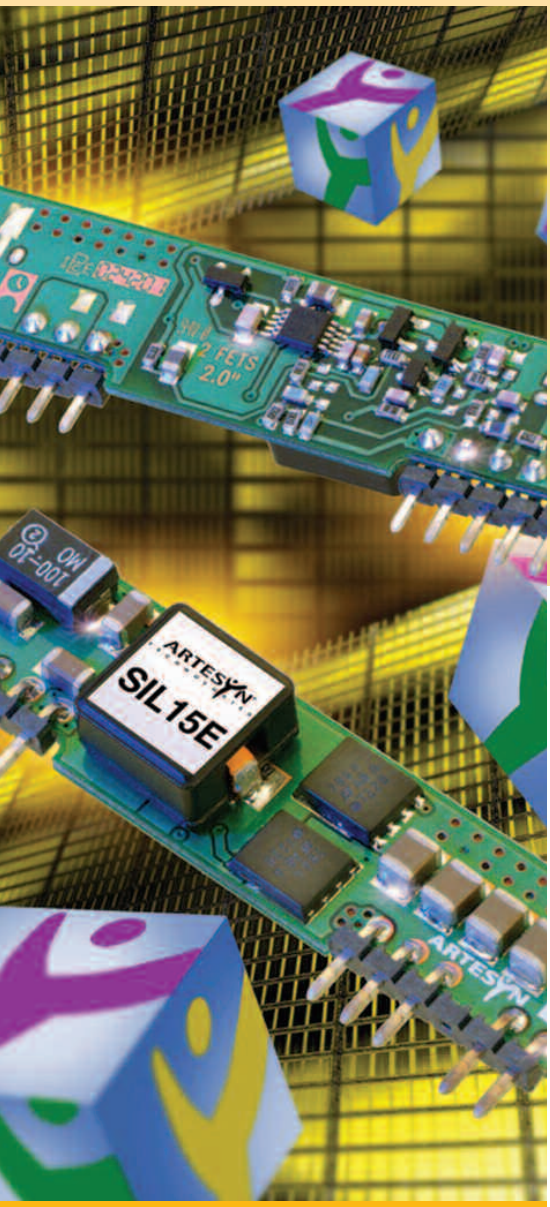
SIL15E-12V SERIES

0.8V - 3.63Vin Single output



- 15A Current rating
- Input voltage range: 10.0V - 14.0V
- Output voltage range: 0.8V - 3.63V
- Ultra high efficiency: 94% @ 12Vin and 3.3Vout
- Extremely low internal power dissipation
- Minimal thermal design concerns
- Designed in reliability: MTBF of 7,042,000 hours per Telcordia SR-332
- Ideal solution where board space is at a premium or tighter card pitch is required
- Industry standard surface-mount footprint
- Available RoHS compliant

THE SIL15E-12 series are non-isolated DC/DC converters packaged in a single-in-line footprint giving designers a cost effective solution for conversion from a 10V to 14V input to output voltages of 0.8V to 3.63V. The SIL15E-12 offers a wide outputs trim range, which allows maximum design flexibility and a pathway for future upgrades.

The SIL15E-12 is designed for applications that include distributed power, workstations, optical network and wireless applications. Implemented using state of the art surface mount technology and automated manufacturing techniques, the SIL15E-12 offers compact size and efficiencies of up to 94%

[2 YEAR WARRANTY]

ARTESYN® TECHNOLOGIES

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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		14	V DC	$V_{in}(+) - V_{in}(-)$
Input voltage - peak/surge	V_{surge}	-0.3		14.5	V DC	2s max, non-repetitive
Operating temperature	T_{op}	-40		85	°C	Measured at thermal reference points, see Note 1
Storage temperature	$T_{storage}$	-40		125	°C	
Output power (3.3V)	$P_{out\ (max)}$			49.5	W	

All specifications are typical at nominal input Vin = 12V, full load under any resistive load combination at 25°C unless otherwise stated.

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - operating	$V_{in\ (oper)}$	10	12	14	V DC	
Input current - no load	I_{in}		70	100	mA DC	V_{in} (min) - V_{in} (max), enabled
Input current - quiescent	$I_{in\ (off)}$		7		mA DC	Converter disabled
Inrush current (i^2t)	I_{inrush}		0.1		$A^2\mu s$	Complies with ETS300 132 Part 4.7, with recommended LISN
Input ripple current			60		mA rms	
Input fuse*				6	A	Slowblow/antisurge HRC recommended*

*See Application Note 142 for manufacturer and part number

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$			10	V DC	
Turn on delay - enabled, then power applied	T_{delay} (power)		35		msec	With the enable signal asserted, this is the time from when the input voltage reaches the minimum specified operating voltage until the output voltage is within the total regulation band
Turn on delay - power applied, then enabled	T_{delay} (enable)		35		msec	$V_{in} = V_{in}$ (nom), then enabled. This is the time taken until the output voltage is within the total error band
Rise time	T_{rise}		10		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/control ON/OFF pin Open collector or equivalent compatible						**See Notes 2 and 3** See Application Note 143 for Remote ON/OFF details
Control pin open circuit voltage	V_{ih}		0		V	I_{ih} = 0 µA; open circuit voltage
High level input current	I_{ih}			1	mA	Current flowing into control pin when pin is pulled high (max at V_{ih} - 5.5V)
High level input voltage	V_{ih}	1.6			Vin	Converter guaranteed ON when control pin is greater than V_{ih}(min) or open cct.
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}			0.8	V	Converter guaranteed OFF when control pin is less than V_{il} (max) volts or open cct.
Low level input current	I_{il}			20	µA	V_{il} = < 0.4 V

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF		482,000		Hours	MIL-HDBK-217F, V_{in} = $V_{in\ (nom)}$; I_{out} = $I_{out\ (max)}$; ambient 25°C; ground benign environment
Mean time between failure	MTBF		7,042,000		Hours	Telcordia SR-332
Mean time between failure	MTBF	TBA			Hours	Demonstrated. This entry will be periodically updated as the number of test hours increase

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	F_{sw}		200		kHz	Fixed frequency
Weight			6.3		g	
Coplanarity			100		µm	Measured from seating plane

Environmental Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Thermal performance		-40		85	°C	See Note 5 and individual derating curves

EMC
Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Immunity:					
Conducted immunity		EN61000-4-6			
Radiated immunity		EN61000-4-3			
ESD	Enclosure	EN61000-4-2	6kV contact 8kV air	NP	As per ETS 300 386-1 table 5

Performance criteria:

NP: Normal Performance: EUT shall withstand applied test and operate within relevant limits as specified without damage.
RP: Reduced Performance: EUT shall withstand applied test. Reduced performance is permitted within specified limits, resumption to normal performance shall occur at the cessation of the test.
LFS: Loss of Function (self recovery): EUT shall withstand applied test without damage, temporary loss of function permitted during test. Unit will self recover to normal performance after test.

Referenced ETSI standards:

ETS 300 386-1 table 5 (1997): Public telecommunication network equipment, EMC requirements
ETS 300 132-2 (1996): Power supply interface at the input to telecommunication equipment: Part 2 operated by direct current (DC)
ETR 283 (1997): Transient voltages at interface A on telecommunication direct current (DC) power distributions

Safety Agency Approvals

Standard	Category
UL/cUL CSA 22.2 UL60950	File No. E174104
TÜV Product Service EN60950	Certificate No. B 02 12 382 72 035

Material Ratings

Characteristic	Notes and Conditions
Flammability rating	UL94V-0

Model Numbers

Model Number	Input Voltage	Output Voltage	Output Current (Max.)	Typical Efficiency	Max. Load Regulation
SIL15E-12W3V3J	10.0-14.0 Vdc	0.8-3.63 Vdc	15 A	93% @ full load	±1.0%

RoHS Compliance Ordering Information

The 'J' at the end of the part number indicates that the part is Pb-free (RoHS 6/6 compliant). TSE RoHS 5/6 (non Pb-free) compliant versions may be available on special request, please contact your local sales representative for details.

W3V3 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		4.4	4.5	A DC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	I_{in} (ripple)		120		mA rms	$I_{out} = I_{out}$ (max.), measured without external filter
Input capacitance - internal filter	C_{input}		18.8		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	100			µF	Recommended customer added capacitance

W3V3 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	0.785	0.8	0.815	V DC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom)
Total regulation band	V_o		3		%	For all line, static load and temperature until end of life
Line regulation				1	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				1	%	$V_{in} = V_{in}$ (nom); I_{out} (min) to I_{out} (max)
Output current continuous	I_{out}	0		15	A DC	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}			80 25	mV pk-pk mV rms	Measurement bandwidth: 20MHz. See Application Note 142 for measurement set-up details

W3V3 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		100		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec. Measurement taken with no external capacitors
Load transient response - recovery	$T_{recovery}$		100		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load. Measurement taken with no external capacitors
External load capacitance	C_{ext}	0		10,000	µF	

W3V3 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Allowable output voltage		0.8		3.63	V	Trim up. Note that the maximum output power is still 49.5W. De-rate the maximum output current accordingly
Open sense voltage				10	%	

W3V3 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	92	93		%	I_{out} = 100% I_{out} (max), V_{in} = V_{in} (nom)
Efficiency	η	92	94		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

W3V3 Model

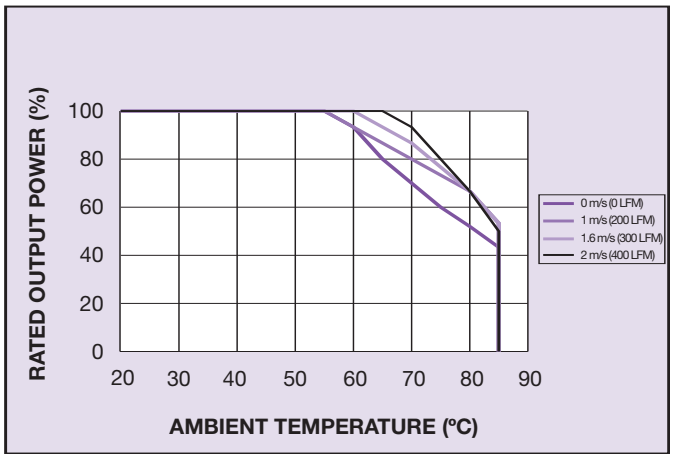


Figure 1: Derating Curve
with V_{in} = 12V and No Trim (Vout = 0.8V)

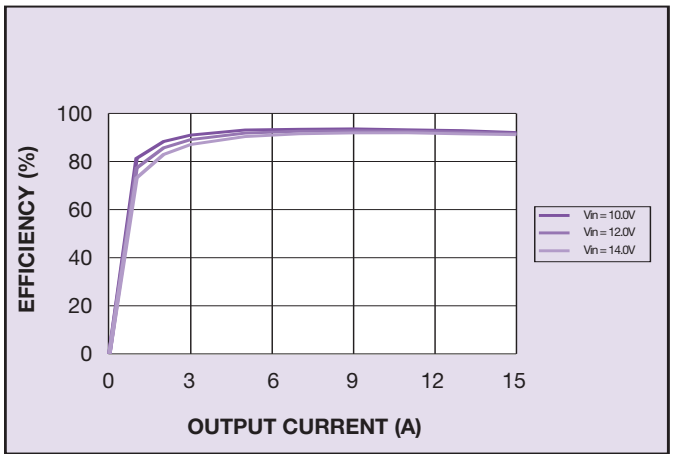


Figure 2: Efficiency vs Load

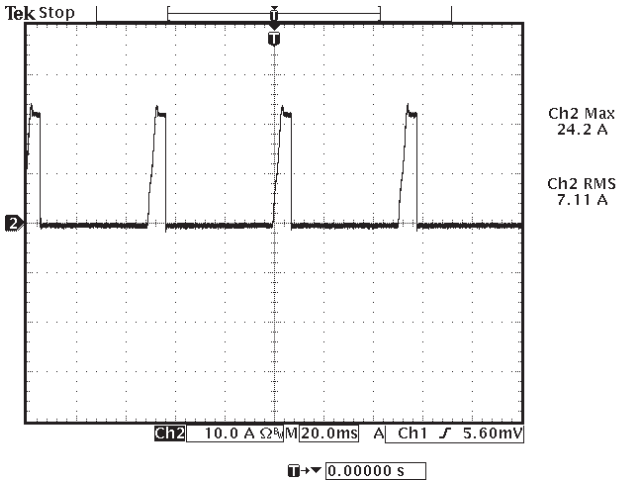


Figure 3: Short Circuit Characteristic
(Channel 2: Is/c)

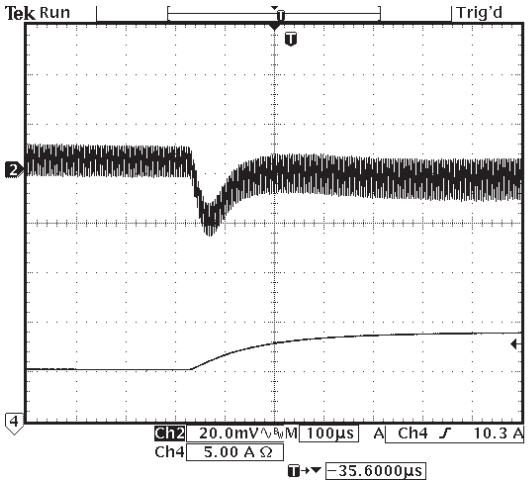


Figure 4: Typical Transient Response 50% - 75%
Step Load Change (Channel 2: Vo, Channel 4: Io)

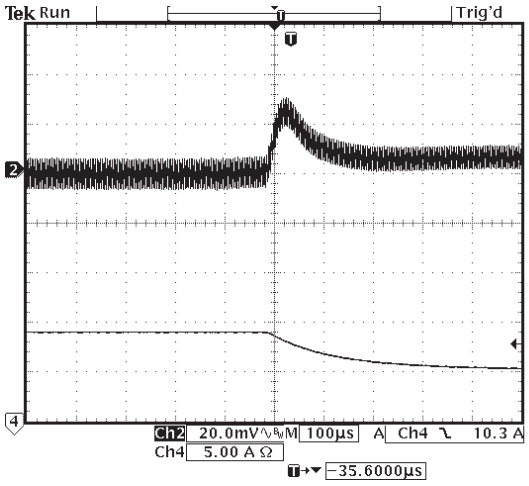


Figure 5: Typical Transient Response 75% - 50%
Step Load Change (Channel 2: Vo, Channel 4: Io)

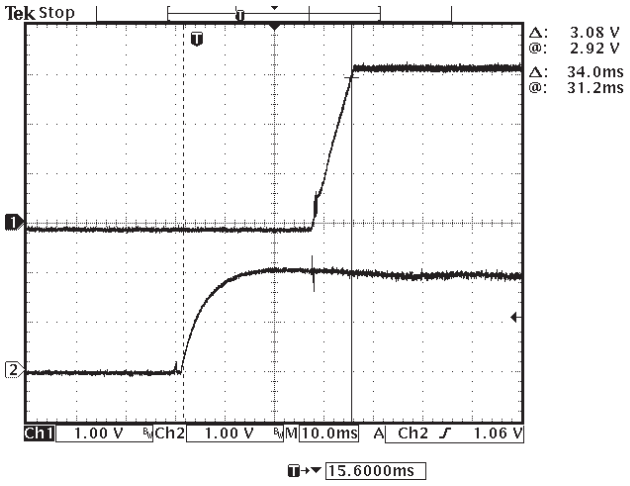


Figure 6: Typical Power-up Characteristic
(Channel 1: Vin, Channel 2: Vo)

W3V3 Model

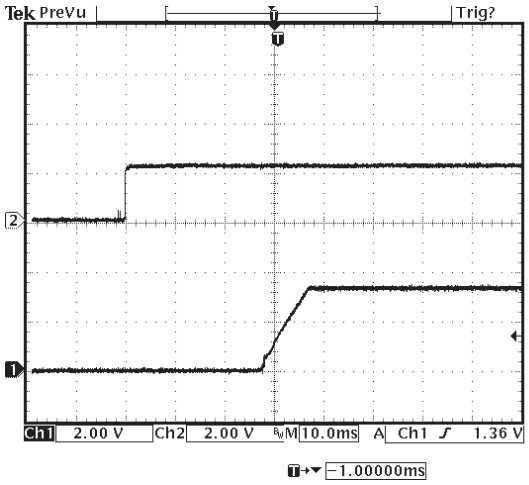


Figure 7: Control On/Off Characteristic
(Channel 1: Vo, Channel 2: Remote ON/OFF)

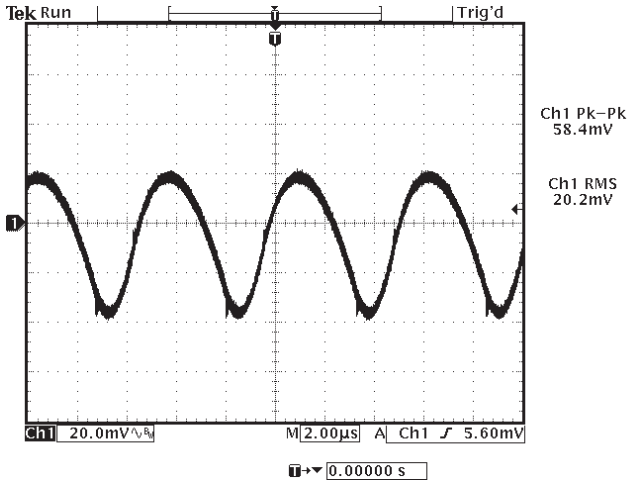
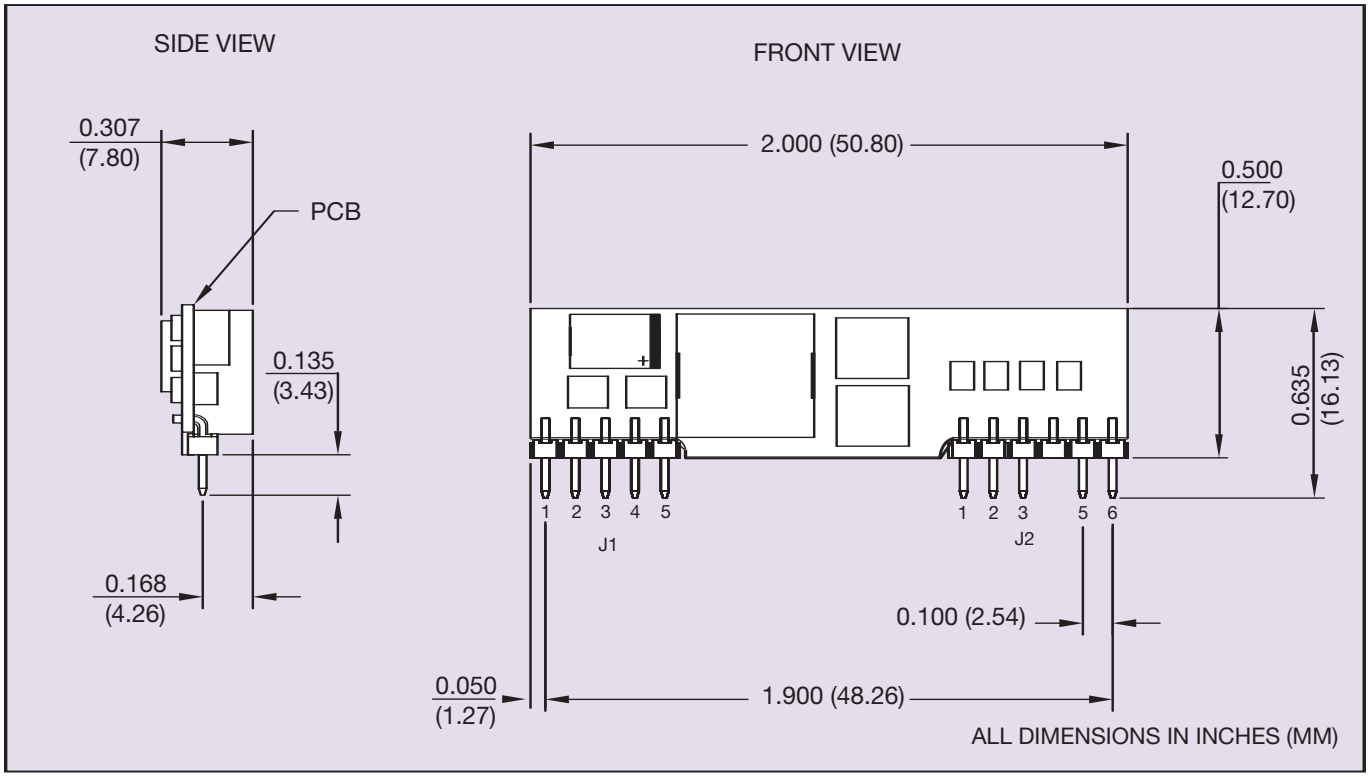


Figure 8: Typical Ripple and Noise
Vin = 12V, Vout = 3V3 and Iout = 15A (Channel 1: Vo)



Pin Connections

Pin No.	*Function*
J1-1	+Vout
J1-2	+Vout
J1-3	Remote Sense (+)
J1-4	+Vout
J1-5	Ground
J2-1	Ground
J2-2	+Vin
J2-3	+Vin
J2-4	No Pin
J2-5	Trim
J2-6	Remote ON/OFF

Figure 9: Mechanical Drawing and Pinout Table

Note 1

Thermal reference is defined as the highest temperature measured at any one of the specified thermal reference points. See Figure 10: Thermal reference points.

Note 2

The Remote ON/OFF pin is referenced to ground.

Note 3

The SIL15E-12 features an 'Active High' Remote ON/OFF operation. If not using the Remote ON/OFF pin, leave the pin open (the converter will be on). The Remote ON/OFF pin is referenced to ground.

The following conditions apply for the SIL15E:

Configuration	Converter Operation
Remote pin open circuit	Unit is ON
Remote pin pulled low [Von/off <.8V]	Unit is OFF
Remote pin pulled high [Von/off >1.6V]	Unit is ON

A an 'Active Low' Remote ON/OFF version is also possible with this converter. Please consult the factory for details.

Note 4

Thermal reference set up: Unit mounted on an edge card test board 203mm x 190mm. Test board mounted vertically. For test details and recommended set-up see Application Note 142.

Note 5

Max 55°C for full load in still air. See Application Note 142 for a detailed thermal de-rating.

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.

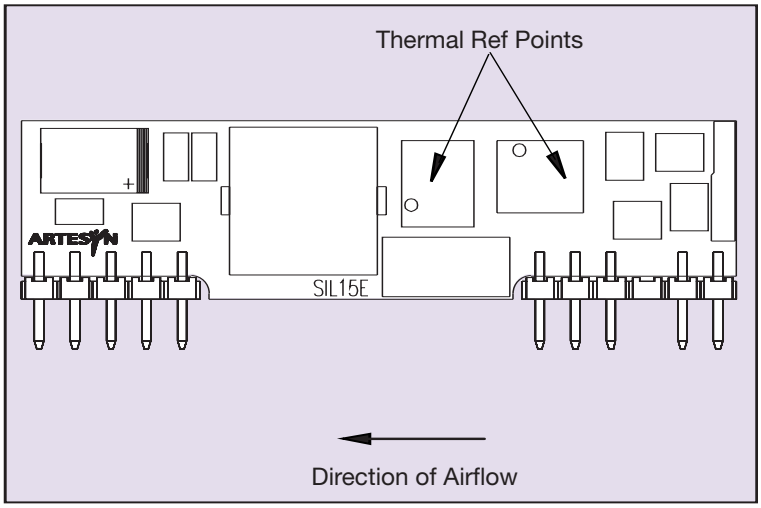


Figure 10: Thermal Reference Points

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