

180kHz 60V 5A Switching Current Boost DC/DC Converter**Features**

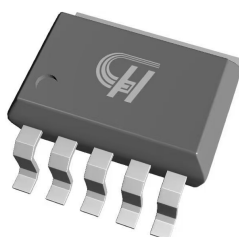
- Wide 5V to 40V Input Voltage Range
- Positive or Negative Output Voltage Programming with a Single Feedback Pin
- Current Mode Control Provides Excellent Transient Response
- 1.25V Reference Adjustable Version
- Fixed 180kHz Switching Frequency
- Maximum 5A Switching Current
- SW Pin Built-in Over Voltage Protection
- Excellent Line and Load Regulation
- EN Pin TTL Shutdown Capability
- Internal Optimized Power MOSFET
- High Efficiency up to 94%
- Built-in Frequency Compensation
- Built-in Soft-Start Function
- Built-in Thermal Shutdown Function
- Built-in Current Limit Function
- Available in TO263-5L Package

General Description

The HCR6637 regulator is a wide input range, current mode, DC/DC converter which is capable of generating either positive or negative output voltages. It can be configured as either a boost, flyback, SEPIC or inverting converter. The HCR6637 has a built-in N-channel power MOSFET and fixed frequency oscillator. Its current-mode architecture results in stable operation over a wide range of supply and output voltages. The HCR6637 regulator is specially designed for portable electronic equipment applications.

Applications

- EPC / Notebook Car Adapter
- Automotive and Industrial Boost / Buck-Boost / Inverting Converters
- Portable Electronic Equipment



TO263-5L

Figure 1. Appearance Diagram of HCR6637

180kHz 60V 5A Switching Current Boost DC/DC Converter

Pin Configuration

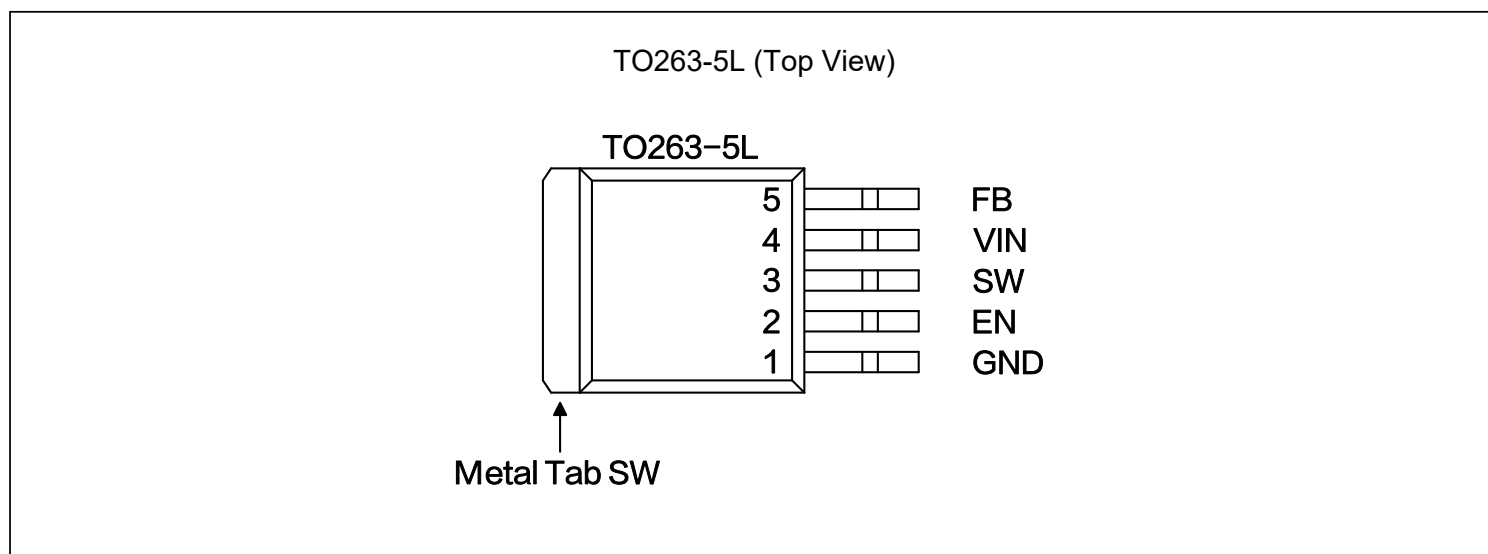


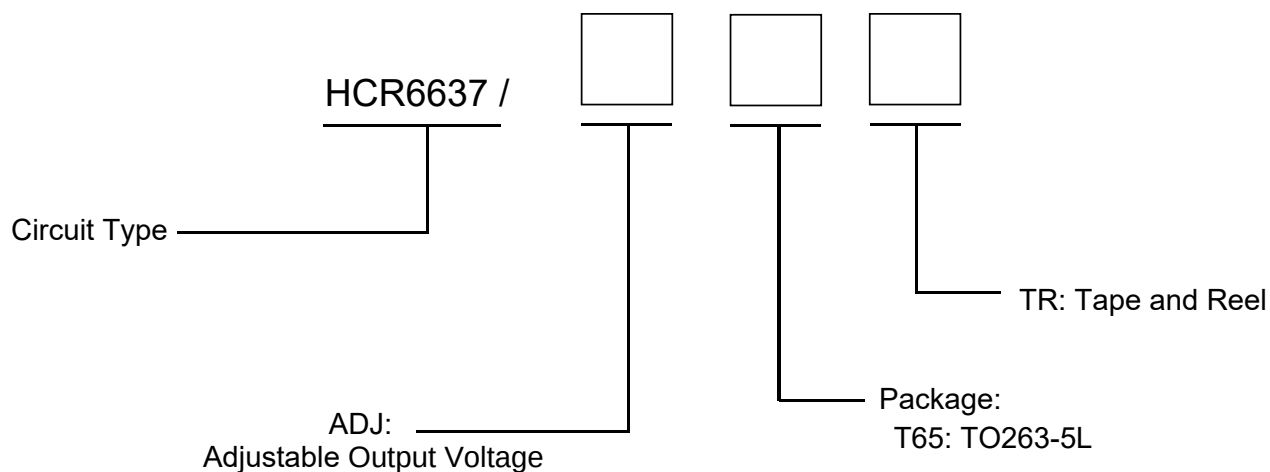
Figure 2. Pin Configuration of HCR6637

Pin Descriptions

Pin No.	Name	Description
1	GND	Ground Pin.
2	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high.
3	SW	Power Switch Output Pin (SW).
4	VIN	Supply Voltage Input Pin. HCR6637 operates from a 5V to 40V DC voltage. Bypass V_{in} to GND with a suitably large capacitor to eliminate noise on the input.
5	FB	Feedback Pin (FB). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 1.25V.

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Ordering Information



Ordering Code

Part Number	Marking ID ^[2]	Operating Junction Temperature	Package	Quantity per Reel
HCR6637/ADJT65TR	HCR6637xx	-40 to +125°C	TO263-5L	800, Tape&Reel

Note 2: HCR6637 is the product type and xx is the date code.

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Typical Application Circuit

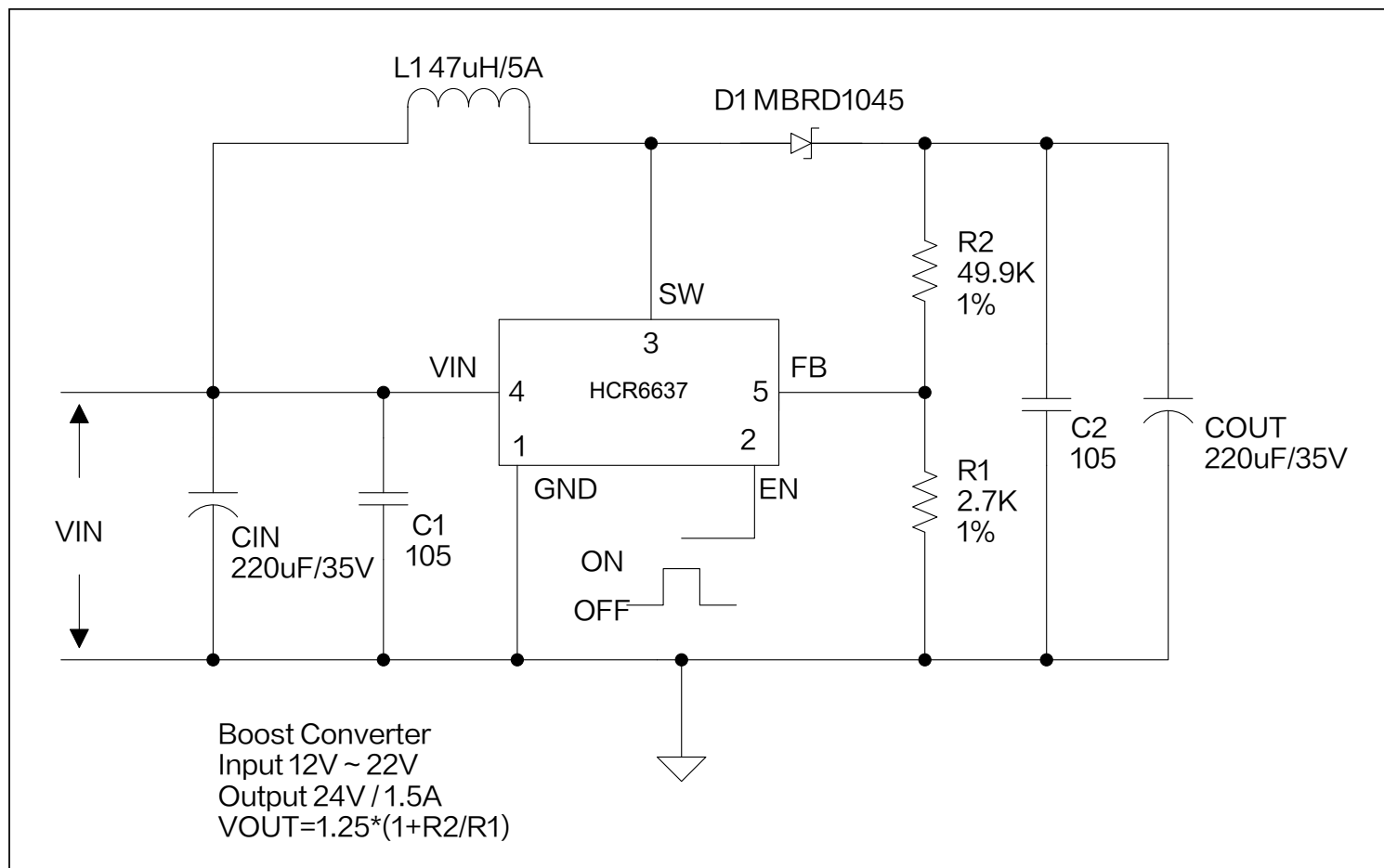


Figure 3. HCR6637 Typical Application Circuit (Boost Converter)

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Functional Block Diagram

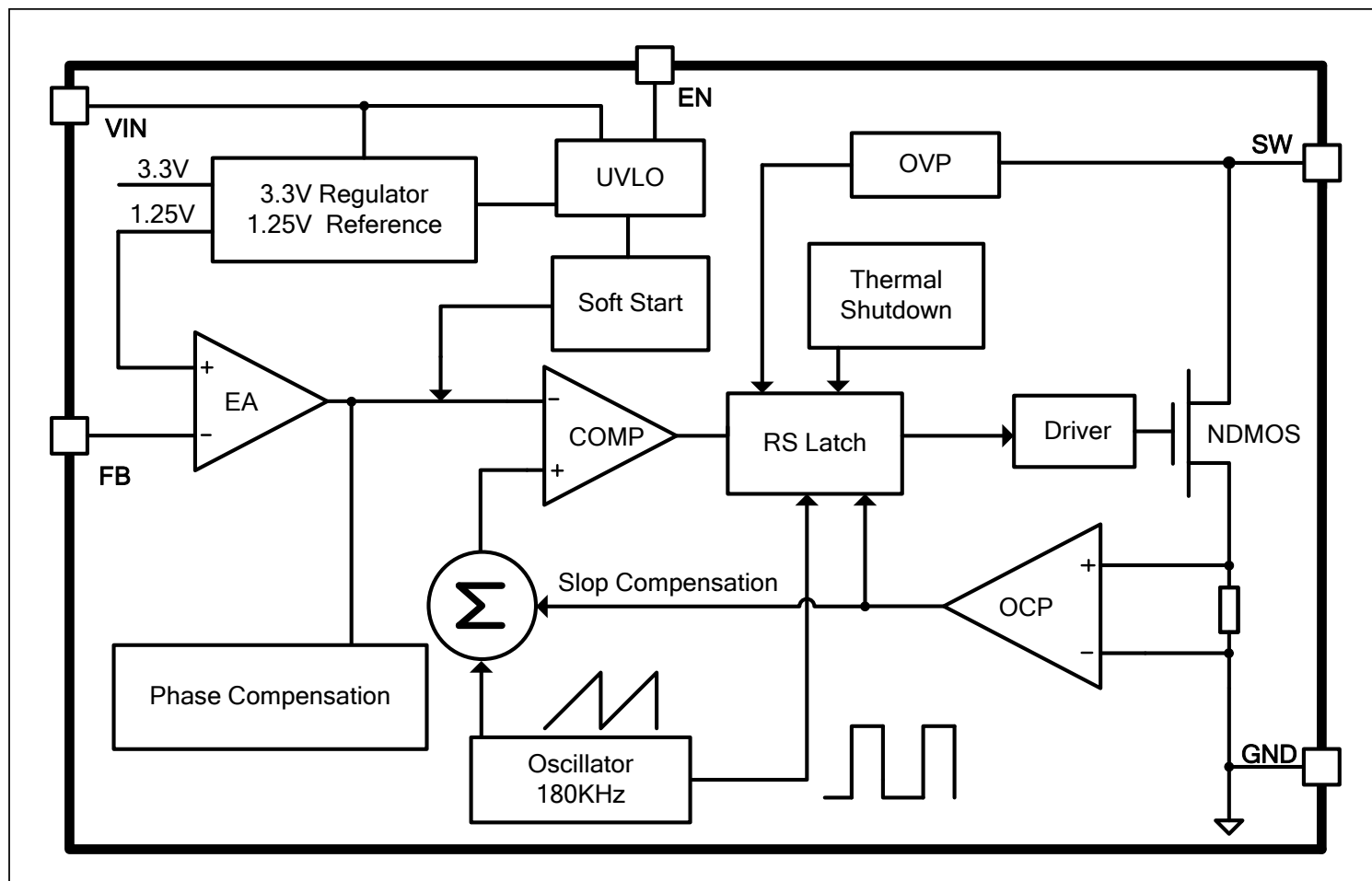


Figure 4. Function Block Diagram of HCR6637

180kHz 60V 5A Switching Current Boost DC/DC Converter
Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{in}	-0.3 to 45	V
Feedback Pin Voltage	V_{FB}	-0.3 to V_{in}	V
EN Pin Voltage	V_{EN}	-0.3 to V_{in}	V
Output Switch Pin Voltage	V_{SW}	-0.3 to 60	V
Power Dissipation	P_D	Internally limited	mW
Thermal Resistance (TO263-5L) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	30	°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)	-	>2000	V

Note 1: 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

Parameter	Symbol	Min.	Max.	Unit
Input Operating Voltage	V_{in}	5	40	V
Operating Junction Temperature	T_J	-40	125	°C

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Electrical Characteristics

$T_A = 25^{\circ}\text{C}$; unless otherwise specified.

System parameters test circuit: Figure 3.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Feedback Voltage	V_{FB}	$V_{in} = 12\text{V to } 20\text{V}$, $V_{out}=24\text{V}$ $I_{load}=0.1\text{A to } 1\text{A}$	1.213	1.25	1.287	V
Efficiency	η	$V_{in}=12\text{V}$, $V_{out}=24\text{V}$ $I_{out}=1\text{A}$	-	93	-	%

Electrical Characteristics (DC Parameters)

$V_{in} = 12\text{V}$, $\text{GND} = 0\text{V}$, V_{in} & GND parallel connect a $100\mu\text{F}/50\text{V}$ capacitor; $I_{out} = 0.5\text{A}$, $T_A = 25^{\circ}\text{C}$; the others floating unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input operation voltage	V_{in}	-	5	-	40	V
Shutdown Supply Current	I_S	$V_{EN} = 0\text{V}$	-	70	100	μA
Quiescent Supply Current	I_q	$V_{EN} = 2\text{V}$, $V_{FB} = V_{in}$	-	2.5	5	mA
Oscillator Frequency	F_{osc}	-	144	180	253	kHz
SW OVP	V_{SW}	$V_{FB} = 0\text{V}$	-	60	-	V
Switch Current Limit	I_L	$V_{FB} = 0\text{V}$	-	5	-	A
Output Power NMOS	R_{dson}	$V_{in} = 12\text{V}$, $I_{SW} = 5\text{A}$	-	110	120	m Ω
EN Pin Threshold	V_{EN}	High (Regulator ON)	-	1.4	-	V
EN Pin Threshold	V_{EN}	Low (Regulator OFF)	-	0.8	-	V
EN Pin Input Leakage Current	I_H	$V_{EN} = 2\text{V}$ (ON)	-	3	10	μA
EN Pin Input Leakage Current	I_L	$V_{EN} = 0\text{V}$ (OFF)	-	3	10	μA
Max. Duty Cycle	D_{MAX}	$V_{FB} = 0\text{V}$	-	90	-	%

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Typical System Application

Recommended Output Current Safe Operating Range

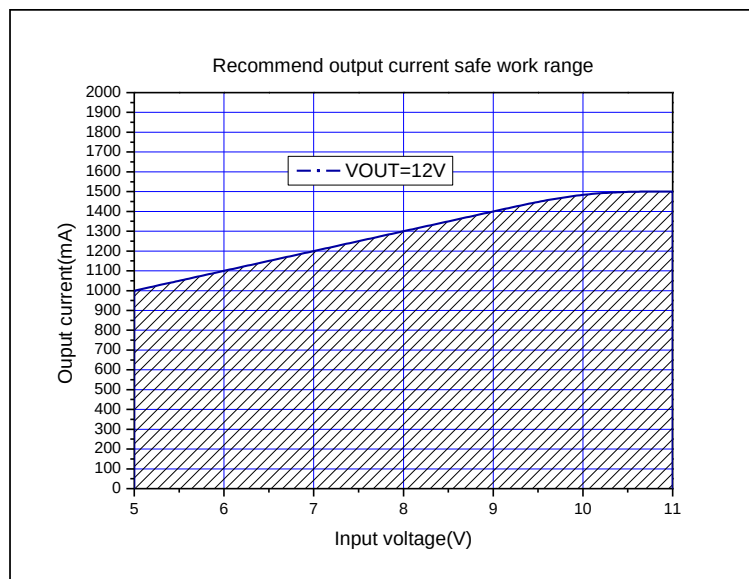


Figure 5. Max. Output Current ($V_{OUT} = 12V$)

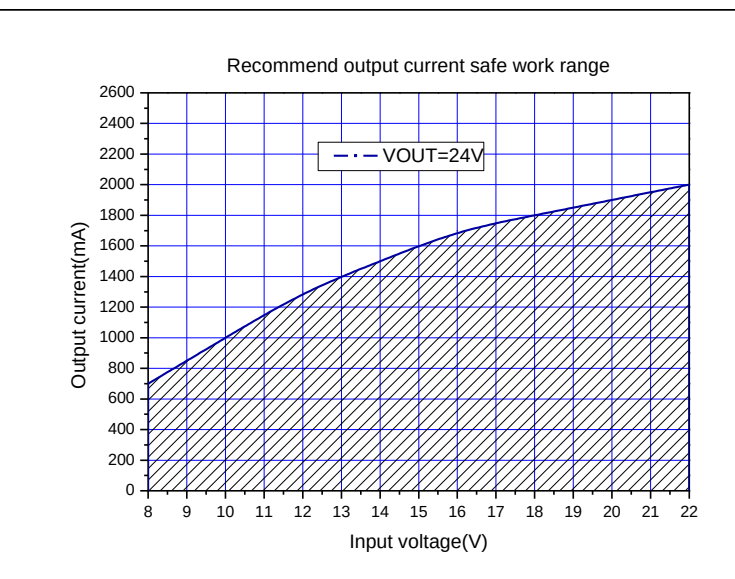


Figure 6. Max. Output Current ($V_{OUT} = 24V$)

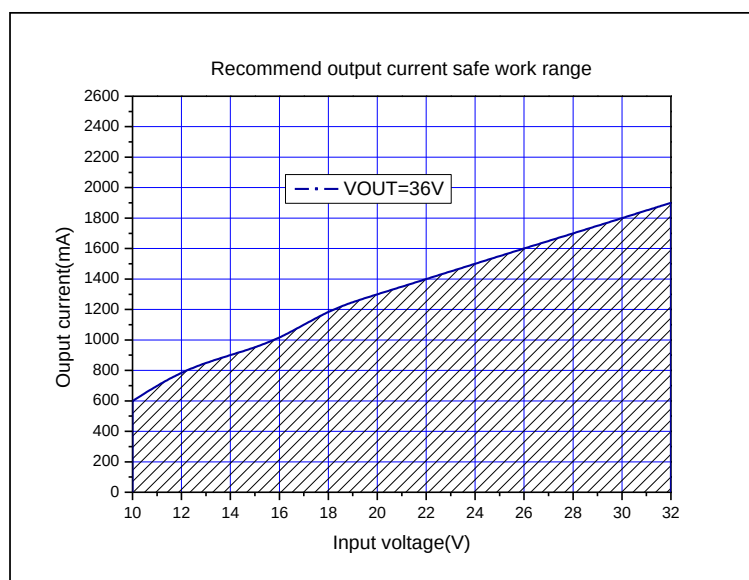


Figure 7. Max. Output Current ($V_{OUT} = 36V$)

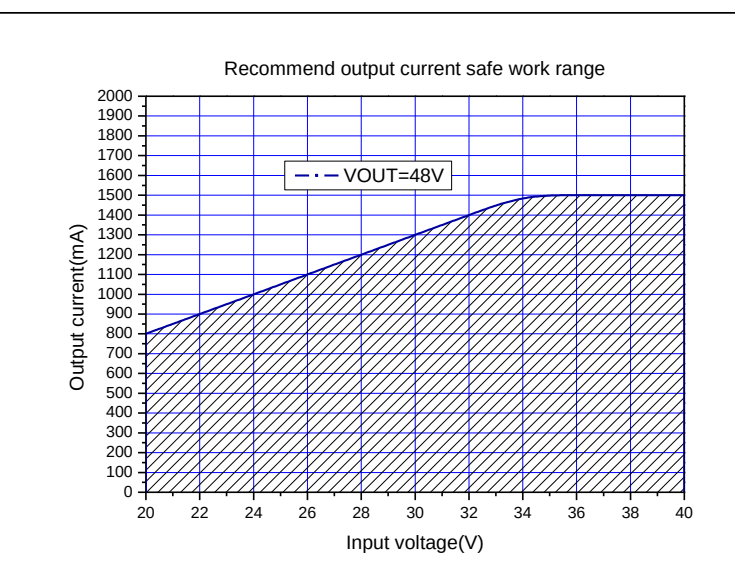


Figure 8. Max. Output Current ($V_{OUT} = 48V$)

180kHz 60V 5A Switching Current Boost DC/DC Converter

Typical System Application

$V_{IN} = 12V$, $V_{OUT} = 24V$

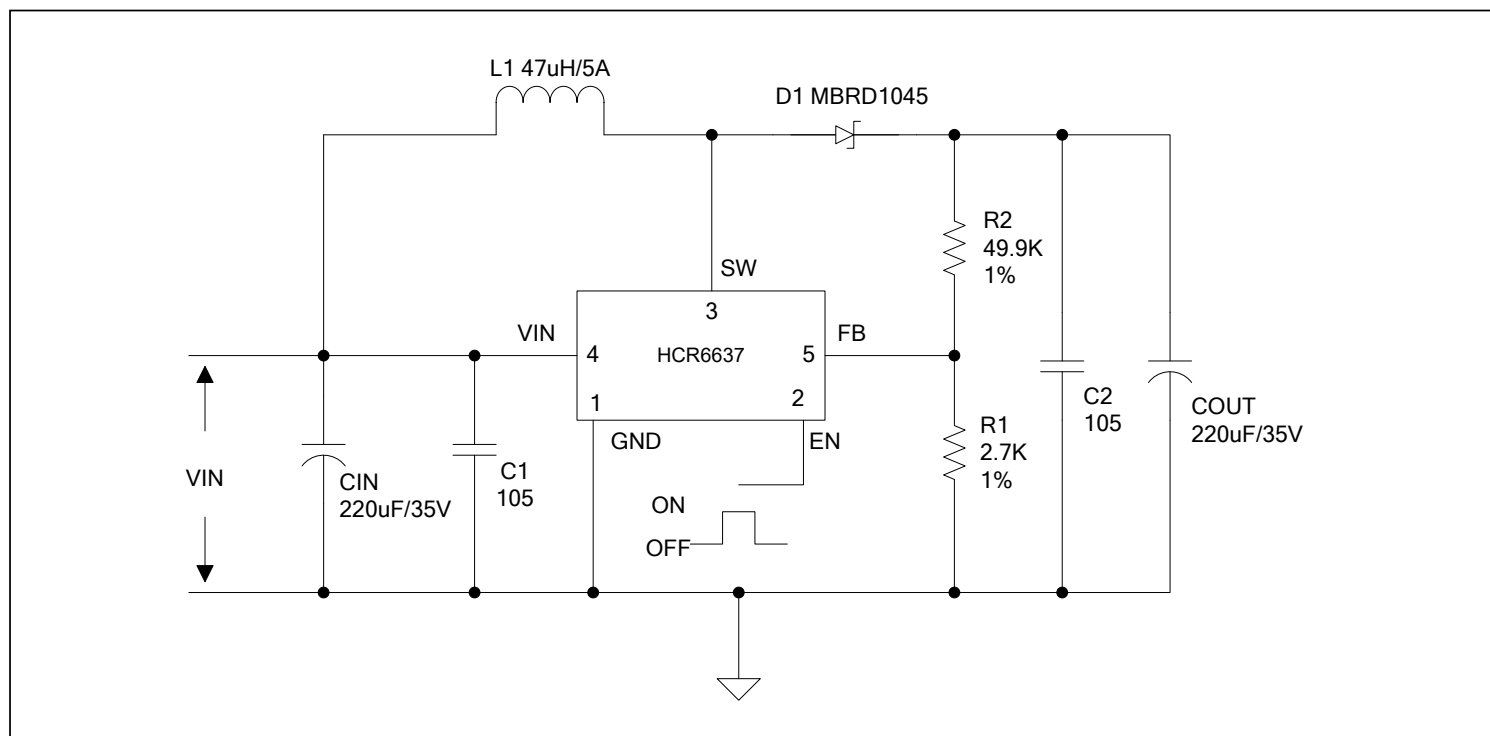


Figure 9. HCR6637 Typical System Application ($V_{IN} = 12V$, $V_{OUT} = 24V$)

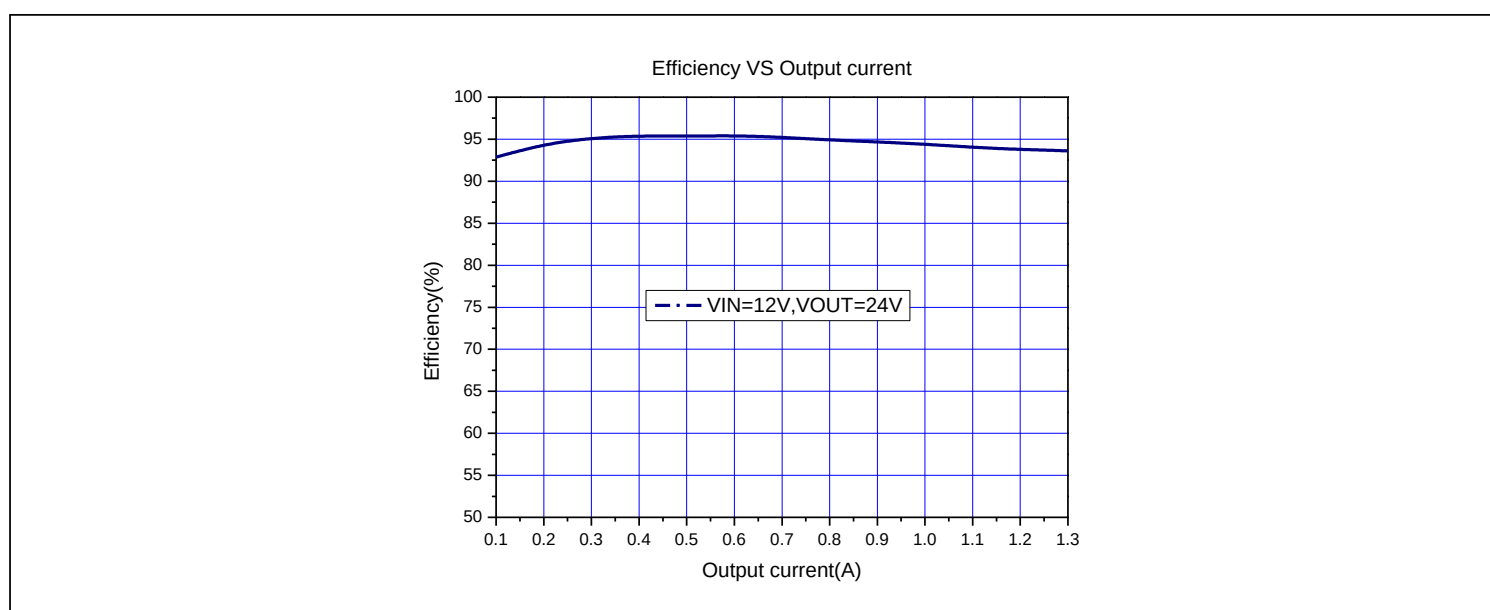


Figure 10. System Efficiency Curve ($V_{IN} = 12V$, $V_{OUT} = 24V$)

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Typical System Application

$V_{IN} = 5V$, $V_{OUT} = 12V$

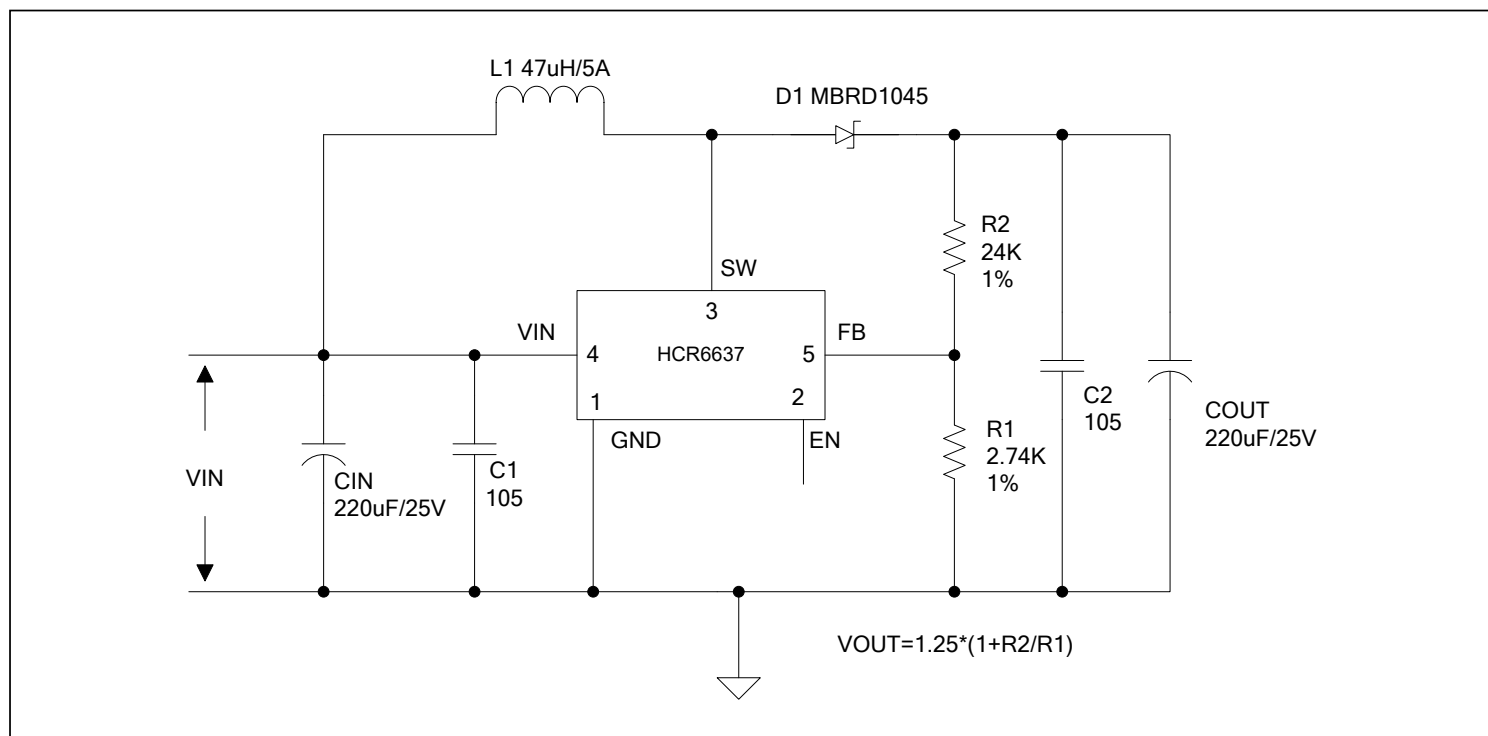


Figure 11. HCR6637 Typical System Application ($V_{IN} = 5V$, $V_{OUT} = 12V$)

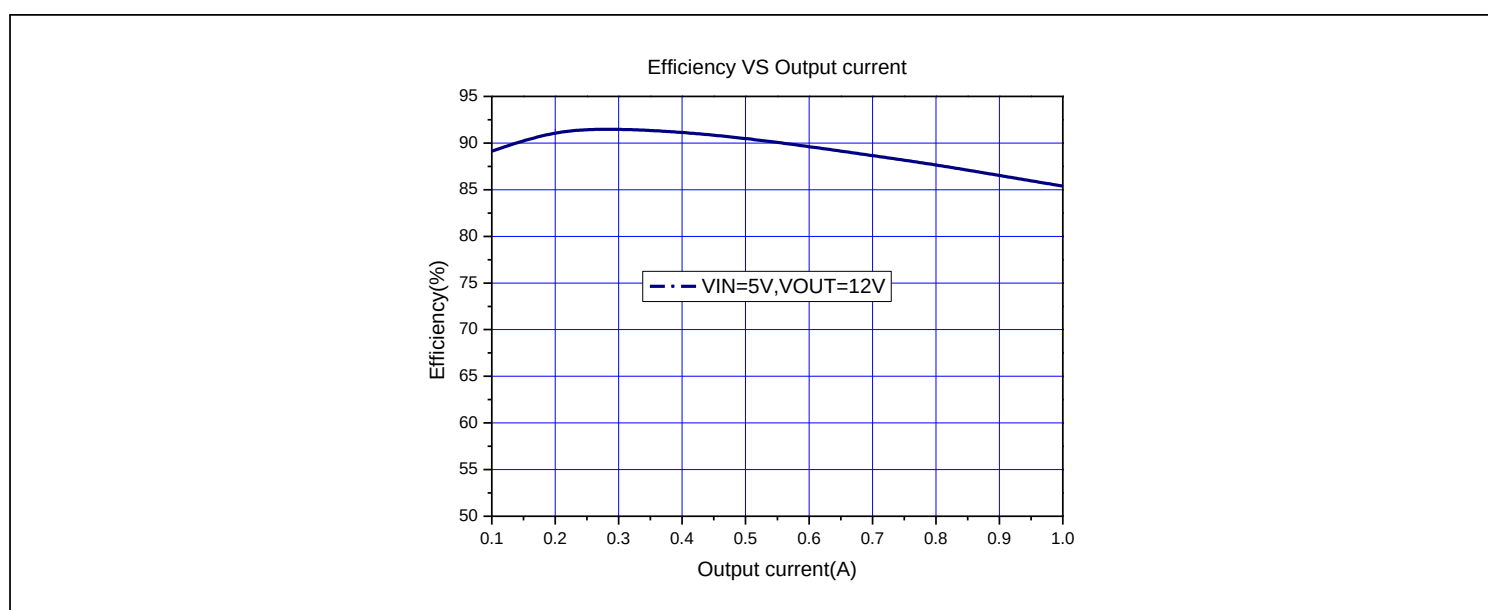


Figure 12. System Efficiency Curve ($V_{IN} = 5V$, $V_{OUT} = 12V$)

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Typical System Application

$V_{IN} = 10\text{--}32\text{V}$, $V_{OUT} = 36\text{V}$

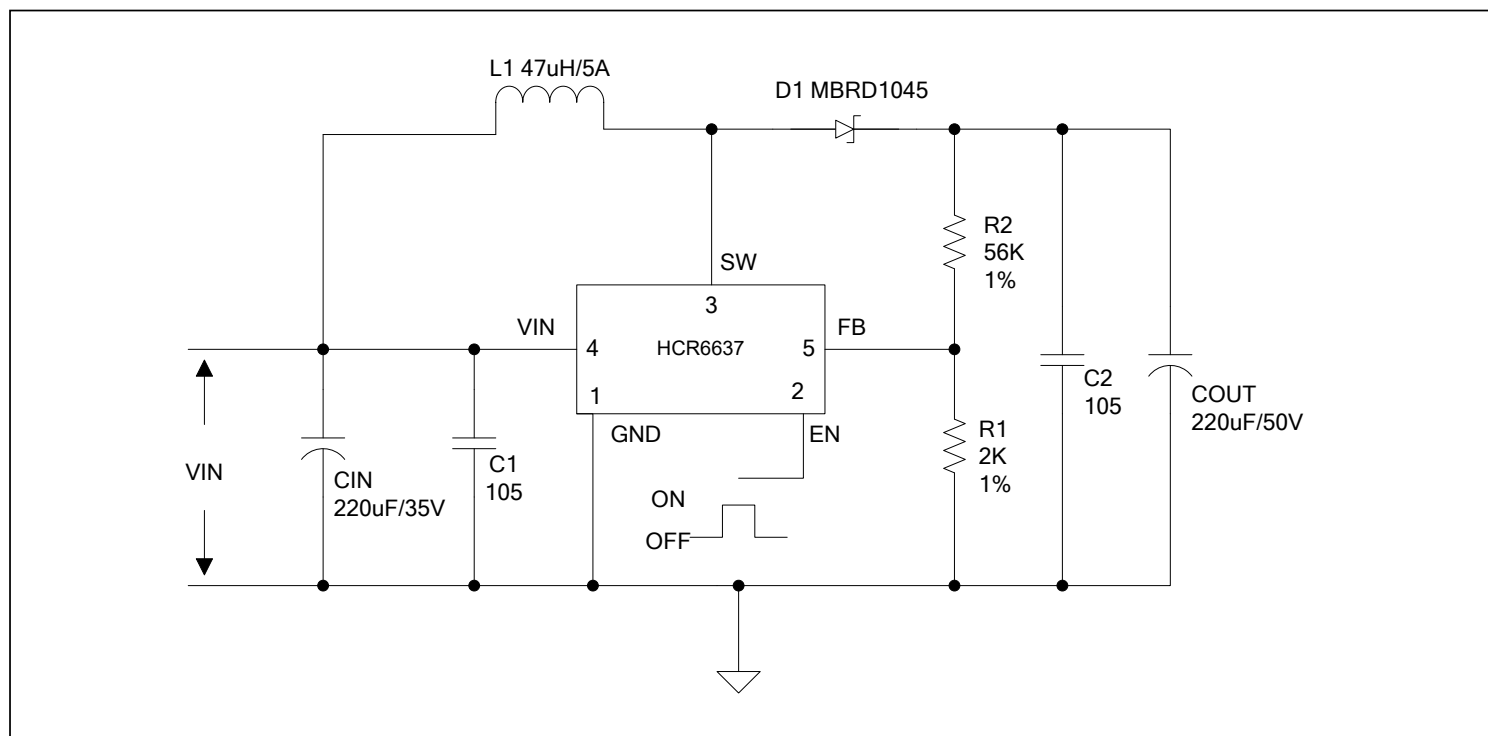


Figure 13. HCR6637 Typical System Application ($V_{IN} = 10\text{--}32\text{V}$, $V_{OUT} = 36\text{V}$)

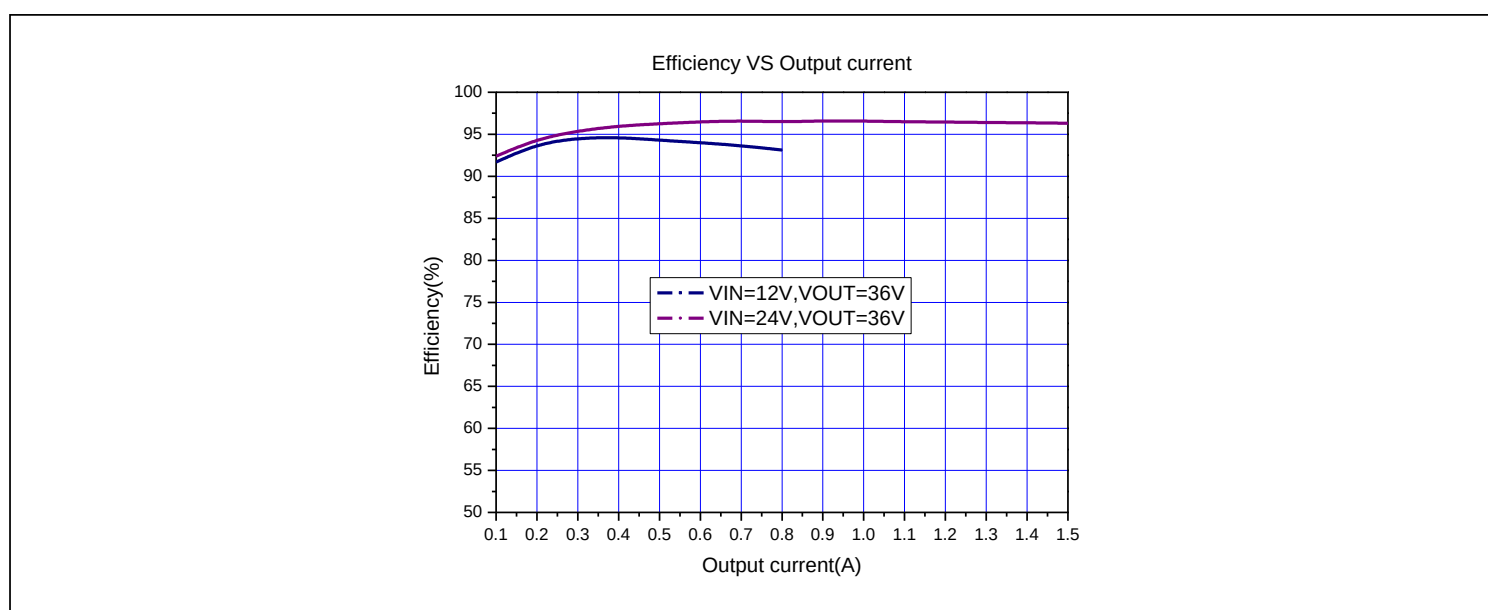


Figure 14. System Efficiency Curve ($V_{IN} = 10\text{--}32\text{V}$, $V_{OUT} = 36\text{V}$)

180kHz 60V 5A Switching Current Boost DC/DC Converter

Typical System Application

$V_{IN} = 20\text{--}40\text{V}$, $V_{OUT} = 48\text{V}$

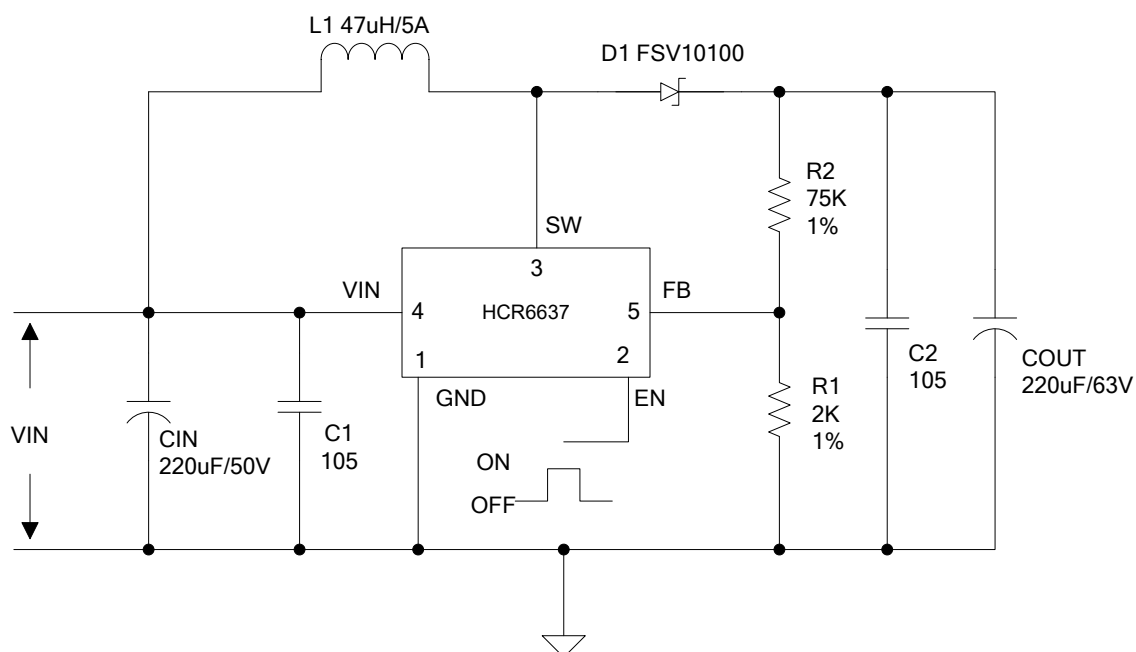


Figure 15. HCR6637 Typical System Application ($V_{IN} = 20\text{--}40\text{V}$, $V_{OUT} = 48\text{V}$)

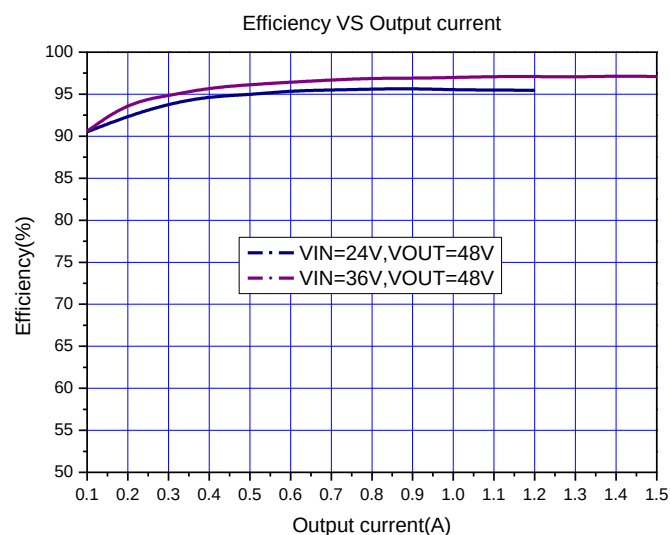


Figure 16. System Efficiency Curve ($V_{IN} = 20\text{--}40\text{V}$, $V_{OUT} = 48\text{V}$)

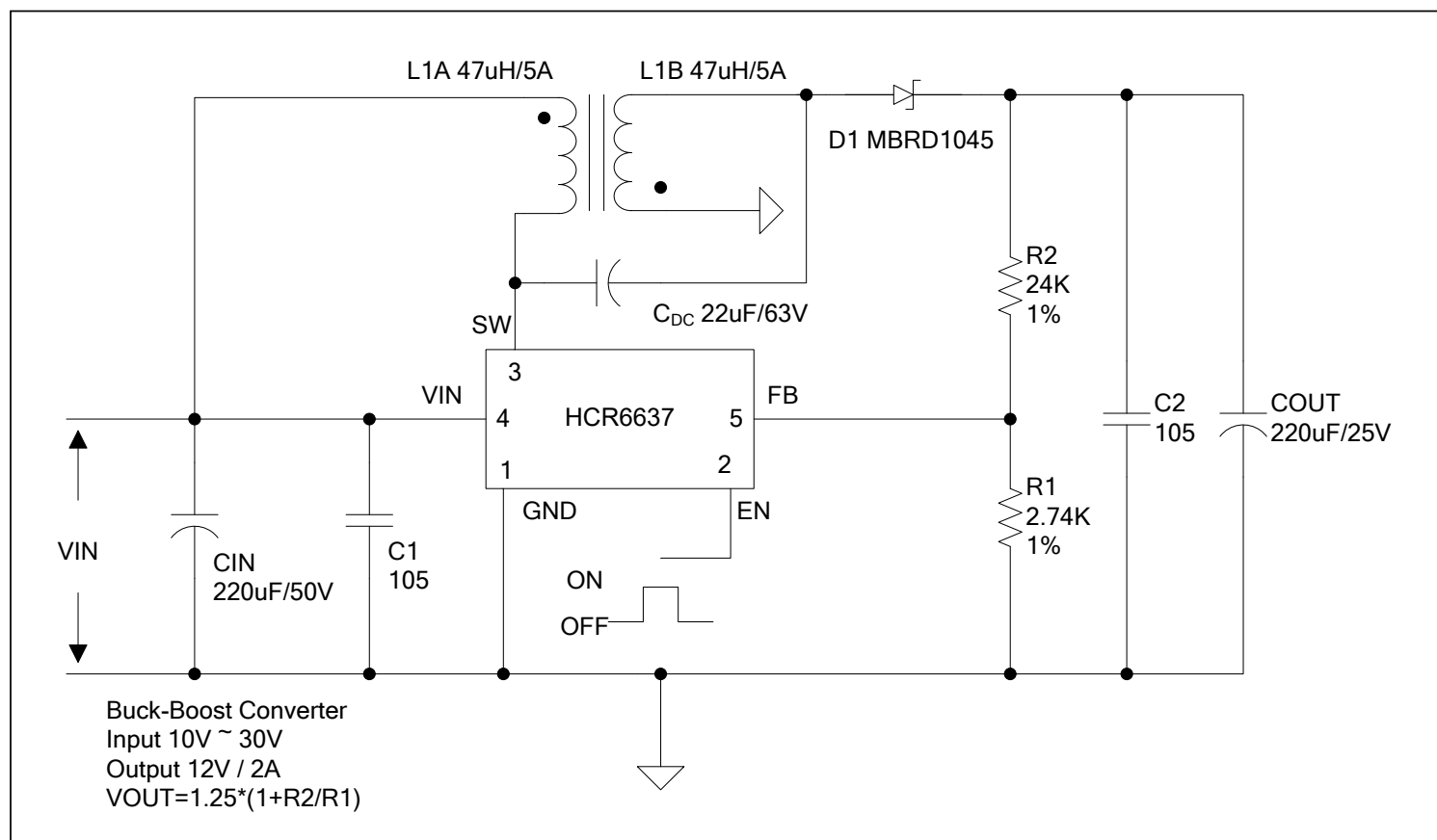
180kHz 60V 5A Switching Current Boost DC/DC Converter
Typical System Application – SEPIC
 $V_{IN} = 10\text{--}30\text{V}$, $V_{OUT} = 12\text{V}$


Figure 17. HCR6637 Typical System Application ($V_{IN} = 10\text{--}30\text{V}$, $V_{OUT} = 12\text{V}$)

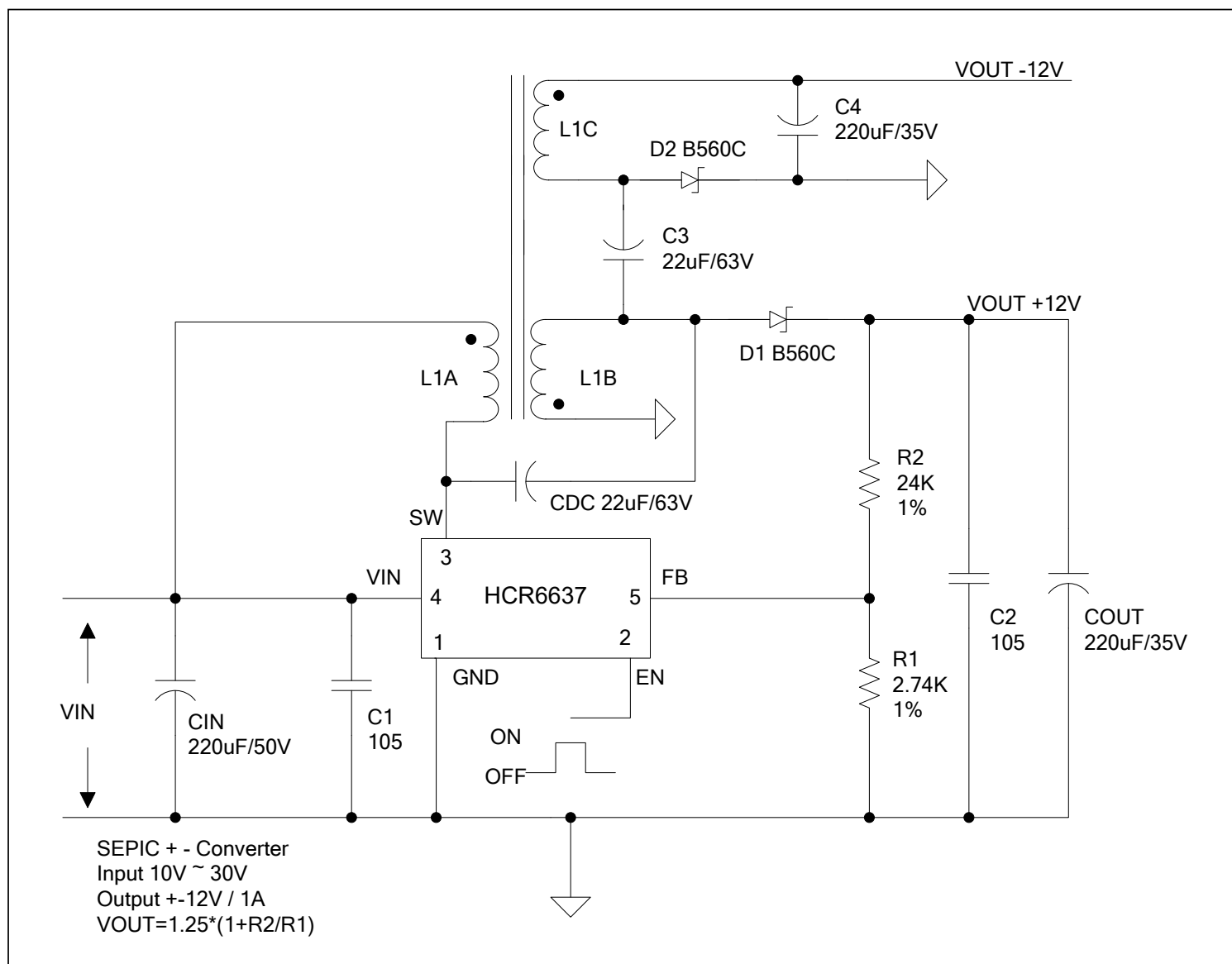
180kHz 60V 5A Switching Current Boost DC/DC Converter
Typical System Application – SEPIC Inverting Topology
 $V_{IN} = 10\text{--}30\text{V}$, $V_{OUT} = \pm 12\text{V}$


Figure 18. HCR6637 Typical System Application ($V_{IN} = 10\text{--}30\text{V}$, $V_{OUT} = \pm 12\text{V}$)

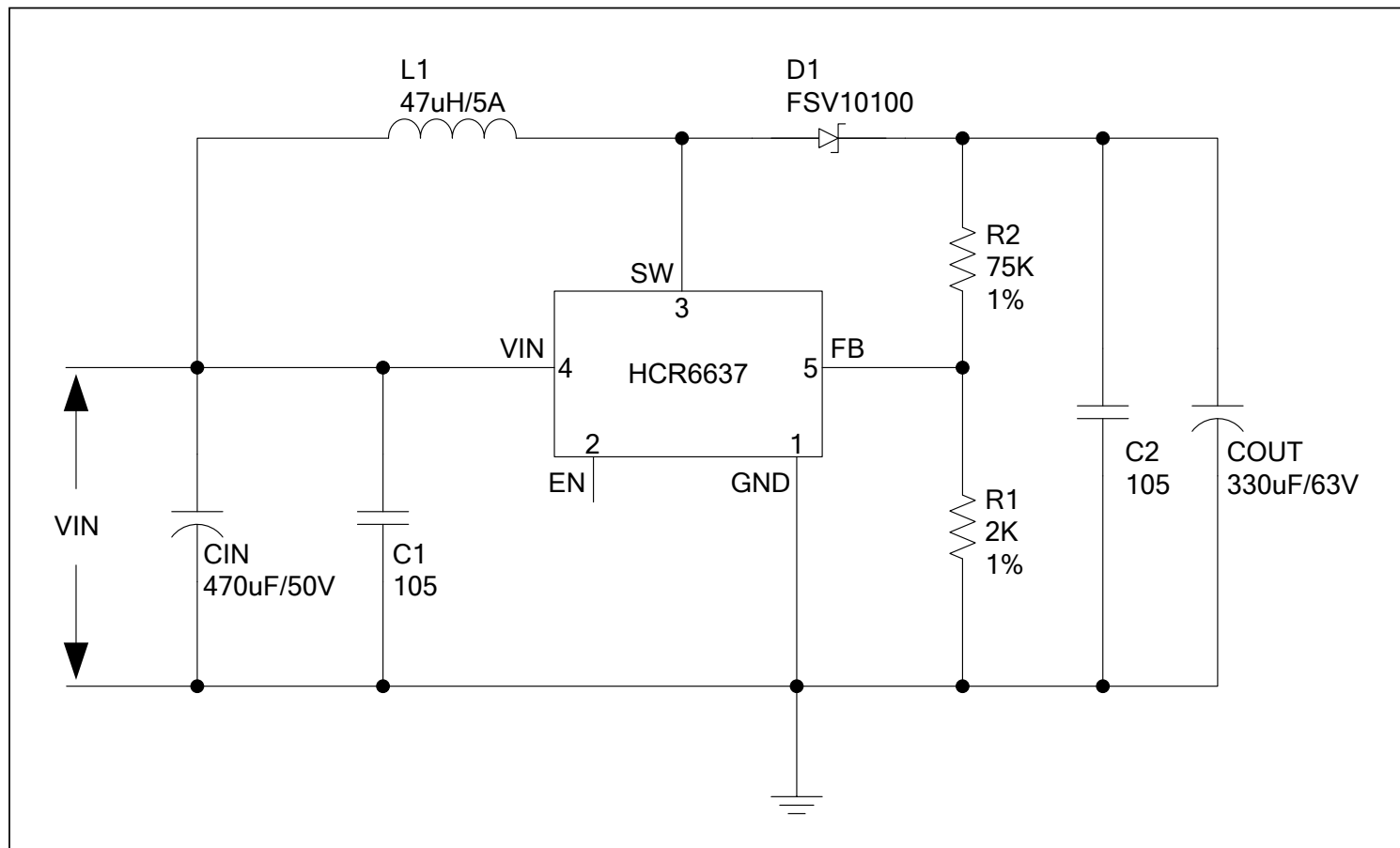
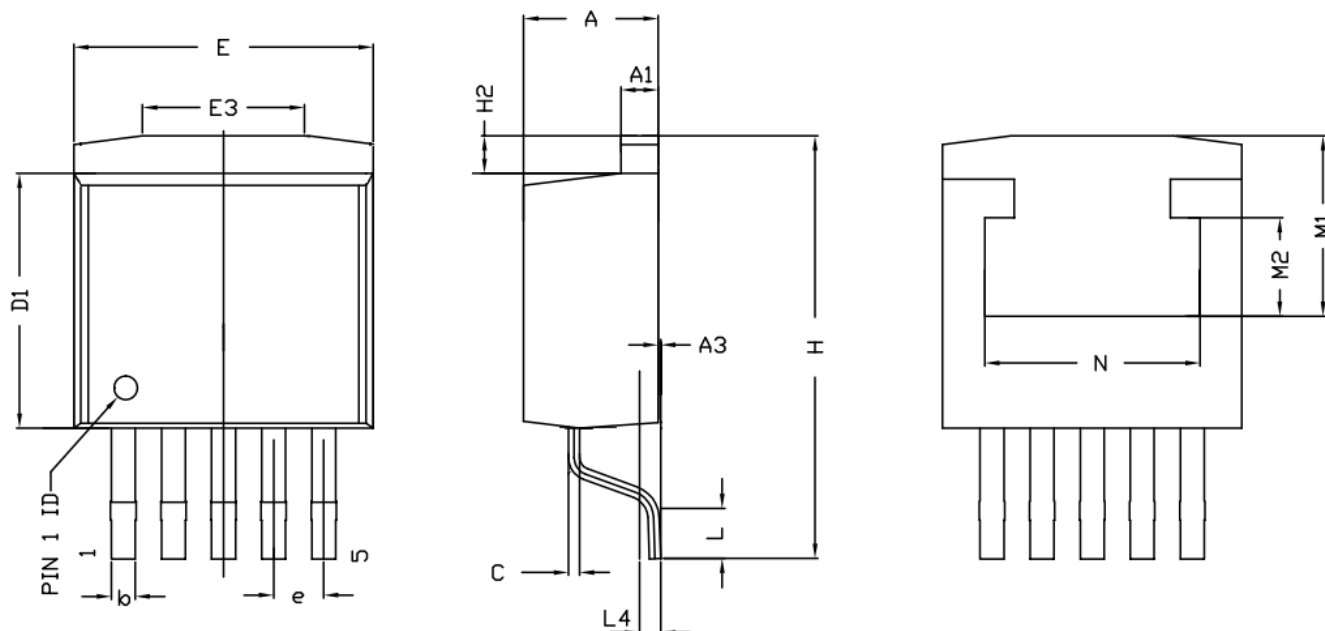
180kHz 60V 5A Switching Current Boost DC/DC Converter
High Power Application Circuit


Figure 19. HCR6637 High Power Application Circuit
($V_{IN} = 36V$, $V_{OUT} = 48V$, $I_{OUT} = 2.1A$)

180kHz 60V 5A Switching Current Boost DC/DC Converter
Mechanical Dimensions

T65 PKG: TO263-5L

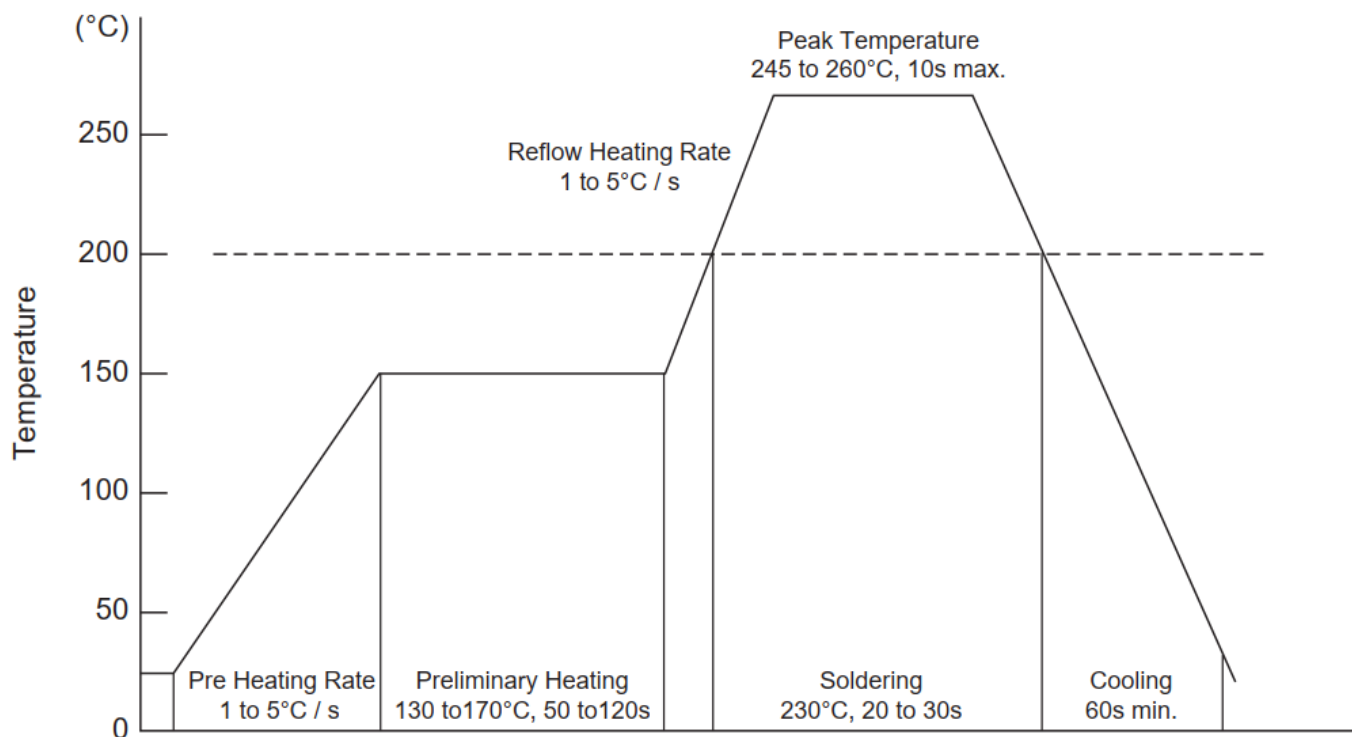


Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	4.45	4.60	4.70	0.175	0.181	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A3	0.00	-	0.15	0.000	-	0.006
b	0.71	-	0.97	0.028	-	0.038
c	0.38	-	0.76	0.015	-	0.030
D1	8.38	8.70	9.00	0.330	0.343	0.354
E	9.91	10.16	10.39	0.390	0.400	0.410
E3	5.00	6.50	8.00	0.197	0.256	0.315
e	1.70 REF.			0.067 REF.		
H	-	-	14.35	-	-	0.565
H2	0.90	1.27	1.42	0.035	0.050	0.056
L	-	1.98	-	-	0.078	-
L4	-	0.76	-	-	0.030	-
M1	-	6.12	-	-	0.241	-
M2	-	3.35	-	-	0.132	-
N	-	7.30	-	-	0.287	-

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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