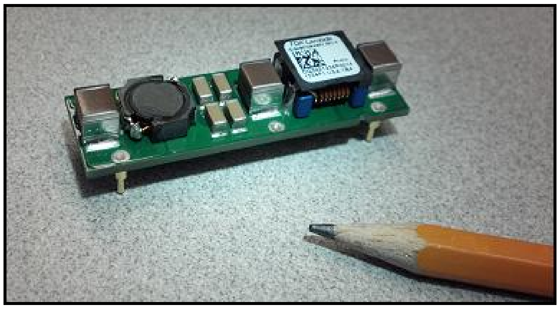
iDQ Series Filter Module
75V Input, 10A Output



iDQ48 filter modules are designed to help reduce differential and common mode conducted emissions from high frequency switching power supplies. The modules take advantage of TDK component technology and help simplify system level compliance with FCC and CISPR standards. Convenient surface mount and through-hole mounting options make iDQ filter modules an ideal choice for almost any application.

Features
- Size – 50 mm x 15 mm x 10.8mm (2.0 in. x 0.59 in. x 0.43 in.)
- Through Hole Pins (3.7mm / 0.145”)
- Maximum weight 11.3g (0.4 oz)
- High on board capacitance, minimizes need for additional external components and provides exceptional differential mode filtering
- Low Power Loss
- 1500V isolation to allow for flexible grounding configurations
- ISO Certified manufacturing facilities

Optional Features
- Surface Mount Terminals

Ordering information:

Product Identifier	Package Size	Platform	Input Voltage	Output Current/ Power	Units	Main Output Voltage	# of Outputs		Safety Class	Feature Set		RoHS Indicator
i	D	Q	48	010	A	480	V	-	0	02	-	R
TDK-Lambda	50 x 15 mm	iDQ	0 to 75V	010- 10	Amps	0 to 75	Single			See option table		R=RoHS Compliant

Option Table:

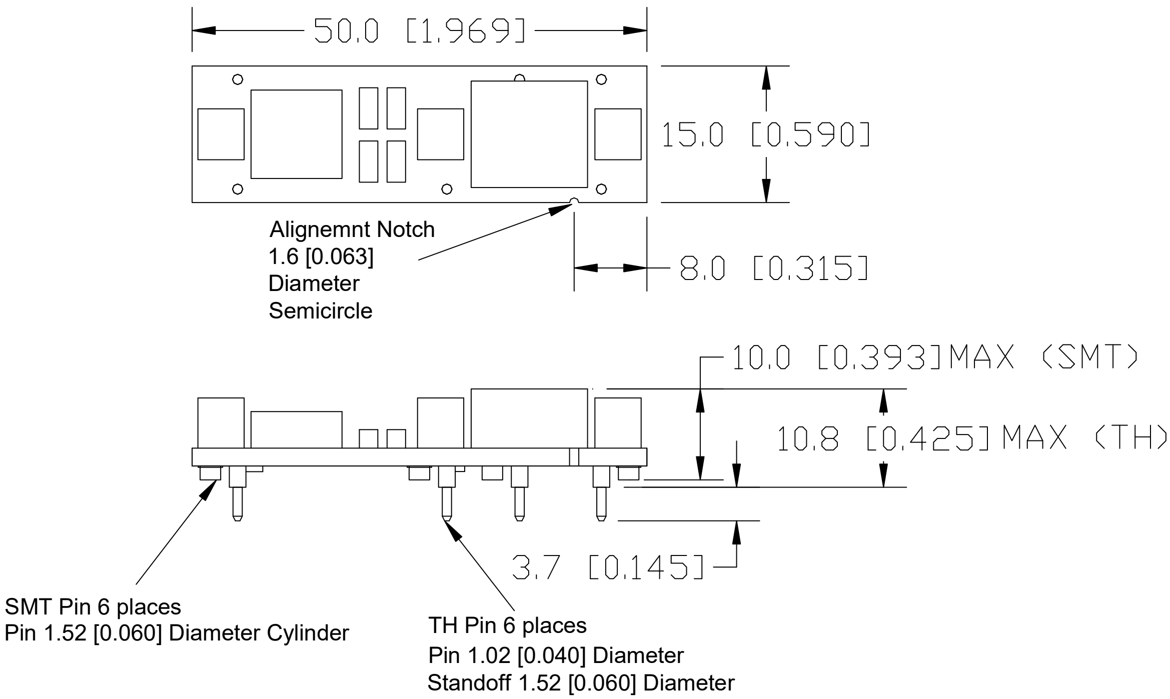
Feature Set	SMT terminals	Thru-hole pins 0.145" tail length	Pin 6 populated
01	X		X
02 (standard)		X	
03		X	X

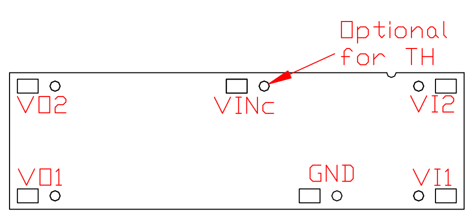
Product Offering:

Code	Input Voltage	Output Current
iDQ48010A480V	0 – 75V	10A

Mechanical Specification:

Dimensions are in mm [in]. Unless otherwise specified tolerances are: x.x ± 0.5 [0.02], x.xx ± 0.25 [0.010]





Pin Side

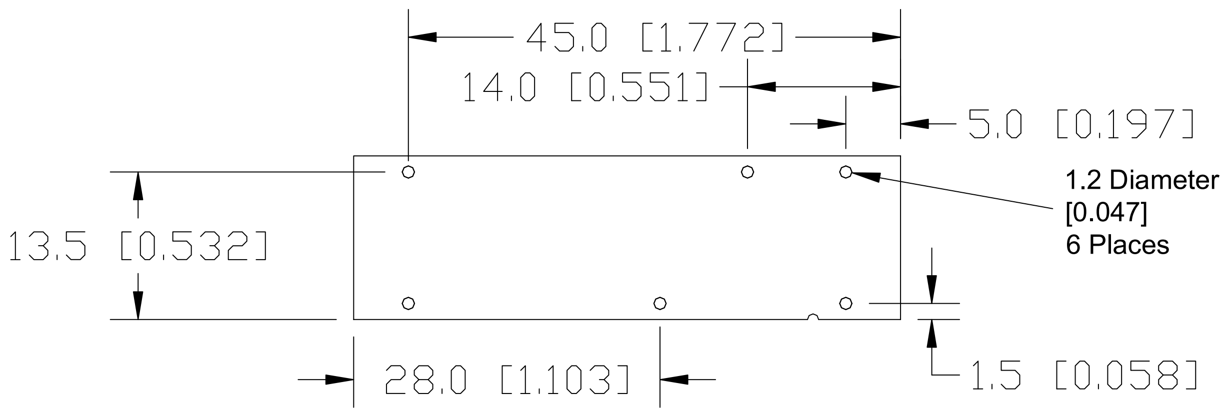
Pin Assignment:

PIN	FUNCTION
1 -VI1	Vin (-), connect to power source
2 - VI2	Vin (+), connect to power source
3 -GND	GND
4 -VO1	VOUT (-), connect to power module to be filtered Vin(-) terminal
5 -VO2	VOUT (+), connect to power module to be filtered Vin(+) terminal
6- VINc*	connect optional external capacitor for additional common mode filtering

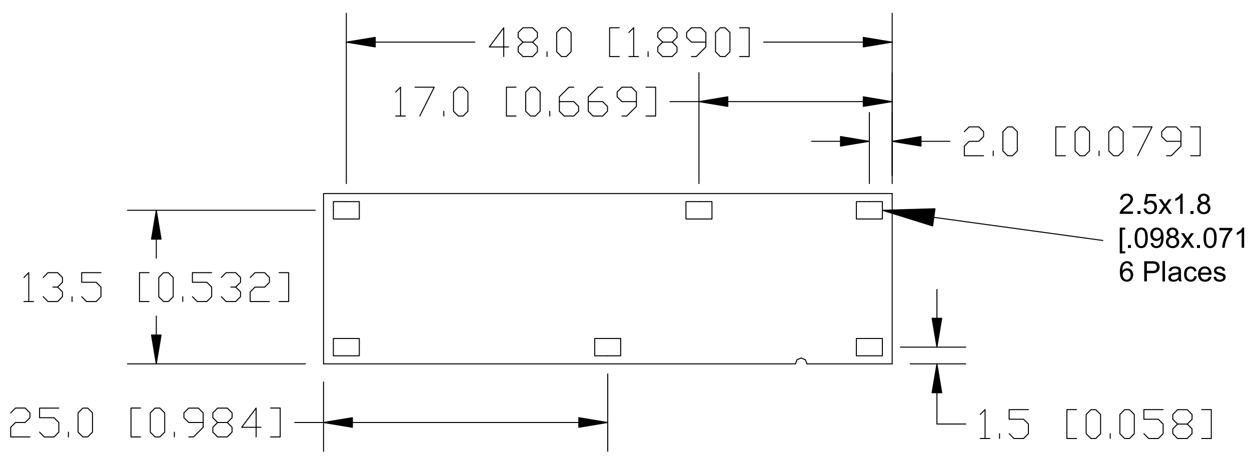
* Pin 6 not populated for -002 through-hole version
SMT pins are copper with gold over nickel plating
Through-hole pins are brass with gold over nickel plating

Recommended Footprint (top view):

Through-hole pin option:



SMT terminal option:



Absolute Maximum Ratings:

Stress in excess of Absolute Maximum Ratings may cause permanent damage to the device.

Characteristic	Min	Max	Unit	Notes & Conditions
Continuous Input Voltage	-0.25	75	Vdc	
Transient Input Voltage (100mS)		100	V	
Isolation Voltage (Ground to other terminals)		1500	V	
Storage Temperature	-55	125	˚C	
Operating Temperature Range (Tc)	-40	120*	˚C	Measured at the location specified in the thermal measurement figure; maximum temperature varies with output current – see curve in the thermal performance section of the data sheet.

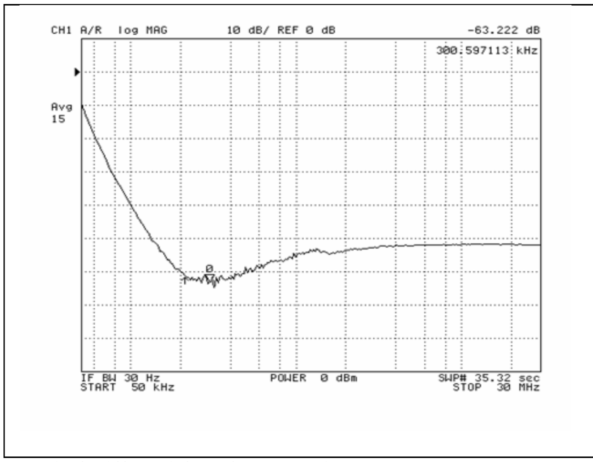
* Engineering estimate

Electrical Characteristics:

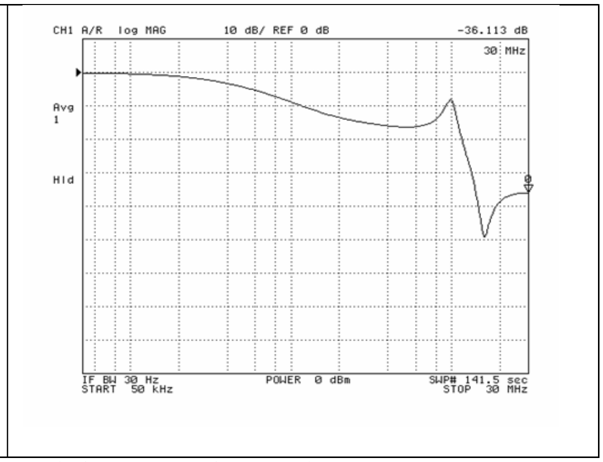
Unless otherwise specified, specifications apply over all rated Input Voltage, Resistive Load, and Temperature conditions.

Characteristic	Min	Typ	Max	Unit	Notes & Conditions
Resistance Positive Leg	---	11.5	---	mohm	
Resistance Negative Leg	---	6.5	---	mohm	
Inrush Transient	---	---	0.4	A^2s	
Maximum Current	---	---	10	A	
Differential Mode Attenuation at 300 KHz	---	63	---	dB	50 ohm source & load impedance
Common Mode Attenuation at 30 MHz	---	36	---	dB	50 ohm source & load impedance

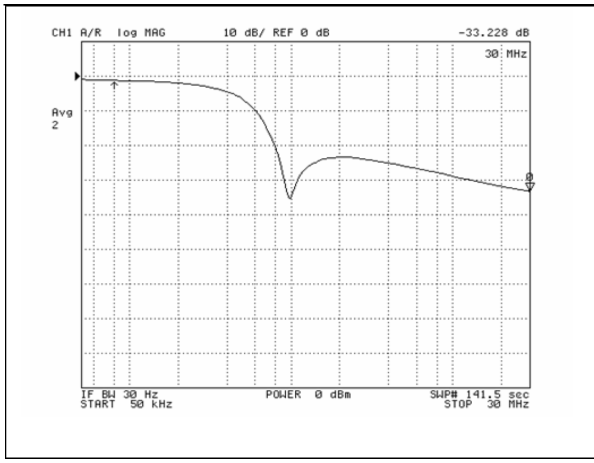
Electrical Characteristics:



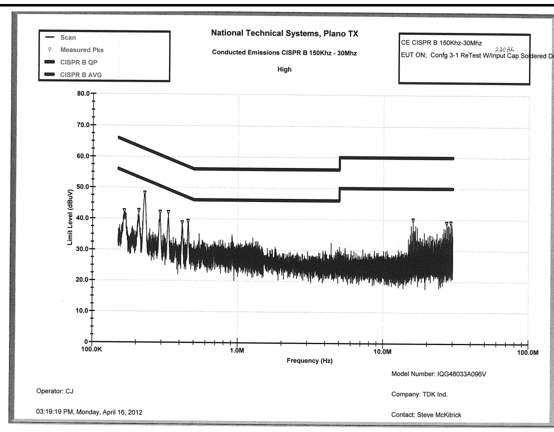
Typical Differential Mode Attenuation



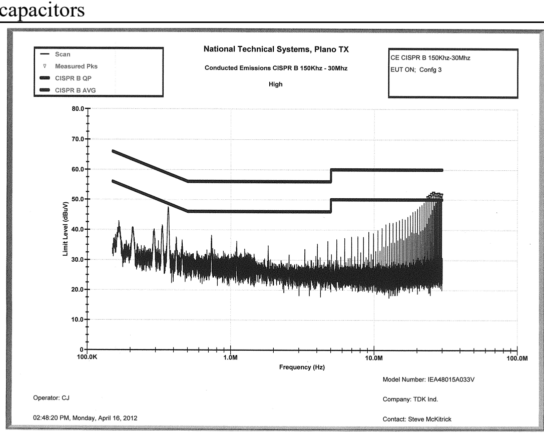
Typical Common Mode Attenuation



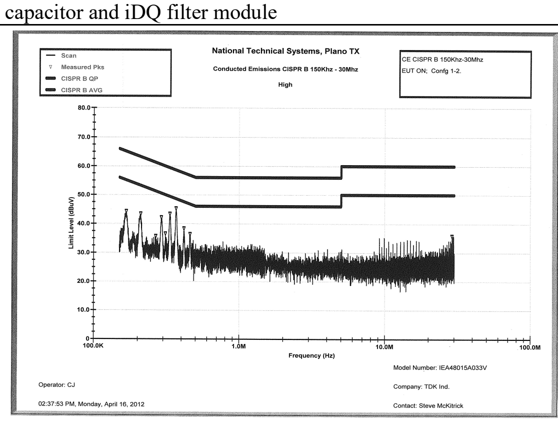
Typical Common Mode Attenuation w/ additional external 1uF capacitors



iQG48033A096V conducted emissions with 220uF bulk input capacitor and iDQ filter module

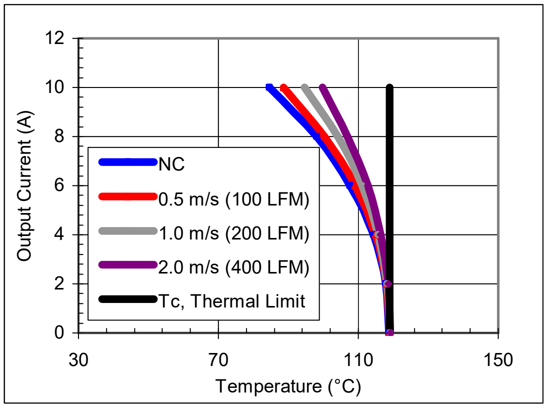


iEA48015A033V conducted emissions with iDQ filter module and no additional external components

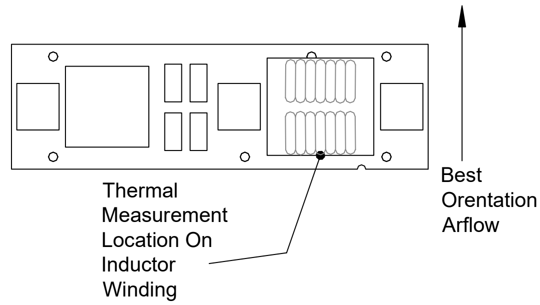


iEA48015A033V conducted emissions with iDQ filter module and supplemental 0.1uF y-capacitors

Thermal Performance:



Maximum output current vs. ambient temperature at nominal input voltage for natural convection (60lfm) with airflow from pin 1 to pin 2.

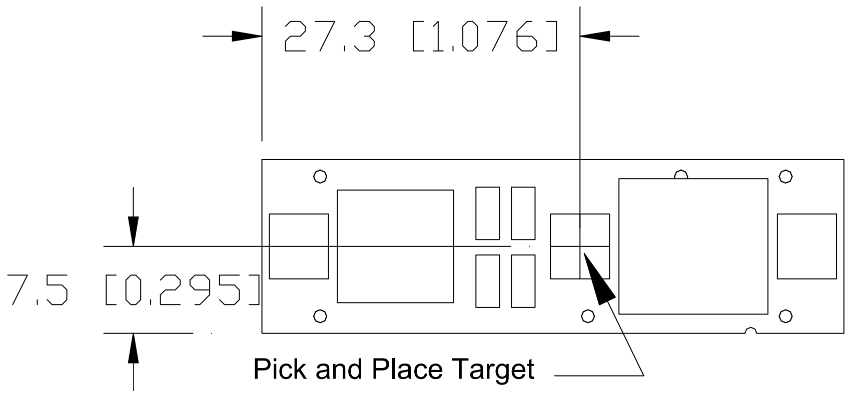


iDQ48010A480V thermal measurement location – top view

The thermal curves provided are based upon measurements made in TDK-Lambda's experimental test setup that is described in the Thermal Management section. Due to the large number of variables in system design, TDK-Lambda recommends that the user verify the module's thermal performance in the end application. The critical component should be thermo coupled and monitored, and should not exceed the temperature limit specified in the derating curve above. It is critical that the thermocouple be mounted in a manner that gives direct thermal contact or significant measurement errors may result. TDK-Lambda can provide modules with a thermocouple pre-mounted to the critical component for system verification tests.

Soldering Information:

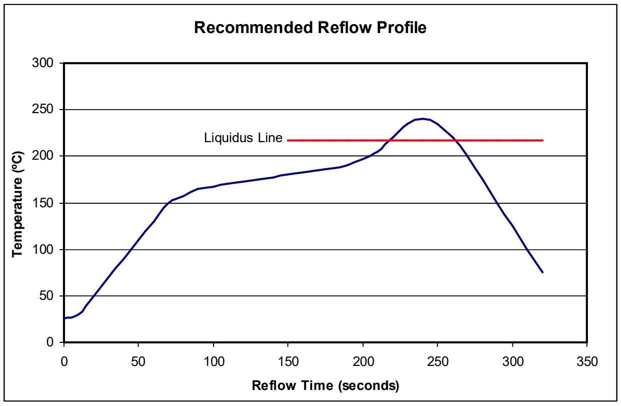
iDQ surface mountable filter modules are intended to be compatible with standard surface mount component soldering processes and either hand placed or automatically picked and placed. The figure below shows the position for vacuum pick up. The maximum weight of the power module is 11.3g (0.4 oz.). Improper handling or cleaning processes can adversely affect the appearance, testability, and reliability of the power modules. The iDQ product is a moisture sensitivity level 2 device. Contact TDK-Lambda technical support for guidance regarding proper handling, cleaning, and soldering of TDK-Lambda's power modules.



Reflow Soldering

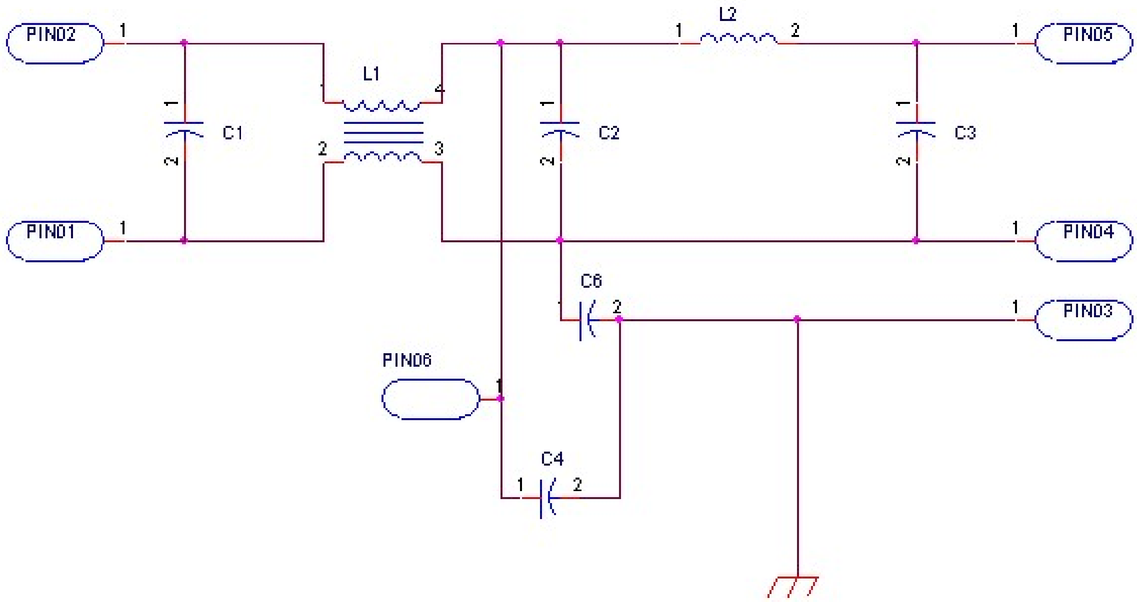
The iDQ platform is an open frame filter module manufactured with SMT (surface mount technology). Due to the high thermal mass of the module and sensitivity to heat of some SMT components, extra caution should be taken when reflow soldering. Failure to follow the reflow soldering guidelines described below may result in permanent damage and/or affect performance of the filter modules.

The iDQ filter modules can be soldered using natural convection, forced convection, IR (radiant infrared), and convection/IR reflow technologies. The module should be thermally characterized in its application to develop a temperature profile. Thermal couples should be mounted to terminal 3 and terminal 4 and be monitored. The temperatures should be maintained below 260 degrees. Oven temperature and conveyer belt speeds should be controlled to ensure these limits are not exceeded. In most manufacturing processes, the solder paste required to form a reliable connection can be applied with a standard 6 mil stencil.



iDQ Module suggested reflow-soldering profile

Simplified Schematic



When combined with an isolated dc-dc power module, the iDQ filter typically produces a sixth order filter configuration that results in dramatically higher differential noise attenuation compared to other filters available in the market.

Additional capacitance can be placed between pin 3 and pin 6, and also between pin 4 and pin 3 in order to increase the common mode noise attenuation. The on board capacitors are 1500V minimum devices, but lower rated parts may be acceptable in many applications depending on the grounding configuration and system safety requirements. A plot showing common mode attenuation data with 1uF capacitors in both locations is provided on the electrical data page of the data sheet.

The high value TDK ceramic capacitors help to avoid input filter oscillations that can be problematic with competitive solutions' highly inductive filter designs. For applications below 100W, C3 is typically sufficient to ensure system stability without additional bulk capacitors. For higher power applications, an additional bulk electrolytic capacitance on the order of 1uF / W is recommended at the input to the dc-dc power module.

The filter will not be damaged by reverse input voltage or by applying voltage at the output pins. Although thermally the filter can supply 10A in many applications, the filtering performance may start to be degraded to some extent as load current moves beyond 8A. In all applications, but particularly high current applications, the thermal and electrical performance should be confirmed in the end application.

Thermal Management:

An important part of the overall system design process is thermal management; thermal design must be considered at all levels to ensure good reliability and lifetime of the final system. Superior thermal design and the ability to operate in severe application environments are key elements of a robust, reliable module.

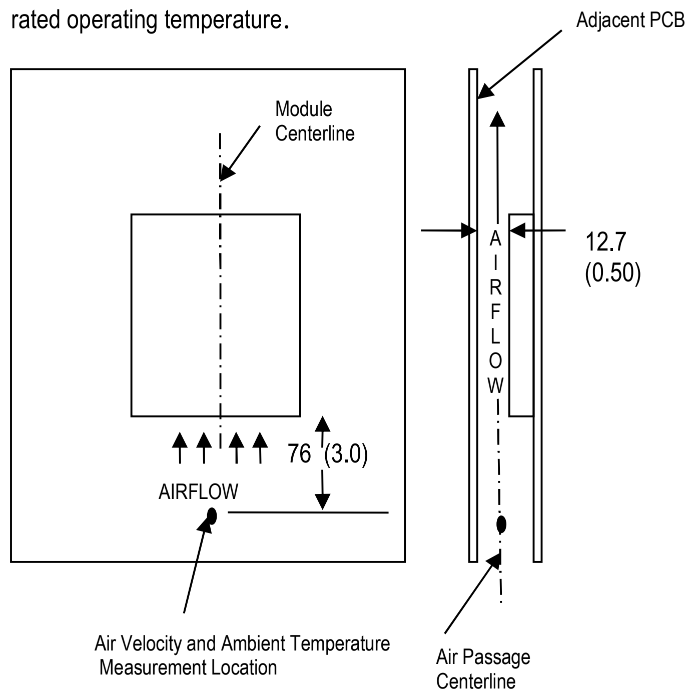
A finite amount of heat must be dissipated from the filter module to the surrounding environment. This heat is transferred by the three modes of heat transfer: convection, conduction and radiation. While all three modes of heat transfer are present in every application, convection is the dominant mode of heat transfer in most applications. However, to ensure adequate cooling and proper operation, all three modes should be considered in a final system configuration.

The open frame design of the filter module provides an air path to individual components. This air path improves convection cooling to the surrounding environment, which reduces areas of heat concentration and resulting hot spots.

Test Setup: The thermal performance data of the filter module is based upon measurements obtained from a wind tunnel test with the setup shown in the wind tunnel figure. This thermal test setup replicates the typical thermal environments encountered in most modern electronic systems with distributed power architectures. The electronic equipment in networking, telecom, wireless, and advanced computer systems operates in similar environments and utilizes vertically mounted PCBs or circuit cards in cabinet racks.

The module, as shown in the figure, is mounted on a printed circuit board (PCB) and is vertically oriented within the wind tunnel. The cross section of the airflow passage is rectangular. The spacing between the top of the module and a parallel facing PCB is kept at a constant (0.5 in). The module's orientation with respect to the airflow direction can have a significant impact on the module's thermal performance.

Thermal Derating: For proper application of the module in a given thermal environment, output current derating curves are provided as a design guideline on the Thermal Performance section for the module of interest. The module temperature should be measured in the final system configuration to ensure proper thermal management of the module. For thermal performance verification, the module temperature should be measured at the component indicated in the thermal measurement location figure on the thermal performance page for the module of interest. In all conditions, the module should be operated below the maximum operating temperature shown on the derating curve. For improved design margins and enhanced system reliability, the module may be operated at temperatures below the maximum rated operating temperature.



Wind Tunnel Test Setup Figure Dimensions are in millimeters and (inches).

Heat transfer by convection can be enhanced by increasing the airflow rate that the module experiences. The maximum output current of the module is a function of ambient temperature (T_{AMB}) and airflow rate as shown in the thermal performance figures on the thermal performance page for the module of interest. The curves in the figures are shown for natural convection through 2 m/s (400 ft/min). The data for the natural convection condition has been collected at 0.3 m/s (60 ft/min) of airflow, which is the typical airflow generated by other heat dissipating components in many of the systems that these types of modules are used in. In the final system configurations, the airflow rate for the natural convection condition can vary due to temperature gradients from other heat dissipating components.

Reliability:

The modules are designed using TDK-Lambda's stringent design guidelines for component derating, product qualification, and design reviews. The MTBF is calculated to be greater than 40M hours at full output power and Ta = 40˚C using the Telcordia SR-332 calculation method.

Quality:

TDK-Lambda's product development process incorporates advanced quality planning tools such as FMEA and Cpk analysis to ensure designs are robust and reliable. All products are assembled at ISO certified assembly plan.

Warranty:

TDK-Lambda's comprehensive line of power solutions includes efficient, high-density DC-DC converters. TDK-Lambda offers a three-year limited warranty. Complete warranty information is listed on our web site or is available upon request from TDK-Lambda.

Safety Considerations:

As of the publishing date, certain safety agency approvals may have been received on the iDQ series and others may still be pending. Check with TDK-Lambda for the latest status of safety approvals on the iDQ product line.

For safety agency approval of the system in which the filter module is installed, the module must be installed in compliance with the creepage and clearance requirements of the safety agency.

To preserve maximum flexibility, the filter modules are not internally fused. An external input line normal blow fuse with a maximum value of 20A is required by safety agencies. A lower value fuse can be selected based upon the maximum dc input current and inrush energy of the filter module.