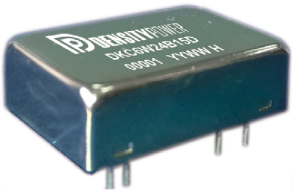
Technical Specification

DKC6W24 Series

4:1 Input, Isolated 6Watts DC/DC Converters (DIP24)

FEATURES

- 4:1 wide input range: 9-36VDC
- Bipolar outputs: ±15Volts DC
- Operation temperature range: -40°C to +85°C
- 6W isolated outputs
- Effciency up to 86%
- Fixed switching frequency
- 1.6KVDC I/O isolation
- Standard 1.25"×0.8"×0.4" footprint
- Extensive self-protection, UVLO, OCP and short protection
- Metal Case, outstanding thermal dissipation
- Fully encapsulated, high reliability
- MTBF ⩾ 1000 KHrs
- Compliance with RoHS



PRODUCT OVERVIEW

The DKC6W24 series are highly reliable, and efficient isolated DC/DC converter. Wide input range of 9-36V(24V nominal) is ideal for automation, power grid, railway, semiconductor equipment, instrumentation, test and measurement, and distribution power system.

A wealth of self-protection features included input under-voltage lockout, over current protection with "hiccup" autorestart technique, provides short-circuit protection, along with output OVP. The operation temperature is -40°C to 85°C, the module delivers full output power @ 85°C ambient temperature.

Advanced fully encapsulated package technology provides outstanding thermal performance, which is ideal for ruggedized applications involving harsh environments.

The DKC6W24 series are designed to safety standards UL/IEC/CSA 60950, 2nd edition.

Models Selections

Basic Models	Input Voltage [VDC]	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [A]	Efficiency Typ. [%]	Capacitive Load Max. [μF]	Package [inch]
DKC6W24B15	24	9-36	±15	±0.2	86	±330	1.25"×0.8"×0.4" DIP24

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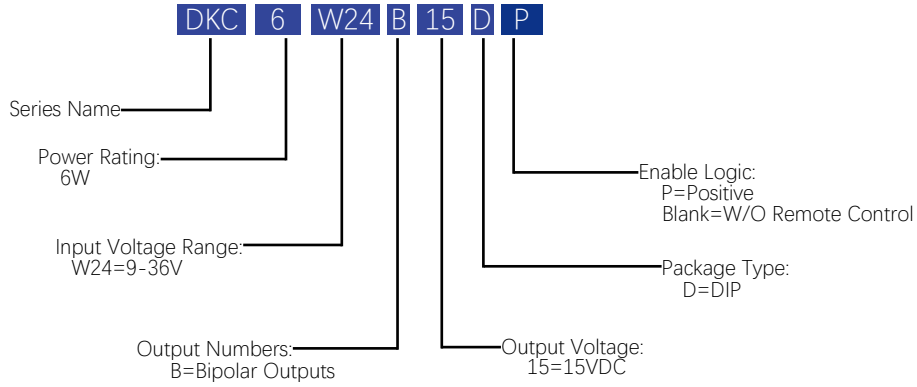
Model Numbering



Absolute Maximum Ratings					
Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage Continuous		-0.7		40	VDC
Input Voltage Transient	< 100ms			50	VDC
Operating Case Temperature		-40		115	°C
Operating Environment Temperature	with no derating	-40		85	°C
Storage Temperature Range		-55		125	°C
Soldering Temperature	Wave soldering < 10s			300	°C
Cooling	Free air convection				
Safety and EMC Compliance					
Conducted Emission	EN55032	Class B (With external filter)			
Radiated Emission	EN55032	Class B (With external filter)			
Conducted Susceptibility	IEC6100-4-6	10Vrms Criteria A			
Radiated Susceptibility	IEC6100-4-3	10V/m Criteria A			
EFT	IEC6100-4-4	±2KV Criteria A (With external filter)			
Surge	IEC6100-4-5	±2KV Criteria A (With external filter)			
ESD	IEC6100-4-2	Contact: ±4KV Air: ±4KV Criteria A			
Isolation Safety Rating	Basic insulation				

Input Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Operating Voltage Range		9	24	36	VDC
Start-up Threshold		8.6	8.8	9	VDC
Under Voltage Shutdown		8.0	8.3	8.6	VDC
Recommended Input Fuse				2	A

General Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage (Test for 1 minute, 1mA)	Input to output	1600			VDC
	Input to case	1000			VDC
	Output to case	1000			VDC
Isolation Resistance (Viso=500VDC)	Input to output	100			MΩ
Isolation Capacitance	Input to output		1000		pF
Switching Frequency			300		KHz
Start-up Delay	From undervoltage shutdown recovery to 10% Vout			50	mS
Rise Time	From 10% Vout to 90% Vout capacitive load			20	mS
Vibration	IEC 60068-2-64, Environmental testing - Part 2				
Shock (Operational)	IEC 60068-2-27, Environmental Testing- Part 2.27				

All specifications are tested at 25 ℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±15 Vout)

Input Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Reflected Input Ripple Current	Measured at input pin with 4.7μH inductance and 100μF capacitance used in combination		20		mA pk-pk
Input Current @ No Load			15	20	mA
Input Current @ Min. Line				2.2	A
Power Loss @ No Load				0.3	W
Recommended External Input Capacitance	1μF CBB and 100μF E-cap used in combination		100		μF

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint	50% Load, Vin=24V	14.85	15	15.15	VDC
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-0.2		+0.2	%
Load Regulation	5% load to 100% load	-0.5		+0.5	%
Cross Regulation	One output @50% FL, the other output is from 10% to 100% FL	-2.0		+2.0	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Over Current Protection	Hiccup, auto-recover	110		160	%
Output Short Protection	Hiccup, auto-recover				
Ripple & Noise Max. ①		-150		150	mV Pk-Pk
Dynamic Load Peak Deviation ②		-5		5	%Vout
Dynamic Load Response				500	μS
Minimum Load	No minimum load required				

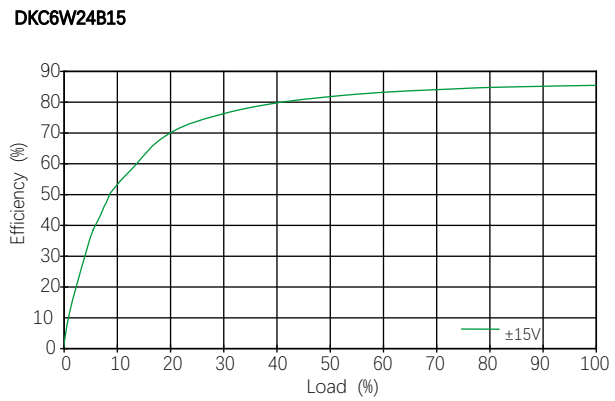
Notes

① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 8 for more details.

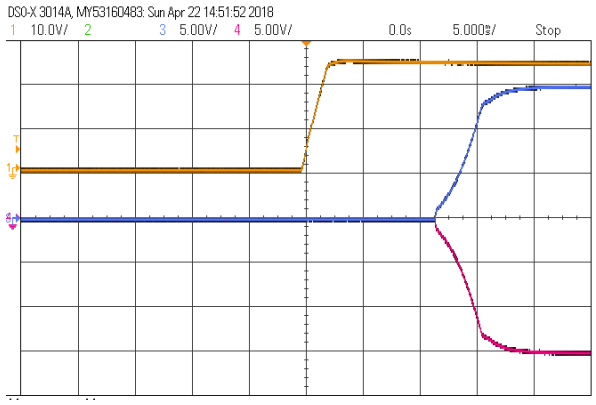
② For single output types, load is set from 50%-75%-50% of full load, di/dt=0.1A/μS, Cout=0μF; for bipolar output types, load is set in same condition in both output, Please refer to dynamic waveforms in performance data for details.

Performance Data

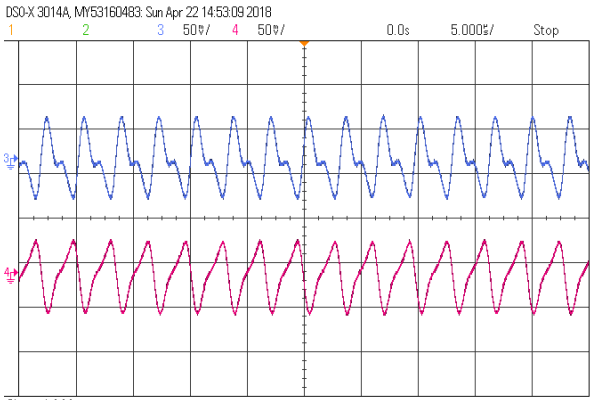
EFFICIENCY VS LOAD



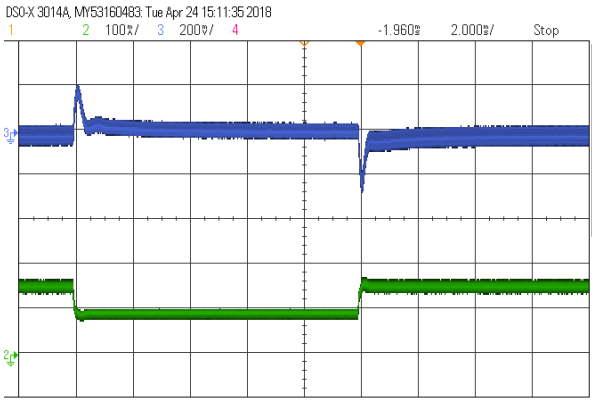
START UP Ch1:Vi Ch3: Vo1 Ch4:Vo2



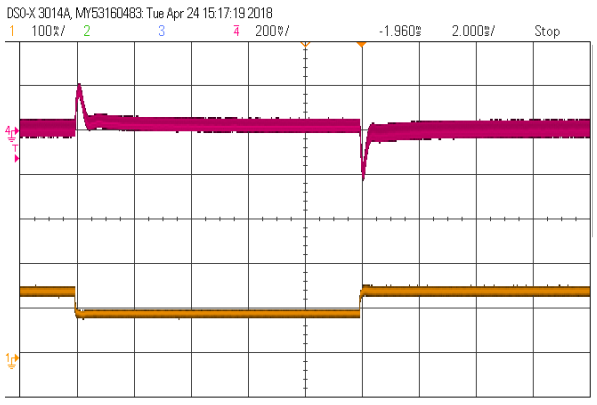
RIPPLE & NOISE 20M Bandwith
Ch3:Vo1 Ch4:Vo2



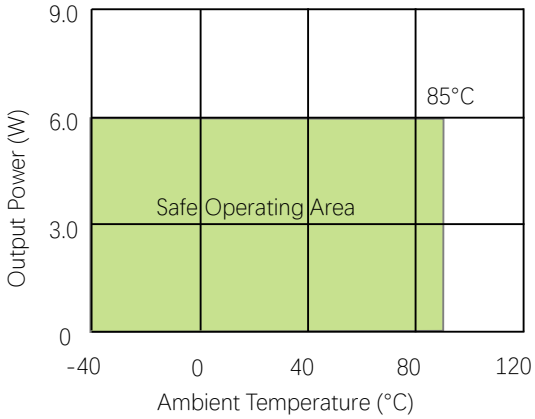
DYNAMIC (50%~75%~50% of $I_{max,}$ di/dt=0.1A/μs)
Ch2:Io1 Ch3:Vo1



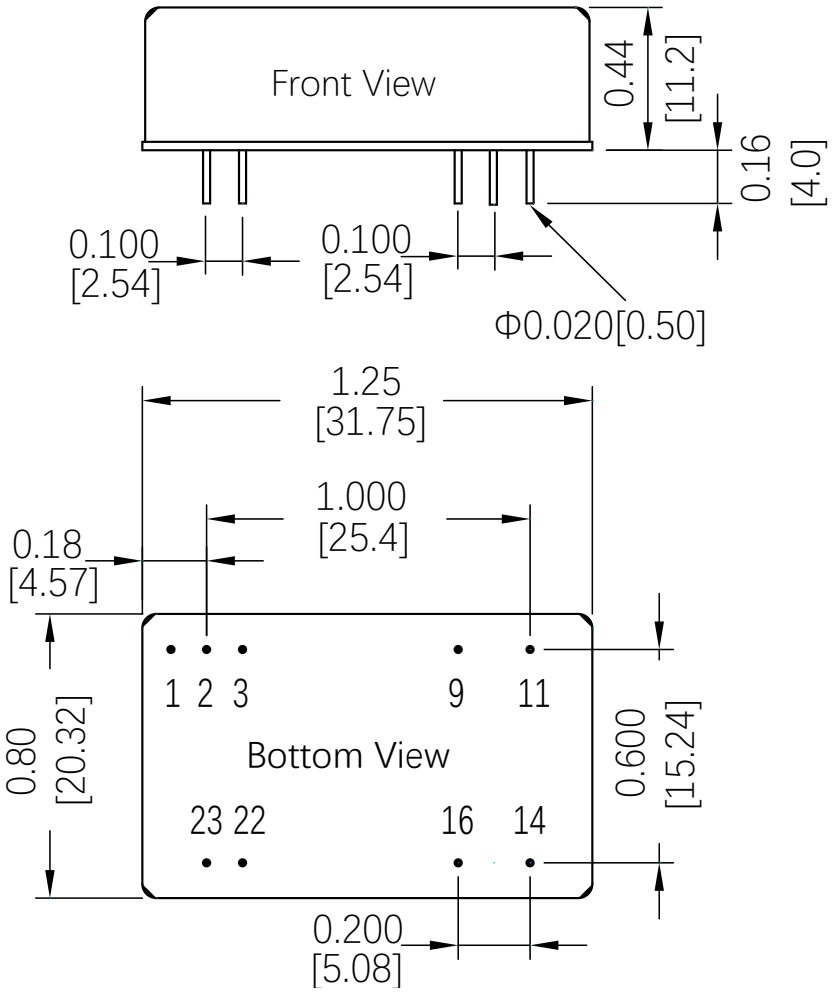
DYNAMIC (50%~75%~50% of $I_{max,}$ di/dt=0.1A/μs)
Ch1:Io2 Ch4:Vo2



TEMBERATURE DERATING



Mechanical Specifications



PIN:
PIN1, PIN2, PIN3, PIN9, PIN11, PIN14, PIN16, PIN22, PIN23: Φ0.020inch
Material: Copper alloy
Finish: Tin 3 ~ 5μm(min.) over nickel 50μm(Min.)

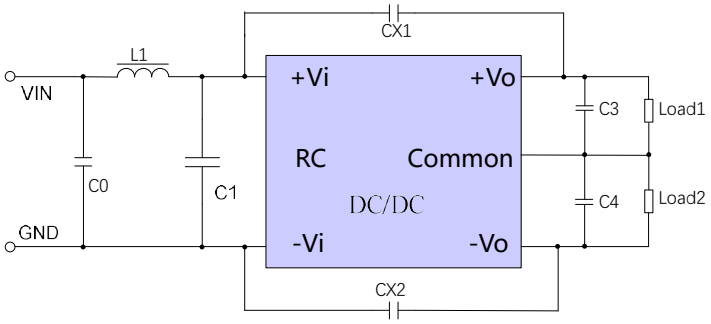
Tolerance:
X.XX=±0.02 (0.5)
X.XXX= ±0.010(0.25)

Dimensions are in inches [mm]
Weight: ~14g.

PIN CONNECTIONS			
Single Output		Bipolar Outputs	
Pin	Function	Pin	Function
1	RC	1	RC
2	-Vin	2	-Vin
3	-Vin	3	-Vin
9	NC	9	Common
11	NC	11	-Vout
14	+Vout	14	+Vout
16	-Vout	16	Common
22	+Vin	22	+Vin
23	+Vin	23	+Vin

Conducted Emission

The sample was tested in accordance with CISPR/EN 55032 requirements. The EUT was supplied with 9V-36VDC and was loaded to the maximum rating 6 Watts. The following EMI filter components were employed and the result can meet class B.



Conducted Emission Test Circuit

EMI Filter Components List

REFERENCE	DESCRIPTION
L1	4.7μH
CX1, CX2	1nF/2KV
C0	1000μF/50V
C1	1μF/50V
C3	100μF/25V
C4	100μF/25V

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INPUT FUSING

Certain applications may require fuse at the inputs of power conversion components. Fuses should also be used when there is possibility of sustained input voltage reversal which is not current limited. The DKC6W24 modules are not internally fused. We strongly recommend a slow-blown fuse to be used in the ungrounded input supply line.
For safety agency approvals, the installer must install the converter in compliance with the end user safety standard.

TYPICAL APPLICATION CONNECTION

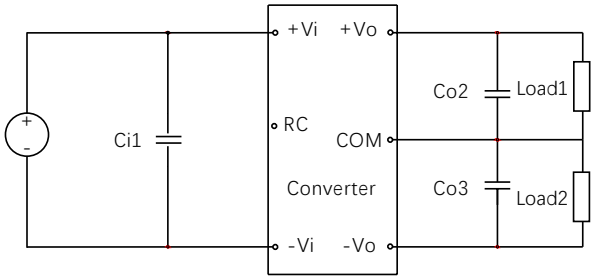

Figure 1· Typical Application Connection

In order to prevent the input line from causing the input oscillation, it is recommended to add the input capacitor close to the input of the module. Similarly, the output capacitor is added to the output of the module. Specific recommended parameters: input capacitance Ci1=47~100μF electrolytic capacitor. For output Capacitance, recommended value is 100μF/A(The current here refers to the output current).

REFLECTED RIPPLE CURRENT

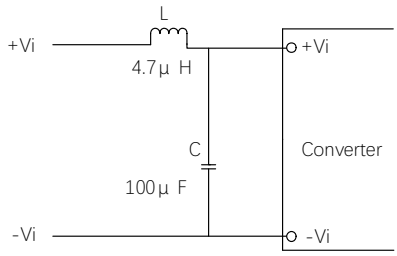

Figure 2· Reflected Ripple Current

Add LC filter at the front of the power module to reduce the interference of reflected ripple current on the DC bus, recommended value of L and C with appropriate current and voltage rating as below: L=4.7μH; C=100μF.

OUTPUT RIPPLE & NOISE

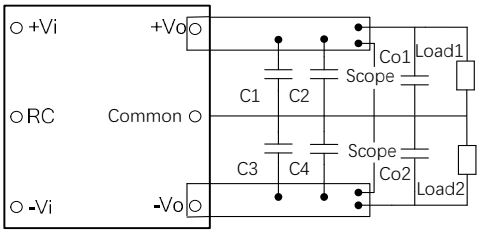

Figure 3· Output Ripple & Noise

These DKC6W24 modules' output ripple and noise is measured at the rated input voltage and output current, along with 10uF tantalum capacitor and 0.1uF MLCC used in parallel with appropriate voltage ratings and placed as C1,C2 & C3,C4 shown in the figure above. The scope's bandwidth is set to 20MHz.
External output capacitors are required to reduce the ripple & noise. The output capacitors should be low ESR and appropriate frequency response with appropriate voltage ratings, and must be located as close to the converters as possible, also PCB layout must be taken into consideration.

INPUT UNDERVOLTAGE SHUTDOWN AND START-UP THRESHOLD

Once operating, module will not turn off until the input voltage drops below the Undervoltage Shutdown threshold. Subsequent re-start will not occur until the input is brought back up to the Start-Up Threshold. This built in hysteresis prevents any unstable on/off situations from occurring at a single input voltage.

CURRENT LIMITING

The maximum current limit remains constant as the output voltage drops. However, once the

Technical Notes

impedance of the short across the output is small enough to make the output voltage drop below the specified Output Current Limit Shutdown Voltage, the converter turns off.
The converter then enters into “hiccup mode” where it repeatedly turns on and off until the short circuit condition is removed. This prevents excessive heating of the converter or the load board.

SHORT CIRCUIT CONDITION

When the converter is in current-limit mode, the output voltage will drop as the output current demand increases and then the converter will be shut down. If the short-circuit condition persists, another shutdown cycle will be initiated. This on/off cycling is referred to as "hiccup" mode. The hiccup cycling reduces the average output current, thereby preventing internal temperatures from rising to excessive levels. The module is capable of enduring an indefinite short circuit output condition.

Density Power Group.
Queens, New York City, New York, U.S.A