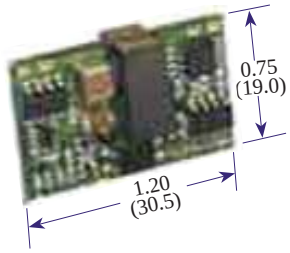
Input Ranges :
10-75 VDC
Output Voltage:
Single Output
3.3V - 48V
Dual Output
+/5.0V/+3.3V
Triple Output
+/5.0V/+3.3V/+13V,
+5V/±15V
Output Power:
13 W



Open Frame (Horizontal Mount)
(0.72”W x 1.17”L x 0.35”H)

Metal Case (Horizontal Mount)
(0.80”W x 1.25”L x 0.40”H)

FEATURES

General:
- Small footprint : 0.75” x 1.20”
- Output power : 13 watts
- Input Voltage from 10 to 75Vdc
- 2:1 & 3:1 Input Voltage Range
- Open frame or Encapsulated
- Integral PCB transformer
- High conversion efficiency to 85%
- Line & load regulation to ±1.0%
- Fixed operating frequency

Protection:
- Output over-load protection
- Hiccup mode short circuit protection
- Input under-voltage lock-out

Control:
- Enable (On/Off) Control
- Output Voltage Trim

Isolation:
- Isolation Voltage > 2250V

APPLICATIONS
- PoE (Power over Ethernet)
- Distributed Power Systems
- Workstations
- Computer Equipment
- Communications Equipment

The **CH** series is a family of 13W DC-DC converters with high power density, high efficiency, and high reliability. It provides 13W output in a 0.75” x 1.20” footprint. The wide input range (2:1, 3:1) is ideal for battery or unregulated input applications.

Integral PCB transformer / inductor is used for all models in this series. This new design technique has greatly improved the magnetic coupling, reduced switching spike and provided performance consistency. It also streamlines the production process by completely eliminating the hand-wind magnetic assembly process from production lines.

CH series provides the most extensive protection to safeguard both the power converter and the load. It includes output over-voltage protection, over-current protection, hiccup mode indefinite short circuit protection and under-voltage lockout. Over-current inception point is set at about 115% of rated load. Hiccup mode cycles at 28mSec period with 3mSec on and 25mSec off.

CH series features low output noise, very tight line and load regulation, and high efficiency. There is no external capacitor requirement for normal operation. Output trim pin is standard for single and dual output.

TABLE OF CONTENTS :

1. Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause performance degradation, adversely effect longterm reliability, and cause permanent damage to the device.

Parameter	Conditions / Description	Min	Max	Units
Input Voltage				
Continuous	12	-0.3	22	Vdc
	24	-0.3	38	Vdc
	48	-0.3	78	Vdc
	30	-0.3	32	Vdc
	60	-0.3	62	Vdc
Transient (100mSec.)	12	-0.3	24	Vdc
	24	-0.3	40	Vdc
	48	-0.3	80	Vdc
	30	-0.3	34	Vdc
	60	-0.3	64	Vdc
Operating Temperature	All models, base plate temperature	-40	+105	°C
Storage Temperature	**Ambient**	-55	+125	°C
Isolation Voltage	Input to Output		+2500	Vdc

2. Input Specifications

Parameter	Conditions / Description	Min	Nom	Max	Units
Input Voltage					
Voltage Range (Continuous)	12	10	12	20	Vdc
	24	18	24	36	Vdc
	48	36	48	75	Vdc
	30	10	24	30	Vdc
	60	20	48	60	Vdc
Under-Voltage Lockout (UVLO)					
Turn-On Threshold (Ramping Up)	12		9.7		Vdc
	24		17.7		Vdc
	48		35		Vdc
	30		9.7		Vdc
	60		17.7		Vdc
Turn-Off Threshold (Ramping Down)	12		9.5		Vdc
	24		16		Vdc
	48		33		Vdc
	30		9.2		Vdc
	60		16		Vdc

3. Enable (On-Off Control)

Parameter	Conditions / Description	Min	Nom	Max	Units
Enable Pin					
Open Circuit Voltage			10		Vdc
Source/Sink Current				1	mA
Positive Logic	**Standard**				
On-Control	Logic High or Floating	2.5		10	Vdc
Off-Control		-0.5		1.8	Vdc
Negative Logic	**Not Available**				

* Enable pin can be left floating if not used.

4. Isolation Specifications

Parameter	Conditions / Description	Min	Nom	Max	Units
Isolation Voltage					
Input to Output		2250			Vdc
I/O to Case		1125			Vdc
Isolation Resistance	Input to Output	10			MΩ
Isolation Capacitance	Input to Output		3		nF

5. Output Specifications

Parameter	Conditions / Description	Min	Nom	Max	Units
Voltage Accuracy	Please see table				%
Output Current	Please see table				Adc
Output Trim			±10		%Vout
Over Voltage Protection				120	%Vdc
Line Regulation			±0.2		%Vout
Load Regulation			±0.5		%Vout
Transient Respoonse	50% ± 25% step load change		400		µSec.
Ripple & Noise	Please see table				mVp-p
Switching Frequency			200		KHz

6. Output Trim

Parameter	Conditions / Description	Min	Nom	Max	Units
Positive Logic	**Standard**				
Trim-Up	Trim Pin to (-)Output			10	%Vdc
Trim-Down	Trim Pin to (+)Output	5			%Vdc
Negative Logic	**Not Available**				

* Trim pin can be left floating if not used.

7. Environmental and Mechanical Specifications

Parameter	Conditions / Description	Min	Nom	Max	Units
Operating Temperature	PCB Temperature				
Standard		-25		+100	°C
Extended		-55		+100	°C
Storage Temperature		-55		+125	°C
Temperature Coefficient				±0.02	%/°C
Shock	Halfsine wave, 3 axes	50			g
Sinusoidal Vibration	GR-63-CORE, Section 5.4.2	1			g
Humidity	Relative Humidity, Non-Condensing			95	%R.H.
Weight					
Open Frame			0.3(8)		Oz(g)
Encapsulated			1.0(28)		Oz(g)
MTBF (calculated)	Bellcore TR-NWT-000332 method 1 - parts count	1			MHrs

8. Protections

Parameter	Conditions / Description	Min	Nom	Max	Units
Over-Load Protection					
Type	Current-Mode, Pulse by Pulse Current Limit				
Threshold	% Rated Load		120		%
Short-Circuit Protection					
Type	Hiccup Mode, Non-Latching, Auto-Recovery				
Threshold	Short-Circuit Resistance			65	mΩ
Over-Temperature Protection					
Type	Non-Latching, Auto-Recovery				
Threshold	PCB Temperature		TBD		°C
Hysteresis			TBD		°C
Over-Voltage Protection	**Not Available**				

CH Series, Single Output 13W

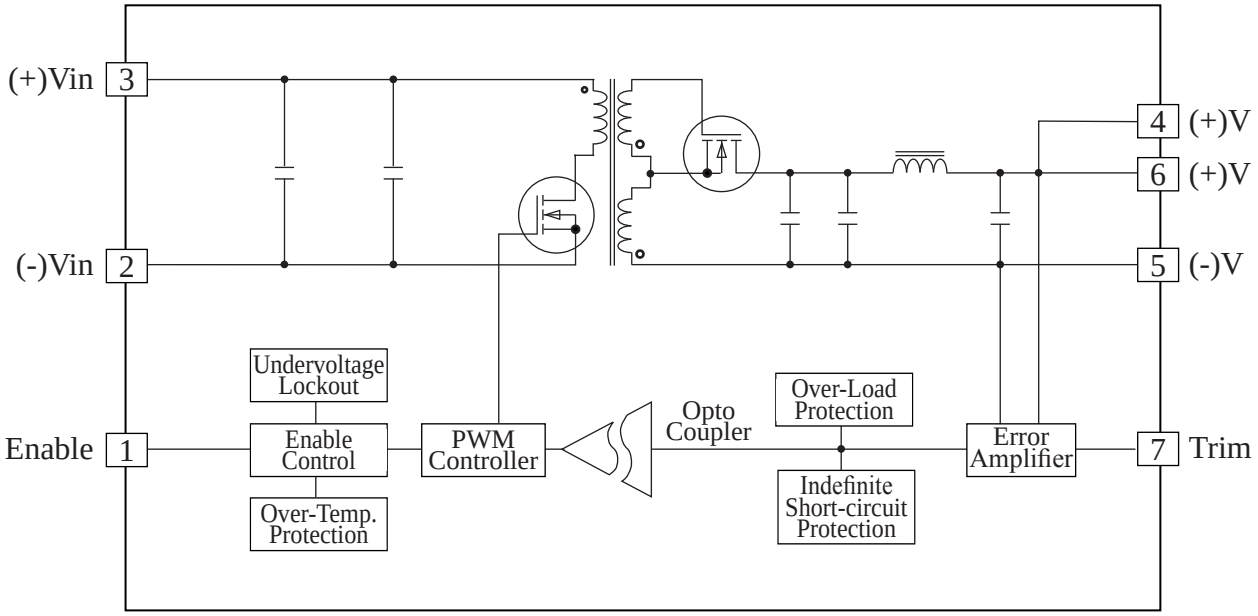
INPUT			OUTPUT										
Nominal (Range)	Under Voltage Lockout (typ.)		Max. Output Power	Voltage (V)			Current (A)		Ripple & Noise		Short Circuit Protection	Over Temp. Shutdown /Recover	EFF. (typ.)	MODEL NO.
	On	Off		Set Point	Min.*	Max.*	Min.	Max.	Peak-Peak	R.M.S.				
12 (10-20)	9.7	9.2	13W	**3.30**	3.20	3.40	0	4.0	75mV	15mV	Hiccup Mode Indefinite	TBD	80%	**CH13S12033**
				5.00	4.90	5.10	0	2.6	75mV	15mV			82%	**CH13S1205**
				7.50	7.40	7.60	0.18	1.8	80mV	20mV			81%	**CH13S12075**
				9.00	8.90	9.10	0.15	1.5	90mV	20mV			81%	**CH13S1209**
				12.0	11.88	12.12	0.10	1.0	100mV	25mV			81%	**CH13S1212**
				15.0	14.85	15.15	0.08	0.87	120mV	30mV			81%	**CH13S1215**
				24.0	23.76	24.24	0.05	0.54	200mV	40mV			81%	**CH13S1224**
				28.0	27.72	28.28	0.04	0.46	240mV	50mV			81%	**CH13S1228**
				32.0	31.70	32.30	0.04	0.40	280mV	60mV			81%	**CH13S1232**
				48.0	47.50	48.50	0.03	0.27	400mV	80mV			81%	**CH13S1248**
24 (18-36)	17.7	16.6	13W	**3.30**	3.20	3.40	0	4.0	75mV	15mV			82%	**CH13S24033**
				5.00	4.90	5.10	0	2.6	75mV	15mV			84%	**CH13S2405**
				7.50	7.40	7.60	0.18	1.8	80mV	20mV			83%	**CH13S24075**
				9.00	8.90	9.10	0.15	1.5	90mV	20mV			83%	**CH13S2409**
				12.0	11.88	12.12	0.10	1.0	100mV	25mV			83%	**CH13S2412**
				15.0	14.85	15.15	0.08	0.87	120mV	30mV			83%	**CH13S2415**
				24.0	23.76	24.24	0.05	0.54	200mV	40mV			83%	**CH13S2424**
				28.0	27.72	28.28	0.04	0.46	240mV	50mV			83%	**CH13S2428**
				32.0	31.70	32.30	0.03	0.40	280mV	60mV			83%	**CH13S2432**
				48.0	47.50	48.50	0.03	0.27	400mV	80mV			83%	**CH13S2448**
48 (36-75)	35	33	13W	**3.30**	3.20	3.40	0	4.0	75mV	15mV			82%	**CH13S48033**
				5.00	4.90	5.10	0	2.6	75mV	15mV			84%	**CH13S4805**
				7.50	7.40	7.60	0.18	1.8	80mV	20mV			83%	**CH13S48075**
				9.00	8.90	9.10	0.15	1.5	90mV	20mV			83%	**CH13S4809**
				12.0	11.88	12.12	0.10	1.0	100mV	25mV			83%	**CH13S4812**
				15.0	14.85	15.15	0.08	0.87	120mV	30mV			83%	**CH13S4815**
				24.0	23.76	24.24	0.05	0.54	200mV	40mV			83%	**CH13S4824**
				28.0	27.72	28.28	0.04	0.46	240mV	50mV			83%	**CH13S4828**
				32.0	31.70	32.30	0.04	0.40	280mV	60mV			83%	**CH13S4832**
				48.0	47.50	48.50	0.03	0.27	400mV	80mV			83%	**CH13S4848**
30 (10-30)	9.7	9.2	13W	**3.30**	3.20	3.40	0	4.0	75mV	15mV			80%	**CH13S30033**
				5.00	4.90	5.10	0	2.6	75mV	15mV			82%	**CH13S3005**
				7.50	7.40	7.60	0.18	1.8	80mV	20mV			81%	**CH13S30075**
				9.00	8.90	9.10	0.15	1.5	90mV	20mV			81%	**CH13S3009**
				12.0	11.88	12.12	0.10	1.0	100mV	25mV			81%	**CH13S3012**
				15.0	14.85	15.15	0.08	0.87	120mV	30mV			81%	**CH13S3015**
				24.0	23.76	24.24	0.05	0.54	200mV	40mV			81%	**CH13S3024**
				28.0	27.72	28.28	0.04	0.46	240mV	50mV			81%	**CH13S3028**
				32.0	31.70	32.30	0.04	0.40	280mV	60mV			81%	**CH13S3032**
				48.0	47.50	48.50	0.03	0.27	400mV	80mV			81%	**CH13S3048**
60 (20-60)	17.7	16.6	13W	**3.30**	3.20	3.40	0	4.0	75mV	15mV			80%	**CH13S60033**
				5.00	4.90	5.10	0	2.6	75mV	15mV			82%	**CH13S6005**
				7.50	7.40	7.60	0.18	1.8	80mV	20mV			81%	**CH13S60075**
				9.00	8.90	9.10	0.15	1.5	90mV	20mV			81%	**CH13S6009**
				12.0	11.88	12.12	0.10	1.0	100mV	25mV			81%	**CH13S6012**
				15.0	14.85	15.15	0.08	0.87	120mV	30mV			81%	**CH13S6015**
				24.0	23.76	24.24	0.05	0.54	200mV	40mV			81%	**CH13S6024**
				28.0	27.72	28.28	0.04	0.46	240mV	50mV			81%	**CH13S6028**
				32.0	31.70	32.30	0.04	0.40	280mV	60mV			81%	**CH13S6032**
				48.0	47.50	48.50	0.03	0.27	400mV	80mV			81%	**CH13S6048**

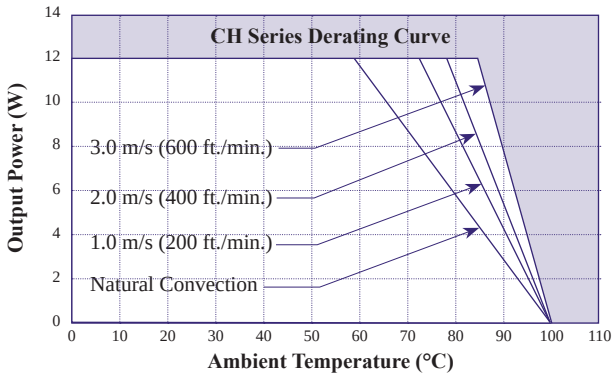
*** Combined Line, Load & Cross Regulation.**

Product Numbering System & Selection Guide

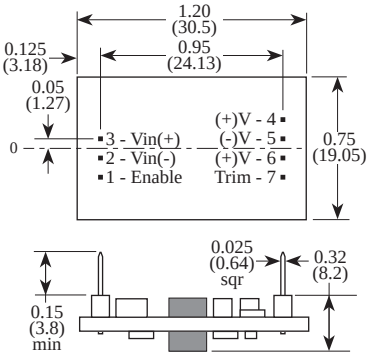
CH	13	S	24	033	C
Series No.	Output Power	No Output	Input Voltage	Output Voltage	Options
CH	**13** : 13W	**S** : Single	**12** : 10-20V	**018** : 1.8V	**C** : -55°C Operation
			24 : 18-36V	**025** : 2.5V	**MC** : Metal Case
			48 : 36-75V	. . . . .	
			30 : 10-30V	**32** : 32V	
			60 : 20-60V	**48** : 48V	

BLOCK DIAGRAM





Open Frame (Standard)



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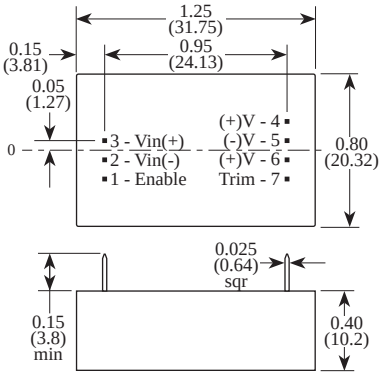
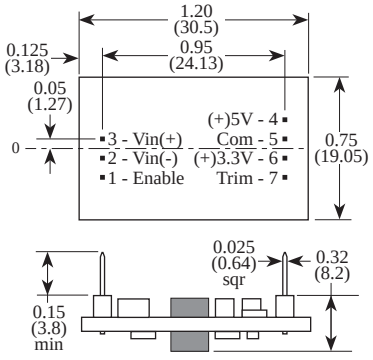


CH Series, Dual Output 13W

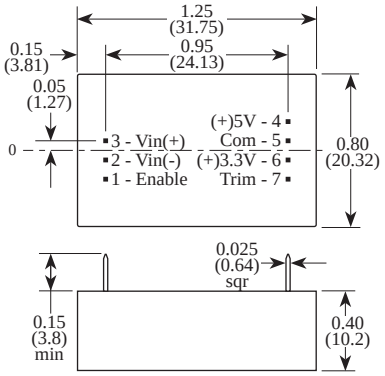
INPUT			OUTPUT													
Nominal (Range)	Under Voltage Lockout (typ.)		Max. Output Power	Voltage (V)					Current (A)			Ripple & Noise		Short Circuit Protection	EFF. (typ.)	MODEL NO.
	On	Off		#		Set Point	Min.*	Max.*	#	Min.	Max.	Peak-Peak	R.M.S.			
12 (10 - 20)	9.5	9.2	13W	**+5.0 +3.3**	**+V1**	+5.00	+4.85	+5.15	+I1	0.2	2.6	75mV	15mV	Hiccup Mode Indefinite	82%	**CH13D1205-033**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			
24 (18 - 36)	17	16	13W	**+5.0 +3.3**	**+V1**	+5.00	+4.85	+5.15	+I1	0.2	2.6	75mV	15mV		84%	**CH13D2405-033**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			
48 (36 - 75)	34	33	13W	**+5.0 +3.3**	**+V1**	+5.00	+4.85	+5.15	+I1	0.2	2.6	75mV	15mV		85%	**CH13D4805-033**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			
30 (10 - 30)	9.5	9.2	13W	**+5.0 +3.3**	**+V1**	+5.00	+4.85	+5.15	+I1	0.2	2.6	75mV	15mV		80%	**CH13D3005-033**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			
60 (18 - 60)	17	16	13W	**+5.0 +3.3**	**+V1**	+5.00	+4.85	+5.15	+I1	0.2	2.6	75mV	15mV		83%	**CH13D6005-033**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			

* Combined Line & Load Regulation.

Open Frame (Standard)



Encapsulated (Suffix - MC)

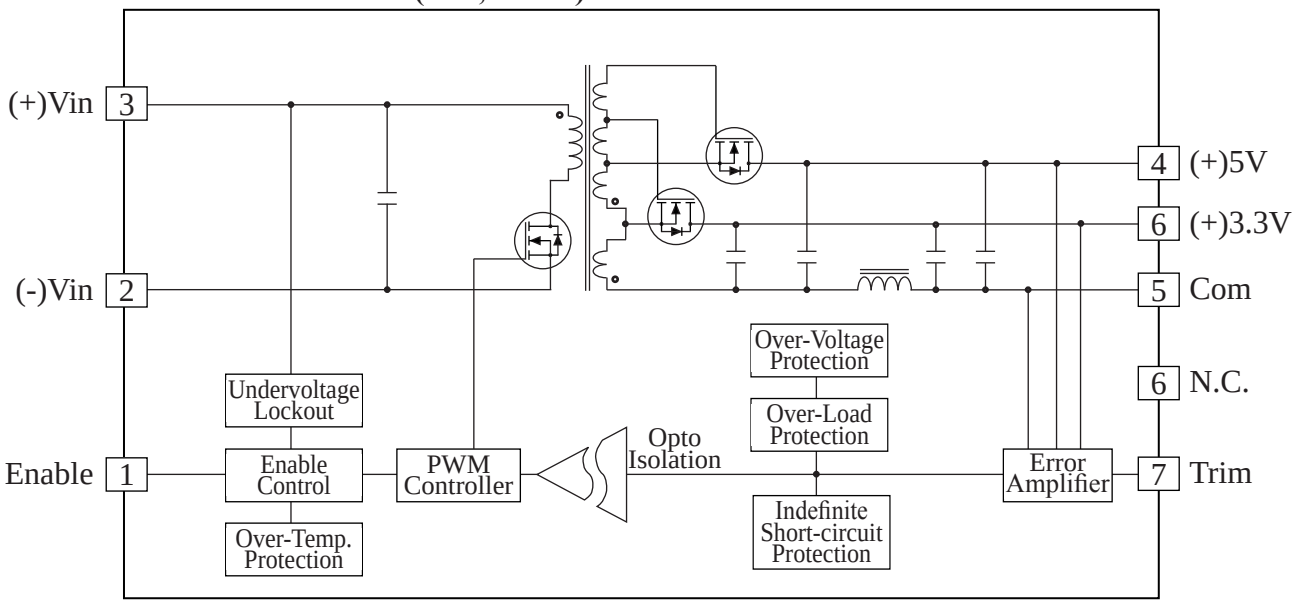


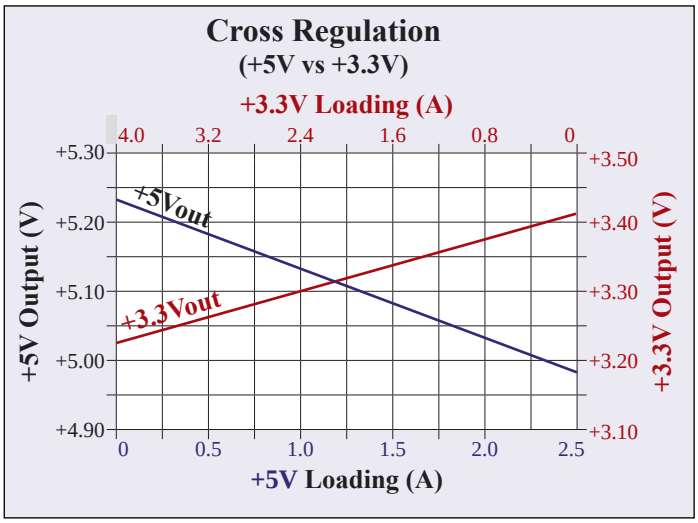
Product Numbering System & Selection Guide

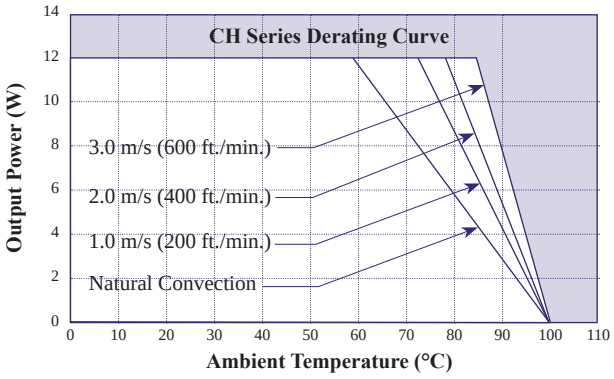
CH	13	D	24	05	-	33	MC

Series No.	Output Power		No Output		Input Voltage		+V1 Output		+V2 Output		Options	
CH	**13 :**	13W	**D :**	Dual	**12 :**	10-20V	**05 :**	5.0V	**033 :**	3.3V	**C :**	-55°C Operation
					24 :	18-36V					**MC :**	Metal Case
					48 :	36-75V						
					30 :	10-30V						
					60 :	20-60V						

BLOCK DIAGRAM (+5V, +3.3V)





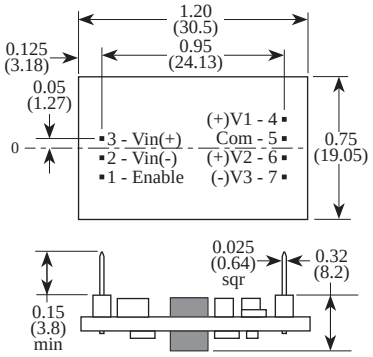


Derating Curve

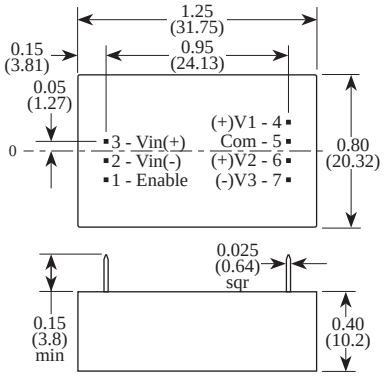
INPUT			OUTPUT														
Nominal (Range)	Under Voltage Lockout (typ.)		Max. Output Power	Voltage (V)					Current (A)			Ripple & Noise		Short Circuit Protection	EFF. (typ.)	MODEL NO.
	On	Off		#		Set Point	Min.*	Max.*	#	Min.	Max.	Peak-Peak	R.M.S.			
12 (10 - 20)	9.7	9.2	13W	**+5.0 +3.30 +13**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV	Hiccup Mode Indefinite	82%	**CH13T1205033-13**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.0	75mV	15mV			
					+V3	+13.2	+12.5	+14.5	+I3	0.05	0.8	150mV	40mV			
			13W	**+5.0 ±15**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV		82%	**CH13T1205-15**
					+V2	+15.0	+14.0	+16.0	+I2	0.05	0.5	150mV	50mV			
					-V3	-15.0	-14.0	-16.0	+I3	0.05	0.5	150mV	50mV			
24 (18 - 36)	17	16	13W	**+5.0 +3.30 +13**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	15mV		84%	**CH13T240503-13**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.8	75mV	15mV			
					+V3	+13.2	+12.5	+14.5	+I3	0.05	0.8	150mV	40mV			
			13W	**+5.0 ±15**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	20mV		85%	**CH13T2405-15**
					+V2	+15.0	+14.0	+16.0	+I2	0.05	0.5	150mV	50mV			
					-V3	-15.0	-14.0	-16.0	+I3	0.05	0.5	150mV	50mV			
48 (36 - 75)	34	33	13W	**+5.0 +3.30 +13**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	15mV		84%	**CH13T480503-13**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.8	75mV	15mV			
					+V3	+13.2	+12.5	+14.5	+I3	0.05	0.8	150mV	40mV			
			13W	**+5.0 ±15**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	20mV		85%	**CH13T4805-15**
					+V2	+15.0	+14.0	+16.0	+I2	0.05	0.5	150mV	50mV			
					-V3	-15.0	-14.0	-16.0	+I3	0.05	0.5	150mV	50mV			
30 (10 - 30)	9.7	9.2	13W	**+5.0 +3.30 +13**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	15mV		81%	**CH13T300503-13**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.8	75mV	15mV			
					+V3	+13.2	+12.5	+14.5	+I3	0.05	0.8	150mV	40mV			
			13W	**+5.0 ±15**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	20mV		82%	**CH13T3005-15**
					+V2	+15.0	+14.0	+16.0	+I2	0.05	0.5	150mV	50mV			
					-V3	-15.0	-14.0	-16.0	+I3	0.05	0.5	150mV	50mV			
60 (18 - 60)	17	16	13W	**+5.0 +3.30 +13**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	15mV		83%	**CH13T600503-13**
					+V2	+3.30	+3.20	+3.40	+I2	0.4	4.8	75mV	15mV			
					+V3	+13.2	+12.5	+14.5	+I3	0.05	0.8	150mV	40mV			
			13W	**+5.0 ±15**	**+V1**	+5.00	+4.90	+5.10	+I1	0.2	2.6	75mV	20mV		84%	**CH13T6005-15**
					+V2	+15.0	+14.0	+16.0	+I2	0.05	0.5	150mV	50mV			
					-V3	-15.0	-14.0	-16.0	+I3	0.05	0.5	150mV	50mV			

* Combined Line and Load Regulation.

Open Frame (Standard)



Encapsulated (Suffix - MC)

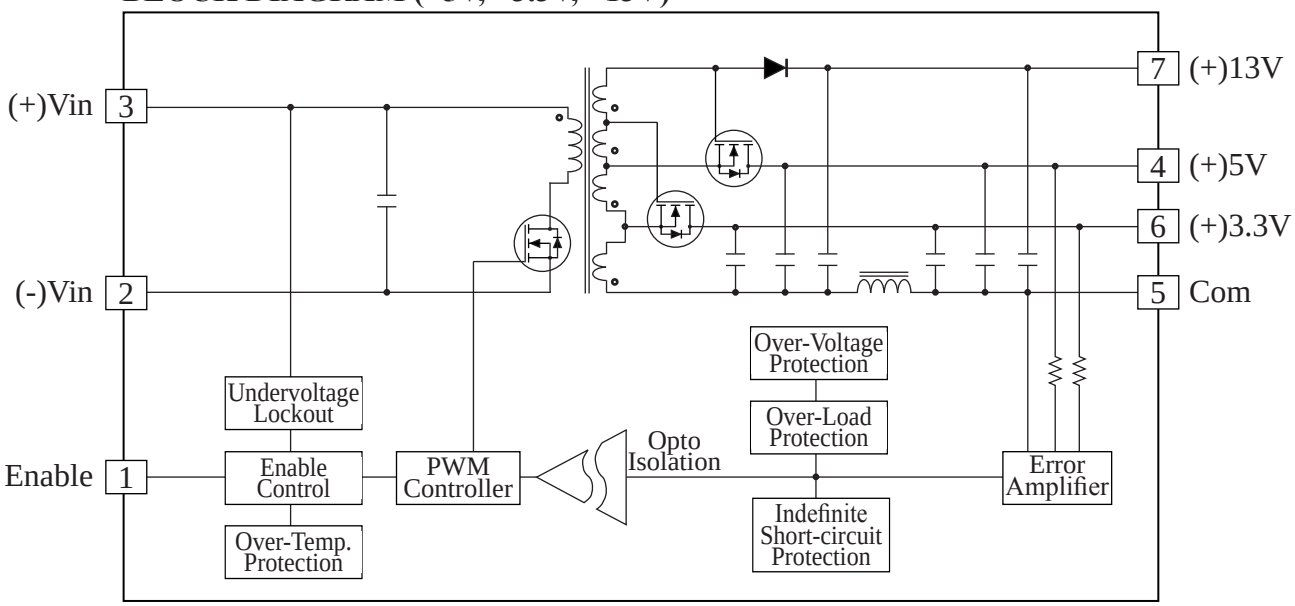


Product Numbering System & Selection Guide

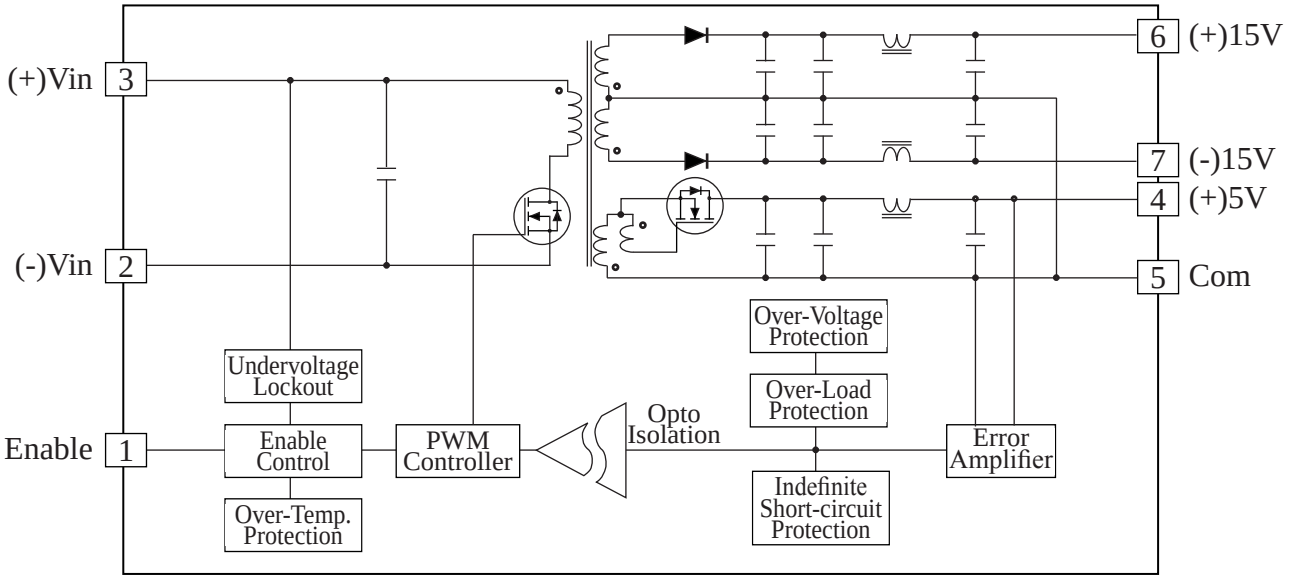
CH	13	T	24	05	-	033	-	13	MC

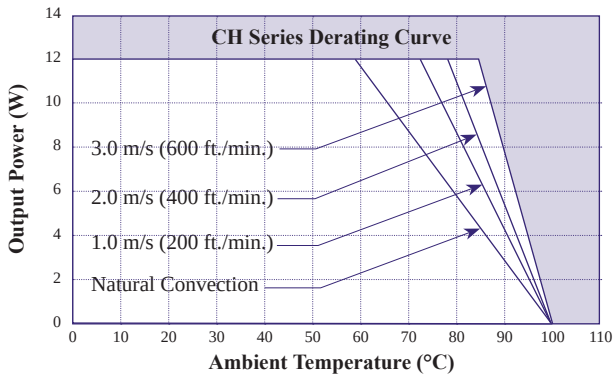
Series No.	Output Power		No Output		Input Voltage		V1 Output		V2 Output		V3 Output		Options	
CH	**13 :**	13W	**T :**	Triple	**12 :**	10-20V	**05 :**	5.0V	033:	3.3V	**13 :**	13V	**C :**	Extended Temp.
					24 :	18-36V							**MC :**	Encapsulated
					48 :	36-75V	**05 :**	5.0V	13:	±13V				
					30 :	10-30V								
					60 :	20-60V								

BLOCK DIAGRAM (+5V, +3.3V, +13V)

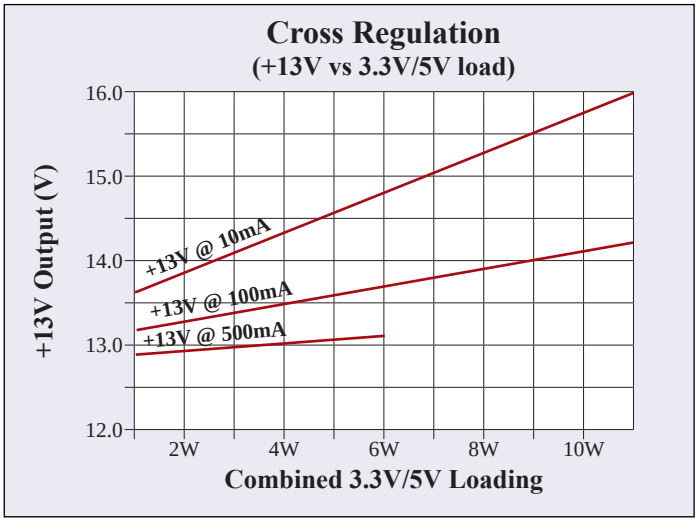


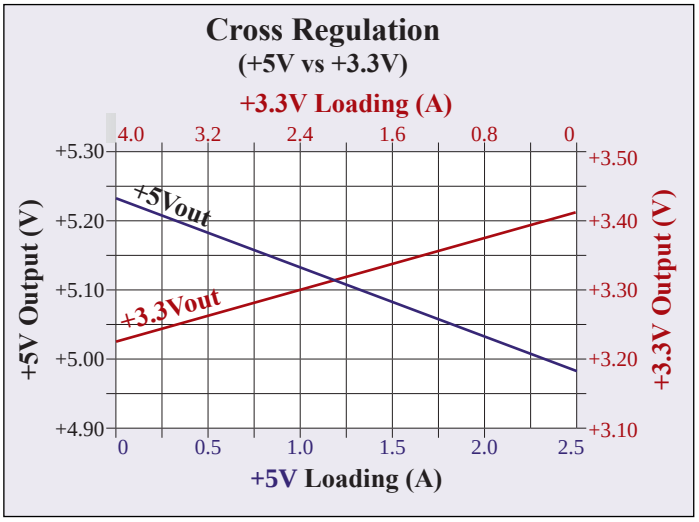
BLOCK DIAGRAM (+5V, ±15V)

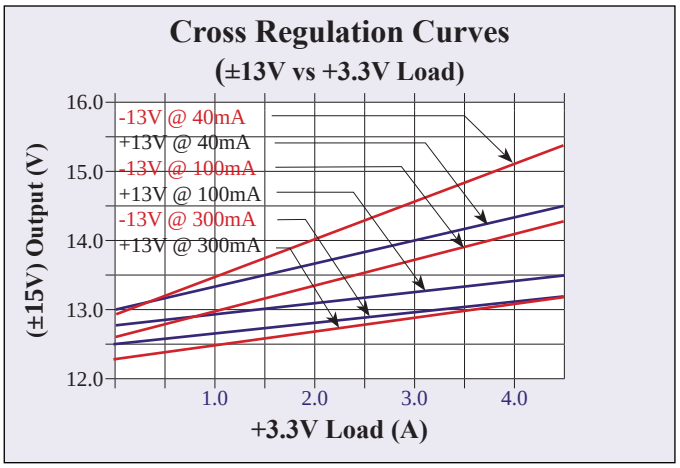


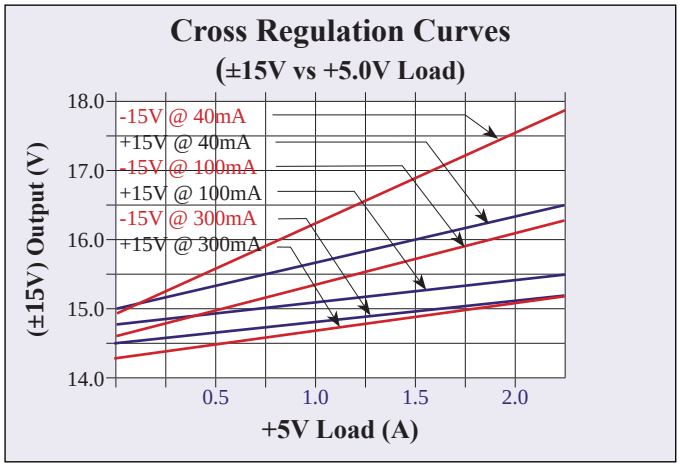


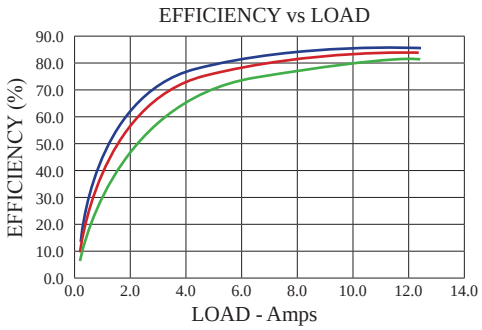
Derating Curve











CH13T2405-033-13