380K, 28V, 3A Buck DC-DC Converter

Features

- Input Voltage Range: 3.6V to 28V
- Fixed 380KHz Switching Frequency
- Output Adjustable from 1.222V to 25V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.6V
- Output Constant Current: 3A
- Internal Optimize Power MOSFET
- High Efficiency: up to 92%
- Excellent line and load regulation
- TTL Shutdown Capability
- EN Pin with hysteresis function
- Built-In Thermal Shutdown Function
- Built-In current limit function

Applications

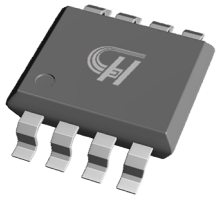
- LCD Monitor and LCD TV
- Digital Photo Frame
- Set-up Box
- ADSL Modem

General Description

The HCR3223 is a 380KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A 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. An internal compensation block is built in to minimize external component count.

The HCR3223 is available in SOIC-8 ROHS compliant package.



SOIC-8

Figure 1. Package Type of HCR3223

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Pin Configuration

SOIC-8 Top View

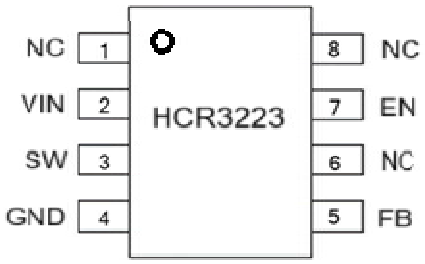
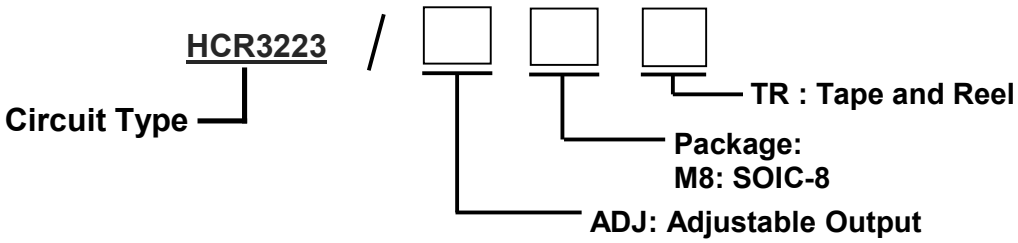


Figure 2. Pin Configuration of HCR3223 (Top View)

Pin Function Table

Pin Number	Pin Name	Function
1, 6, 8	NC	No Connected.
2	VIN	Supply power input pin. HCR3223 operates from a 3.6V to 28V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
3	SW	Power switch output pin(SW). Output is the switch node that supplies power to the output.
4	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 HCR3223.
5	FB	Feedback pin(FB). Through an external resistor divider network, Feedback sense the output voltage and regulates it. The feedback threshold voltage is 1.222V
7	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high.

Ordering Information



Ordering Code

Part Number	Marking ID [2]	Temperature Range	Package	Package Type
HCR3223/ADJM8TR	HCR3223XX	-40'C to +85'C	SOIC-8	4K/Tape&Reel

Note 2: the "XX' is date code

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Absolute Maximum Ratings Note 1

Parameter		Symbol	Value	Unit
VIN Pin Voltage		VIN	-0.3 to 32	V
Feedback (FB) Pin Voltage		VFB	-0.3 to Vin	V
EN Pin Voltage		VEN	-0.3 to Vin	V
Output Switch Pin Voltage		VSW	-0.3 to Vin	V
Power Dissipation		PD	Internally limited	mW
Thermal Resistance Junction to Ambient	SOIC-8	RθJA	100	'C/W
Storage Temperature Range		TSTG	-65 to +150	'C
Operating Junction Temperature note 2		TJ	-40 to +125	'C
Lead Temperature (Soldering, 10s)		TLEAD	260	'C
Human Body Model ESD Protection		ESD HBM	2	KV
Machine Model ESD Protection		ESD MM	200	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 those or any other conditions above those indicated in the operational is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Input Voltage	VIN	3.6	28	V
Operating Ambient Temperature	TA	-40	+85	'C

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Electrical Characteristics

(TA=+25'C, VIN=12V, GND=0V, IOUT=500mA, VOUT=3.3V, Unless Otherwise Specified.)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
SUPPLY VOLTAGE(IN PIN)						
Input Operation Voltage	Vin		3.6	-	28	V
Shutdown Supply Current	ISHDN	VEN=0V	-	60	200	uA
Quiescent Supply Current	IQ	VEN=2V, VFB=Vin	-	3	5	mA
ENABLE (EN PIN)						
EN Shutdown Threshold Voltage	VEN-H	High (Regulator ON)	-	1.4	-	V
	VEN-L	Low (Regulator OFF)	-	0.8	-	V
EN Pin Input Leakage Current	IH	VEN=2V(ON)	-	1	15	uA
	IL	VEN=0V(OFF)	-	1	15	uA
System parameters test circuit figure4						
Feedback Voltage	VFB	Vin=7V to 28V, Vout=5V, Iload=0.2A to 3A	1.186	1,222	1.258	V
Efficiency	η	Vin=12V, Vout=5V, Iout=3A	-	92	-	%
CURRENT LIMIT						
High-Side Switch Leakage Current	ILEAKH	VIN=18V, VEN=VSW=0V	-	0.1	10	uA
Switch Current Limit	ILIM	-	-	4.7	-	A
SWITCHING REGULATOR						
Oscillator Frequency	FOSC	-	323	380	437	KHz
Max. Duty Cycle	DMAX	VFB=0V	-	100	-	%
Min. Duty Cycle	DMIN	VFB=1V	-	-	0	%
ERROR AMPLIFIER						
Error Amplifier Volatge Gain (Note2)	AEA	-	-	400	-	V/V
Error Amplifier Transconductance	GEA	-	-	800	-	uA/V
THERMAL SHUTDOWN						
Thermal Shutdown	TOTSD	-	-	+150	-	'C
Thermal Shutdown Hysteresis	THYS	-	-	+20	-	'C

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Functional Block Diagram

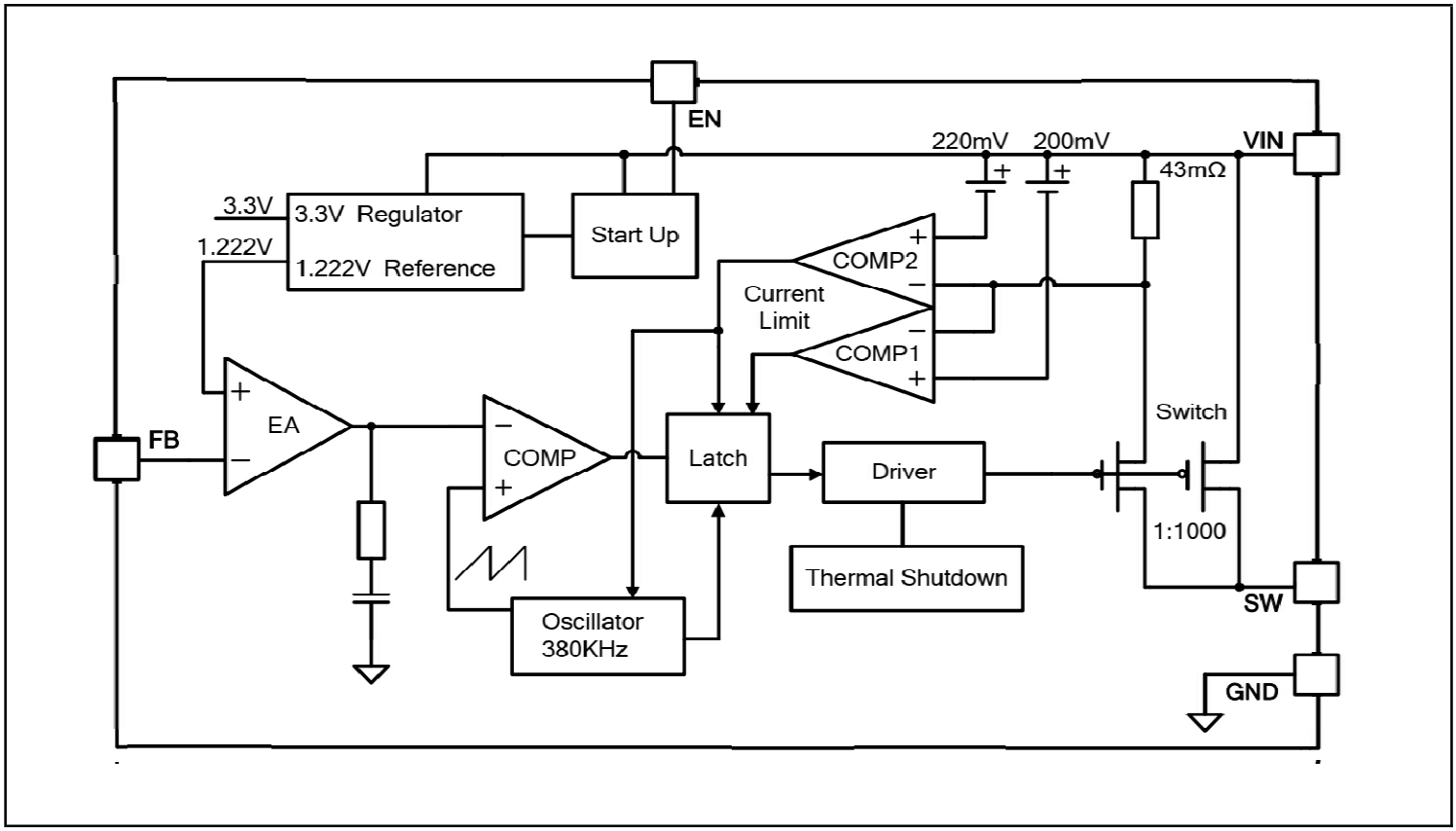

Figure 3. Functional Block Diagram of HCR3223

Typical Application Circuit

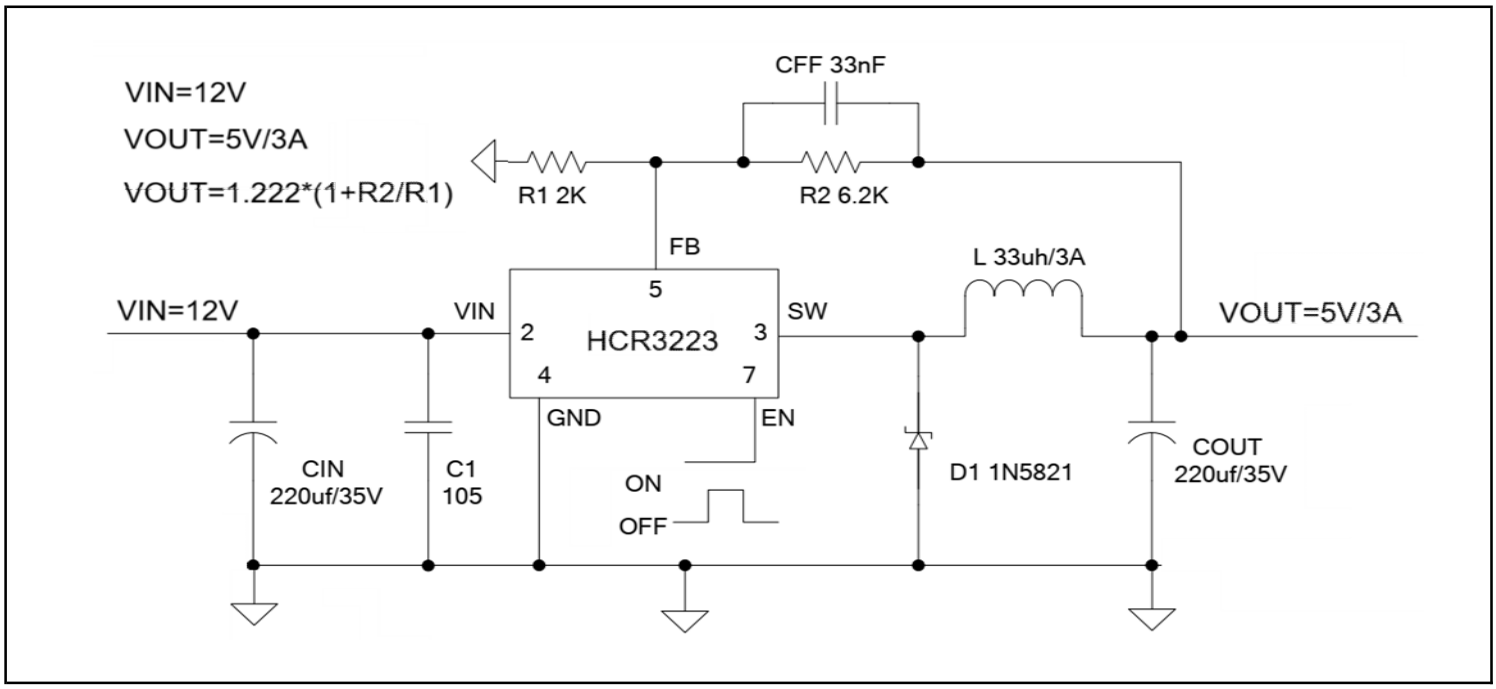

Figure 4. Typical Application Circuit of HCR3223

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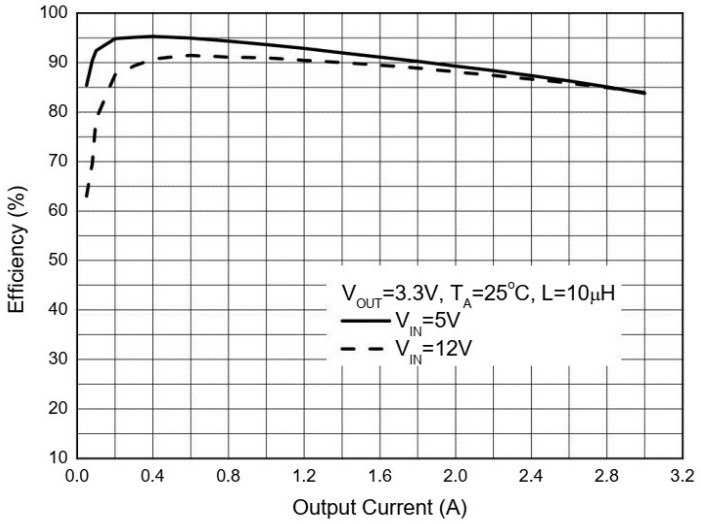
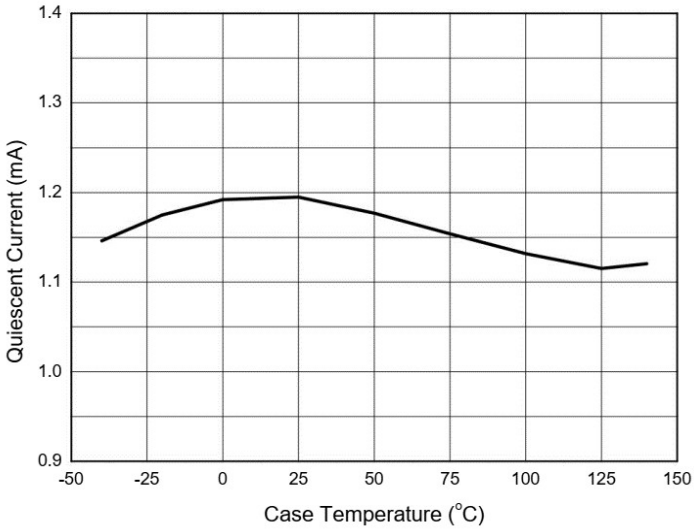
Performance Characteristics(TA=+25'C, VIN=12V, VOUT=3.3V, unless otherwise noted.)

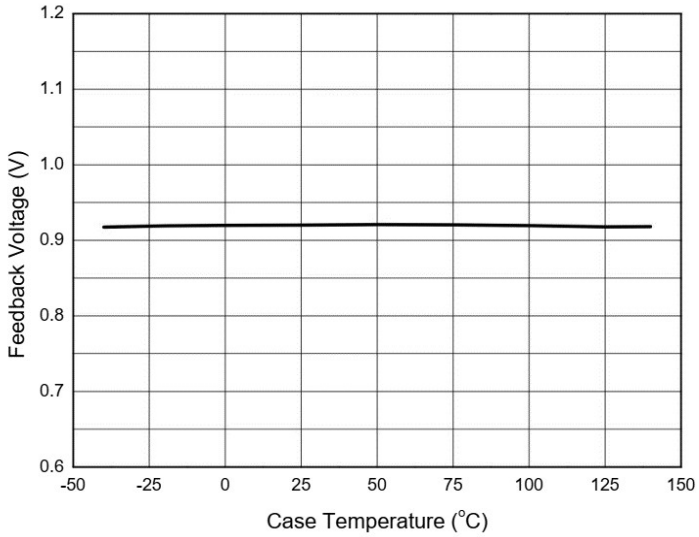
Efficiency vs. Output Current



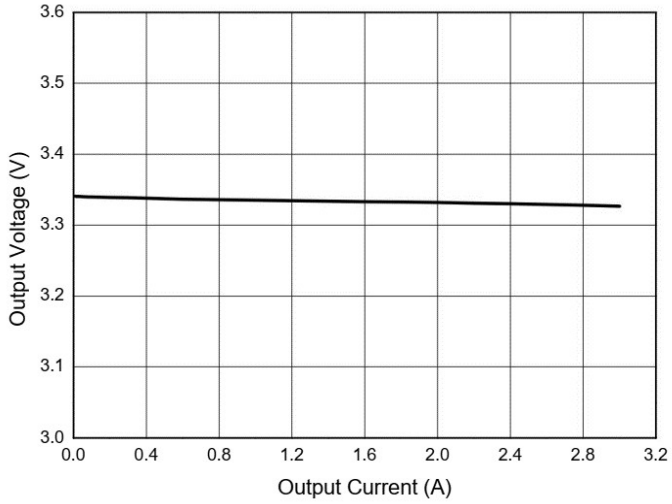
Quiescent Current vs. Case Temperature



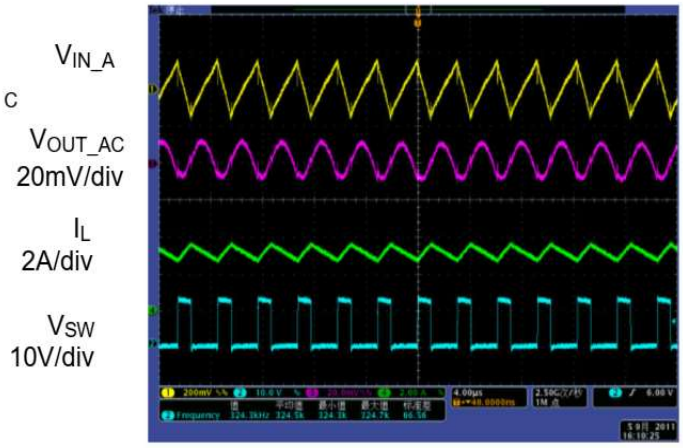
Feedback Voltage vs. Case Temperature



Output Voltage vs. Output Current

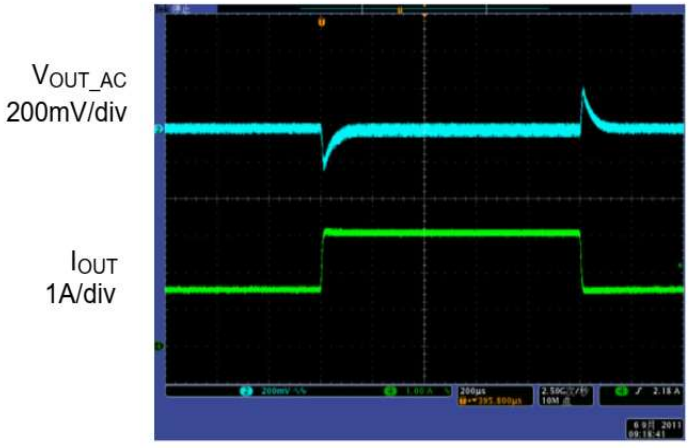


Output Ripple (I_{OUT}=3A)



Time 4μs/div

Load Transient (I_{OUT} =1.5A to 3A)



Time 200μs/div

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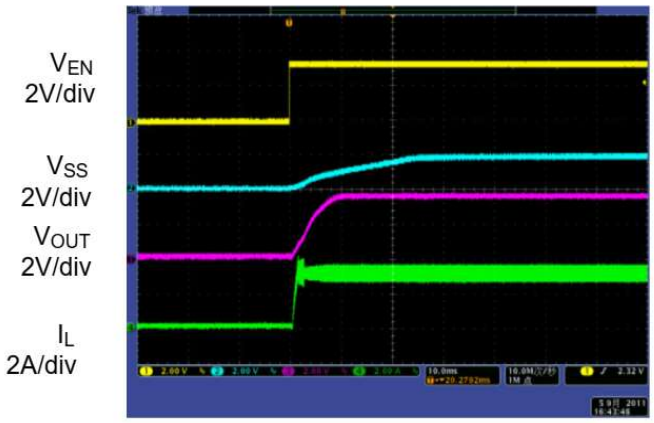
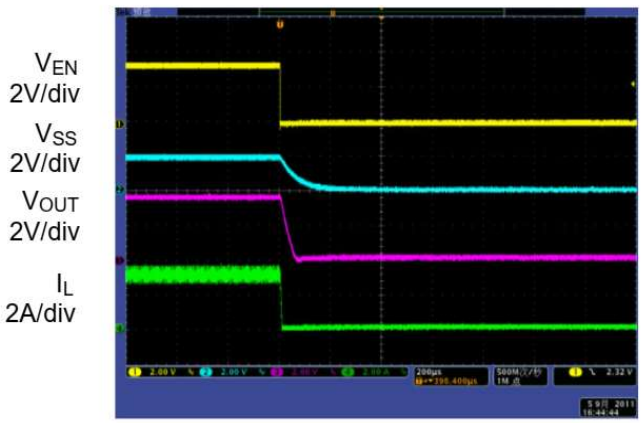
Performance Characteristics (Con.)

Enable Turn on Characteristic
(V_{IN}=12V, V_{EN}=3.3V, V_{OUT}=3.3V, I_L=3A)



Time 10ms/div

Enable Turn off Characteristic
(V_{IN}=12V, V_{EN}=3.3V, V_{OUT}=3.3V, I_L=3A)



Time 200μs/div

Test Circuit and Layout guidelines noite3

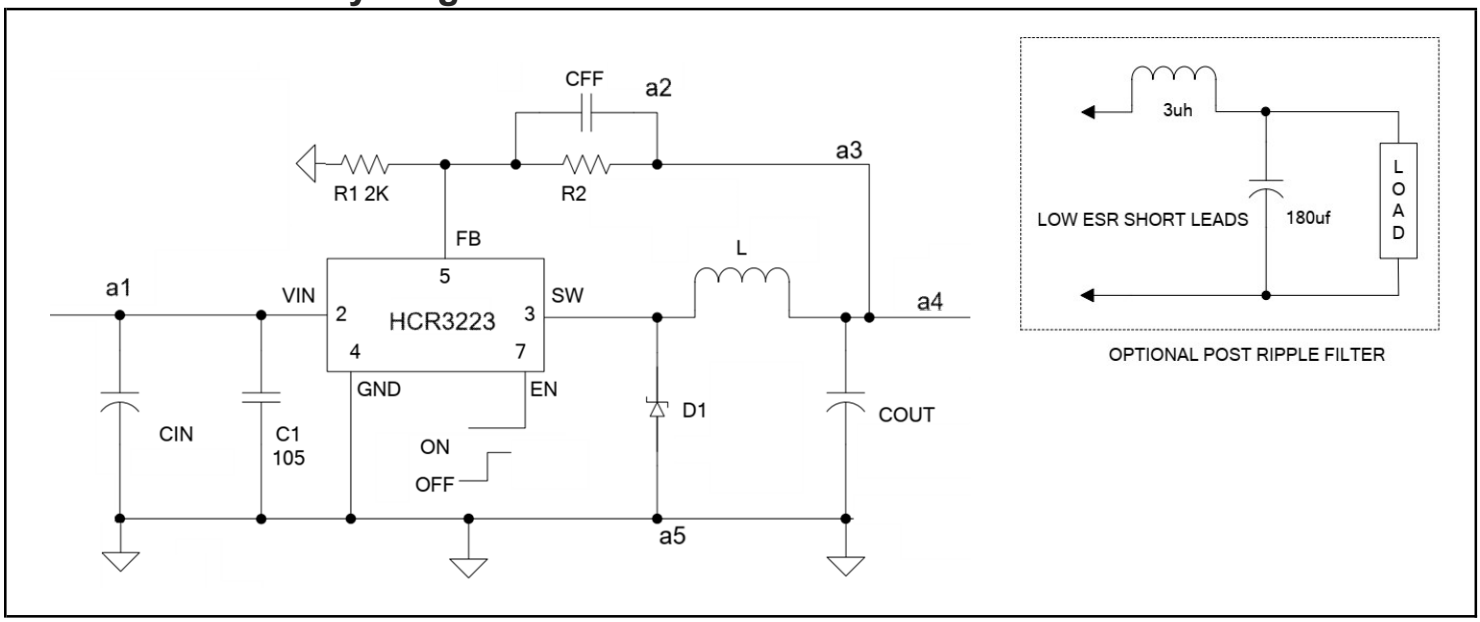


Figure 5. Standard Test Circuits and Layout Guides

Note 3. a1-Unregulated DC Input.

a2-Locate the programming resistors near the feedback pin using short leads

a3-keep feedback wiring away from inductor Flux

a4-Regulated Output base on Load. VOUT=1.222*(1+R2/R1)

a5-Heavy lines must be kept short and use ground plane construction for best results

Select R1 to be approximately 2K, 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 VIN and GND;

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

Test Circuit and Layout guidelines(con.)

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*1000*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.)

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

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Typical System Application for 12V input and output 5V/3A

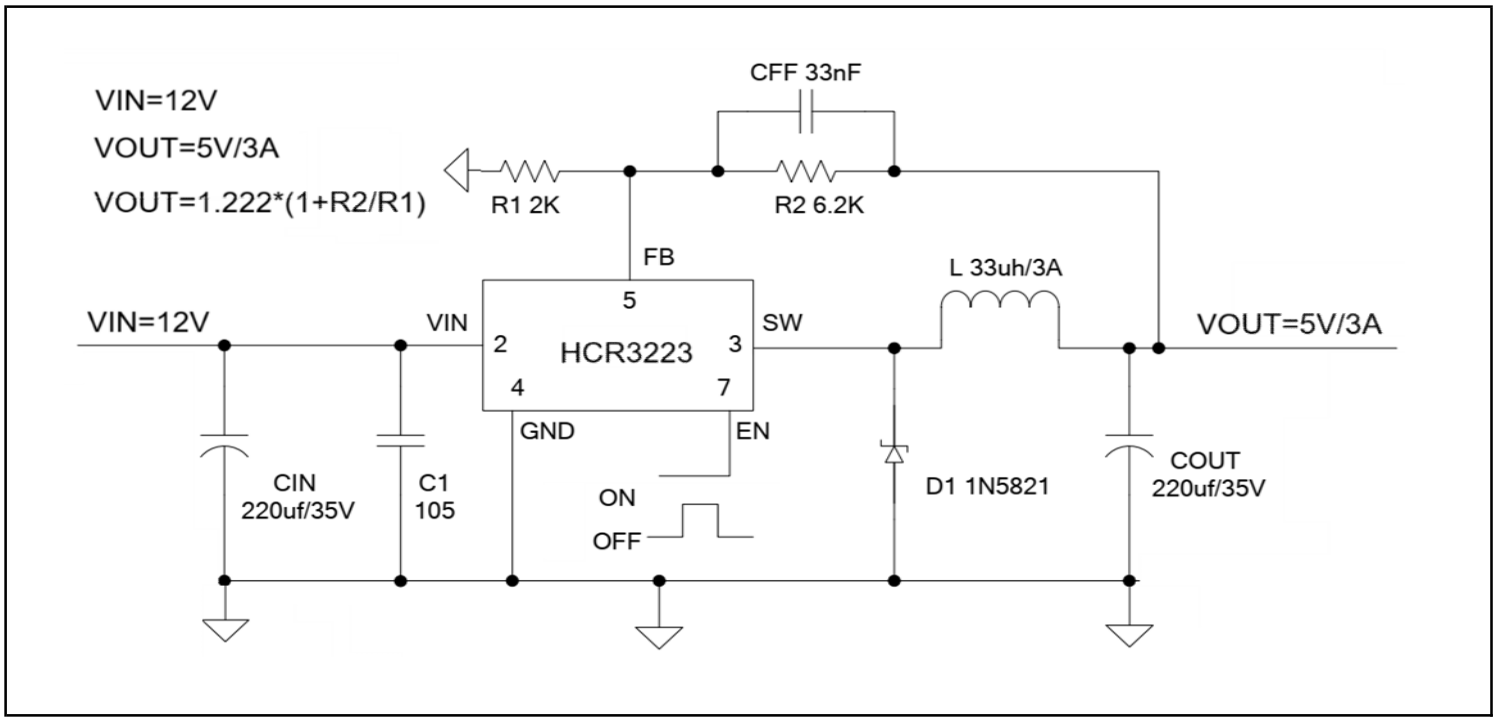


Figure 6. HCR3223 System Parameter test circuit (12V~5V/3A)

Typical System Application for 12V input and output 3.3V/3A

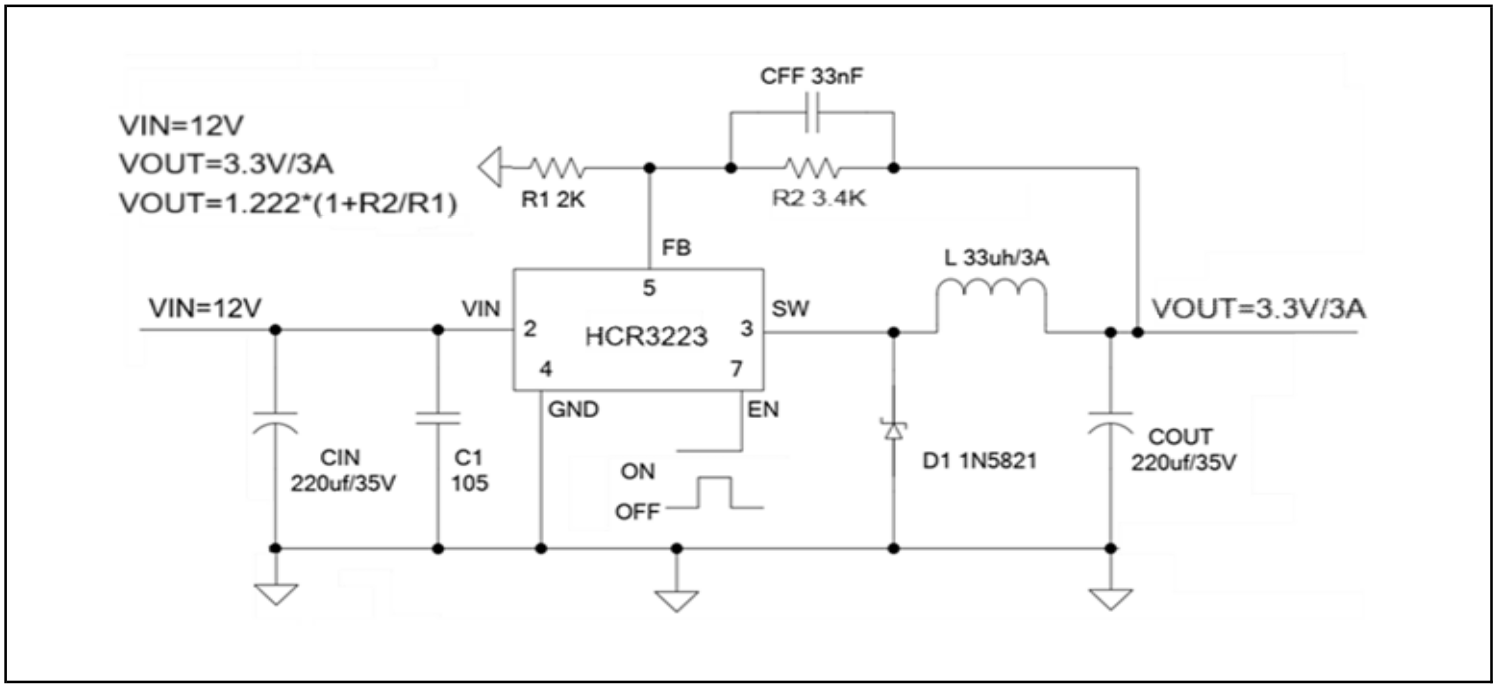


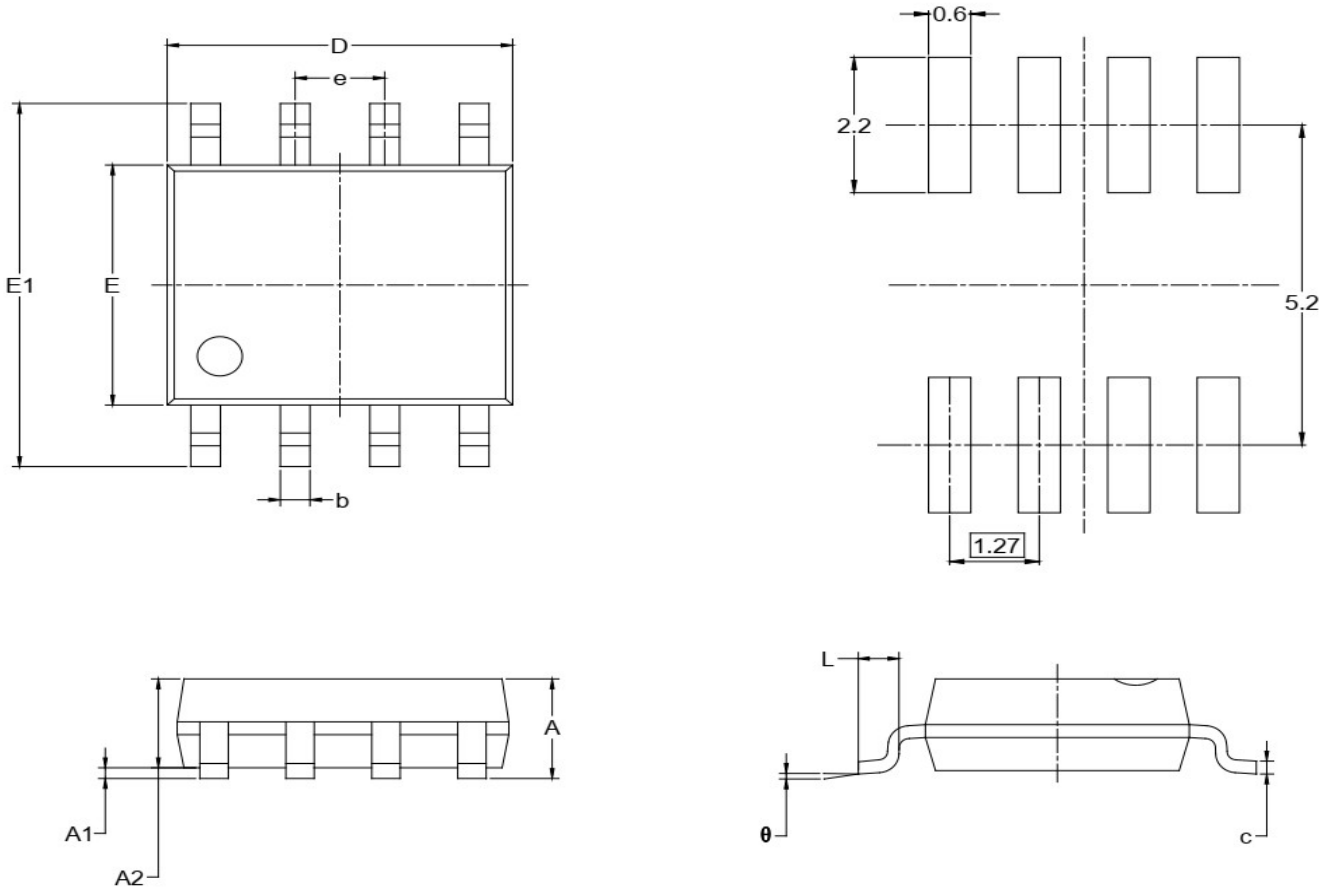
Figure 6. HCR3223 System Parameter test circuit (12V~3.3V/3A)

380K, 28V, 3A Buck DC-DC Converter

Mechanical Dimensions

M8 PKG: SOIC-8

unit:mm

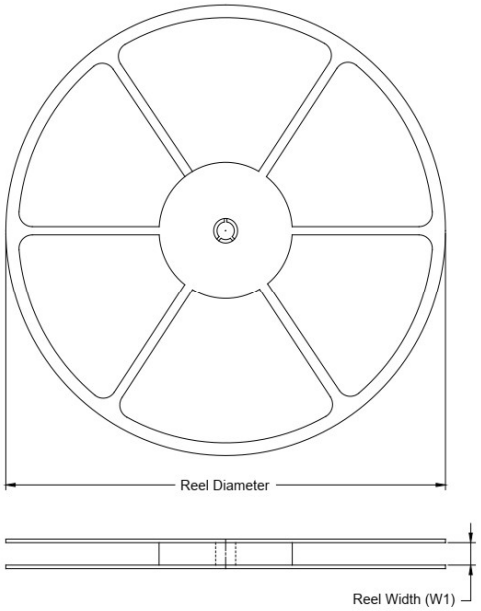


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

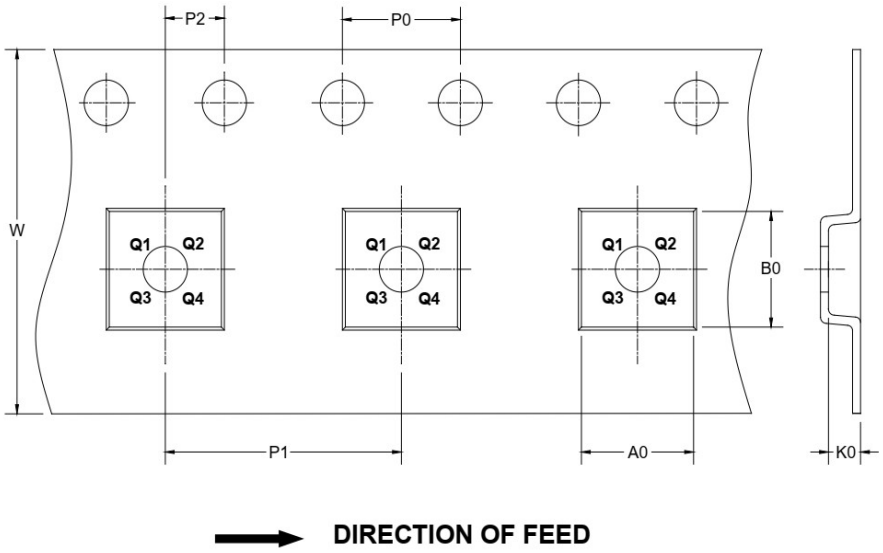
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MS-012.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

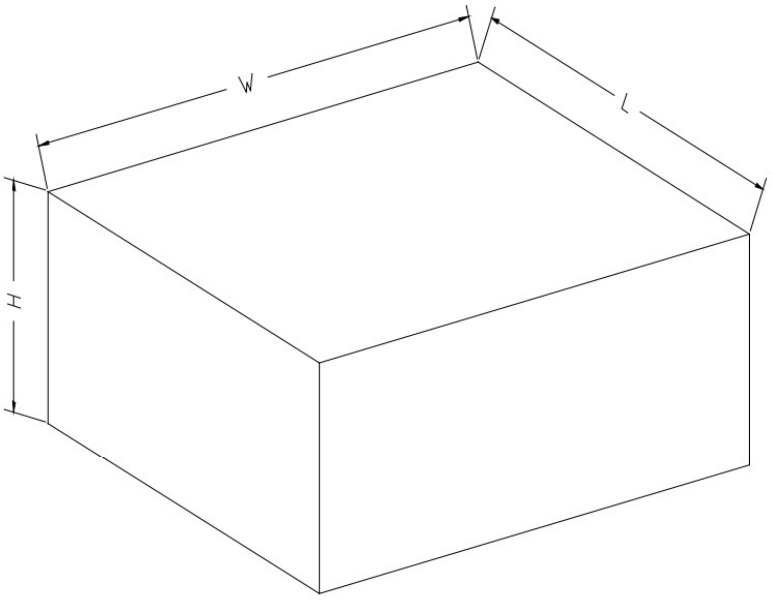


NOTE: The picture is only for reference. Please make the object as the standard.

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	13″	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1

CARTON BOX DIMENSIONS



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

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5