National Semiconductor

February 1995

DP7310/DP8310/DP7311/DP8311 Octal Latched Peripheral Drivers

General Description

The DP7310/8310, DP7311/8311 Octal Latched Peripheral Drivers provide the function of latching eight bits of data with open collector outputs, each driving up to 100 mA DC with an operating voltage range of 30V. Both devices are designed for low input currents, high input/output voltages, and feature a power up clear (outputs off) function.

The DP7310/8310 are positive edge latching. Two active low write/enable inputs are available for convenient data bussing without external gating.

The DP7311/8311 are positive edge latches. The active low strobe input latches data or allows fall through operation when held at logic "0". The latches are cleared (outputs off) with a logic "0" on the clear pin.

Features

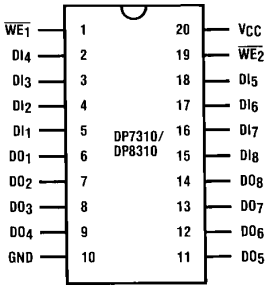
- High current, high voltage open collector outputs
- Low current, high voltage inputs
- All outputs simultaneously sink rated current "DC" with no thermal derating at maximum rated temperature
- Parallel latching or buffering
- Separate active low enables for easy data bussing
- Internal "glitch free" power up clear
- 10% V_{CC} tolerance

Applications

- High current high voltage drivers
- Relay drivers
- Lamp drivers
- LED drivers
- TRIAC drivers
- Solenoid drivers
- Stepper motor drivers
- Level translators
- Fiber-optic LED drivers

Connection Diagrams

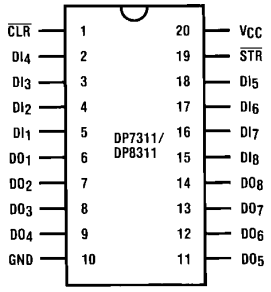
Dual-In-Line Package



TL/F/5246–1

Top View

Dual-In-Line Package



TL/F/5246–2

Top View

Order Number DP7310J, DP7311J,
DP8310N or DP8311N
See NS Package Number J20A or N20A

RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Note 1)

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

Supply Voltage	7.0V
Input Voltage	35V
Output Voltage	35V
Maximum Power Dissipation* at 25°C	
Cavity Package	1821 mW
DP8310/DP8311	2005 mW
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 4 sec.)	260°C

*Derate cavity package 12.1 mW/°C above 25°C; derate molded package 16.0 mW/°C above 25°C.

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	4.5	5.5	V
Temperature			
DP7310/DP7311	−55	+125	°C
DP8310/DP8311	0	+70	°C
Input Voltage		30	V
Output Voltage		30	V

DC Electrical Characteristics DP7310/DP8310, DP7311/DP8311 (Notes 2 and 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{IH}	Logical "1" Input Voltage		2.0			V
V_{IL}	Logical "0" Input Voltage				0.8	V
V_{OL}	Logical "0" Output Voltage	Data outputs latched to logical "0", V_{CC} = Min.				
	DP7310/DP7311	I_{OL} = 75 mA			0.4	V
	DP8310/DP8311	I_{OL} = 100 mA		0.35	0.5	V
I_{OH}	Logical "1" Output Current	Data outputs latched to logical "1", V_{CC} = Min.				
	DP7310/DP7311	V_{OH} = 25V			500	μA
	DP8310/DP8311	V_{OH} = 30V		2.5	250	μA
I_{IH}	Logical "1" Input Current	V_{IH} = 2.7V, V_{CC} = Max		0.1	25	μA
I_I	Input Current at Maximum Input Voltage	V_{IN} = 30V, V_{CC} = Max		1	250	μA
I_{IL}	Logical "0" Input Current	V_{IN} = 0.4V, V_{CC} = Max		−215	−300	μA
V_{clamp}	Input Clamp Voltage	I_{IN} = 12 mA		−0.8	−1.5	V
I_{CC0}	Supply Current, Outputs On	Data outputs latched to a logical "0". All Inputs are at logical "1", V_{CC} = Max.				
	DP7310			100	125	mA
	DP8310			100	152	mA
	DP7311			88	117	mA
	DP8311			88	125	mA
I_{CC1}	Supply Current, Outputs Off	Data outputs latched to a logic "1". Other conditions same as I_{CC0}.				
	DP7310			40	47	mA
	DP8310			40	57	mA
	DP7311			25	34	mA
	DP8311			25	36	mA

AC Electrical Characteristics DP7310/DP8310: $V_{CC} = 4.5V$, $T_A = -55°C$ to $+125°C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd0}	High to Low Propagation Delay Write Enable Input to Output	*(Figure 1)*		40	120	ns
t_{pd1}	Low to High Propagation Delay Write Enable Input to Output	*(Figure 1)*		70	150	ns
t_{SETUP}	Minimum Set-Up Time Data in to Write Enable Input	$t_{HOLD} = 0$ ns *(Figure 1)*	45	20		ns
t_{pWH}, t_{pWL}	Minimum Write Enable Pulse Width	*(Figure 1)*	60	25		ns
t_{THL}	High to Low Output Transition Time	*(Figure 1)*		16	35	ns
t_{TLH}	Low to High Output Transition Time	*(Figure 1)*		38	70	ns
C_{IN}	''N'' Package (Note 4)			5	15	pF

AC Electrical Characteristics DP7311/DP8311: $V_{CC} = 5V$, $T_A = 25°C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd0}	High to Low Propagation Delay Data In to Output	*(Figure 2)*		30	60	ns
t_{pd1}	Low to High Propagation Delay Data to Output	*(Figure 2)*		70	100	ns
t_{SETUP}	Minimum Set-Up Time Data in to Strobe Input	$t_{HOLD} = 0$ ns *(Figure 2)*	0	−25		ns
t_{pWL}	Minimum Strobe Enable Pulse Width	*(Figure 2)*	60	35		ns
t_{pdC}	Propagation Delay Clear to Data Output	*(Figure 2)*		70	135	ns
t_{pWC}	Minimum Clear Input Pulse Width	*(Figure 2)*	60	25		ns
t_{THL}	High to Low Output Transition Time	*(Figure 2)*		20	35	ns
t_{TLH}	Low to High Output Transition Time	*(Figure 2)*		38	60	ns
C_{IN}	Input Capacitance—Any Input	(Note 4)		5	15	pF

Note 1: ''Absolute Maximum Ratings'' are those values beyond which the safety of the device cannot be guaranteed. Except for ''Operating Temperature Range'' they are not meant to imply that the devices should be operated at these limits. The table of ''Electrical Characteristics'' provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DP7310/DP7311 and across the 0°C to +70°C for the DP8310/DP8311. All typical values are for $T_A = 25°C$, $V_{CC} = 5V$.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted.

Note 4: Input capacitance is guaranteed by periodic testing. $f_{TEST} = 10$ kHz at 300 mV, $T_A = 25°C$.

Logic Table

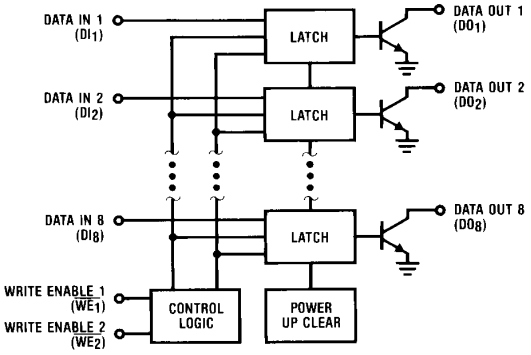
DP7310/DP8310			
Write Enable 1 $\overline{WE}_1$	Write Enable 2 $\overline{WE}_2$	Data Input DI_{1-8}	Data Output DO_{1-8}
0	0	X	Q
0	↓	0	1
0	↓	1	0
↓	0	0	1
↓	0	1	0
0	1	X	Q
1	0	X	Q
1	1	X	Q

DP7311/DP8311			
Clear $\overline{CLR}$	Strobe $\overline{STR}$	Data Input DI_{1-8}	Data Output DO_{1-8}
1	1	X	Q
1	0	0	1
1	0	1	0
0	X	X	1

X = Don't Care
1 = Outputs Off
0 = Outputs On
Q = Pre-existing Output
↓ = Positive Edge Transition

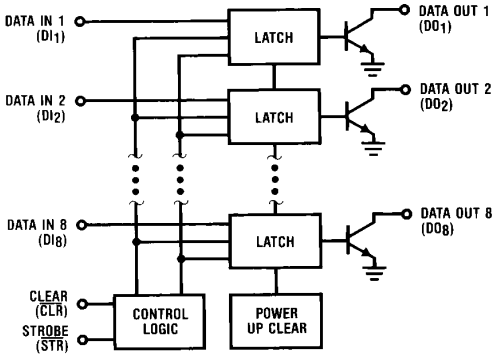
Block Diagrams

DP7310/DP8310



TL/F/5246–3

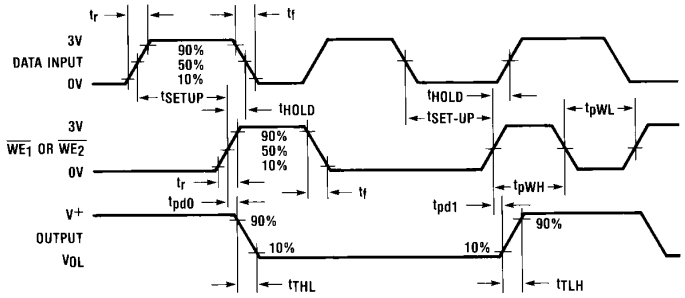
DP7311/DP8311



TL/F/5246–4

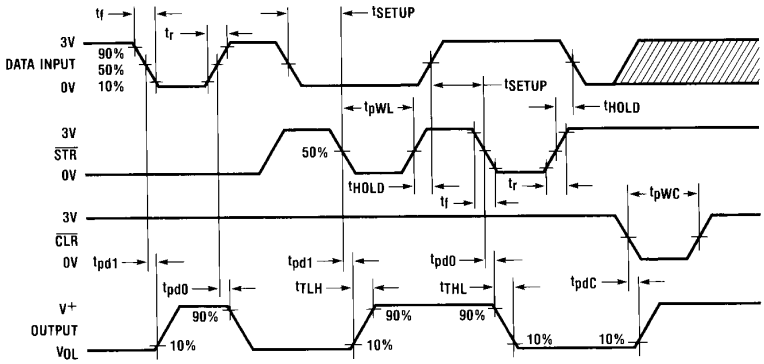
Switching Time Waveforms

DP7310/DP8310



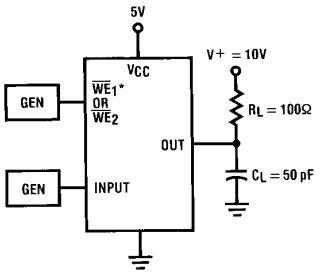
TL/F/5246–5

DP7311/DP8311



TL/F/5246–6

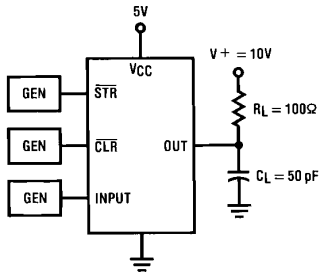
Switching Time Test Circuits



TL/F/5246–7

*$\overline{WE}_1$ = 0V When the Input = $\overline{WE}_2$

FIGURE 1. DP7310/DP8310



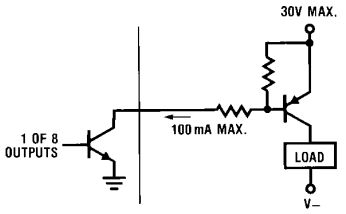
TL/F/5246–8

Pulse Generator Characteristics:
Z_O = 50Ω, t_r = t_f = 5 ns

FIGURE 2. DP7311/DP8311

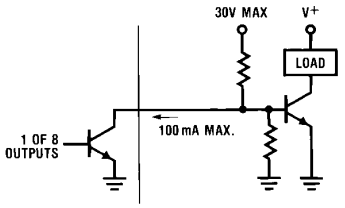
Typical Applications DP8310/11 Buffering High Current Device (Notes 1 and 2)

PNP High Current Driver



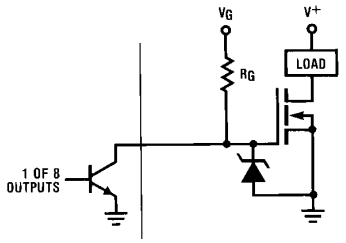
TL/F/5246–9

NPN High Current Driver



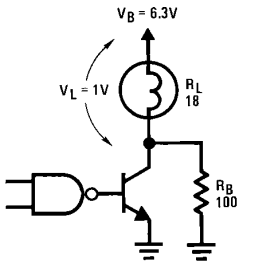
TL/F/5246–10

VMOS High Current Driver



TL/F/5246–11

Circuit Used to Reduce Peak Transient Lamp Current



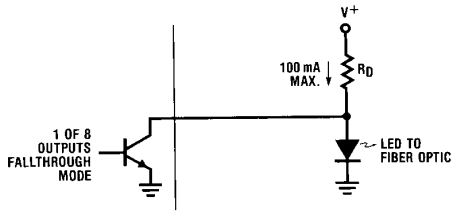
$$R_B = \left(\frac{V_B - V_L}{V_L}\right) R_L$$

$$R_B = \left(\frac{6.3 - 1}{1}\right) 18\Omega = 95.4 \approx 100\Omega$$

TL/F/5246–12

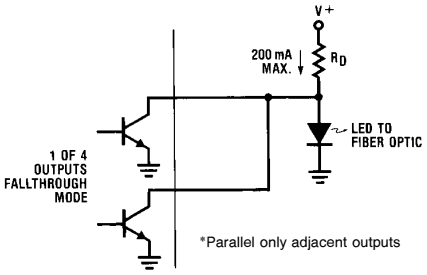
Eight Output/Four Output Fiber Optic LED Driver

DP8311 100 mA Drivers



TL/F/5246–13

DP8311 Parallel Outputs (200 mA) Drivers*

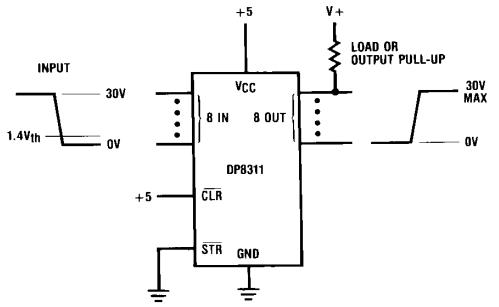


*Parallel only adjacent outputs

TL/F/5246–14

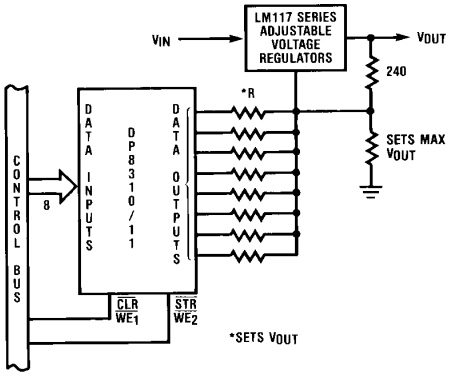
Typical Applications (Continued)

8-Bit Level Translator-Driver



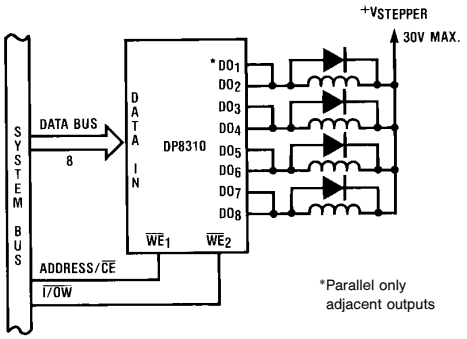
TL/F/5246–15

Digital Controlled 256 Level Power Supply from 1.2V to 30V



TL/F/5246–16

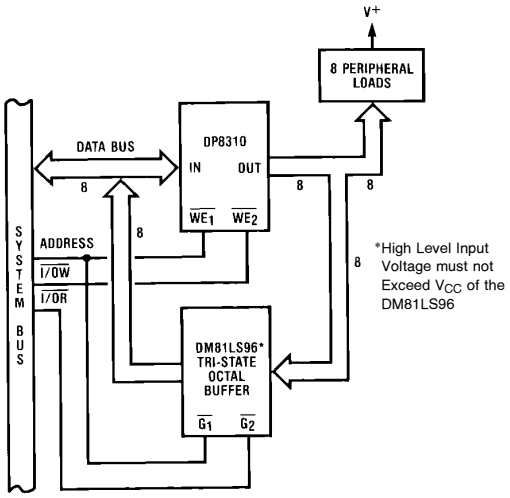
200 mA Drive for a 4 Phase Bifilar Stepper Motor



*Parallel only adjacent outputs

TL/F/5246–17

Reading the State of the Latched Peripherals

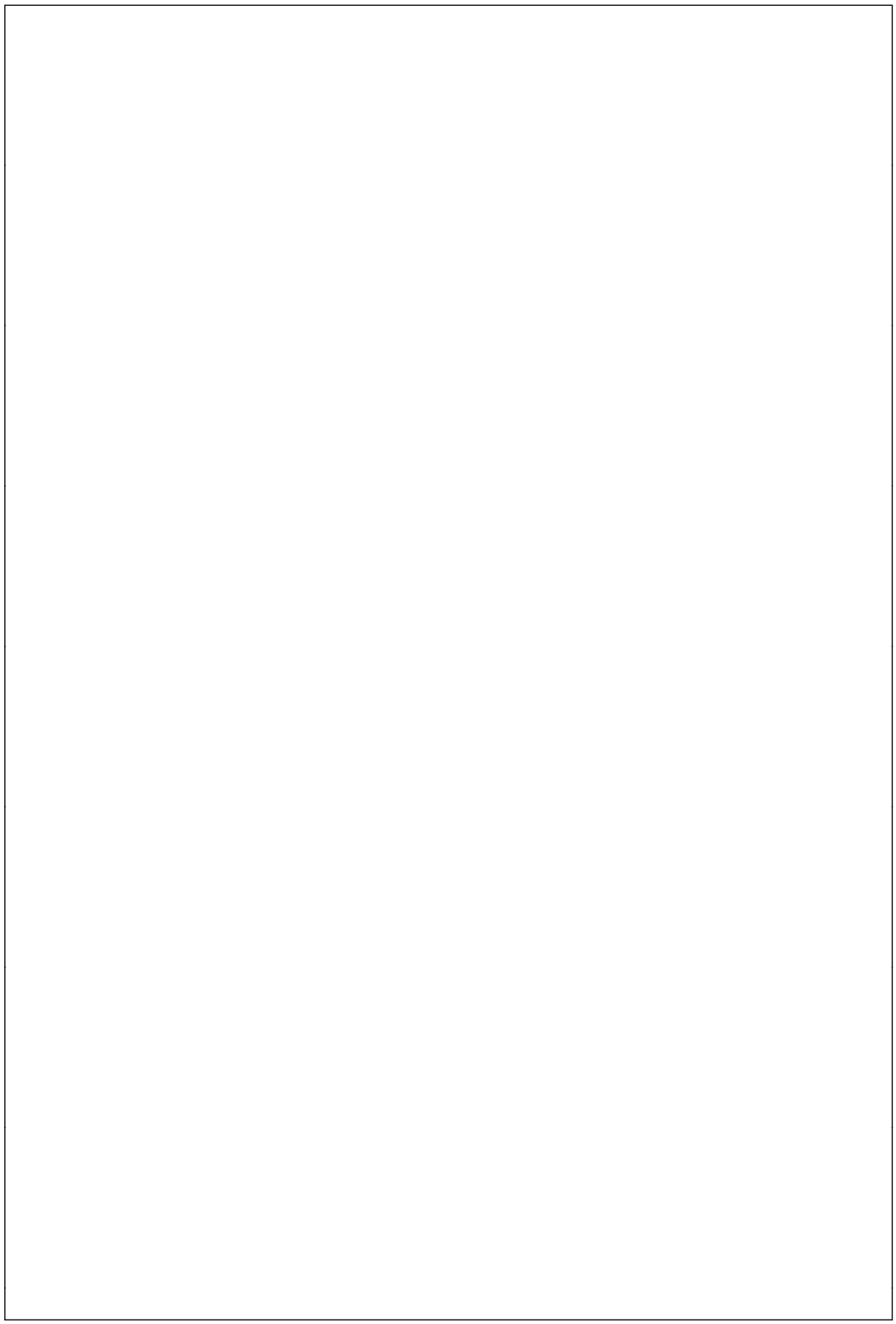


*High Level Input Voltage must not Exceed V_{CC} of the DM81LS96

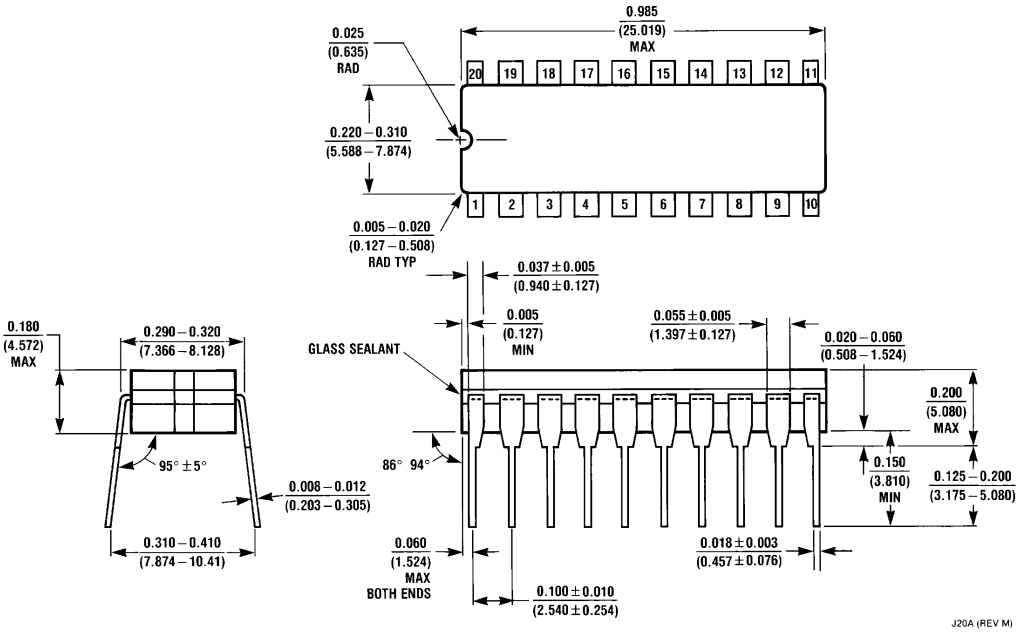
TL/F/5246–18

Note 1: Always use good V_{CC} bypass and ground techniques to suppress transients caused by peripheral loads.

Note 2: Printed circuit board mounting is required if these devices are operated at maximum rated temperature and current (all outputs on DC).

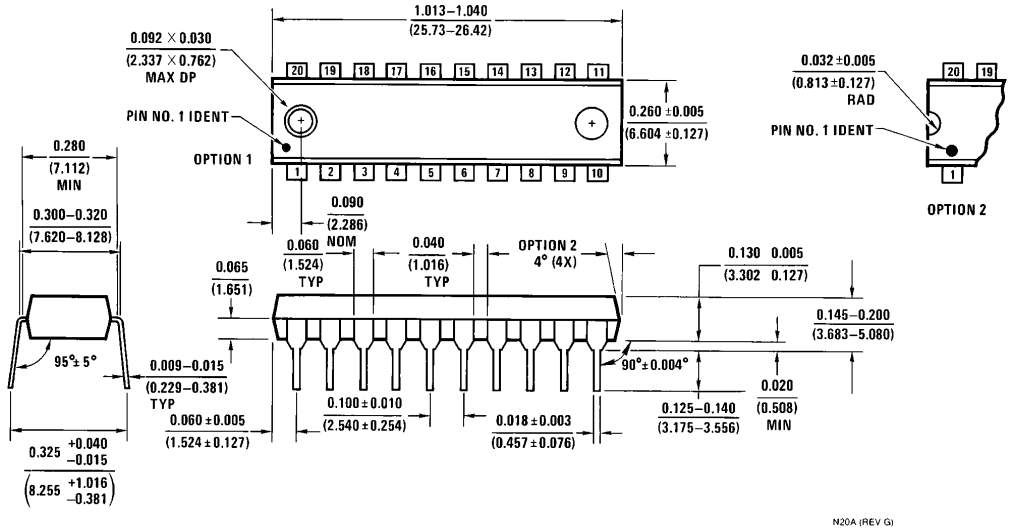


Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number DP7310J or DP7311J
NS Package Number J20A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number DP8310N or DP8311N
NS Package Number N20A

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.

National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408