

# SN10KHT5541 OCTAL ECL-TO-TTL TRANSLATOR WITH 3-STATE OUTPUTS

SDZS003A – OCTOBER 1989 – REVISED OCTOBER 1990

- 10KH 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 10KH ECL signal environment and 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.

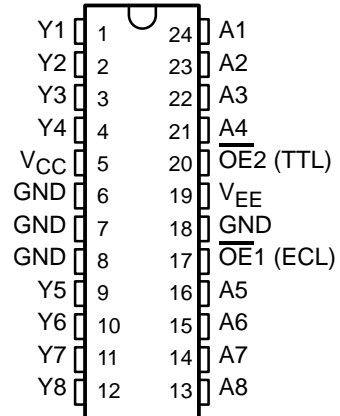
Two output-enable pins,  $\overline{OE}1$  and  $\overline{OE}2$ , are provided. These control inputs are ANDed together with  $\overline{OE}1$  being ECL compatible and  $\overline{OE}2$  being TTL compatible. This offers the choice of controlling the outputs of the device from either a TTL or ECL signal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

The SN10KHT5541 is characterized for operation from 0°C to 75°C.

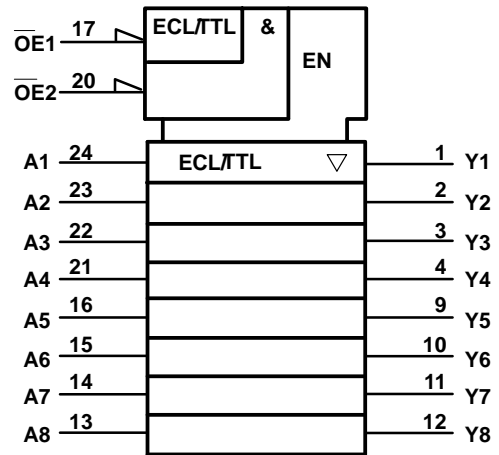
FUNCTION TABLE

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.

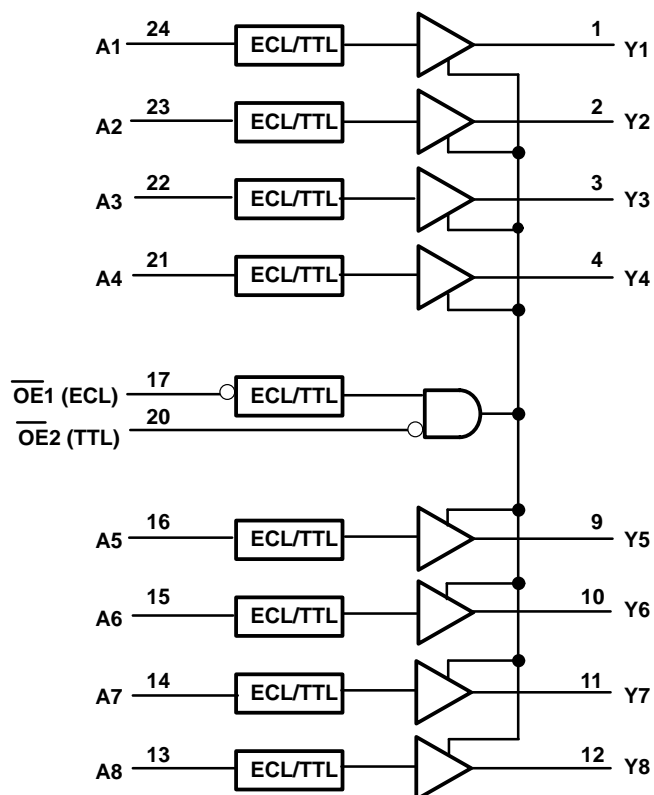
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logic diagram (positive logic)



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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

Supply voltage, $V_{CC}$	–0.5 V to 7 V
Supply voltage, $V_{EE}$	–8 V to 0 V
Input voltage (TTL) (see Note 1)	–1.2 V to 7 V
Input voltage (ECL)	$V_{EE}$ to 0 V
Voltage applied to any output in the disabled or power-off state	–0.5 V to 5.5 V
Voltage applied to any output in the high state	–0.5 V to $V_{CC}$
Input current (TTL)	–30 mA to 5 mA
Current into any output in the low state	96 mA
Operating free-air temperature range	0°C to 75°C
Storage temperature range	–65°C to 150°C

<sup>†</sup> 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	–4.94	–5.2	–5.46	V
$V_{IH}$	TTL high-level input voltage	2			V
$V_{IL}$	TTL low-level input voltage			0.8	V
$V_{IH}^{\ddagger}$	ECL high-level input voltage	$T_A = 0^\circ\text{C}$	–1170	–840	mV
		$T_A = 25^\circ\text{C}$	–1130	–810	
		$T_A = 75^\circ\text{C}$	–1070	–735	
$V_{IL}^{\ddagger}$	ECL low-level input voltage	$T_A = 0^\circ\text{C}$	–1950	–1480	mV
		$T_A = 25^\circ\text{C}$	–1950	–1480	
		$T_A = 75^\circ\text{C}$	–1950	–1450	
$I_{IK}$	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		75	°C

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

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

PARAMETER		TEST CONDITIONS		MIN	TYP <sup>†</sup>	MAX	UNIT
$V_{IK}$	OE2 only	$V_{CC} = 4.5\text{ V}$ , $V_{EE} = -4.94\text{ V}$ , $I_I = -18\text{ mA}$				-1.2	V
$I_I$	OE2 only	$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = 7\text{ V}$				0.1	mA
$I_{IH}$	OE2 only	$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = 2.7\text{ V}$				20	μA
$I_{IL}$	OE2 only	$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = 0.5\text{ V}$				-0.5	mA
$I_{IH}$	Data inputs and $\overline{\text{OE}}1$	$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = -840\text{ mV}$	$T_A = 0^\circ\text{C}$			350	μA
		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = -810\text{ mV}$	$T_A = 25^\circ\text{C}$			350	
		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = -735\text{ mV}$	$T_A = 75^\circ\text{C}$			350	
$I_{IL}$	Data inputs and $\overline{\text{OE}}1$	$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_I = -1950\text{ mV}$	$T_A = 0^\circ\text{C}$		0.5		μA
			$T_A = 25^\circ\text{C}$		0.5		
			$T_A = 75^\circ\text{C}$		0.5		
$V_{OH}$		$V_{CC} = 4.5\text{ V}$ , $V_{EE} = -5.2\text{ V} \pm 5\%$ , $I_{OH} = -3\text{ mA}$		2.4	3.3		V
		$V_{CC} = 4.5\text{ V}$ , $V_{EE} = -5.2\text{ V} \pm 5\%$ , $I_{OH} = -15\text{ mA}$		2	3.1		
$V_{OL}$		$V_{CC} = 4.5\text{ V}$ , $V_{EE} = -5.2\text{ V} \pm 5\%$ , $I_{OL} = 48\text{ mA}$			0.38	0.55	V
$I_{OZH}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_O = 2.7\text{ V}$				50	μA
$I_{OZL}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_O = 0.5\text{ V}$				-50	μA
$I_{OS}^\ddagger$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$ , $V_O = 0$		-100		-225	mA
$I_{CCH}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$			64	97	mA
$I_{CCL}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$			80	120	mA
$I_{CCZ}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$			77	116	mA
$I_{EE}$		$V_{CC} = 5.5\text{ V}$ , $V_{EE} = -5.46\text{ V}$			-22	-33	mA
$C_i$		$V_{CC} = 5\text{ V}$ , $V_{EE} = -5.2\text{ V}$			5		pF
$C_o$		$V_{CC} = 5\text{ V}$ , $V_{EE} = -5.2\text{ V}$			7		pF

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $V_{EE} = -5.2\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

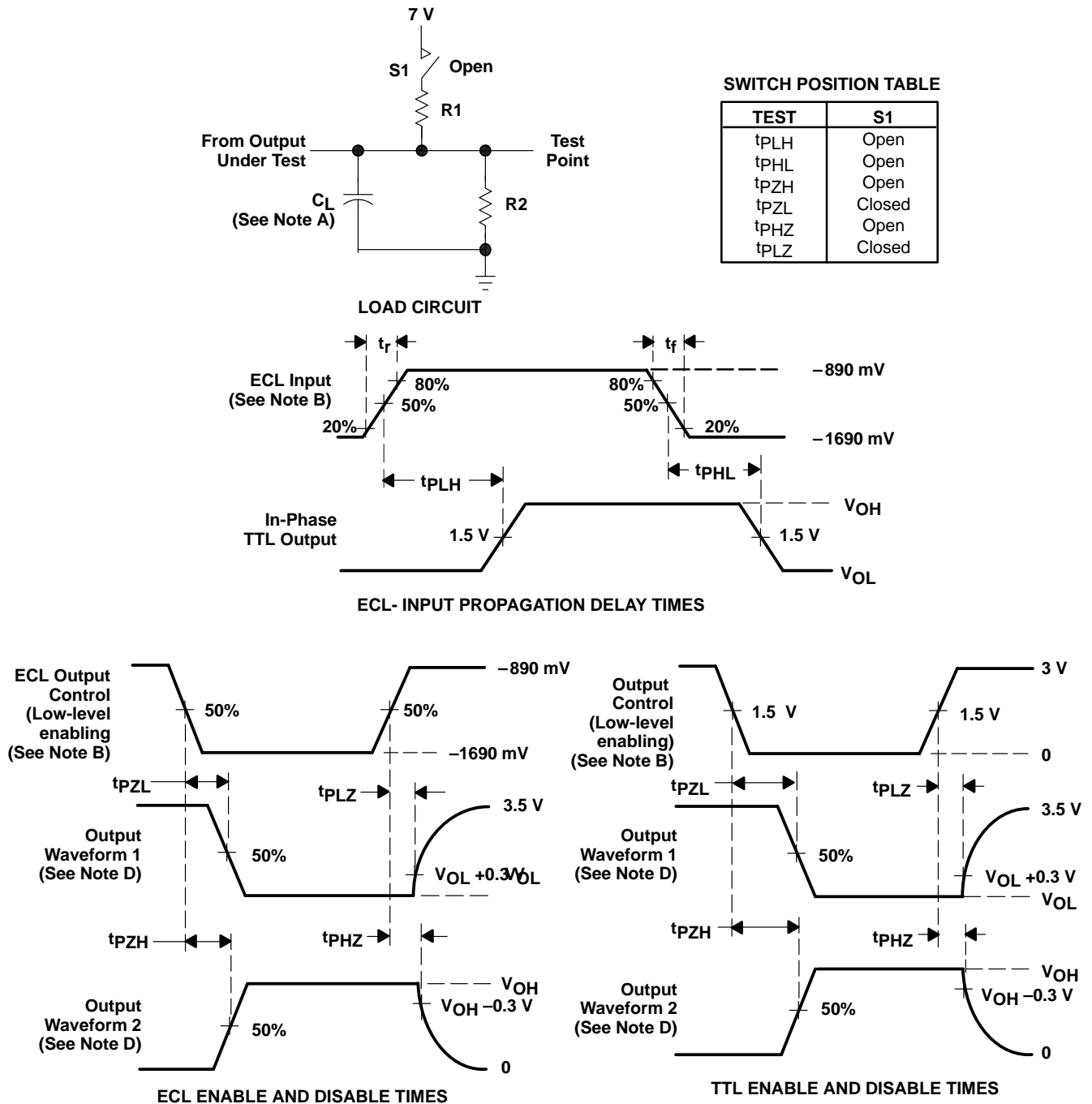
<sup>‡</sup> Not more than one output should be tested at a time and the duration of the test should not exceed 10 ms.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$C_L = 50\text{ pF}$ , $R_1 = 500\ \Omega$ , $R_2 = 500\ \Omega$			UNIT
			MIN	TYP <sup>§</sup>	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	

<sup>§</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $V_{EE} = -5.2\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

## PARAMETER MEASUREMENT INFORMATION



NOTES: A.  $C_L$  includes probe and jig capacitance.

B. For TTL inputs, input pulses are supplied by generators having the following characteristics: PRR  $\leq 10$  MHz,  $Z_0 = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.

C. For ECL inputs, input pulses are supplied by generators having the following characteristics: PRR  $\leq 10$  MHz,  $Z_0 = 50 \Omega$ ,  $t_r \leq 0.7$  ns,  $t_f \leq 0.7$  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

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