0RQ1-C5W24M

Isolated DC-DC Converter

The 0RQ1-C5W24M is an isolated DC/DC converter that provide up to 150 W of output power from a wide input range (72 V, 96 V and 110 V typical).

The unit is designed to be highly efficient. Standard feature include remote on/off, input under-voltage lockout, over current and short circuit protection and overvoltage protection. Conformal coated PCB is used for environmental ruggedness.

Key Features & Benefits

- 72/96/110 VDC Input / 24 VDC @ 6.25 A Output/1/4th Brick Converter
- Isolated
- Fixed Frequency
- High Efficiency
- Input Under Voltage Lockout
- Input Over Voltage Lockout
- OCP/SCP
- Output Over-Voltage Protection
- Over Temperature Protection
- Approved to UL/CSA60950-1, 2nd +A2 version(TBD)
- Class II, Category 2, Isolated DC/DC Converter (refer to IPC-9592B)

Applications

- Industrial
- Railways
- Telecommunications

1. MODEL SELECTION

MODEL NUMBER	OUTPUT VOLTAGE	INPUT VOLTAGE	MAX. OUTPUT CURRENT	MAX. OUTPUT POWER	TYPICAL EFFICIENCY
0RQ1-C5W24M	24 VDC	66 VDC-154 VDC	6.25 A	150 W	93%

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

PART NUMBER EXPLANATION

0	R	Q1	-	C5	W	24	M	x
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
Through hole mount	RoHS 6	DOSA Quarter Brick		150 W	66 – 154 V	24 V	M - Active low, without baseplate	G – Tray package

2. ABSOLUTE MAXIMUM RATINGS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
Continuous non-operating Input Voltage		-0.5	-	160	V
Remote On/Off		-0.3	-	15	V
Current Sink		0	-	10	mA
Isolation voltage	Input to output	-	-	2250	V
Operating Temperature	Ambient Temperature	-40	-	85	°C
Storage Temperature		-55	-	125	°C
Altitude		-	-	2000	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		66	-	154	V
Input Current (full load)		-	-	2.6	A
Input Current (no load)		-	50	-	mA
Remoted Off Input Current		-	2	5	mA
Input Reflected Ripple Current (rms)		-	20	-	mA
Input Reflected Ripple Current (pk-pk)		-	50	-	mA
Under-voltage Turn on Threshold	Lockout turn on	62	63	64	V
Under-voltage Turn off Threshold	Lockout turn off, non-latching	60	61	62	V
Over-voltage Shutdown Threshold	Auto-recovery and non-latching	159	162	164	V
Over-voltage Recovery Threshold		154	155	156	V

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4. OUTPUT SPECIFICATIONS

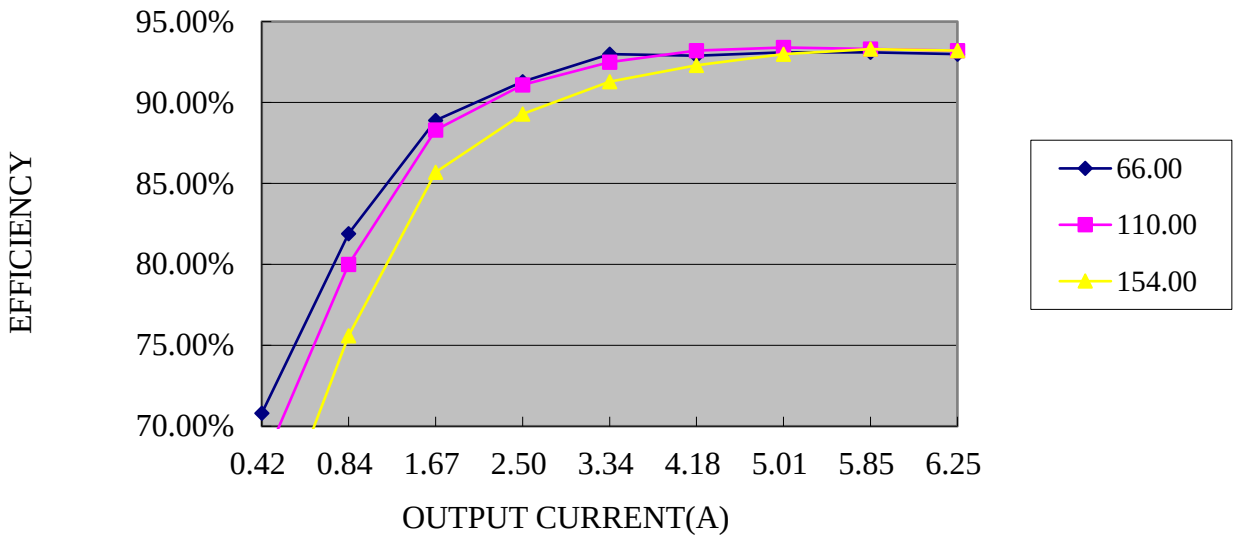
All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Test condition of the output setpoint: Vin=110V, Io=100% load at 25°C ambient	23.52	24	24.48	V
Load Regulation		-	-	±50	mV
Line Regulation		-	-	±50	mV
Regulation Over Temperature		-	±60	±200	mV
Ripple and Noise (pk-pk)	40KHz-100MHz BW, with 1μF ceramic capacitor and 220uF bulk electrolytic at output	-	-	250	mV
Ripple and Noise (rms)		-	-	50	mV
Output Current Range		0	-	6.25	A
Output DC Current Limit	Enter a hiccup mode, non-latching	6.75	7.5	8.25	A
Rise time	Vin=110V, Io=8.3A, with 1μF ceramic capacitor and 220uF bulk electrolytic at output	-	-	200	ms
Start-up time			300	500	ms
Overshoot at Turn on		-	0	3	%
Undershoot at Turn off		-	0	3	%
Output Capacitance		220	-	5000	uF
Transient Response					
50% load to 75% Load	di/dt=0.1A/us, with 1μF ceramic capacitor and 220uF bulk electrolytic at output	-	-	800	mV
Settling Time		-	-	3	ms
75% load to 50% Load		-	-	600	mV
Settling Time		-	-	3	ms

5. GENERAL SPECIFICATIONS

PARAMETER		DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Io=60% Irate – 100% Irate	TA = 25°C	92	93	-	%
	Io=40% Irate - 60% Irate		90	92	-	%
Switching Frequency			-	250	-	kHz
Output Voltage Trim Range			21.6	-	26.4	V
Over Temperature Protection		Temperature measured at the center of the baseplate, full load	-	110	-	℃
Output Over Voltage Protection		Enter a latching. non-hiccup mode	-	-	28	V
Weight			-	69	-	g
FIT		Calculated Per Bell Core SR-332 (Vin=110 V, Vo=24V, Io=6.5A, Ta = 25°C, FIT=10^9/MTBF)	-	TBD	-	-
MTBF			-	TBD	-	Mhrs
Dimensions Inches (L × W × H) Millimeters (L × W × H)				2.30 x 1.45 x 0.67 58.42 x 36.83 x 17		Inches Millimeters
Isolation Characteristics						
Input to Output			-	-	2250	Vdc
Input to Heatsink			-	-	2250	Vdc
Output to Heatsink			-	-	2250	Vdc
Isolation Resistance			10M	-	-	Ohm
Isolation Capacitance			-	2200	-	pF

6. EFFICIENCY DATA



7. RIPPLE AND NOISE

TBD

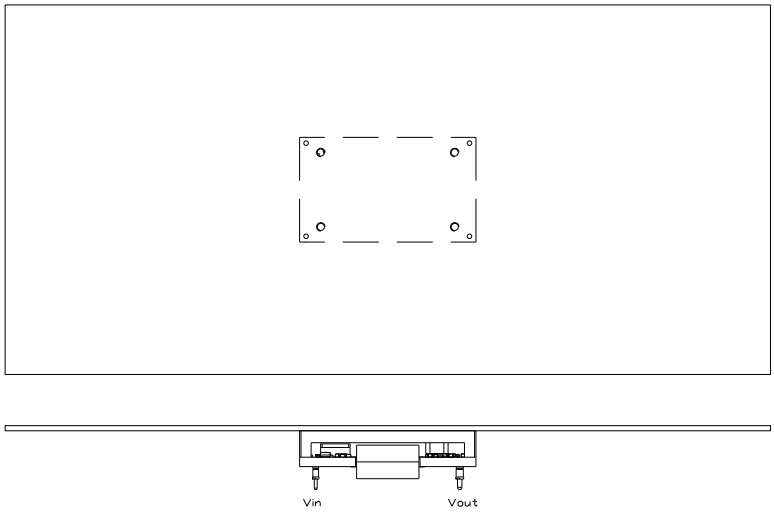
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8. THERMAL DERATING CURVES

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.

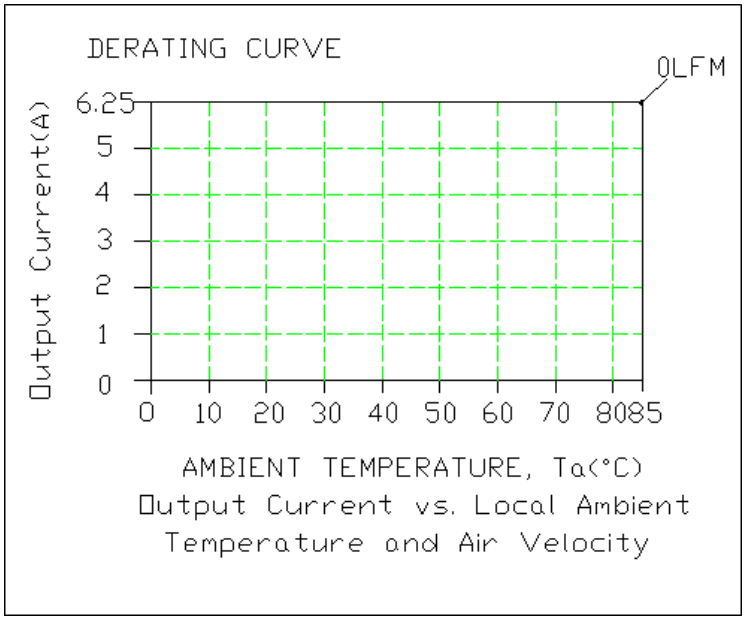
2. If the minimum air velocity is 0LFM or 50LFM, do not mark on the curve, just record as "Natural Convection".

Maximum junction temperature of semiconductors derated to 115 degree C.



HSK Dimension: 270 X 130 X 1.6mm.

TA is the temperature on the large heatsink rib.



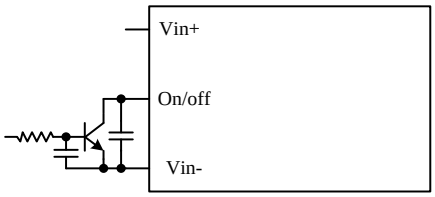
9. TRANSIENT RESPONSE

TBD

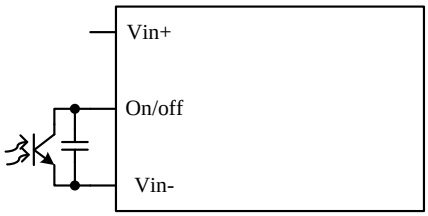
10. REMOTE ON/OFF

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	-	18	V
Current Sink			0	-	1	mA

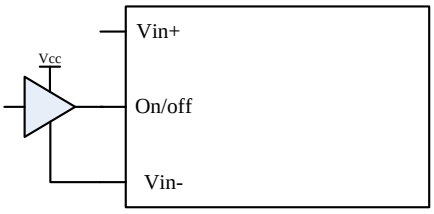
Recommended remote on/off circuit for active low



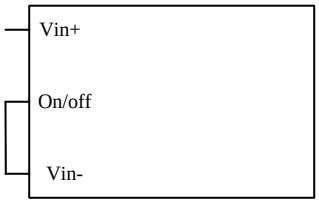
Control with open collector/drain circuit



Control with photocoupler circuit



Control with logic circuit



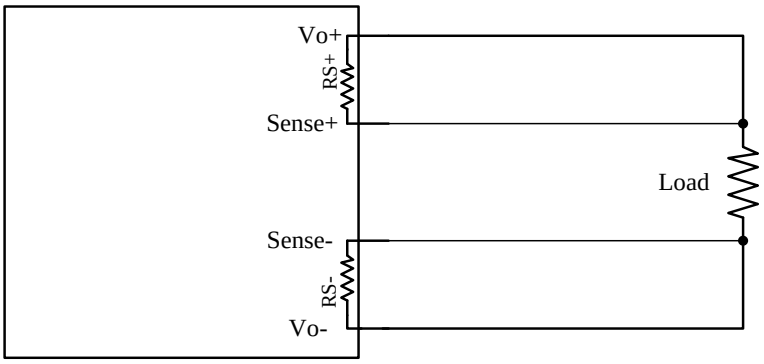
Permanently on

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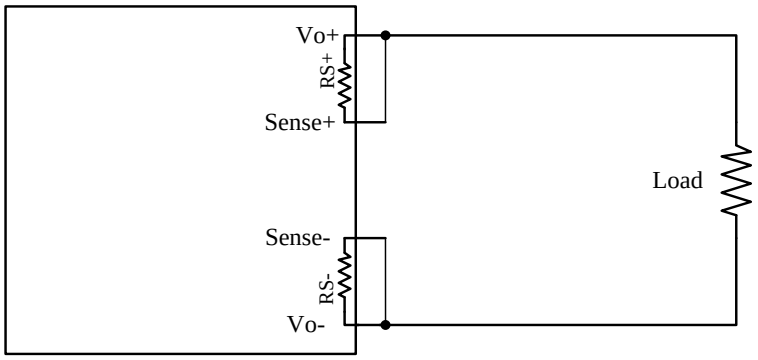
11. REMOTE SENSE

This module has remote sense compensation feature. It can minimizes the effects of resistance between module's output and load in system layout and facilitates accurate voltage regulation at load terminals or other selected point.

1. The remote sense lines carries 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. The can make an effect on the module's compensation, affecting the stability and dyn.
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.



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.



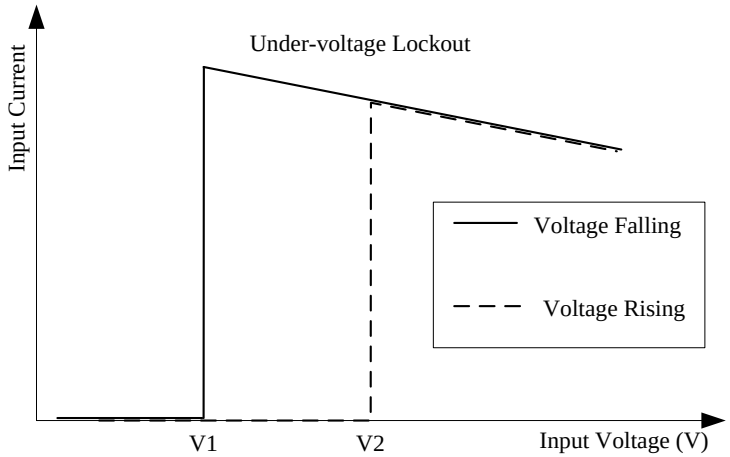
12. OCP

TBD

13. OTP

TBD

14. INPUT UNDER-VOLTAGE LOCKOUT



V1=61V

V2=63V

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15. SAFETY&EMC

Safety:

1. Compliance to UL/CSA60950-1
2. Compliance to EN/IEC60950-1

EMC:

Setup:

TBD

Positive:

TBD

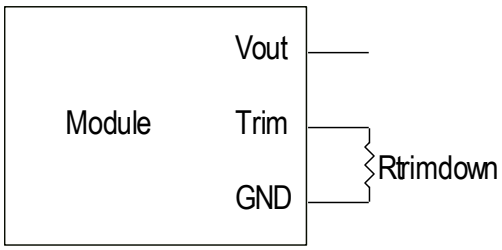
Negative:

TBD

16. TRIM

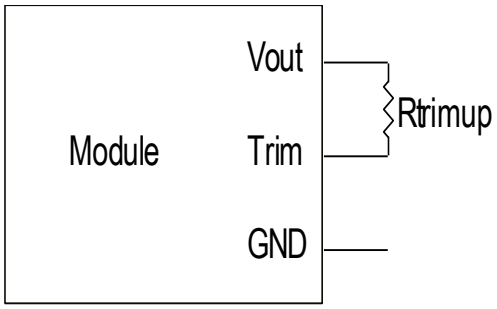
0RQ1-C5W24M Trim Resistor Calculate

Trim down test circuit



$$R_{trimdown} = \frac{Vo_req}{24 - Vo_req} - 1[k\Omega]$$

Trim up test circuit



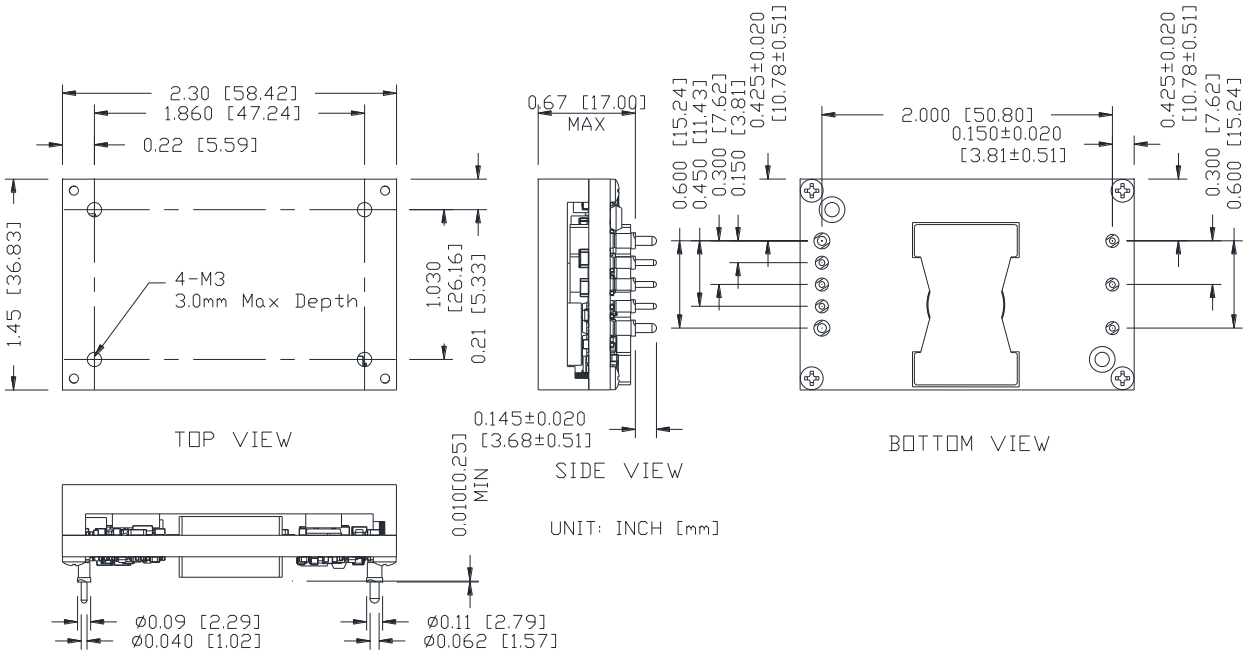
$$R_{trimup} = \frac{1 - 0.051875}{0.051876 - 1.24 / Vo_req} - 1[k\Omega]$$

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

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17. 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:

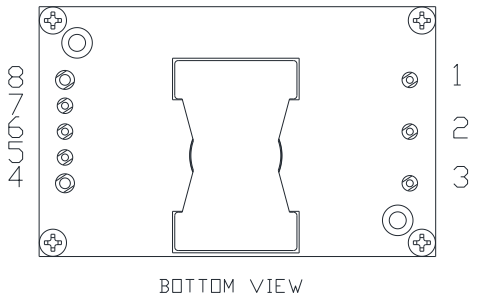
All Pins: Material - Copper Alloy;
Finish – Tin plated.

1） Undimensioned components are shown for visual reference only.

2） All dimensions in inches; Tolerances: x.xx +/-0.02 in [0.51 mm]. x.xxx +/-0.010 in [0.25 mm].

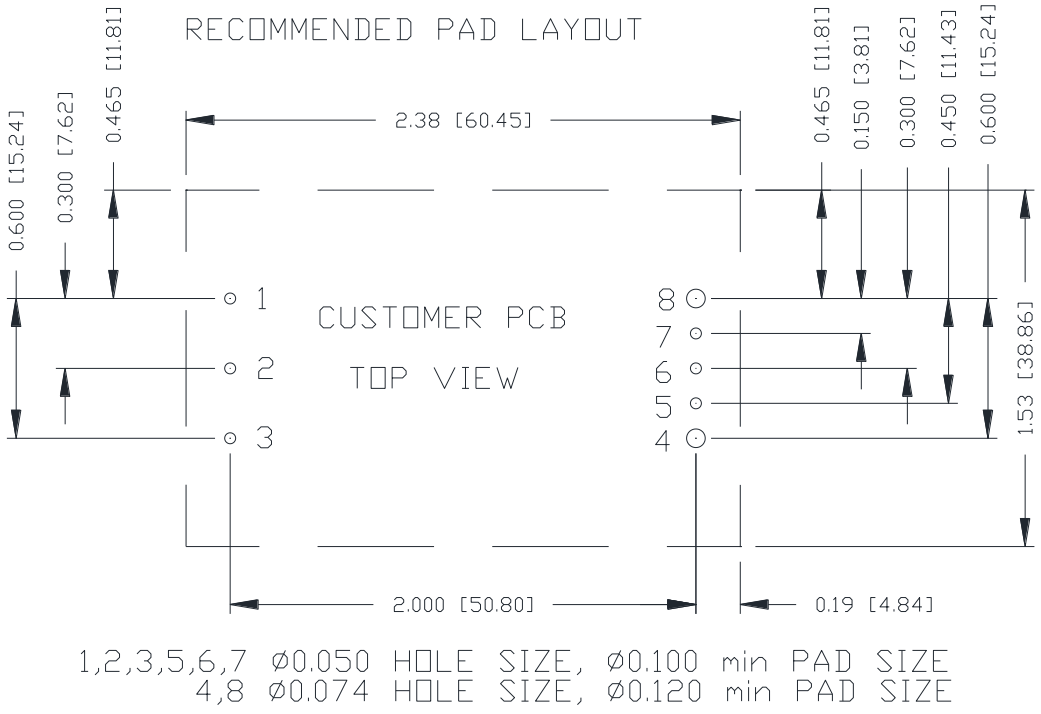
MECHANICAL DIMENSIONS(CONTINUED)

PIN DEFINITIONS



PIN	FUNCTION
1	Vin (+)
2	On/off
3	Vin (-)
4	Vout(-)
5	Sense(-)
6	Trim
7	Sense(+)
8	Vout(+)

RECOMMENDED PAD LAYOUT



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18. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2017-09-11	AA	First release	S Wang
2017-11-24	AB	Update the MD	S Wang
2018-06-20	AC	Update Part Number Explanation	S Wang

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

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