

**eFS10 Series – Isolated AC/DC Converters**
85 – 264Vac Input, Maximum Power: 10WData Sheet
May 12, 2025**eFS10 Series –small size isolated AC/DC converters****Features**

- Encapsulated, compact case
- High Efficiency
- Low input current at no load
(0.2W@220VAC)
- Universal input range
- Built in EMI Filter
- Inrush current limit
- Over current protection
- Over voltage protection
- Output short circuit protection
- Input – Output Isolated
- RoHS directive

**Applications**

- Telecommunication
- Datacom
- Instrumentation
- Distributed Power System

Description

eFS10 Series is a High Efficiency AC/DC Converter that provides up to 10 watts of output power in ultra compact size. This module operate a burst mode below a given output power and it offers a high efficiency at light load. This module has an over current and over voltage protection mode and wide operating temperature range from -30°C to +60°C.



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Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Input Voltage Continuous	85	-	264	VAC	
Operating Ambient Temperature	-30	-	60	°C	
Storage Temperature	-40	-	70	°C	
I/O Isolation Voltage	-	-	3000	VAC	

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device

Electrical Specifications

Input Characteristics

T_A = +25°C, V_{in} = 85 ~ 264VAC After warm up unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit
Operating voltage Range		85		264	Vac
Input current (@ 220V / @110V)	lin				A
eFS10-3R3			0.09(0.15)		
eFS10-5			0.13(0.20)		
eFS10-12			0.13(0.21)		
eFS10-15			0.12(0.20)		
eFS10-24			0.13(0.20)		
eFS10-1212			0.13(0.21)		
eFS10-1515			0.12(0.20)		
eFST10-522			0.13(0.22)		
eFST10-5FF			0.14(0.22)		
No load Input Power					W
eFS10-3R3			0.2		
eFS10-5			0.2		
eFS10-12			0.2		
eFS10-15			0.2		
eFS10-24			0.2		
eFS10-1212			0.2		
eFS10-1515			0.2		
eFST10-522			0.4		
eFST10-5FF			0.4		
Inrush Current@Cold start				30A max	@110VAC

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				60A max	@220VAC
Operating Frequency		47		63	Hz

Output CharacteristicsT_A = +25°C, V_{in} = 85 ~ 264VAC After warm up unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit
Output Voltage tolerance	V _o	-	-	±2	%
Output Current	I _o				
eFS10-3R3				2	A
eFS10-5				2	A
eFS10-12				0.9	A
eFS10-15				0.7	A
eFS10-24				0.45	A
eFD10-1212				±0.45	A
eFD10-1515				±0.35	A
eFST10-522 @5V				1.5	A
@±12V				±0.15	A
eFST10-5FF @5V				1.5	A
@±15V				±0.12	A
Output Regulation;					
- Line Regulation:@5V (From minimum input voltage to maximum input voltage, constant load)		-	-	±1	%
- Load Regulation:@5V (From no load to maximum load, Constant load)		-	-	±1	%
Output Current Limit (Automatic recovery)		>105			%
Output Ripple and noise (V _{in} =220Vac, and I _o =Max Output Current Bandwidth 20MHz, 1uF Ceramic cap)	mVp-p	-	1% of V _{out}		mV
Efficiency					

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eFS10-3R3			72		%
eFS10-5			75		%
eFS10-12			80		%
eFS10-15			81		%
eFS10-24			81		%
eFD10-1212			77		%
eFD10-1515			78		%
eFT10-522			76		%
eFT10-5FF			77		%
(100% of max I _o , V _{in} = 220VAC)					
Dynamic Load Response (1uF Ceramic 25% to 50 %, 50% to 25%, Slew rate = 0.1A/us)			±	3% of Output Voltage	mV
Start – Up Time		-	-	400	ms
Hold – Up Time				10	ms
Turn – on overshoot		-	-	1	%
Maximum output capacitance					μF

Isolation Specifications

Parameter	Symbol	Min	Typ	Max	Unit
I/O Isolation Voltage (AC500V, 1 Min)					
- Input-Output:			-		
Single, Dual output			-	3000	VAC
Triple output			-	2000	VAC
- Input-FG:				2000	VAC
- Output-FG:				500	VAC
Isolation Resistance	Riso				
- Output-Case (at DC500V at 25°C And 70%RH for 1 min)		>100	-	-	MΩ
Isolation Capacitance	Ciso				pF

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May 12, 2025**General Specifications**

Parameter	Symbol	Min	Typ	Max	Unit
Switching Frequency			100		KHz
MTBF (MiL-HDBK- 217F)		6.6 x 10 ⁵			hrs
Dimensions (W.H.L)		58 x 45 x 19.5			mm
Weight			90		Grams

Environmental

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature		-30		50	°C
Operating Humidity (RH non-condensing)		5		95	%
Storage Temperature		-40		70	°C
Vibration @10G(98m/s ²)		10		55	Hz



eFS10 Series – Isolated AC/DC Converters

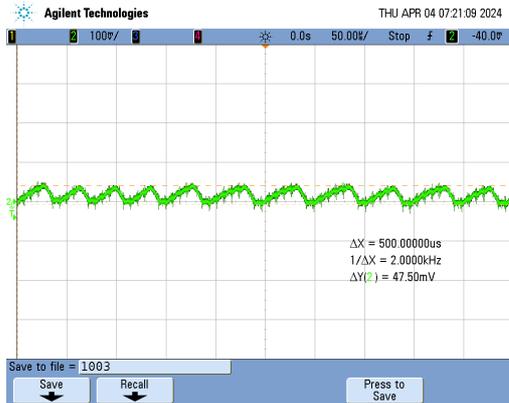
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Characteristic Curves

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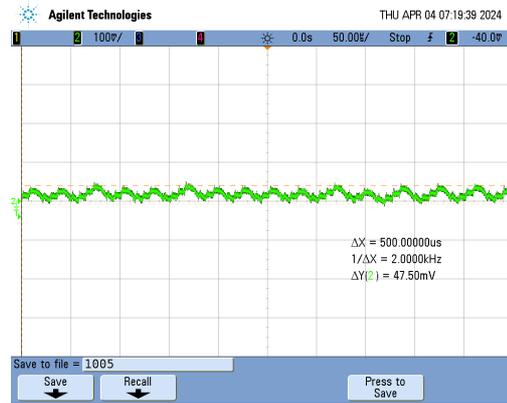
Output Ripple & Noise

eFS10-3R3



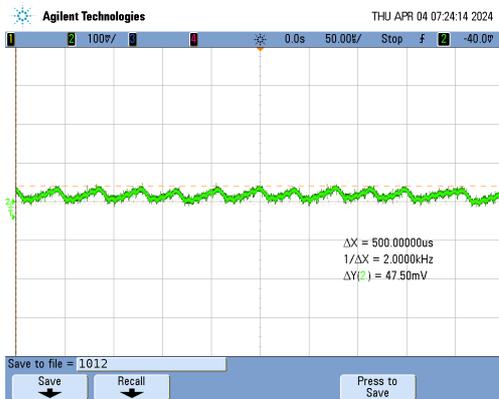
Vin=220VAC, Vo=3.3V@2A, At 25°

eFS10-5



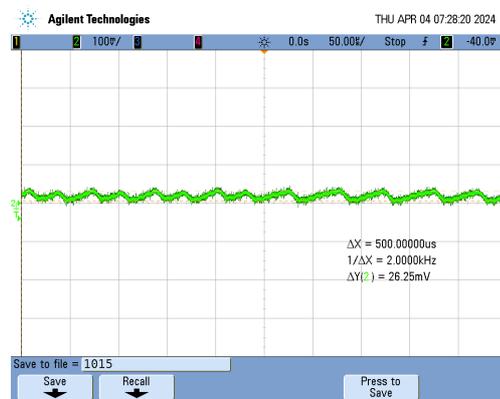
Vin=220VAC, Vo=5V@2A, At 25°

eFS10-12



Vin=220VAC, Vo=12V@0.9A, At 25°

eFS10-15



Vin=220VAC, Vo=15V@0.7A, At 25°

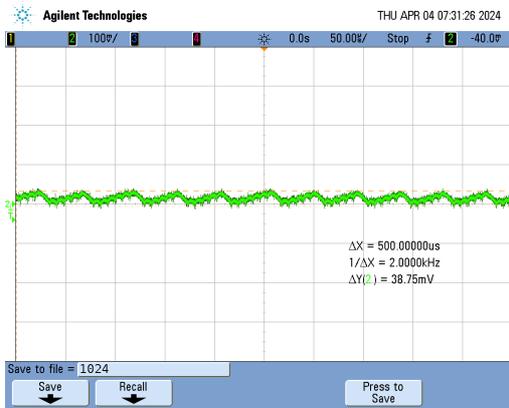
Output Ripple & Noise



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eFS10-24



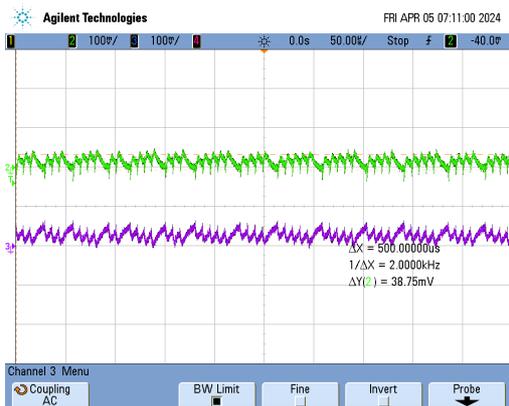
Vin=220VAC, Vo=24V@0.45A , At 25°

eFD10-1212



Vin=220VAC, Vo=±12V@0.45A , At 25°C

eFD10-1515



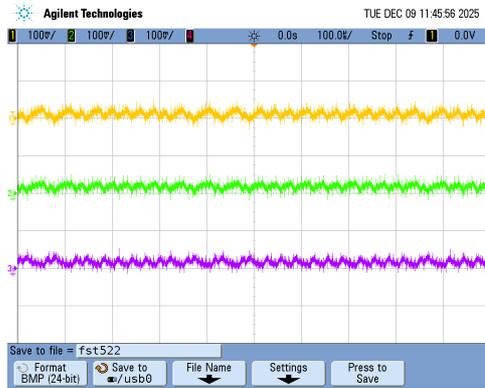
Vin=220VAC, Vo=±15V@0.35A , At 25°C



eFS10 Series – Isolated AC/DC Converters 85 – 264Vac Input, Maximum Power: 10W Output Ripple & Noise

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eFT10-522



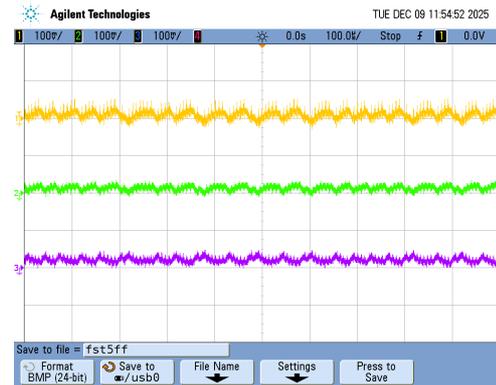
Vin=220VAC, Vo=5V@1.5A

Vo=±12V@0.15A, At 25°C

CH1:5V,CH2:+12V,CH3:-12V

CH1:5V,CH2:+15V,CH3:-15V

eFT10-5FF

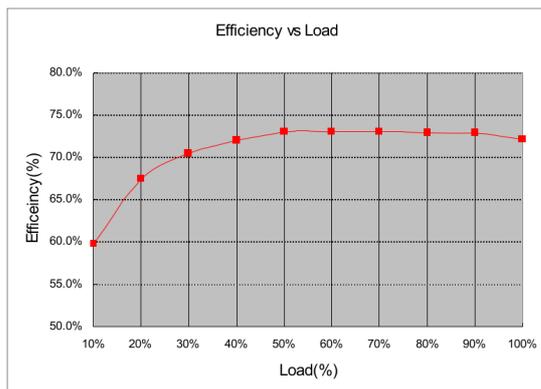


Vin=220VAC, Vo=5V@1.5A

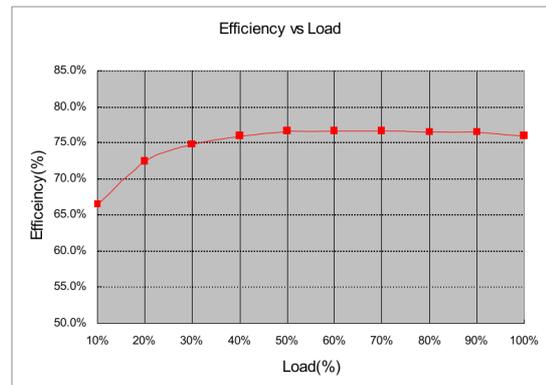
Vo=±15V@0.12A, At 25°C

Efficiency Curve

eFS10-3R3



eFS10-5

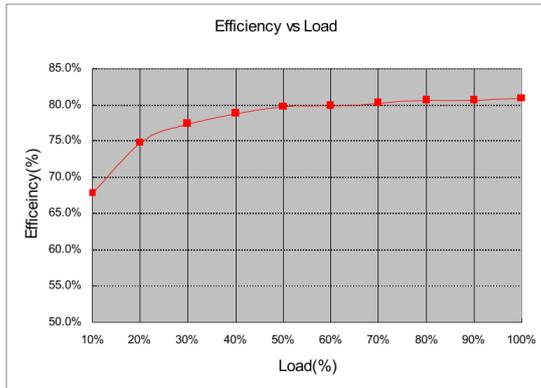


eFS10-12

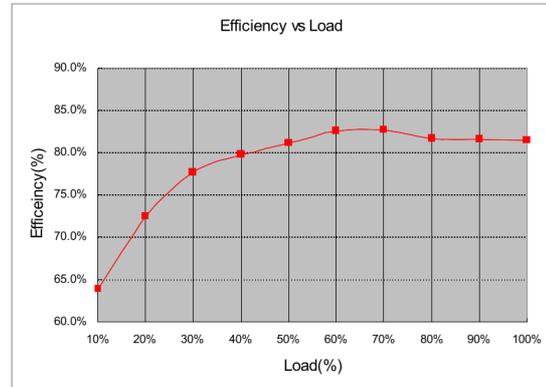


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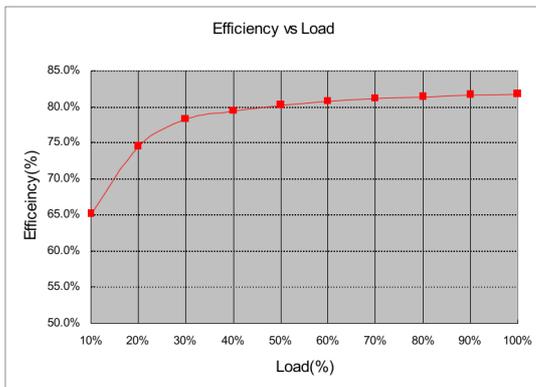
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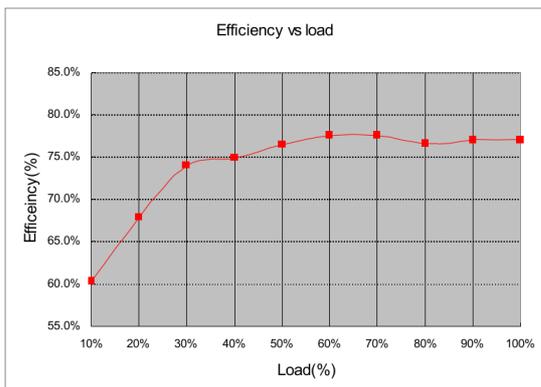
eFS10-15



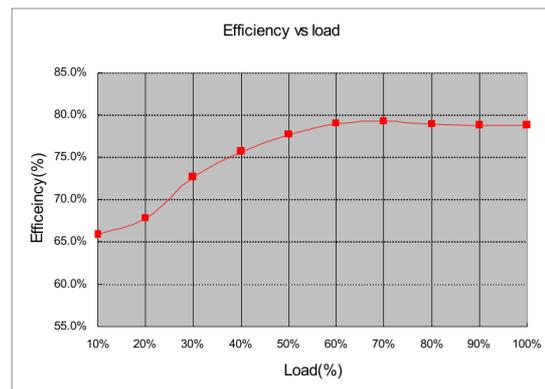
eFS10-24



eFD10-1212



eFD10-1515

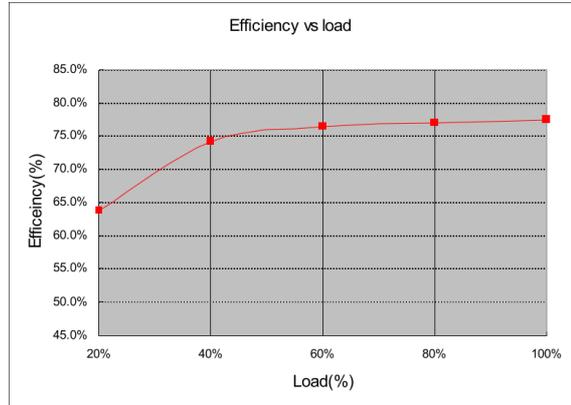
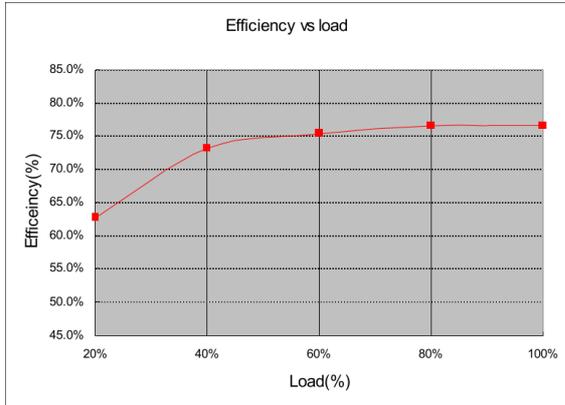


eFST10-522



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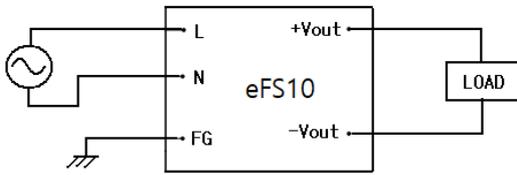
eFST10-5FF

Instruction manual
Basic connection

eFS10 Series – Isolated AC/DC Converters

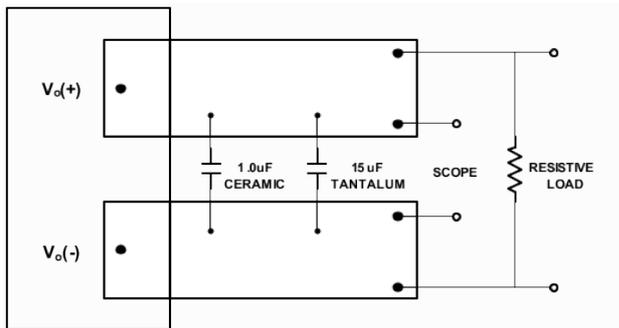
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shown below. Output current in series connection should be lower than the lowest current in each unit. (Please use schottky barrier diode)

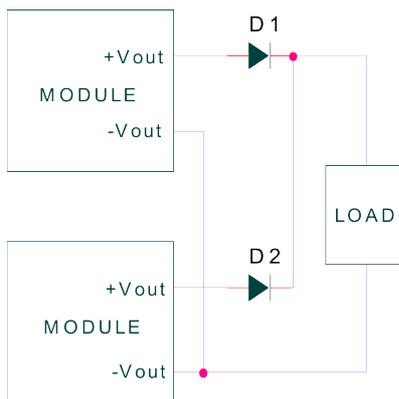
Output ripple and noise Test



* Conductor from Vout-pins to capacitors = 50mm (1.97in)

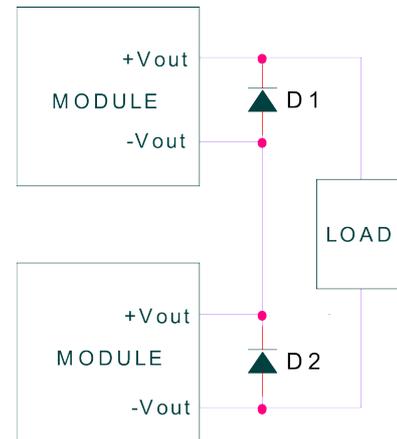
Parallel operation

Parallel operation is available by connecting the units as shown below.



Series operation

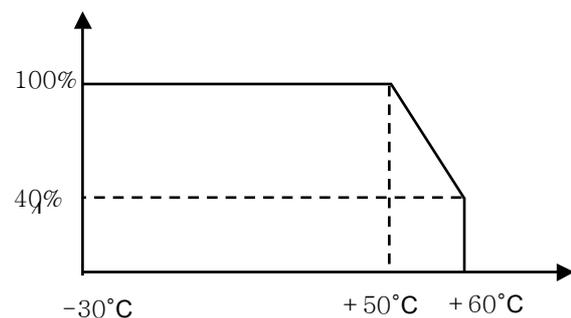
Series operation is available by connecting the outputs of two or more power supplies, as



Thermal Considerations

eFS10 series has wide operating temperature range from -30°C to $+60^{\circ}\text{C}$.

However, it should be required a enough air flow for more reliable operation. Output derating curve provide designers with a quantity of a current under the desired ambient temperature and velocity of a airflow.



Feature Description

Input Fuse

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In order to comply with safety requirements, eFS10 series has a fuse built in.

Input Output Filter

eFS10 series have an internal EMI filter. To reduce conducted noise, additional external input filter is required

To reduce a output ripple and noise, external capacitor is required at the output of the device

Over current Protection (OCP)

eFS10 series built in over current protection circuit which operates when the output current is over 105% of rating and automatically recovers when over current condition is removed

If the short or overload condition continues, the power module could be damaged.

Over Voltage Protection (OVP)

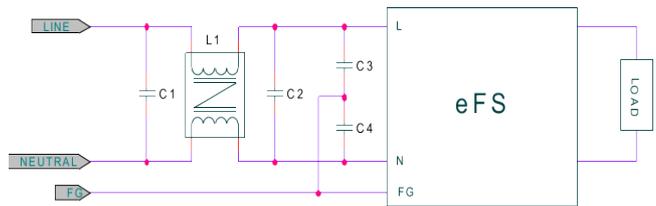
eFS10 series built in overvoltage protection circuit. When the OVP trigger, the output will be shut down. The output automatically recovers when over voltage condition is removed.

Soldering Information

The product is intended for through hole mounting in a PCB, When wave soldering is used, the temperature on the pins is specified to maximum 260°C for maximum 10 seconds when hand soldering, care should be taken to avoid direct contact between the hot soldering iron tip and the pins for more than a few seconds in order to prevent overheating.

EMI Characteristic (conducted Emission)

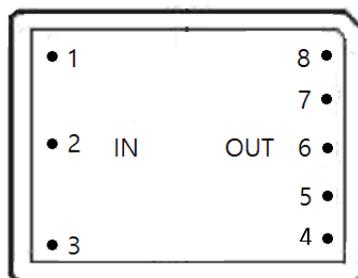
In order to reduce conducted noise install an external input filter as shown in below.



Model Number	L1	C1	C2	C3,C4
eFS10-12	10mH	330nF	100nF	x

Complies with CISPR 22 CLASS B

Pin assignments

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TOP VIEW

Single Output

PIN NO	NAME	FUNCTION
1	FG	Frame Ground
2	AC(L)	AC Input
3	AC(N)	AC Input
4,6,8	No pin	No connection
5	+Vout	Positive side of output voltage
7	GND	

Dual Output

PIN NO	NAME	FUNCTION
1	FG	Frame Ground
2	AC(L)	AC Input
3	AC(N)	AC Input
5	Output1	Positive side of output voltage
6	GND	Common ground
7	Output2	Negative side of output voltage

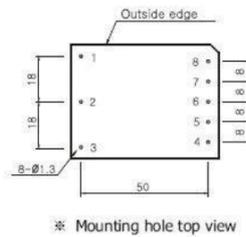
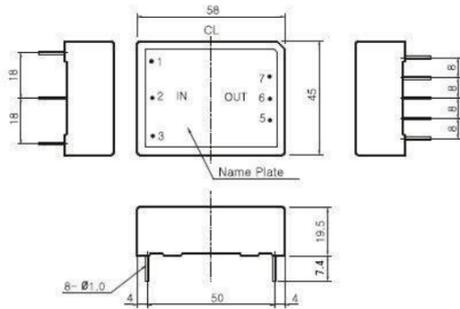
Triple Output

PIN NO	NAME	FUNCTION
1	FG	Frame Ground
2	AC(L)	AC Input
3	AC(N)	AC Input
4	Output1	Positive side of output voltage1
5	GND	Common ground
6	Output2	Positive side of output voltage2
7	GND	Common ground
8	Output3	Negative side of output voltage2

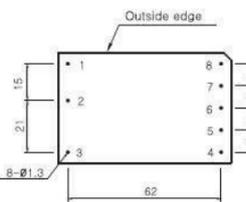
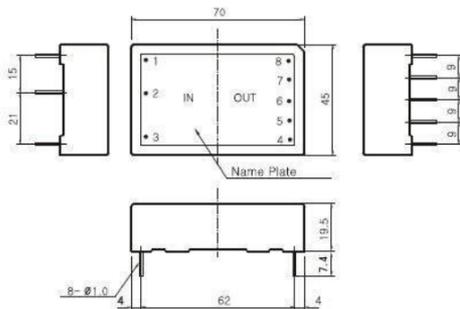
Mechanical Specification

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TOP VIEW


※ Mounting hole top view

▶ Triple Output


※ Mounting hole top view

NOTES

1. All dimensions are mm.
2. Weight : 90g or less (single, dual)
100g or less (triple)

Ordering Information

Input	Output1, Output2 Output3	Maximum Power	Ripple & Noise Typ.	Efficiency Typ.	Model Number
85 – 264V	3.3V@2A	6.6W	80mVp-p	72%	eFS10-3R3(C)
	5V@2A	10W	80mVp-p	75%	eFS10-5(C)
	12V@0.9A	10.8W	120mVp-p	80%	eFS10-12(C)
	15V@0.7A	10.5W	150mVp-p	81%	eFS10-15(C)
	24V@0.45A	10.8W	240mVp-p	81%	eFS10-24(C)
	+12V@0.45A, -12V@0.45A	10.8W	120mVp-p	77%	eFD10-1212(C)
	+15V@0.35A, -15V@0.35A	10.5W	150mVp-p	78%	eFD10-1515(C)
85 – 264V	5V@1.5A, +12V@0.15A, -12V@0.15A,	11.10W	80/120/120mVp-p	76%	eFT10-522(C)



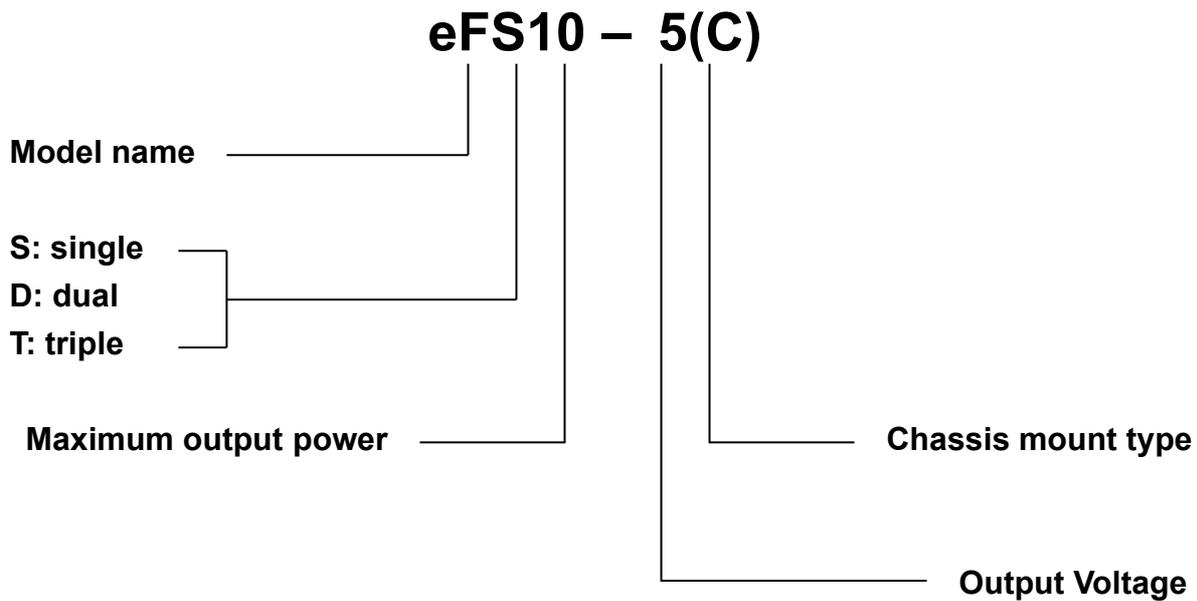
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	5V@1.5A, +15V@0.12A, -15V@0.12A	11.10W	80/150/150mVp-p	77%	eFT10-5FF(C)
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* (C): Chassis mount type

Part number structure



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Korea

HEAD OFFICE & FACTORY

#1401, 14F/L 6th Daeryung TechnoTown 6th,
Seobusaet-gil 648 , Kumchon-Gu, Seoul,
08504, Republic of Korea
TEL: +82 2 855 4955 | FAX: +82 2 855 4954

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Please feel free to
contact : sales@powerplaza.co.kr

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