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

Data Sheet
May 12, 2023

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℃ to +60℃.

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 ,Vin = 85 ~ 264VAC After warm up unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit
Operating voltage Range		85		264	Vac
Input current (@ 220V / @110V)	I_{in}				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)		
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		
Inrush Current@Cold start				30A max	@110VAC
				60A max	@220VAC
Operating Frequency		47		63	Hz

Output Characteristics

T_A = +25˚C ,Vin = 85 ~ 264VAC After warm up unless otherwise specified

Parameter	Symbol	Min	Typ	Max	Unit
Output Voltage tolerance	Vo	-	-	±2	%
Output Current	Io				
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
Output Regulation; - Line Regulation (From minimum input voltage to maximum input voltage, constant load)		-	-	±1	%
- Load Regulation (From no load to maximum load, Constant load)		-	-	±1	%
Output Current Limit (Automatic recovery)		>105			%
Output Ripple and noise (Vin =220Vac, and Io =Max Output Current Bandwidth 20MHz, 1uF Ceramic cap)	mVp-p	-	1% of Vout		mV
Efficiency					
eFS10-3R3			72		%
eFS10-5			75		%
eFS10-12			80		%
eFS10-15			81		%
eFS10-24			81		%
eFD10-1212			77		%
eFD10-1515			78		%

(100% of max Io, Vin = 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: - Input-Case: - Output-case:			 - - -	 3000 3000 1500	 VAC VAC VAC
Isolation Resistance - Output-Case (at DC500V at 25˚C And 70%RH for 1 min)	RISO	>100	-	-	MΩ
Isolation Capacitance	CISO				pF

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Switching Frequency			100		KHz
MTBF (MiL-HDBK- 217F)			6.6×10^5		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

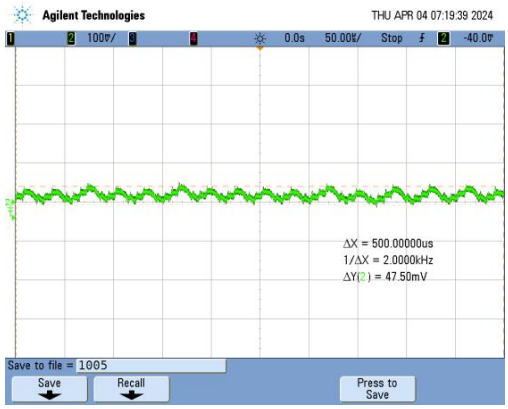
Characteristic Curves

Output Ripple & Noise

eFS10-3R3

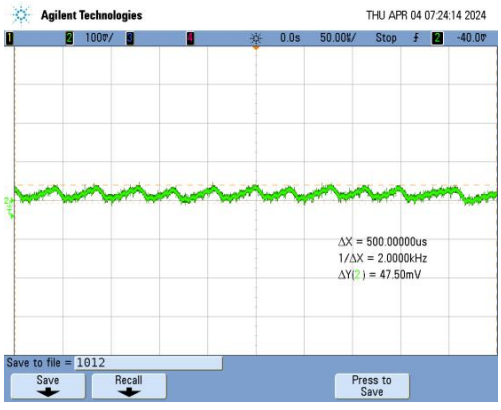
Vin=220VAC, Vo=3.3V@2A , At 25°

eFS10-5



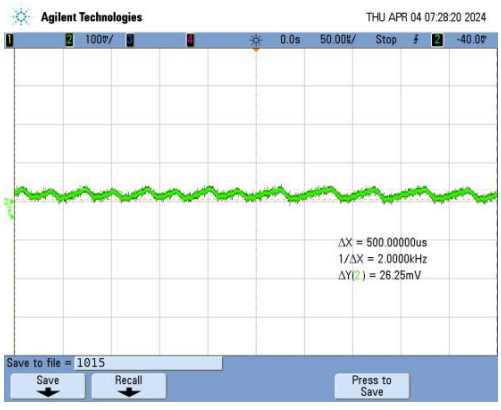
Vin=220VAC, Vo=5V@2A , At 25°

eFS10-12



Vin=220VAC, Vo=12V@0.9A , At 25°

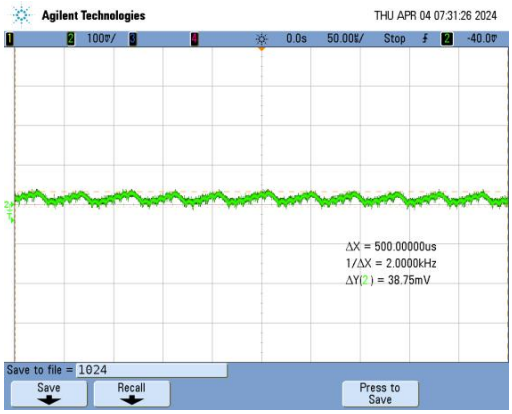
eFS10-15



Vin=220VAC, Vo=15V@0.7A , At 25°

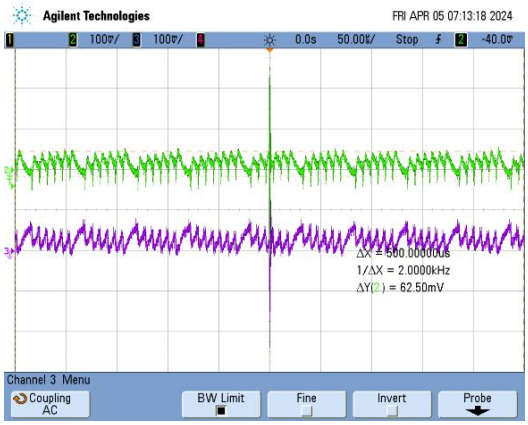
Output Ripple & Noise

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

Efficiency Curve

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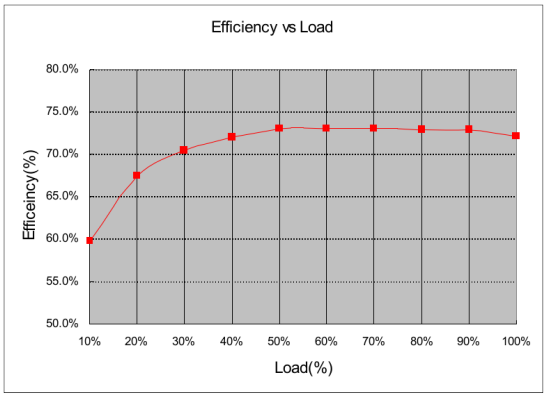
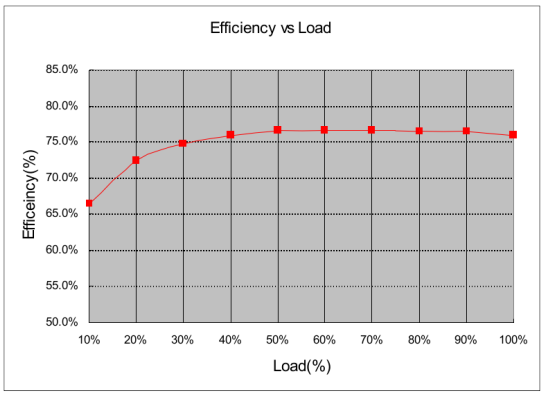
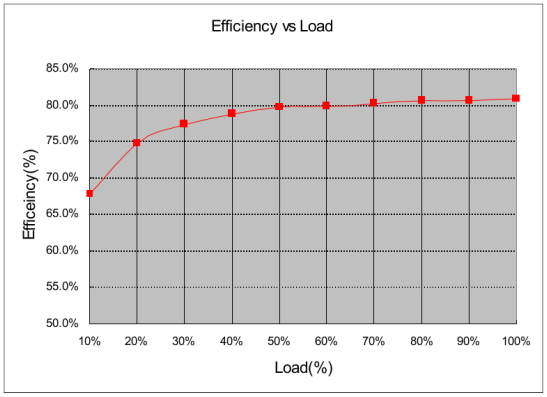
eFS10-3R3



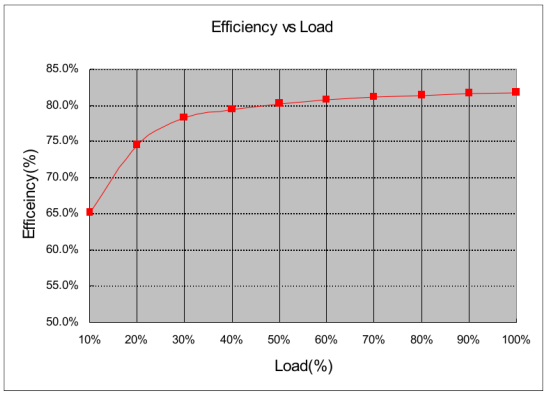
eFS10-5



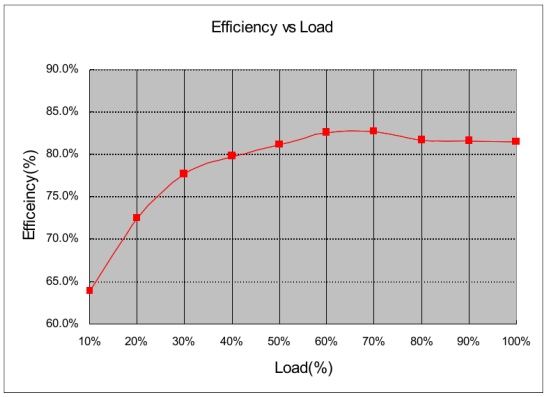
eFS10-12



eFS10-15

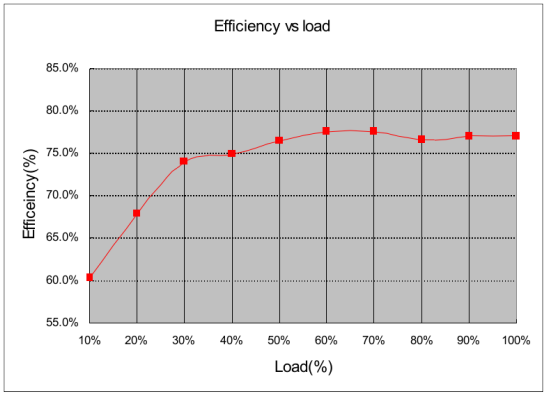


eFS10-24

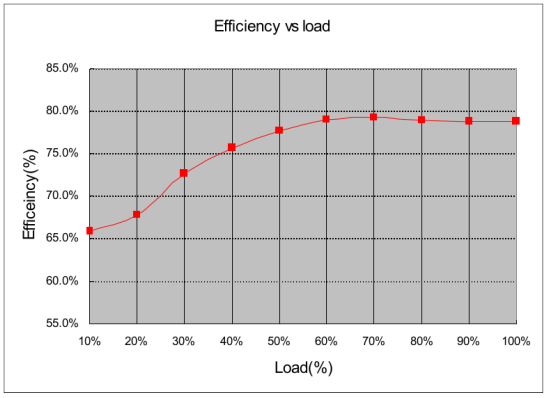


Efficiency Curve

eFD10-1212



eFD10-1515



Instruction manual

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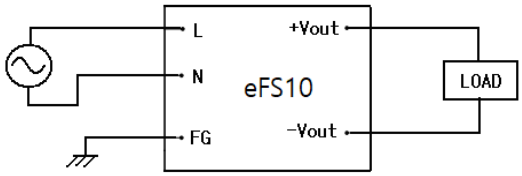
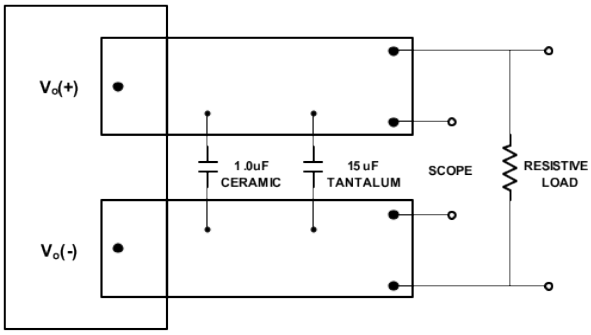
Basic connection



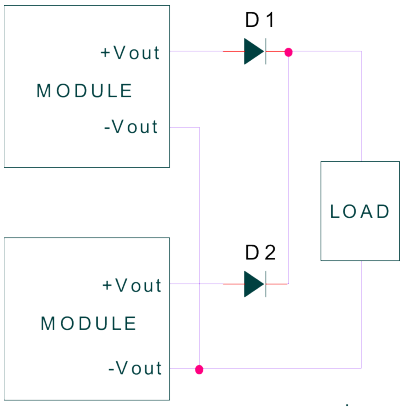
Output ripple and noise Test



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

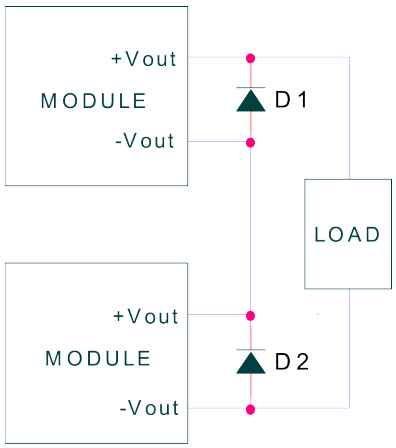
Parallel operation

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



Series operation

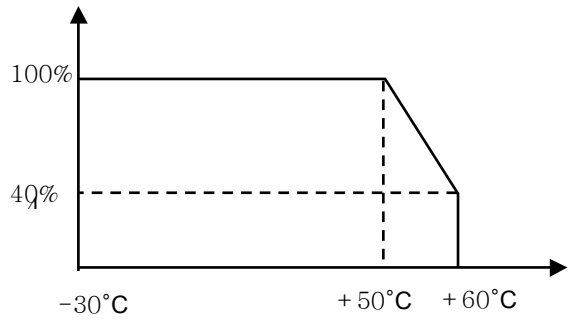
Series operation is available by connecting the outputs of two or more power supplies, as shown below. Output current in series connection should be lower than the lowest current in each unit.(Please use schottky barrier diode)



Thermal Considerations

eFS10 series has wide operating temperature range from -30˚C to +60˚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

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.

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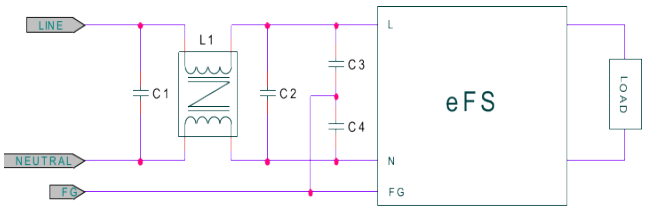
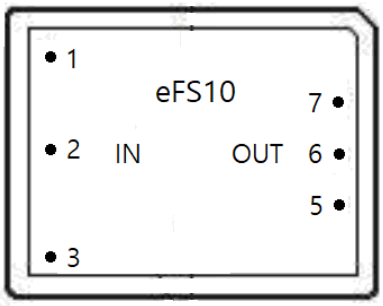


Model Number	L1	C1	C2	C3,C4
eFS10-12	10mH	330nF	100nF	x

Complies with CISPR 22 CLASS B

Pin assignments

TOP VIEW



Single Output

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

6	No pin	
7	GND	
8	No pin	

Dual Output

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

Mechanical Specification

TOP VIEW

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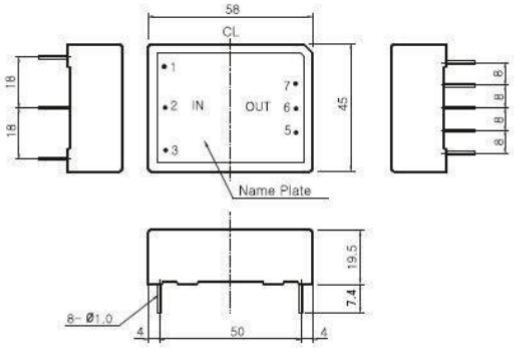
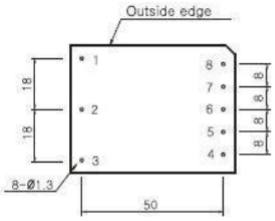
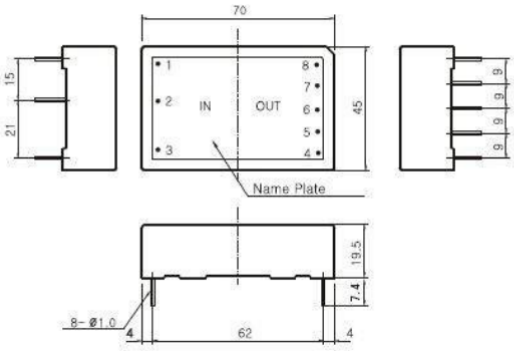


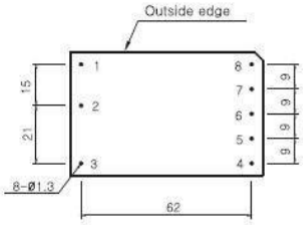


※ Mounting hole top view

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

▶ Triple Output





※ Mounting hole top view

Ordering Information

Input	Output1, Output2	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)

* (C): Chassis mount type

Part number structure

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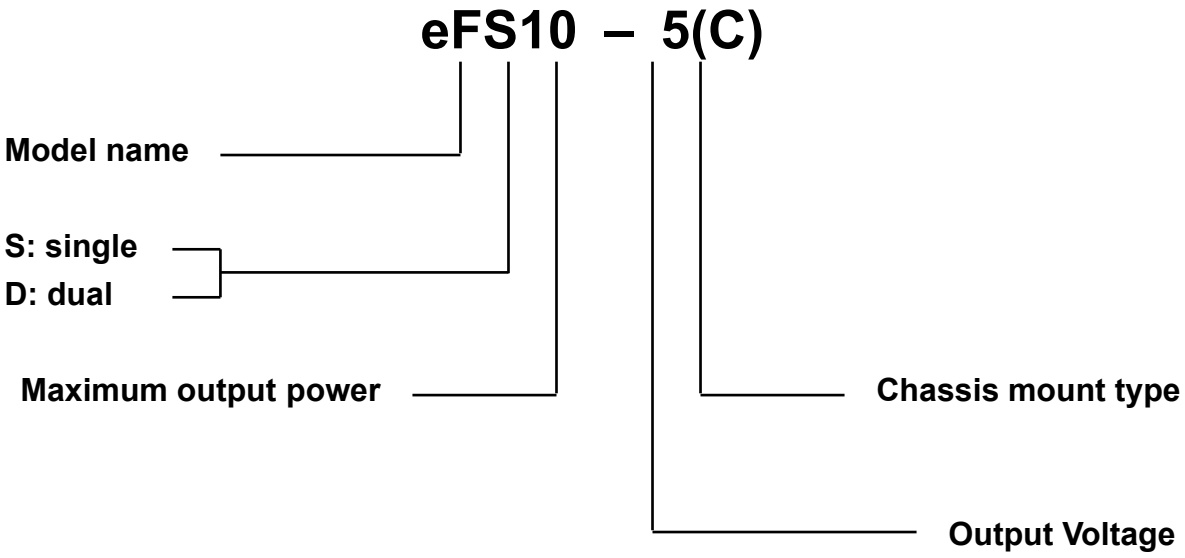

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GENERAL SALES INQUIRIES

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