

Dual Synchronous Step-Down Controller with PMBus Digital Interface

DESCRIPTION

Evaluation board EVB-ES5201 is a dual output synchronous buck converter featuring the ES5201 in a high density, two-sided drop-in layout. The package for the ES5201 is a 48-lead 6mm × 6mm QFN.

The board provides 1.2V/25A and 1.8V/25A from a 4.5V to 18V input. DCR inductor sensing is used to provide the highest efficiency. The demo board comes with PMBus interface. Users can connect the CH341 dongle to the demo board. Which provides an easy way to communicate and program the part.

The main features of the board are listed below:

- Optional resistors for single-output dual-phase operation
- PMBus Digital Interface to Program and Monitor
- Selectable CCM or DCM Operation at Light Load
- FAULTB pins and PGOOD pins for each phase.
- On-Chip and External Over Temperature Protection

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	VALUE
Input Voltage Range		4.5V ~ 18V
Output Voltage V_{OUT1}	$V_{IN} = 4.5V \sim 18V$, $I_{OUT1} = 0 \sim 25A$	$1.2V \pm 1.5\%$
Output Voltage V_{OUT2}	$V_{IN} = 4.5V \sim 18V$, $I_{OUT2} = 0 \sim 25A$	$1.8V \pm 1.5\%$
V_{OUT1} Maximum Continuous Output Current, I_{OUT1}	$V_{IN} = 4.5V \sim 18V$, $V_{OUT1} = 1.2V$	25A
V_{OUT2} Maximum Continuous Output Current, I_{OUT2}	$V_{IN} = 4.5V \sim 18V$, $V_{OUT2} = 1.8V$	25A
Default Operating Frequency		400kHz
Efficiency	$V_{IN} = 12V$, $V_{OUT1} = 1.2V$, $F_S = 400kHz$ $V_{IN} = 12V$, $V_{OUT2} = 1.8V$, $F_S = 400kHz$	See Figure 2
Load Transient	$V_{IN} = 12V$, $V_{OUT2} = 1.8V$, $I_{STEP} = 0 \sim 15A$	See Figure 3

EVB-ES5201 BOARD PHOTO



QUICK START PROCEDURE

Demonstration circuit EVB-ES5201 is easy to set up to evaluate the performance of the ES5201. Please refer to Figure 1 for proper measurement setup and follow the procedure below:

1. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to 12V.
2. Turn on the power supply at the input. The output voltage should be $1.2V \pm 1.5\%$ ($1.182V \sim 1.218V$) and $1.8V \pm 1.5\%$ ($1.773V \sim 1.827V$).
3. Once the proper output voltage is established, adjust the load within the operating range and observe the

output voltage regulation, output voltage ripple, efficiency and other parameters. Output ripple can be measured at J7 and J9 with BNC cables.

4. (Optional) For optional load transient test, apply an adjustable pulse signal between “LOAD-STEP” and “GND” test point. Pulse amplitude (2V ~ 3.5V) sets the load step current amplitude. The output transient current can be monitored at the SMA connector J8 (10mV/A). The pulse signal should have very small duty cycle (0.1%) to limit the thermal stress on the transient load circuit.

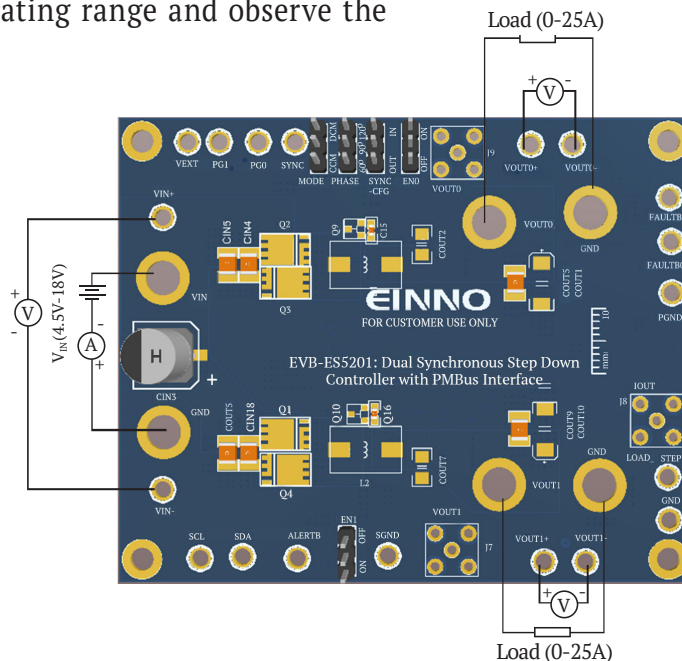


Figure 1 TEST SETUP OF EVB-ES5201

QUICK START PROCEDURE

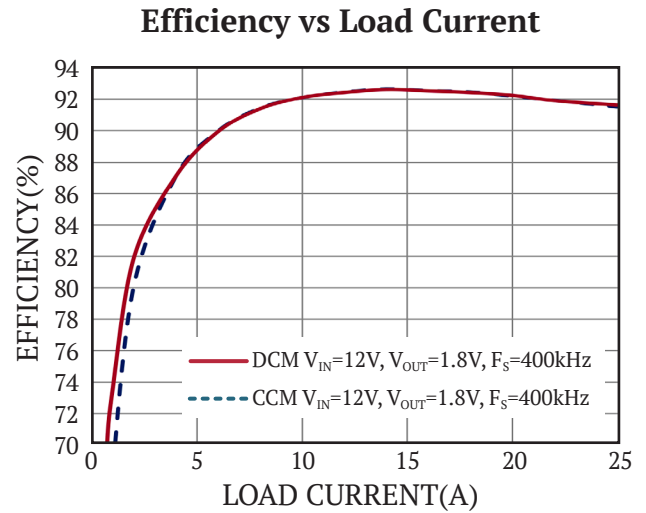
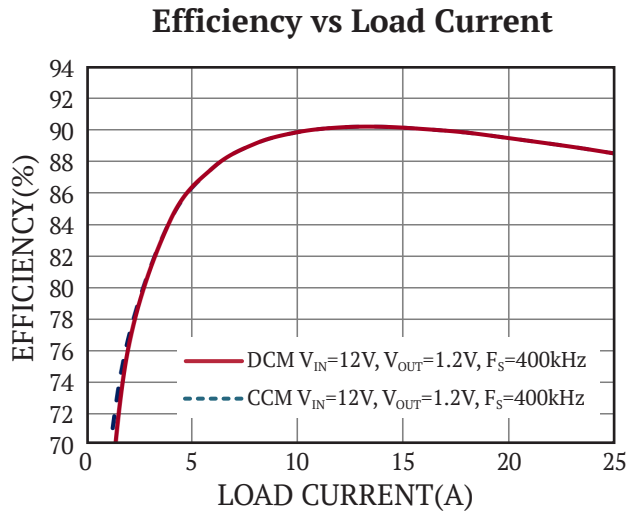


Figure 2 Measured ES5201 Efficiency

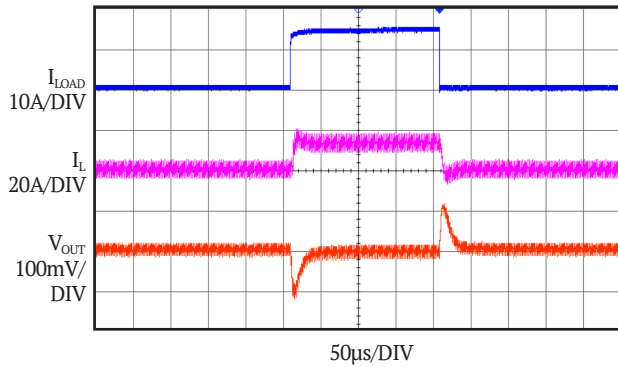


Figure 3 Measured ES5201 0A-15A Load Transient

$F_S = 400\text{kHz}$
 $V_{IN} = 12\text{V}, V_{OUT} = 1.8\text{V}$

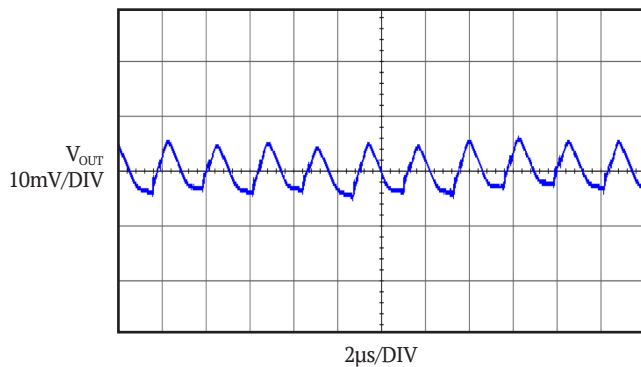


Figure 5 Measure ES5201 Output Voltage Ripple

$F_S = 400\text{kHz}$
 $V_{IN} = 12\text{V}, V_{OUT} = 1.8\text{V}, I_{OUT} = 25\text{A}$

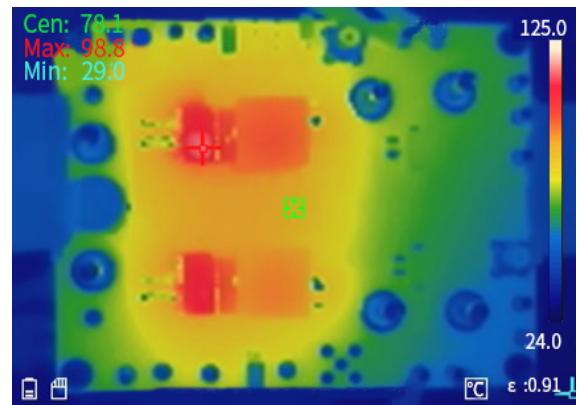


Figure 4 Thermal Performance

$F_S = 400\text{kHz}$
 $V_{IN} = 12\text{V}$
 $V_{OUT1} = 1.2\text{V}/25\text{A}, V_{OUT2} = 1.8\text{V}/25\text{A}$
 $T_A = 26^\circ\text{C}$ No Forced Airflow

EVB-ES5201 PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	2	C1, C3	CAP, 0603, 4.7μF, 20%, 10V, X7S	TDK C1608X7S1A475M080AC
2	7	C2, C4, C5, C6, C9, C10, C13	CAP, 0603, 0.1μF, 20%, 50V, X7R	TDK CGA3E2X7R1H104M080AA
3	2	C7, C11	CAP, 0603, 2.2nF, 10%, 50V, X7R	Murata GCM188R71H222KA37D
4	1	C8	CAP, 0603, 82pF, 20%, 50V, X7R	TDK CGA3E2C0G1H820J
5	1	C12	CAP, 0603, 100pF, 20%, 25V, X7R	KEMET C0603C101M3RACAUTO
6	10	CIN1, CIN2, CIN4, CIN5, CIN6, CIN7, CIN8, CIN9, CIN10, CIN11	CAP, 1210, 22μF, 20%, 25V, X7R	TDK C3225X7R1E226M250AB
7	1	CIN3	CAP, 330μF, 25V, Hybrid CAP	Panasonic EEHJT1E331P
8	4	COUT1, COUT4, COUT6, COUT9	CAP, 7343, 330μF, 6.3V, SPCAP	Panasonic ECGSY0J331R
9	2	COUT2, COUT7	CAP, 1206, 47μF, 20%, 6.3V, X7S	Murata GRM31CE70J476ME15L
10	4	COUT3, COUT5, COUT8, COUT10	CAP, 1210, 100μF, 20%, 6.3V, X7R	TAIYO JMK325AC7107MM-T
11	4	COUT11, COUT12, COUT13, COUT14	CAP, 1210	OPTION
12	2	D1, D2		OPTION
13	2	L1, L2	IND, 0.47μH, 0.67mΩ	Wurth, 744355147
14	2	Q1, Q2	OptiMOS™5 Power-MOSFET, 40V	INFINEON BSC032N04LS
15	3	Q3, Q4, Q8	OptiMOS™5 Power-MOSFET, 40V	INFINEON BS010N04LS6
16	4	Q5, Q6, Q7, Q9		OPTION
17	15	R1, R2, R3, R6, R20, R24, R26, R29, R31, R35, R37, R38, R39, R40, R41	RES, 0603	OPTION
18	1	R5	RES, 0603, 2.2Ω, 1%, 1/10W	YAGEO AC0603FR-072R2L
19	5	R12, R25, R32, R33, R44	RES, 0603, 10kΩ, 1%, 1/10W	KOA RK73G1JTTD1002F

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
20	2	R8, R18	RES, 0603, 23.2k Ω , 1%, 1/10W	YAGEO RC0603DR-0723K2L
21	2	R9, R34	RES, 0603, 7.15k Ω , 1%, 1/10W	KOA RK73H1JTTD7151F
22	4	R15, R17, R19, R23	RES, 0603, 10 Ω , 5%, 1/4W	Panasonic ERJPA3J100V
23	2	R4, R46	RES, 0603, 1k Ω , 1% 1/8W	KOA RK73H1JTTD1001F
24	3	R16, R42, R43	RES, 1206	OPTION
25	1	R30	RES, 0603, 4.99k Ω , 1%, 1/10W	KOA RK73H1JTTD4991F
26	2	R7, R10	RES, 0603, 100k Ω , 1%, 1/10W	YAGEO AA0603FR-07100KL
27	2	R11, R12	RES, 0603, 0 Ω , 1%, 1/10W	KOA RK73Z1JTTD
28	1	R13	RES, 0603, 28k Ω , 1%, 1/10W	YAGEO AC0603FR-0728KL
29	2	R14, R28	RES, 0603, 20k Ω , 1%, 1/10W	YAGEO AF0603FR-0720KL
30	1	R21	RES, 0603, 3.01k Ω , 1%, 1/10W	YAGEO AC0603FR-073K0L
31	1	R36	RES, 0603, 37.4k Ω , 1%, 1/10W	KOA RK73H1JTTD3742F
32	1	R27	RES, 0603, 52.3k Ω , 1%, 1/10W	Panasonic ERJ-3EKF5232V
33	1	R45	RES, 2512, 10m Ω , 1%, 1W	Panasonic ERJM1WSF10MU
34	1	RT1	NTC	OPTION
35	1	U1	ES5201	ES5201IUH#PBF

EVb-ES5201 SCHEMATIC DIAGRAM

