

General Reliability

Power Trends' PT78/79 Series (ISRs) are designed for long reliable operation by using conservative derating factors and integral over-current and over-temperature protection. The ISR circuit utilizes a "buck" regulator topology, as shown in Figure 16. The calculations used to determine the Mean Time Between Failure (MTBF) are based on MIL-STD-217F, and are conservative. Under normal operating conditions, the ISR has a calculated MTBF of over 1,000,000 hours.

Demonstrated MTBF

Empirical verification of the computed MTBF has continued since product introduction with no failures in over 1,500,000 device hours of operation with a 24 volt input and a load of 1.5 Amps.

Figure 15
MEAN TIME BETWEEN FAILURES

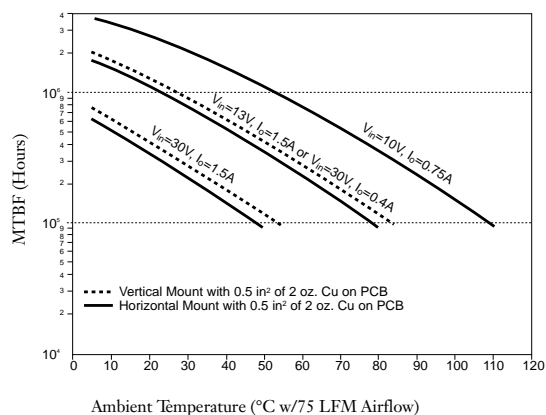
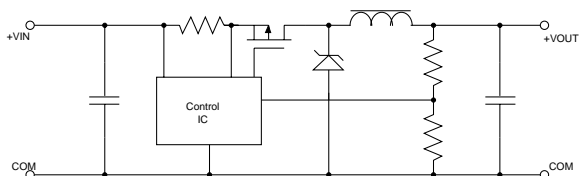


Figure 16
PT78 SERIES ISR BLOCK DIAGRAM



Construction The PT78/79 Series ISR is an assembly of 12 surface mount components and one integrated magnetic inductor mounted on a printed circuit board made from FR-4 material. This assembly is then mounted into a nylon case rated to 94VO molded from high-temperature 30% glass filled-nylon #46-Stanyl, which is resistant to all solvents except 1,1,1 trichloroethane.

Components All of the components used in the ISR are shown in Table 7. The components are the highest quality commercial/industrial parts available. Also shown are the components' operating characteristics and stress factor(s) when operating a +5 VDC ISR with an input voltage of +38VDC and an output current of 1.5 Amps. This is the worst-case operating stress that the unit will experience.

Calculations MIL-STD-217F formulae and tables were used to generate the graph of MTBF versus ambient temperature shown in Figure 15. The environmental conditions are assumed to be ground benign. The quality factor derating multiplier for commercial, plastic case components was used.

Table 7
PT78 SERIES 1.5 AMP ISRs SAMPLE STRESS EVALUATION

| Description | Device Rating | Maximum Operating Condition | Stress Factor |
|--|---------------------------------------|-----------------------------|-------------------------|
| Input Capacitor | 50 VDC | 40 VDC | 0.600 |
| Output Capacitor | 25 VDC | 5-15 VDC | 0.200 |
| Stability Capacitors | 50 VDC | 2.5 VDC | 0.050 |
| Output Rectifier | 40 VDC 5A Avg | 40 VDC 1.2A Avg | 0.750 0.240 |
| Power Transistor | 50 VDC 9.9 ADC 40A Pulse 42W | 40VDC 2A Peak 0.79W | 0.600 0.050 0.020 |
| Voltage Divider and Frequency Resistor | 100 VDC 62.5 mW | 2.5 VDC 0.125 mW | 0.025 0.002 |
| Current Sense Resistor | 200VDC 125 mW | 0.25 VDC 35 mW | 0.001 0.280 |
| Inductor | 150°C | — | — |
| Custom IC | 45 VDC | 40 VDC | 0.750 |

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