0RSB-D5S10L

Isolated DC-DC Converter



The 0RSB-D5S10L is isolated DC/DC converter that operates from a nominal 50V source. This secondary side control unit will provide up to 310W of output power from a nominal 50V input.

This unit is designed to be highly efficient. Features include start-up into pre-biased load, remote on/off, over current protection and overvoltage protection.

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

Key Features & Benefits

- 45-56 VDC Input / 10.4 VDC @ 30 A Output /1/16 th Brick Converter
- Isolated
- Fixed Frequency(400KHz)
- High Efficiency
- High Power Density
- Input Under Voltage Lockout
- Input Over Voltage Lockout
- Output Over-voltage Protection
- Over Current and Short Circuit Protection
- Over Temperature Protection
- Remote On/Off
- Operation Isolation
- Approved to UL/CSA/IEC60950-1, 2nd +A2 version (TBD)
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)

RoHS Compliant

Applications

- Industrial
- Railways
- Telecommunications

Please read our datasheet & drawing disclaimer here.

1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RSB-D5S10L	10.4 VDC	45 VDC - 56 VDC	30 A	310 W	96%

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

PART NUMBER EXPLANATION

0	R	SB	-	D5	S	10	L	G
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
Through hole mount	RoHS	1/16th Brick		310 W	45 – 56V	10.4 V	L – active low, with HSK plate.	G – Tray package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-0.3	-	60	V
Remote On/Off		-0.3	-	15	V
I/O isolation voltage		-	-	500	V
Ambient Temperature		-40	-	85	°C
Altitude		-	-	2000	feet
Storage Temperature		-40	-	100	°C

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		45	50	56	V
Input Current (full load)		-	-	8.0	A
Input Current (no load)		-	80	120	mA
Remote Off Input Current		-	32	60	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 10uH, 5Hz to 20MHz. Use a 100uF/100V electrolytic capacitor with ESR=1 ohm max, at 200KHz@25°C	-	10	20	mA
Input Reflected Ripple Current (pk-pk)		-	30	60	mA
Input Reflected Ripple Current for IC(RMS)	With simulated source impedance of 10uH, 5Hz to 20MHz. Use a 100uF/100V electrolytic capacitor with ESR=1ohm max, at 200KHz@25°C	-	750	1500	mA
Input Reflected Ripple Current for IC(Pk-Pk)		-	3000	5000	mA
I^2t Inrush Current Transient	Inrush Current is defined as the peak current drawn by the Unit when Unit is enabled after Vin is present. Iin is defined as the steady-state operating current when Unit is operating at Vin Min and 100% of Max Rated Power	-	0.5	-	A^2s
Input Turn on Voltage Threshold		43	43.2	45	V
Input Turn off Voltage Threshold		40	40.6	42.5	V
Input Over Voltage		58.5	60.2	61	V

CAUTION: This converter is not internally fused. An input line fuse must be used in application.

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4. OUTPUT SPECIFICATIONS

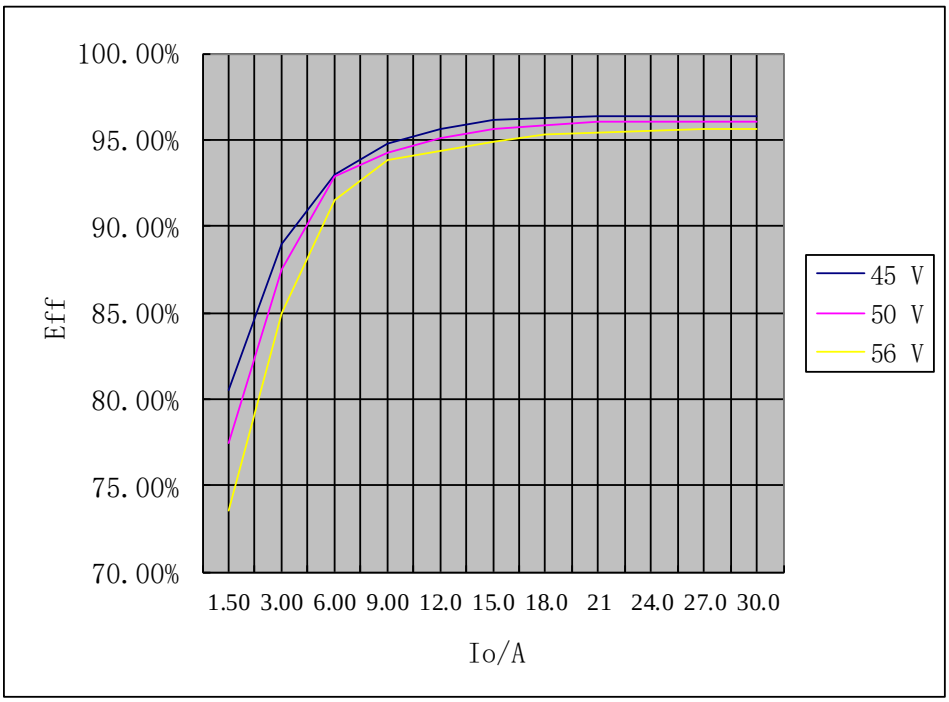
All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Test condition of the output set point: Vin=50V, Io=50% load at 25C ambient	10.2	10.4	10.6	V
Load Regulation	Vin=50V, Iout from 0A load to 30A	-	0.3%Vo	0.7%Vo	V
Line Regulation	Iout=30A, Vin from 45V to 56V	-	0.1%Vo	0.5%Vo	V
Regulation Over Temperature	Vin=50V Iout=30A, temperature from -40°C	-	0.6%Vo	0.9%Vo	V
Ripple and Noise (pk-pk)	0-20MHz BW, with 5*22μF ceramic capacitor and a 135uF Oscon at output	-	40	70	mV
Ripple and Noise (rms)		-	4	8	mV
Output Current Range		0	-	30	A
Output DC Current Limit	Hiccup mode, non-latching	33	35	37	A
Short Circuit Surge Transient		-	1	-	A^2s
Rise time		-	-	10	ms
Turn on Time		-	35	-	ms
		-	35	-	ms
Overshoot at Turn on		-	0	350	mV
Output Capacitance	Typically 50% ceramic + 50% electrolytic capacitors	200	-	1200	uF
Transient Response					
ΔV 50%~75% of Max Load	Test condition of the transient response: di/dt=2A/us,50-75% load, Vin=50Vdc, Ta=25°C, with 1200uF capacitor (Typically 50% ceramic + 50% Oscon) at output	-	120	200	mV
Settling Time		-	360	500	us
ΔV 75%~50% of Max Load		-	120	200	mV
Settling Time		-	360	500	us

5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	The efficiency is measured at Vin=50V, full load and Ta=25°C	95.5	96	-	%
Switching Frequency	Primary FETs	-	400	-	kHz
Isolation capacitance		-	1000	-	pF
Input to Output Isolation Voltage		-	-	500	Vdc
Isolation Resistance		10M	-	-	Ohm
FIT[2]	Calculated Per Bell Core SR-332 (Vin=48 V, Vo=53.5 V, Io=1.6A, Ta = 25C, FIT=10^9/MTBF)	-	TBD	-	
Weight		-	28	-	g
Over Temperature Protection		-	125	-	°C
Dimensions Inches (L × W × H) Millimeters (L × W × H)			1.30 x 0.90 x 0.57 33.02 x 22.86 x 14.50		

6. EFFICIENCY DATA

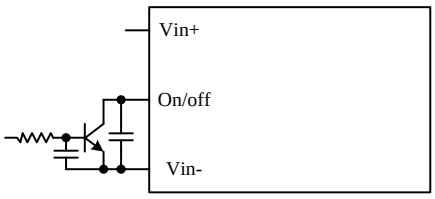


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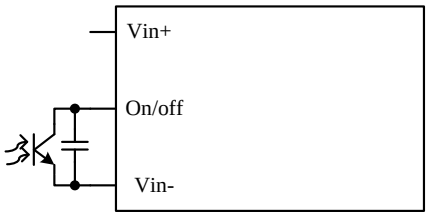
7. REMOTE ON/OFF

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	-	15	V
Current Sink			-	-	0.5	mA

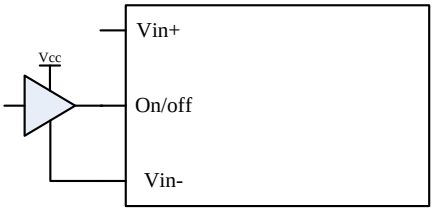
Recommended remote on/off circuit for active low



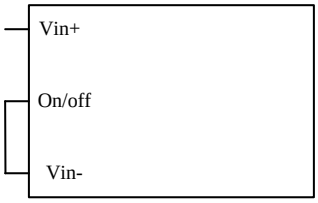
Control with open collector/drain circuit



Control with photocoupler circuit



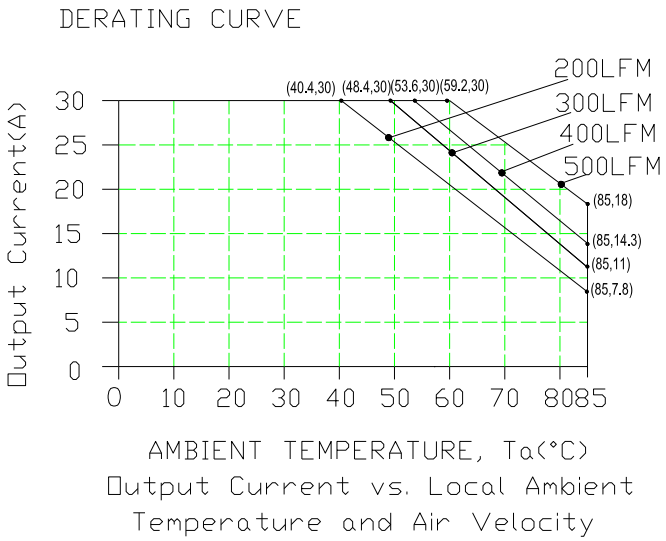
Control with logic circuit



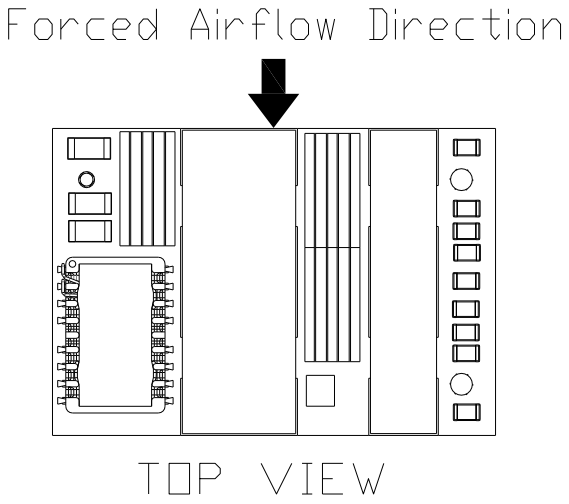
Permanently on

8. THERMAL DERATING CURVES

1. In order to make it convenient for safety and test engineer, each curve has 3 air velocity at most. It is better that the middle one is at the centre of minimum and maximum. For example, 0-200-400, 0-100-200, 100-200-300.
2. If the minimum air velocity is 0LFM or 50LFM, do not mark on the curve, just record as "Natural Convection".



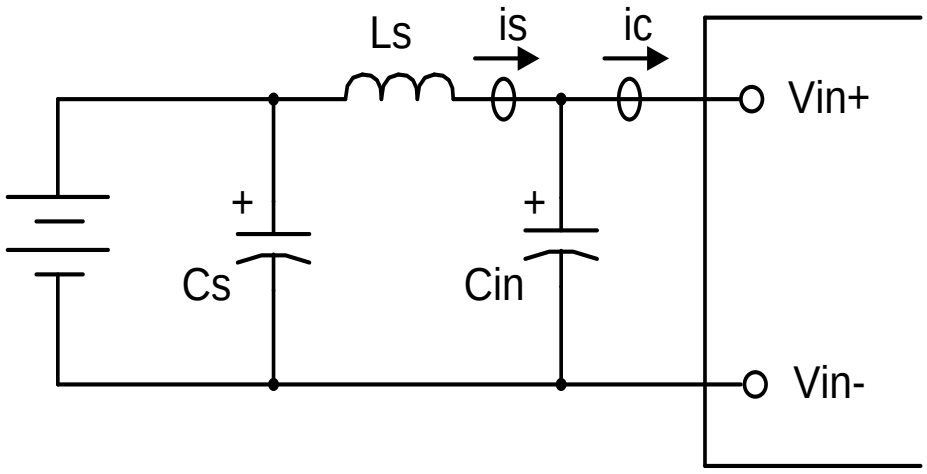
Output Current vs. Local Ambient Temperature and Air Velocity



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9. INPUT REFLECTED RIPPLE CURRENT

Testing set up



Notes and values in testing.

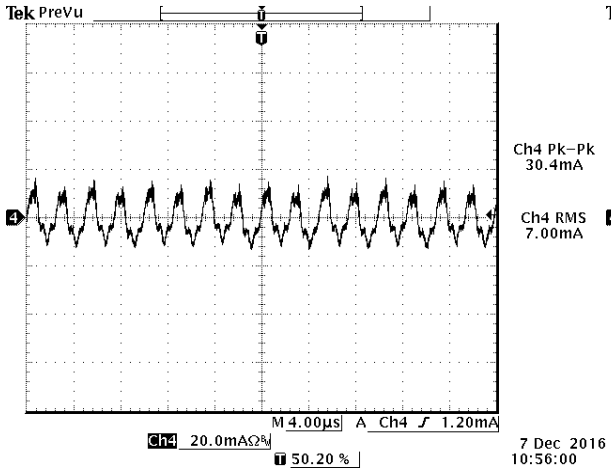
is: Input Reflected Ripple Current

Ls: Simulated Source Impedance (10μH)

Cs: Offset possible source Impedance (Nl)

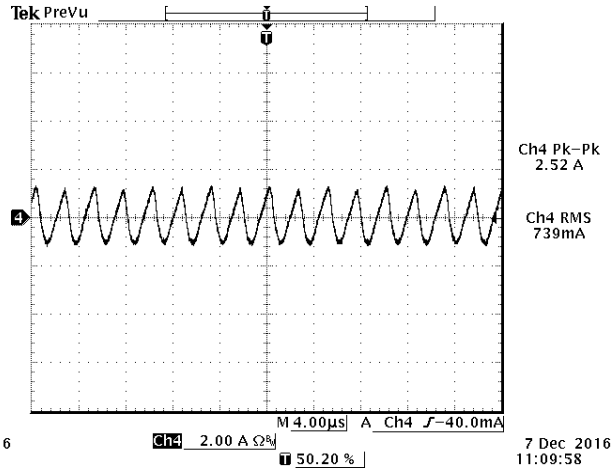
Cin: Electrolytic capacitor, should be as closed as possible to the power module to swallow ic ripple current and help with stability. Recommendation:1*100uF/100V Al-Cap.

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



is (input reflected ripple current), AC component

Vin=50V, Vo=10.4V, Iout=30A



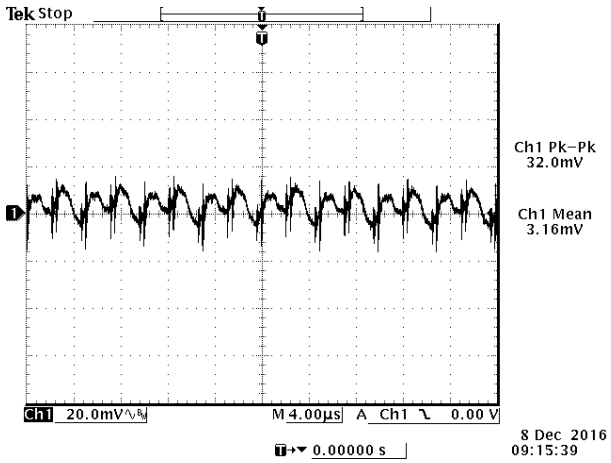
ic (input terminal ripple current), AC component

Vin=50V, Vo=10.4V, Iout=30A

*0-20MHz BW, with 1*10uH inductor and 1*100uF/100V Al-Cap at the input, Ta=25 deg C.*

10. RIPPLE AND NOISE WAVEFORM

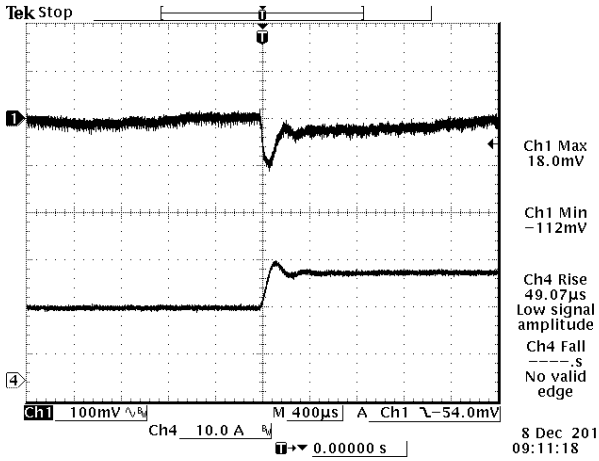
Ripple and noise at full load, 50Vdc input, 10.4Vdc/0A output and Ta=25 deg C, with 5*22μF ceramic capacitor and 135uF Oscon at output.



*Ripple and noise at full load, 50Vdc input, 10.4Vdc/30A output and Ta=25 deg C, with 5*22μF ceramic capacitor and 135uF Oscon at output.*

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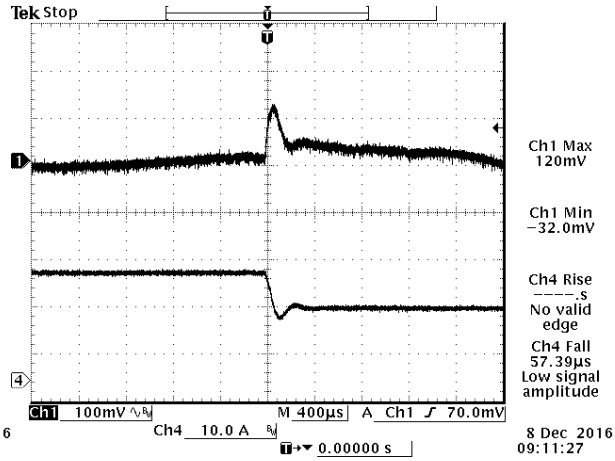
11. TRANSIENT RESPONSE WAVEFORMS



Ch1: Vo

Ch4: Iout

Test Condition: *Vin = 50V, 50% - 75% of Max Load*



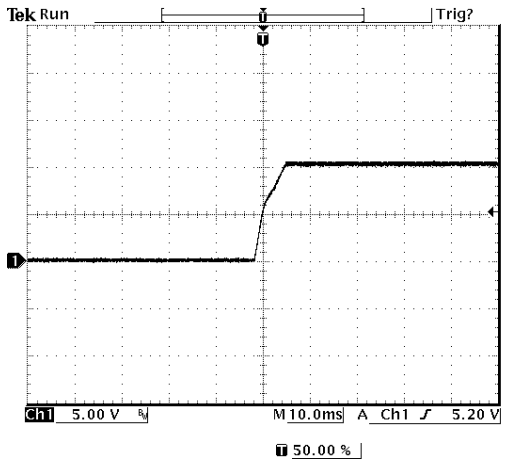
Ch1: Vo

Ch4: Iout

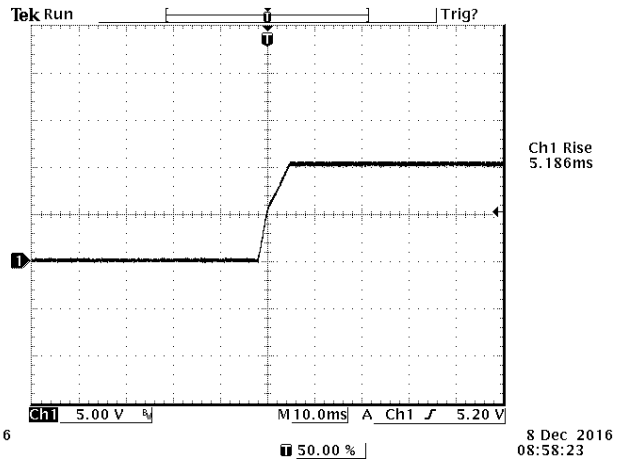
Test Condition: *Vin = 50V, 75% - 50% of Max Load*

12. STARTUP & SHUTDOWN

Rise time

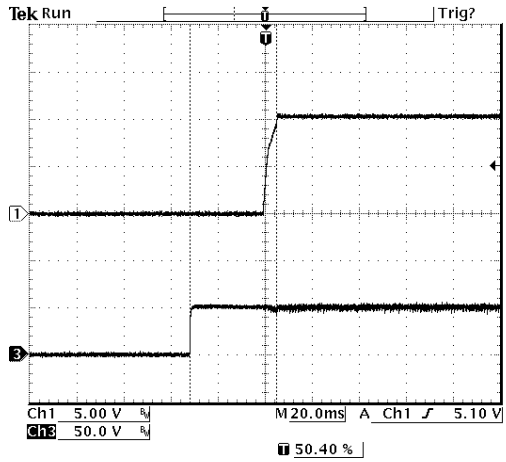


Test Condition: *Vin=50V Iout=30A*



Test Condition: *Vin=50V Iout=30A with external maximum capacitor*

Startup time

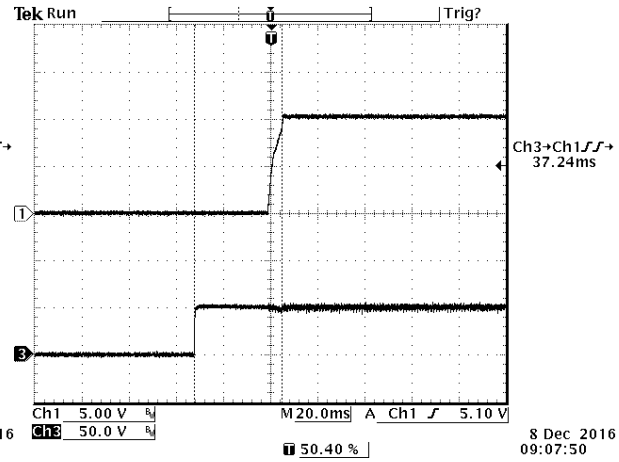


Startup from Vin

Ch1: Vo

Ch3: Vin

Test Condition: *Vin=50V Iout=30A*



Startup from Vin

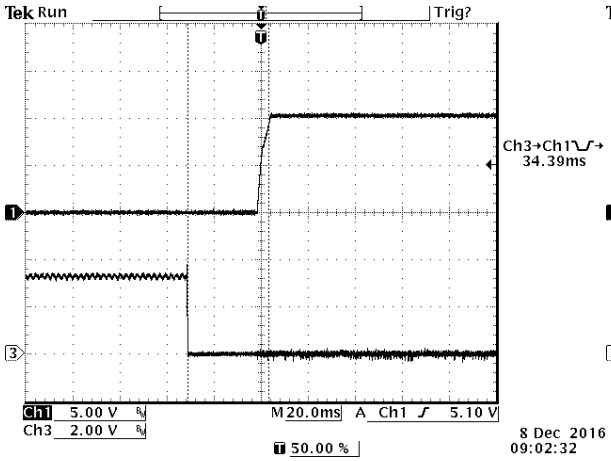
Ch1: Vo

Ch3: Vin

Test Condition: *Vin=50V Iout=30A with external maximum capacitor*

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STARTUP&SHUTDOWN(CONTIUED)

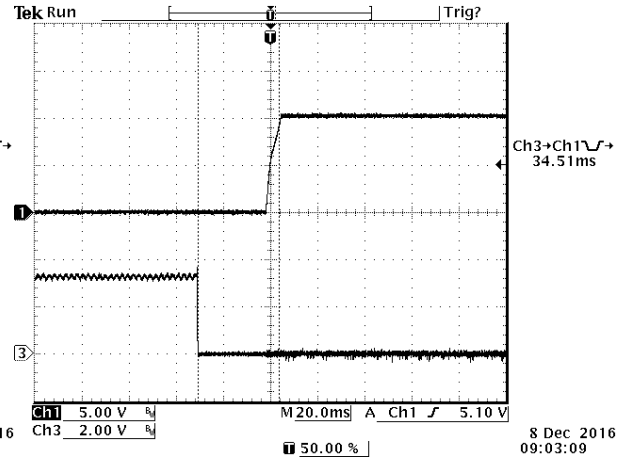


Startup from on/off

Ch1: Vo

Ch3: on/off

Test Condition: *Vin=50V Iout=30A*



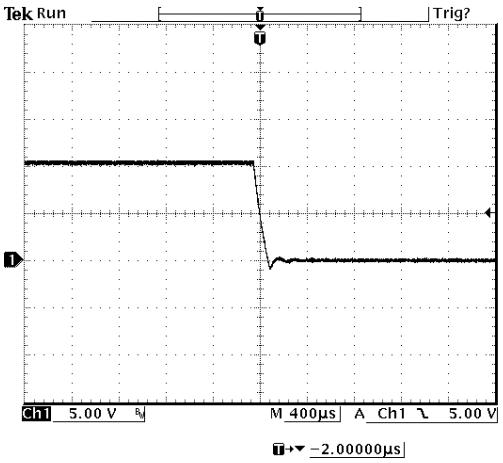
Startup from on/off

Ch1: Vo

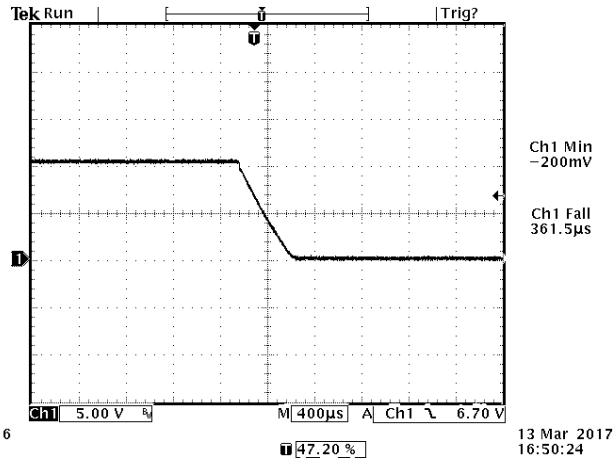
Ch3: on/off

Test Condition: *Vin=50V Iout=30A with external maximum capacitor*

Shutdown

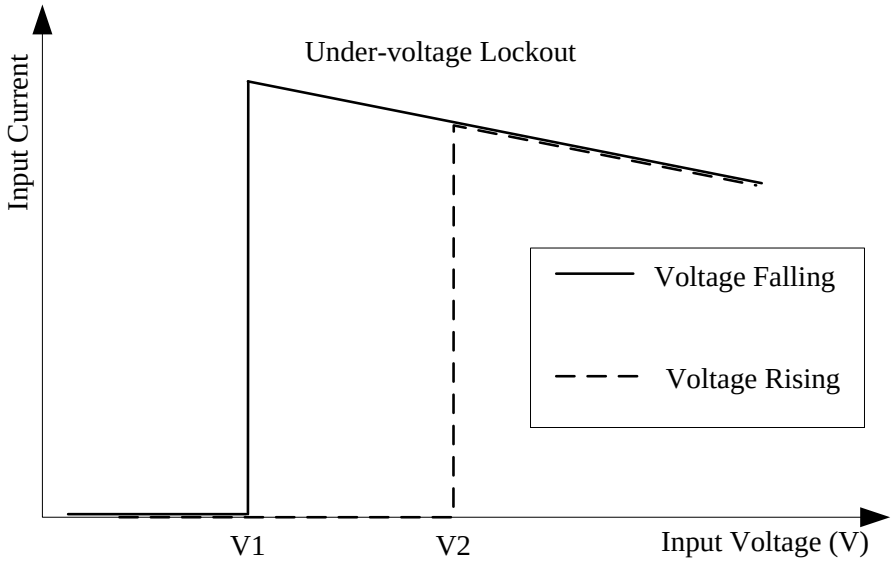


Test Condition: *Vin=50V Iout=30A*



Test Condition: *Vin=50V Iout=30A with external maximum capacitor*

13. INPUT UNDER-VOLTAGE LOCKOUT



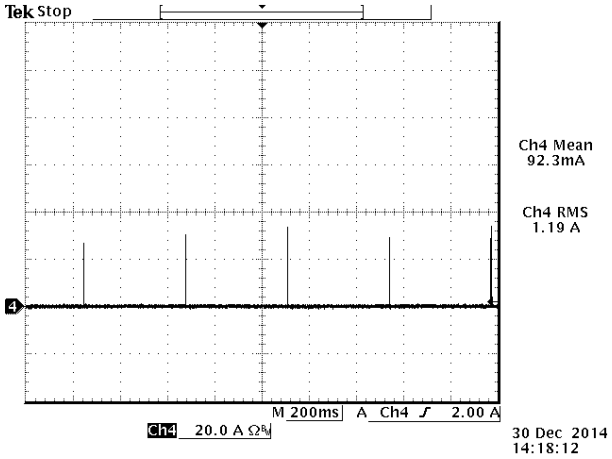
V1 = 40.6V

V2 = 43.2V

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14. SCP

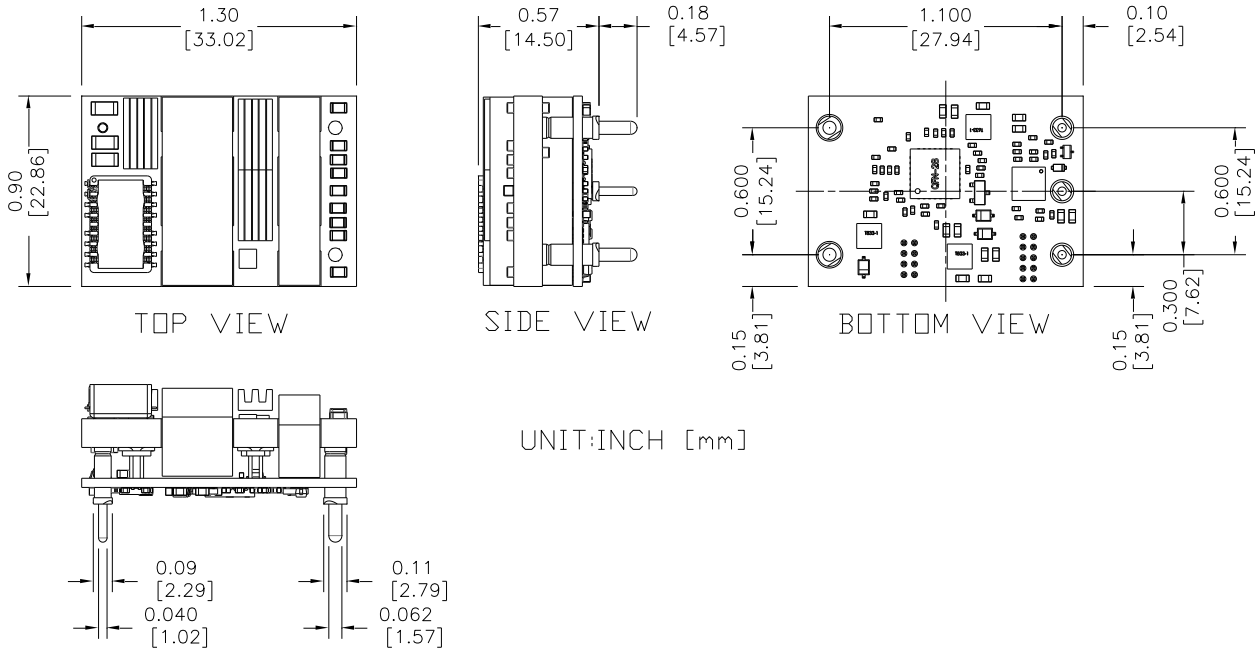
To provide protection in a fault output overload condition, the module is equipped with internal current-limiting circuitry and can endure current limiting for a few mili-seconds. If the overcurrent condition persists beyond a few milliseconds, the module.



Vin = 50V

15. MECHANICAL DIMENSIONS

OUTLINE



Note: This module is recommended and compatible with Pb-Free Wave Soldering and must be soldered using a peak solder temperature of no more than 260 °C for less than 5 seconds.

NOTES:

All Pins: Material - Copper Alloy;
Finish - Tin plated.

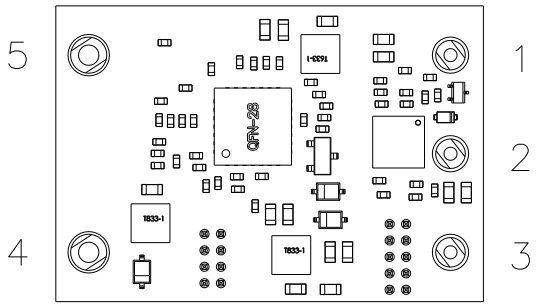
Undimensioned components are shown for visual reference only.

All dimensions in inches; Tolerances: x.xx +/-0.02 in [0.5 mm]. x.xxx +/-0.010 in [0.25 mm]. Unless otherwise stated.

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MECHANICAL DIMENSIONS(CONTINUED)

PIN DEFINITIONS

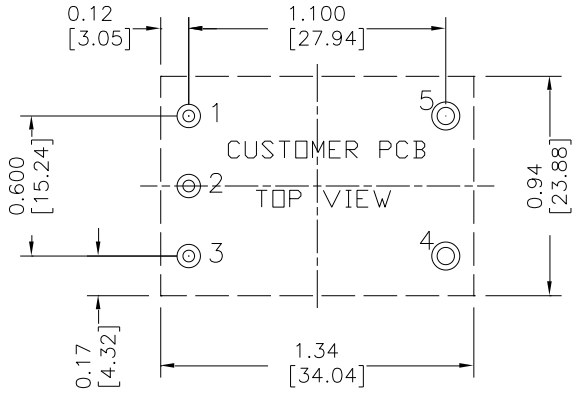


BOTTOM VIEW

PIN	FUNCTION	FUNCTION	PIN SIZE
1	Vin (+)	Positive input voltage	0.04"
2	ON/OFF	Input to turn converter on and off, referenced to Vin(-)	0.04"
3	Vin (-)	Negative input voltage	0.04"
4	Vout(-)	Negative output voltage	0.062"
5	Vout(+)	Positive output voltage	0.062"

RECOMMENDED PAD LAYOUT

RECOMMENDED PCB PAD LAYOUT



1,2,3 Ø0.050 HOLE SIZE, Ø0.10 min PAD SIZE
4,5 Ø0.074 HOLE SIZE, Ø0.12 min PAD SIZE

16. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2016-04-14	A	First release	J Yan
2017-04-18	AB	Update Cover, Output Specs, TD, Startup & Shutdown, Remote on/off, Other and MD. Add Input Noise	XF Jiang
2018-06-19	AC	Update Remote on/off and MD	XF Jiang

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

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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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