National Semiconductor

August 1993

54FCT2245T/54FCT2245AT Octal Bidirectional Transceiver with 25Ω Series Output Resistor

General Description

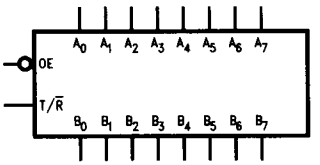
The 'FCT2245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

The information for the 54FCT2245AT is preliminary information only.

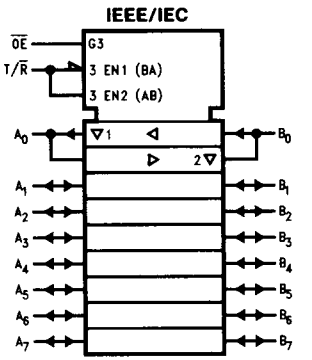
Features

- NSC54FCT2245 is pin and functionally equivalent to IDT54FCT2245
- TTL/CMOS input and output level compatible
- CMOS power levels
- 25Ω resistor limits ground bounce and transmission line ringing
- 12 mAmp I_{OL}/I_{OH}
- TRI-STATE® outputs

Logic Symbols



TL/F/11610–1



TL/F/11610–2

Pin Names	Description
$\overline{OE}$	Output Enable Input
$T/\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A TRI-STATE Inputs or TRI-STATE Outputs
B_0–B_7	Side B TRI-STATE Inputs or TRI-STATE Outputs

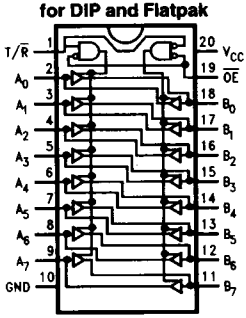
Truth Table

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

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

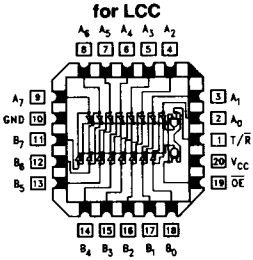
Connection Diagrams

Pin Assignment for DIP and Flatpak



TL/F/11610–3

Pin Assignment for LCC



TL/F/11610–4

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

RRD-B20M83/Printed in U. S. A.

54FCT2245T/54FCT2245AT Octal Bidirectional Transceiver with 25Ω Series Output Resistor

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Terminal Voltage with Respect to GND (V_{TERM})
54FCT −0.5V to +7.0V

Temperature under Bias (T_{BIAS})
54FCT −65°C to +135°C

Storage Temperature (T_{STG})
54FCT −65°C to +150°C

DC Output Current (I_{OUT}) 120 mA

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. Exposure to absolute maximum rating conditions for extended periods may affect reliability. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables.

Recommended Operating Conditions

Supply Voltage (V_{CC})
54FCT 4.5V to 5.5V

Input Voltage 0V to V_{CC}

Output Voltage 0V to V_{CC}

Operating Temperature (T_A)
54FCT −55°C to +125°C

Junction Temperature (T_J)
CDIP 175°C

DC Characteristics for 'FCT Family Devices

Symbol	Parameter	54FCT Min	54FCT Max	Units	Conditions	
V_{IH}	Minimum High Level Input Voltage	2.0		V		
V_{IL}	Maximum Low Level Input Voltage		0.8	V		
I_{IH}	Input High Current		5.0 5.0	μA	V_{CC} = Max	$V_I = V_{CC}$ V_I = 2.7V (Note 2)
I_{IL}	Input Low Current		−5.0 −5.0	μA	V_{CC} = Max	V_I = 0.5V (Note 2) V_I = GND
V_{IK}	Clamp Diode Voltage		−1.3	V	V_{CC} = Min; I_N = −15 mA	
I_{OS}	Short Circuit Current	−60		mA	V_{CC} = Max (Note 1); V_O = GND	
V_{OH}	Minimum High Level Output Voltage		3.0 2.4	V	V_{CC} = Min $V_{IN} = V_{IH}$ or V_{IL}	I_{OH} = −300 μA I_{OH} = −12 mA
V_{OL}	Maximum Low Level Output Voltage		0.2 0.5	V	V_{CC} = Min $V_{IN} = V_{IH}$ or V_{IL}	I_{OL} = 300 μA I_{OL} = 12 mA (Mil)
R_{OUT}	Output Resistor Value	21	38	Ω	V_{CC} = 4.5V, I_{OL} = 12 mA, 25°C	

DC Characteristics for 'FCT Family Devices (Continued)

Symbol	Parameter	54FCT		Units	Conditions	
		Min	Max			
I_{CC}	Maximum Quiescent Supply Current		1.5	mA	V_{CC} = Max $V_{IN} \geq V_{HC}$, $V_{IN} \leq 0.2V$ $f_I = 0$	
ΔI_{CC}	Quiescent Supply Current; TTL Inputs HIGH		2.0	mA	V_{CC} = Max V_{IN} = 3.4V (Note 3)	
I_{CCD}	Dynamic Power Supply Current (Note 4)		0.25	mA/MHz	V_{CC} = Max Outputs Open $T/\overline{R} = \overline{OE}$ = GND One Input Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
I_C	Total Power Supply Current (Note 6)		4.5	mA	V_{CC} = Max Outputs Open $T/\overline{R} = \overline{OE}$ = GND	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
			5.0		f_I = 10 MHz One Bit Toggling 50% Duty Cycle	V_{IN} = 3.4V V_{IN} = GND
			10.0		(Note 5) V_{CC} = Max Outputs Open $T/\overline{R} = \overline{OE}$ = GND	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
			14.5		f_I = 2.5 MHz Eight Bits Toggling 50% Duty Cycle	V_{IN} = 3.4V V_{IN} = GND

Note 1: Maximum test duration not to exceed one second, not more than one output shorted at one time.

Note 2: This parameter guaranteed but not tested.

Note 3: Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.

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

Note 5: Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

Note 6: $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
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 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 = Input Frequency
N_I = Number of Inputs at f_I
All currents are milliamps and all frequencies are in megahertz.

Note 7: For 54FCT, I_{CCD} = 0.40 mA/MHz.

Refer to applicable standard military drawing or NSC Table I for test conditions and I_C/I_{CC} limits.

AC Electrical Characteristics

Symbol	Parameter	54FCT2245T $R_L = 500\Omega$ $C_L = 50$ pF		54FCT2245AT $R_L = 500\Omega$ $C_L = 50$ pF		Units
		Min (Note)	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay A to B, B to A	1.5	7.5	1.5	4.9	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ to A or B	1.5	10.0	1.5	6.5	ns
t_{PHZ} t_{PHL}	Output Disable Time $\overline{OE}$ to A or B	1.5	10.0	1.5	6.5	ns
t_{PZH} t_{PZL}	Output Enable Time T/$\overline{R}$ to A or B	1.5	10.0	1.5	6.5	ns
t_{PHZ} t_{PLZ}	Output Enable Time T/$\overline{R}$ to A or B	1.5	10.0	1.5	6.5	ns

Note: Minimum limits guaranteed but not tested on propagation delays.

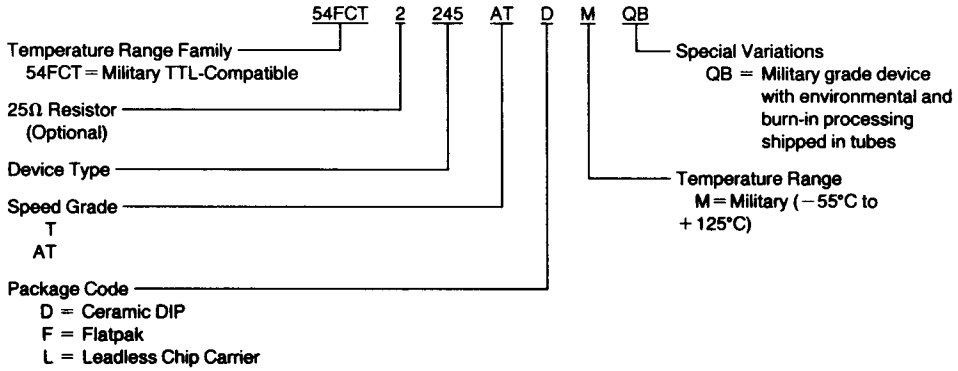
Capacitance $T_A = +25°C$, f = 1.0 MHz

Symbol	Parameter (Note)	Max	Units	Conditions
C_{IN}	Input Capacitance	12	pF	$V_{IN} = 0V$
C_{OUT}	Output Capacitance	12	pF	$V_{OUT} = 0V$

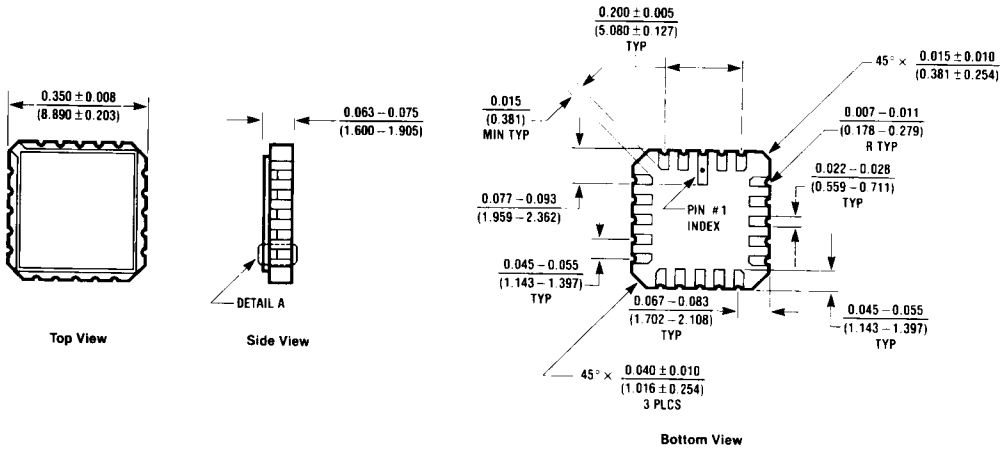
Note: This parameter is measured at characterization but not tested.

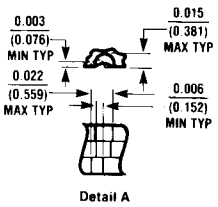
Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

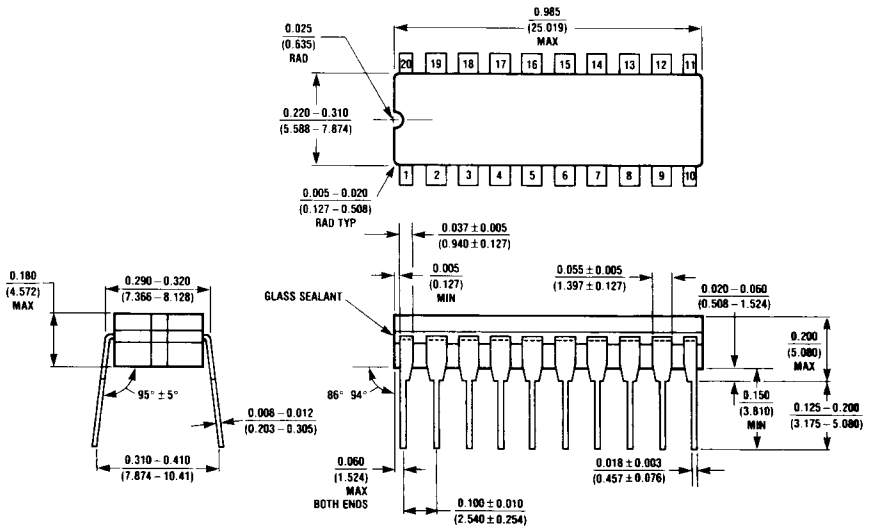


Physical Dimensions inches (millimeters)



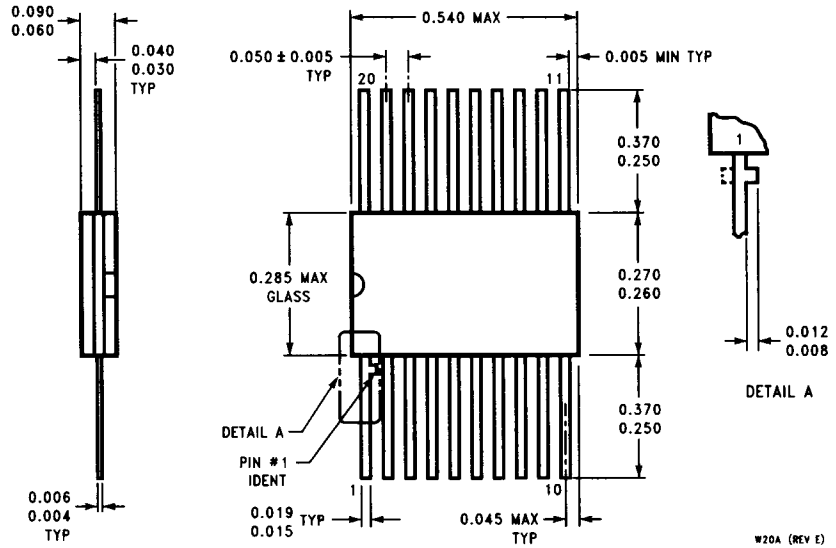


20-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A



20 Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) (Continued)



20 Lead Ceramic Flatpak (F)
NS Package Number W20A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

038619 ✓ R

National Semiconductor Corporation
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090
Tel: 1(800) 272-9959
TWX: (910) 339-9240

National Semiconductor GmbH
Industriestrasse 10
D-8080 Fürstenfeldbruck
Germany
Tel: (0-81-41) 103-0
Telex: 527649
Fax: (0-81-41) 10-35-06

National Semiconductor Japan Ltd.
Sanseido Bldg. 5F
4-15-3 Nishi Shinjuku
Shinjuku-Ku,
Tokyo 160, Japan
Tel: 3-3299-7001
FAX: 3-3299-7000

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 737-1600
Telex: 51292 NSHKL
Fax: (852) 736-9960

National Semiconductores Do Brazil Ltda.
Av. Brig. Faria Lima, 1409
6 Andar
Cep-01451, Paulistano,
Sao Paulo, SP, Brazil
Tel: (55-11) 212-5066
Telex: 391-1131931 NSBR BR
Fax: (55-11) 212-1181

National Semiconductor (Australia) Pty, Ltd.
16 Business Park Dr.
Notting Hill, VIC 3168
Australia
Tel: (3) 558-9999
Fax: (3) 558-9998