FAST CMOS OCTAL BUFFER/LINE DRIVER

74FCT540AT/CT

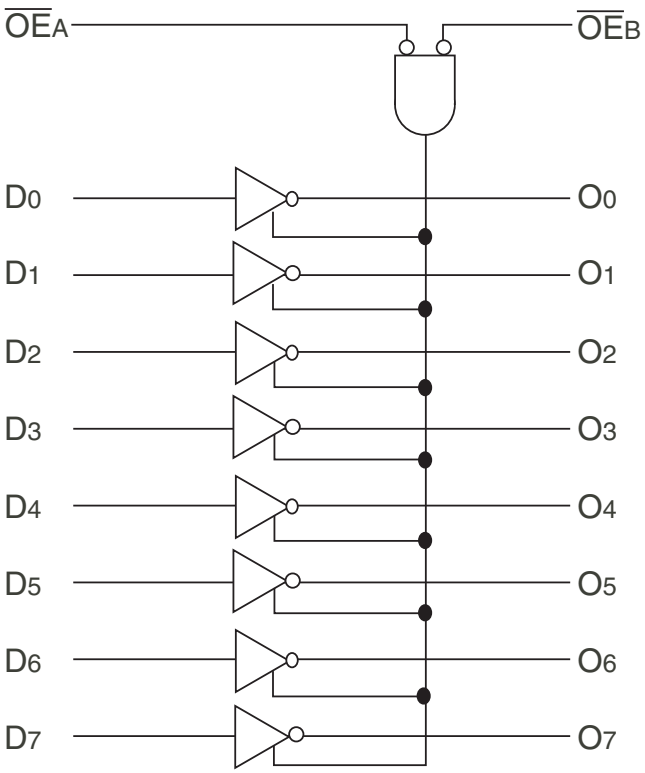
FEATURES:

- **A and C grades**
- **Low input and output leakage ≤1µA (max.)**
- **CMOS power levels**
- **True TTL input and output compatibility:**
  - *V_{OH} = 3.3V (typ.)*
  - *V_{OL} = 0.3V (typ.)*
- **High Drive outputs (-15mA I_{OH}, 64mA I_{OL})**
- **Meets or exceeds JEDEC standard 18 specifications**
- **Power off disable outputs permit "live insertion"**
- **Available in SOIC and QSOP packages**

DESCRIPTION:

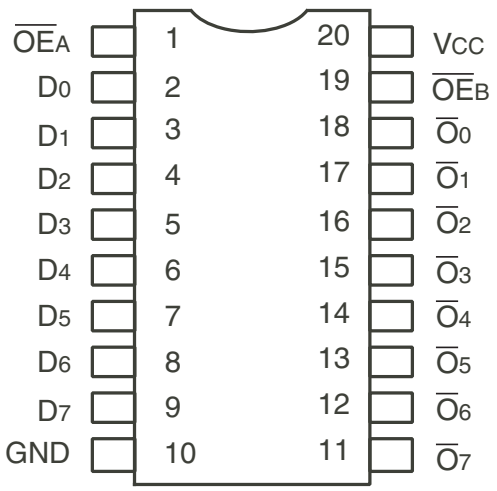
The IDT octal buffer/line driver is built using an advanced dual metal CMOS technology. The FCT540T is similar in function to the FCT240T, except that the inputs and outputs are on opposite sides of the package. This pinout arrangement makes these devices especially useful as output ports for microprocessors and as backplane drivers, allowing ease of layout and greater board density.

FUNCTIONAL BLOCK DIAGRAM



INDUSTRIAL TEMPERATURE RANGE

PIN CONFIGURATION



TOP VIEW

Package Type	Package Code	Order Code
QSOP	PCG20	QG
SOIC	PSG20	SOG

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	–0.5 to +7	V
V_{TERM}(3)	Terminal Voltage with Respect to GND	–0.5 to V_{CC}+0.5	V
T_{STG}	Storage Temperature	–65 to +150	°C
I_{OUT}	DC Output Current	–60 to +120	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. No terminal voltage may exceed Vcc by +0.5V unless otherwise noted.
2. Inputs and Vcc terminals only.
3. Output and I/O terminals only.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	8	12	pF

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

PIN DESCRIPTION

Pin Names	Description
$\overline{OE}_A$, $\overline{OE}_B$	3-State Output Enable Inputs (Active LOW)
D_X	Inputs
$\overline{O}_X$	Outputs

FUNCTION TABLE(1)

Inputs			Outputs
$\overline{OE}_A$	$\overline{OE}_B$	D	
L	L	L	H
L	L	H	L
H	H	X	Z

NOTE:
1. H = HIGH Voltage Level
   X = Don't Care
   L = LOW Voltage Level
   Z = High Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = –40°C to +85°C, V_{CC} = 5.0V ±5%

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{IH}	Input HIGH Level	Guaranteed Logic HIGH Level		2	—	—	V
V_{IL}	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
I_{IH}	Input HIGH Current[4]	V_{CC} = Max.	V_I = 2.7V	—	—	±1	µA
I_{IL}	Input LOW Current[4]	V_{CC} = Max.	V_I = 0.5V	—	—	±1	µA
I_{OZH}	High Impedance Output Current[4]	V_{CC} = Max.	V_I = 2.7V	—	—	±1	µA
I_{OZL}	(3-State Output pins)[4]		V_I = 0.5V	—	—	±1	
I_I	Input HIGH Current[4]	V_{CC} = Max., V_I = V_{CC} (Max.)		—	—	±1	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
V_H	Input Hysteresis	—		—	200	—	mV
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max. V_{IN} = GND or V_{CC}		—	0.01	1	mA

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC} = Min	I_{OH} = –8mA	2.4	3.3	—	V
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = –15mA	2	3	—	
V_{OL}	Output LOW Voltage	V_{CC} = Min V_{IN} = V_{IH} or V_{IL}	I_{OL} = 64mA	—	0.3	0.55	V
I_{OS}	Short Circuit Current	V_{CC} = Max., V_O = GND[3]		–60	–120	–225	mA

NOTES:
1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient.
3. Not more than one output should be tested at one time. Duration of the test should not exceed one second.
4. The test limit for this parameter is ±5µA at T_A = –55°C.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max. V_{IN} = 3.4V[3]		—	0.5	2	mA
I_{CCD}	Dynamic Power Supply Current[4]	V_{CC} = Max. Outputs Open $\overline{OE}_A$ = $\overline{OE}_B$ = GND One Input Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	—	0.15	0.25	mA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max. Outputs Open fi = 10MHz 50% Duty Cycle $\overline{OE}_A$ = $\overline{OE}_B$ = GND One Bit Toggling	V_{IN} = V_{CC} V_{IN} = GND	—	1.5	3.5	mA
			V_{IN} = 3.4V V_{IN} = GND	—	1.8	4.5	
		V_{CC} = Max. Outputs Open fi = 2.5MHz 50% Duty Cycle $\overline{OE}_A$ = $\overline{OE}_B$ = GND Four Bits Toggling	V_{IN} = V_{CC} V_{IN} = GND	—	3	6[5]	mA
			V_{IN} = 3.4V V_{IN} = GND	—	5	14[5]	

NOTES:
1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V). 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 ΔI_{CC} formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_i N_i)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
   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 (HLH or LHL)
   f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
   f_i = Output Frequency
   N_i = Number of Outputs at f_O

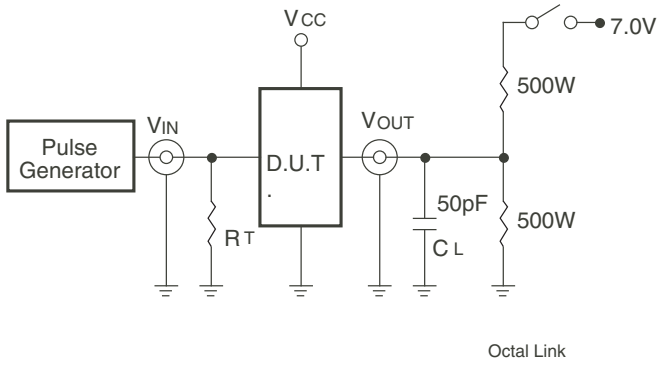
All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter	Condition[1]	FCT540AT		FCT540CT		Unit
			Min.[2]	Max.	Min.[2]	Max.	
t_{PLH} t_{PHL}	Propagation Delay Dx to $\overline{O}$x	C_L = 50pF R_L = 500Ω	1.5	4.8	1.5	4.3	ns
t_{PZH} t_{PZL}	Output Enable Time		1.5	6.2	1.5	5.8	ns
t_{PHZ} t_{PLZ}	Output Disable Time		1.5	5.6	1.5	5.2	ns

NOTES:
1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.

TEST CIRCUITS AND WAVEFORMS



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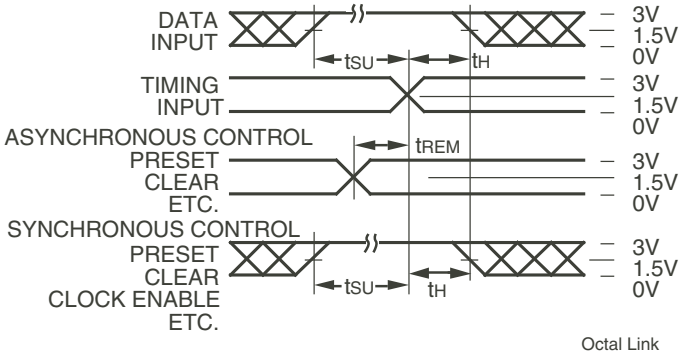
Test Circuits for All Outputs



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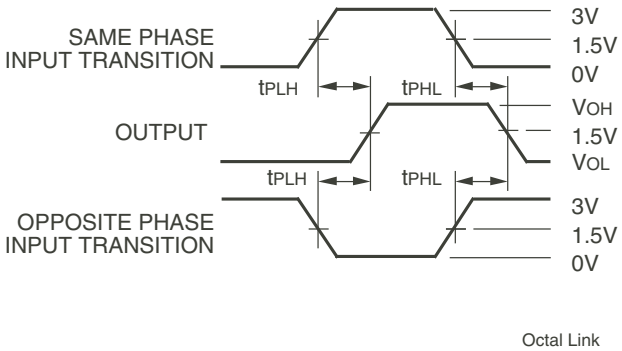
Set-Up, Hold, and Release Times



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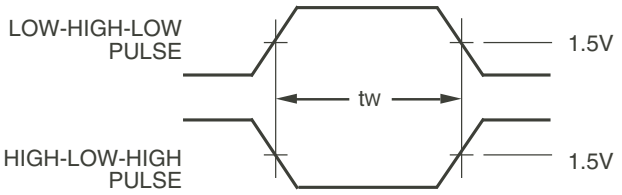
Propagation Delay

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	Closed
All Other Tests	Open

DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.



Pulse Width

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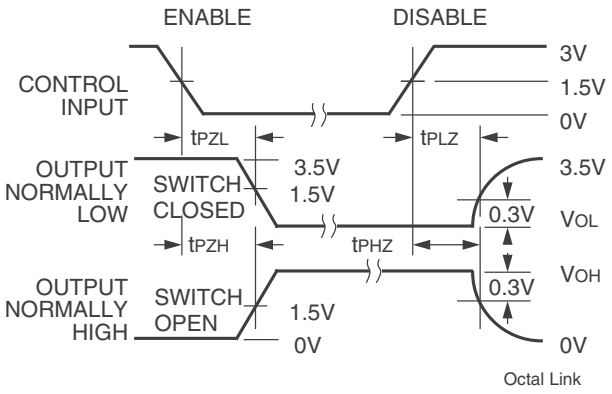

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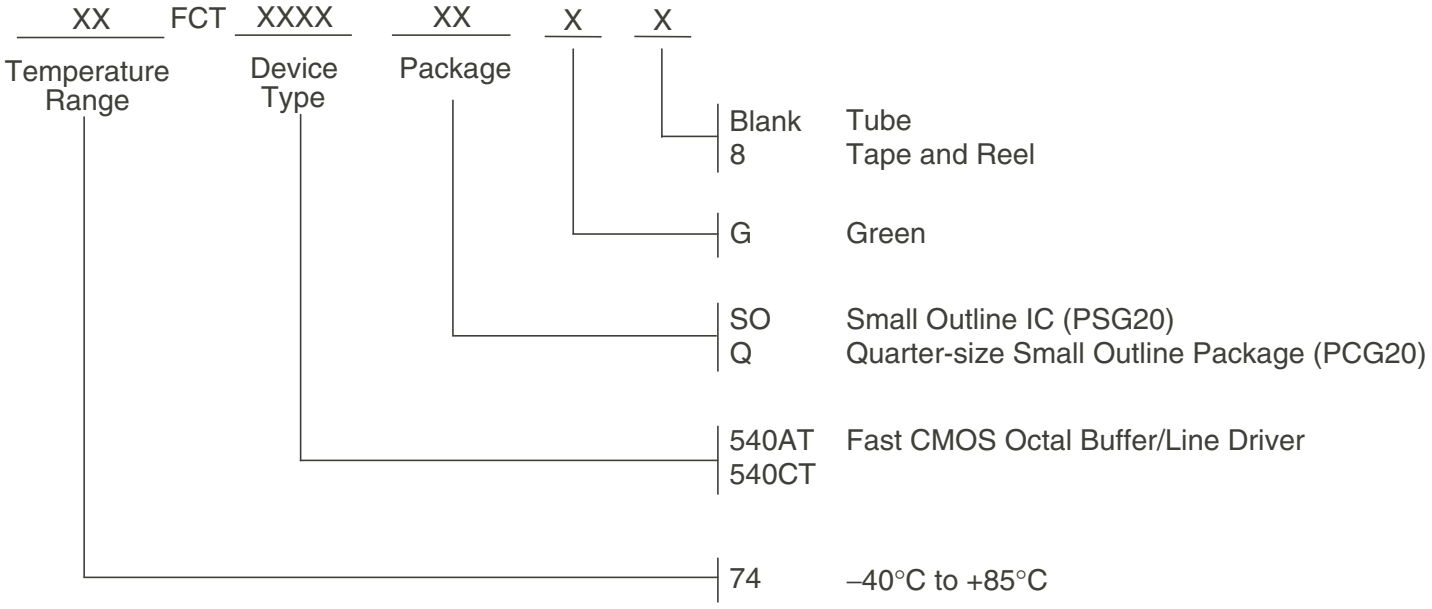
Enable and Disable Times

NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.

ORDERING INFORMATION



Orderable Part Information

Speed (ns)	Orderable Part ID	Pkg. Code	Pkg. Type	Temp. Grade
A	74FCT540ATQG	PCG20	QSOP	I
	74FCT540ATQG8	PCG20	QSOP	I
	74FCT540ATSOG	PSG20	SOIC	I
	74FCT540ATSOG8	PSG20	SOIC	I
C	74FCT540CTQG	PCG20	QSOP	I
	74FCT540CTQG8	PCG20	QSOP	I
	74FCT540CTSOG	PSG20	SOIC	I
	74FCT540CTSOG8	PSG20	SOIC	I

Datasheet Document History

10/10/2009	Pg. 6	Updated the ordering information by removing the "IDT" notation and non RoHS part.
11/28/2016	Pgs. 1,2,6	Updated datasheet obsolete SSOP package and added Tube, Tape and Reel.
05/06/2019	Pgs. 2,6	Added table under pin configuration diagram with detailed package information and orderable part information table.
02/11/2020	Pgs. 1-7	Rebranded as Renesas datasheet.

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