

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### Typical unit



### **FEATURES**

- Wide range input voltages 9-36 and 18-75 Vdc
- 1" x 1" x 0.41" Dimensions.
- Adjustable Vout (+10% to -10%)
- High Efficiency
- Positive & Negative logic, Remote On/Off control Option
- Monotonic startup
- Continuous Short Circuit protection
- Over-temperature protection
- Over-Voltage protection
- Low output ripple and noise
- Strong thermal derating characteristics
- Operational Temperature Range –40°C to +85°C
- 1600V I/O isolation
- Packaged in a five-sided EMI shielding metal package with non-conductive base
- Certified to UL 60950-1, CAN/CSA-C22.2 No. 60950-1, IEC60950-1, safety approvals, 2nd edition, with AM1

### **PRODUCT OVERVIEW**

The SPM15 series isolated DC-DC converters represent the next generation in Industrial Potted Module Technology. Featuring a full 15-Watt output in one square inch of board area, the SPM15 series isolated DC-DC converter family offers efficient regulated DC power for printed circuit board mounting. The  $1^{"} \times 1^{"} \times 0.41^{"}$  (25.4 x 25.4 x 10.41 mm) converter accepts a wide range of input voltages, ideal for industrial applications.

Intended target markets include transportation, medical systems, electronic test equipment, industrial processing equipment, industrial applications where power modules must meet rugged environmental requirements, high power density, and where isolated output voltages are required. These converters offer a feature/option set including: through-hole mounting, positive or negative logic (remote on/off), over-current & over-temperature protection, under-voltage lockout. The input voltage range covers the standard Industrial requirements with a regulated output voltage and power rating up to 15W.

Modules provide voltage isolation (basic insulation) from input to output of up to 1600V. The Operating Ambient Temperature Range is  $-40^{\circ}$ C to  $+85^{\circ}$ C. The Module delivers full output power to  $+70^{\circ}$ C with no airflow. These parts are ideal for applications that do not require any heat sinking or forced air cooling.



## **SPM15 Series**

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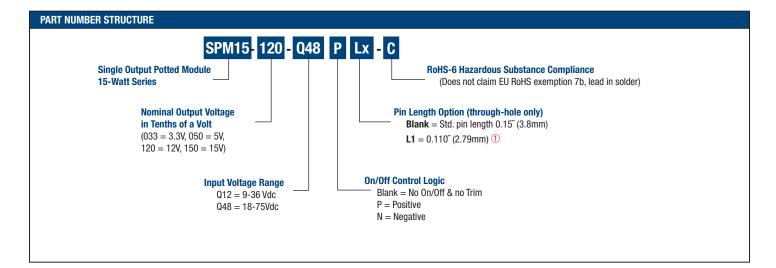
PERFORMANCE	SPECIF	ICATIO	NS SUN	IMARY A	ND ORD	DERING GU	IDE 1) 3								
				Outp	out				In	put					
		Іоит	Total	R/N (n	ıVp-p)	Regulatio	on (Max.)			lin,	In,	Efficier	1Cy (%)	Dim	ensions
Root Models ①	Vоит (V)	(A, max)	Power (W)	Тур. @	Max.	Line	Load	Vin Nom. (V)	Range (V)	min. load (mA)	full load (A)	Min.	Тур.	Case (inches)	Case (mm)
SPM15-033-Q12	3.3	4.5	14.85	60	100	±0.25	±0.25	24	9-36	100	0.695	86.5	89	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-033-Q48	3.3	5	16.5	30	60	±0.25	±0.25	48	18-75	60	0.76	88.5	90	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-050-Q12	5	3	15	40	70	±0.05%	±0.1%	24	9-36	105	0.71	85.5	88	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-050-Q48	5	3	15	60	95	±0.3%	±0.2%	48	18-75	56	0.35	86.5	88.5	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-120-Q12	12	1.3	15.6	60	120	±0.05%	±0.1%	24	9-36	110	0.77	82.3	84	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-120-Q48	12	1.3	15.6	85	120	±0.075%	±0.05%	48	18-75	56	0.76	82	84	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-150-Q12	15	1.1	16.5	130	175	±0.1%	±0.1%	24	9-36	130	0.82	82.5	84	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41
SPM15-150-Q48	15	1.1	16.5	80	150	±0.1%	±0.075%	48	18-75	60	0.41	83	84.5	1.0 x 1.0 x 0.41	25.4 x 25.4 x 10.41

#### Notes:

- ① Please refer to the part number structure for additional options and complete ordering part numbers.
- 2 Ripple and Noise is shown at 20 MHz bandwidth.

INPUT/OUT	PUT EXTERNAL TEST CAP	ACITORS
Model	Input Capacitor (electrolytic)	Output Capacitor(s)
SPM15-033-Q12	100 µF	
SPM15-033-Q48	4.7 μF	
SPM15-050-Q12	100 µF	
SPM15-050-Q48	4.7 μF	1µF ceramic &
SPM15-120-Q12	100 µF	10µF tantalum
SPM15-120-Q48	4.7 μF	
SPM15-150-Q12	100 µF	
SPM15-150-Q48	4.7 μF	

3 All specifications are at nominal line voltage and full load, +25 °C. unless otherwise noted. See detailed specifications for full conditions.



- ① Special quantity order is required; samples available with standard pin length only.
- ② Some model number combinations may not be available. See website or contact your local Murata sales representative.

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-033-Q12

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		36	Vdc
Input Voltage, Transient	100 mS max. duration			50	Vdc
Isolation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.46		15.07	W
Output Current	Current-limited, no damage, short-circuit protected	0.45		4.5	Α
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposu listed in the Performance/Functional Specificati INPUT	e of devices to greater than any of these conditions n ons Table is not implied or recommended.	nay adversely affect lon	g-term reliability. Proper ope	eration under conditions	other than those
Operating Voltage Range		9	24	36	Vdc
Recommended External Fuse	Fast blow			4	Α
Start-up Threshold	Rising input voltage	8	8.5	9	Vdc
Undervoltage Shutdown (50% load)	Falling input voltage	7.7	8.3	8.9	Vdc
Internal Filter Type			C	0.0	100
Input Current			Ū		
Full Load Input Current	Vin = nominal		0.695	0.726	A
Low Line Input Current	Vin = noninal Vin = minimum		1.89	1.947	A
Inrush Transient	viii – illillillulli		0.05	1.347	A2-Sec.
Short Circuit Input Current			50	100	AZ-Sec.
•	laut minimum unit ON				_
Minimum Load Input Current	lout = minimum, unit=0N		100	125	mA
Shut-Down Input Current (Off, UV, OT)			1	2	mA
Reflected (Back) Ripple Current ②	Measured at input with specified filter		30	50	mA, p-p
GENERAL and SAFETY					
Efficiency	Vin = 24V, full load	86.5	89		%
Efficiency	Vin = min., full load	86	87.3		%
Isolation					
Isolation Voltage	Input to output			1600	Vdc
Isolation Resistance			10		MΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1		Yes		
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C		2		Hours x 10 <sup>6</sup>
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency		325	350	375	KHz
Startup Time	Power on to Vout regulated			50	mS
Startup Time	Remote ON to Vout regulated			50	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout		60	100	µSec
Dynamic Load Peak Deviation	same as above		±75	±150	mV
FEATURES and OPTIONS					
Remote On/Off Control ③ "N" suffix					
Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
	OFF = Pin open	-0.7		15	V
Negative Logic, OFF state		IU	4	10	-
Control Current	Open collector/drain		1		mA
"P" suffix		4.0	1		
Positive Logic, ON state	ON = Pin open	10		15	V
Positive Logic, OFF state	OFF = Ground pin	-0.7		0.7	V
Control Current	Open collector/drain		1		mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-033-Q12

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.46	14.85	15.07	W
Voltage					
Nominal Output Voltage	No trim	3.251	3.3	3.35	Vdc
Setting Accuracy	At 50% load, no trim	-1.5		1.5	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom
Overvoltage Protection	Via magnetic feedback	3.7	4.9	5.4	Vdc
Current					
Output Current Range		0.45	4.5	4.5	A
Current Limit Inception	98% of Vnom., after warmup	4.9	7.5	8.5	A
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout		0.321		А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.25	% of Vout
Load Regulation	lout = min. to max., Vin = 24V			±0.25	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=24V		60	90	mV pk-pk
Maximum Capacitive Loading	Low ESR			1000	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See derating	-40		85	0°
Operating Case Temperature Range	No derating	-40		85	°C
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	0°
Thermal Protection/Shutdown	Measured in center	110	115	120	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### **Notes**

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- @ Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220  $\mu F,$  Cin=33  $\mu F$  and Lbus=12  $\mu H.$

# **SPM15 Series**

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#### **TYPICAL PERFORMANCE DATA, SPM15-033-Q12** Efficiency vs. Line Voltage and Load Current @ 25°C Power Dissipation 2.50 90 88 86 84 80 78 76 74 72 70 68 66 64 62 66 58 66 4 52 0.5 2.25 2.00 $V_{IN} = 9V$ Power Dissipation (Watts) $V_{IN} = 12V$ Efficiency (%) 1.75 VIN = 24V1.50 VIN = 36V 1.25 $V_{IN} = 9V$ $V_{IN} = 12V$ 1.00 $V_{IN} = 24V$ 0.75 $V_{IN} = 36V$ 0.50 0.9 1.4 1.8 2.3 2.7 3.2 3.6 4.1 4.5 0.5 0.9 1.4 1.8 2.3 2.7 3.2 3.6 4.1 4.5 **Output Load Current (Amps)** Load Current (Amps) Maximum Current Temperature Derating at sea level Maximum Current Temperature Derating at sea level Vin = 36V (air flow from Pin J1 to Pin J2 on PCB) Vin = 9V, 12V, or 24V (air flow from Pin J1 to Pin J2 on PCB) 5 5 .5 m/s (100 LFM) 4 Δ Natural Convection Output Current (Amps) Output Current (Amps) 3 3 2 2 1 1 0 0 35 40 45 50 55 60 65 70 75 80 85 35 40 45 55 65 70 75 80 85 30 30 50 60 Ambient Temperature (°C) Ambient Temperature (°C)

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-033-Q48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		80	Vdc
Input Voltage, Transient	100 mS max. duration			100	Vdc
Isolation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.63		16.75	W
Output Current	Current-limited, no damage, short-circuit protected	0.5		5	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	С°
Absolute maximums are stress ratings. Expos	ure of devices to greater than any of these conditions may	ay adversely affect long	g-term reliability. Proper ope	ration under conditions	other than those
listed in the Performance/Functional Specifica					
INPUT					
Operating Voltage Range		18	48	75	Vdc
Recommended External Fuse	Fast blow			2	A
Start-up Threshold	Rising input voltage	15.5	16.9	17.9	Vdc
Undervoltage Shutdown (50% load)	Falling input voltage	15	16	16.8	Vdc
Internal Filter Type	i annig nipat totago	10	C	1010	140
Input Current			0		
Full Load Input Current	Vin = 24V		0.764	0.788	Α
Full Load Input Current	Viii = 24V Vin = 48V		0.388	0.403	A
Low Line Input Current	Vin = minimum		1.03	1.04	A
Inrush Transient	VIII – IIIIIIIIdiii		0.05	1.04	A2-Sec.
Short Circuit Input Current			0.05	0.1	A2-000.
Minimum Load Input Current	lout = minimum, unit=0N		60	90	mA
Shut-Down Input Current (Off, UV, OT)			1	2	mA
	Measured at input with aposition filter		30	2	
Reflected (Back) Ripple Current 2	Measured at input with specified filter		30		mA, p-p
GENERAL and SAFETY		00.5	00		01
Efficiency	Vin = 24V, full load	88.5	90		%
	Vin = 48V, full load	86.5	88.5		%
Isolation			1		
Isolation Voltage	Input to output			1600	Vdc
Isolation Resistance			10		MΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1		Yes		
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground		2,000,000		Hours
	fixed, Tambient = $+25^{\circ}C$		2,000,000		Tiours
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency		325	350	375	KHz
Startup Time	Power on to Vout regulated		10	50	mS
Startup Time	Remote ON to Vout regulated		10	50	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout		75	150	μSec
Dynamic Load Peak Deviation	same as above		±75	±125	mV
FEATURES and OPTIONS					·
Remote On/Off Control 3					
"N" suffix					
Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
Negative Logic, OFF state	OFF = Pin open	10		15	V
Control Current	Open collector/drain	10	1	10	mA
"P" suffix			1		
Positive Logic, ON state	ON = Pin open	10		15	V
Positive Logic, ON state	OFF = Ground pin	-0.7		0.7	V
Control Current	Open collector/drain	-0.7	1	0.7	mA
	Open conector/uram				IIIA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-033-Q48

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.63	16.5	16.75	W
Voltage					
Nominal Output Voltage	No trim	3.2505	3.3	3.3495	Vdc
Setting Accuracy	At 50% load, no trim		1.5		% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom
Overvoltage Protection	Via magnetic feedback	4	5	5.6	Vdc
Current					
Output Current Range		0.5	5	5	A
Current Limit Inception	98% of Vnom., after warmup	5.9	7.3	8.4	A
Short Circuit			1		
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.25	% of Vout
Load Regulation	lout = min. to max., $Vin = 48V$			±0.25	% of Vout
Ripple and Noise	20 MHz BW, Vin = 48V		30	60	mV pk-pk
Temperature Coefficient	At all outputs		0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR			5000	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See derating	-40		85	0°
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	0°
Thermal Protection/Shutdown	Measured in center	120	130	140	0°
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

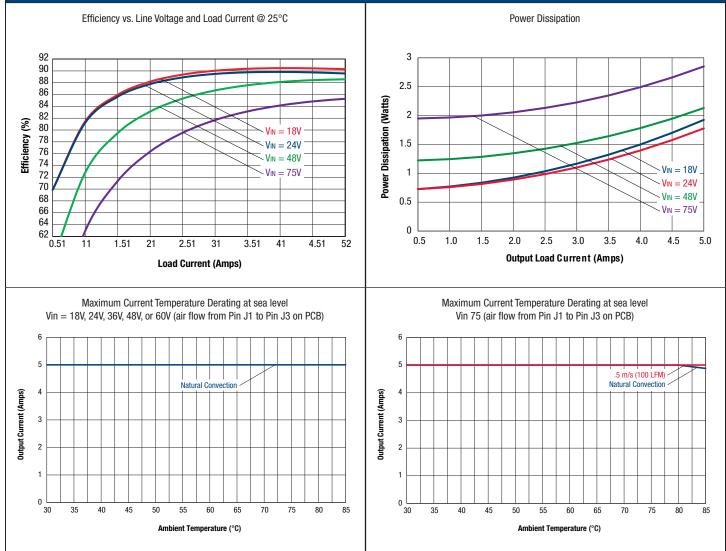
#### Notes

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- @ Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220  $\mu F,$  Cin=33  $\mu F$  and Lbus=12  $\mu H.$

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

#### **TYPICAL PERFORMANCE DATA, SPM15-033-Q48**



# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-050-Q12

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		36	Vdc
Input Voltage, Transient	100 mS max. duration			50	Vdc
Isolation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.48		15.23	W
Output Current	Current-limited, no damage, short-circuit protected	0.30		3	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposu	re of devices to greater than any of these conditions m	ay adversely affect lon	g-term reliability. Proper ope	eration under conditions	other than those
listed in the Performance/Functional Specificati		.,	,		
INPUT					
Operating Voltage Range		9	24	36	Vdc
Recommended External Fuse	Fast blow	-		4	A
Start-up Threshold	Rising input voltage	8	8.6	9	Vdc
Start up Threshold	@-40°C	9.5	10.0	10.5	Vdc
Undervoltage Shutdown	Falling input voltage	7.8	8.25	9	Vdc
Internal Filter Type		7.0	C	5	Vuc
Input Current			0		1
Full Load Input Current	Vin = nominal		0.71	0.73	A
Low Line Input Current	Vin = minimum		1.91	1.97	A
Inrush Transient	VIII = IIIIIIIIIUII		0.05	1.97	A <sup>2</sup> -Sec.
Short Circuit Input Current			50	100	mA
•	laut minimum unit ON		105		
Minimum Load Input Current	lout = minimum, unit=0N			135	mA
Shut-Down Input Current (Off, UV, OT)			1	2	mA
Reflected (Back) Ripple Current ②	Measured at input with specified filter		30		mA, p-p
GENERAL and SAFETY					
Efficiency	Vin = 24V, full load	85.5	88		%
•	Vin = min., full load	86	87.3		%
Isolation					
Isolation Voltage	Input to output	1600			Vdc
Isolation Resistance			10		MΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1		Yes		
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground		6.2		Hours x 10 <sup>6</sup>
	fixed, Tambient = $+25^{\circ}C$		0.2		
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency		330	350	370	KHz
Startup Time	Power on to Vout regulated			50	mS
Startup Time	Remote ON to Vout regulated			50	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout		100	150	μSec
Dynamic Load Peak Deviation	same as above		±85	±125	mV
FEATURES and OPTIONS					
Remote On/Off Control ③					
"N" suffix					
Negative Logic, ON state	ON = Ground pin	-0.7	1	0.8	V
		-0.7		15	V
Negative Logic, OFF state	OFF = Pin open	IU		10	-
Control Current	Open collector/drain		1		mA
"P" suffix		10	1 1	4-	
Positive Logic, ON state	ON = Pin open	10		15	V
Positive Logic, OFF state Control Current	OFF = Ground pin	-0.7		0.7	V
	Open collector/drain		1 1		mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-050-Q12

OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.48	15	15.23	W
Voltage					
Nominal Output Voltage	No trim	4.925	5	5.075	Vdc
Setting Accuracy	At 50% load, no trim	-1.5		1.5	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	5.75	5.9	7	Vdc
Current					
Output Current Range		0.3	3	3	A
Current Limit Inception	98% of Vnom., after warmup	3.5	4.75	6.5	Α
Short Circuit			1		
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation	· · · · · · · · ·				
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.05	% of Vout
Load Regulation	lout = min. to max., Vin = 24V			±0.1	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=24V		40	70	mV pk-pk
Temperature Coefficient	At all outputs		±0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR			1000	μF
MECHANICAL	·				
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
-	Gold overplate		5		µ-inches
ENVIRONMENTAL	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		· · ·
Operating Ambient Temperature Range	See derating	-40		85	°C
Operating Case Temperature Range	No derating	-40		105	°C
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	110	115	120	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
			RoHS-6		

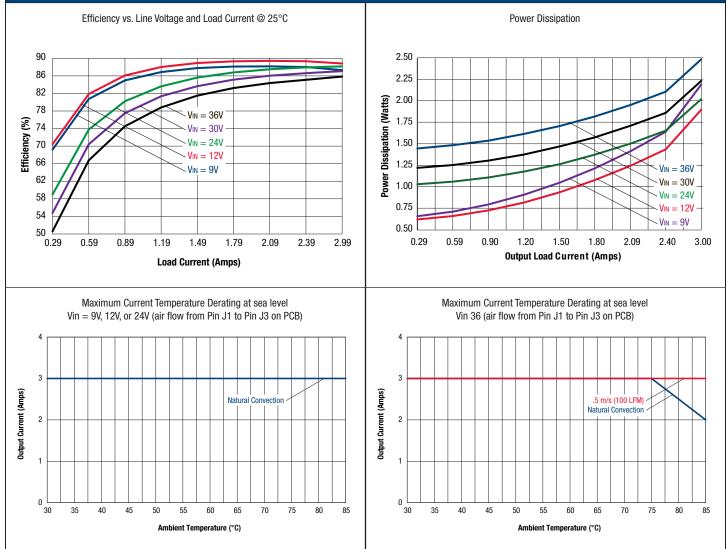
#### Notes

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 μF, Cin=33 μF and Lbus=12 μH.

# **SPM15 Series**

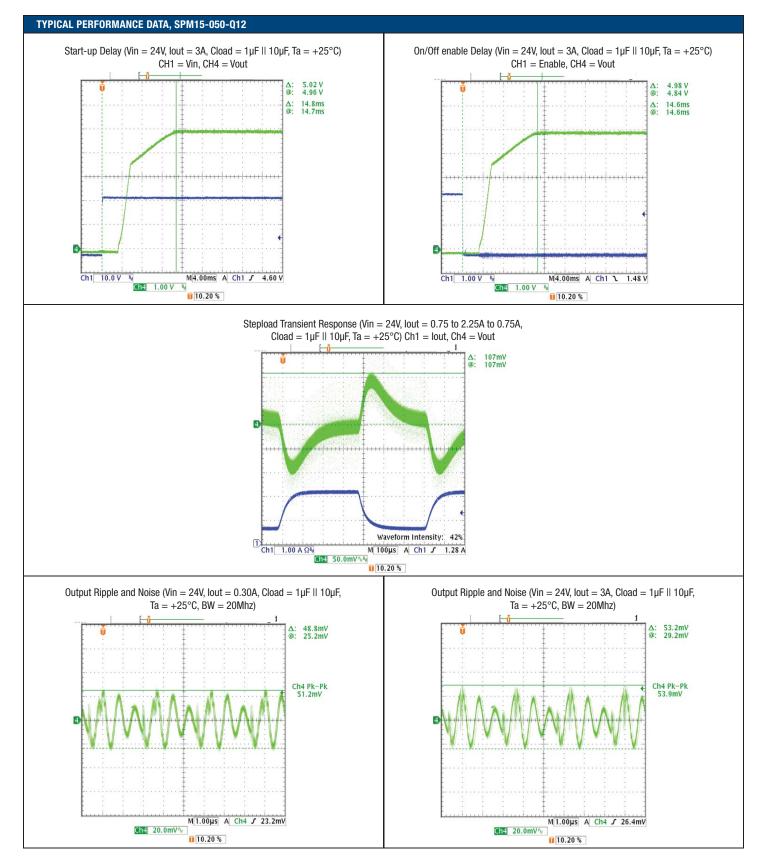
Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

#### TYPICAL PERFORMANCE DATA, SPM15-050-Q12



## **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



www.murata-ps.com/support

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-050-Q48

Input Vortage, Transient      100 ms max duration      00      100      Vortage        On Ord Remote Control      Input output      1600      Vortage        On Ord Remote Control      Power on, referred to -Vm      0      15      Vortage        Ondput Dewer      1.448      15.23      Vortage      Vortage      Vortage      3      A        Storage Temperature Range      Vm – zron top powel      -55      125      TC        Assocher maximums are stress ratings. Exposure of devices to greature than any of these conditions may adversely affect long-term reliability. Proper operation under conditions: the that lated in the PartomaceFunctional Specifications. Table is not implied or recommended.      TW      TC      TC      TC        Overating Voltage Range      Fast blow      8      8      75      Voltage        Recommended External Fuse      Fast blow      8      16      16.9      17.9      Voltage        Internal Filter Type      10      C      17.5      Voltage      No      16.0      17.5      Voltage        Internal Filter Type      10      0.05      0.37      A      10.0      10.0      10.0      10.0	ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Isolation Voltage      Input to output      Imput to output to output      Imput to output to ou	Input Voltage, Continuous		0		80	Vdc
Druff Render Control      Power on, referred to -4/m      0      15      0/0        Output Power      1.4.8      15.2.3      VV        Output Covern      0.1.2      0.0.3      3      A        Storage Temperature Range      VID - 2/m (no power)      -55      12.5      7.0        Absolute maximums are stress ratings. Excosure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions of the than its is in the pilet or recommended.      The VID	Input Voltage, Transient	100 mS max. duration			100	Vdc
Dutput Power      148      15.23      W        Storage Temperature Range      Vin = Zen (ino power)      -55      125      0.70        Storage Temperature Range      Win = Zen (ino power)      -55      125      0.70        Storage Temperature Range      Win = Zen (ino power)      -55      125      0.70        Storage Temperature Range      Win = Arch (ino power)      -55      125      0.70        Decating Voltage Range      18      48      75      Vin Recommended External Fuse      Fast blow      18      48      75      Vin Recommended External Fuse      Fast blow      16      16.0      17.5      Vin Recommended External Fuse      Fast blow      16      16.0      17.5      Vin Recommended External Fuse      Vin Recommended External Fuse      16      17.5      Vin Vin Recommended External Fuse      Vin Recommended External Fuse      16      16.0      17.5      Vin Vin Recommended External Fuse      Vin Recommended External Fuse      16      16.0      17.5      Vin Vin Recommended External Fuse	Isolation Voltage	Input to output			1600	Vdc
Durput Current      Current-limited, no damage, stort-circuit protected      0.3      3      A        Non-2e more privationer Range      Vin = 2en (no powel)      -55      125      70        Nasolde meriantums are stress ratings. Experient of devices by grader than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of these conditions may adversely affect long-term reliability. Proper operation under conditions other than its of the condits of the conditions other than its of the conditio	On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Storage Emperature Range      Vin      Zero (in power)      -55      125      125      125        Storage Emperature Range      Vin      any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than isrde in the Performance/Functional Specifications Table is not implied or recommended.      18      48      75      Vid        Departing Voltage Range      18      48      75      Vid      44      1.5      A        Recommended External Fuse      Fast blow      16      16.9      17.9      Vid      40      41      55      Vid      40      41      43      43      75      Vid      40      41      43      43      75      Vid      40      41      43      43      43      43      44 </td <td>Output Power</td> <td></td> <td>1.48</td> <td></td> <td>15.23</td> <td>W</td>	Output Power		1.48		15.23	W
Description maximum are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than issee in the professional Specifications Table is not implied or recommended.      Implied to the provide that the provid	Output Current	Current-limited, no damage, short-circuit protected	0.3		3	Α
Used in the PerformanceFunctional Specifications Table is not implied or recommended.      18      48      75      V/U        Operating Voltage Range      Fast blow      18      48      75      A        Recommended External Fuse      Fast blow      16      16.9      17.9      Violation        Start-op Threshold      Rising input voltage      16      16.9      17.5      Violation        Undervoltage Shutdown      Failing input voltage      15      16      17.5      Violation        Internal Filter Type	Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Recommended External Fuse      Fast blow      1.5      A        Start-up Threshold      Rising input voltage      16      16.9      17.9      Vid        Ordervoltage Shutdown      Failing input voltage      15      16      16.9      17.9      Vid        Indervoltage Shutdown      Failing input voltage      15      16      17.5      Vid        Indervoltage Shutdown      Failing input voltage      15      16      17.5      Vid        Indervoltage Shutdown      Failing input voltage      15      16      17.5      Vid        Full Load Input Current      Vin = moninal      0.35      0.37      A        Low Line Input Durent      Vin = minimum, unit=0N      0.05      0.1      mm        Short Circuit Input Current      lout = minimum, unit=0N      56      90      mm        Short Circuit Input Current      lout = minimum, unit=0N      56      90      mm        Short Circuit Input Current      lout = minimum, unit=0N      86.5      88.5       %        Startery      Vin = 48%, full load      87.5      88.5       %	listed in the Performance/Functional Specification	e of devices to greater than any of these conditions more a second the second time of time of the second time of the second time of time of the second time of time o	nay adversely affect lon	g-term reliability. Proper ope	eration under conditions	s other than thos
Start-up ThresholdRising input voltage1616.917.9Vid Vid Undervoltage ShutdownPrising input voltage151617.5Vid Vid Vid Vid Vid Vid Vid Vid Vid Vid Palling input voltage1616.917.9Vid <td>Operating Voltage Range</td> <td></td> <td>18</td> <td>48</td> <td>75</td> <td>Vdc</td>	Operating Voltage Range		18	48	75	Vdc
Start-up Threshold      Rising input voltage      16      16.9      17.9      Vid        Undervoltage Shutdown      Falling input voltage      15      16      17.5      Vid        input Current      C      C      Vid	Recommended External Fuse	Fast blow			1.5	A
Undervoltage Shutdown      Failing input voltage      15      16      17.5      VM        Internal Filter Type      C      C      C      Failing input voltage      Failing input volta			16	16.9		Vdc
Internal Filter Type      C      C        mpat Current      0.35      0.37      A        Low Line Input Current      Vin = nominal      0.35      0.37      A        Low Line Input Current      Vin = minimum      0.93      0.97      A        Inrush Transiter      0.05      A-S      Short Circuit Input Current      0.05      0.1      minimum Load Input Current      1      2      mm A        Short Circuit Input Current (*)      Measured at input with specified filter      30      mA      mA        EkleRAL and SAFETY      Vin = min., full load      86.5      88.5      %      %        Isolation Netage      Input to output      1      10      Minimum Load Input Size (Trinting Size (Trintig Size (Trintig Size (Trinting Size (Trinting Size (Trinting Si						Vdc
Input Current      Vin = nominal      0.35      0.37      A        Full Lad Input Current      Vin = nominal      0.035      0.37      A        Low Line Input Current      Win = minimum      0.035      0.37      A        Inrush Transient      Win = minimum      0.05      A      A        Short Circuit Rupt Current      Iout = minimum, unit=0N      56      90      mm        Shut-Down Input Current (Off, UV, 0T)      Incush Transient      1      2      mm        Shut-Down Input Current (Off, UV, 0T)      Measured at input with specified filter      30      mA,        GENERAL and SAFETY      Un = 48V, full load      86.5      88.5      %        Station      Un = 48V, full load      86.5      88.5      %        Isolation Ortage      Input to output      10      MM        Isolation Resistance      10      MM      Measured        Isolation Gagacitance      1, EC/60950-1, CAC+C22.2 No.60950-      1500      P        Startup Time      Power on to Vout regulated      10      50      mm        Startup Time      Power on to Vout regulated <td< td=""><td>v</td><td>r annig niput voltago</td><td>10</td><td></td><td>11.0</td><td>140</td></td<>	v	r annig niput voltago	10		11.0	140
Full Load Input Current      Vin = nominal      0.35      0.37      A A        Low Line Input Current      Vin = minimum      0.93      0.97      A        Inrush Transient      0.05     Ar-S      Short Gircuit Input Current      0.05      0.1      Mr        Minimum Load Input Current      Iout = minimum, unit=0N      56      90      mr        Short Gircuit Input Current (Off, UV, OT)      Int = minimum, unit=0N      56      90      mr        Short Gircuit Input Current (Off, UV, OT)      Measured at input with specified filter      30      mA        GENERAL and SAFETY      Measured at input with specified filter      30      mA        GENERAL and SAFETY      Vin = min., full load      86.5      88.5      %        Isolation Votage      Input to output      10      MM      MM        Isolation Capacitance      10      MM      MM      MM      MM        Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950-1      1, EC/60950-1, CAA -C22.2 No. 60950-1      1600      MM        Isolation Capacitance      Interview on to Vout regulated      10      50      mm        Safety		1				1
Low Line Input Current      Vin = minimum      0.93      0.97      A        Inrush Transiont      0.05      0.05      A      A      S        Short Circuit Input Current      lout = minimum, unit=0N      0.05      0.1      mm        Minimum Load Input Current (0ff, UV, 0T)      1      2      mm        Shut-Down Input Current (0ff, UV, 0T)      Measured at input with specified filter      30      mA        GENERAL and SAFETY      Measured at input with specified filter      30      mA        Efficiency      Vin = 48V, full load      86.5      88.5      %        Isolation      Vin = min, full load      87.5      89.5      %        Isolation Outage      Input to output      10      MM      MM        Isolation Outage      Input to output      100      MM      MM        Isolation Capacitance      1500      VM      MM      MM      MM        Isolation Capacitance      1500      X      MM	•	Vin = nominal		0.35	0.37	Α
Inrush Transient      0.05      A <sup>+</sup> S        Short Circuit Input Current      lout = minimum, unit=0N      56      90      mm        Shut-Down Input Current (Ø)      Measured at input with specified filter      30      mA,        GENERAL and SAFETY      Vin = 48V, full load      86.5      88.5      %        Efficiency      Vin = 48V, full load      87.5      89.5      %        Isolation Nottage      Input to output      10      MM      56        Isolation Resistance      10      MM      56      90      M        Isolation Capacitance      100      MM      60      MM      90      MM        Isolation Resistance      1      100      MM      90      MM      90      MM      90      MM      90      MM      90      90      MM      90      90      90      MM      90						A
Short Circuit Input Current      Iout = minimum, unit=0N      0.05      0.1      mm        Minimum Load Input Current (0ff, UV, 0T)      1      2      mm        Reflected (Back) Ripple Current (2)      Measured at input with specified filter      30      mA,        GENERAL and SAFETY      30      mA,      GENERAL      30      mA,        Efficiency      Vin = 48V, full load      86.5      88.5      %      %        Isolation      10      87.5      89.5      %      %        Isolation Resistance      10      100      MM        Isolation Capacitance      110      MM      Mm        Safety      Certified to UL-60950-1, CSA-C22.2 No.60950- 1, EC/60950-1, 2nd edition, with AM1      Yes      Hours        DYNAMIC CHARACTERISTICS      Free Teording SR32, Siguent (1, class 3, ground fixed, Tambient = +25°C      2      Hours        Startup Time      Power on to Vout regulated      10      50      mm        Dynamic Load Response      50-755-50% load step, setting time to within 1% of Vout regulated      10      100      mm        TeATURES and OP110NS      Same as above      ±50      ±150		VIII – IIIIIIIIIUIII			0.01	A <sup>2</sup> -Sec.
Minimum Load Input Current      Iout = minimum, unit=ON      56      90      mm        Shut-Down Input Current (0ft, UV, 0T)      1      2      mm        GENERAL and SAFETY      30      mA,        GENERAL and SAFETY      Vin = 489, full load      86.5      88.5      %        Efficiency      Vin = 489, full load      87.5      89.5      %        Isolation      Input to output      10      Md      Md        Isolation Resistance      10.0      Md      Md      Isolation Capacitance      1600      Md        Safety      Certified to UL-60950-1, CSA-C22.2 No.60950-1      15000      Pf      Pf        Safety      Certified to UL-60950-1, CSA-C22.2 No.60950-1      1600      Md      Md        Safety      Certified to UL-60950-1, CSA-C22.2 No.60950-1      1500      Pf      Pf        Calculated MTBF      Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C      Yes      Hours        Startup Time      Power on to Vout regulated      10      100      mm        Dynamic Load Response      50-75-50% load step, settling time to within 1% of Vout 1% of Vout 1% of Vout 1% 0% Vout 1% % of Vout 1% %					0.1	mA
Shut-Down Input Current (0ff, UV, 0T)      Measured at input with specified filter      1      2      min        Reflected (Back) Ripple Current (2)      Measured at input with specified filter      30      mA,        GENERAL and SAFETY      Vin = 48V, full load      86.5      88.5      %        Efficiency      Vin = 48V, full load      87.5      89.5      %        Isolation      10      Min      %        Isolation Resistance      100      Md        Isolation Capacitance      Certified to UL-60950-1, CSA-C22.2 No. 60950-1      Yes         Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950-1      Yes       Hours        Calculated MTBF      Per Tecordia SR32, Issue 1, class 3, ground fixed, Tambient = +25°C      2      Hours        DVNAMIC CHARACTERISTICS       320      345      375      KH        Startup Time      Remote ON to Yout regulated      10      100      mm        Oynamic Load Response      50-75-50% load step, settling time to within 1% of Vout      60      120      µSA        Opmamic Load Peak Deviation      same as above      ±50      ±150      m	•	lout – minimum unit–ON			-	
Reflected (Back) Ripple Current (2)Measured at input with specified filter30mA,GENERAL and SAFETYEfficiencyVin = 48V, full load86.588.50%isolationIsolation VoltageInput to output87.589.50%Isolation NoltageInput to output100MdIsolation Capacitance10MdMdIsolation Capacitance10MdMdIsolation Capacitance10MdMdIsolation Capacitance10MdMdIsolation Capacitance1150.0MdCalculated MTBFCertified to UL-60950-1, CSA-C22.2 No.60950- 1, IEC/60950-1, 2nd edition, with AM1YesHoursCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, rambient = +25°C2HoursHoursDYNAMIC CHARACTERISTICS320345375KHStartup TimePower on to Vout regulated1050mtDynamic Load Response050.75-50% load step, settling time to within 1% of Vout60120µScDynamic Load Peak Deviationsame as above±50±150mtFEATURES and OPTIONSFeatures	Shut Down Input Current (Off IIV OT)					
GENERAL and SAFETY      Vin = 48V, full load      86.5      88.5      %        Efficiency      Vin = min., full load      87.5      89.5      %        Isolation      Isolation Voltage      Input to output      1600      Vd        Isolation Resistance      10      MM      MM      Solation Capacitance      10      MM        Isolation Capacitance      Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes      Per      Yes      Per      Hours        Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes      Hours      Hours        DYNAMIC CHARACTERISTICS      Yes      2      Hours      Hours      Hours        Startup Time      Power on to Vout regulated      10      50      mt        Startup Time      Remote ON to Vout regulated      10      100      mt        Oynamic Load Response      50-75-50% load step, setting time to within 1% of Vout      60      120      µSc        Prestive Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, ON state      OFF = Pin open		Measured at input with apositied filter			2	
Vin = 48V, full load      88.5      %        Vin = min., full load      86.5      88.5      %        Vin = min., full load      87.5      89.5      %        Isolation Voltage      Input to output      87.5      89.5      %        Isolation Voltage      Input to output      10      MM        Isolation Capacitance      10      MM      MM        Isolation Capacitance      10      MM      MM        Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes      Imoust        Calculated MTBF      Per Telocodia SR32, issue 1, class 3, ground fixed, Tambient = +25°C      2      Hours        DYNAMIC CHARACTERISTICS      2      Hours      Mours        Startup Time      Power on to Vout regulated      10      50      mm        Dynamic Load Response      50-75-50% load step, settling time to within 1% of Vout      60      120      µSc        Dynamic Load Peak Deviation      same as above      ±50      ±150      mm        FEATURES and OPTIONS      Same as above      ±50      ±150      mM        Negative Logic, OFF s		Measured at input with specified litter		30		mA, p-p
Ethcency      Vin = min., full load      87.5      89.5      %        isolation	GENERAL and SAFETY					
Image: Constraint of the second sec	Efficiency					
Isolation Voltage      Input to output      1600      Vd        Isolation Resistance      10      MM        Isolation Capacitance      10      MM        Isolation Capacitance      1500      9f        Safety      Certified to UL-60950-1, 2SA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes      1        Calculated MTBF      Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C      2      Hours        DYNAMIC CHARACTERISTICS      Fixed Switching Frequency      320      345      375      KH        Startup Time      Power on to Vout regulated      10      500      mm        Dynamic Load Response      50-75-50% load step, settling time to within 1% of Vout      60      120      µSc        Dynamic Load Peak Deviation      same as above      ±50      ±150      mt <b>FEATURES and OPTIONS</b> "M" suffix      "      "      "        Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, ON state      OPen collector/drain      1      mm        "P" suffix      "       0.7      0.7 <t< td=""><td>•</td><td>Vin = min., full load</td><td>87.5</td><td>89.5</td><td></td><td>%</td></t<>	•	Vin = min., full load	87.5	89.5		%
Isolation Resistance10MMIsolation Capacitance1500pfSafetyCertified to UL-60950-1, CSA-C22.2 No. 60950-1, IEC/60950-1, 2nd edition, with AM1YesftCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C2HoursDYNAMIC CHARACTERISTICSPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C2HoursDYNAMIC CHARACTERISTICSSafety320345375KHStartup TimePower on to Vout regulated1050mmStartup TimeRemote ON to Vout regulated10100mmDynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120µSeDynamic Load Peak Deviationsame as above±50±150mmFEATURES and OPTIONS""" suffix""0.8VW" suffixOPF = Pin open1015VNegative Logic, ON stateOPF = Pin open101mm"P" suffix""""1mmPers torio CurrentOpen collector/drain11mm"P" suffix""""1015VPositive Logic, ON stateON = Pin open1015VPositive Logic, OFF stateOFF = Ground pin-0.70.7VPositive Logic, OFF stateOFF = Ground pin-0.70.7V						
Isolation Capacitance1500pfSafetyCertified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1YesCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C2HoursDYNAMIC CHARACTERISTICS*********************************		Input to output			1600	Vdc
Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes        Calculated MTBF      Per Teloordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C      2      Hours        DYNAMIC CHARACTERISTICS      Fixed Switching Frequency      320      345      375      KH        Startup Time      Power on to Vout regulated      10      50      mm        Startup Time      Remote ON to Vout regulated      10      100      md        Dynamic Load Response      50-75-50% load step, settling time to within 1% of Vout      60      120      µSe        Prestive Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V						
Safety1, IEC/60950-1, 2nd edition, with AM1YesCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C2HoursDYNAMIC CHARACTERISTICSFixed Switching Frequency320345375KHStartup TimePower on to Vout regulated1050mmStartup TimePower on to Vout regulated10100mmStartup TimeStartup TimeRemote ON to Vout regulated10100mmDynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120µScDynamic Load Peak Deviationsame as above±50±150mFEATURES and OPTIONSRemote On/Off Control ③""" suffixNegative Logic, ON stateON = Ground pin-0.70.8VOptimic Load, Colspan="2">StateOPT = Pin open1015VPer SuffixPositive Logic, ON stateON = Ground pin-0.70.8VPositive Logic, ON stateON = Pin open1015VPositive Logic, ON stateON = Pin open1015VPositive Logic, OFF stateON = Pin open100.7VPositive Logic, OFF stateON = Pin open100.7V	Isolation Capacitance			1500		pF
Calculated WTBP      fixed, Tambient = +25°C      2      Hours        DYNAMIC CHARACTERISTICS      Fixed Switching Frequency      320      345      375      KH        Startup Time      Power on to Vout regulated      10      50      mt        Startup Time      Remote ON to Vout regulated      10      100      mt        Dynamic Load Response      50°75°50% load step, settling time to within 1% of Vout      60      120      µSe        Dynamic Load Peak Deviation      same as above      ±50      ±150      mt        FEATURES and OPTIONS      #W" suffix      #W" suffix      #W" suffix      #W      Mt      10      15      W        Regative Logic, OFF state      ON = Ground pin      -0.7      0.8      W      W      Mt      Mt      mt      mt        "*" suffix      Image: Weige, OFF state      OFF = Pin open      10      15      W        Positive Logic, OFF state      ON = Pin open      10      15      W        Positive Logic, OFF state      ON = Pin open      10      15      W	Safety	1, IEC/60950-1, 2nd edition, with AM1		Yes		
Fixed Switching Frequency      320      345      375      KH        Startup Time      Power on to Vout regulated      10      50      mt        Startup Time      Remote ON to Vout regulated      10      100      mt        Dynamic Load Response      50-75-50% load step, settling time to within 1% of Vout      60      120      μSe        Dynamic Load Peak Deviation      same as above      ±50      ±150      mt        FEATURES and OPTIONS      #<				2		Hours x 10 <sup>6</sup>
Startup TimePower on to Vout regulated1050mstStartup TimeRemote ON to Vout regulated10100mstDynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120µSeDynamic Load Peak Deviationsame as above±50±150mstFEATURES and OPTIONSRemote On/Off Control ③***********************************						
Startup TimeRemote ON to Vout regulated10100mstDynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120µSeDynamic Load Peak Deviationsame as above±50±150mtFEATURES and OPTIONSRemote On/Off Control ③"W" suffixNegative Logic, ON stateON = Ground pin 0 FF = Pin open-0.70.8VOpen collector/drain-0.70.8VPositive Logic, ON stateON = Pin open1015VPositive Logic, OFF stateOFF = Ground pin-0.70.7V			320			KHz
Dynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120µSeDynamic Load Peak Deviationsame as above±50±150mtFEATURES and OPTIONSRemote On/Off Control ③ "N" suffixNegative Logic, ON stateON = Ground pin-0.70.8VNegative Logic, OFF stateON = Ground pin-0.70.8VControl Current00FF = Pin open1015VPositive Logic, ON stateON = Pin open1015VPositive Logic, OFF stateOFF = Ground pin-0.70.7V	•					mS
Dynamic Load Response      1% of Vout      60      120      µSe        Dynamic Load Peak Deviation      same as above      ±50      ±150      mt        FEATURES and OPTIONS        Remote On/Off Control ③        "N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      mm        "P" suffix      "Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      0.7      V	Startup Time			10	100	mS
FEATURES and OPTIONS        Remote On/Off Control ③        "N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      m/        "Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V	,					μSec
Remote On/Off Control ③        "N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      mm        "P" suffix      Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V		same as above		±50	±150	mV
"N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      m/        "P" suffix      ON = Pin open      10      15      V        Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V	FEATURES and OPTIONS					
Negative Logic, ON state      ON = Ground pin      -0.7      0.8      V        Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      mu        "P" suffix      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V        Positive Logic, OFF state      ON = Pin open      10      15      V	Remote On/Off Control ③					
Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      m/        "P" suffix      The state      ON = Pin open      10      15      V        Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V						
Negative Logic, OFF state      OFF = Pin open      10      15      V        Control Current      Open collector/drain      1      m/        "P" suffix      The pin open      10      15      V        Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V	Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
Control Current      Open collector/drain      1      mu        "P" suffix      Image: Collector of the state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V	Negative Logic, OFF state					V
"P" suffix        Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V		· · · · · · · · · · · · · · · · · · ·		1	-	mA
Positive Logic, ON state      ON = Pin open      10      15      V        Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V		. p				1
Positive Logic, OFF state      OFF = Ground pin      -0.7      0.7      V		ON = Pin open	10		15	V
Lontrol Eurrent Upen collector/drain 1 1 mm	<b>e</b> <i>i</i>		5.1	1	0.1	-
Control Current   Upen collector/oralin   1   m	Control Current	Open collector/drain		1		mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-050-Q48

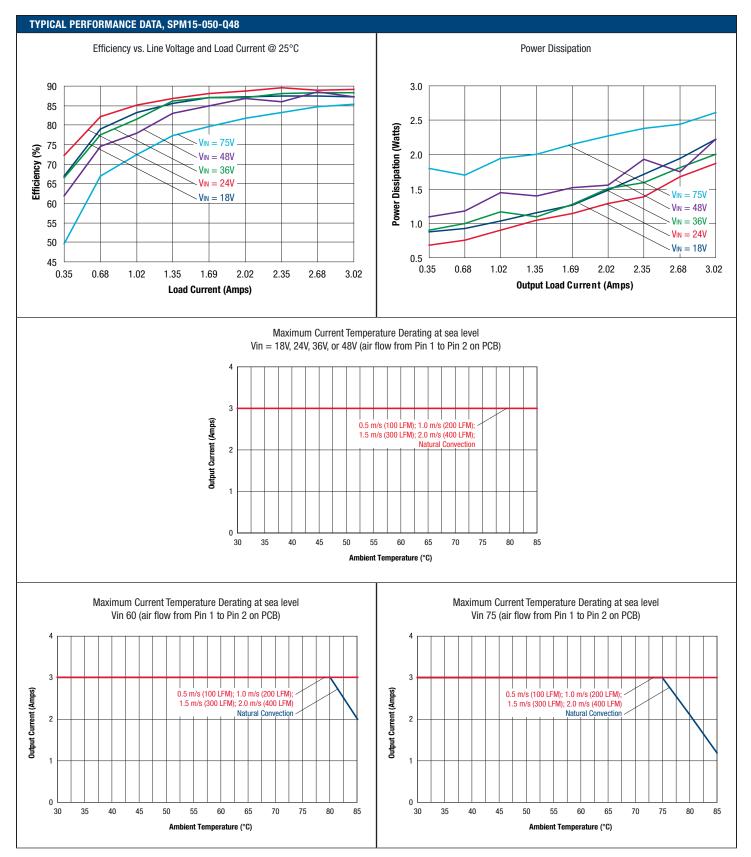
OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.48	15	15.23	W
Voltage	· · ·				•
Nominal Output Voltage	No trim	4.925	5	5.075	Vdc
Setting Accuracy	At 50% load, no trim	-1.5		1.5	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	6	7	8	Vdc
Current					•
Output Current Range		0.3	3	3	A
Current Limit Inception	98% of Vnom., after warmup	3.75	4.5	5.5	A
Short Circuit					•
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.3	% of Vout
Load Regulation	lout = min. to max., Vin = 48V			±0.2	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=48V		60	95	mV pk-pk
Maximum Capacitive Loading	Low ESR			470	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See derating	-40		85	۵°
Operating Case Temperature Range	No derating	-40		85	°C
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	130	135	150	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### **Notes**

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-120-Q12

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		36	Vdc
Input Voltage, Transient	100 mS max. duration			50	Vdc
Isolation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.54		15.76	W
Output Current	Current-limited, no damage, short-circuit protected	0.13		1.3	Α
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposure listed in the Performance/Functional Specification INPUT	of devices to greater than any of these conditions n is Table is not implied or recommended.	nay adversely affect long	g-term reliability. Proper ope	ration under conditions	other than those
Operating Voltage Range		9	24	36	Vdc
Recommended External Fuse	Fast blow			4	A
Start-up Threshold	Rising input voltage	8	8.5	9	Vdc
Undervoltage Shutdown	Falling input voltage	7.9	8.2	8.7	Vdc
Internal Filter Type			C		
Input Current			-		
Full Load Input Current	Vin = nominal		0.77	0.8	А
Low Line Input Current	Vin = minimum		2.05	2.11	A
Inrush Transient			0.05		A <sup>2</sup> -Sec.
Short Circuit Input Current			50	120	mA
Minimum Load Input Current	lout = minimum, unit=0N		105	130	mA
Shut-Down Input Current (Off, UV, OT)			1	2.5	mA
Reflected (Back) Ripple Current 2	Measured at input with specified filter		30	2.0	mA, p-p
GENERAL and SAFETY	Measureu at input with specifieu filter				IIIA, p-p
GENERAL ANU SAFETY	Min OAV full load	00 5	04		0/
Efficiency	Vin = 24V, full load	82.5	84		%
	Vin = min., full load	83	84.5		%
Isolation		(	1		
Isolation Voltage	Input to output	1600	10		Vdc
Isolation Resistance			10		ΜΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1		Yes		
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C		TBD		Hours x 10 <sup>6</sup>
DYNAMIC CHARACTERISTICS					141
Fixed Switching Frequency		300	330	360	KHz
Startup Time	Power on to Vout regulated		5	50	mS
Startup Time	Remote ON to Vout regulated		5	50	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout		60	120	μSec
Dynamic Load Peak Deviation	same as above		±100	±150	mV
FEATURES and OPTIONS					
Remote On/Off Control ③					
"N" suffix					
Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
Negative Logic, OFF state	OFF = Pin open	10		15	V
Control Current	Open collector/drain		1		mA
"P" suffix					1
Positive Logic, ON state	ON = Pin open	10		15	V
					-
Positive Logic, OFF state	OFF = Ground pin	-0.7		0.7	V

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-120-Q12

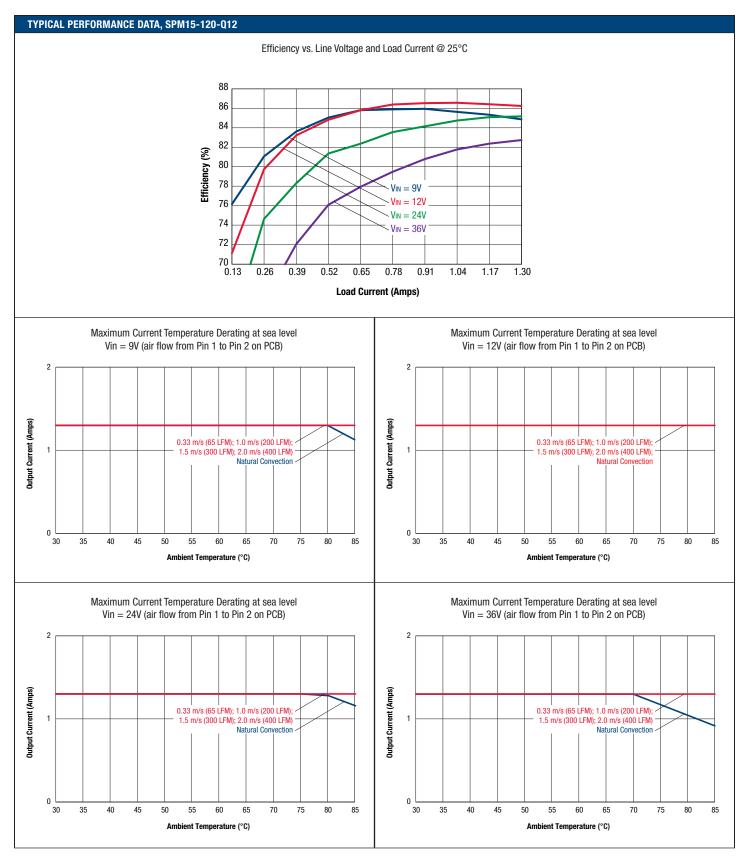
OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.54	15.6	15.76	W
Voltage					
Nominal Output Voltage	No trim	11.88	12	12.12	Vdc
Setting Accuracy	At 50% load, no trim	-1		1	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	15.5	17.2	19.5	Vdc
Current			· ·		
Output Current Range		0.13	1.3	1.3	Α
Current Limit Inception	98% of Vnom., after warmup	1.5	2.1	2.6	Α
Short Circuit			· ·		
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation			· ·		
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.05	% of Vout
Load Regulation	lout = min. to max., Vin = 24V			±0.1	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=24V		60	120	mV pk-pk
Temperature Coefficient	At all outputs		±0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR			470	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See derating	-40		85	°C
Operating Case Temperature Range	No derating	-40		105	°C
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	110	115	120	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### **Notes**

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.

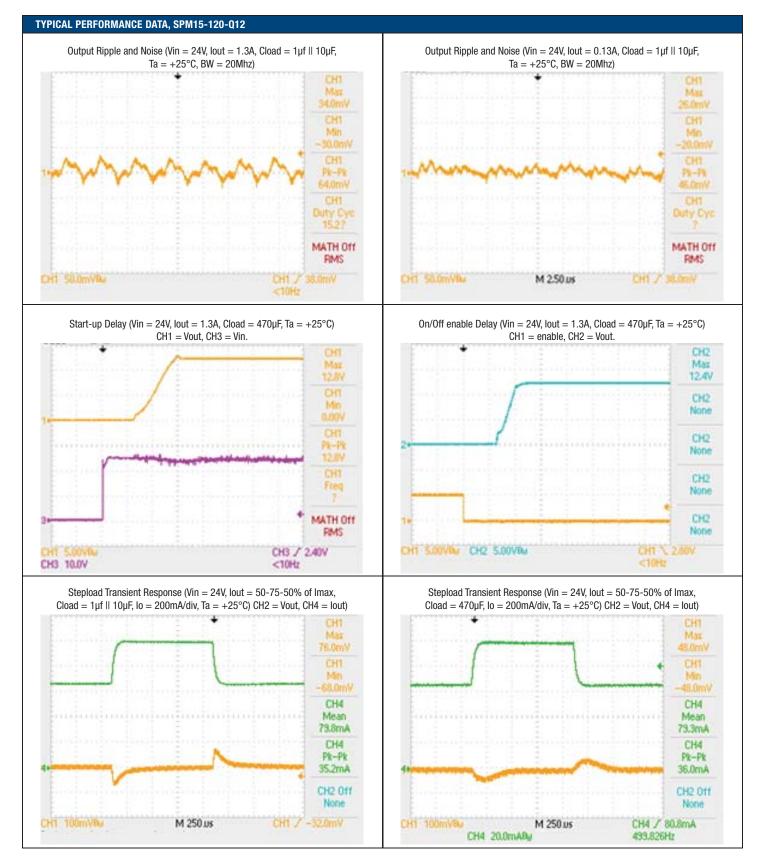


Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters





Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-120-Q48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		80	Vdc
Input Voltage, Transient	100 mS max. duration			100	Vdc
solation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.54		15.76	W
Output Current	Current-limited, no damage, short-circuit protected	0.13		1.3	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposure	of devices to greater than any of these conditions m	ay adversely affect long	j-term reliability. Proper ope	eration under conditions	other than those
listed in the Performance/Functional Specification	s Table is not implied or recommended.				
INPUT					
Operating voltage range		18	48	75	Vdc
Recommended External Fuse	Fast blow			1.5	Α
Start-up threshold	Rising input voltage	16	16.75	17.5	Vdc
Undervoltage shutdown	Falling input voltage	15	16	17	Vdc
Turn-On/Turn-Off Hysteresis	gr		1.5		Vdc
Internal Filter Type			LC		
Input current					
Full Load Input Current	Vin = 24V		0.76	0.782	А
Full Load Input Current	Vin = 48V		0.387	0.400	A
Low Line Input Current	Vin = minimum		1.032	1.042	
Inrush Transient			0.05	1.012	A <sup>2</sup> -Sec.
Short Circuit Input Current			50	100	mA
Minimum Load Input Current	lout = minimum, unit = ON		56	90	mA
Shut-Down Input Current (Off, UV, OT)			1	2	mA
Reflected (back) ripple current @	Measured at input with specified filter		30	L	mA, p-p
GENERAL and SAFETY	Measured at input with specified liner		30		IIIA, p-p
GENERAL AND SAFET	Vin = 48V. full load	82	85.5		%
Efficiency	Viii = 400, full load Vin = 24V., full load	84	84		%
ladation	VIII = 24V., IUII IOAU	84	84		%
Isolation	lumid da midand	1000	1		Mala
Isolation Voltage	Input to output	1600	10		Vdc
Isolation Resistance			10		ΜΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950-		Yes		
•	1, IEC/60950-1, 2nd edition, with AM1				
Calculated MTBF	Per Telcordia SR332, issue 1, class 3, ground		6.4		Hours x 10 <sup>6</sup>
	fixed, Tambient = $+25^{\circ}C$				
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency		300	335	370	KHz
Startup Time	Power on to Vout regulated		10	50	mS
Startup Time	Remote ON to Vout regulated		10	50	mS
Dynamic Load Response	50-75-50% load step, settling time to within		50	100	μSec
	1% of Vout				
Dynamic Load Peak Deviation	same as above		±125	±200	mV
FEATURES and OPTIONS					
D					
Remote Un/Uff Control 3					
"N" suffix Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
"N" suffix Negative Logic, ON state	ON = Ground pin OFF = Pin open	-0.7 10		0.8 15	V V
"N" suffix	· · · · · · · · · · · · · · · · · · ·		1		
"N" suffix Negative Logic, ON state Negative Logic, OFF state	OFF = Pin open		1		V
"N" suffix Negative Logic, ON state Negative Logic, OFF state Control Current	OFF = Pin open		1		V
Negative Logic, OFF state Control Current "P" suffix	OFF = Pin open Open collector/drain	10	1	15	V mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-120-Q48

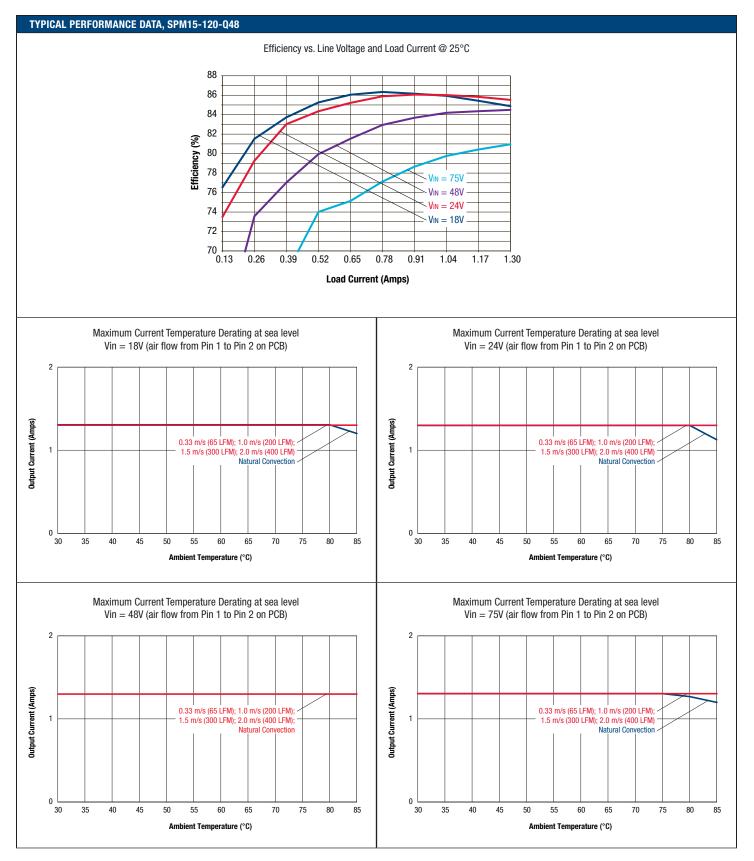
OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.54	15.6	15.76	W
Voltage					
Nominal Output Voltage	No trim	11.88	12	12.12	Vdc
Setting Accuracy	At 50% load, no trim	-1		1	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	14.5	16.5	17.5	Vdc
Current					
Output Current Range		0.13	1.3	1.3	Α
Current Limit Inception	98% of Vnom., after warmup	1.5	1.9	2.3	Α
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			TBD	A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation			•		
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.075	% of Vout
Load Regulation	lout = min. to max., Vin = 48V			±0.05	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=48V		85	120	mV pk-pk
Temperature Coefficient	At all outputs		±0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR	470		470	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See Derating	-40		85	°C
Operating Case Temperature Range	No derating	-40		105	°C
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	٥°
Thermal Protection/Shutdown	Measured in center	130	135	150	٥°
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### **Notes**

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 4.7  $\mu F$ . All capacitors are low-ESR types wired close to the converter.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.



Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-150-Q12

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		36	Vdc
Input Voltage, Transient	100 mS max. duration			50	Vdc
solation Voltage	Input to output			1600	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		1.63		16.67	W
Output Current	Current-limited, no damage, short-circuit protected	0.11		1.1	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposur	e of devices to greater than any of these conditions ma	av adverselv affect long	g-term reliability. Proper ope	ration under conditions	other than those
listed in the Performance/Functional Specification		,,,	,		
INPUT					
Operating voltage range		9	24	36	Vdc
Recommended External Fuse	Fast blow	-		4	A
Start-up threshold (@+25°C and -40°C)	Rising input voltage	8	8.5	9	Vdc
Undervoltage shutdown	Falling input voltage	7.8	8.25	9	Vdc
Internal Filter Type	r annig input voltage	1.0	C	5	100
Input current			U		1
Full Load Input Current	Vin = nominal		0.82	0.84	A
Low Line Input Current	Vin = noninal Vin = minimum		2.13	2.19	A
•	VIII = IIIIIIIIIIIUIII			2.19	-
Inrush Transient			0.05	100	A <sup>2</sup> -Sec.
Short Circuit Input Current			50		mA
Minimum Load Input Current	lout = minimum, unit = ON		130	150	mA
Shut-Down Input Current (Off, UV, OT)			1	2.5	mA
Reflected (back) ripple current 2	Measured at input with specified filter		30		mA, p-p
GENERAL and SAFETY					
Efficiency	Vin = 24V, full load	82.5	84		%
Enclency	Vin = min., full load	84.5	86		%
Isolation					
Isolation Voltage	Input to output	1600			Vdc
Insulation Safety Rating			basic		
Isolation Resistance			10		MΩ
Isolation Capacitance			1500		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1		Yes		
	Per Telcordia SR332, issue 1, class 3, ground		TDD		11
Calculated MTBF	fixed, Tambient = $+25^{\circ}C$		TBD		Hours x 106
DYNAMIC CHARACTERISTICS			· · · · · · · · · · · · · · · · · · ·		·
Fixed Switching Frequency		300	330	360	KHz
Startup Time	Power on to Vout regulated			50	mS
Startup Time	Remote on to Vout regulated			50	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout		100	150	μSec
Dynamic Load Peak Deviation	same as above		±150	±250	mV
FEATURES and OPTIONS					
Remote On/Off Control ③					
"N" suffix					
	ON Operation	07	1	0.0	M
Negative Logic, ON state	ON = Ground pin	-0.7		0.8	V
Negative Logic, OFF state	OFF = Pin open	10		15	V
Control Current	Open collector/drain		1		mA
"P" suffix			1		1
Positive Logic, ON state	ON = Pin open	10		15	V
Positive Logic, OFF state	OFF = Ground pin	-0.7		0.7	V
Control Current	Open collector/drain		1		mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-150-Q12

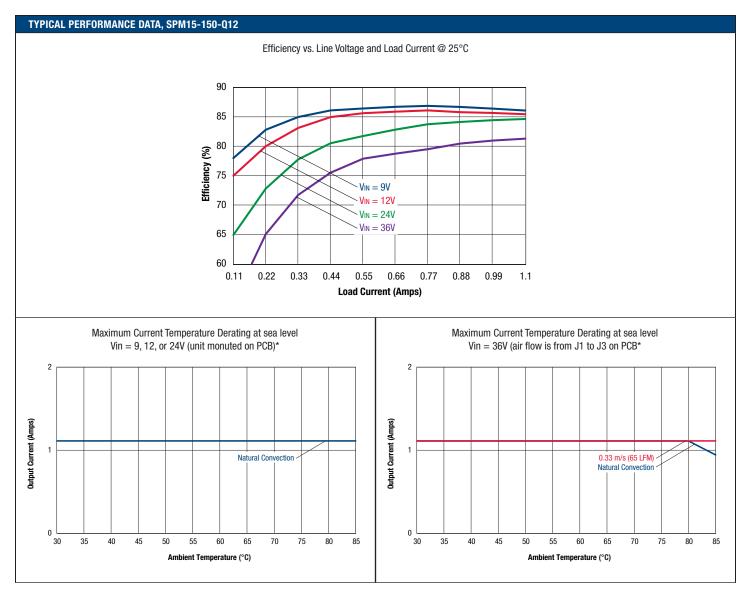
OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.63	16.5	16.67	W
Voltage					
Nominal Output Voltage	No trim	14.85	15	15.15	Vdc
Setting Accuracy	At 50% load, no trim	1		1	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	17	19.5	22.5	Vdc
Current					
Output Current Range		0.11	1.1	1.1	Α
Current Limit Inception	98% of Vnom., after warmup	1.2	1.6	2	Α
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.1	% of Vout
Load Regulation	lout = min. to max., Vin = 24V			±0.1	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=24V		130	175	mV pk-pk
Temperature Coefficient	At all outputs		±0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR			470	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See Derating	-40		85	°C
Operating Case Temperature Range	No derating	-40		105	٥°
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	110	115	120	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### **Notes**

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 100  $\mu F$ , electrolytic. All capacitors are low-ESR types wired close to the converter.
- ② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 μF, Cin=33 μF and Lbus=12 μH.



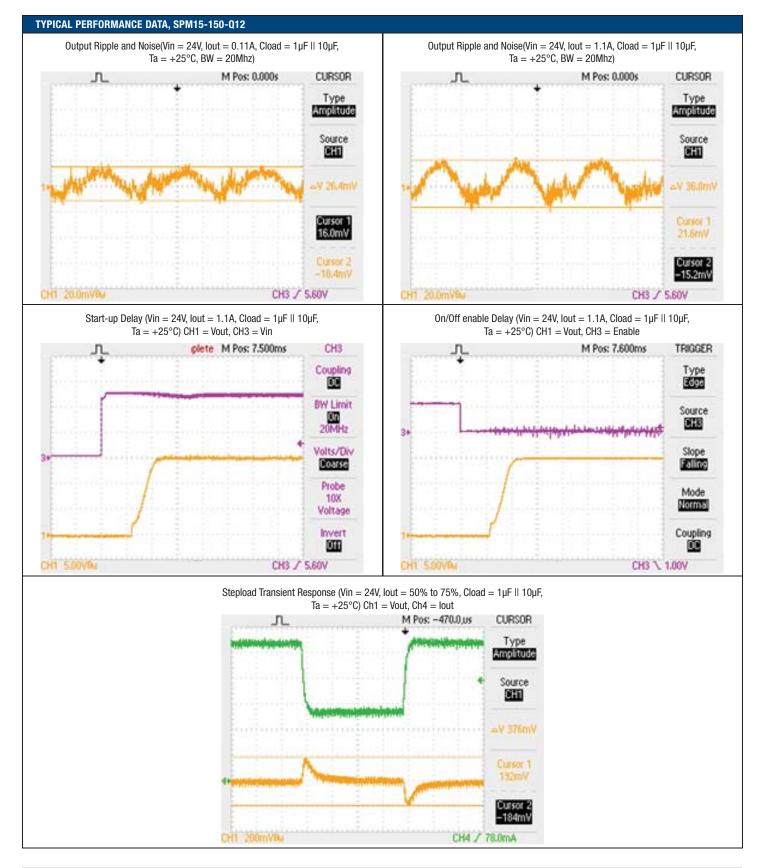
Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



\*Using Burn in board, connection with solder



Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS – MODEL SPM15-150-Q48

Short Circuit Input CurrentIout = minimum, unit = 0N50100Minimum Load Input CurrentIout = minimum, unit = 0N60855Shut-Down Input Current (Off, UV, OT)Input with specified filter30Input 20Reflected (back) ripple current @Measured at input with specified filter30Input 20GENERAL and SAFETYVin = 48V, full load8385.5Input 50EfficiencyUin = 48V, full load8385.5Input 50IsolationIsolation VoltageInsulation Safety RatingInput to output1600Input 50Isolation Capacitance10Input 50Input 50Isolation CapacitanceInput to utput10Input 50SafetyCertified to UL-60950-1, CSA-C22.2 No. 60950-1, IEC/60950-1, IEC/60950-1, IEC/60950-1, CSA-C22.2 No. 60950-1, IEC/60950-1, IEC/60950-1, CSA-C22.2 No. 60950-1, IEC/60950-1, IEE/60950-1, IEE/60950-1	ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Soldiation Voltage      Imput to output      Imput to output      Imput to output      Imput to output        Dutput Dever      1.6.3      16.6.7      Imput to output Dever      16.3      16.7      Imput to output			0			Vdc
Drub Off. Renote Control      Power on, referred to Vin      0      15        Dutput Dever      Durment-immedie on damage, short-incur protocold      0.11      1.1      Inc.67        Stronge Temperature Range      Vin = Zero (to power)      -55      125      125        Stronge Temperature Range      Vin = Zero (to power)      -55      125      125        Stadie the Parformance-Functional Specifications Table is not implied or recommended.      18      48      75      126        Interval      The Zero (to power)      -56      125      127      1        Optimization of the Parformance-Functional Specifications Table is not implied or recommended.      16      16.7      17.9      1        Optimization of the Parformance-Functional Specifications Table is not implied or recommended.      16      16.7      17.9      1        Optimization of the Parformance-Functional Specifications Table is not implied vortage      16      16.7      17.9      1        Data of the Data Optimization of the Parformance-Functional Specifications Table is not implied vortage      16      0.4      0.4      0.4      0.4      0.4      0.4      0.4      0.5      16      15      0.5 <t< td=""><td>nput Voltage, Transient</td><td>100 mS max. duration</td><td></td><td></td><td>100</td><td>Vdc</td></t<>	nput Voltage, Transient	100 mS max. duration			100	Vdc
Unput Power      Image      16.3      16.67      10.5        Dirugh Current      Current-Imited, no damaga, short-circuit protection      0.11      1.1      1.1        Strage Emperature Bange      Win 2 zern (no power)      -56      125      155        Stradit Dirugh Current      Exposure of directs on parter than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other t isside in the Performance/Functional Specifications. Table is not implied or recommended.      18      48      75        Dirugh Specifications. Table is not implied or recommended.      18      48      75      16      16.7      17.9      17.9      17.9      16      16.7      17.9      17.9      17.5      16      16.7      17.9      16      16.7      17.9      17.5      17.5      16      16.0      10.0      11      2      17.5      16      16.0      10.0      10      16.0      16      16.0      10.0      1      2      16      16.0      10      10      1      2      16      16.0      10      1      1      1      1      10      10      1	solation Voltage	Input to output			1600	Vdc
Durput Current      Current ender      0.11      1.1        Non-2 Encore Nume Zero, on power)      -55      125        bisolate maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other 1 ised in the Performance/Functional Specifications Table is not implied or recommended.      18      48      75        Device maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other 1 ised in the Performance/Functional Specifications Table is not implied or recommended.      18      48      75        Device Targe mage      Fast blow      18      48      75      125	Dn/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Storage Temperature Range      Vin = Zero, for power      -55      125      125        Divide maximums are stress ranges      Sparade Temperature Name      Sparade Temperature Name      Sparade Name </td <td>Dutput Power</td> <td></td> <td>1.63</td> <td></td> <td>16.67</td> <td>W</td>	Dutput Power		1.63		16.67	W
Shorage Temperature Range      Vm      Zaro (no power)     55      125      125        Bixolde maximums are stress ratinges to graater than ary of these conditions may adversely affect long-term reliability. Proper operation under conditions of the the Performance-Functional Specifications Table is not implied or recommended.      18      48      75      175        Deprating voltage range      Fast blow      18      48      75      175        Deprating voltage range      Fast blow      16      16.7      17.9      175        Bard-up threshold      Rising input voltage      16      16.7      17.9      1        Inder-ordize shutdown      Falling input voltage      16      16.7      17.9      1        Inder-ordize shutdown      Falling input voltage      16      16.7      17.9      1        Inder-ordize shutdown      Falling input voltage      16      16.7      17.9      1        Inder-ordize shutdown      Falling input voltage      16      16.7      17.9      1        Inder-ordize shutdown      Falling input voltage      10.4      1.0.4      1.0.4      1.0.4      1.0.4      1.0.4      1.0.4      1.0.4	Dutput Current	Current-limited, no damage, short-circuit protected	0.11		1.1	Α
Used in the PerformanceFunctional Specifications Table is not implied or recommended.      INPUT        Operating voltage range      18      48      75      Implied on the performanceFunction of the perform	Storage Temperature Range		-55		125	°C
Used in the PerformanceFunctional Specifications Table is not implied or recommended.      INPUT        Operating voltage range      18      48      75      Implied on the performanceFunction of the perform	Absolute maximums are stress ratings. Exposu	re of devices to greater than any of these conditions m	ay adversely affect lon	g-term reliability. Proper ope	eration under conditions	other than thos
Derating voltage range      18      48      75        Recommended External Fuse      Fast blow      2      2        Recommended External Fuse      Rising input voltage      16      16.7      17.9        Bart-up threshold      Rising input voltage      15      16.2      17.5      1        Undervoltage shutdown      Falling input voltage      15      16.2      17.5      1        Internal Filter Type      0      C      1      2      1      1      1      2      1 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
Becommended External Puse      Fast blow	INPUT	· ·				
Recommended External Puse      Fast blow	Operating voltage range		18	48	75	Vdc
Start-up threshold      Rising input voltage      16      16.7.      17.9        Indervoltage kindbown      Falling input voltage      15      16.2      17.5      17.5        nummal Filter Type      C      C      C      C        mput current      C      C      C      C        Inush frasified      Min = nominal      0.41      0.42      C        Inush frasified      Win = nominal      0.41      0.42      C        Short Circuit Input Current      Win = minimum, unit = O      500      1000      F        Short Circuit Input Current (Off, UV, OT)      Iout = minimum, unit = O      60      85      F        Short Circuit Input Current (Off, UV, OT)      Measured at input with specified filter      0      0      B        Short Circuit Input Current (Off, UV, OT)      Measured at input with specified filter      0      Iout Short	Recommended External Fuse	Fast blow	-		2	A
Indervoltage shutdown      Falling input voltage      15      16.2      17.5        Internal Filter Type      C      C      C      C        Inderval filter Type      C      C      C      C        Full Load Input Current      Vin = nominal      0.41      0.42      C      C        Low Line Input Current      Vin = minimum      1.06      1.09      C      C      Sint Circuit Input Current      0.05      I      O      Minimum Load Input Current      I      2.5      Sint-Down Input Current (0ff, UV, 07)      Measured at input with specified filter      30      I      R <td< td=""><td></td><td></td><td>16</td><td>16.7</td><td></td><td>Vdc</td></td<>			16	16.7		Vdc
Internal Filter Type      C      C        mput current      Vin = nominal      0.41      0.42        Low Line Input Current      Vin = minimum      1.06      1.09        Inrush Transitent      0.05      //      //        Short Circuit Input Current      0.01      50      100        Minimum Load Input Current      lout = minimum, unit = 0N      60      85        Shut-Down Input Current (0f, UV, 07)      1      2      1        Felfected (back) ripple current ©      Measured at input with specified filter      30      n        Stut-Down Input Current (0f, UV, 07)      Vin = min., full load      83      85.5      1        Stut-Down Input Current (0f, UV, 07)      Vin = min., full load      83      85.5      1        Stut-Down Input Current (10f, UV, 07)      Vin = min., full load      83      85.5      1        Stut-Down Input Current (10f, UV, 07)      Vin = min., full load      83      85.5      1        Isolation Safety Rating      Input to output      1600      1      1      1        Isolation Capacitance      Cartified to UL-60950-1, CSA-C22.2 No. 60950-1, CSA-C22.2 No. 60950-1, ESA-C22.2		<u> </u>				Vdc
Input current      Over a nominal      Over a non nominal      Over a nominal      Ove		r annig niput voltago	10		11.0	140
Full Load Input Current      Vin = nominal      0.41      0.42        Low Line Input Current      Vin = minimum      1.06      1.09      1        Inrush Transient      0.05      100      1      2        Short Gircuit Input Current      Iout = minimum, unit = 0N      60      85      100        Minimum Load Input Current (Off, UV, OT)      Interest Constraints      1      2      1      2        Short Gircuit Input Current (Off, UV, OT)      Measured at Input with specified filter      30      Interest Constraints      1      2      1      2      1      2      1      2      1      2      1      2      1      2      1      2      1      2      1      2      1      1      2      1      1      2      1 <td></td> <td>1</td> <td></td> <td>, v</td> <td></td> <td>1</td>		1		, v		1
Low Line Input Current      Vin = minimum      1.06      1.09      //        Inrush Transient      0.05      0.05      //      //        Short Circuit Ingut Current      lout = minimum, unit = 0N      60      85      //        Shut-Down Input Current (0ff, UV, 0T)      0      1      2      //        Shut-Down Input Current (0ff, UV, 0T)      Measured at input with specified filter      30      n        GEREEAL and SAFETY      Win = A8V, full load      83      85.5         Efficiency      Vin = A8V, full load      83      85.5          Isolation Voltage      Input to output      1600	•	Vin = nominal		0.41	0.42	А
Inrush Translent      0.05      /        Short Circuit Input Current      lout = minimum, unit = 0N      50      100      Minimum Load Input Current      100      Minimum Load Input Current      11      2      2        Shurt-Down Input Current (2)      Measured at input with specified filter      30      1      2      7        Reflected (back) ripple current (2)      Measured at input with specified filter      30      1      2      7        GENERAL and SAFETY      Vin = 48V, full load      83      85.5      5      5        Insulation Safety Rating      Input to output      1600      1      1      2        Isolation Capacitance      Input to output      1600      10      1      1        Isolation Capacitance      Input to output      1600      10      1      1        Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950-1      Insulation Capacitance      1500      1      1        Calculated MTBF      Per Telcordia SR32, issue 1, class 3, ground fixed, Tambient = +25°C      TBD      Ho        DYNAMIC CHARACTERISTICS      Safety Time      S0      50      50      50 <td></td> <td></td> <td></td> <td></td> <td></td> <td>A</td>						A
Short Circuit Input Current      Iout = minimum, unit = 0N      50      100        Minimum Load Input Current (Off, UV, OT)      Insulation      1      2      Insulation        Reflected (back) ripple current (2)      Measured at input with specified filter      30      Insulation        CENERAL and SAFETY      Vin = 48V, full load      83      85.5      Insulation        Efficiency      Vin = 48V, full load      85      86.5      Insulation Safety Rating        Isolation Vitage      Input to output      1600      Insulation Safety Rating      Insulation Saf	•	VIII – minindin			1.00	A <sup>2</sup> -Sec.
Minimum Load Input Current      Iout = minimum, unit = 0N      60      85        Shut-Down Input Current (0ff, UV, 0T)      Measured at input with specified filter      30      n        GENERAL and SAFETY      Vin = 48V, full load      83      85.5      Image: Constraint of the					100	mA
Shut-Down Input Current (Off, UV, OT)      1      2        Reflected (back) ripple current ②      Measured at input with specified filter      30      n        GENERAL and SAFETY      30      n      n        GENERAL and SAFETY      Vin = 48V, full load      83      85.5      1        Solation      Vin = min., full load      85      86.5      1        Isolation Otage      Input to output      1600      10      1        Isolation Resistance      100      1500      1      1        Isolation Capacitance      1100      1500      1      1        Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950-1, 1500      1 <t< td=""><td></td><td>lout – minimum unit – ON</td><td></td><td></td><td></td><td>mA</td></t<>		lout – minimum unit – ON				mA
Reflected (back) ripple current (2)      Measured at input with specified filter      30      n        GENERAL and SAFETY      Vin = 48V, full load      83      85.5         Efficiency      Vin = 48V, full load      83      85.5         Isolation      Input to output      1600          Isolation Resistance      10      basic          Isolation Capacitance      110           Safety      Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1      Yes          Calculated MTBF      Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C      TBD      Ho        DYNAMIC CHARACTERISTICS      Free Meering as above      50      50      50        Startup Time      Remote on to Vout regulated      50      50      50        Oynamic Load Response      50-75-50% load step, setting time to within 1% of Vout      60      120      120        Opmanic Load Response      Sorto-55-50% load step, setting time to within 1% of Vout      60      120      50        Remote On/Off Control ③      Tifkit      -	•					mA
GENERAL and SAFETY      Vin = 48V, full load      83      85.5      Image: Control of the second se		Management of importantial and a filter			2	
Vin = 48V, full load      83      85.5         Vin = min., full load      85      86.5           Isolation       85      86.5		Measured at input with specified filter		30		mA, p-p
Vin = min., full load      85      86.5      Image: Solation        Isolation Voltage      Input to output      1600      Image: Solation      Image: Solation        Isolation Safety Rating      Input to output      1600      basic      Image: Solation        Isolation Resistance      10      basic      Image: Solation      10      Image: Solation        Isolation Capacitance      10      1500      Image: Solation      1500      Image: Solation      Solation      Image: S	GENERAL and SAFETY			0.5.5		24
Image: Construct of the minit, full fload  85  86.5    Isolation Voltage  Input to output  1600    Isolation Safety Rating  Input to output  1600    Isolation Resistance  10    Isolation Capacitance  10    Isolation Capacitance  100    Safety  Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1  Yes    Calculated MTBF  Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C  TBD  Ho    DYNAMIC CHARACTERISTICS  Fixed Switching Frequency  300  330  360    Startup Time  Power on to Vout regulated  50  50    Dynamic Load Response  50-75-50% load step, settling time to within 1% of Vout  60  120    Oyamic Load Response  50-75-50% load step, settling time to within 1% of Vout  -0.7  0.8    FEATURES and OPTIONS	Efficiency					%
Isolation Voltage    Input to output    1600    basic      Insulation Safety Rating    10    10    10      Isolation Capacitance    10    10    1500      Safety    Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1    Yes    1500      Calculated MTBF    Per Telocridia SR332, issue 1, class 3, ground fixed, Tambient = +25°C    TBD    Ho      DYNAMIC CHARACTERISTICS    Fixed Switching Frequency    300    330    360    Startup Time      Startup Time    Power on to Vout regulated    50    50    50    50    50      Dynamic Load Response    50-75-50% load step, settling time to within 1% of Vout    60    120    120    50      Prixe Strup Time    Remote on to Vout regulated    50    ±250    50	-	Vin = min., full load	85	86.5		%
Insulation Safety Rating    basic    Image: Constraint of the second seco						1
Isolation Resistance    10    10      Isolation Capacitance    1500    1500      Safety    Certified to UL-60950-1, CSA-C22.2 No. 60950-1, I, IEC/60950-1, 2, Add edition, with AM1    Yes    Image: Comparison of the co		Input to output	1600			Vdc
Isolation Capacitance    1500    1      Safety    Certified to UL-60950-1, CSA-C22.2 No. 60950-1, ILC/60950-1, 2nd edition, with AM1    Yes    Ves      Calculated MTBF    Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C    TBD    Ho      DYNAMIC CHARACTERISTICS    Fixed, Safota 2, issue 1, class 3, ground fixed, Tambient = +25°C    300    330    360      Startup Time    Power on to Vout regulated    50    50    Startup Time    50    50      Dynamic Load Response    50-75-50% load step, settling time to within 1% of Vout    60    120    ±250    FEATURES and OPTIONS      Remote On/Off Control ③    ************************************						
Safety    Certified to UL-60950-1, CSA-C22.2 No. 60950- 1, IEC/60950-1, 2nd edition, with AM1    Yes      Calculated MTBF    Per Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°C    TBD    Ho      DYNAMIC CHARACTERISTICS    TBD    Ho      Fixed Switching Frequency    300    330    360      Startup Time    Power on to Vout regulated    50    50      Startup Time    Remote on to Vout regulated    50    50      Dynamic Load Response    50-75-50% load step, settling time to within 1% of Vout    60    120      Dynamic Load Peak Deviation    same as above    ±150    ±250      FEATURES and OPTIONS    "N" suffix						MΩ
Safety1, IEC/60950-1, 2nd edition, with AM1YesCalculated MTBFPer Telcordia SR332, issue 1, class 3, ground fixed, Tambient = +25°CTBDHoDYNAMIC CHARACTERISTICSFixed Switching Frequency300330360SStartup TimePower on to Vout regulated50SSStartup TimeRemote on to Vout regulated50SSDynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120SDynamic Load Peak Deviationsame as above±150±250SFEATURES and OPTIONSRemote On/Off Control ③"M" suffixNegative Logic, ON stateOFF = Pin open1015SPositive Logic, ON stateOPE = OFF = Pin open1015Positive Logic, ON stateON = Pin open1015	Isolation Capacitance			1500		pF
Calculated MTBFfixed, Tambient = +25°CTBDHoDYNAMIC CHARACTERISTICSFixed Switching Frequency300330360Startup TimePower on to Vout regulated5050Startup TimeRemote on to Vout regulated5050Dynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120Dynamic Load Peak Deviationsame as above±150±250FEATURES and OPTIONS***********************************	Safety	1, IEC/60950-1, 2nd edition, with AM1		Yes		
DYNAMIC CHARACTERISTICS      integration      integratio	Calculated MTRE			TRD		Hours x 10 <sup>6</sup>
Fixed Switching FrequencyNew on to Vout regulatedNew on to Vout regulatedNew on to Vout regulatedNew on to Vout regulatedStartup TimeRemote on to Vout regulated5050Dynamic Load Response50-75-50% load step, settling time to within 1% of Vout60120Dynamic Load Peak Deviationsame as above±150±250FEATURES and OPTIONS***********************************		fixed, Tambient = $+25^{\circ}C$		עסו		HUUIS X TU
Startup Time    Power on to Vout regulated    50      Startup Time    Remote on to Vout regulated    50      Dynamic Load Response    50-75-50% load step, settling time to within 1% of Vout    60    120      Dynamic Load Peak Deviation    same as above    ±150    ±250      FEATURES and OPTIONS      Remote On/Off Control ③      """ suffix      Negative Logic, ON state    ON = Ground pin      OFF = Pin open    10    15      """ suffix      """      Positive Logic, ON state    ON = Pin open      Negative Logic, ON state      Open collector/drain      10      10      """      """      Positive Logic, ON state	DYNAMIC CHARACTERISTICS					
Startup Time    Remote on to Vout regulated    50      Dynamic Load Response    50-75-50% load step, settling time to within 1% of Vout    60    120      Dynamic Load Peak Deviation    same as above    ±150    ±250      FEATURES and OPTIONS      Remote On/Off Control ③      """ suffix      Negative Logic, ON state    ON = Ground pin    -0.7    0.8    0.8      Control Current    0Pen collector/drain    1    1      "P" suffix    0Pen collector/drain    1    1      Positive Logic, ON state    0N = Pin open    10    15	Fixed Switching Frequency		300	330	360	KHz
Dynamic Load Response    50-75-50% load step, setting time to within 1% of Vout    60    120      Dynamic Load Peak Deviation    same as above    ±150    ±250      FEATURES and OPTIONS      Remote On/Off Control ③      "N" suffix      Negative Logic, ON state    ON = Ground pin    -0.7    0.8      Negative Logic, OFF state    OFF = Pin open    10    15      Control Current    Open collector/drain    1       "P" suffix      "Positive Logic, ON state    ON = Pin open    10    15	Startup Time	Power on to Vout regulated			50	mS
Dynamic Load Response1% of Vout60120Dynamic Load Peak Deviationsame as above±150±250FEATURES and OPTIONSrM" suffixNegative Logic, ON stateON = Ground pin-0.70.8Negative Logic, OFF stateOFF = Pin open1015Control CurrentOpen collector/drain1Positive Logic, ON stateON = Pin open101015	Startup Time	Remote on to Vout regulated			50	mS
Dynamic Load Peak Deviationsame as above $\pm 150$ $\pm 250$ FEATURES and OPTIONS"N" suffixNegative Logic, ON state $ON = Ground pin$ $-0.7$ $0.8$ Negative Logic, OFF state $OFF = Pin open$ $10$ $15$ Control Current $Open collector/drain$ $1$ "Pi'' suffix"Positive Logic, ON state $ON = Pin open$ $10$ $15$	Dynamic Load Response			60	120	μSec
FEATURES and OPTIONS        Remote On/Off Control ③        "N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8        Negative Logic, OFF state      OFF = Pin open      10      15        Control Current      Open collector/drain      1         "P" suffix      "Pin open      10      15	Dynamic Load Peak Deviation			±150	±250	mV
Remote On/Off Control ③        "M" suffix      ON = Ground pin      -0.7      0.8 <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td></th<>						
"N" suffix        Negative Logic, ON state      ON = Ground pin      -0.7      0.8        Negative Logic, OFF state      OFF = Pin open      10      15        Control Current      Open collector/drain      1      Positive Logic, ON state      N = Pin open      10      15						
Negative Logic, ON state      ON = Ground pin      -0.7      0.8        Negative Logic, OFF state      OFF = Pin open      10      15        Control Current      Open collector/drain      1      1        "P" suffix      ON = Pin open      10      15						
Negative Logic, OFF state      OFF = Pin open      10      15        Control Current      Open collector/drain      1         "P" suffix        10      15        Positive Logic, ON state      ON = Pin open      10      15		ON – Ground nin	-0.7		0.8	V
Control Current      Open collector/drain      1         "P" suffix         10      15      15						V
"P" suffix        Positive Logic, ON state      ON = Pin open      10      15			10	1	10	mA
Positive Logic, ON state      ON = Pin open      10      15						IIIA
		ON Din anon	10		15	V
<b>POSITIVE LOGIC, UFF STATE</b> $ $ UFF = Ground pin $ $ -U./ $ $ U./ $ $						V
Control Current Open collector/drain 1	<b>e</b> <i>i</i>		-0.7		U. <i>1</i>	V mA

# **SPM15 Series**

Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

### FUNCTIONAL SPECIFICATIONS (CONT.) – MODEL SPM15-150-Q48

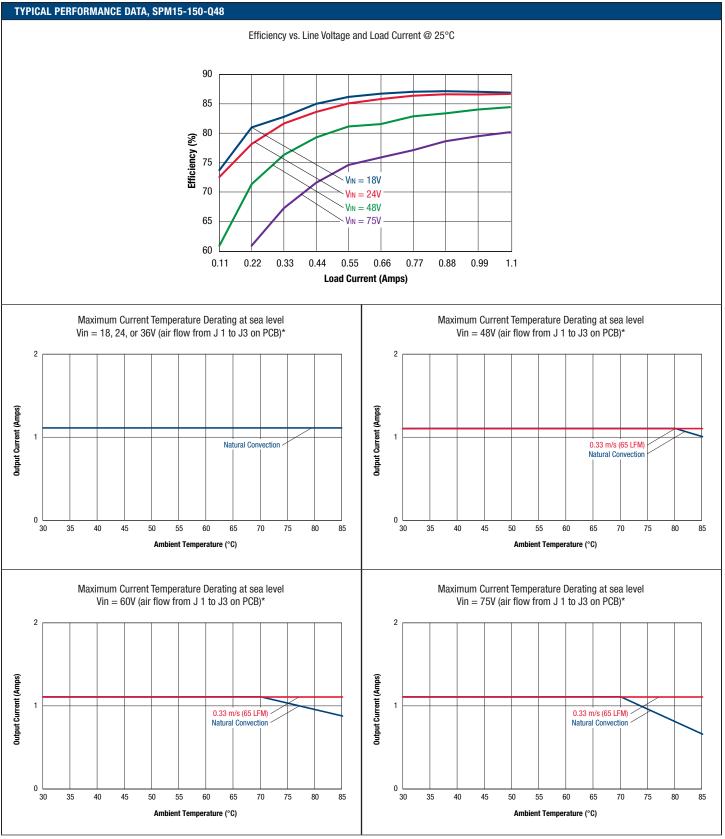
OUTPUT	Conditions ① ③	Minimum	Typical/Nominal	Maximum	Units
Total Output Power		1.63	16.5	16.67	W
Voltage					•
Nominal Output Voltage	No trim	14.85	15	15.15	Vdc
Setting Accuracy	At 50% load, no trim	1		1	% of Vnom
Output Voltage Range	User-adjustable	-10		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	19	20	21.5	Vdc
Current	•				•
Output Current Range		0.11	1.1	1.1	A
Current Limit Inception	98% of Vnom., after warmup	1.3	1.7	2.2	A
Short Circuit	· · · ·				-
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout			0.3	А
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., lout = nom.			±0.1	% of Vout
Load Regulation	lout = min. to max., Vin = 48V			±0.075	% of Vout
Ripple and Noise	5 Hz- 20 MHz BW, Vin=24V		80	150	mV pk-pk
Temperature Coefficient	At all outputs		±0.02		% of Vnom./°C
Maximum Capacitive Loading	Low ESR			470	μF
MECHANICAL					
Outline Dimensions			1 x 1 x 0.41		Inches
(Please refer to outline drawing)	WxLxH		25.4 x 25.4 x 10.41		mm
Weight			0.69		Ounces
			19.56		Grams
Through Hole Pin Diameter			0.04		Inches
			1.016		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	See Derating	-40		85	°C
Operating Case Temperature Range	No derating	-40		105	0°
Case Material	Tin plated steel with black powder coat				
Storage Temperature	Vin = Zero (no power)	-55		125	0°
Thermal Protection/Shutdown	Measured in center	110	115	120	0°
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			В		Class
RoHS rating			RoHS-6		

#### Notes

- $\odot$  Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load. General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow. All models are tested and specified with external parallel 1  $\mu F$  and 10  $\mu F$  output capacitors. The external input capacitor is 4.7  $\mu F$ . All capacitors are low-ESR types wired close to the converter.
- @ Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220  $\mu F,$  Cin=33  $\mu F$  and Lbus=12  $\mu H.$



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\*Using Burn in board, connection with solder

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## **SPM15 Series**

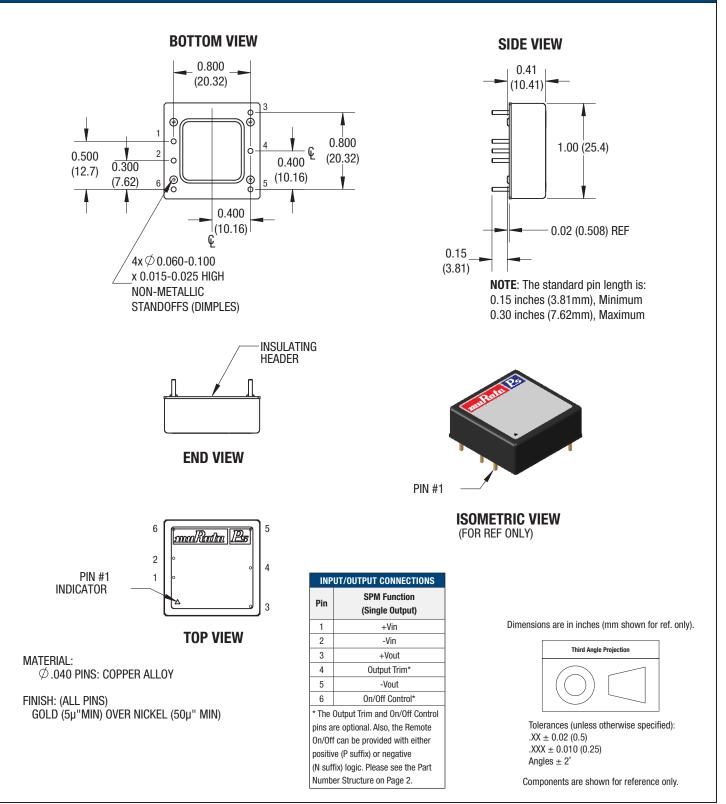
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# **SPM15 Series**

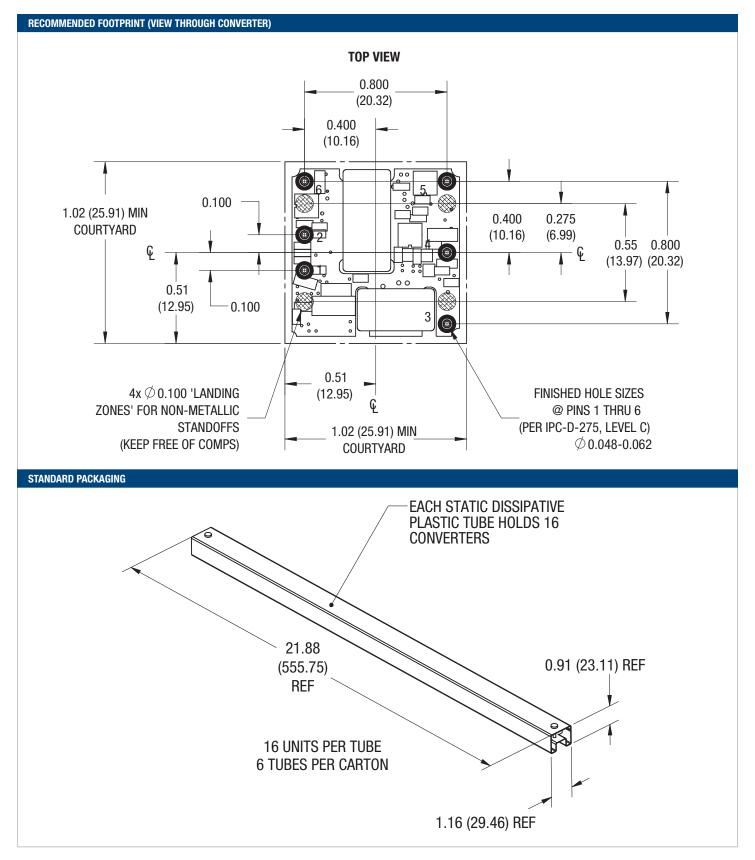
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#### MECHANICAL SPECIFICATIONS





Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters



# **SPM15 Series**

### Single Output Potted Metal Package Isolated 15-Watt DC-DC Converters

#### TECHNICAL NOTES

#### **Input Fusing**

Certain applications and/or safety agencies may 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 current-limited. For greatest safety, we recommend a fast blow fuse installed in the ungrounded input supply line.

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.

Users should be aware however 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, make sure the operating input voltage is well 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 Delay (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  $V_{0UT}$  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

These converters will operate to specifications without external components, assuming that the source voltage has very low impedance and reasonable input voltage regulation. Since real-world voltage sources have finite impedance, performance is improved by adding external filter components. Sometimes only a small ceramic capacitor is sufficient. Since it is difficult to totally characterize all applications, some experimentation may be needed. Note that external input capacitors must accept high speed switching currents. Because of the switching nature of DC/DC converters, the input of these converters must be driven from a source with both low AC impedance and adequate DC input regulation. Performance will degrade with increasing input inductance. Excessive input inductance may inhibit operation. The DC input regulation specifies that the input voltage, once operating, must never degrade below the Shut-Down Threshold under all load conditions. Be sure to use adequate trace sizes and mount components close to the converter.

#### 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 (CN 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 may require additional considerations. Please note that the values of CIN, LBUS and CBUS may vary according to the specific converter model.

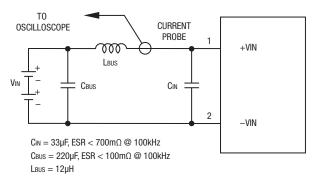


Figure 1. Measuring Input Ripple Current

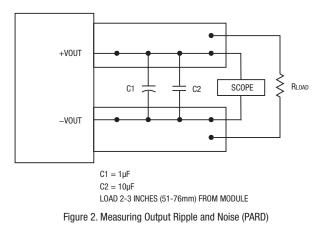
In critical applications, output ripple and noise (also referred to as periodic and random deviations or PARD) may be reduced by adding filter elements such as multiple external capacitors. Be sure to calculate component temperature rise from reflected AC current dissipated inside capacitor ESR.

#### **Floating Outputs**

Since these are isolated DC/DC converters, their outputs are "floating" with respect to their input. The essential feature of such isolation is ideal ZERO CURRENT FLOW between input and output. Real-world converters however do exhibit tiny leakage currents between input and output (see Specifications). These leakages consist of both an AC stray capacitance coupling component and a DC leakage resistance. When using the isolation feature, do not allow the isolation voltage to exceed specifications. Otherwise the converter may be damaged. Designers will normally use the negative output (-Output) as the ground return of the load circuit. You can however use the positive output (+Output) as the ground return to effectively reverse the output polarity.

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#### **Minimum Output Loading Requirements**

These converters employ a synchronous rectifier design topology. All models regulate within specification and are stable from 0% load to full load conditions, unless otherwise specified. Operation under no load will not damage the converter but might, however, slightly increase regulation, output ripple, and noise.

#### **Thermal Shutdown**

To protect against thermal over-stress, these converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the DC/ DC's to rise above the 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. CAUTION: If you operate too close to the thermal limits, the converter may shut down suddenly without warning. Be sure to thoroughly test your application to avoid unplanned thermal shutdown.

#### **Temperature Derating Curves**

The graphs in the performance data section illustrate 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 ("LEM"). Note that these are AVERAGE measurements. The converter will accept brief increases in temperature and/or 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 "natural convection" is defined as very low flow rates which are not using fan-forced airflow. Depending on the application, "natural convection" is usually about 30-65 LFM but is not equal to still air (0 LFM).

Murata Power Solutions makes Characterization measurements in a closed cycle wind tunnel with calibrated airflow. We use both thermocouples and an infrared camera system 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 may 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.

#### **Output Overvoltage Protection (OVP)**

This converter monitors its output voltage for an over-voltage condition using an on-board electronic comparator. The signal is optically coupled to the primary side PWM controller. If the output exceeds OVP limits, the sensing circuit will power down the unit, and the output voltage will decrease. After a time-out period, the PWM will automatically attempt to restart, causing the output voltage to ramp up to its rated value. It is not necessary to power down and reset the converter for this automatic OVP-recovery restart.

If the fault condition persists and the output voltage climbs to excessive levels, the OVP circuitry will initiate another shutdown cycle. This on/off cycling is referred to as "hiccup" mode.

#### **Output Fusing**

The converter is extensively protected against current, voltage and temperature extremes. However, your application circuit may need additional protection. In the extremely unlikely event of output circuit failure, excessive voltage could be applied to your circuit. Consider using an appropriate external protection.

#### **Output Current Limiting**

As soon as the output current increases to approximately its overcurrent limit, the DC/DC converter will enter a current-limiting mode. The output voltage will decrease proportionally with increases in output current, thereby maintaining a somewhat constant power output. This is commonly referred to as power limiting.

Current limiting inception is defined as the point at which full power falls below the rated tolerance. See the Performance/Functional Specifications. Note particularly that the output current may briefly rise above its rated value. This enhances reliability and continued operation of your application. If the output current is too high, the converter will enter the short circuit condition.

#### **Output Short Circuit Condition**

When a converter is in current-limit mode, the output voltage will drop as the output current demand increases. If the output voltage drops too low, the magnetically coupled voltage used to develop PWM bias voltage will also drop, thereby shutting down the PWM controller. Following a time-out period, the PWM will restart, causing the output voltage to begin rising to its appropriate value. If the short-circuit condition persists, another shutdown cycle will initiate. This on/off cycling is called "hiccup mode." The hiccup cycling reduces the average output current, thereby preventing excessive internal temperatures.

#### **Trimming the Output Voltage**

The Trim input to the converter allows the user to adjust the output voltage over the rated trim range (please refer to the Specifications). In the trim equations and circuit diagrams that follow, trim adjustments use a single fixed resistor connected between the Trim input and either Vout pin. Trimming resistors should have a low temperature coefficient (±100 ppm/°C or less) and be mounted close to the converter. Keep leads short. If the trim function is not used, leave the trim unconnected. With no trim, the converter will exhibit its specified output voltage accuracy.

There are two CAUTIONs to observe for the Trim input:

<u>CAUTION</u>: To avoid unplanned power down cycles, do not exceed EITHER the maximum output voltage OR the maximum output power when setting the trim. If the output voltage is excessive, the OVP circuit may inadvertantly shut down the converter. If the maximum power is exceeded, the converter may

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enter current limiting. If the power is exceeded for an extended period, the converter may overheat and encounter overtemperature shut down.

<u>CAUTION</u>: Be careful of external electrical noise. The Trim input is a sensitive input to the converter's feedback control loop. Excessive electrical noise may cause instability or oscillation. Keep external connections short to the Trim input. Use shielding if needed.

#### **Trim Equations**

Trim Up
<connect resistor<="" th="" trim=""></connect>
between Trim and –Vout>

Trim Down <Connect trim resistor between Trim and +Vout>

	SPM15-033-Q12, Q48					
$R_{T_{IIP}}(\Omega) =$	12775		$B_{\text{Topular}}(\Omega) = \frac{5110 (\text{Vo} - 2.5)}{-2050}$			
111 <sub>UP</sub> (12) —	$V_0 - 3.3$	2000	$RT_{DOWN}(\Omega) = \frac{1}{3.3 - V_0} - 2050$			
		SPM15-05	0-Q12, Q48			
$R_{T_{IIP}}(\Omega) =$	12775	- 2050	$R_{T_{DOWN}}(\Omega) = \frac{5110 \text{ x (Vo } -2.5)}{5 \text{ v}} - 2050$			
III <sub>UP</sub> (12) =	$V_0 - 5$	- 2030	$5 - V_0$			
		SPM15-12				
P <sub>T</sub> (0) -	25000	_ 5110	$R_{T_{\text{DOWN}}}(\Omega) = \frac{10000 \text{ (Vo-2.5)}}{12 \text{ Vo}} - 5110$			
$R_{T_{UP}}(\Omega) =$	Vo-12	5110	12 – Vo			
	SPM15-150-Q12, Q48					
PT (0) -	25000	5110	$R_{T_{\text{DOWN}}}(\Omega) = \frac{10000 \text{ (Vo-2.5)}}{15 - V_0} - 5110$			
$R_{T_{UP}}(\Omega) =$	Vo-15	- 5110	$H_{DOWN}(\Omega) = 15 - V_0$			

Where Vo = Desired output voltage. Adjustment accuracy is subject to resistor tolerances and factory-adjusted output accuracy. Mount trim resistor close to converter. Use short leads.

#### **Remote On/Off Control**

On the input side, a remote On/Off Control can be specified with either positive or negative logic as follows:

<u>Positive</u>: Models equipped with Positive Logic are enabled when the On/Off pin is left open or is pulled high to +15Vpc with respect to  $-V_{IN}$ . An internal bias current causes the open pin to rise to  $+V_{IN}$ . Positive-logic devices are disabled when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to  $-V_{IN}$ .

<u>Negative:</u> 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  $+15V_{DC}$  Max. with respect to  $-V_{IN}$ .

Dynamic control of the On/Off function should be able to sink the specified signal current when brought low and withstand specified voltage when brought high. Be aware too that there is a finite time in milliseconds (see Specifications) between the time of On/Off Control activation and stable, regulated output. This time will vary slightly with output load type and current and input conditions.

There are two CAUTIONs for the On/Off Control:

<u>CAUTION</u>: While it is possible to control the On/Off with external logic if you carefully observe the voltage levels, the preferred circuit is either an open drain/open collector transistor or a relay (which can thereupon be controlled by logic). The On/Off prefers to be set at approx. +15V (open pin) for the ON state, assuming positive logic.

<u>CAUTION</u>: Do not apply voltages to the On/Off pin when there is no input power voltage. Otherwise the converter may be permanently damaged.

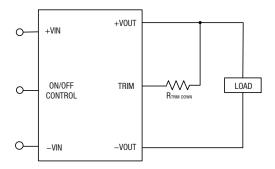


Figure 3. Trim adjustments to decrease Output Voltage using a Fixed Resistor

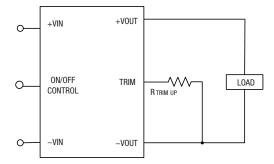


Figure 4. Trim adjustments to increase Output Voltage using a Fixed Resistor

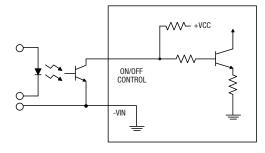
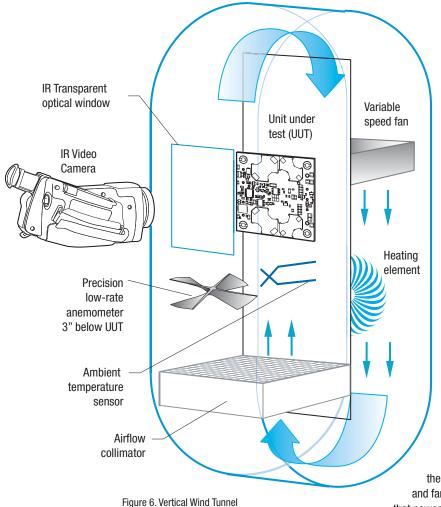


Figure 5. Driving the On/Off Control Pin (suggested circuit)

niny or oscillation. Keep external connections short to the nielding if needed. **ons** 

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#### **Vertical Wind Tunnel**

Murata Power Solutions employs a computer controlled custom-designed closed loop vertical wind tunnel, infrared video camera system, and test instrumentation for accurate airflow and heat dissipation analysis of power products. The system includes a precision low flow-rate anemometer, variable speed fan, power supply input and load controls, temperature gauges, and adjustable heating element.

The IR camera monitors the thermal performance of the Unit Under Test (UUT) under static steady-state conditions. A special optical port is used which is transparent to infrared wavelengths.

Both through-hole and surface mount converters are soldered down to a 10" X10" host carrier board for realistic heat absorption and spreading. Both longitudinal and transverse airflow studies are possible by rotation of this carrier board since there are often significant differences in the heat dissipation in the two airflow directions. The combination of adjustable airflow, adjustable ambient heat, and adjustable Input/Output currents and voltages mean that a very wide range of measurement conditions can be studied.

The collimator reduces the amount of turbulence adjacent to the UUT by minimizing airflow turbulence. Such turbulence influences the effective heat transfer characteristics and gives false readings. Excess turbulence removes more heat from some surfaces and less heat from others, possibly causing uneven overheating.

Both sides of the UUT are studied since there are different thermal gradients on each side. The adjustable heating element and fan, built-in temperature gauges, and no-contact IR camera mean that power supplies are tested in real-world conditions.

#### **Soldering Guidelines**

Murata Power Solutions recommends the specifications below when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications may cause damage to the product. Be cautious when there is high atmospheric humidity. We strongly recommend a mild pre-bake (100° C. for 30 minutes). Your production environment may differ; therefore please thoroughly review these guidelines with your process engineers.

Wave Solder Operations for through-hole mounted products (THMT)						
For Sn/Ag/Cu based solders: For Sn/Pb based solders:						
Maximum Preheat Temperature	115° C.	Maximum Preheat Temperature	105° C.			
Maximum Pot Temperature	270° C.	Maximum Pot Temperature	250° C.			
Maximum Solder Dwell Time	7 seconds	Maximum Solder Dwell Time	6 seconds			

Murata Power Solutions, Inc. 11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A. ISO 9001 and 14001 REGISTERED



This product is subject to the following <u>operating requirements</u> and the <u>Life and Safety Critical Application Sales Policy</u>: Refer to: <u>http://www.murata-ps.com/requirements/</u>

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