

0RQB-C5W54L

Isolated DC-DC Converter

The 0RQB-C5W54L is an isolated DC/DC converter that provide up to 162 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 includes remote on/off, input under-voltage lockout, over current and short circuit protection and overvoltage protection. Conformal coated PCB is used for environmental ruggedness.

Conformal coated PCB is used for environmental ruggedness.



Key Features & Benefits

- 72/96/110 VDC Input, 54 VDC @ 3 A Output
- 1/4th Brick Converter,
- Reinforced isolation
- Fixed Frequency
- High Efficiency
- Conformal Coated
- Input Under Voltage Lockout
- Input Over Voltage Lockout
- Output Over-voltage Protection
- Over Current and Short Circuit Protection
- Over Temperature Protection
- Approved to EN62368-1
- 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
0RQB-C5W54L	54 VDC	72/96/110 VDC	3 A	162 W	91%

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

PART NUMBER EXPLANATION

0	R	QB	-	C5	W	54	L	G
Mounting Type	RoHS Status	Series Name		Output Power	Input Range	Output Voltage	Active Logic	Package Type
Through hole mount	RoHS 6	Quarter Brick		162W	72/96/110 VDC	54 V	L - Active Low, With 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	-	25	V
Trim		0	-	5	V
Thermal resistance	Baseplate to heatsink, flat greased surface	-	0.23	-	°C/W
Current Sink		0	-	10	mA
Isolation voltage	Input to output	-	-	2250	V
Operating Temperature	Temperature measured at the center of the baseplate, full load	-40	-	90	°C
	Temperature measured at the center of the baseplate, half load	-40	-	95	
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		43	-	154	V
Input Current (full load)		-	-	5.0	A
Input Current (no load)	Vin=90V, Ta=25°C	-	100	150	mA
Input Reflected Ripple Current (rms)		-	-	15	mA
Input Reflected Ripple Current (pk-pk)		-	-	40	mA
Under-voltage Turn on Threshold	Lockout turn on	39	40	41.5	V
Under-voltage Turn off Threshold	Lockout turn off, non-latching	38.5	39	41	V
Over-voltage Shutdown Threshold	Auto-recovery and non-latching	159	162	164	V
Over-voltage Recovery Threshold		154	155	156	V

4. OUTPUT SPECIFICATIONS

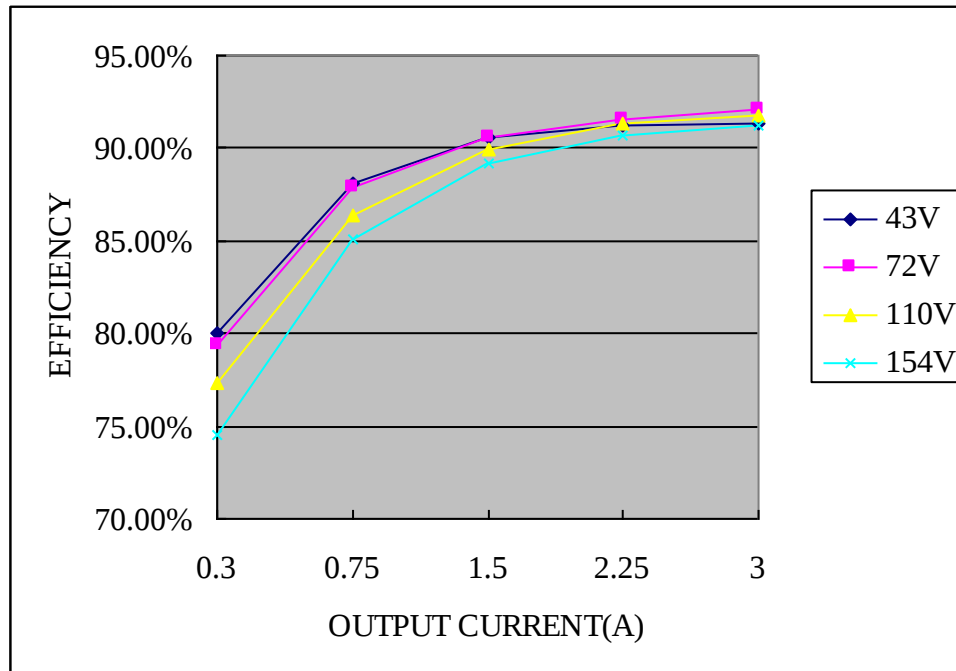
All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Output Voltage Set Point	Test condition of the output set point: Vin=72V, Io=100% load at 25°C ambient	53	54	55	V
Load Regulation		-	50	100	mV
Line Regulation		-	50	100	mV
Regulation Over Temperature		-	±200	±350	mV
Output Ripple and Noise (pk-pk)	40KHz-100MHz BW, with 0.1µF ceramic capacitor and 1000uF bulk electrolytic at output	-	-	300	mV
Output Ripple and Noise (rms)		-	-	100	mV
Output Current Range		0	-	3	A
Output DC Current Limit	Enter a hiccup mode, non-latching	3.3	3.7	4.2	A
Rise time	Vin=72V, Io=3A, with 1000uF bulk electrolytic at output	-	0.5	1	s
Start-up time		-	-	2	s
Overshoot at Turn on		-	0	3	%
Undershoot at Turn off		-	0	3	%
Output Capacitance		200	-	1000	uF
Transient Response					
50% load to 75% Load		-	-	2	%Vout
Settling Time	di/dt=0.1A/us, with 1000uF bulk electrolytic at output	-	-	6	ms
75% load to 50% Load		-	-	2	%Vout
Settling Time		-	-	6	ms

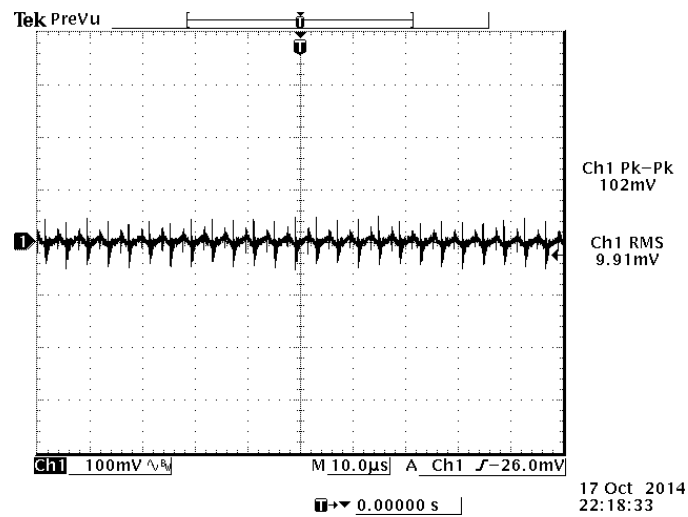
5. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNIT
Efficiency	Io=60% Irate – 100% Irate	88	90	-	%
	Io=40% Irate - 60% Irate	85	88	-	%
TA = 25 °C, natural-convection					
Switching Frequency		-	250	-	kHz
Output Voltage Trim Range		50	-	56	V
Over Temperature Protection	Temperature measured at the center of the baseplate	-	120	-	°C
Over Voltage Protection(Static)	Enter a latching. non-hiccup mode	57.5	58	58.5	V
Weight		-	72	-	g
FIT	Calculated Per IEC 62380 TR 1 (UTEC 80-810) (Vin=72 V, Vo=54V, Io=2.4A, Tac = 50°C, Tae=35°C)	-	195.08	-	-
MTBF		-	5.13	-	Mhrs
Dimensions			2.45 x 1.45x 0.59		Inches
Inches (L x W x H)			62.24 x 36.84 x15		Millimeters
Millimeters (L x W x H)					
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 DAT

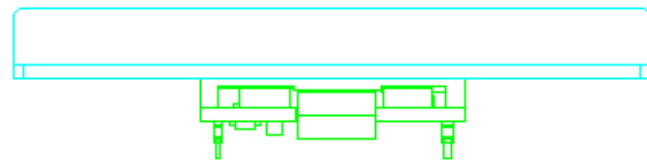
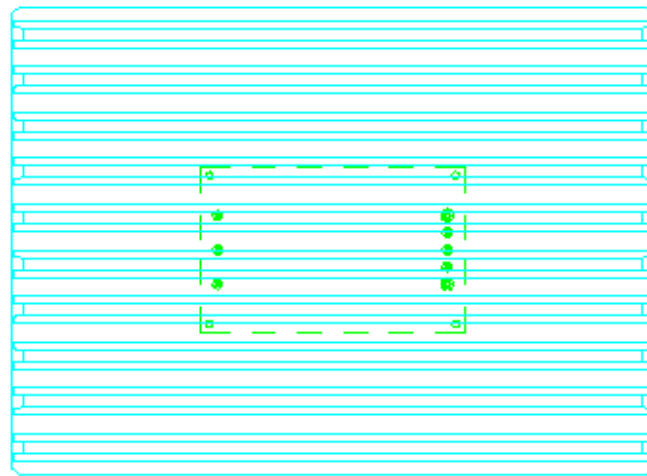


7. RIPPLE AND NOISE



Ripple and noise 72Vdc input, 54Vdc/3A output and $T_a=25$ deg C, and with a 0.1 μ F ceramic cap and 220 μ F electrolytic cap at output

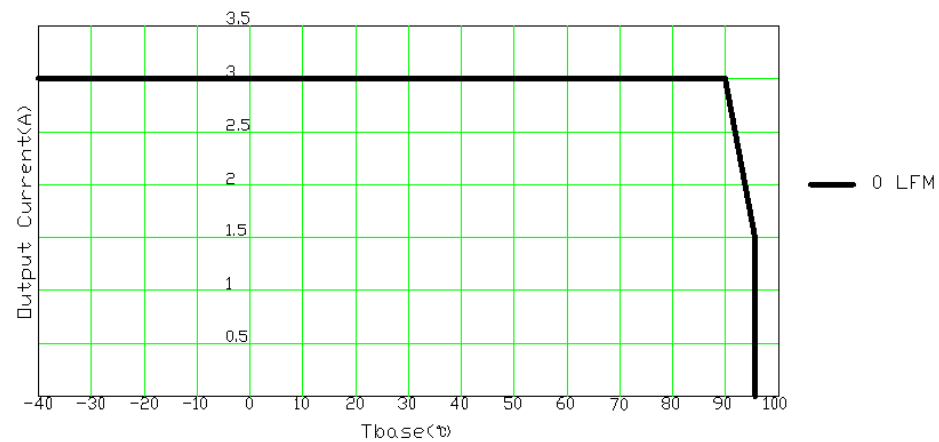
8. THERMAL DERATING CURVE



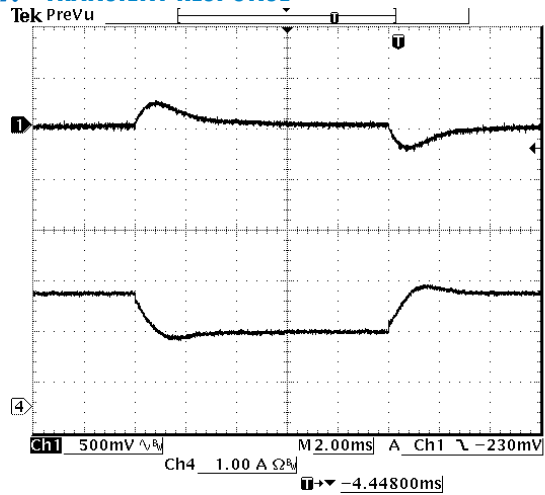
Vin

Vout

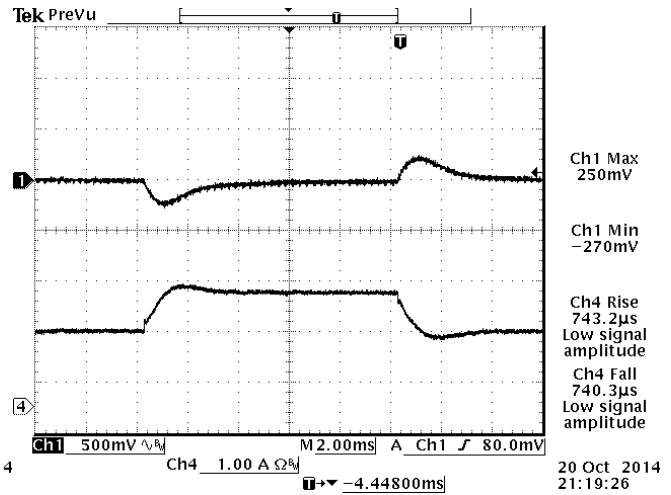
HSK Dimension: 142x110x16mm



9. TRANSIENT RESPONSE



Vout= 54V 50%-75% Load Transients at Vin=72V, Ta=25 deg C



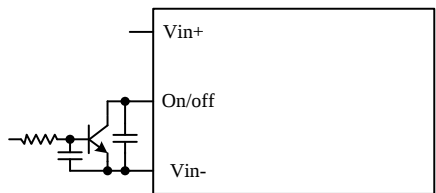
Vout= 54V 75%-50% Load Transients at Vin=72V, Ta=25 deg C

Notes: Transient Response: di/dt=0.1A/μs, 0.1μF ceramic cap and 1220μF electrolytic cap at output.

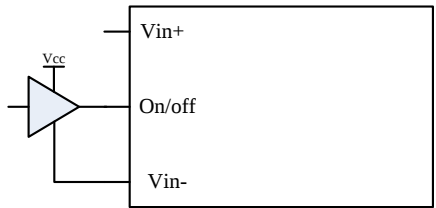
10. REMOTE ON/OFF

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	-	15	V
Current Sink			0	-	1	mA

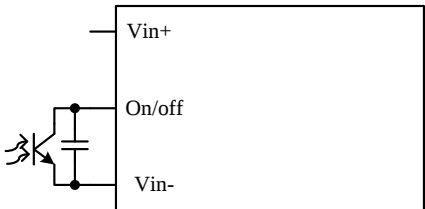
Recommended remote on/off circuit for active low



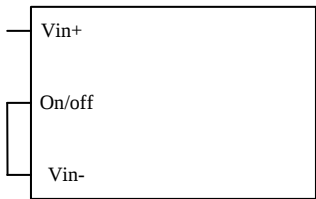
Control with open collector/drain circuit



Control with logic circuit



Control with photocoupler circuit

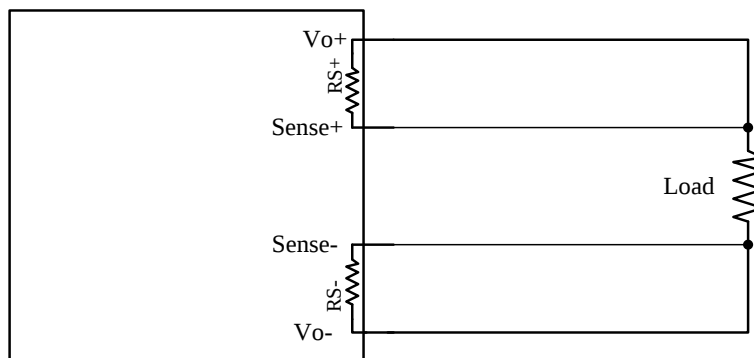


Permanently on

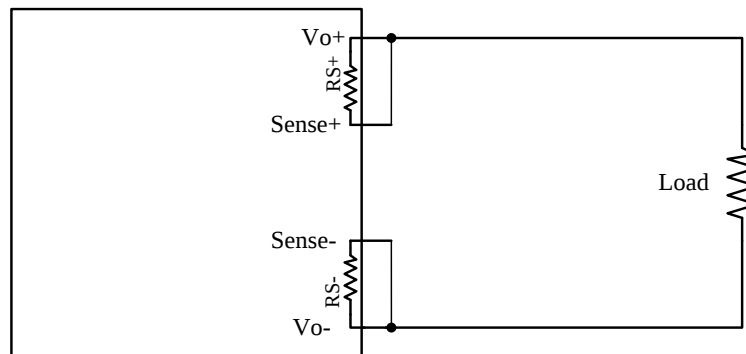
11. REMOTE SENSE

This module has remote sense compensation feature. It can minimize the effects of resistance between module's output and load in system layout and facilitates 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. This 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.

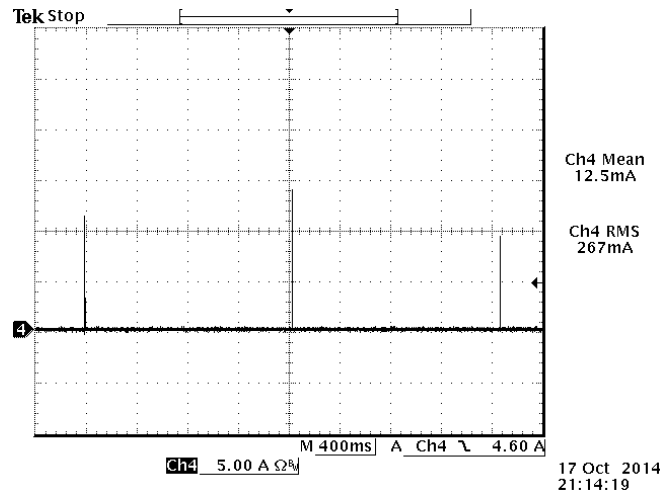


6. If not using remote sense compensation, please connect sense directly to output at module's pin, that is, connect $sense+$ to $Vo+$ and $sense-$ to $Vo-$ at module's pin, the shorter the better. see below figure.

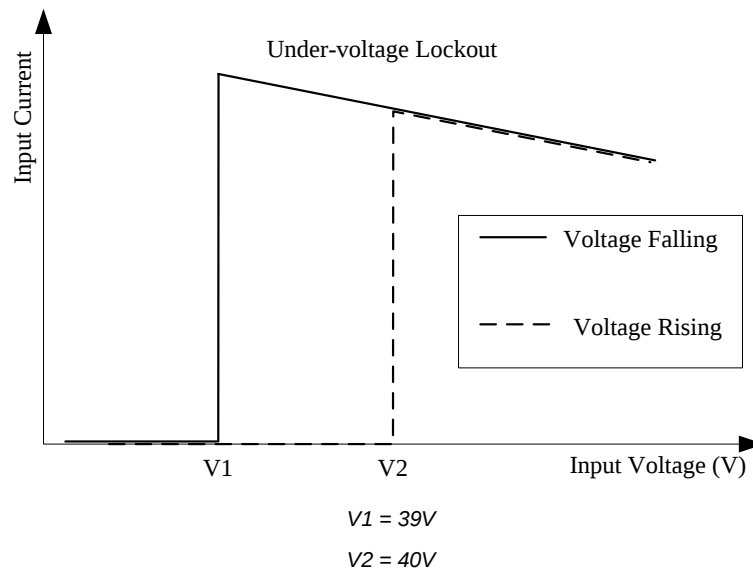


12. OVER CURRENT PROTECTION

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 milli-seconds. If the overcurrent condition persists beyond a few milliseconds, the module will shut down into hiccup mode and restart once every 1600ms. The module operates normally when the output current goes into specified range. The typical average output current is 0.3A during hiccup.

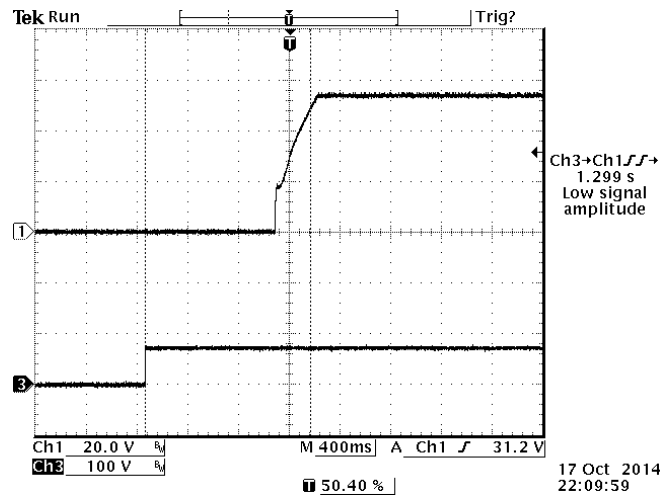


13. INPUT UNDER VOLTAGE LOCKOUT

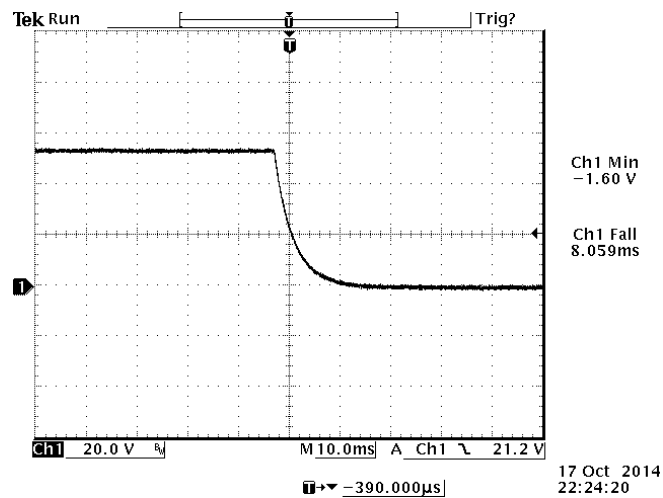


14. STARTUP&SHUTDOWN

Startup



Shutdown



15. SAFETY&EMC

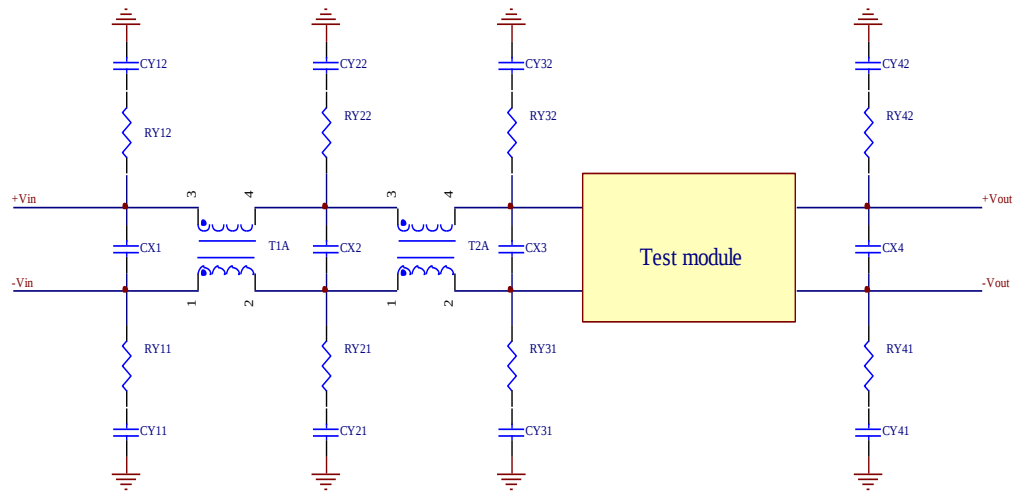
Safety:

TUV certificated to EN 62368-1

CE certificated to Low Voltage Directive 2014/35/EU

EMC

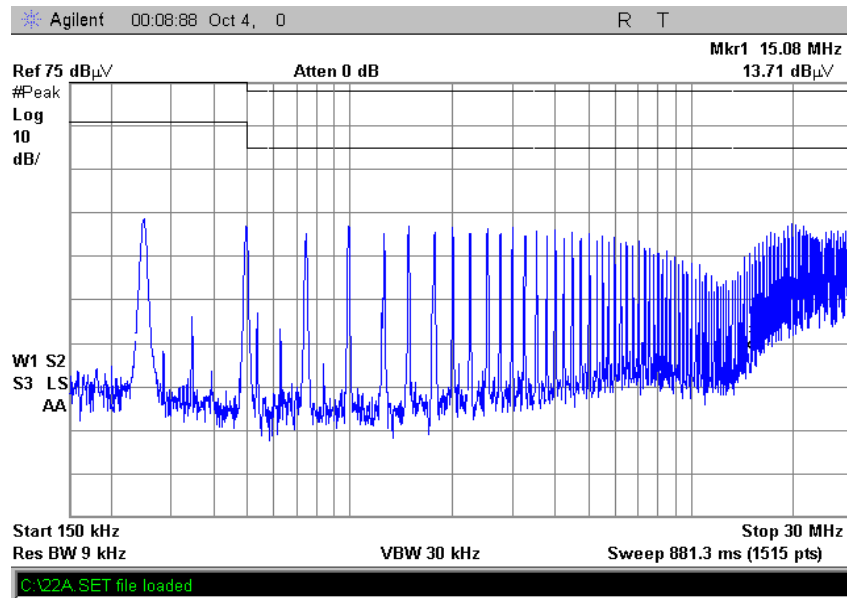
Setup



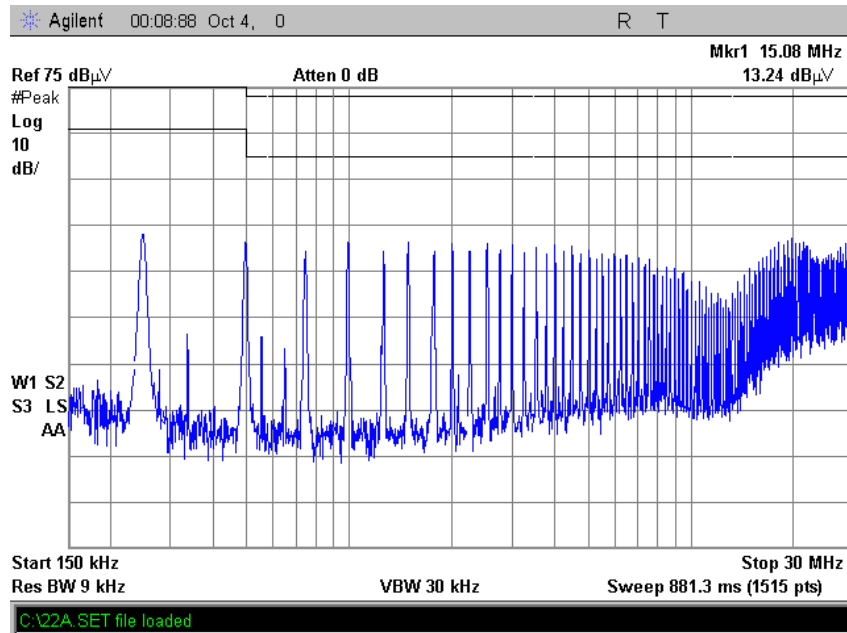
T1A	CX1	RY11	RY12	CY11	CY12
0.45mH	100uF AL	-	-	-	-
T2A	CX2	RY21	RY22	CY21	CY22
0.9mH	220uF AL	0R	0R	0.22uF	0.22uF
-	CX3	RY31	RY32	CY31	CY32
-	220uF AL	-	-	-	-
-	CX4	RY41	RY42	CY41	CY42
-					

SAFETY&EMC(CONTINUED)

Positive:



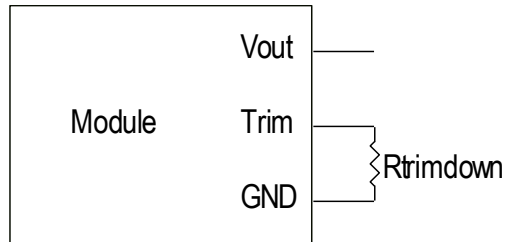
Negative:



16. TRIM

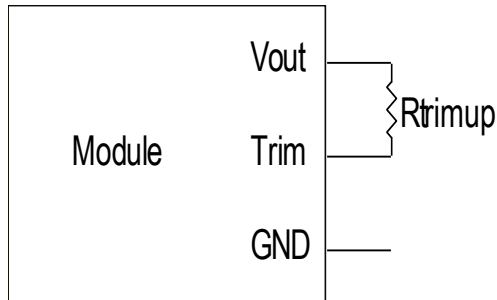
0RQB-C5W54L Trim Resistor Calculate

Trim down test circuit



$$R_{trimdown} = \frac{V_{o_req}}{54 - V_{o_req}} - 1 [k\Omega]$$

Trim up test circuit

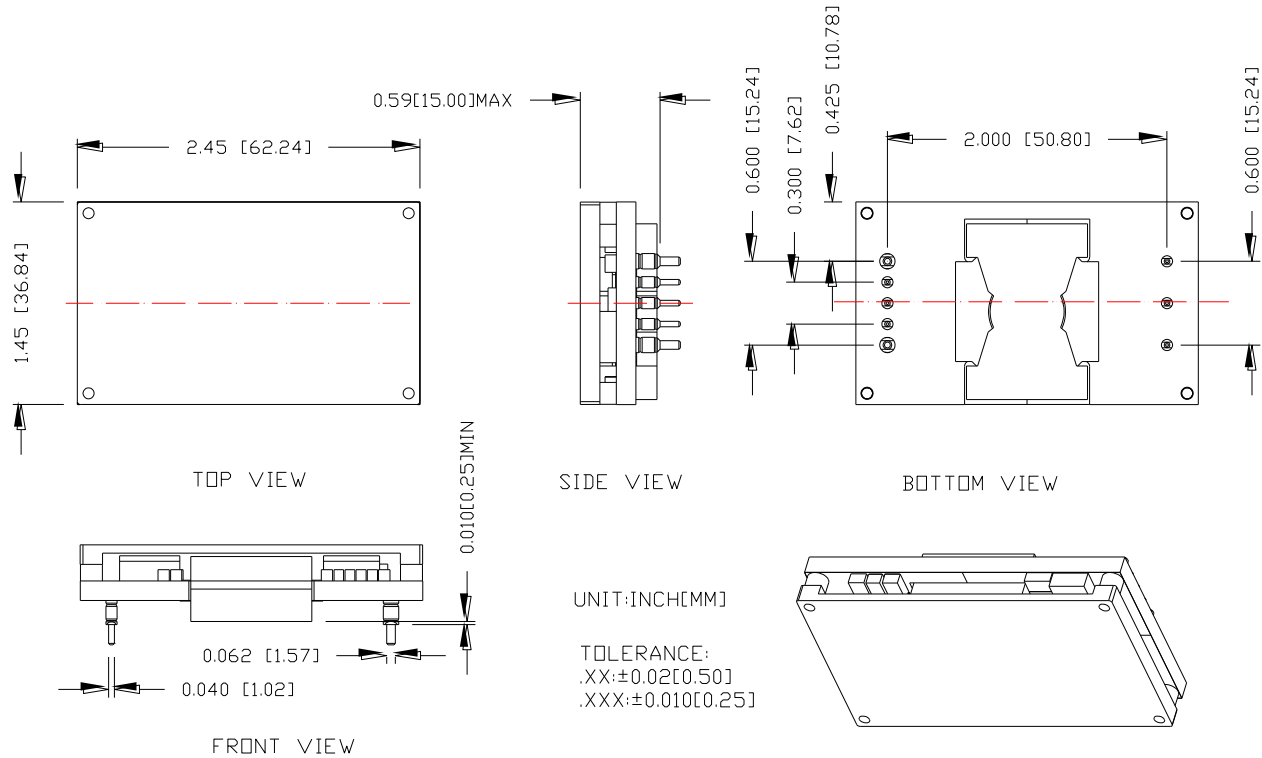


$$R_{trimup} = \frac{1 - 0.02296}{0.02296 - 1.24 / V_{o_req}} - 1 [k\Omega]$$

Note: V_{o_req} = Desired(trimmed) output voltage[V].

17. MECHANICAL DIMENSIONS

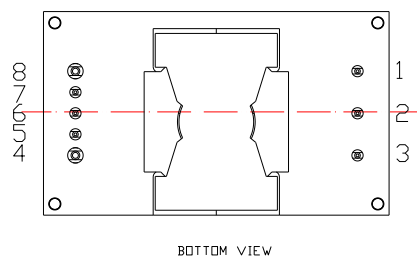
OUTLINE



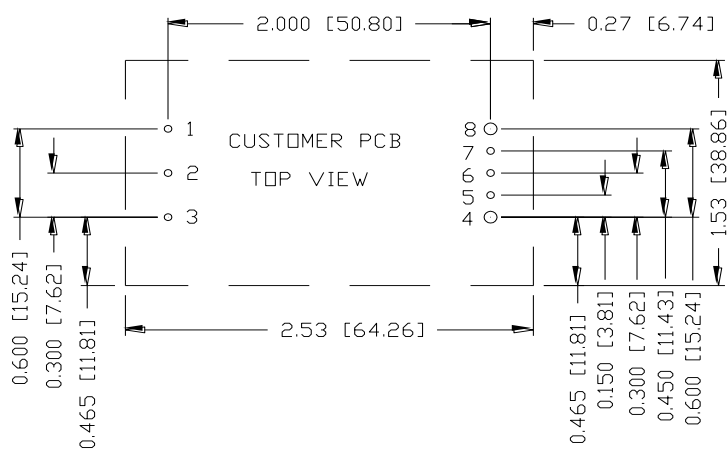
Note: This module is recommended and compatible with Pb-Free Wave Soldering and must be soldered using a peak solder temperature of no more than 260 °C for less than 5 seconds.

NOTES:

- 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; 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**RECOMMENDED PAD LAYOUT**

1,2,3,5,6,7 $\varnothing 0.047$ HOLE SIZE, $\varnothing 0.08$ min PAD SIZE
 4,8 $\varnothing 0.07$ HOLE SIZE, $\varnothing 0.10$ min PAD SIZE

18. REVISION HISTORY

DATE	REVISION	CHANGES DETAIL	APPROVAL
2014-10-28	A	First release	S Wang
2014-12-30	B	Applications update	S Wang
2015-12-21	C	Update Under-voltage Turn on/off Threshold and Over-voltage Shutdown Threshold in Input Specs. Update Transient Response Settling Time and Over Voltage Protection (Static).	S Wang
2016-02-26	D	1. Change the Operation temperature in Absolute Maximum Ratings 2. Add Thermal resistance in Absolute Maximum Ratings 3. Remove 48V as the standard input voltage	S Wang
2016-04-21	E	Update Safety Certification, MTBF, Thermal Derating Curve.	S Wang
2016-05-18	F	Update Operating Temperature, Transient Response	S Wang
2017-09-26	AG	Update the form.	S Wang
2018-06-25	AH	Update Input Spec	S Wang
2019-08-26	AI	Update the safety info.	S Wang
2019-10-24	AJ	Add feature reinforced isolation	S Wang

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.