



## FAST CMOS OCTAL BIDIRECTIONAL TRANSCEIVER

**IDT54/74FCT245/A/C**

### FEATURES:

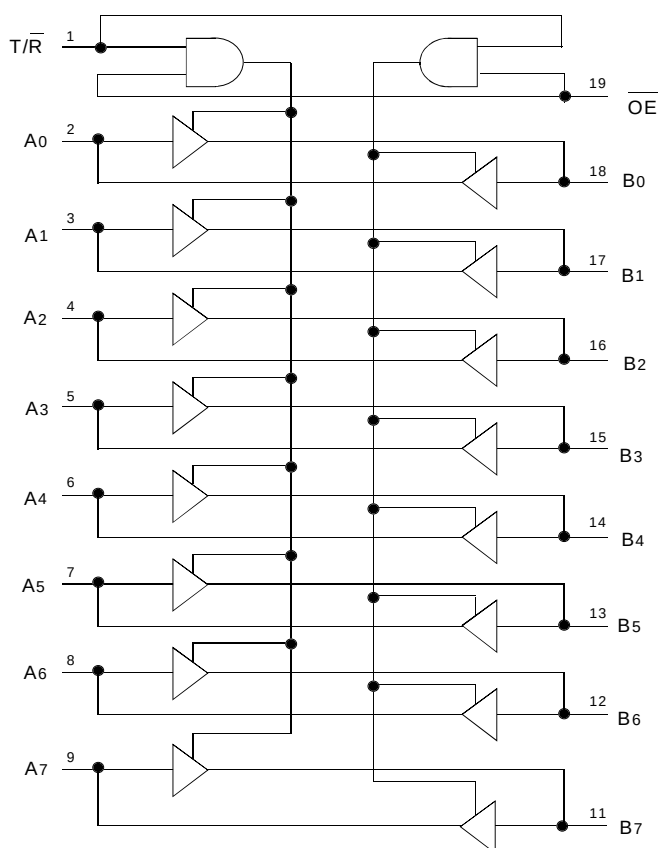
- IDT54/74FCT245 equivalent to FAST™ speed
- IDT54/74FCT245A 25% faster than FAST
- IDT54/74FCT245C 40% faster than FAST
- TTL input and output level compatible
- CMOS output level compatible
- $I_{OL} = 64\text{mA}$  (commercial) and  $48\text{mA}$  (military)
- Input current levels only  $5\mu\text{A}$  max.
- CMOS power levels ( $2.5\text{mW}$  typ. static)
- Direction control and over-riding 3-state control
- Product available in Radiation Tolerant and Radiation Enhanced versions
- Military product compliant to MIL-STD-883, Class B and DESC listed
- Meets or exceeds JEDEC Standard 18 specifications

### DESCRIPTION:

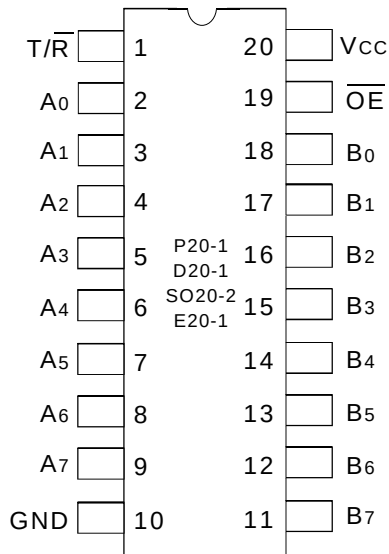
The IDT octal bidirectional transceivers are built using an advanced dual metal CMOS technology. The IDT54/74FCT245/A/C is designed for asynchronous two-way communication between data buses. The transmit/receive (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active high) enables data from A ports to B ports, and receive (active low) from B ports to A ports. The output enable ( $\overline{OE}$ ) input, when high, disables both A and B ports by placing them in High-Z condition.

The IDT54/74FCT245/A/C transceivers have non-inverting outputs.

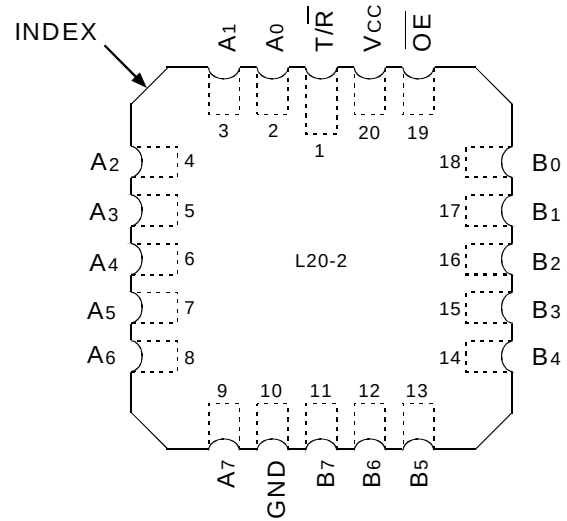
### FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



DIP/ SOIC/ CERPACK  
TOP VIEW



LCC  
TOP VIEW

## 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              | -0.5 to +7              | V    |
| V <sub>TERM</sub> <sup>(3)</sup> | Terminal Voltage with Respect to GND | -0.5 to V <sub>CC</sub> | -0.5 to V <sub>CC</sub> | 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   |
| P <sub>T</sub>                   | Power Dissipation                    | 0.5                     | 0.5                     | W    |
| I <sub>OUT</sub>                 | DC Output Current                    | 120                     | 120                     | mA   |

8-link

### NOTES:

- 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 +.5V unless otherwise noted.
- Input and V<sub>CC</sub> terminals only.
- Outputs and I/O terminals only.

## 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  | 6    | 10   | pF   |
| C <sub>I/O</sub> | I/O Capacitance          | V <sub>OUT</sub> = 0V | 8    | 12   | pF   |

### NOTE:

- This parameter is measured at characterization but not tested.

## PIN DESCRIPTION

| Pin Names                      | Description                      |
|--------------------------------|----------------------------------|
| $\overline{OE}$                | Output Enable Input (Active LOW) |
| T/ $\overline{R}$              | Transmit/Receive Input           |
| A <sub>0</sub> -A <sub>7</sub> | Side A Inputs or 3-State Outputs |
| B <sub>0</sub> -B <sub>7</sub> | Side B Inputs or 3-State Outputs |

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

| Inputs          |                   | Outputs             |
|-----------------|-------------------|---------------------|
| $\overline{OE}$ | T/ $\overline{R}$ |                     |
| L               | L                 | Bus B Data to Bus A |
| L               | H                 | Bus A Data to Bus B |
| H               | X                 | High Z State        |

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:  $V_{LC} = 0.2V$ ;  $V_{HC} = V_{CC} - 0.2V$

Commercial:  $T_A = 0^\circ C$  to  $+70^\circ C$ ,  $V_{CC} = 5.0V \pm 5\%$ ; Military:  $T_A = -55^\circ C$  to  $+125^\circ C$ ,  $V_{CC} = 5.0V \pm 10\%$

| Symbol   | Parameter                                 | Test Conditions <sup>(1)</sup>                                      |                                 | Min.     | Typ. <sup>(2)</sup> | 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<br>(Except I/O pins)   | $V_{CC} = \text{Max.}$                                              | $V_I = V_{CC}$                  | —        | —                   | 5                       | $\mu A$ |
|          |                                           |                                                                     | $V_I = 2.7V$                    | —        | —                   | 5 <sup>(4)</sup>        |         |
| $I_{IL}$ | Input LOW Current<br>(Except I/O pins)    |                                                                     | $V_I = 0.5V$                    | —        | —                   | -5 <sup>(4)</sup>       |         |
|          |                                           |                                                                     | $V_I = GND$                     | —        | —                   | -5                      |         |
| $I_{IH}$ | Input HIGH Current<br>(I/O pins only)     | $V_{CC} = \text{Max.}$                                              | $V_I = V_{CC}$                  | —        | —                   | 15                      | $\mu A$ |
|          |                                           |                                                                     | $V_I = 2.7V$                    | —        | —                   | 15 <sup>(4)</sup>       |         |
| $I_{IL}$ | Input LOW Current<br>(I/O pins only)      |                                                                     | $V_I = 0.5V$                    | —        | —                   | -15 <sup>(4)</sup>      |         |
|          |                                           |                                                                     | $V_I = GND$                     | —        | —                   | -15                     |         |
| $V_{IK}$ | Clamp Diode Voltage                       | $V_{CC} = \text{Min.}$ , $I_N = -18mA$                              |                                 | —        | -0.7                | -1.2                    | V       |
| $I_{OS}$ | Short Circuit Current                     | $V_{CC} = \text{Max.}$ <sup>(3)</sup> , $V_O = GND$                 |                                 | -60      | -120                | —                       | mA      |
| $V_{OH}$ | Output HIGH Voltage                       | $V_{CC} = 3V$ , $V_{IN} = V_{LC}$ or $V_{HC}$ , $I_{OH} = -32\mu A$ |                                 | $V_{HC}$ | $V_{CC}$            | —                       | V       |
|          |                                           | $V_{CC} = \text{Min.}$<br>$V_{IN} = V_{IH}$ or $V_{IL}$             | $I_{OH} = -300\mu A$            | $V_{HC}$ | $V_{CC}$            | —                       |         |
|          |                                           |                                                                     | $I_{OH} = -12mA \text{ MIL.}$   | 2.4      | 4.3                 | —                       |         |
|          |                                           |                                                                     | $I_{OH} = -15mA \text{ COM'L.}$ | 2.4      | 4.3                 | —                       |         |
| $V_{OL}$ | Output LOW Voltage<br>(Port A and Port B) | $V_{CC} = 3V$ , $V_{IN} = V_{LC}$ or $V_{HC}$ , $I_{OL} = 300\mu A$ |                                 | —        | GND                 | $V_{LC}$                | V       |
|          |                                           | $V_{CC} = \text{Min.}$<br>$V_{IN} = V_{IH}$ or $V_{IL}$             | $I_{OL} = 300\mu A$             | —        | GND                 | $V_{LC}$ <sup>(4)</sup> |         |
|          |                                           |                                                                     | $I_{OL} = 48mA \text{ MIL.}$    | —        | 0.3                 | 0.55                    |         |
|          |                                           |                                                                     | $I_{OL} = 64mA \text{ COM'L.}$  | —        | 0.3                 | 0.55                    |         |

### NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ C$  ambient and maximum loading.
- 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.

## POWER SUPPLY CHARACTERISTICS

 $V_{LC} = 0.2V$ ;  $V_{HC} = V_{CC} - 0.2V$ 

| Symbol           | Parameter                                         | Test Conditions <sup>(1)</sup>                                                                                                                        |                                                                                 | Min. | Typ. <sup>(2)</sup> | Max.                | Unit   |
|------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------|---------------------|---------------------|--------|
| I <sub>CC</sub>  | Quiescent Power Supply Current                    | V <sub>CC</sub> = Max.<br>V <sub>IN</sub> ≥ V <sub>HC</sub> ; V <sub>IN</sub> ≤ V <sub>LC</sub>                                                       |                                                                                 | —    | 0.5                 | 1.5                 | mA     |
| ΔI <sub>CC</sub> | Quiescent Power Supply Current<br>TTL Inputs HIGH | V <sub>CC</sub> = Max.<br>V <sub>IN</sub> = 3.4V <sup>(3)</sup>                                                                                       |                                                                                 | —    | 0.5                 | 2                   | mA     |
| I <sub>CCD</sub> | Dynamic Power Supply Current <sup>(4)</sup>       | V <sub>CC</sub> = Max.<br>Outputs Open<br>$\overline{OE} = GND$<br>T/ $\overline{R} = GND$ or V <sub>CC</sub><br>One Input Toggling<br>50% Duty Cycle | V <sub>IN</sub> ≥ V <sub>HC</sub><br>V <sub>IN</sub> ≤ V <sub>LC</sub>          | —    | 0.15                | 0.25                | mA/MHz |
| I <sub>C</sub>   | Total Power Supply Current <sup>(6)</sup>         | V <sub>CC</sub> = Max.<br>Outputs Open<br>f <sub>i</sub> = 10MHz<br>50% Duty Cycle<br>T/ $\overline{R} = \overline{OE} = GND$<br>One Bit Toggling     | V <sub>IN</sub> ≥ V <sub>HC</sub><br>V <sub>IN</sub> ≤ V <sub>LC</sub><br>(FCT) | —    | 2                   | 4                   | mA     |
|                  |                                                   |                                                                                                                                                       | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND                                 | —    | 2.3                 | 5                   |        |
|                  |                                                   | V <sub>CC</sub> = Max.<br>Outputs Open<br>f <sub>i</sub> = 2.5MHz<br>50% Duty Cycle<br>T/ $\overline{R} = \overline{OE} = GND$<br>Eight Bits Toggling | V <sub>IN</sub> ≥ V <sub>HC</sub><br>V <sub>IN</sub> ≤ V <sub>LC</sub><br>(FCT) | —    | 3.5                 | 6.5 <sup>(5)</sup>  |        |
|                  |                                                   |                                                                                                                                                       | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND                                 | —    | 5.5                 | 14.5 <sup>(5)</sup> |        |

### 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<sub>CC</sub> = 5.0V, +25°C ambient.

3. Per TTL driven input (V<sub>IN</sub> = 3.4V); all other inputs at V<sub>CC</sub> 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<sub>CC</sub> formula. These limits are guaranteed but not tested.

6. 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>CP</sub>/2 + f<sub>i</sub>N<sub>i</sub>)

I<sub>CC</sub> = Quiescent Current

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>CP</sub> = Clock Frequency for Register Devices (Zero for Non-Register Devices)

f<sub>i</sub> = Input Frequency

N<sub>i</sub> = Number of Inputs at f<sub>i</sub>

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

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

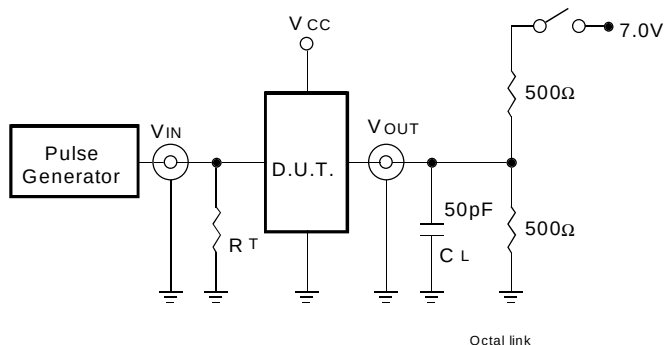
| Symbol       | Parameter                                           | Condition <sup>(1)</sup> | 54/74FCT245         |      |                     |      | 54/74FCT245A        |      |                     |      | 54/74FCT245C        |      |                     |      | Unit |
|--------------|-----------------------------------------------------|--------------------------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|------|
|              |                                                     |                          | Com'l.              |      | Mil.                |      | 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. | Min. <sup>(2)</sup> | Max. | Min. <sup>(2)</sup> | Max. |      |
| tPLH<br>tPHL | Propagation Delay<br>A to B, B to A                 | CL = 50 pF<br>RL = 500Ω  | 1.5                 | 7    | 1.5                 | 7.5  | 1.5                 | 4.6  | 1.5                 | 4.9  | 1.5                 | 4.1  | 1.5                 | 4.5  | ns   |
| tPZH<br>tPZL | Output Enable Time<br>OE to A or B                  |                          | 1.5                 | 9.5  | 1.5                 | 10   | 1.5                 | 6.2  | 1.5                 | 6.5  | 1.5                 | 5.8  | 1.5                 | 6.2  | ns   |
| tPHZ<br>tPLZ | Output Disable Time<br>OE to A or B                 |                          | 1.5                 | 7.5  | 1.5                 | 10   | 1.5                 | 5    | 1.5                 | 6    | 1.5                 | 4.8  | 1.5                 | 5.2  | ns   |
| tPZH<br>tPZL | Output Enable Time<br>T/R to A or B <sup>(3)</sup>  |                          | 1.5                 | 9.5  | 1.5                 | 10   | 1.5                 | 6.2  | 1.5                 | 6.5  | 1.5                 | 5.8  | 1.5                 | 6.2  | ns   |
| tPHZ<br>tPLZ | Output Disable Time<br>T/R to A or B <sup>(3)</sup> |                          | 1.5                 | 7.5  | 1.5                 | 10   | 1.5                 | 5    | 1.5                 | 6    | 1.5                 | 4.8  | 1.5                 | 5.2  | ns   |

### NOTES:

1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not tested.

## TEST CIRCUITS AND WAVEFORMS

### TEST CIRCUITS FOR ALL OUTPUTS



### SWITCH POSITION

| Test                                    | Switch |
|-----------------------------------------|--------|
| Open Drain<br>Disable Low<br>Enable Low | Closed |
| All Other Tests                         | Open   |

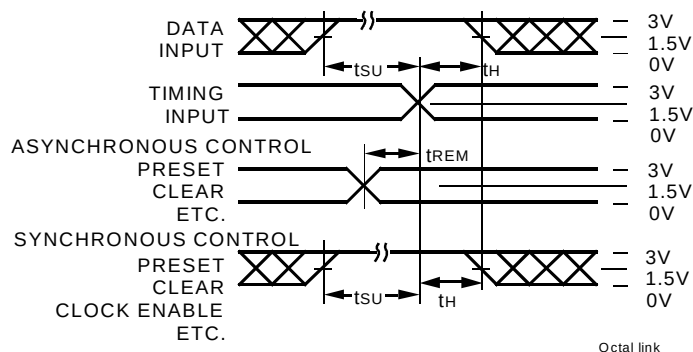
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#### DEFINITIONS:

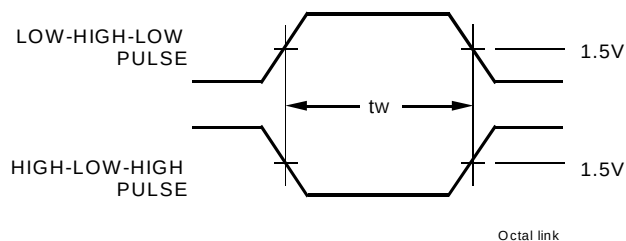
$C_L$  = Load capacitance: includes jig and probe capacitance.

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

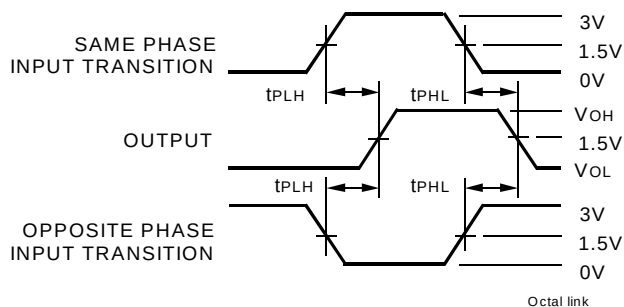
### SET-UP, HOLD, AND RELEASE TIMES



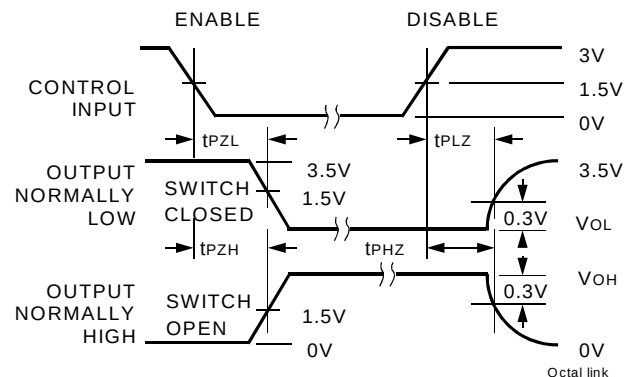
### PULSE WIDTH



### PROPAGATION DELAY



### ENABLE AND DISABLE TIMES



#### NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate  $\leq 1.0\text{MHz}$ ;  $Z_o \leq 50\Omega$ ;  $t_r \leq 2.5\text{ns}$ ;  $t_f \leq 2.5\text{ns}$ .

## ORDERING INFORMATION

| IDT | XX          | FCT | XXXX        | X       | X       |                                 |
|-----|-------------|-----|-------------|---------|---------|---------------------------------|
|     | Temp. Range |     | Device Type | Package | Process |                                 |
|     |             |     |             |         | Blank   | Commercial                      |
|     |             |     |             |         | B       | MIL-STD-883, Class B            |
|     |             |     |             |         | P       | Plastic DIP (P20-1)             |
|     |             |     |             |         | D       | CERDIP (D20-1)                  |
|     |             |     |             |         | SO      | Small Outline IC (SO20-2)       |
|     |             |     |             |         | L       | Leadless Chip Carrier (L20-2)   |
|     |             |     |             |         | E       | CERPACK (E20-1)                 |
|     |             |     |             |         | 245     | Octal Bidirectional Transceiver |
|     |             |     |             |         | 245A    |                                 |
|     |             |     |             |         | 245C    |                                 |
|     |             |     |             |         | 54      | -55°C to +125°C                 |
|     |             |     |             |         | 74      | 0°C to +70°C                    |



### CORPORATE HEADQUARTERS

2975 Stender Way  
 Santa Clara, CA 95054

### for SALES:

800-345-7015 or 408-727-6116  
 fax: 408-492-8674  
[www.idt.com](http://www.idt.com)\*

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