ated CSD95373B's								
Festing note & Power up instructionpage 1								
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3								

Testing note: valid for both with 60A CSD95372B's and with 45A CSD95373B's:

For Vin at 12V and Vout below 900mV, the frequency drops with reduced Vout. At 600mV frequency is 211kHz (4 phases & 120A load). At 500mV frequency is 178kHz. Going to 400kHz setting gets 301kHz at 600mV out and 254kHz at 500mV out. However, lower frequency at these low Vouts saves 620mW at 120A load. Hence, the lower 300kHz setting will be retained. While lower frequency helps efficiency, output ripple could be worse. Hence, ripple was measured at both full load and no load where actual frequency was lowest at both 4 phase and 3 phase settings. In all cases output ripple stayed below 10mV p-p. See pages 4-5 for waveforms.

Power up instructions: valid for both with 60A CSD95372B's and with 45A CSD95373B's:

Increase Vin to at least 5V and start up GUI

Make the 7 updates as shown below with red "U" by them. Then click on "Write to Hardware" (upper left corner of screen) The updates should be accepted and the "U"s disappear.

Then turn on conversion by clicking the "On" button by "OPERATION" (lower right of GUI)

Configure	General Advanced Device Info Al Config		
Write to Hardware	Voltage Limits & Fault Responses	Output Current Limits and Calibrations	
Auto write on rail or device change Discard Changes Reme Canfig on Mor Restore NVM Config Clear Vestors Robins	Voul. Next 1.50 (*) Y Output Voltage Setting and Limits Voul. Next 1.50 (*) Y When allowing PMBus to control Voul. Margin High: 0 6.60 (*) Y When allowing PMBus to control Voul. Margin High: 0 6.60 (*) Y When allowing PMBus to control Voul. Margin High: 0 6.50 (*) Y When allowing PMBus to control Voul. VID, VP, FAULT, LIMIT: 1.500 (*) Y Y VIDULAD, PME_LINE: 4.500 (*) Y Y VIDULAD, Stat. (MPR_202): 0 6.600 (*) Y ShiD_LPMBULS_SEL (MPR_202): 0 1000 (*) V	Ibut OC Warn Limit: 242.0 (≦) A Ibut OC Fault Limit: 302.00 (≦) A Ibut OC #Offset: 0.000 (≦) A Hax # Phases (PFR_20): ④ #Phase ⊂ Taput Current Limits 100 O (Fault Limit: Din OC Warn Limit: 255.0 (≦) A Din OC Warn Limit: 255.0 (≦) A	
	Temperature Limits Temp Warn limit: 95 ∰ ≪ Tampe Radii limit 111 € ar	SVID Alert Repisters DMAX (##R_10): 242 [2] A	
	Turn On/Off Configuration	OPERATION	
	OnyOff Config: 🔮 ox 18 🖸 Mode: OPBRATION Only	Oni/Off: Orl Hargin O Act on Fault Fault Action: O Ignore Pault Margining: O None O Low O Mgh	
	Top & Hints	PMBut log	[6
Configure	OPERATION [0x01] Used to turn the unit on and off in conjunction with the input from the CONTROL pin. It is also unit to set the output voltage to the upper or lower margin voltages. The unit stays in the con-	used to cause the	
🤄 Monitor	mode until a subsequent OPERATION command or change in the state of the CONTROL pin ins to change to another mode.	tructs the device	
To Photos		Bh Innerson I	B. 0

Efficiency and Losses: with CSD95372B's

PMP9738 model t3 set to 600mV output: 12Vin, Vout set at 600mV

Close in Vin & Vout measurements, Vout measurement at output caps and not at sense points,

with fan for ~200 LFM with CSD95372B's

4 Phases Enabled:

Vin	Iin A	Vout	Iout	% Effi	Losses in W	Notes
Volts		Volts	А	ciency		
12.017	7.039	0.6049	120.00	85.8	12.000	211kHz
12.036	5.741	0.6033	100.00	87.3	8.769	
12.026	4.521	0.6018	80.03	88.6	6.207	
12.052	3.344	0.6003	60.01	89.4	4.278	
12.054	2.231	0.5989	40.00	89.1	2.936	192kHz
12.039	1.143	0.5976	19.99	86.8	1.815	
12.028	0.130	0.5962	0	0.0	1.564	174kHz
						301kHz with 400kHz
12.013	7.093	0.6049	120.00	85.2	12.620	setting
						See testing note page 1

3 Phases Enabled:

Vin	Iin A	Vout	Iout	% Effi	Losses in W	Notes
Volts		Volts	А	ciency		
12.028	7.332	0.6044	120.03	82.3	15.643	220kHz
12.015	5.931	0.6029	100.00	84.6	10.971	213kHz
12.025	4.616	0.6015	80.00	86.7	7.387	207kHz
12.043	3.382	0.6001	59.96	88.3	4.747	200.5kHz
12.052	2.227	0.5988	39.98	89.2	2.900	194kHz
12.052	1.135	0.5975	20.00	87.4	1.729	188kHz
12.053	0.104	0.5963	0	0.0	1.254	172kHz

Q

6 phases down to 3 phases at 120A load:

Vin	Iin A	Vout	Iout	% Effi	Losses in W	Notes
Volts		Volts	А	ciency		
12.062	6.820	0.60555	120.31	88.6	9.409	6 phases 204kHz
12.058	6.890	0.60535	120.33	87.7	10.238	5 phases 206kHz
12.051	7.043	0.60505	120.34	85.8	12.063	4 phases 211kHz
12.036	7.350	0.60445	120.33	82.2	15.731	3 phases 220kHz



boot up with 3 phases with ~100usec rise and 30mV overshoot: **with CSD95372B's** 11-Aug-14 20:28:57

Output ripple: with CSD95372B's

12Vin 600mVout 120A load 4 phases with each phase at 211kHz: 6.6mV p-p (20MHz BW) 11-Aug-14





12Vin 600mVout 120A load 3 phases with each phase at 220kHz: 5.8mV p-p (20MHz BW) 11-Aug-14 19:47:31



Thermal Images: with CSD95372B's / 4 phases EX320 Flir camera with emissivity set at 0.94 PMP10393: 12vin 600mV out at 120A 4 phases operating, each @ 210kHz; ~200 LFM airflow from right side 21 deg. C ambient 12W loss on board Power stages left to right: 53.3, 54.5, 52.7, 46.2 deg. C Adjacent copper hottest Inductor tops 47, 47, 44, 38



Thermal Images: with CSD95372B's / 3 phases EX320 Flir camera with emissivity set at 0.94 PMP10393: 12Vin 600mV out at 120A 3 phases operating, each @ 220kHz; ~200 LFM airflow from right side 21 deg. C ambient 15.6W loss on board Power stages left to right: 68, 69, 66 deg. C Adjacent copper hottest Inductor tops 53, 54, 50



This 15.6W compares with 18.4W for the 1.2Vout with same 120A and same 12Vin and similar airflow of ~200LFM in the PMP10306 Test Report.

Efficiency and Losses: with CSD95373B's:

PMP9738 model t3 set to 600mV output: 12Vin, Vout set at 600mV

Close in Vin & Vout measurements, Vout measurement at output caps and not at sense points,

with fan for ~200 LFM $\,$ CSD95373B date code May 2014 $\,$

4 Phases Enabled:

Vin	Iin A	Vout	Iout	% Effi	Losses in W	Notes
Volts		Volts	Α	ciency		
12.065	7.356	0.6068	120.18			4 phases
				82.2	15.825	221.6kHzxxd005rippleIR577_60deg
12.051	5.959	0.6053	99.99	84.3	11.288	215.5kHz; 40degC max
12.027	4.654	0.6039	79.98	86.3	7.674	209.5kHz
12.033	3.418	0.6026	59.98	87.9	4.985	203kHz
12.036	2.255	0.60135	40.00	88.6	3.087	197kHz
12.038	1.147	0.6001	20.01	87.0	1.800	184kHz
12.038	0.120	0.5987	0	0.0	1.445	Rippled007; 173kHz
0						

Q

3 Phases Enabled:

		-				
Vin	Iin A	Vout	Iout	%	Losses in W	Notes
Volts		Volts	Α	Effi		
				ciency		
12.041	7.827	0.6062	120.17			235.5kHz
				77.3	21.398	82 deg. IR576
12.024	6.248	0.6048	100.03	80.5	14.628	226kHz 63degCmax
12.021	4.810	0.6036	79.93	83.4	9.575	217kHz 49degCmax
12.053	3.482	0.6023	59.98	86.1	5.843	208kHz
12.035	2.269	0.6011	40.00	88.0	3.263	201kHz
12.055	1.139	0.5999	20.03	87.5	1.715	191kHz
12.02	0.099	0.5987	0	0.0	1.190	173kHz
Q						

All output ripple measurements under 10mV p-p (see pages 4-5)

Below is full load vs. number of phases 6 down to 3:

Vin	Iin A	Vout	Iout	%	Losses in	Notes
Volts		Volts	Α	Effi	W	
				ciency		
12.071	7.002	0.60725	120.18	86.3	11.542	6 phases 210kHz 45.5degCmax
12.0645	7.131	0.60715	120.18	84.8	13.065	5 phases 214kHz 51degCmax
12.065	7.356	0.6068	120.18	82.2	15.825	4 phases 221.6kHz IR577_60deg
12.041	7.827	0.6062	120.17	77.3	21.398	3 phases 235.5kHz IR576 82 deg
0						



D010 is boot up with 3 phases with CSD95373B's ~90usec rise and 634mV max



Output ripple: 12Vin 600mVout 0A load 4 phases with each phase at 173kHz: **6.5mV p-p** (20MHz BW) 18-Aug-14 19:35:58





-44 µV

476.111 kHz

1 DC 3.72mV

page 11 of 13

濐

mean()

BWL Freq(**1**)

AC DC ₁₀

DC

AC

Josh Mandelcorn

20 µs

2 mV 2 .5 V 3 .5 V 4 50 mV

500 MS/s

STOPPED

Thermal Image: 4 Phases 120A load off 600mV, 12Vin with CSD95373B's

EX320 Flir camera with emissivity set at 0.94 PMP10393: CSD95373B 222kHz 12Vin 600mV out at 120A 4 phases ~200 LFM airflow from right side: 15.8W on board ~22 deg. C ambient Power stages left to right: 60, 60, 57, 53 deg. C Inductor tops left to right: 44, 44, 40, 36



Q

Thermal Image: 3 Phases 120A load off 600mV, 12Vin with CSD95373B's

EX320 Flir camera with emissivity set at 0.94 PMP10393: CSD95373B 235.5kHz 12Vin 600mV out at 120A 3 phases ~200 LFM airflow from right side: 21.4W on board ~22 deg. C ambient Power stages left to right: 82, 82, 75 deg. C Inductor tops left to right: 53, 52, 45



Q

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