High Efficiency Single Inductor Auto Buck-Boost Converter

Features

- **2.1V ~ 5.5V Input Voltage Operation**
- **Adjustable Output Voltage from 1.8V to 5.2V**
- **96% Efficiency DC/DC Converter**
- **1.6A Output Current at 3.3V for VIN > 2.8V**
- **Auto-Transition Between Buck and Boost Mode**
- **Pulse-Skipping Mode at light load for Efficiency**
- **DC/DC Converter can be set to lower quiescent current at light load**
- **Fixed 2.5MHz Frequency**
- **Internal Soft-Start**
- **Cycle-by-Cycle Current Limit, Over Voltage and Short Circuit Protection**
- **Thermal Shutdown Function**
- **WLCSP3X5-15 Package (0.4mm pitch)**

General Description

The G2287 is a high efficiency single inductor Buck-Boost converter which can supply the load current up to 1.6A. It provides auto-transition between Buck and Boost Mode. The G2287 operates at 2.5MHz switching frequency in CCM. DC/DC converter operates at Pulse-Skipping Mode at light load. The output voltage is programmable using an external resistor divider, or is fixed to 3.3V internally. The load is disconnected from the VIN during shutdown.

The G2287 is available in WLCSP3X5-15 package.

Applications

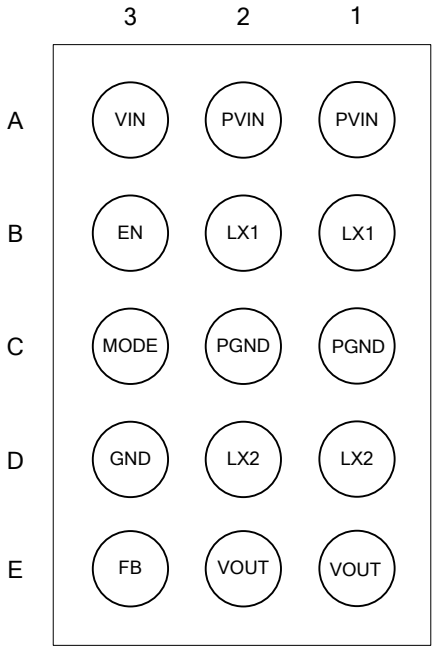
- **Mobile Handsets**
- **Smart Phone**

Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G2287J21U	2287	-40°C~+85°C	WLCSP3X5-15

Note: J2: WLCSP3X5-15
1: Bonding code
U: Tape & Reel
Green : Lead Free / Halogen Free.

Pin Configuration



Bottom View
WLCSP3X5-15

Absolute Maximum Ratings

VIN, PVIN, VOUT . . . . . -0.3V to +6.5V
LX1, LX2 . . . . . -0.3V to +6.5V
EN, MODE, FB . . . . . -0.3V to +6.5V
Thermal Resistance Junction to Ambient, (θ_{JA})
WLCSP3X5-15 . . . . . .TBD
Continuous Power Dissipation (T_A=25°C)
WLCSP3X5-15 . . . . . .TBD

Operating Ambient Temperature . . . . . -40°C to 85°C
Storage Temperature Range. . . . . -55°C to +150°C
Reflow Temperature (soldering, 10 sec) . . . . . 260°C
ESD Susceptibility (Human Body Mode) 2kV
ESD Susceptibility (Machine Mode) 200V

1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Device is ESD sensitive. Handling precaution recommended. The Human Body model is a 100pF capacitor discharged through a 1.5KΩ resistor into each pin.

Electrical characteristics

(VIN=PVIN=3.6V, T_A=25°C, unless otherwise specified)

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

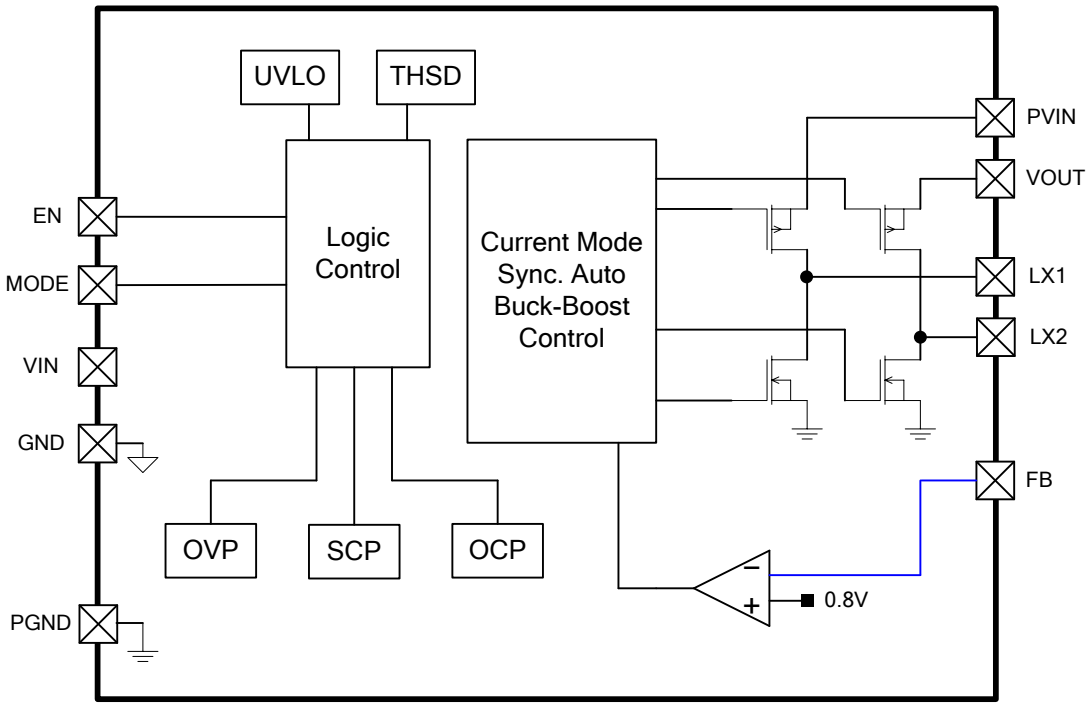
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
GENERAL						
VIN Operating Voltage	V_{IN}		2.1	---	5.5	V
Output Voltage Range	V_{OUT}		1.8	---	5.2	V
Under Voltage Lockout Threshold	$V_{UVLO,R}$	V_{IN} voltage rising	---	1.7	1.795	V
	$V_{UVLO,F}$	V_{IN} voltage falling	---	1.6	---	V
Quiescent Current	I_Q	V_{IN}<5V, I_{OUT}=0A, No Switching	---	45	65	μA
Shutdown Current	I_{SD}	V_{EN}=0V, V_{IN}<5V	---	0.1	1	μA
OSCILLATOR						
Oscillator Frequency	F_{OSC}		2.0	2.5	3.0	MHz
DCDC Converter						
Soft-Start Internal	V_{SS}	V_{IN}=3.6V	---	1	---	ms
Feedback voltage	V_{FB}	Adjustable Output	788	800	812	mV
Output voltage		Fixed 3.3V Output, PWM Mode	-2	---	+2	%
Line Regulation	$\Delta V_{OUT,LINE}$	PWM	---	0.5	---	%
Load Regulation	$\Delta V_{OUT,LOAD}$	PWM	---	0.5	---	%
Maximum Duty Cycle	$D_{MAX,1}$	LX1	---	100	---	%
	$D_{MAX,2}$	LX2	---	93	---	%
FB Leakage Current	$I_{FB,LK}$	Adjustable Mode	---	---	1	μA
VOUT Leakage Current	$I_{VO,LK}$	V_{LX2}=0V, V_{OUT} =5V	-1	---	+1	μA
LX1, LX2 Leakage Current	$I_{LX1,LK}$, $I_{LX2,LK}$	V_{LX1}=V_{LX2}=5V	-1	---	+1	μA
Switch ON Resistance	$R_{ON,P}$	V_{IN}=3.6V	---	50	---	mΩ
	$R_{ON,N}$	V_{IN}=3.6V	---	40	---	
Peak Current Limit	I_{LIM}	V_{IN}=3.6V	---	2.7	---	A
Maximum Output Load Capability	I_{O_MAX}	V_{IN}=2.8V, V_O=3.3V	---	---	1.6	A
Protection						
Output Voltage Clamp	$V_{OUT,CLAMP}$	V_{OUT} voltage rising	---	5.6	---	V
Over Voltage Protection Threshold	$\%V_{FBOVP}$	Ratio=V_{OVP}/V_{FB}, V_{FB} voltage rising	---	125	---	%
Short Circuit Protection threshold	$\%V_{FBSCP}$	Ratio=V_{SCP}/V_{FB}, V_{FB} voltage falling	---	25	---	%
Thermal Shutdown Protection	T_{SD}		---	150	---	°C
Thermal Shutdown Hysteresis	ΔT_{SD}		---	30	---	°C
Control Signal						
EN, MODE Input Voltage	V_{TH}	High Threshold	1.4	---	---	V
	V_{TL}	Low Threshold	---	---	0.4	V
EN, MODE Leakage Current	$I_{EN,LK}$	EN=V_{IN} or 0V	---	---	1	μA

Pin Description

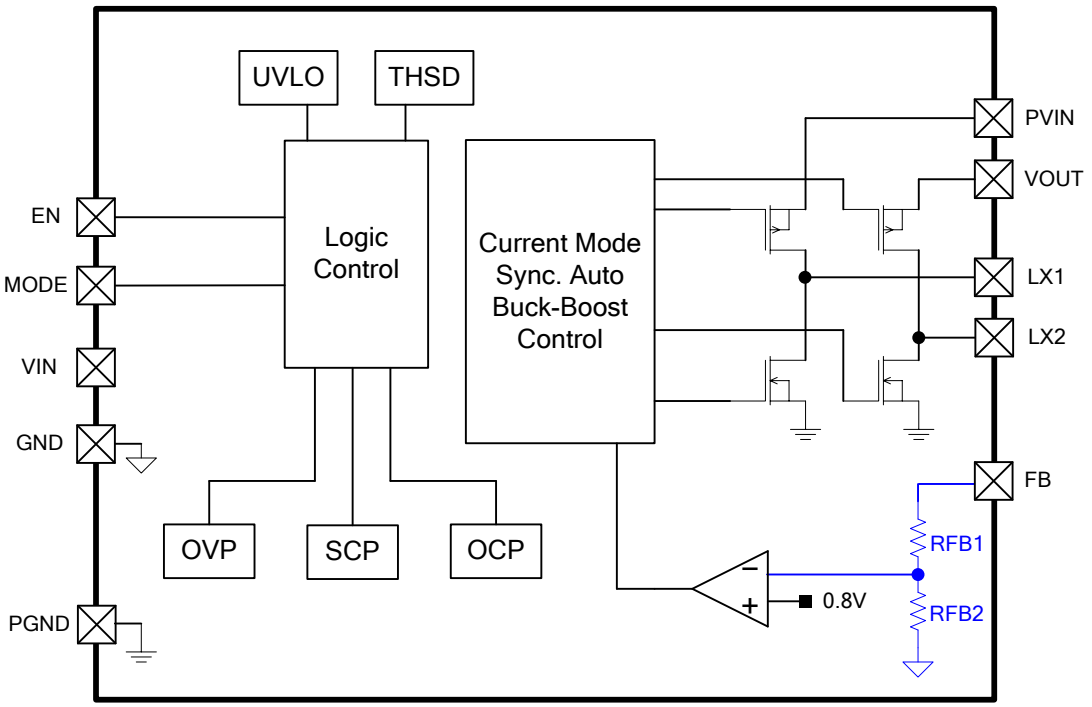
PIN	NAME	Function
A1,A2	PVIN	Power Input of Buck-Boost Converter
A3	VIN	IC Power Supply Input
B1,B2	LX1	Inductor Switch Node
B3	EN	Enable PIN (1 Enabled, 0 Disabled), must not be left open.
C1,C2	PGND	Power Ground of Buck-Boost Converter
C3	MODE	Enable/Disable Auto PFM (1 Enabled, 0 Disabled), must not be left open.
D1,D2	LX2	Inductor Switch Node
D3	GND	Chip Analog Ground
E1,E2	VOUT	Power Output of Buck-Boost Converter
E3	FB	Voltage Feedback of adjustable version, and connected to VOUT on fixed output voltage version.

Block Diagram

Adjustable Output Voltage

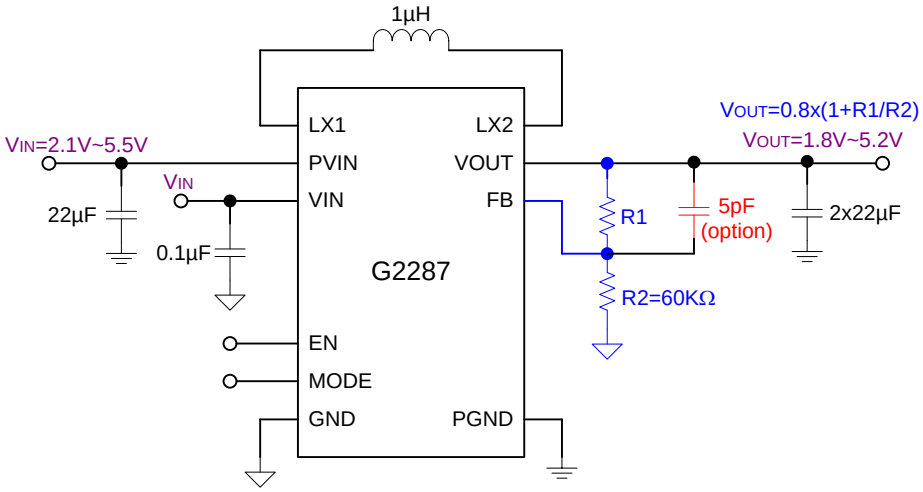


Fixed 3.3V Output Voltage



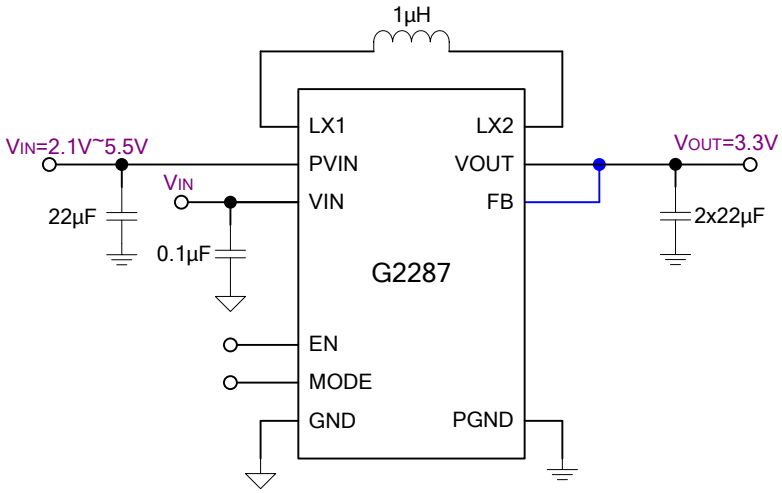
Application circuit

Adjustable Output Voltage



The recommended value for R2 should be in the range of 60kΩ .

Fixed 3.3V Output Voltage



Function Description

The G2287 includes a DC/DC Converters.

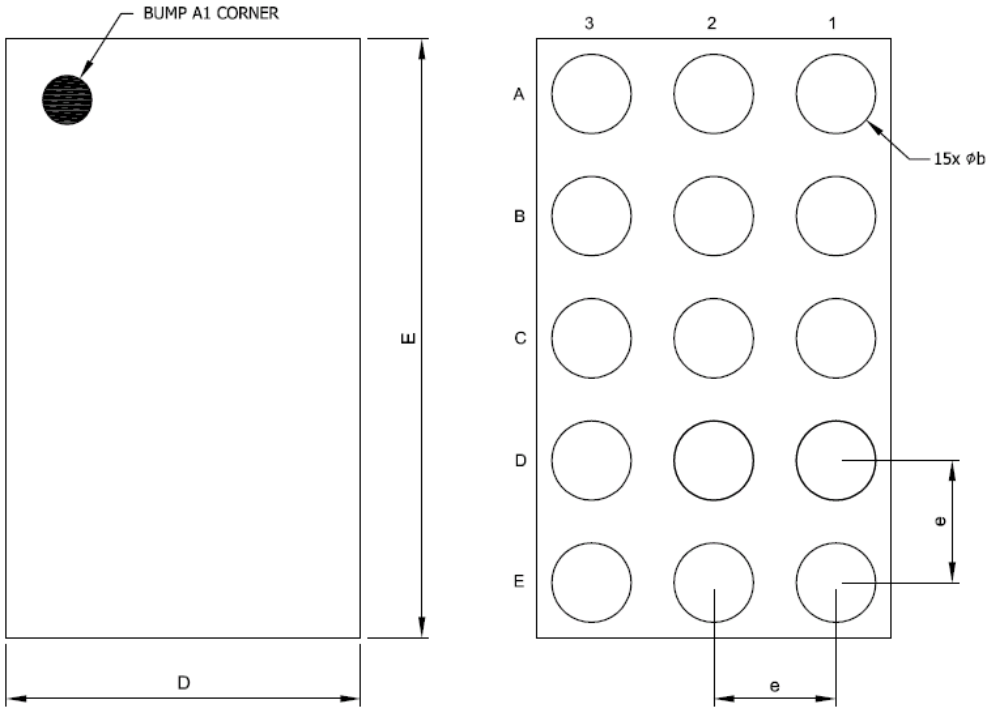
	Topology	Default V_{OUT}	V_{OUT} range	Current rating
DCDC	2.5MHz Sync. Auto Buck-Boost Converter	3.3V	Adjustable Mode: 1.8V to 5.2V Fixed Mode: 3.3V	1.6A

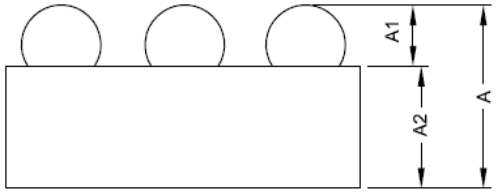
Fault Protection

G2287 provides VIN under-voltage lockout protection, over-current protection, VOUT over-voltage protection, VOUT short-circuit protection, and thermal shutdown protection to achieve complete protection.

	Protection Type	Threshold	Protection methods	Reset Method
VIN	UVLO	VIN<1.6V	DCDC shutdown	VIN>1.7V
DCDC Buck-Boost	Current Limit	Peak Inductor current>3.8A	Buck Mode: PMOS Off, NMOS on Boost Mode: NMOS Off, PMOS on	Automatic Reset at next cycle
	FB OVP	VFB>125%*VFB_{SET}	DCDC stop switching	VFB<120%*VFB_{SET}
	FB SCP	VFB<25%*VFB_{SET}	OSC Frequency=1.25MHz	VFB>30%*VFB_{SET}
	VOUT CLAMP	VOUT>5.6V	DCDC shutdown	VOUT<5.25V
Thermal	THSD	Junction Temp. >150°C	DCDC shutdown	Junction Temp. <120°C

Package Information

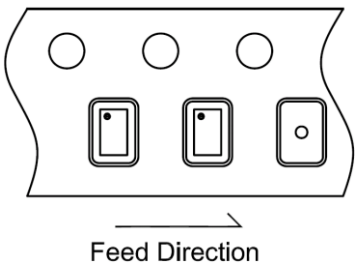




WLCSP3X5-15 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.540	0.600	0.660	0.0213	0.0236	0.0260
A1	0.170	0.200	0.230	0.0067	0.0079	0.0091
A2	0.370	0.400	0.430	0.0146	0.0157	0.0169
D	1.120	1.160	1.200	0.0441	0.0457	0.0472
E	1.920	1.960	2.000	0.0756	0.0771	0.0787
b	0.230	0.260	0.290	0.0091	0.0102	0.0114
e	0.40 BSC			0.0157 BSC		

Taping Specification



PACKAGE	Q'TY/REEL
WLCSP3X5-15	3,000 ea