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 (VIN = 5.5 - 13.2 VDC). The efficiency is typically 91% at 3.3 Vout (Vin = 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)

RoHS Compliant

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^2t Inrush Current Transient		-	-	1	A^2s
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	Vo, set ≥ 0.9VDC	Setpoint test condition: Vin=12V, Iout=half load, Ta=25°C	-2	-	2	%Vo,set
	Vo, set < 0.9VDC		-3	-	3	
Load regulation	Vo ≥ 3.3 VDC	Vin=12V, Io=0-6A, Ta=25°C .	-2	-	2	%Vo,set
	Vo < 3.3VDC		-40		40	mV
Line Regulation	Vo ≥ 3.3 VDC	Vin=8-13.2V, Io=3A, Ta=25°C .	-1.5	-	1.5	%Vo,set
	Vo < 3.3VDC	Vin=5.5-13.2V, Io=3A, Ta=25°C .	-15		15	mV
Regulation Over Temperature			-	0.8	-	%Vo,set
Output Ripple and Noise (pk-pk)		0-20MHz BW, with 360μF 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 (Vo≤20mV)(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						
△V50% ~ 100% Max Load	Overshoot	di/dt=0.25A/μs, Vin=12VDC, Ta=25°C, with 360μF ceramic capacitor at output.	-	40	80	mV
	Settling Time		-	80	200	μs
△V 100% ~ 50% 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

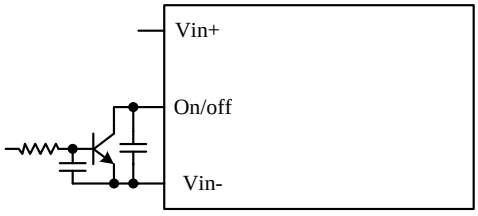
PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Switching Frequency			-	650	-	kHz
Efficiency	5.5 V 3.3 V 0.6 V		92.2 9. 69	94.2 91.6 71		%
Output Voltage Trim Range(Wide Trim)		This voltage is achieved by trimming up output slowly.	0.6	-	5.5	V
FIT		Calculated Telcordia SR-332, Issue 2 (Vin=12 V, Vo=5.5V, Io=6A, Ta = 40C, no forced air, 90% confidence Level FIT=10^9/MTBF)	-	17	-	-
Weight			-	2.5	-	g
Dimensions (L × W ×H)				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.

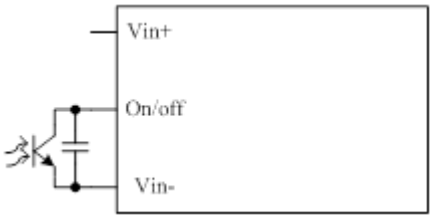
6. REMOTE ON/OFF

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Signal Low (Unit On)	Active High	The remote on/off pin open, Unit off.	-0.3	-	0.8	V
Signal High (Unit Off)			2.4	-	18	V

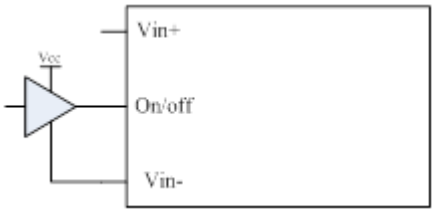
Recommended remote on/off circuit for active high



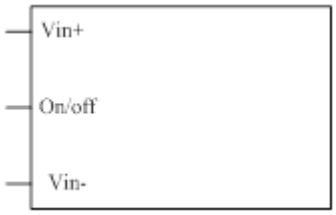
Control with open collector/drain circuit



Control with photocoupler circuit



Control with logic circuit



Permanently off

7. EFFICIENCY DATA

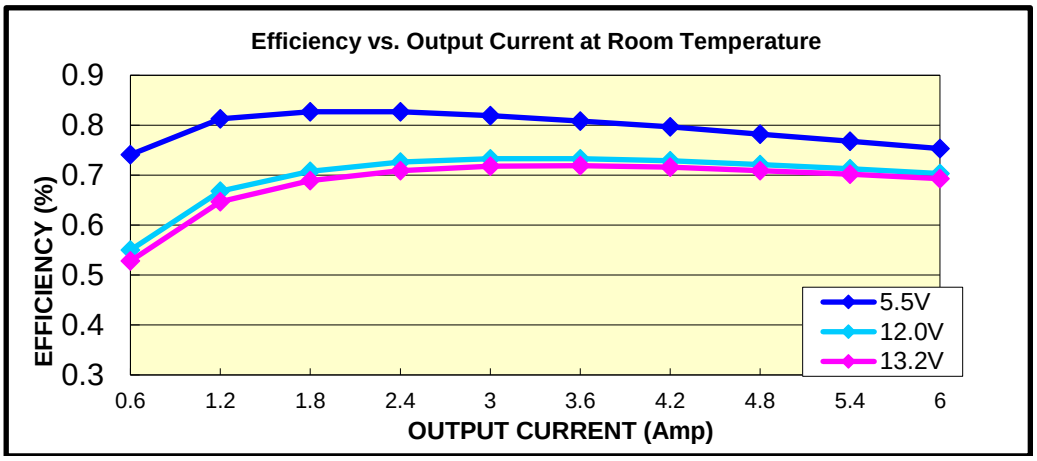


Figure 1. Vout = 0.6 V

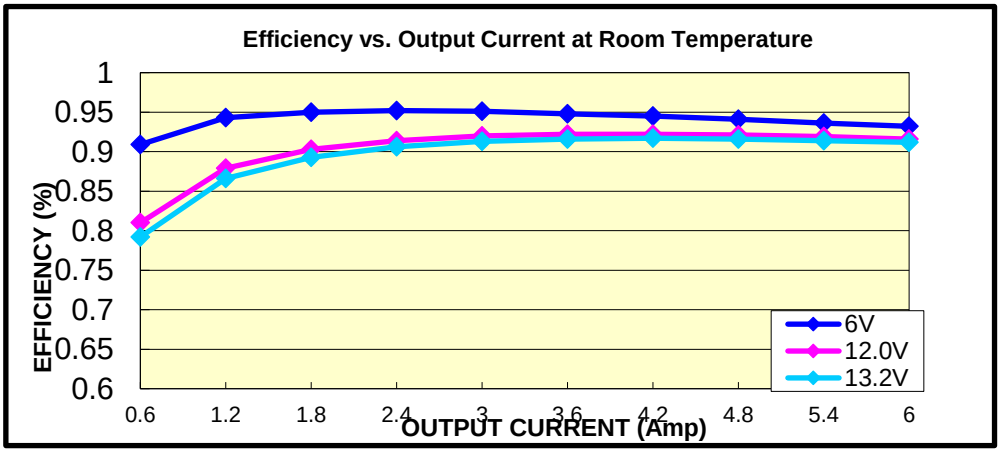


Figure 2. Vout = 3.3 V

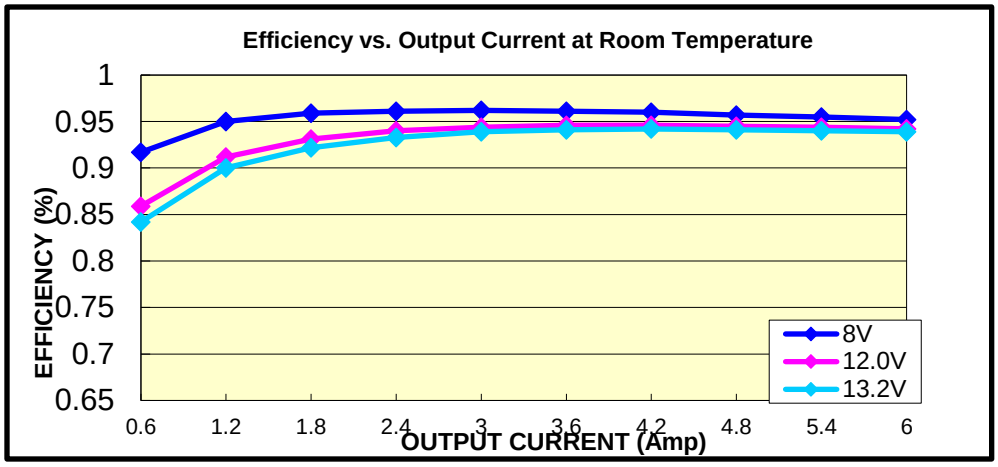
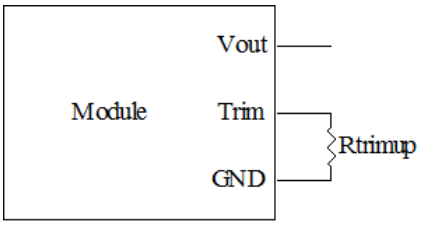


Figure 3. Vout = 5.5 V

8. TRIM

Trim up circuit (using an external resistor)

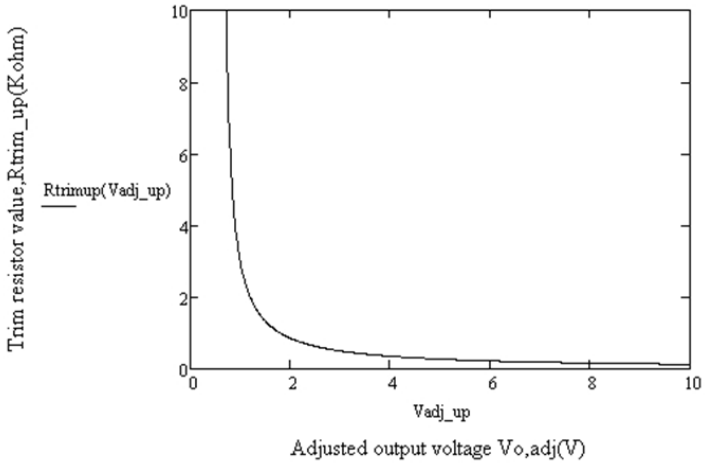


SRPE-06E1A0 Trim up Resistor Calculate

$$Rtrim = \frac{1.2}{Vo - 0.6} k\Omega$$

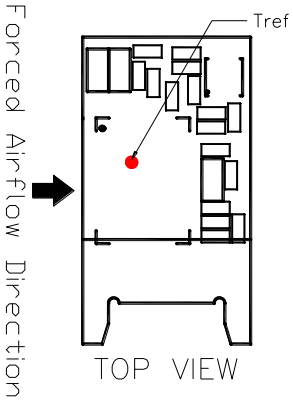
Vo is the desired output voltage

Rtrim is the required resistance between TRIM and GND



9. THERMAL DERATING CURVES

Vin=12V, with maximum junction temperature of semiconductors derated to 115 ˚C.



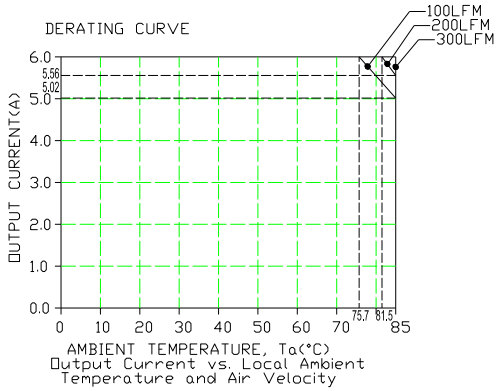


Figure 4. Vout = 0.6 V

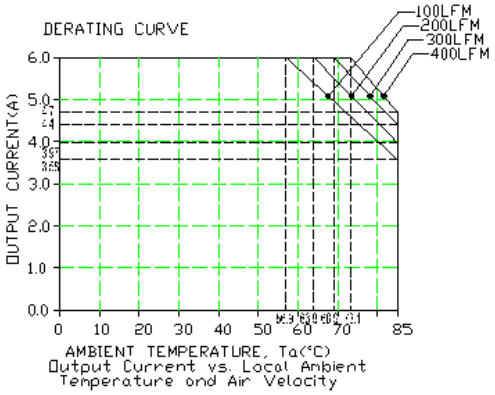


Figure 5. Vout = 1.8 V

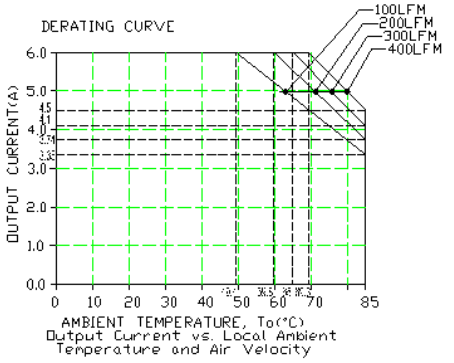


Figure 6. Vout = 3.3 V

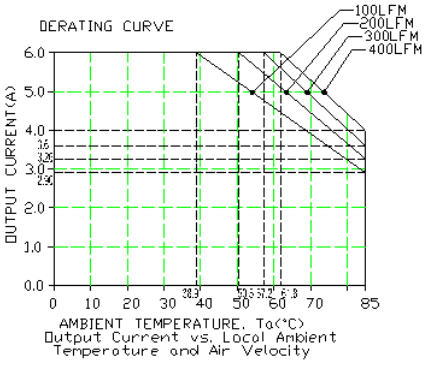


Figure 7. Vout = 5.5 V

10. RIPPLE AND NOISE WAVEFORM

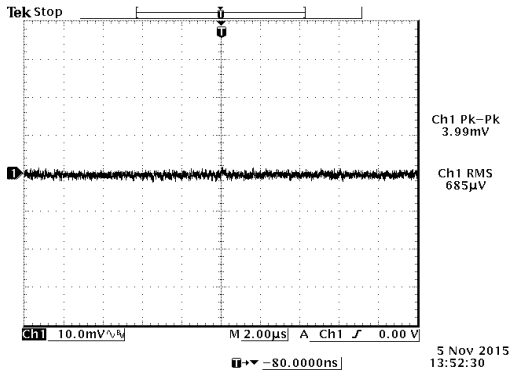


Figure 8. Ripple and noise at full load, 12V input, 0.6V output and Ta=25 ℃

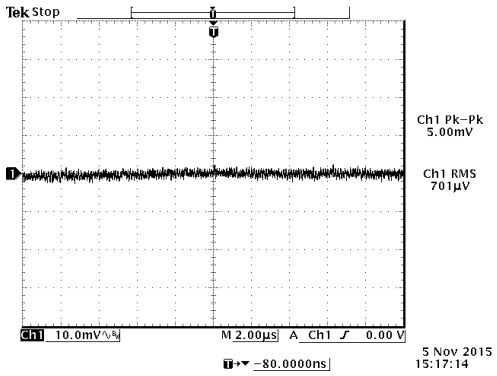


Figure 9. Ripple and noise at full load, 12V input, 3.3V output and Ta=25 ℃

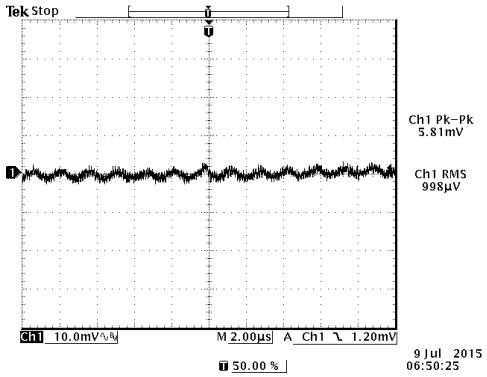


Figure 10. Ripple and noise at full load, 12V input, 5.5V output and Ta=25 ℃

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

11. TRANSIENT RESPONSE WAVEFORMS

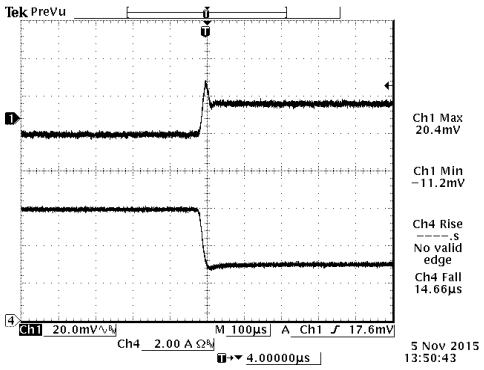


Figure 11. 100%-50% Load Transients at Vin=12V, Vout=0.6V@Ta=25℃

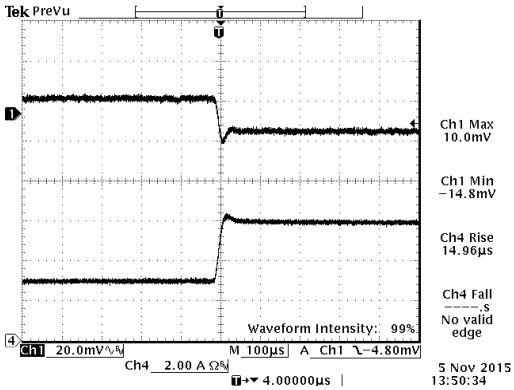


Figure 12. 50%-100% Load Transients at Vin=12V, Vout=0.6V@Ta=25℃

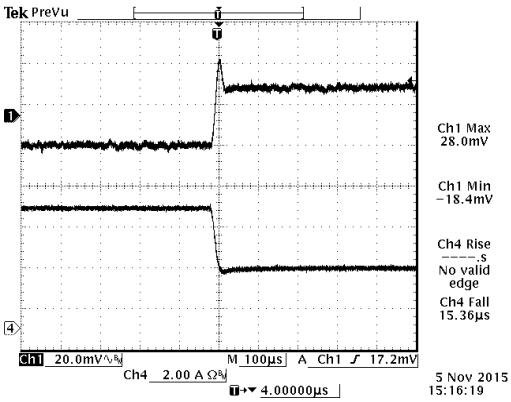


Figure 13. 100%-50% Load Transients at Vin=12V, Vout=3.3V@Ta=25℃

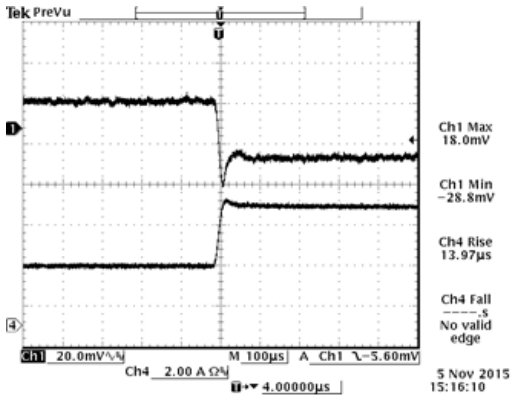


Figure 14. 50%-100% Load Transients at Vin=12V, Vout=3.3V@Ta=25℃

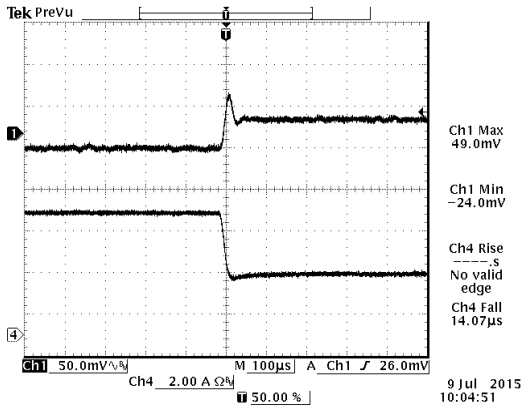


Figure 15. 100%-50% Load Transients at Vin=12V, Vout=5.5V@Ta=25℃

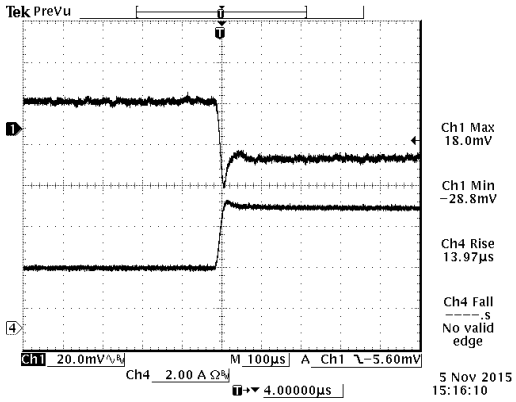
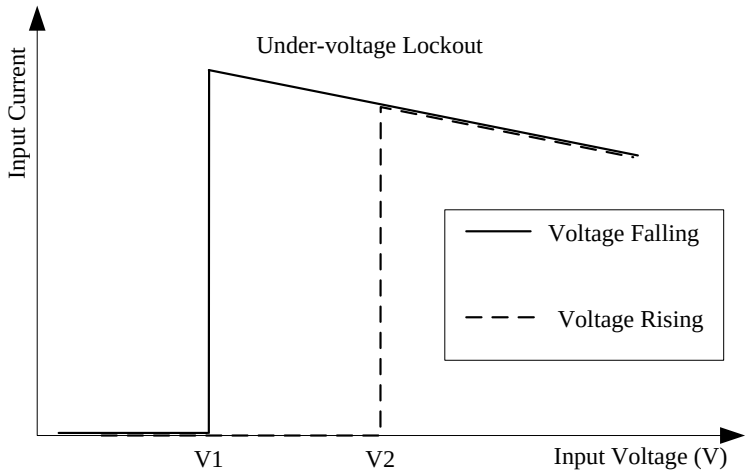


Figure 16. 50%-100% Load Transients at Vin=12V, Vout=5.5@Ta=25℃

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

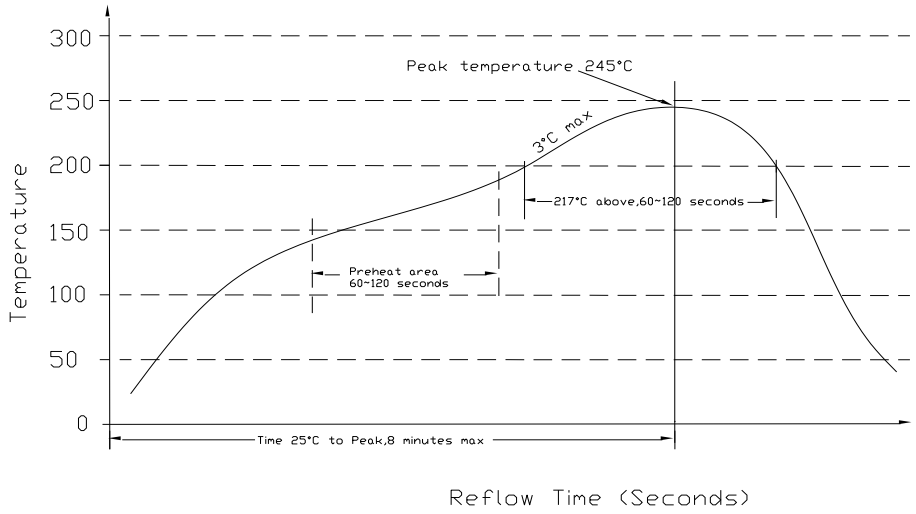
12. INPUT UNDER-VOLTAGE LOCKOUT



V1=4 V
V2=4.15 V

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

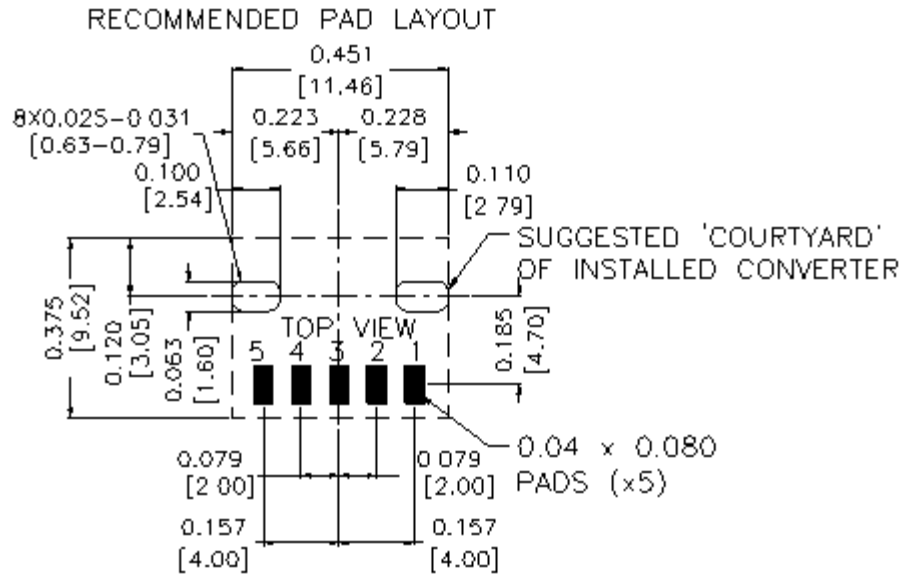
15. STORAGE AND HANDLING

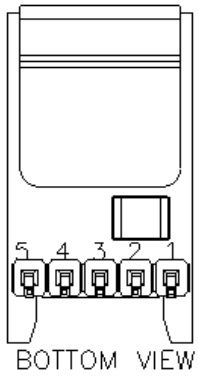
The SRPE-06E1A0 modules are designed to be compatible with J-STD-033 Rev: A (Handling, Packing, Shipping and Use of Moisture /Reflow Sensitive surface Mount devices). Moisture barrier bags (MBB) with desiccant are applied. The recommended storage environment and handling procedure is detailed in J-STD-033.

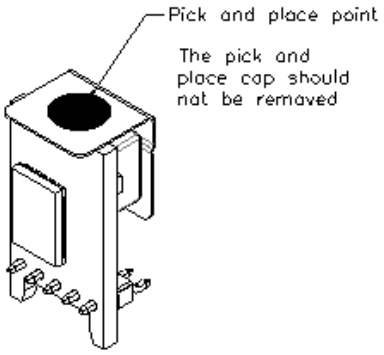
16. PRE-BAKING

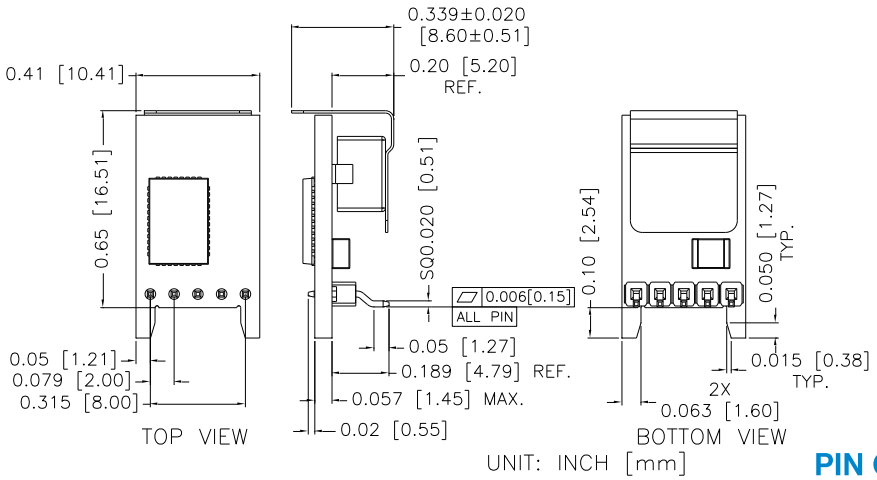
This component has been designed, handled, and packaged ready for Pb-free reflow soldering. If the assembly shop follows J-STD-033 guidelines, no pre-bake of this component is required before being reflowed to a PCB. However, if the J-STD-033 guidelines are not followed by the assembler, Bel recommends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

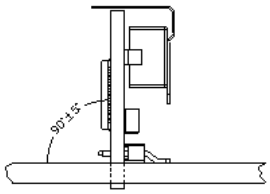
17. MECHANICAL OUTLINE











PIN CONNECTIONS

PIN	FUNCTION
1	Enable
2	Vin
3	GND
4	Vout
5	Trim

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).

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