0.3uA IQ High PSRR, 500mA Low Dropout, RF-Linear Regulators

Features

- 500mA Guaranteed Output Current
- Low Quiescent Current:0.3uA
- PSRR=70dB @1KHz
- Wide Operating Input Voltage Range: 2V to 7V
- Dropout Voltage:100mV@100mA(3.3V)
- ±1.5% Output Accuracy
- Good Transient Response
- Integrated Short-circuit Protection
- Over-temperature Protection
- Available Fixed Outputs Voltage: 0.9V, 1.0V, 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 3.6V

Applications

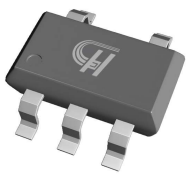
- Portable, Battery Powered，Equipment
- Ultra Low Power Microcontrollers
- Notebook Computers
- Audio/Video Equipment
- Weighting Scales
- Home Automation

General Description

The HCR2134 is a low-power(LDO) voltage regulator with enable function that operates from a 2.0V to 7V supply. It provides up to 500mA of output current in miniaturized packaging.

The features of low quiescent current as low as 0.3uA and almost zero disable current is current ideal for powering battery equipment to a longer service life. The other features include limit function, over temperature protection and output discharge function.

The HCR2134 is available in Green SOT-23-5 packages. It operates over an ambient temperature range of -40'C to +85'C.



SOT-23-5

Figure 1. Package Type of HCR2134

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Pin Configuration

SOT-23-5 Top View

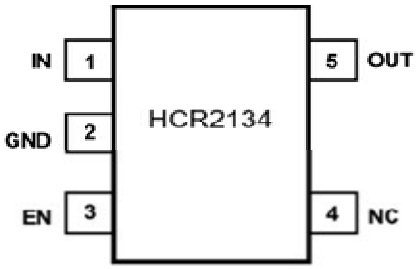

Figure 2. Pin Configuration of HCR2134 (Top View)

Pin Function Table

SOT-23-5	name	Function
1	IN	Regulator Input. Supply voltage can range from 2.0V to 7.0V. Bypass with a 1uF capacitor to GND.
2	GND	Ground
3	EN	Enable Control Input
4	NC	No Internal Connection
5	OUT	Regulator Output

Functional Diagrams

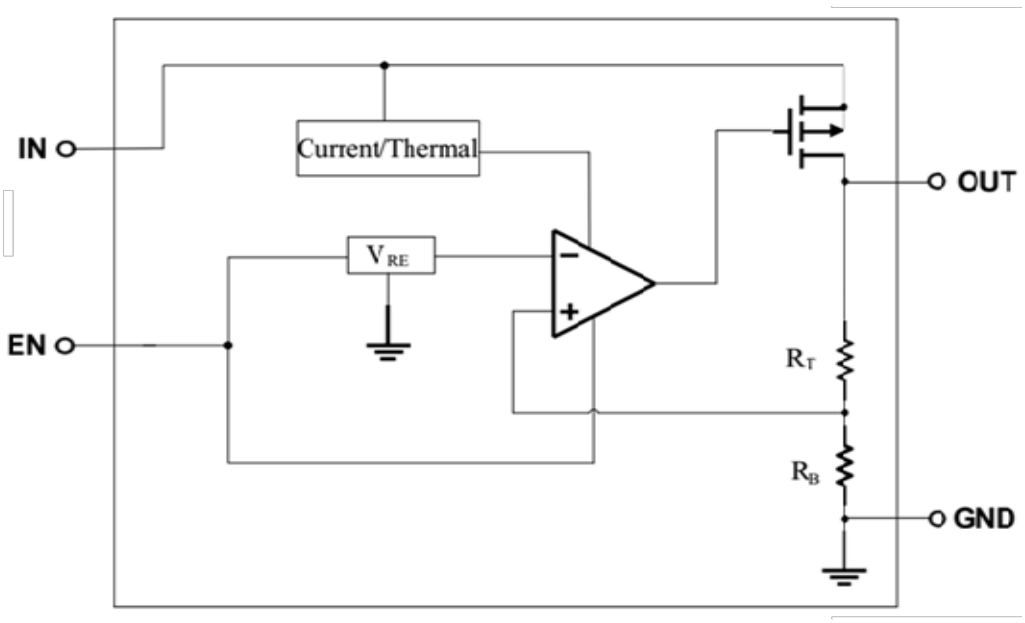

Figure 3. Fixed Output Voltage Functional Diagrams of HCR2134

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Ordering Information

Circuit Type — □ □ □

Type:
HCR2134

TR : Tape and Reel

Package:
M5: SOT-23-5

Output Voltage:

0V9 : 0.9V,	1V0 : 1.0V
1V2 : 1.2V,	1V5 : 1.5V
1V8 : 1.8V,	2V5 : 2.5V
2V8 : 2.8V,	3V0 : 3.0V
3V3 : 3.3V,	3V6 : 3.6V

Ordering Code

Part Number	VOUT(V)	Marking	Temperature Range	Package	Package Type
HCR2134-0V9M5TR	0.9	3409	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-1V0M5TR	1.0	3410	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-1V2M5TR	1.2	3412	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-1V5M5TR	1.5	3415	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-1V8M5TR	1.8	3418	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-2V5M5TR	2.5	3425	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-2V8M5TR	2.8	3428	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-3V0M5TR	3.0	3430	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-3V3M5TR	3.3	3433	-25'C to +85'C	SOT-23-5	3000pcs/TR
HCR2134-3V6M5TR	3.6	3436	-25'C to +85'C	SOT-23-5	3000pcs/TR

Typical Application Circuits

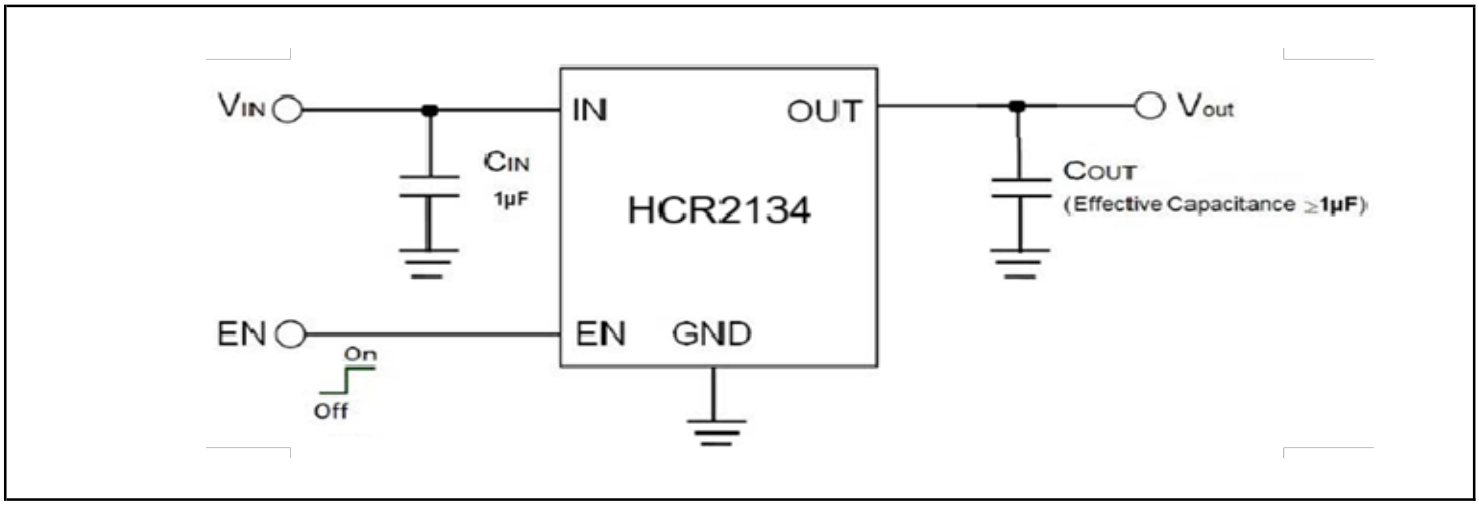

Figure 4. The Fixed output Circuits of HCR2134

Absolute Maximum Ratings Note 2

Parameter		Symbol	Value	Unit
Supply Voltage, IN to GND		VIN	-0.3 to 9.0	V
Supply Voltage, OUT to GND		VOUT	-0.3 to 9.0	V
Supply Voltage, OUT to IN		VDP	-0.3 to (VIN+0.3V)	V
Power Dissipation at TA=25'C	SOT-23-5	PD	0.45	W
Thermal Resistance at TA=+25'C	SOT-23-5	θJA	220	'C/W
Storage Temperature Range		TSTG	-55 to +150	'C
Operating Temperature Range note 2		TOPG	-25 to +85	'C
Junction Temperature		TJ	+150	'C
Lead Temperature (Soldering, 10s)		TLEAD	260	'C
Human Body Model ESD Protection		ESD HBM	±4000	V
Machine Model ESD Protection		ESD MM	±200	V

Note 2: Stresses above 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 listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Operating Voltage Range	VIN	2.0	7.0	V
Operating Temperature Range	TOPG	-25	+85	'C

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Electrical Characteristics

(V_{IN}=$V_{OUT(NOMINAL)}$+1.0V, C_{IN}=1uF, V_{OUT}=3.3V, C_{OUT}=1uF, at T_A=25'C, unless otherwise noted.)

Parameter	Symbol	Conditions		Min	Type	Max	Unit
Input Voltage	V_{IN}			2.0	-	7.0	V
Output Voltage Accuracy		I_{OUT}=1mA		-1.5	-	+1.5	%
Quiescent Current	I_Q	EN=V_{IN}, V_{IN}>V_{OUT}, No load		-	0.3	0.7	uA
Shutdown Ground Current	I_{SD}	V_{EN}=0V		-	-	0.1	uA
VOUT Shutdown Leakage Current	I_{LEAK}	V_{OUT}=0V		-	-	0.1	uA
Maximum Output Current note2	I_{OUT}	V_{IN}-V_{OUT}=0.5V		-	500	-	mA
Current Limit	I_{LIM}	V_{IN}=5V		-	550	-	mA
Dropout Voltage	V_{DPV}	I_{OUT}=100mA, V_{OUT}=3.3V		-	100	120	mV
		I_{OUT}=200mA, V_{OUT}=3.3V		-	200	250	
Line Regulation	ΔV_{LNR}	V_{IN}=V_{OUT}+0.5V to 7.0V, I_{OUT}=1mA		-	0.1	0.15	%/V
Load Regulation	ΔV_{LDR}	V_{IN}=V_{OUT}+1V, I_{OUT}=0.1mA to 500mA		-	20	30	mV
Power Supply Rejection Ratio	PSRR	C_{IN}=1uF, I_{OUT}=100mA C_{OUT}=1uF, V_{IN}=V_{OUT}+1V	f=1KHz	-	70	-	dB
			f=10KHz	-	65	-	
SHUTDOWN							
EN Input Threshold	V_{IH}	V_{IN}=5V, I_{OUT}=1mA		1.2	-	-	V
	V_{IL}			-	-	0.4	
Short/Start Load Current	I_{SHORT}	RL=1Ω		-	90	-	mA
Output Noise Voltage	e_{NO}	10Hz to 100KHz, C_{OUT}=1uF		-	100	-	uV_{RMS}
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}			-	160	-	'C
Thermal Shutdown Hysteresis	ΔT_{SHDN}			-	20	-	'C

note 2. Maximum output current is affected by PCB layout, size of metal trace, the thermal conduction path between metal layers and the environment of the system.

0.3uA IQ High PSRR, 500mA Low Dropout, RF-Linear Regulators

Typical Performance Characteristics (Unless Otherwise Specified.)

(VIN=VOUT(NOMINAL)+1.0V, CIN=1uF, VOUT=3.3V, COUT=1uF, at TA=25'C, unless otherwise noted.)

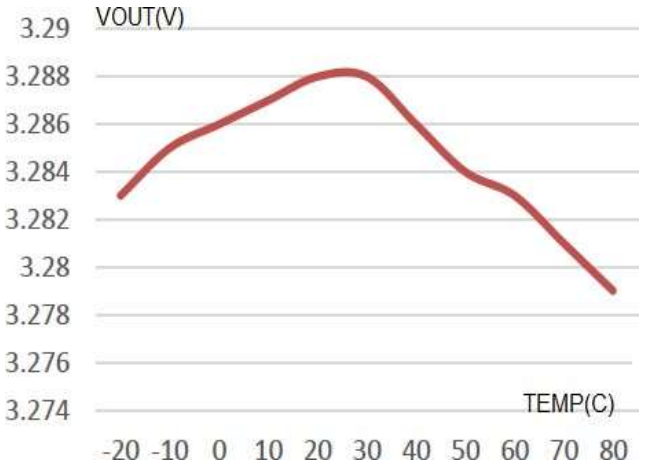


Figure 5. VOUT vs TEMP

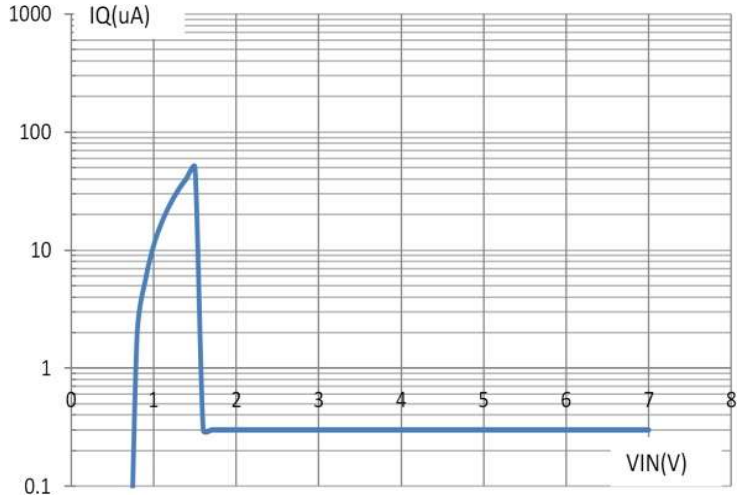


Figure 6. IQ vs VIN(*)

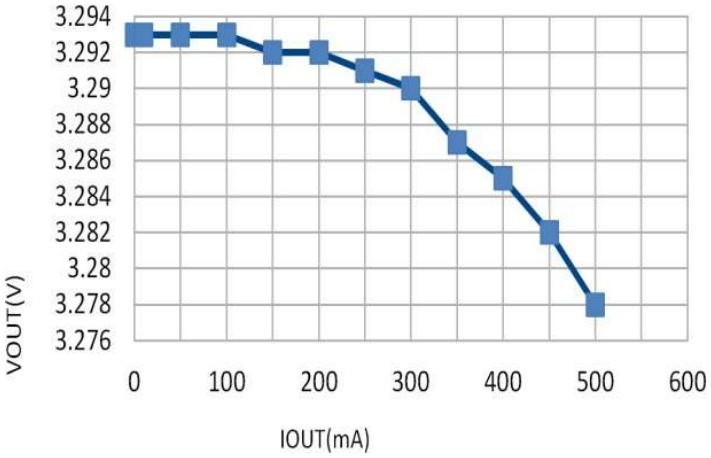


Figure 7. Load Regulation

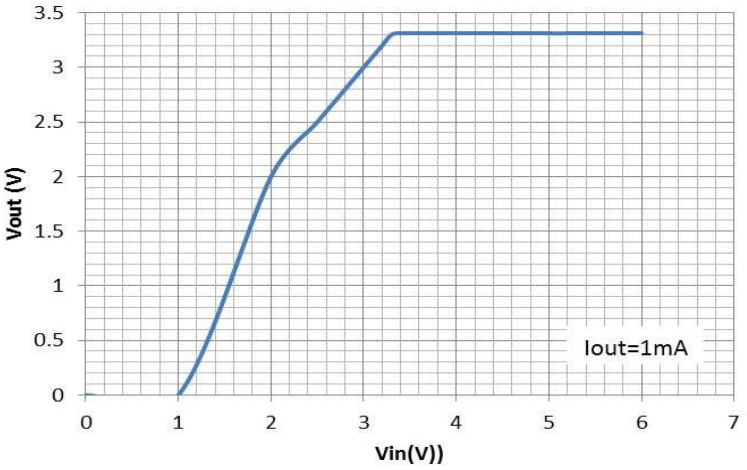


Figure 8. Line Regulation

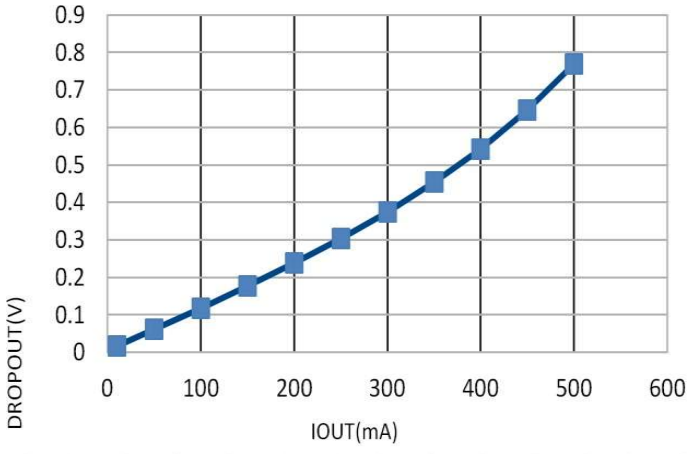


Figure 9. Dropout Voltage vs Load Current

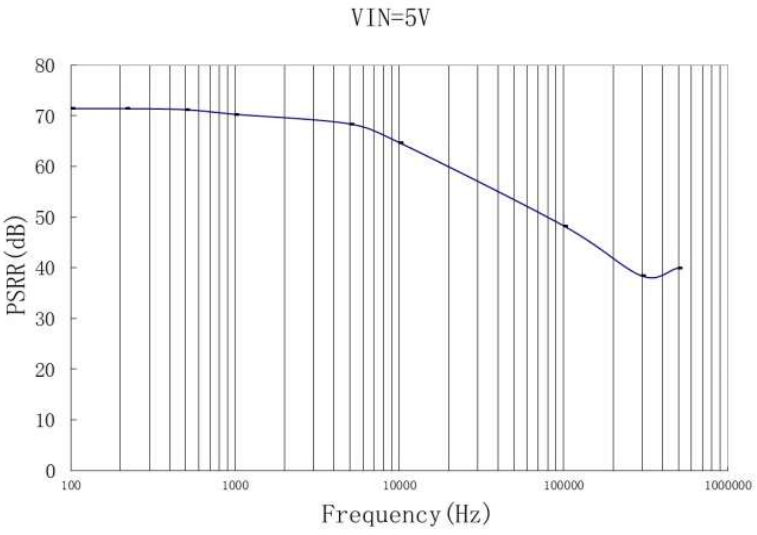


Figure 10. PSRR

Typical Performance Characteristics (Continued)

(VIN=VOUT(NOMINAL)+1.0V, CIN=1uF, VOUT=3.3V, COUT=1uF, at TA=25'C, unless otherwise noted.)

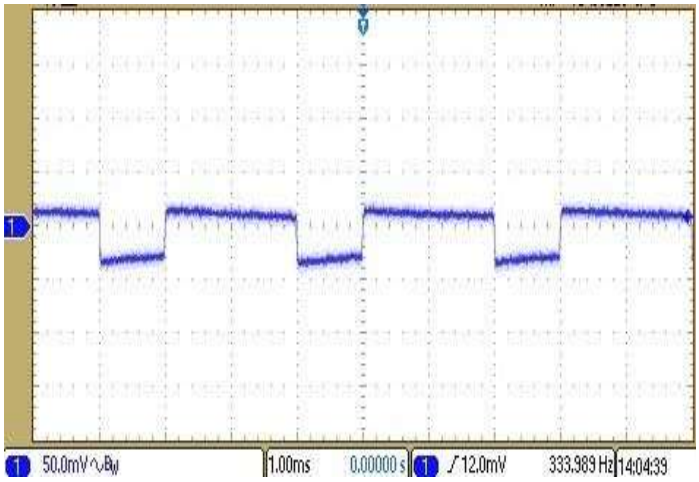


Figure 11. Load Transient Response

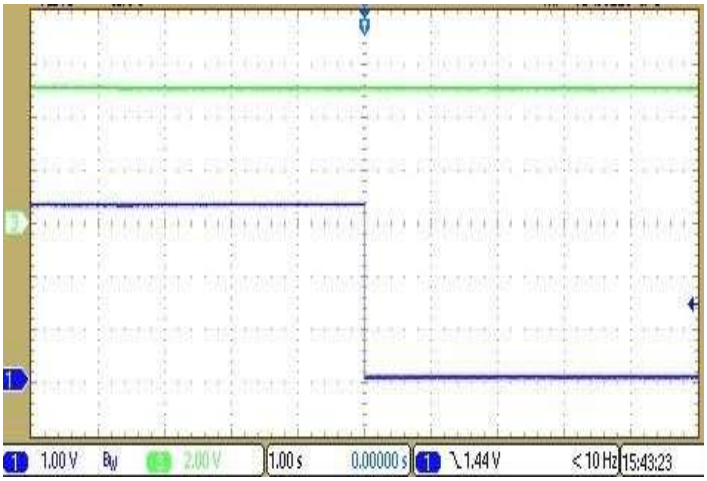


Figure 12. Short Output vs Over-Current Response

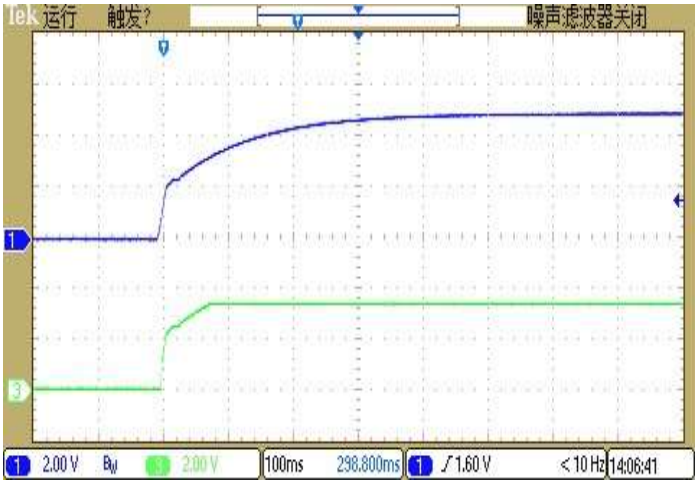


Figure 13. Power-On

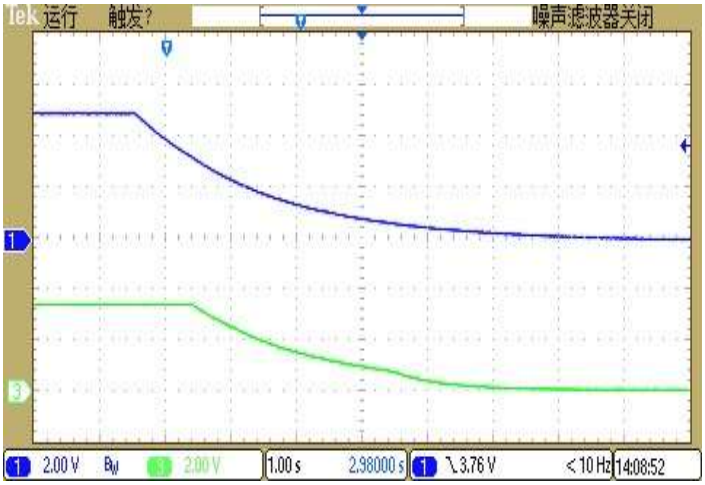


Figure 14. Power-Off

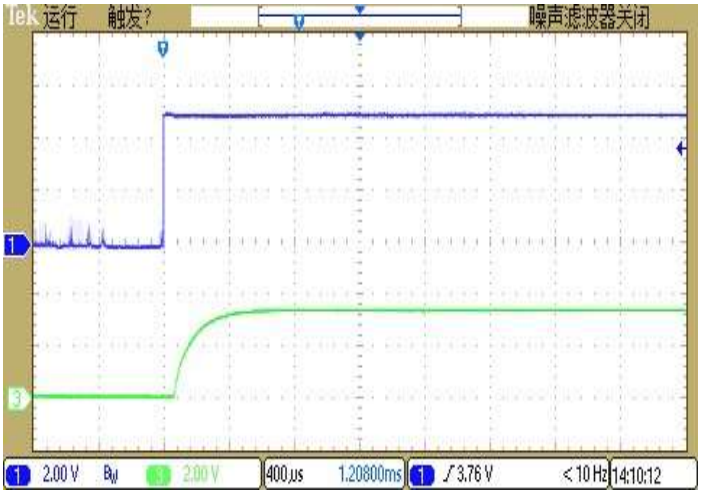


Figure 15. Enable

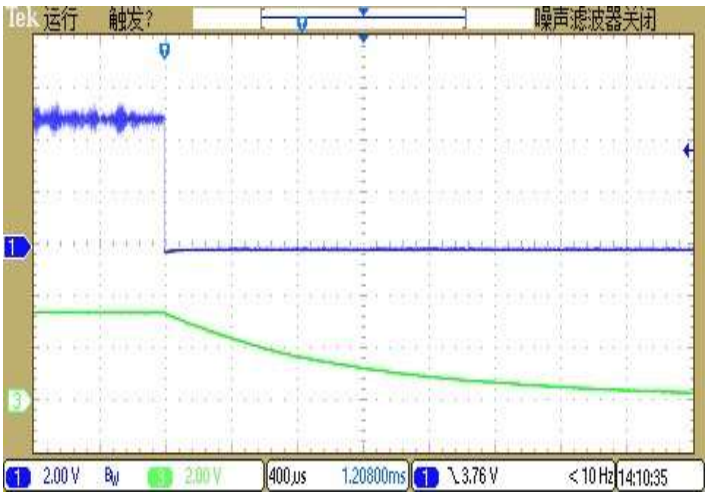


Figure 16. Disable

Note：(※)IQ refers to the working current when the chip is no-load, only when Vin >vout The chip will have a very low working current, the above diagram is for Vout 1.5v Measured Curve, when Vin<Vout, the chip is in an abnormal state that can not reach the intended output, therefore, the operating current will increase significantly. For applications where IQ requirements are strict, make sure the chip stops working when Vin <Vout.

APPLICATION NOTE

Input Capacitor

A 1uF ceramic capacitor is recommended to connect between VDD and GND pins to decouple input power supply glitch and noise.The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 1uF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R, Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

Dropout Voltage

The dropout voltage refers to the voltage difference between the VIN and VOUT pins while operating at specific output current. The dropout voltage V_{DROP} also can be expressed as the voltage drop on the pass-FET at specific output current(I_{RATED}) while the pass-FET is fully operating at ohmic region and the pass-FET can be characterized asan resistance $R_{DS(ON)}$. Thus the dropout voltage can be bedefined as ($V_{DROP}=V_{IN}-V_{OUT}=R_{DS(ON)}XI_{RATED}$). Fornormal operation, the suggested LDO operating range is ($V_{IN}>V_{OUT}+V_{DROP}$) for good transient response and PSRR ability. Vice versa, while operating at the ohmic region will degrade the performance severely.

Thermal Application

For continuous operation, don't exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temp--erature. The maximum power dissipation can be calculated as below: TA=25'C, PCB, The max $P_{D(Max)}$=(125'C-25'C)/(220'C/W)=0.45W for SOT23-5 packages.

power dissipation(PD) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

$$P_D=(V_{IN}-V_{OUT})XI_{OUT}$$

Layout Consideration

By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the HCR2134 ground pin using as wide and as short of a copper trace as is practical. Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

USB interface application

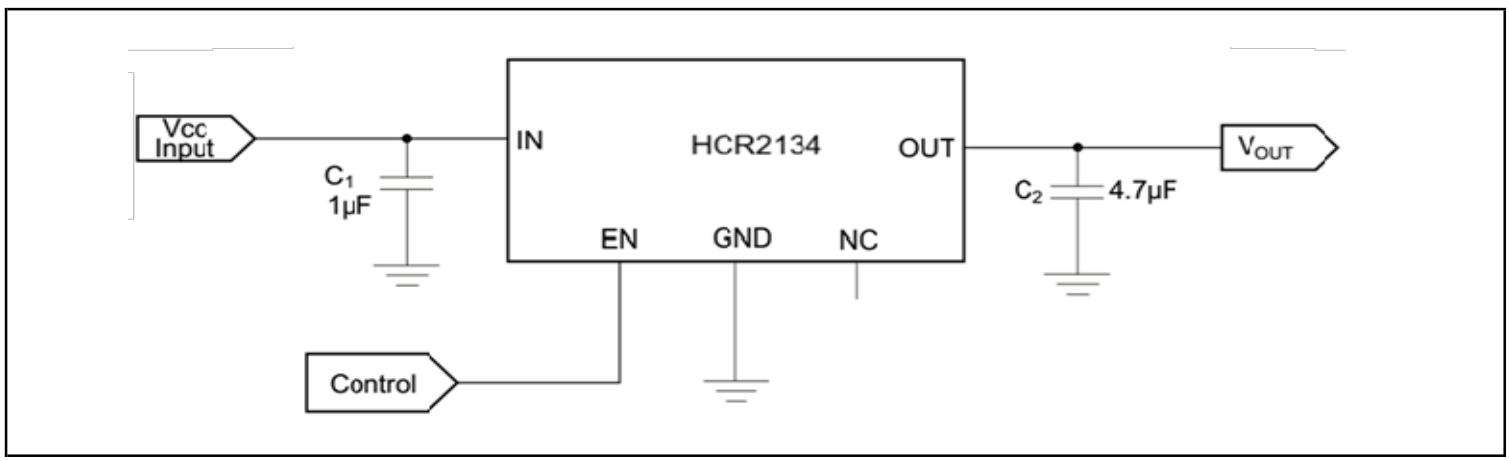
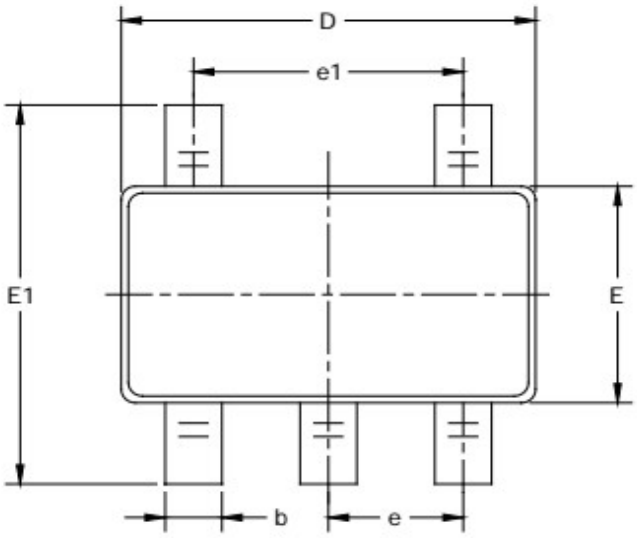


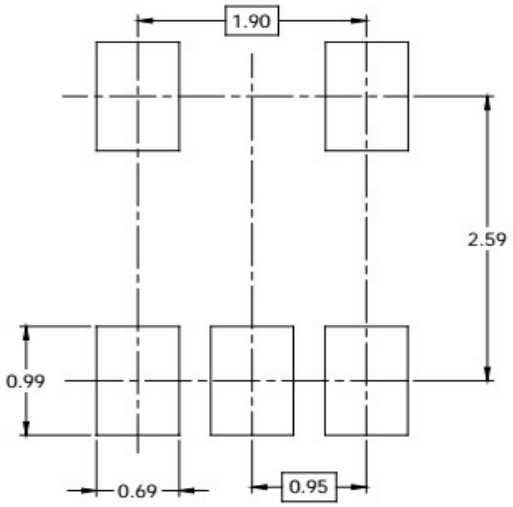
Figure 17. USB interface application of HCR2134

Mechanical Dimensions

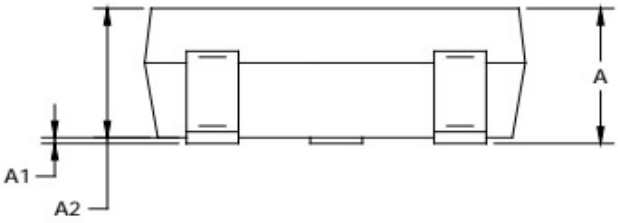
PKG:SOT-23-5 (M5)

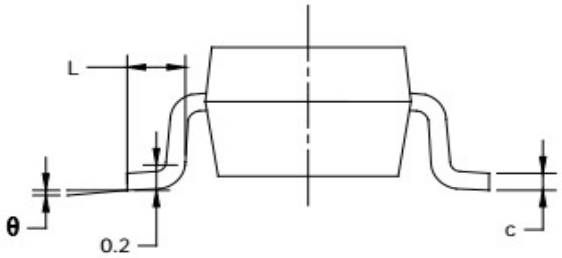
Unit: mm (inch)





RECOMMENDED LAND PATTERN (Unit: mm)

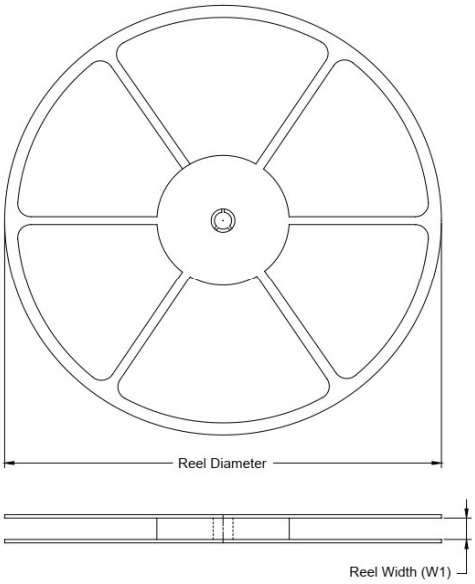




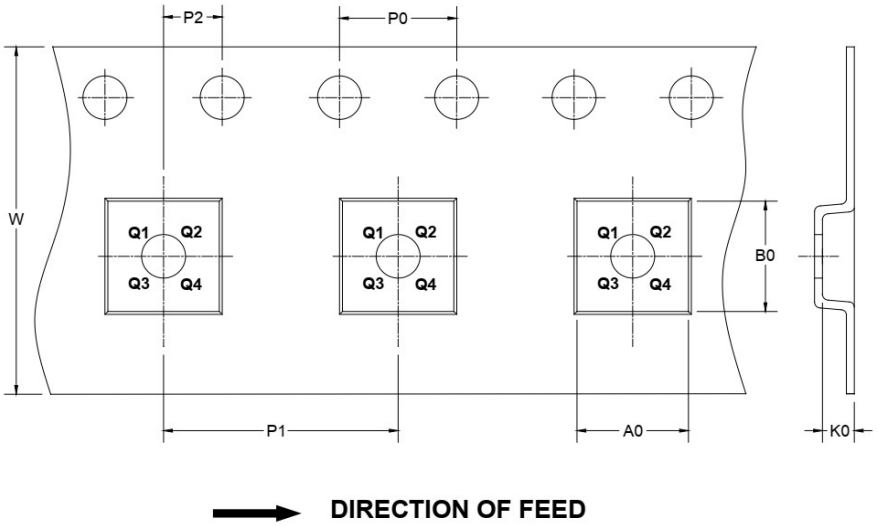
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

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
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3