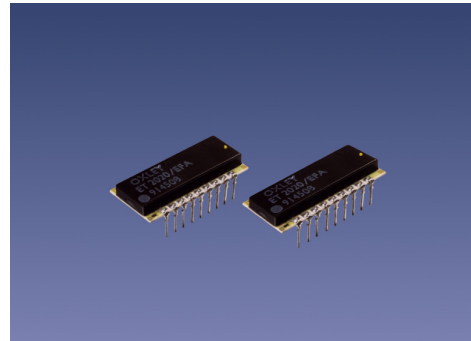


# Elapsed Time Indicator ET2020/EFA

## Features

- EEPROM non-volatile memory.
- 10 years data retention.
- Low power, 10 mW typical.
- Serial and parallel outputs.
- Microprocessor compatible.
- Non-volatile text storage and recall.
- Military specifications.

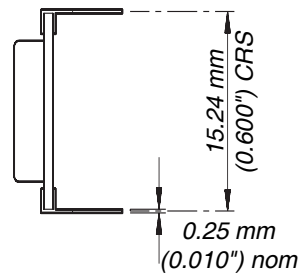
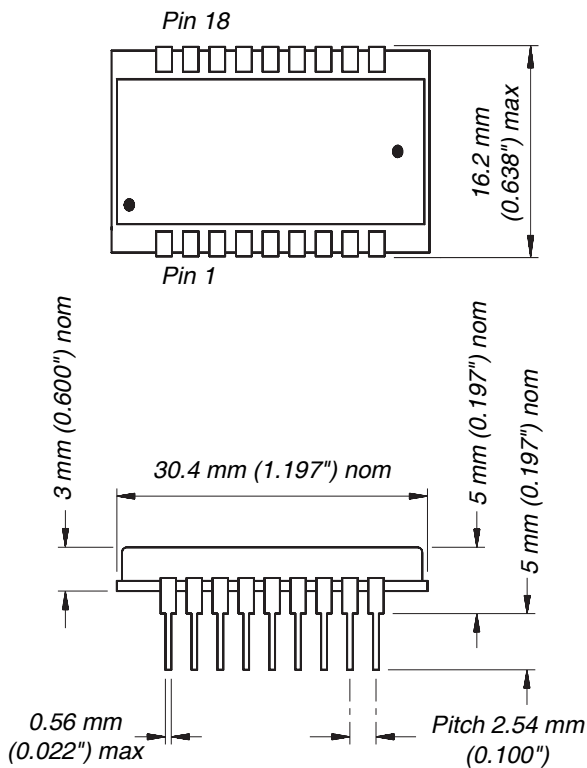
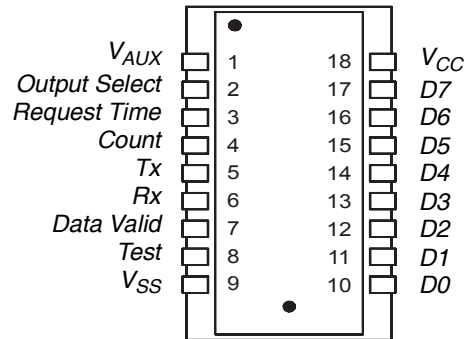
For ordering information see [page 22](#).



**Note:** The Test pin is provided for factory purposes only and should be left unconnected.

## Construction

The 18 pin ceramic dual-in-line package is assembled using thick film chip hybrid technology, ensuring suitability for military, avionic, and industrial applications where severe environmental conditions may be encountered.



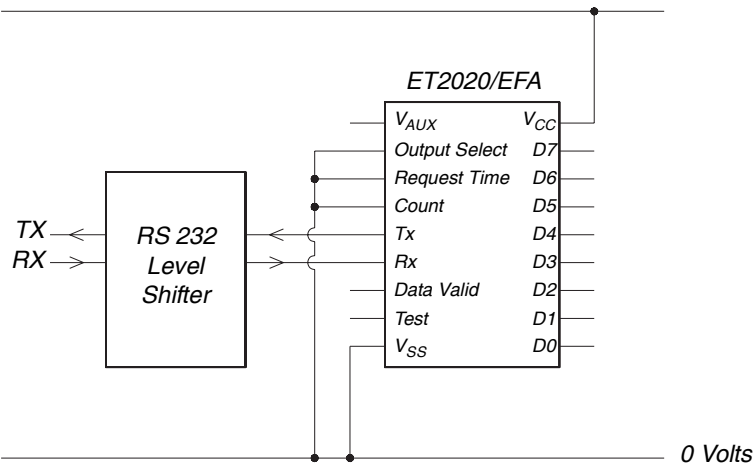


## Application Circuit Diagrams

Typical application ODCSM40539/2/2005 circuit diagrams are shown below for serial and parallel interrogation modes. The internal timer is activated whenever the 5 V power supply is applied. No additional timing control circuitry is required. The total elapsed time is accumulated in the internal non-volatile memory for interrogation through either the serial or parallel interfaces.

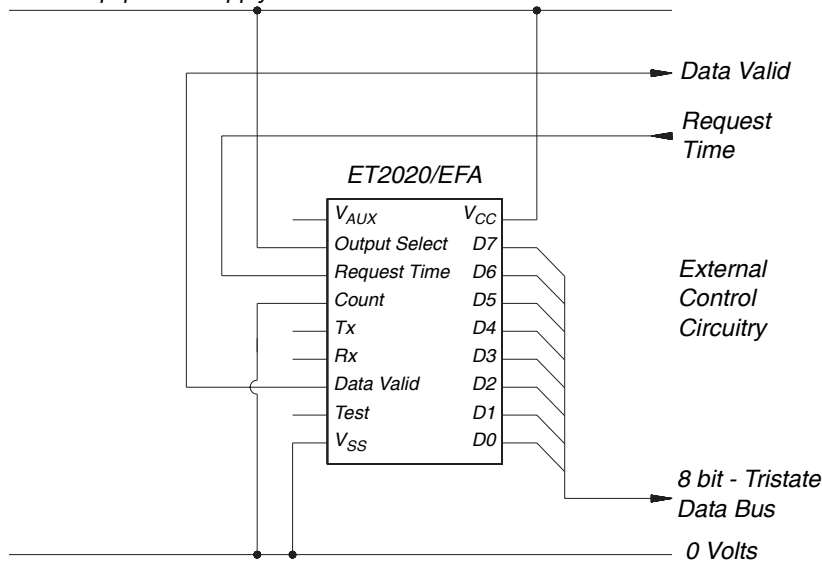
### Serial Mode

5 Volt Equipment Supply



### Parallel Mode

5 Volt Equipment Supply



## Power Supply

A single 5 Volt power supply, Vcc is required for operation. A separate power supply input V<sub>aux</sub> is also provided for energisation from a second power source. A blocking diode is internally connected to prevent current from V<sub>aux</sub> powering parent equipment connected to Vcc. This provides cold read facilities during failure of parent equipment or when it is powered down.

## Interrogation

The ETI can be interrogated in either serial or parallel format. The OUTPUT SELECT (OS) input is used for selection of interrogation mode.

### Serial Data (Output Select = 0)

Serial data transfer uses two pins, Rx (receive data), and Tx (transmit data). Together with a signal common, these lines constitute a 3 wire serial communication interface utilising a standard non-return to zero (NRZ), data format. Direct interface can be made with integrated circuit UART devices. The signals can also be level shifted to conform to RS232 requirements.

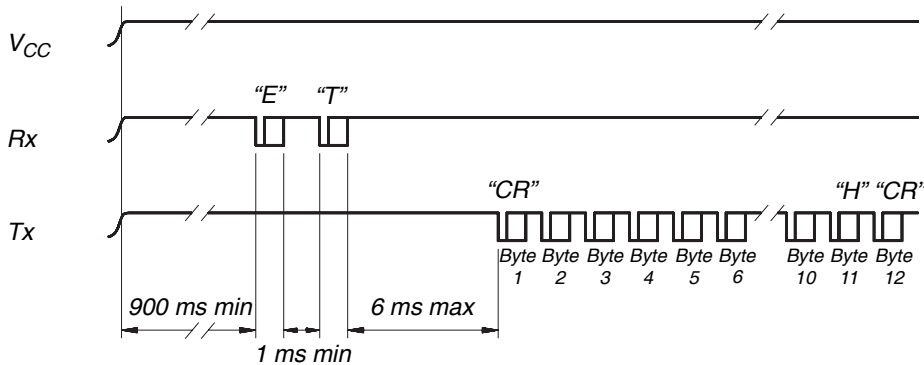
The Rx and Tx signals must meet the following requirements:-

- 1 A High level indicates logic 1 (5 V) and a low level indicates logic 0 (0 V).
- 2 The Rx input must be in a high state prior to reception of data.
- 3 A start bit, (logic 0), is transmitted/received indicating the start of a message.
- 4 Bytes of data are transmitted/received least significant bit first.
- 5 A stop bit, (logic 1), in the 10th bit position indicates transmission/reception of a byte is complete.
- 6 Baud rate: 9600 b/s  
Data bits: 8  
Start bits: 1  
Stop bits: 1  
Parity: None

To initiate transmission of serial elapsed time/pulse count data a unique two character ASCII command "ET" must be received at the Rx input. Following reception of a valid "ET" command the ETI will output the elapsed time message on the Tx output. If an invalid command is received an ASCII carriage return character, (0D hex), is transmitted.



**Serial Elapsed Time Interrogation**



Bytes 1 and 12 are ASCII carriage return characters. Bytes 2 to 9 represent the elapsed time reading and are ASCII characters. Byte 2 is the most significant digit. Byte 7 is always "." and byte 11 "H" denoting units of hours. Elapsed time measurement is suspended for typically 300 ms during serial data output.

BYTE	1	2	3	4	5	6	7	8	9	10	11	12
CHARACTER	cr	0	0	0	0	0	.	0	0		H	cr
HEX	0D	30	30	30	30	30	2E	30	30	20	48	0D

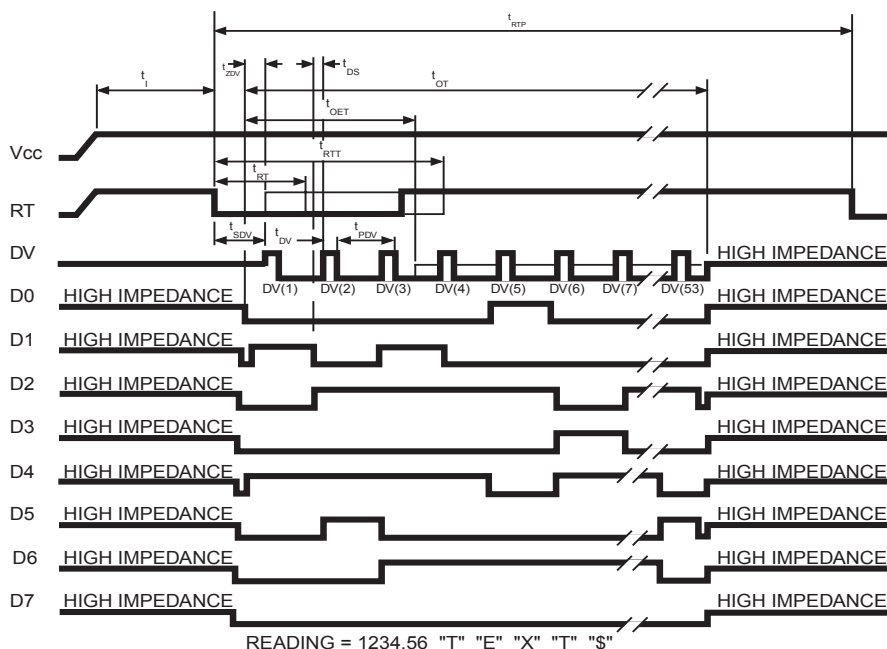
**Parallel Data (Output Select = 1)**

Parallel elapsed time/pulse count interrogation is initiated by holding the REQUEST TIME input at logic 0 for time  $t_{RT}$  or until the positive edge of DV(1). The elapsed time/pulse count time information then appears sequentially in 3 bytes on outputs D0-D7. Data is synchronised with pulses which appear on the DATA VALID (DV) output. Each byte represents a 2 digit BCD number. Outputs D7-D4 represent the most significant digit, outputs D3-D0 represent the least significant digit. D0-D7 are tri state outputs suitable for direct connection onto a high impedance data bus.

**Parallel Text Interrogation**

Parallel text interrogation is initiated by holding the REQUEST TIME input at logic 0 for the time  $t_{RTT}$  or until the positive edge of DV(4). Following the 3 bytes of elapsed time/pulse count information, the ASCII text appears on outputs D0-D7 synchronised with DATA VALID pulses DV(4) to DV(53). To request elapsed time information only, the REQUEST TIME pulse width should not exceed  $t_{RT}$  max. Elapsed time measurement is suspended for typically 300 ms during parallel data output.

### BCD Parallel Output



During DV(1) the digits represent HOURS  $\times 10^3$  and HOURS  $\times 10^2$ .

During DV(2) the digits represent HOURS  $\times 10^1$  and HOURS  $\times 10^0$ .

During DV(3) the digits represent HOURS  $\times 10^{-1}$  and HOURS  $\times 10^{-2}$ .

Parameter	Description	Min	Max	Units
$t_l$	Initialisation time	900		ms
$t_{RT}$	Request time pulse width for time information only	6	12	ms
$t_{RTT}$	Request time pulse width for time & text information	16		ms
$t_{SDV}$	Time to set up 1st data valid		6	ms
$t_{DV}$	Data valid pulse width	90	110	$\mu$ s
$t_{PDV}$	Period of data valid	4.99	5.01	ms
$t_{OT}$	Total bus active time		264	ms
$t_{OET}$	Total bus active time, elapsed time only output		15	ms
$t_{ZDV}$	Time from end of Z state to 1st DV	175 typical		$\mu$ s
$t_{DS}$	Data set up time	90 typical		$\mu$ s
$t_{RTP}$	Request time repetition period	300		ms



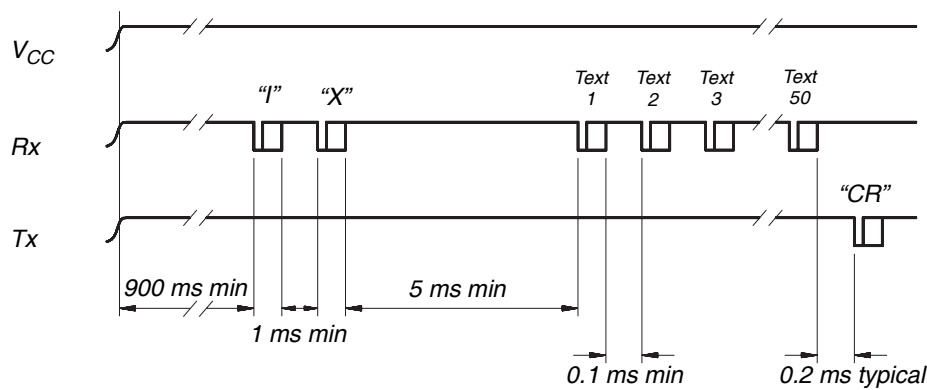
## User Programmable Text

50 bytes of EEPROM are provided for user entry and storage of 50 characters of text information. The text may record, for example, maintenance and warranty status of parent equipment. Text may be rewritten as often as required and can be read by both serial and parallel outputs. Text can only be entered serially.

### Text Entry

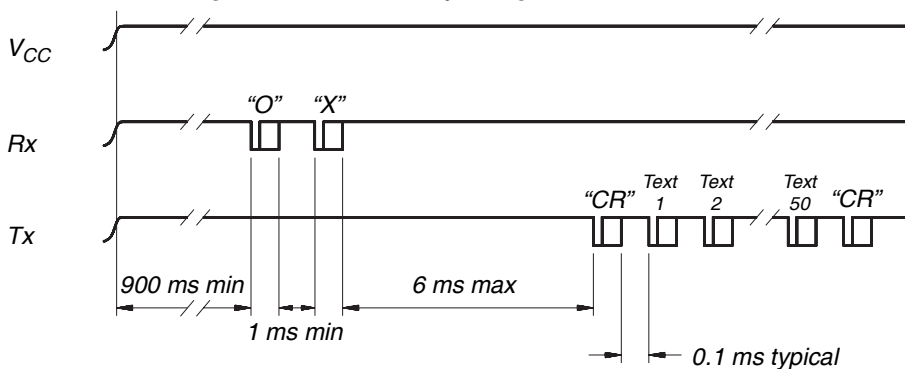
Text entry can only be made whilst in serial mode and is initiated by detection of the ASCII "IX": command at the Rx input. Up to 50 ASCII text characters should then be input, terminated either by a carriage return or by entry of the 50th character. Text entered will overwrite previously stored text.

### Serial Text Input

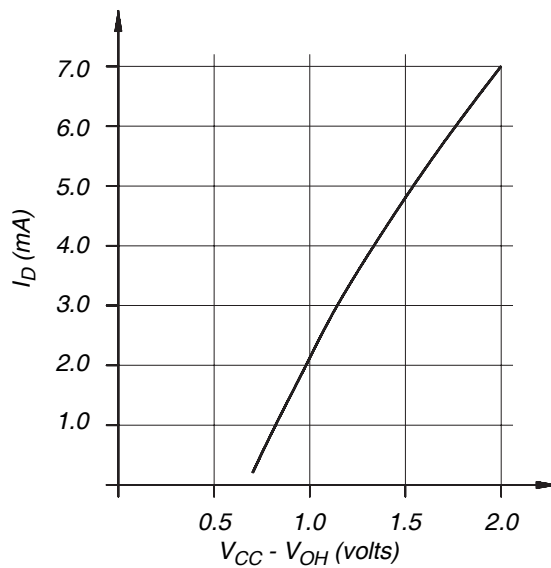


### Serial Text Interrogation

Serial text interrogation is achieved by using the ASCII "OX" command. Serial Text Output



## Typical Drive Current Graph





## Characteristics

Operating temperature range	-55°C to 125°C
Storage temperature range	-55°C to 125°C
Supply voltage, $V_{CC}$	4.5 to 5.5 V d.c.
Supply voltage, $V_{AUX}$	4.0 to 5.5 V d.c.
Supply current	2 mA typical, 4 mA max.
Timing resolution	0.01 hours
Timing accuracy	$\pm 0.1\%$
Capacity (PARALLEL MODE)	$10^4$ hours / $10^6$ pulses
Capacity (SERIAL MODE)	$10^5$ hours / $10^7$ pulses
$V_{OH}$ , Output logic 1	$V_{CC}-1$ to $V_{CC}$ $I_{load} < 1\text{mA}$
$V_{OL}$ , Output logic 0	$V_{SS}$ to 0.4V
$V_{IH}$ , Input logic 1	$0.8 \times V_{CC}$ to $V_{CC}$
$V_{IL}$ , Input logic 0	$V_{SS}$ to $0.2 \times V_{CC}$
$I_Z$ , High Z leakage current	$\pm 10 \mu\text{A}$

## Ordering Information

Elapsed Time Indicator	Order Code ET2020/EFA
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When ordering please state Type No. and quantity required.