

9388929 V T C INC

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VS610J/S

MIL-STD-1397 NTDS

LINE DRIVER/RECEIVER

T-75-45-01

FEATURES

- Meets MIL-STD-1397 Types B and C (with exceptions as noted)
- Output Short Circuit Protection
- Available in 24-Pin LCC and CERDIP
- Military Temperature Range -55°C to +125°C

DESCRIPTION

This device is selectable for MIL-STD-1397A type B (NTDS Fast) or type C (ANEW) I/O Interface of standard digital data for Naval systems.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage Range:

V _{EE}	+0.5V to -7.0V
V _{CC}	-0.5V to +7.0V
V ₊	-0.5V to +7.0V
V _C	+0.5V to -7.0V
V _B	-7.0V to +7.0V

Input Voltages:

DRAI, DRBI, DRCI	-1.5V to +5.5V
RCAI+, RCBI+, RCCI+	-10V to +10V
RCAI-, RCBI-, RCCI-	-10V to +10V
(RCXI+) - (RCXI-)	-10V to +10V
OE, B/C	-1.5V to +5.5V

Operating Temperature Range:

Commercial	 (VS610J)0°C to 70°C
Military (Note 1)	 (VS610S)-55°C to 125°C

Storage Temperature Range

Note 1: Power derating above T_A = 70°C to be based on a maximum junction temperature of 150°C and the thermal factors of $\theta_{JC} = 57.5^\circ\text{C/W}$ and $\theta_{JA} = 106^\circ\text{C/W}$.

RECOMMENDED OPERATING CONDITIONS

High Level Input Voltage (V _{IH})	2.0V Min
Low Level Input Voltage (V _{IL})	0.7V Max

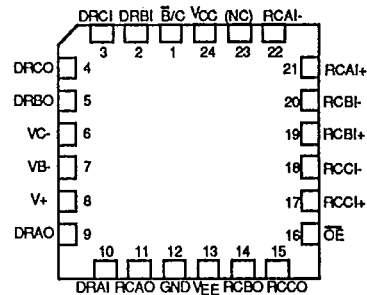
Supply Voltages	Type B	Type C
V ₊	OV (GND)	+4.5V to +5.5V
V _C	NC	OV (GND)
V _{EE}	-4.5V to -5.5V	-4.5V to -5.5V
V _{CC}	+4.5V to +5.5V	+4.5V to +5.5V
V _B	-4.5V to -5.5V	+4.5V to +5.5V (thru 100Ω resistor)
B/C	OV (GND)	+4.5V to +5.5V (thru 1KΩ resistor)

PACKAGE TYPES AVAILABLE

- 24-Pin Plastic DIP
- 24-Pin CERDIP
- 24-Pin LCC
- 28-Pin PLCC/CLCC (CERQUAD)

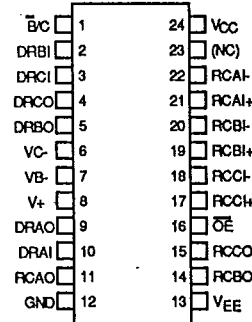
CONNECTION DIAGRAMS

Leadless Chip Carrier Package



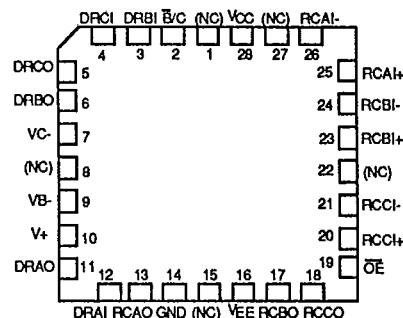
Top View

CERDIP Package



Top View

PLCC/CLCC Package



Top View

LSP FAMILY DATA SHEETS

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ELECTRICAL CHARACTERISTICS $V_{CC} = +5V \pm 10\%$, $T_A = -55^\circ$ to 125°C (unless otherwise specified)

DRIVER SECTION MIL - STD - 1397A			LIMITS VS610S		
PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNITS
Input Low Voltage	V_{IL}			0.7	Volts
Input High Voltage	V_{IH}		2.0		Volts
Output Low Voltage	V_{OL1} (ANEW)	$V_+ = 4.5V$; $V_- = \text{GND}$; $V_{IN} = 2.0V$; $I_{OL} = 40\text{mA}$; $V_{CC} = 4.5V$		0.5	Volts
	V_{OL2} (FAST)	$V_+ = \text{GND}$; $V_{CC} = 4.5V$; $V_{IN} = 0.7V$; $V_- = -4.5V$; $I_{OL} = 0.5\text{mA}$		(Note 1) -3.0	Volts
Output High Voltage	V_{OH1} (ANEW)	$V_+ = 4.5V$; $V_- = \text{GND}$; $V_{IN} = 0.7V$; $I_{OH} = -27\text{mA}$; $V_{CC} = 4.5V$	2.7		Volts
	V_{OH2} (FAST)	$V_+ = \text{GND}$; $V_{CC} = 4.5V$; $V_{IN} = 2.0V$; $V_- = -4.5V$; $I_{OH} = -1.5\text{mA}$	-0.5		Volts
Input Current	I_I	$V_{CC} = 5.5V$; $V_I = 5.5V$		0.1	mA
High-Level Input Current	I_{IH}	$V_{CC} = 5.5V$; $V_{IH} = 2.7V$		20	μA
Low-Level Input Current	I_{IL}	$V_{CC} = 5.5V$; $V_{IL} = 0.4V$		-0.4	mA
Input Clamp Voltage	V_{IK}	$V_{CC} = 5.5V$; $I_{IN} = -18\text{mA}$		-1.5	Volts
Transition Low to High	t_{PLH1}	Type C; $V_{CC} = 5.0V$; $V_{EE} = -5.0V$	$T_A = 25^\circ\text{C}$	75	ns
			$T_A = -55^\circ$ to $+125^\circ\text{C}$	100	
Transition High to Low	t_{PHL1}	Type C; $V_{CC} = 5.0V$; $V_{EE} = -5.0V$	$T_A = 25^\circ\text{C}$	75	ns
			$T_A = -55^\circ$ to $+125^\circ\text{C}$	100	
Transition Low to High	t_{PLH2}	Type B; $V_{CC} = 5.0V$; $V_{EE} = -5.0V$	$T_A = 25^\circ\text{C}$	75	ns
			$T_A = -55^\circ$ to $+125^\circ\text{C}$	100	
Transition High to Low	t_{PHL2}	Type B; $V_{CC} = 5.0V$; $V_{EE} = -5.0V$	$T_A = 25^\circ\text{C}$	75	ns
			$T_A = -55^\circ$ to $+125^\circ\text{C}$	100	
Rise Time	t_R		10	40	ns
Fall Time	t_F		5	40	ns
Output Impedance	R_{OUT}	$V_{EE} = V_{CC} = V_+ = V_- = V_C = 0V$; $-3.5V \leq V_{OUT} \leq +6.4V$	100k	(Note 2)	Ω

Notes: 1. MIL 1397 SPEC = $0.45V$ Max.; 2. MIL 1397 SPEC = $-7V \leq V_{OUT} \leq +7V$ **ELECTRICAL CHARACTERISTICS** $V_{CC} = 5V \pm 10\%$; $V_{EE} = -5V \pm 10\%$; $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ (unless otherwise specified)

SUPPLY CURRENTS			LIMITS VS610J		UNITS
TEST	SYMBOL	CONDITIONS	TYP	MAX	
TYPE B	I_{CC}		25	50	mA
	I_{EE}		-50	-75	mA
	I_{B-}		-20	-50	mA
TYPE C	I_{CC}		25	50	mA
	I_{EE}		-50	-75	mA
	I_+		20	45	mA
	I_{B-}			1.5	mA

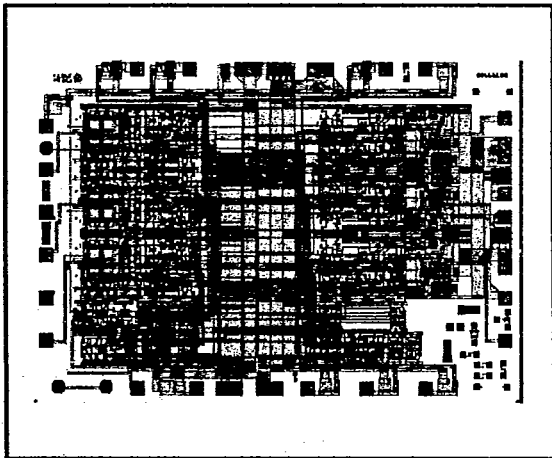
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ELECTRICAL CHARACTERISTICS (continued) $V_{CC} = +5V \pm 10\%$, $V_{EE} = -5V \pm 10\%$, $T_A = -55^\circ$ to 125°C (unless otherwise specified)

RECEIVER SECTION			LIMITS VS610S		
PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNITS
Output Low Voltage	V_{OL}	$V_{CC} = 4.5V$; $V_{EE} = -5V$; $V_{DIFF} = 2.0V$; $I_{OL} = 8mA$		0.4	Volts
Output High Voltage	V_{OH}	$V_{CC} = 4.5V$; $V_{EE} = -5V$; $V_{DIFF} = 1.0V$; $I_{OH} = -400\mu A$	2.5		Volts
Short Circuit Protection	I_{OS}	$V_{CC} = 5.5V$; not to exceed one second	-20	-130	mA
Differential Input Threshold Voltage	V_{TH1}	Receiver Input+ = V_{IN} Receiver Input- = GND (Fast)	-2.1	-0.9 (Note 3)	Volts
	V_{TH2}	Receiver Input+ = V_{IN} Receiver Input- = GND (ANEW)	0.8	2.3	Volts
+ Input Forward Current	$I_F(+\text{Input})$	$V_{CC} = 5.0V$; $V_{EE} = -5.0V$; -Input = GND; $V_F = +5V$		2.5	mA
- Input Forward Current	$I_F(-\text{Input})$	$V_{CC} = 5.0V$; $V_{EE} = -5.0V$; -Input = GND; $V_F = +5V$		-2.5	mA
Output Hi-Z Output Current	I_{OZ}	$V_{CC} = 5.5V$; $V_{IH} = 2.0V$; $V_O = 0.4$ to $2.7V$	-20	+20	μA
Common Mode Voltage	V_{CM}	$V_{CM} = 5.0V$; $V_{EE} = -5.0V$; $V_{DIFF} = 1.3V$ to $1.7V$	-7.5	+7.5	Volts
Tristate Enable Time	$TPZH$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		75	ns
	$TPZL$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		75	ns
Tristate Disable Time	$TPHZ$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		40	ns
	$TP LZ$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		40	ns
Propagation Delay	T_{PLH}	$V_{CC} = +5.0V$ $V_{EE} = -5.0$	$T_A = 25^\circ\text{C}$		75
			$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$		125
	T_{PHL}	$V_{CC} = +5.0V$ $V_{EE} = -5.0$	$T_A = 25^\circ\text{C}$		75
			$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$		125

Notes: 3. MIL 1397 SPEC = (Fast) -1.9V to -1.1V, (ANEW) 0.8V to 2.2V.

DIE

Die size = 0.150 X 0.180 inch (27,000 sq. mils)
 = 3.81 X 4.57mm (17.41 sq. mm)

DICE POLICY**Electrical Characteristics**

Each die is electrically tested to the military grade DC parameters to guard band limits at 25°C to guarantee operation over the full temperature range.

Quality Assurance

All dice are 100% visually inspected to the requirement of MIL-STD-883C, Method 2010.2, Condition 3.

All dice are glass passivated with only the bonding pads exposed to provide scratch protection.

All dice are provided with gold backing.

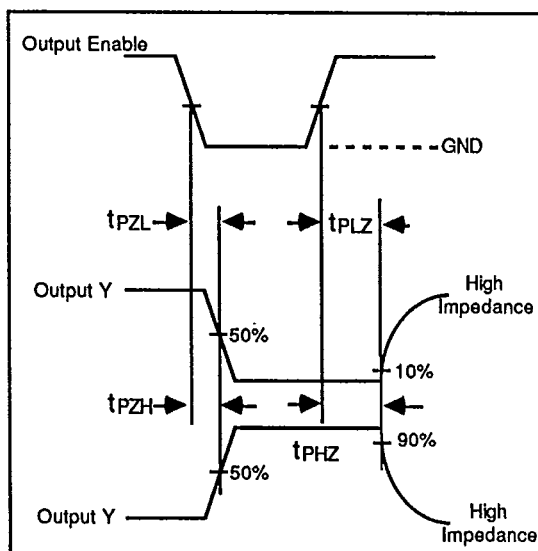
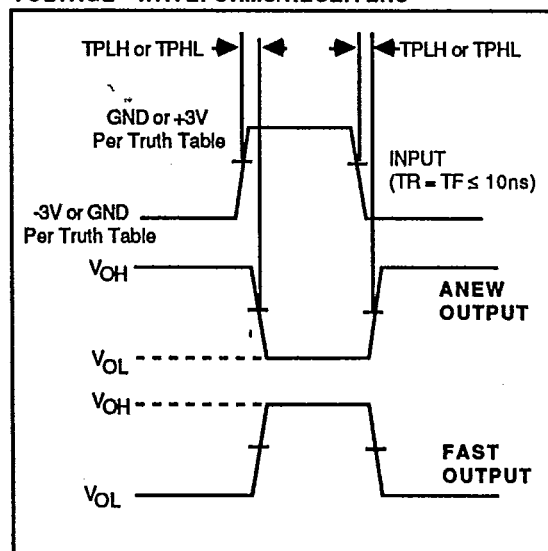
Shipping Packages/Order Information

All dice are packaged in die crates with individual compartments which prevent damage to the die during shipping. Minimum order for dice is 100, supplied only in multiples of 100.

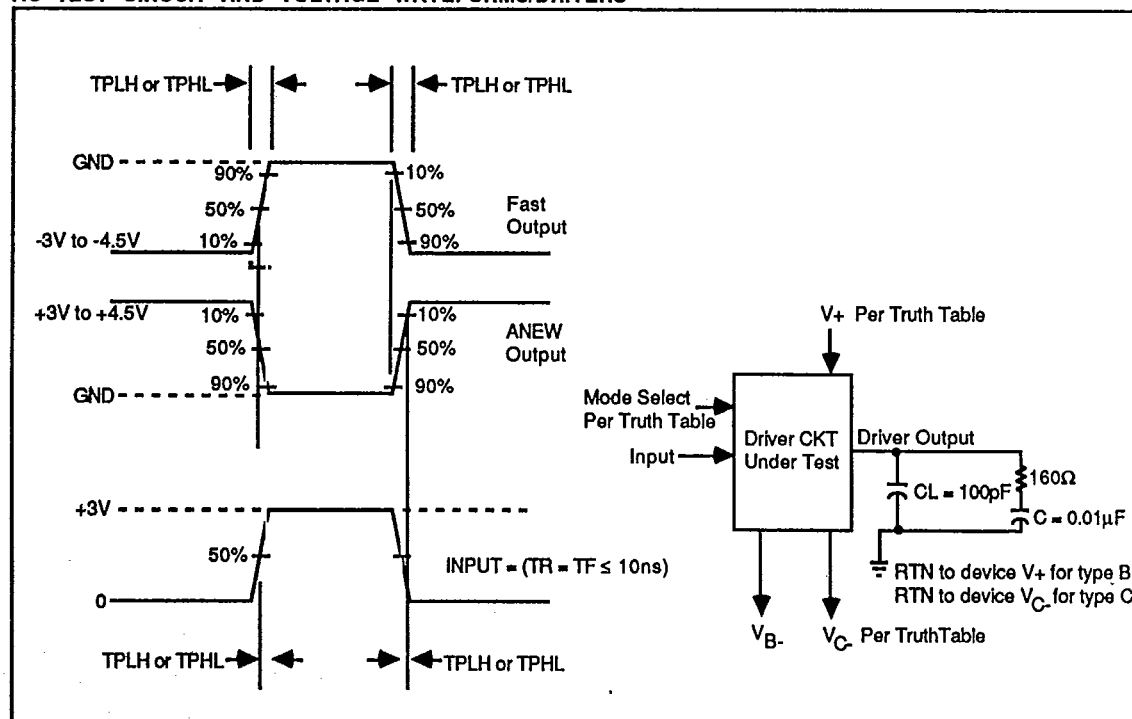
LSP FAMILY DATA SHEETS

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VOLTAGE WAVEFORMS/RECEIVERS



AC TEST CIRCUIT AND VOLTAGE WAVEFORMS/DRIVERS



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DRIVER SECTION

$\bar{B}/C(TTL)$	DRIVER INPUT (TTL)	DRIVER OUTPUT	
		B	C
0	1 (Source Current from V+)	1 (Note 1)	-
0	0 (Sink Current to VB-)	0 (Note 1)	-
1	1 (Sink Current to VC-)	-	1 (Note 2)
1	0 (Source Current from V+)	-	0 (Note 2)

Notes: 1. Fast "1" = 0V, "0" = -3V, V+ = GND, VB- = -5V, VC- = N/C
 2. ANEW "1" = 0V, "0" = 3.5V, V+ = +5V, VB- = +5V thru 100Ω, VC- = GND

RECEIVER SECTION

$\bar{O}E(TTL)$	$\bar{B}/C(TTL)$	RECEIVER INPUT (Note 1)	RECEIVER OUTPUT
0	0	More Negative Than -1.9V	0
0	0	More Positive Than -1.1V	1
0	1	> +2.2V	0
0	1	< +0.8V	1
0	X (Note 2)	Open	0
1	X (Note 2)	X (Note 2)	Hi-Z

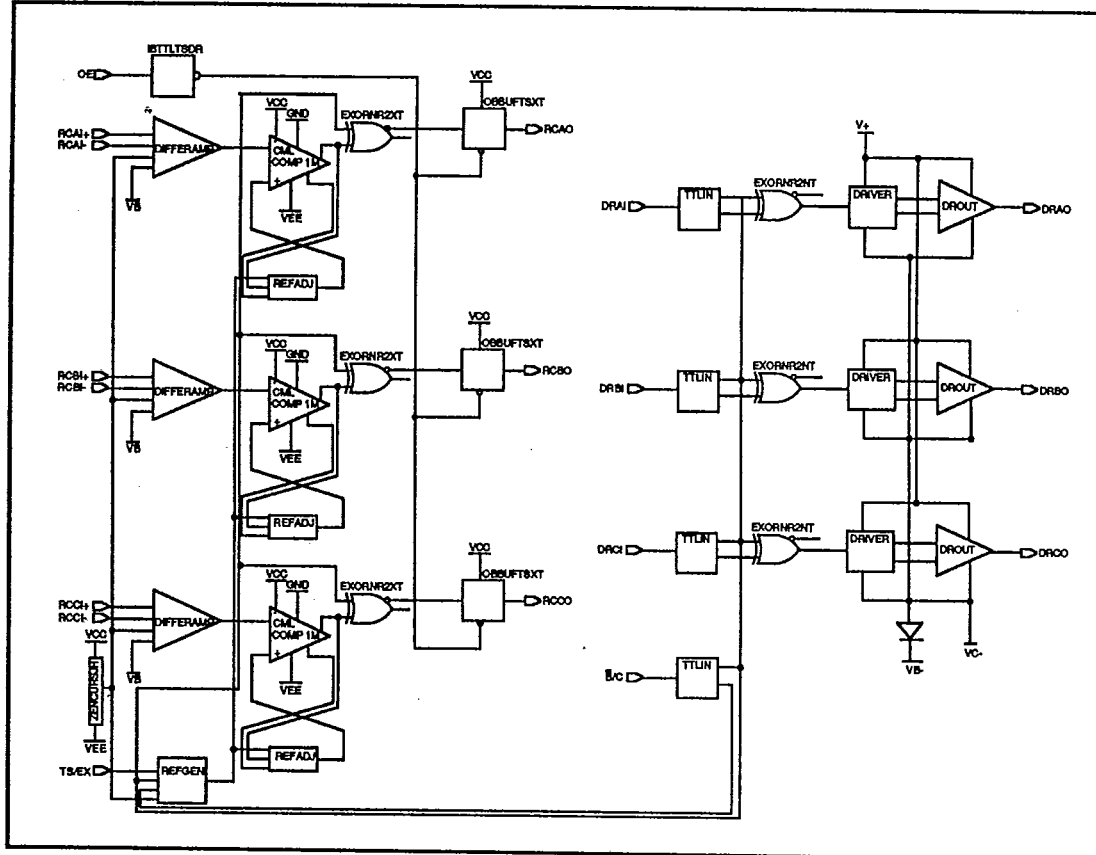
Notes: 1. Referenced (+) to (-)
 2. X = Don't Care

LSP FAMILY DATA SHEETS

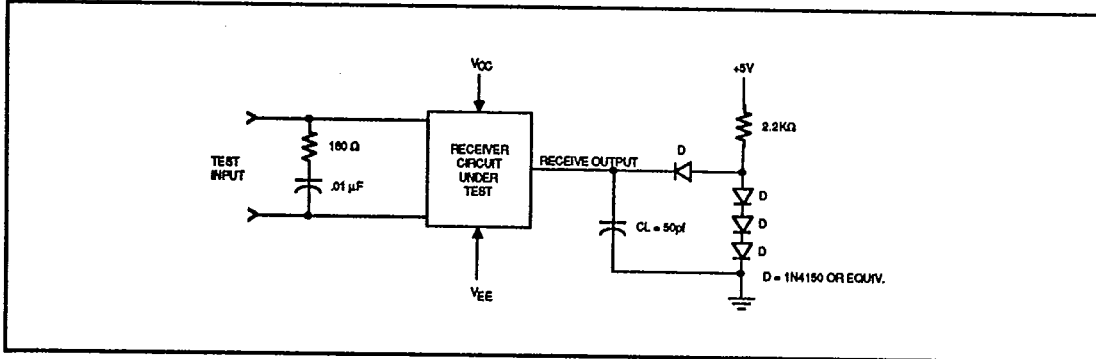
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FUNCTIONAL BLOCK DIAGRAM



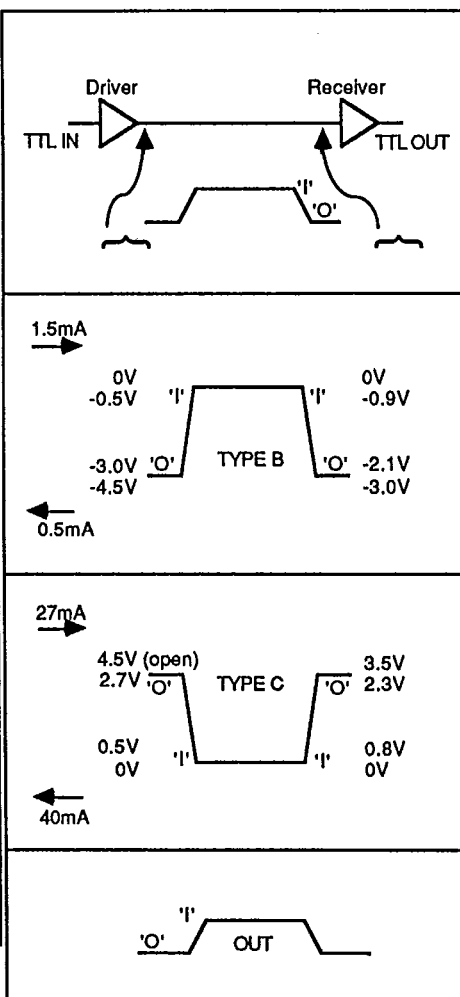
AC TEST CIRCUIT/RECEIVERS



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	TYPE B (NTDS FAST)	TYPE C (ANEW)
Logic Level (nominal)		
"0"	-3V	+3.5V
"1"	0V	0V
Threshold (VDC)	-1.5 ± 0.4	+1.5 ± 0.4
Transfer Rate (WPS)	250,000	250,000
RECEIVER		
Type	Differential	Differential
Transient Suppression	-----	-----
Input Open - Output ____	Logic 0	Logic 0
Input (ma)		
"1" IN	1.5mA Max.	2.5mA Max.
"0" IN	0.5mA Max.	2.5mA Max.
Common Mode Range	±7.5V	±6.0V
Termination		
R	150 to 180Ω	110 to 160Ω
C	6800 to 10,000pf	6800 to 10,000pF
Matched Z _{IN} tot	-----	±8%
DRIVER		
Type	Single Ended	Single Ended
Load	-----	-----
Source Logic 1	-1.5mA @ Logic 1	-27mA @ Logic 0
Sink Logic 0	0.5mA @ Logic 0	40mA @ Logic 1
Rise and Fall Time	100ns Max.	100ns Max.
Power Off, Z _{OUT}	>100KΩ	>100KΩ
LINE		
Z _o	100Ω to 180Ω	100Ω to 180Ω

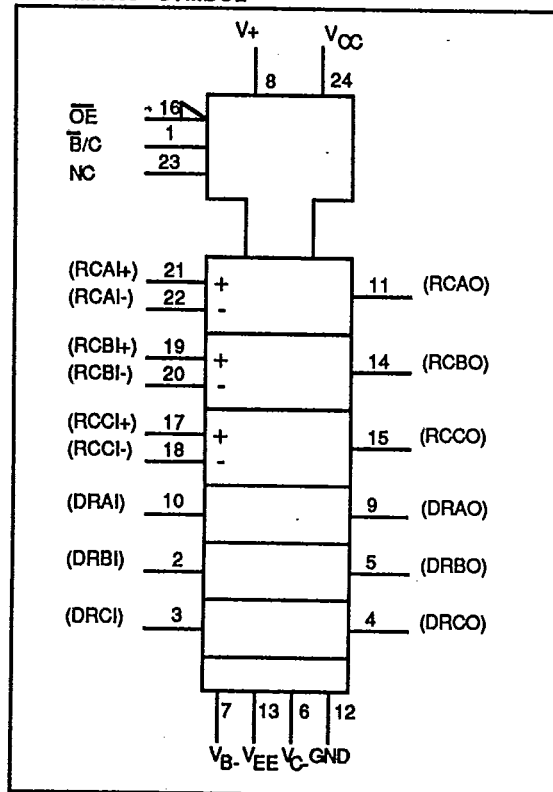


LSP FAMILY DATA SHEETS

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SCHEMATIC SYMBOL



TYPE B NTDS FAST CONNECTION

VC- (Pin 6) N/C

V+ (Pin 8) GND (Driver Return)

B/C (Pin 1) GND

VB- (Pin 7) -5Volts

TYPE C NTDS ANEW CONNECTION

VC- (Pin 6) GND (Driver Return)

VB- (Pin 7) +5V thru 100Ω resistor

V+ (Pin 8) +5Volts

B/C (Pin 1) 1KΩ resistor to +5Volts

PIN	SYMBOL	DESCRIPTION
1	B/C	TTL-Input, Mode Select; NTDS Fast/ANEW
2	DRBI	TTL-Input, Driver B
3	DRCI	TTL-Input, Driver C
4	DRCO	NTDS Fast/ANEW Output Driver C
5	DRBO	NTDS Fast/ANEW Output Driver B
6	VC-	ANEW GND (Driver Return) (N/C for FAST)
7	VB-	FAST Driver Supply -5V(+5 thru 100Ω for ANEW)
8	V+	Driver Source Supply +5V for ANEW, GND (Driver Return) for FAST
9	DRAO	NTDS Fast/ANEW Output Driver A
10	DRAI	TTL-Input Driver A
11	RCAO	TTL-Output Receiver A
12	GND	Ground
13	VEE	-5 Volts
14	RCBO	TTL-Output Receiver B
15	RCCO	TTL-Output Receiver C
16	OE	Receiver Output Tri-State Enable
17	RCCH+	NTDS Fast/ANEW Receiver C Input
18	RCCI-	NTDS Fast/ANEW Receiver C Input
19	RCBI+	NTDS Fast/ANEW Receiver B Input
20	RCBI-	NTDS Fast/ANEW Receiver B Input
21	RCAI+	NTDS Fast/ANEW Receiver A Input
22	RCAI-	NTDS Fast/ANEW Receiver A Input
23	NC	No Connection
24	VCC	+5 Volts