

SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645 OCTAL BUS TRANSCEIVERS

SDLS189 – APRIL 1979 – REVISED MARCH 1988

- **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

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 ($\bar{G}$) can be used to disable the device so the buses are effectively isolated.

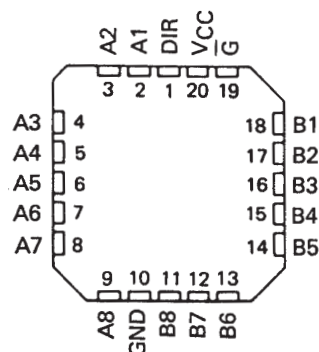
The -1 versions of the SN74LS640 thru SN74LS642, SN74LS644, and SN74LS645 are identical to the standard versions except that the recommended maximum I_{OL} is increased to 48 milliamperes. There are no -1 versions of the SN54LS640 thru SN54LS642, SN54LS644, and SN54LS645.

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 .

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



SN54LS' . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE

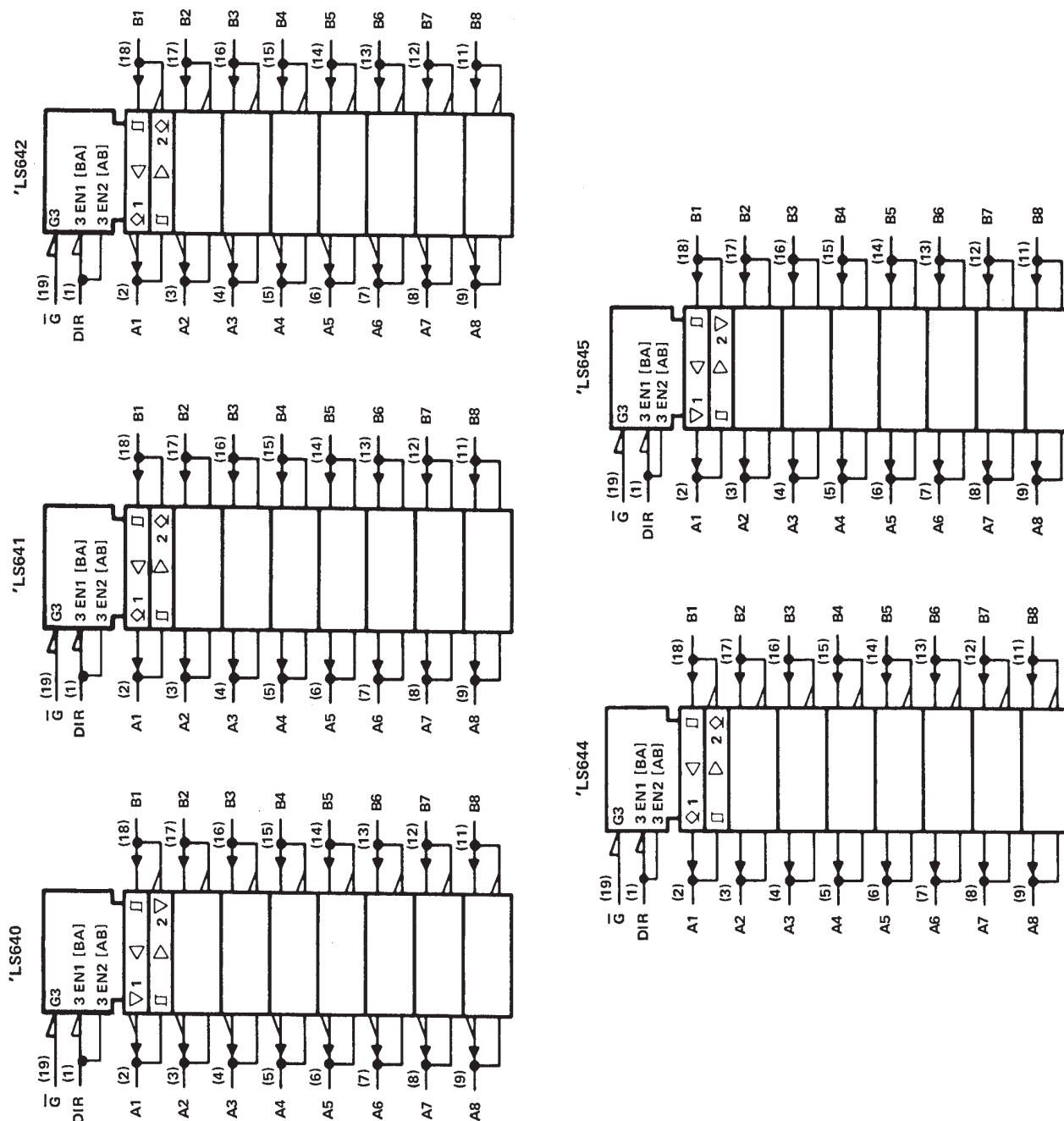
CONTROL INPUTS		OPERATION		
$\bar{G}$	DIR	'LS640 'LS642	'LS641 'LS645	'LS644
L	L	B data to A bus	B data to A bus	B data to A bus
L	H	A data to B bus	A data to B bus	$\bar{A}$ data to B bus
H	X	Isolation	Isolation	Isolation

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

SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645 OCTAL BUS TRANSCEIVERS

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logic symbols†

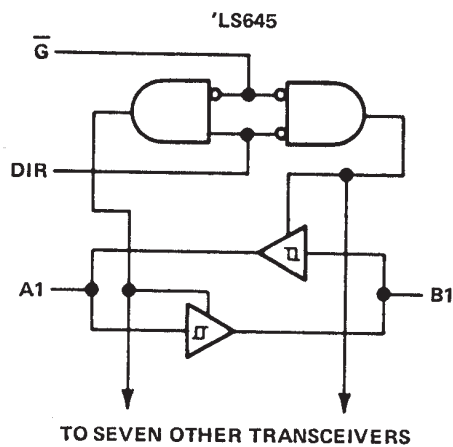
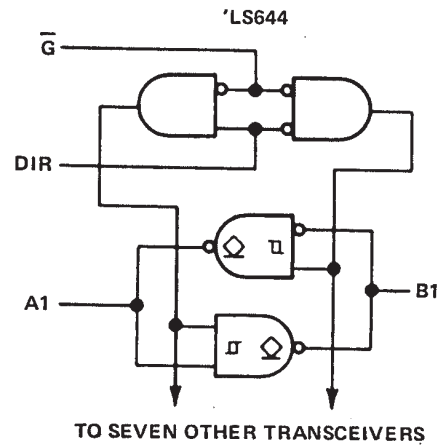
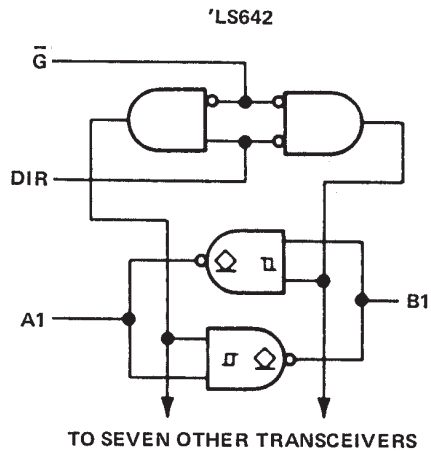
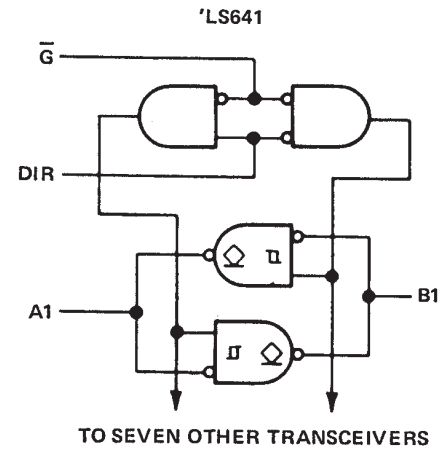
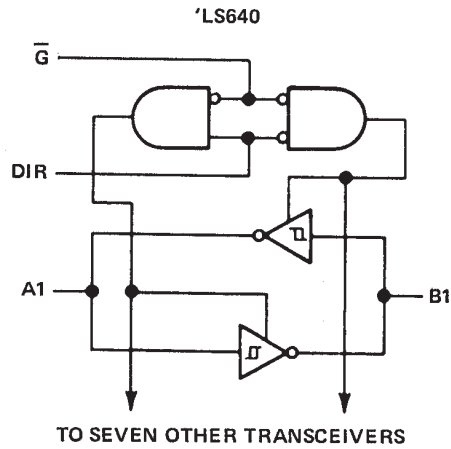


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645
 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645
 OCTAL BUS TRANSCEIVERS

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logic diagrams (positive logic)



SN54LS640, SN54LS645
SN74LS640, SN74LS645
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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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-level 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	
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, $\bar{G}$ at 2 V, V _O = 2.7 V		20		20		µA
I _{OZL}		V _{CC} = MAX, $\bar{G}$ 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 $\bar{G}$		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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

†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.

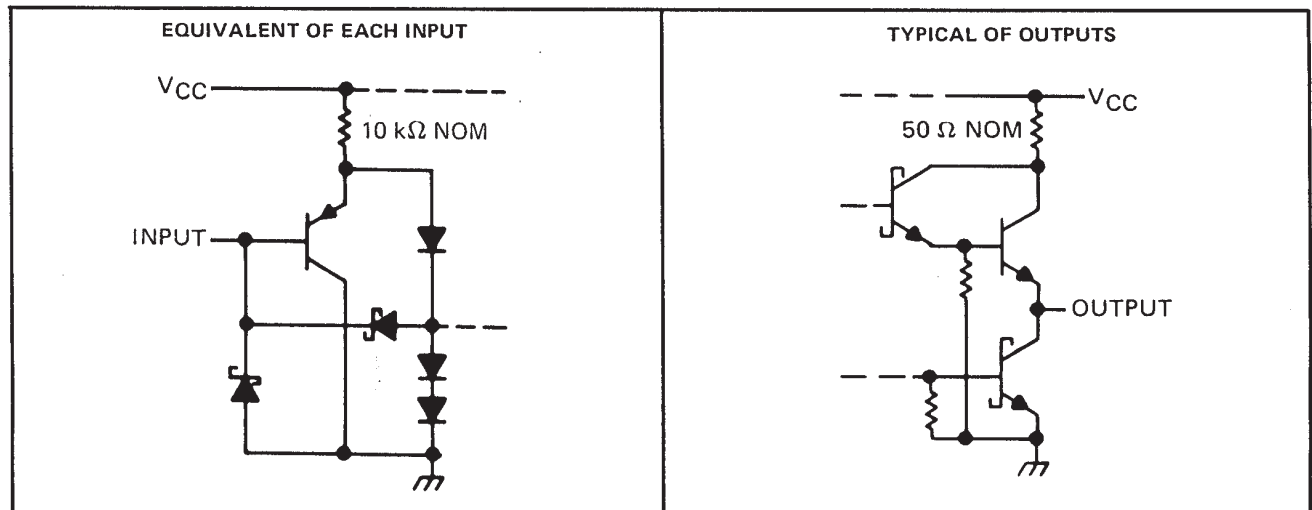


switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

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	$C_L = 45\text{ pF}$, $R_L = 667\ \Omega$, 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	$C_L = 5\text{ pF}$, $R_L = 667\ \Omega$, 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



SN54LS640, SN54LS645
SN74LS640, SN74LS645
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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TYPICAL CHARACTERISTICS

SN54LS'
INVERTING OUTPUT VOLTAGE
 vs
INPUT VOLTAGE

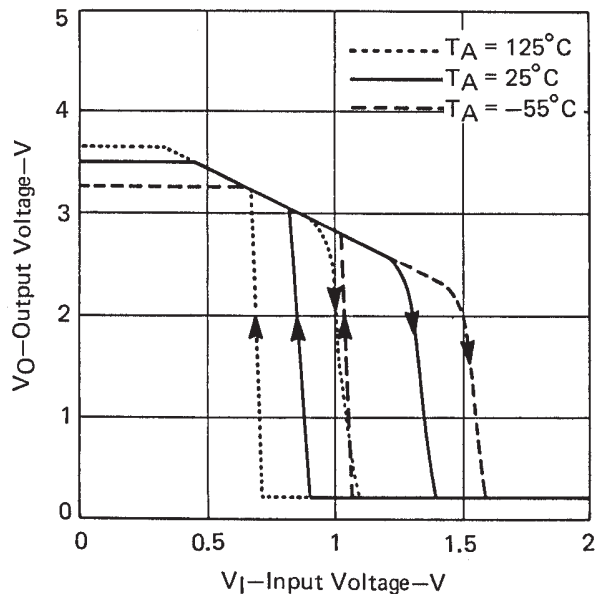


FIGURE 1

SN74LS'
INVERTING OUTPUT VOLTAGE
 vs
INPUT VOLTAGE

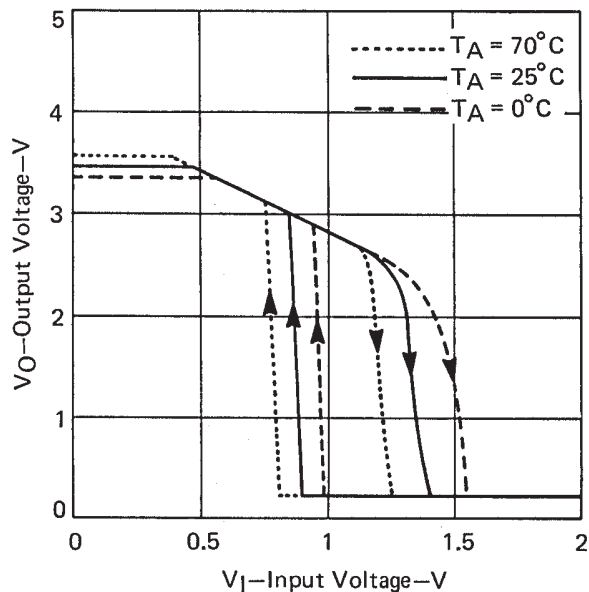


FIGURE 2

SN54LS'
NONINVERTING OUTPUT VOLTAGE
 vs
INPUT VOLTAGE



FIGURE 3

SN74LS'
NONINVERTING OUTPUT VOLTAGE
 vs
INPUT VOLTAGE



FIGURE 4

SN54LS641, SN54LS642, SN54LS644
SN74LS641, SN74LS642, SN74LS644
OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS
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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}		$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			– 1.5			– 1.5	V
Hysteresis ($V_{T+} - V_{T-}$)		$V_{CC} = \text{MIN}, A \text{ or } B \text{ input}$	0.1	0.4		0.2	0.4		V
I_{OH}		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = \text{MAX}, V_{OH} = 5.5 \text{ V}$		0.1			0.1		mA
V_{OL}		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = \text{MAX}, I_{OL} = 12 \text{ mA}$	0.25	0.4		0.25	0.4		V
		$I_{OL} = 24 \text{ mA}$				0.35	0.5		
		$I_{OL} = 48 \text{ mA}^{\S}$				0.4	0.5		
I_I	A or B	$V_{CC} = \text{MAX}$	$V_I = 5.5 \text{ V}$		0.1	$V_I = 5.5 \text{ V}$		0.1	mA
	DIR or $\bar{G}$		$V_I = 7 \text{ V}$		0.1	$V_I = 7 \text{ V}$		0.1	
I_{IH}		$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$		20			20		μA
I_{IL}		$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		– 0.4			– 0.4		mA
I_{CC}	Outputs high	$V_{CC} = \text{MAX}, \text{Outputs open}$	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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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

SN54LS641, SN54LS642, SN54LS644
 SN74LS641, SN74LS642, SN74LS644
 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

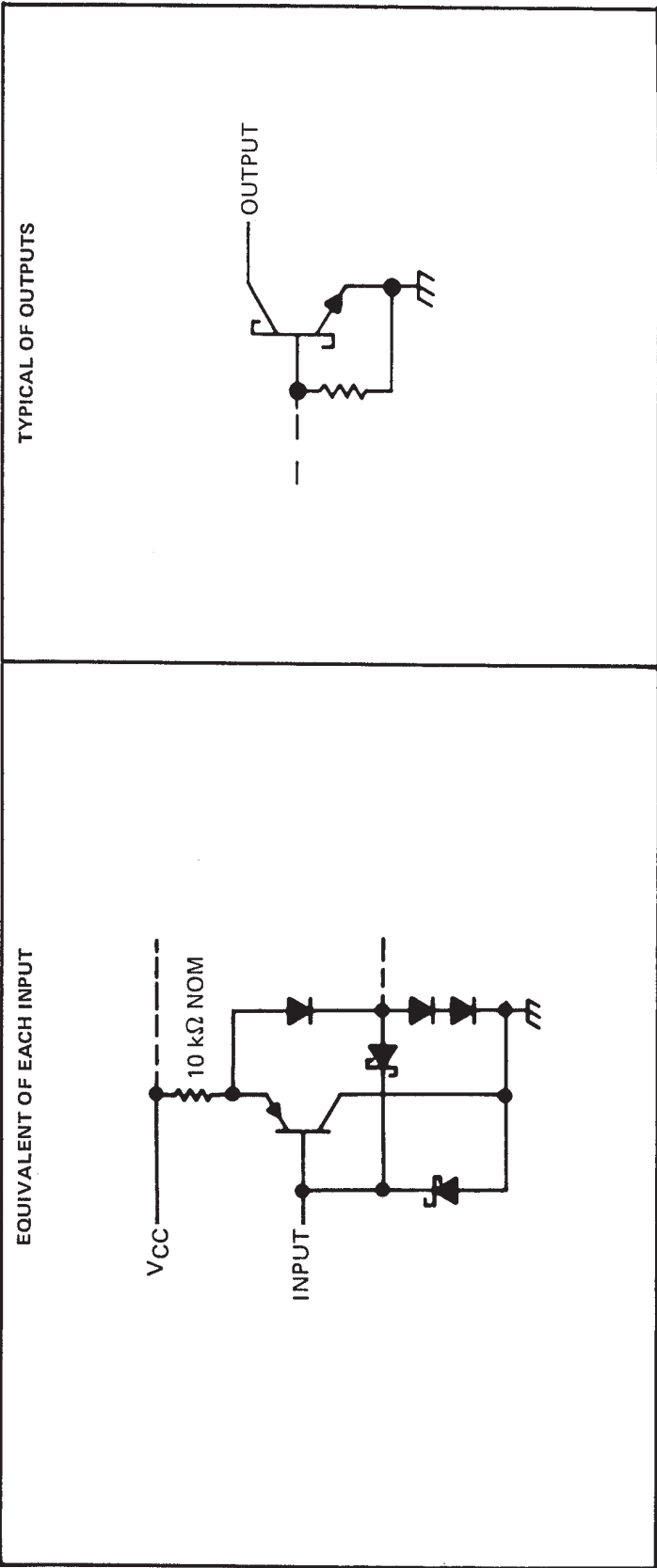
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switching characteristics at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS641, 'LS641-1		'LS642, 'LS642-1		'LS644, 'LS644-1		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	17	25	25	19	25	25	ns
	B	A		17	25	25	19	25	25	
t _{PHL} Propagation delay time, high-to-low-level output	A	B		16	25	25	14	25	25	ns
	B	A		16	25	25	14	25	25	
t _{PLH} Output disable time from low level	$\bar{G}$, DIR	A		23	40	40	26	40	40	ns
	$\bar{G}$, DIR	B		25	40	40	28	40	40	
t _{PHL} Output enable time from high level	$\bar{G}$, DIR	A		34	50	50	43	60	60	ns
	$\bar{G}$, DIR	B		37	50	50	39	60	50	

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

schematics of inputs and outputs



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-8416101VRA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
5962-8416101VSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
5962-8416101VSA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
84161012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
84161012A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
8416101RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
8416101RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
8416101SA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
8416101SA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
SN54LS640J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SN54LS640J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SN54LS645J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SN54LS645J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SN74LS640-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LS640-1DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LS640-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640-1NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640-1NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS640DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS640N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS640NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS640NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS640NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641-1N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS641-1N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS641-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free	CU NIPDAU	N / A for Pkg Type

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
(RoHS)								
SN74LS641DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS641N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS641NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS641NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS641NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS642DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS642NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS642NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS644-1N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS644-1N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS644N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS644N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS645-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645-1N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645-1N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS645-1N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS645-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645-1NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645-1NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645-1NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LS645DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN74LS645N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS645N3	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI
SN74LS645NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS645NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS645NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SNJ54LS640FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS640FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS640J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS640J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS640W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS640W	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS645FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS645FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS645J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SNJ54LS645J	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type
SNJ54LS645W	OBSOLETE	CFP	W	20		TBD	Call TI	Call TI
SNJ54LS645W	OBSOLETE	CFP	W	20		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package is hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

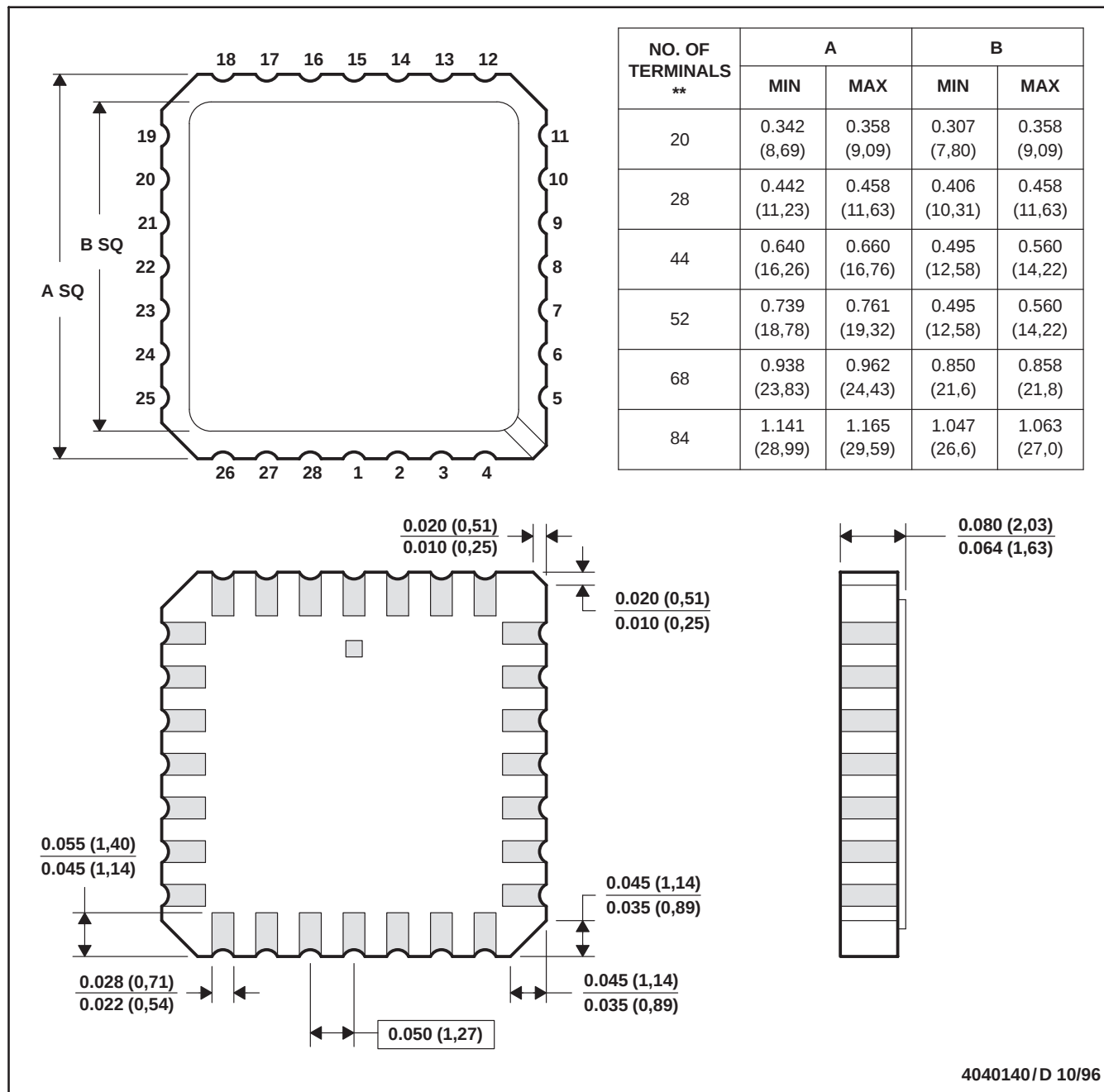


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only.
 - Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - The terminals are gold plated.
 - Falls within JEDEC MS-004

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS **	14	16	18	20
DIM				
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



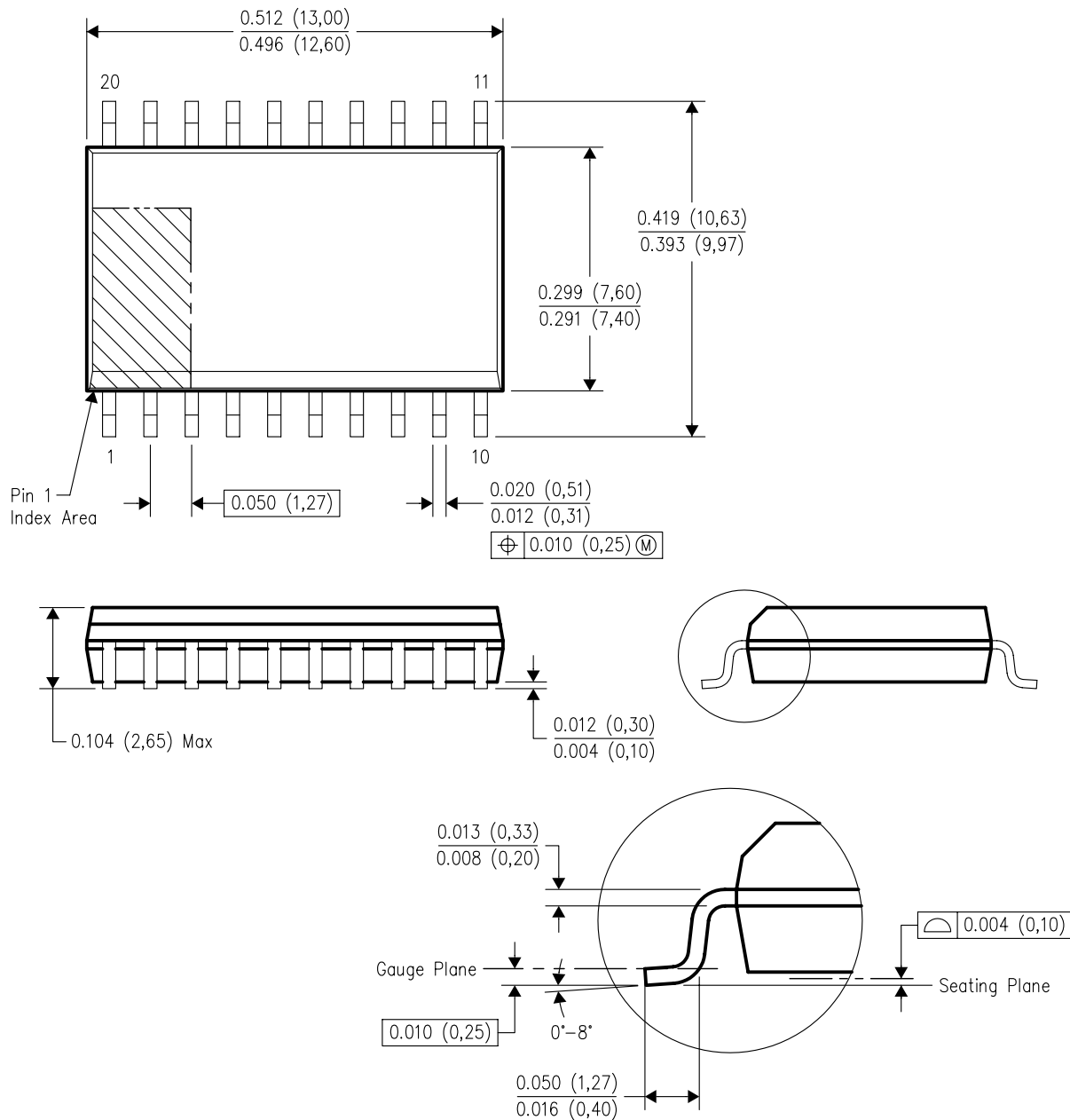
14/18 Pin Only
20 Pin vendor option

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.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



4040000-4/F 06/2004

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 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.

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