QUARTER-BRICK SERIES
Unregulated Output

Embedded Power for
Business-Critical Continuity

QUARTER-BRICK SERIES

Total Power: **450W**
Input Voltage: **42-53Vdc**
# of Outputs: **Unregulated Output**

Special Features

- 48 V Input with isolated 12 V output
- Ultra-high efficiency, 95.5% @ 37.5 A output
- Low profile, 0.40 in (10.2 mm) height
- Industry standard 1/4 brick footprint
- Wide operating ambient temperature range, -40 °C to +85 °C
- Narrow input range: 42 Vdc to 53 Vdc
- 4 to 1 Fixed Input to Output Ratio
- Overvoltage and overtemperature protection
- Remote ON/OFF
- Approvals to EN60950-1 VDE and UL/cUL60950-1
- Monotonic startup into normal and prebiased loads
- Basic insulation
- Parallelable with droop current share
- Available RoHS compliant
- 2 year warranty

NOTICE SOME MODELS LISTED IN THIS DOCUMENT HAVE BEEN DISCONTINUED

Please contact your local Artesyn representative or use the on line model number search tool at http://www.artesyn.com/powergroup/products.htm to find a suitable alternative.

The fixed ratio Quarter Brick Intermediate Bus Converter (IBC) is a new high efficiency, open-frame, 450 W isolated converter in an industry standard quarter-brick footprint. This IBC provides an extremely energy efficient, cost effective solution for the main on-board power source in 12 Vdc distributed power systems. In these systems, the IBC is intended primarily for powering multiple downstream non-isolated point-of-load (POL) converters. Operating from a 42 Vdc to 53 Vdc supply, this new converter provides a high power density (337 W/in3) solution for high-end application design requirements where high output current at 12 volts is required. The converter architecture takes advantage of open-frame construction to provide a low mass and low thermal impedance for a single board design.

Additionally, a patent pending, full wavecoupled inductor topology yields some of the highest full load efficiencies in the industry. All Quarter-Brick IBC converters have, as standard features, remote ON/OFF capability, overcurrent, overvoltage and undervoltage protection and full international safety approval including EN60950-1 VDE and UL/cUL60950-1.

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Stresses in excess of the maximum ratings can cause permanent damage to the device. Operation of the device is not implied at these or any other conditions in excess of those given in the specification. Exposure to absolute maximum ratings can adversely affect device reliability.

Absolute Maximum Ratings

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - continuous	$V_{in\ (cont)}$	-0.3		53	V DC	$V_{in(+)} - V_{in(-)}$
Input voltage -peak/surge	$V_{in\ (peak)}$	-0.3		60	V DC	Transients of 100 ms or less, in duration
Input voltage - remote pin	$V_{rem\ (peak)}$	-0.3		20	V DC	Peaks of any duration
Operating temperature	T_{op}	-40		120	°C	Measured at hotspot
Storage temperature	$T_{storage}$	-55		125	°C	
Output power	$P_{out\ (max)}$			450	W	

All specifications are typical at nominal input Vin = 48V, and with full rated resistive load at 25˚C ambient unless otherwise specified.

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - operating	$V_{in\ (oper)}$	42	48	53	V DC	
Input current - no load	I_{in}		155	180	mA DC	$V_{in\ (nom)}$ to $V_{in\ (max)}$, enabled
Input current - quiescent	$I_{in\ (off)}$		5.5	8	mA DC	Converter disabled
Inrush current (I^2t)	I_{inrush}		0.15		A^2S	
Inrush current ratio	I_t/I_m		6.9			
Input fuse				20	A	Slow Blow/Antisurge HRC recommended 250V Rating. See Application Note 190

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$		40	42	V DC	
Input voltage - turn off	$V_{in\ (off)}$	36.5	38		V DC	
Turn on delay - enabled, then power applied	$T_{delay\ (power)}$		15	25	msec	With Remote ON/OFF signal asserted, time from when V_{in} > $V_{in\ (oper)}$ until V_{out} is within total regulation band
Turn on delay - power applied, then enabled	T_{delay}		5	8	msec	With $V_{in} = V_{in\ (nom)}$, then remote ON/OFF asserted, time until V_o is within total error band
Rise time	T_{rise}		3	6	msec	From 10% to 90%, full resistive load, no external capacitance

Signal Electrical Interface

Characteristic - Signal Name	Symbol	Min	Typ	Max	Units	Notes and Conditions
At remote ON/OFF (control) pin						**See Notes 1 and 2**
Open collector or equivalent compatible						
Control pin open circuit voltage	V_{ih}		4.6	5.0	V	I_{ih} = 0µA; open circuit voltage
High level input voltage	V_{ih}	2.4		20	V V_{ih} (min)	Converter guaranteed ON when when control pin is greater than
High level input current	I_{ih}			10	µA	Current flowing into control pin when pin is pulled high (max. at V_{ih} = 20V)
Acceptable high level leakage current	I_{ih} (leakage)			-10	µA	Acceptable leakage current from signal pin into the open collector driver (neg = from converter)
Low level input voltage	V_{il}	-0.3		0.4	V	Converter guaranteed OFF when control pin is less than V_{il} (max)
Low level input current	I_{il} (max)		-0.2	-0.3	mA	Vil = 0.0V, maximum source current from converter with short circuit

Common Protection/Control

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overtemperature shutdown threshold	T_{ots}	120	125	130	°C	Hotspot temperature, non-latching shutdown protection. See Application Note 190

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF		5.5		Million hours	Telcordia Tech. SR-332 Tamb = 25°C, Tcase = 20°C rise airflow = 400LFM, $V_{in} = V_{in}$ (nom), $I_{out} = 50\% I_{out}$ (max)

Isolation

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input to output test voltage				2,250	V DC	Test duration 1s
Input to output capacitance			1200		pF	
Input to output resistance		10			MΩ	Measured with 500VDC
Input to output insulation system			Basic			

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	f_{sw}		400		kHz	Fixed frequency (all models)

Environmental Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Thermal performance		-40		120	°C	Hotspot temperature
Altitude				3,000 9843 10,000 32,808	m ft m ft	derate total max. output current by 20% derate total max. output current by 50%

Type	Parameter	Reference	Test Level
Air temperature		IEC 60068-2-1 Ab/Ad: Cold IEC680068-2-2 Bb/Bd: Dry heat IEC 68-2-14 Nb: Rate of change	-40°C, 16h +70°C, 16h -5°C/+45°C, 0.5°C/min 2 cycles, 3h ea
Relative humidity		IEC 60068-2-56 Cb: damp heat, steady state	+35°C, 93% RH, 4 days 50% of samples powered at 10% load and 50% unpowered
Vibration		IEC60068-2-6 Fc: sinusoidal	3 axes, 5 sweeps per axis unpowered on test card Freq. range and displacement 5-9Hz, 1.2mm Freq. Range and acceleration 9-200Hz, 10m/s^2
Shock and bump		IEC 60068-2-29 Eb: bump	100 bumps each of 6 directions, mounted on powered on test card, shock spectrum half-sine, duration

EMC Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Immunity:					
ESD	Enclosure	EN61000-4-2	6kV contact 8kV air		Level 3, (output within specification) Level 3, (output within specification)
Radiated field	Enclosure	EN61000-4-3	10V/m		Level 3, (output within specification) X and Y axes
Conducted	DC power	EN61000-4-6	10V		
Input transients	DC power	ETR 283	60V		With recommended Class B external filter, no load, 10J (output remains within ±9%)

Standards Compliance List

Characteristic	
EN60950-1 UL/cUL 60950-1 VDE	1st edition

Safety Agency Approvals

Characteristic	
UL/cUL60950-1File Number	E135734
VDE Certificate Number	10401-3336-0206

Material Ratings

Characteristic - Signal Name	Notes and Conditions
Flammability rating	UL94V-0
Material type	FR4 PCB

Model Numbers

Model Number	Input Voltage	Output Voltage	Overvoltage Protection	Output Current (max.)	Typical Efficiency
IBC38AQT4812	42 - 53VDC	12V	15V	42A	95.5%

IBC38AQT4812

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		10.5	12	A DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max)}$; $V_o = V_{o\ (nom)}$
Input capacitor ripple current	$I_{in\ (ripple)}$		360 1000		mA RMS mA pk-pk	$I_{out} = I_{out\ (max)}$, measured without standard filter. See Application Note 190
Reflected ripple current	$I_{in\ (ref)}$		10 30		mA RMS mA pk-pk	$I_{out} = I_{out\ (max)}$, measured with standard filter. See Application Note 190
Input capacitance - internal	C_{input}		5.4		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}		47		µF	Recommended customer added capacitance, <0.7Ω ESR

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Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	$V_{o\ (nom)}$		12		V DC	$V_{in} = V_{in\ (nom)}$; I_{out} = 37.5A $V_o = V_{o\ (nom)}$
Total regulation band	V_o	9.7		13.4	V DC	For all line, static load and temperature until end of life
Line regulation			+10 -12.5	+12.5 -15	%	$P_{out} = P_{out\ (max)}$; $V_{in\ (nom)}$ to to $V_{in\ (max)}$ or $V_{in\ (nom)}$ to $V_{in\ (min)}$
Load regulation			±1.5	±2.0	%	$V_{in} = V_{in\ (nom)}$; 0A to 19A or 37.5A to 19A
Temperature regulation				±0.02	%/°C	$V_{in} = V_{in\ (nom)}$, I_{out} = 37.5A
Output current continuous	I_{out} I_{out} I_{out}	0 0 0		42 37.5 34	A DC A DC A DC	$V_{in} = V_{in\ (min)}$ $V_{in} = V_{in\ (nom)}$ $V_{in} = V_{in\ (max)}$
Output current - short circuit	I_{sc}		14		A rms	Continuous, unit auto recovers from short, V_o < 100mV
Load transient response - peak deviation	$V_{dynamic}$		 300 600		 mV mV	Peak deviation for 50% to 75% step load, di/dt = 100mA/µs step load, di/dt = 1A/µs
Load transient response - recovery	$T_{recovery}$		75		µs	Settling time to within 1% of output set point voltage for 50% to 75% load step
External load capacitance	C_{ext}	0		5,000	µF	Higher load capacitance values may be possible. Contact Artesyn Technologies for details
Output voltage - noise	V_{p-p} V_{rms}		50 20	100 40	mV pk-pk mV rms	Measurement bandwidth 20MHz See Application Note 190 for test set-up
Current sharing accuracy	I_{share}		±5		%	See Application Note 190

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Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage setpoint	V_{ov}	14		16	V DC	Non-latching. See Application Note 190 for details
Overcurrent limit inception	I_{oc}	41	45	49	A DC	V_o = 90% of V_o (nom), V_{in} = V_{in} (nom)

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Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	h	94.5	95.5		%	I_{out} = 100% Iout (max), V_{in} = V_{in} (nom)
Efficiency	h		95.5		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

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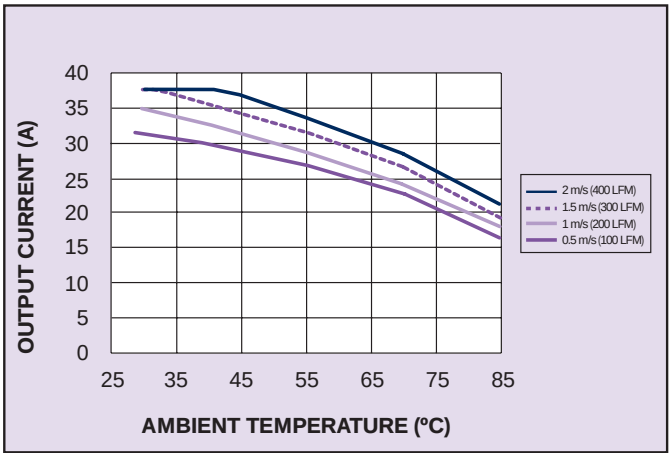

Figure 1: Derating Curve with Forced Air

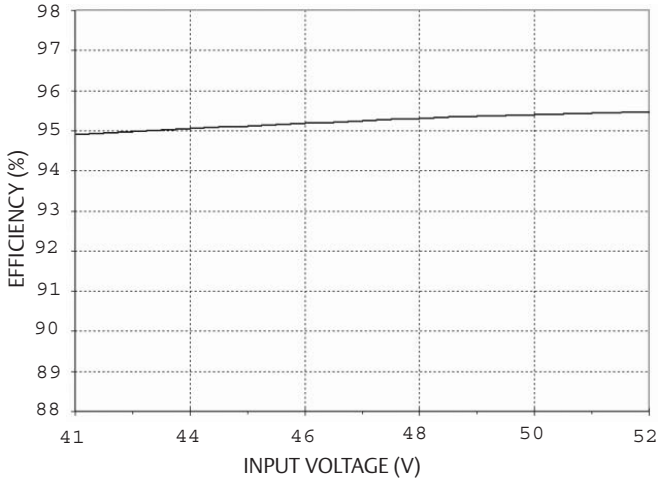

Figure 2: Efficiency vs Line

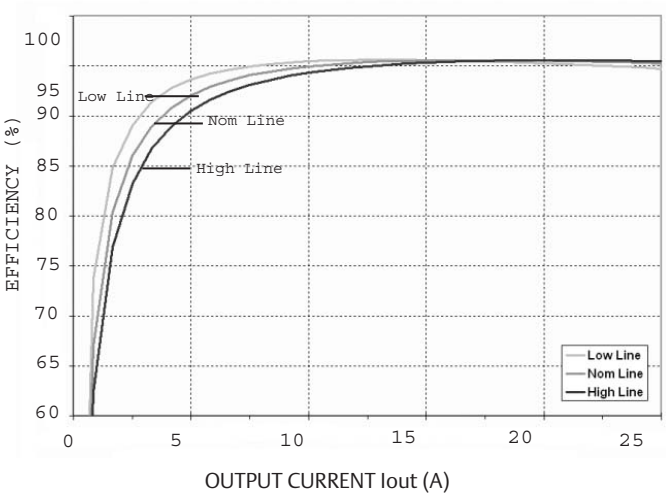

Figure 3: Efficiency vs Load

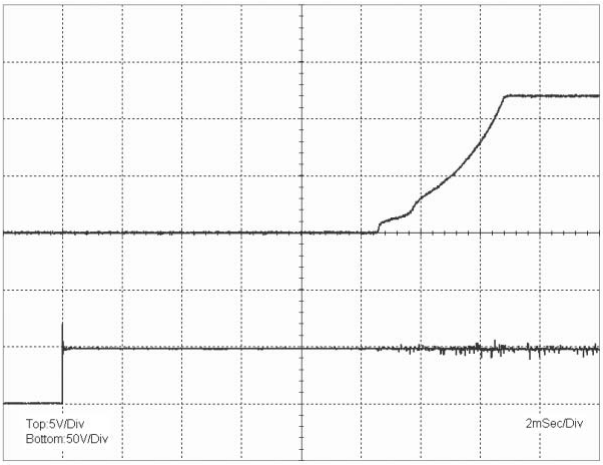

Figure 4: Turn-On Characteristic, Top (Vout), Bottom (Vin)

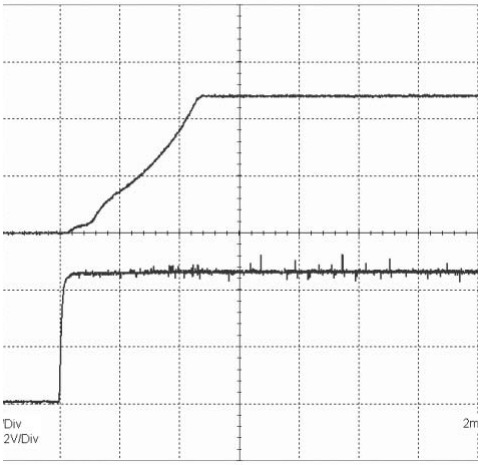

Figure 5: Control On/Off Characteristic, Top (Vout), Bottom (Remote ON/OFF)

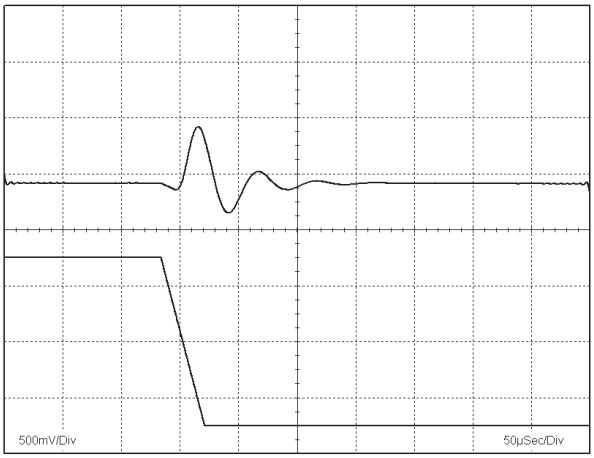

Figure 6: Typical Transient Response 75-50% Step Load Change (1A/µsec), Top (Vout) Bottom (Iout)

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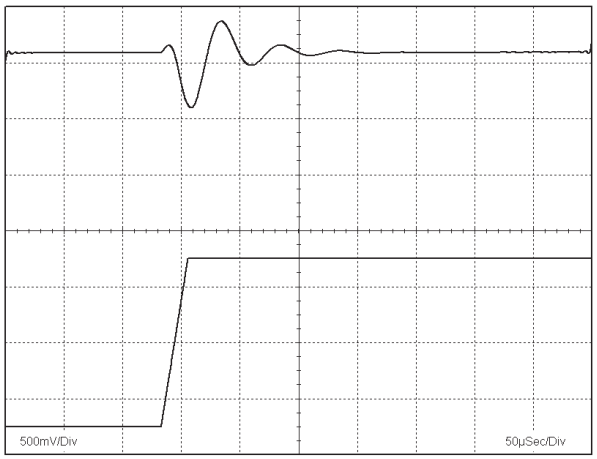


Figure 7: Typical Transient Response 50-75% Step Load Change (1A/µsec), Top (Vout) Bottom (Iout)

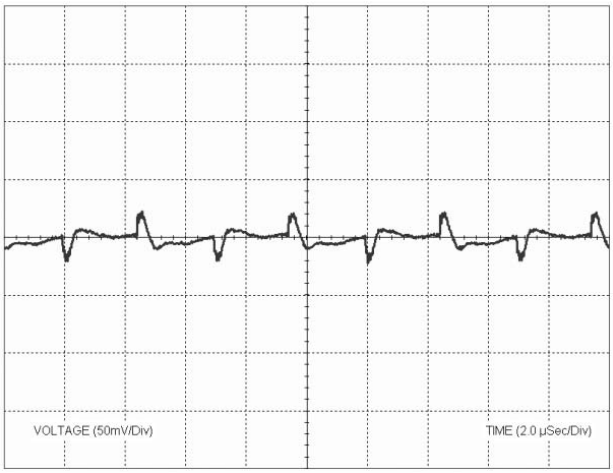


Figure 8: Typical Output Ripple and Noise Measurement

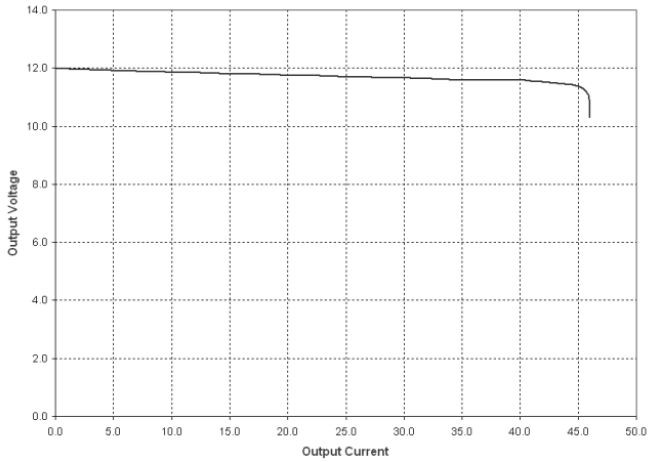


Figure 9: Current Limit Characteristic

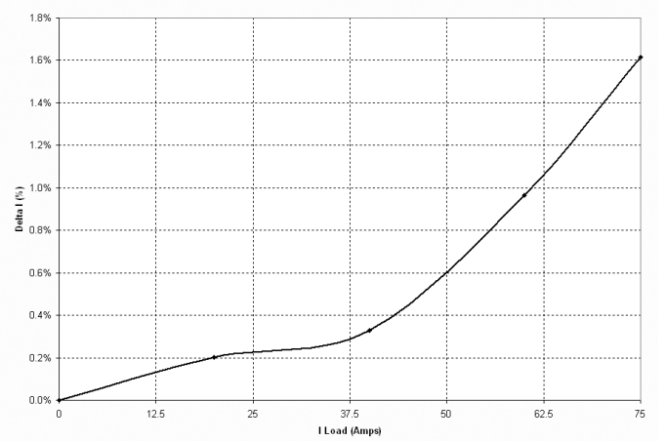
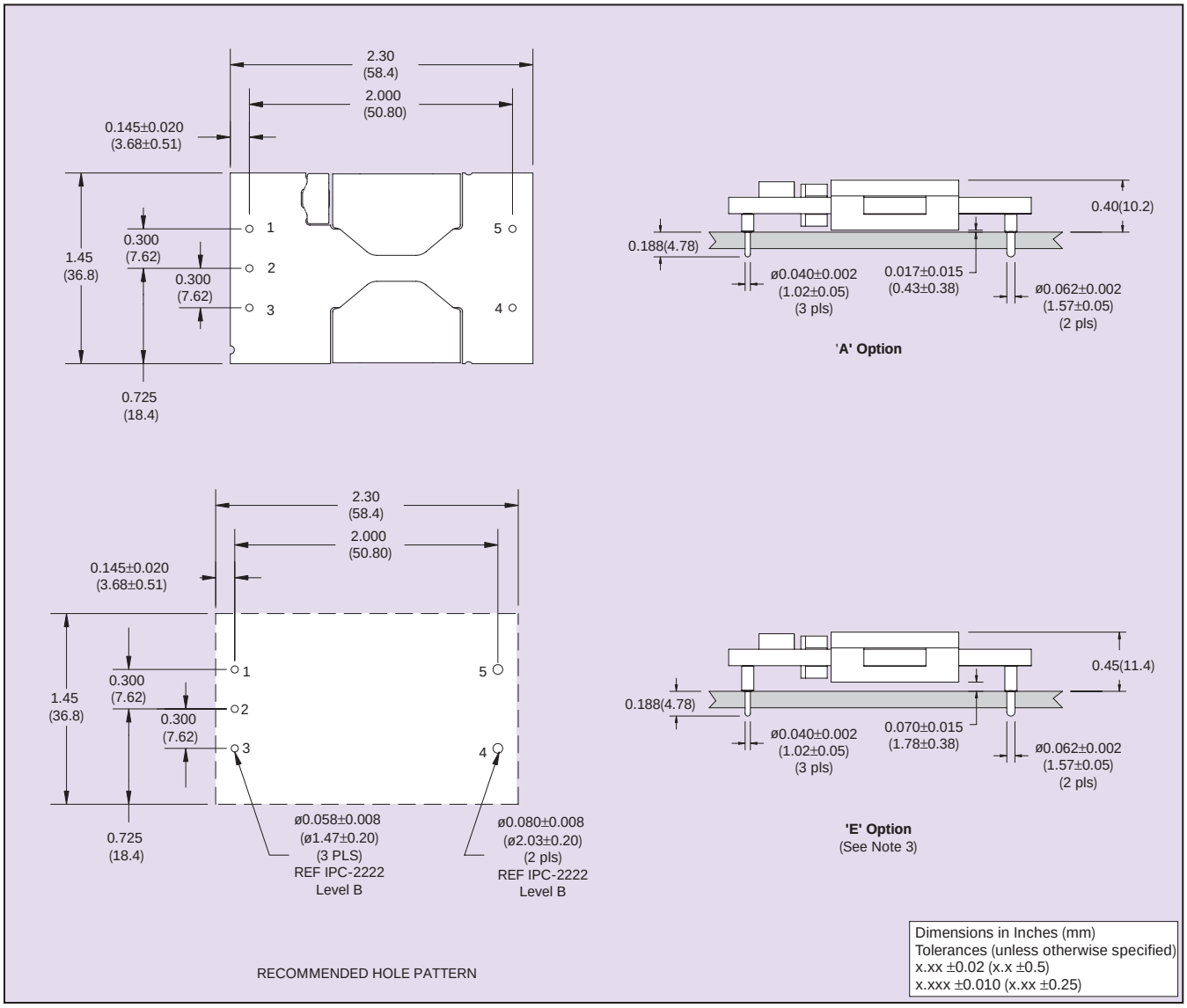


Figure 10: Current Share Accuracy

Calculated as $\Delta I\% = ((I_{load}/2\text{-}Ic)/Irc) \times 100\%$

Where: Ic = Converter's Output Current (A)
Irc = Converter's Rated Output Current (37.5A)
I_{load} = Total Load Current (A)
(See Application Note 190 for more information)



Pin Connections

Pin No.	Function
1	+Vin
2	Remote ON/OFF
3	-Vin
4	-Vout
5	+Vout

Dimension Options

Option	Clearance	Height
A	0.017±0.015 (0.43±0.38)	0.40 (10.2)
E (See Note 3)	0.070±0.015 (1.78±0.38)	0.45 (11.43)

Figure 11: Mechanical Drawing, Pinout Table and Dimension Option Table

Note 1

The remote ON/OFF pin is referenced to Vin-.

Note 2

Active low Remote ON/OFF is available. Standard product is active high. When ordering active low parts, designate with the Suffix R e.g. IBC38AQT4812-RA. See Application Note 190 for detailed information regarding ON/OFF control implementation.

Note 3

'E' option clearance is required to maintain 'Basic' creepage and clearance requirements when minimally insulated conductor paths are placed directly underneath the converter.

CAUTION: Hazardous internal voltages and high temperatures. Ensure that unit is accessible only to trained personnel. The user must provide the recommended fusing in order to comply with safety approvals.

Americas
5810 Van Allen Way
Carlsbad, CA 92008
USA
Telephone: +1 760 930 4600
Facsimile: +1 760 930 0698

Europe (UK)
Waterfront Business Park
Merry Hill, Dudley
West Midlands, DY5 1LX
United Kingdom
Telephone: +44 (0) 1384 842 211
Facsimile: +44 (0) 1384 843 355

Asia (HK)
16th - 17th Floors, Lu Plaza
2 Wing Yip Street, Kwun Tong
Kowloon, Hong Kong
Telephone: +852 2176 3333
Facsimile: +852 2176 3888

For global contact, visit:
www.astecpower.com
www.artesyn.com
technicalsupport@astec.com
technicalsupport@artesyn.com

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