

DUAL/TRIPLE OUTPUT 60 WATT DC/DC CONVERTER

VKP60XT Series



DESCRIPTION

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

FEATURES

- 18 - 40 & 33 - 75V INPUT RANGE
- 2.3" X 2.4" X 0.5"
- USER CONFIGURABLE AS A SINGLE, DUAL OR TRIPLE OUTPUT
- EACH CHANNEL INDEPENDENTLY CURRENT LIMITED
- EXCELLENT CROSS REGULATION
- 500V_{DC} CHANNEL TO CHANNEL ISOLATION
- HIGH EFFICIENCY: 87% TYPICAL
- 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
- CONFORMS TO SAFETY PER UL1950, EN 60950 AND CSA 22.2 #234

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 V_{out}. The peak deviation will not exceed 7% of V_{out} 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 _{DC})	V _{out}			I _{out}		
		RATED OUTPUT VOLTAGE (VDC)			RATED MAXIMUM OUTPUT CURRENT (A)		
		Output 1 (±)	Output 2 (±)	Output 3 (±)	Output 1	Output 2	Output 3
VKP60LT312	24 (18-40)	3.3	12	12	18	2.5	2.5
VKP60LT315		3.3	15	15	18	2	2
VKP60LT512		5.1	12	12	12	2.5	2.5
VKP60LT515		5	15	15	12	2	2
VKP60MT312	48 (33-75)	3.3	12	12	18	2.5	2.5
VKP60MT315		3.3	15	15	18	2	2
VKP60MT512		5.1	12	12	12	2.5	2.5
VKP60MT515		5	15	15	12	2	2

More product information and application notes are available
on our website at www.cdpowerelectronics.com

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INPUT SPECIFICATIONS, ALL MODELS

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Voltage Range					
VKP60LT Series		18	24	40	V_{DC}
VKP60MT Series		33	48	75	V_{DC}
Reflected Ripple Current	Peak - Peak		220		mA
Reflected Ripple Current	Peak - Peak		10		mA
Input Ripple Rejection	DC to 1KHz	50	60		dB
Maximum Input Current	Output Power = 60W				
VKP60LT Series	$V_{IN} = 16\text{V}$			6	A
VKP60MT Series	$V_{IN} = 30\text{V}$			3	A
No Load Power Dissipation	$P_{OUT} = 0, V_{IN, Min} < V_{IN} < V_{IN, Max}$			6	W
Inrush Charge					
VKP60LT Series				0.29	mC
VKP60MT Series				0.165	mC
Quiescent Operating Current					
Primary On/Off Disabled			7.5	10	mA
Secondary On/Off Disabled			15	25	mA

COMMON SPECIFICATIONS, ALL MODELS

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
ISOLATION					
Input to Each Output	Peak Test	1500			V_{DC}
Input to Baseplate		1500			V_{DC}
Channel to Channel	Any Channel to Any Channel	500			V_{DC}
Resistance, Input - Output		10			M Ω
Capacitance, Input - Output			2000		pF
Leakage Current	$V_{ISO} = 240\text{VAC}, 60\text{Hz}$		180		$\mu\text{A}, \text{rms}$
GENERAL					
Turn-on Time	Within 1% of Nominal V_{OUT}		3.5	5	mSec
Remote On/Off Control Inputs					
Primary	Open Collector/Drain				
Sink Current-Logic Low	$V_{IN} = V_{MAX}$			7	mA
Vlow				1	V
Vhigh				6	V
Secondary	Open Collector/Drain				
Sink Current-Logic Low				100	μA
Vlow				0.7	V
Vhigh				2	V
External Synchronization Input					
Frequency		440		520	KHz
Pulse Width	See Application Notes	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	490	KHz
Weight				85 (3)	g (oz)
TEMPERATURE					
Operation/Specification	Case Temperature	-40		+100	$^{\circ}\text{C}$
Storage		-55		+125	$^{\circ}\text{C}$
Shutdown		+100		+115	$^{\circ}\text{C}$
Thermal Impedance	Case to Ambient		8.2		$^{\circ}\text{C/W}$

VKP60xT312 OUTPUT SPECIFICATIONS

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

PARAMETER	CONDITIONS	OUTPUT 1			OUTPUT 2			OUTPUT 3			UNITS
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Power			30	60		15	30		15	30	W
Set Point Voltage	$T_{CASE} = 25^{\circ}\text{C}, I_{O, Max}$		3.3			12.2			12.2		V
Output Current, I_{OUT}		0.5	9	18		1.25	2.5		1.25	2.5	A
Output Ripple, p-p (see fig. 10)	DC to 20MHz		170	225		150	250		150	250	mV
Output Adjust Range	See Application Notes	3.15		4	11.6		14.8	11.6		14.8	V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	$\%/^{\circ}\text{C}$
Line Regulation	$V_{IN, Min} \leq V_{IN} \leq V_{IN, Max}$ $I_O = I_{O, Nom}$		.02	.05		0.6	.8		0.6	.8	%
Load Regulation	No Load to Rated Load		0.3	0.5	See Regulation Curves			See Regulation Curves			%
Current Limit Inception	Other Outputs No Load		23			3.7			3.7		A
Short-Circuit Current	<65 m Ω		19	20		3.3	3.9		3.3	3.9	A
Transient Response	50 to 100% Load Step										
Peak Deviation			150	250							mV
Settling Time	$V_{OUT}, 1\% \text{ of } V_{OUT, Nom}$		35	50							μSec
Overvoltage Limit		4.25		4.75							V

VKP60xT315 OUTPUT SPECIFICATIONS

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

PARAMETER	CONDITIONS	OUTPUT 1			OUTPUT 2			OUTPUT 3			UNITS
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Power			30	60		15	30		15	30	W
Set Point Voltage	$T_{CASE} = 25^{\circ}\text{C}, I_{O\text{ Max}}$		3.3			15.85			15.85		V
Output Current, I_{OUT}		0.5	9	18		1	2		1	2	A
Output Ripple, p-p (see fig. 10)	DC to 20MHz		170	225		125	250		125	250	mV
Output Adjust Range	See Application Notes	3.15		4	15.4		19.5	15.4		19.5	V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/ $^{\circ}\text{C}$
Line Regulation	$V_{IN, Min} \leq V_{IN} \leq V_{IN, Max}$ $I_O = I_{O, Nom}$		.02	.05		0.6	0.8		0.6	0.8	%
Load Regulation	No Load to Rated Load		0.3	0.5	See Regulation Curves			See Regulation Curves			%
Current Limit Inception	Other Outputs No Load		23			3.7			3.7		A
Short-Circuit Current	<65 mΩ		18	20		3.3	3.9		3.3	3.9	A
Transient Response	50 to 100% Load Step										
Peak Deviation			150	250							mV
Settling Time	$V_{OUT}, 1\%$ of $V_{OUT, Nom}$		35	50							μSec
Overvoltage Limit		4.25		4.75							V

VKP60xT512 OUTPUT SPECIFICATIONS

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

PARAMETER	CONDITIONS	OUTPUT 1			OUTPUT 2			OUTPUT 3			UNITS
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Power			30	60		15	30		15	30	W
Set Point Voltage	$T_{CASE} = 25^{\circ}\text{C}, I_{O\text{ Max}}$		5.1			12			12		V
Output Current, I_{OUT}		0.5	6	12		1.25	2.5		1.25	2.5	A
Output Ripple, p-p (see fig. 10)	DC to 20MHz		125	200		150	250		150	250	mV
Output Adjust Range	See Application Notes	4.7		5.5	11		12.9	11		12.9	V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/ $^{\circ}\text{C}$
Line Regulation	$V_{IN, Min} \leq V_{IN} \leq V_{IN, Max}$ $I_O = I_{O, Nom}$		.01	.05		0.6	0.8		0.6	0.8	%
Load Regulation	No Load to Rated Load		.2	.4	See Regulation Curves			See Regulation Curves			%
Current Limit Inception	Other Outputs No Load		16			3.9			3.9		A
Short-Circuit Current	<65 mΩ		12.6	14		3.8	4.3		3.8	4.3	A
Transient Response	50 to 100% Load Step										
Peak Deviation			200	300							mV
Settling Time	$V_{OUT}, 1\%$ of $V_{OUT, Nom}$		35	50							μSec
Overvoltage Limit		6	6.2	6.5							V

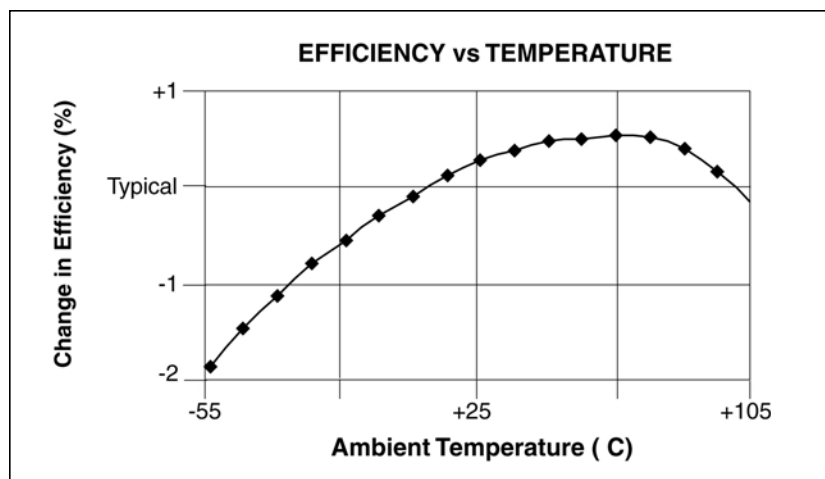
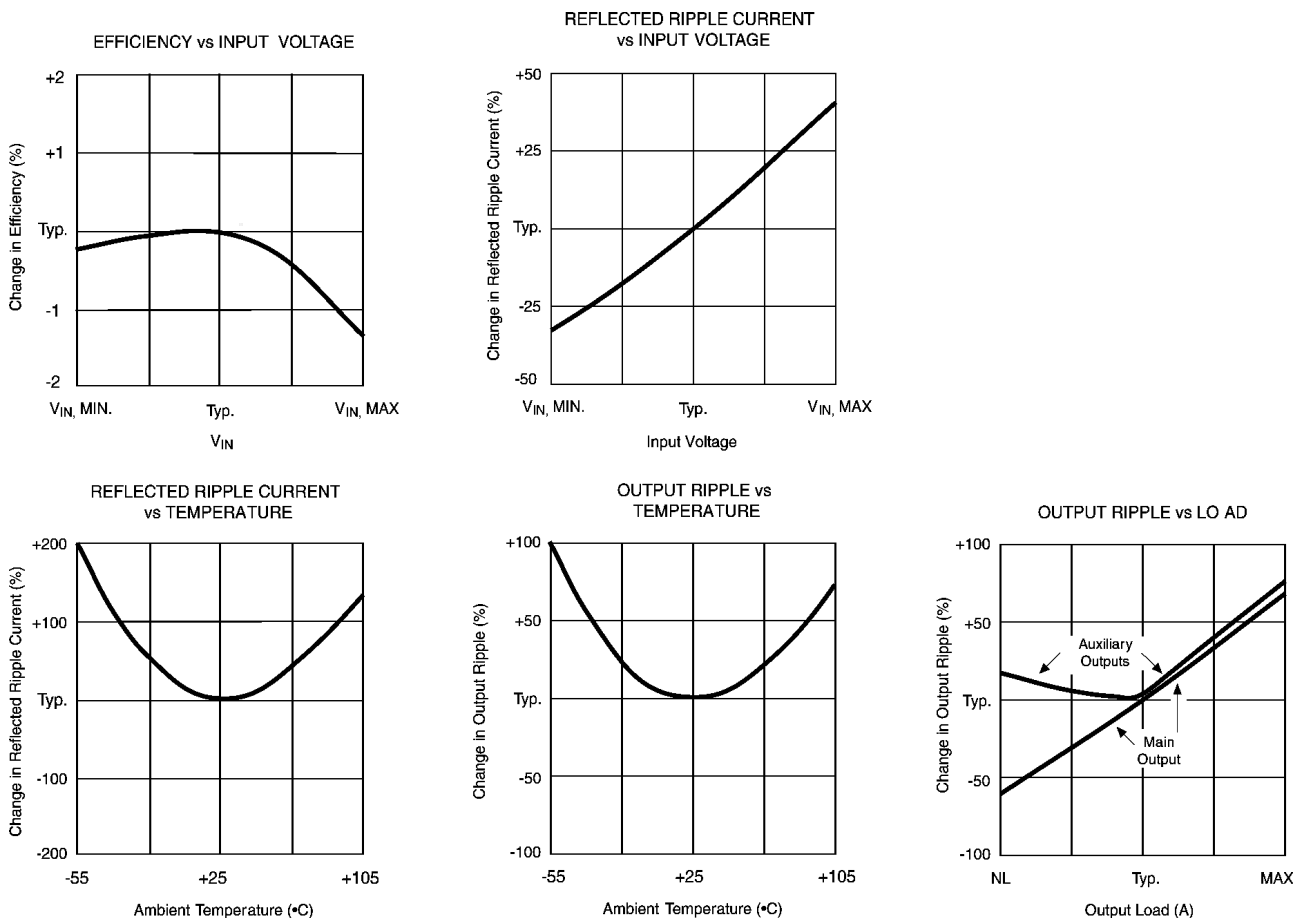
VKP60xT515 OUTPUT SPECIFICATIONS

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

PARAMETER	CONDITIONS	OUTPUT 1			OUTPUT 2			OUTPUT 3			UNITS
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Power			30	60		15	30		15	30	W
Set Point Voltage	$T_{CASE} = 25^{\circ}\text{C}, I_{O\text{ Max}}$		5.0			15.3			15.3		V
Output Current, I_{OUT}		0.5	6	12		1	2		1	2	A
Output Ripple, p-p (see fig. 10)	DC to 20MHz		100	200		125	250		125	250	mV
Output Adjust Range	See Application Notes	4.6		5.5	14		16.8	14		16.8	V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/ $^{\circ}\text{C}$
Line Regulation	$V_{IN, Min} \leq V_{IN} \leq V_{IN, Max}$ $I_O = I_{O, Nom}$		.01	.05		0.6	.8		0.6	.8	%
Load Regulation	No Load to Rated Load		0.2	0.4	See Regulation Curves			See Regulation Curves			%
Current Limit Inception	Other Outputs No Load		16			3.7			3.7		A
Short-Circuit Current	<65 mΩ		12.6	14		3.3	3.9		3.3	3.9	A
Transient Response	50 to 100% Load Step										
Peak Deviation			200	300							mV
Settling Time	$V_{OUT}, 1\%$ of $V_{OUT, Nom}$		35	50							μSec
Overvoltage Limit		6	6.2	6.5							V

TYPICAL PERFORMANCE CURVE

$T_A = +25^\circ\text{C}$, nominal input voltage, rated load,
recommended external components applied, unless otherwise specified.



ABSOLUTE MAXIMUM 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 $^\circ\text{C}$
Internal Power Dissipation	13 Watts
Input to Output Isolation	1500 Vdc

ORDERING INFORMATION

Device Family **VKP60** **xyzzz** -

Indicates 60 Watt Regulated Unit

Model Number

Selected from Table of Electrical Characteristics

Where:

- x = Input Voltage (L = 24VDC, M = 48VDC)
- y = Number of Outputs (Triple "T")
- zzz = Output Voltage

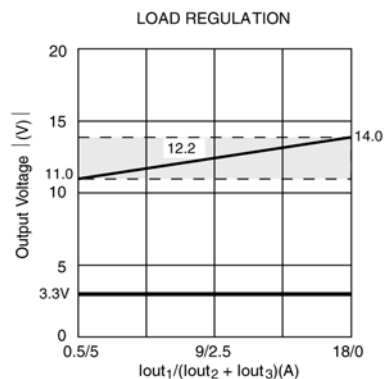
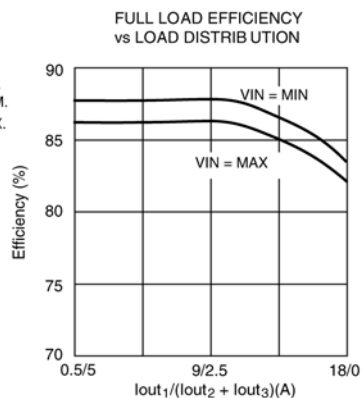
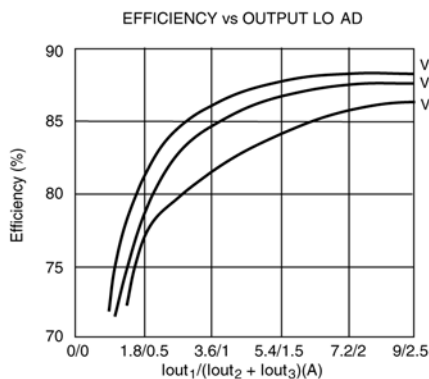
Lead Length

- 0.200" - No Number
- 0.145" - (6)
- 0.110" - (8)

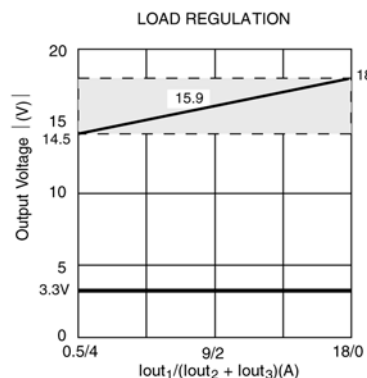
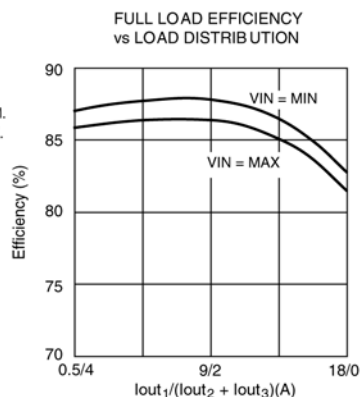
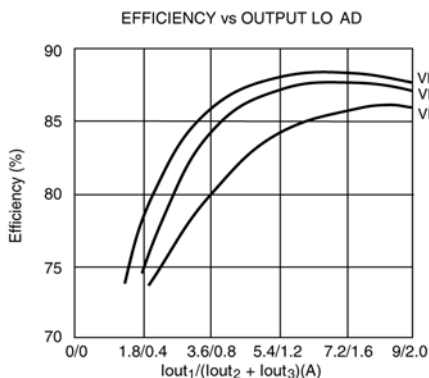
TYPICAL PERFORMANCE CURVE

$T_A = +25^\circ\text{C}$, nominal input voltage, rated load, recommended external components applied, unless otherwise specified.

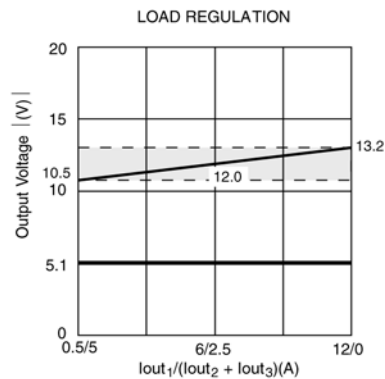
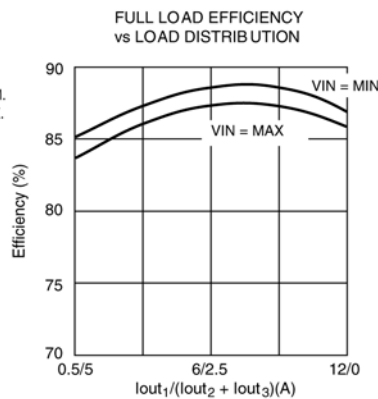
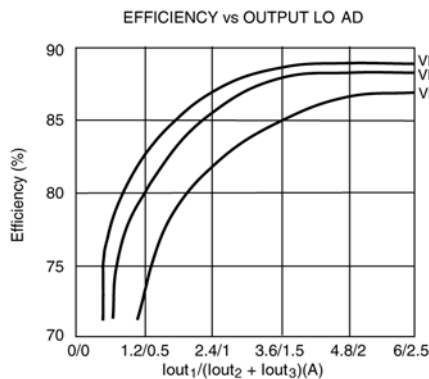
VKP60xT312



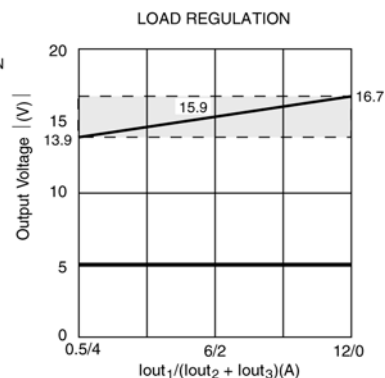
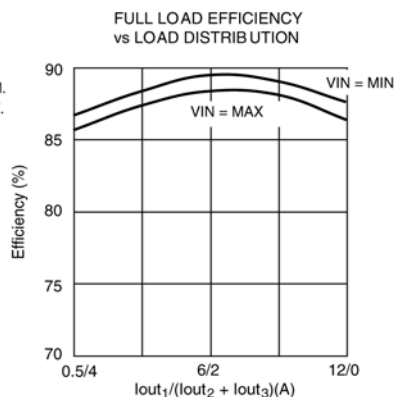
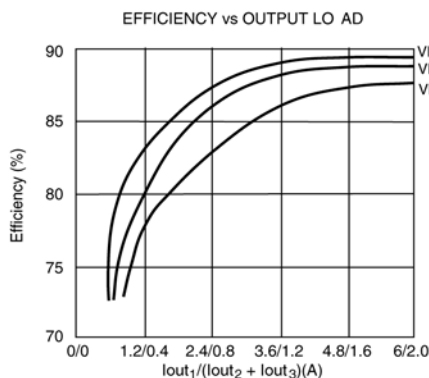
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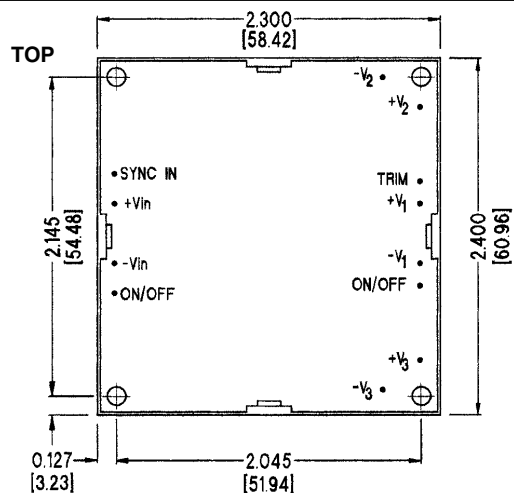
VKP60xT512



VKP60xT515



MECHANICAL



NOTES:

All dimensions are in inches (millimeters).

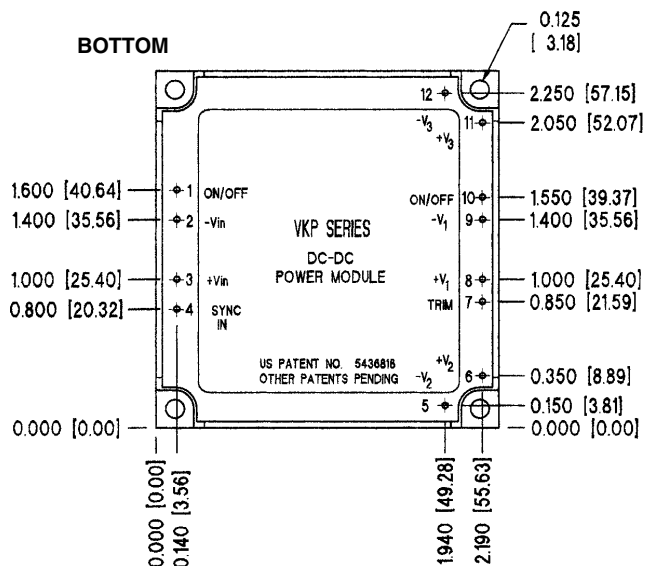
PIN PLACEMENT TOLERANCE: ± 0.005 "

MECHANICAL TOLERANCE: ± 0.015 "

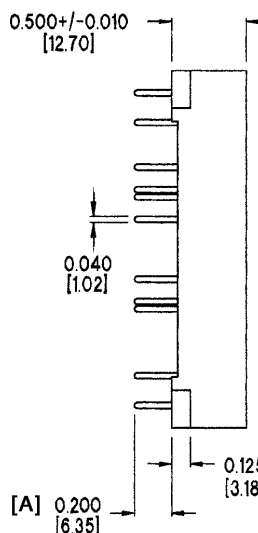
Marked with: specific model ordered, date code, job code.

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.

BOTTOM



SIDE

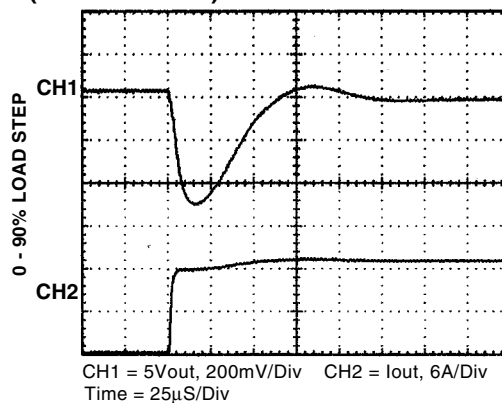
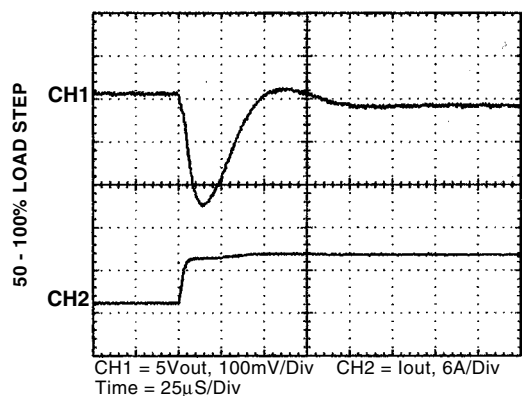


PIN CONNECTIONS

1	PRIMARY ON/OFF
2	-VIN
3	+VIN
4	SYNC IN
5	-V ₂
6	+V ₂
7	TRIM
8	+V ₁
9	-V ₁
10	SECONDARY ON/OFF
11	+V ₃
12	-V ₃

[A] See Ordering Information on page 4 for available line lengths.

TRANSIENT RESPONSE (VKP60MT512)



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