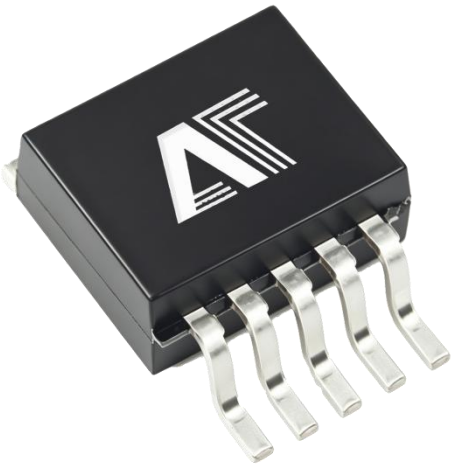
AOTE SEMICONDUCTOR



Switching type voltage regulator

LM2576HVS-ADJ(AT)

Product Data Sheet

AOTE DCC
RELEASE

◆ Summary ：

The LM2576 series voltage regulator is a monolithic integrated circuit capable of providing various functions of a step-down switching regulator (buck), driving loads up to 3A, with excellent line and load regulation capabilities. These devices offer fixed output voltages of 3.3V, 5V, 12V, and 15V, as well as adjustable output models.

These voltage regulators incorporate a frequency compensator and a fixed-frequency oscillator, minimizing the number of external components required for use and ensuring ease of operation.

The efficiency of the LM2576 is significantly higher than that of popular three-terminal linear regulators, making it an ideal replacement. In most cases, no external heatsink is required or only a very small one is needed.

The optimized standard series inductors compatible with LM2576 are available from several different inductor manufacturers. This feature significantly simplifies the design of switching power supplies. Additional features include a guaranteed output voltage error of ±4% under specified input voltage and output load conditions, as well as an oscillator frequency error of ±10%. The external shutdown circuit also features a quiescent current of 50μA (typical). The output switch incorporates cycle-by-cycle current limiting and thermal shutdown for full protection in fault conditions

◆ Product features

- 3.3V,5V,12V,15Vand adjustable output voltage models
- Adjustable Output Model Output Voltage Range: 1.23~37V (HV model 57V) under linear and load conditions, maximum +4%
- Ensure 3A output current
- Wide input voltage range, from 40V to 60V for HV models
- Only 4 external devices are needed to support it
- 52kHz fixed frequency internal oscillator
- TTL shutdown capability, low-power standby mode
- High efficiency
- Use readily available standard inductors
- Thermal shutdown and current limiting protection

◆ Applications

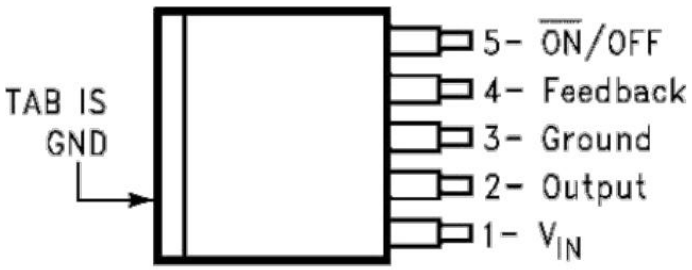
- Simple and efficient Buck voltage regulator
- Efficient pre regulator for linear regulators
- Card on switch regulator
- Buck Boost converter from positive to negative
- Negative boost converter
- Power supply for battery charger

◆ Product ordering information

Order model	Encapsulation	Print name	Packaging	Quantity per package
LM2576S-ADJ/TR	TO-263-5	LM2576-ADJ	tape	500/plate
LM2576S-3.3/TR		LM2576-3.3	tape	500/plate
LM2576S-5.0/TR		LM2576-5.0	tape	500/plate
LM2576S-12/TR		LM2576-12	tape	500/plate
LM2576S-15/TR		LM2576-15	tape	500/plate
LM2576HVS-ADJ/TR		LM2576HV-ADJ	tape	500/plate
LM2576HVS-3.3/TR		LM2576HV-3.3	tape	500/plate
LM2576HVS-5.0/TR		LM2576HV-5.0	tape	500/plate
LM2576HVS-12/TR		LM2576HV-12	tape	500/plate
LM2576HVS-15/TR		LM2576HV-15	tape	500/plate

◆ Pin definition

TO-236-5 Top View



Side View

LM2576S-XX or LM2576HVS-XX

◆ Typical application (fixed output voltage model)

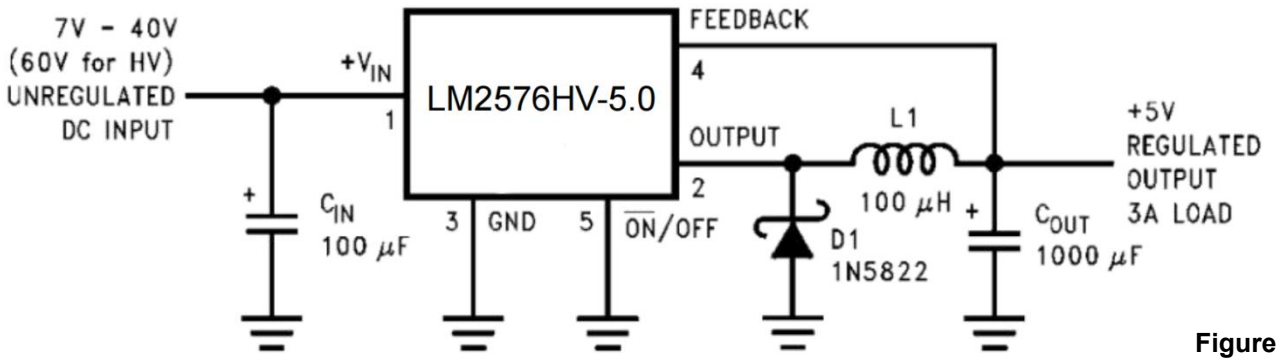
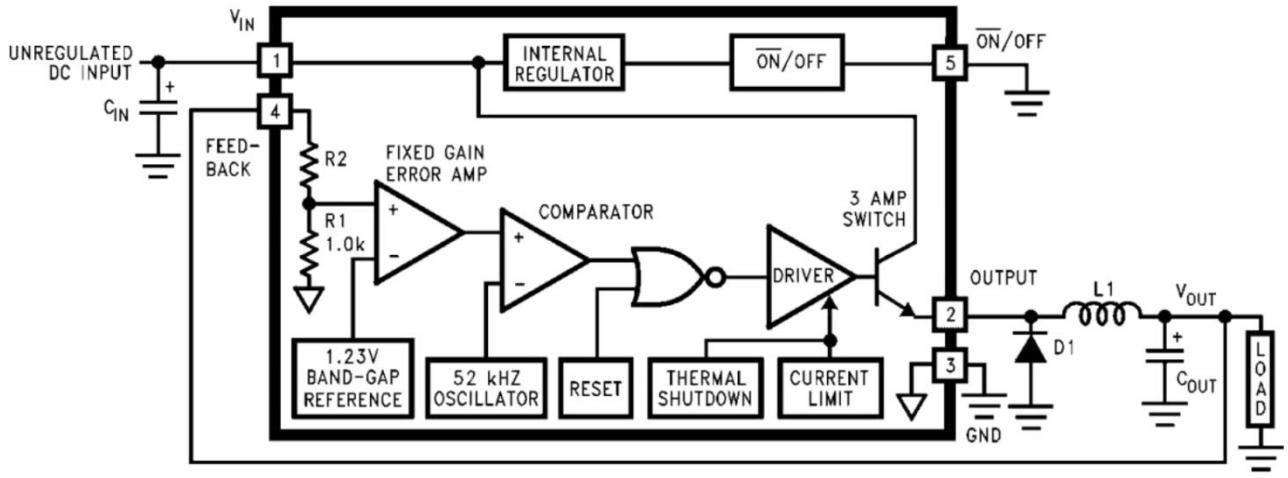


Figure 1

◆ Block diagram



3.3V R2= 1.7k 5V, R2 = 3.1k

12V, R2 = 8.84k

15V, R2 = 11.3k

Adjustable model

R1=open circuit, R2=0 Ω

◆ Absolute maximum rating

Parameter	symbol	Scope		Unit
Maximum power supply voltage LM2576	V_{IN}	40		V
Maximum power supply voltage LM2576HV	V_{IN}	60		V
On/off pin input voltage	V_{ON_OFF}	-0.3≦V≦+VIN		V
Ground output voltage (steady state)	-	-1		V
power consumption	P_D	Internal limitations		m/W
Save temperature range	T_{STG}	-65~+150		℃
Maximum junction temperature	T_J	150		℃
Minimum electrostatic discharge rating (C=100pF, R=1.5k Ω)	ESD	2		KV
Lead temperature (welding, 10 seconds)	T_{LEAD}	TO-263:	245	℃

◆ Hot information

Parameter	symbol	Scope	Unit
		TO-263	
Connected to environmental thermal resistance	$R_{\theta JA}$	42.6	℃/W
Thermal resistance at the top of the shell	$R_{\theta JC(top)}$	43.3	℃/W
Thermal resistance of the junction to the board	$R_{\theta JB}$	22.4	℃/W
Top characteristic parameters	ψ_{JT}	10.7	℃/W
Characteristic parameters of the structure to the board	ψ_{JB}	21.3	℃/W
Thermal resistance at the bottom of the shell	$R_{\theta JC(bot)}$	0.4	℃/W

◆ Recommended working conditions

Parameter	symbol	scope	Unit
Power supply voltage LM2576	V_{IN}	40	V
Power supply voltage LM2576HV	V_{IN}	60	V
Working temperature range	T_A	-40~+125	℃

◆ Electrical Characteristics

LM2576-3.3,LM2576HV-3.3

The standard font indicator is at T_J=25℃, and bold font is applicable to the entire working crystallization range.

Symbol	Feature	Condition	LM2576-3.3 LM2576HV-3.3		Unit(Limit)
			Typical value	limit value	
System Parameters (Note 3) Test Circuit Diagram 2					
V_{OUT}	output voltage	V_{IN}=12V,I_{load}=0.5A Circuit Diagram 2	3.3	3.234 3.366	V(Min) V(Max)
V_{OUT}	output voltage LM2576	6V≦V_{IN} ≦40V, 0.5A≦I_{load} ≦3A Circuit diagram 2	3.3	3.168/3.135 3.432/3.465	V(Min) V(Max)
V_{OUT}	Input voltage LM2576HV	15V≦V_{IN} ≦60V, 0.5A≦I_{load} ≦2A Circuit diagram 2	3.3	3.168/3.135 3.450/3.482	V(Min) V(Max)
n	efficiency	V_{IN}=12V,I_{load}=3A	75	-	%

◆ Electrical Characteristics

LM2576-5.0,LM2576HV-5.0 The standard font indicator is at T_J=25℃, and bold font is applicable to the entire working crystallization range.

symbol	Feature	Condition	LM2576-3.3 LM2576HV-3.3		Unit(Limit)
			Typical value	limit value	
System Parameters (Note 3) Test Circuit Diagram 2					
V_{OUT}	output voltage	V_{IN}=12V,I_{load}=0.5A Circuit Diagram 2	5.0	7.900 5.100	V(Min) V(Max)
V_{OUT}	output voltage LM2576	6V≦V_{IN} ≦40V, 0.5A≦I_{load} ≦3A Circuit diagram 2	5.0	4.800/4.750 5.200/5.250	V(Min) V(Max)
V_{OUT}	Input voltage LM2576HV	15V≦V_{IN} ≦60V, 0.5A≦I_{load} ≦2A Circuit diagram 2	5.0	4.800/7.750 5.225/5.275	V(Min) V(Max)
n	efficiency	V_{IN}=12V,I_{load}=3A	77	-	%

◆ Electrical Characteristics

LM2576-12,LM2576HV-12 The standard font indicator is at T_J=25℃, and bold font is applicable to the entire working crystallization range.

Symbol	Feature	Condition	LM2576-12 LM2576HV-12		Unit(Limit)
			Typical value	limit value	
System Parameters (Note 3) Test Circuit Diagram 2					
V_{OUT}	output voltage	V_{IN}=12V,I_{load}=0.5A Circuit Diagram 2	12	11.76 12.24	V(Min) V(Max)
V_{OUT}	output voltage LM2576	6V≦V_{IN} ≦40V, 0.5A≦I_{load} ≦3A Circuit diagram 2	12	11.52/11.40 12.48/12.60	V(Min) V(Max)
V_{OUT}	Input voltage LM2576HV	15V≦V_{IN} ≦60V, 0.5A≦I_{load} ≦2A Circuit diagram 2	12	11.52/11.40 12.54/12.60	V(Min) V(Max)
n	efficiency	V_{IN}=12V,I_{load}=3A	88	-	%

◆ Electrical Characteristics

LM2576-15,LM2576HV-15 The standard font indicator is at T_J=25℃, and bold font is applicable to the entire working crystallization range.

Symbol	Feature	Condition	LM2576-15 LM2576HV-15		Unit(Limit)
			Typical value	limit value	
System Parameters (Note 3) Test Circuit Diagram 2					
V_{OUT}	output voltage	V_{IN}=12V,I_{load}=0.5A Circuit Diagram 2	15	14.70 15.30	V(Min) V(Max)
V_{OUT}	output voltage LM2576	6V≦V_{IN} ≦40V, 0.5A≦I_{load} ≦3A Circuit diagram 2	15	14.40/14.25 15.60/15.75	V(Min) V(Max)
V_{OUT}	Input voltage LM2576HV	15V≦V_{IN} ≦60V, 0.5A≦I_{load} ≦2A Circuit diagram 2	15	14.40/14.25 15.68/15.83	V(Min) V(Max)
n	efficiency	V_{IN}=12V,I_{load}=3A	88	-	%

◆ Electrical Characteristics

LM2576-ADJ,LM2576HV-ADJ The standard font indicator is at T_J=25℃, and bold font is applicable to the entire working crystallization range.

Symbol	Feature	Condition	LM2576-ADJ LM2576HV-ADJ		Unit(Limit)
			Typical value	limit value	
System Parameters (Note 3) Test Circuit Diagram 2					
V_{OUT}	output voltage	V_{IN}=12V,I_{load}=0.5A Circuit Diagram 2	1.230	1.217 1.243	V(Min) V(Max)
V_{OUT}	output voltage LM2576	6V≦V_{IN} ≦40V, 0.5A≦I_{load} ≦3A Circuit diagram 2	1.230	1.193/1.180 1.267/1.280	V(Min) V(Max)
V_{OUT}	Input voltage LM2576HV	15V≦V_{IN} ≦60V, 0.5A≦I_{load} ≦2A Circuit diagram 2	1.230	1.193/1.180 1.273/1.286	V(Min) V(Max)
n	efficiency	V_{IN}=12V,I_{load}=3A	77	-	%

◆ Electrical characteristics of all output voltage devices

The standard font indicator is at T_J=25 ℃, and bold font is applicable to the entire working junction temperature range. Unless otherwise specified, V_{IN} =12V for 3.3V, 5V, and adjustable models, V_{IN} =25V for 12V models, and V_{IN} =30V for 15V models. I_{load}=500mA

Symbol	Feature	Condition	LM2576-XX LM2576HV-XX		Unit(Limit)
			Typical value	limit value	
Device parameters					
I_b	Feedback bias current	V_{OUT}=5V	50	100/500	nA
f_0	Oscillator frequency	(Note 11)	52	47/42 58/63	kHz (Min) kHz (Max)
V_{SAT}	Saturation voltage	I_{OUT}=3A (Note 4)	1.4	1.8/2.0	V(Max)
DC	Maximum Space Proportion(continuity)	(Note 5)	98	93	% (Min)
I_{CL}	current limit	(Note 4，11)	5.8	4.2/3.5 6.9/7.5	A (Min) A (Max)
I_L	Output leakage current	(Note 6,7) Output=0V Output=-1V Output=-1V	7.5	2 30	mA(Max) mA(Max)
I_Q	quiescent current	(Note 6)	5	10	mA(Max)
I_{STBY}	Standby static current	On/off pin=5V (cut-off)	50	200	μA (Max)
θθ JA JA JC θθ JA	thermal resistance	T-shaped packaging, connected to the environment (Note 8) T-shaped packaging, connected to the environment (Note 9) T-shaped packaging, connected to the outer shell S-shaped packaging, connected to the environment (Note 10)	6545 2 50	-	°C/W
Circuit diagram 2 for on/off control test					
V_{IH}	On/off control Logic input level	V_{OUT}=0V	1.4	2.2/2.4	V (Min)
V_{IL}		V_{OUT}=Rated input voltage	1.2	1.0/0.8	V (Max)

I_{IH}	On/off control input current	On/off control=5V (off)	12	30	μA (Max)
I_{IL}		On/off control=0V (on)	0	10	μA (Max)

1. The absolute maximum rated value is expressed as the limit. If it exceeds this range, it may damage the device. The working rated value refers to the device that should be able to work under this condition, but does not guarantee the specified performance limit value. For the guaranteed indicators and testing conditions, please refer to the electrical characteristics.

2. All limit values are guaranteed at room temperature (standard font) and throughout the working junction temperature range (bold font).

3. External components such as MOSFETs, inductors, and input-output capacitors can affect the performance of the switching regulator system. When LM2576/LM2576HV is applied to the test circuit shown in Figure 2, the system performance will be as shown in the system parameter section of the white gas characteristics.

4. Output pulling current. Do not connect diodes, inductors, or capacitors to the output pins.

5. Disconnect the feedback pin from the output and connect it to 0V.

6. Disconnect the feedback pin from the output, connect+12V for adjustable models and 33V, 5.0V models, and+25V for 12V, 15V models to turn off the output transistor.

7. VIN=40V (high voltage model is 60V).

8. Vertically install the 5-pin TO-220 package onto the thermal resistance material (without external heat sink), using 1/2 inch pins to connect to the socket, or connect to the PCB board with the smallest copper area.

9. Vertically install the 5-pin TO-220 package onto the thermal resistance material (without external heat sink), and solder the 1/4 inch pins to a PCB board with approximately 4 square inches of copper area around the pins.

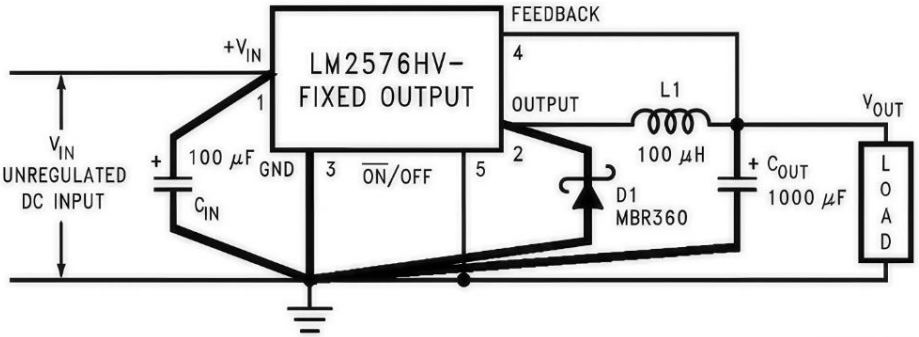
10.If TO-263 packaging is used, the heat can be reduced by increasing the copper area where the PCB board and the package are heat sealed together. The copper area at 0.5 square feet, θ JA is 50 ° C W: The copper area at 1 square foot, θ JA is 37 ° C; The copper area of 1.6 square inches or more, θ JA is 32 ℃ W.

11.When the output is short circuited or overloaded, the regulated output voltage will drop by about 40% of the nominal output voltage, and the oscillation frequency will drop to about 11kHz. This self-protection feature reduces the minimum duty cycle from 5% to about 2% to reduce the average loss of the integrated circuit.

◆ Principles for testing circuits and PCB layout

The layout of the printed circuit board is crucial in any switching regulator. Due to the inductance of the lead wires, fast switching currents can cause voltage transients, leading to many problems. To minimize the inductance and grounding circuit, thick wire marked leads should be used as short as possible.

To achieve the best results, a single point grounding (as shown in the diagram) or a grounding plane structure should be used. When using adjustable voltage regulators, the regulating resistor should be placed as close to the regulator as possible to keep sensitive feedback wiring as short as possible.



C_{IN}—100μF,75V,aluminum electrolysis

C_{OUT}—1000μF,25V,aluminum electrolysis

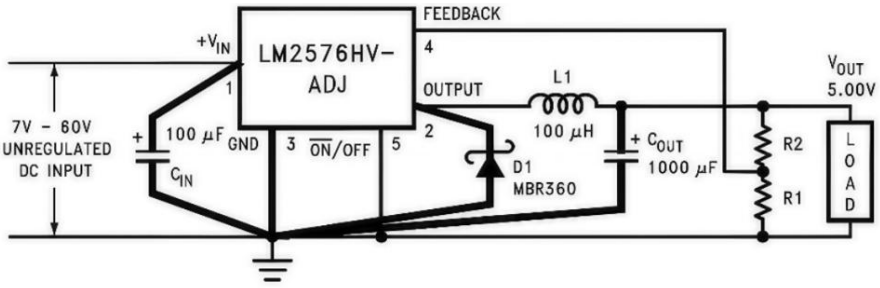
D1- Schottky,MBR360

L1—100μH, pulse PE-92108

R_1—2k,0.1%

R_2—6.12k,0.1%

Adjustable output voltage model



$$VOUT = VREF\left(1+\frac{R_2}{R_1}\right)$$

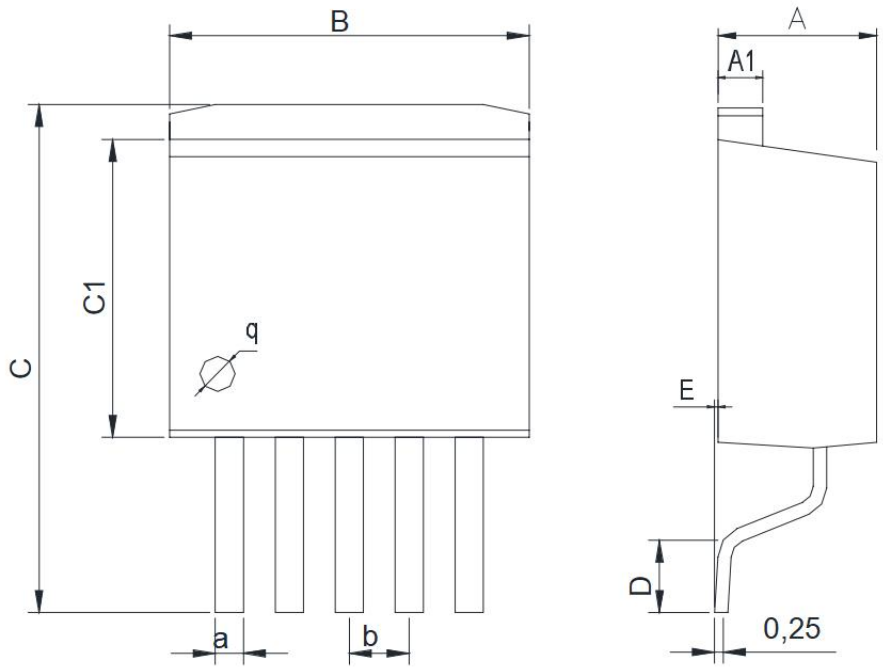
Among them, VREF=1.23V, R1 is between 1.0k Ω and 5.0k Ω

$$R_2 = R_1\left(\frac{VOUT}{VREF}\right) - 1$$

Attention: It is necessary to ensure that the negative pressure of the OUT pin is higher than the turn-on voltage of the parasitic diode inside the chip in order to avoid negative pressure on the output pin and damage to the internal parasitic diode Switching on causes an increase in power consumption of the internal pre driver module, so it is recommended to choose diodes such as Schottky diodes with vf<0.5V

◆ PACKAGE OUTLINE DIMENSIONS

TO-263-5



Dimensions In Millimeters									
Symbol:	**A**	**A1**	**B**	**C**	**C1**	**D**	**Q**	**a**	**b**
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

◆ Attention

- AOTE implements dynamic technical updates. Specifications are subject to change. Refer to the official website for the latest version.
- Users must strictly adhere to specified conditions. Failures caused by misuse (overload, high temperature, incompatible circuits) are excluded from warranty.
- Contact technical support for customized validation in critical applications (medical devices, industrial control).
- This document is valid until December 31, 2026. Updates will be notified on the official website.
- For further clarification on technical specifications or application solutions, please contact us through official channels: