



Integrated Device Technology, Inc.

# FAST CMOS BUFFER/CLOCK DRIVER

IDT49FCT805/A  
IDT49FCT806/A

### FEATURES:

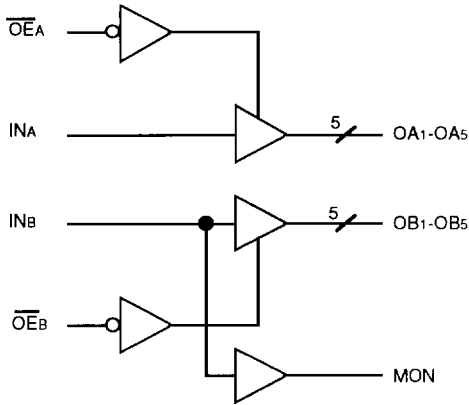
- 0.5 MICRON CMOS Technology
- Guaranteed low skew < 700ps (max.)
- Low duty cycle distortion < 1ns (max.)
- Low CMOS power levels
- TTL compatible inputs and outputs
- Rail-to-rail output voltage swing
- High drive: -24mA IOH, 64mA IOL
- Two independent output banks with 3-state control
- 1:5 fanout per bank
- 'Heartbeat' monitor output
- Available in DIP, SOIC, SSOP (805 only), Cerpack and LCC packages
- Military product compliant to MIL-STD-883, Class B

### DESCRIPTION:

The IDT49FCT805/A and IDT49FCT806/A are clock drivers built using advanced dual metal CMOS technology. The IDT49FCT805/A is a non-inverting clock driver and the IDT49FCT806/A is an inverting clock driver. Each device consists of two banks of drivers. Each bank drives five output buffers from a standard TTL compatible input. The devices feature a "heartbeat" monitor for diagnostics and PLL driving. The MON output is identical to all other outputs and complies with the output specifications in this document. The IDT49FCT805/A and IDT49FCT806/A offer low capacitance inputs with hysteresis. Rail-to-rail output swing improves noise margin and allows easy interface with CMOS inputs.

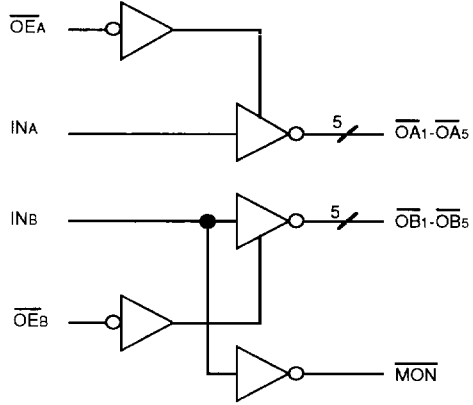
## FUNCTIONAL BLOCK DIAGRAMS

IDT49FCT805



2574 drw 01

IDT49FCT806



2574 drw 02



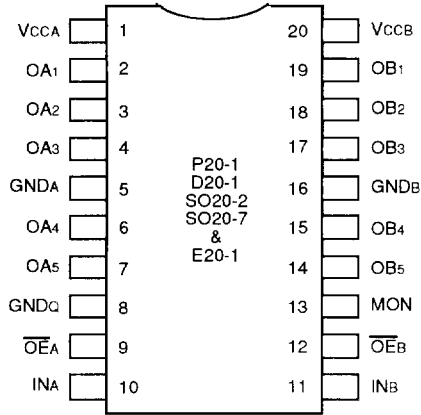
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MILITARY AND COMMERCIAL TEMPERATURE RANGES

MARCH 1994

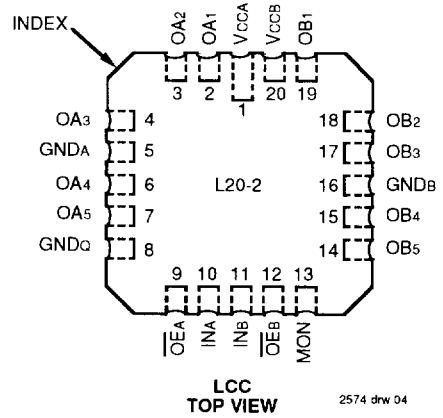
## PIN CONFIGURATIONS

### IDT49FCT805



DIP/SOIC/SSOP/CERPACK  
TOP VIEW

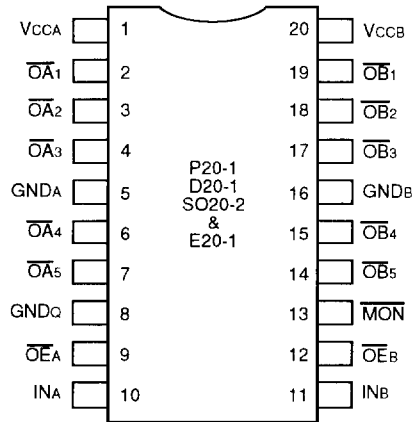
2574 drw 03



LCC  
TOP VIEW

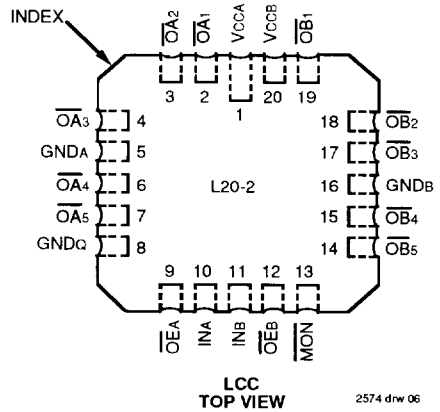
2574 drw 04

### IDT49FCT806



DIP/SOIC/CERPACK  
TOP VIEW

2574 drw 05



LCC  
TOP VIEW

2574 drw 06

## PIN DESCRIPTION

Pin Names	Description
$\overline{OE}A, \overline{OE}B$	3-State Output Enable Inputs (Active LOW)
INA, IN <sub>B</sub>	Clock Inputs
OA <sub>n</sub> , OB <sub>n</sub>	Clock Outputs (FCT805)
$\overline{OA}n, \overline{OB}n$	Clock Outputs (FCT806)
MON	Monitor Output (FCT805)
$\overline{MON}$	Monitor Output (FCT806)

2574 tbl 01

## FUNCTION TABLE<sup>(1)</sup>

Inputs		Outputs			
		49FCT805		49FCT806	
$\overline{OE}A, \overline{OE}B$	INA, IN <sub>B</sub>	OA <sub>n</sub> , OB <sub>n</sub>	MON	$\overline{OA}n, \overline{OB}n$	$\overline{MON}$
L	L	L	L	H	H
L	H	H	H	L	L
H	L	Z	L	Z	H
H	H	Z	H	Z	L

NOTE:

1. H = HIGH, L = LOW, Z = High Impedance

2574 tbl 02

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

Symbol	Rating	Commercial	Military	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
V <sub>TERM</sub> <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to V <sub>CC</sub> +0.5	-0.5 to V <sub>CC</sub> +0.5	V
T <sub>A</sub>	Operating Temperature	0 to +70	-55 to +125	°C
T <sub>BIAS</sub>	Temperature Under Bias	-55 to +125	-65 to +135	°C
T <sub>STG</sub>	Storage Temperature	-55 to +125	-65 to +150	°C
I <sub>OUT</sub>	DC Output Current	-60 to +120	-60 to +120	mA

**CAPACITANCE** (T<sub>A</sub> = +25°C, f = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	4.5	6.0	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	5.5	8.0	pF

**NOTE:** 2574 Ink 04  
1. This parameter is measured at characterization but not tested.

- NOTES:** 2574 Ink 03
- 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. No terminal voltage may exceed V<sub>CC</sub> by +0.5V unless otherwise noted.
  - Input and V<sub>CC</sub> terminals.
  - Output and I/O terminals.

**DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE**

Following Conditions Apply Unless Otherwise Specified: V<sub>LC</sub> = 0.2V; V<sub>HC</sub> = V<sub>CC</sub> - 0.2V  
Commercial: T<sub>A</sub> = 0°C to +70°C, V<sub>CC</sub> = 5.0V ± 5%; Military: T<sub>A</sub> = -55°C to +125°C, V<sub>CC</sub> = 5.0V ± 10%

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Unit
V <sub>IH</sub>	Input HIGH Level	Guaranteed Logic HIGH Level	2.0	—	—	V
V <sub>IL</sub>	Input LOW Level	Guaranteed Logic LOW Level	—	—	0.8	V
I <sub>IH</sub>	Input HIGH Current <sup>(5)</sup>	V <sub>CC</sub> = Max. V <sub>I</sub> = V <sub>CC</sub>	—	—	±1	μA
I <sub>IL</sub>	Input LOW Current <sup>(5)</sup>	V <sub>CC</sub> = Max. V <sub>I</sub> = GND	—	—	±1	μA
I <sub>OZH</sub>	Off State (HIGH Z) <sup>(5)</sup>	V <sub>CC</sub> = Max. V <sub>O</sub> = V <sub>CC</sub>	—	—	±1	μA
I <sub>OZL</sub>	Output Current <sup>(5)</sup>	V <sub>CC</sub> = Max. V <sub>O</sub> = GND	—	—	±1	μA
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA	—	-0.7	-1.2	V
I <sub>OS</sub>	Short Circuit Current	V <sub>CC</sub> = Max. <sup>(3)</sup> , V <sub>O</sub> = GND	-60	-120	—	mA
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = 3V, V <sub>IN</sub> = V <sub>LC</sub> or V <sub>HC</sub> , I <sub>OH</sub> = -32μA	V <sub>HC</sub>	V <sub>CC</sub>	—	V
		V <sub>CC</sub> = Min. I <sub>OH</sub> = -300μA	V <sub>HC</sub>	V <sub>CC</sub>	—	
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -12mA MIL. I <sub>OH</sub> = -15mA COM'L.	3.6	4.3	—	
		I <sub>OH</sub> = -24mA MIL. I <sub>OH</sub> = -24mA COM'L.	2.4	3.8	—	
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = 3V, V <sub>IN</sub> = V <sub>LC</sub> or V <sub>HC</sub> , I <sub>OL</sub> = 300μA	—	GND	V <sub>LC</sub>	V
		V <sub>CC</sub> = Min. I <sub>OL</sub> = 300μA	—	GND	V <sub>LC</sub> <sup>(4)</sup>	
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 48mA MIL. I <sub>OL</sub> = 64mA COM'L.	—	0.3	0.55	
V <sub>H</sub>	Input Hysteresis for all inputs	—	—	200	—	mV
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = GND or V <sub>CC</sub>	—	5	500	μA

- NOTES:** 2574 tbl 05
- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
  - Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient.
  - Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.
  - This parameter is guaranteed but not tested.
  - The test limit for this parameter is ± 5μA at T<sub>A</sub> = -55°C.



**POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
$\Delta I_{CC}$	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	1.0	2.5	mA
$I_{CCD}$	Dynamic Power Supply Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$ Outputs Open $\overline{OE}_A = \overline{OE}_B = \text{GND}$ 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.15	0.20	mA/ MHz/bit
$I_C$	Total Power Supply Current <sup>(6)</sup>	$V_{CC} = \text{Max.}$ Outputs Open $f_o = 10\text{MHz}$ 50% Duty Cycle $\overline{OE}_A = \overline{OE}_B = V_{CC}$ Mon. Output Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	1.5	2.5	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	2.0	3.8	
		$V_{CC} = \text{Max.}$ Outputs Open $f_o = 2.5\text{MHz}$ 50% Duty Cycle $\overline{OE}_A = \overline{OE}_B = \text{GND}$ Eleven Outputs Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	4.1	6.0 <sup>(5)</sup>	
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	5.1	8.5 <sup>(5)</sup>	

**NOTES:**

2574 tbl 06

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient.
- Per TTL driven input; ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_o N_O)$   
 $I_{CC} = \text{Quiescent Current } (I_{CC1}, I_{CC2} \text{ and } I_{CC3})$   
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$   
 $D_H = \text{Duty Cycle for TTL Inputs High}$   
 $N_T = \text{Number of TTL Inputs at } D_H$   
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$   
 $f_o = \text{Output Frequency}$   
 $N_O = \text{Number of Outputs at } f_o$   
 All currents are in milliamps and all frequencies are in megahertz.

**SWITCHING CHARACTERISTICS OVER OPERATING RANGE<sup>(3,4)</sup>**

Symbol	Parameter	Condition <sup>(1)</sup>	IDT49FCT805/806				IDT49FCT805A/806A				Unit
			Com'l.		Mil.		Com'l.		Mil.		
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay INA to OAn, INb to OBn	CL = 50pF RL = 500Ω	1.5	6.5	1.5	7.5	1.5	5.8	1.5	6.8	ns
t <sub>R</sub>	Output Rise Time		—	1.5	—	1.5	—	1.5	—	1.5	ns
t <sub>F</sub>	Output Fall Time		—	1.5	—	1.5	—	1.5	—	1.5	ns
tsk(o)	Output skew: skew between outputs of all banks of same package (inputs tied together)		—	0.7	—	0.9	—	0.7	—	0.9	ns
tsk(p)	Pulse skew: skew between opposite transitions of same output (t <sub>PHL</sub> -t <sub>PLH</sub> )		—	1.0	—	1.1	—	1.0	—	1.1	ns
tsk(t)	Package skew: skew between outputs of different packages at same power supply voltage, temperature, package type and speed grade		—	1.5	—	1.5	—	1.5	—	1.5	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time OE <sub>A</sub> to OAn, OE <sub>B</sub> to OBn		1.5	8.0	1.5	8.5	1.5	8.0	1.5	8.5	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time OE <sub>A</sub> to OAn, OE <sub>B</sub> to OBn		1.5	7.0	1.5	7.5	1.5	7.0	1.5	7.5	ns

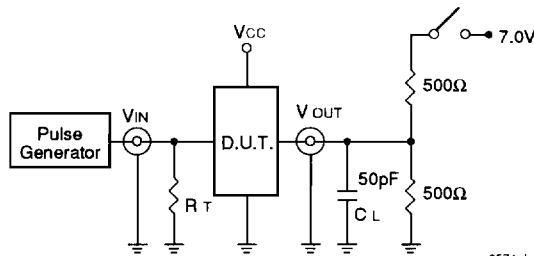
**NOTES:**

2574 tbl 07

1. See test circuits and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. t<sub>PLH</sub>, t<sub>PHL</sub>, tsk(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 V<sub>CC</sub>, operating temperature and process parameters. These propagation delay limits do not imply skew.

TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



2574 drw 07

ENABLE AND DISABLE TIME SWITCH POSITION

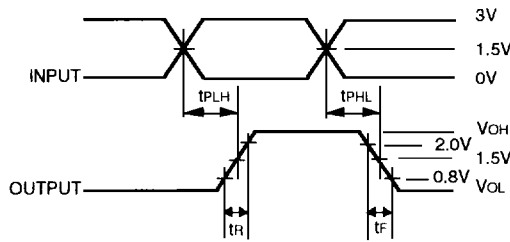
Test	Switch
Disable LOW Enable LOW	Closed
Disable HIGH Enable HIGH	Open

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.  
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

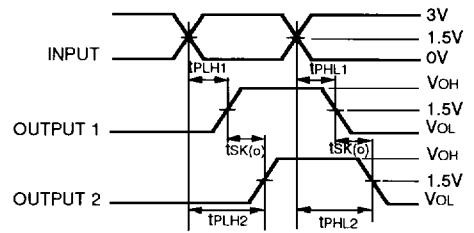
2574 Ink 11

PACKAGE DELAY



2574 drw 08

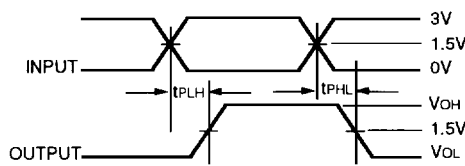
OUTPUT SKEW - tSK(o)



$$tSK(o) = |tPLH2 - tPLH1| \text{ or } |tPHL2 - tPHL1|$$

2574 drw 09

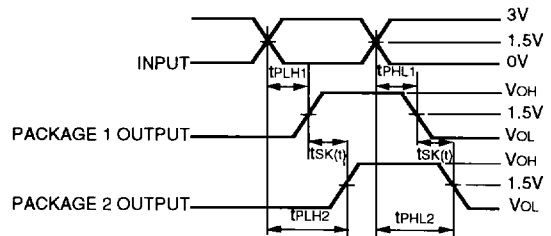
PULSE SKEW - tSK(p)



$$tSK(p) = |tPHL - tPLH|$$

2574 drw 10

PACKAGE SKEW - tSK(t)

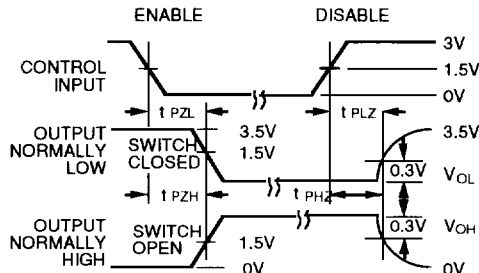


$$tSK(t) = |tPLH2 - tPLH1| \text{ or } |tPHL2 - tPHL1|$$

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

2574 drw 11

ENABLE AND DISABLE TIMES

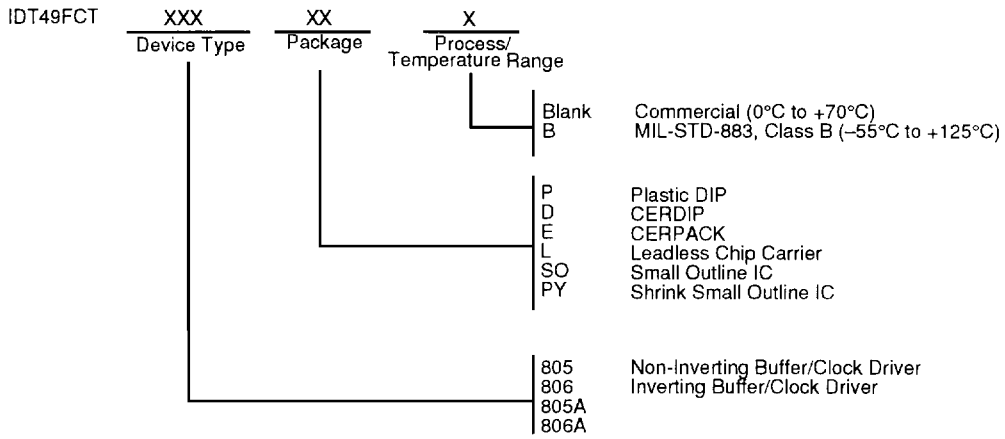


NOTES:

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

2574 drw 12

ORDERING INFORMATION



2574 drw 17