



# CY54/74FCT240T CY54/74FCT244T

## 8-Bit Buffers/Line Drivers

### Features

- Function, pinout, and drive compatible with FCT and F logic
- FCT-C speed at 4.1 ns max. (Com'l)  
FCT-A speed at 4.8 ns max. (Com'l)
- Reduced  $V_{OH}$  (typically = 3.3V) versions of equivalent FCT functions
- Edge-rate control circuitry for significantly improved noise characteristics
- Power-off disable feature
- ESD > 2000V

- Matched rise and fall times
- Fully compatible with TTL input and output logic levels
- Sink current 64 mA (Com'l),  
48 mA (Mil)  
Source current 32 mA (Com'l),  
12 mA (Mil)

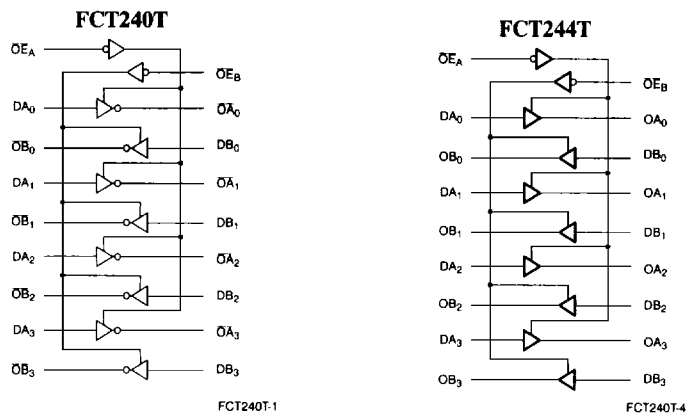
### Functional Description

The FCT240T and FCT244T are octal buffers and line drivers designed to be employed as memory address drivers, clock drivers, and bus-oriented

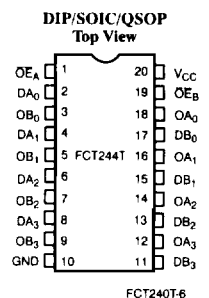
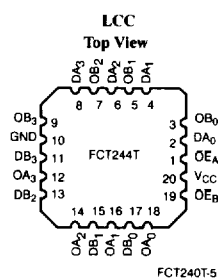
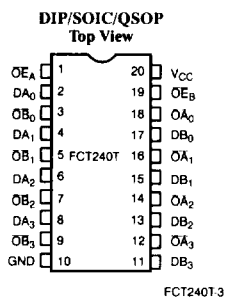
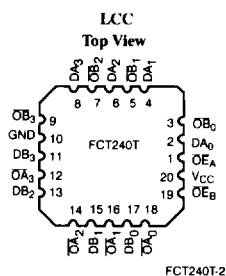
transmitters/receivers. The devices provide speed and drive capabilities equivalent to their fastest bipolar logic counterparts while reducing power consumption. The input and output voltage levels allow direct interface with TTL, NMOS, and CMOS devices without external components.

The outputs are designed with a power-off disable feature to allow for live insertion of boards.

### Logic Block Diagram



### Pin Configurations



**Function Table FCT240T<sup>[1]</sup>**

| Inputs          |                 |   | Output |
|-----------------|-----------------|---|--------|
| OE <sub>A</sub> | OE <sub>B</sub> | D |        |
| L               | L               | L | H      |
| L               | L               | H | L      |
| H               | H               | X | Z      |

**Function Table FCT244T<sup>[1]</sup>**

| Inputs          |                 |   | Output |
|-----------------|-----------------|---|--------|
| OE <sub>A</sub> | OE <sub>B</sub> | D |        |
| L               | L               | L | L      |
| L               | L               | H | H      |
| H               | H               | X | Z      |

**Maximum Ratings<sup>[2, 3]</sup>**

(Above which the useful life may be impaired. For user guidelines, not tested.)

|                                              |                 |
|----------------------------------------------|-----------------|
| Storage Temperature                          | –65°C to +150°C |
| Ambient Temperature with Power Applied       | –65°C to +135°C |
| Supply Voltage to Ground Potential           | –0.5V to +7.0V  |
| DC Input Voltage                             | –0.5V to +7.0V  |
| DC Output Voltage                            | –0.5V to +7.0V  |
| DC Output Current (Maximum Sink Current/Pin) | 120 mA          |
| Power Dissipation                            | 0.5W            |

Static Discharge Voltage ..... >2001V  
(per MIL-STD-883, Method 3015)

**Operating Range**

| Range                   | Speed  | Ambient Temperature | V <sub>CC</sub> |
|-------------------------|--------|---------------------|-----------------|
| Commercial              | CT, DT | 0°C to +70°C        | 5V ± 5%         |
| Commercial              | T, AT  | –40°C to +85°C      | 5V ± 5%         |
| Military <sup>[4]</sup> | All    | –55°C to +125°C     | 5V ± 10%        |

**Electrical Characteristics Over the Operating Range**

| Parameter        | Description                                 | Test Conditions                                         | Min.  | Typ. <sup>[5]</sup> | Max. | Unit   |
|------------------|---------------------------------------------|---------------------------------------------------------|-------|---------------------|------|--------|
| V <sub>OH</sub>  | Output HIGH Voltage                         | V <sub>CC</sub> =Min., I <sub>OH</sub> =–32 mA          | Com'l | 2.0                 |      | V      |
|                  |                                             | V <sub>CC</sub> =Min., I <sub>OH</sub> =–15 mA          | Com'l | 2.4                 | 3.3  | V      |
|                  |                                             | V <sub>CC</sub> =Min., I <sub>OH</sub> =–12 mA          | Mil   | 2.4                 | 3.3  | V      |
| V <sub>OL</sub>  | Output LOW Voltage                          | V <sub>CC</sub> =Min., I <sub>OL</sub> =64 mA           | Com'l |                     | 0.3  | 0.55 V |
|                  |                                             | V <sub>CC</sub> =Min., I <sub>OL</sub> =48mA            | Mil   |                     | 0.3  | 0.55 V |
| V <sub>IH</sub>  | Input HIGH Voltage                          |                                                         |       | 2.0                 |      | V      |
| V <sub>IL</sub>  | Input LOW Voltage                           |                                                         |       |                     | 0.8  | V      |
| V <sub>H</sub>   | Hysteresis <sup>[6]</sup>                   | All inputs                                              |       | 0.2                 |      | V      |
| V <sub>IK</sub>  | Input Clamp Diode Voltage                   | V <sub>CC</sub> =Min., I <sub>IN</sub> =–18 mA          |       | –0.7                | –1.2 | V      |
| I <sub>I</sub>   | Input HIGH Current                          | V <sub>CC</sub> =Max., V <sub>IN</sub> =V <sub>CC</sub> |       |                     | 5    | μA     |
| I <sub>IH</sub>  | Input HIGH Current                          | V <sub>CC</sub> =Max., V <sub>IN</sub> =2.7V            |       |                     | ±1   | μA     |
| I <sub>IL</sub>  | Input LOW Current                           | V <sub>CC</sub> =Max., V <sub>IN</sub> =0.5V            |       |                     | ±1   | μA     |
| I <sub>OZH</sub> | Off State HIGH-Level Output Current         | V <sub>CC</sub> = Max., V <sub>OUT</sub> = 2.7V         |       |                     | 10   | μA     |
| I <sub>OZL</sub> | Off State LOW-Level Output Current          | V <sub>CC</sub> = Max., V <sub>OUT</sub> = 0.5V         |       |                     | –10  | μA     |
| I <sub>OS</sub>  | Output Short Circuit Current <sup>[7]</sup> | V <sub>CC</sub> =Max., V <sub>OUT</sub> =0.0V           | –60   | –120                | –225 | mA     |
| I <sub>OFF</sub> | Power-Off Disable                           | V <sub>CC</sub> =0V, V <sub>OUT</sub> =4.5V             |       |                     | ±1   | μA     |

**Notes:**

- H = HIGH Voltage Level. L = LOW Voltage Level. X = Don't Care.
- Unless otherwise noted, these limits are over the operating free-air temperature range.
- Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.
- T<sub>A</sub> is the "instant on" case temperature.
- Typical values are at V<sub>CC</sub>=5.0V, T<sub>A</sub>=+25°C ambient.
- This parameter is guaranteed but not tested.
- Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample and hold techniques are preferable in order to minimize internal chip heating and more accurately reflect operational values. Otherwise prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parametric tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

**Capacitance<sup>[6]</sup>**

| Parameter        | Description        | Typ. <sup>[5]</sup> | Max. | Unit |
|------------------|--------------------|---------------------|------|------|
| C <sub>IN</sub>  | Input Capacitance  | 5                   | 10   | pF   |
| C <sub>OUT</sub> | Output Capacitance | 9                   | 12   | pF   |

**Power Supply Characteristics**

| Parameter        | Description                                 | Test Conditions                                                                                                                                                                                                      | Typ. <sup>[5]</sup> | Max.                 | Unit   |
|------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|--------|
| I <sub>CC</sub>  | Quiescent Power Supply Current              | V <sub>CC</sub> =Max., V <sub>IN</sub> ≤0.2V,<br>V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V                                                                                                                              | 0.1                 | 0.2                  | mA     |
| ΔI <sub>CC</sub> | Quiescent Power Supply Current (TTL inputs) | V <sub>CC</sub> =Max., V <sub>IN</sub> =3.4V <sup>[8]</sup><br>f <sub>1</sub> =0, Outputs Open                                                                                                                       | 0.5                 | 2.0                  | mA     |
| I <sub>CCD</sub> | Dynamic Power Supply Current <sup>[9]</sup> | V <sub>CC</sub> =Max., One Input Toggling,<br>50% Duty Cycle, Outputs Open, OE <sub>1</sub> =OE <sub>2</sub> =GND,<br>V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V                                | 0.06                | 0.12                 | mA/MHz |
| I <sub>C</sub>   | Total Power Supply Current <sup>[10]</sup>  | V <sub>CC</sub> =Max., 50% Duty Cycle,<br>Outputs Open,<br>One Bit Toggling at f <sub>1</sub> =10 MHz,<br>OE <sub>1</sub> =OE <sub>2</sub> =GND, V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V     | 0.7                 | 1.4                  | mA     |
|                  |                                             | V <sub>CC</sub> =Max.,<br>50% Duty Cycle, Outputs Open,<br>One Bit Toggling at f <sub>1</sub> =10 MHz,<br>OE <sub>1</sub> =OE <sub>2</sub> =GND, V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND                       | 1.0                 | 2.4                  | mA     |
|                  |                                             | V <sub>CC</sub> =Max.,<br>50% Duty Cycle, Outputs Open,<br>Eight Bits Toggling at f <sub>1</sub> =2.5 MHz,<br>OE <sub>1</sub> =OE <sub>2</sub> =GND, V <sub>IN</sub> ≤0.2V or V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V | 1.3                 | 2.6 <sup>[11]</sup>  | mA     |
|                  |                                             | V <sub>CC</sub> =Max.,<br>50% Duty Cycle, Outputs Open,<br>Eight Bits Toggling at f <sub>1</sub> =2.5 MHz,<br>OE <sub>1</sub> =OE <sub>2</sub> =GND, V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND                   | 3.3                 | 10.6 <sup>[11]</sup> | mA     |

**Notes:**

8. Per TTL driven input (V<sub>IN</sub>=3.4V); all other inputs at V<sub>CC</sub> or GND.  
 9. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.

10. I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>  
 I<sub>C</sub> = I<sub>CC</sub> + ΔI<sub>CC</sub>D<sub>H</sub>N<sub>T</sub> + I<sub>CCD</sub>(f<sub>0</sub>/2 + f<sub>1</sub>N<sub>1</sub>)  
 I<sub>CC</sub> = Quiescent Current with CMOS input levels  
 ΔI<sub>CC</sub> = Power Supply Current for a TTL HIGH input (V<sub>IN</sub>=3.4V)  
 D<sub>H</sub> = Duty Cycle for TTL inputs HIGH

- N<sub>T</sub> = Number of TTL inputs at D<sub>H</sub>  
 I<sub>CCD</sub> = Dynamic Current caused by an input transition pair (HLH or LHL)  
 f<sub>0</sub> = Clock frequency for registered devices, otherwise zero  
 f<sub>1</sub> = Input signal frequency  
 N<sub>1</sub> = Number of inputs changing at f<sub>1</sub>

- All currents are in milliamps and all frequencies are in megahertz.  
 11. Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are guaranteed but not tested.

**Switching Characteristics** Over the Operating Range

| Parameter                            | Description                        | FCT240T              |      |                      |      | FCT240AT             |      |                      |      | Unit | Fig. No. <sup>[13]</sup> |
|--------------------------------------|------------------------------------|----------------------|------|----------------------|------|----------------------|------|----------------------|------|------|--------------------------|
|                                      |                                    | Military             |      | Commercial           |      | Military             |      | Commercial           |      |      |                          |
|                                      |                                    | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. |      |                          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Input | 1.5                  | 9.0  | 1.5                  | 8.0  | 1.5                  | 5.1  | 1.5                  | 4.8  | ns   | 1, 2                     |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time                 | 1.5                  | 10.5 | 1.5                  | 10.0 | 1.5                  | 6.5  | 1.5                  | 6.2  | ns   | 1, 7, 8                  |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable<br>Time             | 1.5                  | 10.0 | 1.5                  | 9.5  | 1.5                  | 5.9  | 1.5                  | 5.6  | ns   | 1, 7, 8                  |

| Parameter                            | Description                        | FCT240CT             |      |                      |      | FCT240DT             |      | Unit | Fig. No. <sup>[13]</sup> |
|--------------------------------------|------------------------------------|----------------------|------|----------------------|------|----------------------|------|------|--------------------------|
|                                      |                                    | Military             |      | Commercial           |      | Commercial           |      |      |                          |
|                                      |                                    | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. |      |                          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Input | 1.5                  | 4.7  | 1.5                  | 4.3  | 1.5                  | 3.6  | ns   | 1, 2                     |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time                 | 1.5                  | 5.7  | 1.5                  | 5.0  | 1.5                  | 4.8  | ns   | 1, 7, 8                  |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time                | 1.5                  | 4.6  | 1.5                  | 4.5  | 1.5                  | 4.0  | ns   | 1, 7, 8                  |

| Parameter                            | Description                        | FCT244T              |      |                      |      | FCT244AT             |      |                      |      | Unit | Fig. No. <sup>[13]</sup> |
|--------------------------------------|------------------------------------|----------------------|------|----------------------|------|----------------------|------|----------------------|------|------|--------------------------|
|                                      |                                    | Military             |      | Commercial           |      | Military             |      | Commercial           |      |      |                          |
|                                      |                                    | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. |      |                          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Input | 1.5                  | 7.0  | 1.5                  | 6.5  | 1.5                  | 5.1  | 1.5                  | 4.6  | ns   | 1, 3                     |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time                 | 1.5                  | 8.5  | 1.5                  | 8.0  | 1.5                  | 6.5  | 1.5                  | 6.2  | ns   | 1, 7, 8                  |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable<br>Time             | 1.5                  | 7.5  | 1.5                  | 7.0  | 1.5                  | 5.9  | 1.5                  | 5.6  | ns   | 1, 7, 8                  |

| Parameter                            | Description                        | FCT244CT             |      |                      |      | FCT244DT             |      | Unit | Fig. No. <sup>[13]</sup> |
|--------------------------------------|------------------------------------|----------------------|------|----------------------|------|----------------------|------|------|--------------------------|
|                                      |                                    | Military             |      | Commercial           |      | Commercial           |      |      |                          |
|                                      |                                    | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. | Min. <sup>[12]</sup> | Max. |      |                          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Input | 1.5                  | 4.6  | 1.5                  | 4.1  | 1.5                  | 3.6  | ns   | 1, 3                     |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time                 | 1.5                  | 6.5  | 1.5                  | 5.8  | 1.5                  | 4.8  | ns   | 1, 7, 8                  |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time                | 1.5                  | 5.7  | 1.5                  | 5.2  | 1.5                  | 4.0  | ns   | 1, 7, 8                  |

Shaded areas contain preliminary information.

**Notes:**

12. Minimum limits are guaranteed but not tested on Propagation Delays.

13. See "Parameter Measurement Information" in the General Information Section.



**Ordering Information—FCT240T**

| Speed (ns) | Ordering Code   | Package Name | Package Type                        | Operating Range |
|------------|-----------------|--------------|-------------------------------------|-----------------|
| 3.6        | CY74FCT240DTQC  | Q5           | 20-Lead (150-Mil) QSOP              | Commercial      |
|            | CY74FCT240DTSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
| 4.3        | CY74FCT240CTPC  | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT240CTSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT240CTQC  | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 4.7        | CY54FCT240CTDMB | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT240CTLMB | L61          | 20-Pin Square Leadless Chip Carrier |                 |
| 4.8        | CY74FCT240ATPC  | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT240ATSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT240ATQC  | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 5.1        | CY54FCT240ATDMB | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT240ATLMB | L61          | 20-Pin Square Leadless Chip Carrier |                 |
| 8.0        | CY74FCT240TPC   | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT240TSOC  | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT240TQC   | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 9.0        | CY54FCT240TDMB  | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT240TLMB  | L61          | 20-Pin Square Leadless Chip Carrier |                 |

**Ordering Information—FCT244T**

| Speed (ns) | Ordering Code   | Package Name | Package Type                        | Operating Range |
|------------|-----------------|--------------|-------------------------------------|-----------------|
| 3.6        | CY74FCT244DTQC  | Q5           | 20-Lead (150-Mil) QSOP              | Commercial      |
|            | CY74FCT244DTSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
| 4.1        | CY74FCT244CTPC  | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT244CTSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT244CTQC  | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 4.6        | CY54FCT244CTDMB | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT244CTLMB | L61          | 20-Pin Square Leadless Chip Carrier |                 |
| 4.6        | CY74FCT244ATPC  | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT244ATSOC | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT244ATQC  | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 5.1        | CY54FCT244ATDMB | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT244ATLMB | L61          | 20-Pin Square Leadless Chip Carrier |                 |
| 6.5        | CY74FCT244TPC   | P5           | 20-Lead (300-Mil) Molded DIP        | Commercial      |
|            | CY74FCT244TSOC  | S5           | 20-Lead (300-Mil) Molded SOIC       |                 |
|            | CY74FCT244TQC   | Q5           | 20-Lead (150-Mil) QSOP              |                 |
| 7.0        | CY54FCT244TDMB  | D6           | 20-Lead (300-Mil) CerDIP            | Military        |
|            | CY54FCT244TLMB  | L61          | 20-Pin Square Leadless Chip Carrier |                 |

Shaded areas contain preliminary information.

Document #: 38-00259-A