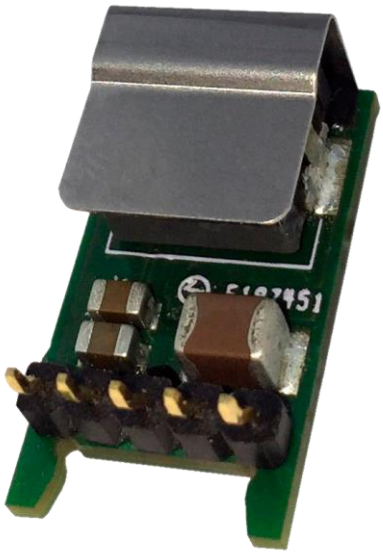
SRPE-03E1A0

Non-Isolated DC-DC Converter

The Bel SRPE-03E1A0 is part of the non-isolated DC-DC converter power module series. The modules use a SMD 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 VDC - 13.2 VDC). The efficiency is typically 92% at 3.3 Vout (Vin = 12 VDC) at full load.



RoHS Compliant

Key Features & Benefits

- 5.5 VDC - 13.2 VDC Input
- 0.6 VDC - 5.5 VDC @ 3 A Output
- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Wide Input
- Under-Voltage Lockout
- Wide Trim
- OCP/SCP
- Remote On/Off
- Class 2, Category 2 (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
SRPE-03E1A0	0.6 V - 5.5 V	5.5 V - 13.2 V	3 A	16.5 W	92%

NOTE: Add “G” suffix at the end of the model numbers listed above to indicate “Tray Packaging”.

1.1 PART NUMBER EXPLANATION

S	R	PE	-	03	E	1A	0	X
Surface mount	RoHS 6	Series name, SMD		Series code	Wide input range (5.5 - 13.2 V)	Wide output range (0.6 - 5.5 V)	Suffix	Package

2. ABSOLUTE MAXIMUM RATINGS

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

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input 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: Use 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
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	-	-	2.6	A
Input Current (no load)		-	10	150	mA
Remote Off Input Current		-	1	5	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 1000 nH, 5 Hz to 20 MHz. Use a 1000 uF/25V AL-Cap with ESR = 0.03 ohm max and 2*100 uF/25 V Tan cap with ESR = 0.013 ohm max, at 100 KHz @ 25°C.	-	5	15	mA
Input Reflected Ripple Current (pk-pk)		-	15	30	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

4. OUTPUT SPECIFICATIONS

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

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Vo, set ≥ 0.9 VDC	Setpoint test condition: Vin = 12 V, Iout = half load, Ta = 25°C	-2	-	2	%Vo,set
	Vo, set < 0.9 VDC		-3	-	3	%Vo,set
Load Regulation	Vo ≥ 3.3 VDC	Vin = 12 V, Io = 0 – 3 A, Ta = 25°C	-1.5	-	1.5	%Vo,set
	Vo < 3.3VDC		-20		20	mV
Line Regulation	Vo ≥ 3.3 VDC	Vin = 8 - 13.2 V, Io = 1.5 A, Ta = 25°C Vin = 5.5 - 13.2 V, Io = 1.5 A, Ta = 25°C	-1.5	-	1.5	%Vo,set
	Vo < 3.3VDC		-15		15	mV
Regulation Over Temperature			-	0.8	-	%Vo,set
Output Ripple and Noise (pk-pk)		0-20 MHz BW, with 360 µF ceramic capacitor at output.	-	20	50	mV
Output Ripple and Noise (rms)			-	5	20	mV
Output Current Range			0	-	3	A
Output DC Current Limit			3.5	4	6	A
Output Short-Circuit Current (Vo ≤ 20 mV) (Hiccup Mode)			-	-	2	ADC
Rise time			-	2	2.5	ms
Turn On Time			-	3	5	ms
Overshoot at Turn on			-	0	3.5	%
Output Capacitance			200	-	1000	uF
Transient Response						
ΔV50% ~ 100% of Max Load	Overshoot	di/dt = 0.25 A/us, Vin = 12 VDC, Ta = 25°C, with 360 µF ceramic capacitor at output.	-	30	60	mV
	Settling Time		-	20	50	us
ΔV100% ~ 50% of Max Load	Overshoot		-	30	60	mV
	Settling Time		-	20	50	us

5. GENERAL SPECIFICATIONS

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

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	5.5 V 3.3 V 0.6 V	The efficiency is measured at Vin = 12 V, full load and Ta = 25°C.	92 90 72	94 92 74		%
Switching Frequency			-	650	-	kHz
Output Voltage Trim Range (Wide Trim)		This voltage is achieved by trimming up output slowly.	0.6	-	5.5	V
Weight			-	2.5	-	g
FIT		Calculated Telcordia SR-332, Issue 2 (Vin = 12 V, Vo = 5.5 V, Io = 12 A, Ta = 40°C, no forced air, 90% confidence Level, FIT = 10^9/MTBF)		16.8		-
Dimensions		Inches (L × W × H) Millimeters (L × W × H)		0.41 x 0.65 x 0.339 10.41 x 16.51 x 8.60		-

6. EFFICIENCY DATA

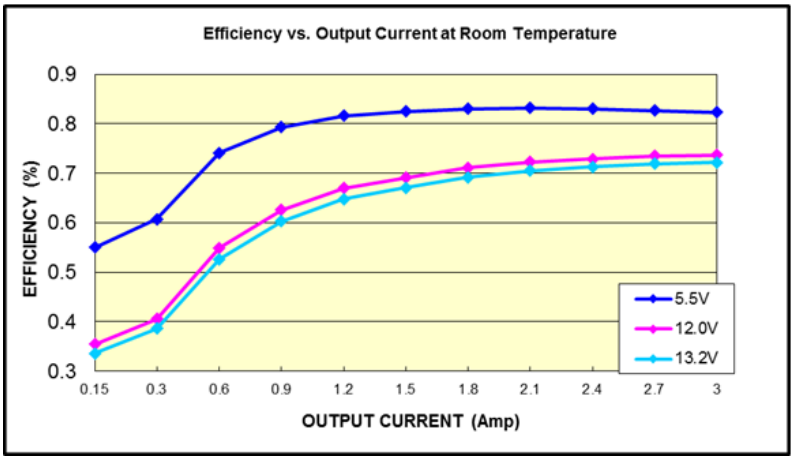


Figure 1. Vout: 0.6 V

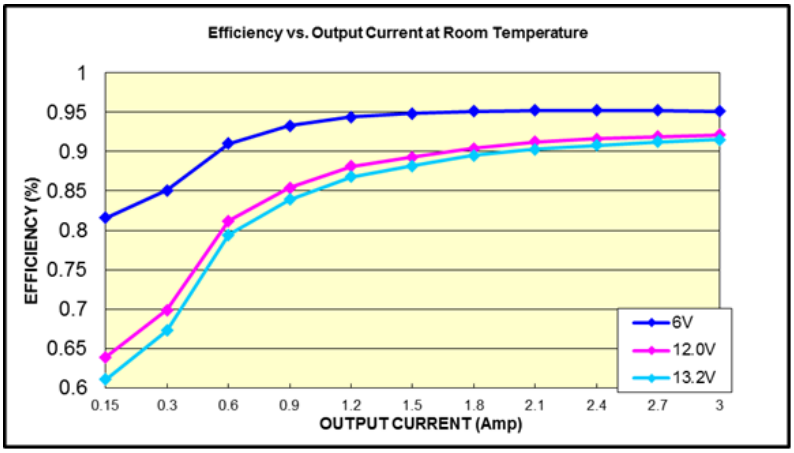


Figure 2. Vout: 3.3 V

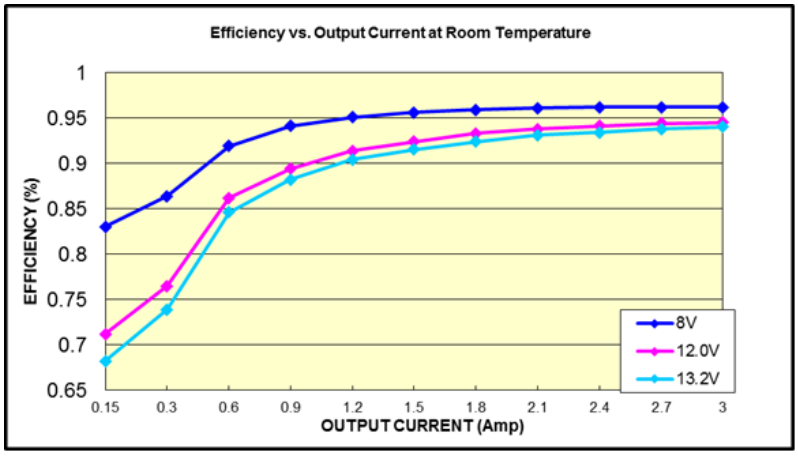
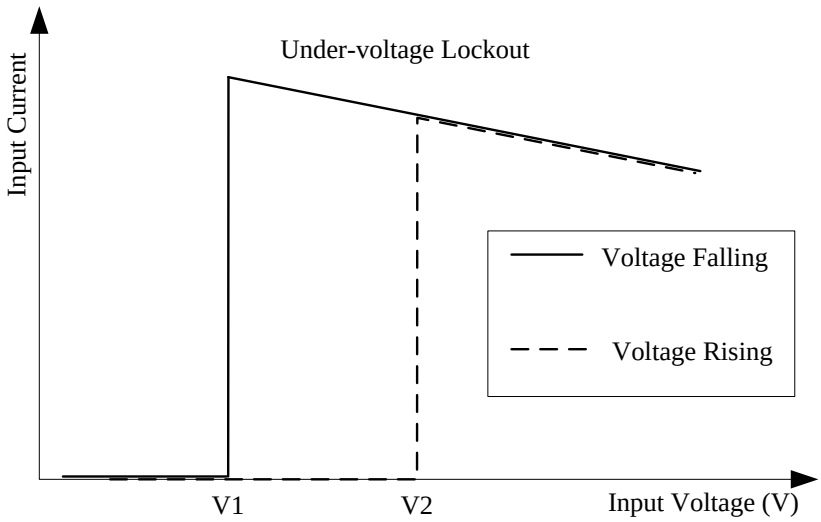


Figure 3. Vout: 5.5 V

7. INPUT UNDER-VOLTAGE LOCKOUT



V1 = 4.0 V
V2 = 4.15 V

Figure 4. Input Under-Voltage Lockout

8. THERMAL DERATING CURVES

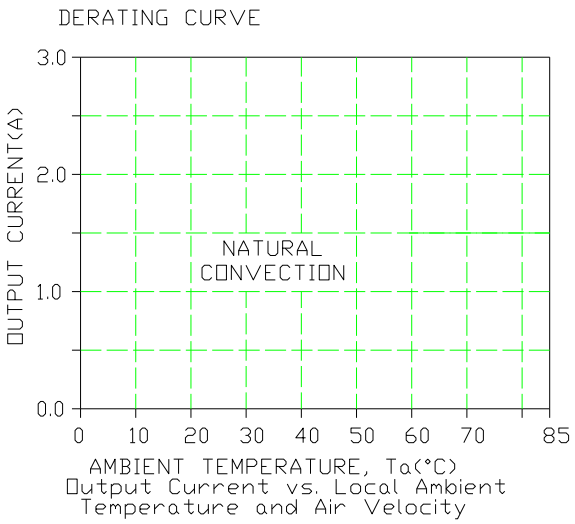
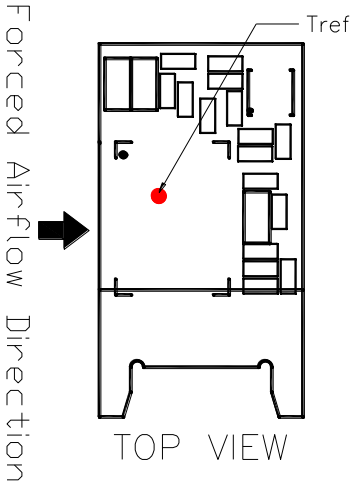


Figure 5. Vout = 0.6 - 5.5 V



9. RIPPLE AND NOISE WAVEFORM

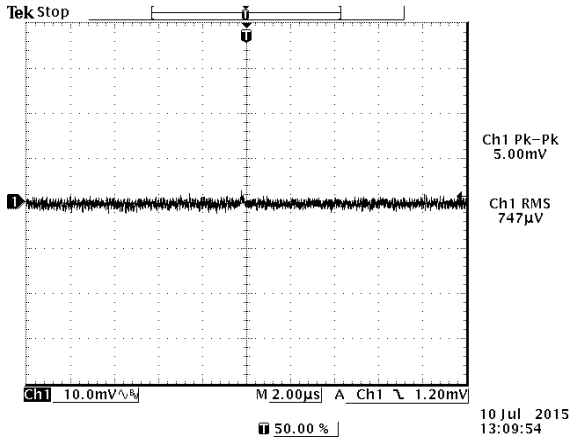


Figure 6. Ripple and noise at full load, 12 V input, 0.6 V output and Ta = 25°C

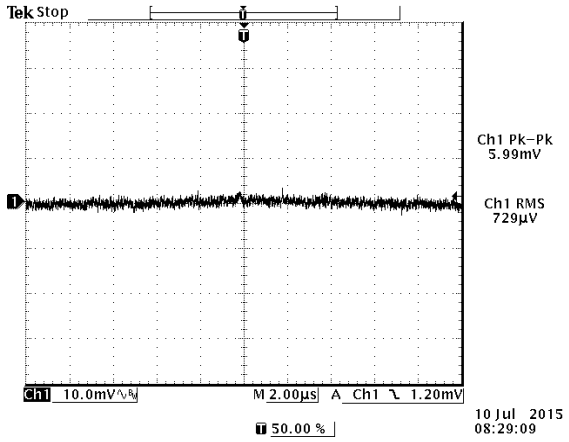


Figure 7. Ripple and noise at full load, 12 V input, 3.3 V output and Ta = 25 °C

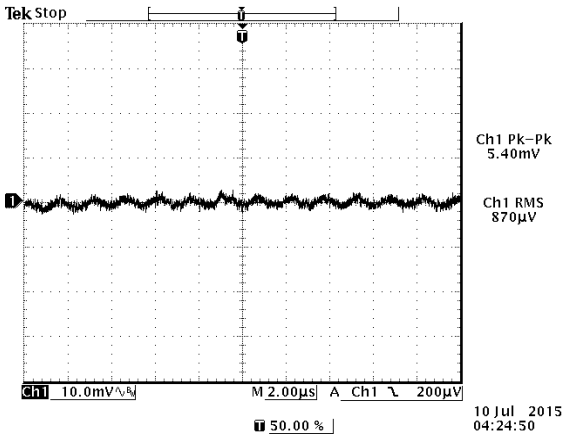


Figure 8. Ripple and noise at full load, 12 V input, 5.5 V output and Ta = 25°C

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

10. TRANSIENT RESPONSE WAVEFORMS

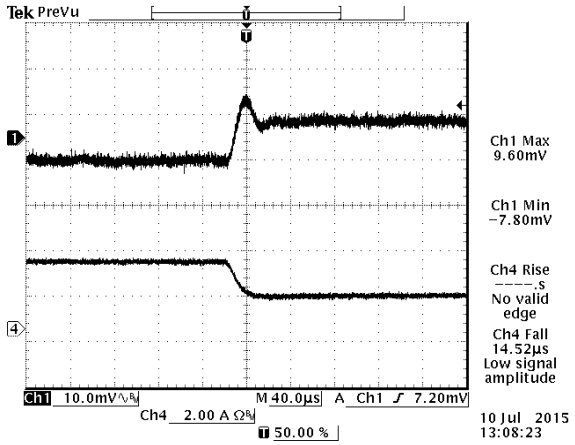


Figure 9. 100%-50% Load Transients at Vin = 12 V, Vout = 0.6 V @ Ta = 25°C

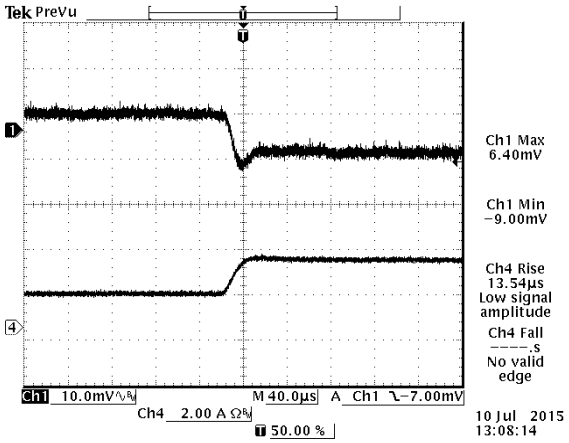


Figure 10. 50%-100% Load Transients at Vin = 12 V, Vout = 0.6V @ Ta = 25°C

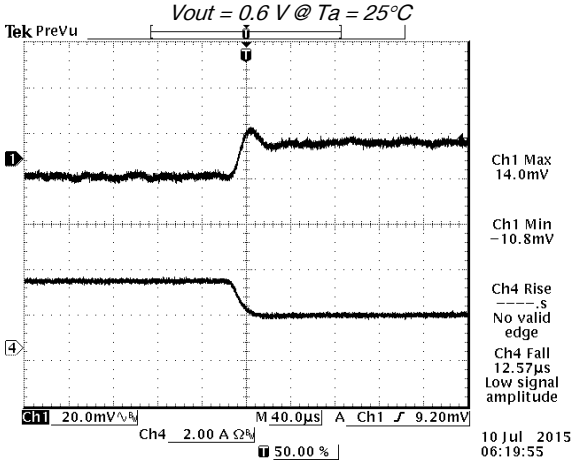


Figure 11. 100%-50% Load Transients at Vin = 12 V, Vout = 3.3 V @ Ta = 25°C

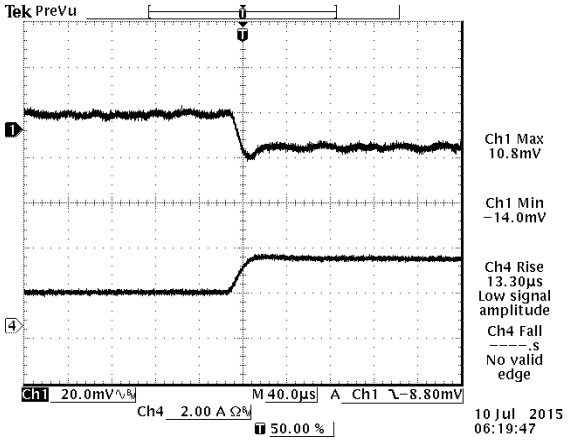


Figure 12. 50%-100% Load Transients at Vin = 12 V, Vout = 3.3 V @ Ta = 25°C

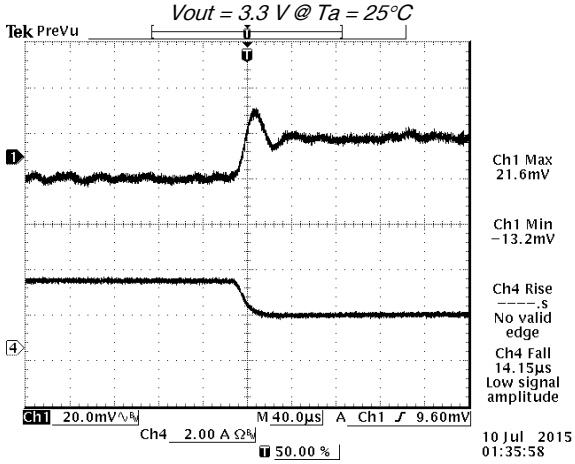


Figure 13. 100%-50% Load Transients at Vin = 12 V, Vout = 5.5 V @ Ta = 25°C

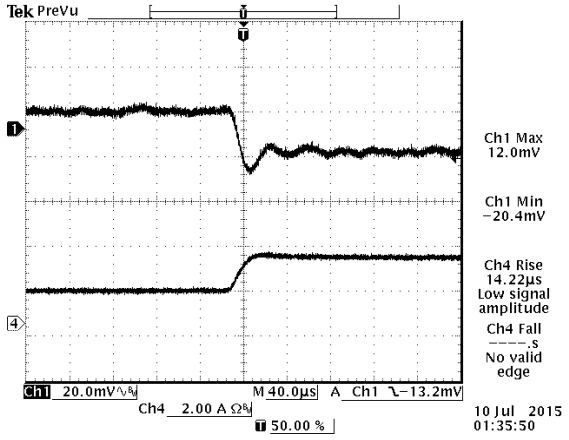


Figure 14. 50%-100% Load Transients at Vin = 12 V, Vout = 5.5 V @ Ta = 25°C

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

11. REMOTE ON/OFF

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

Recommended remote on/off circuit for active high

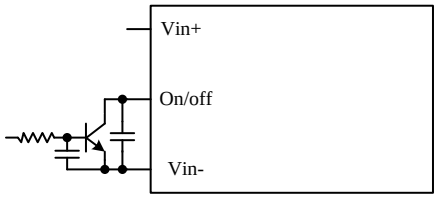


Figure 15. Control with open collector/drain circuit

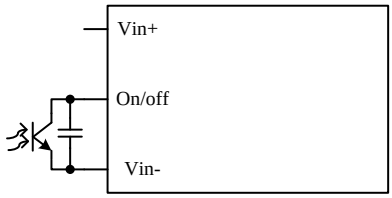


Figure 16. Control with photocoupler circuit

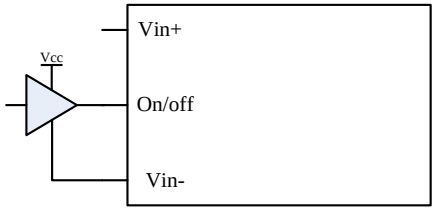


Figure 17. Control with logic circuit

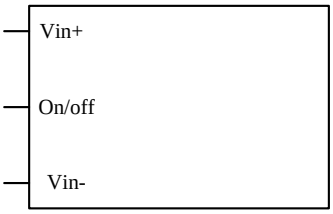
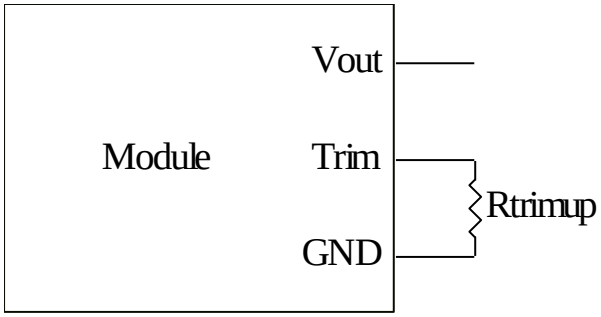


Figure 18. Permanently off

12. TRIM

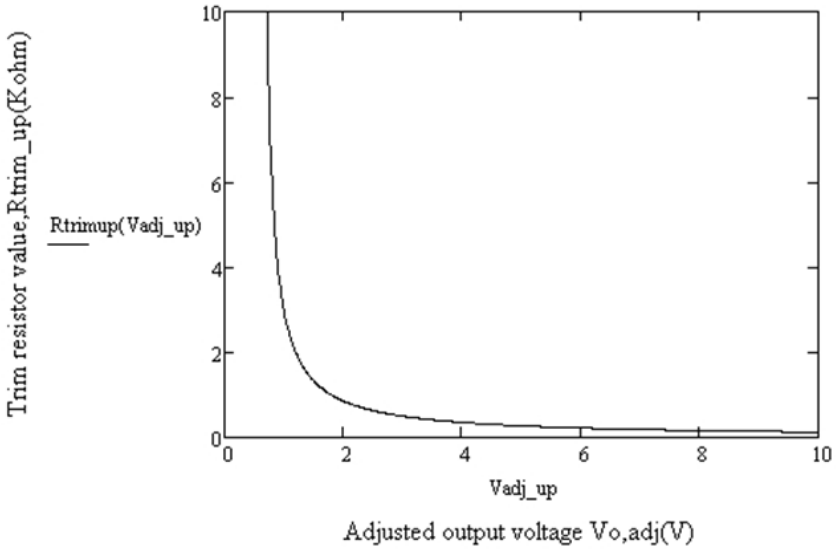
Trim up circuit (using an external resistor)



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

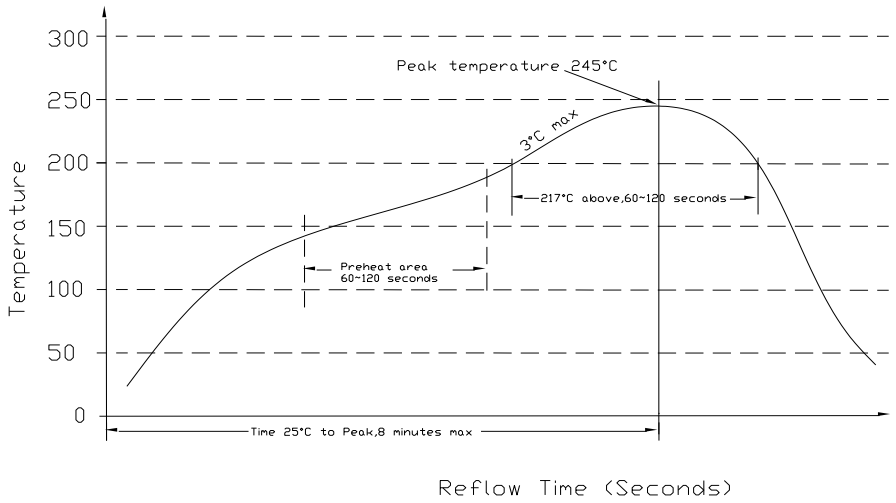
Vo is the desired output voltage
Rtrim is the required resistance between TRIM and GND

Figure 19. SRPE-03E1A0 Trim up Resistor Calculate



13. SOLDERING INFORMATION

The SRPE-03E1A0G 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 10 seconds. 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-03E1A0G modules have a MSL rating of 3.

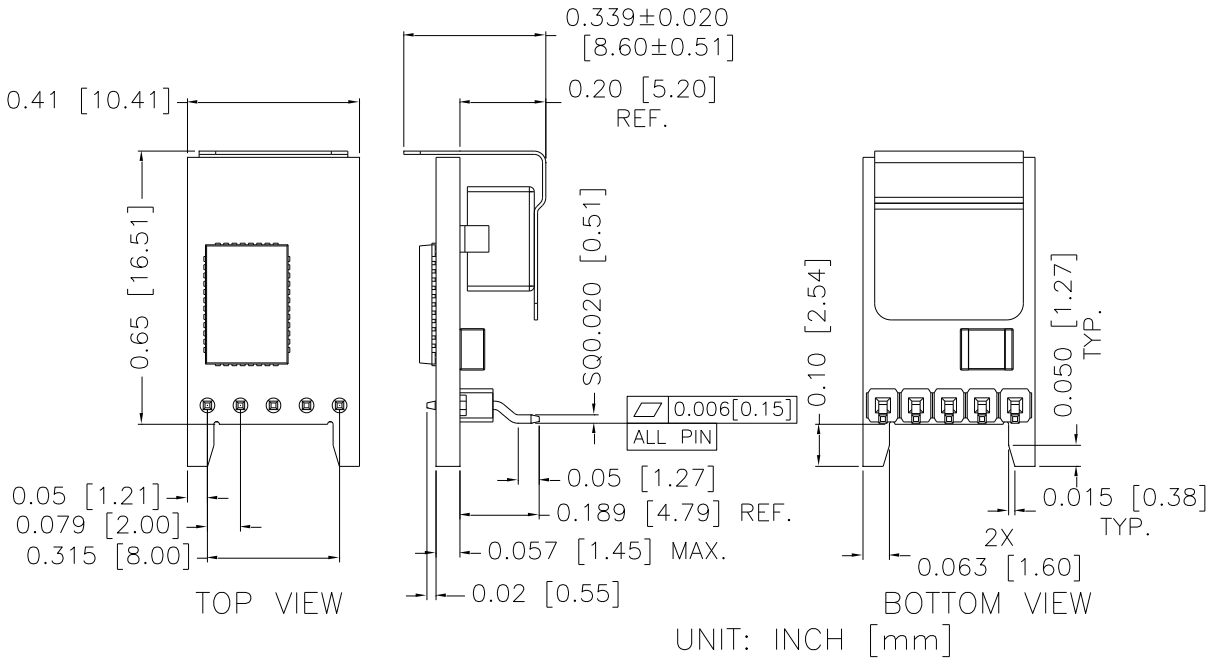
15. STORAGE AND HANDLING

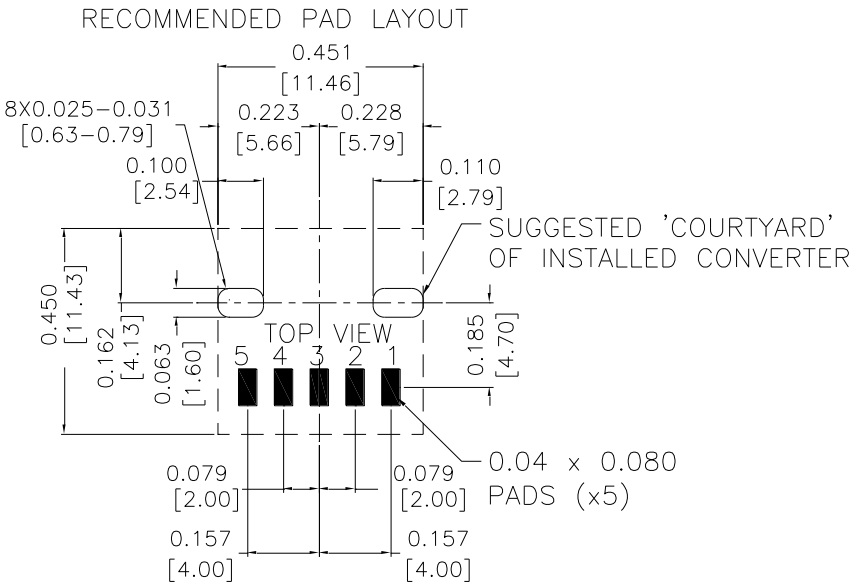
The SRPE-03E1A0G modules are designed to be compatible with J-STD-033 Rev: A (Handling, Packing, Shipping and Use of Moisture /Reflow Sensitive surface Mount devices). Moisture barrier bags (MBB) with desiccant are applied. The recommended storage environment and handling procedure is detailed in J-STD-033.

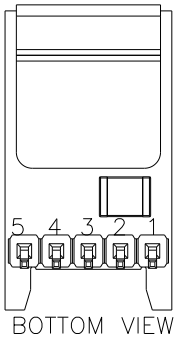
16. PRE-BAKING

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 DIMENSIONS

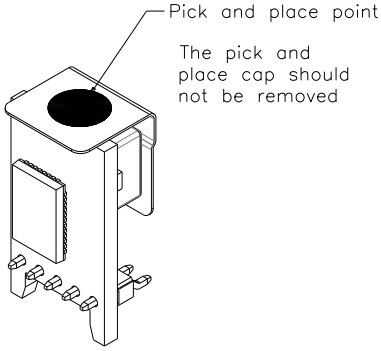


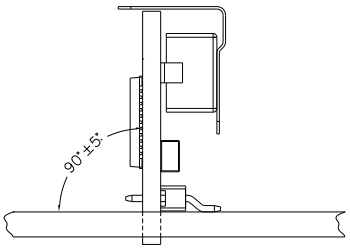




PIN CONNECTIONS

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





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.
3) All dimensions in inches (mm); Tolerances: x.xx +/-0.02 in [0.5 mm] x.xxx +/-0.010 in [0.25 mm].

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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