

SN74GTL2007

12-BIT GTL-/GTL/GTL+ TO LVTTTL TRANSLATOR

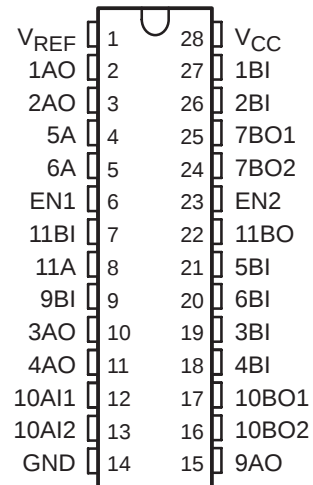
SCLS609 – MARCH 2005

- Operates as a GTL-/GTL/GTL+ to LVTTTL or LVTTTL to GTL-/GTL/GTL+ Translator
- Series Termination on TTL Outputs of 30 Ω
- Latch-Up Testing Done to JEDEC Standard JESD 78
- ESD Performance Tested Per JESD 22
 - 2000-V Human-Body Model (A114-B, Class II)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

description/ordering information

The SN74GTL2007 is a 12-bit translator to interface between the 3.3-V LVTTTL chip set I/O and the Xeon™ processor GTL-/GTL/GTL+ I/O. The device is designed for platform health management in dual-processor applications.

PW PACKAGE
(TOP VIEW)



PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	V _{REF}	GTL reference voltage
2-6, 8, 10-13, 15, 23	EN _n nA _n	Data and enable inputs/outputs (LVTTTL)
7, 9, 16, 17-22, 24-27	nB _n	Data inputs/outputs (GTL-/GTL/GTL+)
14	GND	Ground (0 V)
28	V _{CC}	Positive supply voltage

ORDERING INFORMATION

T _A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	TSSOP – PW	Tube	SN74GTL2007PW	GK2007
		Tape and reel	SN74GTL2007PWR	

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



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Function Tables

INPUTS		OUTPUT 1AO/2AO
EN1	1BI/2BI	
H	L	L
H	H	H
L	X	H

INPUTS		OUTPUT 3AO/4AO
EN2	3BI/4BI	
H	L	L
H	H	H
L	X	H

INPUT 9BI	OUTPUT 9AO
L	L
H	H

INPUTS		OUTPUT 10BO1/10BO2
10AI1/10AI2	9BI	
L	L	L
L	H	L
H	L	L
H	H	H

INPUTS		INPUT/OUTPUT 5A/6A (OPEN DRAIN)	OUTPUT 7BO1/7BO2
EN2	5BI/6BI		
H	L	L	H [†]
H	H	L [‡]	L
H	H	H	H
L	H	L [‡]	L
L	H	H	H
L	L	H	H
L	L	L [‡]	H

INPUT 11BI	INPUT/OUTPUT 11A (OPEN DRAIN)	OUTPUT 11BO
L	H	L
L	L [‡]	H
H	L	H

H = High voltage level

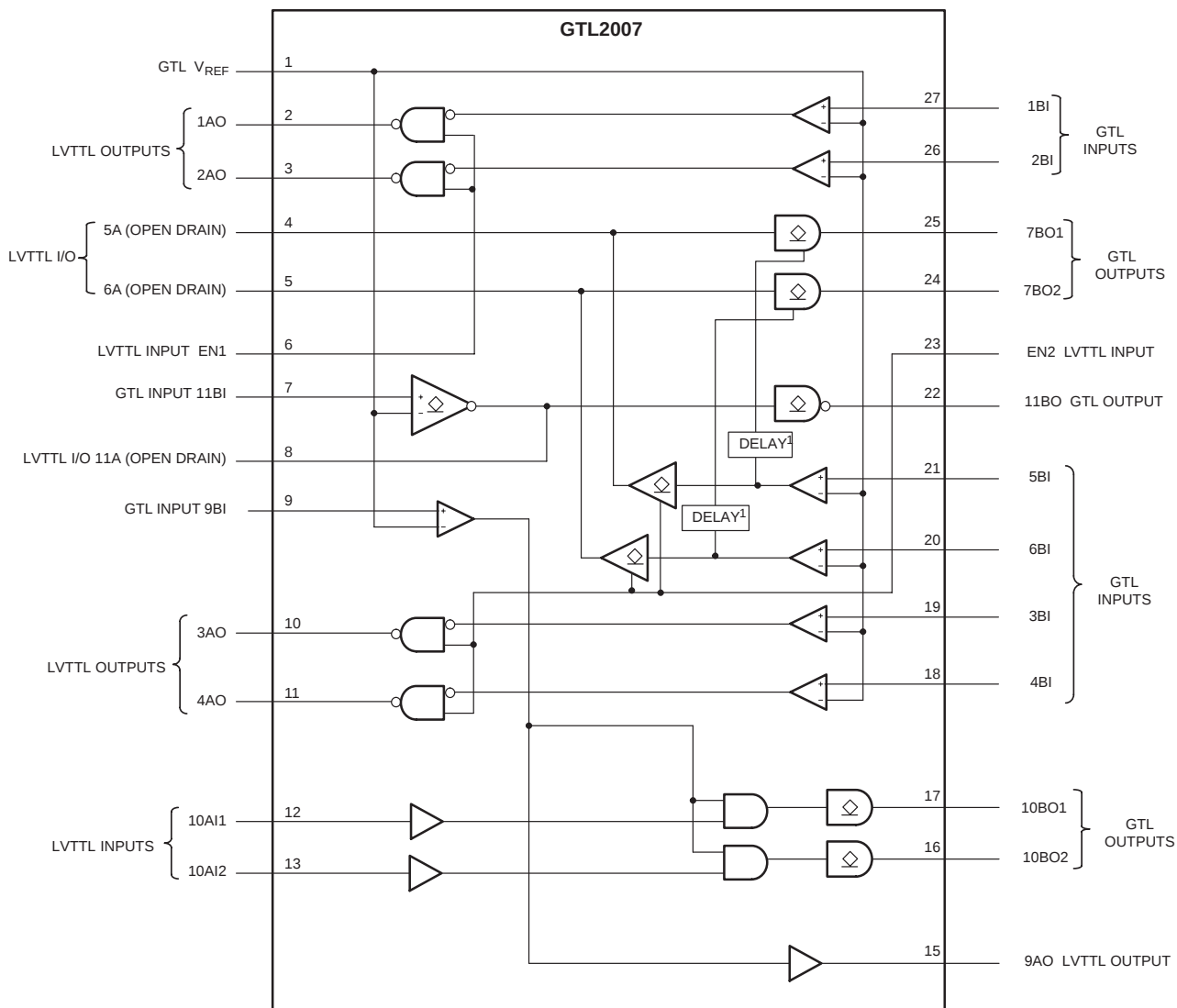
L = Low voltage level

[†] The enable on 7BO1/7BO2 includes a delay that prevents a transient condition (where 5BI/6BI goes from low to high, and the low to high on 5A/6A lags up to 100 ns) from causing a low glitch on the 7BO1/7BO2 outputs.

[‡] Open-drain input/output terminal is driven to a logic-low state by an external driver.



logic symbol



NOTE A: The enable on 7BO1/7BO2 includes a delay that prevents a transient condition (where 5BI/6BI go from low to high, and the low to high on 5A/6A lags up to 100 ns) from causing a low glitch on the 7BO1/7BO2 outputs.

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absolute maximum ratings over operating free-air temperature (unless otherwise noted)^{†‡}

Supply voltage range, V_{CC}	–0.5 to 4.6 V
Input voltage range, V_I (see Note 2): A port (LVTTTL)	–0.5 to 4.6 V
B port (GTL)	–0.5 to 4.6 V
Output voltage range, V_O (output in OFF or HIGH state)(see Note 2): A port	–0.5 to 4.6 V
B port	–0.5 to 4.6 V
Input diode current, I_{IK} ($V_I < 0$)	–50 mA
Output diode current, I_{OK} ($V_O < 0$)	–50 mA
Current into any output in the LOW state: A port	32 mA
B port	30 mA
Current into any output in the HIGH state, A port	–32 mA
Package thermal impedance, θ_{JA} (see Note 1)	62°C/W
Storage temperature range, T_{stg}	–60 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.

[‡] Voltages are referenced to GND (ground = 0 V).

- NOTES: 1. The performance capability of a high-performance integrated circuit, in conjunction with its thermal environment, can create junction temperatures that are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
2. The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	3	3.3	3.6	V
V_{TT}	Termination voltage	GTL–	0.85	0.9	0.95
		GTL	1.14	1.2	1.26
		GTL+	1.35	1.5	1.65
V_{REF}	Reference voltage	Overall	0.5	$2/3 V_{TT}$	1.8
		GTL–	0.5	0.6	0.63
		GTL	0.76	0.8	0.84
		GTL+	0.87	1	1.1
V_I	Input voltage	A port	0	3.3	3.6
		B port	0	V_{TT}	3.6
V_{IH}	HIGH-level input voltage	A port	2		
		B port	$V_{REF} + 50 \text{ mV}$		
V_{IL}	LOW-level input voltage	A port		0.8	
		B port	$V_{REF} - 50 \text{ mV}$		
I_{OH}	HIGH-level output current	A port		–16	mA
I_{OL}	LOW-level output current	A port		16	mA
		B port		15	
T_A	Operating free-air temperature range	–40		85	°C



electrical characteristics over recommended operating conditions

PARAMETER		TEST CONDITIONS	–40°C TO +85°C			UNIT
			MIN	TYP†	MAX	
VOH‡	A port	VCC = 3 V to 3.6 V, IOH = –100 µA	VCC – 0.2			V
		VCC = 3 V, IOH = –16 mA	2.1			
VOL‡	A port	VCC = 3 V, IOL = 16 mA	0.8			V
	B port	VCC = 3 V, IOL = 15 mA	0.4			
II	A port	VCC = 3.6 V, VI = VCC	±1			µA
		VCC = 3.6, VI = 0 V	±1			
	B port	VCC = 3.6 V, VI = VTT or GND	±1			
ICC	A or B port	VCC = 3.6 V, VI = VCC or GND, IO = 0	12			mA
ΔICC§	A port or control inputs	VCC = 3.6 V, VI = VCC – 0.6 V	500			µA
CIO	A port	VO = 3 V or 0	5			pF
	B port	VO = VTT or 0	4			

† All typical values are measured at $V_{CC} = 3.3\text{ V}$ and $T_A = 25^\circ\text{C}$.

‡ The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

§ This is the increase in supply current for each input that is at the specified LVTTTL voltage, rather than V_{CC} or GND.

switching characteristics over recommended operating free-air temperature range

PARAMETER		WAVEFORM	GTL–			GTL			GTL+			UNIT
			V _{CC} = 3.3 V ± 0.3 V V _{REF} = 0.6 V			V _{CC} = 3.3 V ± 0.3 V V _{REF} = 0.8 V			V _{CC} = 3.3 V ± 0.3 V V _{REF} = 1 V			
			MIN	TYP†	MAX	MIN	TYP†	MAX	MIN	TYP†	MAX	
t _{PLH}	An to Bn	1	2	4	8	2	4	8	2	4	8	ns
t _{PHL}			2	5.5	10	2	5.5	10	2	5.5	10	
t _{PLH}	Bn to An	2	2	5.5	10	2	5.5	10	2	5.5	10	ns
t _{PHL}			2	5.5	10	2	5.5	10	2	5.5	10	
t _{PLH}	9BI to 10BOn	3	2	6	11	2	6	11	2	6	11	ns
t _{PHL}			2	6	11	2	6	11	2	6	11	
t _{PLH}	11BI to 11BO	3	2	8	13	2	8	13	2	8	13	ns
t _{PHL} [¶]			2	14	21	2	14	21	2	14	21	
t _{PLH}	Bn to Bn	3	4	7	11	4	7	11	4	7	11	ns
t _{PHL}			120	205	350	120	205	350	120	205	350	
t _{PLH}	ENn to An	4	1	3	7	1	3	7	1	3	7	ns
t _{PHL}			1	3	7	1	3	7	1	3	7	
t _{PLZ}	Bn to An (I/O)	5	2	5	10	2	5	10	2	5	10	ns
t _{PZL}			2	5	10	2	5	10	2	5	10	
t _{PLZ}	EN2 to An (I/O)	6	1	3	7	1	3	7	1	3	7	ns
t _{PZL}			1	3	7	1	3	7	1	3	7	

† All typical values are measured at $V_{CC} = 3.3\text{ V}$ and $T_A = 25^\circ\text{C}$.

‡ Includes ~7.6-ns RC rise time of test-load pullup on 11-A, 1.5-k Ω pullup, and 21-pF load on 11 A has approximately 23-ns RC rise time.

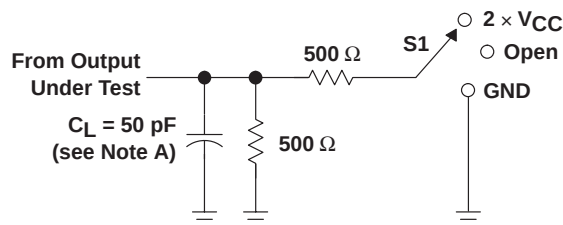
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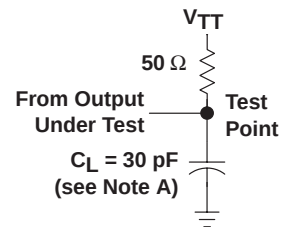
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PARAMETER MEASUREMENT INFORMATION

$V_{TT} = 1.2 \text{ V}$, $V_{REF} = 0.8 \text{ V}$ FOR GTL AND $V_{TT} = 1.5 \text{ V}$, $V_{REF} = 1 \text{ V}$ FOR GTL+

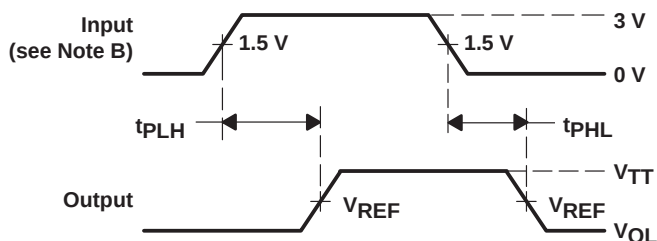


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$

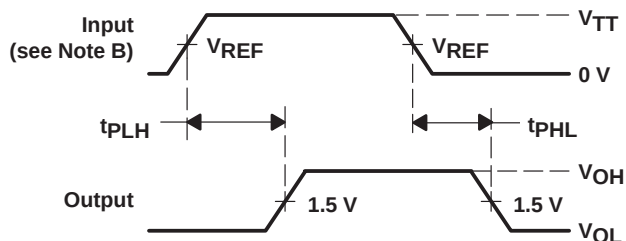


LOAD CIRCUIT FOR A OUTPUTS

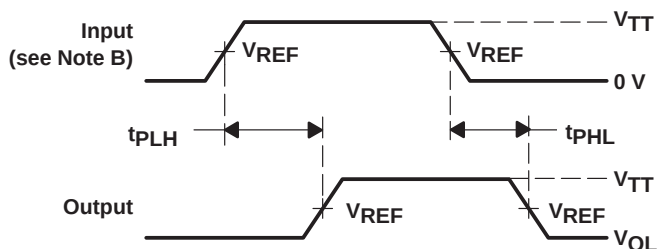
LOAD CIRCUIT FOR B OUTPUTS



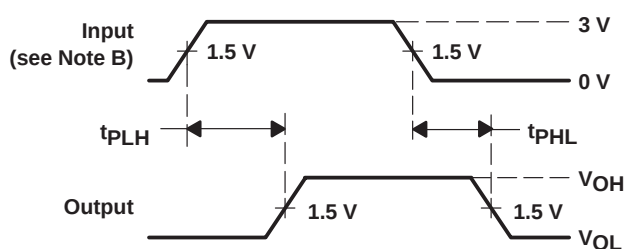
VOLTAGE WAVEFORM 1
PROPAGATION DELAY TIMES
(A port to B port)[†]



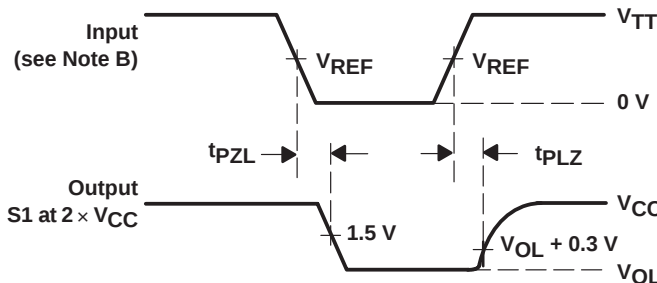
VOLTAGE WAVEFORM 2
PROPAGATION DELAY TIMES
(B port to A port)[†]



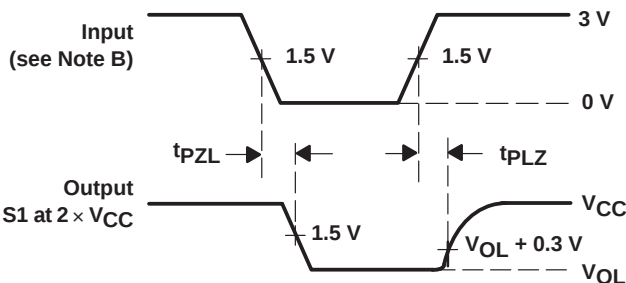
VOLTAGE WAVEFORM 3
PROPAGATION DELAY TIMES
(B port to B port)[†]



VOLTAGE WAVEFORM 4
PROPAGATION DELAY TIMES
(ENn to A port)[†]



VOLTAGE WAVEFORM 5
PROPAGATION DELAY TIMES
(B port to A (I/O) port)[†]



VOLTAGE WAVEFORM 6
ENABLE AND DISABLE TIMES
(EN2 to A (I/O) port)[†]

[†] All control inputs are LVTTTL levels.

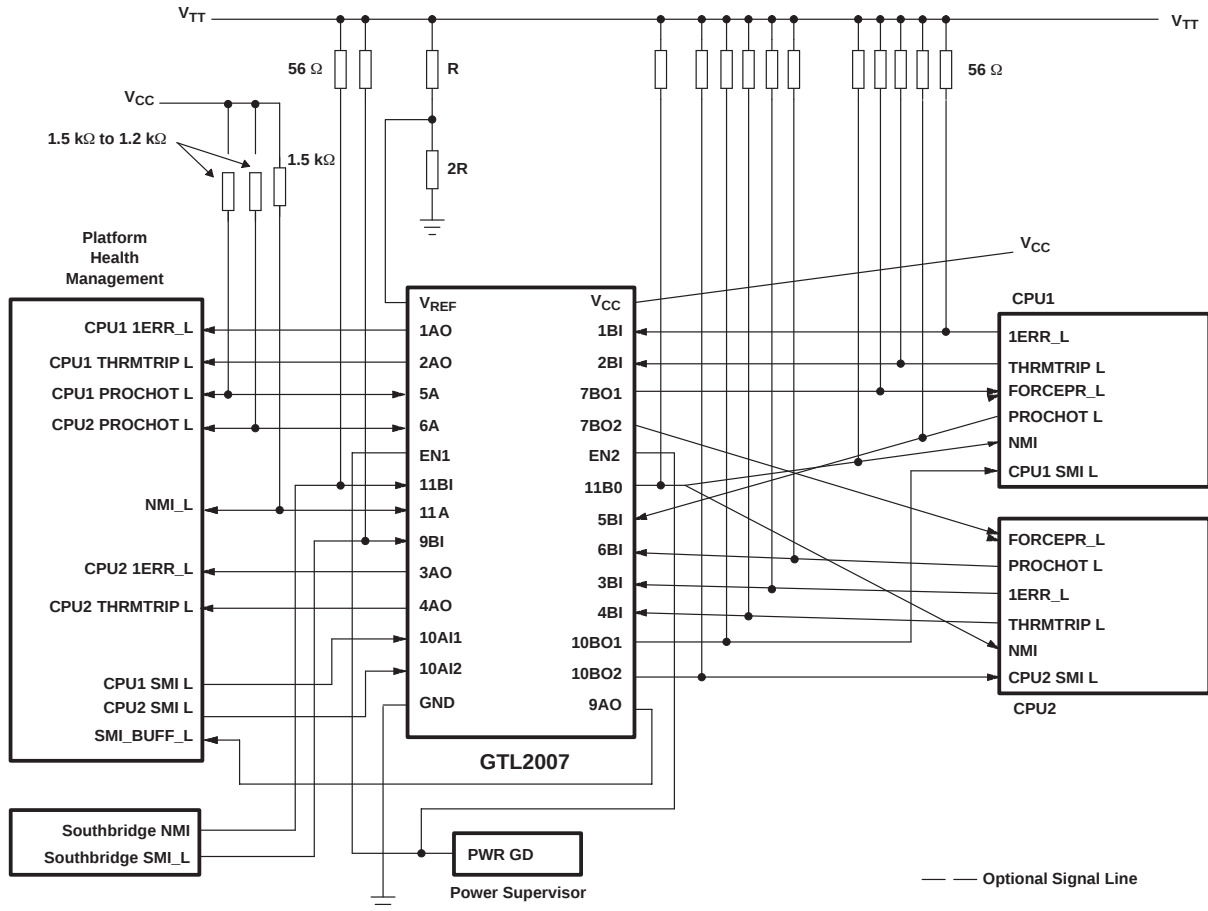
NOTES: A. C_L includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.

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

Figure 1. Load Circuits and Voltage Waveforms

APPLICATION INFORMATION



Frequently Asked Questions

Question 1: On the GTL2007 LVTTTL input, specifically 10AI1 and 10AI2, when the GTL2007 is powered down, these inputs may be pulled up to 3.3 V, and we want to ensure that there is no leakage path to the power rail under this condition. Are the LVTTTL inputs high impedance when the device is powered down, and will there be any leakage?

Answer 1: When the device is powered down, the LVTTTL inputs are in a high-impedance state and do not leak to V_{DD} if they are pulled high while the device is powered down.

Question 2: Do all the LVTTTL inputs have the same powered-down characteristic?

Answer 2: Yes

Question 3: What is the condition of the other GTL I/O and LVTTTL output pins when the device is powered down?

Answer 3: The open-drain outputs, both GTL and LVTTTL, do not leak to the power supply if they are pulled high while the device is powered down. The GTL inputs also do not leak to the power supply under the same conditions. The LVTTTL totem-pole outputs, however, are not open-drain type outputs, and there is no current flow on these pins if they are pulled high when V_{DD} is at ground.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74GTL2007PW	Active	Production	TSSOP (PW) 28	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	GK2007
SN74GTL2007PW.B	Active	Production	TSSOP (PW) 28	50 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	GK2007
SN74GTL2007PWR	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	GK2007
SN74GTL2007PWR.B	Active	Production	TSSOP (PW) 28	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	GK2007

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TAPE AND REEL INFORMATION



*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
SN74GTL2007PWR	TSSOP	PW	28	2000	330.0	16.4	6.75	10.1	1.8	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74GTL2007PWR	TSSOP	PW	28	2000	353.0	353.0	32.0

TUBE

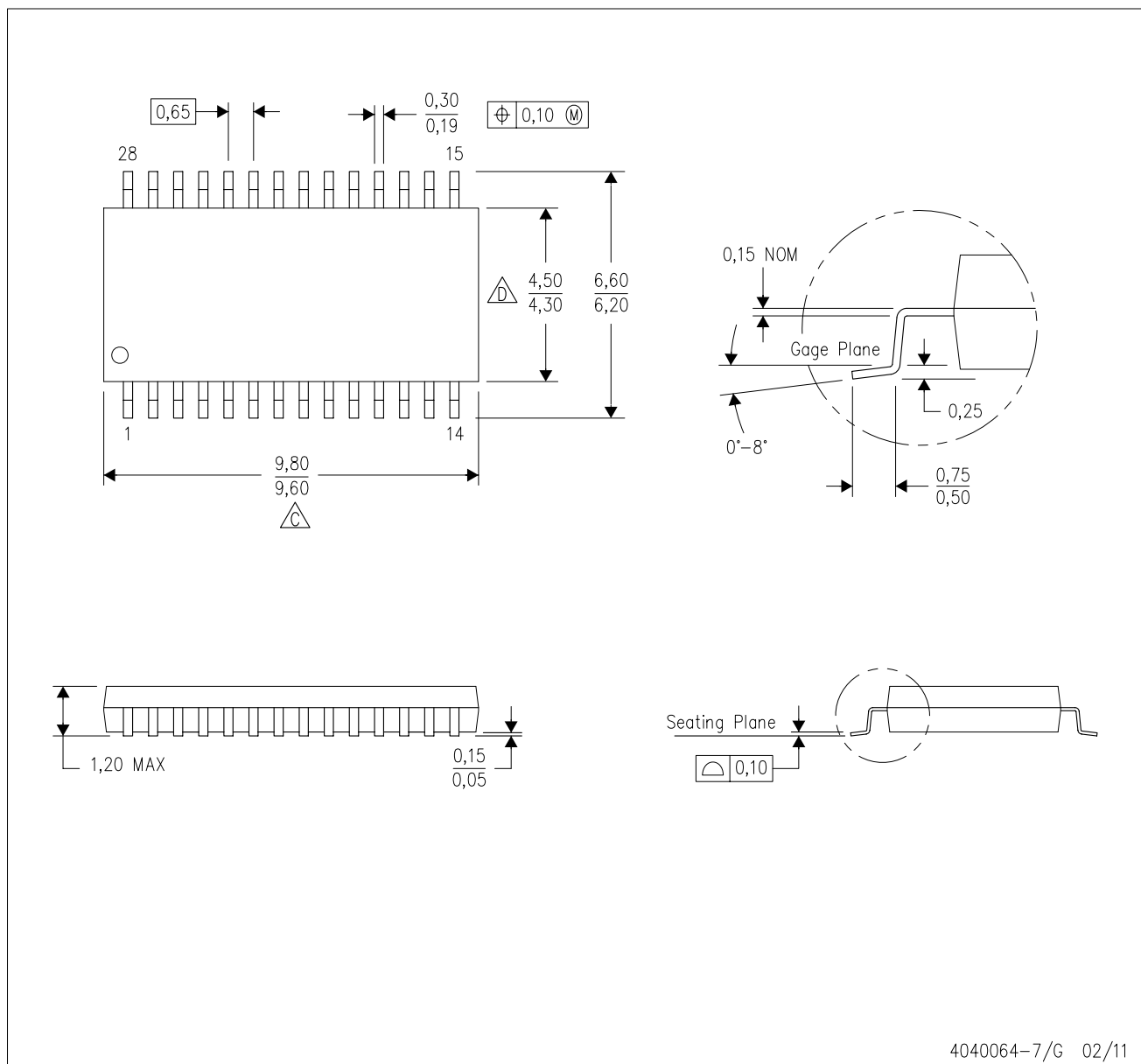


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74GTL2007PW	PW	TSSOP	28	50	530	10.2	3600	3.5
SN74GTL2007PW.B	PW	TSSOP	28	50	530	10.2	3600	3.5

PW (R-PDSO-G28)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

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