

## Hysteretic DC/DC Controller Demoboard

### General Description

The Supertex HV9150DB1 demoboard is for the evaluation of the HV9150 hysteretic DC/DC controller. This demoboard consists of all necessary components to create a 5V to 200V step up converter capable of providing 600mW of output power.

This DC/DC converter has a single voltage input and a single voltage output. The demoboard is configured to use the internal voltage reference. In addition, the user also has access to an external voltage reference pin if it is preferred. The output voltage can be adjusted from 50V to 200V by adjusting the potentiometer next to the output terminals.

The potentiometer is used in the resistor feedback network for demonstration purposes.

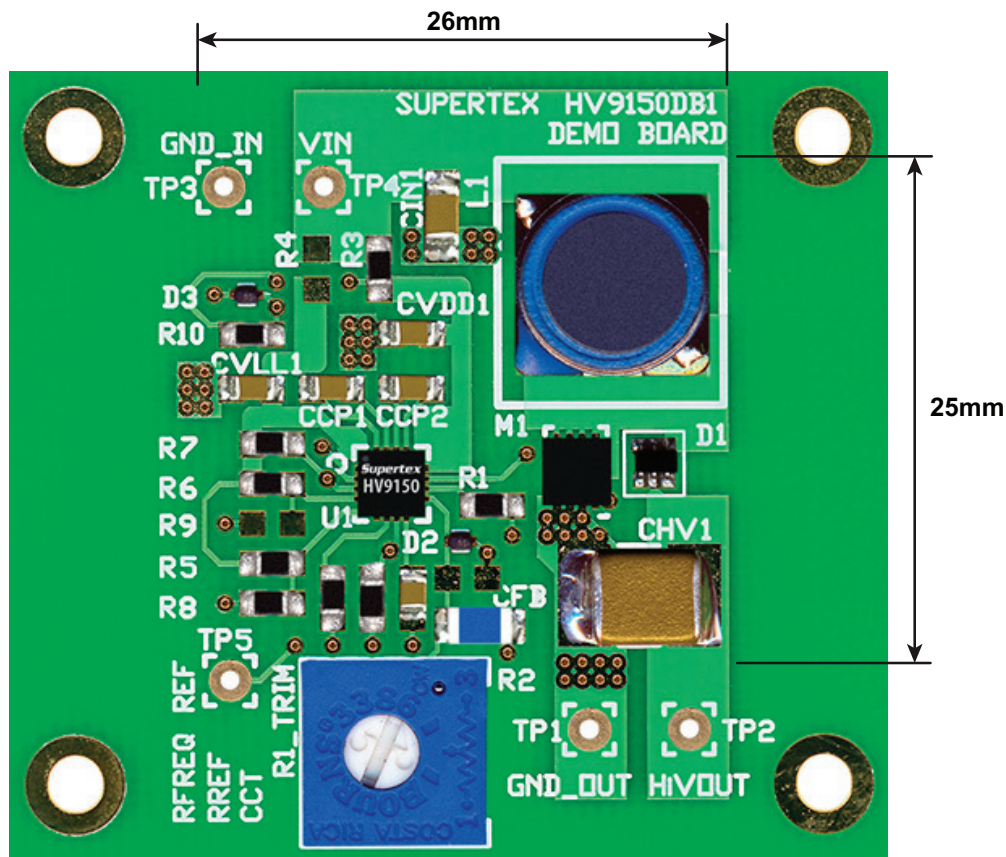
The demoboard shows that all necessary components for this 600mW converter can be packed into a square inch, single sided, PCB area.

To ensure a stable operation of the DC/DC converter, it is recommended that a low ESR bulk decoupling capacitor be connect at the input voltage supply.

### Specifications

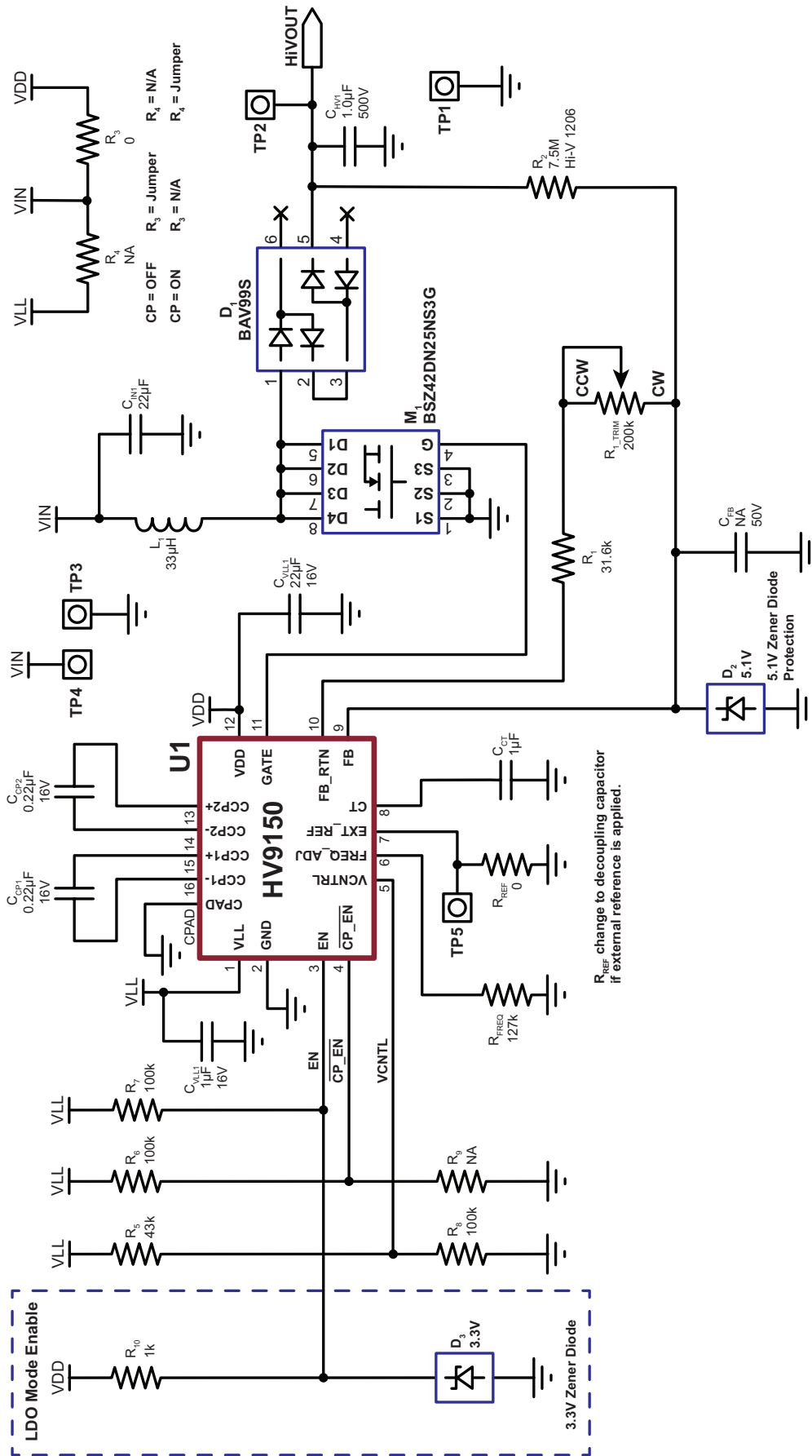
Parameter	Value
$V_{IN}$ input voltage	4.75V to 5.25V
$V_{OUT}$ output voltage	50V to 200V
$I_{OUT}$ output current	3mA max at 200V
Operating frequency	200kHz typical

### Board Layout



Actual Dimensions: 46mm x 41mm

HV9150DB1 Circuit Schematic



## LDO (Linear Regulator) and CP (Charge Pump) Mode Option

The HV9150 can operate in either LDO or CP modes. The CP mode is preferred if the voltage of the input supply is lower than 5V. The internal charge pump converter can generate a higher voltage supply to drive the gate driver. If a higher supply voltage is available, the LDO mode should be chosen. The following table shows the options to select between LDO and CP modes.

The  $R_{10}$  and  $D_3$  form an independent 3.3V output startup circuit to set the device to LDO mode operation. These components are not required on the demoboard if the CP mode operation is preferred.

Part Reference	LDO Mode	CP Mode
$R_3$	0 $\Omega$	Not installed
$R_4$	Not installed	0 $\Omega$
$R_{10}$	1k $\Omega$	Not installed
$D_3$	3.3V Zener	Not installed
$R_7$	Not installed	100k $\Omega$

## Internal and External Voltage Reference Option

The HV9150 can be configured to use either an internal or external voltage reference. The demoboard is set to use the internal voltage reference. In order to use external voltage reference, the user can replace the  $R_{REF}$  0 $\Omega$  jumper with a 0.1 $\mu$ F decoupling capacitor and connect the external reference to the TP5 terminal. Please be aware that the EN pin is required to toggle once to activate the device to enable the external voltage reference option.

## Modification to 300V Output Operation

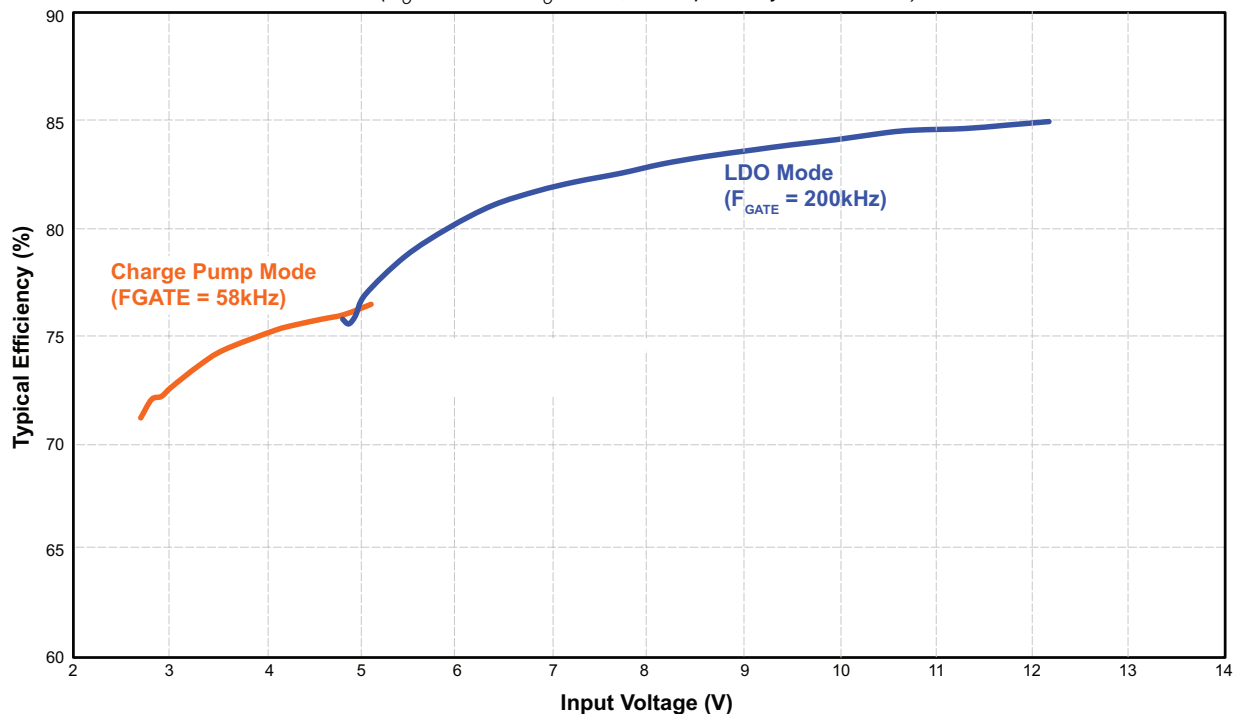
The demoboard can be reconfigured to generate a 300V output voltage. The user can replace the MOSFET driver with one rated at 300V and adjust the value of potentiometer to obtain a 300V output voltage. Since the ON-resistance is different, the maximum output current may change. The user can adjust the switching frequency or duty cycle to compensate for the lower ON-resistance. Please see the table below.

Part Reference	250V Output	300V Output
$M_1$	BSZ42DN25NS3G 250V, 425m $\Omega$ , 5A	AON7460 300V, 830m $\Omega$ , 4A

## HV9150DB1 - Typical Performance

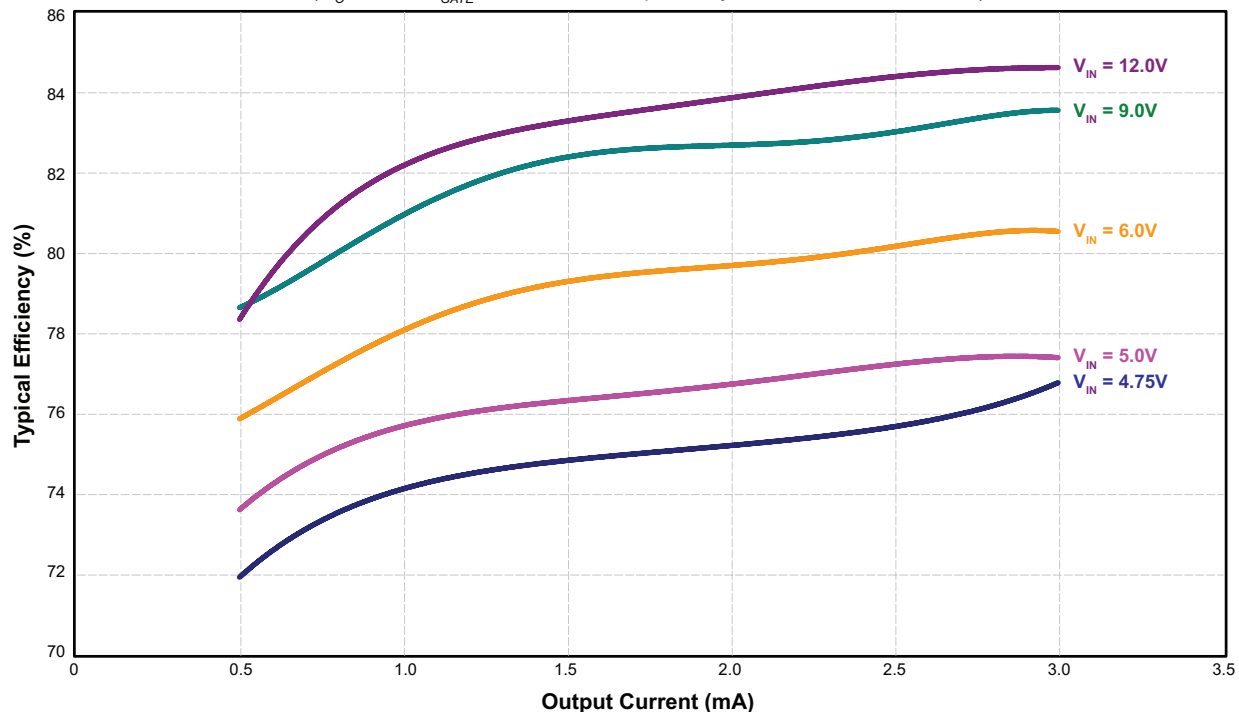
### HV9150 Hysteretic Converter Efficiency

( $V_o = 200V$  and  $I_o = 3mA$ ,  $L = 33\mu H$ , Duty = 75%, 25°C)

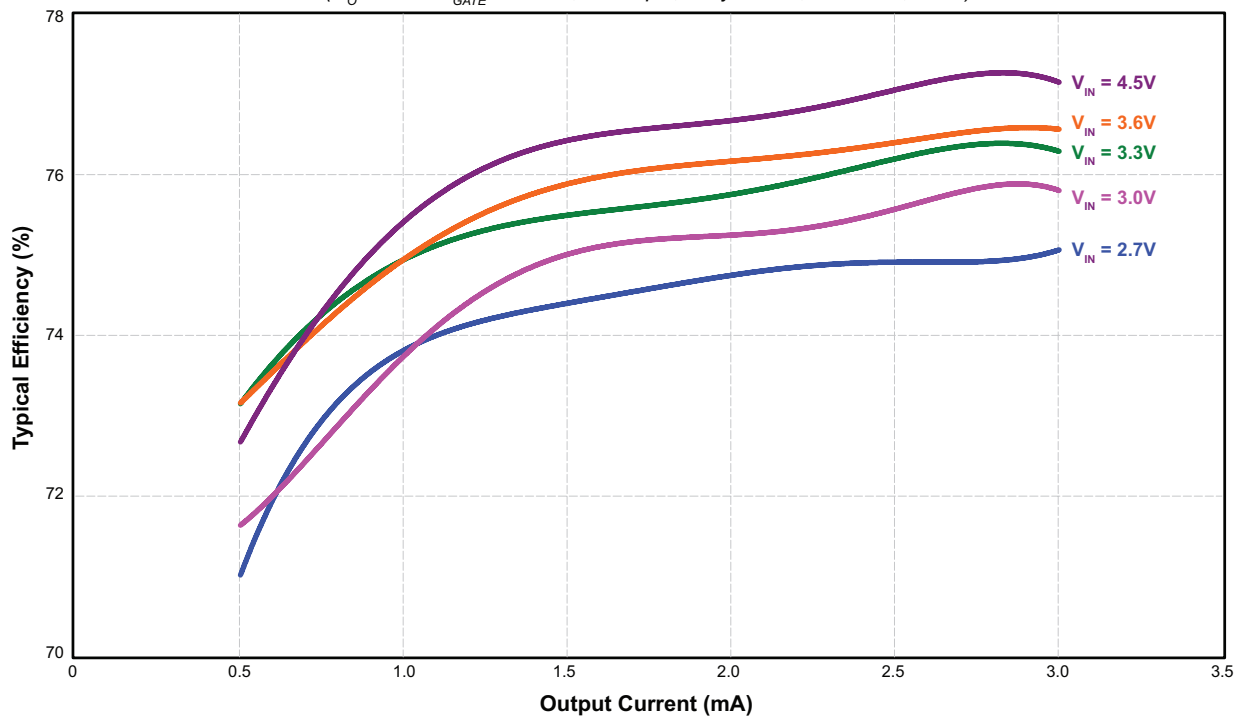


HV9150DB1 - Typical Performance

**HV9150 Hysteretic Converter Efficiency**  
 ( $V_o = 200V$ ,  $F_{GATE} = 200kHz$ ,  $L = 33\mu H$ ,  $Duty = 50%$ ,  $LDO Mode$ ,  $25^\circ C$ )



**HV9150 Hysteretic Converter Efficiency**  
 ( $V_o = 200V$ ,  $F_{GATE} = 58kHz$ ,  $L = 33\mu H$ ,  $Duty = 75%$ ,  $CP Mode$ ,  $25^\circ C$ )



## Bill of Materials

Reference	Description	Voltage	Package	Manufacturer
$C_{VDD1}$ , $C_{CP1}$ , $C_{CP2}$	0.22 $\mu$ F, 25V ceramic capacitor	16V	0805	Any
$C_{CT}$	1 $\mu$ F, 16V, ceramic capacitor	16V	0805	Any
$C_{FB}$	Not installed	50V	0805	Any
$C_{HV1}$	1.0 $\mu$ F, 500V, ceramic capacitor	500V	2220	Any
$C_{IN1}$	22 $\mu$ F, 16V, ceramic capacitor	16V	1206	Any
$C_{VLL1}$	1 $\mu$ F, 16V, ceramic capacitor	16V	0805	Any
$D_1$	BAV99S diodes 100V	-	SOT-363	Any
$D_2$	DZ2705100L 5.1V Zener diode	-	SSSMINI2	Any
$D_3$	DZ2S03300L 3.3V Zener diode	-	SSSMINI2	Any
$L_1$	33 $\mu$ H	-	-	Any
$M_1$	BSZ42DN25NS3G 250V MOSFET	-	8-Lead (3x3) DFN	Infineon
$R_{FREQ}$	125k $\Omega$	-	0805	Any
$R_3$ , $R_{REF}$	0 $\Omega$ jumper	-	0805	Any
$R_1$	31.6k $\Omega$	-	0805	Any
$R_{1\_TRIM}$	200k $\Omega$ trimmer potentiometer	-	3386F	Any
$R_2$	7.5M $\Omega$ high voltage chip resistor	300V	1206	Any
$R_4$ , $R_9$	Not installed	-	0805	Any
$R_5$	43k $\Omega$	-	0805	Any
$R_6$ , $R_7$ , $R_8$	100k $\Omega$	-	0805	Any
$R_{10}$	1k $\Omega$	-	0805	Any
$TP_1$ , $TP_2$ , $TP_3$ , $TP_4$ , $TP_5$	Power supply input/output terminals	-	-	Any
$U_1$	HV9150K6-G	-	16-Lead (3x3) QFN	Supertex

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