

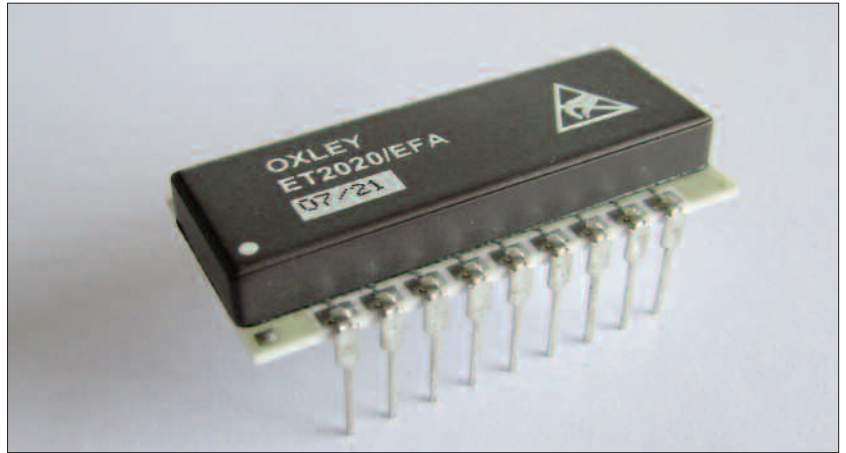


Elapsed time indicator

ET2020/EFA

features

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



description

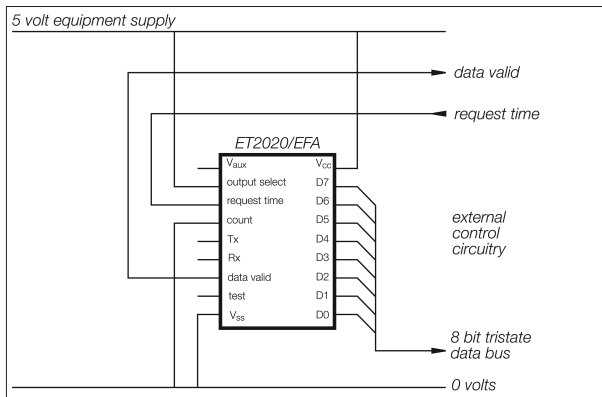
The 18 pin ceramic dual-in-line elapsed time indicator (ETI) is assembled using hybrid technology, ensuring suitability for applications where severe environmental conditions may be encountered.

application diagrams

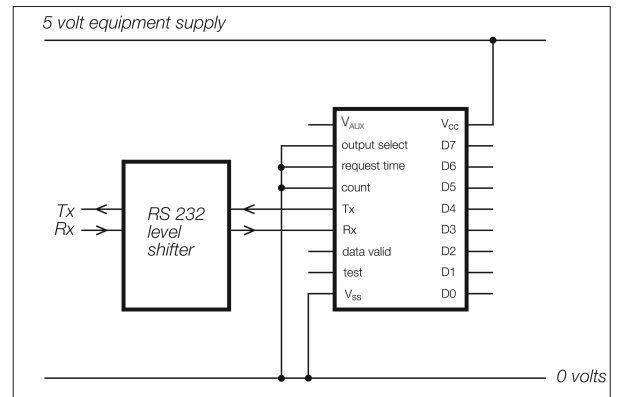
Typical serial and parallel application diagrams are shown below. The internal timer is activated whenever the 5V power supply is applied. No additional timing control circuitry is required.

The total elapsed time is accumulated in the internal non-volatile memory for interrogation through the serial or parallel interfaces.

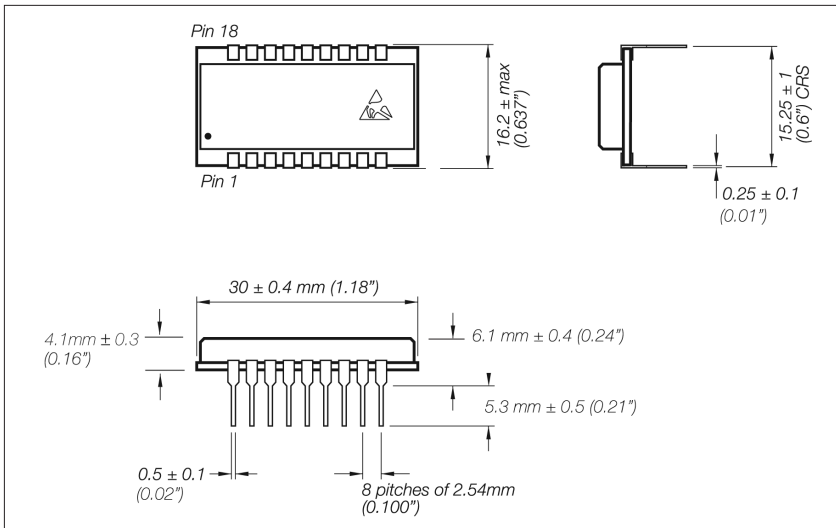
parallel mode



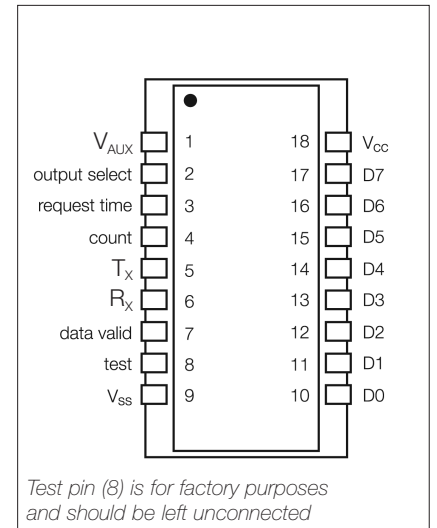
serial mode



dimensions



pin assignment



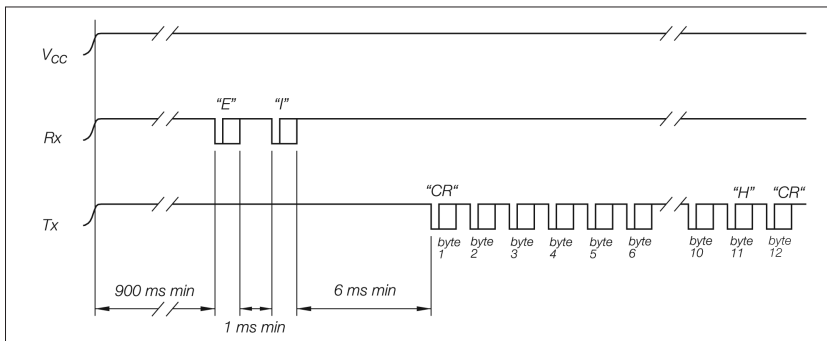
characteristics

Operating temperature range	-55 to 125°C
Storage temperature range	-55 to 125°C
Supply voltage V_{CC}	4.5 to 5.5 Vdc
Supply voltage V_{AUX}	4.0 to 5.5 Vdc
Supply current	1mA typical, 2mA max
Timing resolution	0.01 hours
Timing accuracy	±0.1%
Capacity (parallel mode)	10 ⁴ hours/10 ⁶ pulses
Capacity (serial mode)	10 ⁵ hours/10 ⁷ pulses
Pulse count frequency	30 Hz max
Pulse width	10ms min
V_{OH} output logic 1	$V_{CC} - 1$ to V_{CC}
V_{OL} output logic 0	V_{SS} to $0.2 \times V_{CC}$
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	± 10µA

interrogation

ETIs can be interrogated via serial or parallel format. The **output select** (OS) input is used for selection of interrogation mode.

serial elapsed time



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

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.

serial data (output select = 0)

Serial data transfer uses two pins, R_x (receive data) and T_x (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 R_x and T_x signals must meet the following requirements:

- 1 A High level indicates logic 1 (5V) and a low level indicates logic 0 (0V)
- 2 The R_x input must be 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: 9600b/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 R_x input. Following reception of a valid "ET" command the ETI will output the elapsed time message on the T_x output. If an invalid command is received an ASCII carriage return character, (0D hex), is transmitted.

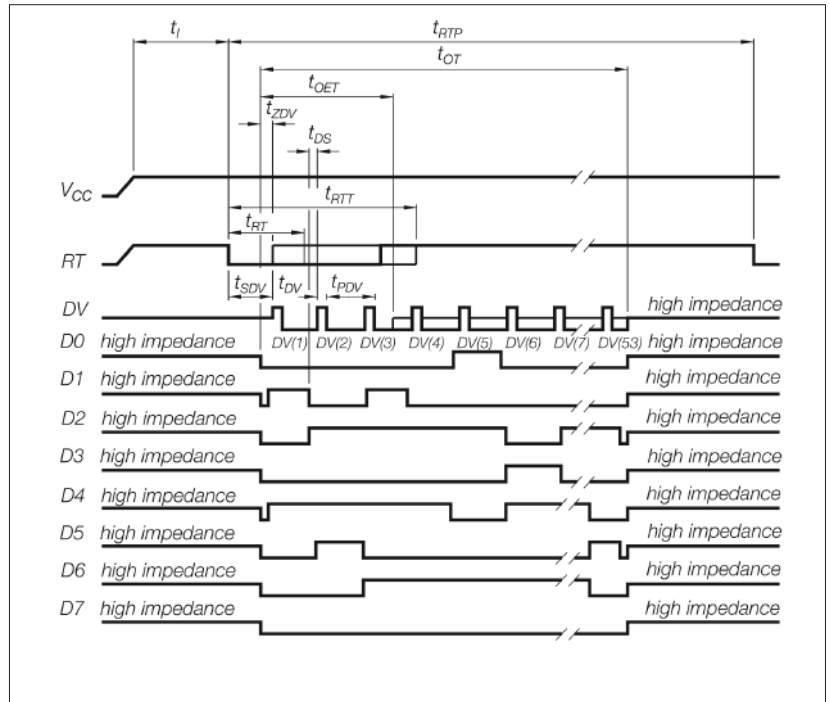
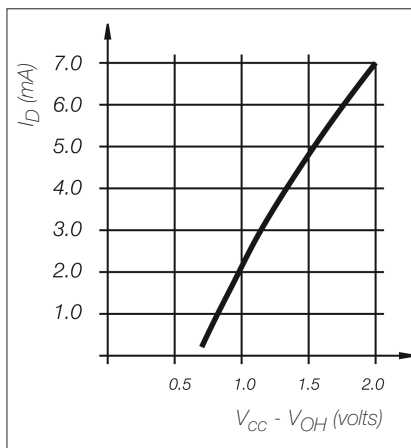
parallel data (output select = 1)

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 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.

power supply

A single 5 volt power supply, V_{CC} is required for operation. A separate power supply input V_{AUX} is also provided for energisation from a second power source. A blocking diode is internally connected to prevent current from V_{AUX} powering parent equipment connected to V_{CC} . This provides cold read facilities during failure of parent equipment or when it is powered down.

typical drive current graph



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 $\times 10^{-2}$

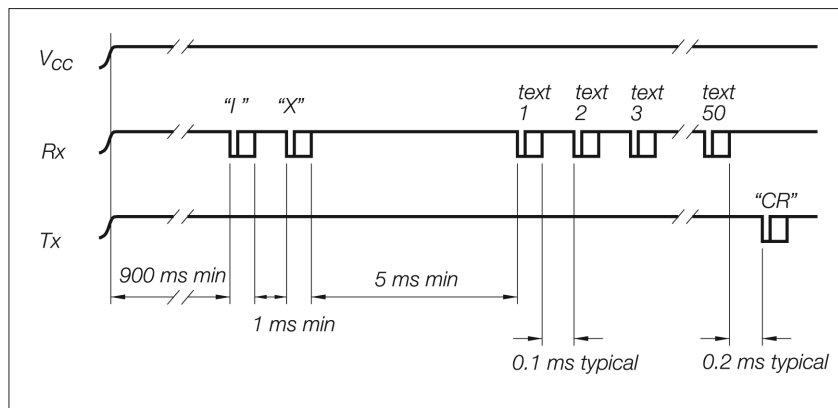
parameter	description	min	max	units
t_i	initialisation time		600	ms
t_{RT}	request time pulse width for time information only	6	12	ms
t_{RIT}	request time pulse width for time and text information	16		ms
t_{SDV}	time to set up first data valid		6	ms
t_{DV}	data valid pulse width	90	110	μ s
t_{PDV}	period 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 first DV	175 typical		μ s
t_{DS}	data set up time	90 typical		μ s
t_{RTP}	request time repetition period	300		ms

user programmable text text entry

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.

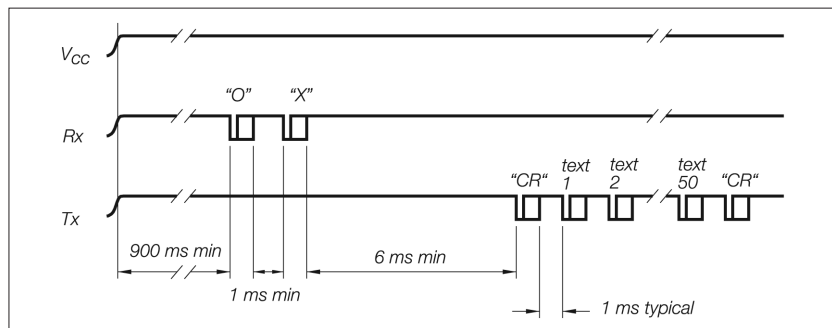
Text entry can only be made whilst in serial mode and is initiated by detection of the ASCII "IX": command at the R_x input. Up to 50 ASCII text characters should then be input, terminated either by a carriage return or by entry of the 50th character. Text entered will overwrite previously stored text.

serial text input



serial text interrogation

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



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 300ms during parallel data output.

ordering information

Elapsed time indicator ET2020/EFA
Non volatile pulse counter PC2020/EFA

This product data also applies to the ET2020/EFA/01 variant

qualification

Originally approved to DEF-STAN 59-61 (Part 90/257)

Company approvals:
BS EN 9001:2000 (FM 01759)
BS EN ISO 14001:2004 (EMS 60559)
AS EN 9100 REV B



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