

xRSB-80T05x

Isolated DC-DC Converter

The xRSB-80T05x is isolated DC/DC converter. This secondary side control unit will provide up to 100 W of output power from a nominal 48 V input.

This converter is provided in an industry standard sixteenth brick package.



Key Features & Benefits

- 36–75 VDC Input
- 5 VDC @ 20 A Output
- 1/16th Brick Converter
- Isolated
- Fixed Frequency (500 kHz)
- High Efficiency
- High Power Density
- Low Cost
- Input Under Voltage Lockout
- Start-up into pre-biased load
- Over Temperature Protection
- Remote On/Off
- Output voltage trim
- Positive/Negative remote sense
- Approved to UL/CSA/IEC60950-1, 2nd +A2 version(TBD)
- Output overvoltage protection with autorecovery
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)

Applications

- Networking
- Computers and Peripherals
- Telecommunications

Option

- Remote ON/OFF Logic
- Through hole and SMT



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1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
xRSB-80T05x	5 VDC	36-75 VDC	20 A	100 W	92%

NOTE: Add "G" or "R" suffix at the end of the model number to indicate packaging.

PART NUMBER EXPLANATION

x	R	SB	-	80	T	05	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	1/16 th Brick		100 W	36 – 75V	5 V	L – active low, 0 – active high,	G – Tray package R – Tape and Reel packaging

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-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	A
Input Current (no load)		-	40	70	mA
Remote Off Input Current		-	2	5	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 10 μ H, 5Hz to 20MHz. Use a 150 μ F, ESR<0.1 Ω @ 100kHz, 20C Al-electrolytic capacitor and 3*2.2 μ F/100V ceramic capacitor with ESR<0.01 Ω @ 100kHz, 20C.	-	6	12	mA
Input Reflected Ripple Current (pk-pk)		-	20	30	mA
I ² t Inrush Current Transient		-	-	1	A ² s
Turn-on Voltage Threshold		32.5	34	35.5	V
Turn-off Voltage Threshold		31	32	34	V
Input UV lockout hysteresis		1.5	2	2.5	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.

4. OUTPUT SPECIFICATIONS

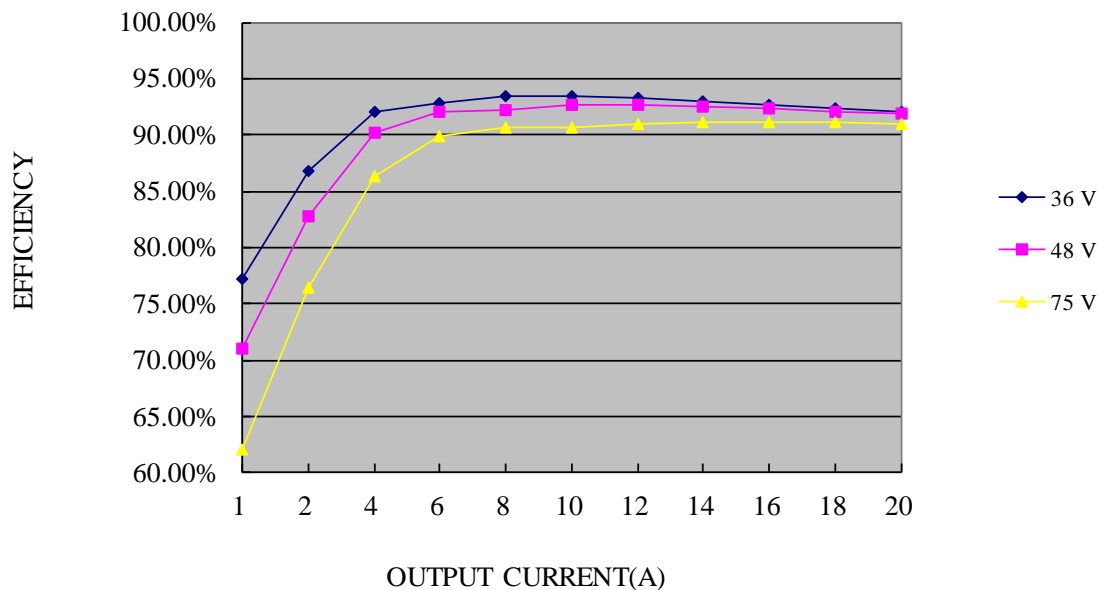
All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	V _{in} =48V, I _o =0% load at 25C ambient.	4.925	5.000	5.075	V
Load Regulation	I _o =0A to full load	-	±8	±15	mV
Line Regulation	V _{in} =36 to 75V	-	±8	±15	mV
Regulation Over Temperature	ambient temperature=-40°C to 85°C	-	±30	±50	mV
Total Output Voltage Range	Over sample load, line and temperature	4.85	-	5.15	V
Ripple and Noise (pk-pk)	V _{in} =48V, 0-20MHz BW, with 500 μ F ceramic capacitor and 2200 μ F Al-electrolytic capacitor at output.	-	35	70	mV
Ripple and Noise (rms)		-	3	10	mV
Output Current Range		0	-	20	A
Output DC Current Limit		24	27	32	A
Short Circuit Surge Transient		-	-	3	A ² s
Rise time		3	5	8	ms
Turn on Time	From V _{in} to 90% of V _{out} .	-	15	30	ms
	From on/off to 90% of V _{out} .	-	30	50	ms
Overshoot at Turn on		-	0	1	%
Output Capacitance	Typically 50% ceramic + 50% electrolytic capacitors	270	-	5000	μ F
Transient Response					
Δ V 50%~75% of Max Load		-	130	180	mV
Settling Time	di/dt=1A/ μ s, V _{in} =48VDC, T _a =25°C, with 500 μ F ceramic capacitor and 2200 μ F Al-electrolytic capacitor at output.	-	100	200	μ s
Δ V 75%~50% of Max Load		-	130	180	mV
Settling Time		-	100	200	μ s

5. GENERAL SPECIFICATIONS

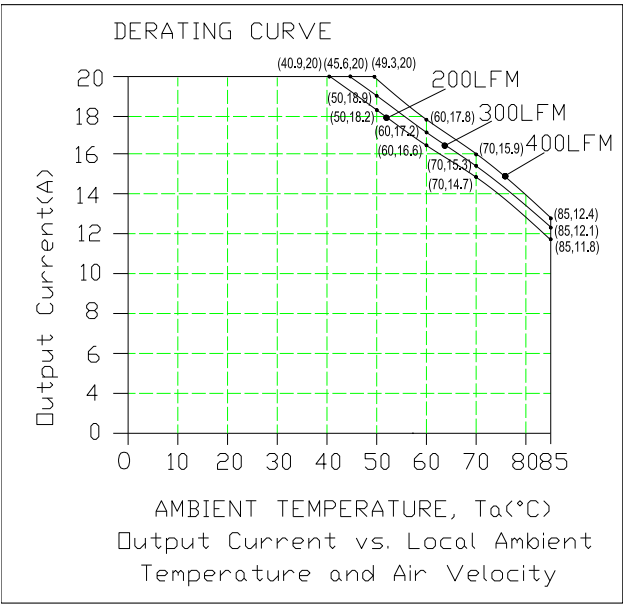
PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	The efficiency is measured at Vin = 48 V, full load and Ta = 25°C.	90	92	-	%
Switching Frequency		-	500	-	kHz
FIT	Calculated Per Telcordia SR-332 (Vin=48 V, Vo=4.8 V, Io=16A, Ta = 25C, FIT=10 ⁹ /MTBF	-	146	-	-
MTBF		-	6.8	-	Mhrs
Over Temperature Protection		-	125	-	°C
Over Voltage Protection (Static)	This voltage is achieved by trimming up output slowly.	5.8	6.2	6.4	V
Weight		-	15.5	-	g
Dimensions (L x W x H)		1.30 x 0.90 x 0.453 33.02 x 22.86 x 11.50			in mm
<i>Isolation Characteristics</i>					
Input to Output		-	-	1500	Vdc
Isolation Resistance		10M	-	-	Ohm
Isolation Capacitance		-	1000	-	pF

6. EFFICIENCY DATA



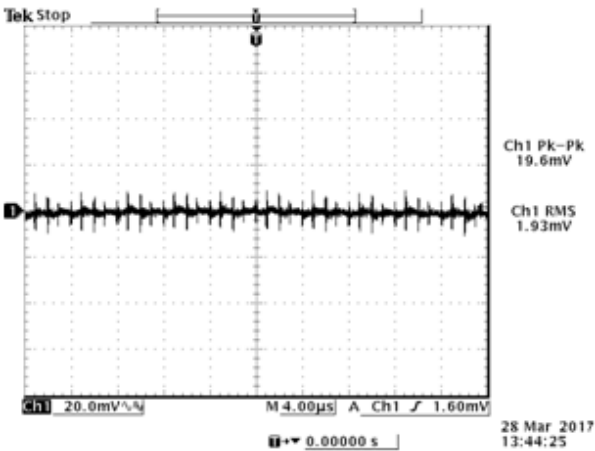
7. THERMAL DERATING CURVE

Maximum junction temperature of semiconductors derated to 120 °C.



Derating curve under normal input

8. RIPPLE AND NOISE

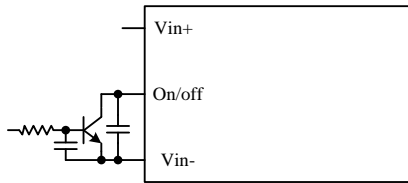


Ripple and noise at full load, 48VDC input, 5VDC/20A output and Ta=25 °C,
and with 500µF ceramic capacitor and 2200µF Al-electrolytic capacitor at output.

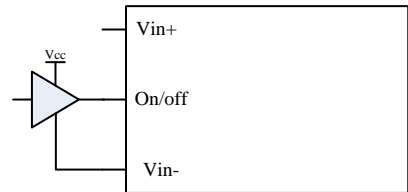
9. REMOTE ON/OFF

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	-	18	V
Signal Low (Unit Off)	Active High	Remote On/Off pin is open, the module is on.	-0.3	-	0.8	V
Signal High (Unit On)			2.4	-	18	V
Current Sink			0	-	1	mA

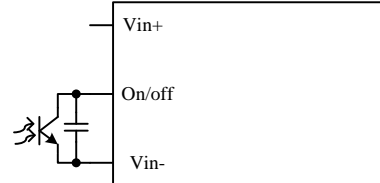
Recommended remote on/off circuit for active low



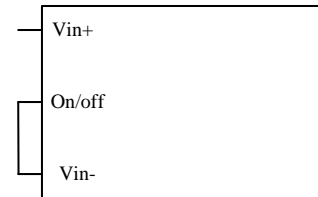
Control with open collector/drain circuit



Control with logic circuit

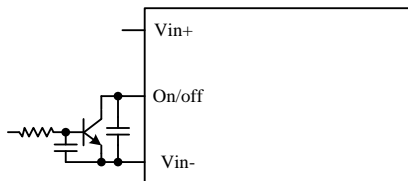


Control with photocoupler circuit

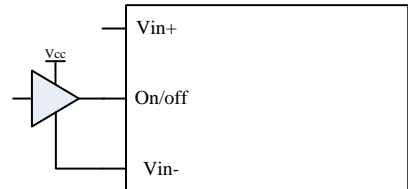


Permanently on

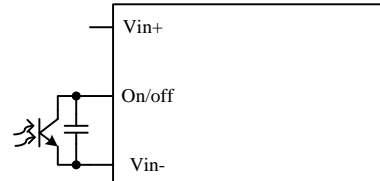
Recommended remote on/off circuit for active high



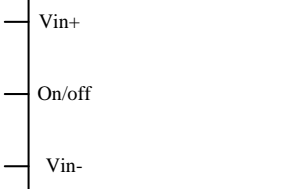
Control with open collector/drain circuit



Control with logic circuit



Control with photocoupler circuit



Permanently on

10. OUTPUT TRIM EQUATIONS

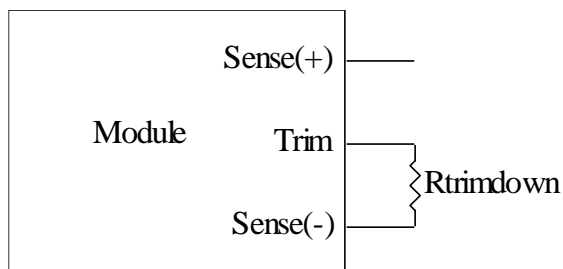
Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and Sense (-) pin. The Trim Up resistor should be connected between the Trim pin and the Sense (+). Only one of the resistors should be used for any given application.

Minimum trim down voltage is 4.5V

Maximum trim up voltage is 5.5V.

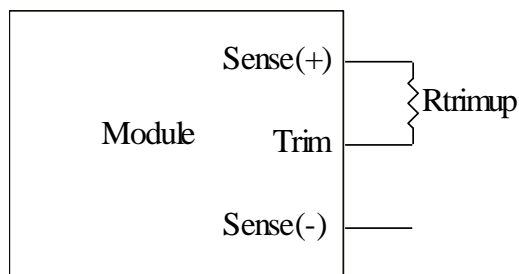
The total voltage increased by trim and remote sense should not exceed 10% of the nominal output voltage.

Trim down test circuit



$$R_{trimdown} = \frac{511}{|\Delta|} - 10.22 [k\Omega]$$

Trim up test circuit



$$R_{trimup} = \frac{(100 + \Delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \Delta} - 10.22 [k\Omega]$$

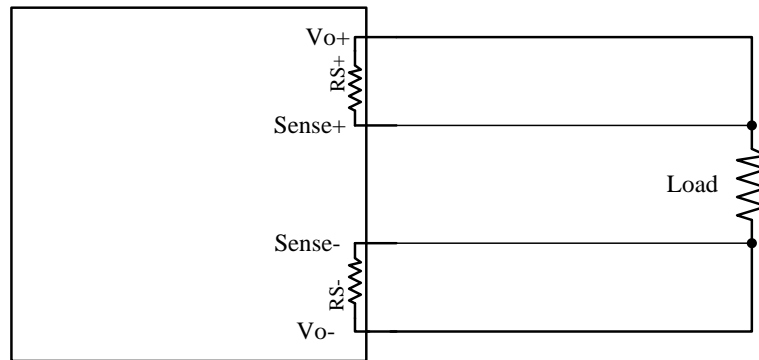
NOTE: V_{o_req} =Desired (trimmed) output voltage [V]

Output voltage V_o =5.0V

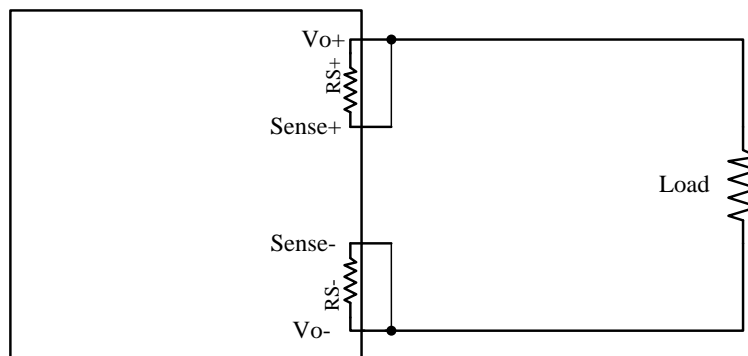
11. REMOTE SENSE

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

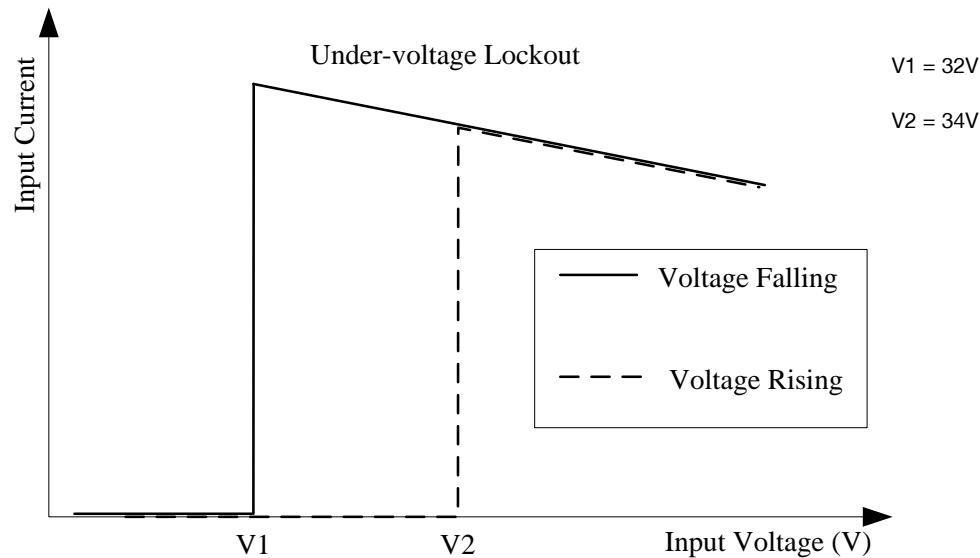
1. The remote sense lines carry very little current and hence do not require a large cross-sectional area.
2. This module compensates for a maximum drop of 10% of the nominal output voltage.
3. If the unit is already trimmed up, the available remote sense compensation range should be correspondingly reduced. The total voltage increased by trim and remote sense should not exceed 10% 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. This can make an effect on the module's compensation, affecting the stability and dynamic response. A 0.1uF 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.



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.



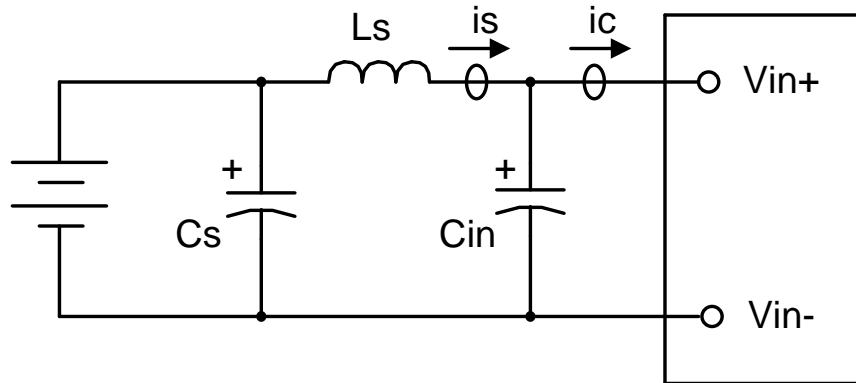
12. UNDER VOLTAGE LOCKOUT



13. INPUT NOISE

Input reflected ripple current

Testing setup



NOTES AND VALUES IN TESTING.

is: Input Reflected Ripple Current

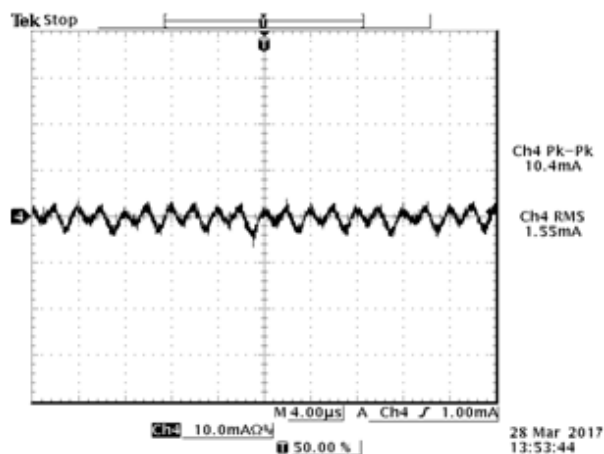
ic: Input Terminal Ripple Current

Ls: Simulated Source Impedance (10 μ H)

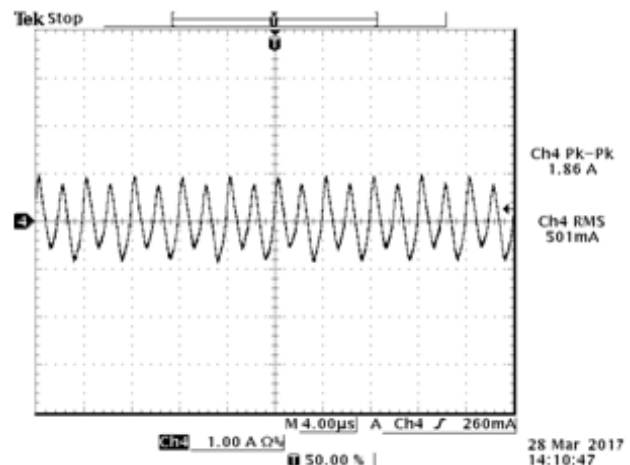
Cs: Offset possible source Impedance (none)

Cin: Electrolytic capacitor, should be as closed as possible to the power module to swallow ic ripple current and help with stability. Recommendation: 150 μ F, ESR<0.1 Ω @ 100kHz, 20C Al-electrolytic capacitor and 3*2.2 μ F/100V ceramic capacitor with ESR<0.01 Ω @ 100kHz, 20C.

Below measured waveforms are based on above simulated and recommended inductance and capacitance.



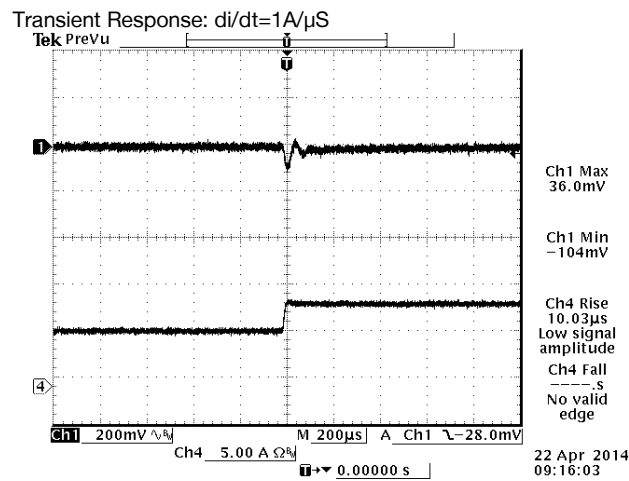
is (input reflected ripple current), AC component



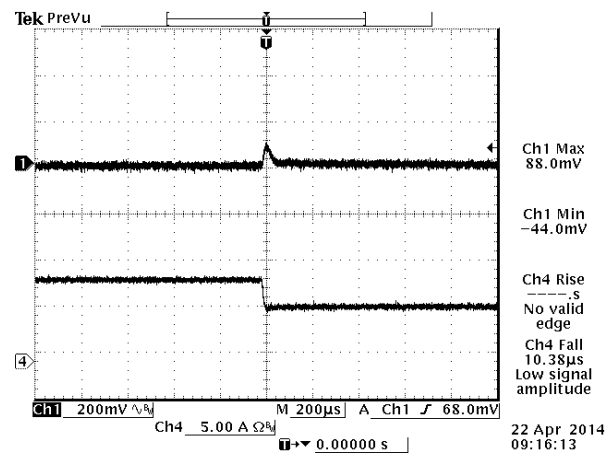
ic (input terminal ripple current), AC component

Test condition: 48VDC input, 5VDC/20A output and Ta=25 °C, with 500 μ F ceramic capacitor and 2200 μ F Al-electrolytic capacitor at output.

14. TRANSIENT RESPONSE WAVEFORMS



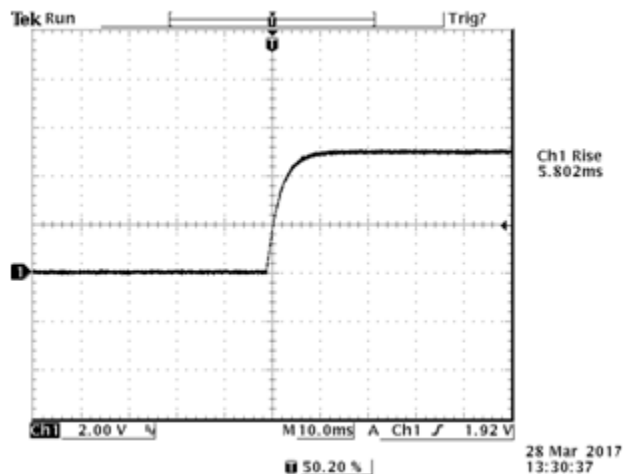
Vout=5V 50%-75% Load Transients at Vin=48V@Ta=25°C with 500μF ceramic capacitor and 2200μF Al-electrolytic capacitor at output.



Vout= 5V 75%-50% Load Transients at Vin=48V@Ta=25°C with 500μF ceramic capacitor and 2200μF Al-electrolytic capacitor at output.

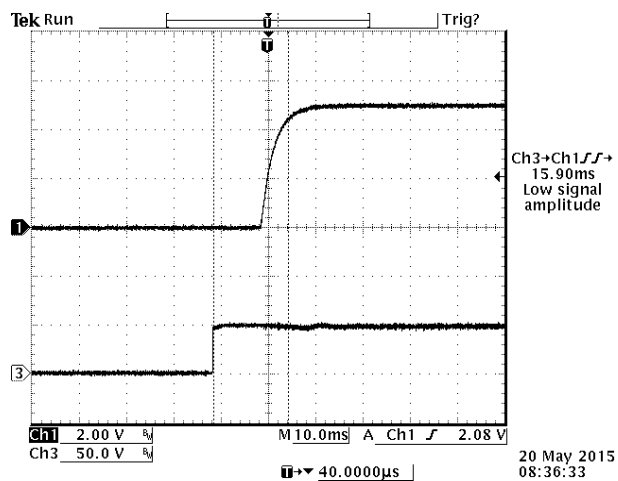
15. STARTUP & SHUTDOWN

RISE TIME



Test Condition: 48Vin, 5V, 20A output, Cout=500μF ceramic + 2200μF electrolytic

STARTUP TIME



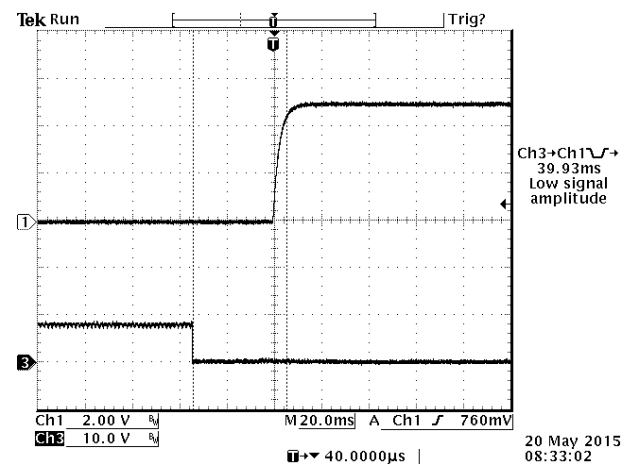
Startup from Vin

Ch1: Vo

Ch2: Vin

Test Condition: Vin =48, Vo=5V, 20A output

Cout=500μF ceramic + 2200μF electrolytic



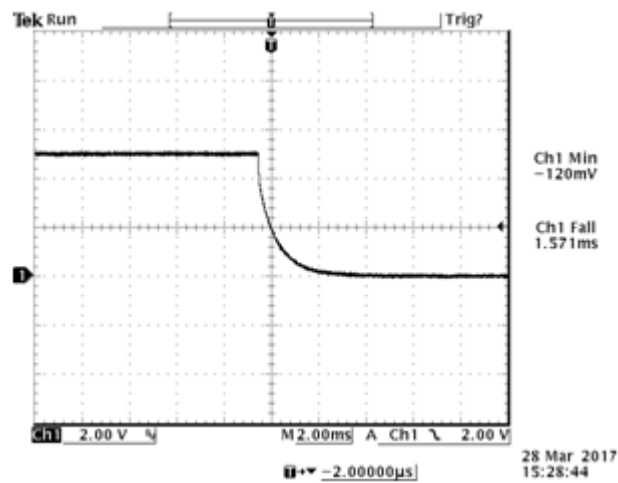
Startup from on/off

Ch1: Vo

Ch2: on/off

Test Condition: Vin =48, Vo=5V, 20A output

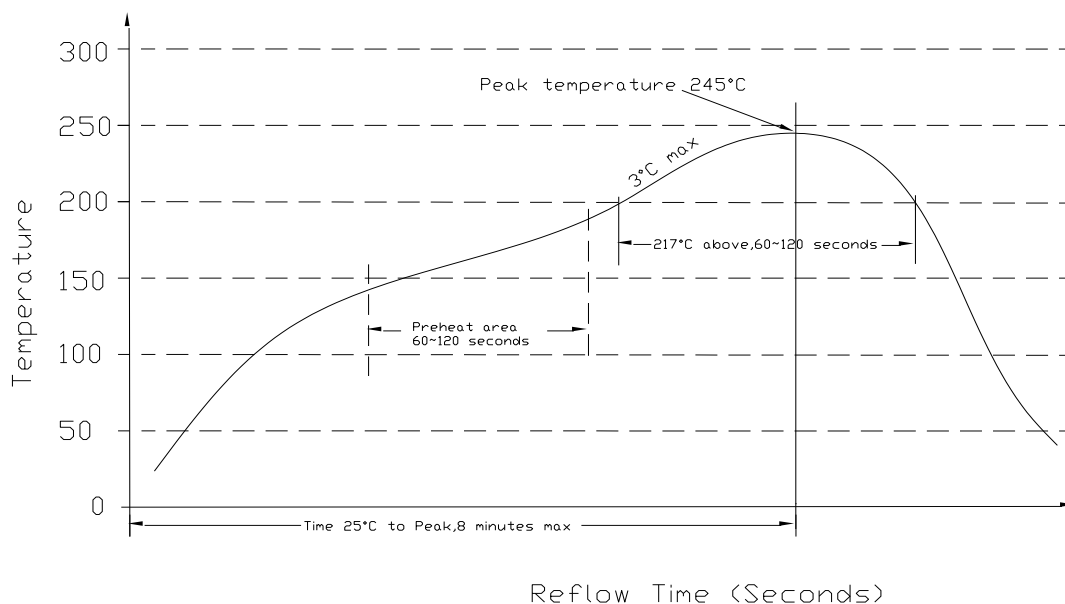
Cout=500μF ceramic + 2200μF electrolytic

STARTUP & SHUTDOWN(CONTINUED)**SHUTDOWN**

Test Condition: 48Vin, 5V, 20A output, Cout=500µF ceramic + 2200µF electrolytic

16. SOLDERING INFORMATION

The SRSB-80T05x modules are designed to be compatible with a Paste-In-Hole assembly 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.



17. MSL RATING

The SRSB-80T05x modules have a MSL rating of 3.

18. STORAGE AND HANDLING

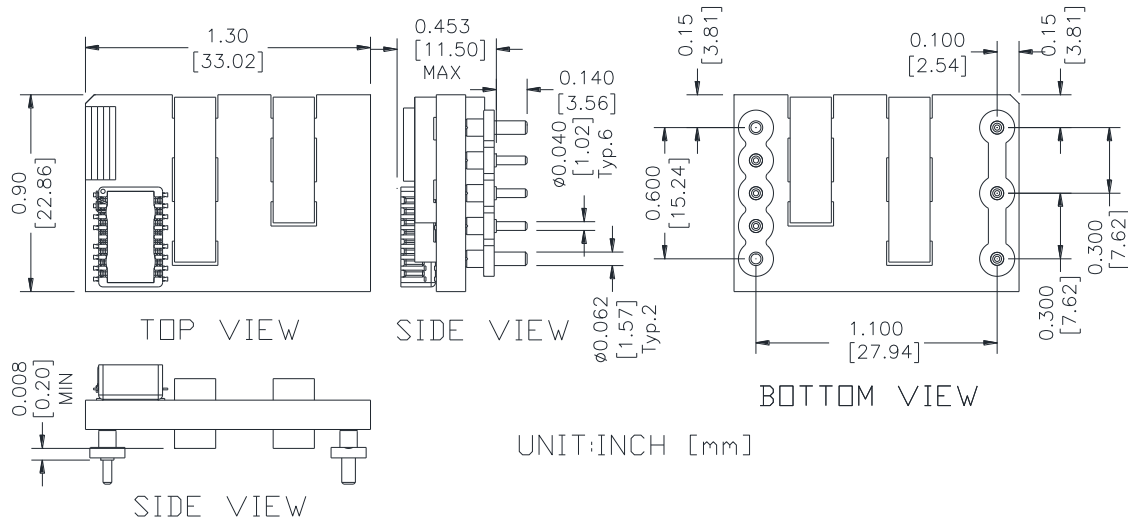
The SRSB-80T05x modules are designed to be compatible with J-STD-033 Rev:A (Handling, Packing, Shipping and Use of Moisture /Reflow Sensitive surface Mount devices). Moisture barrier bags (MBB) with desiccant are applied. The recommended storage environment and handling procedure is detailed in J-STD-033.

19. PRE-BAKING

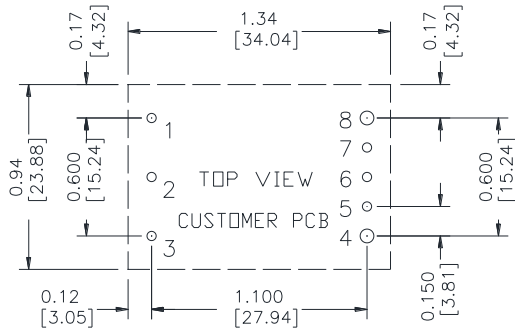
This component has been designed, handled, and packaged ready for pb-free reflow soldering. If the assembly shop follows J-STD-033 guidelines, no pre-bake of this component is required before being reflowed to a PCB. However, if the J-STD-033 guidelines are not followed by the assembler, Bel recommends that the modules should be pre-baked @ 120~125°C for a minimum of 4 hours (preferably 24 hours) before reflow soldering.

20. MECHANICAL DIMENSIONS

0RSB-80T05x



RECOMMENDED PCB PAD LAYOUT



HOLE SIZE: 1-3, 5-7 $\phi 0.047$ [1.19],
4,8 $\phi 0.07$ [1.78]
PAD SIZE: 1-3, 5-7 $\phi 0.08$ [2.03]
4,8 $\phi 0.10$ [2.54]

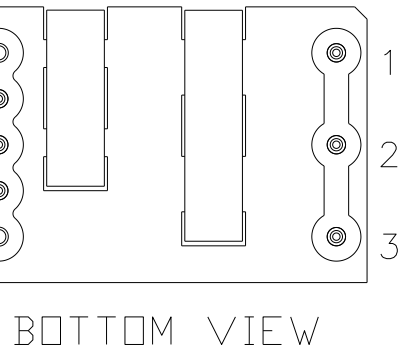
NOTE: These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 260 °C.

NOTES:

- 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.

All dimensions in inches; Tolerances: x.xx +/-0.02 in [0.5 mm].

x.xxx +/-0.010 in [0.25 mm]. Unless otherwise stated

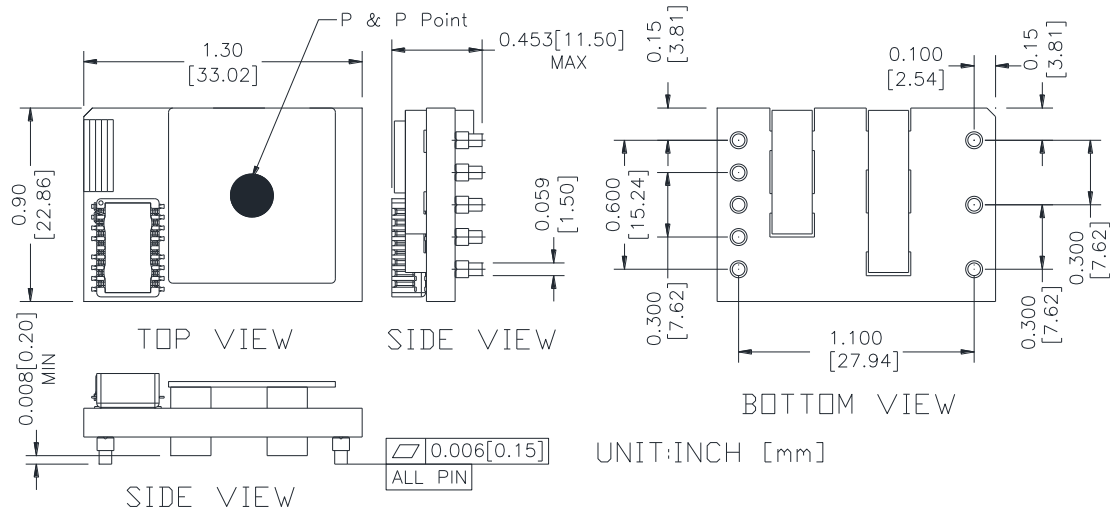


PN CONNECTIONS

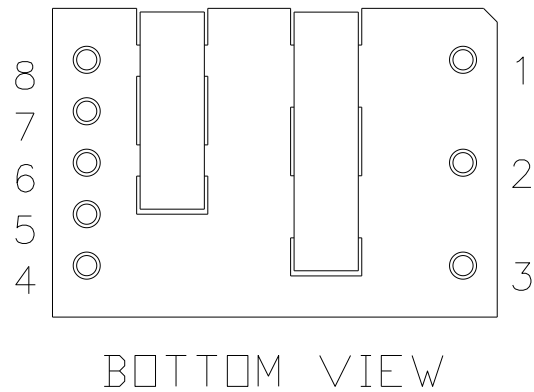
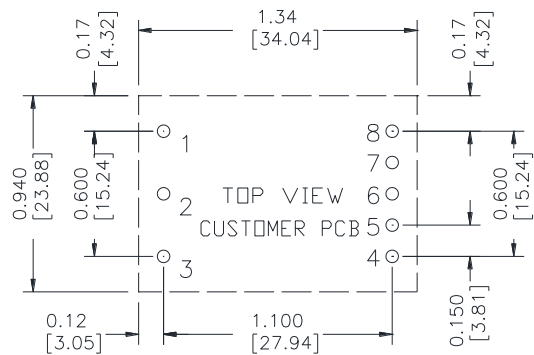
PIN	FUNCTION
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout-
5	SENSE(-)
6	TRIM
7	SENSE(+)
8	Vout(+)

MECHANICAL DIMENSIONS(CONTINUED)

SRSB-80T05x



RECOMMENDED PCB PAD LAYOUT



PIN CONNECTIONS

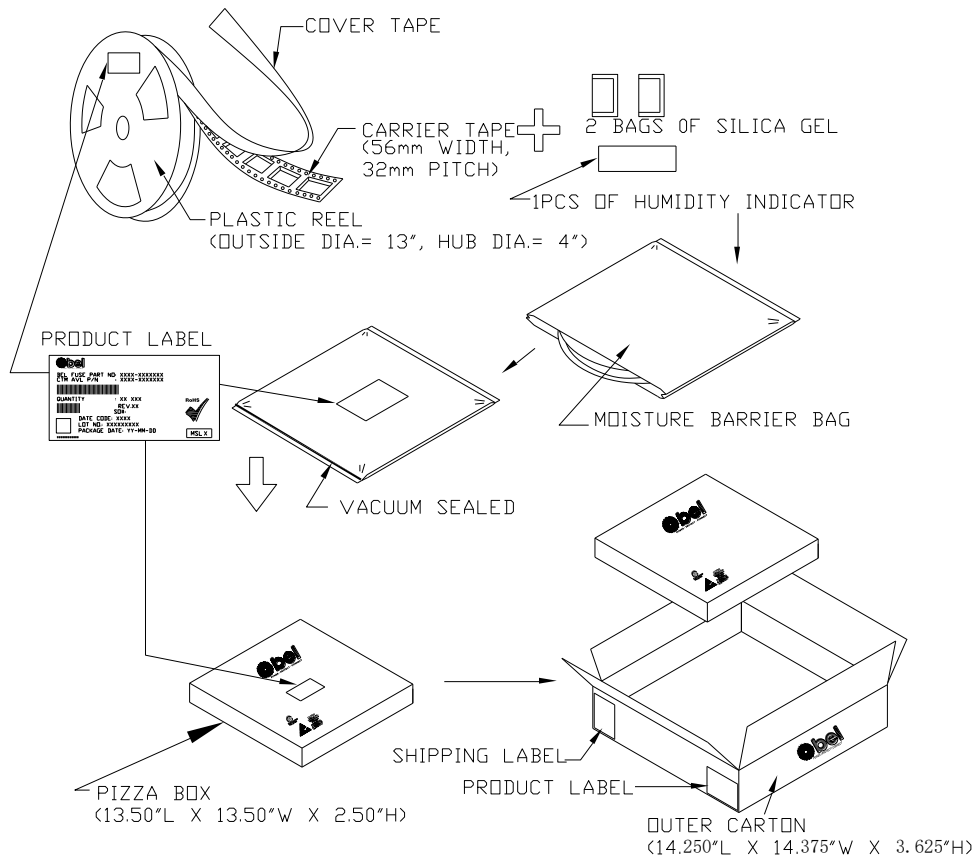
PIN	FUNCTION
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout-
5	SENSE(-)
6	TRIM
7	SENSE(+)
8	Vout(+)

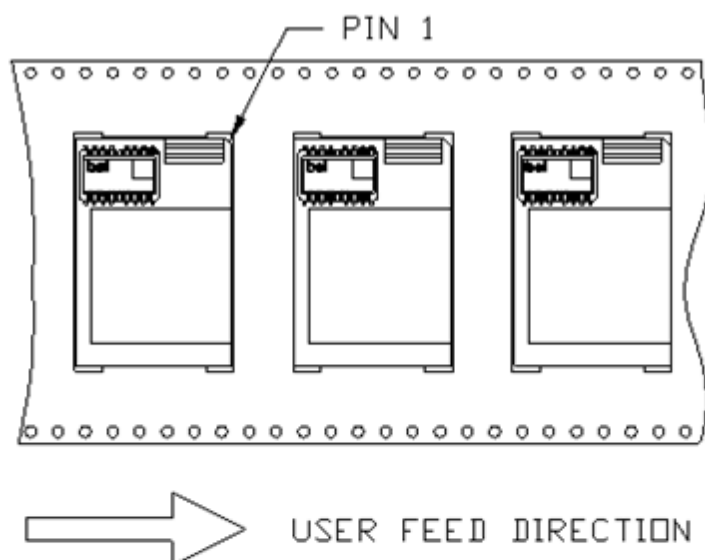
NOTE:

- 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; Tolerances: $x.xx \pm 0.02$ [0.50], $x.xxx \pm 0.010$ [0.25] unless otherwise stated.

21. PACKAGING INFORMATION

SRSB-80T05xR

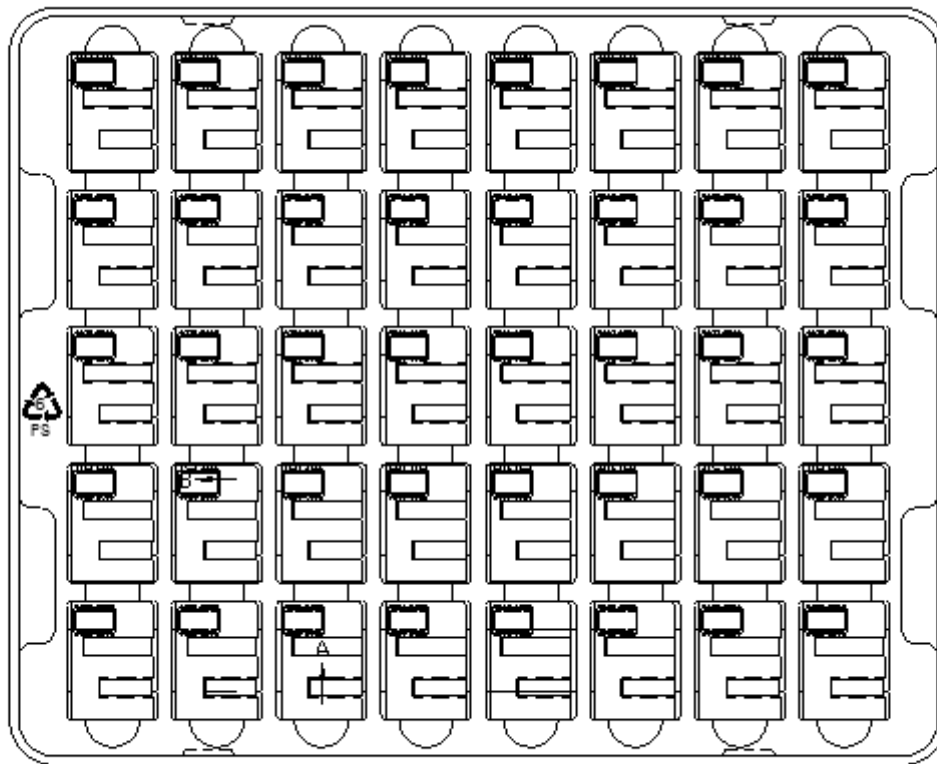




ORIENTATION OF COMPONENT INSIDE POCKET

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	

xRSB-80T05xG



22. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2017-06-29	AA	First release	J Yan
2017-08-30	AB	Update soldering information	J Yan
2018-7-23	AC	Update mechanical dimensions and change max output current to 20A	Jbel.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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