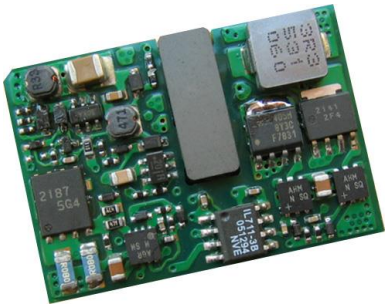
xRSB-40Uxxx

Isolated DC-DC Converter

The xRSB-40U series are isolated dc/dc converters that operate from a nominal 24 Vdc or 48 Vdc source. These units will provide up to 40 W of output power from an 18 Vdc - 75 Vdc wide input range. These units are designed to be highly efficient and low cost. Features include remote on/off, over current protection and under voltage lockout. These converters are provided in an industry standard sixteenth brick package.



RoHS Compliant

Key Features & Benefits

- 18-75VDC Input
- 1.2V-12VDC @ 3.5-18A Output
- Isolated
- Fixed Frequency
- High Efficiency
- High Power Density
- Low Cost
- Output Voltage Trim
- Basic Insulation
- Remote On/Off Logic (Option)
- Input Under Voltage Lockout
- Output Over Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Wide Input Voltage
- Positive/Negative Remote Sense
- Through Hole and SMT(Option)
- Input Over Voltage Protection
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)
- UL60950-1 Recognized (UL/cUL) (Pending)

Applications

- Networking
- Computers and peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER ACTIVE LOW	MODEL NUMBER ACTIVE HIGH	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
xRSB-40UV2L	xRSB-40UV20	1.2 Vdc	18 Vdc - 75 Vdc	18 A	22 W	82%
xRSB-40UV5L	xRSB-40UV50	1.5 Vdc	18 Vdc - 75 Vdc	16 A	24 W	84%
xRSB-40UV8L	xRSB-40UV80	1.8 Vdc	18 Vdc - 75 Vdc	14 A	25 W	85%
xRSB-40U02L	xRSB-40U025	2.5 Vdc	18 Vdc - 75 Vdc	12 A	30 W	86%
xRSB-40U03L	xRSB-40U033	3.3 Vdc	18 Vdc - 75 Vdc	10 A	33 W	87.5%
xRSB-40U05L	xRSB-40U050	5.0 Vdc	18 Vdc - 75 Vdc	8 A	40 W	87%
xRSB-40U12L	xRSB-40U120	12 Vdc	18 Vdc - 75 Vdc	3.5 A	42 W	85%

NOTE: Add “G” suffix at the end of the model number to indicate Tray Packaging.

PART NUMBER EXPLANATION

x	R	SB	-	40	U	xx	x	Y
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
0 - Through hole mount S – Surface mount	RoHS 6	1/16th Brick		22W 24W 25W 30W 33W 40W 42W	18-75V	1.2V 1.5V 1.8V 2.5V 3.3V 5.0V 12V	L – Active low 0 – Active high	G – Tray package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Input Voltage (continuous)		-0.3	-	80	V
Input Transient Voltage	100mS maximum	-	-	100	V
Remote On/Off		-0.3	-	18	V
I/O Isolation Voltage		-	-	1500	V
Ambient Temperature		-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	m

NOTE: Ratings used beyond the maximum ratings may cause a reliability degradation of the converter or may permanently damage the device.

3. INPUT SPECIFICATIONS

All specifications are typical at 25°C unless otherwise stated.

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Input Voltage		18	48	75	V
Input Current (full load)	Vo=1.2 V - 1.8 V Vo=2.5 V - 3.3 V Vo=5.0 V - 12 V	- - -	- - -	2.5 3.0 3.5	A A A
Input Current (no load)		-	60	120	mA
Remote Off Input Current		-	1	3	mA
Input Reflected Ripple Current (pk-pk)	Tested with simulated source impedance of 15 uH, 5 Hz to 20 MHz; use a 100 uF/100 V electrolytic capacitor with ESR=1 ohm max at 200 kHz at the input	-	20	50	mA
Input Reflected Ripple Current (rms)		-	3	7	mA
Input Over Voltage Lockout		78	-	82	V
I^2t Inrush Current Transient		-	0.01	0.02	A^2s
Turn-on Voltage Threshold		16.6	17.2	17.8	V
Turn-off Voltage Threshold		16.2	16.8	17.4	V

4. OUTPUT SPECIFICATIONS

All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Test conditions: Vin=48 V; Io=50% load	Vo=1.2 V	1.182	1.2	1.218	V
		Vo=1.5 V	1.478	1.5	1.523	V
		Vo=1.8 V	1.773	1.8	1.827	V
		Vo=2.5 V	2.463	2.5	2.538	V
		Vo=3.3 V	3.250	3.3	3.350	V
		Vo=5.0 V	4.925	5.0	5.075	V
		Vo=12 V	11.750	12	12.250	V
Line Regulation		Vo=1.2 V - 1.8 V	-	±0.5	±3	mV
		Vo=2.5 V	-	±1.0	±4	mV
		Vo=3.3 V	-	±3.0	±8	mV
		Vo=5.0 V	-	±4.0	±9	mV
		Vo=12 V	-	±6.0	±15	mV
Load Regulation		Vo=1.2 - 2.5 V	-	±3	±5	mV
		Vo=3.3 - 5.0 V	-	±4	±9	mV
		Vo=12 V	-	±9	±18	mV
Regulation Over Temperature (-40 °C to +85 °C)		Vo=1.2 V	-	±4	±9	mV
		Vo=1.5 - 1.8 V	-	±6	±14	mV
		Vo=2.5 - 3.3 V	-	±9	±16	mV
		Vo=5.0 V	-	±15	±30	mV
		Vo=12 V	-	±20	±35	mV
Output Current		Vo=1.2 V	0	-	18	A
		Vo=1.5 V	0	-	16	A
		Vo=1.8 V	0	-	14	A
		Vo=2.5 V	0	-	12	A
		Vo=3.3 V	0	-	10	A
		Vo=5.0 V	0	-	8	A
		Vo=12 V	0	-	3.5	A
Short Circuit Surge Transient	Hiccup mode, auto recovery	-	-	0.5	1	A^2s
Current Limit Threshold		Vo=1.2 V	21	25	33	A
		Vo=1.5 V	19	22	26	A
		Vo=1.8 V	17	20	23	A
		Vo=2.5 V	14	17	20	A
		Vo=3.3 V	11	14	16	A
		Vo=5.0 V	8.8	10	12.5	A
		Vo=12 V	3.7	5	6	A
Ripple and Noise (rms)	Tested at 0-20 MHz BW, with a 1 uF ceramic capacitor and a 10 uF Tantalum capacitor at the output	Vo=1.2 V - 1.8 V	-	6	12	mV
		Vo=2.5 V	-	10	20	mV
		Vo=3.3 V	-	12	25	mV
		Vo=5.0 V	-	25	50	mV
		Vo=12 V	-	30	55	mV
Ripple and Noise (pk-pk)		Vo=1.2 V - 1.8 V	-	40	70	mV
		Vo=2.5 V	-	45	80	mV
		Vo=3.3 V	-	55	90	mV
		Vo=5.0 V	-	70	120	mV
		Vo=12 V	-	90	180	mV
Turn on Time		-	-	25	50	mS
Overshoot at Turn on		-	-	0	5	%
Output Capacitance	Recommend to use AVX TPS series Tantalum capacitor as min capacitor	Vo=1.2 V	470	-	15000	uF
		Vo=1.5 V	470	-	10000	uF
		Vo=1.8 V	470	-	10000	uF
		Vo=2.5 V	470	-	5600	uF
		Vo=3.3 V	330	-	4700	uF
		Vo=5.0 V	150	-	2200	uF
		Vo=12 V	10	-	220	uF

OUTPUT SPECIFICATIONS(CONTINUED)

PARAMETER			DESCRIPTION	MIN	TYP	MAX	UNIT
Transient Response							
25% ~ 50% Max	Overshoot	Vo=1.2 V	di/dt = 0.1 A/uS, Vin=48 V, with a 1 uF ceramic capacioor and a Min Capacitance of Tantalum capacitor at the output	-	60	110	mV
	Settling Time			-	80	150	uS
50% ~ 25% Max	Overshoot			-	60	110	mV
	Settling Time			-	80	150	uS
25% ~ 50% Max	Overshoot	Vo=1.5 -1.8 V		-	90	180	mV
	Settling Time			-	80	150	uS
50% ~ 25% Max	Overshoot			-	90	180	mV
	Settling Time			-	80	150	uS
25% ~ 50% Max	Overshoot	Vo=2.5 -3.3 V		-	180	250	mV
	Settling Time			-	80	150	uS
50% ~ 25% Max	Overshoot			-	180	250	mV
	Settling Time			-	80	150	uS
25% ~ 50% Max	Overshoot	Vo=5.0 V		-	250	350	mV
	Settling Time			-	100	200	uS
50% ~ 25% Max	Overshoot			-	250	350	mV
	Settling Time			-	100	200	uS
25% ~ 50% Max	Overshoot	Vo=12 V		-	400	650	mV
	Settling Time			-	150	300	mS
50% ~ 25% Max	Overshoot			-	400	650	mV
	Settling Time			-	150	300	mS

Note: All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency Vin=48 V, full load	Vo=1.2 V Vo=1.5 V Vo=1.8 V Vo=2.5 V Vo=3.3 V Vo=5.0 V Vo=12 V	78 79 81 83 85 85 83	82 84 85 86 87.5 87 85	- - - - - - -	% % % % % % %
Switching Frequency	Vo=1.2 V -12 V Vo=1.8 V	450 500	500 550	550 600	KHz KHz
Isolation Capacitance		-	3900	-	pF
Over Temperature Protection	The OTP threshold is set at 125°C in non-latch mode, and the module will restart automatically when temperature falls down to 115°C	-	125	-	°C
Output Voltage Trim Range		90	-	110	% Vo
Over Voltage Protection	Test conditions: Vin=48 V, full load and short the feedback optocoupler.	-	130	160	% Vo
Dimensions Inches (L × W × H) Millimeters (L × W × H)	SRSB-40Uxxx 0RSB-40Uxxx		1.30 x 0.90 x 0.493 33.02 x 22.86 x 12.53 1.30 x 0.90 x 0.507 33.02 x 22.86 x 12.89		- -
Weight		-	14	-	g

Note: All specifications are typical at 25 °C unless otherwise stated.

6. REMOTE ON/OFF

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit On)	Active Low	When Remote On/Off pin is open, for active low option, unit is off; for active high option, unit is on	-0.3	-	0.8	V
Signal High (Unit Off)			2.4	-	18	V
Signal Low (Unit Off)	Active High		-0.3	-	0.8	V
Signal High (Unit On)			2.4	-	18	V
Current Sink			0	-	1	mA

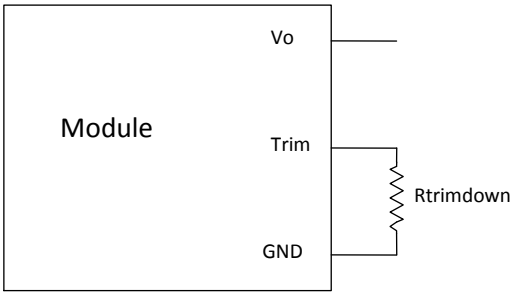
7. OUTPUT TRIM EQUATIONS

Equations for calculating the trim resistor are shown below (Unit: kΩ). The Trim Down resistor should be connected between the Trim pin and Ground pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

1) Trim Equations for Vo=1.2 V

$$R_{trimdown} = \frac{511}{|delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + delta) \cdot Vo \cdot 5.11 - 313}{0.6125 \cdot delta} - 10.22$$



Note:

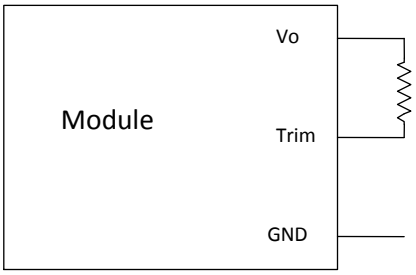
$$delta = \frac{(Vo\_req - Vo)}{Vo} \times 100[\%]$$

Vo_req=Desired (trimmed) output voltage [V] Vo=1.202 V

2) Trim Equations for Vo=1.5 V - 12 V

$$R_{trimdown} = \frac{511}{|delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + delta) \cdot Vo \cdot 511 - 626}{1.225 \cdot delta} - 10.22$$



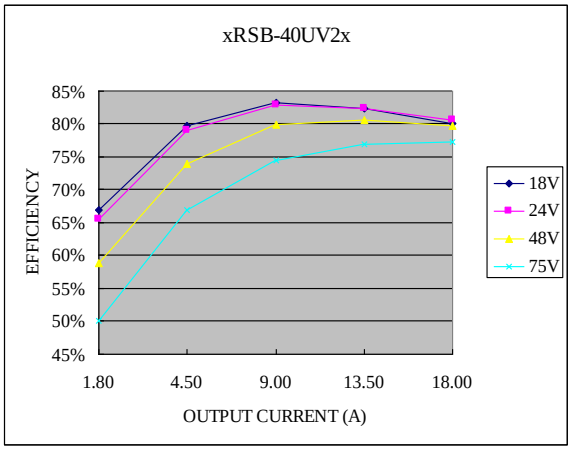
Note:

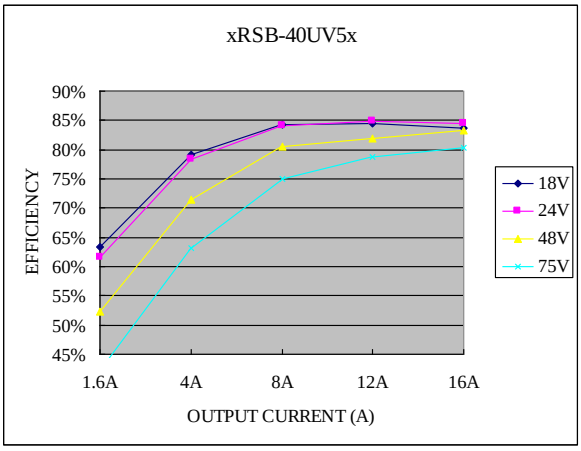
$$delta = \frac{(Vo\_req - Vo)}{Vo} \times 100[\%]$$

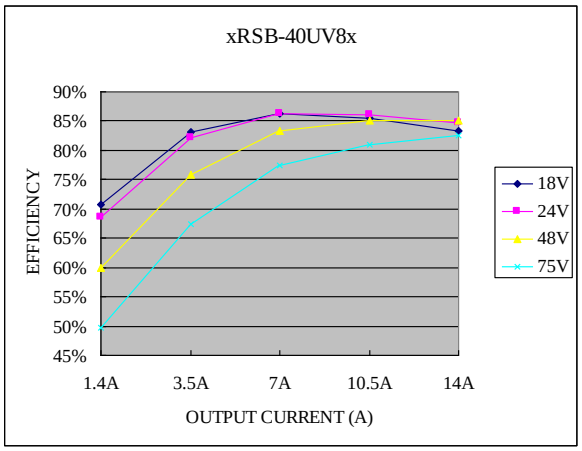
Vo_req=Desired (trimmed) output voltage [V]

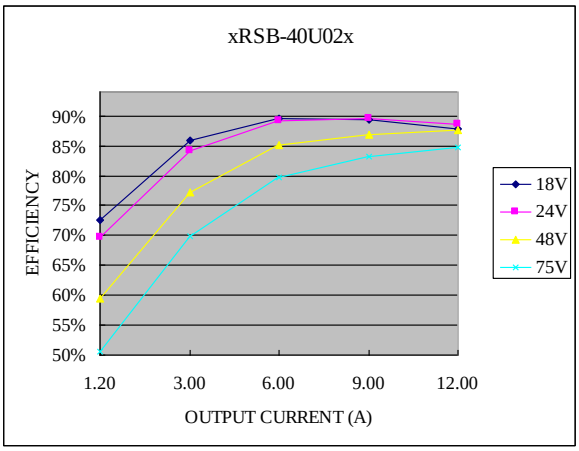
Vo=1.503V, Vo=1.800V, Vo=2.505V, Vo=3.308V, Vo=5.002V, Vo=12.007V

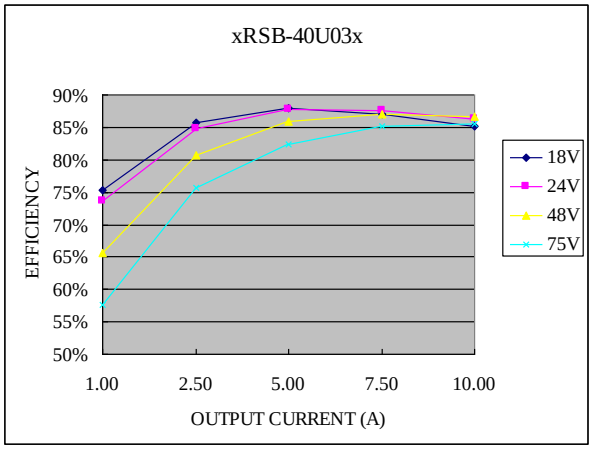
8. EFFICIENCY DATA

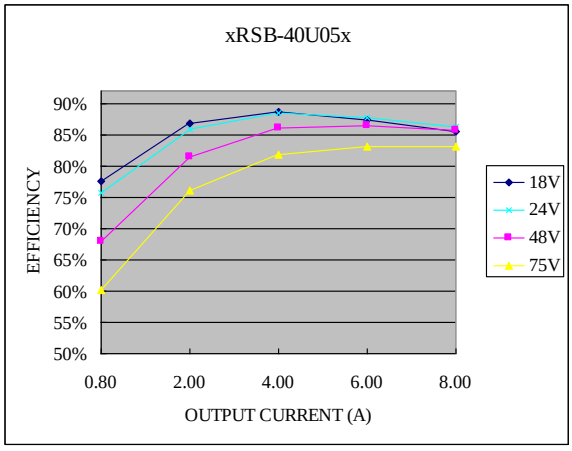




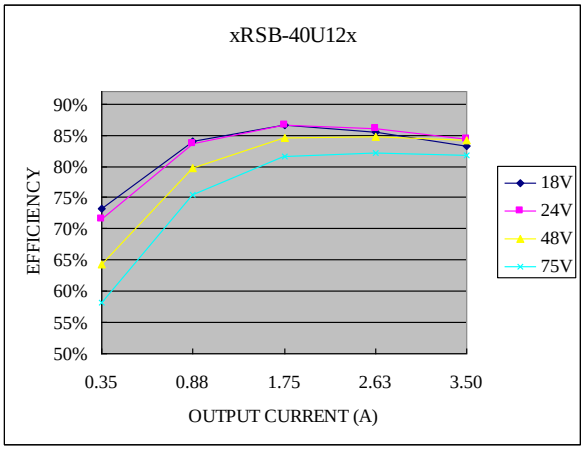






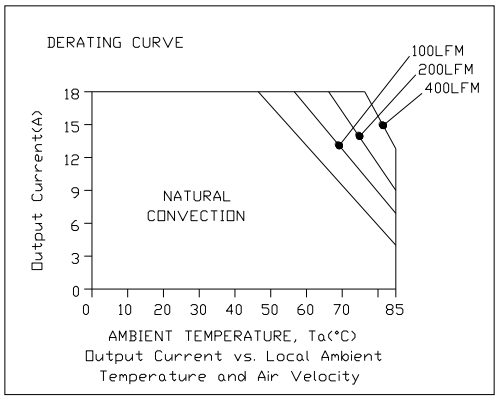


EFFICIENCY DATA(CONTINUED)

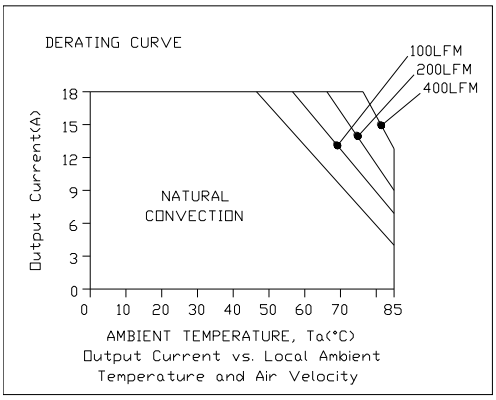


9. THERMAL DERATING CURVES

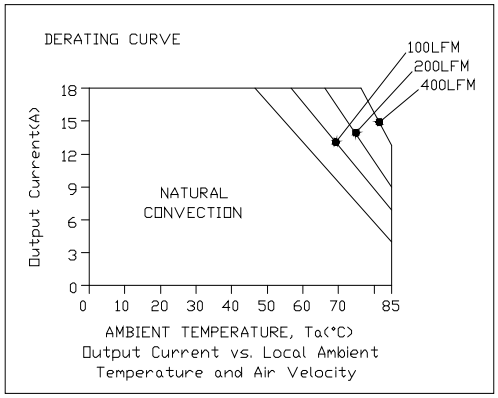
Derating curve of 1.2V output module



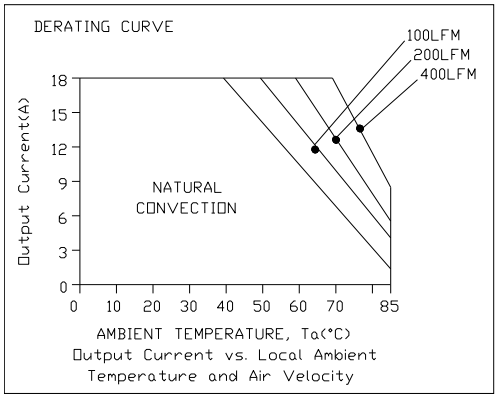
xRSB-40UV2x, Vin=18V



xRSB-40UV2x, Vin=24V

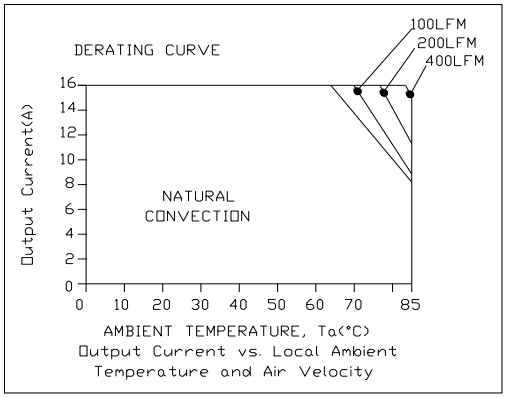


xRSB-40UV2x, Vin=48V

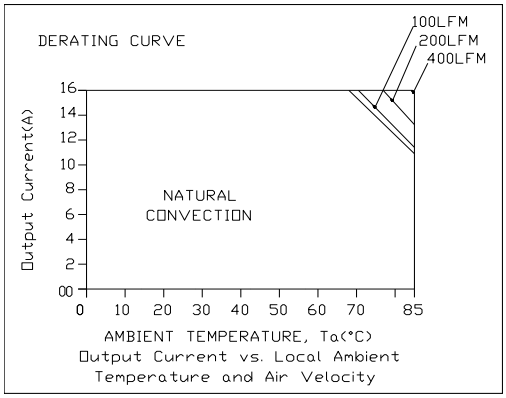


xRSB-40UV2x, Vin=75V

Derating curve of 1.5V output module

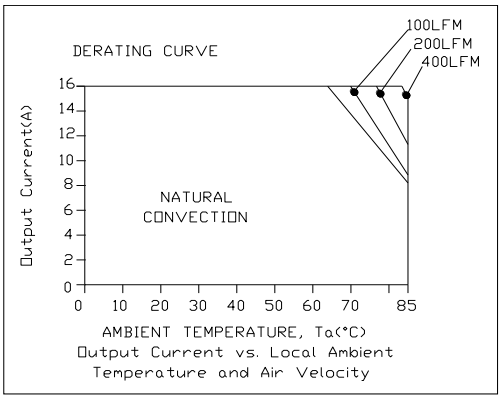


xRSB-40UV5x, Vin=18V

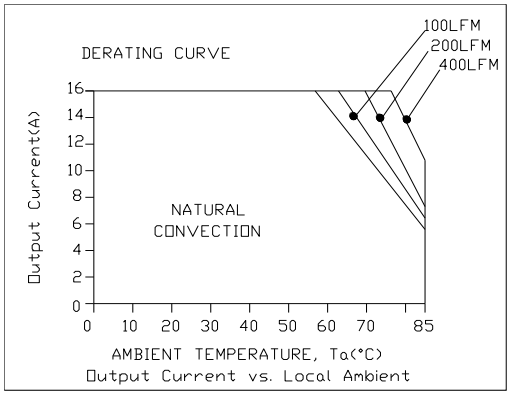


xRSB-40UV5x, Vin=24V

THERMAL DERATING CURVES(CONTINUED)

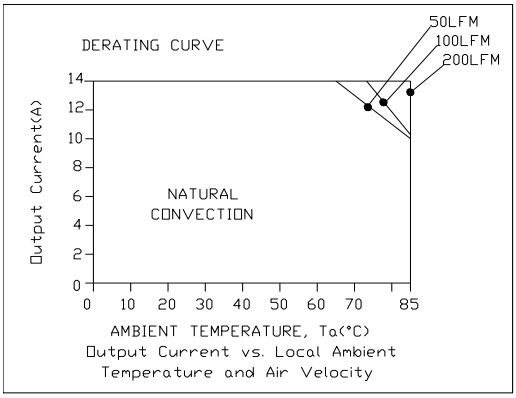


xRSB-40UV5x, Vin=48V

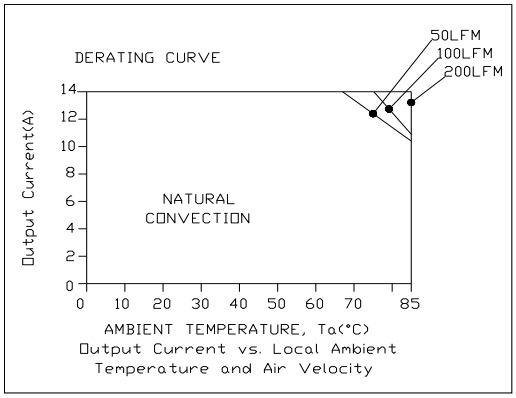


xRSB-40UV5x, Vin=75V

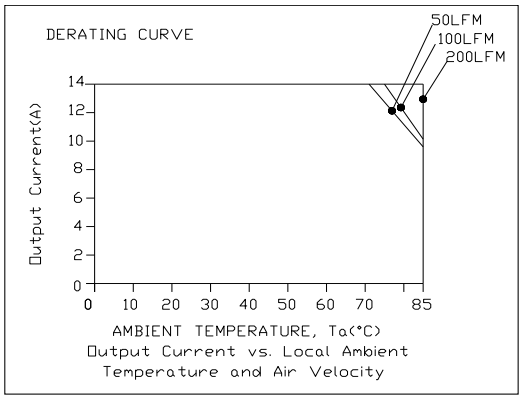
Derating curve of 1.8V output module



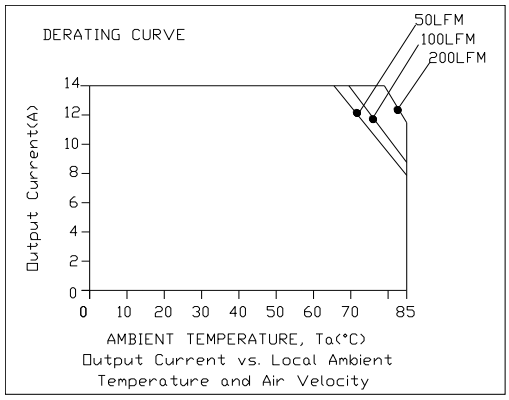
xRSB-40UV8x, Vin=18V



xRSB-40UV8x, Vin=24V



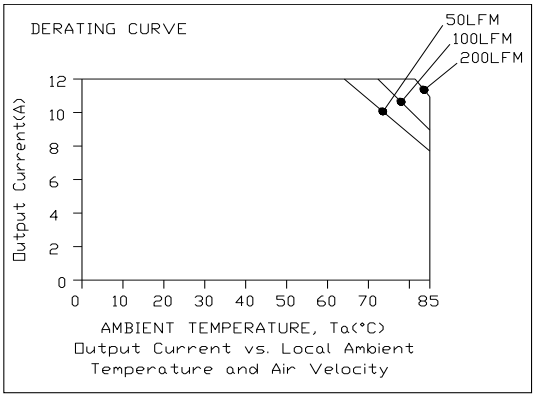
xRSB-40UV8x, Vin=48V



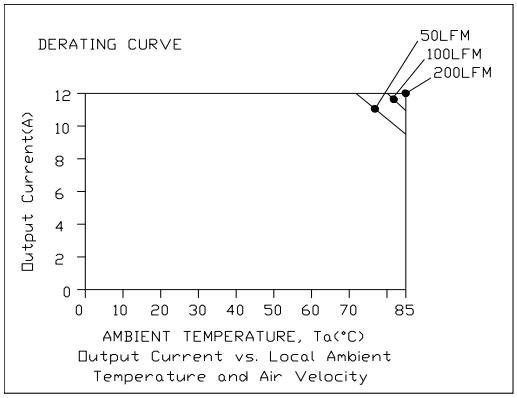
xRSB-40UV8x, Vin=75V

THERMAL DERATING CURVES(CONTINUED)

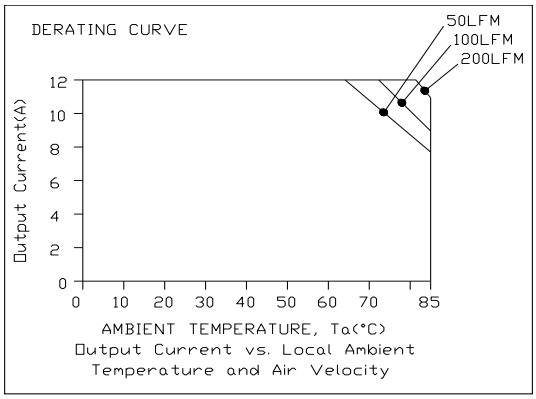
Derating curve of 2.5V output module



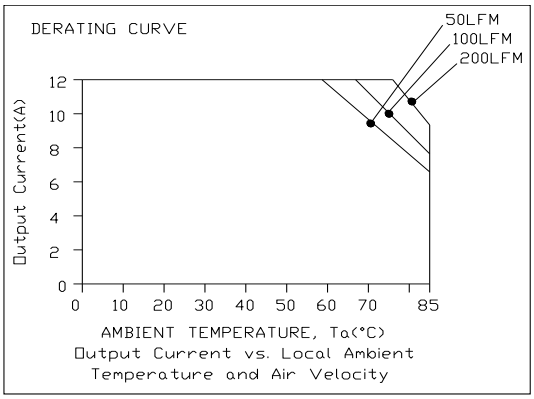
xRSB-40U02x, Vin=18V



xRSB-40U02x, Vin=24V

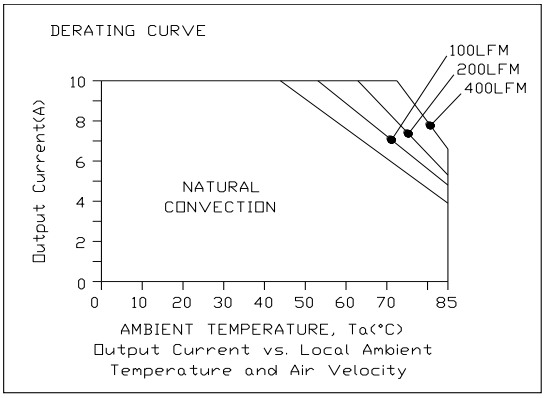


xRSB-40U02x, Vin=48V

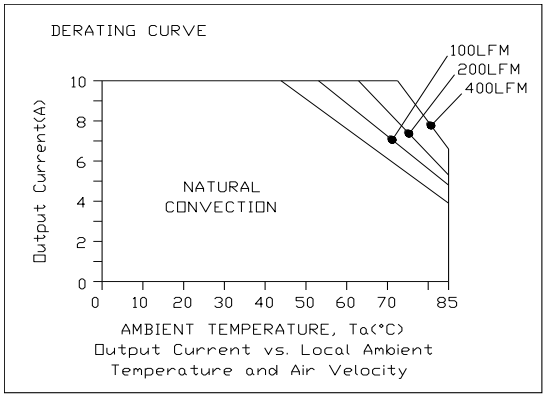


xRSB-40U02x, Vin=75V

Derating curve of 3.3V output module

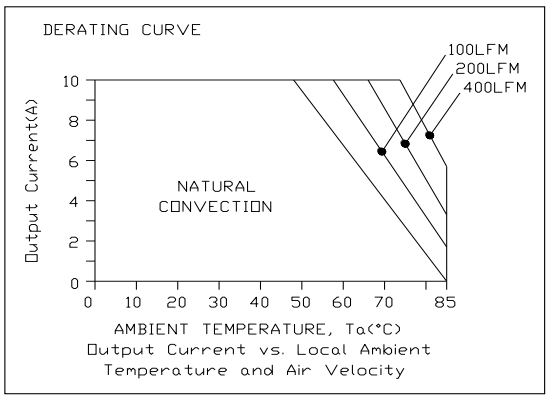


xRSB-40U03x, Vin=18V

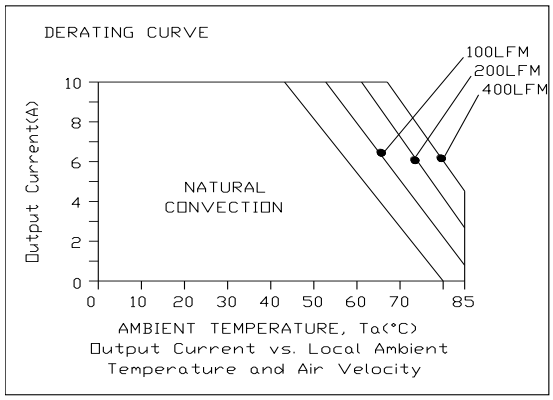


xRSB-40U03x, Vin=24V

THERMAL DERATING CURVES(CONTINUED)

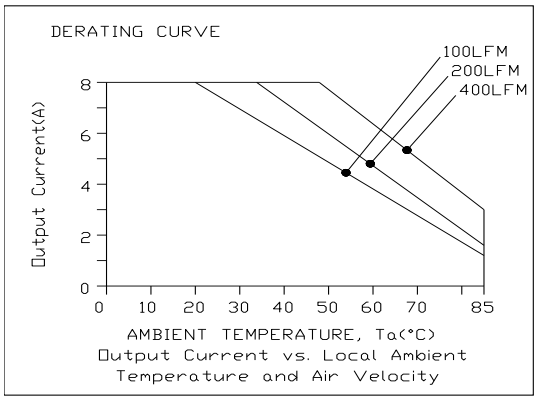


xRSB-40U03x, Vin=48V

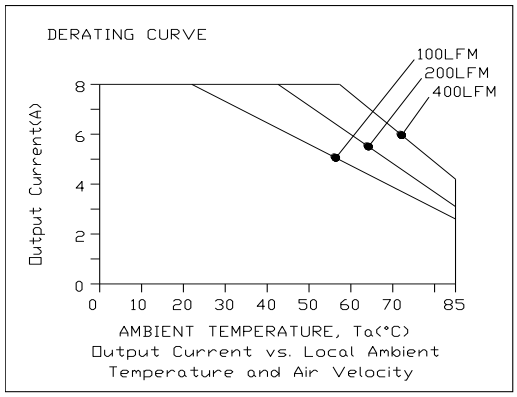


xRSB-40U03x, Vin=75V

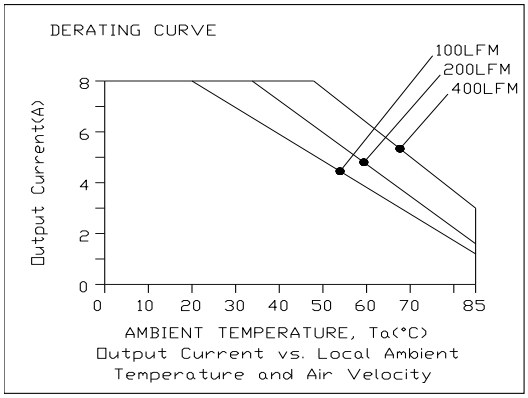
Derating curve of 5V output module



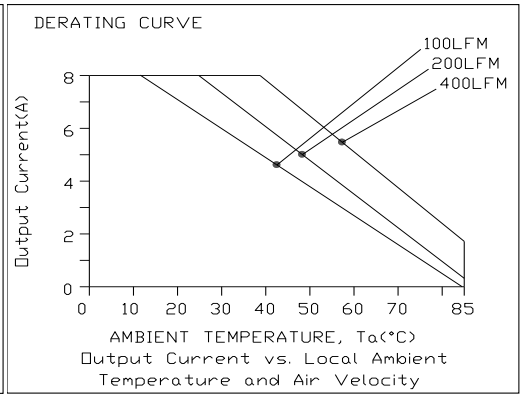
xRSB-40U05x, Vin=18V



xRSB-40U05x, Vin=24V



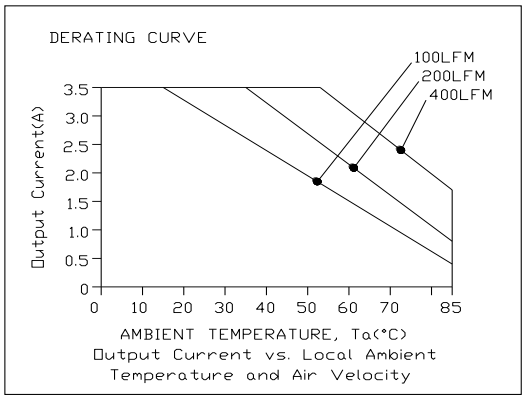
xRSB-40U05x, Vin=48V



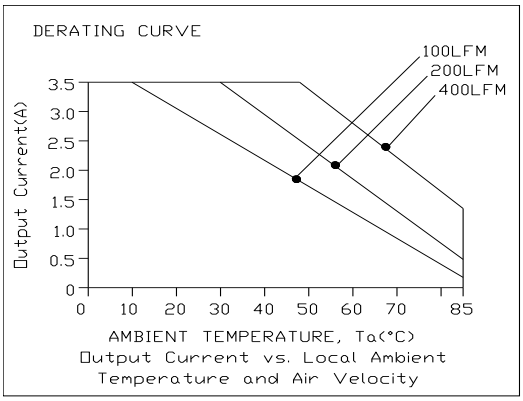
xRSB-40U05x, Vin=75V

THERMAL DERATING CURVES(CONTINUED)

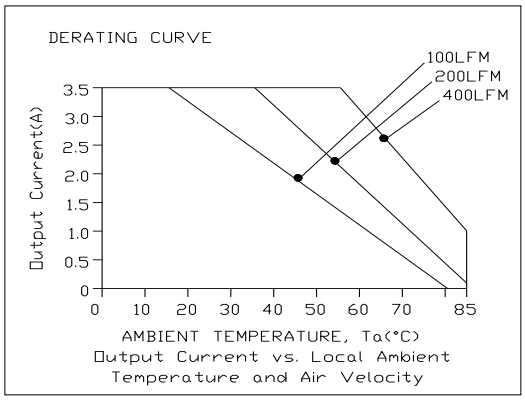
Derating curve of 12.0V output module



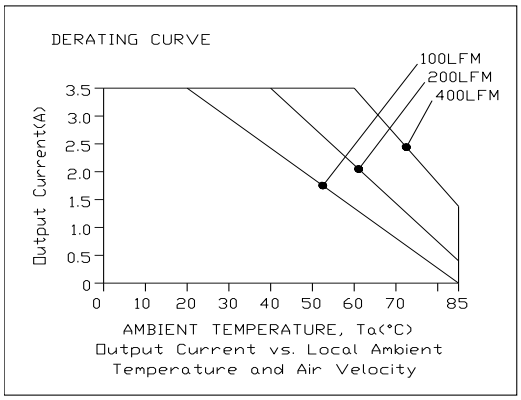
xRSB-40U12x, Vin=18V



xRSB-40U12x, Vin=24V

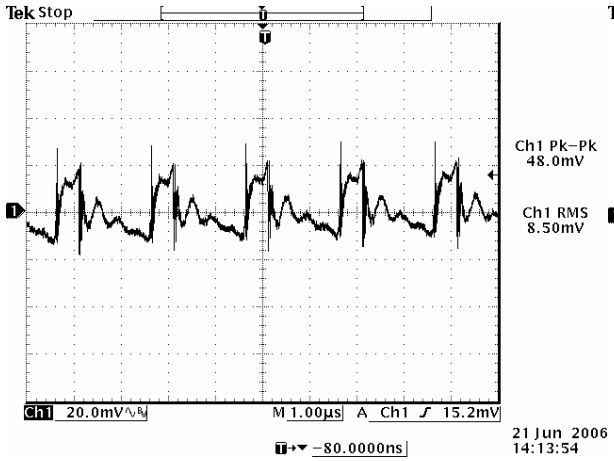


RSB-40U12x, Vin=48V

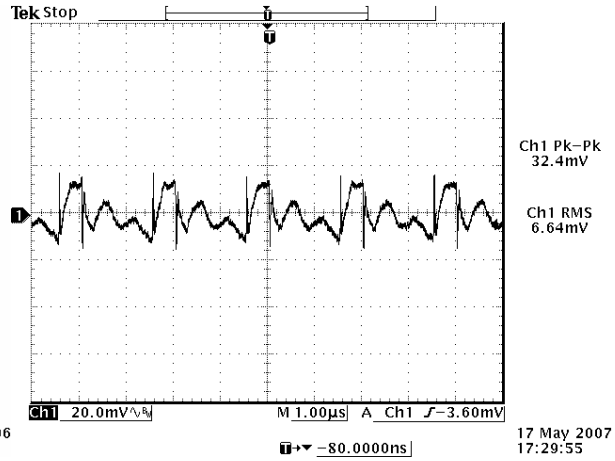


xRSB-40U12x, Vin=75V

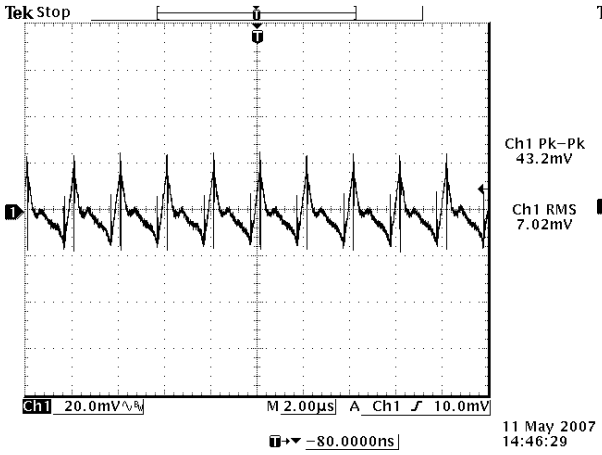
10. RIPPLE AND NOISE WAVEFORMS



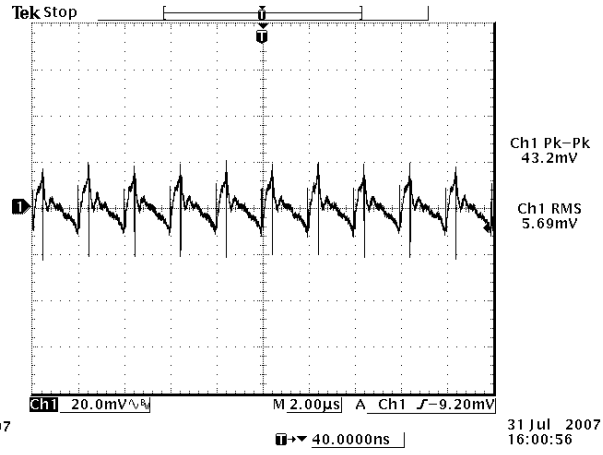
48 Vdc input, 1.2 Vdc output



48 Vdc input, 1.5 Vdc output

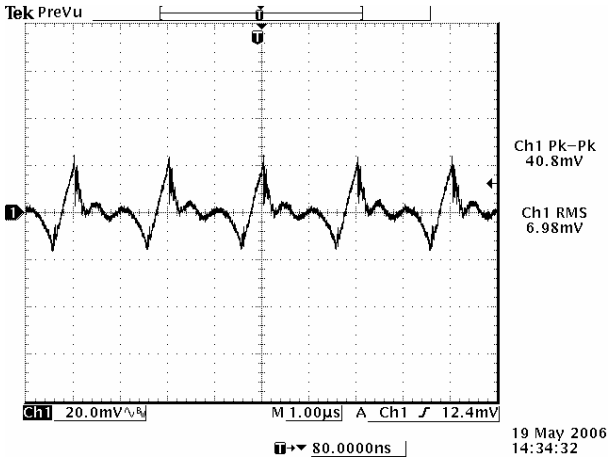


48 Vdc input, 1.8 Vdc output

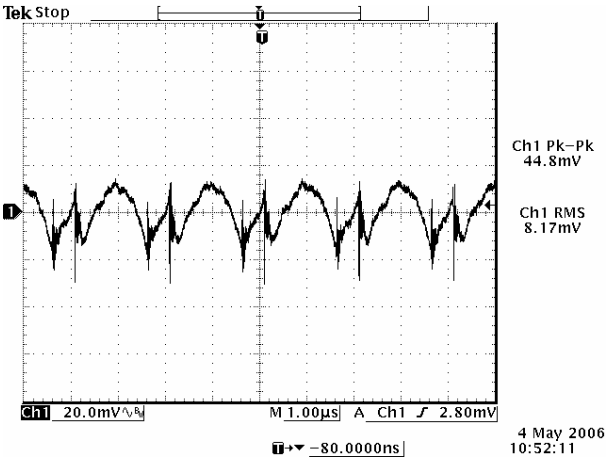


48 Vdc input, 2.5 Vdc output

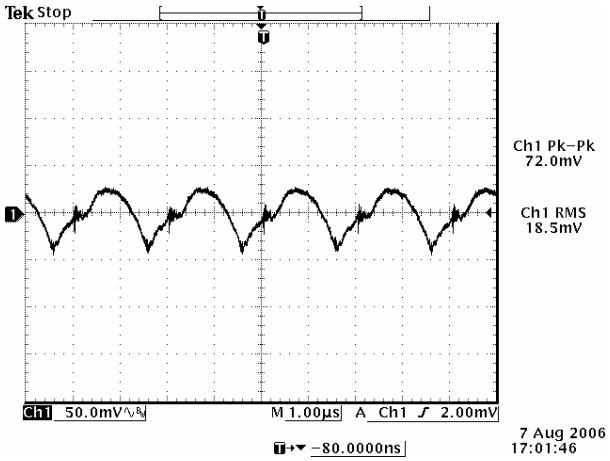
RIPPLE AND NOISE WAVEFORMS(CONTINUED)



48 Vdc input, 3.3 Vdc output



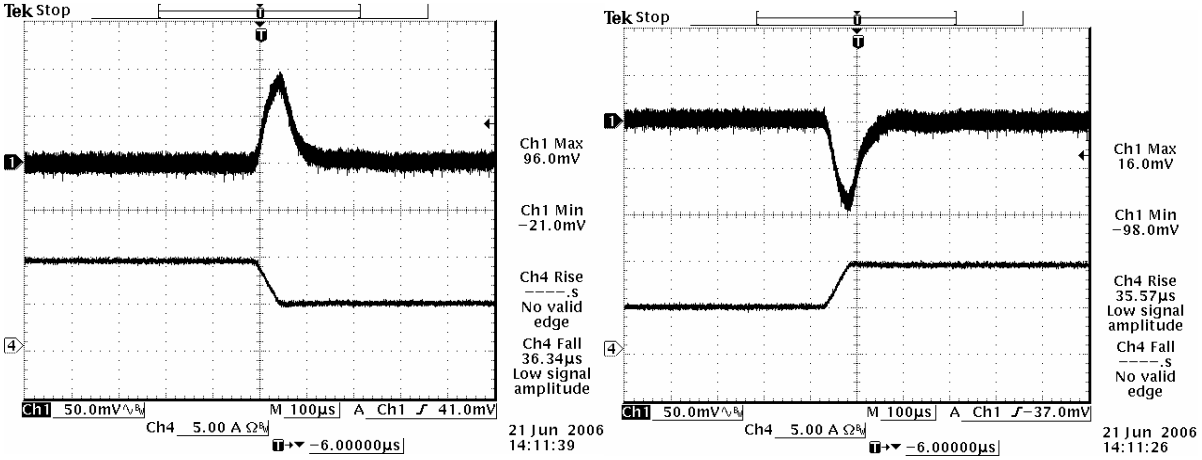
48 Vdc input, 5.0 Vdc output



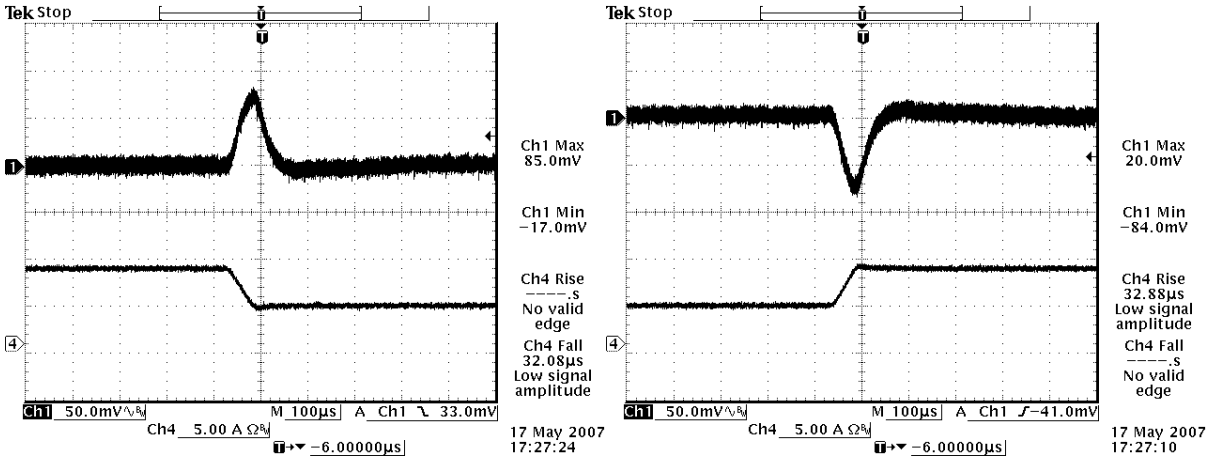
48 Vdc input, 12 Vdc output

Note: Ripple and noise at full load, with external a 1 uF ceramic cap and a 470 uF Tantalum cap for 1.2-1.8V output, with external a 1 uF ceramic cap and a 10 uF Tantalum cap for 2.5V and 12V output, with external a 1 uF ceramic cap and a 220 uF Tantalum cap for 3.3V output, with external a 1 uF ceramic cap and a 100 uF Tantalum cap for 5V output, Ta=25 deg C.

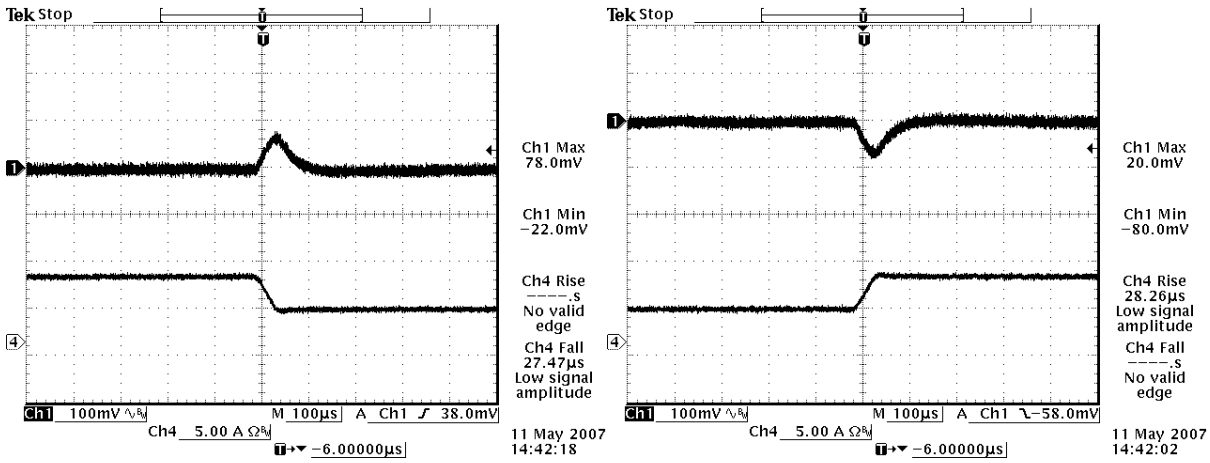
11. TRANSIENT RESPONSE WAVEFORMS



Vout=1.2 V 50% to 25% Load Transients *Vout=1.2 V 25% to 50% Load Transients*

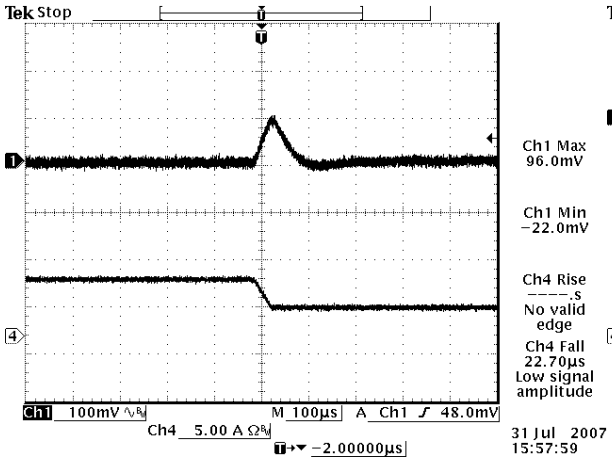


Vout=1.5 V 50% to 25% Load Transients *Vout=1.5 V 25% to 50% Load Transients*

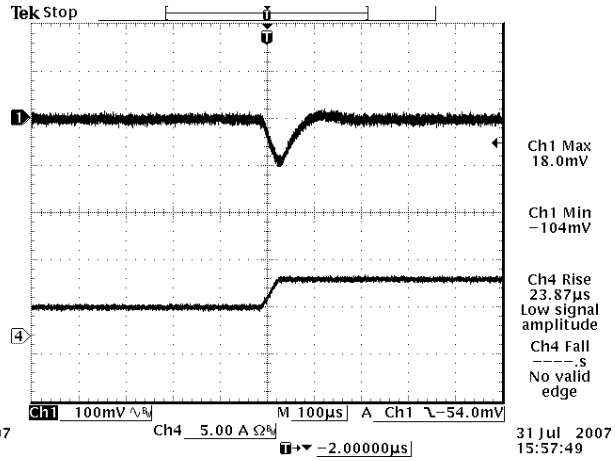


Vout=1.8 V 50% to 25% Load Transients *Vout=1.8 V 25% to 50% Load Transients*

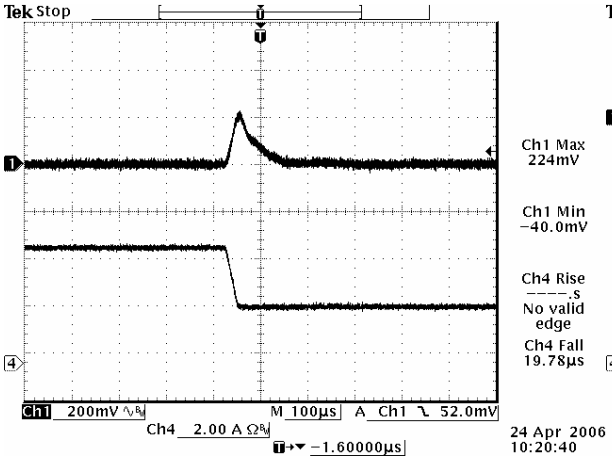
TRANSIENT RESPONSE WAVEFORMS(CONTINUED)



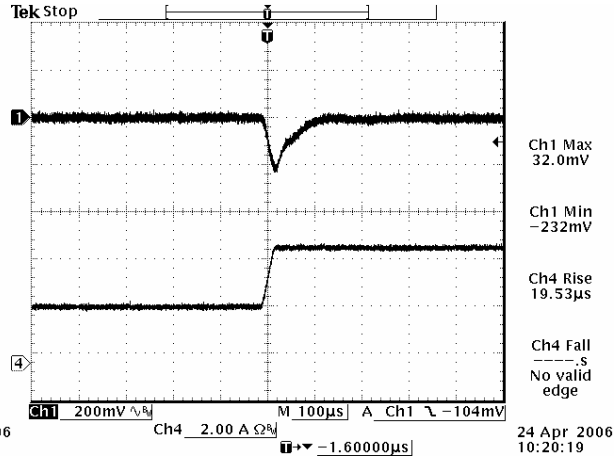
Vout=2.5 V 50% to 25% Load Transients



Vout=2.5 V 25% to 50% Load Transients

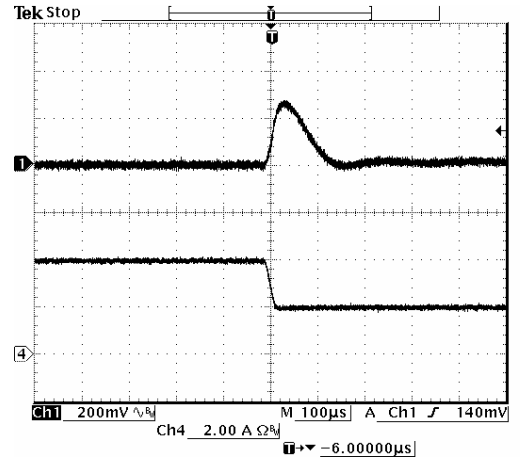


Vout=3.3 V 50% to 25% Load Transients

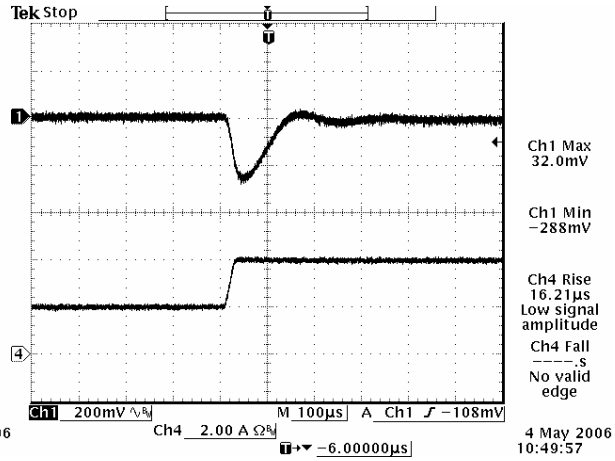


Vout=3.3 V 25% to 50% Load Transients

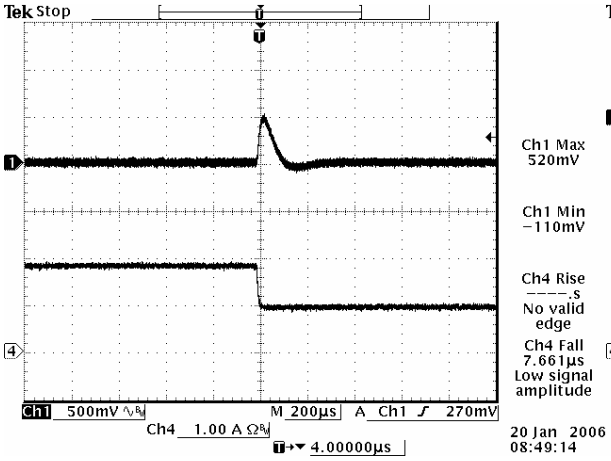
TRANSIENT RESPONSE WAVEFORMS(CONTINUED)



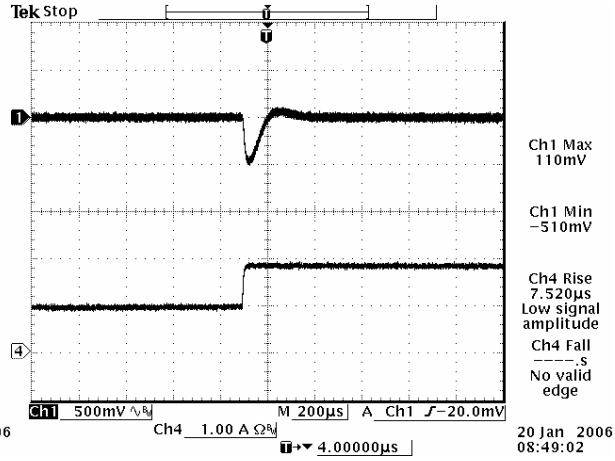
Vout=5.0 V 50% to 25% Load Transients



Vout=5.0 V 25% to 50% Load Transients



Vout=12 V 50% to 25% Load Transients

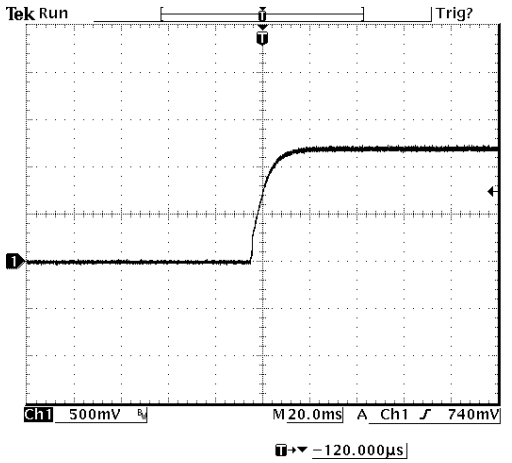


Vout=12 V 25% to 50% Load Transients

Note: Transient Response at Vin=48 V, di/dt=0.1 A/uS, with external a 1 uF ceramic cap and a 470 uF Tantalum cap for 1.2-1.8V output, with external a 1 uF ceramic cap and a 10 uF Tantalum cap for 2.5V and 12V output, with external a 1 uF ceramic cap and a 220 uF Tantalum cap for 3.3V output, with external a 1 uF ceramic cap and a 100 uF Tantalum cap for 5V output, Ta=25 deg C.

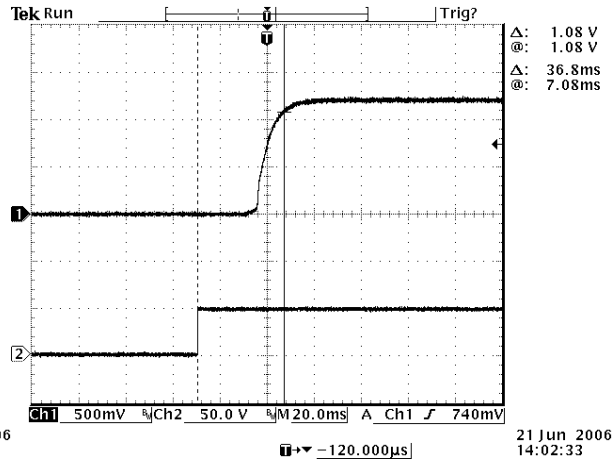
12. STARTUP

Rise Time



Vout=1.2V 100% Load at Vin=48V

Startup time

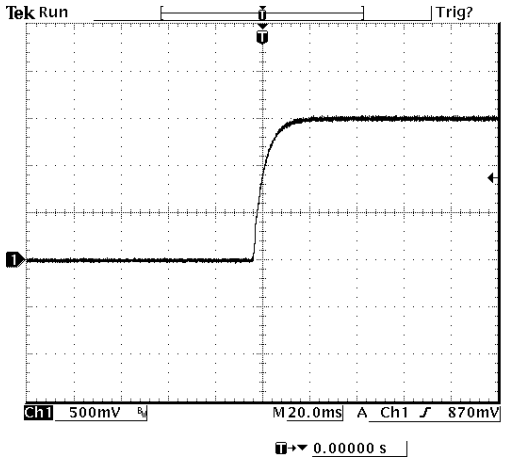


CH1: Vout

CH2: Vin

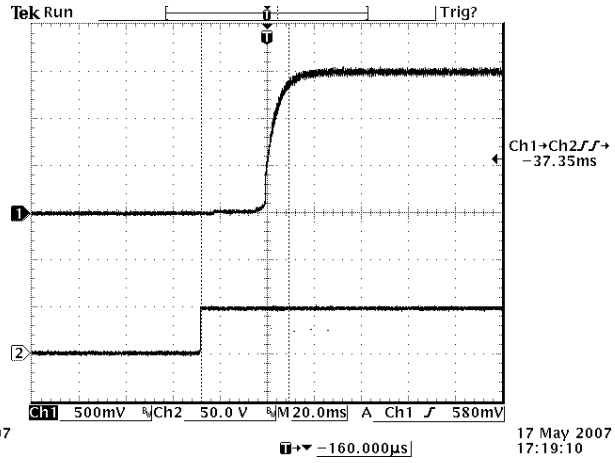
Vout=1.2V 100% Load at Vin=48V

Rise Time



Vout=1.5V 100% Load at Vin=48V

Startup time



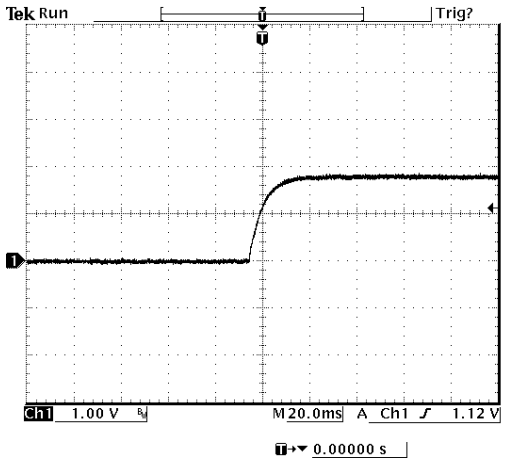
CH1: Vout

CH2: Vin

Vout=1.5V 100% Load at Vin=48V

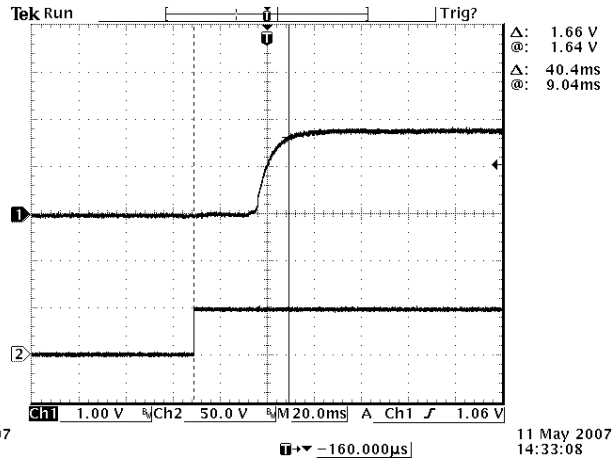
STARTUP(CONTINUED)

Rise Time



Vout=1.8V 100% Load at Vin=48V

Startup time

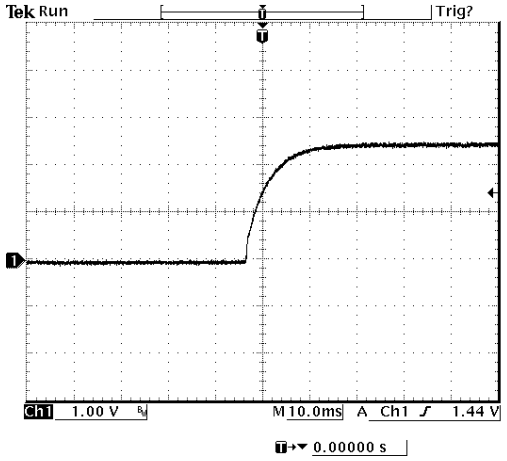


CH1: Vout

CH2: Vin

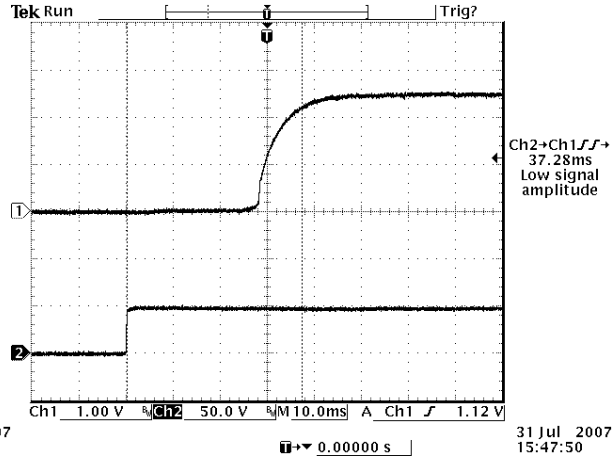
Vout=1.8V 100% Load at Vin=48V

Rise Time



Vout=2.5V 100% Load at Vin=48V

Startup time



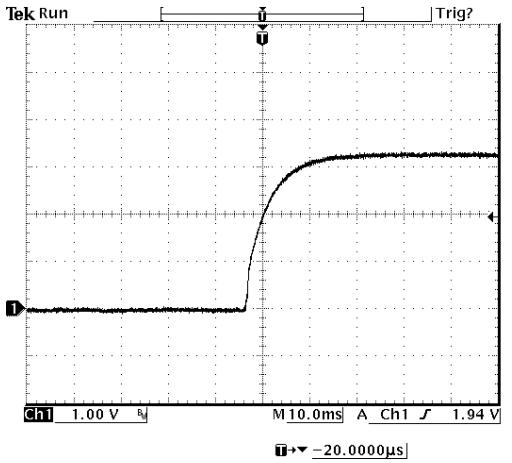
CH1: Vout

CH2: Vin

Vout=2.5V 100% Load at Vin=48V

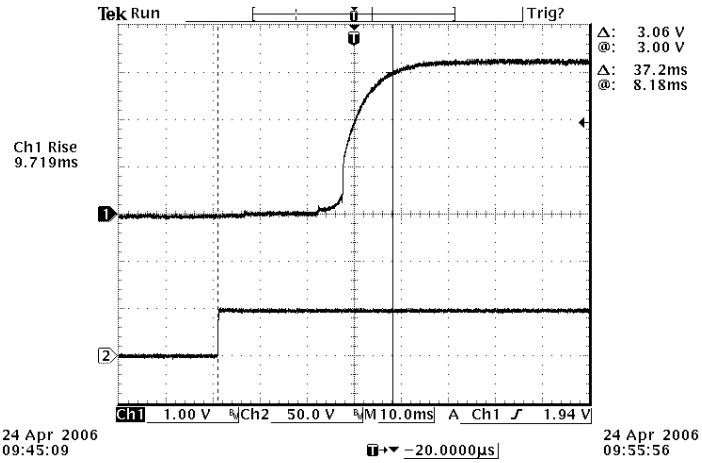
STARTUP(CONTINUED)

Rise Time



Vout=3.3V 100% Load at Vin=48V

Startup time

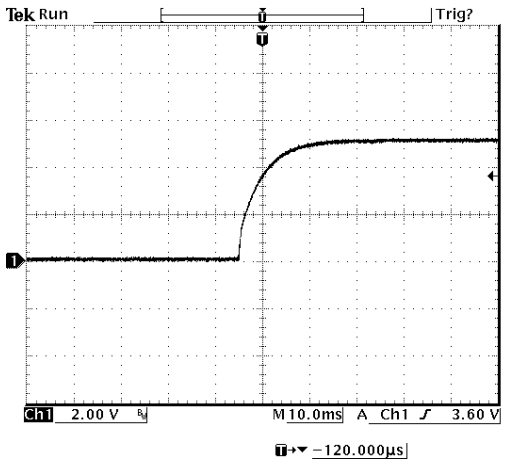


CH1: Vout

CH2: Vin

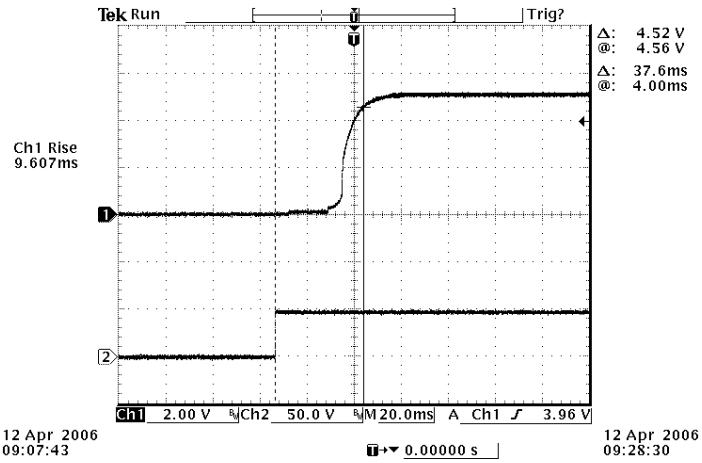
Vout=3.3V 100% Load at Vin=48V

Rise Time



Vout=5V 100% Load at Vin=48V

Startup time



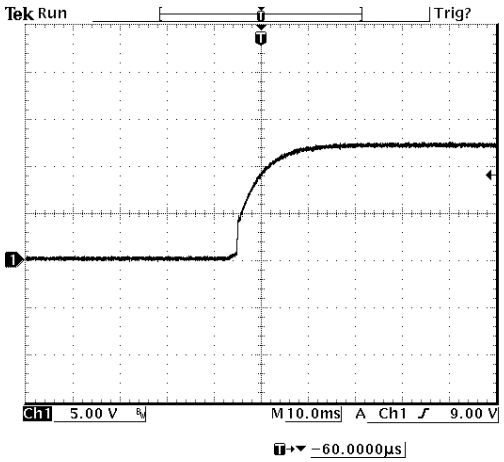
CH1: Vout

CH2: Vin

Vout=5V 100% Load at Vin=48V

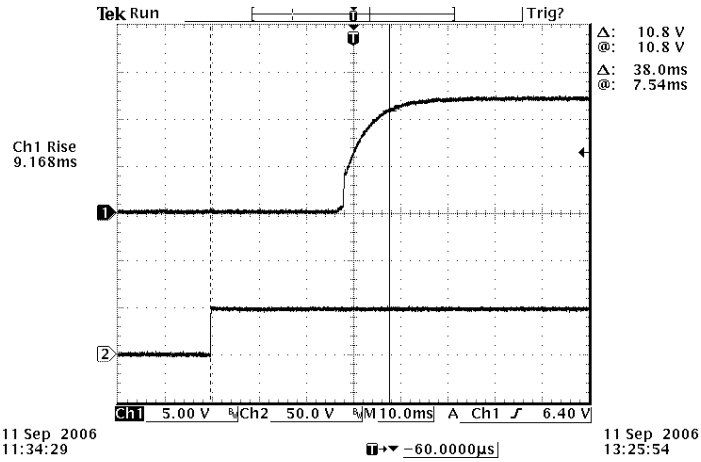
STARTUP(CONTINUED)

Rise Time



Vout=12V 100% Load at Vin=48V

Startup time



CH1: Vout

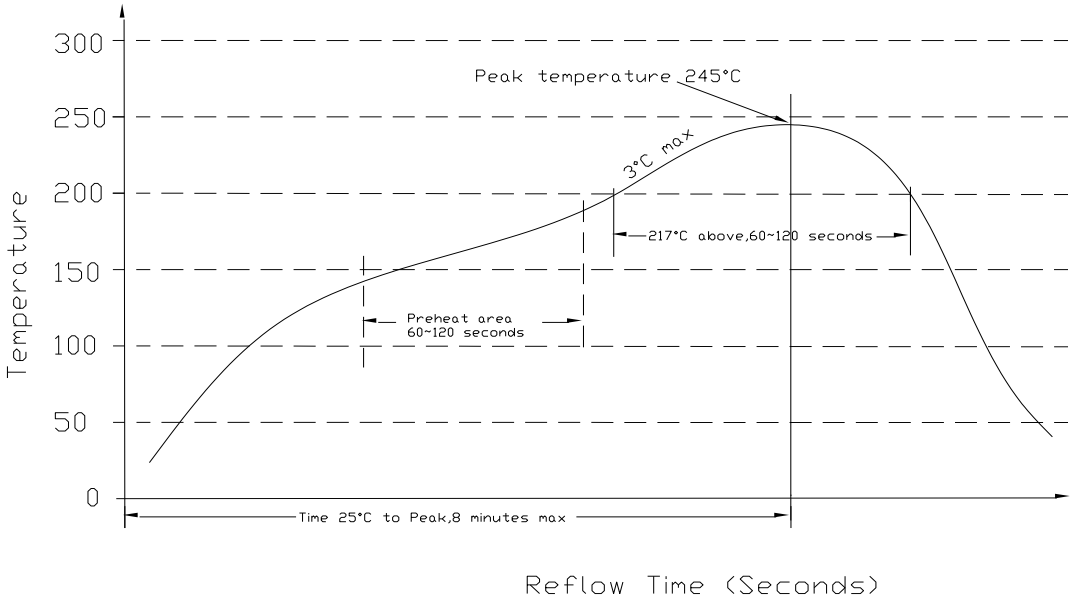
CH2: Vin

Vout=12V 100% Load at Vin=48V

Note: Start up waveform, External 220uF Tantalum Cap and 1uF Ceramic Cap, Ta=25 deg C.

13. SOLDERING INFORMATION

The xRSB-40Uxxx modules are designed to be compatible with reflow soldering process. The suggested Pb-free solder paste is Sn/Ag/Cu(SAC). The recommended reflow profile using Sn/Ag/Cu solder is shown in the following. Recommended reflow peak temperature is 245℃ while the part can withstand peak temperature of 260℃ maximum for 10seconds. This profile should be used only as a guideline. Many other factors influence the success of SMT reflow soldering. Since your production environment may differ, please thoroughly review these guidelines with your process engineers.



14. MSL RATING

The xRSB-40Uxxx modules have a MSL rating of 3.

15. STORAGE AND HANDING

The xRSB-40Uxxx modules are designed to be compatible with J-STD-033 Rev:A (Handling, Packing, Shipping and Use of Moisture /Reflow Sensitive surface Mount devices). Moisture barrier bags (MBB) with desiccant are applied. The recommended storage environment and handling procedure is detailed in J-STD-033.

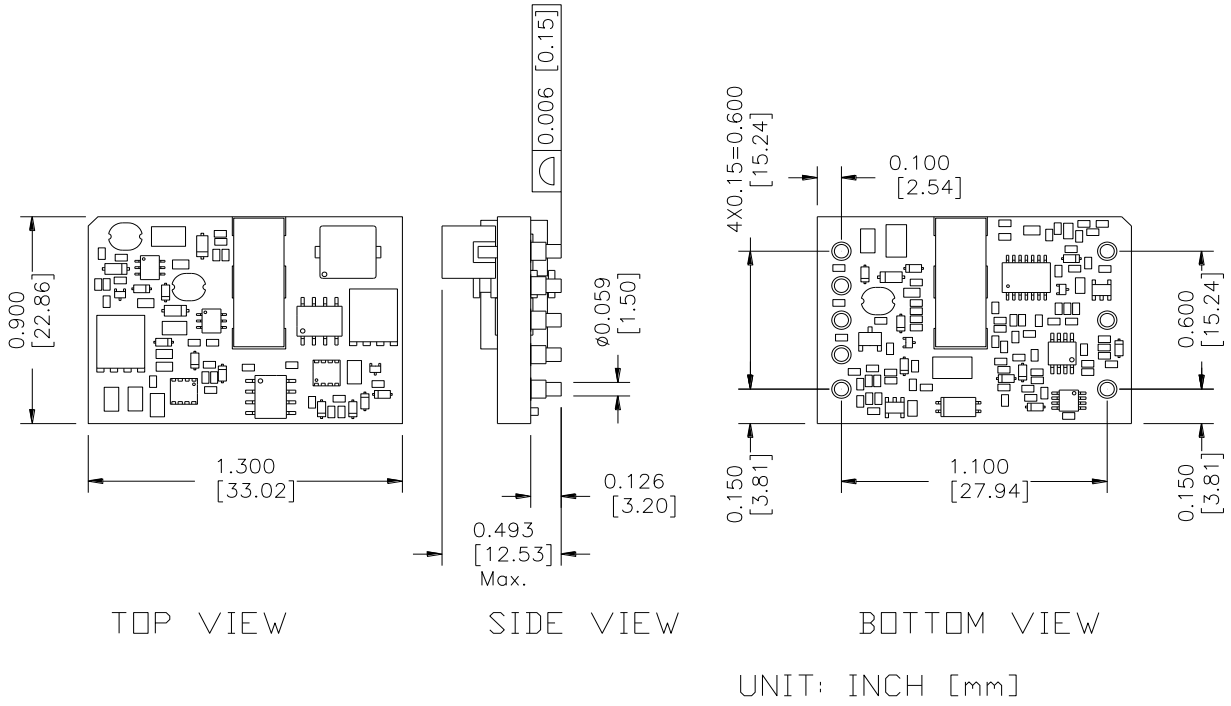
16. PRE-BAKING

This component has been designed, handled, and packaged ready for Pb-free reflow soldering. If the assembly shop follows J-STD-033 guidelines, no pre-bake of this component is required before being reflowed to a PCB. Our packaging tray can only withstand temperature of 70°C max.

17. MECHANICAL DIMENSIONS

OUTLINE

SRSB-40Uxxx

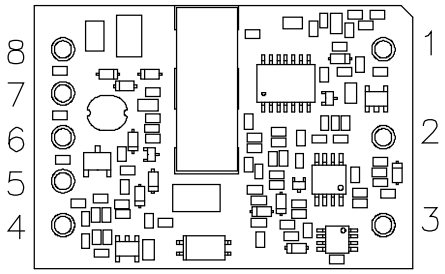


Note: These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 245 °C.

MECHANICAL DIMENSIONS(CONTINUED)

PIN DEFINITIONS

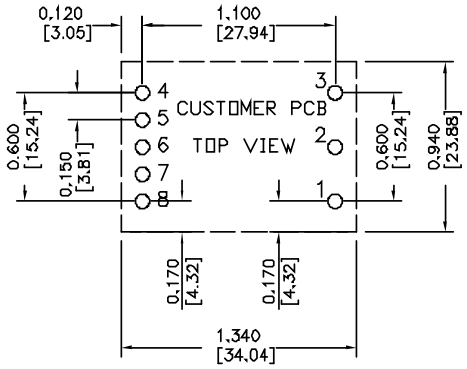
SRSB-40Uxxx



PIN	FUNCTION
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout (-)
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

RECOMMENDED PAD LAYOUT

RECOMMENDED PCB PAD LAYOUT

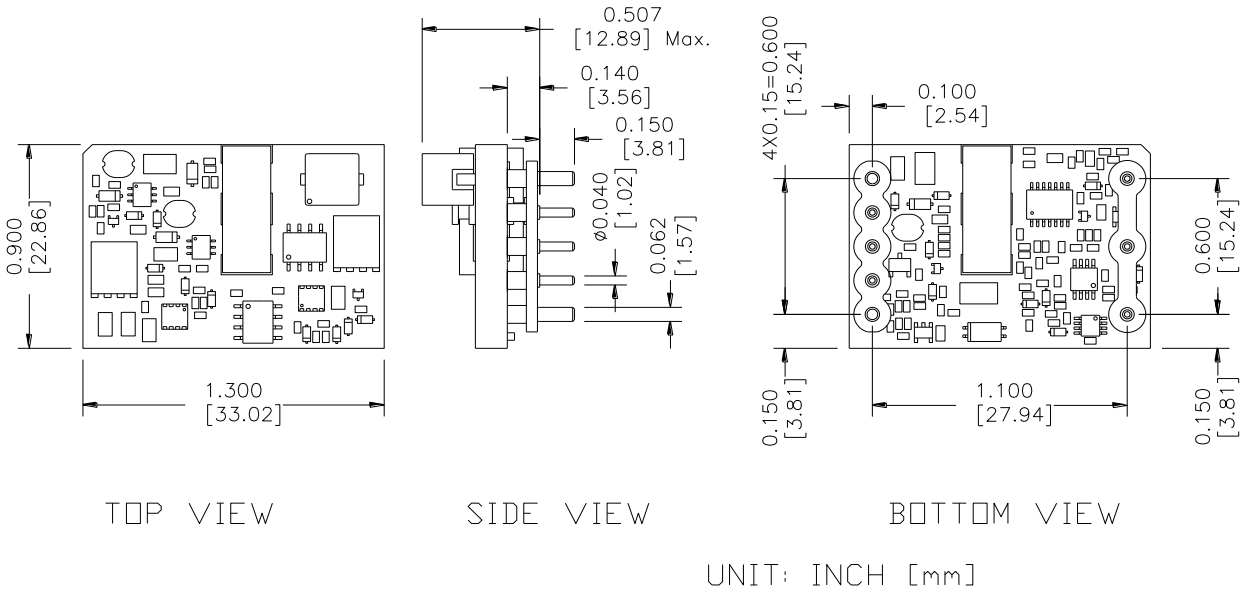


Recommended Surface Mount Pads
Min. Ø0.080" [2.03]
Max. Ø0.092" [2.34]

MECHANICAL DIMENSIONS(CONTINUED)

OUTLINE

0RSB-40Uxxx



Note:

1) All Pins: Material - Copper Alloy;

   Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.

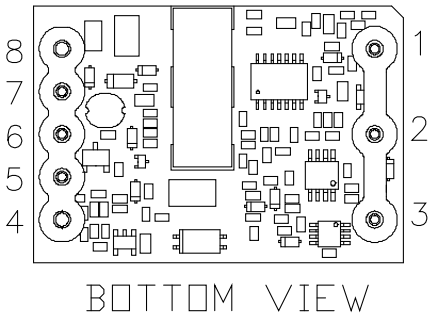
2) Undimensioned components are shown for visual reference only.

3) All dimensions in inches (mm); Tolerances: x.xx +/-0.02 in[0.5mm]. x.xxx +/-0.010 in[0.25mm].

MECHANICAL DIMENSIONS(CONTINUED)

PIN DEFINITIONS

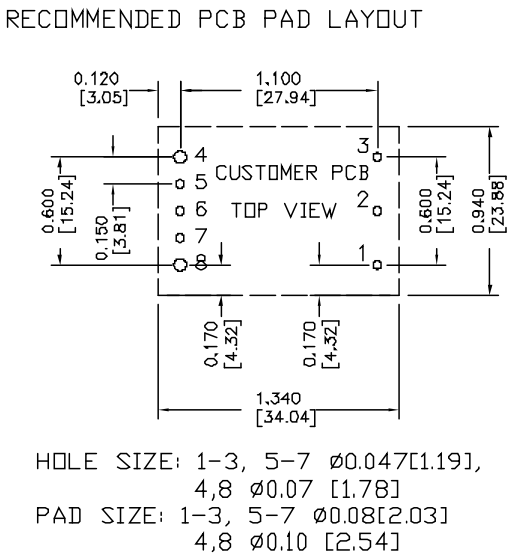
0RSB-40Uxxx



RECOMMENDED PAD LAYOUT

PIN	FUNCTION
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout (-)
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

RECOMMENDED PAD LAYOUT



18. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2011-04-07	C	Add input transient voltage in absolute maximum ratings. Add input over voltage lockout in input specifications. Add startup waveform.	JZ Wang
2011-08-25	D	Update the reflow solder temperature.	HL
2011-11-8	E	Add thermal dearing curve for 18Vin and 75Vin.	JZ Wang
2016-01-05	F	Update Part Number Explanation, Soldering Information.	Falling Tao
2018-06-19	AG	Update Rev.	Falling Tao

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.
TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.