

Table 1. Bill of Materials for 2.5V/15A Application

Comp.	Description	Vendors
C1	1.0μF/25V ceramic cap, TMK316BJ105ML, 20mΩ max esr.	Taiyo Yuden
C2	4X330μF/25V aluminum caps, ZA series, 26mΩ max esr.	Rubycon
C3	4.7μF/10V ceramic cap, JMK212BJ475MG, 20mΩ esr max.	Taiyo Yuden
C4	0.47μF/10V ceramic capacitor, LMK107BJ474MA	Taiyo Yuden
C5	10μF/6.3V ceramic capacitor, JMK316BJ106ML, 20mΩ max esr.	Taiyo Yuden
C6	3X560μF, 4SP560M, 14mΩ max esr each capacitor.	Sanyo
C7	0.22μF/10V ceramic capacitor, LMK107BJ224MA	Taiyo Yuden
D1	30V/100mA Schottky diode, CMPSH-3	Central Semi.
L1	0.75μH/24A, CDEP149-OR7NC, (esr, 1.2mΩ max)	Sumida
Q1	IRF7822	IR
Q2	2XIRF7822	IR
Q3	2N7002K	Siliconix
R1	400k, 1%	
R2	5.1k, 5%	
R3	20k, 5%	
R4	15k, 0.1%	
R5	10k, 0.1%	
R6*	1.78k, 1%	

*See equation (2).

Set the Output Voltage

According to the schematic shown in Figure 1, the feedback reference voltage is set to 1.0V. The output voltage can be adjusted from 1.0V and up. The following equation determines the output voltage:

$$V_O = \left(1 + \frac{R_4}{R_5}\right) \cdot 1.0 \text{ V.} \quad (1)$$

Set the Switching Frequency

The switching frequency of the MAX1917/8 can be set to either 300kHz or 550kHz by leaving the FSEL pin floating or connecting it to ground. However, the switching frequency can be set anywhere between 300kHz to 1MHz by adding one resistor (R6). The actual switching frequency is given by,

$$f_s = \frac{V_O}{1.82} \cdot \frac{R_6}{R_2 + R_6} \cdot 10^3 \text{ kHz.} \quad (2)$$

For the above equation to be true, the FSEL pin should be grounded. The corresponding off time is given by,

$$T_{\text{off}} = \frac{1}{f_s} - \frac{1.82}{V_{\text{IN}}} \cdot \left(1 + \frac{R_2}{R_6}\right) \mu\text{s.} \quad (3)$$

The switching frequency is independent of the input voltage. However, the off time depends on the input

voltage. The MAX1917 has a minimum off time of 350ns typical and 400ns max. Therefore, one should be very careful when choosing the switching frequency at low input voltage (5V input) to make sure that the required off time from Equation 3 is at least 1.4 times of the minimum off time to meet the transient response requirements.

Figure 2 shows the converter efficiencies as a function of load current for 5V and 12V inputs respectively. It is evident that the converter exhibits very high efficiencies for load current less than 12A. The figures below (**Figure 3a** and **3b**) show the output ripple voltage and the low side MOSFET drain to source voltage waveforms for 5V and 12V inputs respectively. The output ripple voltage is maintained less than 25mV for 5V input and less than 50mV for 12V input. Large output inductor, (for example 1.5 μ H, Sumida CEP125-1R5-H), should be used to keep the ripple voltage less than 1% of the output voltage at 12V input.

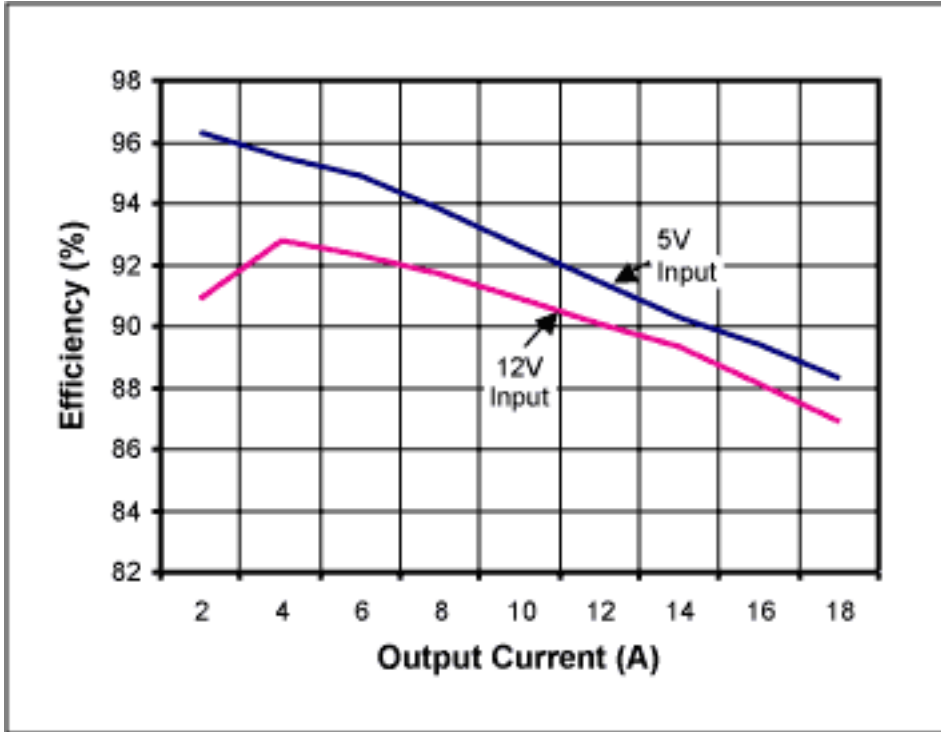


Figure 2. Efficiency vs output load current.

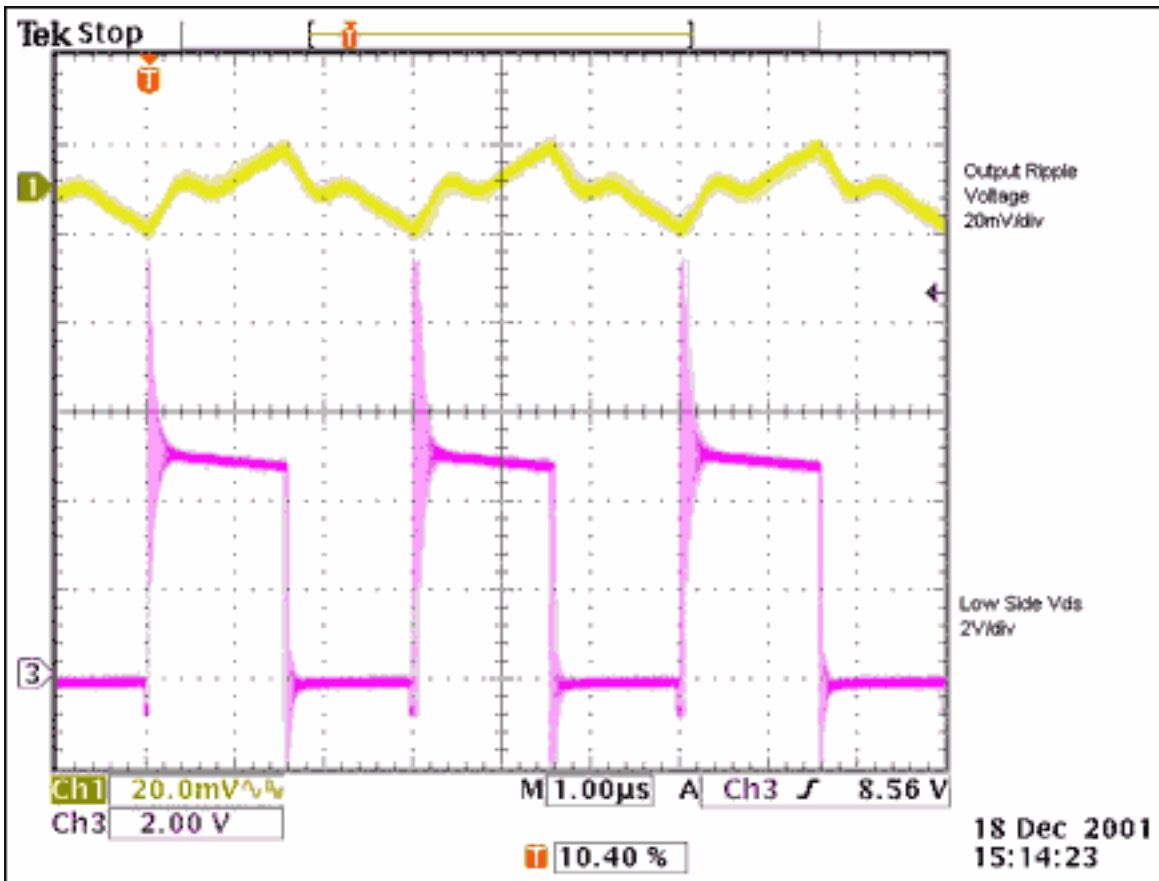


Figure 3a. Output ripple voltage and low side MOSFET Vds waveforms at 5V input.

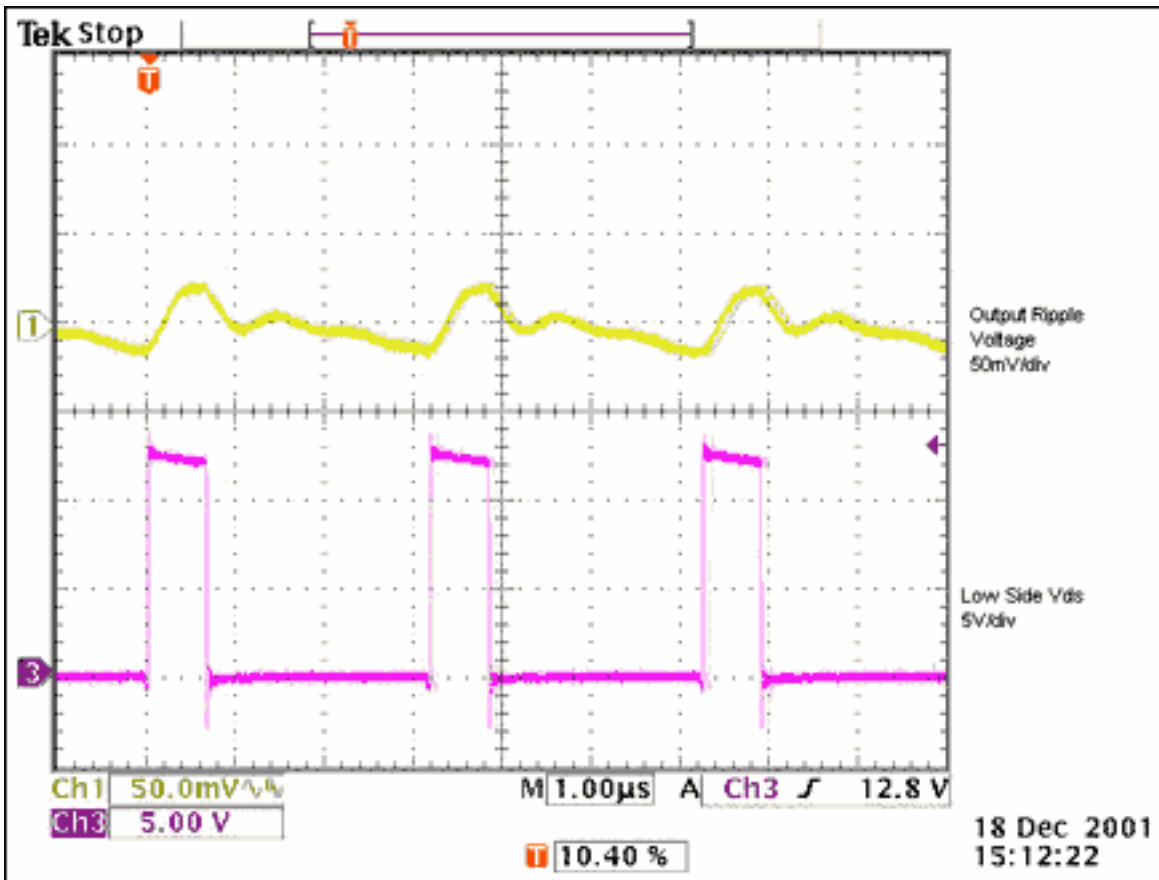


Figure 3b. Output ripple voltage and low side MOSFET Vds waveforms at 12V input.

Application Note 1053: <http://www.maxim-ic.com/an1053>

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Related Parts

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AN1053, AN 1053, APP1053, Appnote1053, Appnote 1053

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