



(Bottom View)



## ■ Features

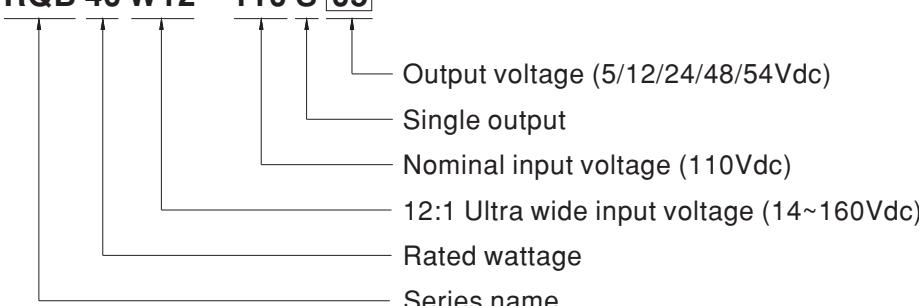
- Quarter-brick(2.28" x 1.45" x 0.5") with industrial standard pin-out
- Compliance with railway standard EN50155
- 12:1(14~160Vdc) ultra-wide input range
- Wide operating temperature range -40 ~ +90°C
- No minimum load required
- Full encapsulated
- Protections: Short circuit (Continuous) / Overload / Over temperature / Over voltage / Input under voltage
- 3KVDC or 2KVAC I/O isolation
- Remote ON/OFF control and remote sense
- Trimming output( $\pm 10\%$ )
- 3 years warranty

## ■ Description

RQB40W12 series is 40W module type DC-DC reliable railway with quarter brick package. It features international standard pins, a high efficiency up to 90%, wide working temperature range -40~+90°C , 3KVDC or 2KVAC I/P-O/P isolation voltage, meet EN50155 with external circuits, continuous-mode short circuit protection, etc. The models input for 14~160VDC 12:1 ultra-wide input range, and various output voltage, 5V/12V/24V/48V/54V for single output, which are suitable for railway, trams, buses and also can be used in the harsh environment with high vibration, high dust, extremely low or high temperature, etc.

## ■ Model Encoding

**RQB 40 W12 – 110 S 05**



## ■ Applications

- Bus, tram, metro or railway system
- Telecom/datacom system
- Wireless network
- Industrial control facility
- Instrument
- Analyzer
- Highly vibrating, heavily dusty, extremely low or high temperature harsh environment

## ■ GTIN CODE

MW Search: <https://www.meanwell.com/serviceGTIN.aspx>



40W Quarter Brick 14~160Vdc Ultra-wide Input Railway DC-DC Converter

**RQB40W12** series**MODEL SELECTION TABLE**

ORDER NO.	INPUT		OUTPUT		EFFICIENCY (Typ.)	CAPACITOR LOAD (MAX.)	
	INPUT VOLTAGE (RANGE)	INPUT CURRENT		OUTPUT VOLTAGE	OUTPUT CURRENT		
		NO LOAD	FULL LOAD				
RQB40W12-110S05	Nominal 24V,36V,48V,72V,96V,110V (14 ~ 160V)	15mA	420mA	5V	8A	88%	
RQB40W12-110S12		15mA	420mA	12V	3.333A	89%	
RQB40W12-110S24		15mA	420mA	24V	1.667A	88%	
RQB40W12-110S48		15mA	410mA	48V	0.833A	89%	
RQB40W12-110S54		15mA	410mA	54V	0.741A	90%	

SPECIFICATION			
INPUT	VOLTAGE RANGE	14 ~ 160Vdc	
	SURGE VOLTAGE (1s max.)	200Vdc	
	FILTER	Pi type	
	PROTECTION	7A fast acting fuse	
	SETUP TIME	40ms(100% Load at Nominal Vin)	
OUTPUT	VOLTAGE ACCURACY	±1.0%	
	RATED POWER	40W	
	RIPPLE & NOISE Note.2	150mVp-p	
	LINE REGULATION Note.3	±0.2%	
	LOAD REGULATION Note.4	±0.2%	
	SWITCHING FREQUENCY (Typ.)	250KHz	
	EXTERNAL TRIM ADJ. RANGE (Typ.)	±10%	
	HOLD UP TIME	Please refer to page 5 & 6 Hold up time	
PROTECTION	SHORT CIRCUIT	Protection type : Continuous, automatic recovery	
	OVERLOAD	110 ~ 180% rated output power	
		Protection type : Recovers automatically after fault condition is removed	
	OVER VOLTAGE	Protection type : Clamp by zener diode	
	OVER TEMPERATURE	+115°C thermal shutdown, recovers automatically after fault condition is removed	
	UNDER VOLTAGE LOCKOUT (Table 3)	Start-up voltage	13.6V
		Shutdown voltage	12.7V
FUNCTION	REMOTE CONTROL	Power ON: R.C ~ -Vin > 3 ~ 12Vdc or open circuit Power OFF: R.C ~ -Vin < 1.2Vdc or short	
ENVIRONMENT	COOLING	Free-air convection	
	WORKING TEMP.	-40 ~ +90°C (Refer to "Derating Curve")	
	CASE TEMPERATURE	+105°C max.	
	WORKING HUMIDITY	5% ~ 90% RH non-condensing	
	STORAGE TEMP., HUMIDITY	-55 ~ +125°C, 10 ~ 95% RH non-condensing	
	TEMP. COEFFICIENT	0.05% / °C (0 ~ 65°C)	
	SOLDERING TEMPERATURE	1.5mm from case of 3 ~ 5sec./260°C max.	
	VIBRATION	EN61373	
SAFETY & EMC (Note.5)	OPERATING ALTITUDE	3000 meters	
	SAFETY STANDARDS	CB IEC62368-1, UL62368-1, EAC TP TC 020/2011 approved	
	WITHSTAND VOLTAGE	I/P-O/P:3KVDC or 2KVAC	
	ISOLATION RESISTANCE	I/P-O/P:1000M Ohms / 500VDC / 25°C / 70% RH non-condensing	
	ISOLATION CAPACITANCE (Typ.)	1500pF	
	EMC EMISSION	Parameter	Standard
		Conducted	BS EN/EN55032
		Radiated	BS EN/EN55032
	EMC IMMUNITY	Parameter	Standard
		ESD	BS EN/EN61000-4-2
		Radiated Susceptibility	BS EN/EN61000-4-3
		EFT/Burst	BS EN/EN61000-4-4
		Surge	BS EN/EN61000-4-5
		Conducted	BS EN/EN61000-4-6
		Magnetic Field	BS EN/EN61000-4-8
OTHERS	RAILWAY STANDARD	EN50155 / IEC60571 including EN61373 for shock & vibration, EN50121-3-2 for EMC	
	MTBF	205Khrs MIL-HDBK-217F(25°C)	
	DIMENSION (L*W*H)	57.9*36.8*12.7mm (2.28*1.45*0.5 inch)	
	CASE MATERIAL	Aluminum base plate with plastic case	
	PACKING	68g ; 11pcs/per tube, 132pcs/12 tube/per carton	
NOTE	1. All parameters are specified at normal input(110Vdc), rated load, 25°C 70% RH ambient. 2. Ripple & noise are measured at 20MHz by using a 12" twisted pair terminated with a 0.1µF & 47µF capacitor. 3. Line regulation is measured from low line to high line at rated load. 4. Load regulation is measured from 0% to 100% rated load. 5. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies." (as available on <a href="http://www.meanwell.com">http://www.meanwell.com</a> ) ※ Product Liability Disclaimer : For detailed information, please refer to <a href="https://www.meanwell.com/serviceDisclaimer.aspx">https://www.meanwell.com/serviceDisclaimer.aspx</a>		

## External Output Trimming

In order to trim the voltage up or down, one needs to connect the trim resistor either between the trim pin and -Vout for trim\_up or between trim pin and +Vout for trim\_down. The output voltage trim range is -10% to +10%. This is shown in Figures 1 and 2:

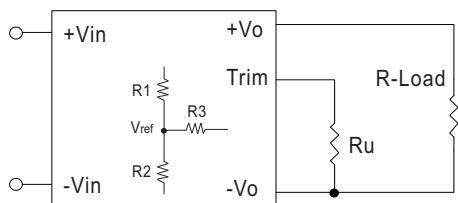


Figure 1. Trim\_up Voltage Setup

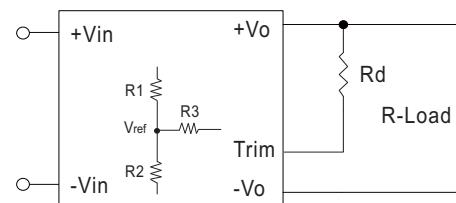


Figure 2. Trim\_down Voltage Setup

### 1. The value of Rtrim\_up defined as:

$$A = \frac{V_{ref}}{V_{o'} - V_{ref}} \times R1$$

$$R_{trim\_up} = \frac{AR2}{R2-A} - R3$$

For example, to trim\_up the output voltage of 5.0V module (RQB40W12-110S05) by 10% to 5.5V, Rtrim\_up is calculated as follows:

$$V_{o,nom} = 5V$$

$$V_{o'} = 5.5V$$

$$V_{ref} = 1.25V$$

$$R1 = 30.3 \text{ k}\Omega$$

$$R2 = 10 \text{ k}\Omega$$

$$R3 = 68 \text{ k}\Omega$$

$$A = \frac{V_{ref}}{V_{o'} - V_{ref}} \times R1$$

$$= \frac{1.25}{5.5 - 1.25} \times 30.3 = 8.911$$

$$R_{trim\_up} = \frac{AR2}{R2-A} - R3$$

$$= \frac{8.911 \times 10}{10 - 8.911} - 68$$

$$= 13.827 \text{ k}\Omega$$

### 2. The value of Rtrim\_down defined as:

$$A = \frac{V_{o'} - V_{ref}}{V_{ref}} \times R2$$

$$R_{trim\_down} = \frac{AR1}{R1-A} - R3$$

For example, to trim\_down the output voltage of 5.0V module (RQB40W12-110S05) by 10% to 4.5V, Rtrim\_down is calculated as follows:

$$V_{o,nom} = 5V$$

$$V_{o'} = 4.5V$$

$$V_{ref} = 1.25V$$

$$R1 = 30.3 \text{ k}\Omega$$

$$R2 = 10 \text{ k}\Omega$$

$$R3 = 68 \text{ k}\Omega$$

$$A = \frac{V_{o'} - V_{ref}}{V_{ref}} \times R2$$

$$= \frac{4.5 - 1.25}{1.25} \times 10 = 2.6 \times 10 = 26$$

$$R_{trim\_down} = \frac{AR1}{R1-A} - R3$$

$$= \frac{26 \times 30.3}{30.3 - 26} - 68$$

$$= 115.2 \text{ k}\Omega$$

Table 1 – Trim\_up and Trim\_down Resistor Values

Model Number	V <sub>o,nom</sub> (V)	V <sub>ref</sub> (V)	R1 (kΩ)	R2 (kΩ)	R3 (kΩ)
RQB40W12-110S05	5	1.25	30.3	10	68
RQB40W12-110S12	12	2.5	12.56	3.3	24.9
RQB40W12-110S24	24	2.5	17.2	2	15
RQB40W12-110S48	48	2.5	36.4	2	15.8
RQB40W12-110S54	54	2.5	41.2	2	15.8

#### Note:

1. Rtrim\_up, Rtrim\_down is mean trim resistor, please check the formula.

2. A & B: user define parameter, no actual meanings.

3. Vo' is target trim voltage.

4. Value for R1, R2, R3 and Vref refer to above table.

### ■ Hold-up Time

As Figure 3 shows, an electrolytic cap (Cbus) about 47μF connected between Vbus and -Vin is necessary. The Vbus can provide or absorb transient power and make the converter operating stable.

In Figure 4 when input voltage is below 56Vdc, the Vbus voltage will keep at 60V. As the input voltage increase and over 60V, the Vbus and Vin will had the same voltage level.

During the transition of different power source, the electric power on the train become unstable in a short time. Such as a sudden voltage drop or a short-term power failure. Under this situation, hold-up time circuit is suitable for this situation.

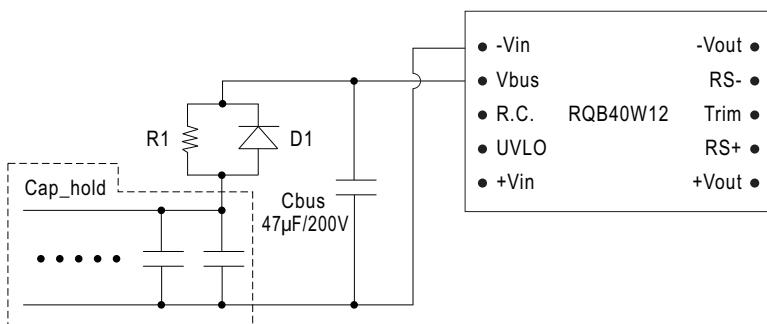


Figure 3 Vbus circuit for hold up Cap

Table 2 – Cap\_hold table (Hold up time)

Nominal Vin	24V	48V	72V	96V	110V
10ms(S2)	800μF	800μF	440μF	180μF	120μF
20ms(S3)	1600μF	1600μF	800μF	440μF	300μF
30ms(C2)	2200μF	2200μF	1200μF	540μF	400μF

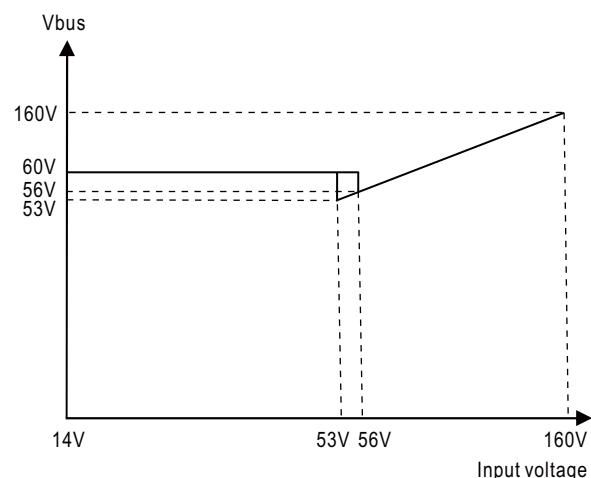


Figure 4 Input and Vbus voltage relationship

As Figure 3 shows, hold-up time circuit comprises R1, D1 and Cap\_hold. The capacity of Cap\_hold decides the hold-up time during interruption of input power. And Table 2 shows the table for Cap\_hold with different input voltage. For Example, if input voltage is 24V, and output load is full load. The Cap\_hold need 800μF for hold-up 10ms.

During start up, R4 endures a high pulse power, and should be selected carefully. The power is related to Vbus and Cap\_hold. We recommend to use 25 ohm/10W resistor.

## ■ UVLO

The under voltage threshold can be set by external resistor placed between the UVLO and -Vin. (Please refer to Table 3)

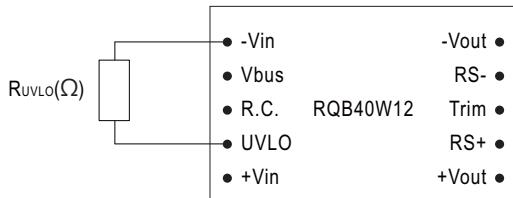
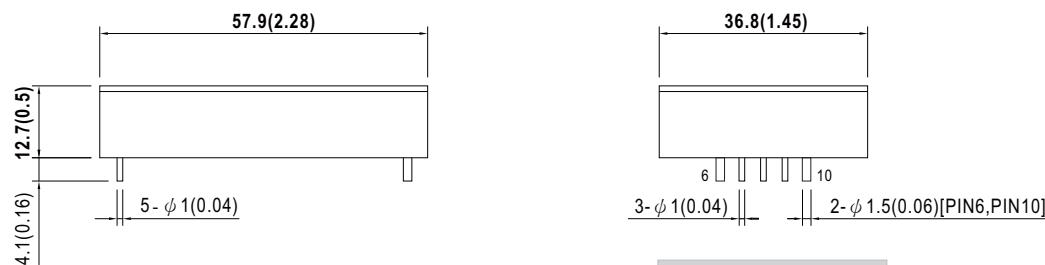


Table 3 – UVLO

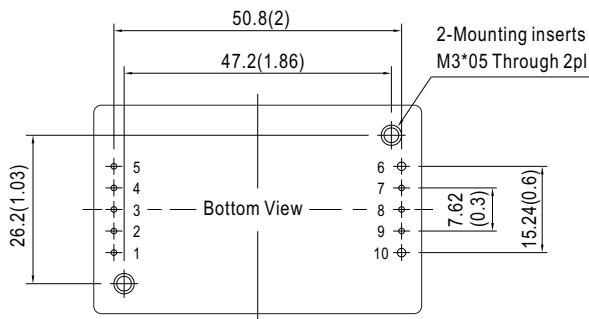
UVLO External Resistor $R_{UVLO}(\Omega)$	OPEN	140K	62K
Shutdown	12.7V	19.6V	26.3V
Start up	13.6V	20.4V	27.3V

## ■ Mechanical Specification

- All dimensions in mm(inch)
- Tolerance:  $x.x \pm 0.5\text{mm}$  ( $x.x \pm 0.02\text{"}$ )
- $x.xx \pm 0.25\text{mm}$  ( $x.xx \pm 0.01\text{"}$ )
- Pin size is:  $1.x \pm 0.1\text{mm}$  ( $0.04\text{"} \pm 0.005\text{"}$ )

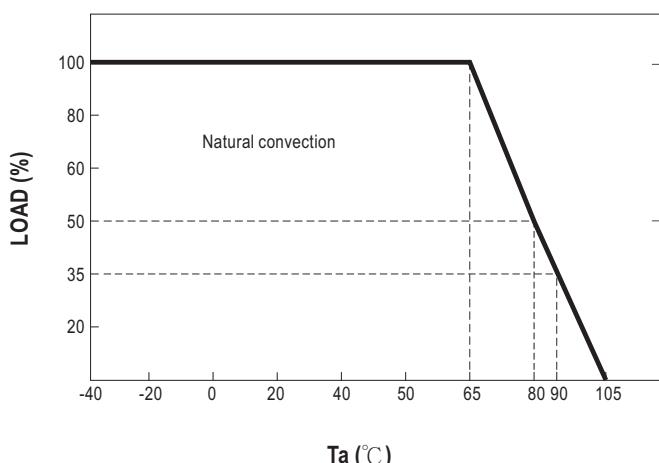


## ■ Plug Assignment



Pin-Out			
Pin No.	Output	Pin No.	Output
1	+Vin	6	-Vout
2	UVLO	7	RS-
3	Remote ON/OFF	8	Trim
4	Vbus	9	RS+
5	-Vin	10	+Vout

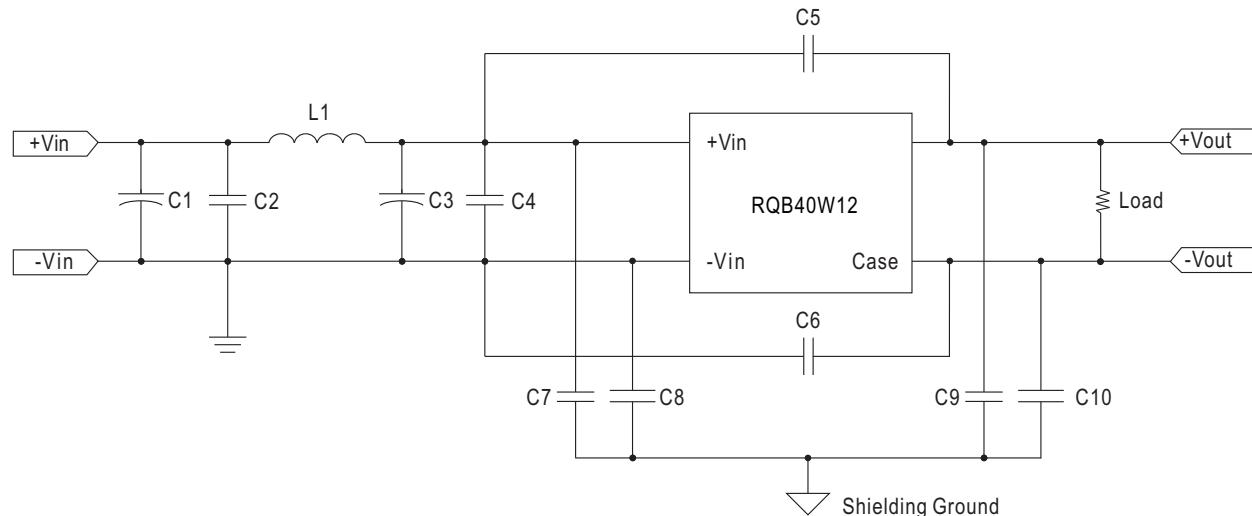
## ■ Derating Curve



**EMC Suggestion Circuit**

※ EMI Test standard: BS EN/EN55032 Class A Output Conducted & Radiated Emission are as below:

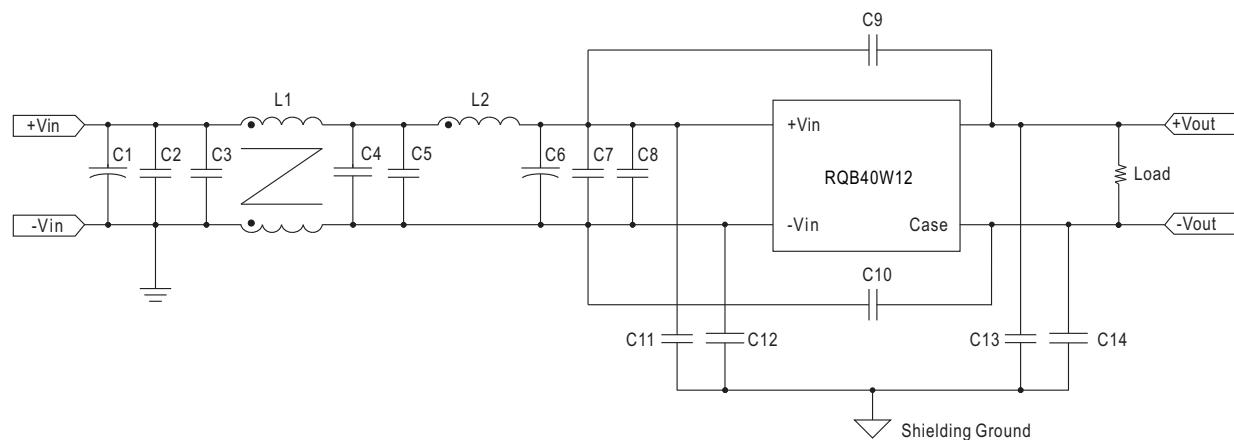
(Test Condition: Input Voltage: 110Vdc, Output Load: Full Load)



Model No.	BS EN/EN55032 Class A						
	C1	C2,4	C3	C5	C6	C7,8,9,10	L1
RQB40W12-110S05	100μF/200V Aluminum Cap.	0.68μF/250V Ceramic Cap.	47μF/200V Aluminum Cap.	1000pF/3KV	1000pF/3KV Ceramic Cap.	1000pF/2KV Ceramic Cap.	10μH GSTD1265PE-100M
RQB40W12-110S12				2200pF/3KV Ceramic Cap.			
RQB40W12-110S24							
RQB40W12-110S48							
RQB40W12-110S54							

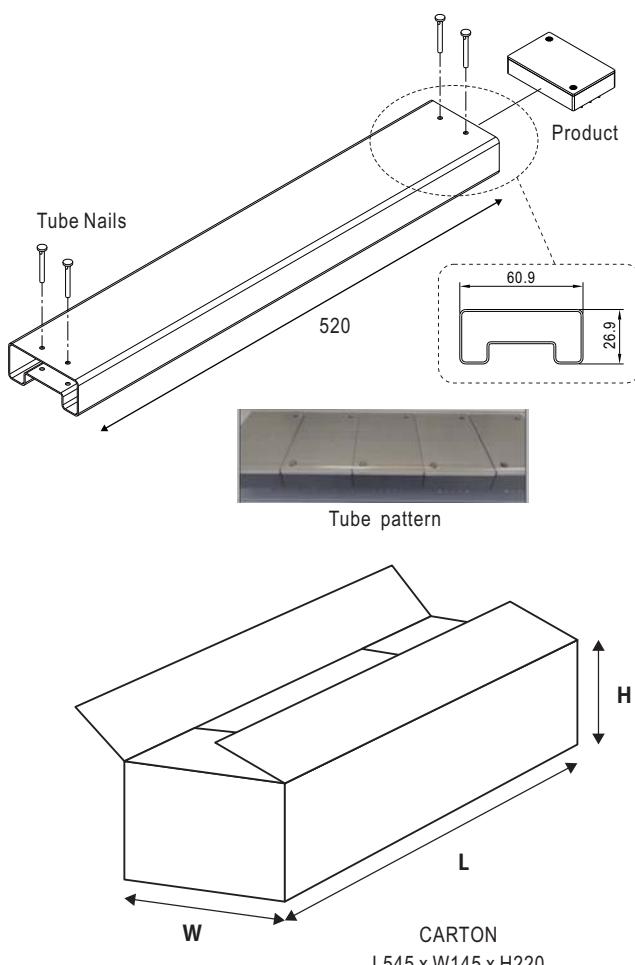
※ EMI Test standard: BS EN/EN55032 Class B Output Conducted & Radiated Emission are as below:

(Test Condition: Input Voltage: 110Vdc, Output Load: Full Load)



Model No.	BS EN/EN55032 Class B							
	C1	C2,3,4,5,7,8	C6	C9	C10	C11,12,13,14	L1	L2
RQB40W12-110S05	100μF/200V Aluminum Cap.	0.68μF/250V Ceramic Cap.	47μF/200V Aluminum Cap.	2200pF/3KV	3300pF/2KV	1000pF/3KV Ceramic Cap.	Common Choke A10 T16x12x8C 2.2mH±35%	4.7μF GSTD1265PE 4R7M
RQB40W12-110S12				2200pF/3KV Ceramic Cap.	4700pF/2KV Ceramic Cap.			
RQB40W12-110S24								
RQB40W12-110S48								
RQB40W12-110S54				1000pF/3KV				

**■ Packing**

Standard Tube Packing	MPQ Per Tube (PCS)	One Tube G.W.	Max. Q'TY/ Carton(PCS)	One Carton G.W.
<p>Unit : mm</p>  <p>Product</p> <p>Tube Nails</p> <p>520</p> <p>60.9</p> <p>26.9</p> <p>Tube pattern</p> <p>CARTON L545 x W145 x H220</p>	11	880g	132	10.88Kg

**■ Installation Manual**

Please refer to : <http://www.meanwell.com/manual.html>