

SN75LBC775 SINGLE-CHIP APPLTALK™ AND LOCALTALK™ TRANSCIVER

SLLS216A – MAY 1995 – REVISED JANUARY 1996

- **Single-Chip Interface Solution for AppleTalk™ and LocalTalk™**
- **Designed to Operate Up To 1 Mbps In AppleTalk and LocalTalk**
- **Switched-Capacitor Voltage Converter Allows for Single 5-V Operation**
- **4-kV ESD Protection on Bus Terminals**
- **Combines Multiple Components into a Single Chip Solution**
- **LinBiCMOS™ Process Technology**

description

The SN75LBC775 is a low-power LinBiCMOS™ device that incorporates the drivers and receivers for an AppleTalk or a LocalTalk interface and a switched-capacitor voltage converter for a single 5-V supply operation. LocalTalk uses a hybrid of RS-422 with the transceiver connected to the network through a small isolation transformer. The AppleTalk mode provides point-to-point communications and uses the same differential driver and receiver as LocalTalk with the addition of a hybrid RS-423, single-ended handshake driver (HSK) and receiver. In the AppleTalk mode, the port connects directly to the receiver with no isolation transformer.

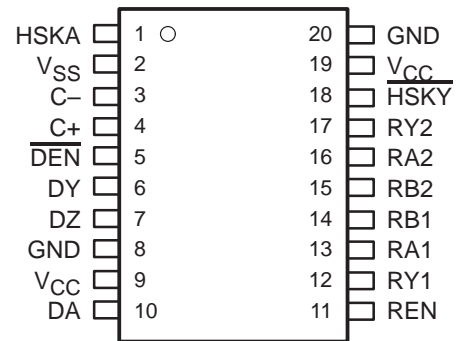
While the device power is turned off ($V_{CC} = 0$) or disabled in the LocalTalk mode, the outputs are in a high-impedance state. When the driver enable (\overline{DEN}) terminal is high, both the differential and serial driver outputs are in a high-impedance state.

The receiver output can be disabled and becomes a high impedance when the REN terminal is low.

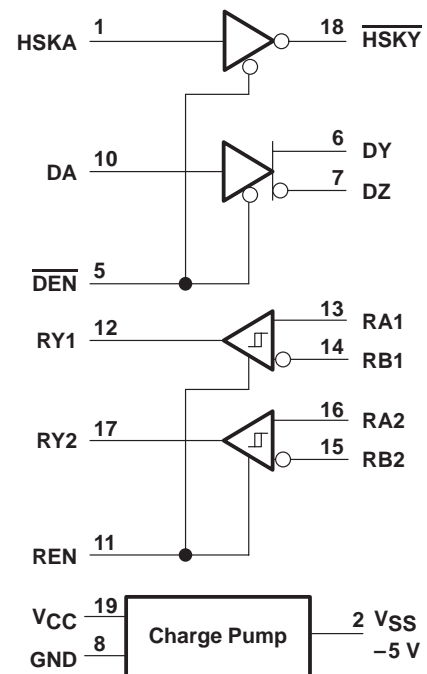
A switched-capacitor voltage converter generates the negative voltage required from a single 5-V supply using two 22- μ F capacitors. One capacitor is between the C+ and C- terminals and the second is between V_{SS} and ground.

The SN75LBC775 is characterized for operating over the temperature range of 0°C to 70°C.

**DW PACKAGE
(TOP VIEW)**



functional diagram



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DRIVER FUNCTION TABLE

INPUT		ENABLE	OUTPUT		
DA	HSKA	$\overline{\text{DEN}}$	A	B	$\overline{\text{HSKY}}$
H	X	L	H	L	X
L	X	L	L	H	X
X	H	L	X	X	L
X	L	L	X	X	H
OPEN	OPEN	L	H	L	L
X	X	H	Z	Z	Z
X	X	OPEN	Z	Z	Z

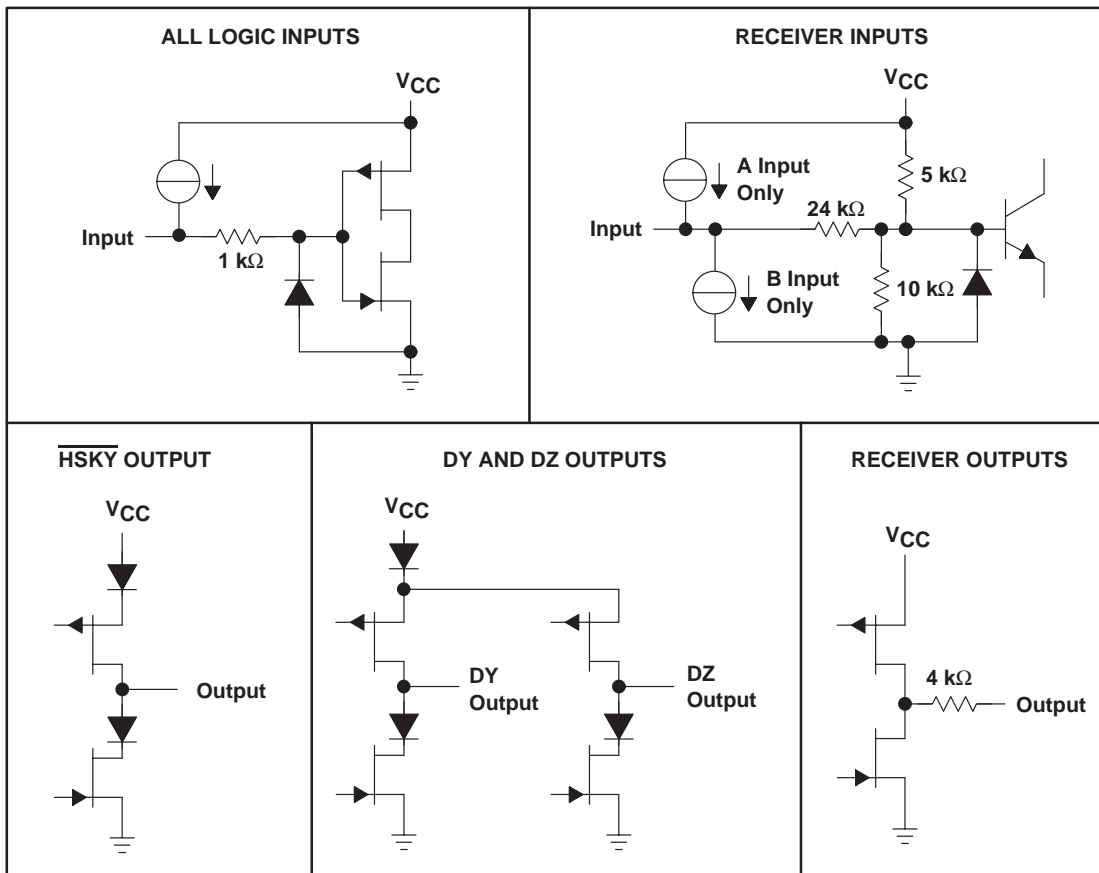
RECEIVER FUNCTION TABLE

INPUT		ENABLE	OUTPUT
RA	RB	REN	RY
H	L	H	H
L	H	H	L
OPEN		H	H
SHORT†		H	?
X		L	Z

† $-0.2 \text{ V} < V_{\text{ID}} < 0.2 \text{ V}$

H = high level, L = low level, X = irrelevant, ? = indeterminate, Z = high impedance (off)

schematics of inputs and outputs



SN75LBC775

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

Supply voltage range, V_{CC} (see Note 1)	–0.5 to 7 V
Supply voltage range, V_{SS}	–7 to 0.5 V
Receiver input voltage range, V_I (RA)	–15 V to 15 V
Receiver differential input voltage range, V_{ID}	–12 V to 12 V
Receiver output voltage range, V_O (RY)	–0.5 V to 5.5 V
Driver output voltage range, V_O (Power Off) (DY, DZ, \overline{HSKY})	–15 V to 15 V
(Power On) (DY, DZ, \overline{HSKY})	–11 V to 11 V
Driver input voltage range, V_I (DA, HSKA, \overline{DEN} , REN)	–0.5 V to $V_{CC} + 0.4$ V
Electrostatic discharge (see Note 2) Class 3, A: Bus terminals	4 kV
All other terminals	2 kV
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	0°C to 70°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. All voltage values are with respect to network ground terminal unless otherwise noted.
 2. This maximum rating is tested according to MIL-STD-883C, Method 3015.7.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 85^\circ\text{C}$ POWER RATING
DW	1125 mW	9.0 mW/°C	585 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level input voltage, V_{IH}	DA, HSKA, \overline{DEN} , REN			V
Low-level input voltage, V_{IL}	DA, HSKA, \overline{DEN} , REN			0.8 V
Receiver input common-mode voltage range, V_{ICR}^\ddagger	–7		7	V
Differential input voltage, V_{ID}^\ddagger	–12		12	V
Voltage-converter filter capacitance	22			μF
Voltage-converter filter-capacitor equivalent series resistance (ESR)			2	Ω
Operating free-air temperature, T_A	0		70	°C

‡ The algebraic convention, in which the less-positive (more negative) limit is designated minimum, is used in this data sheet.



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DRIVER

electrical characteristics over recommend operating characteristics (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT	
V _{OH}	High-level output voltage	R _L = 3 kΩ, See Figure 1	3.7			V	
V _{OL}	Low-level output voltage				-3.7	V	
V _{OD}	Magnitude of differential output voltage (V _{DY} - V _{DZ})	See Figure 2	4.0	5.6		V	
Δ V _{OD}	Change in differential voltage magnitude	See Figure 2		10	250	mV	
V _{OC}	Common-mode output voltage‡	See Figure 3	-1		3	V	
ΔV _{OC(SS)}	Change in steady-state common-mode output voltage	See Figure 3			±200	mV	
I _{OZ}	High-impedance output current	V _{CC} = 0, -10 V ≤ V _O ≤ 10 V			±100	μA	
I _{OS}	Short-circuit output current	-5 V ≤ V _O ≤ 5 V			450	mA	
I _{CC}	Supply current	DEN at 0 V, No load REN at 5 V,		5	10	mA	
I _{IH}	High-level input current	V _I = 5 V			200	μA	
I _{IL}	low-level input current	All terminals except REN	V _I = 0		-100	-200	μA
		REN			-300	-455	μA

† All typical values are at V_{CC} = 5 V and T_A = 25°C.

‡ The algebraic convention, in which the less positive (more negative) limit is designated minimum, is used in this data sheet.

switching characteristics over recommend operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
t _{PHL}	Propagation delay time, high- to low-level	Single ended		155	300	ns	
		Differential		115	180	ns	
t _{PLH}	Propagation delay time, low- to high-level	Single ended		140	300	ns	
		Differential		115	180	ns	
t _{PZL}	Propagation delay time, high-impedance to low-level output	See Figures 1 and 2		100	250	ns	
t _{PZH}	Propagation delay time, high-impedance to high-level output			100	250	ns	
t _{PLZ}	Propagation delay time, low-level to high-impedance output			100	250	ns	
t _{PHZ}	Propagation delay time, high-level to high-impedance output			100	250	ns	
t _r	Rise time		Single ended		135	300	ns
			Differential		90	180	ns
t _f	Fall time		Single ended		145	300	ns
			Differential		95	180	ns
t _{sk(p)}	Pulse skew, t _{PLH} - t _{PHL}	Single ended		15	50	ns	
		Differential		2	22	ns	



RECEIVER

electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT	
V_{IT+}	Positive-going differential input voltage threshold	$I_{OH} = 2 \text{ mA}$, See Figure 4	$I_{OL} = -2 \text{ mA}$,		200	mV	
V_{IT-}	Negative-going differential input voltage threshold‡			-200		mV	
V_{hys}	Input voltage hysteresis ($V_{IT+} - V_{IT-}$)			30		mV	
V_{OH}	High-level output voltage			2	4.5		V
V_{OL}	Low-level output voltage					0.8	V
I_{OS}	Short-circuit output current‡	$V_O = 0$	8	50	85	mA	
		$V_O = V_{CC}$	-85	-50	-8	mA	
r_i	Input resistance	$V_{CC} = 0$ or 5.25 V , $-12 \text{ V} \leq V_I \leq 12 \text{ V}$	6			k Ω	

† All typical values are at $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$.

‡ The algebraic convention, in which the less positive (more negative) limit is designated minimum, is used in this data sheet.

switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{PHL}	Propagation delay time, high- to low-level output	$R_L = 2 \text{ k}\Omega$, See Figure 4	$C_L = 15 \text{ pF}$,	25	60	ns
t_{PLH}	Propagation delay time, low- to high-level output			22	60	ns
t_r	Rise time			8	25	ns
t_f	Fall time			7	25	ns
$t_{SK(P)}$	Pulse skew, $ t_{PLH} - t_{PHL} $			3	20	ns
t_{PZL}	Receiver output enable time to low-level output	$C_L = 80 \text{ pF}$, See Figure 5		50		ns
t_{PZH}	Receiver output enable time to high-level output			50		ns
t_{PLZ}	Receiver output disable time to low-level output			50		ns
t_{PHZ}	Receiver output disable time to high-level output			50		ns

† All typical values are at $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$.



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PARAMETER MEASUREMENT INFORMATION

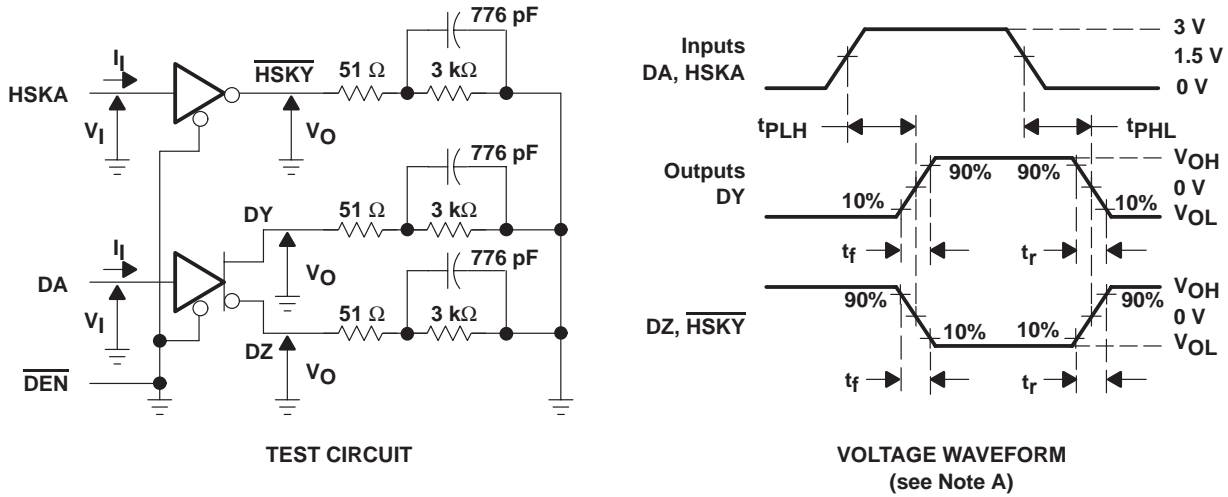
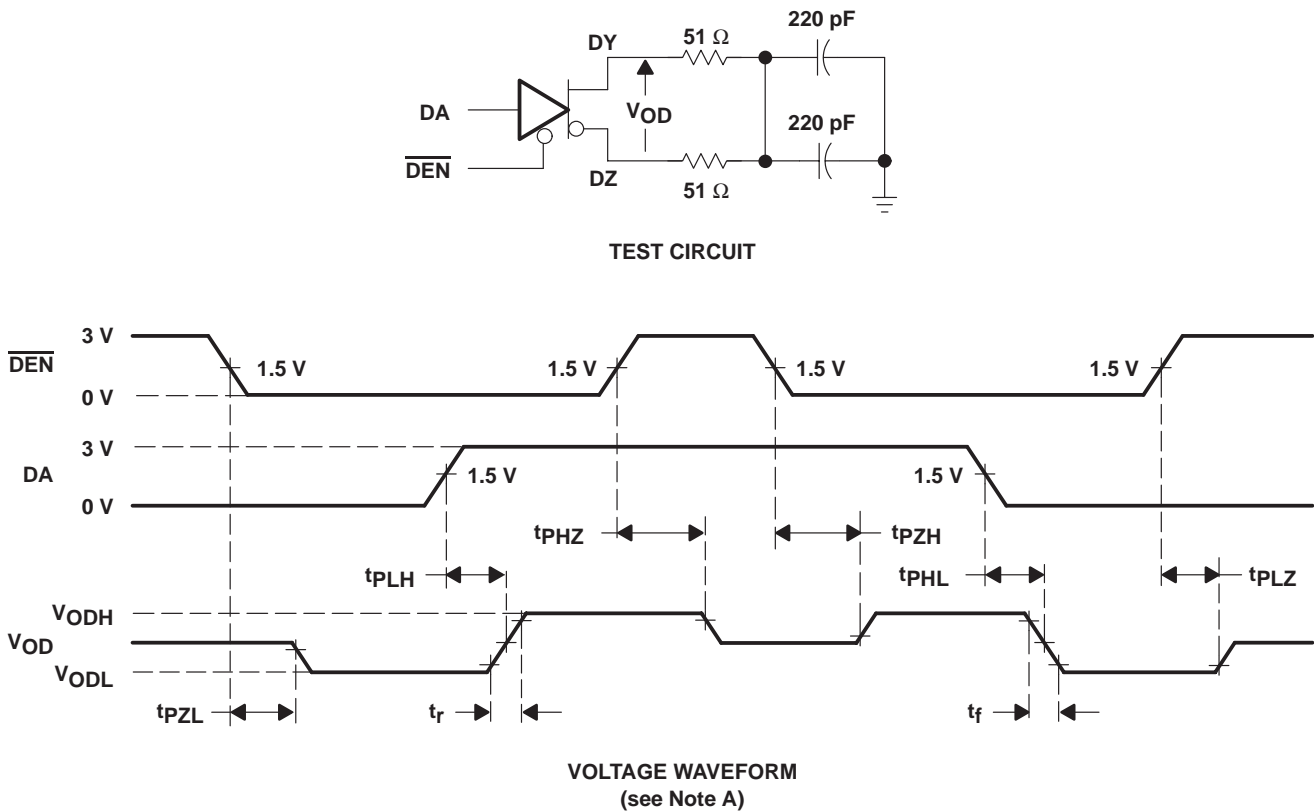


Figure 1. Driver Propagation and Transition Times for AppleTalk



NOTE A: The input waveform $t_r, t_f \leq 10$ ns

Figure 2. Driver Propagation and Transition Times for LocalTalk



PARAMETER MEASUREMENT INFORMATION

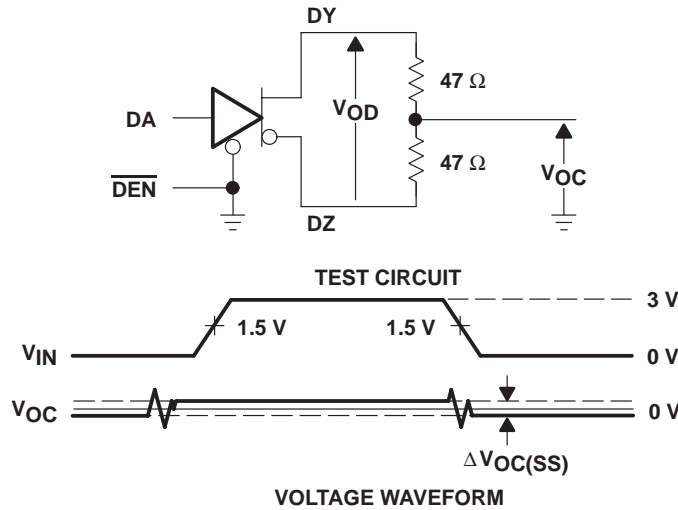
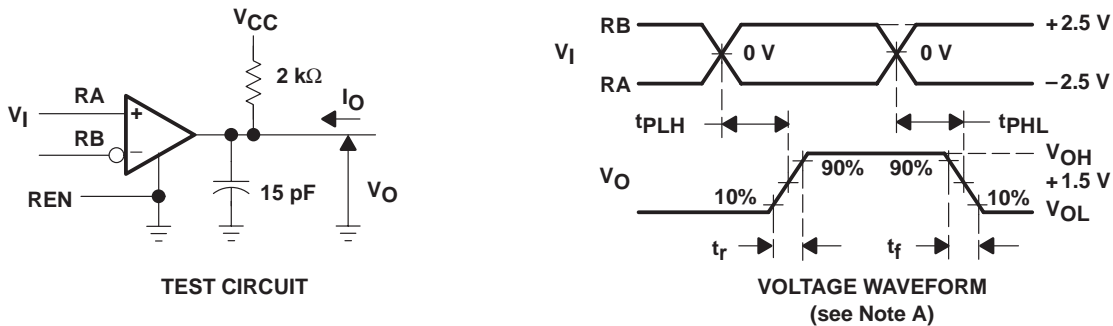


Figure 3. Differential Driver Common Mode Output Voltage Tests



NOTE A: The input waveform $t_r, t_f \leq 10$ ns

Figure 4. Receiver Propagation and Transition Times

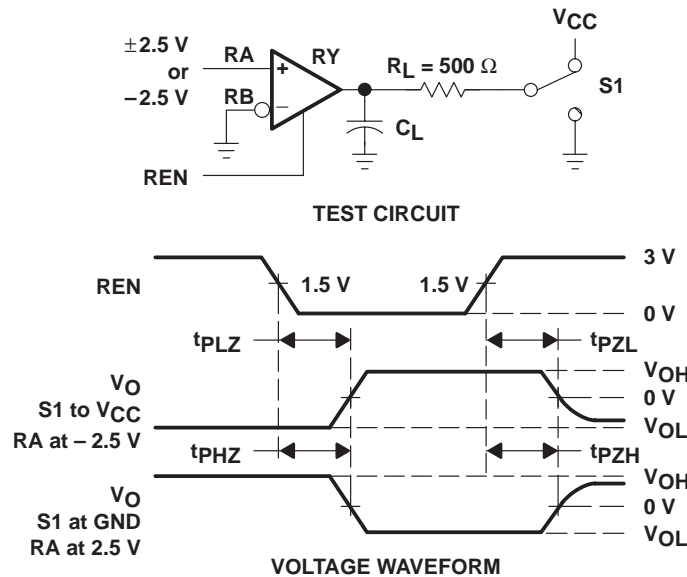


Figure 5. Receiver Enable and Disable Test Circuit and Waveform

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TYPICAL CHARACTERISTICS

MAXIMUM DRIVER DATA RATE vs CAPACITIVE LOAD

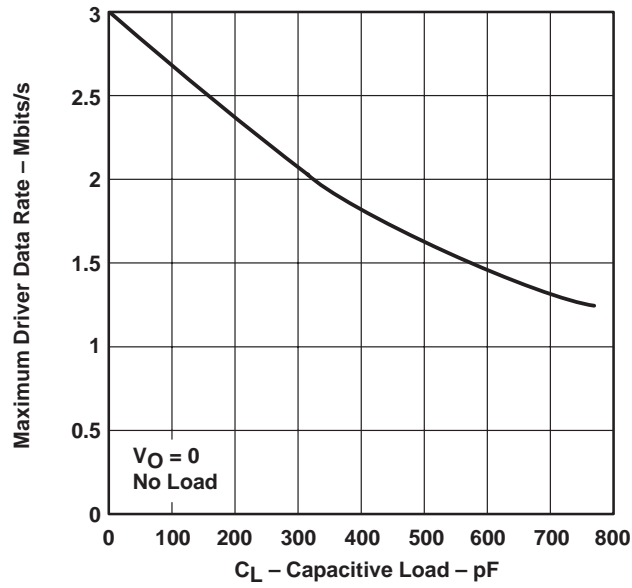


Figure 6



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APPLICATION INFORMATION

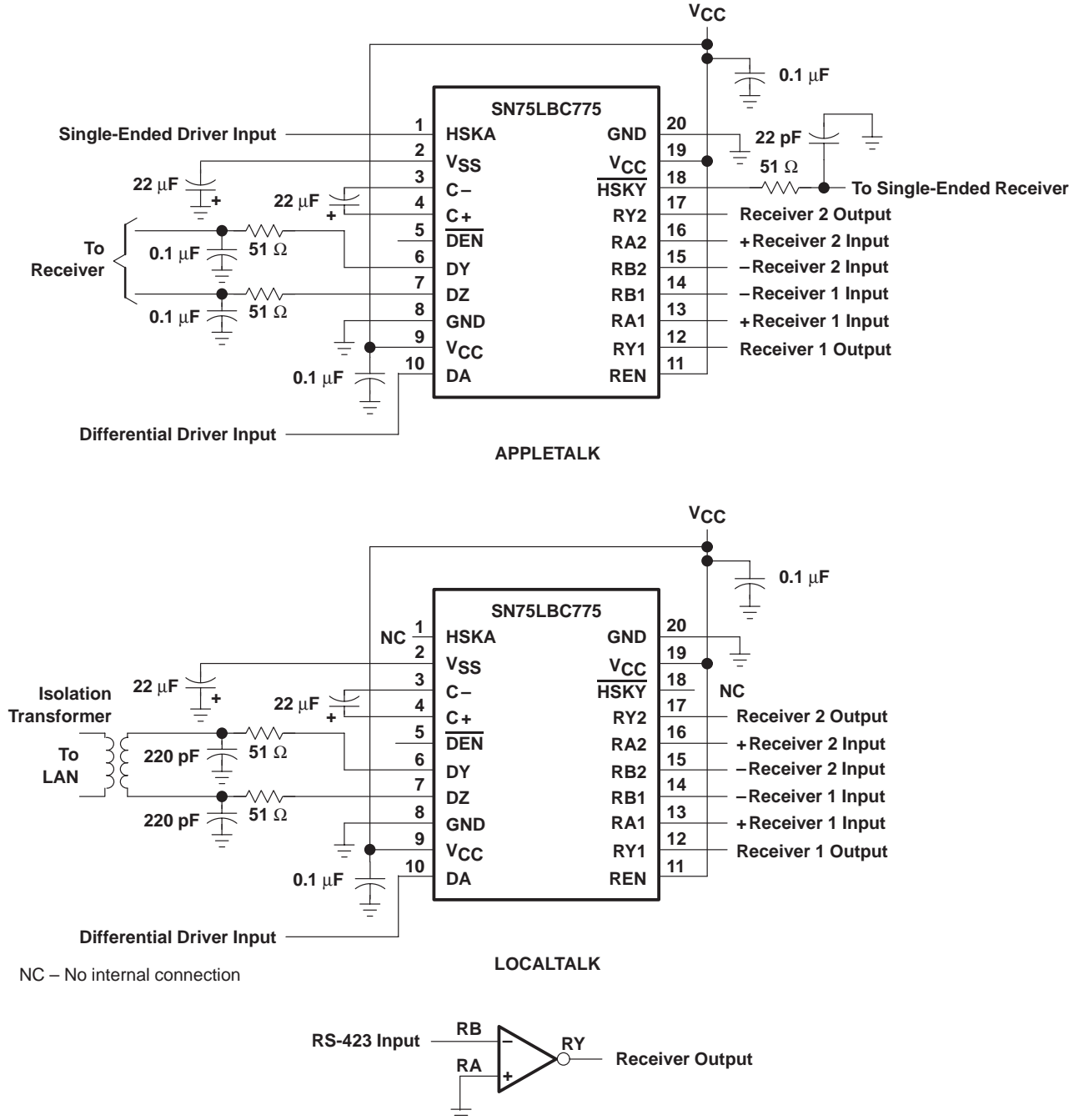


Figure 7. Receiving RS-423 Signals With a Differential Receiver

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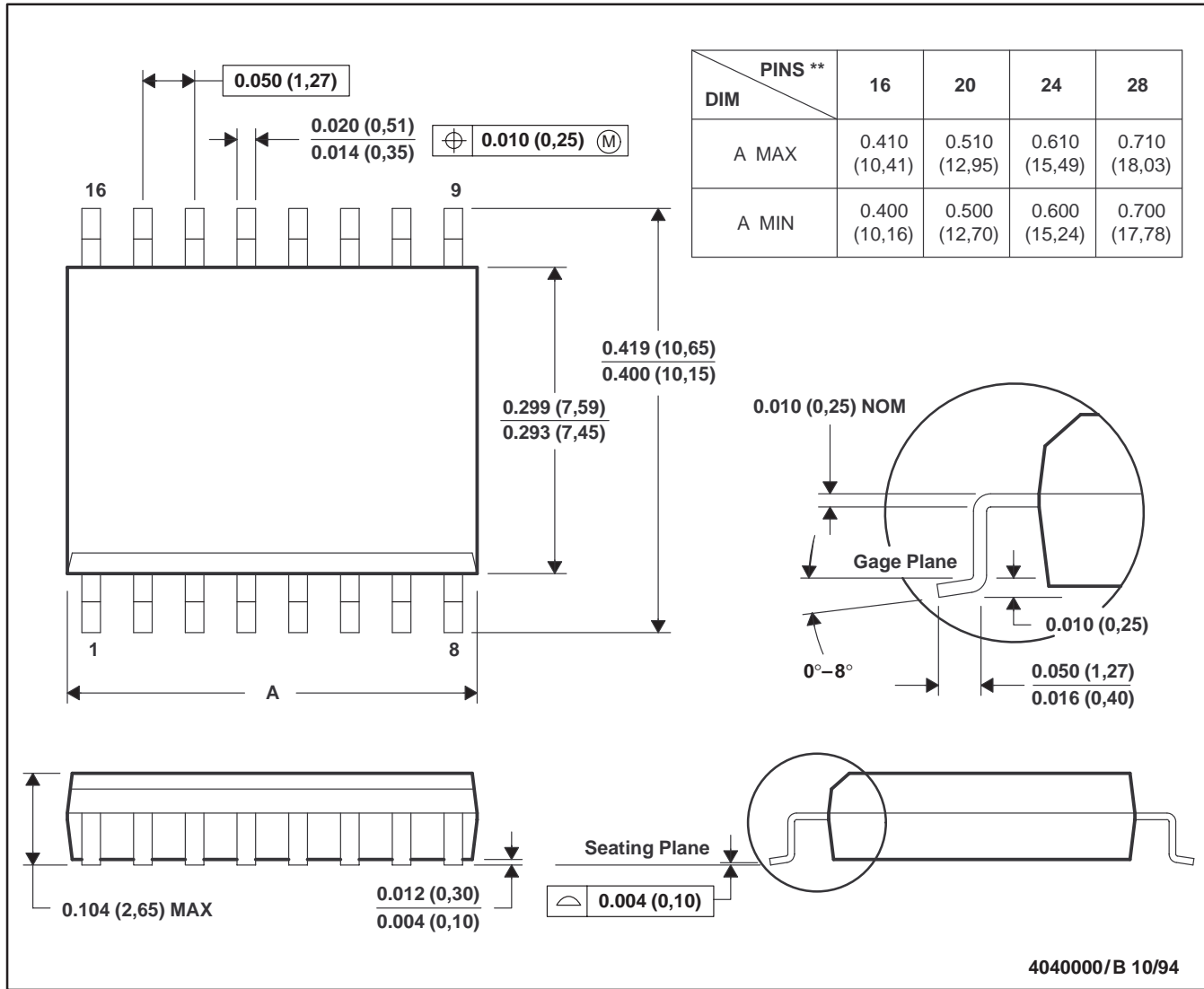
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MECHANICAL INFORMATION

DW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

16 PIN SHOWN



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

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN75LBC775DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC775DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC775DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC775DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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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TAPE AND REEL INFORMATION



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
SN75LBC775DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.1	2.65	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)
SN75LBC775DWR	SOIC	DW	20	2000	346.0	346.0	41.0

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