

# VKP60xT

## 60 Watt Triple Output Half Brick DC/DC Converter



- 18 - 40 & 33 - 75V Input Range
- Each Channel Independently Current Limited
- High Efficiency: 87% Typical
- Excellent Cross Regulation
- 1500V<sub>DC</sub> Isolation Between Input and Output
- 500 V<sub>DC</sub> Channel to Channel Isolation
- Fixed Frequency Operation
- Operation to 100°C Baseplate Temperature
- 50µS Transient Recovery, 0-90% Load Step
- Primary & Secondary Remote On/Off
- Adjustable Output Voltage
- External Synchronization
- VKP60xT Series Approved to UL/CUL 1950, EN60950

The VKP60LT and VKP60MT Series are members of the VK high density DC/DC converter family. They are multiple output DC/DC converters offered in both a 18-40 and 33-75 input voltage range. Their versatile architecture featuring fully isolated channels enables the system designer to utilize the converter in either a single, dual or triple output scheme without excessive minimum load requirements or cross

regulation degradation.

The VKP60xT's architecture results in an economical and practical solution for use in distributed power schemes for today's demanding telecommunication and electronic data processing applications requiring ground separation between noise sensitive digital logic and bipolar analog components. The VKP60xT's proprietary control circuitry responds to 50-100% load

steps in 35µSeconds to within 1% of nominal Vout. The peak deviation will not exceed 7% of Vout for pulsed load slew rates in excess of 75 Amps per microsecond. The VKP60xT is ideal for electronic data processing applications utilizing modern disk drives and low voltage microprocessors that require dynamic load current response while maintaining tight output voltage tolerances.

### PRODUCT SELECTION CHART

MODEL	INPUT VOLTAGE (V <sub>DC</sub> )	RATED VOUT (V <sub>DC</sub> )			RATED MAXIMUM IOUT (A)		
		V1 (±)	V2 (±)	V3 (±)	V1(±)	V2(±)	V3(±)
VKP60LT312	24 (18-40)	3.3	12	12	18	2.5	2.5
VKP60LT315	24 (18-40)	3.3	15	15	18	2.0	2.0
VKP60LT512	24 (18-40)	5.1	12	12	12	2.5	2.5
VKP60LT515	24 (18-40)	5.0	15	15	12	2.0	2.0
VKP60MT312	48 (33-75)	3.3	12	12	18	2.5	2.5
VKP60MT315	48 (33-75)	3.3	15	15	18	2.0	2.0
VKP60MT512	48 (33-75)	5.1	12	12	12	2.5	2.5
VKP60MT515	48 (33-75)	5.0	15	15	12	2.0	2.0

# SPECIFICATIONS, ALL MODELS

Specifications are at  $T_{CASE} = +40^{\circ}C$  nominal input voltage unless otherwise specified.

INPUT	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
	Voltage Range					
	IHB60T24XX Series		18	24	40	V <sub>DC</sub>
	IHB60T48XX Series		33	48	75	V <sub>DC</sub>
	Reflected Ripple Current	Peak - Peak			220	mA
	Input Ripple Rejection	DC to 1KHz	50	60		dB
	Maximum Input Current	Output Power = 60W				
	IHB60T24XX Series	V <sub>IN</sub> = 16V			6	A
	IHB60T48XX Series	V <sub>IN</sub> = 30V			3	A
	No Load Power Dissipation	P <sub>OUT</sub> = 0, V <sub>IN,Min</sub> < V <sub>IN</sub> < V <sub>IN,Max</sub>			6	W
Inrush Charge						
IHB60T24XX Series				0.29	mC	
IHB60T48XX Series				0.165	mC	
Quiescent Operating Current						
Primary On/Off Disabled			7.5		mA	
Secondary On/Off Disabled			15		mA	

GENERAL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	
	<b>ISOLATION</b>						
	Input to Output	Peak Test	1500			V <sub>DC</sub>	
	Input to Baseplate		1500			V <sub>DC</sub>	
	Channel to Channel	Any Channel to Any Channel	500			V <sub>DC</sub>	
	Resistance, Input - Output		10			MΩ	
	Capacitance, Input - Output			2000		pF	
	Leakage Current	V <sub>ISO</sub> = 240V <sub>AC</sub> , 60Hz		180		μA, rms	
	<b>GENERAL</b>						
	Set Point Accuracy	V <sub>IN</sub> = Nominal, 50% Load			1	%	
Turn-on Time	Within 1% of Nominal V <sub>OUT</sub>		3.5	5	mSec		
Remote On/Off Control Inputs							
Primary	Open Collector/Drain						
Sink Current-Logic Low	V <sub>IN</sub> = V <sub>MAX</sub>			7	mA		
Vlow				0.8	V		
Vhigh				Open Collector			
Secondary	Open Collector/Drain						
Sink Current-Logic Low				100	μA		
Vlow				0.4	V		
Vhigh				Open Collector			
External Synchronization Input							
Frequency		440		520	KHz		
Pulse Width		150		320	nSec		
Source Impedance				47	Ω		
Input High Voltage		4		5	V		
Input Low Voltage		0		1	V		
Input Impedance			470		Ω		
Switching Frequency		470	480		KHz		
Weight				3 (85)	oz (g)		
<b>TEMPERATURE</b>							
	Case Temperature						
Operation/Specification		-40		+100	°C		
Storage		-55		+125	°C		
Shutdown		+100		+115	°C		
Thermal Impedance	Case to Ambient		8.2		°C/W		

VKP60xT312**	PARAMETER	CONDITIONS	V1			V2			V3			UNITS
			Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	
	Output Power	Total Combined O/P Power = 60 Watts Max.		30	60		15	30		15	30	W
	Set Point Voltage	I <sub>O,Nom</sub>		3.3			12.2			12.2		V
	Output Current, I <sub>OUT</sub>		0.5	9	18	0	1.25	2.5	0	1.25	2.5	A
	Output Ripple, p-p	DC to 20MHz*		100	200		150	250		150	250	mV
	Output Adjust Range	*	3.15		3.80					Dependent on V1		V
	Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/°C
	Line Regulation	V <sub>IN,Min</sub> ≤ V <sub>IN</sub> ≤ V <sub>IN,Max</sub> I <sub>O</sub> = I <sub>O,Nom</sub>		0.05	1.0		1.0	2.0		1.0	2.0	%
	Load Regulation	Min Load to Rated Load		0.50	1.0		See Regulation Curves			See Regulation Curves		%
Current Limit Inception	Other Outputs Min Load		23			5.0			5.0		A	
Short-Circuit Current			19	25		4.0	5.0		4.0	5.0	A	
Transient Response	50 to 100% Load Step											
Peak Deviation			150	250							mV	
Settling Time	V <sub>OUT</sub> , 1% of V <sub>OUT,Nom</sub>		35	50							μSec	
Overvoltage Limit		4.2		5.0							V	
Efficiency	I <sub>OUT1</sub> = 9A, (I <sub>OUT2</sub> + I <sub>OUT3</sub> ) = 2.5A F.L. V <sub>IN</sub> = Nominal	85	86								%	

\* See Application Notes available on the web at [www.cdpowerelectronics.com](http://www.cdpowerelectronics.com)

\*\* X = Either L (24) or M (48)

# SPECIFICATIONS, ALL MODELS

Specifications are at  $T_{CASE} = +40^{\circ}C$  nominal input voltage unless otherwise specified.

PARAMETER	CONDITIONS	V1			V2			V3			UNITS	
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max		
VKP60xT315** OUTPUT	Output Power	Total Combined O/P Power = 60 Watts Max.									W	
	Set Point Voltage	$I_{O,Nom}$									V	
	Output Current, $I_{OUT}$										A	
	Output Ripple, p-p	DC to 20MHz*									mV	
	Output Adjust Range	See Application Notes*									V	
	Output Temperature Drift										%/°C	
	Line Regulation	$V_{IN,Min} \leq V_{IN} \leq V_{IN,Max}$ $I_O = I_{O,Nom}$	0.05 1.0			1.0 2.0			1.0 2.0			%
	Load Regulation	Min Load to Rated Load	0.50 1.0			See Regulation Curves			See Regulation Curves			%
	Current Limit Inception	Other Outputs Min Load	23			4.0			4.0			A
	Short-Circuit Current		19 25			3.2 4.0			3.2 4.0			A
	Transient Response	50 to 100% Load Step										mV
	Peak Deviation		150 250									
	Settling Time	$V_{OUT}$ : 1% of $V_{OUT,Nom}$	35 50									µSec
Overvoltage Limit		4.2 5.0									V	
Efficiency	$I_{OUT1}=9A, (I_{OUT2}+I_{OUT3})=2A$ F.L. $V_{IN}$ =Nominal	85 86									%	

PARAMETER	CONDITIONS	V1			V2			V3			UNITS	
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max		
VKP60xT512** OUTPUT	Output Power	Total Combined O/P Power = 60 Watts Max									W	
	Set Point Voltage	$I_{O,Nom}$									V	
	Output Current, $I_{OUT}$										A	
	Output Ripple, p-p	DC to 20MHz*									mV	
	Output Adjust Range	*									V	
	Output Temperature Drift										%/°C	
	Line Regulation	$V_{IN,Min} \leq V_{IN} \leq V_{IN,Max}$ $I_O = I_{O,Nom}$	0.05 0.10			1.0 2.0			1.0 2.0			%
	Load Regulation	Min Load to Rated Load	0.50 1.0			See Regulation Curves			See Regulation Curves			%
	Current Limit Inception	Other Outputs Min Load	16			5.0			5.0			A
	Short-Circuit Current		12.6 16			4.0 5.0			4.0 5.0			A
	Transient Response	50 to 100% Load Step										mV
	Peak Deviation		200 300									
	Settling Time	$V_{OUT}$ : 1% of $V_{OUT,Nom}$	35 50									µSec
Overvoltage Limit		6.0 6.8									V	
Efficiency	$I_{OUT1}=6A, (I_{OUT2}+I_{OUT3})=2.5A$ F.L. $V_{IN}$ =Nominal	86 87									%	

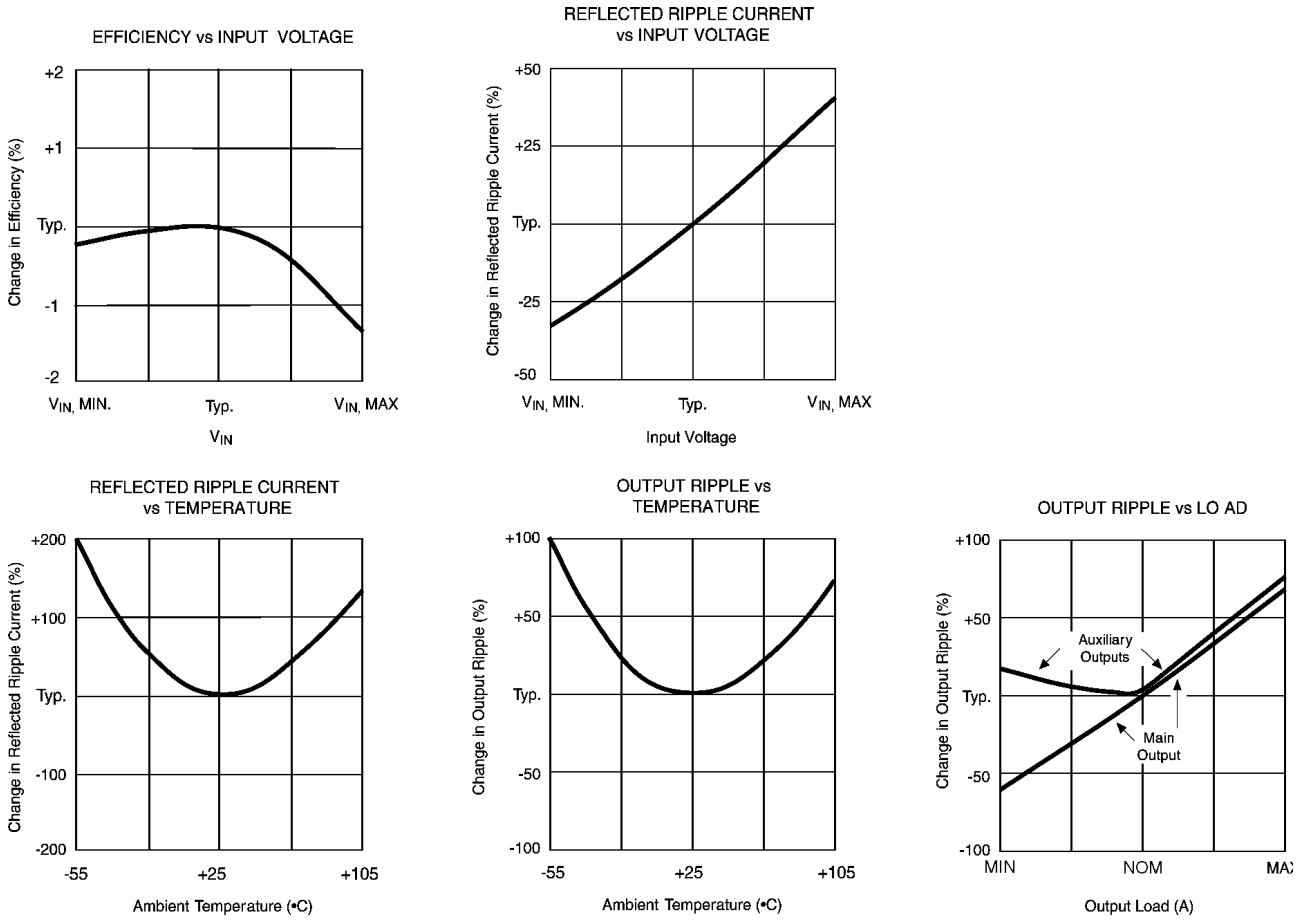
PARAMETER	CONDITIONS	V1			V2			V3			UNITS	
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max		
VKP60xT515** OUTPUT	Output Power	Total Combined O/P Power = 60 Watts Max									W	
	Set Point Voltage	$I_{O,Nom}$									V	
	Output Current, $I_{OUT}$										A	
	Output Ripple, p-p	DC to 20MHz*									mV	
	Output Adjust Range	*									V	
	Output Temperature Drift										%/°C	
	Line Regulation	$V_{IN,Min} \leq V_{IN} \leq V_{IN,Max}$ $I_O = I_{O,Nom}$	0.05 0.10			1.0 2.0			1.0 2.0			%
	Load Regulation	Min Load to Rated Load	0.50 1.0			See Regulation Curves			See Regulation Curves			%
	Current Limit Inception	Other Outputs Min Load	16			4.0			4.0			A
	Short-Circuit Current		12.6 16			3.2 4.0			3.2 4.0			A
	Transient Response	50 to 100% Load Step										mV
	Peak Deviation		200 300									
	Settling Time	$V_{OUT}$ : 1% of $V_{OUT,Nom}$	35 50									µSec
Overvoltage Limit		6.0 6.8									V	
Efficiency	$I_{OUT1}=6A, (I_{OUT2}+I_{OUT3})=2A$ F.L. $V_{IN}$ =Nominal	86 87									%	

\* See Application Notes available on the web at [www.cdpowerelectronics.com](http://www.cdpowerelectronics.com)

\*\* X = Either L (24VDC Input Voltage) or M (48VDC Input Voltage)

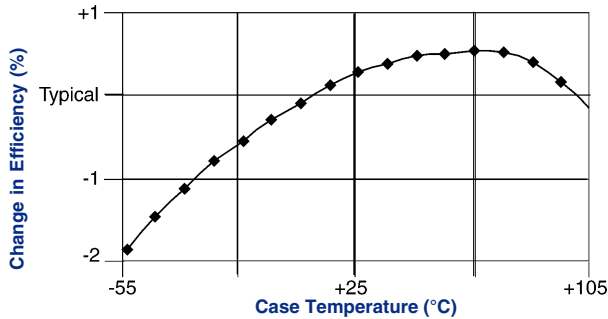
# TYPICAL PERFORMANCE CURVES

Specifications are at  $T_{CASE} = +40^{\circ}\text{C}$  nominal input voltage, nominal load, recommended external components applied, unless otherwise specified. (Refer to Application Note DCAN-9 at [www.cdpowerelectronics.com](http://www.cdpowerelectronics.com))



## EFFICIENCY vs TEMPERATURE

$T_{CASE} = +40^{\circ}\text{C}$ , nominal input voltage, nominal load, recommended external components applied, unless otherwise specified.\*



## ABSOLUTE MAX. RATINGS

Output Short-Circuit Duration	Continuous
Baseplate Temperature	$+100^{\circ}\text{C}$
Lead Temperature (soldering, 10 seconds max)	$+300^{\circ}\text{C}$
Storage Temperature	$+125^{\circ}\text{C}$
Input to Output Isolation	1500 VDC

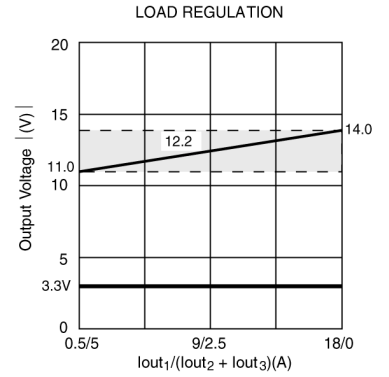
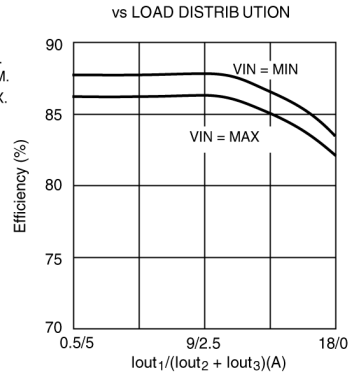
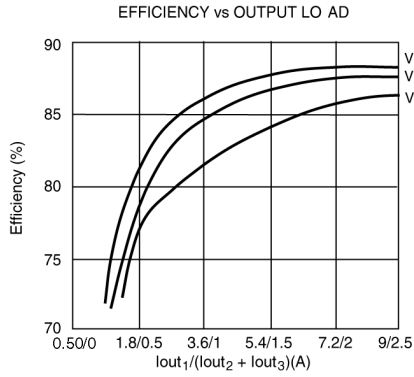
## ORDERING INFORMATION

Device Family VKP60 xTyz - L  
 Indicates 100 Watt Regulated Unit  
 Model Number \_\_\_\_\_  
 Selected from Table of Electrical Characteristics  
 Where:  
 x = Input Voltage (L = 24VDC, M = 48VDC)  
 T = Number of Outputs (Triple 'T')  
 y = 3 for 3.3V, 5 for 5V  
 z = 12 for 12V, 15 for 15V  
 Lead Length \_\_\_\_\_  
 0.250" - No Number  
 0.145" - (6)  
 0.110" - (8)

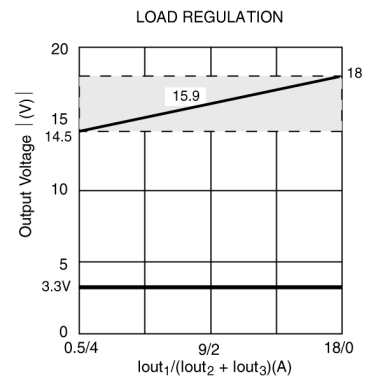
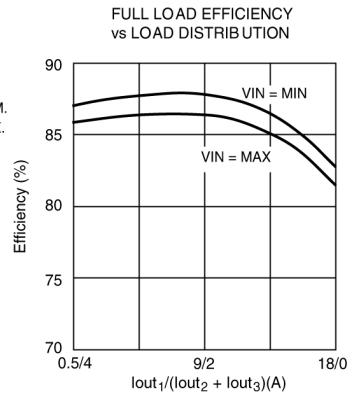
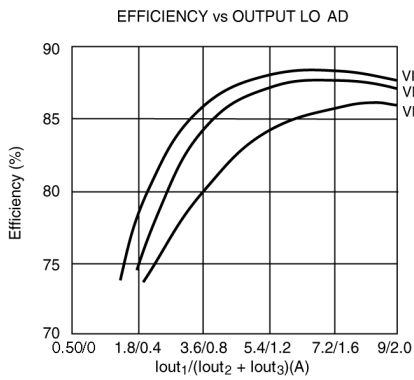
# TYPICAL PERFORMANCE CURVES

Specifications are at  $T_{CASE} = +40^{\circ}C$  nominal input voltage, nominal load, recommended external components applied, unless otherwise specified. (Refer to Application Note DCAN-9 at [www.cdpowerelectronics.com](http://www.cdpowerelectronics.com))

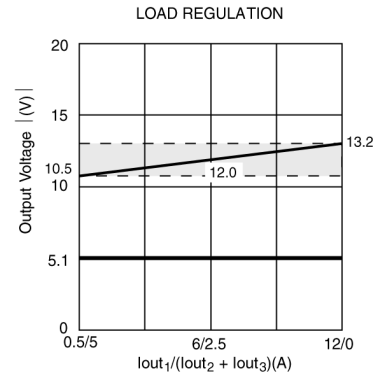
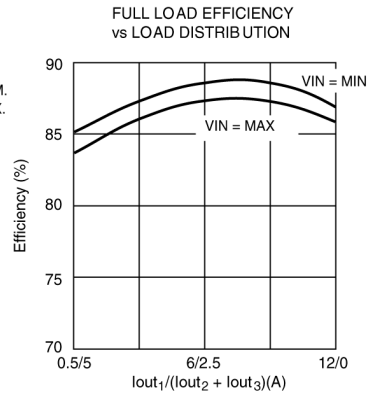
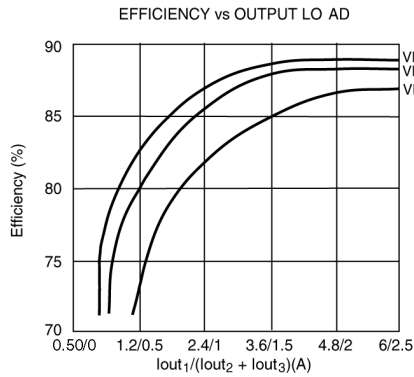
## VKP60xT312



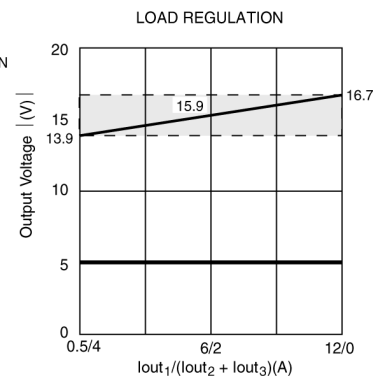
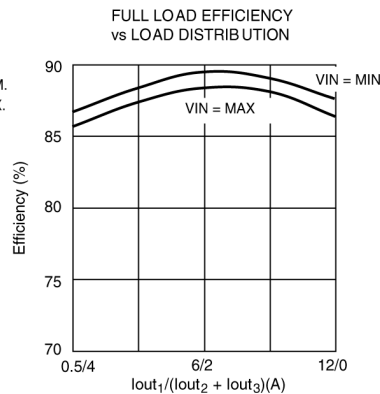
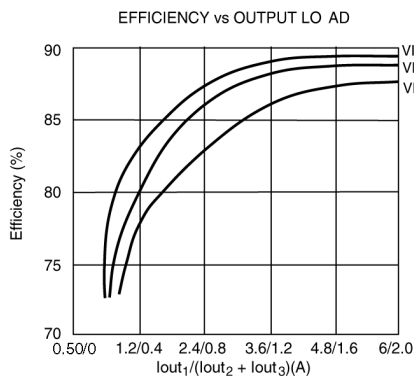
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## VKP60xT512

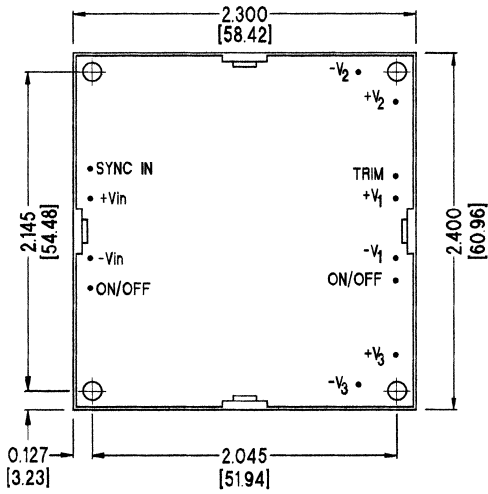


## VKP60xT515



# MECHANICAL

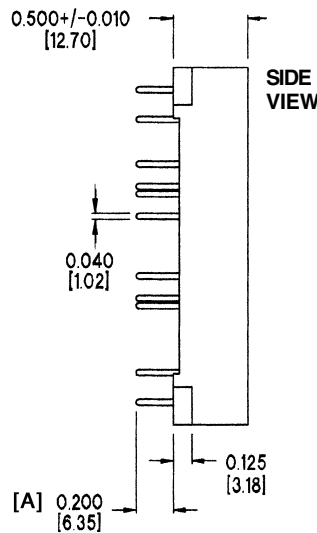
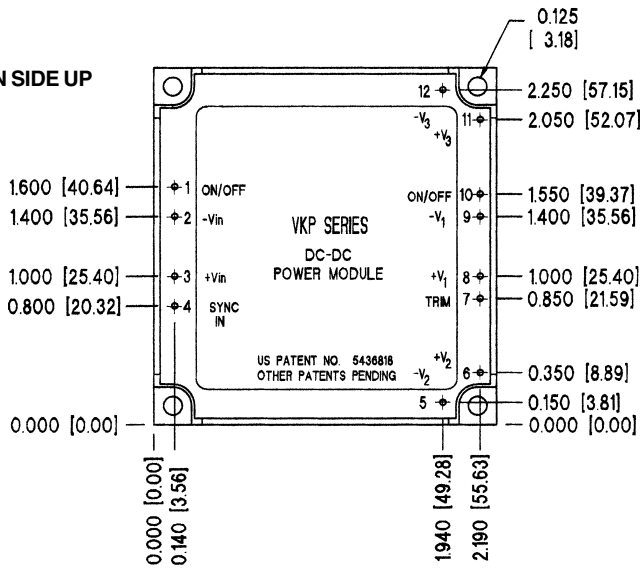
**PIN SIDE DOWN**



**NOTES:**

All dimensions are in inches (millimeters).  
 PIN PLACEMENT TOLERANCE:  $\pm 0.005$ "  
 MECHANICAL TOLERANCE:  $\pm 0.015$ "  
 Marked with: specific model ordered, date code, job code.  
 MATERIAL: Units are encapsulated in a low thermal resistance molding compound which has excellent chemical resistance and electrical properties in high humidity environments and over a wide operating temperature range. The encapsulant and outer shell of the unit have UL94V-0 ratings. Lead material is solder plated to allow ease of solderability.  
 [A] See Ordering Information on page 4 for available lead lengths.

**PIN SIDE UP**



**PIN CONNECTIONS**

Pin	Function
1	PRIMARY ON/OFF
2	-VIN
3	+VIN
4	SYNC IN
5	-V2
6	+V2
7	TRIM
8	+V1
9	-V1
10	SECONDARY ON/OFF
11	+V3
12	-V3

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