

SRPE-06E1A0 Series

Non-Isolated DC-DC Converter

The Bel SRPE-06E1A0 is part of the non-isolated dc/dc converter Power Module series. The modules use a SIP package. These converters are available in a range of output voltages from 0.6 VDC to 5.5 VDC over a wide range of input voltage ($V_{IN} = 5.5 - 13.2$ VDC). The efficiency is typically 91% at 3.3 Vout ($V_{in} = 12$ VDC) at full load.



Key Features & Benefits

- 5.5 VDC – 13.2 VDC Input
- 0.6 VDC – 5.5 VDC /6 A Output
- Non-Isolated
- Under-Voltage Lockout
- High Efficiency
- Wide Trim
- Fixed Frequency
- OCP/SCP
- Low Cost
- Remote On/Off
- Wide Input
- Class II, Category 2, Non-Isolated DC/DC Converter (refer to IPC-9592B)



Applications

- Networking
- Computers and Peripherals
- Telecommunications

1. MODEL SELECTION

OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY	MODEL NUMBER
0.6 V - 5.5 V	5.5 V - 13.2 V	6 A	33 W	91%	SRPE-06E1A0

NOTE: 1. Add "G" or "R" suffix at the end of the model numbers for package.

PART NUMBER EXPLANATION

S	R	PE	-	06	E	1A	0	x
Mounting type	RoHS Status	Series name		Output current	Input range	Output voltage	Active logic and HSK feature	Package type
Surface mount	RoHS 6	SMD SIP		6A	5.5-13.2V	0.6-5.5V	active high, without HSK	G – Tray R – Tape and Reel

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Input Supply Voltage		-0.3	-	15	V
Remote On/Off		-0.3	-	15	V
Ambient Temperature		0	-	50	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	m

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

3. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Input Voltage		5.5	-	13.2	V
Input Current (full load)	This power module is not internally fused. An input line fuse must always be used	-	-	4.9	A
Input Current (no load)		-	50	150	mA
Remote Off Input Current		-	1	5	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 1000nH, 5Hz to 20MHz. Use a 1000µF/25V AL-Cap with ESR=0.03 ohm max and 2*100µF/25V Tan cap with ESR=0.013 ohm max, at 100KHz@25°C.	-	7	20	mA
Input Reflected Ripple Current (pk-pk)		-	22	40	mA
I ² t Inrush Current Transient		-	-	1	A ² s
Turn-on Voltage Threshold		4.15	4.2	4.45	V
Turn-off Voltage Threshold		3.7	4	4.2	V

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

4. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	$V_o, \text{set} \geq 0.9\text{VDC}$ $V_o, \text{set} < 0.9\text{VDC}$	-2 -3	- -	2 3	$\%V_{o,\text{set}}$
Load regulation	$V_o \geq 3.3\text{VDC}$ $V_o < 3.3\text{VDC}$	-2 -40	-	2 40	$\%V_{o,\text{set}}$ mV
Line Regulation	$V_o \geq 3.3\text{VDC}$ $V_o < 3.3\text{VDC}$	-1.5 -15	-	1.5 15	$\%V_{o,\text{set}}$ mV
Regulation Over Temperature		-	0.8	-	$\%V_{o,\text{set}}$
Output Ripple and Noise (pk-pk)	0-20MHz BW, with 360 μF ceramic capacitor at output.	-	60	200	mV
Output Ripple and Noise (rms)		-	15	80	mV
Output Current Range		0	-	6	A
Output DC Current Limit		7	-	10	A
Output Short-Circuit Current ($V_o \leq 20\text{mV}$)(Hiccup Mode)		-	-	4	ADC
Rise time		-	2	2.5	ms
Turn On Time		-	2.9	5	ms
Overshoot at Turn on		-	0	4.5	%
Output Capacitance		200	-	2000	μF

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
TRANSIENT RESPONSE					
$\Delta V_{50\% \sim 100\% \text{ Max Load}}$	Overshoot	-	40	80	mV
	Settling Time	-	80	200	μs
$\Delta V_{100\% \sim 50\% \text{ Max Load}}$	Overshoot	-	40	80	mV
	Settling Time	-	80	200	μs

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
Switching Frequency		-	650	-	kHz
Efficiency	5.5 V 3.3 V 0.6 V	92.2 9. 69	94.2 91.6 71	-	%
Output Voltage Trim Range(Wide Trim)	This voltage is achieved by trimming up output slowly.	0.6	-	5.5	V
FIT	Calculated Telcordia SR-332, Issue 2 ($V_{in}=12\text{V}$, $V_o=5.5\text{V}$, $I_o=6\text{A}$, $T_a = 40\text{C}$, no forced air, 90% confidence Level $\text{FIT}=10^9/\text{MTBF}$)	-	17	-	-
Weight		-	2.5	-	g
Dimensions (L x W xH)			0.41 x 0.65 x 0.339 10.41 x 16.51 x 8.60		inch mm

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



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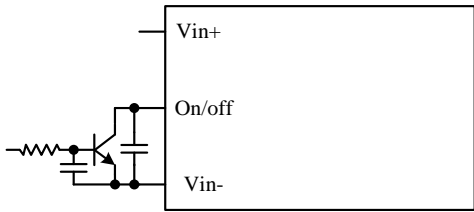
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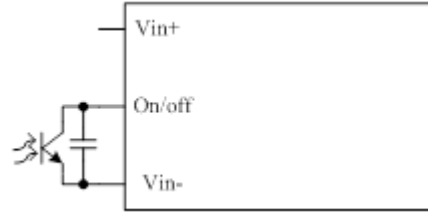
6. REMOTE ON/OFF

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit On)	Active High	-0.3	-	0.8	V
Signal High (Unit Off)		2.4	-	18	V

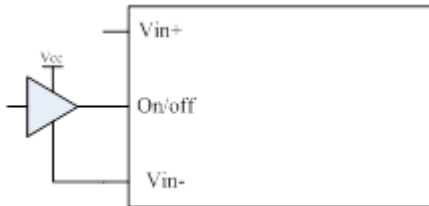
Recommended remote on/off circuit for active high



Control with open collector/drain circuit



Control with photocoupler circuit



Control with logic circuit



Permanently off

7. EFFICIENCY DATA

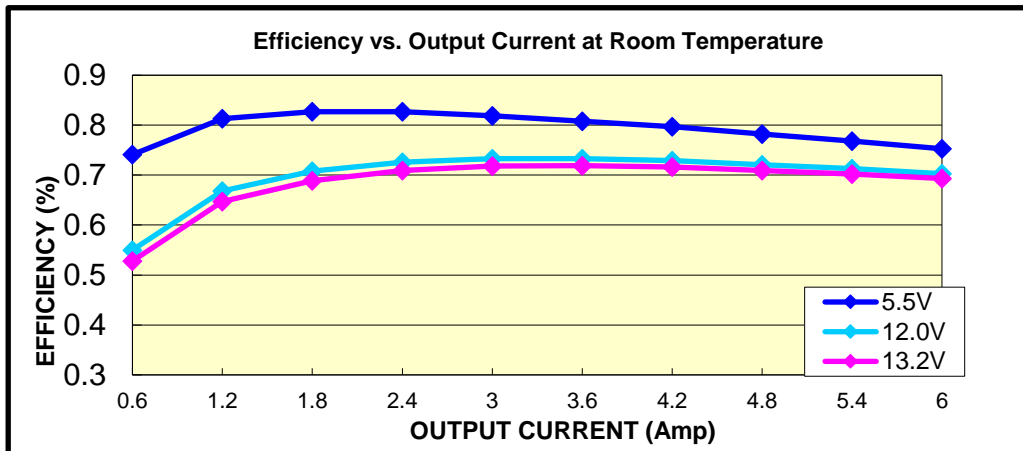


Figure 1. $V_{out} = 0.6 V$

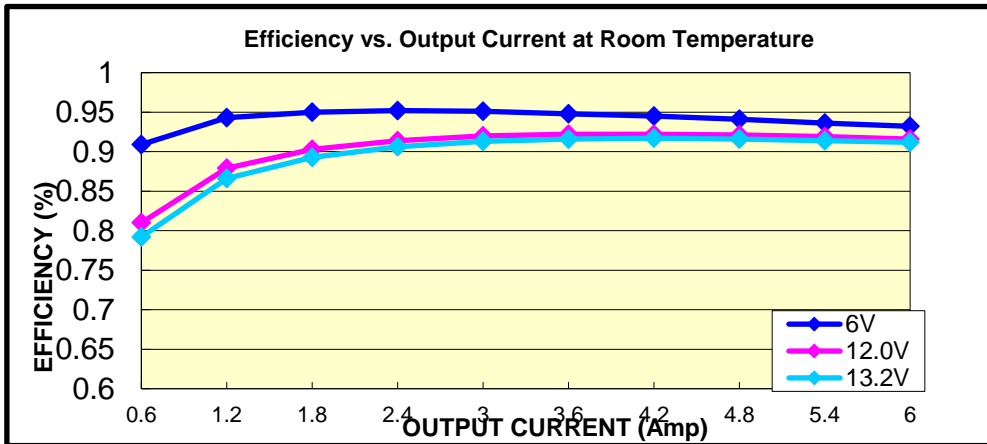


Figure 2. $V_{out} = 3.3V$

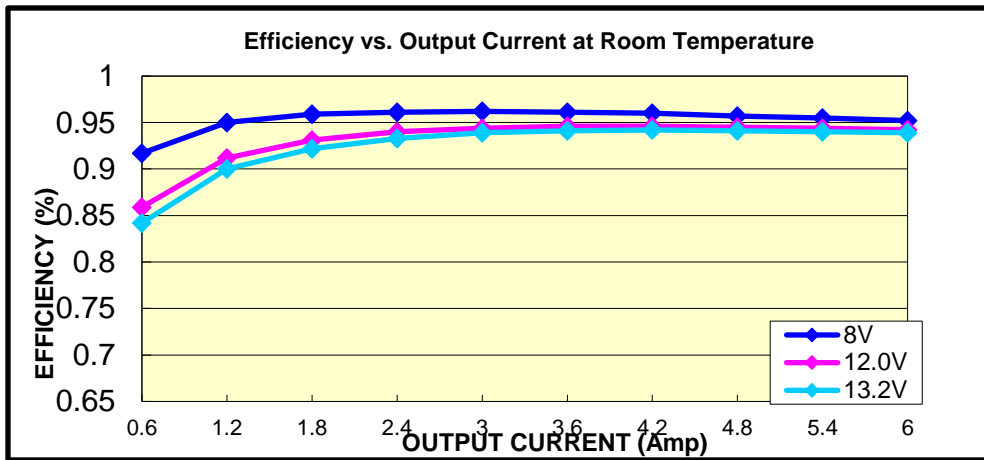
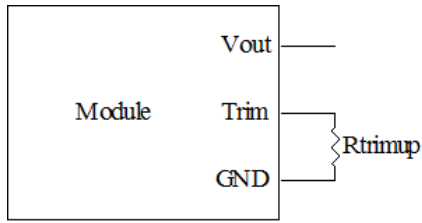


Figure 3. $V_{out} = 5.5V$

8. TRIM

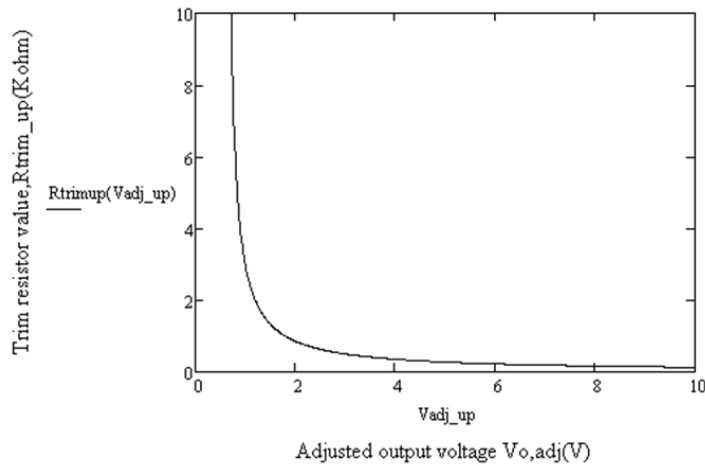
Trim up circuit (using an external resistor)



SRPE-06E1A0 Trim up Resistor Calculate

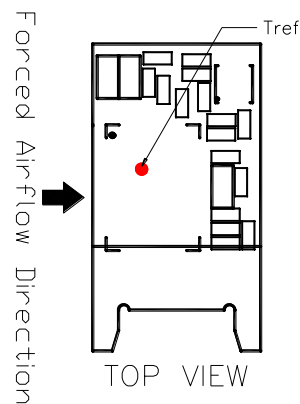
$$R_{trim} = \frac{1.2}{V_o - 0.6} k\Omega$$

V_o is the desired output voltage
 R_{trim} is the required resistance between TRIM and GND



9. THERMAL DERATING CURVES

$V_{in}=12V$, with maximum junction temperature of semiconductors derated to 115 °C.



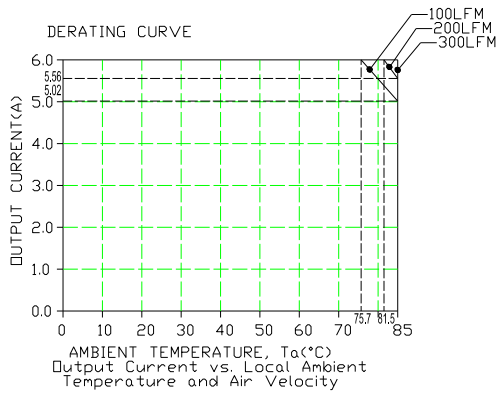


Figure 4. $V_{out} = 0.6 V$

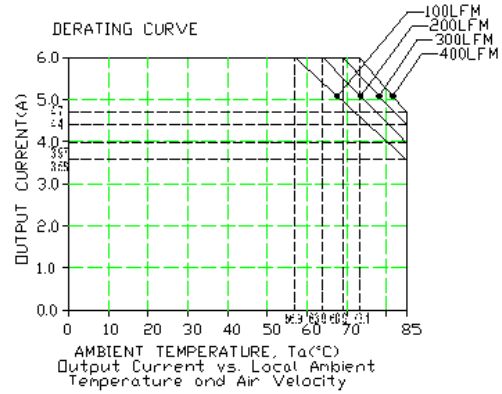


Figure 5. $V_{out} = 1.8 V$

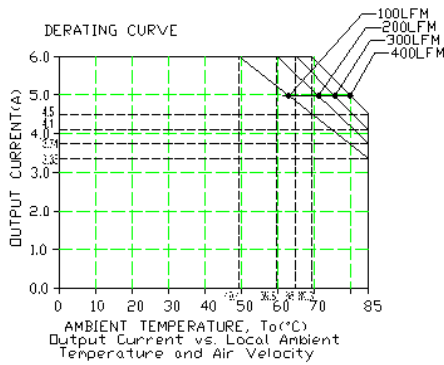


Figure 6. $V_{out} = 3.3 V$

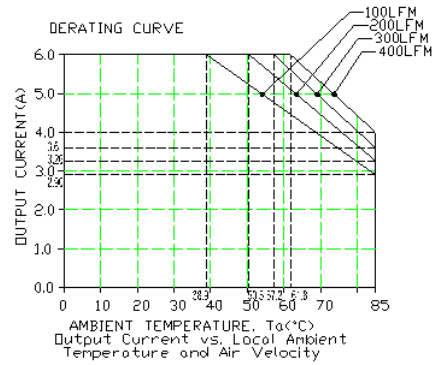


Figure 7. $V_{out} = 5.5 V$

10. RIPPLE AND NOISE WAVEFORM

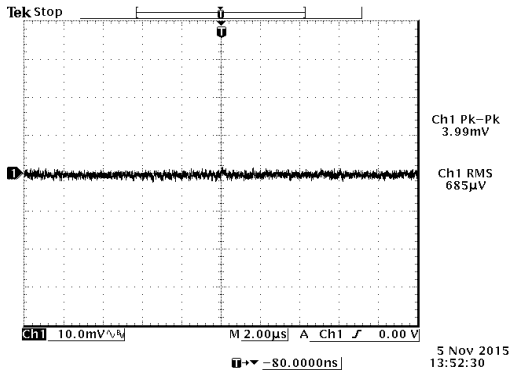


Figure 8. Ripple and noise at full load, 12V input, 0.6V output and $T_a=25^\circ C$

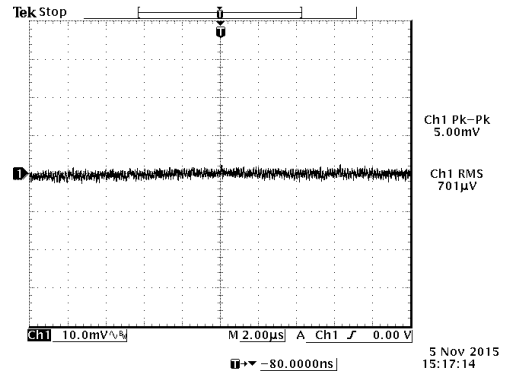


Figure 9. Ripple and noise at full load, 12V input, 3.3V output and $T_a=25^\circ C$



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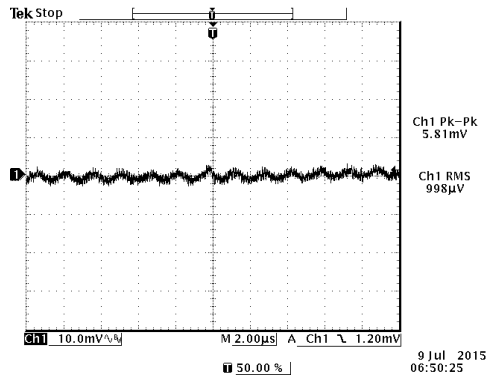


Figure 10. Ripple and noise at full load, 12V input, 5.5V output and $T_a=25^\circ\text{C}$

NOTE: Test condition of the output ripple and noise: 0-20MHz BW, with 360µF ceramic cap at output

11. TRANSIENT RESPONSE WAVEFORMS

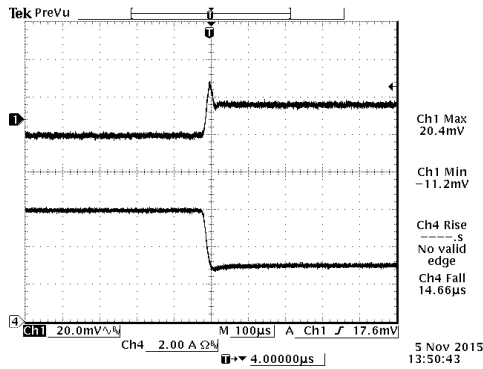


Figure 11. 100%-50% Load Transients at $V_{in}=12\text{V}$, $V_{out}=0.6\text{V}@T_a=25^\circ\text{C}$

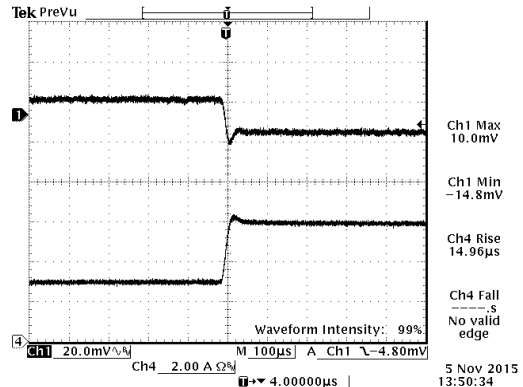


Figure 12. 50%-100% Load Transients at $V_{in}=12\text{V}$, $V_{out}=0.6\text{V}@T_a=25^\circ\text{C}$

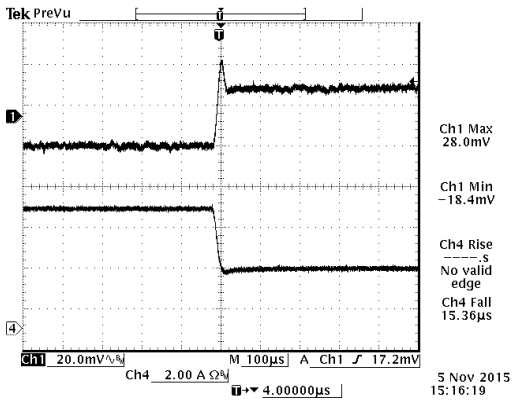


Figure 13. 100%-50% Load Transients at $V_{in}=12\text{V}$, $V_{out}=3.3\text{V}@T_a=25^\circ\text{C}$

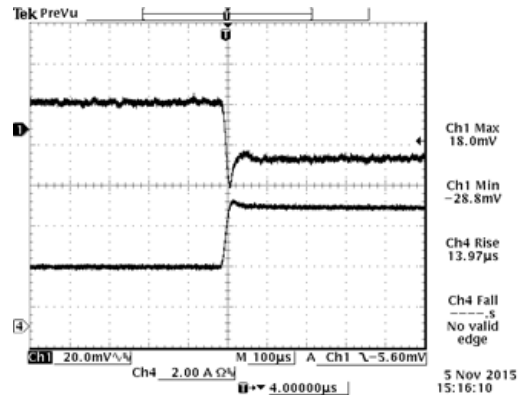


Figure 14. 50%-100% Load Transients at $V_{in}=12\text{V}$, $V_{out}=3.3\text{V}@T_a=25^\circ\text{C}$

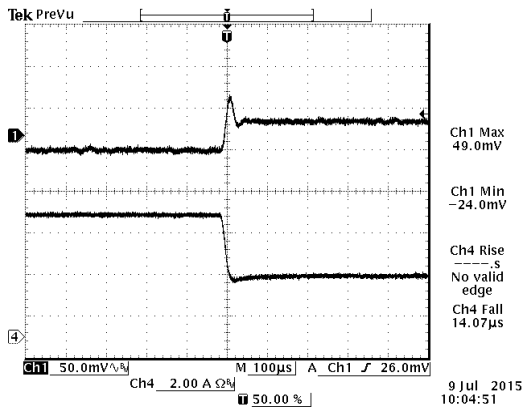


Figure 15. 100%-50% Load Transients at $V_{in}=12V$, $V_{out}=5.5V@T_a=25^\circ C$

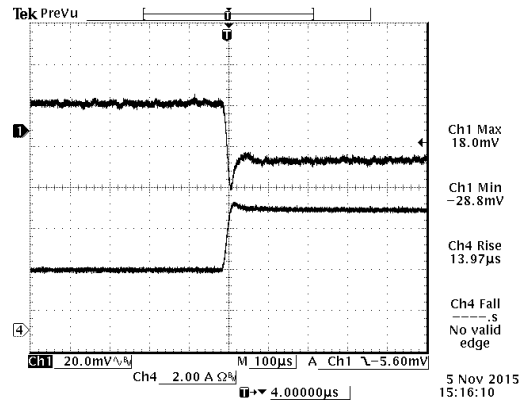
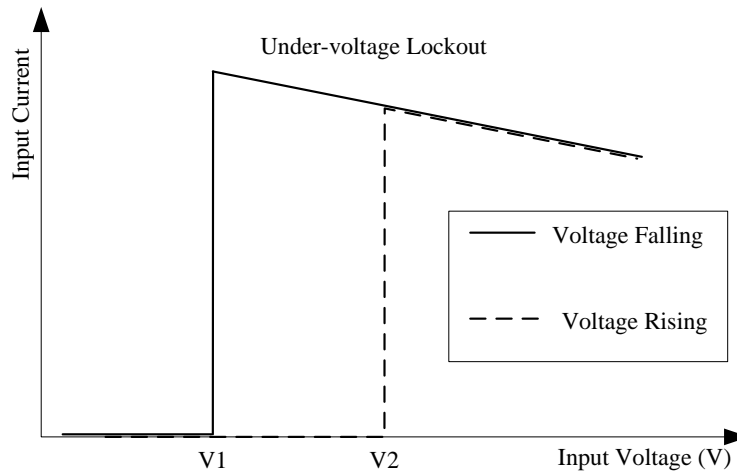


Figure 16. 50%-100% Load Transients at $V_{in}=12V$, $V_{out}=5.5V@T_a=25^\circ C$

NOTE: Test condition of the transient response: $di/dt=0.25A/\mu s$, with 360uF ceramic cap at output.

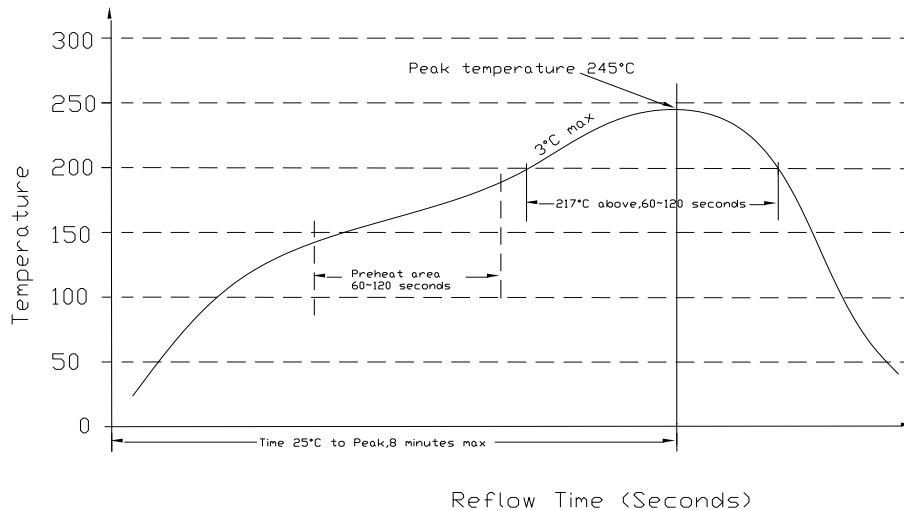
12. INPUT UNDER-VOLTAGE LOCKOUT



$V1=4V$
 $V2=4.15V$

13. SOLDERING INFORMATION

The SRPE-06E1A0 modules are designed to be compatible with a 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.



14. MSL RATING

The SRPE-06E1A0 modules have a MSL rating of 3.

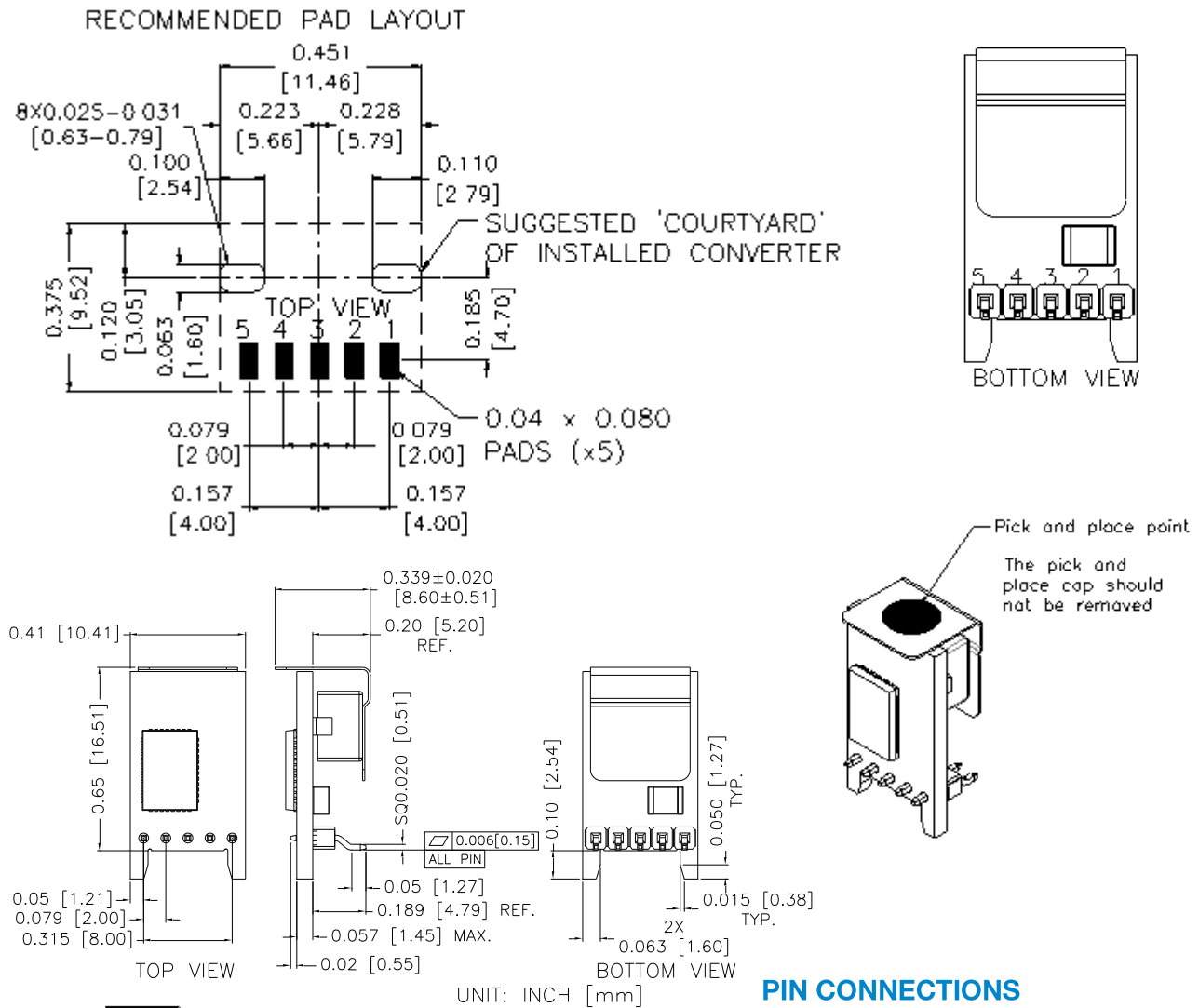
15. STORAGE AND HANDLING

The SRPE-06E1A0 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. 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.

17. MECHANICAL OUTLINE



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. (x.x +/-0.5mm) x.xxx +/-0.010 in. (x.xx +/-0.25mm).



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18. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2013-8-20	A	First Release	XF JIANG
2014-1-23	B	1.Mechanical drawing; 2. Output ripple and noise; 3.Output DC Current Limit; 4.Transient Response; 5.add ROHS logo; 6.Output Voltage Set Point; 7.Load Regulation; 8.Line Regulation; 9.Output DC Current Limit; 10.Efficiency; 11.Turn on/off Voltage Threshold; 12.Update on/off description, add a note for UVLO.	XF JIANG
2014-4-8	C	Update MD.	XF JIANG
2014-6-24	D	Update MD.	XF JIANG
2014-7-3	E	Update part number explanation, RoHS compliance , Add MD Note.	XF JIANG
2014-11-5	F	Update MD.	XF JIANG
2014-11-18	G	Update General Specifications, TD, MD.	XF JIANG
2015-11-12	H	Update Input Specs, Output Specs, General, Efficiency Data, NR, TR, MD.	XF JIANG
2015-12-22	I	Update Output Specs.	XF JIANG
2016-05-12	J	Update Thermal Derating Curves.	XF JIANG

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

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