Bay Linear

*Inspire the Linear Power*

# 1.0A Step Down Switching voltage Regulator

# LM2575

**Adjustable & Fix Output**

## Description

The Bay Linear LM2575 contains fixed and adjustable switching voltage regulators that require a minimum of external components. All circuitry necessary to build a buck-switching regulator is included.

The LM2575 is available in 3.3V; 5V, 12V & 15V fixed voltages, or an adjustable version with an output voltage range from 1.23V to 37V. The guaranteed accuracy for specified input and load conditions is ±4%.

The LM2575 can supply 1A with an excellent load and line regulation. Protection such as cycle-by-cycle current limiting or thermal shutdown has been designed. In standby mode, the current consumption has been minimized (200μA).

For 3A step-down switching regulators refer to LM2576 data sheets

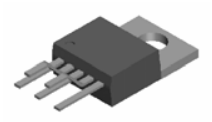
## Features

- **Guaranteed 1A Output Current**
- **High Efficiency**
- **Wide Input Voltage, up to 40V**
- **3.3V, 5V, 12V, 15V and Adjustable Output Versions**
- **Thermal Shutdown and Current Limit Protection**
- **Requires only 4 External Components**
- **Low Power Standby Mode < 200μA Typical**
- **Shutdown Capability (Standby Mode)**
- **52kHz Fixed Frequency Internal Oscillator**
- **Uses Standard Inductors**
- **Pin-to-Pin Compatible with LM2575**

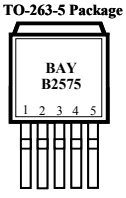
## Applications

- **Efficient Pre-Regulator for Linear Regulators**
- **On-card Switching Regulators**
- **Positive to Negative Converter (Buck-Boost)**
- **Simple High-efficiency Step-down (Buck)**
- **Portable Instruments**

## Pin Connection



**TO-263-5 Package**




1) $V_{IN}$
2) $V_{OUT}$
3) GND
4) FB
5) $\overline{ON/OFF}$

**Top View**

**TO-220-5 Package**


1) $V_{IN}$
2) $V_{OUT}$
3) GND
4) FB
5) $\overline{ON/OFF}$

## Ordering Information

| Devices | Package | Temp. |
|---|---|---|
| LM2575T-X | TO-220 | -40 °C to 125 °C |
| LM2575S-X | TO-263 | -40°C to 125 °C |
| LM2575J-X | LPDD | -40°C to 125 °C |

X= Output Voltage (X=3.3V, 5.0V, 12V, 15V or Blank for Adjustable)
Consult factory for other fixed voltages.

## Absolute Maximum Rating

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Maximum Input Voltage | $V_{IN}$ | 45 | V |
| Power Dissipation | $P_O$ | Internally Limited | W |
| ON/Off Pin Input Voltage | | $-0.3V<V<V_{IN}$ | |
| Output Voltage to Ground | | -1 | V |
| Supply Voltage | | 40 | V |
| Operating Junction Temperature Range<br>Control Section<br>Power Transistor | $T_J$ | $-40<T_J<85$ | °C |
| Storage Temperature Range | $T_{STG}$ | -65 to 150 | |
| Lead Temperature (Soldering 10 Sec.) | $T_{LEAD}$ | 260 | |

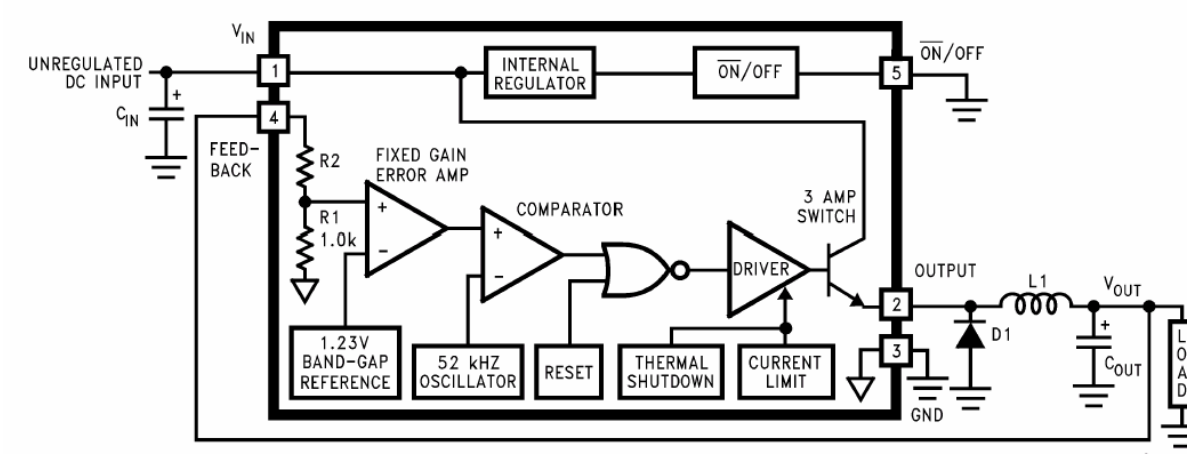
**ELECTRICAL CHARACTERISTICS** $T_A = 25°C$ $V_{IN} = 12V$, $I_{LOAD} = 100mA$ unless otherwise specified.
**Boldface** type applies over full Operating Temperature Range.

| Parameter | Conditions | LM2575 Typ | LM2575 Min | LM2575 Max | Units |
|---|---|---|---|---|---|
| **Adjustable Regulators** (Note 3)(Note 8) | | | | | |
| Output Voltage ($V_{OUT}$) | $V_{IN} = 12V$, $I_{LOAD} = 0.2A$, $V_{OUT} = 5V$ | 1.230 | 1.217 | 1.243 | V |
| | $0.5A \le I_{LOAD} \le 1A$, $8V \le V_{IN} \le 40V$, $V_{OUT} = 5V$ | 1.230<br>**1.230** | 1.193<br>**1.180** | 1.267<br>**1.280** | V |
| Efficiency (Note 7) | $V_{IN} = 12V$, $I_{LOAD} = 1A$, $V_{OUT} = 5V$ | 82 | | | % |
| **3.3V Version** (Note 3)(Note 9) | | | | | |
| Output Voltage ($V_{OUT}$) | $V_{IN} = 12V$, $I_{LOAD} = 0.2A$, $V_{OUT} = 3.3V$ | 3.3 | 3.234 | 3.366 | V |
| | $0.2A \le I_{LOAD} \le 1A$, $4.75V \le V_{IN} \le 40V$, $V_{OUT} = 3.3V$ | 3.3<br>**3.3** | 3.168<br>**3.135** | 3.432<br>**3.465** | V |
| Efficiency | $V_{IN} = 12V$, $I_{LOAD} = 1A$ | 77 | | | % |
| **5V Version** (Note 3)(Note 9) | | | | | |
| Output Voltage ($V_{OUT}$) | $V_{IN} = 12V$, $I_{LOAD} = 0.2A$, $V_{OUT} = 5V$ | 5.0 | 4.900 | 5.100 | V |
| | $0.2A \le I_{LOAD} \le 1A$, $8V \le V_{IN} \le 40V$, $V_{OUT} = 5V$ | 5.0<br>**5.0** | 4.800<br>**4.750** | 5.200<br>**5.250** | V |
| Efficiency (Note 7) | $V_{IN} = 12V$, $I_{LOAD} = 1A$, $V_{OUT} = 5V$ | 77 | | | % |
| **12V Version** (Note 3)(Note 9) | | | | | |
| Output Voltage ($V_{OUT}$) | $V_{IN} = 25V$, $I_{LOAD} = 0.2A$, $V_{OUT} = 12V$ | 12 | 11.760 | 12.240 | V |
| | $0.2A \le I_{LOAD} \le 1A$, $15V \le V_{IN} \le 40V$, $V_{OUT} = 12V$ | 12<br>**12** | 11.520<br>**11.400** | 12.480<br>**12.600** | V |
| Efficiency (Note 7) | $V_{IN} = 25V$, $I_{LOAD} = 1A$ | 88 | | | % |
| **15V Version** (Note 3)(Note 9) | | | | | |
| Output Voltage ($V_{OUT}$) | $V_{IN} = 30V$, $I_{LOAD} = 0.2A$, $V_{OUT} = 15V$ | 15 | 14.700 | 15.300 | V |
| | $0.2A \le I_{LOAD} \le 1A$, $18V \le V_{IN} \le 40V$, $V_{OUT} = 15V$ | 15<br>**15** | 14.400<br>**14.250** | 15.600<br>**15.750** | V |
| Efficiency (Note 7) | $V_{IN} = 30V$, $I_{LOAD} = 1A$ | 88 | | | % |

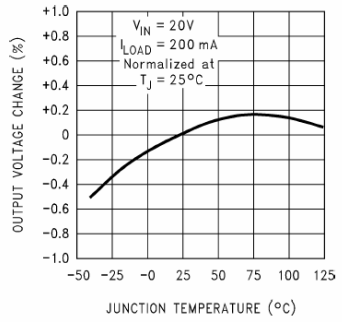
**ELECTRICAL CHARACTERISTICS** $T_A = 25°C$ $V_{IN} = 12V$, $I_{LOAD} = 100mA$ unless otherwise specified.
**Boldface** type applies over full Operating Temperature Range.

| Parameters | Conditions | LM2575 Typ | LM2575 Min | LM2575 Max | Units |
|---|---|---|---|---|---|
| **Adjustable Regulator** | | | | | |
| Feedback Bias Current | $V_{OUT} = 5V$ | 50 | | 100<br>**500** | nA |
| **Fixed and Adjustable Regulators** | | | | | |
| Oscillator Frequency | | 52 | 47<br>**42** | 58<br>**63** | kHz |
| Saturation Voltage | $I_{OUT} = 1A$, (Note 4) | 0.9 | | 1.2<br>**1.4** | V |
| Max Duty Cycle | (Note 5) | 98 | 93 | | % |
| Current Limit | Peak Current, $t_{ON} \leq 3\mu s$, (Note 4) | 2.2 | 1.7<br>**1.3** | 3.0<br>**3.2** | A |
| Output Leakage Current | $V_{IN}$, (Note 6), Output = 0V<br>(Note 6 ), Output = -1V | <br>7.5 | | 2<br>30 | mA |
| Quiescent Current | (Note 6) | 5 | | 10 | mA |
| Standby Quiescent Current | ON/OFF Pin = 5V (OFF) | 50 | | 200 | µA |
| Thermal Resistance | T,U package, Junction to Ambient, (Note 7)<br>T,U package, Junction to case<br>M | 65<br>2<br>37 | | | °C/W |
| **ON/OFF Control, Fixed & Adjustable Regulators** (Note 8) (Note9) | | | | | |
| OFF Input Level | $V_{OUT} = 0V$ | 1.4 | 2.2<br>**2.4** | | V |
| ON Input Level | $V_{OUT} = 15V$ or 5V | 1.2 | | 1.0<br>**0.8** | V |
| OFF Logic Current | ON/OFF Pin = 5V (OFF) | 4 | | 30 | µA |
| ON Logic Current | ON/OFF Pin = 0V (ON) | 0.01 | | 10 | µA |

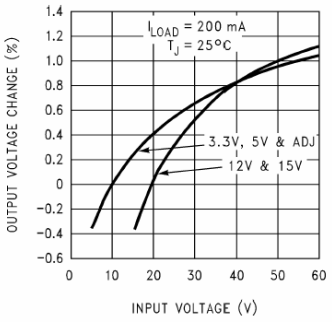
Note 1: Absolute Maxium Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate test conditions for which the device s intended to be functional, but do not guarantee specific performance limits. For quaranteed specifications and test conditions see the Electrical Characteristics.
Note 2: All limits guaranteed 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 guaranteed via testing.
Note 3: External components such as the diode, inductor and capacitor can affect the system performance.
Note 4: Output (pin 2) sourcing current. No diode, inductor, or capacitor connected to input.
Note 5: Feedback (pin 4) removed from output and connected to 0V.
Note 6: Feedback (pin 4) removed from output and connected to 12V to force the output transistor OFF.
Note 7: Junction to ambient thermal resistance with approximately 1 square inches of PC board cooper surrounding the leads.
Note 8: Test circuit refers to figure 2.
Note 9: Test circuit refers to figure 3.



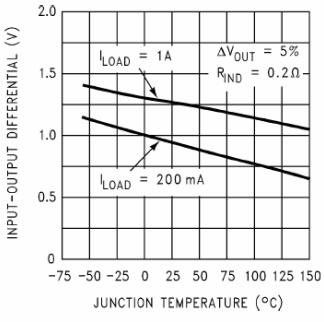
### Normalized Output Voltage



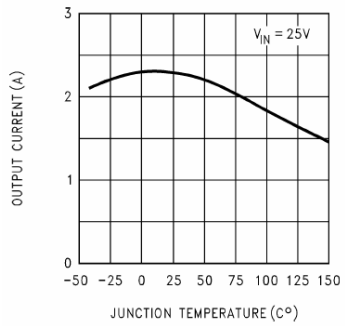

### Line Regulation



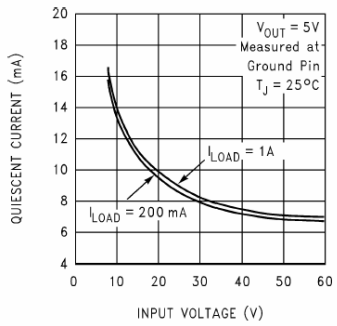

### Dropout Voltage



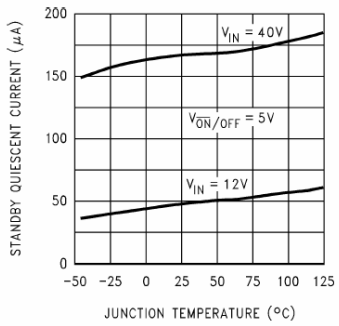

### Current Limit



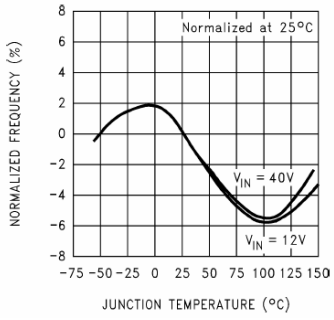

### Quiescent Current



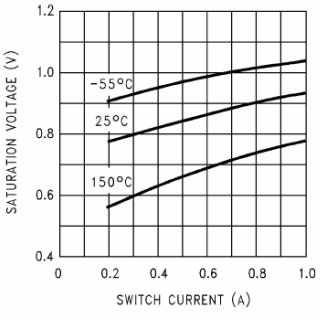

### Standby Quiescent Current



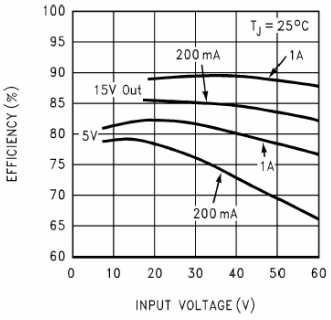

### Oscillator Frequency



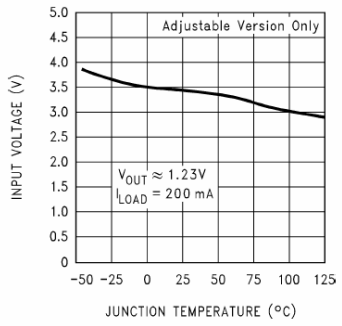

### Switch Saturation Voltage



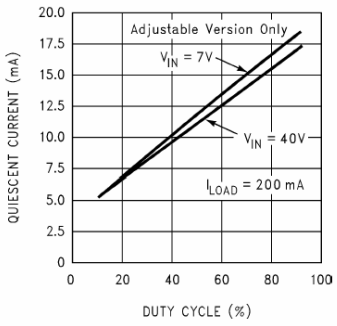

### Efficiency



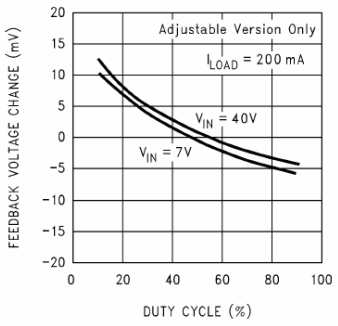
**Minimum Operating Voltage**



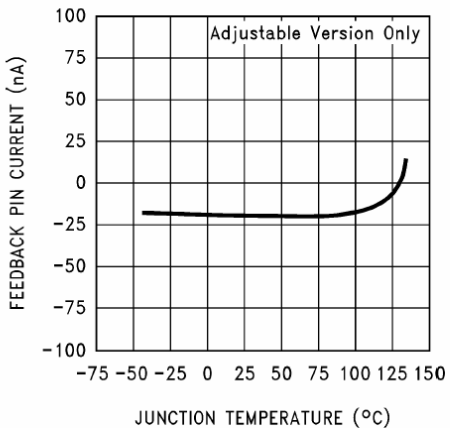

**Quiescent Current vs Duty Cycle**



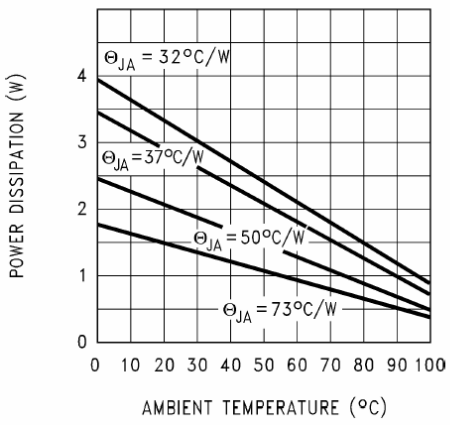

**Feedback Voltage vs Duty Cycle**

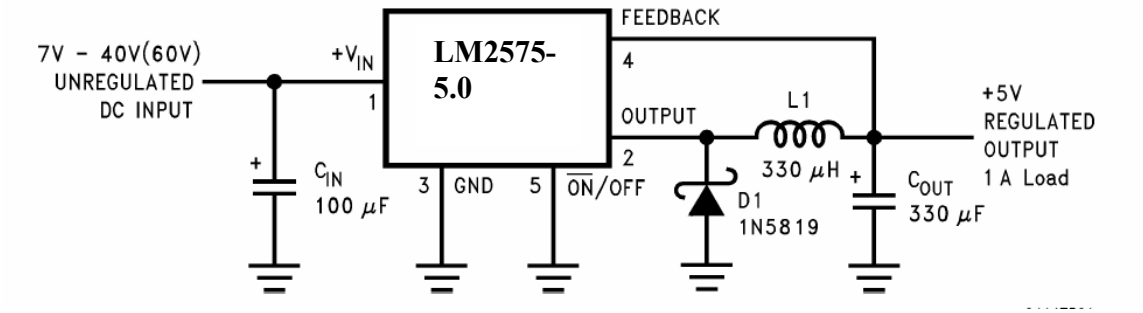



**Feedback Pin Current**

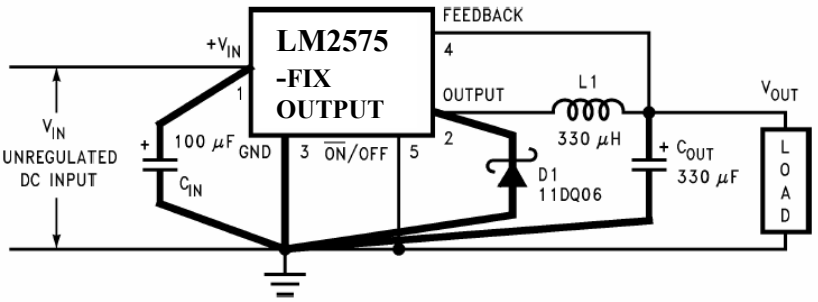



**Maximum Power Dissipation (TO-263) (See (Note 12))**



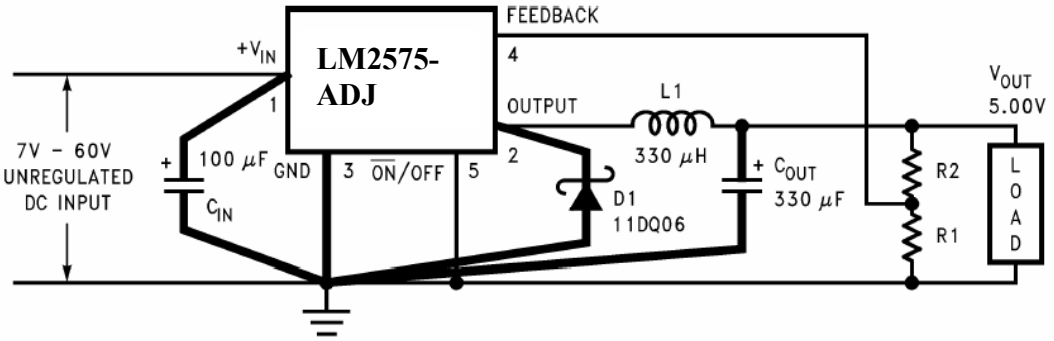



**Fixed Output Voltage Versions**




$C_{IN}$ — 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)

**Adjustable Output Voltage Version**




$$V_{OUT} = V_{REF}\left(1 + \frac{R_2}{R_1}\right)$$

$$R_2 = R_1\left(\frac{V_{OUT}}{V_{REF}} - 1\right)$$

where $V_{REF}$ = 1.23V, R1 between 1k and 5k.

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

**Advance Information-** These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

**Preliminary Information-** These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including " Typical" for each customer application.

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