

**FEATURES:**

- SMD Package
- Single Output Models
- Low Ripple and Noise
- Industry Standard Pinout
- Input / Output Isolation 1500 & 3000 VDC
- Operating Temperature -40°C to +105°C
- RoHS Compliant
- Continuous Short Circuit Protection



Models

Single output

Model	Input Voltage (V)	Output Voltage (V)	Output Current Max / Min (mA)	Isolation (VDC)	Input Current Max No Load (mA)		Max Capacitive Load (μF)	Efficiency (%) (Typ.)
AM1LS-0303S-NZ‡	2.97-3.63	3.3	303 / 30	1500	415	25	220	69
AM1LS-0305S-NZ‡#	2.97-3.63	5	200 / 20	1500	404	25	220	74
AM1LS-0309S-NZ‡	2.97-3.63	9	111 / 12	1500	404	25	220	80
AM1LS-0312S-NZ‡	2.97-3.63	12	84 / 9	1500	404	25	220	80
AM1LS-0315S-NZ‡	2.97-3.63	15	67 / 7	1500	404	25	220	80
AM1LS-0324S-NZ‡	2.97-3.63	24	42 / 4	1500	404	25	220	80
AM1LS-0503SJZ	4.5-5.5	3.3	303 / 30	1500	286	10	2400	74
AM1LS-0505SJZ**	4.5-5.5	5	200 / 20	1500	286	10	2400	82
AM1LS-0509SJZ	4.5-5.5	9	111 / 12	1500	254	20	1000	83
AM1LS-0512SJZ	4.5-5.5	12	84 / 9	1500	254	20	560	83
AM1LS-0515SJZ	4.5-5.5	15	67 / 7	1500	254	30	560	83
AM1LS-0524SJZ	4.5-5.5	24	42 / 4	1500	254	30	220	85
AM1LS-0503S-NZ***	4.5-5.5	3.3	303 / 30	1500	263	20	2400	74
AM1LS-0505S-NZ***	4.5-5.5	5	200 / 20	1500	250	20	2400	82
AM1LS-0506S-NZ#	4.5-5.5	6	167 / 17	1500	250	20	220	80
AM1LS-0509S-NZ***	4.5-5.5	9	111 / 12	1500	250	20	1000	83
AM1LS-0512S-NZ***	4.5-5.5	12	84 / 9	1500	250	20	560	83
AM1LS-0515S-NZ***	4.5-5.5	15	67 / 7	1500	250	20	560	83
AM1LS-0524S-NZ***	4.5-5.5	24	42 / 4	1500	250	20	220	85
AM1LS-1203S-NZ#	10.8-13.2	3.3	303 / 30	1500	111	15	220	75
AM1LS-1205S-NZ#	10.8-13.2	5	200 / 20	1500	104	15	220	80
AM1LS-1209S-NZ#	10.8-13.2	9	111 / 12	1500	104	15	220	80
AM1LS-1212S-NZ#	10.8-13.2	12	84 / 9	1500	103	15	220	81
AM1LS-1215S-NZ#	10.8-13.2	15	67 / 7	1500	103	15	220	81
AM1LS-1224S-NZ	10.8-13.2	24	42 / 4	1500	103	15	220	81
AM1LS-1505S-NZ	13.5-16.5	5	200 / 20	1500	82	10	220	80
AM1LS-1509S-NZ	13.5-16.5	9	111 / 12	1500	82	10	220	80
AM1LS-1515S-NZ	13.5-16.5	15	67 / 7	1500	82	10	220	81
AM1LS-2403S-NZ‡	21.6-26.4	3.3	303 / 30	1500	52	7	220	71
AM1LS-2405S-NZ‡	21.6-26.4	5	200 / 20	1500	52	7	220	80
AM1LS-2409S-NZ‡	21.6-26.4	9	111 / 12	1500	52	7	220	80
AM1LS-2412S-NZ‡	21.6-26.4	12	84 / 9	1500	52	7	220	80
AM1LS-2415S-NZ‡	21.6-26.4	15	67 / 7	1500	51	7	220	81
AM1LS-2424S-NZ‡	21.6-26.4	24	42 / 4	1500	51	7	220	81
AM1LS-0303SH30-NZ‡	2.97-3.63	3.3	303 / 30	3000	415	25	220	73
AM1LS-0305SH30-NZ‡#	2.97-3.63	5	200 / 20	3000	388	25	220	78
AM1LS-0503SH30-NZ***	4.5-5.5	3.3	303 / 30	3000	263	20	2400	74
AM1LS-0505SH30-NZ***	4.5-5.5	5	200 / 20	3000	250	20	2400	82
AM1LS-0509SH30-NZ***	4.5-5.5	9	111 / 12	3000	250	20	1000	83
AM1LS-0512SH30-NZ***	4.5-5.5	12	84 / 9	3000	250	20	560	83
AM1LS-0515SH30-NZ***	4.5-5.5	15	67 / 7	3000	250	20	560	83
AM1LS-0524SH30-NZ***	4.5-5.5	24	42 / 4	3000	250	20	220	85
AM1LS-1203SH30-NZ#	10.8-13.2	3.3	303 / 30	3000	111	15	220	75
AM1LS-1205SH30-NZ#	10.8-13.2	5	200 / 20	3000	104	15	220	80
AM1LS-1209SH30-NZ#	10.8-13.2	9	111 / 12	3000	104	15	220	80

AM1LS-1212SH30-NZ#	10.8-13.2	12	84 / 9	3000	103	15	220	81
AM1LS-1215SH30-NZ#	10.8-13.2	15	67 / 7	3000	103	15	220	81
AM1LS-1224SH30-NZ	10.8-13.2	24	42 / 4	3000	103	15	220	81
AM1LS-1515SH30-NZ	13.5-16.5	15	67 / 7	3000	82	10	220	80
AM1LS-2405SH30-NZ‡#	21.6-26.4	5	200 / 20	3000	52	7	220	80
AM1LS-2409SH30-NZ‡#	21.6-26.4	9	111 / 12	3000	52	7	220	80
AM1LS-2415SH30-NZ‡#	21.6-26.4	15	67 / 7	3000	52	7	220	80
AM1LS-2424SH30-NZ‡#	21.6-26.4	24	42 / 4	3000	52	7	220	80

Models

Dual output

Model	Input Voltage (V)	Output Voltage (V)	Output Current Max / Min (mA)	Isolation (VDC)	Input Current Max No Load (mA)		Max Capacitive Load(μF)	Efficiency (%)
AM1LS-0305D-NZ‡	2.97-3.63	±5	±100 / ±10	1500	415	25	100	78
AM1LS-0312D-NZ‡	2.97-3.63	±12	±42 / ±5	1500	388	25	100	80
AM1LS-0315D-NZ‡	2.97-3.63	±15	±33 / ±3	1500	263	20	100	80
AM1LS-0505D-NZ***	4.5-5.5	±5	±100 / ±10	1500	250	20	1200	82
AM1LS-0509D-NZ***	4.5-5.5	±9	±56 / ±6	1500	250	20	470	82
AM1LS-0512D-NZ***	4.5-5.5	±12	±42 / ±5	1500	250	20	220	83
AM1LS-0515D-NZ***	4.5-5.5	±15	±33 / ±3	1500	250	20	220	83
AM1LS-0524D-NZ***	4.5-5.5	±24	±21 / ±3	1500	254	30	100	85
AM1LS-1205D-NZ#	10.8-13.2	±5	±100 / ±10	1500	111	15	100	75
AM1LS-1209D-NZ#	10.8-13.2	±9	±56 / ±6	1500	104	15	100	80
AM1LS-1212D-NZ#	10.8-13.2	±12	±42 / ±5	1500	104	15	100	80
AM1LS-1215D-NZ#	10.8-13.2	±15	±33 / ±3	1500	103	15	100	81
AM1LS-1224D-NZ#	10.8-13.2	±24	±21 / ±2	1500	103	15	100	81
AM1LS-1515D-NZ	13.5-16.5	±15	±33 / ±3	1500	103	15	100	81
AM1LS-2405D-NZ‡#	21.6-26.4	±5	±100 / ±10	1500	83	12	100	82
AM1LS-2409D-NZ‡#	21.6-26.4	±9	±56 / ±6	1500	52	7	100	82
AM1LS-2412D-NZ‡#	21.6-26.4	±12	±42 / ±5	1500	52	7	100	82
AM1LS-2415D-NZ‡#	21.6-26.4	±15	±33 / ±3	1500	51	7	100	82
AM1LS-2424D-NZ‡#	21.6-26.4	±24	±21 / ±2	1500	51	7	100	82
AM1LS-0305DH30-NZ‡	2.97-3.63	±5	±100 / ±10	3000	389	25	100	76
AM1LS-0312DH30-NZ‡	2.97-3.63	±12	±42 / ±5	3000	389	25	100	77
AM1LS-0505DH30-NZ***	4.5-5.5	±5	±100 / ±10	3000	250	20	1200	82
AM1LS-0509DH30-NZ***	4.5-5.5	±9	±56 / ±6	3000	250	20	470	83
AM1LS-0512DH30-NZ***	4.5-5.5	±12	±42 / ±5	3000	250	20	220	83
AM1LS-0515DH30-NZ***	4.5-5.5	±15	±34 / ±4	3000	250	20	220	83
AM1LS-0524DH30-NZ***	4.5-5.5	±24	±21 / ±3	3000	254	30	100	85
AM1LS-1205DH30-NZ#	10.8-13.2	±5	±100 / ±10	3000	111	15	100	80
AM1LS-1209DH30-NZ#	10.8-13.2	±9	±56 / ±6	3000	104	15	100	80
AM1LS-1212DH30-NZ#	10.8-13.2	±12	±42 / ±5	3000	104	15	100	81
AM1LS-1215DH30-NZ#	10.8-13.2	±15	±33 / ±3	3000	103	15	100	81
AM1LS-1224DH30-NZ#	10.8-13.2	±24	±21 / ±2	3000	103	15	100	81
AM1LS-1515DH30-NZ	13.5-16.5	±15	±33 / ±3	3000	83	12	100	81
AM1LS-2405DH30-NZ‡#	21.6-26.4	±5	±100 / ±10	3000	82	10	100	82
AM1LS-2409DH30-NZ‡#	21.6-26.4	±9	±56 / ±6	3000	52	7	100	82
AM1LS-2412DH30-NZ‡#	21.6-26.4	±12	±42 / ±5	3000	52	7	100	82
AM1LS-2415DH30-NZ‡#	21.6-26.4	±15	±33 / ±3	3000	51	7	100	82
AM1LS-2424DH30-NZ‡#	21.6-26.4	±24	±21 / ±2	3000	51	7	100	82

‡ With Momentary short circuit protection of 1 second

NOTE 1: Add suffix "TR" to a part number when ordering in tape and reel package

NOTE: All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified.

Input Specifications

Parameters	Nominal	Typical	Maximum	Units
Voltage Range	3	2.97-3.63		VDC
	5	4.5-5.5		
	12	10.8-13.2		
	15	13.5-16.5		
	24	21.6-26.4		
Absolute Max Input Voltage (1 sec max)	3 Vin		5	VDC
	5 Vin		9	
	12 Vin		18	
	15 Vin		21	
	24 Vin		30	
Filter	Capacitor			

Isolation Specifications

Parameters	Conditions	Typical	Maximum	Units
Tested I/O Voltage	60 sec	1500 / 3000		VDC
Resistance	500VDC	>1000		MOhm
Capacitance		20		pF

Output Specifications

Parameters	Conditions	Typical	Maximum	Units
Voltage Accuracy	100% load (see tolerance chart)	±5		%
Short Circuit Protection	Continuous, unless marked with ‡			
Short Circuit Restart	Auto-Recovery			
Line Voltage Regulation	For ±1% of Vin, 3.3V output models only		±1.5	% of Vin
	For ±1% of Vin, others		±1.2	
Load Voltage Regulation (10% - 100% Load)	3.3V	18	20	%
	5V	12	15	
	6V	10	13	
	9V	8	10	
	12V	7	10	
	15V	6	10	
	24 V	5	10	
Temperature Coefficient	100% load, 5V input models	±0.02		% / °C
	100% load, Others	±0.03		
Ripple & Noise	5V input, 24V output	50	100	mV p-p
	5V input, other models	30	75	
	Others	60	150	

General Specifications

Parameters	Conditions	Typical	Maximum	Units
Switching frequency	100% load, 5V input models	270	300	KHz
	100% load, others	100		
Operating temperature	With derating above +100	-40 to +105		°C
Storage temperature	-55 to +125			°C
Cooling	Free air convection			
Storage Humidity	Non-condensing		95	% RH
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1 For 5Vin models only	Level 1		
Case material	Flame retardant plastic (UL94-V0)			
Weight	Single 1.5(5Vin models 1.4) Dual 1.8(5Vin models 1.4)			g
Dimensions (L x W x H)	5V Input Single Output Models	0.52 x 0.45 x 0.28 inches (13.20 x 11.40 x 7.25 mm)		
	Other Single Output Models	0.50 x 0.44 x 0.28 inches (12.70 x 11.20 x 7.25 mm)		
	5V Input Dual Output Models	0.60 x 0.45 x 0.28 inches (15.24 x 11.40 x 7.25 mm)		
	Other Dual Output Models	0.60 x 0.44 x 0.28 inches (15.24 x 11.20 x 7.25 mm)		
MTBF	>3500Khrs (MIL-HDBK -217F, Ground Benign, t=+25°C)			
Maximum soldering temperature	Lead temp. 1.5mm from case for 10 sec Reflow Soldering	300		°C

		Peak temp. $\leq 245^{\circ}\text{C}$, maximum duration time $\leq 60\text{s}$ at 217°C	
Maximum case temperature		130	$^{\circ}\text{C}$

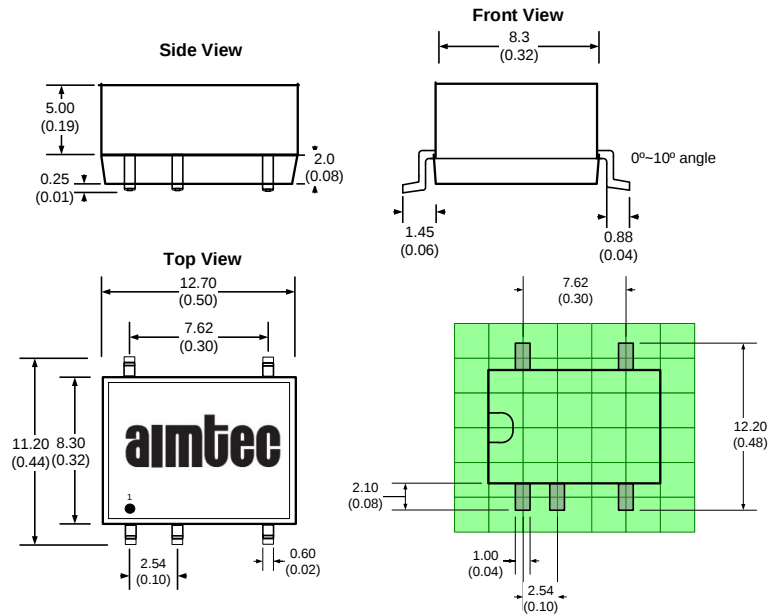
Safety Specifications

Parameters				
Agency approvals		cULus		
Standards	Information technology Equipment		UL 60950-1 (The models marked with # only)	
			UL 62368 (The models marked with ** only)	
	EMI - Conducted and radiated emission	5V input	CISPR32/EN55032, class B (with the recommended EMC circuit for 5V input models)	
		Others	EN55022, class B (with the recommended EMC circuit)	
	Electrostatic Discharge Immunity	5V input	IEC 61000-4-2, Contact $\pm 4\text{kV}$, Air $\pm 8\text{kV}$, Criteria B	
		Others	IEC 61000-4-2, Contact $\pm 8\text{kV}$, Criteria B	

Pin Out Specifications and Dimensions for 3.3V, 12V, 15V, 24V Input Models

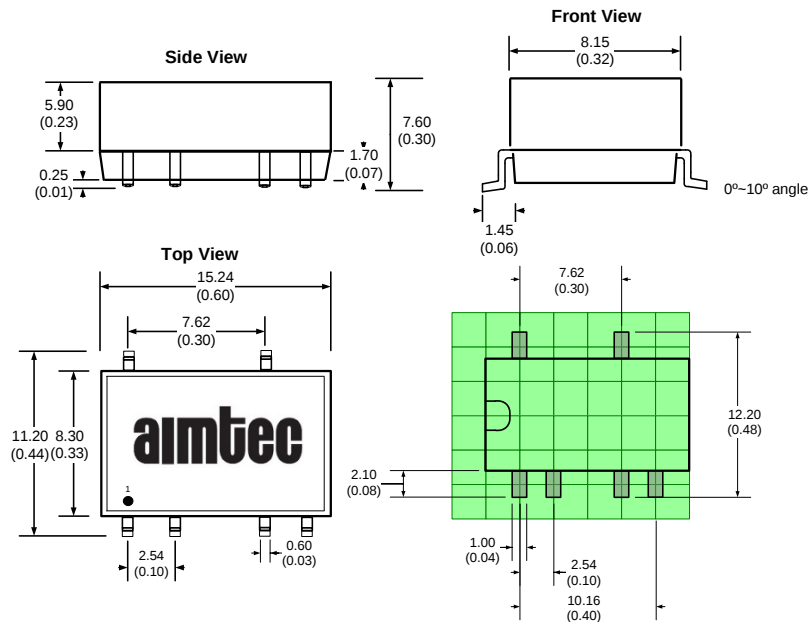
Pin	Single
1	- V Input
2	+ V Input
3	No Pin
4	-V Output
5	+V Output
6	No Pin
7	No Pin
8	N.C.

Single Output Models



Pin	Dual Output Models
1	-V Input
2	+V Input
3	No Pin
4	Common
5	-V Output
6	No Pin
7	+V Output
8	No Pin
9	No Pin
10	N.C.

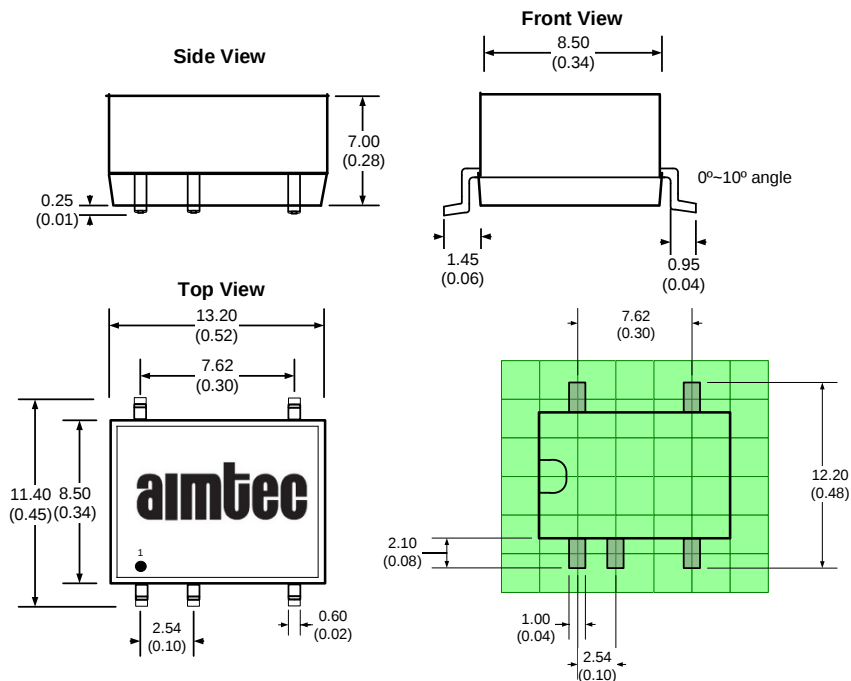
Dual Output Models



Pin Out Specifications and Dimensions for 5V Input Models

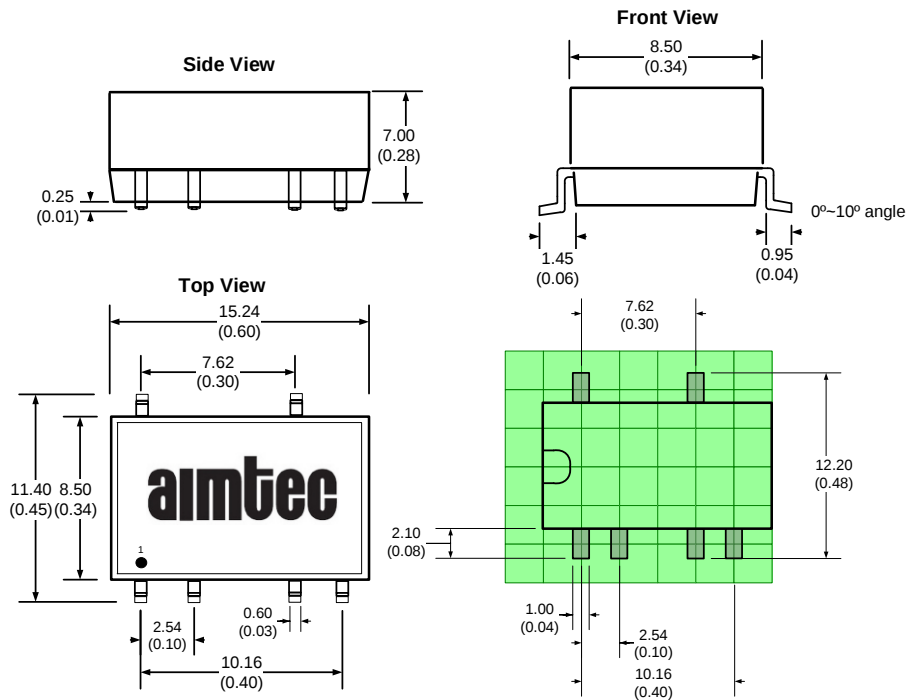
Pin	Single
1	- V Input
2	+ V Input
3	No Pin
4	-V Output
5	+V Output
6	No Pin
7	No Pin
8	N.C.

5V Input Single Output Models



Pin	Dual Output Models
1	-V Input
2	+V Input
3	No Pin
4	Common
5	-V Output
6	No Pin
7	+V Output
8	No Pin
9	No Pin
10	N.C.

5V Input Dual Output Models

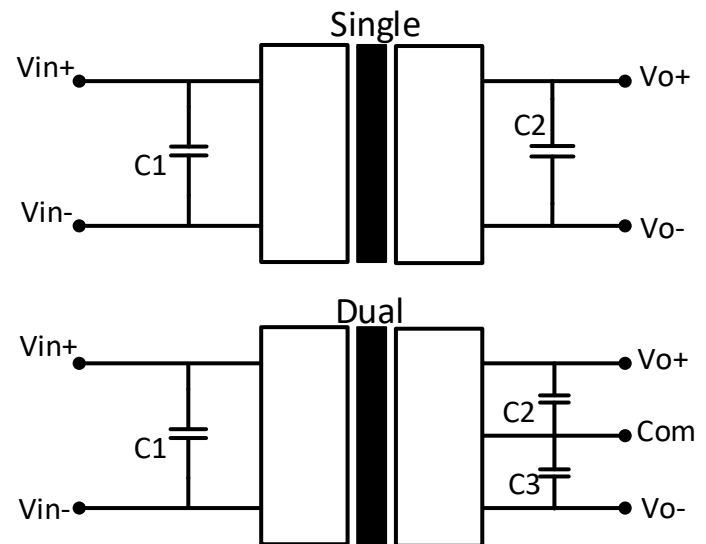


Typical Application Circuits

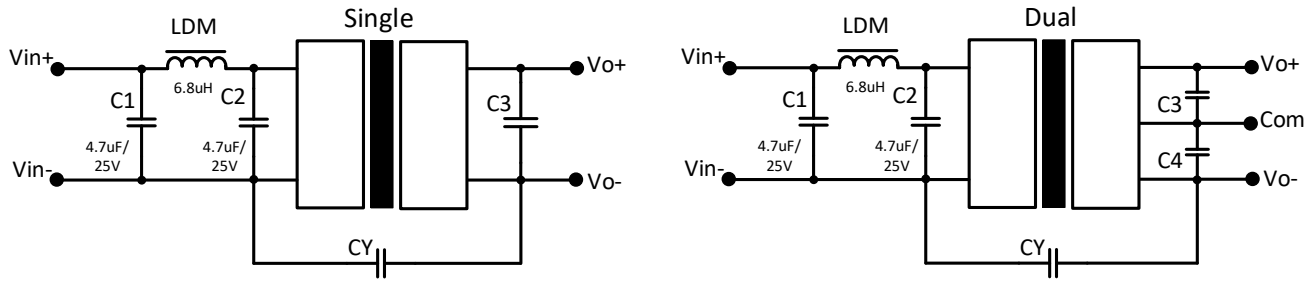
Capacitor selection Table

Vin	C1	Single VDC	C2	Dual VDC	C2/C3
3.3	4.7 μ F	3.3 V	10 μ F	$\pm$ 3.3	4.7 μ F
5	4.7 μ F	5V/6V	10 μ F	$\pm$ 5V	4.7 μ F
		9 V	4.7 μ F	$\pm$ 9V	2.2 μ F
12	2.2 μ F	12 V	2.2 μ F	$\pm$ 12 V	1 μ F
15	2.2 μ F	15 V	1 μ F	$\pm$ 15 V	1 μ F
24	1 μ F	24V	0.47 μ F	$\pm$ 24 V	1 μ F

- 1) Ensure output load of Min 10%, or specifications may not be met
- 2) Under normal operation, there is no protection for overload condition
- 3) Converter may exhibit start up delay if capacitive load exceeds recommended
- 4) Ceramic or electrolytic type capacitors are recommended, tantalum type may damage converter
- 5) Parallel connections, or hot swapping is not recommended

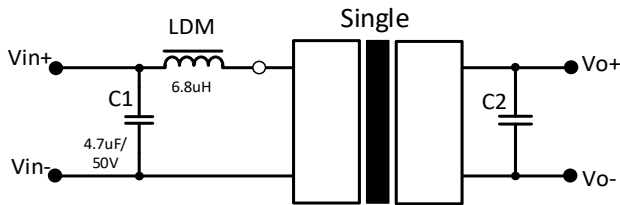


EMI Recommended Circuit for 5V input models (Class B)

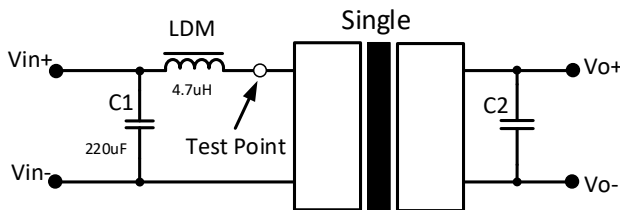


Vout	CY
3.3	-
5	-
9	-
12	1nF/2KVDC for 1.5KVDC isolation models 1nF/4KVDC for 3KVDC isolation models
15	
24	

EMI Recommended Circuit for other input models (Class B)

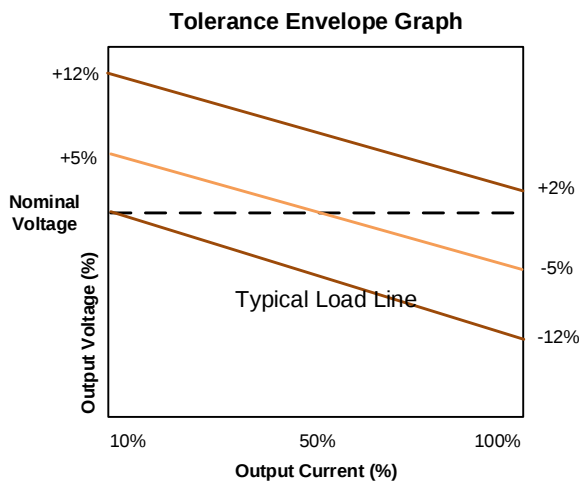


Input Reflected Ripple Current Test Circuit

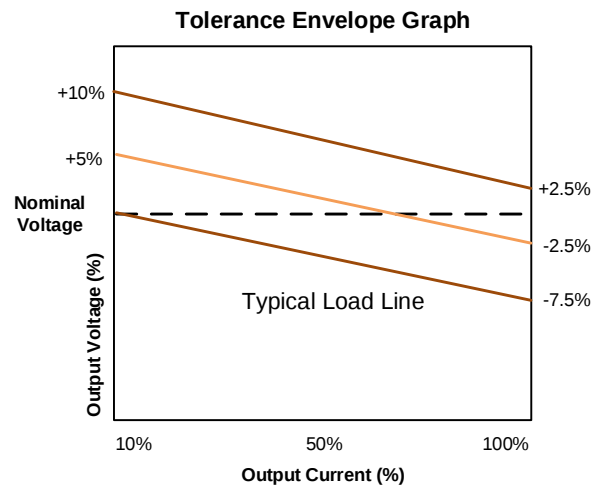


Load Accuracy Tolerance Graph

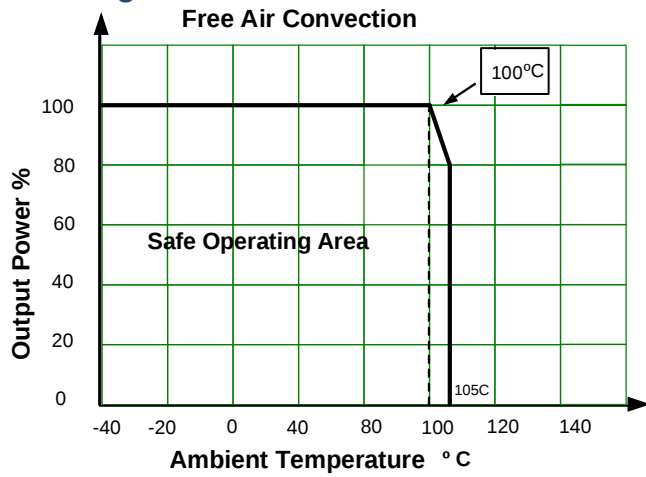
For AM1LS-0503S-NZ, AM1LS-0503SH30-NZ and AM1LS-0503SJZ



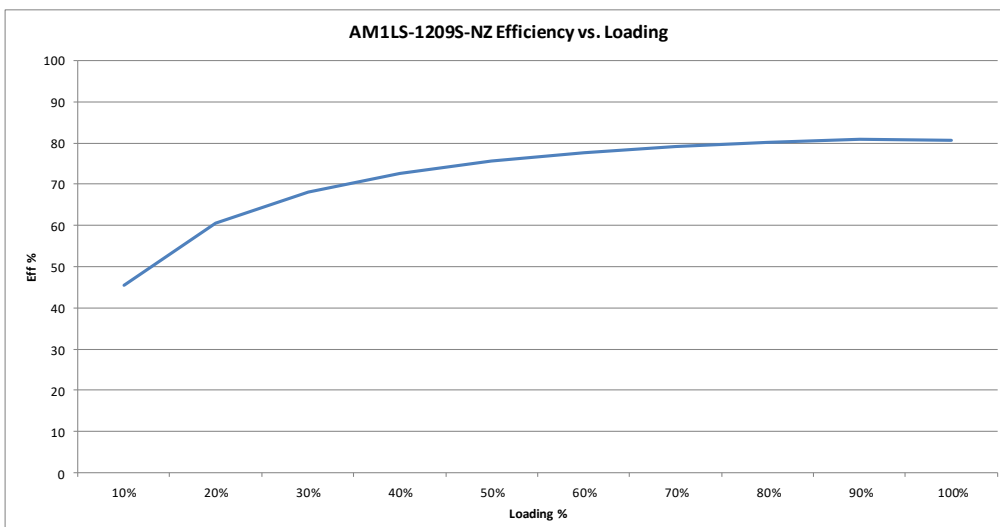
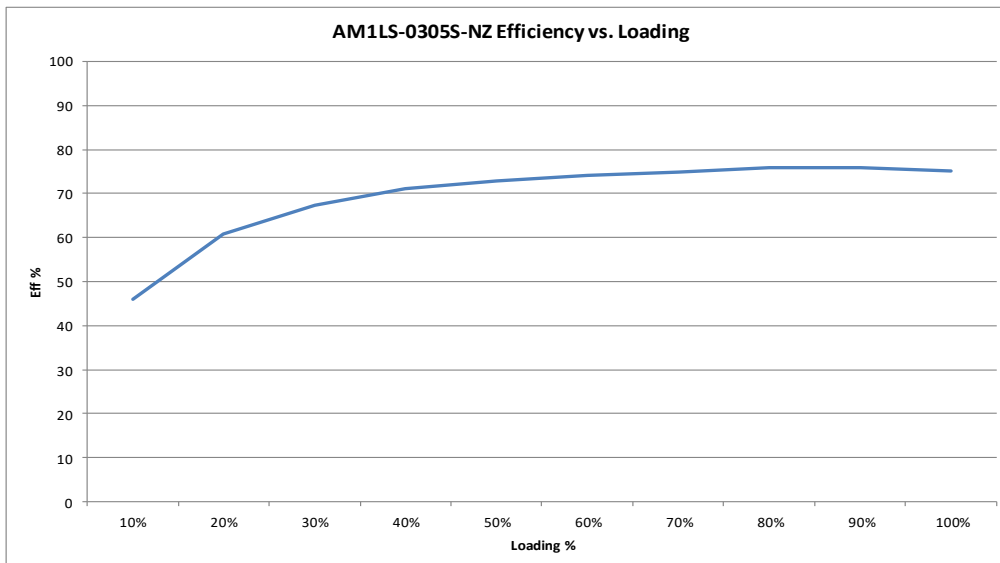
For other models

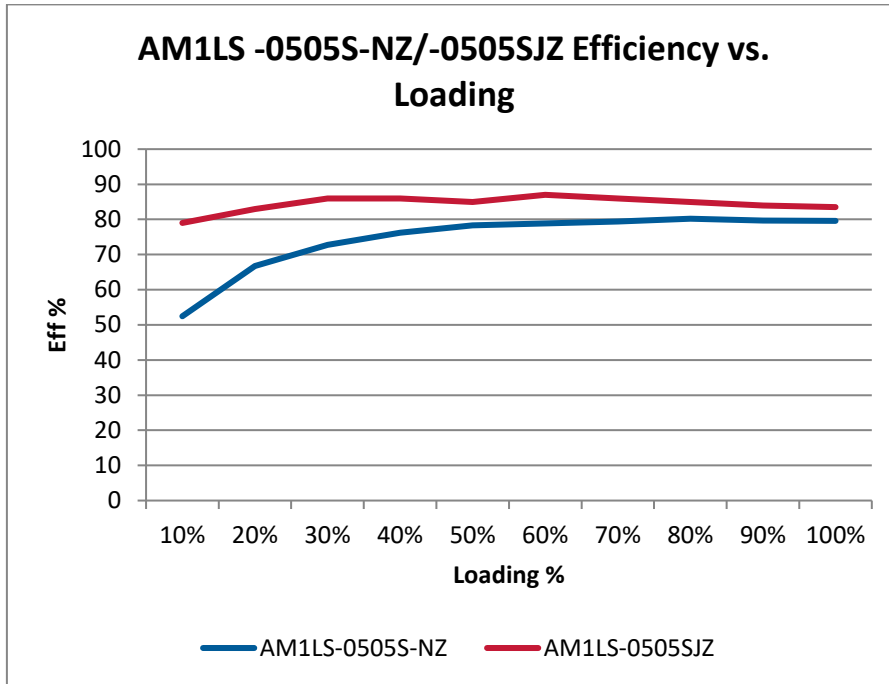


Derating



Typical Efficiency vs. Loading





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