

LM2673 SIMPLE SWITCHER® 3A Step-Down Voltage Regulator with Adjustable Current Limit

General Description

The LM2673 series of regulators are monolithic integrated circuits which provide all of the active functions for a step-down (buck) switching regulator capable of driving up to 3A loads with excellent line and load regulation characteristics. High efficiency (>90%) is obtained through the use of a low ON-resistance DMOS power switch. The series consists of fixed output voltages of 3.3V, 5V and 12V and an adjustable output version.

The SIMPLE SWITCHER concept provides for a complete design using a minimum number of external components. A high fixed frequency oscillator (260KHz) allows the use of physically smaller sized components. A family of standard inductors for use with the LM2673 are available from several manufacturers to greatly simplify the design process.

Other features include the ability to reduce the input surge current at power-ON by adding a softstart timing capacitor to gradually turn on the regulator. The LM2673 series also has built in thermal shutdown and resistor programmable current limit of the power MOSFET switch to protect the device and load circuitry under fault conditions. The output voltage is guaranteed to a ±2% tolerance. The clock frequency is controlled to within a ±11% tolerance.

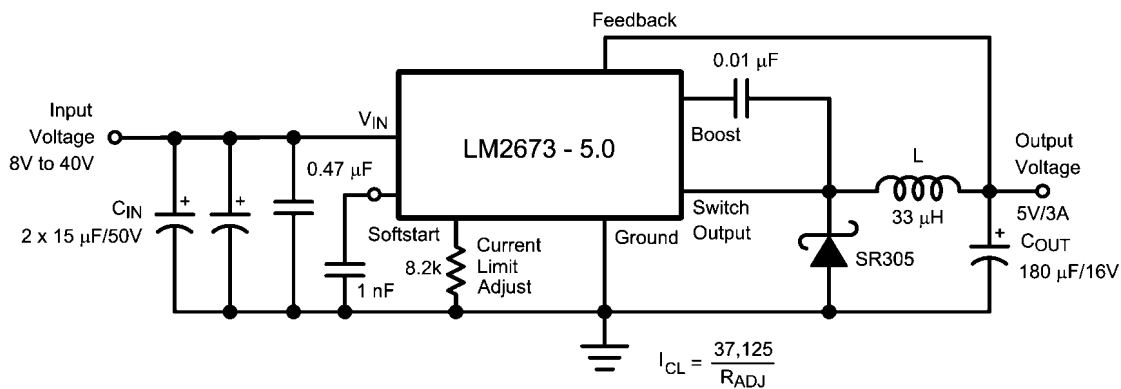
Features

- Efficiency up to 94%
- Simple and easy to design with (using off-the-shelf external components)
- Resistor programmable peak current limit over a range of 2A to 5A.
- 150 mΩ DMOS output switch
- 3.3V, 5V and 12V fixed output and adjustable (1.2V to 37V) versions
- ±2% maximum output tolerance over full line and load conditions
- Wide input voltage range: 8V to 40V
- 260 KHz fixed frequency internal oscillator
- Softstart capability
- -40 to +125°C operating junction temperature range

Applications

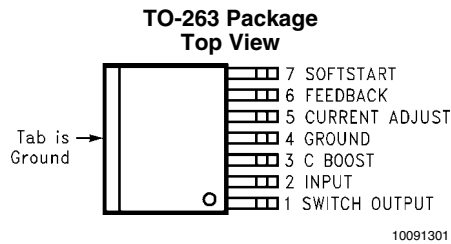
- Simple to design, high efficiency (>90%) step-down switching regulators
- Efficient system pre-regulator for linear voltage regulators
- Battery chargers

Typical Application

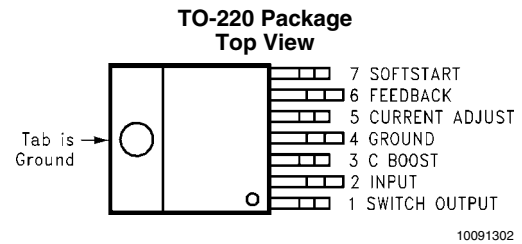


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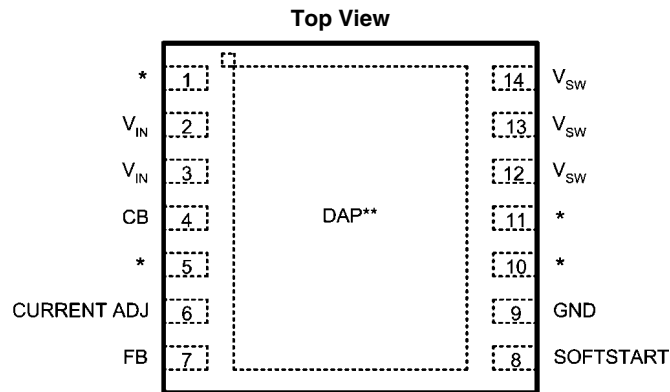
Connection Diagrams and Ordering Information



Order Number
LM2673S-3.3, LM2673S-5.0,
LM2673S-12 or LM2673S-ADJ
 See NSC Package Number TS7B



Order Number
LM2673T-3.3, LM2673T-5.0,
LM2673T-12 or LM2673T-ADJ
 See NSC Package Number TA07B



LLP-14
 See NS package Number SRC14A

Ordering Information for LLP Package

Output Voltage	Order Information	Package Marking	Supplied As
12	LM2673SD-12	S0002SB	250 Units on Tape and Reel
12	LM2673SDX-12	S0002SB	2500 Units on Tape and Reel
3.3	LM2673SD-3.3	S0002TB	250 Units on Tape and Reel
3.3	LM2673SDX-3.3	S0002TB	2500 Units on Tape and Reel
5.0	LM2673SD-5.0	S0002UB	250 Units on Tape and Reel
5.0	LM2673SDX-5.0	S0002UB	2500 Units on Tape and Reel
ADJ	LM2673SD-ADJ	S0002VB	250 Units on Tape and Reel
ADJ	LM2673SDX-ADJ	S0002VB	2500 Units on Tape and Reel

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Input Supply Voltage	45V
Softstart Pin Voltage	-0.1V to 6V
Switch Voltage to Ground (Note 13)	-1V to V_{IN}
Boost Pin Voltage	$V_{SW} + 8V$
Feedback Pin Voltage	-0.3V to 14V
Power Dissipation	Internally Limited

ESD (Note 2)	2 kV
Storage Temperature Range	-65°C to 150°C
Soldering Temperature	
Wave	4 sec, 260°C
Infrared	10 sec, 240°C
Vapor Phase	75 sec, 219°C

Operating Ratings

Supply Voltage	8V to 40V
Junction Temperature Range (T_J)	-40°C to 125°C

Electrical Characteristics Limits appearing in **bold type face** apply over the entire junction temperature range of operation, -40°C to 125°C. Specifications appearing in normal type apply for $T_A = T_J = 25^\circ\text{C}$. $R_{ADJ} = 8.2\text{K}\Omega$

LM2673-3.3

Symbol	Parameter	Conditions	Typical (Note 3)	Min (Note 4)	Max (Note 4)	Units
V_{OUT}	Output Voltage	$V_{IN} = 8V \text{ to } 40V, 100\text{mA} \leq I_{OUT} \leq 3A$	3.3	3.234/ 3.201	3.366/ 3.399	V
η	Efficiency	$V_{IN} = 12V, I_{LOAD} = 3A$	86			%

LM2673-5.0

Symbol	Parameter	Conditions	Typical (Note 3)	Min (Note 4)	Max (Note 4)	Units
V_{OUT}	Output Voltage	$V_{IN} = 8V \text{ to } 40V, 100\text{mA} \leq I_{OUT} \leq 3A$	5.0	4.900/ 4.850	5.100/ 5.150	V
η	Efficiency	$V_{IN} = 12V, I_{LOAD} = 3A$	88			%

LM2673-12

Symbol	Parameter	Conditions	Typical (Note 3)	Min (Note 4)	Max (Note 4)	Units
V_{OUT}	Output Voltage	$V_{IN} = 15V \text{ to } 40V, 100\text{mA} \leq I_{OUT} \leq 3A$	12	11.76/ 11.64	12.24/ 12.36	V
η	Efficiency	$V_{IN} = 24V, I_{LOAD} = 3A$	94			%

LM2673-ADJ

Symbol	Parameter	Conditions	Typ (Note 3)	Min (Note 4)	Max (Note 4)	Units
V_{FB}	Feedback Voltage	$V_{IN} = 8V \text{ to } 40V, 100\text{mA} \leq I_{OUT} \leq 3A$ V_{OUT} Programmed for 5V	1.21	1.186/ 1.174	1.234/ 1.246	V
η	Efficiency	$V_{IN} = 12V, I_{LOAD} = 3A$	88			%

All Output Voltage Versions Electrical Characteristics

Limits appearing in **bold type face** apply over the entire junction temperature range of operation, -40°C to 125°C .

Specifications appearing in normal type apply for $T_A = T_J = 25^{\circ}\text{C}$. Unless otherwise specified, $R_{\text{ADJ}} = 8.2\text{K}\Omega$, $V_{\text{IN}} = 12\text{V}$ for the 3.3V, 5V and Adjustable versions and $V_{\text{IN}} = 24\text{V}$ for the 12V version.

Symbol	Parameter	Conditions	Typ	Min	Max	Units
DEVICE PARAMETERS						
I_Q	Quiescent Current	$V_{\text{FEEDBACK}} = 8\text{V}$ For 3.3V, 5.0V, and ADJ Versions $V_{\text{FEEDBACK}} = 15\text{V}$ For 12V Versions	4.2		6	mA
V_{ADJ}	Current Limit Adjust Voltage		1.21	1.181/1.169	1.229/1.246	V
I_{CL}	Current Limit	$R_{\text{ADJ}} = 8.2\text{K}\Omega$, (Note 5)	4.5	3.8/3.6	5.25/5.4	A
I_L	Output Leakage Current	$V_{\text{IN}} = 40\text{V}$, Softstart Pin = 0V $V_{\text{SWITCH}} = 0\text{V}$ $V_{\text{SWITCH}} = -1\text{V}$	1.0 6		1.5 15	mA mA
$R_{\text{DS(ON)}}$	Switch On-Resistance	$I_{\text{SWITCH}} = 3\text{A}$	0.15		0.17/0.29	Ω
f_O	Oscillator Frequency	Measured at Switch Pin	260	225	280	kHz
D	Duty Cycle	Maximum Duty Cycle Minimum Duty Cycle	91 0			% %
I_{BIAS}	Feedback Bias Current	$V_{\text{FEEDBACK}} = 1.3\text{V}$ ADJ Version Only	85			nA
V_{SFST}	Softstart Threshold Voltage		0.63	0.53	0.74	V
I_{SFST}	Softstart Pin Current	Softstart Pin = 0V	3.7		6.9	μA
θ_{JA}	Thermal Resistance	T Package, Junction to Ambient (Note 6)	65			$^{\circ}\text{C/W}$
θ_{JA}		T Package, Junction to Ambient (Note 7)	45			
θ_{JC}		T Package, Junction to Case	2			
θ_{JA}		S Package, Junction to Ambient (Note 8)	56			
θ_{JA}		S Package, Junction to Ambient (Note 9)	35			
θ_{JA}		S Package, Junction to Ambient (Note 10)	26			
θ_{JC}		S Package, Junction to Case	2			
θ_{JA}		SD Package, Junction to Ambient (Note 11)	55			
θ_{JA}		SD Package, Junction to Ambient (Note 12)	29			

