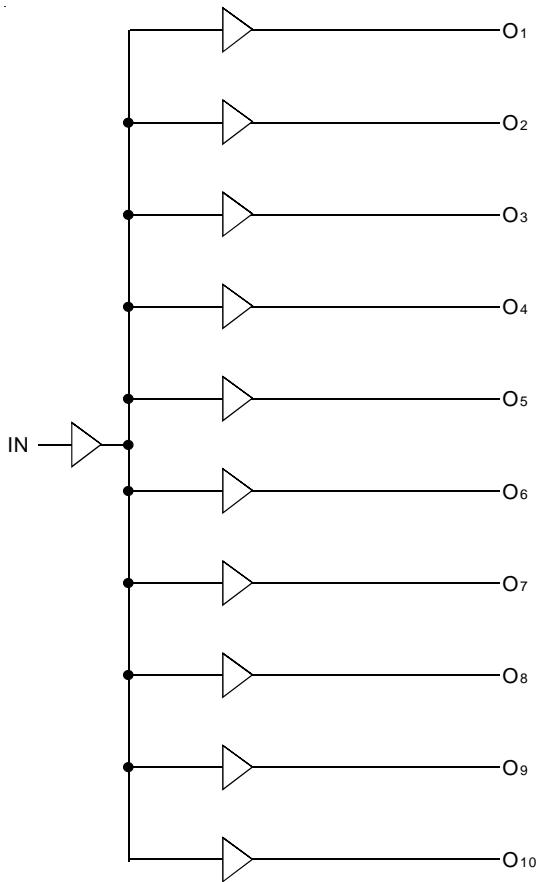
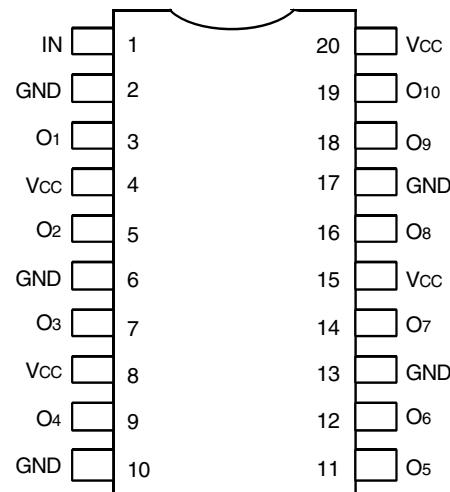


FEATURES:

- 0.5 MICRON CMOS Technology
- Guaranteed low skew < 350ps (max.)
- Very low duty cycle distortion < 350ps (max.)
- High speed: propagation delay < 3ns (max.)
- Very low CMOS power levels
- TTL compatible inputs and outputs
- 1:10 fanout
- Maximum output rise and fall time < 1.5ns (max.)
- Maximum operating frequency of 133.33MHz
- Low input capacitance: 4.5pF typical
- $V_{CC} = 3.3V \pm 0.3V$
- Inputs can be driven from 3.3V or 5V components
- Available in SSOP, SOIC, and QSOP packages

DESCRIPTION:

The FCT3807/A 3.3V clock driver is built using advanced dual metal CMOS technology. This low skew clock driver offers 1:10 fanout. The large fanout from a single input reduces loading on the preceding driver and provides an efficient clock distribution network. The FCT3807/A offers low capacitance inputs with hysteresis for improved noise margins. Multiple power and grounds reduce noise. Typical applications are clock and signal distribution.

FUNCTIONAL BLOCK DIAGRAM**PIN CONFIGURATION**SOIC/ SSOP/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
VTERM ⁽²⁾	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
VTERM ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to +7	V
VTERM ⁽⁴⁾	Terminal Voltage with Respect to GND	-0.5 to Vcc+0.5	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-60 to +60	mA

NOTES:

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. Vcc terminals.
3. Input terminals.
4. Outputs and I/O terminals.

CAPACITANCE ($T_A = +25^\circ\text{C}$, $f = 1.0\text{MHz}$)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
CIN	Input Capacitance	$V_{IN} = 0\text{V}$	4.5	6	pF
COUT	Output Capacitance	$V_{OUT} = 0\text{V}$	5.5	8	pF

NOTE:

1. This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description
IN	Clock Inputs
Ox	Clock Outputs

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	—	10	30	μA
	TTL Inputs HIGH	$V_{IN} = V_{CC} - 0.6\text{V}^{(3)}$				
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Input toggling 50% Duty Cycle Outputs Open	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.31	0.45
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Input toggling 50% Duty Cycle Outputs Open	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	15.5	22.8
		$f_i = 50\text{MHz}$	$V_{IN} = V_{CC} - 0.6\text{V}$ $V_{IN} = \text{GND}$	—	15.5	22.8

NOTES:

1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at $V_{CC} = 3.3\text{V}$, $+25^\circ\text{C}$ ambient.

3. Per TTL driven input ($V_{IN} = V_{CC} - 0.6\text{V}$); all other inputs at V_{CC} or GND.

4. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.

5. Values for these conditions are examples of the I_C formula. These limits are guaranteed but not tested.

6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$$I_C = I_{CC} + \Delta I_{CC} D_{H} N_{T} + I_{CCD} (f_i)$$

I_{CC} = Quiescent Current (I_{CC1} , I_{CC2} and I_{CC3})

ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = V_{CC} - 0.6\text{V}$)

D_H = Duty Cycle for TTL Inputs High

N_T = Number of TTL Inputs at D_H

I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HHL or LHL)

f_i = Input Frequency

All currents are in millamps and all frequencies are in megahertz.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified

Commercial: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 3.3V \pm 0.3V$

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ.	Max.	Unit
V _{IH}	Input HIGH Level (Input pins)		Guaranteed Logic HIGH Level	2	—	5.5	V
	Input HIGH Level (I/O pins)			2	—	$V_{CC} + 0.5$	
V _{IL}	Input LOW Level (Input and I/O pins)	Guaranteed Logic LOW Level		-0.5	—	0.8	V
I _{IH}	Input HIGH Current (Input pins)	V _{CC} = Max.	V _I = 5.5V	—	—	± 1	μA
	Input HIGH Current (I/O pins)		V _I = V _{CC}	—	—	± 1	
I _{IL}	Input LOW Current (Input pins)	V _{CC} = Max.	V _I = GND	—	—	± 1	μA
	Input LOW Current (I/O pins)		V _I = GND	—	—	± 1	
I _{OZH}	High Impedance Output Current	V _{CC} = Max.	V _O = V _{CC}	—	—	± 1	μA
I _{OZL}	(3-State Output Pins)		V _O = GND	—	—	± 1	
V _{IK}	Clamp Diode Voltage	V _{CC} = Min., I _{IN} = -18mA		—	-0.7	-1.2	V
I _{ODH}	Output HIGH Current	V _{CC} = 3.3V, V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽³⁾		-36	-60	-110	mA
I _{ODL}	Output LOW Current	V _{CC} = 3.3V, V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽³⁾		50	90	200	mA
V _{OH}	Output HIGH Voltage	V _{CC} = Min.	I _{OH} = -0.1mA	V _{CC} -0.2	—	—	V
		V _{IN} = V _{IH} or V _{IL}	I _{OH} = -8mA	2.4 ⁽⁵⁾	3	—	
V _{OL}	Output LOW Voltage	V _{CC} = Min.	I _{OL} = 0.1mA	—	—	0.2	V
		V _{IN} = V _{IH} or V _{IL}	I _{OL} = 16mA	—	0.2	0.4	
			I _{OL} = 24mA	—	0.3	0.5	
I _{OFF}	Input Power Off Leakage	V _{CC} = 0V, V _{IN} = 4.5V		—	—	± 1	μA
I _{OS}	Short Circuit Current ⁽⁴⁾	V _{CC} = Max., V _O = GND ⁽³⁾		-60	-135	-240	mA
V _H	Input Hysteresis	—	—	150	—	—	mV
I _{CCL}	Quiescent Power Supply Current	V _{CC} = Max.		—	0.1	10	μA
I _{CCH}		V _{IN} = GND or V _{CC}		—	—	—	
I _{CCZ}				—	—	—	

NOTES:

1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3V$, $+25^\circ\text{C}$ ambient.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. $V_{OH} = V_{CC} - 0.6V$ at rated current.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE - COMMERCIAL^(3,4)

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	50Ω to Vcc/2 $CL = 10\text{pF}$ (See figure 1) or 10Ω AC termination, $CL = 50\text{pF}$ (See figure 2) $f \leq 100\text{MHz}$ Outputs connected in groups of two	1.5	3.5	1.5	3	ns
t_{PHL}			—	1.5	—	1.5	ns
t_R	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_F	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.5	—	0.35	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.5	—	0.35	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	0.9	—	0.65	ns

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	$CL = 30\text{pF}$ $f \leq 67\text{MHz}$ (See figure 3)	1.5	4.5	1.5	4	ns
t_{PHL}			—	1.5	—	1.5	ns
t_R	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_F	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.5	—	0.35	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.5	—	0.35	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	1	—	0.75	ns

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	$CL = 50\text{pF}$ $f \leq 40\text{MHz}$ (See figure 4)	1.5	4.8	1.5	4.3	ns
t_{PHL}			—	1.5	—	1.5	ns
t_R	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_F	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.5	—	0.35	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.5	—	0.35	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	1	—	0.75	ns

NOTES:

1. See test circuits and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. t_{PLH} , t_{PHL} , $t_{SK(T)}$ are production tested. All other parameters guaranteed but not production tested.
4. Propagation delay range indicated by Min. and Max. limit is due to Vcc, operating temperature and process parameters. These propagation delay limits do not imply skew.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE - INDUSTRIAL^(3,4)

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	50Ω to Vcc/2 $CL = 10\text{pF}$ (See figure 1) or 50Ω AC termination, $CL = 10\text{pF}$ (See figure 2) $f \leq 100\text{MHz}$ Outputs connected in groups of two	1.5	3.5	1.5	3	ns
t_{R}	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_{F}	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.6	—	0.45	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.6	—	0.45	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	0.9	—	0.65	ns

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	CL = 30pF $f \leq 67\text{MHz}$ (See figure 3)	1.5	4.5	1.5	4	ns
t_{PHL}			—	1.5	—	1.5	ns
t_{R}	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_{F}	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.6	—	0.45	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.6	—	0.45	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	1	—	0.75	ns

Symbol	Parameter	Conditions ⁽¹⁾	FCT3807		FCT3807A		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t_{PLH}	Propagation Delay	CL = 50pF $f \leq 40\text{MHz}$ (See figure 4)	1.5	4.8	1.5	4.3	ns
t_{PHL}			—	1.5	—	1.5	ns
t_{R}	Output Rise Time (0.8 to 2V)		—	1.5	—	1.5	ns
t_{F}	Output Fall Time (0.8 to 2V)		—	1.5	—	1.5	ns
$t_{SK(O)}$	Output skew: skew between outputs of same package (same transition)		—	0.6	—	0.45	ns
$t_{SK(P)}$	Pulse skew: skew between opposite transitions of same output ($ t_{PHL} - t_{PLH} $)		—	0.6	—	0.45	ns
$t_{SK(T)}$	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	1	—	0.75	ns

NOTES:

1. See test circuits and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. t_{PLH} , t_{PHL} , $t_{SK(T)}$ are production tested. All other parameters guaranteed but not production tested.
4. Propagation delay range indicated by Min. and Max. limit is due to Vcc, operating temperature and process parameters. These propagation delay limits do not imply skew.

TEST CIRCUITS

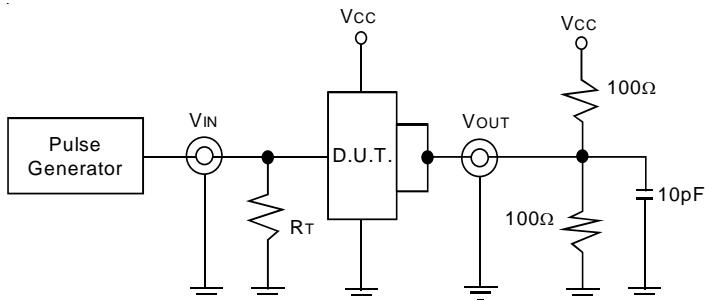


Figure 1. $Z_0 = 50\Omega$ to $V_{cc}/2$, $C_L = 10pF$

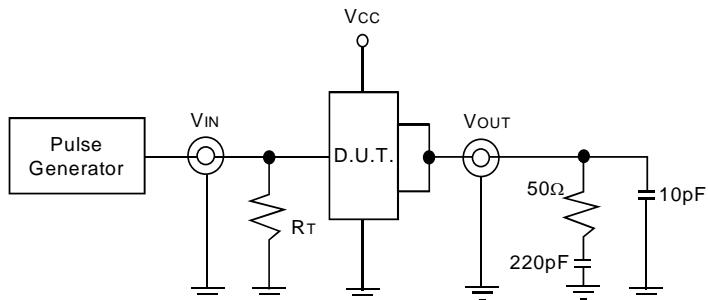


Figure 2. $Z_0 = 50\Omega$ AC Termination, $C_L = 10pF$

The capacitor value for ac termination is determined by the operating frequency. For very low frequencies a higher capacitor value should be selected.

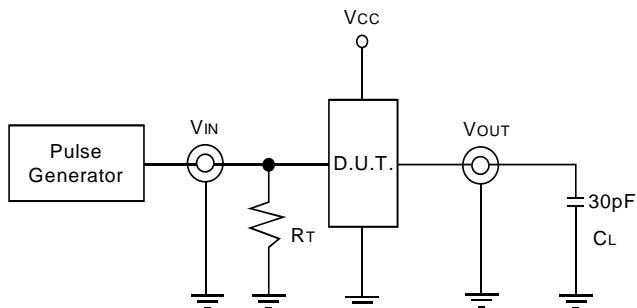


Figure 3. $C_L = 30pF$ Circuit

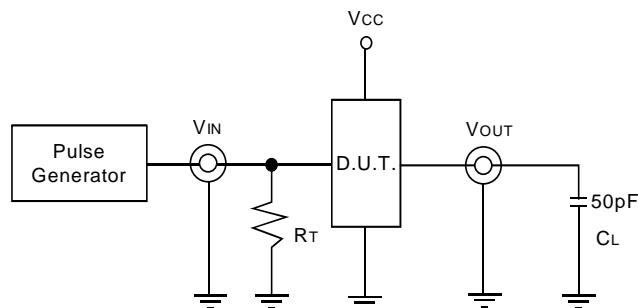


Figure 3. $C_L = 50pF$ Circuit

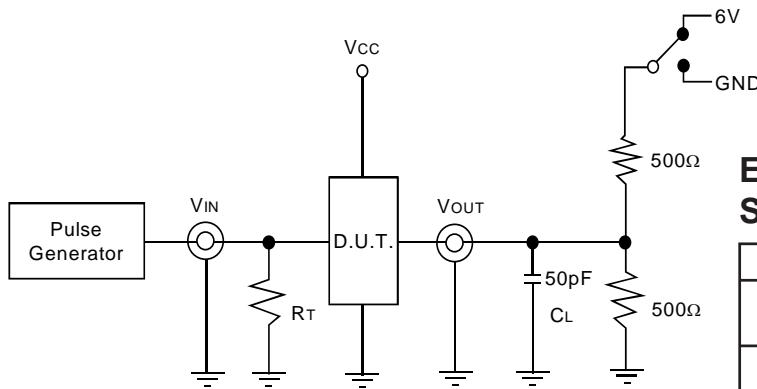


Figure 5. Enable and Disable Time Circuit

ENABLE AND DISABLE TIME SWITCH POSITION

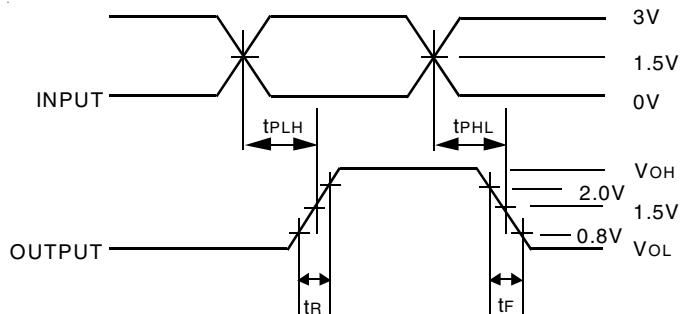
Test	Switch
Disable LOW Enable LOW	6V
Disable HIGH Enable HIGH	GND

DEFINITIONS:

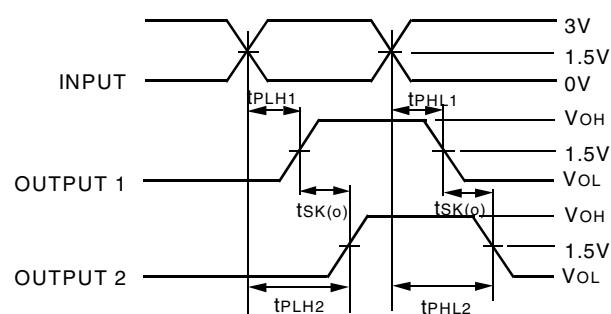
C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{out} of the Pulse Generator.

TEST WAVEFORMS

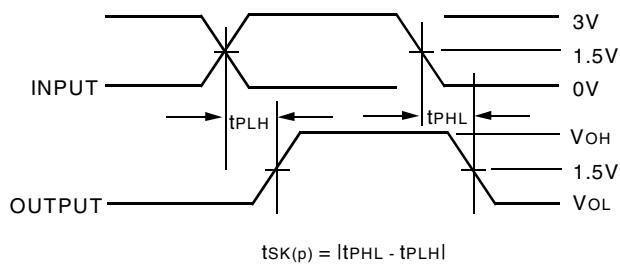


Package Delay

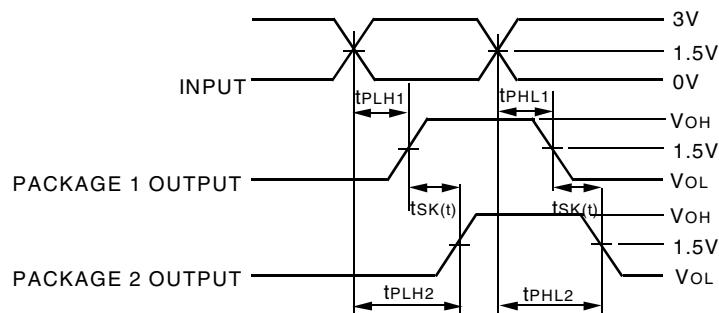


$$t_{SK(o)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

Output Skew - $t_{SK(O)}$



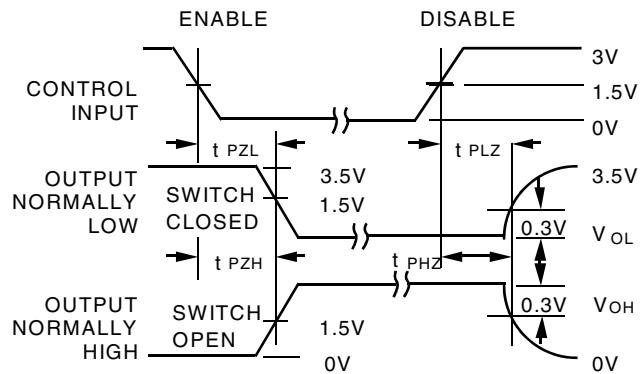
Pulse Skew - $t_{SK(P)}$



$$t_{SK(t)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

Package Skew - $t_{SK(T)}$

Package 1 and Package 2 are same device type and speed grade



Enable and Disable Times

NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH
2. Pulse Generator for All Pulses: $f \leq 1.0\text{MHz}$; $t_f \leq 2.5\text{ns}$; $t_R \leq 2.5\text{ns}$

ORDERING INFORMATION

74FCT	XXXXX	XX	XX	X	Shipping	
Device Type	Package	Process/ Temp. Range				
				Blank	Tubes	
				8	Tape and Reel	
				Blank	Commercial (0°C to +70°C)	
				I	Industrial (-40°C to +85°C)	
				SOG	SOIC – Green	
				PYG	SSOP – Green	
				QG	QSOP – Green	
				3807	3.3V CMOS 1-to-10 Clock Driver	
				3807A		

REVISION HISTORY

October 16, 2014 Updated ordering information to include Tubes/Tape and Reel

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES ("RENESAS") PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit www.renesas.com/contact-us/.