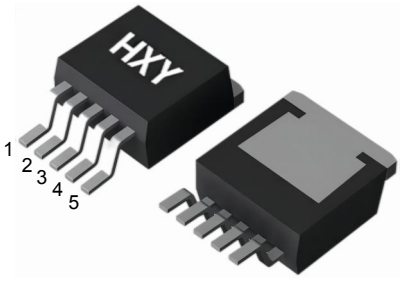
## General Description

The LM2576S is a series of easy to use fixed and adjustable step-down (buck) switch-mode voltage regulators. These devices are available in fixed output voltage of 3.3V, 5V, and an adjustable output version. Both versions are capable of driving a 3.5A load with excellent line and load regulation.

Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed-frequency oscillator.

The output voltage is guaranteed to ±3% tolerance under specified input voltage and output load conditions. The oscillator frequency is guaranteed to ±15%. External shutdown is included, featuring typically 80 μA standby current. Self protection features include a two stage frequency reducing current limit for the output switch and an over temperature shutdown for complete protection under fault conditions.




5 ON/OFF
4 Feedback
3 Gnd
2 Output
1 Vin

**TO263-5L**

## Features

- 3,3V,5V and adjustable output versions
- Output adjustable from 1.23v to 37V
- Fixed 52KHz frequency internal oscillator
- Guaranteed 3.5A output load current
- Input voltage range up to 40V
- Low power standby mode, $I_Q$ typically 80 μA
- TTL shutdown capability
- Excellent line and load regulation
- Requires only 4 external components
- High efficiency
- Thermal shutdown and current limit protection

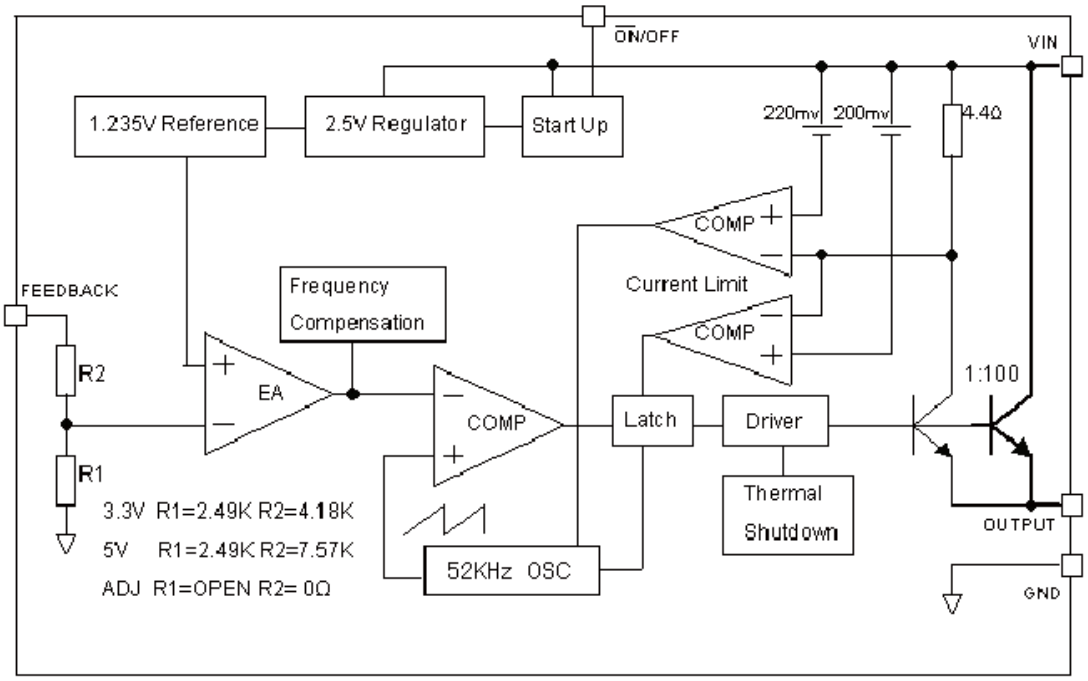
| Name | Description |
|---|---|
| Vin | Input supply voltage |
| Output | Switching output |
| Gnd | Ground |
| Feedback | Output voltage feedback |
| ON/OFF | ON/OFF shutdown<br>Active is “Low” or floating |

**Pin Descriptions**

## Applications

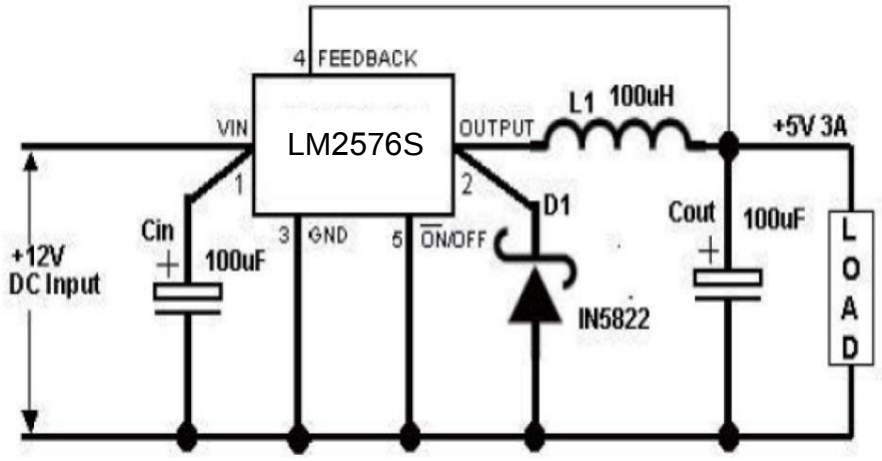
- Simple High-efficiency step-down regulator
- On-card switching regulators
- Positive to negative converter
- LCD monitor and LCD TV
- DVD recorder and PDP TV
- Battery charger
- Step-down to 3.3V for microprocessors

## Functional Block Diagram




Functional Block Diagram of LM2576S

## Typical Application (Fixed Output Voltage Versions)




Typical Application of LM2576S

## Absolute Maximum Ratings

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

| Parameter | Value | Unit |
|---|---|---|
| Supply Voltage Vin | -0.3 to 40 | V |
| Feedback VFB pin voltage | -0.3 to Vin+0.3 | V |
| ON/OFF Pin voltage | -0.3 to Vin+0.3 | V |
| Output pin voltage | -0.3 to Vin+0.3 | V |
| Output Voltage to Ground (Steady State) | -1 | V |
| Power Dissipation | Internally limited | W |
| Operating Temperature Range | -40 to +125 | °C |
| Storage Temperature | -65 to +150 | °C |
| Lead Temperature (Soldering, 10 sec) | 260 | °C |
| ESD(HM) | 2000 | V |
| Thermal Resistance-Junction to Ambient(RθJA) | 85 | ºC / W |
| Thermal Resistance-Junction to Case(RθJC) | 45 | ºC / W |

## Electrical Characteristics (All Output Voltage Versions)

Unless otherwise specified, Ta = 25℃.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_b$ | Feedback bias current | Adjustable only, $V_{FB}$=1.3V | | 10 | 50 | nA |
| $I_Q$ | Quiescent current | $V_{FB}$=12V force driver off | | 5 | 10 | mA |
| $I_{STBY}$ | Standby quiescent current | ON/OFF=5V, $V_{IN}$=36V | | 80 | 200 | uA |
| $F_{OSC}$ | Oscillator frequency | | 47 | 52 | 58 | KHz |
| $V_{SAT}$ | Saturation voltage | $I_{OUT}$=3.5A | | 1.2 | 1.4 | V |
| $I_{CL}$ | Current Limit | Peak Current ($V_{FB}$=0V) | | 4.5 | 5.5 | A |
| $I_L$ | Output leakage current | Output=0V ($V_{FB}$=12V) | | | 50 | uA |
| $I_L$ | Output leakage current | Output=-1V ($V_{IN}$=36V) | | 2 | 30 | mA |
| $V_{IL}$ | ON/OFF pin logic input | Low (Regulator ON) | | 1.3 | 1.6 | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{IH}$ | Threshold voltage | High (Regulator OFF) | 2.0 | 1.3 | | V |
| $I_H$<br>$I_L$ | ON/OFF pin input current | $V_{LOGIC}$=2.5V(Regulator OFF) | | 5 | 15 | uA |
| | | $V_{LOGIC}$=0.5V(Regulator ON) | | 0.02 | 5 | uA |
| $\theta_{JC}$ | Thermal Resistance Junction to Case | | | 3.5 | | $^{O}$C/W |
| $\theta_{JA}$ | Thermal Resistance Junction to Ambient (Note1) | | | 23 | | $^{O}$C/W |
| LM2576 S-ADJ | Vout: Output Voltage | 11V $\leqslant V_{IN} \leqslant$ 40V, 0.2A $\leqslant I_{LOAD} \leqslant$3.5A, $V_{OUT}$ for 9V | 1.193 | 1.23 | 1.267 | V |
| | $\eta$: Efficiency | $V_{IN}$=12V,$V_{OUT}$=9V,$I_{LOAD}$=3.5A | | 88 | | % |
| LM2576 S-3.3V | Vout: Output Voltage | 4.75V $\leqslant V_{IN} \leqslant$ 40V, 0.2A $\leqslant I_{LOAD} \leqslant$3.5A | 3.168 | 3.3 | 3.432 | V |
| | $\eta$: Efficiency | $V_{IN}$=12V, $I_{LOAD}$=3.5A | | 76 | | % |
| LM2576 S-5V | Vout: Output Voltage | 7V$\leqslant V_{IN} \leqslant$40V, 0.2A$\leqslant I_{LOAD} \leqslant$3.5A | 4.800 | 5.0 | 5.200 | V |
| | $\eta$: Efficiency | $V_{IN}$=12V, $I_{LOAD}$=3.5A | | 83 | | % |

Specifications with **boldface type** are for full operationg temperature range, the other type are for $T_J$=25$^{O}$C.

Note1: Thermal resistance with copper area of approximately 3 in$^2$.

## Typical Performance Characteristics

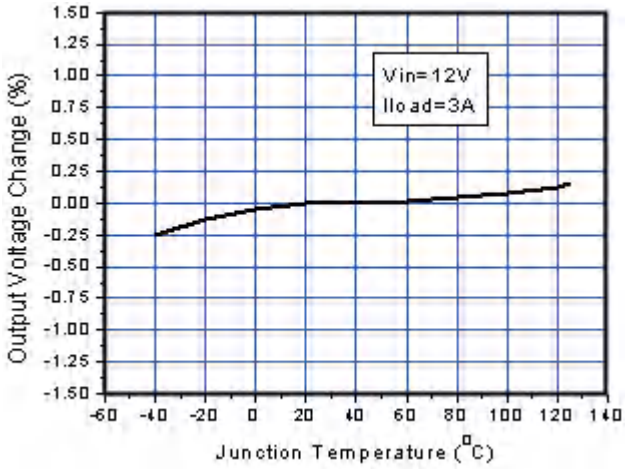



Figure 1. Output Voltage vs. Temperature

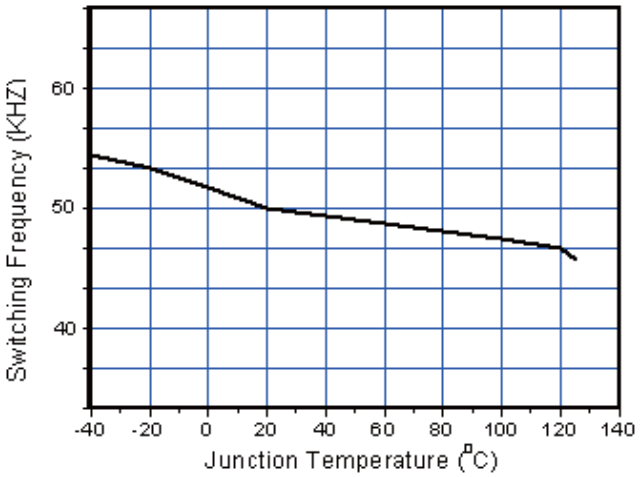



Figure 2. Switching Frequency vs. Temperature

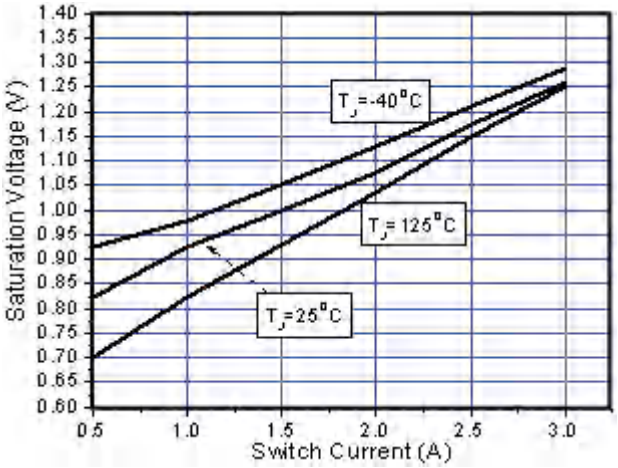



Figure 3. Output Saturation Characteristics

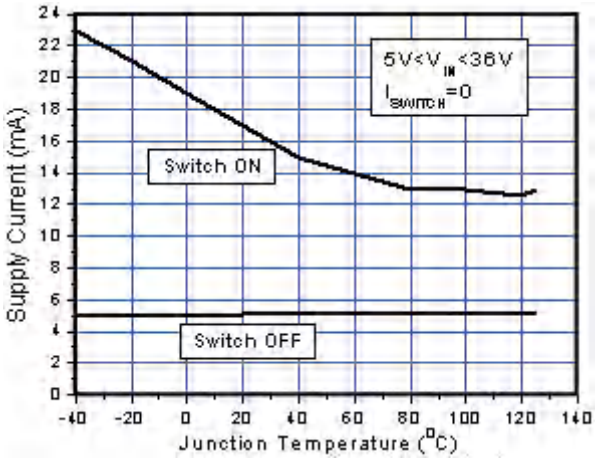



Figure 4. Quiescent Current vs. Temperature

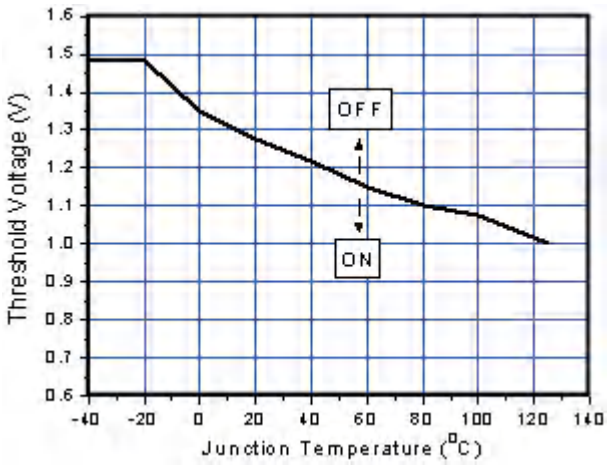



Figure 5. ON/OFF Pin Voltage

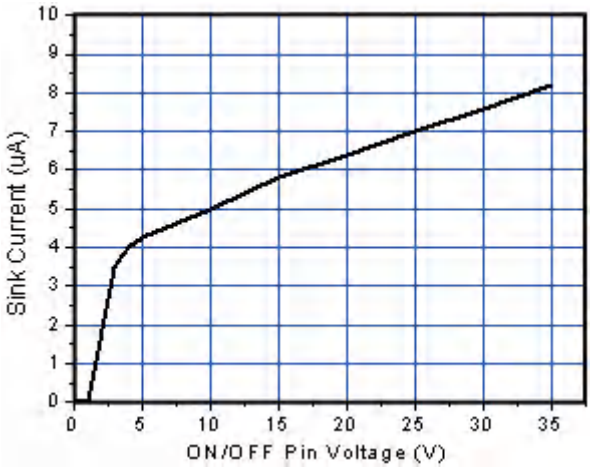



Figure 6. ON/OFF Pin Sink Current

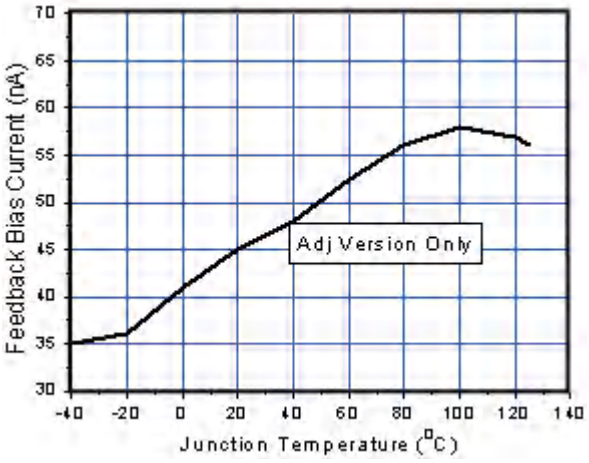



Figure 7. Output Saturation Characteristics

## Typical Application Circuit

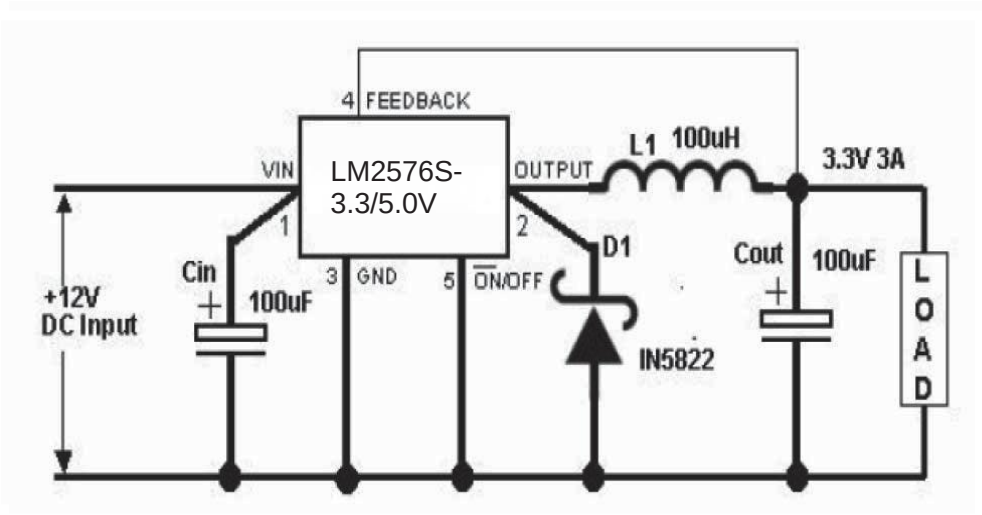



Figure 8. Typical Application of LM2576S For 3.3V,5.0V

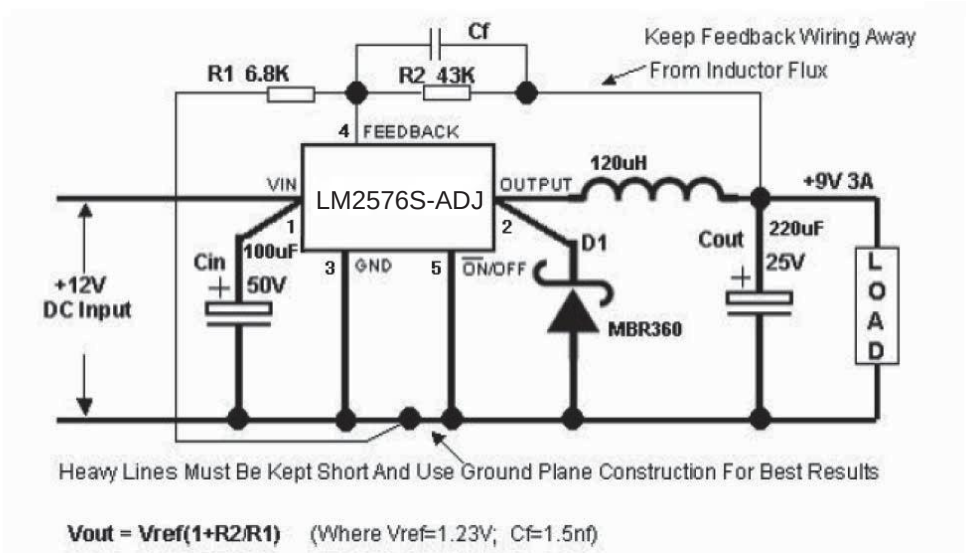
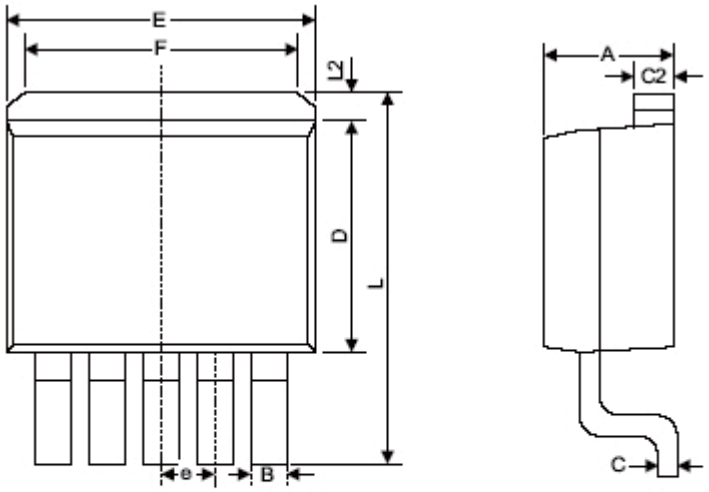
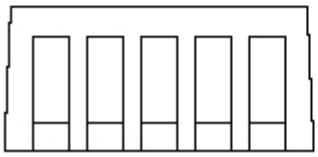



Figure 9. Typical Application of LM2576S For ADJ

## **Package Information** (TO263-5L)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.06 | 4.83 | 0.160 | 0.190 |
| B | 0.76 | 1.02 | 0.030 | 0.040 |
| C | 0.36 | 0.64 | 0.014 | 0.025 |
| C2 | 1.14 | 1.40 | 0.045 | 0.055 |
| D | 8.64 | 9.65 | 0.340 | 0.380 |
| E | 9.78 | 10.54 | 0.385 | 0.415 |
| e | 1.57 | 1.85 | 0.062 | 0.073 |
| F | 6.60 | 7.11 | 0.260 | 0.280 |
| L | 15.11 | 15.37 | 0.595 | 0.605 |
| L2 | - | 1.40 | - | 0.055 |

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