

# HS20116 EVB Guide

## Single output

### DESCRIPTION:

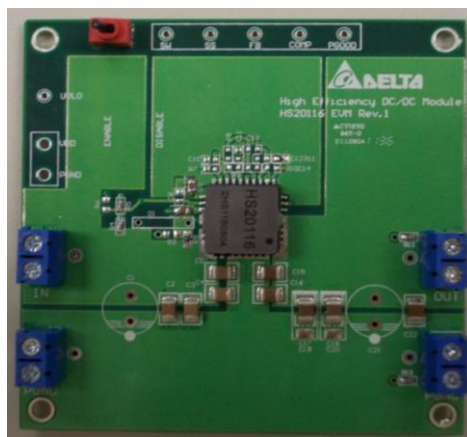
The evaluation board is for the HS20116, high efficiency DC/DC power module. The evaluation board is generates a +5V output voltage at load currents up to 20A from a 12V input voltage range. Output setting resistor R11 can be adjusted for evaluating different output voltage.

And output current protection point (OCP) can be setting resistor R8 and R9. The HS20116 switches at 300kHz and achieve up to 95% efficiency with the supplied components.

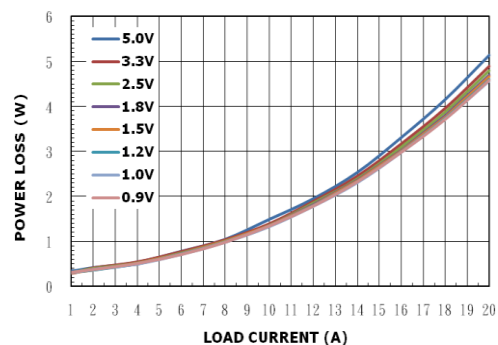
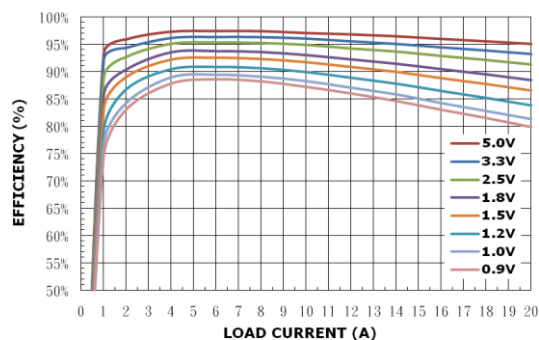
### ELECTRICAL SPECIFICATION:

Parameters	Symbol	Value	Unit
Input Voltage	VIN	12	V
Output Voltage	VOUT	5	V
Output Current	IOUT	20	A

### EVALUATION BOARD:



### EFFICIENCY AND POWER LOSS:



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## Single output

### OVER CURRENT PROTECTION:

The over-current function protects the converter from a shorted output by using the equivalent series resistor of inductor, DCR, to monitor the current. A resistor networking of ILIM and VSH pins ( $R_{ILIM}$  and  $R_{VSH}$ ) programs the over-current trip level. If over-current is detected, the output immediately shuts off, it cycles the soft-start function in a hiccup mode (7 dummy soft-start time-outs, then up to one real one) to provide fault protection. If the shorted condition is not removed, this cycle will continue indefinitely. The over-current function will trip at a peak inductor current ( $I_{PEAK}$ ) determined by Equation 8.

$$I_{PEAK} = \frac{I_{ILIM} \times (R_{ILIM} // R_{VSH}) - \left( \frac{V_{RMP}}{VIN} \right) \times V_{VSH} - \Delta V_{PHASE}}{G_{CS} \times DCR} - \frac{(VIN - VOUT)}{2 \times Fs \times L} \times \frac{VOUT}{VIN} \quad (EQ.1)$$

Where:

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_{ILIM}$	ILIM current source	Note	21.5	23.5	25.5	uA
$V_{RMP}$	Ramp voltage	Note	420	500	525	mV
$V_{VSH}$	Sharing Reference	Note	1.7	1.8	1.9	V
$\Delta V_{PHASE}$	8 Phase Reference	Note	-	31	-	mV
	6 Phase Reference	Note	-	42	-	mV
$G_{CS}$	Current Sensing Gain	Note	11.25	12.5	13.75	V/V
DCR	equivalent series resistor of inductor	$T_c=25^\circ C$	-	3.0	3.6	m $\Omega$
L	L0 Inductance	Current = 0A, $T_c=25^\circ C$	1.44	1.8	2.16	uH
	Lsat Inductance	Current = 38A, $T_c=25^\circ C$ , Refer to L0 (typ)	-	1.26	-	uH
$R_{ILIM-IN}$	Internal resistor between ILIM and VOUT pins		83.6	84.5	85.4	k $\Omega$
$R_{VSH-IN}$	Internal resistor between VSH and ILIM pins		1.98	2	2.02	Meg $\Omega$

Note: Parameters guaranteed by PWM IC vendor design and test prior to module assembly.

And also,

$$R_{ILIM} = R_{ILIM-IN} // R_8 \quad \text{and} \quad R_{VSH} = R_{VSH-IN} // R_9 \quad (EQ.2)$$

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### EVALUATION BOARD SCHEMATIC:

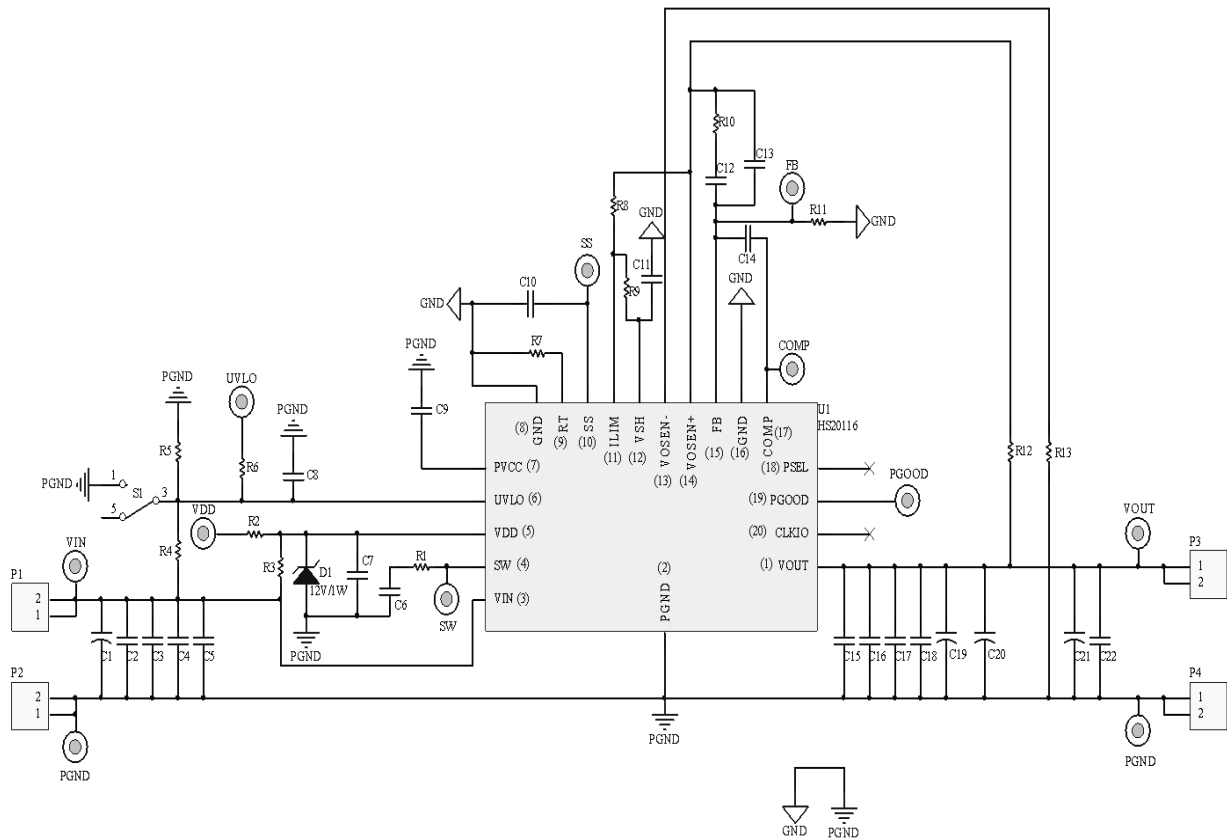


TABLE 1: OUPUT VOLTAGE SETTING

Vout(V)	0.9V	1.0V	1.2V	1.5V	1.8V	2.5V	3.3V	5V
R11 (Ohm)	34.8k	23.2k	14k	8.66k	6.34k	3.83k	2.61k	1.62k

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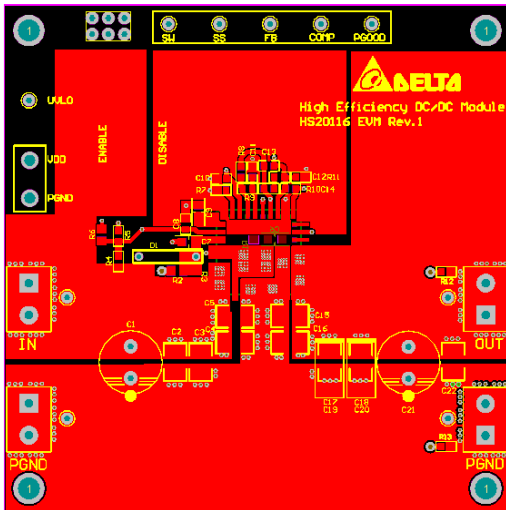
#### BILL OF MATERIALS:

Qty	Ref.	Value	Description	Package	Manufacturer
0	C1,C6,C8 C10~C14, C21,C22	NC	-	-	-
4	C2,C3,C4,C5	22uF/16V	Ceramic Cap X7R	1210	Murata
5	C15,C16,C17, C18,C22	100uF/6.3V	Ceramic Cap X7R	1210	Murata
2	C7,C9	2.2uF	Ceramic Cap X7R	0603	Murata
0	R1,R2, R6~R10	NC	-	-	-
3	R3,R12,R13	0 ohm	Chip Resistor	0603	Cyntec
2	R4,R5	10K ohm	Chip Resistor	0603	Cyntec
0	D1	NC	Zener diode	-	-
1	U1	-	DC/DC Power Module	Stack-QFN	Cyntec

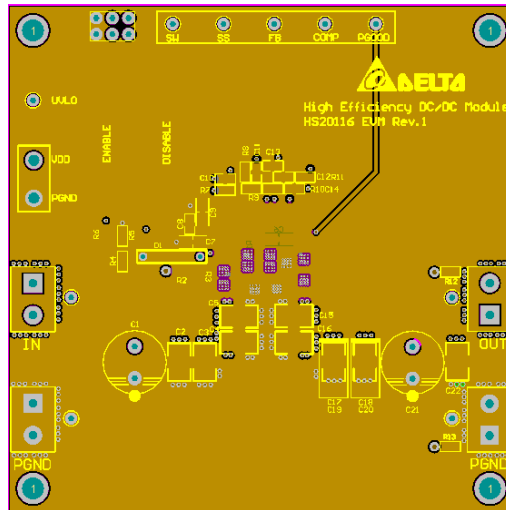
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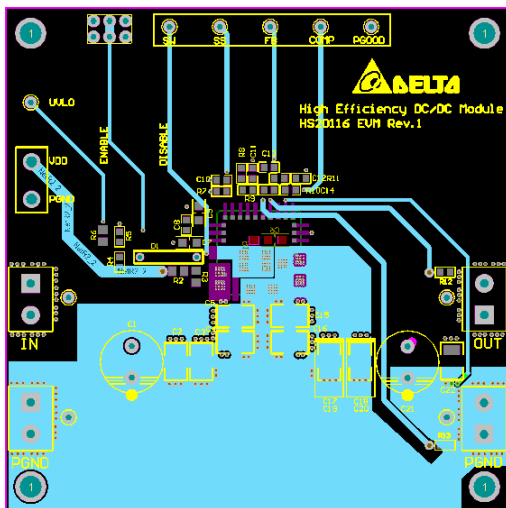
### PRINTED CIRCUIT BOARD LAYOUT:



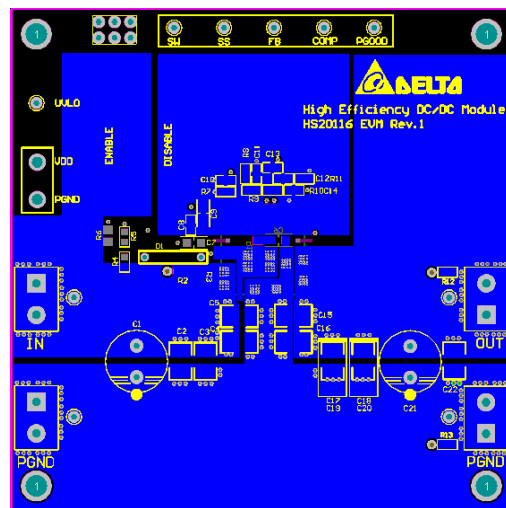
Top Layer



Mid1 Layer



Mid2 Layer



Bottom Layer