

# FDD15 SERIES

DC - DC CONVERTER  
10 ~ 15W SINGLE & DUAL OUTPUT



## FEATURES

- LOW COST
- 2:1 WIDE INPUT RANGE
- I/O ISOLATION
- LC INPUT FILTER
- SHORT CIRCUIT PROTECTION
- HIGH PERFORMANCE
- 3 YEARS WARRANTY

## MODEL LIST

MODEL NO.	INPUT VOLTAGE	INPUT CURRENT (typ.)	OUTPUT WATTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF. (min.)	EFF. (typ.)	CAPACITOR LOAD (max.)
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### Single Output Models

FDD15 - 03S1	9~18 VDC	1.1 A	10 WATTS	+ 3.3 VDC	3000 mA	75%	77%	4700 $\mu$ F
FDD15 - 05S1	9~18 VDC	1.08 A	10 WATTS	+ 5 VDC	2000 mA	75%	77%	4700 $\mu$ F
FDD15 - 12S1	9~18 VDC	1.07 A	10 WATTS	+ 12 VDC	834 mA	75%	77%	3500 $\mu$ F
FDD15 - 15S1	9~18 VDC	1.07 A	10 WATTS	+ 15 VDC	667 mA	76%	78%	3500 $\mu$ F
FDD15 - 03S2	18~36 VDC	0.54 A	10 WATTS	+ 3.3 VDC	3000 mA	75%	77%	4700 $\mu$ F
FDD15 - 05S2	18~36 VDC	0.79 A	15 WATTS	+ 5 VDC	3000 mA	78%	80%	4700 $\mu$ F
FDD15 - 12S2	18~36 VDC	0.78 A	15 WATTS	+ 12 VDC	1250 mA	79%	81%	3500 $\mu$ F
FDD15 - 15S2	18~36 VDC	0.77 A	15 WATTS	+ 15 VDC	1000 mA	80%	82%	3500 $\mu$ F
FDD15 - 03S3	36~72 VDC	0.27 A	10 WATTS	+ 3.3 VDC	3000 mA	74%	76%	4700 $\mu$ F
FDD15 - 05S3	36~72 VDC	0.39 A	15 WATTS	+ 5 VDC	3000 mA	78%	80%	4700 $\mu$ F
FDD15 - 12S3	36~72 VDC	0.39 A	15 WATTS	+ 12 VDC	1250 mA	79%	81%	3500 $\mu$ F
FDD15 - 15S3	36~72 VDC	0.39 A	15 WATTS	+ 15 VDC	1000 mA	79%	81%	3500 $\mu$ F

### Dual Output Models

FDD15 - 12D1	9~18 VDC	1.12 A	10 WATTS	$\pm$ 12 VDC	$\pm$ 417 mA	73%	76%	$\pm$ 1000 $\mu$ F
FDD15 - 15D1	9~18 VDC	1.09 A	10 WATTS	$\pm$ 15 VDC	$\pm$ 334 mA	75%	78%	$\pm$ 1000 $\mu$ F
FDD15 - 12D2	18~36 VDC	0.77 A	15 WATTS	$\pm$ 12 VDC	$\pm$ 625 mA	80%	83%	$\pm$ 1000 $\mu$ F
FDD15 - 15D2	18~36 VDC	0.77 A	15 WATTS	$\pm$ 15 VDC	$\pm$ 500 mA	80%	83%	$\pm$ 1000 $\mu$ F
FDD15 - 12D3	36~72 VDC	0.38 A	15 WATTS	$\pm$ 12 VDC	$\pm$ 625 mA	80%	83%	$\pm$ 1000 $\mu$ F
FDD15 - 15D3	36~72 VDC	0.38 A	15 WATTS	$\pm$ 15 VDC	$\pm$ 500 mA	80%	83%	$\pm$ 1000 $\mu$ F

### SPECIFICATION

All Specifications Typical At Nominal Line, Full Load, 25°C Unless Otherwise Noticed

#### GENERAL

Characteristics	Conditions	min.	typ.	max.	unit
Switching frequency	Vi nom, Io nom		200		KHz
Isolation voltage	Input - Output	1,500			VDC
Isolation resistance	Input - Output, @ 500VDC	100			MΩ
Isolation capacitance	100KHz / 1V			1,000	PF
Ambient temperature	Operating at Vi nom, Io nom	-10		+ 51	°C
Case temperature	Operating at Vi nom, Io nom			+ 85	°C
Derating	Vi nom	See derating curve			
Storage temperature	Non operational	-25		+ 100	°C
Relative humidity	Vi nom, Io nom	20		95	% RH
Temperature coefficient	Vi nom, Io min			± 0.02	% / °C
Dimension		L50.8 x W50.8 x H12.0			mm
MTBF	Bellcore issue 6@40°C, GB		889,000		Hours
Cooling	Free air convection				

#### INPUT SPECIFICATIONS

Characteristics	Conditions	min.	typ.	max.	unit
Input voltage range	Ta min ... Ta max, Io nom	9	12	18	VDC
		18	24	36	VDC
		36	48	72	VDC
No load input current	Vi nom, Io = 0	12V		30	mA
		24V		25	mA
		48V		15	mA
Input voltage w/o damage	Io nom	12V		20	VDC
		24V		40	VDC
		48V		75	VDC
Startup voltage	Io nom	12V	8.5		VDC
		24V	15		VDC
		48V	35		VDC
Input filter	Pi type				

#### OUTPUT SPECIFICATIONS

Characteristics	Conditions	min.	typ.	max.	unit
Output voltage accuracy	Vi nom, Io nom			± 2	%
Minimum load	Vi nom single output models	0			%
	Vi nom dual output models (each output)	20			%
Line regulation	Io nom, Vi min ... Vi max			± 1	%
Load regulation	Vi nom, Io 0 ... Io nom, single output models			± 2	%
	Vi nom, Io min ... Io nom, dual output models			± 5	%
Cross regulation (Dual model)	Aymmetrical load 20% - 100% FL			± 5	%
Startup time	Vi nom, Io nom			1,000	ms
Transient recovery time	Vi nom, I ~ 0.5 Io nom			500	μs
Ripple & noise	Vi nom, Io nom, BW = 20MHz	3.3V		100	mV
	5V, 12V, 15V & dual			Vout x ± 1%	mV
Efficiency	Vi nom, Io nom, Po / Pi	Up to 83%, See model list and efficiency curve			

#### CONTROL AND PROTECTION

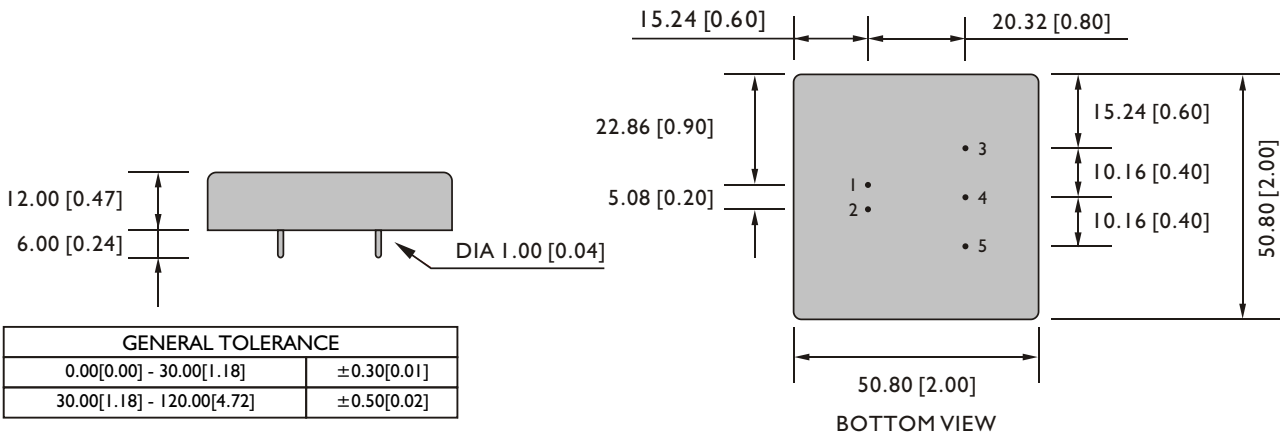
Input reversed	Shunt diode built in, external fuse recommended (12Vin : 1.5A, 24Vin : 1 A, 48Vin : 0.5 A)
Output short circuit	Current limited (Auto-recovery)
Rated over load protection	110%min....140%max

### PHYSICAL CHARACTERISTICS

Case size	50.8 x 50.8 x 12.0 mm (2 x 2 x 0.47 inches)
Case material	Plastic base / Metal case
Weight	70 g
Potting material	Epoxy

### MECHANISM & PIN CONFIGURATION

mm [inch]

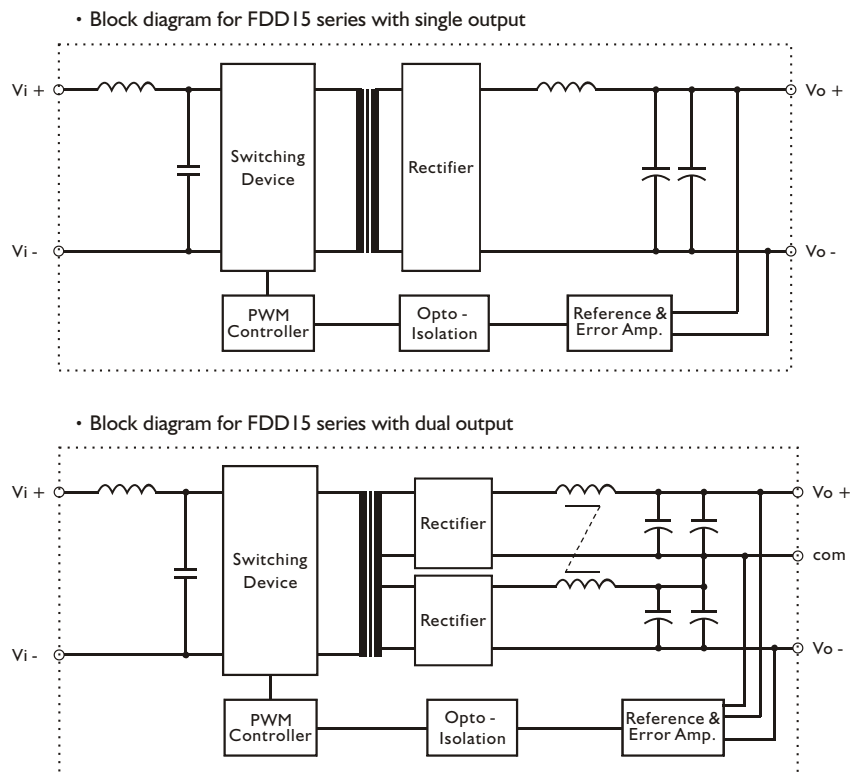


### PIN ASSIGNMENT

#### GENERAL

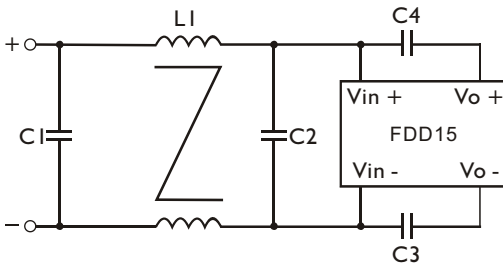
PIN NO.	1	2	3	4	5
SINGLE	Vi+	Vi-	Vo+	NO PIN	Vo-
DUAL	Vi+	Vi-	Vo+	com	Vo-

### CIRCUIT SCHEMATIC



### RECOMMENDED CIRCUIT

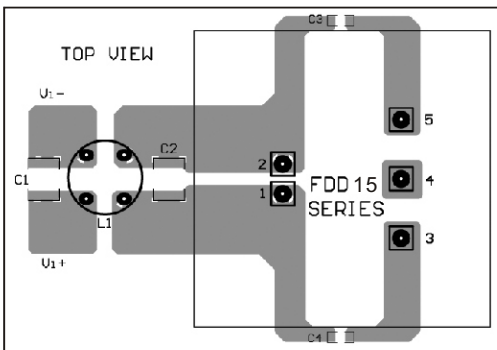
- Recommended filter for EN 55032 Class B compliance



- The components used in the above figure, together with the manufacturer part numbers for these components, are as follows.

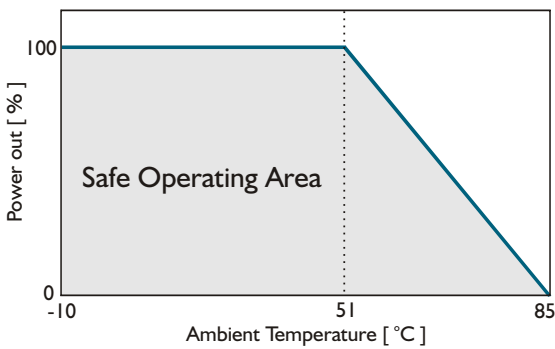
	C1	C2	C3	C4	L1
FDD15-XXX1	6.8 $\mu$ F / 50V MLCC	4.7 $\mu$ F / 50V MLCC	1nF / 2KV MLCC	1nF / 2KV MLCC	0.5mH Common Choke
FDD15-XXX2	4.7 $\mu$ F / 50V MLCC	4.7 $\mu$ F / 50V MLCC	1nF / 2KV MLCC	1nF / 2KV MLCC	0.5mH Common Choke
FDD15-XXX3	4.7 $\mu$ F / 100V MLCC	4.7 $\mu$ F / 100V MLCC	1nF / 2KV MLCC	1nF / 2KV MLCC	0.5mH Common Choke

- Recommended EN 55032 Class B filter circuit layout.

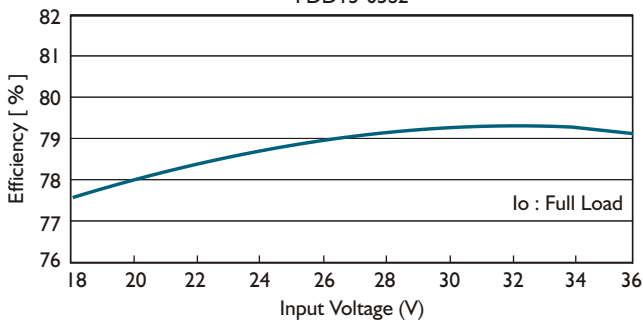


### DERATING AND EFFICIENCY CURVE

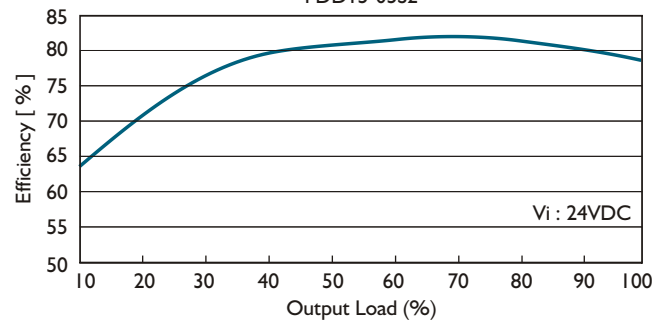
Temperature derating curve



Efficiency Vs Input Voltage  
FDD15-05S2



Efficiency Vs Output Load  
FDD15-05S2



# FDD15 SERIES

DC - DC CONVERTER  
10 ~ 15W TRIPLE OUTPUT



## FEATURES

- LOW COST
- 2:1 WIDE INPUT RANGE
- I/O ISOLATION
- LC INPUT FILTER
- SHORT CIRCUIT PROTECTION
- HIGH PERFORMANCE
- 3 YEARS WARRANTY

## MODEL LIST

MODEL NO.	INPUT VOLTAGE	INPUT CURRENT (typ.)	OUTPUT WATTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF. (min.)	EFF. (typ.)	CAPACITOR LOAD (max.)
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### Triple Output Models

FDD15 - 0512T1	9~18 VDC	1.07 A	10 WATTS	+5 / ±12 VDC	1500 mA / ± 120 mA	77%	79%	4700 μF / ±2200 μF
FDD15 - 0515T1	9~18 VDC	1.07 A	10 WATTS	+5 / ±15 VDC	1500 mA / ± 100 mA	77%	79%	4700 μF / ±2200 μF
FDD15 - 0512T2	18~36 VDC	0.76 A	15 WATTS	+5 / ±12 VDC	2000 mA / ± 200 mA	80%	82%	4700 μF / ±2200 μF
FDD15 - 0515T2	18~36 VDC	0.76 A	15 WATTS	+5 / ±15 VDC	2000 mA / ± 160 mA	80%	82%	4700 μF / ±2200 μF
FDD15 - 0512T3	36~72 VDC	0.38 A	15 WATTS	+5 / ±12 VDC	2000 mA / ± 200 mA	80%	82%	4700 μF / ±2200 μF
FDD15 - 0515T3	36~72 VDC	0.38 A	15 WATTS	+5 / ±15 VDC	2000 mA / ± 160 mA	80%	82%	4700 μF / ±2200 μF

### SPECIFICATION

All Specifications Typical At Nominal Line, Full Load, 25°C Unless Otherwise Noticed

#### GENERAL

Characteristics	Conditions	min.	typ.	max.	unit
Switching frequency	Vi nom, Io nom		180		KHz
Isolation voltage	Input - Output	1,500			VDC
Isolation resistance	Input - Output, @ 500VDC	100			MΩ
Isolation capacitance	100KHz / 1V			1,000	PF
Ambient temperature	Operating at Vi nom, Io nom	-10		+ 51	°C
Case temperature	Operating at Vi nom, Io nom			+ 100	°C
Derating	Vi nom	See derating curve			
Storage temperature	Non operational	-40		+ 100	°C
Relative humidity	Vi nom, Io nom	20		95	% RH
Temperature coefficient	Vi nom, Io min			± 0.02	% / °C
Dimension		L50.8 x W50.8 x H12.0			mm
MTBF	Belcore issue 6@40°C, GB		720,000		Hours
Cooling	Free air convection				

#### INPUT SPECIFICATIONS

Characteristics	Conditions	min.	typ.	max.	unit
Input voltage range	Ta min ... Ta max, Io nom	9	12	18	VDC
		18	24	36	VDC
		36	48	72	VDC
No load input current	Vi nom, Io = 0	12V		30	mA
		24V		25	mA
		48V		15	mA
Input voltage w/o damage	Io nom	12V		20	VDC
		24V		40	VDC
		48V		75	VDC
Startup voltage	Io nom	12V	8.5		VDC
		24V	13.6		VDC
		48V	24		VDC
Input filter	Pi type				

#### OUTPUT SPECIFICATIONS

Characteristics	Conditions	min.	typ.	max.	unit
Output voltage accuracy	Vi nom, Io nom	+ 5V		± 2	%
		±12V or ±15V		± 6	%
Minimum load	Vi nom	+ 5V	10		%
		±12V or ±15V	20		%
Line regulation	Vi min ... Vi max, Io nom	+ 5V		± 2	%
		±12V or ±15V		± 6	%
Load regulation	Vi nom, Io min ... Io nom	+ 5V		± 2	%
		±12V or ±15V		± 6	%
Cross regulation	Aymmetrical load 20% - 100% FL			± 6	%
Startup time	Vi nom, Io nom			30	ms
Transient recovery time	Vi nom, I ~ 0.5 Io nom			500	μs
Ripple & noise	Vi nom, Io nom, BW = 20MHz			Vout x ± 1%	mV
Efficiency	Vi nom, Io nom, Po / Pi	Up to 82%, See model list and efficiency curve			

#### CONTROL AND PROTECTION

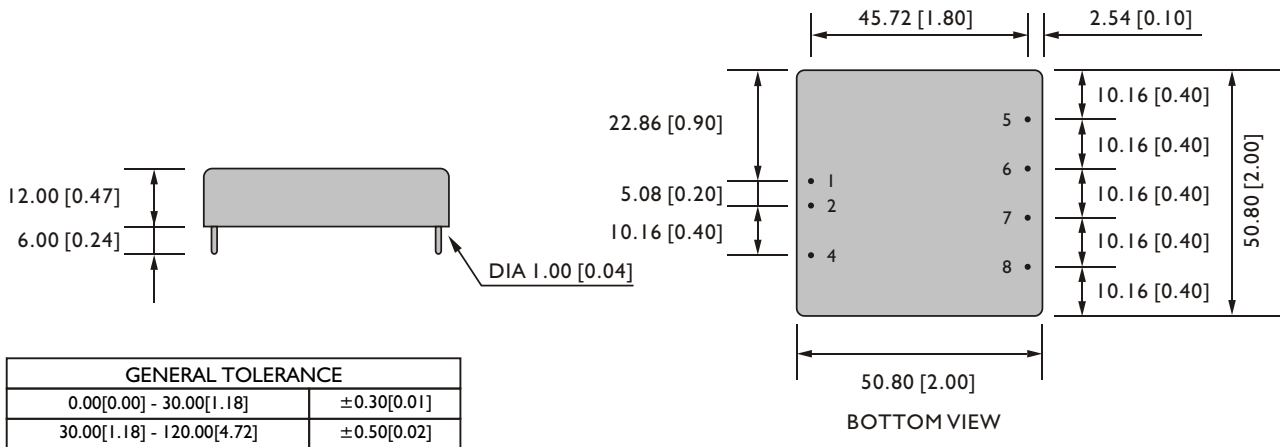
Remote ON / OFF	ON : opened or 8 ~ 10VDC applied, reference to input GND OFF : -0.3 ~ 2VDC applied, reference to input GND
Input reversed	Shunt diode built in, external fuse recommended (12Vin : 1.5A, 24Vin : 1A, 48Vin : 0.5A)
Output short circuit	Current limited (Auto-recovery)
Rated over load protection	I 10%min.... I 40%max

### PHYSICAL CHARACTERISTICS

Case size	50.8 x 50.8 x 12.0 mm (2 x 2 x 0.47 inches)
Case material	Plastic base / Metal case
Weight	70 g
Potting material	Epoxy

### MECHANISM & PIN CONFIGURATION

mm [inch]

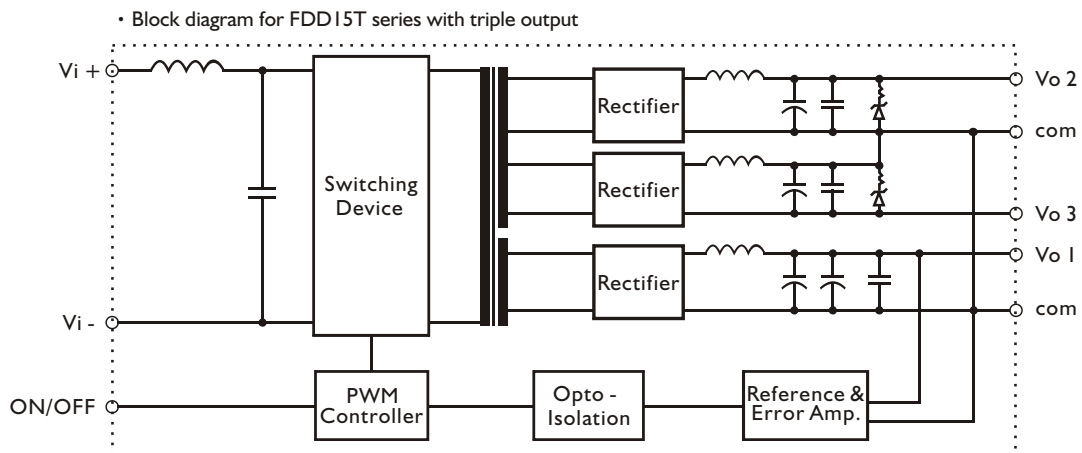


### PIN ASSIGNMENT

#### GENERAL

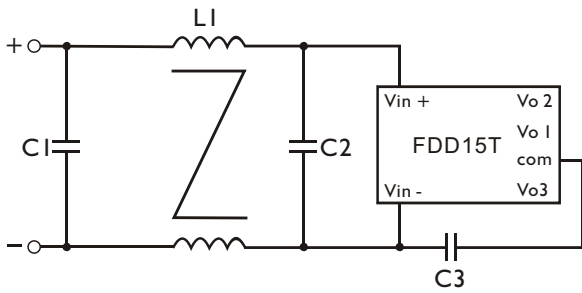
PIN NO.	1	2	4	5	6	7	8
TRIPLE	Vi+	Vi-	ON / OFF	Vo2 (+ OUT)	Vo1 (+ 5V)	com	Vo3 (- OUT)

### CIRCUIT SCHEMATIC



### RECOMMENDED CIRCUIT

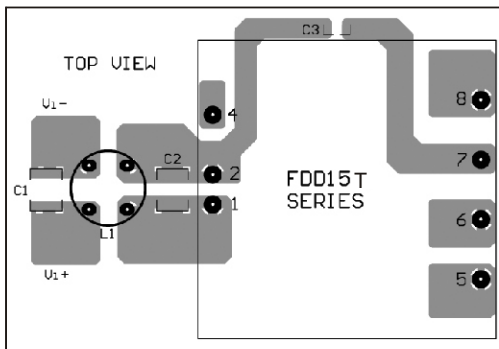
- Recommended filter for EN 55032 Class B compliance



- The components used in the above figure, together with the manufacturer part numbers for these components, are as follows.

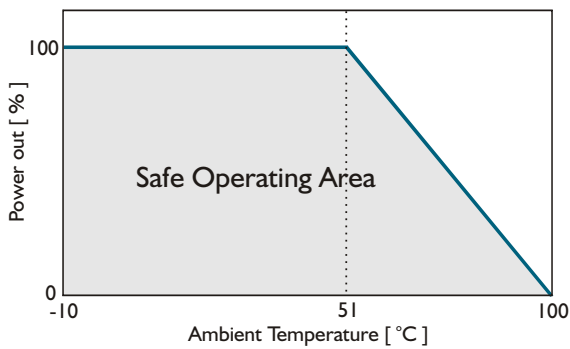
	C1	C2	C3	L1
FDD15-XXXXT1	3.3 $\mu$ F / 50V MLCC	3.3 $\mu$ F / 50V MLCC	1nF / 2KV MLCC	0.5mH Common Choke
FDD15-XXXXT2	3.3 $\mu$ F / 50V MLCC	3.3 $\mu$ F / 50V MLCC	1nF / 2KV MLCC	0.5mH Common Choke
FDD15-XXXXT3	2.2 $\mu$ F / 100V MLCC	2.2 $\mu$ F / 100V MLCC	1nF / 2KV MLCC	0.5mH Common Choke

- Recommended EN 55032 Class B filter circuit layout.

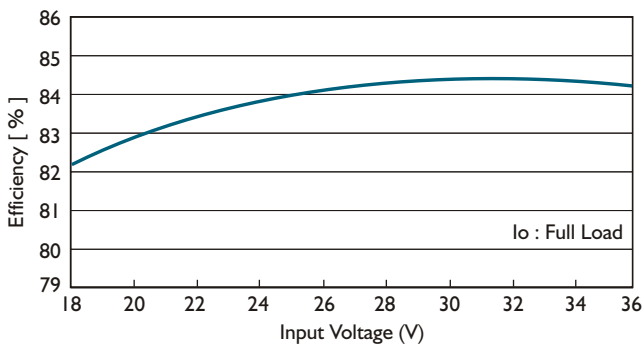


### DERATING AND EFFICIENCY CURVE

Temperature derating curve



Efficiency Vs Input Voltage  
FDD15-0515T2



Efficiency Vs Output Load  
FDD15-0515T2

