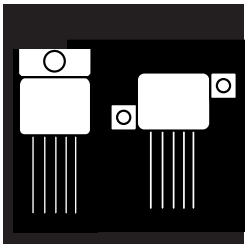
# STEP-UP SWITCHING VOLTAGE REGULATOR IN HERMETIC ISOLATED PACKAGE



**1 Amp, 12 V, 15 V And Adjustable Output Voltage Versions In MO-078 Metal Package**

## FEATURES

- Similar To Industry Standard LM1577 Series
- Available in 12V, 15V And Adjustable Output Voltage Versions
- Hermetic Isolated Packages
- Requires Few External Components
- Protection Features Current And Thermal Limitations
- Hi-Rel Screened

## DESCRIPTION

These devices are monolithic integrated circuits that provide all of the power and control functions for step-up (boost), flyback and converter switching regulators. They are simple to use and cost effective as they only require a small number of external components for implementation. The chip incorporates a 3.0 Amp NPN switch and associated protection circuitry featuring current and thermal limitations and under voltage lockout.

## ABSOLUTE MAXIMUM RATINGS (See note 1)

Input Voltage, $V_{IN}$ . . . . . 45 V
Output Switch Voltage, $V_{SWITCH}$ . . . . . 65 V
Output Switch Current, $I_{SWITCH}$ (See note 2) . . . . . 6.0 A
Storage Temperature Range . . . . . -65°C to + 150°C
Junction Temperature, $T_J$ . . . . . +150°C
Lead Soldering Temperature, (10 seconds) . . . . . 260°C
Power Dissipation, $P_D$ . . . . . Internally Limited
Thermal Resistance:
Junction-to-Case, $q_{JC}$ . . . . . 3.0°C/W Typically
Junction-to-Ambient, $q_{JA}$ . . . . . 65°C/W

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## RECOMMENDED OPERATING CONDITIONS

Input Voltage Range, $V_{IN}$ . . . . . 3.5 to 40 V
Ambient Operating Temperature Range, $T_A$ . . . . . -55°C to + 125°C
Output Switch Voltage Range, $V_{SWITCH}$ . . . . . 0 to 60 V
Output Switch Current, $I_{SWITCH}$ . . . . . 3.0 A

**Notes:**

1. Stresses above the absolute maximum rating may cause damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
2. Output current cannot be internally limited when the device is used as a step-up regulator. To prevent damage to the switch, the current must be externally limited to 6.0 A. However, output current is internally limited when the device is used as a flyback or forward converter regulator.

## ELECTRICAL CHARACTERISTICS - OM1577-12

-55°C $T_A$ 125°C, $V_{IN}$ = 5V, $I_{SWITCH}$ - 0A, $V_{FEEDBACK}$ = $V_{REF}$ unless otherwise specified.

| Parameter | Symbol | Test Conditions | | Min. | Max. | Unit |
|---|---|---|---|---|---|---|
| **System Parameters** | | | | | | |
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 5V to 10V | | 11.60 | 12.40 | V |
| | | $I_{LOAD}$ = 100mA to 800mA | • | 11.40 | 12.60 | |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ | $V_{IN}$ = 3.5V to 10V | | | 60 | mV |
| | | $I_{LOAD}$ = 300mA | • | | 120 | |
| Load Regulation | $\frac{\Delta V_{OUT}}{\Delta I_{LOAD}}$ | $V_{IN}$ = 5V | | | 60 | mV |
| | | $I_{LOAD}$ = 100mA to 800mA | • | | 120 | |
| **Device Parameters** | | | | | | |
| Input Supply Current | $I_S$ | $V_{FEEDBACK}$ = 14V | | | 14 | mA |
| | | (Switch Off) | • | | 18 | |
| | | $I_{SWITCH}$ = 2.0A | | | 60 | |
| | | $V_{COMP}$ = 2.0 V, (Max. duty cycle) | • | | 95 | |
| Input Supply | $V_{UV}$ | $I_{SWITCH}$ = 100mA | | 2.70 | 3.10 | V |
| Under-Voltage Lockout | | | • | 2.65 | 3.15 | |
| Reference Voltage | $V_{REF}$ | Measures at FEEDBACK Pin | | | | V |
| | | $V_{IN}$ = 3.5V to 40V | | 11.76 | 12.24 | |
| | | $V_{COMP}$ = 1.0V | • | 11.64 | 12.36 | |
| Error Amplifier | gm | $I_{COMP}$ = -30µA to +30µA | | 210 | 515 | µmho |
| Transconductance | | $V_{COMP}$ = 1.0V | • | 130 | 615 | |
| Error Amplifier | $A_{VOL}$ | $V_{COMP}$ = 1.1V to 1.9V | | 40 | | V/V |
| Voltage Gain | | $R_{COMP}$ = 1.0M (Note 1) | • | 20 | | |
| Error Amplifier | | $V_{FEEDBACK}$ = 10.0V | | 2.1 | 5.0 | V |
| Output Swing | | Upper Limit | • | 1.9 | 5.0 | |
| | | $V_{FEEDBACK}$ = 15.0V | | | 0.45 | V |
| | | Lower Limit | • | | 0.60 | |
| Error Amplifier | $I_{EAO}$ | $V_{FEEDBACK}$ = 10.0V to 15.0V | | ±120 | ±300 | µA |
| Output Current | | $V_{COMP}$ = 0V | • | ±280 | ±400 | |
| Soft Start Current | $I_{SS}$ | $V_{FEEDBACK}$ = 10.0V | | 2.2 | 7.5 | µA |
| | | $V_{COMP}$ = 0V | • | 7.0 | 9.5 | |
| Maximum Duty Cycle | $D_C$ | $I_{SWITCH}$ = 100mA | | 93 | | % |
| | | $V_{COMP}$ = 1.5 V | • | 90 | | |
| Switch Leakage Current | $I_L$ | $V_{FEEDBACK}$ = 15V | | -1.0 | 360 | µA |
| | | $V_{SWITCH}$ = 65V, switch off | • | -1.0 | 700 | |
| Switch Saturation Voltage | $V_{SAT}$ | $V_{COMP}$ = 2.0V | | | .65 | V |
| | | $I_{SWITCH}$ = 2.0A (Max. Duty Cycle) | • | | .85 | |
| NPN Switch Current Limit | | $V_{COMP}$ = 2.0V | | 3.5 | 5.3 | A |
| | | | • | 2.9 | 6.0 | |
| Oscillator Frequency | $f_o$ | Measured at SWITCH pin, | | 48 | 56 | kHz |
| | | $I_{SWITCH}$ = 100mA | • | 42 | 62 | |

**Notes:**

The • denotes the specifications which apply over the full operating temperature range.

1. A 1.0 M resistor is connected to the COMPENSATION pin (error amplifier output) to ensure accuracy in measuring $A_{VOL}$. In actual applications, the COMPENSATION pin's load resistance should be 10 M , resulting in $A_{VOL}$ that is typically twice the guaranteed minimum limit.
2. OM1577-ADJ have the same test conditions as OM1577-12 (see Test Circuit on page 3).

## ELECTRICAL CHARACTERISTICS - OM1577-15

-55°C $T_A$ 125°C, $V_{IN}$ = 5V, $I_{SWITCH}$ - 0A, $V_{FEEDBACK}$ = $V_{REF}$ unless otherwise specified.

| Parameter | Symbol | Test Conditions | | Min. | Max. | Unit |
|---|---|---|---|---|---|---|
| **System Parameters** | | | | | | |
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 5V to 12V | | 14.50 | 15.50 | V |
| | | $I_{LOAD}$ = 100mA to 600mA | • | 14.25 | 15.75 | |
| Line Regulation | $\frac{^3V_{OUT}}{^3V_{IN}}$ | $V_{IN}$ = 3.5V to 12V | | | 60 | mV |
| | | $I_{LOAD}$ = 300mA | • | | 120 | |
| Load Regulation | $\frac{^3V_{OUT}}{^3V_{LOAD}}$ | $V_{IN}$ = 5V | | | 60 | mV |
| | | $I_{LOAD}$ = 100mA to 600mA | • | | 120 | |
| **Device Parameters** | | | | | | |
| Input Supply Current | $I_S$ | $V_{FEEDBACK}$ = 18V | | | 14 | mA |
| | | (Switch Off) | • | | 18 | |
| | | $I_{SWITCH}$ = 2.0A | | | 60 | |
| | | $V_{COMP}$ = 2.0 V, (Max. duty cycle) | • | | 95 | |
| Input Supply | $V_{UV}$ | $I_{SWITCH}$ = 100mA | | 2.70 | 3.10 | V |
| Under-Voltage Lockout | | | • | 2.65 | 3.15 | |
| Reference Voltage | $V_{REF}$ | Measures at FEEDBACK Pin | | | | V |
| | | $V_{IN}$ = 3.5V to 40V | | 14.70 | 15.30 | |
| | | $V_{COMP}$ = 1.0V | • | 14.55 | 15.45 | |
| Error Amplifier | gm | $I_{COMP}$ = -30µA to +30µA | | 160 | 420 | µmho |
| Transconductance | | $V_{COMP}$ = 1.0V | • | 400 | 500 | |
| Error Amplifier | $A_{VOL}$ | $V_{COMP}$ = 1.1V to 1.9V | | 35 | | V/V |
| Voltage Gain | | $R_{COMP}$ = 1.0M (Note 1) | • | 15 | | |
| Error Amplifier | | $V_{FEEDBACK}$ = 12.0V | | 2.1 | 5.0 | V |
| Output Swing | | Upper Limit | • | 1.9 | 5.0 | |
| | | $V_{FEEDBACK}$ = 18.0V | | | 0.45 | V |
| | | Lower Limit | • | | 0.60 | |
| Error Amplifier | $I_{EAO}$ | $V_{FEEDBACK}$ = 12.0V to 18.0 V | | ±120 | ±300 | µA |
| Output Current | | $V_{COMP}$ = 1.0V | • | ±280 | ±400 | |
| Soft Start Current | $I_{SS}$ | $V_{FEEDBACK}$ = 12.0V | | 2.2 | 7.5 | µA |
| | | $V_{COMP}$ = 0V | • | 7.0 | 9.5 | |
| Maximum Duty Cycle | $D_C$ | $I_{SWITCH}$ = 100mA | | 93 | | % |
| | | $V_{COMP}$ = 1.5 V | • | 90 | | |
| Switch Leakage Current | $I_L$ | $V_{FEEDBACK}$ = 18V | | -1.0 | 360 | µA |
| | | $V_{SWITCH}$ = 65V, switch off | • | -1.0 | 700 | |
| Switch Saturation Voltage | $V_{SAT}$ | $V_{COMP}$ = 2.0V | | | .65 | V |
| | | $I_{SWITCH}$ = 2.0A (Max. Duty Cycle) | • | | .85 | |
| NPN Switch Current Limit | | $V_{COMP}$ = 2.0V | | 3.5 | 5.3 | A |
| | | | • | 2.9 | 6.0 | |
| Oscillator Frequency | $f_o$ | Measured at SWITCH pin, | | 48 | 56 | kHz |
| | | $I_{SWITCH}$ = 100mA | • | 42 | 62 | |

**Notes:**

The • denotes the specifications which apply over the full operating temperature range.

1. A 1.0 M resistor is connected to the COMPENSATION pin (error amplifier output) to ensure accuracy in measuring $A_{VOL}$. In actual applications, the COMPENSATION pin's load resistance should be 10 M , resulting in $A_{VOL}$ that is typically twice the guaranteed minimum limit.

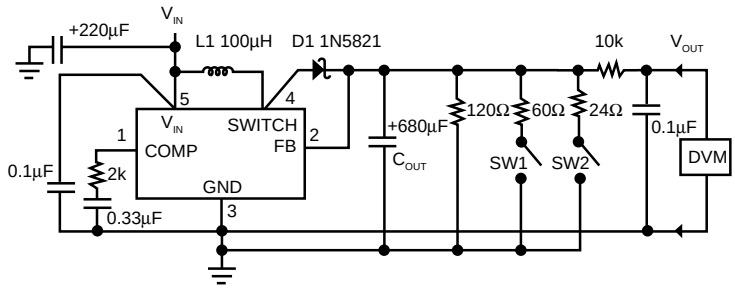
# ORDERING INFORMATION

**EXAMPLE: P/N OM1577-12SCM = 12 Volt, C5 Package With Screening**

| BASIC PART NUMBER | VOLTAGE LEVEL | CASE STYLE | SCREENING |
|---|---|---|---|
| OM1577 | 12 = 12 Volt | SC = C5 Package | Add “M” |
| | 15 = 15 Volt | SCZ = C5S Package | for 883 |
| | A = Adjustable | Both Packages Isolated | screening |

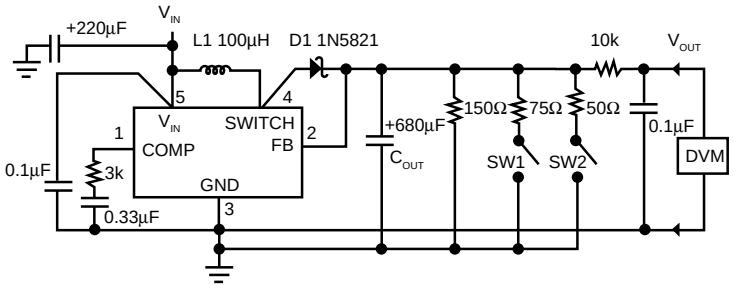
## OM1577-12 TEST CIRCUIT

**Circuit Used To Specify System Parameters For 12 Volt Version.**



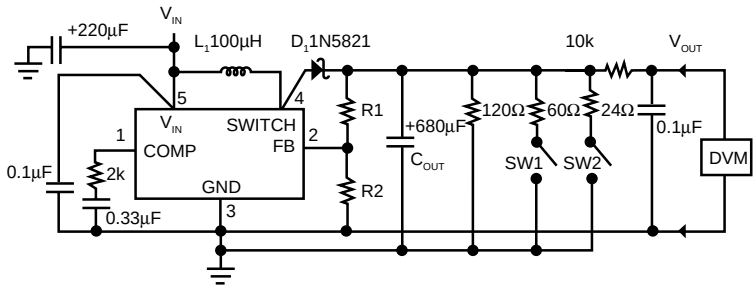

## OM1577-15 TEST CIRCUIT

**Circuit Used To Specify System Parameters For 15 Volt Version.**




## OM1577-A TEST CIRCUIT

**Circuit Used To Specify System Parameters For Adjustable Voltage Version.**

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