

Positive/Negative Switching Regulators

FN-Family

No input to output isolation
Single output (positive or negative) of 5, 12 or 15 V DC/1.5...3 W
Double output (positive/negative) of ± 12 or ± 15 V DC/1.5...3 W
Input voltage from 2.7 V up to 7 V DC

- 2.7...7 V input range
- High efficiency and low heat generation
- High reliability and long life
- Good output stability
- Silicon packed: high immunity against humidity
- No electrolytic capacitors used inside
- Choke coils for optimum EMI filtering (optional)
- Suitable for rack 3 TE (15.24 mm)

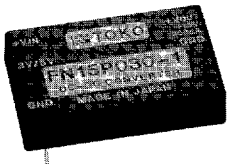


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Type Survey

Table 1a: Survey of 1.5 W types

Nominal output voltage $U_{o\text{ nom}}$	Nominal output current I_o	Input voltage range U_i	Nominal input voltage $U_{i\text{ nom}}$	Efficiency η	Type designation	Rated output power $P_o\text{ max}$
+5 V	3...300 mA	2.7...4 V	3 V	79%	FN05P015-0	1.5 W
+12 V	2...125 mA	2.7...7 V	5 V		FN12P015-1	
+15 V	2...100 mA				FN15P015-1	
−5 V	3...300 mA			71%	FN05N015-1	
−12 V	2...125 mA				FN12N015-1	
−15 V	2...100 mA				FN15N015-1	
±12 V	±18...±62 mA	FN12D015-1				
±15 V	±15...±50 mA	FN15D015-1				

Table 1b: Survey of 3.0 W types

Nominal output voltage $U_{o\text{ nom}}$	Nominal output current I_o	Input voltage range U_i	Nominal input voltage $U_{i\text{ nom}}$	Efficiency η	Type designation	Rated output power $P_o\text{ max}$
+5 V	6...600 mA	2.7...4 V	3 V	79%	FN05P030-0	3.0 W
+12 V	3...250 mA	2.7...7 V	5 V		FN12P030-1	
+15 V	2...200 mA				FN15P030-1	
−5 V	6...600 mA		70%	FN05N030-1		
−12 V	3...250 mA			FN12N030-1		
−15 V	2...200 mA			FN15N030-1		
±12 V	±37...±125 mA			FN12D030-1		
±15 V	±30...±100 mA			FN15D030-1		

Description

The FN family of switching regulators (DC-DC converters) offers low profile, high stability and high reliability. The regulators are suited to all kind of applications in electronic systems, specially to control equipment, measuring instru-

ments, telecommunications and general purpose, where high reliability is paramount. A full range of specifications and innovative optional choke coils are available to suit a wide variety of technical needs.

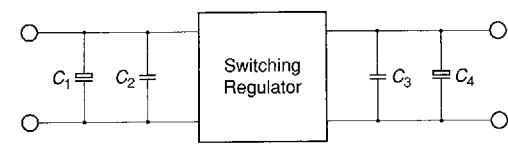


Fig. 1
External circuitry without chokes

Filtering Recommendations

- Two different design-in circuits can be recommended:
- a) circuit design by means of adding just input and output capacitors in order to reduce ripple and noise to a moderate value
 - b) circuit design by adding input and output π -filtering by means of capacitors and filtering chokes (in series connection) in order to achieve enhanced ripple and noise behaviour

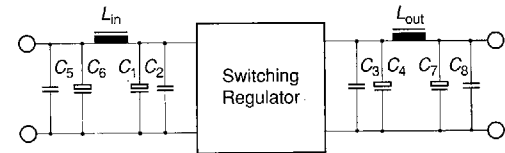


Fig. 2
External circuitry including chokes

Notes:

Capacitors and chokes should be within 20 mm of regulator terminals;
 C_2 and C_3 : 0.047 μ F ceramic capacitors
 C_5 and C_8 : 0.01 μ F ceramic capacitors
 $C_6 = 82 \mu$ F
 C_1 , C_4 and C_7 : see table below
 $L_{in} = 22 \mu$ H (TOKO 8RDB-220M),
 $L_{out} = 33 \mu$ H (TOKO 8RDB-330M)

Table 2a: External capacitors for 1.5 W types

$U_i = 3 \text{ V}$ $C_i [\mu\text{F}]$	$U_i = 5 \text{ V}$ $C_i [\mu\text{F}]$	Type	$I_{o \text{ max}}$ [mA]	C_4 [μ F]	C_7 [μ F]
1000	470	FN 05P015-0	300	330	82
		FN 12P015-1	125	120	56
		FN 15P015-1	100	82	39
		FN 05N015-1	300	680	82
		FN 12N015-1	125	120	56
		FN 15N015-1	100	82	39
		FN 12D015-1	± 62	2x120	2x56
		FN 15D015-1	± 50	2x82	2x39

Table 2b: External capacitors for 3.0 W types

$U_i = 3 \text{ V}$ $C_i [\mu\text{F}]$	$U_i = 5 \text{ V}$ $C_i [\mu\text{F}]$	Type	$I_{o \text{ max}}$ [mA]	C_4 [μ F]	C_7 [μ F]
2200	1000	FN 05P030-0	600	680	82
		FN 12P030-1	250	330	56
		FN 15P030-1	200	270	39
		FN 05N030-1	600	1000	82
		FN 12N030-1	250	330	56
		FN 15N030-1	200	270	39
		FN 12D030-1	± 125	2x330	2x56
		FN 15D030-1	± 100	2x180	2x39

Derating Characteristics

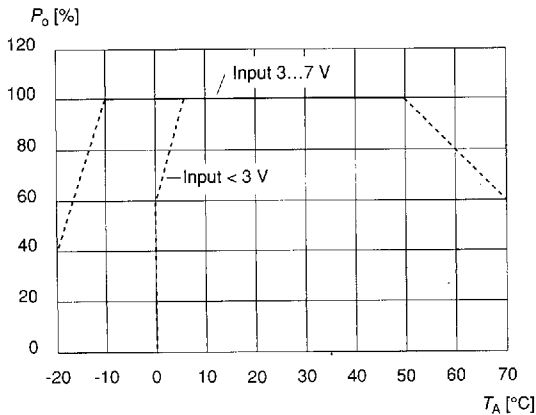


Fig. 3
Output power vs. ambient temperature

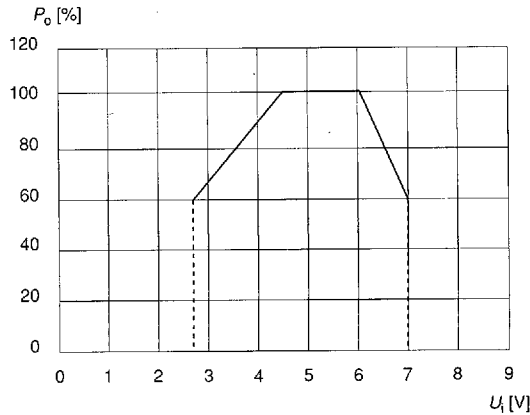


Fig. 4
Output power vs. input voltage

Electrical Input and Output Data

General Condition; $T_A = +25^\circ\text{C}$, see also "Derating Characteristics"

Table 3a: Input and output data 1.5 W types with positive output

Characteristics		Conditions	FN 05P015-0			FN 12P015-1			FN 15P015-1			Unit
			min	typ	max	min	typ	max	min	typ	max	
Output												
U_o	Output voltage	$U_{i \min} \dots U_{i \max}$	4.75		5.25	11.40		12.60	14.25		15.75	V
$I_o \text{ nom}$	Output current	$U_{i \min} \dots U_{i \max}$	3		300	2		125	2		100	mA
u_o	Output ripple and noise	$U_{i \text{ nom}}$, with choke	120			120			120			mV _{pp}
ΔU_{oU}	Static control deviation versus input voltage U_i	$U_{i \min} \dots U_{i \max}$	± 1.5			± 1.5			± 1.5			%
ΔU_{oI}	Static control deviation versus output current I_o	$U_{i \text{ nom}}$ $I_o \text{ min} \dots I_o \text{ max}$	± 1			± 1			± 1			
$\Delta U_o/\Delta T$	Thermal coefficient	$U_{i \text{ nom}}$, $I_o \text{ min} \dots I_o \text{ max}$	± 1			± 1			± 1			
Input												
U_i	Input voltage	$I_o \text{ min} \dots I_o \text{ max}$	2.7		4.0	2.7		7.0	2.7		7.0	V DC
Efficiency												
η	Efficiency	$U_{i \text{ nom}}$, $I_o \text{ nom}$	79			79			79			%

Table 3b: Input and output data 1.5 W types with negative output

Characteristics		Conditions	FN 05N015-1			FN 12N015-1			FN 15N015-1			Unit
			min	typ	max	min	typ	max	min	typ	max	
Output												
U_o	Output voltage	$U_{i \min} \dots U_{i \max}$	-4.75		-5.25	-11.40		-12.60	-14.25		-15.75	V
$I_o \text{ nom}$	Output current	$U_{i \min} \dots U_{i \max}$	3		300	2		125	2		100	mA
u_o	Output ripple and noise	$U_{i \text{ nom}}$, with choke	120			120			120			mV _{pp}
$\Delta U_{o \text{ U}}$	Static control deviation versus input voltage U_i	$U_{i \min} \dots U_{i \max}$	± 1.5			± 1.5			± 1.5			%
$\Delta U_{o \text{ I}}$	Static control deviation versus output current I_o	$U_{i \text{ nom}}$ $I_o \text{ min} \dots I_o \text{ max}$	± 1			± 1			± 1			
$\Delta U_o / \Delta T$	Thermal coefficient	$U_{i \text{ nom}}, I_o \text{ min} \dots I_o \text{ max}$	± 1			± 1			± 1			
Input												
U_i	Input voltage	$I_o \text{ min} \dots I_o \text{ max}$	2.7		7.0	2.7		7.0	2.7		7.0	V DC
Efficiency												
η	Efficiency	$U_{i \text{ nom}}, I_o \text{ nom}$	71			71			71			%

Table 3c: Input and output data 1.5 W types with double output

Characteristics		Conditions	FN 12D015-1			FN 15D015-1			Unit
			min	typ	max	min	typ	max	
Output									
U_o	Output voltage	$U_{i \min} \dots U_{i \max}$			±11.40	±12.60	±14.25	±15.75	V
$I_o \text{ nom}$	Output current	$U_{i \min} \dots U_{i \max}$			±18	±62	±15	±50	mA
u_o	Output ripple and noise	$U_{i \text{ nom}}$, with choke			120		120		mV _{pp}
$\Delta U_{o \text{ U}}$	Static control deviation versus input voltage U_i	$U_{i \min} \dots U_{i \max}$			±1.5		±1.5		%
$\Delta U_{o \text{ I}}$	Static control deviation versus output current I_o	$U_{i \text{ nom}}$ $I_o \text{ min} \dots I_o \text{ max}$			±1		±1		
$\Delta U_o / \Delta T$	Thermal coefficient	$U_{i \text{ nom}}, I_o \text{ min} \dots I_o \text{ max}$			±1		±1		
Input									
U_i	Input voltage	$I_o \text{ min} \dots I_o \text{ max}$			2.7	7.0	2.7	7.0	V DC
Efficiency									
η	Efficiency	$U_{i \text{ nom}}, I_o \text{ nom}$			71		71		%

General condition: $T_A = +25^{\circ}\text{C}$, see also "Derating Characteristics"

Table 4a: Input and output data 3.0 W types with positive output

Characteristics		Conditions	FN 05P030-0			FN 12P030-1			FN 15P030-1			Unit
			min	typ	max	min	typ	max	min	typ	max	
Output												
U_o	Output voltage	$U_{i\min} \dots U_{i\max}$	4.75	5.25		11.40	12.60		14.25	15.75		V
$I_o\text{ nom}$	Output current	$U_{i\min} \dots U_{i\max}$	6	600		3	250		2	200		mA
u_o	Output ripple and noise	$U_{i\text{ nom}}$, with choke	120			120			120			mV _{pp}
$\Delta U_o\text{ U}$	Static control deviation versus input voltage U_i	$U_{i\min} \dots U_{i\max}$	± 1.5			± 1.5			± 1.5			%
$\Delta U_o\text{ I}$	Static control deviation versus output current I_o	$U_{i\text{ nom}}$ $I_o\text{ min} \dots I_o\text{ max}$	± 1			± 1			± 1			
$\Delta U_o/\Delta T$	Thermal coefficient	$U_{i\text{ nom}}, I_o\text{ min} \dots I_o\text{ max}$	± 1			± 1			± 1			
Input												
U_i	Input voltage	$I_o\text{ min} \dots I_o\text{ max}$	2.7	4.0		2.7	7.0		2.7	7.0		V DC
Efficiency												
η	Efficiency	$U_{i\text{ nom}}, I_o\text{ nom}$	79			79			79			%

Table 4b: Input and output data 3.0 W types with negative output

Characteristics		Conditions	FN 05N030-1			FN 12N030-1			FN 15N030-1			Unit
			min	typ	max	min	typ	max	min	typ	max	
Output												
U_o	Output voltage	$U_{i\min} \dots U_{i\max}$	-4.75	-5.25		-11.40	-12.60		-14.25	-15.75		V
$I_o\text{ nom}$	Output current	$U_{i\min} \dots U_{i\max}$	6	600		3	250		2	200		mA
u_o	Output ripple and noise	$U_{i\text{ nom}}$, with choke	140			120			120			mV _{pp}
$\Delta U_o\text{ U}$	Static control deviation versus input voltage U_i	$U_{i\min} \dots U_{i\max}$	± 1.5			± 1.5			± 1.5			%
$\Delta U_o\text{ I}$	Static control deviation versus output current I_o	$U_{i\text{ nom}}$ $I_o\text{ min} \dots I_o\text{ max}$	± 1			± 1			± 1			
$\Delta U_o/\Delta T$	Thermal coefficient	$U_{i\text{ nom}}$, $I_o\text{ min} \dots I_o\text{ max}$	± 1			± 1			± 1			
Input												
U_i	Input voltage	$I_o\text{ min} \dots I_o\text{ max}$	2.7	7.0		2.7	7.0		2.7	7.0		V DC
Efficiency												
η	Efficiency	$U_{i\text{ nom}}$, $I_o\text{ nom}$	70			70			70			%

Table 4c: Input and output data 3.0 W types with double output

Characteristics		Conditions		FN 12D030-1		FN 15D030-1		Unit	
				min	typ	max	min	typ	max
Output									
U_o	Output voltage	$U_{i\min}\dots U_{i\max}$		±11.40	±12.60	±14.25	±15.75	V	
$I_o\text{ nom}$	Output current	$U_{i\min}\dots U_{i\max}$		±37	±125	±30	±100	mA	
u_o	Output ripple and noise	$U_{i\text{ nom}}$, with choke		120		120		mV _{pp}	
$\Delta U_o\text{ U}$	Static control deviation versus input voltage U_i	$U_{i\min}\dots U_{i\max}$		±1.5		±1.5		%	
$\Delta U_o\text{ I}$	Static control deviation versus output current I_o	$U_{i\text{ nom}}$ $I_o\text{ min}\dots I_o\text{ max}$		±1		±1			
$\Delta U_o/\Delta T$	Thermal coefficient	$U_{i\text{ nom}}, I_o\text{ min}\dots I_o\text{ max}$		±1		±1			
Input									
U_i	Input voltage	$I_o\text{ min}\dots I_o\text{ max}$		2.7	7.0	2.7	7.0	V DC	
Efficiency									
η	Efficiency	$U_{i\text{ nom}}, I_o\text{ nom}$		70		70		%	

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Immunity to Environmental Conditions

Table 5: Temperature specifications

Temperature			Operating		Storage		Unit
Characteristics	Conditions		min	max	min	max	
T _A	Ambient temperature ¹	U _I min...U _I max I _O min...I _O max	-10	50	-25	85	°C
r.H.	Relative humidity			95		95	%

¹ See also "Derating Characteristics"

Mechanical Data

Dimensions in mm. Tolerances ±0.3 mm unless otherwise stated

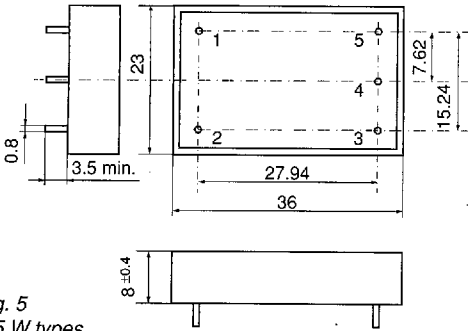
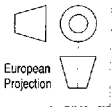


Fig. 5
1.5 W types

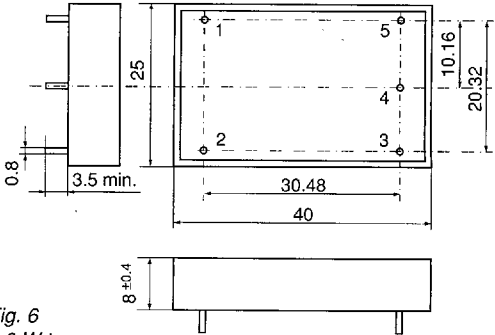


Fig. 6
3.0 W types

Table 6: Pin assignments

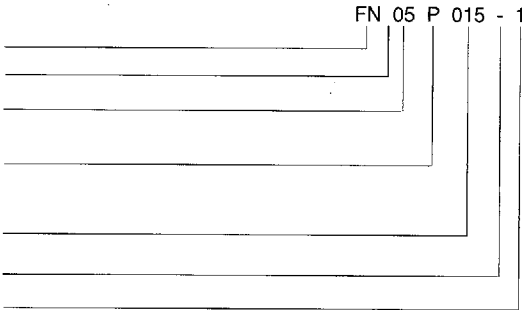
Type of regulator	P _o	Pin no. 1	Pin no. 2	Pin no. 3	Pin no. 4	Pin no. 5
FN 05P015-0, FN 12P015-1, FN 15P015-1	1.5 W	GND	Vi+	Vo+	GND	n.a.
FN 05N015-1, FN 12N015-1, FN 15N015-1		GND	Vi+	n.a.	GND	Vo-
FN 12D015-1, FN 12D015-1		GND	Vi+	Vo+	COMMON	Vo-
FN 05P030-0, FN 12P030-1, FN 15P030-1	3.0 W	GND	Vi+	Vo+	GND	n.a.
FN 05N030-1, FN 12N030-1, FN 15N030-1		GND	Vi+	n.a.	GND	Vo-
FN 12D030-1, FN 15D030-1		GND	Vi+	Vo+	COMMON	Vo-

n.a. -> not assembled

Type Key and Product Marking

Type Key

Family, (DC-DC converter)	FN
Blank	
Nominal output voltage in volt	5...15
Output configuration:	
positive	P
negative	N
double (±, common ground)	D
Nominal output power:	
1.5 watts	015
3.0 watts	030
Dash	
Version	0...1



Product Marking

Main face: Manufacturer, specific type designation, input and output pin designation, input and output voltage(s)