

PFE1100-12-054xD

DC-DC Front-End Power Supply

The PFE1100-12-054xD is a 1100 watt DC to DC power supply that converts DC input into a main output of 12 VDC for powering intermediate bus architectures (IBA) in high performance and reliability servers, routers, and network switches.

The PFE1100-12-054xD meets international safety standards and displays the CE-Mark for the European Low Voltage Directive (LVD).





Key Features & Benefits

- High efficiency up to 94% at 50% load
- Wide input voltage range: 40 72 VDC
- Always-On 16.5 W programmable standby output (3.3 / 5 V)
- Hot-plug capable
- Parallel operation with active digital current sharing
- High density design: 25.6 W/in³
- Small form factor: 321.5 x 54.5 x 40 mm (12.66 x 2.14 x 1.57 in)
- I²C communication interface for control, programming and monitoring with PSMI and Power Management Bus protocol
- Overtemperature, output overvoltage and overcurrent protection
- 256 Bytes of EEPROM for user information
- 2 Status LEDs: IN OK and OUT OK with fault signaling

Applications

- High Performance Servers
- Routers
- Switches



1. ORDERING INFORMATION

| PFE | 1100 | | 12 | | 054 | x | D |
|-----------------------|-------------|------|-----------|------|-------|---|-------|
| Product Family | Power Level | Dash | V1 Output | Dash | Width | | Input |
| PFE Front-Ends | 1100 W | | 12 V | | 54 mm | N: Normal air flow R: Reverse air flow S: Screw type input connector / normal air flow T: Screw type input connector / reverse air flow | D: DC |

2. INPUT SPECIFICATIONS

General Condition: $T_A = 0...45$ °C unless otherwise specified.

| PARAMETER | | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNIT |
|-------------------------------|-------------------------------------|---|-----|------|-----|-------|
| V i nom | Nominal input voltage | | | 53 | | VDC |
| Ví | Input voltage ranges | Normal operating (V_{min} to V_{max}) | 40 | | 72 | VDC |
| / max | Max input current | | | | 33 | Arms |
| √ip | Inrush Current Limitation | $V_{i \min}$ to $V_{i \max}$ | | | 60 | A_p |
| $V_{\mathrm{i}\ \mathrm{on}}$ | Turn-on input voltage ¹ | Ramping up | 42 | | 45 | VDC |
| V i off | Turn-off input voltage ¹ | Ramping down | 37 | | 40 | VDC |
| | | $V_{1 \text{ nom}}$, $0.1 \cdot k_{1 \text{ nom}}$, $V_{2 \text{ nom}}$, $V_{2 \text{ nom}}$, $V_{3 \text{ nom}}$ | | 89.3 | | |
| n | Efficiency without fan | $V_{1 \text{ nom}}$, $0.2 \cdot k_{1 \text{ nom}}$, $V_{2 \text{ nom}}$, $V_{3 \text{ nom}}$, $V_{4 \text{ nom}}$ | | 93.5 | | % |
| " | η Efficiency without fan | $V_{1 \text{ nom}}$, $0.5 \cdot k_{1 \text{ nom}}$, $V_{2 \text{ nom}}$, $V_{3 \text{ nom}}$, $V_{4 \text{ nom}}$ | | 95 | | 70 |
| | | $V_{1 \text{ nom}}$, $V_{x \text{ nom}}$, $V_{x \text{ nom}}$, $T_{A} = 25 \text{ °C}$ | | 92.9 | | |
| \mathcal{T}_{hold} | Hold-up Time | $V_1 > 10.8 \text{ V}$, V _{SB} within regulation, $V_1 = 53 \text{ VDC}$, $P_{x \text{ nom}}$ | 5 | | | ms |

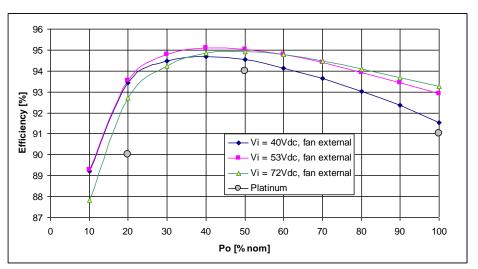


Figure 1. Efficiency

¹ The Front-End is provided with a minimum hysteresis of 3 V during turn-on and turn-off within the ranges.



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3. OUTPUT SPECIFICATIONS

General Condition: $T_A = 0... 45^{\circ}C$ unless otherwise specified.

| Main Output VI Minor | PARAM | IETER | CONDITIONS / DESCRIPTION | | MIN | NOM | MAX | UNIT |
|--|----------------------|-----------------------------|---|--------------------------------------|------|------|--------|-----------------------------|
| V _{1 set} Output Setpoint Accuracy 0.5 · Anom. Temb = 25 °C -0.5 · Anom. Nominal Output Power V I = 12 VDC 1080 · W V I nom. Nominal Output Current V = 12 VDC 1080 · W V ADC ADC V Moninal Output Current V = 12 VDC 90 · ADC ADC ADC V Moninal Output Current V = 12 VDC 90 · ADC | Main Ou | utput V ₁ | | | | | | |
| VI set Output Setpoint Accuracy -0.5 % N resm d N to to Total Regulation V min to V max, 0 to 100% h nom, 7a min to 7a max -1 +1 % V row Λ nom Nominal Output Current V = 12 VDC 1080 W N so Output Ripple Voltage V row, 20 MHz BW, 150 90 ADC V so Output Ripple Voltage V row, 20 MHz BW, 150 150 mVpp d N Load Load Regulation V = V row, 0 - 100 % h row 80 mV M Name Current Limitation V = V row, 0 - 100 % h row 10 mV M row Current Sharing Deviation from A tot / N h > 10% -53 43 A d Vay Dynamic Load Regulation Δh = 50% h row, h = 5 100% h row, 1 -0.6 0.6 V T rec Recovery Time dh/d = 1 A/µs, recovery within 1% of V row 1 10 ms Ab = 50% h row, h row V = 1090% N row 1 10 ms No Ac to set Start-Up Time From DC V = 1090% N row VSB_SEL = 1 3.3 | V _{1 nom} | Nominal Output Voltage | 0.5./. T 25.°C | | | 12 | | VDC |
| Prinom Nominal Output Power V = 12 VDC 1080 W Λ rom Nominal Output Current V = 12 VDC 90 ADC N rip Output Ripple Voltage Vrem. A rom. 20 MHz BW, rom. 4 rom. 150 mVpp dV Lipe Load Regulation V = Vrem. 0 - 100 % A rom. 80 mV dV Lipe Line Regulation V = Vrem. Limitation V = Vrem. Limitation 95 105 ADC dAnax Current Sharing Deviation from A tax! / N, A > 10% -3 43 A dVgn Dynamic Load Regulation ΔA = 50% A rom. A = 5 100% A rom. -0.6 0.6 V Tree Recovery Time ΔA = 50% A rom. A = 5 100% A rom. -0.6 0.6 V A rome Rise Time V = 1090% Viron 1 10 ms Acovid Capacitive Loading 7 = 25 °C VSB_SEL = 1 3.3 VDC VBs non Nominal Output Voltage 0.5 ½s rom. Tamb = 25 °C VSB_SEL = 0 5 40.5 W VBs strom Nominal Out | V _{1 set} | Output Setpoint Accuracy | 0.5 71 nom, 7amb = 25 C | | -0.5 | | +0.5 | % V _{1 nom} |
| A nom Nominal Output Current V = 12 VDC 90 ADC ν pp Output Ripple Voltage 10 mm, arom, 20 MHz BW, 10 mm, arom, aro | $d V_{1 tot}$ | Total Regulation | $V_{i min}$ to $V_{i max}$, 0 to 100% $A_{i nom}$, $T_{a n}$ | nin to $\mathcal{T}_{a \text{ max}}$ | -1 | | +1 | % <i>V</i> _{1 nom} |
| V pp Output Ripple Voltage V nom, A nom, 20 MHz BW, 10n6/16V/XTR/1210 + 10u6/16V at V 150 mVp d V Load Load Regulation V = V mom, 0 - 100 % h nom 80 mV d V Load Line Regulation V = V mom, 0 - 100 % h nom 10 mV d Minax Current Limitation 95 105 ADC d Abause Current Sharing Deviation from A last / N, A > 10% -3 +3 A d Mom Dynamic Load Regulation ΔA = 50% h nom, A = 5 1000% h nom, a - 0.6 0.6 V Trec Recovery Time ΔA = 50% h nom, A = 5 1000% h nom, a - 0.6 0.6 V Mot vi Start-Up Time From DC V = 10.8 VDC 2 sec M1 nee Rise Time V = 10.8 VDC 2 sec M1 nee Rise Time V = 10.8 VDC 2 sec M1 nee Rise Time V = 10.8 VDC 3.3 VDC VSB nom VSB _ SEL = 1 3.3 VDC VSB nom VSB _ SEL = 1 3.3 VDC <td< td=""><td>P_{1 nom}</td><td>Nominal Output Power</td><td>V₁ = 12 VDC</td><td></td><td></td><td>1080</td><td></td><td>W</td></td<> | P _{1 nom} | Nominal Output Power | V ₁ = 12 VDC | | | 1080 | | W |
| V P | A nom | Nominal Output Current | V₁ = 12 VDC | | | 90 | | ADC |
| d V Line Line Regulation N = Minimal Minimal 10 mV Λ max Current Limitation 95 105 ADC d Monard Current Sharing Deviation from Λ tot / N, Λ > 10% -3 +3 A d Voyn Dynamic Load Regulation ΔΛ = 50% Λ nom, Λ = 5 100% Λ nom, -0.6 0.6 V Tree Recovery Time dΛ/d = 1 A/μs, recovery within 1% of 14 nom 1 ms 1 ms Δc V1 Start-Up Time From DC V = 10.8 VDC 2 sec Minimal Dutput Dimer From DC 1 10 ms ΔL V1 Start-Up Time From DC V = 10.8 VDC 2 sec Minimal Dutput Voltage 1 10 ms ΔL V2 Start-Up Time From DC V = 10.8 VDC VSB_SEL = 1 3.3 VDC VDC VSB_SEL VSB_SEL = 1 3.3 VDC VDC VSB_SEL VSB_SEL = 0 5 VDC VSB_SEL VDC VSB_SEL = 0 5 VDC VSB_SEL VSB_SEL = 0 1 16.5 W < | V 1 pp | Output Ripple Voltage | | at 1/1 | | | 150 | mVpp |
| A max Current Limitation 95 105 ADC d β name Current Sharing Deviation from A tot / N, A > 10% -3 +3 A d Woyn Dynamic Load Regulation ΔA = 50% A nom, A = 5 100% A nom, d / M/d = 1 A/μs, recovery within 1% of M nom -0.6 0.6 V Tree Recovery Time ΔA = 50% A nom, A = 5 100% A nom, d / M/d = 1 A/μs, recovery within 1% of M nom -0.6 0.6 V Act v1 Start-Up Time From DC M = 10 90% M nom, d / M nom, d / M nom 1 1 ms Act v1 Start-Up Time From DC M = 10 90% M nom 1 10 ms Closed Capacitive Loading Ta = 25 °C VSB_SEL = 1 10 10 ms Standby Output Vsts Vsb set Output Vstage VSB_SEL = 1 3.3 VDC Vsb set Output Setpoint Accuracy Vsb senom, Tambe = 25 °C VSB_SEL = 0 / 1 -0.5 40.5 % Nome Vsb set Output Setpoint Accuracy Vsb SES = 0 / 1 -0.5 40.5 % Nome Vsb set Output Setpoint | $dV_{1 Load}$ | Load Regulation | $V_i = V_{i \text{ nom}}, 0 - 100 \% h_{i \text{ nom}}$ | | | 80 | | mV |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | d V₁ Line | Line Regulation | $V_i = V_i _{min} V_i _{max}$ | | | 10 | | mV |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | I₁ max | Current Limitation | | | 95 | | 105 | ADC |
| Troc Recovery Time dh/dz 1 A/μs, recovery within 1% of V nom 1 ms | d/ _{share} | Current Sharing | Deviation from h_{tot} / N, $h > 10\%$ | | -3 | | +3 | Α |
| | $d V_{dyn}$ | Dynamic Load Regulation | $\Delta h = 50\% h \text{ nom}, h = 5 \dots 100\% h$ | nom, | -0.6 | | 0.6 | V |
| | \mathcal{T}_{rec} | Recovery Time | $dh/dt = 1 A/\mu s$, recovery within 19 | % of V₁ nom | | | 1 | ms |
| C_Load Capacitive Loading Ta = 25 °C 10 000 μF Standby Output VsB VSB nom Nominal Output Voltage VSB_SEL = 1 3.3 VDC VSB_set Output Setpoint Accuracy VSB_SEL = 0 / 1 -0.5 +0.5 % If nom dVsB tot Total Regulation Vmin to Vmax, 0 to 100% &B nom, 7a min to 7a max -2 +2 % VsBnom PsB nom Nominal Output Power VSB_SEL = 0 / 1 16.5 W MsB nom Nominal Output Current VsB = 3.3 VDC 5 ADC VsB = 5.0 VDC 3.3 ADC VsB = 5.0 VDC 3.3 ADC VsB = 5.0 VDC 3.3 ADC VsB pom VsB_SEL = 1 67 mV d VsB pom VSB_SEL = 1 67 mV MSB nom VSB_SEL = 1 67 mV VsB_SEL = 0 VSB_SEL = 0 3.45 4.3 ADC As max VSB_SEL = 1 5.25 6 ADC VsB_SEL = 0 VsB_SEL = 0 | <i>t</i> AC V1 | Start-Up Time From DC | V₁ = 10.8 VDC | | | | 2 | sec |
| Standby Output VsB VsB nom Nominal Output Voltage VSB_SEL = 1 3.3 VDC VsB set Output Setpoint Accuracy VSB_SEL = 0 / 1 -0.5 +0.5 % Vnoc V/sB set Output Setpoint Accuracy VSB_SEL = 0 / 1 -0.5 +0.5 % Vnoc dV/sB tot Total Regulation V min to V max, 0 to 100% kB nom, 7a min to 7a max -2 +2 % VsBnom RB nom Nominal Output Power VSB_SEL = 0 / 1 16.5 W MB nom Nominal Output Current VsB = 3.3 VDC 5 ADC MSB nom Nominal Output Current VsB = 5.0 VDC 3.3 ADC VSB pp Output Ripple Voltage VsB nom, &B nom, 20 MHz BW, 10nF/16V/X7R/1210 + 10uF/16V at VsB 100 mVpp dVsB Droop 0 - 100 % kB nom VSB_SEL = 1 67 mV VSB_SEL = 0 VSB_SEL = 0 44 mV MSB max Current Limitation VsB_SEL = 0 3.45 4.3 ADC VSB_SEL = 0 VsB_SEL = 0 3.45 4.3 < | t _{V1 rise} | Rise Time | $V_1 = 1090\% \ V_{1 \text{ nom}}$ | | 1 | | 10 | ms |
| VSB nom Nominal Output Voltage VSB_SEL = 1 3.3 VDC VSB set Output Setpoint Accuracy 0.5 ⋅ ks nom, Tamb = 25 °C VSB_SEL = 0 / 1 -0.5 +0.5 % Vnom dVsB tot Total Regulation V.min to V.max, 0 to 100% ks nom, Tamin to Tamax -2 +2 % VsBnom Ass nom Nominal Output Power VSB_SEL = 0 / 1 16.5 W √sB nom Nominal Output Current VsB = 3.3 VDC 5 ADC √sB = 5.0 VDC 3.3 ADC √sB nom, ks nom, 20 MHz BW, 10nF/16V/X7R/1210 + 10uF/16V at VsB 100 mVpp d VsB Droop 0 - 100 % ks nom VSB_SEL = 1 67 mV √sB max Current Limitation VSB_SEL = 1 5.25 6 ADC √sB max Current Limitation VSB_SEL = 0 3.45 4.3 ADC √sB max Dynamic Load Regulation ΔsB = 50% kB nom, kB = 5 100% kB nom, and black in the first interesting the form DC Input VsB = 90% VsB nom -3 3 % VsB nom Δc vsB Start-Up Time from DC Input VsB = 90% VsB no | C_{Load} | Capacitive Loading | <i>T</i> _a = 25 °C | | | | 10 000 | μF |
| VSB nom Nominal Output Voltage 0.5 · ks nom, Tamb = 25 °C VSB_SEL = 0 5 VDC VSB set Output Setpoint Accuracy VSB_SEL = 0 / 1 -0.5 +0.5 % Vinor dVsB tot Total Regulation V min to V max, 0 to 100% ks nom, Ta min to Ta max -2 +2 % Vssnom PSB nom Nominal Output Power VSB_SEL = 0 / 1 16.5 W Ks nom Nominal Output Current Vss = 3.3 VDC 5 ADC Vsb pp Output Ripple Voltage Vss nom, ks nom, 20 MHz BW, 10nF/16V/X7R/1210 + 10uF/16V at Vss 100 mVpp d Vss Droop 0 - 100 % ks nom VSB_SEL = 1 67 mV ks max Current Limitation VSB_SEL = 1 5.25 6 ADC ks max Dynamic Load Regulation Δss = 50% ks nom, ks = 5 100% ks nom, 100 ks nom -3 3 % Vssnom Trec Recovery Time dk/dt = 0.5 A/μs, recovery within 1% of Vi nom 250 μs Mc Vss Inse Nss Time Vss = 90% Vss nom 4 10 ms | Standby | ∕ Output V _{SB} | | | | | | |
| VSB set Output Setpoint Accuracy VSB_SEL = 0 5 VDC VSB set Output Setpoint Accuracy VSB_SEL = 0 / 1 -0.5 +0.5 % V nom VSB_SEL = 0 / 1 -0.5 +0.5 % V nom VSB_SEL = 0 / 1 -0.5 +0.5 % V nom VSB_SEL = 0 / 1 -0.5 +0.5 % V nom VSB_SEL = 0 / 1 16.5 W VSB_SEL = 0 3.3 ADC VSB_SEL = 0 3.3 ADC VSB_SEL = 0 0.5 VSB_SEL = 1 VSB_SEL = 1 0.5 VSB_SEL = 1 VSB_SEL = 1 0.5 VSB_SEL = 1 VSB_SEL = 0 0.5 VSB_SEL = 1 VSB_SEL = 0 3.45 4.3 ADC VSB_SEL = 0 4.4 4.5 ADC VSB_SEL = 0 | VSB nom | Nominal Output Voltage | | VSB_SEL = 1 | | 3.3 | | VDC |
| $dV_{SB tot}$ Total Regulation V_{min} to V_{max} , 0 to 100% $k_{SB nom}$, $T_{a min to}$ $T_{a max}$ -2 +2 % $V_{SB nom}$ $P_{SB nom}$ Nominal Output Power VSB_SEL = 0 / 1 16.5 W $V_{SB nom}$ Nominal Output Current V_{SB} = 3.3 VDC 5 ADC $V_{SB nom}$ $V_{SB nom}$, $V_{$ | 2 OB HOIL | Tronima Garpar Tonago | $0.5 \cdot I_{SB \text{ nom}}, T_{amb} = 25 ^{\circ}\text{C}$ | VSB_SEL = 0 | | 5 | | VDC |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | V SB set | Output Setpoint Accuracy | | VSB_SEL = 0 / 1 | -0.5 | | +0.5 | % V _{1 nom} |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | dV _{SB tot} | Total Regulation | $V_{i \text{ min}}$ to $V_{i \text{ max}}$, 0 to 100% $I_{SB \text{ nom}}$, T_{a} | min to $\mathcal{T}_{a \text{ max}}$ | -2 | | +2 | % V _{SBnom} |
| $k_{\rm B\ nom}$ Nominal Output Current $V_{\rm SB}$ = 5.0 VDC3.3ADC $V_{\rm SB\ pp}$ Output Ripple Voltage $V_{\rm SB\ nom}$, $k_{\rm B\ nom}$, 20 MHz BW, 10nF/16V/X7R/1210 + 10uF/16V at $V_{\rm SB}$ 100mVpp $dV_{\rm SB}$ Droop $0 - 100\%$ $k_{\rm B\ nom}$ VSB_SEL = 1 VSB_SEL = 1 VSB_SEL = 067mV $k_{\rm SB\ max}$ Current LimitationVSB_SEL = 1 VSB_SEL = 05.256 ADC $dV_{\rm SB\ max}$ Dynamic Load Regulation VSB_SEL = 03.454.3 ADC $dV_{\rm SB\ dyn}$ Dynamic Load Regulation AkB = 50% $k_{\rm B\ nom}$, $k_{\rm SB}$ = 5 100% $k_{\rm B\ nom}$, -33 % $V_{\rm SB\ nom}$ $T_{\rm rec}$ Recovery Time dk/dt = 0.5 A/ μ s, recovery within 1% of $V_{\rm N\ nom}$ 250 μ s $t_{\rm AC\ VSB}$ Start-Up Time from DC Input $V_{\rm SB\ nom}$ $V_{\rm SB\ nom}$ 410ms | PSB nom | Nominal Output Power | VSB_SEL = 0 / 1 | | | 16.5 | | W |
| $V_{\text{SB pp}} \text{Output Ripple Voltage} \begin{array}{c} V_{\text{SB nom}} = 5.0 \text{VDC} \\ V_{\text{SB nom}}, v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB SEL}} = 1 \\ 0 - 100 \text{W} & v_{\text{SB som}} \\ 0 - 1$ | SR nom | Nominal Output Current | $V_{SB} = 3.3 \text{ VDC}$ | | | 5 | | ADC |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | 735 110111 | Tronimal Galpat Galloni | | | | 3.3 | | ADC |
| d V_{SB} Droop 0 - 100 % $k_{B nom}$ VSB_SEL = 0 44 mV $k_{SB max}$ Current Limitation VSB_SEL = 1 5.25 6 ADC V_{SB_SEL} VSB_SEL = 0 3.45 4.3 ADC V_{SB_SEL} Dynamic Load Regulation Δk_{B} = 50% k_{B} nom, k_{B} = 5 100% k_{B} nom, k_{B} = 3 3 % $V_{SB_{nom}}$ V_{RC} Recovery Time V_{RC} V | V _{SB pp} | Output Ripple Voltage | | at V _{SB} | | | 100 | mVpp |
| $VSB_SEL = 0 \qquad 44 \qquad \text{mV}$ $k_{SB \text{ max}} \text{Current Limitation} \qquad \begin{array}{c} VSB_SEL = 1 \\ VSB_SEL = 0 \\ \end{array} \qquad \begin{array}{c} 5.25 \\ \text{ADC} \end{array} \qquad \begin{array}{c} 6 \\ \text{ADC} \end{array}$ $d V_{SB \text{ Max}} \text{Dynamic Load Regulation} \qquad \Delta k_{SB} = 50\% k_{SB \text{ nom}}, k_{SB} = 5 \dots 100\% k_{SB \text{ nom}}, \qquad -3 \qquad 3 \qquad \% V_{SB \text{ nom}}$ $T_{\text{rec}} \text{Recovery Time} \qquad \qquad d k_{SB} = 50\% k_{SB \text{ nom}}, k_{SB} = 5 \dots 100\% k_{SB \text{ nom}}, \qquad -3 \qquad 3 \qquad \% V_{SB \text{ nom}}$ $k_{AC} VSB \text{Start-Up Time from DC Input} V_{SB} = 90\% V_{SB \text{ nom}} \qquad \qquad 250 \qquad \mu_{SB} \qquad \qquad 250 \qquad \text{ms}$ $k_{AC} VSB \text{Start-Up Time from DC Input} V_{SB} = 90\% V_{SB \text{ nom}} \qquad $ | d V∕sв | Droop | 0 - 100 % & R nom | VSB_SEL = 1 | | 67 | | mV |
| $k_{\rm B max}$ Current LimitationVSB_SEL = 03.454.3ADCd $V_{\rm SB dyn}$ Dynamic Load Regulation $\Delta k_{\rm B} = 50\% k_{\rm B nom}, k_{\rm B} = 5 \dots 100\% k_{\rm B nom}, 3$ 3% $V_{\rm SB nom}$ $T_{\rm rec}$ Recovery Time $d k_{\rm B} = 50\% k_{\rm B nom}, k_{\rm B} = 5 \dots 100\% k_{\rm B nom}, 3$ 250 $\mu_{\rm S}$ $k_{\rm C VSB}$ Start-Up Time from DC Input $V_{\rm SB} = 90\% V_{\rm SB nom}$ 2sec $t_{\rm VSB rise}$ Rise Time $V_{\rm SB} = 10 \dots 90\% V_{\rm SB nom}$ 410ms | | | | VSB_SEL = 0 | | 44 | | mV |
| $VSB_SEL = 0 \\ dV_{SBdyn} Dynamic Load Regulation \\ T_{rec} Recovery Time \\ dk/dt = 0.5 \text{ A/µs, recovery within 1\% of } \\ V_{SB nom} -3 \\ dk/dt = 0.5 \text{ A/µs, recovery within 1\% of } \\ A_{SB} = 50\% \text{ k/sB nom, k/sB} = 5 \dots 100\% k/sB no$ | /SB max | Current Limitation | VSB_SEL = 1 | | 5.25 | | 6 | ADC |
| I_{Trec} Recovery Time I_{SB} = 90% I_{SB} nom, I_{SB} = 3 100% I_{SB} nom, I_{SB} = 90% I_{SB} nom 250 μs I_{AC} vsb Start-Up Time from DC Input I_{SB} = 90% I_{SB} nom 2 sec I_{VSB} rise Rise Time I_{SB} = 1090% I_{SB} nom 4 10 ms | -OB max | | VSB_SEL = 0 | | 3.45 | | 4.3 | ADC |
| the Covery Time Start-Up Time from DC Input $V_{SB} = 90\% \ V_{SB \ nom}$ 2 sec the Time Rise Time $V_{SB} = 1090\% \ V_{SB \ nom}$ 4 10 ms | dV_{SBdyn} | Dynamic Load Regulation | | | -3 | | 3 | % V _{SBnom} |
| t/sB rise Rise Time $V_{SB = 1090\%} V_{SB nom}$ 4 10 ms | \mathcal{T}_{rec} | Recovery Time | $d h/d t = 0.5 \text{ A/}\mu\text{s}$, recovery within | 1% of 1∕ _{1 nom} | | | 250 | μs |
| _ | t _{AC VSB} | Start-Up Time from DC Input | V _{SB} = 90% V _{SB nom} | | | | 2 | sec |
| C_{Load} Capacitive Loading $T_{\text{amb}} = 25 ^{\circ}\text{C}$ 10000 μF | t∕VSB rise | Rise Time | V _{SB} = 1090% V _{SB nom} | | 4 | | 10 | ms |
| | CLoad | Capacitive Loading | T _{amb} = 25 °C | | | | 10000 | μF |



4. SIGNAL & CONTROL SPECIFICATIONS

4.1 FRONT LEDS

| OPERATING CONDITION | LED SIGNALING |
|---|-----------------------------|
| IN LED (INPUT OK) | |
| DC Line within range | Solid Green |
| DC Line UV condition | Off |
| Redundant Operation - PSU1 operating and PSU2 has input power removed | Solid Yellow (PSU2) 1 |
| OUT LED 2 (OUTPUT OK) | |
| PSON High | Blinking Yellow (1:1) |
| Hot-Standby Mode | Blinking Yellow/Green (1:2) |
| V₁ or V _{SB} out of regulation | |
| Over temperature shutdown | |
| Output over voltage shutdown (1/4 or 1/5B) | Solid Yellow |
| Output over current shutdown (V_1 or V_{SB}) | |
| Fan error (>15%) | |
| Over temperature warning | Blinking Yellow/Green (2:1) |
| Minor fan regulation error (>5%, <15%) | Blinking Yellow/Green (1:1) |
| Redundant Operation - PSU1 operating and PSU2 has input power removed | Off (PSU2) |

 $^{^{\}mbox{\scriptsize 1}}$ The LEDs will be ON till input power from PSU1 is removed.

Table 1. LED Status

The front-end has 2 front LEDs showing the status of the supply. LED number one is green and indicates DC power is on or off, while LED number two is bi-colored: green and yellow and indicates DC power presence or fault situations. For the position of the LEDs see Figure 5.



² The order of the criteria in the table corresponds to the testing precedence in the controller.

4.2 GRAPHICAL USER INTERFACE

The Bel Power Solutions provides with its "I²C Utility" a Windows® XP/Vista/Win7 compatible graphical user interface allowing the programming and monitoring of the PFE1100-12-054xD Front-End.

The utility can be downloaded on www.belpowersolutions.com and supports both the PSMI and Power Management Bus protocols.

The GUI allows automatic discovery of the units connected to the communication bus and will show them in the navigation tree. In the monitoring view the power supply can be controlled and monitored.

If the GUI is used in conjunction with the PFE1100-12-054xD Evaluation Kit it is also possible to control the PSON pin(s) of the power supply.

Further there is a button to disable the internal fan for approximately 5 seconds (not implemented yet). This allows the user to take input power measurements without fan consumptions to check efficiency compliance to the Climate Saver Computing Platinum specification.

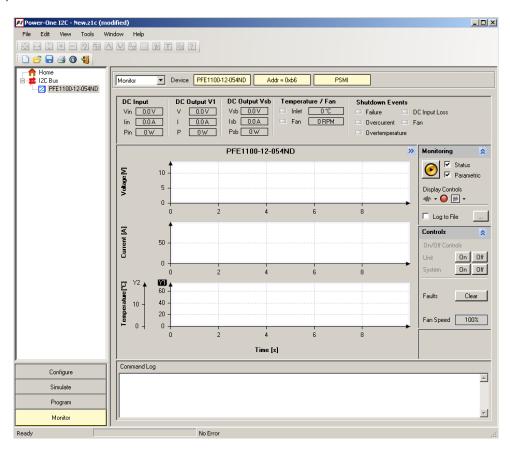


Figure 2. I2C Bus to uC (Graphical User Interface)

The monitoring screen also allows to enable the hot-standby mode on the power supply. The mode status is monitored and by changing the load current it can be monitored when the power supply is being disabled for further energy savings. This obviously requires 2 power supplies being operated as a redundant system (like the evaluation kit).

NOTE: The user of the GUI needs to ensure that only one of the power supplies have the hot-standby mode enabled.



5. ELECTROMAGNETIC COMPATIBILITY

NOTE: Meets the EMC requirements according to EN IEC 61204-3, EN 55035 and EN 55032.

5.1 IMMUNITY

| TEST | STANDARD / DESCRIPTION | CRITERIA |
|--------------------------------|---|----------|
| ESD Contact Discharge | IEC / EN 61000-4-2, ±8 kV, 25 + 25 discharges per test point (metallic case, LEDs, connector body) | В |
| ESD Air Discharge | IEC / EN 61000-4-2, ±15 kV, 25 + 25 discharges per test point (non-metallic user accessible surfaces) | В |
| Radiated Electromagnetic Field | IEC / EN 61000-4-3, 10 V/m, 1 kHz / 80% Amplitude Modulation, 1 μs Pulse Modulation, 10 kHz2 GHz | А |
| Burst | IEC / EN 61000-4-4, Level 3 Input DC port ±1 kV, 1 minute DC port ±0.5 kV, 1 minute | В |
| Surge | IEC / EN 61000-4-5 Line to earth: ±1 kV Line to line: ±0.5 kV | А |
| RF Conducted Immunity | IEC/EN 61000-4-6, Level 3, 10 Vrms, CW, 0.1 80 MHz | Α |

5.2 EMISSION

| TEST | STANDARD / DESCRIPTION | CRITERIA |
|---------------------|--|------------------------|
| Conducted Fusionism | EN55032 / CISPR 32: 0.15 30 MHz, QP and AVG, single unit, $V_i = 53$ VDC, $P_{x \text{ nom}}$ | Class A 6 dB margin |
| Conducted Emission | EN55032 / CISPR 32: 0.15 30 MHz, QP and AVG, 2 units in rack system, $V_i = 53$ VDC, $P_{X \text{ nom}}$ | Class A 6 dB margin |
| Dadiated Emission | EN55032 / CISPR 32: 30 MHz 1 GHz, QP, single unit, $V_1 = 53$ VDC, $P_{x \text{ nom}}$ | Class A 6 dB margin |
| Radiated Emission | EN55032 / CISPR 32: 30 MHz 1 GHz, QP, 2 units in rack system, $V_i = 53$ VDC, $P_{X \text{ nom}}$ | Class A 6 dB margin |
| Acoustical Noise | Sound power statistical declaration (ISO 9296, ISO 7779, IS9295) @ 50% load | 62 dBA |

6. SAFETY / APPROVALS

Maximum electric strength testing is performed in the factory according to EN/IEC 62368-1, and UL 62368-1. Input-to-output electric strength tests should not be repeated in the field. Bel Power Solutions will not honor any warranty claims resulting from electric strength field tests.

| PARA | METER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|-----------------------|--------------------------|---|--------------|------------|-----|------------|
| | Agency Approvals | Approved to latest edition of the following standards: UL/CSA 62368-1, EN/IEC 62368-1 | | | | |
| | | Input (L/N) to case (PE) | | Basic | | |
| | Isolation Strength | Input (L/N) to output | | Basic | | |
| | | Output to case (PE) | | Functional | | |
| 4 | Croopers / Clearance | Primary (L/N) to protective earth (PE) | | | | |
| d _C | Creepage / Clearance | Primary to secondary | | | | |
| | Electrical Strength Test | Input to case Input to output (tested by manufacturer only) | 1500 1500 | | | VDC VDC |

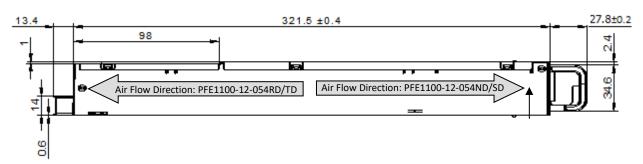


7. ENVIRONMENTAL SPECIFICATIONS

| PARAM | METER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|----------------|----------------------|---|-----|-----|-----|------|
| T _A | Ambient Temperature | Vi min to Vi max, Hi nom, AB nom | 0 | | +45 | °C |
| T_{Aext} | Extended Temp. Range | Derated output | +45 | | +65 | °C |
| | | $V_{1 min}$ to $V_{1 max}/h$ < 77 A, $k_{SB nom}$ | | | +55 | °C |
| | | $V_{1 min}$ to $V_{1 max}/h$ < 35 A, $I_{SB nom}$ | | | +65 | °C |
| T_S | Storage Temperature | Non-operational | -20 | | +70 | °C |
| N a | Audible Noise | Sound power @ V _{nom} , 50% lonom, T _A = 25°C | | 62 | | dBA |

8. MECHANICAL SPECIFICATIONS

| PARA | METER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|------|------------|-------------------------|-----|-------|-----|------|
| | | Width | | 54.5 | | |
| | Dimensions | Height | | 40 | | mm |
| | | Depth | | 321.5 | | |
| M | Weight | | | 1.12 | | kg |



NOTES: A 3D step file of the power supply casing is available on request. Unlatching the supply is performed by pulling the green trigger in the handle.

Figure 3. Side View 1



Figure 4. Top View



Asia-Pacific +86 755 298 85888 Europe, Middle East +353 61 49 8941

North America +1 866 513 2839

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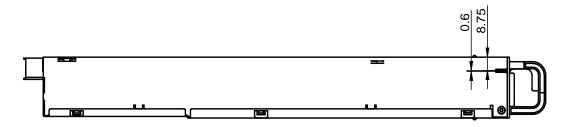


Figure 5. Side View 2

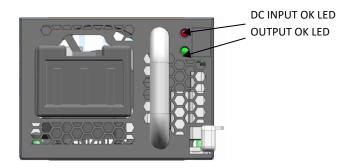
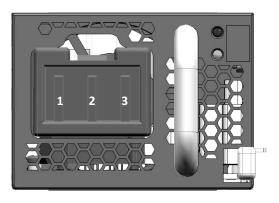


Figure 6. Front View (PFE1100-12-054ND/RD)

9. CONNECTIONS

9.1 INPUT CONNECTOR

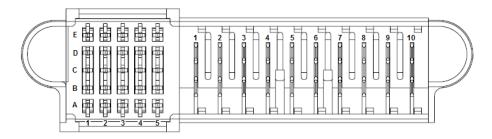


| PIN | NAME | DESCRIPTION |
|------|------|----------------|
| Inpu | ıt | |
| 1 | Vin+ | Input positive |
| 2 | Vin- | Input negative |
| 3 | PE | Ground 📳 |

Unit: China Aviation (JOHNON OPTRONIC) P/N DP5ZJW0300-001 or equivalent Counter part: China Aviation (JOHNON OPTRONIC) P/N DP5TJY0300-001(provided)



9.2 OUTPUT CONNECTOR



Power Supply Connector: Tyco Electronics P/N 1926736-3 or FCI connector 10133129-002LF or equivalent (NOTE: Column 5 is recessed (short pins))

Mating Connector: Tyco Electronics P/N 2-1926739-5 or FCI 10108888-R10253SLF

| PIN | NAME | DESCRIPTION |
|----------------|--------------|--|
| Output | | |
| 6, 7, 8, 9, 10 | V1 | +12 VDC main output |
| 1, 2, 3, 4, 5 | PGND | Power ground (return) |
| Control Pins | | |
| A1 | VSB | Standby positive output (+3.3 / 5 V) |
| B1 | VSB | Standby positive output (+3.3 / 5 V) |
| C1 | VSB | Standby positive output (+3.3 / 5 V) |
| D1 | VSB | Standby positive output (+3.3 / 5 V) |
| E1 | VSB | Standby positive output (+3.3 / 5 V) |
| A2 | SGND | Signal ground (return) |
| B2 | SGND | Signal ground (return) |
| C2 | HOTSTANDBYEN | Hot standby enable signal |
| D2 | VSB_SENSE_R | Standby output negative sense |
| E2 | VSB_SENSE | Standby output positive sense |
| A3 | APS | I ² C address and protocol selection (select by a pull down resistor) |
| B3 | nc | Reserved |
| C3 | SDA | I ² C data signal line |
| D3 | V1_SENSE_R | Main output negative sense |
| E3 | V1_SENSE | Main output positive sense |
| A4 | SCL | I ² C clock signal line |
| B4 | PSON | Power supply on input (connect to A2/B2 to turn unit on) |
| C4 | SMB_ALERT | SMB Alert signal output |
| D4 | nc | Reserved |
| E4 | INOK | DC input OK signal |
| A5 | PSKILL | Power supply kill (lagging pin) |
| B5 | ISHARE | Current share bus (lagging pin) |
| C 5 | PWOK | Power OK signal output (lagging pin) |
| D5 | VSB_SEL | Standby voltage selection (lagging pin) |
| E5 | PRESENT_L | Power supply present (lagging pin) |
| | | |

Table 2. Pin Description



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Europe, Middle East

North America

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+353 61 49 8941

+1 866 513 2839

9.3 INPUT CONNECTOR MODIFICATION - MODELS PFE1100-12-054SD/TD

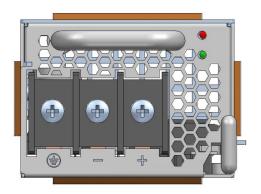


Figure 7. Front View (PFE1100-12-054SD/TD)

Unit: MF: Dinkle; P/N: DT-66-B11W-03 or equivalent

Counter part: Wire with lugs: 18 – 8 AWG (wire range); lugs for M4 screws

NOTE: Column 5 is lagging (short pins)

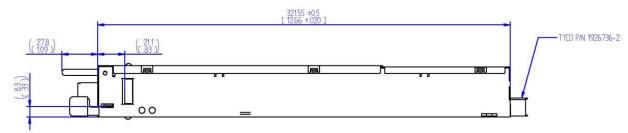


Figure 8. Side View (PFE1100-12-054SD/TD

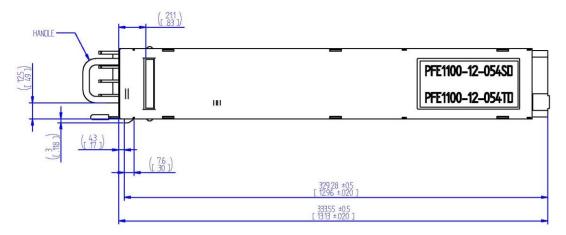
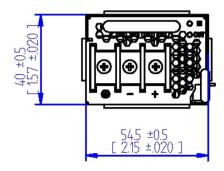


Figure 9. Top View (PFE1100-12-054SD/TD)





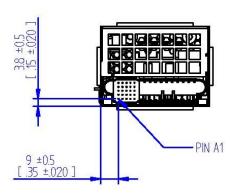


Figure 10. Front and Rear View (PFE1100-12-054SD/TD)

10. ACCESSORIES

| ITEM | DESCRIPTION | ORDERING PART NUMBER | SOURCE |
|------|--|-------------------------|-----------------------------|
| | I ² C Utility Windows XP/Vista/7 compatible GUI to program, control and monitor PFE Front-Ends (and other I ² C units) | N/A | belfuse.com/power-solutions |
| | USB to I ² C Converter Master I ² C device to program, control and monitor I ² C units in conjunction with the <i>PC</i> Utility | ZM-00056 | Bel Power Solutions |
| | Dual Connector Board Connector board to operate 2 PFE units in parallel. Includes an on-board USB to I ² C converter (use <i>FC Utility</i> as desktop software) | SNP-OP-BOARD-01 | Bel Power Solutions |
| | Cable Harness with Mating input Connector CHINA AVIATION, PN: DP5TJY0300-001, 2.44m length, 10AWG wire with 10mm stripping at the end, encased with braided sleeving | ZLH.00742 | Bel Power Solutions |
| | Female Pin Connector Terminal Spare Mating Connectors | ZES.00046 | Bel Power Solutions |



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11. APPENDIX

11.1 SOCKET CRIMPING OPERATION INSTRUCTION (DP5TJY0300-001)

I. CRIMPING TOOLS AND MACHINE PREPARATION

Machine needed before crimping: Terminal Crimping Machine, Crimping Mould, Crimping Tools, Wire Strippers, Utility Knife and Wrench.

NOTES: 1.Crimping tool need to install onto crimping mould, and crimping mould need to fix onto crimping machine.

- 2. Two factors must be considered during the design of crimping mould:
- A: must meet dimensions of tools installation.
- B: Easy to install in machine and be in machine effective itinerary

| NAME | SUPPLIER | PART NUMBER |
|---------------------------|-----------------|-------------------------------|
| Terminal Crimping Machine | JonHon Optronic | THB Terminal Crimping Machine |
| Crimping Mould | JonHon Optronic | 12A-01 |
| Crimping tools | JonHon Optronic | YJD-DP5 |

Crimping tools YJD-DP5 including 4 parts: 4U-A5881-1, 4U-A5881-2, 4D-A5881-1, 4D-A5881-2. (See picture 1)

Table 1. A Set of Machine Recommended

II. CRIMPING MACHINE AND TOOLS INSTALLATION

Crimping mould and crimping tools must be installed well before crimping.

Install Requirements:

- 1. Up tools 4U-A5881-1 and 4U-A5881-2 need install in dynamic mould. Down Tools 4D-A5881-1 and 4D-A5881-2 need install in static mould. (See picture 2)
- 2. 4 pieces of crimping tools can be divided into 2 pairs: 4U-A5881-1 mated with 4D-A5881-1, which is crimping cable jacket. 4U-A5881-2 match 4D-A5881-2, which is crimping cable core.
- 3. Up tool 4U-A5881-1 has U-shaped hole. Customer can adjust the install position according to wire thickness, which to make sure the wire jacket and core will be crimping tightly. Tool 4D-A5881-1 need to install outside of crimping mould, in order to adjust tool 4U-A5881-1. (Reference at Picture 2)



Picture 1. YJD-DP5 (4 pieces crimping tools)





Picture 2. Tools Installation

III. CRIMPING

- Wire Cutting: Cutting wire with required length, and the wire can be used 8AWG American standard wire or other 8mm2 wire.
- 2. Wire Stripping: Stripping the wire jacket 8±1mm with Wire Strippers and cutting the jacket straight with Utility Knife. The wire should be at the set of bundles after stripping, shown as Picture 3.



Picture 3. The wire stripped



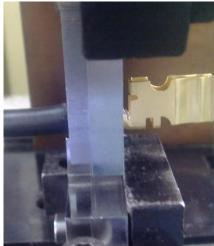
Picture 4. Wire and Terminal before Crimping

3. **Crimping:** Placing the wire and the terminal shown as picture 4, and placing them into the gap between up tool and down tool shown as picture 5.



BCD.00034_AP





Picture 5. Position before Crimping

Picture 6. Positon after crimped

- 4. Start the terminal crimping machine, and crimping closed shown as picture 6.
- 5. Test after Crimping
- a) Appearance Inspection: The crimped position should be smooth and firm. (reference see picture 7)



Picture 7.

If the severe deformation after crimping, we need to adjust the machine knob to adjust the crimping mould and distance between up tool and down tool, which to ensure the crimp the wire correctly and beautifully. Meanwhile, we need to avoid too much crimping strength so as to short the tools life, or even to damage the tools.

b) Pulling-Out Force Test: When the first batch after a terminal crimping, crimp pull out force should be inspected Test Method: Fixed the terminal and Non-crimped wire onto ends of tension meter, and then gradually increase the tension until the wire is pulled and separated from the terminal, and read the tension meter reading is to pull off the greatest force.

Qualification Criterion: When the pull-out force meets the requirements of Table 2, and then can show pull-out force is qualified.

Failure Treatment: When the pull-out force failed, we need to adjust the machine knob to adjust the crimping mould and distance between up tool and down tool, and then re-crimp until the test qualified. After that, we can make mass production.



| CABLE SIZE | CORE CROSS-SECTIONAL AREA | PULL-OUT FORCE |
|------------|---------------------------|----------------|
| 8 AWG | 8.5 mm ² | 950 N |
| 10 AWG | 5.5 mm² | 650 N |

Table 2. Pull-Out Force Table

NOTE: Mid-value clustering Method will be used if core cross-sectional area is not in the range of Table 2

IV. TREATMENT AFTER CRIMPING

Crimping tools, crimping mould should be removed from crimping machine and properly kept after crimping work.

11.2 INPUT CONNECTOR DATASHEET (DP5ZJW0300-001/DP5TJY0300-001)

- Material Code :
- Part Name: DP5ZJW0300-001 3pin PCB receptacle, DP5TJY0300-001 3 pin crimp plug
- Part Number : Receptacle (fix connector) DP5ZJW0300-001 or equivalent

Plug (moving connector) DP5TJY0300-001

Information of environment protection: compliant with ROHS

Technical Parameter Mated :

- Electrical
 - o Current rating: 40 A at 55°C (accord with UL1977)
 - Withstanding voltage: 1500 V
 - o Insulation Resistance ≥ 500 MΩ (Normal temperature); ≥ 100 MΩ (Damp Heat)
 - Hot plug function: Can meet the over load requirement of UL1977

Mechanical Characteristics

- Terminal type: receptacle PCB, plug crimp
- Service life: 250 cycles

Material and Surface Treatment

- o Contact material sockets: Copper alloy; pins: Copper
 - Surface Treatment : 0.2~0.6 μm gold plated over 1.27 μm nickel (or 5 um silver, up to customer requirement)
- Housing material & processing
 - Material: glass fiber strengthened flameless PET UL94V-0
 - Color: black
 - Processing method: plastic injection

• Operating Environment

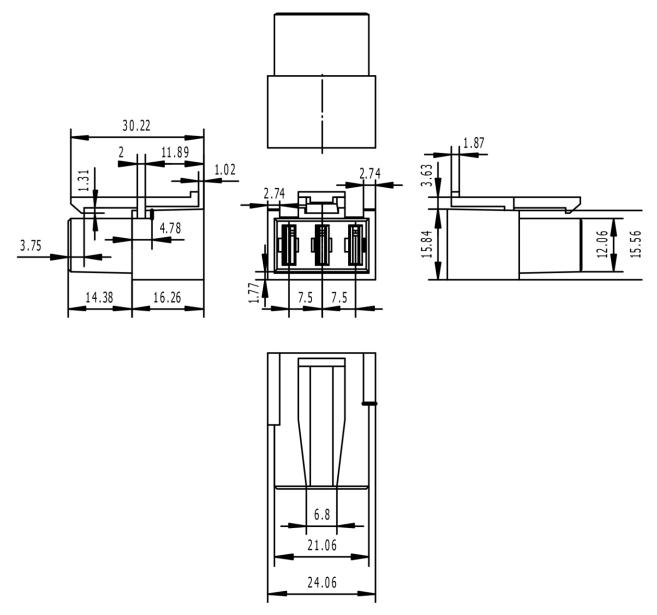
- o Range of temperature : -55°C∼125°C
- Humidity: 93% at 40°C
- Shock acceleration 490 m/s2
- Vibration: 10Hz~2000 Hz, acceleration: 98 m/s2

• Dimensions of Product

o Dimension



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Picture 8. Receptacle: DP5ZJW0300-001

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

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