

# VS610K/T

MIL-STD-1397 NTDS  
LINE DRIVER/RECEIVER

T-75-45-01

### FEATURES

- Meets MIL-STD-1397 Types B and C
- 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:

VEE	+0.5V to -7.0V
VCC	-0.5V to +7.0V
V+	-0.5V to +7.0V
VC-	+0.5V to -7.0V
VB-	-7.0V to +7.0V

#### Input Voltages:

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

#### Operating Temperature Range:

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

#### Storage Temperature Range

-65°C to 150°C

Note 1: Power derating above  $T_A = 70^\circ\text{C}$  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.

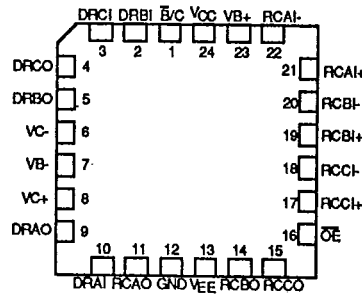
Supply Voltages	Type B	Type C
V+	OV (GND)	N/C
VC-	N/C	OV (GND)
VEE	-4.5V to -5.5V	-4.5V to -5.5V
VCC	+4.5V to +5.5V	+4.5V to +5.5V
VB-	-4.5V to -5.5V	+4.5V to +5.5V (thru 100Ω resistor)
B/C	OV (GND)	+4.5V to +5.5V (thru 1KΩ resistor)

### PACKAGE TYPES AVAILABLE

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

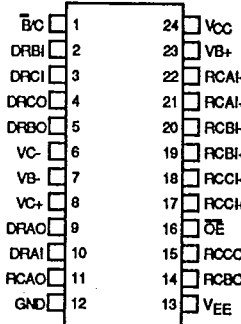
### CONNECTION DIAGRAMS

#### Leadless Chip Carrier Package



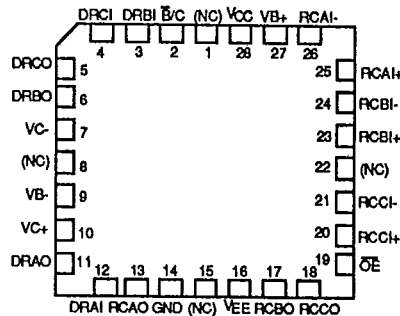
Top View

#### CERDIP Package



Top View

#### PLCC/CLCC Package



Top View

LSP FAMILY DATA SHEETS

T-75-45-01

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

DRIVER SECTION MIL - STD - 1397A			LIMITS VS610T		
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)	$V_+ = 4.5V$ ; $V_- = GND$ ; $V_{IN} = 2.0V$ ; $I_{OL} = 40mA$ ; $V_{CC} = 4.5V$		0.45	Volts
	$V_{OL2}$ (FAST)	$V_+ = GND$ ; $V_{CC} = 4.5V$ ; $V_{IN} = 0.7V$ ; $V_- = -4.5V$ ; $I_{OL} = 0.5mA$		-3.0	Volts
Output High Voltage	$V_{OH1}$ (ANEW)	$V_+ = 4.5V$ ; $V_- = GND$ ; $V_{IN} = 0.7V$ ; $I_{OH} = -27mA$ ; $V_{CC} = 4.5V$	2.7		Volts
	$V_{OH2}$ (FAST)	$V_+ = GND$ ; $V_{CC} = 4.5V$ ; $V_{IN} = 2.0V$ ; $V_- = -4.5V$ ; $I_{OH} = -1.5mA$	-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	$\mu A$
Low-Level Input Current	$I_{IL}$	$V_{CC} = 5.5V$ ; $V_{IL} = 0.4V$		-0.4	mA
Input Clamp Voltage	$V_{IK}$	$V_{CC} = 5.5V$ ; $I_{IN} = -18mA$		-1.5	Volts
Transition Low to High	$t_{PLH1}$	Type C; $V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ$ to $+125^\circ C$	100	
Transition High to Low	$t_{PHL1}$	Type C; $V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ$ to $+125^\circ C$	100	
Transition Low to High	$t_{PLH2}$	Type B; $V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ$ to $+125^\circ C$	100	
Transition High to Low	$t_{PHL2}$	Type B; $V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ$ to $+125^\circ C$	100	
Rise Time	$t_R$		10	40	ns
Fall Time	$t_F$		5	40	ns
Output Impedance	$R_{OUT}$	$V_{EE} = V_{CC} = V_{B+} = V_{C+} = V_{B-} = V_{C-} = 0V$ ; $-7V \leq V_{OUT} \leq 7V$	100k		$\Omega$

**ELECTRICAL CHARACTERISTICS**

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

SUPPLY CURRENTS			LIMITS VS610K		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
	$I_{C+}$		20	45	mA
	$I_{B-}$			1.5	mA

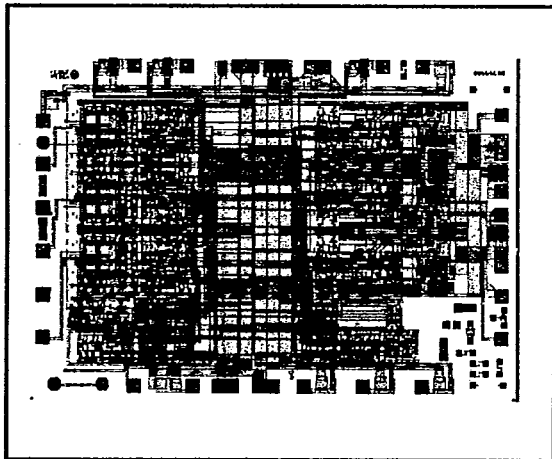
VS610K/T  
T-75-45-01

**ELECTRICAL CHARACTERISTICS (continued)**

$V_{CC} = +5V \pm 10\%$ , $V_{EE} = -5V \pm 10\%$ , $T_A = -55^\circ$ to $125^\circ C$ (unless otherwise specified)					
RECEIVER SECTION			LIMITS VS610T		
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)	-1.9	-1.1	Volts
	$V_{TH2}$	Receiver Input+ = $V_{IN}$ Receiver Input- = GND (ANEW)	0.8	2.2	Volts
+ Input Forward Current	$I_F(+Input)$	$V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$ ; -Input = GND; $V_F = +5V$		2.5	mA
- Input Forward Current	$I_F(-Input)$	$V_{CC} = 5.0V$ ; $V_{EE} = -5.0V$ ; -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	$\mu A$
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	$T_{PZH}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		75	ns
	$T_{PZL}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		75	ns
Tristate Disable Time	$T_{PHZ}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		40	ns
	$T_{PLZ}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$		40	ns
Propagation Delay	$T_{PLH}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ C$ to $+125^\circ C$	100	
	$T_{PHL}$	$V_{CC} = +5.0V$ $V_{EE} = -5.0$	$T_A = 25^\circ C$	75	ns
			$T_A = -55^\circ C$ to $+125^\circ C$	100	

LSP FAMILY DATA SHEETS

**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  $25^\circ C$  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.

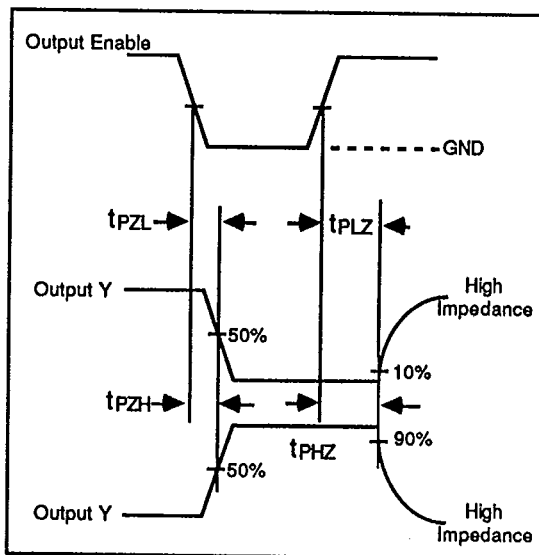
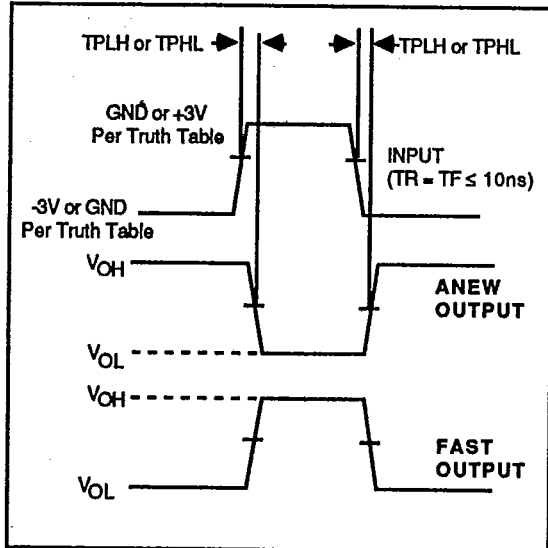
All dice are provided with gold backing.

**Shipping Packages/Order Information**

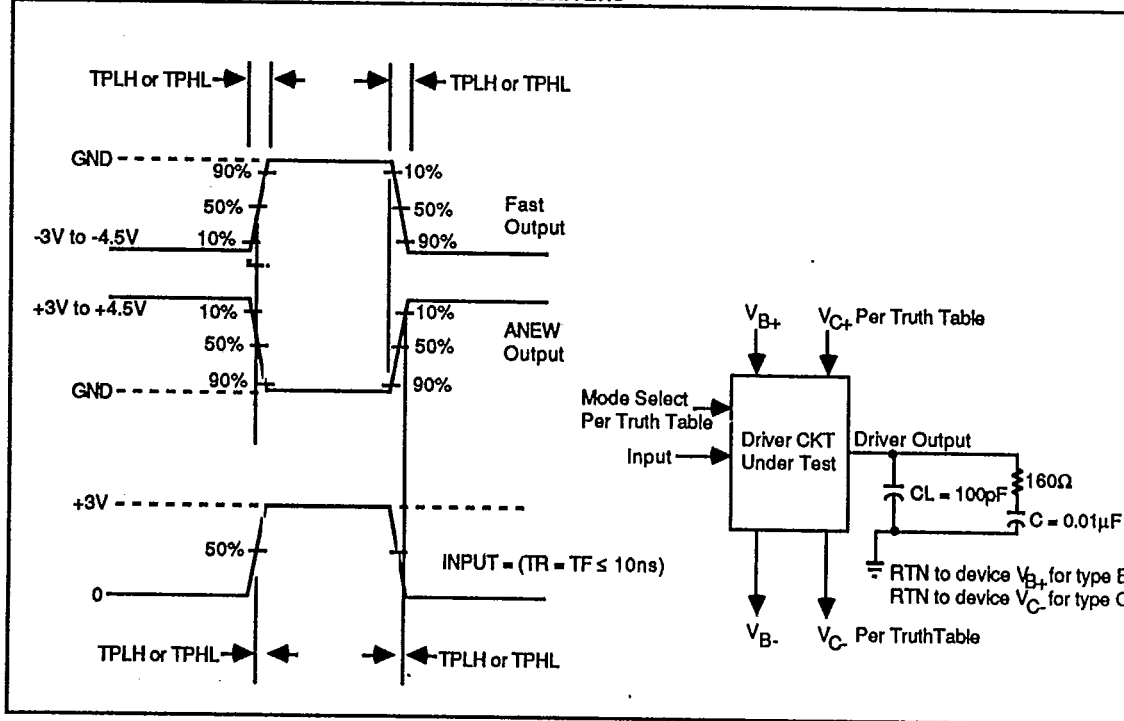
All dice are packaged in die crates with individual compartments which prevent damage to the die during shipping. Minimum order for dice is 100, supplied only in multiples of 100.

T-75-45-01

VOLTAGE WAVEFORMS/RECEIVERS



AC TEST CIRCUIT AND VOLTAGE WAVEFORMS/DRIVERS



**DRIVER SECTION**

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

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

**RECEIVER SECTION**

$\overline{OE}$ (TTL)	$\overline{B/C}$ (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

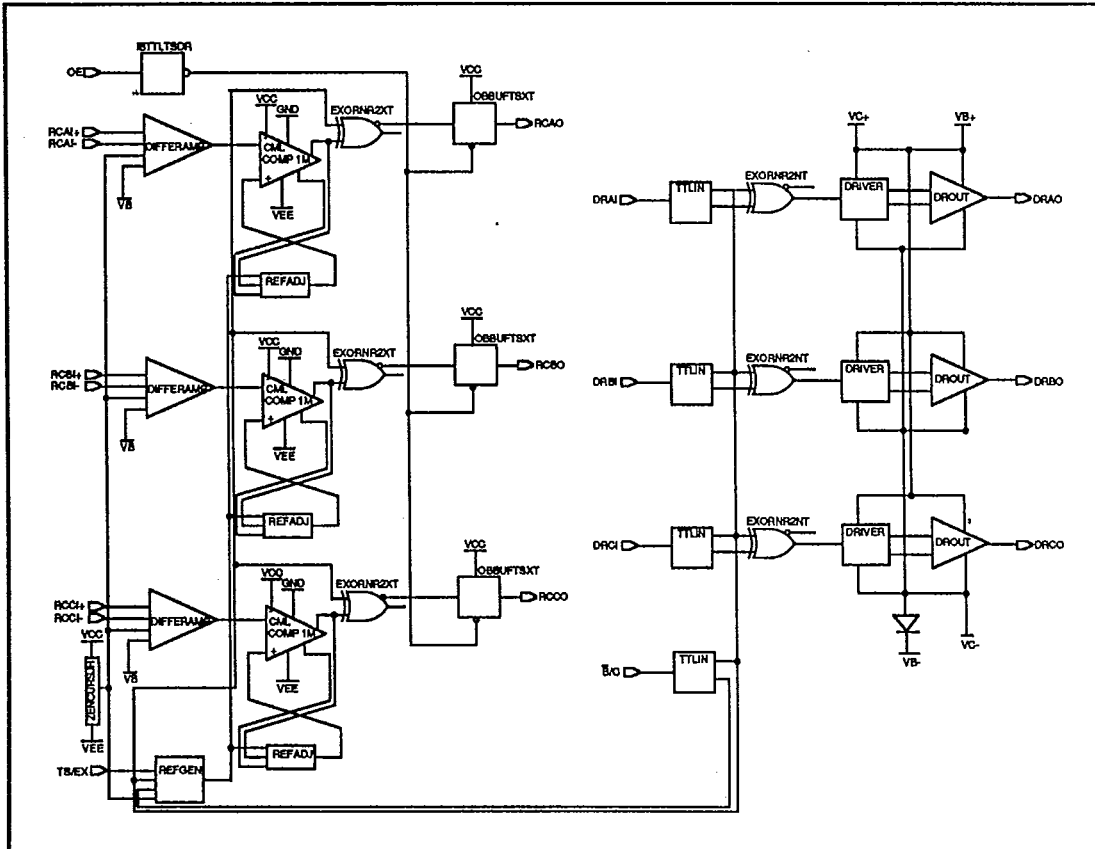
Notes: 1. Referenced (+) to (-)  
 2. X = Don't Care

LSP FAMILY DATA SHEETS

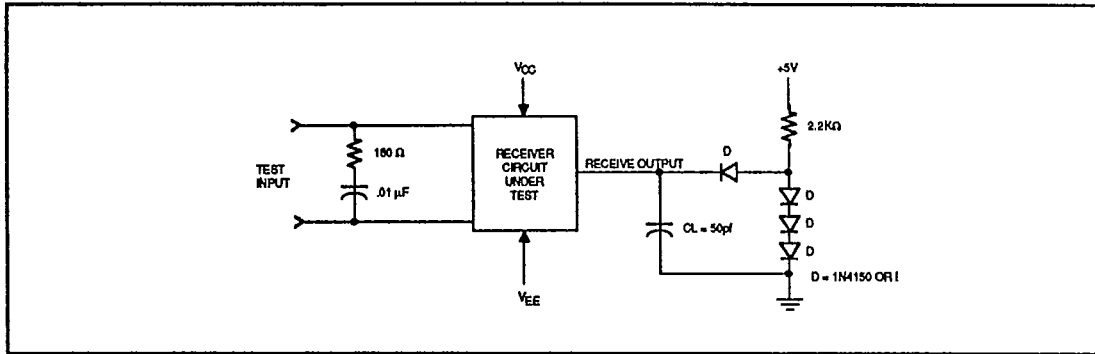
VS610K/T

T-75-45-01

FUNCTIONAL BLOCK DIAGRAM



AC TEST CIRCUIT/RECEIVERS

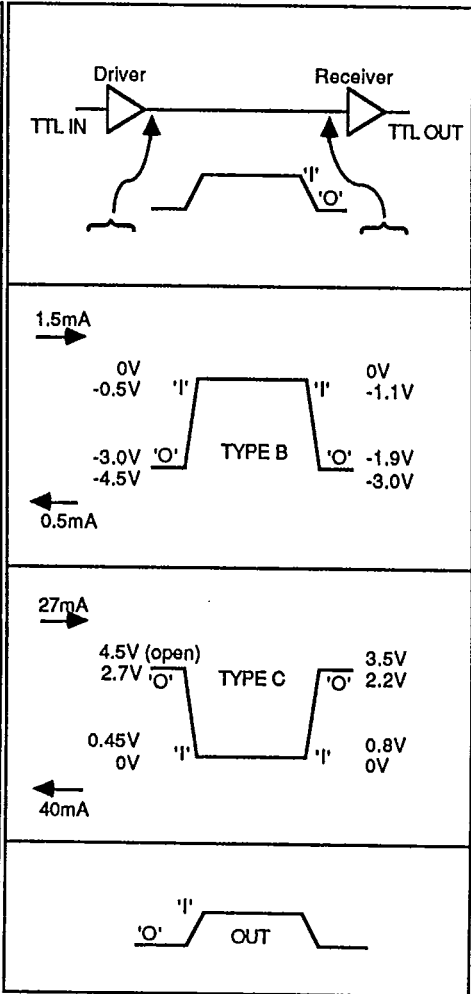


LSP FAMILY DATA SHEETS

VS610K/T

T-75-45-01

	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
<b>RECEIVER</b>		
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 <sub>IN</sub> tot	—	±8%
<b>DRIVER</b>		
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 <sub>OUT</sub>	>100KΩ	>100KΩ
LINE		
Z <sub>o</sub>	100Ω to 180Ω	100Ω to 180Ω

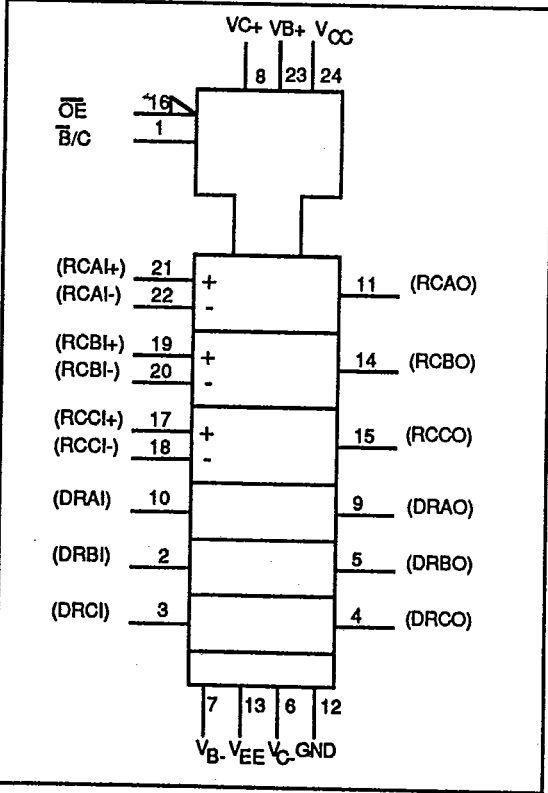


LSP FAMILY DATA SHEETS

VS610K/T

T-75-45-01

**SCHEMATIC SYMBOL**



PIN	SYMBOL	DESCRIPTION
1	$\overline{B/C}$	TTL-Input, Mode Select; NTDS Fast/ANEW
2	DRBI	TTL-Input, Driver C
3	DRCI	TTL-Input, Driver B
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	VC+	Driver Source Supply +5V for ANEW, (N/C 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	$\overline{OE}$	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	VB+	Fast GND (Driver Return) (N/C for ANEW)
24	VCC	+5 Volts

**TYPE B NTDS FAST CONNECTION**

VC- (Pin 6) NC
VC+ (Pin 8) NC
$\overline{B/C}$ (Pin 1) GND
VB+ (Pin 23) GND (Driver Return)
VB- (Pin 7) -5Volts

**TYPE C NTDS ANEW CONNECTION**

VC- (Pin 6) GND (Driver Return)
VB- (Pin 7) +5V thru 100Ω resistor
VC+(Pin 8) +5Volts
$\overline{B/C}$ (Pin 1) 1KΩ resistor to +5Volts
VB+ (Pin 23) NC

LSP FAMILY DATA SHEETS