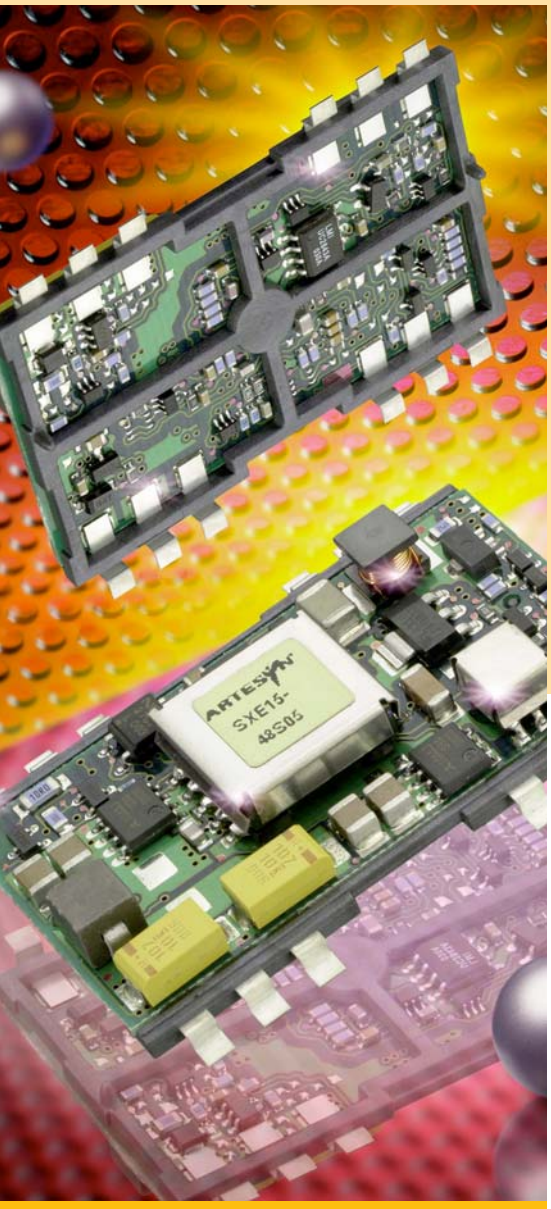
SXE15 48V SERIES

Single output



- High efficiency topology, 87% typical at 5V
- Wide operating temperature, up to and exceeding +70˚C (natural convection)
- 90% to 110% output trim
- No minimum load
- Overvoltage protection
- Remote on/off
- Approvals to EN60950 and UL/cUL1950
- Complies with ETS 300 019-1-3/2-3
- Complies with ETS 300 132-2 (input voltage and current requirements)
- Complies with ETS 300 386-1

The SXE15 is a new high efficiency open frame isolated 15 Watt converter series in an industry standard footprint. The first five models in the series feature an input voltage range of 33 to 75VDC and are available in output voltages of 12V, 5V, 3.3V, 2.5V and 1.8V. The output voltage on each model is adjustable from 90% to 110% of the nominal value. Typical efficiencies are 85% for 12V, 87% for the 5V, 86% for the 3.3V, 85% for the 2.5V and 12V and 83% for the 1.8V version. The SXE15 series has a remote on/off capability, with active 'HI' and active 'LO' options available. Overcurrent and overvoltage protection features are included as standard. With full international safety approval including EN60950 and cUL1950, the SXE15 reduces compliance costs and time to market.

[2 YEAR WARRANTY]

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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		75	V DC	$V_{in(+)}$ - $V_{in(-)}$
Input voltage - peak/surge	V_{surge}	-0.3		80	V DC	2s max, non-repetitive
Operating temperature	T_{op}	-40		115	°C	Measured at thermal reference points, see Note 1
Storage temperature	$T_{storage}$	-40		120	°C	
Output power (1.8V)	Pout (max)			10.8	W	
Output power (2.5V)	$P_{out\ (max)}$			15	W	
Output power (3.3V)	$P_{out\ (max)}$			15	W	
Output power (5V)	$P_{out\ (max)}$			15	W	

All specifications are typical at nominal input Vin = 48V, 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	$V_{in\ (oper)}$	33	33	75	V DC	
Input current - no load	I_{in}		28	35	mADC	$V_{in\ (min)}$ - $V_{in\ (max)}$, enabled
Input current - Quiescent	$I_{in\ (off)}$		20	25	mADC	Converter disabled
Input voltage variation	dv/dt			5	V/ms	Complies with ETS300 132 Part 4.4
Inrush current (i^2t)	Iinrush		300		μA^2s	Complies with ETS300 132 Part 4.7, with recommended LISN
Inrush current ratio	I_t/I_m		19.5			Complies with ETS300 132 Part 4.7, with recommended LISN
Input ripple rejection			45		dB	Frequency <1 kHz
Input fuse				2	A	Slowblow/Antisurge HRC recommended, 200V rating

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$	30	33	36	V DC	
Input voltage - turn off	$V_{in\ (off)}$	27	30	33	V DC	
Hysteresis			3		V DC	
Turn on delay - enabled, then power applied	T_{delay} (power)		1.5	4	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)		2.5	4	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}		0.6	1	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						**See Notes 2 and 3**
Open collector or equivalent compatible						See Application Note 116 for Remote On/Off detail
Control pin open circuit voltage	V_{ih}		12	13	V	I_{ih} = 0 µA; open circuit voltage
High level input current	I_{ih}			10	µA	Current flowing into control pin when pin is pulled high (max. at V_{ih} = 75V)
Acceptable high level leakage current	I_{ih} (leakage)			-50	µA	Acceptable leakage current from signal pin into the open collector driver (neg = from converter)
Low level input voltage	V_{il}	0		1.2	V	Converter guaranteed off when control pin is less than V_{il} (max)
Low level input current	I_{il}		-1.4		mA	V_{il} = 0.4 V
Low level input current	I_{il} (max)			-1.5	mA	V_{il} = 0.0 V

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF	600,000			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	1,500,000			Hours	per Bellcore TR-NWT-000332 Issue 3, ground benign, temp. = 40°C, V_{in} = $V_{in\ (nom)}$, I_{out} = I_{out} (max)
Mean time between failure	MTBF	1,790,000			Hours	Demonstrated.
Expected service life					Years	

Isolation

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input to output test voltage				1500	V DC	Test duration 1s
Input to output capacitance			1000		pF	
Input to output resistance		100			MΩ	Measured with 500 V DC
Input to output insulation system			Operational			

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	F_{sw}		265		kHz	Fixed frequency (all models)
Weight			12		g	

Environmental Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Thermal performance						
1V8 and 2V5 models		-40		70	ºC	See Notes 1, 4 and
3V5 and 5V models		-40		65	ºC	individual derating curves

Type	Parameter	Reference	Test Level	Notes and Conditions
Air temperature	Low	IEC 68-2-1	-40ºC	All characteristics and parameters
	High	IEC 68-2-2	+70ºC	extracted from ETS 300 019
	Change	IEC 68-2-14	-40ºC to +70ºC	classes 3.1, 3.2, 3.3, 3.4 and 3.5
				$T_{max.}$ = +70ºC for T3.4
Relative humidity	Low		10%	
	High	IEC 68-2-56	100%	
	Condensation	IEC 68-2-30	90 to 100%	
Vibration IEC Class 3M5	Freq. velocity	IEC 68-2-6	5-9Hz 5mm/s	
	Freq. acceleration	IEC 68-2-6	9-200Hz 1g	
Shock IEC Class 3M5	Acceleration	IEC 68-2-29	10g	

Referenced ETSI standards:

ETS 300 019: Environmental conditions and environmental tests for telecommunications equipment
ETS 300 019: Part 1-3 (1997) Classification of environmental conditions stationary use at weather protected locations
ETS 300 019: Part 2-3 (1997) Specification of environmental tests stationary use at weather protected locations

EMC
Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Immunity:					
ESD	Enclosure	EN61000-4-2	6kV contact 8kV air		As per ETS 300 386-1 table 5
EFT	DC power	EN61000-4-4	2kV 4kV		As per ETS 300 386-1 table 5
	Signal	EN61000-4-4	1kV 2kV		As per ETS 300 386-1 table 5
Radiated field	Enclosure	EN61000-4-3	10V/m		As per ETS 300 386-1 table 5
Conducted	DC power	EN61000-4-6	10V		As per ETS 300 386-1 table 5
	Signal	EN61000-4-6	10V		Signal line assumed < 3m in length
Input transients	DC power				ETS 300 132, ETR 283

EMC
Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Emission:					
Conducted	DC power	EN55022	Level A		With recommended external filter for compliance bandwidth 20 kHz to 30 MHz, as per ETS 300 386-1. See Application Note 116 for details
		EN55022	Level B		With recommended external filter for compliance bandwidth 20 kHz to 30 MHz, as per ETS 300 386-1. See Application Note 116 for details
	Signal	EN55022	Level B		Bandwidth 150kHz to 30MHz, as per ETS 300 386-1
Radiated		EN55022	Level B		Bandwidth 30 MHz to 1 GHz, as per ETS 300 386-1

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

Standards Compliance List

Standard	Category
EN60950	2000
UL/cUL 1950	3rd edition
TÜV Rheinland	EN60950:2000

Safety Agency Approvals

Characteristic	
UL/cUL 1950 File Number	E135734
TÜV Rheinland Certificate No.	R2074133

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	Max. Load Regulation
SXE15-48S1V8	33-75 VDC	1.8V	2.3V	6A	83%	2.0%
SXE15-48S2V5	33-75 VDC	2.5V	3.2V	6A	85%	1.5%
SXE15-48S3V3	33-75 VDC	3.3V	4V	4.5A	86%	0.5%
SXE15-48S05	33-75 VDC	5V	6V	3A	87%	0.5%
SXE15-48S12	33-75 VDC	12V	15V	1.25A	85%	0.5%

SXE15-48S1V8 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		0.271	0.274	A DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Input current - maximum	$I_{in\ (max.)}$		0.399	0.404	A DC	$V_{in} = V_{in\ (min)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$ (measured at converter)
Reflected ripple current	$I_{in\ (ripple)}$		1.8 5		mA RMS mA pk-pk	$I_{out} = I_{out\ (max.)}$, measured with external Pi filter. See Application Note 116 for recommended external filter
Input capacitance - internal filter	C_{input}		1.5		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	0			µF	Recommended customer added capacitance

SXE15-48S1V8 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	1.76	1.80	1.84	V DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	1.74		1.86	V DC	For all line, static load and temperature until end of life
Line regulation				0.5	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				2.0	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	Iout	0		6.0	A DC	
Output current - short circuit	I_{sc}		10	12	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		40 14	70 20	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 116 for measurement set-up details

SXE15-48S1V8 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		150		mV	Peak deviation for 50% to 75% step load, di/dt = 100mA/µsec
Load transient response - recovery	$T_{recovery}$		400		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}			10,000	µF	

SXE15-48S1V8 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage clamp voltage	V_{ov}	2.0	2.2	3.0	V DC	Non-latching. Refer to Application Note 116 for details
Overcurrent limit inception	I_{oc}		7.5	8.4	A DC	V_o = 90% of V_o (nom)
Output voltage trim range				110	%	Trim up (% of $V_{o\ nom}$)
		90			%	Trim down (% of $V_{o\ nom}$)
						See Application Note 116 for details of trim equations and trim curves
Open sense voltage					V DC	No sense option

SXE15-48S1V8 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	82	83		%	I_{out} = 100% Iout (max), V_{in} = V_{in} (nom)
Efficiency	η	78	80		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

SXE15-48S2V5 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		0.367	0.372	ADC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Input current - maximum	$I_{in\ (max.)}$		0.541	0.548	ADC	$V_{in} = V_{in\ (min)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Reflected ripple current	$I_{in\ (ripple)}$		1.8 5		mA RMS mA pk-pk	$I_{out} = I_{out\ (max.)}$, measured with external filter. See Application Note 116 for details
Input capacitance - internal filter	C_{input}		1.5		µF	Internal to converter
Input capacitance - External bypass	C_{bypass}	0			µF	Recommended customer added capacitance

SXE15-48S2V5 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	$V_{o\ (nom.)}$	2.44	2.50	2.56	VDC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	2.42		2.58	VDC	For all line, static load and temperature until end of life
Line regulation				0.5	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				1.5	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	I_{out}	0		6	ADC	
Output current - short circuit	I_{sc}		10	12	A RMS	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		40 14	70 20	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 116 for set-up details

SXE15-48S2V5 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		150		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec
Load transient response - recovery	$T_{recovery}$		400		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}			10,000	µF	

SXE15-48S2V5 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage clamp voltage	V_{ov}	2.7	3.0	4.0	V DC	Non-latching See Application Note 116
Overcurrent limit inception	I_{oc}		7.5	8.4	A DC	V_o = 90% of V_o (nom)
Output voltage trim range		90		110	%	Trim up (% of $V_{o\ nom}$) Trim down (% of $V_{o\ nom}$) See Application Note 116 for details of trim equations and trim curves
Open sense voltage					V DC	No sense feature

SXE15-48S2V5 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	84	85		%	Iout = 100% Iout (max), $V_{in} = V_{in\ (nom)}$
Efficiency	η	81	83		%	I_{out} = 50% $I_{out\ (max)}$, $V_{in} = V_{in\ (nom)}$

SXE15-48S3V3 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		0.360	0.364	A DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Input current - maximum	$I_{in\ (max.)}$		0.529	0.536	A DC	$V_{in} = V_{in\ (min)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ nom}$ (measured at converter)
Reflected ripple current	$I_{in\ (ripple)}$		1.8 5		mA RMS mA pk-pk	$I_{out} = I_{out\ (max.)}$, measured with external filter. See Application Note 116 for details
Input capacitance - internal filter	C_{input}		1.5		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	0			µF	Recommended customer added capacitance

SXE15-48S3V3 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	3.23	3.30	3.37	V DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	3.19		3.41	V DC	For all line, static load and temperature until end of life
Line regulation				0.10	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				0.50	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	I_{out}	0		4.5	A DC	
Output current - short circuit	I_{sc}		8.0	10	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		70 20	100 35	mV pk-pk mV rms	Measurement bandwidth: 20 MHz. See Application Note 116 for measurement set-up details

SXE15-48S3V3 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
Load transient response - recovery	$T_{recovery}$		400		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}			10,000	µF	

SXE15-48S3V3 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage clamp voltage	Vov	3.6	4.0	5.0	V DC	Non-latching Refer to Application Note 116
Overcurrent limit inception	I_{oc}		5.6	6.3	A DC	V_o = 90% of $V_{o\ (nom)}$
Output voltage trim range		90		110	%	Trim up (% of $V_{o\ nom}$) Trim down (% of $V_{o\ nom}$) See Application Note 116 for details of trim equations and trim curves
Open sense voltage					V DC	No sense feature

SXE15-48S3V3 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	85	86		%	Iout = 100% Iout (max), $V_{in} = V_{in\ (nom)}$
Efficiency	η	83	85		%	I_{out} = 50% $I_{out\ (max)}$, $V_{in} = V_{in\ (nom)}$

SXE15-48S05 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		0.359	0.364	ADC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Input current - maximum	$I_{in\ (max.)}$		0.529	0.541	ADC	$V_{in} = V_{in\ (min)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Reflected ripple current	$I_{in\ (ripple)}$ -		1.8 5.0		mA RMS mA pk-pk	$I_{out} = I_{out\ (max.)}$, measured with external filter. See Application Note 116 for details
Input capacitance - internal filter	C_{input}		1.5		µF	Internal to converter
Input capacitance - External bypass	C_{bypass}	0			µF	Recommended customer added capacitance

SXE15-48S05 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	$V_{o\ (nom.)}$	4.90	5.00	5.10	VDC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	4.83		5.17	VDC	For all line, static load and temperature until end of life
Line regulation				0.1	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				0.5	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	I_{out}	0		3	ADC	
Output current - short circuit	I_{sc}		5.5	7.0	A RMS	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		70 20	100 35	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 116 for set-up details

SXE15-48S05 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 = 100mA/µsec
Load transient response - recovery	$T_{recovery}$		400		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}			10,000	µF	

SXE15-48S05 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage clamp voltage	V_{ov}	5.5	6.0	7.2	V DC	Non-latching See Application Note 116
Overcurrent limit inception	I_{oc}		3.7	4.2	A DC	V_o = 90% of V_o (nom)
Allowable output voltage trim range				110	%	Trim up (% of $V_{o\ nom}$). Note that the maximum output power is still 15W. Derate the maximum output current accordingly
		90			%	Trim down (% of $V_{o\ nom}$) See Application Note 116 for details of trim equations and trim curves
Open sense voltage					V DC	No sense function

SXE15-48S05 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	86	87		%	I_{out} = 100% $I_{out\ (max)}$, V_{in} = $V_{in\ (nom)}$
Efficiency	η	82	84		%	I_{out} = 50% $I_{out\ (max)}$, V_{in} = $V_{in\ (nom)}$

SXE15-48S12 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		0.367	0.372	ADC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Input current - maximum	$I_{in\ (max.)}$		0.541	0.55	ADC	$V_{in} = V_{in\ (min)}$; $I_{out} = I_{out\ (max.)}$; $V_o = V_{o\ (nom)}$
Reflected ripple current	$I_{in\ (ripple)}$ -		1.8 5.0		mA RMS mA pk-pk	$I_{out} = I_{out\ (max.)}$, measured with external filter. See Application Note 116 details
Input capacitance - internal filter	C_{input}		1.5		µF	Internal to converter
Input capacitance - External bypass	C_{bypass}	0			µF	Recommended customer added capacitance

SXE15-48S12 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	$V_{o\ (nom.)}$	11.76	12.0	12.24	VDC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	11.52		12.48	VDC	For all line, static load and temperature until end of life
Line regulation				0.1	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation			0.3	0.5	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	I_{out}	0		1.25	ADC	
Output current - short circuit	I_{sc}		2.45	2.8	A RMS	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		65 20	100 35	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 116 for set-up details

SXE15-48S12 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		110		mV	Peak deviation for 50% to 75% step load, di/dt = 100mA/µsec
Load transient response - recovery	$T_{recovery}$		400		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}			10,000	µF	

SXE15-48S12 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Overvoltage clamp voltage	V_{ov}		14.0	17	V DC	Non-latching See Application Note 116
Overcurrent limit inception	I_{oc}		1.45	1.6	A DC	V_o = 90% of V_o (nom)
Allowable output voltage trim range				110	%	Trim up (% of $V_{o\ nom}$). Note that the maximum output power is still 15W. Derate the maximum output current accordingly
		90			%	Trim down (% of $V_{o\ nom}$) See Application Note 116 for details of trim equations and trim curves
Open sense voltage					V DC	No sense function

SXE15-48S12 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	84	85	-	%	I_{out} = 100% $I_{out\ (max)}$, V_{in} = $V_{in\ (nom)}$
Efficiency	η	81	83	-	%	I_{out} = 50% $I_{out\ (max)}$, V_{in} = $V_{in\ (nom)}$

SXE15-48S1V8 Model

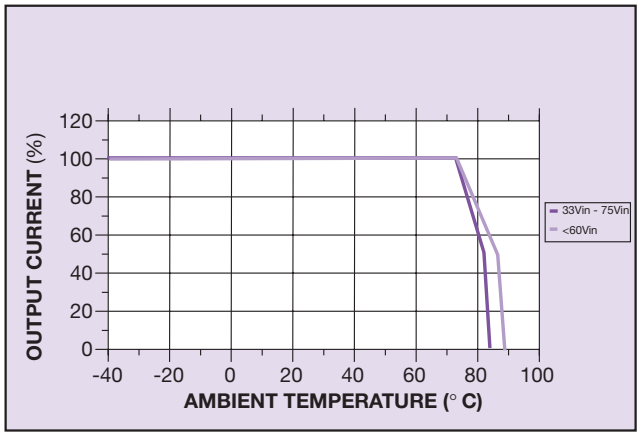


Figure 1: Output Current vs Temperature (Still Air)

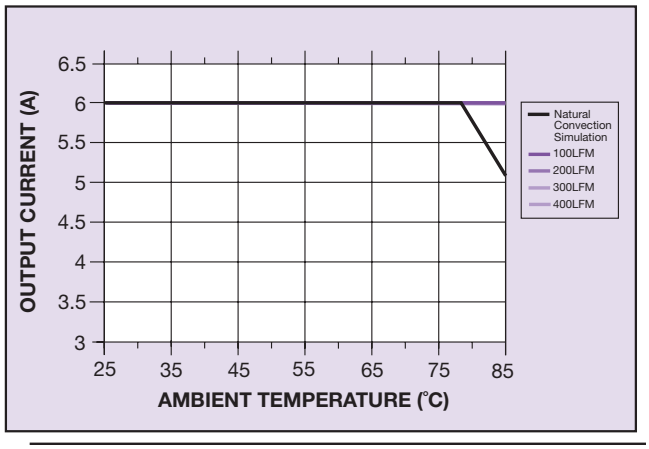


Figure 2: Output Current vs Temperature with Forced Air Cooling

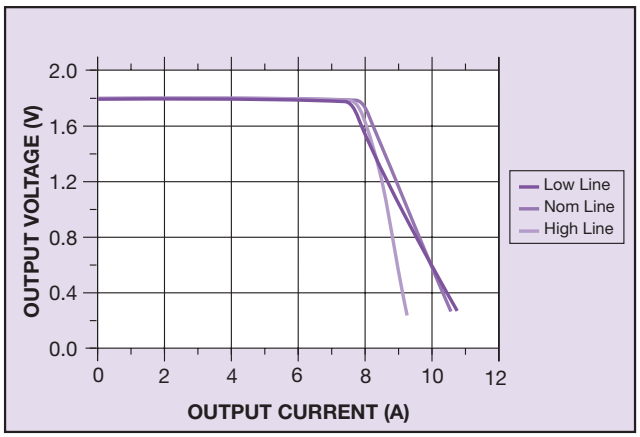


Figure 3: V-I Characteristic Over Input Line

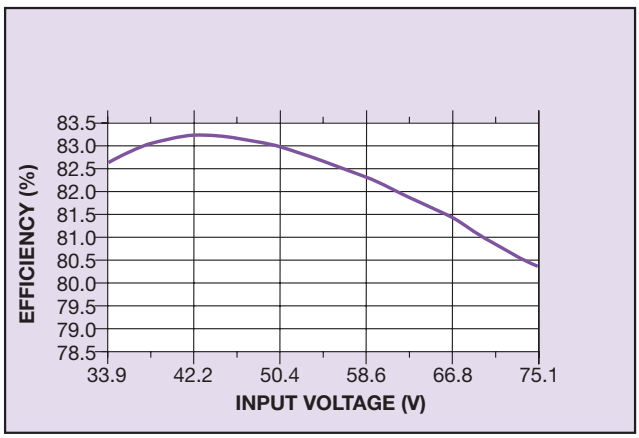


Figure 4: Efficiency vs Line

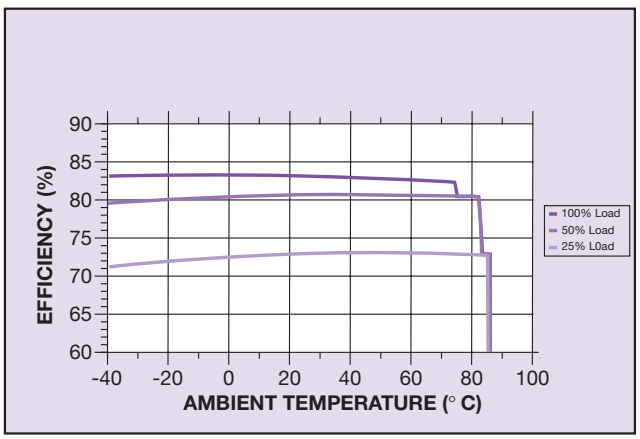


Figure 5: Typical Efficiency vs Ambient Temperature

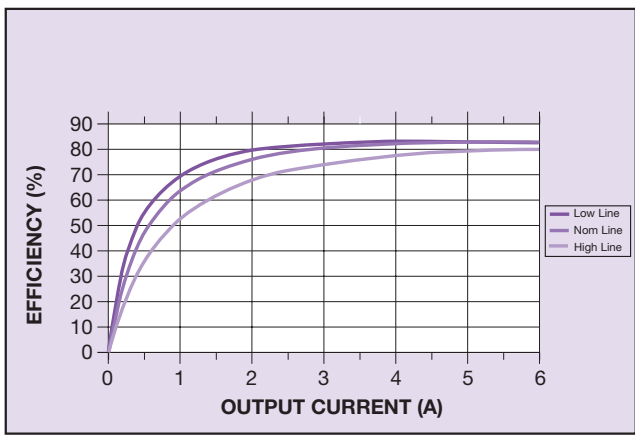


Figure 6: Efficiency vs Load

SXE15-48S1V8 Model

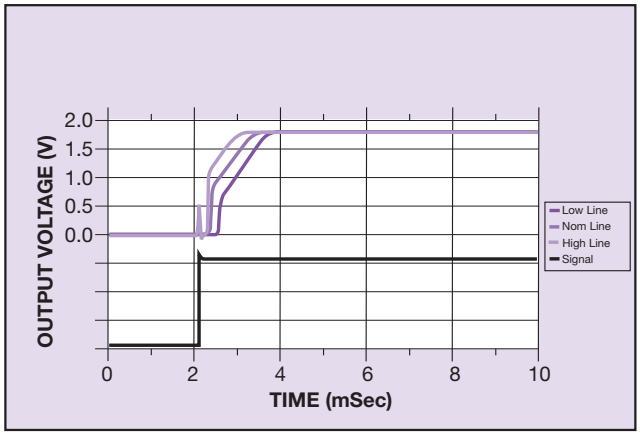


Figure 7: Typical Power-up Characteristic

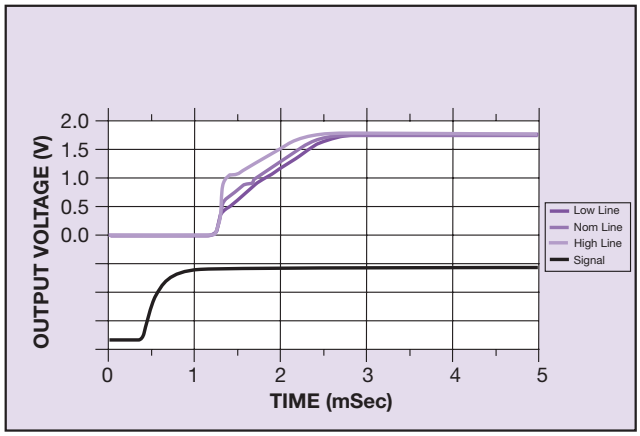


Figure 8: Control On/Off Characteristic

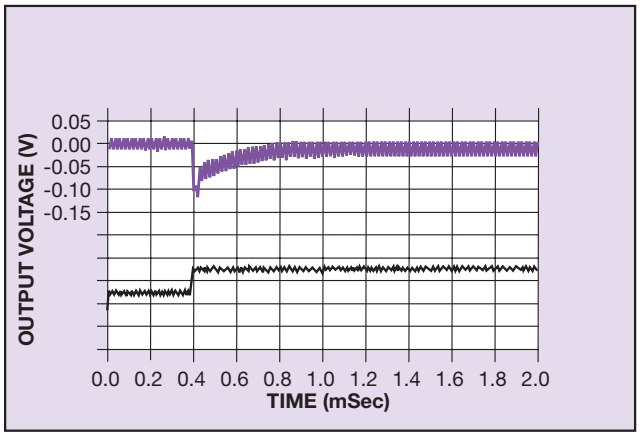


Figure 9: Typical Transient Response 50%-75% Step Load Change

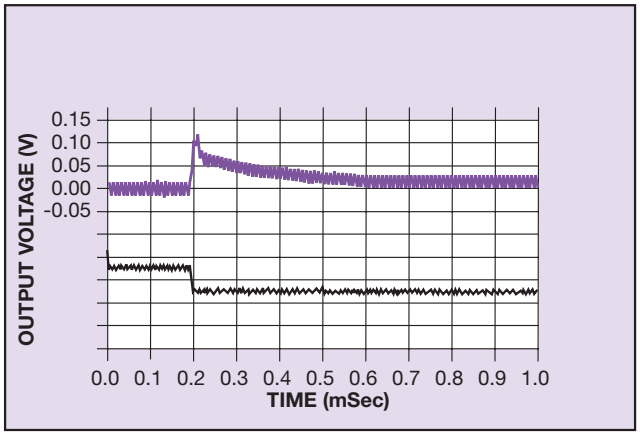


Figure 10: Typical Transient Response 75%-50% Step Load Change

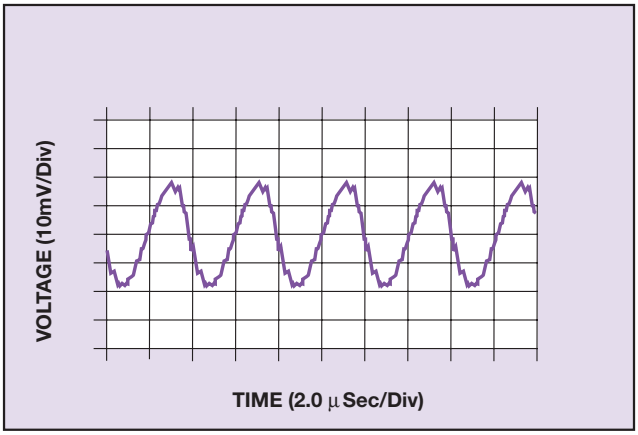


Figure 11: Typical Ripple and Noise Measurement

SXE15-48S2V5 Model

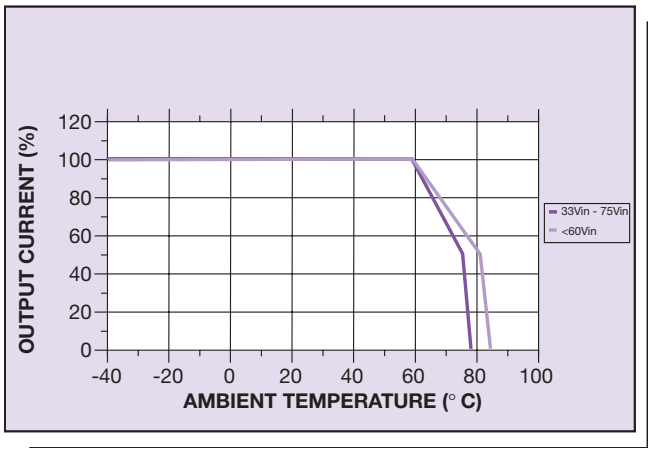


Figure 12: Output Current vs. Temperature (Still Air)

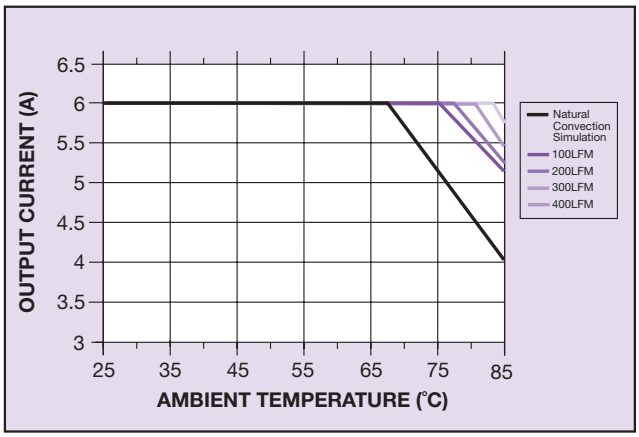


Figure 13: Output Current vs Temperature with Forced Air Cooling

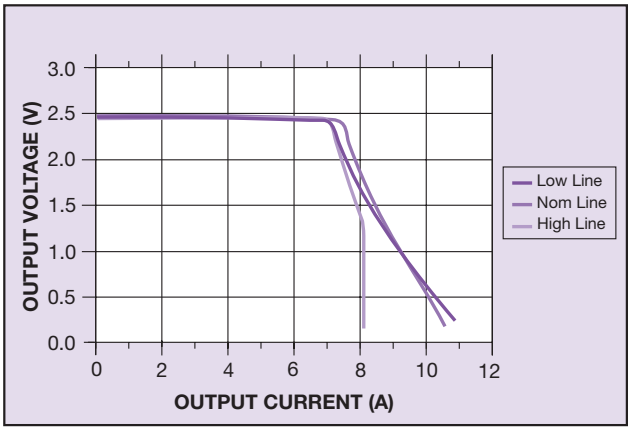


Figure 14: V-I Characteristic Over Input Line

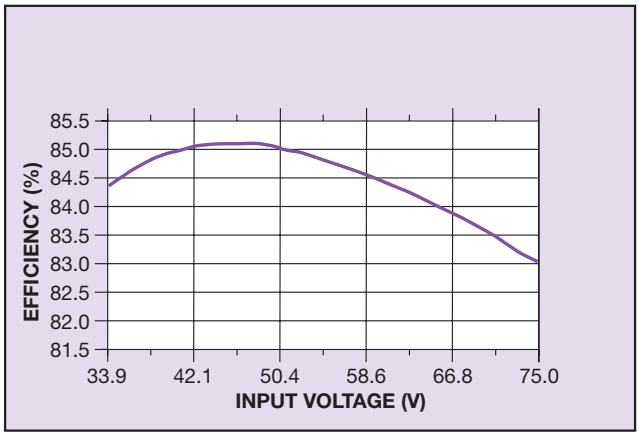


Figure 15: Efficiency vs. Line

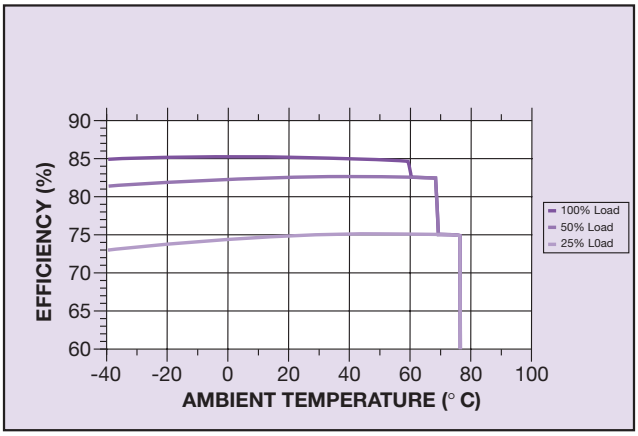


Figure 16: Typical Efficiency vs. Ambient Temperature

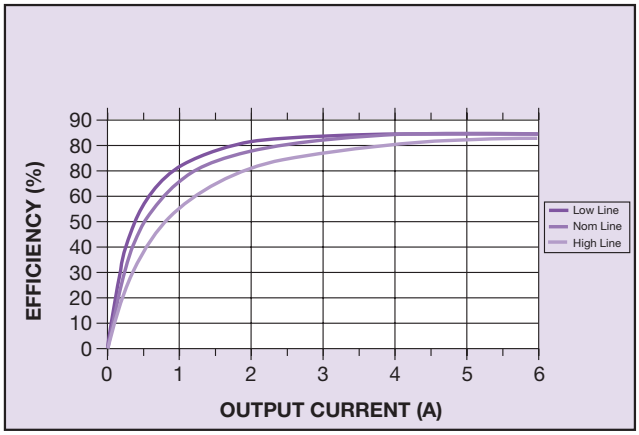


Figure 17: Efficiency vs. Load

SXE15-48S2V5 Model

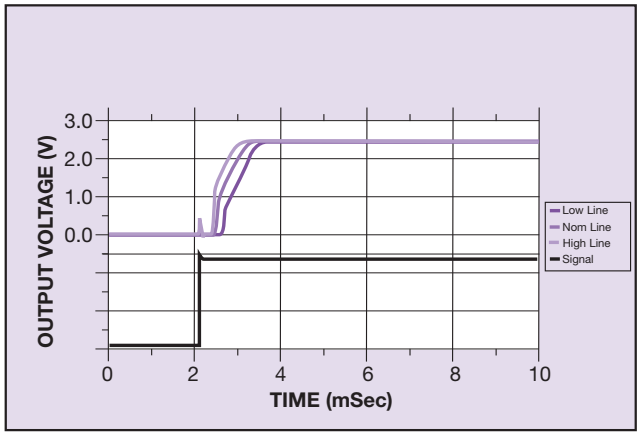


Figure 18: Typical Power-up Characteristic

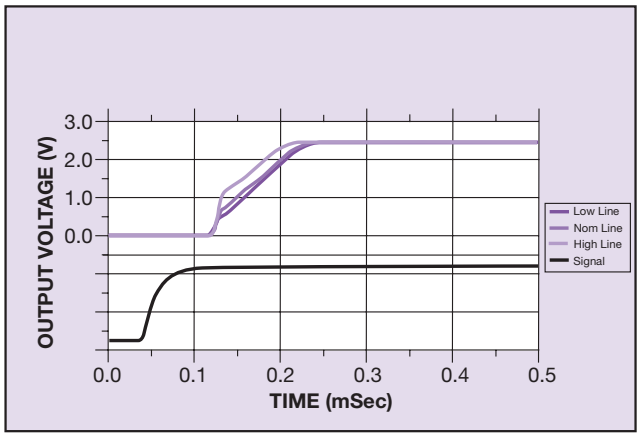


Figure 19: Control On/Off Characteristic

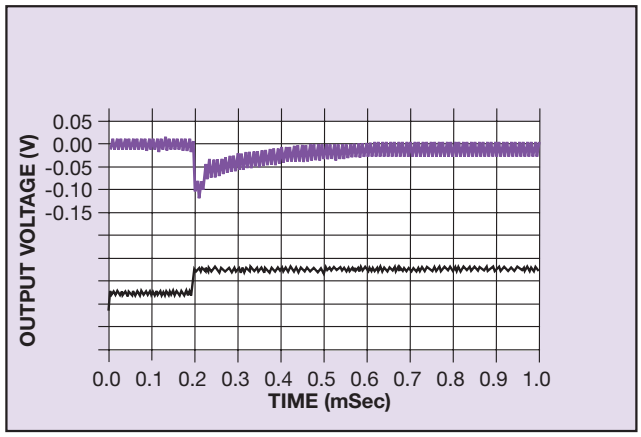


Figure 20: Typical Transient Response 50%-75% Step Load Change

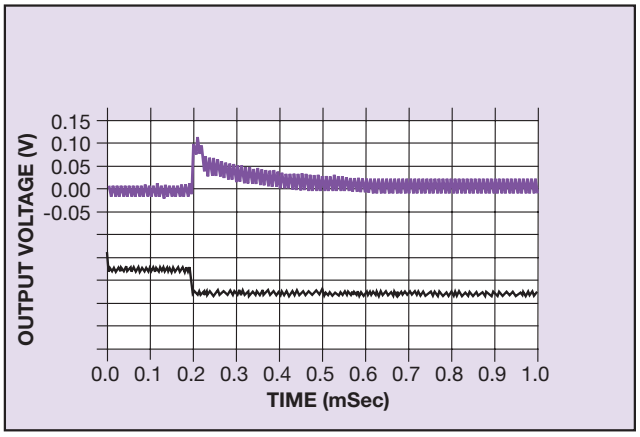


Figure 21: Typical Transient Response 75%-50% Step Load Change

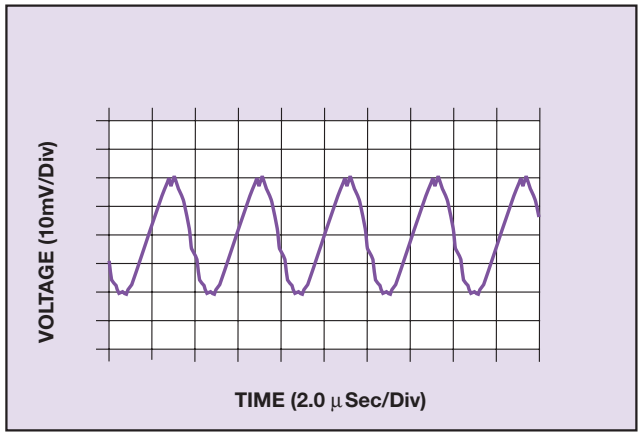


Figure 22: Typical Ripple and Noise Measurement

SXE15-48S3V3 Model

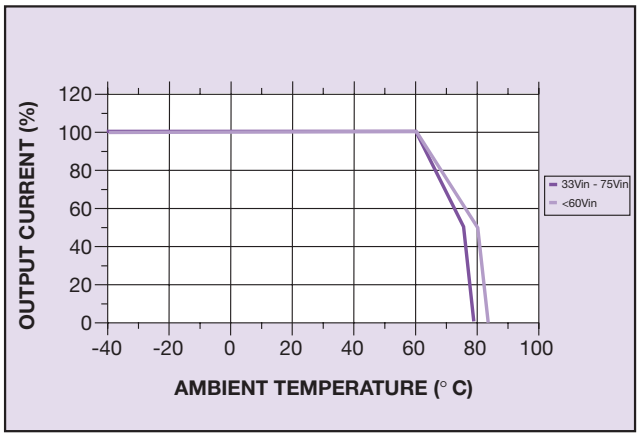


Figure 23: Output Current vs Temperature (Still Air)

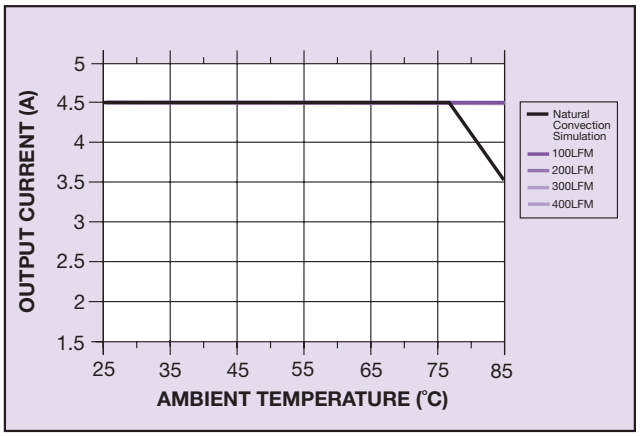


Figure 24: Output Current vs Temperature with Forced Air Cooling

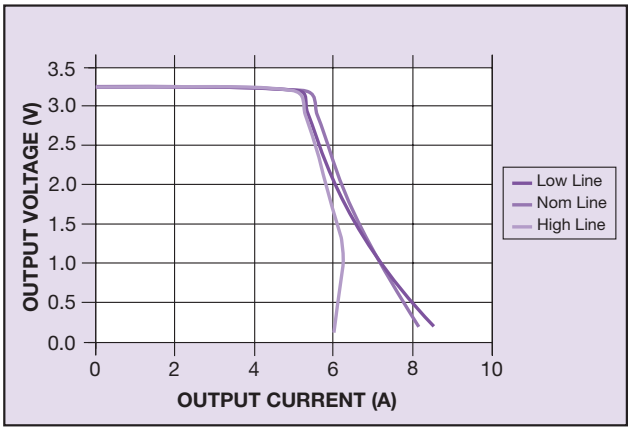


Figure 25: V-I Characteristic Over Input Line

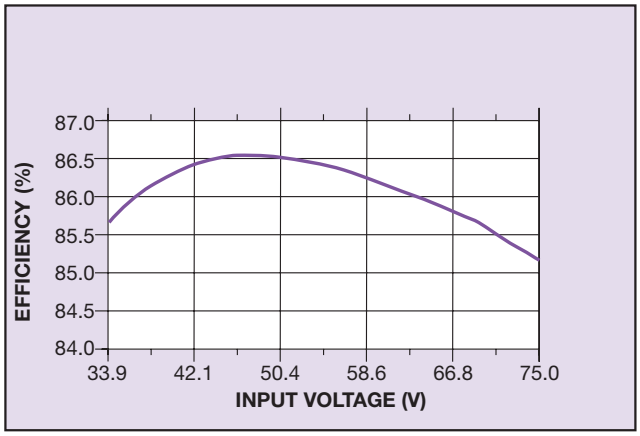


Figure 26: Efficiency vs Line

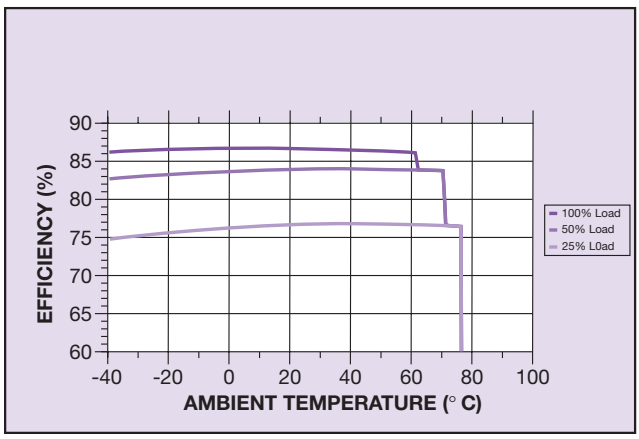


Figure 27: Typical Efficiency vs Ambient Temperature

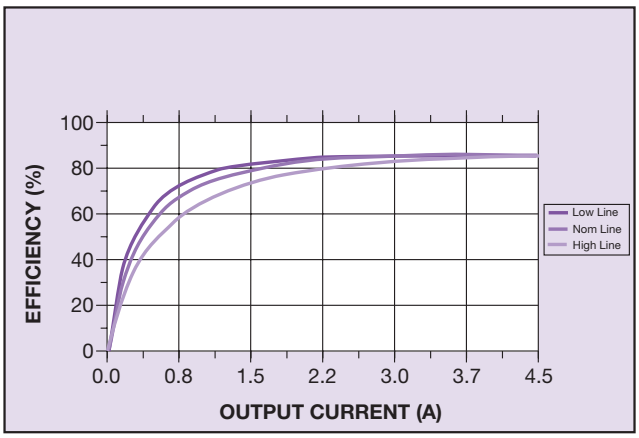


Figure 28: Efficiency vs Load

SXE15-48S3V3 Model

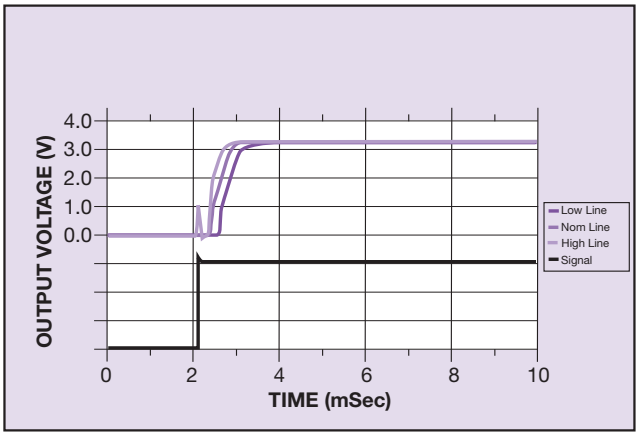


Figure 29: Typical Power-up Characteristic

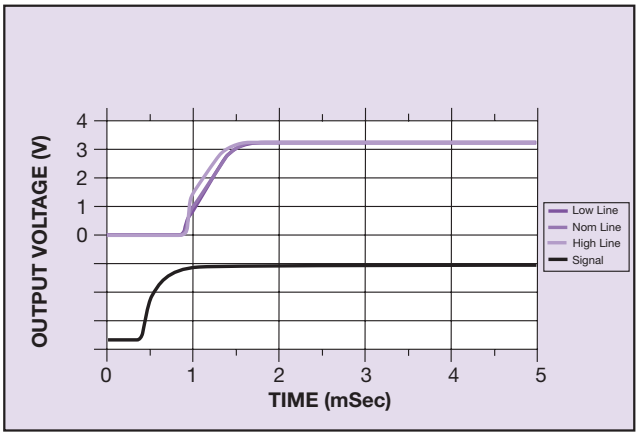


Figure 30: Control On/Off Characteristic

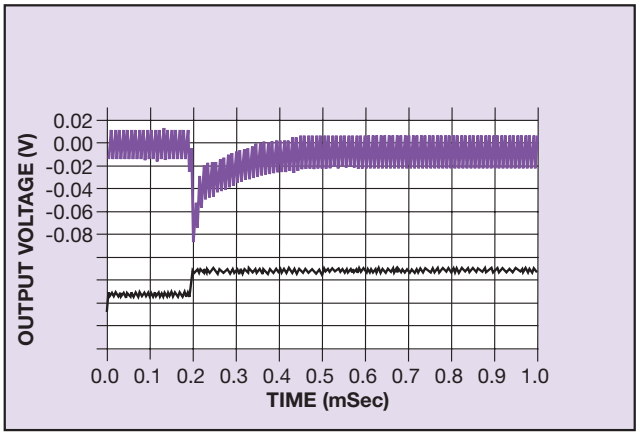


Figure 31: Typical Transient Response 50%-75% Step Load Change

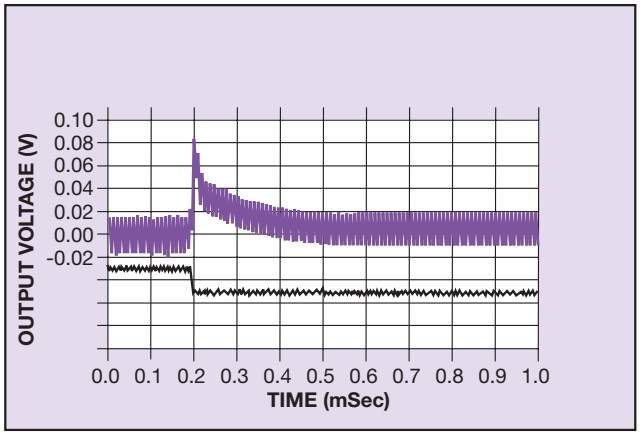


Figure 32: Typical Transient Response 75%-50% Step Load Change

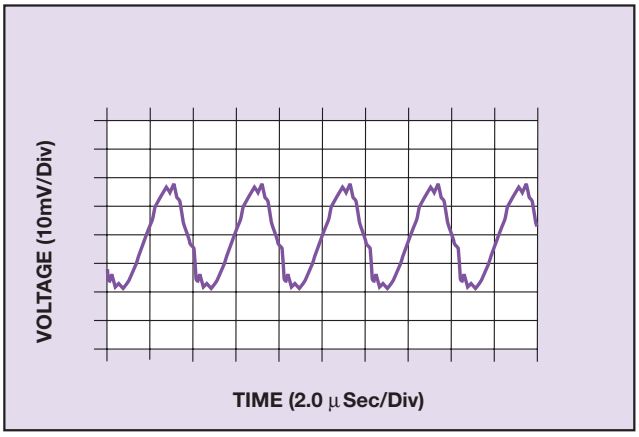


Figure 33: Typical Ripple and Noise Measurement

SXE15-48S05 Model

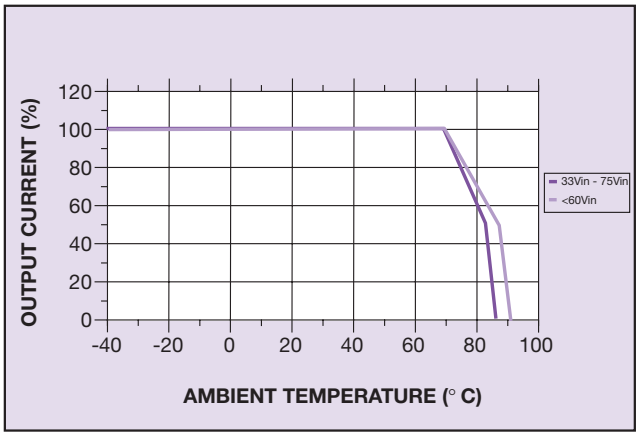


Figure 34: Output Current vs Temperature (Still Air)

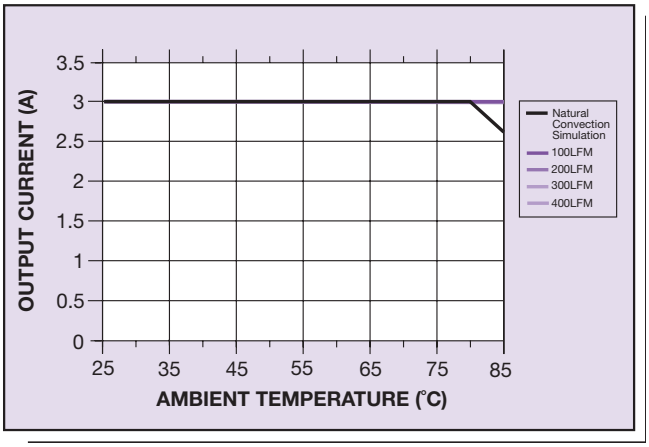


Figure 35: Output Current vs Temperature with Forced Air Cooling

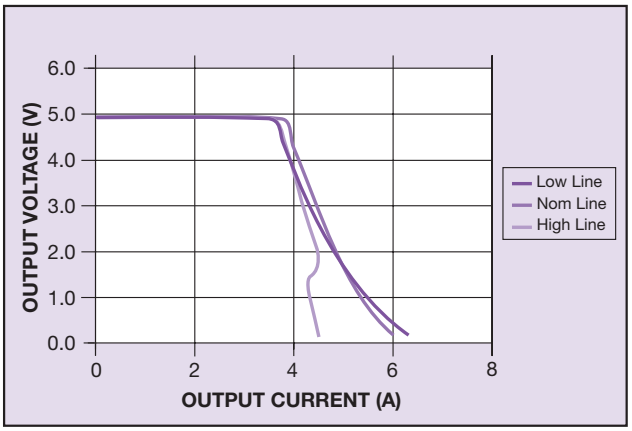


Figure 36: V-I Characteristic Over Input Line

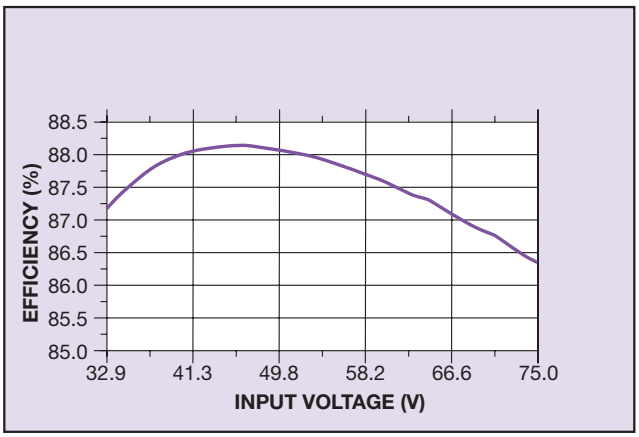


Figure 37: Efficiency vs Line

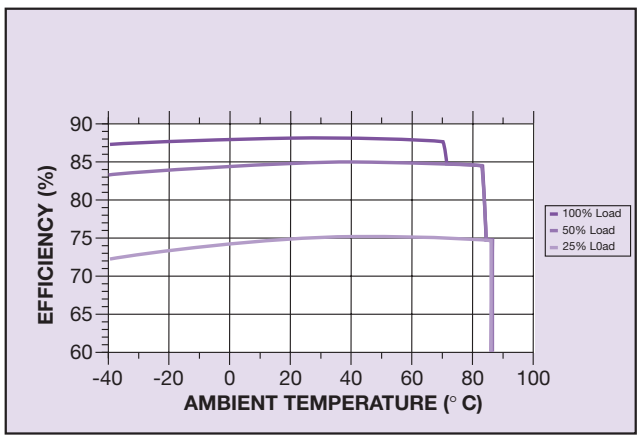


Figure 38: Typical Efficiency vs Ambient Temperature

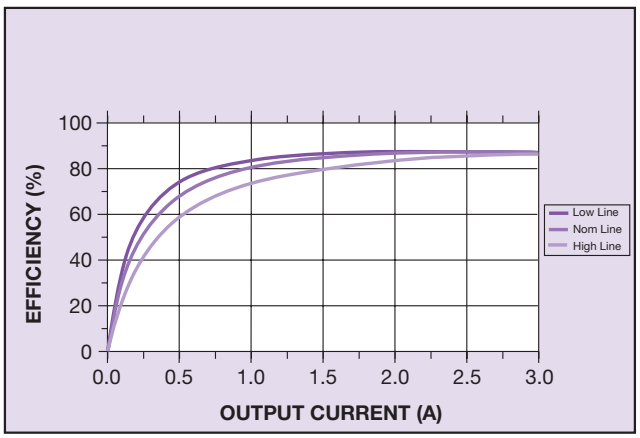


Figure 39: Efficiency vs Load

SXE15-48S05 Model

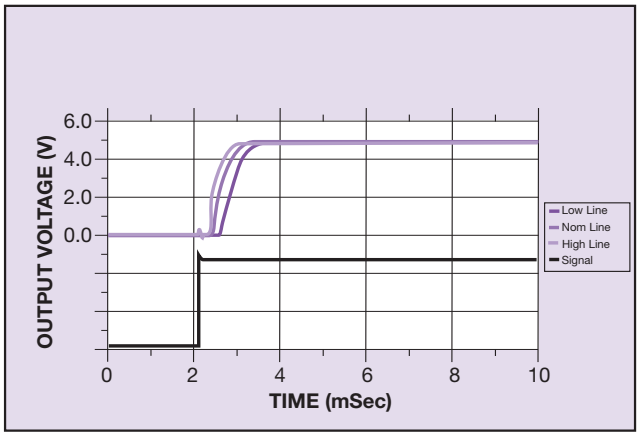


Figure 40: Typical Power-up Characteristic

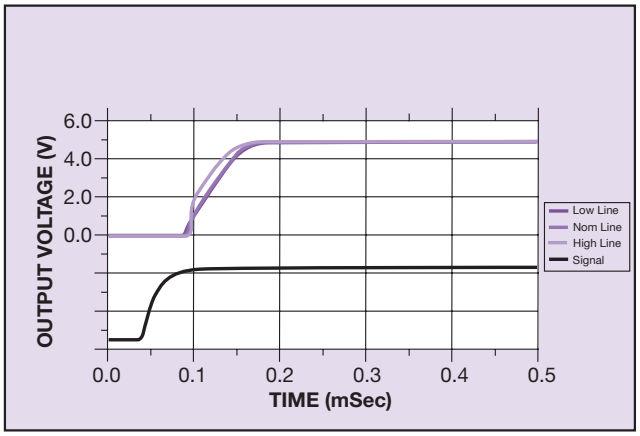


Figure 41: Control On/Off Characteristic

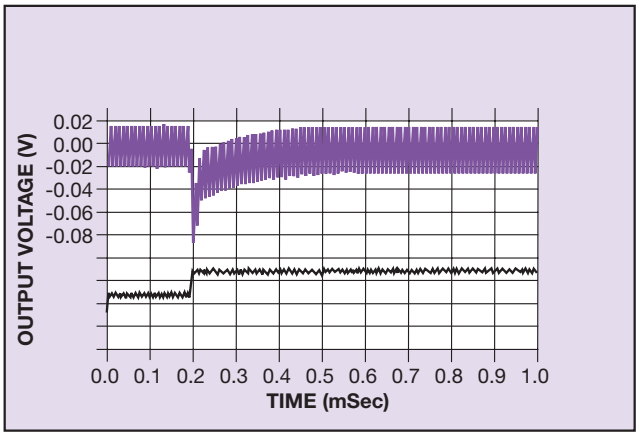


Figure 42: Typical Transient Response 50%-75% Step Load Change

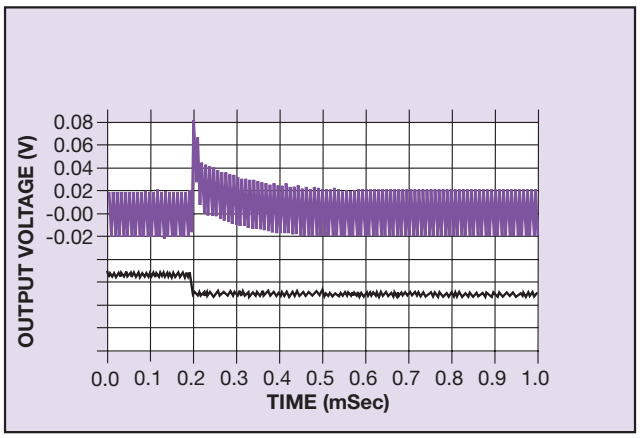


Figure 43: Typical Transient Response 75%-50% Step Load Change

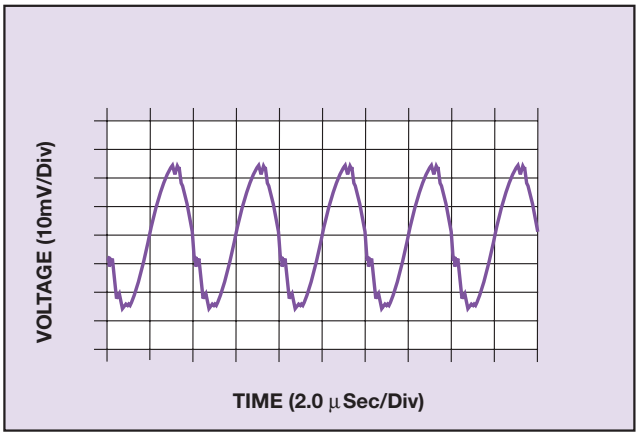


Figure 44: Typical Ripple and Noise Measurement

SXE15-48S12 Model

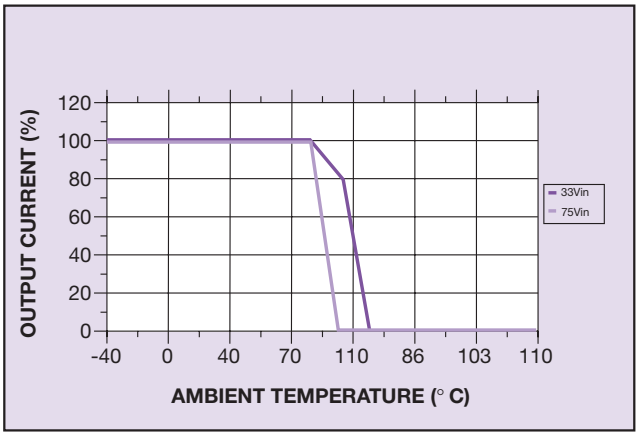


Figure 45: Output Current vs Temperature (Still Air)

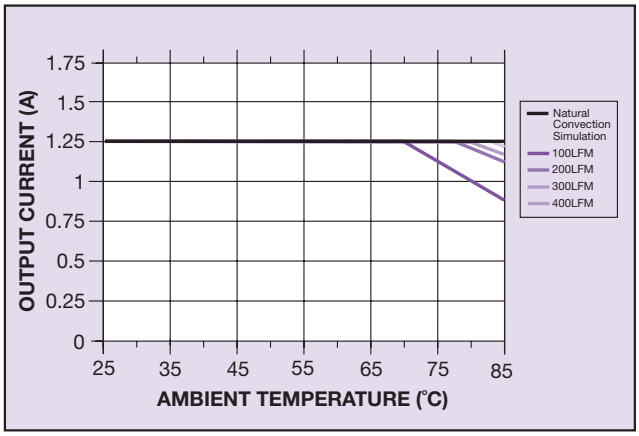


Figure 46: Output Current vs Temperature with Forced Air Cooling

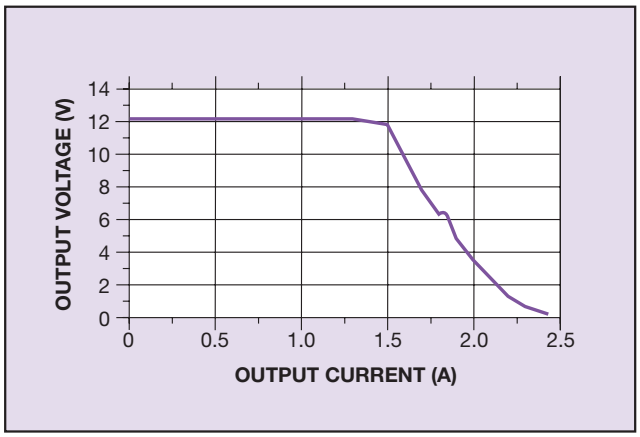


Figure 47: V-I Characteristic (Vin = 48V)

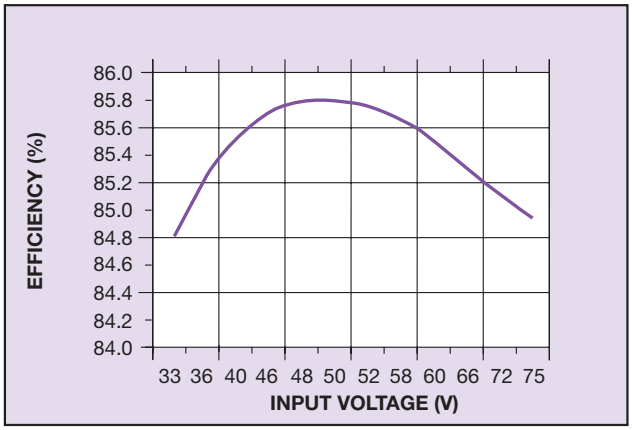


Figure 48: Typical Efficiency vs Input Voltage

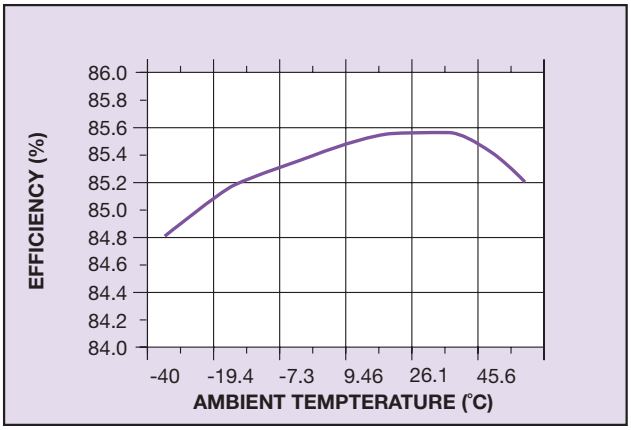


Figure 49: Typical Efficiency vs Ambient Temperature Vin = 48V, Lout = 1.25A

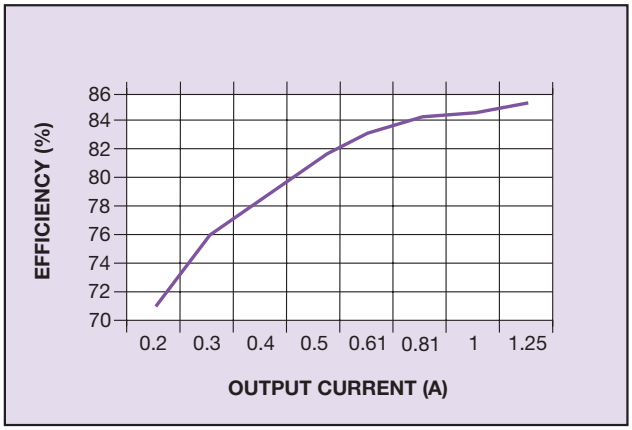


Figure 50: Efficiency vs Load Characteristic

SXE15-48S12 Model

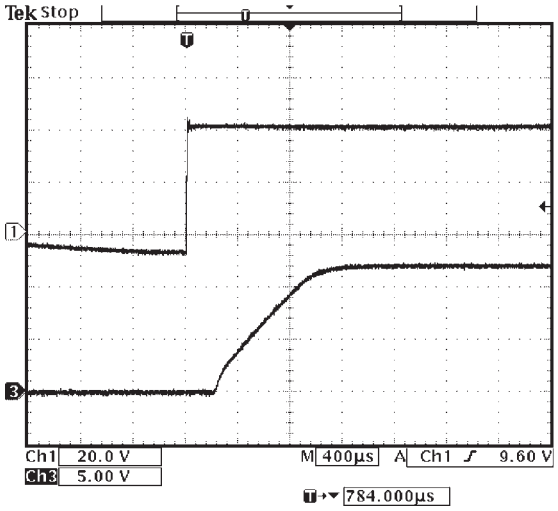


Figure 51: Typical Start-up Characteristic
Vin = 48V, Io_1 = 1.25A, 400µs/div

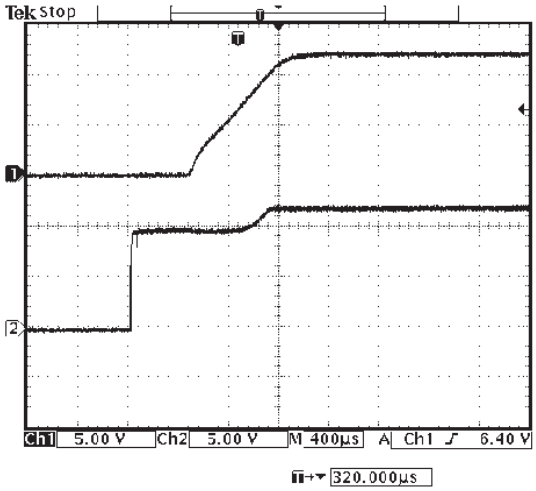


Figure 52: Control On/Off Characteristic

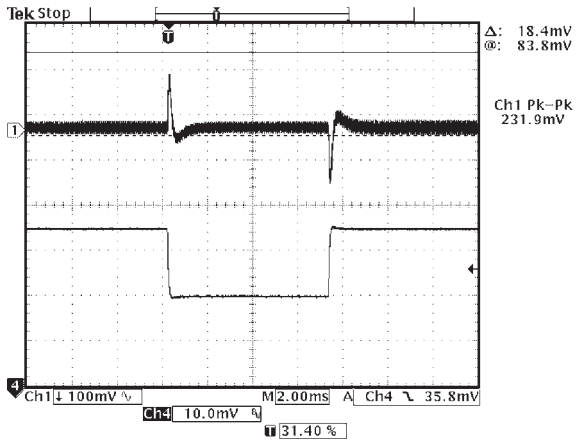


Figure 53: Typical Transient Load Response
Vin = 48V, Io_1 = (75%-50%-75%) of nominal

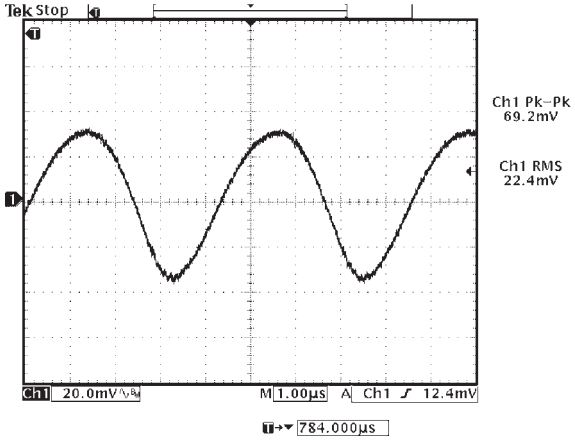
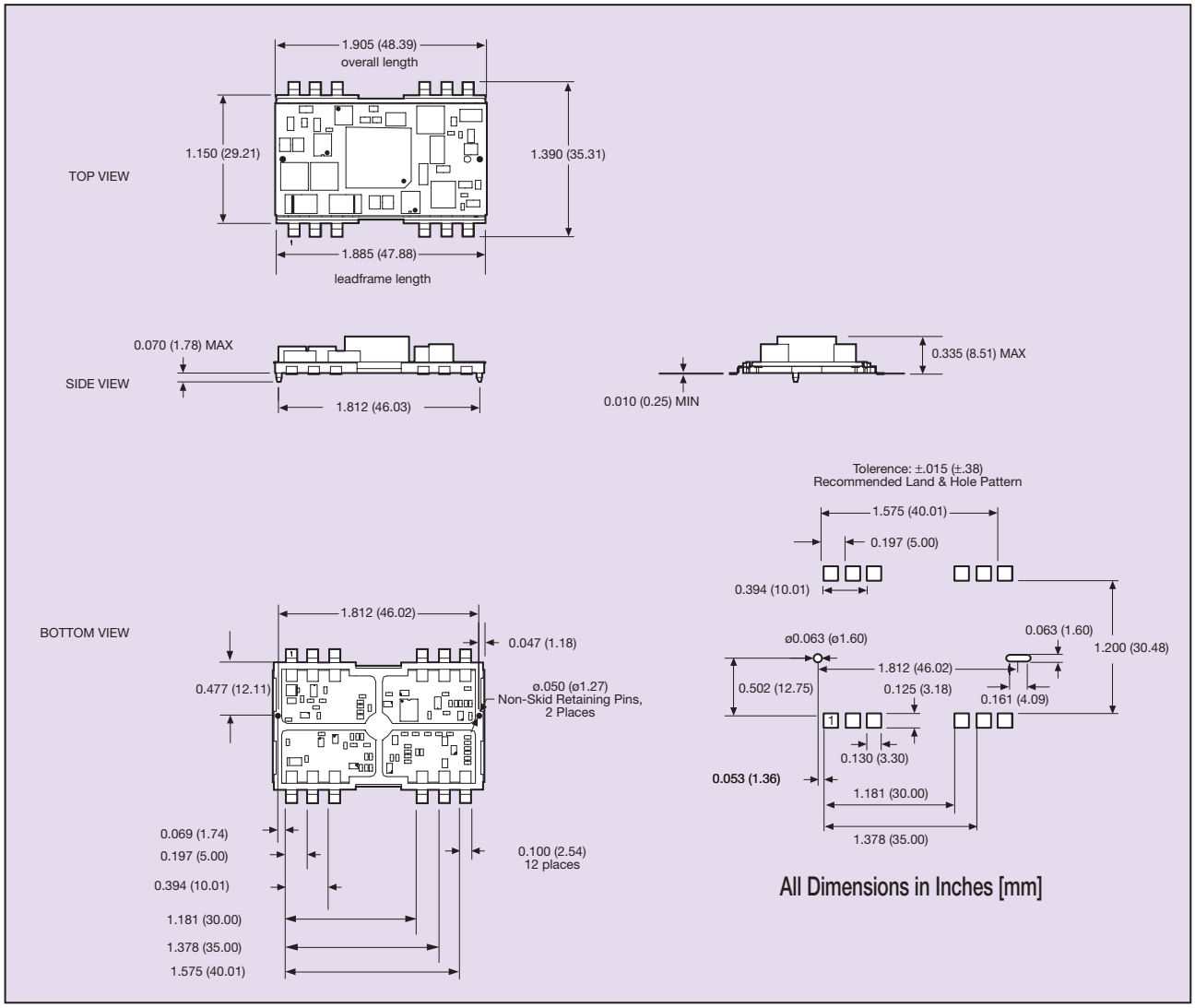


Figure 54: Typical Ripple and Noise Measurement



Pin Connections

Pin No.	Function
1	Vout+
2	Vout-
3	N/C
4	Trim
5	N/C
6	N/C
7	N/C
8	On/Off
9	N/C
10	N/C
11	Vin -
12	Vin +

Figure 55: Dimensions and Pinout

Note 1

Hot spot temperature is defined as the highest temperature measured at any one of the specified hotspot checkpoints. See Figure 51: Hotspot temperature check points.

Note 2

The control pin is referenced to Vin-.

Note 3

The SXE15 is supplied as standard with active high logic.
Control input pulled low: Unit disabled.
Control input left open: Unit enabled.

Note 4

Thermal reference set up: Unit mounted on an edge card test board 215mm x 115mm. Test board mounted vertically. For test details and recommended set-up see Application Note 116.

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.

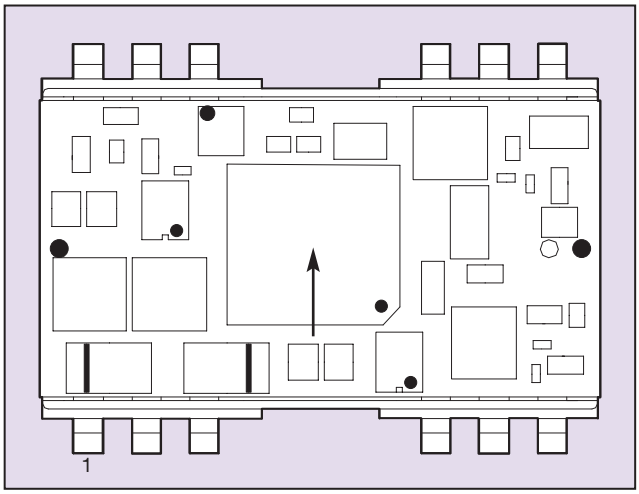


Figure 56: Hot Spot Locations on all Models

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