Power-Up and Power-Down Characteristics for Digital Potentiometers (DP)

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ABSTRACT: This design note discusses what happens when power (Vcc) is applied or removed from a digital potentiometers in an application circuit.

Turn-on and Power-on-Recall (POR): DP 7111-7114

Power-up means a bias supply voltage is applied to the DP's V_{CC} pin and it rises from 0V to a final value. The range of operating values for V_{CC} is 2.5V to 6V. During power-up, an internal power on recall (POR) circuit transfers the stored wiper setting from nonvolatile memory to the wiper control register. Some of the industry's electronic potentiometers are designed such that their power on recall (POR) function will only be initiated if the slope of the applied V_{CC} voltage is linear, continuous, and falls between a certain minimum and maximum value. The POR circuit for COPAL's potentiometers (DP7111-7114) will trip at a fixed voltage (1.2V maximum) and is not rate/slope dependent.

For a successful turn-on operation, V_{CC} MUST start below 100mV. When V_{CC} rises to 1.2V, a power on reset condition (1msec) is initiated in the DP during which time the contents of nonvolatile memory are transferred to the wiper control register.

The DP is fully functional and will meet all data sheet specifications when V_{CC} is at 2.5V AND 1msec has elapsed after V_{CC} reached 1.2V.

During power-up, V_W, V_L, $V_H < V_{CC}$.

Turn-off and Brown-out: DP 7111-7114

(a) If V_{CC} drops below its nominal value (2.5V-6V) but stays above 1.2V and then returns back to its nominal value, the device is fully functional and meets all specs. (b) If V_{CC} drops below its nominal value to a value between 0.1V and 1.2V, and then returns to its nominal value, the DP wiper will, more than likely, NOT return to its previous condition/state.
(c) To ensure a successful re-start or a new power-up case, V_{CC} MUST be driven below 100mV and then brought up again.

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