FHW-E SERIES

50W 8:1 DC-DC Converter

REACH RoHS 3 YEARS WARRANTY

Industry IPC Automate Datacom Telecom

FEATURES

- **DIP 2“x 1” package with standard pinout**
- **8:1 Wide input range**
- **High efficiency up to 90%**
- **No minimum load required**
- **No external components required internal filtering**
- **Over temperature protection**
- **Overload protection & UVLO**
- **3000Vdc I/O isolation**

APPLICATIONS

- **Automation equipment**
- **Power supplies**
- **Industrial PC**
- **Data communications**
- **Distributed power system**

DESCRIPTION

FHW-E series is a 50W DC-DC converter product with 2”x1” standard industrial package. It contains 8:1 extra wide input voltage range, and features high efficiency up to 90%, 3000Vdc isolation voltage between input and output. The models meet radiated Class A of EN55032 without external components, and suit all kinds of systems like industrial control, automation field, and so on.

MODEL ENCODING

FHW	S	-	24	05	E
Series Name	**Output Quantity**		**Input Voltage**	**Output Voltage**	**Input Range**
	S : Single		24 : 9~75V	03.3 : 3.3V 05 : 5V 12 : 12V 15 : 15V	E: 8:1 , 3KVdc Isolation

■ 8:1 MODEL SELECTION TABLE

MODEL NUMBER	INPUT				OUTPUT		EFF. (%)	CAPACITOR LOAD (Max.)
	VOLTAGE (VDC)		CURRENT (mA)		VOLTAGE (VDC)	CURRENT (mA)		
	NOMINAL	RANGE	NO LOAD	FULL LOAD				
FHWS-2403.3E	24	9~75	10	1562	3.3	0~10000	88	680uF
FHWS-2405E			10	2367	5	0~10000	88	680uF
FHWS-2412E			10	2315	12	0~4170	90	330uF
FHWS-2415E			10	2315	15	0~3333	90	220uF

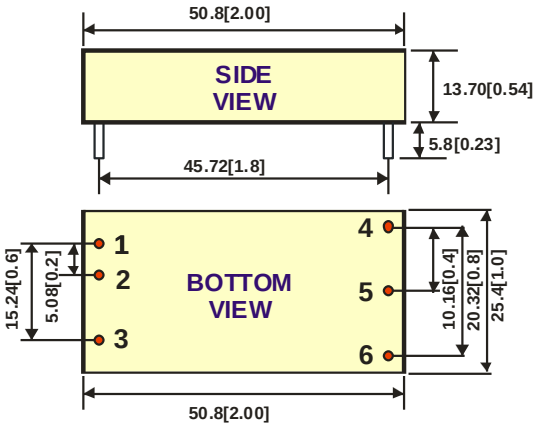
Note: Efficiency and input current are measured at nominal input voltage and full load.

Other input to output voltages may be available. Please contact factory.

■ SPECIFICATION

INPUT	Voltage Range	9~75V		
	Surge Voltage(100ms max.)	24Vin models : 100Vdc		
	Filter	Pi network		
	Under Voltage Lockout	Start-up voltage：8.8 Vdc		
		Shutdown voltage：7.5 Vdc		
	Remote Control	See page 4		
	Over Voltage Lockout	See page 5		
	Protection	Fuse recommended (see page 7)		
OUTPUT	Voltage Accuracy	±2% max.		
	Rated Power	33W~50W		
	Ripple & Noise[1]	150mVp-p max.		
	Line Regulation[2]	±0.5%		
	Load Regulation[3]	±0.5%	±1% for 3.3Vdc output	
	Switching Frequency	200KHz typ.(PWM)		
	External Trim Adj. Range	±10% typ.		
PROTECTION	Short Circuit	Protection type : continuous, recovery		
	Overload	110%~180%		
		Protection type : recovers automatically after fault condition is removed		
	Over Voltage	Clamp by TVS diode		
	Over Temperature	120°C. Shut down o/p voltage, re-power on to recover		
ENVIRONMENT	Cooling	Free-air convection		
	Working Temperature	-40~ +60°C (refer to “Derating Curve”)		
	Case Temperature	+110 °C max.		
	Working Humidity	5% ~ 95% RH non-condensing		
	Storage Temp., Humidity	-55 ~ +125°C, 10 ~ 95% RH non-condensing		
	Temperature Coefficient	±0.05% / °C		
	Soldering Temperature	1.5mm from case of 3~5 sec./265°C(max.)		
	Vibration	10~500Hz, 2G 10min./1cycle, period for 60 min. each along X, Y, Z axes		
SAFETY & EMC	Isolation Voltage	I/P-O/P：3KVdc		
	Isolation Resistance	I/P-O/P : 1000M Ohms / 500VDC / 25°C / 70% RH		
	Isolation Capacitance	1000pF typ.		
	EMC Emission	**Parameter**	**Standard**	**Test Level / Note**
		Conducted	EN55032(CISPR32)	N/A
		Radiated	EN55032(CISPR32)	Class A
	EMC Immunity	**Parameter**	**Standard**	**Test Level / Note**
		ESD	BS IEC 61000-4-2	Contact ±4KV
		Radiated Susceptibility	BS IEC 61000-4-3	3V/m
		EFT/Burst	BS IEC 61000-4-4	±0.5KV
		Surge	BS IEC 61000-4-5	Line-Line ±0.5KV
		Conducted	BS IEC 61000-4-6	3Vrms
		Magnetic field immunity	BS IEC 61000-4-8	1A/m
OTHERS	MTBF[4]	>460,000Hours		
	Weight	43.0g typ.		
	Dimension(L*W*H)	50.8mm*25.4mm*13.7mm		
	Case Material	Six-side shielded case		
NOTE	**[1] Ripple & noise are measured at 20MHz BW with 1uF ceramic capacitor connect to the output pins.** **[2] High line to low line.** **[3] Load regulation is for output load current change from 0% to 100%.** **[4] MIL-HDBK-217F @25 °C, Ground Benign.** ***All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.**			

MECHANICAL SPECIFICATION



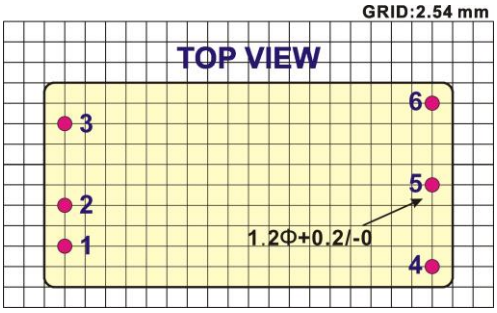
All dimensions are in millimeters [inches]

PIN CONNECTION	
PIN	SINGLE
1	+Vin
2	-Vin
3	Remote
4	+Vout
5	-Vout
6	Trim

All dimensions are in mm[Inches]

Pin size is 1.0Φ ±0.10mm

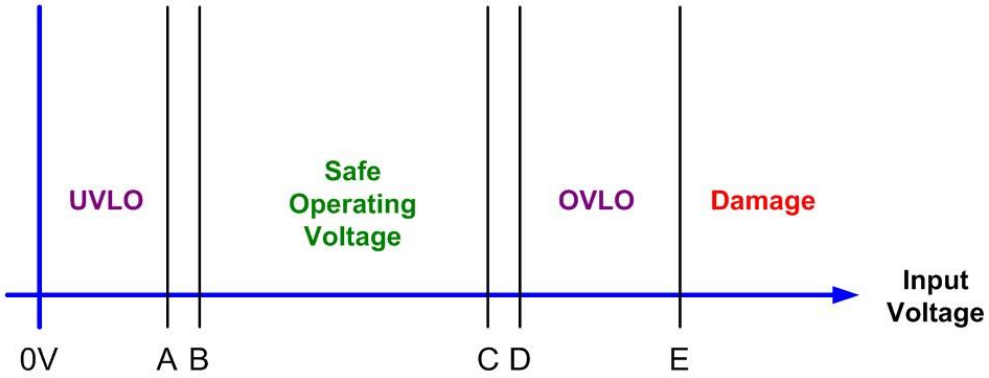
Tolerance .X or .XX= ±0.5mm



REMOTE ON/OFF CONTROL

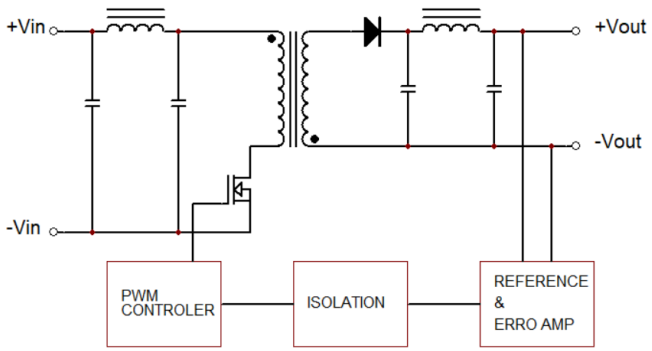
Remote On/Off Control			
Control Input	PIN3	Control Common	PIN2
Control Voltage		Converter Shutdown Idle Current	10mA
ON	> 2.5 ~ 75VDC or Open Circuit	Logic Compatibility	CMOS or Open Collector TTL
OFF	< 1.0VDC or Jumper to PIN2		

INPUT OPERATING VOLTAGE



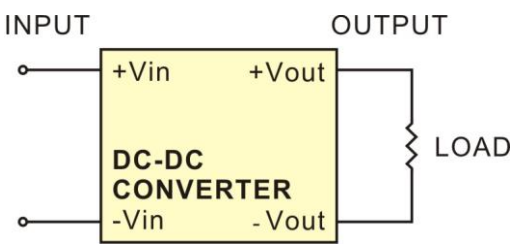
MODEL NUMBER	A	B	C	D	E
FHWS-24XXE	8.8V typ.	9V	75V	87V typ.	100V

SIMPLIFIED SCHEMATIC

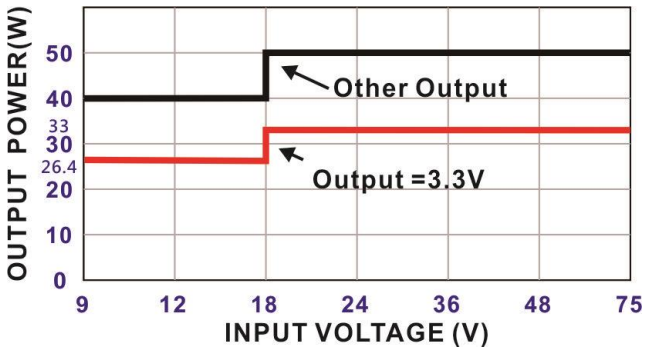


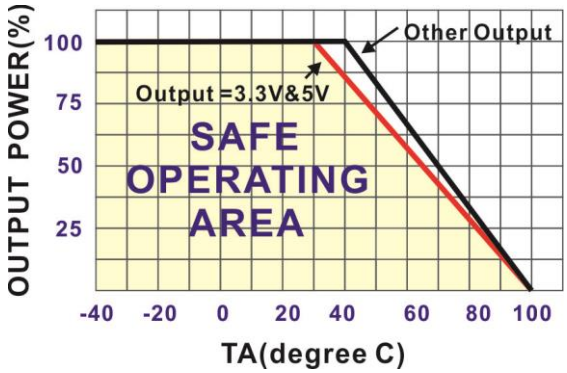
TYPICAL APPLICATIONS

FIXED VOLTAGE OUTPUT



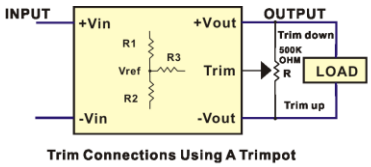
■ DERATING CURVE



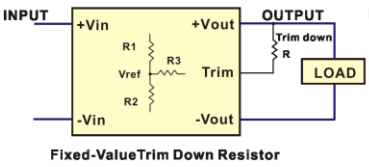


■ EXTERNAL OUTPUT TRIMMING

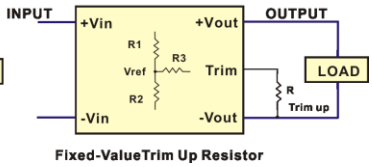
Trim up and Trim down resistor values



Trim Connections Using A Trimpot



Fixed-ValueTrim Down Resistor



Fixed-ValueTrim Up Resistor

Vout	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref
3.3	2.43	1.47	7.5	1.24
5	1	1	3.9	2.5
12	3.83	1	7.5	2.5
15	7.5	1.5	11	2.5

Trim-down:

A=[(Vo'-Vref)/Vref] *R2

RT-down=[(A*R1)/(R1-A)]-R3

Trim-up:

A=[Vref/(Vo'-Vref)]*R1

RT-up=[(A*R2)/(R2-A)]-R3

For example :

Vout=12V

Trim=+/-10% (13.2V / 10.8V)=Vo'

trim=-10% (-10.8v)=Vo'

Trim-down:

A=[(Vo'-Vref)/Vref] *R2

=[(10.8-2.5)/2.5]*1

=3.32

RT-down=[(A*R1)/(R1-A)]-R3

=[(3.32*3.83)/(3.83-3.32)]-7.5

=(12.715/0.51)-7.5

=24.931-7.5

=17.431KΩ

trim=+10% (+13.2V)=Vo'

Trim-up:

A=[Vref/(Vo'-Vref)]*R1

= [2.5/(13.2-2.5)]*3.83

=0.894

RT-up=[(A*R2)/(R2-A)]-R3

=[(0.894*1)/(1-0.894)]-7.5

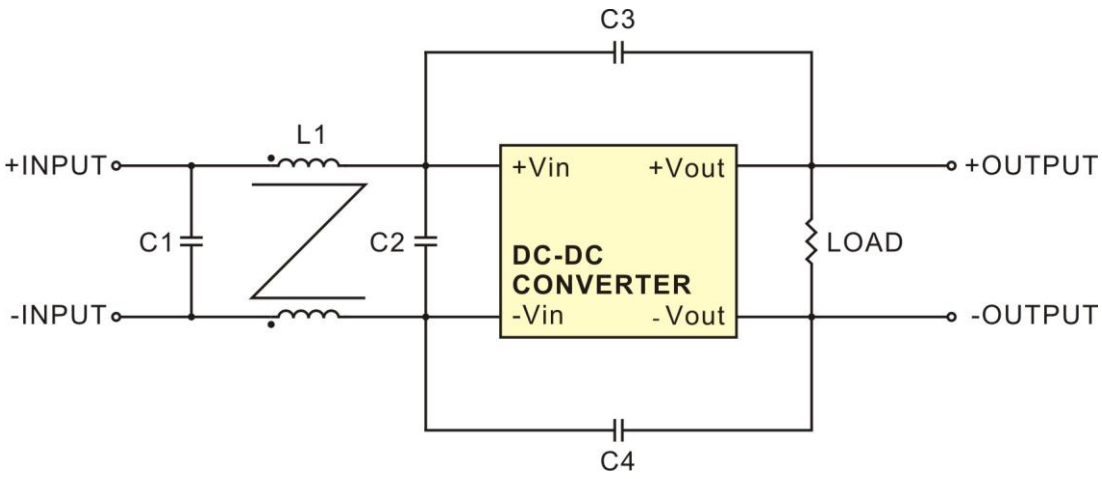
=(0.894/0.106)-7.5

=8.433-7.5

=0.933KΩ

■ RECOMMENDED FILTER FOR EN55032 CLASS B

The components used in the under figure, together with the manufacturer's part numbers for these components, are as follows:

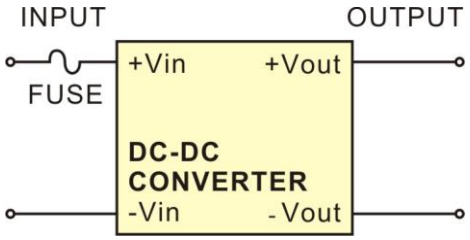


MODEL NUMBER	C1	C2	C3	C4	L1
FHWS-24XXE	47uF/100V	2.2uF/100V MLCC	1000pF/5KV	1000pF/5KV	325uH Common Choke

■ INPUT FUSE SELECTION GUIDE

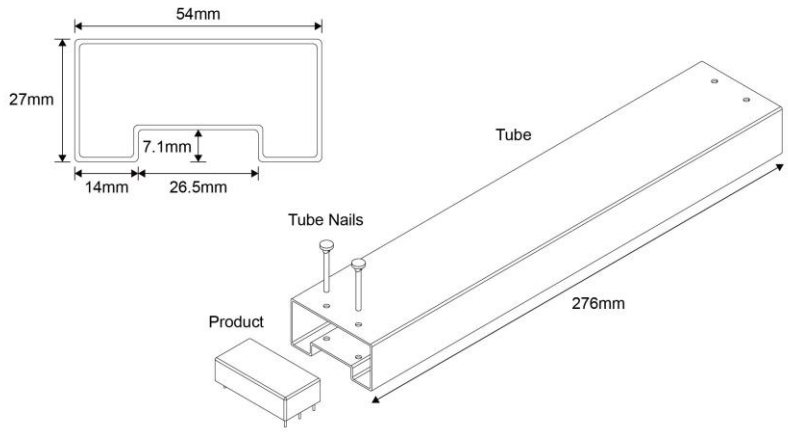
9-75V Input Voltage (Vdc)

8000mA Slow-Blow Type



Note: Certain applications may require the installation of external fuse in front of the input.

■ PACKAGING INFORMATION



Packaging Quantity: 10 pcs converter per tube

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