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(22) 2002 07 12

(71) 136-1

(72) 33-47

(74)

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(54)

M 가 (Electro Migration; EM 가) , EM
가 ; DUT
가 , DUT
가 , E

4

1 EM

2 EM DUT(Device Under Test)

3 2

4 EM

5 4 EM DUT

6 4 EM

- < >
- 21, 22 : (current force pad)
- 23, 24 : (voltage measure pad)
- RM1, RM2 RMn : (metal line resistance)
- JD1, JD2 JDn : (junction diode)

Test) (Electro Migration; EM) (test pattern) ,
(junction diode) (pad set) DUT(Device Under
EM ,
EM 가 (package level) (wafer level)
1 EM , Lloyd
Lloyd ng) , (short), (medium), (lo
4
2 EM DUT
13, 14)가 RM (11, 12)가 , (
(11, 12) 가 , (13, 14)
3 2
R₀ R 가 R DUT가
, DUT가 (fail) , (probe station) DUT (Manual bench probe station) DUT (stress) 가
, (metal line) (real operation condition) (hard) (current
forcing) , 30% 가가 , (failure cri
teria)
DUT (life time) DUT 50% , [1]

[1]

$$t_{50(OP)} = A \times J_{OP}^{-N} \times \exp\left(\frac{Ea}{kT}\right) = t_{50(ST)} \times \left(\frac{J_{OP}}{J_{ST}}\right) \times \exp\left[\frac{Ea}{k} \left(\frac{1}{T_{OP}} - \frac{1}{T_{ST}}\right)\right]$$

$$t_{0.1(OP)} = t_{50(OP)} \times \exp(-3.09\sigma)$$

1 DUT가 , 가 20 DUT가 , 1 DUT가 1
 가 , 가 1 DUT 가
 1 가 4 가 20
 1 5

가 DUT , DUT (junction diode) , / (forcing/sensing) 4

EM , EM
 가 ;
 가 DUT , 가
 DUT ,
 DUT 가

4 EM
 (21, 22) RM1, RM2, ..., RMn , (21, 22)
 (23, 24)가 JD1, JD2, ..., JDn가 ,

5 4 EM DUT
 I_T 가 DUT(RM) , DUT(RM)
 I_T RM JD ,
 , dir 1mA EM , 0.3 0.6V DUT 300 600 () , DUT 가
 , , JD가 , DUT , 가 0.7V 가

JD가 (failure criteria) EM

DUT, DUT가 DUT가 T1, ..., Tn-1, Tn 1/16

EM 가 가가 가

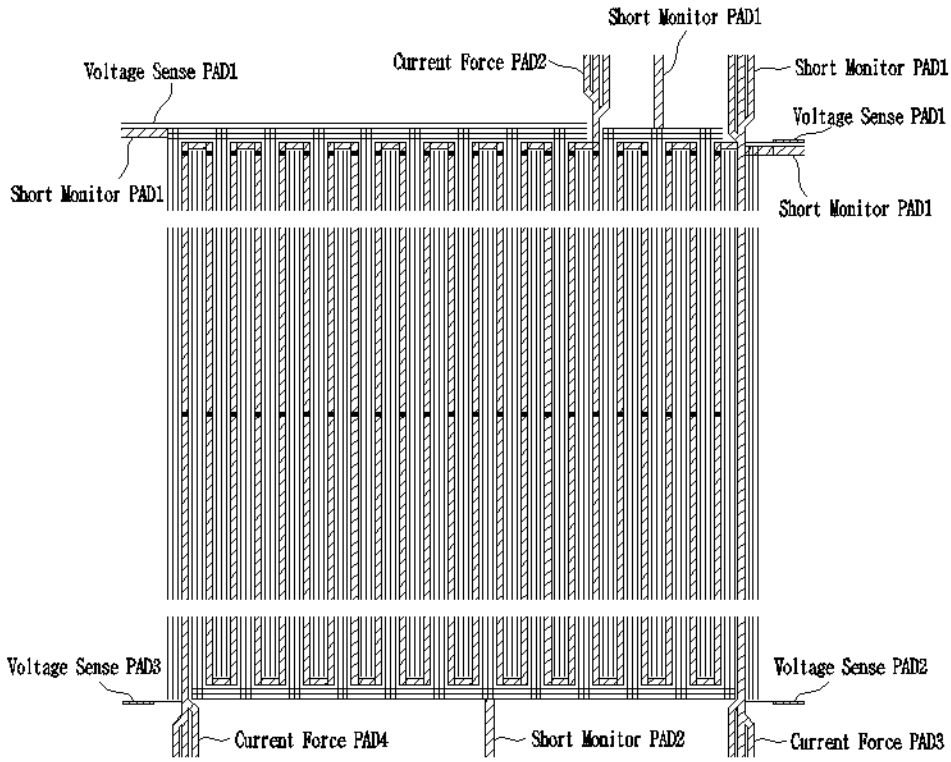
(57)

1. EM 가 ; 가 DUT EM 가 DUT EM

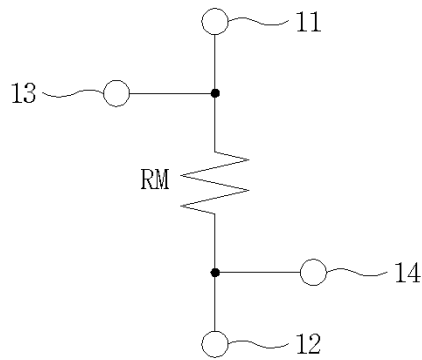
2. 1 DUT 300 600 EM

3. 1 0.7V EM

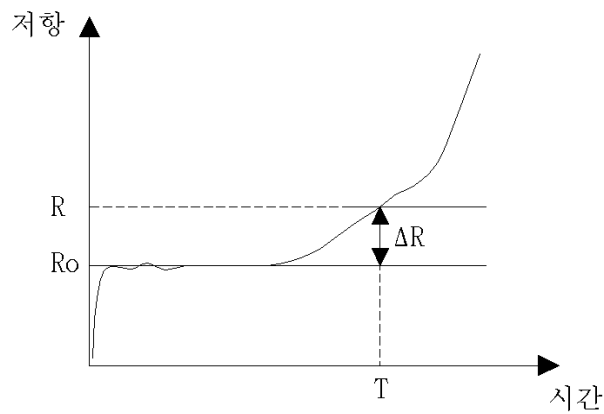
1



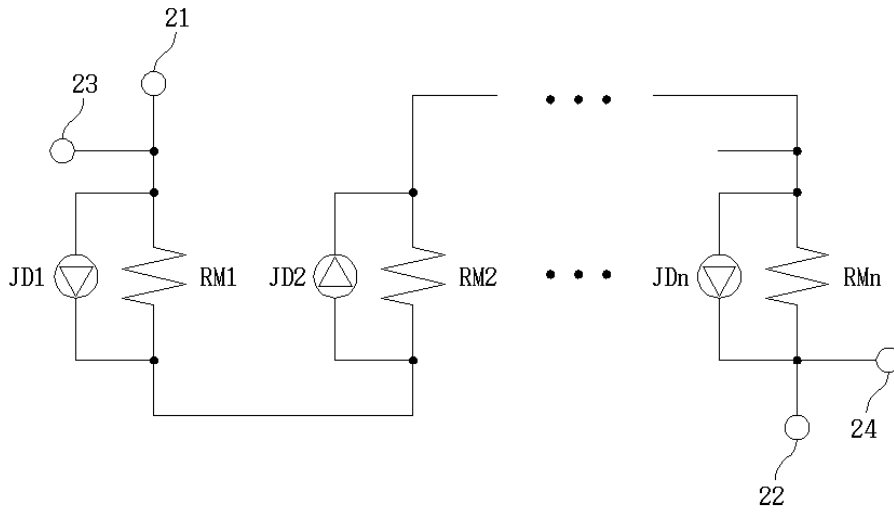
2



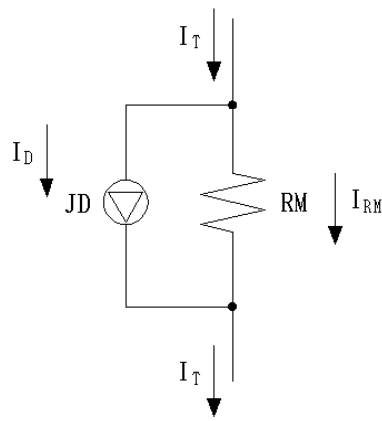
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4



5



6

