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IEEE 802.3 DTE Power via MDI Detection and Signature Protocol

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Detection and Signature Protocol Overview

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- At the Source:
  - PROBE (low voltage and high resistance) for power-request signature from DTE.
  - APPLY full voltage (low resistance) after signature is detected.
  - REMOVE voltage when current becomes too high or too low.
- At the Load:
  - PRESENT power-request signature (high-resistance) while in off condition.
  - ACCEPT power at load resistance when full voltage is offered.
  - MAINTAIN appropriate current

The Probe will reject:

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- Open circuit
- Short circuit
- Bob Smith termination
- Another probe or source (opposite polarity)
- Another probe or source (same polarity)
- Appliances with an input impedance low enough to have a damaging amount of power applied

Protocol at DTE

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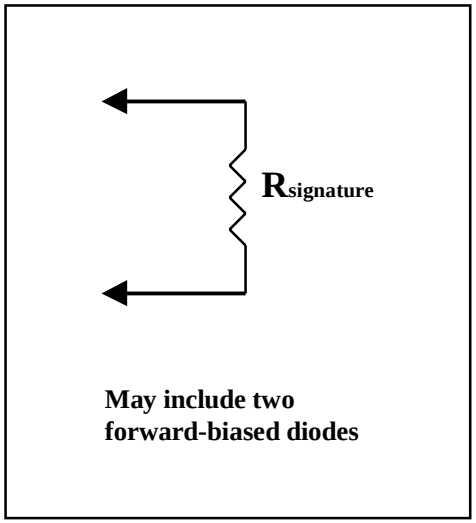
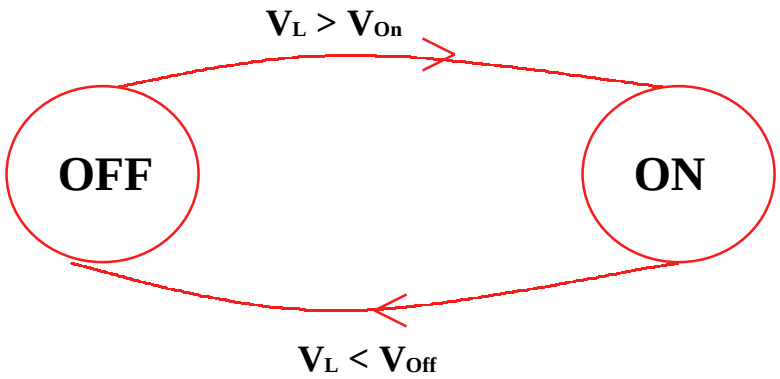
- Present Signature to Loop in OFF State
- Polarity Insensitivity (recommended)
- Provide Galvanic Isolation to Ground
- In ON State:
  - Limit I inrush < I max
  - Maintain I min < I < Imax

Thevenin Equivalent (OFF State)



Suggested Values

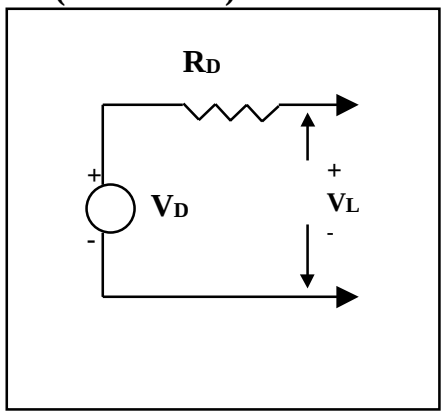
V_{On} = Turn On Voltage = 35Vdc
V_{Off} = Turn Off Voltage = 30Vdc
V_L = Voltage across load
$R_{signature}$ = 25K ohms +/-2%



Protocol at Source

- **Pass when $V_S < V_L < V_O$ (I.e., within signature voltage characteristic)**
- **Reject when**
  - $V_L < V_S$: Short, Bob Smith, another Probe or foreign voltage (aiding).
  - $V_L > V_O$: Open, another Probe or foreign voltage (opposing).
- **Turn OFF when $I > I_{max}$ or $I < I_{min}$.**

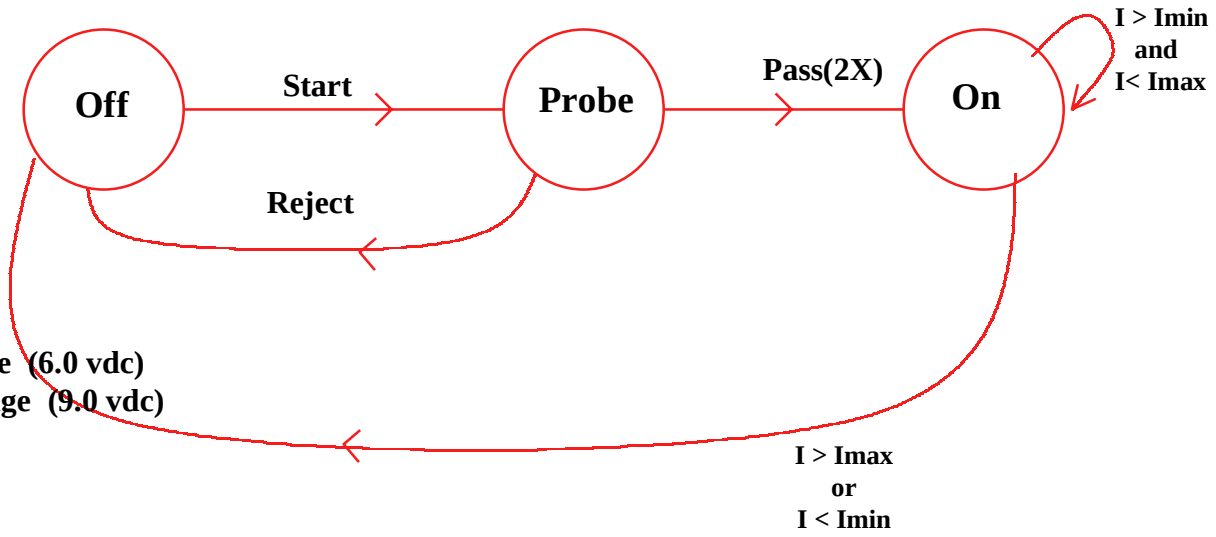
Thevenin Equivalent (Probe State)



Suggested Values

I_{max} = 450ma +/-50mA
I_{min} = 1-10ma
V_D = 24.5Vdc +/-3.5V
R_D =75K ohms+/-2%

V_L = Voltage across load
V_S = Lowest signature voltage (6.0 vdc)
V_O = Highest signature voltage (9.0 vdc)



Schematic Connections

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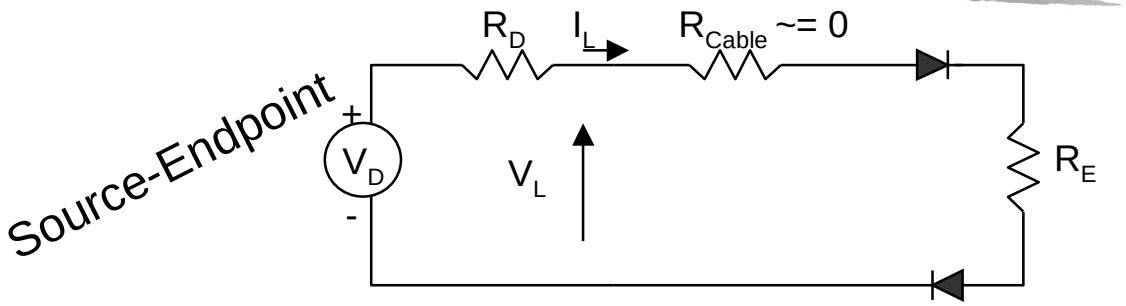
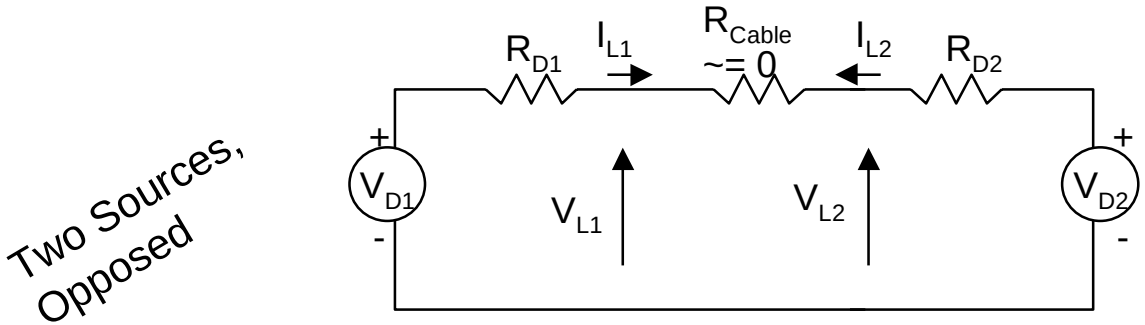
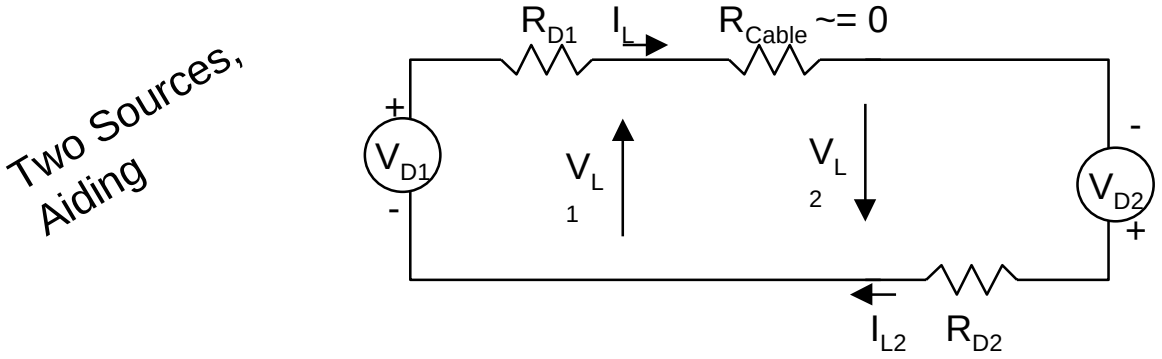




V_{L1} ~=V_{L2}

I_{L1} = - I_{L2}

For un-powered state , VD2 = 0



V_{L1} ~= -V_{L2}

I_{L1} = I_{L2}

For un-powered state , VD2 = 0

Signature Margins

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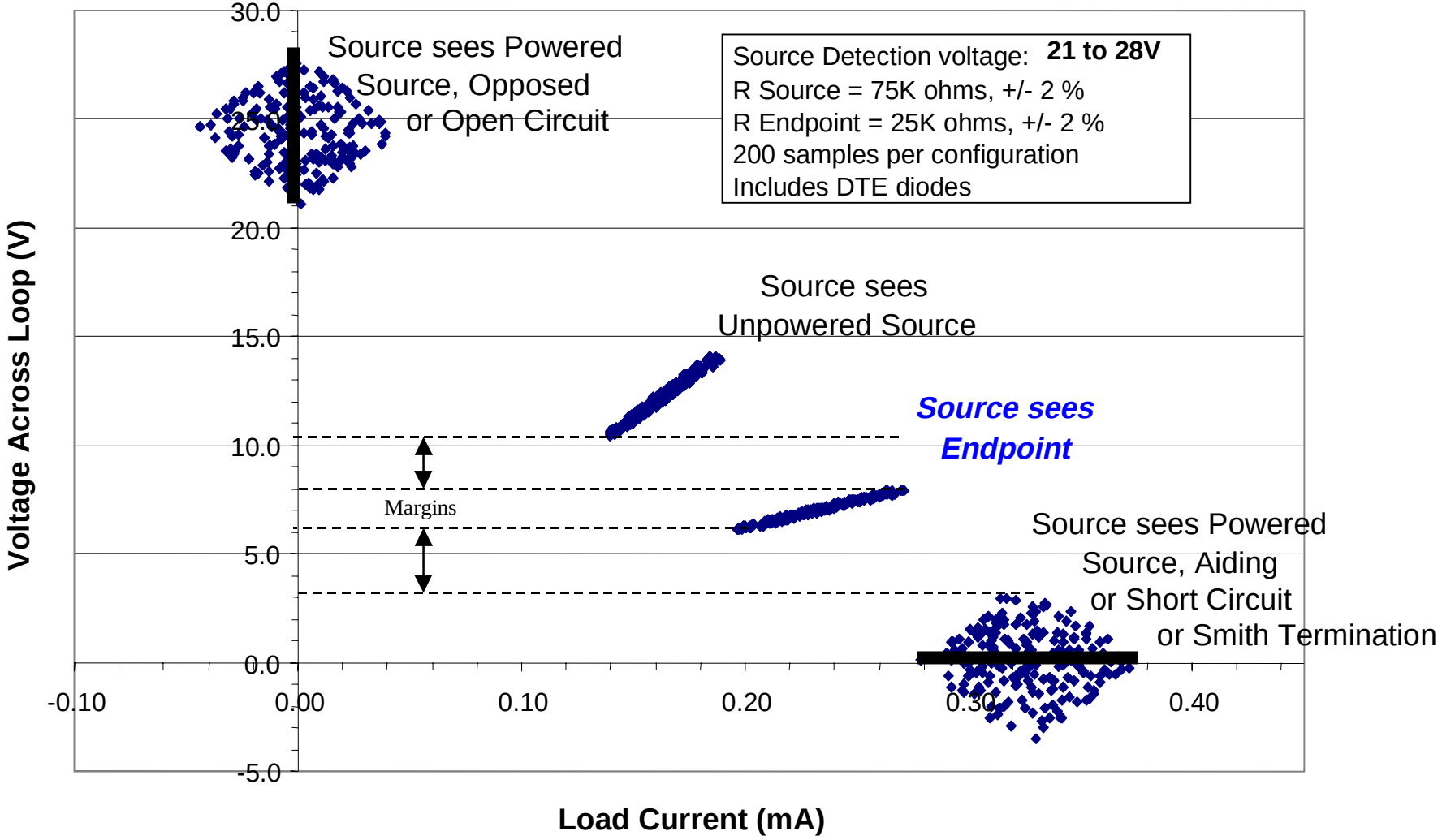

Conformance Test

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DTE Conformance Test:

- Verify Rout=25K+/-2% for $10V<V_L<30V$
- Verify $10mA<I_{ON}<350mA$ for $35V<V_L<54V$
- Verify Inrush < I_{MAX}
- Verify Emission < FCC

Source Conformance Test:

- Verify for a test load $0<R_{LOAD}<24K$, $I_{out}<1mA$, $V_L<30V$ and for $26K<R_{LOAD}<$Infinity ,$V_L<30V$
- Verify 48V+/-6V link maintained for $10mA<I_{OUT}<400mA$ after a 25K resistor signature is presented.