

ORCY-50U12x

Isolated DC-DC Converter

The ORCY-50U12x is part of the isolated dc/dc converters that operate from a wide input range (18 Vdc - 75 Vdc) and can cover both 24 Vin and 48 Vin input range. These units will provide up to 60 W of output power. They are designed to be highly efficient and low cost. Features include remote on/off, over current protection, over voltage shut down, over temperature protection and under-voltage lockout. These converters are provided in an industry standard 1/8 brick package.

Key Features & Benefits

- Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (330 kHz)
- Input Under Voltage Lockout
- Input Over Voltage Lockout
- Ultra Wide Input Range: 18 Vdc - 75 Vdc
- Output Over-Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Low Cost
- Output Voltage Trim
- Positive/Negative Remote Sense
- Remote On/Off
- Basic Isolation
- Approved to UL/CSA/IEC 62368-1 (TBD)
- 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 |
|----------------------------|----------------|---------------|---------------------|-------------------|--------------------|
| ORCY-50U120 ORCY-50U12L | 12 VDC | 18 – 75 VDC | 5 A | 60 W | 89% |

NOTE: 1. Add “G” suffix at the end of the model number to indicate Tray Packaging.

PART NUMBER EXPLANATION

| 0 | R | CY | - | 50 | U | 12 | x | G |
|--------------------|-------------|-------------------------|---|--------------|-------------|----------------|------------------------------------|------------------|
| Mounting Type | RoHS Status | Series Name | | Output Power | Input Range | Output Voltage | Active Logic | Package Type |
| Through hole mount | RoHS | 1/8 th Brick | | 60 W | 18 – 75 V | 12 V | 0 – active high, L – active low | G – Tray package |

2. ABSOLUTE MAXIMUM RATINGS

| PARAMETER | DESCRIPTION | MIN | TYP | MAX | UNITS |
|---------------------------|-------------|------|-----|------|-------|
| Input Voltage(continuous) | | -0.3 | - | 80 | V |
| Remote On/Off | | -0.3 | - | 18 | V |
| I/O isolation voltage | | - | - | 1500 | V |
| 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 |
|--|---|------|-------|------|------------------|
| Input Voltage | | 18 | 24/48 | 75 | V |
| Input Current (full load) | V _{in} =18 V | - | - | 3.8 | A |
| | V _{in} =75 V | - | - | 1.0 | A |
| Input Current (no load) | | - | 100 | 180 | mA |
| Remote Off Input Current | | - | 10 | 15 | mA |
| Input Reflected Ripple Current (rms) | Tested with simulated source impedance of 10 uH, 5 Hz to 20 MHz; use a 1 uF/100 V ceramic cap and a 100 uF/100 V electrolytic cap with ESR = 1 ohm max. at 200 kHz at 25°C. | - | 2 | 5 | mA |
| Input Reflected Ripple Current (pk-pk) | | - | 15 | 20 | mA |
| I _{2t} Inrush Current Transient | | - | 0.05 | 0.1 | A ² s |
| Turn-on Voltage Threshold | | 16.5 | 17.0 | 17.5 | V |
| Turn-off Voltage Threshold | | 15.5 | 16.0 | 16.5 | V |
| Input Over Voltage Lockout | | 76 | 78 | 80 | 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 25°C unless otherwise stated.

| PARAMETER | DESCRIPTION | MIN | TYP | MAX | UNIT |
|--|---|-------|-------|-------|------------------|
| Output Voltage Set Point | V _{in} =48V, I _o =50% load | 11.76 | 12.00 | 12.24 | V |
| Load Regulation | | - | ±6 | ±12 | mV |
| Line Regulation | | - | ±12 | ±24 | mV |
| Regulation Over Temperature (-40deg.C ~ +85deg.C) | | - | ±30 | ±50 | mV |
| Output Ripple and Noise (rms) | 0-20 MHz BW, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at the output. | - | 30 | 50 | mV |
| Output Ripple and Noise (pk-pk) | | - | 100 | 150 | mV |
| Output Current Range | | 0 | - | 5 | A |
| Output DC Current Limit | | 6 | - | 9 | A |
| Short Circuit Surge Transient | | - | 3 | 5 | A ² s |
| Turn-On Time | | 10 | 20 | 30 | ms |
| Overshoot at Turn on | | - | 0 | 3 | % |
| Output Capacitance | | 0 | - | 1000 | µF |
| Transient Response | | | | | |
| ΔV 75%~50% of Max Load | | - | 300 | 400 | mV |
| Settling Time | di/dt=1 A/us, V _{in} =24 Vdc, T _a =25 °C, with a 0.1 µF ceramic cap and a 10 µF tantalum cap at output. | - | 100 | 150 | us |
| ΔV 75%~50% of Max Load | | - | 300 | 400 | mV |
| Settling Time | | - | 100 | 150 | us |

5. GENERAL SPECIFICATIONS

All specifications are typical at 25°C unless otherwise stated.

| PARAMETER | DESCRIPTION | MIN | TYP | MAX | UNIT |
|----------------------------------|--|------|-----------------------|------|------|
| Efficiency | V _{in} =24 V | 87.5 | 89 | - | % |
| | V _{in} =48 V | 85.5 | 87 | - | |
| Switching Frequency | | 310 | 330 | 350 | kHz |
| Remote Sense Compensation | The total voltage increased by trim and remote sense should not exceed 15%V _o . | - | - | 10 | % |
| Output Voltage Trim Range | | 80 | - | 110 | % |
| Over Temperature Protection | | - | 125 | - | °C |
| Over Voltage Protection | V _{in} =48 V, full load, in Hiccup mode. | - | - | 13.8 | V |
| MTBF | Calculated Per Bell Core SR-332 (I _o =80%load, T _a = 25 °C) | - | 1,867,232 | - | hour |
| Weight | | - | 31.2 | - | g |
| Dimensions | | | | | |
| Inches (L x W x H) | | | 2.30 x 0.896 x 0.47 | | INCH |
| Millimeters (L x W x H) | | | 58.42 x 22.76 x 11.94 | | mm |
| Isolation Characteristics | | | | | |
| I/O isolation voltage | | - | - | 1500 | Vdc |
| Isolation Capacitance | | - | 1500 | - | pF |

6. EFFICIENCY DATA

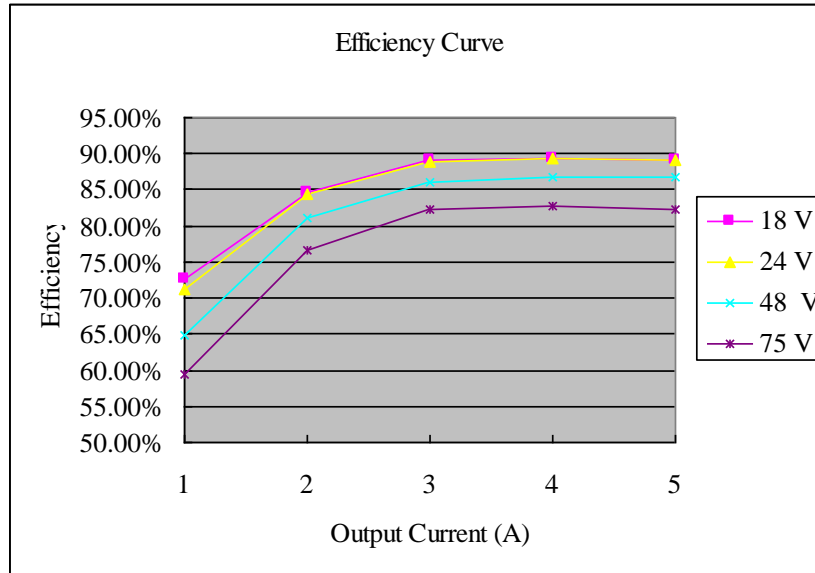


Figure 1. Efficiency curve

7. REMOTE ON/OFF

| PARAMETER | | DESCRIPTION | MIN | TYP | MAX | UNIT |
|------------------------|-------------|--|------|-----|------|------|
| Signal Low (Unit On) | Active Low | ORCY-50U12L. The remote on/off pin open, Unit off. | -0.3 | - | 0.8 | V |
| Signal High (Unit Off) | | | 2.4 | - | 18 | V |
| Signal Low (Unit Off) | Active High | ORCY-50U12O. The remote on/off pin open, Unit on. | -0.3 | - | 0.8 | V |
| Signal High (Unit On) | | | 2.4 | - | 18 | V |
| Current Sink | | | 0 | - | 0.75 | mA |

8. OUTPUT TRIM EQUATIONS

Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and GND pin. The Trim Up resistor should be connected between the Trim pin and the Vout pin. Only one of the resistors should be used for any given application.

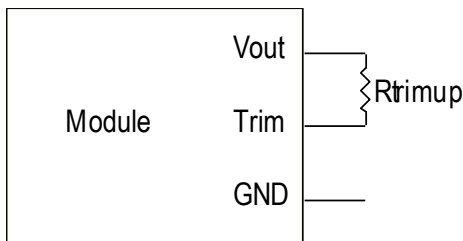


Figure 2.

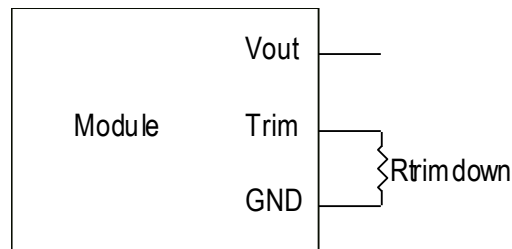


Figure 3.

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22 [k\Omega]$$

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \delta} - 10.22 [k\Omega]$$

Note:

$$\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100 [\%]$$

V_o_{req} = Desired (trimmed) output voltage [V]

Output voltage V_o = 12.00 V

9. RIPPLE AND NOISE WAVEFORM

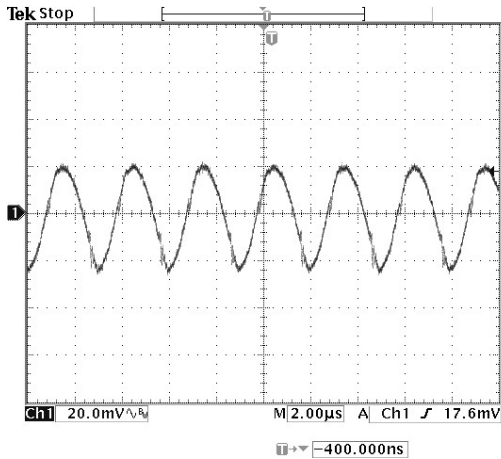


Figure 4.
24 Vdc input, 12 Vdc/5 A output

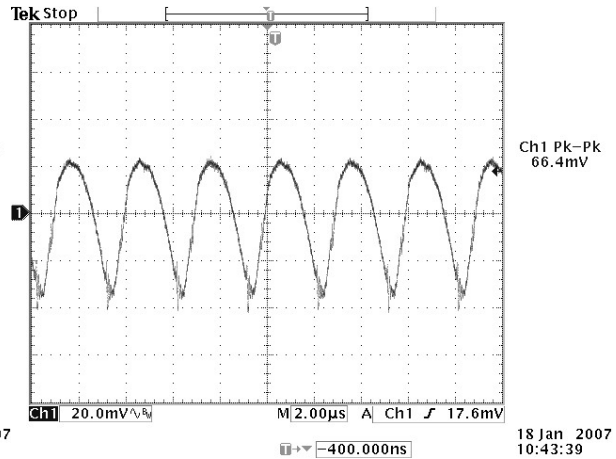


Figure 5.
48 Vdc input, 12 Vdc/5 A output

Note: Ripple and noise at full load, 0-20 MHz BW, with a 0.1 uF ceramic cap and a 10 uF tantalum cap at the output, and Ta=25 deg C.

10. THERMAL DERATING CURVES

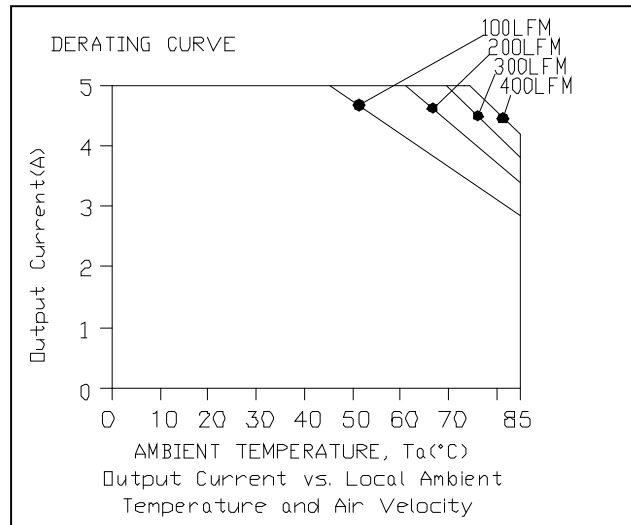


Figure 6.

$V_{in}=24V, V_o=12V$; Maximum FET junction temperature derated to 120 C

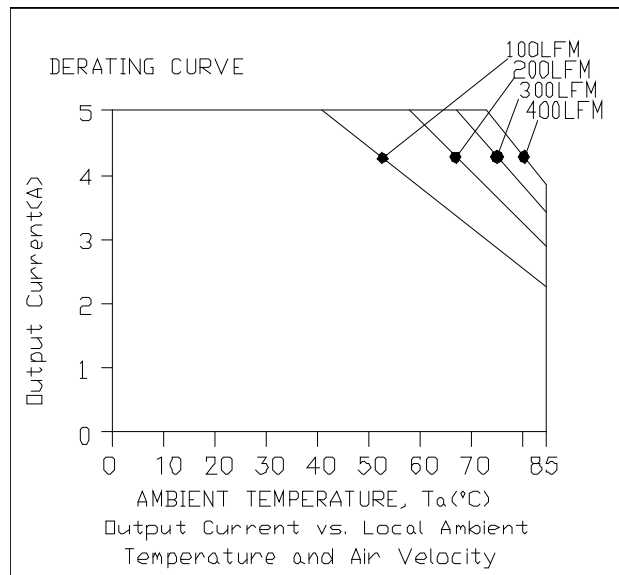


Figure 7.

$V_{in}=48V, V_o=12V$; Maximum FET junction temperature derated to 120 C

11. TRANSIENT RESPONSE WAVEFORMS

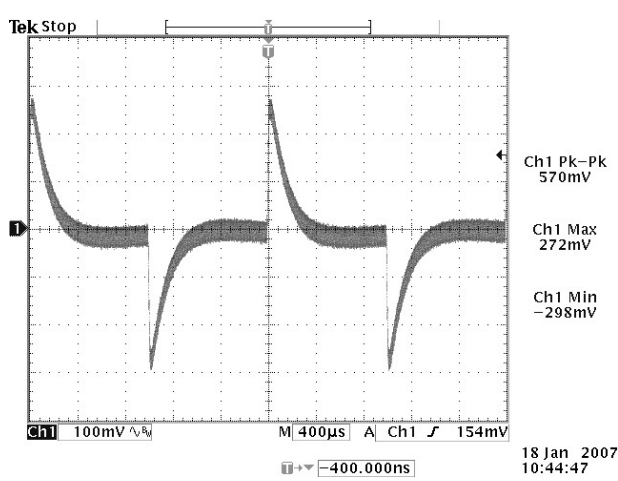


Figure 8.

50%-75%-50% Load Transients at $V_{in}=24\text{ V}$

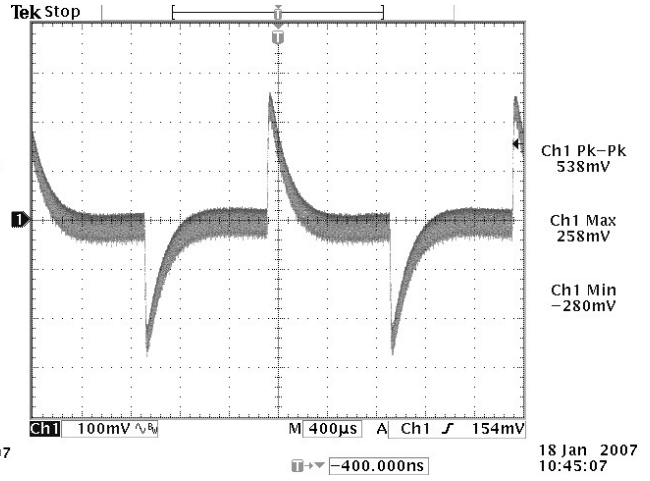


Figure 9.

50%-75%-50% Load Transients at $V_{in}=48\text{ V}$

Note: Transients Response at $di/dt=1\text{ A}/\mu\text{s}$, with a $0.1\ \mu\text{F}$ ceramic cap and a $10\ \mu\text{F}$ tantalum cap at output, and $T_a=25\text{ deg C}$.

12. MECHANICAL DIMENSIONS

OUTLINE

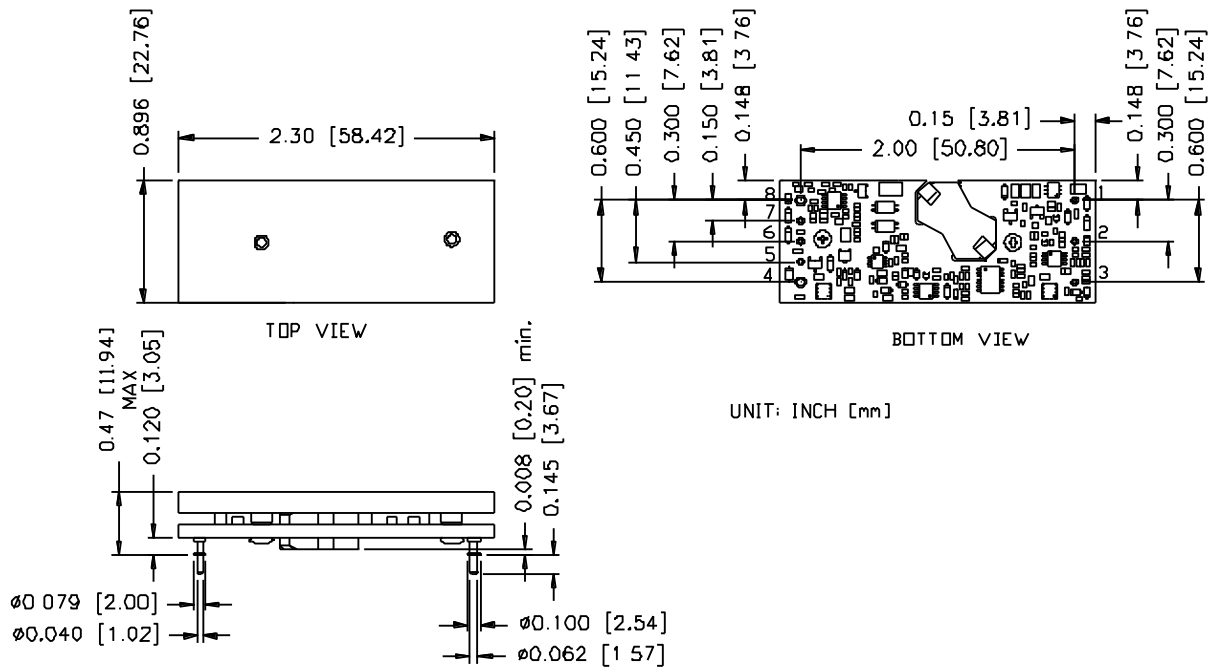


Figure 10. Outline

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 – 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

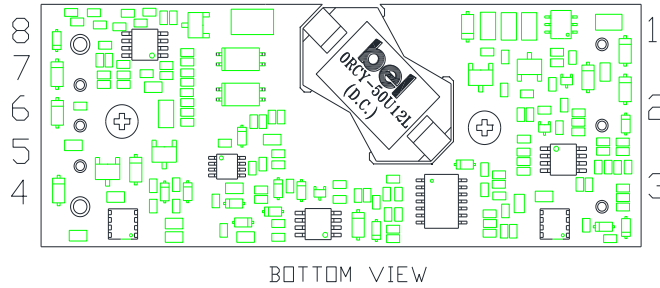
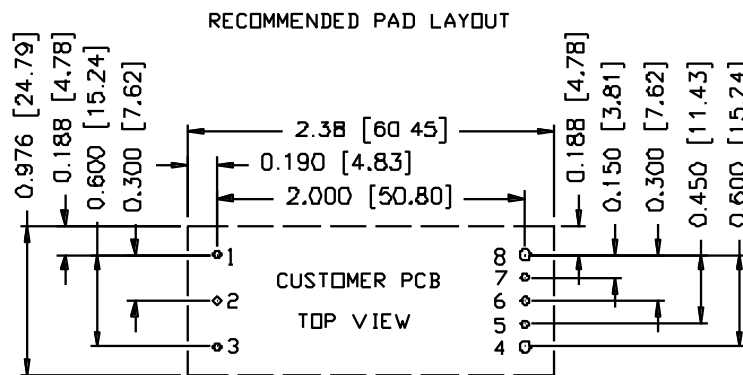


Figure 11. Bottom view

| PIN | NAME | FUNCTION | PIN DIA |
|-----|---------|--|---------|
| 1 | Vin(+) | Positive input voltage | 0.040" |
| 2 | On/Off | Input to turn converter on and off, referenced to Vin- | 0.040" |
| 3 | Vin(-) | Negative input voltage | 0.040" |
| 4 | Vout(-) | Negative output voltage | 0.062" |
| 5 | Sense- | Negative remote sense | 0.040" |
| 6 | Trim | Output voltage trim | 0.040" |
| 7 | Sense+ | Positive remote sense | 0.040" |
| 8 | Vout(+) | Positive output voltage | 0.062" |

- Notes:**
1. Pin 5 must be connected to Vout-.
 2. Leave Pin 6 open for nominal voltage.
 3. Pin 7 must be connected to Vout+.

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

Figure 12. Recommended pad layout



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13. REVISION HISTORY

| DATE | REVISION | CHANGES DETAIL | APPROVAL |
|------------|----------|--|----------|
| 2006-11-27 | VP1 | First release | X.Ye |
| 2007-01-19 | A | 1.Add efficiency data; 2. Change test condition; 3.Change output capacitance; 4.Change efficiency; 5.Add NR; 6.Add TR; 7.Add TD. | X.Ye |
| 2007-01-23 | B | 1.Update the thermal derating curve. | X.Ye |
| 2007-05-10 | C | 1.Continuous Input Voltage; 2.Output Ripple and Noise; 3.Output DC Current Limit; 4.Turn on Time; 5.Overshoot at Turn on; 6.Transient Response; 7.Efficiency; 8.EFFICIENCY CURVE | WQ.Zeng |
| 2007-06-21 | D | 1.Test condition of input reflected ripple;2.An exchange of the TD curves;3.Input Reflected Ripple Current | WQ.Zeng |
| 2007-06-28 | E | 1.Add MTBF | WQ.Zeng |
| 2019-06-18 | AF | Update to new form | F.Tao |

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

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