



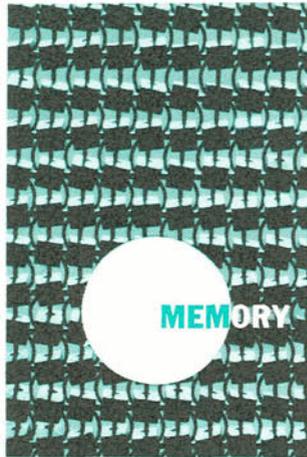
BIAX ELEMENT SPECIFICATION

M-145-05

FORD MOTOR COMPANY • AERONUTRONIC DIVISION • NEWPORT BEACH, CALIF.

BOGUSLAW FRACKIEWICZ

BIAX MEMORY SYSTEMS
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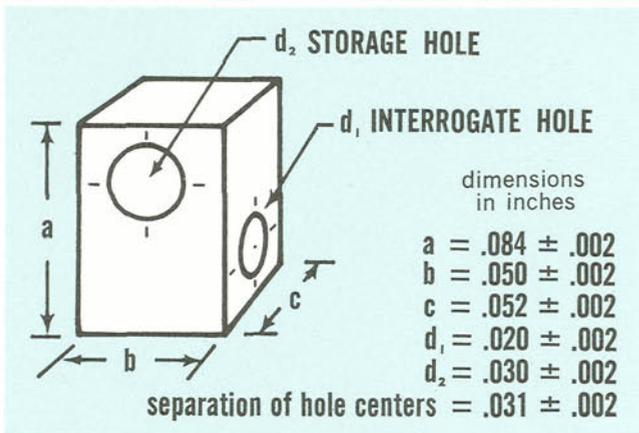
BIAx

MEMORY ELEMENT SPECIFICATION

Type M-145-05

The BIAx element type M-145-05 is a low drive, very fast switching core intended for use in word-select memories. These are non-destructive readout memories with writing speed capability to 333 kc. and reading speed capability to 2 mc. The type M-145-05 exhibits good characteristics over the temperature range of 0° to 50°C.

MECHANICAL SPECIFICATIONS:

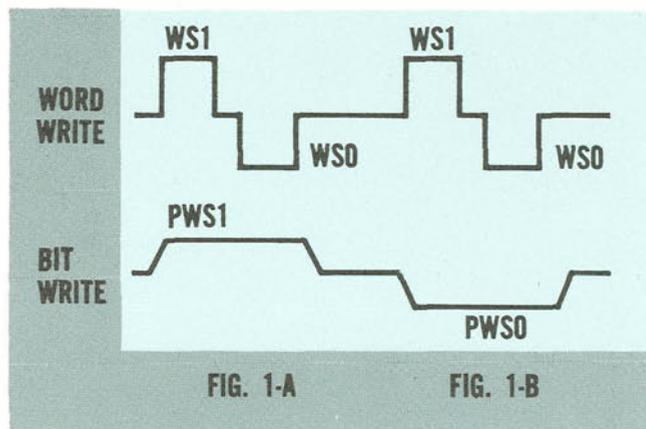


ELEMENT DESCRIPTION:

The BIAx element is an information storage device utilizing the reversible interaction of two different but interfering flux paths to produce a non-destructive read capability. Information is stored by the polarity of the remanent flux around one of these holes (the storage hole) and detected by the interaction between this stored flux and a changing flux around the other hole (the interrogate hole); this flux change is produced by an interrogate pulse.

An interrogate pulse does not switch any flux but merely drives the interrogate hole toward saturation in the direction in which it is already magnetized; this results in non-destructive readout. The polarity of the voltage induced by the interrogate pulse indicates whether the stored information is a "one" or "zero". The phenomenon which occurs is purely one of reversible domain rotation. The BIAx element offers several basic advantages over the conventional core: the domain rotation is so rapid that the BIAx element introduces no measurable delay in the reading operation; there is no internal heating of the element and thus read cycle times are not limited by the element; and the absence of ferrite switching results in negligible power consumption in the element.

WRITING CYCLE:



The elements are organized in the memory with provision to pass current through the storage holes of the elements in both the word and the bit directions. In Fig. 1-A, above, a "one" is written by a WS1 + PWS1 pulse (TS1) and disturbed by a WS0 - PWS1 pulse (DS0) which slightly reduces the "one" signal strength. In Fig. 1-B, a single "one" disturb (DS1) of magnitude WS1 - PWS0 is followed by a WS0 + PWS0 pulse (TS0), which writes a strong "zero". All words are repeatably subjected to disturb pulses of magnitude PWS0 and PWS1, which slightly reduce the signal strength (less than ten percent in usual design cases). The effect of the disturb pulses is negligible after three such pulses.

ELECTRICAL SPECIFICATIONS:

Typical Operating Conditions (Read-write mode)
Temperature: 25°C.

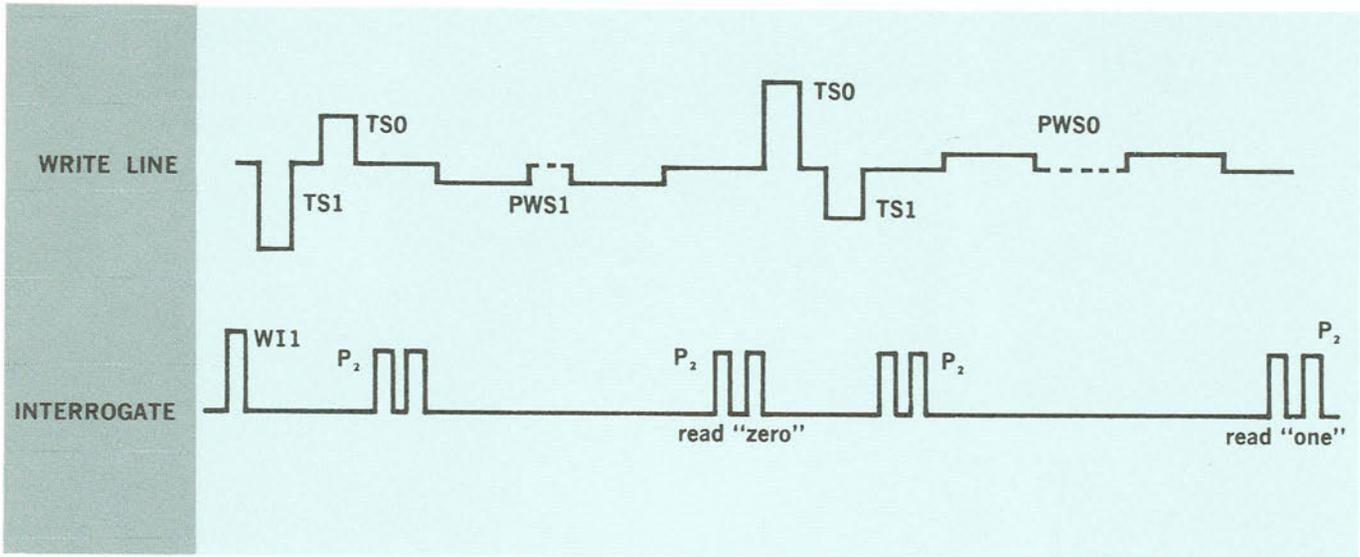
WS1	265ma./0.5us.	$t_r = t_f = 0.04\mu s.$
WS0	220ma./1.0us.	$t_r = t_f = 0.04\mu s.$
PWS0 = PWS1	100ma./2.5us.	$t_r = t_f = 0.04\mu s.$
P_2	225ma./0.3us.	$t_r = t_f = 0.03\mu s.$

TYPICAL OUTPUTS:

(LOAD = 180 OHMS)

INTERROGATE CURRENT (P_2 , ma.)	BIAx OUTPUT (mv.)
200	40
225	46
250	56

TEST PROGRAM



DEFINITIONS:

WSO

Word write pulse in the "zero" direction

WS1

Word write pulse in the "one" direction

PWSO

Bit write pulse in the "zero" direction (repeated disturb)

PWS1

Bit write pulse in the "one" direction (repeated disturb)

TSO

Total writing pulse in the "zero" direction (WSO + PWSO)

TS1

Total writing pulse in the "one" direction (WS1 + PWS1)

DSO

Disturb pulse in the "zero" direction (WSO - PWS1)

DS1

Disturb pulse in the "one" direction (WS1 - PWSO)

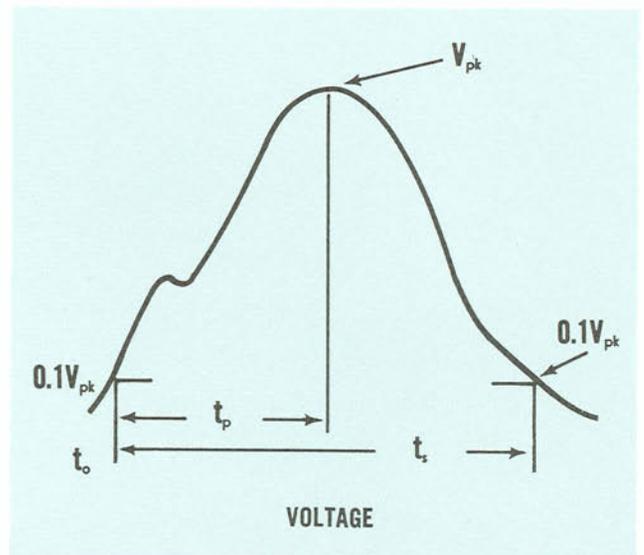
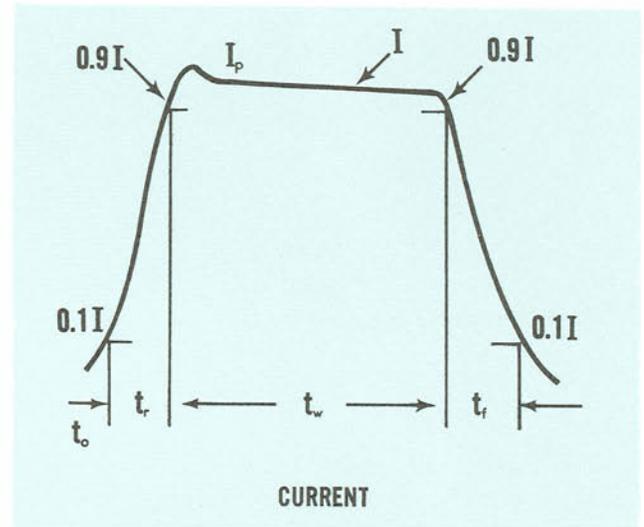
P₂

Interrogate pulse

V_{pk}

Peak voltage response to TSO pulse

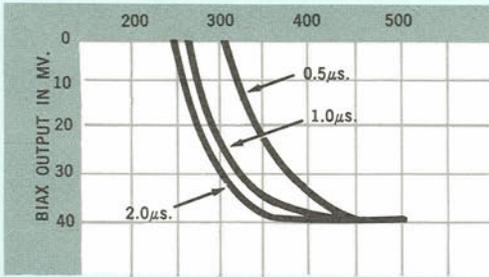
ELEMENT WAVEFORMS



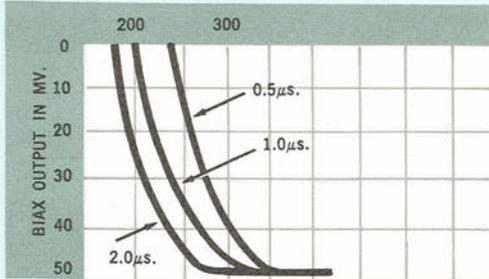
TYPICAL BIAx ELEMENT TYPE M-145-05 CHARACTERISTIC CURVES

SWITCHING CURRENT CHARACTERISTICS

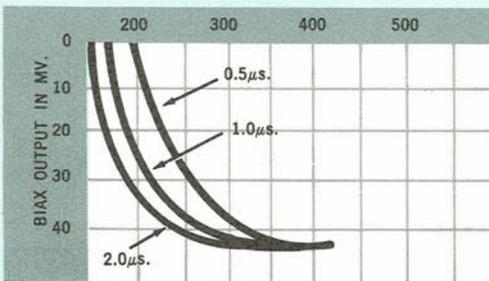
BIAX OUTPUT VS. TSO, T = 0°C
TSO (Write Zero) IN MA.



BIAX OUTPUT VS. TSO, T = 25°C.
TSO (Write Zero) IN MA.

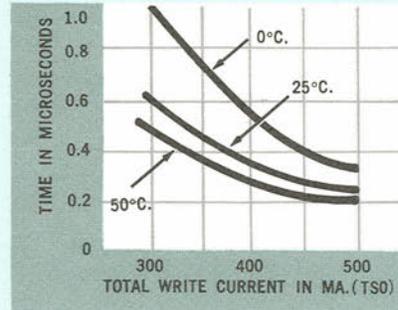


BIAX OUTPUT VS. TSO, T = 50°C.
TSO (Write zero) IN MA.

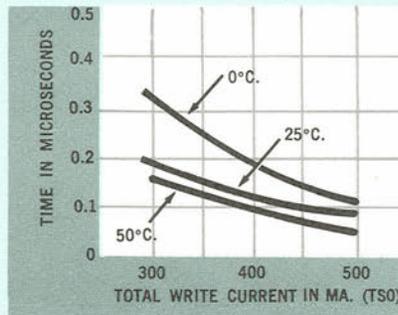


SWITCHING TIME CHARACTERISTICS

t_s VS. TSO
(Switching time)

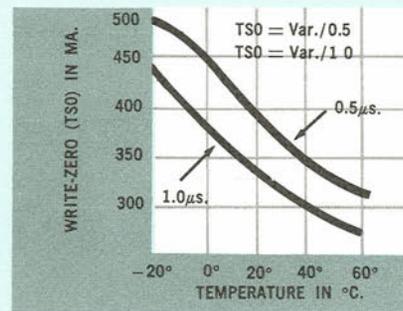


t_p VS. TSO
(Peaking time)



FULL WRITE CHARACTERISTICS

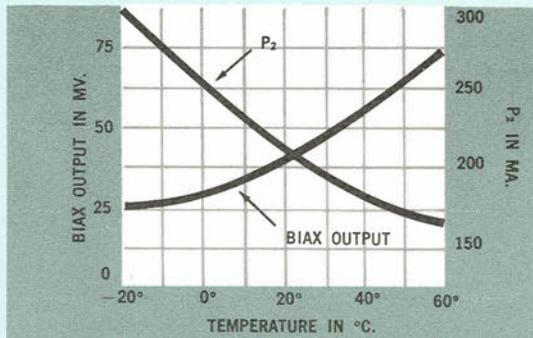
TSO VS. TEMP. FOR FULL-WRITE ZERO



INTERROGATE CHARACTERISTICS

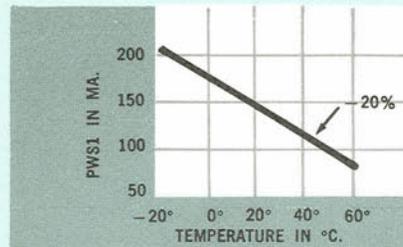
P_2 VS. TEMP.
(BIAx OUTPUT CONSTANT)

BIAX OUTPUT VS. TEMP.
(P_2 CONSTANT)



DISTURB CHARACTERISTICS

PWS1 VS. TEMP. FOR CONSTANT SIGNAL
DETERIORATION (20%)



NOTE: ALL ELEMENTS CLEARED BEFORE EACH WRITE PULSE

For additional technical information and application data, please call or write: Manager of Marketing, BIAx Memory Systems.

Ford Motor Company

AERONUTRONIC DIVISION
FORD ROAD / NEWPORT BEACH, CALIFORNIA