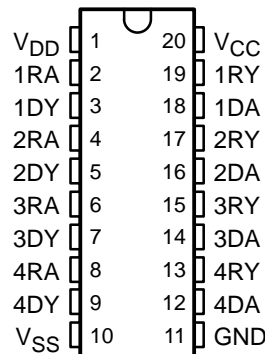


SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

- Meet or Exceed the Requirements of TIA/EIA-232-F and ITU Recommendation V.28
- Very Low Power Consumption . . . 5 mW Typ
- Wide Driver Supply Voltage . . . ± 4.5 V to ± 15 V
- Driver Output Slew Rate Limited to 30 V/ μ s Max
- Receiver Input Hysteresis . . . 1000 mV Typ
- Push-Pull Receiver Outputs
- On-Chip Receiver 1- μ s Noise Filter

SN65C1154 . . . N PACKAGE
SN75C1154 . . . DW, N, OR NS PACKAGE
(TOP VIEW)



description/ordering information

The SN65C1154 and SN75C1154 are low-power BiMOS devices containing four independent drivers and receivers that are used to interface data terminal equipment (DTE) with data circuit-terminating equipment (DCE). These devices are designed to conform to TIA/EIA-232-F. The drivers and receivers of the SN65C1154 and SN75C1154 are similar to those of the SN75C188 quadruple driver and SN75C189A quadruple receiver, respectively. The drivers have a controlled output slew rate that is limited to a maximum of 30 V/ μ s and the receivers have filters that reject input noise pulses of shorter than 1 μ s. Both these features eliminate the need for external components.

The SN65C1154 and SN75C1154 have been designed using low-power techniques in a BiMOS technology. In most applications, the receivers contained in these devices interface to single inputs of peripheral devices such as ACEs, UARTs, or microprocessors. By using sampling, such peripheral devices usually are insensitive to the transition times of the input signals. If this is not the case, or for other uses, it is recommended that the SN65C1154 and SN75C1154 receiver outputs be buffered by single Schmitt input gates or single gates of the HCMOS, ALS, or 74F logic families.

ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP (N)	Tube of 20	SN65C1154N	SN65C1154N
0°C to 70°C	PDIP (N)	Tube of 20	SN75C1154N	SN75C1154N
	SOIC (DW)	Tube of 25	SN75C1154DW	SN75C1154
		Reel of 2500	SN75C1154DWR	
SOP (NS)	Reel of 2000	SN75C1154NSR	SN75C1154	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

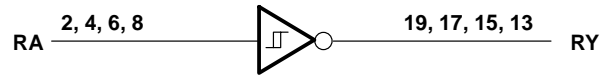
Copyright © 2003, Texas Instruments Incorporated

SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

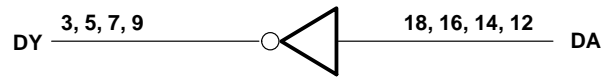
SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

logic diagram (positive logic)

Typical of Each Receiver



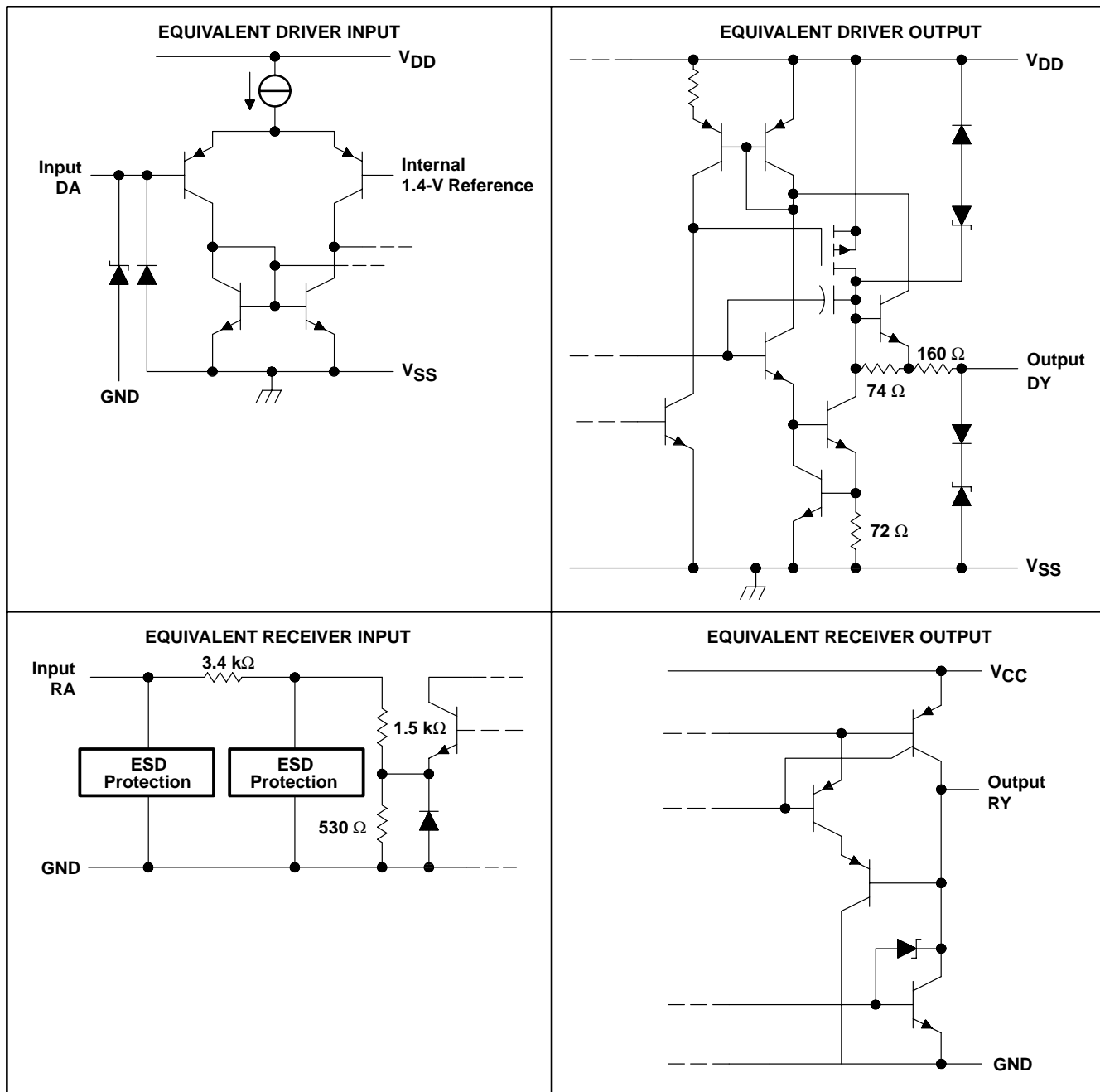
Typical of Each Driver



SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

schematics of inputs and outputs



Resistor values shown are nominal.

SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

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

Supply voltage: V_{DD} (see Note 1)	15 V
V_{SS}	-15 V
V_{CC}	7 V
Input voltage range, V_I : Driver	V_{SS} to V_{DD}
Receiver	-30 V to 30 V
Output voltage range, V_O : Driver	$(V_{SS} - 6 V)$ to $(V_{DD} + 6 V)$
Receiver	-0.3 V to $(V_{CC} + 0.3 V)$
Package thermal impedance, θ_{JA} (see Notes 2 and 3): DW package	58°C/W
N package	69°C/W
NS package	60°C/W
Operating virtual junction temperature, T_J	150°C
Storage temperature range, T_{stg}	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°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 s are with respect to the network GND terminal.
 2. Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{DD}	Supply voltage	4.5	12	15	V
V_{SS}	Supply voltage	-4.5	-12	-15	V
V_{CC}	Supply voltage	4.5	5	6	V
V_I	Input voltage	Driver	$V_{SS} + 2$	V_{DD}	V
		Receiver		± 25	
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			-1	mA
I_{OL}	High-level output current			3.2	mA
T_A	Operating free-air temperature	SN65C1154	-40	85	°C
		SN75C1154	0	70	



SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

DRIVER SECTION

electrical characteristics over operating free-air temperature range, $V_{DD} = 12\text{ V}$, $V_{SS} = -12\text{ V}$, $V_{CC} = 5\text{ V} \pm 10\%$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V _{OH} High-level output voltage	V _{IL} = 0.8 V, R _L = 3 k Ω , See Figure 1	V _{DD} = 5 V, V _{SS} = -5 V	4	4.5	V
		V _{DD} = 12 V, V _{SS} = -12 V	10	10.8	
V _{OL} Low-level output voltage (see Note 4)	V _{IH} = 2 V, R _L = 3 k Ω , See Figure 1	V _{DD} = 5 V, V _{SS} = -5 V	-4.4	-4	V
		V _{DD} = 12 V, V _{SS} = -12 V	-10.7	-10	
I _{IH} High-level input current	V _I = 5 V, See Figure 2			1	μA
I _{IL} Low-level input current	V _I = 0, See Figure 2			-1	μA
I _{OS(H)} High-level short-circuit output current‡	V _I = 0.8 V, V _O = 0 or V _{SS} , See Figure 1	-7.5	-12	-19.5	mA
I _{OS(L)} Low-level short-circuit output current‡	V _I = 2 V, V _O = 0 or V _{DD} , See Figure 1	7.5	12	19.5	mA
I _{DD} Supply current from V _{DD}	No load, All inputs at 2 V or 0.8 V	V _{DD} = 5 V, V _{SS} = -5 V	115	250	μA
		V _{DD} = 12 V, V _{SS} = -12 V	115	250	
I _{SS} Supply current from V _{SS}	No load, All inputs at 2 V or 0.8 V	V _{DD} = 5 V, V _{SS} = -5 V	-115	-250	μA
		V _{DD} = 12 V, V _{SS} = -12 V	-115	-250	
r _o Output resistance	V _{DD} = V _{SS} = V _{CC} = 0, V _O = -2 V to 2 V, See Note 5	300	400		Ω

† All typical values are at T_A = 25°C.

‡ Not more than one output should be shorted at one time.

NOTES: 4. The algebraic convention, where the more positive (less negative) limit is designated as maximum, is used in this data sheet for logic levels only.

5. Test conditions are those specified by TIA/EIA-232-F.

switching characteristics, $V_{DD} = 12\text{ V}$, $V_{SS} = -12\text{ V}$, $V_{CC} = 5\text{ V} \pm 10\%$, T_A = 25°C (see Figure 3)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH} Propagation delay time, low- to high-level output§	R _L = 3 to 7 k Ω , C _L = 15 pF		1.2	3	μs
t _{PHL} Propagation delay time, high- to low-level output§	R _L = 3 to 7 k Ω , C _L = 15 pF		2.5	3.5	μs
t _{TLH} Transition time, low- to high-level output¶	R _L = 3 to 7 k Ω , C _L = 15 pF	0.53	2	3.2	μs
t _{THL} Transition time, high- to low-level output¶	R _L = 3 to 7 k Ω , C _L = 15 pF	0.53	2	3.2	μs
t _{TLH} Transition time, low- to high-level output#	R _L = 3 to 7 k Ω , C _L = 2500 pF		1	2	μs
t _{THL} Transition time, high- to low-level output#	R _L = 3 to 7 k Ω , C _L = 2500 pF		1	2	μs
SR Output slew rate	R _L = 3 to 7 k Ω , C _L = 15 pF	4	10	30	V/ μs

§ t_{PHL} and t_{PLH} include the additional time due to on-chip slew rate control and are measured at the 50% points.

¶ Measured between 10% and 90% points of output waveform

Measured between 3 V and -3 V points of output waveform (TIA/EIA-232-F conditions) with all unused inputs tied either high or low



SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

RECEIVER SECTION

electrical characteristics over operating free-air temperature range, $V_{DD} = 12\text{ V}$, $V_{SS} = -12\text{ V}$, $V_{CC} = 5\text{ V} \pm 10\%$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage	See Figure 5	1.7	2.1	2.55	V
V_{IT-}	Negative-going input threshold voltage	See Figure 5	0.65	1	1.25	V
V_{hys}	Input hysteresis voltage ($V_{IT+} - V_{IT-}$)		600	1000		mV
V_{OH}	High-level output voltage	$V_I = 0.75\text{ V}$, $I_{OH} = -20\text{ }\mu\text{A}$, See Figure 5 and Note 6	3.5			V
		$V_I = 0.75\text{ V}$, $I_{OH} = -1\text{ mA}$, See Figure 5	$V_{CC} = 4.5\text{ V}$		2.8 4.4	
			$V_{CC} = 5\text{ V}$		3.8 4.9	
		$V_{CC} = 5.5\text{ V}$	4.3 5.4			
V_{OL}	Low-level output voltage	$V_I = 3\text{ V}$, $I_{OL} = 3.2\text{ mA}$, See Figure 5		0.17	0.4	V
I_{IH}	High-level input current	$V_I = 25\text{ V}$	3.6	4.6	8.3	mA
		$V_I = 3\text{ V}$	0.43	0.55	1	
I_{IL}	Low-level input current	$V_I = -25\text{ V}$	-3.6	-5	-8.3	mA
		$V_I = -3\text{ V}$	-0.43	-0.55	-1	
$I_{OS(H)}$	Short-circuit output at high level	$V_I = 0.75\text{ V}$, $V_O = 0$, See Figure 4		-8	-15	mA
$I_{OS(L)}$	Short-circuit output at low level	$V_I = V_{CC}$, $V_O = V_{CC}$, See Figure 4		13	25	mA
I_{CC}	Supply current from V_{CC}	No load, All inputs at 0 or 5 V	$V_{DD} = 5\text{ V}$, $V_{SS} = -5\text{ V}$	400	600	μA
			$V_{DD} = 12\text{ V}$, $V_{SS} = -12\text{ V}$	400	600	

† All typical values are at $T_A = 25^\circ\text{C}$.

NOTE 6: If the inputs are left unconnected, the receiver interprets this as an input low and the receiver outputs will remain in the high state.

switching characteristics, $V_{DD} = 12\text{ V}$, $V_{SS} = -12\text{ V}$, $V_{CC} = 5\text{ V} \pm 10\%$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	$C_L = 50\text{ pF}$, $R_L = 5\text{ k}\Omega$, See Figure 6		3	4	μs
t_{PHL}	Propagation delay time, high- to low-level output	$C_L = 50\text{ pF}$, $R_L = 5\text{ k}\Omega$, See Figure 6		3	4	μs
t_{TLH}	Transition time, low- to high-level output	$C_L = 50\text{ pF}$, $R_L = 5\text{ k}\Omega$, See Figure 6		300	450	ns
t_{THL}	Transition time, high- to low-level output	$C_L = 50\text{ pF}$, $R_L = 5\text{ k}\Omega$, See Figure 6		100	300	ns
$t_{w(N)}$	Duration of longest pulse rejected as noise‡	$C_L = 50\text{ pF}$, $R_L = 5\text{ k}\Omega$	1		4	μs

‡ The receiver ignores any positive- or negative-going pulse that is less than the minimum value of $t_{w(N)}$ and accepts any positive- or negative-going pulse greater than the maximum of $t_{w(N)}$.



PARAMETER MEASUREMENT INFORMATION

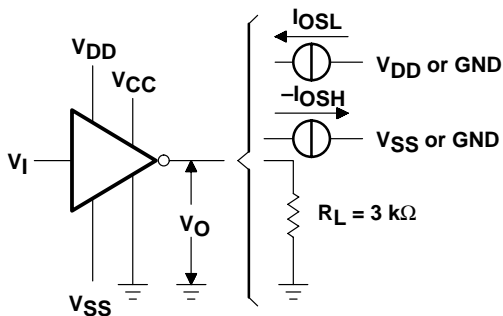


Figure 1. Driver Test Circuit (V_{OH} , V_{OL} , I_{OSL} , I_{OSH})

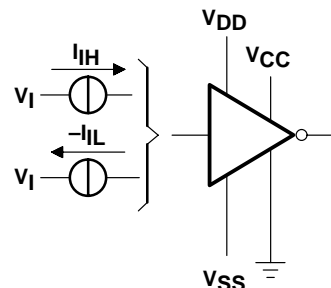
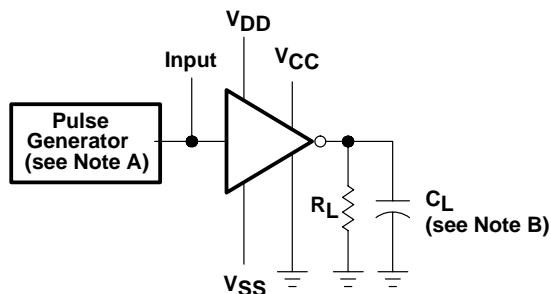
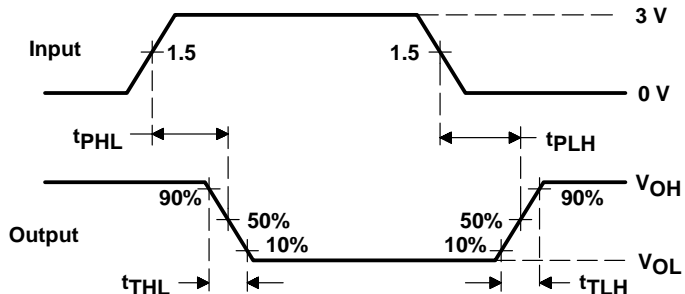


Figure 2. Driver Test Circuit (I_{IL} , I_{IH})



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: $t_w = 25 \mu s$, PRR = 20 kHz, $Z_O = 50 \Omega$, $t_r = t_f < 50 ns$.
 B. C_L includes probe and jig capacitance.

Figure 3. Driver Test Circuit and Voltage Waveforms

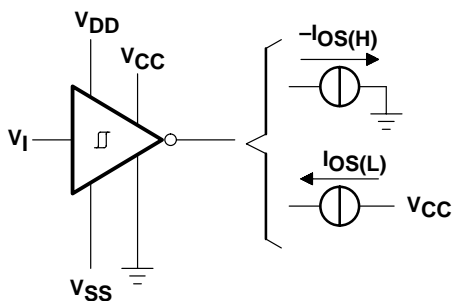


Figure 4. Receiver Test Circuit (I_{OSH} , I_{OSL})

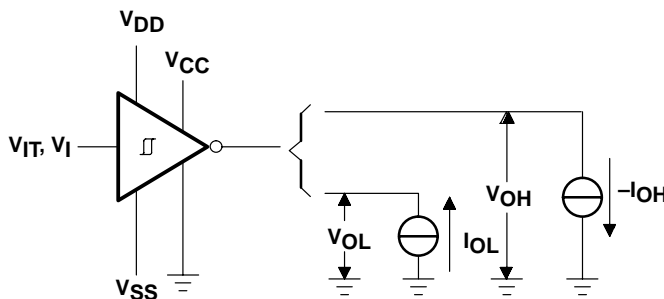
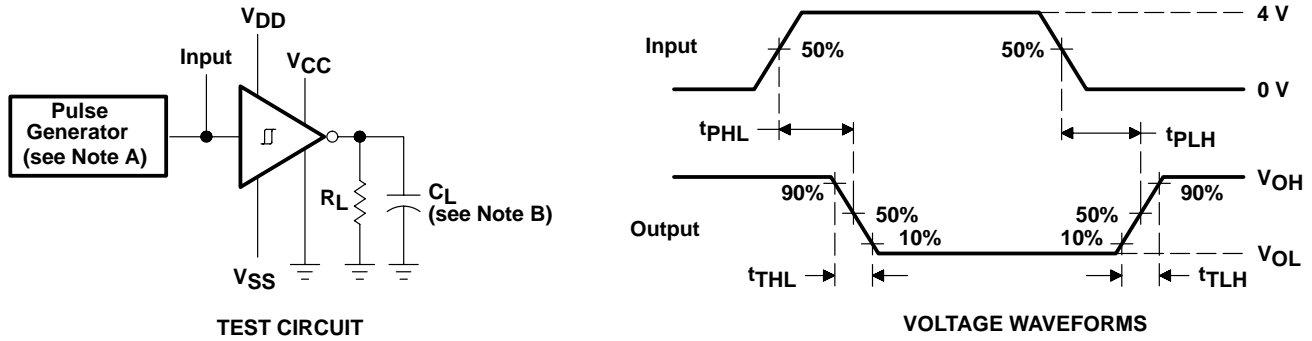


Figure 5. Receiver Test Circuit (V_{IT} , V_{OL} , V_{OH})

SN65C1154, SN75C1154 QUADRUPLE LOW-POWER DRIVERS/RECEIVERS

SLLS151D – DECEMBER 1988 – REVISED APRIL 2003

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generator has the following characteristics: $t_w = 25 \mu s$, $PRR = 20 \text{ kHz}$, $Z_O = 50 \Omega$, $t_r = t_f < 50 \text{ ns}$.
 B. C_L includes probe and jig capacitance.

Figure 6. Receiver Test Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN65C1154DW	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN65C1154DWR	OBSOLETE	SOIC	DW	20		TBD	Call TI	Call TI
SN65C1154N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN65C1154NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75C1154DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75C1154NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75C1154NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C1154NSRG4	ACTIVE	SO	NS	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.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is

provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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
SN75C1154DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.1	2.65	12.0	24.0	Q1
SN75C1154NSR	SO	NS	20	2000	330.0	24.4	8.2	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)
SN75C1154DWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN75C1154NSR	SO	NS	20	2000	346.0	346.0	41.0

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

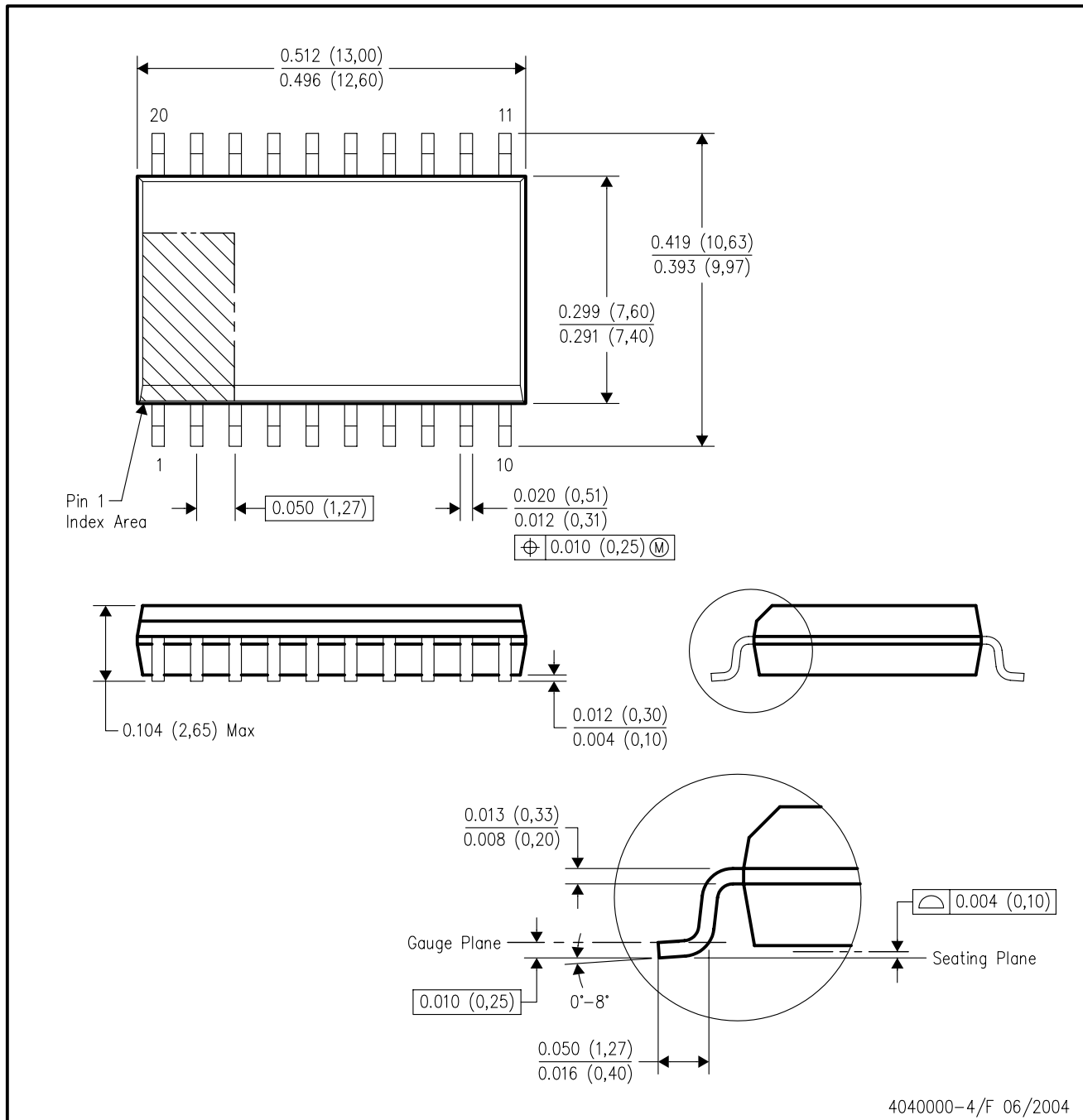
14-PINS SHOWN



- 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.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



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

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

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

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated