RQ40WR12-J Series

40W Wide-range DC-DC Converter

Features

- 40 Watts output power in Quarter brick
- Ultra wide 12:1 input voltage range from 14V to 160VDC
- Efficiency up to 89%
- Operating baseplate temperature -40°C to +105°C
- 3KVDC / 1 minute isolation
- Compliance to EN50155 and EN45545-2 railway standard
- RoHS compliant

Application

- Industrial automation control system
- Railway application
- Transportation system

Selection Guide

Part number	Input voltage	Output voltage	Output current @ full load	Efficiency (1) (typ.)	Ripple& Noise (2) (max.)	Capacitive load (3) (max.)
RQ40WR12-11005J	14-160 VDC Nom. 110VDC	5 VDC	8000mA	88%	100mVp-p	24000μF
RQ40WR12-11012J		12 VDC	3333mA	89%	150mVp-p	3900μF
RQ40WR12-11024J		24 VDC	1667mA	88%	200mVp-p	820μF
RQ40WR12-11048J		48 VDC	833mA	88%	300mVp-p	220μF
RQ40WR12-11054J		54 VDC	741mA	88%	300mVp-p	150μF

1 (1) The efficiency is test by nominal input and max. full load @25°C.

2 (2) RQ40WR12-11005 measured with 20MHZ BW at Vin range 0%~100% load with a 47μF/10V X7R MLCC.
Others measured with 20MHZ BW at Vin range 0%~100% load with a 1μF/50V X7R MLCC.

3 (3) The capacitive load is test by minimum input and constant resistive load.

4 All specifications valid at nominal input voltage, full load and 25°C after warm-up time unless otherwise stated.

5 The product information and specifications are subject to change without prior notice.

Part Number

RQ 40 WR 12-110 12 J

- 40: Power
- WR: 12:1 input voltage range
- 110: Input voltage
- 12: Output voltage

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The products were used in Computers, Industrial controls, Medical equipment, Transportation, EV, ECO-power, Aero-space application and communication.

Specifications

	Parameter	Conditions	Min.	Typ.	Max.	Unit
Input	Input filter			Pi type		
	Input voltage range		14	110	160	VDC
	No load input current				15	mA
	Under voltage lockout	0%~100% load		12		VDC
	Start-up voltage	0%~100% load			13.9	VDC
	Remote ON/OFF	DC-DC ON		Open or 3V < Vr < 12V		
		DC-DC OFF		Short or 0V < Vr < 1.2V		
	Input surge voltage	1s max.		200		VDC
	Start-up time/max	100% Load at Nominal Vin		40		mS
Output	Voltage accuracy		-1		+1	%
	Voltage adjustability				±10	%
	Minimum load				0	%
	Line regulation	LL to HL at 100% load	-0.2		+0.2	%
	Load regulation	0%~100% load	-0.2		+0.2	%
	Temperature coefficient				+0.05	%/˚C
	Transient response recovery time	25% load step change (75%-100% load)		500		μs
	Short circuit protection			Continuous, automatic recovery		
	Operating frequency	100% Load at Nominal Vin		250		KHz
Environment	Operating temperature	With derating	-40		105	˚C
	Storage temperature		-55		125	˚C
	Baseplate temperature				110	˚C
	Over temperature protection				115	˚C
	Relative humidity		5		95	%RH
	Operating altitude			3000m		
	Safety approval			EN50155/EN62368-1		
Function	Isolation voltage	1 minute, Input to Output Cut-off current: 1mA for VDC	3000			VDC
		1 minute, Input to Output Cut-off current: 2mA for VAC	2000			VAC
	Isolation resistance	500VDC	1000			MΩ
	Isolation capacitance				1500	pF
	Short circuit protection			Continuous, automatic recovery		
	Over load protection	110 Vdc		150		%
	Over voltage protection Zener diode clamp	RQ40WR12-11005	5.6		8.0	VDC
		RQ40WR12-11012	13.4		19.2	VDC
		RQ40WR12-11024	26.9		38.4	VDC
		RQ40WR12-11048	53.8		76.8	VDC
		RQ40WR12-11054	60.5		86.4	VDC
	MTBF	25˚C	205			KHrs
	Vibration			EN61373		
Physical	Dimension			57.9(L) x 36.8(W) x 12.7(H) mm		
	Weight			68		g
	Case material			Plastic		
	Potting material			Silicon		
	Cooling method			Nature Convection		
EMC	EMI	EN55032/55011		Class A/B		

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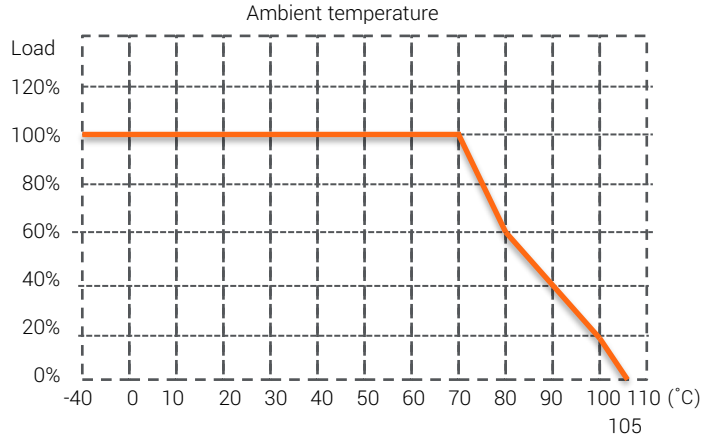
	Parameter	Conditions	Min.	Typ.	Max.	Unit
	ESD	EN61000-4-2 air±8kV, contact±6kV		Criteria A		
	Radiated immunity	EN61000-4-3 10V/m		Criteria A		
	Fast transient (1)	EN61000-4-4 ±2kV		Criteria A		
	Surge (1)	EN61000-4-5 ±2kV		Criteria A		
	Conducted immunity	EN61000-4-6 10 V/rms		Criteria A		
	Magnetic field immunity	EN61000-4-8 10 A/m		Criteria A		

1. (1) External input capacitor required 330μF/200V.
2. All specifications valid at nominal input voltage, full load and 25˚C after warm-up time unless otherwise stated.
3. The product information and specifications are subject to change without prior notice.

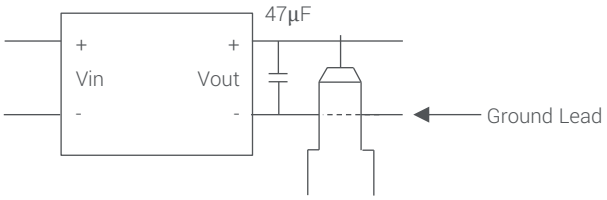
Derating Curve



The de-rating curve was measured at 110V input in chamber with natural convection.

Ripple & Noise Measure Method

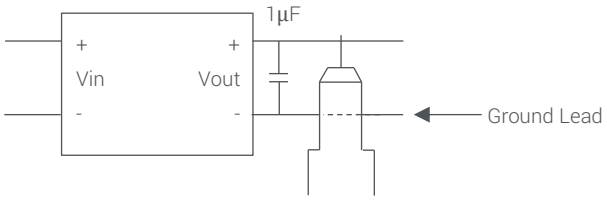
RQ40WR12-11005J



Measured with 20MHz bandwidth and 47μF ceramic capacitor.

RQ40WR12-11012J, RQ40WR12-11024J, RQ40WR12-11048J,

RQ40WR12-11054J



Measured with 20MHz bandwidth and 1μF ceramic capacitor

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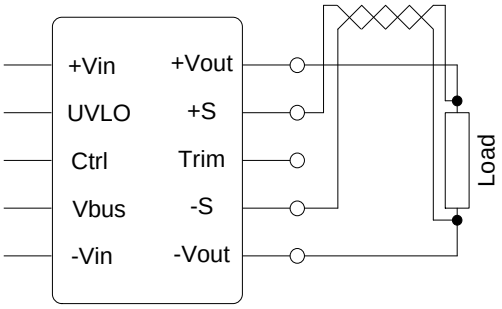
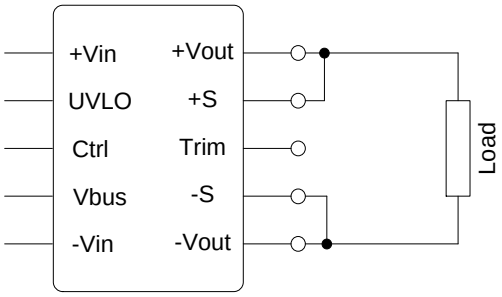
Remote Sense Application

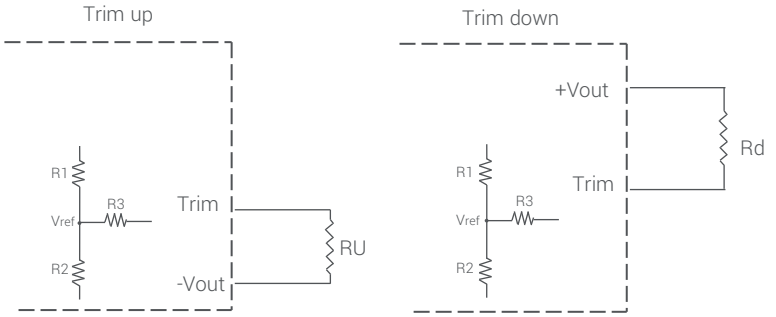


(a) With Remote Sense



(b) Without Remote Sense

Trim Application



Formula for trim resistor:

UP: $Ru=\frac{aR_2}{R_2-a}-R_3$ $a=\frac{V_{ref}}{V_o'-V_{ref}}\cdot R_1$

DOWN: $Rd=\frac{bR_1}{R_1-b}-R_3$ $b=\frac{V_o'-V_{ref}}{V_{ref}}\cdot R_2$

Note:

1.Ru, Rd is mean trim resistor, please check the formula.

2.a & b: user define parameter, no actual meanings.

3. V_o' is mean trim up/down voltage.

4.Value for R1, R2, R3 and V_{ref} refer to the table below.

Vout	Vref	R1	R2	R3
5V	1.25V	30.30KΩ	10.00KΩ	68.00KΩ
12V	2.50V	12.56KΩ	3.30KΩ	24.90KΩ
24V	2.50V	17.20KΩ	2.00KΩ	15.00KΩ
48V	2.50V	36.40KΩ	2.00KΩ	15.80KΩ
54V	2.50V	41.20KΩ	2.00KΩ	15.80KΩ

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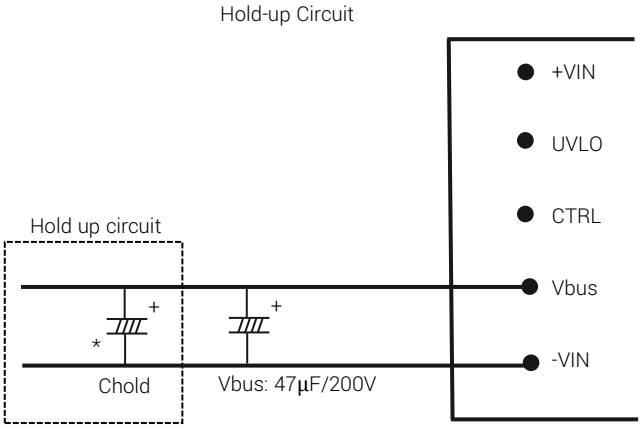
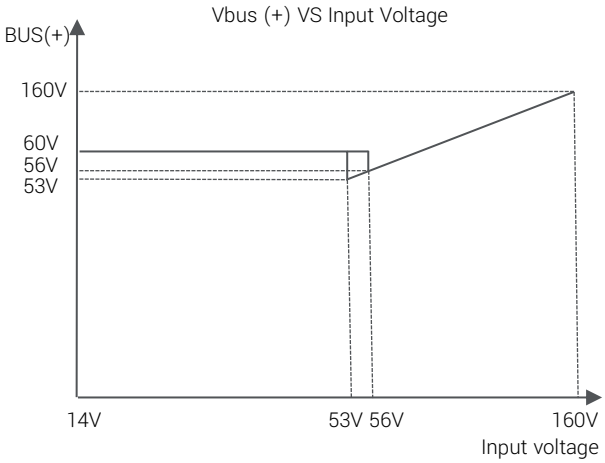
Hold Up Time

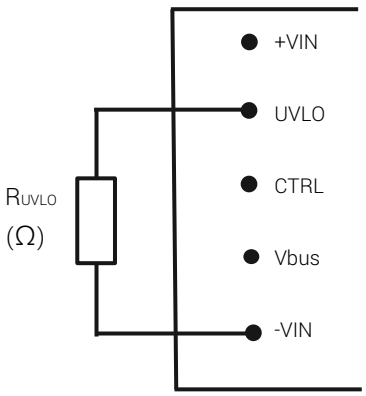




Chold table

Nominal Vin	24V	36V	48V	72V	96V	110V
10ms (S2)	800uF	800uF	800uF	440uF	180uF	120uF
30ms(C2)	2200uF	2200uF	2200uF	1200uF	540uF	400uF

UVLO

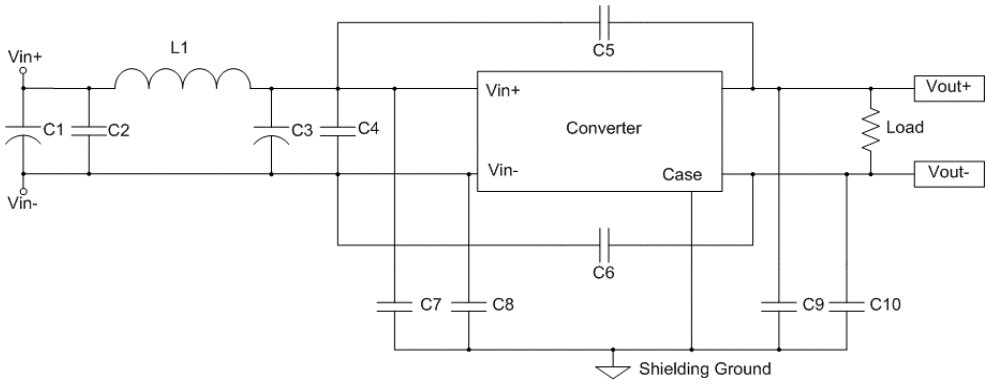


UVLO table

UVLO External Resistor RUVLO(Ω)	OPEN	140K	62K
Turn-off Threshold	12.7V	19.6V	26.3V
Turn-on Threshold	13.6V	20.4V	27.3V

The under voltage threshold can set by external resistor placed between the UVLO and -VIN.

EMI filtering-suggestion for EN55032/55011 Class A



Vout	C1	C2,4	C3	C5	C6	C7,8,9,10	L1
5V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	1000pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	1000pF 1206 2kV Ceramic Cap.	10uF GSTD1265PE-100M
12V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	1000pF 1206 2kV Ceramic Cap.	10uF GSTD1265PE-100M
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54V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	1000pF 1206 2kV Ceramic Cap.	10uF GSTD1265PE-100M

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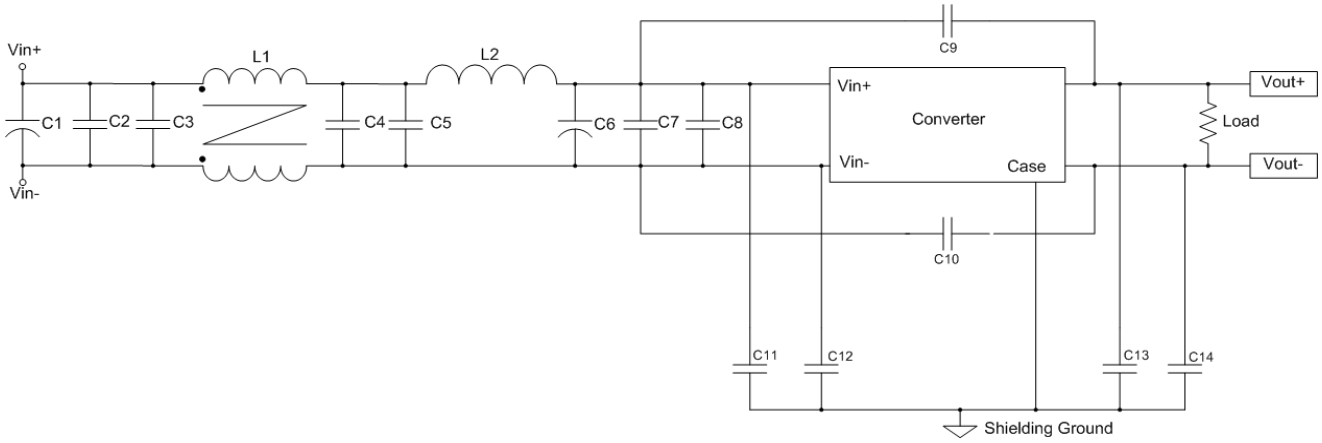
EMI filtering-suggestion for EN55032/55011 Class B



Vout	C1	C2,3,4,5,7,8	C6	C9	C10	C11,12,13,14	L1	L2
5V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1206 3kV Ceramic Cap.	2200pF 1808 3kV Ceramic Cap.	3300pF 1206 2kV Ceramic Cap.	CommomChoke A10 T16X12X8C 2.2mH ± 35%	4.7uF GSTD1265 PE-4R7M
12V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	4700pF 1206 2kV Ceramic Cap.	CommomChoke A10 T16X12X8C 2.2mH ± 35%	4.7uF GSTD1265 PE-4R7M
24V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	4700pF 1206 2kV Ceramic Cap.	CommomChoke A10 T16X12X8C 2.2mH ± 35%	4.7uF GSTD1265 PE-4R7M
48V	100uF 200V Aluminum Cap. KXJ Series	0.68uF 1210 250V Ceramic Cap.	47uF 200V Aluminum Cap. KXJ Series	2200pF 1808 3kV Ceramic Cap.	1000pF 1808 3kV Ceramic Cap.	4700pF 1206 2kV Ceramic Cap.	CommomChoke A10 T16X12X8C 2.2mH ± 35%	4.7uF GSTD1265 PE-4R7M
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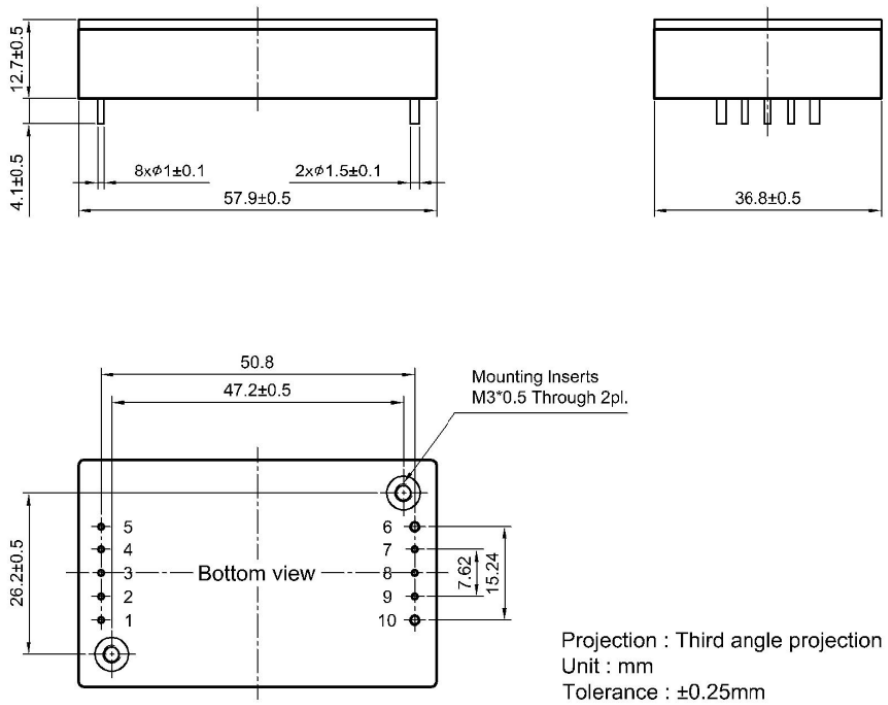
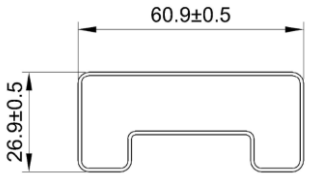
Mechanical Dimension & Pinning



Pin	Function
1	+Vin
2	UVLO
3	Ctrl
4	Vbus
5	-Vin
6	-Vout
7	-S
8	Trim
9	+S
10	+Vout

Package



UNIT:mm
1 Tube = 11 pcs
Length:520±2mm

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