Programmable Encoder

Ordering Information

Device	Package	Order No.
ET13	20-Pin Plastic DIP	ET13P
ET13	20-Pin SO Surface Mount	ET13WG

Features

- ☐ High Density Transmit only ED Device
- ☐ 13 Address Bits (8192 Addresses)
- ☐ Manchester Phase Encoding
- ☐ Transmitter Compatible with ED15 Series
- ☐ Schmitt Trigger Input for excellent noise reduction
- ☐ Built-in Oscillator using non-critical RC components
- ☐ Zener Diode to regulate the power supply
- ☐ Low power, High Noise Immunity
- ☐ 20-Pin Surface Mount SO package
- ☐ Automatic Preamble Generation

Applications

- ☐ Smoke and Fire Alarm Systems
- ☐ Pocket Pagers
- ☐ Digital Locks
- ☐ Theft Alarm Systems
- ☐ Security Systems
- ☐ Digital Paging Systems
- ☐ Special Identification Code Systems
- ☐ Remote Sensor Data Acquisition Systems
- ☐ Single Channel Digital Transmission of Information

Absolute Maximum Ratings

Supply Voltage with respect to V_{SS}	6.4V
Operating Temperature	0°C to +70°C
Storage Temperature	-55°C to +150°
Zener Current	100mA

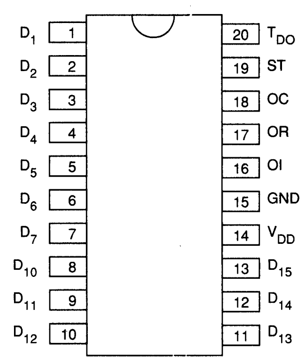
Note: All inputs except OI contain protection circuitry to prevent damage due to static charges. Care should be exercised to prevent application of voltages outside of the specification range. The OI has a special input protection circuit and special care should be taken with this input.

General Information

The ET13 is a single monolithic chip using metal gate CMOS technology for low cost, low power, high yield and high reliability. This circuit is capable of working as an encoder in applications where exclusive recognition of address codes is required. This circuit is capable of generating 8192 codes by connecting the Address Inputs to V_{DD} for a "1", or allowed to Float for a "0".

The ET13 Transmitter is a device in the Supertex ED Series of parts that is communication compatible with any other ED Series device. The ET13 provides the maximum numbers of address codes in a small package which makes them ideally suited for remote security transmitter applications where receiver operation is unnecessary. The ET13 is also available in a new 20-pin surface mount SOW package with .050-inch pitch Gullwing leads, providing high package density for remote transmitter applications.

Pin Configuration



top view

20-pin DIP/SOW 20

Electrical Characteristics

DC Characteristics (V_{DD} = 5.0 ± 5%; GRD = 0.0V; T_A = 25°C)

Symbol	Parameter	Min	Typ (Note 1)	Max	Unit	Conditions
V_{IH}	Input High Voltage	V_{DD} - 0.3		V_{DD} + 0.3	V	"1" INPUT
V_{IL}	Input Low Voltage	-0.3		0.3	V	"0" INPUT
I_{LKC}	Input Leakage Current		0.1	2.0	µA	V_{IN} = 5.0V for ST
I_{LC}	Input Load Current	2.0	6.0	20.0	µA	V_{IN} = 5.0V for pins RS, D1-D15
V_{OH}	Output High Voltage	V_{DD} - 0.3			V	V_{DD} = 4.75V, I_{LOAD} = -100µA
V_{OL}	Output Low Voltage			0.3	V	V_{DD} = 4.75V, I_{LOAD} = 100µA
I_{OH}	Output High Current (Sourcing)	-1.0	-1.5		mA	V_{OH} = V_{DD} -1.0V
I_{OL}	Output Low Current (Sinking)	1.0	3.0		mA	V_{OL} = 1.0V
V_Z	Zener Voltage	5.5	6.4	7.0	V	I_Z = 10µA (Note 2)
		6.0	6.7	7.5	V	I_Z = 10mA (Note 2)
C_{IN}	Input Capacitance			10	pF	(Note 2)
C_{ONT}	Output Capacitance			10	pF	(Note 2)
I_{DD}	Drain Current			10	µA	V_{DD} = 5.0V, all inputs = GRD all inputs floating

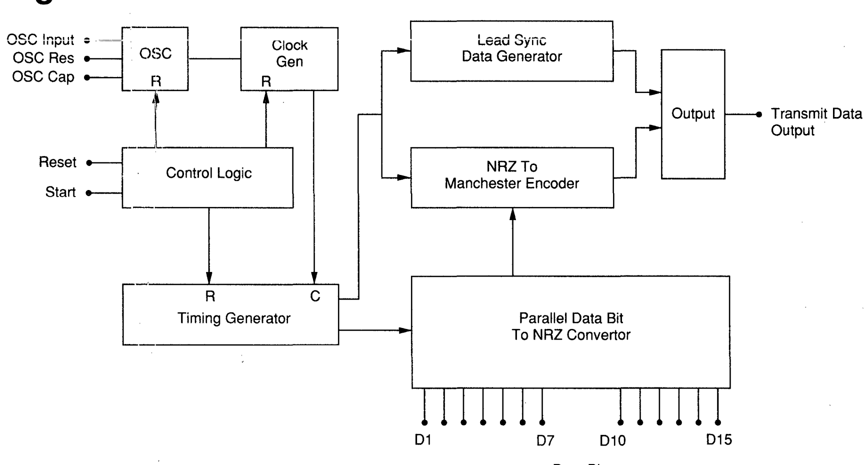
Note 1: Typical values are those values measured in a production sample at V_{CC} = 5.0V.
Note 2: This parameter is periodcally sampled and is not 100% tested.

AC Characteristics (V_{DD} = 5.0 ± 5%; T_A = 25°C)

Symbol	Parameter	Min	Typ (Note 1)	Max	Unit	Conditions
f_c	Clock Frequency	0		25	kHz	R = 150k, C = 100pF; Clock Period (t_c) = 1/f_c
t_{st}	Start Pulse Width	500			ns	
T_{DO}	TDO Delay from SDI		5		µs	
t_{WORD}	Full Cycle Word Length		130t_c		sec	

Note 1: Typical values are those values measured on a production sample at V_{CC} = 5.0V.

Block Diagram



Pin Definition

Label	Pin Name	Function
GND	Ground	Supply Potential negative side.
OI	Oscillator Input	This input is to drive the oscillator and is the tie point of the timing resistor (RT), and the timing capacitor (CT). It also is connected through a diode to an open drain P-channel device that turns on to V_{DD} when the oscillator is being reset. This input can exceed the power supplies and does during normal oscillator operation.
OR	Oscillator Resistor	Provides phase feedback to the RC timing circuit through the connected timing resistor. NOTE: This pin is driven high during oscillator reset.
OC	Oscillator Capacitor	Capacitor connection of RC timing circuit provides phased feedback from the oscillator. This pin is driven low during oscillator reset.
RS	Reset Input	This input pin may be used to override the data transmission cycle or to inhibit an SDI input. It clears the D/DO to a low state and resets the internal oscillator and data comparison circuits. This pin may be left open (No Connection) when not used, or it may be driven as an input, or an external capacitor (100pF) to V_{DD} may be added for power-up reset. The Reset function is activated when this input is connected to V_{DD}.
ST	Start	Start input is used to start the oscillator which enables the transmission of encoded word.
TDO	Transmit Data Output	This pin is the encoded sequence data output.
D1-D15	Data Bit Inputs	In the ED series devices, these inputs provide parallel input data to be sequentially transmitted. The 20-pin ET13 has some pins omitted and, hence, these data positions will have logical zeros transmitted.
V_{DD}	V_{DD}	Positive Supply Potential — This circuit contains an on-chip zener of approximately 6.7 volts across the supply terminals.

Operation

General

The ET13 mode of operation is a programmable transmitter, encoding 13 data bits into a serial Manchester code bit stream.

The ET13 contains an on-chip zener diode to clamp the power supply to around 6.7 volts. The circuit will operate from 4.0 volts to the zener voltage, but operation is recommended at 5 volts ±5%, or a regulated power supply in order to stabilize the time constants of the oscillator circuit. In order to use the on-chip zener diode, a current limiting resistor of 1K ohm or greater is required. If pull-up resistors are used for the Data Inputs, the resistors should be tied to a voltage no higher than that on Pin 14 or 6 volts, whichever is lower.

Output drivers are capable of sinking or sourcing 1.0 mA minimum at 1.0 volts V_{DS}. All inputs are gate protected to both power supplies by internal diodes. The Address Data Inputs of the ET13 each have pull down resistors to ground so that only a "1" will have to be programmed. This allows the inputs to be programmed by using SPST switches or jumpers V_{DD} only. The Start/Data Input also does not have a pull up or pull down resistor, but is applied to a Schmitt Trigger input circuit to improve noise rejection.

Function

The ET13 functions as an encoder, sampling the 13 Data Input pins digital information and encoding this parallel data in NRZ format, combining it with the clock in Manchester Code (Phase Encoded) and presenting it to the TDO pin for transmission (usually to an ED device used as the decoder circuit). The encoder will transmit the serial data each time the Start (ST) input is activated.

This encoded Data word is transmitted in two parts. The first part is preamble information which is a series of 12 "1's" and then a space indicating that the encoded Data is to follow. This preamble information is intended to be used to synchronize a phase locked-loop at the receiver or used as a setting time for receivers that have automatic gain control. The second part contains the 13 bits of Data.

Transmit and Receive Data Patterns of ED-Series Devices

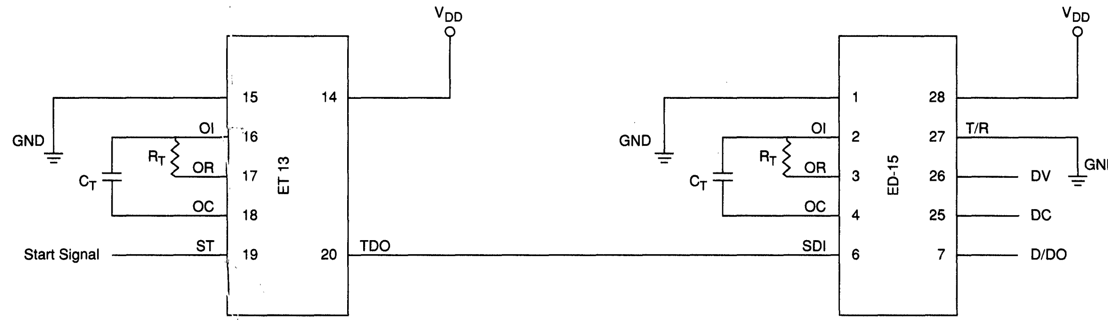
Note: Bit Sequence Code Format

x = Programmable

0 = Hardwired Internally Zero

1 = Hardwired Internally One

ET-13 to ET-15



Transmitted Bit Sequence

1	X	X	X	X	X	X	X	0	0	X	X	X	X	X	X

D1 … D15

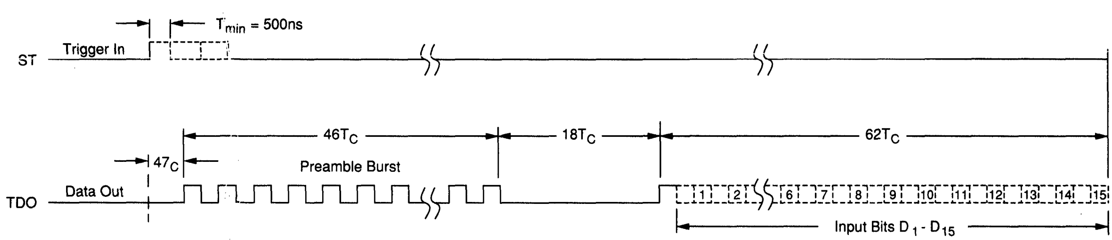
Received Address Code

1	X	X	X	X	X	X	X	0	0	X	X	X	X	X	X

D1 … D15

Timing Diagram – Transmit

Timing Diagram – Transmit

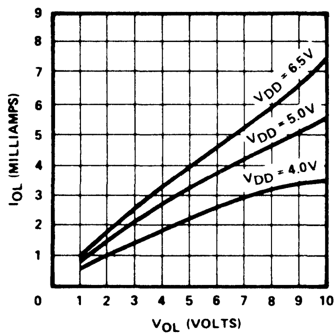


Total Time Required for Transmission of One Sequence = $130T_C$

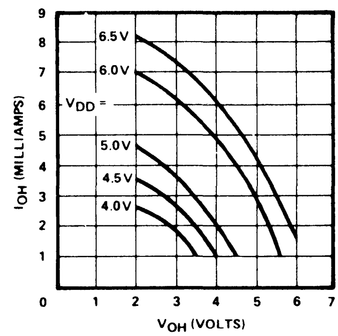
$$T_C = \frac{1}{\text{CLOCK FREQUENCY}}$$

Typical Performance Curves (T_A = 25°C unless otherwise noted)

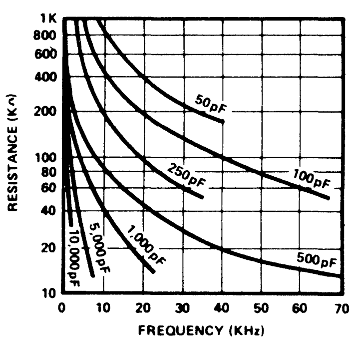
I_{OL} vs V_{DD} vs V_{OL}



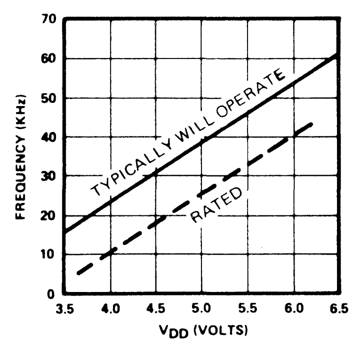
I_{OH} vs V_{DD} vs V_{OH}



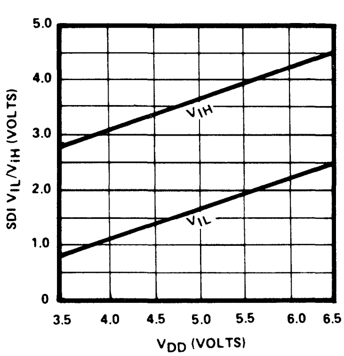
RESISTANCE
vs
OSCILLATOR FREQUENCY



OPERATING FREQUENCY
vs
V_{DD}



SDI INPUT
V_{IL}/V_{IH} vs V_{DD}



I_{DD} vs V_{DD}