

DATA SHEET

GTL2005

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

Product data
Supersedes data of 2000 Jun 19

2004 May 10

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

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FEATURES

- Operates as a quad GTL–/GTL/GTL+ sampling receiver or as a LVTTTL/TTL to GTL–/GTL/GTL+ driver
- Quad bidirectional bus interface
- 3.0 V to 3.6 V operation with 5 V tolerant LVTTTL I/O
- Live insertion/extraction permitted
- Latch-up protection exceeds 500 mA per JESD78
- ESD protection exceeds 2000 V HBM per JESD22-A114
200 V mm per JESD22-A115, and 1000 V CDM per JESD22-CC101
- Package offered: TSSOP14

DESCRIPTION

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

The GTL2005 LVTTTL interface is tolerant up to 5.5 V allowing direct access to TTL on 5 V CMOS outputs.

PIN CONFIGURATION

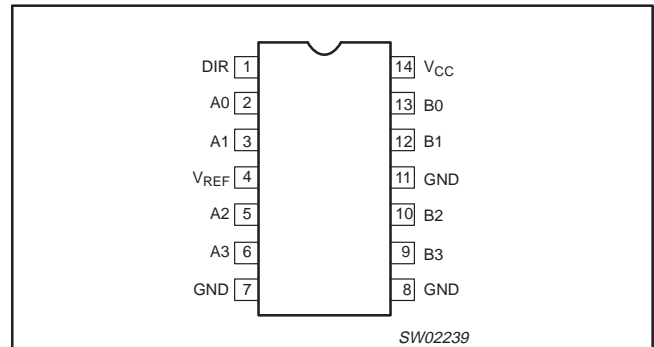


Figure 1. TSSOP14 pin configuration

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	V _{REF}	GTL reference voltage
7, 8, 11	GND	Ground (0 V)
14	V _{CC}	Positive supply voltage

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T _{amb} = 25 °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 pF; V _{CC} = 3.3 V	2.1 1.9	4.1 4.3	ns
C _{IN}	Input capacitance DIR	V _I = 0 V or V _{CC}	3.0	3.0	pF
C _{I/O}	I/O pin capacitance	Outputs disabled; V _{I/O} = 0 V or 3.0 V	7.8	4.5	pF

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	TOPSIDE MARK	DWG NUMBER
14-Pin Plastic TSSOP	–40 °C to +85 °C	GTL2005PW	GTL2005	SOT402-1

Standard packing quantities and other packaging data is available at www.philipslogic.com/packaging.

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LOGIC SYMBOL

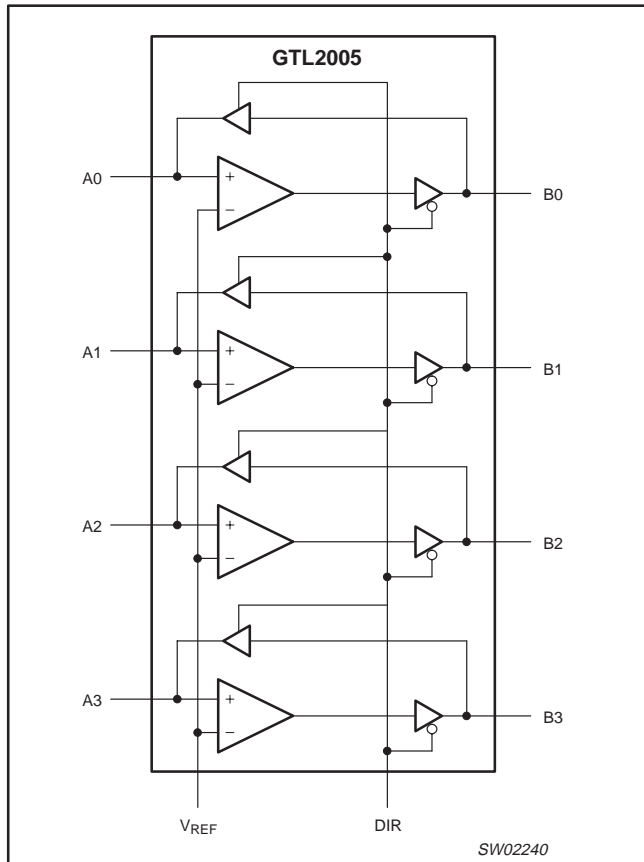


Figure 2. Logic symbol

FUNCTION TABLE

INPUT DIR	INPUT/OUTPUT	
	B	A
H	Inputs	Bn = An
L	An = Bn	Inputs

H = HIGH voltage level
L = LOW voltage level

ABSOLUTE MAXIMUM RATINGS¹

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

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		–0.5 to +4.6	V
I _{IK}	DC input diode current	V _I < 0 V	–50	mA
V _I	DC input voltage ³	A port	–0.5 to +7.0	V
		B port	–0.5 to +4.6	V
I _{OK}	DC output diode current	V _O < 0 V	–50	mA
V _O	DC output voltage ³	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 _{OL}	Current into any output in the LOW state	A port	128	mA
		B port	80	mA
I _{OH}	Current into any output in the HIGH state	A port	–64	mA
T _{stg}	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.

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RECOMMENDED OPERATING CONDITIONS¹

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
V_{CC}	Supply voltage		3.0	3.3	3.6	V
V_{TT}	Termination voltage	GTL–	0.85	0.9	0.95	V
		GTL	1.14	1.2	1.26	
		GTL+	1.35	1.5	1.65	
V_{REF}	Supply voltage	Overall ³	0.5	$\frac{2}{3}V_{TT}$	1.8	V
		GTL–	0.5	0.6	0.63	
		GTL	0.76	0.8	0.84	
		GTL+	0.87	1.0	1.10	
V_I	Input voltage	A port	0	V_{TT}	3.6	V
		Except A port	0	3.3	5.5	
V_{IH}	HIGH-level input voltage	A port	Note 2	–	–	V
		Except A port	2	–	–	
V_{IL}	LOW-level input voltage	A port	–	–	Note 2	V
		Except A port	–	–	0.8	
I_{OH}	HIGH-level output current	B port	–	–	–12	mA
I_{OL}	LOW-level output current	A port	–	–	40	mA
		B port	–	–	12	mA
T_{amb}	Operating free-air temperature range		–40	–	85	°C

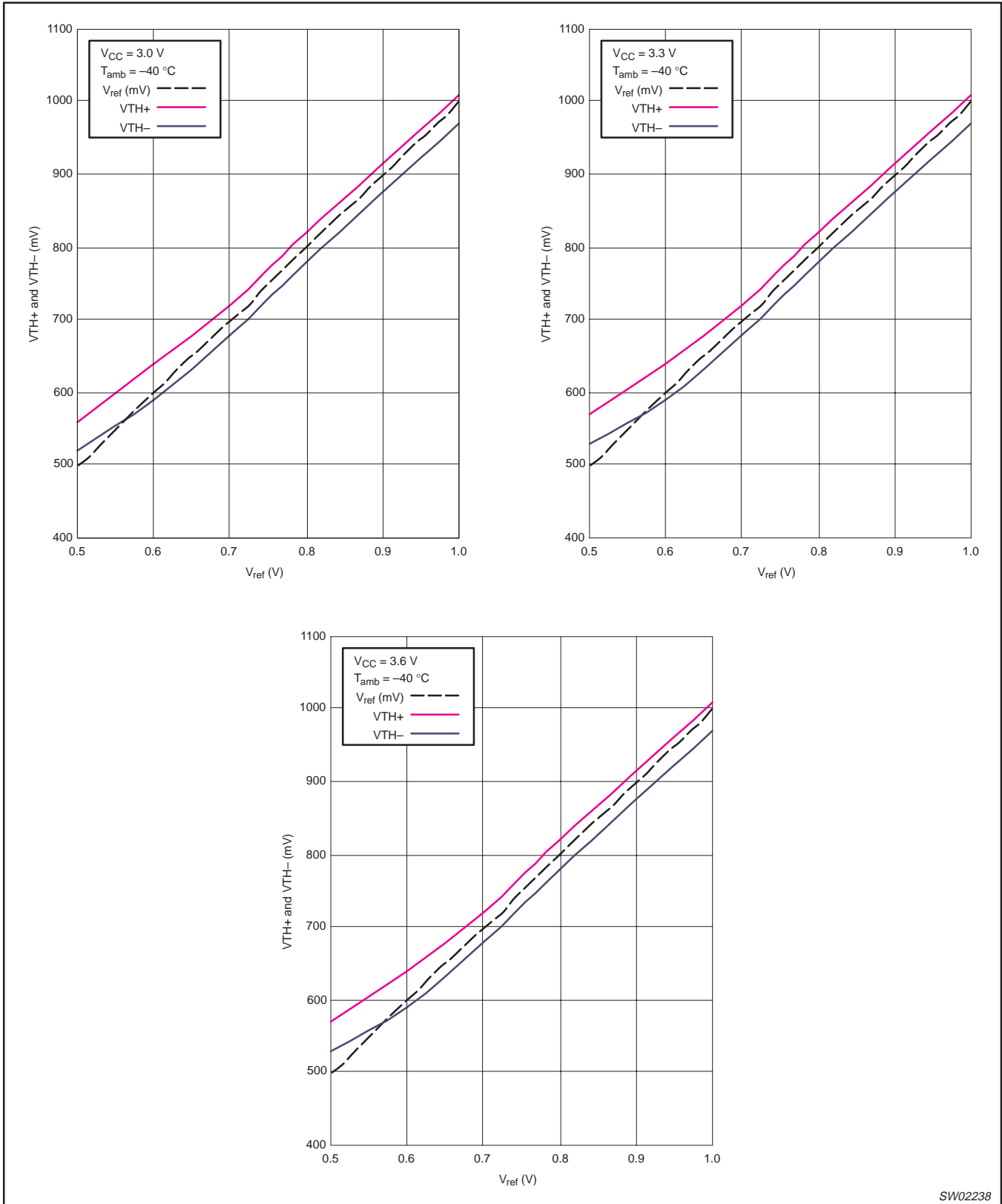
NOTES:

- Unused control inputs must be held HIGH or LOW to prevent them from floating.
- Nominally ± 50 mV around V_{REF} . See Figures 3, 4, and 5 for actual performance versus V_{REF} , V_{CC} , and Temperature.
- V_{REF} is normally $\frac{2}{3}V_{TT}$, but based upon application and noise margin requirements can be set anywhere within this range and does not need to follow GTL–/GTL/GTL+ specification.

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Performance curves



SW02238

Figure 3. GTL V_{TH+} and V_{TH-} versus V_{REF} at $T_{amb} = -40\text{ }^{\circ}\text{C}$

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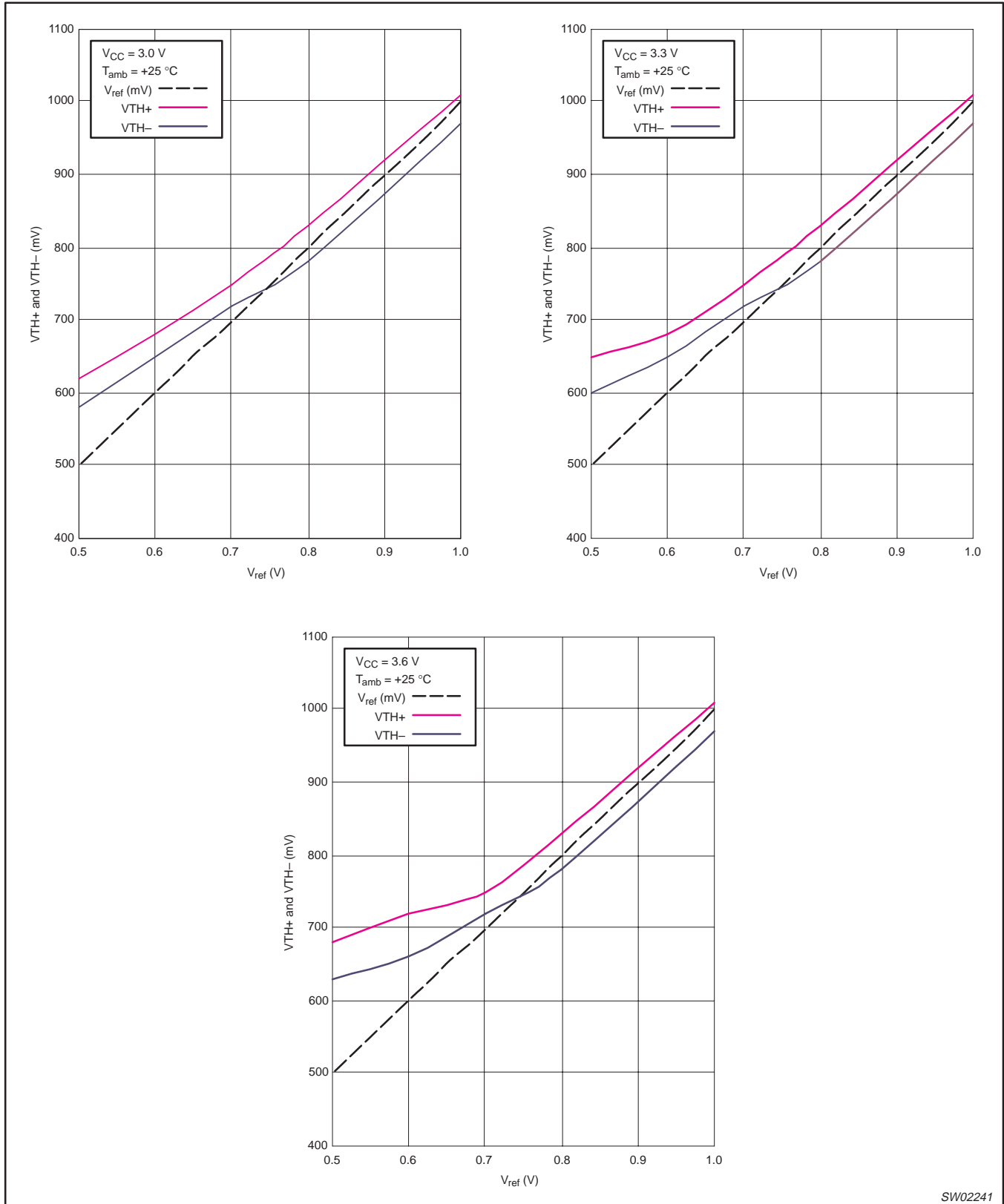


Figure 4. GTL V_{TH+} and V_{TH-} versus V_{REF} at $T_{amb} = +25\text{ }^{\circ}\text{C}$

SW02241

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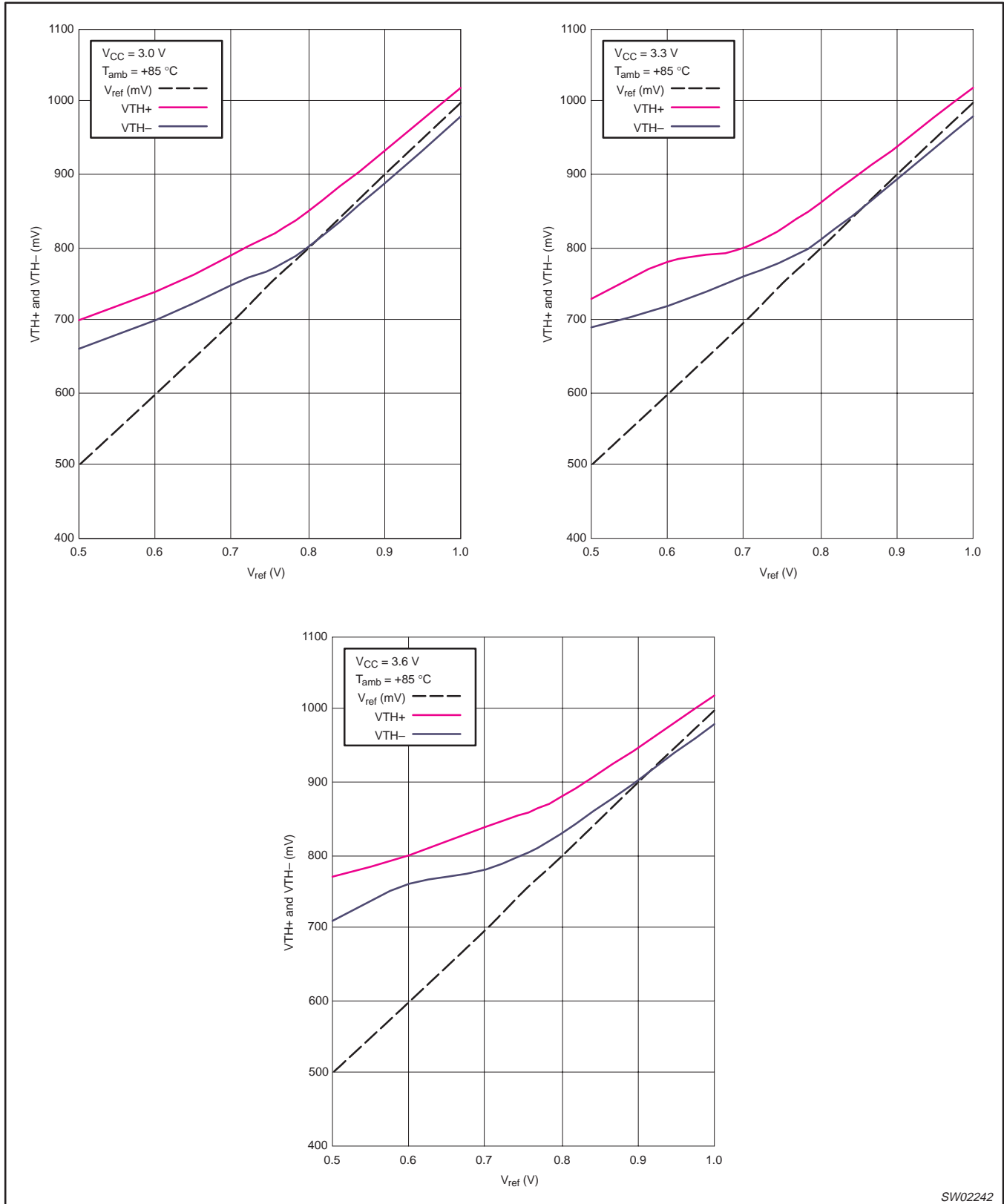


Figure 5. GTL V_{TH+} and V_{TH-} versus V_{REF} at $T_{amb} = +85^\circ\text{C}$

SW02242

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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 ¹	MAX	
V _{OH}	B port	V _{CC} = 3.0 V to 3.6 V; I _{OH} = –100 μA	V _{CC} – 0.2	–	–	V
		V _{CC} = 3.0 V; I _{OH} = –12 mA	2.0	–	–	
V _{OL}	A port	V _{CC} = 3.0 V; I _{OL} = 40 mA	–	–	0.4	V
	B port	V _{CC} = 3.0 V; I _{OL} = 12 mA	–	–	0.8	V
I _I	Control inputs	V _{CC} = 3.6 V; V _I = V _{CC} or GND	–	–	±1	μA
	A port	V _{CC} = 3.6 V; V _I = V _{TT} or GND	–	–	±1	
	B port	V _{CC} = 0 V or 3.6 V; V _I = 5.5 V	–	–	10	
		V _{CC} = 3.6 V; V _I = V _{CC}	–	–	±1	
		V _{CC} = 3.6 V; V _I = 0 V	–	–	–5	
I _{OFF}	A port	V _{CC} = 0 V; V _I or V _O = 0 V to 4.5 V	–	–	±100	μA
I _{EX}	B port	V _O = 5.5 V; V _{CC} = 3.0 V	–	50	125	μA
I _{CC}	A or B port	V _{CC} = 3.6 V; V _I = V _{CC} or GND; I _O = 0 mA	–	–	3	mA
ΔI _{CC} ³	B port or control inputs	V _{CC} = 3.6 V; V _I = V _{CC} – 0.6 V	–	–	500	μA
C _I	Control inputs	V _I = 3.0 V or 0 V	–	3	–	pF
C _{IO}	B port	V _O = 3.0 V or 0 V	–	7.8	–	pF
	A port	V _O = V _{TT} or 0 V	–	4.5	–	

NOTES:

- All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 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_{CC} or GND.

AC CHARACTERISTICS (3.3 V ± 0.3 V RANGE)

SYMBOL	PARAMETER	WAVEFORM	LIMITS (GTL–)			LIMITS (GTL)			LIMITS (GTL+)			UNIT
			V _{CC} = 3.3 V ± 0.3 V T _{amb} = 0 °C to +60 °C V _{REF} = 0.6 V			V _{CC} = 3.3 V ± 0.3 V T _{amb} = –40 °C to +85 °C V _{REF} = 0.8 V			V _{CC} = 3.3 V ± 0.3 V T _{amb} = 0 °C to +60 °C V _{REF} = 1.0 V			
			MIN	TYP ¹	MAX	MIN	TYP ¹	MAX	MIN	TYP ¹	MAX	
t _{PLH} t _{PHL}	Bn to An	1	–	2.1	2.3	–	2.1	2.3	–	2.1	2.3	ns
			–	1.9	2.6	–	1.9	2.6	–	1.9	2.6	
t _{PLH} t _{PHL}	An to Bn	2	–	4.1	5.4	–	4.1	5.4	–	4.2	5.3	ns
			–	4.4	5.4	–	4.4	5.4	–	3.8	4.8	

NOTES:

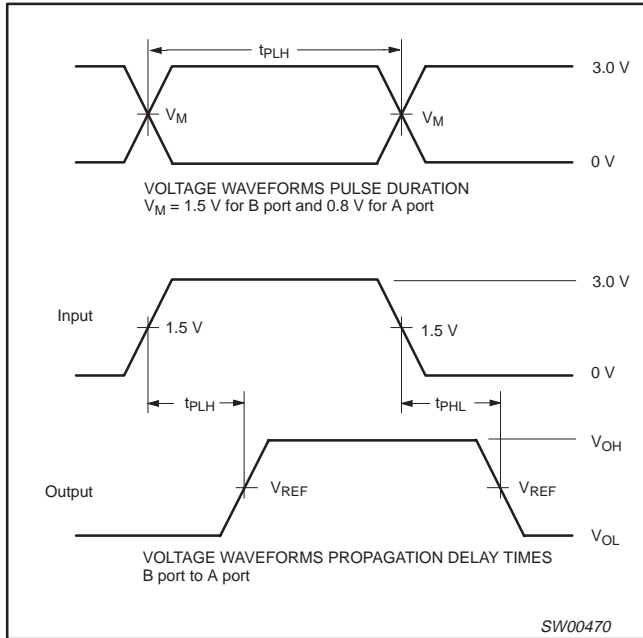
- All typical values are at V_{CC} = 3.3 V and T_{amb} = 25 °C.

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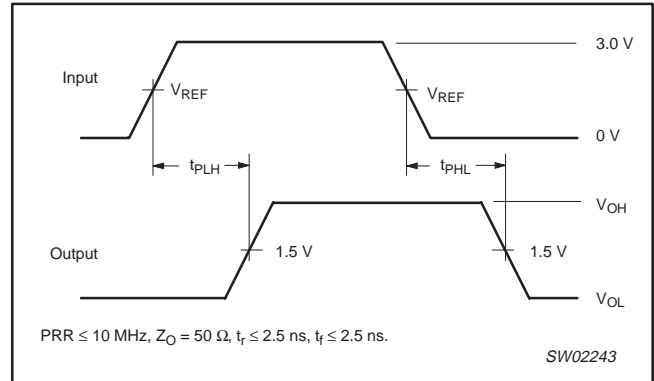
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AC WAVEFORMS

$V_M = 1.5\text{ V}$ 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

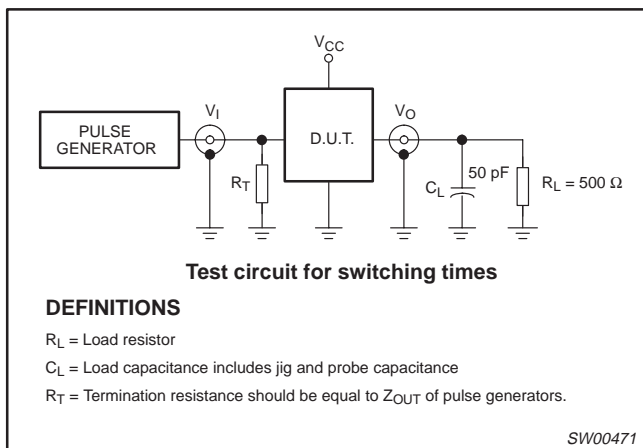


Figure 6. Load circuitry for switching times

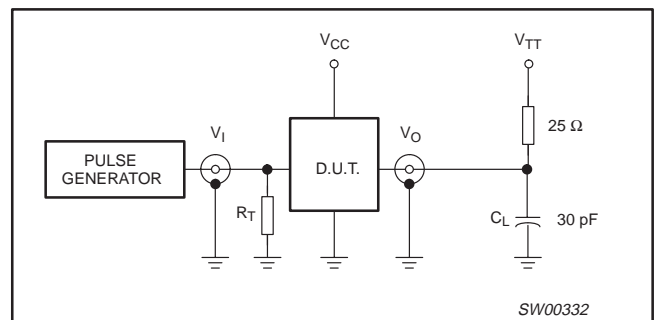


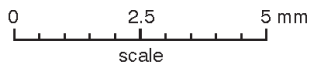
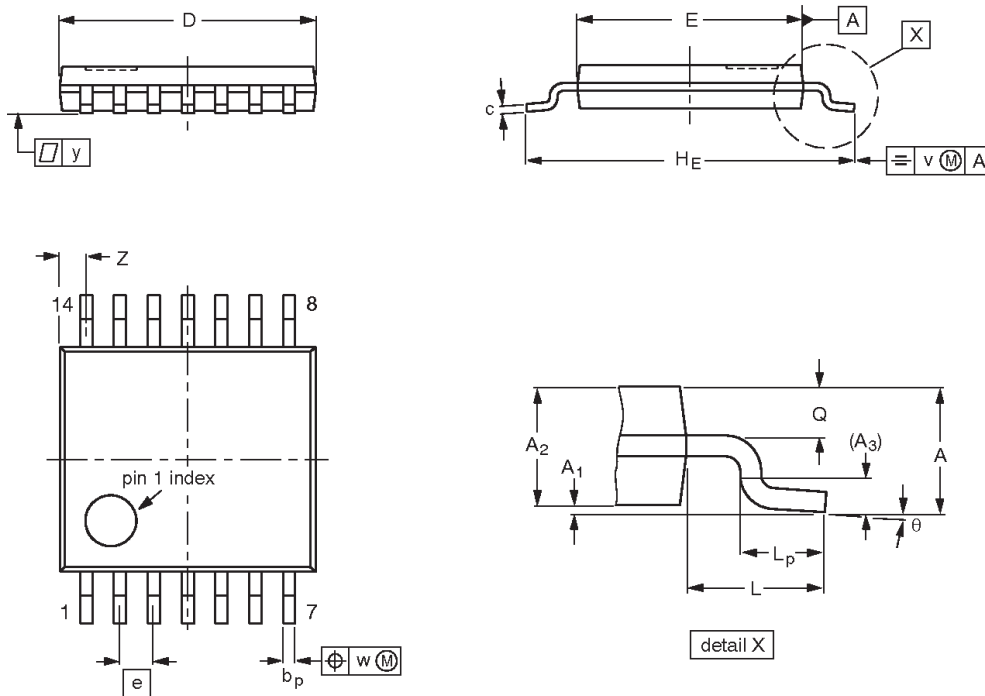
Figure 7. Load circuit for A outputs

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

SOT402-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	1.1	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	0.75 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	JEITA			
SOT402-1		MO-153				-99-12-27 03-02-18

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REVISION HISTORY

Rev	Date	Description
4	20040510	<p>Product data (9397 750 13104). Supersedes data of 2000 Jun 19 (9397 750 07222).</p> <p>Modifications:</p> <ul style="list-style-type: none"> ● Features section, first bullet: from “GTL/GTL+” to “GTL–/GTL/GTL+” ● All figures numbered. ● Figure 2, Logic symbol updated to new drawing standard. ● “Recommended operating conditions” table: <ul style="list-style-type: none"> – Add notes 2 and 3. – V{IH} (min) on A port: change from “$V_{REF} + 50$ mV” to “Note 2” – V_{IL} (max) on A port: change from “$V_{REF} - 50$ mV” to “Note 2” ● Added Figures 3, 4, and 5 (subsequent figures re-numbered). ● AC characteristics table: added temperature ratings to Limits header row.
_3	20000619	Product data (9397 750 07222). ECN 853-2171 23901 of 19 June 2000.
_2	19990917	Product data (9397 750 06695). ECN 853-2171 22353 of 17 September 1999.

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Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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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