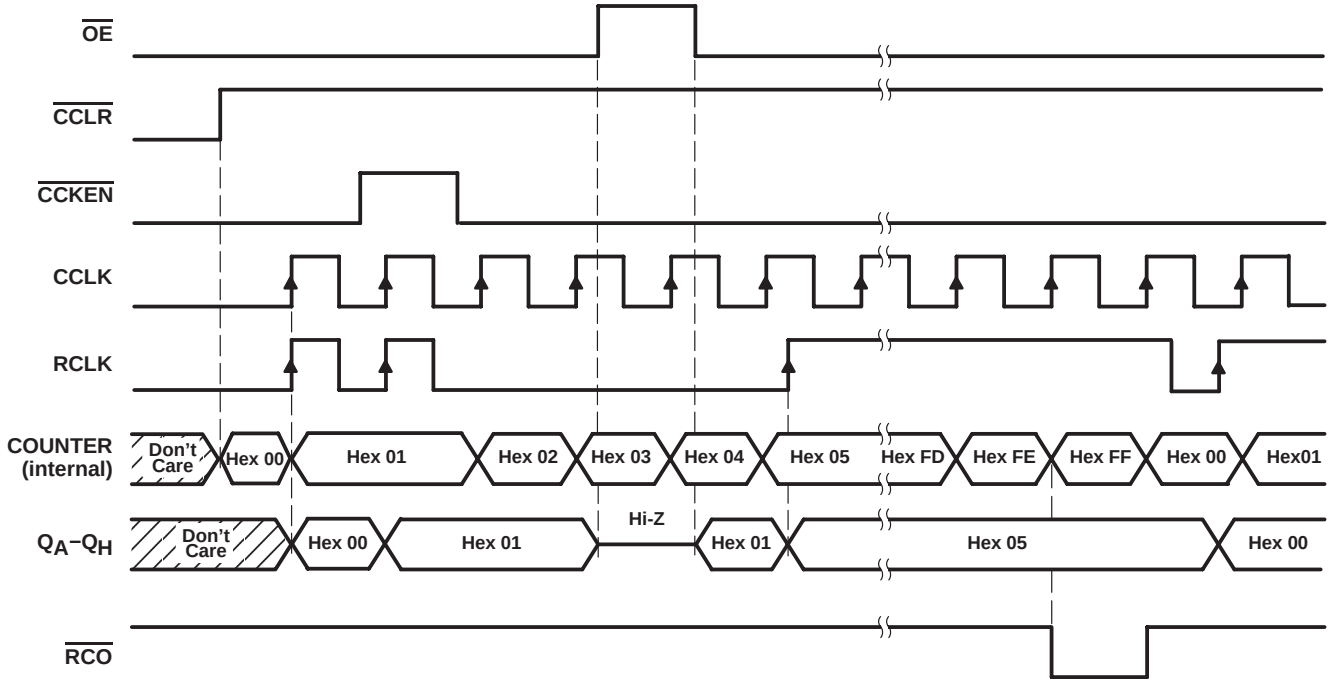
CCLK and the register clock (RCLK) inputs are positive-edge triggered. If both clocks are connected together, the counter state always is one count ahead of the register. Internal circuitry prevents clocking from the clock enable.

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	HC590A
		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.

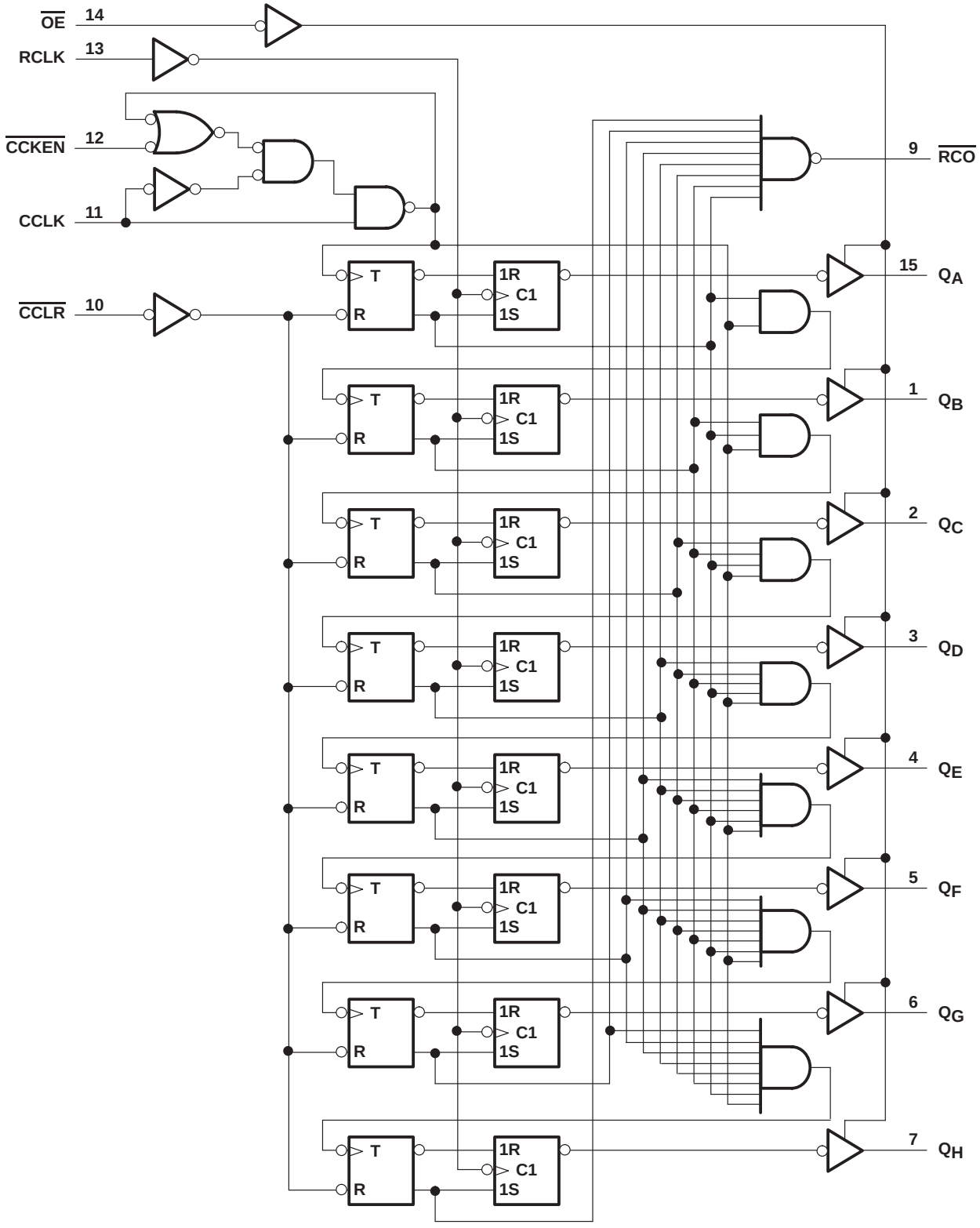
timing diagram



TIMING SEQUENCE

1. Clear Counter (asynchronous).
2. Count up: 0x01. Store 0x00 in register.
3. Inhibit counter clock ($\overline{CCKEN}$ = 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.

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_{IL}max = 0.5 V to V_{IH}min = 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.

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		
		$\overline{RCO}$, 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		
		$\overline{RCO}$, 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	
		$\overline{RCO}$, 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	
		$\overline{RCO}$, 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

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	CCLK or RCLK high or low	2 V	125		200		155		ns
			4.5 V	25		38		31		
			6 V	21		32		26		
		$\overline{CCLR}$ low	2 V	100		150		125		
			4.5 V	20		30		25		
			6 V	17		26		21		
t_{su}	Setup time	$\overline{CCKEN}$ low before CCLK↑	2 V	100		150		125		ns
			4.5 V	20		30		25		
			6 V	17		26		21		
		$\overline{CCLR}$ 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	Hold time	$\overline{CCKEN}$ 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.

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}	$\overline{CCLR}$↓	$\overline{RCO}$	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}	$\overline{OE}$↓	Q	2 V		80	125		185	ns
			4.5 V		20	30		37	
			6 V		15	28		31	
t_{dis}	$\overline{OE}$↑	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.

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}	$\overline{CCLR}$↓	$\overline{RCO}$	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}	$\overline{OE}$↓	Q	2 V		80	125		155	ns
			4.5 V		20	25		31	
			6 V		15	21		26	
t_{dis}	$\overline{OE}$↑	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	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	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.

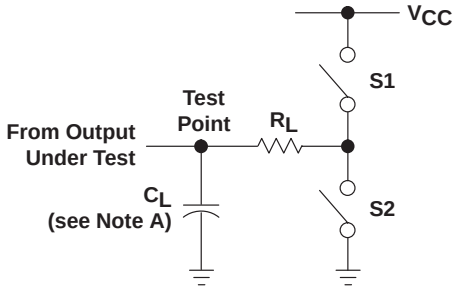
switching characteristics over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	SN74HC590A					UNIT
				T_A = 25°C			MIN	MAX	
				MIN	TYP	MAX			
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°C

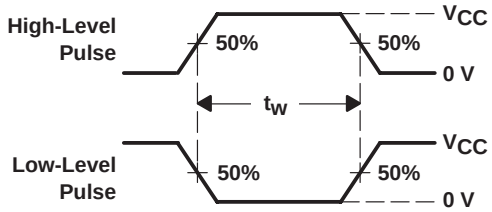
PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load	250	pF

PARAMETER MEASUREMENT INFORMATION

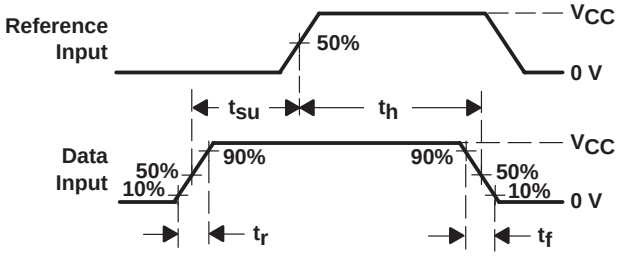


LOAD CIRCUIT

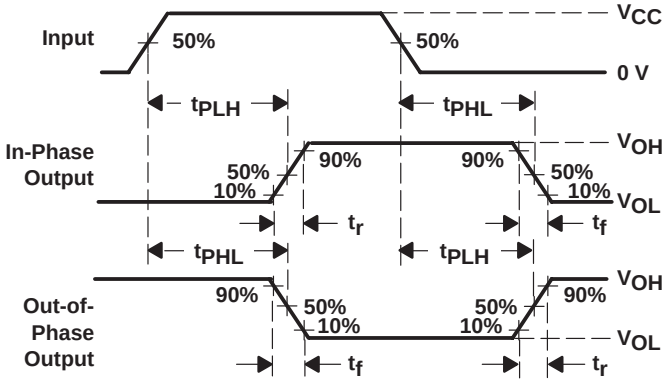
PARAMETER		R_L	C_L	S1	S2
t_{en}	t_{PZH}	1 kΩ	50 pF or 150 pF	Open	Closed
	t_{PZL}			Closed	Open
t_{dis}	t_{PHZ}	1 kΩ	50 pF	Open	Closed
	t_{PLZ}			Closed	Open
t_{pd} or t_t		−−	50 pF or 150 pF	Open	Open



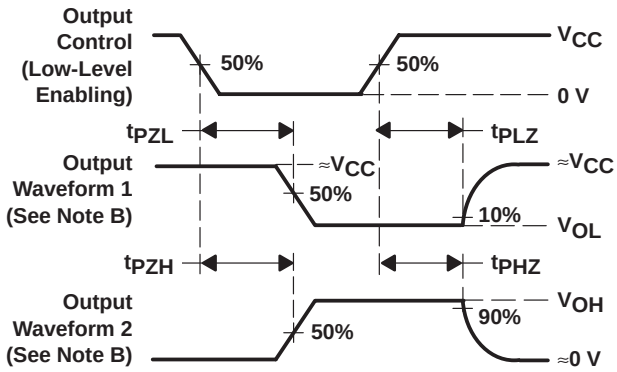
VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
SETUP AND HOLD AND INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

NOTES: A. C_L includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 6 ns, t_f = 6 ns.
D. The outputs are measured one at a time with one input transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. 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 SNJ54HC590AFK
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	HC590A
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 SNJ54HC590AFK
SNJ54HC590AFK.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-89603012A SNJ54HC590AFK
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.

OTHER QUALIFIED VERSIONS OF SN54HC590A, SN74HC590A :

- Catalog : SN74HC590A

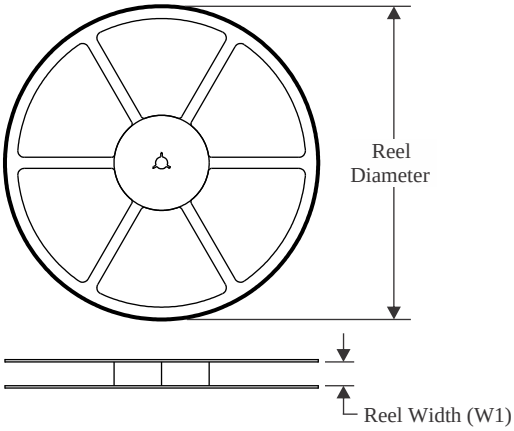
- Military : SN54HC590A

NOTE: Qualified Version Definitions:

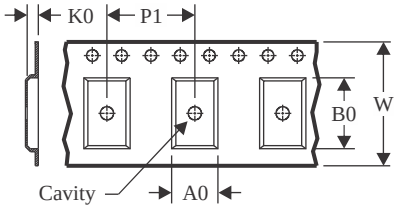
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

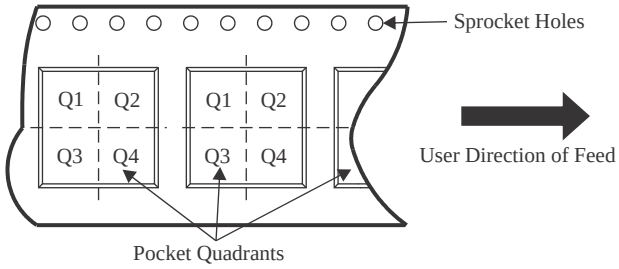


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

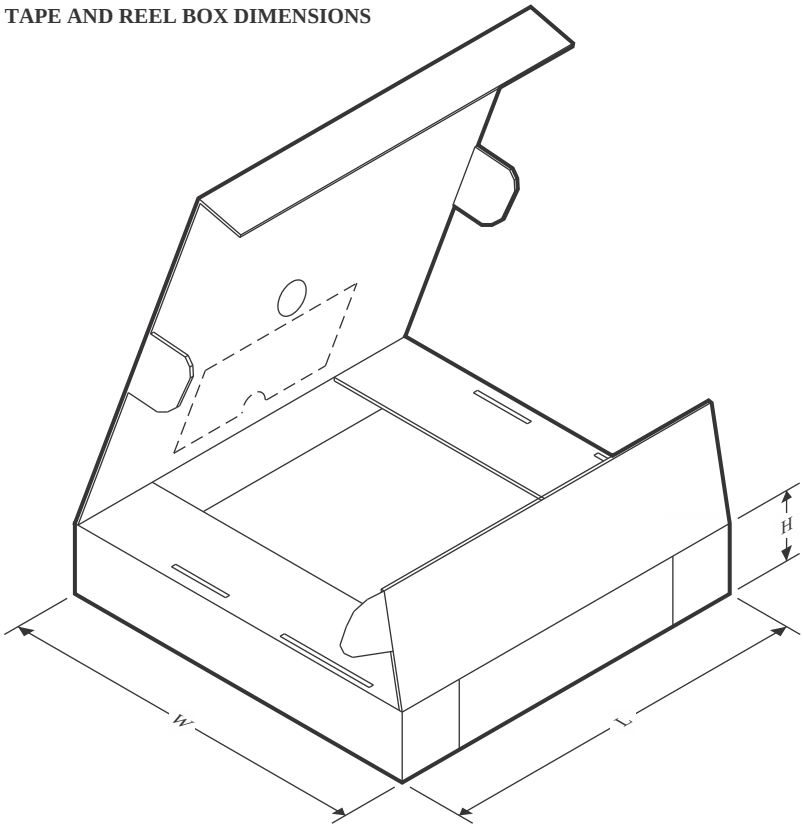
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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

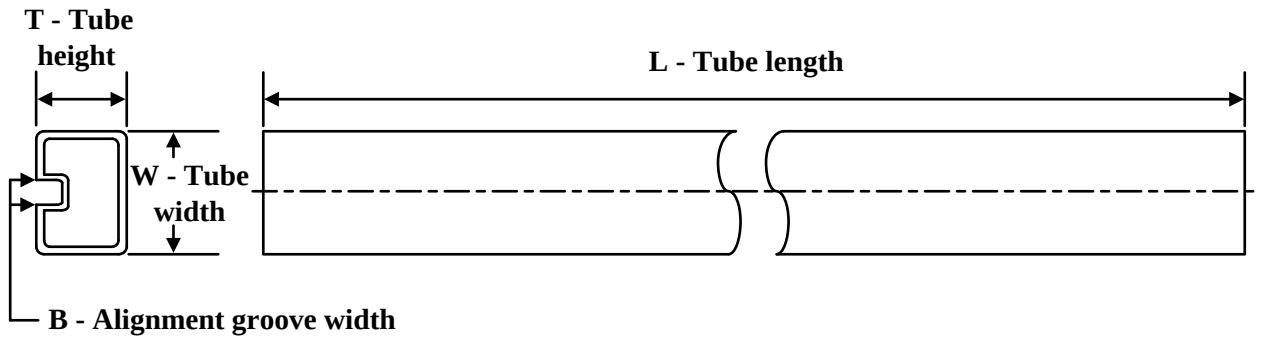
TAPE AND REEL BOX DIMENSIONS



*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

GENERIC PACKAGE VIEW

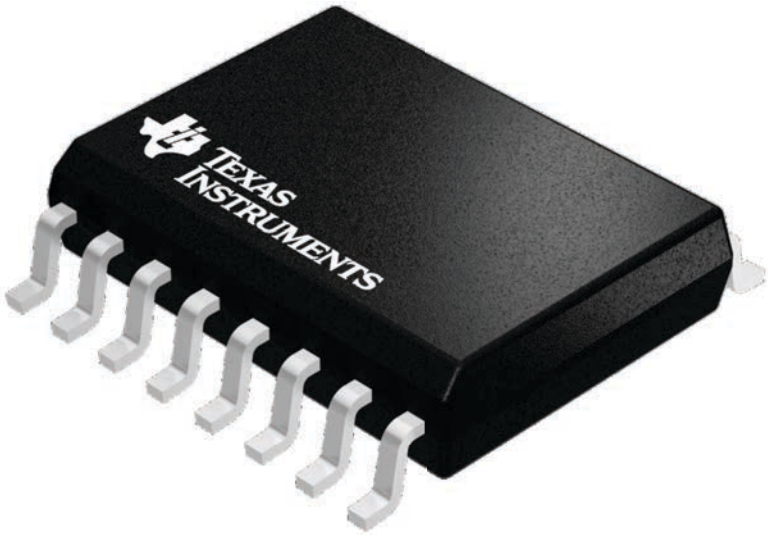
DW 16

SOIC - 2.65 mm max height

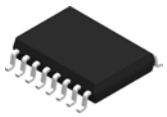
7.5 x 10.3, 1.27 mm pitch

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

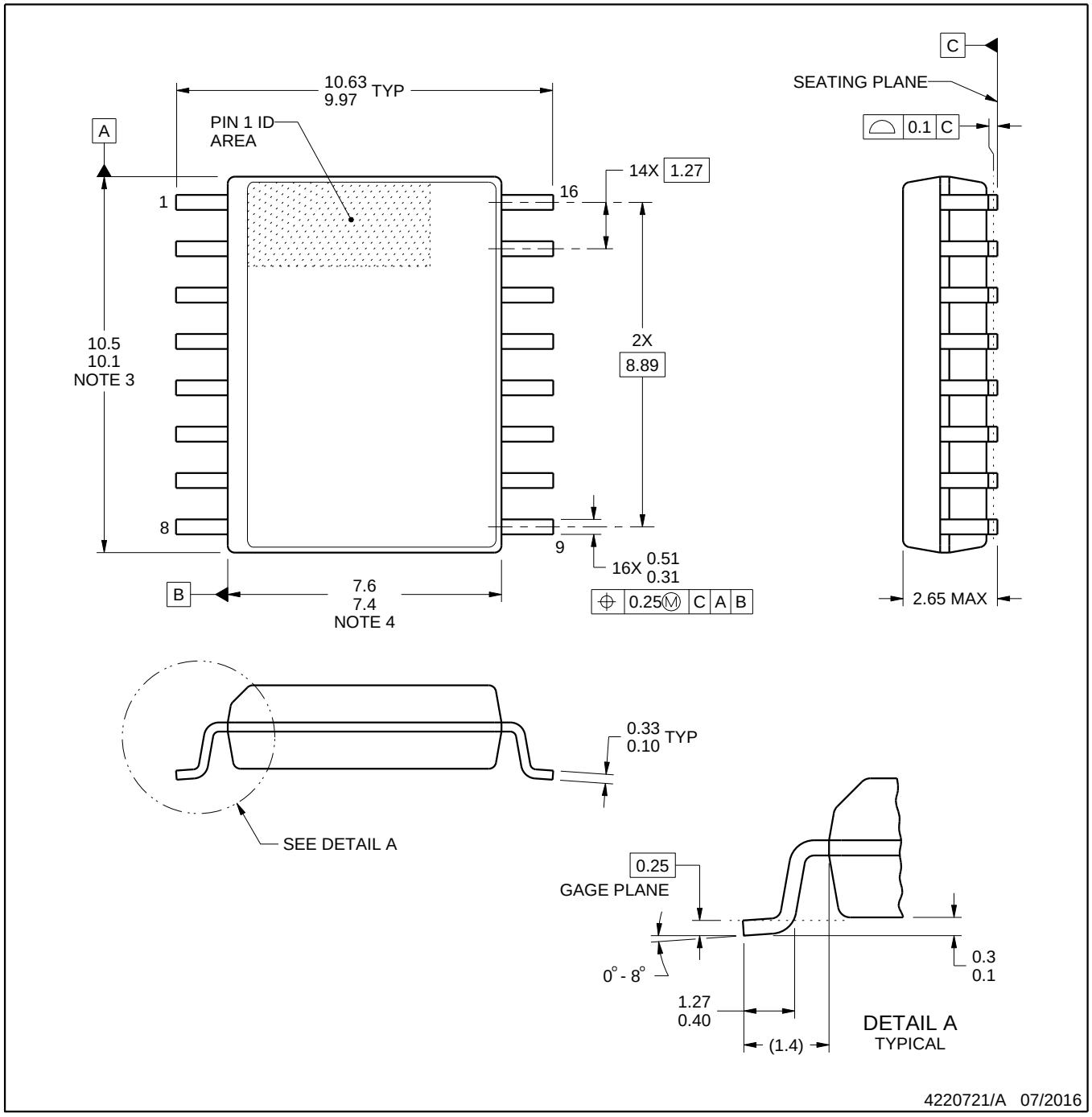


PACKAGE OUTLINE

DW0016A

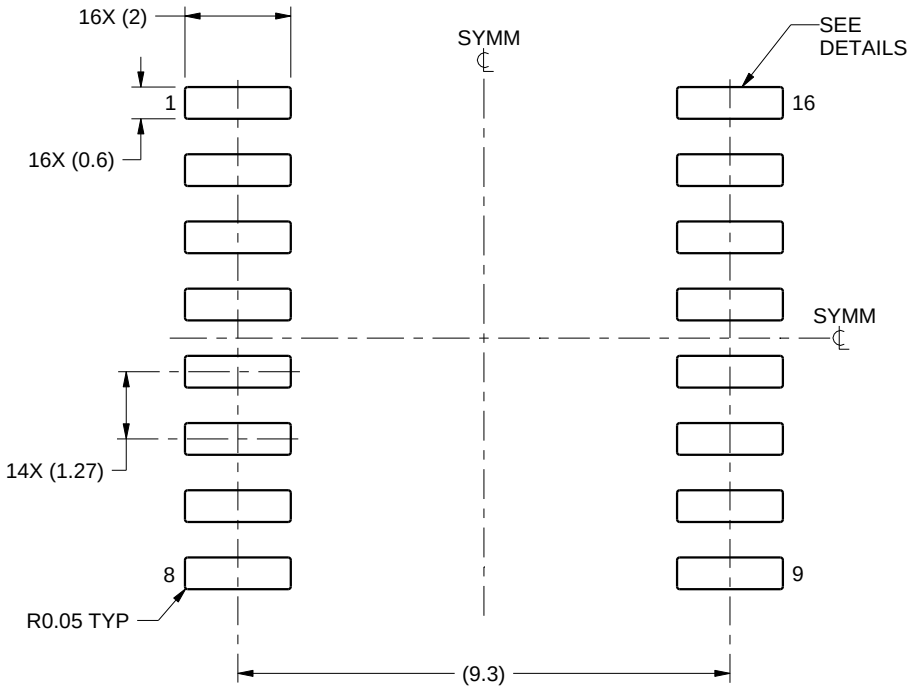
SOIC - 2.65 mm max height

SOIC

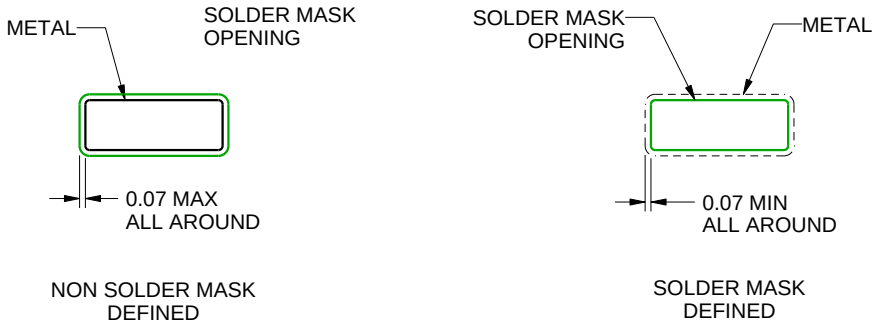


NOTES:

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 0.25 mm, per side.
5. Reference JEDEC registration MS-013.



LAND PATTERN EXAMPLE
SCALE:7X

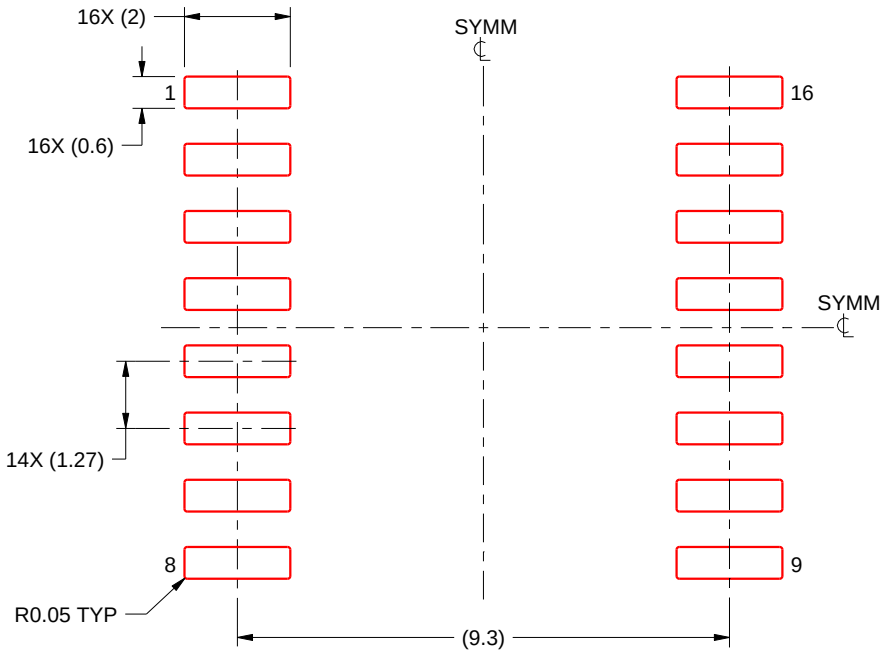


SOLDER MASK DETAILS

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.



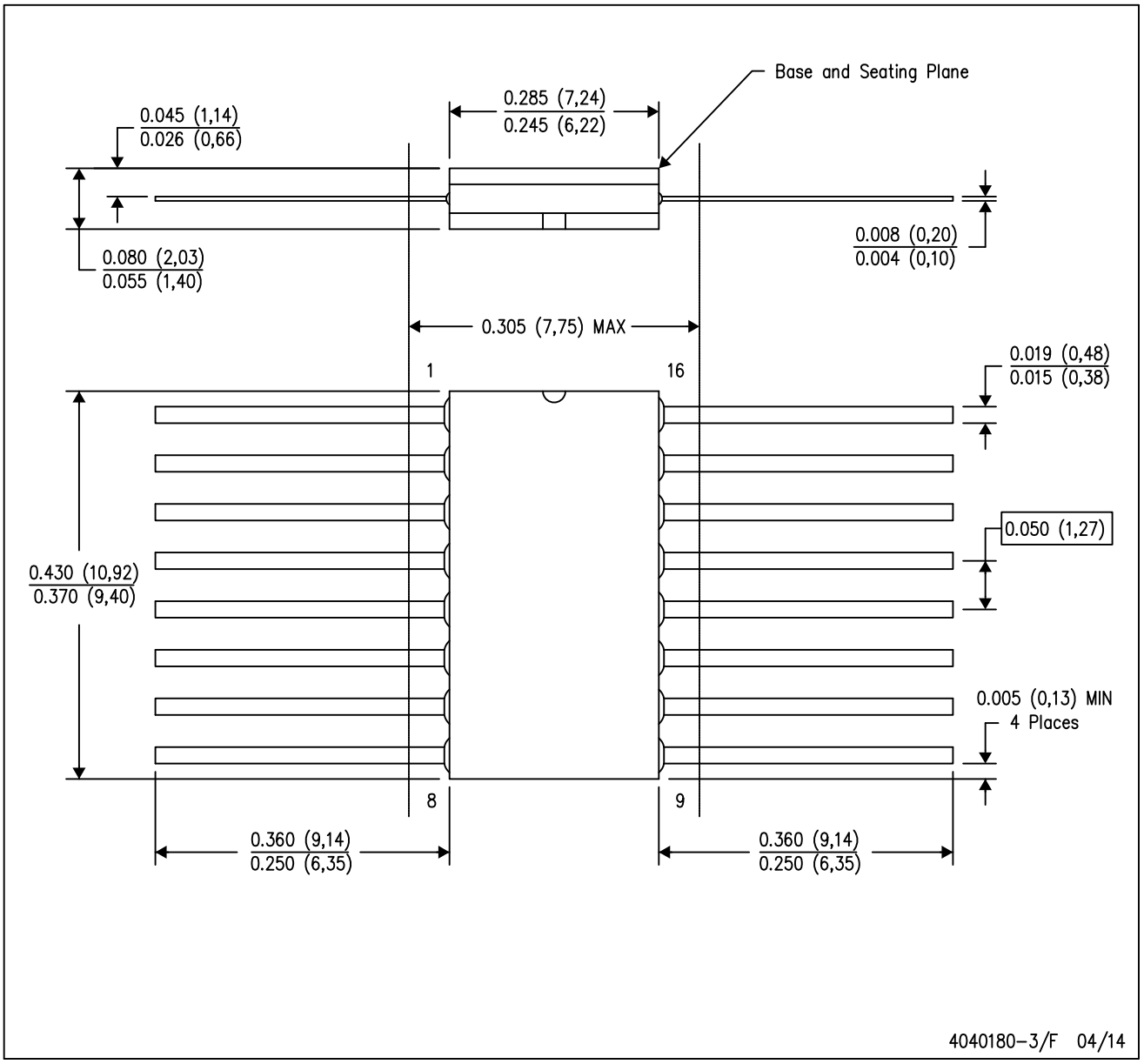
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

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:
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 ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP2–F16

GENERIC PACKAGE VIEW

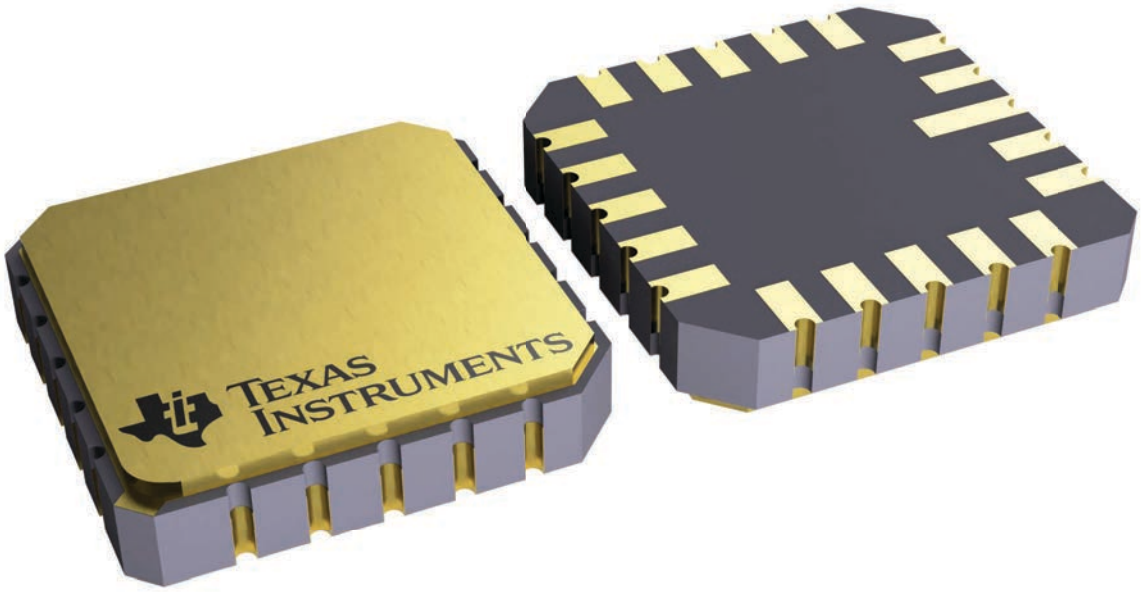
FK 20

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.

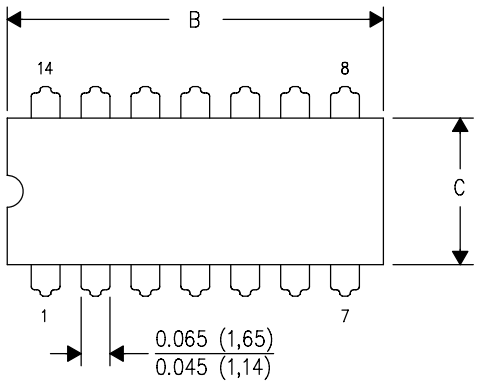


4229370VA\

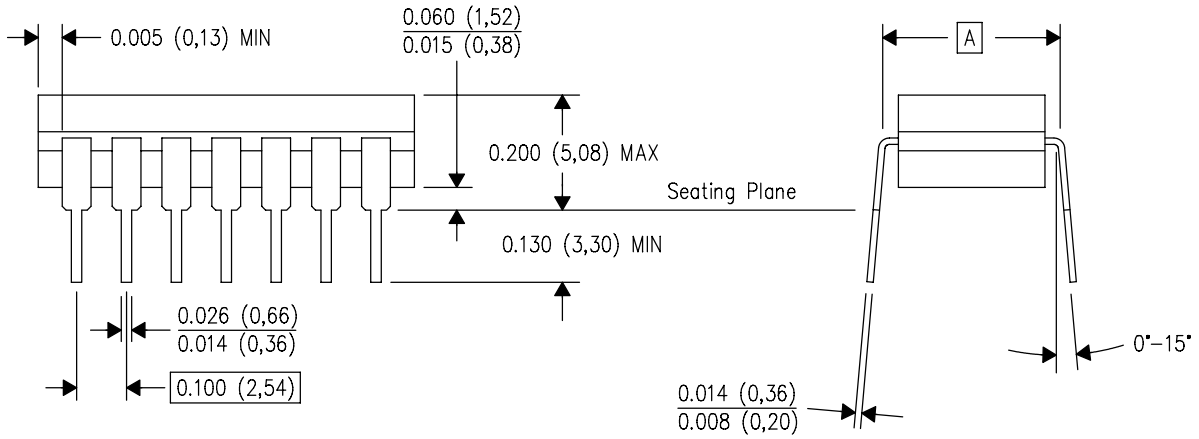
J (R–GDIP–T**)

14 LEADS SHOWN

CERAMIC DUAL IN–LINE PACKAGE



DIM \ PINS **	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)



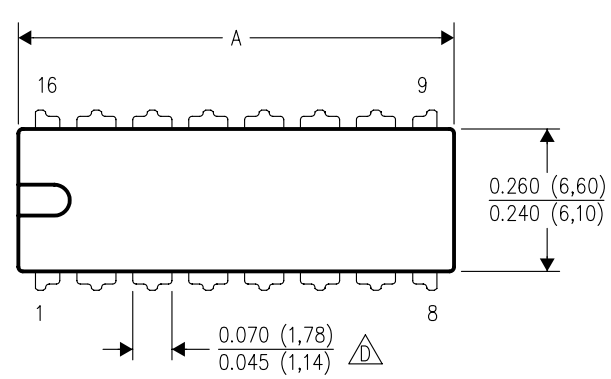
4040083/F 03/03

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.

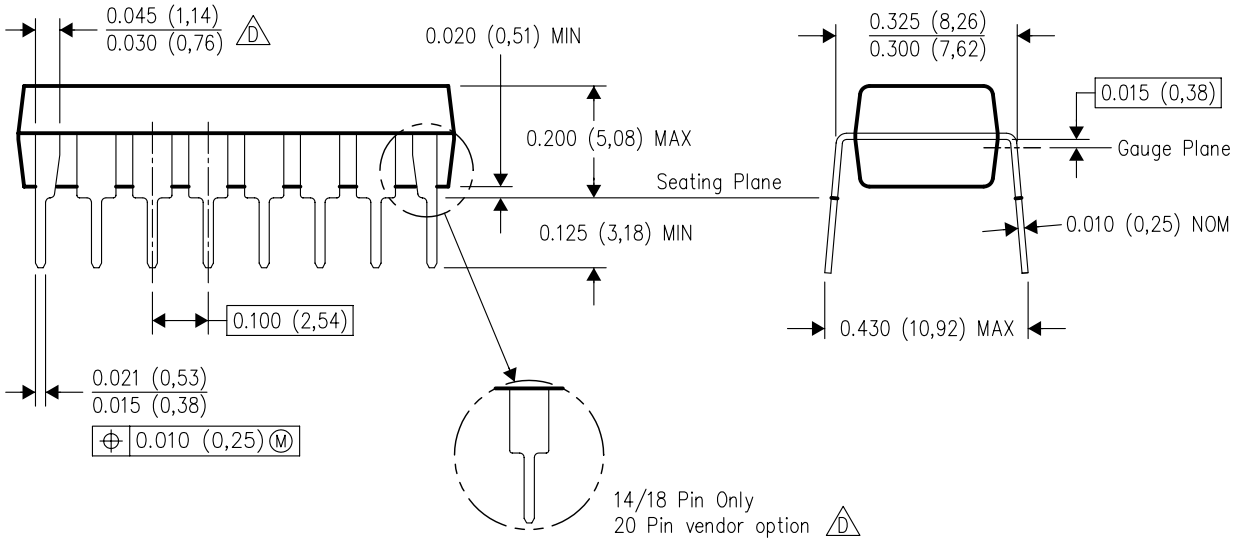
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



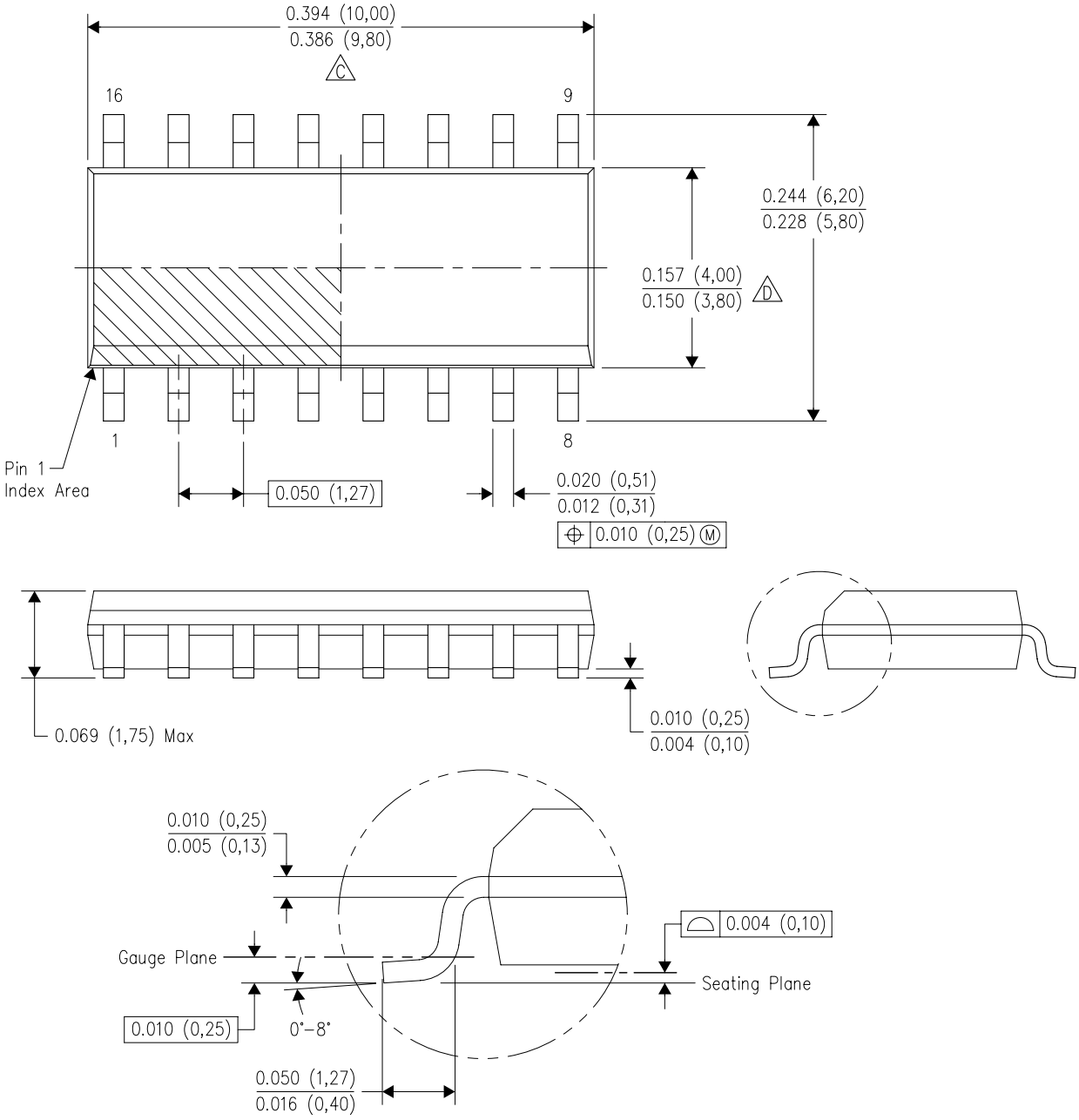
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

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.
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.

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