xRSB-80T07L

Isolated DC-DC Converter

The xRSB-80T07L series are isolated DC/DC converters that operate from a nominal 48 VDC source. These secondary side control units will provide up to 60 W of output power from a nominal 48 VDC input.

Features include start-up into pre-biased load, 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

- 48 VDC Input
- 7.5 VDC @ 8 A Output
- 1/16th Brick Converter
- Isolated
- Fixed Frequency (400 kHz)
- High Efficiency
- High Power Density
- Low Cost
- Basic Insulation
- Input Under-Voltage Lockout
- Start-up into Pre-biased Load
- OCP/SCP
- Over Temperature Protection
- Remote On/Off
- Output Voltage Trim
- Positive/Negative Remote Sense
- Output Over-Voltage Protection with Auto-recovery
- Secondary Side Control for Fast Transient Response and High Reliability
- Approved to UL/CSA 62368-1
- Approved to IEC/EN 62368-1
- Class II, Category 2, Non-Isolated DC/DC Converter (refer to IPC-9592B)

Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RSB-80T07LG SRSB-80T07LG SRSB-80T07LR	7.5 VDC	36 - 75 VDC	8 A	60 W	90.5%

PART NUMBER EXPLANATION

x	R	SB	-	80	T	07	L	x
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
0 - Through Hole Mount S – Surface Mount	RoHS	1/16th Brick		60 W	36 – 75 V	7.5 V	Active Low, with HSK and Fins	G – Tray Package R - Tape and Reel Package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Voltage	Continuous, non-operating	-0.3	-	75	V
Input Transient Voltage	100 ms 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
Operating Input Voltage		36	48	75	V
Input Current (full load)		-	-	2.5	A
Input Current (no load)		-	30	70	mA
Remote Off Input Current		-	2	5	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 10 µH, 5 Hz to 20 MHz. Use a 100 µF/100 V electrolytic capacitor with ESR=1 ohm max, at 200 kHz @ 25°C	-	7	15	mA
Input Reflected Ripple Current (pk-pk)		-	30	50	mA
I^2t Inrush Current Transient		-	-	1	A^2s
Turn-on Voltage Threshold		32.5	-	35.5	V
Turn-off Voltage Threshold		31	-	34	V

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 5 A on system board. Refer to the fuse manufacture's datasheet for further information.

NOTES: This converter has internal L-C (0.47 µF - 0.33 µH - 2.35 µF) filter.

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	Vin = 48V, Io = 50% load	7.350	7.500	7.650	V
Load Regulation	Vin = 48 V, Io = 0%-100% load	-	±12	±24	mV
Line Regulation	Vin = 36 to 75V	-	±12	±24	mV
Regulation Over Temperature	Ambient temperature = -40°C to 85°C	-	±30	±50	mV
Ripple and Noise (pk-pk)	0-20 MHz BW, with a 1 µF ceramic and a 10 µF Tan capacitor at output.	-	90	120	mV
Ripple and Noise (rms)		-	20	30	mV
Output Ripple and Noise (pk-pk) under worst case	Over entire operating input voltage range, load and ambient temperature	-	-	150	mV
Output Current Range		0	-	8	A
Output DC Current Limit		8.5	10	11.5	A
Short Circuit Surge Transient		-	-	3	A^2s
Rise Time (from ON/OFF or Vin)	From 10% to 90% of Vo	-	-	80	ms
Turn on Delay Time	Enable from Vin Turn on time from Vin to 90% of Vo	-	-	100	ms
	Enable from ON/OFF Turn on time from ON/OFF to 90% of Vo	-	-	100	ms
Overshoot at Turn on		-	0	3	%
Output Capacitance	Typically 50% ceramic + 50% electrolytic capacitors	0	-	3300	µF
Transient Response					
△V 50%~75% of Max Load	di/dt = 0.1 A/µs, Vin = 48 VDC, Ta = 25°C Load capacitor = 1000 µF = 50% ceramic + 50% electrolytic capacitors	-	-	250	mV
Settling Time		-	-	300	µs
△V 75%~50% of Max Load		-	-	250	mV
Settling Time		-	-	300	µs

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	The efficiency is measured at Vin = 48 V, full load and Ta = 25°C	89	90.5	-	%
Switching Frequency		-	400	-	kHz
FIT	Calculated Per Bell Core SR-332 (Vin = 48 V, Vo = 7.5 V, Io = 8 A, Ta = 25°C, FIT = 10^9/MTBF)	-	TBC	-	-
Over Temperature Protection		-	125	-	°C
Over Voltage Protection (Static)	This voltage is achieved by trimming up output slowly	-	10	-	V
Weight		-	15.5	-	g
Dimensions (L × W × H)	For 0RSB-80T07L		1.30 x 0.90 x 0.453		inch
			33.02 x 22.86 x 11.50		mm
	For SRSB-80T07L		1.30 × 0.90 × 0.422		inch
			33.02 × 22.86 × 10.72		mm
Isolation Characteristics					
Input to Output		-	-	1500	V
Isolation Resistance		10M	-	-	Ohm
Isolation Capacitance		-	1000	-	pF

6. EFFICIENCY DATA

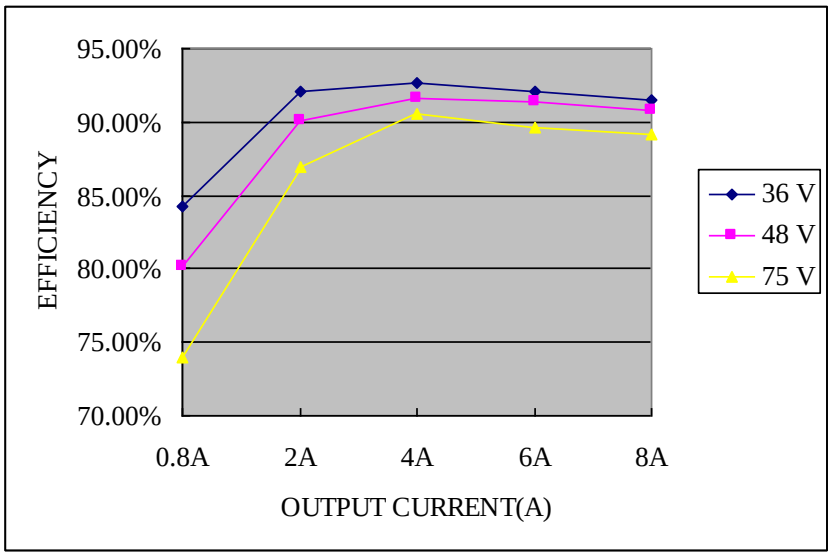


Figure 1. Efficiency data

7. REMOTE ON/OFF

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit Off)	Active Low	Remote On/Off pin is open, the module is off	-0.3	-	0.8	V
Signal High (Unit On)			2.4	-	18	V
Current Sink			0	-	1	mA

Recommended remote on/off circuit for active low

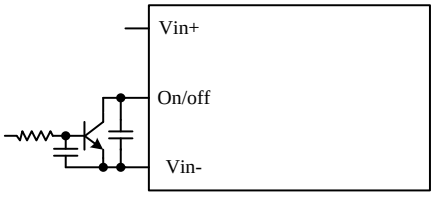


Figure 2. Control with open collector/drain circuit

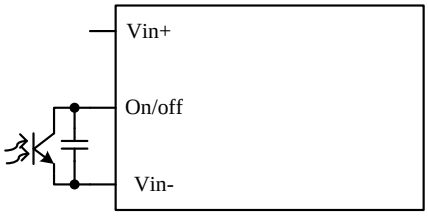


Figure 3. Control with photocoupler circuit

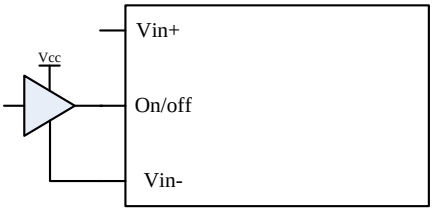


Figure 4. Control with logic circuit

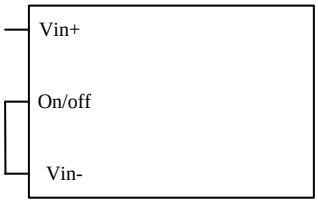


Figure 5. Permanently on

8. REMOTE SENSE

This module has remote sense compensation feature. It can minimize the effects of resistance between output and load in system layout and facilitate accurate voltage regulation at load terminals or other selected point.

1. The remote sense lines carry very little current and hence do not require a large cross-sectional area.

2. This module compensates for a maximum drop of 5% of the nominal output voltage.

3. If the unit is already trimmed up, the available remote sense compensation range should be correspondingly reduced. The total voltage increased by trim and remote sense should not exceed 5% of the nominal output voltage.

4. When using remote sense compensation, all the resistance, parasitic inductance and capacitance of the system are incorporated within the feedback loop of this module which can make an effect on the module's compensation, affecting the stability and dynamic response. A 0.1 uF ceramic capacitor can be connected at the point of load to de-couple noise on the sense wires.

5. Recommend the connection of remote sense compensation as below figure. There are a resistor RS+ (100 ohm) from Vo+ to Sense+ and a resistor RS- (11.3 ohm) from Vo- to Sense- inside of this module.

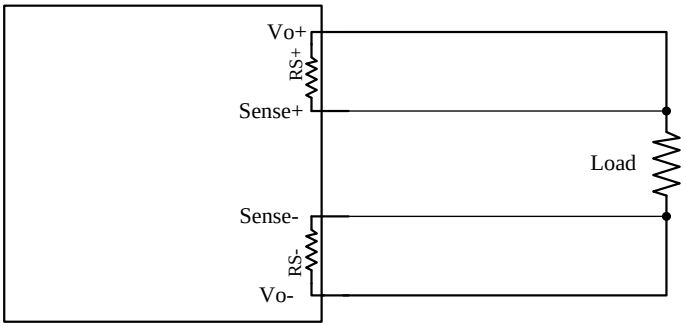


Figure 6.

6. If not using remote sense compensation, please connect sense directly to output at module's pin, that is, connect sense+ to Vo+ and sense- to Vo- at module's pin, the shorter the better. see below figure.

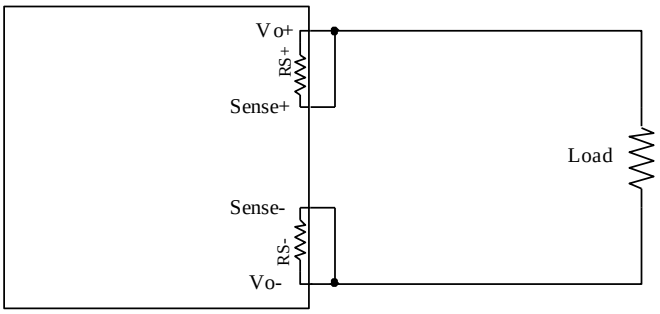
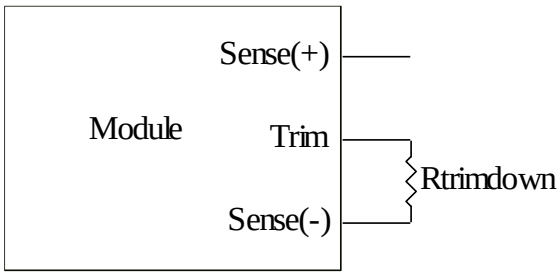


Figure 7.

9. OUTPUT TRIM EQUATIONS

Equations for calculating the trim resistor are shown below. The trim down resistor should be connected between the Trim pin and Sense (-) pin. The trim up resistor should be connected between the Trim pin and the Sense (+). Only one of the resistors should be used for any given application.
Minimum trim down voltage is 6 V.
Maximum trim up voltage is 9 V.
The total voltage increased by trim and remote sense should not exceed 20% of the nominal output voltage.

Trim Down Test Circuit:



$$Rtrimdown = \frac{1540}{|delta|} - 20.51[k\Omega]$$

Figure 8. Trim down test circuit

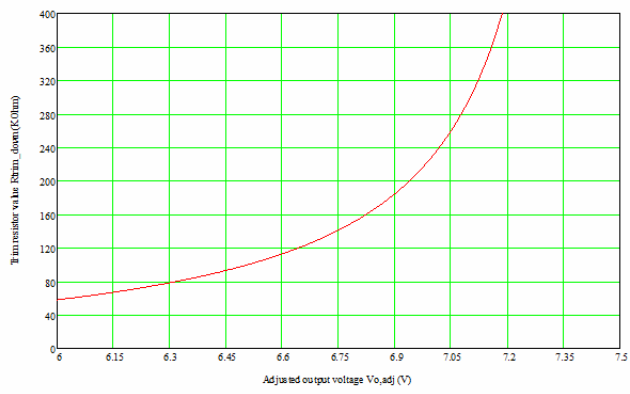
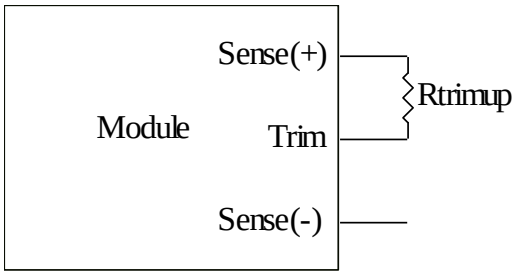


Figure 9. Trim down curve

Trim Up Test Circuit:



$$Rtrimup = \frac{(100 + delta) \cdot Vo \cdot 15.4 - 626}{1.225 \cdot delta} - 20.51[k\Omega]$$

Figure 10. Trim up test circuit

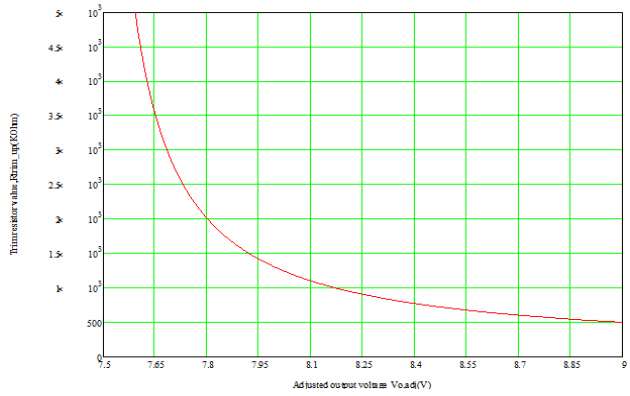


Figure 11. Trim up curve

NOTE:

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

Vo_req = Desired (trimmed) output voltage [V]

Output voltage Vo = 7.5 V

10. RIPPLE AND NOISE WAVEFORM

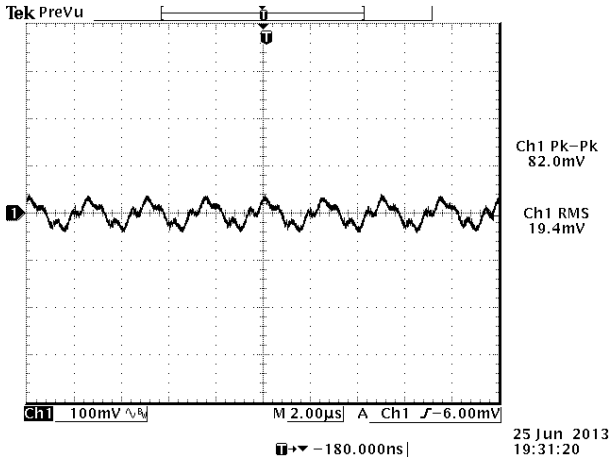


Figure 12.

NOTE: Ripple and noise at full load, 48 VDC input, 7.5 VDC / 8 A output and Ta = 25 °C, with a 1 µF ceramic cap at output.

11. TRANSIENT RESPONSE WAVEFORMS

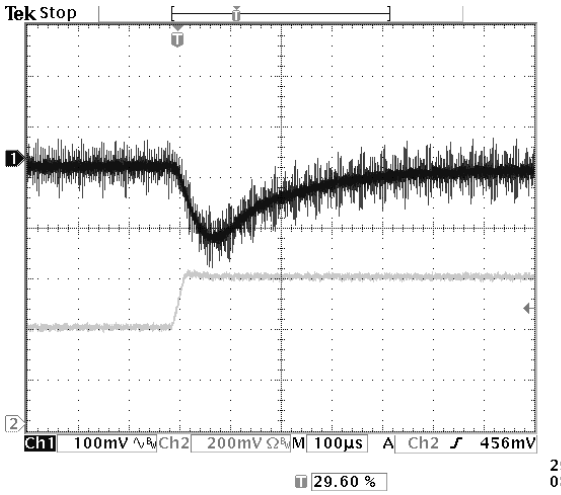


Figure 13. Vo = 7.5 V, 50% to 75% Load Transients

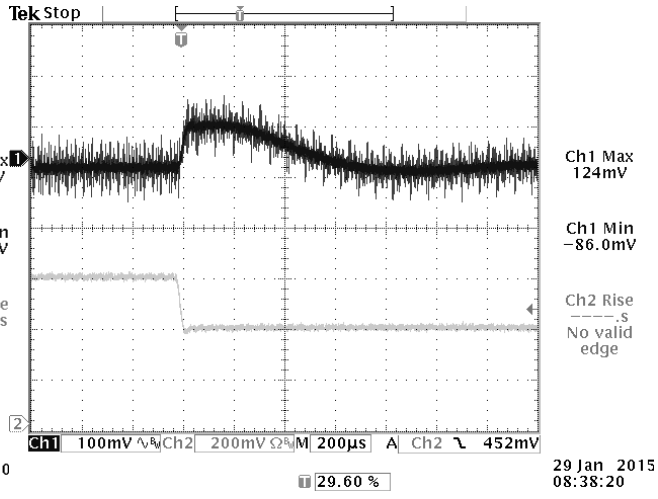


Figure 14. Vo = 7.5 V, 75% to 50% Load Transients

NOTE: Transients Response at Vin = 48 V, di/dt = 0.1 A/µs, Ta = 25°C.

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12. STARTUP & SHUTDOWN

RISE TIME

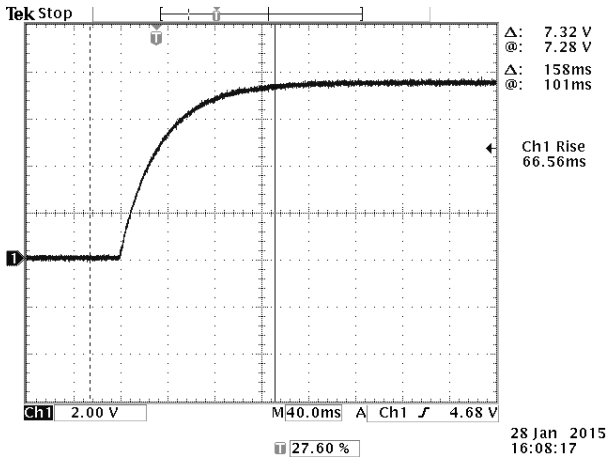


Figure 15. Vin = 48 V, Vo = 7.5 V, Io = 8 A

STARTUP TIME

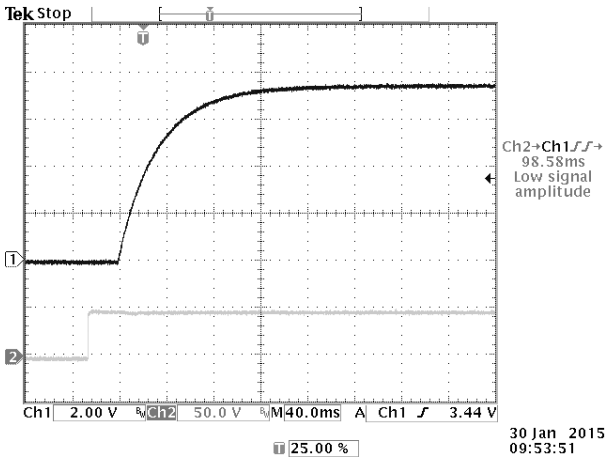


Figure 16. Startup from Vin
Ch1: Vo, Ch3: Vin
***Test Condition:** 48 Vin, 7.5 V / 8 A*

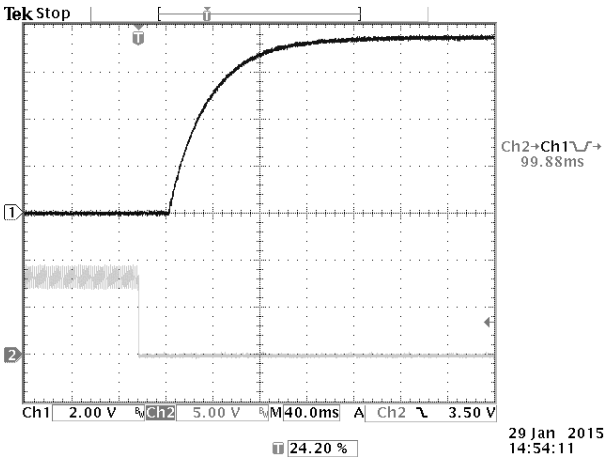


Figure 17. Startup from on/off
Ch1: Vo, Ch3: on/off
***Test Condition:** 48 Vin, 7.5 V / 8 A*

SHUTDOWN

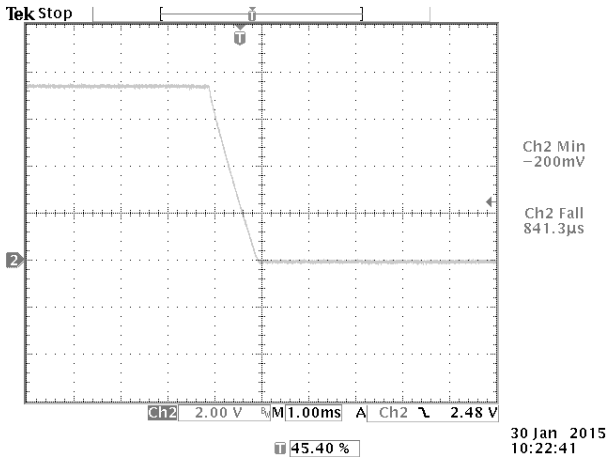


Figure 18. Shutdown

***Test Condition**: 48 Vin, 7.5 V / 8 A*

13. OVER VOLTAGE PROTECTION

The output over voltage protection consists of circuitry that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over voltage protection threshold, the module will shut down into hiccup mode and restart once every 400 ms. The module operates normally when the fault is cleared.

Test setup:

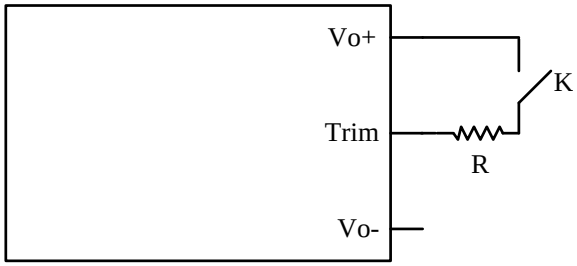


Figure 19.

14. 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 800 ms. The module operates normally when the output current goes into specified range. The typical average output current is 0.25 A during hiccup.

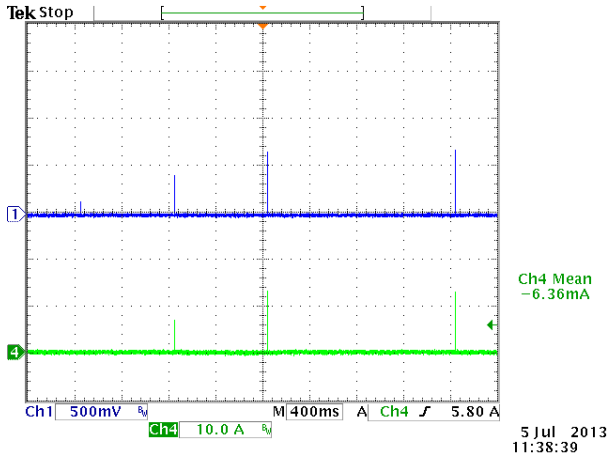


Figure 20.
CH1: Output Voltage
CH2: Output current waveform
Test condition: *48Vin, short module output by E-load*

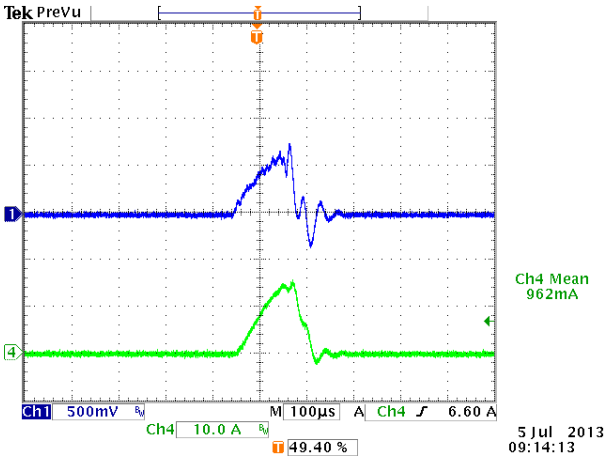


Figure 21.
Expansion of on time portion of above figure

15. THERMAL DERATING CURVE

Maximum junction temperature of semiconductors derated to 120 °C.

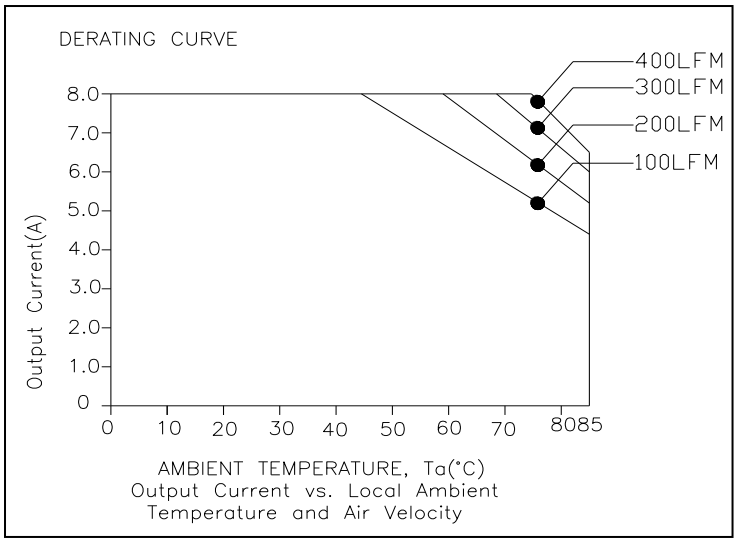


Figure 22. Vo = 7.5 V

The airflow is in either the transverse or longitudinal direction

16. SOLDERING INFORMATION

The xRSB-80T07L 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.

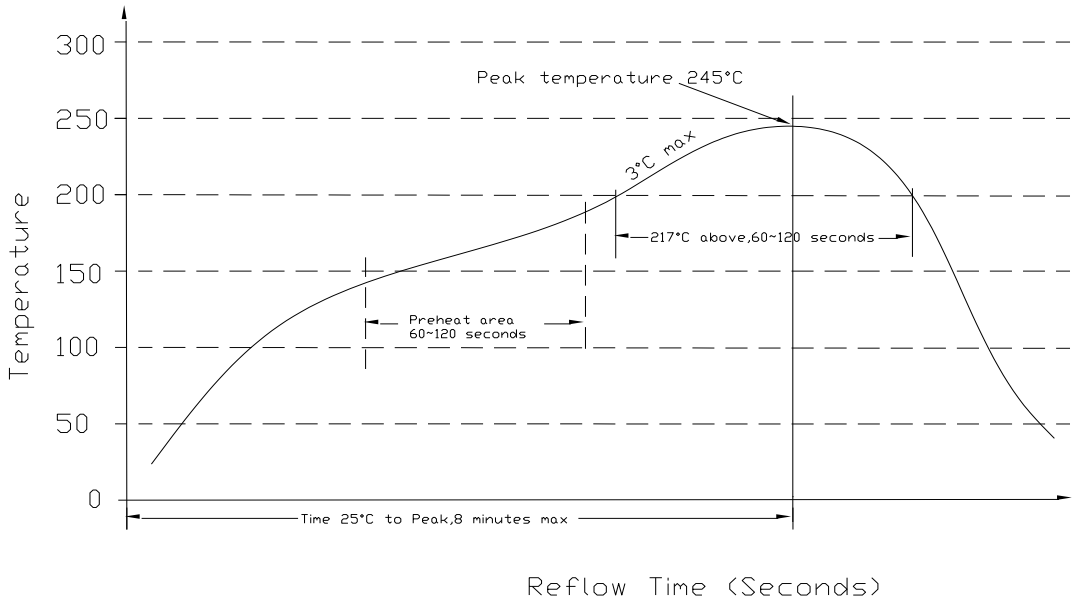


Figure 23. Soldering information

17. MSL RATING

The xRSB-80T07L modules have a MSL rating of 3.

18. STORAGE AND HANDING

The xRSB-80T07L 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

0RSB-80T07L OUTLINE

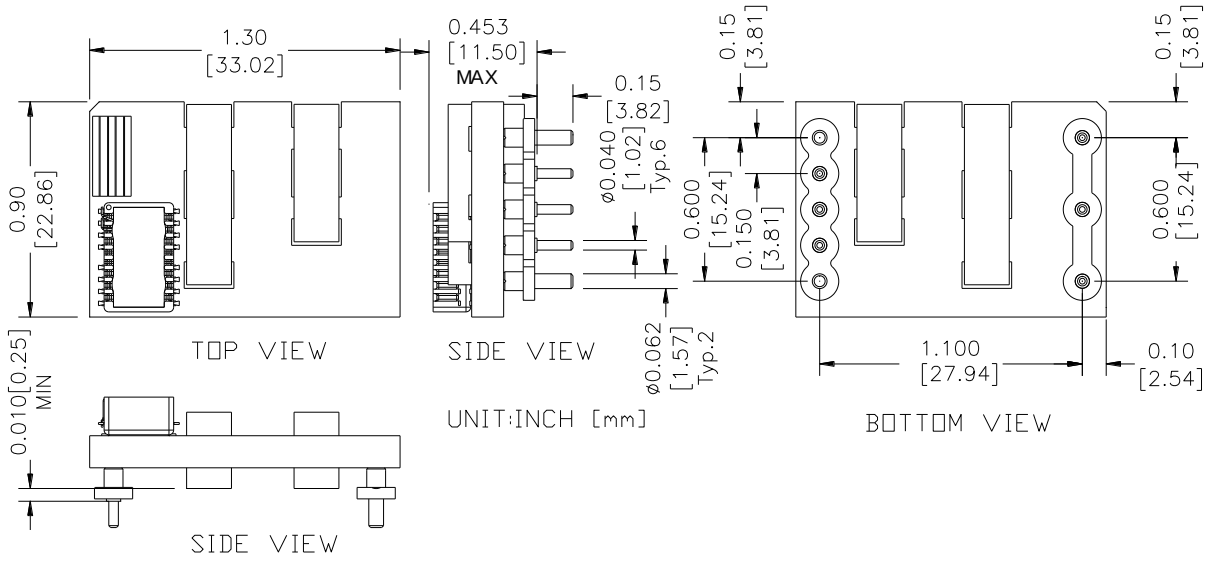


Figure 24. 0RSB-80T07L Outline

NOTE:

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 +/-0.02 inch [0.51 mm];
x.xxx +/-0.010 inch [0.25 mm].

0RSB-80T07L PIN DEFINITIONS

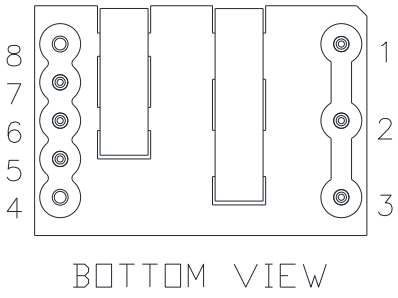


Figure 25. 0RSB-80T07L Pins

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

0RSB-80T07L RECOMMENDED PAD LAYOUT

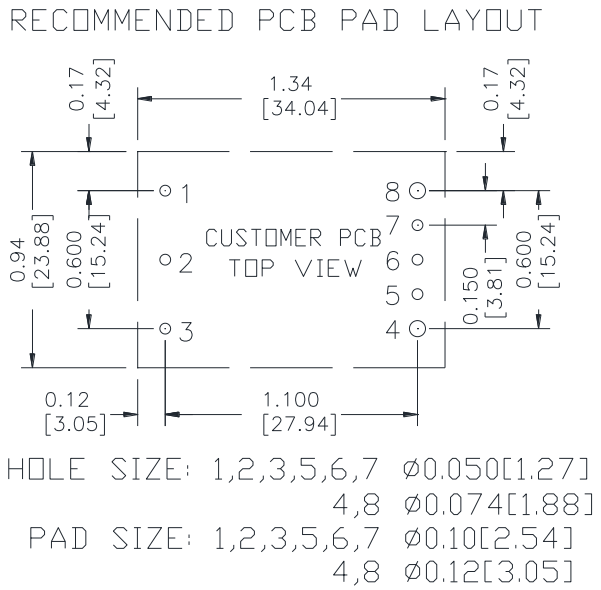


Figure 26. 0RSB-80T07L Recommended pad layout

SRSB-80T07L OUTLINE

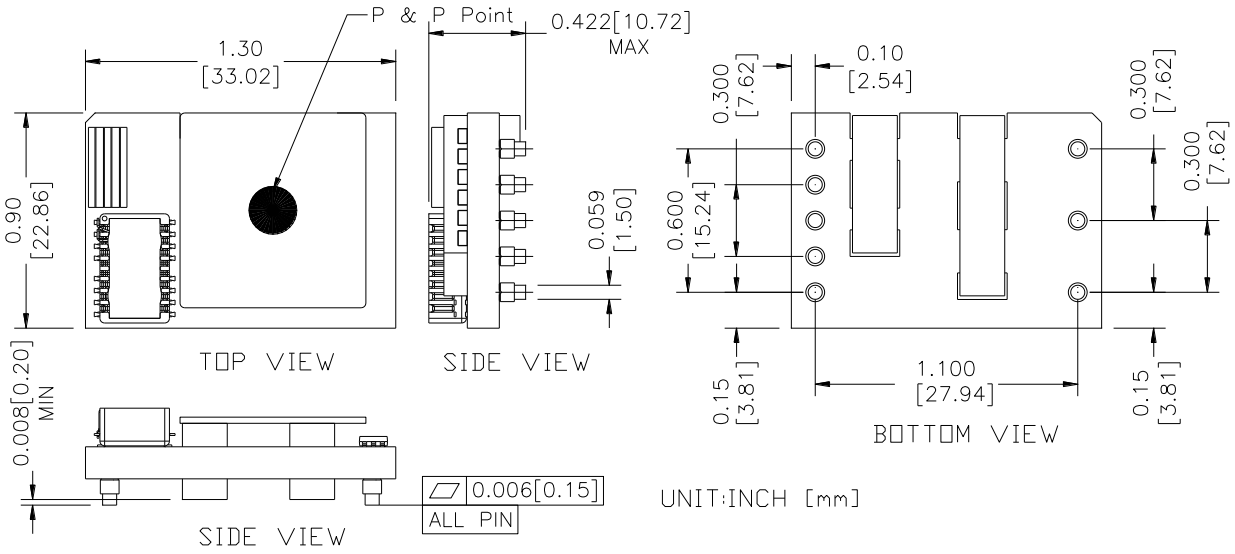


Figure 27. SRSB-80T07L Outline

NOTE:

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 +/-0.02 inch [0.51 mm];
x.xxx +/-0.010 inch [0.25 mm].

SRSB-80T07L PIN DEFINITIONS

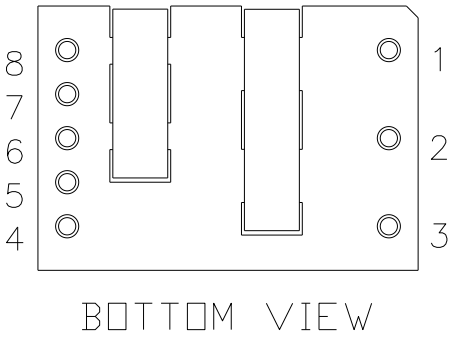


Figure 28. SRSB-80T07L Pins

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

SRSB-80T07L RECOMMENDED PAD LAYOUT

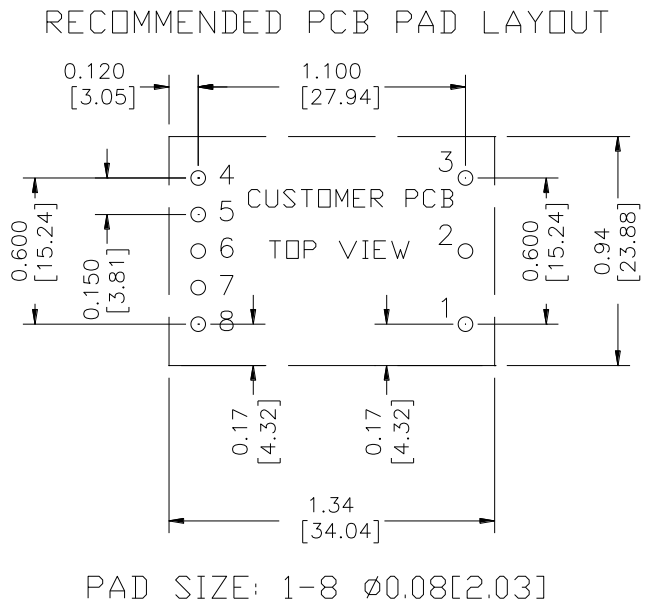
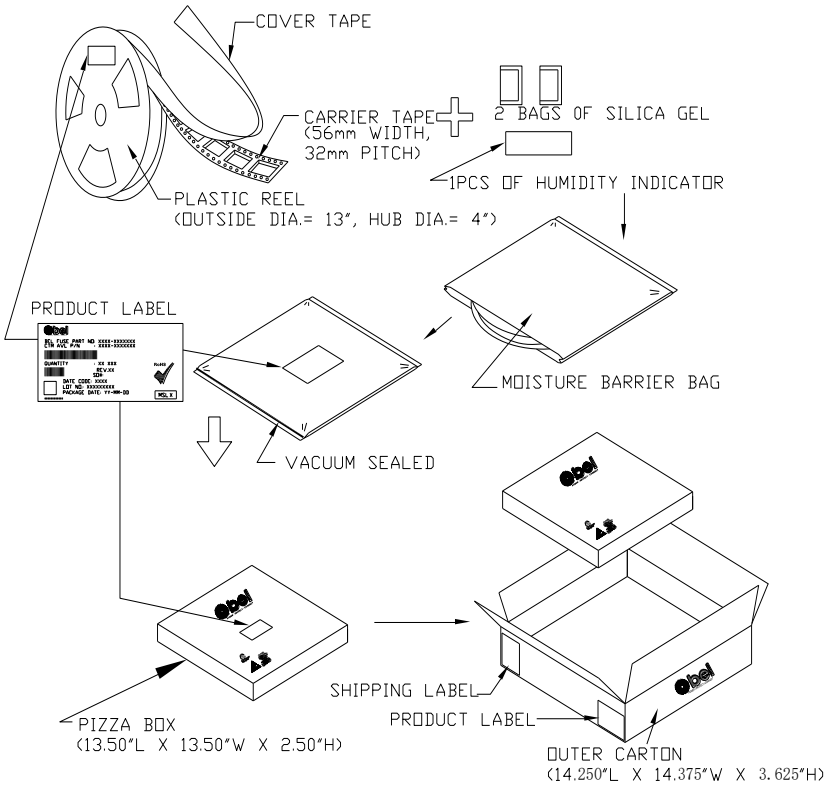
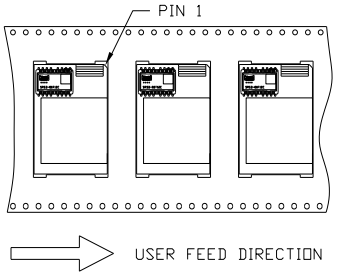


Figure 29. SRSB-80T07L Recommended pad layout

21. PACKAGING INFORMATION

SRSB-80T07LR





ORIENTATION OF COMPONENT INSIDE POCKET

TAPE WIDTH	56mm
POCKET PITCH	32mm
QUANTITY OF COMPONENTS PER REEL	160
PLASTIC REEL OUTER DIAMETER	13 INCHES
PLASTIC REEL HUB DIAMETER	4 INCHES
COMPLY WITH EIA 481-2-A	

Figure 30. SRSB-80T07LR packaging information

0RSB-80T07LG / SRSB-80T07LG

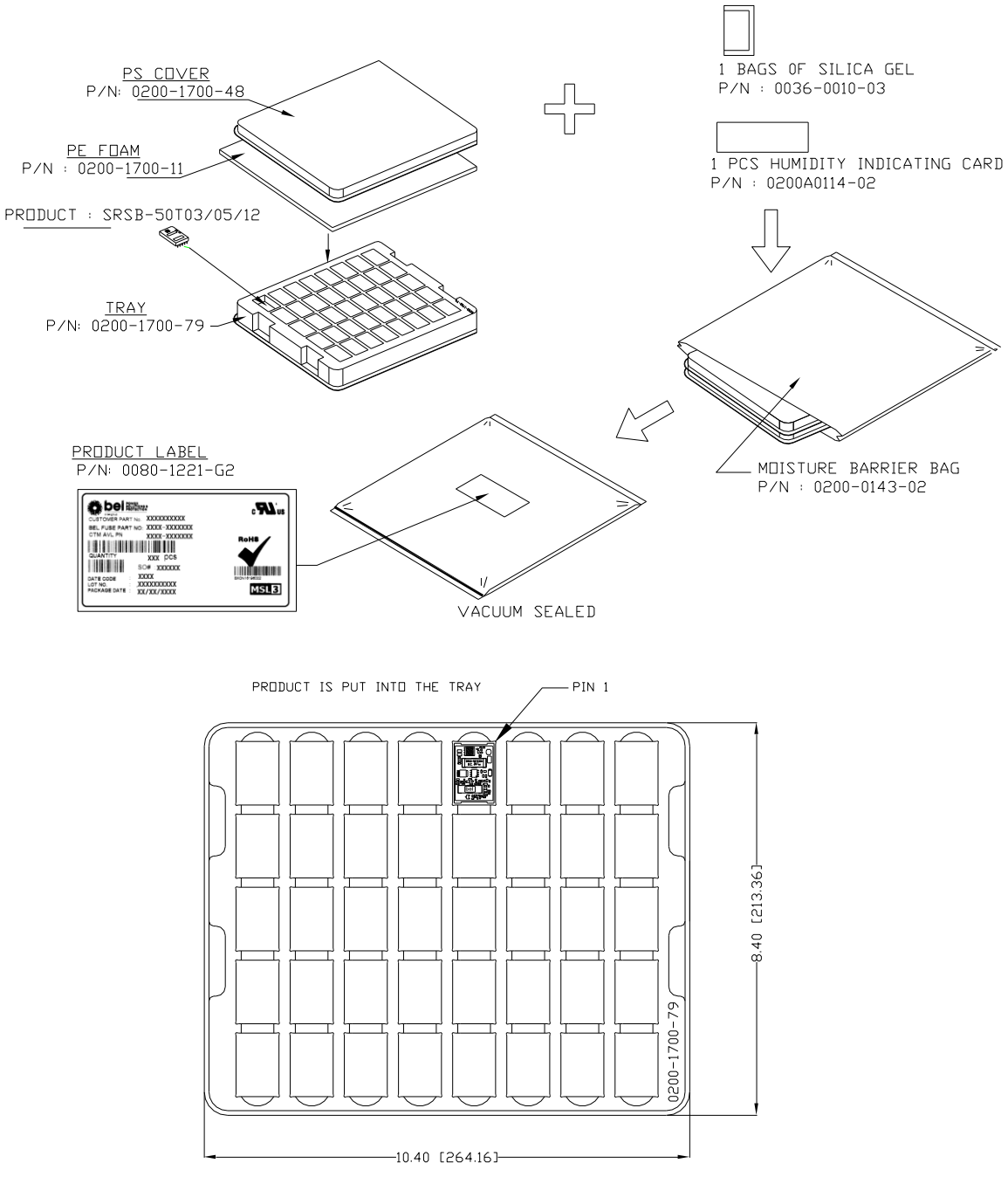


Figure 31. 0RSB-80T07LG / SRSB-80T07LG packaging information

22. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2013-07-10	A	First release	J.Yan
2015-02-09	B	Update Output Specs, TR, Startup & Shutdown, Trim, MD	J.Yan
2016-07-27	C	Update	J.Yan
2017-12-21	D	Add reflow profile and tray package	J.Yan
2018-06-25	AE	Update MD	J.Yao
2021-05-28	AF	Add object ID. Update 0RSB-80T07L outline and SRSB-80T07L mechanical dimensions.	J.Yao

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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