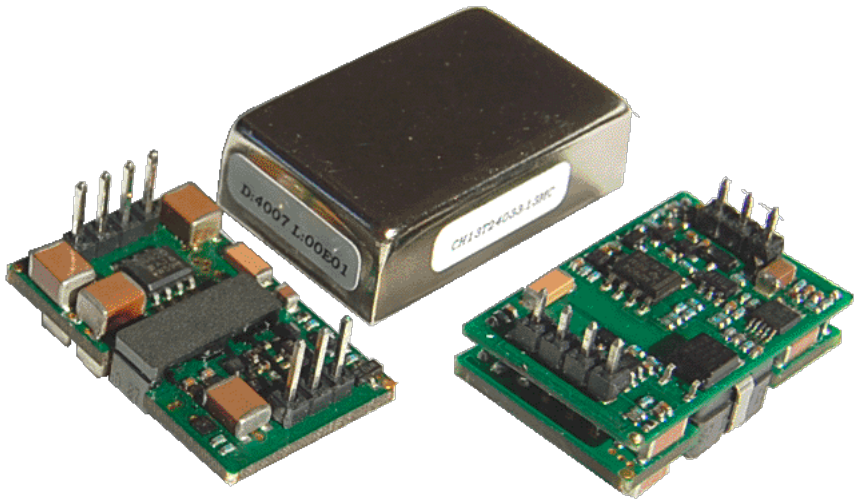
CH Series, 10 - 13W

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:
10-13 W



FEATURES

General:
- Small footprint : 0.75” x 1.20”
- Output power : 6-13 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 90%
- 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 10 to 13W DC-DC converters with high power density, high efficiency, and high reliability. It provides 10-13W 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.

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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
	24W	-0.3	38	Vdc
	48W	-0.3	78	Vdc
Transient (100mSec.)	12	-0.3	24	Vdc
	24	-0.3	40	Vdc
	48	-0.3	80	Vdc
	24W	-0.3	40	Vdc
	48W	-0.3	80	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	9	12	18	Vdc
	24	18	24	36	Vdc
	48	36	48	75	Vdc
	24W	10	24	36	Vdc
	48W	20	48	75	Vdc
Under-Voltage Lockout (UVLO)					
Turn-On Threshold (Ramping Up)	12		8.6		Vdc
	24		17.7		Vdc
	48		35		Vdc
	24W		9.7		Vdc
	48W		17.7		Vdc
Turn-Off Threshold (Ramping Down)	12		8.3		Vdc
	24		16		Vdc
	48		33		Vdc
	24W		9.5		Vdc
	48W		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.

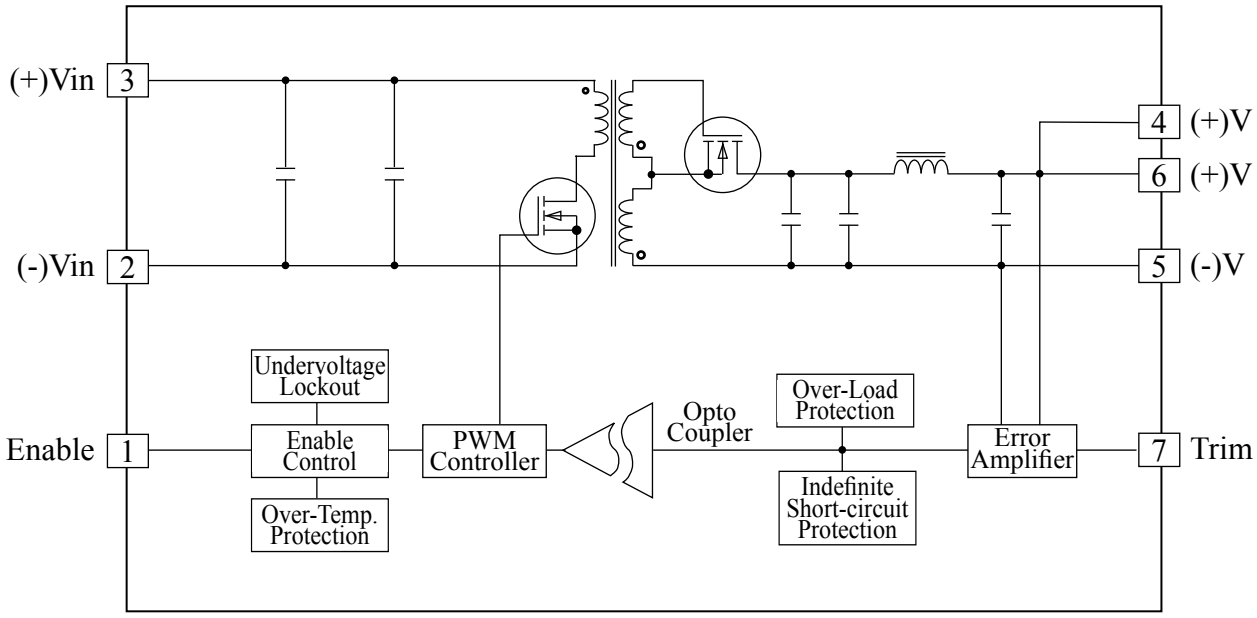
7. Environmental and Mechanical Specifications

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

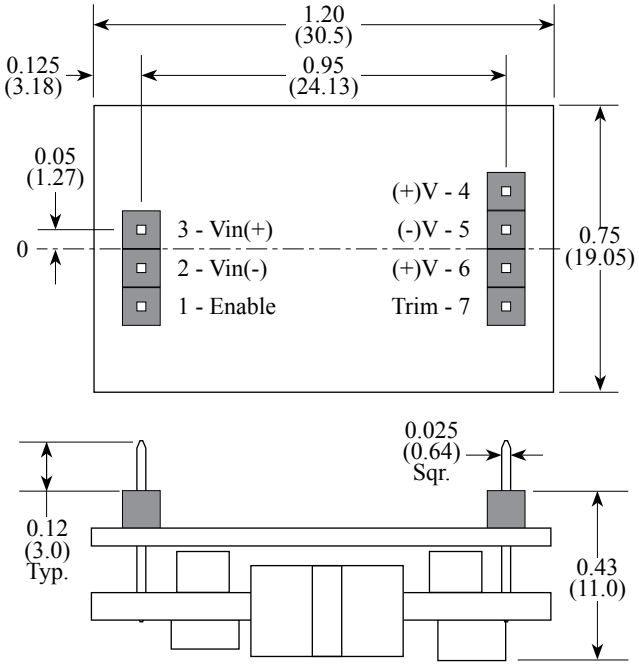
8. Protections

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**				

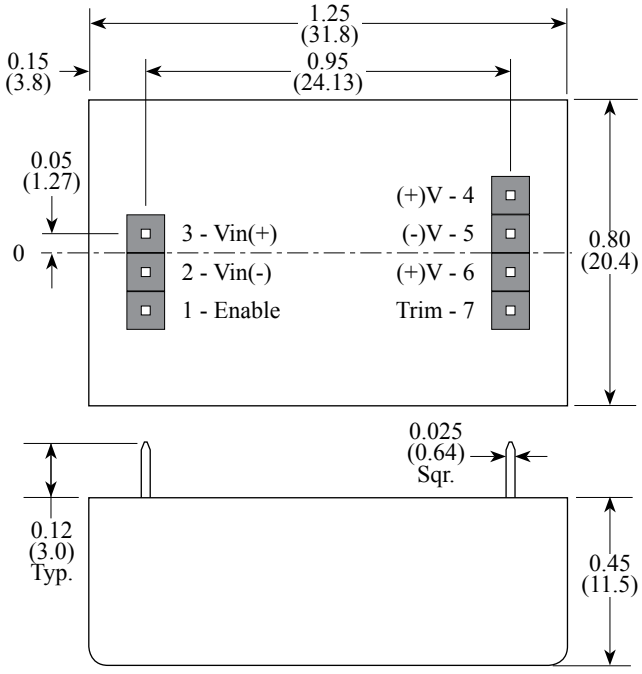
BLOCK DIAGRAM



Open Frame (Standard)



Encapsulated (Optional, suffix MC)



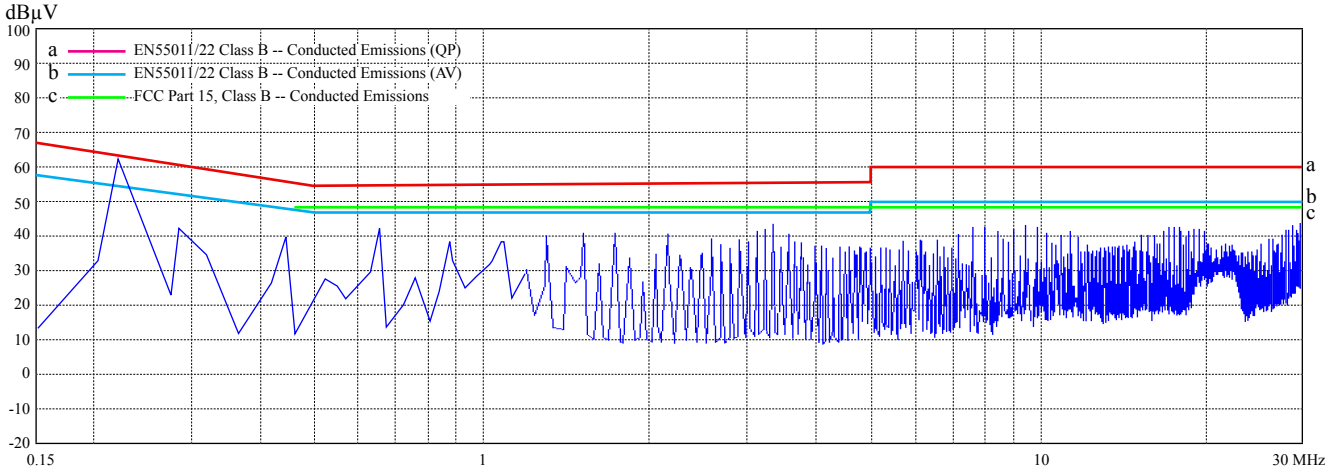
INPUT			OUTPUT										
Nominal (Range)	Under Voltage Lockout (typ.)		Power max/peak (W)	Voltage (V)			Current (mA)		Ripple & Noise		Short Circuit Protection	Over Temp. Shutdown /Recover	EFF. (typ.)	MODEL NO.
	On	Off		Set Point	Min.*	Max.*	Min.	Max.	Peak-Peak	R.M.S.				
12 (10-20)	8.6	8.3	10/13	**3.30**	3.20	3.40	0	4000	75mV	15mV	Hiccup Mode Indefinite	TBD	86%	**CH13S12033**
				5.00	4.90	5.10	0	2600	75mV	15mV			88%	**CH13S1205**
				7.50	7.40	7.60	80	1750	80mV	20mV			84%	**CH13S12075**
				12.0	11.88	12.12	50	1080	100mV	25mV			84%	**CH13S1212**
				24.0	23.76	24.24	25	1080	200mV	40mV			84%	**CH13S1224**
				48.0	47.50	48.50	12	270	400mV	80mV			84%	**CH13S1248**
24 (18-36)	17.7	16.6	10/13	**3.30**	3.20	3.40	0	4000	75mV	15mV			86%	**CH13S24033**
				5.00	4.90	5.10	0	2600	75mV	15mV			88%	**CH13S2405**
				7.50	7.40	7.60	80	1750	80mV	20mV			84%	**CH13S24075**
				12.0	11.88	12.12	50	1080	100mV	25mV			84%	**CH13S2412**
				24.0	23.76	24.24	25	1080	200mV	40mV			84%	**CH13S2424**
				48.0	47.50	48.50	12	270	400mV	80mV			84%	**CH13S2448**
48 (36-75)	35	33	10/13	**3.30**	3.20	3.40	0	4000	75mV	15mV			86%	**CH13S48033**
				5.00	4.90	5.10	0	2600	75mV	15mV			88%	**CH13S4805**
				7.50	7.40	7.60	80	1750	80mV	20mV			84%	**CH13S48075**
				12.0	11.88	12.12	50	1080	100mV	25mV			84%	**CH13S4812**
				24.0	23.76	24.24	25	1080	200mV	40mV			84%	**CH13S4824**
				48.0	47.50	48.50	12	270	400mV	80mV			84%	**CH13S4848**
24W (10-36)	9.7	9.2	10/13	**3.30**	3.20	3.40	0	4000	75mV	15mV			84%	**CH13S24W033**
				5.00	4.90	5.10	0	2600	75mV	15mV			86%	**CH13S24W05**
				7.50	7.40	7.60	80	1750	80mV	20mV			84%	**CH13S24W075**
				12.0	11.88	12.12	50	1080	100mV	25mV			84%	**CH13S24W12**
				24.0	23.76	24.24	25	1080	200mV	40mV			84%	**CH13S24W24**
48W (20-75)	17.7	16.6	10/13	**3.30**	3.20	3.40	0	4000	75mV	15mV			84%	**CH13S48W033**
				5.00	4.90	5.10	0	2600	75mV	15mV			86%	**CH13S48W05**
				7.50	7.40	7.60	80	1750	80mV	20mV			84%	**CH13S48W075**
				12.0	11.88	12.12	50	1080	100mV	25mV			84%	**CH13S48W12**
				24.0	23.76	24.24	25	1080	200mV	40mV			84%	**CH13S48W24**

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

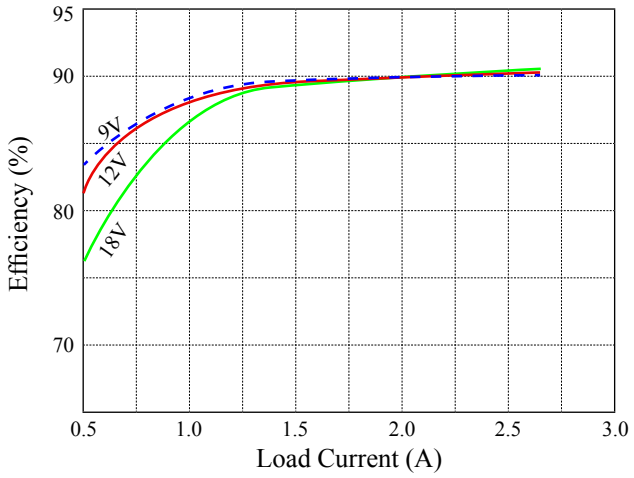
Product Numbering System & Selection Guide

CH	13	S	24	033	C
Series No.	Output Peak Power	No Output	Input Voltage	Output Voltage	Options
CH	**13** : 13W	**S** : Single	**12** : 9-18V	**05** : 5.0V	**C** : -55°C Operation
			24 : 18-36V	**075** : 7.5V	**MC** : Metal Case
			48 : 36-75V	. . . . .	
			24W : 9-36V	**24** : 24V	
			48W : 20-75V	**48** : 48V	

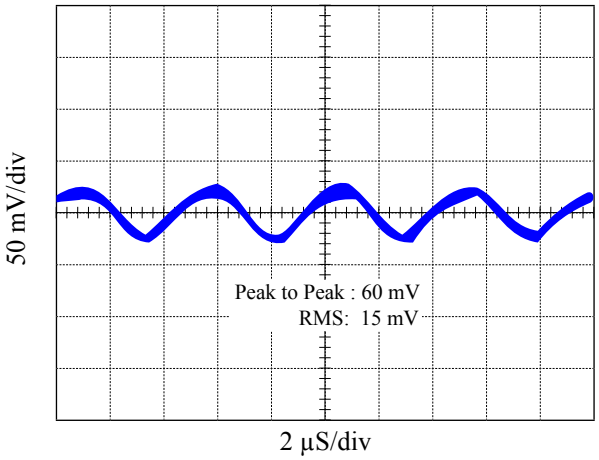
Conducted EMI Input terminal value (typ)



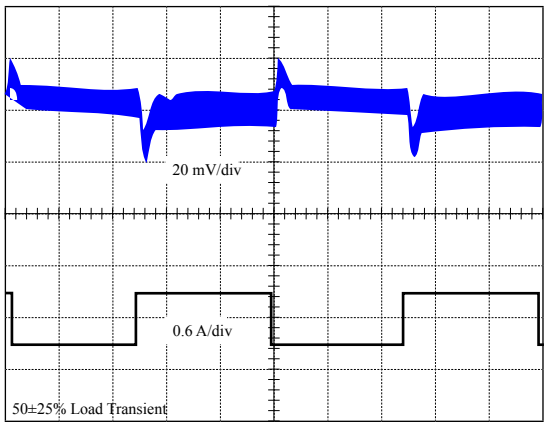
Efficiency (typ)



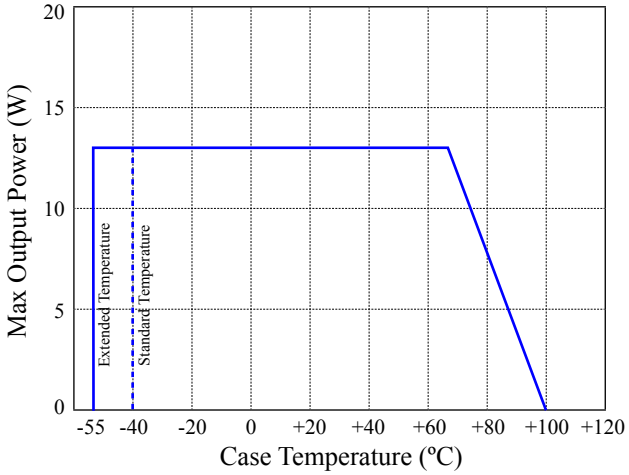
Output Ripple/Noise (typ)



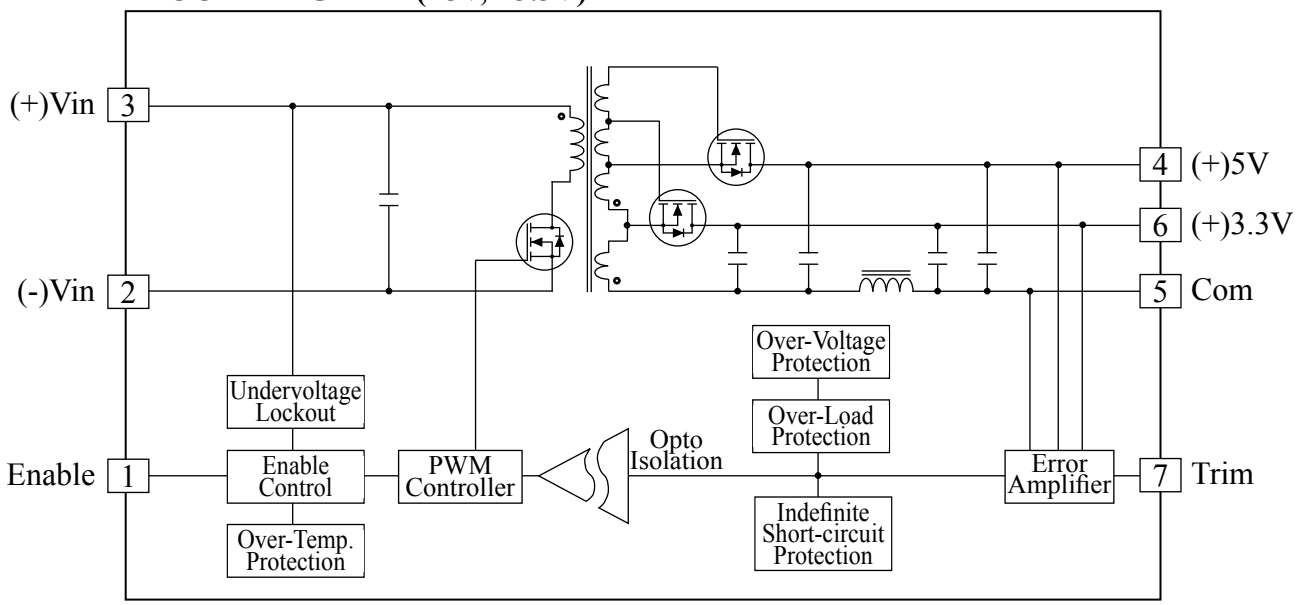
Load Transient Response (typ)



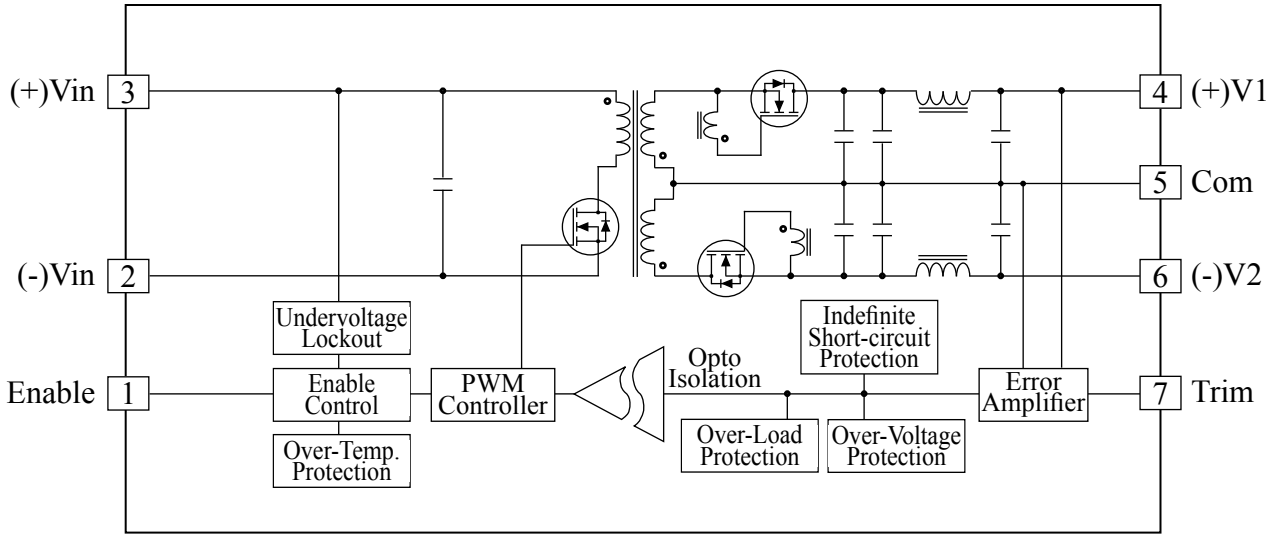
Power Derating



BLOCK DIAGRAM (+5V, +3.3V)

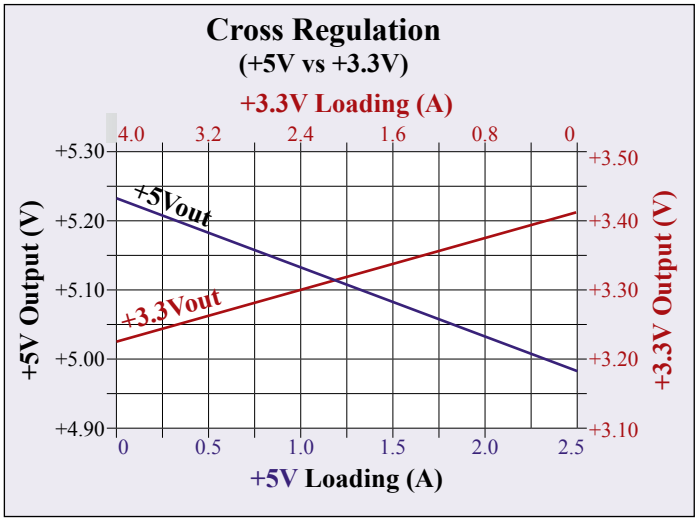


BLOCK DIAGRAM (+V1, -V2)



INPUT			OUTPUT												EFF. (typ.)	MODEL NO.
Nominal (Range)	Under Voltage Lockout (typ.)		Power max/peak (W)	Voltage (V)					Current (mA)			Ripple & Noise		Short Circuit Protection		
	On	Off		#		Set Point	Min.*	Max.*	#	Min.	Max.	Peak-Peak	R.M.S.			
12 (10 - 20)	9.5	9.2	10/13	+5.0 +3.3	+V1	+5.00	+4.85	+5.15	+I1	100	2000	75mV	15mV	Hiccup Mode Indefinite	82%	CH13D1205-033
					+V2	+3.30	+3.20	+3.40	+I2	150	3000	75mV	15mV			
			10/13	±12	+V1	+12.0	+11.88	+12.12	+I1	40	800	100mV	25mV		82%	CH13D1212
					-V2	-12.0	-11.76	-12.24	-I2	40	800	100mV	25mV			
			10/13	±15	+V1	+15.0	+14.85	+15.15	+I1	30	650	120mV	30mV		82%	CH13D1215
					-V2	-15.0	-14.70	+15.30	-I2	30	650	120mV	30mV			
24 (18 - 36)	17	16	13/13	+5.0 +3.3	+V1	+5.00	+4.85	+5.15	+I1	100	2000	75mV	15mV		84%	CH13D2405-033
					+V2	+3.30	+3.20	+3.40	+I2	150	3000	75mV	15mV			
			13/13	±12	+V1	+12.0	+11.88	+12.12	+I1	40	800	100mV	25mV		84%	CH13D2412
					-V2	-12.0	-11.76	-12.24	-I2	40	800	100mV	25mV			
			13/13	±15	+V1	+15.0	+14.85	+15.15	+I1	30	650	120mV	30mV		84%	CH13D2415
					-V2	-15.0	-14.70	+15.30	-I2	30	650	120mV	30mV			
48 (36 - 75)	34	33	13/13	+5.0 +3.3	+V1	+5.00	+4.85	+5.15	+I1	100	2000	75mV	15mV		84%	CH13D4805-033
					+V2	+3.30	+3.20	+3.40	+I2	150	3000	75mV	15mV			
			13/13	±12	+V1	+12.0	+11.88	+12.12	+I1	40	800	100mV	25mV		84%	CH13D4812
					-V2	-12.0	-11.76	-12.24	-I2	40	800	100mV	25mV			
			13/13	±15	+V1	+15.0	+14.85	+15.15	+I1	30	650	120mV	30mV		84%	CH13D4815
					-V2	-15.0	-14.70	+15.30	-I2	30	650	120mV	30mV			
24W (10 - 36)	9.5	9.2	10/13	+5.0 +3.3	+V1	+5.00	+4.85	+5.15	+I1	100	2000	75mV	15mV		82%	CH13D24W05-033
					+V2	+3.30	+3.20	+3.40	+I2	150	3000	75mV	15mV			
			10/13	±12	+V1	+12.0	+11.88	+12.12	+I1	40	800	100mV	25mV		82%	CH13D24W12
					-V2	-12.0	-11.76	-12.24	-I2	40	800	100mV	25mV			
			10/13	±15	+V1	+15.0	+14.85	+15.15	+I1	30	650	120mV	30mV		82%	CH13D24W15
					-V2	-15.0	-14.70	+15.30	-I2	30	650	120mV	30mV			
48W (20 - 75)	17	16	10/13	+5.0 +3.3	+V1	+5.00	+4.85	+5.15	+I1	100	2000	75mV	15mV		82%	CH13D48W05-033
					+V2	+3.30	+3.20	+3.40	+I2	150	3000	75mV	15mV			
			10/13	±12	+V1	+12.0	+11.88	+12.12	+I1	40	800	100mV	25mV		82%	CH13D48W12
					-V2	-12.0	-11.76	-12.24	-I2	40	800	100mV	25mV			
			10/13	±15	+V1	+15.0	+14.85	+15.15	+I1	30	650	120mV	30mV		82%	CH13D48W15
					-V2	-15.0	-14.70	+15.30	-I2	30	650	120mV	30mV			

* Combined Line & Load Regulation.

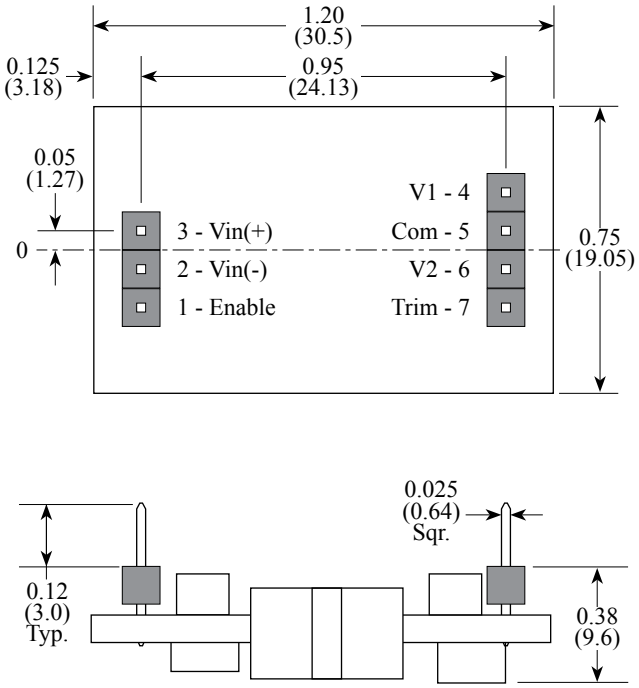


Product Numbering System & Selection Guide

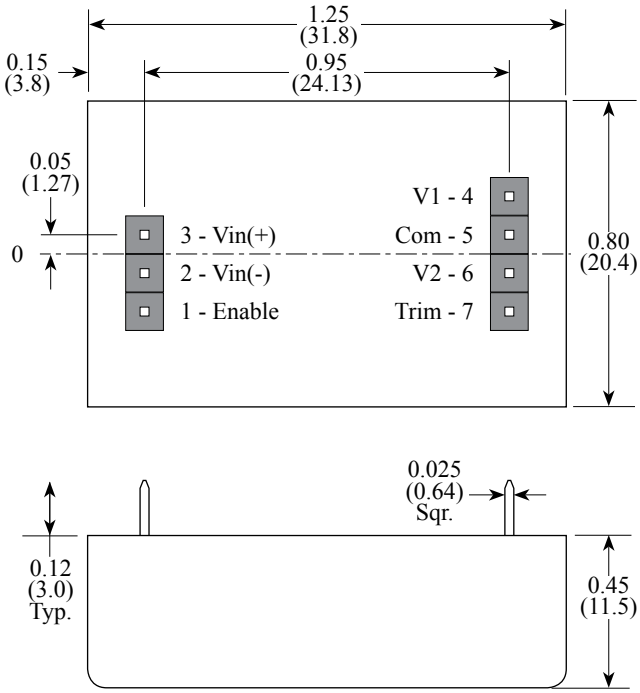
CH	13	D	24	05	-	33	MC

Series No.	Output Peak 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						
					24W :	10-36V						
					48W:	20-75V						

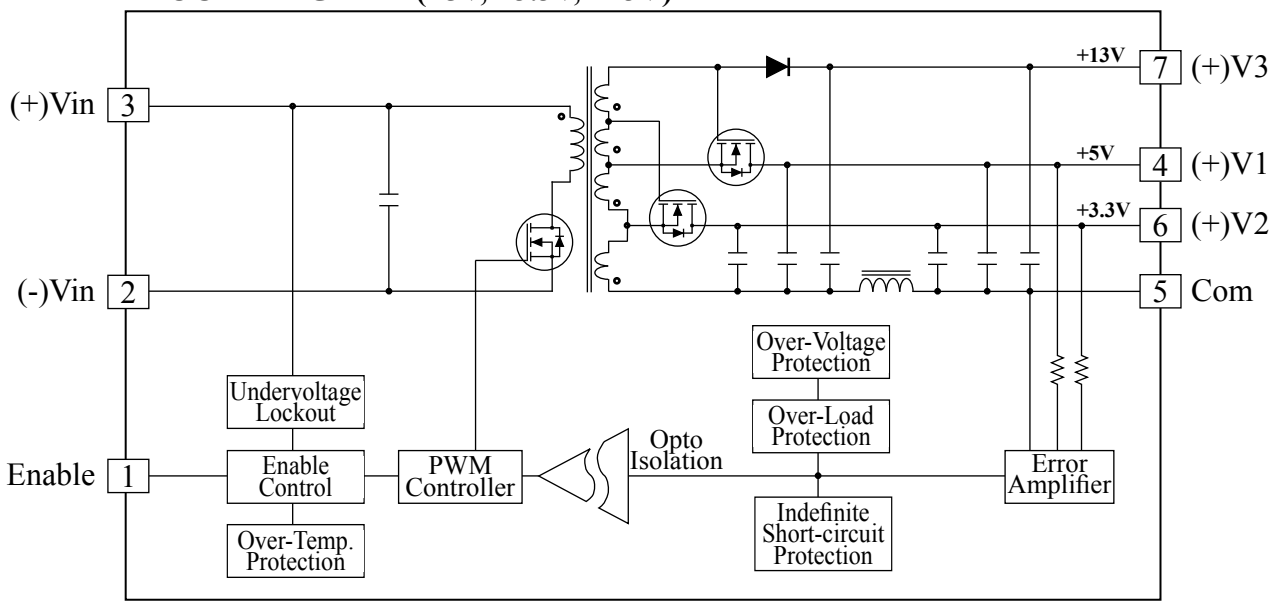
Open Frame (Standard)



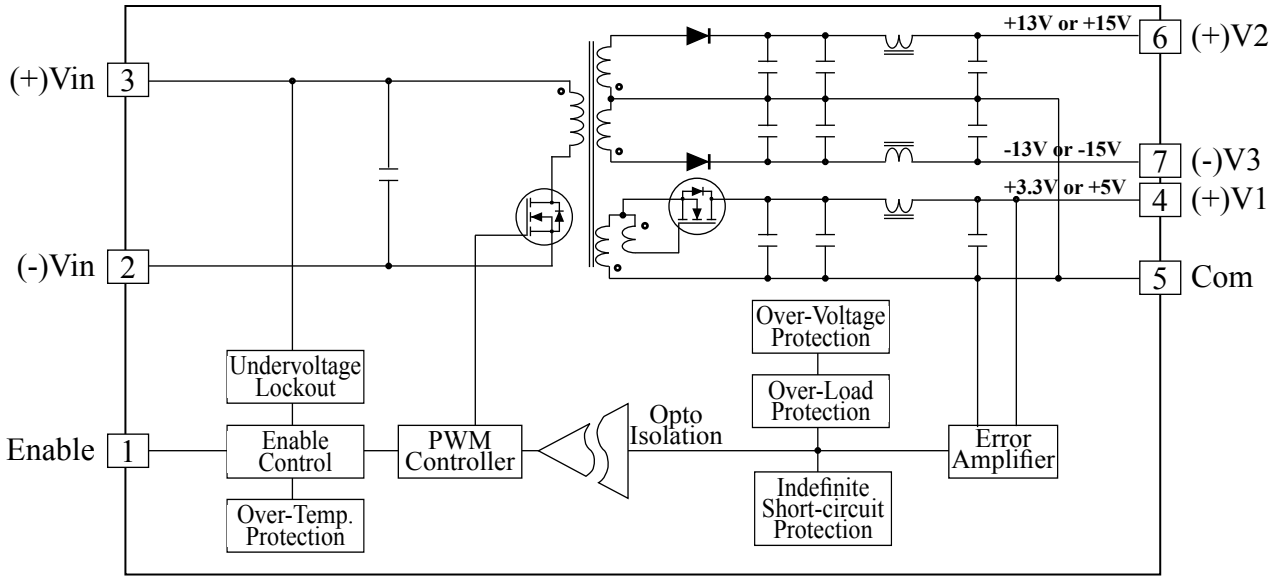
Encapsulated (Optional, suffix MC)



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



BLOCK DIAGRAM (+3.3V, ±13V or +5V, ±15V)



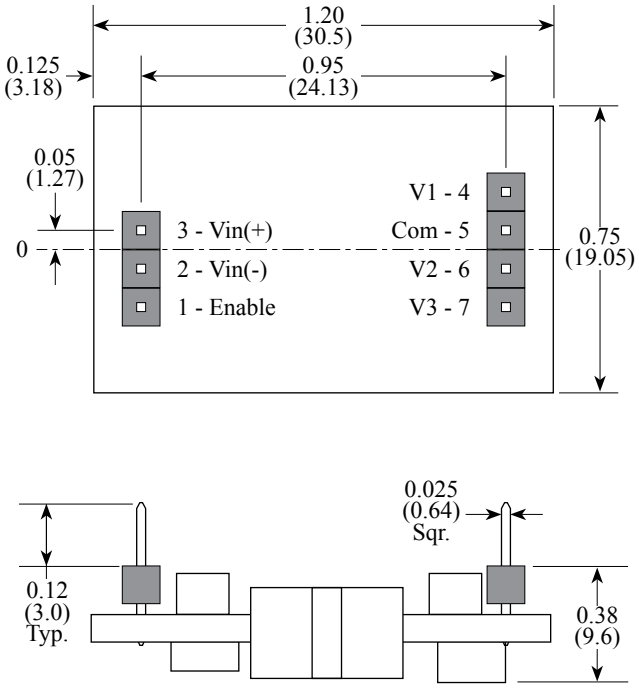
INPUT			OUTPUT													EFF. (typ.)	MODEL NO.
Nominal (Range)	Under Voltage Lockout (typ.)		Power max/peak (W)	Voltage (V)					Current (A)			Ripple & Noise		Short Circuit Protection			
	On	Off		#		Set Point	Min.*	Max.*	#	Min.	Max.	Peak-Peak	R.M.S.				
12 (10 - 20)	9.7	9.2	10/13	+5.0 +3.3 +13	+V1	+5.00	+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				
			10/13	+3.3 ±13	+V1	+3.30	+3.20	+3.40	+I1	0.2	3.0	75mV	15mV			82%	CH13T12033-13
					+V2	+13.0	+12.0	+14.5	+I2	0.05	0.5	150mV	50mV				
					-V3	-13.0	-12.0	-14.5	-I3	0.05	0.5	150mV	50mV				
			10/13	+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	13/13	+5.0 +3.3 +13	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			84%	CH13T2405033-13
					+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				
			13/13	+3.3 ±13	+V1	+3.30	+3.20	+3.40	+I1	0.2	3.0	75mV	15mV			84%	CH13T24033-13
					+V2	+13.0	+12.0	+14.5	+I2	0.05	0.5	150mV	50mV				
					-V3	-13.0	-12.0	-14.5	-I3	0.05	0.5	150mV	50mV				
			13/13	+5.0 ±15	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			84%	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	13/13	+5.0 +3.3 +13	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			84%	CH13T4805033-13
					+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				
			13/13	+3.3 ±13	+V1	+3.30	+3.20	+3.40	+I1	0.2	3.0	75mV	15mV			84%	CH13T48033-13
					+V2	+13.0	+12.0	+14.5	+I2	0.05	0.5	150mV	50mV				
					-V3	-13.0	-12.0	-14.5	-I3	0.05	0.5	150mV	50mV				
			13/13	+5.0 ±15	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			84%	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				
24W (10 - 36)	9.7	9.2	10/13	+5.0 +3.3 +13	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			82%	CH13T24W05033-13
					+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				
			10/13	+3.3 ±13	+V1	+3.30	+3.20	+3.40	+I1	0.2	3.0	75mV	15mV			82%	CH13T24W033-13
					+V2	+13.0	+12.0	+14.5	+I2	0.05	0.5	150mV	50mV				
					-V3	-13.0	-12.0	-14.5	-I3	0.05	0.5	150mV	50mV				
			10/13	+5.0 ±15	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			82%	CH13T24W05-15
					+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				
48W (20 - 75)	17	16	10/13	+5.0 +3.3 +13	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			82%	CH13T48W05033-13
					+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				
			10/13	+3.3 ±13	+V1	+3.30	+3.20	+3.40	+I1	0.2	3.0	75mV	15mV			82%	CH13T48W033-13
					+V2	+13.0	+12.0	+14.5	+I2	0.05	0.5	150mV	50mV				
					-V3	-13.0	-12.0	-14.5	-I3	0.05	0.5	150mV	50mV				
			10/13	+5.0 ±15	+V1	+5.00	+4.90	+5.10	+I1	0.2	2.0	75mV	15mV			82%	CH13T48W05-15
					+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.

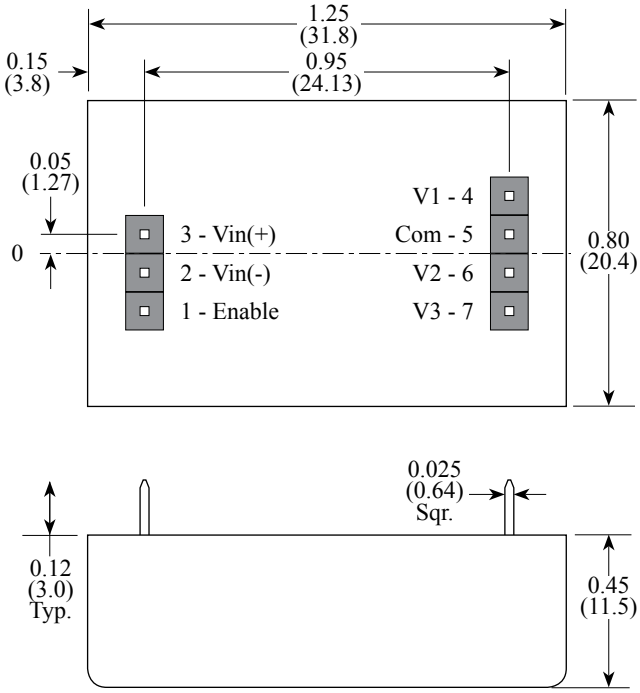
Product Numbering System & Selection Guide

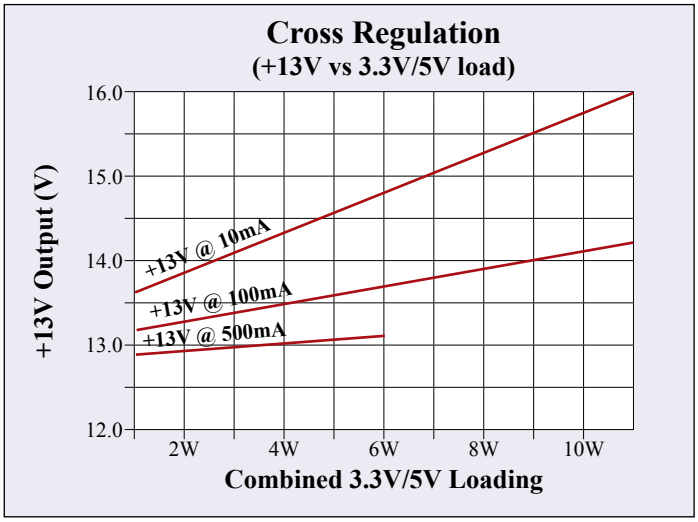
CH	13	T	24	05	-	033	-	13	MC
Series No.	Output Peak Power	No Output	Input Voltage	V1 Output		V2 Output		V3 Output	Options
CH	**13** : 13W	**T** : Triple	**12** : 10-20V	**05** : 5.0V		033: 3.3V		**13** : 13V	**C** : Extended Temp.
			24 : 18-36V						**MC** : Encapsulated
			48 : 36-75V	**05** : 5.0V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

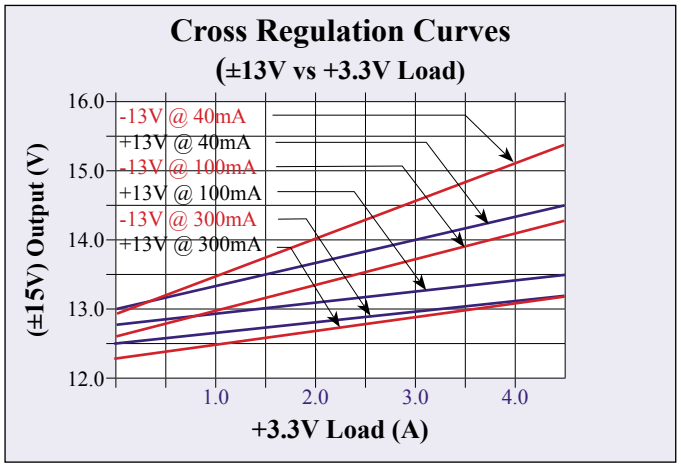
Open Frame (Standard)

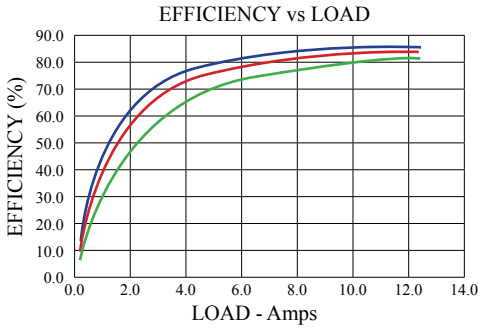


Encapsulated (Optional, suffix MC)









CH13T2405-033-13