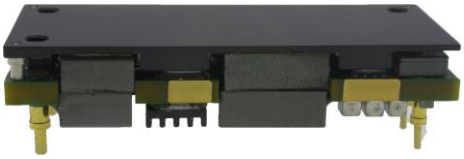
0RRE-32S10R

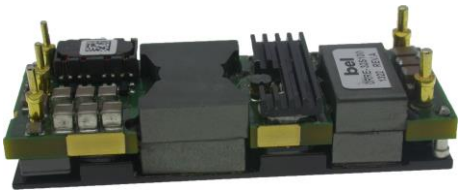
Isolated DC-DC Converter

The 0RRE-32S10R is an isolated DC/DC converter that operates from a nominal 42 VDC / 50 VDC source. This converter is intended to provide isolation and step down to generate a regulated intermediate bus for the purpose of powering non-isolated Point-of-Load (POL) converters.

This unit will provide up to 300 W of output power from a nominal 42 VDC / 50 VDC input. The output of the converter has the droop function which allow the modules operating in parallel with high output current sharing precision.

This converter is provided in a 1/8th brick package.





Key Features & Benefits

- 38 - 55 VDC Input
- 8.2 VDC / 36 A Output
- Isolated
- High Efficiency
- Fixed Frequency (300 kHz)
- High Power Density
- Low Cost
- Parallel Operation
- Input Under-Voltage Protection
- Input Over-Voltage Protection
- Output Over-Voltage Protection
- OCP/SCP
- Over Temperature Protection
- Remote ON/OFF
- Approved to IEC/EN 62368-1
- Approved to UL/CSA 62368-1
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)

RoHS Compliant

Applications

- Networking
- Computers and Peripherals
- Telecommunication

1. MODEL SELECTION

MODEL NUMBER ACTIVE LOW	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RRE-32S10R	8.2 VDC	38 – 55 VDC	36 A	300 W	96.3%

NOTE: 1. Add “G” suffix at the end of the model number to indicate a ROHS compliant module without requiring 7c-III exemption shipped in a standard tray packaging.

2. Add “P” suffix at the end of the model number to indicate a ROHS compliant module without requiring the 7c-III exemption that is Paste in Hole compliant (see reflow temp specs in datasheet) shipped in a special Paste in Hole process compliant tray (see tray bake temp specs in datasheet).

3. Add “H” suffix at the end of the model number to indicate a customer specific ROHS compliant module without requiring the 7c-III exemption shipped in a standard tray packaging.

PART NUMBER EXPLANATION

0	R	RE	-	32	S	10	R	x
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Logic Status	Package
Through Hole Mount	RoHS	1/8th brick		300 W	38 – 55 V	8.2 V	Active Low, with Baseplate	See Above

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-0.3	-	60	V
Remote On/Off		-0.3	-	10	V
Ambient Temperature		-20	-	70	°C
Storage Temperature		-40	-	100	°C
Altitude		-	-	5000	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

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Operating Input Voltage		38	42/50	55	V
Input Current		-	-	10	A
Input Current (no load)		-	80/84	100	mA
Remote Off Input Current		-	4	8	mA
Input Reflected Ripple Current (pk-pk)		-	350	450	mA
Input Reflected Ripple Current (rms)		-	100	150	mA
Turn on Voltage Threshold		35	36.5	38	V
Turn off Voltage Threshold		33	34.5	36	V
I^2t Inrush Current Transient		-	-	1	A^2s

CAUTION: This converter is not internally fused. An input line fuse must be used in application.

Recommend a fast-acting fuse with maximum rating of 15 A on system board. Refer to the fuse manufacture’s datasheet for further information.

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

4. OUTPUT SPECIFICATIONS

PARAMETER		DESCRIPTION		MIN	TYP	MAX	UNIT
Output Voltage Set Point		Vin = 38-55 V, Io = 0 load		8.77	8.8	8.83	V
		Vin = 38-55 V, Io = 100% load		8.175	8.2	8.225	
		Vin < 38 V, Io = 0 load		8.0	8.1	8.2	
		Vin < 38 V, Io = 100% load		7.4	7.5	7.6	
Line Regulation		Vin = 38-55 V, Io = 100% load		-	25	40	mV
Load Regulation		Vin = 42/50 V, Io = 0~100% load (The output droop voltage from no load to full load is about 0.6 V)		-	0.6	0.65	V
Regulation Over Temperature				-	-	±100	mV
Output Ripple and Noise (pk-pk)		Vin = 42/50 V, Io = 100% load, 0-20 MHz BW, with 8×22 μF ceramic capacitor		-	45/50	150	mV
Output Ripple and Noise (rms)				-	10	25	mV
Ripple and Noise (pk-pk) under worst case		Over entire operating input voltage range, load and ambient temperature condition		-	-	200	mV
Output DC Current Limit				39	45	51	A
Output Current Range				0	-	36	A
Current Share Accuracy		Vin = 42/50 V, Io = full load, two units parallel operation		-	-	±5	%
Turn on Time		Enable from Vin		-	30	35	ms
		Enable from ON/OFF		-	30	35	
Rise Time				-	-	15	ms
Overshoot at Turn on				-	0	3	%
Short Circuit Surge Transient				-	-	2	A^2s
Output Capacitance				0	-	5000	μF
Transient Response							
△V 50% ~ 75% of Max Load	Overshoot	di/dt = 1 A/μs, Vin = 42/50 VDC, with a with 8×22 μF ceramic capacitor	Vo = 8.5 V	-	340/350	500	mV
	Settling Time			-	100	200	μs
△V 75% ~ 50% of Max Load	Overshoot			-	350/370	500	mV
	Settling Time			-	100	200	μs

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

5. OUTPUT PLOT VS INPUT

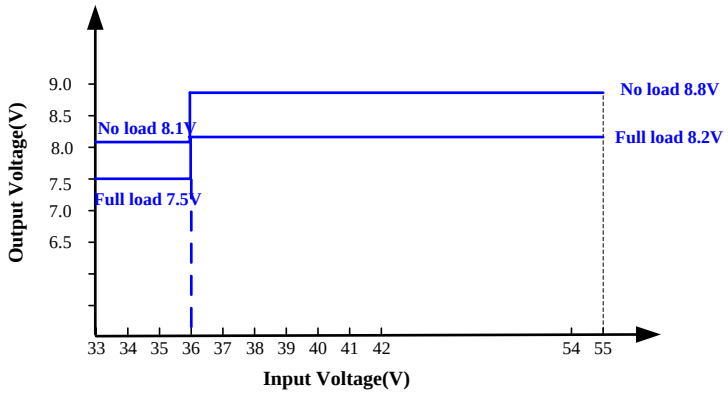


Figure 1. Output plot vs input

PARAMETER	MIN	TYP	MAX	UNITS
Turn-on Voltage Threshold	35	36.5	38	V
Turn-off Voltage Threshold	33	34.5	36	V

6. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Vin = 50 V, full load	95	96.3	-	%
Switching Frequency		280	300	320	kHz
FIT*	Calculated Per Bell Core SR-332 (Vin = 50 V, Vo = 9.2 V, Io = 26 A, FIT = 10^9/MTBF)	-	168	-	-
Over Temperature Protection		-	125	130	°C
Over Voltage Protection		-	-	15	V
Weight		-	42	-	g
Dimensions (L × W × H)			2.30 x 0.90 x 0.48 58.42 x 22.86 x 12.19		inch mm
Isolation Characteristics					
Isolation Capacitance		-	2700	-	pF
Isolation Resistance		10M	-	-	ohm
Input to Output		500	-	-	V

7. EFFICIENCY DATA

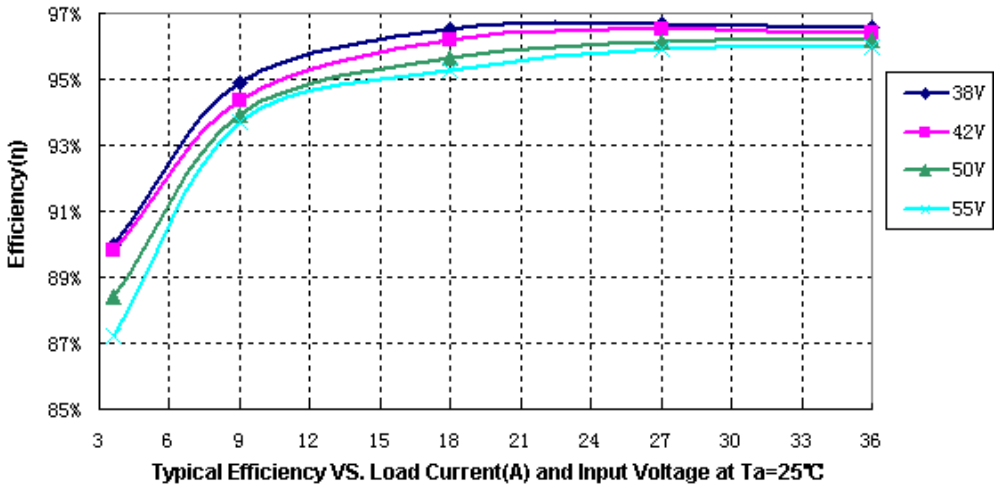


Figure 2. Efficiency data

8. REMOTE ON/OFF

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit On)	Active Low	Remote On/Off pin is open, the module is off	-0.3	-	0.8	V
Signal High (Unit Off)			2.4	-	10	
Current Sink			0	-	0.5	mA

Recommended remote on/off circuit for active low

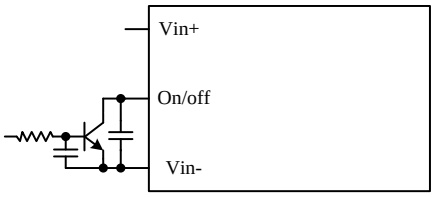


Figure 3. Control with open collector/drain circuit

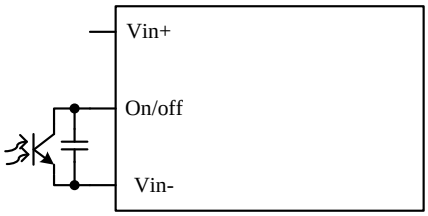


Figure 4. Control with photocoupler circuit

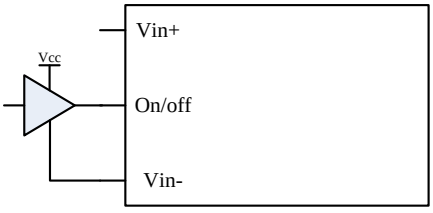


Figure 5. Control with logic circuit

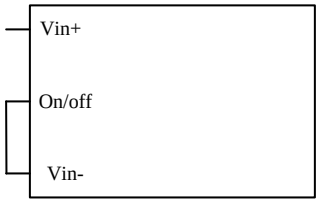


Figure 6. Permanently on

9. RIPPLE AND NOISE WAVEFORM

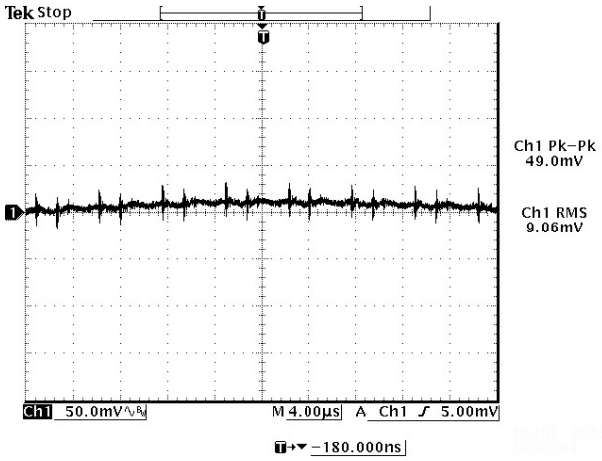


Figure 7. 50 VDC input, 8.2 VDC / 36 A output

NOTE: Ripple and noise at full load, 48 V input, with a 1 µF ceramic capacitor and a 10 µF tantalum capacitor at the output, Ta = 25°C.

10. TRANSIENT RESPONSE

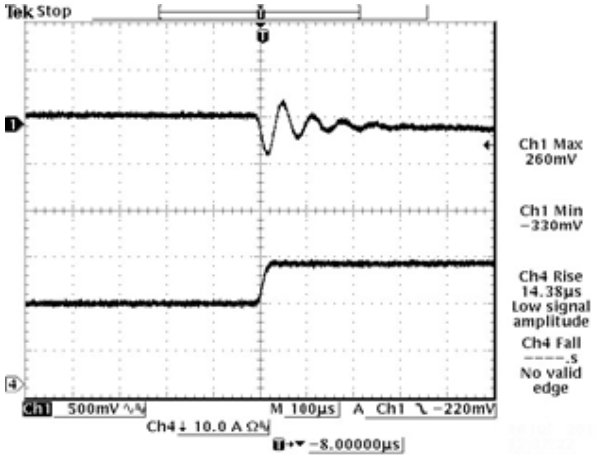


Figure 8. Vin = 50 V, 50%-75% Load Transients

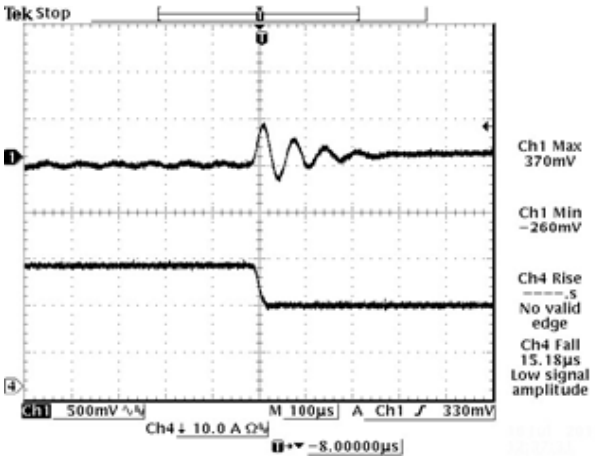


Figure 9. Vin = 50 V, 75%-50% Load Transients

NOTE: Transient Response at di/dt = 1 A/µs, with 8×22 µF ceramic capacitor, Ta = 25°C.

11. STARTUP & SHUTDOWN

Turn on Rise Time

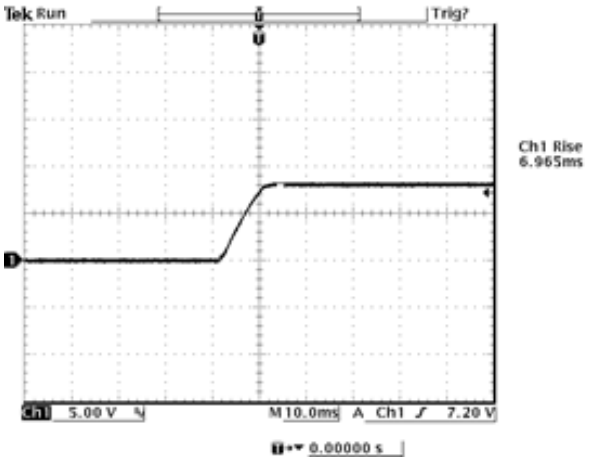


Figure 10. Vin = 50 V, Vo = 8.2 V, Io = 36 A

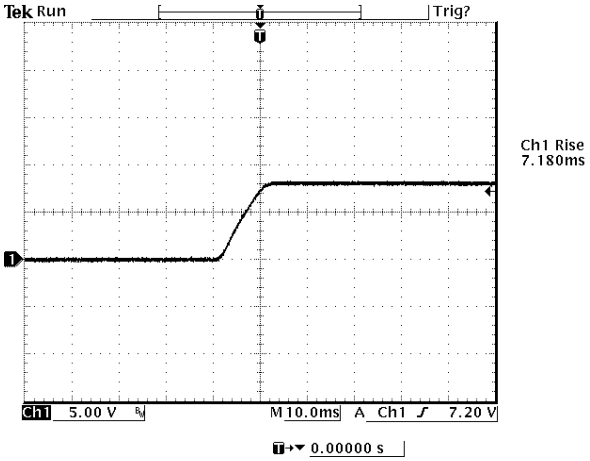


Figure 11. Vin = 50 V, Vo = 8.2 V, Io = 36 A with Cext = 3800 µF

Turn on Delay Time

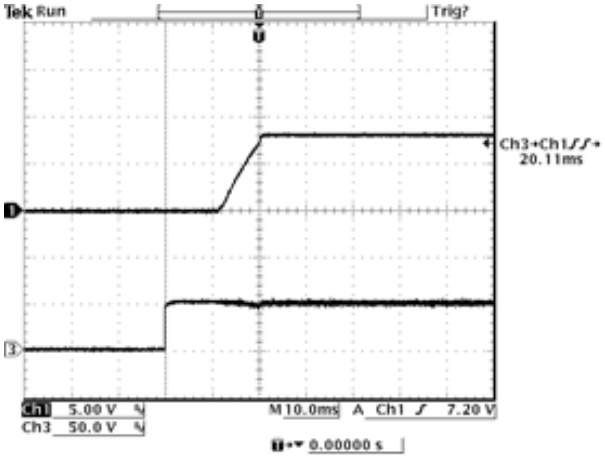


Figure 12. Startup from Vin
Ch1: Vo
Ch3: Vin
Vin = 50 V, Vo = 8.2 V, Io = 36 A

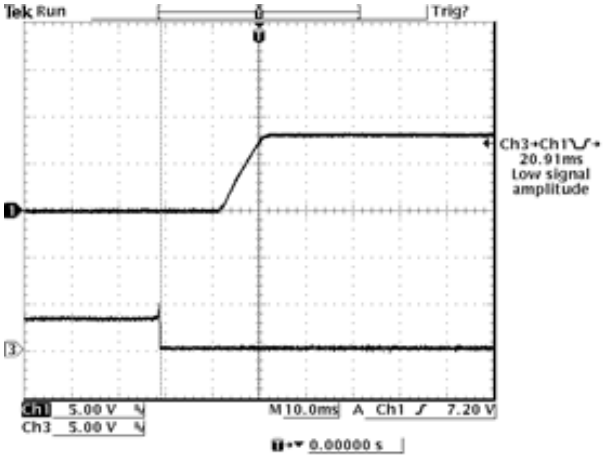


Figure 13. Startup from on/off
Ch1: Vo
Ch3: on/off
Vin = 50 V, Vo = 8.2 V, Io = 36 A

Shutdown

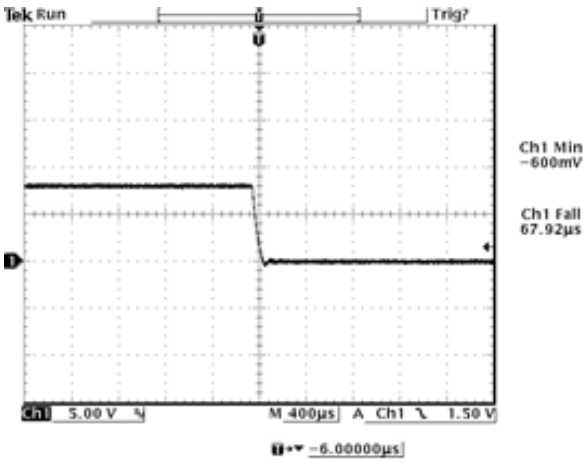


Figure 14. Vin = 50 V, Vo = 8.2 V, Io = 36 A

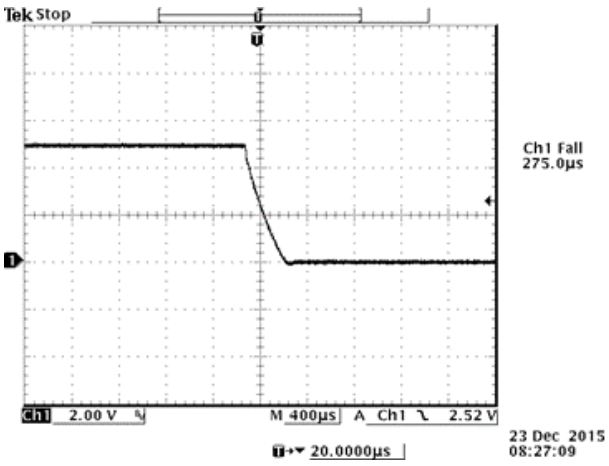


Figure 15. Vin = 50 V, Vo = 8.2 V, Io = 36 A, with Cext = 3800 µF

12. OVER CURRENT PROTECTION

To provide protection in a fault output overload condition, the module is equipped with internal current-limiting circuitry which can endure current limiting for a few milliseconds. If the over current condition persists beyond a few milliseconds, the module will shut down into hiccup mode and restart once every 400 ms. The module operates normally when the output current goes into specified range. The typical average output current is 2 A during hiccup.

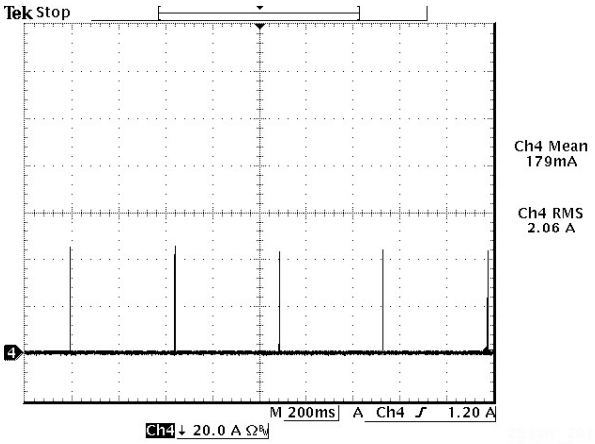


Figure 16. CH4: Output Current Waveform

Vin = 50 V

13. INPUT UNDER-VOLTAGE LOCKOUT

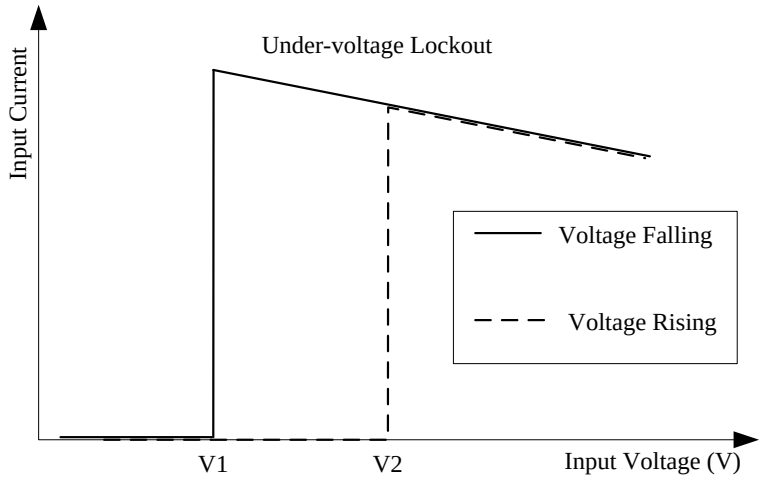


Figure 17. Input under-voltage lockout
V1 = 34.5 V
V2 = 36.5 V

14. THERMAL DERATING CURVES

Maximum junction temperature of semiconductors derated to 120 ˚C.

1. Airflow direction from Vin(+) to Vin(-)

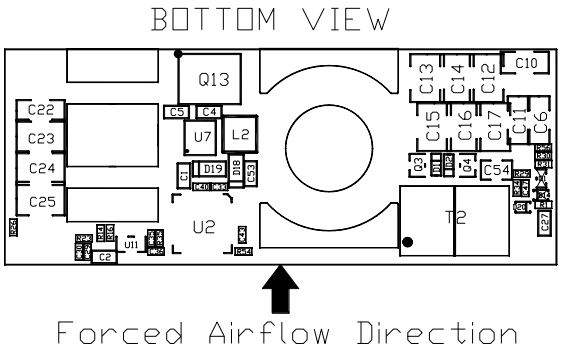


Figure 18. Airflow direction from Vin(+) to Vin(-)

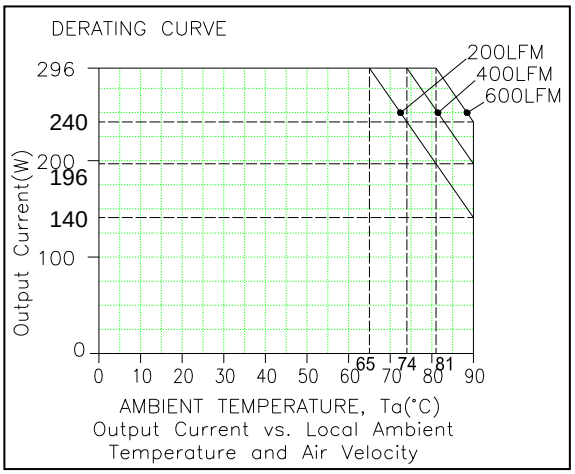


Figure 19. Output power derating in transverse orientation with baseplate

2. Airflow direction from Vin to Vout and from Vout to Vin

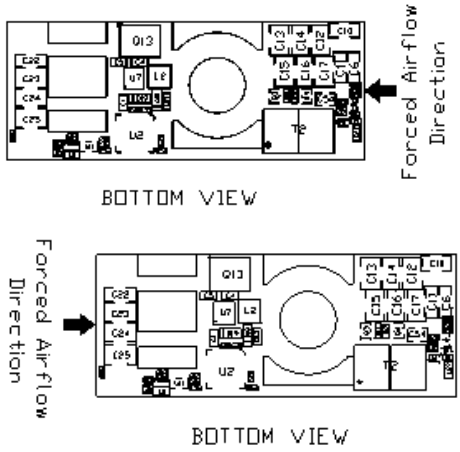


Figure 20. Airflow direction from Vin to Vout and from Vout to Vin

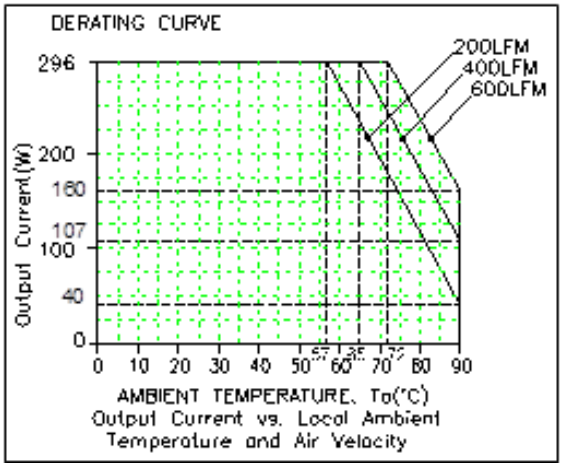


Figure 21. Output power derating in longitudinal orientation with baseplate

3. Airflow direction from Vin to Vout and from Vout to Vin

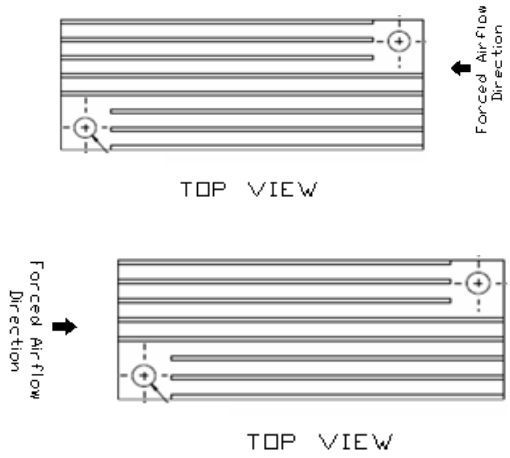


Figure 22. Airflow direction from Vin to Vout and from Vout to Vin

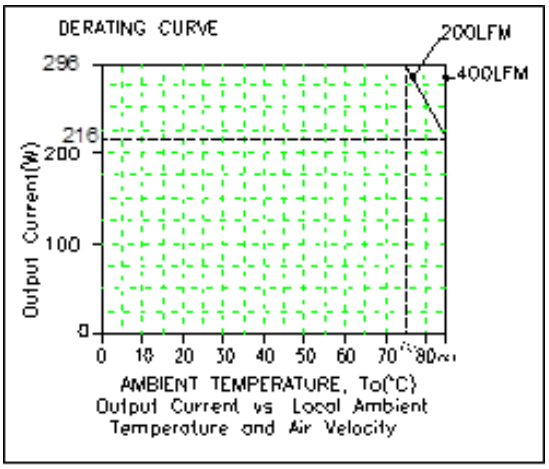


Figure 23. Output power derating in longitudinal orientation with 0.6" heatsink

The OTP will be triggered when the hot spot reaches 115°C and restart automatically when the temperature falls to 100 ℃. The protecting point will be varied a little under different conditions (air flow, ambient temperature, input voltage, load...).

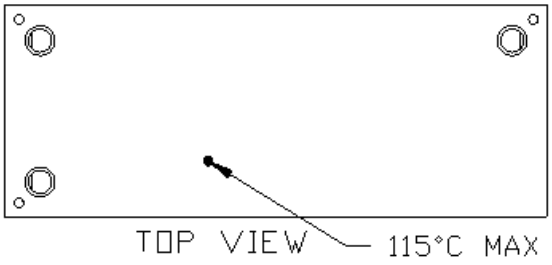


Figure 24. Hot spot

15. SAFETY & EMC

Safety:

1. Material flammability UL94V-0
2. Approved to IEC/EN 62368-1
3. Approved to UL/CSA 62368-1

EMC:

1. Conductive EMI: EN 55032 class A

   Compliance to EN 55032 class A (both peak and average) with the following inductive and capacitive filter

Test Setup:

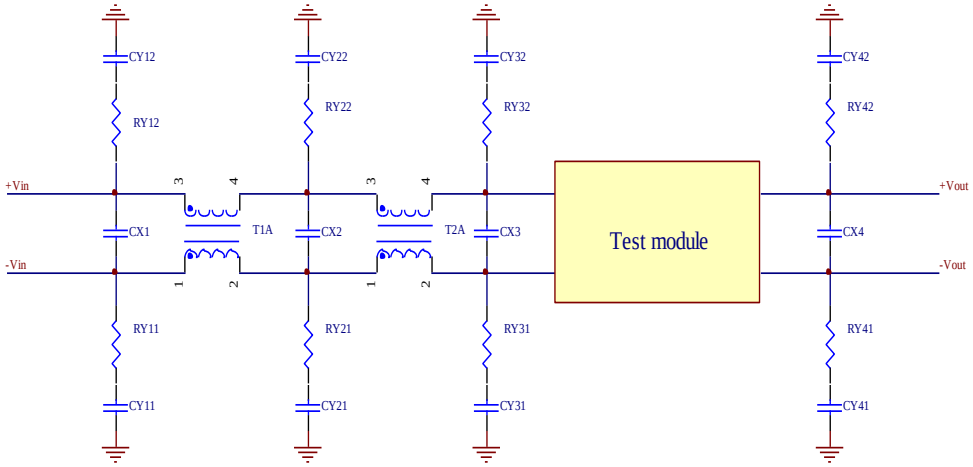


Figure 25.

T1A	CX1	RY11	RY12	CY11	CY12
T2A	CX2	RY21	RY22	CY21	CY22
0.75mH	100uF AL				
	CX3	RY31	RY32	CY31	CY32
	220uF AL	0R	0R	6.8nF	6.8nF
	CX4	RY41	RY42	CY41	CY42
		0R	0R	6.8nF×2	6.8nF× 2

Positive

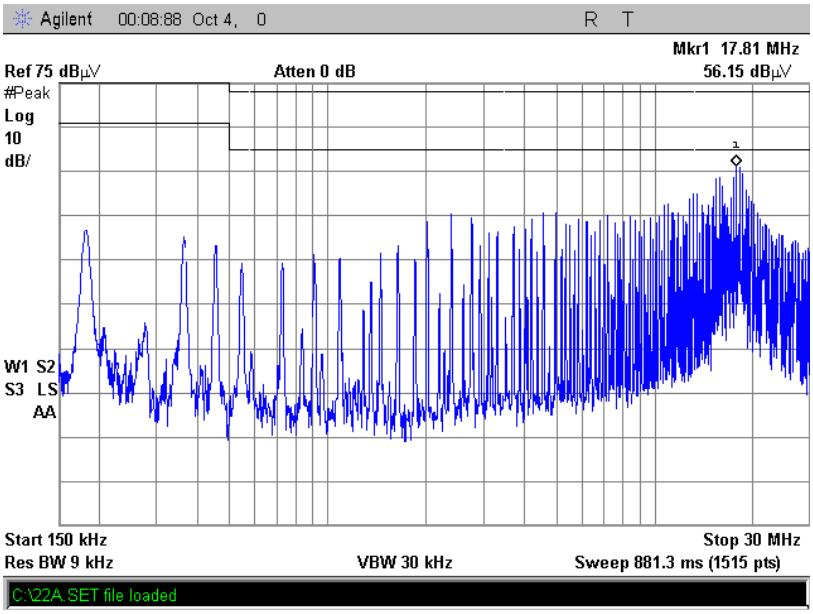


Figure 26.

Negative

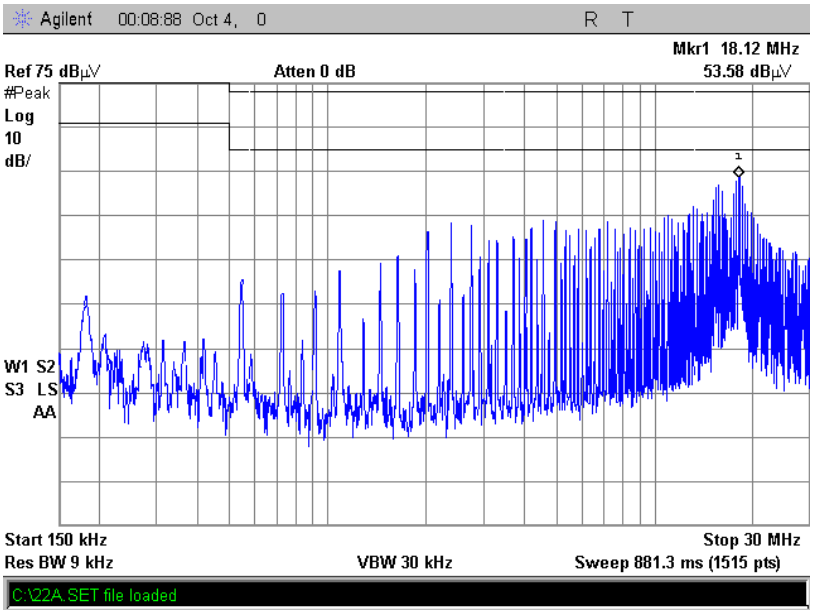


Figure 27.

16. SOLDERING INFORMATION

The 0RRE-32S10R 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°C while the part can withstand peak temperature of 260°C 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.

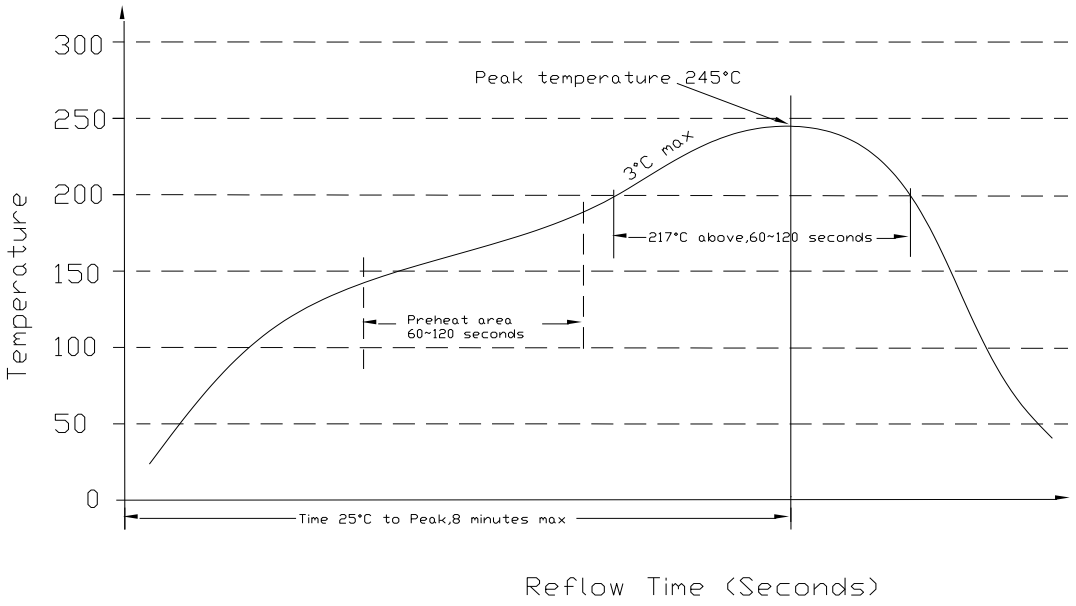


Figure 28. Soldering temperature

17. MSL RATING

The 0RRE-32S10R modules have a MSL rating of 3.

18. STORAGE AND HANDING

The 0RRE-32S10R 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.

19. 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.

20. MECHANICAL DIMENSIONS

OUTLINE

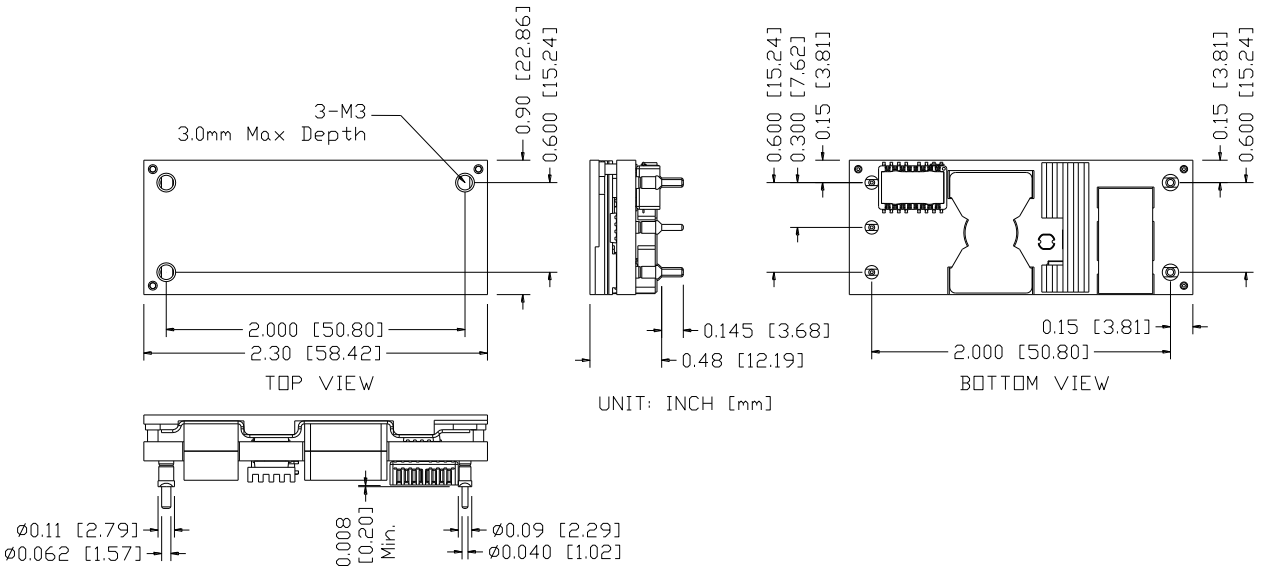


Figure 29. Outline

NOTES:

1) All Pins: Material - Copper Alloy;
   Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
2) Un-dimensioned components are shown for visual reference only.
3) All dimensions in inch [mm]; Tolerances: x.xx +/-0.020 inch [0.51 mm].
   x.xxx +/-0.010 inch [0.25 mm].

PIN DEFINITIONS

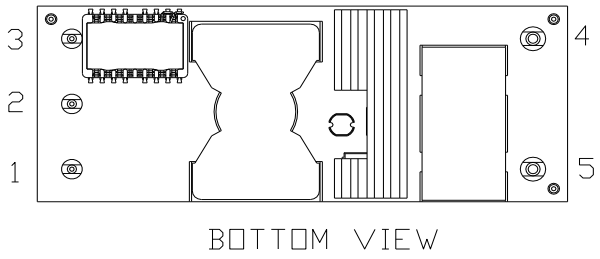


Figure 30. Pins

PIN	LENGTH	FUNCTION	DIA.
1	0.145''	Vin(+)	0.040''
2	0.145''	Remote	0.040''
3	0.145''	Vin(-)	0.040''
4	0.145''	Vout(-)	0.062''
5	0.145''	Vout(+)	0.062''

RECOMMENDED PAD LAYOUT

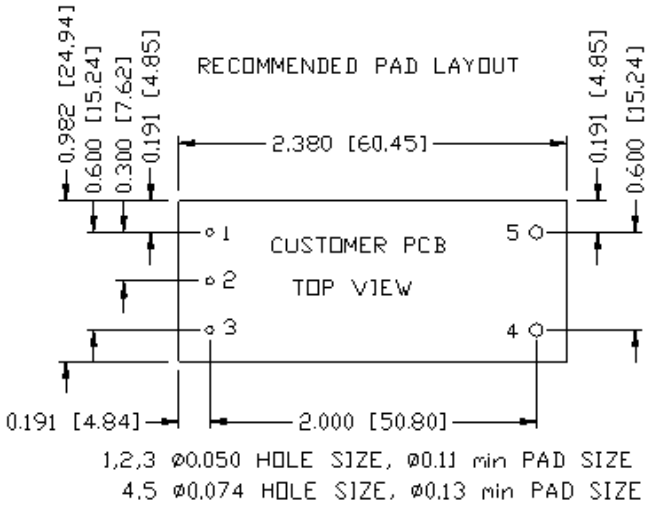


Figure 31. Recommended pad layout

21. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2013-08-01	PA	First release	Z.Tang
2013-08-21	PB	Add a figure about Vo set point in output specs	Z.Tang
2014-04-23	PC	Updated the efficiency graph	Z.Tang
2017-08-30	D	Add soldering information	Z.Tang
2018-06-25	AE	Update Remote on/off	Z.Tang
2019-06-18	AF	Update safety certification	F.Tao
2021-05-26	AG	Add object ID and safety&EMC. Update pins diameter.	XF.Jiang
2022-05-06	AH	Add safety certificate UL/CSA 62368-1. Update altitude to 5000m.	XF.Jiang

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.

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