

1MHz, 600mA Synchronous Step-Down Regulator

Features

- High Efficiency: Up to 95%
- Low Quiescent Current: Only 50 μ A During Operation
- Internal Soft Start Function
- 600mA Output Current
- 2.5V to 5.5V Input Voltage Range
- 1MHz Switching Frequency
- No Schottky Diode Required
- 100% Duty Cycle in Dropout Operation
- 0.6V Reference Allows Low Output Voltages
- < 1 μ A Shutdown Current
- Current Mode Operation for Excellent Line and Load Transient Response
- Over Temperature Protected

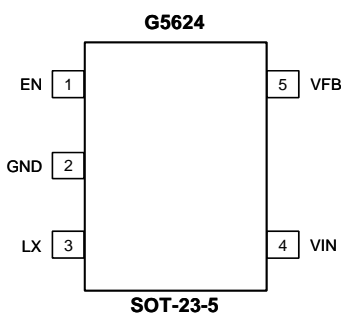
General Description

The G5624 is a high efficiency monolithic synchronous buck regulator using a constant frequency, current mode architecture. Supply current during operation is only 50 μ A and drops to < 1 μ A in shutdown. The 2.5V to 5.5V input voltage range makes the G5624 ideally suited for single Li-Ion battery-powered applications. 100% duty cycle provides low dropout operation, extending battery run time in portable systems. PFM mode operation increases efficiency at light loads, further extend battery run time. Switching frequency is internally set at 1MHz, allowing the use of small surface mount inductors and capacitors. The internal synchronous switch increase efficiency and eliminates the need for an external Schottky diode. Built-in soft start function eliminates in-rush current that could damage the system.

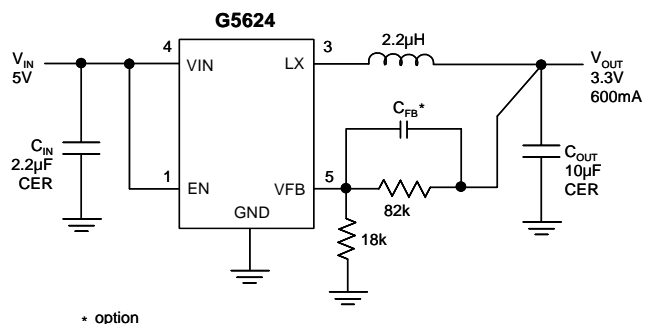
Applications

- Cellular Telephones
- Personal Information Appliances
- Microprocessors and DSP Core Supplies
- Wireless and DSL Modems
- Digital Still and Video Cameras
- MP3 Players
- Portable Instruments

Pin Configuration



Typical Application Circuit



Ordering Information

ORDER NUMBER	MARKING	OUTPUT VOLTAGE	TEMP. RANGE	PACKAGE (Pb free)
G5624ADJT1U	EFADx	Adjustable	-40°C~ +85°C	SOT-23-5

For other output voltage, please contact us at sales@gmt.com.tw

Note: T1: SOT-23-5

U: Tape & Reel

Selector Guide

ORDER NUMBER	MARKING	OUTPUT VOLTAGE (V)	PACKAGE (Pb free)
G5624ADJT1U	EFADx	Adjustable	SOT-23-5
G5624-12T1U	EF12x	1.2	SOT-23-5
G5624-15T1U	EF15x	1.5	SOT-23-5
G5624-18T1U	EF18x	1.8	SOT-23-5
G5624-25T1U	EF25x	2.5	SOT-23-5
G5624-33T1U	EF33x	3.3	SOT-23-5

**Absolute Maximum Ratings**

LX, VIN to GND. -0.3V to +7V
 EN, VFB to GND. -0.3V to (VIN + 0.3V)
 P-Channel Switch Source Current (DC) 800mA
 N-Channel Switch Sink Current (DC) 800mA
 Peak LX Sink and Source Current. 1.3A

Operating Temperature Range. -40°C to 85°C
 Storage Temperature Range. -65°C to 165°C
 Reflow Temperature (soldeing, 10 sec) 260°C

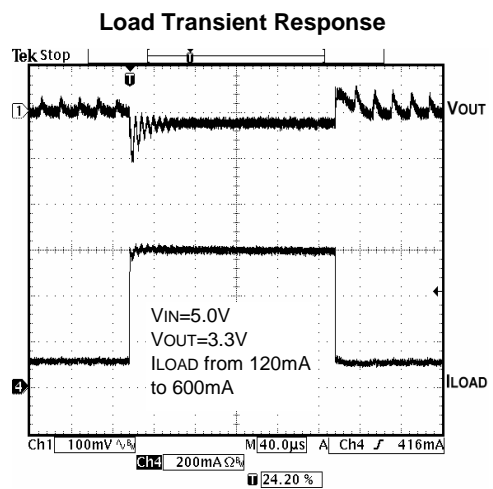
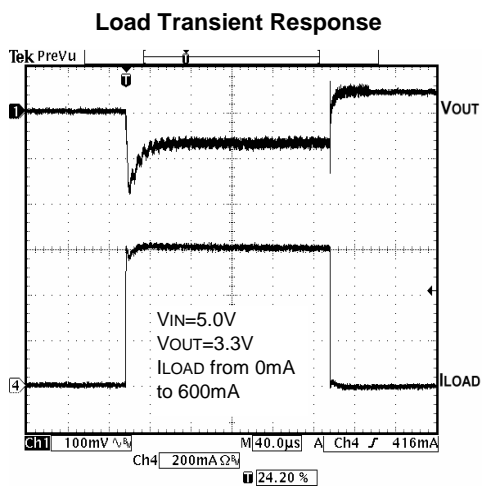
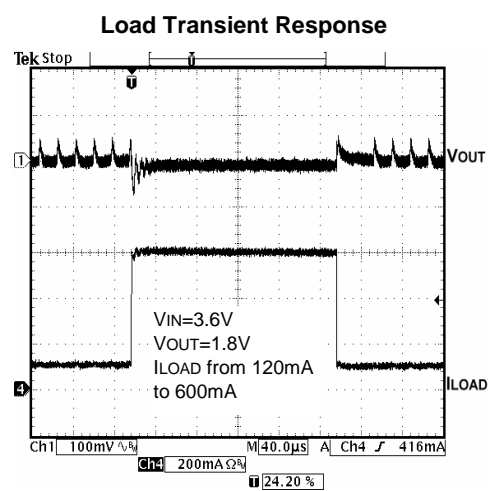
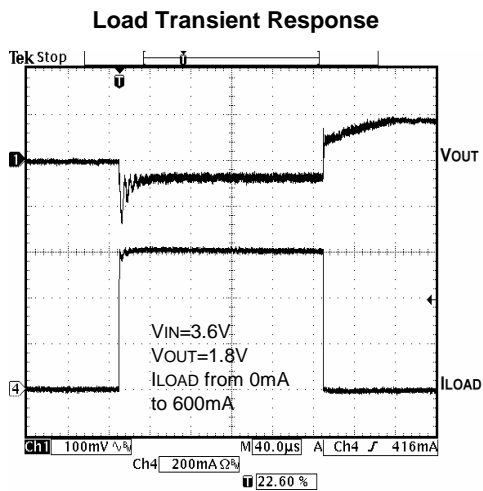
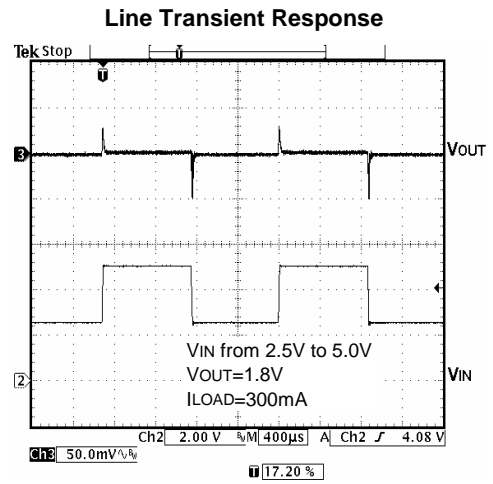
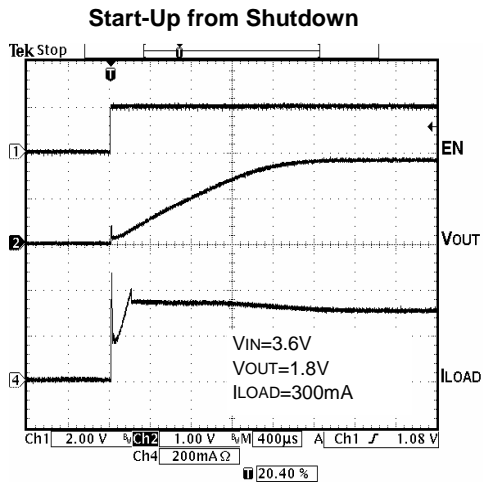
Electrical Characteristics

($T_A=25^\circ\text{C}$, $V_{IN}=3.6\text{V}$, unless otherwise specified.)

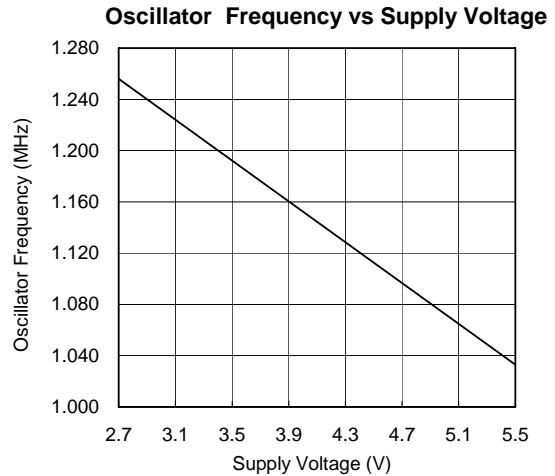
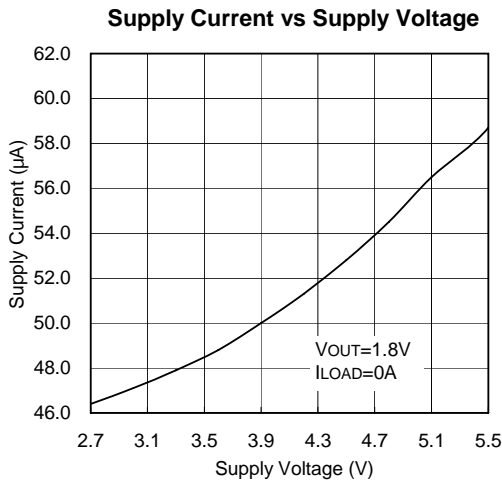
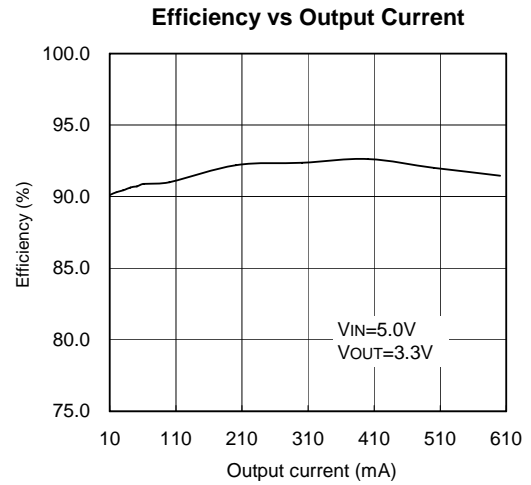
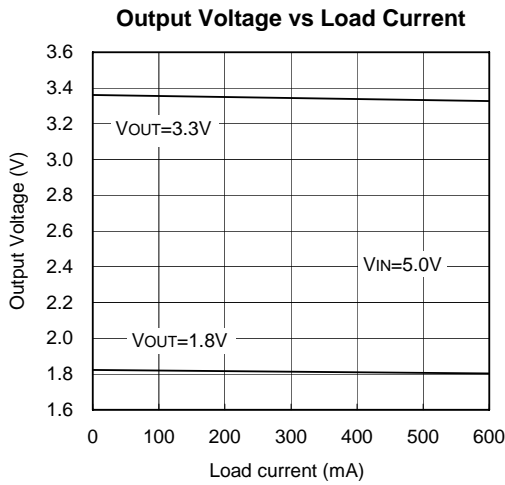
PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
Feedback Current		-30	0	+30	nA
Regulated Feedback Voltage		0.588	0.6	0.612	V
Reference Voltage Line Regulation	$V_{IN} = 2.5\text{V to } 5.5\text{V}$	---	0.1	---	%/V
Peak Inductor Current	$V_{IN} = 5\text{V}, V_{OUT} = 3\text{V}$	---	1	---	A
Output Voltage Load Regulation		---	0.5	---	%
Input Voltage Range		2.5	---	5.5	V
Quiescent Current	Active Mode (no switching)	---	50	150	μA
	Shutdown Mode	---	0	1	
Oscillator Frequency		---	1.0	---	MHz
$R_{DS(ON)}$ of P-Channel FET	$I_{LX} = 100\text{mA}$	---	0.3	0.5	Ω
$R_{DS(ON)}$ of N-Channel FET	$I_{LX} = 100\text{mA}$	---	0.3	0.5	Ω
LX Leakage Current	$EN = 0\text{V}, V_{LX} = 5\text{V}, V_{IN} = 5\text{V}$	---	---	1	μA
EN Threshold		---	1	---	V
EN Leakage Current		---	0	1	μA

Typical Performance Characteristics

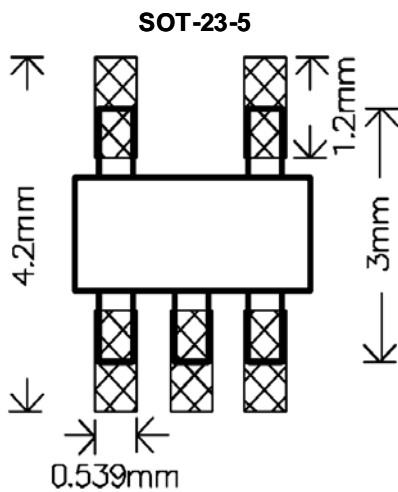
$C_{VIN}=2.2\mu F$, $C_{VOUT}=10\mu F$, $L=2.2\mu H$, $T_A=25^\circ C$, unless otherwise noted.



Typical Performance Characteristics (continued)



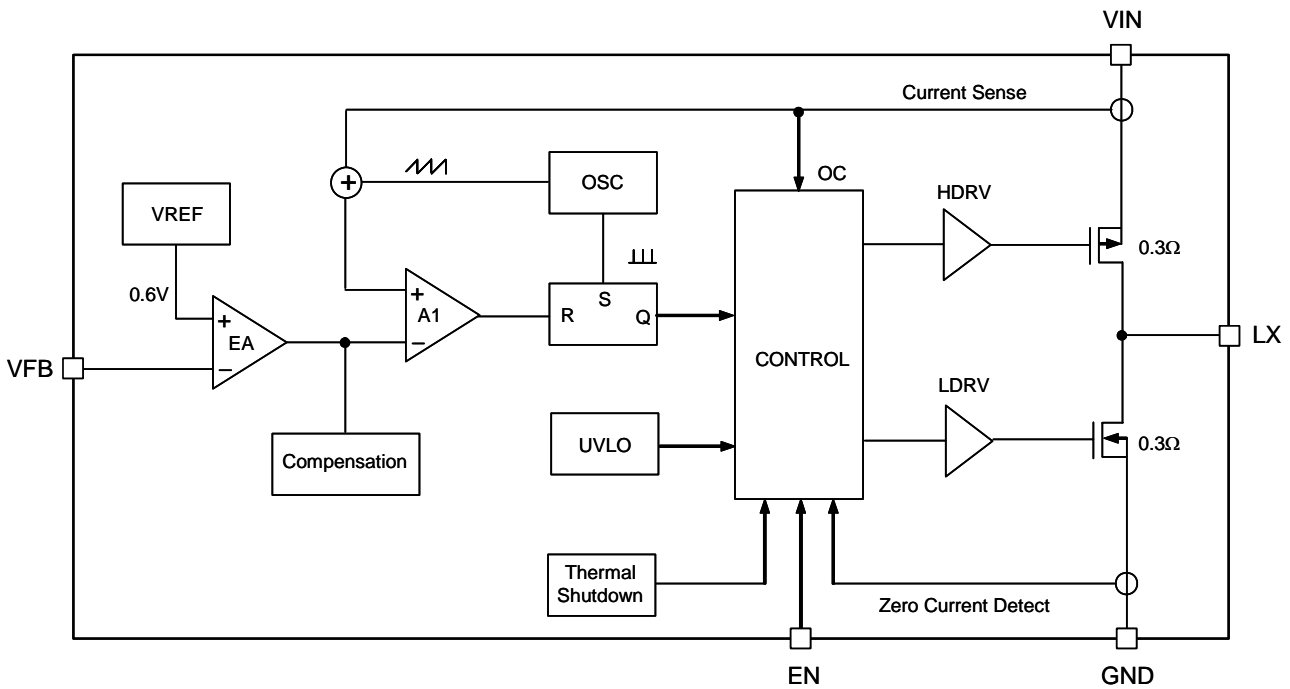
Recommended Minimum Footprint



Pin Descriptions

PIN	NAME	FUNCTION
1	EN	Enable Control Pin
2	GND	Ground Pin
3	LX	Switch Pin
4	VIN	Input Supply Pin
5	VFB	Feedback Pin

Block Diagram





Function Description

Normal Operation

The G5624 uses a constant frequency, current mode step-down architecture. Both the high/low-side switches are internal. During normal operation, the internal high-side (PMOS) switch is turned on each cycle when the oscillator sets the SR latch, and turned off when the comparator(A1) resets the SR latch. The peak inductor current at which comparator(A1) resets the SR latch, is controlled by the output of error amplifier EA. While the high-side switch is off, the low-side switch is turned on until either the inductor current starts to reverse or the beginning of the next switching cycle.

Dropout Operation

As the input supply voltage decreases to a value approaching the output voltage, the duty cycle increases toward the maximum on-time. Further reduction of the supply voltage forces the high-side switch to remain on for more than one cycle until it reaches 100% duty cycle. The output voltage is dropped from the input supply for the voltage which across the high-side switch.

Over Temperature Protection

In most applications the G5624 does not dissipate much heat due to high efficiency. But, in applications where the G5624 is running at high ambient temperature with low supply voltage and high duty cycles, such as in dropout, the heat dissipated may exceed the maximum junction temperature of the part. If the junction temperature reaches approximately 150°C, both power switches will be turned off and the SW node will become high impedance.

Application Information

Inductor Selection

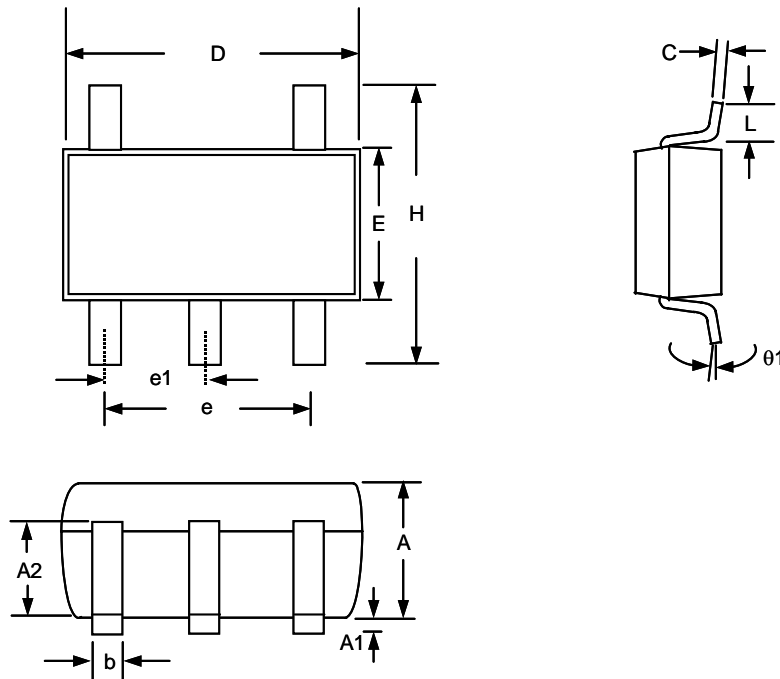
For most applications, the value of the inductor will fall in the range of 2.2 μ H to 10 μ H. Its value is chosen based on the desired ripple current. Large value inductors lower ripple current and small value inductors result in higher ripple currents. Higher V_{IN} or V_{OUT} also increase the ripple current.

The DC current rating of the inductor should be at least equal to the maximum load current plus half the ripple current to prevent core saturation. For better efficiency, choose a low DCR inductor.

Capacitor Selection

Higher values, lower cost ceramic capacitors are now becoming available in smaller case sizes. Their high ripple current, high voltage rating and low ESR make them ideal for G5624 applications. When choosing the input and output ceramic capacitors, choose the X5R or X7R dielectric formulations. These dielectrics have the best temperature and voltage characteristics of all the ceramics for given value and size.

Package Information

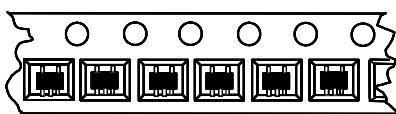


Note:

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance ± 0.1000 mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. Dimension L is measured in gage plane

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.30	0.039	0.043	0.051
A1	0.00	-----	0.10	0.000	-----	0.004
A2	0.70	0.80	0.90	0.028	0.031	0.035
b	0.35	0.40	0.50	0.014	0.016	0.020
C	0.10	0.15	0.25	0.004	0.006	0.010
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.40	1.60	1.80	0.055	0.063	0.071
e	-----	1.90(TYP)	-----	-----	0.075(TYP)	-----
e1	-----	0.95	-----	-----	0.037	-----
H	2.60	2.80	3.00	0.102	0.110	0.118
L	0.37	-----	-----	0.015	-----	-----
$\theta 1$	1°	5°	9°	1°	5°	9°

Taping Specification



Feed Direction
SOT-23-5 Package Orientation

PACKAGE	Q'TY/REEL
SOT-23-5	3,000 ea

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