

## Programmable Encoder

### Ordering Information

Device	Package	Order No.
ET15	20-Pin Plastic DIP	ET15P
ET15R*	20-Pin Plastic DIP	ET15RP
ET15	20-Pin SO Surface Mount	ET15WG
ET15R*	20-Pin SO Surface Mount	ET15RWG

\* Gate-protected version

### Features

- High density transmit only ED device
- 12 address bits (4096 addresses)
- Manchester phase encoding
- Data reset (DRS) pin for multiple transmissions
- 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
- Ruggedized devices available

### 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

### General Information

The ET15 and ET15R 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 4096 codes by connecting the address inputs to  $V_{DD}$  for a "1," or allowing them to float for a "0." The ET15 and ET15R permits multiple transmissions of data, improving the probability of valid reception in high-noise environments.

The ET15 and ET15R Transmitter is a device in the Supertex ED Series of parts that is communication-compatible with any other ED Series device. The ET15 and ET15R provides the maximum number of address codes in a small package which makes it ideally suited for remote security transmitter applications where receiver operation is unnecessary. The ET15 and ET15R 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.

"R" version products are ruggedized to provide greater protection against ESD damage caused by improper handling. These devices are gate-protected and meet the 2000V ESD ratings of EIA standards.

### Absolute Maximum Ratings

Supply Voltage with respect to $V_{SS}$	6.4V
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C
Zener Current	100mA

Note: All inputs of non-"R" version device, 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.

## Electrical Characteristics

DC Characteristics ( $V_{DD} = 5.0 \pm 5\%$ ;  $GND = 0.0V$ ;  $T_A = 25^\circ C$ )

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	$GND - 0.3$		0.3	V	"0" INPUT
$I_{LKC}$	Input Leakage Current		0.1	2.0	$\mu A$	$V_{IN} = 5.0V$ for ST
$I_{LC}$	Input Load Current	2.0	6.0	20.0	$\mu A$	$V_{IN} = 5.0V$ for pins RS, D2-D15
$V_{OH}$	Output High Voltage	$V_{DD} - 0.3$			V	$V_{DD} = 4.75V$ , $I_{LOAD} = -100\mu A$
$V_{OL}$	Output Low Voltage			0.3	V	$V_{DD} = 4.75V$ , $I_{LOAD} = 100\mu A$
$I_{OH}$	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	$I_Z = 10\mu A$ (Note 2)
		6.0	6.7	7.5	V	$I_Z = 10mA$ (Note 2)
$C_{IN}$	Input Capacitance			10	pF	(Note 2)
$C_{OUT}$	Output Capacitance			10	pF	(Note 2)
$I_{DD}$	Drain Current			10	$\mu A$	$V_{DD} = 5.0V$ , all inputs = GND all inputs floating

### Notes:

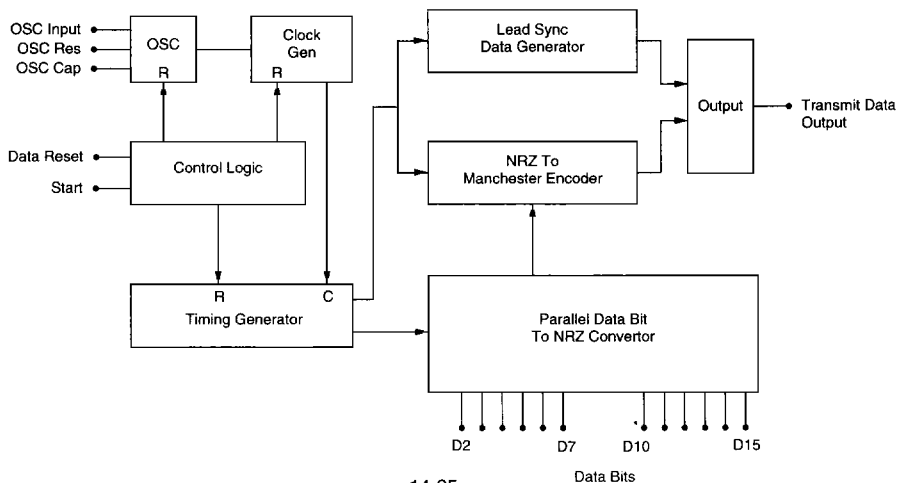
- Typical values are those values measured in a production sample at  $V_{CC} = 5.0V$ .
- This parameter is periodically sampled and is not 100% tested.

AC Characteristics ( $V_{DD} = 5.0 \pm 5\%$ ;  $T_A = 25^\circ C$ )

Symbol	Parameter	Min	Typ (Note 1)	Max	Unit	Conditions
$f_C$	Clock Frequency	0		15	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		$\mu s$	
$t_{WORD}$	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 so 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.
DRS	Data Reset	This output goes high after a valid data transmission (see Timing Diagram). This may be used to either indicate a completed transmission or to restart transmission.
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.
D2-D15	Data Bit Inputs	In the ED series devices, these inputs provide parallel input data to be sequentially transmitted. The 20-pin ET15 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 ET15 and ET15R is a programmable transmitter, encoding 12 data bits into a serial Manchester code bit stream.

The ET15 and ET15R 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  $\pm 5\%$ , or from 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.

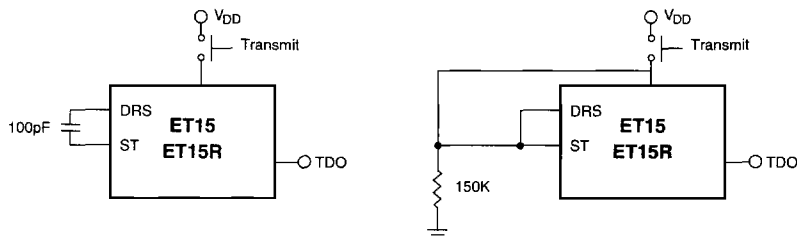
Output drivers are capable of sinking or sourcing 1.0 mA minimum at 1.0 volts  $V_{DS}$ . All inputs are gate protected to both power supplies by internal diodes. The address data inputs of the ET15 and ET15R each have pull-down resistors to ground so that only a "1" will have to be programmed. This allows the inputs to be programmed by using SPST switches or jumpers to  $V_{DD}$  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 ET15 and ET15R functions as an encoder, sampling the 12 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. For multiple transmissions of the preamble/encoded data, the DRS pin may be connected to the ST input, with the TRANSMIT function controlled by a push button switch in the  $V_{DD}$  line. (See diagrams below.) In high-noise environments, multiple transmissions can improve the probability of a valid received transmission.

This encoded data word is transmitted in two parts. The first part is preamble information which is a series of 12 "1s" 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 12 bits of data.

## Two Ways to Implement Multiple Transmissions



# Transmit and Receive Data Patterns of ED-Series Devices

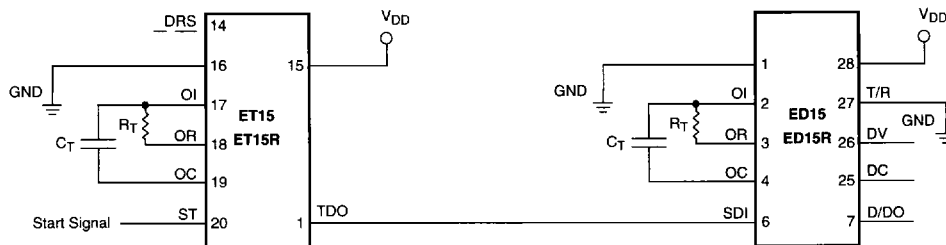
Note: Bit Sequence Code Format

x = Programmable

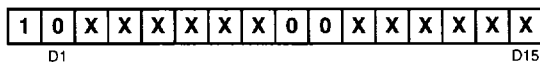
0 = Hardwired Internally Zero

1 = Hardwired Internally One

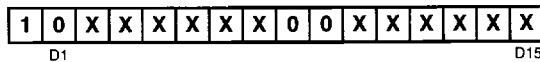
## ET15 to ED15 and ET15R to ED15R



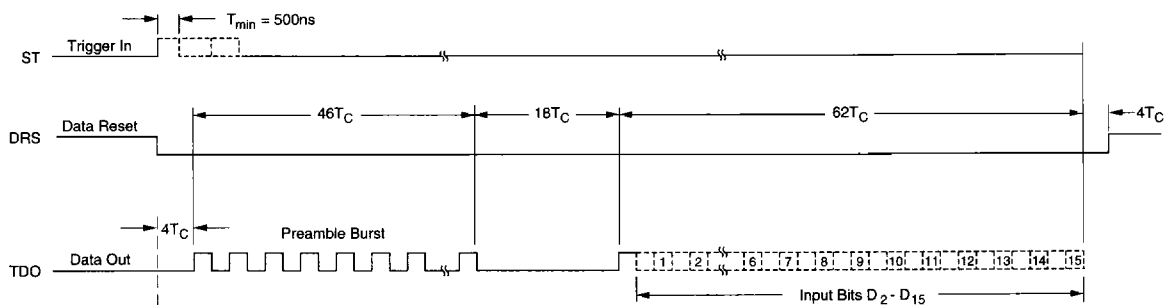
Transmitted Bit Sequence



Received Address Code



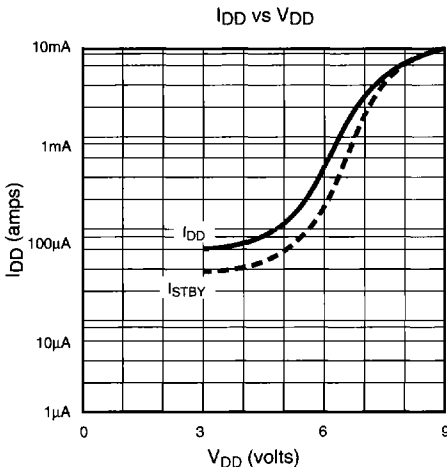
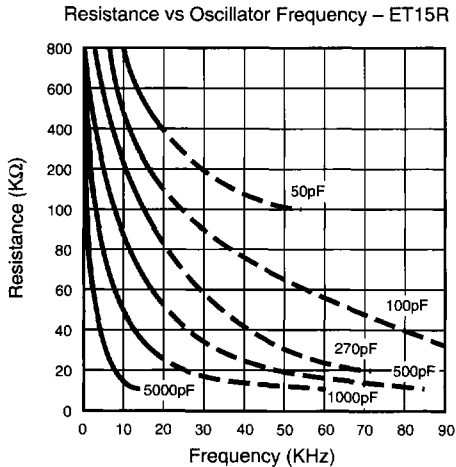
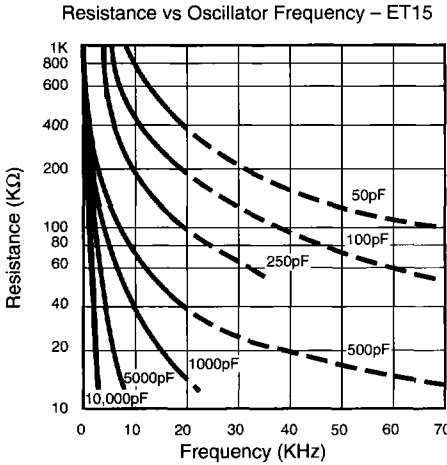
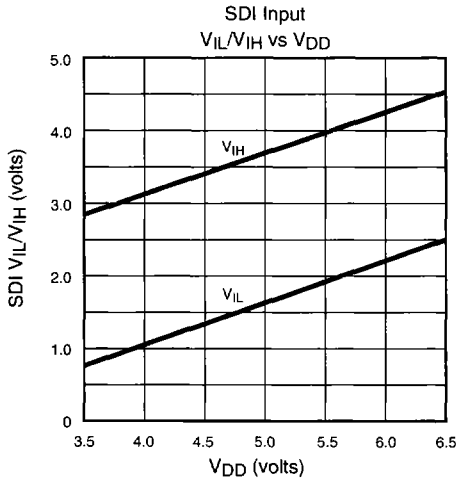
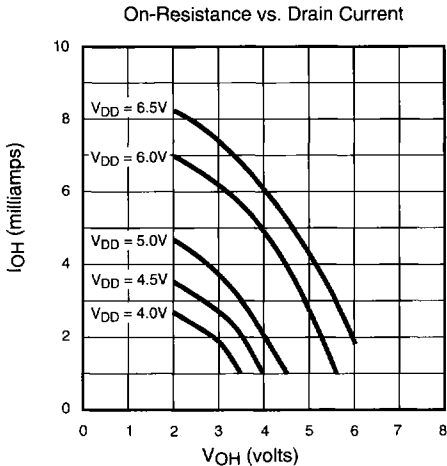
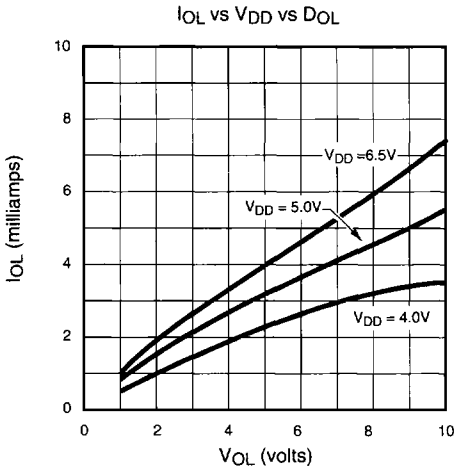
## Timing Diagram – Transmit



Total Time Required for Transmission of One Sequence =  $(DRS - 4T_C) = 130T_C$

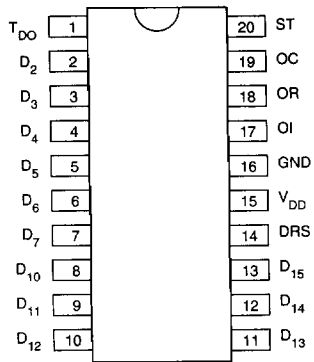
$$T_C = \frac{1}{\text{CLOCK FREQUENCY}}$$

**Typical Performance Curves** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)



Note: Operation is not guaranteed if the oscillation frequency is higher than 20KHz.

## Pin Configuration



top view  
20-pin DIP/SOW 20