MEAN WELL

12A SDM Type Non-Isolated DC-DC Converter

SPOL-12 series

TPTC004

Automate Industrial Security Network Telecom

Features

- 3-14.4Vdc wide input range
- High efficiency up to 91%@ 12Vin
- Remote ON/OFF control
- Compact size 12.19*12.19*3.1mm
- Ultra-wide operating temperature range -40 ~ +90℃
- Protections: Short circuit (Continuous)
- EN62368 safety approval
- 3 years warranty

Applications

- Distrbuted power architectures
- Intermediate bus voltage application
- Telecommunications equipment
- Servers and storage applications
- Networking equipment
- Industrial equipment

Description

Model Encoding

SPOL – 12 F

- F: Remote ON/OFF control：P：Positire logic / N：Negative logic
- 12: Output current
- SPOL: Series name

MODEL SELECTION TABLE

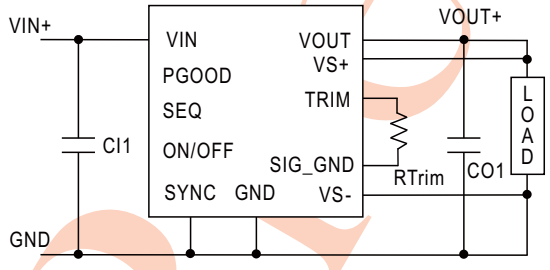
ORDER NO.	INPUT			OUTPUT		EFFICIENCY (TYP.)	CAPACITOR LOAD (MAX.)
	INPUT VOLTAGE (RANGE)	INPUT CURRENT		OUTPUT VOLTAGE	OUTPUT CURRENT		
		NO LOAD	FULL LOAD				
SPOL-12	Normal 12V (3 ~ 14.4V)	30mA	5.4A	5V	12A	91%	200μF
		30mA	3.8mA	3.3V		88%	
		30mA	2.9A	2.5V		86%	
		30mA	2.2A	1.8V		82.5%	
		30mA	1.55A	1.2V		77%	
		30mA	1A	0.6V		65%	

* For each output

■ Output Voltage Trim

The Formula for Output Voltage Trim

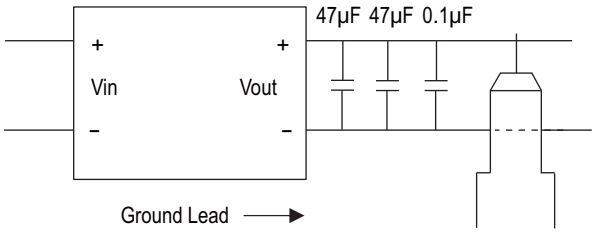
$$Rtrim\ (K\Omega) = \frac{12K}{Vo-0.6}$$



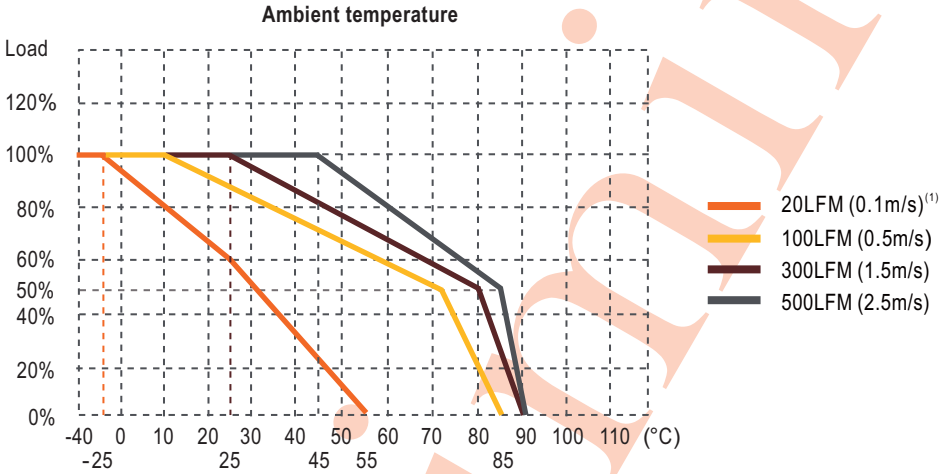
Output Voltage	Calculated Rtrim (KΩ)
5V	2.727
3.3V	4.444
2.5V	6.316
1.8V	10
1.5V	13.33
1.2V	20
0.6V	∞(Open)

SPECIFICATION				
INPUT	VOLTAGE RANGE	3~14.4Vdc (Start-up voltage 3Vdc)		
	START-UP VOLTAGE	3.0V max.		
OUTPUT	VOLTAGE ACCURACY	±3%		
	RATED CURRENT	12A		
	RIPPLE & NOISE Note.2	Vo<1.2Vdc 50mVp-p max ; Vo>1.2Vdc 3% Vo mVp-p		
	LINE REGULATION Note.4	±0.4%		
	LOAD REGULATION Note.5	±0.2%		
	SWITCHING FREQUENCY (Typ.)	800KHz		
	OUTPUT VOLTAGE TRIM	0.6V min to 5.5Vmax. The see output voltage trim example application circuit		
PROTECTION	SHORT CIRCUIT	Protection type : Continuous, automatic recovery		
	OVER VOLTAGE	Protection type : Clamp by diode		
	UNDER VOLTAGE LOCKOUT	Start-up voltage	24Vin: 8.8Vdc, 48Vin: 17Vdc, 110Vin: 40Vdc	
		Shutdown voltage	24Vin: 8Vdc,48Vin: 16Vdc, 110Vin: 38Vdc	
FUNCTION	REMOTE CONTROL	Positive Power ON : open or <1.6V≦Von/off≦5.5Vdc ; Power OFF: Short to Gnd or≦Von/off≦0.6Vdc		
		Nositive Power ON : Short to Gnd or 0V≦Von/off≦0.6Vdc ; Power OFF: 1V ≦Von/off≦5.5Vdc		
	POWER GOOD	Overvoltage threshold for PGOOD ON 116.5% Vo		
		Overvoltage threshold for PGOOD OFF 120% Vo		
		Undervoltage threshold for PGOOD ON 91% Vo		
		PGOOD low sink current @VPGOOD = 0.2V 100μA		
ENVIRONMENT	COOLING METHOD	Free-air convection		
	WORKING TEMP.	-40 ~ +90℃ (Refer to "Derating Curve")		
	WORKING HUMIDITY	20% ~ 90% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-55 ~ +125℃, 10 ~ 95% RH non-condensing		
	TEMP. COEFFICIENT	0.03% / ℃ (0 ~ 90℃)		
	SOLDERING TEMPERATURE	1.5mm from case of 1 ~ 3sec./240℃ max.		
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes		
SAFETY & EMC (Note.6)	SAFETY STANDARDS	BS EN/EN62368-1, EAC TP TC 004 approved		
	EMC EMISSION	**Parameter**	**Standard**	**Test Level / Note**
		Conducted	BS EN/EN55032	N/A
		Radiated	BS EN/EN55032	Class A(with external components)
	EMC IMMUNITY	**Parameter**	**Standard**	**Test Level / Note**
		ESD	BS EN/EN61000-4-2	Level3, ±8KV air, ±6KV contact
		EFT/Burest	BS EN/EN61000-4-4	Level 3, 2.0KV
		Surge	BS EN/EN61000-4-5	Level 4, 2KV
OTHERS	MTBF	1132Khrs MIL-HDBK-217F(25℃)		
	DIMENSION (L*W*H)	12.19*12.19*3.10mm (0.48*0.48*0.122 inch)		
	PACKING	0.8g		
NOTE	1.All parameters are specified at normal input(12Vdc), rated load, 25℃ 70% RH ambient. 2.Ripple & noise are measured at 20MHz by using a 12" twisted pair terminated with a 0.1μf & 47μf capacitor. 3.The output voltage range is limited by Vin. (Vout≦Vin -2Vdc). 4.Line regulation is measured from low line to high line at rated load. 5.Load regulation is measured from 10% to 100% rated load. 6.The final equipment must be re-confirm that it still meet EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies."(as available on http://www.meanwell.com) ※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx			

■ Ripple & Noise measure method

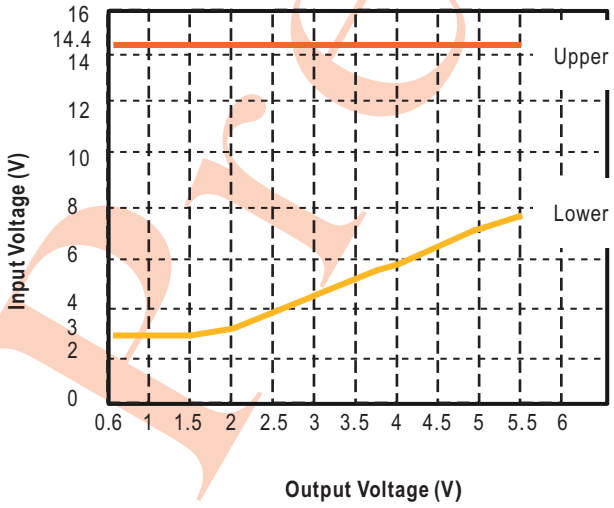


■ Derating Curve

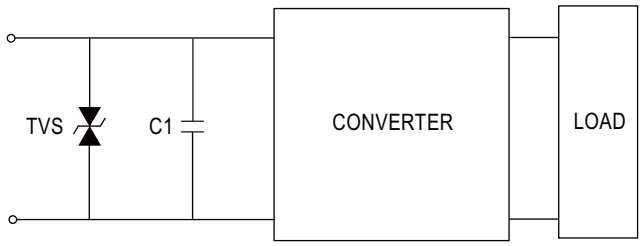


The derating curve was measured at 12V input and 5V output., all of the element can't be higher than 125°C.
(1)The derating curve is at 7V input and 5V output.

■ Output Voltage vs. Input Voltage Set Point Area Plot



■ EFT and surge external input capacitor required



TVS	C1
P4SMAJ13CA	10000μF/25V

■ Example Application Circuit

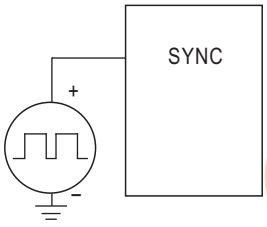
1.Power Good

Power Good monitor output. This open-drain output goes low during overcurrent, short-circuit, UVLO, overvoltage and undervoltage, overtemperature, or when the output is not regulated (such as an prebias output). An external pullup resistor to VDD or to an external rail is required. Included is a 20-μs deglitch filter. PGOOD pin can be connected through a pullup resistor suggested value 100KΩ) to a source of 5VDC or lower.

2.Synchronization

The module switching frequency can be synchronized to a signal with an external frequency within a specified range.

Synchronization can be done by using the external signal applied to the SYNC pin of the module, with the converter being synchronized by the rising edge of the external signal. The Electrical Specifications table specifies the requirements of the external SYNC signal. If the SYNC pin is not used, the module should free run at the default switching frequency. If synchronization is not being used, connect the SYNC pin to GND.



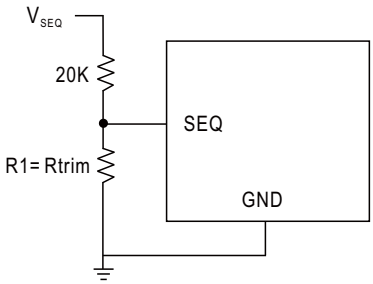
3.Output Voltage Sequencing

The SEQ pin can be used when master-slave power-supply tracking is required.The voltage applied to the SEQ pin should be scaled down by the same ratio as used to scale the output voltage down to the reference voltage of the module. This is accomplished by an external resistive divider connected across the sequencing voltage before it is fed to the SEQ pin.

The minimum recommended delay between the ON/OFF signal and the sequencing signal is 10ms to ensure that the module output is ramped up according to the sequencing signal. This ensures that the module soft-start routine is completed before the sequencing signal is allowed to ramp up.

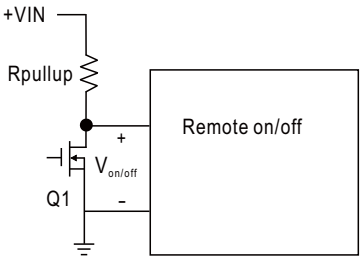
When an analog voltage is applied to the SEQ pin, the output voltage tracks this voltage until the output reaches the set-point voltage. The final value of the SEQ voltage must be set higher than the set-point voltage of the module. The output voltage follows the voltage on the SEQ pin on a one-to-one basis. By connecting multiple modules together, multiple modules can track their output voltages to the voltage applied on the SEQ pin.

To initiate simultaneous shutdown of the modules, the SEQ pin voltage is lowered in a controlled manner. The output voltage of the modules tracks the voltages below their setpoint voltages on a one-to-one basis. A valid input voltage must be maintained until the tracking and output voltages reach ground potential.



The SEQ pin can be used when master-slave power-supply tracking is required.

4.Remote ON/OFF



The circuit configuration for using the Remote On/Off pin is shown in figure. And the logic type active mode as the description below.

Positive Logic
DC/DC ON : Q1 OFF
DC/DC OFF : Q1 ON

Negative Logic
DC/DC ON : Q1 ON
DC/DC OFF: Q1 OFF

■ Surface Mount Information

1.Pick and Place

The 12A Open Frame modules use an open frame construction and are designed for a fully automated assembly process. We suggest the pick and place operations is inductor.

2.MSL Rating

The 12A Open Frame modules have a MSL rating of 3.

3.Storage and Handling

The recommended storage environment and handling procedures for moisture-sensitive surface mount packages is detailed in J-STD-033 (Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices).

Moisture barrier bags (MBB) with desiccant are required for MSL ratings of 3 or greater. These sealed packages should not be broken until time of use. Once the original package is broken, the floor life of the product at conditions of ≦ 30°C and 60% relative humidity 168 hours varies according to the MSL rating (see J-STD-033). The shelf life for dry packed SMT packages will be a maximum of 12 months from the bag seal date, when stored at the following conditions: < 40°C, < 90% relative humidity.

4.Post Solder Cleaning and Drying Considerations

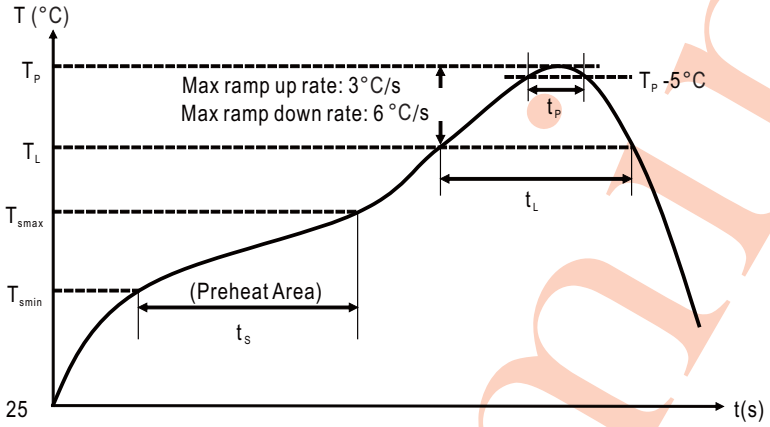
To avoid contamination on the soldering pads extra care has to be taken when handling the boards. Clean soldering surfaces don not generate as much gases when the flux reduce the metal oxides or react with contaminants during the soldering process.

5.Nozzle

The module weight has been kept to a minimum by using open frame construction. Variables such as nozzle size, tip style, vacuum pressure and placement speed should be considered to optimize this process.

6.Lead-free Reflow Profile

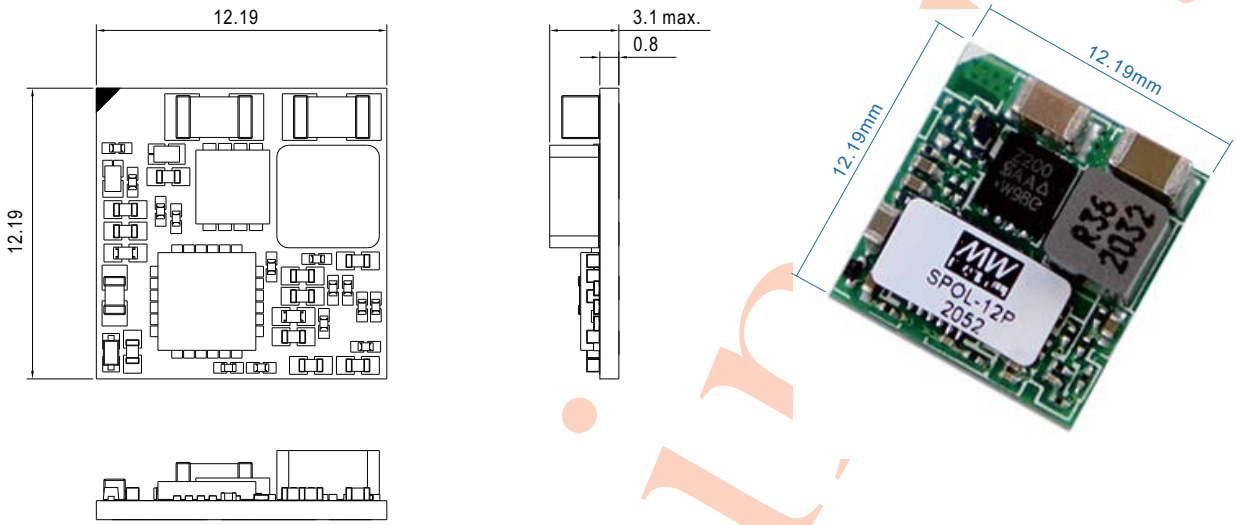
Power Systems will comply with J-STD-020 (Moisture/Reflow Sensitivity Classification for non-hermetic Solid State Surface Mount Devices) for both Pb-free solder profiles and MSL classification procedures. This standard provides a recommended forced-air-convection reflow profile based on the volume and thickness of the package. The suggested Pb-free solder paste is Sn/Ag/Cu (SAC). The recommended linear reflow profile using Sn/Ag/Cu solder is shown. Soldering outside of the recommended profile requires testing to verify results and performance.

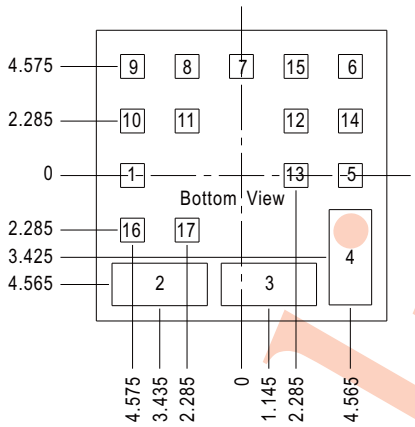


Profile	Pb-Free Assembly
Average ramp-up rate (Tsmax to TP)	3°C/s max.
Preheat Temperature Min. (Tsmin) Temperature Max. (Tsmax) Ts (Tsmin to Tsmax)	 150°C 200°C 60-120s
Temperature (TP)	245°C
Time maintained above Temperature (TL) Time (tl)	 217°C 60-150s
Time within 5°C of the specified Peak temperature (TP)	20-40s
Ramp down rate (TP to TL)	6°C/s max
Time 25°C to peak temperature	8 minutes max.

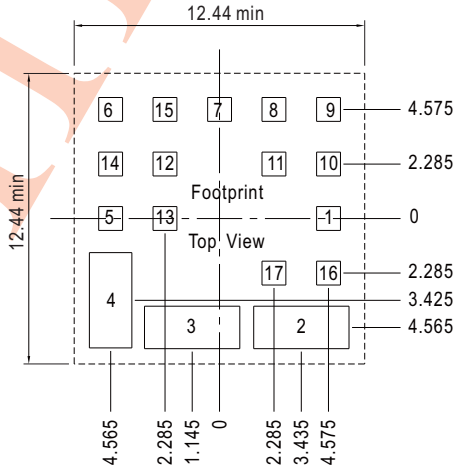
■ Mechanical Specification

• Tolerance: ±0.25mm





Pad2~4 Dimension = 4x1.78mm
Pad1 & Pad5~17 Dimension = 1x1mm



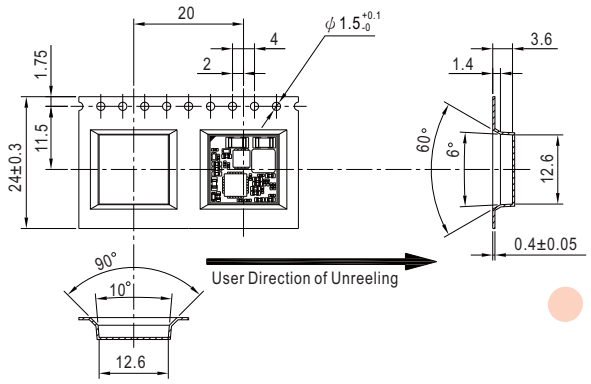
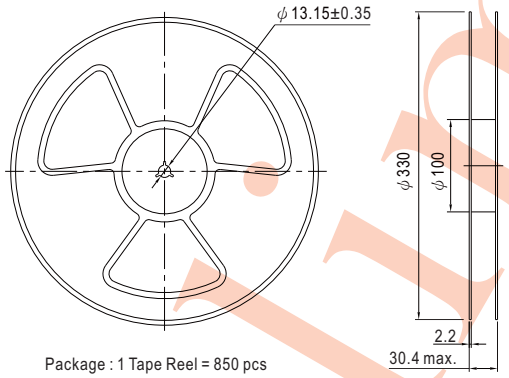
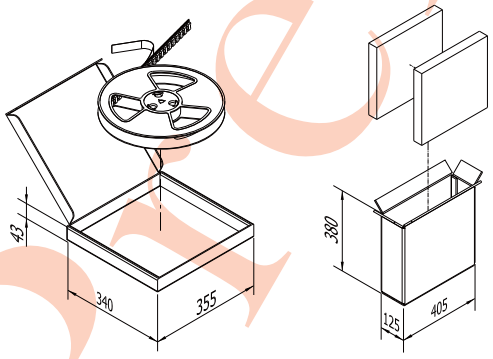
Pad2~4 Dimension = 4.2x1.87mm
Pad1 & Pad5~17 Dimension = 1.05x1.05mm

■ Plug Assignment

Pin-Out			
Pin No.	Single	Pin No.	Single
1	ON/OFF	8,14,15,16,17	NC
2	Vin	9	SEQ
3,7	GND	10	PGOOD
4	Vout	11	SYNC
5	VS+(sense)	12	VS-
6	Trim	13	SIG_GND

If Pin11 is not being used, connect the SYNC pin to GND.
NC= No Connection

■ Packing

Reel Packing	MPQ Per Reel (PCS)	One Box G.W.	Max. Q'TY/ Carton(PCS)	One Carton G.W.
Unit : mm  1).10 sprocket hole pitch cumulative tolerance ±0.2 mm. 2).All dimensions meet EIA-481-2A requirements. 3).Component loader per 13" reel : 850 pcs. 4).All dimensions = ±0.1 mm.  Package : 1 Tape Reel = 850 pcs  1 Tape Reel = 650 converters Carton accommodates 2 boxes 1300 converters per carton	850	0.8g	1700	2.91Kg

■ Installation Manual

Please refer to : http://www.meanwell.com/manual.html