

ZN9553

1553-BUS TRANSCEIVER

The Plessey ZN9553 monolithic transceiver is a cost effective, high performance replacement for more expensive hybrid devices. The ZN9553 transceiver is a complete transmitter and receiver pair conforming fully to MIL STD 1553B. The transceiver is available in either a 24 pin ceramic dual in line or 24 pin leadless ceramic chip carrier.

The Transceiver meets or exceeds all the requirements of MIL STD 1553B.

Due to its monolithic nature and use of digital filtering techniques, the ZN9553 Transceiver operates from +12V to +15V and +5V supplies and offers various interfacing options in a single package. (This important feature considerably reduces stock holding requirements for the user, and thus creates further cost saving for the 1553 producer and interface user).

FEATURES

- Low Power Consumption
- Totally Monolithic
- No Negative Supply Required
- 12V to 15V operation
- Replaces Existing 1553B Transceivers with no additional components
- Digital Filtering
- Supports Marconi, Harris and MCE/Smiths Interface Types
- Thermal Shutdown Option
- Radiation Hard Bipolar technology
- Available in 24 Pin Ceramic DIL and 24 Pin Leadless Ceramic Chip Carrier
- Time-out protection for transmitter output drivers

ABSOLUTE MAXIMUM RATINGS

Supply Voltage V_{CC1} (pin 20)	7V
Supply Voltage V_{CC2} (pin 13)	17V
Input Voltage (Control Inputs)	-0.3V to V_{CC1}
Storage Temperature range	
(Military)	-55°C to +135°C
(Commercial)	-55°C to +125°C

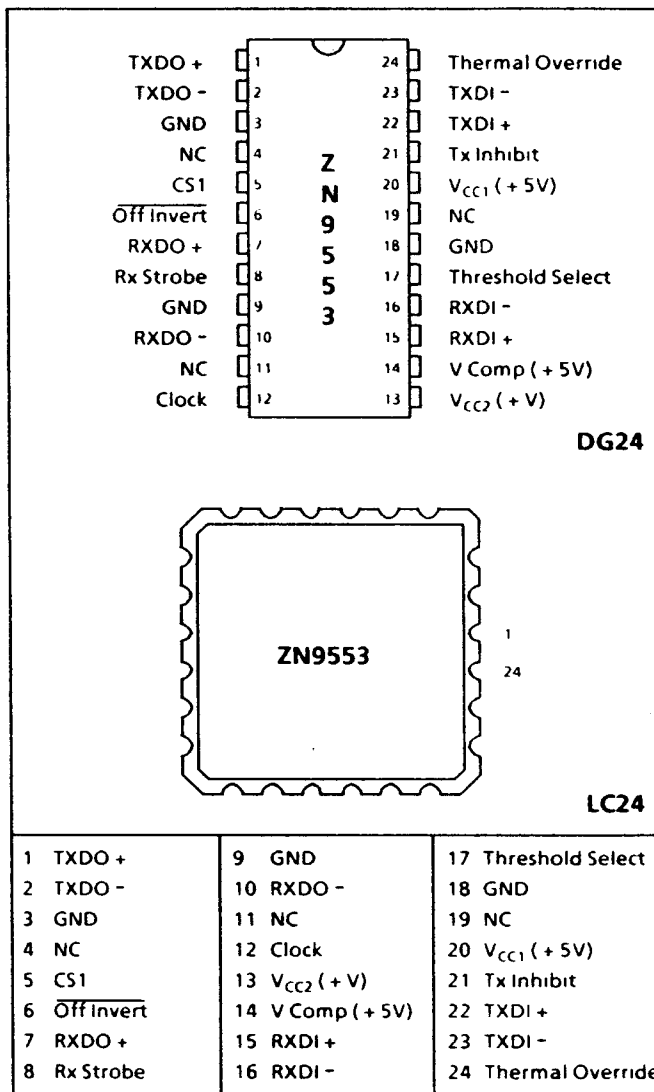


Fig 1 Pin Connections (top view)

RECOMMENDED OPERATING CONDITIONS

Supply Voltage V_{CC1}	4.5V to 5.5V
Supply Voltage V_{CC2}	10.8V to 16.5V
Operating free air temperature	
(Military)	-55°C to +125°C
(Commercial)	0°C to +70°C

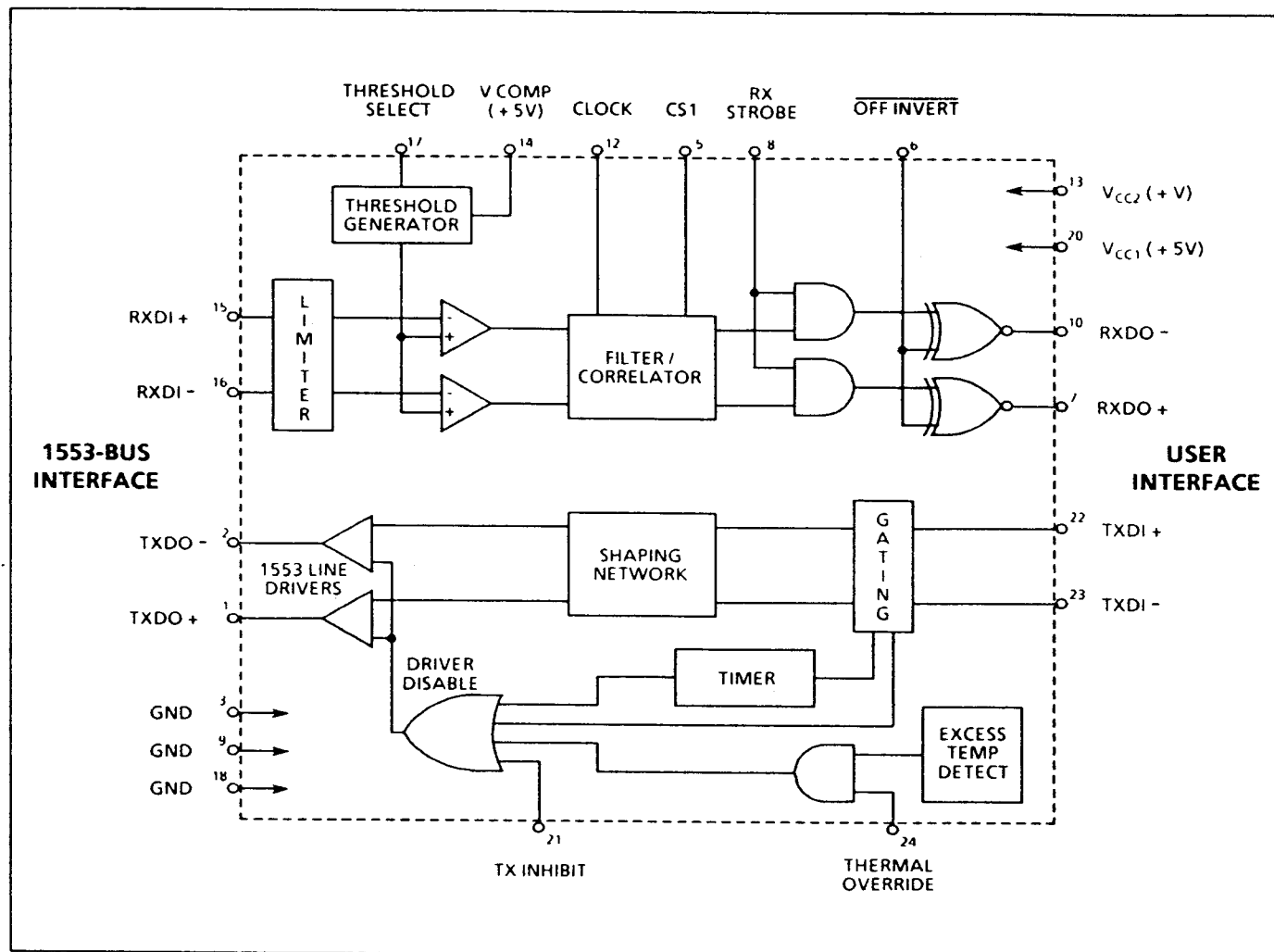


Fig 2 ZN9553 Block Diagram

PIN DESCRIPTIONS

TRANSMIT DATA IN (TXDI+, TXDI-)

These provide TTL level complementary input data to the transmit section of the ZN9553. When TXDI+ is high and TXDI- low, output TXDO+ will be driven to a more positive voltage than TXDO-. When TXDI+ is low and TXDI- high, then TXDO- will be more positive than TXDO+. If TXDI+ and TXDI- are both taken high or both low, TXDO+ and TXDO- will become high impedance.

TRANSMIT DATA OUT (TXDO+, TXDO-)

These are the complementary transmit outputs, which may be transformer coupled directly to the 1553-bus or through an isolation transformer.

RECEIVE DATA IN (RXDI+, RXDI-)

Complementary receive inputs which accept bi-phase Manchester II data from the 1553-bus.

RECEIVE DATA OUT (RXDO+, RXDO-)

These provide TTL level complementary output data from the receive section of the ZN9553. When the input voltage on RXDI+ is more positive than on RXDI-, RXDO+ will be driven high and RXDO- low. When RXDI- is more positive than RXDI+, RXDO+ will be driven low and RXDO- high. The quiescent levels of both RXDO+ and RXDO- may be set by OFF INVERT.

TRANSMIT INHIBIT (TX INHIBIT)

This input may be used to disable the transmit data outputs. When a logic high is applied to TX INHIBIT, both TXDO+ and TXDO- will become high impedance.

RECEIVE STROBE (RX STROBE)

When RX STROBE is low, the receiver is disabled and both RXDO+ and RXDO- assume their quiescent state. When RX STROBE is high, the receiver is enabled.

OFF INVERT

This input controls the quiescent state of the receive data outputs and may be used to adapt the ZN9553 for different interface requirements. When OFF INVERT is low, RXDO+ and RXDO- will be high in their quiescent state (MCE/Smiths interface type). When OFF INVERT is high, RXDO+ and RXDO- will be low in their quiescent state (Harris or Marconi interface types).

CLOCK SELECT (CS1)

This input should be set according to the clock rate used for the Filter/Correlator circuitry. For a 10MHz (Marconi) or 12MHz (Harris) clock rate, CS1 should be left unconnected (internal pull-up resistor). For a 16MHz (MCE/Smiths) clock rate, CS1 should be connected to 0V.

THRESHOLD SELECT

This input controls the switching threshold levels of the receive data inputs and allows them to be set for different interface requirements. A higher threshold level (Harris or Marconi interface types) is selected by leaving this input unconnected (internal pull-up resistor). A lower threshold level (MCE/Smiths interface type) is selected by connecting THRESHOLD SELECT to 0V.

V COMP (+5V)

This is the reference input voltage for the receiver threshold generator. It should be connected to the 5V supply which is applied to the centre tap of the coupling or isolation transformer (see fig 5).

TTL INPUTS			1553 OUTPUTS	
TXINHIBIT	TXDI +	TXDI-	TXDO +	TXDO-
0	0	0	OFF	OFF
0	1	1	OFF	OFF
0	1	0	+ *	- *
0	0	1	- *	+ *
1	X	X	OFF	OFF

*acceptable 1553 signals are transmitted under these conditions
X = don't care

Table 1 Transmit Conditions

THERMAL OVERRIDE

The ZN9553 has an internal temperature detection circuit which disables the transmit data output drivers if the chip junction temperature exceeds 175°C. For this protection system to operate, THERMAL OVERRIDE should be left unconnected (internal pull-up resistor). To disable this feature, this input should be connected to 0V.

CLOCK

This input provides the clock to the ZN9553 Filter/Correlator circuit. The clock rate will depend on the interface type being used, but may be 10MHz (Marconi), 12MHz (Harris) or 16MHz (MCE/Smiths).

1553 INPUTS		TTL INPUTS		TTL OUTPUTS	
RXDI +	RXDI-	RXSTROBE	OFF INV	RXDO +	RXDO-
X	X	0	0	1	1
X	X	0	1	0	0
+ *	- *	1	X	1	0
- *	+ *	1	X	0	1
OFF	OFF	1	0	1	1
OFF	OFF	1	1	0	0

*assumes acceptable 1553 signal levels
X = don't care

Table 2 Receive Conditions

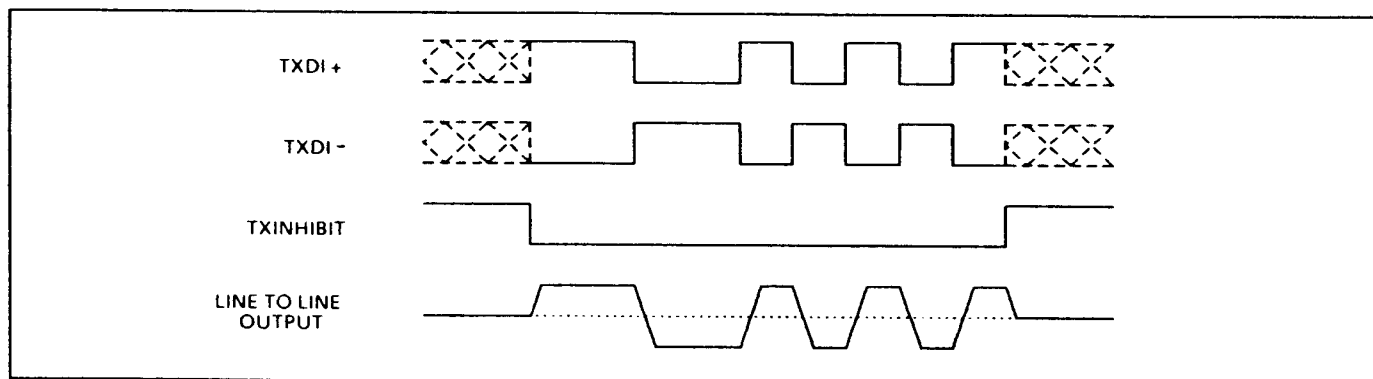


Fig 3 Transmit Waveforms

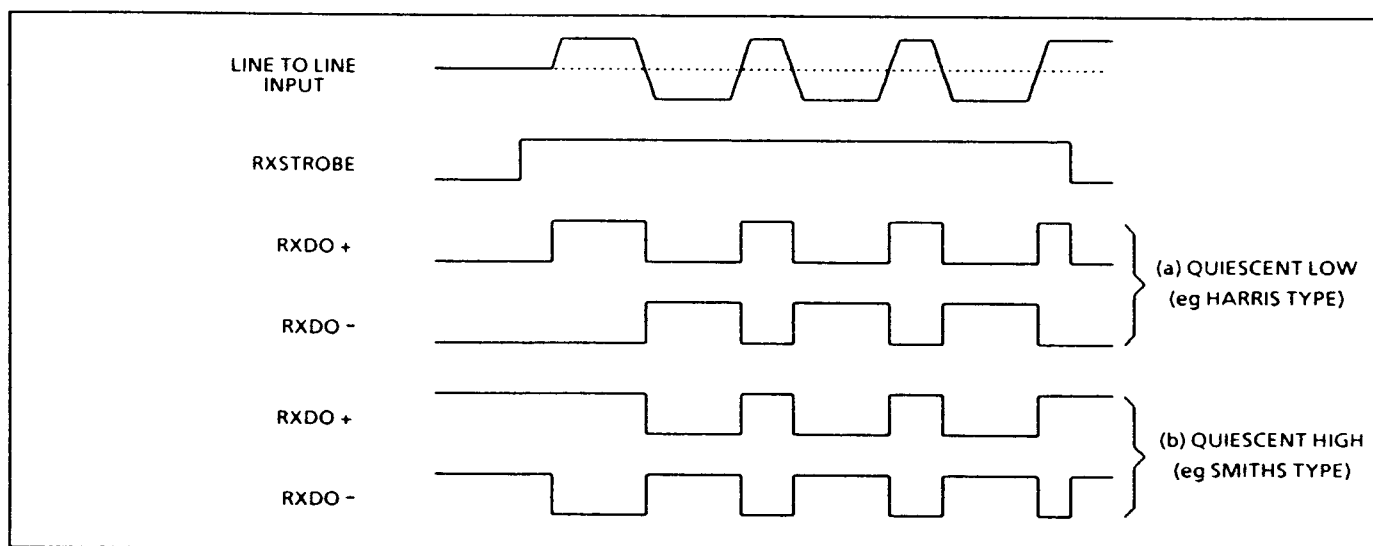


Fig 4 Receive Waveforms

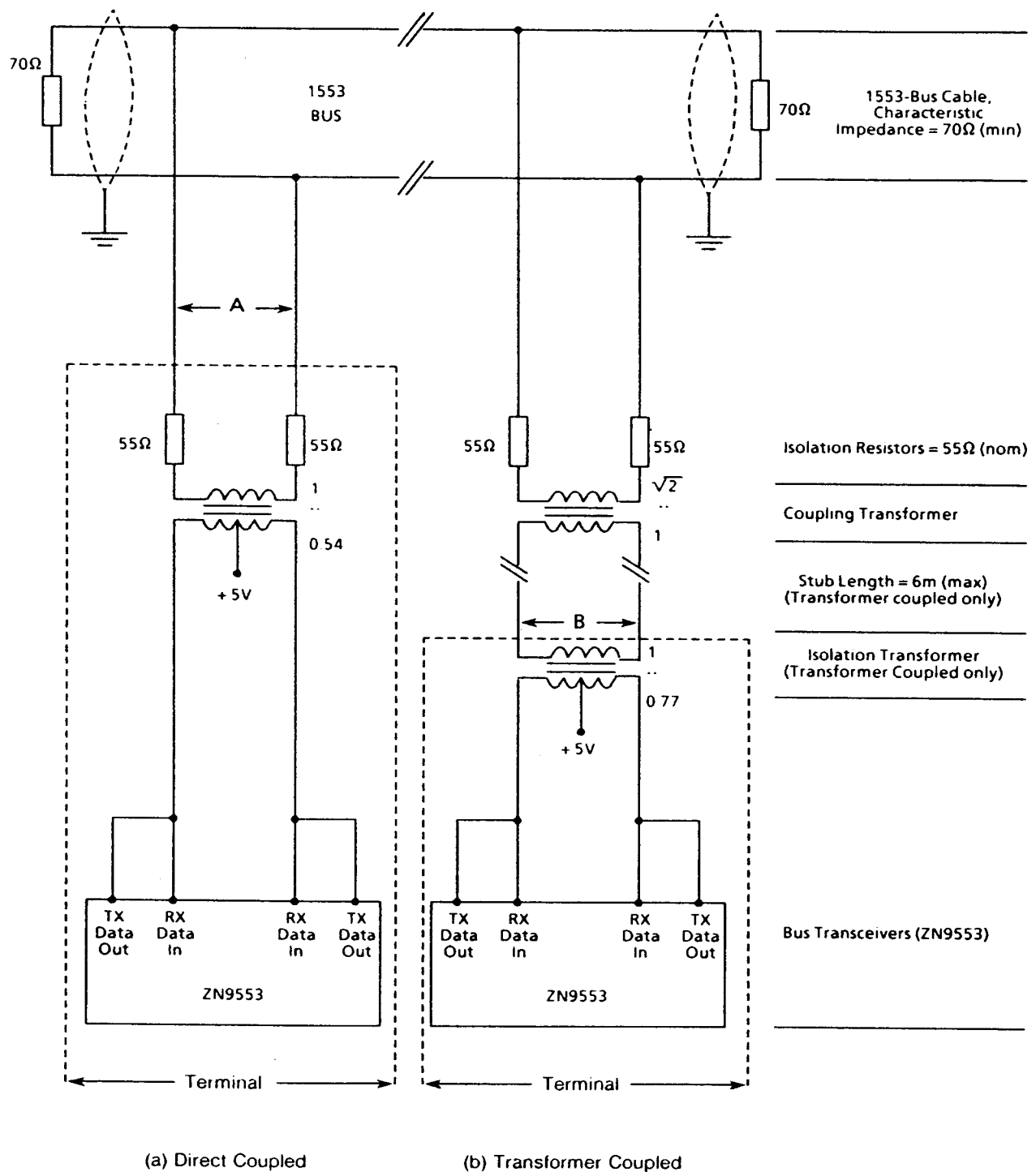


Fig 5 Transceiver to Bus Connections

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated)

T_{amb} = -55 to 125 °C, V_{CC1} = 5V ± 10%, V_{CC2} = 10.8V to 16.5V

Characteristic	Pin	Value			Units	Conditions
		Min	Typ	Max		
Supply Current, I _{CC2}	13		7.5		mA	V _{CC2} = 16.5V
Supply Current, I _{CC1}	20		148		mA	V _{CC1} = 5.5V @ 25% duty cycle
	20		230		mA	V _{CC1} = 5.5V @ 50% duty cycle
	20		393		mA	V _{CC1} = 5.5V @ 100% duty cycle
Standby Current, I _{CC1}	20		65		mA	V _{CC1} = 5.5V
TRANSMITTER						
Low Level I/P Current, I _{IL}						
TXINHIBIT	21		-0.38	-0.6	mA	V _{CC1} = 5.5V, V _{CC2} = 16.5V V _{IN} = 0.4V
THERMAL OVERRIDE*	24		-1.28	-1.6	mA	
TXDI +, TXDI-	22,23		-0.38	-0.6	mA	
High Level I/P Current, I _{IH}						
TXINHIBIT	21		< 1	20	µA	V _{CC1} = 5.5V, V _{CC2} = 16.5V V _{IN} = 5.5V
TXDI +, TXDI-	22,23		< 1	20	µA	
Input Clamp Voltage, V _K						
TXINHIBIT	21		-0.9	-1.5	V	V _{CC1} = 4.5V, I _{IN} = -18mA
THERMAL OVERRIDE	24		-0.9	-1.5	V	
TXDI +, TXDI-	22,23		-0.9	-1.5	V	
RECEIVER						
Low Level I/P Current, I _{IL}						
CSI*	5		-1.25	-1.6	mA	V _{CC1} = 5.5V, V _{CC2} = 16.5V V _{IN} = 0.4V
OFF INVERT*	6		-1.25	-1.6	mA	
RXSTROBE*	8		-1.25	-1.6	mA	
CLOCK	12		-0.38	-0.6	mA	
THRESHOLD SELECT*	17		-1.25	-1.6	mA	
High Level I/P Current, I _{IH}						
CLOCK	12		< 1	20	µA	V _{CC1} = 5.5V, V _{CC2} = 16.5V V _{IN} = 5.5V
Low Level O/P Voltage, V _{OL}						
RXDO +, RXDO-	7,10		0.2	0.4	V	V _{CC1} = 4.5V, I _{IL} = 16mA
High Level O/P Voltage, V _{OH}						
RXDO +, RXDO-	7,10	2.4	2.7		V	V _{CC1} = 5.5V, I _{IH} = -400µA
Input Clamp Voltage, V _K						
CSI	5		-0.9	-1.5	V	V _{CC1} = 4.5V, I _{IN} = -18mA
OFF INVERT	6		-0.9	-1.5	V	
RXSTROBE	8		-0.9	-1.5	V	
CLOCK	12		-0.9	-1.5	V	
THRESHOLD SELECT	17		-0.9	-1.5	V	
Short Circuit O/P Current, I _{SC}						
RXDO +, RXDO-	7,10	-20	-60	-100	mA	V _{CC1} = 5.5V, CLOCK = 0.8V
Threshold Voltage, V _{TH} (measured at A on Fig 6)			188		mV pk L-L	THRESHOLD SELECT = high
			312		mV pk L-L	THRESHOLD SELECT = low

* denotes internal pull-up resistor to V_{CC1}

TRANSMITTER ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated)

T_{amb} = -55 to 125 °C, V_{CC1} = 5V ± 10%, V_{CC2} = 10.8V to 16.5V

1553B Specification reference	Characteristic	Value		Unit	Conditions
		Min	Max		
Terminal with Direct Coupled Stubs					
4.5.2.2.1.1.	Output Voltage Level	6.0	9.0	V Pk-Pk Line-Line	Measured at point A on fig 6
4.5.2.2.1.2.	Output Waveform Rise and Fall Times	100	300	nsec	
4.5.2.2.1.2.	Output Waveform Distortion	-300	300	mV pk L-L	Measured at point A on fig 6
4.5.2.2.1.2.	Output Zero Crossing Deviation		25	nsec	With respect to the previous zero crossing
4.5.2.2.1.3.	Output Noise		5	mV RMS Line-Line	Measured at point A on fig 6
4.5.2.2.1.4.	Output Symmetry	-90	90	mV peak Line-Line	Measured at point A on fig 6
Terminal with Transformer Coupled Stubs					
4.5.2.1.1.1.	Output Voltage Level	18	27	V Pk-Pk Line-Line	Measured at point B on fig 7
4.5.2.1.1.2.	Output Waveform Rise and Fall Times	100	300	nsec	
4.5.2.1.1.2.	Output Waveform Distortion	-900	900	mV pk L-L	Measured at point B on fig 7
4.5.2.1.1.2.	Output Zero Crossing Deviation		25	nsec	With respect to the previous zero crossing
4.5.2.1.1.3.	Output Noise		14	mV RMS Line-Line	Measured at point B on fig 7
4.5.2.1.1.4.	Output Symmetry	-250	250	mV peak Line-Line	Measured at point B on fig 7

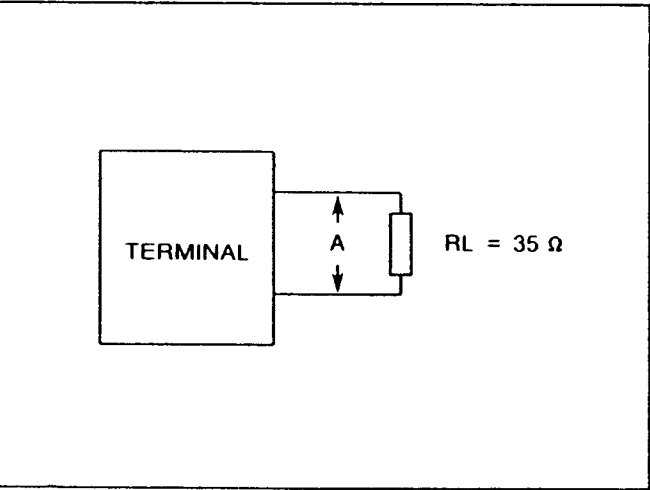


Fig 6 Terminal I/O Characteristics for
Direct Coupled Stubs

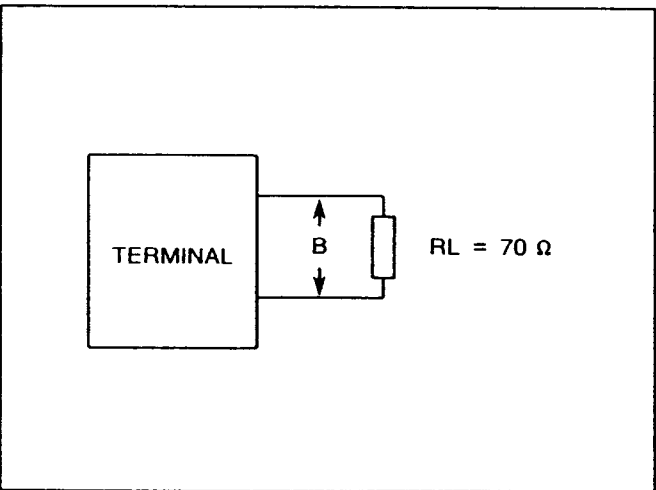


Fig 7 Terminal I/O Characteristics for
Transformer Coupled Stubs

RECEIVER ELECTRICAL CHARACTERISTICS

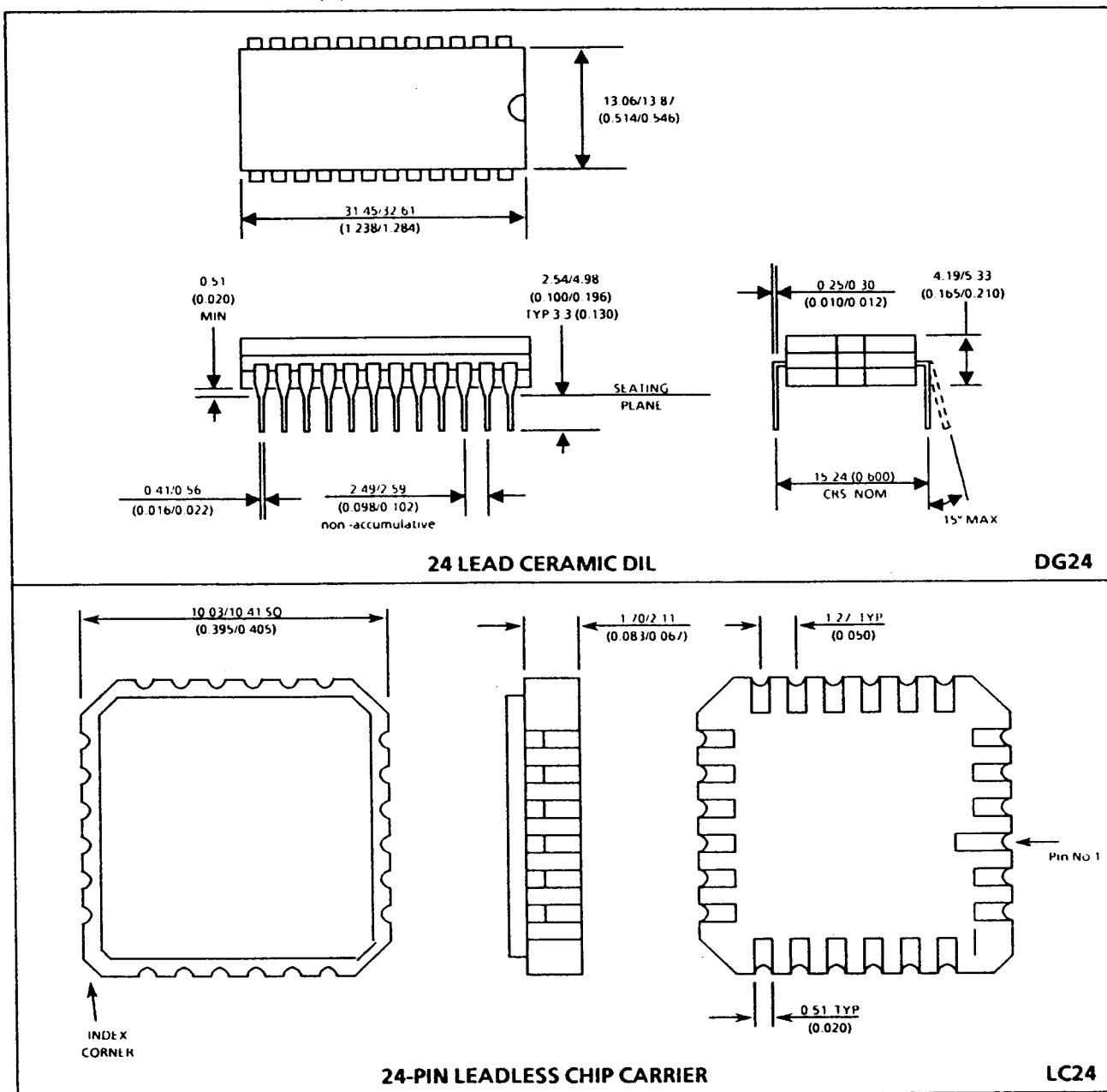
Test conditions (unless otherwise stated)

T_{amb} = -55 to 125 °C, V_{CC1} = 5V ± 10%, V_{CC2} = 10.8V to 16.5V

1553B Specification reference	Characteristic	Value		Unit	Conditions
		Min	Max		
Terminal with Direct Coupled Stubs					
4.5.2.2.2.1.	Input Waveform Compatability				Sine Wave to Square Wave
4.5.2.2.2.1.	Input Zero Crossing Deviation	-150	150	nsec	Minimum received input voltage with sinusoidal waveshape.
4.5.2.2.2.1.	Input Response Voltage	1.2	20	V pk-pk Line-Line	Measured at point A on fig 6.
4.5.2.2.2.1.	Input Non-Response Voltage	0	0.28	V pk-pk Line-Line	Measured at point A on fig 6.
4.5.2.2.2.2.	Common Mode Rejection	-10	10	V peak Line-GND	Signals from DC to 2MHz, measured at point A on fig 6.
4.5.2.2.2.3.	Input Impedance	2000		Ω	Within the frequency range 75KHz to 1MHz, measured line to line at point A on fig 6
4.5.2.2.2.4.	Noise Rejection		1 in 10 ⁷		
Terminal with Transformer Coupled Stubs					
4.5.2.1.2.1.	Input Waveform Compatibility				Sine Wave to Square Wave
4.5.2.1.2.1.	Input Zero Crossing Deviation	-150	150	nsec	Measured w.r.t. the previous zero crossing at the minimum received input voltage with sinusoidal waveshape.
4.5.2.1.2.1.	Input Response Voltage	0.86	14	V pk-pk Line-Line	Measured at point B on fig 7
4.5.2.1.2.1.	Input Non-Response Voltage	0	0.2	V pk-pk Line-Line	Measured at point B on fig 7
4.5.2.1.2.2.	Common Mode Rejection	-10	10	V peak Line-GND	Signals from DC to 2MHz measured at point B on fig 7
4.5.2.1.2.3.	Input Impedance	1000		Ω	Within the frequency range 75KHz to 1MHz measured line to line at point B on fig 7
4.5.2.1.2.4.	Noise Rejection		1 in 10 ⁷		

PACKAGE DETAILS

Dimensions are shown thus: mm(in)



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