- 'LS377 and 'LS378 Contain Eight and Six Flip-Flops, Respectively, with Single-Rail Outputs
- 'LS379 Contains Four Flip-Flops with Double-Rail Outputs
- Individual Data Input to Each Flip-Flop
- Applications Include:
  Buffer/Storage Registers
  Shift Registers
  Pattern Generators

description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with an enable input. The 'LS377, 'LS378, and 'LS379 devices are similar to 'LS273, 'LS174, and 'LS175, respectively, but feature a common enable instead of a common clear.

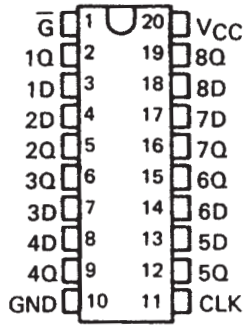
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if the enable input $\overline{G}$ is low. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output. The circuits are designed to prevent false clocking by transitions at the $\overline{G}$ input.

These flip-flops are guaranteed to respond to clock frequencies ranging from 0 to 30 MHz while maximum clock frequency is typically 40 megahertz. Typical power dissipation is 10 milliwatts per flip-flop.

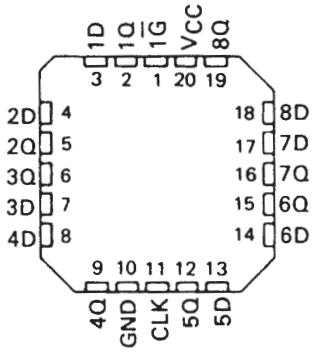
FUNCTION TABLE
(EACH FLIP-FLOP)

INPUTS			OUTPUTS	
$\overline{G}$	CLOCK	DATA	Q	$\overline{Q}$
H	X	X	Q_0	$\overline{Q}_0$
L	↑	H	H	L
L	↑	L	L	H
X	L	X	Q_0	$\overline{Q}_0$

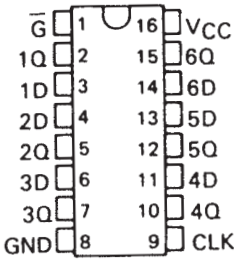
SN54LS377 . . . J PACKAGE
SN74LS377 . . . DW OR N PACKAGE
(TOP VIEW)



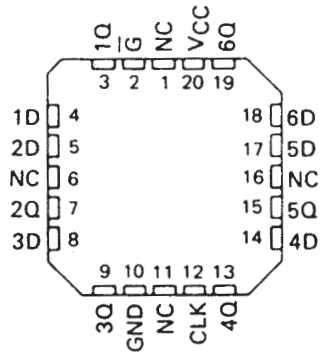
SN54LS377 . . . FK PACKAGE
(TOP VIEW)



SN54LS378 . . . J OR W PACKAGE
SN74LS378 . . . D OR N PACKAGE
(TOP VIEW)

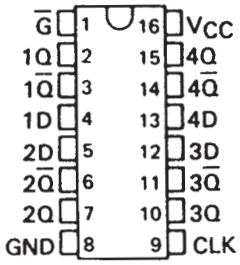


SN54LS378 . . . FK PACKAGE
(TOP VIEW)

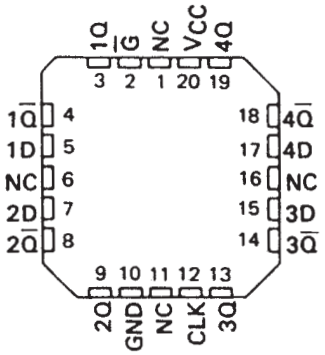


NC – No internal connection

SN54LS379 . . . J OR W PACKAGE
SN74LS379 . . . D OR N PACKAGE
(TOP VIEW)

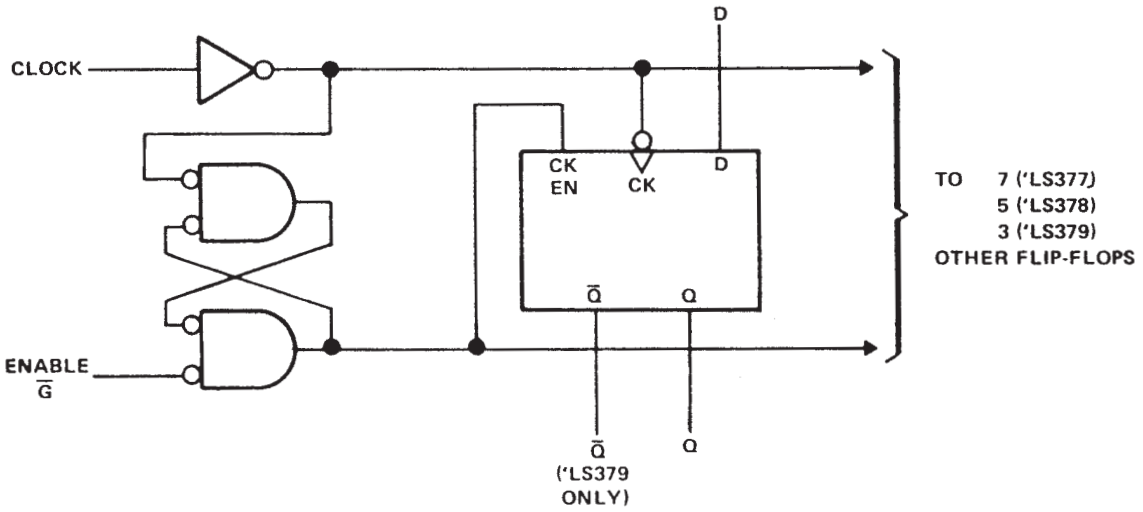


SN54LS379 . . . FK PACKAGE
(TOP VIEW)

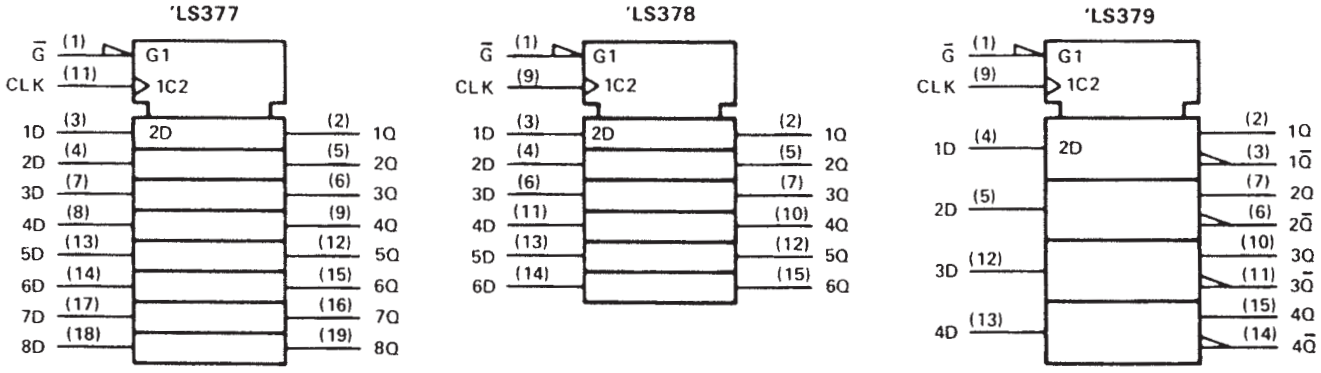


NC – No internal connection

logic diagram (positive logic)



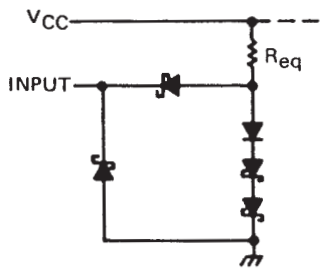
logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

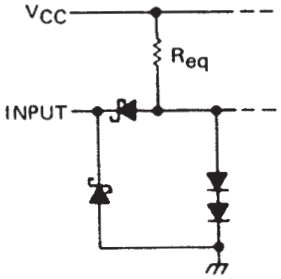
schematics of inputs and outputs

EQUIVALENT OF DATA INPUT



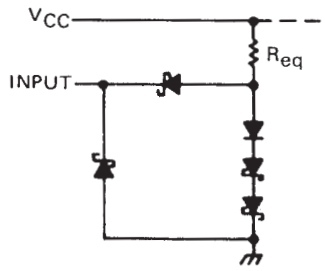
'LS379 : R_{eq} = 30 kΩ NOM
others : R_{eq} = 25 kΩ NOM

EQUIVALENT OF CLOCK INPUTS



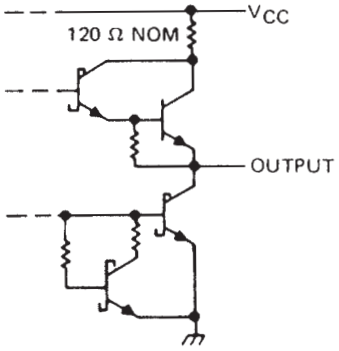
'LS379 :R_{eq} = 17 kΩ NOM
others :R_{eq} = 20 kΩ NOM

EQUIVALENT OF ENABLE INPUTS



'LS379 :R_{eq} = 25 kΩ NOM
others :R_{eq} = 20 kΩ NOM

TYPICAL OF ALL OUTPUTS



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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 7 V
Operating free-air temperature range: SN54LS' . . . . . −55°C to 125°C
SN74LS' . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

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

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
Clock frequency, f_{clock}		0		30	0		30	MHz
Width of clock pulse, t_w		20			20			ns
Setup time, t_{su}	Data input	20↑			20↑			ns
	Enable active-state	25↑			25↑			
	Enable inactive-state	10↑			10↑			
Hold time, t_h	Data and enable	5↑			5↑			ns
Operating free-air temperature, T_A		−55		125	0		70	°C

↑The arrow indicates that the rising edge of the clock pulse is used for reference.

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} = MIN,	I_I = −18 mA				−1.5			−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IL} = V_{IL} max,	V_{IH} = 2 V, I_{OH} = −400 μA		2.5	3.5		2.7	3.5		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = V_{IL} max	V_{IH} = 2 V,	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
				I_{OL} = 8 mA					0.35	0.5	
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 7 V				0.1			0.1	mA
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V				20			20	μA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V				−0.4			−0.4	mA
I_{OS}	Short-circuit output current§	V_{CC} = MAX			−20		−100	−20		−100	mA
I_{CC}	Supply current	V_{CC} = MAX,	See Note 2	'LS377		17	28		17	28	mA
				'LS378		13	22		13	22	mA
				'LS379		9	15		9	15	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 V, T_A = 25°C.
§ Note more than one input should be shorted at a time, and duration of the short-circuit should not exceed one second.
NOTE 2: With all outputs open and ground applied to all data and enable inputs, I_{CC} is measured after a momentary ground, then 4.5 V, is applied to clock.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{max}	Maximum clock frequency	C_L = 15 pF, R_L = 2 kΩ, See Note 3	30	40		MHz
t_{PLH}	Propagation delay time, low-to-high-level output from clock			17	27	ns
t_{PHL}	Propagation delay time, high-to-low-level output from clock			18	27	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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)
5962-8992501EA	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8992501EA SNJ54LS378J
JM38510/32504BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
JM38510/32504BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
JM38510/32504BRA.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
JM38510/32504BRA.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
JM38510/32504BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
JM38510/32504BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
JM38510/32504BSA.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
JM38510/32504BSA.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
M38510/32504BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
M38510/32504BRA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BRA
M38510/32504BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
M38510/32504BSA	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 32504BSA
SN54LS377J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS377J
SN54LS377J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS377J
SN54LS377J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS377J
SN54LS377J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS377J
SN54LS378J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS378J
SN54LS378J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS378J

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)
SN54LS378J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS378J
SN54LS378J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS378J
SN54LS379J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS379J
SN54LS379J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS379J
SN54LS379J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS379J
SN54LS379J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS379J
SN74LS377DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS377
SN74LS377DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS377
SN74LS377DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	(LS374, LS377)
SN74LS377DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	(LS374, LS377)
SN74LS377DWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	(LS374, LS377)
SN74LS377DWR.A	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	(LS374, LS377)
SN74LS377N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377N.A	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377NE4	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377NE4	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS377N
SN74LS377NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS377
SN74LS377NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS377
SN74LS377NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS377
SN74LS377NSR.A	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS377
SN74LS378D	Obsolete	Production	SOIC (D) | 16	-	-	Call TI	Call TI	0 to 70	LS378
SN74LS378D	Obsolete	Production	SOIC (D) | 16	-	-	Call TI	Call TI	0 to 70	LS378
SN74LS378DR	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS378
SN74LS378DR	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS378
SN74LS378DR.A	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS378
SN74LS378DR.A	Active	Production	SOIC (D) | 16	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS378
SN74LS378N	Active	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS378N
SN74LS378N	Active	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS378N
SN74LS378N.A	Active	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS378N

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)
SN74LS378N.A	Active	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS378N
SNJ54LS377J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377J
SNJ54LS377J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377J
SNJ54LS377J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377J
SNJ54LS377J.A	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377J
SNJ54LS377W	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377W
SNJ54LS377W	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377W
SNJ54LS377W.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377W
SNJ54LS377W.A	Active	Production	CFP (W) | 20	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS377W
SNJ54LS378J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8992501EA SNJ54LS378J
SNJ54LS378J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8992501EA SNJ54LS378J
SNJ54LS378J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8992501EA SNJ54LS378J
SNJ54LS378J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8992501EA SNJ54LS378J
SNJ54LS379FK	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 379FK
SNJ54LS379FK	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 379FK
SNJ54LS379FK.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 379FK
SNJ54LS379FK.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS 379FK
SNJ54LS379J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS379J
SNJ54LS379J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS379J
SNJ54LS379J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS379J
SNJ54LS379J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS379J

(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 SN54LS377, SN54LS378, SN74LS377, SN74LS378 :

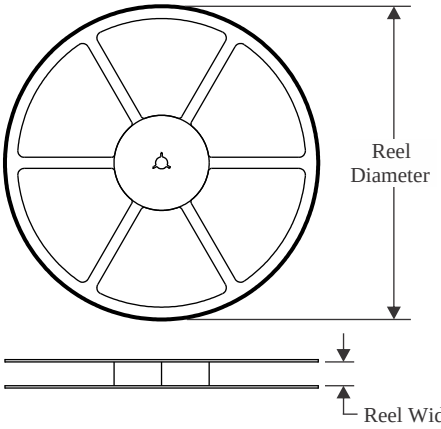
- Catalog : SN74LS377, SN74LS378
- Military : SN54LS377, SN54LS378

NOTE: Qualified Version Definitions:

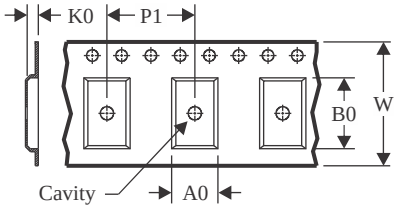
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

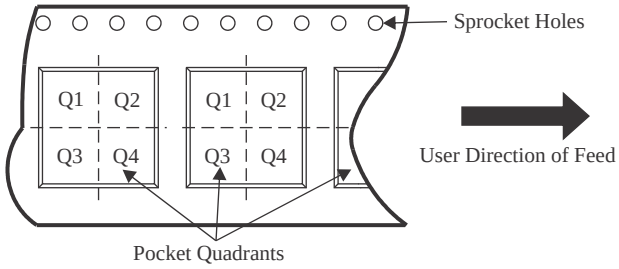


TAPE DIMENSIONS



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

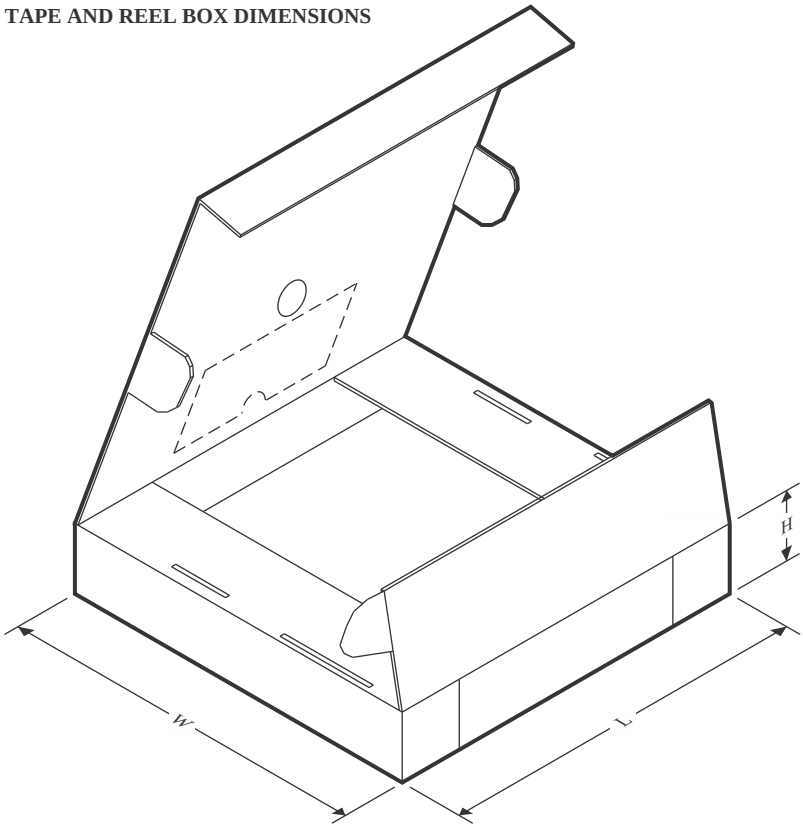
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74LS377DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LS377NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS378DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

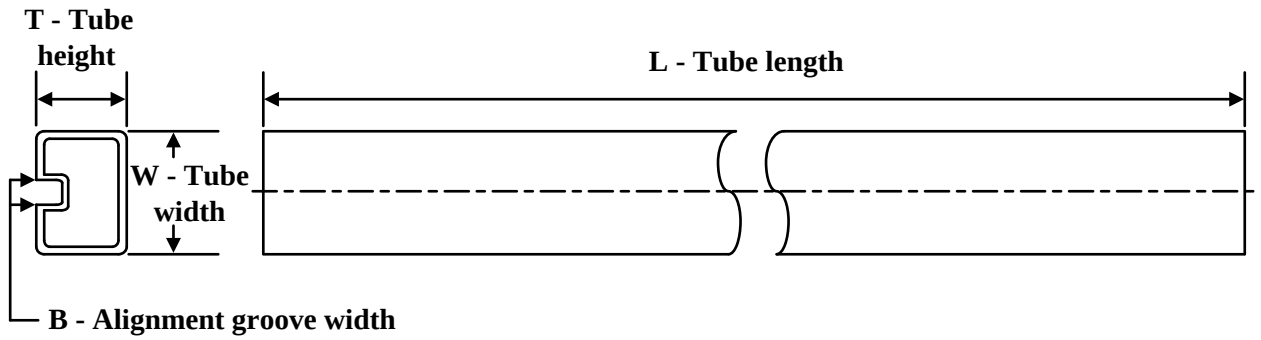
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS377DWR	SOIC	DW	20	2000	356.0	356.0	45.0
SN74LS377NSR	SOP	NS	20	2000	356.0	356.0	45.0
SN74LS378DR	SOIC	D	16	2500	340.5	336.1	32.0

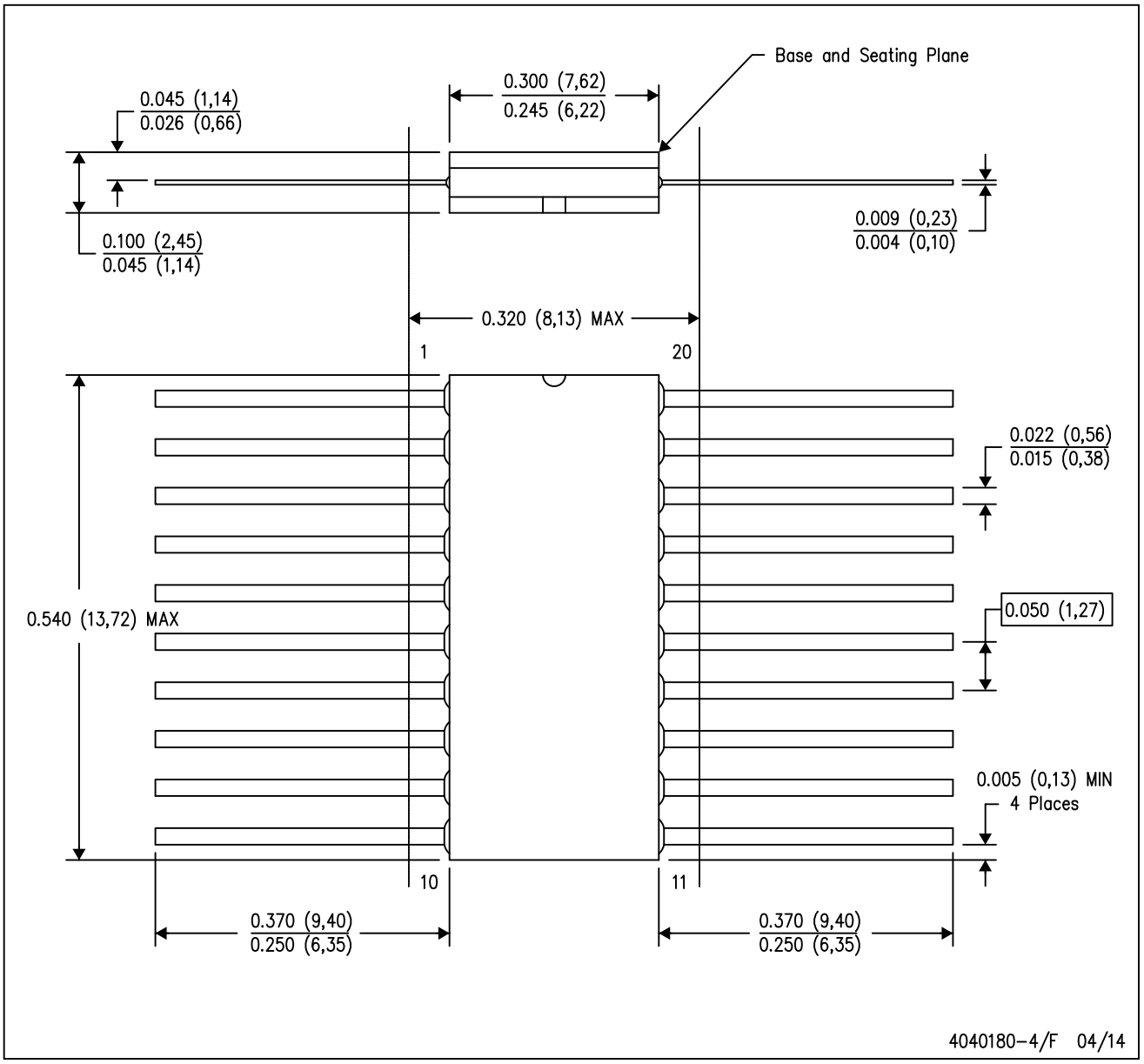
TUBE



*All dimensions are nominal

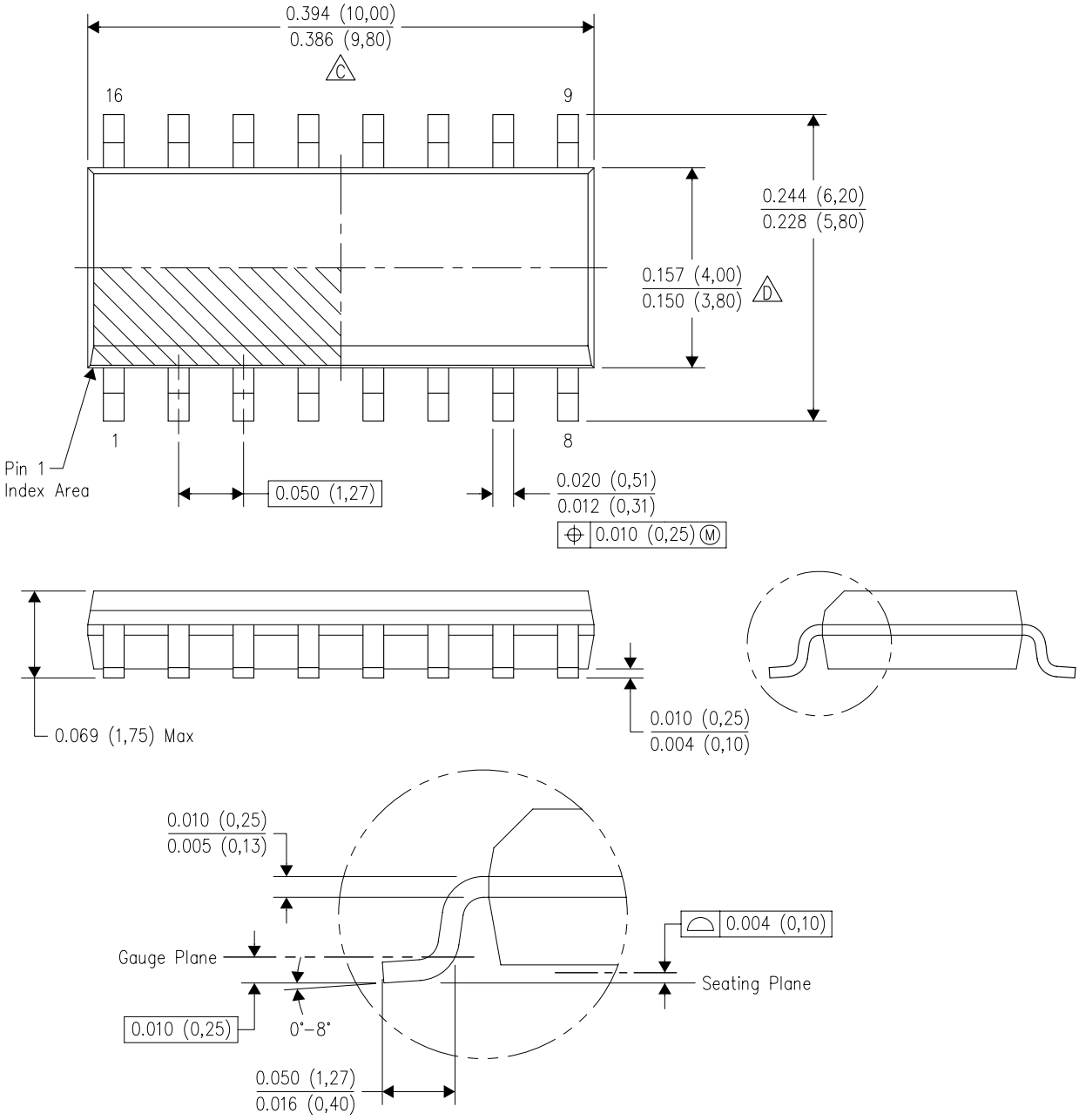
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
JM38510/32504BSA	W	CFP	20	25	506.98	26.16	6220	NA
JM38510/32504BSA.A	W	CFP	20	25	506.98	26.16	6220	NA
M38510/32504BSA	W	CFP	20	25	506.98	26.16	6220	NA
SN74LS377N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS377N.A	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS377NE4	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS378N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS378N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS378N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS378N.A	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS377W	W	CFP	20	25	506.98	26.16	6220	NA
SNJ54LS377W.A	W	CFP	20	25	506.98	26.16	6220	NA
SNJ54LS379FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LS379FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA

W (R–GDFP–F20) 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–F20

D (R–PDSO–G16) PLASTIC SMALL OUTLINE

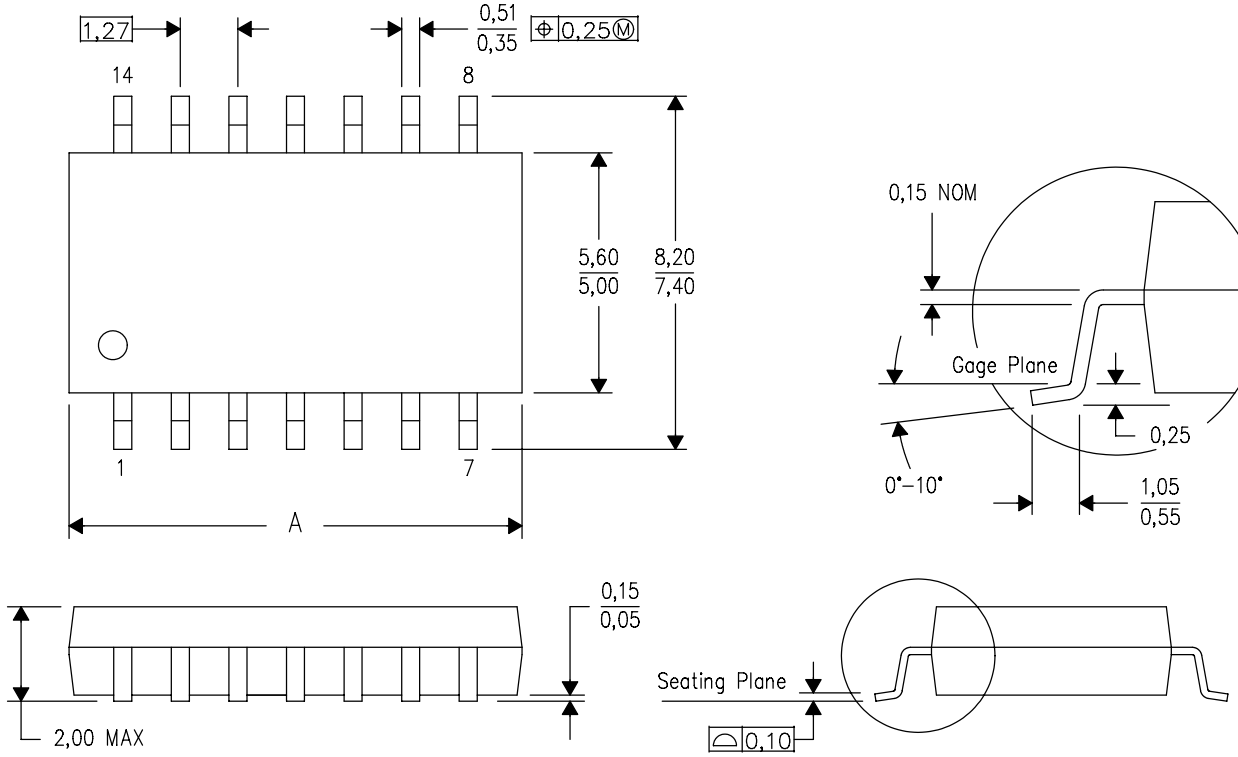


NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead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

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

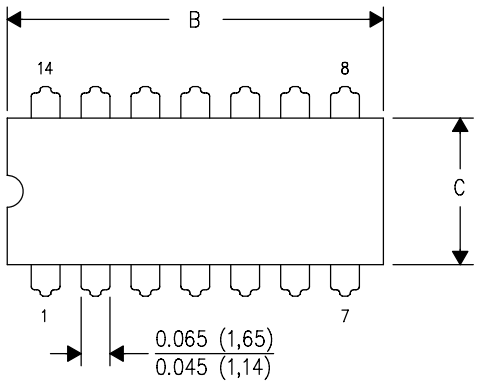
4040062/C 03/03

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.

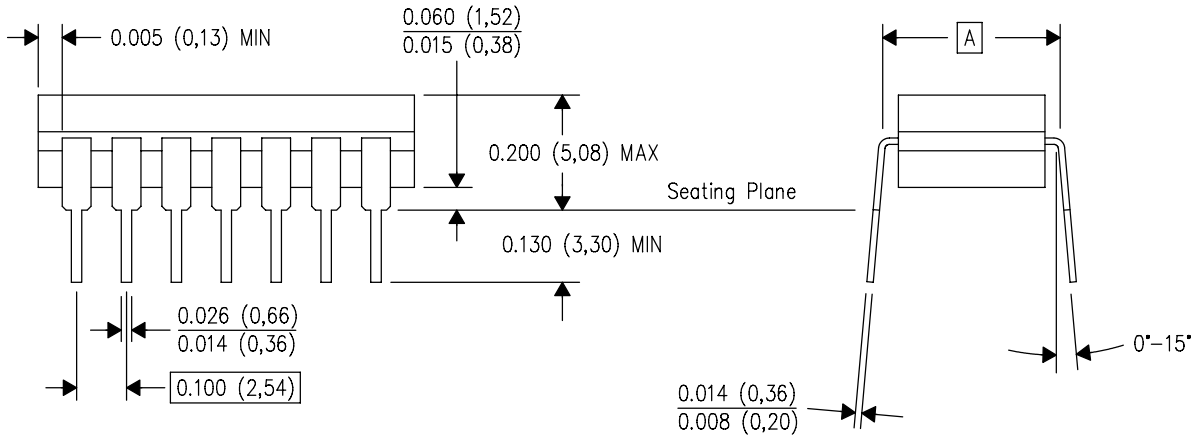
J (R–GDIP–T**)

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.

GENERIC PACKAGE VIEW

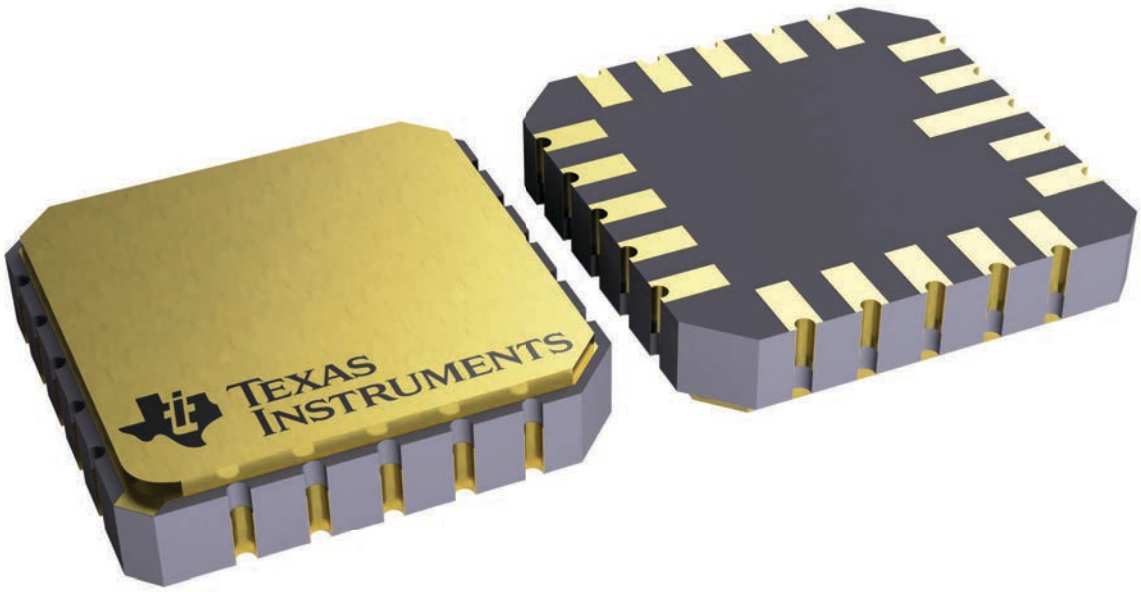
FK 20

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.

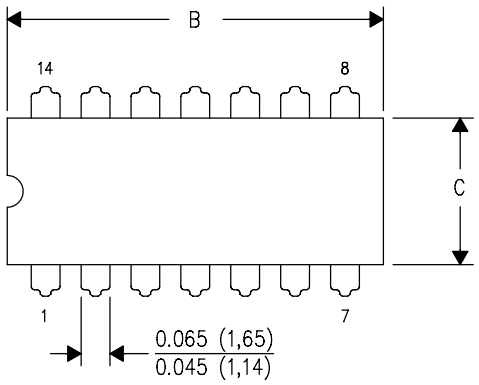


4229370VA\

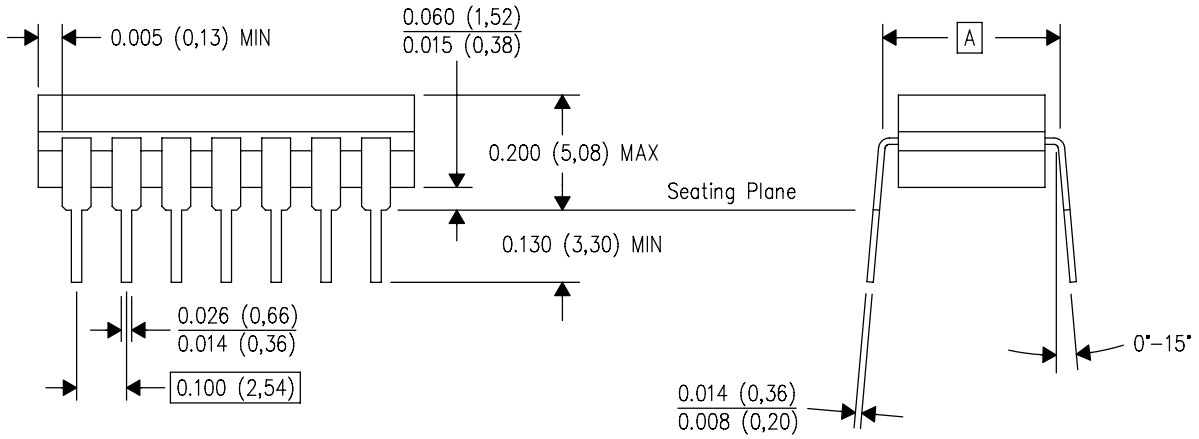
J (R–GDIP–T**)

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)



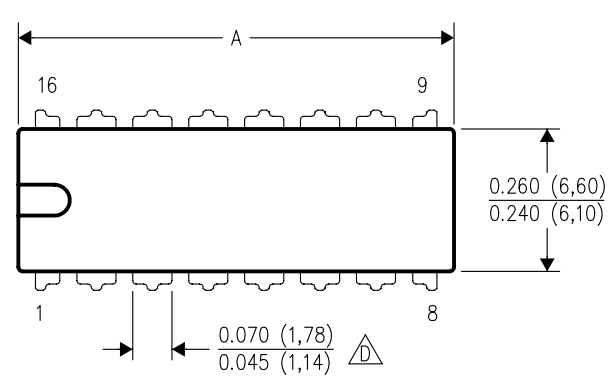
4040083/F 03/03

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.

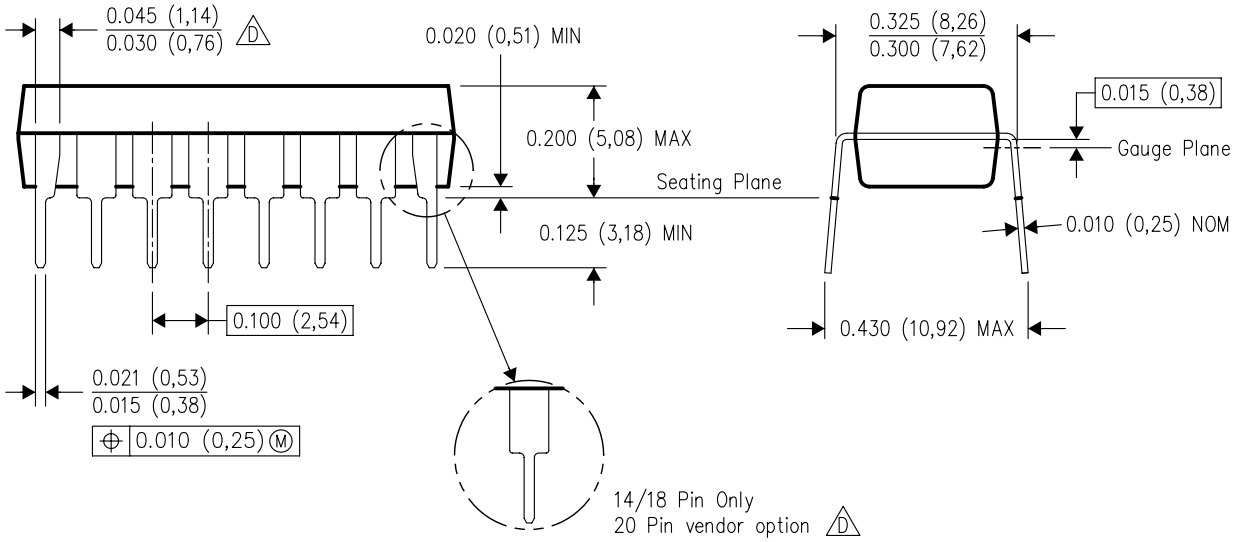
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

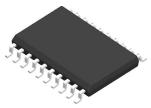


DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



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.

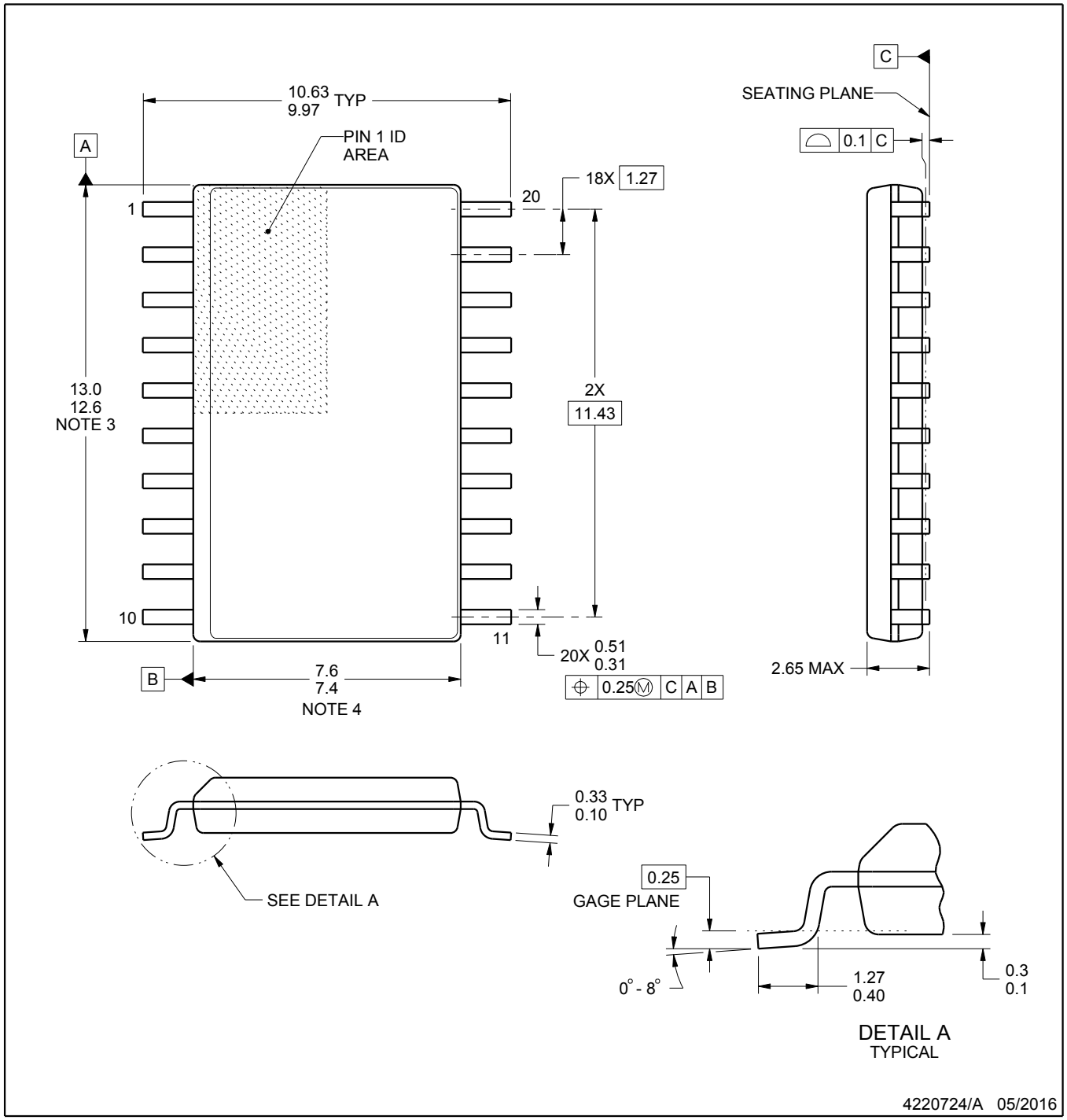


PACKAGE OUTLINE

DW0020A

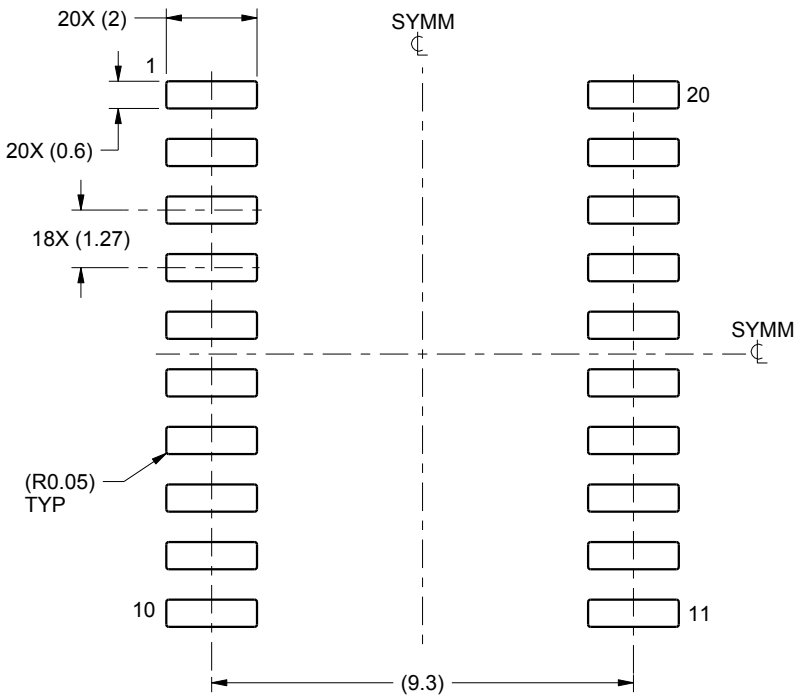
SOIC - 2.65 mm max height

SOIC

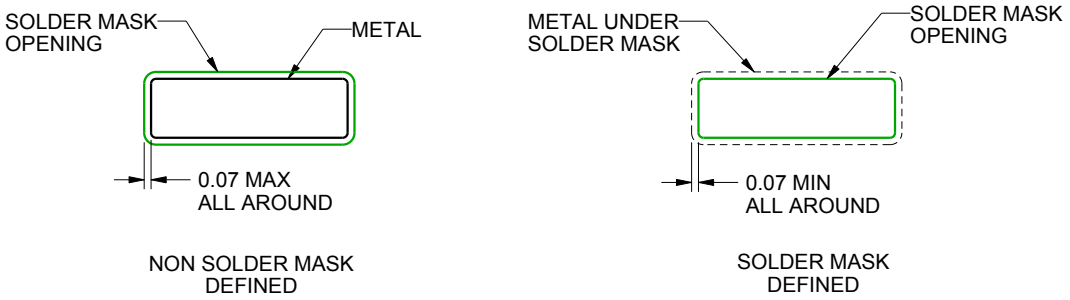


NOTES:

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



LAND PATTERN EXAMPLE
SCALE:6X

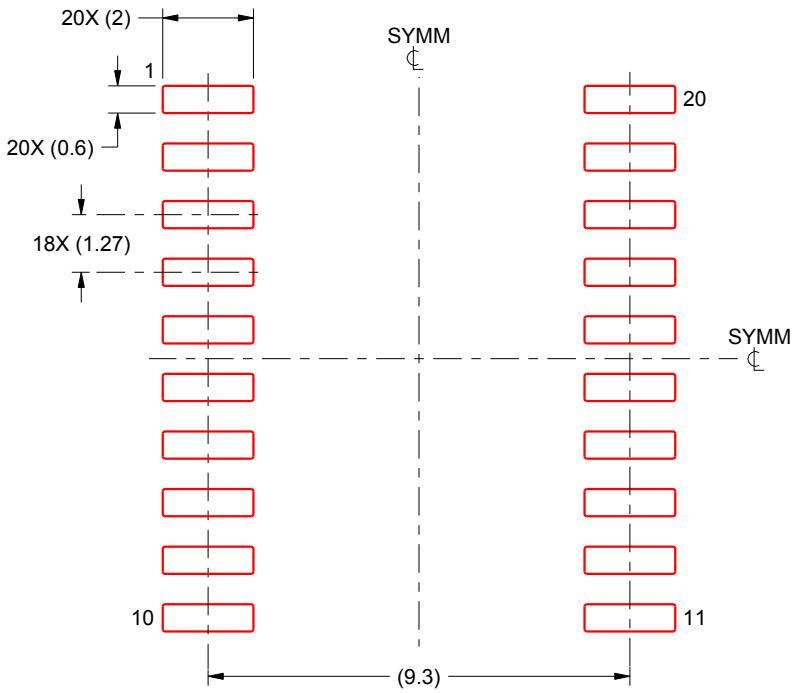


SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



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

4220724/A 05/2016

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.

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