# Point-of-Load Switching Regulator
## 4.5Vdc - 12Vdc Input, 1.21Vdc - 5.0Vdc Output, 5.5A
## (Preliminary)

## FEATURES

- Input Range 4.5V to 12V
- Rad-Tolerant to 100Krad (TID)[1]
- Adjustable or Fixed Output Voltage
- Up to 5.5A Output Current
- Fully Integrated assembly includes Inductor
- Remote-Sense operation
- Under-Voltage Lockout
- Internal Soft Start
- Current Limiting
- Efficiencies up to 85%
- 120W/in$^3$ Power Density

*PRELIMINARY*

## DESCRIPTION

The SAT8564 is a non-isolated PowerPac module for high reliability and full military distributed power, point of load applications. Fully integrated, the SAT8564 includes buck controller, inductor, and input/output capacitors integrated in a single package. The SAT8564 operates from an input voltage of +4.5V to +12V providing step down power conversion to output voltages as low as 1.21V. Operating features include output voltage adjust, output current limit, shutdown, external synchronization, soft start and under voltage lockout. The SAT8564 can also be set up in a parallel configuration to increase output current capability.

Careful design and layout ensure excellent stability, transient response, and low noise operation. Packaged in a compact 16-lead flat-pack the SAT8564 is manufactured in a facility certified to MIL-PRF-38534, class H & K and operates over the full –55$^o$C to +125$^o$C temperature range.

## ABSOLUTE MAXIMUM RATINGS
(Exceeding maximum ratings may damage the device)

Table.1

| Symbol | Parameter | Value | unit |
|--------|-----------|-------|------|
| Vin | DC input Voltage Vin-Vground | 12 | V |
| Io | Output Current | 6 | A |
| Pd | Power Dissipation Tcase=25deg.C | 20 | W |
| Rthjc | Thermal Resistance, Junction to Case | 5.0 | $^o$C/W |
| Tstg | Storage Temperature | -65 to +150 | $^o$C |
| Tj | Operating Temperature Range | -55 to +125 | $^o$C |
| Tsold | Maximum Soldering Temperature, 10sec | 300 | $^o$C |

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# ELECTRICAL CHARACTERISTICS @ Ta=-55deg.C to +125deg.C
### (Unless Otherwise Specified)

Table 2. **Pre-Radiation**

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
| Vout | Output Voltage accuracy | Vin=5.0V, Iout=3.0A | | 2.0 | | % |
| Kvi | Line Regulation | +4.5V ≤ Vin ≤ +6.0V, Iout = 4A | | 0.1 | | % |
| Kvo | Load regulation | Vin = 5V, 1A ≤ Iout ≤ 4A | | 2.0 | | % |
| Vin | Input Voltage Range | Iout=2.5A | 4.5 | | 12 | V |
| Fsync | Synchronizing Range | | 580 | | 1000 | KHz |
| Vsync | Sync input voltage, (note 4) | | | 1.5 | 2.2 | V |
| Isc | Short-circuit current Limit | Vin=5.0V, | | 6.0 | | A |
| | Ripple Rejection | F=120Hz, Iout=50mA | 55 | | | dB |
| Ishdn | Shutdown Source Current | Vshdn=5.0V | | | 75 | uA |
| Vshdn | Shutdown Input Voltage (Note 2,3) | Vin=5.0, Vout < 0.5V | 0.4 | | | V |

Table 3. **Post-Radiation** (Projected)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
| Vout | Output Voltage Accuracy | Vin=5.0V, Iout=3.0A | | 4.0 | | % |
| Kvi | Line Regulation | +4.5V ≤ Vin ≤ +6.0V, Iout = 4A | | 0.2 | | % |
| Kvo | Load regulation | Vin = 5V, 1A ≤ Iout ≤ 4A | | 3.0 | | % |
| Isc | Short Current Limit | Vin=5.0V, Over current Latch Up | | 6.0 | | A |
| Ishdn | Shutdown Source Current | Vshdn=5.0V | | | 75 | uA |
| Vshdn | Shutdown Input Voltage (Note 2,3) | Vin=5.0, Vout < 0.5V; | 0.4 | | | V |

Notes:
1. At this time, SatCon does NOT have a DSCC approved Radiation Program
2. Output Inhibit guaranteed @ Vshdn< 0.4V.
3. Shutdown input should be pulled up to Vin when not used.
4. Synch input should be grounded when not in use

# Typical Performance Characteristics

### Efficiency vs. Output Current
### Vin= +5V



### Efficiency vs. Current
### Vin= +5V



### Output Ripple vs. Current
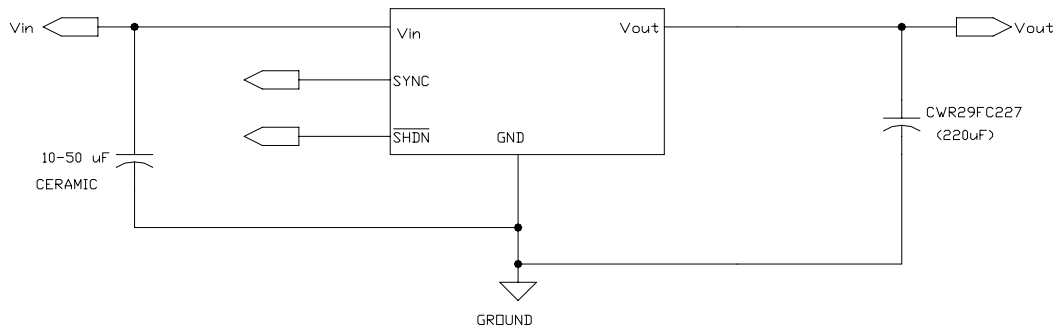### Vout= +3.3V
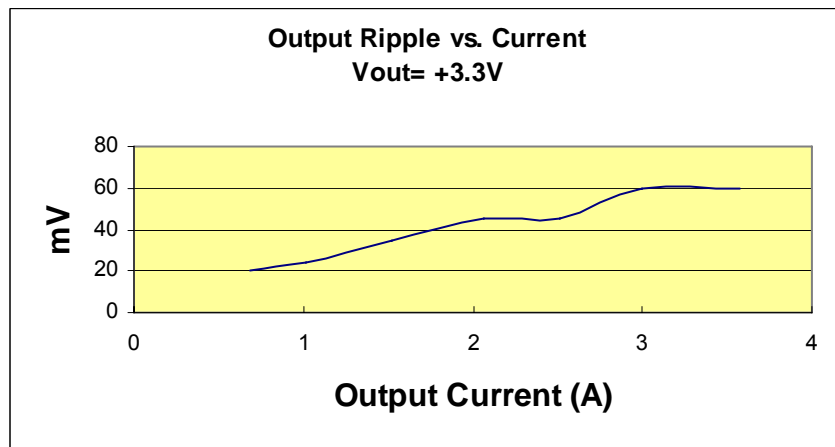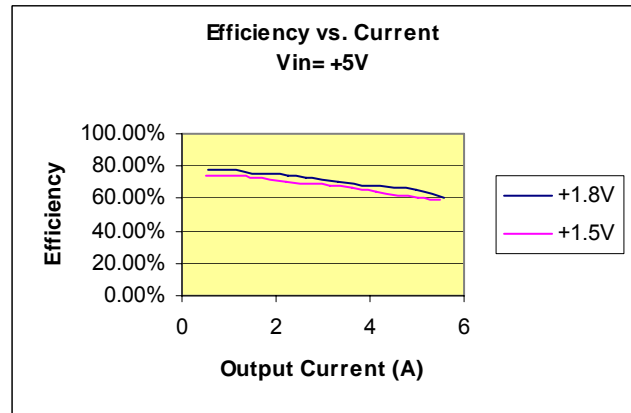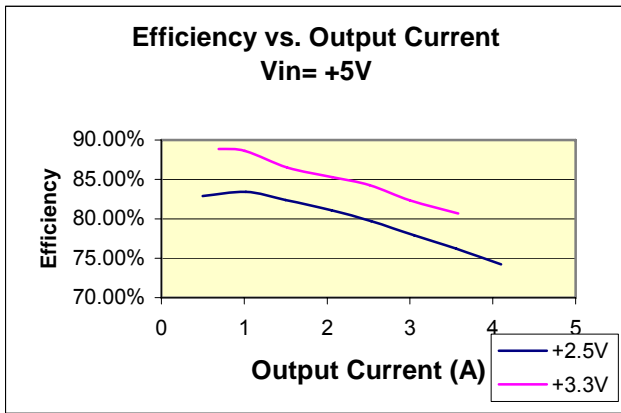


# Application Circuits



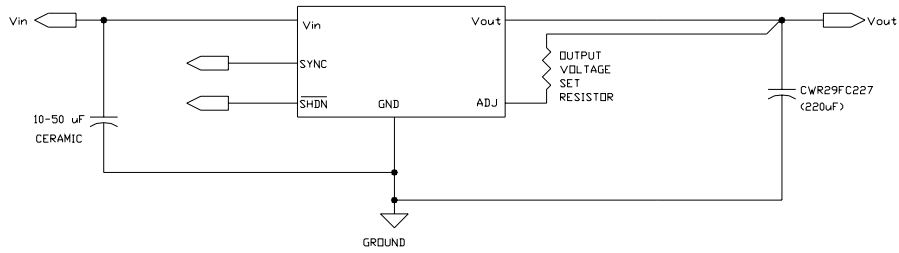Figure 3.- Basic Fixed Regulator Version

Figure 4.- Adjustable Regulator Version

$$V_{out} = V_{ref} \times (1 + R_{adj}/2490), \text{ with } V_{ref} \sim 1.21 \text{ Volts}$$

Table 4.- Commonly Available 1% resistor values

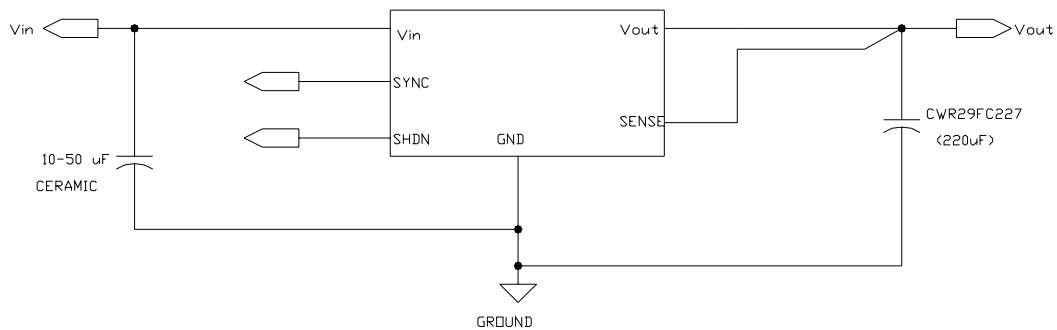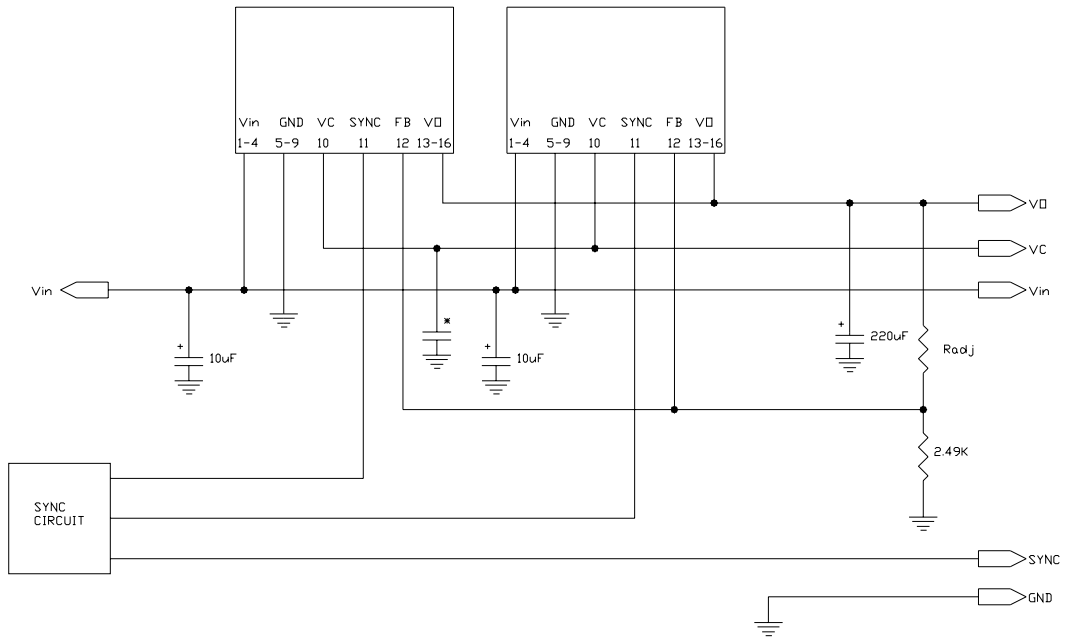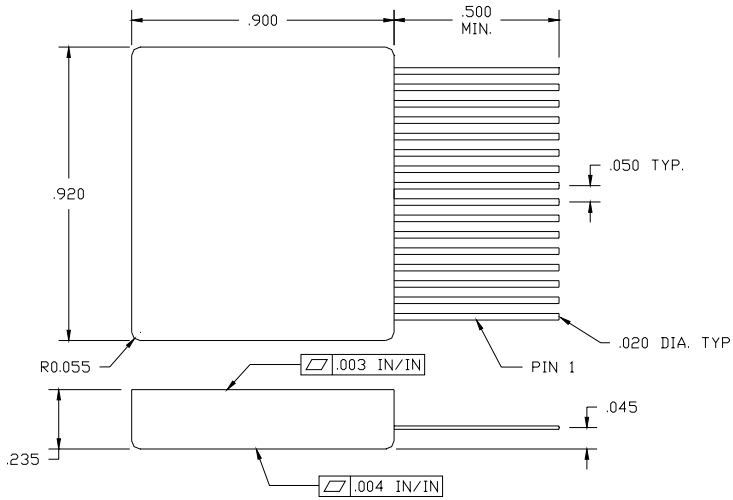| $V_{out}$ (V) | $R_{adj}$ ($\Omega$) | $V_{out}$ (V) | $R_{adj}$ ($\Omega$) |
|---|---|---|---|
| 1.21 | 0 | 2.8 | 3240 |
| 1.5 | 590 | 3.0 | 3650 |
| 1.8 | 1210 | 3.3 | 4320 |
| 2.0 | 1620 | 3.5 | 4750 |
| 2.2 | 2050 | 3.8 | 5360 |
| 2.5 | 2670 | 4.0 | 5760 |

Figure 5.- Remote Sense Version

Fig 6- Parallel configuration schematic
(See Design Note for SAT8564 for further information)

## PACKAGE OUTLINE



**SAT8564R/F/A**

| Pin # | Description |
|-------|-------------|
| 1-4 | Vin |
| 5-9 | GND |
| 10 | Shutdown |
| 11 | Sync |
| 12 | Adjust/ Sense* |
| 13-16 | Vout |

\* No connection for Fixed. Adjust pin for adjustable configuration.  Sense pin for Remote version.

**SAT8564P**

| Pin # | Description |
|-------|-------------|
| 1-4 | Vin |
| 5-9 | GND |
| 10 | Vcomp |
| 11 | Synch |
| 12 | Feedback (FB) |
| 13-16 | Vout |

## *ORDERING INFORMATION:*

| **SAT8564R** | **K** | **F** | **-3.3** |
|---|---|---|---|
| Product Number | Screening Level | Package Type | Output Voltage |

R= Remote Sense Version*
P= Parallel Version
F= Fixed Version
A= Adjustable Version

\* Only available as -ADJ

K = Class-K Compliant
H= Class H compliant
EM= Eng. Model
Blank= 25deg C COTs

F= 16 Pin Flat Pak

  -0.8 = 0.8V fixed
- 1.3 = 1.3V Fixed
- 1.8 = 1.8V Fixed
- 2.5 = 2.5V Fixed
- 3.3 = 3.3V Fixed
- 5.0 = 5.0V Fixed
-ADJ = Adjustable Output