

4A, 45V, 120KHz Synchronous Buck DC to DC Converter**Features**

- 4A Constant output Current Capability
- Maximum Duty Cycle Up to 100%
- Feedback Voltage Accuracy $\pm 2\%$
- 5V to 40V Input Operating Range
- Output Adjustable from 1.25V to 35V
- Internal Optimize Power MOSFET
- High efficiency up to 94%
- Max. Output power up to 30W
- Fixed 120KHz Switching Frequency
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit protection function
- Built in output short protection function
- Temperature range from -40°C to +125°C
- Device HBM ESD Classification Level Class3A
- Available in TO-252-5L Package

Applications

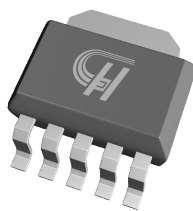
- Automotive Electronics
- Industrial Control
- Networking Equipment
- Internet of Things

General Description

The HCR3327 is a 120KHz fixed frequency PWM synchronous buck DC/DC converter, capable of driving a 4.0A load with high efficiency, low ripple and excellent line and load regulation. HCR3327 supports wide input operating voltage range of 5V~40V and a maximum duty cycle of 100% output. A built-in loop compensation module reduces components in the system, lowering power system cost and reducing printed circuit board space.

The HCR3327 has built-in thermal shutdown current limit protection and output short protection function and so on. When the output short protection function happens, the operation frequency will be reduced about from 120KHz to 30KHz.

The HCR3327 require a minimum number of external components. It is available in TO-252-5L Package.



TO-252-5L

Figure 1. Package Type of HCR3327

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Pin Configuration

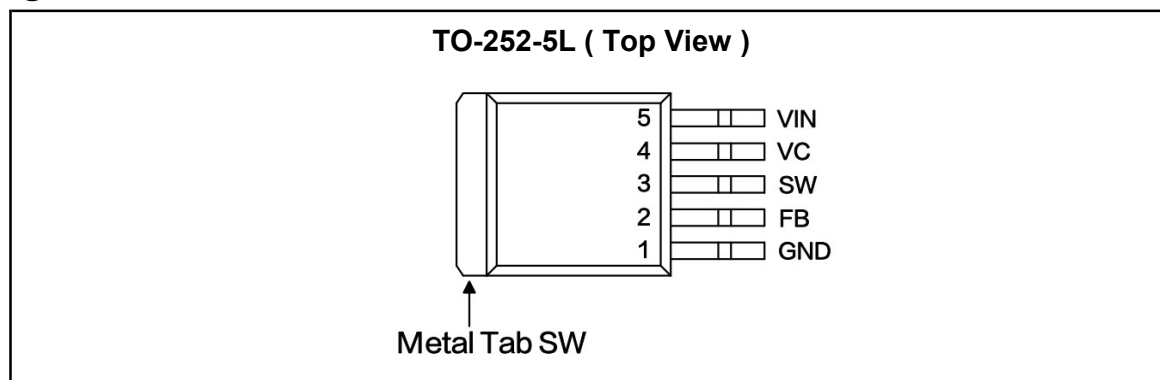
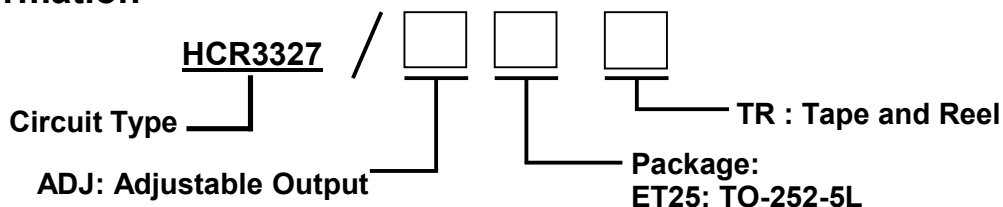


Figure 2. Pin Configuration of HCR3327 (Top View)

Pin Function Table

Pin Number	Pin Name	Function Description
1	GND	Ground Pin.
2	FB	Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.25V.
3	SW	Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.
4	VC	Internal Voltage Regulator Bypass Capacity. In typical system application, The VC pin connect a 1uF capacitor to VIN.
5	VIN	Supply Voltage Input Pin. The HCR3327 operates from 5V to 40V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.

Ordering Information



Ordering Code

Part Number	Marking ID ²	Temperature Range	Package	Quantity per Reel
HCR3327/ADJET25TR	HCR3327XXX	-40°C to +125°C	TO-252-5L	2500pcs/TR

Note2: the HCR3327 is type and "XXX" is date code.

4A, 45V, 120KHz Synchronous Buck DC to DC Converter**Absolute Maximum Ratings** Note 1

Parameter	Symbol	Value	Unit
Supply Input Voltage	V _{IN}	-0.3 to +45	V
Internal Voltage Regulator Bypass Capacity	V _C	-0.3 to V _{IN}	V
Feedback Pin Voltage	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}	50	'C/W
Thermal Resistance Junction to Case	R _{θJC}	18	'C/W
Storage Temperature Range	T _{STG}	-65 to 150	'C
Operating Junction Temperature	T _J	-40 to 150	'C
Lead Temperature (Soldering, 10s)	T _{LEAD}	260	'C
ESD (HBM)	HBM	4000	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
Supply Input Voltage	V _{IN}	5.0	40.0	V
Ambient Operating Temp	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.

4A, 45V, 120KHz Synchronous Buck DC to DC Converter**Electrical Characteristics**

TA=25°C, VIN=12V; system parameters test circuit figure6, unless otherwise specified.

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Input Operation Voltage	V _{IN}		5.0	-	40	V
Quiescent Supply Current	I _Q	V _{FB} =2V	-	2.3	5.0	mA
Feedback Voltage	V _{FB}	V _{IN} =12V, V _{out} =5.0V, I _{out} =0.5A	1.225	1.250	1.275	V
Efficiency	η	V _{IN} =12V, V _{out} =5.0V, I _{out} =1A	-	93.0	-	%
Efficiency	η	V _{IN} =24V, V _{out} =5.0V, I _{out} =1.5A	-	95.0	-	%
High-side Switch On-Resistance	R _{DS(ON)H}		-	68	-	mΩ
Low-side Switch On-Resistance	R _{DS(ON)L}		-	50	-	mΩ
Switch Current Limit	I _{LIMIT}	V _{FB} =0V	-	4.2	-	A
Oscillator Frequency	F _{osc}		96	120	144	KHz
Maximum Duty Cycle	D _{MAX}	V _{FB} =0V	-	100	-	%
Thermal Shutdown Temperature	T _{SD}		-	170	-	°C
Thermal Shutdown Hysteresis	T _D		-	50	-	°C

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical Performance Characteristics

(TA=25°C, unless otherwise noted.)

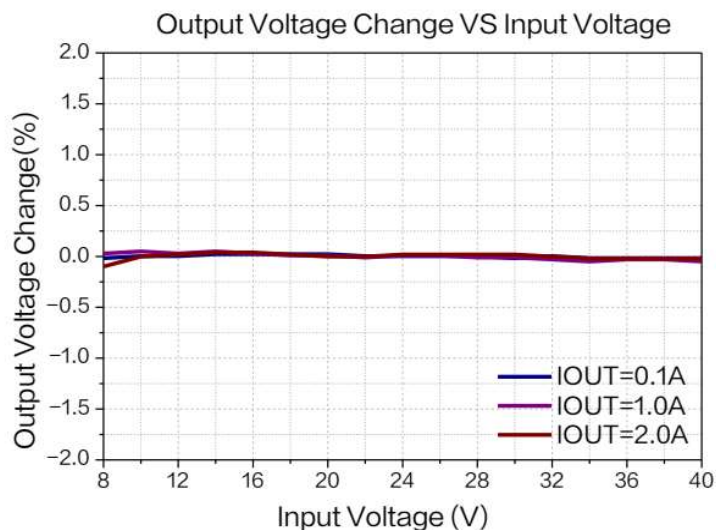


Figure 3. Line Regulation

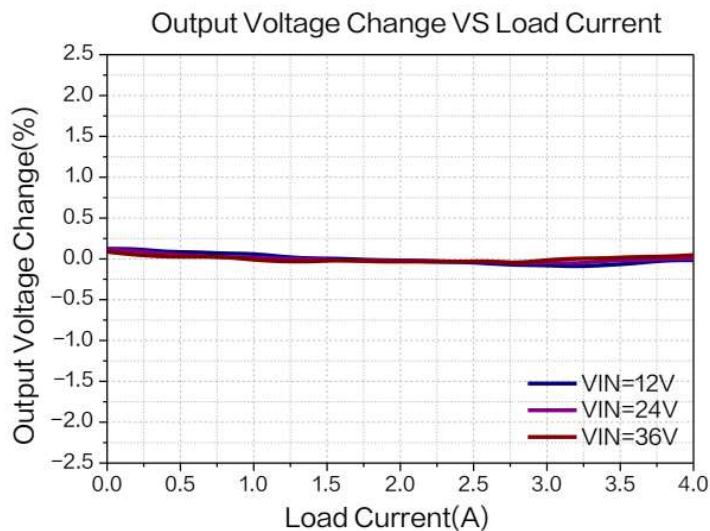


Figure 4. Load Regulation

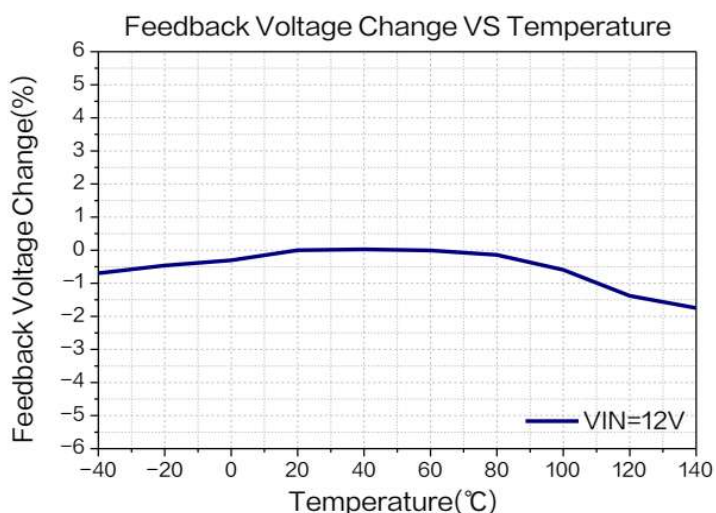


Figure 5. Feedback Voltage Regulation

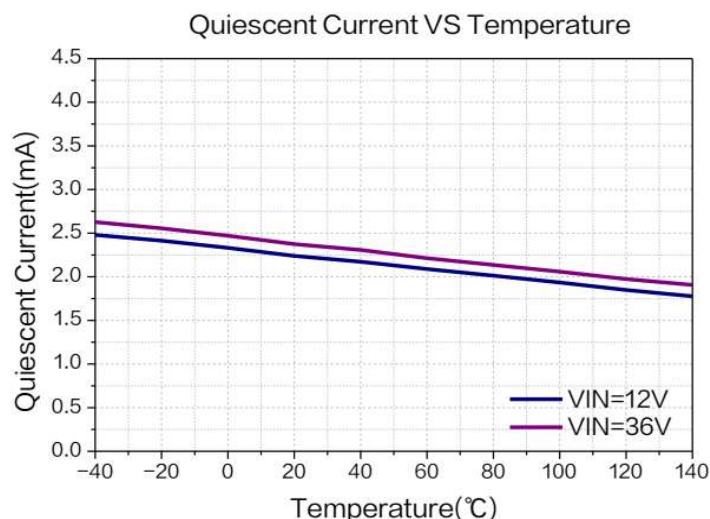


Figure 6. Quiescent Current

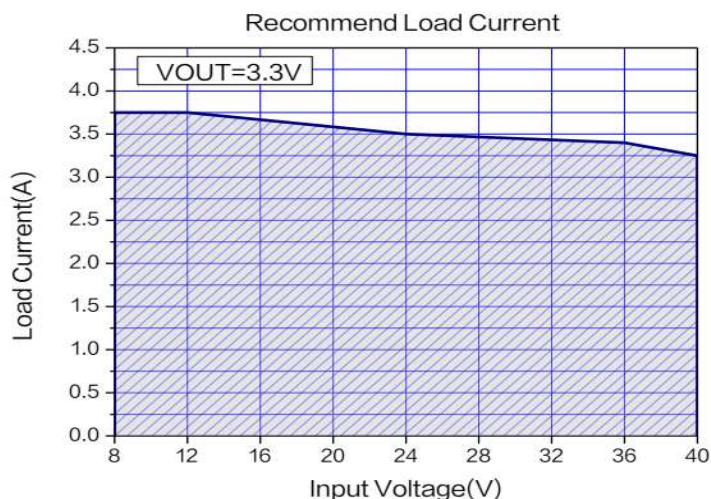


Figure 7. Max Output Current

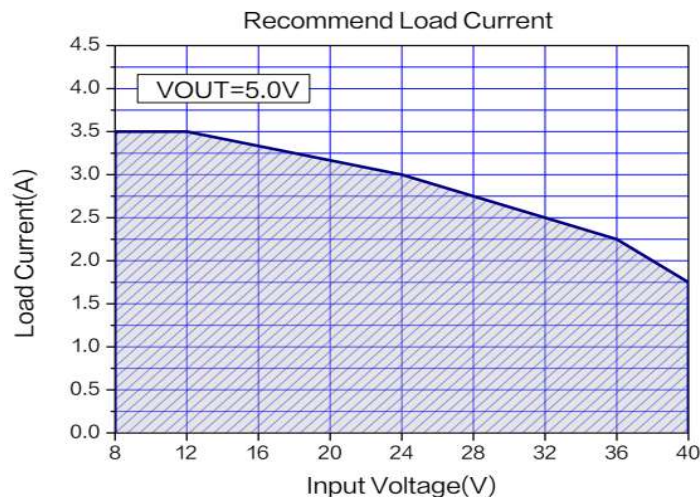


Figure 8. Max Output Current

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical Performance Characteristics(con)

(TA=25°C, unless otherwise noted.)

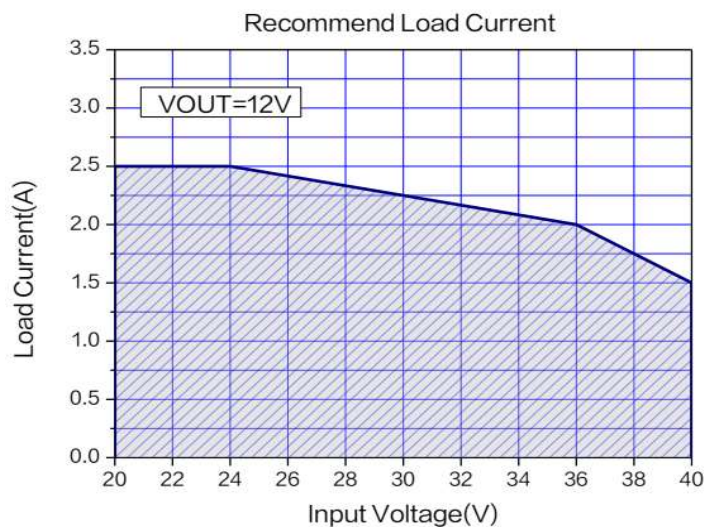


Figure 9. Max Output Current

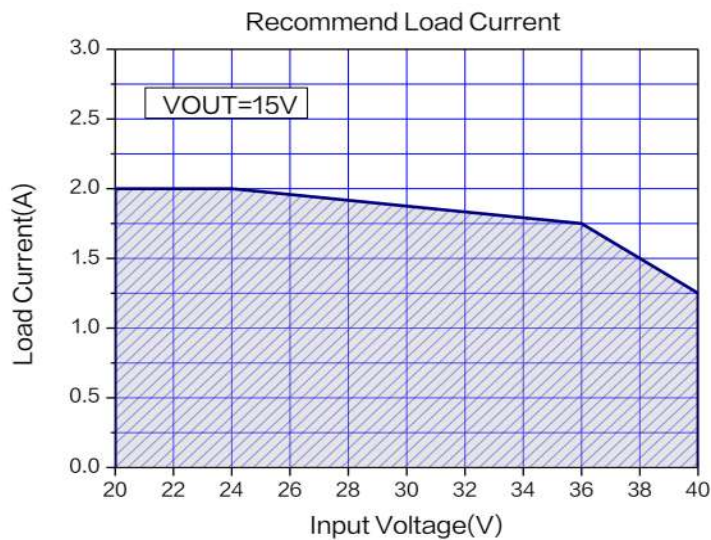


Figure 10. Max. Output Current

(VIN=8V, Vout=5.0V, Iout=0.1A)

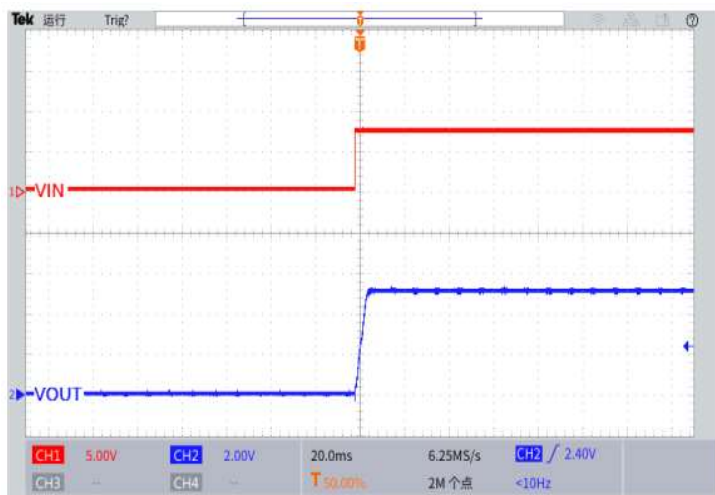


Figure 11. Star-Up Characteristic

(VIN=12V, Vout=5.0V, Iout=0.1A)



Figure 12. Star-Up Characteristic

(VIN=24V, Vout=5.0V, Iout=0.1A)

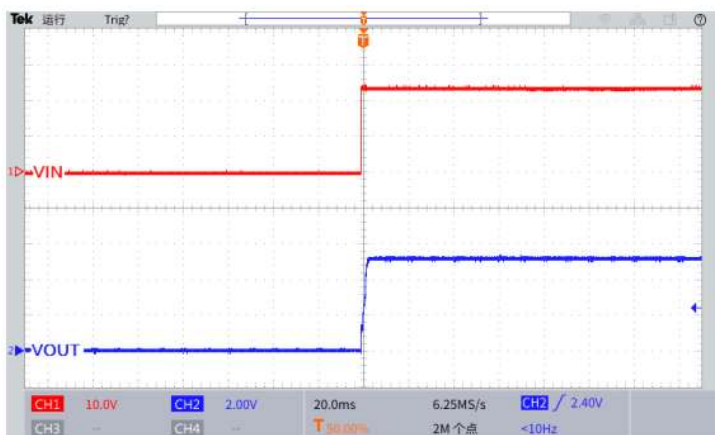


Figure 13. Star-Up Characteristic

(VIN=36V, Vout=5.0V, Iout=0.1A)

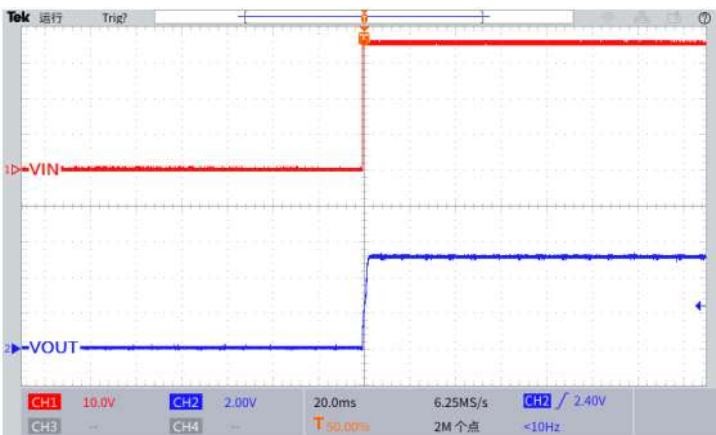


Figure 14. Star-Up Characteristic

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical Performance Characteristics(con)

(TA=25°C, unless otherwise noted.)

(VIN=8V, Vout=5.0V)

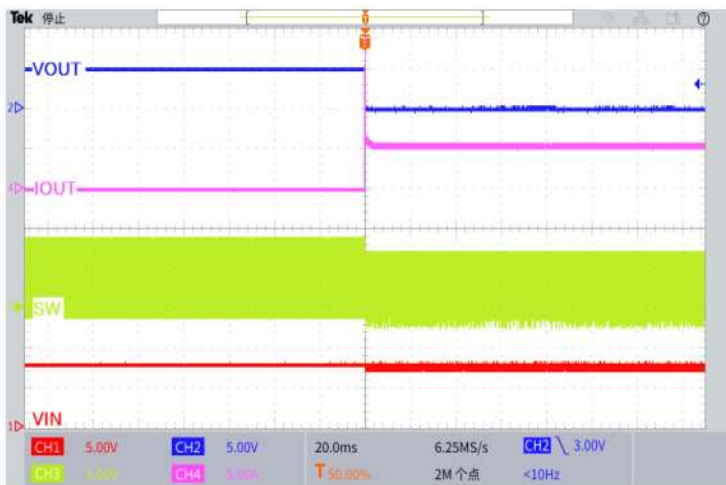


Figure 15. Output Short Current Waveform

(VIN=12V, Vout=5.0V)

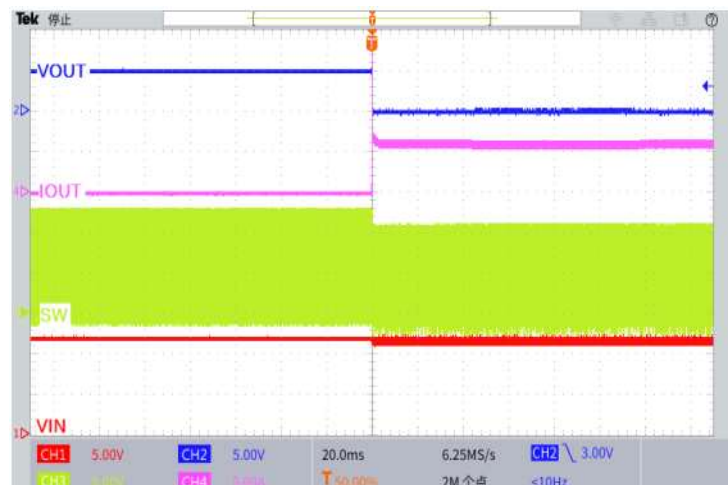


Figure 16. Output Short Current Waveform

(VIN=8V, Vout=5.0V)

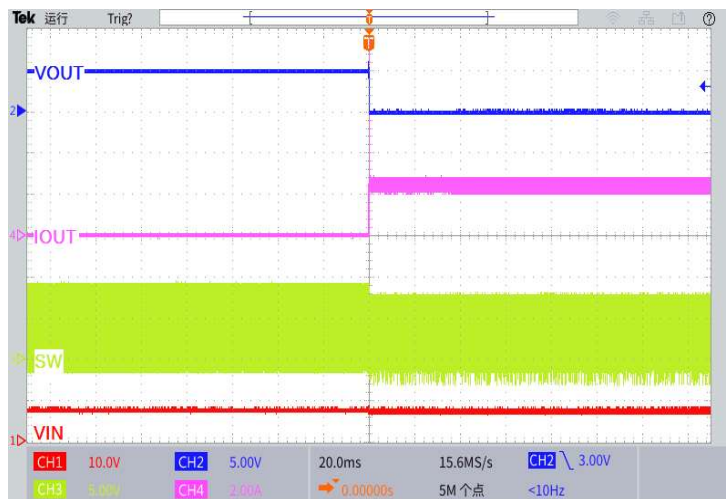


Figure 17. Output Short Current Waveform

(VIN=12V, Vout=5.0V)

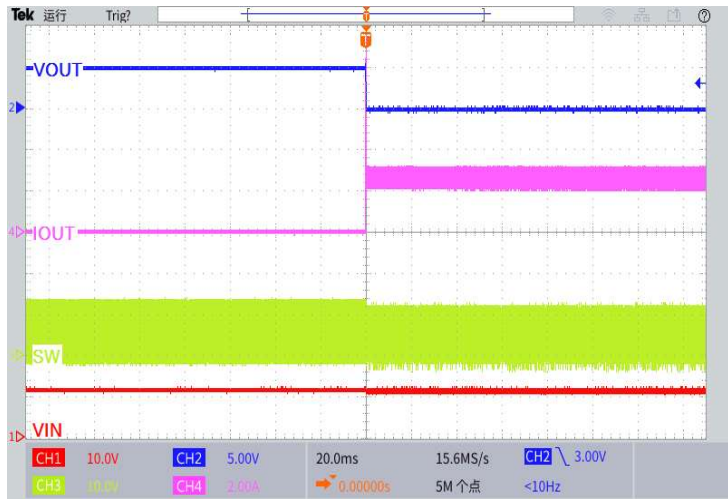


Figure 18. Output Short Current Waveform

(VIN=24V, Vout=5.0V)

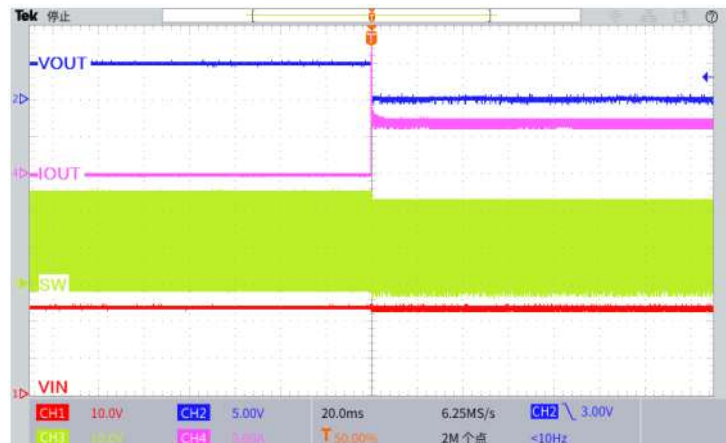


Figure 19. Output Short Circuit Waveform

(VIN=36V, Vout=5.0V)

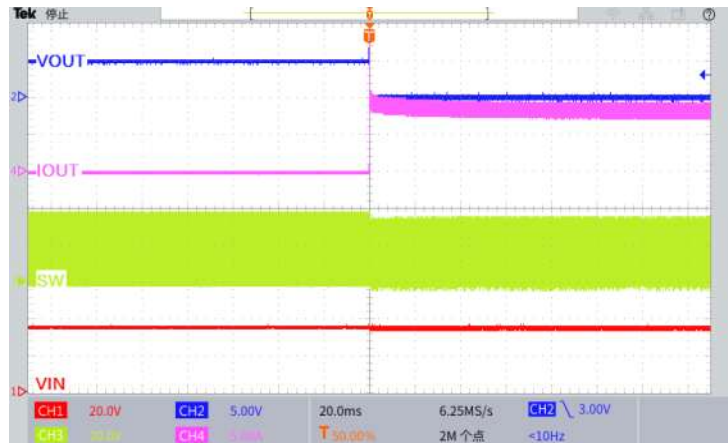


Figure 20. Output Short Circuit Waveform

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical Performance Characteristics(con)

(TA=25°C, unless otherwise noted.)

(VIN=8V, Vout=5.0V, Iout=0.1 to 1A)

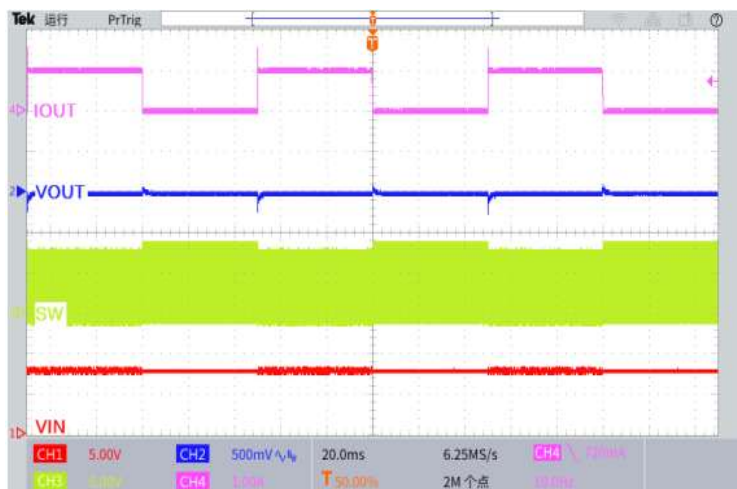


Figure 21. Load Transient Response

(VIN=12V, Vout=5.0V, Iout=0.1 to 1A)

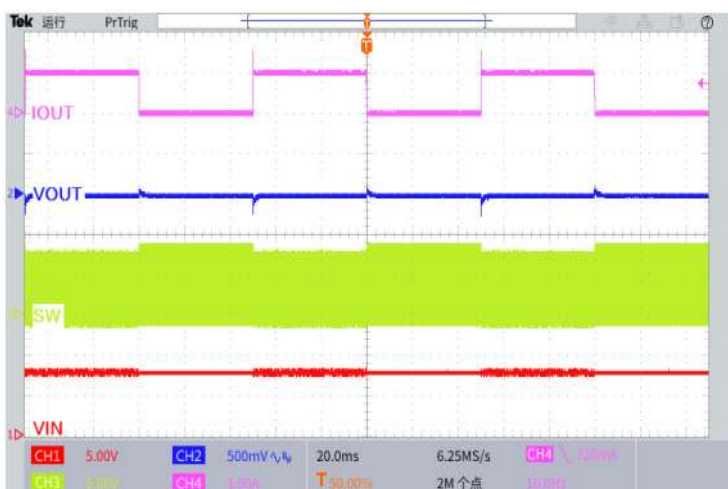


Figure 22. Load Transient Response

(VIN=24V, Vout=5.0V, Iout=0.1 to 1A)

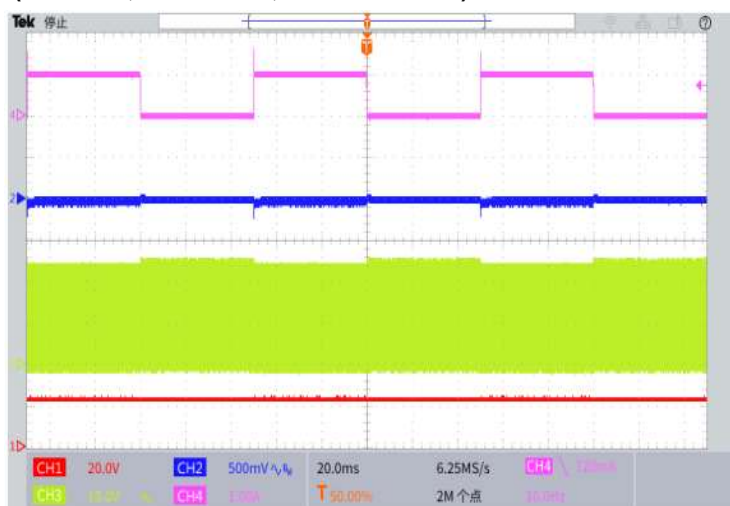


Figure 23. Load Transient Response

(VIN=36V, Vout=5.0V, Iout=0.1 to 1A)

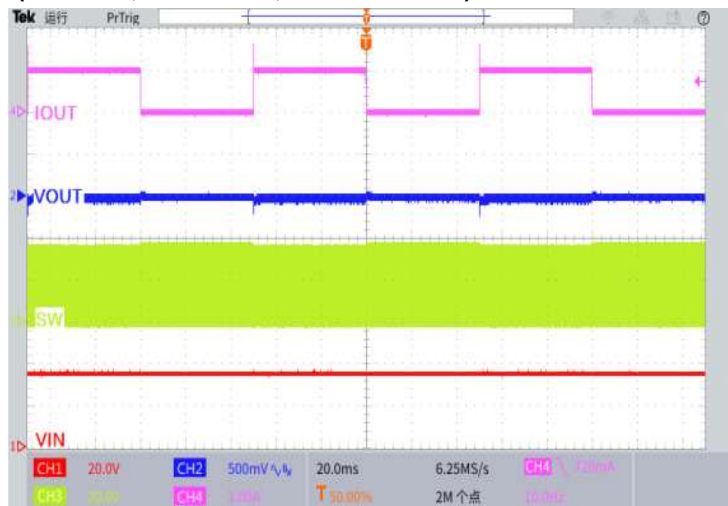


Figure 24. Load Transient Response

Function Block

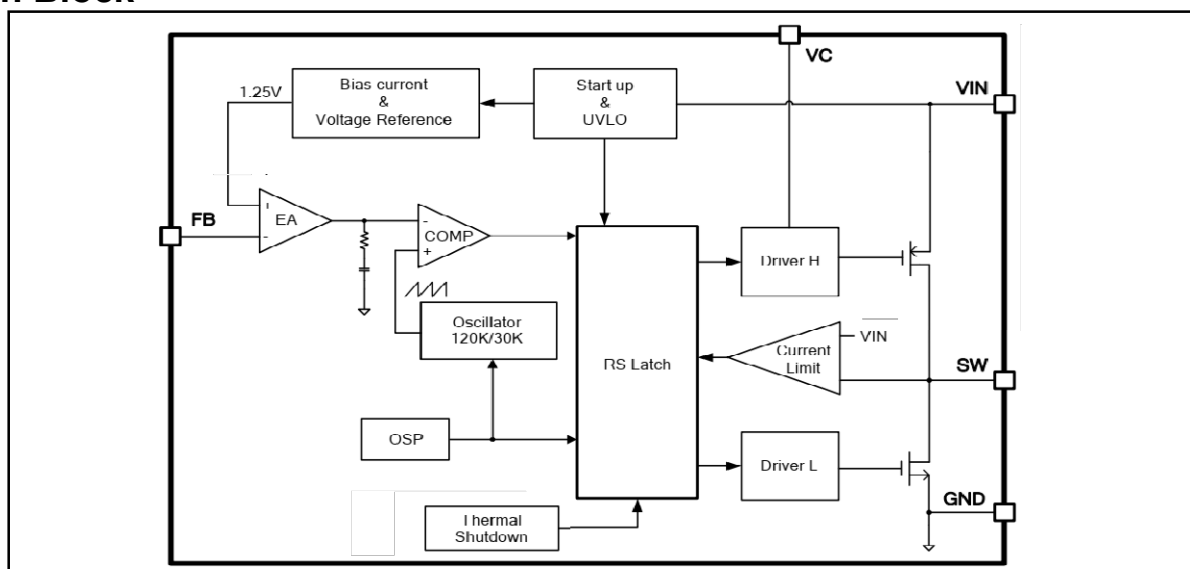


Figure 25. Function Block Diagram of HCR3327

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical System Application Circuit

(VIN=5V~40V, Vout=3.3V, Iout=0~4.0A)

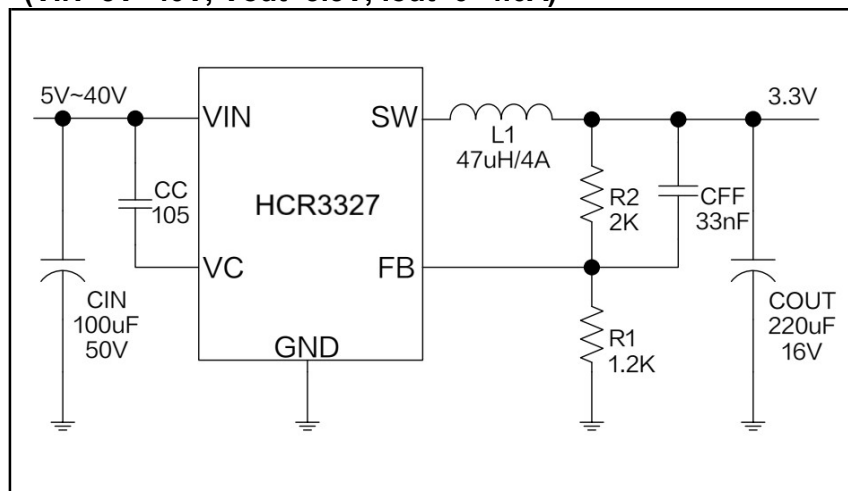


Figure 26. Typical System Application Schematic

Transfer Efficiency

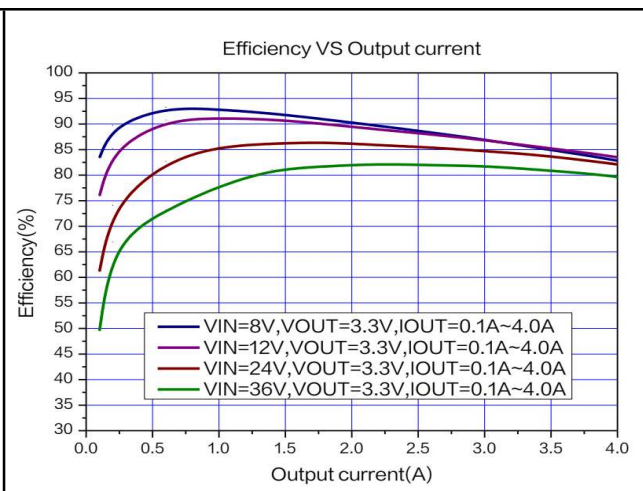


Figure 27. Efficiency Curve(Vout=3.3V)

(VIN=8V~40V, Vout=5V, Iout=0~4.0A)

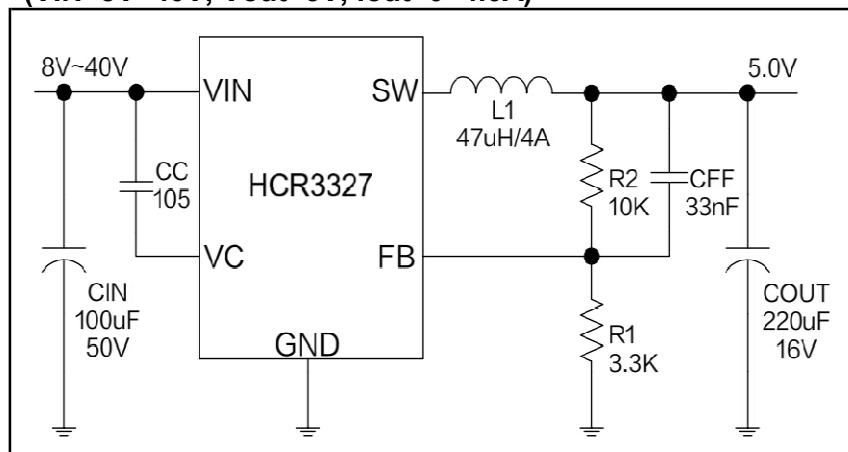


Figure 28. Typical System Application Schematic

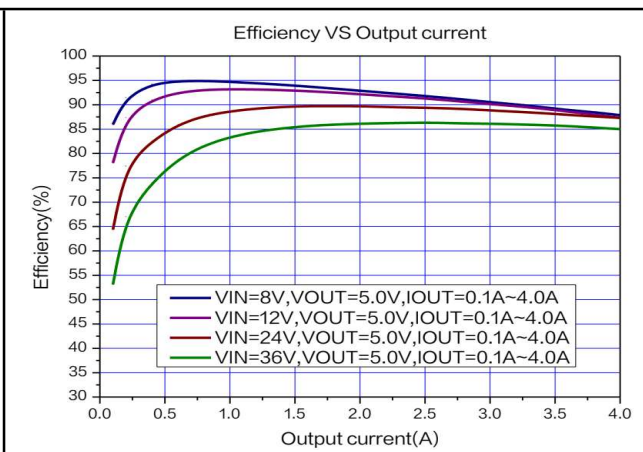


Figure 29. Efficiency Curve(Vout=5V)

(VIN=15V~40V, Vout=12V, Iout=0~2.5A)

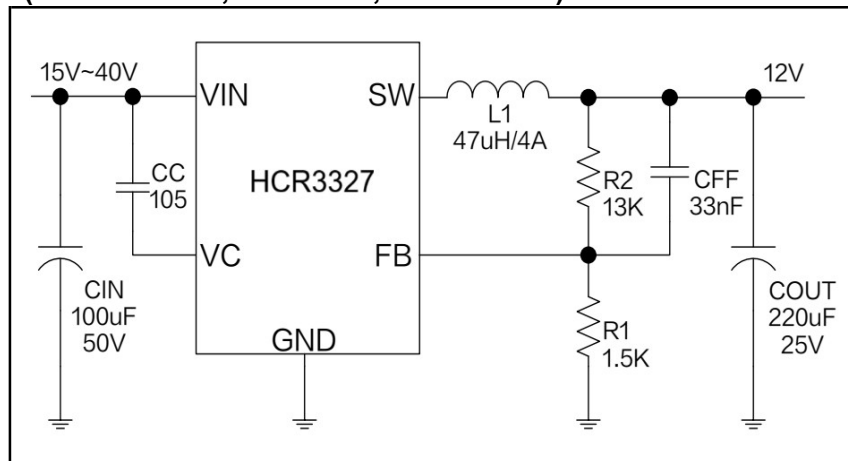


Figure 30. Typical System Application Schematic

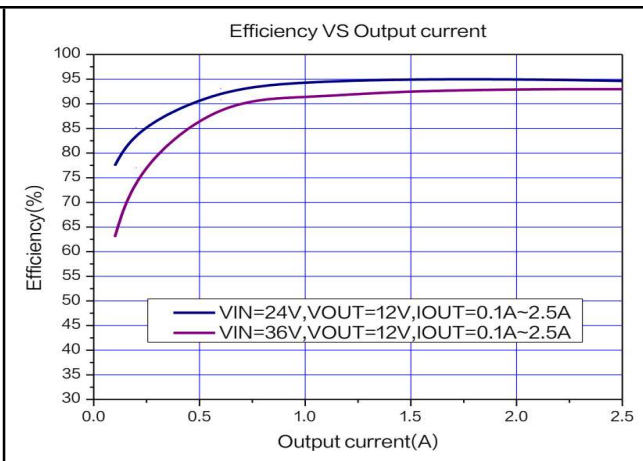


Figure 31. Efficiency Curve(Vout=12V)

4A, 45V, 120KHz Synchronous Buck DC to DC Converter

Typical System Application Circuit

(VIN=18V~40V, Vout=15V, Iout=0~2A)

Transfer Efficiency

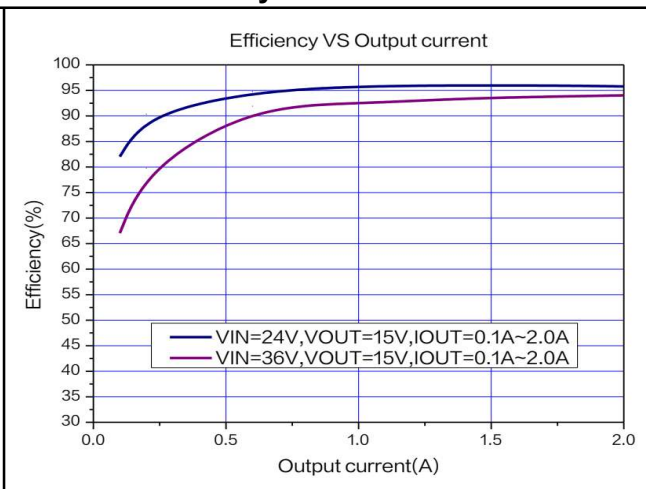
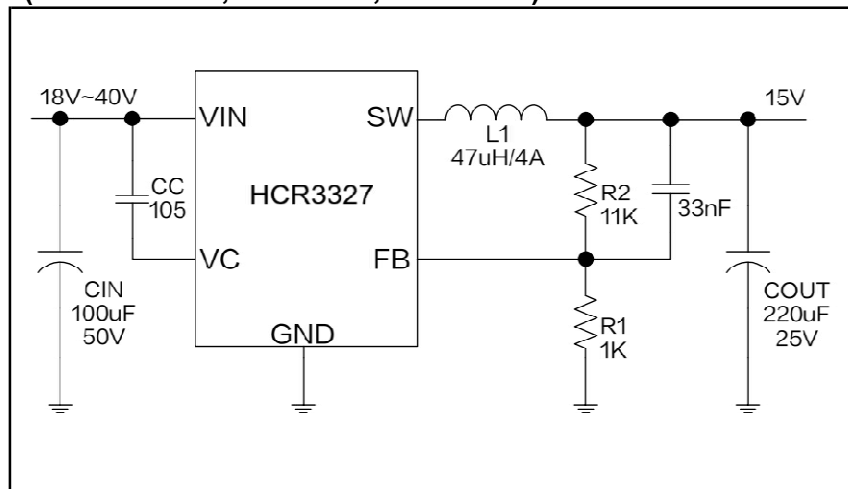


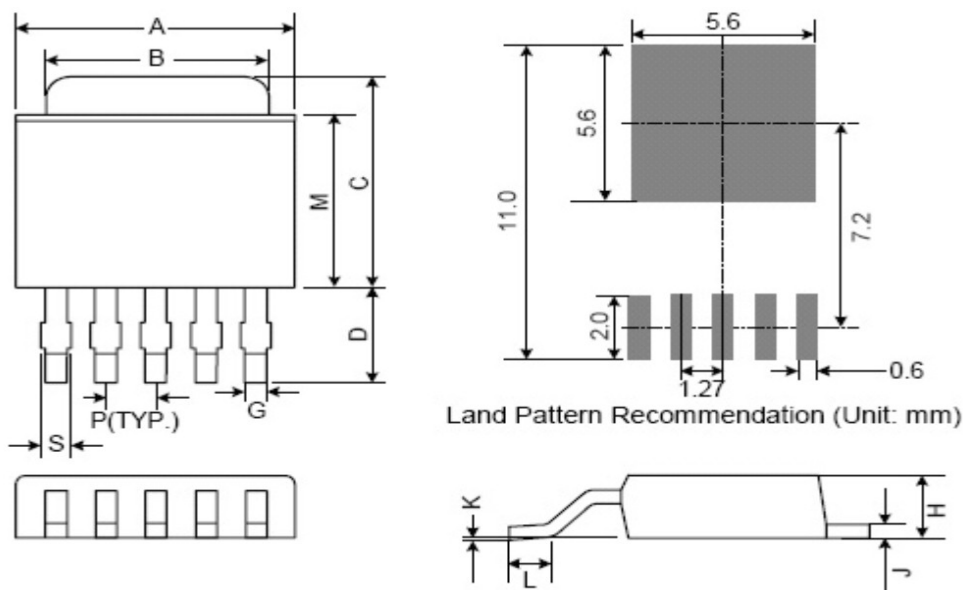
Figure 32. Typical System Application Schematic

Figure 33. Efficiency Curve(Vout=15V)

Mechanical Dimensions

ET25: TO-252-5L

unit:mm



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	6.35	6.60	6.85	0.250	0.260	0.270
B	5.20	5.35	5.50	0.205	0.211	0.217
C	6.80	7.00	7.30	0.268	0.276	0.287
D	2.40	2.80	3.20	0.094	0.110	0.126
P	1.27 REF.			0.05 REF.		
S	0.50	0.65	0.80	0.020	0.026	0.031
G	0.40	0.50	0.63	0.016	0.020	0.025
H	2.20	2.30	2.40	0.087	0.091	0.094
J	0.45	0.52	0.58	0.018	0.020	0.023
K	0.00	0.08	0.15	0.000	0.003	0.006
L	0.90	1.20	1.77	0.035	0.047	0.064
M	5.40	5.80	6.20	0.213	0.228	0.244