

2A, 36V, 150KHz Buck DC to DC Converter**Features**

- 2A Constant output Current Capability
- 4.5V to 36V Input Operating Range
- Fixed Volts: 3.3V/5.0V and Adjustable Versions
- Output Adjustable from 1.25V to 28V
- Fixed 150KHz Switching Frequency
- Maximum Duty Cycle 100%
- Minimum Drop Out 1.5V
- Internal Optimize Power Transistor
- High efficiency
- TTL shutdown capability
- Excellent line and load regulation
- EN pin with hysteresis function
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in SOIC-8(SOP-8) Package.

Applications

- Telecom / Networking Equipment
- Smart Terminal
- Industrial Control

General Description

The HCR3249 is a 150 KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 2A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function is built inside. When output short protection function happens, the operation frequency will be reduced from 150KHz to 38KHz. An internal compensation block is built in to minimize external component count.

The HCR3249 is available in a green SOIC-8 (SOP-8) package. Its Operating Junction Temperature range from -40'C to +125'C'



SOIC-8(SOP-8)

Figure 1. Package Type of HCR3249

2A, 36V, 150KHz Buck DC to DC Converter

Pin Configuration

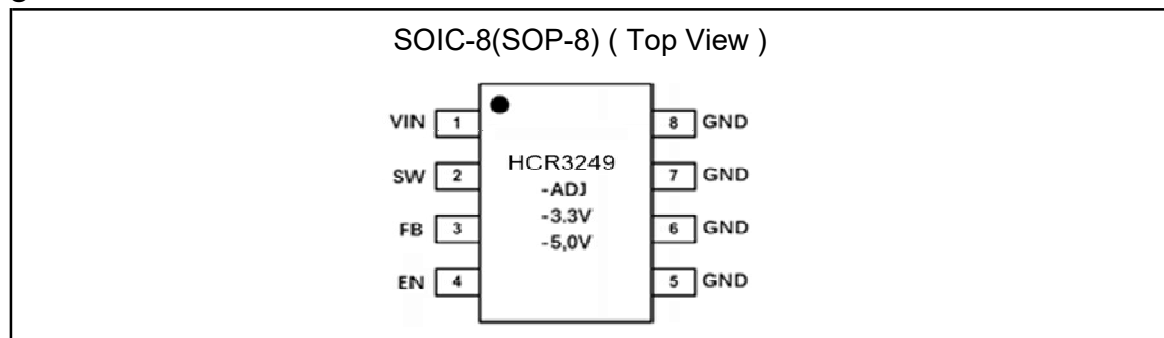
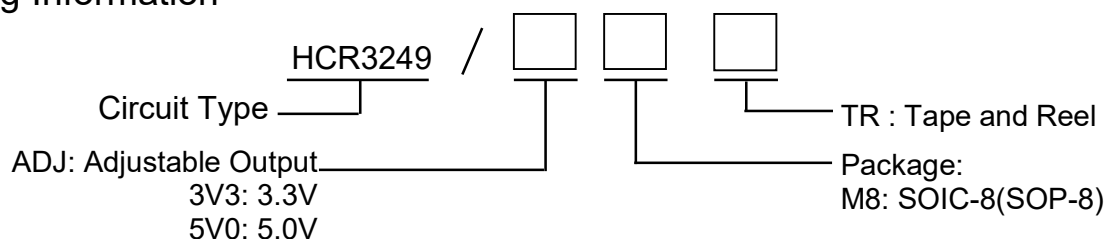


Figure 2. Pin Configuration of HCR3249 (Top View)

Pin Function Table

Pin Number	Pin Name	Function
1	VIN	Supply Voltage Input Pin. The HCR3249 operates from 4.5V to 36V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
2	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
3	FB	Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.23V.
4	EN	Enable Pin. Drive EN pin low to turn on the device, drive it high to turn it off. Floating is default low.
5/6/7/8	GND	Ground Pin. Care must be taken in layout. This pin should be placed outside of the Schottky Diode to output capacitor ground path to prevent switching current spikes from inducing voltage noise into HCR3249

Ordering Information



Ordering Code

Part Number	Marking ID ²	Temperature Range	Package	Quantity per Reel
HCR3249/ADJM8TR	HCR3249-ADJxx	-40°C to +125°C	SOIC-8(SOP-8)	4000pcs/TR
HCR3249/3V3M8TR	HCR3249-3V3xx	-40°C to +125°C	SOIC-8(SOP-8)	4000pcs/TR
HCR3249/5V0M8TR	HCR3249-5Vxx	-40°C to +125°C	SOIC-8(SOP-8)	4000pcs/TR

Note2: the HCR3249-ADJ/3V3/5V0" is product type and the "XX" is date code.

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Function Block

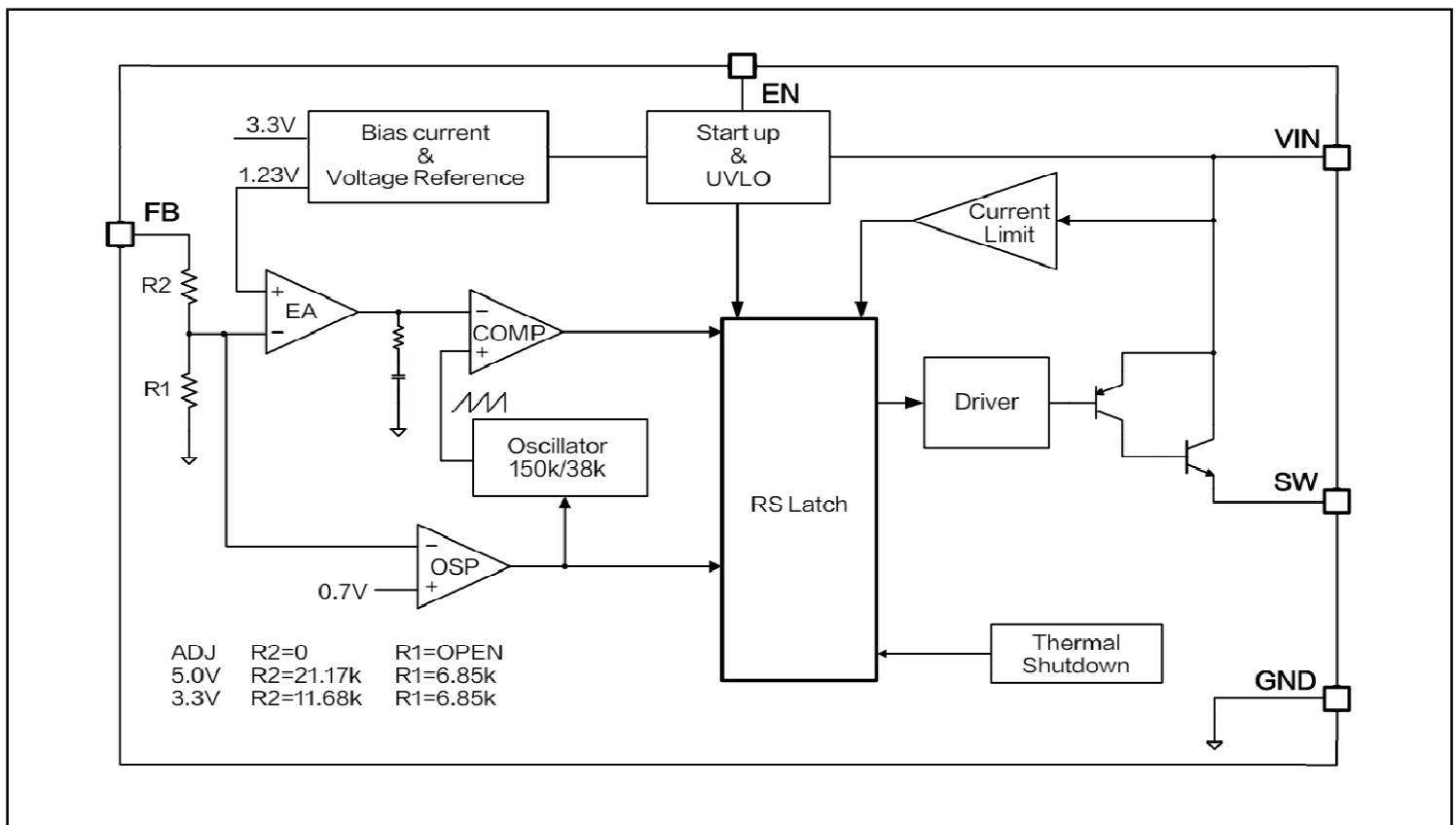


Figure 3. Function Block of HCR3249

Typical Application Circuit

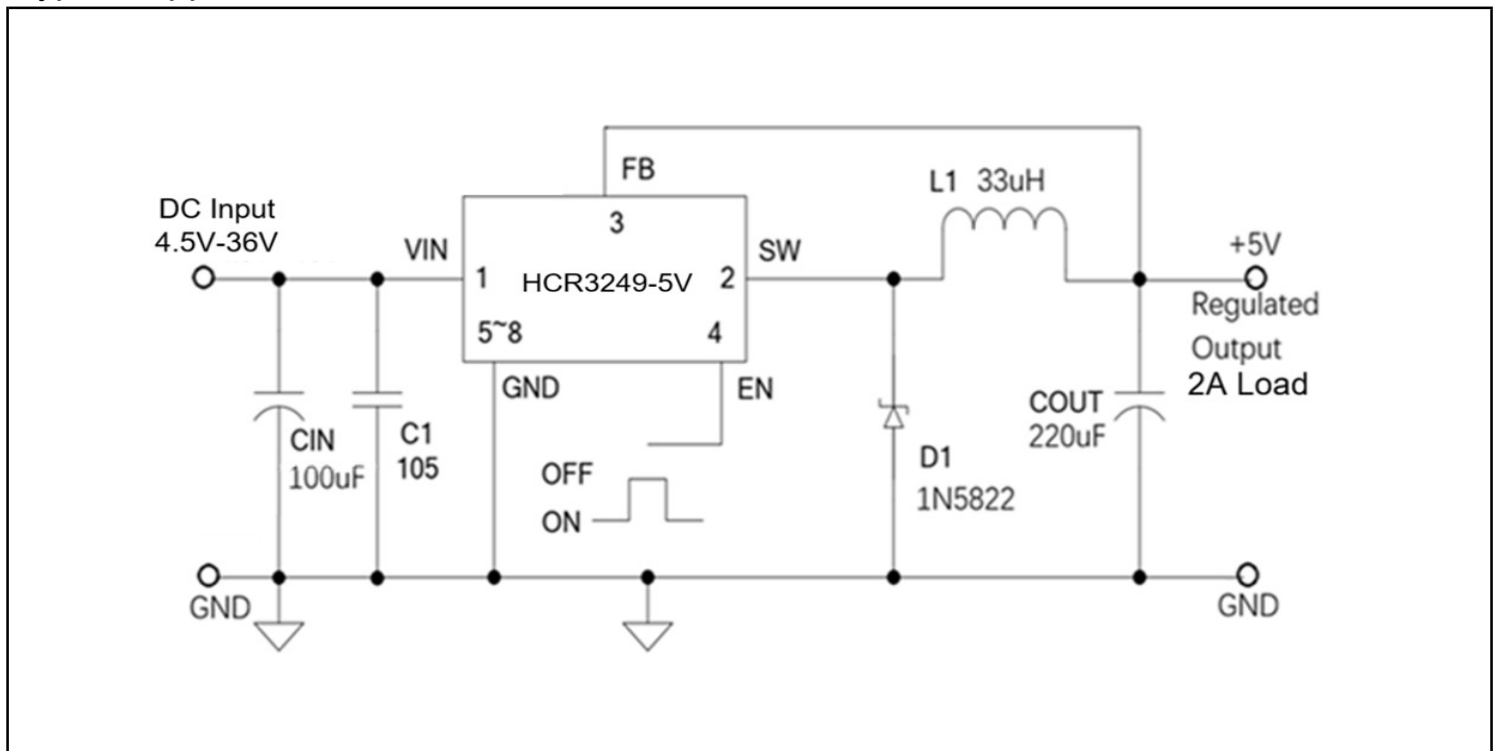


Figure 4. Typical Application Circuit of HCR3249

2A, 36V, 150KHz Buck DC to DC Converter**Absolute Maximum Ratings** ^{Note 1}

Parameter	Symbol	Value	Unit
Supply Voltage	V _{IN}	-0.3 to +40	V
Enable Voltage	V _{EN}	-0.3 to +V _{IN}	V
Feedback Pin Voltage(for the ADJ, 3.3V, 5V)	V _{FB}	-0.3 to +7	V
Output Switch Pin Voltage	V _{SW}	-0.3 to V _{IN}	V
Maximum Power Dissipation	P _D	Internally limited	W
Thermal Resistance (Junction to Ambient, No Heatsink, Free Air)	R _{θJA}	100	'C/W
Thermal Resistance Junction to Case	R _{θJC}	68	'C/W
Storage Temperature Range	T _{STG}	-65 to 150	'C
Operating Junction Temperature	T _J	-40 to 125	'C
Lead Temperature (Soldering, 10s)	T _{LEAD}	260	'C
ESD (HBM)	HBM	3000	V
ESD (MM)	MM	300	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device.

This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommend Operating Conditions ^{note2}

Parameter	Symbol	Min.	Max.	Unit
Input Voltage	V _{IN}	4.5	36.0	V
Output Adjustable Voltage	V _{OUT}	1.25	28.0	V
Operating Junction Temperature	T _A	-40	+125	'C

Note 1: Stresses beyond those listed under "Absolute maximum Ratings" may damage the device.

2: The device is not guaranteed to function outside the recommended operating conditions.

2A, 36V, 150KHz Buck DC to DC Converter**Electrical Characteristics (DC Parameters)**

TA=25°C, VIN=12V, IOUT=500mA, The others floating unless otherwise specified.

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Input Operation Voltage	V _{in}		4.5	-	36	V
Shutdown Supply Current	I _s	V _{EN} =2V	-	70	200	uA
Quiescent Supply Current	I _q	V _{FB} =6V	-	1.4	-	mA
Feedback Voltage	V _{FB}		1.19	1.23	1.26	V
Switching Current Limit	I _{LIMIT}	V _{FB} =0V	-	2.2	-	A
Oscillator Frequency	F _{sw}		120	150	180	KHz
Maximum Duty Cycle	D _{MAX}	V _{FB} =0V	-	100	-	%
EN Input Voltage	V _{EN_H}	High(Regulator OFF)	-	1.4	-	V
	V _{EN_L}	Low (Regulator ON)	-	0.8	-	
EN Input Current	I _{EN}	V _{EN} =2.5V(OFF)	-	5	-	uA
Output Saturation Voltage	V _{CE}	V _{FB} =0V, I _{out} =2A	-	1.3	1.5	V
Thermal Shutdown Temperature	T _{SD}		-	155	-	°C
Thermal Shutdown Hysteresis	T _{SDHYS}		-	40	-	°C

2A, 36V, 150KHz Buck DC to DC Converter**Electrical Characteristics(Con.)**

Ta=25°C; unless otherwise specified

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
HCR3321-3V3 Electrical Characteristics						
System Parameters test Circuit Figure 6.						
Output Voltage	V _{OUT}	V _{in} =12V, I _{load} =0.5A	3.201	3.3	3.399	V
Efficiency	η	V _{in} =12V, V _{OUT} =3.3V, I _{OUT} =0.5A	-	82.6	-	%
HCR3321-5V0 Electrical Characteristics						
System Parameters test Circuit Figure 7.						
Output Voltage	V _{OUT}	V _{in} =12V, I _{OUT} =0.5A	4.85	5.0	5.15	V
Efficiency	η	V _{in} =12V, V _{OUT} =5.0V, I _{OUT} =0.5A	-	86.5	-	%
HCR3321-ADJ Electrical Characteristics						
System Parameters test Circuit Figure 8.						
Feedback Voltage	V _{FB}	V _{in} =12V, V _{OUT} =5.0V, I _{OUT} =0.5A	1.193	1.23	1.267	V
Efficiency	η	V _{in} =12V, V _{out} =5V, I _{OUT} =0.5A	-	86.5	-	%

2A, 36V, 150KHz Buck DC to DC Converter

Test Circuit ^{note5}

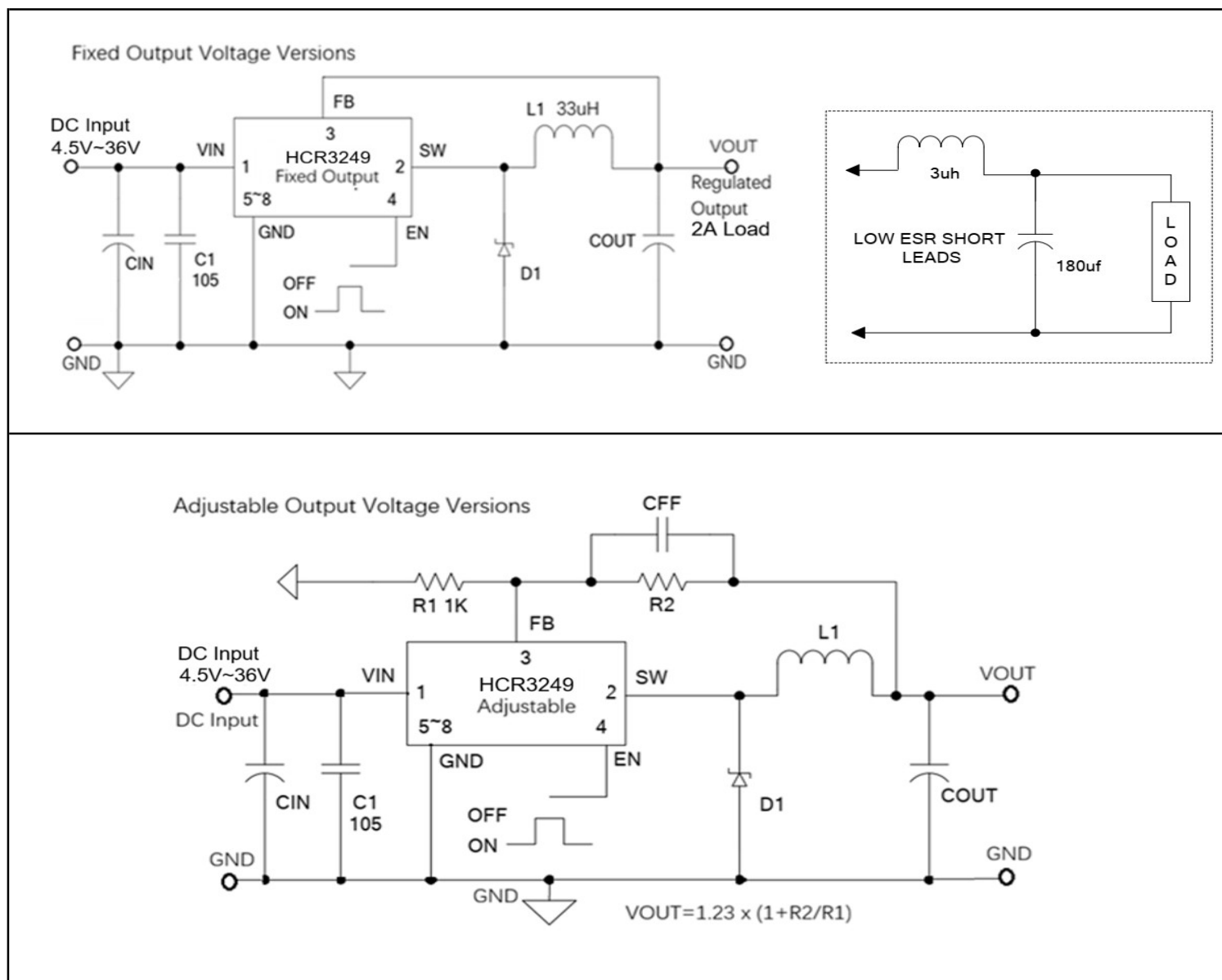


Figure 5. Standard Test Circuits of HCR3249

Note 5. Select R1 to be approximately 1K, use a 1% resistor for best stability.

C1 and CFF are optional; in order to increase stability and reduce the input power line noise, C1 must be placed near to PIN1 and PIN5~8;

For output voltages greater than approximately 10V, an additional capacitor CFF is required. The compensation capacitor is typically between 100 pf and 33 nf, and is wired in parallel with the output voltage setting resistor, R2. It provides additional stability for high output voltage, low input-output voltages, and/or very low ESR output capacitors, such as solid tantalum capacitors.

$CFF = 1 / (31 \times 1000 \times R2)$; This capacitor type can be ceramic, plastic, silver mica, etc. (Because of the unstable characteristics of ceramic capacitors made with Z5U material, they are not recommended.)

2A, 36V, 150KHz Buck DC to DC Converter
HCR3249 Series Buck Regulator Design Procedure (Fixed Output)

Conditions			Inductor	Output Capacitor (COUT)			
			(L1)	Through Hole Electrolytic		Surface Mount Tantalum	
Output Voltage	Load Current	Max Input Voltage	Inductance	Panasonic HFQ Series	Nichicon PL Series	AVX TPS Series	Sprague 595D Series
(V)	(A)	(V)	(uH)	(uF/V)	(uF/V)	(uF/V)	(uF/V)
3.3	2.0	6	22	470 / 25	470 / 35	330 / 6.3	390 / 6.3
		10	33	330 / 35	330 / 35	330 / 6.3	390 / 6.3
		40	47	330 / 35	270 / 50	220 / 10	330 / 10
5.0	2.0	9	22	470 / 25	560 / 35	220 / 10	330 / 10
		20	68	180 / 35	180 / 35	100 / 10	270 / 10
		40	68	180 / 35	180 / 35	100 / 10	270 / 10

Buck Regulator Design Procedure (Adjustable Output) of HCR3249 Series

Conditions			Inductor	Output Capacitor (COUT)			
	Through Hole Output Electrolytic			Surface Mount Output Capacitor			
Output Voltage	Panasonic HFQ Series	Nichicon PL Series	Feedforward Capacitor	AVX TPS Series	Sprague 595D Series	Feedforward Capacitor	
(V)	(uF/V)	(uF/V)		(uF/V)	(uF/V)		
2	820 / 35	820 / 35	33nF	330 / 6.3	470 / 4	33nF	
4	560 / 35	470 / 35	10nF	330 / 6.3	470 / 6.3	10nF	
6	470 / 25	470 / 35	3.3nF	220 / 10	330 / 10	3.3nF	
9	330 / 25	330 / 25	1.5nF	100 / 16	180 / 16	1.5nF	
12	330 / 25	330 / 25	1nF	100 / 16	180 / 16	1nF	
15	220 / 25	220 / 35	680pF	68 / 20	120 / 20	680pF	
24	220 / 35	150 / 35	560pF	33 / 25	33 / 25	220pF	
28	100 / 50	100 / 50	390pF	10 / 35	15 / 50	220pF	

Schottky Diode Selection Table

Current	Surface Mount	Through Hole	VR (The same as system maximum input voltage)				
			20V	30V	40V	50V	60V
1A		√	1N5817	1N5818	1N5819		
3A		√	1N5820	1N5821	1N5822		
		√	MBR320	MBR330	MBR340	MBR350	MBR360
	√		SK32	SK33	SK34	SK35	SK36
	√			30WQ03	30WQ04	30WQ05	
		√		31DQ03	31DQ04	31DQ05	
		√	SR302	SR303	SR304	SR305	SR306

2A, 36V, 150KHz Buck DC to DC Converter

Typical System Application for 3.3V Version

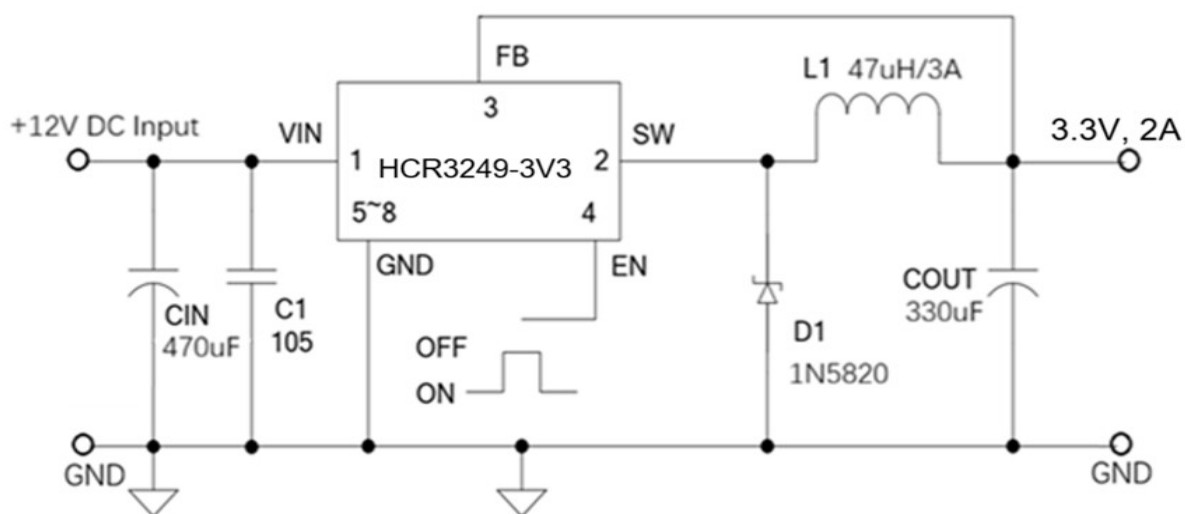


Figure 6. System Parameters Test Circuit for HCR3249-3V3

Typical System Application for 5V Version

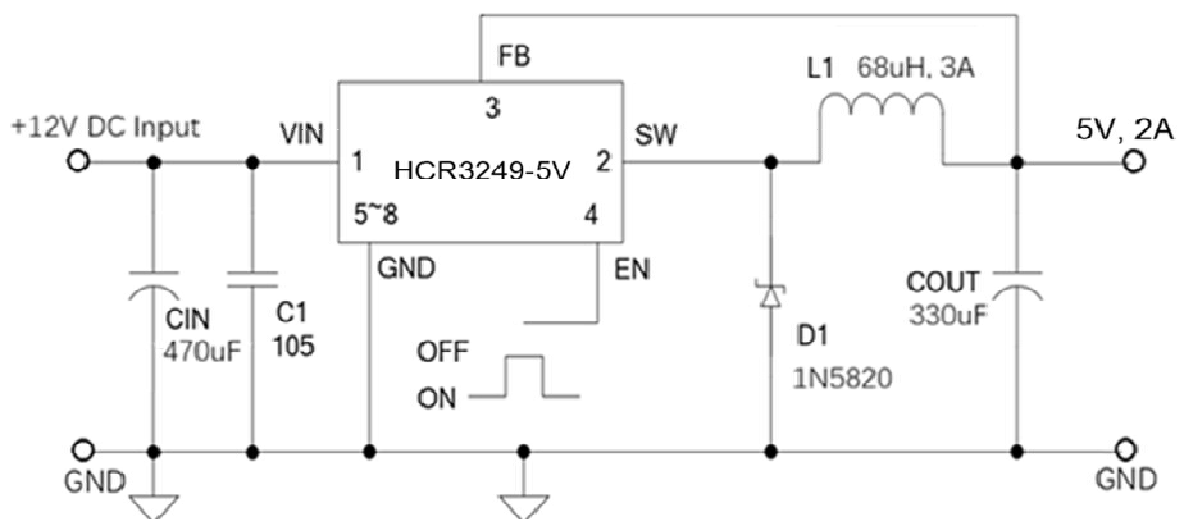


Figure 7. System Parameters Test Circuit for HCR3249-5V0

2A, 36V, 150KHz Buck DC to DC Converter

Typical System Application for ADJ Version

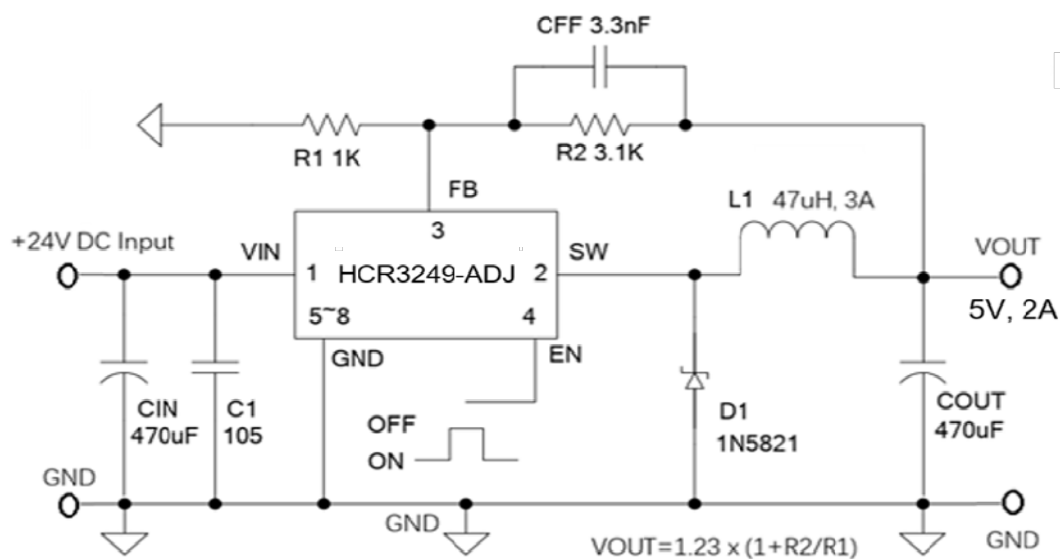
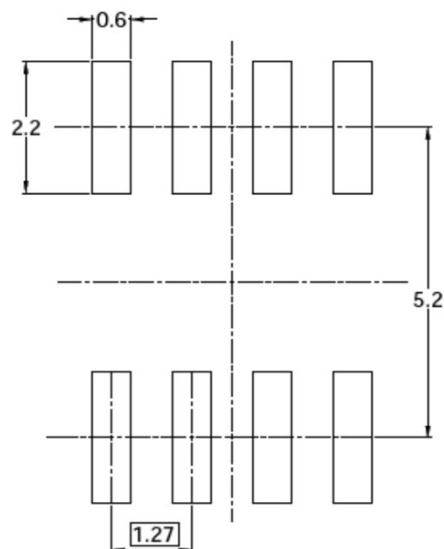
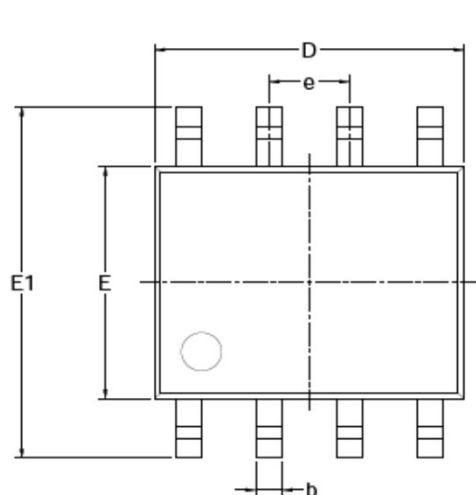
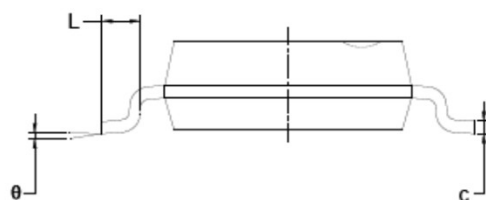
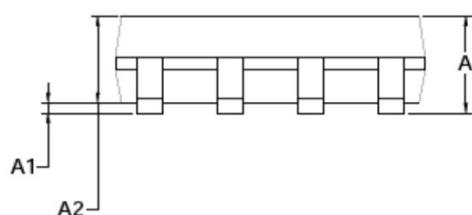


Figure 8. System Parameters Test Circuit for HCR3249-ADJ

2A, 36V, 150KHz Buck DC to DC Converter
Mechanical Dimensions

M8: SOIC-8(SOP-8) Package

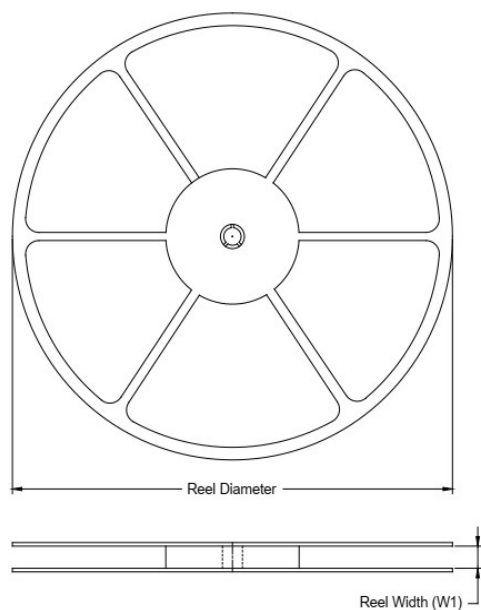
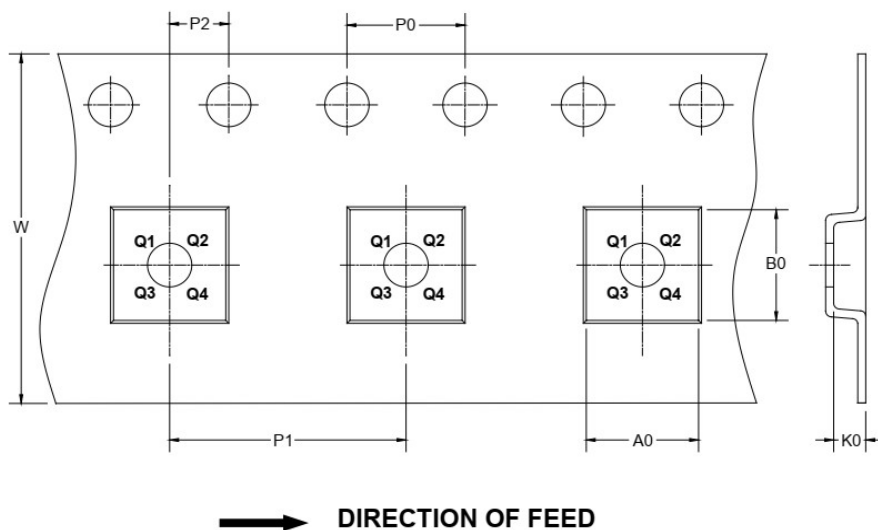
Unit: mm(inch)


RECOMMENDED LAND PATTERN (Unit: mm)


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

2A, 36V, 150KHz Buck DC to DC Converter
Tape and Reel Information
REEL DIMENSIONS

TAPE DIMENSIONS


NOTE: The picture is only for reference. Please make the object as the standard.

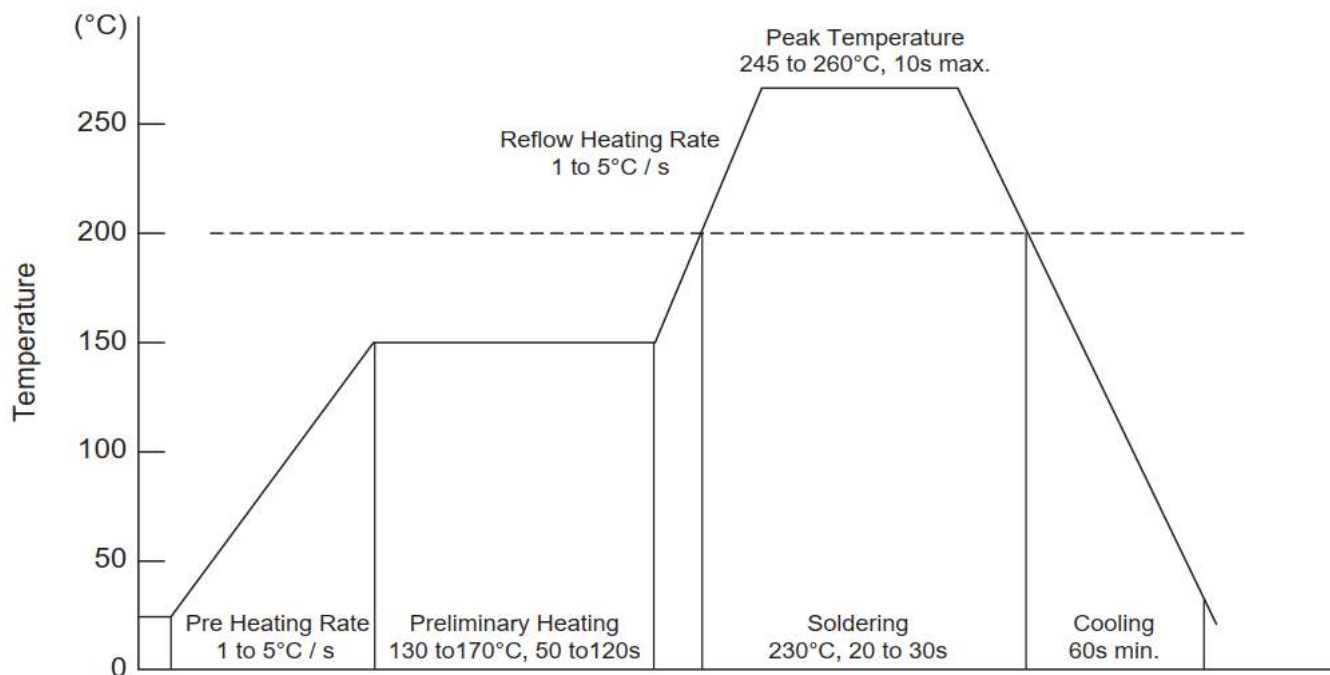
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-8(SOP-8)	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1

2A, 36V, 150KHz Buck DC to DC Converter

Conditins 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