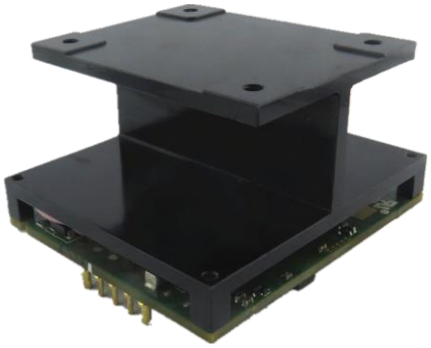
0RQB-70N54

Isolated DC-DC Converter

The 0RQB-70N54 series are isolated DC/DC converters that operate from a nominal 24 VDC ,48 VDC source. These units will provide up to 70 W of output power from a nominal 24 VDC ,48 VDC input.

These units are designed to be highly efficient. Features include over current protection, over voltage protection and input under-voltage lockout.



RoHS Compliant

Key Features & Benefits

- Isolated
- Fixed Frequency
- High Efficiency
- Input Under-Voltage Lockout
- Input Over-Voltage Lockout
- Output Over-Voltage Protection
- OCP/SCP
- Over Temperature Protection
- Approved to UL/CSA 62368-1
- Approved to IEC/EN 62368-1
- Class II, Category 2, Isolated DC/DC Converter (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
0RQB-70N54LG 0RQB-70N540G	54 VDC	48 VDC	1.3 A	70 W	92%

PART NUMBER EXPLANATION

0	R	QB	-	70	N	54	x	G
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
Through Hole Mount	RoHS	1/4th Brick		70 W	18 - 60 V	54 V	L- Active Low, with HSK 0 - Active High, with HSK	Tray Package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-0.5	-	65	V
Remote On/Off		-0.3	-	15	V
Current Sink		0	-	10	mA
I/O Isolation Voltage		-	-	1500	V
Ambient Temperature	Iout from 0 A to 1.3 A	-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	5000	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		18	-	60	V
Input Current		-	-	4.5	A
Input Current (no load)	Vin = 48 V, Ta = 25°C	-	60	100	mA
Input Reflected Ripple Current (rms)	With simulated source impedance of 12 µH, 5 Hz to 20 MHz. Use a 47 µF/100 V electrolytic capacitor with ESR = 1 ohm max, at 25°C.	-	-	15	mA
Input Reflected Ripple Current (pk-pk)		-	-	40	mA
Inrush Current		-	10	15	A
Under-voltage Turn on Threshold	Lockout turn on	16	16.5	17	V
Under-voltage Turn off Threshold	Lockout turn off, non-latching	14	15	15.5	V
Over-voltage Shutdown Threshold	Auto-recovery and non-latching	63	63.5	65	V
Over-voltage Recovery Threshold		61	62	63	V

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

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	Vin = 48 V, Io = 100% load at 25°C	52.5	54.0	55.5	V
Load Regulation		-	50	100	mV
Line Regulation		-	50	100	mV
Regulation Over Temperature		-	±200	±350	mV
Ripple and Noise (pk-pk)	40 kHz -100 MHz BW, with 0.1 µF ceramic capacitor and 1500 µF bulk electrolytic at output.	-	-	300	mV
Ripple and Noise (rms)		-	-	100	mV
Output Current Range		0	-	1.3	A
Output DC Current Limit	Enter a hiccup mode, non-latching.	1.6	1.8	2	A
Rise Time	Vin = 48 V, Io = 1.3 A, with 1500 µF bulk electrolytic at output.	-	0.5	1	s
Start-up Time		-	-	3	s
Overshoot at Turn on		-	0	4	%
Undershoot at Turn on		-	0	4	%
Output Capacitance		300	-	1500	µF
Transient Response					
Min load to Max Load	di/dt = 0.1 A/µs, with 1500 µF bulk electrolytic at output.	-	-	4	%Vout
Settling Time		-	-	500	µs
Max load to Min Load		-	-	4	%Vout
Settling Time		-	-	500	µs

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5. GENERAL SPECIFICATIONS

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Io=60% Irate - 100% Irate	Ta = 25 °C, natural-convection air cooler	90	92	-	%
	Io=40% Irate - 60% Irate		85	88	-	%
Switching Frequency			-	200	-	kHz
Output Voltage Trim Range			50	-	56	V
Over Temperature Protection			-	120	-	°C
Over Voltage Protection		Enter a latching. non-hiccup mode	56.5	57	57.5	V
FIT		Calculated Per Bell Core SR-332 (Vin = 48 V, Vo = 54 V, Io = 1.3 A, Ta = 25°C, FIT = 10^9/MTBF)	-	256	-	-
Weight			-	95	-	g
Dimensions (L × W × H)			2.30 x 2.00 x 1.435			inch
			58.42 x 50.80 x 36.45			mm
Isolation Characteristics						
Input to Output			-	-	1500	VDC
Input to Case			-	-	1500	VDC
Output to Case			-	-	2250	VDC
Isolation Resistance			10M	-	-	ohm
Isolation Capacitance			-	-	3900	pF

6. EFFICIENCY DATA

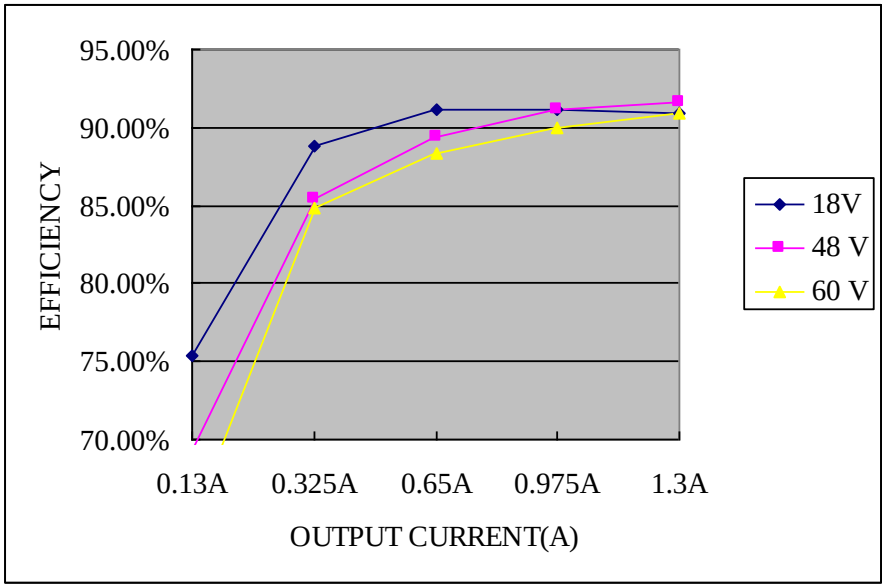


Figure 1. Efficiency data

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	-	1.2	V
Signal High (Unit Off)			3	-	15	V
Signal Low (Unit Off)	Active High	Remote On/Off pin is open, the module is on.	-0.3	-	1.2	V
Signal High (Unit On)			3	-	15	V
Current Sink			0	-	1.5	mA

Recommended remote on/off circuit for active low

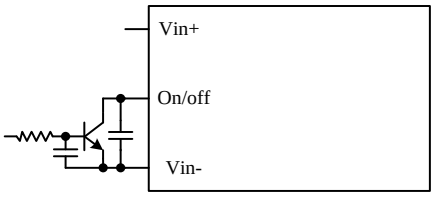


Figure 2. Recommended remote on/off circuit for active low

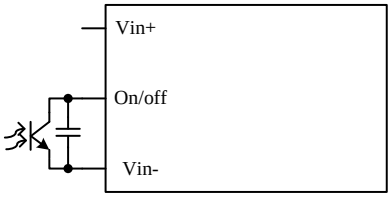


Figure 3. Control with open collector/drain circuit

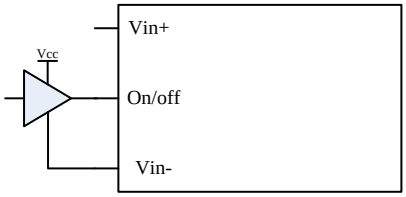


Figure 4. Control with logic circuit

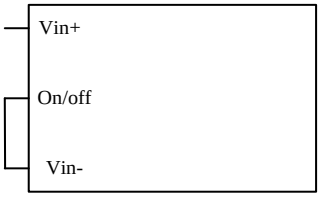


Figure 5. Permanently on

Recommended remote on/off circuit for active high

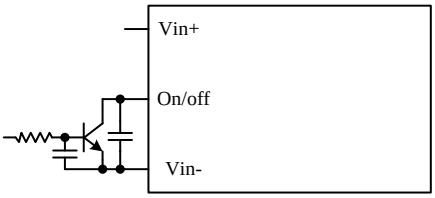


Figure 6. Control with open collector/drain circuit

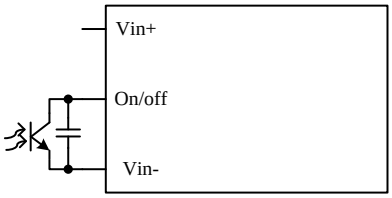


Figure 7. Control with photocoupler circuit

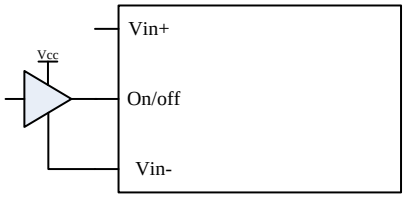


Figure 8. Control with logic circuit

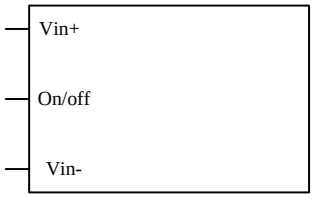


Figure 9. Permanently on

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8. 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 facilitate 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 4% 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 4% 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 which 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- (100 ohm)) from Vo- to Sense- inside of this module.

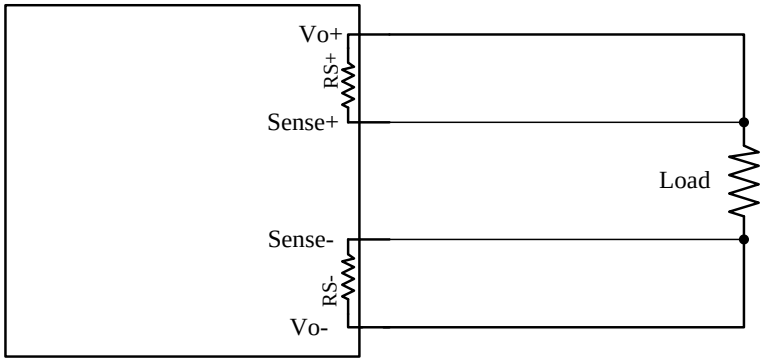


Figure 10.

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.

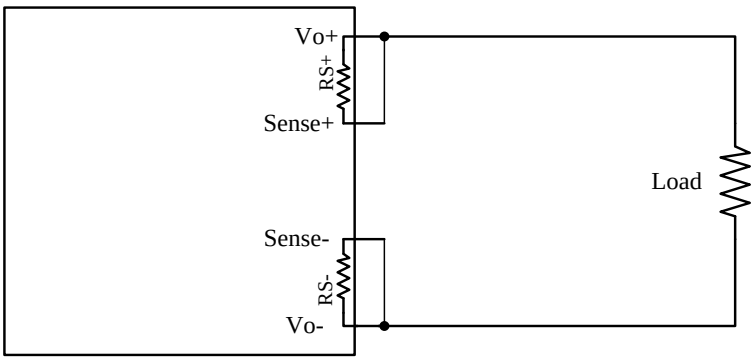


Figure 11.

9. RIPPLE AND NOISE WAVEFORM

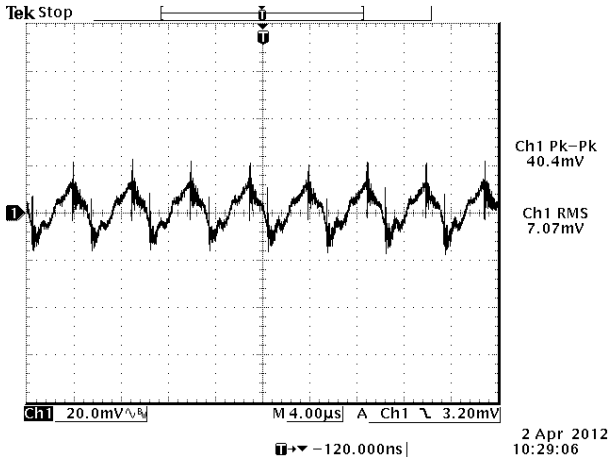


Figure 12.

Note: Ripple and noise 48 VDC input, 54 VDC / 1.3 A output and Ta = 25 °C, and with a 0.1 µF ceramic cap and 300 µF electrolytic cap at output.

10. TRANSIENT RESPONSE WAVEFORMS

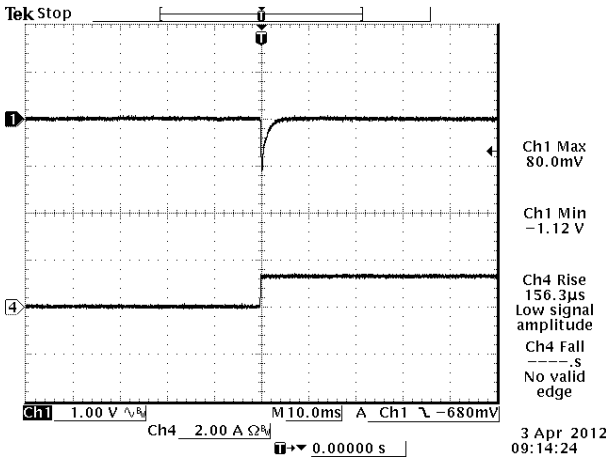


Figure 13. Load Transients at Vin = 48 V, Ta = 25 °C Vout = 54 V, 0%-100%

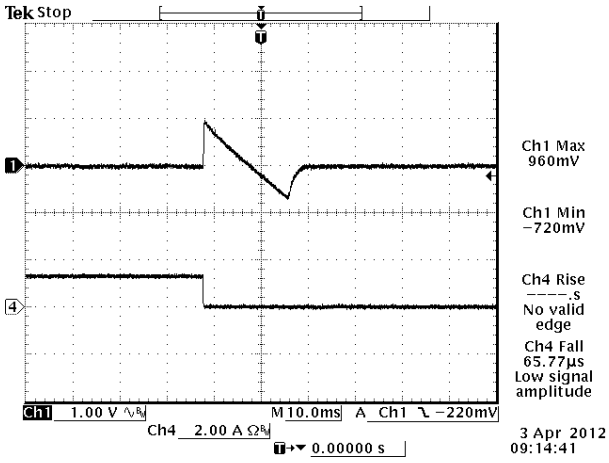


Figure 14. Load Transients at Vin = 48 V, Ta = 25 °C Vout = 54 V, 100%-0%

Note: Transient Response: di/dt = 0.1 A / µs, 0.1 µF ceramic cap and 1500 µF electrolytic cap at output.

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11. STARTUP & SHUTDOWN

Startup

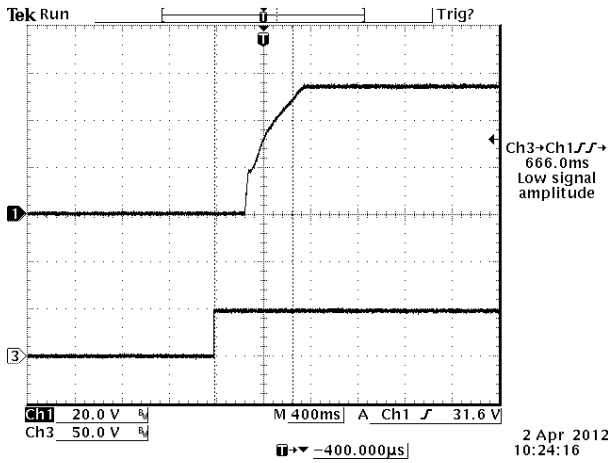


Figure 15. Startup from Vin
Ch1: Vo
Ch3: Vin
Test Condition: Vin = 48 V, Vout = 54 V,
Iout = 1.3 A and Ta = 25°C, Co = 1500 µF

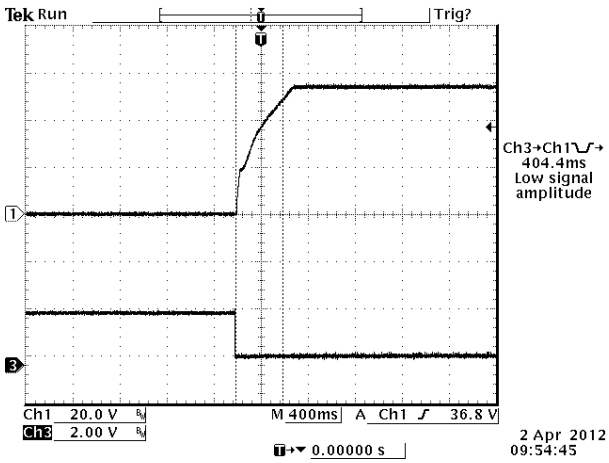


Figure 16. Startup from on/off
Ch1: Vo
Ch3: on/off
Test Condition: Vin = 48 V, Vout = 54 V,
Iout = 1.3 A and Ta = 25°C, Co = 1500 µF

Shutdown

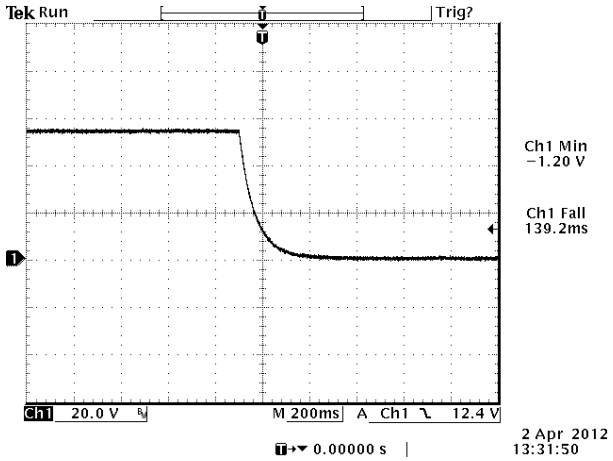
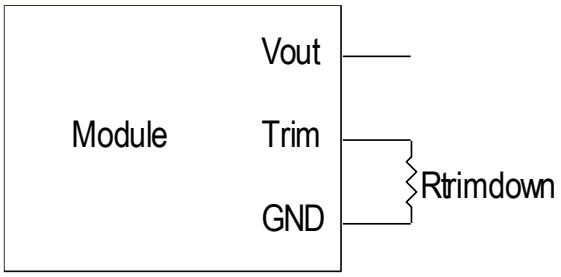


Figure 17.

Test Condition: Vin = 48 V, Vout = 54 V, Iout = 1.3 A and Ta = 25°C, Co = 1500 µF

12. OUTPUT TRIM EQUATIONS

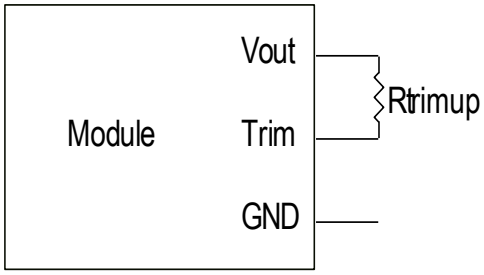
Trim down test circuit



$$Rtrimdown = \frac{Vo_req}{54 - Vo_req} - 1\left[k\Omega\right]$$

Figure 18. Trim down test circuit

Trim up test circuit



$$Rtrimup = \frac{1 - 0.02296}{0.02296 - 1.24/Vo_req} - 1\left[k\Omega\right]$$

Figure 19. Trim up test circuit

Notes: Vo_req = Desired (trimmed) output voltage [V]

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13. THERMAL DERATING CURVE

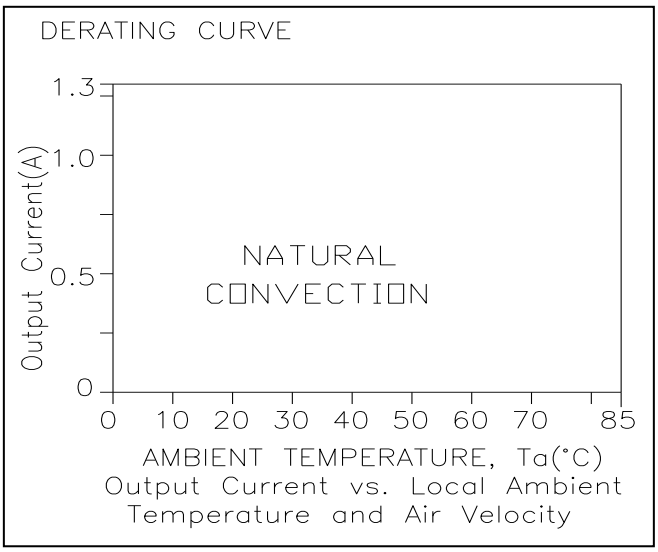


Figure 20. Thermal derating curve under normal input

14. MECHANICAL DIMENSIONS

OUTLINE

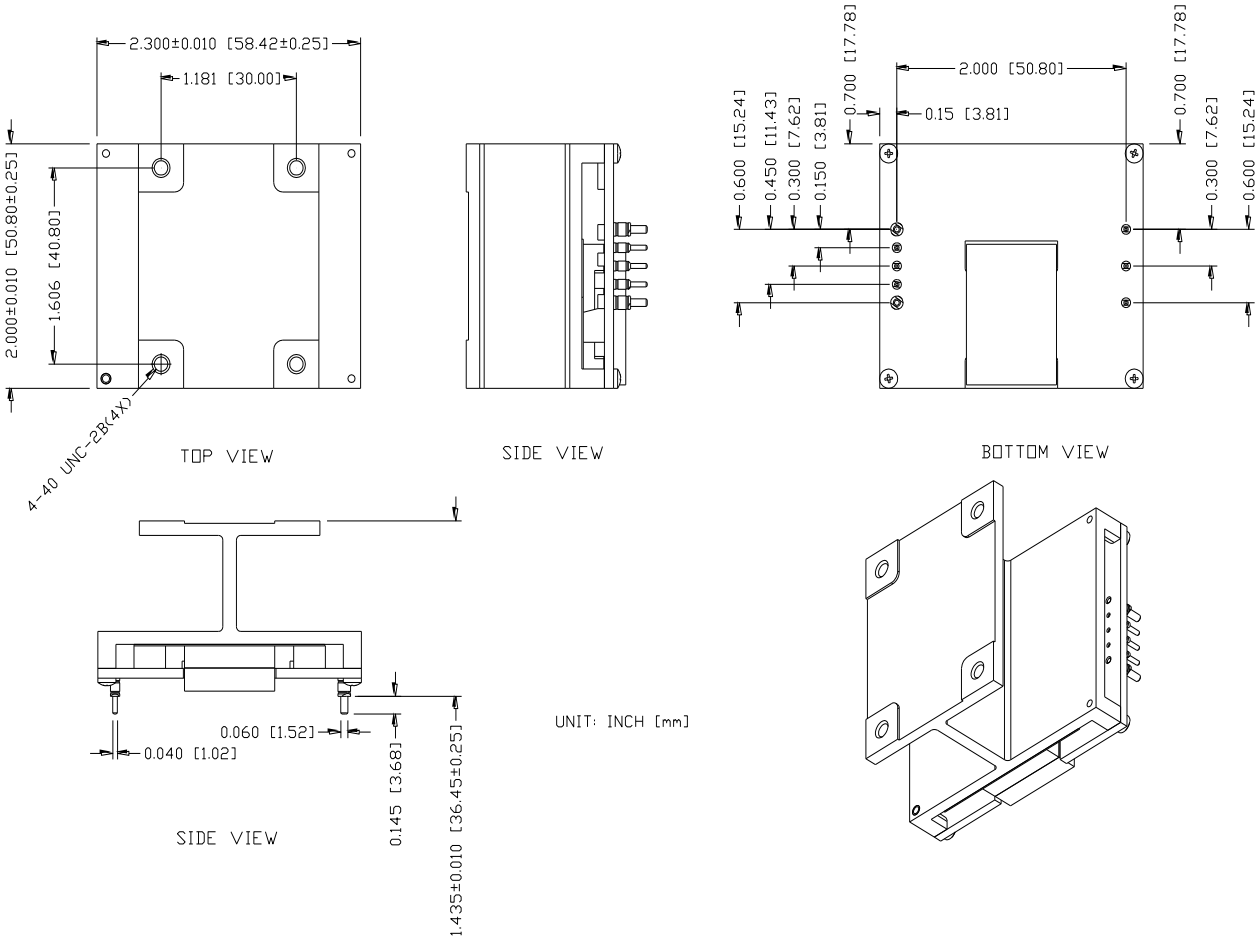


Figure 21. Outline

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.

NOTE:

1) All Pins: Material - Copper Alloy;
   Finish – Gold plated
2) Un-dimensioned components are shown for visual reference only.
3) All dimensions in inch [mm]; Tolerances: x.xx +/-0.02 inch [0.5 mm].
   x.xxx +/-0.010 inch [0.25 mm].

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PIN DEFINITIONS

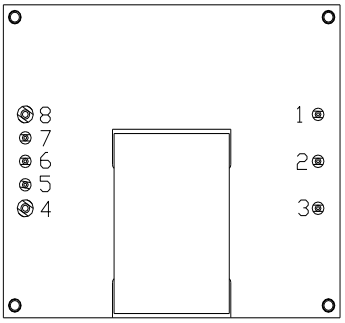


Figure 22. Pins

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

RECOMMENDED PAD LAYOUT

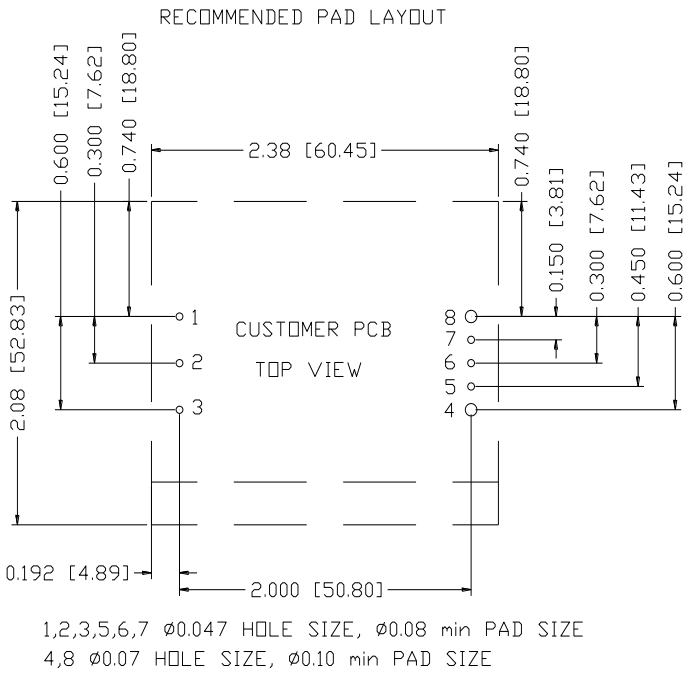


Figure 23. Recommended pad layout

15. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2011-12-26	A	First release.	YF.SUN
2012-02-08	B	Updated MD.	Xia.Wang
2012-02-14	C	Updated MD.	Xia.Wang
2012-02-15	D	Updated Isolation characteristics of Output to Case.	Xia.Wang
2012-03-26	E	Update Output Capacitance and Rise time of Output Specifications, Under-voltage Turn off Threshold of Input Specifications.	Xia.Wang
2012-04-10	F	Add Efficiency Data, Trim; Update the Load Regulation, Line Regulation, Regulation Over Temperature of Output Specifications; Update Weight in General; Update MD.	Xia.Wang
2012-04-19	G	Update OCP mode of Output Specifications; Add NR, TR and Startup&Shutdown.	Xia.Wang
2012-05-21	H	Update No Load Input Current and Under-voltage Turn on Threshold of Input specifications; Update OCP mode and Rise time of Output Specifications; Update the Efficiency Data; Delete Note for protection feature.	Xia.Wang
2012-06-06	I	Update MD.	Xia.Wang
2019-06-18	AJ	Update to new form.	F.Tao
2021-05-14	AK	Add object ID. Update altitude and remote on/off.	XF.Jiang

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

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