

ROHM and Comet Electronics offer you high power flexible switching regulator with output current up to 2 A, suitable for powering electronic modules like printer modules, scanners, GSM modules.

- ◆ High maximum output current (2A);
- ◆ Wide input voltage range;
- ◆ On chip switching MOSFET;
- ◆ Adjustable output voltage up to  $V_{IN}$
- ◆ Selectable operating frequency up to 500 kHz;
- ◆ Wide operating temperature range;
- ◆ Over current protected output;
- ◆ Built in temperature shut down circuit;
- ◆ Enable pin for external mode control;
- ◆ 5.5W SMD package HRP7

BD9778HFP		
Parameter	Value	Unit
Output current	2	A
Maximum power dissipation	5.5	W
Supply voltage $V_{IN}$	5 to 35	V
Output voltage	1 to $V_{IN}$	V
Reference voltage precision	$\pm 2$	%
Operating temperature	-40 to +125	$^{\circ}\text{C}$
Operating frequency	50 to 500	kHz
Soft start	5	ms
Oscillation mode	Self oscillation	
Package	HRP7	

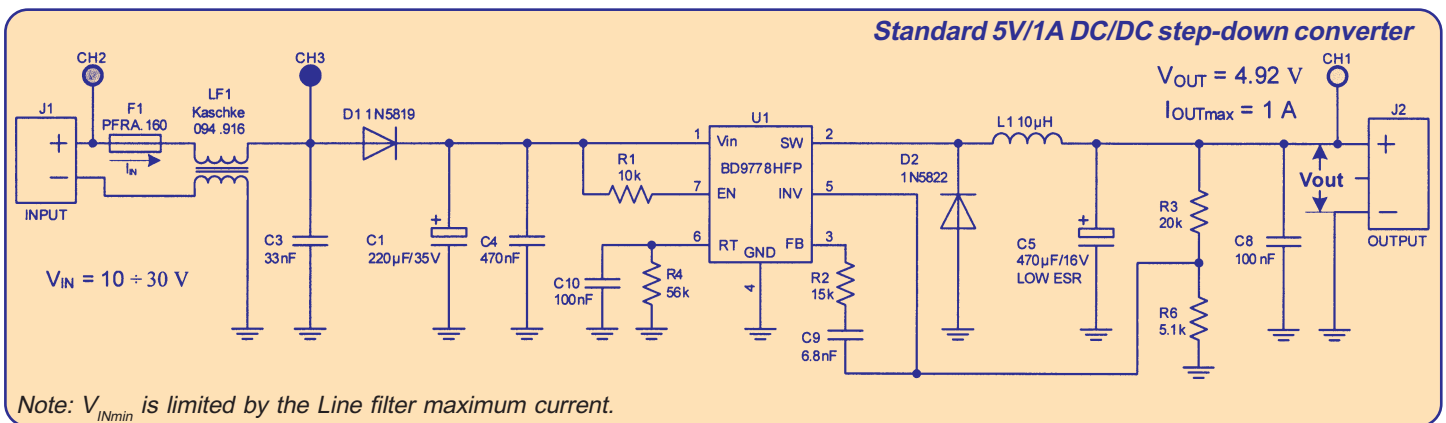
### BD9778HFP Demo PCB

The BD9778HFP Demo board is capable of working as standard SMPS module, or as Constant Current High Power LED driver.

Applications:

- ◆ Powering Sony Ericsson M2M GSM/GPRS radio devices GM/GR47 and GR/GS64.
- ◆ Constant Current High Power LED driver, suitable for CREE XLamp series.

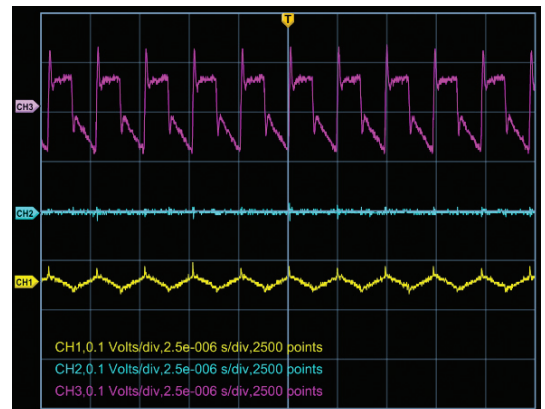
### Application schematics supported by BD9778HFP Demo PCB



### Output voltage calculation

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_3}{R_6}\right), \quad V_{REF} = 1.00 \text{ V internally generated}$$

### Input and output ripple

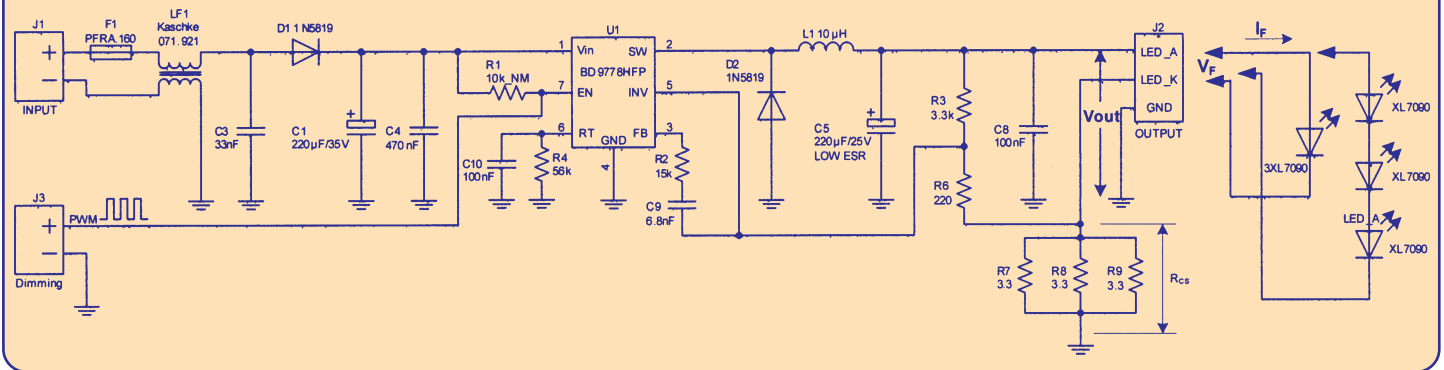


CH1 – Output, CH2 – Input noise with LF1, CH3 – Input noise without LF1

Output voltage:  $V_{OUT} = 4.92\text{V}$ ;  
 Input voltage:  $V_{IN} = 12\text{V}$ ;  
 Output current:  $I_{OUT} = 1\text{A}$ ;  
 Operating frequency:  $f_{SW} = 440\text{kHz}$ ;  
 Ambient temperature:  $T_A = 25^{\circ}\text{C}$ ;  
 Input current:  $I_{IN} = 540\text{mA}$ .

Designator	Part	Order code	Note
U1	BD9778HFP	BD9778HFP ROHM	HRP7
D1	1N5819	1N5819(SS14) SMD (SMA)	Schottky
D2	1N5822	1N5822(SS34) SMD (SMC)	Schottky
L1	Inductor 10 $\mu\text{H}$	CL10uH DRH125	SMD
LF1	2x22 mH, 0.8 A	Kaschke 094.916	Line filter
F1	1.6 A fuse	PFRA.160 SCHURTER	Resettable
C1	Capacitor 220 $\mu\text{F}$	CE 220uF 35V Fujicon	Electrolytic
C3	Capacitor 33 nF	C1206 33nF 50V X7R	Ceramic
C4	Capacitor 470 nF	C1206 470nF 50V X7R	Ceramic
C5	Capacitor 470 $\mu\text{F}$	CE 470uF 16V 105C LOW ESR	LOW ESR
C8, C10	Capacitor 100 nF	C1206 100nF 50V X7R	Ceramic
C9	Capacitor 6.8 nF	C1206 6.8nF 50V X7R	Ceramic
R1	Resistor 10k $\Omega$ 5%	R1206 10K 5%	
R2	Resistor 15k $\Omega$ 1%	R1206 15K 1%	Precise
R3	Resistor 5.1k $\Omega$ 1%	R1206 5.1K 1%	Precise
R4	Resistor 56k $\Omega$ 1%	R1206 56K 1%	Precise
R6	Resistor 20k $\Omega$ 1%	R1206 20K 1%	Precise
J1	Terminal block 2 pin	TS-502 2P	
J2	Terminal block 3 pin	TS-502 3P	
PCB	PCB, no components	BD9778HFP Demo PCB	

## White Power LED driver with dimming



The application shown above is capable for driving 3 CREE white 1W LEDs XL7090 at 320 mA or 1 white 3W LED 3XL7090 at 680mA. The switching frequency is 440 kHz.

Designator	Part	Order code	Note
U1	BD9778HFP	BD9778HFP ROHM	
D1, D2	1N5819	1N5819(SS14) SMD (SMA)	Schottky
L1	Inductor 10 $\mu$ H	CL10uH SD73	SMD
LF1	2x12 mH, 0.54A	Kaschke 071.921	Line filter
F1	1.6 A fuse	PFRA.160 SCHURTER	Resettable
C1	Capacitor 220 $\mu$ F	CE 220uF 35V Fujicon	Electrolytic
C3	Capacitor 33 nF	C1206 33nF 50V X7R	Ceramic
C4	Capacitor 470 nF	C1206 470nF 50V X7R	Ceramic
C5	Capacitor 220 $\mu$ F	CE 220uF 25V 105C LOW ESR	LOW ESR
C8, C10	Capacitor 100 nF	C1206 100nF 50V X7R	Ceramic
C9	Capacitor 6.8 nF	C1206 6.8nF 50V X7R	Ceramic
R1	Resistor 10k $\Omega$ 5%	R1206 10K 5%	
R2	Resistor 15k $\Omega$ 1%	R1206 15K 1%	Precise
R3	Resistor 3.3k $\Omega$ 1%	R1206 3.3K 1%	Precise
R4	Resistor 56k $\Omega$ 1%	R1206 56K 1%	Precise
R6	Resistor 220 $\Omega$ 1%	R1206 220R 1%	Precise
R7, R8, R9	Resistor 3.3 $\Omega$ 1%	R1206 3.3R 1% SAMSUNG	Precise
J1, J3	Terminal block 2 pin	TS-502 2P	
J2	Terminal block 3 pin	TS-502 3P	
PCB	PCB, no components	BD9778HFP Demo PCB	

### Calculating the forward LED current $I_F$ (no dimming)

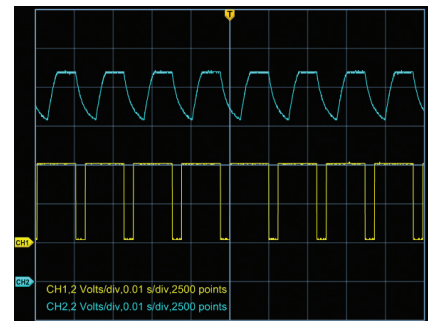
$$I_F = \frac{1}{R_{CS}} - \frac{V_F}{R_{CS} \times (R_3 + R_6)} \times (R_6 + R_{CS})$$

### Dimming 3 white 1W LEDs XL7090

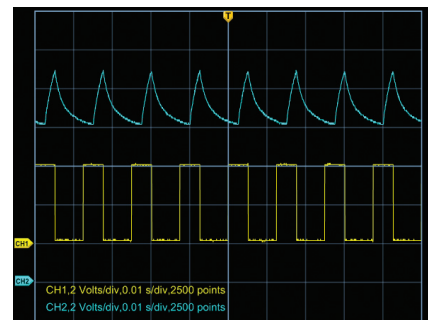
(Resistor R1 is not mounted, dimming through J3)

Input voltage:  $V_{IN} = 18V$ ;  
 Dimming frequency:  $f_{DIMM} = 80Hz$ ;  
 Operating frequency:  $f_{SW} = 440kHz$ ;

Forward LEDs current:  $I_F = 200mA$ ;  
 Forward LEDs voltage:  $V_F = 9.6V$  (Over all 3 LEDs);  
 Duty cycle:  $D = t_{ON}/T = 0.81$ .



Forward LEDs current:  $I_F = 80mA$ ;  
 Forward LEDs voltage:  $V_F = 8.7V$  (Over all 3 LEDs);  
 Duty cycle:  $D = t_{ON}/T = 0.42$ .

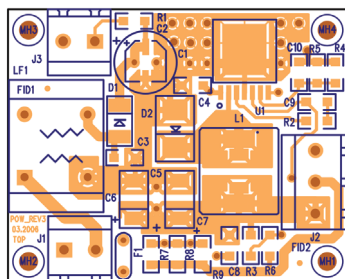
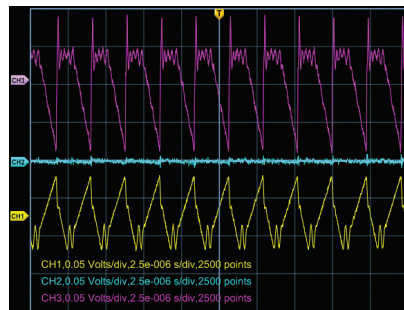


CH1 – PWM Pulse train, CH2 – Output voltage

### Driving 3 white 1W LEDs XL7090

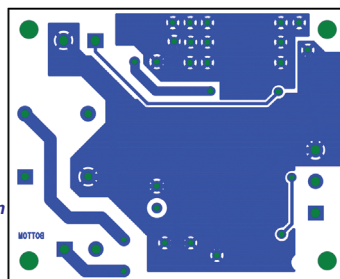
(R1 mounted, no dimming)

Forward LEDs current:  $I_F = 320mA$ ;  
 Forward LEDs voltage:  $V_F = 10.3V$   
 (Over all 3 LEDs);  
 Total output voltage:  $V_{OUT} = 10.68V$ ;  
 Input voltage range:  $V_{IN} = 14 - 30V$ ;  
 Operating frequency:  $f_{SW} = 440kHz$ ;  
 Input current @  $V_{INmin}$ :  $I_{INmax} = 300mA$ ;  
 CH1 – Output;  
 CH2 – Input noise with LF1;  
 CH3 – Input noise without LF1.



**BD9778HFP  
Demo PCB**

44.2mm x 54.6mm



# COMET ELECTRONICS

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