

Fig. 1a

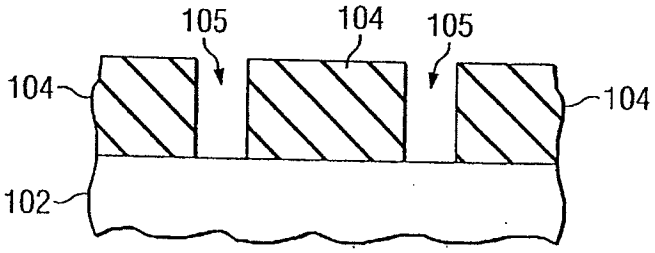


Fig. 1b

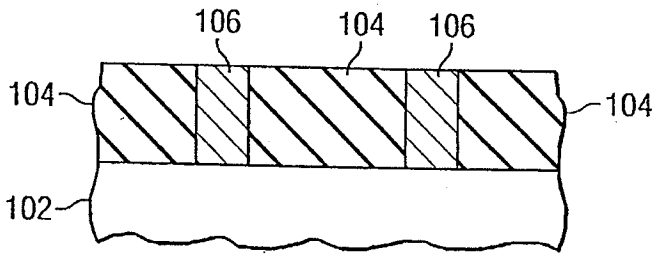


Fig. 1c

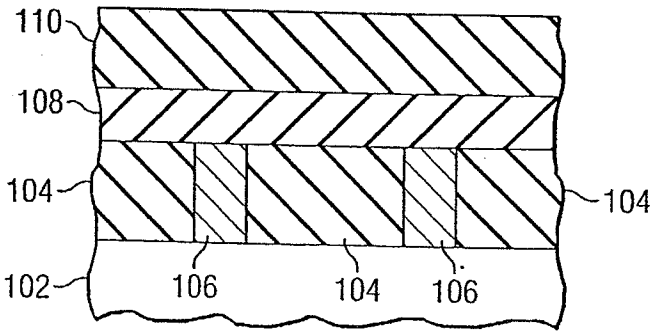


Fig. 1d

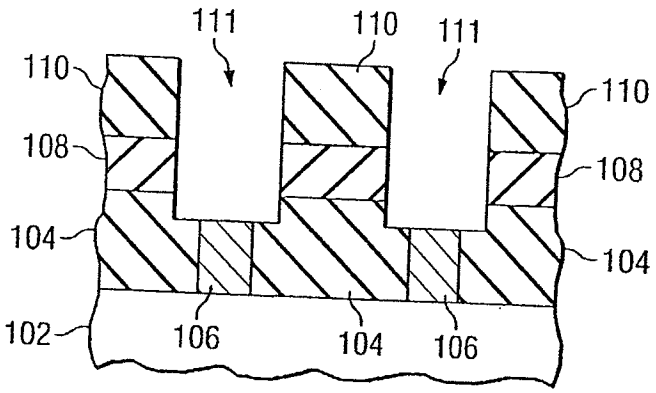


Fig. 1e

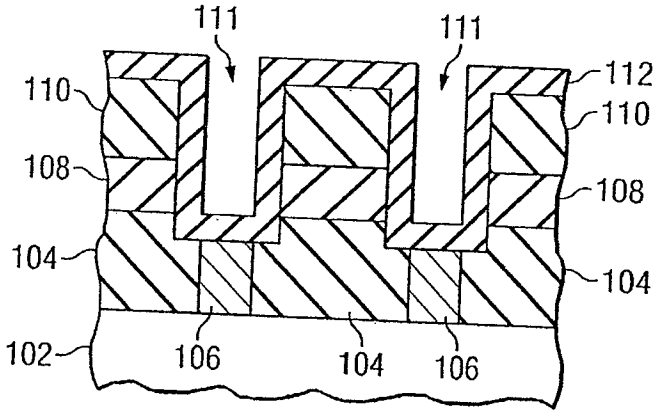


Fig. 1f

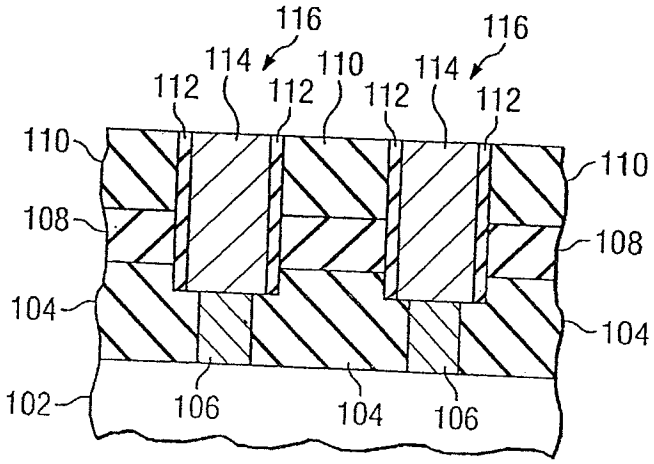


Fig. 1g

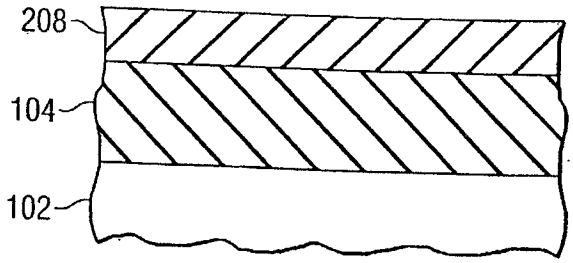


Fig. 2a

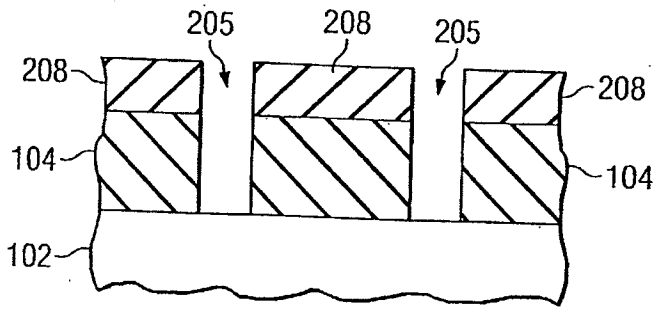


Fig. 2b

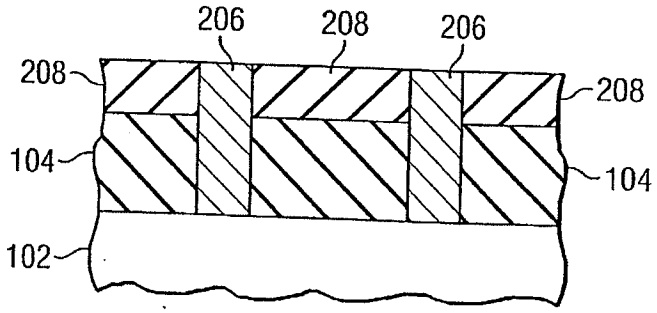


Fig. 2c

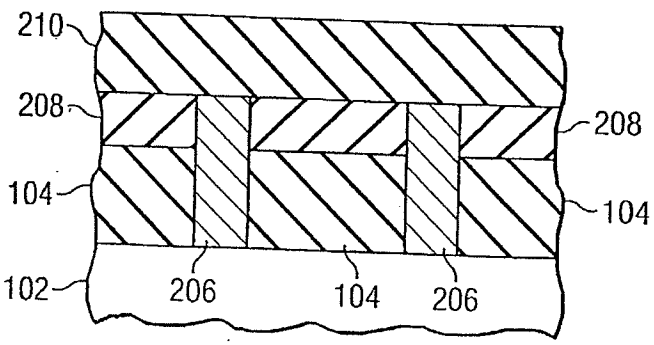


Fig. 2d

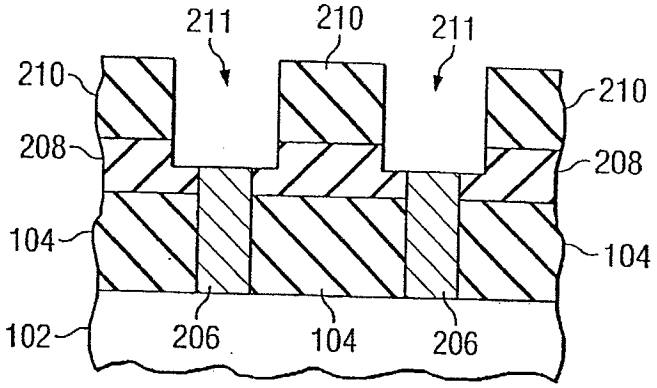


Fig. 2e

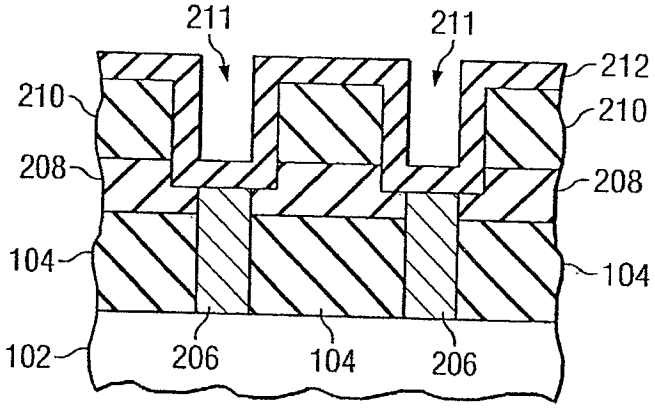


Fig. 2f

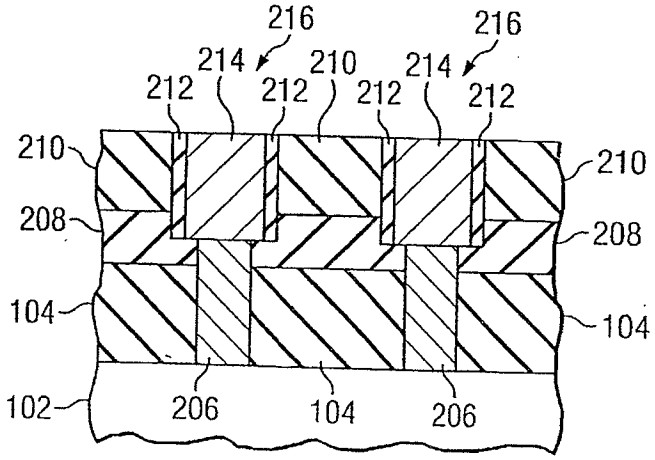


Fig. 2g

Fig. 3

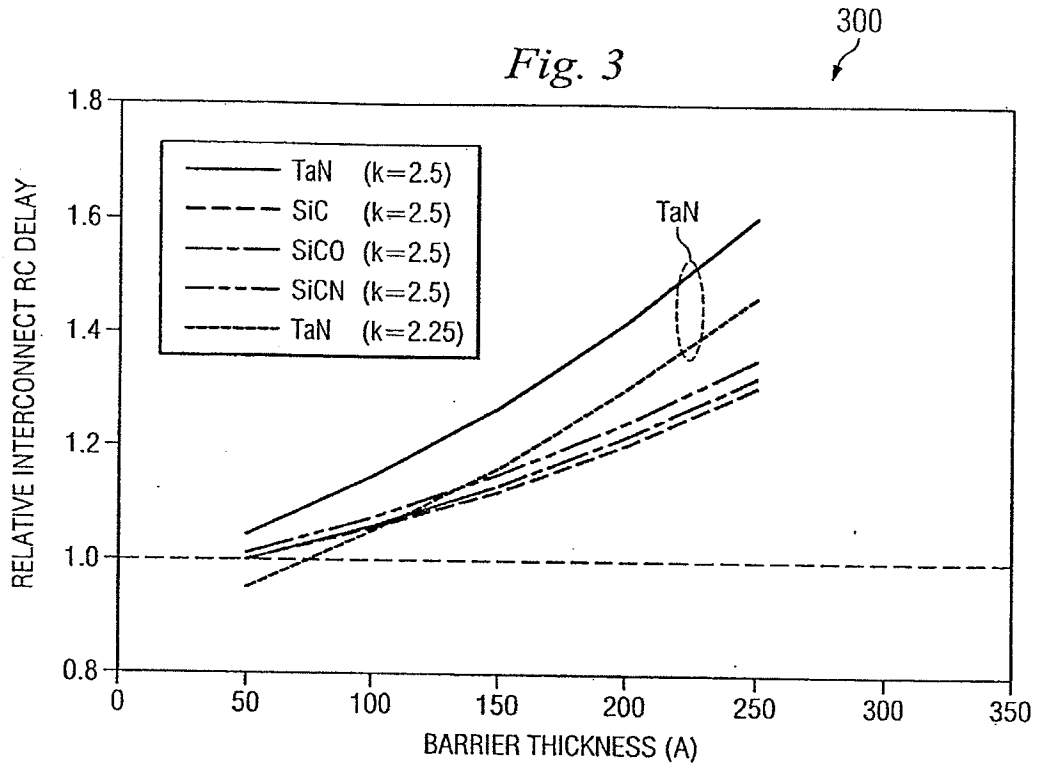

300
TaN (k=2.5)
SiC (k=2.5)
SiCO (k=2.5)
SiCN (k=2.5)
TaN (k=2.25)
TaN
RELATIVE INTERCONNECT RC DELAY
1.8
1.6
1.4
1.2
1.0
0.8
0
50
100
150
200
250
300
350
BARRIER THICKNESS (A)

Fig. 4

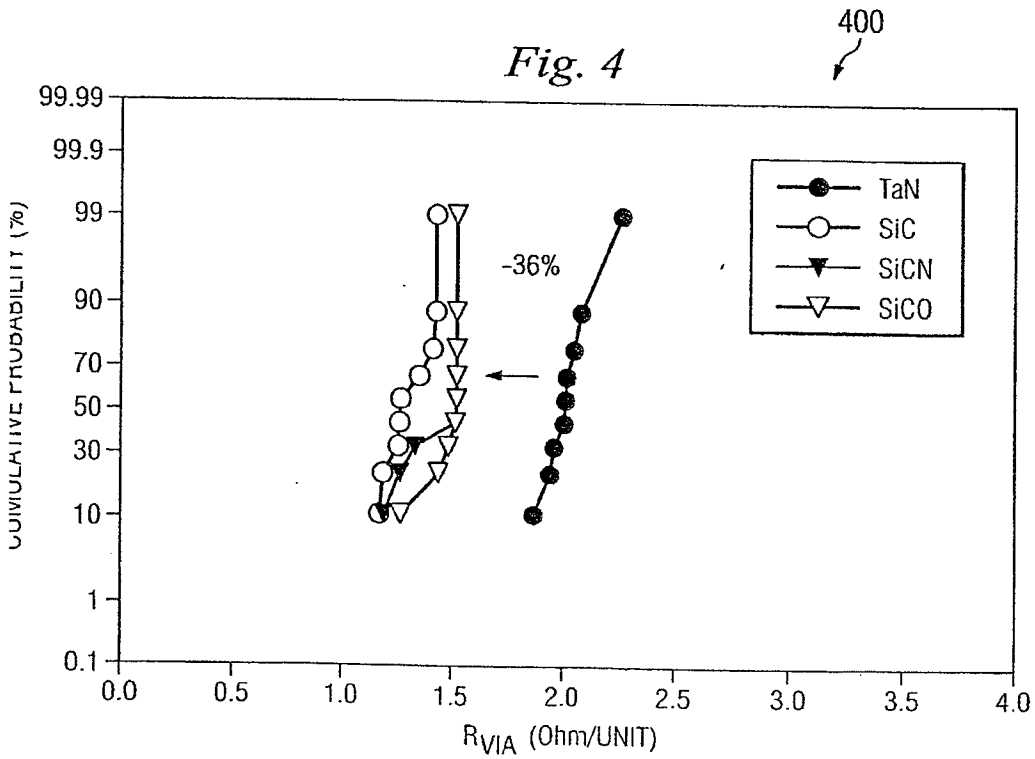

400
TaN
SiC
SiCN
SiCO
-36%
99.99
99.9
99
90
70
50
30
10
1
0.1
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
R_{VIA} (Ohm/UNIT)

FIG. 5

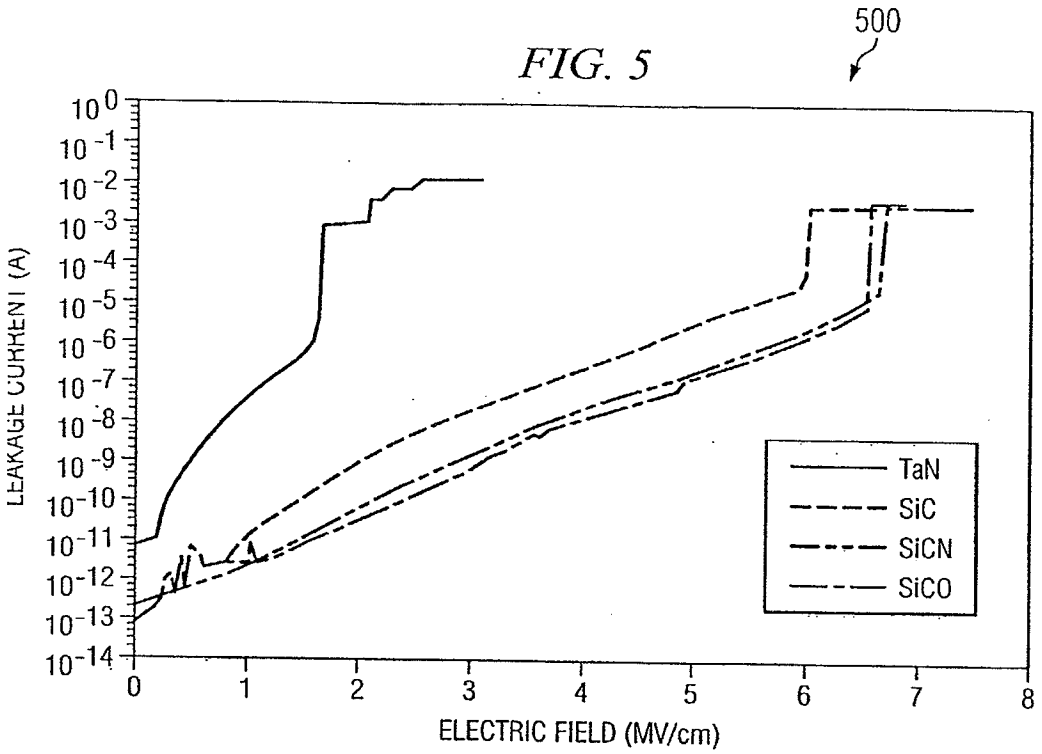
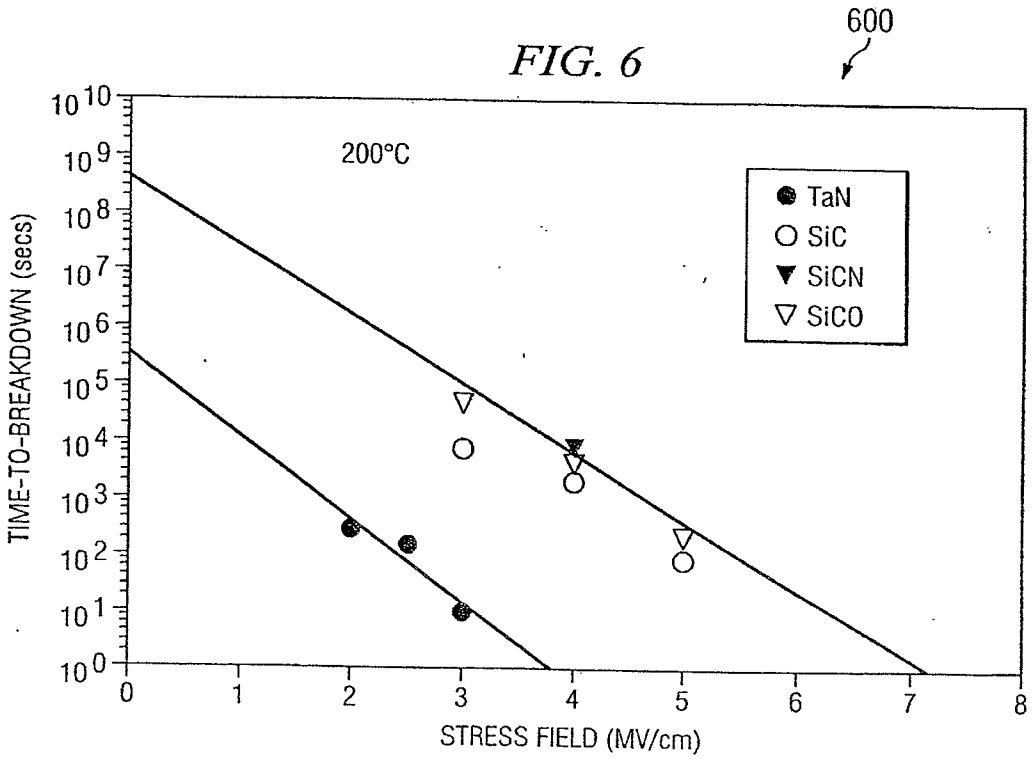

500
LEAKAGE CURRENT (A)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
10^{-11}
10^{-12}
10^{-13}
10^{-14}
0 1 2 3 4 5 6 7 8
ELECTRIC FIELD (MV/cm)
TaN
SiC
SiCN
SiCO

FIG. 6


600
200°C
TIME-TO-BREAKDOWN (secs)
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
0 1 2 3 4 5 6 7 8
STRESS FIELD (MV/cm)
TaN
SiC
SiCN
SiCO