



- RoHS Compliant
- 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
- VKP60MT Series UL/cUL approved to UL1950 and VDE approved to EN60950-1



For full details go to  
[www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

The VKP60LTC and VKP60MTC 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 VKP60xTC'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 VKP60xTC's proprietary control circuitry responds to 50-100% load steps in 35μSeconds to within 1% of nominal V<sub>out</sub>. The peak deviation will not exceed 7% of V<sub>out</sub> for pulsed load slew rates in excess of 75 Amps per microsecond. The VKP60xTC is ideal for electronic data processing applications utilizing modern disk drives and low voltage micro-processors that require dynamic load current response while maintaining tight output voltage tolerances.

## PRODUCT SELECTION CHART

MODEL	INPUT VOLTAGE (V <sub>DC</sub> )	RATED V <sub>out</sub> (V <sub>DC</sub> )			RATED MAXIMUM I <sub>out</sub> (A)		
		V1 (±)	V2 (±)	V3 (±)	V1(±)	V2(±)	V3(±)
VKP60LT312C	24 (18-40)	3.3	12	12	18	2.5	2.5
VKP60LT315C	24 (18-40)	3.3	15	15	18	2.0	2.0
VKP60LT512C	24 (18-40)	5.1	12	12	12	2.5	2.5
VKP60LT515C	24 (18-40)	5.0	15	15	12	2.0	2.0
VKP60MT312C	48 (33-75)	3.3	12	12	18	2.5	2.5
VKP60MT315C	48 (33-75)	3.3	15	15	18	2.0	2.0
VKP60MT512C	48 (33-75)	5.1	12	12	12	2.5	2.5
VKP60MT515C	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					
	VKP60LTXXC Series		16	24	40	V <sub>DC</sub>
	VKP60MTXXC Series		33	48	75	V <sub>DC</sub>
	Reflected Ripple Current	Peak - Peak			220	mA
	Input Ripple Current	DC to 1KHz	50	60		dB
	Maximum Input Current	Output Power = 60 W				
	VKP60LTXXC Series	V <sub>IN</sub> = 16V			6	A
	VKP60MTXXC 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						
VKP60LTXXC Series				0.29	mC	
VKP60MTXXC Series				0.165	mC	
Quiescent Operating Current						
Primary On/Off Disabled			7.5	10	mA	
Secondary On/Off Disabled			15	25	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 Channel	500			V <sub>DC</sub>
	Resistance, Input to Output		10			MΩ
	Capacitance, Input to Output			2000		pF
	Leakage Current			180		oA, rms
	<b>GENERAL</b>					
	Set-point Accuracy				1	%
	Turn-on Time			3.5	5	mSec
	Remote On/Off Control Inputs					
	Primary	Open Collector/Drain				
	Sink Current Logic Low	V <sub>IN</sub> = V <sub>IN MAX</sub>		24	7	mA
	V <sub>low</sub>			48	0.8	V
	V <sub>high</sub>				Open Collector	
	Secondary	Open Collector/Drain				
	Sink Current Logic Low				100	μA
	V <sub>low</sub>				0.4	V
	V <sub>high</sub>				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	490	KHz	
Weight				3 (85)	oz (g)	

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

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

**SPECIFICATIONS, ALL MODELS**

Specifications are at T<sub>CASE</sub> = +40°C nominal input voltage unless otherwise specified.

GENERAL <i>continued</i>	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
	<b>TEMPERATURE</b>	Case temperature				
	Operation/Specification		-40		+100	°C
	Storage		-50		+125	°C
	Shutdown		+100		+115	°C
Thermal Impedance	Case to Ambient		8.2		°C/W	

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	$V_{IN,Min} \leq V_{IN} \leq V_{IN,Max}$ 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								%

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			15.85			15.85		V
Output Current, I <sub>OUT</sub>		0.5	9	18	0	1	2	0	1	2	A
Output Ripple, p-p	DC to 20MHz*		100	200		125	250		125	250	mV
Output Adjust Range	See Application Notes*	3.15		3.80	Dependent on V1						V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/°C
Line Regulation	$V_{IN,Min} \leq V_{IN} \leq V_{IN,Max}$ 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			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										
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> )=2A F.L. V <sub>IN</sub> =Nominal	85	86								%

\* See Application Notes available on the web at www.murata-ps.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	
Output Power	Total Combined O/P Power = 60 Watts Max		30	60		15	30		15	30	W
Set Point Voltage	$I_O, Nom$		5.1			12			12		V
Output Current, $I_{OUT}$		0.5	6.0	12	0	1.25	2.5	0	1.25	2.5	A
Output Ripple, p-p	DC to 20MHz*		125	200		150	250		150	250	mV
Output Adjust Range	*	4.75		5.50				Dependent on V1			V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/°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										
Peak Deviation			200	300							mV
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. $V_{IN} = Nomina$	86	87								%

VKP60xT512\*\* OUTPUT

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	$I_O, Nom$		5.0			15.3			15.3		V
Output Current, $I_{OUT}$		0.5	6	12	0	1	2	0	1	2	A
Output Ripple, p-p	DC to 20MHz*		100	200		125	250		125	250	mV
Output Adjust Range	Output Adjust Range	*	4.60		5.50			Dependent on V1			V
Output Temperature Drift			.02	.05		.02	.05		.02	.05	%/°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										
Peak Deviation			200	300							mV
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								%

VKP60xT515\*\* OUTPUT

\* See Application Notes available on the web at [www.murata-ps.com](http://www.murata-ps.com)  
 \*\* X = Either L (24) or M (48)

**ORDERING INFORMATION**

Device Family \_\_\_\_\_ VKp60    xTyz-    L    C  
 Indicates 100 Watt Regulated Unit

Model Number \_\_\_\_\_  
 Selected from Table of Electrical Characteristics

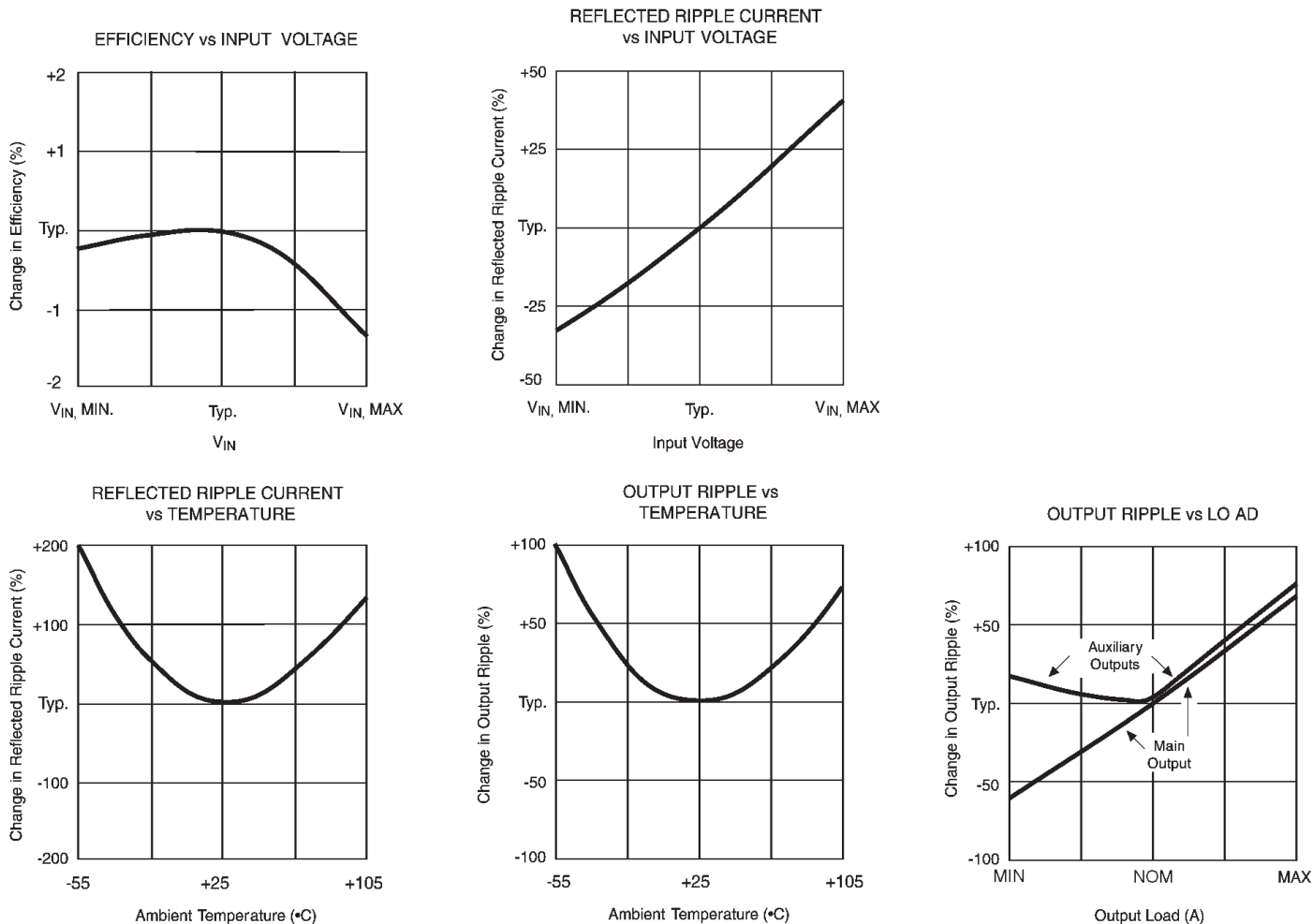
Where:  
 x = Input Voltage (L = 24Voc, M = 48Voc)  
 T = Number of Outputs (Triple 'T')  
 y = 3 for 3.3V, 5 for 5V  
 z = 12 for 12V, 15 for 15V

Lead Length \_\_\_\_\_  
 0.250" - No Number  
 0.145" - (6)  
 0.110" - (8)

RoHS Compliant \_\_\_\_\_

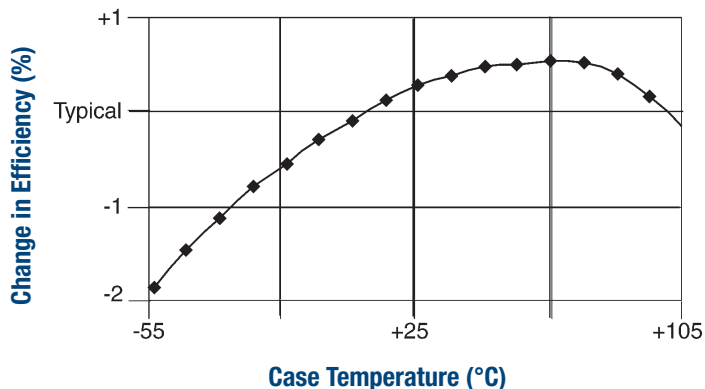
**TYPICAL PERFORMANCE CURVES**

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.murata-ps.com](http://www.murata-ps.com))



**EFFICIENCY vs TEMPERATURE**

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

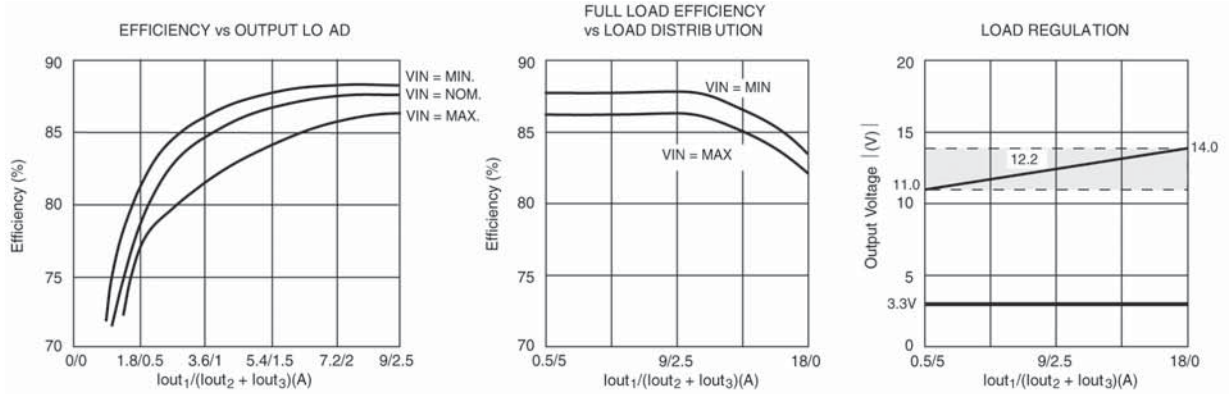


**ABSOLUTE MAX. RATINGS**

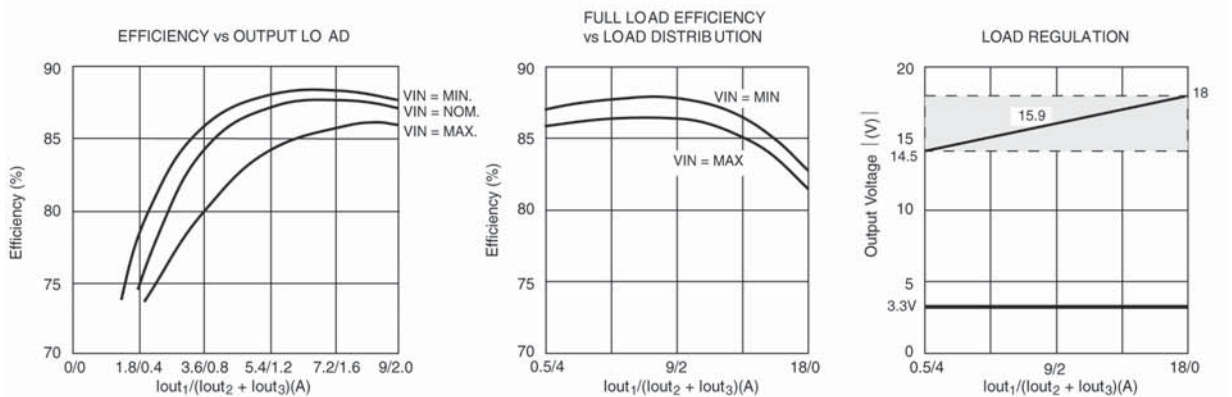
Output Short-Circuit Duration	Continuous
Baseplate Temperature	$+100^{\circ}C$
Lead Temperature (soldering, 10 seconds max)	$+300^{\circ}C$
Storage Temperature	$+125^{\circ}C$
Input to Output Isolation	1500 V <sub>DC</sub>

**TYPICAL PERFORMANCE CURVES**

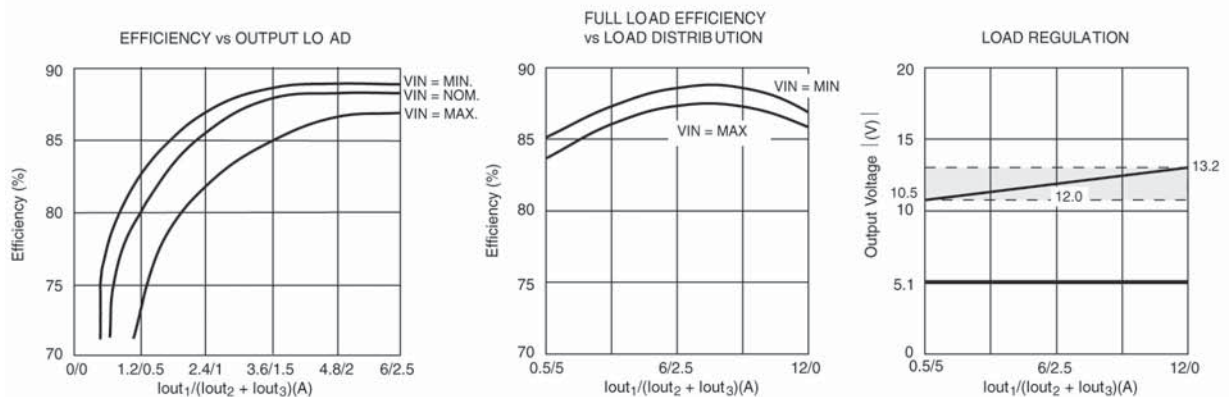
**VKP60xT312**



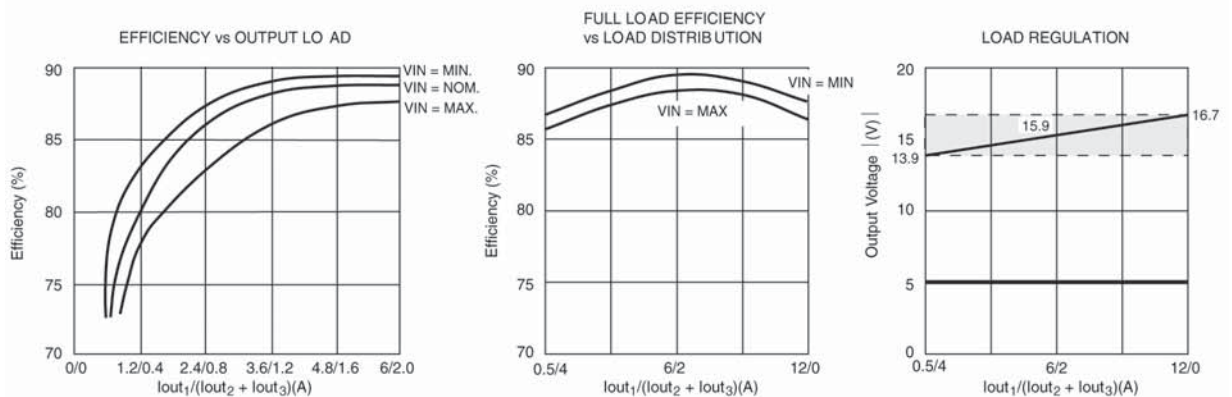
**VKP60xT315**



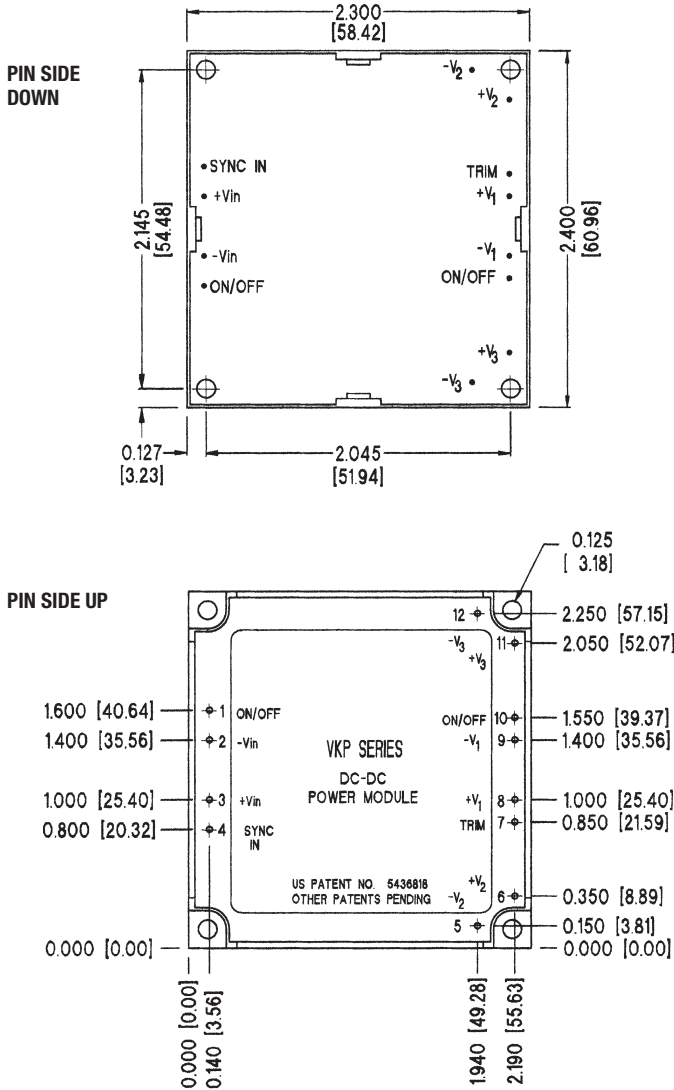
**VKP60xT512**



**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, wide operating temperature range, and good electrical properties under high humidity environments. The encapsulant and outer shell of the unit have UL94V-0 ratings. Lead material is matte tin 100 microinches min., over nickel, 40-80 microinches.  
 [A] See Ordering Information on page 4 for available lead lengths.

PIN CONNECTIONS	
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