DAT-31575A/3175A/15575A Series Evaluation Boards Operation to V_{DD}=5.2V

1. Background:

Mini-Circuits DAT series of 75 ohm Digital Step Attenuators support a wide variety of configurations including attenuation range, step size and operating power supply voltages. Table 1 shows the models, their operating Voltages and associated Evaluation Boards

Table 1 DAT Series Models, their Operating Voltages and associated Evaluation Boards

31.5 dB Models	31dB Models	15.5 dB Models	V_{DD}(V) Spec	V_{SS}(V) Spec	Evaluation Board P/N
DAT-31575-SP+	DAT-3175-SP+	DAT-15575-SP+	+ 2.7 to +3.3	N/A	TB-344
DAT-31575-SN+	DAT-3175-SN+	DAT-15575-SN+	+ 2.7 to +3.3	-2.7 to -3.3V	TB-343
DAT-31575-PP+	DAT-3175-PP+	DAT-15575-PP+	+ 2.7 to +3.3	N/A	TB-337
DAT-31575-PN+	DAT-3175-PN+	DAT-15575-PN+	+ 2.7 to +3.3	-2.7 to -3.3V	TB-341

Mini-Circuits is updating the above models with a new series of DAT Attenuators (Table 2). These models ("A" Suffix) are form-fit functional equivalents. The specified operating supply voltage ranges are nearly identical.

Table 2 Updated DAT Models ("A" Series) , their Operating Voltages and associated Evaluation Boards

31.5 dB Models	31dB Models	15.5 dB Models	V_{DD}(V) Spec	V_{SS}(V) Spec	Evaluation Board P/N
DAT-31575A-SP+	DAT-3175A-SP+	DAT-15575A-SP+	+ 2.3 to +3.6	N/A	TB-344
DAT-31575A-SN+	DAT-3175A-SN+	DAT-15575A-SN+	+ 2.7 to +3.6	-3.2 to -3.6V	TB-343
DAT-31575A-PP+	DAT-3175A-PP+	DAT-15575A-PP+	+ 2.3 to +3.6	N/A	TB-337
DAT-31575A-PN+	DAT-3175A-PN+	DAT-15575A-PN+	+ 2.7 to +3.6	-3.2 to -3.6V	TB-341

The "A" series models are released to the market using the existing Evaluation Boards which are designed to operate over the specified V_{DD} of up to 3.6V.

HOWEVER: The "A" series is capable of operation over a wider voltage range of V_{DD}, as high as +5.2V.

This Application Note describes the application circuit and provides detailed instructions to configure the existing Evaluation Boards, as shown below, to operate over the extended voltage range (up to +5.2V).

NOTE: Mini-Circuits uses Schmitt Triggers on the Evaluation Boards in order to ensure proper control signals level to the DUT and to filter external noise. For example if a user uses the PC LPT to control the DATs (provides 5 volts level), we need to ensure that the levels will not exceed 3.6 volts max and this is done with the Schmitt Trigger:

a) N19 on TB-343 & TB-344
b) N3, N4 & N23 on TB-337 & TB-341.

Mini-Circuits will be releasing updated Evaluation Boards which will operate over the entire voltage range, up to 5.2V. These Evaluation Boards will be available from December 2016.

2. TB-344 Evaluation Board Modification to operate with V_{DD} from 3.6V to +5.2V (Models: DAT-31575A-SP+, DAT-3175A-SP+, DAT-15575A-SP+)

Modifications:

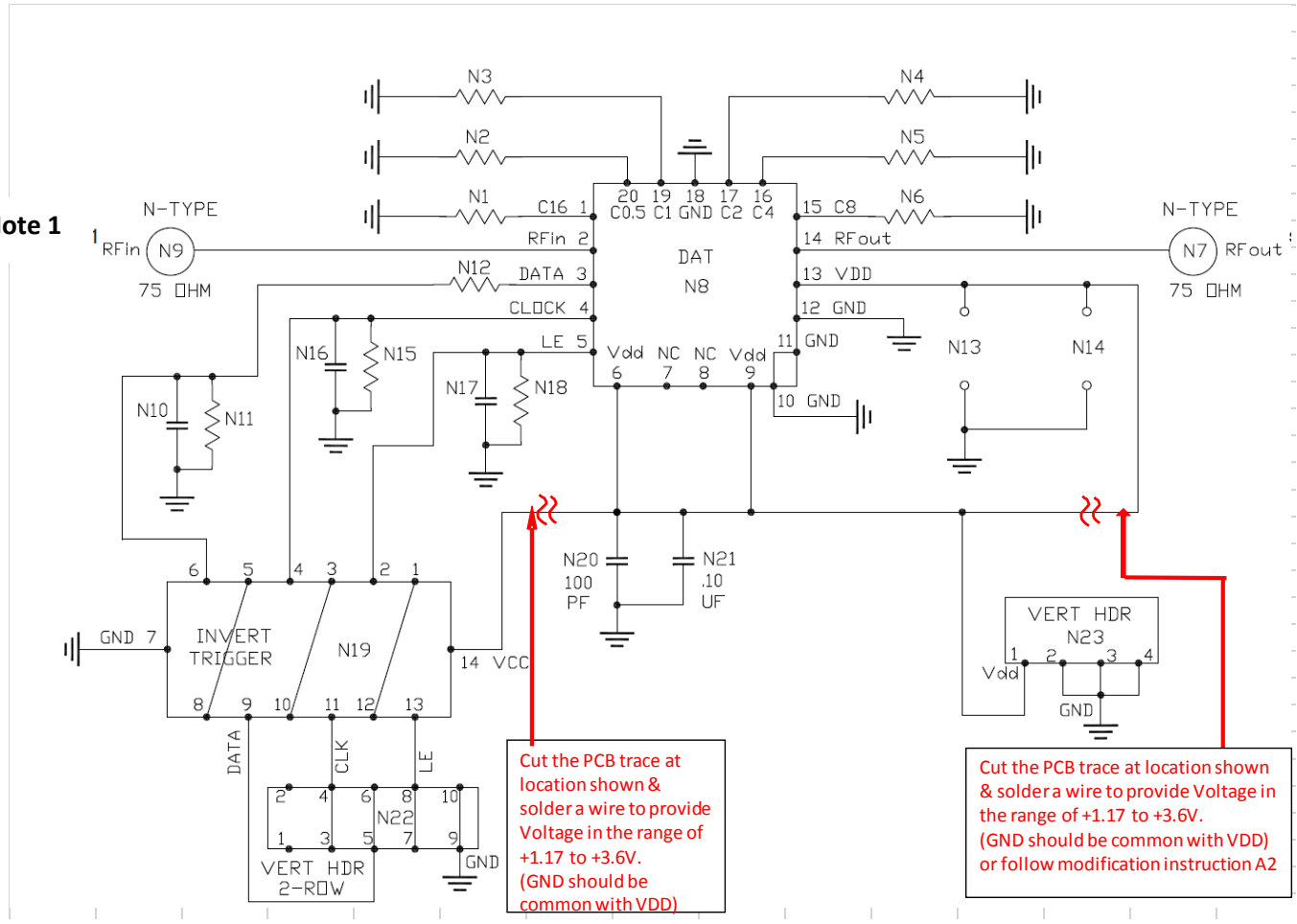
A) Limit DC voltage on Pin 13 of DUT (N15) to +3.6V max as follows:

A1) Cut PCB trace going to Pin 13 as shown below & apply a separate DC voltage in the range of +1.17 to +3.6V or

A2) Place a resistive voltage divider from Pin 1 of N2 to Pin 13 of DUT to limit the voltage to +3.6V (eg: for Vdd=+5V use 178kΩ in series and 365kΩ in shunt)

B) Cut PCB trace going to Pin +14 of N7 & apply a separate DC Voltage to Pin 14 in the range of +1.17 to +3.6V

See Note 1



Note 1: Both RF ports must be held at 0V DC or DC blocked with external series capacitors.

3. TB-343 Evaluation Board Modification to operate with VDD from 3.6V to +5.2V (Models: DAT-31575A-SN+, DAT-3175A-SN+, DAT-15575A-SN+)

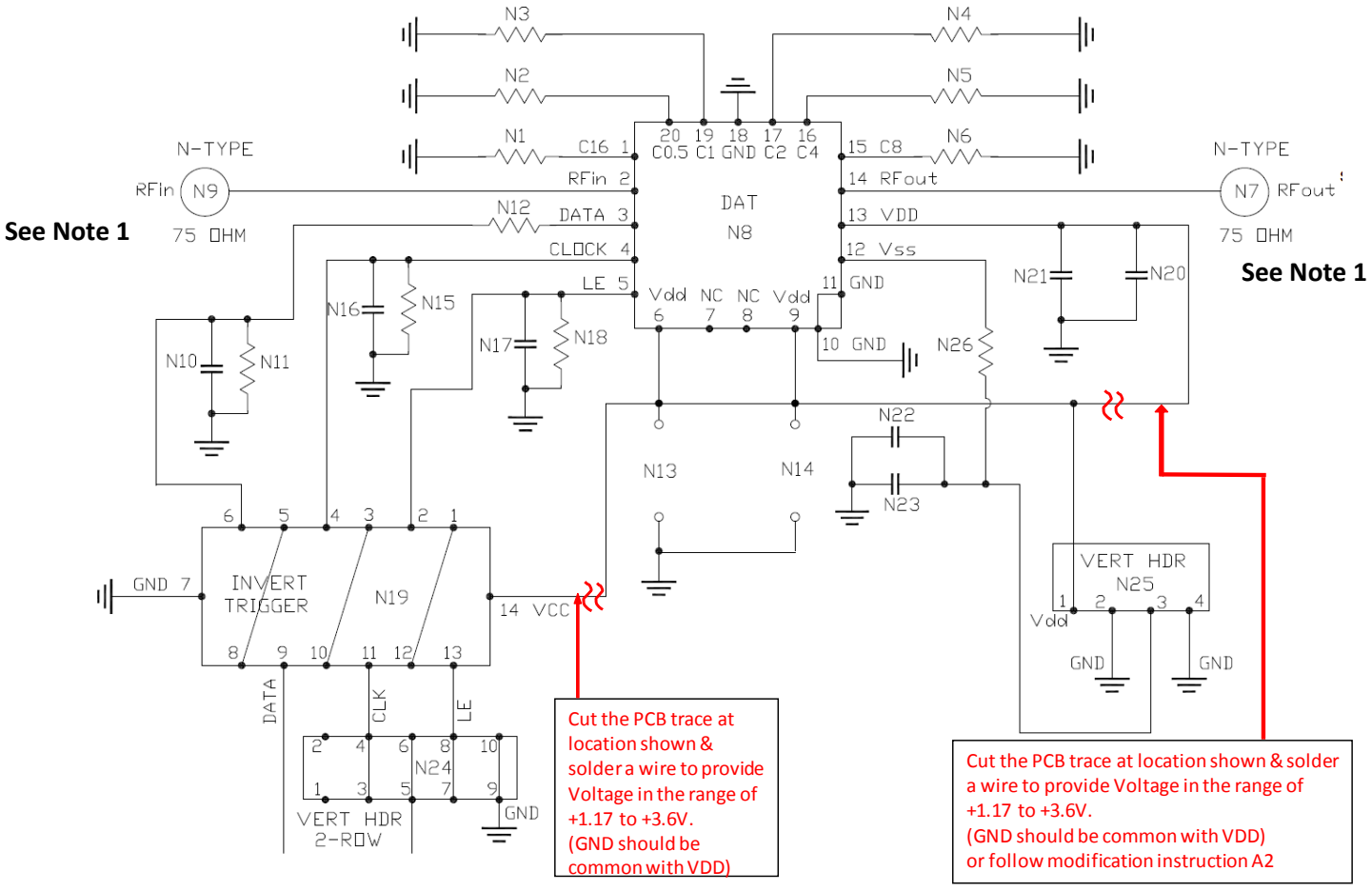
Modifications:

A) Limit DC voltage on Pin 13 of DAT(N8) to +3.6V max as follows:

A1) Cut PCB trace going to Pin 13 as shown below & apply a separate DC voltage in the range of +1.17 to +3.6V or

A2) Place a resistive voltage divider from Pin 1 of N25 to Pin 13 of DUT to limit the voltage to +3.6V (eg: for Vdd=+5V use 178kΩ in series and 365kΩ in shunt)

B) Cut PCB trace going to Pin 14 of N19 & apply a separate DC Voltage to Pin 14 in the range of +1.17 to +3.6V

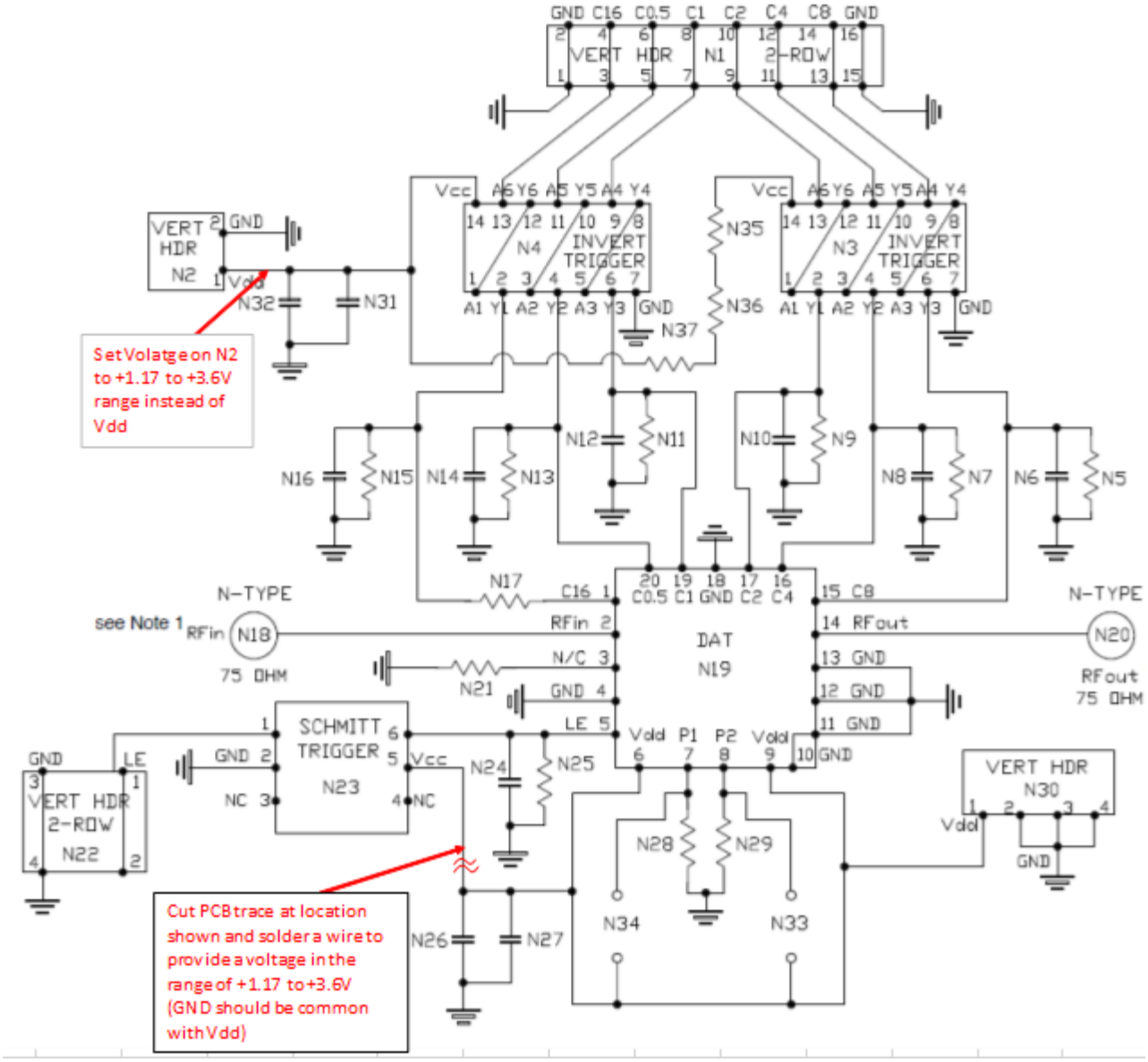


4. TB-337 Evaluation Board Modification to operate with VDD from 3.6V to +5.2V (Models: DAT-31575A-PP+, DAT-3175A-PP+, DAT-15575A-PP+)

Modifications:

A) Set DC voltage at pin 1 of connector N2, +1.17 to +3.6V max.

B) Cut PCB trace going to Pin 5 of N23 & apply a separate DC Voltage to Pin 5 in the range of +1.17 to +3.6V

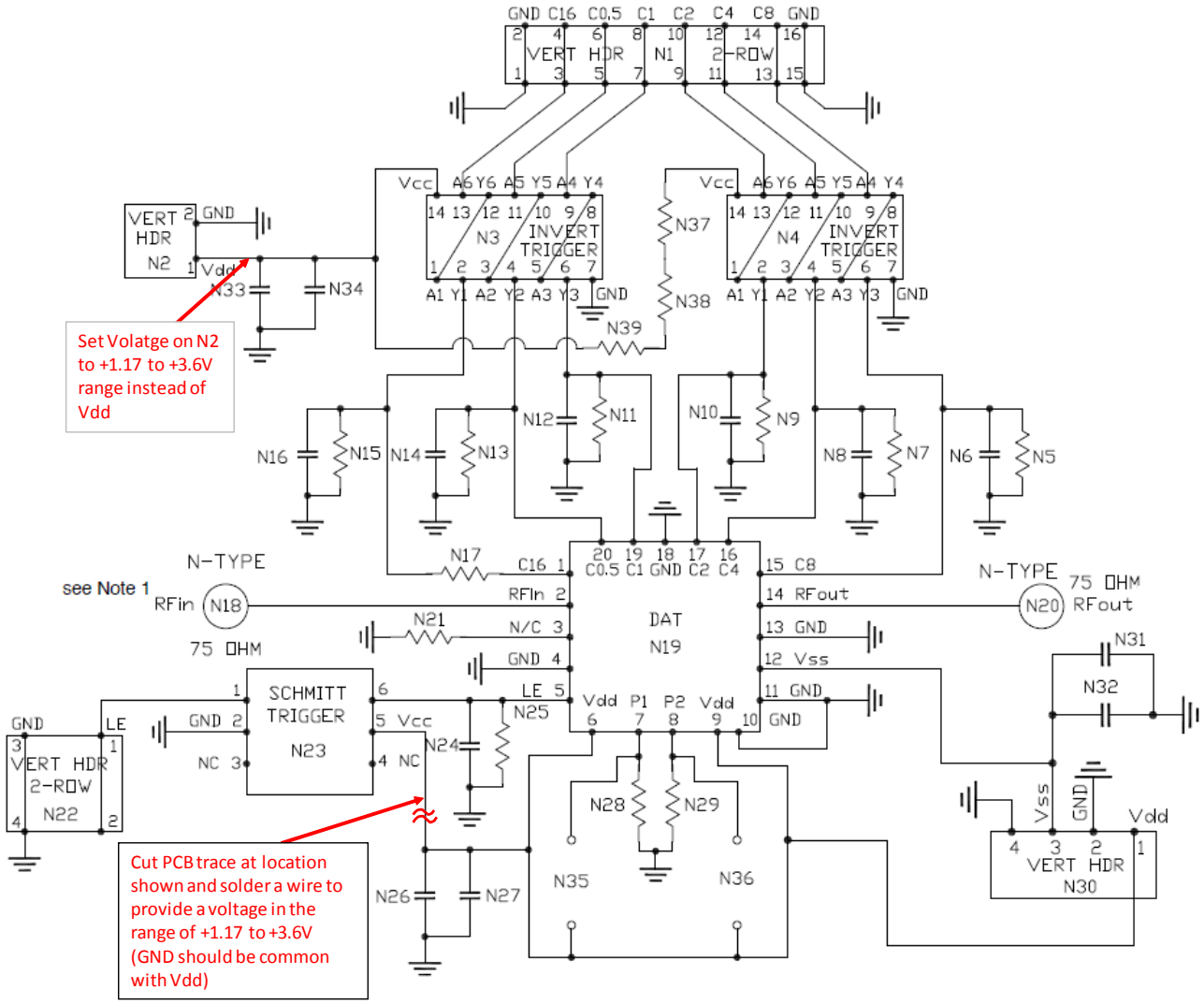


5. TB-341 Evaluation Board Modification to operate with VDD from 3.6V to +5.2V (Models: DAT-31575A-PN+, DAT-3175A-PN+, DAT-15575A-PN+)

Modifications:

A) Set DC voltage at pin 1 of connector N2, +1.17 to +3.6V max.

B) Cut PCB trace going to Pin 5 of N23 & apply a separate DC Voltage to Pin 5 in the range of +1.17 to +3.6V



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