ISL6413 Power Saving with PWM Supply for BBP/MAC

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ISL6413 Triple Output Regulator with Single Synchronous Buck and Dual LDO

The ISL6413 is a highly integrated triple output regulator which provides a single chip solution for wireless chipset power management. The device integrates a high efficiency synchronous buck regulator with two ultra low noise LDO regulators and a RESET. It accepts an input voltage range of 3.0V to 3.6V and provides three regulated output voltages: 1.8V (PWM), 2.84V (LDO1), and another ultra low noise 2.84V (LDO2). The PWM output maintains regulator down to 2.7V input voltage.

The PWM regulator is a current mode control synchronous buck regulator with integrated N- and P- channel power MOSFETs. It's output is pre-set to 1.8V for the BBP/MAC core supply. Synchronous rectification with internal MOSFETs achieves >92% efficiency. The operating frequency is typically 750kHz allowing the use of smaller inductor and capacitor values. The device can be synchronized to an external clock signal in the range of 500kHz to 1MHz. The PG_PWM output indicates any loss of regulation on the PWM output.

The ISL6413 also has two LDO regulators which use internal PMOS transistors as the pass devices. LDO2 features ultra low noise that typically does not exceed $30\mu V_{RMS}$ to aid VCO stability. The EN_LDO pin controls LDO1 and LDO2 outputs. The ISL6413 also integrates a RESET function, eliminating the need for an additional RESET IC usually required in WLAN applications. This function asserts a RESET signal whenever the VIN supply voltage drops below a preset threshold, keeping it asserted for at least 25ms after VIN has risen above the reset threshold. The PG_LDO output indicates loss of regulation on either of the two LDO outputs. Additional features include over current protection for all three outputs and thermal shutdown.

High integration, excellent efficiency and the thin, Quad Flat No-lead (QFN) package makes the ISL6413 an ideal choice to power many of today's small form factor industry standard wireless cards such as PCMCIA, mini-PCI and Cardbus-32.

Power Saving with PWM Supply for BBP/MAC

The ISL6413 offers significant power savings compared to a LDO based 1.8V BBP/MAC power supply. Figure 1 shows the efficiency comparison between PWM and LDO outputs for 1.8V supply.

For a typical 300mA current drawn from the 1.8V output by the BBP/MAC, the PWM efficiency will be close to 92% and the Input current drawn from the 3.3V supply will be:

$I_{IN(PWM)} = (1.8V \times 300mA)/(3.3V \times 0.92) = 178mA$

For the same 300mA output current drawn by BBP/MAC on LDO based 1.8V output supply, the LDO efficiency will be 54% and the input current drawn from the 3.3V supply will be 300mA.

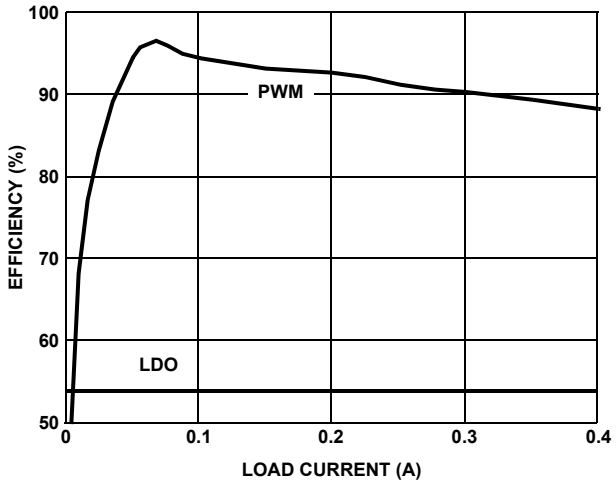

FIGURE 1. PWM AND LDO EFFICIENCY vs LOAD CURRENT

Hence, the ISL6413 reduces the supply current by about 120mA, saving 400mW of power compared to the LDO option for the 1.8V BBP/MAC power supply at a typical 300mA load. This power saving and efficiency improvement not only increases system battery life but also offers better thermal performance due to reduced on-chip power dissipation.

For high efficiency applications where battery life is critical, the ISL6413 is recommended, whereas the ISL6414 is recommended for low cost applications.