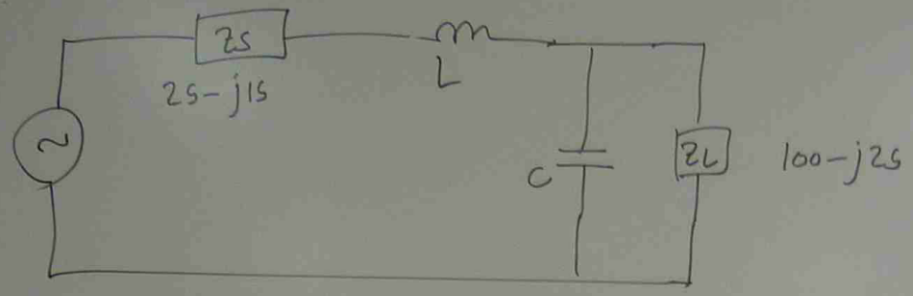
pb



FIND MATCHING INDUCTANCE AND CAPACITANCE FOR GIVEN TRANSMISSION LINE

BY USING SMITH CHART.

$f = 6 \times 10^7$ HZ
(60 MHZ)

$Z_s = 25 - j15$

$Z_0 = 50\Omega$

$$Z_s/_{Z_0} = \frac{25 - j15}{50} = 0.5 - j0.3$$

FOR MATCHING

$$Z_s^* = 0.5 + j0.3$$

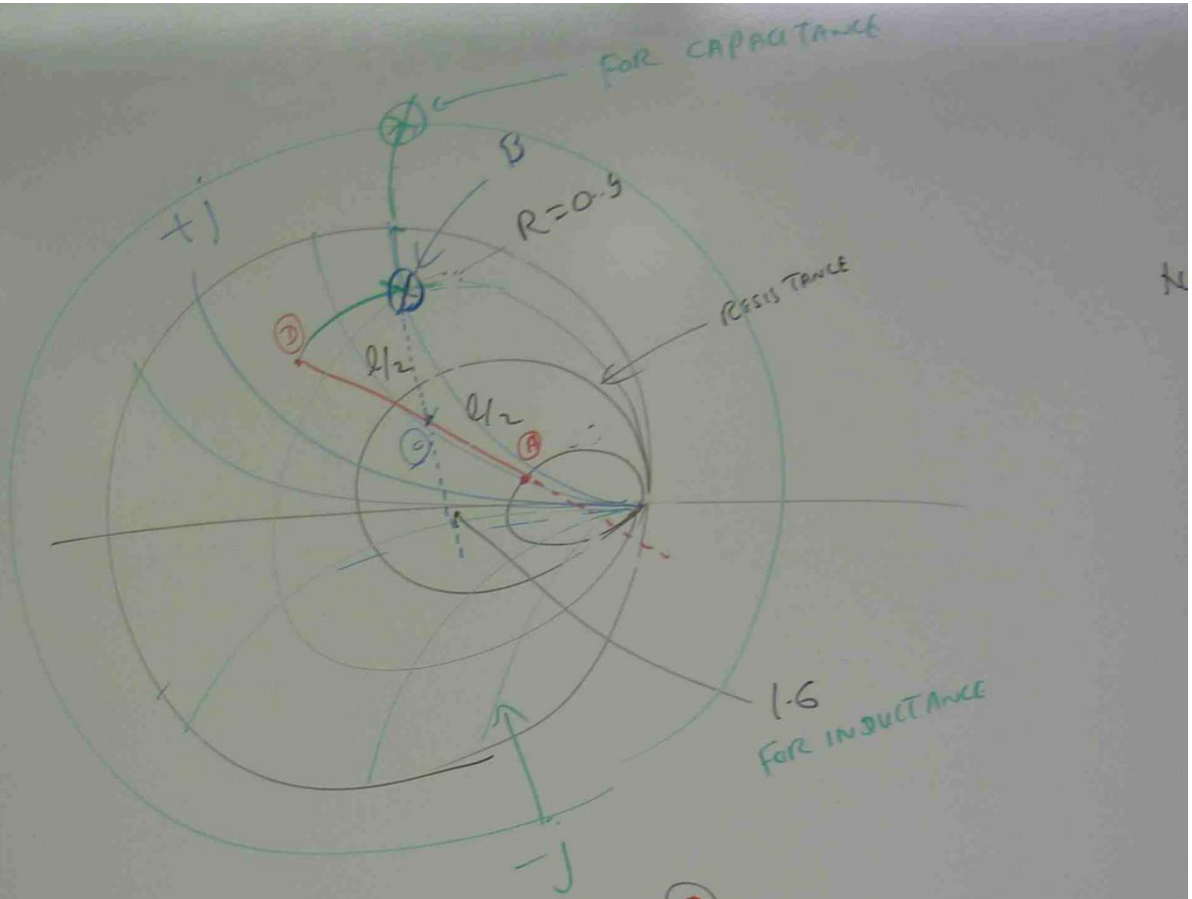
$Z_L = 100 - j25$

$$Z_L/_{Z_0} = \frac{100 - j25}{50}$$

$$= 2 - j0.5$$

MATCHING

$$Z_L^* = 2 + j0.5$$



LOCATE $0.5+j0.3$ for (D)

$2+j0.5$ for (A)

JOIN A & D

DRAW (D) (A) TO CROSS THE HORIZONTAL LINE

NOTE HORIZONTAL CUTTING POINT

VSWR = 1S

DIVIDE THE LINE (A D)

MARK THE MIDDLE POINT (C)

USE THE MIDDLE POINT AS CENTRE

RADIUS $\frac{\ell}{2}$ DRAW THE ARC UNTIL IT MEETS RESISTANCE 0.5 LINE

MARK THE MEETING POINT. (B)

JOIN (B) & (C), DRAW THE LINE B C UNTIL IT CUTS

THE HORIZONTAL LINE.

NOTE THE HORIZONTAL CUTTING POINT 1.6

$$L = \frac{\text{HORIZONTAL CUTTING POINT OF LINE BD} \times 20}{2\pi f} \quad (H)$$

$$= \frac{1.6 \times 50}{2 \times 3.1416 \times 6 \times 10^{7}} = 2.12 \times 10^{-7} \text{ H}$$

$$= 0.212 \ \mu\text{H}$$

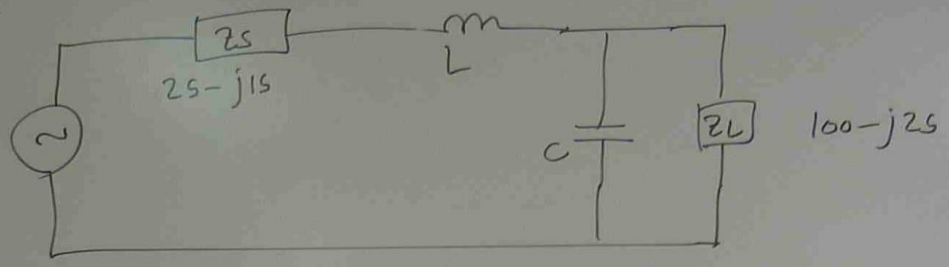
AT (B) POINT DRAW THE CURVES PARALLEL TO OTHER CURVES UNTIL IT MEETS THE FIRST INNER CIRCLE.

$$\text{CAPACITANCE} = \frac{\text{READING OF THE MEETING POINT ON FIRST INNER CIRCLE}}{20 \times 2\pi \times f} \quad (f)$$

$$= \frac{0.5}{50 \times 2 \times 3.1416 \times 6 \times 10^{7}}$$

=

pb



FIND MATCHING INDUCTANCE AND CAPACITANCE FOR GIVEN TRANSMISSION LINE BY USING SMITH CHART.

$f = 6 \times 10^7$ Hz (60 MHz)

$Z_s = 25 - j15$

$Z_0 = 50\,\Omega$

$$\frac{Z_s}{Z_0} = \frac{25 - j15}{50} = 0.5 - j0.3$$

FOR MATCHING

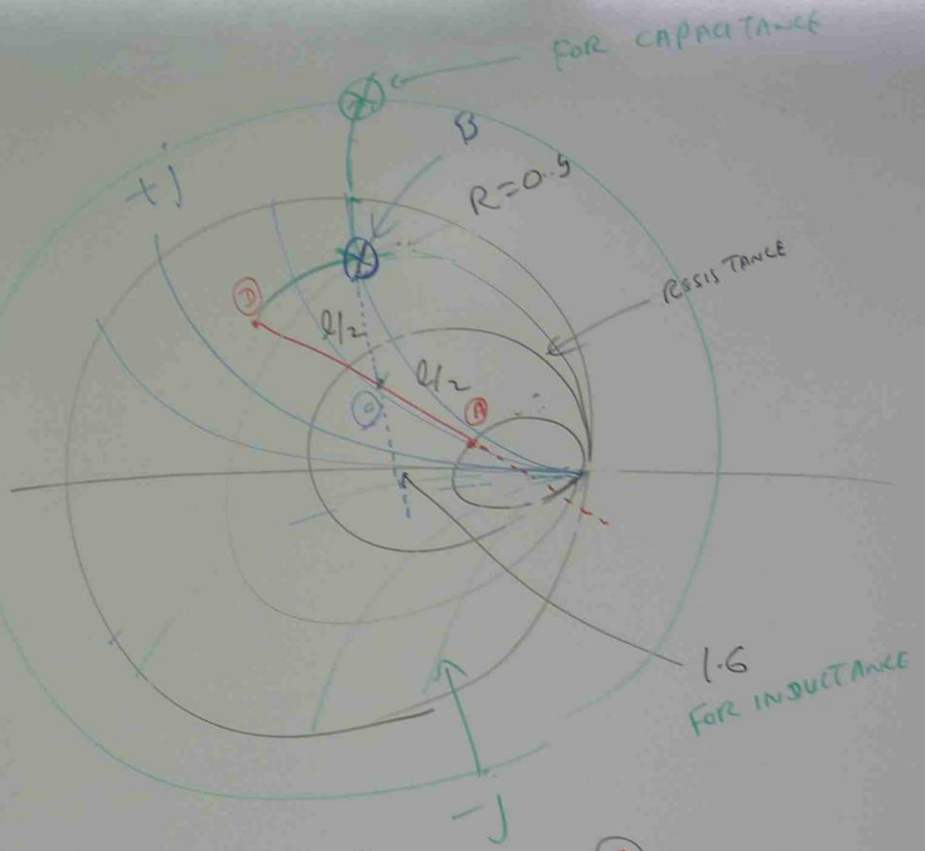
$$Z_s^* = 0.5 + j0.3$$

$Z_L = 100 - j25$

$$\frac{Z_L}{Z_0} = \frac{100 - j25}{50} = 2 - j0.5$$

FOR MATCHING

$$Z_L^* = 2 + j0.5$$



LOCATE 0.5+j0.3 FOR (D)

2+j0.5 FOR (A)

JOIN A & D

DRAW (D) (A) TO CROSS THE HORIZONTAL LINE

NOTE HORIZONTAL CUTTING POINT

VSWR = 1.5

DIVIDE THE LINE (A D)

MARK THE MIDDLE POINT (O)

USE THE MIDDLE POINT AS CENTRE

RADIUS $\frac{\ell}{2}$ DRAW THE ARC UNTIL IT MEETS RESISTANCE 0.5 LINE

MARK THE MEETING POINT. (B)

JOIN (B) & (C), DRAW THE LINE BC UNTIL IT CUTS

THE HORIZONTAL LINE.

NOTE THE HORIZONTAL CUTTING POINT 1.6

$$L = \frac{\text{HORIZONTAL CUTTING POINT OF LINE BD} \times 20}{2\pi f} \quad (H)$$

$$= \frac{1.6 \times 50}{2 \times 3.1416 \times 6 \times 10^{7}} = 2.12 \times 10^{-7} \text{ H}$$

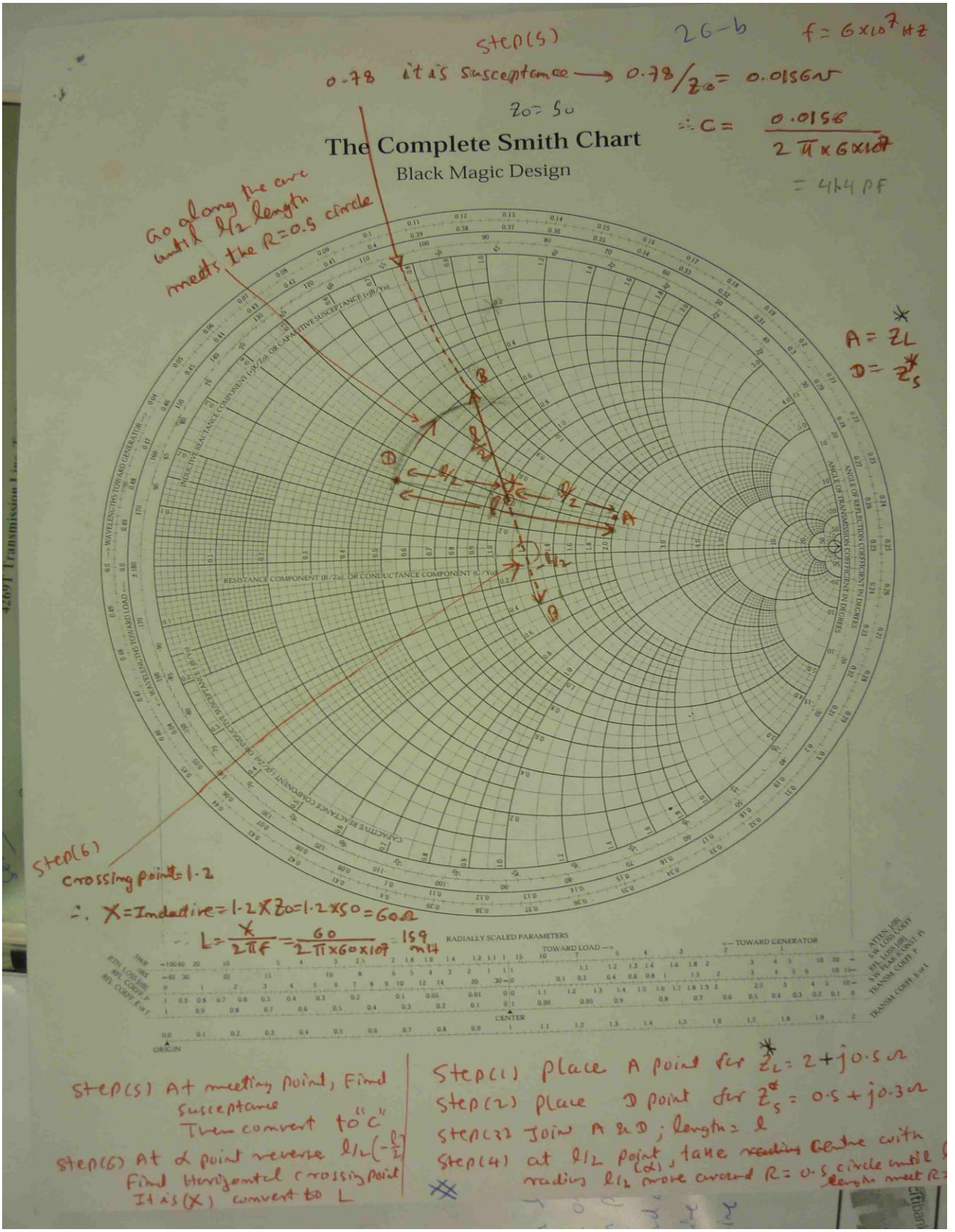
$$= 0.212 \ \mu\text{H}$$

AT (B) POINT DRAW THE CURVES PARALLEL TO OTHER CURVES UNTIL IT MEETS THE FIRST INNER CIRCLE.

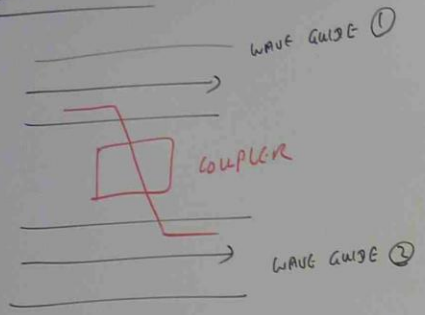
$$\text{CAPACITANCE} = \frac{\text{READING OF THE MEETING POINT ON FIRST INNER CIRCLE}}{20 \times 2\pi \times f} \quad (f)$$

$$= \frac{0.5}{50 \times 2 \times 3.1416 \times 6 \times 10^{7}}$$

=


Step(5)
2G-b
f = 6×10^7 Hz
0.78 it is susceptance → 0.78/Z0 = 0.0156℧
Z0 = 50
∴ C = 0.0156 / 2π×6×10^7
= 414 pF
The Complete Smith Chart
Black Magic Design
Go along the arc until λ/2 length meets the R=0.5 circle
A = ZL*
D = Zs*
Step(6)
crossing point = 1.2
∴ X = Inductive = 1.2×Z0 = 1.2×50 = 60Ω
L = X/2πf = 60/2π×60×10^7 = 159 nH
RADIALLY SCALED PARAMETERS
TOWARD LOAD →
← TOWARD GENERATOR
CENTER
ORIGIN
Step(5) At meeting point, Find susceptance Then convert to "C"
Step(6) At A point reverse λ/2 (-λ/2) Find Horizontal crossing point It is (X) convert to L
Step(1) Place A point for ZL* = 2+j0.5Ω
Step(2) Place D point for Zs* = 0.5+j0.3Ω
Step(3) Join A & D; length = l
Step(4) at λ/2 point (A), take reading Centre with reading λ/2 more around R = 0.5 circle until l length meet R=

WAVE GUIDES

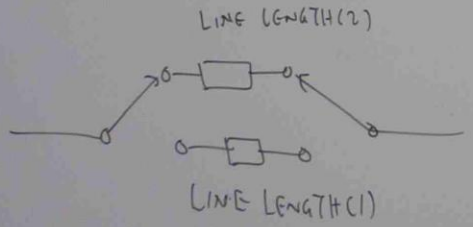


DIPLEXER

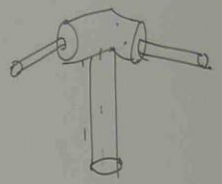
A DIPLEXER IS A PASSIVE DEVICE THAT IMPLEMENTS FREQUENCY DOMAIN MULTIPLEXING.

PHASE SHIFTER

PHASE SHIFTERS ARE DEVICES USED TO ADJUST TRANSMISSION PHASE IN A SYSTEM



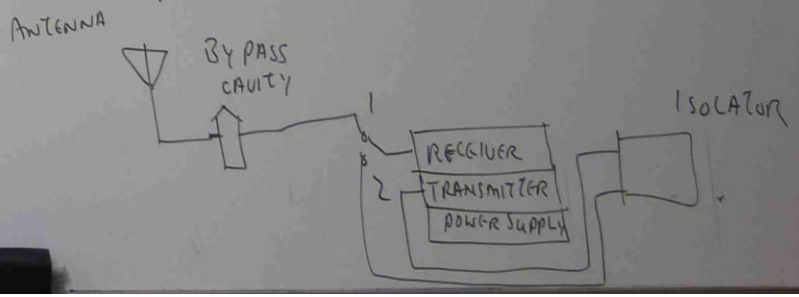
PHASE SPLITTER



PHASE SPLITTERS ARE LOW LOSS REACTIVE SPLITTERS FOR DISTRIBUTION OF RF SIGNALS TO RADIO ANTENNAS

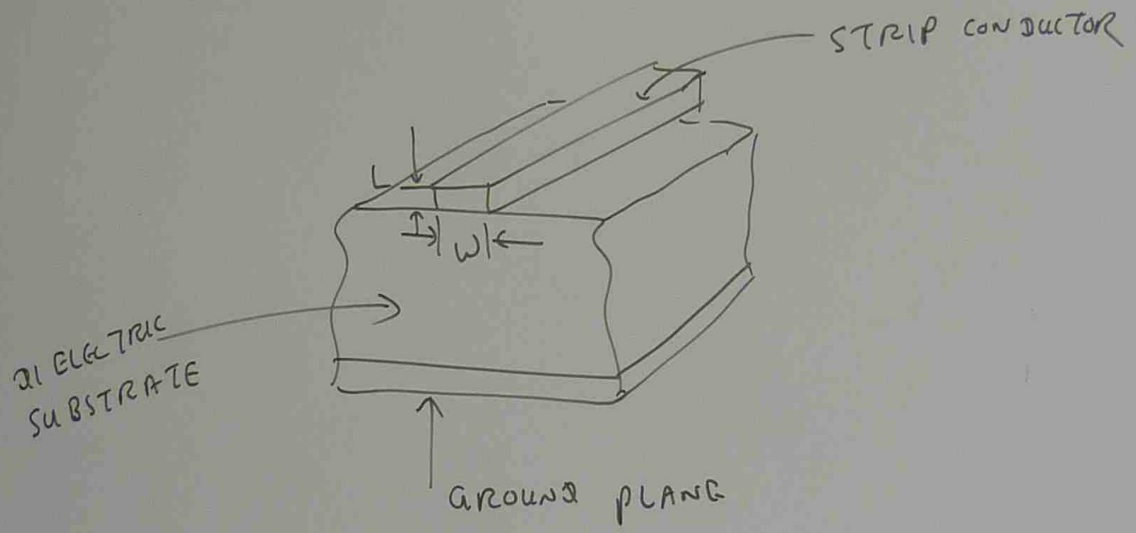
CIRCULATORS

CIRCULATOR IS A PASSIVE ELECTRONIC COMPONENT WITH 3 (OR) MORE PORTS IN WHICH THE PORTS CAN BE ACCESSED IN SUCH A WAY THAT WHEN A SIGNAL IS FED INTO ANY PORT IT IS TRANSFERRED TO NEXT PORT ONLY



MICRO STRIP TRANSMISSION LINE

MICRO STRIP TRANSMISSION LINE IS A KIND OF HIGH GRADED PRINTED CIRCUIT CONSTRUCTION CONSISTING OF A TRACK OF COPPER OR OTHER CONDUCTOR ON AN INSULATING SUBSTRATE.



SUBSTRATE MATERIAL

IMPORTANT QUALITIES OF DIELECTRIC SUBSTRATE INCLUDES

- MICROWAVE DIELECTRIC CONSTANT
- THE FREQUENCY DEPENDENCY
- SURFACE FINISH AND FLATNESS
- DI ELECTRIC LOSS TANGENT
- THE COST
- THERMAL EXPANSION AND CONDUCTIVITY
- DIMENSIONAL STABILITY WITH TIME
- SURFACE ADHESION PROPERTIES
- POROSITY

COMMON SUBSTRATE MATERIALS

PLASTIC - CHEAP, GOOD SURFACE ADHESION
POOR MICROWAVE PROPERTIES
LOW THERMAL CONDUCTIVITY

CERAMICS - RIGID, HARD, DIFFICULT TO SHAPE
CUT AND DRILL

SINGLE CRYSTAL

DIELECTRIC CONSTANT 9.4 TO 11.6

SURFACE ROUGHNESS $\frac{1}{100}$ MICRON

SINGLE CRYSTAL GALLIAN

- DIELECTRIC CONSTANT = 13

LOSS TANGENT $\frac{6}{10000}$

THERMAL CONDUCTIVITY 0.3 WATT/sqcm/Deg.

KINDS OF MICROSTRIP LINES

SINGLE STRIP LINE

DUAL STRIP LINE