

# DATA SHEET

## **GTL2005**

Quad GTL/GTL+ to LVTTTL/TTL  
bidirectional non-latched translator

Product specification  
Supersedes data of 1999 Jun 23

1999 Sep 17

# Quad GTL/GTL+ to LVTTTL/TTL bidirectional non-latched translator

## GTL2005

### FEATURES

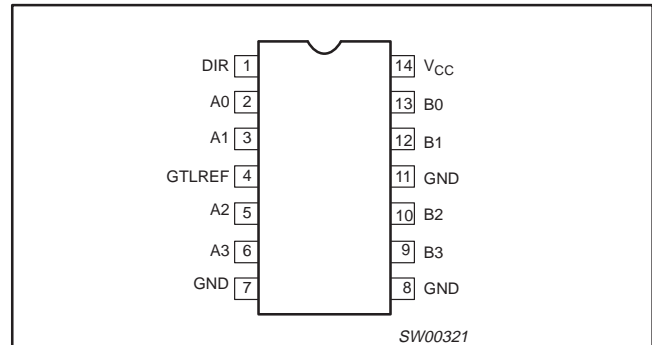
- Operates as a quad GTL/GTL+ sampling receiver or as a LVTTTL/TTL to GTL/GTL+ driver
- Quad bidirectional bus interface
- Live insertion/extraction permitted
- Latch-up protection exceeds 500 mA per JESD78
- ESD protection exceeds 2000 V HBM per JESD22-A114, and 1000 V CDM per JESD22-CC101

### DESCRIPTION

The GTL2005 is a quad translating transceiver designed for 3.3 V system interface with a GTL/GTL+ bus.

The direction pin allows the part to function as either a GTL to TTL sampling receiver or as a TTL to GTL interface.

### PIN CONFIGURATION



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}C$	TYPICAL		UNIT
			B to A	A to B	
$t_{PLH}$ $t_{PHL}$	Propagation delay An to Bn or Bn to An	$C_L = 50 \text{ pF}; V_{CC} = 3.3 \text{ V}$	2.1 1.9	4.1 4.3	ns
$C_{IN}$	Input capacitance DIR	$V_I = 0 \text{ V or } V_{CC}$	3.0	3.0	pF
$C_{I/O}$	I/O pin capacitance	Outputs disabled; $V_{I/O} = 0 \text{ V or } 3.0 \text{ V}$	7.8	4.5	pF

### ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DWG NUMBER
14-Pin Plastic TSSOP Type II	$-40^{\circ}C \text{ to } +85^{\circ}C$	GTL2005 PW DH	SOT402-1

### PIN DESCRIPTION

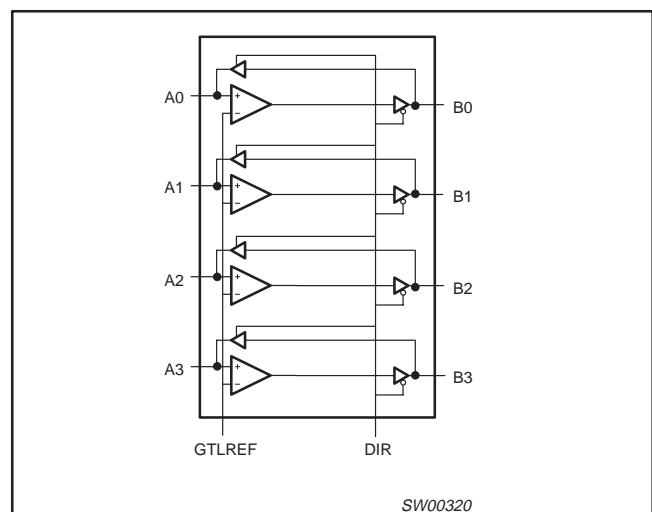
PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	DIR	Direction control input
2, 3, 5, 6	A0 – A3	Data inputs/outputs (A side, GTL)
13, 12, 10, 9	B0 – B3	Data inputs/outputs (B side, TTL)
4	GTLREF	GTL reference voltage
7, 8, 11	GND	Ground (0 V)
14	$V_{CC}$	Positive supply voltage

### FUNCTION TABLE

INPUT DIR	INPUT/OUTPUT	
	B	A
H	Inputs	$B_n = A_n$
L	$A_n = B_n$	Inputs

H = HIGH voltage level  
L = LOW voltage level

### LOGIC SYMBOL



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## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

In accordance with the Absolute Maximum System (IEC 134); voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +4.6	V
I <sub>IK</sub>	DC input diode current	V <sub>I</sub> < 0	-50	mA
V <sub>I</sub>	DC input voltage <sup>3</sup>	A port	-0.5 to +7.0	V
		B port	-0.5 to +4.6	V
I <sub>OK</sub>	DC output diode current	V <sub>O</sub> < 0	-50	mA
V <sub>O</sub>	DC output voltage <sup>3</sup>	Output in Off or High state; A port	-0.5 to +7.0	V
		Output in Off or High state; B port	-0.5 to +4.6	V
I <sub>OL</sub>	Current into any output in the LOW state	A port	128	mA
		B port	80	mA
I <sub>OH</sub>	Current into any output in the HIGH state	A port	-64	mA
T <sub>stg</sub>	Storage temperature range		-60 to +150	°C

### NOTES:

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

## RECOMMENDED OPERATING CONDITIONS<sup>1</sup>

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V <sub>CC</sub>	Supply voltage		0		3.6	V
V <sub>TT</sub>	Termination voltage	GTL	1.14	1.2	1.26	V
		GTL+	1.35	1.5	1.65	
V <sub>REF</sub>	Supply voltage	GTL	0.74	0.8	0.87	V
		GTL+	0.87	1.0	1.10	
V <sub>I</sub>	Input voltage	A port	0	0	V <sub>TT</sub>	V
		Except A port	0		5.5	
V <sub>IH</sub>	HIGH-level input voltage	A port	V <sub>REF</sub> + 50 mV			V
		Except A port	2			
V <sub>IL</sub>	LOW-level input voltage	A port			V <sub>REF</sub> - 50 mV	V
		Except A port			0.8	
I <sub>OH</sub>	HIGH-level output current	B port			-12	mA
I <sub>OL</sub>	LOW-level output current	A port			40	mA
		B port			12	mA
T <sub>amb</sub>	Operating free-air temperature range		-40		85	°C

### NOTE:

- Unused control inputs must be held HIGH or LOW to prevent them from floating.

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## DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			-40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>OH</sub>	B port	V <sub>CC</sub> = 3.0 to 3.6 V; I <sub>OH</sub> = -100 μA	V <sub>CC</sub> -0.2			V
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -12 mA	2.0			
V <sub>OL</sub>	A port	V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 40 mA			0.4	V
	B port	V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 12 mA			0.8	V
I <sub>I</sub>	Control inputs	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND			± 1	μA
	A port	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>TT</sub> or GND			± 1	
	B port	V <sub>CC</sub> = 0 or 3.6 V; V <sub>I</sub> = 5.5			10	
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub>			± 1	
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V			-5	
I <sub>OFF</sub>	A port	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5 V			± 100	μA
I <sub>EX</sub>	B port	V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 3.0 V		50	125	μA
I <sub>CC</sub>	A or B port	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0			3	mA
ΔI <sub>CC</sub> <sup>3</sup>	B port or control inputs	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V			500	μA
C <sub>I</sub>	Control inputs	V <sub>I</sub> = 3.0 V or 0		3		pF
C <sub>IO</sub>	B port	V <sub>O</sub> = 3.0 V or 0		7.8		pF
	A port	V <sub>O</sub> = V <sub>TT</sub> or 0		4.5		

### NOTES:

- All typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25°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 TTL voltage level rather than V<sub>CC</sub> or GND.

## AC CHARACTERISTICS (3.3 V ± 0.3 V RANGE)

SYMBOL	PARAMETER	WAVEFORM	LIMITS (GTL)			LIMITS (GTL+)			UNIT
			V <sub>CC</sub> = 3.3 V ± 0.3 V V <sub>REF</sub> = 0.8 V			V <sub>CC</sub> = 3.3 V ± 0.3 V V <sub>REF</sub> = 1.0 V			
			MIN	TYP <sup>1</sup>	MAX	MIN	TYP <sup>1</sup>	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Bn to An	1		2.1 1.9	2.3 2.6		2.1 1.9	2.3 2.6	ns
t <sub>PLH</sub> t <sub>PHL</sub>	An to Bn	2		4.1 4.4	5.4 5.4		4.2 3.8	5.3 4.8	

### NOTES:

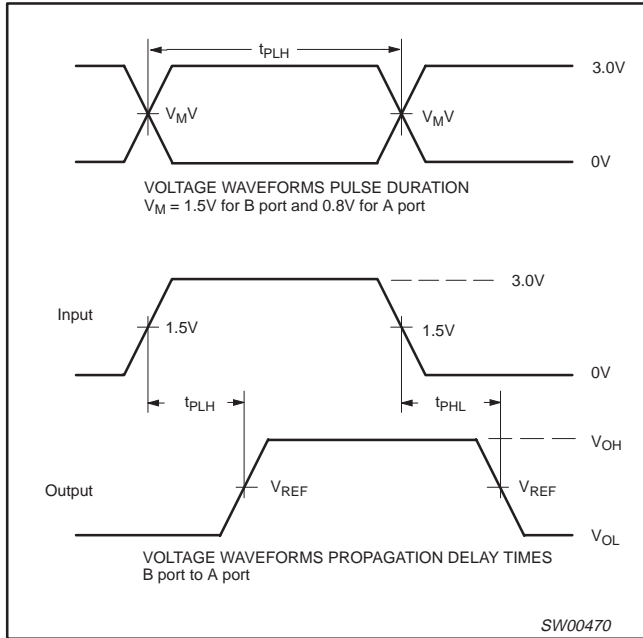
- All typical values are at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25°C.

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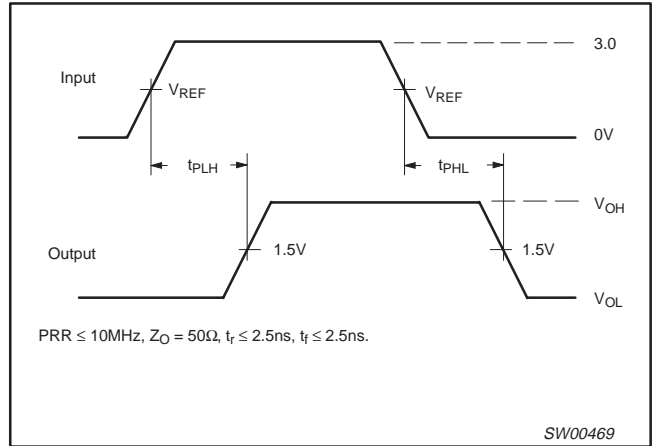
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## AC WAVEFORMS

$V_M = 1.5\text{ V}$  at  $V_{CC} \geq 3.0\text{ V}$ ,  $V_M = V_{CC}/2$  at  $V_{CC} \leq 2.7\text{ V}$  for B ports and control pins  
 $V_M = V_{REF}$  for A ports



Waveform 1.



Waveform 2.

## TEST CIRCUIT

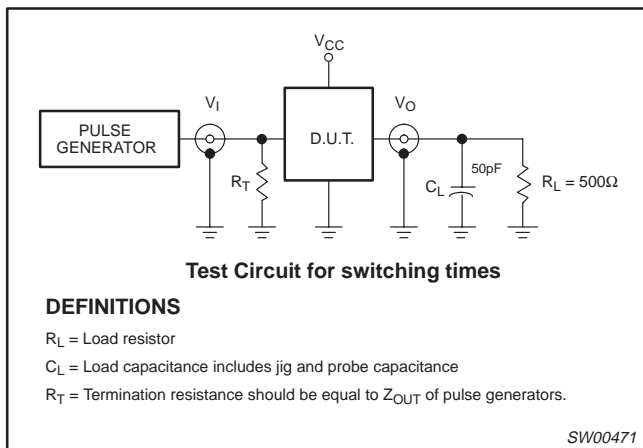


Figure 1. Load circuitry for switching times

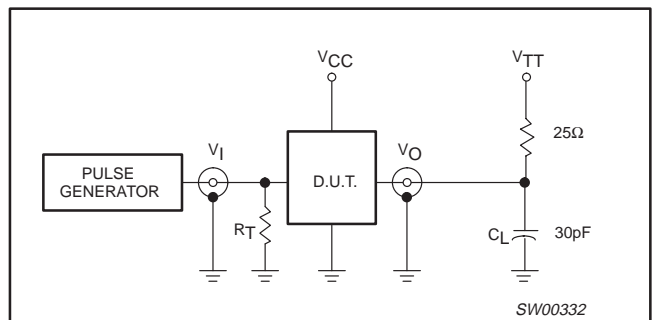


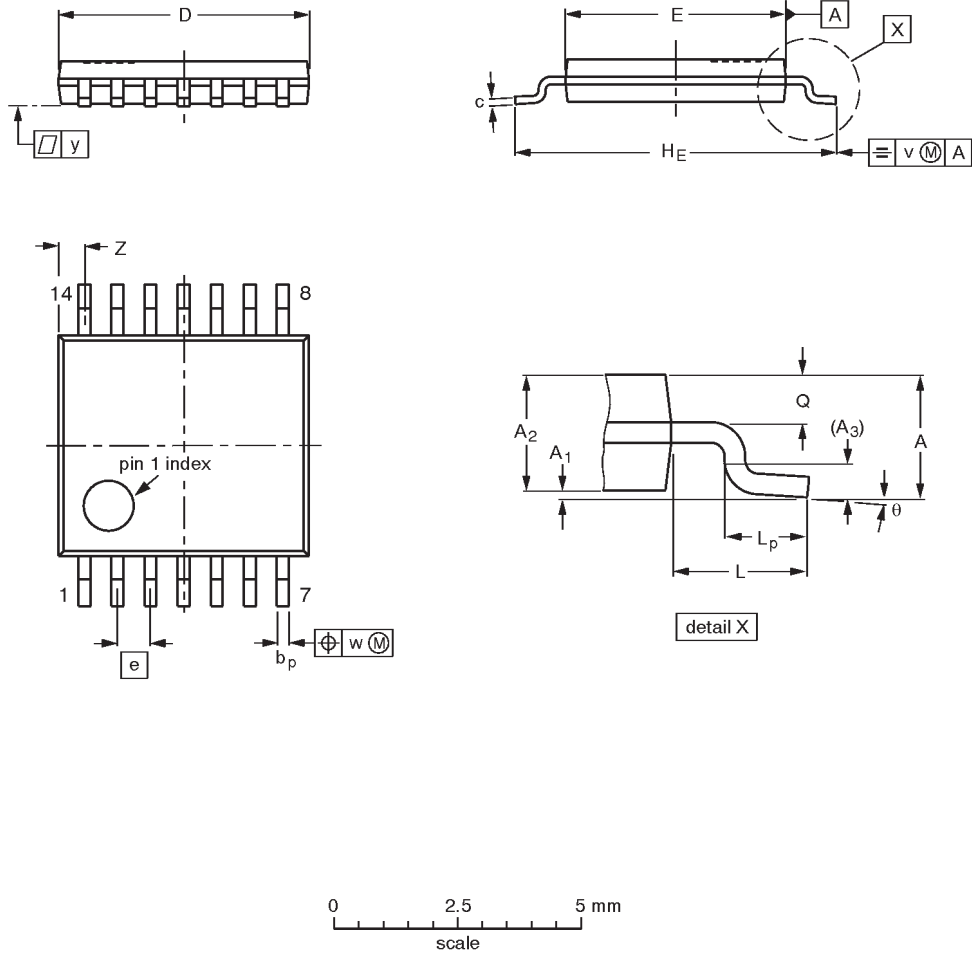
Figure 2. Load circuit for A outputs

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TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

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DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT402-1		MO-153				-94-07-12- 95-04-04

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**NOTES**

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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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Date of release: 12-99

Document order number:

9397 750 06695

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