

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Features

- Operating voltage: 2.5V to 25V
- Output voltage: 3V to 27V
- Shutdown current: 3 μ A
- Fixed 1.2MHz switching frequency
- 1A constant output current capability
- Built-in high-frequency power transistor
- Built-in Schottky diode
- High efficiency up to 89%
- Excellent line and load regulation
- EN pin TTL ON/OFF capability
- Boost or SEPIC topologies
- Built-in output overvoltage protection
- Built-in thermal shutdown
- Device HBM ESD classification: Class 3A
- Available in PDFN-3x3-8L package

Applications

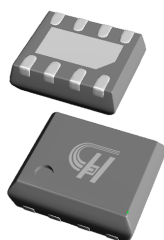
- Panel power supply
- GPS receiver
- DSL modem
- Wearable portable electronic devices

General Description

The HCR6612 is a boost DC/DC converter with a built-in high-frequency power transistor and Schottky diode. It uses fixed-frequency 1.2MHz PWM and supports an input operating voltage range of 2.5V to 25V. Built-in frequency compensation allows small external components, reducing power-supply cost and printed circuit board space.

The output voltage is adjustable by external divider resistors. The low 410mV feedback voltage reduces power consumption in the external sampling resistors. The EN pin supports TTL ON/OFF control. Output overvoltage protection and thermal shutdown protection are built in.

The device is suitable for applications requiring very low quiescent current and an ultra-small size.



PDFN-3x3-8L

Figure 1. Package Type of HCR6612

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Pin Configuration

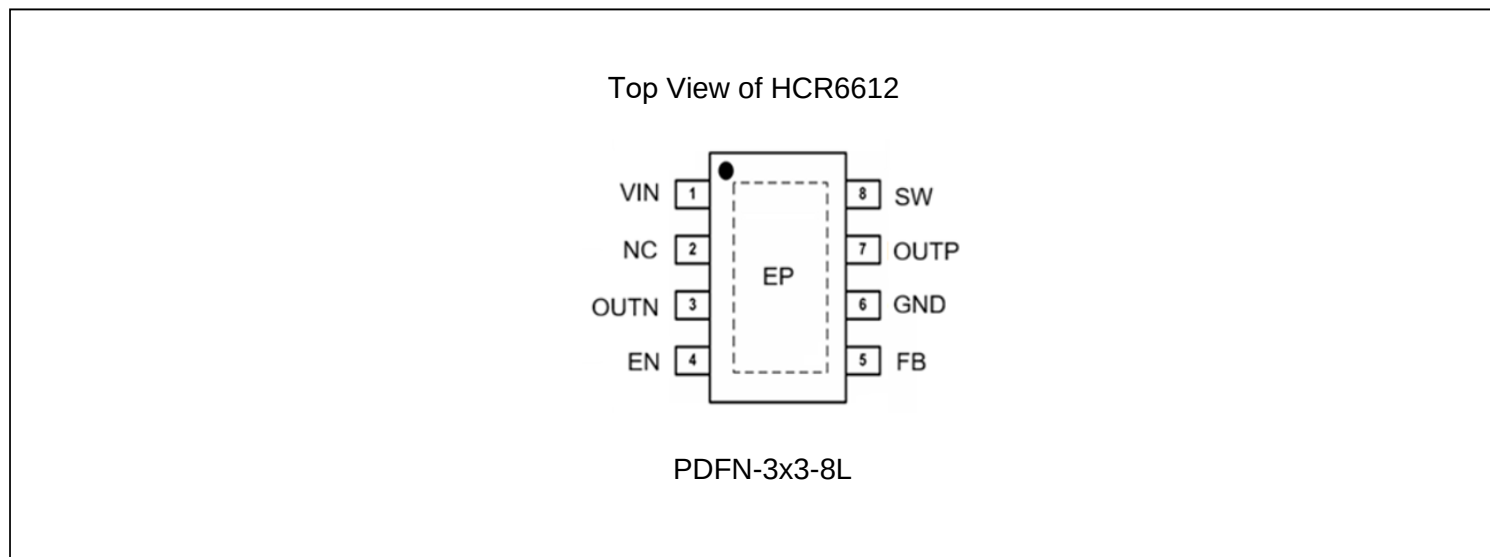


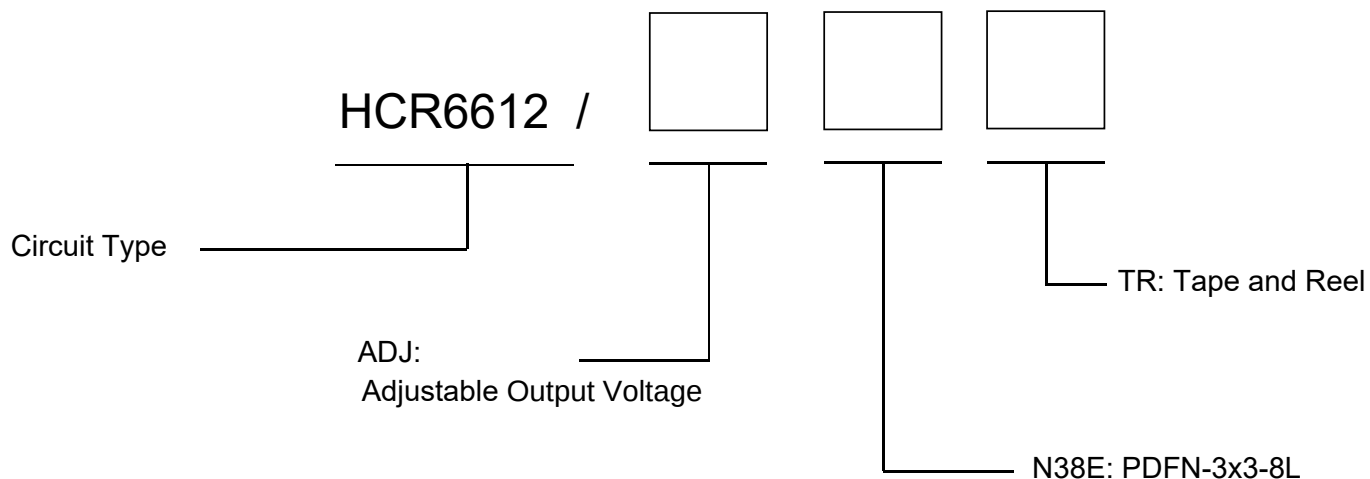
Figure 2. Pin Configuration of HCR6612

Pin Descriptions

Pin Number	Pin Name	Description
1	VIN	Supply voltage input pin. Operates from 2.5V to 25V DC. Bypass V_{IN} to GND with a suitably large capacitor to eliminate input noise.
2	NC	Not connected.
3	OUTN	Output pin. Internal Schottky diode cathode.
4	EN	Enable pin. Drive high to turn on the device; drive low to turn it off. Floating is default high.
5	FB	Feedback pin. An external resistor divider senses and regulates the output voltage. The feedback threshold is 410mV.
6	GND	Ground pin.
7	OUTP	Internal Schottky diode anode.
8	SW	Power switch pin.
EP	GND	The exposed pad is GND.

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Ordering Information



Ordering Code

Part Number	Marking ID (Note 2)	Temperature Range (Junction)	Package	Quantity per Reel
HCR6612/ADJN38ETR	HCR6612xx	-40 to +125°C	PDFN-3x3-8L	5000, Tape&Reel

Note 2: HCR6612 is the product marking; xx is the date code.

Eco Plan: RoHS & HF.

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD
Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input voltage	V_{IN}	-0.3 to 32	V
EN pin voltage	V_{EN}	-0.3 to V_{IN}	V
Feedback pin voltage	V_{FB}	-0.3 to V_{IN}	V
Switch pin voltage	V_{SW}	-0.3 to 40	V
OUTN pin voltage	V_{OUTN}	-0.3 to 40	V
Power dissipation	P_D	250	mW
Thermal resistance (PDFN-3x3-8L) Junction to ambient, no heatsink, free air	R_{JA}	55	°C/W
Maximum junction temperature	T_J	-40 to 150	°C
Operating junction temperature	T_J	-40 to 125	°C
Storage temperature	T_{STG}	-65 to 150	°C
Lead temperature (soldering, 10 sec)	T_{LEAD}	260	°C
ESD (HBM)	-	>4000	V

Note 1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation at these or any other conditions above those indicated in the operating conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Input operating voltage	V_{IN}	2.5	25	V
Operating junction temperature	T_J	-40	125	°C

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD
Electrical Characteristics

$T_A = 25^\circ\text{C}$; system test circuit in Figure 8, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Feedback voltage	V_{FB}	$V_{IN} = 5V, V_{OUT} = 12V$ $I_{OUT} = 30mA$	401.8	410	418.2	mV
Efficiency	η	$V_{IN} = 5V, V_{OUT} = 12V$ $I_{OUT} = 80mA$	-	84.0	-	%
Efficiency	η	$V_{IN} = 12V, V_{OUT} = 24V$ $I_{OUT} = 80mA$	-	89.1	-	%

Electrical Characteristics (DC Parameters)

$T_A = 25^\circ\text{C}$, $V_{IN} = 3V$; system test circuit in Figure 6, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input operating voltage	V_{IN}	-	2.5	-	25	V
Shutdown supply current	I_S	$V_{EN} = 0V$ OUTN flowing	-	3	-	μA
Quiescent supply current	I_Q	$V_{FB} = 2V$	-	2.3	-	mA
Oscillator frequency	F_{OSC}	-	0.96	1.20	1.44	MHz
Switch current limit	I_L	$V_{FB} = 0V$	-	1	-	A
Switch V_{CE} saturation voltage	V_{SAT}	$I_{SW} = 300mA$	-	0.3	-	V
Schottky forward drop	V_F	$I_F = 300mA$	-	0.8	-	V
EN pin threshold	V_{EN_H}	High (ON)	2.0	-	-	V
	V_{EN_L}	Low (OFF)	-	-	0.5	
Max. duty cycle	D_{MAX}	$V_{FB} = 0V$	-	90	-	%
Overvoltage protection	V_{OUT}	$V_{FB} = 0V$	-	27	-	V
Thermal shutdown temperature	T_{SD}	-	-	150	-	$^\circ\text{C}$

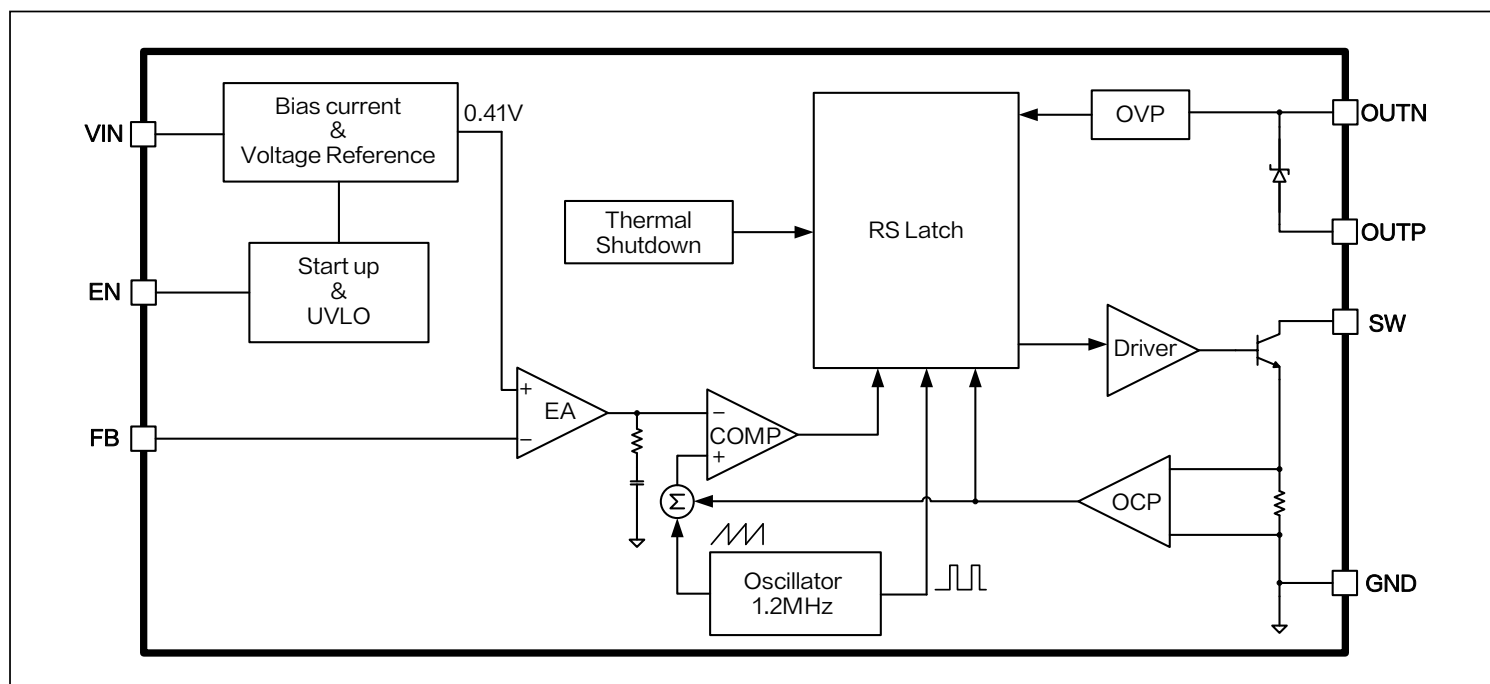
1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD
Functional Block Diagram


Figure 3. Functional Block Diagram of HCR6612

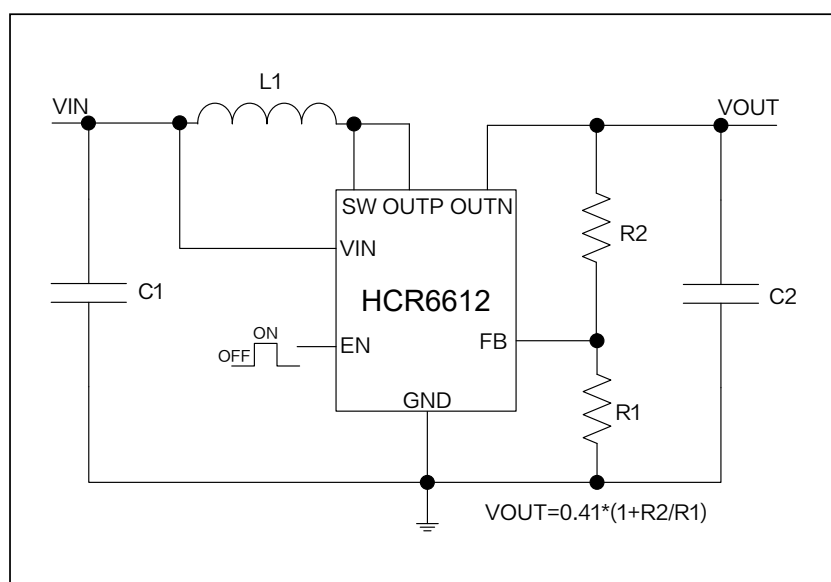
Typical Application Schematic


Figure 4. Typical Application Schematic

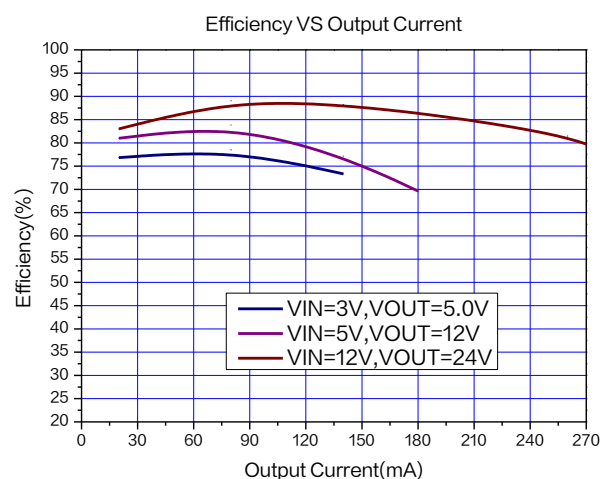


Figure 5. Efficiency Curves

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Typical System Application

Single Li Battery Boost Driver Circuit

$V_{IN} = 2.5V$ to $4.2V$, $V_{OUT} = 5.0V$

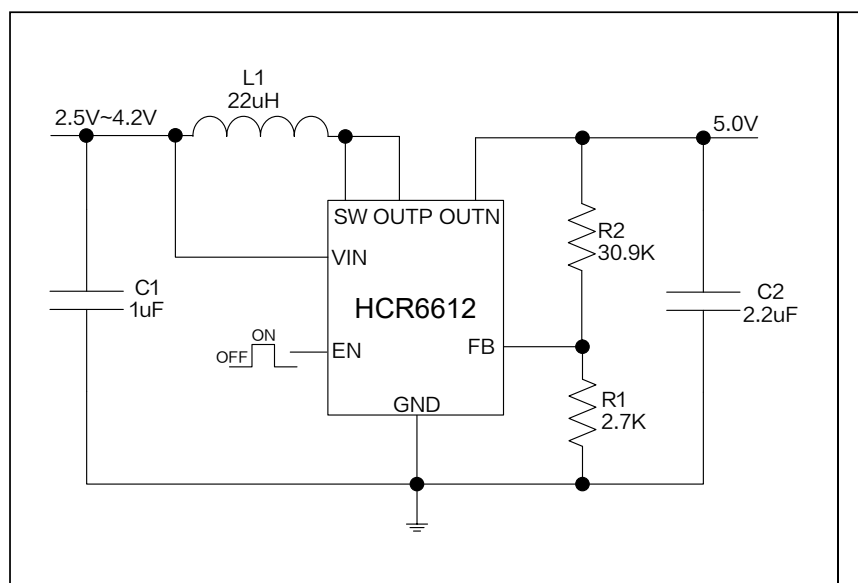


Figure 6. System Application Circuit
($V_{OUT} = 5.0V$)

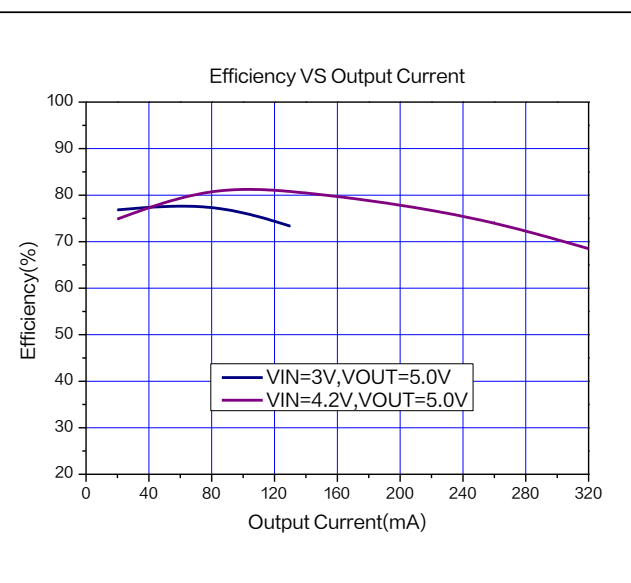


Figure 7. Efficiency Curve
($V_{OUT} = 5.0V$)

Bill of Materials for Figure 6

Qty	Ref. Des.	Description	Mfg. Part Number	Mfg.
1	L1	22μH, 1A, inductor, 3×3	YHNR3015-220M	YJYCOIN
1	C1	1μF, 50V, ceramic, X7R, 0603	0603B105K500NT	Fenghua
1	C2	2.2μF, 50V, ceramic, X7R, 0805	0805X225K500NT	Fenghua
1	R1	2.7kΩ, 1%, 1/16W, thick film, 0603	RS-03K2701FT	Fenghua
1	R2	30.9kΩ, 1%, 1/16W, thick film, 0603	RS-03K3092FT	Fenghua

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Typical System Application

Two Li Batteries Boost Driver Circuit

$V_{IN} = 5V \text{ to } 8.4V$, $V_{OUT} = 12V$

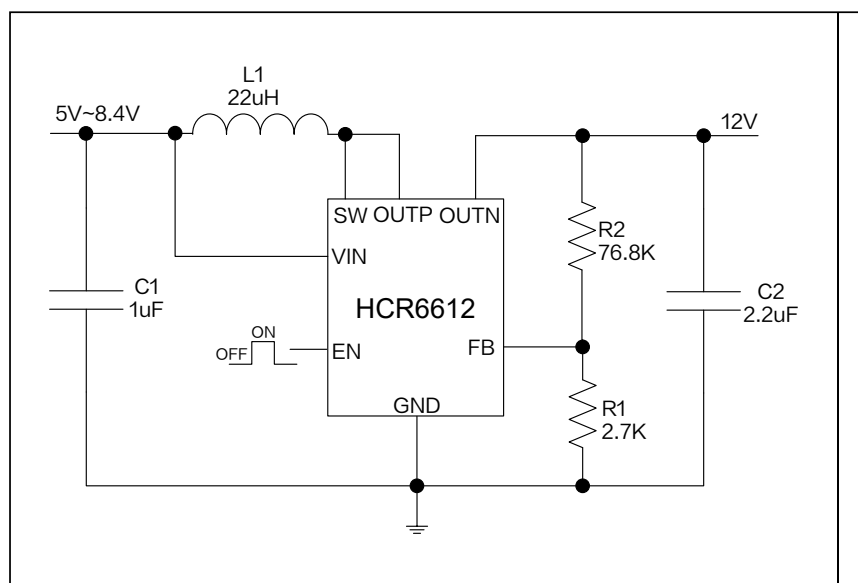


Figure 8. System Application Circuit
($V_{OUT} = 12V$)

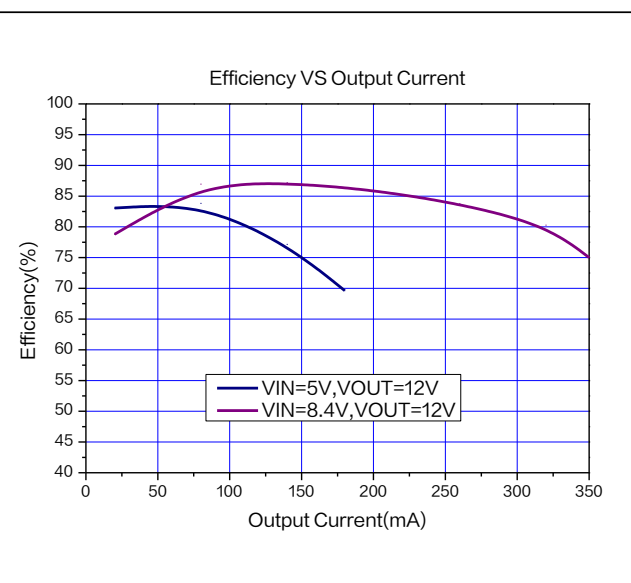


Figure 9. Efficiency Curve
($V_{OUT} = 12V$)

Bill of Materials for Figure 8

Qty	Ref. Des.	Description	Mfg. Part Number	Mfg.
1	L1	22μH, 1A, inductor, 3×3	YHNR3015-220M	YJYCOIN
1	C1	1μF, 50V, ceramic, X7R, 0603	0603B105K500NT	Fenghua
1	C2	2.2μF, 50V, ceramic, X7R, 0805	0805X225K500NT	Fenghua
1	R1	2.7kΩ, 1%, 1/16W, thick film, 0603	RS-03K2701FT	Fenghua
1	R2	76.8kΩ, 1%, 1/16W, thick film, 0603	RS-03K7682FT	Fenghua

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Typical System Application

SEPIC Topology Circuit

$V_{IN} = 2.5V$ to $15V$, $V_{OUT} = 5.0V$

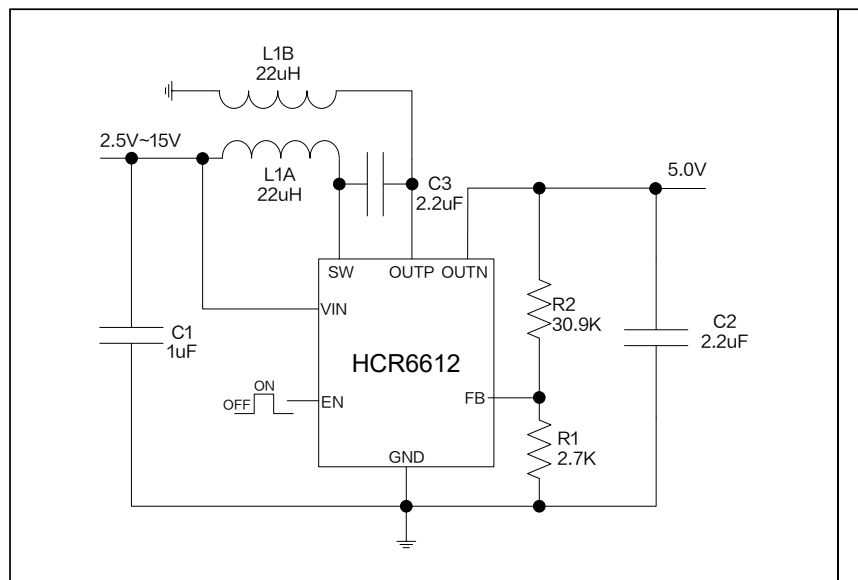


Figure 10. System Application Circuit
($V_{OUT} = 5.0V$)

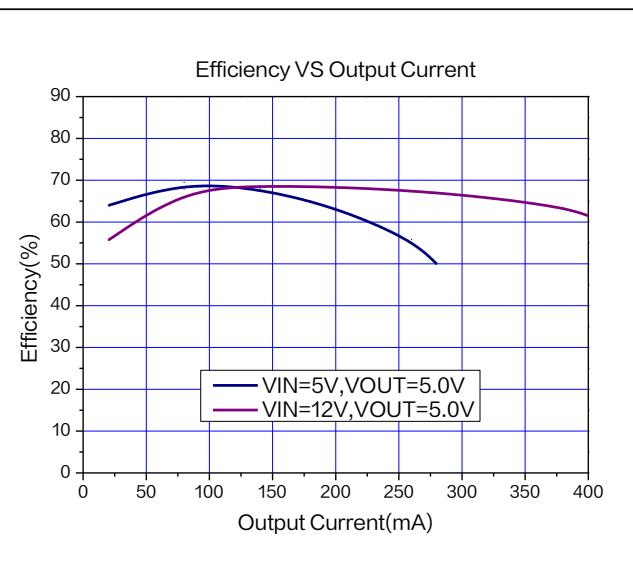


Figure 11. Efficiency Curve
($V_{OUT} = 5.0V$)

Bill of Materials for Figure 10

Qty	Ref. Des.	Description	Mfg. Part Number	Mfg.
2	L1A, L1B	22μH, 1A, inductor, 3×3	YHNR3015-220M	YJYCOIN
1	C1	1μF, 50V, ceramic, X7R, 0603	0603B105K500NT	Fenghua
2	C2, C3	2.2μF, 50V, ceramic, X7R, 0805	0805X225K500NT	Fenghua
1	R1	2.7kΩ, 1%, 1/16W, thick film, 0603	RS-03K2701FT	Fenghua
1	R2	30.9kΩ, 1%, 1/16W, thick film, 0603	RS-03K3092FT	Fenghua

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Typical System Application

SEPIC Topology Circuit

$V_{IN} = 2.5V$ to $15V$, $V_{OUT} = 12V$

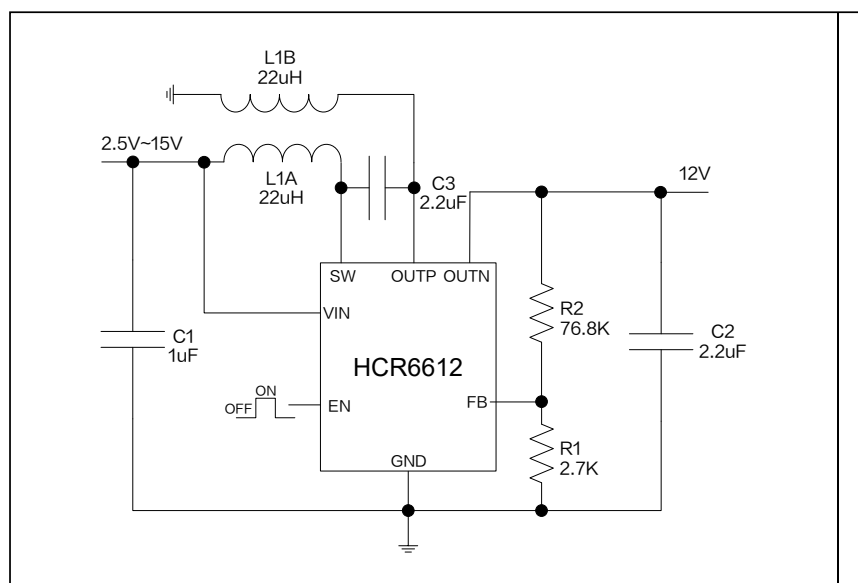


Figure 12. System Application Circuit
($V_{OUT} = 12V$)

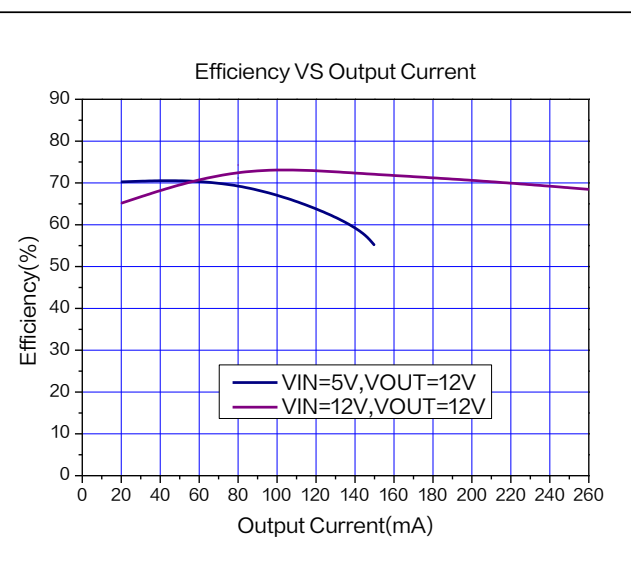
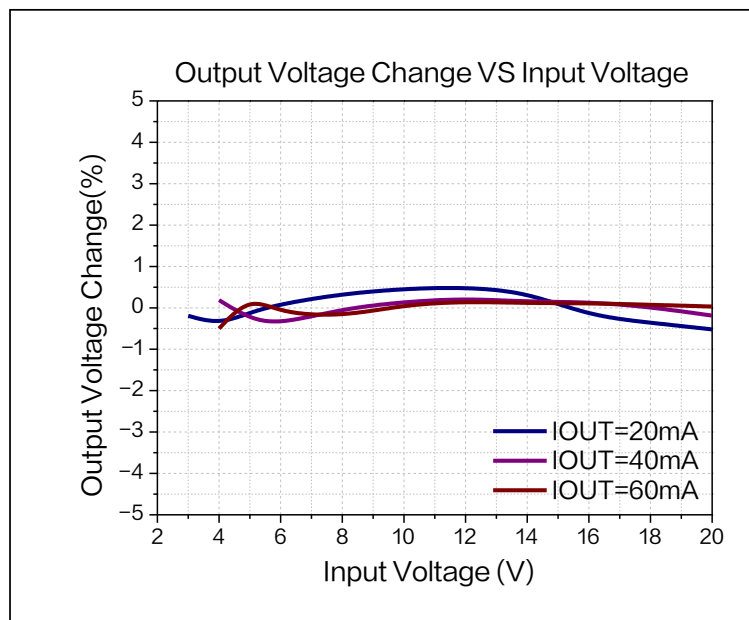
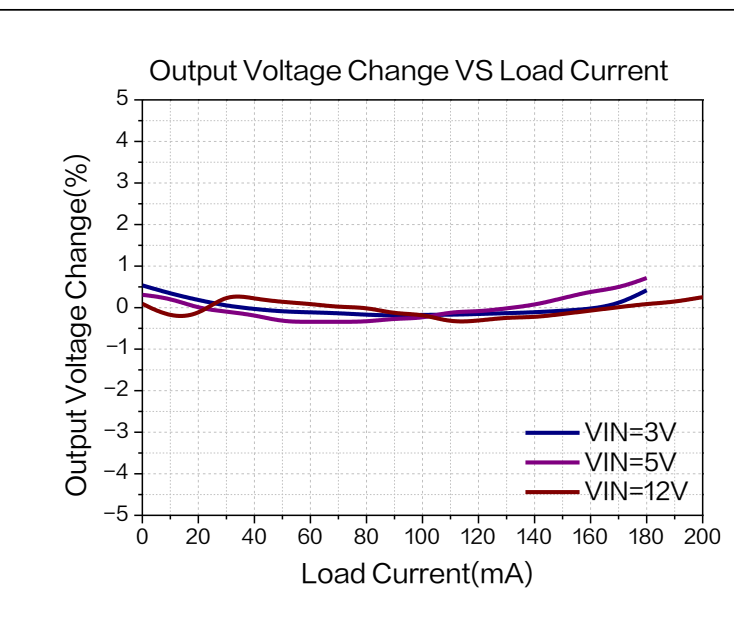
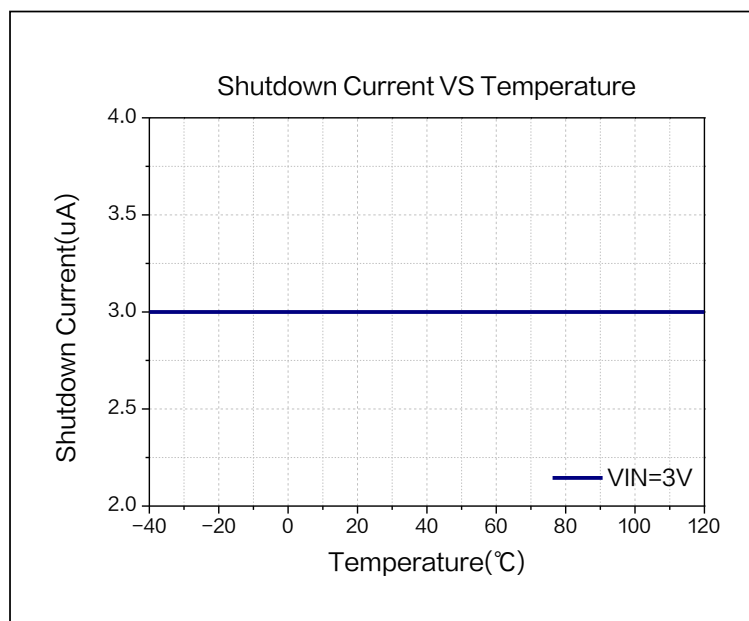
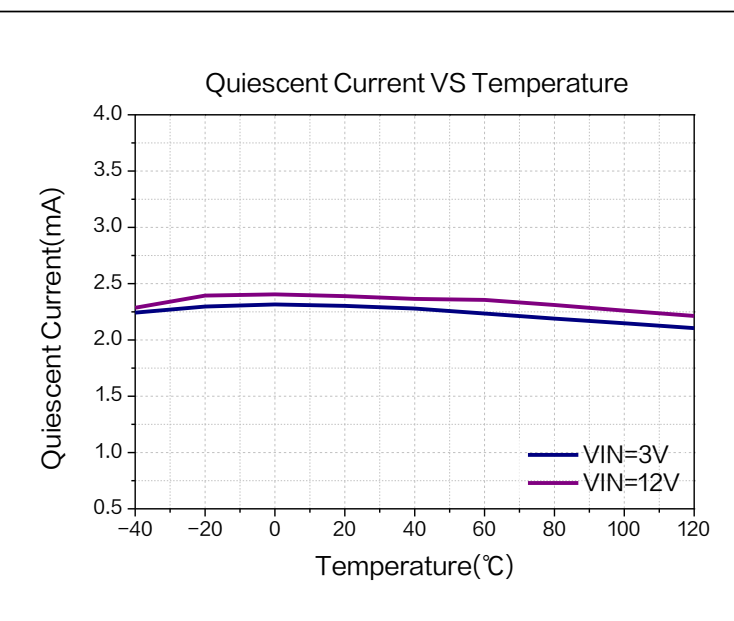


Figure 13. Efficiency Curve
($V_{OUT} = 12V$)

Bill of Materials for Figure 12

Qty	Ref. Des.	Description	Mfg. Part Number	Mfg.
2	L1A, L1B	22 μ H, 1A, inductor, 3 $\times$ 3	YHNR3015-220M	YJYCOIN
1	C1	1 μ F, 50V, ceramic, X7R, 0603	0603B105K500NT	Fenghua
2	C2, C3	2.2 μ F, 50V, ceramic, X7R, 0805	0805X225K500NT	Fenghua
1	R1	2.7k Ω , 1%, 1/16W, thick film, 0603	RS-03K2701FT	Fenghua
1	R2	76.8k Ω , 1%, 1/16W, thick film, 0603	RS-03K7682FT	Fenghua

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Typical Characteristics

Figure 14. Line Regulation

Figure 15. Load Regulation

Figure 16. Shutdown Current

Figure 17. Quiescent Current

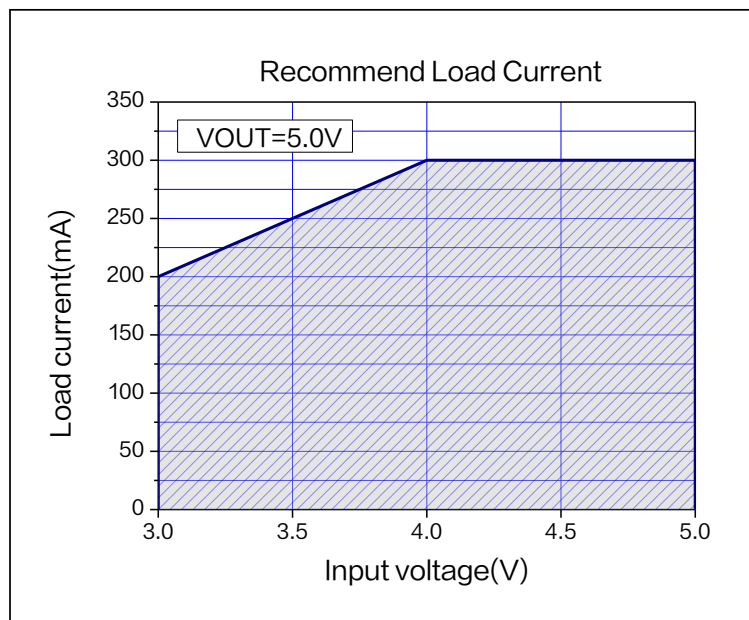
1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD
Typical Characteristics (Continued)


Figure 18. Max. Output Current
($V_{OUT} = 5.0V$, $T_A = 25^\circ C$)

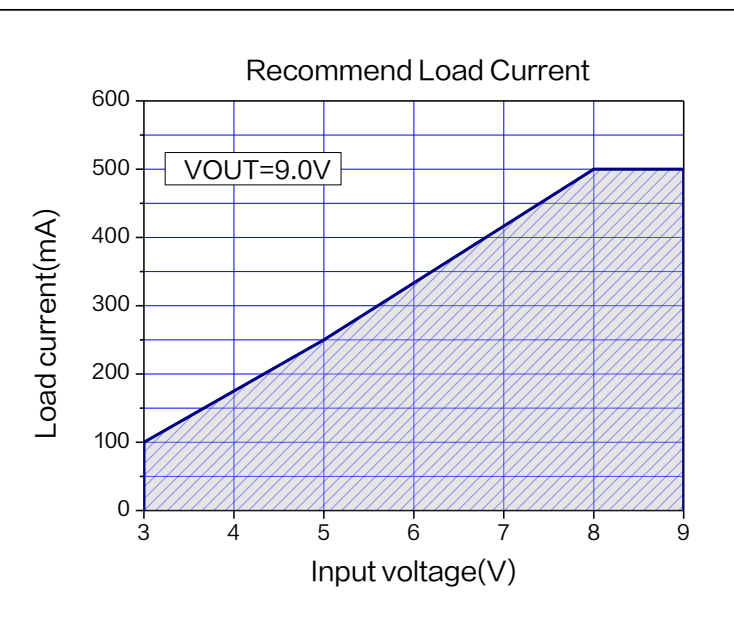


Figure 19. Max. Output Current
($V_{OUT} = 9.0V$, $T_A = 25^\circ C$)

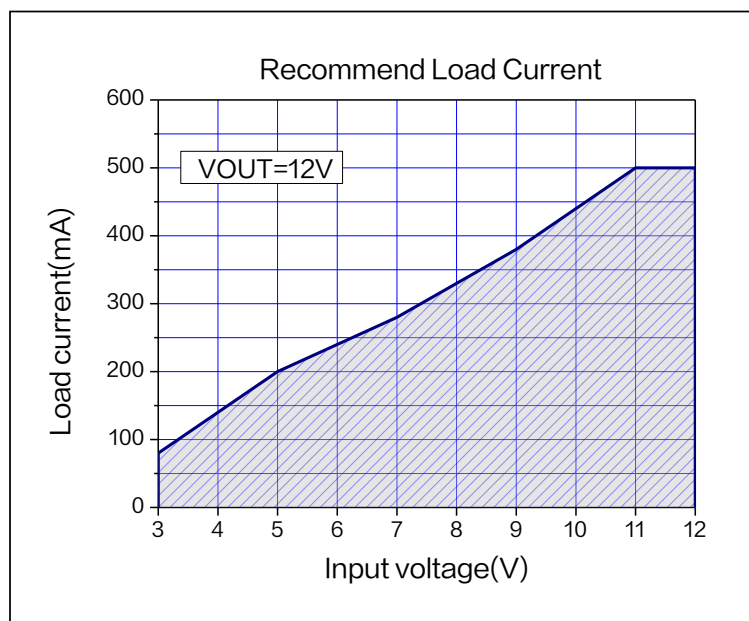


Figure 20. Max. Output Current
($V_{OUT} = 12V$, $T_A = 25^\circ C$)

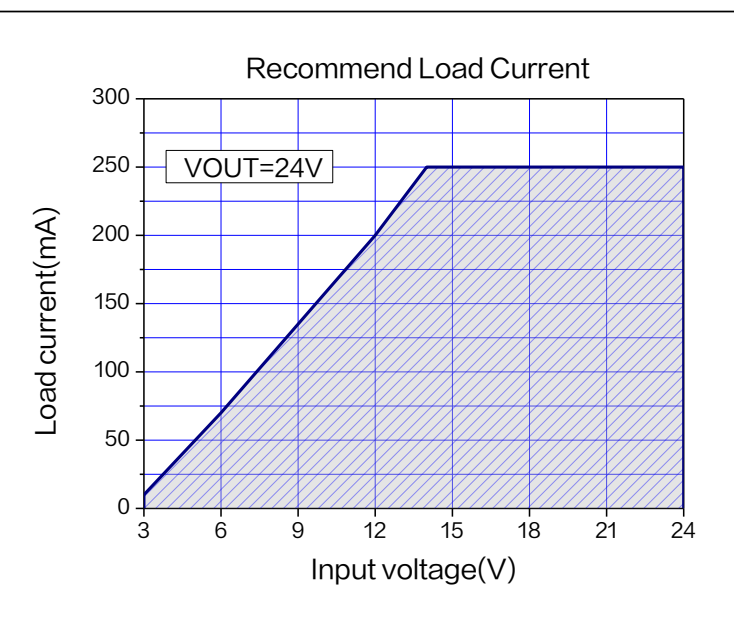


Figure 21. Max. Output Current
($V_{OUT} = 24V$, $T_A = 25^\circ C$)

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD
Package Dimensions

PDFN-3x3-8L

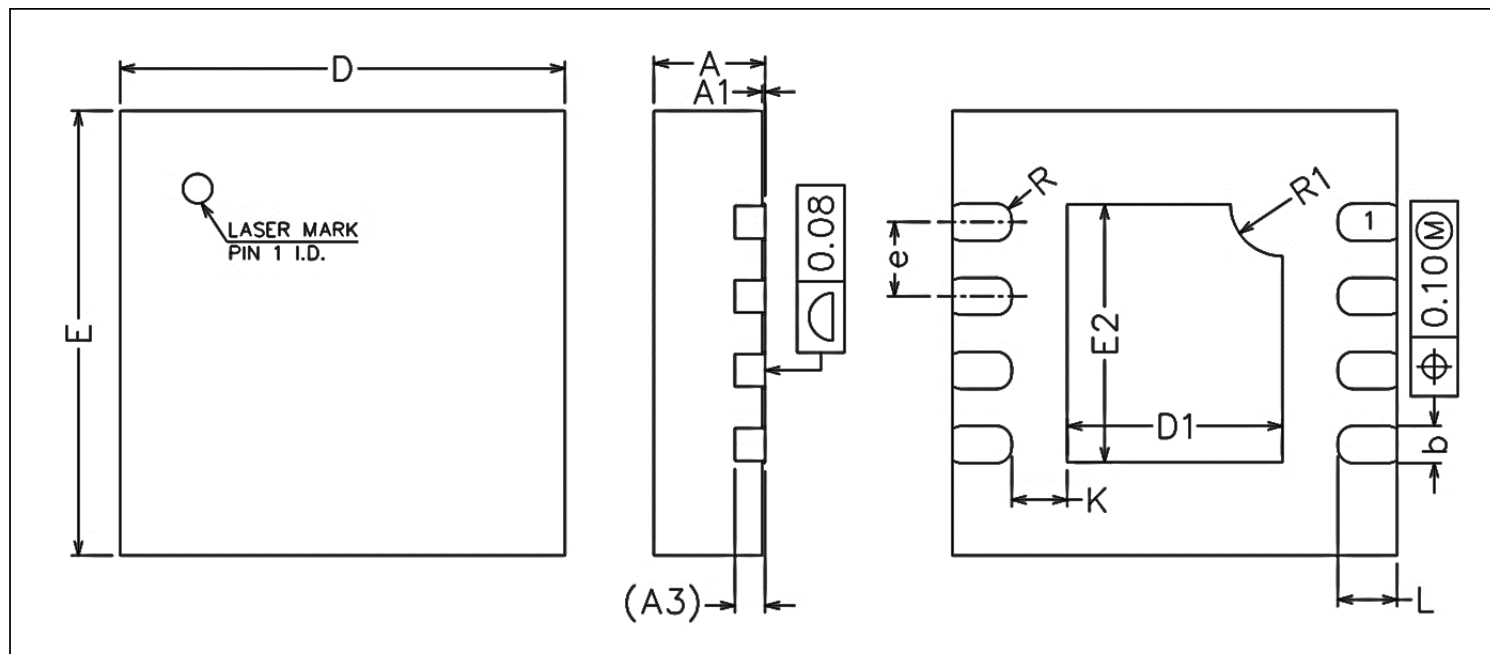


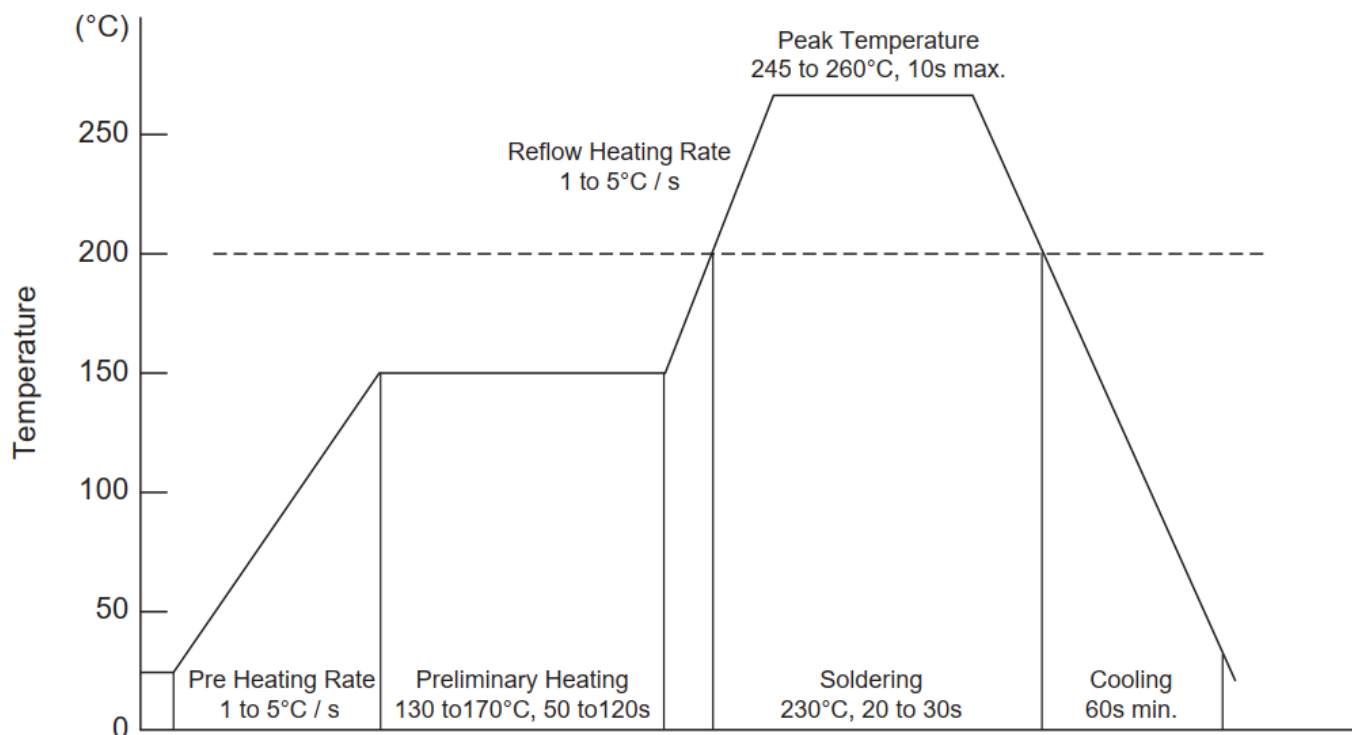
Figure 22. Package Dimensions of PDFN-3x3-8L

Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.700	0.750	0.800	0.027	0.030	0.032
A1	0.000	0.020	0.050	0.000	0.001	0.002
A3	0.203 REF.			0.008 REF.		
b	0.200	0.250	0.300	0.007	0.010	0.012
D	2.900	3.000	3.100	0.114	0.118	0.122
E	2.900	3.000	3.100	0.114	0.118	0.122
D2	1.350	1.450	1.550	0.053	0.057	0.061
E2	1.640	1.740	1.840	0.064	0.068	0.072
e	0.400	0.500	0.600	0.016	0.020	0.024
K	0.275	0.375	0.475	0.011	0.015	0.019
L	0.300	0.400	0.500	0.012	0.016	0.020
R	0.100 REF.			0.004 REF.		
R1	0.350 REF.			0.014 REF.		

1A 1.2MHz 27V Boost DC/DC Converter with Built-in SBD

Conditions of Soldering and Storage

Recommended Condition of Reflow Soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

Conditions of Hand Soldering

- Temperature: 300°C
- Time: 3s max
- Times: one time

Storage Conditions

- Temperature: 5 to 40°C
- Humidity: 30 to 80% RH
- Recommended period: One year after manufacturing