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 me. The type M-145-05 exhibits good characteristics over the temperature range of 0° to 50°C.

MECHANICAL SPECIFICATIONS:

- STORAGE HOLE
- INTERROGATE HOLE

dimensions in inches
a = .084 ± .002
b = .050 ± .002
c = .052 ± .002
d = .020 ± .002
d = .030 ± .002
separation of hole centers = .031 ± .002

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 repeatedly 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS1</td>
<td>265ma./0.5us.</td>
</tr>
<tr>
<td>WS0</td>
<td>220ma./1.0us.</td>
</tr>
<tr>
<td>PWS0 = PWS1</td>
<td>100ma./2.5us.</td>
</tr>
<tr>
<td>P2</td>
<td>225ma./0.3us.</td>
</tr>
</tbody>
</table>

TYPICAL OUTPUTS:

(LOAD = 180 OHMS)

<table>
<thead>
<tr>
<th>Interrogate Current (P2, ma.)</th>
<th>BIAx Output (mv.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>225</td>
<td>46</td>
</tr>
<tr>
<td>250</td>
<td>56</td>
</tr>
</tbody>
</table>
TEST PROGRAM

DEFINITIONS:

WSO  Word write pulse in the "zero" direction

WS1  Word write pulse in the "one" direction

PWS0 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 + PWS0)

TS1  Total writing pulse in the "one" direction (WS1 + PWS1)

DSO  Disturb pulse in the "zero" direction (WS0 - PWS1)

DS1  Disturb pulse in the "one" direction (WS1 - PWS0)

P2   Interrogate pulse

Vpk  Peak voltage response to TSO pulse

ELEMENT WAVEFORMS:

CURRENT

VOLTAGE
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)

Peak time

TIME IN MICROSECONDS

TSO VS. TEMP. FOR FULL-WRITE ZERO

WRITE-ZERO TSO IN MA.

Pwvs. TEMP. FOR CONSTANT SIGNAL
DETERIORATION (20%)