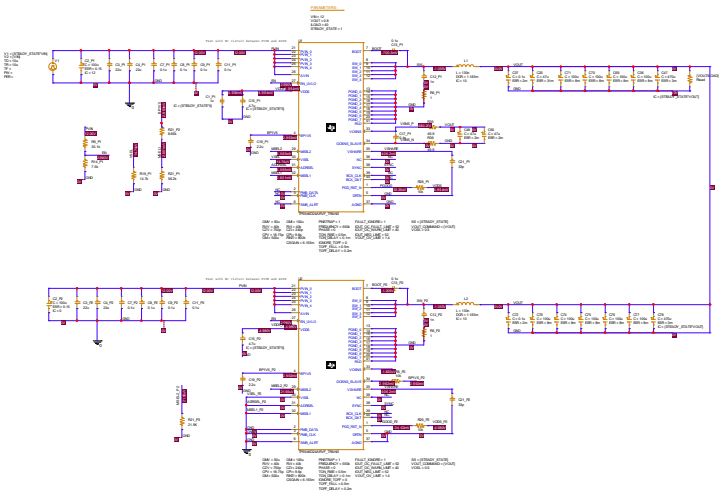
TPS546D24A TWO PHASE STEADY STATE SIMULATION



Application Notes:

1. The TPS546D24A model is encrypted and will only run in PSPICE Versions 16.6 and up.
2. The test bench has been configured to stack two TPS546D24A devices for VIN= 12V, VOUT= 0.8V, IOUT= 40A.
3. The MSEL2 pin selection is changed w.r.t to EVM schematic to reduce soft start time to 0.5ms from 3ms and keep maximum current limit.
4. In this model, use parameter SS=0 to run the Startup Simulation.
5. To run the simulation directly in steady state without going through startup in order to see steady state information like ripple, switching freq, load and line transients, set SS=1 and use appropriate initial conditions.
6. All transients can be applied after the output voltage reaches steady-state.
7. Model can be configured to operate in buck, inverting buck-boost configuration.
8. PINSTRAP = 1 enables the pin strapping feature and disables the parameters corresponding to them
   - The following parameters get disabled when PINSTRAP = 1.
     1. FREQUENCY
     2. VOUT_COMMAND
     3. PHASE
     4. TON_RISE
     5. IOUT_OC_FAULT_LIMIT.
   - PINSTRAP = 0 disables the pin strapping. Use the parameters to program the model.
9. The PMBUS interface has not been implemented in the model. However, the model has several parameters that are programmable via the PMBUS interface. The user must carefully enter these values in accordance with the datasheet. The description of these parameters are as below.
   Extract the Compensation values from the code obtained using Compensation calculator.
   - GMV sets the Transconductance gain of voltage error amplifier.
   - RVV sets the output resistance of voltage error amplifier.
   - CPV, CZV set the internal compensation capacitors of voltage error amplifier.
   - GMI sets the Transconductance gain of current error amplifier.
   - RVI sets the output resistance of current error amplifier.
   - CPI, CZI set the internal compensation capacitors of current error amplifier.
   - RINFO sets the internal resistance for current error amplifier.
   - VOUT_COMMAND sets the output voltage. Also change VOSL appropriately.
   - VOSL sets the VOUT_SCALE_LOOP value. This needs to be set appropriately to get the proper VOUT.
   - PHASE is used to shift the input obtained from SYNC. It is only applicable when SYNC is programmed as input.
   - IGNORE_TOFF. Setting this to 1 disables Soft stop time and TOFF_DELAY.
   - TON_RISE sets the soft start time. To use this, PINSTRAP must be set to 0.
   - TON_DELAY sets the internal delay from Enable High to device enable.
   - TOFF_FALL sets the soft stop time.
   - TOFF_DELAY sets the internal delay from device disable to VOUT disable.
   - Please check Figure 'TPS546D24 Startup and Shutdown' from the datasheet for the TON, TOFF parameters.
   - FAULT_IGNORE: Setting this to 1 disables all fault checks. Set 0 to check for faults.
   - IOUT_OC_FAULT_LIMIT sets the average current limit for across the inductor. It also sets the peak current limit.
   - IOUT_NEG_LIMIT programs the Negative OC Fault.
   - VOUT_OV_LIMIT, VOUT_UV_LIMIT set the overvoltage, undervoltage limits for the devices.
10. The operating quiescent current and shutdown current have not been modeled.
11. Thermal shutdown characteristics of the part have not been modeled.
12. The simulation runs for 0.2ms and takes approximately 11 minutes to run on a quad core 2.8GHz machine.