



FEATURES

- 40-60V Input Voltage Range (54V nominal)
- Up to 97.5% Efficiency
- Industry Standard 1/4th Brick Package
- Output Voltage/Current: 12V/150A
- Low Output Ripple & Noise
- Operating Temperature Range: -40°C to +85°C
- Integrated Baseplate for Thermal Performance
- Over Current /Voltage /Temperature Protection
- PMBusTM interface (optional)
- Remote On/Off(negative logic – standard configuration)
- Black Box Feature

SAFETY APPROVALS

- UL 62368-1 3rd Edition
- CSA C22.2 No. 62368-1-19
- IEC 62368-1:2018



PRODUCT OVERVIEW

MPQ1800-12V150-L48 Series are 1800W, highly efficient, digitally controlled DC-DC board-mount power converters with a single 12Vdc output. PMBus® digital communication capability, included in all base models, supports a comprehensive command list providing capability for the system/host to configure control and monitor status. Robust hardware fault protection from overvoltage, overtemperature and overload conditions is provided and supports operation over a wide temperature range.

ORDERING GUIDE¹

Part Number ¹	V _{IN} (V)	V _{OUT} (V)	P _{OUT} (W)	L inch(mm)	W inch(mm)	H inch(mm)
MPQ1800-12V150-L48NBMC	40-60	12	1800W	2.3 (58.42)	1.45 (36.83)	0.591(15.00)

¹ See the Part Number Structure table on page 2 for more information.

ABSOLUTE MAXIMUM RATINGS¹

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Voltage		-0.5	-	65	Vdc
Isolation Voltage	Input to Output	-	-	700V	
On/Off Remote Control		0	-	15	
Output Power ²		0	-	1800	W
Operating Temperature Range		-40	-	85	°C
Storage Temperature Range	Vin=Zero (no power)	-55	-	125	

¹ Absolute maximum are stress ratings. Exposure of devices to greater than any of these conditions might adversely affect long-term reliability.

² See thermal consideration section.

INPUT VOLTAGE CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Input Voltage, Operating		40	54	60	Vdc
Start-up Voltage		36	38	40	
Input Capacitance	2 Nichicon UPM1J470MPH or equivalent.	940	-	-	μF
Input Current		-	-	50	A
Inrush Current ¹		-	4-	-	A ² s
Ripple Current ²		-	1.25	-	mA _{RMS} /W

OUTPUT VOLTAGE CHARACTERISTICS

Parameter	Conditions	Min.	Nom.	Max.	Units
Peak Efficiency	Vin=40V, Pout=750W, Ta=25°C	-	97.5	-	%
Efficiency	Vin=48V, 50% of Max Pout, Ta=25°C	-	97	-	
	Vin=48V, 100% of Max Pout, Ta=25°C	-	96	-	
	Vin=54V, 50% of Max Pout, Ta=25°C	-	96.5	-	
	Vin=54V, 100% of Max Pout, Ta=25°C	-	95.5	-	
Output Voltage Set Point ⁴	Vin=54V, Pout=0W, Ta=25°C	11.94	12.0	12.06	
Output Current		0	-	150	A
Output Power		-	-	1800	W
Ripple and Noise	20MHz bandwidth	-	-	200	mVp-p
Output Capacitance	50% ceramic, 50% Oscon or POSCAP	2200	-	20,000	μF
Load Regulation		-	100	-	mV
Line Regulation		-	20	60	mV
Output voltage tolerance band	Vin=40-60V, 0-100% of Load	11.4	-	12.6	Vdc
Output Current share accuracy				5	%

NOTES:

¹ I_{in} is defined as the steady-state operating current when Unit is operating at V_{in} Max, While V_{out} is rising, P_{out} is ≤25% of rated power with a resistive load.

² Measured at input pin with maximum specified C_{in} and <500μH inductance between voltage source and C_{in}.

PART NUMBER STRUCTURE													
Product Family	M	P											MP = Murata Power
From Factor			Q										Q = Quarter Brick
Output Power				1800									1800W
Output Voltage					12V								12Vout
Output Current						150							150A
Input Voltage Range							L48						L48=40-60Vin
On/Off Control Logic								N					N = Negative Logic
Mechanical Configuration									B				B = Baseplate
PMBus Option										M			M = PMBus supported, Blank = No PMbus
Reflow Compliant											R		R= MSL-3 compliant packaging, Omit for Standard through hole processing
Power Good Signal(option) ¹												G	Omit = Low Logic(default), G = configurable(contact factory)
RoHS													C C = RoHS Compliant

¹ Contact Factory or local sales channels for availability

RELIABILITY & SAFETY					
Parameter	Conditions	Min.	Nom.	Max.	Units
Isolation Voltage	Input to Output Test Voltage	-	-	700	Vdc
	Input to Baseplate Test Voltage	-	-	700	
	Baseplate to Output Test Voltage	-	-	0	
Safety Rating	Functional	-	-	-	-
Isolation Capacitance		-	-	4700	pF
Calculated MTBF	Telcordia SR-332 @ 90°C baseplate temperature	6	-	-	Mhrs

TURN-ON/TURN-OFF CHARACTERISTICS					
Parameter	Conditions	Min.	Nom.	Max.	Units
Turn-On Delay-1	from Vin reaching Turn-On voltage, Vin slew rate is 1V/ms	-	-	24	ms
Turn-On Delay-2	from Enabled asserted	-	-	15	
Restart Delay		-	15	-	
Output Voltage Rise Time		-	-	20	Vdc
Pre-Bias Voltage		0	-	V _{out}	

PROTECTION					
Parameter	Conditions	Min.	Nom.	Max.	Units
Vin Undervoltage Shutdown		34	36	38	Vdc
Vin Undervoltage Shutdown Recover		36	38	40	
Vin UVP Hysteresis		1	-	4	
Vin Overvoltage Shutdown		62	64	67	
Vin Overvoltage Shutdown Recover		60	62	64	
Vin OVP Hysteresis		1	-	5	
Vout Overvoltage Shutdown		-	14.2	-	A
Output Over-Current	Tp1<Max Tp1	206	220	234	
Output current limit (OCP) response time and type	Disable and do not retry	20	30	50	us
Current limit threshold (Slow OCP)	-		200		A
Current limit Off Delay (Slow OCP)	Load step 150-200A			100	ms
Over-Temperature (internal temperature sensor)		-	125	-	°C

Note: The protection threshold can be configured through PMBus. See the PMBus section for details.

OUTPUT ENABLE (NEGATIVE LOGIC)					
Parameter	Conditions	Min.	Nom.	Max.	Units
Unit OFF: On/Off Pin open ^{1, 2, 3}		2.4	-	20	Vdc
Unit ON: On/Off Pin low ^{1, 2, 3}		-0.1	-	0.8	mV
Enable Pin Current (into pin, ext. pull-up to 15V) ^{1, 2, 3}		-	-	0.5	mA
Enable Pin Current (into pin, ext. pull-up to 10V) ^{1, 2, 3}		-	-	0.3	
¹ Enable signal is referenced to V _{in} (-).					
² Unit disabled using the Control Pin, open collector configuration.					
³ The enable logic can be changed via PMBus.					

DYNAMIC CHARACTERISTICS					
Parameter	Conditions	Min.	Nom.	Max.	Units
Dynamic Load Response ^{1, 2}		-	-	250	μS
Dynamic Load Peak Deviation ^{1, 2}		-	-	±600	mV
Response to Vin Step ³		-	-	1.5	Vdc
¹ 25-75-25% load step of Pout Max at 1A/μS, settling time to within 1% of Vout, measurement method.					
² With a 4500μF output capacitance, 50% ceramic, 50% OSCON or POSCAP.					
³ The occurring max 0.1V/μS rate within Vin operating range, Pout = 10% - 100% Rated Power, Cout = Cout Max /2.					

POWER-GOOD SIGNAL ¹					
Parameter	Conditions	Min.	Nom.	Max.	Units
Output Voltage Low (trigger limits)		-	9	-	Vdc
Output Voltage High (trigger limits)		-	10.8	-	
Output Voltage Hysteresis		0.2		-	
High State Voltage		2.8	-	5.5	μA
High State Leakage Current (into pin)		2.8	-	10	
Low State Voltage		0	-	0.8	Vdc
Low State Current (into pin)		0	-	5	mA
Power Good Signal De-assert Response Time		0	-	3	ms
Power Good Signal Assert Response Time		0	-	3	
¹ The power good logic can be changed via PMBus.					

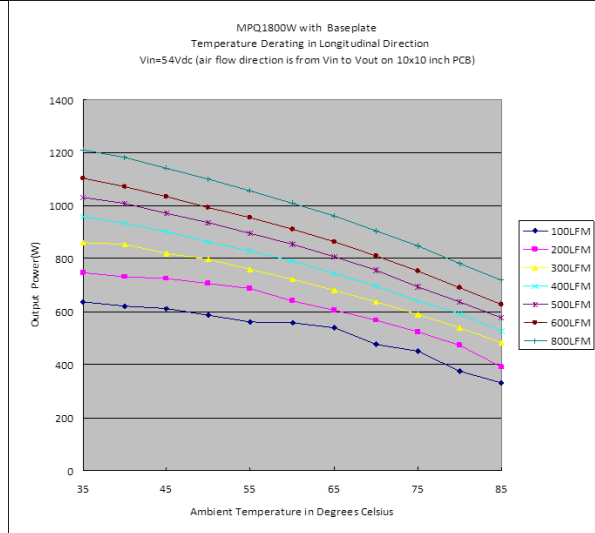
ENVIRONMENTAL CHARACTERISTICS					
Parameter	Conditions	Min.	Nom.	Max.	Units
Operating Temperature - Ambient		-40	-	85	°C
Storage Temperature		-50	-	125	
Altitude, Operating		-500	-	13,120	feet
Relative Humidity, Operating, Non-Condensing		10	-	90	%
Relative Humidity, Non-Operating, Non-Condensing		10	-	95	
Electromagnetic Interference Conducted, EN55022/CISPR22, Part 15 (external filter required)			A		Class

GENERAL INFORMATION					
Parameter	Conditions	Min.	Typ.	Max.	Units
Mechanical Dimensions (L x W x H)		2.3 x 1.45 x 0.58			inches
		58.42 x 36.83 x 15.0			mm
Product Weight (per unit)			3.74		ounces
			106		grams
Pin Length			0.210		inches
			5.3		mm

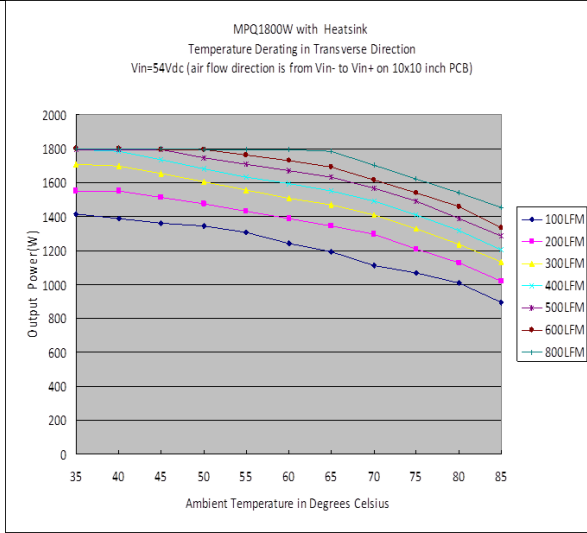
Pin Diameter		0.04/0.06	inches
		1.02/2.154	mm
Pin Material		Copper with gold plating over nickel under plating	
Baseplate Material		Black anodized aluminum	

Performance Curves

Thermal Derating

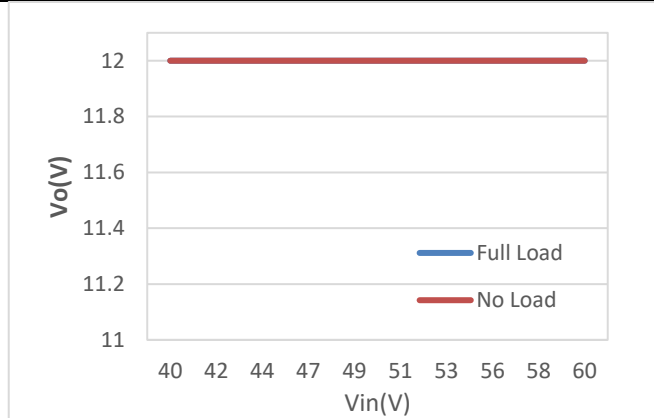


Baseplate – 54Vin

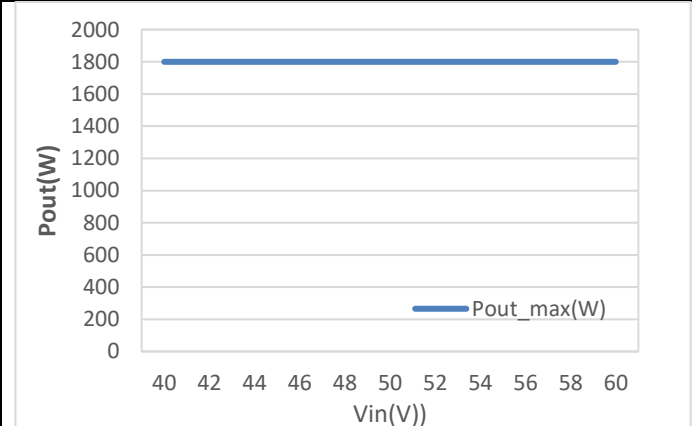


1" Heat Sink – 54Vin

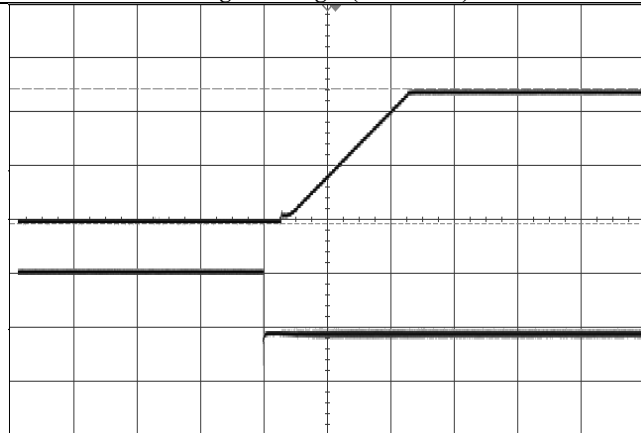
Output Voltage vs Input Voltage



Output Power vs Input Voltage

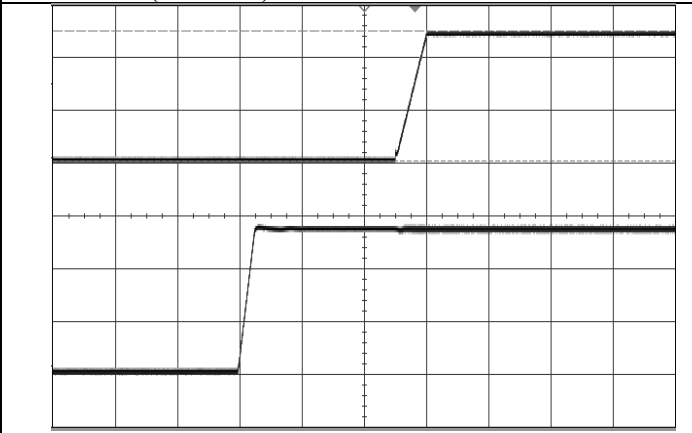


Enable Turn on - Negative Logic (Vin = 54V)



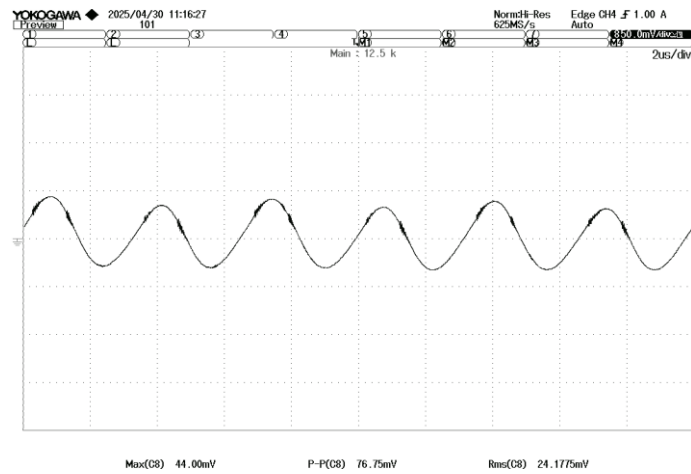
Top Trace: Vout, 5V/div
Bottom trace: Venable, 5V/div
Time: 5ms/div

Vin Turn on (Vin = 54V)

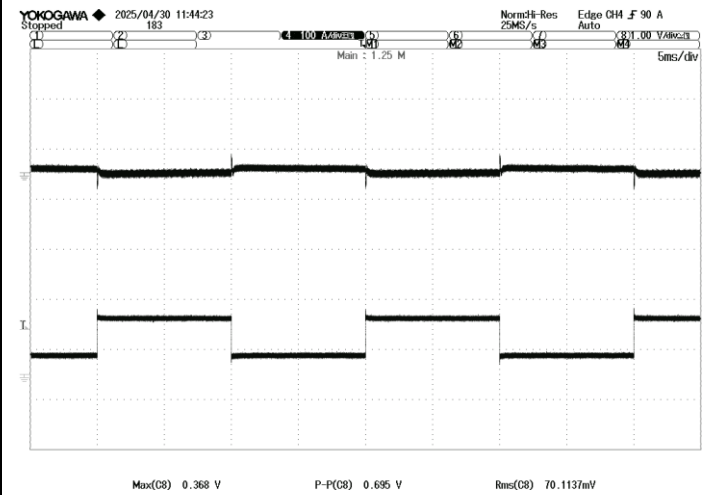


Top Trace: Vout, 5V/div
Bottom trace: Vin, 20V/div
Time: 20ms/div

Ripple & Noise



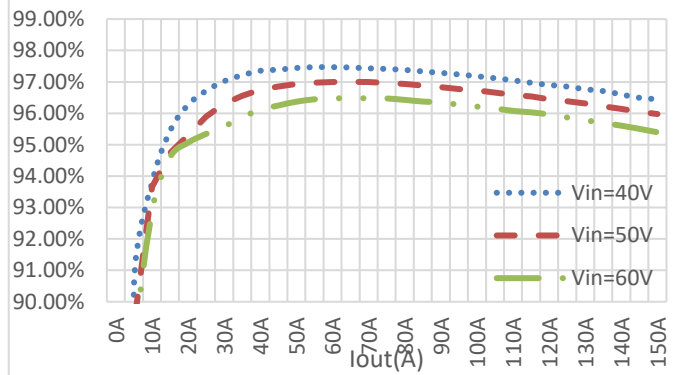
Transient Response



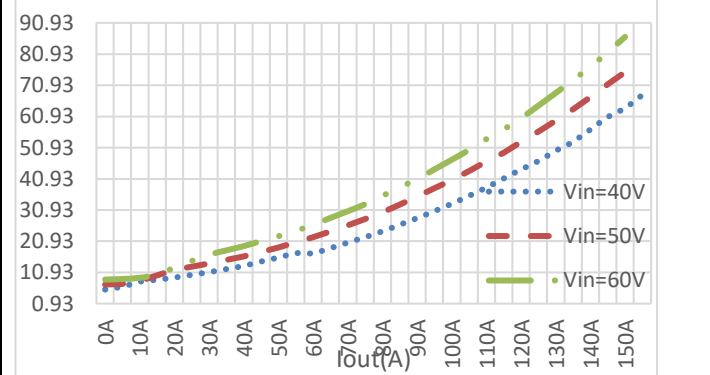
Trace: Vout, 50mV/div
Time: 2uS/div

Top Trace: Vout, 1V/div
Bottom trace: Iout, 100A/div
Time: 5ms/div

Efficiency



Power Loss



PMBus Monitoring Accuracy

Parameter	Conditions	Min.	Typ.	Max.	Units
PMBus General					
PMBus Rev. 1.2; SMBALERT# is supported; PEC is supported; Linear data format is used.					
Bus Speed			100/400		kHz
Logic High Input		2.1		3.3	Vdc
Logic Low Input		0		0.8	Vdc
Logic High Output		2.3			Vdc
Logic Low Output				0.4	Vdc
PMBus Monitoring Accuracy					
VIN_READ		-4		4	%
VOUT_READ		-2		2	%
IOUT_READ	Vin=54V, Io=50% ~ 100% of Io, max.	-6		6	%
	Vin=54V, Io=5% ~ 50% of Io, max.	-4.5		4.5	A
TEMP_READ		-5		5	°C

PMBus Commands List

CMD	Command Name	PMBus Transaction Type: Writing Data	PMBus Transaction Type: Reading Data	Number Of Data Bytes	Default Value		Unit
00h	PAGE	Write Byte	Read Byte	1	0x00		
01h	OPERATION	Write Byte	Read Byte	1	0x80		
02h	ON_OFF_CONFIG	Write Byte	Read Byte	1	0x1D		
03h	CLEAR_FAULTS	Send Byte		1			
10h	WRITE_PROTECT	Write Byte	Read Byte	1	0x00		
11h	STORE_DEFAULT_ALL	Send Byte		1			
12h	RESTORE_DEFAULT_ALL	Send Byte		1			
15h	STORE_USER_ALL	Send Byte		1			
16h	RESTORE_USER_ALL	Send Byte		1			
17h	STORE_USER_CODE	Write byte		1			
18h	RESTORE_USER_CODE	Write byte		1			
19h	CAPABILITY	N/A	Read Byte	1	0b10110000		
18h	SMBALERT_MASK	Write word	Block Write-Block Read Process Call	2	N/A		
20h	VOUT_MODE	Write Byte	Read Byte	1	14	-12	
21h	VOUT_COMMAND	Write Word	Read Word	2	C000	12.000	V
22h	VOUT_TRIM	Write Word	Read Word	2	0000	0.00000	V
23h	VOUT_CAL_OFFSET	Write Word	Read Word	2	0000	0.00000	V
24h	VOUT_MAX	Write Word	Read Word	2	D800	13.500	V
25h	VOUT_MARGIN_HIGH	Write Word	Read Word	2	D333	13.19995	V
26h	VOUT_MARGIN_LOW	Write Word	Read Word	2	ACCD	10.80005	V
27h	VOUT_TRANSITION_RATE	Write Word	Read Word	2	E810	2.000	mV/us
28h	VOUT_DROOP	Write Word	Read Word	2	E806	0.750	mΩ
29h	VOUT_SCALE_LOOP	Write Word	Read Word	2	1732	0.090606690000	
28h	VOUT_MIN	Write Word	Read Word	2	0100	0.063	V
32h	MAX_DUTY	Write Word	Read Word	2	F18A	98.50	%

CMD	Command Name	SMBus Transaction Type: Writing Data	SMBus Transaction Type: Reading Data	Number Of Data Bytes	Default Value		Unit
33h	FREQUENCY_SWITCH	Write Word	Read Word	2	0096	150	kHz
34h	POWER_MODE	Write Byte	Read Byte	1	03	0x03	
35h	VIN_ON	Write Word	Read Word	2	F088	34.00	V
36h	VIN_OFF	Write Word	Read Word	2	0000	0x0000	V
39h	IOUT_CAL_OFFSET	Write Word	Read Word	2	F7EE	-4.5	A
40h	VOUT_OV_FAULT_LIMIT	Write Word	Read Word	2	E333	14.2	V
41h	VOUT_OV_FAULT_RESPONSE	Write Byte	Read Byte	1	87	Disable and Retry- No retry-128 delay unit	
42h	VOUT_OV_WARN_LIMIT	Write Word	Read Word	2	D330	13.199	V
43h	VOUT_UV_WARN_LIMIT	Write Word	Read Word	2	A000	10	V
44h	VOUT_UV_FAULT_LIMIT	Write Word	Read Word	2	8000	8	V
45h	VOUT_UV_FAULT_RESPONSE	Write Byte	Read Byte	1	87	Disable and Retry- No retry-128 delay unit	
46h	IOUT_OC_FAULT_LIMIT	Write Word	Read Word	2	00DC	220	A
47h	IOUT_OC_FAULT_RESPONSE	Write Byte	Read Byte	1	D7	Shutdown-Retry Twice-128 delay unit	
48h	IOUT_OC_LV_FAULT_LIMIT	Write Word	Read Word	2	0000	0	
4Ah	IOUT_OC_WARN_LIMIT	Write Word	Read Word	2	00A5	165	A
48h	IOUT_UC_FAULT_LIMIT	Write Word	Read Word	2	0780	-128	
4Ch	IOUT_UC_FAULT_RESPONSE	Write Byte	Read Byte	1	07	Ignore-No retry- 128 delay unit	
4Fh	OT_FAULT_LIMIT	Write Word	Read Word	2	007D	125 °C	°C
50h	OT_FAULT_RESPONSE	Write Byte	Read Byte	1	FD	Disable & Resume when ok-Retry Continuously-32 delay unit	
51h	OT_WARN_LIMIT	Write Word	Read Word	2	006E	110	°C
52h	UT_WARN_LIMIT	Write Word	Read Word	2	0FEC	-40	
53h	UT_FAULT_LIMIT	Write Word	Read Word	2	0FE7	-50	
54h	UT_FAULT_RESPONSE	Write Byte	Read Byte	1	07	Ignore-No retry- 128 delay unit	
55h	VIN_OV_FAULT_LIMIT	Write Word	Read Word	2	F100	64.0000 V	V
56h	VIN_OV_FAULT_RESPONSE	Write Byte	Read Byte	1	FD	Disable & Resume when ok-Retry Continuously-32 delay unit	
57h	VIN_OV_WARN_LIMIT	Write Word	Read Word	2	F0F8	62.0000	V
58h	VIN_UV_WARN_LIMIT	Write Word	Read Word	2	F098	38.0000	V
59h	VIN_UV_FAULT_LIMIT	Write Word	Read Word	2	F090	36.0000	V
5Ah	VIN_UV_FAULT_RESPONSE	Write Byte	Read Byte	1	FD	Disable & Resume when ok-Retry Continuously-32 delay unit	
5Eh	POWER_GOOD_ON	Write Word	Read Word	2	8000	8.000	V
5Fh	POWER_GOOD_OFF	Write Word	Read Word	2	5000	5.000	V

CMD	Command Name	PMBus Transaction Type: Writing Data	PMBus Transaction Type: Reading Data	Number Of Data Bytes	Default Value		Unit
60h	TON_DELAY	Write Word	Read Word	2	F804	2.0 ms	ms
61h	TON_RISE	Write Word	Read Word	2	F050	20.000 ms	ms
62h	TON_MAX_FAULT_LIMIT	Write Word	Read Word	2	F3FC	255.000 ms	ms
63h	TON_MAX_FAULT_RESPONSE	Write Byte	Read Byte	1	00	Ignore-No retry-1 delay unit	
64h	TOFF_DELAY	Write Word	Read Word	2	F800	0.0 ms	ms
65h	TOFF_FALL	Write Word	Read Word	2	F000	0.0 ms	ms
6Ah	POUT_OP_WARN_LIMIT	Write Word	Read Word	2	11EF	1980.000	W
68h	PIN_OP_WARN_LIMIT	Write Word	Read Word	2	1203	2060.000	W
78h	STATUS_BYTE	Write byte	Read Byte	1	41	0x41	
79h	STATUS_WORD	Write Word	Read Word	2	8A41	0x8A41	
7Ah	STATUS_VOUT	Write byte	Read Byte	1	10	0x10	
7Bh	STATUS_IOUT	Write byte	Read Byte	1	00	0x00	
7Ch	STATUS_INPUT	Write byte	Read Byte	1	00	0x00	
7Dh	STATUS_TEMPERATURE	Write byte	Read Byte	1	00	0x00	
7Eh	STATUS_CML	Write byte	Read Byte	1	00	0x00	
7Fh	STATUS_OTHER	Write byte	Read Byte	1	01	0x01	
80h	STATUS_MFR_SPECIFIC	Write byte	Read Byte	1			
88h	READ_VIN		Read Word	2			
89h	READ_IIN		Read Word	2			
8Bh	READ_VOUT		Read Word	2			
8Ch	READ_IOUT		Read Word	2			
8Dh	RAED_TEMPERATURE_1		Read Word	2			
8Eh	READ_TEMPERATURE_2		Read Word	2			
94h	READ_DUTY_CYCLE		Read Word	2			
95h	READ_FREQUENCY		Read Word	2			
96h	READ_POUT		Read Word	2			
97h	READ_PIN		Read Word	2			
98h	PMBUS_REVISION		Read Byte	1	0x33		
99h	MFR_ID	Block Write	Block Read	12	20202073702D61746152756D	muRata-Ps	
9Ah	MFR_MODEL	Block Write	Block Read	20	2A4E38344C2D3035315632312D3030383151504D	MPQ1800-12V150-L48N*	
9Bh	MFR_REVISION	Block Write	Block Read	12			
9Ch	MFR_LOCATION	Block Write	Block Read	12	2020204E414855575F534144	XXXXXX	
9Dh	MFR_DATE	Block Write	Block Read	12		YYYYMMDD	
9Eh	MFR_SERIAL	Block Write	Block Read	20	2020202020202020303030303030303030303030	xxxxxxxxxxx	
A0h	MFR_VIN_MIN	Write Word	Read Word	2	0028	40	V
A1h	MFR_VIN_MAX	Write Word	Read Word	2	003C	60	V
A2h	MFR_IIN_MAX	Write Word	Read Word	2	003C	60	A

CMD	Command Name	SMBus Transaction Type: Writing Data	SMBus Transaction Type: Reading Data	Number Of Data Bytes	Default Value		Unit
A3h	MFR_PIN_MAX	Write Word	Read Word	2	03FF	1023	W
A4h	MFR_VOUT_MIN	Write Word	Read Word	2	6000	6	V
A5h	MFR_VOUT_MAX	Write Word	Read Word	2	F99A	15.6	V
A6h	MFR_IOUT_MAX	Write Word	Read Word	2	0096	150	A
A7h	MFR_POUT_MAX	Write Word	Read Word	2	03FF	1023	W
A8h	MFR_TAMBIENT_MAX	Write Word	Read Word	2	0055	85.000	°C
B1h	MFR_VOUT_OVP_FAULT_LIMIT	Write Word	Read Word	2	E800	14.2	v
B2h	MFR_VOUT_OVP_FAULT_RESPONSE	Write Byte	Read Byte	1	80	Disable and Retry- No retry-128 delay unit	
B3h	MFR_VOUT_UVP_FAULT_LIMIT	Write Word	Read Word	2	ACCD	10.8	v
B4h	MFR_VOUT_UVP_FAULT_RESPONSE	Write Byte	Read Byte	1	0	Ignore-No retry- 128 delay unit	
B7h	MFR_OTP_CRC	Block Write	Block Read	4	0		
CAh	MFA_IOUT_OC_FAST_FAULT_RESPONSE	Write Byte	Read Byte	1	CA	Shutdown-Retry once-4 delay unit	
CDh	MFR_VRECT_SCALE	Write Word	Read Word	2	B04B	0.073	
CEh	MFR_TRANSFORMER_SCALE	Write Word	Read Word	2	B155	0.333	
D1h	MFR_IOUT_OC_FAST_FAULT_LIMIT	Write Word	Read Word	2	00F0	240	A
DAh	MFR_ISHARE_THRESHOLD	Write Word	Read Word	2	9		
DCh	MFR_SELECT_TEMPERATURE_SENSOR	Write Byte	Read Byte	1	0B	0x0B	
DFh	MFR_BLACKBOX_ERASE	Write Word	Read Word	2	0000		
E0h	MFR_BLACKBOX_DATA_READ		Block Read	31	FFFFFFFFFFFFFFFF FFFFFFFFFFFFFFFF FFFFFFFFFFFFFFFF FFFFFFFF		
E1h	MFR_BLACKBOX_INDEX	Write Byte	Read Byte	1	2		
E2h	MFR_BLACKBOX_MAX_CAPACITY		Read Byte	1	0F		
E3h	MFR_BLACKBOX_RECORD_COUNT		Read Word	2	002D		
E5h	MFR_BLACKBOX_CONFIG	Write Byte	Read Byte	1	3		
EAh	MFR_IOUT_APC	Write Word	Read Word	2	B927	0.5762	
F0h	MFR_DEBUG_BUFF		Block Read	8	0000000000000000 00	0x000000000000 0000	
FDh	MFR_FIRMWARE_COMMAND_DATA	Block Write	Block Read	16	00000000	0x0000000000	
F6h	MFR_FW_OCP_FAULT_LIMIT	Write Word	Read Word	2	00B4	180	A
F7h	MFR_FW_OCP_FAULT_RESPONSE	Write Byte	Read Byte	1	80	latch	

CMD	Command Name	SMBus Transaction Type: Writing Data	SMBus Transaction Type: Reading Data	Number Of Data Bytes	Default Value		Unit
F8h	MFR_FW_OCP_FAULT_CNT	Write Word	Read Word	2	64	100	ms
FCh	MFR_ADDED_DROOP_DURING_RAMP	Write Word	Read Word	2	2	2	mΩ

Notes:

* Only available in supervisor mode (default state is user mode, send password to command 0xFC to change to supervisor mode).

- a) Unit restores the entire contents of the non-volatile user store memory when power up.
- b) PEC is needed when write or send data to power module.
- c) Maximum bus speed: 400kHz.
- d) Linear data format used.
- e) Addressing: If PMBus address setting out of the address table, default PMBus address 64d is assigned instead.

MFR Commands

01-FCh (see PMBUS 1.2 Specification & Command List)

41h VOUT_OV_FAULT-RESPONSE

Bits	Meaning
7:6	Response: 00: Ignore 01: Operate for delay time then shut down if fault condition is still present 10: Disable and retry 11: Disable and resume when OK
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 1ms)

45h VOUT_UV_FAULT-RESPONSE

Bits	Meaning
7:6	Response: 00: Ignore 01: Operate for delay time then shut down if fault condition is still present 10: Disable and retry 11: Disable and resume when OK
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on retry number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 1ms)

47h IOUT_OC_FAULT_RESPONSE

Bits	Meaning
7:6	Response:

	00: Continues to operate while maintaining the output current (CC) 01: Continues to operate while maintaining the output current, with overcurrent low voltage protection 10: Continues to operate while maintaining the output current for delay time 11: Shut down and retry
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on retry number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 4ms)

50h OT_FAULT_RESPONSE

Bits	Meaning
7:6	Response: 00: Ignore 01: Operate for delay time then shut down if fault condition is still present 10: Disable and retry 11: Disable and resume when OK
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on retry number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 1ms)

56h VIN_OV_FAULT_RESPONSE

Bits	Meaning
7:6	Response: 00: Ignore 01: Operate for delay time then shut down if fault condition is still present 10: Disable and retry 11: Disable and resume when OK
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on retry number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 1ms)

5Ah VIN_UV_FAULT_RESPONSE

Bits	Meaning
7:6	Response: 00: Ignore 01: Operate for delay time then shut down if fault condition is still present 10: Disable and retry 11: Disable and resume when OK
5:3	Retry setting: 000: No retry 001 to 110: Retry 1 to 6 times based on retry number 111: Retry continuously
2:0	Delay time in ms. Delay time, ms = (2 ^{delay time}) * Vout_Delay_Unit (configured by FW_CONFIG_FAULTS) (Time unit 1ms)

E0h MFR_READ_HISTORY_EVENTS (31bytes)

Read the black box stored data

Bytes	Meaning	Bytes	Meaning
0	Event Number	16	Power On Timer Byte0
1	Status Word High Byte	17	Power On Timer Byte1
2	Status Word Low Byte	18	Power On Timer Byte2
3	Status Vout	19	Power On Timer Byte3
4	Status Iout	20	RSVD
5	Status Input	21	RSVD
6	Status Temperature	22	RSVD
7	Status CML	23	RSVD
8	READ_VIN High Byte	24	RSVD
9	READ_VIN Low Byte	25	RSVD
10	READ_VOUT High Byte	26	RSVD
11	READ_VOUT Low Byte	27	RSVD
12	READ_IOUT High Byte	28	RSVD
13	READ_IOUT Low Byte	29	RSVD
14	READ_TEMPERATURE High Byte	30	RSVD
15	READ_TEMPERATURE Low Byte		

E1h MFR_SET_HISTORY_EVENT_OFFSET.

This instruction is used to set the offset of a specified event record. By setting the corresponding time offset, the corresponding event record information can be read using the 0xE0 instruction. Meanwhile, it should be noted that this module can only record a maximum of 15 records, and the offset setting cannot exceed 15

E2h PMBUS_CMDCODE_MFR_BLACKBOX_MAX_CAPACITY

This instruction is a read-only byte instruction that represents the maximum number of event records for the module. MPQ1800 can only record a maximum of 15 records.

E3h PMBUS_CMDCODE_MFR_BLACKBOX_RECORD_COUNT

This instruction is a read-only byte instruction, indicating how many events have occurred in the module in total.

E5h PMBUS_CMDCODE_MFR_BLACKBOX_CONFIG

default 0x03

Bit0: Blackbox Enable

Black-box enable means that when a module malfunctions, the corresponding fault information can be recorded. 0 indicates disabled, and 1 indicates enabled.

Bit1: Rewrite Enable

The rewrite function means that when the module's EERPOM records reach 15 entries, if rewrite is enabled, fault information will start from entry 0 and overwrite the existing records. If disabled, the module will stop recording subsequent events once it reaches 15 entries.

Status Word and Byte

GREEN = Supported

STATUS_VOUT
7 VOUT_OV_FAULT
6 VOUT_OV_WARNING
5 VOUT_UV_WARNING
4 VOUT_UV_FAULT
3 VOUT_MAX Warning
2 TON_MAX_FAULT
1 TOFF_MAX_WARNING
0 VOUT Tracking Error

STATUS_IOUT
7 IOUT_OC_FAULT
6 IOUT_OC_LV_FAULT
5 IOUT_OC_WARNING
4 IOUT_UC_FAULT
3 Current Share Fault
2 In Power Limiting Mode
1 POUT_OP_FAULT
0 POUT_OP_WARNING

STATUS_TEMPERATURE
7 OT_FAULT
6 OT_WARNING
5 UT_WARNING
4 UT_FAULT
3 Reserved
2 Reserved
1 Reserved
0 Reserved

STATUS_CML
7 Invalid/Unsupported Command
6 Invalid/Unsupported Data
5 Packet Error Check Failed
4 Memory Fault Detected
3 Processor Fault Detected
2 Reserved
1 Other Communication Fault
0 Other Memory Or Logic Fault

STATUS_WORD
7 VOUT
6 IOUT/POUT
5 INPUT
4 MFR_SPECIFIC
3 POWER_GOOD#
2 FANS
1 OTHER
0 UNKNOWN
7 BUSY
6 OFF
5 VOUT_OV_FAULT
4 IOUT_OC_FAULT
3 VIN_UV_FAULT
2 TEMPERATURE
1 CML
0 CML

STATUS_OTHER
7 Reserved
6 Reserved
5 Input A Fuse/Breaker Fault
4 Input B Fuse/Breaker Fault
3 Input A OR-ing Device Fault
2 Input B OR-ing Device Fault
1 Output OR-ing Device Fault
0 Reserved

STATUS_INPUT
7 VIN_OV_FAULT
6 VIN_OV_WARNING
5 VIN_UV_WARNING
4 VIN_UV_FAULT
5 VIN_UV_FAULT
2 IIN_OC_FAULT
1 IIN_OC_WARNING
0 PIN_OP_WARNING

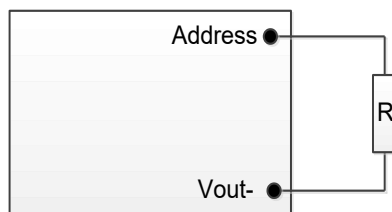
STATUS_MFR_SPECIFIC
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined
Manufacturer Defined

STATUS_FANS_1_2
7 Fan 1 Fault
6 Fan 2 Fault
5 Fan 1 Warning
4 Fan 2 Warning
3 Fan 1 Speed Override
2 Fan 2 Speed Override
1 Air Flow Fault
0 Air Flow Warning

STATUS_FANS_3_4
7 Fan 3 Fault
6 Fan 4 Fault
5 Fan 3 Warning
4 Fan 4 Warning
3 Fan 3 Speed Override
2 Fan 4 Speed Override
1 Reserved
0 Reserved

PMBus Address List

The module has flexible PMBus addressing capability. By connecting different resistors from Address pin to GND pin, 14 possible addresses can be acquired. The 7-Bit PMBus address is defined by the value of the resistor as shown in the table below, and +/-1% resistor accuracy is acceptable. If there is any resistance exceeding the requested range.



PMBus address is selected by applying an external resistor from the Address to Vout (-) as defined in the table below.

I²C/PMBus address offset of eight-segment decode

Resistor-to-GND (1 percent accuracy)		Address
XADDR1,	1.20 kΩ	0x47
	1.80 kΩ	0x46
	2.70 kΩ	0x45
	3.90 kΩ	0x44
	6.80 kΩ	0x43
	10.00 kΩ	0x42
	18.00 kΩ	0x41
	47.00 kΩ or open)	0x40

If PMBus address setting is out of the address table, default PMBus address 0x40 is assigned instead.

PIN DEFINITION/DETAILS

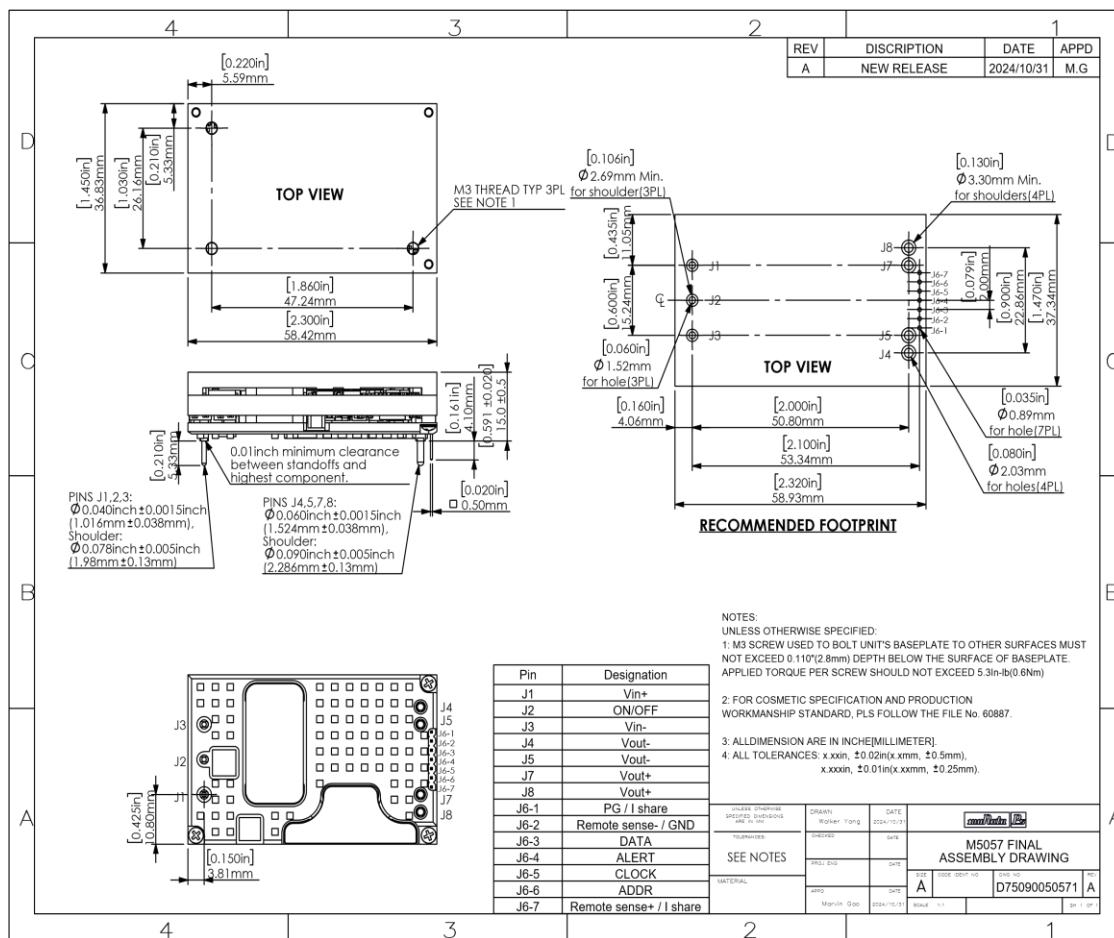
Input/Output Pinout Table

Pin #	Notes	Diameter (inches)	Length (inches)	Name	Function
J1	1, 2	0.040	0.180	Vin(+)	Positive input voltage
J2	1, 2	0.040	0.180	Enable	Turns unit On (low) and Off (high or open)
J3	1, 2	0.040	0.180	Vin(-)	Negative input voltage
J4	1, 2	0.060	0.180	Vout(-)	Negative output voltage
J5	1, 2	0.060	0.180	Vout(-)	Negative output voltage
J6-1		0.028	0.150	PG	Power Good/ Current Share Bus
J6-2		0.028	0.150	GND	GND/Remote sense-
J6-3		0.028	0.150	DATA	
J6-4		0.028	0.150	ALERT	
J6-5		0.028	0.150	CLOCK	
J6-6		0.028	0.150	ADDR1	
J6-7		0.028	0.150	IMON	Current Share Bus/Remote sense+
J7	1,2	0.06	0.180	Vout(+)	Positive output voltage
J8	1,2	0.06	0.180	Vout(+)	Positive output voltage

1 Tolerance on pin diameter is $\pm 0.0015"$, tolerance on pin length is $\pm 0.010"$

2 Unit's footprint on customer's PCB has pin holes that are 40mils larger than unit pin diameter. Design of the unit must prevent it from mounting lower Customer's PCB than intended. If pin shoulders are used for this purpose, they must be a minimum (including tolerance) of 45mils larger than unit's nominal pin diameter. Shoulder design must allow out-gassing from pin holes during customer's manufacturing process.

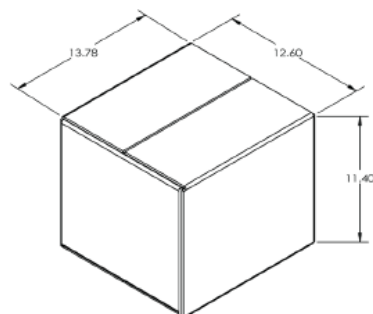
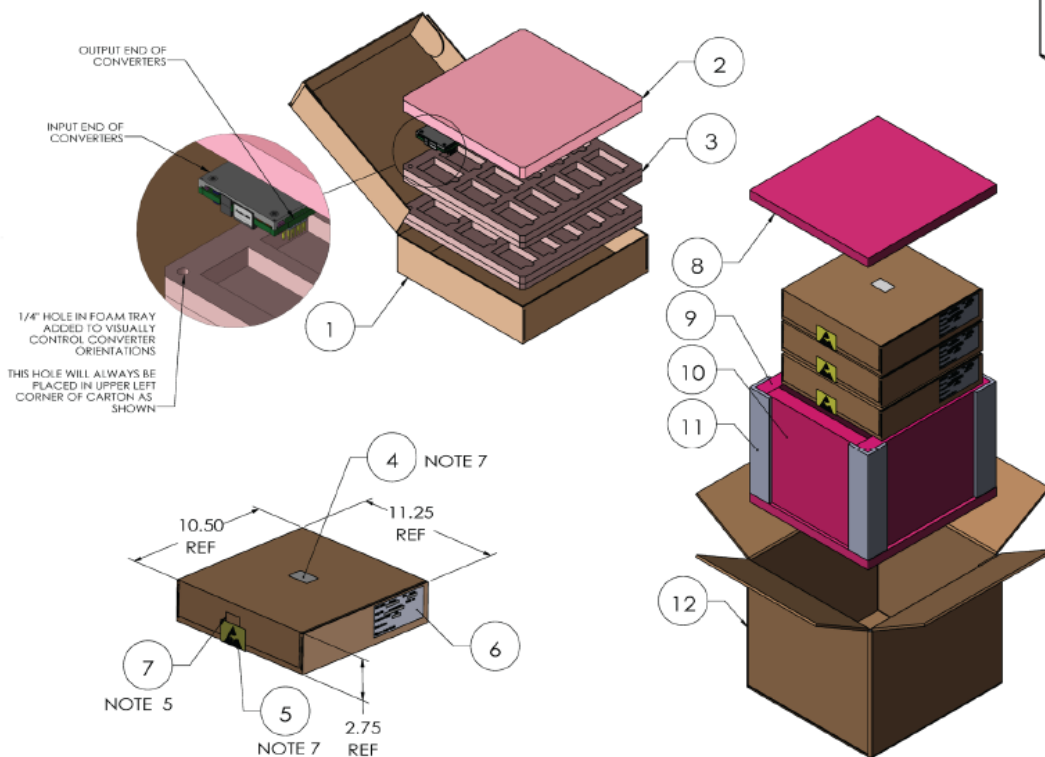
MECHANICAL SPECIFICATIONS



PACKAGING INFORMATION

ITEM NO. (95000050121)	PART NUMBER	DESCRIPTION	QTY
1	2300208	SHIPPING BOX, 10" X 10" X 2.50"	3
2	2300221	SHIPPING TRAY BASE (PAD), .75" THICK	3 (NOTE 8)
3	2300234	SHIPPING TRAY, 1/4 BRICK (15 CAVITY)	6
4	2300159	LABEL, 1.0" X 1.5" PAPER	3
5	5600-01098-0	LABEL, PRE-PRINTED ESD ATTENTION	3
6	5652-01166-0	LABEL, PAPER, 2.0" X 4.0"	3 (NOTE 6)
7	6200-01211-0	ESD TAPE, 3/4" WIDE	1.0'
8	6256-01125-0	ESD PAD 335mm X 305mm	2
9	6256-01124-0	ESD PAD 335mm X 225mm	2
10	6256-01126-0	ESD PAD 255mm X 225mm	2
11	6256-01127-0	RIGHT ANGLE CLIP	4
12	6256-01671-0	SHIPPING BOX, 350*320*230 WITH MFS LOGO	1

ITEM NUMBERS REFER TO 95000050121 BOM. ITEMS ABOVE ARE FOR REFERENCE ONLY, REFER TO APPROPRIATE BOM FOR COMPLETE LIST OF PARTS



NOTES:

1. THIS DOCUMENT DEFINES THE GENERAL PACKING RULES FOR APPLICABLE SHIPPING KIT. INFORMATION FOR SEALING AND MARKING IS NOT PART OF THIS DOCUMENT.
2. REFER TO SHIPPING KIT BOM DETAILS.
3. INSERT UNITS INTO FOAM POCKETS IN TRAYS APPROX AS SHOWN.
4. EACH FOAM TRAY (ITEM 3) CONTAINS 15 UNITS. EACH BOX (ITEM 1) CONTAINS 30 UNITS. IN FULL CARTON ITEM 12 QUANTITIES, 3 BOXES (ITEM 1) EQUAL A TOTAL OF 90 UNITS.
5. IF SHIPPING QTY IS 30PCS, PLEASE ALSO USE ITEM 12 TO MAKE THE PACKAGE (TWO EMPTY BOX ITEM 1 PUT ON THE BOX ITEM 1 WITH PRODUCTS).
6. FRONT FLAP SHALL BE SEALED WITH ESD TAPE SPECIFIED OR EQUIVALENT AFTER THE BOX IS CLOSED.
7. LABEL (ITEM 6) USED FOR MFR OVERPACK CARTON
8. APPLY ESD LABEL (ITEM 5) OVER TAPE USED TO SEAL BOX AND APPLY IDENTIFICATION LABEL (ITEM 4) APPROX AS SHOWN.
9. PAD (ITEM 2) MAY, AT MFR'S OPTION, BE EXCHANGED FOR THINNER PAD IF FOAM STACKUP EXCEEDS CARTON HEIGHT BY >1/8" OR ADDITIONAL PAD MAY BE ADDED IF STACKUP IS BELOW INSIDE CARTON HEIGHT BY >1/8".
ALTERNATE PADS: 1/4" THK=2300216, 3/8" THK=2300218, 1/2" THK=2300219, 3/4" THK=2300221

MPQ = 90

(15 units per tray, 2 trays per box, 3 boxes/cartons)

Shipping Box Dimensions = 10.0 inches x 10.0 inches x 2.5 inches

TECHNICAL NOTES

THROUGH-HOLE SOLDERING GUIDELINES

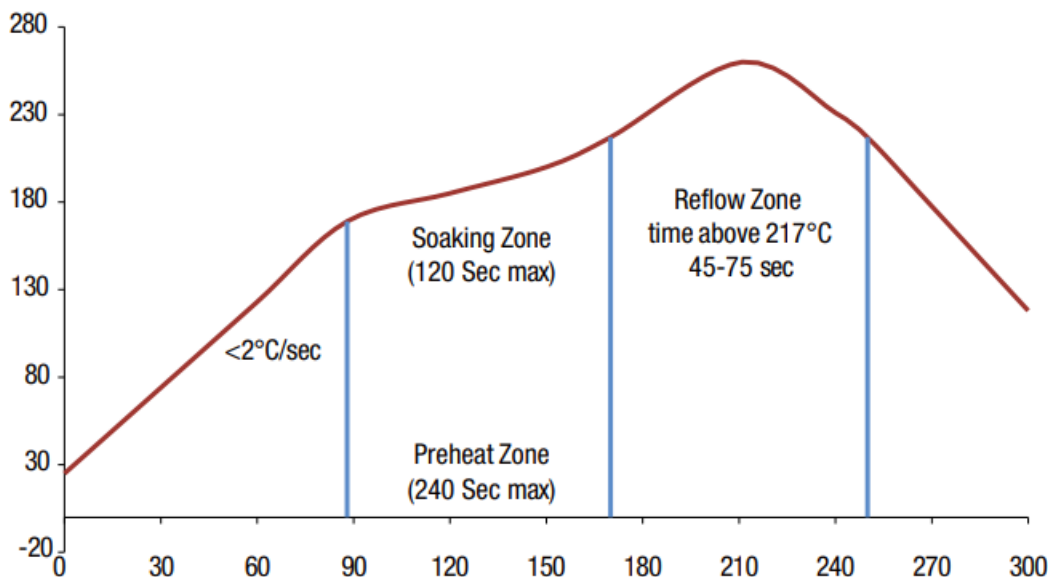
Murata Power recommends the following specifications when installing these converters. These specifications vary depending on the solder type.

Exceeding these specifications can cause damage to the product. Your production environment can differ; therefore, thoroughly review these guidelines with your process engineers.

The pin-in-paste mount product is intended for forced convection or vapor phase reflow soldering in SnPB and Pb-free process. Reflow soldering is not preferred for through-hole mounted power modules due to challenges resulting in reduced reliability. High temperature reflow soldering causing IMC layer thickness increase results in shorten solder joint lifetime. To avoid component or solder failure a module peak temperature higher than 245 degrees and above 217 degrees more than 90 seconds is not recommended. To prevent re-melt of module internal solder joints shielding cap is required during reflow process.

A no-clean flux is recommended to avoid entrapment of cleaning fluids in cavities inside the product or between the product and the host board, since cleaning residues may affect long time reliability and isolation voltage.

PIH Soldering Profile



Wave Solder Operations for through-hole mounted products (THMT)

For Sn/Ag/Cu based solders:

Maximum Preheat Temperature 115°C.
Maximum Pot Temperature 270°C.
Maximum Solder Dwell Time 7 seconds

For Sn/Pb based solders:

Maximum Preheat Temperature 105°C.
Maximum Pot Temperature 250°C.
Maximum Solder Dwell Time 6 seconds

Input Fusing

Certain applications and safety agencies might require fuses at the inputs of power conversion components. Fuses should also be used when there is the possibility of sustained input voltage reversal which is not currently limited. For greatest safety, Murata recommends a fast blow fuse installed in the ungrounded input supply line with a value which is approximately twice the maximum line current, calculated at the lowest input voltage. The installer must observe all relevant safety standards and regulations. For safety agency approvals, install the converter in compliance with the end-user safety standard.

Input Under-Voltage Shutdown and Start-Up Threshold

Under normal start-up conditions, converters will not begin to regulate properly until the rising input voltage exceeds and remains at the Start-Up Threshold Voltage (see Specifications). Once operating, converters will not turn off until the input voltage drops below the Under-Voltage Shutdown Limit. Subsequent restart will not occur until the input voltage rises again above the Start-Up Threshold.

This built-in hysteresis prevents any unstable on/off operation at a single input voltage. Be aware of input sources near the Under-Voltage Shutdown whose voltage decays as input current is consumed (such as capacitor inputs), the converter shuts off and then

restarts as the external capacitor recharges. Such situations could oscillate. To prevent this, ensure the operating input voltage is above the UV shutdown voltage at all times.

Start-Up Delay

Assuming that the output current is set at the rated maximum, the Vin to Vout Start-Up Time (see Specifications) is the time interval between the point when the rising input voltage crosses the Start-Up Threshold and the fully loaded regulated output voltage enters and remains within its specified regulation band. Actual measured times will vary with input source impedance, external input capacitance, input voltage slew rate and final value of the input voltage as it appears at the converter.

These converters include a soft start circuit to moderate the duty cycle of the PWM controller at power up, thereby limiting the input inrush current. The On/Off Remote Control interval from inception to Vout regulated assumes that the converter already has its input voltage stabilized above the Start-Up Threshold before the On command. The interval is measured from the On command until the output enters and remains within its specified regulation band. The specification assumes that the output is fully loaded at maximum rated current.

Input Source Impedance

To ensure peak performance and stability of this module in all applications, the input source impedance and load conditions must be understood. The input source and load conditions will affect the performance of the module in the application. The input source must have a low impedance and to ensure this, a minimum input capacitor of 940uF is recommended, mounted as close as possible to the input pins of the module.

The type of capacitor should also be considered, an electrolytic capacitor will degrade at lower temperatures therefore, the chosen capacitor should allow for temperature variations during operation of the module and maintain 470uF. If the input source is inductive, additional low ESR ceramic capacitors in the range of 22-100pF will be required across the Vin terminals to ensure stable operation. The output load also influences the minimum input capacitor requirements. Higher power, dynamic loading conditions might require higher input capacitance to ensure stable operation.

I/O Filtering, Input Ripple Current and Output Noise

All models in this converter series are tested and specified for input reflected ripple current and output noise using designated external input/output components, circuits and layout as shown in the figures below. External input capacitors (Cin in the figure) serve primarily as energy storage elements, minimizing line voltage variations caused by transient IR drops in the input conductors. Users should select input capacitors for bulk capacitance (at appropriate frequencies), low ESR and high RMS ripple current ratings. In the figure below, the Cbus and Lbus components simulate a typical DC voltage bus. Your specific system configuration might require additional considerations. Note that the values of Cin, Lbus and Cbus vary according to the specific converter model.

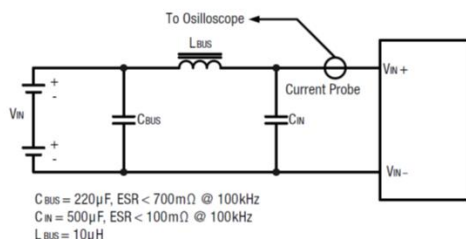


Figure 2. Measuring Input Ripple Current

In critical applications, output ripple and noise (also referred to as periodic and random deviations (PARD) can be reduced by adding filter elements such as multiple external capacitors. Be sure to calculate component temperature rise from reflected AC current dissipated inside the capacitor ESR.

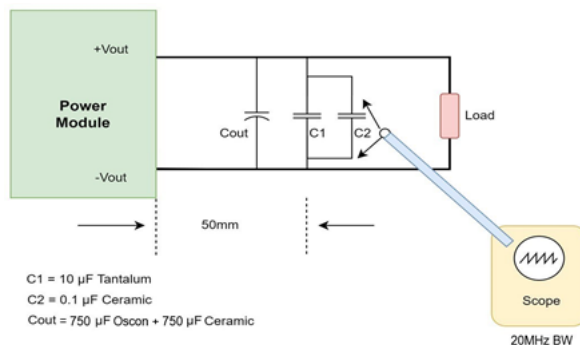
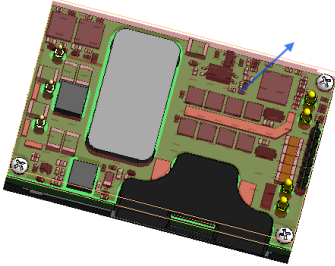


Figure 3. Measuring Output Ripple and Noise (PARD)

Product Operating Temperature

Product operating temperature is used to monitor the temperature of the product, and proper thermal conditions can be verified by measuring the temperature at position. Temperature at these positions (Tref_point) should not exceed the maximum temperature in the following table. The number of measurement points can vary with different thermal design and topology. Temperatures above maximum Tref_point, measured at the reference point are not allowed and can cause permanent damage.

Position	Description	Maximum Temperature
Reference Point	PCB Pin Side	Tref_point = 125°C



Thermal Shutdown

To protect against thermal overstress, these converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the DC/DC's to rise above their operating temperature range (up to the shutdown temperature) an on-board electronic temperature sensor will power down the unit. When the temperature decreases below the turn-on threshold, the converter will automatically restart. There is a small amount of hysteresis to prevent rapid on/off cycling. The temperature sensor is typically located adjacent to the switching controller, approximately in the center of the unit. See the Performance and Functional Specifications.

CAUTION: If you operate too close to the thermal limits, the converter might shut down suddenly without warning. Be sure to thoroughly test your application to the fan flowrate specifications.

Temperature Derating Curves

The graphs in this datasheet illustrate a typical operation under a variety of conditions. The Derating curves show the maximum continuous ambient air temperature and decreasing maximum output current, which is acceptable under increasing forced (airflow measured in Linear Feet per Minute "LFM"). Note that these are AVERAGE measurements. The converter accepts brief increases in current or reduced airflow as long as the average is not exceeded.

Note that the temperatures are of the ambient airflow, not the converter itself which is obviously running at higher temperature than the outside air. Also note that very low flow rates (below about 25 LFM) are similar to "natural convection," that is, not using fan-forced airflow.

Murata Power Solutions performs characterization measurements in a closed cycle wind tunnel with calibrated airflow. Both thermocouples and an infrared camera system are used to observe thermal performance. As a practical matter, it is quite difficult to insert an anemometer to precisely measure airflow in most applications. Sometimes it is possible to estimate the effective airflow if you thoroughly understand the enclosure geometry, entry/exit orifice areas and the fan flowrate specifications.

CAUTION: If you exceed these derating guidelines, the converter might have an unplanned Over-Temperature shut down. Also, these graphs are all collected near Sea Level altitude. Be sure to reduce the derating for higher altitude.

Peak Power/Slow OCP

In order to handle higher power than the thermal design power (TDP), the DC/DC converter uses a peak power calculation function. It is build upon a Exponential Moving Average (EMA) method, weighting new current measurements against old current measurements. At all times when telemetry is active, the instantaneous output current will be added to the average output current using EMA. A fault limit can be configured to compare against the averaged value and trigger the over current fault response when exceeded. Peak power is configured to allow a load step from TDP to Peak Power level for 100ms. Even higher power can be achieved but for a decreased time period. High di/dt on load step up to peak power, might cause current overshoot resulting in OCP fault. Maximum load step slew rate is application dependent and can vary between systems. Application test is required to find maximum load step slew rate.

Output Short Circuit Protection

If the output current is too high, the converter enters output short-circuit protection mode. In output short circuit protection mode, the DC/DC converter immediately turns off the PWM, the output voltage drops to 0V, and the module will enter latch mode. It can be recovered by restarting enable or Vin.

Remote On/Off Control

On the input side, a remote On/Off Control can be used with negative logic.

Negative: Models with negative logic are on (enabled) when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to $-V_{in}$. The device is off (disabled) when the On/Off is left open or is pulled high to approximately +15V with respect to $-V_{in}$.

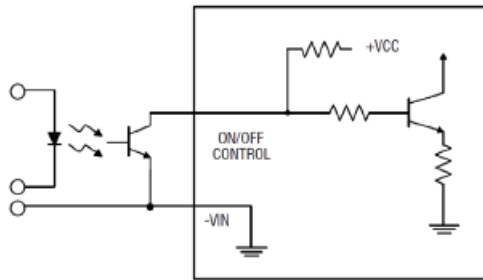


Figure 4. Driving the On/Off Control Pin (suggested circuit)

Load Sharing

Load sharing occurs when two or more MPQs are connected in parallel, at both the input and output terminals, to supply greater output current than one unit alone or to offer system redundancy for moderate loads. If one converter fails, the other converter(s) will carry the load until the system is repaired.

The MPQs design allows load sharing using the active current share method. Compared to using traditional droop load sharing (DLS), it enables better thermal balance between load and sharing units. This is due to the higher accuracy achieved by active current sharing, and the fact that each unit can deliver higher output power in parallel mode.

Load Sharing Guidelines

If you want to operate two or more MPQ's in load sharing, use the following guidelines:

[1] Operate both converters connected in parallel from the same 48V input power source. This simplifies the design and makes for more balanced power sharing. Using two different 48V input supplies must be carefully analyzed to avoid overloading one of the converters and is not recommended. Make sure the single 48V input source can supply the total current needed by all the parallel-connected MPQ's. (It is possible to rate the full system at more than the current capacity of a single MPQ. However, you lose the redundancy protection feature.)

[2] Use conservative loading. Do not assume for example that two parallel MPQ's can always supply "times two" amounts of output current. Allow for limits in input voltage and other factors. The maximum load of the paralleled modules equals to (max load of single module-6.25A) * number of paralleled modules. The maximum load during ramp up is still limited to number of modules x maximum load of single module x 90% (modules x Ioutmax x 0.9).

If one MPQ overloads while in load share, it protects itself by entering overcurrent mode. If the whole system is running close to maximum output current, the remaining good MPQ soon enters overcurrent mode. These two events might not happen together, possibly leaving the system operating in degraded mode for a while. The solution is conservative design to avoid getting close to the load limits.

[3] Make the input wiring lengths and wire gauges identical on both inputs and outputs. If in doubt, make some precision measurements under full load. If you attempt to measure the current in one of the converters using a series shunt, the current meter might introduce enough finite resistance to affect the readings.

(Note: Use a non-contacting "clamp-on" Hall effect DC current meter with zero IR loss.)

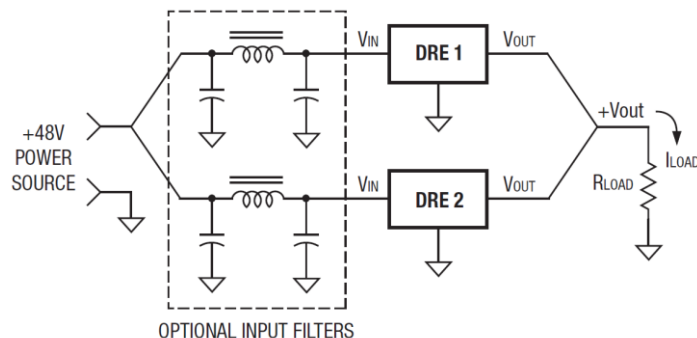


Figure 5. Load Sharing Block Diagram

[4] If you add the optional input filters, use identical components with the same layout.

[5] Operate both converters in the same temperature and airflow environment. Under load sharing, small differences in cooling can amplify into load imbalances.

[6] Avoid operation near the low input voltage limit of the converter. Another subtle factor here is the external source impedance of the input supply. A source with higher impedance at full load might make the net input voltage seen by the converter close to its minimum input voltage. Be sure to account for the decrease in effective input voltage under load.

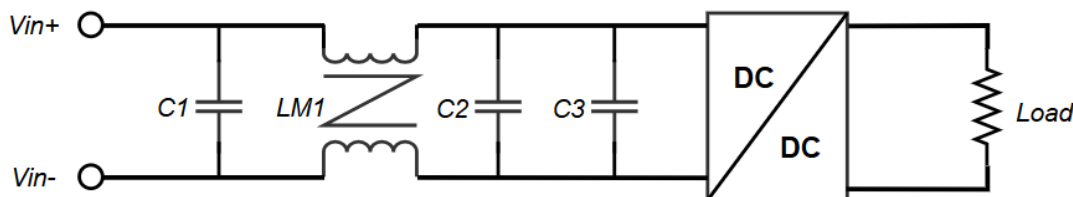
For battery sources, this means that the batteries should be freshly charged and that the AC trickle charger is in good working order. Note that older batteries increase their internal cell impedance even if their no-load output voltage appears acceptable. What counts is the voltage seen at the MPQ input connections with full current.

[7] As with any system design, thoroughly test the MPQ's connected in load sharing before committing the design to a real application.

Emissions Performance

Murata Power measures its products for conducted emissions against the EN 55032 and CISPR 32 standards. Passive resistance loads are employed and the output is set to the maximum voltage. If you set up your own emissions testing, ensure the output load is rated at continuous power while doing the tests.

The recommended external input and output capacitors (if required) are included. Refer to the fundamental switching frequency. This information is detailed in the Product Specifications. An external discrete filter is installed and the circuit diagram is shown below.



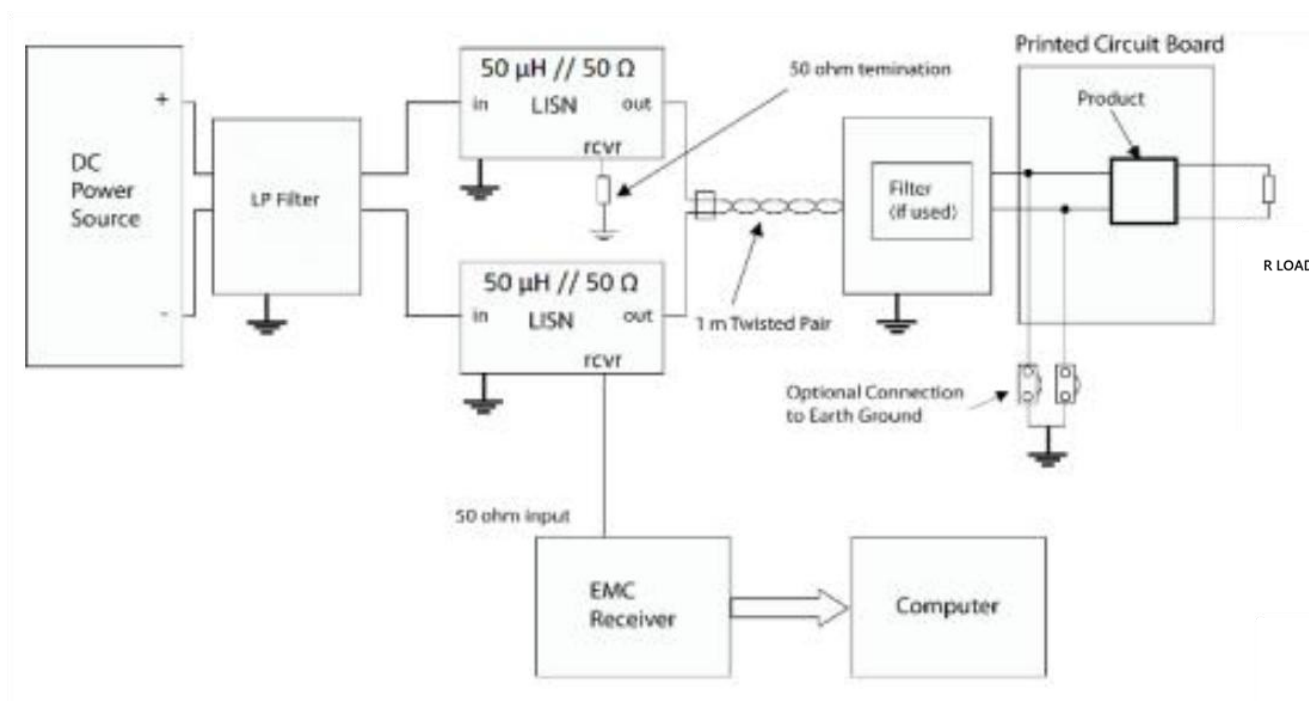
[1] Conducted Emissions Parts List

Reference	Description
C1	2.2uF*8 (MLCC)
C2	2.2uF*8 (MLCC)
C3	1.2mF (Solid Capacitor)
L1	330uH

[2] Conducted Emissions Test Equipment Used

Hewlett Packard HP8594L Spectrum Analyzer – S/N 3827A00153

2Line V-networks LS1-15V 50Ω/50Uh Line Impedance Stabilization Network

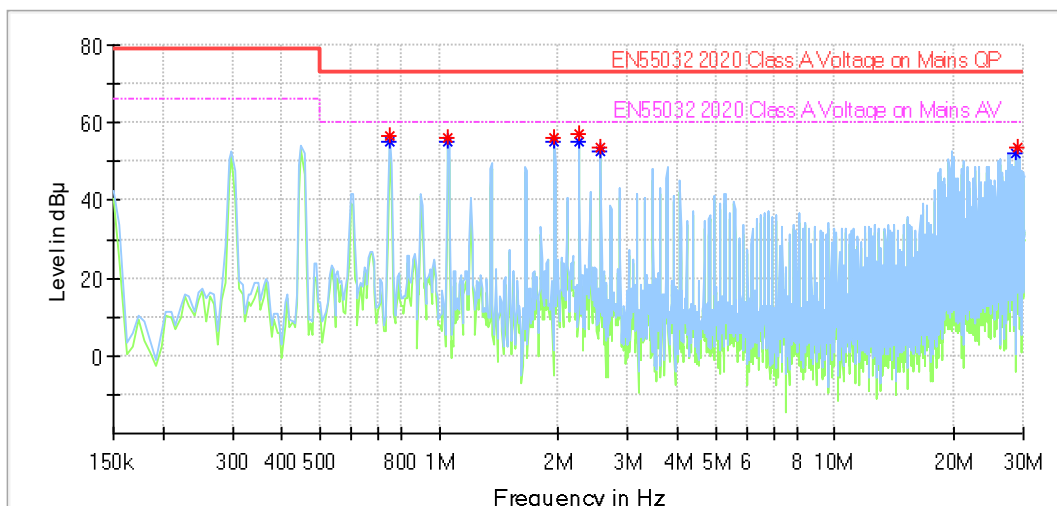


[3] Conducted Emissions Test Results – Negative Line

Conducted emissions performance, EN55032, Class A, full load

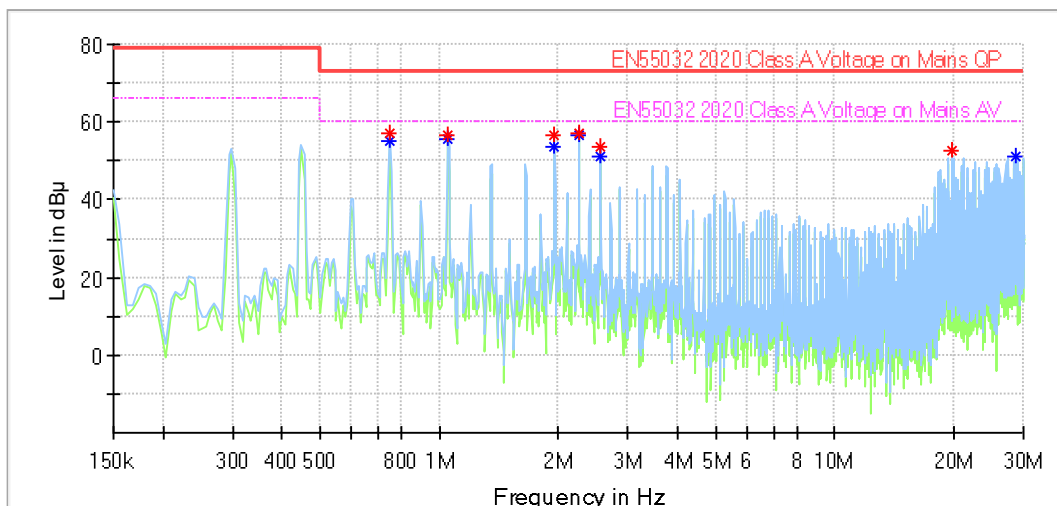
Vin = 48V, Line L

Full Spectrum



Vin = 48V, Line N

Full Spectrum



[4] Layout Recommendations

Most applications can use filtering which is already installed inside the converter or with the addition of the recommended external capacitors. For greater emissions suppression, consider additional filter components and shielding. Emissions performance depends on the user's PC board layout, the chassis shielding environment, and choice of external components. Since many factors affect both the amplitude and spectra of emissions, Murata Power Solutions recommends using an engineer who is experienced at emissions suppression.

Horizontal Wind Tunnel

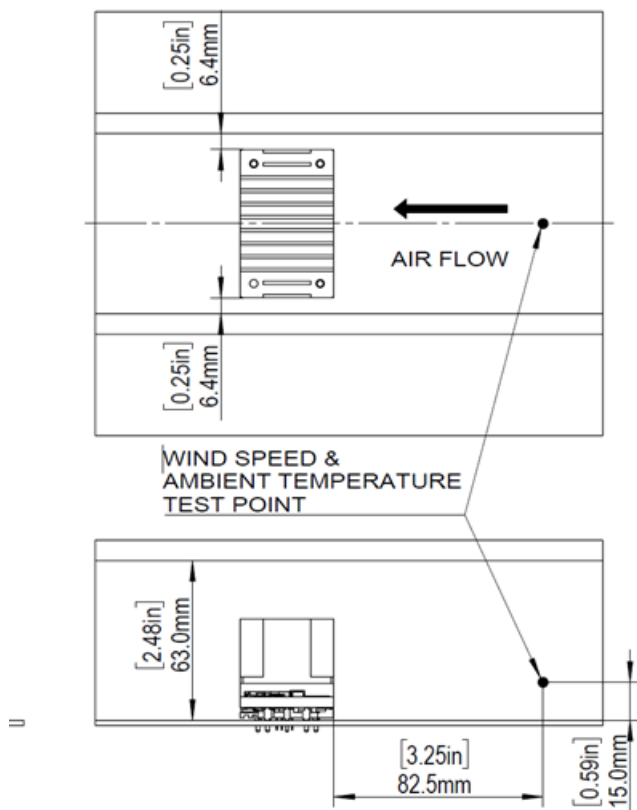


Figure 6. Wind Tunnel Test Setup

Murata Power Solutions employs a computer-controlled, custom-designed closed-loop horizontal wind tunnel, an infrared video camera system, and specialized test instrumentation for accurate airflow and heat dissipation analysis of power products, closely simulating real customer applications.

The system includes a precision low-flow anemometer, a variable-speed fan, power supply input and load controls, temperature gauges, and an adjustable heating element.

A thermal coupler monitors the thermal performance of the Unit Under Test (UUT) under static steady-state conditions.

Both through-hole and surface-mount converters are soldered onto a 10" × 8" host carrier board (6 layers, 3 oz.) to ensure realistic heat absorption and spreading. Longitudinal and transverse airflow studies are possible by rotating the carrier board, as significant differences in heat dissipation often occur between the two airflow directions.

The combination of adjustable airflow, ambient heat, and input/output currents and voltages allows for a wide range of measurement conditions.

Murata Power, Inc.
129 Flanders Road
Westborough, MA 01581 USA
ISO 9001 and 14001 REGISTERED



This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy: Refer to: <https://www.murata.com/products/power/requirements/>
Murata Power, Inc. makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Specifications are subject to change without notice

©2024 Murata Power, Inc