钍地半导体
Tudi Semiconductor

Product Specification

TUDI-LM2575/LM2575HV

1A Step-Down Voltage Regulator

网址 www.sztdbdt.com

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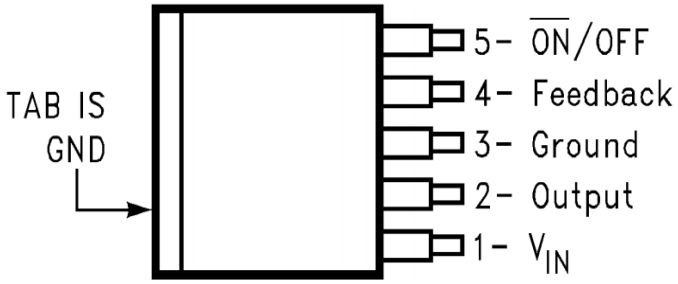
semiconductor device manufacturer

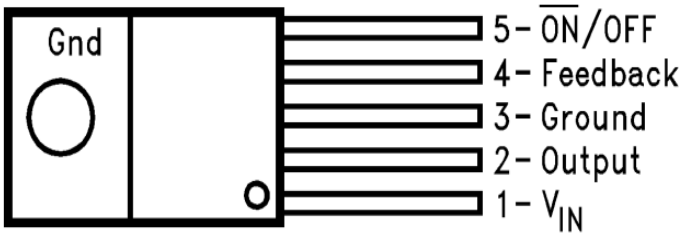
- Design
- research and development
- production
- and sales

FEATURES

- 3.3V, 5V, 12V, 15V, and Adjustable Output Versions
- AdjustableVersionOutput Voltage Range,
  - 1.23 V to 37V (57V for HV Version) ±4% Max Over
  - Lineand Load Conditions
- Specified 1A Output Current
- Wide Input Voltage Range,40V up to 60V for HV Version
- Requires Only 4 External Components
- 52 kHz Fixed Frequency Internal Oscillator
- TTL Shutdown Capability,Low Power Standby Mode
- High Efficiency
- Uses Readily Available Standard Inductors
- Thermal Shutdown and Current Limit Protection
- P+ Product Enhancement Tested



TO-263 Package



TO-220 Package

APPLICATIONS

- Simple High-Efficiency Step-Down (Buck) Regulator
- Efficient Pre-Regulator for Linear Regulators
- On-Card Switching Regulators
- Positive to Negative Converter (Buck-Boost)

DESCRIPTION

The LM2575 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 1A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3V, 5V, 12V, 15V, and an adjustable output version.

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

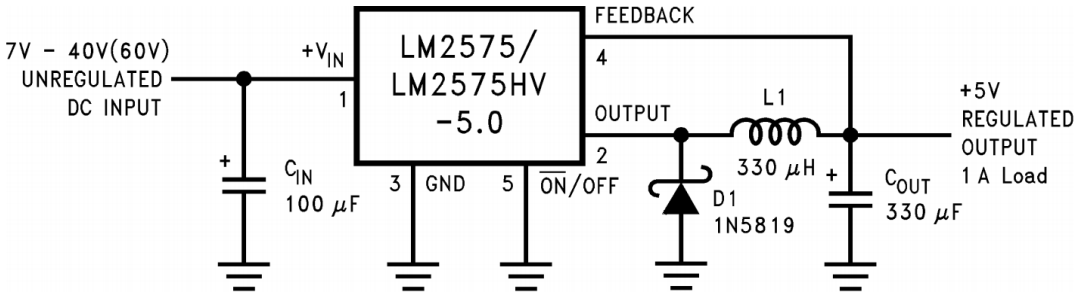
The LM2575 series offers a high-efficiency replacement for popular three-terminal linear regulators. It substantially reduces the size of the heat sink, and in many cases no heat sink is required.

A standard series of inductors optimized for use with the LM2575 are available from several different manufacturers. This feature greatly simplifies the design of switch-mode power supplies.

Other features include a specified ±4% tolerance on output voltage within specified input voltages and output load conditions, and ±10% on the oscillator frequency. External shutdown is included, featuring 50 μA (typical) standby current. The output switch includes cycle-by-cycle current limiting, as well as thermal shutdown for full protection under fault conditions.

Typical Application

(Fixed Output Voltage Versions)



Pin numbers are for the TO-220 package

Block Diagram and Typical Application

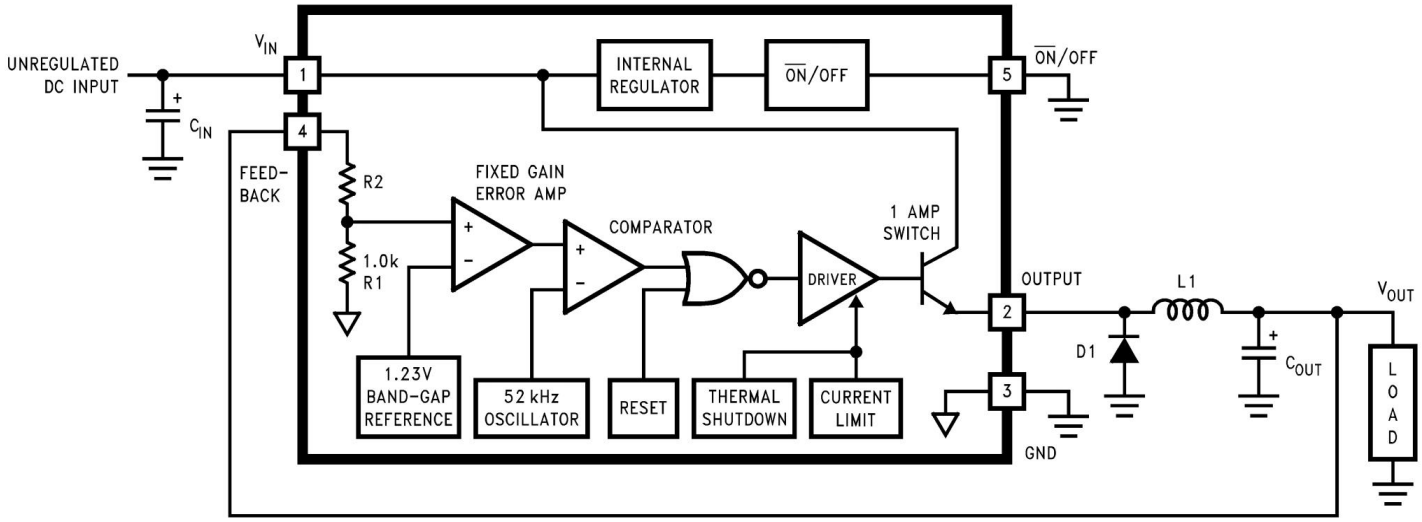


Figure 1.

3.3V, R2 = 1.7k
5V, R2 = 3.1k
12V, R2 = 8.84k
15V, R2 = 11.3k
For ADJ. Version
R1 = Open, R2 = 0Ω
Pin numbers are for the TO-220 package.

ABSOLUTE MAXIMUM RATINGS

Maximum Supply Voltage	LM1575/LM2575	45V
	LM2575HV	63V
ON /OFF Pin Input Voltage		-0.3V≤V≤+VIN
Output Voltage to Ground	(Steady State)	-1V
Power Dissipation		Internally Limited
Storage Temperature Range		-65℃ to +150℃
Maximum Junction Temperature		150℃
Minimum ESD Rating	(C=100 pF,R=1.5 kΩ)	2 kV
Lead Temperature	(Soldering,10 sec.)	260℃

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not ensure specific performance limits. For specified specifications and test conditions, see Electrical Characteristics.
(2) If Military/Aerospace specified devices are required, please contact the TI Sales Office/ Distributors for availability and specifications.
(3) Refer to RETS LM1575J for current revision of military RETS/SMD.

OPERATING RATINGS

Temperature Range	LM2575/LM2575HV	-40℃≤Tj≤+125℃
Supply Voltage	LM2575HV	60V

ELECTRICAL CHARACTERISTICS LM2575-3.3, LM2575HV-3.3

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range .

Symbol	Parameter	Conditions	Typ	LM2575-3.3LM2575HV-3.3 Limit	Units(Limits)
SYSTEM PARAMETERS Test Circuit Figure 2 and Figure 3					
V_{OUT}	Output Voltage	VIn=12V,ILOAD =0.2ACircuit Figure 2 and Figure 3	3.3	3.2343.366	VV(Min)V (Max)
V_{OUT}	Output VoltageLM1575/ LM2575	4.75V≤VIn≤40V,0.2A≤LOAD≤ 1ACircuit Figure 2 and Figure 3	3.3	3.168/3.1353 .432/3.465	VV(Min)V (Max)
V_{OUT}	Output VoltageLM2575HV	4.75V≤VIn≤60V,0.2A≤LoAD≤ 1ACircuit Figure 2 and Figure 3	3.3	3.168/3.1353 .450/3.482	VV(Min)V (Max)
η	Efficiency	VIN=12V,ILOAD =1A	75		%

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance. When the LM2575 is used as shown in the test circuit Figure 2 and Figure 3, system performance will be as shown in system parameters of Electrical Characteristics.

ELECTRICAL CHARACTERISTICS LM2575-5.0, LM2575HV-5.0

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range.

Symbol	Parameter	Conditions	Typ	LM2575-5.0LM2575HV-5.0 Limit	Units (Limits)
SYSTEM PARAMETERS Test Circuit Figure 2 and Figure 3					
V_{OUT}	Output Voltage	VIN=12V,ILOAD=0.2ACircuit Figure 2 and Figure 3	5.0	4.9005.100	V V(Min) V(Max)
V_{OUT}	Output Voltage LM2575	0.2A≤ILOAD≤1A,8V≤VIN≤40V Circuit Figure 2 and Figure 3	5.0	4.800/4.7505.200/5.250	V V(Min) V(Max)
V_{OUT}	Output Voltage LM2575HV	0.2A≤ILOAD≤1A,8V≤VIn≤60VCircuit Figure 2 and Figure 3	5.0	4.800/4.7505.225/5.275	V V(Min) V(Max)
η	Efficiency	VIN=12V,LOAD=1A	77		%

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance. When the LM1575/LM2575 is used as shown in the test circuit Figure 2 and Figure 3, system performance will be as shown in system parameters of Electrical Characteristics.

ELECTRICAL CHARACTERISTICS LM2575-12, LM2575HV-12

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range .

Symbol	Parameter	Conditions	Typ	LM2575-12LM2575HV-12 Limit	Units (Limits)
SYSTEM PARAMETERS Test Circuit Figure 2 and Figure 3					
VoUT	Output Voltage	VIn=25V,ILOAD =0.2A Circuit Figure 2 and Figure 3	12	11.76 12.24	VV(Min)V (Max)
VoUT	Output VoltageLM2575	0.2A≤LOAD≤1A,15V≤VIN≤40V Circuit Figure 2 and Figure 3	12	11.52/11.40 12.48/12.60	V V(Min) V(Max)
VouT	Output VoltageLM2575HV	0.2A≤ILOAD≤1A,15V≤VIN≤60V Circuit Figure 2 and Figure 3	12	11.52/11.40 12.54/12.66	V V(Min) V(Max)
η	Efficiency	VIN=15V,ILOAD=1A	88		%

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance. When the LM1575/LM2575 is used as shown in the test circuit Figure 25 and Figure 26, system performance will be as shown in system parameters of Electrical Characteristics.

ELECTRICAL CHARACTERISTICS LM2575-15, LM2575HV-15

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range .

Symbol	Parameter	Conditions	Typ	LM2575-15 LM2575HV-15 Limit	Units (Limits)
SYSTEM PARAMETERS Test Circuit Figure 2 and Figure 3					
V_{OUT}	Output Voltage	VIN=30V,LOAD=0.2A Circuit Figure 2 and Figure 3	15	14.70 15.30	V V(Min) V(Max)
V_{OUT}	Output Voltage LM2575	0.2A≤LOAD≤1A,18V≤VIN≤40V Circuit Figure 2 and Figure 3	15	14.40/14.25 15.60/15.75	V V(Min) V(Max)
V_{OUT}	Output Voltage LM2575HV	0.2A≤ILOAD≤1A,18V≤VIN≤60V Circuit Figure 2 and Figure 3	15	14.40/14.25 15.68/15.83	V V(Min) V(Max)
η	Efficiency	VIn=18V,LOAD=1A	88		%

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance. When the LM1575/LM2575 is used as shown in the test circuit Figure 25 and Figure 26, system performance will be as shown in system parameters of Electrical Characteristics.

ELECTRICAL CHARACTERISTICS LM2575-ADJ, LM2575HV-ADJ

Specifications with standard type face are for T_J= 25 ° C, and those with boldface type apply over full Operating Temperature Range.

Symbol	Parameter	Conditions	Typ	LM2575-ADJLM2575HV-ADJ	Units (Limits)
				Limit	
SYSTEM PARAMETERS Test Circuit Figure 2 and Figure 3					
V_{OUT}	Feedback Voltage	VI=12V,LOAD=0.2A VoUT=5V Circuit Figure 2 and Figure 3	1.230	1.2171.243	V V(Min) V(Max)
V_{OUT}	Feedback VoltageLM1575/ LM2575	0.2A≤lLOAD≤1A,8V≤VIN≤40V VouT=5V,Circuit Figure 2 and Figure 3	1.230	1.193/1.180 1.267/1.280	V V(Min) V(Max)
V_{OUT}	Feedback VoltageLM2575HV	0.2A≤LOAD≤1A,8V≤VIn≤60V VoUT=5V,Circuit Figure 2 and Figure 3	1.230	1.193/1.180 1.273/1.286	V V(Min) V(Max)
η	Efficiency	VIn=12V,LOAD=1A,V_{OUT}=5V	77		%

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance. When the LM1575/LM2575 is used as shown in the test circuit Figure 2 and Figure 3, system performance will be as shown in system parameters of Electrical Characteristics.

ELECTRICAL CHARACTERISTICS ALL OUTPUT VOLTAGE VERSIONS

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range. Unless otherwise specified, V_{IN} = 12V for the 3.3V, 5V, and Adjustable version, V_{IN} = 25V for the 12V version, and V_{IN} = 30V for the 15V version. I_{LOAD} = 200 mA.

Symbol	Parameter	Conditions	Typ	LM2575-XX LM2575HV-XX	Units (Limits)
				Limit	
DEVICE PARAMETERS					
Ib	Feedback Bias Current	VoUT=5V(Adjustable Version Only)	50	100/500	nA
fo	Oscillator Frequency	See(3)	52	47/4258/63	kHzkHz (Min) kHz (Max)
VSAT	Saturation Voltage	IouT=1A(4)	0.9	1.2/1.4	VV (Max)
DC	Max Duty Cycle (ON)	See(5)	98	93	%% (Min)
IcL	Current Limit	Peak Current(4 3)	2.2	1.7/1.33.0/3.2	AA(Min)A(Max)
LL	Output LeakageCurrent	Output =OVOutput =-1VOutput=-1V(6 7)	7.5	230	mA (Max) mAmA (Max)
IQ	Quiescent Current	See(6)	5	10	mAmA (Max)
ISTBY	Standby QuiescentCurrent	ON /OFF Pin=5V(OFF)	50	200	μAμA (Max)

θ JA	Thermal Resistance	TO-220 Package,Junction to Ambientt(8)	65		°C/W
θ JA		TO-220 Package,Junction to Ambient(9)	45		
θ JC		TO-220 Package,Junction to Case	2		
θ JA		DIP Package,Junction to Ambient(10)	85		
θ JA		SOIC Package,Junction to Ambient(10)	100		
θ JA		TO-263 Package,Junction to Ambient(11)	37		

(1) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All limits are used to calculate Average Outgoing Quality Level, and all are 100% production tested.
(2) All limits specified at room temperature (standard type face) and at temperature extremes (bold type face). All room temperature limits are 100% production tested. All limits at temperature extremes are specified via correlation using standard Statistical Quality Control (SQC) methods.
(3) The oscillator frequency reduces to approximately 18 kHz in the event of an output short or an overload which causes the regulated output voltage to drop approximately 40% from the nominal output voltage. This self protection feature lowers the average power dissipation of the IC by lowering the minimum duty cycle from 5% down to approximately 2%.
(4) Output (pin 2) sourcing current. No diode, inductor or capacitor connected to output pin.
(5) Feedback (pin 4) removed from output and connected to 0V.
(6) Feedback (pin 4) removed from output and connected to +12V for the Adjustable, 3.3V, and 5V versions, and +25V for the 12V and 15V versions, to force the output transistor OFF.
(7) V_{IN} = 40V (60V for the high voltage version).
(8) Junction to ambient thermal resistance (no external heat sink) for the 5 lead TO-220 package mounted vertically, with 1/2 inch leads in a socket, or on a PC board with minimum copper area.
(9) Junction to ambient thermal resistance (no external heat sink) for the 5 lead TO-220 package mounted vertically, with 1/2 inch leads soldered to a PC board containing approximately 4 square inches of copper area surrounding the leads.
(10) Junction to ambient thermal resistance with approximately 1 square inch of pc board copper surrounding the leads. Additional copper area will lower thermal resistance further. See thermal model in Switchers made Simple software.
(11) If the DDPAK/TO-263 package is used, the thermal resistance can be reduced by increasing the PC board copper area thermally connected to the package: Using 0.5 square inches of copper area, θ_{JA} is 50 ° C/W; with 1 square inch of copper area, θ_{JA} is 37 ° C/W;and with 1.6 or more square inches of copper area, θ_{JA} is 32 ° C/W.

ELECTRICAL CHARACTERISTICS ALL OUTPUT VOLTAGE VERSIONS (continued)

Specifications with standard type face are for T_J = 25 ° C, and those with boldface type apply over full Operating Temperature Range. Unless otherwise specified, V_{IN} = 12V for the 3.3V, 5V, and Adjustable version, V_{IN} = 25V for the 12V version, and V_{IN} = 30V for the 15V version. I_{LOAD} = 200 mA.

Symbol	Parameter	Conditions	Typ	LM2575-XXLM2575HV-XX Limit(2)	Units (Limits)
ON /OFF CONTROL Test Circuit Figure 2 and Figure 3					
VH	ON/OFF Pin LogicInput Level	VOUT=OV	1.4	2.2/2.4	V(Min)
VL		VOUT=Nominal Output Voltage	1.2	1.0/0.8	V(Max)
IH	ON/OFF Pin InputCurrent	ON /OFF Pin=5V(OFF)	12	30	μA μA(Max)
IL		ON /OFF Pin =OV(ON)	0	10	μA μA(Max)

TEST CIRCUIT AND LAYOUT GUIDELINES

As in any switching regulator, layout is very important. Rapidly switching currents associated with wiring inductance generate voltage transients which can cause problems. For minimal inductance and ground loops, the length of the leads indicated by heavy lines should be kept as short as possible. Single-point grounding (as indicated) or ground plane construction should be used for best results. When using the Adjustable version, physically locate the programming resistors near the regulator, to keep the sensitive feedback wiring short.

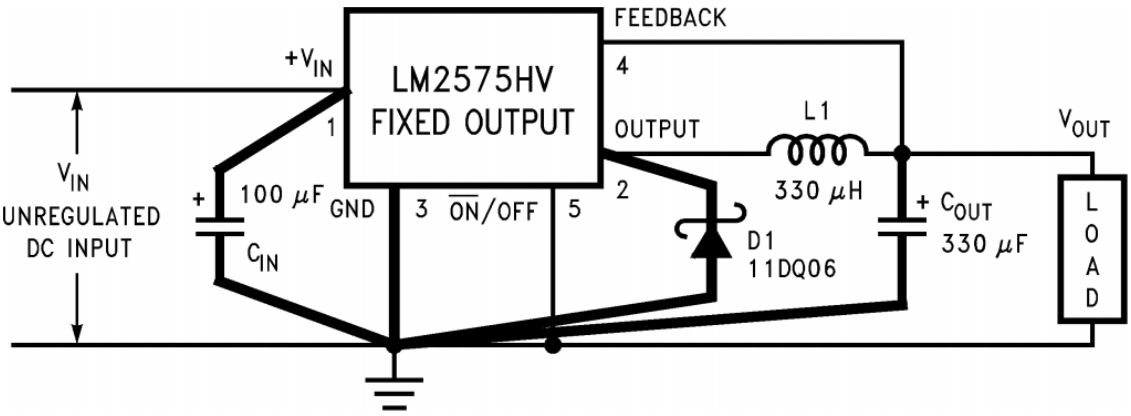


Figure 2. Fixed Output Voltage Versions

C_{IN} — 100 μF, 75V, Aluminum Electrolytic C_{OUT} — 330 μF, 25V, Aluminum Electrolytic
D1 — Schottky, 11DQ06 L1 — 330 μH, PE-52627 (for 5V in, 3.3V out, use 100 μH, PE-92108)

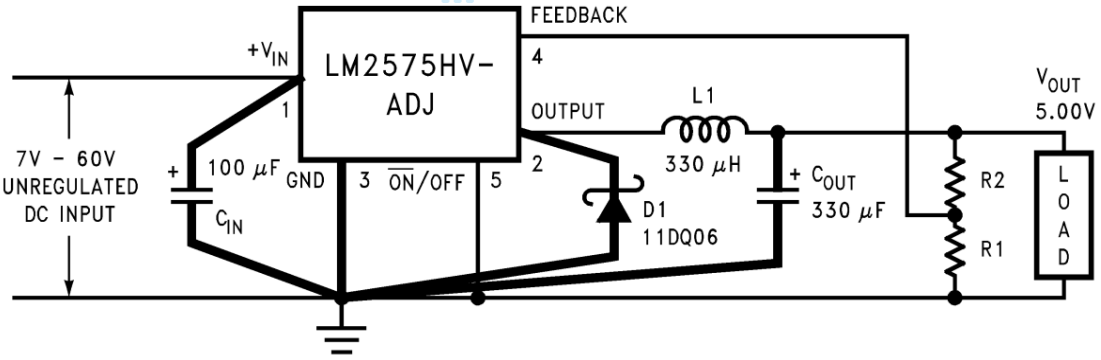


Figure 3. Adjustable Output Voltage Version

$$V_{OUT} = V_{REF}\left(1 + \frac{R2}{R1}\right)$$

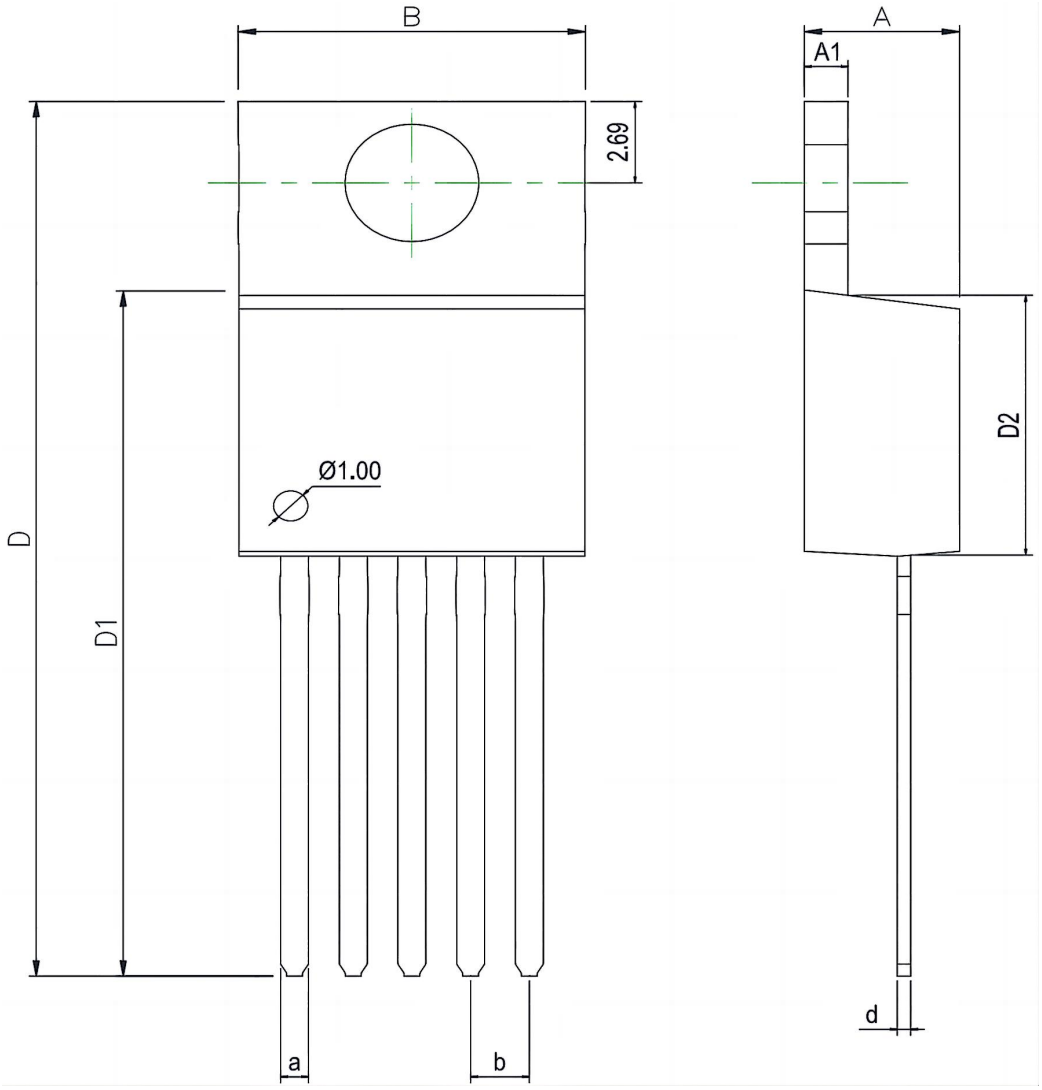
$$R2 = R1\left(\frac{V_{OUT}}{V_{REF}} - 1\right)$$

where
V_{REF} = 1.23V, R1 between 1k and 5k.
R1 — 2k, 0.1%
R2 — 6.12k, 0.1%
Pin numbers are for the TO-220 package.

ORDERING INFORMATION

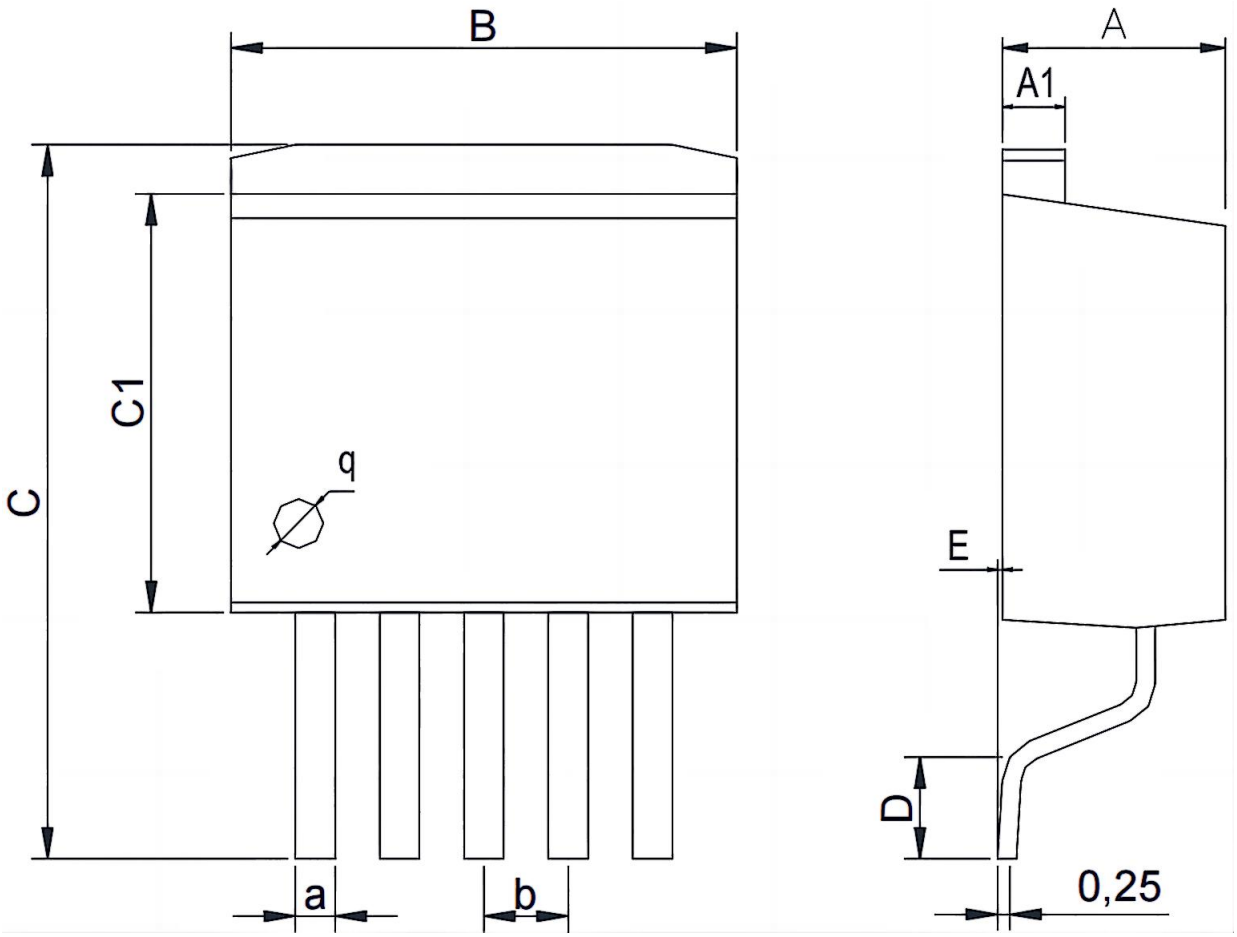
Order Number	Package	Package Quantity	Marking On The park	Temperature
LM2575HVSX-15/NOPB-TUDI	TO263	Tape,Reel,500	LM2575HVS-15	-40℃ to 125 ℃
LM2575HVSX-3.3/NOPB-TUDI	TO263	Tape,Reel,500	LM2575HVS-3.3	
LM2575HVSX-5.0/NOPB -TUDI	TO263	Tape,Reel,500	LM2575HVS-5.0	
LM2575HVSX-ADJ/NOPB -TUDI	TO263	Tape,Reel,500	LM2575HVS-ADJ	
LM2575HVSX-12/NOPB -TUDI	TO263	Tape,Reel,500	LM2575HVS-12	
LM2575HVT-12/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575HVT-12	
LM2575HVT-15/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575HVT-15	
LM2575HVT-3.3/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575HVT-3.3	
LM2575HVT-5.0/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575HVT-5.0	
LM2575HVT-ADJ/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575HVT-ADJ	
LM2575SX-12/NOPB-TUDI	TO263	Tape,Reel,500	LM2575S-12	
LM2575SX-15/NOPB-TUDI	TO263	Tape,Reel,500	LM2575S-15	
LM2575SX-3.3/NOPB-TUDI	TO263	Tape,Reel,500	LM2575S-3.3	
LM2575SX-5.0/NOPB-TUDI	TO263	Tape,Reel,500	LM2575S-5.0	
LM2575SX-ADJ/NOPB-TUDI	TO263	Tape,Reel,500	LM2575S-ADJ	
LM2575T-12/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575T-12	
LM2575T-15/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575T-15	
LM2575T-3.3/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575T-3.3	
LM2575T-5.0/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575T-5.0	
LM2575T-ADJ/NOPB-TUDI	TO220	Tube,50,A box of 1000	LM2575T-ADJ	

Package TO220-5



Dimensions In Millimeters(TO-220-5)									
Symbol:	**A**	**A1**	**B**	**D**	**D1**	**D2**	**a**	**d**	**b**
Min:	4.52	1.25	10	28.2	22.4	8.69	0.71	0.33	1.70BSC
Max:	4.62	1.29	10.3	28.9	22.6	8.79	0.97	0.42	

Package TO263-5



Dimensions In Millimeters(TO-263-5)									
Symbol:	**A**	**A1**	**B**	**C**	**C1**	**D**	**E**	**a**	**b**
Min:	4.45	1.22	10	13.7	8.40	1.90	0	0.71	1.70BSC
Max:	4.62	1.32	10.4	14.6	8.90	2.10	0.20	0.97	

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