

# TPS546D24A PSPICE Model Features and Limitations

## Model Usage Notes:

### A. Features that have been modelled

1. Programmable Output Voltages
2. Compensation configuration using parameters
3. Switch current limits(Average positive and negative current limits).
4. Frequency, Soft start time, TON\_Delay, TOFF\_Delay, Soft stop time setting using parameters.
5. FREQUENCY\_SWITCH using MSEL1
6. IOUT\_OC\_FAULT\_LIMIT and TON\_RISE configuration using MSEL2
7. STACK\_CONFIG using MSEL2
8. SYNC\_CONFIG, INTERLEAVE using ADDRSEL

### B. Features have not been modelled

1. COMPENSATION\_CONFIG using MSEL1 pin selection
2. VOSL, VOUT\_MAX, VOUT\_MIN using VSEL pin selection
3. SLAVE\_ADDRESS using ADDRSEL pin selection
4. Operating Current, Shutdown Current and Temperature dependent characteristics are not modelled.

### C. Application Notes

1. In this model, use parameter STEADY\_STATE=0 to run the Startup Simulation.
2. 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 STEADY\_STATE=1 and use appropriate initial conditions. It is advised to keep parameter FAULT\_IGNORE=1.
3. PINSTRAP = 0 disables the pin strapping. Use the parameters to program the model in such case
4. 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. VOSL
    3. PHASE
    4. TON\_RISE
    5. IOUT\_OC\_FAULT\_LIMIT
    6. VOUT\_COMMAND
5. The PMBUS interface has not been implemented in the model. However, the model has several parameters that are used to mimic the behaviour of the PMBUS. 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
- RINTI 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 sets the overvoltage limit for the device