

SN100KT5541 OCTAL ECL-TO-TTL TRANSLATOR WITH 3-STATE OUTPUTS

SDZS004A – NOVEMBER 1989 – REVISED MAY 1990

- 100K Compatible
- ECL and TTL Control Inputs
- Noninverting Outputs
- Flow-Through Architecture Optimizes PCB Layout
- Center Pin V_{CC} , V_{EE} , and GND Configurations Minimize High-Speed Switching Noise
- Package Options Include “Small Outline” Packages and Standard Plastic 300-mil DIPs

description

This octal ECL-to-TTL translator is designed to provide a efficient translation between a 100K ECL signal environment to a TTL signal environment. This device is designed specifically to improve the performance and density of ECL-to-TTL CPU/bus-oriented functions such as memory-address drivers, clock drivers, and bus-oriented receivers and transmitters.

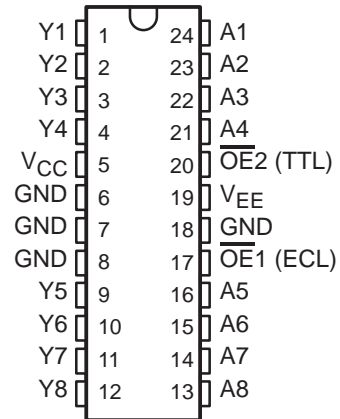
Two output-enable pins, $\overline{OE}1$ and $\overline{OE}2$ are provided. These control inputs are ANDed together with $\overline{OE}1$ being ECL compatible and $\overline{OE}2$ being TTL compatible. This offers the choice of controlling the outputs of the device from either a TTL or ECL signal environment.

The SN100KT5541 is characterized for operation from 0°C to 85°C.

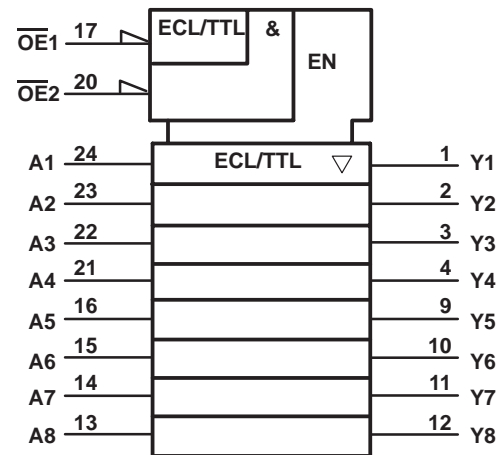
FUNCTION TABLE

OUTPUT ENABLE		DATA INPUT A	OUTPUT (TTL) Y
$\overline{OE}1$	$\overline{OE}2$		
X	H	X	Z
H	X	X	Z
L	L	L	L
L	L	H	H

DW OR NT PACKAGE
(TOP VIEW)



logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

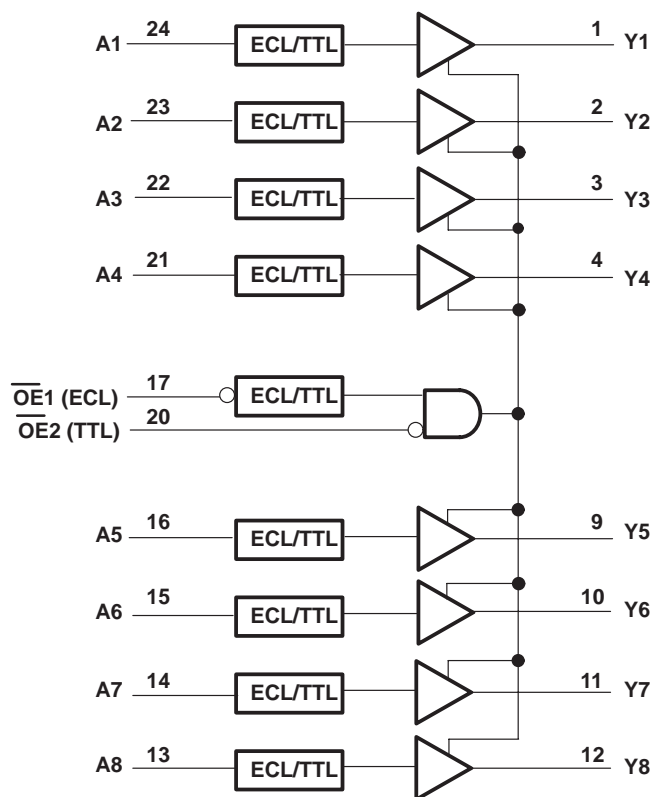
SN100KT5541

OCTAL ECL-TO-TTL TRANSLATOR

WITH 3-STATE OUTPUTS

SDZS004A – NOVEMBER 1989 – REVISED MAY 1990

logic diagram (positive logic)



SN100KT5541
OCTAL ECL-TO-TTL TRANSLATOR
WITH 3-STATE OUTPUTS

SDZS004A – NOVEMBER 1989 – REVISED MAY 1990

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Supply voltage range, V_{EE}	–8 V to 0 V
Input voltage range (TTL) (see Note 1)	–1.2 V to 7 V
Input voltage range (ECL)	V_{EE} to 0 V
Voltage applied to any output in the high state	–0.5 V to V_{CC}
Voltage applied to any output in the disabled or power-off state	–0.5 V to 5.5 V
Input current range (TTL)	–30 mA to 5 mA
Current into any output in the low state	96 mA
Operating free-air temperature range	0°C to 85°C
Storage temperature range	–65°C to 150°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.

NOTE 1: The TTL input voltage ratings may be exceeded provided the input current ratings are observed.

recommended operating conditions

	MIN	NOM	MAX	UNIT
V_{CC} TTL supply voltage	4.5	5	5.5	V
V_{EE} ECL supply voltage	–4.2	–4.5	–4.8	V
V_{IH} TTL high-level input voltage	2			V
V_{IL} TTL low-level input voltage			0.8	V
V_{IH} ECL high-level input voltage [‡]	–1150		–840	mV
V_{IL} ECL low-level input voltage [‡]	–1810		–1490	mV
I_{IK} TTL input clamp current			–18	mA
I_{OH} High-level output current			–15	mA
I_{OL} Low-level output current			48	mA
T_A Operating free-air temperature	0		85	°C

[‡] The algebraic convention, in which the least positive (most negative) value is designated minimum, is used in this data sheet for logic levels only.



SN100KT5541

OCTAL ECL-TO-TTL TRANSLATOR

WITH 3-STATE OUTPUTS

SDZS004A – NOVEMBER 1989 – REVISED MAY 1990

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

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{IK}	OE2 only	$V_{CC} = 4.5\text{ V}$, $V_{EE} = -4.2\text{ V}$, $I_I = -18\text{ mA}$			-1.2	V
I_I	OE2 only	$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_I = 7\text{ V}$			0.1	mA
I_{IH}	OE2 only	$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_I = 2.7\text{ V}$			20	μA
I_{IL}	OE2 only	$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_I = 0.5\text{ V}$			-0.5	mA
I_{IH}	Data inputs and $\overline{\text{OE}}1$	$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_{IH} = -840\text{ mV}$			350	μA
I_{IL}	Data inputs and $\overline{\text{OE}}1$	$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_{IL} = -1810\text{ mV}$	0.50			μA
V_{OH}		$V_{CC} = 4.5\text{ V}$, $V_{EE} = -4.5\text{ V} \pm 0.3\text{ V}$, $I_{OH} = -3\text{ mA}$	2.4	3.3		V
		$V_{CC} = 4.5\text{ V}$, $V_{EE} = -4.5\text{ V} \pm 0.3\text{ V}$, $I_{OH} = -15\text{ mA}$	2	3.1		
V_{OL}		$V_{CC} = 4.5\text{ V}$, $V_{EE} = -4.5\text{ V} \pm 0.3\text{ V}$, $I_{OL} = 48\text{ mA}$		0.38	0.55	V
I_{OZH}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_O = 2.7\text{ V}$			50	μA
I_{OZL}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_O = 0.5\text{ V}$			-50	μA
I_{OS}^{\ddagger}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$, $V_O = 0\text{ V}$	-100		-225	mA
I_{CCH}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$		64	97	mA
I_{CCL}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$		80	120	mA
I_{CCZ}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$		77	116	mA
I_{EE}		$V_{CC} = 5.5\text{ V}$, $V_{EE} = -4.8\text{ V}$		-22	-33	mA
C_i		$V_{CC} = 5\text{ V}$, $V_{EE} = 4.5\text{ V}$		5		pF
C_o		$V_{CC} = 5\text{ V}$, $V_{EE} = 4.5\text{ V}$		7		pF

[†] All typical values are at $V_{CC} = 5\text{ V}$, $V_{EE} = -4.5\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡] Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

switching characteristics over recommended ranges of supply voltage and operating free-air temperature (see Figure 1)

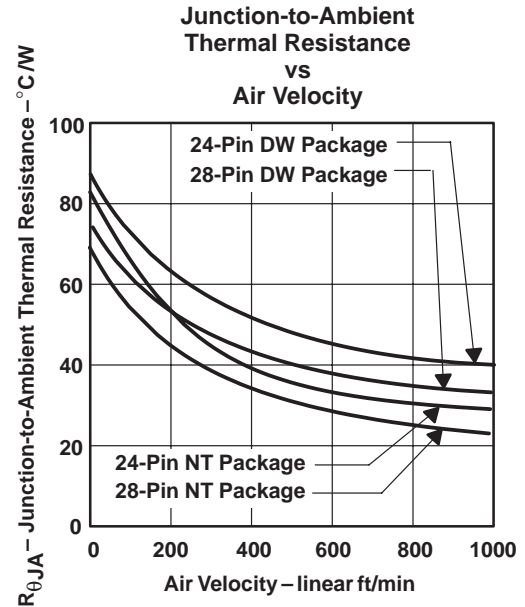
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$			UNIT
			MIN	TYP [§]	MAX	
t_{PLH}	A	Y	1.7	4	6.2	ns
t_{PHL}			1.6	4	6.2	
t_{PZH}	$\overline{\text{OE}}1$	Y	2.6	4.7	6.7	ns
t_{PZL}			3.2	5.9	8.5	
t_{PHZ}	$\overline{\text{OE}}1$	Y	2.9	5.4	7.8	ns
t_{PLZ}			1.9	4.9	7.8	
t_{PZH}	$\overline{\text{OE}}2$	Y	1.7	4	6.2	ns
t_{PZL}			2.5	5.1	7.7	
t_{PHZ}	$\overline{\text{OE}}2$	Y	2.1	4.3	6.4	ns
t_{PLZ}			1.1	3.7	6.3	

[§] All typical values are at $V_{CC} = 5\text{ V}$, $V_{EE} = -4.5\text{ V}$, $T_A = 25^\circ\text{C}$.

THERMAL INFORMATION

In digital system designs utilizing 100KT' or 10KHT' series logic level translators, good thermal management is an important consideration for proper circuit performance and extended reliability. The size of the "small outline" package makes thermal management even more important due to the increased board and thermal densities.

The thermal resistances in Figure 1 can be used to approximate typical and maximum virtual junction temperatures for the SN100KT' and SN10KHT' translators. The junction temperature of these devices may be estimated using Equation 1.



$$T_J = R_{\theta JA} (V_{CC} \cdot I_{CC} + V_{EE} \cdot I_{EE} + P_{DRIVER}) + T_A \quad (1)$$

where

T_J = virtual junction temperature

T_A = ambient air temperature

$R_{\theta JA}$ = thermal resistance, junction to ambient air

I_{CC} = TTL level supply current (from the databook)

I_{EE} = ECL supply current

V_{CC} = TTL level supply voltage (5 V for typical, 5.5 V for maximum)

V_{EE} = ECL level supply voltage:

SN10KHT' – (–5.2 V Typ, –5.46 V Max)

SN100KHT' – (–54.5 V Typ, –4.80 V Max)

P_{DRIVER} = total power consumed by the output driver

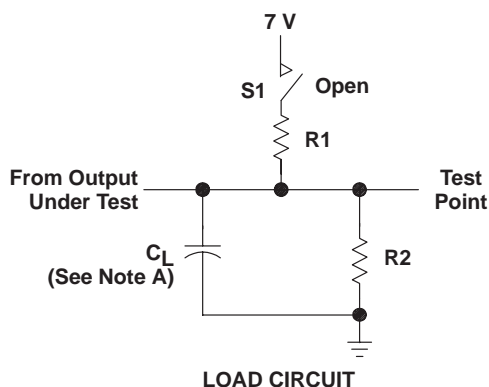
SN100KT5541

OCTAL ECL-TO-TTL TRANSLATOR

WITH 3-STATE OUTPUTS

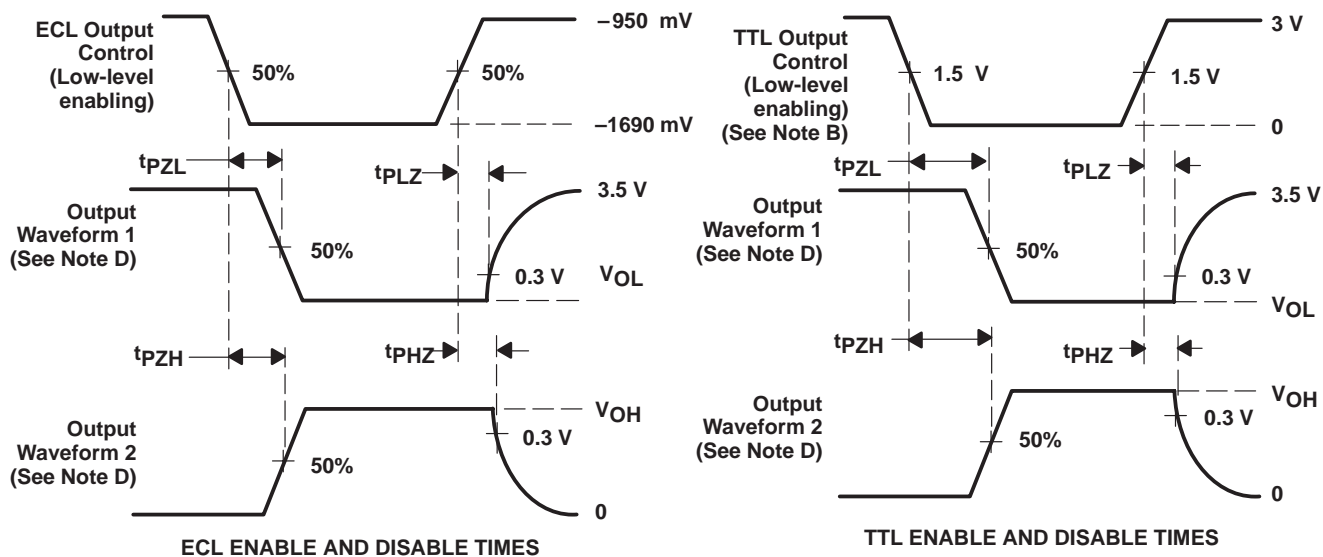
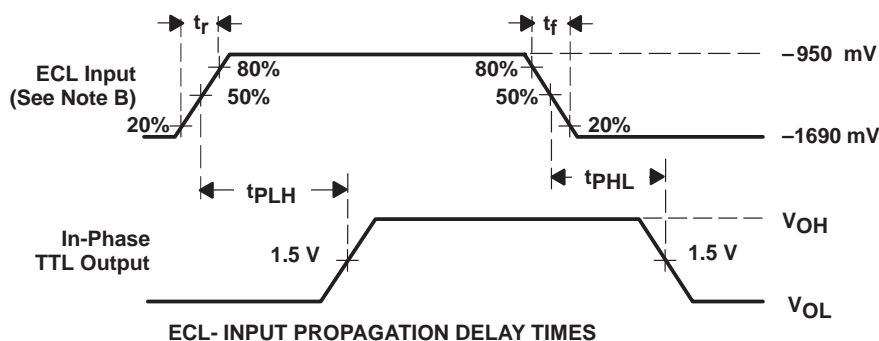
SDZS004A – NOVEMBER 1989 – REVISED MAY 1990

PARAMETER MEASUREMENT INFORMATION



SWITCH POSITION TABLE

TEST	S1
t _{PLH}	Open
t _{PHL}	Open
t _{PZH}	Open
t _{PZL}	Closed
t _{PHZ}	Open
t _{PLZ}	Closed



NOTES: A. C_L includes probe and jig capacitance.

B. For TTL inputs, input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.

C. For ECL inputs, input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 1.5 ns, t_f ≤ 1.5 ns.

D. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN100KT5541DW	OBSOLETE	SOIC	DW	24		TBD	Call TI	Call TI
SN100KT5541NT	OBSOLETE	PDIP	NT	24		TBD	Call TI	Call TI
SN100KT5541NT	OBSOLETE	PDIP	NT	24		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) 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.

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.

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 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.

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.

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

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
Low Power Wireless	www.ti.com/lpw	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 © 2006, Texas Instruments Incorporated