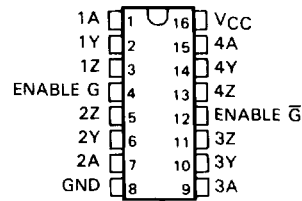


SN55ALS192, SN75ALS192 QUADRUPLE DIFFERENTIAL LINE DRIVERS

D2904, JULY 1985 - REVISED JUNE 1986

- Meets EIA Standard RS-422-A
- High-Speed, Low-Power ALS Design
- 3-State TTL Compatible
- Single 5-V Supply Operation
- High Output Impedance in Power-Off Condition
- Complementary Output Enable Inputs
- Improved Replacement for the AM26LS31

SN55ALS192 . . . J PACKAGE
SN75ALS192 . . . D, J, OR N PACKAGE
(TOP VIEW)



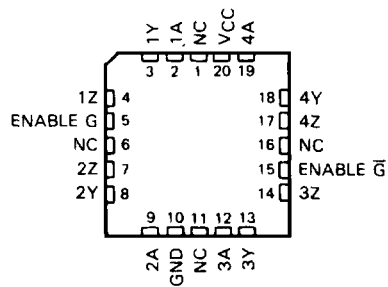
description

These quadruple complementary-output line drivers are designed for data transmission over twisted-pair or parallel-wire transmission lines. They meet the requirements of EIA Standard RS-422-A and are compatible with 3-state TTL circuits. Advanced Low-Power Schottky technology provides high speed without the usual power penalties. Standby supply current is typically only 26 mA, while typical propagation delay time is less than 10 ns.

High-impedance inputs maintain input currents low, less than 1 μ A for a high level and less than 100 μ A for a low level. Complementary control inputs, G and \bar{G} , allow these devices to be enabled at either a high input level or low input level. The SN75ALS192 is capable of data rates in excess of 20 megabits per second and is designed to operate with the SN75ALS193 quadruple line receiver. The SN55ALS192 is also capable of data rates in excess of 20 megabits per second and designed to operate with the SN55ALS193; however, it may be limited to a lower bit rate based on the temperature. Reference should be made to the Dissipation Rating Table and Figure 15.

The SN55ALS192 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN75ALS192 is characterized for operation from 0°C to 70°C .

SN55ALS192 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

FUNCTION TABLE (EACH DRIVER)

INPUT A	ENABLES		OUTPUTS	
	G	\bar{G}	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

H = high level, L = low level,
Z = high impedance (off),
X = irrelevant

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

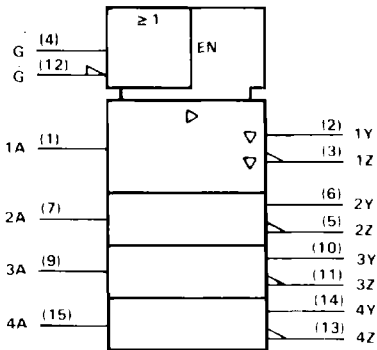
**TEXAS
INSTRUMENTS**

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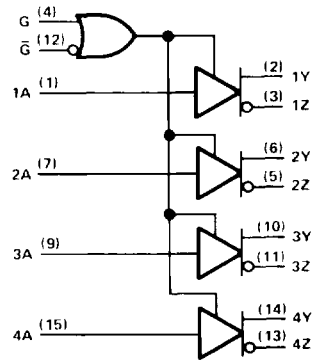
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SN55ALS192, SN75ALS192 QUADRUPLE DIFFERENTIAL LINE DRIVERS

logic symbol†



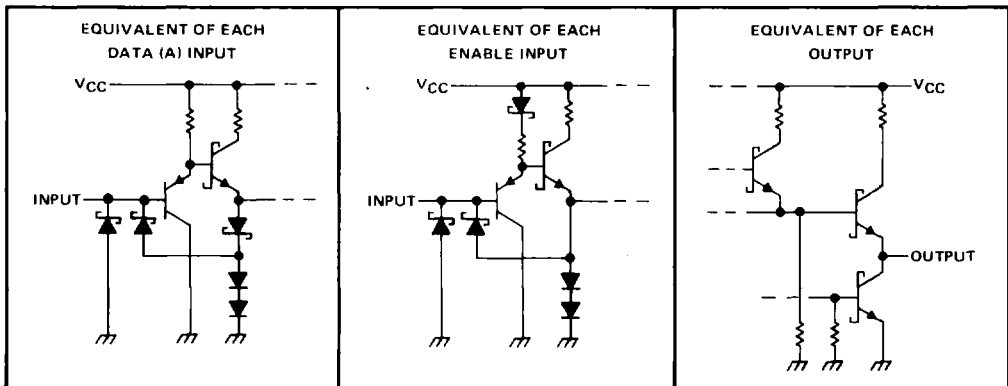
logic diagram (positive logic)



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

schematics of inputs and outputs



SN55ALS192, SN75ALS192 QUADRUPLE DIFFERENTIAL LINE DRIVERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		SN55ALS192	SN75ALS192	UNIT
Supply voltage, V_{CC} (see Note 1)		7	7	V
Input voltage, V_I		7	7	V
Output off-state voltage		6	6	V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	D package		950	mW
	FK package	1375		
	J package	1375	1025	
	N package		1150	
Operating free-air temperature range		-55 to 125	0 to 70	°C
Storage temperature range		-65 to 150		°C
Case temperature for 60 seconds		FK package	260	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds		J package	300	
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		D or N package	260	

- NOTES: 1. All voltage values except differential output voltage V_{OD} are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to the Dissipation Rating Table. In the J package, SN55ALS192 chips are either alloy or silver glass mounted and SN75ALS192 chips are glass mounted.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR	$T_A = 70^\circ\text{C}$	$T_A = 125^\circ\text{C}$
	POWER RATING	ABOVE $T_A = 25^\circ\text{C}$	POWER RATING	POWER RATING
D	950 mW	7.6 mW/°C	608 mW	
FK or J (SN55ALS192)	1375 mW	11.0 mW/°C	880 mW	275 mW
J (SN75ALS192)	1025 mW	8.2 mW/°C	656 mW	
N	1150 mW	9.2 mW/°C	736 mW	

recommended operating conditions

	SN55ALS192			SN75ALS192			UNIT	
	MIN	NOM	MAX	MIN	NOM	MAX		
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V	
High level input voltage, V_{IH}	2			2			V	
Low-level input voltage, V_{IL}	0.8			0.8			V	
High-level output current, I_{OH}	-20			-20			mA	
Low-level output current, I_{OL}	20			20			mA	
Operating free-air temperature, T_A	-55			0			70	°C

SN55ALS192, SN75ALS192 QUADRUPLE DIFFERENTIAL LINE DRIVERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS ¹		SN55ALS192		SN75ALS192		UNIT
			MIN	TYP ²	MAX	MIN	
V _{IK} Input clamp voltage	V _{CC}	MIN. I _I 18 mA		1.5		1.5	V
V _{OH} High-level output voltage	V _{CC}	MIN. I _{OH} 20 mA	2.4		2.5		V
V _{OL} Low-level output voltage	V _{CC}	MIN. I _{OL} 20 mA		0.5		0.5	V
V _O Output voltage	V _{CC}	MAX. I _O 0	0	6	0	6	V
V _{OD1} Differential output voltage	V _{CC}	MIN. I _O 0	1.5	6	1.5	6	V
V _{OD2} Differential output voltage	R _L	100 Ω. See Figure 1	V _{OD1}		V _{OD1}		V
Δ V _{OD} Change in magnitude of differential output voltage ³			±0.2		±0.2		V
V _{OC} Common mode output voltage ⁴	R _L	100 Ω. See Figure 1	±3		±3		V
Δ V _{OC} Change in magnitude of common mode output voltage ³			±0.2		±0.2		V
I _O Output current with power off	V _{CC}	0	V _O 6 V	100	V _O 0.25 V	100	μA
I _{OZ} Off state (high impedance state) output current	V _{CC}	MAX	V _O 0.5 V	20	V _O 2.5 V	20	μA
I _I Input current at maximum input voltage	V _{CC}	MAX. V _I 7 V	0.1		0.1		mA
I _{IH} High-level input current	V _{CC}	MAX. V _I 2.7 V	20		20		μA
I _{IL} Low-level input current	V _{CC}	MAX. V _I 0.4 V	0.2		0.2		mA
I _{OS} Short circuit output current ⁵	V _{CC}	MAX	30	150	30	150	mA
I _{CC} Supply current (all drivers)	V _{CC}	MAX. All outputs disabled	26	45	26	45	μA

¹For conditions shown as MIN or MAX, use the appropriate value specified under Recommended Operating Conditions.

²All typical values are at V_{CC} = 5 V and T_A = 25°C.

³Δ|V_{OD}| and Δ|V_{OC}| are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.

⁴In EIA Standard RS-422A, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage. V_{OS}.

⁵Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH} Propagation delay time, low to high level output			6	13	ns
t _{PHL} Propagation delay time, high to low level output			9	14	ns
Output to output skew	C _L = 30 pF, S1 and S2 open		3	6	ns
t _{PZH} Output enable time to high level	R _I = 75 Ω		11	15	ns
t _{PZL} Output enable time to low level	R _I = 150 Ω		16	20	ns
t _{PHZ} Output disable time from high level			8	15	ns
t _{PLZ} Output disable time from low level	C _L = 10 pF, S1 and S2 closed		18	20	ns

PARAMETER MEASUREMENT INFORMATION

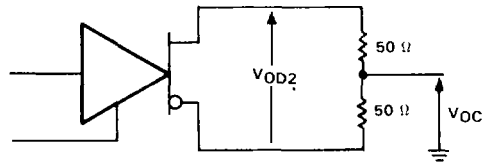
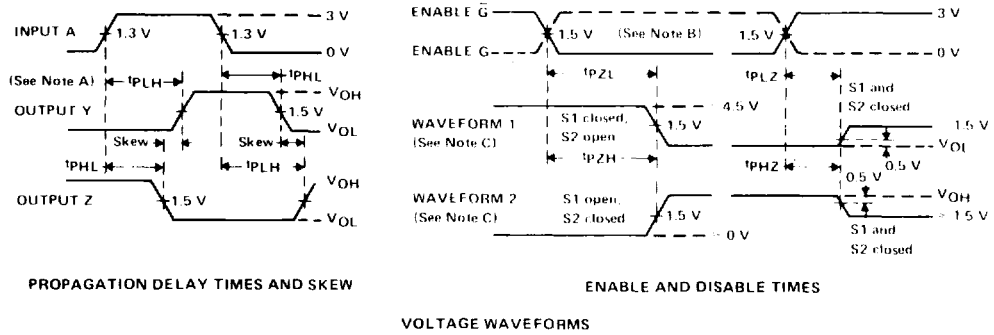


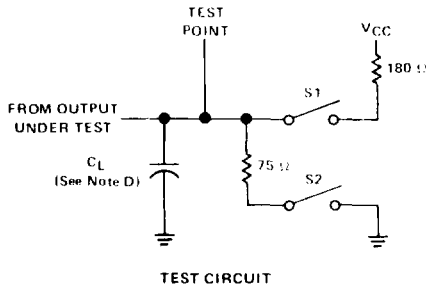
FIGURE 1. DIFFERENTIAL AND COMMON-MODE OUTPUT VOLTAGES



PROPAGATION DELAY TIMES AND SKEW

ENABLE AND DISABLE TIMES

VOLTAGE WAVEFORMS



TEST CIRCUIT

- NOTES: A. When measuring propagation delay times and skew, switches S1 and S2 are open.
 B. Each enable is tested separately.
 C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 D. C_L includes probe and jig capacitance.
 E. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_0 \approx 50 \Omega$, $t_r \leq 15 \text{ ns}$, and $t_f \leq 6 \text{ ns}$.

FIGURE 2. SWITCHING TIMES

SN55ALS192, SN75ALS192
QUADRUPLE DIFFERENTIAL LINE DRIVERS

TYPICAL CHARACTERISTICS

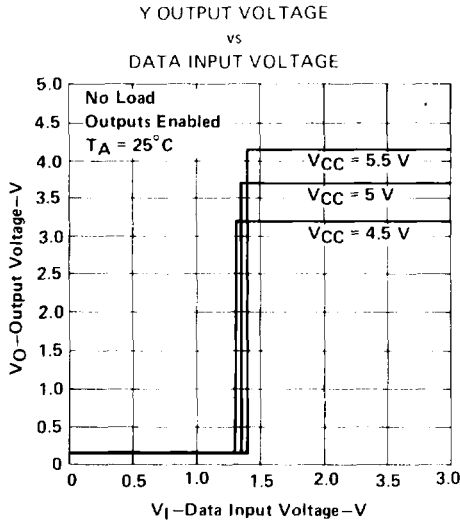


FIGURE 3

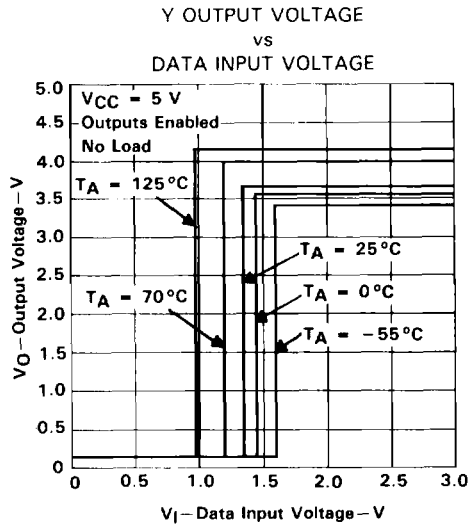


FIGURE 4

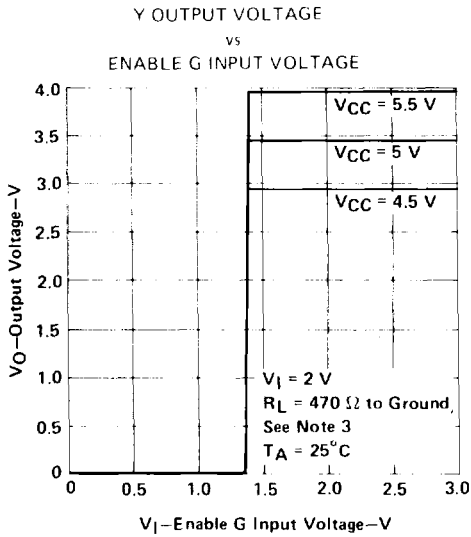


FIGURE 5

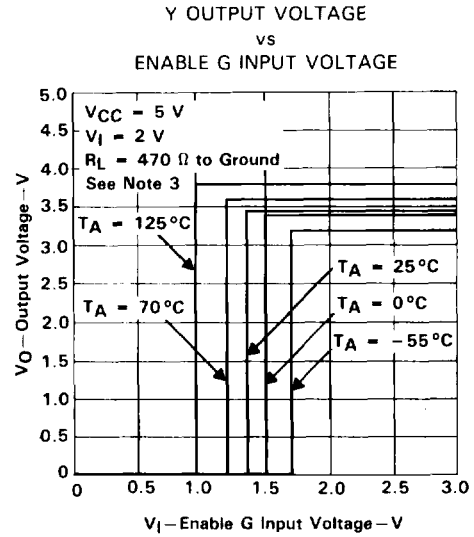


FIGURE 6

NOTE 3: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.



TYPICAL CHARACTERISTICS

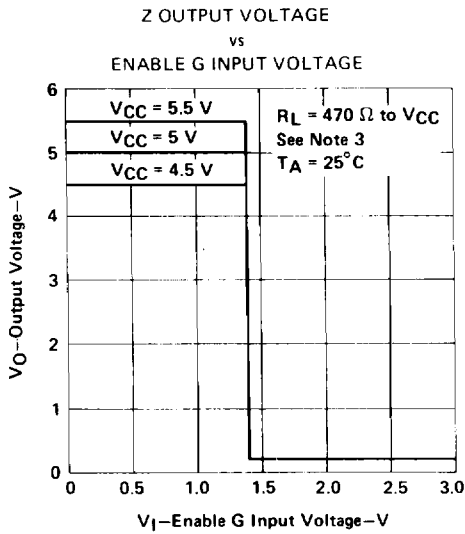


FIGURE 7

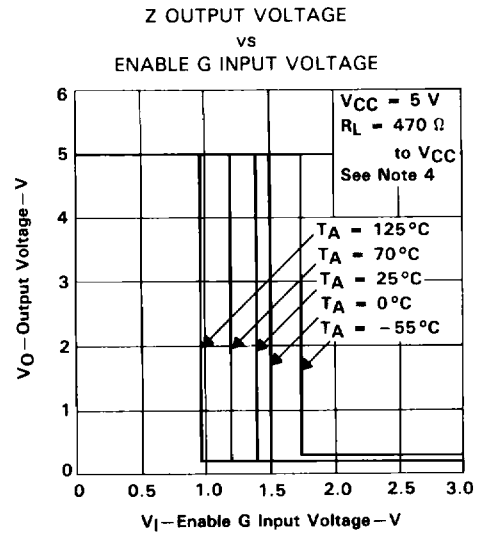


FIGURE 8

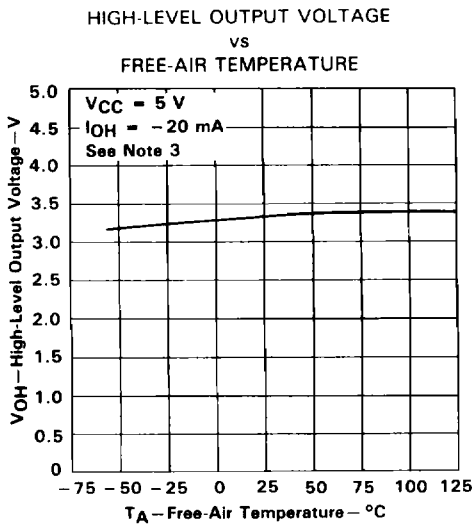


FIGURE 9

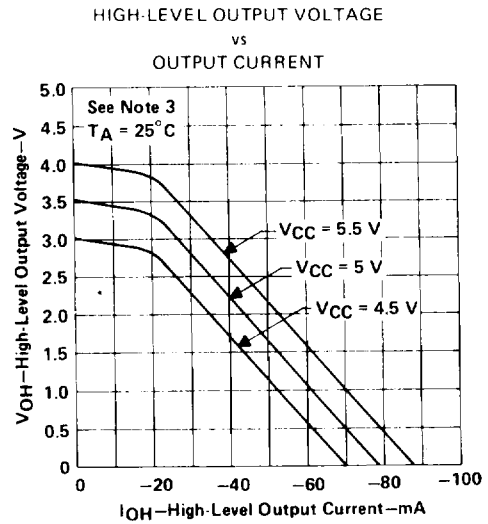


FIGURE 10

NOTES: 3. The A input is connected to VCC during the testing of the Y outputs and to ground during the testing of the Z outputs.
 4. The A input is connected to ground during the testing of the Y outputs and to VCC during the testing of the Z outputs.

SN55ALS192, SN75ALS192
QUADRUPLE DIFFERENTIAL LINE DRIVERS

TYPICAL CHARACTERISTICS

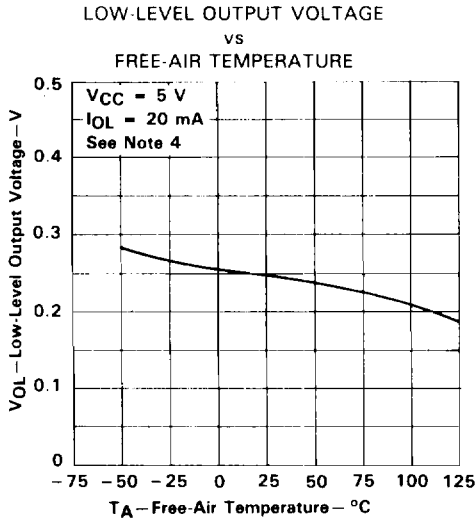


FIGURE 11

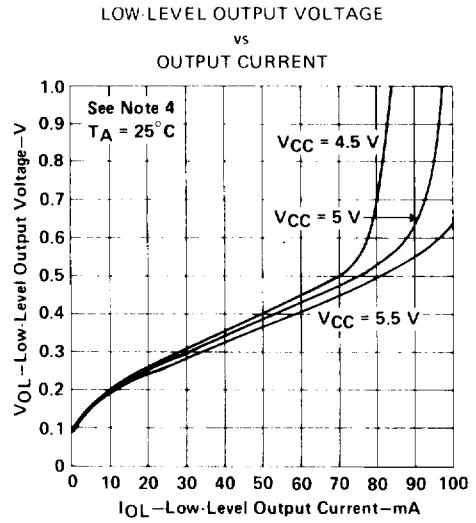


FIGURE 12

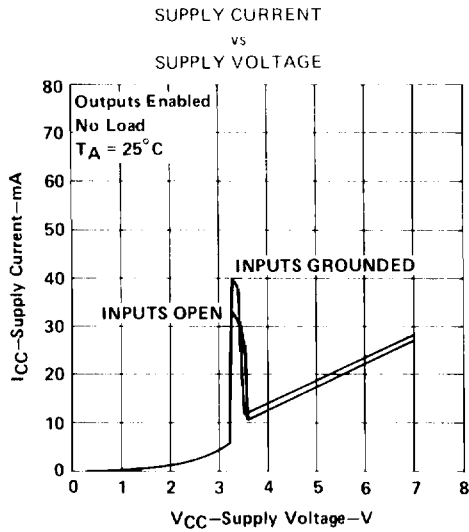


FIGURE 13

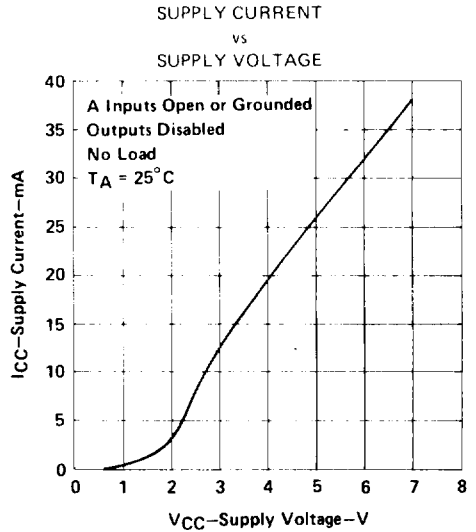


FIGURE 14

NOTE 4: The A input is connected to ground during the testing of the Y outputs and to V_{CC} during the testing of the Z outputs.

TYPICAL CHARACTERISTICS

SUPPLY CURRENT
vs
FREQUENCY

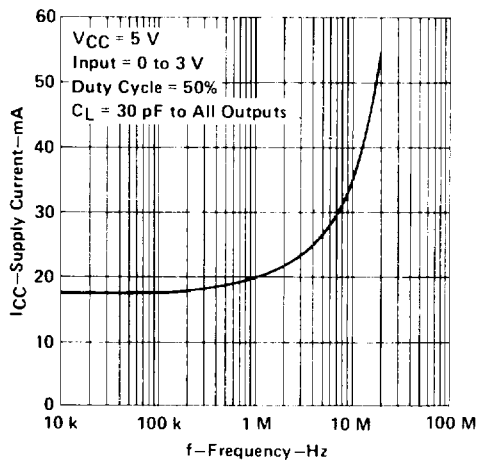


FIGURE 15

