Randomized pulse width modulation (RPWM) is a technique used to spread the power spectrum over a wide frequency range; it aims to reduce the amplitudes of the power harmonics and consequently the conducted electromagnetic interferences (EMI). In this paper, a dual RPWM (DRPWM) scheme for the buck converter fed by a photovoltaic (PV) source, operating in discontinuous conduction mode (DCM) is proposed. It combines two simple schemes, random pulse position (RPPM) and random switching frequency modulation (RSFM). First, the modulating principle is presented and then, a general mathematical model of power spectral density (PSD) of the input current is derived and validated for the three schemes. The PSD analysis of the input current is carried out in order to show the advantage of the proposed scheme compared to the simple RPWM schemes. An application on a buck converter fed by photovoltaic source confirms that the proposed technique does not affect the solar PV buck converter performances, in the other side the randomization effect is confirmed and analyzed in steady-state characteristics of the buck converter, which is advantageous in reducing (EMI) in both input (PV source) and output (load).