

Figure 2: Input And Output Equivalent Circuit

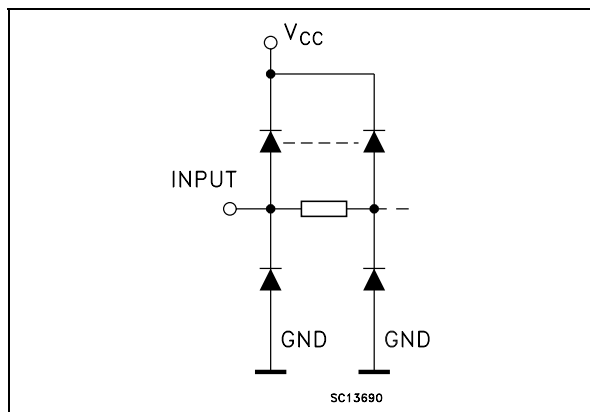


Table 2: Pin Description

PIN N°	SYMBOL	NAME QND FUNCTION
2	DIR	Directional Control
3, 4, 5, 6, 7, 8, 9, 10	A1 to A8	Data Inputs/Outputs
21, 20, 19, 18, 17, 16, 15, 14	B1 to B8	Data Inputs/Outputs
22	G	Output Enable Input
11, 12, 13	GND	Ground (0V)
23	NC	Not Connected
1	V <sub>CCA</sub>	Positive Supply Voltage
24	V <sub>CCB</sub>	Positive Supply Voltage

Table 3: Truth Table

INPUTS		FUNCTION		OUTPUT
$\overline{G}$	DIR	A BUS	B BUS	
L	L	OUTPUT	INPUT	A = B
L	H	INPUT	OUTPUT	B = A
H	X	Z	Z	Z

X : Don't Care

Z : High Impedance

Table 4: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V <sub>CCA</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>CCB</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CCA</sub> + 0.5	V
V <sub>I/OA</sub>	DC I/O Voltage	-0.5 to V <sub>CCA</sub> + 0.5	V
V <sub>I/OB</sub>	DC I/O Voltage	-0.5 to V <sub>CCB</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 50	mA
I <sub>OA</sub>	DC Output Current	± 50	mA
I <sub>OB</sub>	DC Output Current	± 50	mA
I <sub>CCA</sub>	DC V <sub>CC</sub> or Ground Current	± 200	mA
I <sub>CCB</sub>	DC V <sub>CC</sub> or Ground Current	± 100	mA
P <sub>d</sub>	Power Dissipation	180	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

Table 5: Recommended Operating Conditions

Symbol	Parameter	Value	Unit
$V_{CCA}$	Supply Voltage (note 1)	2.7 to 3.6	V
$V_{CCB}$	Supply Voltage (note 1)	4.5 to 5.5	V
$V_I$	Input Voltage	0 to $V_{CCA}$	V
$V_{I/OA}$	I/O Voltage	0 to $V_{CCA}$	V
$V_{I/OB}$	I/O Voltage	0 to $V_{CCB}$	V
$T_{op}$	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (note 2)	0 to 10	ns/V

1)  $V_{IN}$  from 30% to 70% of  $V_{CC}$ 2)  $V_{CCA} = 2.7$  to  $3.6V$ ;  $V_{CCB} = 4.5$  to  $5.5V$ ;Table 6: DC Specifications For  $V_{CCA}$ 

Symbol	Parameter	Test Condition			Value						Unit	
		$V_{CCA}$ (V)	$V_{CCB}$ (V)		$T_A = 25\text{ }^\circ\text{C}$			$-40$ to $85\text{ }^\circ\text{C}$		$-55$ to $125\text{ }^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IHA}$	High Level Input Voltage	3.6	5.0		2.0			2.0		2.0		V
		2.7	5.0		2.0			2.0		2.0		
$V_{ILA}$	Low Level Input Voltage	3.6	5.0				0.8		0.8		0.8	V
		2.7	5.0				0.8		0.8		0.8	
$V_{OHA}$	High Level Output Voltage	3.0	4.5	$I_O = -100\text{ }\mu\text{A}$	2.9	2.99		2.9		2.9		V
		3.0	4.5	$I_O = -24\text{ mA}$	2.35	2.65		2.25		2.25		
		2.7	4.5	$I_O = -12\text{ mA}$	2.3	2.5		2.2		2.2		
		2.7	4.5	$I_O = -24\text{ mA}$	2.1	2.3		2.0		2.0		
$V_{OLA}$	Low Level Output Voltage	3.0	4.5	$I_O = 100\text{ }\mu\text{A}$		0.002	0.1		0.1		0.1	V
		3.0	4.5	$I_O = 24\text{ mA}$		0.21	0.36		0.44		0.44	
		2.7	4.5	$I_O = 12\text{ mA}$		0.11	0.36		0.44		0.44	
		2.7	4.5	$I_O = 24\text{ mA}$		0.22	0.42		0.5		0.5	
$I_{IA}$	Input Leakage Current	3.6	5.5	$V_I = V_{CC}$ or GND			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu\text{A}$
$I_{OZA}$	High Impedance Output Leakage Current	3.6	5.5	$V_{IA} = V_{IHA}$ or $V_{ILA}$ $V_{IB} = V_{IHB}$ or $V_{ILB}$ $V_{I/OA} = V_{CCA}$ or GND			$\pm 0.5$		$\pm 5$		$\pm 5$	$\mu\text{A}$
$I_{CCTA}$	Quiescent Supply Current	3.6	5.5	$V_{IA} = V_{CCA}$ or GND $V_{IB} = V_{CCB}$ or GND			5		50		50	$\mu\text{A}$
$\Delta I_{CCTA}$	Maximum Quiescent Supply Current / Input (An, DIR, G)	3.6	5.5	$V_{IA} = V_{CCA} - 0.6V$ $V_{IB} = V_{CCB}$ or GND			0.35		0.5		0.5	mA

Table 7: DC Specifications For  $V_{CCB}$ 

Symbol	Parameter	Test Condition			Value						Unit	
		$V_{CCA}$ (V)	$V_{CCB}$ (V)		$T_A = 25\text{ }^\circ\text{C}$			$-40\text{ to }85\text{ }^\circ\text{C}$		$-55\text{ to }125\text{ }^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IHB}$	High Level Input Voltage	3.3	4.5		2.0			2.0		2.0		V
		3.3	5.5		2.0			2.0		2.0		
$V_{ILB}$	Low Level Input Voltage	3.3	4.5				0.8		0.8		0.8	V
		3.3	5.5				0.8		0.8		0.8	
$V_{OHB}$	High Level Output Voltage	3.0	4.5	$I_O = -100\text{ }\mu\text{A}$	4.4	4.5		4.4		4.4		V
		3.3	4.5	$I_O = -24\text{ mA}$	3.86	4.25		3.75		3.75		
$V_{OLB}$	Low Level Output Voltage	3.0	4.5	$I_O = 100\text{ }\mu\text{A}$		0.002	0.1		0.1		0.1	V
		3.3	4.5	$I_O = 24\text{ mA}$		0.18	0.36		0.44		0.44	
$I_{IB}$	Input Leakage Current	3.6	5.5	$V_I = V_{CCA}$ or GND			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu\text{A}$
$I_{OZB}$	High Impedance Output Leakage Current	3.6	5.5	$V_{IA} = V_{IHA}$ or $V_{ILA}$ $V_{I/OB} = V_{CCB}$ or GND			$\pm 0.5$		$\pm 5$		$\pm 5$	$\mu\text{A}$
$I_{CCB}$	Quiescent Supply Current	3.6	5.5	$V_{IA} = V_{CCA}$ or GND $V_{IB} = V_{CCB}$ or GND			8		80		80	$\mu\text{A}$
$\Delta I_{CCB}$	Maximum Quiescent Supply Current / Input	3.6	5.5	$V_{IA} = V_{CCA}$ or GND $V_{IB} = V_{CCB} - 2.1\text{V}$			1.35		1.5		1.5	mA

Table 8: Dynamic Switching Characteristics

Symbol	Parameter	Test Condition			Value						Unit	
		$V_{CCA}$ (V)	$V_{CCB}$ (V)		$T_A = 25\text{ }^\circ\text{C}$			$-40\text{ to }85\text{ }^\circ\text{C}$		$-55\text{ to }125\text{ }^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{OLPA}$	Dynamic Low Level Quiet Output (note 1, 2)	3.3	5.0			1.0	1.5					V
		3.3	5.0		-1.2	-0.6						
$V_{OLPB}$	Dynamic Low Level Quiet Output (note 1, 2)	3.3	5.0			0.8	1.2					V
		3.3	5.0		-0.8	-0.5						
$V_{IHDA}$	Dynamic High Voltage Input (note 1, 3)	3.3	5.0				2					V
$V_{ILD A}$	Dynamic Low Voltage Input (note 1, 3)	3.3	5.0		0.8							V
$V_{IHD B}$	Dynamic High Voltage Input (note 1, 3)	3.3	5.0				2					V
$V_{ILD B}$	Dynamic Low Voltage Input (note 1, 3)	3.3	5.0		0.8							V

1) Worst case package

2) Max number of output defined as (n). Data inputs are driven 0V to 3.3V, (n-1) outputs switching and one output at GND

3) Max number of data inputs (n) switching. (n-1) switching 0V to 3.3V. Inputs under test switching: 3V to threshold ( $V_{ILD}$ ). 0V to threshold ( $V_{IHD}$ )  $f = 1\text{MHz}$

Table 9: AC Electrical Characteristics ( $C_L = 50\text{pF}$ , Input  $t_r = t_f = 3\text{ns}$ )

Symbol	Parameter	Test Condition		Value <sup>(3)</sup>						Unit				
				$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$					
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.			
$t_{PLH}$	Propagation Delay Time ( $A_n$ to $B_n$ )	2.7					1.0	9.0	1.0	10.0	ns			
		3.0 <sup>(*)</sup>					1.0	5.4	8.0	1.0		8.5	1.0	9.5
$t_{PHL}$	Propagation Delay Time ( $A_n$ to $B_n$ )	2.7					1.0	8.5	1.0	9.5	ns			
		3.0 <sup>(*)</sup>					1.0	5.6	7.5	1.0		8.0	1.0	9.5
$t_{PZL}$	Output Enable Time ( $\bar{G}$ to $B_n$ )	2.7					1.0	9.0	1.0	10.0	ns			
		3.0 <sup>(*)</sup>					1.0	4.8	8.0	1.0		8.5	1.0	9.5
$t_{PZH}$	Output Enable Time ( $G$ to $B_n$ )	2.7					1.0	9.5	1.0	10.5	ns			
		3.0 <sup>(*)</sup>					1.0	6.3	8.5	1.0		9.0	1.0	10.0
$t_{PLZ}$	Output Disable Time ( $\bar{G}$ to $B_n$ )	2.7					1.0	8.5	1.0	9.5	ns			
		3.0 <sup>(*)</sup>					1.0	5.3	7.5	1.0		8.5	1.0	9.5
$t_{PHZ}$	Output Disable Time ( $\bar{G}$ to $B_n$ )	2.7					1.0	8.0	1.0	9.0	ns			
		3.0 <sup>(*)</sup>					1.0	4.2	7.0	1.0		7.5	1.0	8.5
$t_{PLH}$	Propagation Delay Time ( $B_n$ to $A_n$ )	2.7					1.0	8.5	1.0	9.5	ns			
		3.0 <sup>(*)</sup>					1.0	5.1	7.5	1.0		8.0	1.0	8.5
$t_{PHL}$	Propagation Delay Time ( $B_n$ to $A_n$ )	2.7					1.0	8.5	1.0	9.0	ns			
		3.0 <sup>(*)</sup>					1.0	5.7	7.5	1.0		8.0	1.0	8.5
$t_{PZL}$	Output Enable Time ( $G$ to $A_n$ )	2.7					1.0	9.5	1.0	10.0	ns			
		3.0 <sup>(*)</sup>					1.0	6.3	8.5	1.0		9.0	1.0	9.5
$t_{PZH}$	Output Enable Time ( $\bar{G}$ to $A_n$ )	2.7					1.0	10.0	1.0	10.5	ns			
		3.0 <sup>(*)</sup>					1.0	6.8	9.0	1.0		9.5	1.0	10.0
$t_{PLZ}$	Output Disable Time ( $G$ to $A_n$ )	2.7					1.0	9.0	1.0	9.5	ns			
		3.0 <sup>(*)</sup>					1.0	5.3	8.0	1.0		8.5	1.0	9.0
$t_{PHZ}$	Output Disable Time ( $\bar{G}$ to $A_n$ )	2.7					1.0	7.5	1.0	8.0	ns			
		3.0 <sup>(*)</sup>					1.0	3.7	6.5	1.0		7.0	1.0	8.0
$t_{OSLH}$ $t_{OSHL}$	Output To Output Skew Time (note 1, 2)	2.7						0.5	1.0		1.5		1.5	ns
		3.0 <sup>(*)</sup>						0.5	1.0		1.5		1.5	

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW

2) Parameter guaranteed by design

3) Typical values at  $V_{CCA} = 3.3\text{V}$ ,  $V_{CCB} = 5.0\text{V}$

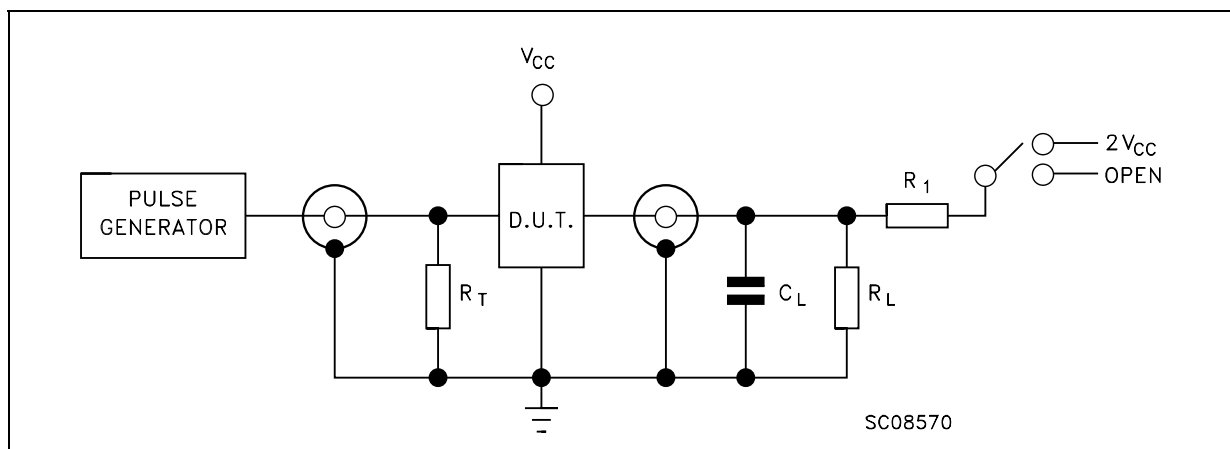
(\*) Voltage range is  $3.0\text{V} \pm 0.3\text{V}$

Table 10: Capacitive Characteristics

Symbol	Parameter	Test Condition			Value						Unit	
		$V_{CCA}$ (V)	$V_{CCB}$ (V)		$T_A = 25\text{ }^\circ\text{C}$			$-40\text{ to }85\text{ }^\circ\text{C}$		$-55\text{ to }125\text{ }^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$C_{IN}$	Input Capacitance	open	open			4.5						V
$C_{I/O}$	Input/Output Capacitance	3.3	5.0			10						V
$C_{PD}$	Dynamic Low Level Quiet Output (note 1) A to B	3.3	5.0			55						V
$C_{PD}$	Dynamic Low Level Quiet Output (note 1) B to A	3.3	5.0			40						V

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/8$  (per circuit)

Figure 3: Test Circuit

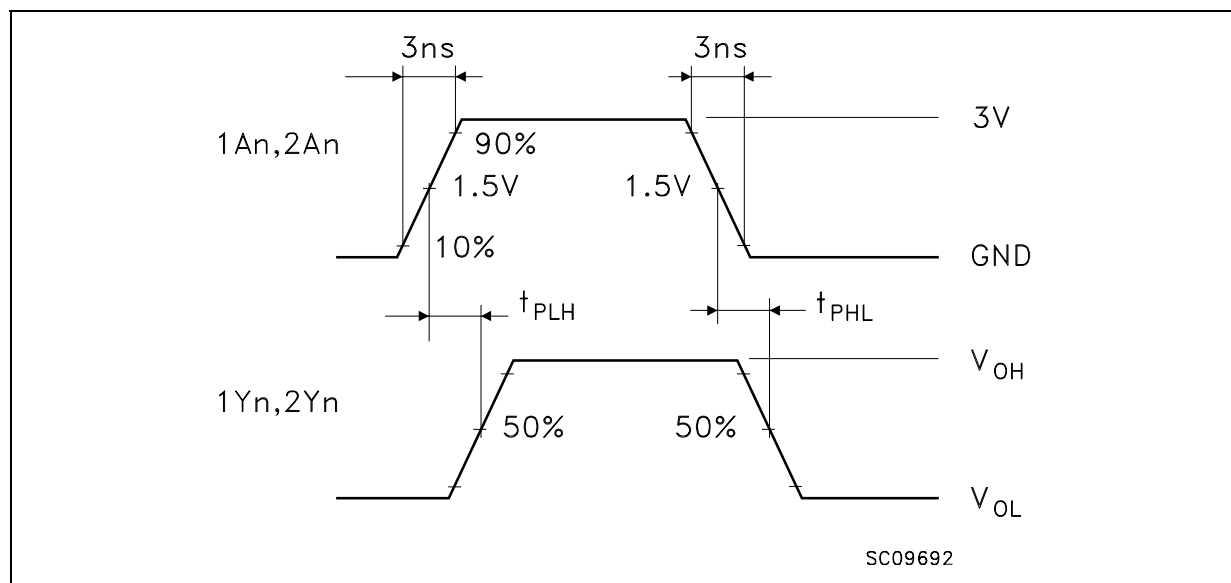
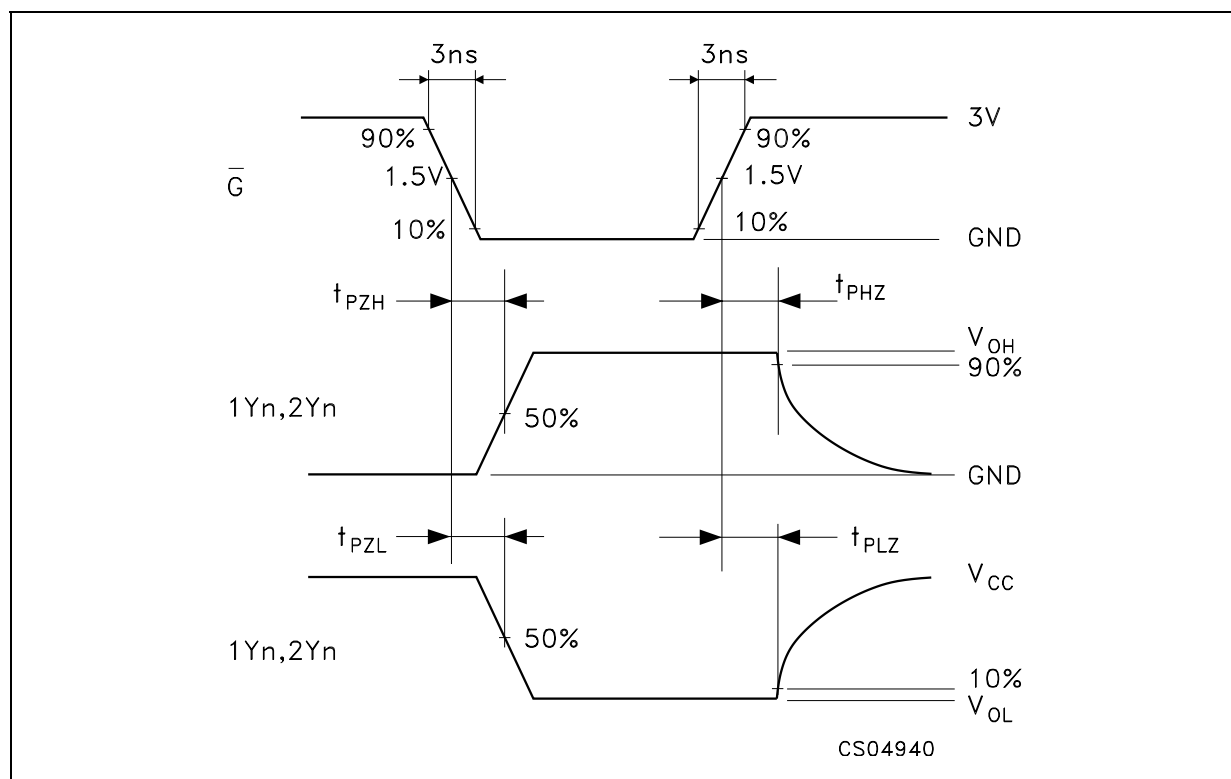


TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$2V_{CC}$
$t_{PZH}$ , $t_{PHZ}$	Open

$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)

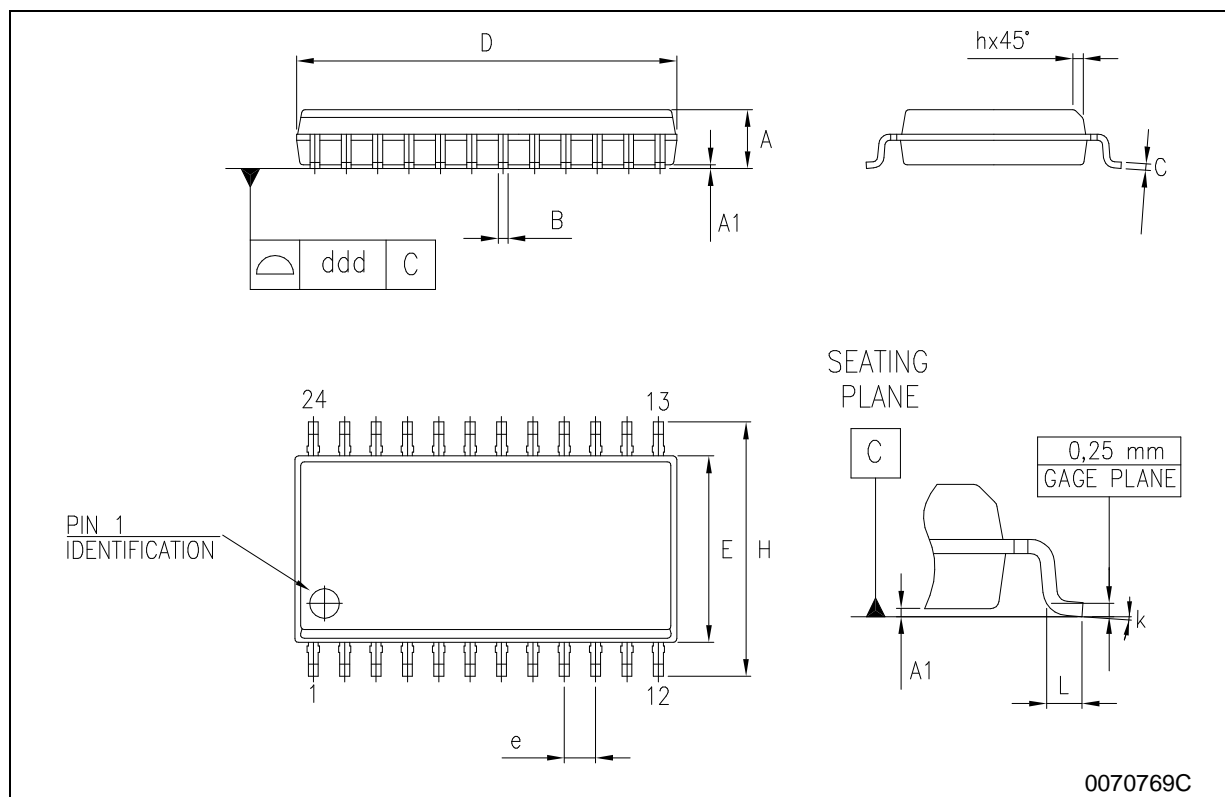
$R_L = R_1 = 500\Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

Figure 4: Waveform - Propagation Delays ( $f=1\text{MHz}$ ; 50% duty cycle)Figure 5: Waveform - Output Enable And Disable Time ( $f=1\text{MHz}$ ; 50% duty cycle)

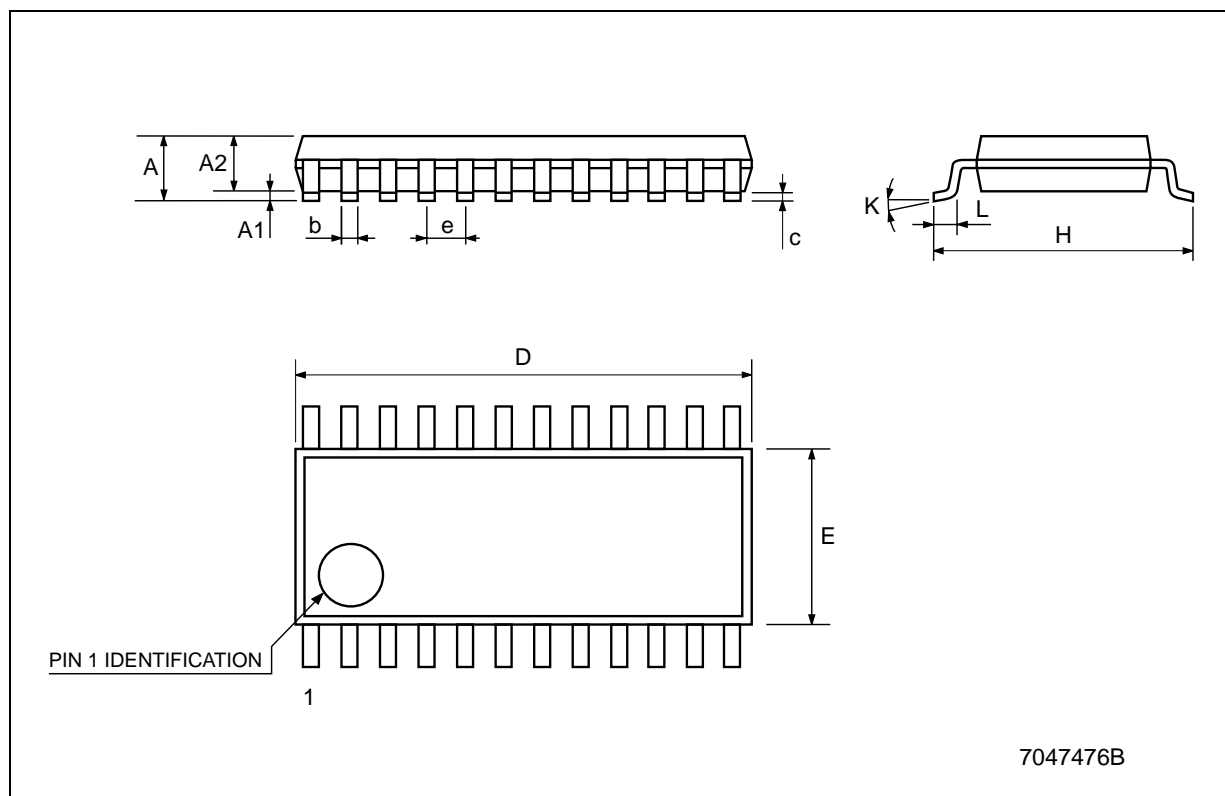
## SO-24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.1		0.30	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	15.20		15.60	0.598		0.614
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.4		1.27	0.016		0.050
k	0°		8°	0°		8°
ddd			0.100			0.004



## TSSOP24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.1			0.043
A1	0.05		0.15	0.002		0.006
A2		0.9			0.035	
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	7.7		7.9	0.303		0.311
E	4.3		4.5	0.169		0.177
e		0.65 BSC			0.0256 BSC	
H	6.25		6.5	0.246		0.256
K	0°		8°	0°		8°
L	0.50		0.70	0.020		0.028



7047476B



## Tape &amp; Reel SO-24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			30.4			1.197
Ao	10.8		11.0	0.425		0.433
Bo	15.7		15.9	0.618		0.626
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



## Tape & Reel TSSOP24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.8		7	0.268		0.276
Bo	8.2		8.4	0.323		0.331
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



**Table 11: Revision History**

<b>Date</b>	<b>Revision</b>	<b>Description of Changes</b>
27-Aug-2004	4	Ordering Codes Revision - pag. 1.

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