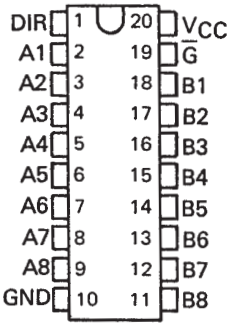
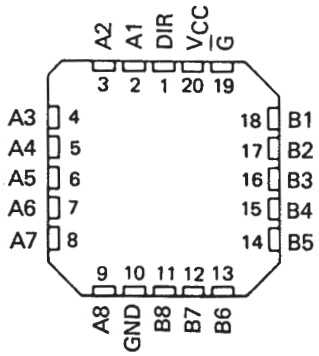
- **SN74LS64X-1 Versions Rated at I_{OL} of 48 mA**
- **Bi-directional Bus Transceivers in High-Density 20-Pin Packages**
- **Hysteresis at Bus Inputs Improves Noise Margins**
- **Choice of True or Inverting Logic**
- **Choice of 3-State or Open-Collector Outputs**

DEVICE	OUTPUT	LOGIC
'LS640	3-State	Inverting
'LS641	Open-Collector	True
'LS642	Open-Collector	Inverting
'LS644	Open-Collector	True and inverting
'LS645	3-State	True

SN54LS' . . . J PACKAGE
SN74LS' . . . DW OR N PACKAGE
(TOP VIEW)



SN54LS' . . . FK PACKAGE
(TOP VIEW)



description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus depending upon the level at the direction control (DIR) input. The enable input ($\overline{G}$) can be used to disable the device so the buses are effectively isolated.

The -1 versions of the SN74LS640 thru SN74LS642, SN74LS644, and SN74LS645 are identical to the standard versions except that the recommended maximum I_{OL} is increased to 48 milliamperes. There are no -1 versions of the SN54LS640 thru SN54LS642, SN54LS644, and SN54LS645.

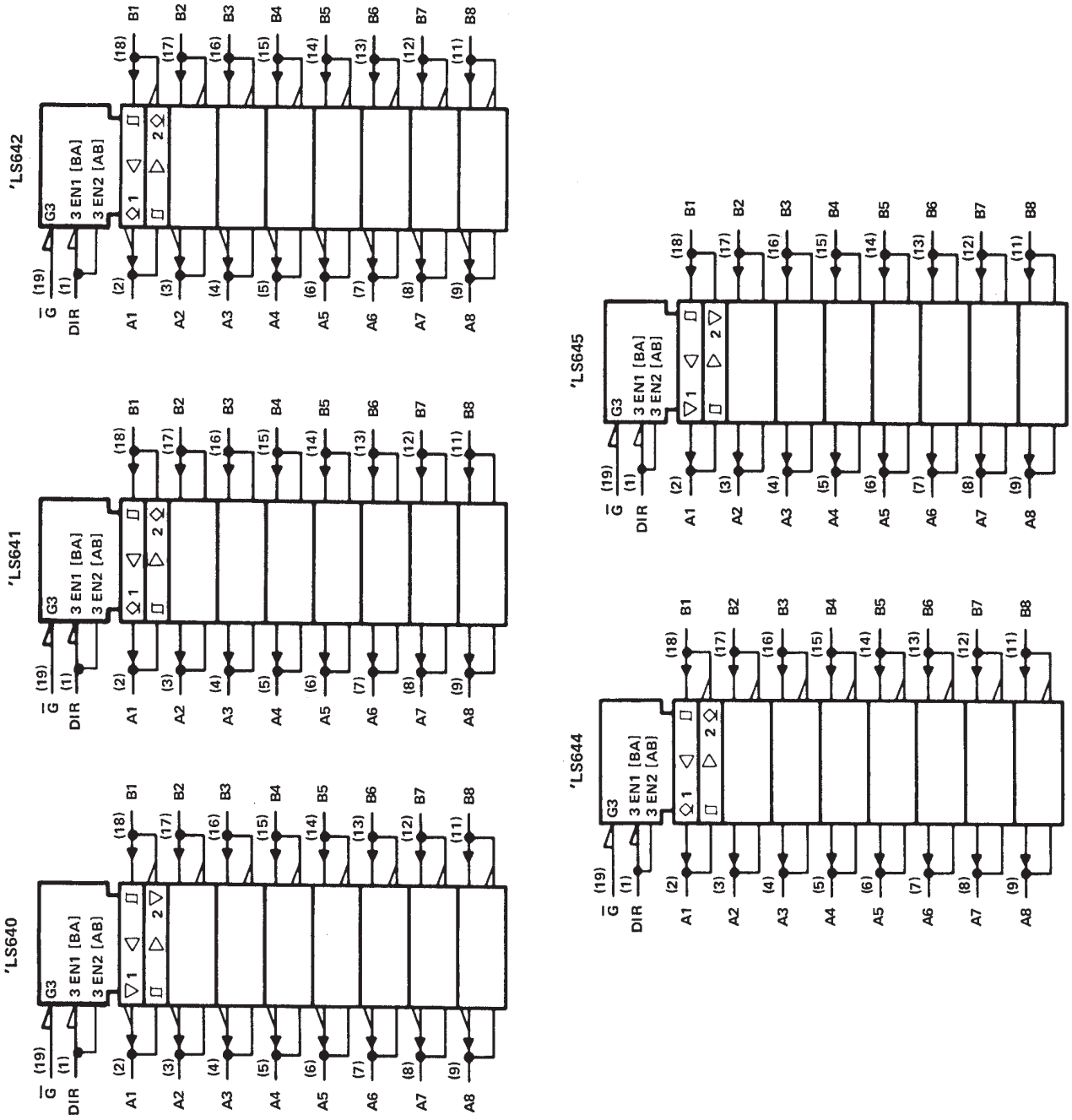
The SN54LS640 thru SN54LS642, SN54LS644, and SN54LS645 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74LS640 thru SN74LS642, SN74LS644, and SN74LS645 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

CONTROL INPUTS		OPERATION		
$\overline{G}$	DIR	'LS640 'LS642	'LS641 'LS645	'LS644
L	L	$\overline{B}$ data to A bus	B data to A bus	B data to A bus
L	H	$\overline{A}$ data to B bus	A data to B bus	$\overline{A}$ data to B bus
H	X	Isolation	Isolation	Isolation

H = high level, L = low level, X = irrelevant

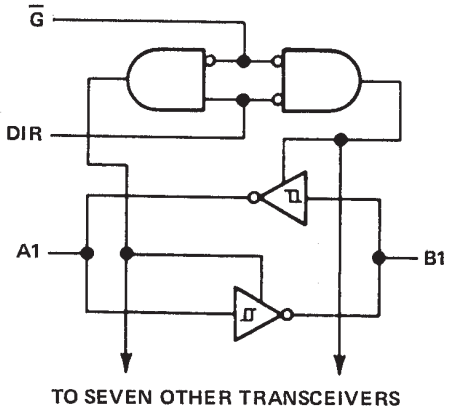
logic symbols†



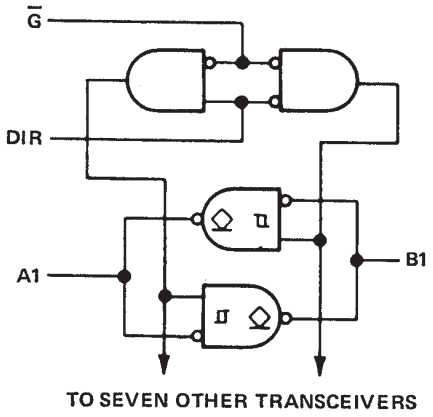
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

logic diagrams (positive logic)

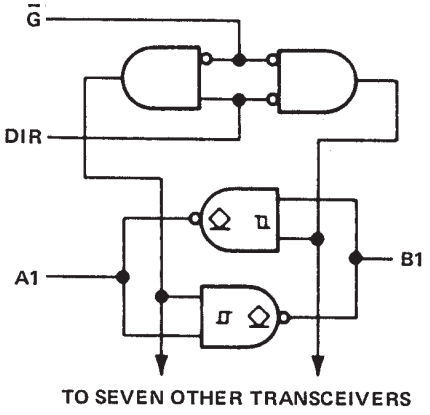
'LS640



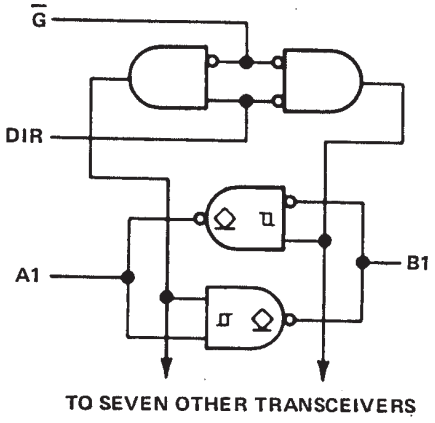
'LS641



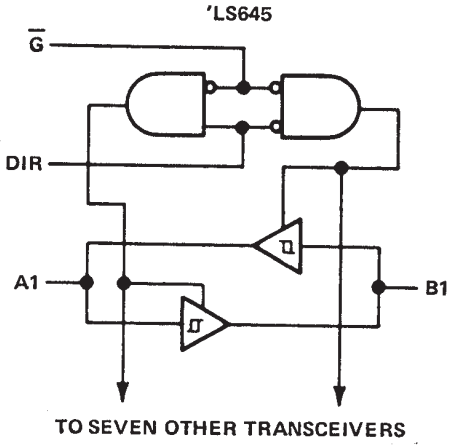
'LS642



'LS644



'LS645



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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage: All inputs . . . . . 7 V
I/O ports . . . . . 5.5 V
Operating free-air temperature range: SN54LS640, SN54LS645 . . . . . −55°C to 125°C
SN74LS640, SN74LS645 . . . . . 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

PARAMETER		SN54LS640 SN54LS645			SN74LS640 SN74LS645			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-lvel input voltage	2			2			V
V_{IL}	Low-level input voltage			0.5			0.6	V
I_{OH}	High-level output current			−12			−15	mA
I_{OL}	Low-level output current			12			24	mA
							48†	
T_A	Operating free-air temperature	−55		125	0		70	°C

†The 48-mA limit applies for the SN74LS640-1 and SN74LS645-1 only.

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

PARAMETER		TEST CONDITIONS‡			SN54LS640 SN54LS645			SN74LS640 SN74LS645			UNIT
					MIN	TYP§	MAX	MIN	TYP§	MAX	
V_{IK}		V_{CC} = MIN, I_I = −18 mA					−1.5			−1.5	V
Hysteresis ($V_{T+} - V_{T-}$)		V_{CC} = MIN,		A or B input	0.1	0.4		0.2	0.4		V
V_{OH}		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = MAX		I_{OH} = −3 mA	2.4	3.4		2.4	3.4		
				I_{OH} = MAX	2			2			
V_{OL}		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = MAX		I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
				I_{OL} = 24 mA					0.35	0.5	
				I_{OL} = 48 mA#					0.4	0.5	
I_{OZH}		V_{CC} = MAX, $\overline{G}$ at 2 V,		V_O = 2.7 V			20			20	μA
I_{OZL}		V_{CC} = MAX, $\overline{G}$ at 2 V,		V_O = 0.4 V			−0.4			−0.4	mA
I_I	A or B	V_{CC} = MAX		V_I = 5.5 V			0.1			0.1	mA
	DIR or $\overline{G}$			V_I = 7 V			0.1			0.1	
I_{IH}		V_{CC} = MAX, V_{IH} = 2.7 V					20			20	μA
I_{IL}		V_{CC} = MAX, V_{IL} = 0.4 V					−0.4			−0.4	mA
I_{OS}¶		V_{CC} = MAX			−40		−225	−40		−225	mA
I_{CC}	Outputs high	V_{CC} = MAX, Outputs open				48	70		48	70	mA
	Outputs low					62	90		62	90	
	Outputs at Hi-Z					64	95		64	95	

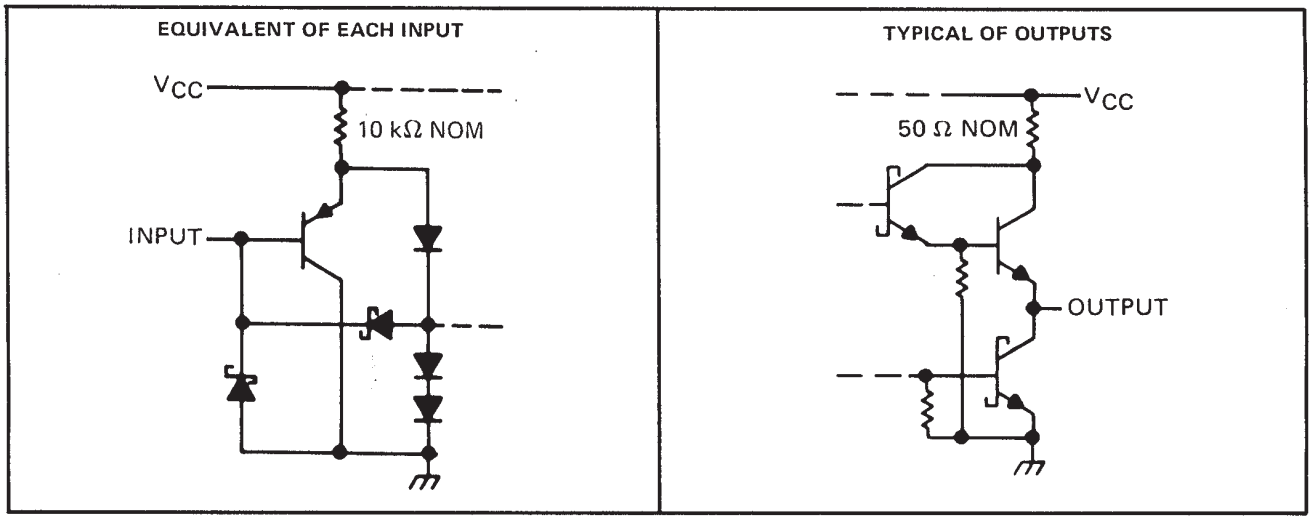
†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
§All typical values are at V_{CC} = 5 V, T_A = 25°C.
¶Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.
#The 48-mA condition applies for the SN74LS640-1 and SN74LS645-1 only.

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

PARAMETER		FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS640, 'LS640-1			'LS645, 'LS645-1			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	A	B	C_L = 45 pF, R_L = 667 Ω, See Note 2		6	10		8	15	ns
		B	A			6	10		8	15	
t_{PHL}	Propagation delay time, high-to-low-level output	A	B			8	15		11	15	ns
		B	A			8	15		11	15	
t_{PZL}	Output enable time to low level	$\overline{G}$	A			31	40		31	40	ns
		$\overline{G}$	B			31	40		31	40	
t_{PZH}	Output enable time to high level	$\overline{G}$	A			23	40		26	40	ns
		$\overline{G}$	B			23	40		26	40	
t_{PLZ}	Output disable time from low level	$\overline{G}$	A	C_L = 5 pF, R_L = 667 Ω, See Note 2		15	25		15	25	ns
		$\overline{G}$	B			15	25		15	25	
t_{PHZ}	Output disable time from high level	$\overline{G}$	A			15	25		15	25	ns
		$\overline{G}$	B			15	25		15	25	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



TYPICAL CHARACTERISTICS

SN54LS'
INVERTING OUTPUT VOLTAGE
vs
INPUT VOLTAGE

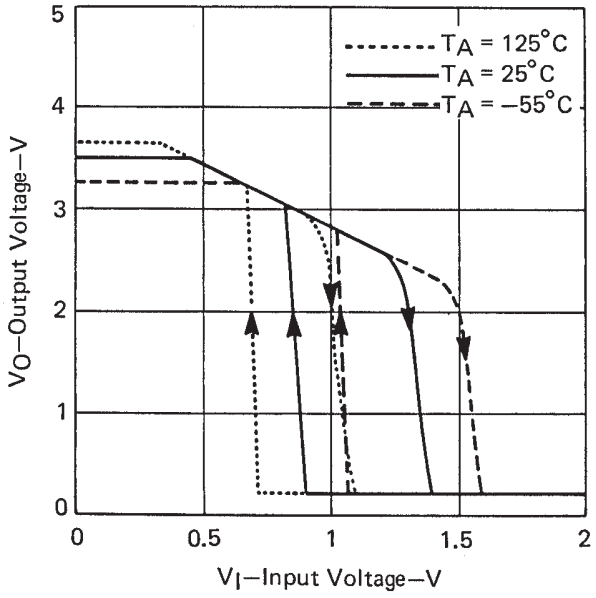


FIGURE 1

SN74LS'
INVERTING OUTPUT VOLTAGE
vs
INPUT VOLTAGE

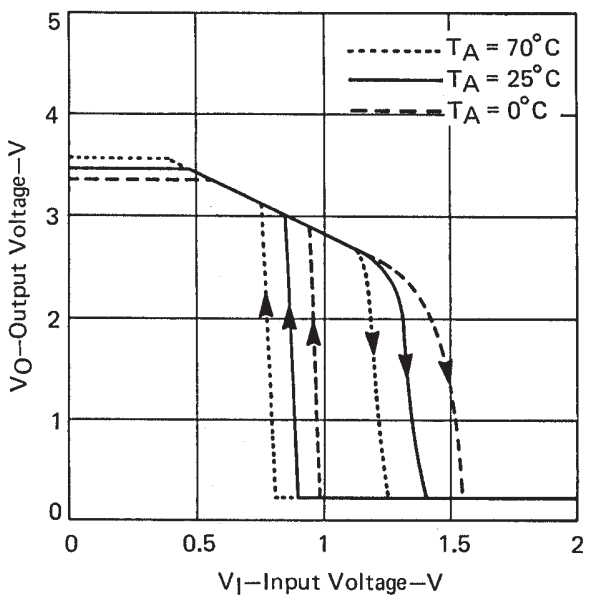


FIGURE 2

SN54LS'
NONINVERTING OUTPUT VOLTAGE
vs
INPUT VOLTAGE

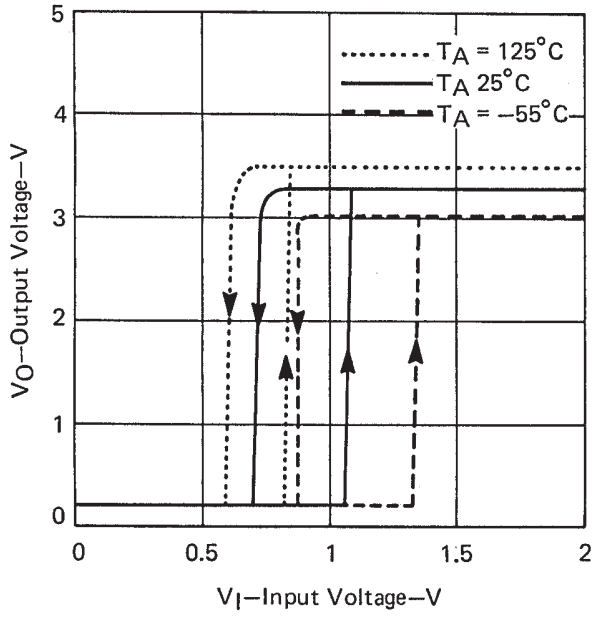


FIGURE 3

SN74LS'
NONINVERTING OUTPUT VOLTAGE
vs
INPUT VOLTAGE

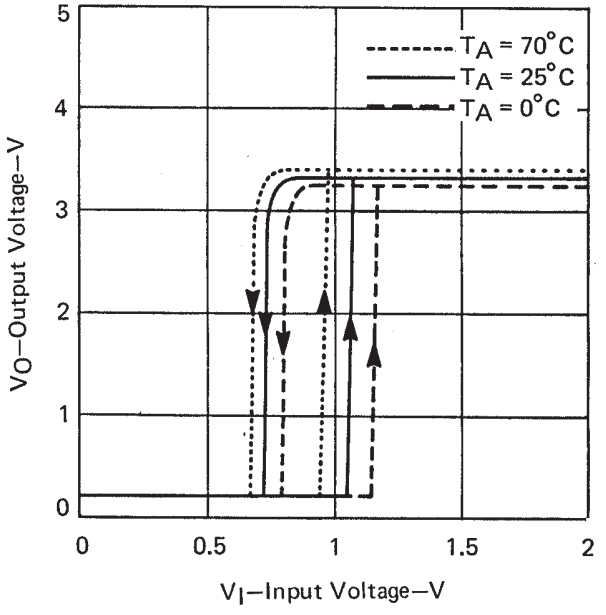


FIGURE 4

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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage: All inputs and I/O ports . . . . . 7 V
Operating free-air temperature range: SN54LS641, SN54LS642, SN54LS644 . . . . . – 55°C to 125°C
SN74LS641, SN74LS642, SN74LS644 . . . . . 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

PARAMETER		SN54LS641 SN54LS642 SN54LS644			SN74LS641 SN74LS642 SN74LS644			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.5			0.6	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			12			24	mA
							48§	
T_A	Operating free-air temperature	– 55		125	0		70	°C

§The 48 mA limit applies for the SN74LS641-1, SN74LS642-1, and SN74LS644-1 only.

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

PARAMETER		TEST CONDITIONS†		SN54LS641 SN54LS642 SN54LS644			SN74LS641 SN74LS642 SN74LS644			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}		V_{CC} = MIN,	I_I = – 18 mA			– 1.5			– 1.5	V
Hysteresis ($V_{T+} - V_{T-}$)		V_{CC} = MIN,	A or B input	0.1	0.4		0.2	0.4		V
I_{OH}		V_{CC} = MIN, V_{IL} = MAX,	V_{IH} = 2 V, V_{OH} = 5.5 V			0.1			0.1	mA
V_{OL}		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = MAX	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
			I_{OL} = 48 mA§					0.4	0.5	
I_I	A or B	V_{CC} = MAX	V_I = 5.5 V			0.1			0.1	mA
	DIR or $\overline{G}$		V_I = 7 V			0.1			0.1	
I_{IH}		V_{CC} = MAX,	V_I = 2.7 V			20			20	μA
I_{IL}		V_{CC} = MAX,	V_I = 0.4 V			– 0.4			– 0.4	mA
I_{CC}	Outputs high	V_{CC} = MAX,	Outputs open		48	70		48	70	mA
	Outputs low				62	90		62	90	
	Outputs at Hi-Z				64	95		64	95	

† 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.
§The 48 mA condition applies for the SN74LS641-1, SN74LS642-1, and SN74LS644-1 only.

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

PARAMETER		FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS641, 'LS641–1			'LS642, 'LS642–1			'LS644, 'LS644–1			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	A	B	C_L = 45 pF, R_L = 667 Ω, See Note 2		17	25		19	25		17	25	ns
		B	A			17	25		19	25		19	25	
t_{PHL}	Propagation delay time, high-to-low-level output	A	B			16	25		14	25		14	25	ns
		B	A			16	25		14	25		16	25	
t_{PLH}	Output disable time from low level	$\overline{G}$, DIR	A			23	40		26	40		26	40	ns
		$\overline{G}$, DIR	B			25	40		28	40		25	40	
t_{PHL}	Output enable time from high level	$\overline{G}$, DIR	A			34	50		43	60		43	60	ns
		$\overline{G}$, DIR	B			37	50		39	60		37	50	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT

TYPICAL OF OUTPUTS

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)
84161012A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	84161012A SNJ54LS 640FK
8416101RA	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8416101RA SNJ54LS640J
SN54LS640J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS640J
SN54LS645J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS645J
SN74LS640-1DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS640-1
SN74LS640-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS640-1N
SN74LS640-1NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS640-1
SN74LS640DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS640
SN74LS640DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS640
SN74LS640N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS640N
SN74LS640NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS640
SN74LS641-1DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS641-1
SN74LS641-1DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS641-1
SN74LS641-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS641-1N
SN74LS641DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS641
SN74LS641N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS641N
SN74LS641NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS641
SN74LS642-1DW	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS642-1
SN74LS642-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS642-1N
SN74LS642DW	Active	Production	SOIC (DW) | 20	25 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS642
SN74LS642N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS642N
SN74LS642NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS642
SN74LS645-1DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS645-1
SN74LS645-1DWR	Active	Production	SOIC (DW) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS645-1
SN74LS645-1N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS645-1N
SN74LS645-1NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS645-1
SN74LS645DW	Obsolete	Production	SOIC (DW) | 20	-	-	Call TI	Call TI	0 to 70	LS645

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)
SN74LS645N	Active	Production	PDIP (N) | 20	20 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS645N
SN74LS645NSR	Active	Production	SOP (NS) | 20	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS645
SNJ54LS640FK	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	84161012A SNJ54LS 640FK
SNJ54LS640J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8416101RA SNJ54LS640J
SNJ54LS645J	Active	Production	CDIP (J) | 20	20 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54LS645J

(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 SN54LS640, SN54LS645, SN74LS640, SN74LS645 :

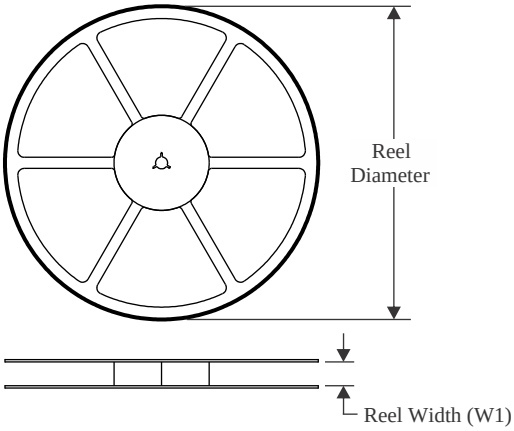
- Catalog : SN74LS640, SN74LS645
- Military : SN54LS640, SN54LS645

NOTE: Qualified Version Definitions:

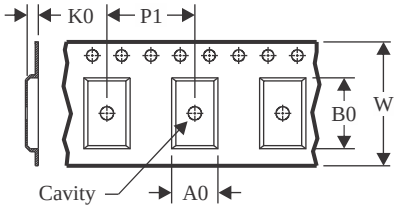
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

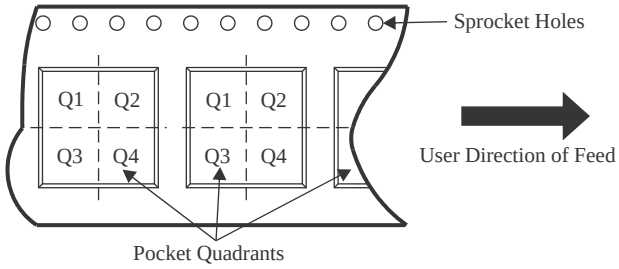


TAPE DIMENSIONS



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

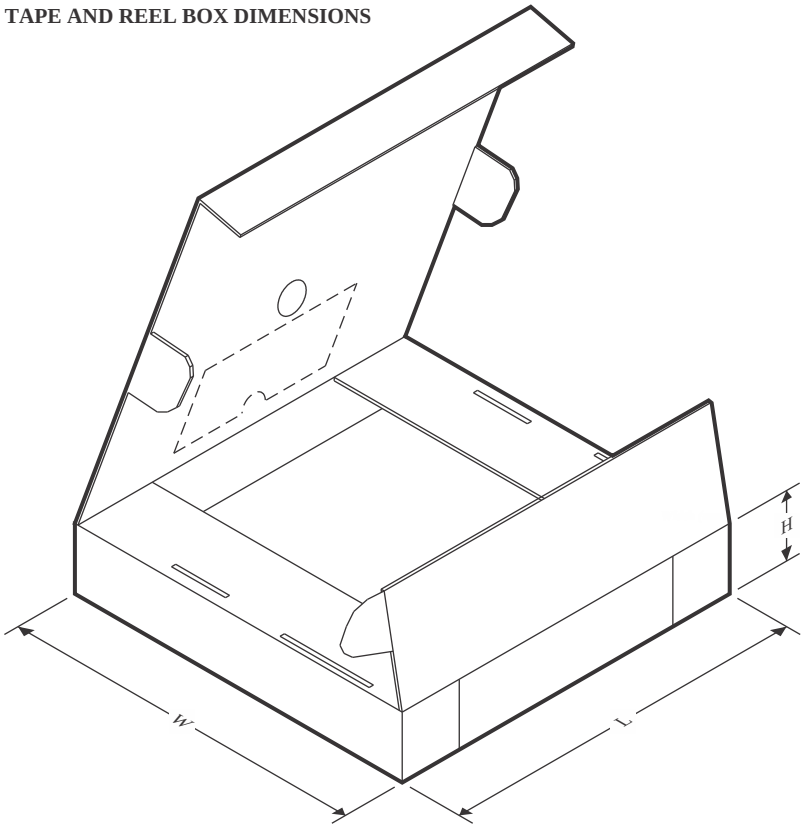
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74LS640-1NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS640DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LS640NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS641-1DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LS641NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS642NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS645-1DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74LS645-1NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74LS645NSR	SOP	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1

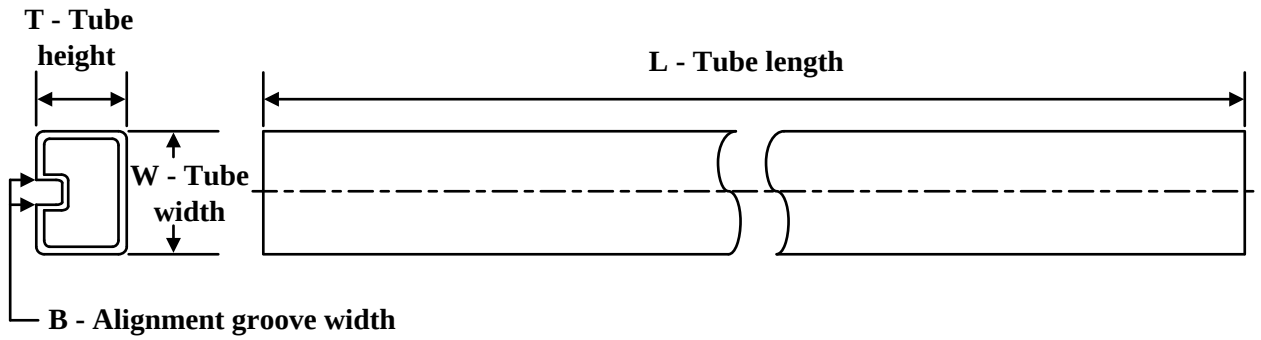
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS640-1NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74LS640DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74LS640NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74LS641-1DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74LS641NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74LS642NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74LS645-1DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74LS645-1NSR	SOP	NS	20	2000	367.0	367.0	45.0
SN74LS645NSR	SOP	NS	20	2000	367.0	367.0	45.0

TUBE



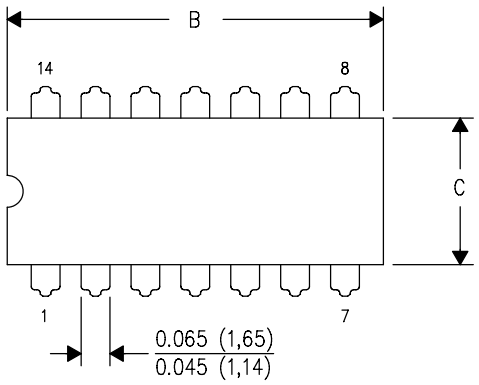
*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
84161012A	FK	LCCC	20	55	506.98	12.06	2030	NA
SN74LS640-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS640N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS641-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS641N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS642-1DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74LS642-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS642DW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74LS642N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS645-1N	N	PDIP	20	20	506	13.97	11230	4.32
SN74LS645N	N	PDIP	20	20	506	13.97	11230	4.32
SNJ54LS640FK	FK	LCCC	20	55	506.98	12.06	2030	NA

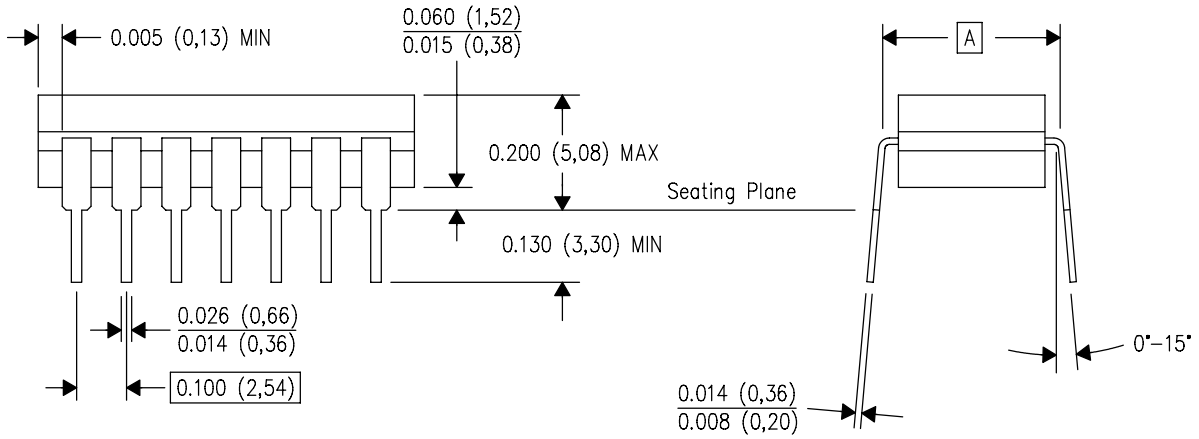
J (R–GDIP–T**)

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

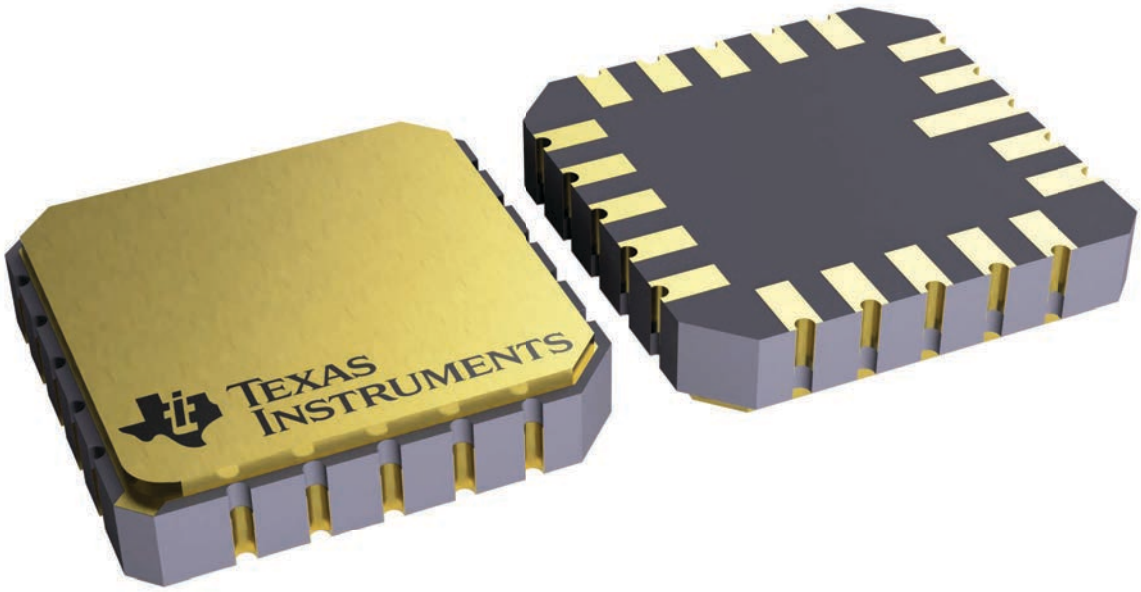
FK 20

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.

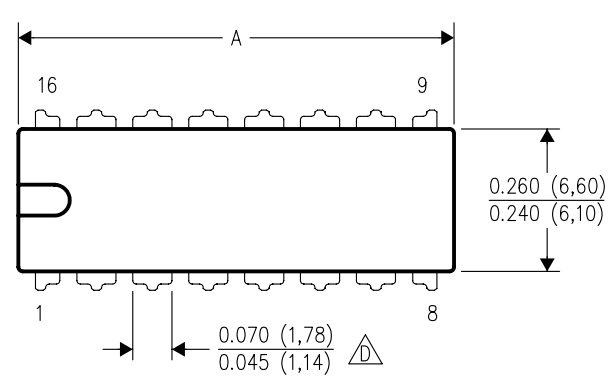


4229370VA\

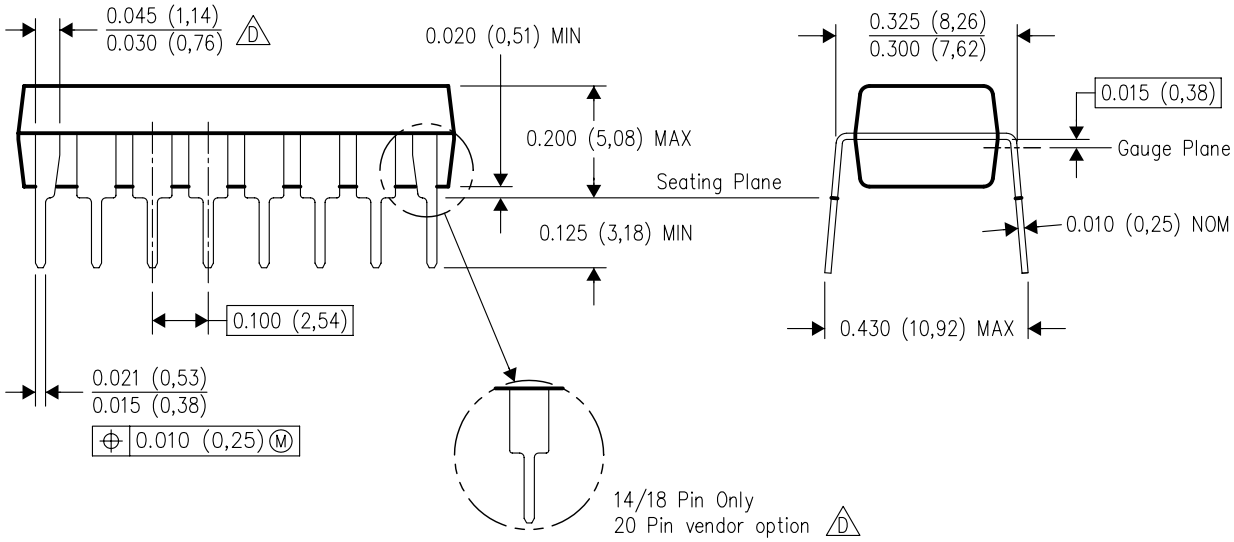
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

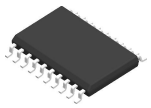


DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



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.

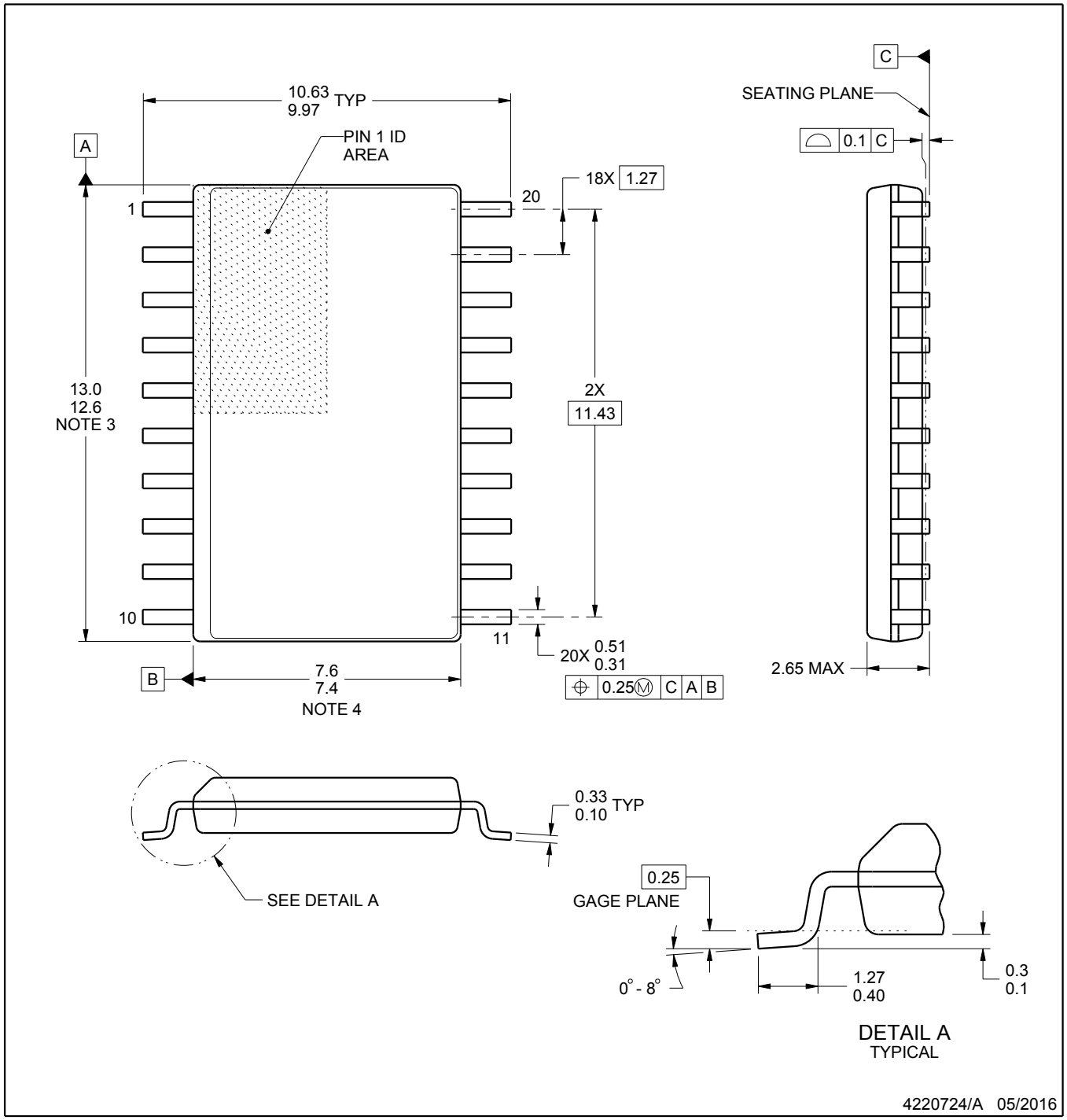


PACKAGE OUTLINE

DW0020A

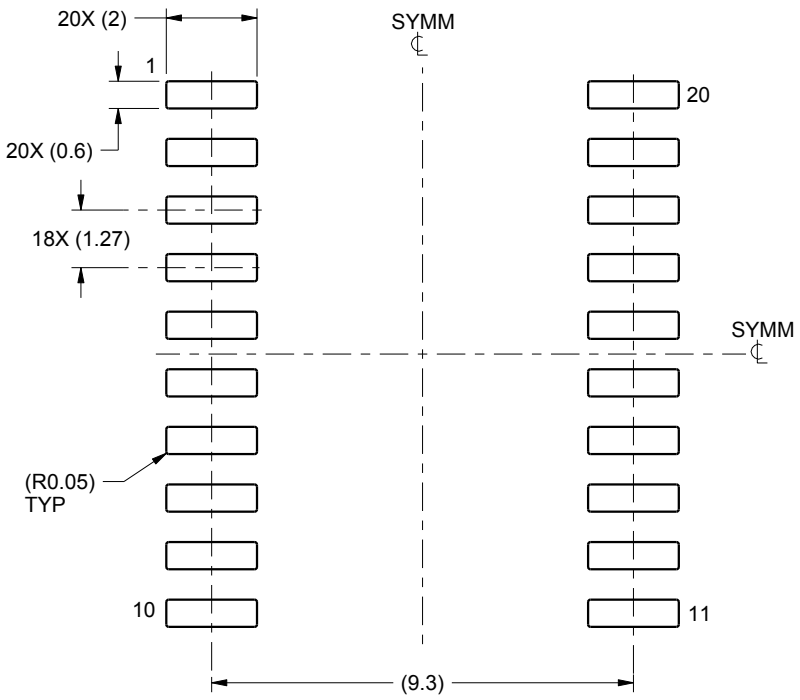
SOIC - 2.65 mm max height

SOIC

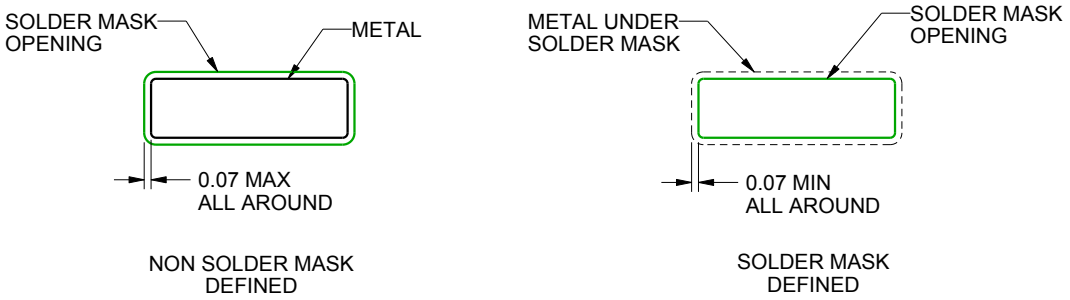


NOTES:

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

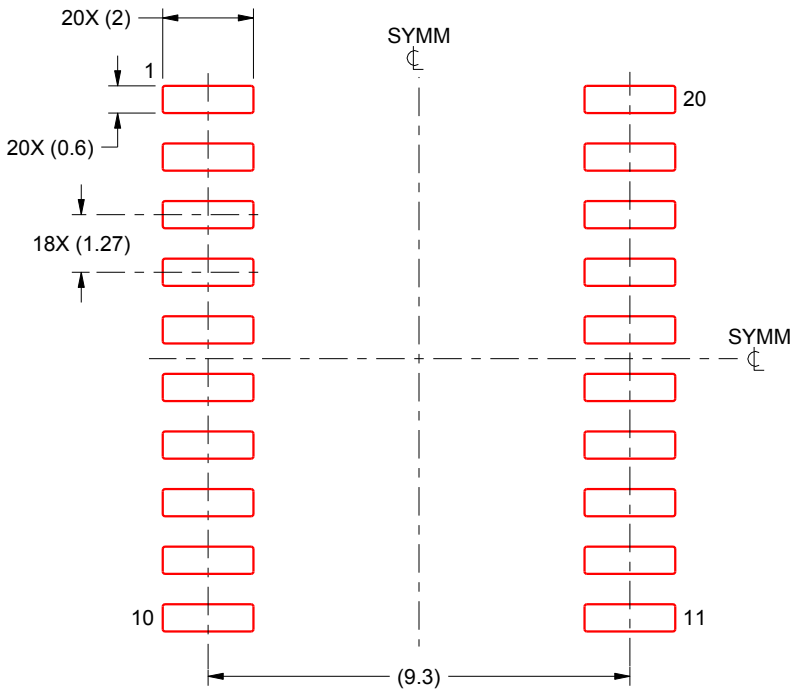


SOLDER MASK DETAILS

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

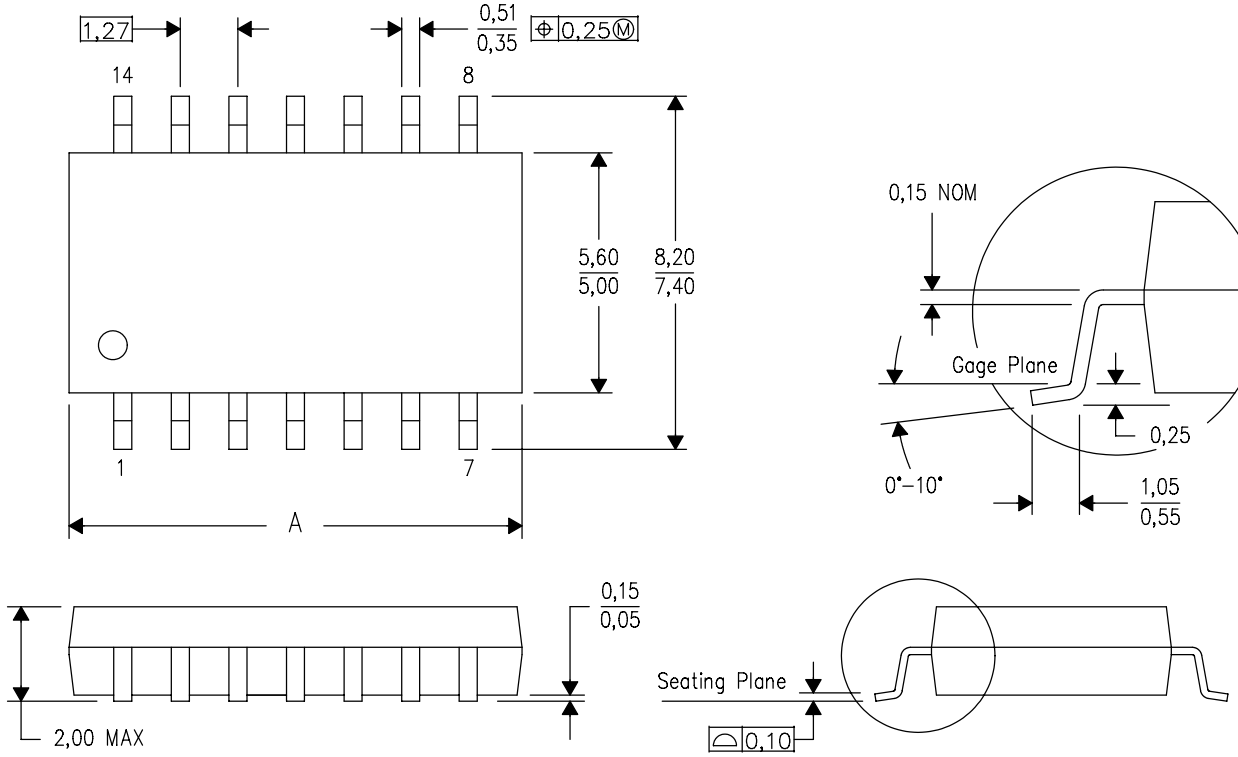
NOTES: (continued)

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.

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.

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