

# De-embedding Using MMICAD

A special feature of MMICAD is that it can de-embed networks. This is done by defining the parasitic network as a one- or two-port and then connecting it to the appropriate node of the network to be de-embedded with an asterisk character ("\*") before the name, with the syntax:

```
*<NETWORK> n1 n2 (one port)
*<NETWORK> n1 n2 n3 (two port)
```

A practical example of this approach would be the de-embedding of package parasitics from a measured transistor. The package parasitics are believed to have the topology given in Figure 1. The measured transistor data would consist of these parasitics as chosen in Figure 2, with the block diagram of the two port connection necessary to achieve de-embedding given in Figure 3. The circuit file necessary to accomplish de-embedding is given in Figure 4.

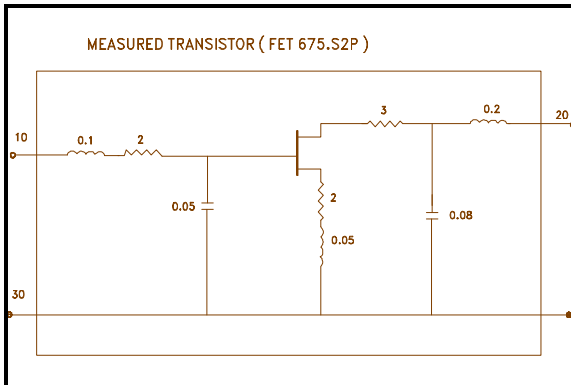


Figure 1 Measured Transistor FET675.S2P

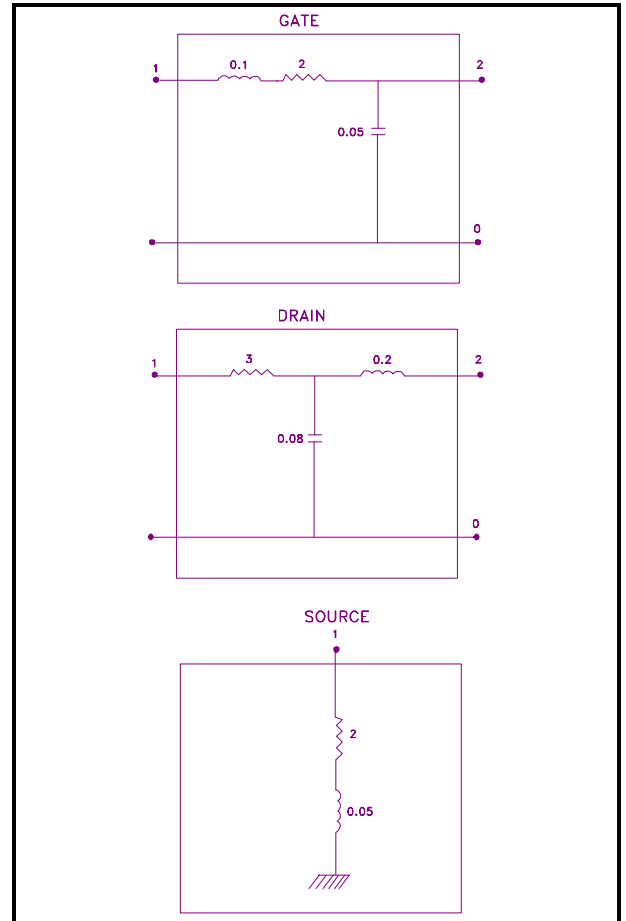


Figure 2 Gate (Top) Drain (Middle) Source (Bottom)

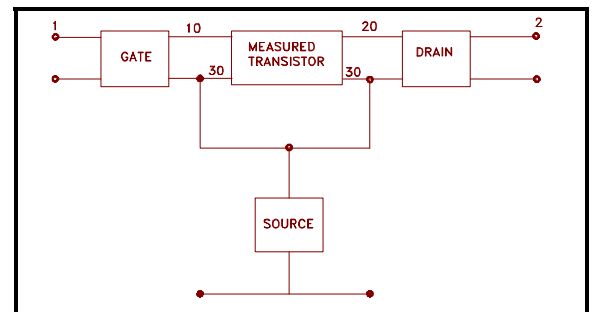


Figure 3 Block Diagram Illustrating Parasitics to be Removed

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!
!DEMO OF DE-EMBEDDING
!
FILES
\MMICAD\EXAMPLES\FET675.S2P FET 675
CKT
IND 1 3 L=0.1
RES 3 2 R=2
CAP 2 0 C=0.05
DEF2P 1 2 GATE
RES 1 3 R=3
CAP 3 0 C=0.08
L 3 2 L=0.2
DEF2P 1 2 DRAIN
SRLC 1 2 R=2 L=0.05 C=1E20
DEF1P 1 SOURCE
FET675 10 20 30
*GATE 1 10 30
*DRAIN 20 2 30
*SOURCE 30 0
DEF2P 1 2 DEEMB
!DEEMB CONTAINS THE DE-EMBEDDED S2P DATA

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**Figure 4** De-embedding of Package Parasitics

In the circuit file, the gate and drain parasitics are defined as two port networks and the source parasitics as a one port; they are then connected to the gate, drain and source of the measured transistor with asterisks before the network names. The resulting de-embedded transistor is defined as the network DEEMB using a DEF2P statement.

This technique allows for effective "de-embedding" of a topology from another circuit.